IMPORTANT!!!

PLEASE TAKE THE TIME TO FILL OUT THIS FORM COMPLETELY. FILE IT IN A SAFE PLACE. IN THE EVENT YOU EXPERIENCE PROBLEMS WITH OR HAVE QUESTIONS CONCERNING YOUR CONTROLLER, THE FOLLOWING INFORMATION IS NECESSARY TO OBTAIN PROPER SERVICE AND PARTS.

MODEL # E2/3DB2

SERIAL #

PURCHASE DATE

PURCHASED FROM
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1.0 INTRODUCTION

The TWR Lighting®, Inc. (TWR®) Model E2/3DB2 Type L-864/L-865 Controller has been designed and built to the Federal Aviation Advisory Circular 150/5345-43F with safety and reliability in mind. TWR® is committed to providing our customers with some of the best products and services available. TWR® welcomes you to our family of fine products and we look forward to servicing your needs now and in the future. **NOTE:** Structures exceeding 500’ will require to be painted, in addition to this lighting, for added visual hazard marking.

1.1 APPLICATION

The E2/3DB2 Controller is for use on lighting structures or towers 351’ to 700’ AGL (above ground level) that are approved to be lighted with Dual White/Red Flashing Medium Intensity Strobes in accordance with the FAA Advisory Circular 70/7460-1K.

1.2 SPECIFICATIONS OF EQUIPMENT

Dimensions:
- Controller (H x W x D)/Weight: 29.52” x 19.68” x 11.81” / 125lbs.
- Mounting Dim (H x W): 31.10” x 18.11”
- Beacon Height/Weight: 28.0” / 36 lbs.
- Cable Diameter/Weight per 100 ft.: 625” +/- 10% / 24 lbs.

Electrical Voltage:
- 120V AC +/- 10% 60 Hz (Standard)
- 240V AC +/- 10% 60 Hz (Available)

Intensity:
- White Daymode: 20,000 +/- 25% Effective Candelas
- Red Nightmode: 2,000 +/- 25% Effective Candelas
- White Nightmode (Back-up mode): 2,000 +/- 25% Effective Candelas

Beam Spread:
- Horizontal: 360°
- Vertical: 3° Minimum

Flash Rate:
- White Daymode: 40 fpm +/- 2 fpm
- Red Nightmode: 22 fpm +/- 2 fpm
- White Nightmode (Back-up mode): 40 fpm +/- 2 fpm

Wattage:
- Daymode: 285 Watts
- Red Nightmode: 398 Watts
- White Nightmode: 105 Watts

Temperature: +55°C / -55°C

Beacon Wind Load: 2.1 ft²
2.0 INSTALLATION

WARNING - DANGER!!

THIS SYSTEM OPERATES AT HIGH VOLTAGE LEVELS THAT COULD BE LETHAL TO SERVICE PERSONNEL. ALL INSTALLATION AND MAINTENANCE WORK SHOULD BE DONE BY QUALIFIED SERVICE PERSONNEL ONLY. WHEN PERSONNEL IS INSTALLING SYSTEM OR PERFORMING MAINTENANCE ON THIS SYSTEM, MAKE SURE THE POWER IS TURNED OFF AT THE SERVICE BREAKER PANEL!!

READ AND UNDERSTAND THE THEORY OF OPERATION AND ITS SAFETY MESSAGES BEFORE ATTEMPTING INSTALLATION/MAINTENANCE OF THIS SYSTEM. DO NOT ATTEMPT TO DEFEAT THE INTERNAL SAFETY SWITCHES IN THE CONTROLLER AND BEACONS!!

2.1 POWER SUPPLY CONTROL CABINET MOUNTING

The power supply control cabinet can be located at the base of the structure or in an equipment building. Mounting Dimensions can be found in Section 1.2, on page 1. Pay particular attention when choosing your controller mounting location to ensure proper door opening and room for service personnel. Refer to installation drawings INS-340, and HD0-340, for ease of install.

2.2 PHOTOCCELL HOUSING

The standard photocell housing is supplied with a 20’ pigtail of 16 AWG TYPE TFFN wire. On occasion, in mounting of the photocell, an additional amount of wire may be required. Refer to drawing 100239, for proper assistance on determining gauge of wire for your specific needs.
2.3 PHOTOCELL WIRING  
(Refer to Drawings HD0-340, and H40-340)

If the control cabinet is mounted inside an equipment building, the photocell should be mounted vertically on ½” conduit outside the building above the eaves facing north. Wiring from the photocell housing socket to the control cabinet should consist of one (1) each; red, black, and white wires.  

The white wire is connected to the socket terminal marked "N," the black wire is connected to the socket terminal marked "Li," and the red wire is connected to the socket terminal marked "Lo." The photocell should be positioned so that it does not "see" ambient light, which would prevent it from switching to the nightmode.  

If the control cabinet is mounted outside an equipment building, the photocell should be mounted vertically on ½” conduit so the photocell is above the control cabinet. Care must be taken to assure that the photocell does not "see" any ambient light that would prevent it from switching into the nightmode. The photocell housing socket wiring is the same as above.

2.3.1 Connect the BLACK wire from the photocell to terminal block TB2-5.  
2.3.2 Connect the RED wire from the photocell to terminal block TB2-6.  
2.3.3 Connect the WHITE wire from the photocell to terminal block TB2-7.  
2.3.4 Install the photocell into the receptacle and twist to the right while depressing to lock into place.

2.4 POWER WIRING  
(Refer to Drawing H40-340)

Power wiring to the control cabinet should be in accordance with local methods and the National Electric Code (NEC).  

2.4.1 A 30 amp circuit breaker is recommended at service panel  
2.4.2 Connect the "HOT" side of the 120V AC line to TB2-8.
2.4.3 Connect the "NEUTRAL" side of the 120V AC line to TB2-9.

2.4.4 Connect the AC ground to the ground lug to the lower right of the terminal block TB2.

2.4.5 Controller panel should be connected to the tower and/or building grounding system with the exception of installations on AM/RF Applications where controller grounding to earth ground is prohibited. Ground the controller only to the tower itself using a suitable RF ground.

2.5 TOWER LIGHTING KIT

When installing this system, the customer will need to use strobe cable method to wire the strobe beacons. Refer to lighting kit drawings 601-01DB2, for conduit cable, and 601DB2, for cable installations.

WARNING - DANGER!!!
THIS SYSTEM OPERATES AT HIGH VOLTAGE LEVELS THAT COULD BE LETHAL TO SERVICE PERSONNEL. ALL INSTALLATION AND MAINTENANCE WORK SHOULD BE DONE BY QUALIFIED SERVICE PERSONNEL ONLY. WHEN PERSONNEL IS INSTALLING SYSTEM OR PERFORMING MAINTENANCE ON THIS SYSTEM, MAKE SURE THE POWER IS TURNED OFF AT THE SERVICE BREAKER PANEL!!

