IMPORTANT!!!

PLEASE TAKE THE TIME TO FILL OUT THE 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 #  
D-1LVS-24V DC

SERIAL #

PURCHASE DATE

PURCHASED FROM
# TABLE OF CONTENTS

1.0 INTRODUCTION .......................................................................................................................... 1
  1.1 APPLICATION......................................................................................................................... 1
  1.2 SPECIFICATIONS OF EQUIPMENT...................................................................................... 1

2.0 INSTALLATION ........................................................................................................................... 2
  2.1 POWER SUPPLY CONTROL CABINET MOUNTING ........................................................... 2
  2.2 PHOTOCELL HOUSING ....................................................................................................... 2
  2.3 PHOTOCELL WIRING .......................................................................................................... 2
  2.4 POWER WIRING ............................................................................................................... 3
  2.5 TOWER LIGHTING KIT .................................................................................................... 3
    2.5.1 Beacon Mounting ............................................................................................................ 3
    2.5.2 Lighting Kit Wiring ...................................................................................................... 4
  2.6 ALARM WIRING .............................................................................................................. 4
    2.6.1 Alarm testing ............................................................................................................... 4
    2.6.2 Strobe Failure (SF) ...................................................................................................... 4
    2.6.3 Power Failure (PF) ...................................................................................................... 4
    2.6.4 Photocell (PC) .......................................................................................................... 4

3.0 THEORY OF OPERATION ............................................................................................................. 5
  3.1 THE POWER SUPPLY ...................................................................................................... 5
  3.2 THE FLASHTUBE .......................................................................................................... 5
  3.3 TIMING CIRCUIT ........................................................................................................... 6
  3.4 TRIGGER CIRCUIT ....................................................................................................... 6
  3.5 ALARM CIRCUITS ......................................................................................................... 6
    3.5.1 Strobe Failure (SF) ...................................................................................................... 6
    3.5.2 Photocell (PC) .......................................................................................................... 6
  3.6 BLEEDER CIRCUIT ....................................................................................................... 6
  3.7 DIAGNOSTIC LEDs ...................................................................................................... 7

4.0 TROUBLESHOOTING ................................................................................................................ 8
  4.1 TOOL REQUIREMENTS ............................................................................................... 8
  4.2 DIAGNOSTIC EVALUATION ....................................................................................... 8
  4.3 TROUBLESHOOTING ASSISTANCE ........................................................................ 9
    4.3.1 Flash Verify LED - Out ............................................................................................... 9
    4.3.2 Control Power On LED - Out ................................................................................... 9
    4.3.3 Primary Timing LED Out ......................................................................................... 9
    4.3.4 False or Nonexistent Beacon Alarms ................................................................. 9
5.0 MAINTENANCE GUIDE ........................................................................................................... 10
5.1 FLASHTUBE REPLACEMENT .......................................................................................... 10
5.2 POWER SUPPLY ............................................................................................................ 10
5.3 PHOTOCELL ................................................................................................................... 10

6.0 MAJOR COMPONENTS PARTS LIST ................................................................................ 11

7.0 RECOMMENDED SPARE PARTS LIST ............................................................................. 13

WARRANTY & RETURN POLICY

RETURN MATERIAL AUTHORIZATION (RMA) FORM
APPENDIX

Chassis Layout ...........................................................................................................H40-293 (REV D)
Wiring Diagram ........................................................................................................M01-293 (REV A)
Housing Details D-1LVS–24V DC ........................................................................HD0-293 (REV B)
Installation Guideline ...........................................................................................INS-293 (REV A)
Photocell Housing Detail ......................................................................................100239 (REV A)
Tower Lighting Kit - Cable .....................................................................................500-15 (REV B)
Control PCB #1 .....................................................................................................H01-293 (REV A)
Relay PCB #3 .........................................................................................................H03-226 (REV B)
Power Supply Detail .............................................................................................100529
Strobe Beacon Detail ............................................................................................100325 (REV B)
1.0 INTRODUCTION

The TWR Lighting, Inc. (TWR) Model D-1LVS-24V DC Type L-865 Controller has been designed and built to the Federal Aviation Administration’s (FAA) Advisory Circular 150/5345-43E 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 product, and we look forward to servicing your needs now and in the future.

1.1 APPLICATION

The D-1LVS-24V DC L-865 Controller is for use on lighting structures or towers that are approved to be lighted with Medium Intensity Strobes in accordance with the FAA’s Advisory Circular 70/7460-1K. Structures from 201’ to 350’ may be lighted with Medium Intensity lights.

