INSTRUCTIONS

PRLC-2-A8

TOWER LIGHTING CONTROL

PI-ROD TOWER

PLYMOUTH, INDIANA

USA

Ser. #_____

Date _____

Tested _____

CAUTION

For 120VAC 50/60 Hertz only.

Mains Voltage from P1 to neutral is 120VAC

Mains Voltage from P2 to neutral is 120VAC

TABLE OF CONTENTS

1. INTRODUCTION

The Pi-Rod Model PRLC-2 Tower Lighting Control has been designed and manufactured using the most up-to-date technology. The all solid state feature of the PRLC-2 allows the use of metal oxide varistors (MOV's) to protect the electronic circuitry from surges and tansients that occur on the supply lines and the load lines. Also incorporated in the PRLC-2 are solid state relays (SSR's).

Solid state relays are now widely accepted in heavy industry for high current load controlling, frequent and fast switching and long operating life. SSR's are designed to turn on at a "zero-crossover point" to minimize radio-frequency interference (RFI). Due to the inherent contact closure and arcing upon contact opening, electromechanical type relays can create RFI for as long as 250 us. Also the relay coil can be another source of RFI when its power is interrupted. This interference is radiated as tansients into other circuitry. In an SSR, there is no contact bounce, no arcing and consequently no extensive RFI is produced. Since the SSR output is switched on in less than 1 us, the radiated RFI lasts about 5% of the time of a single contact bounce of an electromechanical relay.

In SSR's there is additional circuitry that incorporates light emitting diodes (LED's) and photo-transistors to optically couple and electrically isolate the input to the output. Optical isolation minimizes coupling of noise, present on the load lines, from affecting the control circuitry.

The PRLC-2-A8 is used to control obstruction and beacon lights in the A-3 to A-8 configurations. (FAA-AC 70/7460-1F, App. 2, Fig. 1 & 2). The system consists of a photocell sensor, a photocell amplifier module (PCAM), solid state relays (SSR's) and bypass switches for emergency operation.

Indicator lights are provided, with the bypass switches, on a wiring diagram for ease of understanding the system operation. These indicator lights show the condition of incoming power, the PCAM and the SSR outputs or bypass switches. Fuses are provided to each beacon and the obstruction lights to protect the control from shorts or grounded cables on the tower. Beacons are fused separately to prevent a fault at one beacon from affecting any other beacon or obstruction light.

The PRLC-2 is based on the modular concept. This allows replacement of individual parts or the complete control can be replaced by a spare control easily and quickly.

2. PHOTOCELL

The photocell is mounted in a weather-proof housing, usually at the top of the control box. It is pointed toward the north in the northern hemisphere and toward the south in the southern hemisphere and should be clear of obstructions. The photocell must be mounted in such a way as to shade it from direct sunlight and artificial light (headlights, streetlights, signs, etc.) to prevent erroneous operation.

The photocell resistance in bright sunlight will be approximately 100 to 400 ohms. In absolute darkness the resistance will be approximately 1 meg ohm or higher.

Turn-on at night should occur at approximately 35 foot-candles, and the photocell resistance will measure between 5000 ohms and 100K ohms.

3. PHOTOCELL AMPLIFIER MODULE

The photocell amplifier module (PCAM) is located behind the inner door on a printed circuit board. Wires to the module are brought to a push-on type edge connector, which allows the PCAM to be replaced easily in the field.

The PCAM provide several functions:

1. Converts 120 VAC 50/60 Hz to +15 VDC for POWER (LED green light).
2. Receives photocell resistance input and compares it to the resistance of the sensitivity adjustment potentiometer. At dark, when the photocell resistance is greater than sensitivity pot, the LED yellow indicator labeled ON will light.
3. After a time delay of about 10 seconds an LED red indicator labeled OPERATE will light. also, the LED red indicator labeled OBSTRUCTION LIGHTS will light, and the LED red indicators labeled BEACONS B1 & 2 and B3 & 4 will flash (2 seconds on, 1 second off).
4. Output signals are sent to solid state relays with the LED red indicators in series; therefore, the input to a solid state relay must be connected in order to light an indicator. Neon lamps indicate output voltage from SSR is available - switched.