READ AND UNDERSTAND THE THEORY OF OPERATION AND ITS SAFETY MESSAGES BEFORE ATTEMPTING INSTALLATION/MAINTENANCE OF THIS SYSTEM. DO NOT ATTEMPT TO DEFEAT THE INTERNAL SAFETY SWITCHES IN THE CONTROLLER AND BEACONS!!
2.5.1 Beacon Mounting and Wiring
(Refer to Drawings HD0-340, and INS-340)

2.5.1.1 Bolt the beacon to the mounting plate using four (4) 5/8” x 1-1/4” galvanized bolts that are supplied. Installer should make sure to check for full thread engagement on Anco locknut. Allow 16” clearance in back of the hinge (25” from the center of the base) to tilt lens back without hitting an obstruction.

2.5.1.2 Level the beacon using the spirit level at the base of the lens. Shims may be used under beacon base or triple nutting each bolt with palnuts on all four (4) nuts.

2.5.1.3 Slip the electrical cable for the dual beacon through the watertight connector (cable gland bushing) and tighten the gland nut to make a watertight seal. Attach the wires to the terminal strip as follows:

<table>
<thead>
<tr>
<th>Connect cable Wire color</th>
<th>to match</th>
<th>Lamp platform wire color</th>
<th>Terminal Block No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Gauge Black</td>
<td>16 Gauge Black</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10 Gauge Red</td>
<td>12 Gauge Red</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10 Gauge Red/Black</td>
<td>12 Gauge Red/Black</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14 Gauge White</td>
<td>16 Gauge White</td>
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<td>14 Gauge White/Green</td>
<td>16 Gauge White/Green</td>
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<td></td>
</tr>
<tr>
<td>14 Gauge Green</td>
<td>16 Gauge Green</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16 Gauge Blue</td>
<td>18 Gauge Blue</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>16 Gauge Brown</td>
<td>18 Gauge Brown</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>16 Gauge Bare Wire</td>
<td>Beacon Base</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.5.2 LIGHTING KIT WIRING

Install wiring between the controller and the beacon utilizing strobe cable method. Refer to drawings HD0-340, 601DB2, and 601-01DB2, for installation of light kits. Following these minimum guidelines as well as any local or end user addition requirements, installing light kits will require lifting of the cable by the supplied cable grip or conduit to affix to the tower. Always work safely and adhere to all OSHA Safety Guidelines when lifting wiring or working on the structure or tower itself. It is the installer’s responsibility to install the lighting kit in a safe manner. Installers can request from OSHA their requirements 29CFR 1926.21, and 29CFR 1926.105, to ensure compliance to regulations.

**NOTE: On occasion, a set of custom lighting kit drawings may be specifically requested by a customer and installed in this manual. In cases such as this, the drawings will precede the manual if a conflict occurs.**

All the necessary information for wiring the dual beacons and sidelights is contained on the tower kit drawings 601DB2, and 601-01DB2. The connections for the dual beacons and sidelights in the controller are as follows:

2.5.2.1 Connect the 10 gauge **Red/Black** wire from Beacon #1 wiring to TB1-1.

2.5.2.2 Connect the 10 gauge **Red** wire from Beacon #1 wiring to TB1-2.

2.5.2.3 Connect the 10 gauge **Black** wire from Beacon #1 wiring to TB1-3.

2.5.2.4 Connect the 14 gauge **White** wire from Beacon #1 wiring to TB1-4.

2.5.2.5 Connect the 14 gauge **White/Green** wire from Beacon #1 wiring to TB1-5.
2.5.2.6 Connect the 10 gauge **Red/Black** wire from Beacon #2 wiring to TB1-6.

2.5.2.7 Connect the 10 gauge **Red** wire from Beacon #2 wiring to TB1-7.

2.5.2.8 Connect the 10 gauge **Black** wire from Beacon #2 wiring to TB1-8.

2.5.2.9 Connect the 14 gauge **White** wire from Beacon #2 wiring to TB1-9.

2.5.2.10 Connect the 14 gauge **White/Green** wire from Beacon #2 wiring to TB1-10.

2.5.2.11 Connect the 10 gauge **Red/Black** wire from Beacon #3 wiring to TB1-11.

2.5.2.12 Connect the 10 gauge **Red** wire from Beacon #3 wiring to TB1-12.

2.5.2.13 Connect the 10 gauge **Black** wire from Beacon #3 wiring to TB1-13.

2.5.2.14 Connect the 14 gauge **White** wire from Beacon #3 wiring to TB1-14.

2.5.2.15 Connect the 14 gauge **White/Green** wire from Beacon #3 wiring to TB1-15.

2.5.2.16 Connect the 14 gauge **Green** wire and 16 gauge Bare Drain wire (if strobe cable install) from Beacon #1 to the ground lug located to the left of TB1.

2.5.2.17 Connect the 14 gauge **Green** wire and 16 gauge Bare Drain wire (if strobe cable install) from Beacon #2 to the ground lug located to the left of TB1.
2.5.2.18 Connect the 14 gauge **Green** wire and 16 gauge Bare Drain wire (if strobe cable install) from Beacon #3 to the ground lug located to the right of TB1.

2.5.2.19 Connect the 16 gauge **Brown** wire from Beacon #1 wiring to TB2-1.

2.5.2.20 Connect the 16 gauge **Blue** wire from Beacon #1 to TB2-2.

2.5.2.21 Connect the 16 gauge **Blue** wire from Beacon #2 to TB2-2.

2.5.2.22 Connect the 16 gauge **Brown** wire from Beacon #2 to TB2-3.

2.5.2.23 Connect the 16 gauge **Brown** wire from Beacon #3 to TB2-3.

2.5.2.24 Connect the 16 gauge **Blue** wire from Beacon #3 to TB2-4.

2.5.2.25 Connect the **Red** wire from the first level Sidelights to TB2-10 marked S1.

2.5.2.26 Connect the **Yellow** wire from the second level Sidelights to TB2-10 marked S1.

2.5.2.27 Connect the **White Neutral** wire from the first and second level Sidelights to TB2-9.

2.5.2.28 Connect the **Green** ground wire (if cable is used) from first and second level Sidelights to the ground lug located to the right of TB2.
2.6 ALARM WIRING

Alarm contacts (Form C) are provided for strobe failures, power failure, and photocell on. It is left up to the customer or installer on how they choose to utilize these contacts with their monitoring equipment. External monitoring equipment is available. Please inquire within the sales staff for models available and pricing. Alarm configurations are shown on drawings H40-340, and M01-340.

2.6.1 White Strobe #1 Failure (ST1)

Connect the customer's alarm common to plug J3, terminal #2. Connect the customer's alarm wire to plug J3, terminal #3, for normally open (or) terminal #1, for normally closed monitoring.

