ENERGY SAVING LIGHTING CONTROLS

Intelligent Lighting Controls, Inc.

For LightMaster Panels in Standard Network Applications

LIGHTMaster USER GUIDE

Includes setup, installation, programming, and application information for the ILC LightMaster lighting controller in ILC Standard Network applications

www.ilc-usa.com

For LightMaster
Panels in
Standard Network
Applications

LIGHTMaster

USER GUIDE

Version 2E-N
1/1/05

Standard Network 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 residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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Introduction

The LightMaster Programmable Lighting Controller is a microprocessor-based programmable lighting controller with LightSync™ network cabability (see Section 4). You can program each of the controller inputs to control any or all of the relay outputs. Individual controllers may be linked together to form a local area network (LAN) and function as a facility-wide lightng control system. The LightMaster is UL and FCC approved 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 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.
- the *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 and pilot 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.

Section 1 Controller Description

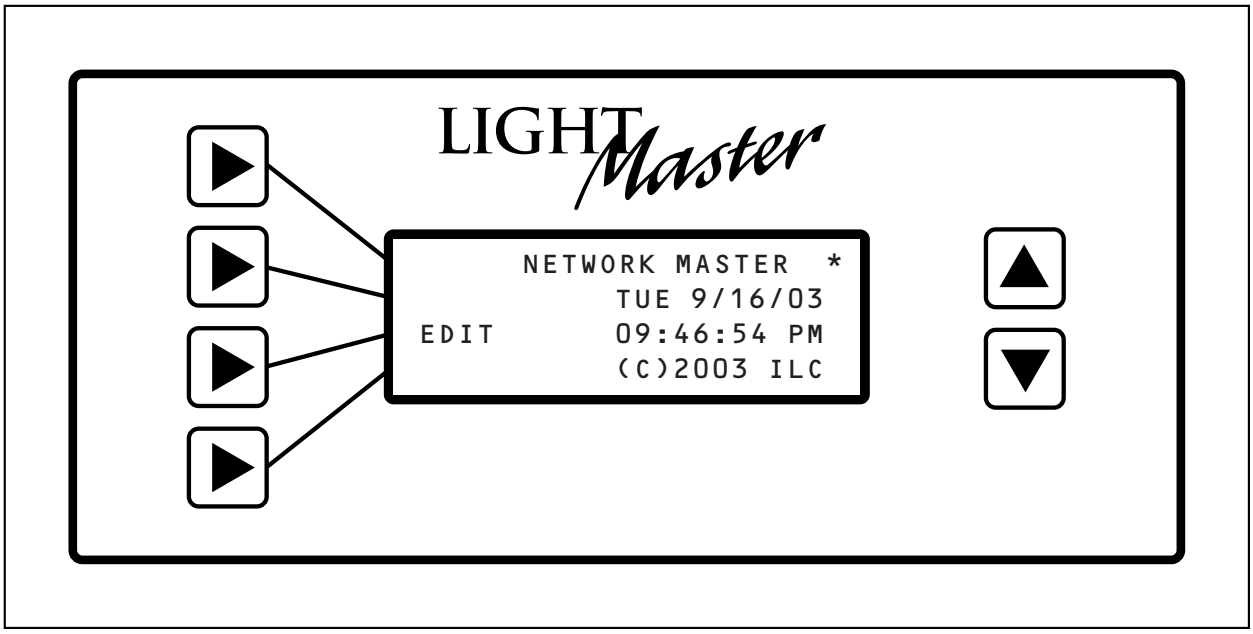
Section 2 Installation

Section 3 Programming

Section 4 LightSync Device Switching

Section 5 Appendix

Section 1
Controller Description



Section 1 Controller Description

Section 1 – Controller Description

Objectives

In this Section you will learn about the structure and configuration of the LightMaster Controller and how the individual controllers may be linked together to form a facility-wide integrated lighting control system.

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.

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 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

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.

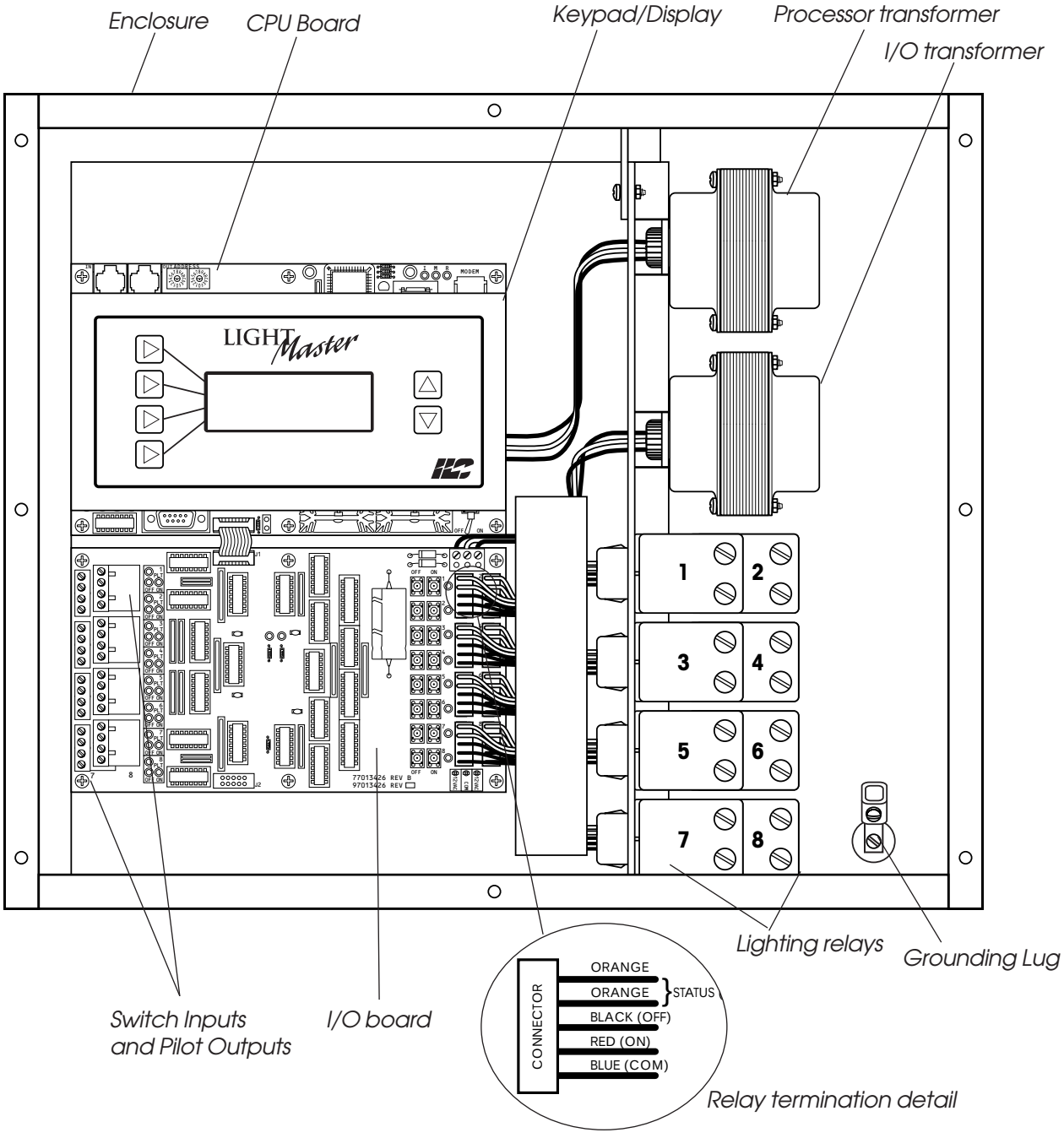


Figure 1.1 – LightMaster 8 Controller

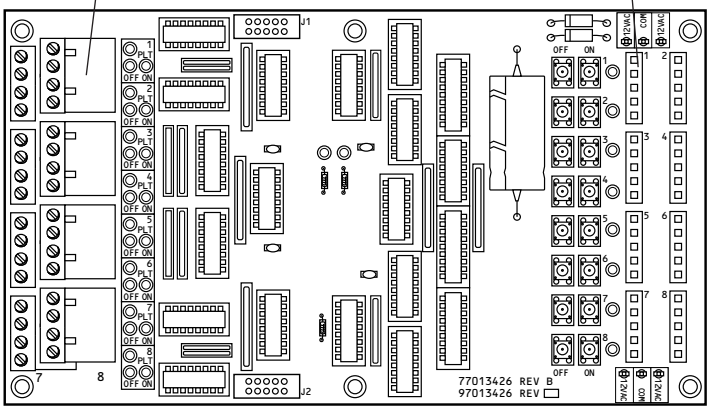
- *Micro-Processor* – executes the computer code and coordinates all controller functions including the controller real time clock.
- *PROM Chip* – contains the controller operating system and basic tasks.
- the *NVRAM Chips* – store the user-entered operating parameters.
- *Real time clock* – maintains 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 which can be programmed to track the state of a selected relay, relay group, or preset. See the Table 1.1 (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 lites 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.

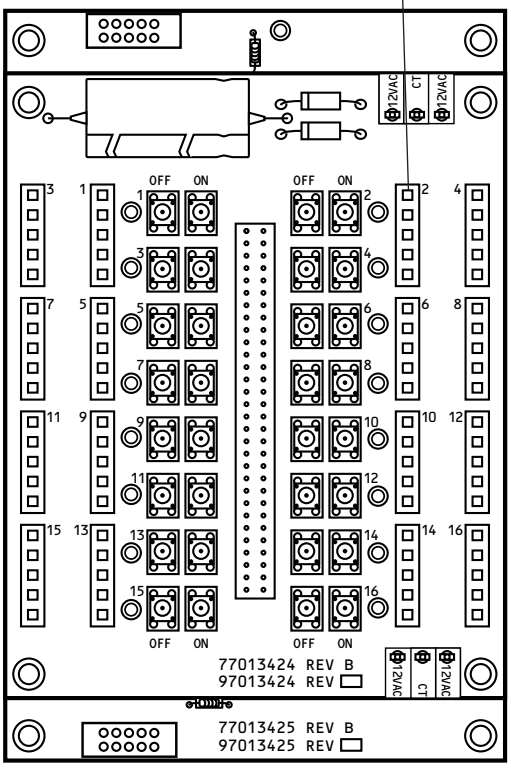
Switch inputs and pilot outputs (8 per board)

Relay outputs (8 per board)

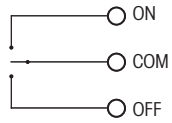
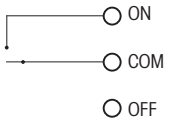
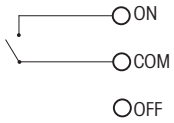
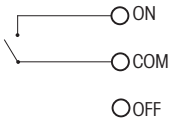
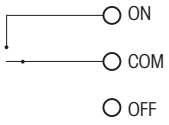
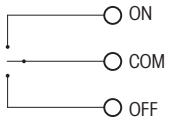
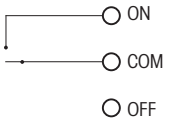
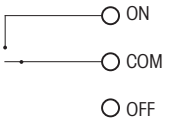
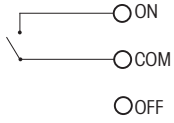
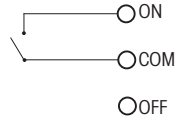
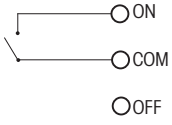
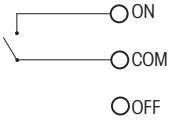
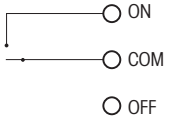
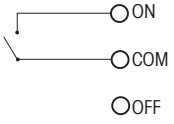
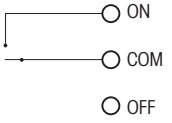
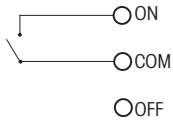
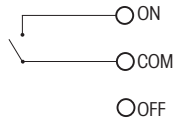
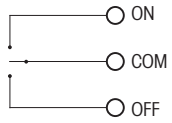


LightMaster Standard I/O board

Relay outputs (16 per board)



LightMaster Double sided I/O board

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.  MOMENTARY	***Momentary Push- Button:*** 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.  MOMENTARY	***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.  MAINTAINED	***Maintained Multi-Way:*** When contact is either made or broken between the 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.  MAINTAINED	***Set Preset:*** When momentary contact is made between ON and COM, the selected preset will be activated.  MOMENTARY	***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.  MOMENTARY
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.  MOMENTARY	***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.  MOMENTARY	***Input Disable:*** When contact is made between ON and COM, selected input or inputs will be ignored.  MAINTAINED	***Timer Disable:*** While contact is made between ON and COM, selected timer or timers will be ignored.  MAINTAINED	***Network Disable:*** While contact is made between ON and COM, all network commands will be ignored.  MAINTAINED	***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.**  MAINTAINED
Photo Sensor Inputs: LightMaster controllers can be connected to either momentary or maintained output photo sensors as shown below.  MOMENTARY Programmed as "Momentary"  MAINTAINED Programmed as "Maintained ON/OFF input"	***Motion Sensor Inputs:*** LightMaster controllers can be connected to either momentary or maintained output motion sensors as shown below.  MOMENTARY Programmed as "Momentary"  MAINTAINED Programmed as "Maintained ON/OFF input"	***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).  MAINTAINED Programmed as "Output Override input"	***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.	***Force Timer:*** A switch input can be mapped to force a LightMaster Timer activation.  MAINTAINED	***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.  MOMENTARY

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

Table 1.1 – LightMaster Switch Input Types

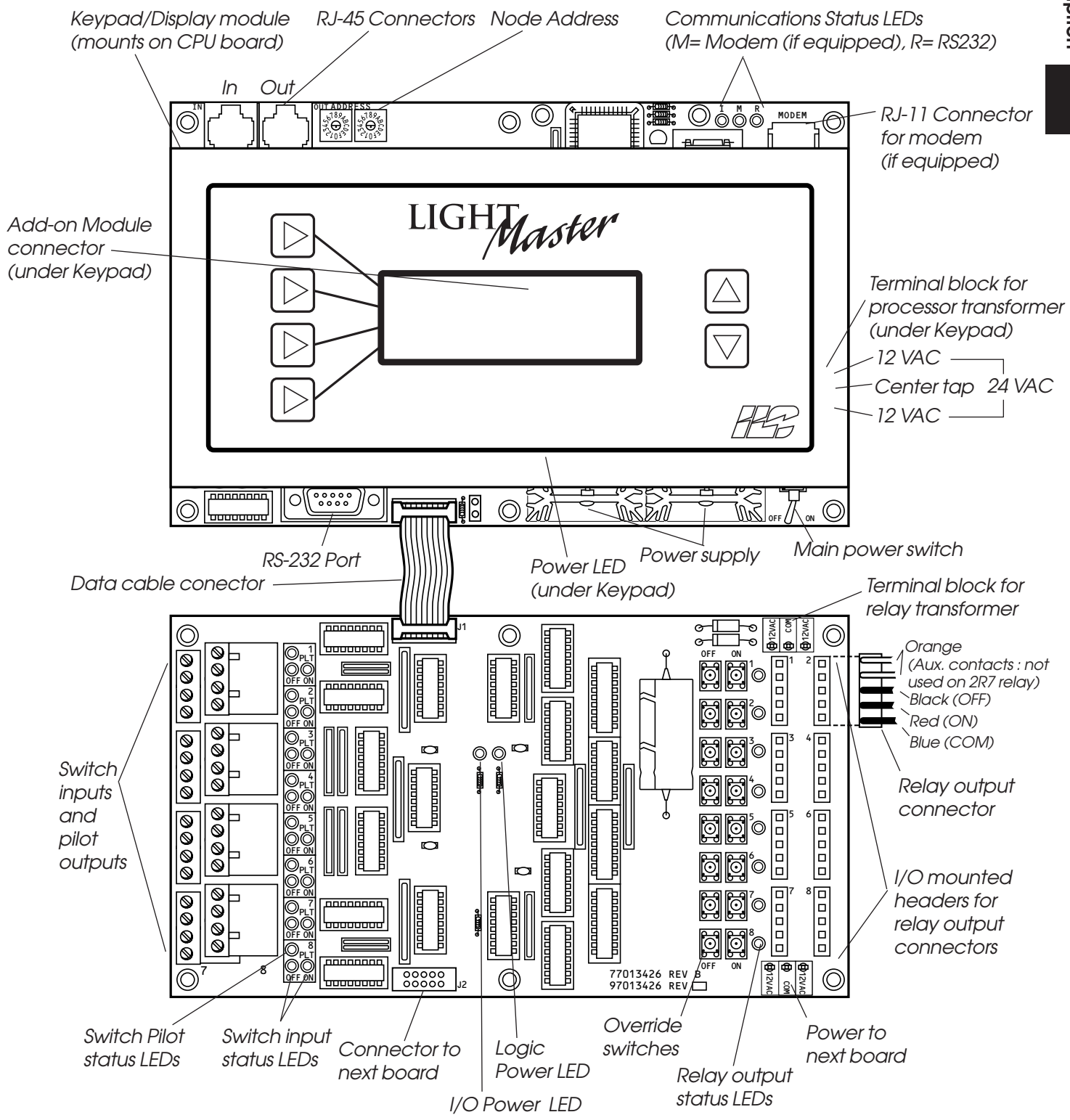


Figure 1.2 – CPU Board and I/O

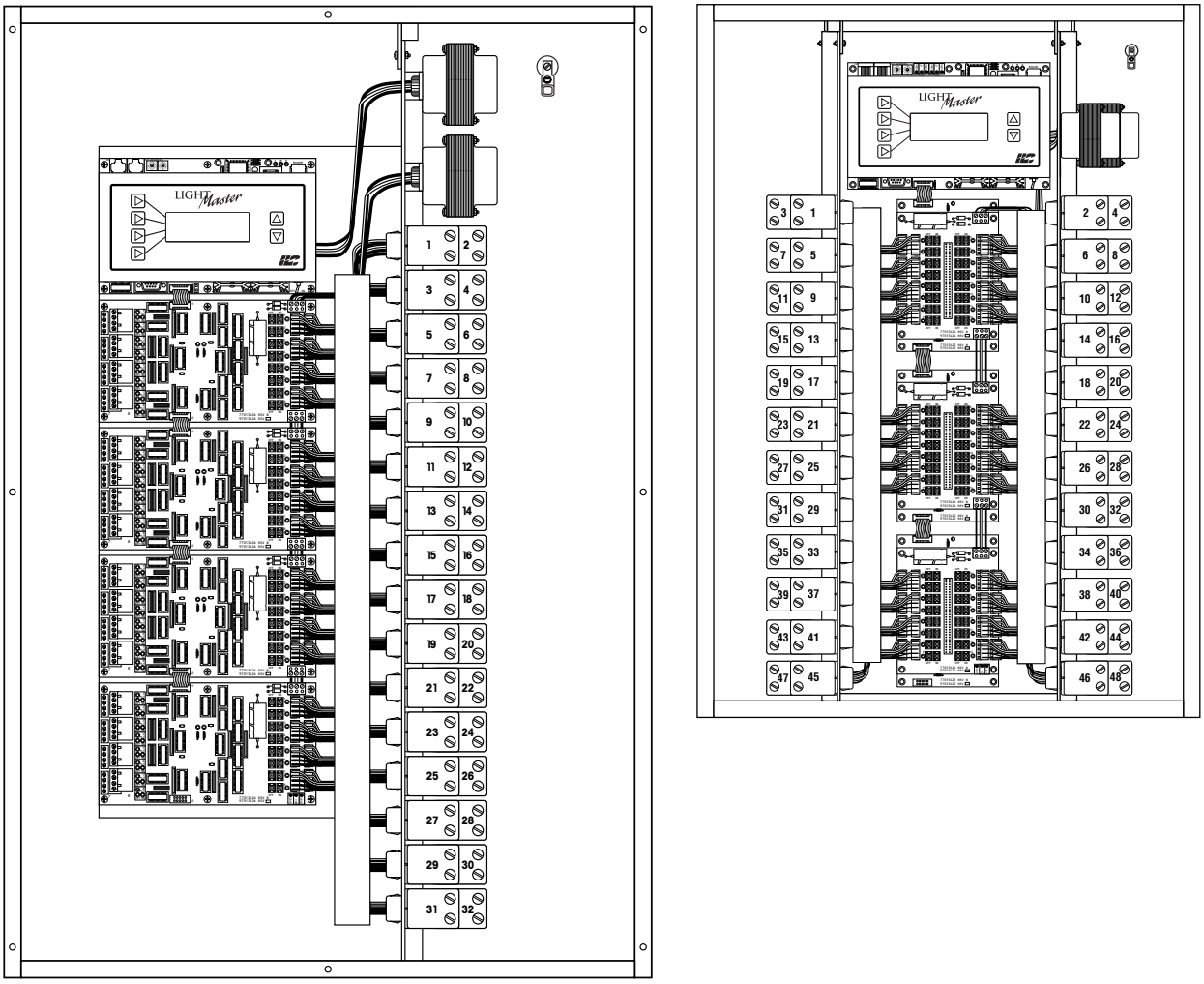


Figure 1.3 – LightMaster 32 and LightMaster 48DS

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.

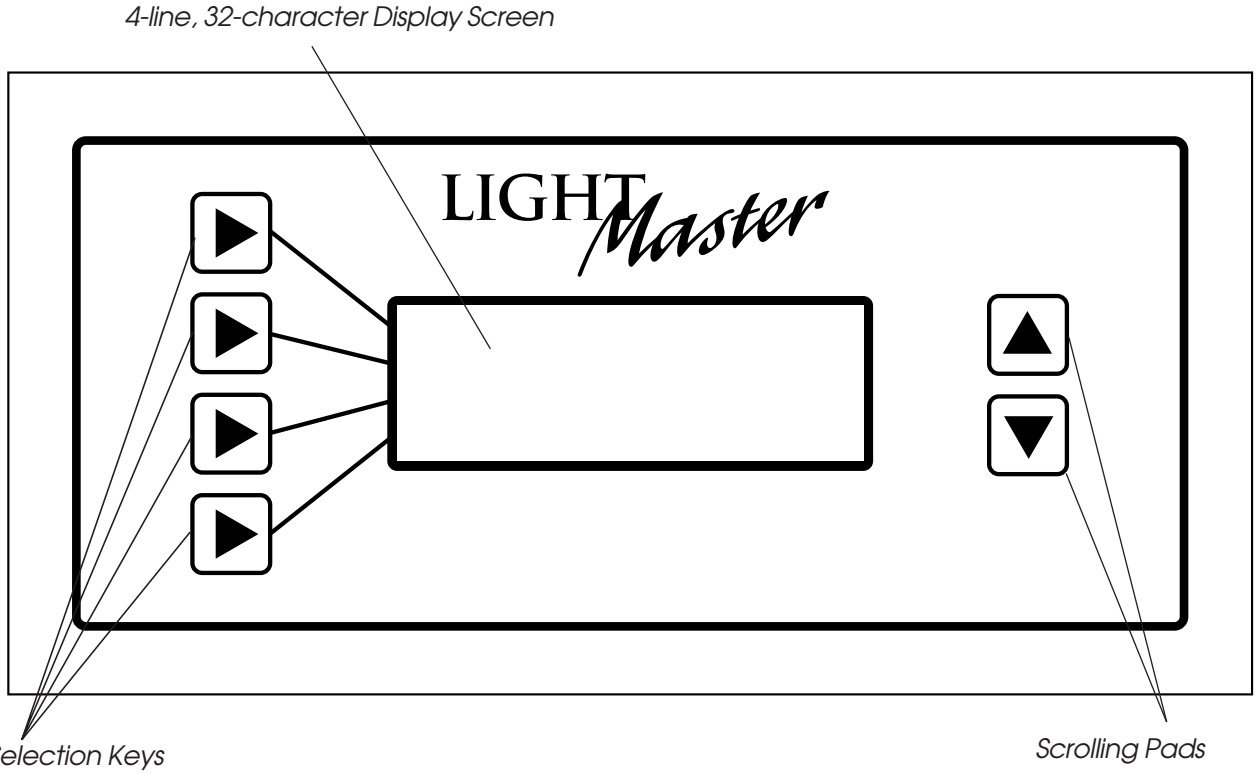


Figure 1.4 – LightMaster Keypad/Display

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 Lighting Controller Network

LightMaster controllers in a Standard Network are networked together in a Local Area Network (LAN) to form a comprehensive lighting control system for an entire faciltity.

1.3.1 Communications Protocol And Transmission Media – Devices that operate on ILC's LightSync CAT-5 data line include LightMaster lighting controllers, LightSync switches, photocells, and interfaces like the LightSync D-6 and SIB-4. A standard 24 gauge CAT-5 cable is used for the data line and provides both data and power to these devices. See Figure 1.5 which details cable specifications. The cable terminates to ports on each Lightmaster controller as shown in Figure 1.7. The total data line end to end distance may not exceed 3000 feet without the addition of a Power Supply Repeater (PSR) (See Figure 1.8) to the data line. Only a PSR will extend the data line. A PSR has one incoming and two outgoing RJ45 ports to split the line into two different directions. See Figure 1.8 for an example of possible project layout.

1.3.2 Network Architecture- Base System The base system can have a network of up to 32 Lightmaster controller Nodes. Each controller receives a unique controller node address. This is done via the address dials on the controller CPU board. (See Figure 1.7) The possible addresses range from 01-20.

The Master Controller which coordinates communications and data transmission and serves as the system programming mechanism must be addressed as Node 01.

You must address the Slave controller Nodes with individual and specific addresses (02, 03, etc.).

As an alternative to programming from the Master Controller Keypad, programming may be done from a personal computer (PC) equipped with proprietary networking software. See Appendix C for details.

1.3.3 Network Architecture- Expansion – It is possible to expand the base system to a network system of up to 127 nodes (address range 01-80) with the use of a network manager. A Power Supply Repeater (PSR) is required for each 32 Lightmaster controller nodes/3000 feet of Cat-5 network data cable and provide an additional OUT port to the CAT-5 network in the event a T-split is required in the cable run.

The network can also be front ended by a personal computer equipped with networking software. Consult Appendix C for details.

1.3.4 Device Nodes – Standard Networks also feature Device Nodes. These are data switches, photocells and other I/O devices connected to the CAT-5 data line. (See Figure 1.8). There can be a maximum of up to 127 device nodes in a the lighting control network.

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 Figure 1.6), depending on the application. The specific use of these devices depends on the project layout.

Each controller will power up to 8 device nodes without a Power Supply Repeater (PSR), Power Supply (PS) or LightSync Hub (HUB). Each of these will supply power to an additional 20 devices. If "T" connections are required, or if data needs to be extended, a PSR is necessary. A LightSync Hub (See Figure 1.9) provides "home run" wiring capability. Consult factory for details.

Each device node is addressed via address dials that are part of the device. *Possible addresses for device nodes are 01-7F. These are a different set of addresses from the controller node addresses.*

If your project features device nodes, consult Section 4 for details.

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, which 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	Contact Cassidey Technolgies (800 464 9473), manufacturer, or local distributor
General	2137113	CAT-5 non-plenum	
	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.

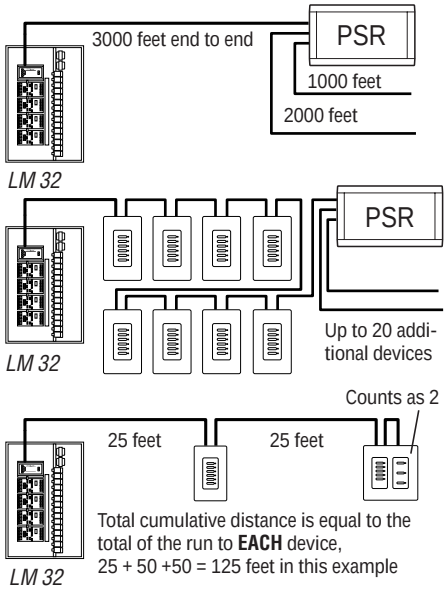
Figure 1.5 – Data Cable Requirements

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 Suppy (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

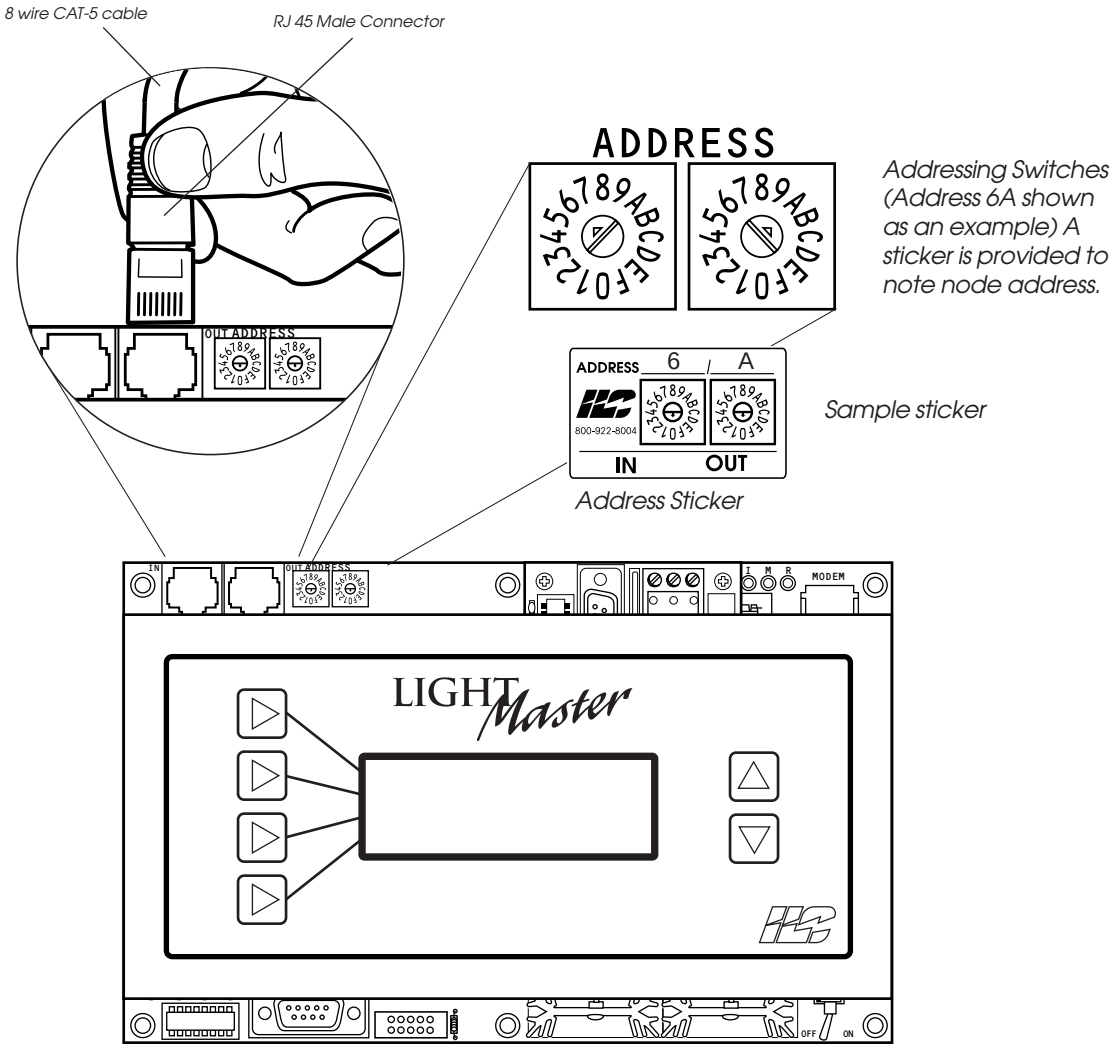
ILC Power and Data Repeating Devices

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 RJ45 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.

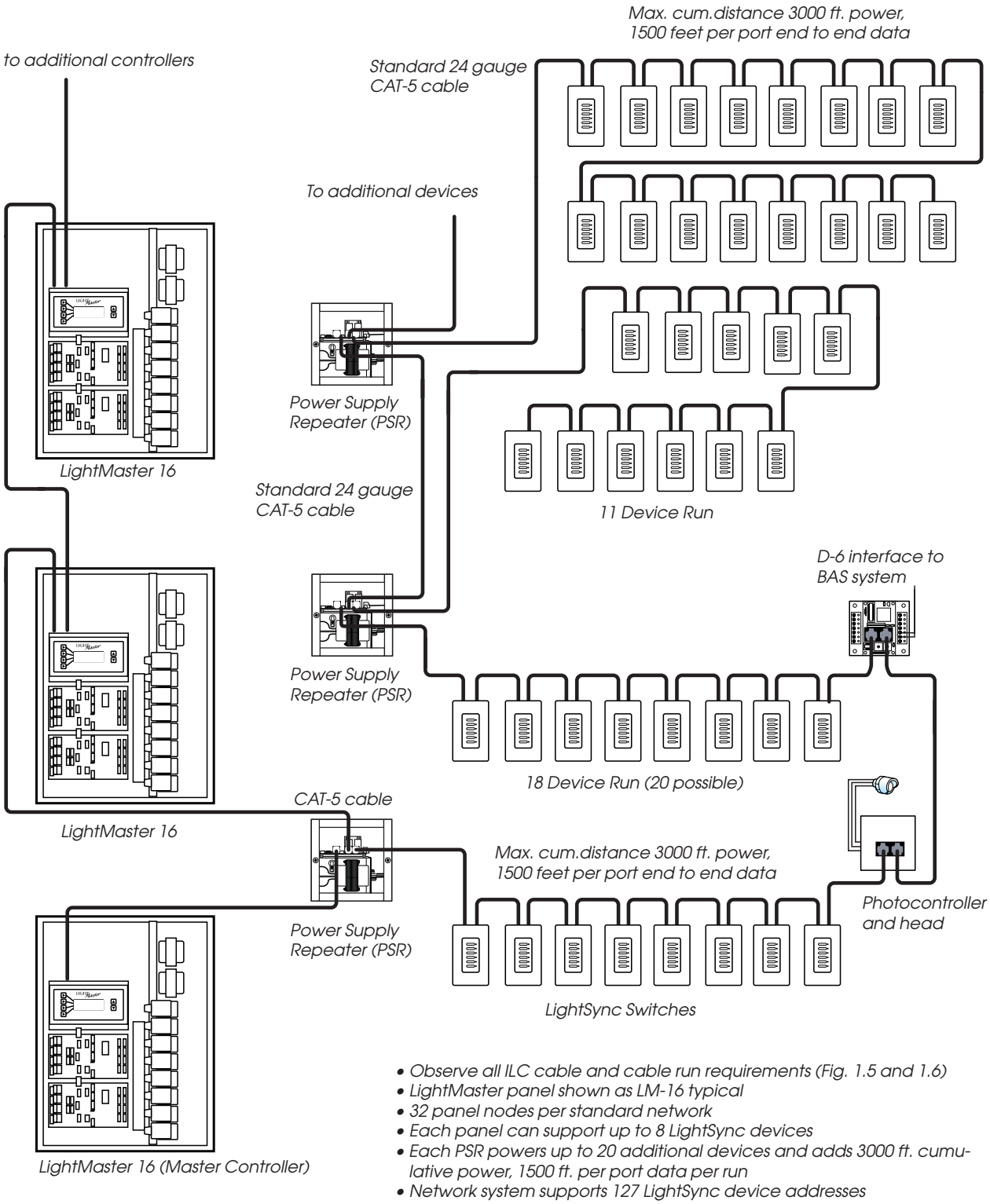
A **LightSync Hub** (HUB) is a device that allows a home run configuration by providing RJ45 ports for up to 20 LightSync devices, supplying power and data up to 1500 feet per each port.

Figure 1.6 – LightSync Network Cable Run Distance Detail



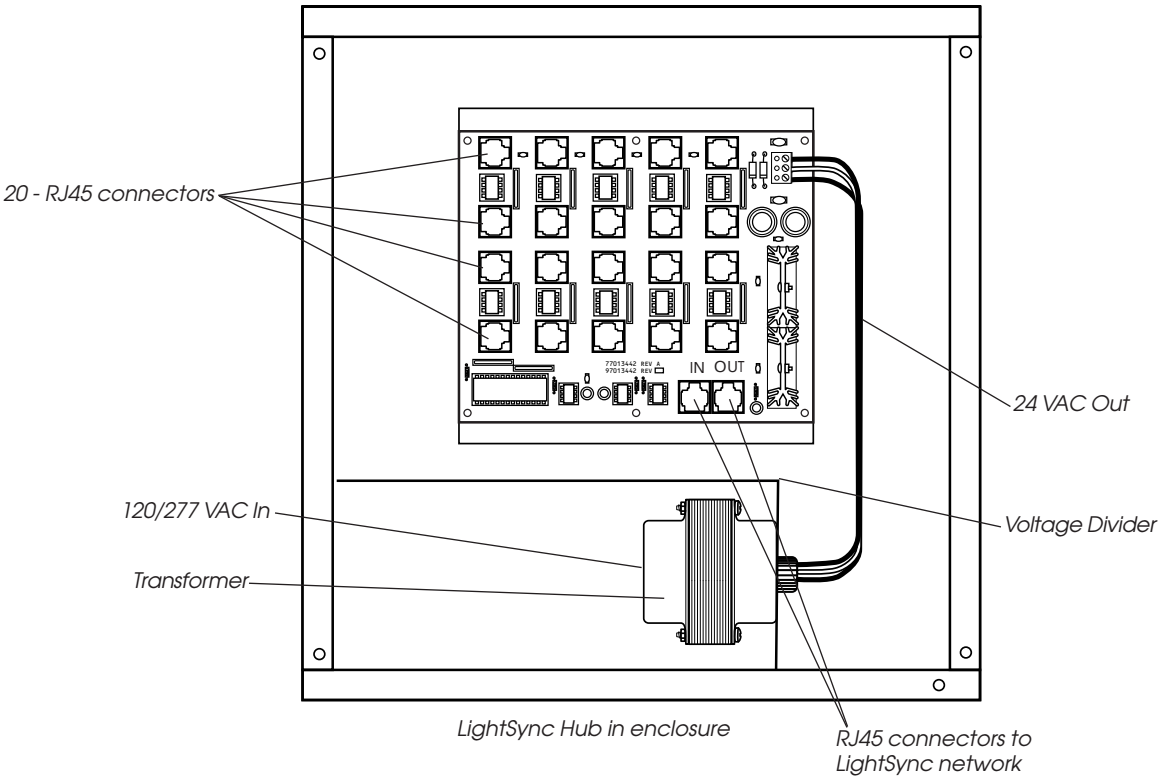
- Each networked LightMaster relay control panel must be given a unique 2-digit node address using the addressing switches noted above. Settings from 01 to 20 can be used to address up to 32 panels in a network.
- This 2-digit address code system is also used with LightSync data line devices.
- LightMaster panels and LightSync device addresses are unique.
- Document and record all node addresses on the supplied sticker for future reference (they will be needed for programming).

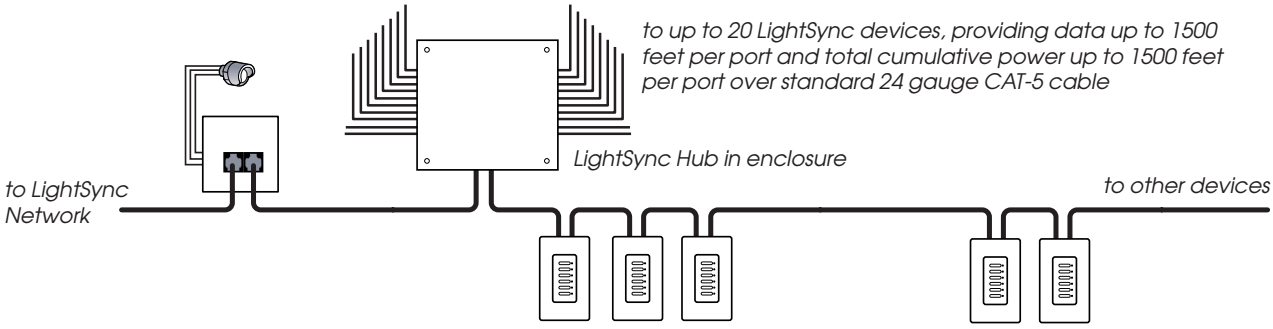
Figure 1.7 – CAT-5 Termination and Node Address Detail



- *Observe all ILC cable and cable run requirements (Fig. 1.5 and 1.6)*
- *LightMaster panel shown as LM-16 typical*
- *32 panel nodes per standard network*
- *Each panel can support up to 8 LightSync devices*
- *Each PSR powers up to 20 additional devices and adds 3000 ft. cumulative power, 1500 ft. per port data per run*
- *Network system supports 127 LightSync device addresses*

Figure 1.8 – Example Network Riser

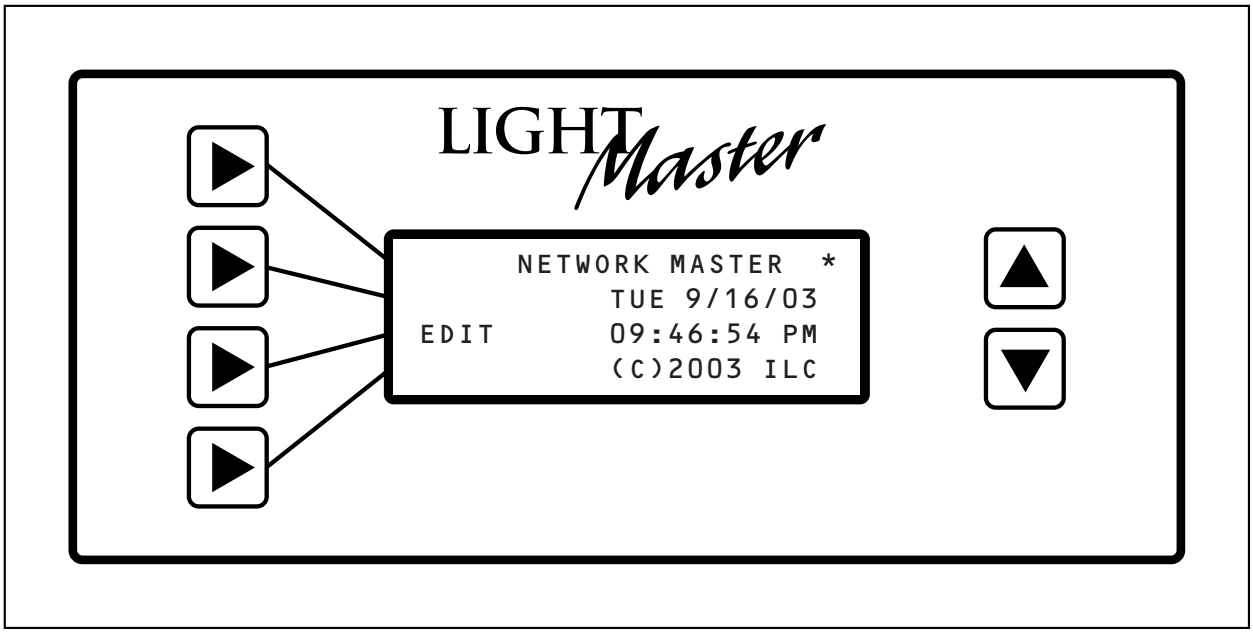




LightSync Network Example with LightSync Hub

Figure 1.9 – LightSync Hub Option

Section 2
Installation



Section 2 Installation

Objectives

This section shows you how to install **LightMaster** controllers and how to set up a LAN composed of multiple controllers.

NOTE: Consult Section 4 for information for installation of LightSync™ device nodes.

Overview

This section covers the following topics:

- Pre-installation checks
- Mounting the controller
- Wiring the controller
- Network installation issues
- 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. Determine the optimum network data cable routing and the number of controller device nodes. Observe all ILC cable and cable run distance requirements. See Section 1 for details.
3. Ensure that you have a digital multi-meter, CAT-5 crimp tool and CAT-5 cable tester.

2.2 Mounting the Controller

Consider the following when selecting a site for the LightMaster.

2.2.1 Location – Typically, the LightMaster controller is mounted near the lighting panel containing the circuits to be controlled by the lighting relays. The enclosure is manufactured with pre-drilled 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.

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.

2.2.2 Environmental Considerations – The LightMaster is designed to operate in temperatures between 0 and 50 degrees C (32°-112°F) and10%-90% humidity non-condensing.

2.2.3 Distance From Control Devices – See Sections 1 and 4 for LightSync requirements. Direct wired switches and pilots may be located up to 1500 ft. from the controller using 18GA 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 any unused leads. (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. (See Figure 2.1.)

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. NOTE: Must **NOT** be run in with high voltage wiring. 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.

