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IMPORTANT!!!

PLEASE TAKE THE TIME TO FILL OUT THE FORM COMPLETELY. FILE 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

SERIAL # _____

PURCHASE DATE _____

PURCHASED FROM _____

TWR Lighting, Inc. **MARK**[®]

Enlightened Technology[®]

D-1LVS CONTROLLER

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WARRANTY & RETURN POLICY

RETURN MERCHANDISE AUTHORIZATION (RMA) FORM



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APPENDIX

CHASSIS COMPONENT LAYOUT.....	H40-283 (REV F)
SCHEMATIC LAYOUT	M01-283 (REV B)
HOUSING DETAILS D-1LVS	HD0-283 (REV B)
INSTALLATION GUIDELINE.....	INS-283
PHOTOCELL HOUSING DETAIL.....	100239 (REV H)
TOWER LIGHTING KIT - CABLE.....	500-12 (REV B)
CONTROL PCB #1	H01-226B (REV F)
HIGH VOLTAGE RECTIFIED PCB #2	H02-226A (REV A)
RELAY PCB #3.....	H03-226 (REV B)
STROBE BEACON DETAIL	100437 (REV G)
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1.0 INTRODUCTION

The TWR Lighting[®], Inc. (TWR[®]) Model D-1LVS Type L-865 Controller has been designed and built to the Federal Aviation Administration's (FAA) Advisory Circular 150/5345-43G 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.

1.1 APPLICATION

The D-1LVS 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. **NOTE: Structures exceeding 500' will require to be painted in addition to this lighting for added visual hazard marking.**

1.2 SPECIFICATIONS OF EQUIPMENT

Dimensions:

Controller (HxWxD)/Weight	18.0"x16.0"x9.25"	45.0 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	120V AC +/- 10% 60 Hz (Standard)	
	240V AC +/- 10% 60 Hz (Available)	

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

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2.0 INSTALLATION

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-283, for ease of install.

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 HD0-283, and H40-283)

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 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 TB1-8.

2.3.2 Connect the **RED** wire from the photocell to TB1-6.

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

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- 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 H40-283)

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

- 2.4.1 A 15 amp circuit breaker is recommended at service panel.
- 2.4.2 Connect the “**HOT**” side of the 120V AC line to TB1-9.
- 2.4.3 Connect the “**NEUTRAL**” side of the 120V AC line to TB1-10.
- 2.4.4 Connect the AC ground to the ground stud to the lower right of the terminal block TB1.
- 2.4.5 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 to wire the strobe beacon. Refer to Lighting Kit Drawing 500-12 for cable installation.

2.5.1 Beacon Mounting

(Refer to Drawing HDO-283)

- 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. Shims may be used under beacon base or triple nutting each bolt with palnuts on all four (4) nuts.

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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-283 and 500-12 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 29CFT 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 H40-283.

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.

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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 cover the photocell and alarm status should change state. After test turn SW3 to normal operating position.

2.7 CONTROLLER CONFIGURATION (Refer to Drawing H01-226B)

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 dipswitch settings (DS1) as drawing indicates.

- 2.7.1 Connect at least an 18/20 gauge wire from the master unit D1LVS PCB #1, P1, Position 15, to D1LVS slave unit PCB #1, P1, Position 15. Refer to drawing H40-283.
- 2.7.2 Connect another 18/20 gauge wire, along with the existing wire, into SSR1, Position 6, of P2, of the master unit.
- 2.7.3 Remove the existing wire, SSR1, from Position 6, P2, of the slave unit and capoff.
- 2.7.4 Connect the 18/20 gauge wire from (Note: 2.7.2) the master unit to Position 6, P2, of the slave unit.
- 2.7.5 Only one (1) photocell is needed, and is to be connected to the master unit.
- 2.7.6 Connect at least an 18/20 gauge wire (ground) from one (1) chassis to the other chassis.
- 2.7.7 Both controllers must be connected to the same phase of power supply.
- 2.7.8 Follow standard instructions provided in the manual supplied with the controller.

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3.0 THEORY OF OPERATION

3.1 THE POWER SUPPLY

The AC line is sent to transformer T1 through fuse F1 and relay K1. In order for K1 to energize and complete the circuit to T1, the safety interlock switch CSS, BSS, must be closed. The BSS switch is located in the base of the beacon. In order for the system to operate, the beacon and the power supply must be closed and secured.

Transformer T1 secondary output is around 1,000V AC. These outputs are sent to the high voltage rectifier PCB (PCB #3) and converts the 1,000V AC of the transformer to around +500V DC and -500V DC in daymode and +700V DC and -550V DC in nightmode. This high voltage is then used to charge the energy storage capacitor C102 through current limiting resistor R31 steering diode D5 for nightmode operation. Resistor R31 is by-passed through relay K5 for daymode operation.

Energy storage capacitors bank C103-109 is used for the daymode operation and are connected to the high voltage through the normally closed contacts of relay K5. When the light level drops below 3 foot candles, photocell 6390-FAA2 supplies 120V AC to relay K5, which removes C103-109 from the discharge path leaving capacitor C102 in the circuit for nightmode operation.

The energy storage capacitor bank is connected to the flashtube through the interconnecting tower wiring.

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.

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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 printed circuit board #1. The timing circuit has its own power supply. This circuit converts the AC line 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 1.4 seconds to operate the flashtube during the daylight 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 is supplied by one (1) of transformer T1's secondary windings. The 300V 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 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.

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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 AC line voltage is turned off, relays close allowing the resistors to discharge the high voltage stored in the capacitor bank 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 VOLTMETER 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 and BSS isolation transformer T2, fuse F3, and relay K1 to PCB #1. Once this voltage is at PCB #1, it is sent to a step down transformer and is rectified then sent to LED4 (D15). If for any reason power is interrupted, (beacon opened, controller door open, blown F3 fuse, failed relay, etc.) LED4 would be extinguished.

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3.7.2 High Voltage

The Cathode side of the high voltage HV is routed through current limiting resistor. When the unit is in daymode, D14 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 LED fails to glow, then high voltage is no longer present.

3.7.3 Trigger Voltage

The trigger voltage from fuse F2 (CT1A) is sent to current limiting resistor R30 and LED6 (D20). 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 RLY1. Whenever the photocell senses darkness or switch SW3 is on, relay RLY1 will energize thereby sending 12V to the timing circuit as well as to LED7, letting LED7 (D7) glow a constant red.

3.7.5 Primary Timing

The primary timing pulses are received at LED8 (D3). 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 for secondary timing operation. The strobe unit should produce 40 (+/-2) pulses per minute.

3.7.6 Timing Signal Verify

Timing pulses (either primary or secondary) are received at LED9 (D28). The LED will flash according to the pulses received from the timing circuit, but should be 40 +/-2 FPM. In the unlikely event that this LED is out, then total timing failure has occurred.

