User Manual
Light Control Module

Intu! - User Manual for LCM

Craig Klem
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Introduction

This document provides the user with knowledge of the Intu! Light Control Module function, operation and installation.
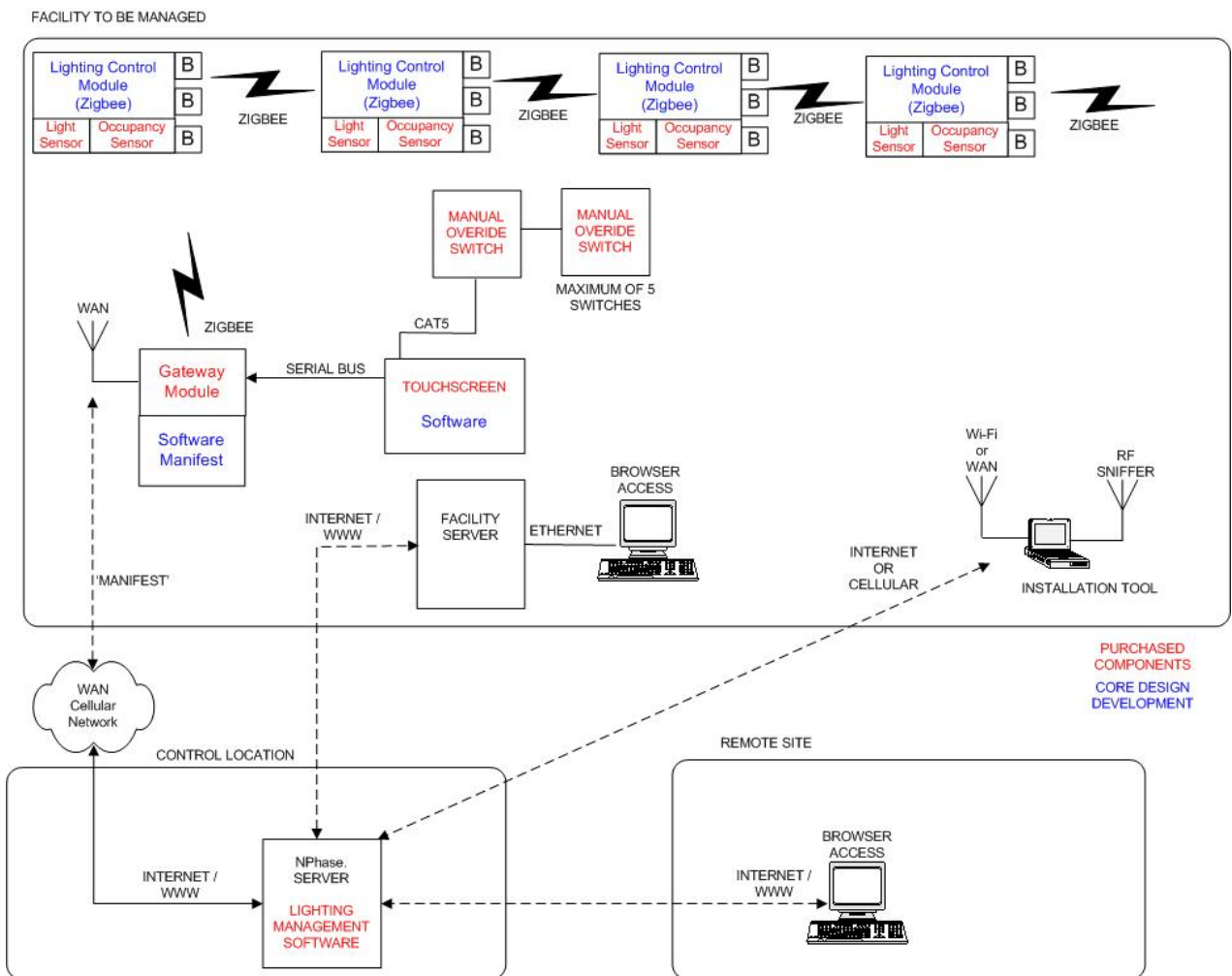
Objectives

To describe the function of the Intu! Light Control Module.
To describe the operation of the Intu! Light Control Module.
To describe the installation of the Intu! Light Control Module.