2.4 Install Network Cable

1. Run the cable between nodes. If PSRs are required, ensure they are powered.
2. Install RJ-45 male connectors to the cable ends for each node run. See Figure 2.1a.
3. Verify the integrity of each run with the CAT-5 cable tester.
4. Set the node address for each controller. (See Figure 1.7)

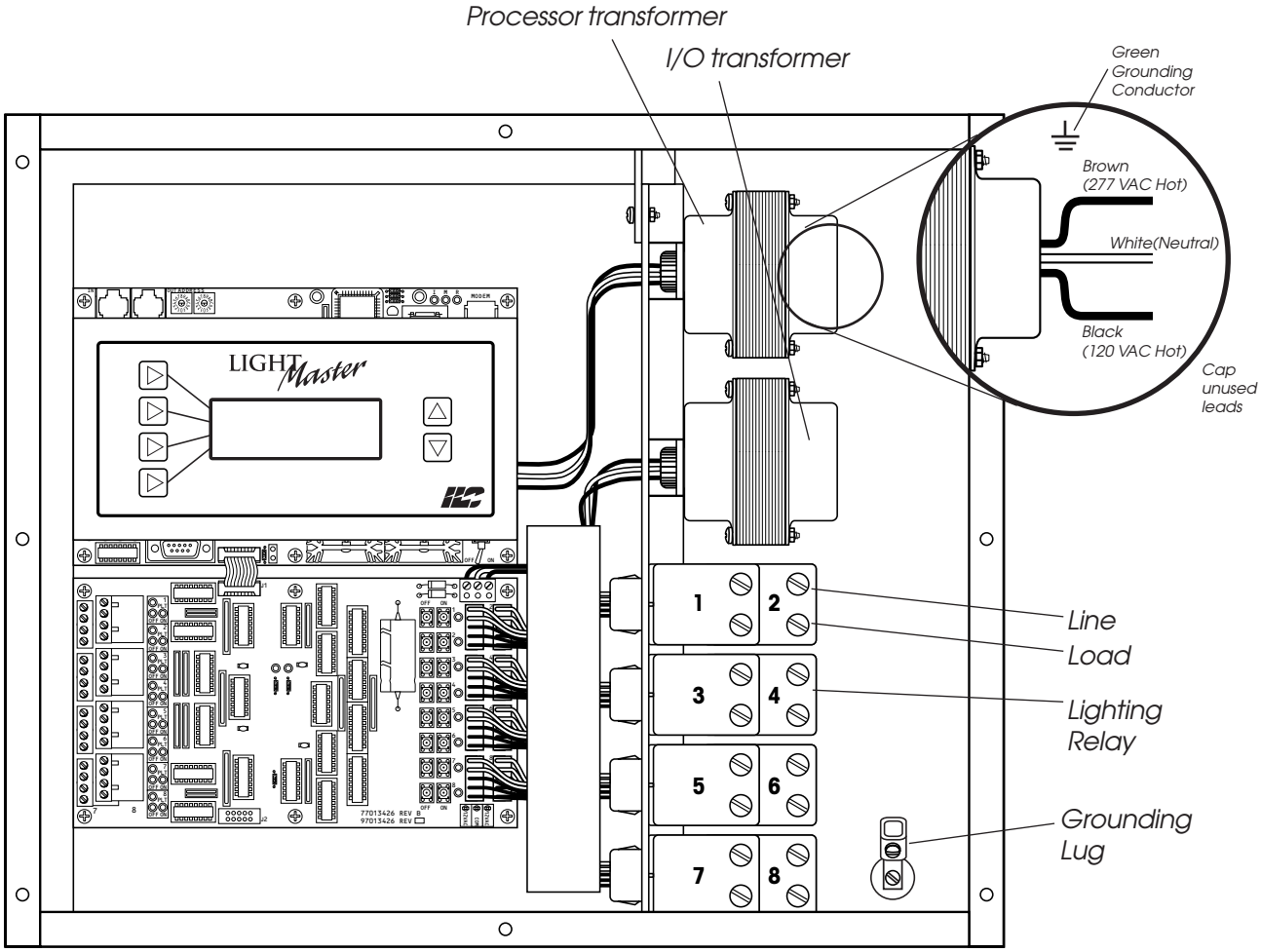


Figure 2.1 – Terminate Line to Control Transformer Primaries

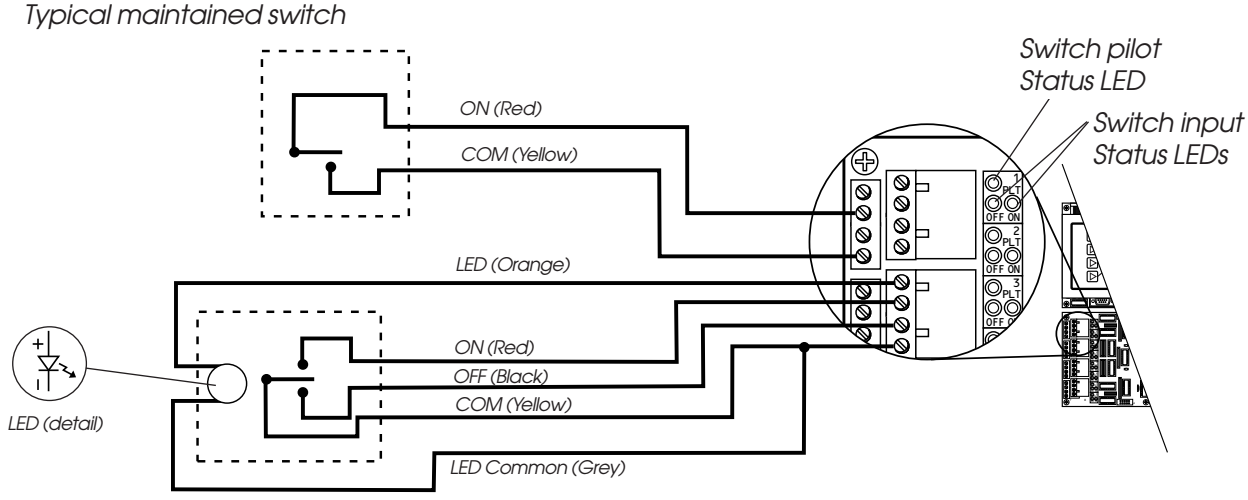


Figure 2.2 – Wire Class 2 Switch Circuits

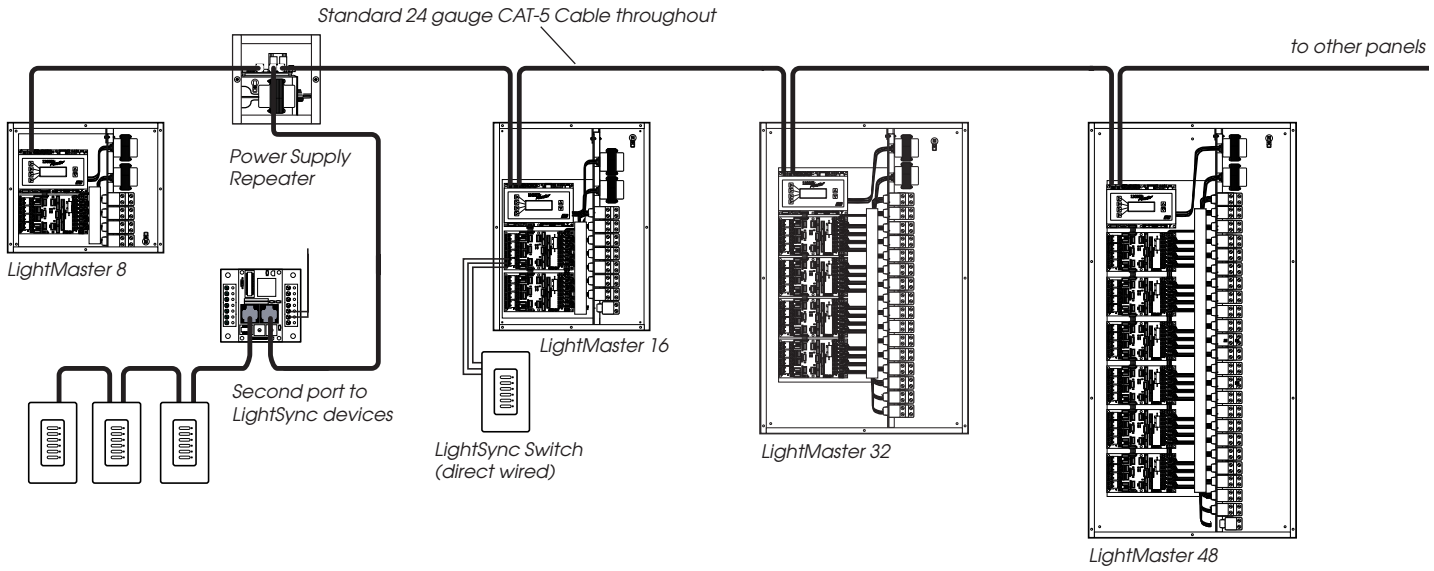


Figure 2.3 – LightMaster Network Example

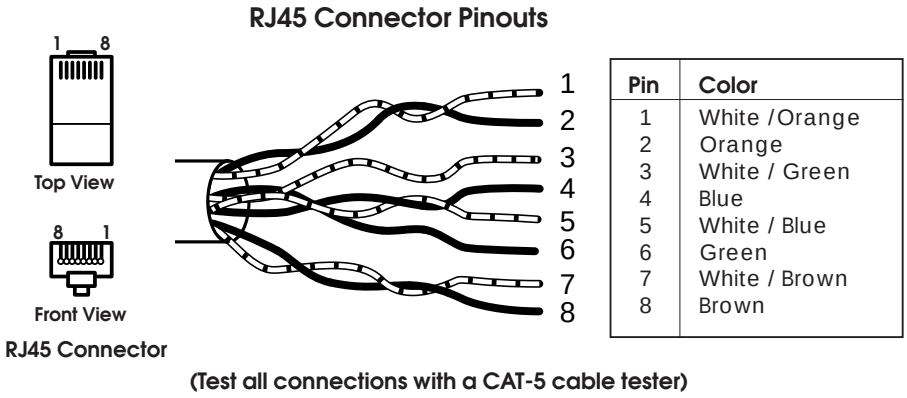


Figure 2.4 – Cable Termination Detail

2.5 Pre-Power Checks

Complete the following checks BEFORE applying power to the **LightMaster** controller.

2.5.1 Check Controller Power Input

1. Verify that the controller power switch is OFF.
2. After verifying that the processor and I/O transformers 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.

2.5.2 Verify Controller's Supply Voltage

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

2.5.3 Double-Check Connections

1. Verify integrity of I/O connections.
2. Verify integrity of all internal and external wire/cabling.

2.5.4 External Monitoring and Control

If control of the LightMaster via a PC is desired, consult Appendix B, or C for instructions regarding the approriate port (on-board modem, RS 232). If controlling via on-board modem, a telephone cord should be used to connect to the telephone network that is compliant to FCC part 68 rules and regulations.

2.6 Power-Up and Check Out

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

2.6.1 Power-Up the Controller

1. Turn the power switch located on each controller CPU board ON. (See Figure 1.2.) NOTE: Power-up the Node 01 Controller last.
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.)

2.6.2 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 1.2.) 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.

2.6.3 Perform Initial Programming Procedures from the Main Controller Keypad

(See Section 3.)

NOTE: Conduct all programming operations from the Master Controller.

1. Clear memory: From the home screen, press EDIT, then EDIT SYSTEM. Scroll down until SPECIAL FUNCTIONS appears. In the SPECIAL FUNCTIONS menu press the up and down arrows at the same time for 5 seconds to clear memory in the entire network.
2. Set the correct date and time on the master controller. (See Section 3.11.)
3. Verify that the network is operational by accessing each controller node, determining its type (number of I/O points) and turning a relay in each node ON and OFF from the Master Controller Keypad (See Section 3).
4. Program the switch inputs and timers.

2.6.4 Verify the Switching Function

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

2.6.5 Verify the Timer Functions

1. Temporarily adjust the Master Controller clock and verify that the relays respond to the timers as programmed.
2. Reset the Master Controller clock to the correct date and time.

2.7 Troubleshooting

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

2.7.1 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 all the power LEDs on the CPU and I/O boards are 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.

2.7.2 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 lighting control 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 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.

2.7.3 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 probably 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 Page 3-19). Also the outputs of the I/O board(s)s can be tested through the keypad. Relays can be forced individually or all swept ON or OFF using the keypad (See Page 3-13).
8. If the switch input or affected relay does not respond (or no response is viewed through the keypad), consult the factory.

2.7.4 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.

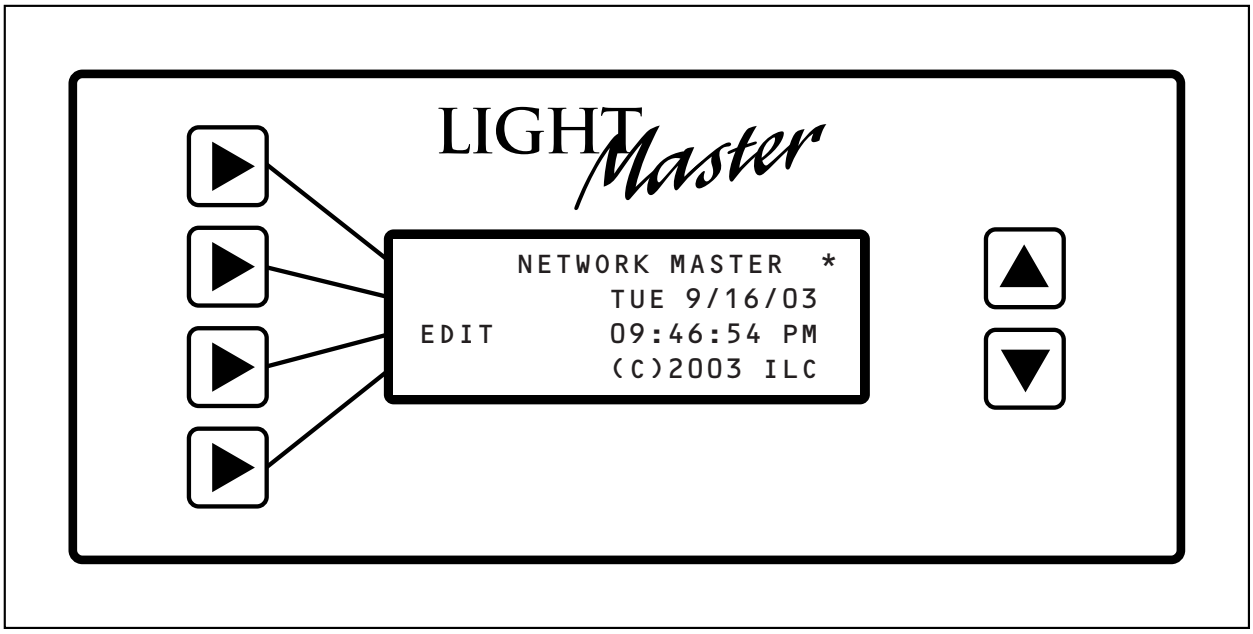
2.7.5 Entire I/O Board(s) Doesn't Work

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 expansion 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 Page 3-13).
4. If the I/O board is not recognized by the CPU, consult the factory.

2.7.6 No Communication with Nodes

1. Verify the affected node is powered up.
2. Check that the node address is properly set.
3. Verify the integrity of the CAT-5 cable and connections with a CAT-5 cable tester.

Section 3
Programming



Section 3 Programming

3.0 Overview

In this section you will learn how to program a **LightMaster** controller network.

Conventions/Definitions

Actual key strokes/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 the figure below.)

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.

Three other terms used are Network Home screen, Network Menu, and Node Home screen. The Network Home Screen is the top level screen of the controller network . It features the system date and the time. (See Figure 3.1) The master controller displays this screen on power-up and at times when you are not programming or checking input/output status. The Network Main Menu appears when you press ▶ EDIT from the Network Home Screen. This screen serves as the gateway to either programming at the system or the node level. (See Figure 3.2) The Node Home Screen is the top level screen of each of the individual controllers making up the network. It features the controller name, and the system date and time (set and synchronized from the master controller). Each controller node displays this screen on power-up and at times when you are not programming or checking input/output status. (See Figure 3.3)

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.


```
      NETWORK MASTER  *
           TUE 9/16/03
EDIT       09:46:54 PM
           (C)2003 ILC
```

Figure 3.1 - Network Home Screen

```
EDIT SYSTEM
EDIT NODES
SYNCHRONIZE SETTINGS
EXIT
```

Figure 3.2 - Network Menu

```
     LM NETWORK NODE 01
           TUE 09/16/03
EDIT        09:46:55 AM
EXIT        (C)2003 ILC
```

Figure 3.3 - Node Home Screen

Basic Concepts

To program a network of Lightmaster controllers you must enter parameters at both the system and the individual node level. See Figures 3-6 and 3-7 to view the screen flow and top level menu choices for these levels. Generally speaking you enter time dependent and group parameters at the system level and individual input/output parameters at the individual node level. See Figure 3.5 for a graphic representation of the level at where various programming operations take place.

In some cases to achieve a functional objective (for example) controlling a relay with a timer you will need to enter parameters at both the system and individual node level.(See Table 3.1 for a quick reference on the level required to implement control objectives.)

NOTE: All programming should be done from the master controller (Node 01). Following certain parameter entries, the master will automatically synchronize the network settings. The message shown in figure 3-4 will be displayed. (Certain I/O parameters may be programmed at the slave controllers but this will necessitate synchronizing the system from the master.)

3.1 Sequence of Programming

1. Enter the system level parameters starting with the time and date. (See Section 3.11.)
2. Beginning with the master node 01, enter the node level parameters. Start first by defining the node type (number of controller I/O points). (See Section 3.4.)

```
SYNCHRONIZING DATA
  ON THE NETWORK
...PLEASE WAIT...
```

Figure 3.4 - Data Sync Message

LightMaster V.6 Firmware Menu Tree

START HERE

Main Menu Choices
- Edit System
- Edit Node
- Synchronize Settings

EDIT SYSTEM Functions
- Group Control
- LightSync Settings
- Timer Settings
- Set Times
- Capture Presets
- Special Functions

EDIT NODE Functions
- Relay Outputs
- Switch Inputs
- Switch Pilots
- Timers
- Set Times
- Presets
- Add-on Modules
- Special Functions

Group Control
- Turn Defined Relay Groups ON or OFF

LightSync Settings
- View LightSync Node Status
- Configure LightSync Node Characteristics
- Define LightSync Pilot Characteristics

Timer Settings
- Configure Timers
- Define Timer/Relay Group Control
- Define Timer/Preset Control
- Set Blink Alert, Override, and Alarm Times

Set Times
- Set System Time/Date
- Daylight Savings
- Astro Clock
- Open/Close Times
- Off Hours Sweeps
- Interval and Groups

Capture Presets
- Capture and Set Presets

Special Functions
- Edit Group, Timer, Preset & LightSync Names
- Change Password
- Change Photocell Filter

Relay Outputs
- View Relay Status
- Configure Relay Options (Blink, Power Up, etc.
- Define Relay Groups

Switch Inputs
- Local (Hardwired) Inputs: Status, Switch Type Definition, Input/Relay Control, Input/Group Control
- Network (Global) Inputs: Input/Relay Control
- LightSync Inputs: Input/Relay Control

Switch Pilots
- Hardwired Switch Pilot Configuration

Timers
- Define Timer/Relay Control
- View Timers
- View Blink Alert, Override, Alarm Times

Set Times
- VIEW: Time/Date, Daylight Savings, Astro Clock, Open/Close Times
- DEFINE: Individual Relay Output Off Hour Sweeps, Input Active Times

Presets
- Edit Presets

Add-on Module
- Used with optional cards: DMX, etc.

Special Functions
- EDIT:
  – Panel, Relay, Input Names
  – Access to Hidden Functions

Figure 3.5

Operation	Programming Level
Set the System Clock	Program at the system level
Control a Relay Group or Preset w/ a Timer	Define timer and timer to group or preset control at the system level. Define the relay group or edit the preset at the node level
Control a Relay w/ a Timer	Define timer at system level. Define timer to relay control at the node level
Control a Relay with a hardwired switch	Define the input and input/relay control at the node level
Control a Relay with a Lightsync switch	Define the Lightsync node at the system level. Program input/relay control at the node level
Control a Relay Group with a hardwired switch	Define the input, input to relay control, and relay group at the node level
Control a Relay Group with a Lightsync Switch	Define the Lightsync node and input/group control at the system level. Define the relay group at the node level.
Work w/Presets	Capture and set presets at the system level. Edit presets at the node level
Program Astro Clock	Enter Astro parameters at the system level
Program Open/Close Times	Define open/close times at the system level
Program Off Hours Group Sweeps	Define Off hours relay group sweeps at system level
Program Off Hours Relay Sweeps	Define Off hours individual relay sweeps at the node level
Program Lightsync Switch Pilots	Define Lightsync switch pilots at the system level
Program hardwired switch pilots	Define hardwired switch pilots at the node level
Program Input Active Times	Define Input active times at the node level
Program blink alert, override, and alarm times	Configure these parameters at the system level
Program relay option parameters	Program blink, HID delay, power up state etc. at the node level
Control relay groups ON/OFF from the Master Controller keypad	Perform this operation at the system level.
Control or Sweep Individual relays ON/OFF from the Master controller keypad	Perform this function at the node level
Edit Names of Groups, Presets, Timers & Lightsync Nodes	Customize names of these entities at the system level
Edit Names of Panels, Relays, and Inputs	Customize names of these entities at the node level
Change the Photocell Filter	Perform this operation at the system level
Define the Controller Type (number of I/O Points)	Perform this operation at the node level
View Controller Firmware Revision and gain access to "Hidden Functions" (Cear Memory, COM Monitor, Relay Drive)	Access these features at the node level
View Lightsync Node Status	Perform at the system level
View timers, hardwired inputs, relays	Perform at the node level

Table 3.1 – Quick Reference Programming Level for Major Operations

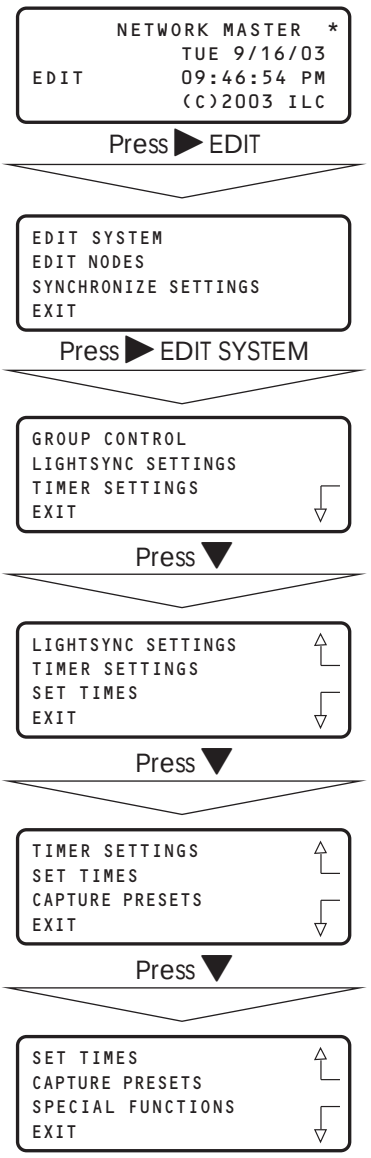


Figure 3-6 System Level Screen Flow - Main Menu Choices

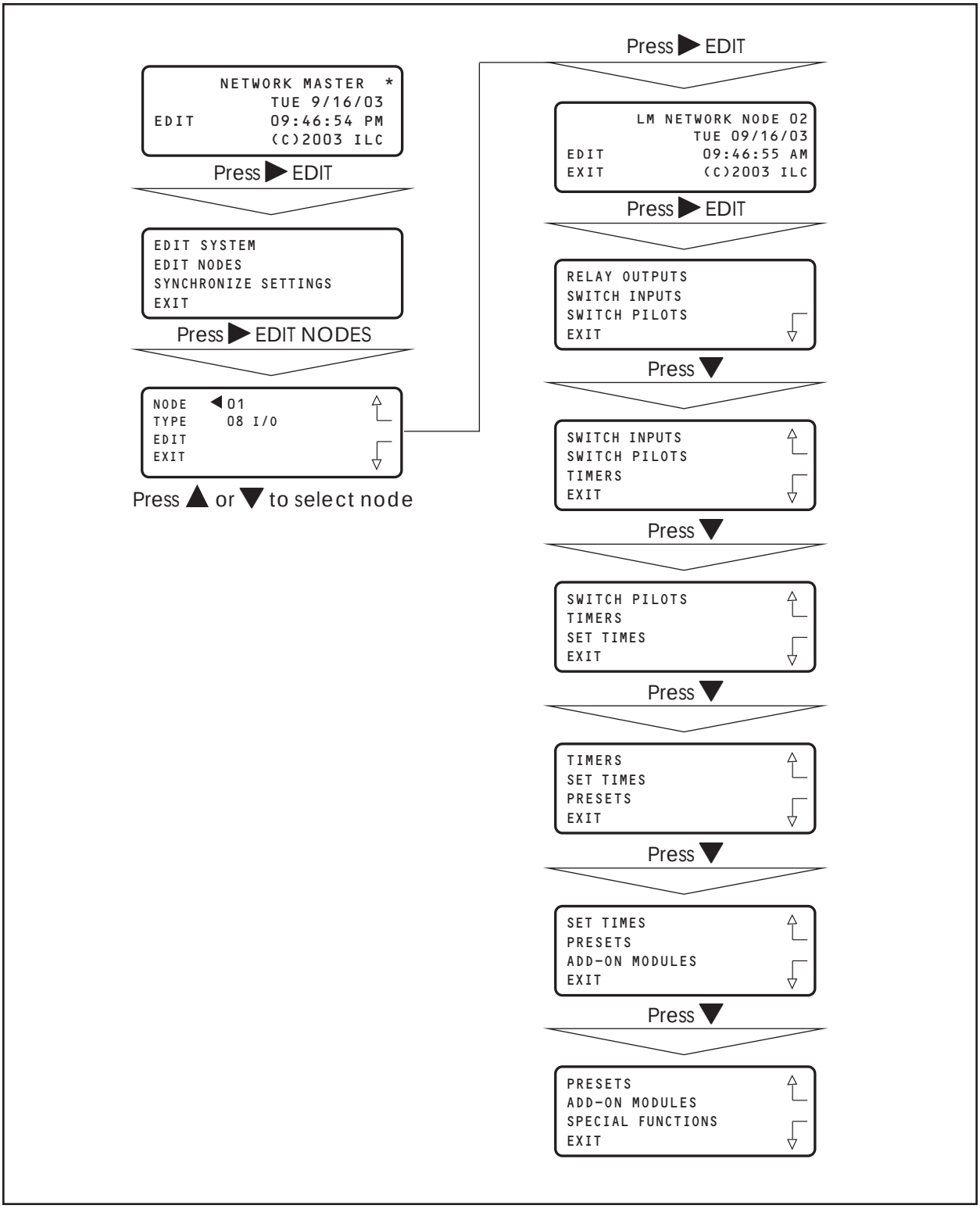


Figure 3-7 Node Level Screen Flow-Main Menu Choices

3.2 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.

3.3 How To Access The System Main Menu

1. From the Network Home screen, press ▶ EDIT.
2. When the Network menu appears, press ▶ EDIT SYSTEM. The System Main menu will appear.

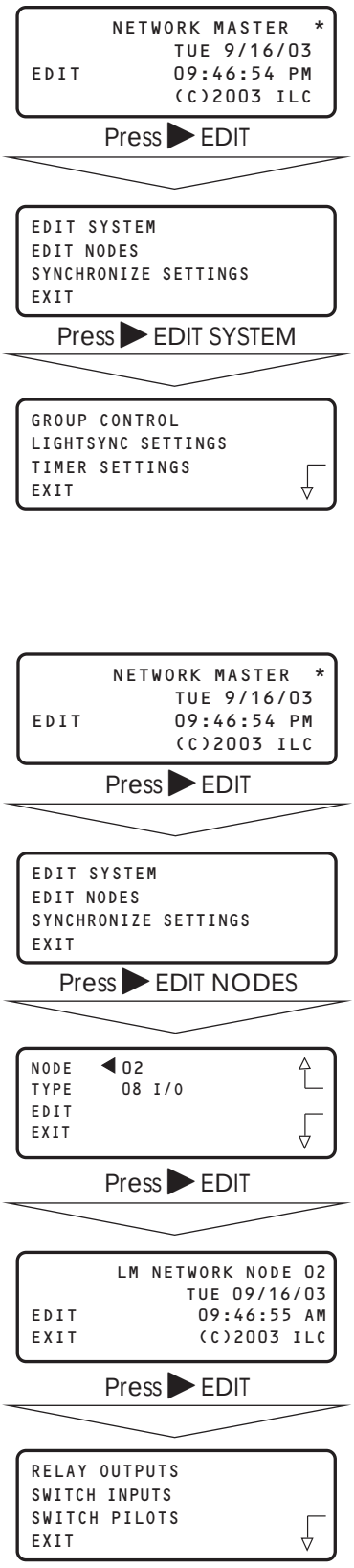
3.4 How To Access The Node Home Screens

1. From the Network Home screen, press ▶ EDIT.
2. When the Network Menu appears, press ▶ EDIT NODES. The Node Selection will appear.
3. Press ▲ or ▼ to select the node you want to access.
4. If you have not accessed the node before, press ▶ TYPE; then ▲ or ▼ to configure the node I/O characteristics.
5. Press ▶ EDIT ; the Node Main menu will appear.

3.5 "Hidden" Menu Choices

Each Node Features a "Hidden menu accessed from the FIRMWARE REVISION screen. There are two operations you can perform from the "Hidden": Menu: CLEAR MEMORY. allows you to clear the programmed memory that has been entered in the node and resets the parameters to their default value. The second operation concerns changing the relay output pulse duration.

Clearing memory in the entire network can be accomplished by pressing ▶ EDIT, then ▶ EDIT SYSTEM, then press ▶ SPECIAL FUNCTIONS, then ▲ or ▼ together for 5 seconds. Press ▶ CLEAR MEMORY,



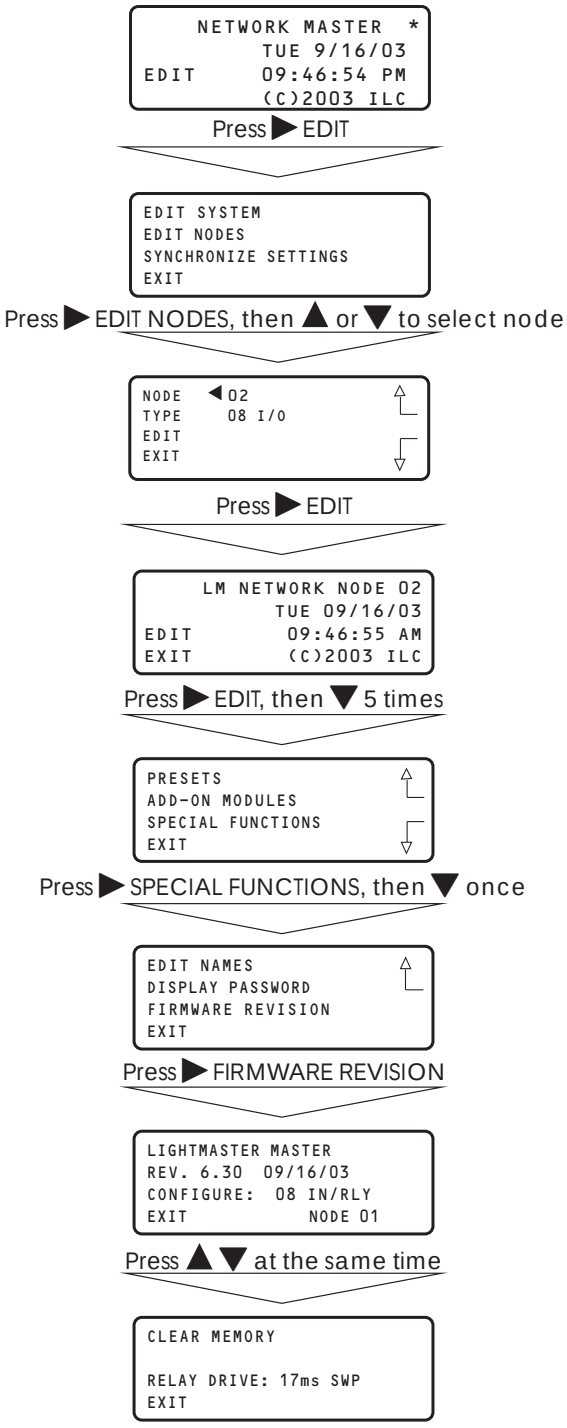


Figure 3-8 Hidden Access Screens

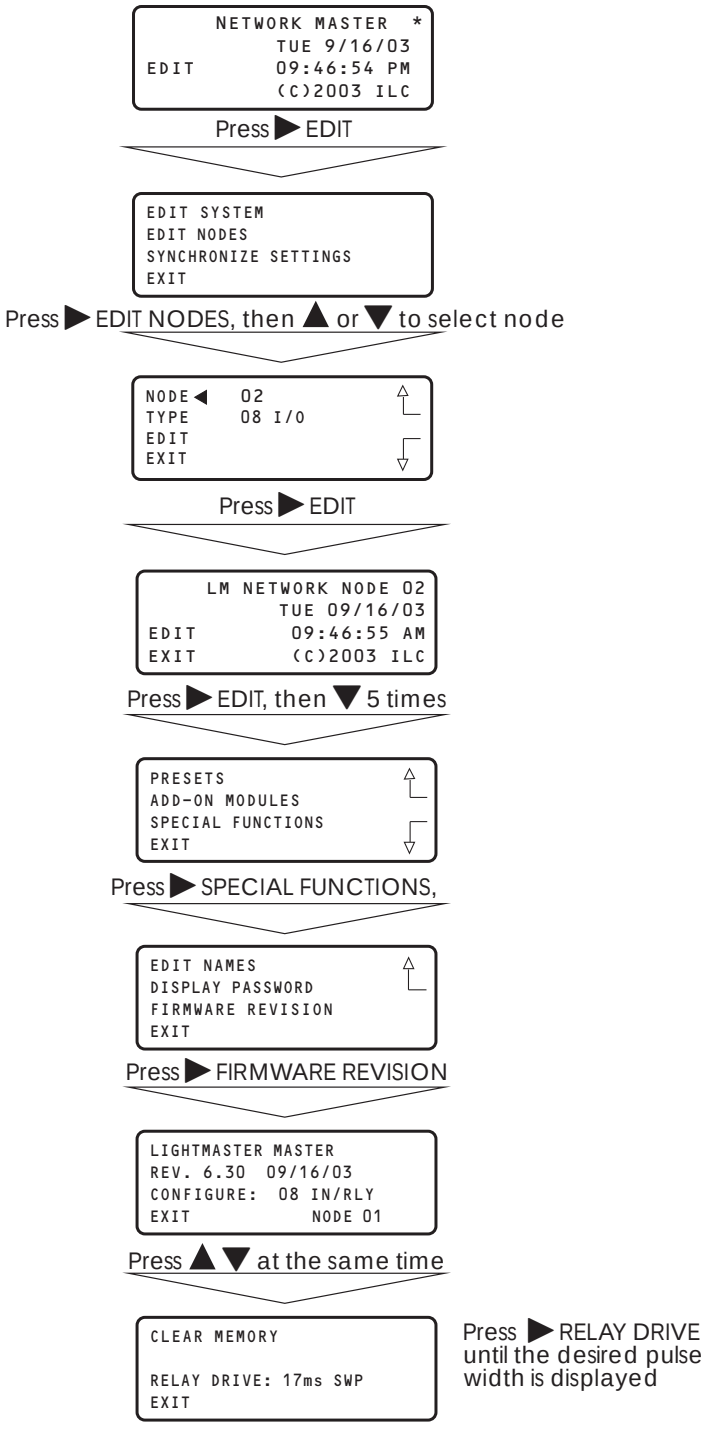


Figure 3-9 Setting Relay Pulse Width Screens

3.6 How to Change the Relay Pulse

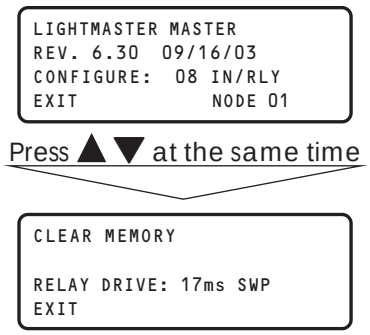
DURATION CONCEPTS AND PARAMETERS

This operation is programmed at the node level.

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, 50 ms sweep pulse for each relay in succession, 17ms pulse with instant ON/OFF for all the relays, and 50 ms instant ON/OFF for all the relays.

SAMPLE OPERATION:
Change the Relay Output pulse to 50ms SWP

1. From the Node 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 to leave the Hidden Menu Screen and return to the Home Screen



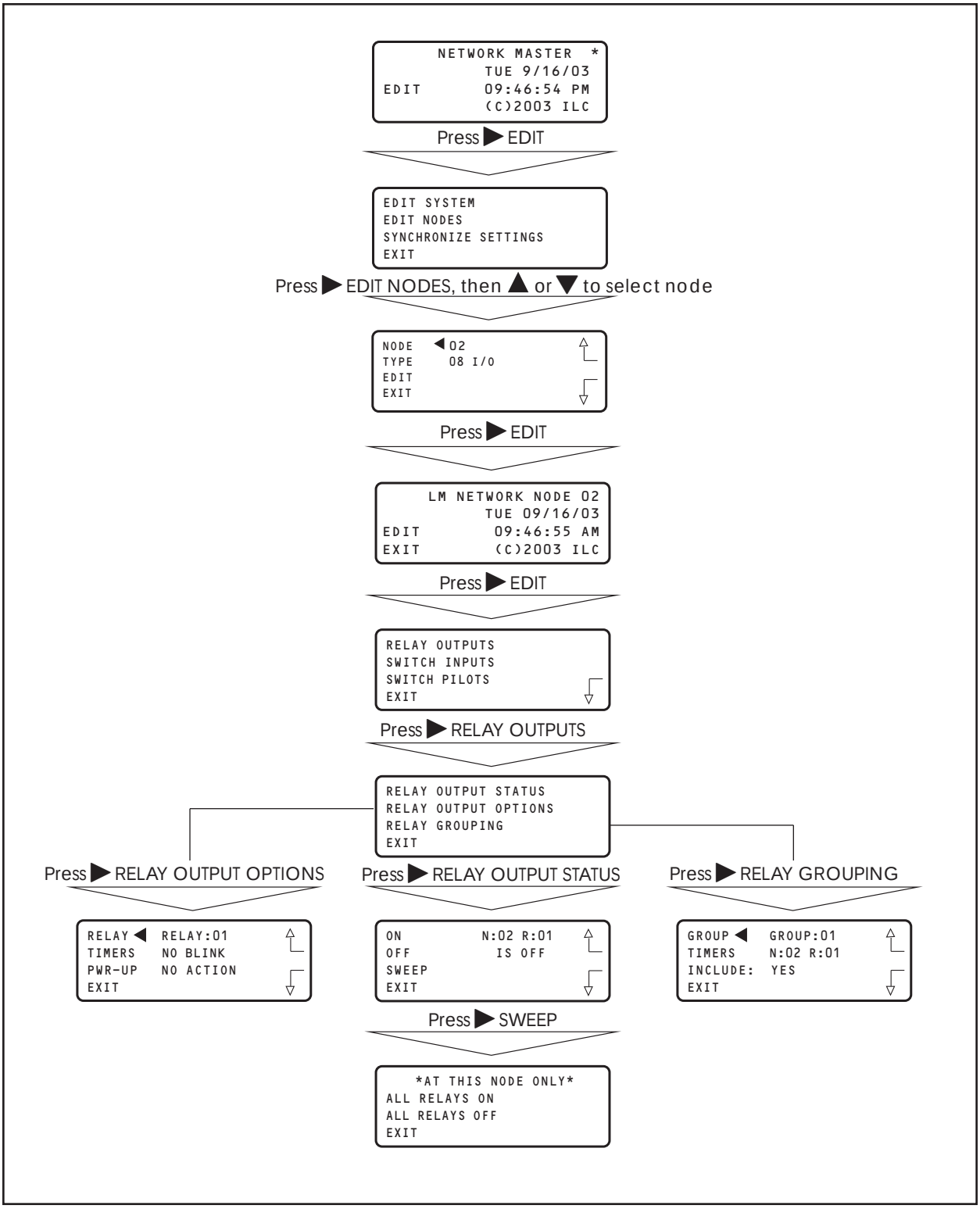


Figure 3-10 Relay Output Operations Screens

3.7 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 3.2, 3.3) and form relay groups.

Parameter Key:

RELAY: One of a possible 48 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 3.2

TIMERS Choice	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 settable 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.
Note: *how to change blink alert, override, and alarm pulse times defaults is done by selecting BLINK ALERT/ALARMS from the TIMER SETTINGS menu.*	

Table 3.3

PWR-UP Choices	Definition
NO ACTION (default)	The relay output holds its pre-existing state when power is applied or re-applied 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/OFF from the Master Controller Keypad

This operation is performed at the node level

1. Access the desired Node Home screen, press ▶ EDIT.

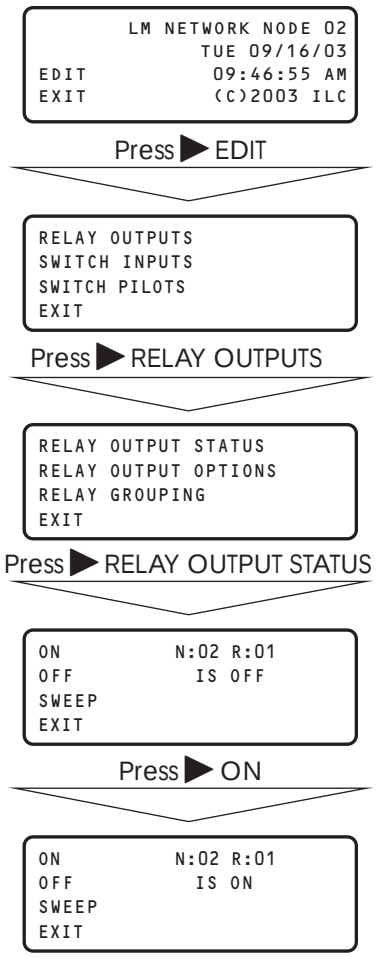
2. When the Node Main menu appears, press ▶ RELAY OUTPUTS.

3. When the RELAY OUTPUTS menu appears, press ▶ RELAY OUTPUT STATUS.

4. When the Relay Status menu appears, press ▲ or ▼ until the relay you want to control appears.

5. Press ▶ ON to switch ON the relay or ▶ OFF to switch OFF the relay.

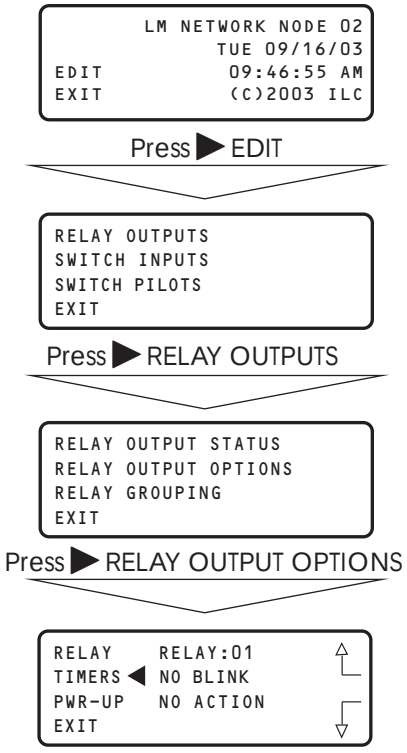
6. Press ▶ EXIT 3 times to return to the Node Home Screen.



SAMPLE OPERATION:
How To Program a Relay To Perform a Blink Alert

This operation is performed at the node level

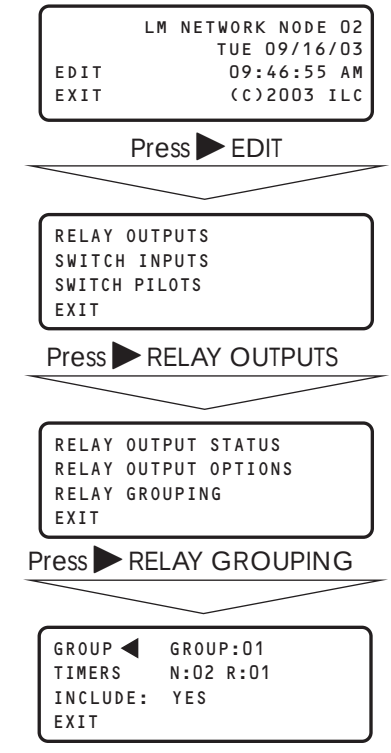
1. Access the desired Node Home screen, press ▶ EDIT.
2. When the Node Main menu appears, press ▶ RELAY OUTPUTS.
3. Press ▶ RELAY OUTPUT OPTIONS.
4. When the Relay Options screen appears, press ▲ or ▼ until the Relay you want to do the blink alert appears.
5. Press ▶ TIMERS; then ▲ or ▼ until BLINK appears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



SAMPLE OPERATION:
How To Define a Relay Group

This operation is performed at the node level

1. Access the desired Node Home screen, press ▶ EDIT.
2. When the Node 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 ▲ 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 Node Home screen.



