L-884 Land and Hold Short Operations (LAHSO) Power Control Unit

User Manual

96A0235, Rev. R, 2020/09/01

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and FAA Airfield regulations. The FAA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

All Products Guarantee

ADB SAFEGATE will correct by repair or replacement per the applicable guarantee above, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE furthers reserves the right to require the return of such goods to establish any claim.

ADB SAFEGATE's obligation under this guarantee is limited to making repair or replacement within a reasonable time after receipt of such written notice and does not include any other costs such as the cost of removal of defective part, installation of repaired product, labor or consequential damages of any kind, the exclusive remedy being to require such new parts to be furnished.

ADB SAFEGATE's liability under no circumstances will exceed the contract price of goods claimed to be defective. Any returns under this guarantee are to be on a transportation charges prepaid basis. For products not manufactured by, but sold by ADB SAFEGATE, warranty is limited to that extended by the original manufacturer. This is ADB SAFEGATE's sole guarantee and warranty with respect to the goods; there are no express warranties or warranties of fitness for any particular purpose or any implied warranties of fitness for any particular purpose or any implied warranties other than those made expressly herein. All such warranties being expressly disclaimed.

Standard Products Guarantee

Products of ADB SAFEGATE manufacture are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

See your sales order contract for a complete warranty description.

FAA Certified product installed in the United States and purchased or funded with monies through the Airport Improvement Program (AIP) installations guarantee

ADB SAFEGATE L858 Airfield Guidance Signs are warranted against mechanical and physical defects in design or manufacture for a period of 2 years from date of installation, per FAA AC 150/5345-44 (applicable edition).

ADB SAFEGATE L858(L) Airfield Guidance Signs are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition).

ADB SAFEGATE LED light fixtures (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). .

Note

See your sales order contract for a complete warranty description.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

	WARNING Failure to observe a warning may result in personal injury, death or equipment damage.
	DANGER - Risk of electrical shock or ARC FLASH Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	WARNING - Wear personal protective equipment Failure to observe may result in serious injury.
	WARNING - Do not touch Failure to observe this warning may result in personal injury, death, or equipment damage.
	CAUTION Failure to observe a caution may result in equipment damage.

Qualified Personnel

	Important Information The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements. Always use required personal protective equipment (PPE) and follow safe electrical work practice.

1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow this instruction can result in serious injury or equipment damage

Additional Reference Materials

Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

1.1.3 Material Handling Precautions: Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.4 Material Handling Precautions: Fasteners

DANGER

Foreign Object Damage - FOD
This equipment may contain fasteners that may come loose - torque properly.

- Only use fasteners of the same type as the one originally supplied with the equipment.
- Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create safety risk .
- You need to know what base the light fixture will be installed in, in order to chose the correct gasket, bolts and nuts.
- Bolt type, length, and torque value are determined by type of base, height of spacers used, and clamp force required in FAA Engineering Brief No 83 (latest revision).
- Due to the risk of bolts vibrating loose, do not use any type of washer with the fixing bolts (such as split lock washers) other than an anti-vibration washer. Anti-vibration washers as defined in FAA EB 83 (latest edition) must be used. For installations other than FAA, use the base can manufacturer's recommendations.
- Always tighten the fasteners to the recommended torque. Use a calibrated torque wrench and apply the recommended adhesive type.
- Obey the instructions of the adhesives necessary for the fasteners.

Failure to follow these warnings may cause the fasteners to loosen, damage the equipment, potentially to loosen the equipment. This can lead to a highly dangerous situation of FOD, with potential lethal consequences.

Note

To minimize the risk of errors, the ADB SAFEGATE Sales Representative will have information on which gasket goes with which base. This information is also provided in the product Data sheets, the User Manuals and the Spare Part Lists.

CAUTION

Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create multiple safety risks.

To obtain a safe and watertight installation the O-ring and retaining bolt stated in the document must be used.

You need to know what base the light fixture will be installed in, in order to choose the correct gasket, bolts and nuts.

Failure to follow these cautions can result in equipment damage or aircraft FOD.

1.1.5 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

Failure to follow these instructions can result in death or equipment damage

1.1.6 Material Handling Precautions, ESD

CAUTION

Electrostatic Sensitive Devices
This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

Failure to follow this instruction can result in equipment damage

1.1.7 Arc Flash and Electric Shock Hazard

DANGER

Series Circuits have Hazardous Voltages
This equipment produces high voltages to maintain the specified current - Do NOT Disconnect while energized.

- Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.
- Only persons who are properly trained and familiar with ADB SAFEGATE equipment are permitted to service this equipment.
- An open airfield current circuit is capable of generating >5000 Vac and may appear OFF to a meter.
- Never unplug a device from a constant current circuit while it is operating; Arc flash may result.
- Disconnect and lock out electrical power.
- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in the product manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB SAFEGATE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check the interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with airfield electrical equipment.

Failure to follow these instructions can result in death or equipment damage

2.0 L-884 / LAHSO PCU

Land and Hold Short Operations (LAHSO) include landing and holding short of an intersecting runway, taxiway, predetermined runway point and/or an approach/departure flight path. A LAHSO system is controlled by the LAHSO PCU, this consists of a row of six or seven in-pavement unidirectional pulsing white lights installed across the runway at the hold-short point.

2.1 About this manual

2.1.1 Introduction

The manual shows the information necessary to:

- Install and maintain the L-884 / LAHSO PCU equipment.

2.1.2 How to work with the manual

1. Become familiar with the structure and content.
2. Carry out the actions completely and in the given sequence.

3.0 Product Introduction

Land and Hold Short Operations (LAHSO) include landing and holding short of an intersecting runway, taxiway, predetermined runway point and/or an approach/departure flight path. A LAHSO system is controlled by the LAHSO PCU, this consists of a row of six or seven in-pavement unidirectional pulsing white lights installed across the runway at the hold-short point.

3.1 Land and Hold Short Operations Power and Control Unit

Uses

A Land and Hold Short Operations (LAHSO) system is used to increase airport capacity. A LAHSO system, controlled by an L-884 Power and Control Unit (PCU), consists of a row of six or seven in-pavement unidirectional pulsing white lights installed across the runway at the hold-short point.

For new installations, six lights are used. Seven lights are used if five lights were installed according to AC 150/5345-54. Lights pulse simultaneously at a rate of 1.72 seconds ON, 0.46 seconds OFF. The fixture may be either clear L-850A or L-850F (incandescent fixtures only). The L-850F has two lamps, one primary and one backup. If two or more lights in the primary LAHSO bar have failed, the PCU switches from the primary to the backup lamp bar. See data sheet 2001 (L-850A) or data sheet 2037 (L-850F) for more information.

PCU Specifications

Input Voltage	Outdoor unit: 240 VAC, 60 Hz Indoor unit: 120 VAC, 208 VAC, 240 VAC; 60 Hz
PCU maximum load	1,600 VA
Distance	LAHSO lights may be up to 10,000 ft (3 km) away (20,000 ft/6 km round trip) using AWG 8, L-824 wire
Indoor enclosure	- NEMA 1 - Style I, -40 °F to +131 °F (40 °C to +55 °C) - 63 lb (2 8.58 kg) - 24 × 8.6 3 × 24 in (61 × 22 × 61 cm)
Outdoor enclosure	- NEMA 4 - Style II, -67 °F to +158 °F (-55 °C to +70 °C) - 72 lb (3 2.66 kg) - 24 × 8 × 24 in (61 × 20.3 × 61 cm)

Note

Outdoor PCU must be mounted outside airfield safety area. Mounting an outdoor PCU in the vicinity of the LAHSO fixtures is the preferred method of installation.

Theory of Operation

LAHSO lights are flashing in-pavement white lights designed to pulse simultaneously so that they are distinguishable from the various runway lights. The lights pulse from one of the three steps (6.6 A, 5.2 A, or 4.1 A) for 1.72 seconds and then to 1 A for 0.46 seconds. The pulsing lights provide an effective visual cue for the pilot from short final through the landing rollout, indicating the point beyond which the landing aircraft is not authorized to proceed. Either six or seven unidirectional clear L-850A or L-850F lights (without film disc cutouts) are used.

The L-884 PCU consists of a microprocessor-controlled circuit that regulates the output current in a manner similar to an L-828 constant current regulator.

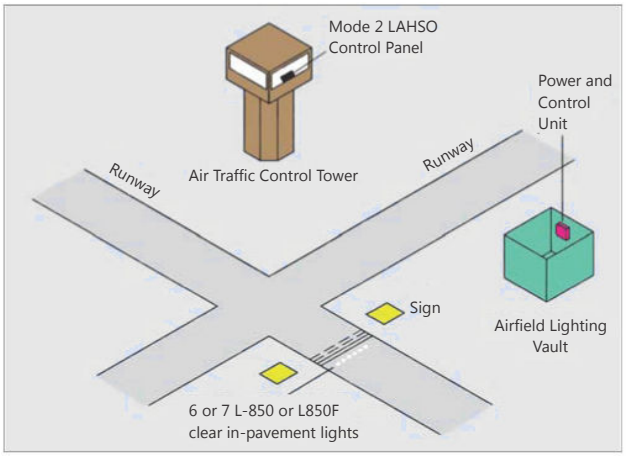
ON/OFF control is activated from the Air Traffic Control Tower or by a local control switch on the PCU (See Figure 1). If the PCU local control switch is in the Local position (OFF or B3/B4/B5), then the Field/Tower PCU contact will open, activating a “Field Control” light on the LAHSO panel. When the PCU local control switch is in the Remote position, the Field/Tower PCU contact will close, activating a “Tower Control” light on the LAHSO panel.

The PCU photocell defines whether day or night conditions exist. During daytime, the intensity is always set to B5 (6.6 A) even if the runway edge lights are off. At nighttime, the PCU uses two current sensing relays (mounted separately) to monitor the intensity of the corresponding HIRL (5-step) or MIRL (3-step) runway edge lighting circuit and to automatically set the intensity step. Alternately, an L-830 transformer can be used to monitor the runway edge circuit.

A fault alarm is generated if one of the following conditions occurs:

- Failure of the PCU electronics due to failure of the DC power supply (Time Delay = 0 sec)
- Loss of input power to PCU (Time Delay = 0 sec)
- Failure to pulse the lights (Time Delay = 5 sec)
- Two or more lights in a bar have failed (Time Delay = 5 sec)

Figure 1: Figure 1



The PCU has the following fail-safe modes:

- If the photocell fails, intensity reverts to the highest step
- If PCU DC power supply fails (using either L-850A or L-850F lamps), a Fault alarm is generated and LAHSO lamps go OFF
- If L-850A fixtures are used or if the LAHSO PCU has switched to the backup L-850F lamps and if the number of lamps out for Fault alarm occurs, then a Fault alarm is generated and the remaining LAHSO lamps continue to pulse

Note
The PCU is not designed for use with an L-847 Circuit Selector Switch.

3.2 Equipment Specification Data

3.2.1 LAHSO Power Control Unit: Required Equipment

Refer to Table 1 for equipment supplied with the LAHSO.

Refer to Table 2 for equipment supplied with the outdoor LAHSO.

Refer to Table 3 for required equipment that is not supplied with the PCU for indoor and outdoor LAHSOs. Refer to the Spare Parts for part numbers.

Table 1: Indoor LASHO Required Equipment Supplied

Description	Quantity
PCU	1
Photocell	2
Photocell socket	2
Current Sensing Relays	2
Instruction Manual	1 per order

Table 2: Outdoor LASHO Required Equipment Supplied

Description	Quantity
PCU	1
Current Sensors	2
Instruction Manual	1 per order

Table 3: Required Equipment Not Supplied with PCU (Indoor and Outdoor LAHSO)

Description	Quantity
Mounting Hardware	As required
L-850A or L0850F inset lights	6 or 7
Lighting Control Panel (in ATCT)	1
L-868 base can	6 or 7
Wire for Control, Input Voltage	As required
Ground Wire, Solid Copper	As required
L-830 Transformers	6 or 7

3.2.2 Flashing Operation

Note

No requirement exists for a 1000-foot bar for LAHSO.

Table 4: Flashing Operation for L-850A and optional L-850F

On/Off	Flashing Rate
ON	1.72 ±0.1 seconds
OFF	0.46 ±0.1 seconds

Table 5: Power Consumption

Load	VA
Maximum	1800
Total	1610

Table 6: Style

Style	Function
Style I, NEMA 1	Indoor use
Style II, NEMA 4X	Outdoor use

Table 7: Input Power

Input power for indoor and outdoor LAHSO	240 Vac, 60 Hz

Table 8: Line Length

Type Of Equipment	Maximum Line Length Of Light Bar To Controller
48 W L-850s using 8 AWG wire	14,000 feet (if enclosure is mounted in the vault). This equates to a maximum round-trip line length of 28,000 feet.
62 W L-850s	13,000 feet.

Table 9: Load

Load is seven L-850A/L-850Fs for	Maximum load is 1500 VA
existing installations **Six L-850A/L-850Fs will be used for new installations**	

3.2.3 LAHSO Control Panel

The LAHSO Control Panel consists of:

- Microprocessor and memory.
- Lamp failure detection circuit capable of detecting one or two lamps out.
- Two input ports capable of detecting 120 Vac levels.
- Four input ports capable of detecting 120 Vac, 48 and 24 Vdc levels.
- Eight relay contacts capable of supplying 120 Vac at one amp (7 NO, 1 NO/NC).
- RS-422 port capable of communicating via protocol.

3.2.4 Power Supply for LAHSO Controller

+ 5 Vdc @ 2 amps

+ 16 Vdc @ 100 mA

-16 Vdc @ 100 mA

4.0 Installation

WARNING

Electric Shock

- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow these warnings may result in serious injury or equipment damage.

This section provides installation instructions for the indoor and outdoor Land and Hold Short Operations (LAHSO) Power Control Unit (PCU). Refer to FAA specification AC 150/5340-30 for L-884 LAHSO installation.

Note

The LAHSO is not designed to be installed in the safety area.

LAHSO installation involves mounting and wiring the LAHSO, connecting the Remote control interface, and calibrating and turning on the LAHSO system.

Note

The outdoor LAHSO installation differs from the indoor LAHSO installation in the following ways:

- Photocells are already mounted.
- Current sensors must be mounted in a separate box or L-830 secondary must be brought in. The primary edge circuit wire may also be run through the current sensors directly.
- Does not use an output transformer.

Note

If using the L-850F light fixture, input power must be cycled off/on to manually switch back to the primary lamp bar.

4.1 Mounting and Wiring the LAHSO Components

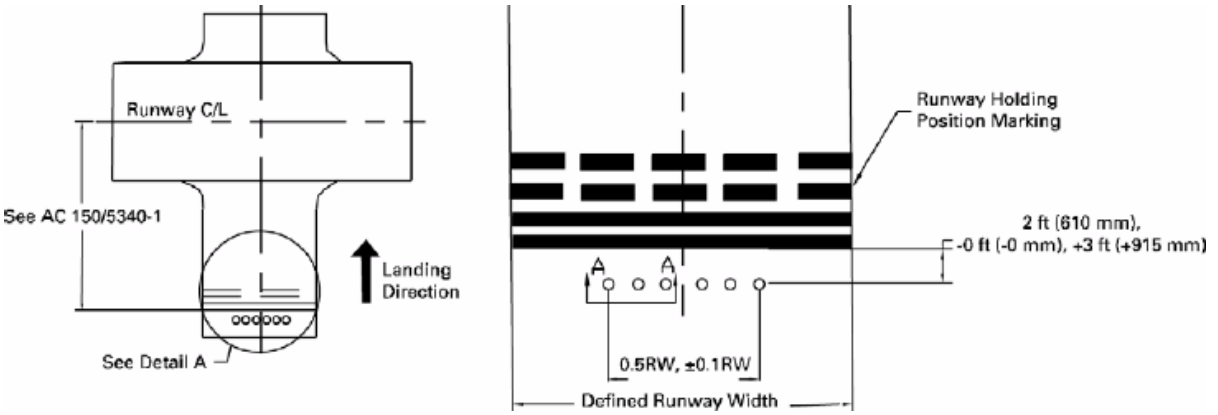
To mount and wire the LAHSO system, perform the following procedure:

1. Install the LAHSO light fixtures on the runway in accordance with airport plans and FAA Advisory Circular AC 150/5340-29.

Note

See Figure 39 and, for standard contact wiring schematic and see Figure 40 and Figure 41 for the dry contact wiring schematic.

Figure 2: LAHSO Fixture Installation



2. Connect the appropriately sized L-830 isolation transformers to the LAHSO light fixtures.

Note

ADB Safegate unidirectional L-850A or L-850F F-Range fixtures use a 48 W lamp.

Use a 45 W, 6.6 A/6.6 A, L-830-1 isolation transformer with these fixtures.