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3.7.7 Flash Verified

Current from the Cathode side of the flashtube (FTC) is sent through the current sensing transformer T1 on PCB #1. T1 will send a pulse to the gate of the SCR's Q2 and turns it on. Capacitor C11 via Q2 will send voltage to LED5 (D8). After each confirmed flash, LED 5 will blink. Absence of a blinking LED signifies that strobe beacon has ceased to flash.

3.7.8 Strobe Fail Test

Switch S1, when turned on, cuts off the timing signal to the trigger circuit and illuminates LED2 (D25). At this time a strobe alarm should be received at J2. The normal position of S1 is off (switch upward).

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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 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 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.

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 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 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.

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LEDs on PCB #1 are numbered from top to bottom 1-9. LEDs on PCB #2 are numbered from top to bottom D14 - D16. The following chart will indicate normal LED operation.

INDICATOR	OPERATION	NORMAL STATUS
LED 1	Flash Verify 2	N/A
LED 2	Strobe Fail Test	Normal OFF/Flashes in Test Mode
LED 3	Flash Verify 1	Blinks
LED 4	Control Power ON	Steady ON
LED 5	Flash Verify 3	N/A
LED 6	Trigger Voltage	Steady ON
LED 7	Nightmode	Steady ON During Nightmode Operation
LED 8	Primary Timing	Flashing
LED 9	Timing Verify	Flashing
D11	High Voltage #1	Steady ON when Voltage Above 50V DC
D12	High Voltage #2	N/A
D13	High Voltage #3	N/A

4.3 TROUBLESHOOTING ASSISTANCE

4.3.1 Flash Verify LED - Out

- 4.3.1.1 Observe high voltage LED on the same beacon circuit to determine if it is available. If the LED is dim or out completely, then check high voltage capacitor bank for a short. If no capacitor is found to be shorted, check the resonant cap for a short. If the resonant cap 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 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. Replace if bad.

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4.3.3 Primary Timing LED Out

Observe the status of the timing LED. If the LED is dim or out completely, check LED9, if dim or out, replace PCB #1. If one 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 turning “on” switch S1 (on the circuit board #1). When this switch is in the alarm test mode, the test mode indicator (LED2) will be illuminated or blinking slightly.

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*****WARNING - HIGH - VOLTAGE*****

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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 single quick open bolt located on the hinge assembly so that it can recline.

5.1.2 Open the lens and tilt it backward.

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 pins are aligned with the socket. Make sure tube is flush on socket.

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 single quick open bolt 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.

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6.0 MAJOR COMPONENTS PARTS LIST

SCHEMATIC TAG #	DESCRIPTION	TWR PART #
BSS1	BEACON SAFETY SWITCH	STJ02003
C103 - C109	40uf 1KV CAP	STB99006
C102	3uf 660V AC CAP	STB99008CSI
C101	3uf 660V AC CAP	STB99008CSI
CSS	CABINET SAFETY SWITCH	STJ02001
F1	10 amp FUSE	KTK10
F2	1/8 amp FUSE	FLQ 1/8
F3	.5 amp FUSE	FUSE .5
FT	FLASHTUBE	STFLSHTB5
K5, K1, K4	DPDT OCTAL RELAY	KRPA11AG120V
K6	SPDT OCTAL RELAY	KRPA5AG120V
K2	HV BLEEDER RELAY	STJ10006
L1	INDUCTOR	INDCTR3001
L11	BURSTING CHOKE	100273
MOV1, MOV2	METAL OXIDE VARISTOR	MOV524V15
MOV3	METAL OXIDE VARISTOR	V1000LA80A
P1	15 POSITION PLUG	STT60021
PCB #1	D-1LVS CONTROL PCB	STH01226B
PCB #2	HIGH VOLTAGE RECTIFIER PCB	STH02226A
PCB #3	RELAY PCB	STH03226
PHOTOCELL	120 – 240V AC PHOTOCELL	6390-FAA2 (This replaces the P2455L Photocell)
R31	150 ohm 100W	STA08018
R32	35K 20W	STA08015
R33	2.4 MEG 2W	STA08010
SW3	SPDT 15 amp SWITCH	STJ01004

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6.0 MAJOR COMPONENTS PARTS LIST (continued)

SCHEMATIC TAG #	DESCRIPTION	TWR PART #
T2	ISOLATION TRANSFORMER	STC05004
T1	FERRORESONANT TRANSFORMER	STC30018
T4	TRIGGER TRANSFORMER	STC05005
TB1	10 PART TERM BLK	TERMBLK - 10
TB2	12 PART TERM BLK	TERMBLK 141 - 12
TLS	THERMAL LIMITING SWITCH	STJ10008
	STROBE BEACON	STBEACON7
	STROBE BEACON LENS	STDBCLENS
	BEACON GASKET	STBEAGSK2
	STBEACON7 TERMINAL BLOCK	TERMBLK7KIT
	6 CONDUCTOR MULTI-GAUGE CABLE	STROBCABLE-2
	STROBE CABLE TIE	STCABLTIE
	SINGLE EYE LACE MESH .50 - .62	CABLEGRIP1

D-1LVS CONTROLLER

7.0 RECOMMENDED SPARE PARTS LIST

QTY	PART NUMBER	DESCRIPTION
1	STH01226B	D-1LVS PRINTED CIRCUIT BOARD
1	STJ10006	DPDT CONTACTOR RELAY
1	STFLSHTB5	STROBE FLASHTUBE
1	6390-FAA2 (This replaces the P2455L Photocell)	120 – 240V AC PHOTOCCELL
2	KTK10	10 amp FUSE
2	FLQ18	1/8 amp FUSE
2	FUSE .5	1/2 amp FUSE
1	KRPA5AG120V	SPDT RELAY
2	KRPA11AG120V	DPDT RELAY

TWR Lighting, Inc. **HARK**

Enlightened Technology®

D-1LVS CONTROLLER

Warranty & Return Policy

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:

- x Improper Installation or Operation
- x Misuse
- x Abuse
- x Unauthorized or Improper Repair or Alteration
- x Accident or Negligence in Use, Storage, Transportation, or Handling
- x Any Acts of God or Nature
- x **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.

TWR Lighting, Inc. HARK[®]

Enlightened Technology[®]

D-1LVS CONTROLLER

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:

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

TWR Lighting, Inc. **HARK**[®]

Enlightened Technology[®]

D-1LVS CONTROLLER

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.

- x Product(s) that is deemed defective and/or unrepairable and covered under warranty - a credit will be issued to the customer's account.
- x 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.
- x 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.

TWR Lighting, Inc. **MARK**[®]

Enlightened Technology[®]

D-1LVS CONTROLLER

Warranty & Return Policy (continued)

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.