2.6.2 White Strobe #2 Failure (ST2)

Connect the customer's alarm common to plug J3, terminal #5. Connect the customer's alarm wire to plug J3, terminal #6, for normally open (or) terminal #4, for normally closed monitoring.

2.6.3 White Strobe #3 Failure (ST3)

Connect the customer's alarm common to plug J3, terminal #8. Connect the customer's alarm wire to plug J3, terminal #9, for normally open (or) terminal #7, for normally closed monitoring.

2.6.4 Red Strobe Failure (RF)

Connect the customer's alarm common to plug J3, terminal #14. Connect the customer's alarm wire to plug J3, terminal #15, for normally open (or) terminal #13, for normally closed monitoring. **NOTE:** All three (3) red strobe alarms are grouped due to the fail-safe operation.
2.6.5 Power Failure (PF)

Connect the customer's alarm common to plug J3, terminal #11. Connect the customer's alarm wire to plug J3, terminal #12, for normally open (or) terminal #10, for normally closed monitoring.

2.6.6 Photocell (PC)

Connect the customer's alarm common to plug J3, terminal #17. Connect the customer's alarm wire to plug J3, terminal #18, for "off" operation (or) terminal #16, for "on" operation monitoring.

2.6.7 Sidelight Alarm (SA)

Connect the customer's alarm common to Module M1 (item #17), terminal #11. Connect the customer's alarm wire to Module M1, terminal #14, for normally open (or) terminal #12, for normally closed monitoring.

2.7 ALARM TESTING

To test alarms, follow these procedures using an "ohm" meter between alarm common and alarm points.

2.7.1 White Strobe Failure (ST1, ST2, and ST3)

White strobe failure testing can be performed in the daymode operation. Check for status of strobe beacons. Turn "off" switch S1 on PCB #1, and status should change after a nine (9) second delay. After test, turn S1 to the normal operating position. The normal position of S1 is down.
2.7.2 Red Strobe Failure (RF)

Red strobe failure testing can be performed in the nightmode operation. Check for status of strobe beacons. Turn "off" switch SW2 on controller panel, and status should change after a ten (10) second delay. This testing will cause the unit to go into the back-up white strobe operation. To clear this situation, turn on SW2, and reset the breaker.

2.7.3 Power Failure (PF)

While the controller is in normal operation, shut off power to the controller at the breaker panel. Alarm should be prompt. Reset the breaker to resume normal operation.

2.7.4 Photocell (PC)

Controller should be in the daymode of operation when performing this test. Check status of operation. Turn SW1 on or cover the photocell and operation status should change state. After test, turn SW1 to normal operating position.

2.7.5 Sidelight Alarm (SA)

Controller should be in the nightmode operation. Check status of operation. Pull fuse switch S1 open. Alarm should occur within five (5) seconds. After test, re-engage fuse switch S1.

2.8 CONTROLLER CONFIGURATION
(Refer to Drawing H01-340)

This unit is factory set-up to be a master controller. If this unit is to be used in conjunction with an additional unit, change dip switch settings as drawing indicates. The following connections will need to be interfaced between systems.
2.8.1 Connect at least an 18 gauge wire from PCB #1, connector P1-15, from unit set-up to be the master unit to PCB #1, connector P1-15, of unit set-up to be the slave unit.

2.8.2 Connect at least an 18 gauge wire from PCB #1, terminal J3, of master unit to slave unit PCB #1, terminal J3.

2.8.3 Connect at least an 18 gauge wire from relay PCB, J1-2 of master unit to slave unit relay PCB, J1-2, or 1-5.

2.8.4 Connect at least a 16 gauge wire (ground) from one (1) chassis to the other chassis.

2.8.5 Use a single breaker for supply power to all controllers.

2.8.6 Follow standard instructions provided in the manual supplied with the controller.
3.0 THEORY OF OPERATION

3.1 THE POWER SUPPLY

The AC line is sent to transformers T2A through fuses F2, MOVMOD, and relay K1. In order for K1 to energize and complete the circuit to T2A, the safety interlock switch CSS, BSS, must be closed. The BSS switch is located in the middle of the beacon. In order for the system to operate, the beacons and the power supply must be closed and secured.

Transformers T2A secondary output is around 1,000V AC. This output is sent to the high voltage rectifier PCB (PCB #2) and converts the 1,000V AC of each transformer to around +550V DC and -550V DC in daymode and +700V DC and -550V DC in nightmode. This high voltage is then used to charge the energy storage capacitors C102, C112, and C122 through current limiting resistors R31A, R31B, and R31C, and steering diodes D5, D6, and D8, for nightmode operation. Resistors R31A, R31B, and R31C are bypassed through K5A, K5B, and K5C for daymode operation.

Day energy storage capacitor banks C103-111, C113-121, and C123-131, are used for the daymode operation and are connected to the high voltage through the normally closed contacts of relays K5A, K5B, and K5C. When the light level drops below 3 foot candles, the photocell supplies 120V AC to relays K5A, K5B, and K5C, which removes day capacitors from the discharge path leaving capacitors C102, C112, and C122, in the circuit for nightmode operation. The energy storage capacitor banks are connected to the flashtube through the interconnecting tower wiring.

3.2 THE FLASHTUBE

The flashtubes FTW1, FTW2, and FTW3, (daymode) and FTR1, FTR2, and FTR3, (nightmode) are quartz tubes containing two (2) electrodes each. The electrode at the positive (+) end is called the anode, and is connected to the positive side of the storage capacitors through inductors L1, L11, L2, L22, L3, and L33. The electrode at the negative (-) end of the tube is called the cathode, and is connected to the negative side of the energy storage capacitor bank.
The flashtube contains a gas called Xenon. When the high voltage energy in the storage capacitors is connected to the flashtube, nothing will happen since Xenon in its natural state is not a conductor of electricity. However, when a very short duration high voltage pulse is impressed on the trigger element of the tube, (via the power supply and trigger transformers T4, T5, T6, T7, T8, and T9) the Xenon gas is ionized and thereby becomes a good conductor of electricity. This allows the electrical energy in the storage capacitors to discharge rapidly through the flashtube, which converts this energy to light energy and heat energy. When the voltage stored in the capacitors discharges to a low level, the Xenon gas can no longer sustain conduction and, since the short trigger pulse is gone by this time, it de-ionizes returning to its non-conducting state until another trigger pulse arrives to repeat the process. Meanwhile, the storage capacitor is being re-charged by the transformer and the high voltage rectifiers.

### 3.3 TIMING CIRCUIT

The timing circuit is contained entirely on PCB #1. The timing circuit has its own power supply. This circuit converts the AC voltage to approximately 12V DC, which is used to supply all of the components in this circuit. It uses this low voltage DC to generate pulses that control the flash rate of the flashtube. It actually generates two (2) groups of pulses. The first is a pulse approximately once every 1.5 seconds to operate the flashtube during daylight hours. The second is a burst at 50Hz to elongate the apparent flash during the night time hours at reduced flash energy.