A 3-position test switch is provided for testing the PCAM. The NORMAL operating position is in the center. Moving the test switch to PHOTOCELL TEST will disconnect the photocell which simulates a dark or high resistance condition. The PCAM should then go through a normal operate cycle.

Moving the test switch to AMPLIFIER TEST will activate SSR drivers. The PCAM should immediately provide signals to all solid state relays. No time delay is involved and the LED yellow ON indicator will not light. The obstruction LED red indicator should light and the beacon LED red indicators should flash normally.

4. SOLID STATE RELAYS

The solid state relays (SSR's) used in this control are line synchronized to turn on at zero voltage to minimize lamp inrush current and RFI. These relays are rated at 120 VAC at 40 Amps with proper heat removal. The bottom surface of the SSR is covered with a silicon heat conductor grease to provide adequate heat removal to the chassis and ambiant air.

The SSR input signal is approximately 5 VDC. Any input between 3 VDC and 32 VDC will operate the SSR. A neon indicator lamp on the door is provided for each SSR output.

5. BYPASS SWITCHES

High amperage toggle switches are provided for solid state relay bypass function. Moving the switch to BYPASS position will bypass the SSR and provide line current directly to the obstruction lights or beacons.

6. INCOMING POWER INDICATOR

Neon indicators (P1 & P2) are provided to show status of incoming 120 VAC 50/60 Hz power. Two indicators are provided where 240 VAC is available to allow load splitting (i.e., partial load on each 120 VAC line).

7. TROUBLE SHOOTING GUIDE - CONDENSED

Conditions necessary for tower lights to be on:

1. 120 VAC power to control - 'P1' and 'P2' neon indicator ON
2. Green LED light for power to PCAM ON
3. Darkness turn on at not less than 35 foot-candles of light
4. Yellow LED light for photocell dark 'ON'
5. Red LED light for time delay, about 10 seconds 'operate' ON
6. Red LED light for obstruction lights - also red neon - ON
7. Red LED light for beacon(s) - also red neon(s) should flash 2 seconds on, 1 second off - ON
8. Output neon indicators for obstruction lights and flashing neon indicators for beacon(s) - (check fuses?)
9. Obstruction and beacon lights should operate. If not, then check wiring to tower and bulbs.

8. MAINTENANCE

Periodic cleaning of photocell window is the only maintenance recommended. In case of malfunction, refer to Section 7, Trouble Shooting Guide.

9. REPAIR

All repair must be performed by the factory or its authorized service center. Repair parts can be sent quickly. Indicate what trouble shooting stage in Section 7 failed and appropriate parts kit will be sent. See parts layout drawing on inside cover.

Pi-Rod Tower
Po Box 128
Plymouth, IN 46563
(219)-936-6751

PCAM

909-67.

10 pin Edge Connector

Call about Remote indicator

10. CONTROL OPERATION

Incoming power 120VAC-50/60 Hertz only is applied between P 1 and neutral and P 2 and neutral. If only single phase 120VAC is used, a jumper is placed between P 1 and P 2. The red neon indicators marked 'P 1' and 'P 2' should glow with power on.

If these indicators do not glow, check mains, circuit breaker or fused power source. If fuse is open or circuit breaker interrupted check for cause of fault and correct it before reactivating circuit.

The photocell resistance is low during daylight, less than 1000 ohms, and very high at nighttime, over 1 meg ohm. This resistance is compared to the sensitivity control potentiometer. When the photocell resistance is higher than the setting of the sensitivity control at nighttime the yellow LED marked PHOTOCELL should glow. If it does not, then adjust the sensitivity control knob. If the yellow LED still does not glow, push the test switch to PHOTOCELL TEST. This will disconnect the photocell and the yellow LED should glow. If it does not glow, the PCAM module must be replaced. If it does glow, then check for a short circuit to the photocell or replace the photocell. The test switch may be left in the photocell test position for emergency operation.

If the yellow photocell LED glows, a 10-second time delay will occur and the red operate LED should glow. If it does not, then replace the PCAM module. Push the test switch to the amplifier test position for emergency operation. At this time the tower lights should operate.