Enlightened Technology®

D-1LVS CONTROLLER

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



Enlightened Technology®

D-1LVS CONTROLLER

RETURN MERCHANDISE AUTHORIZATION (RMA) FORM

RMA#: _____ **DATE:** _____

CUSTOMER: _____

CONTACT: _____ **PHONE NO.:** _____

ITEM DESCRIPTION (PART NO.): _____

MODEL NO.: _____ **SERIAL NO.:** _____

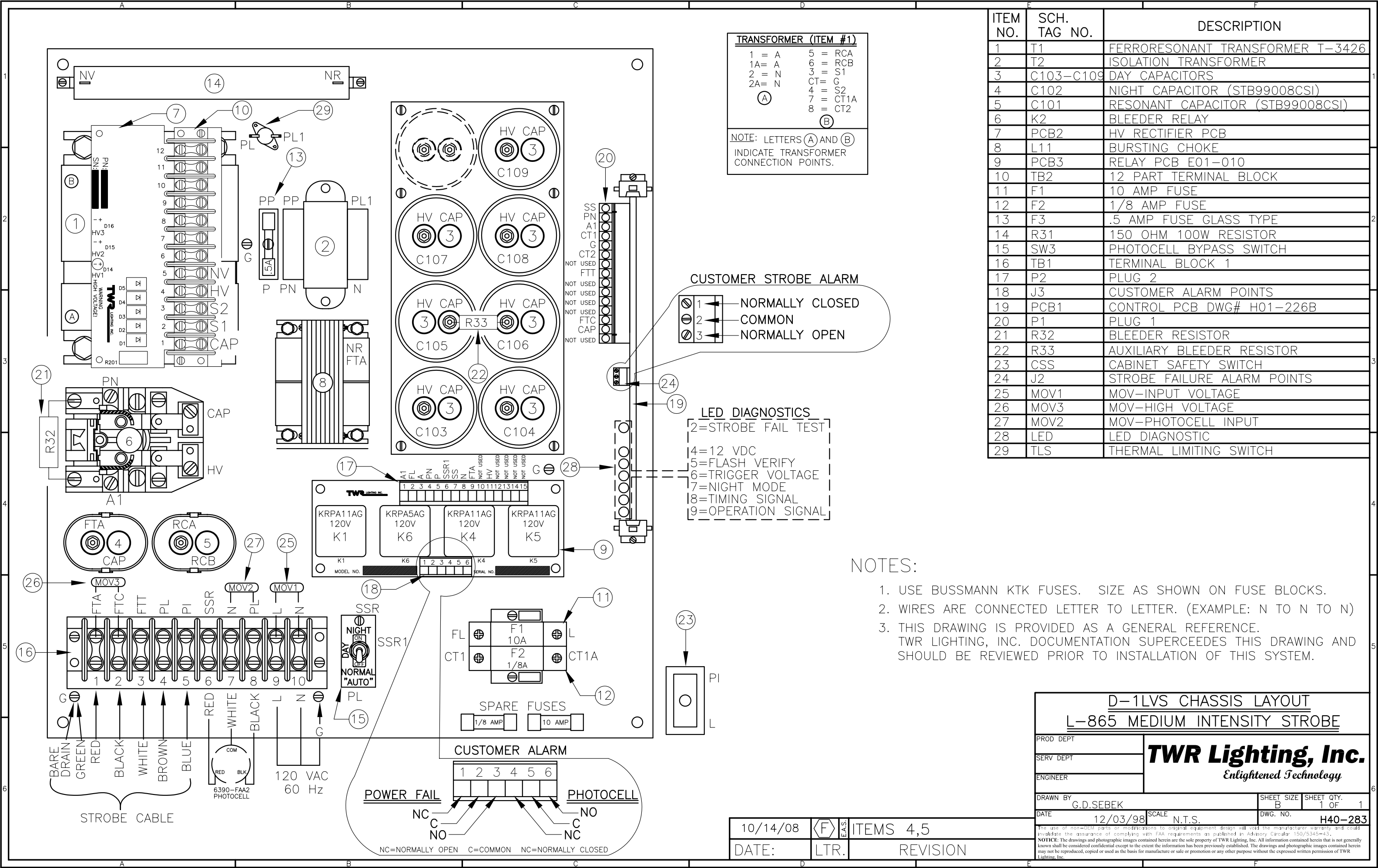
ORIGINAL TWR INVOICE NO.: _____ **DATED:** _____