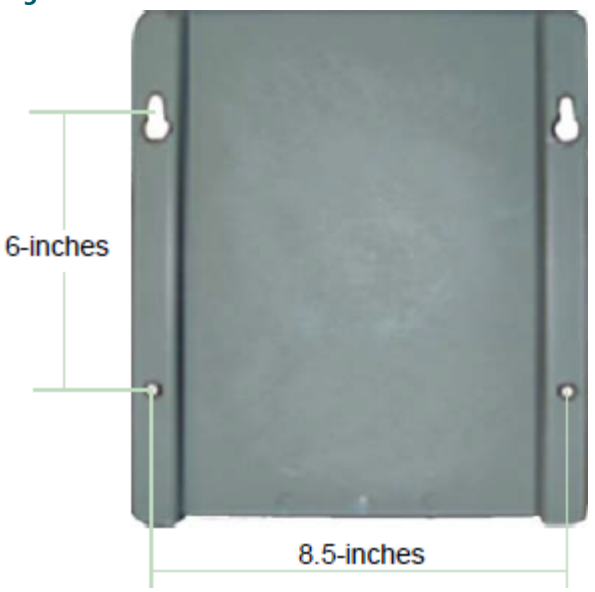
Figure 4 shows the L-850A installation. L-850F installation is the same as L-850A installation except that the L-850F light fixtures require a separate circuit and L-830 isolation transformers for the backup lamps.

Indoor L-884 – Mounting the Isolation Transformer

The indoor LAHSO requires an output transformer to be installed external to the indoor enclosure.The output transformer isolates the field circuit from earth ground and the PCU. This feature allows the circuit to float like a CCR field circuit.

See Figure 5 and Figure 6 for wiring the transformer. The output transformer is installed near the input side of the LAHSO enclosure. The transformer enclosure has knock-outs on the sides and an access door on the bottom of the enclosure to make necessary wiring connections. The transformer weighs 47 lbs. and should be mounted solidly against a wall or by using u-channels or similar type of mounting rails.

Figure 3: Rear view of the Isolation Transformer



There are 2 mounting holes located in each of the mounting rails on the side of the transformer.The vertical centerline between the mounting holes is 6.0 inches. The horizontal centerline between the mounting holes is 8.5 inches. The holes will accommodate ¼-20 mounting bolts.

Figure 4: L-850A/L-850F Installation

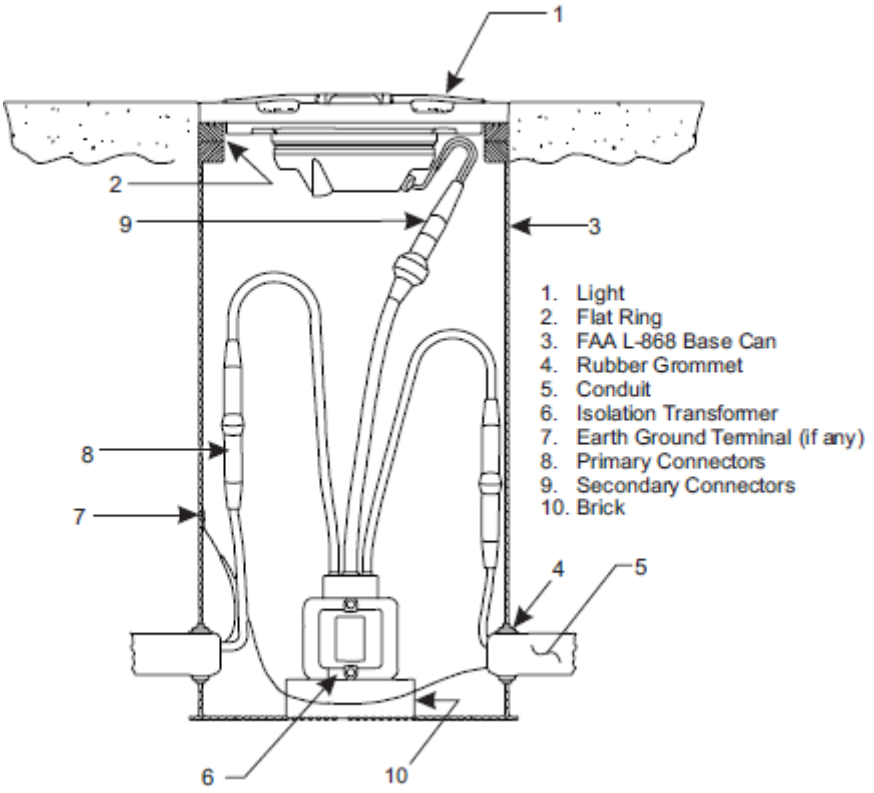
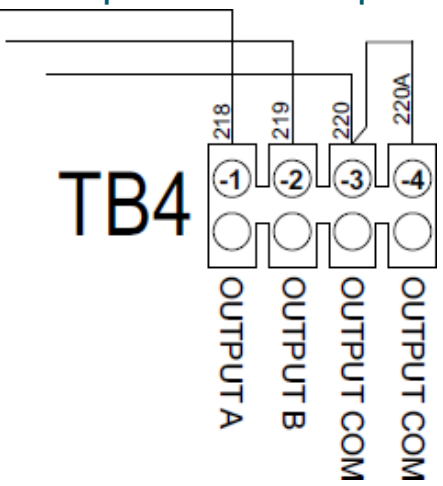


Figure 5: Output Sources for Hookup



3. Mount the LAHSO PCU in the proper location.
   See Figure 4 or Figure 5 for the box dimensions.
4. (For Indoor Unit Only) Mount the two photocells in the proper location outside the vault.
   Orient the photocells so that they point north.
5. Mount the two current sensors.

> **Note**
> See Figure 6. The current sensor may be mounted in a separate enclosure, if desired.

6. See Figure 6 through Figure 8.
   Run the wire for the Runway Edge Circuit (that the LAHSO is on) through the center holes in current sensors CT#1 and CT#0.
7. Wire the entire LAHSO system according to airport plans.
   See Figure 6 through Figure 8 for general guidance.
8. See Figure 39 and Figure 40 in the Wiring Schematics section also refer to Figure 30.
   Wire the two photocells to terminal TB3.
9. Wire the current sensors 0 and 1 to TB3 as illustrated on Figure 8.

   Also refer to Current Sensing Relays.

> **Note**
> See Figure 32 for alternate current relay sensor wiring.

10. See Figure 9.
    Run a wire from TB3-24 and TB3-26 to Neutral. Run a wire from a 120 Vac voltage source or CCI to current sensor #0 and then do the same for sensor #1. Run a wire from current sensor #0 to TB3-25. Run a wire from sensor #1 to TB3- 23.
11. If the L-850A light fixture is used for LAHSO lights, connect the LAHSO field circuit to TB4, OUTPUT A and OUTPUT COMON.

    -**OR**-

    If L-850F backup lamps are implemented, connect the primary lamp circuit to OUTPUT A the backup lamp circuit, connect to OUTPUT B. Both circuit returns connect to TB4 COMMON. See Figure 5, Figure 39 and Figure 40.

> **Note**
> The LAHSO PCU is designed only for use with L-850A or L-850F F-Range light fixtures that do not use a film disc cutout.

Figure 6: Block Diagram for LAHSO Wiring (L-850A Fixtures)

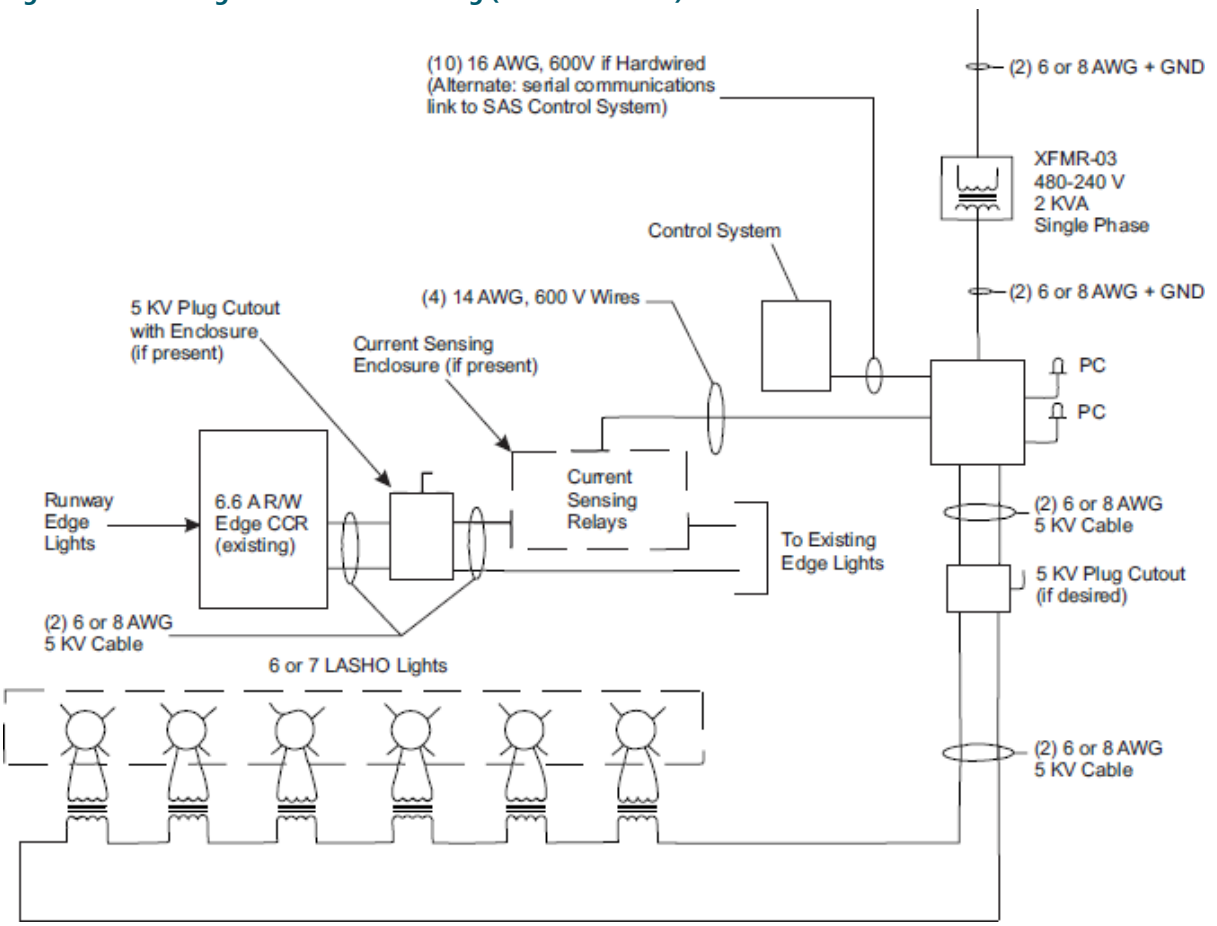


Figure 7: Block Diagram for LAHSO 4-Wire Connection (L-850F Fixtures)

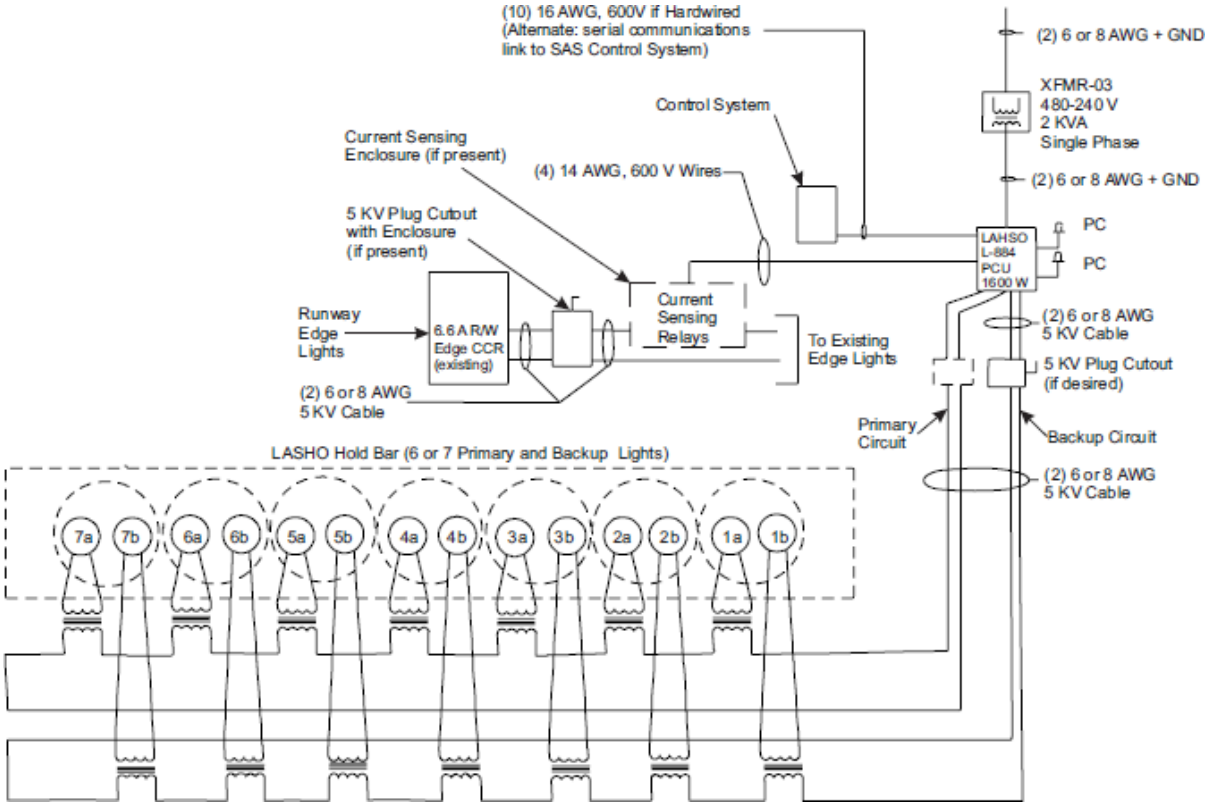
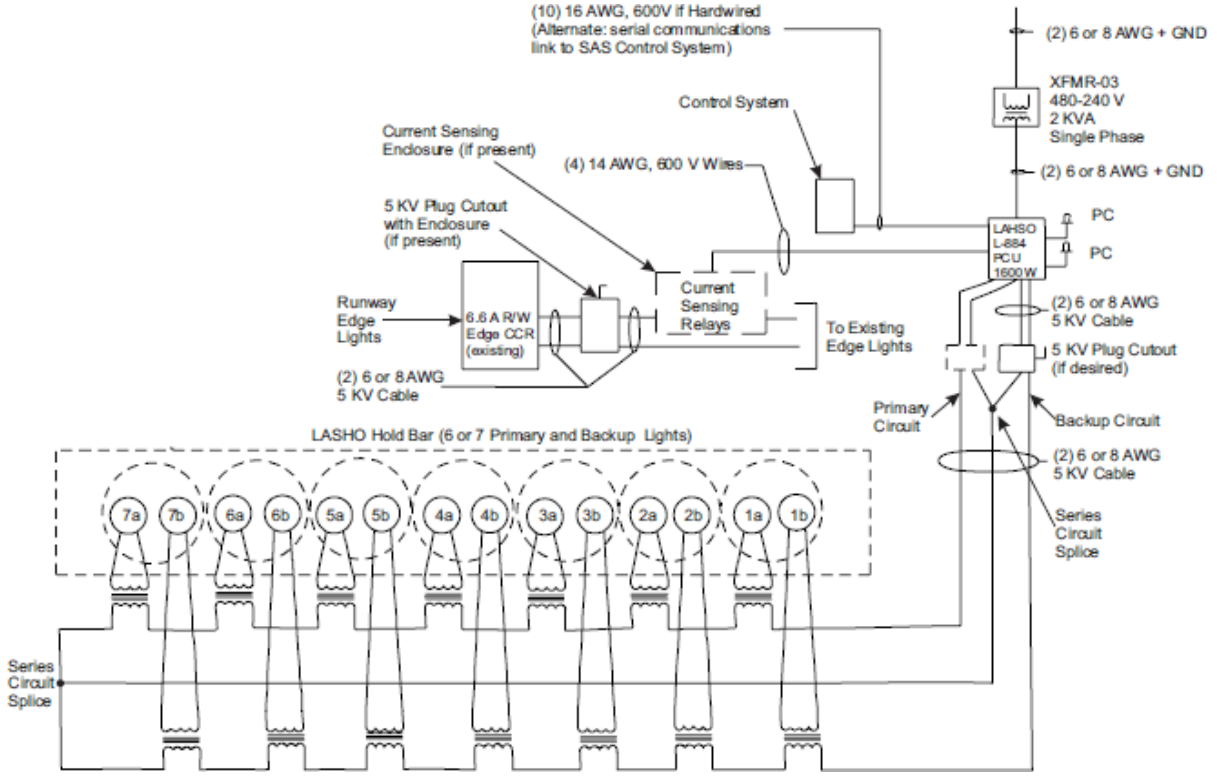


Figure 8: Block Diagram for LAHSO 3-Wire Connection (L-850F Fixtures)



4.2 Connecting a Remote Control Interface

This subsection provides instructions for connecting the outputs and inputs for the Remote Control Interface. See Figure 39 through Figure 40 in the Wiring Schematics section.