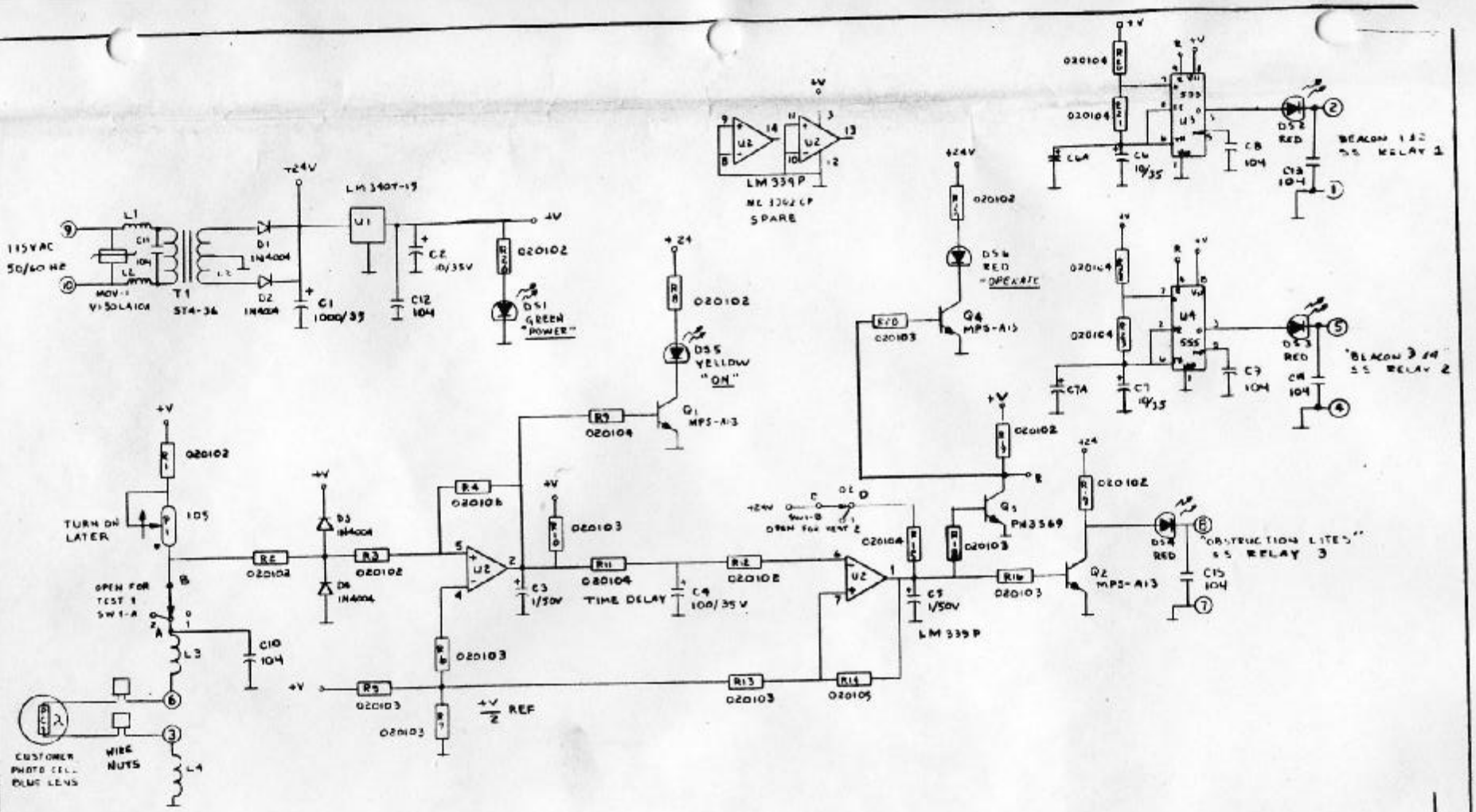
If the red operate LED glows the indicators for BEACON 1 & 2, BEACON 3 & 4, should glow 2 seconds on, 1 second off, and the red LED indicator for the obstruction light should glow. These LED's

are wired in series with the input to the solid state relays (SSR). If the wires to the SSR inputs are disconnected, then the red LED will not glow. If the SSR input should fail, this also will prohibit the red LED from glowing. The SSR should be replaced. The SSR bypass switch should be used for emergency operation.