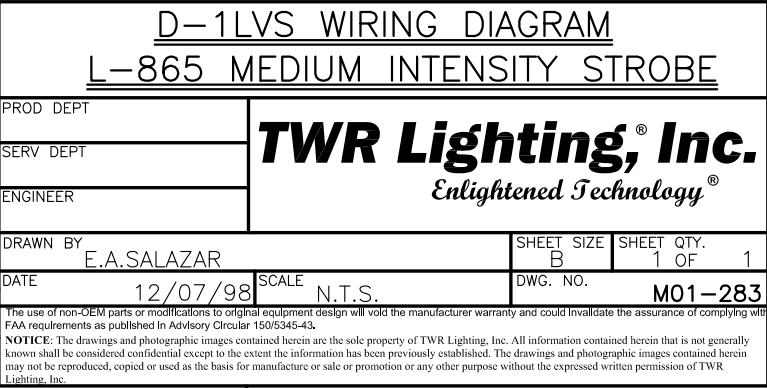
DESCRIPTION OF PROBLEM: _____

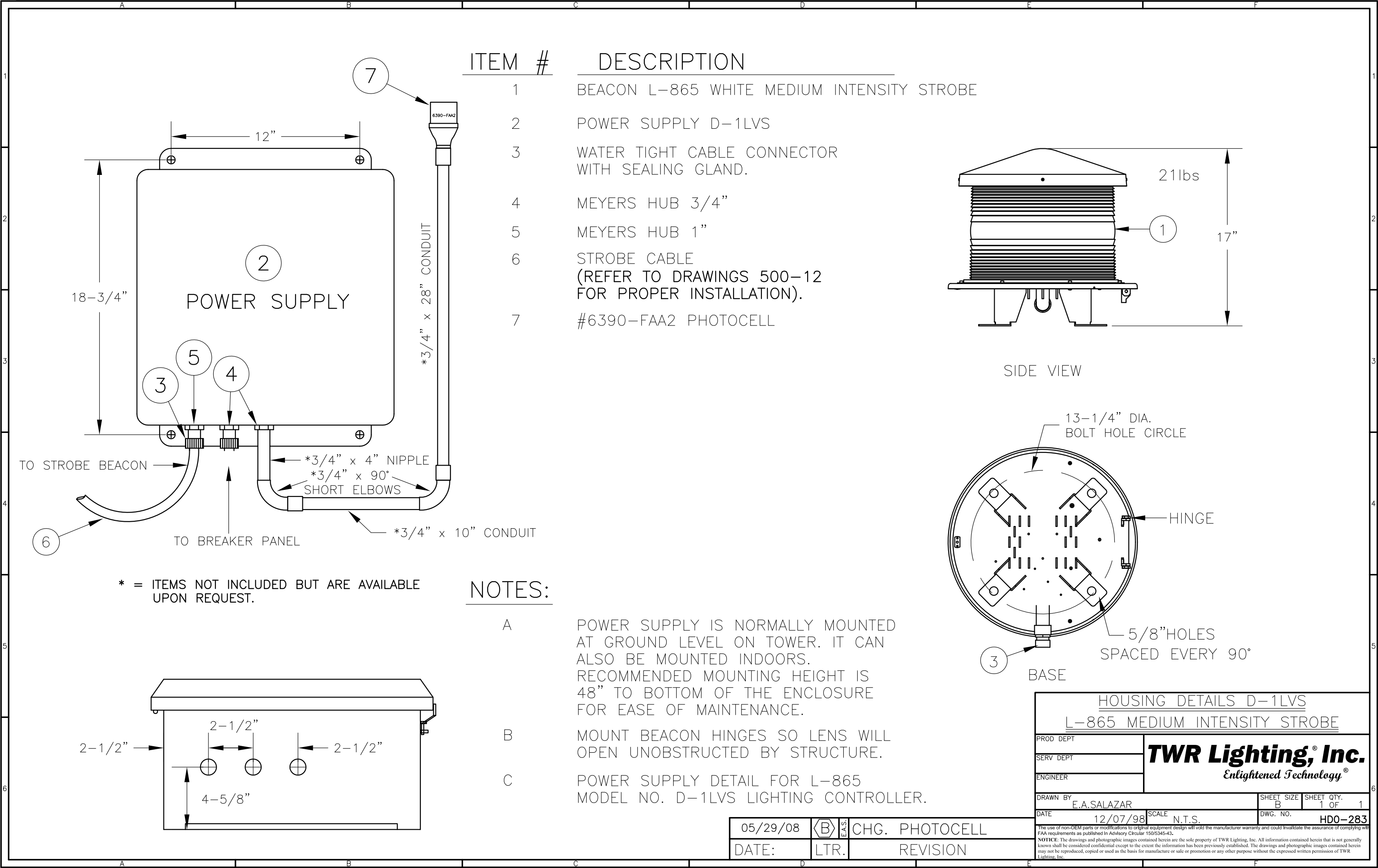
SIGNED: _____ **DATE NEEDED:** _____

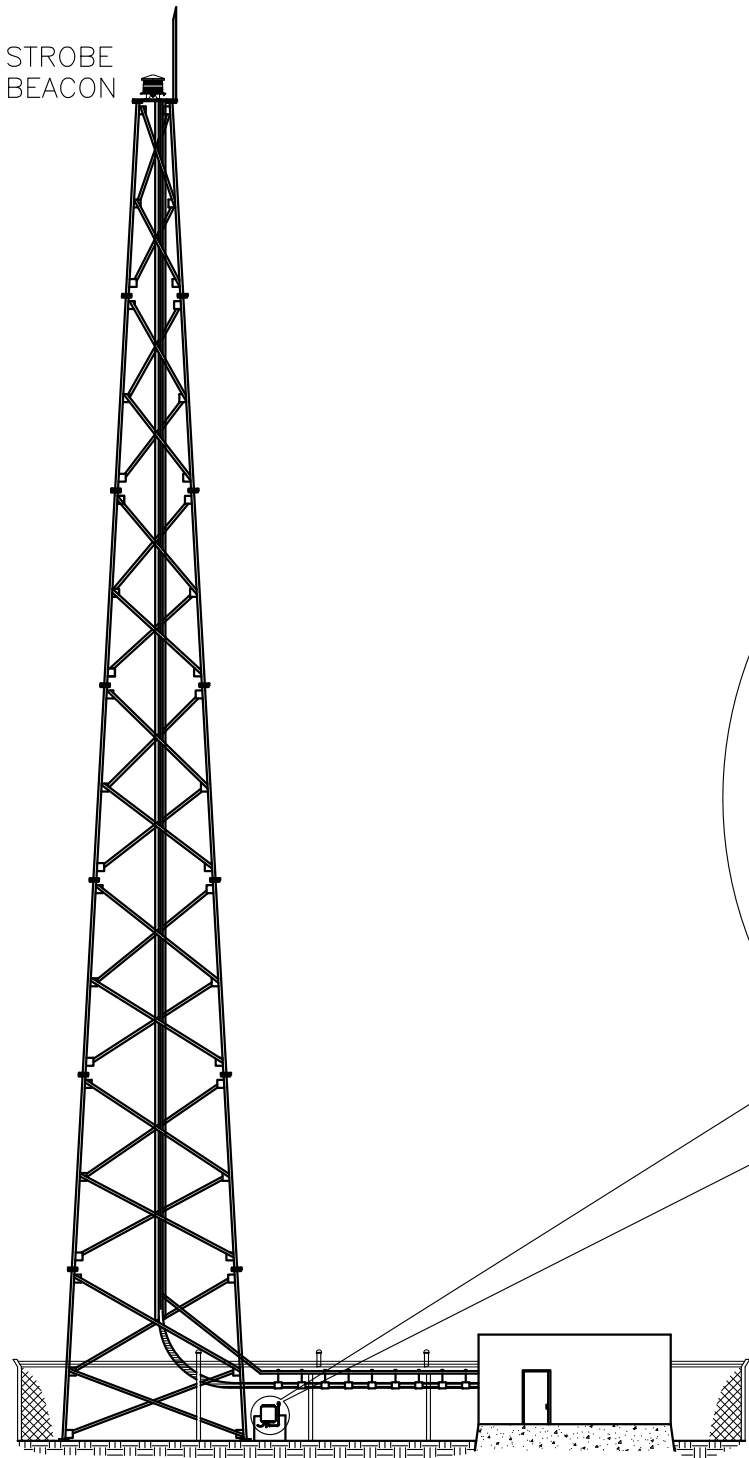
RETURN ADDRESS: _____

PLEASE RETURN PRODUCT TO: 10810 W. LITTLE YORK RD., #130 HOUSTON, TX 77041-4051



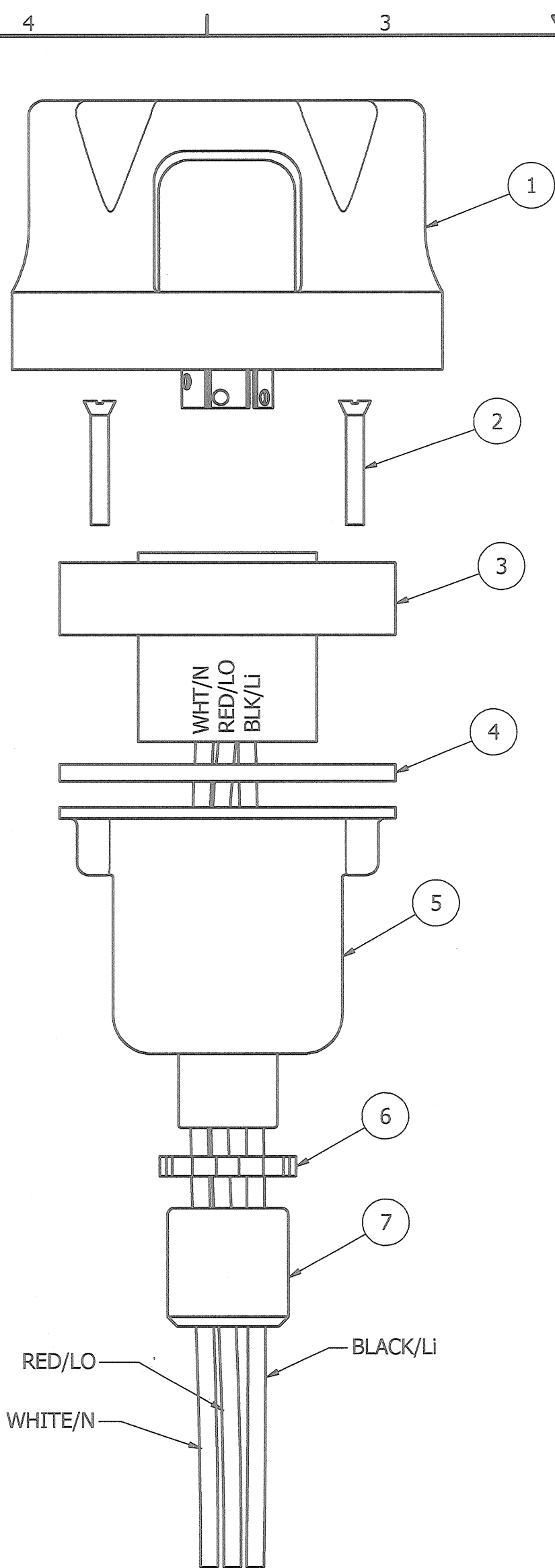






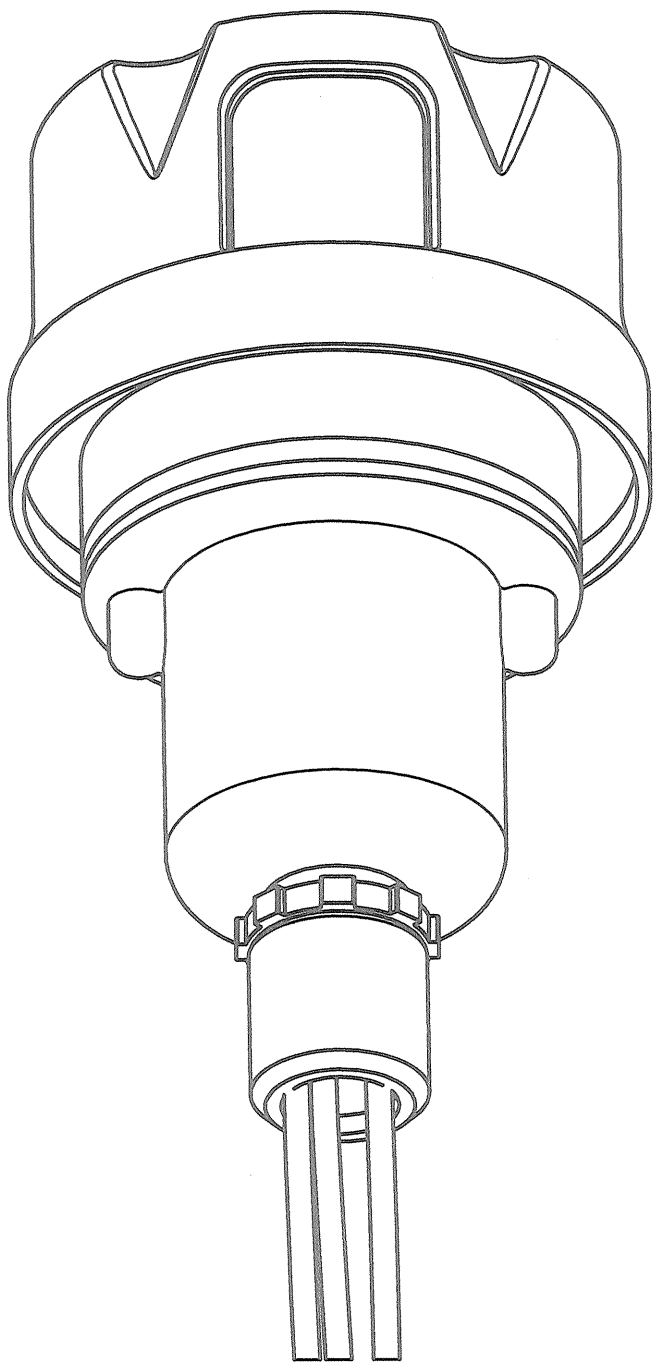
- NOTES:
1. THIS CONTROLLER CAN BE MOUNTED INDOOR OR OUTDOOR.
 2. IT IS HIGHLY RECOMMENDED TO MOUNT A LIGHTING ROD AT THE TOP LEVEL.

D-1LVS INSTALLATION GUIDELINE			
PROD. DEPT.	TWR Lighting, Inc. <i>Enlightened Technology®</i>		
SERV. DEPT.			
ENGINEER			
DRAWN BY	E.A.SALAZAR	SHEET SIZE	SHEET QTY.
DATE	10/07/98	B	1 OF 1
SCALE	N.T.S.	DWG. NO.	INS-283
<small>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.</small>			
<small>NOTICE: The drawings and photographic images contained herein are the sole property of TWR Lighting, Inc. All information contained herein that is not generally known shall be considered confidential except to the extent the information has been previously established. The drawings and photographic images contained herein may not be reproduced, copied or used as the basis for manufacture or sale or promotion or any other purpose without the expressed written permission of TWR Lighting, Inc.</small>			



EXPLODED VIEW

PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	PHOTOCELL
2	2	6-32 x 1" SCREW
3	1	RECEPTACLE SOCKET
4	1	RECEPTACLE GASKET
5	1	RECEPTACLE HOUSING
6	1	1/2" CONDUIT LOCKNUT
7	1	3/4" TO 1/2" REDUCER