4.3 FAA Specified Outputs

Table 10: LAHSO Outputs

OUTPUT	FUNCTION
LAHSO On	Active when LAHSO is flashing lamps.
LAHSO in Remote mode	Active when local panel is set to Remote mode.
Backup Lamps in Use	Active when optional backup lamps are configured and being used.
Fault	Active when fault condition exists.

4.4 FAA Specified Inputs

Table 11: LAHSO Inputs

INPUTS	DESCRIPTION	EFFECT
Reset Alarm	Activates to cancel FAULT alarm	Cancels FAULT alarm
Remote Power On	Activates flash if Local control is set to Remote mode	Causes lamps to flash

4.5 ADB SAFEGATE LAHSO Calibration Procedure

The following procedure will follow the LAHSO calibration process and provide step by step instructions for performing the calibration for a single circuit LAHSO.

Note

If the LAHSO has a backup circuit, refer to the manual flowchart. The procedure is the same as listed below, but after performing the calibration on the primary circuit the LAHSO will restart the procedure on the backup circuit. Be aware and prepared if a backup circuit is present. *** Be aware that the LAHSO calibration will require fixtures to be removed from the circuit, so field personnel will need to be on hand to assist with the calibration procedure. In between steps, the LAHSO shuts off, so no current should be present in thecircuit.

Note

Read completely through this document before performing the procedure.

Note

Before calibrating the Runway Edge Circuit, set the current relay jumper in the proper position.

For 6.6 A, do not use a jumper.

For 20 A, place jumper in the MID position.

Calibrating Current Sensors (3-Step Runway Edge Circuit)

Note

Refer to Table 18 intensity settings.

The calibration of the LAHSO is performed by following the steps listed below:

1. Make sure all fixtures are working in the field. If a backup circuit is connected, verify that all fixtures are functional for that circuit as well. To properly calibrate the LAHSO, no lamps can be out.
2. The LAHSO may or may not be showing “Uncalibrated”. If it is showing this alarm condition, the following procedure will clear the alarm.

   Note

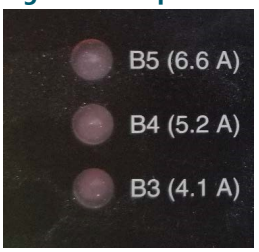
   If the LAHSO unit has been running for an extended time it might be necessary to power cycle the unit. In some extreme cases it has been noted that the LAHSO will start the calibration but will stop at Step B5 during the “CAL-ALL” process.

3. Note that the LED Status Color Code (See Figure 1) at the bottom left of the LAHSO front panel is not an alarm panel. The colors, and the respective statuses marked to the left, are representative of the potential states of the LED indicators on the panel.

Figure 9: LED Status indicator color code reference

4. The image below shows the Step indicators. See Figure 2

Figure 10: Step Control indicators



5. Make note of the indicated items below. See Figure 3

   a) Item #1 is the Enter button

   b) Item #2 is the Calibrate button

   c) Item #3 is the Uncalibrated indicator

   d) Item #4 is the Remote Local Switch

   e) Item #5 is the Exit/Clr button

Figure 11: Front Panel and Remote/Local Switch

6. The first step of the calibration procedure is to turn the Local Control switch to the OFF position. Verify that the LAHSO unit is off, and no current is flowing in the circuit.

CAUTION

Even though the switch is in the OFF position, the LAHSO will turn on during the calibration procedure, so make sure all personnel are clear of the circuit when the unit cycles through the steps.

Figure 12: Remote/ Local Switch in the OFF position

7. Press the Calibrate button located to the left and below the display screen. The Calibrate button (Item #2) can be seen in Image #3. The display should show the dialogue as seen in Image #5 below. Note that the LAHSO is not ON at this point. If there is a need to exit the calibration at any time, use the Exit/Clr button (Item #5) shown in Image #3.

Figure 13: Beginning of the calibration process

Turning ON the LAHSO:

DANGER

The following steps will cause the LAHSO unit to turn ON. Make sure all personnel are aware and clear of the circuit.

8. Once it has been confirmed that all fixtures are connected, press the Enter button and the LAHSO will start the calibration process. The LAHSO display will show “CAL-ALL” and it will start at step B5. At this point, the LAHSO is ON, and current is flowing in the circuit.

Figure 14: CAL-ALL at Step B5

9. The LAHSO will automatically start cycling through the step to continue the calibration. Verify that the fixtures are flashing in the field. The below image shows the LAHSO now at step B4.

Figure 15: CAL-ALL at Step B4

10. The LAHSO will automatically continue to step B3.

Figure 16: CAL-ALL at Step B3

11. After performing the calibration with all fixtures present, and operational, in the circuit. The LAHSO will turn OFF and the display will show the dialogue shown in Image #9. The LAHSO is now ready for the two lamps out sequence. At this time, two fixtures should be removed from the circuit.

Figure 17: 2-OUT/ Start of sequence

12. Once the fixtures have been removed and airfield personnel are clear, press the ENTER button and the calibration will continue. The process is the same as the ALL-CAL sequence. Note that the LAHSO will once again start at Step B5. Verify that the fixtures are flashing in the field, except for the two that have been removed.

Figure 18: CAL-TWO at Step B5

13. The LAHSO will automatically continue to Step B4.

Figure 19: CAL-TWO at Step B4

14. The LAHSO will automatically continue to Step B3.

Figure 20: CAL-TWO at Step B3

Shut OFF the LAHSO

Note

Refer to Table 18 intensity settings.

15. Once the LAHSO has finished with the CAL-TWO sequence, the unit will shut OFF. It is now time to install one of the two removed fixtures back into the circuit. The following process will be with only one fixture removed from the circuit.

Figure 21: Start of the 1-OUT sequence

16. Verify that only one fixture has not been removed from the circuit. If so, then once all personnel are clear of the circuit, press the ENTER button to continue with the final calibration sequence. As in the previous sequences, the LAHSO will start the calibration in Step B5. Verify that all but the removed fixture is flashing in the field.

Figure 22: CAL-ONE Step B5

17. 17. The LAHSO will automatically continue to Step B4.

Figure 23: CAL-ONE Step B4

18. The LAHSO will automatically continue to Step B3.

Figure 24: CAL-ONE Step B3

19. Once the LAHSO turns OFF, install all removed fixtures. Verify that airfield personnel are clear and then power cycle the LAHSO unit. Return the Remote/ Local control switch to the “REM” position. The calibration is now complete, and the “Uncalibrated” indicator should be no longer be lit.

Figure 25: CAL-END/ End of the calibration sequence

20. The link below is to the ADB SAFEGATE LAHSO web page. The latest manual can be obtained by clicking on the “Manual” tab and downloaded the attached document. The Calibration flowchart is included towards the back of the manual should there be any questions.

Note

https://adbsafegate.com/product-center/airfield/power-equipment/L-884-LAHSO-PCU-land and-hold-short-operations-power-and-control-unit

4.6 Setting Dip Switches

Check the two sets of dip switches (SW2 and SW3) on the LAHSO control board to make sure that they are set properly for the desired LAHSO configuration. Refer to Table 12.

Table 12: Setting SW2 and SW3 Dip Switches

SWITCH	POSITION
SW2 position 1	On = High intensity Runway Edge Lamps - default position Off = Medium Intensity Runway Edge Lamps
SW2 position 2	On = Default position Off = Bootstrap enabled (used for diagnostics)
SW3 position 1	On = Runway Edge Lamp current transformer enabled Off = Runway Edge Lamp current relay enabled - default position
SW3 position 2	On = backup lamps installed Off = backup lamps not installed - default position

4.7 Turning on LAHSO

This subsection provides the standard test procedure for turning on the LAHSO system.

To turn on the LAHSO system, perform the following test procedure:

1. Apply power with the LAHSO Rotary Switch set to OFF.
2. Turn the Rotary Switch to Step B3.
3. Verify that the LAHSO lamps are pulsing and that no alarms occur.
4. Verify the operations of the Rotary Switch when set to Step B4 and Step B5.
5. Set the rotary switch to Remote.
6. Verify the Remote ON/OFF functions properly.
7. Vary Runway Edge Circuit intensity and verify that LAHSO lamps change to the proper intensity.

4.8 LAHSO Output Current Adjustment Procedures

This subsection provides procedures for adjusting output current and over-current.

Note

The LAHSO has been adjusted at the factory to provide the nominal output current levels but, due to field circuit differences the LAHSO will likely need the output current settings adjusted.

If the current level settings need to be adjusted, read the following warning statement before proceeding.

WARNING

Read installation instructions in their entirety before starting installation.

- Never service the LAHSO when it is in protective shutdown mode, remote controls or power fluctuations can restart the LAHSO.
- Turn the rotary selector switch on the front panel of the LAHSO PCU to position OFF. Remove input power before servicing control circuitry.

Failure to follow these warnings may result in serious injury or equipment damage.

4.9 Adjusting Output Current

To adjust the output current, perform the following procedure:

1. Connect a clamp-on True RMS-reading instrument (such as a Fluke 87 multi-meter with Y8101A current clamp or equivalent) around one of the output current leads.

   Note
   Make sure the meter is set on the AC current scale.

   Because the output current waveform is not a true sine wave, the ammeter must be of the True-RMS type. Field instruments such as clamp-on ammeters and Simpson voltmeters will give erroneously low readings.

2. Verify that the Control PCB jumper J9 (1) is set to the 3-step setting.
3. Turn on the LAHSO and set local control switch to the highest intensity step.

   Note
   See. The external True-RMS ammeter should read 6.60 ±0.1 amps.

   If the reading is outside of this range, adjust the output current with push-buttons **INC** and **DEC** (2) on the Control PCB until the correct current is obtained. Press and hold the **SAVE** push button (3) for two seconds to save the setting.

   Each LAHSO output current step is independently adjustable and must be independently saved.

4. Set the local switch to next to the lowest brightness step, and verify that the True-RMS ammeter reading corresponds to Table 13

   If the reading is not in the current value range given in the Tables, adjust the appropriate step until the correct current value is obtained.

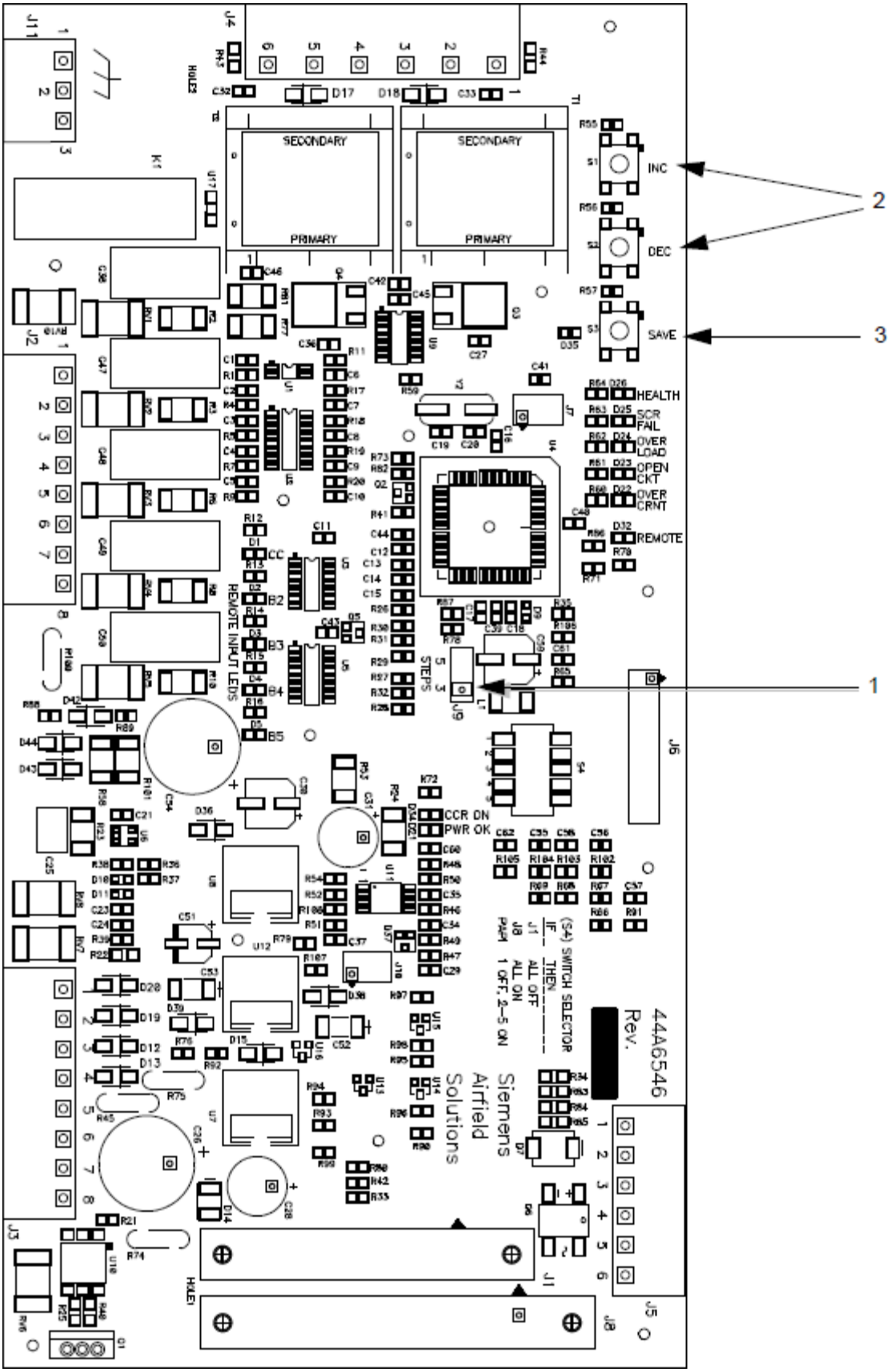
5. Repeat Step 4 for the remaining lower brightness step(s).
6. When the output current adjustment has been completed, turn off the LAHSO.

Close all panel doors before returning the LAHSO to an operational status.

Table 13: Output Current from the Rotary Switch

If you set the rotary switch to the following...	The result is...
B3	4.1 A current output
B4	5.2 A current output
B5	6.6 A current output

Figure 26: Control 44A6546/LAHSO PCB



4.10 Adjusting Over Current

Before adjusting the over current, set up the LAHSO and adjust the output current. Refer to

To adjust the over current, perform the following procedure:

1. Short the output of the LAHSO so the field circuit cannot be damaged by an over current situation.
2. Connect a clamp-on True RMS-reading instrument (such as a Fluke 87 multi-meter with Y8101A current clamp or equivalent) around one of the output current leads.

   Note
   Make sure the meter is set on the AC current scale.

   Because the output current waveform is not a true sine wave, the ammeter must be of the True-RMS type. Field instruments such as clamp-on ammeters and Simpson voltmeters will give erroneously low readings.
3. Turn the local switch to the highest brightness step.
4. Press and hold for three seconds both the **INC**and **DEC**push buttons (2).
   The LED next to the **SAVE** button (3) will light when you are in the Over current Adjustment Mode and the output current will increase slightly.

   Note
   The LAHSO output current will change to the level previously set as the over current level.
5. Press the **INC**or **DEC** push buttons (2) until you reach the desired Over current level.
   (i.e. 5%=6.93 A)
6. Press and hold the **SAVE** push button for two seconds.
   The SAVE LED will go out and the LAHSO output will go back to the top step setting.
7. When the over current adjustment has been completed, turn off the LAHSO.
   Close all panel doors before returning the LAHSO to an operational status.

5.0 Operation

LAHSO lights are flashing in-pavement white lights designed to pulse simultaneously so that they are distinguishable from the various runway lights. The lights pulse from one of the three steps (6.6 A, 5.2 A, or 4.1 A) for 1.72 seconds and then to 1 A for 0.46 seconds. The pulsing lights provide an effective visual cue for the pilot from short final through the landing roll out, indicating the point beyond which the landing aircraft is not authorized to proceed. Either six or seven unidirectional clear L-850A or L-850F lights (without film disc cutouts) are used.

