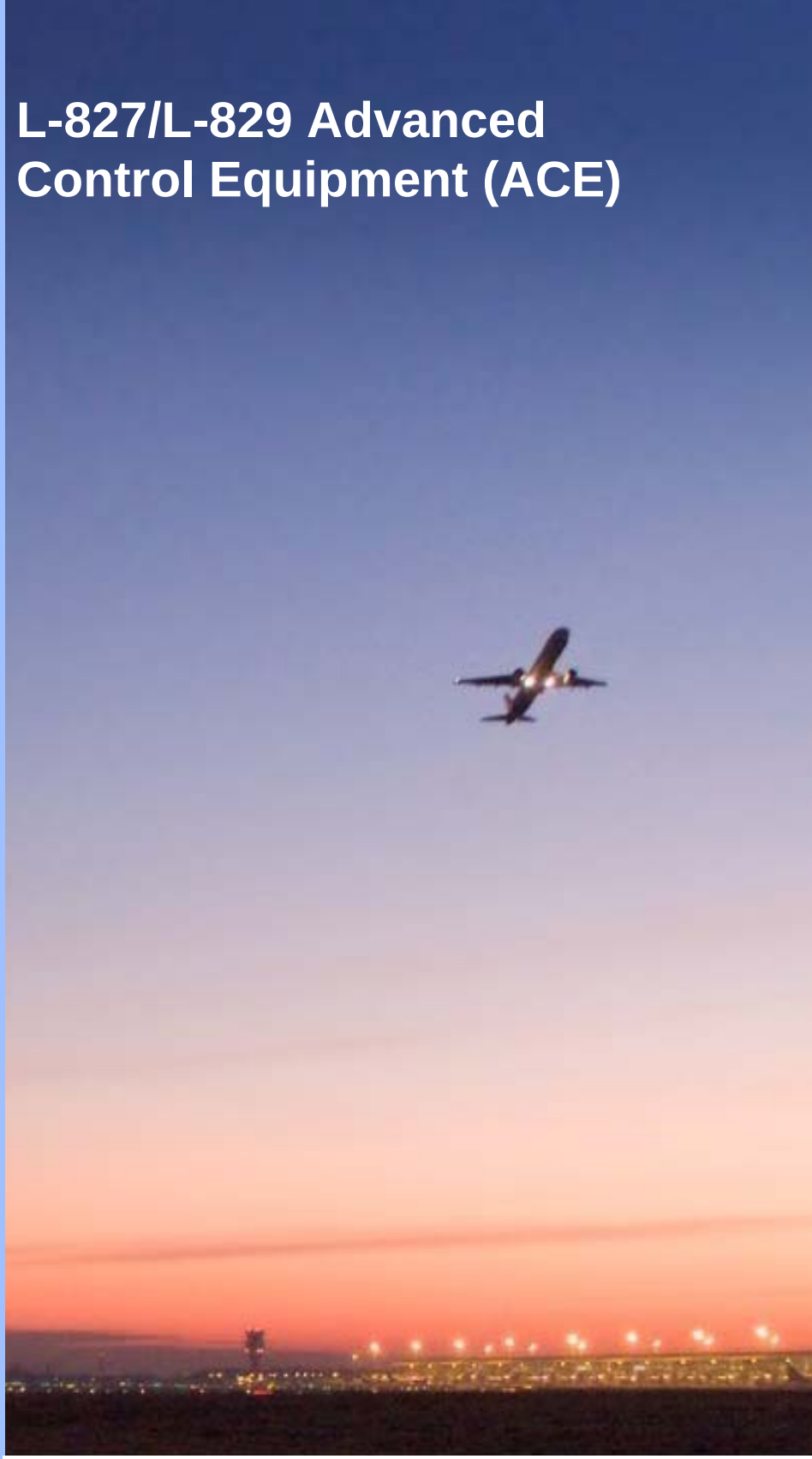
L-827/L-829 Advanced Control Equipment (ACE)

User's Manual

96A0287

Retain for future use.

Rev. L, 6/27/11



ADB
Airfield Solutions

Disclaimer

This manual could contain technical inaccuracies or typographical errors. ADB Airfield Solutions reserves the right to revise this manual from time to time in the contents thereof without obligation of ADB Airfield Solutions to notify any person of such revision or change.

Details and values given in this manual have been compiled with care. They are not binding, however, and ADB Airfield Solutions disclaims any liability for damages or detriments suffered as a result of reliance on the information given herein or the use of products, processes or equipment to which this manual refers. No warranty is made that the use of the information or of the products, processes or equipment to which this manual refers will not infringe any third party's patents or rights.

Warranties

Products of ADB Airfield Solutions manufacturer are guaranteed against mechanical, electrical, and physical defects (excluding lamps) for a period of one year from the date of installation or a maximum of 18 months from date of shipment and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

ADB Airfield Solutions will correct by repair or replacement, 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 Airfield Solutions 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 Airfield Solutions 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 Airfield Solutions furthers reserves the right to require the return of such goods to establish any claim.

ADB Airfield Solutions' 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 Airfield Solutions' 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 Airfield Solutions, warranty is limited to that extended by the original manufacturer.

This is ADB Airfield Solutions' 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.

Trademarks

General notice: other product names used here are for identification purposes only and may be trademarks of their respective companies.

Proprietary Information

This information carrier contains proprietary information, which shall not be used for other purposes than those for which it has been released, nor be reproduced or disclosed to third parties without the prior written consent of ADB Airfield Solutions.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, mechanical, photocopy, recording, or otherwise, without the prior written permission of ADB Airfield Solutions. No patent liability is assumed with respect to the use of the information contained herein. Neither is any liability assumed for damages resulting from the use of the information contained herein.

ADB Airfield Solutions shall not be liable to the purchaser of this product or third parties for damages, losses, costs, or expenses incurred by purchaser or third parties as a result of accident, misuse, or abuse of this product or unauthorized modifications, repairs, or alterations to this product. ADB Airfield Solutions shall not be liable against any damages arising from the use of any options or parts other than those designated as approved products.

TABLE OF CONTENTS

Table of Contents

1.0 Safety

This section contains general safety instructions for installing and using ADB Airfield Solutions 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 To use this equipment safely:

WARNING

Read installation instructions in their entirety before starting installation.

- Refer to the FAA Advisory Circular AC 150/5340-26, Maintenance of Airport Visual Aids Facilities, for instructions on safety precautions.
- Observe all safety regulations. To avoid injuries, always disconnect power before making any wiring connections or touching any parts. Refer to FAA Advisory Circular AC 150/5340-26.
- 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 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.

1.1.1 Additional Reference Materials:

- NFPA 70B, Electrical Equipment Maintenance.
- NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- OSHA 29 CFR, Part 1910, Occupational Health and Safety Standards.
- National and local electrical codes and standards.

1.1.2 Qualified Personnel

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 practices.