Document History

Date	Author	Version	Change Justification
14-Mar-08	Craig Klem	1.00	First Release

Block Diagram

FACILITY TO BE MANAGED

| Lighting Control Module (Zigbee) | B |
| Light Sensor / Occupancy Sensor | B |

ZIGBEE

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ZIGBEE

MANUAL OVERIDE SWITCH — MANUAL OVERIDE SWITCH

MAXIMUM OF 5 SWITCHES

WAN

ZIGBEE

CAT5

Gateway Module

SERIAL BUS

Software Manifest

TOUCHSCREEN
Software

Wi-Fi or WAN

RF SNIFFER

BROWSER ACCESS

INTERNET / WWW

FACILITY SERVER

ETHERNET

INTERNET OR CELLULAR

INSTALLATION TOOL

I 'MANIFEST'

PURCHASED COMPONENTS
CORE DESIGN DEVELOPMENT

WAN Cellular Network

CONTROL LOCATION

REMOTE SITE

BROWSER ACCESS

INTERNET / WWW

NPhase. SERVER

LIGHTING MANAGEMENT SOFTWARE

INTERNET / WWW

Functional Description – Lighting Control Module

- Input power from 120/ 277
- Powered continually. No battery operation.
- Installed a maximum of 150' from the nearest ballast controller.
- Control up to 3 ballasts.
- Maximum continuous current draw of 100mA.
- LEDs to indicate its status.
- Controller will not include switches. Operation and configuration will be accomplished with Zigbee messages.
- Certified Zigbee pro mesh stack
- Zigbee "router" Operation. Messages will be routed to other Light Control Modules
- Respond to Zigbee messages to turn on its ballast(s).
- Support over the air boot-loading for SW field upgrades.
- Diagnostic port for RS232 type messages.
- There will be two types of ballast controllers: basic controllers and advanced controllers.

- A basic ballast controller will have all the features listed above and allow for an interface to external occupancy and ambient light sensor's. GEN1 design
- An advanced ballast controller will have all the features listed above plus integrated occupancy and ambient light sensors. GEN2 design
- The occupancy sensor will detect will someone is present and turn on its ballast(s) and send messages to other ballast controllers to turn on their ballast(s).
- The light sensor will detect the amount of ambient light and control how many ballasts it turns on as well as send messages to other ballast controllers telling them how many ballasts to turn on.
- Slot Antenna design integrated into fixture
- 1 year warranty
- Temperature range 0C to 85C
- TRIAC's will be used for ballast switching and will operate for 10 years assuming 2 operations per day.
- UL approval mark
- No user switches. Light nodes will be enabled for network creation within a limited time after power is applied to the light fixture.
- AC current measurement will be implemented in the LCM hardware.   Software to report the current values will not be implemented for Gen1.
- The LCM will maintain 3 ballast usage timers. This information will be logged to the Web Management SW using the Data Table.
- The LCM will also maintain a bulb usage timer. This bulb timer runs whenever any of the ballasts are active.   The bulb usage information will be logged to the Web Management SW using the Data Table.

Operation - Events Description

OVERVIEW

There are three different event types:

Scheduled: events that are active during a specified time period. These events can be recurring; for example, every weekday between 8 am and 5 pm.

Manual: events that are triggered by an external event, for instance a key press on the TouchScreen device. The definition of each Manual event includes a "default duration" timer (in minutes). When a manual event "activate" request is received by the gateway, the light group command(s) will be executed. When the timer has elapsed, the light group(s) controlled by the event will be turned off.   More detail covering the specifics of manual events follows below.

Reactive: events that are triggered by sensor activation.   Some light nodes may contain ambient light and/or occupancy sensors, and the reactive events define what is to occur when these sensors change state.