The L-884 PCU consists of a microprocessor-controlled circuit that regulates the output current in a manner similar to an L-828 constant current regulator.

ON/OFF control is activated from the Air Traffic Control Tower or by a local control switch on the PCU (See Figure 3). If the PCU local control switch is in the Local position (OFF or B3/B4/B5), then the Field/Tower PCU contact will open, activating a “Field Control” light on the LAHSO panel. When the PCU local control switch is in the Remote position, the Field/Tower PCU contact will close, activating a “Tower Control” light on the LAHSO panel.

The PCU photocell defines whether day or night conditions exist. During daytime, the intensity is always set to B5 (6.6 A) even if the runway edge lights are off. At nighttime, the PCU uses two current sensing relays (mounted separately) to monitor the intensity of the corresponding HIRL (5-step) or MIRL (3-step) runway edge lighting circuit and to automatically set the intensity step. Alternately, an L-830 transformer can be used to monitor the runway edge circuit.

A fault alarm is generated if one of the following conditions occurs:

- Failure of the PCU electronics due to failure of the DC power supply (Time Delay = 0 sec)
- Loss of input power to PCU (Time Delay = 0 sec)
- Failure to pulse the lights (Time Delay = 5 sec)
- Two or more lights in a bar have failed (Time Delay = 5 sec)

The PCU has the following fail-safe modes:

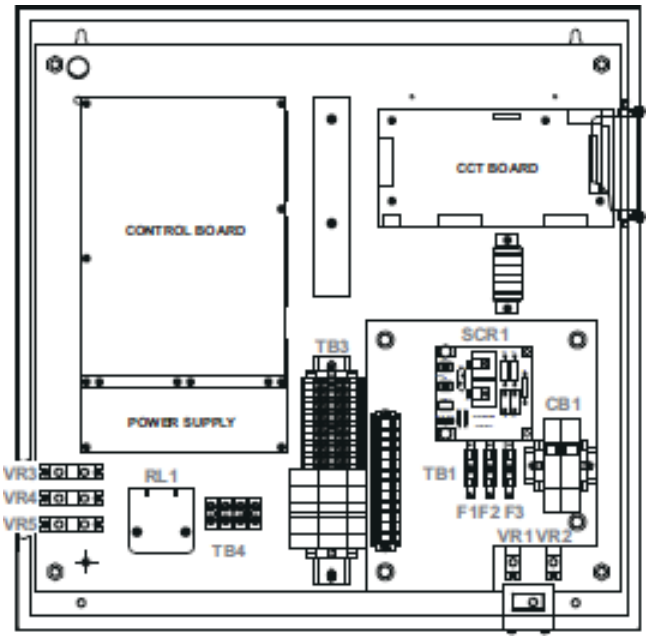
- If the photocell fails, intensity reverts to the highest step
- If PCU DC power supply fails (using either L-850A or L-850F lamps), a Fault alarm is generated and LAHSO lamps go OFF
- If L-850A fixtures are used or if the LAHSO PCU has switched to the backup L-850F lamps and if the number of lamps out for Fault alarm occurs, then a Fault alarm is generated and the remaining LAHSO lamps continue to pulse

Note

The PCU is not designed for use with an L-847 Circuit Selector Switch.

This subsection describes the LAHSO PCU theory of operation. This includes current regulation, SCRs, contactor, transformer, on/off control, and current sensing relays.

Figure 27: PCU Main Assembly (Indoor LAHSO)



5.1 Current Regulation

Current regulation is obtained by using silicon controlled rectifiers (SCRs) to switch the supply power (varying the on duration of the AC cycle) to the applied load and by using feedback circuitry to monitor the PCU's output. The brightness level is selected from one of three preset values.

When the load varies, the feedback circuit changes the control-voltage level, which changes the conduction angle of the AC voltage to the SCRs to allow power to flow into the field circuit. This changes the supply power flow to the field circuit to compensate for the load variation and to maintain the output current at the preset level.

Note

For outdoor LAHSO only: Unlike the CCR, the field circuit in the PCU is not isolated from the input power.

5.2 SCRs

When power is applied, contactor K1 and circuit breaker CB1 are closed. Current does not flow to the field circuit until the SCRs (located on the SCR PCB) receive a triggering pulse. When this pulse occurs, the SCRs turn on, allowing current to flow to the field circuit until the SCR is switched off by the zero crossing of the input power. Since alternating current is used for the regulator operation, after zero-crossing the current flows in the opposite direction using the other SCR.

The power level in the field circuit is controlled by varying the phase of the conduction angle. If very low output current is desired, the conduction angle would be near zero degrees, that is, the SCR is not triggered until the input voltage is near zero-crossing. Little power is then available to the field circuit.

For maximum power to occur in the field circuit, the conduction angle is near 180 degrees. Immediately after zero-crossing of the input-power sine wave, the SCR is triggered and operates continuously throughout the 180-degree duration of the input sine wave.

For 67% power from the power transformer, the conduction angle is nearly 90 degrees. This occurs approximately at the voltage peak of the sine wave when the SCR switches into conduction. Switching the field circuit on-line at this time creates a rather abrupt rise time, since the input sine wave is at its peak voltage. Inductors L1 and L2 slow this rapid rise time from the conduction of the SCRs.

5.3 Contactor

In the event of an SCR failure, the contactor provides a means to break the current driving the field circuit. The contactor K1 has no making or breaking current across it, since the SCR is off when the contactor is opening and closing. This is accomplished by the coil-control circuitry and provides increased life for the contactor.

5.4 Transformers

Transformer T3A provides current feedback for the LASHO Control Board.

Transformer T3 provides current feedback for the CCT Board.

5.5 On/Off Control

On/off control is activated by the Air Traffic Control Tower (ATCT) or by a local control switch inside the PCU cabinet. While the PCU is in operation, a microprocessor monitors the field circuit and provides operational feedback on the functionality of the system and the status of the flashing lights.

5.6 Current Sensing Relays

The PCU uses two current sensing relays to monitor the intensity of the corresponding runway edge lighting circuit. These are necessary during night LAHSO operations because the intensity level of the LAHSO hold short position lights corresponds to the runway edge light intensity. The current sensing relays provide the microprocessor with the required feedback to monitor the edge light intensity.

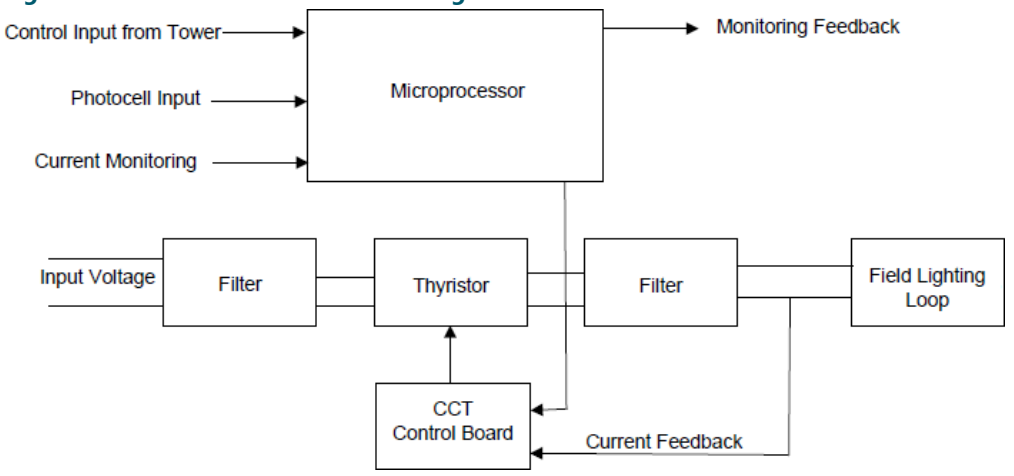
5.7 PCU Control and Monitoring Systems

This subsection describes the PCU control and monitoring systems.

5.8 Control System

See Figure 28. Power is delivered to the hold-short position lights through the PCU. The PCU controls the lamp intensity levels of the lights, accepts remote and local control, and provides remote alarm monitoring.

Figure 28: Power Control Unit Block Diagram



The hold-short position lights pulse simultaneously from one of three ON steps, B3 (4.1 A), B4 (5.2 A), or B5 (6.6 A) for 1.72 seconds and then to the OFF step (1 A) for 0.46 seconds.

The PCU develops a maximum output current (RMS) during the ON cycle within the limits of while powering any load between no load and full load.

Table 14: Peak Output Current

Nominal Output	Allowable Range
Step 5 (6.6) (High)	6.40 A-6.70 A
Step 4 (5.2) (Medium)	5.04 A-5.36 A
Step 3 (4.1) (Low)	3.98 A-4.22 A
Step 2	Not Used
Step 1	Not Used

During the OFF cycle, the PCU maintains 1 A (RMS) current through the lamps while powering any load between no load and full load. This (1 A OFF) state prolongs lamp life by preventing the lamp filaments from going completely out. It also lets the lamp flash on and off faster.

5.9 Monitoring System

The PCU has an integral monitoring circuit that monitors the status of the PCU, the series lighting circuit, and the lights. The PCU provides three indications of a system failure that include a dry contact closure, optional RS422 communications, and the local alarm. The monitor operates over all lighting intensities regardless of whether the PCU is in Remote or Local control.

The microprocessor continuously energizes the alarm relay while the PCU is operating properly. Should a failure occur, the monitor de-energizes a fault relay. This provides a dry contact closure. At the same time, the local alarm indicator illuminates (except in the event of a power loss).

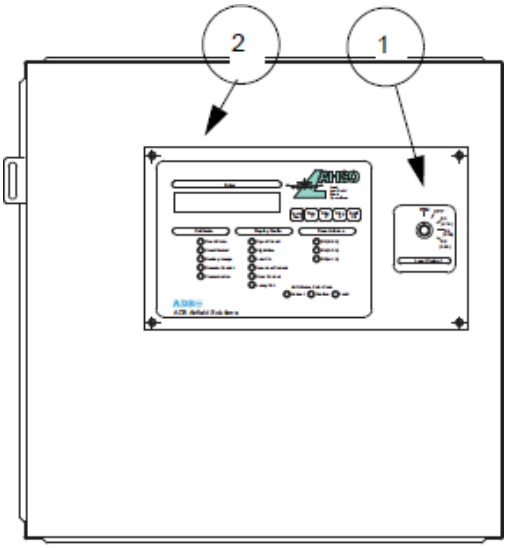
5.10 PCU Local Control Panel

This subsection describes the PCU local control panel touchpad switches and indicators. It also describes the rotary switch.

5.11 Touchpad Switches and Indicators

See Figure 29 for the touchpad switches and indicators. Refer to Table 15 and Table 16.

Figure 29: Local Control Panel Indicators and Switches



[1] Rotary Switch

[2] Display Panel touchpad

Table 15: PCU Touchpad LED Indicator Functions

INDICATOR	FUNCTION
Flash State	Lights GREEN when lamps are flash on.
Uncalibrated	Lights YELLOW if LAHSO needs calibration.
Backup Lamps	Lights YELLOW when optional backup lamps are being used.
Remote Control	Lights GREEN when the tower is controlling the LAHSO.
Com Active	Flashes GREEN whenever serial communication is active.
Open Circuit	Lights RED when an open circuit is detected.
Nighttime	Lights GREEN if nighttime. Extinguishes if daytime. Lights RED if a bad photocell is detected. Lights YELLOW when photocells are not in agreement.
Low VA	Lights RED when Step current is below tolerance.
Incorrect Current	Lights RED when Step current goes above tolerance.
Over Current	Lights RED when Step current is above safety limit.
Lamp Out	Lights YELLOW when one lamp out or one LAHSO sign has lost power. Lights RED when two or more lamps out. Lights RED when two or more LAHSO signs have lost power.
B5 (6.6A)	Lights GREEN when CCR step B5 (6.6A) is selected. Lights RED when the CCT board has lost power or its flash capability.
B4 (5.2A)	Lights GREEN when CCR step B4 (5.2A) is selected. Lights RED when the CCT board has lost power or its flash capability.
B3 (4.1A)	Lights GREEN when CCR step B3 (4.1A) is selected. Lights RED when the CCT board has lost power or its flash capability.
Normal	Lights GREEN when system is operating normally.
Caution	Lights YELLOW when system has a fault that does not stop the system from operating. Indicates a need to press the Display Faults switch to display faults.
Fault	Lights RED when system has a critical fault that stops the system from operating. Indicates a need to press the Display Faults switch to display faults.

Table 16: PCU Touchpad Switch Functions

SWITCH	FUNCTION
Calibrate	Starts and controls the lamps out calibration sequence.
Display Faults	Displays all active LAHSO alarms.
Reset Alarms	Resets all LAHSO alarms.
Enter	Selects calibration sequence and diagnostic tests.
Lamp Test	Lights all the LEDs on the display panel
Diag 1	Enter LAHSO diagnostics mode
Diag 2	Select diagnostic test.
Diag 3	Select diagnostic test.
Exit/Clr	Exit calibration sequence or diagnostic test. Clear the display.

5.12 Rotary Switch

See Figure 29. Refer to Table 17 for rotary switch functions.

The rotary switch is used to select remote or local control.

Table 17: Rotary Switch Functions

Rotary Switch Setting	Function
REM	Allows PCU to be turned on and off remotely. Disables local control.
OFF	Local control. Cannot be turned on from a remote location.
B3	Local control. Forces PCU to pulse current to 4.1 A in the ON state.
B4	Local control. Forces PCU to pulse current to 5.2 A in the ON state.
B5	Local control. Forces PCU to pulse current to 6.6 A in the ON state.

When the local control selector at the PCU is set to Remote, all manual local control functions are disabled. Remote control from the Air Traffic Control Tower is strictly limited to on/off.

When the PCU is in local control, it overrides all automatic intensity control inputs. Local control at the PCU provides for on/off and manual intensity control.

Remote control is enabled by applying 48 Vdc or 120 Vac across TB3-21 and TB3-22.

Most installations achieve this by tying TB3-21 to N (TB3-15) and then sourcing CCI (TB3-13) to a Remote dry contact that then feeds back to TB3-22.

Refer to Table 18. When the PCU is operated in Remote control (Tower control), the intensity selection is dependent on two photoelectric cells and two current sensing relays (CSRs). When turned on, the microprocessor scans the photocell and the CSR inputs to determine the night and day mode and what intensity level to turn ON the lamps.

Table 18: Intensity Settings

Runway Edge Lights Intensity Step	Medium Intensity Runway Edge Lights	High Intensity Runway Edge Lights	PCU Intensity Step
5	--	6.6 A	High 6.6 A
4	--	5.2 A	High 6.6 A
3	6.6 A	4.1 A	Medium 5.2 A
2	5.5 A	3.4 A	Low 4.1 A
1	4.8 A	2.8 A	Low 4.1 A
OFF	OFF	OFF	Low 4.1 A

5.13 Current Sensing Relays

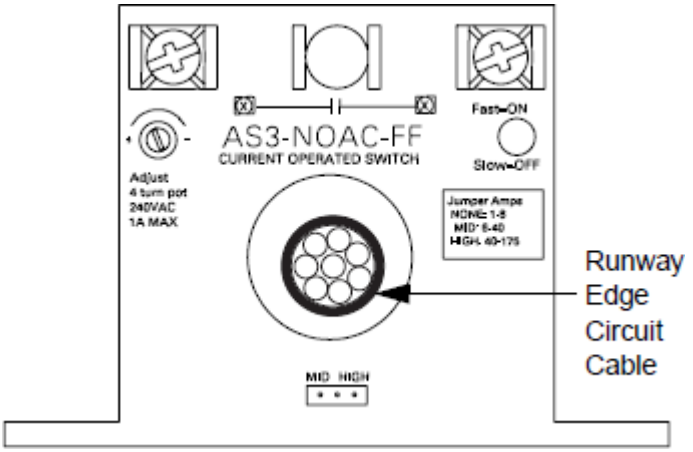
The corresponding edge light intensity levels are monitored by two current sensing relays (CSRs). The relays are mounted internal to the PCU cabinet and require a separate isolation transformer to be added to the edge circuit that is to be monitored and a wire pulled from the secondary of the transformer back to the PCU cabinet.

See Table 1. When the monitored edge regulator is turned on, the current output is detected as it flows through the CSR and the current operated switches are closed. The signal is then input into the microprocessor. This tells the microprocessor that the regulator has turned on and to what intensity level.

Note

Set the current sensor at the range required. The typical jumper amps setting (for the 6.6 A circuit) is NONE, as shown in Figure 30. For the 20 A circuit, jumper setting is MID.

Figure 30: Current Sensing Relay



See Figure 31 and Figure 32 for series circuit wiring and alternate wiring using isolation transformers. The appropriate runway edge lighting circuit is monitored by adding a 30/45 W isolation transformer in the loop and running the secondary through both CSRs. (The secondary of the isolation transformer will actually be shorted.)