If the red LED's for B1 and B2, B3 and B4, and obstruction lights glow, then the red neon indicators of each of these functions should glow. Note - if the red neon indicators should glow at half brilliance, this may indicate an open circuit load caused by open fuse, broken wire or defective lamp socket. The half brilliance glow indicates voltage is available but no load is connected. If a fuse is open, check for wire short circuit on tower or in lamp sockets before replacing fuse and reactivating circuit.

If the red neon indicators do not glow at all, then the SSR is defective and should be replaced. Then the SSR bypass switch may be used for emergency operation.

If the red neon indicators glow full brilliance, then the tower lights should be operating properly. Be sure that both lamps of a double lamp beacon are both glowing for proper tower operation.



L	4		
P	1		
DS	6		
U	4		
Q	4		
D	4		
C	15		
R	28	24.25	
DEV	LAST	NOT USED	

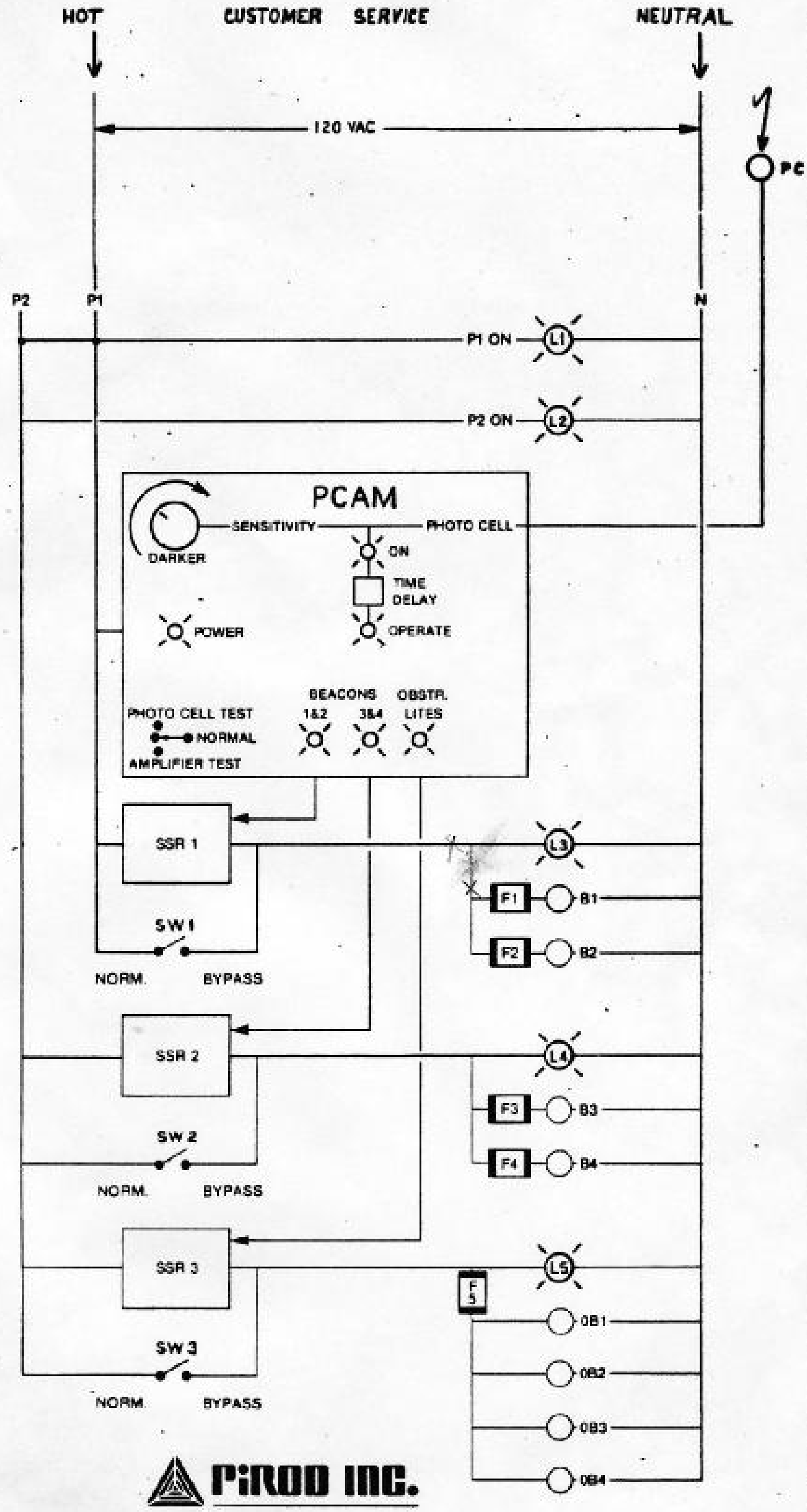
LTR	DATE	DESCRIPTION	BY
G	2-23-83	ADD [illegible] C10-15	JC
F	11-10-82	SHOW SW1-B	
E	8-4-82	[illegible]	JC
D	5-7-82	ADD Q4, ETC	
C	5-3-82	ADD BEACON OUTPUTS	
B	4-23-82	RELEASED FOR ARTWORK	JC
A	4-22-82	RELEASED FOR PROTOTYPE	JC