1.2 SPECIFICATIONS OF EQUIPMENT

Dimensions:
- Controller (HxWxD)/Weight: 18.0"x16.0"x9.25"  31 lbs.
- Mounting Dim (HxW): 18.74"x12"
- Beacon Height/Weight: 17.25"  21 lbs.
- Cable Diameter/Weight Per 100 ft.: .625" +/- 10%  24 lbs.
- Electrical: 24V DC

Intensity:
- Daymode: 20,000 +/- 25% Effective Candelas
- Nightmode: 2,000 +/- 25% Effective Candelas

Beamspread:
- Horizontal: 360°
- Vertical: 3° minimum

Flash Rate:
- Daymode: 40 fpm +/- 2 fpm
- Nightmode: 40 fpm +/- 2 fpm

Wattage:
- Daymode: 95 Watts
- Nightmode: 35 Watts

Temperature: +55 °C / -55°C
2.0 INSTALLATION

WARNING DANGER

THIS SYSTEM OPERATES AT HIGH VOLTAGE LEVELS THAT COULD BE LETHAL TO SERVICE PERSONNEL. ALL INSTALLATION MAINTENANCE WORK SHOULD BE DONE BY QUALIFIED SERVICE PERSONNEL ONLY. WHEN PERSONNEL ARE 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 OPERATIONS AND ITS SAFETY MESSAGES BEFORE ATTEMPTING INSTALLATION / MAINTENANCE OF THIS SYSTEM. DO NOT ATTEMPT TO DEFEAT THE INTERNAL SAFETY SWITCHES IN THE CONTROLLER AND BEACON.

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 drawing HDO-293 for ease of installation.

2.2 PHOTOCELL 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 HD0-293 and H40-293)

If the control cabinet is mounted inside an equipment building, the photocell should be mounted vertically on ½" conduit outside the building above the eave facing north. Wiring from the photocell housing socket to the control cabinet should consist of one (1) each: red, black, and blue wires. The black wire is connected to the socket terminal marked “N,” the blue wire is connected to the socket terminal marked “L,” 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 ensure 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 BLUE wire from the photocell to TB1-8.
2.3.2 Connect the **RED** wire from the photocell to TB1-6.

2.3.3 Connect the **BLACK** wire from the photocell to TB1-7.

2.3.4 Install the photocell into the receptacle and twist to the right while depressing to lock into place.

**NOTE:** When installing multiple controllers together, the photocell is only required on one (1) unit. It can be installed on the master or slave. SSR interconnect wire must be common to all units. D2/3LV SSR TB3-2 / D-1LVS-24V DC SSR TB1-6.

### 2.4 POWER WIRING
(Refer to Drawing H40-293)

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

2.4.1 A 24V DC power supply is required to power the controller.

2.4.2 Connect the **“HOT”** side of the 24V DC line to TB1-9.

2.4.3 Connect the **“GROUND”** side of the 24V DC line to TB1-10.

2.4.4 Controller panel should be connected to 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 wiring method to wire the strobe beacons. Refer to Lighting Kit Drawing 500-15 for cable installation.

#### 2.5.1 Beacon Mounting
(Refer to Drawing HDO-293)

2.5.1.1 Bolt the beacon to the mounting plate using four 5/8" x 1 1/2" galvanized bolts that are supplied. Installer should make sure to check for full thread engagement on Anco locknut. Allow 18" 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 level at the base of the lens. Shim may be used under beacon base or triple nutting each bolt with palnuts on all four (4) nuts.
2.5.2 Lighting Kit Wiring

Install wiring between the controller and the beacon, utilizing strobe cable method. *(TWR LIGHTING CANNOT WARRANTY SYSTEMS THAT EMPLOY SPlicing CABLE.)* Refer to drawings HDO-293, and 50045 for install of lighting kits. Follow these minimum guidelines as well as any local or end user addition requirements. Installing lighting 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.

2.6 ALARM WIRING

Individual alarm contacts (Form C) are provided for strobe failure, 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. Alarm configurations are shown on drawing H40-293.

2.6.1 Alarm testing

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

2.6.2 Strobe Failure (SF)

Strobe failure testing can be performed in either day or nightmode strobe operation. Check for status of strobe beacon. Turn on switch S1 on PCB #1, and status should change after an eight (8) second delay. After test, switch S1 to normal operating position.

2.6.3 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 breaker to resume normal operation.