1.1.3 Intended Use

WARNING

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.

ADB Airfield Solutions cannot be responsible for injuries or damages resulting from nonstandard, unintended applications of its equipment. This equipment is designed and intended only for the purpose described in this manual. Uses not described in this manual are considered unintended uses and may result in serious personal injury, death or property and equipment damage. Unintended uses may result from taking the following actions:

- Making changes to equipment that are not recommended or described in this manual or using parts that are not genuine ADB Airfield Solutions replacement parts.
- Failing to make sure that auxiliary equipment complies with approval-agency requirements, local codes and all applicable safety standards.
- Using materials or auxiliary equipment that are inappropriate or incompatible with ADB Airfield Solutions equipment.
- Allowing unqualified personnel to perform any task.

1.1.4 Storage

CAUTION

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 injury or equipment damage.

Safety

1.1.4.1 Operation

WARNING

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- 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.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

1.1.4.2 Material Handling Precautions

CAUTION

This equipment may contain electrostatic sensitive 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 should 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.

1.1.4.3 Action in the Event of a System or Component Malfunction

WARNING

- 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.

1.1.4.4 Maintenance and Repair

WARNING

Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.

- Only persons who are properly trained and familiar with ADB Airfield Solutions equipment are permitted to service this equipment.
- 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 Airfield Solutions replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check 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 electrical equipment.

2.0 L-827/L-829 Advanced Control Equipment

About this manual

The manual shows the information necessary to:

- Install
- Carry Out Maintenance
- Carry Out Troubleshooting on the L-827/L-829 Advanced Control Equipment.

2.1 How to work with the manual

1. Familiarize yourself with the structure and content.
2. Carry out the actions completely and in the given sequence.

2.1.1 Record of changes

Page	Rev	Description	Checked	Approved	Date
	A	Released Manual	BM	WT	1/10/02
2-9, 2-10	F	Added wall mount ACE and split Section 4 into Section 5 programming	CS	WT	4/10/04
All	G	Removed Programming Section	WT	WT	9/16/05
All	H	Removed Portable ACE	WT	WT	11/8/05
All	K	Name Change	JM	JM	7/17/09
All	L	Updated for ADB new format	RH	CS	8/2/11

2.1.2 Icons used in the manual

For all WARNING symbols see the Safety section.

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.

CAUTION
- Failure to observe a caution may result in equipment damage.

2.2 Description

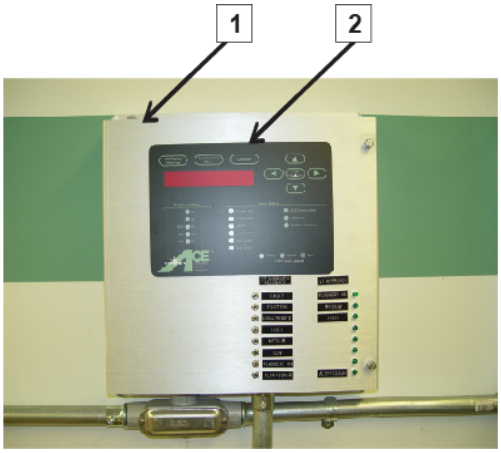
This section describes the L-827, L-829 Advanced Control Equipment (ACE™).

NOTE: ACE is a trademark of ADB Airfield Solutions.

2.2.1 L-827/L-829 ACE

See Figures 1 for L827 ACE, Wall Mount, and Figure 2-2 for L-829 ACE. The L-827 ACE is a standalone version of the ADB Airfield L829 ACE. The ACE can perform all FAA specified L-827/L-829 monitoring functions according to FAA AC 150/5345-10E.

Figure 1: 827 ACE

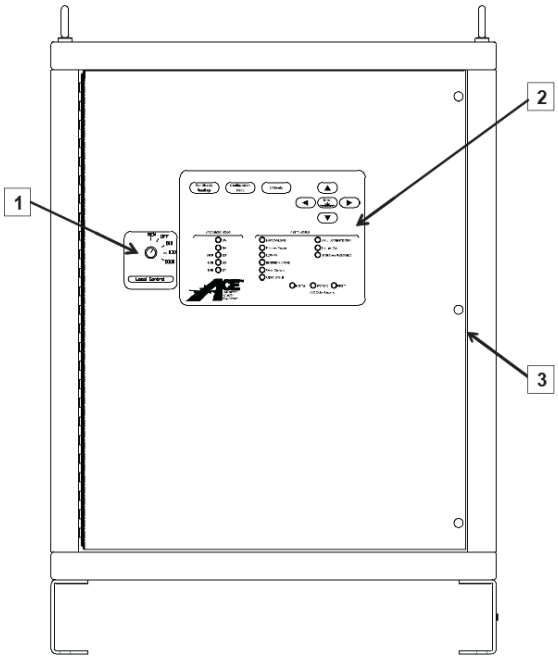


1. Enclosure
2. ACE Front Display Panel

NOTE: Optional LEDs on enclosure door vary depending upon project.

The L-827, L-829 ACE can be configured to monitor constant current regulators (CCRs), lamp circuits, and airfield series circuit insulation resistance. An external control system is not needed for configuration and control. The ACE can be configured to operate with a central computer system, if needed. See Figure 2.

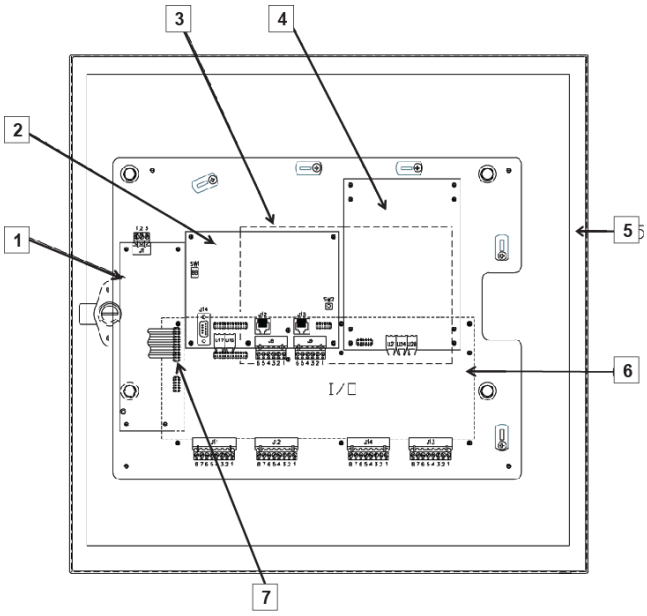
Figure 2: L-829 ACE



1. Rotary Switch
2. ACE Display
3. Constant Current Regulator

See Figure 4. The ACE is a universal device used to control most types of CCRs and/or controlled elements, regardless of the manufacturer. The ACE printed circuit boards are mounted inside a small and rugged environmental enclosure wall-mounted or directly attached to a CCR. The ACE consists of microprocessor-based module(s) processing communication, controlling commands, input/output interfaces, and failsafe functionality for controlled elements in the airfield lighting vault.