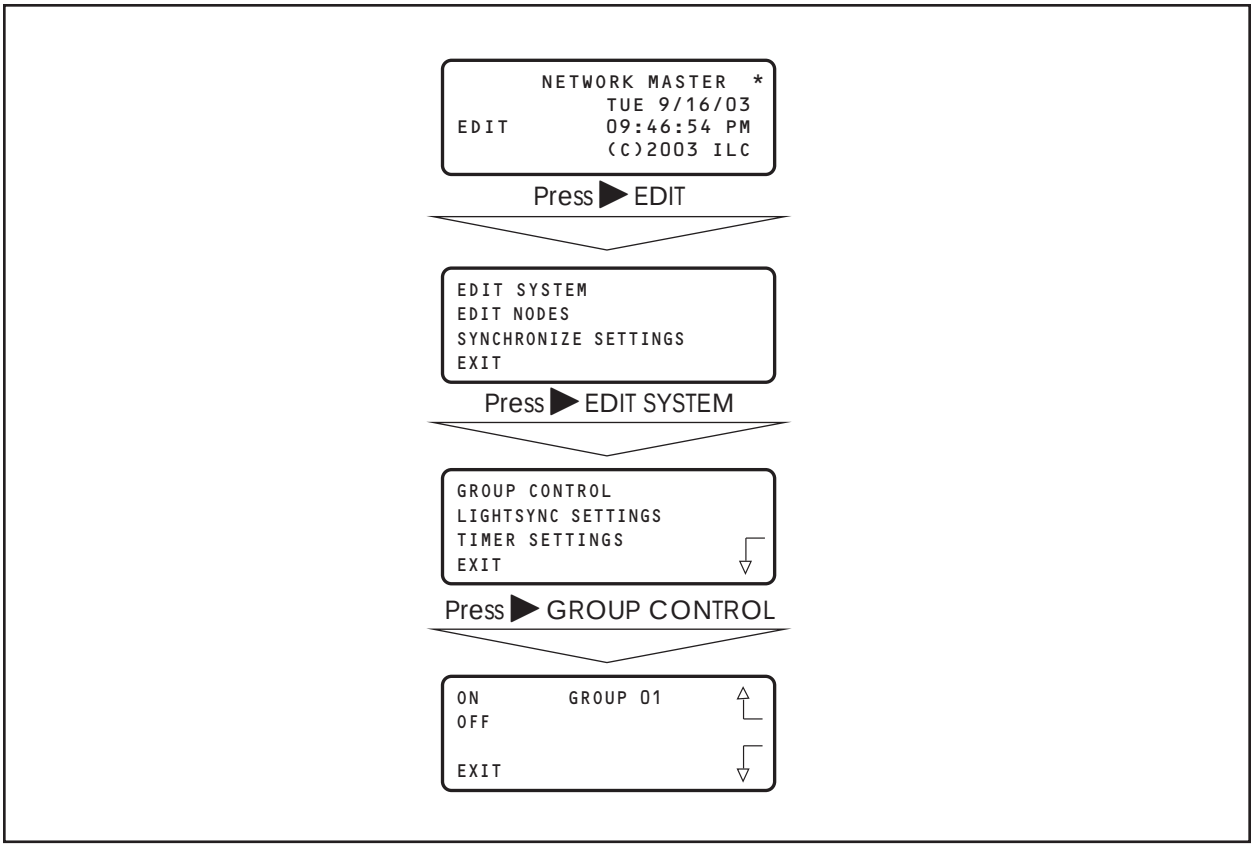


Figure 3-11 Relay Group Control Screens

SAMPLE OPERATION:
How To Turn A Relay Group ON/OFF From the Master Controller Keypad

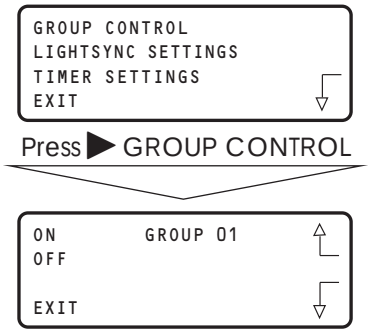
1. Access the system Main Menu

2. Press ▶ GROUP CONTROL

3. When the Group Control screen appears, press ▲ or ▼ until the group you want to control appears.

4. Press ▶ ON or ▶ OFF.

5. Press ▶ EXIT 3 times to return to the Network Home screen.



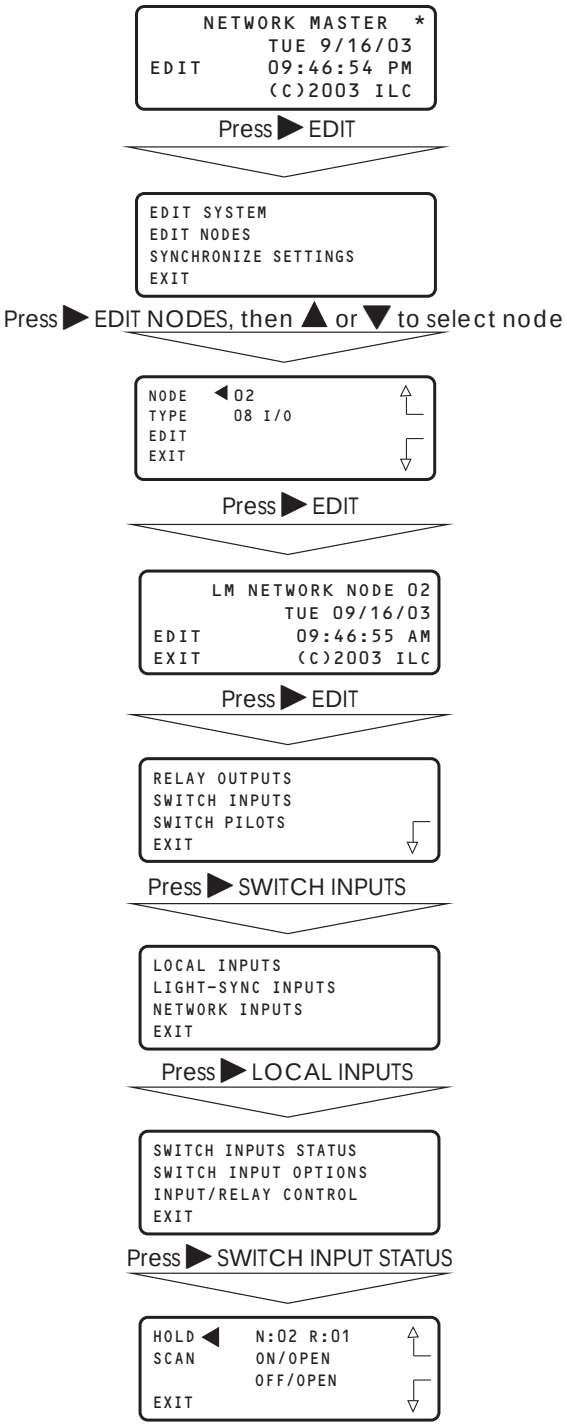


Figure 3-12 Switch Operations Screens

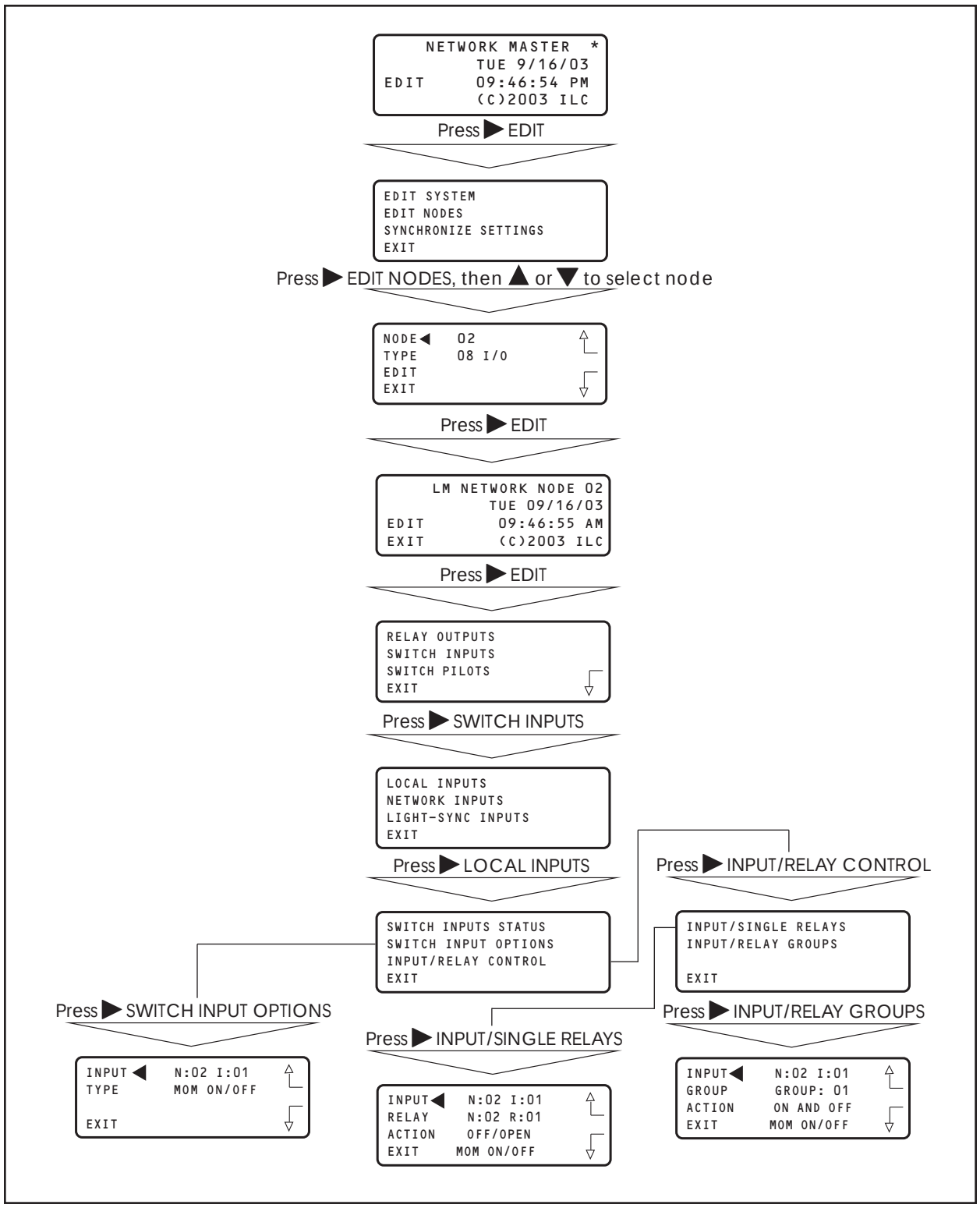
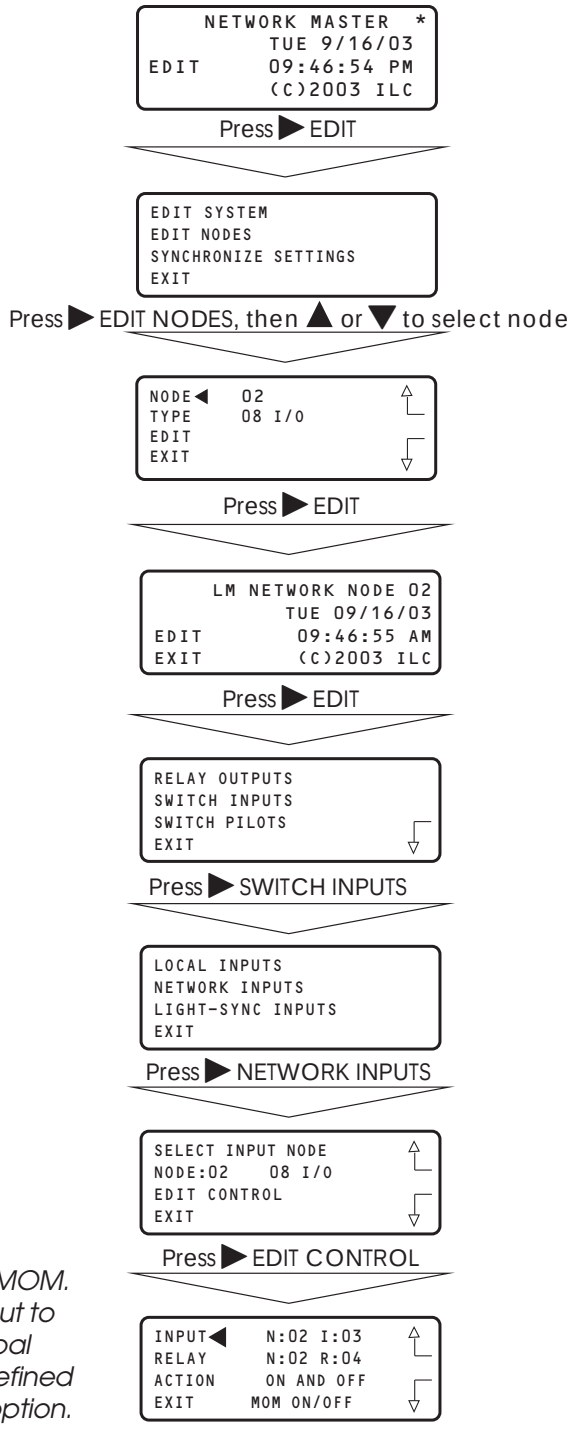


Figure 3-13 Controlling Relays with a Hardwired Switch Screens



NOTE: The switch type (MOM. ON/OFF, etc.) of the input to which the network (global switch) is hardwired is defined under the local switch option.

Figure 3-14 Controlling Relays with a Network Switch

3.8 Switch Status

CONCEPTS AND PARAMETERS

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

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

Parameter Key:

INPUT = One of a possible 48 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

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

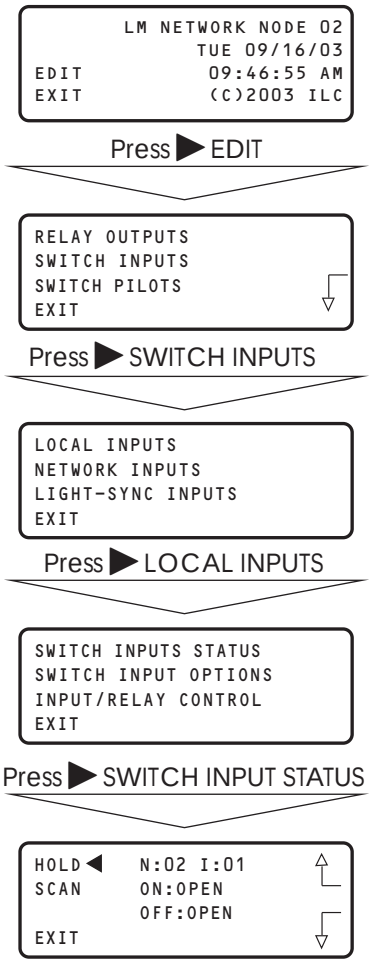
1. From the desired Node Home screen. Press ▶ EDIT.

2. From the Main Menu, Press ▶ SWITCH INPUTS; then ▶ LOCAL INPUTS.

3. From the Switch Input Menu, press ▶ SWITCH INPUT STATUS.

4. When the Switch Input Status screen appears, press ▲ until the switch you want to check appears.

5. Press ▶ EXIT four times to return to the Home screen.



3.9 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 3.15)

Parameter Key:

SWITCH INPUT OPTIONS:

INPUT = 1 of 48 possible controller switch inputs. An input can be LOCAL -an input actuated by a hardwired switch in the selected node that controls relays in that controller node, NETWORK - an input actuated by a hardwired switch in the selected node that controls relays in multiple nodes via the CAT-5 communications link or LightSync switch node which controls relays via the CAT-5 communications link (See Section 4)

TYPE = switch type (Default is MOM. ON/OFF; see Table 3.4 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 effect the relay. (Default is NO ACTION). Other possible responses ON ONLY, OFF ONLY, ON AND OFF, BLINK ALERT

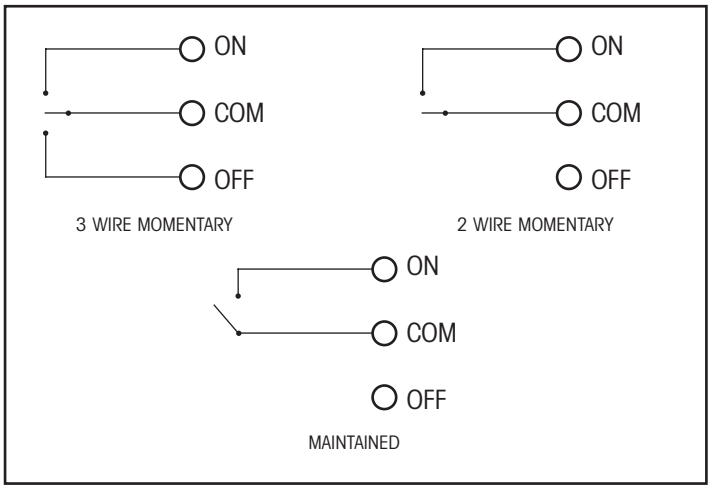


Figure 3.15

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.
Two-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.
Four-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.
Network Disable	2 wire maintained	As long as the switch is closed, all network commands 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 if switch is open.
FORCE TIMER	2 wire maintained	The switch closure will trigger the selected timer.

Table 3.4 – LightMaster Switch Types

SAMPLE OPERATION:
Control a single Relay Output with a Local Switch
This operation is programmed at the node level.
Define the switch input:

1. From the desired Node Home screen, press ▶ EDIT.

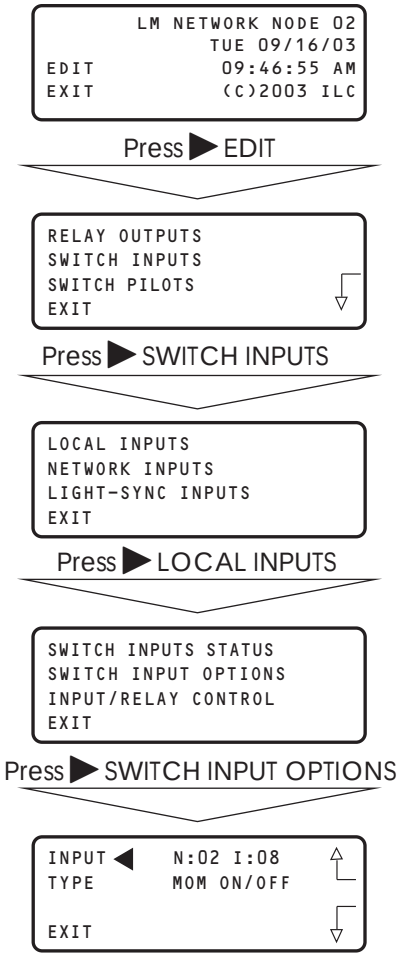
2. When the MAIN menu appears, press ▶ SWITCH INPUTS; then ▶ LOCAL INPUTS.

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 ▲ or ▼ until the desired switch type appears.

6. Press ▶ EXIT to return to the Switch Input menu.



Select the relay that you want the switch to control.
This operation is programmed at the node level.

1. From the Local Switch Input Menu, press ▶ INPUT/RELAY CONTROL.

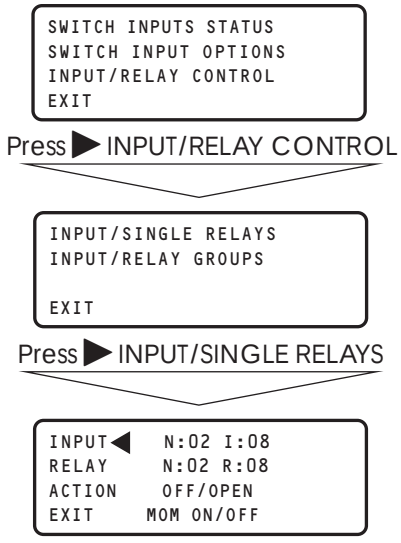
2. When the Single Relay/Relay Group Control menu appears, press ▶ INPUT/ SINGLE RELAYS.

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 ▲ or ▼ until the desired switch action appears.

6. Press ▶ EXIT 5 times to return to the Home screen.



SAMPLE OPERATION:
Control a Relay Group with a Local Switch

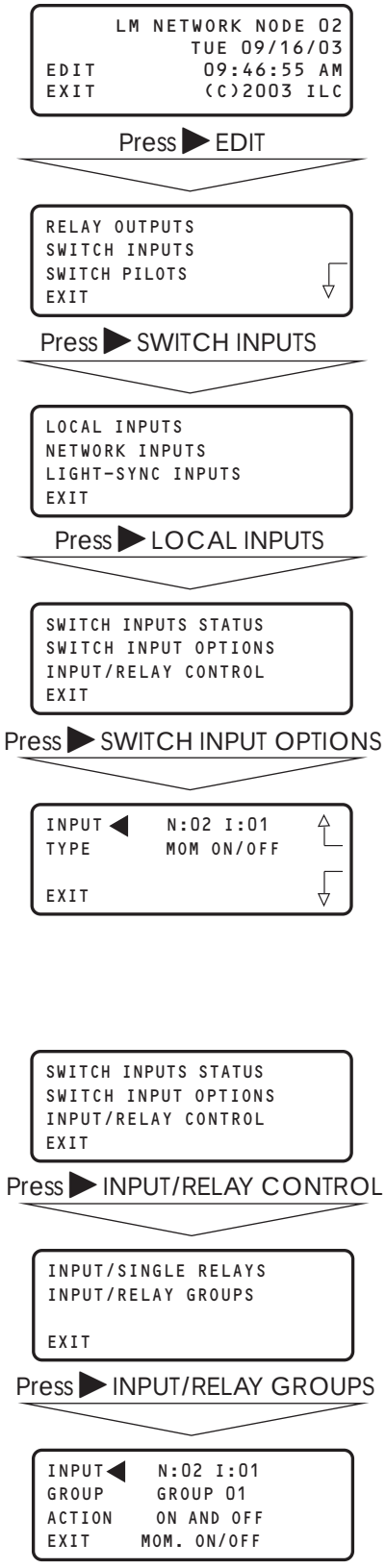
This operation is programmed at the node level.

Define the switch input:

1. From the desired Node Home screen, press ▶ EDIT.
2. When the MAIN menu appears, press ▶ SWITCH INPUTS; then ▶ 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 ▲ or ▼ until the desired switch type appears.
6. Press ▶ EXIT to return to the Switch Input menu.

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



SAMPLE OPERATION:
Control Relays with a Network Switch

This operation is programmed at the node level.

Define the switch input:

1. Define the switch as described previously.

2. From the Switch Input Menu, press ▶ NETWORK INPUTS.

3. When the top level Network Input screen appears press ▲ or ▼ to select the controller node containing hardwired input programmed as a network input.

4. Press ▶ EDIT CONTROL second level Network Input Screen appears press ▲ or ▼ to select the network input.

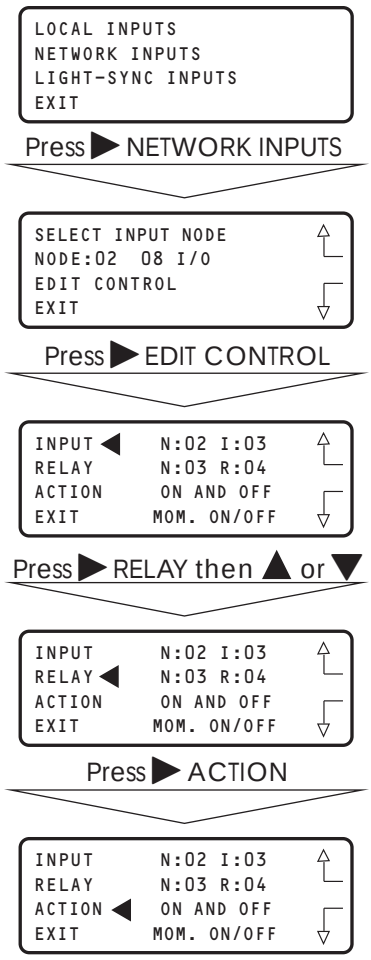
Note: You must select an input in a controller node other than the one you are currently programming.

5. Then press ▶ EDIT RELAY then ▲ or ▼ to select the relay to be controlled by the network input.

6. Press ▶ ACTION until the desired switch action appears.

7. Repeat steps 5 & 6 to include additional relays.

Note: To include relays in other controller nodes besides the one you are presently programming you will have to select each node from the EDIT NODES on the network main menu and then include the relays when programming NETWORK INPUT parameters.



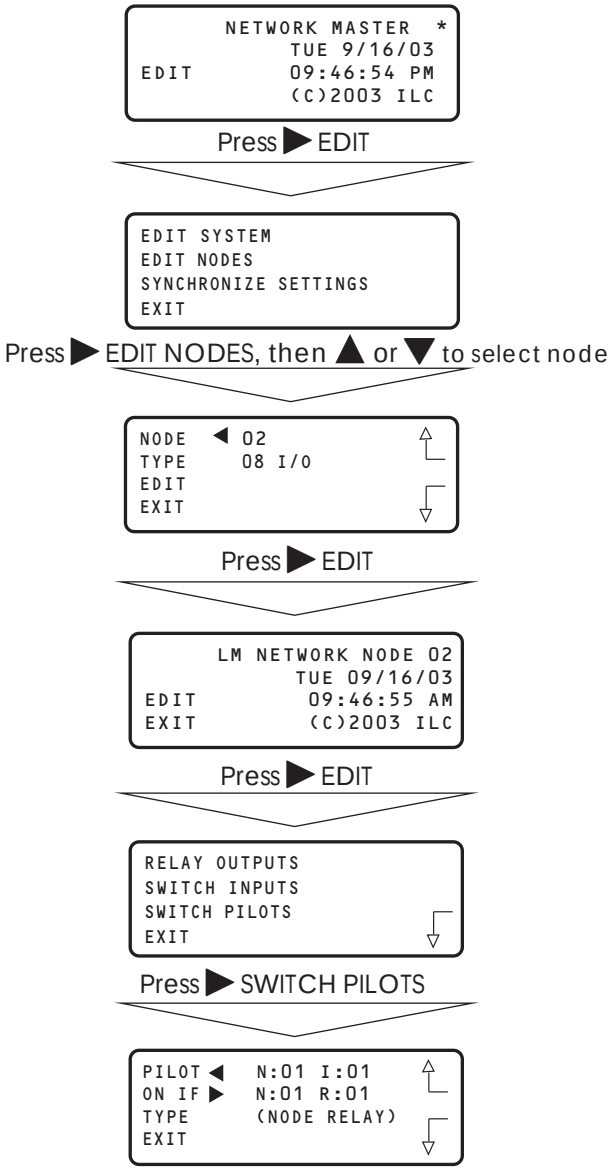


Figure 3-16 Local Switch Pilot Operations Screens

3.10 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)

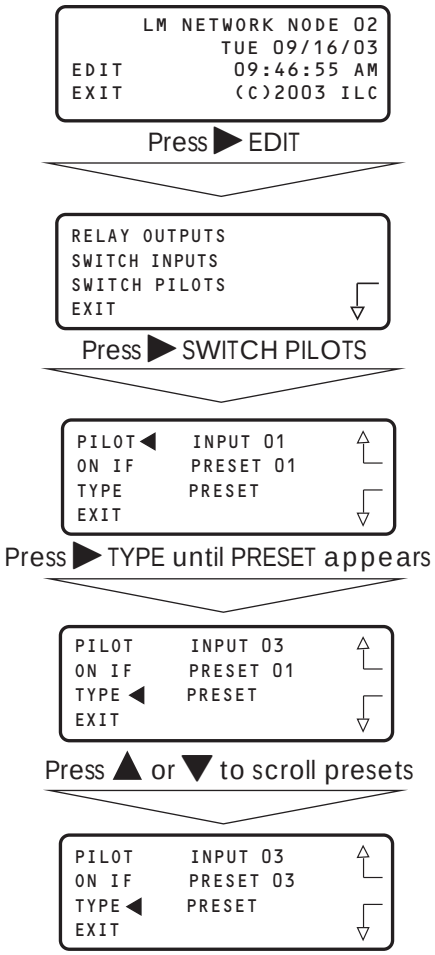
ON IF= The number of the relay, relay group, or preset which will actuate the switch pilot (1-48)

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
3. From the Status Definition Screen, press ▲ or ▼ to select the Input.
4. Press ▶ TYPE until PRESET appears.
5. Press ▲ or ▼ until the desired preset appears.
6. Press ▶ EXIT two times to return to the Home Screen.



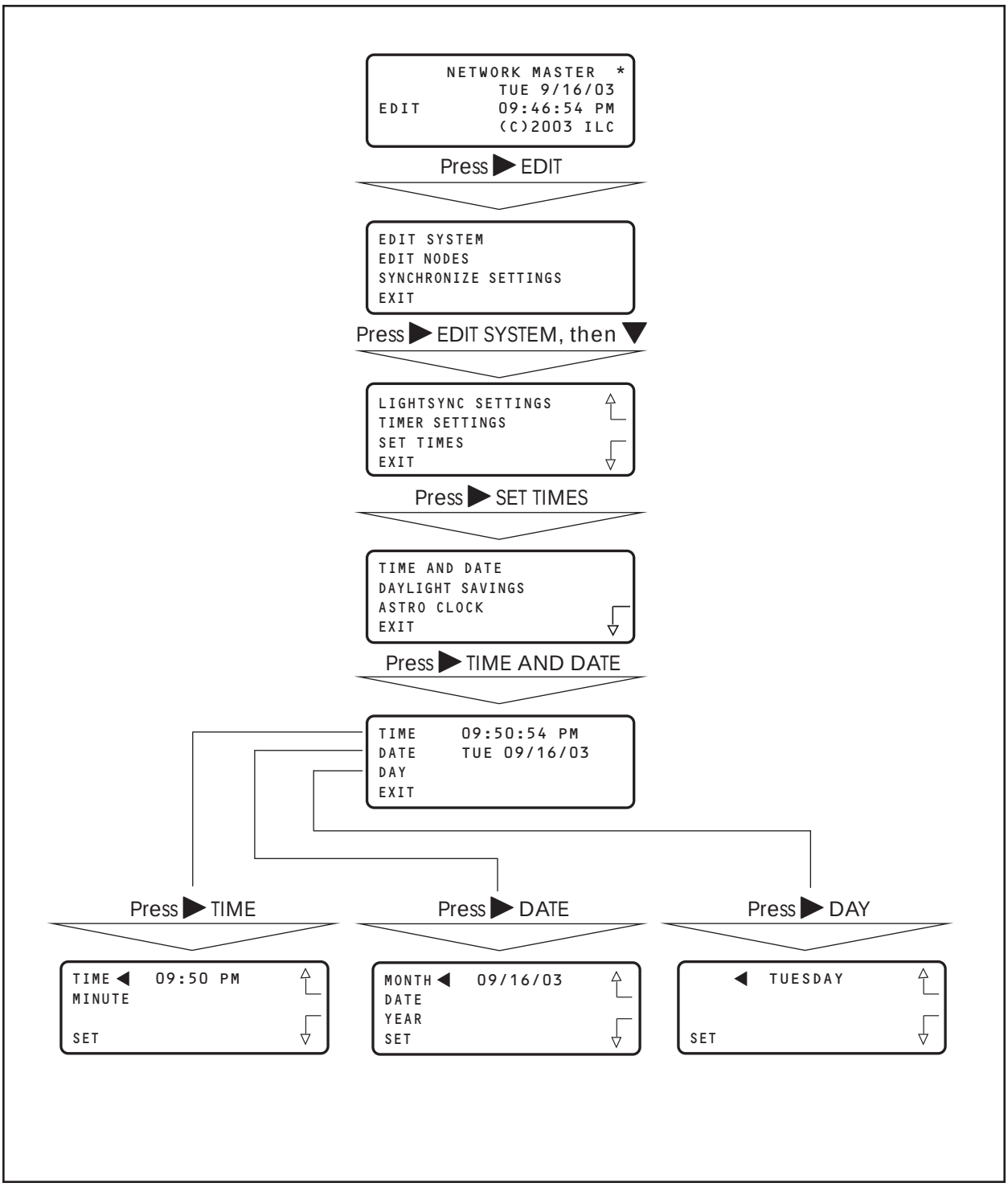


Figure 3-17 Setting the Controller Clock Screens

3.11 How to Set the Controller Clock

CONCEPTS AND PARAMETERS

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

This operation is performed at the system level.

SAMPLE OPERATION:
Setting the Controller Clock

1. From the Network Home screen, press ▶ EDIT, then press ▼.

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 date is displayed.

11. Press ▶ YEAR; then press ▲ or ▼ until the correct year is displayed.

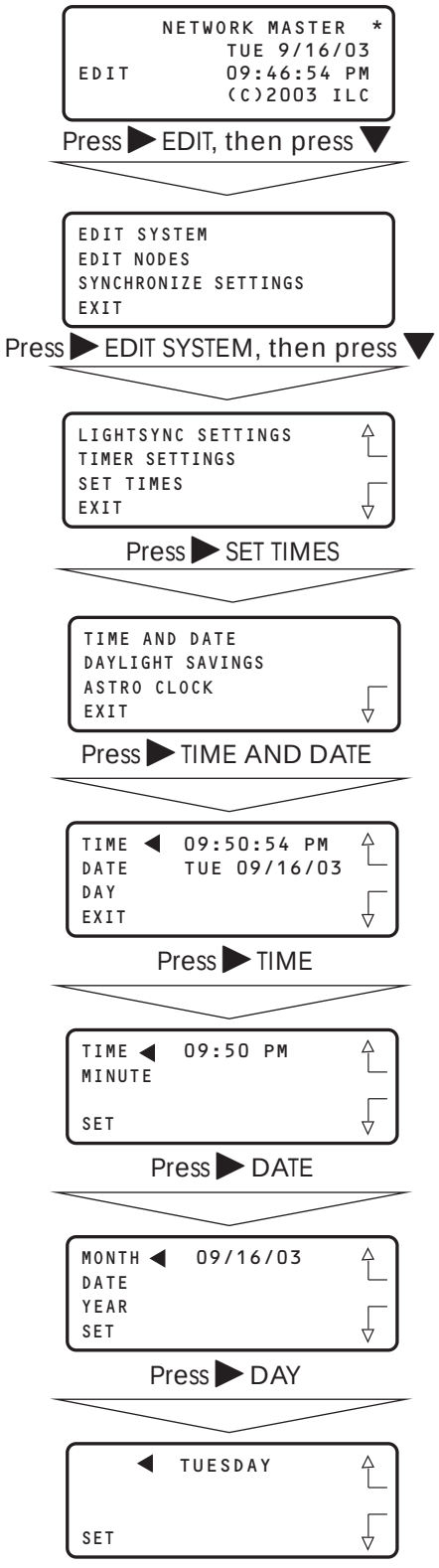
12. Press ▶ SET to return to the Time/Date menu.

13. Press ▶ DAY.

14. When the Day of the week Setting screen appears, press ▲ or ▼ to set the day.

15. Press ▶ SET to return to the Time/Date menu.

16. Press ▶ Exit 4 times to return to the Network Home screen.



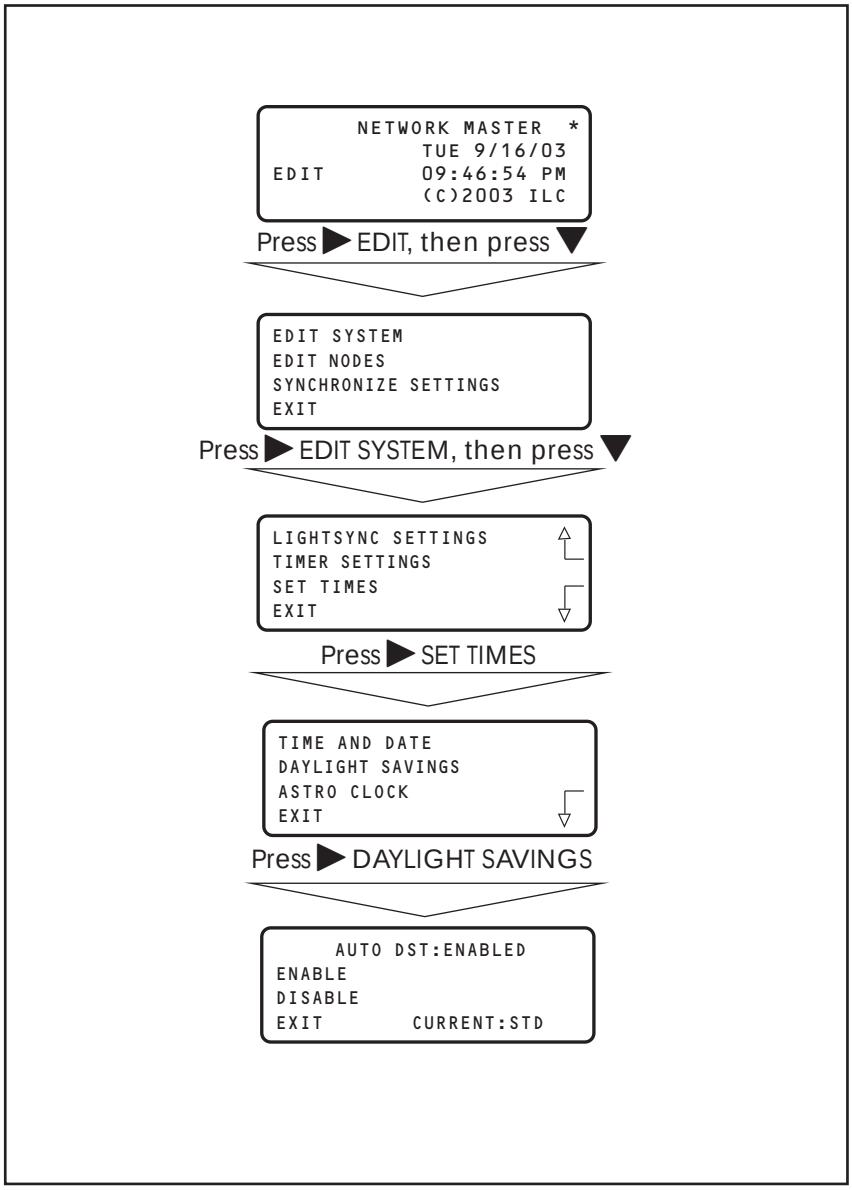


Figure 3-18 Enable/Disable Daylight Savings Time Screens

3.12 How to Enable and Disable Day Light Savings

CONCEPTS AND PARAMETERS

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

This operation is performed at the system level.

SAMPLE OPERATION:
Disable Automatic Day Light Savings Change Over

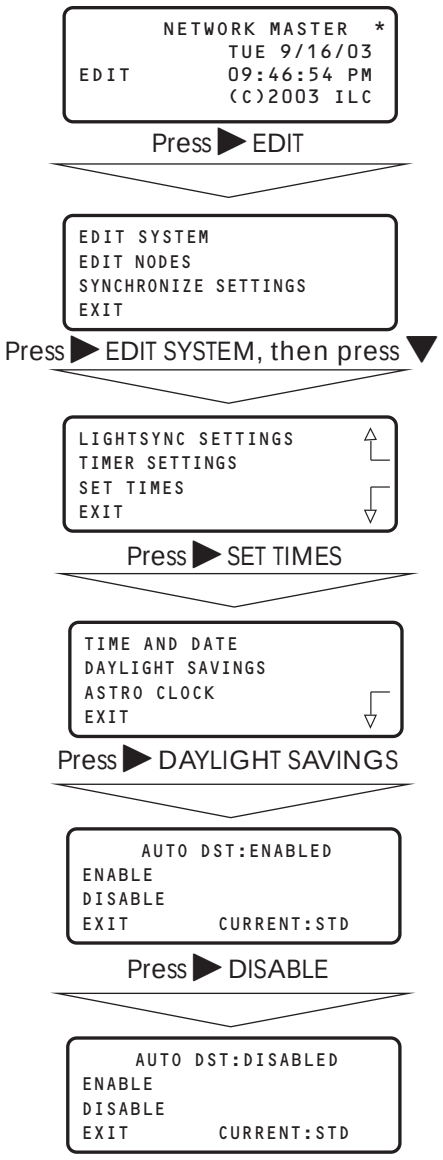
1. From the Network Home screen, press ▶ EDIT, when the Netwok menu appears, press ▶ EDIT SYSTEM, then press ▼.

