TWR Lighting, Inc.

4300 WINDFERN RD., SUITE 100 HOUSTON, TX 77041-8943
VOICE: (713) 973-6905 FAX: (713) 973-9352
WEB: twrlighting.com

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-2/3LVS

SERIAL # _____

PURCHASE DATE _____

PURCHASED FROM _____

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L-865 MEDIUM INTENSITY STROBE
MODEL D-2/3LVS

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L-865 MEDIUM INTENSITY STROBE
MODEL D-2/3LVS

1.0 INTRODUCTION

TWR Lighting Division Model D-2/3LVS Type L-865 Controller has been designed and built to the Federal Aviation 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 products and we look forward to servicing your needs now, and in the future.

1.1 APPLICATION

The D-2/3LVS Controller is for use on lighting structures or towers that are approved to be lighted with Medium Intensity Strobes in accordance with the Federal Aviation Administration's (FAA) Advisory Circular 70/7460-1K. Structures from 351' to 700' 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	29.52" x 19.68" x 11.81" / 107.0 lbs
Mounting Dim (HxW)	31.10" x 18.11"
Beacon Height / Weight	17" / 21 lbs
Cable Diameter / Weight Per 100 ft.	.625" +/- 10% / 24 lbs
Electrical Voltage:	120V AC +/- 10% 60 Hz
Intensity:	
Daymode	20,000 +/- 25% Effective Candelas
Nightmode	2,000 +/- 25% Effective Candelas
Beamspread:	
Horizontal	360°
Vertical	3° min
Flash Rate:	
Daymode	40 fpm +/- 2 fpm
Nightmode	40 fpm +/- 2 fpm
Wattage:	
Daymode	250 Watts
Nightmode	110 Watts
Temperature:	+55°C / -55°C

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 drawings HDO-285 and INS-285 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 and 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 HD0-285, H40-285, and 100239)

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 “COM”, the black wire is connected to the socket terminal marked “B”, and the red wire is connected to the socket terminal marked “R”. These socket connections are made by using .25" quick connect terminals, which must be crimped to the wires. As above, 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 1/2" 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 night mode. The photocell housing socket wiring is the same as above.

2.3.1 Connect the BLACK wire from the photocell to TB3-1.

2.3.2 Connect the RED wire from the photocell to TB3-2.

2.3.3 Connect the WHITE wire from the photocell to TB3-3.

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

2.4 POWER WIRING

(Refer to Drawing H40-285)

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

2.4.1 A 20 amp circuit breaker is recommended at service panel.

2.4.2 Connect the “HOT” side of the 120V AC line to TB1-14.

2.4.3 Connect the “NEUTRAL” side of the 120V AC line to TB1-15.

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 wiring methods to wire the strobe beacons. Refer to Lighting Kit Drawing 500-14 for cable installations.

2.5.1 Beacon Mounting
(Refer to Drawings HDO-285 and INS-285)

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 23" clearance in back of the hinge (35" 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.

2.5.2 Lighting Kit Wiring

Install wiring between the controller to the beacon utilizing strobe cable method. **(TWR LIGHTING CANNOT WARRANTY SYSTEMS THAT EMPLOY SPLICING CABLE.)** Refer to drawings HDO-285 and 500-14 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 insure 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 proceed the manual if a conflict occurs.

2.6 ALARM WIRING

Individual 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. Alarm configurations are shown on Drawing H40-285.

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. Perform this for each strobe beacon.

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.

2.6.5 Controller Configuration (Refer to Drawing H01-258)

This unit is factory setup to be a master controller. If this unit is to be used in conjunction with an additional unit, change jumper at TP7-TP10 as drawing indicates.

2.6.5.1 Connect at least an 18/20-gauge wire from master unit D-2/3LVS PCB 1-15 (TS) to slave D-2/3LVS PCB1 P1-15 (TS) or D-1LVS PCB1 P1-15 (TS).

2.6.5.2 Connect at least an 18/20-gauge wire (ground) from one chassis to the other chassis.

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

2.6.5.4 Follow standard instructions provided in the manuals supplied with the controllers.

3.0 THEORY OF OPERATION

3.1 THE POWER SUPPLY

The AC line is sent to transformers T1 and T3 through fuses F1 and F4, and relay K1. In order for K1 to energize and complete the circuit to T1 and T3, the safety interlock switches CSS, BSS1, BSS2, and BSS3 must be closed. All BSS switches are located in the base of the beacons. In order for the system to operate, all the beacons and the power supply must be closed and secured.

Transformers T1 and T3 secondary outputs are both around 1,000V AC. These outputs are sent to the high voltage rectifier PCB (PCB #2) and converts the 1,000V AC of both transformers to around +500 VDC and -500V DC. In daymode and +700V DC and –550V DC in nightmode. This high voltage is then used to charge the three (3) energy storage capacitors C102, C110, and C118 through current limiting resistors R31, R33, and R35, steering diodes D5 and D6 for nightmode operation. Resistors R31, R33, and R35 are bypassed through relays K5, K7, and K9 for daymode operation.

Energy storage capacitor banks C103-109, C111-117, and C119-125 are used for the daymode operation, and are connected to the high voltage through the normally closed contacts of relay K5, K7, and K9. When the light level drops below 3-foot candles, the photocell supplies 120V AC to relays K5, K7, and K9, which removes C103-109, C111-117, and C119-125 from the discharge path leaving capacitors C102, C110, and C118 in the circuits for nightmode operation. The three (3) energy storage capacitor banks are connected to the flashtubes through the interconnecting tower wiring.

3.2 THE FLASHTUBE

The flashtubes FT1, FT2, and FT3 all have 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 inductors L1, L2, and L3. 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 transformers T4, T5, and T6), 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 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 of transformer T3 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 points can be accessed on J2, J3, and J4 on PCB #1.

3.5.2 Power Failure (PF)

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.

3.5.3 Photocell (PC)

The photocell 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 resistors R32, R34, and R36, each connected to the high voltage storage capacitors through relays K2 and K2A. When the AC line voltage is turned off, relays close allowing the resistors to discharge the high voltage stored in the three- (3) capacitor 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 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, BSS1, BSS2, and BSS3, isolation transformer T2, and fuse F3 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.

3.7.2 High Voltage

The Cathode side of the high voltage HV1, HV2, and HV3 are routed through current limiting resistors. 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 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.

3.7.7 Flash Verified

Current from the Cathode side of each flashtube (FTC1, FTC2, and FTC3) are sent through the current sensing transformers T1, T2, and T3 on PCB #1. T1, T2, and T3 will send a pulse to the gate of the SCR's Q2, Q3, and Q6, and turns them on. Capacitors C11, C12, and C13, via Q2, Q3, and Q6, will send voltage to LED5 (D8), LED3 (D10), and LED1 (D9). After each confirmed flash, each LED (1, 3, and 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 timing signal to the trigger circuit and illuminates LED2 (D25). At this time a strobe alarm should be received at J2, J3, and J4. The normal position of S1 is off (switch upward).

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 a 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.

*****W A R N I N G - H I G H - V O L T A G E*****

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.

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	Blinks
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	Blinks
LED 6	Trigger Voltage	Steady ON
LED 7	Nightmode	Steady ON During Nightmode Operation
LED 8	Primary Timing	Flashing
LED 9	Timing Verify	Flashing
D14	High Voltage #1	Steady ON when Voltage Above 50V DC
D15	High Voltage #2	Steady ON when Voltage Above 50V DC
D16	High Voltage #3	Steady ON when Voltage Above 50V DC

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, then re-lamp 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.

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 throwing "on" switch number 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.

5.0 MAINTENANCE GUIDE

*****W A R N I N G - H I G H - V O L T A G E*****

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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.

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 needed.