PHOTOCELL AMPLIFIER FOR PI ROD TOWER CO

721

CUSTOMER
PLACE JUMPER FROM
P1 TO P2 FOR
SINGLE POWER
SOURCE

BOTH LAMPS
P1 AND P2
MUST BE ON



SINGLE POWER SOURCE

A8

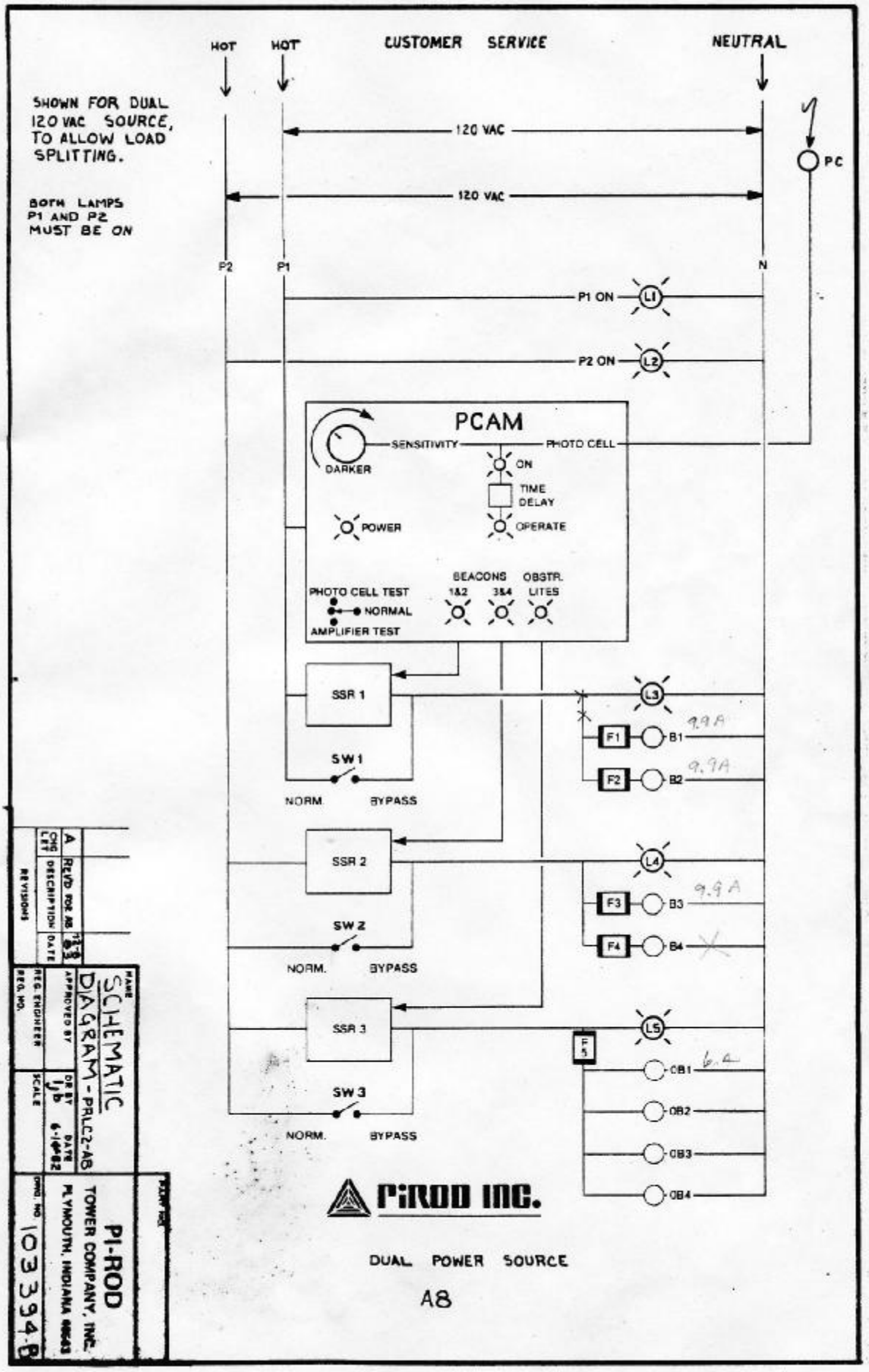
CHG LET	DESCRIPTION	DATE
A	Rev'd for A8	12-8-83