2.6.4 Photocell (PC)

Controller should be in the daymode of operation when performing this test. Check status of operation. Turn SW3 on or off over the photocell and alarm status should change state. After test turn SW3 to normal operating position.
3.0 THEORY OF OPERATION

3.1 THE POWER SUPPLY

The 24V DC is connected to power converter through F1 and Relay K1. In order for K1 to energize and complete the circuit to the power converter, the safety interlock switches CSS and BSS must be closed. The BSS switch is located in the base of the beacon. For the safety reason, both beacon and power supply must be closed and secured to have the system operate.

The HV output of the power converter sends 1,000V DC to the day capacitor bank. The energy is stored there and discharged to the flashtube upon the trigger pulses. In the nightmode, Relay K5 is energized, which inserts R31 and bursting choke between the day capacitor bank and night capacitor, so a small portion of the energy that stored in night capacitor is discharged to the flashtube.

3.2 THE FLASHTUBE

The flashtube FT is a quartz tube 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 inductor L1. The electrode at the negative (-) end of the tube is called the Cathode and is connected to the negative side of the energy storage capacitors banks.

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 transformer T4) 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 deionizes returning to its non-conducting state until another trigger pulse arrives to repeat the process. Meanwhile, the storage capacitor is being recharged by the transformer and the high voltage rectifier.
3.3 TIMING CIRCUIT

The timing circuit is contained entirely on PCB #1, and has its own power supply. This circuit converts the 24V DC 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 1.4 seconds to operate the flashtube during the daytime hours. The second is a burst of 10 or more very rapid pulses (to elongate the apparent flash) every flash to operate the flashtube during the nighttime hours at reduced flash energy.

3.4 TRIGGER CIRCUIT

The trigger circuit consists of two (2) main components, electronic switch and trigger capacitor. The trigger capacitor is charged by a 300V DC output of the power converter. The energy is stored in trigger capacitor much like the action of the high voltage circuit. The main difference is that the storage capacitor is much smaller. When the electronic switch of the trigger circuit receives a pulse from the timing circuit, it switches on and releases the stored energy in the trigger capacitor and delivers to trigger transformer to initiate a flash.

3.5 ALARM CIRCUITS

3.5.1 Strobe Failure (SF)

Strobe Failure alarm circuit monitors each flash of the flashtube within each beacon. If the flashtube fails to flash (for any reason), the alarm circuit operates a relay (on PCB #1) that the customer can connect to their alarm transmitting devices. The alarm point can be accessed on J2, on PCB #1.

The power failure alarm relay is energized during normal operation. Should the power be removed for any reason, then Relay K6 would drop, creating an alarm for the customer alarm transmitting device.

3.5.2 Photocell (PC)

The photocell alarm relay 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.

3.6 BLEEDER CIRCUIT

The bleeder circuit is the most important safety item in this system. It consists of resistor R32 connected to the high voltage storage capacitor through relay K2. When the 24V DC power supply is turned off, relays close allowing the resistors to discharge the high voltage stored in the capacitor bank below 50V in 30 seconds.
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 VOLTMETER BEFORE STARTING ANY OTHER WORK ON THIS SYSTEM. NEVER ATTEMPT TO DEFEAT THE SAFETY INTERLOCKS.

3.7 DIAGNOSTIC LEDS

The diagnostic LEDs are provided as a means of making system check and maintenance more convenient. These LEDs are located at the edge of PCB #1.

LED #1  Flash Verify
LED #2  Disable the Flash for Flash Fail Test
LED #4  Power Supply 12V
LED #6  Trigger Voltage 300V
LED #7  Nightmode Operation
LED #8  Timing Signal
LED #9  Trigger Signal
4.0 TROUBLE SHOOTING

Much of the trouble shooting of this system will consist of correcting a “beacon out” situation. There may also be a failure mode where the 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.

***WARNING - HIGH - VOLTAGE***

THIS SYSTEM OPERATES AT HIGH VOLTAGE LEVELS THAT COULD BE LETHAL TO SERVICE PERSONNEL. ALL INSTALLATION AND MAINTENANCE WORK MUST 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.

4.1 TOOL REQUIREMENTS

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

1) 5/16 Electrician’s Screwdriver
1) Nut Drivers or Socket Set
1) Multi meter - Analog or Digital 600V AC/600V DC Minimum

4.2 DIAGNOSTIC EVALUATION

The first step in trouble shooting 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), which is located at the lower right edge of the enclosure. Observe at this time the LEDs located on PCB #1. 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. The following chart will indicate normal LED operation.