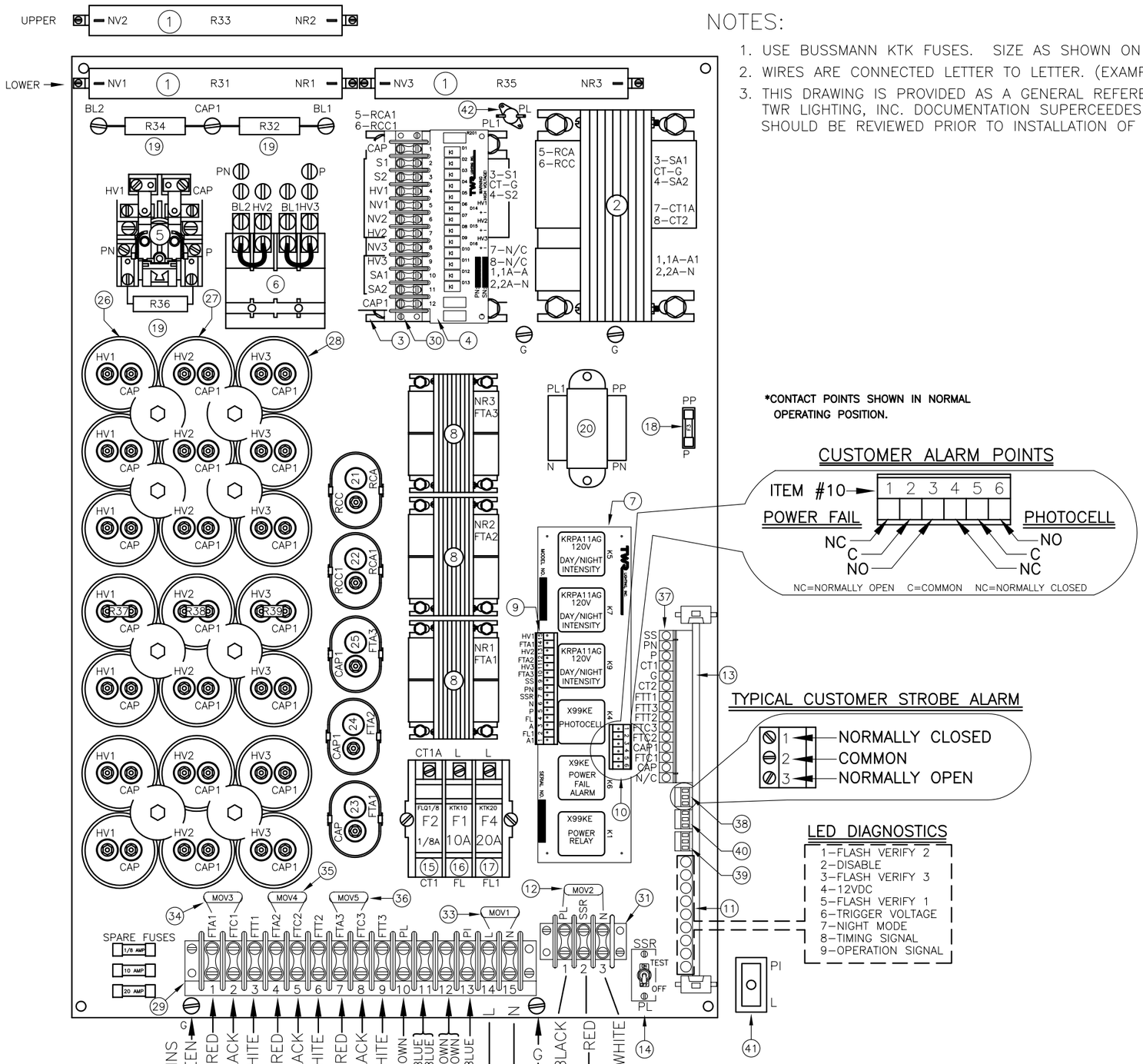
6.0 MAJOR COMPONENTS PARTS LIST

SCHEMATIC TAG #	DESCRIPTION	PART NUMBER
BSS1, BSS2, BSS3	BEACON SAFETY SWITCH	STJ02003
C103 - C109 C111 - C117 C119 - C125	40uF 1kv CAP	STB99006
C102, C110, C118	3uF 660V AC CAP	STB99008CSI
C101	4uF 660V AC CAP	STB99005
C126	3uF 660V AC CAP	STB99008
CSS1	CABINET SAFETY SWITCH	STJ02001
F1	10 amp FUSE	KTK10
F2	1/8 amp FUSE	FLQ18
F3	.5 amp FUSE	FUSE -.5
F4	20 amp	KTK20
FT1, FT2, FT3	FLASHTUBE	STFLSHTB5
K1, K4	DPDT OCTAL RELAY	X99KE
K6	SPDT OCTAL RELAY	X9KE
K2	HV BLEEDER RELAY	STJ10006
K2A	4PDT RELAY	PM17AY
K5, K7, K9	DPDT OCTAL RELAY	KRPA11AG-120V
L1, L2, L3	INDUCTOR	INDCTR3001
L11, L21, L31	BURSTING CHOKE	100273
MOV1, MOV2	METAL OXIDE VARISTOR	MOV524V15
MOV3, MOV4, MOV5	METAL OXIDE VARISTOR	V1000LA80A
P1	15 POSITION PLUG	STT60009
PCB #1	D-2/3LVS CONTROL PCB	STH01258B

SCHEMATIC TAG #	DESCRIPTION	PART NUMBER
PCB #2	HIGH VOLTAGE RECTIFIER PCB	STH02258A
PCB #3	RELAY PCB	STH03258
PHOTOCELL	120V AC PHOTOCELL	P2455L
R31, R33, R35	150 ohm100W	STA08018
R32, R34, R36	35K 20W	STA08015
R37, R38, R39	2.4 MEG 2W	STA08010
SW3	SPDT 10 amp SWITCH	STJ01002
T2	ISOLATION TRANSFORMER	STC05006
T1	FERRORESONANT TRANSFORMER	STC30018
T3	FERRORESONANT TRANSFORMER	STC30019
T4, T5, T6	TRIGGER TRANSFORMER	STC05005
TB1	15 PART TERM BLK	TERMBLK - 15
TB2	12 PART TERM BLK	TERMBLK 14 -12
TB3	3 PART TERM BLK	TERMBLK-3
TLS	210° THERMAL LIMITING SWITCH	STJ10008
	LVS STROBE BEACONS	STBEACON7

7.0 RECOMMENDED SPARE PARTS LIST

QUANTITY	PART NUMBER	DESCRIPTION
1	STH01258B	D-2/3LVS PRINTED CIRCUIT BOARD
1	STJ10006	DPDT CONTACTOR RELAY
3	STFLSHTB5	STROBE FLASHTUBE
1	P2455L	PHOTOCELL - 120V
2	KTK20	20 amp FUSE
2	KTK10	10 amp FUSE
2	FLQ18	1/8 amp FUSE
2	FUSE -.5	1/ 2 amp FUSE
1	X9KE	SPDT RELAY
1	X99KE	DPDT RELAY
1	KRPA11AG120V	DPDT 120V RELAY



NOTES:

1. USE BUSSMANN 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 SUPERCEEDES THIS DRAWING AND SHOULD BE REVIEWED PRIOR TO INSTALLATION OF THIS SYSTEM.