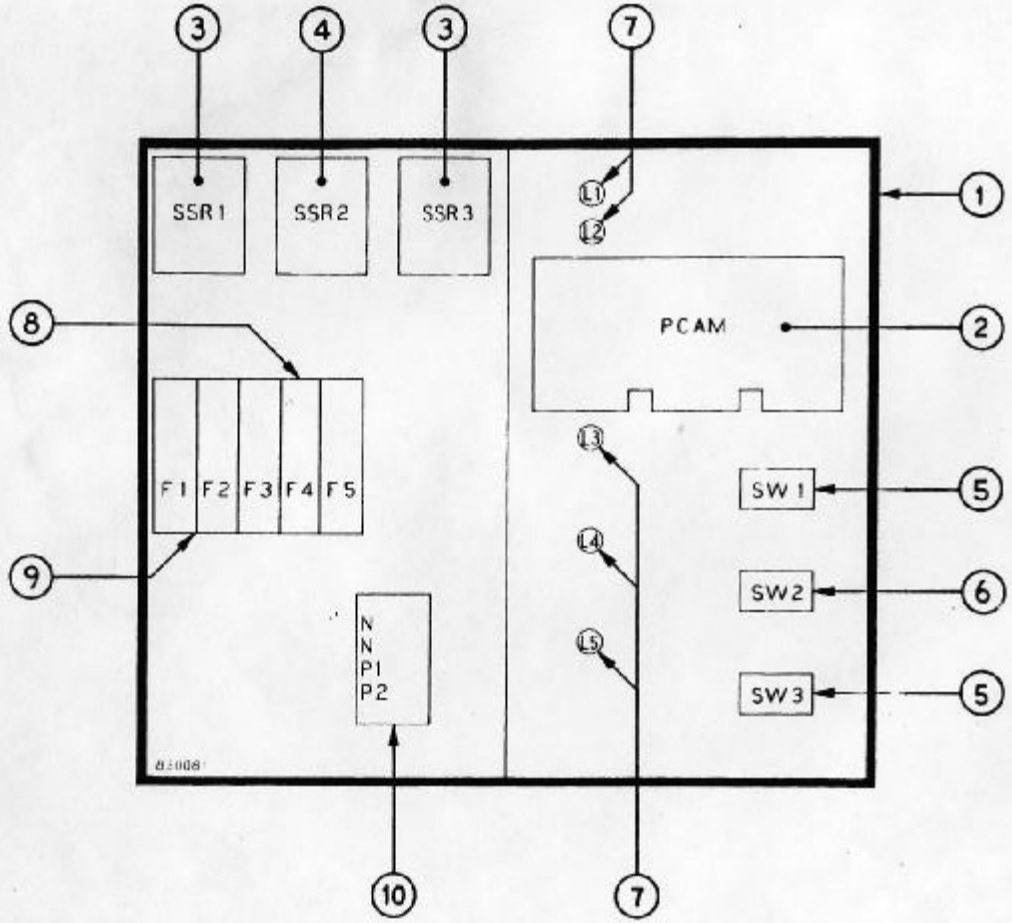
REVISIONS

NAME: SCHEMATIC DIAGRAM - PRLC2-A8
APPROVED BY — DR BY: jb — DATE: 6-14-82
REG. ENGINEER — SCALE
REG. NO.
PRINT NO.

PI-ROD TOWER COMPANY, INC.
PLYMOUTH, INDIANA 46563

DWG NO. 103394-B


HOT
HOT
CUSTOMER SERVICE
NEUTRAL
SHOWN FOR DUAL 120 VAC SOURCE, TO ALLOW LOAD SPLITTING.
BOTH LAMPS P1 AND P2 MUST BE ON
120 VAC
120 VAC
PC
P2
P1
N
P1 ON
L1
P2 ON
L2
PCAM
SENSITIVITY
PHOTO CELL
DARKER
ON
TIME DELAY
POWER
OPERATE
BEACONS
OBSTR. LITES
1&2
3&4
PHOTO CELL TEST
NORMAL
AMPLIFIER TEST
SSR 1
SW 1
NORM.
BYPASS
L3
F1
B1
9.9A
F2
B2
9.9A
SSR 2
SW 2
NORM.
BYPASS
L4
F3
B3
9.9A
F4
B4
SSR 3
SW 3
NORM.
BYPASS
L5
F5
OB1
6.4
OB2
OB3
OB4
REVISIONS
A
CHG LET
REVD FOR AB
DESCRIPTION
DATE
NAME
SCHEMATIC DIAGRAM - PRLC2-AB
APPROVED BY
REG. ENGINEER
REG. NO.
DR BY
SCALE
DATE
PI-ROD TOWER COMPANY, INC.
PLYMOUTH, INDIANA
DRWG. NO.
103394-B
PI-ROD INC.
DUAL POWER SOURCE
A8



ITEM	DESCRIPTION	PART NO.
1	COMPLETE CONTROL ASSEMBLY	PRLC-2-A-(8)
2	PHOTOCELL AMPLIFIER MODULE	910061
3	SOLID STATE RELAY	380010
4	SOLID STATE RELAY	380010
5	BYPASS TOGGLE SWITCH	610020
6	BYPASS TOGGLE SWITCH	610020
7	NEON INDICATOR LAMP	850023
8	3 FUSE-FUSE BLOCK	790012
9	2 FUSE-FUSE BLOCK	790013
10	TERMINAL BLOCK	730014