Figure 31: Wiring Current Sensing Relay Using Series Circuit

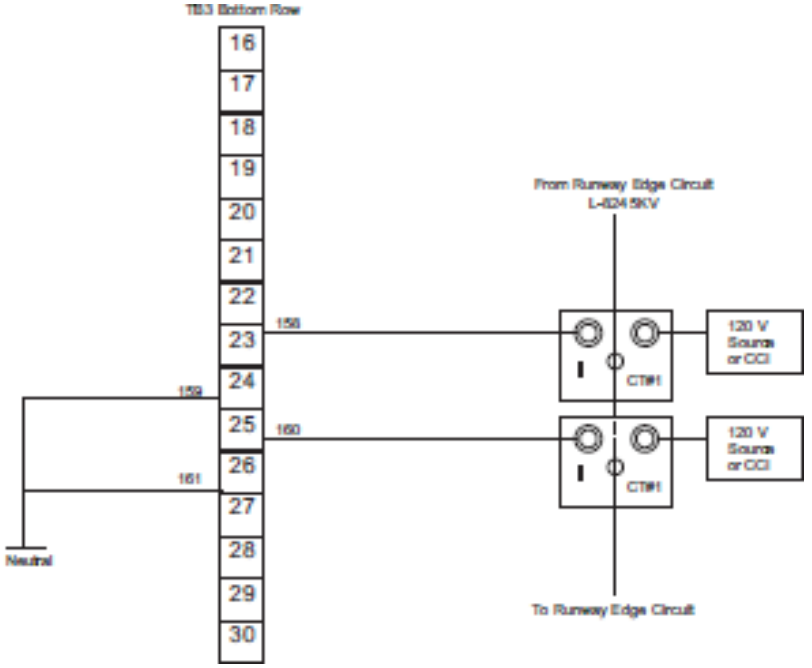
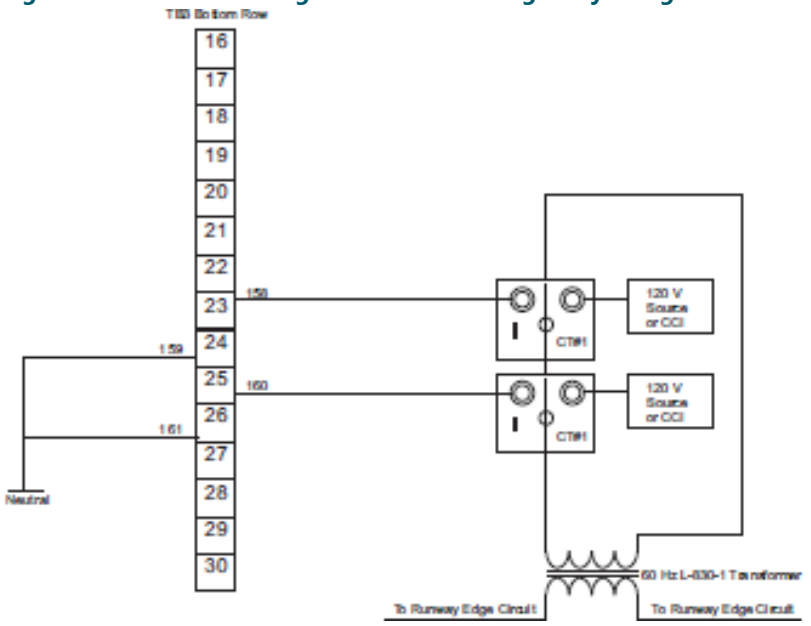


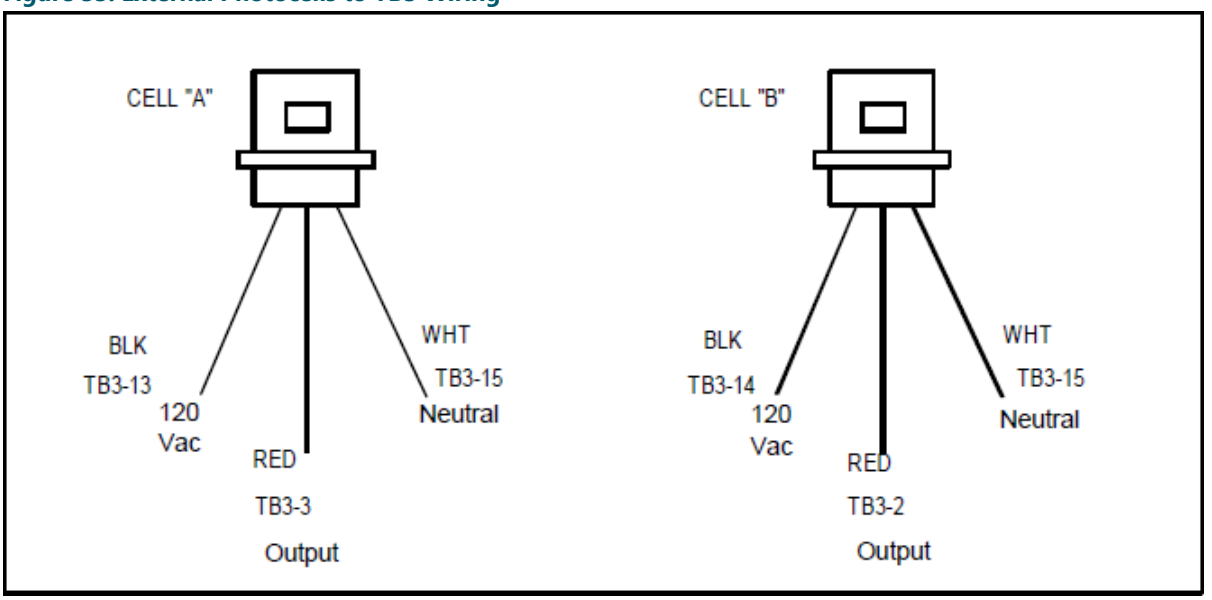
Figure 32: Alternate Wiring for Current Sensing Relay Using Isolation Transformers



5.14 Photocells

The photocell incorporates a time delay of 45 to 75 seconds to prevent erroneous tripping when switching from day or night mode. The day mode is activated when the illumination on the photocell rises to 58 foot-candles and the night mode is activated when the illumination drops to 35 foot-candles.

Figure 33: External Photocells to TB3 Wiring



5.15 Operation Procedure Details

This section provides operational procedures for indoor and outdoor Land and Hold Short Operations (LAHSO) power control units (PCUs).

5.15.1 LAHSO Monitoring Operational Procedures

This subsection provides information about LAHSO monitoring operational procedures. It includes procedures for turning on LAHSO and checking for CCT power and lamp flashing, over current, under current, sign failure, lamps out, and backup lamp operations.

5.15.2 Turning On LAHSO

See Figure 2.6. Turn on the LAHSO PCU by setting the LAHSO rotary switch to B3, B4 or B5 position. The PCU can also be turned on by the tower if the LAHSO rotary switch is set to the Remote position and the tower applies voltage to the remote power in connection.

5.15.3 Checking Power for CCT Board and Lamp Flash

Upon turning on the PCU, the LAHSO system checks for power on the CCT board and for CCT lamp flash operation. The B3, B4 and B5 LEDs are lit RED if either of these conditions are not normal. Refer to Table 22 for indicator functions. Refer to Table 19 for operational procedures.

Table 19: LAHSO Operational Procedures

To Produce This Result...	Perform This Procedure...	NOTE
Reset CAUTION or FAULT relay alarm	Depress the Reset Alarms switch on the local display panel or Activate the LAHSO Reset Alarms switch in the tower.	
Display specific FAULT relay alarm on the local display panel	Depress the Display Alarms switch.	Note [1]
Clear display on local display panel	Depress the Exit/Clr switch on the display panel.	Note [2]
Reactivate primary lamp circuit	Reset the LAHSO. (manually cycle the power)	
Reset LAHSO	Manually power-cycle the unit.	
View/reset the fault and caution alarms that have been activated by LAHSO	Refer to Diagnostic Procedures in Troubleshooting.	

Notes

1 Table 20 for specific local panel displays.

2 The B3, B4 and B5 LEDs are not reset until the problem is corrected. LAHSO operation does not function under this fault condition. The error condition is sent via serial communication to a host processor, if present.

Table 20: Local Panel Displays

When Lahso Does This ...	This Displays on Local Panel (When Display Alarms Switch Is Depressed) ...
Detects no power on the CCT board	URC-PWR
Detects no CCT lamp flash operation	NOFLASH
Detects open circuit	OPENCKT
Detects over circuit	OVER_I
Detects low current	LOW-VA
Detects high current	HIGHAMP
Detects lamps out condition	ONE-OUT or TWO-OUT
Activates back-up lamps	BKUPLMP
Detects sign failure	ONESIGN or TWOSIGN

Table 20: Local Panel Displays (continued)

When Lahso Does This ...	This Displays on Local Panel (When Display Alarms Switch Is Depressed) ...
Detects backup lamp out	ONE-OUT or TWO-OUT
Detects bad photocell	BADCELL
Detects primary lamps not calibrated	PRIMCAL
Detects backup lamps not calibrated	BKUPCAL

5.15.4 Checking for Open Circuit, Over Current, Current Out of Range, and Lamps Out

The LAHSO system checks for open circuit, over current, current out of range, and lamps out while the lamps are flashing. Refer to Table 19 and Table 20 for operational procedures and local panel displays.

If an open circuit or over current is detected, lamp flash current is turned off.

- Open Circuit LED is lit RED for open circuit.
- Over Current LED is lit RED for over current.
- FAULT relay alarm is activated if the LAHSO is running under remote operation.

If current out of range is detected, lamps continue to flash.

- Low VA LED is lit RED for low current.
- Incorrect Current LED is lit RED for high current.
- FAULT relay alarm is activated, if the LAHSO is running under remote operation.

5.15.5 Checking for LAHSO Position Sign Failure

The LAHSO checks for LAHSO position sign failure. Refer to Table 21 for indicator responses to sign failure. Refer to Table 19 for operational procedures.

Table 21: Indicator Responses to Sign Failure

If This Number of Signs Fail...	Alarms and Indicators Produce These Responses...
One	Lamp Out LED is lit YELLOW. CAUTION relay alarm is activated, if the LAHSO is running under Remote operation. One lamp out output is activated.
Two or more	Lamp Out LED is lit RED. FAULT relay alarm is activated, if the LAHSO is running under remote operation.

5.15.6 Checking for Lamp Out

Lamp out detection is not activated until the lamp out monitoring calibration has been performed. Refer to Lamp Out Monitoring Calibration Procedures in this section.

When a lamp out is detected, lamps continue to flash.

- Lamps out detection still functions for the rest of the lamps.
- Uncalibrated LED is lit YELLOW.

After the lamp out has been replaced, recalibration is recommended but is not required if the replacement lamp is the same wattage as the original lamp. The Uncalibrated LED can be extinguished by recalibrating the lamps or power cycling the LAHOS unit.

FAULT relay is activated if two lamps out are detected on the primary lamp circuit.

Refer to Table 22 for indicator responses. Refer to Table 19 for operational procedures.

Table 22: Indicator Responses to Lamp Out Condition

If This Number of Lamps is Out...	Alarms and Indicators Produce These Responses...
One	Lamp Out LED is lit YELLOW. CAUTION relay alarm is activated, if the LAHSO is running under Remote operation. One lamp out output is activated.
Two or more	Lamp Out LED is lit RED. FAULT relay alarm is activated, if the LAHSO is running under remote operation.

If lamp out is detected and backup lamps are installed and configured, flashing is switched to the backup lamps, if two lamps are out on the primary circuit.

- FAULT relay alarm is activated, if the LAHSO is running under remote operation until the backup lamps are determined to be working properly.
- Lamp Out LED is extinguished and the Backup Lamps LED is lit YELLOW.:

CAUTION

The relay alarm is activated, if the LAHSO is running under remote operation.

- Refer to Table 19 for operational procedures.

5.15.7 Checking Backup Lamp Out

If a backup lamp out is detected, lamps will continue to flash. Refer to Table 23 for LAHSO display panel indicator responses to backup lamp out. Refer to Table 19 for operational procedures.

Table 23: Indicator Responses to Backup Lamp Out Condition

If This Number of Lamps is Out...	Alarms and Indicators Produce These Responses...
One	Lamp Out LED is lit YELLOW. CAUTION relay alarm will be activated, if the LAHSO is running under Remote operation.
Two or more	Lamp Out LED is lit RED. FAULT relay alarm is activated, if the LAHSO is running under remote operation.

5.15.8 Automatic Monitoring Lights during Daylight and Darkness

To use the LAHSO PCU to monitor lights automatically during daylight and darkness, turn on the LAHSO rotary switch to the Remote position and activate the Tower's Remote control. Refer to Table 24 for LAHSO indicator responses to daylight and darkness.

Note

The LAHSO uses the photocell input to determine daylight or darkness.

Table 24: Indicator Responses in Daylight and Darkness

This Indicator Response...	Signals This Condition...
Nighttime LED is lit GREEN.	Darkness
Nighttime LED is not lit.	Daytime
Nighttime LED is lit RED.	Two photocells are not in agreement after a defined settling time.
Nighttime LED is lit YELLOW.	Two photocells are not in agreement and are being monitored for a user-specified time to resynchronize.
LAHSO lamps flash at the maximum brightness.	Daytime

During nighttime, the LAHSO monitors the runway edge light intensity to determine which brightness level to flash the LAHSO lamps. The runway edge lights can operate under either Medium Intensity Runway Edge Light (MIRL) or High Intensity Runway Edge Light (HIRL). The LAHSO is informed of the intensity level based on the position of the LAHSO board switch SW2-1. SW2-1 in the ON position indicates HIRL and in the OFF position it indicates MIRL. See Table 12

Either current relays or a current transformer monitors the runway edge light current. The LAHSO board switch SW3-1 in the ON position indicates a current transformer is monitoring the current. SW3-1 in the OFF position indicates current relays have been installed to monitor the current. Table 18 defines the LAHSO intensity settings for the various runway edge light intensity settings and the detected current.

5.15.9 Lamp Out Monitoring Calibration Procedures

This subsection provides lamp out monitoring calibration. See Figure 34 through Figure 36 for calibration without backup lamps. See Figure 37 for calibration with backup lamps.

Note

Once the calibration sequence is started, it must be finished for all lamps on, two lamps out and one lamp out. Otherwise the Uncalibrated LED remains lit since the full calibration sequence was not completed.