***CONTACT POINTS SHOWN IN NORMAL OPERATING POSITION.**

CUSTOMER ALARM POINTS

TYPICAL CUSTOMER STROBE ALARM

LED DIAGNOSTICS

1–FLASH VERIFY 2
2–DISABLE
3–FLASH VERIFY 3
4–12VDC
5–FLASH VERIFY 1
6–TRIGGER VOLTAGE
7–NIGHT MODE
8–TIMING SIGNAL
9–OPERATION SIGNAL

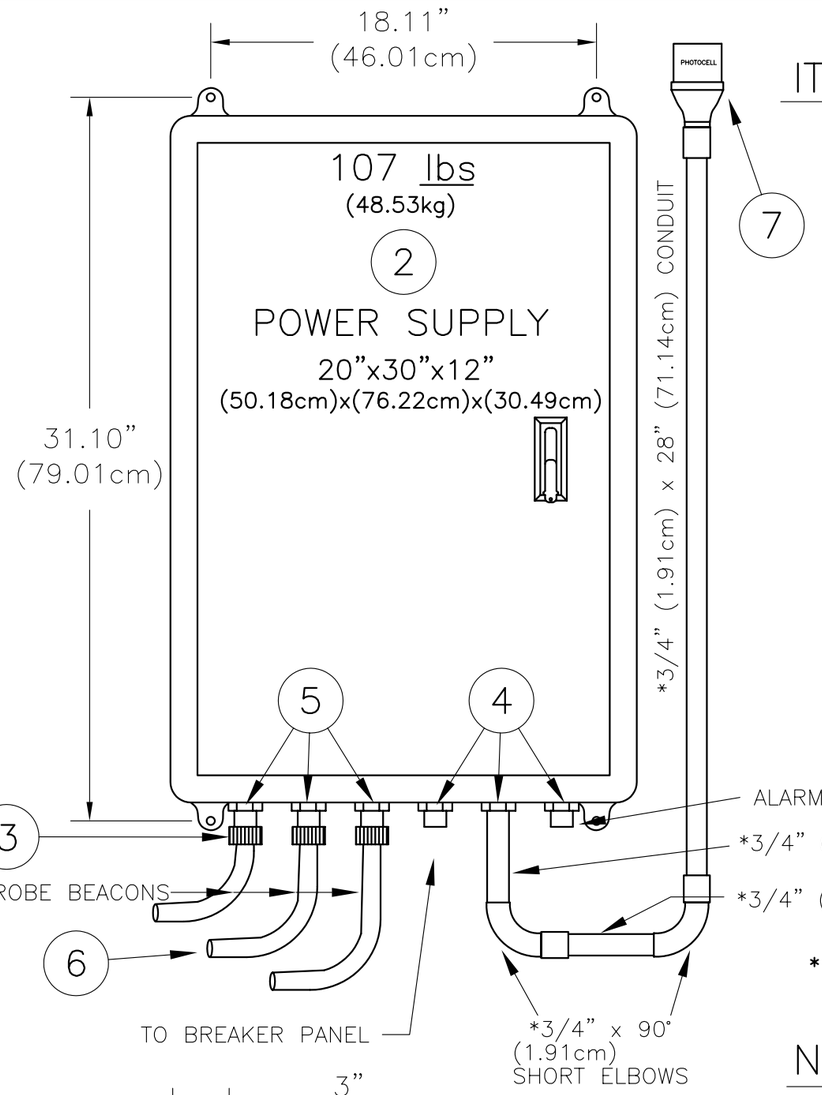
ITEM NO.	SCH. TAG NO.	DESCRIPTION
1	R31,R33,R35	150 OHM 100W RESISTOR
2	T3	FERRORESONANT TRANS. (T–3448)
3	T1	FERRORESONANT TRANS. (T–3426)
4	PCB2	HV RECTIFY PCB #STH02258
5	K2	BLEEDER RELAY #1
6	K2A	BLEEDER RELAY #2
7	PCB3	RELAY PCB #STH0325B
8	L11,L21,L31	BURSTING CHOKE
9	J2	PLUG #2
10	J1	CUSTOMER ALARM POINT
11	LED	DIAGNOSTIC LED
12	MOV105	MOV PHOTOCELL INPUT
13	PCB1	CONTROL & TIMING PCB #STH01–258B
14	SW3	PHOTOCELL BYPASS SWITCH
15	F2	1/8 AMP FUSE AND FUSE HOLDER
16	F1	10 AMP FUSE AND FUSE HOLDER
17	F4	20 AMP FUSE AND FUSE HOLDER
18	F3	.5 AMP FUSE AND FUSE HOLDER
19	R32,R34,R36	35K 20W BLEEDER RESISTORS
20	T2	ISOLATION TRANSFORMER
21	C101	RESONANT CAP. (1) 4uf @ 660VAC
22	C126	RESONANT CAPACITOR 2
23	C102	NIGHT MODE CAPACITOR 1
24	C110	NIGHT MODE CAPACITOR 2
25	C118	NIGHT MODE CAPACITOR 3
26	C103–109	DAY MODE CAPACITORS 1
27	C111–117	DAY MODE CAPACITORS 2
28	C119–125	DAY MODE CAPACITORS 3
29	TB1	15–POSITION TERMINAL BLOCK
30	TB2	12–POSITION TERMINAL BLOCK
31	TB3	PHOTOCELL TERMINAL BLOCK
32	R37,R38,R39	AUXILARY BLEEDER RESISTORS
33	MOV101	MOV–INPUT VOLTAGE
34	MOV102	BEACON 1 MOV
35	MOV103	BEACON 2 MOV
36	MOV104	BEACON 3 MOV
37	P1	PLUG
38	J4	STROBE #3 FAILURE ALARM
39	J3	STROBE #2 FAILURE ALARM
40	J2	STROBE #1 FAILURE ALARM
41	CSS	CABINET SAFETY SWITCH
42	TLS	THERMAL LIMITING SWITCH

D–2/3LVS 120V 60HZ CHASSIS LAYOUT
L–865 MEDIUM INTENSITY STROBE

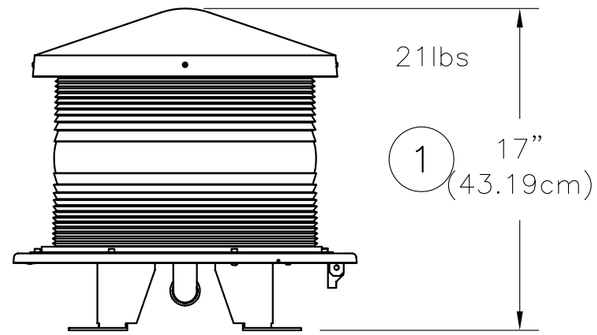
TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY
DRAWN BY: E.A.SALAZAR	SHEET SIZE: B	SHEET QTY.: 1 OF 1
DATE: 12/22/98	SCALE: N.T.S.	DRAWING NO.: H40–285

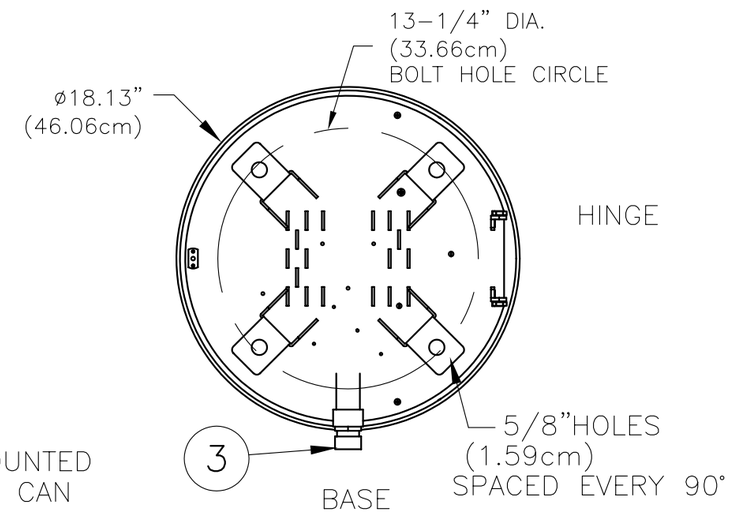
DATE:	LTR.	REVISION
03/01/1999	B	E.A.S. CHG. CONNECTIONS



ITEM #	DESCRIPTION
1	BEACON L-865 WHITE MEDIUM INTENSITY STROBE
2	POWER SUPPLY D-2/3LVS 120V 60HZ
3	WATER TIGHT CABLE CONNECTOR WITH SEALING GLAND.
4	MEYERS™ HUB 3/4" (1.91cm)
5	MEYERS™ HUB 1" (2.54cm)
6	STROBE CABLE. (REFER TO DRAWING 500-14 FOR PROPER INSTALLATION).
7	#P2455L PHOTOCELL