CHG LET	DESCRIPTION	DATE
A	REVD PER ECN	12-8-82

REVISIONS

NAME: Block DIAGRAM PRLC-2-AB CONTROL

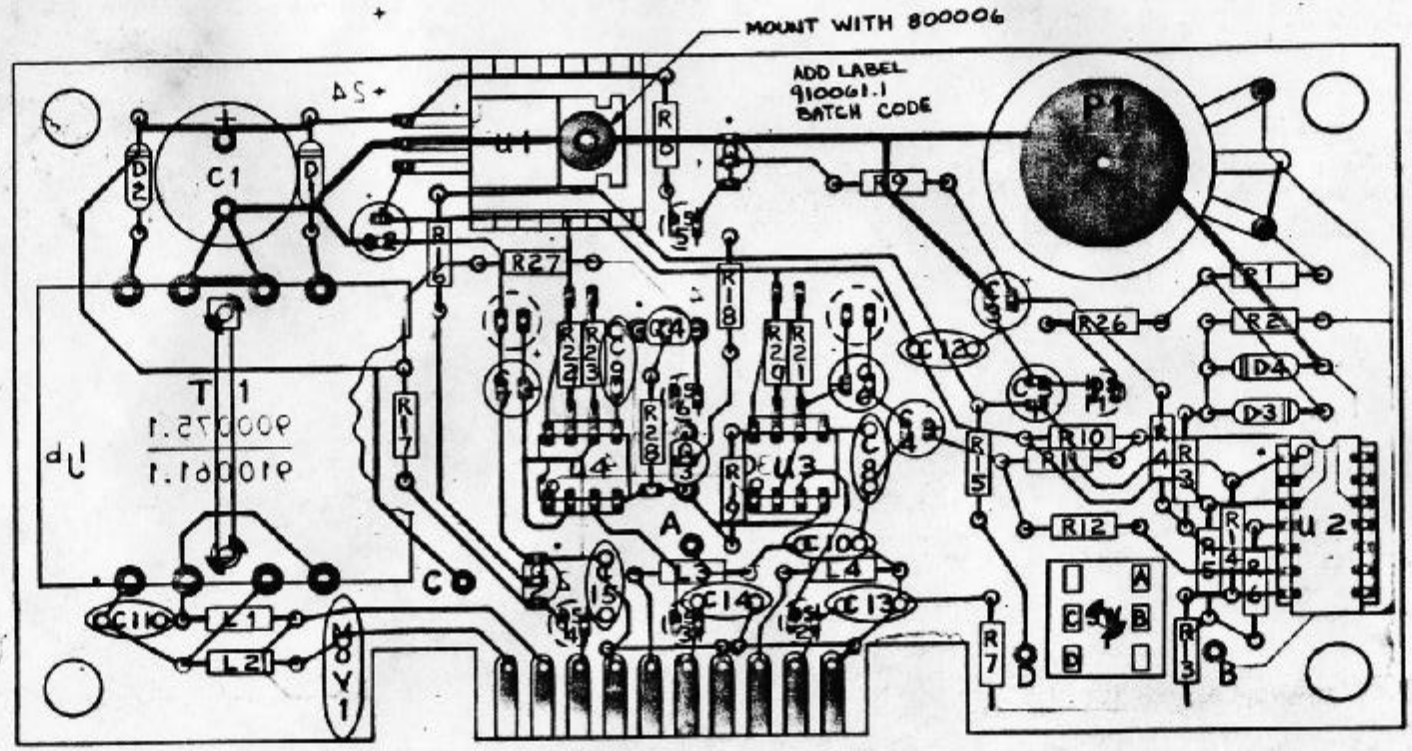
APPROVED BY | DR BY: jb | DATE: 6-14-82

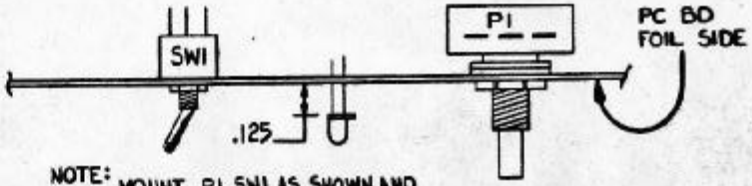
REG. ENGINEER REG. NO. | SCALE

PART NO.

PI-ROD
TOWER COMPANY, INC.
PLYMOUTH, INDIANA 46563

DWG. NO. 103395 B





NOTE: MOUNT P1, SW1 AS SHOWN AND SOLDER WIRES AS INDICATED.

MOUNT DS1-6 AT DISTANCE SHOWN.

2	900075.1	PC BOARD
1	721 REV G	REF SCH DWG

ELECTRONICS INCORPORATED
1520 N. MAIN, MISHAWAKA, IN. 46545

SCALE: 2x		BY: ljb
DATE: 3-7-83		

PHOTOCELL AMPLIFIER FOR
PI-ROD TOWER CO.

ASSEMBLY DRAWING 1 of 2 — 910061.1