Figure 3: ACE Internal Parts



1. ACE Power Supply PCB Assembly
2. ACE Control Board PCB Assembly
3. ACE Display PCB Assembly
4. ACE Lamps-Out Circuit Board
5. Enclosure
6. ACE I/O PCB Assembly
7. PIN #1

Each ACE has identical and interchangeable internal components. The following is a summary of the internal components of the ACE.

2.2.2 ACE Power Supply Circuit Board

The ACE Power Supply printed circuit board refer to Figure 3, provides each of the printed circuit boards with a regulated and isolated power source.

2.2.3 ACE Input / Output Circuit Board

The ACE input/output printed circuit board refer to Figure 2, provides the interface for all control and monitoring connections. This board incorporates a distribution bus for interfacing internal boards. In addition, the quick-disconnect terminal blocks provide an easy-to-service point of connection. The input /output printed circuit board contains eight discrete latching relay outputs and eight discrete input lines.

2.2.4 ACE Control Board

The ACE control board refer to Figure 3, is the brain behind the design. It provides an interface for a redundant communication network that allows for the ACE to be connected to a distributed processing system. For easy access when connecting the redundant communication network to the ACE the board includes both RJ-45 plugs and quick-disconnects. In addition, the control board contains a fiber optic interface for the insulation resistance monitoring system (IRMS).

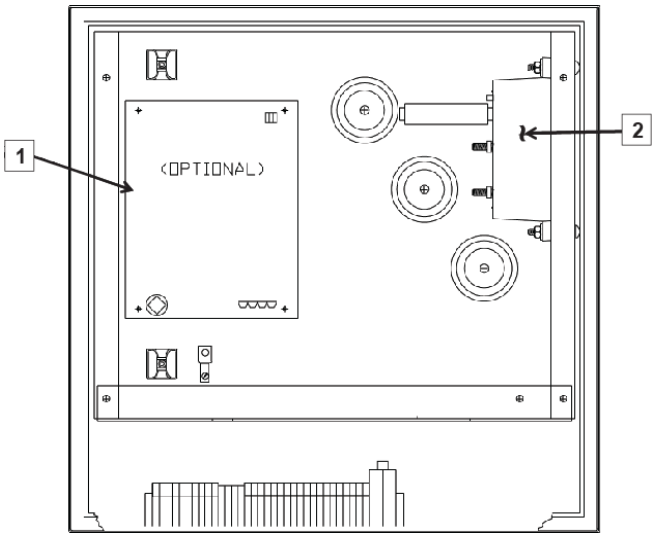
2.2.5 ACE Lamps-Out Monitoring Board

The ACE lamps-out monitoring (LOM) board refer to Figure 3, consists of a processor which interfaces, over a fiber optic serial communications link, with a current and voltage module (CVM). The ADB Airfield Solutions' CVM, shown in Figure 4, measures current and voltage

waveforms. In addition to RMS voltage, RMS current, apparent power (VA), true power, and power factor, the LOM Board also calculates the number of lamps burned-out at each brightness level. The LOM Board can be expanded, from single circuit monitoring capability to monitoring of up to eight circuits. This requires additional circuit boards, when the ACE is configured to be controlled by a distributed processing system.

NOTE: Figure 4 shows the CVM and IRM module only on the L-827 ACE. The CVM and IRM are also provided as options for the L-829 ACE. The CVM and IRM are standard equipment in the portable ACE.

Figure 4: CVM and IRM Module (L-827 ACE)



1. Insulation Resistance Monitoring Module
2. Current and Voltage Module

2.2.6 ACE Insulation Resistance Monitoring Module

Refer to Figure 4. The ACE insulation resistance monitoring module (IRM) is a highly reliable and easily maintained board used to monitor the resistance of cable insulation used in airfield lighting series circuits. The ACE performs scheduled resistance measurements as well as manually requested measurements, and displays the results of the dielectric strength conditions. This provides the ability for monitoring the long-term degradation of the series circuit cabling. The IRM provides a wide range for resistance measurements from <20k Ohms up to 2G Ohms. The IRM operates on circuits that are hot, regulator ON, or cold, regulators OFF, with little change in accuracy.

2.2.7 ACE Front Panel Display Circuit Board

The ACE control/monitor display provides a local control and monitoring interface for each controllable element. The display consists of several LEDs that give status indication of the ACE CCR brightness step, CCR remote/local status, CCR primary power, circuit current or voltage readings, and distributed processing channel status. The display has buttons for configuring the ACE unit and executing lamps-out monitor calibration.

2.3 Theory of Operation

This subsection provides the theory of operation for the L-827, L-829 ACE.

2.3.1 ACE Communication

The L-827/L-829 ACE is a standalone system that does not require connection to a distributed processing system. The L-827 and L-829 can be configured to communicate with a distributed processing system such as the ADB Airfield Solutions' distributed computer control system, the Advanced Lighting Control System (ALCS).

2.3.2 ACE Input/output Interface

The ACE design is modular in nature. The input/output board incorporates a distribution bus for interfacing additional internal printed circuit boards. In addition, the quick-disconnect terminal blocks provide an easy-to-service point of connection. The input/output printed circuit board contains eight discrete latching relay outputs and eight discrete input lines.

The L-829 ACE uses the output relays for controlling the CCR during lamps-out monitoring calibration. The L-827/L-829/portable ACE uses two outputs for activating external warning and alarm indicators.

2.3.3 ACE Lamps-Out Monitoring Interface

The LOM board receives data from the Current and Voltage Sensor module. It calculates RMS voltage, RMS current, apparent power (VA), true power, power factor, and the number of lamps burned-out at each brightness level. It passes this information to the ACE control board for display.

2.3.4 ACE Insulation Resistance Monitoring (IRM) Interface

The ACE IRM generates the high voltage, 50-1000 VDC. imposed onto the series circuit. The IRM performs insulation resistance measurements by measuring the earth fault current and relays this data, via the fiber cable, back to the ACE for display.

The IRM allows considerable flexibility in selecting when the insulation resistance readings are be taken. Repetitive measurements can be scheduled by entering a start time and a sample period, then enabling the circuit.

2.3.5 ACE Failsafe Functionality

The L-827/L-829 ACE provides failsafe functionality only when it is configured to be connected to a distributed system and has been downloaded by the distributed system.