Figure 34: Calibration Without Backup Lamps (1 of 3)

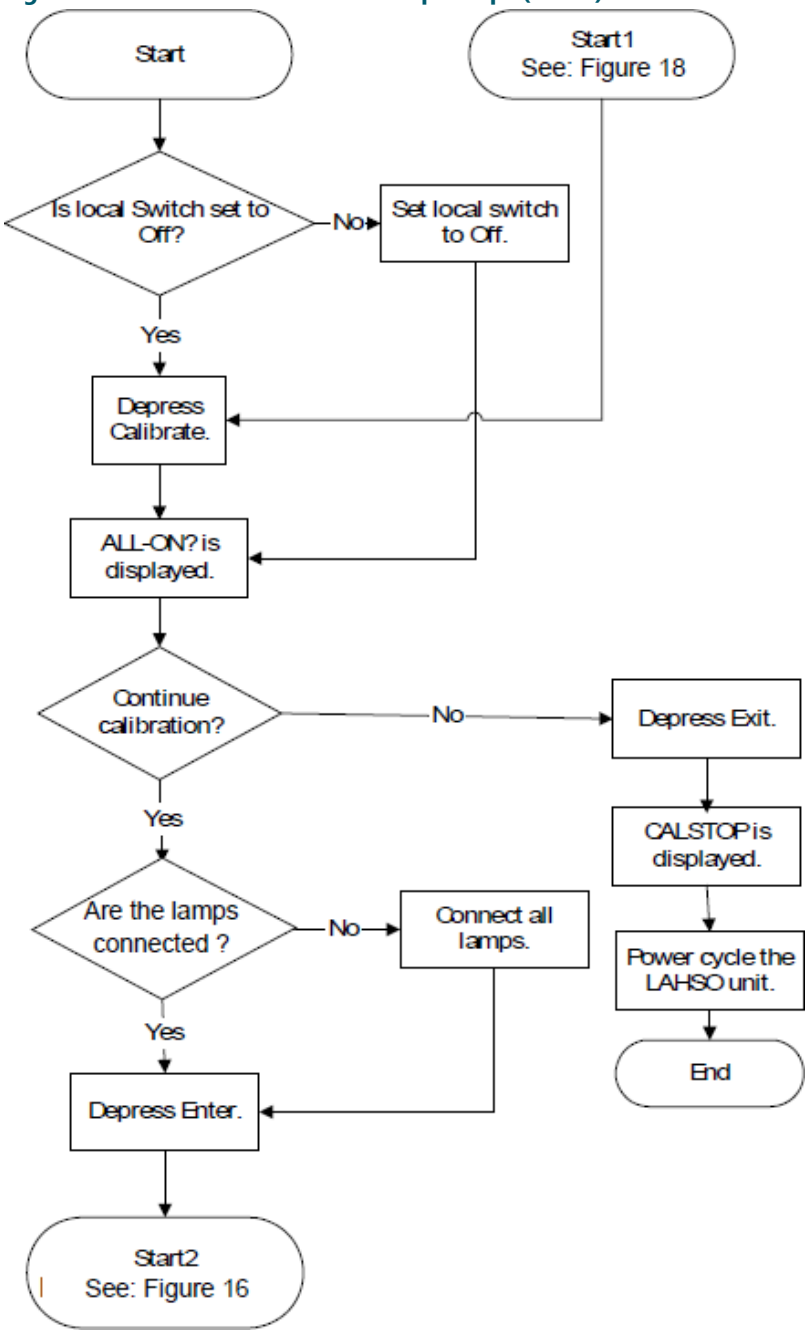


Figure 35: Calibration Without Backup Lamps (2 of 3)

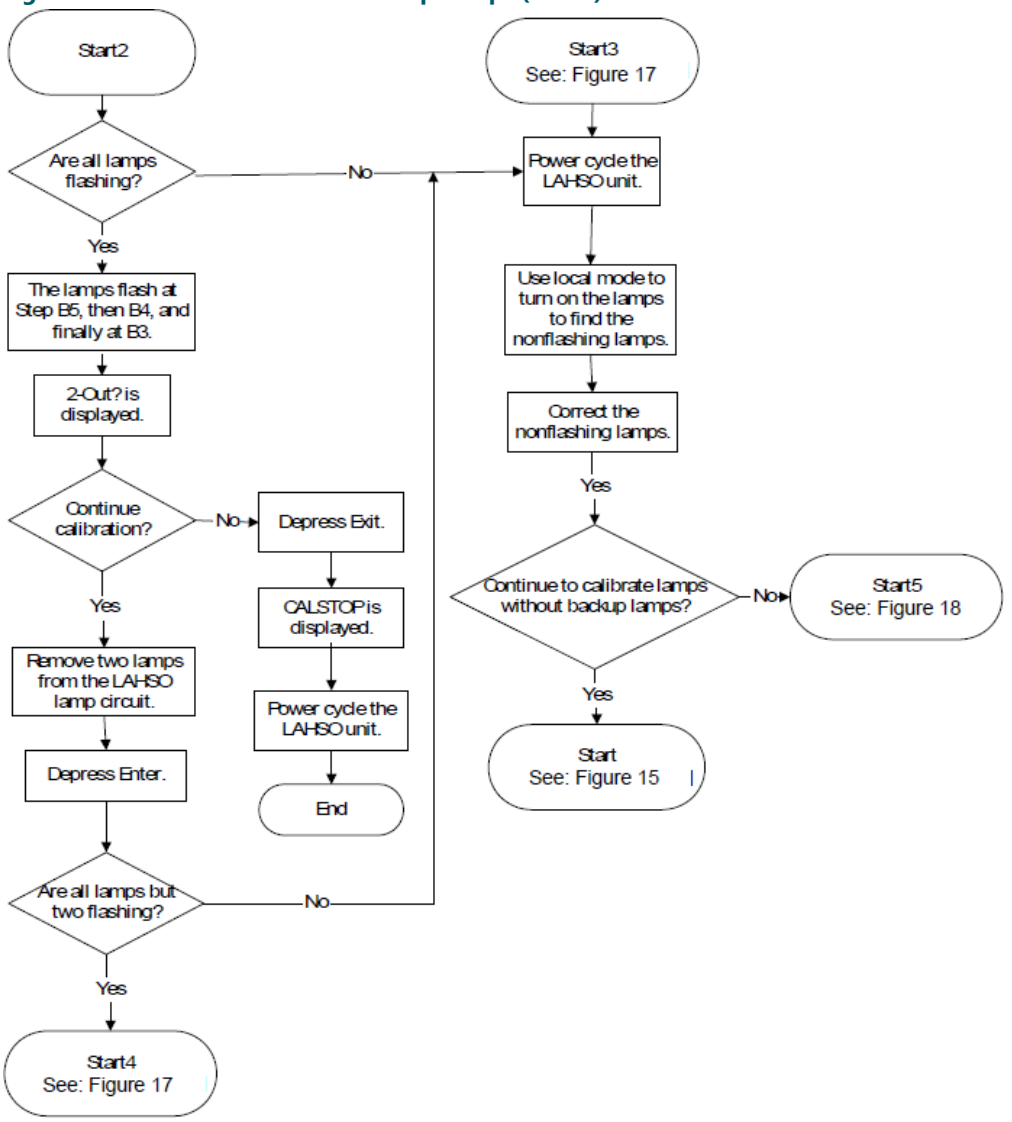


Figure 36: Calibration Without Backup Lamps (3 of 3)

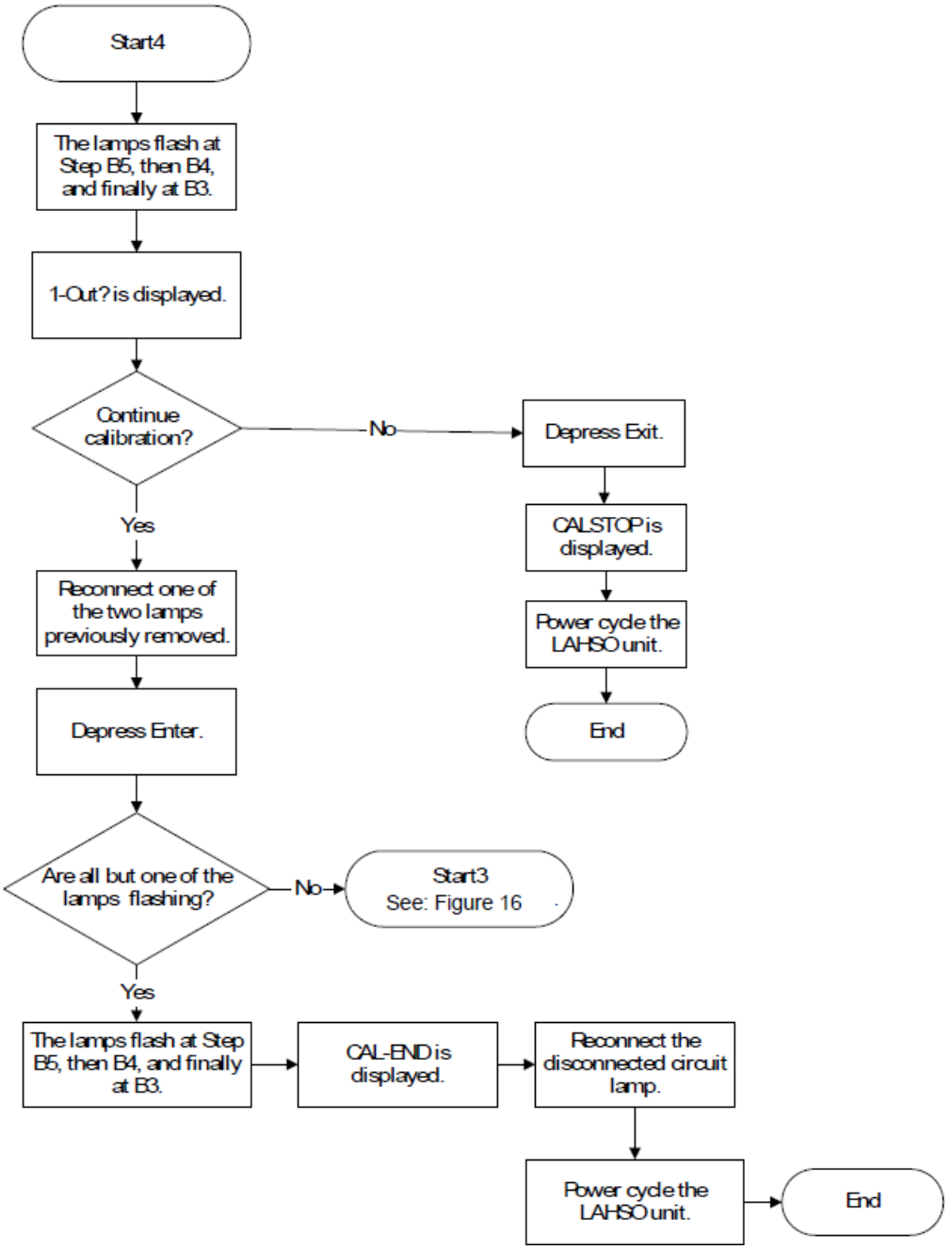
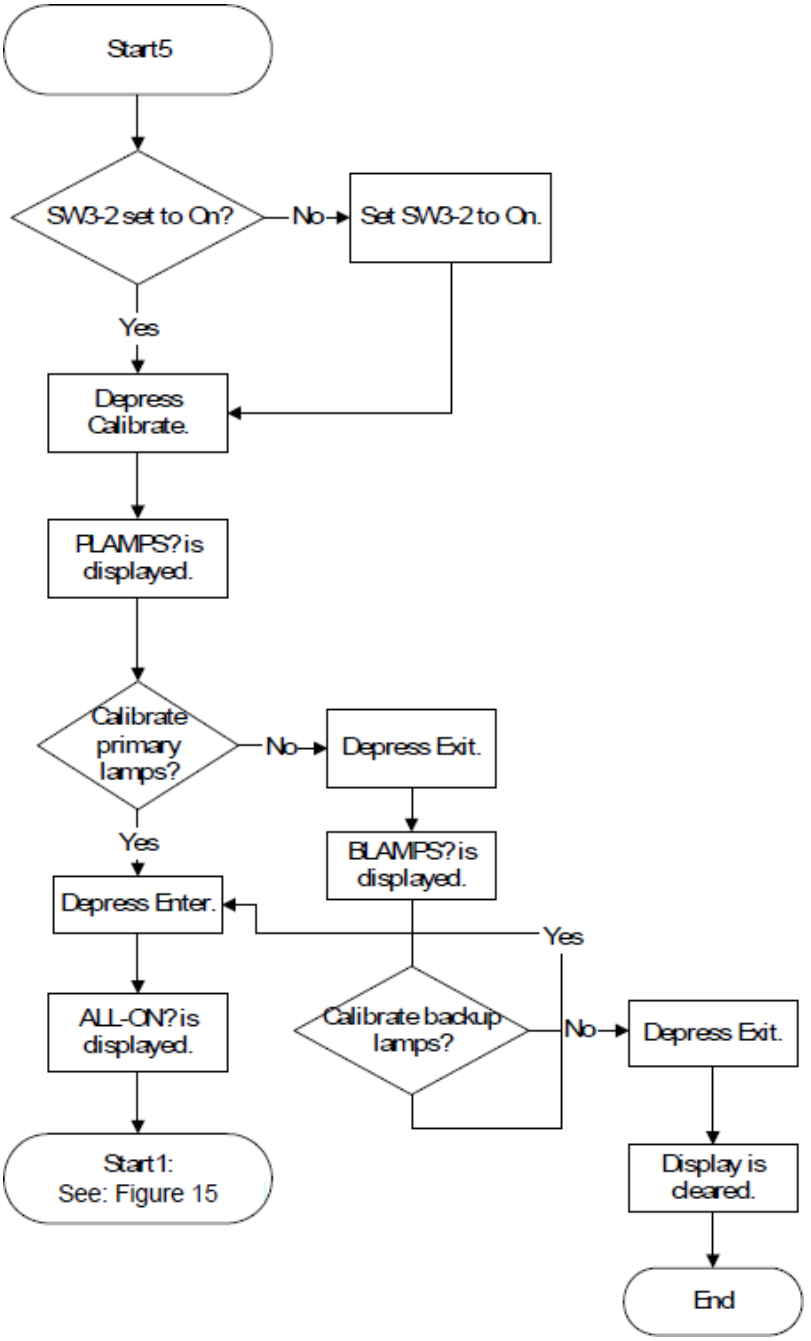


Figure 37: Calibration with Backup Lamps



5.15.10 LAHSO Operations

For L-850C refer to Table 25, and for L-850A refer to Table 26, LAHSO operations.

Note

Table 25 assumes L-850F fixtures are used with a primary bar of lights and a backup or secondary bar of lights

Table 25: LAHSO Operations (L-850C Only)

Operational Situation	Fault Alarm	Caution Alarm	1 Lamp Failed Alarm	Backup Mode Indication	Notes
Primary Bar; No Lamps Out	Deactivated	Deactivated	Deactivated	Deactivated	
Primary Bar; 1 Lamp Failed	Deactivated	Activated	Activated	Deactivated	
Primary Bar; 2 Lamps Failed (PCU switches to Secondary or Backup Bar)	Activated for a short period of time, then becomes deactivated after PCU verifies backup bar is ON and functional.	Activated	Deactivated	Becomes activated after PCU verifies backup bar is ON and functional.	
Backup Bar, No Lamps Out	Deactivated	Activated	Deactivated	Activated	
Backup Bar, 1 Lamp Failed	Deactivated	Activated	Activated	Activated	
Backup Bar, 2 Lamps Failed	Activated	Activated	Deactivated	Activated	1

Notes

1 A: PCU keeps pulsing lights no matter how many lamps have failed.

Note

Table 26 assumes L-850A fixtures are used with only a primary bar of lights (no backup).

Table 26: LAHSO Operations (L-850A Only)

Operational Situation	Fault Alarm	Caution Alarm	1 Lamp Failed Alarm	Backup Mode Indication	Notes
Primary Bar; No Lamps Out	Deactivated	Deactivated	Deactivated	Deactivated	
Primary Bar; 1 Lamp Failed	Deactivated	Activated	Activated	Deactivated	
Primary Bar, 2 Lamps Failed	Activated	Deactivated	Deactivated	Deactivated	1

Notes

1 A: PCU keeps pulsing lights no matter how many lamps have failed.

6.0 Maintenance

WARNING

Read installation instructions in their entirety before starting Maintenance.

- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Protect components from damage, wear, and harsh environment conditions.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for maintenance, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow these warnings may result in serious injury or equipment damage.

This section provides preventive maintenance for indoor and outdoor Land and Hold Short Operations (LAHSO) power control units (PCUs).

6.1 Maintenance Schedule

To keep the LAHSO PCU operating efficiently, follow a preventive maintenance schedule.

Table 27: LAHSO PCU Maintenance

INTERVAL	MAINTENANCE TASK	ACTION
Daily	Check lights.	Replace lights as required.
Annually	Redo calibration.	Refer to Lamp Out Monitoring Calibration Procedures in Operation, Operation.
	Check for rust.	Repaint.
	Check for dirt inside PCU.	Clean PCU.

6.2 Troubleshooting

This section contains troubleshooting information. The troubleshooting table below covers only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local ADB SAFEGATE representative for help.

WARNING

Electric Shock
Read installation instructions in their entirety before starting troubleshooting.

- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Protect components from damage, wear, and harsh environment conditions.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for troubleshooting, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow these warnings may result in serious injury or equipment damage.

Table 28: 2.6.1 Troubleshooting Procedures

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. CCT LED is not flashing when LAHSO rotary switch set to B3, B4 or B5.	Connector J2, J3, J4 or J4 is not plugged in.	Verify the connectors are properly seated.
	110VAC is not at connector J2, pin2 and J3, pin 5.	Review the LAHSO wiring diagram and trace back where 120VAC comes in to the connector.
	110VAC is not at connector J3 between pin 3 and 8.	Review the LAHSO wiring diagram and trace back where 120VAC comes in to the connector.
	24VAC is not at J3 between pins 1 and 3.	Review the LAHSO wiring diagram and trace back where 24VAC comes in to the connector.
2. CCT LED flashes for a second and then goes out. Contactor closes and then opens with a few seconds.	Lamp circuit has an open circuit.	Repair the lamp circuit.
3. CCT LED flashing but LAHSO lamps are on steady.	Jumper J9 is loose or missing.	Replace J9 on the CCT board.
4. Uncalibrated LED lights YELLOW.	Lamp circuit needs to be calibrated.	Run the calibration procedure described in Lamp Out Monitoring Calibration Procedures in Operation.
5. Open Circuit LED lights RED.	Lamp circuit has an open circuit.	Repair the lamp circuit. Turn power off and then on to the LAHSO unit to reset the open circuit indicator.
6. Nighttime LED light is RED.	Bad photocell exists.	Replace one photocell. If LED still RED then replace the other photocell.
7. Nighttime LED is YELLOW.	One photocell is indicating daytime, and the other photocell is indicating nighttime.	Wait for the user-specified time to see if the photocells come into agreement. Refer to LAHSO Bad Photo Cell Detection Timer Adjustment in this section.