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>OPERATION</th>
<th>NORMAL STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED #1</td>
<td>Flash Verify</td>
<td>Blinks</td>
</tr>
<tr>
<td>LED #2</td>
<td>Strobe Fail Test</td>
<td>Normal OFF/Flashes in Test Mode</td>
</tr>
<tr>
<td>LED #4</td>
<td>Control Power ON</td>
<td>Steady ON</td>
</tr>
<tr>
<td>LED #6</td>
<td>Trigger Voltage</td>
<td>Blinks</td>
</tr>
<tr>
<td>LED #7</td>
<td>Nightmode</td>
<td>Steady ON during Nightmode Operation</td>
</tr>
<tr>
<td>LED #8</td>
<td>Primary Timing</td>
<td>Flashing</td>
</tr>
<tr>
<td>LED #9</td>
<td>Timing Verify</td>
<td>Flashing</td>
</tr>
</tbody>
</table>

4.3 TROUBLE SHOOTING ASSISTANCE

4.3.1 Flash Verify LED - Out

4.3.1.1 Check capacitor voltage with a voltmeter 1,000 V DC volt range. If no high voltage (1,000 V DC), replace power converter and / or check for bad capacitors. If HV is present at capacitors, go to the next step.

4.3.1.2 Check the status of the trigger LED. If LED is dim or off, check fuse F2. If blown, replace with exact type of fuse. If the fuse blows again, replace PCB #1. 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, relamp the beacon.

4.3.2 Control Power On LED - Out

Check interlock circuit for an open circuit. If open, make the necessary repairs. If okay, check fuse F3 on PCB #1. Replace if bad.

4.3.3 Primary Timing LED Out

Observe the status of the timing LED. If the LED is dim or out completely, check LED #9. 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

4.3.4.1 If alarms trip when the system appears to be working normally or fails to show an alarm when there is an obvious failure, replace PCB #1.

4.3.4.2 The time delay between an actual failure and the point where the relay trips is preset at the factory at about eight (8) seconds. This delay period can be tested by throwing “on” switch S1 (on the circuit board #1). When this switch is in the alarm test mode, the test mode indicator (LED #2) will be illuminated or blinking slightly.
THIS SYSTEM OPERATES AT HIGH VOLTAGE LEVELS THAT COULD BE LETHAL TO SERVICE PERSONNEL. ALL INSTALLATION AND MAINTENANCE WORK MUST 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.

5.0 MAINTENANCE GUIDE

5.1 FLASHTUBE REPLACEMENT

The only required maintenance needed to be performed is the replacement of the flashtubes every two (2) years. By following these instructions, maximum safety and performance can be achieved.

5.1.1 Loosen the wing nut on each latch pin so that it can recline.

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 screwdriver to remove lamp.

5.1.4 Install the new flashtube making sure that the red marked pin is aligned with the red wire on the socket. Make sure tube is flush on all socket lugs.

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

5.1.6 Close the lens - make sure nothing hampers safety interlock action.

5.1.7 Re-tighten the three (3) wing nuts on the beacon.

5.2 POWER SUPPLY

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

5.3 PHOTOCELL

The photocell is a sealed unit. No maintenance is needed or required other than replacement as necessary.
## 6.0 MAJOR COMPONENTS PARTS LIST