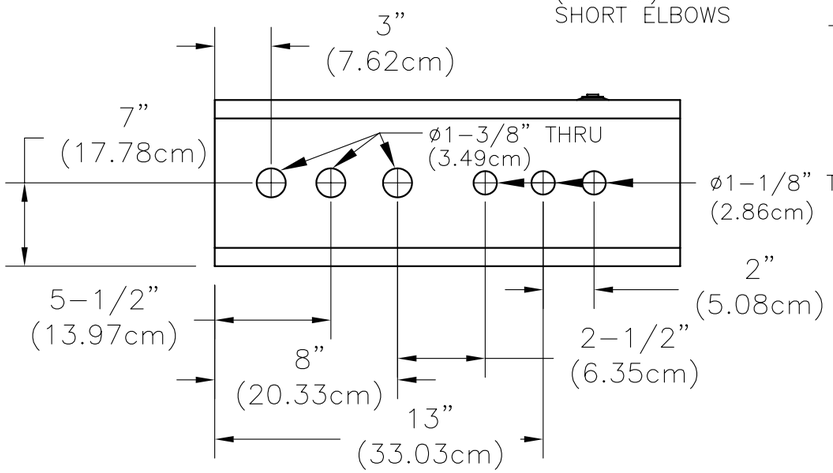


SIDE VIEW



BASE

* = ITEMS NOT INCLUDED BUT ARE AVAILABLE UPON REQUEST.



NOTES:

A. POWER SUPPLY IS NORMALLY MOUNTED AT GROUND LEVEL ON TOWER. IT CAN ALSO BE MOUNTED INDOORS. RECOMMENDED MOUNTING HEIGHT IS 42" TO BOTTOM OF THE ENCLOSURE FOR EASE OF MAINTENANCE.

B. MOUNT BEACON HINGES SO LENS WILL OPEN UNOBSTRUCTED BY STRUCTURE.

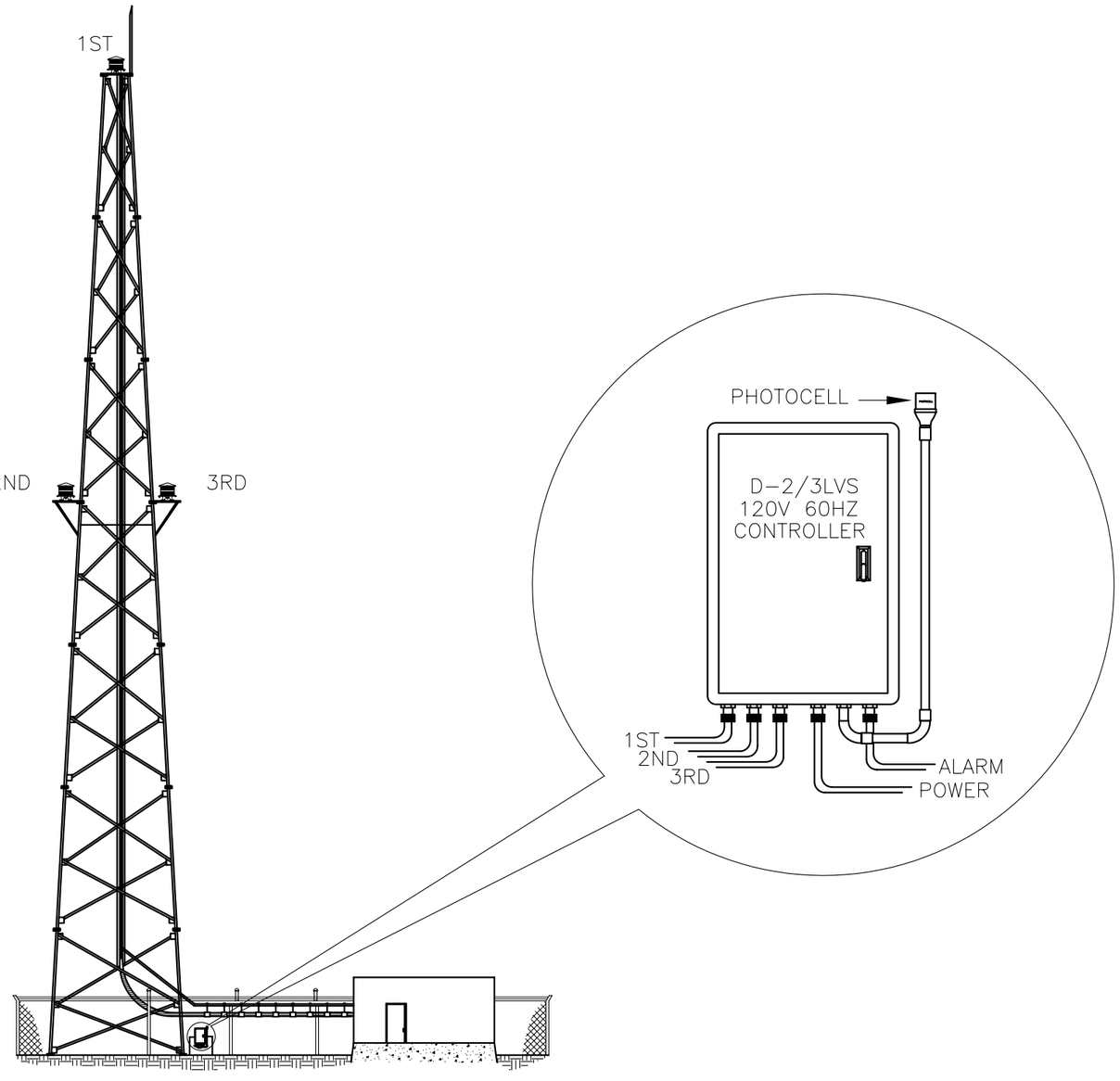
C. POWER SUPPLY DETAIL FOR L-865 MODEL NO. D-2/3LVS AND D-2/3LVS SLAVE LIGHTING CONTROLLER.

DATE:	LTR.	REVISION
04/10/03	B	MDF. NOTE #6

HOUSING DETAILS D-2/3LVS 120V
L-865 MEDIUM INTENSITY STROBE

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY	
DRAWN BY: E.A.SALAZAR		SHEET SIZE: B	SHEET QTY.: 1 OF 1
DATE: 12/22/98	SCALE: N.T.S.	DRAWING NO.: HD0-285	



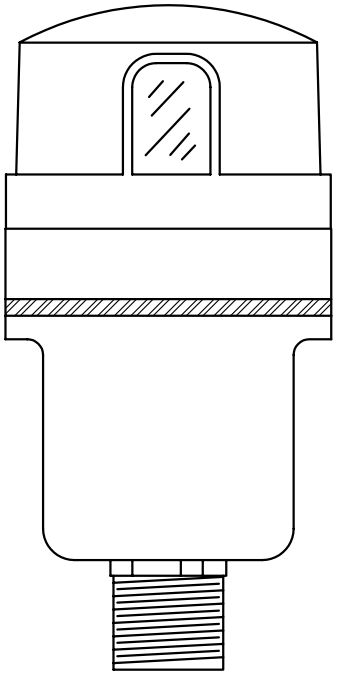
NOTES:

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

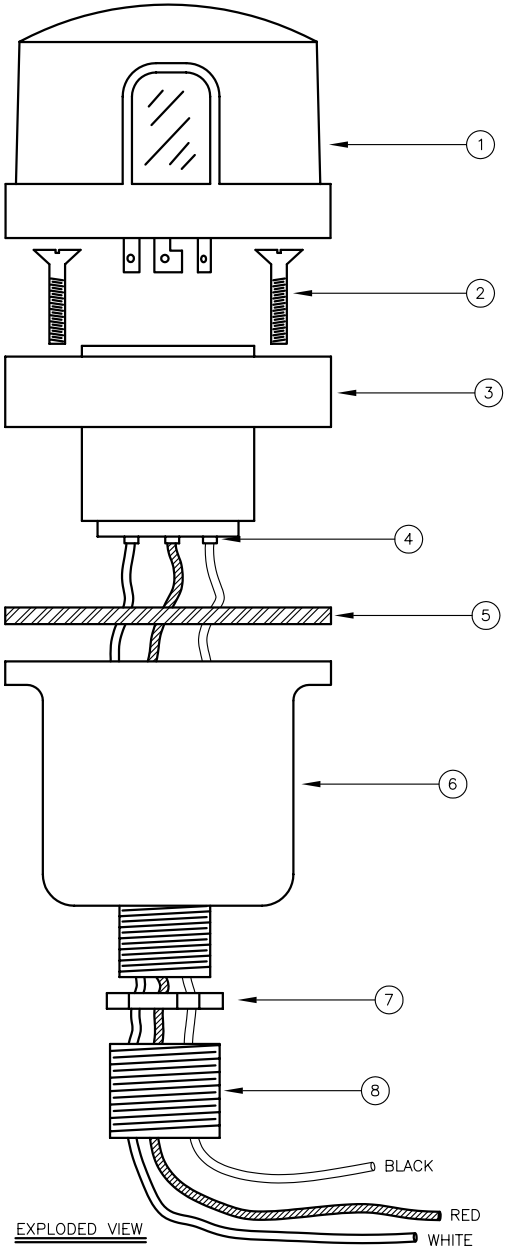
D-2/3LVS 120V 60HZ INSTALLATION GUIDELINE

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY	
DRAWN BY: E.A.SALAZAR		SHEET SIZE: B	SHEET QTY.: 1 OF 1
DATE: 12/22/98	SCALE: N.T.S.	DRAWING NO.: INS-285	



ASSEMBLY



EXPLODED VIEW

ITEM	QTY.	DESCRIPTION
1	1	PHOTOCELL
2	2	6–32 x 7/8" SCREW
3	1	RECEPTACLE SOCKET
4	3	.250 SPADE CONNECTOR
5	1	RECEPTACLE GASKET
6	1	RECEPTACLE HOUSING
7	1	1/2" CONDUIT LOCKNUT
8	1	3/4" TO 1/2" REDUCER

NOTES:

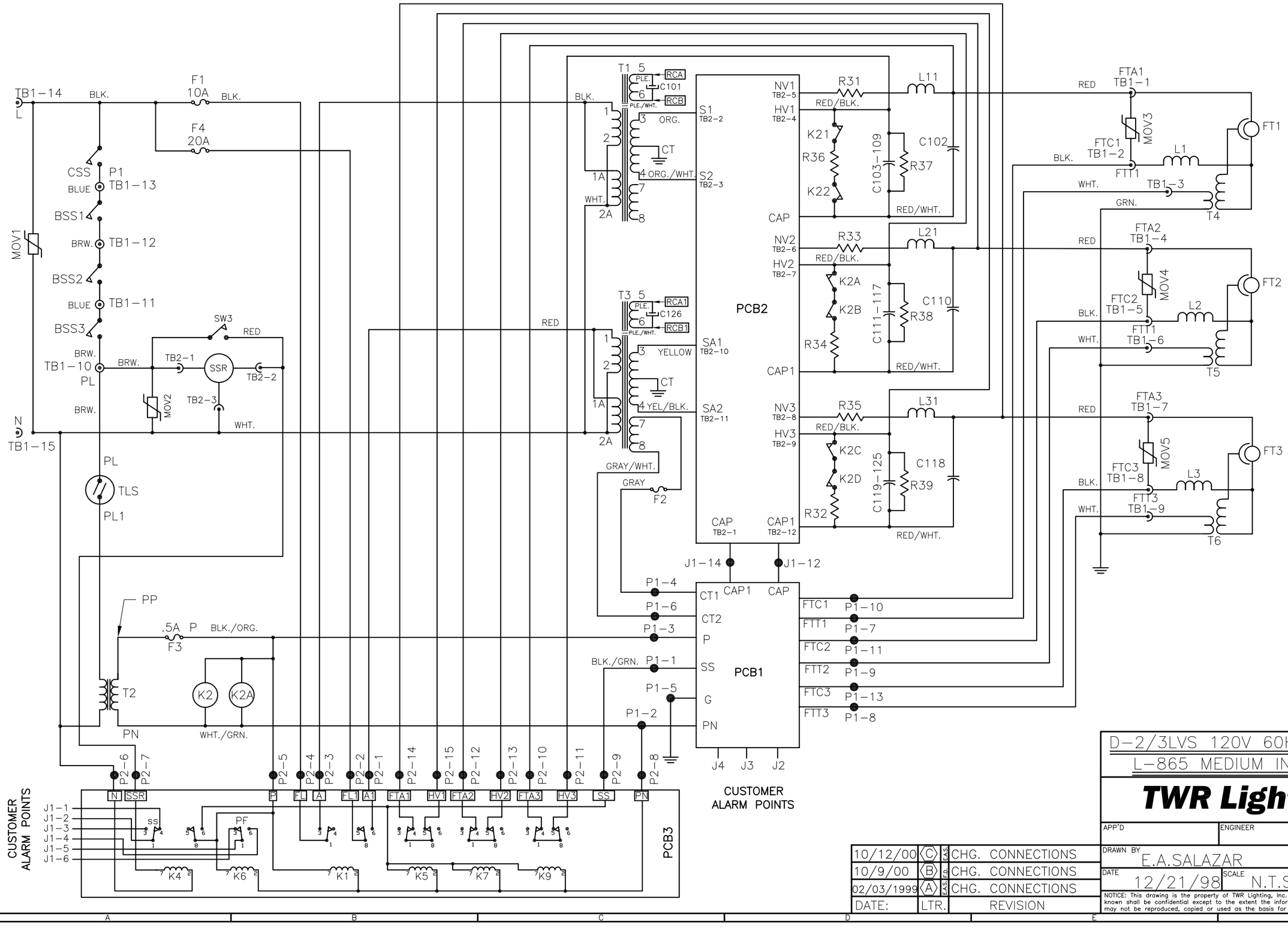
1. ITEM #8 CAN BE USED TO REDUCE 3/4" CONDUIT TO 1/2" CONDUIT AT THE HOUSING OR AT THE CONTROLLER ITSELF.
2. IF ADDITIONAL WIRE IS REQUIRED OVER THE FACTORY 20', USE THE FOLLOWING CHART.

   21' TO 300' – 16 AWG TFFN
   301' TO 500' – 14 AWG TFFN

PHOTOCELL HOUSING DETAIL

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY	
DRAWN BY E.A.SALAZAR		SHEET SIZE B	SHEET QTY. 1 OF 1
DATE 10/18/95	SCALE N.T.S.	DRAWING NO. 100239	