2.4 Installation

WARNING

- Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

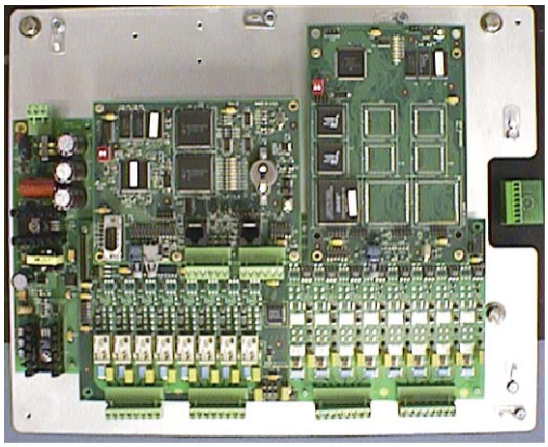
2.4.1 Introduction

This section provides instructions for installing the L-827/L-829 CCR with Advanced Control Equipment (ACE). Refer to airport project plans and specifications for the specific installation instructions. The installation conforms to the applicable sections of the National Electric Code and local codes.

2.4.2 L-827 ACE /L-829 CCR with ACE Wiring

This subsection provides wiring installation instructions for the L-829 CCR with ACE. See L-827 ACE wiring in the Wiring Schematics section. See Figure 5 for L-829 CCR with ACE wiring connections. See the CCR manual for CCR connections. Check connections in the Wiring Schematics section of this manual.

Figure 5: L-829 CCR with ACE Wiring Connections



2.4.3 Wall-mount ACE Installation and Wiring

Locate each ACE unit as close as possible to each of the controllable elements the regulator, the generator, etc. Exact locations should be coordinated with the Airport Engineer.

Each ACE is mounted flush against a wall or on U-Channels supporting all four corners of the enclosure. The unit is orientated as seen in Figure 6. Use the four mounting holes.

Figure 6: ACE Wall Mount

NOTE: The ACE™ enclosure is designed so the unit can be replaced easily without having to remove any of the mounting hardware. Follow these instructions closely.

1. Position the enclosure flush on its mounting surface and mark the mounting holes in all four corners. Make sure to mark the top portion of the slotted mounting hole as seen in Figure 7. Mounting hardware must fit through lower opening of the top slotted mounting holes.
2. Drill out the marked holes and insert anchor hardware as required.
3. Carefully remove the lid of the enclosure and disconnect the grounding strap from the main enclosure.
4. Mount the enclosure using the top two slotted holes then install the hardware for the bottom two holes.

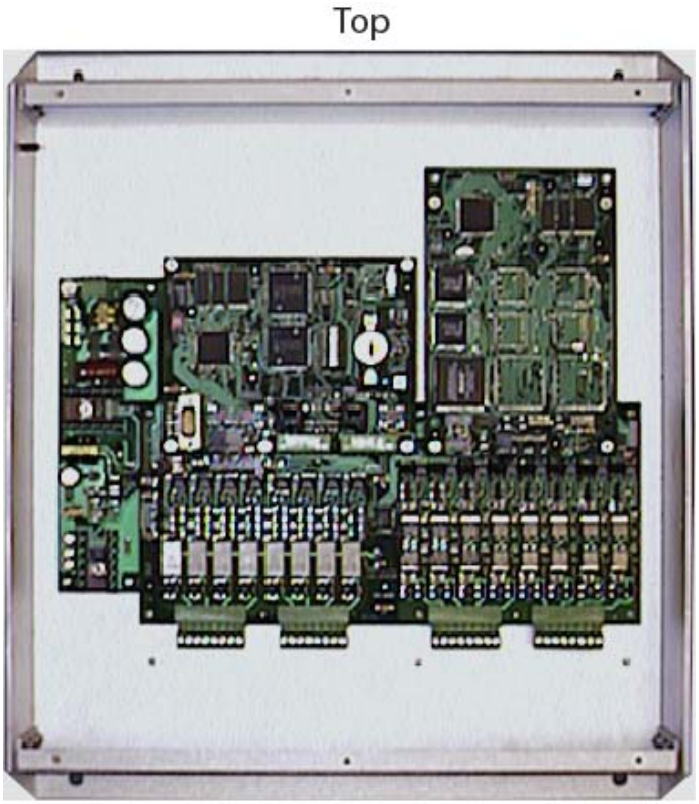
2.4.4 ACE Cable Entry

NOTE: All conduit and wiring must only enter the ACE™ enclosure through the bottom access plate. This facilitates quick maintenance and replacement of the ACE unit.

DO NOT blow out enclosures as metal shavings can damage the electronics.

Attach all conduit as required to the bottom access plate ONLY, as seen in Figure 8. Make sure to protect all electronic equipment in the ACE enclosure while installing conduit to the BOTTOM access plate.

Figure 7: Cable and Conduit Entry location



Operation

2.5 Operation

This section provides operational information for the L-827/L-829 Advanced Control Equipment (ACE).

2.5.1 ACE Front Panel Display

See Figure 8. The L-827/L-829 ACE front panel display is used to configure and monitor, the constant current regulator (CCR), and the field circuit status. It is also used to perform lamps-out monitoring calibration. The display consists of eight pressure sensitive buttons, a 7-character alpha-numeric display, and 14 status LEDs. See Figure 10 for the front panel display buttons.

Figure 8: ACE Front Panel Display

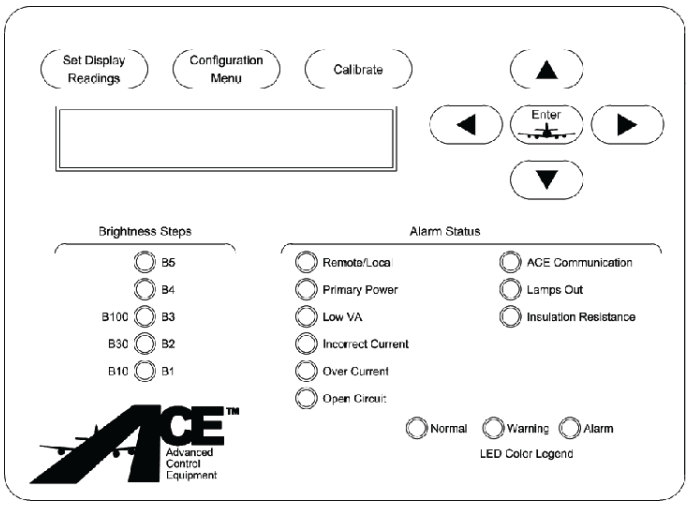


Table 1: L-827 Front Panel Display Button Functions

Button	Function
Set Display Readings	Selects what is displayed during normal operation. Refer to Table 2.
Configuration Menu	Enters/exits configuration menus to configure the system.
Calibration	Enters lamps out monitoring calibration.
Enter	Selects Configuration Menu items and sequences calibration.
Left Arrow	Goes back to a previous Configuration Menu or scrolls left on multiple character menu entries.
Right Arrow	Goes to the next Configuration Menu or scrolls right on multiple character menu entries.
Up Arrow	Scrolls forward through Configuration Menu entry selections or scrolls forward through individual characters within a modifiable entry.
Down Arrow	Scrolls backward through Configuration Menu entry selections or scrolls backward through individual characters within a modifiable entry.