2. From the main menu, press ▶ SET TIMES.

3. From the Set Times menu, press ▶ DAYLIGHT SAVINGS.

4. When the Day Light Savings screen appears, press ▶ DISABLE.

5. Press ▶ EXIT 4 times to return to the Home screen.



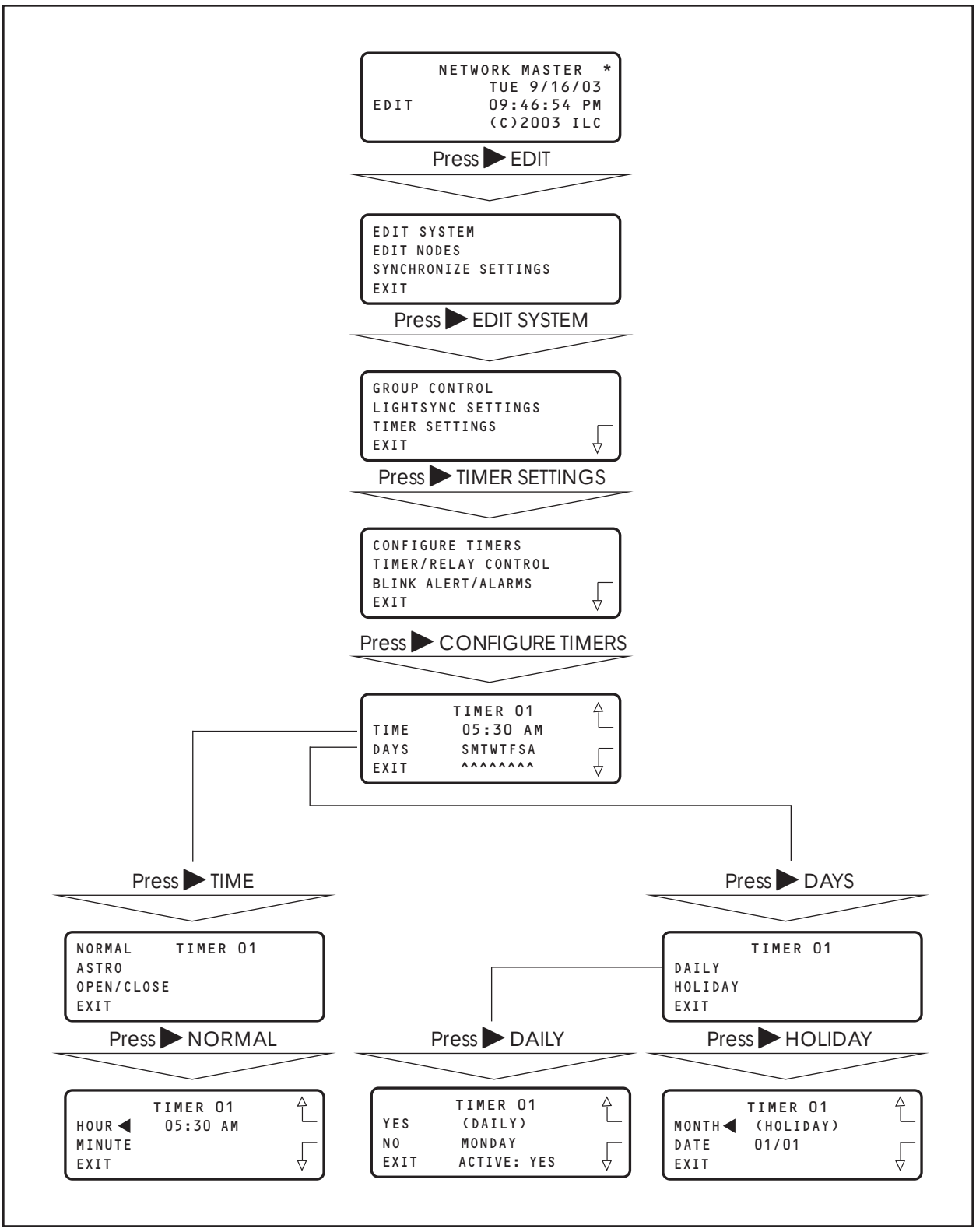


Figure 3-19 How to Define a Normal Timer Screens

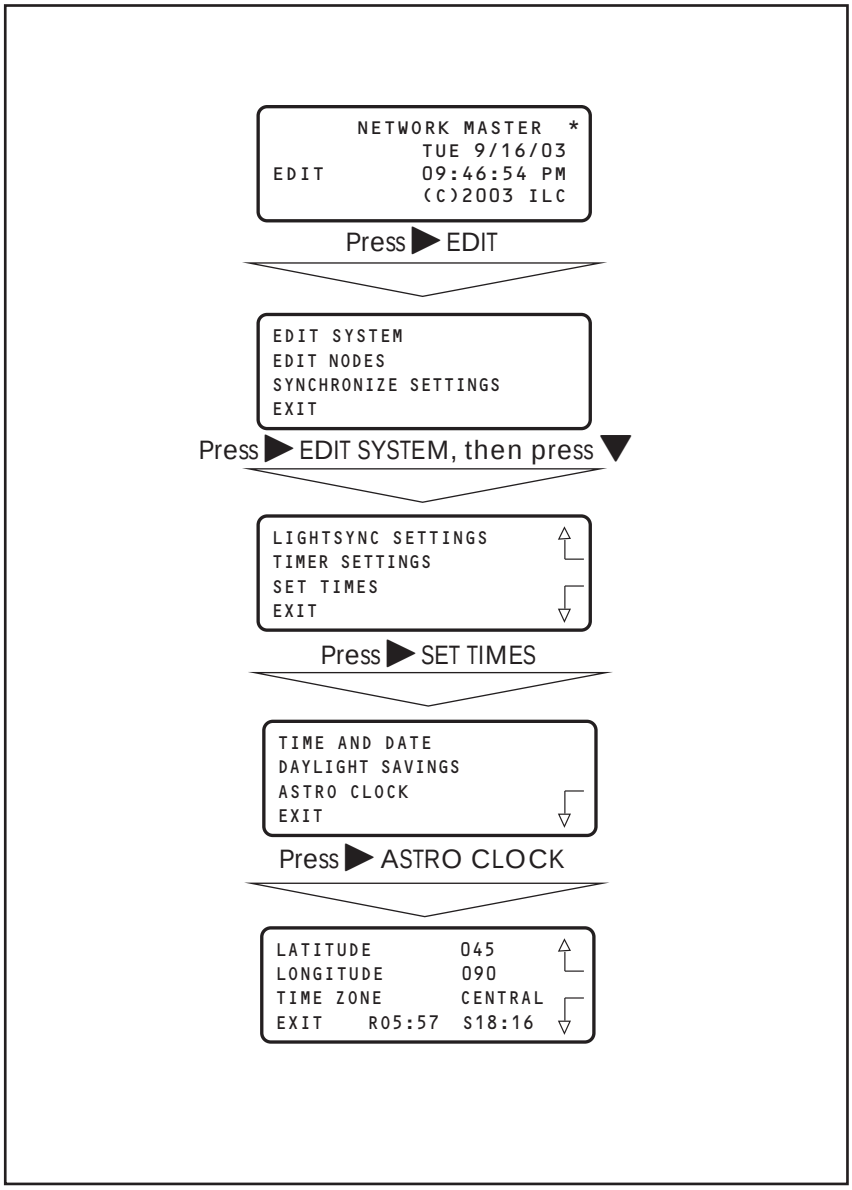


Figure 3-20 Astro Clock Screens

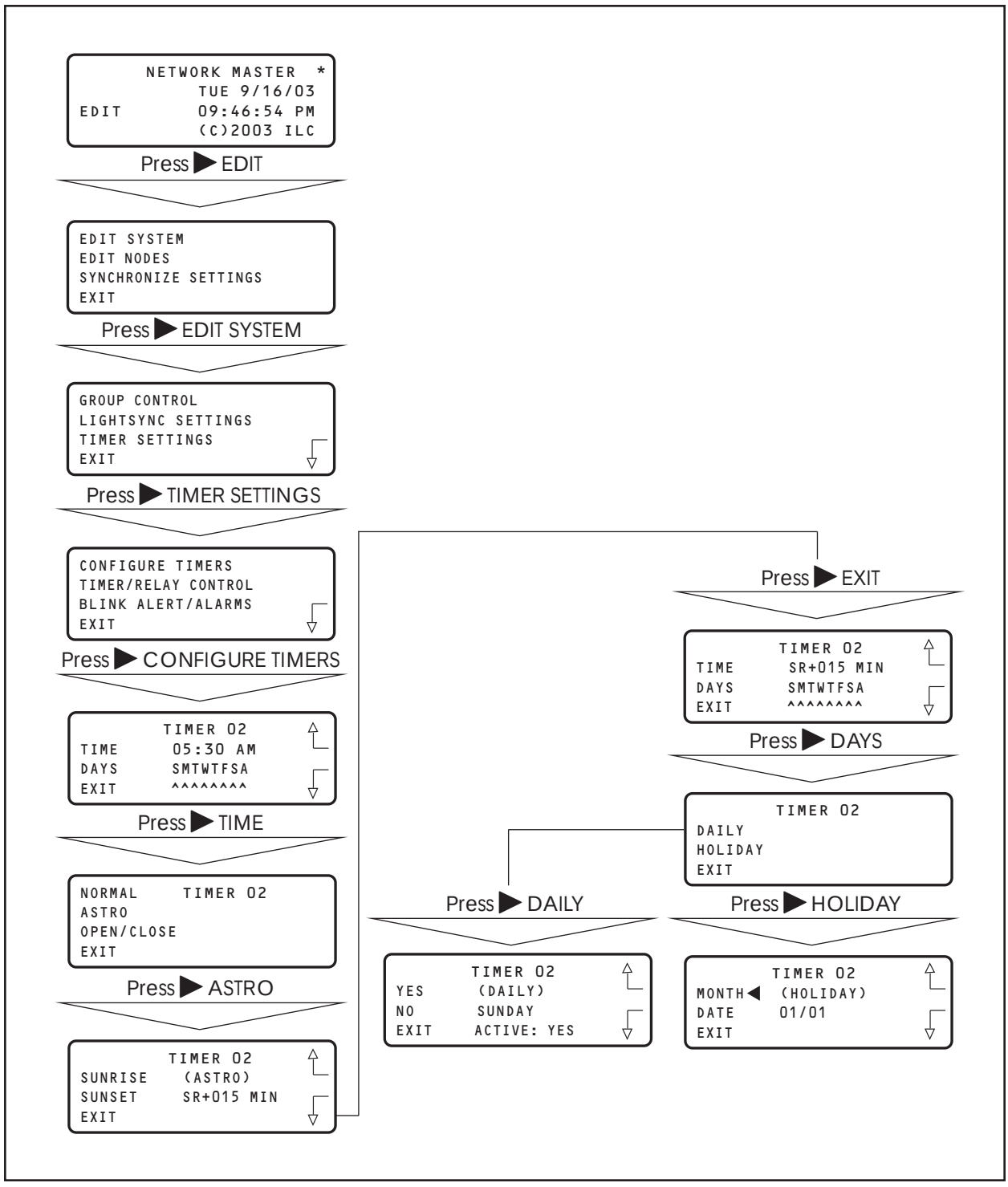


Figure 3-21 How to Define an Astro Timer

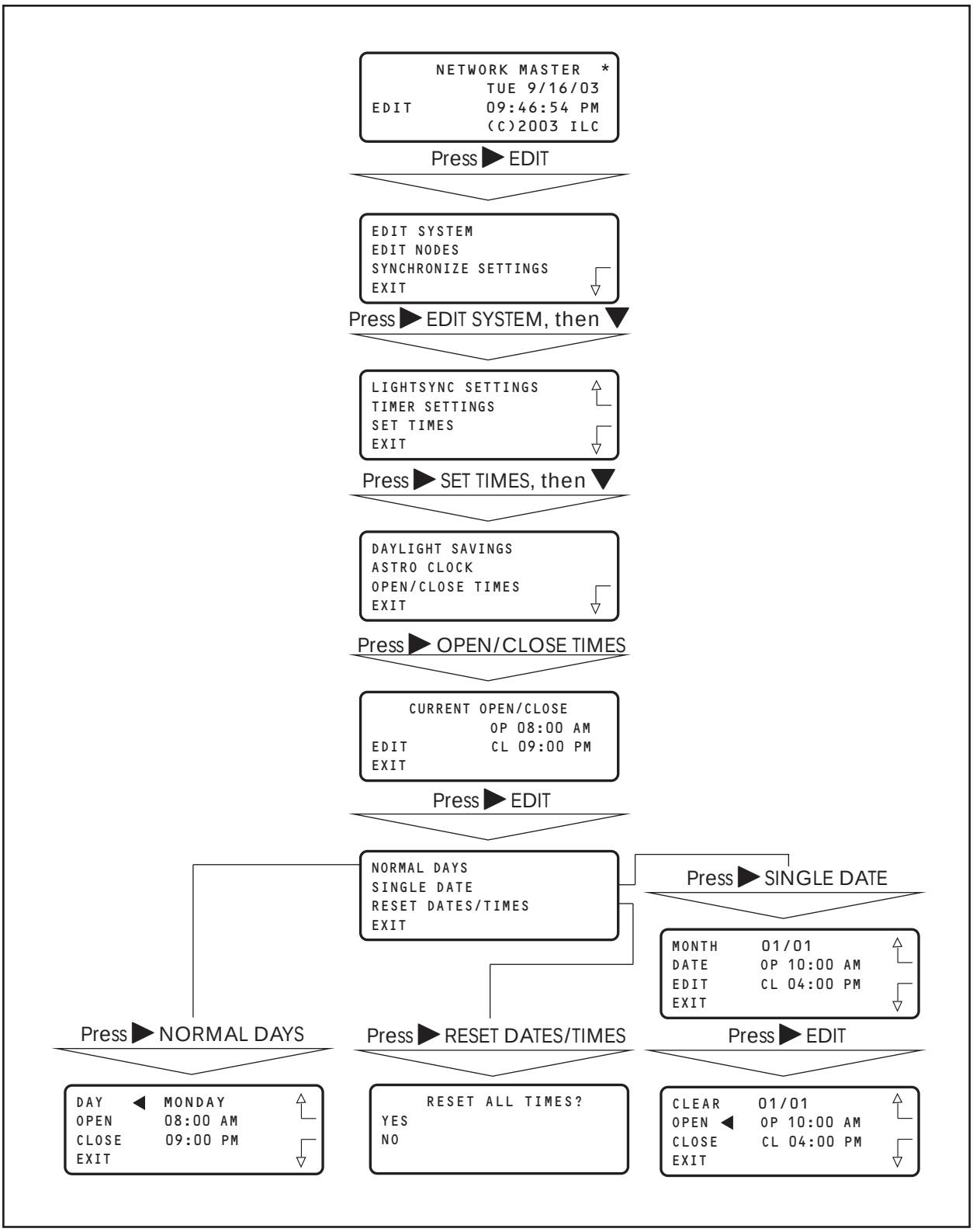


Figure 3-22 How to Set Open/Closed Parameters Screens

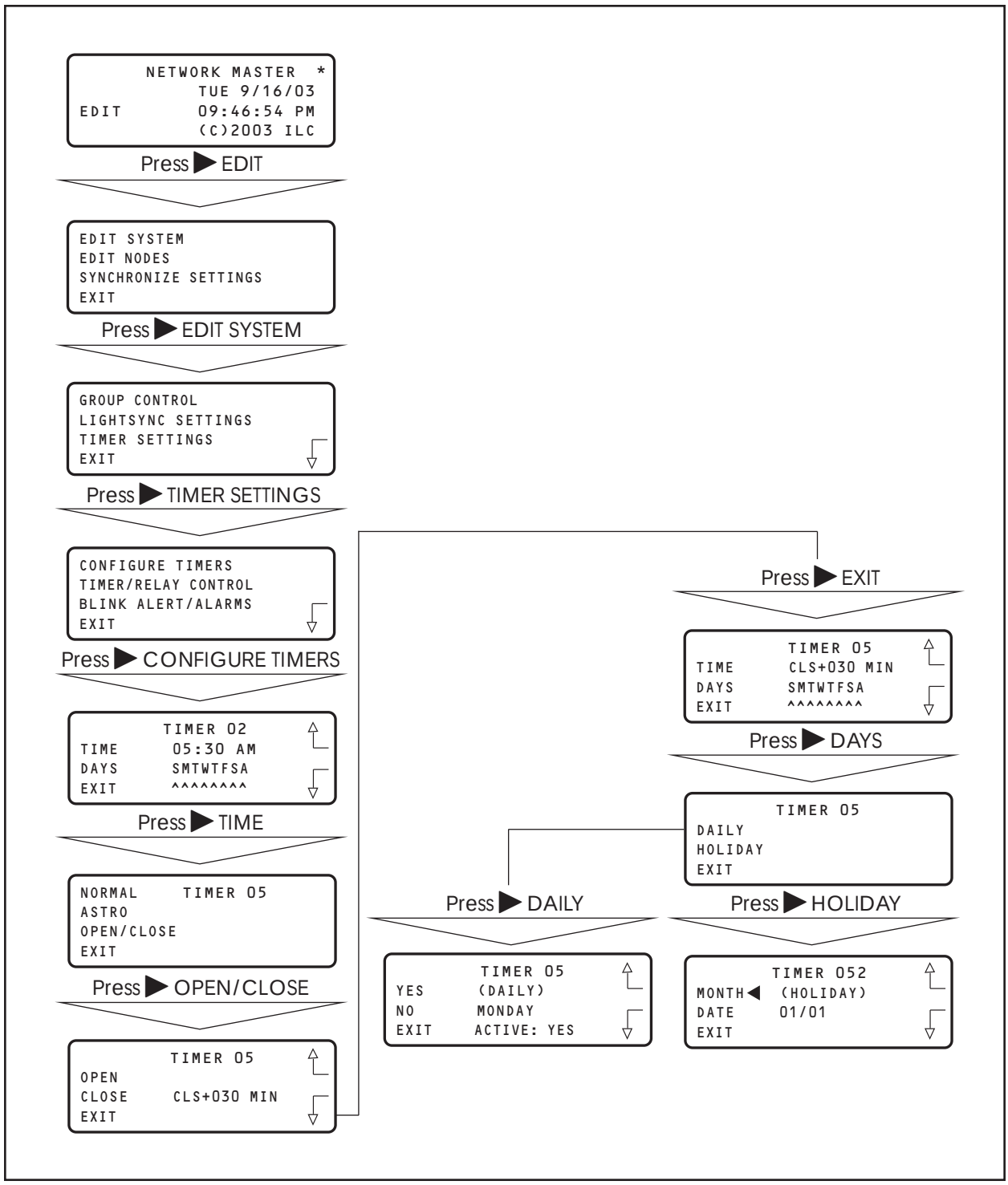


Figure 3-23 How to Define an Open/Close Timer

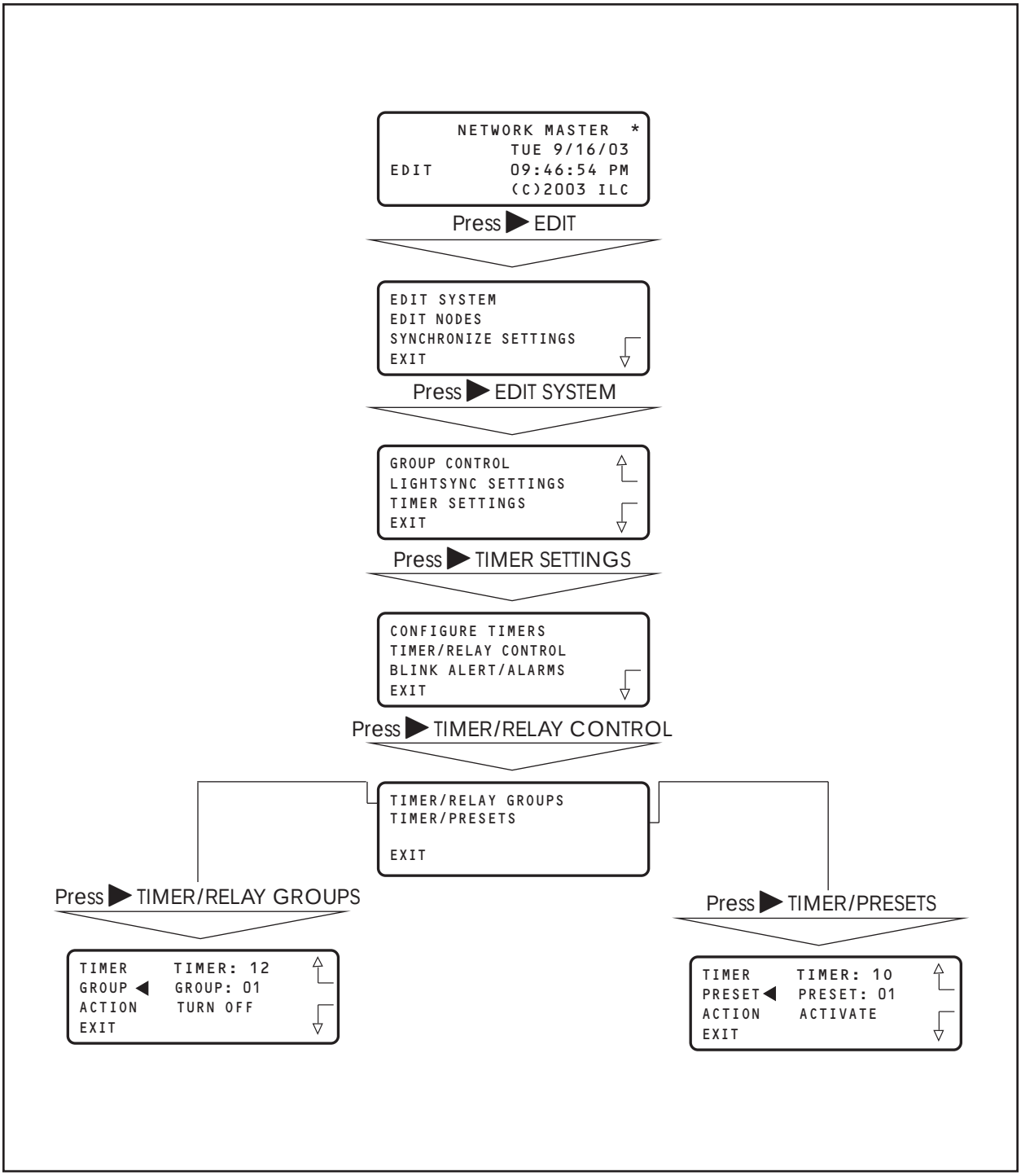


Figure 3-23 How to Control a Relay Group or Preset with a Timer Screens

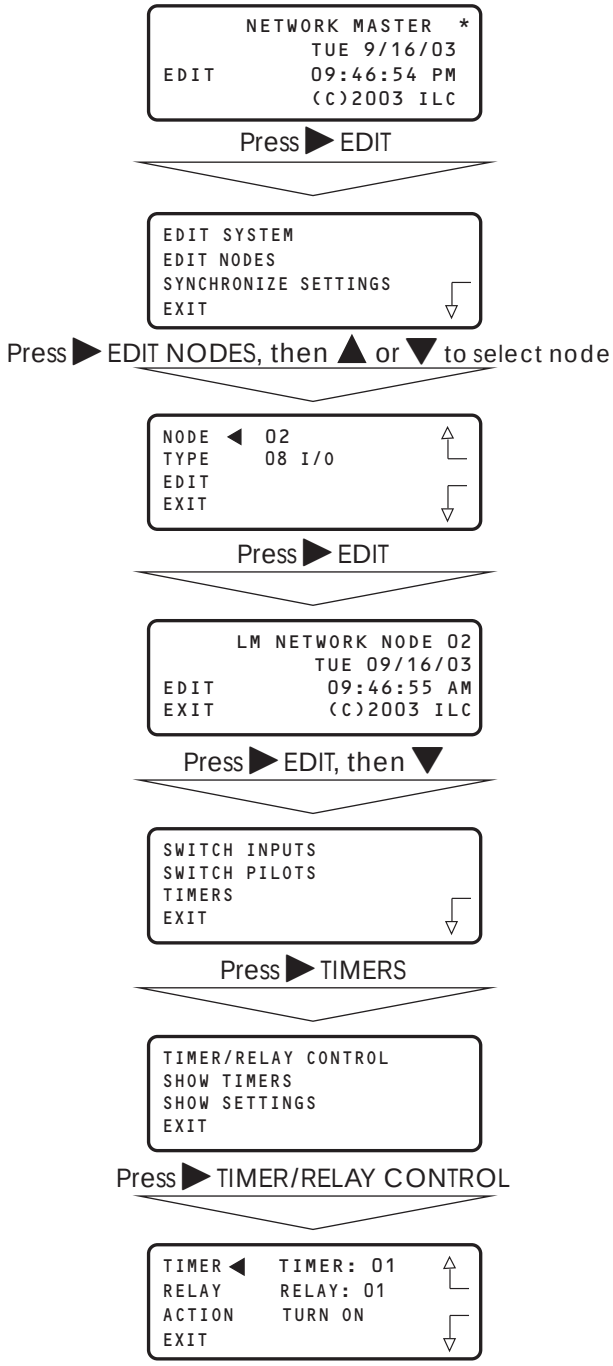


Figure 3-23 How to Control a Relay with a Timer Screens

3.13 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 user defined group of relays programmed to assume a pre-determined 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 the Appendix P.

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 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 = one of 48 available relay outputs impacted by the timers

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

PRESET = one 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:
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network Menu appears, press ▶ EDIT SYSTEM.

2. From the System Main Menu press ▶ TIMER SETTINGS.

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 ▲ or ▼ until the hour for the timer to occur appears.

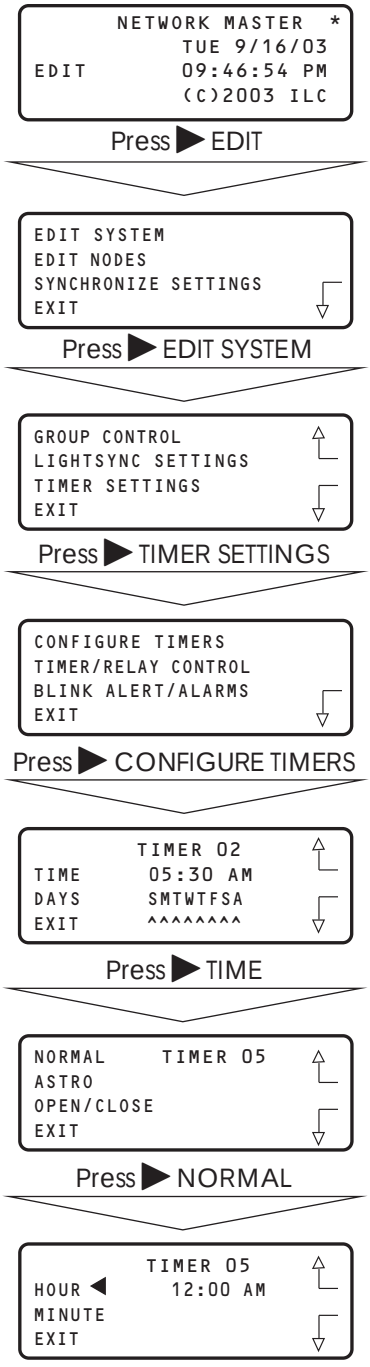
7. Press ▶ MINUTE, then ▲ or ▼ until the correct time appears on the screen.

8. Press ▶ EXIT to return to the Timer Definition screen.

9. Press ▶ DAYS; when the Day menu appears press ▶ DAILY.

10. Day Choice screen appears, press ▲ or ▼ and then ▶ YES or ▶ NO to include or exclude each day from the timer operation.

11. Press ▶ EXIT 5 times to return to the TIMER menu.



SAMPLE OPERATION:
Program an Astro Timer

Step 1: Enter The Astro Clock Parameters:
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; then press ▶ EDIT SYSTEM.

2. From the System Menu, press ▶ SET TIMES.

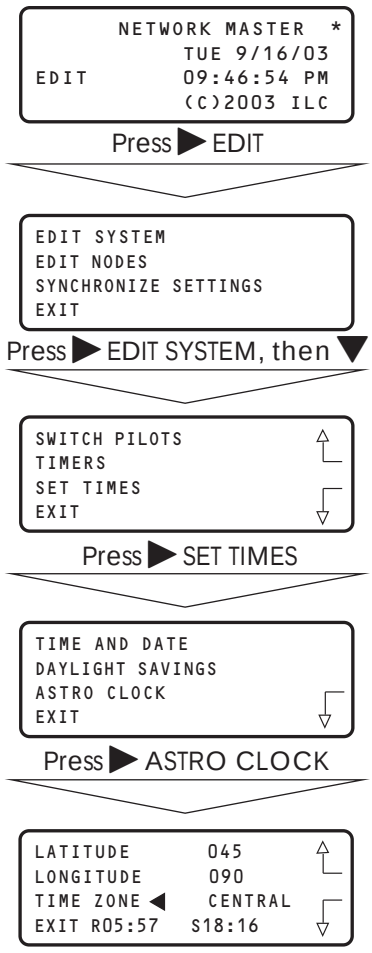
3. From the Set Times Menu, press ▶ ASTRO CLOCK.

4. When the Astro Clock screen appears, press ▲ or ▼ until the proper latitude appears.

5. Press ▶ LONGITUDE; then ▲ or ▼ until the proper longitude appears.

6. Press ▶ TIME ZONE then ▲ or ▼ until the proper time zone appears.

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.)



SAMPLE OPERATION:
Program an Astro Timer

Step 2: Define the Astro Timer:
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network Menu appears, press ▶ EDIT SYSTEM.

2. From the System Main Menu press ▶ TIMER SETTINGS.

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.

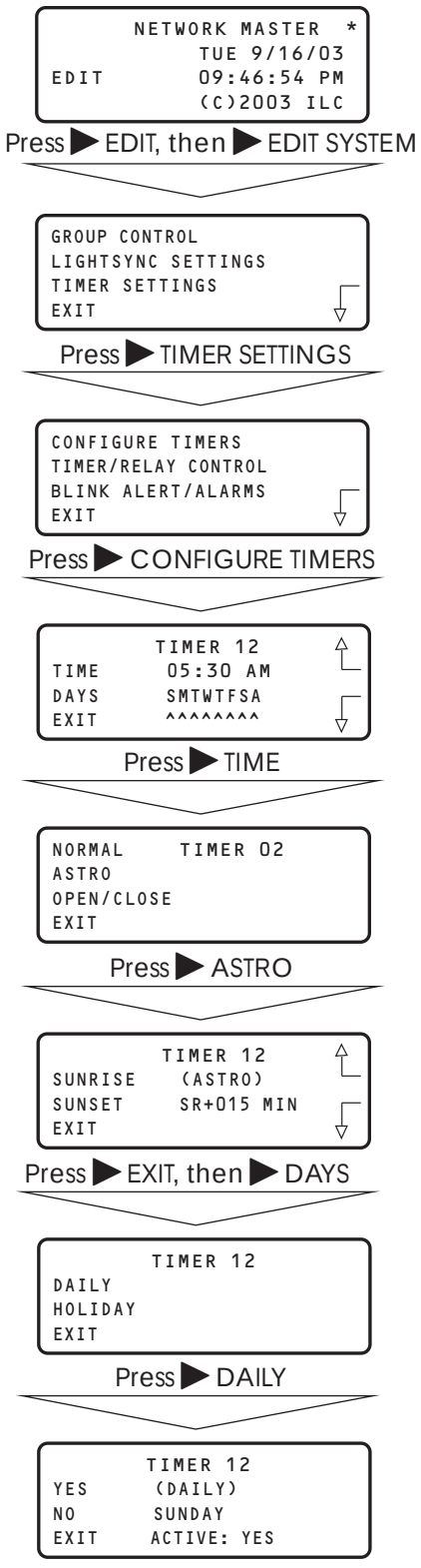
5. Press ▶ TIME; then when the Timer type menu appears, press ▶ ASTRO

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.



SAMPLE OPERATION:
Program an Open/Close Timer

Step 1: Define the Open/Close Parameters:
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network Menu appears, press ▶ EDIT SYSTEM, then press ▼.

2. From the System 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

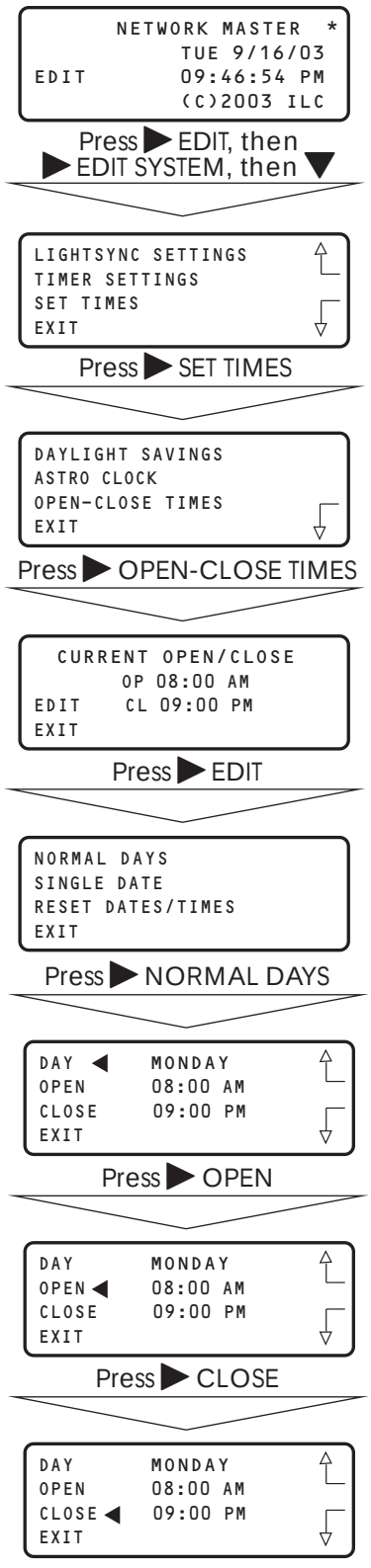
5. When the Open/Close Day menu appears, press ▶ NORMAL DAYS

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; the repeat steps 5 and 6 for that day.

9. After finishing setting all the open and close times for the facility, press ▶ EXIT 6 times to return to the Home screen.



SAMPLE OPERATION:
Program an Open/Close Timer

Step 2: Define the Open/Close Timer:
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network Menu appears, press ▶ EDIT SYSTEM.

2. From the Main Menu press ▶ TIMER SETTINGS.

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.

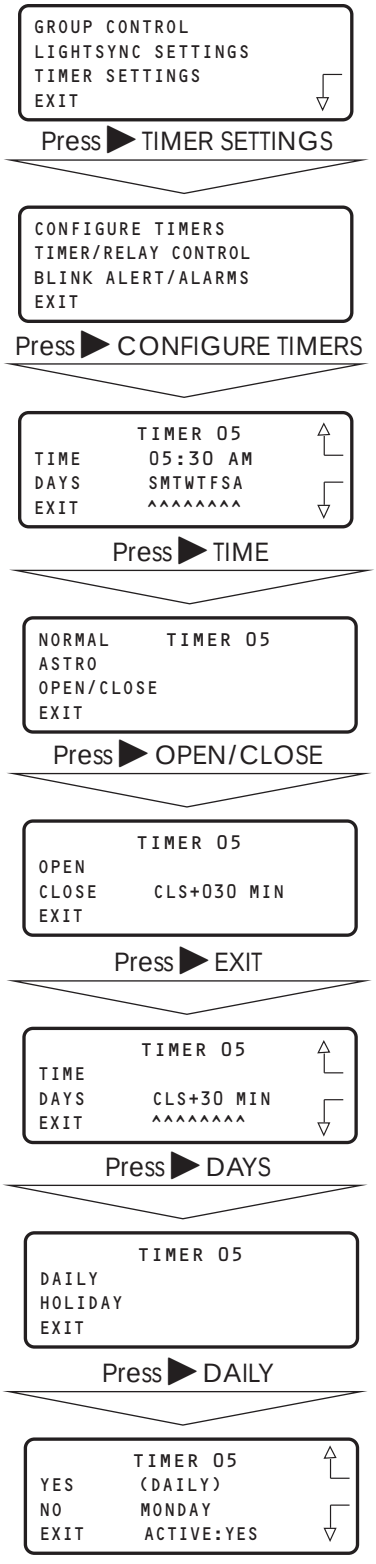
5. Press ▶ TIME; then when the Timer Type menu appears, press ▶ OPEN/CLOSE.

6. When the Open/Close Set screen appears, press either ▶ OPEN or ▶ CLOSE to tie the timer to either the facility open 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. 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.



SAMPLE OPERATION:
Program a Timer to Control a Single Relay

Program the Timer to Control the Relay:
This operation is performed at the node level.

1. Access the desired Node Home screen and press ▶ EDIT; then ▼.

2. From the Node Main Menu press ▶ TIMERS.

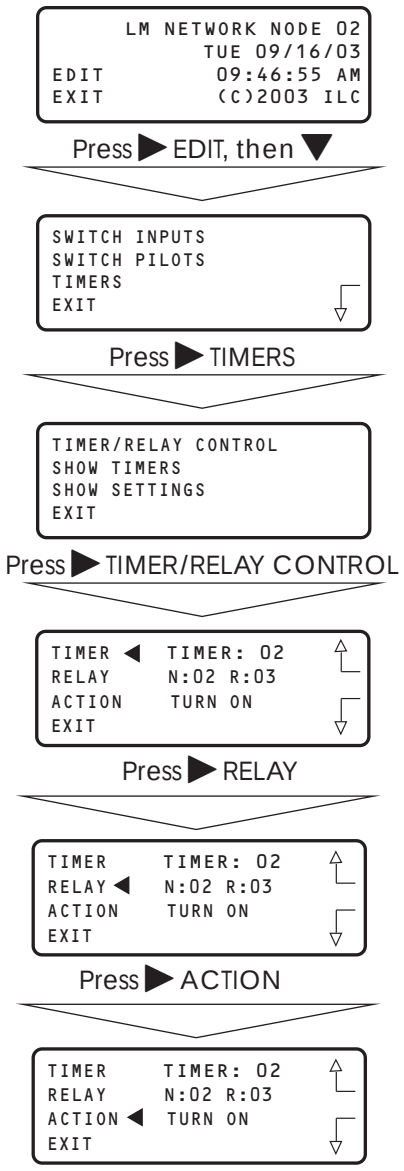
3. When the Timer menu appears, press ▶ TIMER/RELAY CONTROL.

4. When the Timer/Relay Control screen appears, press ▲ or ▼ until the timer you want to program appears in the timer field.

5. Press ▶ RELAY; then ▲ or ▼ until the relay you want to control appears in the relay field.

6. Press ▶ ACTION; then ▲ or ▼ until the way you want the timer to control the relay appears.

7. Press ▶ EXIT three times to return to the Node Home screen.



SAMPLE OPERATION:
Program an Astro Timer to Control a Relay Group

Program the Timer to Control a Relay Group:
This operation is performed at the system level.

1. From the Timer menu, press ▶ TIMER/RELAY CONTROL.

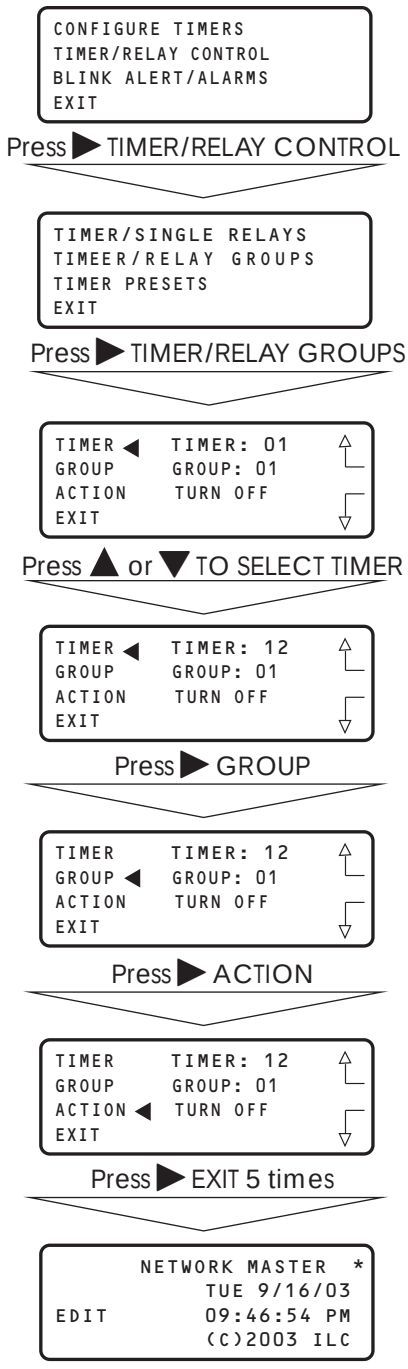
2. From the Timer Control menu, press ▶ TIMER/RELAY GROUPS

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 ▲ or ▼ until the relay group you want to be controlled by the timer appears in the relay field.

5. Press ▶ ACTION; then ▲ or ▼ until the way you want the timer to control the relay group appears.

6. Press ▶ EXIT five times to return to the Home screen.



SAMPLE OPERATION:
Program an Open/Close Timer to Control a Preset

Program the Open/Close Timer to Control a Preset:
This operation is performed at the system level.

1. From the Timer menu, press ▶ TIMER/RELAY CONTROL.

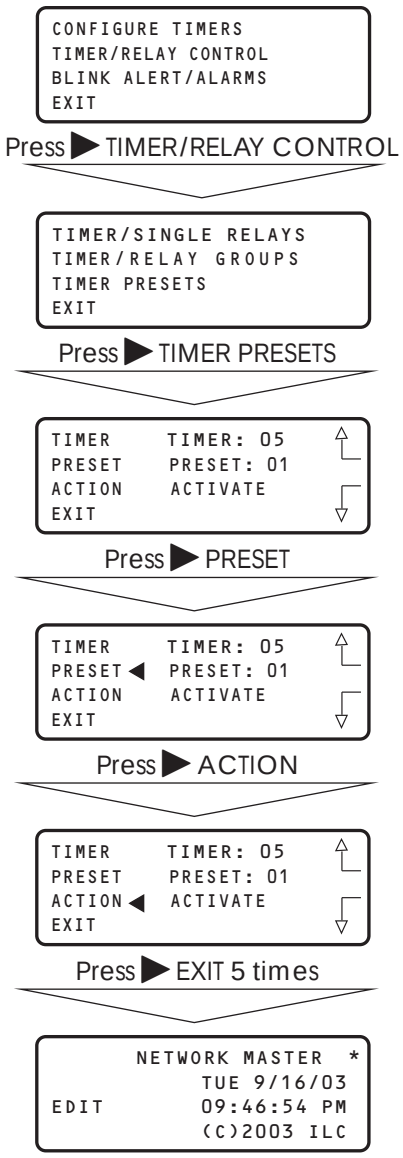
2. From the Timer Control menu, press ▶ TIMER/PRESETS

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 ▲ or ▼ until the preset you want to be controlled by the timer appears in the relay field.

5. Press ▶ ACTION; then ▲ or ▼ until the way you want the timer to control the preset appears.

6. Press ▶ EXIT 5 times to return to the Home screen.



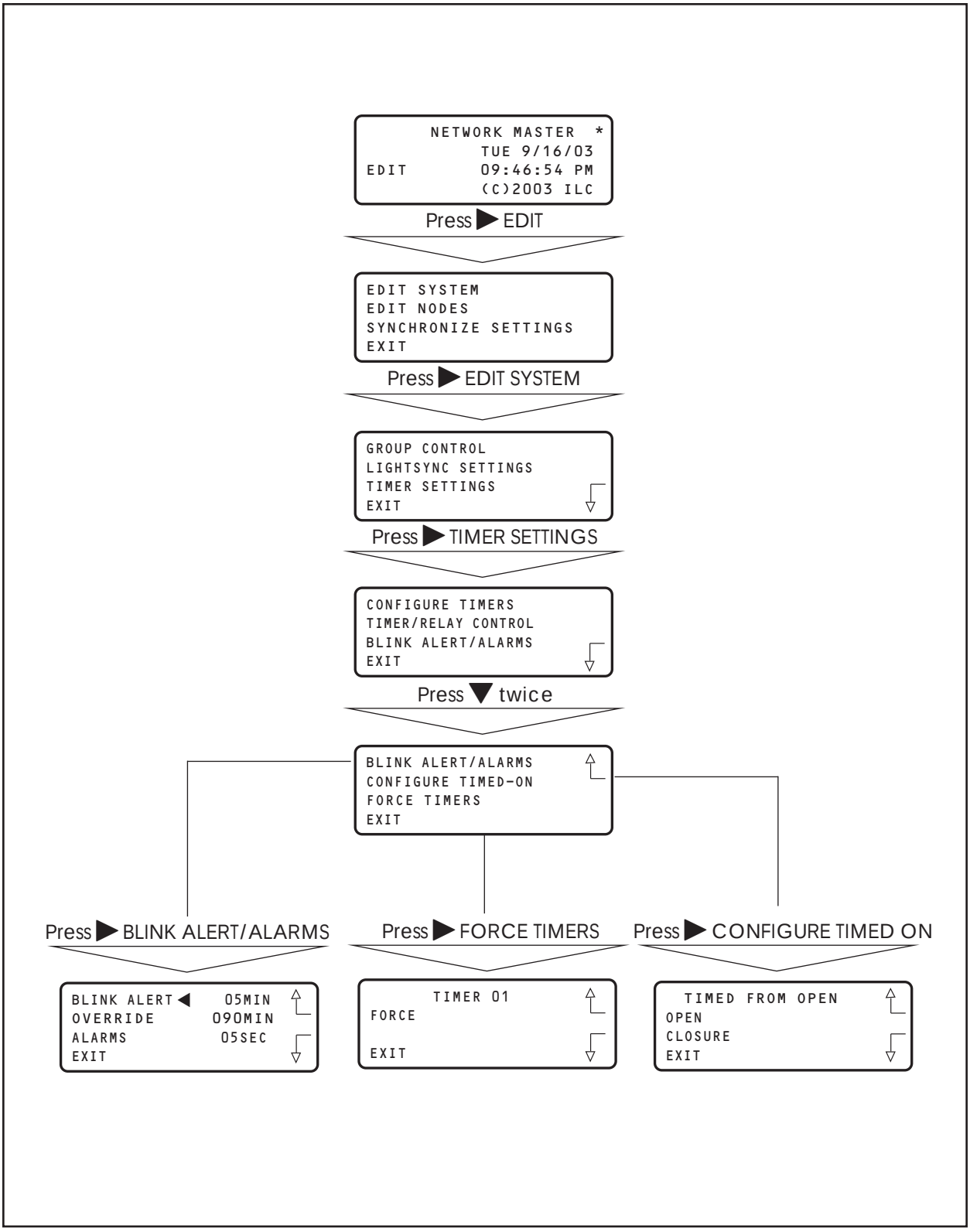


Figure 3-24 Blink Alert/Alarms Screens

3.14 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
This operation is performed at the system level.

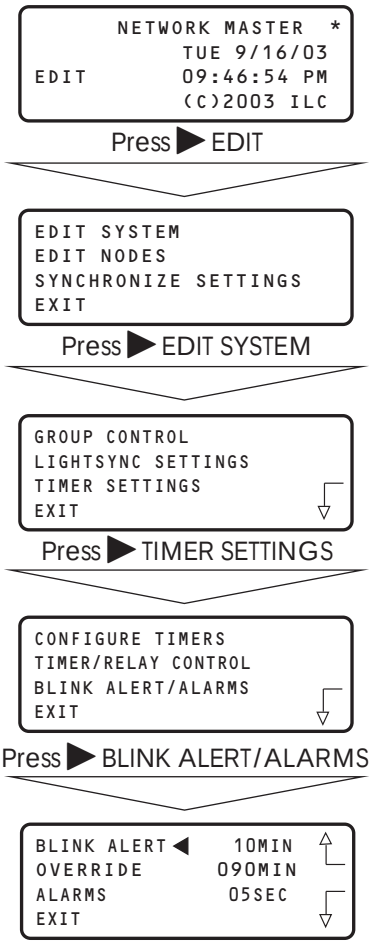
1. From the Network Home screen, press ▶ EDIT; when the Network menu appears, press EDIT SYSTEM, then ▼.

2. When the Main menu appears, press ▶ TIMER SETTINGS.

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 4 times to return to the Home screen.



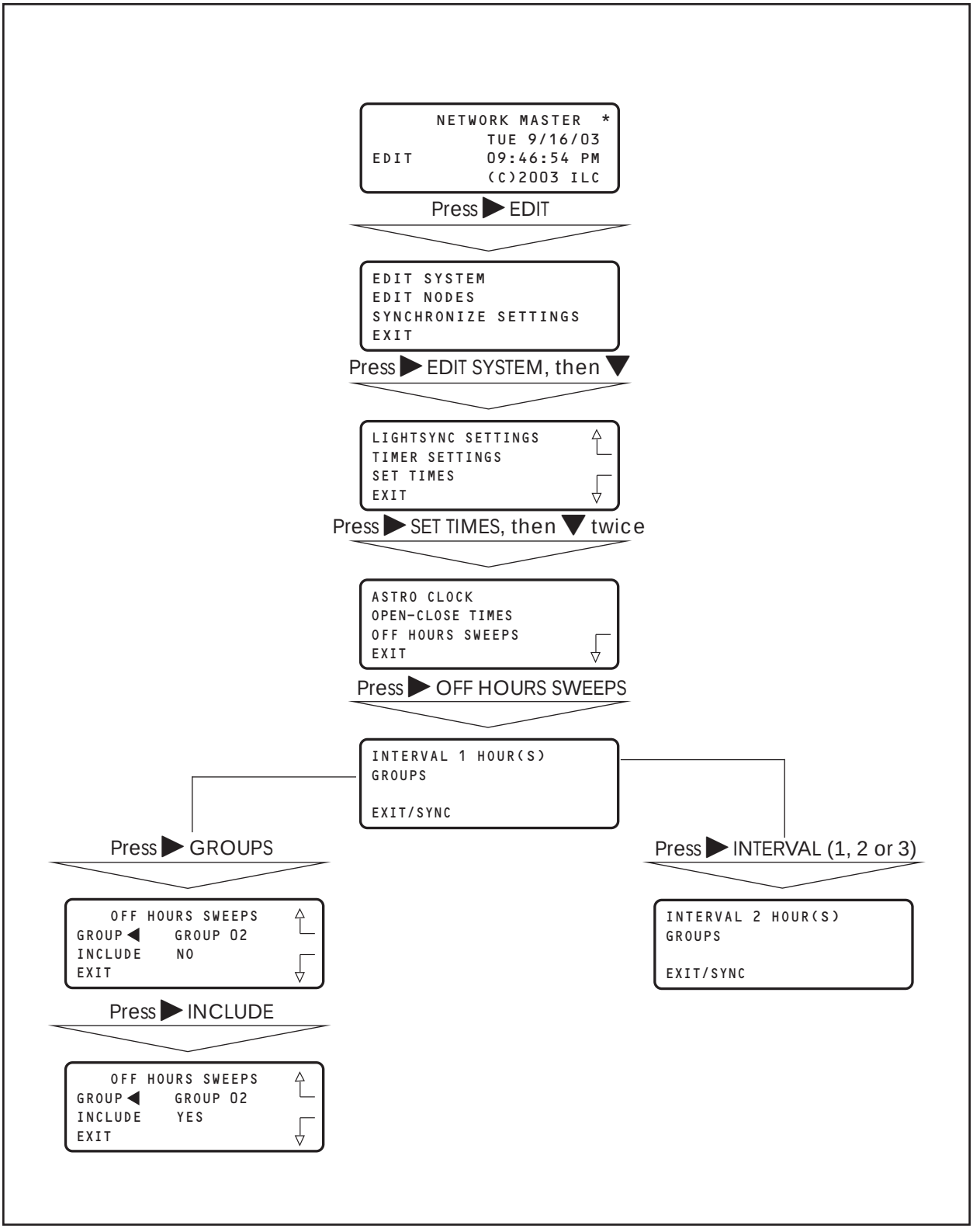


Figure 3-25 How to Program Group OFF Hours Sweeps Screens

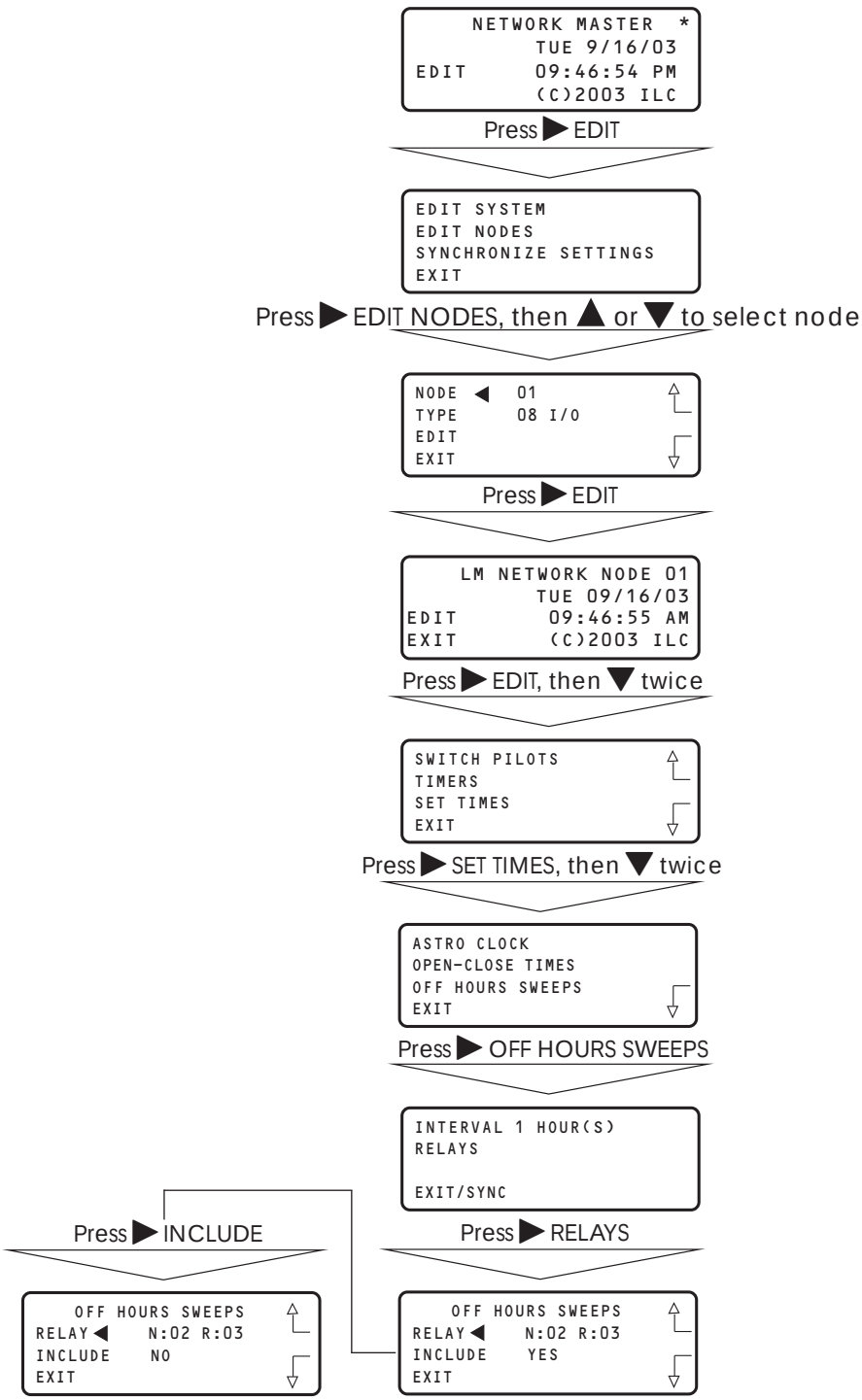


Figure 3-25 How to Program OFF Hours Sweep of Relays in a Node Screens

3.15 Off Hours Sweeps

CONCEPTS AND PARAMETERS

You can program the controller to execute OFF sweeps to insure 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 3-34, 3-35 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
This operation is performed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network menu appears, press ▶ EDIT SYSTEM, then press ▼.