D–2/3LVS 120V 60HZ WIRING DIAGRAM

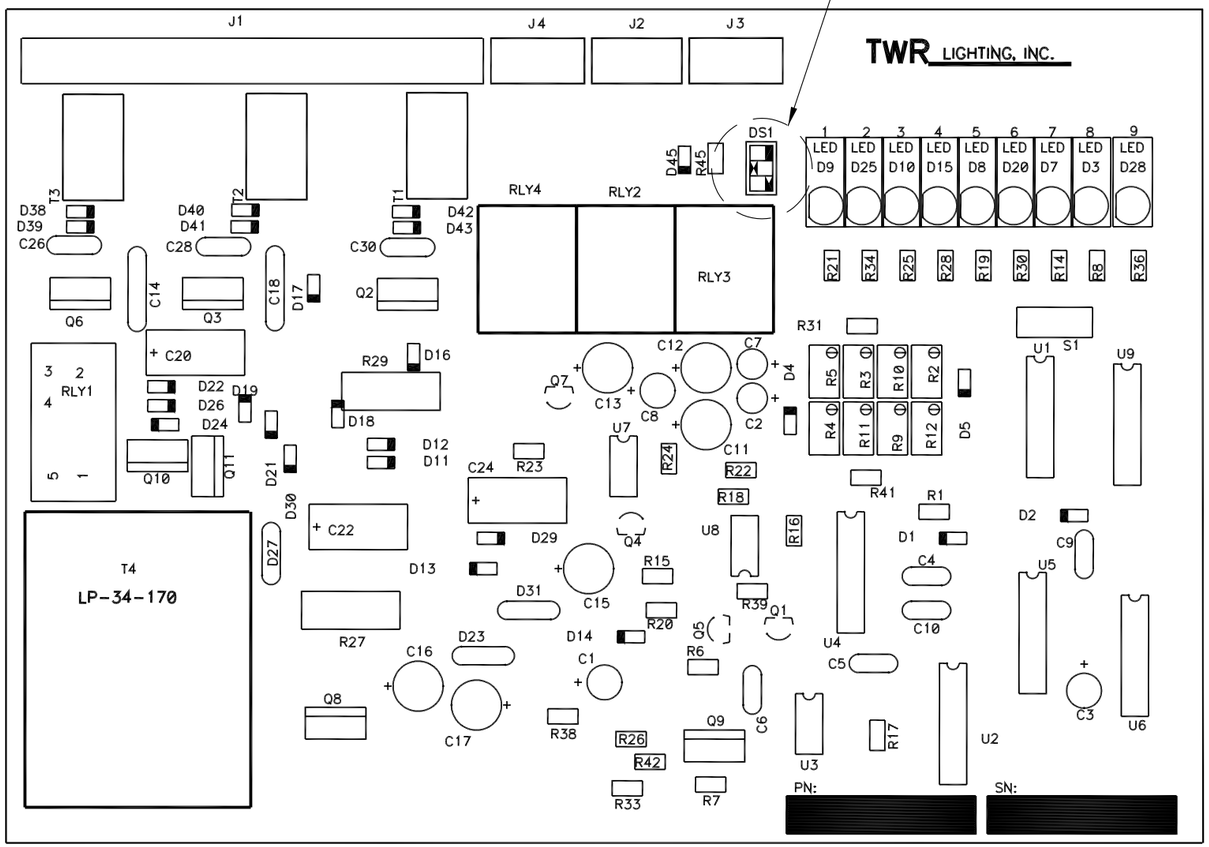
L–865 MEDIUM INTENSITY STROBE

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY

DRAWN BY	SHEET SIZE	SHEET QTY.
E.A.SALAZAR	B	1 OF 1
DATE 12/21/98	SCALE N.T.S.	DRAWING NO. M01–285

DATE:	LTR.	REVISION
10/12/00	C	E.A.S. CHG. CONNECTIONS
10/9/00	B	E.A.S. F.D. CHG. CONNECTIONS
02/03/1999	A	E.A.S. CHG. CONNECTIONS



SETTINGS:

MASTER: DS1

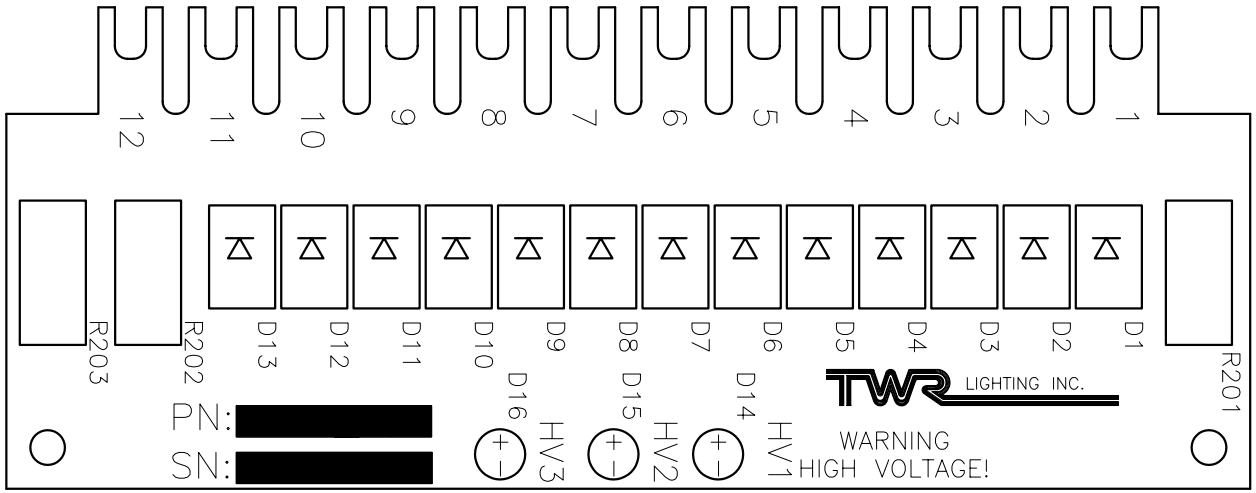
SLAVE: DS1

DATE:	LTR.	REVISION
05/17/01	D	ADDED J3 & J4

D-2/3LVS CONTROL PCB
(COMPONENT LAYOUT)

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY
DRAWN BY: E.A.SALAZAR	SHEET SIZE: B	SHEET QTY.: 1 OF 1
DATE: 5/15/97	SCALE: FULL	DRAWING NO.: H01-258

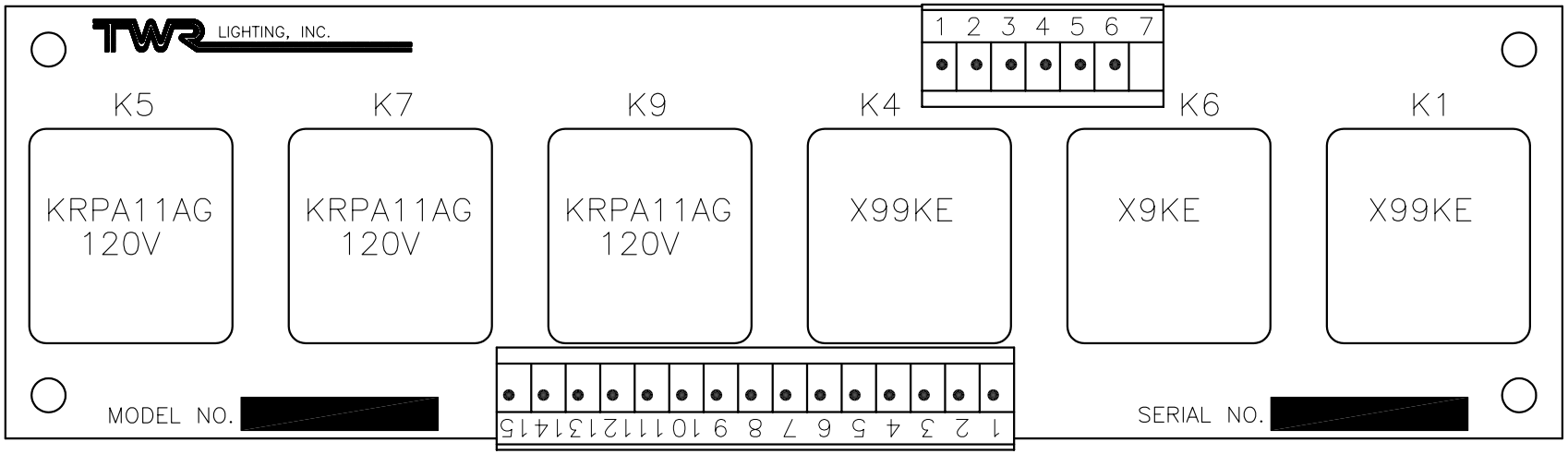


D-2/3LV/E-2/3DB HV RECTIFIER PCB2
L-865 MEDIUM INTENSITY STROBE

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY
DRAWN BY: E.A.SALAZAR	SHEET SIZE: A	SHEET QTY.: 1 OF 1
DATE: 6/15/95	SCALE: FULL	DRAWING NO.: H02-258