Table 2: Set Display Readings, Selections, and Functions

Set Display Readings Selections	Function
Amps	Displays the amperage reading for the CCR step selected
Volts	Displays the voltage reading for the CCR step selected
VA	Displays the VA reading for the CCR step selected
Watts	Displays the wattage reading for the CCR step selected
Lamps	Displays the number of lamps out on the lamp circuit.

Table 2: Set Display Readings, Selections, and Functions

Ohms	Displays the last insulation resistance reading for the lamp circuit
Cycle	Cycles through the above menus

NOTE: VA refers to the Volt-Amps in a system and is measured by simply measuring the RMS voltage, measuring the RMS current, and then multiplying these two numbers together. **Watts** corresponds to the amount of power actually consumed by a system. These two numbers are only equal in the case of a purely resistive system. In systems with reactance (capacitance or inductance), power from the source enters the reactive portions of the system, only to be returned back to the source, un-used. This additional unused energy is the difference between the VA and Watts delivered to a system. The power factor of a system is simply the ratio of the power (watts) used by a system, to the volts and amps (VA) that must be delivered to the system. This is always less than or equal to 1.

It is important to remember that all electrical components in a power system must be designed to deliver the necessary VA a system needs in order for it to consume the watts it needs. CCR sizes are actually designed to deliver a kVA value because it is impossible to account for the different power factors in airfield loads. If an airfield load has open-circuited transformers, signs, etc. it requires more VA to deliver the watts needed. For instance, if a 30kW CCR delivered 30kVA into a load with a power factor of 0.5, the resultant watts would be 15KkW.

The Configuration Menu main selections can be displayed by pressing **Configuration Menu** by pressing **Enter**, then press the **Right Arrow**. See Table 3.

Table 3: Configuration Menu Selection Functions

Configuration Menu Selections	Function
CircCfg	Configures ACE type, CCR type, number of CCR steps and allows for automatic configuration of the system with default values
CCR	Configures the minimum, maximum and nominal current values, the nominal VA value, the current range (percentage) and VA range (percentage) for each CCR step
IRMS	Configures the enable status, the voltage range, the alarm and warning levels and automatic scheduling of insulation resistance measurements
MegImm	Starts an immediate insulation resistance measurement on the lamp circuit
StopMeg	Stops the insulation resistance measurement that is in progress
LampTst	Lights the display panel LEDs to verify that they are operational
Sys Cfg	Configures the system date and time
Inputs	Configures input mode and enable status of the 8 inputs
Outputs	Configures the output mode and enable status of the 8 outputs
LampOut	Configures the settle time for lamps out measurements, the lamp circuit enable status and the lamps out alarm and warning levels
Version	Displays the firmware version for the ACE components.

Fourteen LEDs provide monitoring status of the CCR, the lamp circuit, and field circuit cabling. See Table 4.

Table 4: LED Indicator Functions

LED Indicator	Function
B5	Lights GREEN when CCR step B5 is selected. Lights RED when the CCR has lost power or its generating capability.

Table 4: LED Indicator Functions

B4	Lights GREEN when CCR step B4 is selected. Lights RED when the CCR has lost power or its generating capability.
B3 or B100	Lights GREEN when CCR step B3 or B100 is selected. Lights RED when the CCR has lost power or its generating capability.
B2 or B30	Lights GREEN when CCR step B2 or B30 is selected. Lights RED when the CCR has lost power or its generating capability.
B1 or B10	Lights GREEN when CCR step B1 or B10 is selected. Lights RED when the CCR has lost power or its generating capability.
Remote/Local	Lights GREEN when the CCR is in Remote mode. Lights RED when the CCR is in Local mode.
Primary Power	Normally lights GREEN. Lights RED when the CCR has lost input power.
Low VA	Normally lights GREEN. Lights RED when CCR output voltage or current drops causing the VA to drop below the configured VA range.
Incorrect Current	Normally lights GREEN. Lights RED when CCR output current goes above or below the configured maximum and minimum current or the configured current range (percentage).
Over Current	Normally lights GREEN. Lights RED when the CCR current is above a safety limit.
Open Circuit	Normally lights GREEN. Lights RED when an open lamp circuit is detected.
ACE Communications	Normally extinguished indicating no active host communication. Lights GREEN when communicating with a host system. Lights YELLOW if one of two communication channels has failed or the RS-232 serial port on the ACE control board is connected to a PC.
Lamps Out	Normally lights GREEN. Lights YELLOW when the configured lamps out warning level is active. Lights RED when the configured lamps out alarm level is active.
Insulation Resistance	Normally lights GREEN. Lights YELLOW when the configured insulation resistance warning level is active. Lights RED when the configured insulation resistance alarm level is active. Flashes when insulation resistance measuring (megging) is active.

2.6 ACE Menu Quick Reference

Refer below for a quick reference for the Configuration Menu selections. These menus are explained in more detail in the sections that follow. Indentations indicate submenus.
For example: AutoCfg is a submenu of the CirCfg menu.

CONFIG			
	CircCfg		
		AutoCfg	
			SysDate
			SysTime
	StrtCfg		
		ACEType	
		CCRtype	
		# Steps	
	CCR		
		SetMinI	
		SetMaxI	
		SetNomI	
		SetNmVA	
		SetMnVA	
		IRange	
		VARange	
		PwrCycl	
		RunTime	
IRMS			
		IR_Enabl,	
		IR_Volt,	
		IRAlarm	
		IR_Warn	
		StDate1	
		StTime1	
		Period1	
		StDate2	
		StTime2	
		Period2	
	MegImm		
	StopMeg		
	LampTs		
	Sys Cfg		
		SysDate	
		SysTime	
		SysComm	
		Overlay	
	Inputs		
		InpMode	
		InpEnab	
	Outputs		
		OutMode	
		OutEnab	
	LampOut		
		LOAlarm	

		LOWarn	
		LoopEna	
		TimeDly	
		Hertz	
Version			

2.6.1 ACE Configuration Menus

NOTE: This sub-section has been removed from the manual and has been replaced with a separate configuration manual.

2.7 Troubleshooting

This section contains troubleshooting information. The information covers only the most common problems encountered. If the problem cannot be solved with the information given here, contact the local ADB Airfield Solutions representative for help.

2.7.1 Troubleshooting procedures

Troubleshooting procedures for the Advanced Control Equipment (ACE) are contained here.

NOTE: Before beginning, remember that improper or incorrect wiring is the cause of most problems. So the first thing to check is all of the wiring for loose connections or possible electrical shorts/opens.