2. When the System Main menu appears, press ▶ SET TIMES; then ▼ twice.

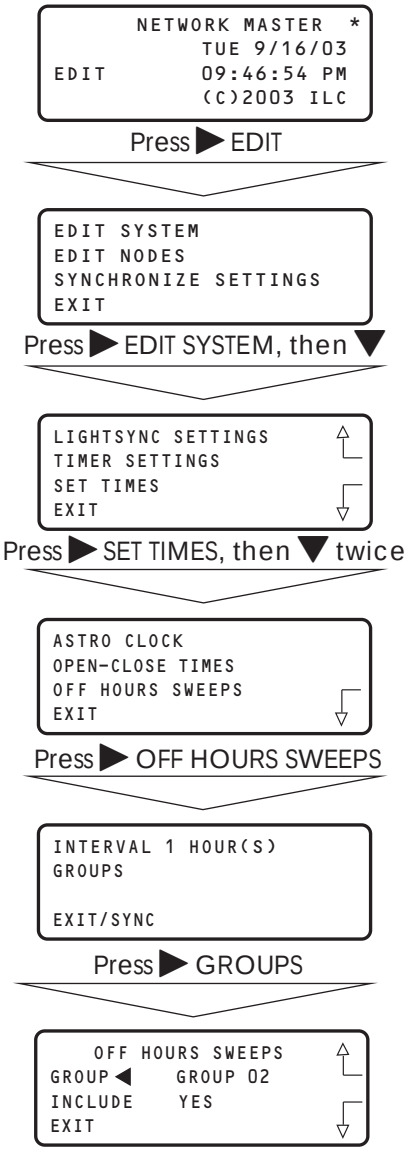
3. When the SET TIMES Menu appears, press ▶ OFF HOURS SWEEPS

4. When the Off Hours Sweep menu appears, press ▶ GROUPS

5. When the Off Sweep Group screen appears, press ▲ to select the relay group subject to the Off sweep.

6. Press ▶ INCLUDE until YES appears.

7. Press ▶ EXIT five times to return to the Home screen.



SAMPLE OPERATION:
Program a Relay(s) in a Node for Off Hours Sweep
This operation is performed at the node level.

1. Access the desired node, press ▶ EDIT, then ▼ twice.

2. Press ▶ SET TIMES, then ▼ twice.

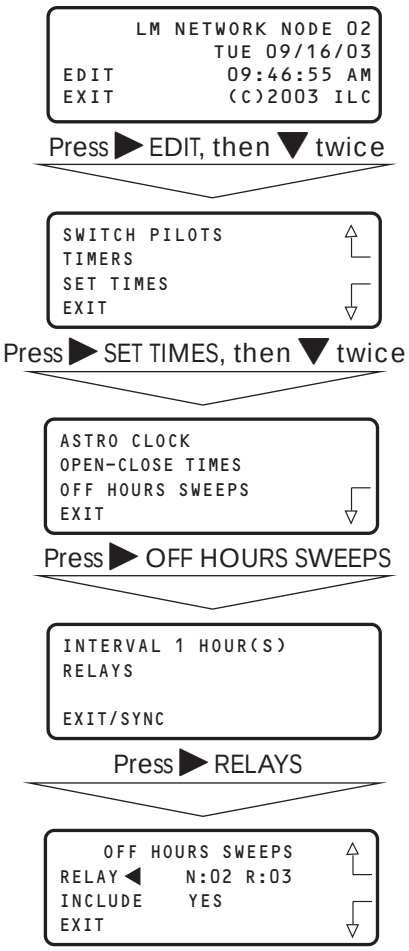
3. Press ▶ OFF HOURS SWEEPS.

4. When the Off Hours Sweep menu appears, press ▶ RELAYS.

5. When the Off Sweep Group screen appears, press ▲ to select the relay subject to the Off sweep.

6. Press ▶ INCLUDE until YES appears.

7. Press ▶ EXIT seven times to return to the Network Home screen.



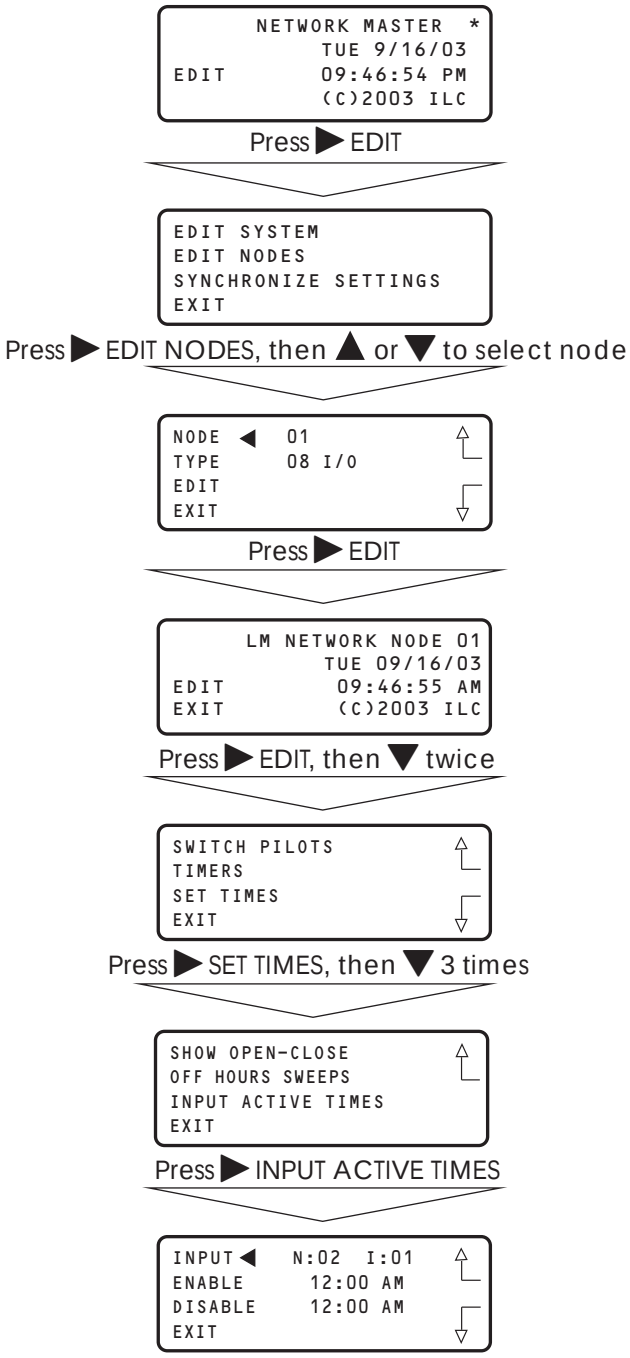


Figure 3-26 Input Active Times Screens

3.16 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 = one 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
This operation is performed at the Node level.

1. From the desired Node Home screen, press ▶ EDIT; then press ▼ twice.

2. When the Main menu appears, press ▶ SET TIMES; then ▼ 3 times.

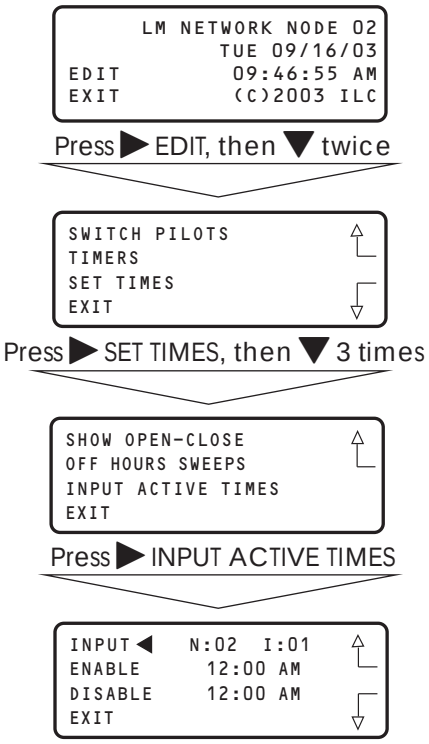
3. When the SET TIMES Menu appears, press ▶ INPUT ACTIVE TIMES.

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 6 times to return to the Home screen.



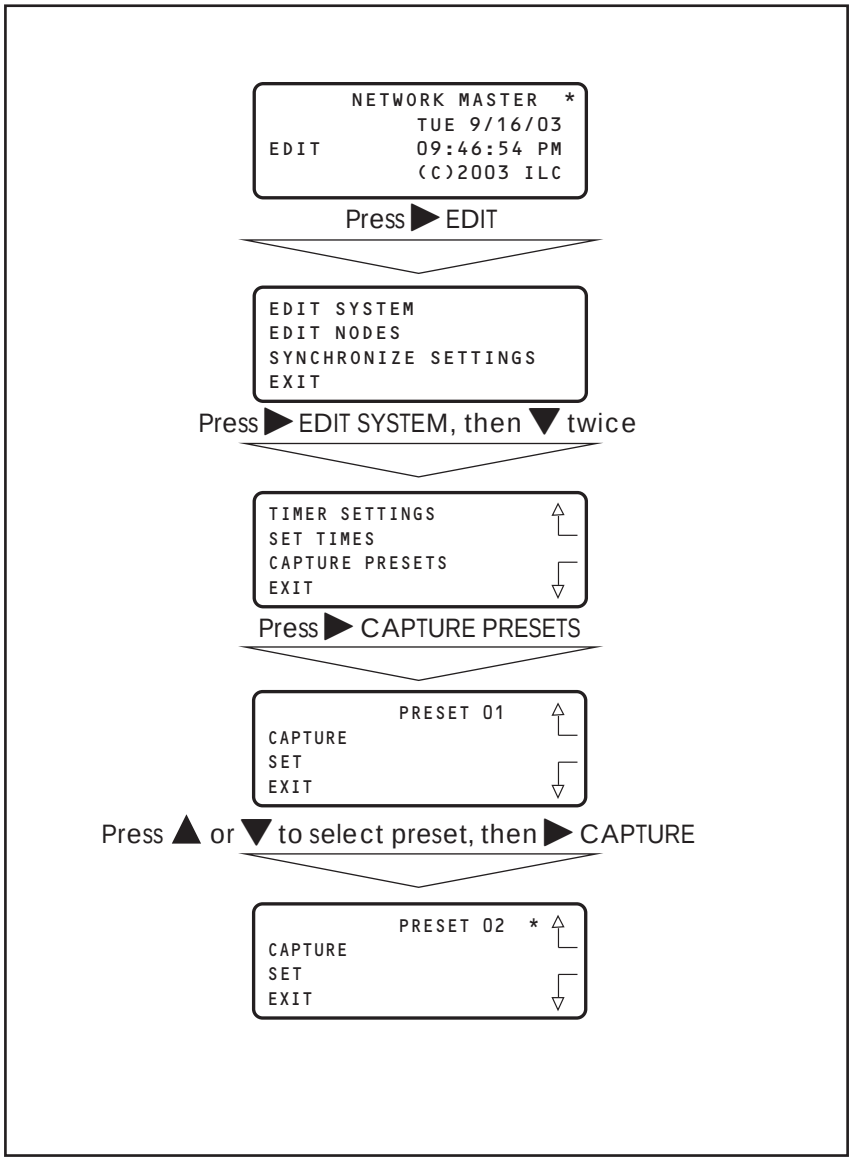


Figure 3-27 Capture and Set Presets Screens

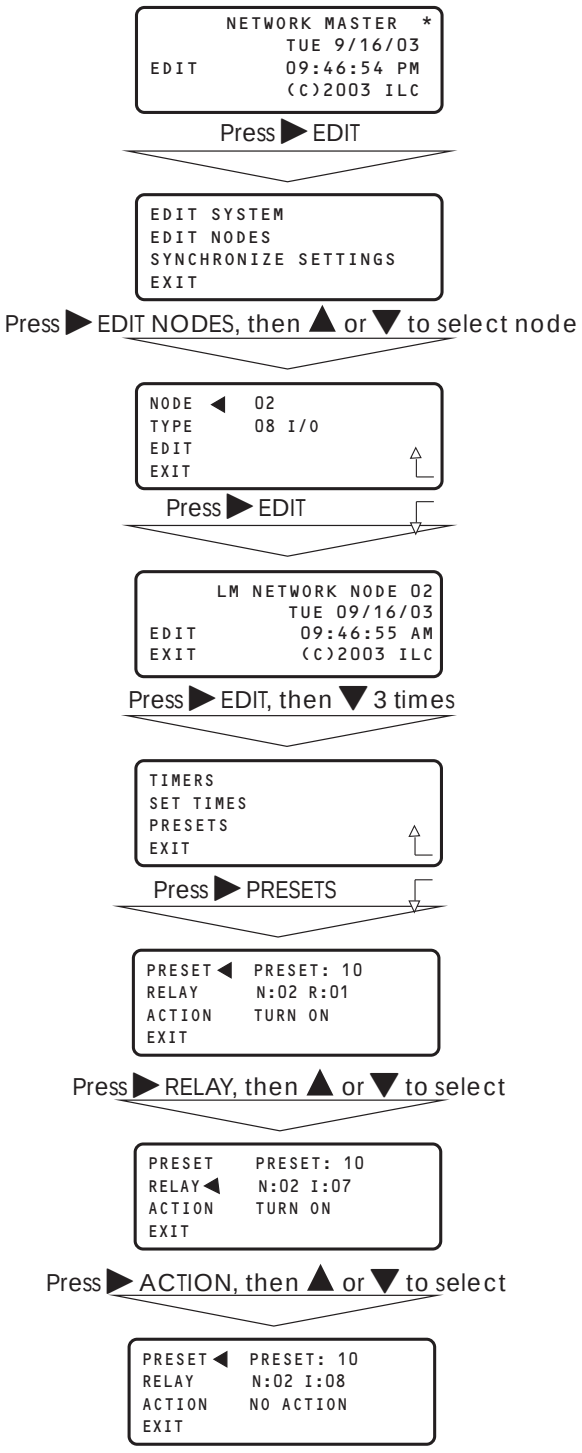


Figure 3-28 Edit Presets Screens

3.17 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 = one 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

CAPTURE & SET operations are performed at the system level.

EDIT PRESETS:

RELAY = one of 48 possible relay outputs making up the preset

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

EDIT operations are performed at the node level.

SAMPLE OPERATION:
Capture, EDIT, and Set a Preset

CAPTURE and SET operations are done at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network menu appears, press ▶ EDIT SYSTEM, then ▼ twice.

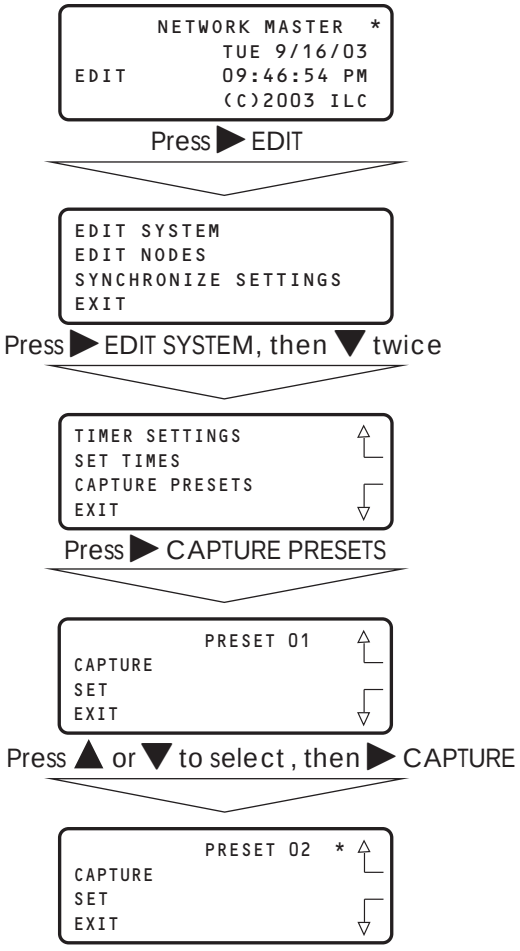
2. When the Main menu appears press ▶ CAPTURE PRESETS.

3. When the Presets Capture screen appears, press ▲ until the preset you want to capture appears in the preset field.

4. Press ▶ CAPTURE to save the current relay state as the preset.

6. Press ▶ SET to invoke the preset.

7. Press ▶ EXIT 3 times to return to the Network Home Screen.



EDIT operations are performed at the node level.

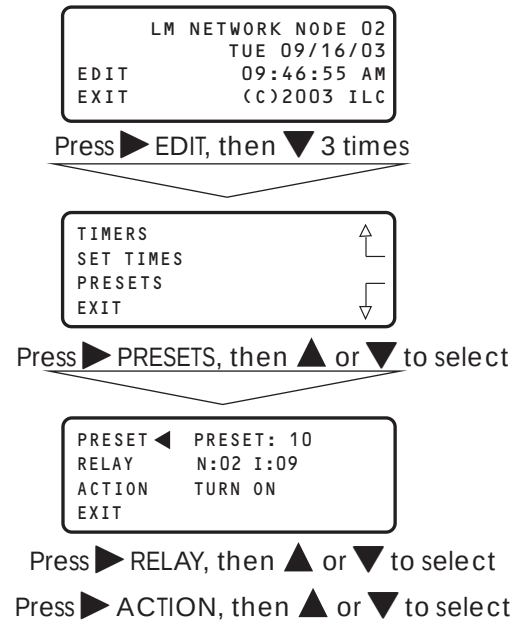
1. Access the desired Node; press ▶ EDIT; then press ▼ 3 times.

2. When the Edit Presets screen appears, press ▲ or ▼ until the preset you previously captured appears in the action field.

3. Press ▶ RELAY; then press ▲ or ▼ until the desired relay state appears in the action field.

5. Repeat steps 3 and 4 for any additional relays you want to change in the selected node.

6. Access other nodes if required to complete the edit.



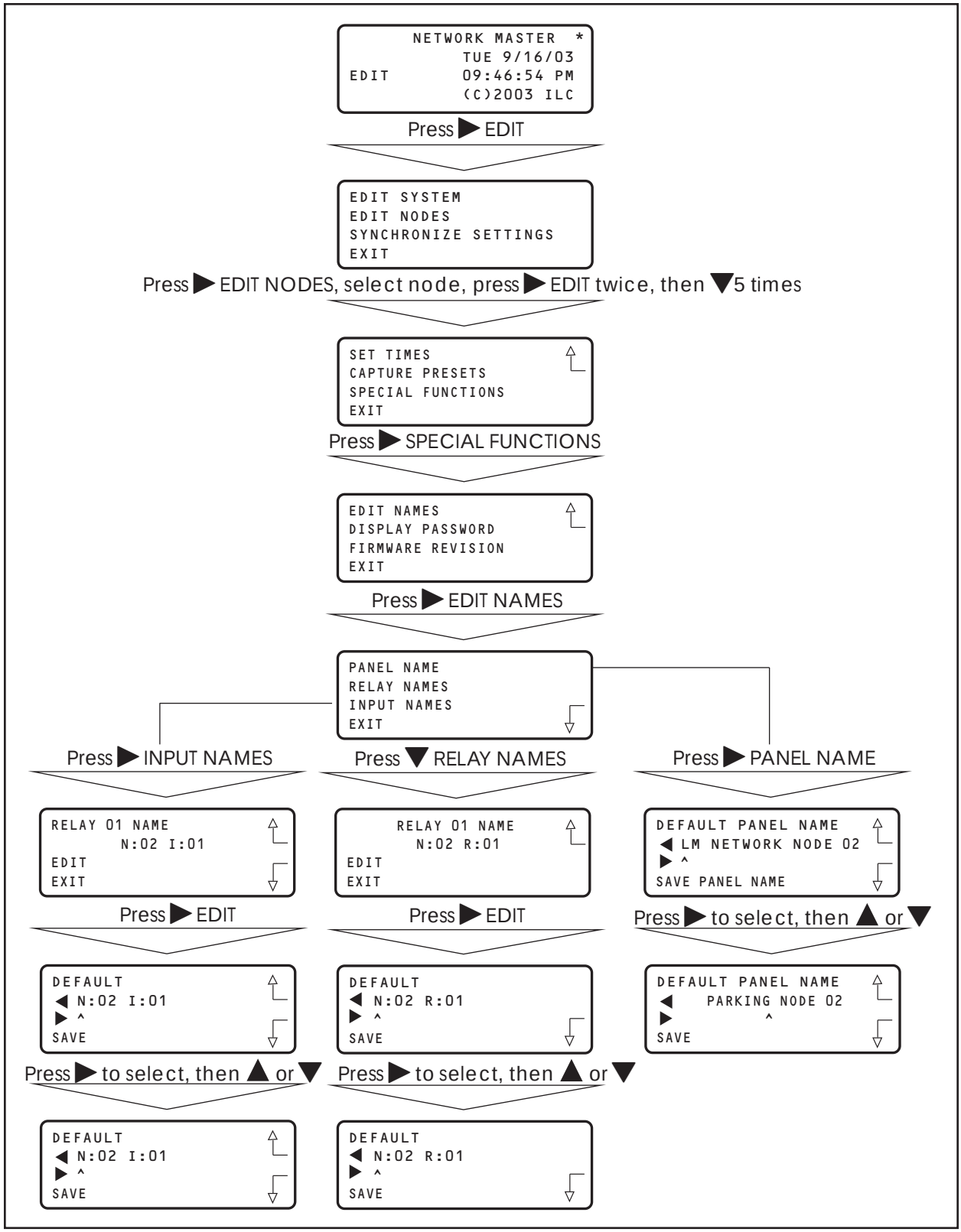


Figure 3-29 Edit System Names Screens

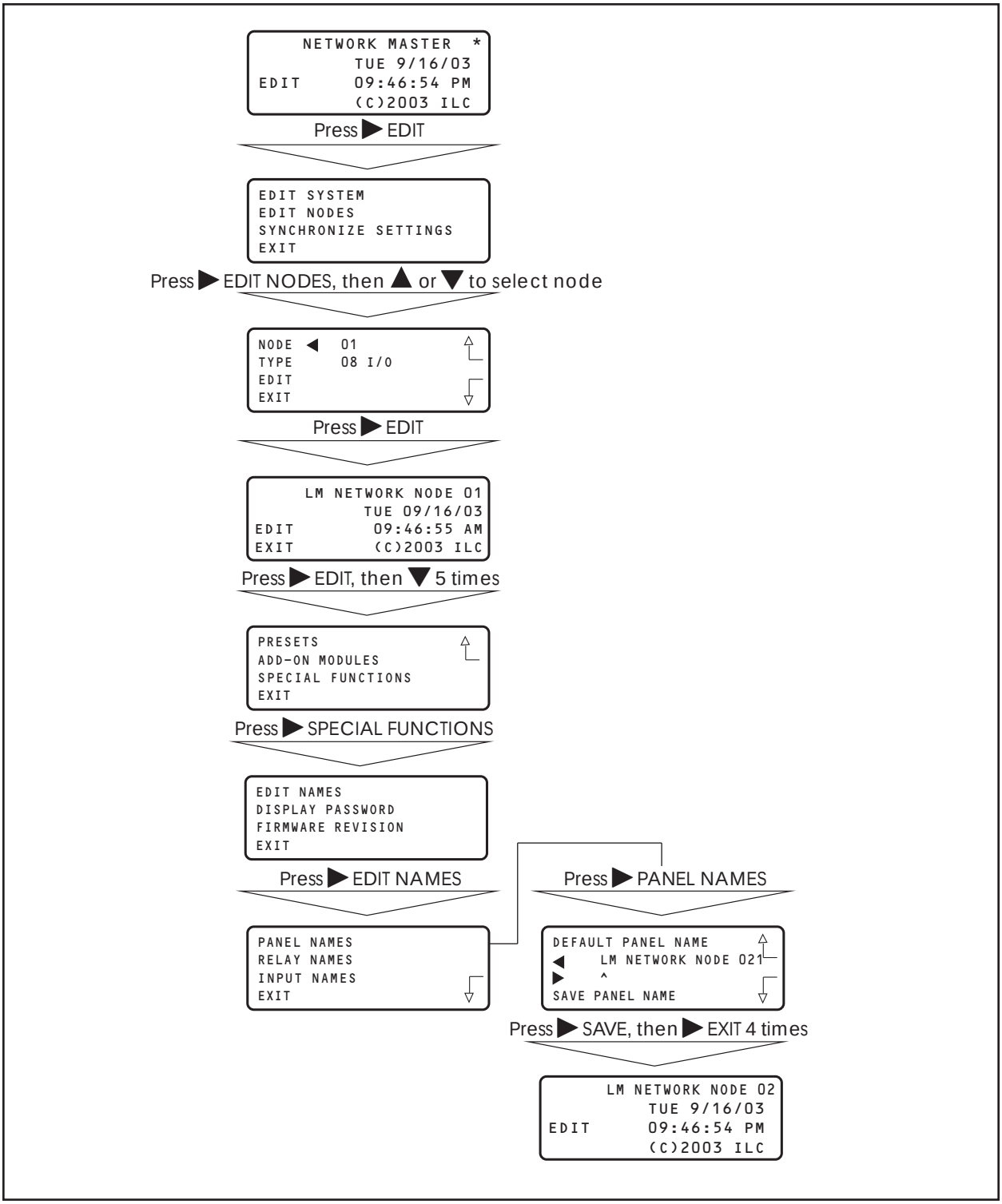


Figure 3-30 Edit Node Names Screens

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

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.

NOTE: Panel, Relay and Input names are edited on the Node level. Group, Preset, Timer and LightSync Names are edited on the System level.

SAMPLE OPERATION:
Customize The Name Of a Panel

1. Access the desired Node 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.

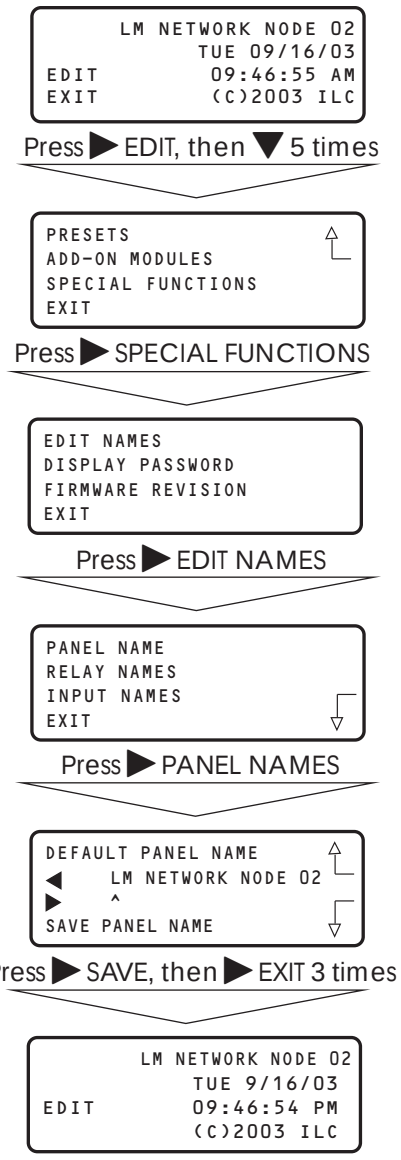
4. When the Edit Names menu appears, press ▶ PANEL NAMES.

5. When the Panel 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.

6. Repeat step 5 until the customized name has completely overwritten the default name.

7. Press ▶ SAVE PANEL NAME.

8. Press ▶ EXIT 6 times to return to the Network Home Screen.



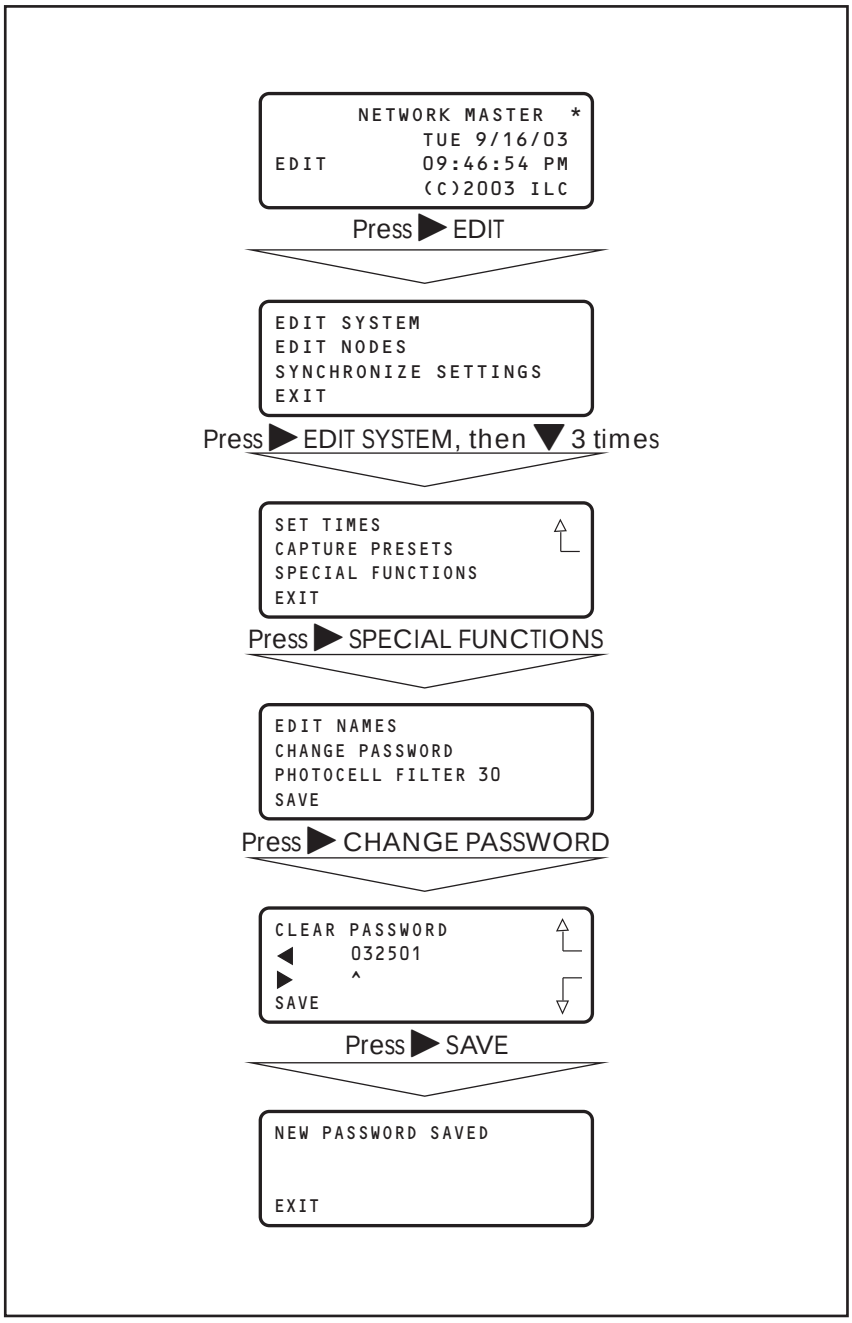


Figure 3-31 How to Enter or Change a Password Screens

3.19 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
This operation is programmed on the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network menu appears, press ▶ EDIT SYSTEM, then press ▼ 3 times.

2. When the Main menu appears, press ▶ SPECIAL FUNCTIONS.

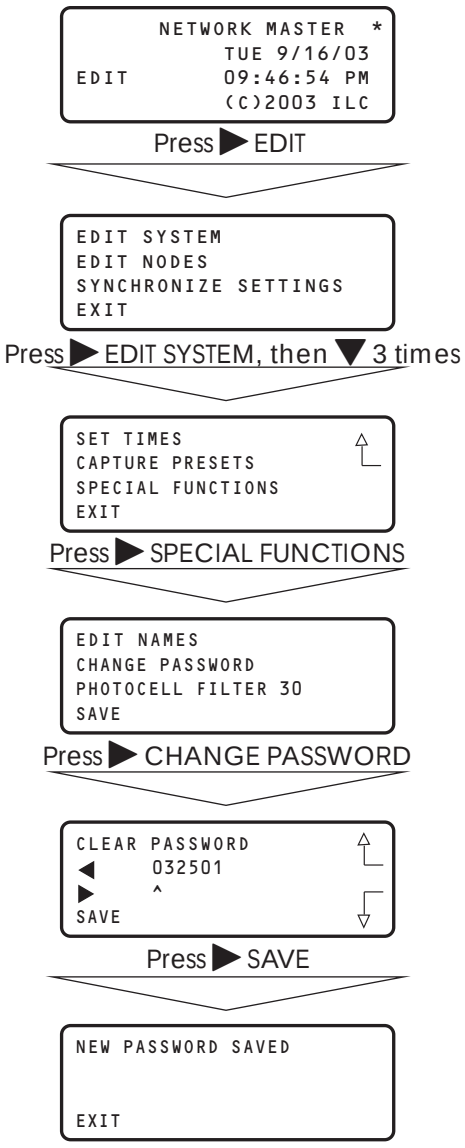
3. When the Special Functions menu appears, press ▶ CHANGE PASSWORD

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

4. Repeat step 7 for the remaining digits.

6. Press ▶ SAVE. A message will appear saying NEW PASSWORD SAVED

7. Press ▶ EXIT to return to the Network Home screen



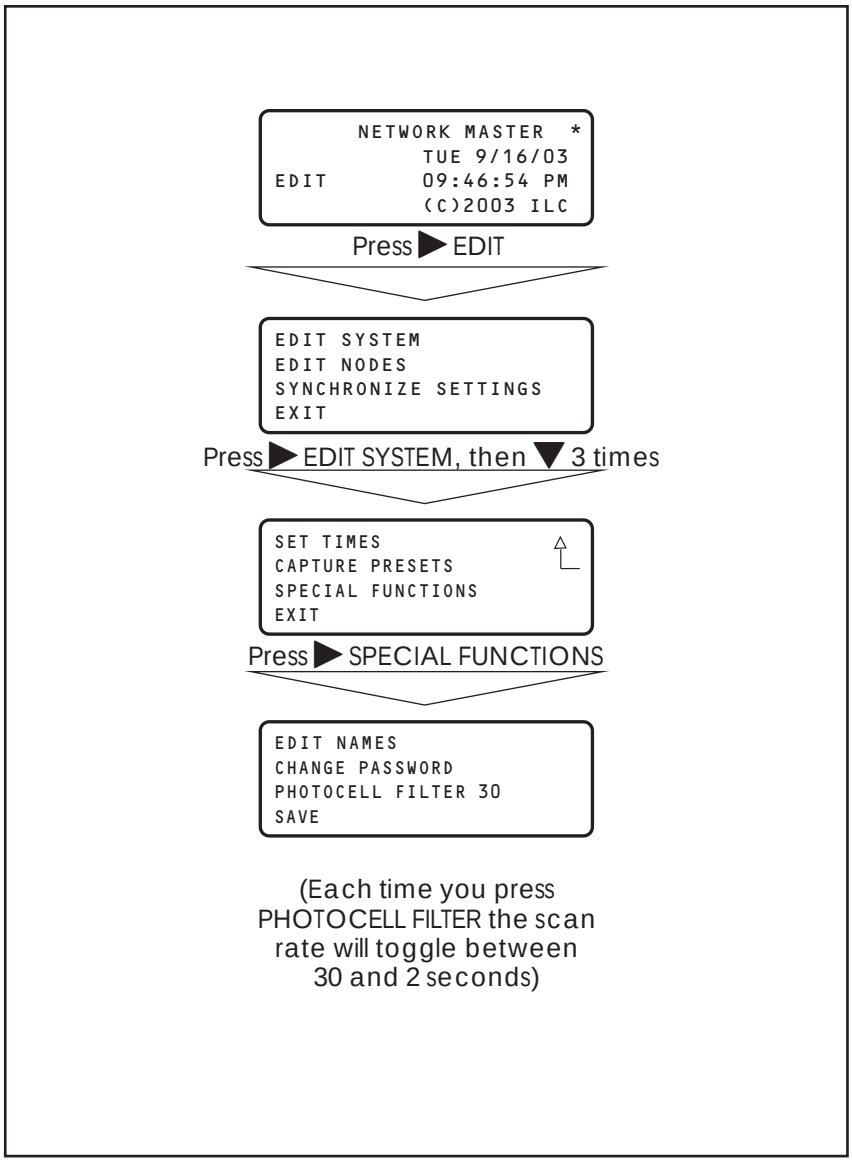


Figure 3-32 How to Enter the Photocell Scan Rate Screens

3.20 How to Change the Photocell Filter

CONCEPTS AND PARAMETERS

The controller checks the state of the ILC photocell every 30 seconds. You have the option of changing the default scan rate (filter) to every 2 seconds.

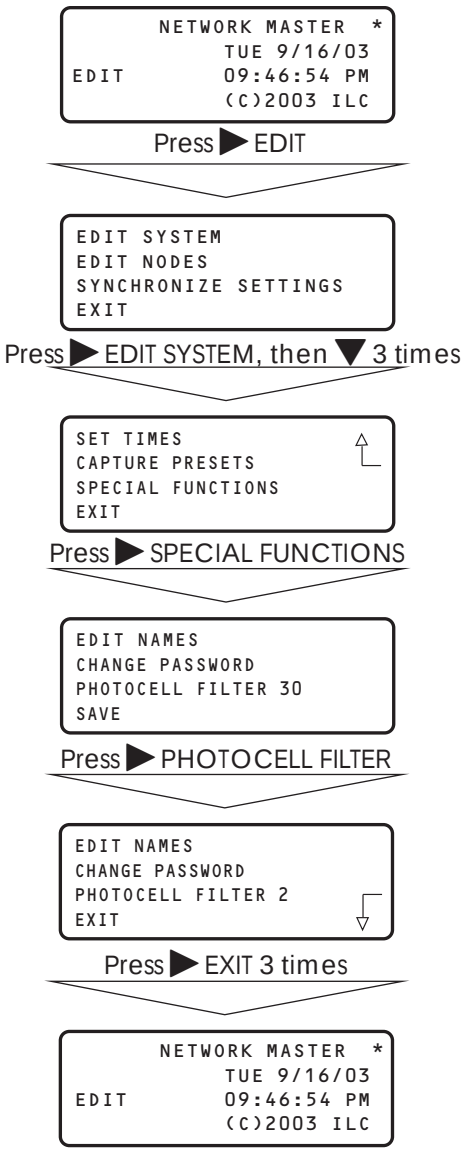
SAMPLE OPERATION:
Change the Photocell Filter to 2 seconds
This operation is programmed at the system level.

1. From the Network Home screen, press ▶ EDIT; when the Network menu appears, press ▶ EDIT SYSTEM, then press ▼ 3 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 3 times to return to the Home screen.



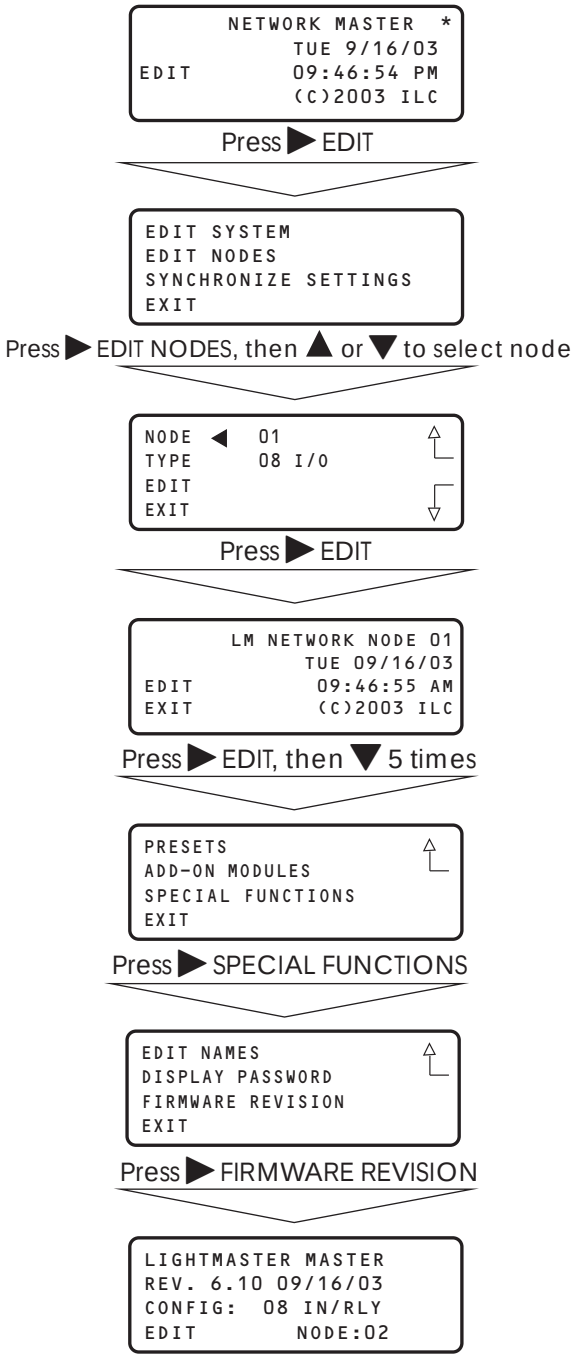


Figure 3-33 How to View a Controller's Firmware Revision Screens

3.21 How to View The Controller Firmware Revision

The Firmware Revision screen list 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 a gateway to a "Hidden" screen used to perform certain operations. *(Note: See Hidden Menu Choices near the beginning of this section.)*

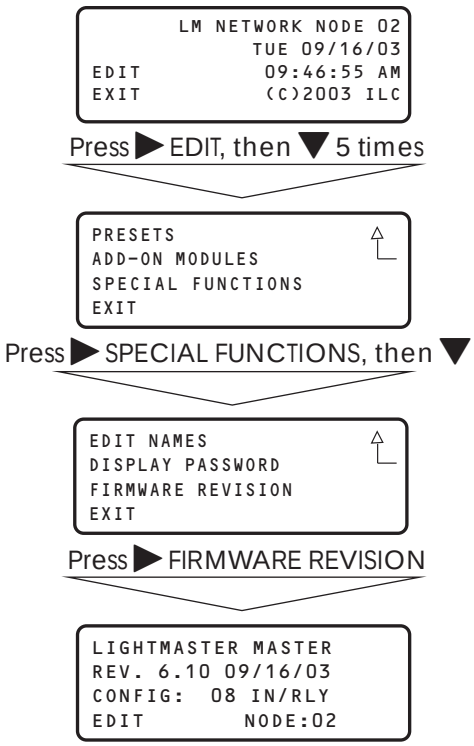
SAMPLE OPERATION:
View The Controller Firmware Revision
This operation is performed at the node level.

1. Access the desired Node 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 ▶ FIRMWARE REVISION to view the Firmware Revision screen.

4. Press ▶ EXIT 6 times to return to the Home screen.

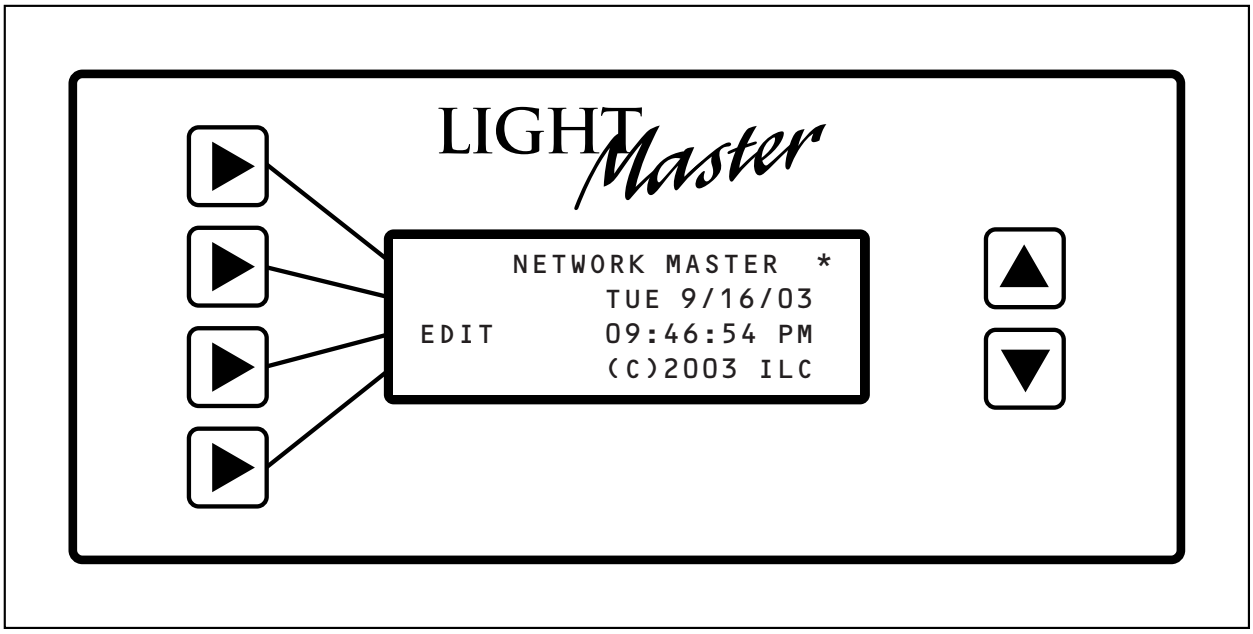


3.22 Add-On Modules

ADD-ON MODULES is a choice on the Node 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™ Device Switching



Section 4 LightSync Device Switching

4.0 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 hard-wired connection to the switch inputs are also available for LightSync switching (see Table 4-1). 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 RJ45 female connectors. (See Figure 4.1). You run the CAT-5 cable between the controller and specially designed LightSync devices installed throughout the facility. (See Figure 4.2). 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. (See Figure 4.2b for detail). The devices are equipped with two RJ45 connectors. Each switch must have a unique node address (01-7F). (See Figure 4-3a). NOTE: LightSync switch node addresses are pre set at the factory.

LightSync switches are available in either momentary push button, maintained, or key switch configurations. Switches are available with up to 6 push buttons 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 4.3b), a 4-input switch station (SIB-4) (Figure 4.3c), and a 6-Input/Output module (D-6) (Figure 4.3d) 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 a "T" connections (one incoming and two outgoing lines). See Figure 4.9.