### 3.4 TRIGGER CIRCUIT

The trigger circuit is supplied by transformer T1 secondary windings. The 250V AC is converted to DC, which is stored in a storage capacitor much like the action of the high voltage circuit. The main difference is that the storage capacitor is much smaller. The trigger circuit receives the pulses generated by the timing circuit. It releases its stored energy with each pulse and delivers it to the flashtube's trigger element to initiate each flash.
3.5 ALARM CIRCUITS

3.5.1 White Strobe Failure (ST1, ST2, and ST3)

White Strobe Failure alarm circuit monitors each flash of the daymode flashtube within the beacon. If the flashtube fails to flash (for any reason) the alarm circuit operates relays K7A, K7B, and K7C (on PCB #3) that the customer can connect to their alarm transmitting devices. The alarm point can be accessed on J3, of PCB #3.

3.5.2 Red Strobe Failure (RF)

Red Strobe Failure alarm circuit monitors each flash of the nightmode flashtube within each beacon. If any Red Strobe flashtube fails to flash (for any reason) the alarm circuit would operate relay K8 (on PCB #3) that the customer can connect to their alarm transmitting devices. The alarm point can be accessed on J3, of PCB #3.

3.5.3 Power Failure (PF)

The power failure alarm relay is energized during normal operation. Should the power be removed for any reason, then relay K1A would drop, creating an alarm for the customer’s alarm transmitting device.

3.5.4 Photocell (PC)

The photocell alarm relay K4 is energized whenever the photocell or SW3 is on. This relay will allow the customer to monitor the modes of operation to determine if switch from day to nightmode has occurred.

3.5.5 Sidelight Alarm (SA)

Module M1 monitors the current flowing to the sidelights. These modules can monitor from (1-8) 116W lamps. Factory setting is generally for six (6) lamps. When the current falls below five (5) amps (one [1] lamp less than the factory setting), then the onboard relay will engage, creating an alarm.
3.6 BLEEDER CIRCUIT

The bleeder circuit is the most important safety item in this system. It consists of resistors R32A, R32B, and R32C, connected to the high voltage storage capacitors through relay K2. When the AC line voltage is turned off, the relay will close, allowing the resistors to discharge the high voltage stored in the capacitors' banks below 50V in 30 seconds.

**CAUTION**

NEVER RELY ON THIS CIRCUIT TO RENDER THIS SYSTEM HARMLESS. ANY DEFECT IN THIS CIRCUIT COULD ALLOW A HAZARDOUS HIGH VOLTAGE CHARGE TO REMAIN ON THE STORAGE CAPACITORS. ALWAYS WAIT AT LEAST 30 SECONDS AFTER POWER HAS BEEN TURNED OFF BEFORE STARTING ANY WORK ON THIS SYSTEM. ALWAYS MEASURE THE VOLTAGE ON THE STORAGE CAPACITORS WITH A VOLTOMETER BEFORE STARTING ANY OTHER WORK ON THIS SYSTEM. NEVER ATTEMPT TO DEFEAT THE SAFETY INTERLOCKS.

3.7 STROBE DIAGNOSTIC CIRCUITS

The diagnostic circuit is provided as a means of making system checks and maintenance more convenient. This circuit is entirely contained on the printed circuit boards PCB #1, and PCB #2. The circuits that are contained on PCB #1, and PCB #2 are as follows:

3.7.1 Control Power On

Line from the 120V AC input is sent through safety switches CSS, BSS, isolation transformer T1, and fuse F1 on PCB #1. Once this low voltage is at PCB #1, it is rectified, and then sent to LED4 (D5). If, for any reason, power is interrupted, (beacons opened, controller door open, blown F1 fuse, failed relay, etc.) LED4 would be extinguished.
3.7.2 High Voltage

The cathode side of the high voltage HV1, HV2, and HV3, are routed through current limiting resistors (R201, R202, and R203). When the unit is in daymode, D14, D15, and D16 will be at full brightness when the capacitors are at full charge, but dims with the discharging of the storage capacitors. A constant intensity indicates that high voltage is present but capacitors are not discharging (check other indicators for fault). When the red LEDs fail to glow, then the high voltage is no longer present.

3.7.3 Trigger Voltage

The trigger voltage from fuse F41 (PCB #4) is sent to current limiting resistor R1, and LED6 (PCB #1, D11). Under normal circumstances, the red LED should be at full intensity, indicating voltage to be normal. An absence of this indication means that the voltage is no longer present.

3.7.4 Nightmode

Output voltage from the photocell (SSR) is connected to the coil of relay K4 on PCB #3. Whenever the photocell senses the darkness, or switch SW1 is on, relay K4 will energize, thereby sending 120V to relay K2 (PCB #1). Relay K2 will supply 12V DC to the timing circuit as well as LED7 (D7). LED7 will glow a constant red when in the nightmode.

3.7.5 Primary Timing

The primary timing pulses are received at LED8 (PCB #1, D12). LED8 will flash according to the pulses received from the timing circuit. If LED8 fails to flash, then the primary timing circuit has failed. Check LED9 (D28) for secondary timing operation. The strobe unit should produce 40 (+/- 2) pulses per minute in daymode or nightmode back-up operation. The strobe unit in nightmode operation should produce 22 (+/- 2) pulses per minute.
3.7.6 Timing Signal Verify

Timing pulses (either primary or secondary) are received at LED9 (PCB #1, D28). The LED will flash according to the pulses received from the timing circuit. In the unlikely event that this LED is out, then total timing failure has occurred.

3.7.7 Flash Verified

Current from the Cathode side of the flashtube (FTC1, FTC2, and FTC3) are sent through the current sensing transformers T1, T2, T3, T4, T5, and T6, on PCB #1. T1, T2, T3, T4, T5, and T6 will send a pulse to the gate of the SCR’s Q6, Q8, Q10, Q13, Q14, and Q17, and turns it on. Capacitors C12, C13, C14, C15, C16, and C17, via Q6, Q8, Q10, Q13, Q14, and Q17, will send voltage to LED1 (D20), LED3 (D21), and LED5 (D22). After each confirmed flash, LED1 and LED3 will blink. Absence of a blinking LED signifies the strobe beacon has ceased to flash.

3.7.8 Strobe Fail Test

Switch S1, when turned up, cuts off timing signal to the trigger circuit and extinguishes LED8 (D12). At this time the strobe alarm should be received at J3. The normal position of S1 is down.
4.0 **TROUBLESHOOTING**

Much of the troubleshooting of this system will consist of correcting a "beacon out" situation. There may also be a failure mode where flashtube is still flashing, but at the wrong rate or the wrong intensity.