Table 5: Troubleshooting

Problem	Possible Cause	Corrective Action
1. ACE Front Panel Status LED is not illuminated.	No power ACE ribbon cable not secure	Make sure the main power LEDs on the input/output printed circuit board are illuminated. If these LEDs are not illuminated then power to the ACE is not being supplied. Make sure that the ACE Power supply printed circuit board (see Figure 2-3) is receiving 120 VAC at the main power quick disconnect terminal block. Make sure that all wire connections are secure. If the main power LEDs on the input/output printed circuit board are illuminated, make sure the ribbon cable that connects the front panel display to the ACE processor board is secure. Check the ACE type in CONFIG. It should be set to L-827 or L-829. Refer to Table 4-7.
2. Either of the Internal Processor Board Diagnostic LEDs is frozen on or off.	Board not seating properly No power	Reseat the PC board. Cycle the power to the ACE. If the problem still persists, contact the ADB Airfield Solutions service representative.
3. Lamps out board LED is not flashing.	No power Lamp circuit loop not enabled Board not seated properly	Make sure the power LED on the lamps out board is on. If it is not on, turn the power to the ACE off. Check the integrity of the header connection on the lamps out board. Turn the power to the ACE on. If the problem still persists, contact the ADB Airfield Solutions service representative. Refer to Table 4-45 to enable the loop. Reseat the PC board.
4. 4. ACE front panel displays ACE I/O and front panel status LEDs not lit.	Incorrect ACE type	The ACE has been configured to communicate with a host system. Press the hidden button (by the lower right of the E on the ACE logo) three times. CONFIG displays. Press Enter. CircCfg displays. Configure the ACE type to L-827 or L-829. Refer to Table 4-7.
5. Modified CONFIG data is not being saved.	Incorrect exiting of CONFIG	Make the data modification in CONFIG and exit completely from CONFIG (CONFIG no longer displayed) by pressing the Configuration Menu button repeatedly until the ACE resets. RESET displays.
6. No IRMS versionnumber is displayed.	IRMS board not connected via fiber optic cable No power	Connect IRMS board via fiber optic cable to the ACE. Connect power to IRMS board.

Table 5: Troubleshooting

7. ACE lamps outcalibration is started and IO board LED 158 (output 2) keeps flashing.	Incorrect ACE to CCR cabling Lamp-out calibration was cancelled before completion.	Check the cable between the ACE IO board and the CCR. The ACE is trying to set a CCR step but is not detecting it being set. Power cycle the ACE.
8. 8. ACE lamps outcalibration is started and IO Board LED 158 (output 2) and LED 159 (output 3) keep flashing.	Incorrect ACE to CCR cabling Incorrect CCR type Lamps out calibration was cancelled before completion.	Check the cable between the ACE IO board and the CCR. The ACE is trying to set a CCR step but is not detecting it being set. Check the CCR type in CONFIG. It should be set to Generic. Refer to Table 4-8. Power cycle the ACE.
9. 9. ACE lamps-out calibration is started and IO Board IO Board LED 158 through 163 light sequentially, then LED 159 through LED 161 light sequentially and then only LED 157 is lit.	Incorrect CCR type	Check the CCR type in CONFIG. It should be set to Generic. Refer to Table 4-8.
10.1Incorrect voltageand/or current reading occurs on the ACE front panel display.	No power Fiber optic cable not connected Lamp circuit not enabled	Check the Current Voltage Monitor (CVM) power source. Check the fiber optic connection from the Lamps Out Board to the CVM. Refer to Table 4-45 to enable the loop.
11.Lamps out calibrationis started and the LowVA, Incorrect Current and Open Circuit LEDs are lit.	No power Fiber optic cable not connected Lamp circuit not enabled	Check the Current Voltage Monitor (CVM) power source. Check the fiber optic connection from the Lamps Out Board to the CVM. Refer to Table 4-45 to enable the loop.
12.LowVA LEDs lights inall CCR steps.	CCR shorted	CCR output may be shorted. Remove the short from the CCR output.

Table 5: Troubleshooting

13. Periodic IRMS megging is not being performed.	No power	Verify the IRM has power.
	Fiber optic cable not connected	Check the fiber optic connection from the IRM to the ACE processor board.
	IRM is not enabled.	Enable the IRM. Refer to Table 4-17.
	IRM configuration not set properly	Verify the IRMS date, time and period are set.Refer to Tables 4-23 through 4-28.
14. Non zero Ampsdisplay after performing lamps out calibration.	Lamp load not adequate.	The lamp load should be at least 60% of the CCR's rated load. Turn on the CCR to its highest step and verify the VA display is at or above 60% of the CCR's rated load. Correct the lamp load and rerun lamps out calibration.
	Failed URC board.	Replace the URC board on the CCR. Rerun lamps out calibration.

All of the ACE printed circuit boards have power indication LEDs. A bank of three LEDs are located on the input/output board. These LEDs indicate the status of the raw DC voltage, regulated DC voltage, and board Reset status. All three of these LEDs should be on when power to the ACE is ON.

The second bank of LEDs indicate communication status and internal processor board diagnostic status. This bank of LEDs also form binary error codes. The codes are used by ADB Airfield Solutions to determine board level problems. Table 6 summarizes the function of the Processor Board LEDs. Table 7 summarizes the function of the Lamps-Out Board LEDs. Table 8 summarizes the function of the IRMS Board LEDs.

Table 6: Processor Board LED

Circuit Board Label	LED Description	Normal Working Operation
D10	Processor board Power	Always on
D6	Internal Processor Board Diagnostics	Flashing
D7	Internal Processor Board Diagnostics	Flashing
D8	Only used for error codes	Off
D9	Only used for error codes	Off
D2	Local Debug Communications Port Status	Flashing If Laptop is connected
D3	Lamps Out Board communications Port Status	Flashing If lamps out board is connected
D4	Channel B Communications Port Status	Flashing
D5	Channel A Communications Port Status	Flashing

Table 7: Lamps-Out Board LED

Circuit Board Label	LED Description	Normal Working Operation
D10	Lamps Out board Power	Always on
D2	Idle Task Running	Always on
D3	Processor Heartbeat	Flashing
D4	Communications with ACE control board	Flashes when communicating
D6	Channel 0 communications with a CVM	Flashes when communicating

Table 7: Lamps-Out Board LED

D7	Channel 1 communications with a CVM	Flashes when communicating
D8	Channel 2 communications with a CVM	Flashes when communicating

Table 8: IRMS Board LED

Circuit Board Label	LED Description	Normal Working Operation
D1	IRMS board Power	Always on
D12	50 Volt	Flashes quickly when powering up or down.Flashes slowly when sampling
D42	500 Volt	Flashes quickly when powering up or down.Flashes slowly when sampling
D43	1000 Volt	Flashes quickly when powering up or down.Flashes slowly when sampling
D12, D42, D43	Idle mode	Flashing in D12, D42, D43 D42, D12 sequence

2.8 Parts

To order parts, call ADB Airfield Solutions Customer Service or the local ADB Airfield Solutions representative. Use this four-column parts list to describe and locate parts correctly.