Table 28: 2.6.1 Troubleshooting Procedures (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
8. Low VA LED lights RED.	Step current is below tolerance.	Connect a current probe or scope to the lamp circuit. On the CCT board: • To lower current, press DEC to decrease the current, press SAVE when the current reads correct. • To raise current, press INC to increase the current, press SAVE when the current reads correct.
9. Incorrect Current lights RED.	Step current is above tolerance.	Connect a current probe or scope to the lamp circuit. On the CCT board: • To lower current, press DEC to decrease the current, press SAVE when the current reads correct. • To raise current, press INC to increase the current, press SAVE when the current reads correct.
10. Lamp Out LED lights YELLOW.	Lamp has burned out in the lamp circuit.	Turn off the LAHSO. Repair the lamp.
11.Lamp Out LED lights RED.	Two or more lamps have burned out in the lamp circuit.	Turn off the LAHSO. Repair the lamps.
12.Over Current LED lights RED.	Lamp circuit is drawing an unsafe current.	Turn off the LAHSO. Locate the problem. Turn power off and then on to the LAHSO unit to reset the over current indicator.
13.The B3, B4 and B5 LEDs light RED.	CCT board is not pulsing the lamp circuit or the CCT doesn't have power.	Refer to the above problem of the CCT LED not flashing when the LAHSO rotary switch is set to B3, B4 or B5.
14.The LAHSO board Heartbeat LED is not flashing after power up.	SW2-2 is not set to ON.	Set SW2-2 to ON.
15.The backup lamps do not get activated when two lamps are burned out on the primary lamp circuit.	SW3-2 is not set to ON to enable the backup lamps.	Set SW3-2 to ON.
16. 16.The LAHSO lamps are not set to the same brightness as the illuminated runway edge lamps.	SW2-1 is not set properly.	SW2-1 set to ON means HIRL. SW2-1 set to OFF means MIRL.
	LAHSO is not running in Remote mode.	Turn the LAHSO rotary switch to Remote and have the tower energize the LAHSO.
	Runway edge light current relays are not calibrated properly.	Refer to Calibrating Current Sensors (3-Step Runway Edge Circuit) in Installation.
17.PCU is in fault, but fault condition is not present.	• Alarm from LAHSO • Shorted wire • PLC malfunction	Refer to LAHSO Alarm .
18.Photocell constantly gives alarm.	Timer not long enough for re synchronization	Refer to LAHSO Bad Cell Detection Timer Adjustment in this section.

6.2.1 Diagnostic Procedures

The LAHSO alarm diagnostic procedure is used when the LAHSO Power Control Unit (PCU) is in Alarm condition, but a fault condition is not present.

The LAHSO firmware will set a bit or bits when it detects a fault or caution alarm condition. This information is useful during installation in determining whether the LAHSO is sending an alarm to the tower or some other source is generating the alarm. The user can view this diagnostic information while the lamps are flashing or when the lamps are turned off.

6.2.1.1 Lamps Flashing

While lamps are flashing, perform the following procedure:

- See Table 29. Depress Diag1 for FAULT ALARM Values.
- See Table 30. Depress Diag2 for FAULT1 ALARM Values.
- See Table 31. Depress Diag3 for CAUTION ALARM Values.

Table 29: Diagnostic FAULT ALARM Values:

DISPLAYED VALUE	MEANING OF DISPLAYED VALUE
+0000	no alarms
+0001	lowVA for the active step
+0002	high amps for the active step
+0003	lowVa and high amps
+0004	bad photocell
+0005	lowVA and bad photocell
+0006	high amps and bad photocell
+0007	lowVA, high amps and bad photocell
+0008	two lamps out
+0009	lowVA and two lamps out
+ 000A	high amps and two lamps out
+ 000B	lowVA, high amps and two lamps out
+ 000C	bad photocell and two lamps out
+000D	lowVA, bad photocell and two lamps out
+ 000E	high amps, bad photocell and two lamps out
+000F	lowVA, high amps, bad photocell and two lamps out
+0010	no power on the CCT board
+0020	open circuit detected on the lamp circuit
+0030	no CCT power and open circuit detected
+0040	no lamp flash detected
+0050	no CCT power and no flash detected
+0060	open circuit detected and no flash detected
+0070	no CCT power, open circuit detected and no flash detected
+0080	two LAHSO signs have lost power
+0090	no CCT power and two signs out
+ 00A0	open circuit detected and two signs out
+00B0	no CCT power, open circuit detected and two signs out

Table 29: Diagnostic FAULT ALARM Values: (continued)

DISPLAYED VALUE	MEANING OF DISPLAYED VALUE
+ 00C0	no flash detected and two signs out
+00D0	no CCT power, no flash detected and two signs out
+00E0	open circuit detected, no flash detected and two signs out
+00F0	no CCT power, open circuit detected, no flash detected and two signs out

Table 30: Diagnostic FAULT1 ALARM Values:

DISPLAYED VALUE	MEANING OF DISPLAYED VALUE
-0000	no alarms
-0001	backup lamps not calibrated
-0002	amps above safe limit
-0003	backup lamps not calibrated and amps above safe limit

Table 31: Diagnostic CAUTION ALARM Values

DISPLAYED VALUE	MEANING OF DISPLAYED VALUE
0000	no alarms
0001	one lamp out
0002	backup lamps in use
0003	one lamp out and backup lamps in use
0004	one LAHSO sign has lost power
0005	one lamp out and one sign out
0006	backup lamps in use and one sign out
0007	one lamp out, backup lamps in use and one sign out
0008	primary lamps not calibrated
0009	one lamp out and primary lamps not calibrated
000A	backup lamps in use and primary lamps not calibrated
000B	one lamp out, backup lamps in use and primary lamps not calibrated
000C	one sign out and primary lamps not calibrated
000D	one lamp out, one sign out and primary lamps not calibrated
000E	backup lamps in use, one sign out and primary lamps not calibrated
000F	one lamp out, backup lamps in use, one sign out and primary lamps not calibrated

6.2.1.2 Lamps Turned Off

When lamps are turned off, perform the following procedure:

1. See Table 29 through Table 31.
2. Depress Diag1 twice to display ckALRM? and then depress Enter.
3. FAULT, FAULT1 and CAUTION ALARM values are displayed to indicate the source of the problem.
4. Depress Exit until the LAHSO display clears.
5. Diagnostic alarm flags can be reset by power cycling the LAHSO unit or by turning off the lamps, depressing DIAG1 twice to display ckALRM?, and then depressing Alarm Reset.

ALReset is displayed briefly.

6. Then depress Exit until the LAHSO display clears.

6.2.2 LAHSO Bad Photo Cell Detected Time Out Adjustment

The time-out value for determining whether a photo cell has failed can be adjusted between 2 minutes and 240 minutes (4 hours). This timer is started when the two photo cells in the LAHSO are not in agreement. A bad photo cell alarm is generated if the photo cells do not agree within the time period.

Note
The timer can be adjusted only when the lamps are turned off so that LAHSO diagnostics can be entered.

To adjust the bad photocell time out value, perform the following procedure:

1. Depress Diag1 two times and Exit once to display SetCTO?, depress Exit, and then depress Enter.
   The current timer setting is displayed.

   Note
   The acronym CTO means Cell Time Out.

2. Press Diag2 to increase the number of minutes.
3. Press Diag3 to decrease the number of minutes.
4. Press Exit to save the adjusted timer value.
   CTOsave displays briefly.
5. Press Exit until the LAHSO display clears.

   Note
   The Nighttime LED will light YELLOW whenever the photo cells are not in agreement and the timer is active. The Nighttime LED will light RED if the photo cells do not agree at the end of the time period.

6.2.2.1 LAHSO Diagnostic Primary Lamp Test

The LAHSO primary lamps can be turned on while in diagnostic mode. This feature allows the user to test repaired primary lamps.

Note
Turn off lamps.

To test the primary lamps, perform the following procedure:

1. Press Diag1 two times and EXIT two times.
   PLtest? is displayed.
2. Press Enter to turn on the backup lamps.
   PLMPon will be displayed and the primary lamps will be energized.
3. Press Exit to turn off the backup lamps.
   PLMPoff is displayed briefly and the primary lamps are de-energized.
4. Press Exit until the LAHSO display clears.

6.2.2.2 LAHSO Diagnostic Backup Lamp Test

The LAHSO backup lamps can be turned on while in diagnostic mode. This feature allows the user to test repaired backup lamps.

Note
Turn off lamps. Verify that SW3-2 dip switch is turned on.

To test the backup lamps, perform the following procedure:

1. Press Diag1 two times and exit three times to display BLtest?.
2. Press Enter to turn on the backup lamps.
   BKUPon is displayed and the backup lamps are energized. BKUPdis is displayed if the LAHSO unit is not configured for backup lamps.
3. Press Exit to turn off the backup lamps.
   BKUPoff is displayed briefly and the backup lamps are de-energized.
4. Press Exit until the LAHSO display clears.

6.2.2.3 LAHSO Diagnostic Display Button Test

To test the buttons, perform the following procedure:

Note
Turn off lamps.

1. Press Diag1 once to display DIAGNOS.
2. Press Diag2 once to display PBtest?.
3. Press Enter to display PressPB.
4. Press any buttons on the display panel to display a message that tells you which button was depressed.
5. Press Exit until the LAHSO display clears.

6.2.2.4 LAHSO Diagnostic SW2 and SW3 Test

To test the SW2 and SW3 switches, perform the following procedure:

Note
Turn off lamps.

1. Depress Diag1 once to display DIAGNOS.
2. Depress Diag2 once and Exit once to display SWtest?.
3. Depress Enter to start reading and displaying the meaning of the SW2 and SW3 current switch positions.
   Refer to Table 12 for SW2 and SW3 switch positions.
4. Depress Exit until the LAHSO display clears.

6.2.2.5 LAHSO Switch Back to Primary Lamps Function

This function is used to switch back to the primary lamps without power cycling the LAHSO unit.

Note
Turn off lamps.

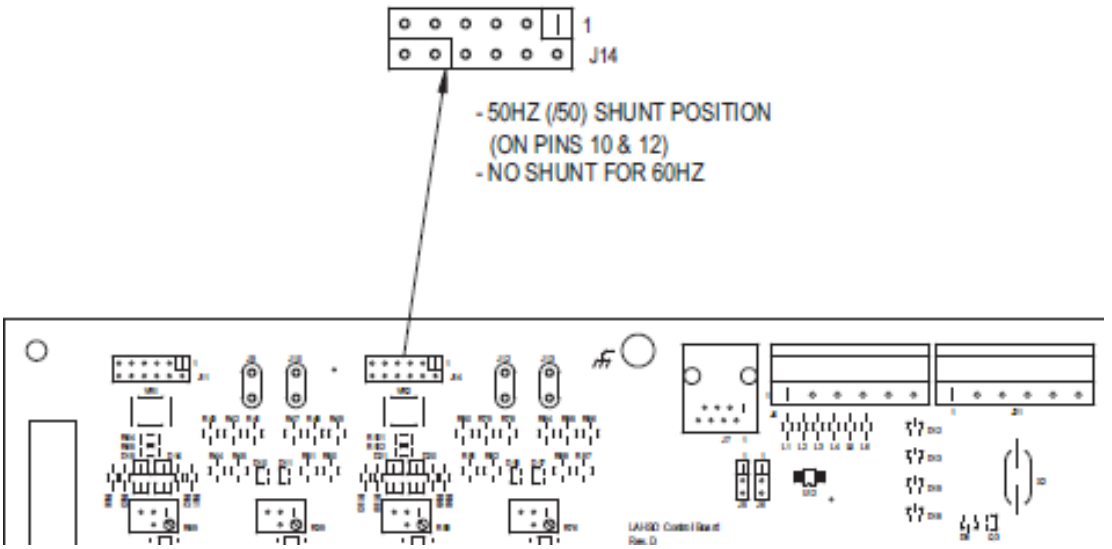
To switch back to the primary lamps function, perform the following procedure:

1. Press Diag1 once to display DIAGNOS.
2. Press Diag3 once to display GoToPL?.
3. Press Enter to switch backup lamps back to the primary lamps.
   PLEnabd displays briefly.
4. Press Exit until the LAHSO display clears.

6.2.3 Replacing the LAHSO Control PCB 44A5928

When replacing the LAHSO Control PCB 44A5928 for 50Hz systems you must place a jumper on J14 Pins 10 and 12 as shown in Figure 38.

Figure 38: Jumper for LAHSO Control PCB on 50Hz Systems



7.0 Wiring Schematics

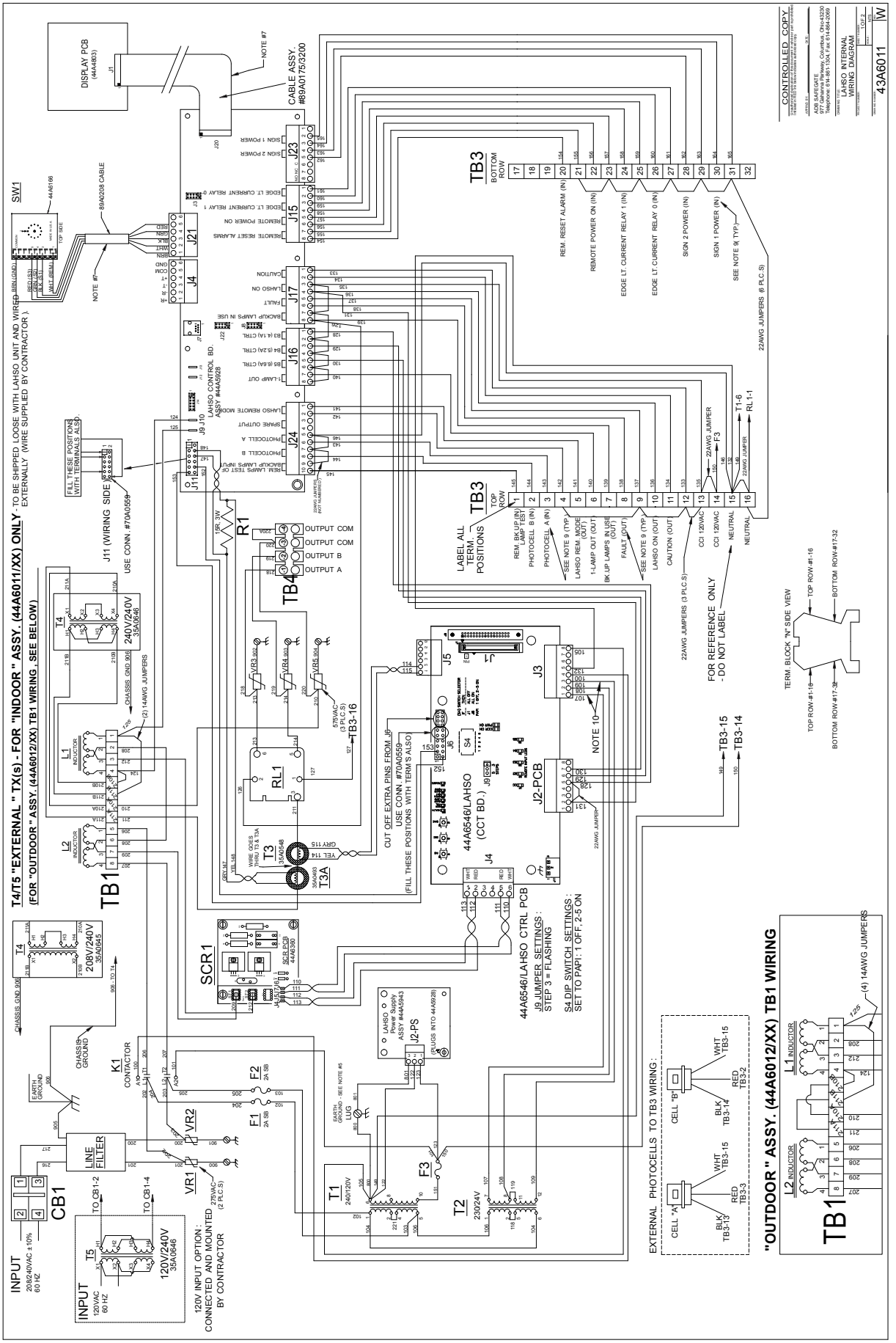
This section provides wiring schematics for the Land and Holding Short (LAHSO) power control unit (PCU).