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 RJ45 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 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 also 5 device nodes address them 06-0A

4. Set each node address and plug the cables into the apprpriate 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 each switch controls. (See programming information later in this section.)
7. Actuate each switch to verify correct operation.

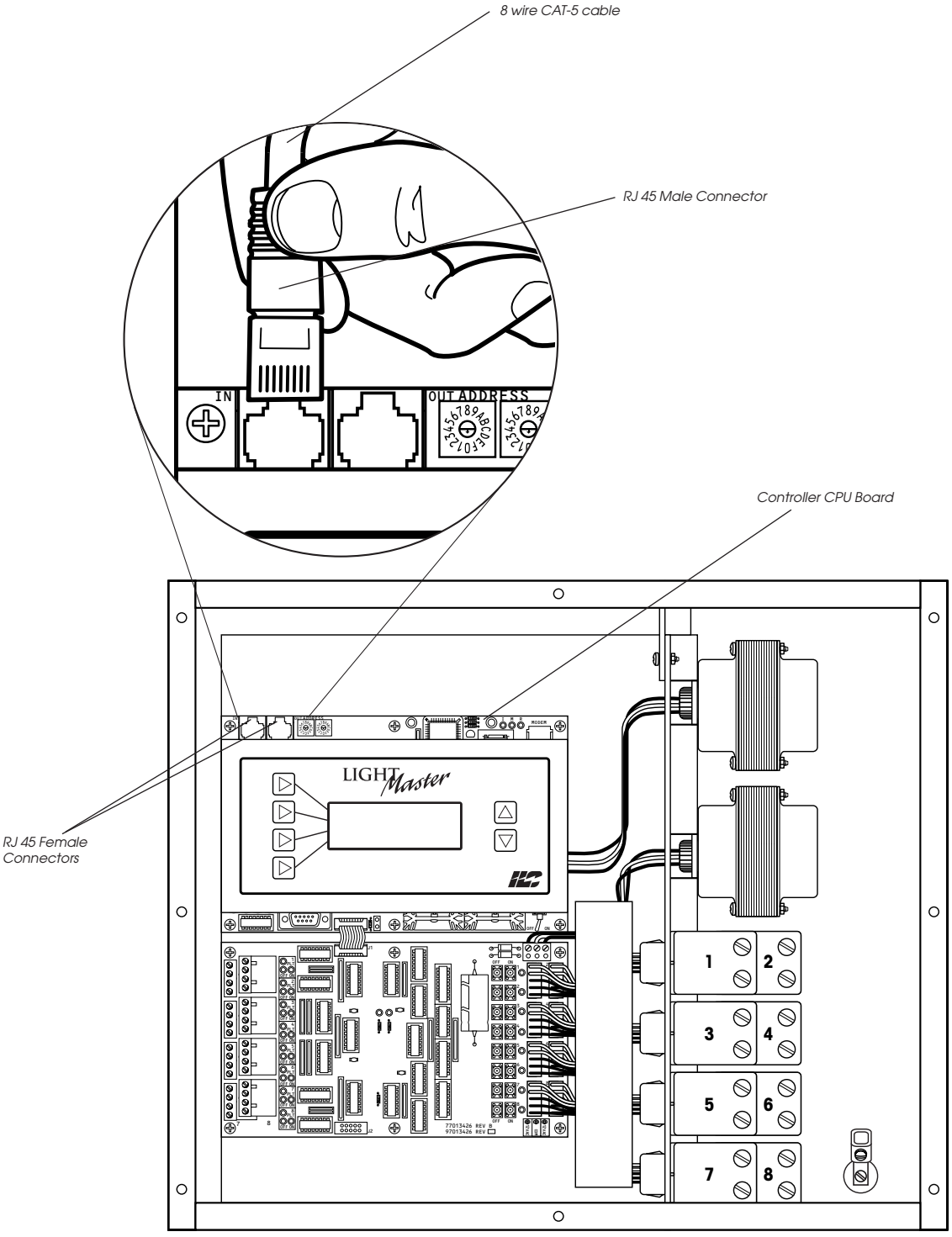


Figure 4.1 – CPU Board LightSync Connection Detail

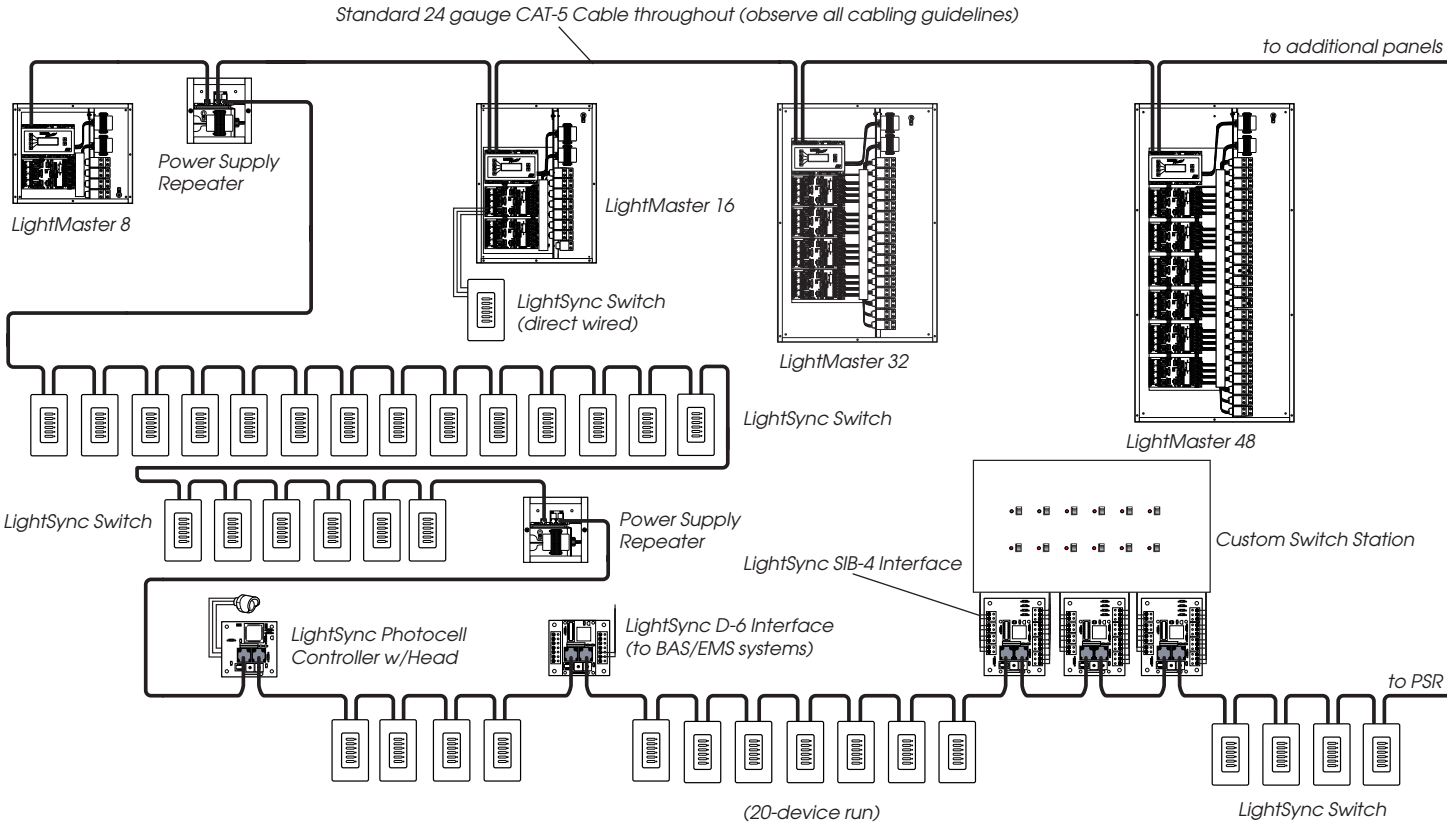


Figure 4.2 – Typical LightSync Switching Layout

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 RJ45 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 RJ45 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.

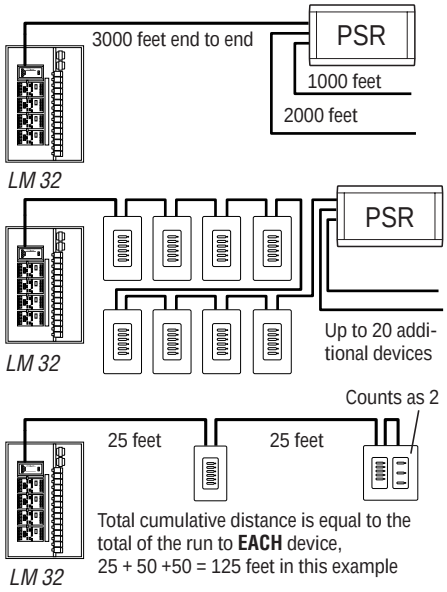
Figure 4.2a – Device Overview and Wiring Guidelines

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 Suppy (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 RJ45 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 RJ45 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

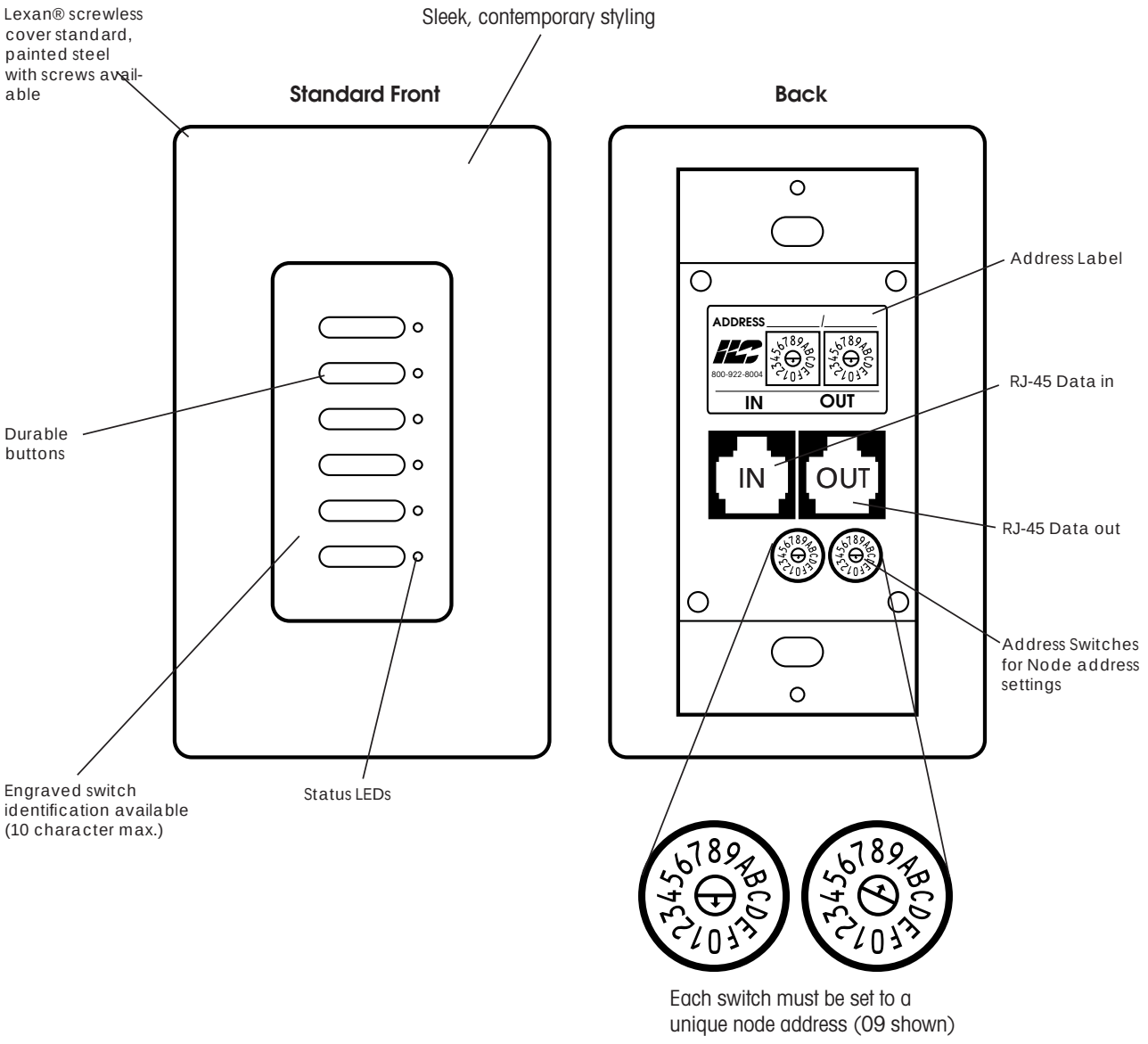


Figure 4.3a – LightSync Switch Detail

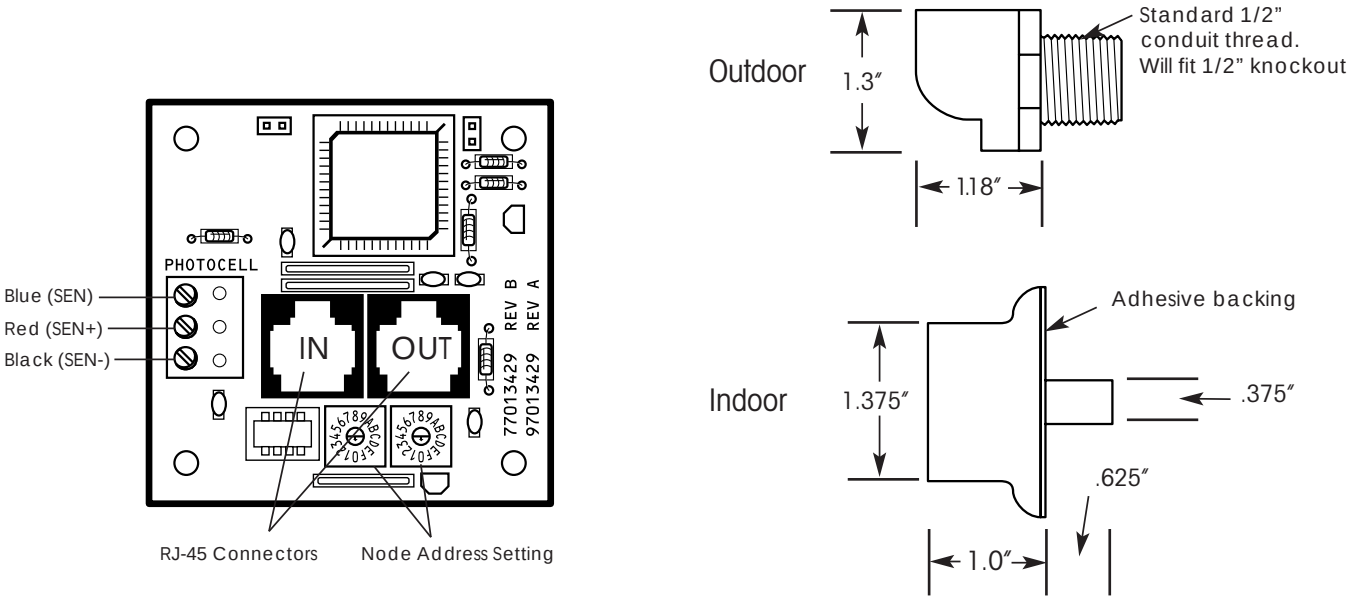


Figure 4.3b– LightSync Photocell Controller and Heads Detail

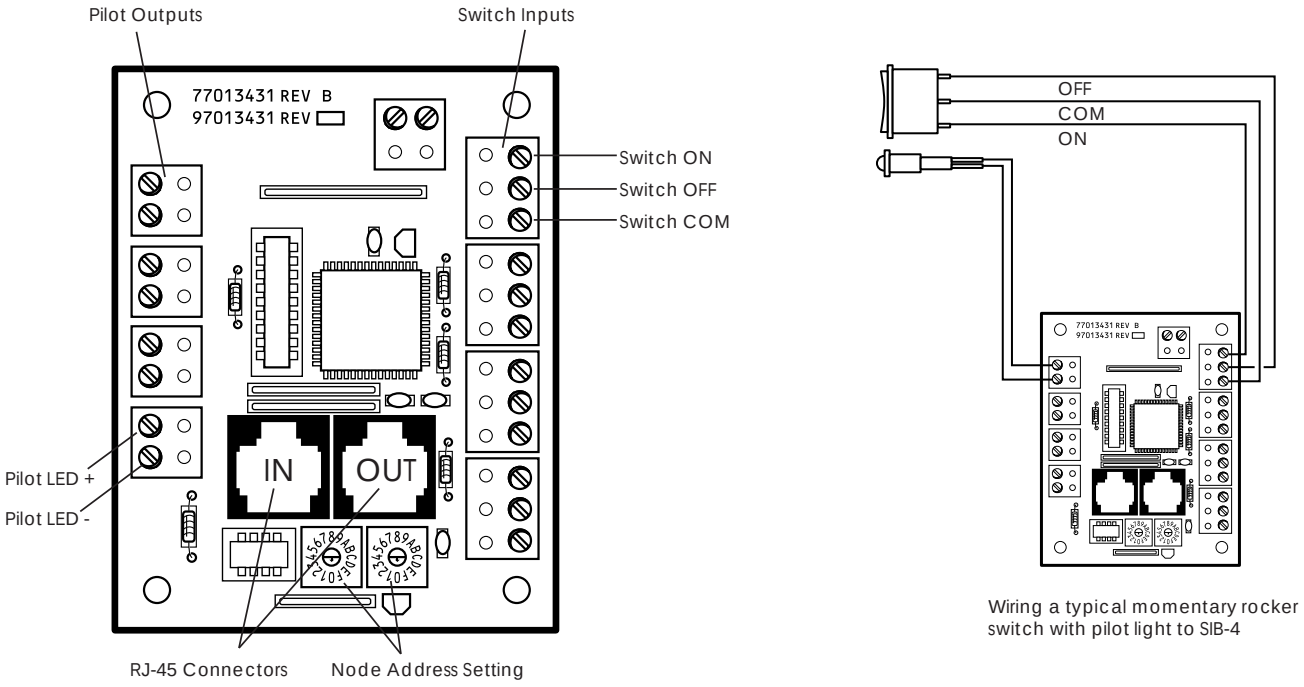
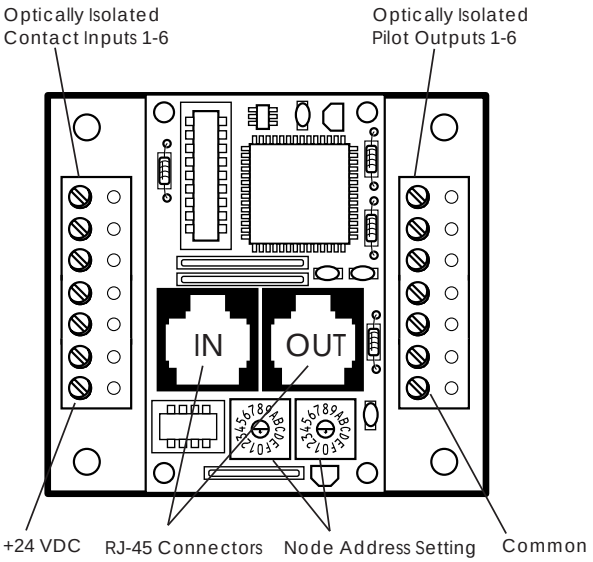
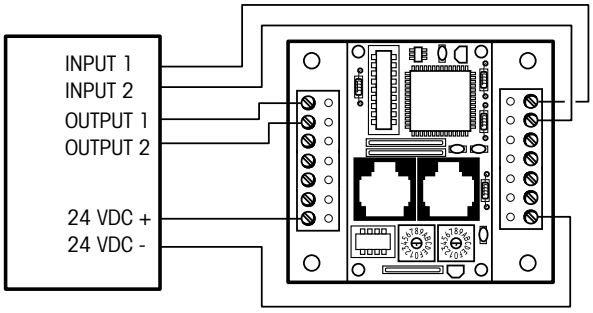


Figure 4.3c – LightSync SIB-4 Switch Interface





Wiring a typical BAS interface to D-6

Figure 4.3d – LightSync D-6 Network Contact Interface

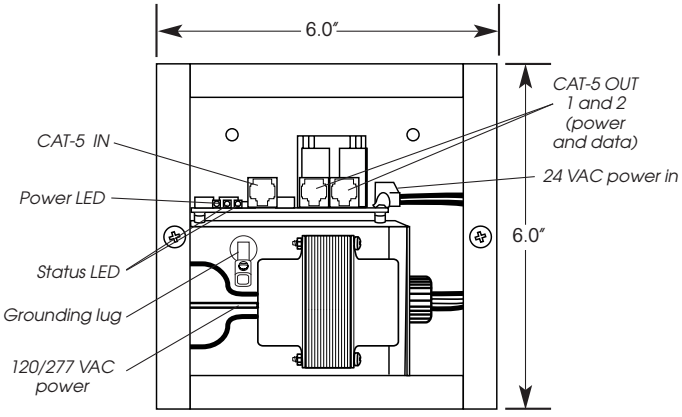


Figure 4.4 – LightSync Power Supply Repeater (PSR) Detail

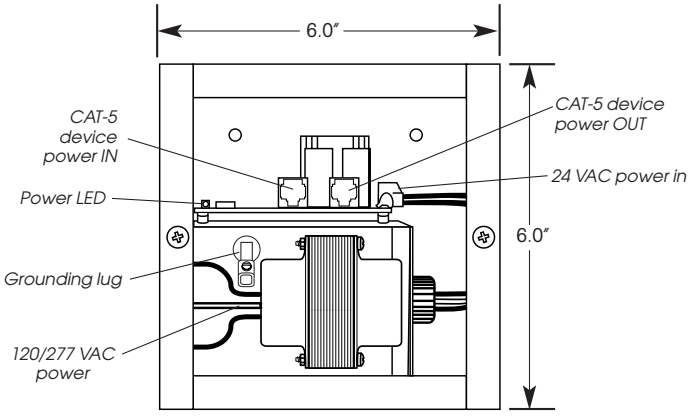
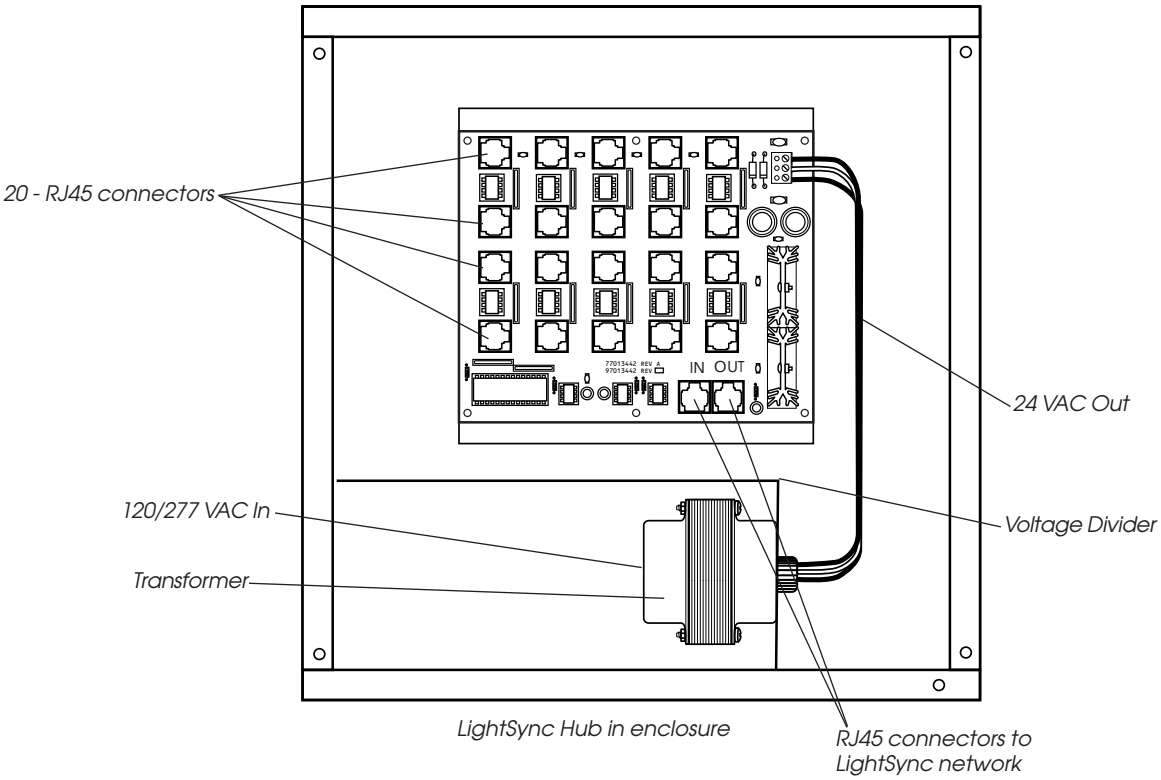
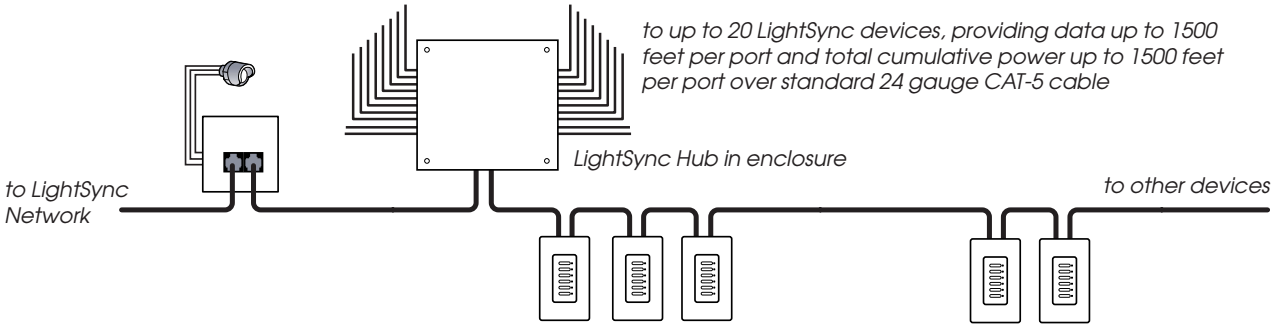


Figure 4.4a – LightSync Power Supply (PS) Detail





LightSync Network Example with LightSync Hub

Figure 4.4a – LightSync Hub Option

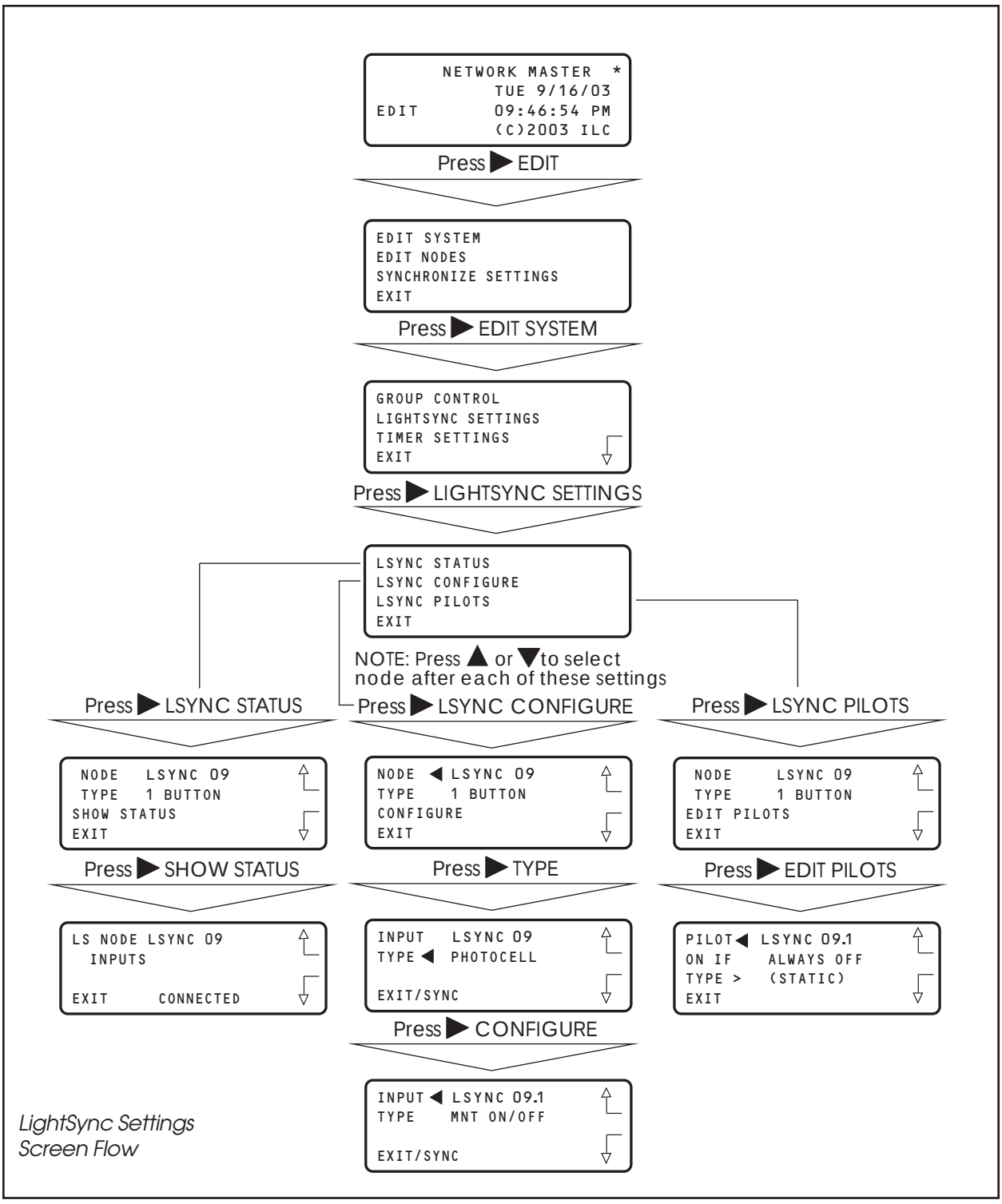
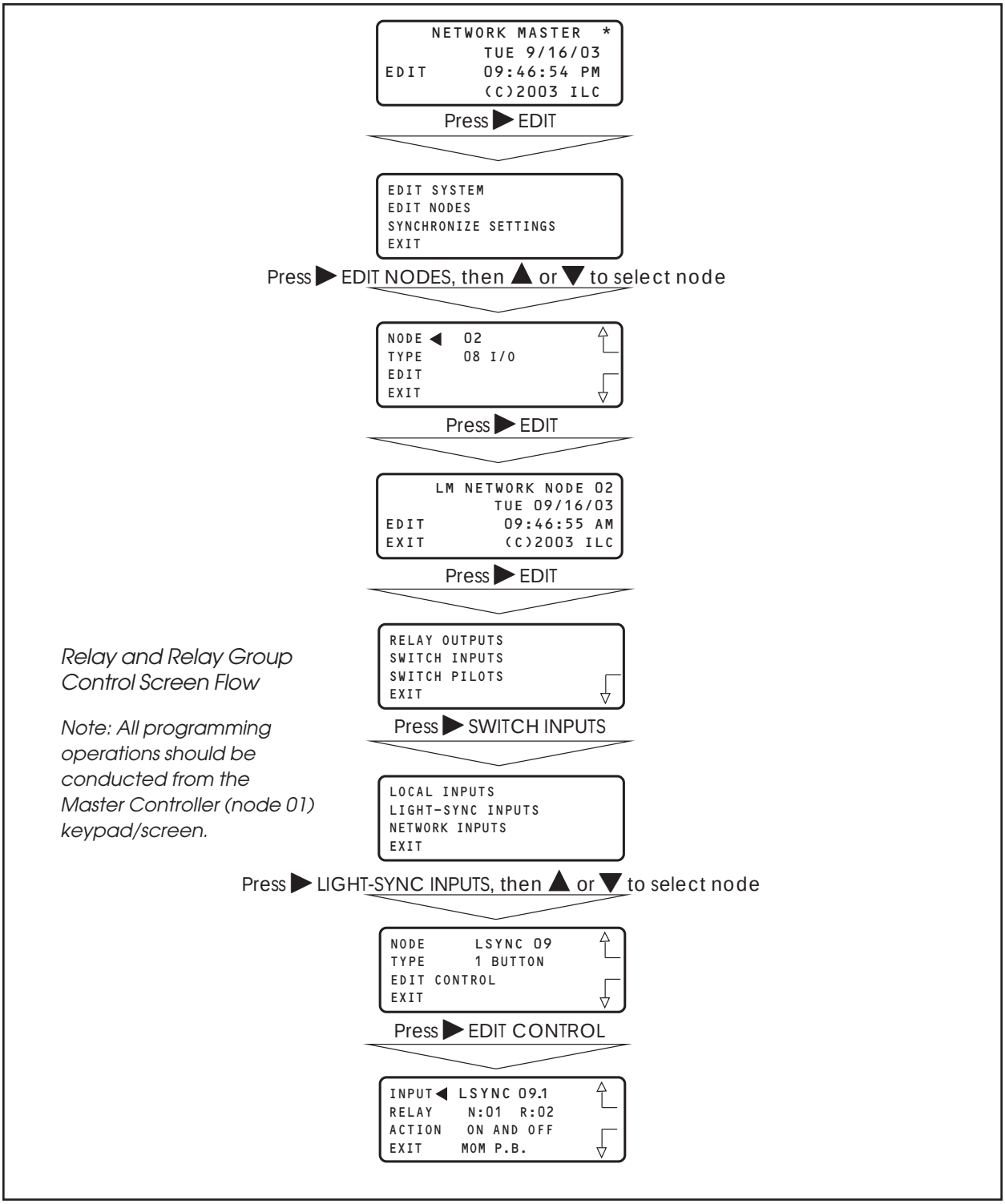


Figure 4.5 How to Define a LightSync Switch Node Screens



Relay and Relay Group Control Screen Flow

Note: All programming operations should be conducted from the Master Controller (node 01) keypad/screen.

Figure 4.6 How to Control Relays and Relay Groups with a LightSync Switch Screens

4.2 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 device 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 or relay group

Note: All programming operations should be conducted from the Master Controller node 01 keypad/screen.

LIGHT-SYNC NODE CONTROL: PARAMETERS/OPTIONS:

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

TYPE (node) = the physical configuration of the node: 1-6 pushbutton switch, 4-input switch unit (SIB-4), 6-unit I/O unit (D-6), LightSync 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 4-1 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 effect the relay. (Default is NO ACTION). Other possible responses ON ONLY, OFF ONLY, ON AND OFF, BLINK ALERT

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	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 are 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 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.
Timer Disable	LightSync SIB-4	As long as the switch is closed, selected timers are disabled.
Output Override	LightSync SIB-4	As long as the switch is closed, selected relay output(s) will ignore all input, timer, or network commands.

Table 4.1 – Switch Types

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

Define the LightSync switch node:
This operation is programmed at the system level.

1. From the Network Home screen, press ▶ EDIT. When the Network Menu appears, press ▶ EDIT SYSTEM.

2. When the system MAIN menu appears, press ▶ LIGHTSYNC SETTINGS.

3. From the LightSync menu appears, press ▶ LSYNC CONFIGURE.

4. When the top level configuration screen appears, press ▲ or ▼ until the device node address you want to define appears.

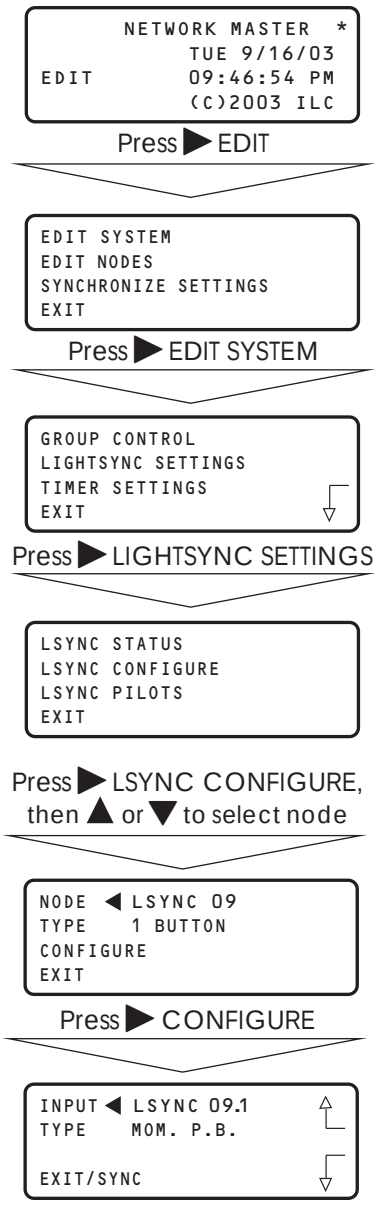
5. Press ▶ TYPE; then ▼ until the physical device node type appears.

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 ▲ until the desired functional switch type appears. *Note: Functional switch types are limited by the physical node type. See Table 4-1.*

9. Press ▶ EXIT/SYNC, then ▶ EXIT to return to the LightSync Input menu.



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

Select the relay that the switch node controls
This operation is programmed at the node level.

1. From the desired controller node Home screen, press ▶ EDIT, then press ▶ SWITCH INPUTS.

2. When the Switch Inputs Menu appears, press ▶ LIGHT-SYNC INPUTS.

3. Press ▲ or ▼ until the device node input that controls relay(s) appears.

4. Press ▶ EDIT CONTROL.

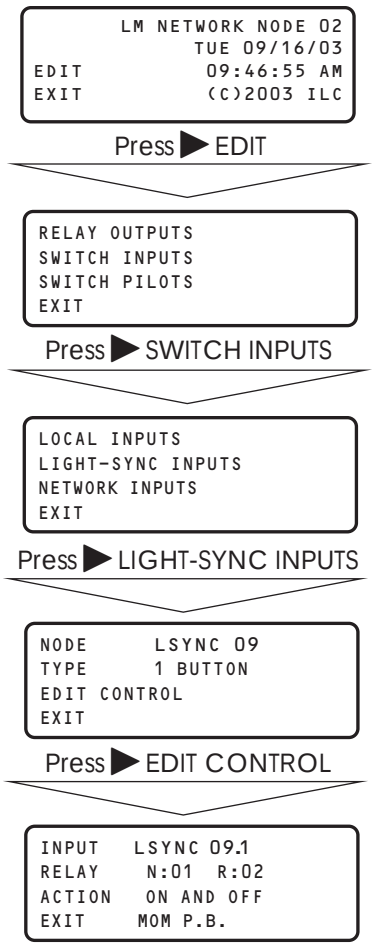
5. When the Input Relay Control screen appears, if the device node has sub-addresses, press ▶ INPUT; then ▲ or ▼ to select the device node sub-address.

6. Press ▶ RELAY; then ▲ or ▼ until the relay to be controlled appears.

7. Press ▶ ACTION; then ▲ until the desired relay action appears.

8. Repeat steps 5 and 7 for any additional relays controlled by the input.

9. Press ▶ EXIT seven times to return to the Network Home Screen.



SAMPLE OPERATION:
Control a Relay Group From a LightSync Switch Node

Define the LightSync device 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)

Note: You can program LightSync/single relay control by accessing any desired controller node. However all LightSync/Group Control MUST be programmed by accessing The Master Node 01.

1. From the Master controller node 01 Home screen, press ▶ EDIT, then ▶ SWITCH INPUTS.

2. When the Switch Inputs Menu appears, press ▶ LIGHT-SYNC INPUTS

3. Press ▲ or ▼ until the device node that controls relay appears.

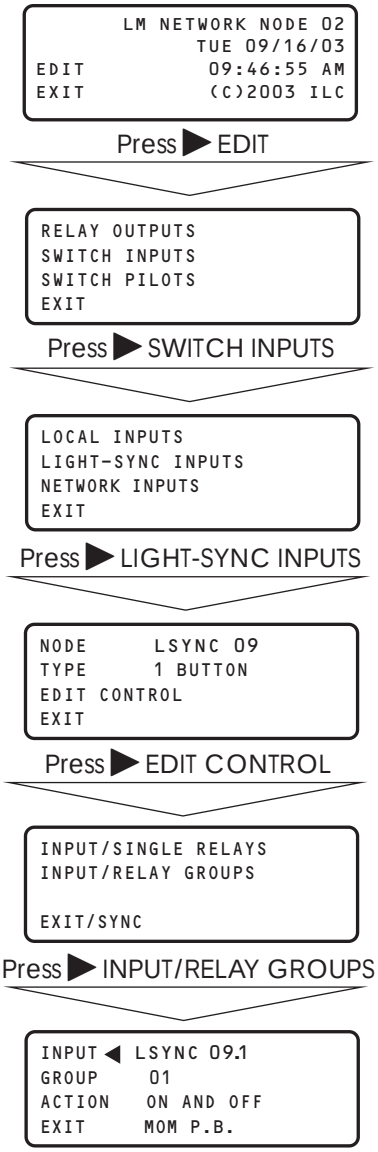
4. Press ▶ EDIT CONTROL; then press ▶ INPUT/RELAY GROUPS

5. When the Input/Relay Control screen appears, if the device node has sub-addresses, press ▶ INPUT then ▲ or ▼ to select the device node sub-address.

6. Press ▶ GROUP; then ▲ until the group to be controlled appears.

7. Press ▶ ACTION; then ▲ until the desired relay action appears.

8. Press ▶ EXIT 8 times to return to the Network Home Screen



4.3 LightSync Switch Status

CONCEPTS AND PARAMETERS

You can view the current status of each LightSync input.

Parameter Key:

NODE = One of a possible 127 switching nodes

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

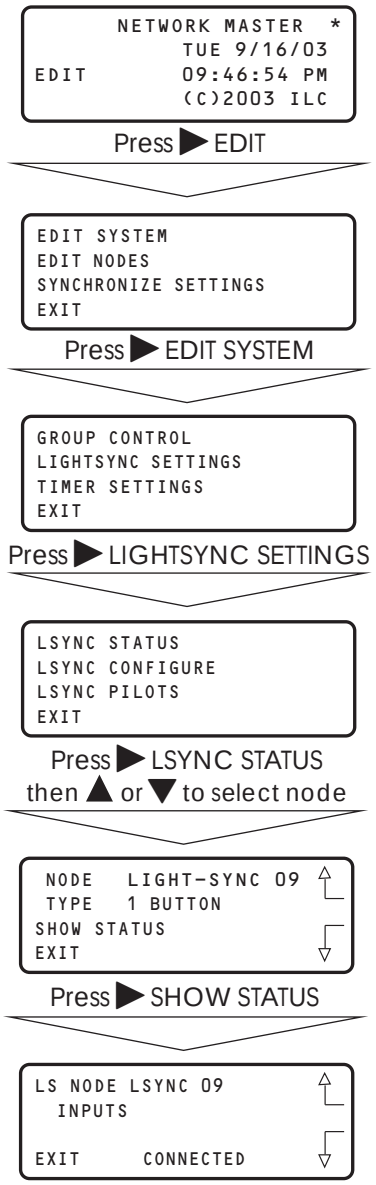
CONNECTED = LightSync device node is operational.

NO RESPONSE = LightSync device node is not communicating.

SAMPLE OPERATION:
Check the current status of a Switch Input

This operation is programmed on the system level.

1. From the Network Home screen. Press ▶ EDIT. When the Network Menu Appears, press ▶ EDIT SYSTEM.
2. From the System Main Menu, Press ▶ LIGHTSYNC SETTINGS; then ▶ LSYNC STATUS.
3. Press ▲ or ▼ until the device node you want to check appears.
4. Press ▶ SHOW STATUS to check the status of the node.
5. Press ▶ EXIT five times to return to the Network Home screen



4.4 How to Define a LightSync Switch Pilot

CONCEPTS AND PARAMETERS

To Define a Switch Pilot you must:

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

Note:The default is for the switch pilot light(s) on a LightSync switch is to be always OFF. If you want the Pilot lights to light you will have to program a change from the default.

Parameter Key:

PILOT = the number of the switch input pilot (1-48) located on a LightSync switch

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

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

STATIC = the user has the option of locking the switch pilots into either Always ON or Always OFF

SAMPLE OPERATION:
Program a Status LED to Light when a Preset is ON

This operation is programmed on the system level.