2.8.1 Using the Illustrated Parts List

This subsection describes how to use the parts list covered later in this section. It does not provide the actual parts list.

The Part Number column gives the ADB Airfield Solutions part number.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentations show the relationships among assemblies, subassemblies, and parts.

Table 9: Part Numbers

Part Number	Description	Quantity	Note
xxxxxxxx	Assembly	1	A
xxxxxxxx	Part	1	
xxxxxxxx	Part or Assembly		
xxxxxxxx	Assembly	1	
Note A			

The Quantity column contains the quantity required per unit, per assembly, or per subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

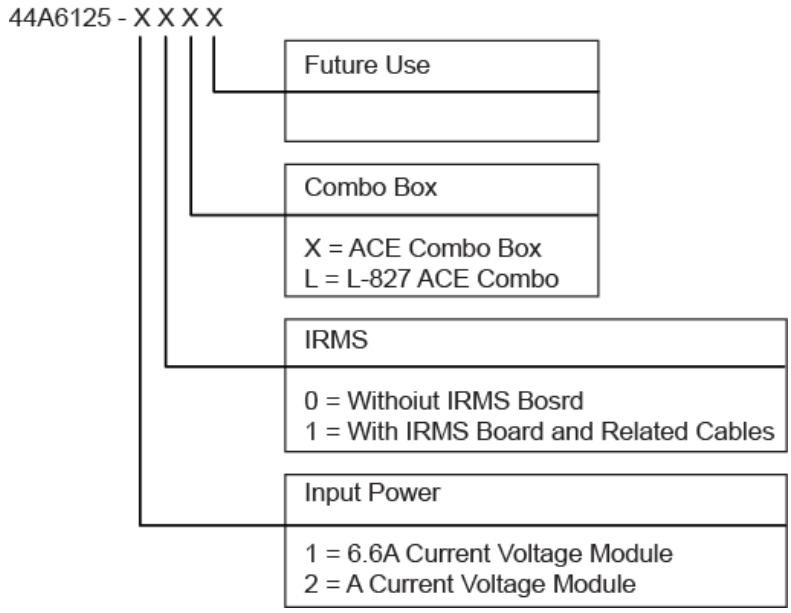
The Note column contains letters that refer to notes at the end of each parts list. Notes contain special ordering or product/part version information.

2.8.2 L-827/L-829 ACE Ordering Code

This subsection provides the ordering code for the L-827 Advanced Control Equipment.

For the part numbers for the L-829 ACE, refer to the Signature Series™ Ferroresonant L-828/L-829 Constant Current Regulator with Universal Regulator Controller (URC) 4-30 kW/6.6 A/20 A manual (96A0288). Figure10 shows how to determine the part number for a particular L-827 ACE.

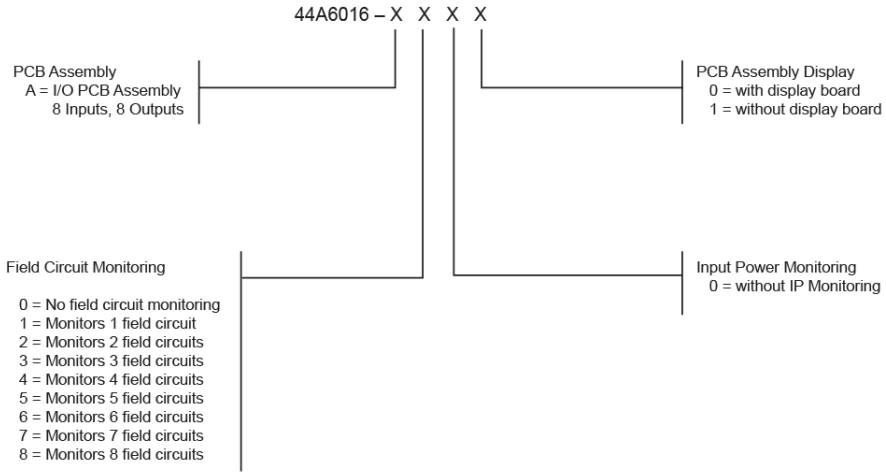
Figure 9: L-827 Ordering Code



NOTE: NOTE: Unit operates on 6.6 or 20 amp circuits.

Parts

Figure 10: L-827 ALCMS ACE Ordering Code



See Table 10 below for the L-827/ L-829 ACE parts list.

Table 10: L-827/ L-829 ACE Parts List

Part Number	Description	Quantity	Note
44A4801	ACE control board PCB assembly	1	
44A4803	ACE display PCB assembly	1	
44A4850	ACE power supply PCB assembly	1	
44A4800-1	ACE input/output PCB assembly	1	
44A4802-1	ACE lamps out monitoring 1-channel PCB assembly	1	
44A5876	IRMS ACE PCB assembly (optional)	1	
44A6006-XX	Fiber optic cable	As required	
44A5914-20	Current voltage module, 20 A	1	
44A5914	Current voltage module, 6.6 A	1	

2.9 Button Location and Display Overlays

This section provides information for locating buttons and using display overlays.

2.9.1 Button Location and Display Overlays

See Figures 12 and 13 for using firmware versions 90A0017 and 90A0020 with display overlays 44A5904 and 44A6106.

Figure 11: Display Overlay Button Location for Firmware Version 90A002

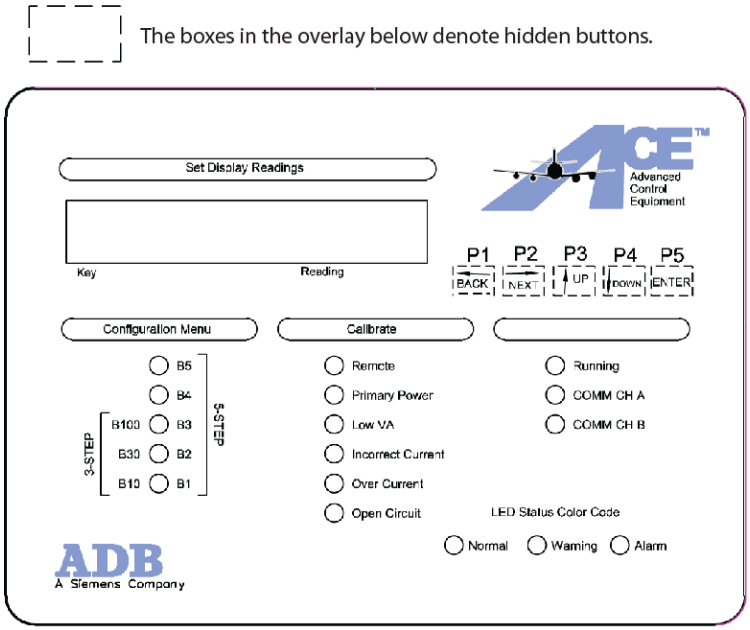
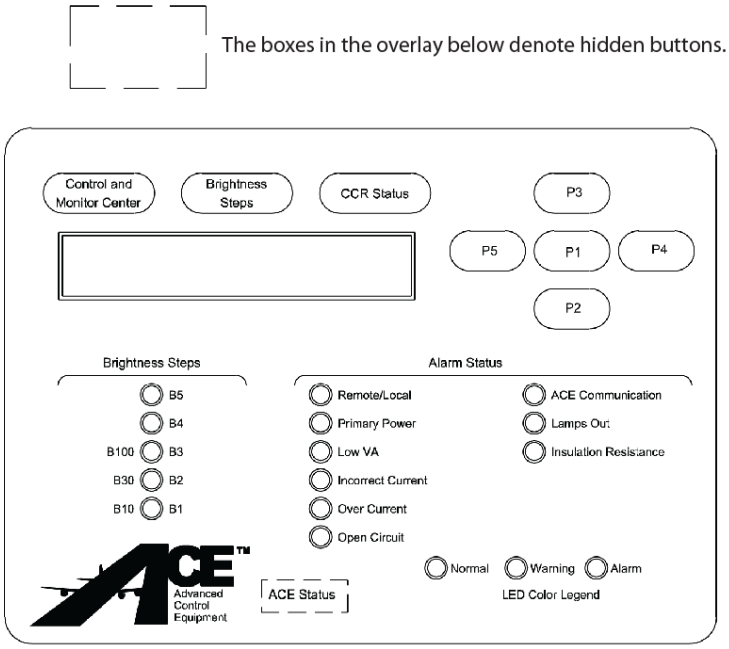