<table>
<thead>
<tr>
<th>SCHEMATIC TAG #</th>
<th>DESCRIPTION</th>
<th>TWR PART #</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS1</td>
<td>BEACON SAFETY SWITCH</td>
<td>STJ02003</td>
</tr>
<tr>
<td>C103 - C108</td>
<td>40uf 1KV CAP</td>
<td>STB99006</td>
</tr>
<tr>
<td>C102</td>
<td>3uf 660V AC CAP</td>
<td>STB99008CSI</td>
</tr>
<tr>
<td>CSS</td>
<td>CABINET SAFETY SWITCH</td>
<td>STJ02001</td>
</tr>
<tr>
<td>F1</td>
<td>10 amp FUSE</td>
<td>KTK10</td>
</tr>
<tr>
<td>F2</td>
<td>1/8 amp FUSE</td>
<td>FLQ 1/8</td>
</tr>
<tr>
<td>FT3</td>
<td>FLASHTUBE</td>
<td>STFLSHTB5</td>
</tr>
<tr>
<td>K6</td>
<td>SPDT OCTAL RELAY</td>
<td>KRPA5DG24</td>
</tr>
<tr>
<td>K1, K4, K5</td>
<td>DPDT OCTAL RELAY</td>
<td>KRPA11DG24</td>
</tr>
<tr>
<td>K2</td>
<td>HV BLEEDER RELAY</td>
<td>PRD-11DYO24</td>
</tr>
<tr>
<td>L1</td>
<td>INDUCTOR</td>
<td>INDCTR3001</td>
</tr>
<tr>
<td>L11</td>
<td>BURSTING</td>
<td>100273</td>
</tr>
<tr>
<td>D1, D2</td>
<td>TVS ZENER DIODES</td>
<td>STD01009</td>
</tr>
<tr>
<td>MOV3</td>
<td>METAL OXIDE VARISTOR</td>
<td>V1000LA80A</td>
</tr>
<tr>
<td>P1</td>
<td>15 POSITION PLUG</td>
<td>STT60021</td>
</tr>
<tr>
<td>PCB #1</td>
<td>D-1LVS24V DC PCB</td>
<td>STH01293</td>
</tr>
<tr>
<td>PCB #3</td>
<td>RELAY PCB</td>
<td>STH03226</td>
</tr>
<tr>
<td>PHOTOCELL</td>
<td>12 - 48V DC PHOTOCELL</td>
<td>6589C-FAA2</td>
</tr>
<tr>
<td>R31</td>
<td>150 ohm 100W</td>
<td>STA08018</td>
</tr>
<tr>
<td>R32 35K</td>
<td>20W</td>
<td>STA08015</td>
</tr>
<tr>
<td>R33</td>
<td>2.4 MEG 2W</td>
<td>STA08010</td>
</tr>
<tr>
<td>SW3</td>
<td>SPDT 15 amp SWITCH</td>
<td>STJ01002</td>
</tr>
<tr>
<td>PS</td>
<td>WILMORE PS# (1699A)</td>
<td>1699A</td>
</tr>
<tr>
<td>T4 TRIGGER</td>
<td>TRANSFORMER</td>
<td>STC05005</td>
</tr>
<tr>
<td>TB1</td>
<td>10 PART TERM BLK</td>
<td>TERMBLK-10</td>
</tr>
</tbody>
</table>
## TWR Lighting, Inc.

**Enlightened Technology℠**

**D-1LVS-24V DC CONTROLLER**

<table>
<thead>
<tr>
<th>SCHEMATIC TAG #</th>
<th>DESCRIPTION</th>
<th>TWR PART #</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLS</td>
<td>THERMAL LIMITING SWITCH</td>
<td>STJ10008</td>
</tr>
<tr>
<td>STROBE</td>
<td>BEACON</td>
<td>STBEACON6</td>
</tr>
</tbody>
</table>
### 7.0 RECOMMENDED SPARE PARTS LIST

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STH01293</td>
<td>D-1LVS24V DC PCB</td>
</tr>
<tr>
<td>1</td>
<td>PRD-11DYO24</td>
<td>DPDT CONTACTOR RELAY</td>
</tr>
<tr>
<td>1</td>
<td>STFLSHTB5</td>
<td>STROBE FLASHTUBE</td>
</tr>
<tr>
<td>1</td>
<td>6589C-FAA2</td>
<td>PHOTOCELL, 12 - 48V DC</td>
</tr>
<tr>
<td>2</td>
<td>KTK10</td>
<td>10 amp FUSE</td>
</tr>
<tr>
<td>2</td>
<td>FLQ18</td>
<td>1/8 amp FUSE</td>
</tr>
<tr>
<td>1</td>
<td>KRPA5DG24</td>
<td>SPDT RELAY</td>
</tr>
<tr>
<td>2</td>
<td>KRPA11DG24</td>
<td>DPDT RELAY</td>
</tr>
</tbody>
</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 70% of the minimum intensity requirements as defined in the FAA Advisory Circular 150/5345-43E dated 10/19/95. 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.

Field Service – Repairs are warranted for 90 days from the date of service, except where TWR has made recommendations that were not adhered to that may cause premature failure on previous repairs. Labor, Travel, and Tower Climb are not covered under warranty. Customer shall be obligated to pay for all incurred charges not related to warranty. All warranty repairs are performed by trained TWR personnel, or dispatched through an extensive network of certified and insured Service Representatives.
Return Policy

Return 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
- 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., 4300 WINDFERN RD #100, HOUSTON TX 77041-8943, 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).

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 $60.00 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.
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 **$60.00 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.