1. From the Network Home screen. Press ▶ EDIT. When the Network Menu Appears, press ▶ EDIT SYSTEM.

2. From the System Main Menu, Press ▶ LIGHTSYNC SETTINGS; then ▶ LIGHTSYNC PILOTS.

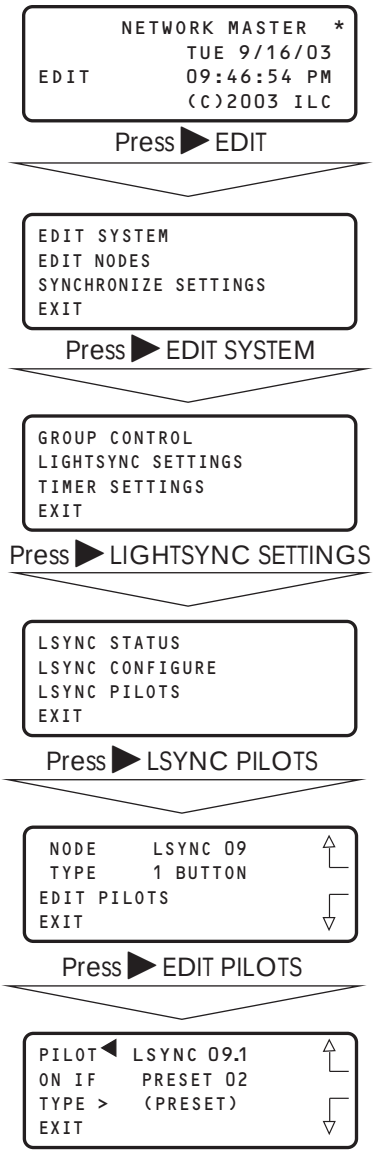
3. When the top level Switch Pilot definition screen appears, press ▲ or ▼ to select the device node

4. Press ▶ EDIT PILOTS

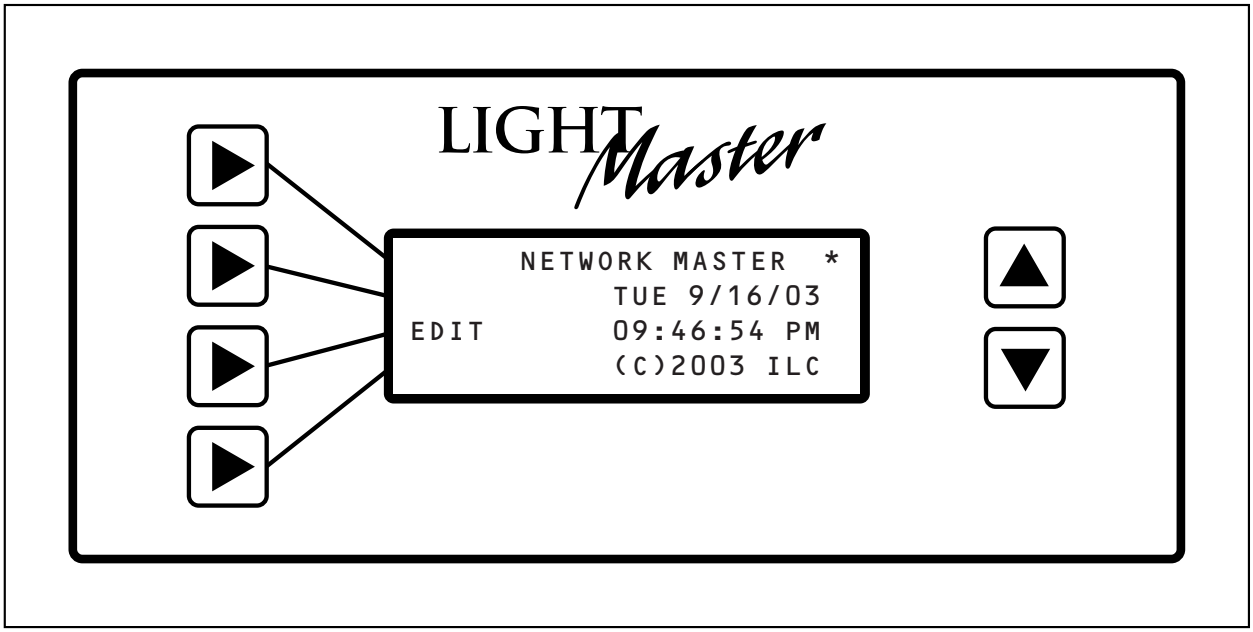
5. If the device node has sub-addresses, press ▶ PILOT then ▲ or ▼ to select the device node sub-address.

6. Press ▶ TYPE; then ▲ or ▼, to select the desired action.

7. From ▶ EXIT 5 times to return to the network Home screen



Section 5
Appendix



Section 5 Appendix

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 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 he 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 t elecommunications 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

Panel Level Connection: The DTMF Add-On Module is an one line optional board that easily plugs in the expansion port provided on the LightMaster controller CPU board. The module supports dual-tone multi-frequency (DTMF) touchtone telephone control allowing panel level relay control, or to check input status in that panel. (See Figures A.1 and A.3.)

Network Level Connection: The telephone network Add-On Module is an optional board that is easily added to a LightMaster Node 01 master controller. The module supports (DTMF) touchtone telephone control and monitoring and plugs in the expansion port provided on the LightMaster Node 01 master controller CPU board.

Single to Four Line Gateway Connection: The LightMaster 4-line DTMF Gateway module can easily be added to any LightSync data line network application to provide multi-line Voice Prompted DTMF touch-tone telephone control and monitoring. (See Figure A.3)

All three devices support the use of the DTMF control signals allowing the user to command relays, groups of relays, or activate preset scenes from the convenience of any touch-tone telephone, including cellular phones. Clear voice prompts are built in to make navigating command menus easy and straightforward.

A.2 Voice/DTMF Control Features

This Add-On Modules support the following touchtone telephone control features:

- Get the current status of the controller's relay outputs (panele level only)
- Turn ON or OFF single relays, groups of relays or presets
- Get the current status of the controller's switch inputs (panel level only)

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 Panel LevelVoice/DTMF Control Setup

1. If you are field-installing the module, power-down the controller and plug the module into the expansion port on the controller CPU board. (See Figure A.2.)
2. Connect a phone cord to the module's RJ11 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. See A.4 for prompts and codes.

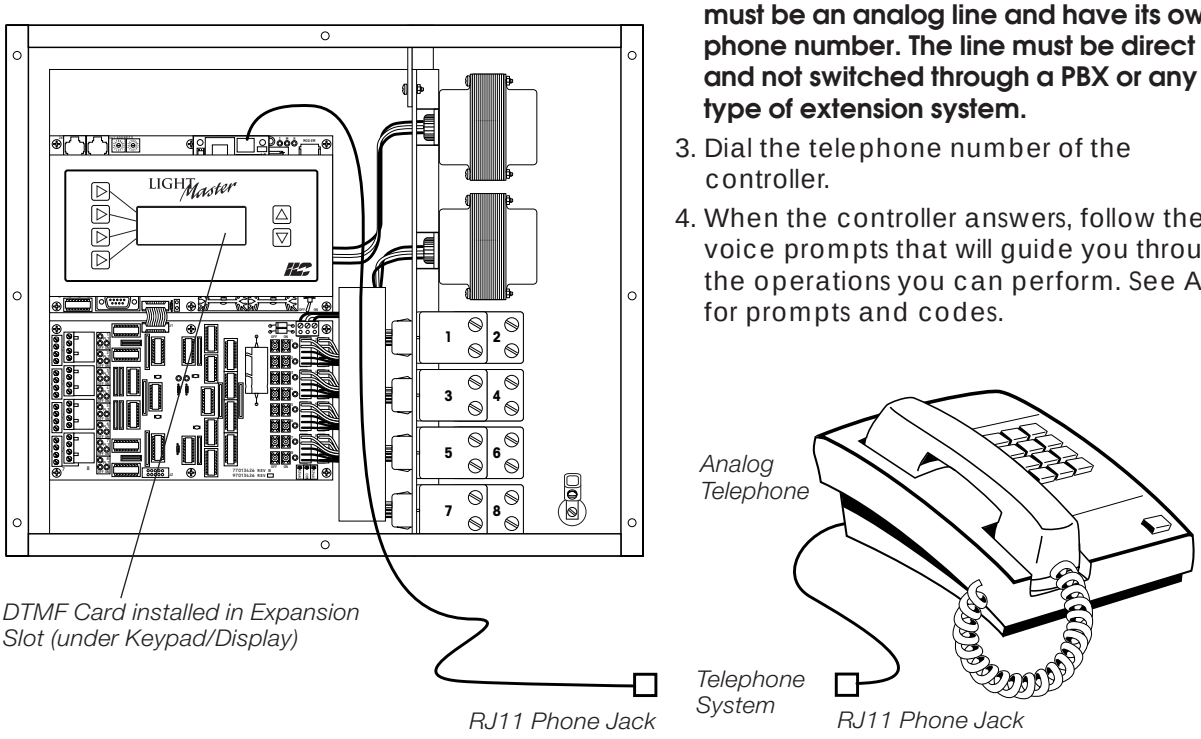


Figure A.1 – Panel Level DTMF Phone Control

A.4 Voice Prompts for System Wide SNET and ENET 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 all)

For relay status and control press 1
(Enter the relay number follwed by the # key or press * to return to the main menu)
For presets press 3
(Enter the preset number follwed by the # key or press * to return to the main menu)
For group control press 4
(Enter the group number follwed by the # key or press * to return to the main menu)
To end this call press #
To repeat this m'enu press *

A.4.1 Panel Level Control Codes

Use the telephone keypad to enter the following control codes:

- Relay Codes (2 digits)
  The digits designate which relay in that panel (01-48)
- Preset codes (2 digit)
  01-48
  Sample: Enter code 31 to set Preset 31
- Group codes (2 digit)
  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

A.4.2 Network Level Control Codes

Use the telephone keypad to enter the following control codes:

- Relay Codes (4 digits)
  First two digits designate which panel (01-32) (convert panel node to decimal for networked applications)
  Second two digits designate which relay in that panel (01-48)
  Sample: Enter code 3112 to control panel 1F, relay 12
- Preset codes (2 digit)
  (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 digit)
  (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

A.4.3 Gateway Level Control Codes

Due to the potential for very large numbers of relays controlled in an extended network, a code is needed for specific relays. This code consists of 4 digits. The formula for this code is: (Node # x 48)+ relay number. NOTE: The Node # must be converted to decimal first. (See conversion chart).
Sample: Node 1C (decimal 28), Relay 17 is code (28 x 48) + 17 = 1361

Hexadecimal Conversion Chart

No.	Hex	No.	Hex	No.	Hex	No.	Hex
0	00	32	20	65	41	97	61
1	01	34	22	66	42	98	62
2	02	35	23	67	43	99	63
3	03	36	24	68	44	100	64
4	04	37	25	69	45	101	65
5	05	38	26	70	46	102	66
6	06	39	27	71	47	103	67
7	07	40	28	72	48	104	68
8	08	41	29	73	49	105	69
9	09	42	2A	74	4A	106	6A
10	0A	43	2B	75	4B	107	6B
11	0B	44	2C	76	4C	108	6C
12	0C	45	2D	77	4D	109	6D
13	0D	46	2E	78	4E	110	6E
14	0E	47	2F	79	4F	111	6F
15	0F	48	30	80	50	112	70
16	10	49	31	81	51	113	71
17	11	50	32	82	52	114	72
18	12	51	33	83	53	115	73
19	13	52	34	84	54	116	74
20	14	53	35	85	55	117	75
21	15	54	36	86	56	118	76
22	16	55	37	87	57	119	77
23	17	56	38	88	58	120	78
24	18	57	39	89	59	121	79
25	19	58	3A	90	5A	122	7A
26	1A	59	3B	91	5B	123	7B
27	1B	60	3C	92	5C	124	7C
28	1C	61	3D	93	5D	125	7D
29	1D	62	3E	94	5E	126	7E
30	1E	63	3F	95	5F	127	7F
31	1F	64	40	96	60	128	80

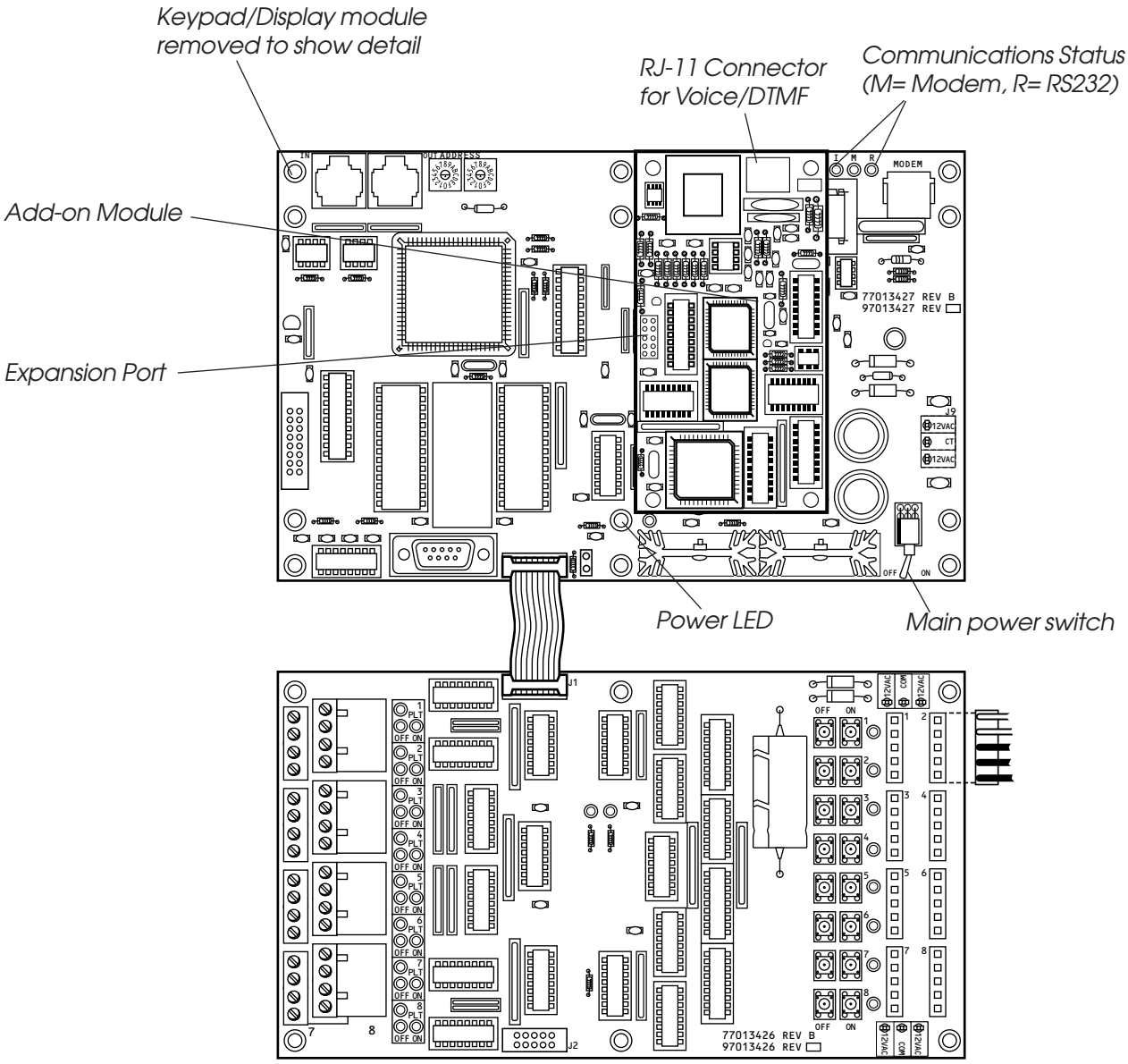
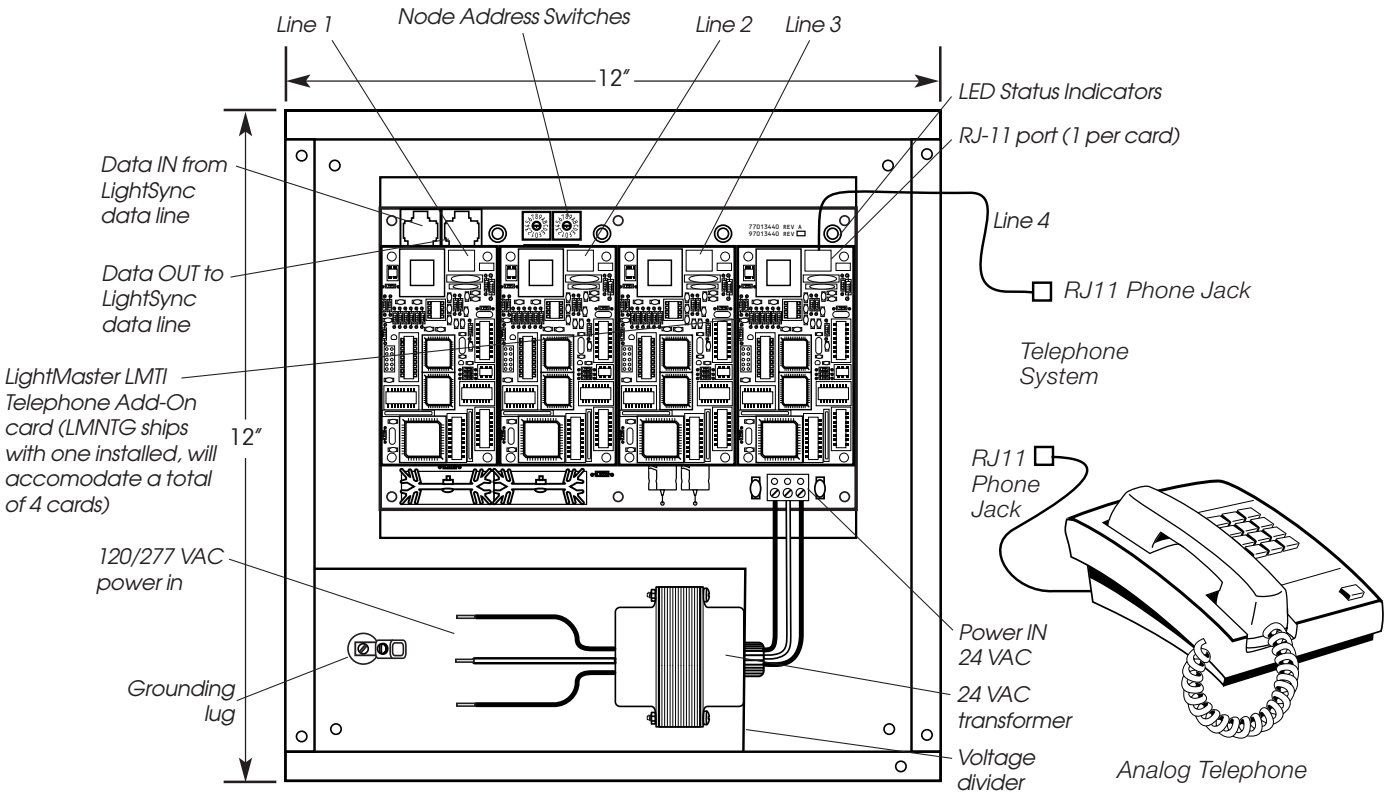


Figure A.2 – Voice/DTMF Module Installation



LightMaster 4-line DTMF Gateway (shown in NEMA-type enclosure with transformer)

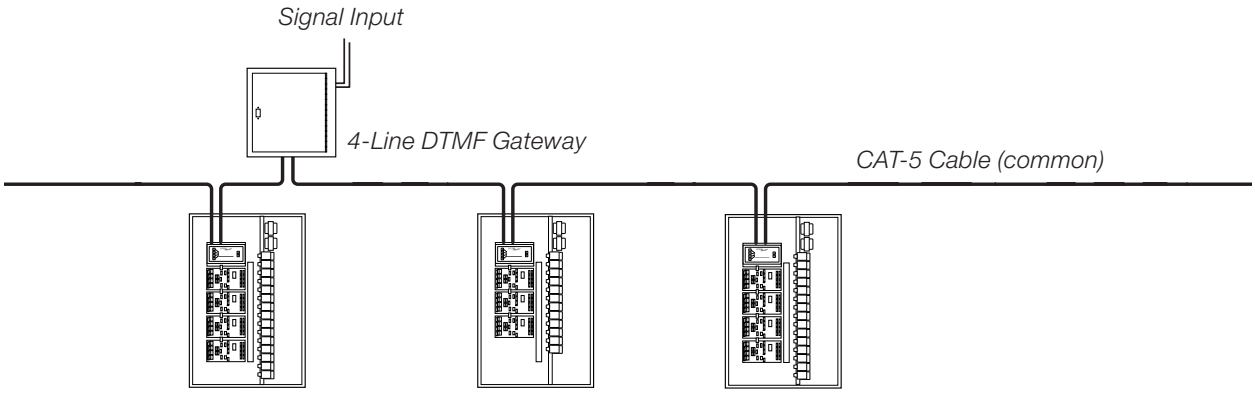


Figure A.3 – 4-Line DTMF Gateway Connection to LightMaster network

Overview

B.1 On Board Modem Programming Control and Monitoring (if equipped)

Using an analog phone line, you can link a personal computer (PC) equipped with a modem and LightMaster Pro SNET networking software to the LightMaster controller's on-board modem and perform all the control and programming operations supported by LightMaster Pro SNET, 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
- Program switch inputs and map them to relay outputs
- Program timers and map them to relay outputs
- Program 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 RJ11 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 SNET, dial the controller phone number.
3. When your PC and the controller link, perform the desired LightMaster Pro SNET operations.

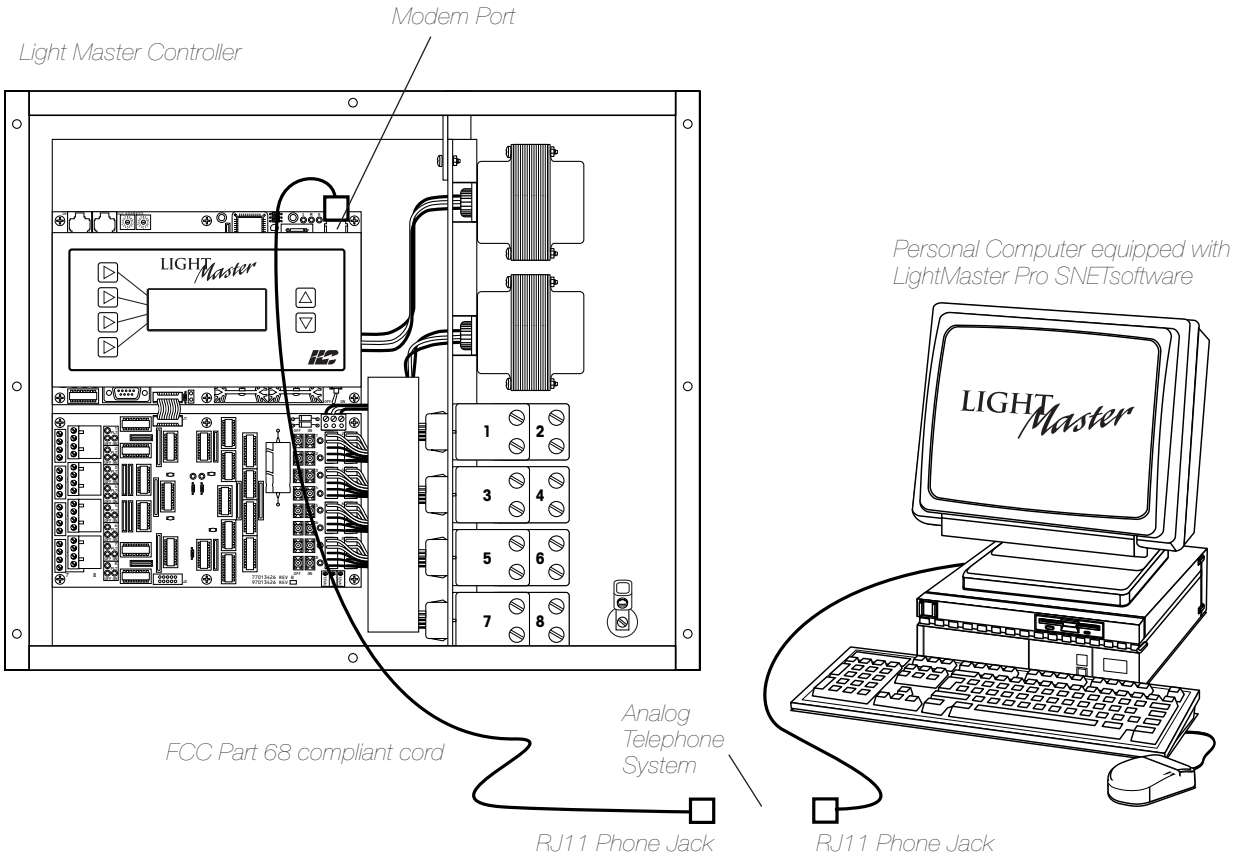


Figure B.1 – Programming the Controller from a PC

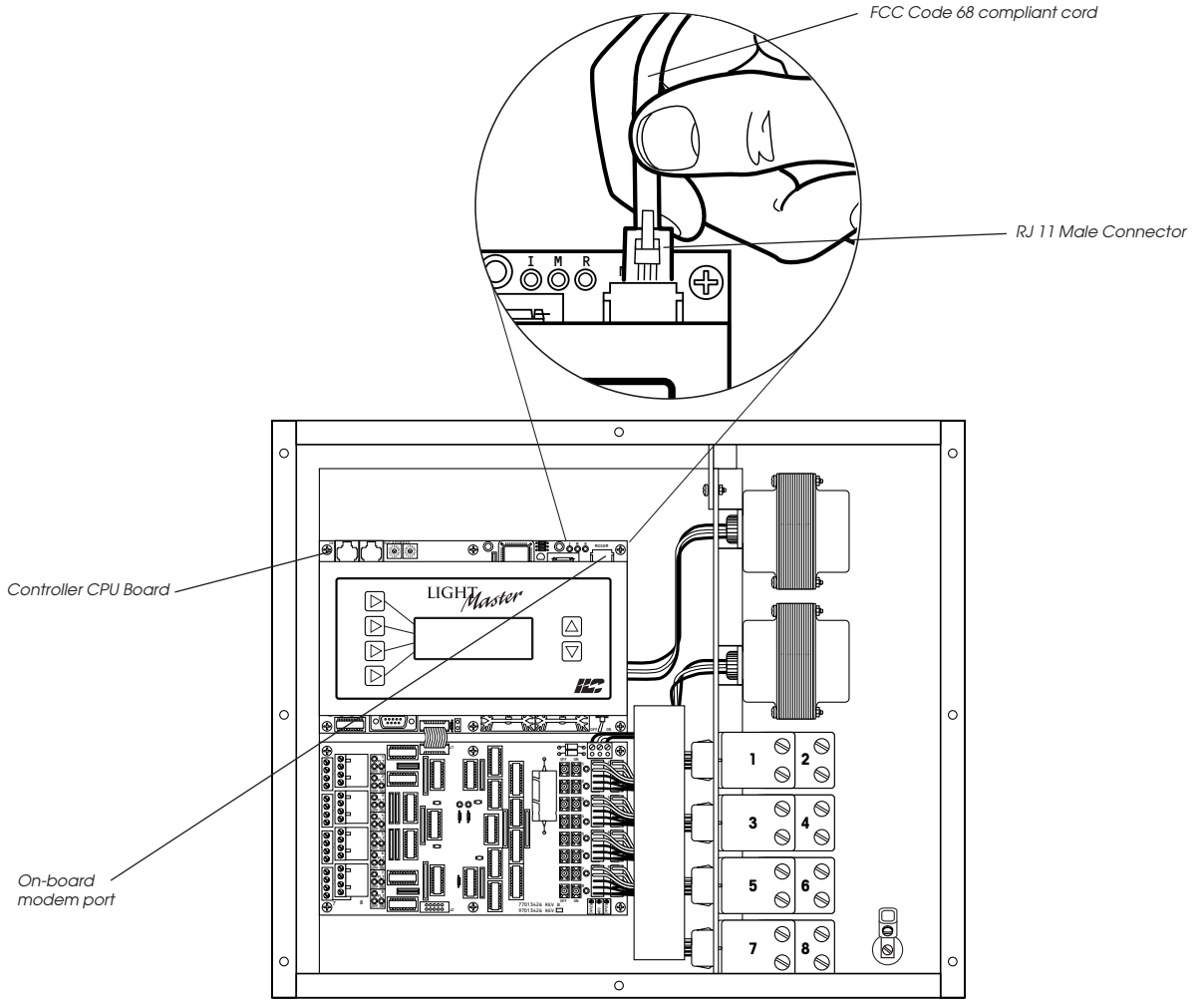


Figure B.2 – On-board Modem Cable Termination

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 RJ11C 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: RJ11C

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 REN's 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 REN's 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 REN's, 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 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 preformed. 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 arrestor is suggested.

Overview

C.1 RS-232 Programming Control and Monitoring

You can link a personal computer (PC) equipped with a RS 232 port and LightMaster Pro SNET networking software to the **LightMaster** Node 01 master controller's RS 232 port and perform all the control and programming operations supported by LightMaster Pro SNET, 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
- Program switch inputs and map them to relay outputs
- Program timers and map them to relay outputs
- Program 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 (part of LightMaster Pro SNET package) 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 SNET, connect with the controller.
3. When your PC and the controller link, perform the desired LightMaster Pro SNET operations.

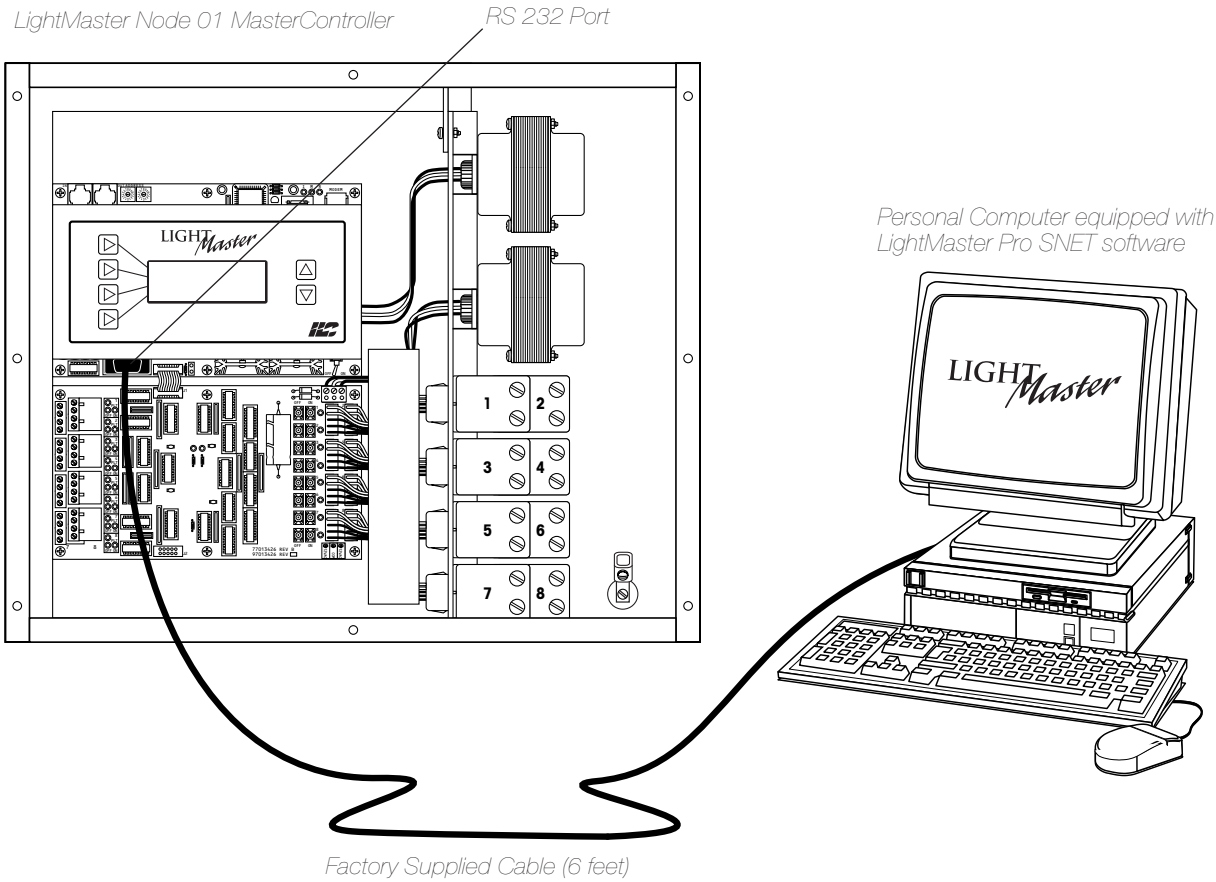


Figure B.1 – Programming the Controller from a PC

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 esired 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 due to the ILC Apprentice not reading each frame.

E.2 Objectives

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

E.3 Panel Level Connection

In applications where signal timing is critical, (Example: Theatrical Applications) a separate out cable is daisy-chained to each of the DMX device nodes. See Figure D.2

E.4 Single Point Gateway Connection

In applications where signal timing is less critical, a special DMX Gateway node may be installed on the network. This provides the advantage of eliminating the installation of dedicated cable runs and DMX modules to each controller. See Figure D.3

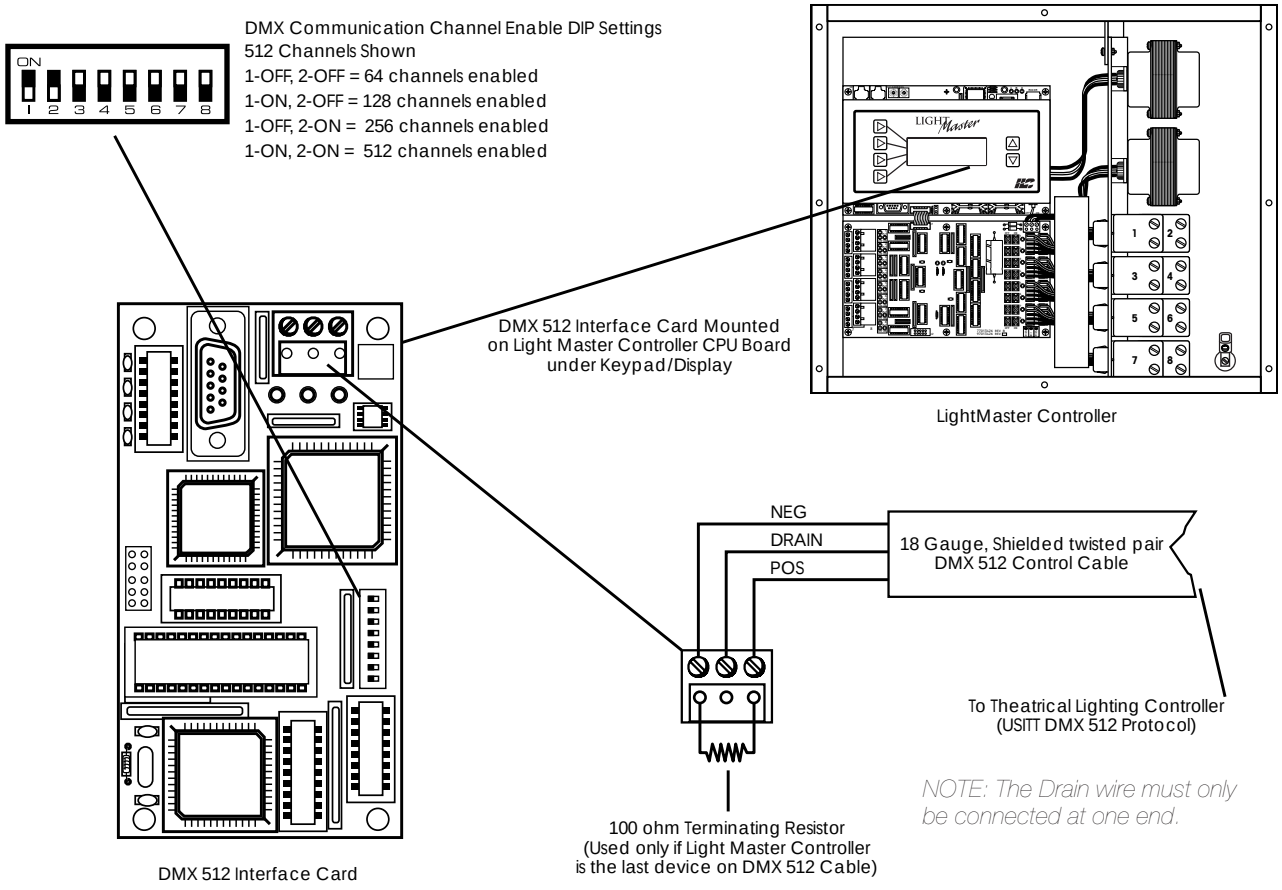


Figure D.1 – DMX Interface Hardware Features

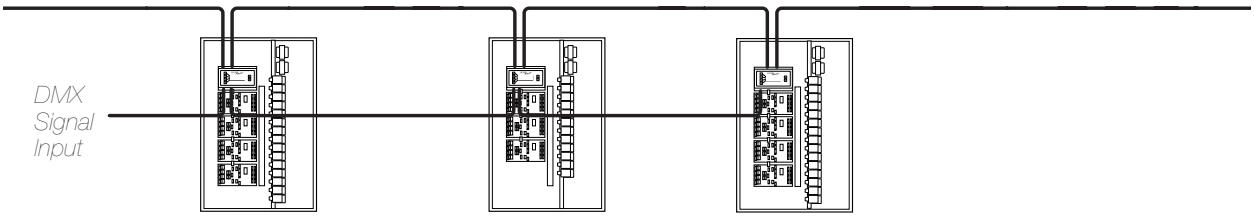


Figure D.2 – Panel lLevel DMX Connection

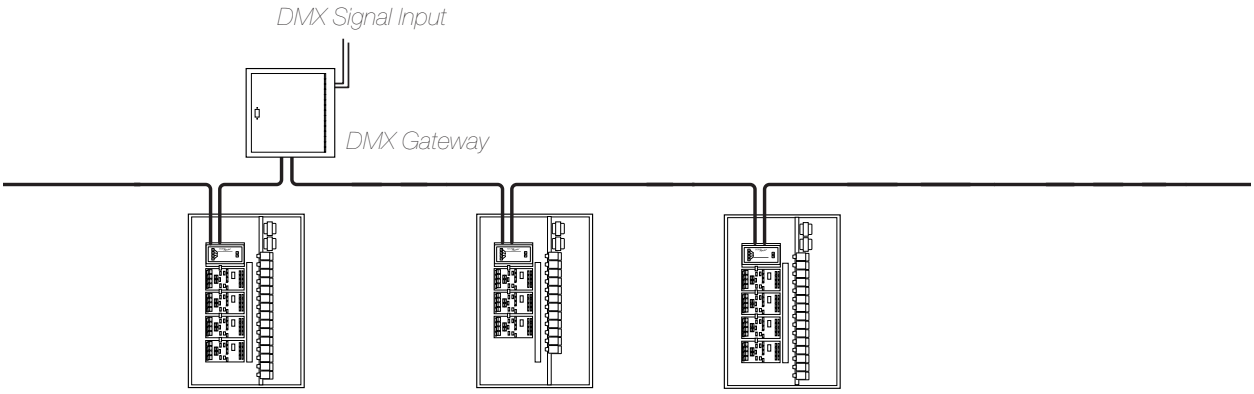
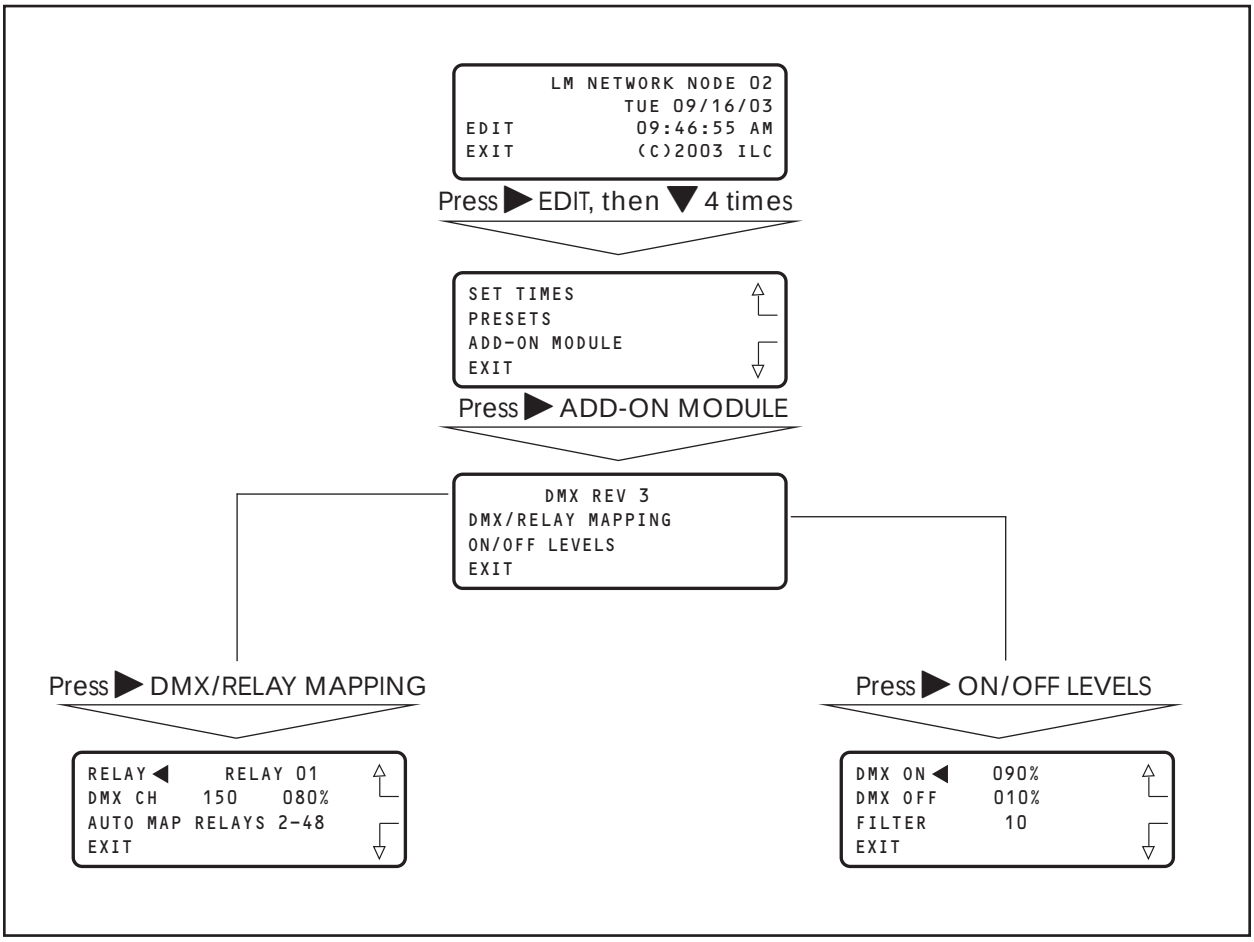


Figure D.3 – Gateway Level DMX Connection

DMX Control – Fast Track



E.3 Programming Example

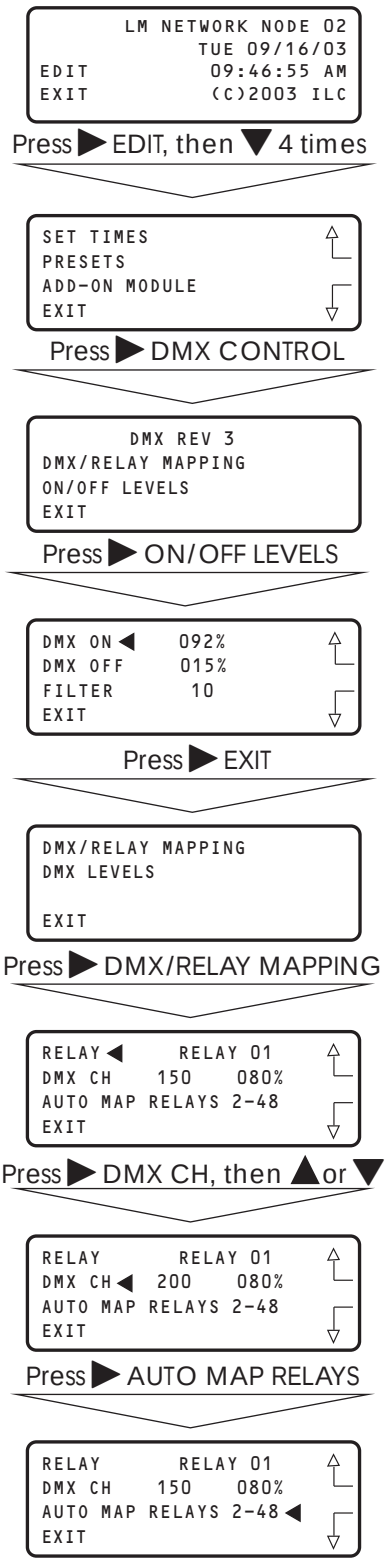
Set the DMX signal ON level at 92% and the OFF level at 15%. Program relay output 1 to respond by switching ON at 92% and OFF at 15% on channel 200. (The default values are 90% and 10%, respectively.) All programming should be done from the 01 Node Master Controller.

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. Access the desired node Home screen, press ▶ EDIT; then ▼ 4 times
2. Press ▶ ADD-ON MODULE .
3. Press ▶ ON/OFF LEVELS.
4. When the Level screen appears, press ▲ until 92% appears in the ON field.
5. Press ▶ DMX OFF, then ▲ until 15% appears in the OFF field.
6. Press ▶ FILTER, then ▲ 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 ▲ 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 node Home screen.



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. By setting a unique address via the 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 Panel Level Connection

In applications where signal timing is critical, (Example: Theatrical Applications) a separate out cable is daisy-chained to each of the MODBUS device nodes. See Figure M.2

M.4 Single Point Gateway Connection

In applications where signal timing is less critical, a special MODBUS Gateway node may be installed on the network. This provides the advantage of eliminating the installation of dedicated cable runs and MODBUS modules to each controller. See Figure M.3

M.5 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 slected 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 tranbsmission modes are ASCII (American Standard Code For Information Interchange) and RTU (Remote Terminal Unit)

M.5.1 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.5.2 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)

M.6 Transmission Mode Characteristics

ASCII printable characters are easy to view when trouble shooting 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.