DATE:	LTR.	REVISION
10/08/98	B	E.A.S. UPDATED PCB

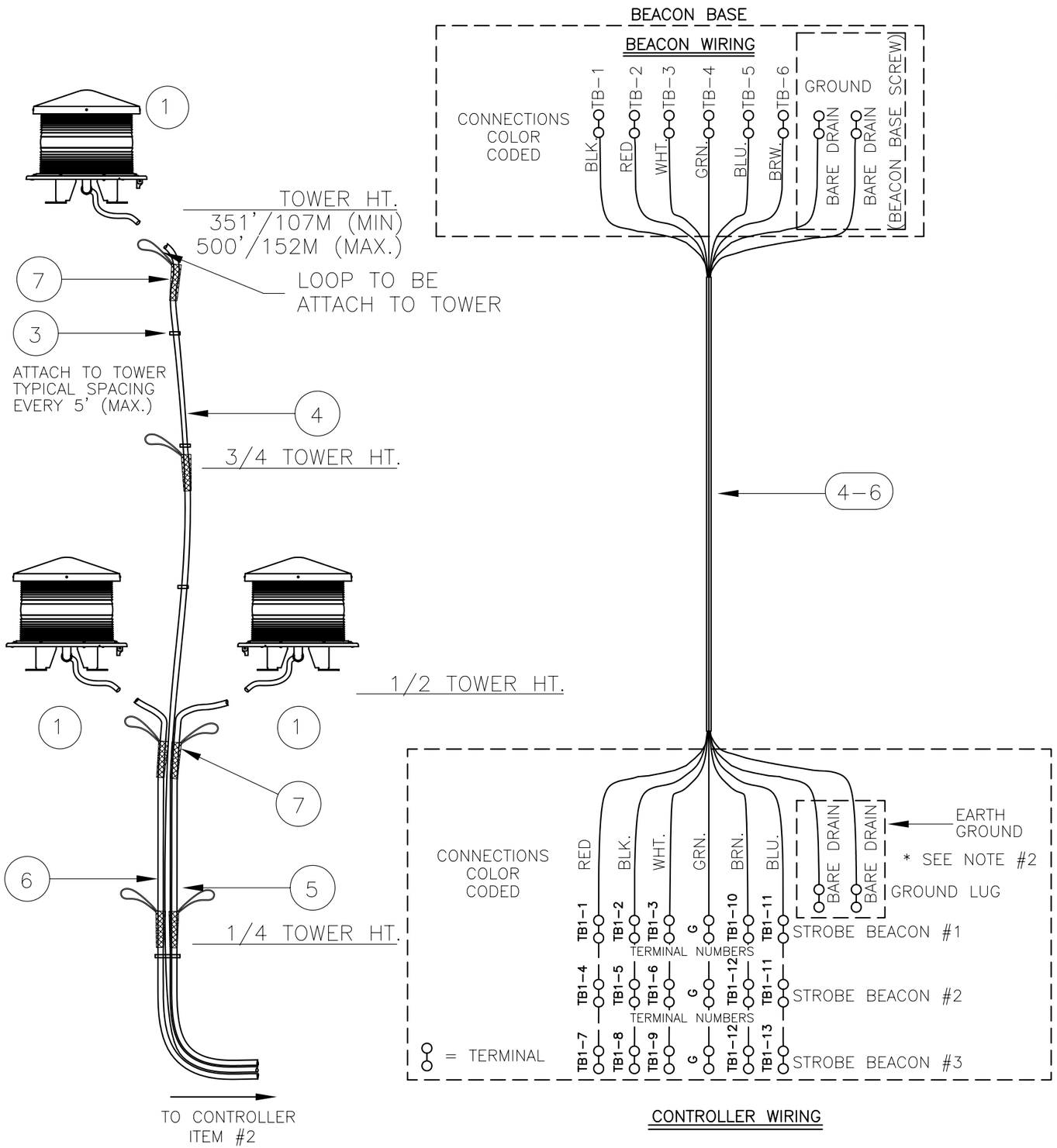


D-2/3LVS RELAY PCB

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY
DRAWN BY: E.A.SALAZAR		SHEET SIZE: A / SHEET QTY.: 1 OF 1
DATE: 07/24/97	SCALE: N.T.S.	DRAWING NO.: H03-258

DATE:	LTR.	REVISION
02/19/03	A E.A.S.	MODIFIED RELAYS



CONTROLLER WIRING

BILL OF MATERIALS

	ITEM NO.	QTY.	TWR PART NO.	DESCRIPTION
	1	3	STBEACON7	LVS STROBE BEACON
*	2	1	STH40285	D-2/3LVS CONTROLLER
	3	–	STCABLTIE	PRT5EH-CO PANDUIT CABLE TIE (TWR HT÷ 5 x 2)
	4	–	STROCABLE-2	6 CONDUCTOR CABLE (TWR HT + 30'/9M)
	5	–	STROCABLE-2	6 CONDUCTOR CABLE (1/2 TWR HT + 30'/9M)
	6	–	STROCABLE-2	6 CONDUCTOR CABLE (1/2 TWR HT + 30'/'9M)
	7	8	CABLGRIP1	SINGLE EYE LACE MESH .5 – .62

* = ITEMS NOT SHOWN

NOTES:

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

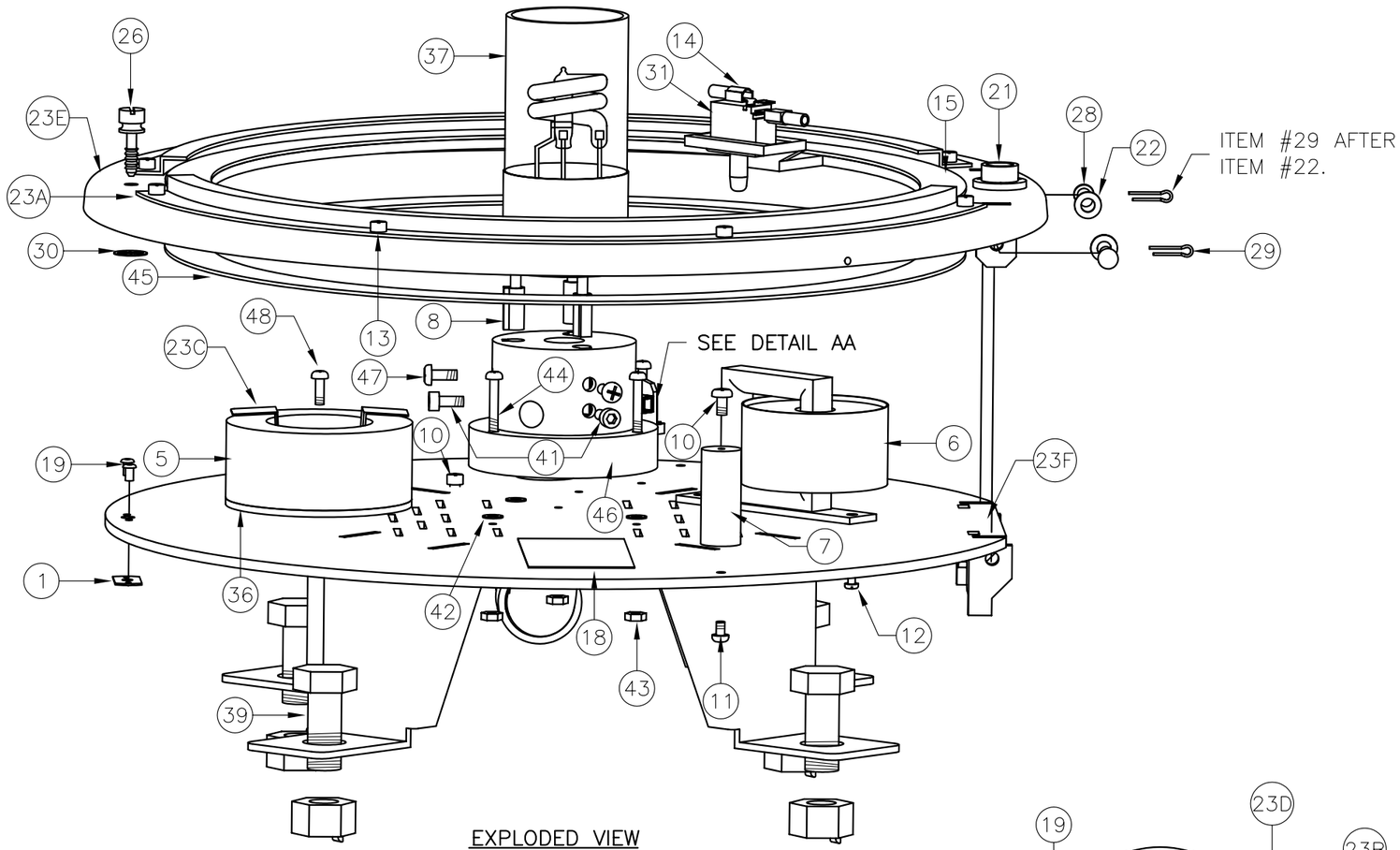
DATE:	LTR.	REVISION
08/02/00	A	CHANGED B.O.M.