You must study and understand the safety messages and the theory of operation before attempting any service on this system. Servicing this system must be done by qualified personnel only.

4.1 **TOOL REQUIREMENTS**

In order to be prepared to troubleshoot or repair this system, a minimum amount of tools and equipment will be required. A recommendation list includes:

1) 5/16 Flat Electrician’s Screwdriver
1) #2 Phillips Screwdriver
1) Nut Driver or Socket Set
1) Multi meter - Analog or Digital 600V AC / 600V DC Minimum

4.2 **DIAGNOSTIC EVALUATION**

The first step in troubleshooting of this system, or performing annual maintenance, will require the technician to open the controller door. With the power off to the controller, the technician should look over the controller circuit, and repair or replace any apparent problems, such as loose wire connections, or corroded terminations. After the initial visual checks have been completed, restore power to the controller, and pull out on the plunger of the cabinet safety switch (CSS) located at the lower right edge of the enclosure. Observe at this time the LEDs located on PCB #1, and PCB #2. Determine, by observation of these LED indicators, if the controller is performing to normal operation.

LEDs on PCB #1 are numbered from top to bottom, 1-9. LEDs on PCB #2 are numbered from left to right D16 – D14. (See drawings H40-340, H01-340, and H02-258A.)
4.3 TROUBLESHOOTING ASSISTANCE

4.3.1 Flash Verify LED - Out

4.3.1.1 Observe high voltage LED (D14, D15, and D16) on the same beacon circuit to determine if it is available. If the LED is dim or out completely, then check the high voltage capacitor bank (C103 - C111, C113 - C121, C123 - C131 day, C102, C112, and C122 night) for a short. If no capacitor is found to be shorted, check the resonant capacitor (C101) for a short. If the resonant capacitor is okay, replace PCB #2. If the LED is at full illumination, go to the next step.

4.3.1.2 Check the status of trigger LED6. If LED is dim or off, check fuse F41 of PCB #4. If blown, replace with exact type of fuse. If the fuse blows again, check PCB #1 and #4. Replace as necessary. If LED is okay, go to the next step.

4.3.1.3 If steps 4.3.1.1 and 4.3.1.2 check out okay, re-lamp the beacon.

4.3.2 Control Power on LED - Out

Check interlock circuits for an open circuit. If open, make the necessary repairs. If okay, check fuses F2. Replace if bad.

4.3.3 Primary Timing LED - Out

Observe the status of the timing indicator LED8. If the LED is dim or out completely, check LED9, if dim or out, replace PCB #1. If one (1) or both are lit, you should have timing.

4.3.4 False or Nonexistent Beacon Alarms (ST1, ST2, and ST3)

4.3.4.1 If alarm trips when the system appears to be working normally, or fails to show an alarm when there is an obvious failure, check PCB #1 P1-4, P2-5 and P2-6, for 120V AC output. If voltage is okay, go to the next step.
4.3.4.2 Check relays K7A, K7B, and K7C coils for an open condition. Normal resistance should be around 2K ohm. If one (1) or more coils are open, replace relay.

4.3.4.3 The time delay between an actual failure and the point where the relay trips is about nine (9) seconds, and is preset at the factory. This delay period can be tested by throwing "on" (upward) switch number S1 (on PCB #1). After testing, return switch S1 to its normal (downward) position.

4.3.5 False or Nonexistent Beacon Alarm (RF)

If alarm trips when the system appears to be working normally, or fails to show an alarm when there is an obvious failure, check relay K8 coil for an open condition. Normal resistance should be around 2K ohm. If coil is open, replace K8.

4.3.6 No Red Strobe Operation

4.3.6.1 Check if switch SW2 is on. If switch is off, turn switch to the on position (upward). Reset the circuit breaker at the service panel. If okay, go to the next step.

4.3.6.2 Turn switch SW1 to the upward position. On the breaker at the service panel to the lights, turn off, then back on. If the beacons come on, then the unit fail-safes back to the white back-up mode of operation, then replace the failed red mode flashtube.

**Note:** Once the unit fail-safes, you will need to reset the breaker at the panel in order to release the latched relay in this circuit anytime a failure has been detected. This is an important fact to remember when troubleshooting this system.
5.0 MAINTENANCE GUIDE

**WARNING - HIGH - VOLTAGE**

This system operates at high voltage levels that could be lethal to service personnel. All installation and maintenance work should be done by qualified service personnel. Read and understand the theory of operation and its safety messages before attempting; installation of this system. Do not attempt to defeat the internal safety devices.

Tools Required: #2 Phillips Screwdriver
3/16 Flat Blade Screwdriver

5.1 FLASHTUBE REPLACEMENT

The only required maintenance needed to be performed is the replacement of the flashtubes every four (4) years. By following these instructions, maximum safety and performance can be achieved.

5.1.1 Loosen the single quick open bolt located on upper hinge assembly.

5.1.2 Open the lens and tilt it back.

**ALWAYS WAIT AT LEAST 30 SECONDS AFTER OPENING THE BEACON BEFORE STARTING ANY WORK ON THE BEACON.**

5.1.3 Loosen the three (3) socket screws with a #2 Phillips screwdriver to remove lamp.

5.1.4 Install the new nightmode flashtube making sure that the pins are aligned with the socket. Make sure tube is flush on the socket.

5.1.5 Tighten the socket screws snug, then 1/4 turn more.

5.1.6 Open the internal hatch-plate latch, and let it recline open.

5.1.7 Disconnect the cable running through the tube from the ten (10) position terminal block located at the base of the fixture.
5.1.8 Loosen the three (3) socket screws with a #2 Phillips screwdriver.

5.1.9 To remove the flashtube, slide the lamp down to the cable.

5.1.10 To install a flashtube, slide the lamp over the connector on to the cable with the lamp in the base up position.

5.1.11 Insert the flashtube with the pins aligned with the socket.

5.1.12 Tighten the socket screws snug, then 1/4 turn more.

5.1.13 Reconnect cable connection. Make sure to follow the color codes on the cable to the terminal block.

5.1.14 Close the hatch and latch securely.

5.1.15 Close the upper hinge assembly and latch securely.

5.2 RED OBSTRUCTION LIGHTING

The only required maintenance needed to be performed is replacement of the lamps in the L-810 fixture. Lamps should be replaced after being operated for not more than 75% of the rated life, or immediately upon failure as per FAA Advisory Circular 70/7460-1K. By following these instructions, maximum safety and performance can be achieved.

Tools Required: None

5.2.1 LAMP REPLACEMENT

5.2.1.1 Unclasp the two (2) latches and let the bail recline back.

5.2.1.2 Lift the lens up and over the lamp letting the lens hang from the safety cable.

5.2.1.3 Unscrew the lamp counter-clockwise and remove.

5.2.1.4 Install the new lamp by screwing the lamp clockwise.

5.2.1.5 Re-install the lens making sure it is seated properly on the base.
5.2.1.6 Re-clasp the two (2) latches.

5.3 **POWER SUPPLY**

No scheduled maintenance is required. Perform on an as needed basis only.