See Figure 39 for the internal wiring schematic for the LAHSO PCU.

7.1 LAHSO Internal Wiring Schematic

Figure 39: LAHSO Internal Wiring Schematic

Also see Table 32 for notes



7.2 LAHSO Internal Wiring Schematic Notes and Options

Figure 40: TB4 Connections

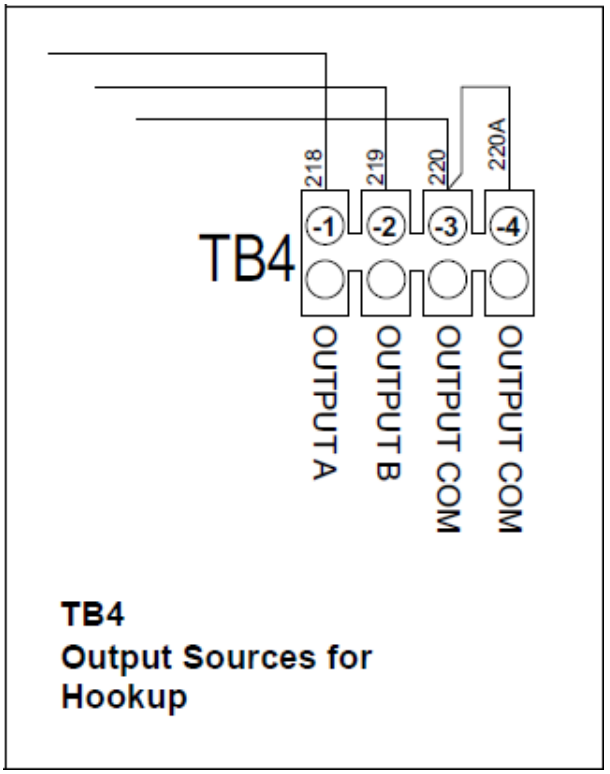


Figure 41: TB3 Terminal Numbering Legend

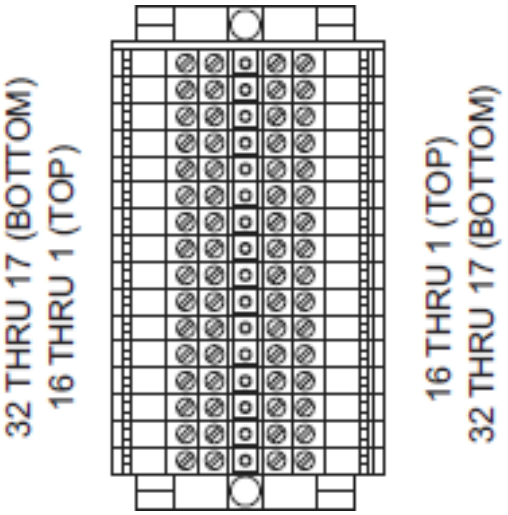


Table 32: Wiring Diagram Notes

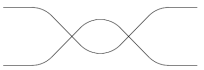
	Notes
1	"100" SERIES IS AWG 22, WHT., 600VAC, (89A0002/9). "200" SERIES IS AWG 14, WHT., 600VAC, (89A0060/1). "900" SERIES IS AWG 12, GRN/YEL, 600VAC, (89A0163/5). "800" SERIES IS AWG 16, GRN/YEL, 600VAC, (89A0163/6).
2	 Twisted pair
3	Relay contacts and contactor shown de-energized.

Table 32: Wiring Diagram Notes (continued)

Notes	
4	See 43A6011, Figure 39 for LAHSO wiring.
5	Incoming ground wire should be #4 copper.
7	When building a “panel only” assembly, do not wire/assemble the SW1 cable/switch or the 89A0175/3200 display ribbon cable
8	T4 external TX used for “INDOOR” ASSY. (44A6011/XX) only. See 43A6011 for contractor T4 connections.
9	(OUT) indicates an output is a dry contact relay at 0.3A @ 125VAC that when output is active, sources 110VAC referenced from “N’ AT TB3-15 & -16. (IN) indicates an input requiring 110VAC sourced to “CCI” (TB1-13,14) And referenced to “N” (TB3-15,16).
10	Due to phasing of T2, wires 107 and 109 may need to be reversed (SWAPPED) at J3 during assembly.

8.0 LAHSO Parts

The parts section is a separate file in the book so that it can be used in the Parts manual.

Ordering Code[1,2]

44A601X - X X

Location
1 = Indoor LAHSO[3]
2 = Outdoor LAHSO

Input Voltage
1 = 240 V
2 = 208 V (indoor only)
3 = 120 V (indoor only)

Contact Relay
0 = Without dry contact relay (standard)
1 = With dry contact relay (optional)[4]

Notes

1. Current sensing relays are mounted separately. Current sensing relays are connected to the runway edge circuit associated with the LAHSO fixture.
2. To ensure proper lamp-out monitoring, L-850A and L-850F fixtures must not have film disc cutouts
3. Photocells are automatically mounted on the enclosure but can be removed and mounted separately
4. Custom monitoring output points when used with non-ADB SAFEGATE control systems. Contact the ADB SAFEGATE Sales Department for details.

Figure 42: Outdoor LAHSO PCU

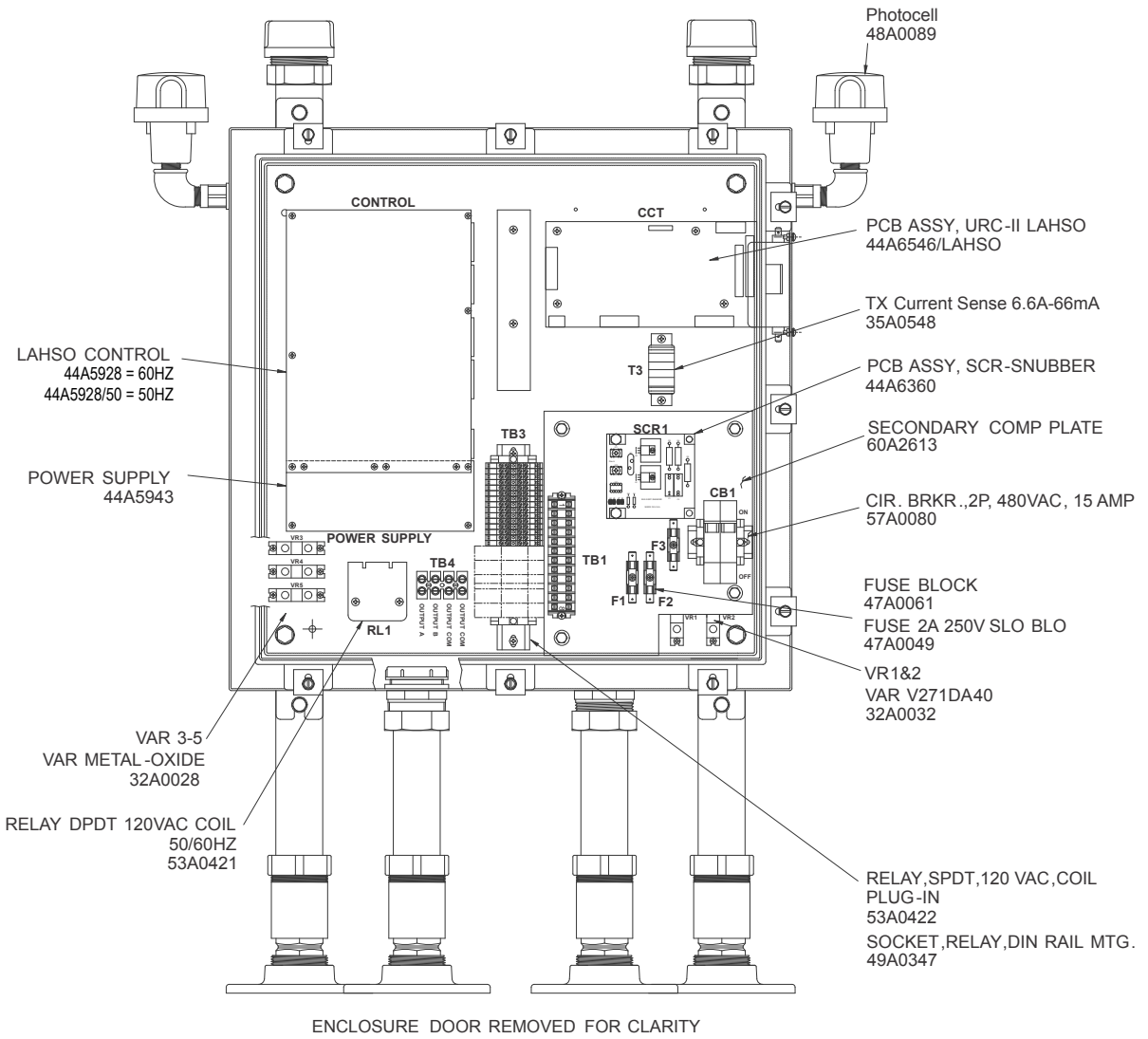


Figure 43: Components under Secondary Component Plate

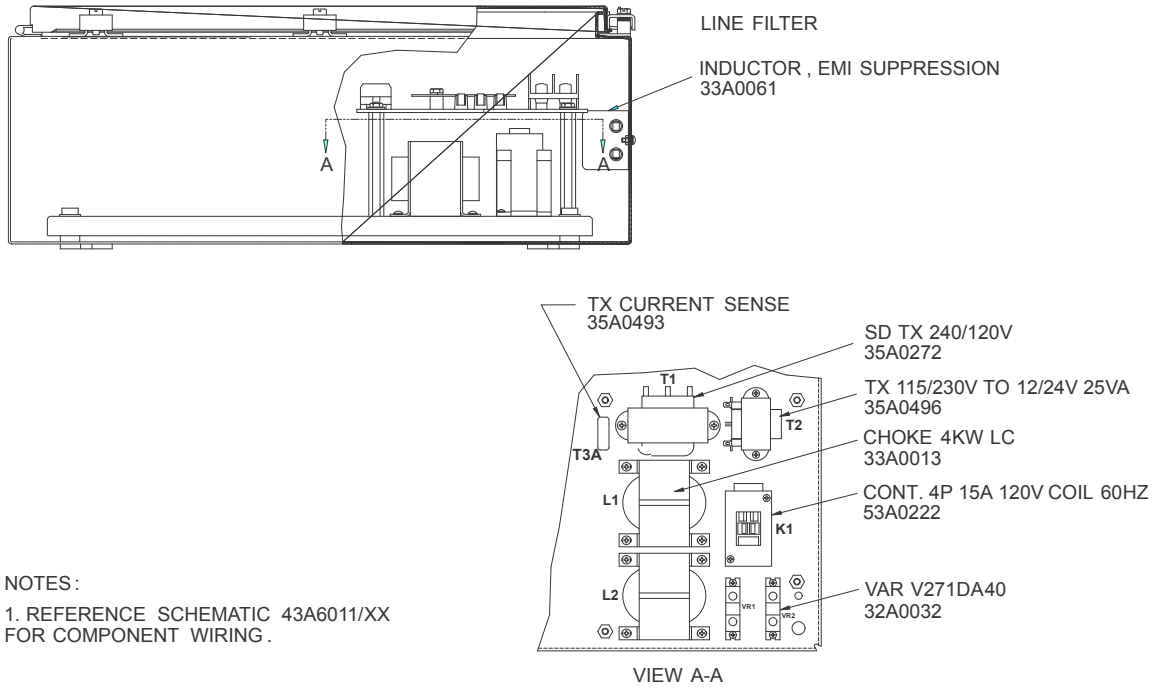
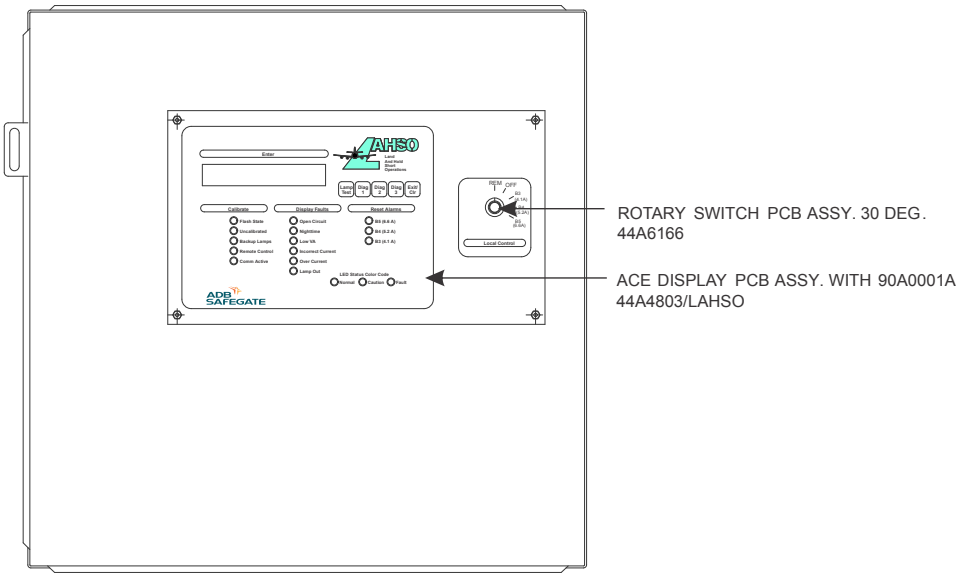


Figure 44: ACE Panel



8.1 Spare Parts

Create a sufficiently large stock of spare parts to maintain the APS unit and the fixtures in the field. Consider acquiring approximately 10% spare final assemblies (with a minimum quantity of 1) for the total amount of equipment in the field. This allows for repairs to be made in the shop. Components that are more likely to need replacement, such as prisms, prism gaskets and PCB sub-assemblies should be stocked in smaller quantities. For the APS unit, it is recommended to have a least one entire LAHSO unit as a spare, or for larger installations, at least 10% of the total LAHSO units installed.

See individual product manuals for recommended fixture spares.

For the LAHSO unit, see the table below for spares.

- Consider acquiring 10% spares for critical components noted as (A) in the table below. If only a small number of LAHSO units are installed, consider acquiring at least 1 of each of the components noted as (A) below.
- Also consider acquiring 1% spares for parts noted as (B) in the table below. If it is important to have a robust level of spare parts on hand, and only a small number of LAHSO units are installed, consider acquiring 1 of each of the components noted as (B) below.

Table 33: LAHSO Unit Spare Parts

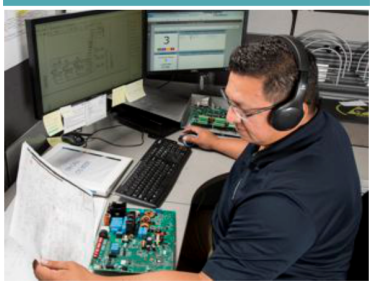
Part Number	Description	Location	Notes	Spares
44A6360	SCR/SNUBBER PCB assembly	SCR1		B
47A0049	Fuse, 2A, 250 V, SLO-BLO	F1, 2	3	A
47A0061	Fuse block		2	B
53A0421	Relay PDT, 25 A, 240 Vac, coil	RL1	1	B
32A0032	Varistor, V271DA40	VAR 1, 2	2	B
44A5943	PCB assembly, DC Power Supply		1	B
44A5928	PCB assembly, LAHSO control		60 Hz	B
44A5928/50	PCB assembly, LAHSO control 50Hz		50 Hz	B
44A6546/LASHO	UCR PCB assembly		1	B
32A0028	Varistor, 575 V	VAR 3-5	3	B
48A0089	Photocell (outdoor)	Outdoor only		B
53A0222	Contactor, 4 pole, 15 A, 120 V coil, 60 Hz	K1	1	B
35A0548	Current sensing transformer 6.6 A to 66 mA	T3	1	B
53A0422	Relay SPDT, 120 VAC plug in (dry contact option)		1	B
57A0080	C.B., 2p, 480 Vac, 15 Amp., DIN Rail Mtg.	CB1	1	B
35A0272	SD TX 240/120 Vac	T1	1	B
35A0496	TX 115/230 V to 12/24 V, 25 Amp.	T2	1	B
44A6166	Rotary Sw. PCB Assy., 30 Deg.		1	B
53A0283	Switch AC Output	Contractor Supplied	2	B
45A0269	Interlock Switch, SPST, 10A		1	B
44A4803/LASHO	ACE Display PCB with 90A0001A		1	B
35A0493	Current sensor		1	B
33A0013	Choke 4kW LC	L1/L2	2	B

Appendix A: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Live Technical Support - Americas
If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.
ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304
During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!
Before You Call
When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.



- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot

Note
For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Brussels: +32 2 722 17 11
Rest of Europe: +46 (0) 40 699 17 40
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106

A.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

A.2 Recycling

A.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

A.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

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