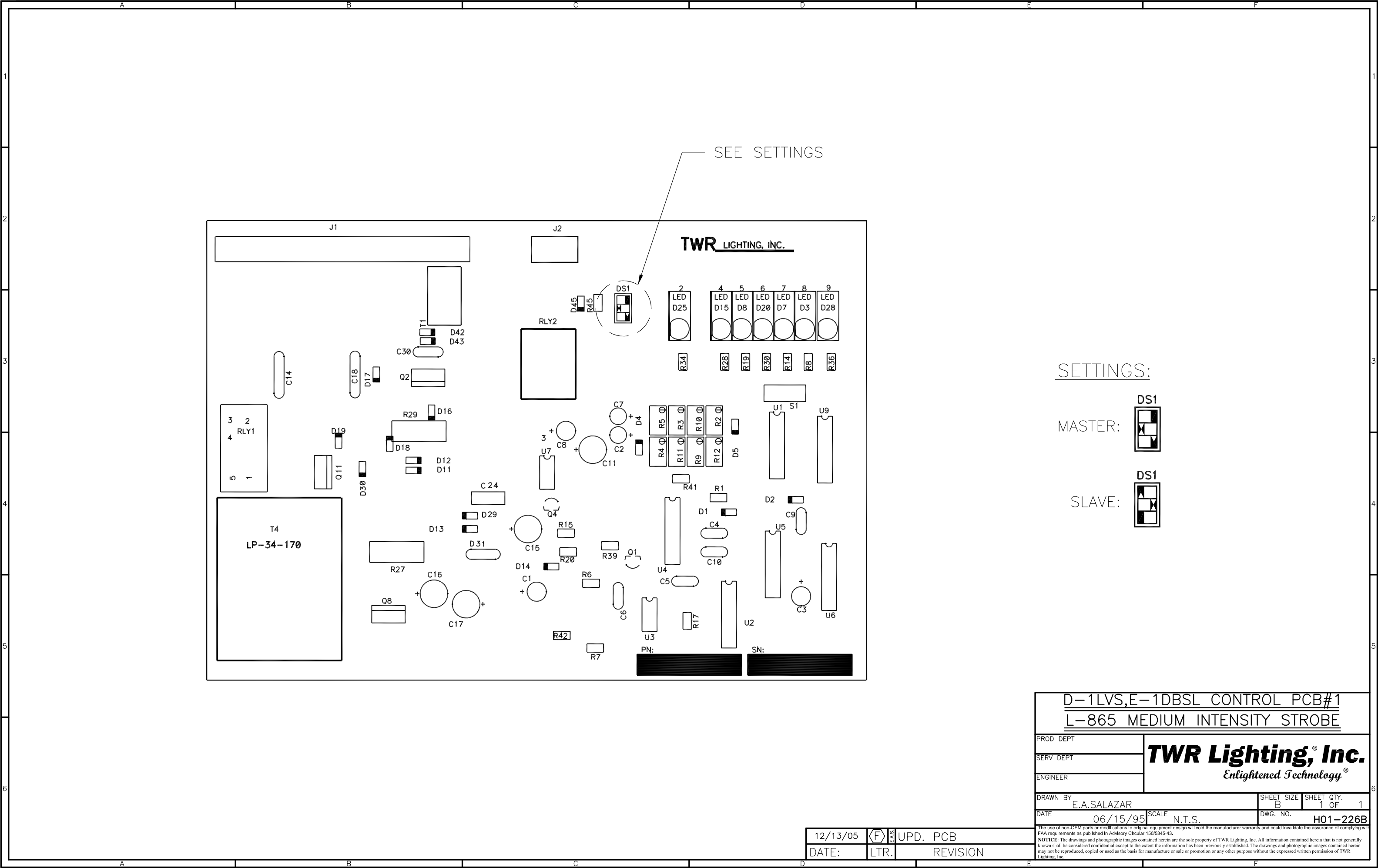


ASSEMBLY


- NOTES:
- ITEM #7 CAN BE USED TO REDUCE 3/4" CONDUIT TO 1/2" CONDUIT AT THE HOUSING OR AT THE CONTROLLER ITSELF.
 - 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


PHOTOCELL HOUSING DETAIL			
PROD. DEPT.		TWR Lighting, Inc. HARK <i>Enlightened Technology®</i>	
SERV. DEPT.			
ENGINEER			
DRAWN BY		vhernandez	
DATE		SCALE	
10/18/1995		1/1	
SHEET SIZE		SHEET QTY.	
B		1 OF 1	
DWG. NO.		100239i	
<small>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.</small>			
<small>NOTICE: The drawings and photographic images contained herein are the sole property of TWR Lighting, Inc. All information contained herein that is not generally known shall be considered confidential except to the extent the information has been previously established. The drawings and photographic images contained herein may not be reproduced, copied or used as the basis for manufacture or sale or promotion or any other purpose without the expressed written permission of TWR Lighting, Inc.</small>			

DATE	REV	AUTHOR	DESCRIPTION
02/03/2015	H	JZAMORANO	UPDATED NOTES




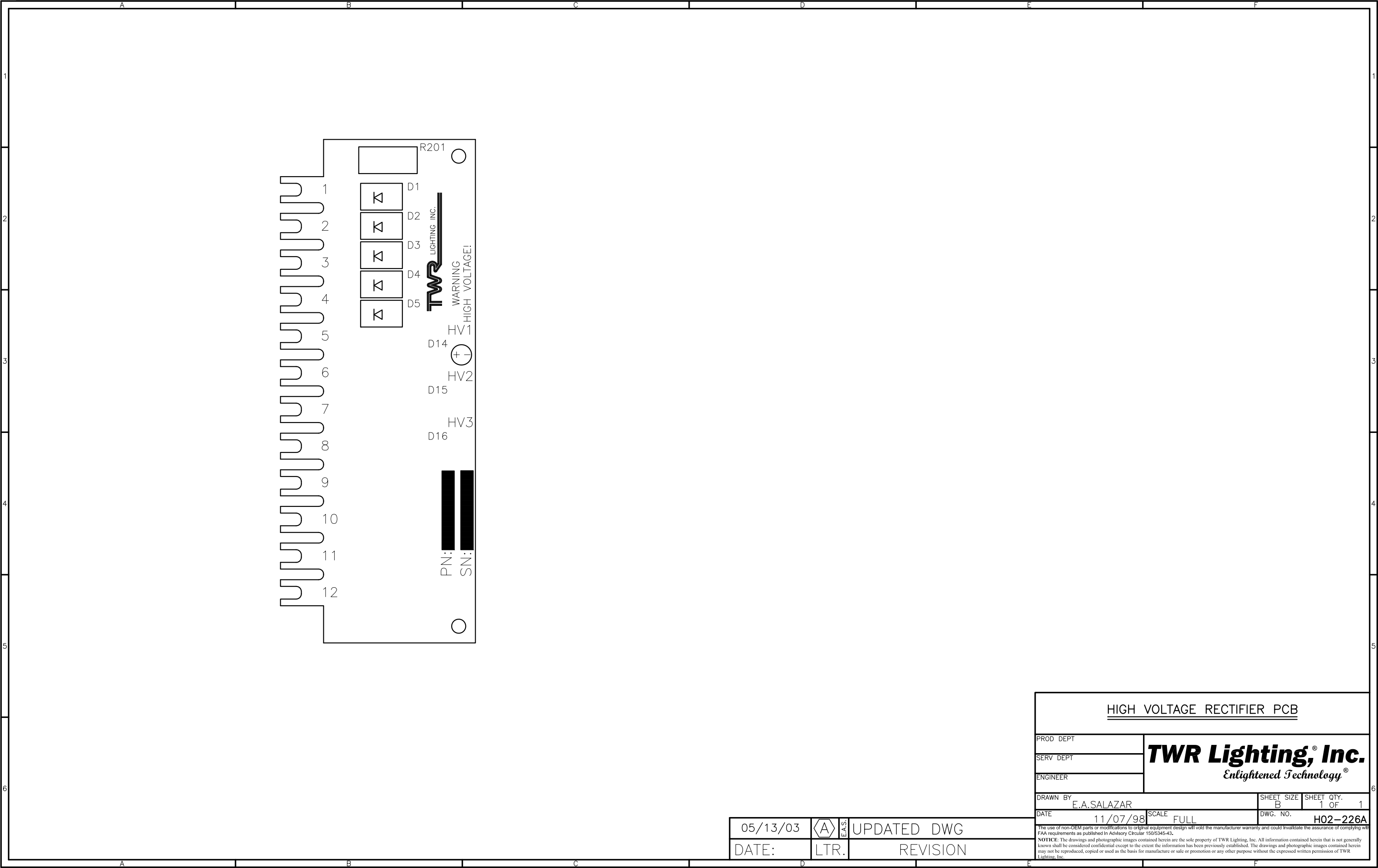
SETTINGS:

MASTER: 

SLAVE: 

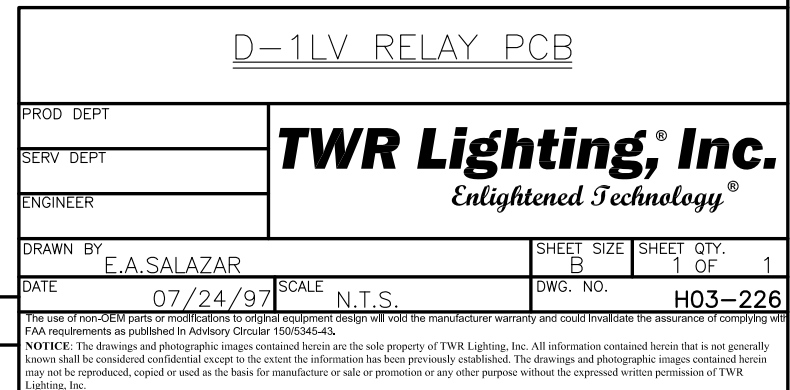
D-1LVS,E-1DBSL CONTROL PCB#1			
L-865 MEDIUM INTENSITY STROBE			
PROD DEPT		TWR Lighting, Inc. <i>Enlightened Technology®</i>	
SERV DEPT			
ENGINEER			
DRAWN BY E.A.SALAZAR		SHEET SIZE B	SHEET QTY. 1 OF 1
DATE 06/15/95		SCALE N.T.S.	DWG. NO. H01-226B
The use of non-OEM parts or modifications to original 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.			
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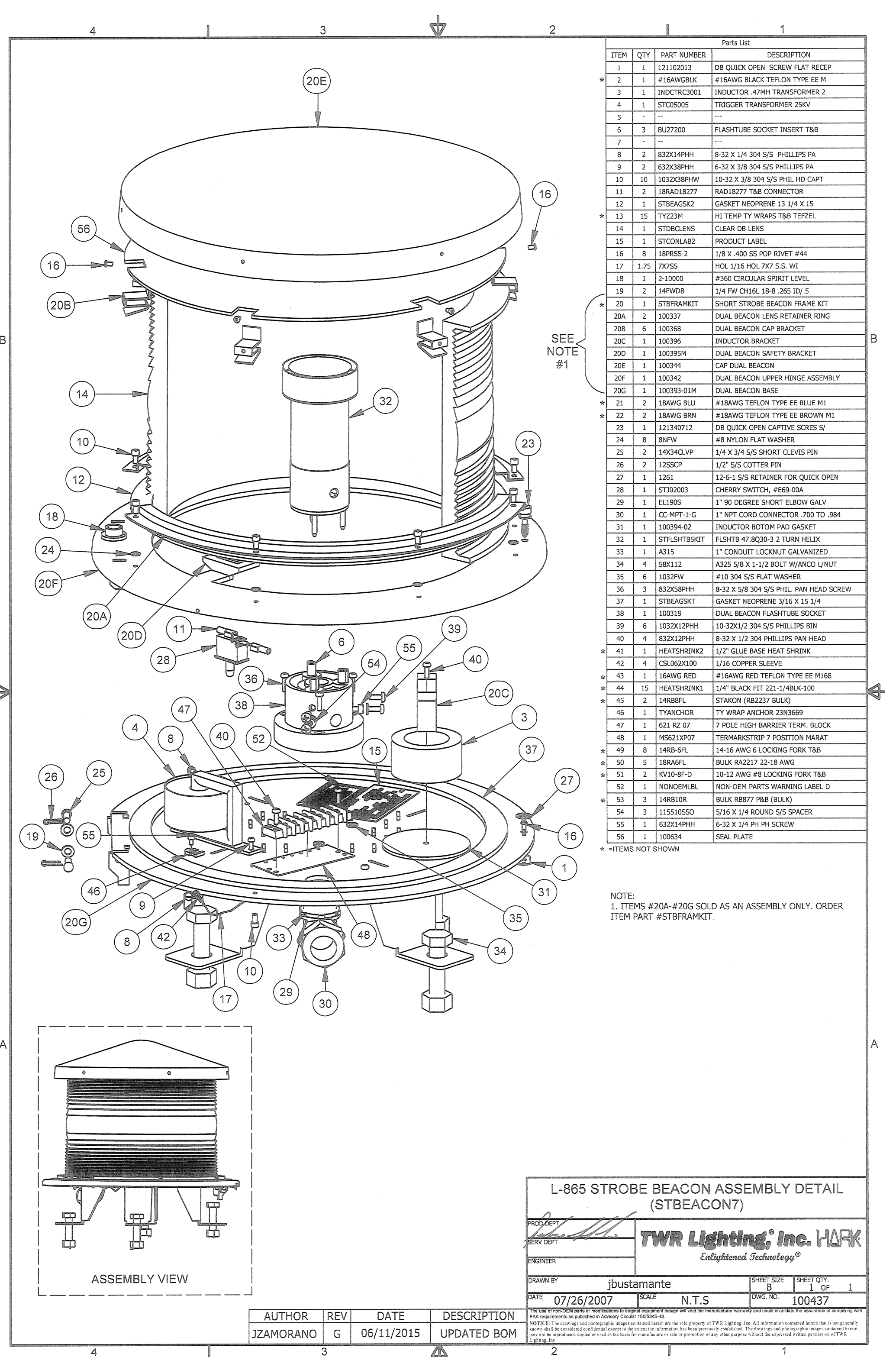
12/13/05		UPD. PCB
DATE:	LTR.	REVISION



HIGH VOLTAGE RECTIFIER PCB			
PROD DEPT		TWR Lighting, Inc. <i>Enlightened Technology®</i>	
SERV DEPT			
ENGINEER			
DRAWN BY E.A.SALAZAR		SHEET SIZE B	SHEET QTY. 1 OF 1
DATE 11/07/98		SCALE FULL	DWG. NO. H02-226A
<small>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.</small>			
<small>NOTICE: The drawings and photographic images contained herein are the sole property of TWR Lighting, Inc. All information contained herein that is not generally known shall be considered confidential except to the extent the information has been previously established. The drawings and photographic images contained herein may not be reproduced, copied or used as the basis for manufacture or sale or promotion or any other purpose without the expressed written permission of TWR Lighting, Inc.</small>			