5.4 **PHOTOCELL**

The photocell is a sealed unit. No maintenance is needed nor required, other than replacement as necessary.
# 6.0 MAJOR COMPONENTS LIST

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<tr>
<th>SCHEMATIC TAG #</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
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<td>BSS1, BSS2, BSS3</td>
<td>STJ02003</td>
<td>BEACON SAFETY SWITCH</td>
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<td>C101</td>
<td>STB99005</td>
<td>4uf 660V AC CAP</td>
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<td>STB99008CSI</td>
<td>3uf 660V AC/DC CAP</td>
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<td>F1</td>
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<td>1 amp FUSE</td>
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<td>F2</td>
<td>FNQ20</td>
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<td>F41</td>
<td>FUSE.5</td>
<td>½ amp FUSE (ON PCB)</td>
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<td>FUSE.125</td>
<td>1/8 amp FUSE</td>
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<td>DAYMODE FLASHTUBE</td>
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<td>K9</td>
<td>SPEC224</td>
<td>TIME DELAY RELAY</td>
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<tr>
<td>MOVMOD</td>
<td>SPM120</td>
<td>SURGE SUPPRESSOR</td>
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<td>(This replaces the DTK-120HW)</td>
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<td>METAL OXIDE VARISTOR</td>
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<td>RELAY PCB w/ALARM LOCKOUT ELIMINATION</td>
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<td>MODIFICATION</td>
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<td>25K ohm 20W BLEEDER RESISTORS</td>
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<td>2.4 MEG 2W AUXILIARY BLEEDER RESISTORS</td>
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<td>ISOLATION TRANSFORMER</td>
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<td>TRIGGER TRANSFORMER</td>
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<td>15 PART TERM BLK</td>
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<td>10 PARK TERM BLK</td>
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<td>TERMBLK 141-12</td>
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<td>TERMBLK 141-4</td>
<td>4 PART TERM BLK</td>
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6.0 **MAJOR COMPONENTS LIST (continued)**

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<td>STDBEACON HATCH LATCH ASSEMBLY</td>
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<td>116W, 120V SIDELIGHT BULB</td>
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7.0 **SUGGESTED SPARE PARTS LIST**

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<td>2</td>
<td>FUSE.5</td>
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<td>120 - 240V AC PHOTOCELL</td>
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<td>KRPA11AG120V</td>
<td>DPDT OCTAL RELAY</td>
</tr>
<tr>
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<td>SPDT OCTAL RELAY</td>
</tr>
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<td>40UF 1KV CAP</td>
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<td>PHOTOCELL MOV</td>
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<td>V275LA20A</td>
<td>TRIGGER CIRCUIT MOV</td>
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<td>STB99005</td>
<td>4UF RESONANT CAP</td>
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<td>STJ10018</td>
<td>12 amp DPDT OCTAL RELAY</td>
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</table>
TWR Lighting®, Inc. (“TWR®”) warrants its products (other than “LED Product”) against defects in design, material (excluding incandescent bulbs) and workmanship for a period ending on the earlier of two (2) years from the date of shipment or one (1) year from the date of installation.

TWR Lighting®, Inc. (“TWR®”) warrants its “LED Product” against defects in design, material and workmanship for a period of five (5) years from the date of shipment. TWR®, at its sole option, will, itself, or through others, repair, replace or refund the purchase price paid for “LED Product” that TWR® verifies as being inoperable due to original design, material, or workmanship. All warranty replacement “LED Product” is warranted only for the remainder of the original warranty of the “LED Product” replaced. Replacement “LED Product” will be equivalent in function, but not necessarily identical, to the replaced “LED Product.”

TWR Lighting®, Inc. (“TWR®”) warrants its “LED Product” against light degradation for a period of five (5) years from the date of installation. TWR®, at its sole option, will, itself, or through others, repair, replace, or refund the purchase price paid for “LED Product” that TWR® verifies as failing to meet 75% of the minimum intensity requirements as defined in the FAA Advisory Circular 150/5345-43G dated 09/26/12. All warranty replacement “LED Product” is warranted only for the remainder of the original warranty of the “LED Product” replaced. Replacement “LED Product” will be equivalent in function, but not necessarily identical, to the replaced “LED Product.”

Replacement parts (other than “LED Product”) are warranted for 90 days from the date of shipment.

Conditions not covered by this Warranty, or which might void this Warranty are as follows:

- Improper Installation or Operation
- Misuse
- Abuse
- Unauthorized or Improper Repair or Alteration
- Accident or Negligence in Use, Storage, Transportation, or Handling
- Any Acts of God or Nature
- Non-OEM Parts
  The use of Non-OEM parts or modifications to original equipment design will void the manufacturer warranty and could invalidate the assurance of complying with FAA requirements as published in Advisory Circular 150/5345-43.
Warranty & Return Policy  (continued)

Field Service – Labor, Travel, and Tower Climb are not covered under warranty. Customer shall be obligated to pay for all incurred charges. An extensive network of certified and insured Service Representatives is available if requested.

Repair, Replacement or Product Return RMA Terms – You must first contact our Customer Service Department at 713-973-6905 to acquire a Return Merchandise Authorization (RMA) number in order to return the product(s). Please have the following information available when requesting an RMA number:

- The contact name and phone number of the tower owner or
- The contact name and phone number of the contractor
- The site name and number
- The part number(s)
- The serial number(s) (if any)
- A description of the problem
- The billing information
- The Ship To address

This RMA number must be clearly visible on the outside of the box. If the RMA number is not clearly labeled on the outside of the box, your shipment will be refused. Please ensure the material you are returning is packaged carefully. The warranty is null and void if the product(s) are damaged in the return shipment.

All RMAs must be received by TWR LIGHTING®, INC., 10810 W. LITTLE YORK RD. #130, HOUSTON, TX 77041-4051, within 30 days of issuance.

Upon full compliance with the Return Terms, TWR® will replace, repair and return, or credit product(s) returned by the customer. It is TWR®’s sole discretion to determine the disposition of the returned item(s).
Warranty & Return Policy
(continued)

**RMA Replacements** – Replacement part(s) will be shipped and billed to the customer for product(s) considered as Warranty, pending return of defective product(s). When available, a certified reconditioned part is shipped as warranty replacement with a Return Merchandise Authorization (RMA) number attached. Upon receipt of returned product(s), inspection, testing, and evaluation will be performed to determine the cause of defect. The customer is then notified of the determination of the testing.