SCHEDULED TYPES

Scheduled events contain a start and end date (mm/dd/yyyy) that specifies the range of dates in which the event is active. There are seven types of scheduled events:

Single Run: Specified by a start date/time, and an end date/time, this event is active during that entire timeframe, even if it spans multiple days. Once the end time has been reached, the event will never be active again.

Daily: This is used for events that occur on a daily basis, starting and ending at the specified time on the day(s) that it is active. The daily event may be defined to occur every other day, every third day, etc.

Weekly: Like daily events, except that period is weeks rather than days. The weekly event may be defined to occur bi-weekly, every three weeks, etc. Additionally, the event can specify which day(s) of the week the event is active. Typically, this type of event would be used to schedule an event that occurs (for instance) every week: Monday – Friday, 8 am through 5 pm.

Monthly Numbered: This type is used to define an event that occurs on a specific day of the month. The event may also define monthly, bi-monthly, etc.

Monthly Relative: The monthly relative event allows users to specify schedules such as "the second Tuesday of month". As with other events, the recurrence may be defined as every other month, every third month, etc. Similar to the weekly type, the event can define which day(s) of the week are active, and indicates the week of the month. Another example of an event that may be defined by this type: "the third Monday, Wednesday, and Friday of every fourth month".

Yearly Numbered: An event that occurs on a specific day of a specific month, e.g. "December 25". The event specifies the month and the day. As with all other scheduled event types, this event can span multiple years.

Yearly Relative: Yearly relative implement events such as "the second Tuesday of March". The recurrence may be define the month, the day(s) of the week, and the week of the month. Another example: "the first Tuesday and Wednesday of May".

EVENT SUSPENSION

Events are continuously processed by the gateway which operates one or more group of lights. If groups of lights are being controlled manually by a group trigger command, it is quite possible that normal event processing will change the dim level of the groups. Suspension of event processing can be used to override this behavior.

Suspending the event processing effectively stops ALL events from being processed, and allows complete manual control of the lights.

__Installation Operation__

- All light fixtures are installed in the facility including those equipped with the light control module (LCM). Fixtures can be installed in any location.
- Gateway and TouchScreen are installed near the wireless network of LCM's. The TouchScreen must be within 3ft of the gateway.
- The installation laptop is connected to the nPhase server using an internet browser and a WiFi or WAN connection.
- The nPhase GUI will have a network installation screen for user's logged on with this level of access.
- Installer will issue a "Create Network" command from the GUI. The Gateway will establish a Zigbee network and be ready to allow nodes to join the network.
- Installer will initiate the discovery process. (ex: click "Start Discovery"). The gateway will continuously allow LCM's to join the network and report them to the GUI.
- Power up or cycle power to a circuit of light fixtures by turning on a circuit breaker. Light control modules will automatically attempt to join the network when powered up. If they fail, they will try again every 10 seconds for up to 5 minutes.
- LCM's that join the network will show up on the GUI as a newly discovered MAC ID. When the installer selects a discovered MAC ID, the light will begin to flash at a 2 second interval. The installer will map the MAC ID, sensor type and fixture type to the correct location on the GUI layout drawing. Installer will then select the next MAC ID in the discovered list. This light will begin to flash and the previous light will stop flashing and remain on.   Installer will continue until all MAC ID's are mapped.
- Power up the next circuit of lights and repeat the mapping procedure.
- After all the nodes have been joined to the network, the installer will close the network. (ex: click "Stop Discovery).
- Installer will confirm all lights are mapped correctly by selecting a light icon on the layout drawing and confirm the correct light is flashing. A "Next" button allows the installer to quickly cycle through all lights.
- After all lights have been confirmed to be mapped correctly, the installer will group lights and confirm group operation is correct.
- Manual events are defined and downloaded to the gateway. The gateway will automatically update the TouchScreen with the manual event names. Installer will test that manual events operate from the TouchScreen.
- Reactive events are defined and downloaded to the gateway. Installer will test that the occupancy sensor or ambient light sensor works correctly.
- Installation is complete.