05/13/03	<div>A</div>	UPDATED DWG
DATE:	LTR.	REVISION

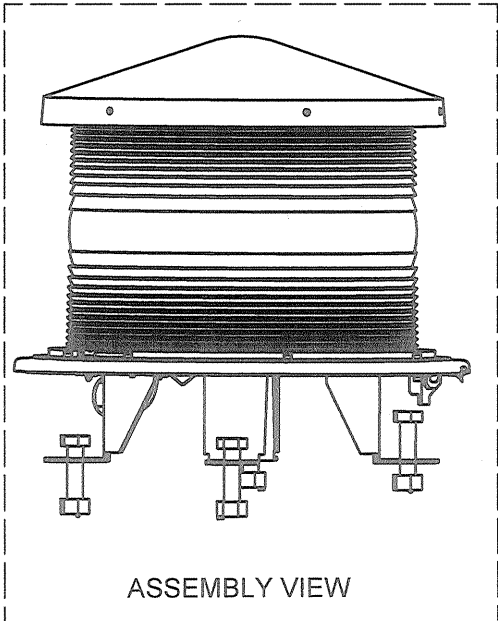




Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	121102013	DB QUICK OPEN SCREW FLAT RECEP
* 2	1	#16AWGBLK	#16AWG BLACK TEFLON TYPE EE M
3	1	INDCTRC3001	INDUCTOR .47MH TRANSFORMER 2
4	1	STC05005	TRIGGER TRANSFORMER 25KV
5	-	---	---
6	3	BU27200	FLASHTUBE SOCKET INSERT T&B
7	-	---	---
8	2	832X14PHH	8-32 X 1/4 304 S/S PHILLIPS PA
9	2	632X38PHH	6-32 X 3/8 304 S/S PHILLIPS PA
10	10	1032X38PHW	10-32 X 3/8 304 S/S PHIL HD CAPT
11	2	18RAD18277	RAD18277 T&B CONNECTOR
12	1	STBEAGSK2	GASKET NEOPRENE 13 1/4 X 15
* 13	15	TYZ23M	HI TEMP TY WRAPS T&B TEFZEL
14	1	STDBCLENS	CLEAR DB LENS
15	1	STCONLAB2	PRODUCT LABEL
16	8	18PRSS-2	1/8 X .400 SS POP RIVET #44
17	1.75	7X7SS	HOL 1/16 HOL 7X7 S.S. WI
18	1	2-10000	#360 CIRCULAR SPIRIT LEVEL
19	2	14FWDB	1/4 FW CH16L 18-8 .265 ID/.5
* 20	1	STBFRAMKIT	SHORT STROBE BEACON FRAME KIT
20A	2	100337	DUAL BEACON LENS RETAINER RING
20B	6	100368	DUAL BEACON CAP BRACKET
20C	1	100396	INDUCTOR BRACKET
20D	1	100395M	DUAL BEACON SAFETY BRACKET
20E	1	100344	CAP DUAL BEACON
20F	1	100342	DUAL BEACON UPPER HINGE ASSEMBLY
20G	1	100393-01M	DUAL BEACON BASE
* 21	2	18AWG BLU	#18AWG TEFLON TYPE EE BLUE M1
* 22	2	18AWG BRN	#18AWG TEFLON TYPE EE BROWN M1
23	1	121340712	DB QUICK OPEN CAPTIVE SCRES S/
24	8	8NFW	#8 NYLON FLAT WASHER
25	2	14X34CLVP	1/4 X 3/4 S/S SHORT CLEVIS PIN
26	2	12SSCP	1/2" S/S COTTER PIN
27	1	1261	12-6-1 S/S RETAINER FOR QUICK OPEN
28	1	STJ02003	CHERRY SWITCH, #E69-00A
29	1	EL190S	1" 90 DEGREE SHORT ELBOW GALV
30	1	CC-MPT-1-G	1" NPT CORD CONNECTOR .700 TO .984
31	1	100394-02	INDUCTOR BOTOM PAD GASKET
32	1	STFLSHTB5KIT	FLSHTB 47.8Q30-3 2 TURN HELIX
33	1	A315	1" CONDUIT LOCKNUT GALVANIZED
34	4	58X112	A325 5/8 X 1-1/2 BOLT W/ANCO L/NUT
35	6	1032FW	#10 304 S/S FLAT WASHER
36	3	832X58PHH	8-32 X 5/8 304 S/S PHIL. PAN HEAD SCREW
37	1	STBEAGSKT	GASKET NEOPRENE 3/16 X 15 1/4
38	1	100319	DUAL BEACON FLASHTUBE SOCKET
39	6	1032X12PHH	10-32X1/2 304 S/S PHILLIPS BIN
40	4	832X12PHH	8-32 X 1/2 304 PHILLIPS PAN HEAD
* 41	1	HEATSHRINK2	1/2" GLUE BASE HEAT SHRINK
42	4	CSL062X100	1/16 COPPER SLEEVE
* 43	1	16AWG RED	#16AWG RED TEFLON TYPE EE M168
* 44	15	HEATSHRINK1	1/4" BLACK FIT 221-1/4BLK-100
* 45	2	14RB8FL	STAKON (RB2237 BULK)
46	1	TYANCHOR	TY WRAP ANCHOR 23N3669
47	1	621 RZ 07	7 POLE HIGH BARRIER TERM. BLOCK
48	1	MS621XP07	TERMARKSTRIP 7 POSITION MARAT
* 49	8	14RB-6FL	14-16 AWG 6 LOCKING FORK T&B
* 50	5	18RA6FL	BULK RA2217 22-18 AWG
* 51	2	KV10-8F-D	10-12 AWG #8 LOCKING FORK T&B
52	1	NONOEMLBL	NON-OEM PARTS WARNING LABEL D
* 53	3	14RB10R	BULK RB877 P&B (BULK)
54	3	115510SSO	5/16 X 1/4 ROUND S/S SPACER
55	1	632X14PHH	6-32 X 1/4 PH PH SCREW
56	1	100634	SEAL PLATE

* =ITEMS NOT SHOWN

NOTE:
1. ITEMS #20A-#20G SOLD AS AN ASSEMBLY ONLY. ORDER ITEM PART #STBFRAMKIT.



AUTHOR	REV	DATE	DESCRIPTION
JZAMORANO	G	06/11/2015	UPDATED BOM

L-865 STROBE BEACON ASSEMBLY DETAIL (STBEACON7)			
PROD. DEPT.	TWR Lighting, Inc. HARK <i>Enlightened Technology®</i>		
SERV. DEPT.			
ENGINEER			
DRAWN BY	jbustamante		SHEET SIZE B
DATE	07/26/2007	SCALE	N.T.S.
			SHEET QTY. 1 OF 1
			DWG. NO. 100437
<small>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.</small>			
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