- Product(s) that is deemed defective and/or unrepairable and covered under warranty - a credit will be issued to the customer’s account.
- Product(s) found to have no defect will be subject to a **$75.00 per hour testing charge (1 hour minimum), which will be invoiced to the customer**. At this time the customer may decide to have the tested part(s) returned and is responsible for the return charges.
- Product(s) under warranty, which the customer does not wish returned, the customer will be issued a credit against the replacement invoice.

**RMA Repair & Return** – A Return Merchandise Authorization (RMA) will be issued for all part(s) returned to TWR® for repair. Upon receipt of returned product(s), inspection, testing, and evaluation will be performed to determine the cause of defect. The customer is then notified of the determination of the testing. If the returned part(s) is deemed unrepairable, or the returned part(s) is found to have no defect, the customer will be subject to a **$75.00 per hour testing charge (1 hour minimum), which will be invoiced to the customer**. Should the returned parts be determined to be repairable, a written estimated cost of repair will be sent to the customer for their written approval prior to any work being performed. In order to have the tested part(s) repaired and/or returned, the customer must issue a purchase order and is responsible for the return shipping charges.

**RMA Return to Stock** – Any product order that is returned to TWR® for part(s) ordered incorrectly or found to be unneeded upon receipt by the customer, the customer may be required to pay a minimum **20% restocking fee**. Product returned for credit must be returned within 60-days of original purchase, be in new and resalable condition, and in original packaging. Once the product is received by TWR it’s condition will be evaluated and a credit will be issued only once it is determined that the RMA Return Terms have been met.

**Credits** – Credits are issued once it is determined that all of the Warranty and Return Terms are met. All credits are processed on Fridays. In the event a Friday falls on a Holiday, the credit will be issued on the following Friday.

**Freight** – All warranty replacement part(s) will be shipped via ground delivery and paid for by TWR®. Delivery other than ground is the responsibility of the customer.
REMEDIES UNDER THIS WARRANTY ARE LIMITED TO PROVISIONS OF REPLACEMENT PARTS AND REPAIRS AS SPECIFICALLY PROVIDED. IN NO EVENT SHALL TWR® BE LIABLE FOR ANY OTHER LOSSES, DAMAGES, COSTS, OR EXPENSES INCURRED BY THE CUSTOMER, INCLUDING, BUT NOT LIMITED TO, LOSS FROM FAILURE OF THE PRODUCT(S) TO OPERATE FOR ANY TIME, AND ALL OTHER DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING ALL PERSONAL INJURY OR PROPERTY DAMAGE DUE TO ALLEGED NEGLIGENCE, OR ANY OTHER LEGAL THEORY WHATSOEVER. THIS WARRANTY IS MADE BY TWR® EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED. WITHOUT LIMITING THE GENERALITY OF THE FORGOING, TWR® MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS OF THE PRODUCT(S) FOR ANY PARTICULAR PURPOSE. TWR® EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES.
RETURN MERCHANDISE AUTHORIZATION (RMA) FORM

RMA#: ___________________________ DATE: ___________________________

CUSTOMER: _______________________________________________________

_________________________________________________________________

CONTACT: _______________________ PHONE NO.: _____________________

ITEM DESCRIPTION (PART NO.): ______________________________________

_________________________________________________________________

MODEL NO.: ______________________ SERIAL NO.: ______________________

ORIGINAL TWR INVOICE NO.: ___________ DATED: _________________

DESCRIPTION OF PROBLEM: _________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

SIGNED: _________________________ DATE NEEDED: _________________

RETURN ADDRESS: _________________________________________________

_________________________________________________________________

PLEASE RETURN PRODUCT TO: 10810 W LITTLE YORK RD #130 HOUSTON TX 77041-4051
RETURN MERCHANDISE AUTHORIZATION (RMA) FORM

RMA#: ______________________ DATE: ______________________

CUSTOMER: __________________________________________________________

_____________________________________________________________

CONTACT: __________________ PHONE NO.: __________________

ITEM DESCRIPTION (PART NO.): __________________

_____________________________________________________________

MODEL NO.: ______________ SERIAL NO.: __________________

ORIGINAL TWR INVOICE NO.: ______________ DATED: __________

DESCRIPTION OF PROBLEM: __________________

_____________________________________________________________

_____________________________________________________________

_____________________________________________________________

_____________________________________________________________

SIGNED: ___________________ DATE NEEDED: __________

RETURN ADDRESS: ______________________________________________

PLEASE RETURN PRODUCT TO: 10810 W LITTLE YORK RD #130 HOUSTON TX 77041-4051
ITEM # | DESCRIPTION
--- | ---
1 | BEACON L-864/L865 DUAL RED/WHITE STROBE
2 | POWER SUPPLY E-2/3DB2
3 | WATER TIGHT CABLE CONNECTOR WITH SEALING GLAND.
4 | ENTRANCE HUB 3/4"
5 | ENTRANCE HUB 1"
6 | RIGID GALVANIZED CONDUIT OR STROBE CABLE.
7 | #6390-FAA2 PHOTOCELL

NOTES:

A. POWER SUPPLY IS NORMALLY MOUNTED AT GROUND LEVEL ON TOWER. IT CAN ALSO BE MOUNTED INDOORS. RECOMMENDED MOUNTING HEIGHT IS 48" TO BOTTOM OF THE ENCLOSURE FOR EASE OF MAINTENANCE.

B. MOUNT BEACON HINGES SO LENS WILL OPEN UNOBSTRUCTED BY STRUCTURE.
NOTES:
1. THIS CONTROLLER CAN BE MOUNTED INDOOR OR OUTDOOR.
2. IT IS HIGHLY RECOMMENDED TO MOUNT A LIGHTING ROD AT THE TOP LEVEL.
3. FOR MORE DETAILS REFER TO DRAWINGS HDG-340 (CONTROLLER INSTALLATION), 601DB2 & 601-01DB2 (LIGHT KIT CABLE RUNS.)
NOTES:
1. ITEM #7 CAN BE USED TO REDUCE 3/4" CONDUIT TO 1/2" CONDUIT AT THE HOUSING OR AT THE CONTROLLER ITSELF.
2. IF ADDITIONAL WIRE IS REQUIRED OVER THE FACTORY 20', USE THE FOLLOWING CHART:
   21' TO 300' - 18 AWG TFFN
   301' TO 500' - 14 AWG TFFN
### Parts List

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>OL1/LED</td>
<td>3/4&quot; OBSTRUCTION LIGHT</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>T27CG</td>
<td>3/4&quot; CONDUIT W/COVER AND GASKET</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>EL3430</td>
<td>3/4&quot; 30° ELBOW</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>N34T3</td>
<td>3/4&quot; X 3&quot; NIPPLE</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>HC402</td>
<td>3/4&quot; NO THREAD CONNECTOR</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>A314</td>
<td>3/4&quot; CONDUIT LOCKNUTS</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>CONDUIT34</td>
<td>3/4&quot; CONDUIT</td>
</tr>
</tbody>
</table>