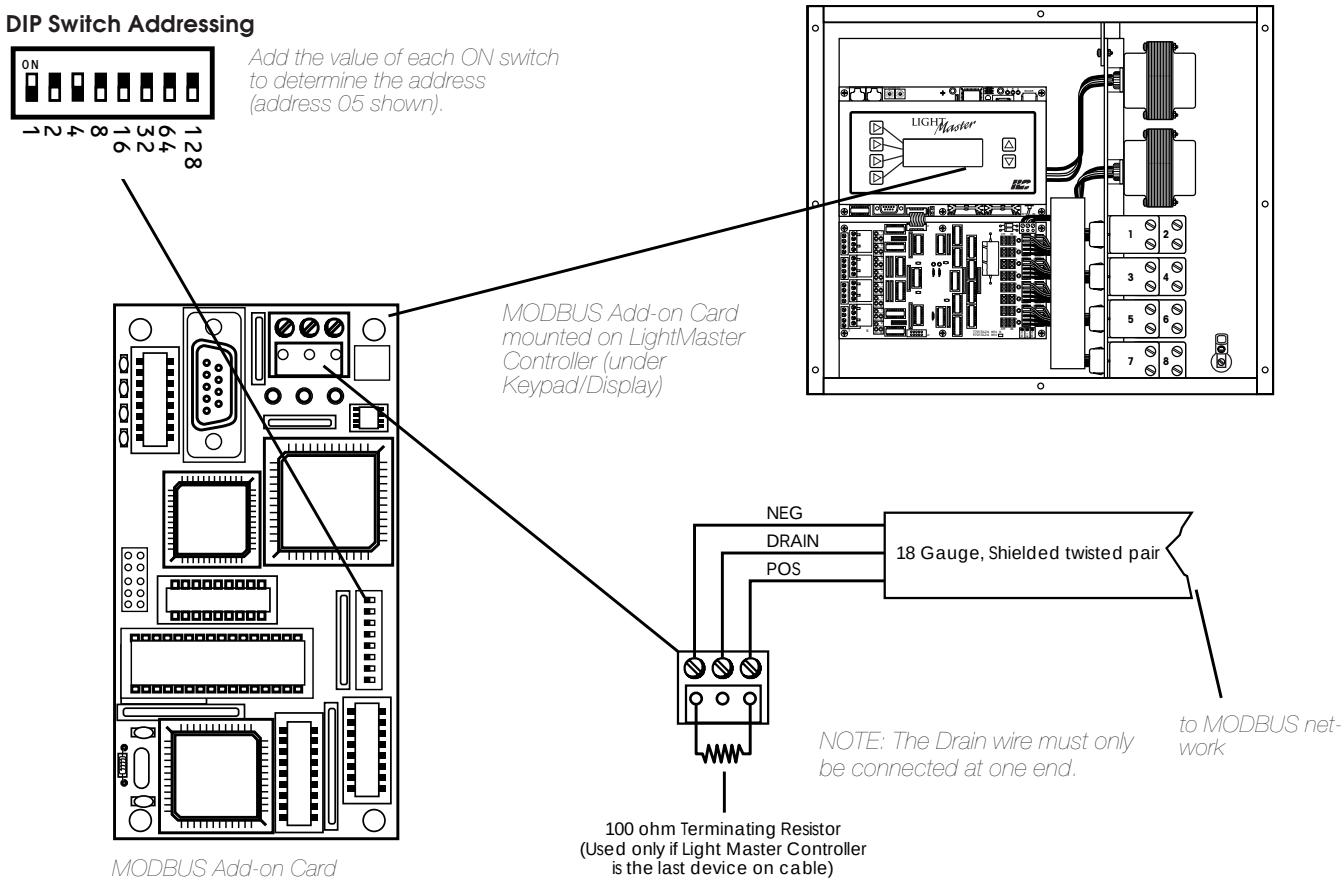


Figure M-1 MODBUS Set-Up

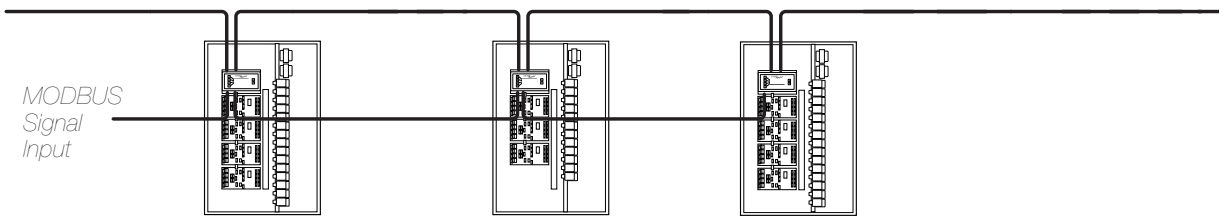
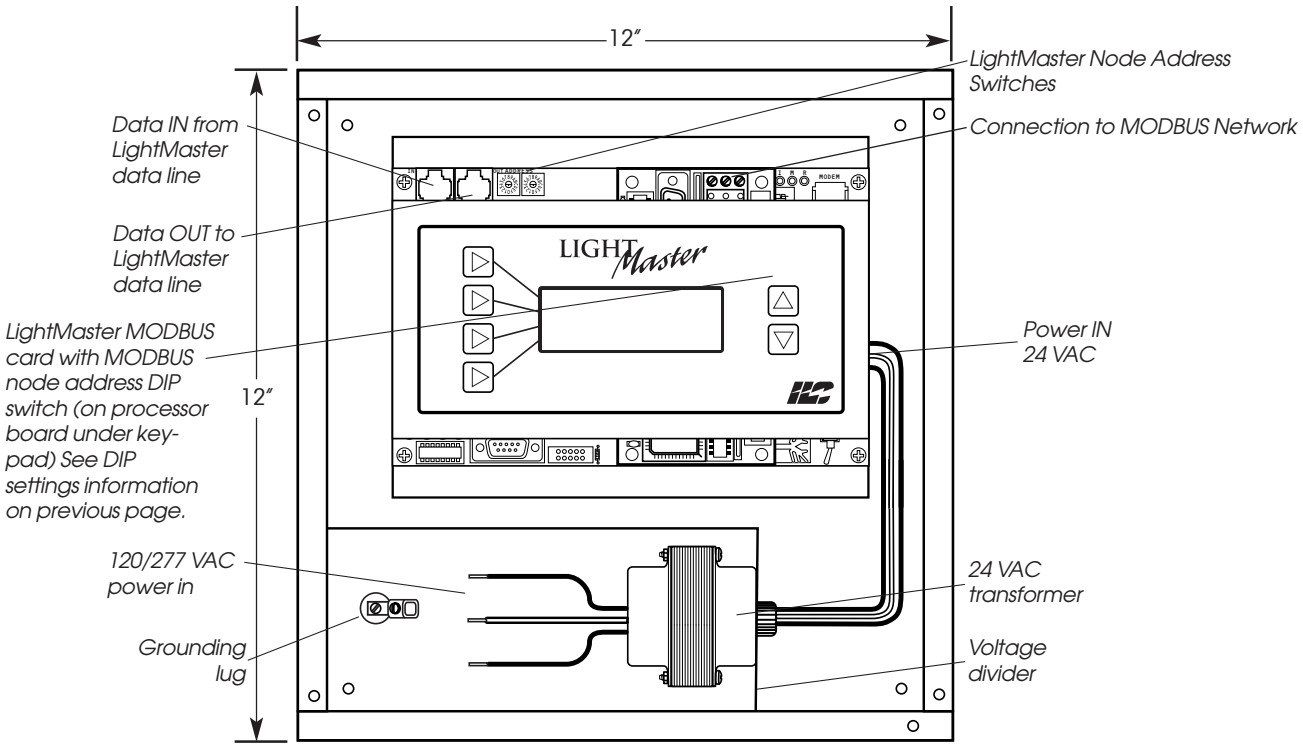


Figure M.2 – Panel ILevel MODBUS Connection



LightMaster MODBUS Gateway (shown in NEMA-type enclosure with transformer)

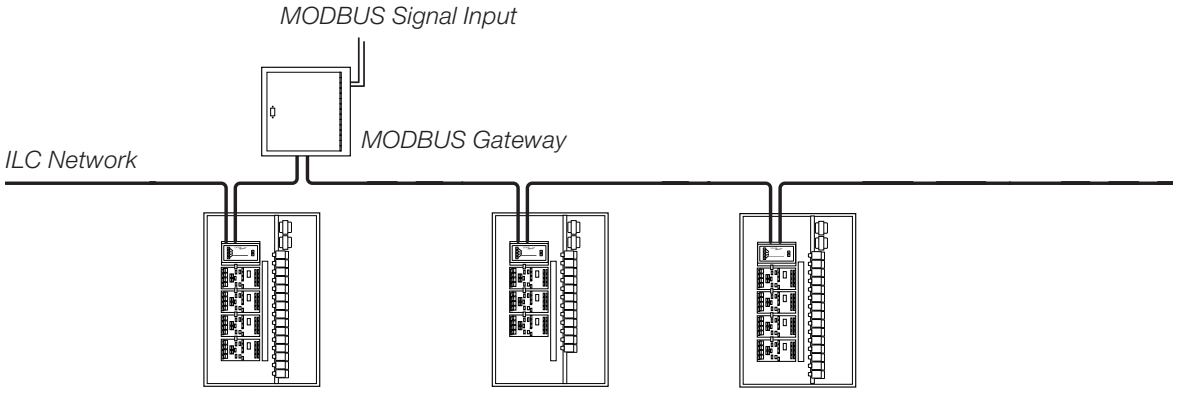


Figure M.3 – Gateway Level MODBUS Connection

M.7 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 two wire shielded twisted pair. Consult the Automation system provider for the exact specifications. Terminate the cable as shown in Figure M.1.

M.8 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.9 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.10 Supported Commands

01 Read coil status

02 Read input status

05 Force singe coil
15 Force multiple coils
For more information refer to Modicon Modbus Protocol Reference Guide (PI-MBUS-300)

M.11 Additional Functions

- ON/OFF with Time options (Blink/Alarm) See table M.1.2

M.12 Additional Information

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

M.13 Programming

Panel Level Installation: From the software or from the Network Master's keypad, select the node containing the controller with the MODBUS module installed. From the EDIT NODE menu choice (software) or NODE STATUS (keypad), click on ADD ON MODULES. The MODBUS screen will appear. Select communications mode (ASCII or RTU), baud rate, and Parity from this screen. See Tables M.1, M.1.1, and M.1.2 for panel level point addresses.

Gatway Installation: From the Network Manager's keypad, press EDIT. Press NODE STATUS, then select the node number assigned to the MODBUS Gateway. Press EDIT, then press EDIT again. Select communications mode (ASCII or RTU), baud rate, and Parity.See Table M.1.3 for Gateway level point addresses.

NOTE: DMX Gateway may also be programmed using ILC LightMaster DMX Gateway configuration software.

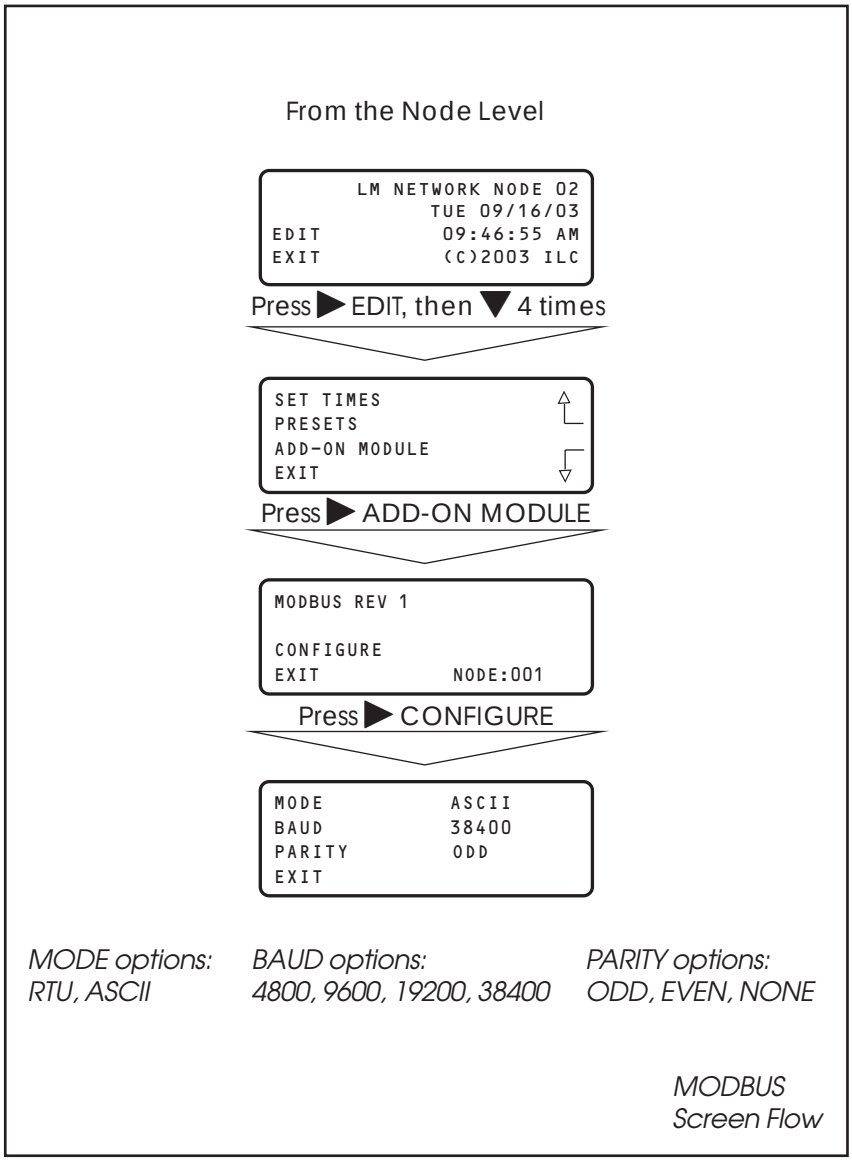
M.14 Gateway Point Address

The address is a four-digit Hex number. The upper two digits are the node number and the lower digits are the input,relay or group numbers. Example: Node 2D/Relay 23 is MODBUS number 2D17H. For commands 01 and 05, node FF controls groups. See table below and M1.3.

Hexadecimal Conversion Chart

No.	Hex	No.	Hex	No.	Hex	No.	Hex
0	00	12	0C	24	18	37	25
1	01	13	0D	25	19	38	26
2	02	14	0E	26	1A	39	27
3	03	15	0F	27	1B	40	28
4	04	16	10	28	1C	41	29
5	05	17	11	29	1D	42	2A
6	06	18	12	30	1E	43	2B
7	07	19	13	31	1F	44	2C
8	08	20	14	32	20	45	2D
9	09	21	15	34	22	46	2E
10	0A	22	16	35	23	47	2F
11	0B	23	17	36	24	48	30

MODBUS – Fast Track



MODBUS Screen Flow

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
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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
30	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 Group	Point	Closed (True)	Open (False)
1	01	1=Group Closed	0=Group Open
2	02	1=Group Closed	0=Group Open
3	03	1=Group Closed	0=Group Open
4	04	1=Group Closed	0=Group Open
5	05	1=Group Closed	0=Group Open
6	06	1=Group Closed	0=Group Open
7	07	1=Group Closed	0=Group Open
8	08	1=Group Closed	0=Group Open
9	09	1=Group Closed	0=Group Open
10	0A	1=Group Closed	0=Group Open
11	0B	1=Group Closed	0=Group Open
12	0C	1=Group Closed	0=Group Open
13	0D	1=Group Closed	0=Group Open
14	0E	1=Group Closed	0=Group Open
15	0F	1=Group Closed	0=Group Open
16	10	1=Group Closed	0=Group Open
17	11	1=Group Closed	0=Group Open
18	12	1=Group Closed	0=Group Open
19	13	1=Group Closed	0=Group Open
20	14	1=Group Closed	0=Group Open
21	15	1=Group Closed	0=Group Open
22	16	1=Group Closed	0=Group Open
23	17	1=Group Closed	0=Group Open
24	18	1=Group Closed	0=Group Open
25	19	1=Group Closed	0=Group Open
26	1A	1=Group Closed	0=Group Open
27	1B	1=Group Closed	0=Group Open
28	1C	1=Group Closed	0=Group Open
29	1D	1=Group Closed	0=Group Open
30	1E	1=Group Closed	0=Group Open
31	1F	1=Group Closed	0=Group Open
32	20	1=Group Closed	0=Group Open
33	21	1=Group Closed	0=Group Open
34	22	1=Group Closed	0=Group Open
35	23	1=Group Closed	0=Group Open
36	24	1=Group Closed	0=Group Open
37	25	1=Group Closed	0=Group Open
38	26	1=Group Closed	0=Group Open
39	27	1=Group Closed	0=Group Open
40	28	1=Group Closed	0=Group Open
41	29	1=Group Closed	0=Group Open
42	2A	1=Group Closed	0=Group Open
43	2B	1=Group Closed	0=Group Open
44	2C	1=Group Closed	0=Group Open
45	2D	1=Group Closed	0=Group Open
46	2E	1=Group Closed	0=Group Open
47	2F	1=Group Closed	0=Group Open
48	30	1=Group Closed	0=Group Open

Table M.1.3 – Gateway Level LightMaster Data Field Group Point Designators (Node FF)

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.

M.2 Panel Level Connection

In applications where signal timing is critical, (Example: Theatrical Applications) a separate out cable is daisy-chained to each of the N2 device nodes. See Figure N.2 and Table n.1 (Point Maps).

M.3 Single Point Gateway Connection

In applications where signal timing is less critical, a special N2 Gateway node may be installed on the network. This provides the advantage of eliminating the installation of dedicated cable runs and N2 modules to each controller. See Figure N.3 and Table N.2.

N.4 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)	
Bit 1	Override active	Always 0 (not 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	Always 0
Attribute 2		
Bit 0	Always reliable (0)	
Bit 1	Override active	Always 0 (not 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	

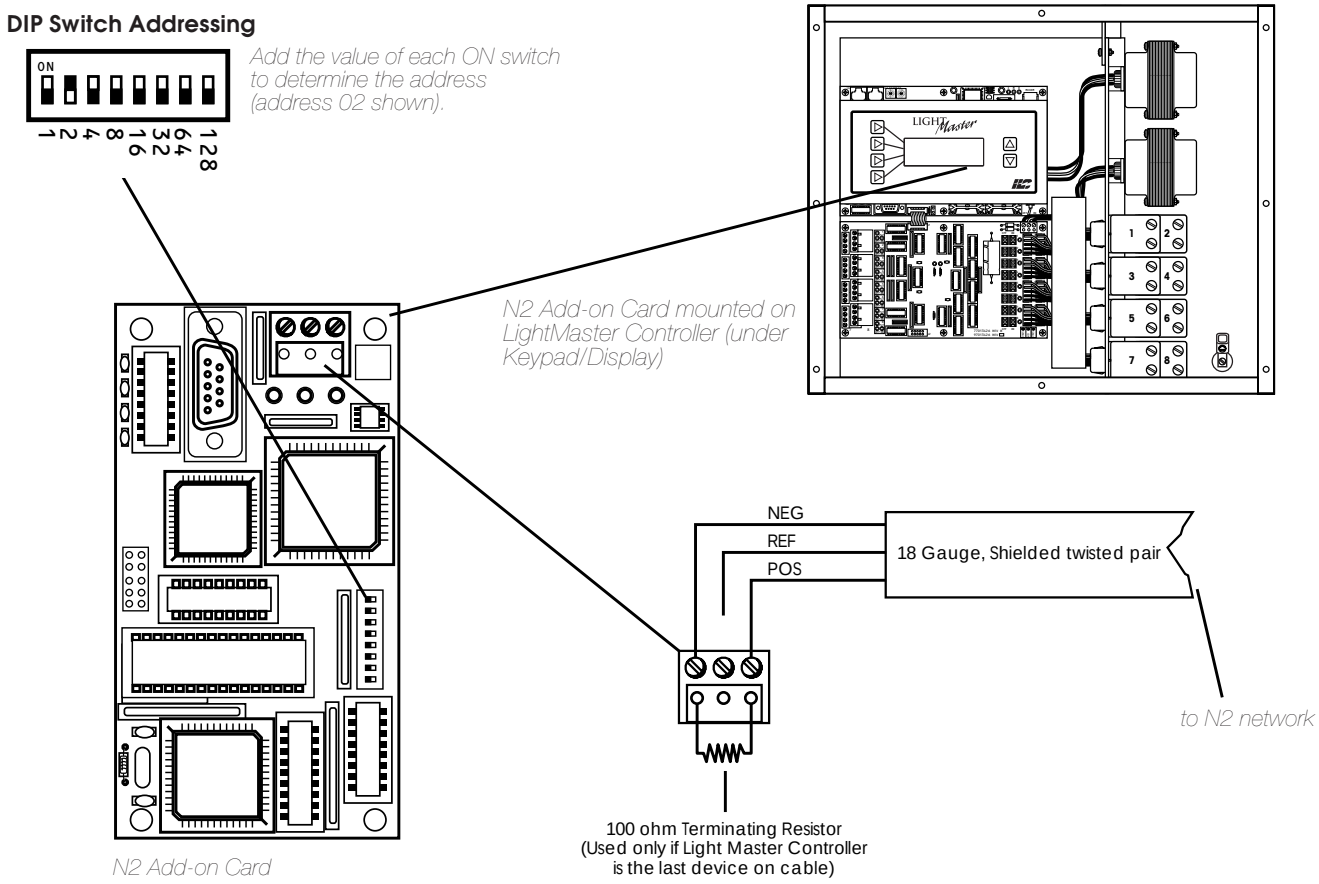


Figure N.1 N2 Set-Up

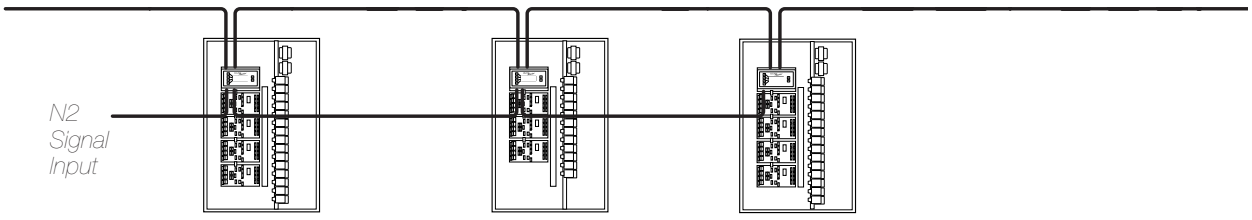


Figure N.2 – Panel Level N2 Connection

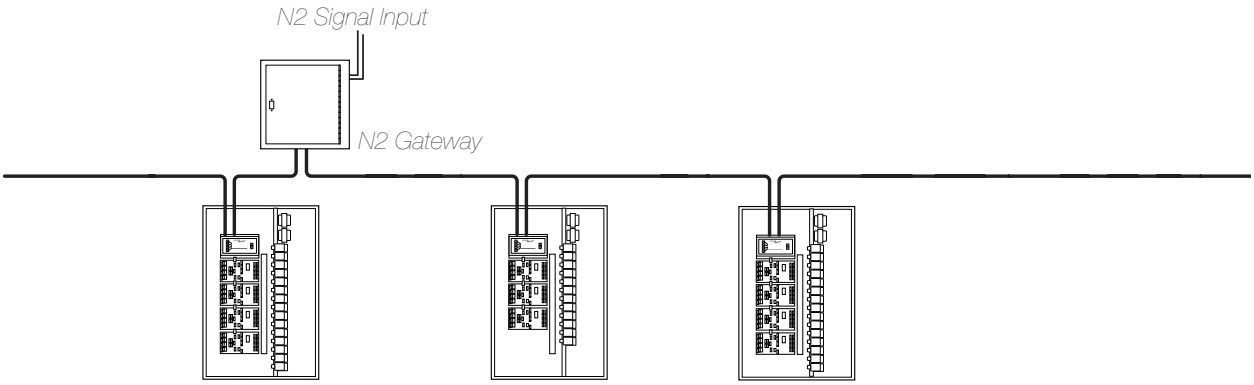
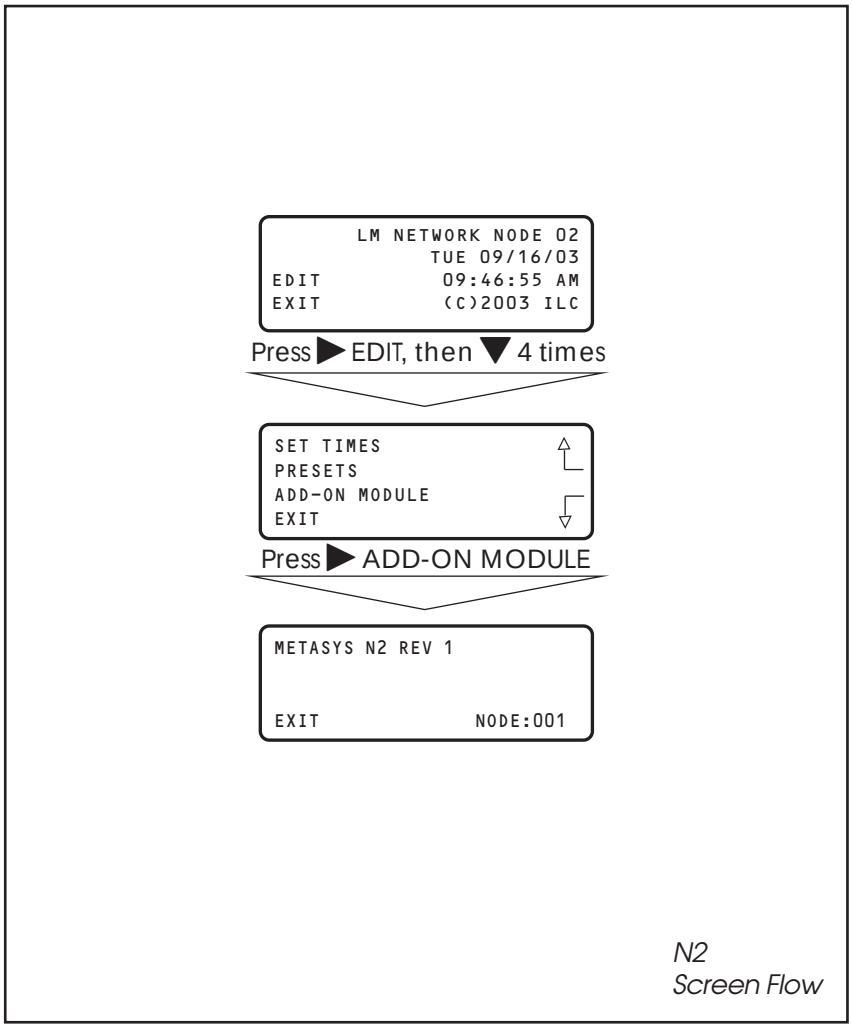


Figure N.3 – Gateway Level N2 Connection

N2 – Fast Track



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 – Light Master N2 Point Map

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 – Light Master N2 Point Map

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 – Light Master N2 Point Map

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 – Light Master N2 Point Map

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

Table N.1 – Light Master N2 Point Map

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

Table N.1 – Light Master N2 Point Map

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	2 03	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

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

Gateway Level Communication: Controller Node #1

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.2 – LightMaster N2 Gateway Point Map

Gateway Level Communication: Controller Node #1

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.2 – LightMaster N2 Gateway Point Map

Gateway Level Communication: Controller Node #1

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.2 – LightMaster N2 Gateway Point Map

Gateway Level Communication: Controller Node #1

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.2 – LightMaster N2 Gateway Point Map

Gateway Level Communication: System Wide

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

Table N.2 – LightMaster N2 Gateway Point Map

Gateway Level Communication: System Wide

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

Table N.2 – LightMaster N2 Gateway Point Map

Alabama,Birmingham,33,87
Alabama,Gadsden,34,86
Alabama,Huntsville,34,86
Alabama,Mobile,30,88
Alabama,Montgomery,32,86
Alaska, Anchorage, 61,150
Alaska, Fairbanks, 65,148
Alaska, Juneau, 58,135
Arizona,Flagstaff,35,111
Arizona,Phoenix,33,112
Arizona,Tucson,32,111
Arizona,Yums,32,114
Arkansas,Fort Smith,35,94
Arkansas,Little Rock,34,92
California,Bakersfield,35,119
California,Berkeley,38,122
California,Eureka,41,124
California,Fresno,36,120
California,Los Angeles,34,118
California,Oakland,37,122
California,Pasadena,34,118
California,Sacramento,38,121
California,San Bernandio,34,117
California,San Diego,32,117
California,San Francisco,38,122
California,San Jose,37,122
California,Santa Barbara,34,119
California,Santa Cruz,37,122
California,Stockton,38,121
Colorado,Colorado Springs,39,105
Colorado,Denver,39,105
Colorado,Grand Junction,39,108
Colorado,Pueblo,38,104
Connecticut,Bridgeport,41,73
Connecticut,Hartford,42,72
Connecticut,Meriden,41,73
Connecticut,New Britain,41,73
Connecticut,New Haven,41,73
Connecticut,Stanford,41,73
Delaware,Wilmington,39,75
District of Columbia,
Washington,39,77
Florida,Daytona Beach,29,81
Florida,Gainesville,29,82
Florida,Jacksonville,30,81
Florida,Key West,24,82
Florida,Miami,26,80
Florida,Orlando,28,81
Florida,Penescola,30,87
Florida,Sarasota,27,82
Florida,St. Petersburgh,28,82
Florida,Tallahassee,30,84
Florida,Tampa,28,82
Florida,West Palm Beach,26,80
Georgia,Atlanta,34,84
Georgia,Augusta,33,82
Georgia,Columbus,32,85
Georgia,Macon,33,83
Georgia,Savannah,32,81
Idaho,Boise,43,116
Idaho,Pocatello,43,112
Illinois,Bloomington,40,89
Illinois,Champaign,40,88
Illinois,Chicago,42,87
Illinois,Decatur,40,89
Illinois,Peoria,40,89
Illinois,Rockford,42,89
Illinois,Springfield,40,89
Illinois,Urbana,40,86
Indiana,Evansville,38,87
Indiana,Ft. Wayne,41,85
Indiana,Gary,41,87
Indiana,Indianapolis,40,86
Indiana,Lafayette,40,87
Indiana,Muncie,40,85
Indiana,South Bend,41,86
Indiana,Terre Haute,39,87
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Iowa,Iowa City,41,91
Iowa,Sioux City,43,96
Iowa,Waterloo,42,92
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Louisiana,New Orleans,30,90
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Maine,Bangor,45,69
Maine,Lowell,42,71
Maine,Portland,43,70
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Maryland,Springfield,42,72
Massachusetts,Boston,42,71
Massachusetts,Brockton,42,71
Massachusetts,Cambridge,42,71
Massachusetts,Fall River,41,71
Massachusetts,Lawrence,42,71
Massachusetts,Plainfield,42,73
Massachusetts,Worcester,42,72
Michigan,Ann Arbor,42,83
Michigan,Battle Creek,42,85
Michigan,Bay City,43,84
Michigan,Detroit,42,83
Michigan,Flint,43,83
Michigan,Grand Rapids,43,85
Michigan,Jackson,42,84
Michigan,Kalamazoo,42,85
Michigan,Lansing,42,84
Michigan,Saginaw,43,84
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Minnesota,St. Cloud,45,94
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Montana,Helena,46,112
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New Jersey,Trenton,40,75
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New Mexico,Gallup,35,108
New Mexico,Santa Fe,35,106
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Washington,Tacoma,47,122
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Washington,Yakima,46,120
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West Virginia,Wheeling,40,80
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Wisconsin,Green Bay,44,88
Wisconsin,Kenosha,42,88
Wisconsin,Madison,43,89
Wisconsin,Milwaukee,43,88
Wisconsin,Racine,42,88
Wisconsin,Sheboygan,44,87
Wisconsin,Superior,46,92
Wyoming,Cheyenne,41,105
Wyoming,Sheridan,45,107

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 on and communicates with the LightMaster via a standard CAT-5 data cable network.

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 10 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 12 VDC power supply. See Figures P.1 and P.2 for detailed set-up 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 on the RS485 data network 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 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.

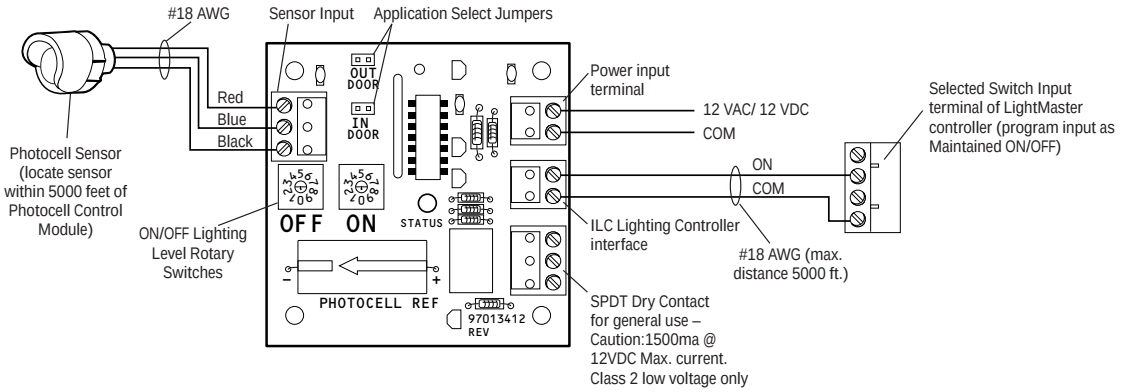
Table P.1– LightSync Photocell Set Points

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

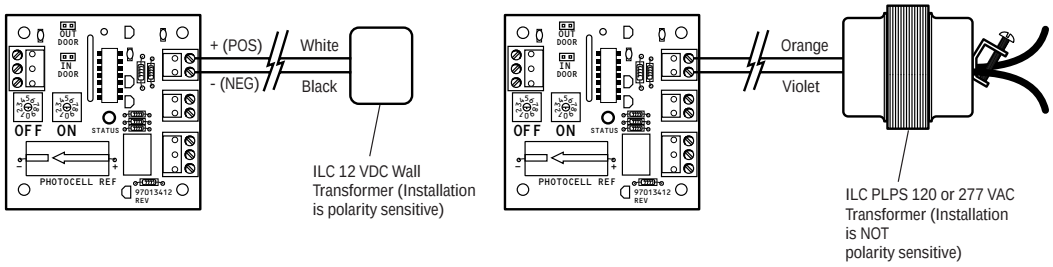
Note: Typical ON/OFF set points for an outdoor application are 25 fc (110) ON and 75 fc (137) OFF.

Photocell Controller Board Installation Guide

Wiring Overview



Power Supply Termination

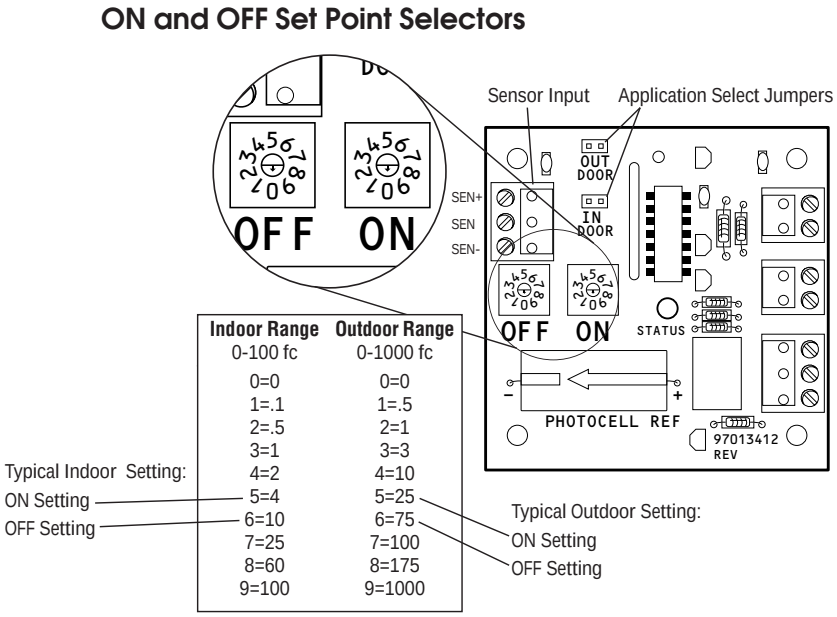


Installation

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 night time 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



Description

The ILC Photocell is an electronic device which 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 LightMaster lighting controllers or by dry contact inputs to other devices which 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 LightMaster lighting controller, or in an enclosure suitable for remote mounting. The photocell control module requires either a 12 VAC or 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 LightSync™ device node.
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.

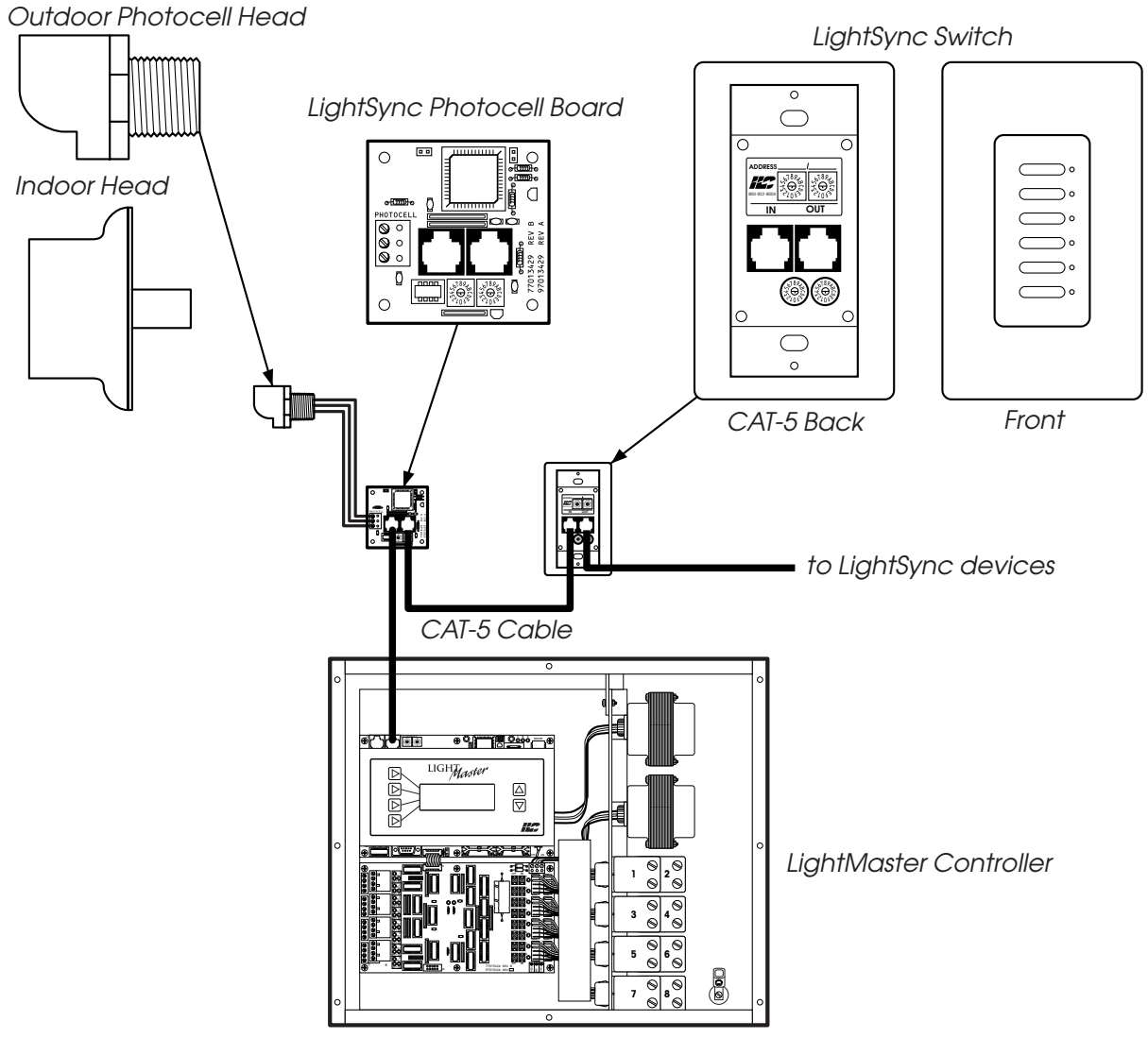
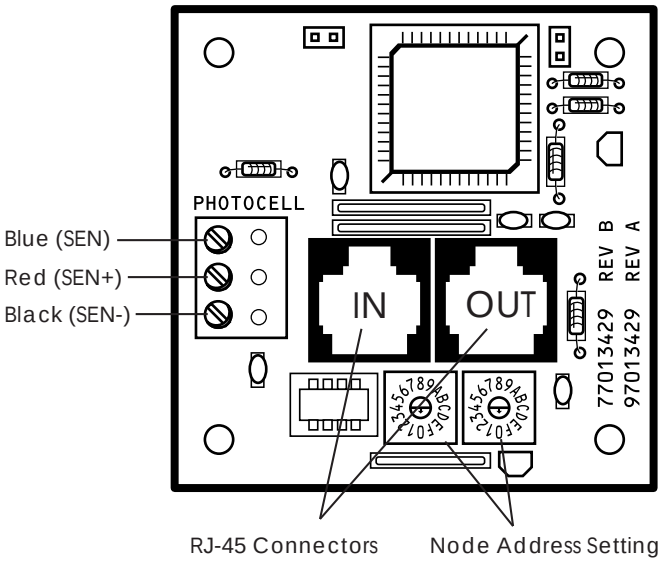


Figure P.3– LightSync Photocell Installation Overview

LightSync Photocell Controller Board



LightSync Photocell Controller Board Mounting Options

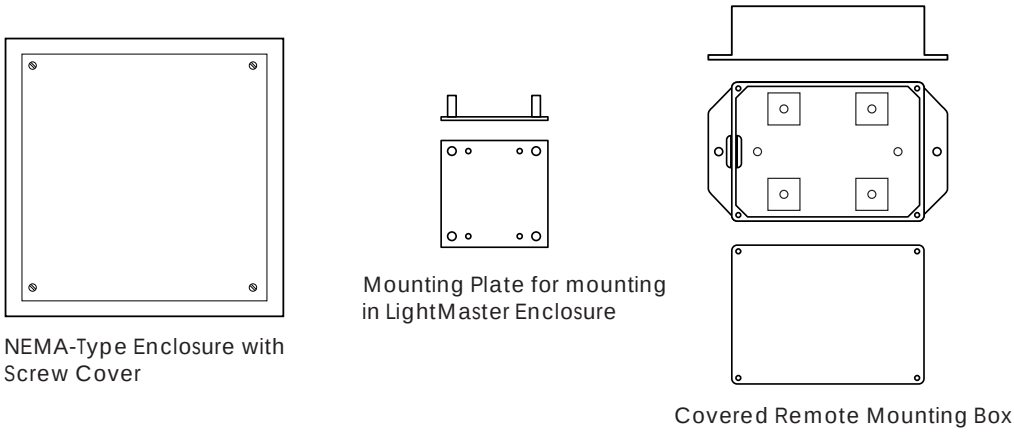


Figure P.4– LightSync Photocell Controller Board Detail and Mounting options

P.6 Programming Example

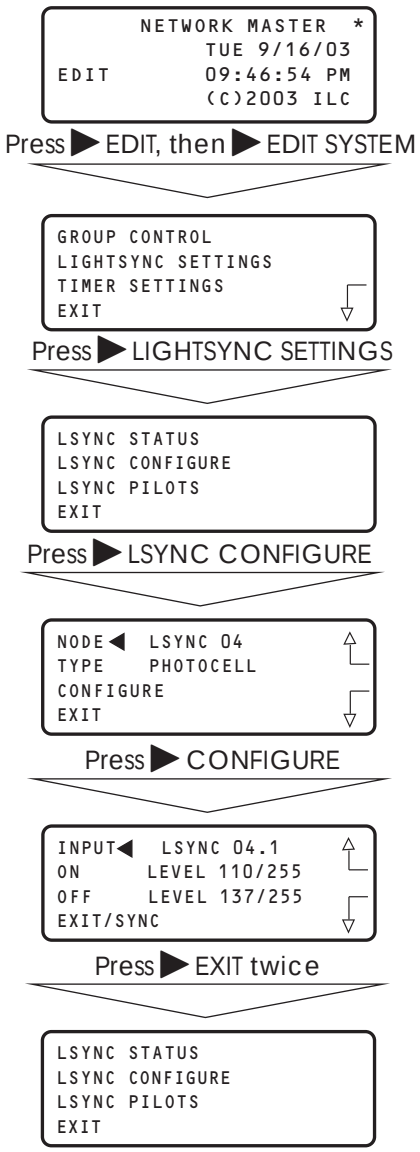
How to Program a LightSync™ Photocell to Control Relay Outputs

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: (This operation is performed at the System level)

1. From the Home screen, press ▶ EDIT, then press ▶ EDIT SYSTEM.
2. Press ▶ LIGHTSYNC SETTINGS.
3. From the Settings Menu, press ▶ LSYNC CONFIGURE .
4. When the top level configuration screen appears, press ▲ or ▼until the node address of the photocell appears.
5. Press ▶ TYPE; then ▼until PHOTOCELL appears.
6. Press ▶ CONFIGURE to access the second configuration screen.
7. Press ▶ INPUT; then ▲ or ▼ to select the sub-address (1 to 8) for this switch
8. Press ▶ ON then ▲ or ▼until the desired ON set point appears.
9. Press ▶ OFF then▲ or ▼until the desired OFF set point appears.
10. If your application requires more that one pair of set points press ▶ INPUT ; then ▲ or ▼and repeat steps 7 & 8.
11. Press ▶ EXIT twice to return to the LIGHTSYNC SETTINGS menu.



P.6 Programming Example, continued

Select the relay that the switch node controls (This operation is performed at the Node level)

1. From the desired Node menu, press ▶ EDIT; when the next screen appears press ▶ SWITCH INPUTS. Then on the next screen, press ▶ LIGHT-SYNC INPUTS.

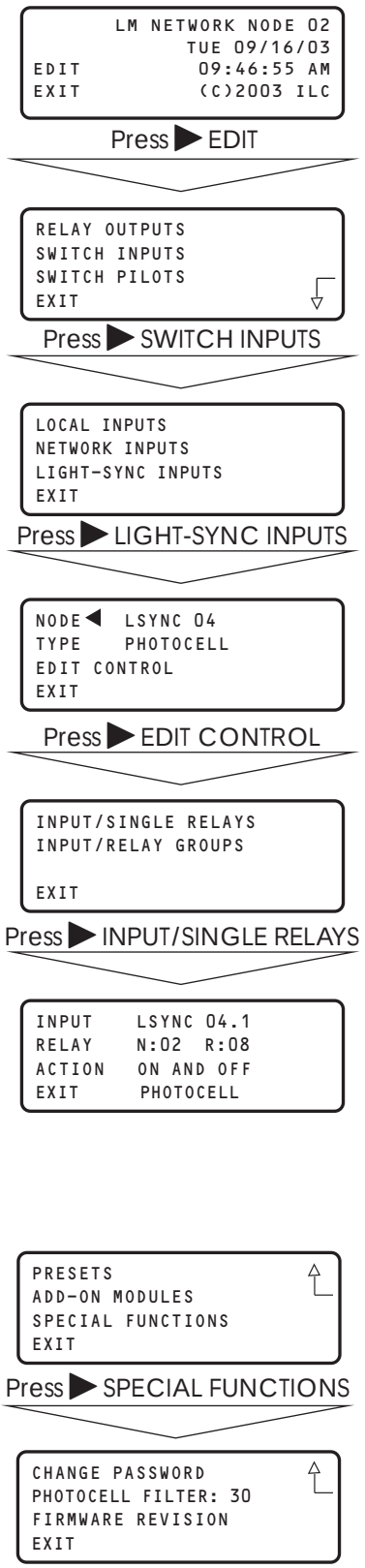
2. Press ▲ or ▼until the node you have used to define the photocell appears..

3. Press ▶ INPUT/SINGLE RELAYS; Press ▶ RELAY;then ▲ or ▼until the relay to be controlled appears.

4. Press ▶ ACTION; then ▲ or ▼until the desired relay action appears.

5. Repeat steps 3 and 4 for any additional relays controlled by the input.

6. Press ▶ EXIT three times to return to the Switch Input menu.



If desired, change the photocell filter.

1. From the Home screen, press ▶ EDIT SYSTEM; then press ▼ 3 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