LK1D2/3LVS TOWER LIGHTING KIT

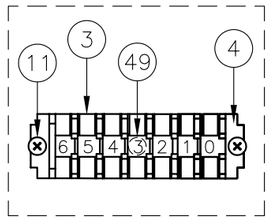
(CABLE RUN FOR 351'/107M TO 500'/152M TOWERS)

TWR Lighting, Inc.

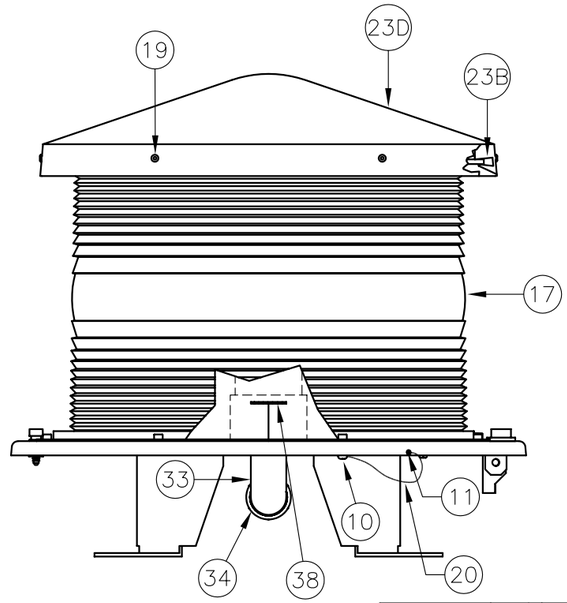
APP'D	ENGINEER	CHK'D BY	
DRAWN BY: E.A.SALAZAR		SHEET SIZE: B	SHEET QTY.: 1 OF 1
DATE: 12/16/98	SCALE: N.T.S.	DRAWING NO.: 500-14	



EXPLODED VIEW



DETAIL AA



ASSEMBLY VIEW

BILL OF MATERIALS

	ITEM NO.	QTY.	TWR PART NUMBER	DESCRIPTION
	1	1	121102013	DB QUICK OPEN SCREW FLAT
*	2	.5'	16AWGBLK	#16AWG BLACK TEFLON WIRE
	3	7	525B	BUCHANNAN
	4	1	530B	BUCHANNAN END SECTION
	5	1	INDCTRC3001	INDUCTOR
	6	1	STC05005	TRIGGER TRANSFORMER
	7	1	INSULATOR	CERAMIC INSULATOR
	8	3	BU27200	FLASHTUBE SOCKET INSERT
*	9	4"	HEATSHRINK2	1/2" GLUE LINED HEAT SHRINK
	10	4	1032X38PHH	10-32 x 3/8 PHILLIPS BINDER HEAD SCREW
	11	4	832X14PHH	8-32 x 1/4" PHILLIPS PAN HEAD SCREW
	12	2	632X38PHH	6-32 x 3/8" PHILLIPS PAN HEAD SCREW
	13	8	1032X38SCSS	10-32 x 3/8" S.S. PHILLIPS PAN HEAD SCREW
	14	2	18RAD18277	T & B CONNECTOR
	15	1	STBEAGSKT	GASKET, NEOPRENE, 13-1/4" x 15"
*	16	11	TYZ23M	HI TEMP TY WRAPS T&B
	17	1	STDBCLENS	CLEAR DB LENS
	18	1	STCONLAB2	PRODUCT LABEL DWG #100223
	19	8	18PRSS-2	1/8 x 0.40 SS.S. POP RIVET #44
	20	1.75'	7X7SS	1/16 7x7 S.S. WIRE
	21	1	2-10000	2-1000000 CIRCULAR SPIRIT LEVEL
	22	2	14FWDB	1/4 FW CH16L 18-8 0.265 ID/5
*	23	1	STBFRAMKIT	SHORT STROBE BEACON FRAME KIT
SEE NOTE #1	23A	2	100337	DUAL BEACON LENS RETAINER
	23B	6	100368	DUAL BEACON CAP BRACKET
	23C	1	100396	INDUCTOR BRACKET
	23D	1	100344	CAP DUAL BEACON
	23E	1	100342	DUAL BEACON UPPER HINGE
	23F	1	100393M	DUAL BEACON BASE
*	24	1'	18AWG BLU	18AWG BLUE WIRE, TEFLON
*	25	1'	18AWG BRN	18AWG BROWN WIRE, TEFLON
	26	1	121340712	DB QUICK OPEN CAPTIVE S. W/FIBER WASHER
*	27	8	8NFW	#8 NYLON FLAT WASHER
	28	2	14X34CLVP	1/4" x 3/4" SHORT CLEVIS PIN
	29	2	12SSCP	1/2 S.S. COTTER PIN
	30	1	1261	12-6-1 S.S. CAPTIVE SCREW
	31	1	STJ02003	CHERRY SWITCH
*	32	.5'	16AWG RED/BLK	M16878/5 16AWG TEFLON TYPE EE
	33	1	EL190S	1" 90° SHORT ELBOW GALVANIZED
	34	1	CGB395SA	1" CORD CONNECTOR 0.5 TO 0.625
*	35	1.25'	HEATSHRINK1	1/4" GLUE LINED BLACK HEAT SHRINK
	36	1	100394-02	INDUCTOR BOTTOM PAD GASKET
	37	1	STFLSHTB5	FLASHTUBE LV
*	38	1	A315	1" CONDUIT LOCKNUT, GALVANIZED
	39	4	58X112	A325 5/8" x 1-1/2" WITH ANCO L/N
*	40	1	CSL062X100	1/16 COPPER SLEEVE
	41	3	1032X12SCSS	FLASHTUBE SOCKET INSERT SCREW
	42	3	1032FW	#10 FLAT WASHER
	43	3	832NUT	8-32 NUT
	44	3	832X114PHH	8-32 x 1-1/4" PHILLIPS PAN HEAD SCREW
	45	1	STBEAGSK2	NEOPRENE GASKET, 3/16" x 15-1/4"
	46	1	100319	DUAL BEACON FLASHTUBE SOCKET
	47	3	1032X12PHH	10-32 x 1/2" PHILLIPS PAN HEAD
	48	2	832X12PHH	8-32 x 1/2" PHILLIPS PAN HEAD
	49	1	832X38PHHN	8-32 x 3/8" PHILLIPS PAN HEAD NYLON SCREW
*	50	3	TV18-12PT-1	20AWG ISOLATED FERROLE

* = ITEMS NOT SHOWN

NOTE:

1. ITEM #23A-23F SOLD AS AN ASSEMBLY ONLY. ORDER ITEM PART #STBFRAMKIT.

STBEACON7

STROBE BEACON DETAIL
L-865 MEDIUM INTENSITY

TWR Lighting, Inc.

APP'D	ENGINEER	CHK'D BY	
DRAWN BY E.A.SALAZAR		SHEET SIZE B	SHEET QTY. 1 OF 1
DATE 12/07/00	SCALE N.T.S.	DRAWING NO. 100437M	

DATE:	LTR.	REVISION
03/23/01	C	ITEM #23E & #13