### Notes:
1. THIS DRAWING IS A TYPICAL INSTALLATION DETAIL FOR 3 OL1 PER LEVEL SYSTEM.
2. PART # EL3430 MAY BE OMITTED WHEN ARRANGING FOUR LEG TOWERS.
3. PART # CONDUIT34 CUT TO LENGTH FOR PROPER EXTENTION OF OL1 FROM STRUCTURE (6"-12"). ATTACH PART # HC402 TO UNTHEADED CONDUIT TO COMPLETE ASSEMBLY.
4. USE COUPLING THAT IS PROVIDED BY PART # CONDUIT34.
5. GREEN WIRE USED ONLY ON LED SIDELIGHTS
FACTORY SETUP:

MASTER & STAND ALONE

1 ON
2 OFF
3 ON
4 OFF
5 ON

DIPSW

OPTIONAL SETUP:

SLAVE

1 OFF
2 ON
3 OFF
4 OFF
5 OFF

DIPSW
CURRENT MEASUREMENT RELAY RM35JA32MR

120VAC PRODUCT SPECIFIC SETTINGS

<table>
<thead>
<tr>
<th>QTY.</th>
<th>PART NO.</th>
<th>INPUT</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
<th>PRD.</th>
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<td>&lt;1</td>
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<td>20</td>
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<td>ORGA</td>
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<td>20</td>
<td>20</td>
<td>30</td>
<td>OFF</td>
<td>ORGA</td>
</tr>
<tr>
<td>3</td>
<td>LEDBEACON2A</td>
<td>E1</td>
<td>&lt;1</td>
<td>30</td>
<td>20</td>
<td>30</td>
<td>OFF</td>
<td>ORGA</td>
</tr>
<tr>
<td>1</td>
<td>116A21TS</td>
<td>E1</td>
<td>&lt;1</td>
<td>30</td>
<td>20</td>
<td>30</td>
<td>OFF</td>
<td>TWR</td>
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<tr>
<td>2</td>
<td>116A21TS</td>
<td>E2</td>
<td>&lt;1</td>
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<td>20</td>
<td>30</td>
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<td>TWR</td>
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<tr>
<td>3</td>
<td>116A21TS</td>
<td>E2</td>
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<td>20</td>
<td>30</td>
<td>OFF</td>
<td>TWR</td>
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<td>4</td>
<td>116A21TS</td>
<td>E2</td>
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<td>65</td>
<td>20</td>
<td>30</td>
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</table>

*NO MEMORY

24VDC PRODUCT SPECIFIC SETTINGS

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<td>20</td>
<td>30</td>
<td>OFF</td>
<td>TWR</td>
</tr>
</tbody>
</table>

*NO MEMORY

FUNCTIONS

1) Configuration: Selection of operation mode 
   (<1 / >1 / >1<) with or without memory.
2) Adjustment of current threshold as % of setting range.
3) Hysteresis adjustment from 5% to 50%.
4) Time Delay adjustment from 0.1 to 30sec.
5) Diagnostic button.
6) Yellow indicator light (See conditions below)
7) Dial Pointer (Green) LED
   - Steady green LED indicates that supply to the RM35 is present
   - Flashing green LED indicates a setting has been changed that requires a power cycle.

YELLOW LED CONDITIONS

Steady Burn Fixtures
- Yellow light on: Normal condition (no alarm)
- Yellow light flashing: Undercurrent condition detected and time delay initiated
- Yellow light off: Alarm condition

Flashing Fixtures
- Yellow light flashing inconsistent: Normal condition (no alarm)
- Yellow light flashing consistent: Under current condition detected and time delay initiated

NOTE: To help troubleshoot or to set the sense current, turn the time delay to 0sec. Adjusting the current setting should only be done if it is known that all the lights are functioning. For Steady Burn adjust the current until the yellow LED comes on, and the relay in not dropping in and out. For Flashing Fixtures adjust the current setting until the yellow light starts to flash. This is the normal condition setting. Return the time delay back to 30sec.

- Yellow light off: Alarm condition

*Due to current draw tolerances slight adjustments to setting #1 may be needed for proper alarming.
NOTE:
1. FAA APPROVED LIGHT USES THE 116A21TS LAMP. OTHER LAMPS ARE AVAILABLE TO MEET YOUR APPLICATION.

* = PART NOT SHOWN
~ = PART SOLD SEPARATELY
**NOTES:**

1) **DRAWING ILLUSTRATES METHOD OF STRAIN RELIEVING WIRE. USE THIS METHOD ON ALL JUNCTION BOXES.**

2) **THE NATIONAL ELECTRICAL CODE—ARTICLE 300–19–B3 REQUIRES CONDUCTORS IN A VERTICAL CONDUIT BE SUPPORTED TO RELIEVE STRAIN ON TERMINAL BLOCK CONNECTIONS.**

3) **SKETCH ILLUSTRATES METHOD OF STRAIN RELIEVING A SINGLE CONDUCTOR. SEVERAL CONDUCTORS MAY BE GROUPED TOGETHER.**

4) **CONDUCTORS MAY BE MIXED BUT SHOULD NOT TAKE UP MORE THAN 40% OF CONDUIT'S INSIDE AREA.**

<table>
<thead>
<tr>
<th>AWG</th>
<th>MAX. NUMBER WIRE SIZE</th>
<th>MAX. NUMBER WIRE</th>
<th>WIRE AREA</th>
<th>WEIGHT PER 100 FEET</th>
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<td>12 THHN</td>
<td>16</td>
<td>26</td>
<td>0.0117</td>
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<tr>
<td>10 THHN</td>
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<td>17</td>
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<td>4 THHN</td>
<td>4</td>
<td>4</td>
<td>0.0845</td>
<td>16.20</td>
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</table>
DIRECTIONS FOR USING WrapLock
CUT OFF BAND TO PROPER LENGTH.
(SEE TABLE ON COVER OF BOX)

1. — PASS ONE END THROUGH YOKE AND BEND BACK ABOUT 1 1/2" AND FLATTEN DOWN.

2. — PASS BAND AROUND WORK AND THROUGH YOKE.

3. — REPEAT AND PASS END THROUGH A SECOND TIME, DRAW UP FREE END SNUGLY WITH PLIERS.

4. — INSERT FREE END IN SLOT OF RATCHET.

5. — TURN DOWN UNTIL CLAMP IS TIGHT.

6. — BACK OFF SLIGHTLY TO REMOVE RATCHET, CLAMP IS NOW SECURELY LOCKED.

TO REMOVE WrapLock
UNCOIL END WITH RATCHET, PRESS DOWN AT POINT WHERE BAND METAL HAS BEEN FORCED THROUGH CURVED PART OF YOKE.

WRAPLOCK FASTENING DETAIL