Return to Stock – Any order that is returned to TWR for part(s) ordered incorrectly by the customer, or unneeded upon receipt, the customer is required to pay a 20% restocking fee. A credit will be issued once it is determined that the Return Terms are 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: __________________________________________

ADDRESS: TWR LIGHTING, INC. - 4300 WINIFERN RD., SUITE 100 – HOUSTON, TX. 77041-8943
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: _______________________________________________

ADDRESS: TWR LIGHTING, INC. - 4300 WINDFERN RD., SUITE 100 – HOUSTON, TX. 77041-8943
NOTES:
1. USE BUSSMAN KTK FUSES. SIZE AS SHOWN ON FUSE BLOCKS.
2. WIRES ARE CONNECTED LETTER TO LETTER. (EXAMPLE: N TO N TO N)
3. THIS DRAWING IS PROVIDED AS A GENERAL REFERENCE.
   TWR LIGHTING, INC. DOCUMENTATION SUPERCEDES THIS DRAWING AND
   SHOULD BE REVIEWED PRIOR TO INSTALLATION OF THIS SYSTEM.

D-11VS 24VDC CHASSIS LAYOUT
L-865 MEDIUM INTENSITY STROBE

11/14/06   (D)  CHG. ITEM PHOTOCELL
DATE:  LTR:  REVISION

12/03/06   N.T.S.
PRINTED SHEET:  M40-203

TWR Lighting, Inc.
Enlightened Technology

Drawing prepared by
F. de la cruz
D. de la cruz
ITEM # | DESCRIPTION
-- | --
1 | BEACON L-865 WHITE MEDIUM INTENSITY STROBE
2 | POWER SUPPLY D-1LVS 24VDC
3 | WATER TIGHT CABLE CONNECTOR WITH SEALING GLAND.
4 | MEYERS HUB 3/4"
5 | MEYERS HUB 1"
6 | RIGID GALVANIZED CONDUIT OR STROBE CABLE. (REFER TO DRAWINGS 500-15 FOR PROPER INSTALLATION).
7 | #6589C-FAA2 PHOTOCCELL

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 UNOBSCTURED BY STRUCTURE.

C. POWER SUPPLY DETAIL FOR L-865 MODEL NO. D-1LVS 24VDC LIGHTING CONTROLLER.
NOTES:
1. THIS CONTROLLER CAN BE MOUNTED INDOOR OR OUTDOOR.
2. IT IS HIGHLY RECOMMENDED TO MOUNT A LIGHTING ROD AT THE TOP LEVEL.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>PHOTOCELL</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6-32 x 1/2&quot; SCREW</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>RECEPTACLE SOCKET</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>RECEPTACLE GASKET</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>RECEPTACLE HOUSING</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1/2&quot; CONDUIT LOCKNUT</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>3/4&quot; TO 1/2&quot; REDUCER</td>
</tr>
</tbody>
</table>

**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' = 16 AWG TFFN
   - 301' TO 500' = 14 AWG TFFN
### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>QTY</th>
<th>TWR PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>MT-1206BC</td>
<td>WHITE STROBE BEACON</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0-190-0108</td>
<td>0-190-0108 (100 VOLTAGE CTR)</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>PR-100-0108</td>
<td>PR-100-0108 (EVERY 5')</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>PR-100-0108</td>
<td>PR-100-0108 (EVERY 5')</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>A-190-0108</td>
<td>SINGLE EYE LACE MESH 5 - 0.62</td>
</tr>
</tbody>
</table>

### NOTES:

1. POWER SUPPLY IS NORMALLY MOUNTED AT EYE LEVEL ON TOWER. IT CAN ALSO BE MOUNTED INDOORS. RECOMMENDED MOUNTING HEIGHT IS 42" TO BOTTOM OF ENCLOSURE FOR EASE OF MAINTENANCE.
2. MOUNT BEACON HINGE SO LENS WILL OPEN UNOBSERVED BY STRUCTURE.
3. ON AM TOWER APPLICATIONS, KEEP GROUND LUG FROM BEING CONNECTED TO EARTH GROUND.
4. STROBE CABLE IS TO BE FASTENED TO TOWER STRUCTURE W/PART NUMBER STCABLE (ATTACH EVERY 5')
5. THIS DRAWING IS PROVIDED AS A GENERAL REFERENCE. TWR LIGHTING, INC. DOCUMENTATION SUPERCEDES THIS DRAWING & SHOULD BE REVIEWED PRIOR TO INSTALLATION OF THIS SYSTEM.