Figure 12: Overlay Button Location for Firmware Version 90A0017



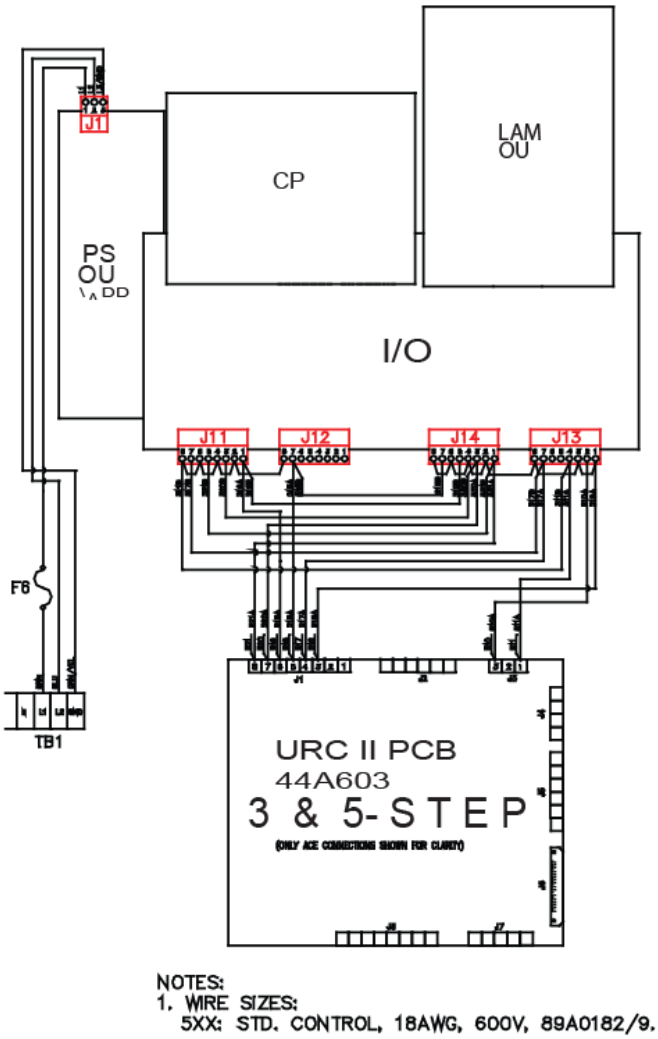
2.10 Wiring Schematics

This section provides wiring schematics for L-827/L-829 Advanced Control Equipment (ACE).

2.10.1 Wiring Schematics

See Figure 13 for the L-827/L-829 ACE wiring connections to the constant current regulator (CCR).

Figure 13: ACE to URC PCB Internal Wiring Diagram for Ferro Regulator (3- and 5-Step)



Registered office:

ADB Airfield Solutions LLC
977 Gahanna Parkway
Columbus, OH 43230
USA
Phone: +1 (614) 8611 304
Fax: +1 (614) 8642 069

Other addresses:

ADB Airfield Solutions Ltd.
5500 North Service Road, Suite 1108
Burlington, Ontario L7L 6W6
Canada
Phone: +1 (905) 331 6887
Fax: +1 (905) 331 9389

ADB Airfield Technologies Ltd.
01A Unit, 9F, LSH Plaza
8, Wangjing Jie
Chaoyang District
Beijing 100102
P.R. China
Phone: +86 10 8476 0106
Fax: +86 10 8476 0090

ADB N.V.
Dubai Silicon Oasis
Wing D - Office D-309
P.O. Box 341218
United Arab Emirates
Phone: + 971 4372 4970
Fax: + 971 4372 4975

ADB N.V./S.A.
39/47 Boulevard Ornano
93200 Saint-Denis
France
Phone: +33 (1) 4922 9250
Fax: +33 (1) 4922 9255

ADB Airfield Solutions GmbH & Co. KG
Von-der-Tannstr. 31
90439 Nürnberg
Germany
Phone: +49 (911) 9239 1287
Fax:+49 (911) 2852 582

ADB N.V.
Asia Pacific Regional HQ
Unit C-9.3.1, Level 9, Block C
Mines Waterfront Business Park
No. 3, Jalan Tasik
The Mines Resort City
43300 Seri Kembangan Selangor
Malaysia
Phone: +603 8941 4868
Fax: +603 8942 4869

ADB Airfield Solutions Netherlands
Prinses Beatrixlaan 614
Office D3.14
2595 BM Den Haag
The Netherlands
Phone: +31 (0)70 304 3611
Fax: +31 (0)70 333 8094

ADB Airfield Solutions, Ltd.
2nd Floor, 3 Rivonia Village
Cnr Mutual Road and Rivonia Boulevard
South
Rivonia 2128
South Africa
Phone: +27 (11)234 6768
Fax: +27 (11)234 6739

ADB
Unit 44, Business Innovation Centre
Binley Business Park
Harry Weston Road
Coventry, CV3 2TX
United kingdom
Phone: +44 (0)1455 883130
Fax: +44 (0)1455 883179

ADB
Airfield Solutions
Leuvensesteenweg 585
B-1930 Zaventem
Belgium
Phone: +32 (2) 722 17 11
Fax: +32 (2) 722 17 64
info.adb@adb-air.com
www.adb-air.com

ADB Airfield Solutions USA

977 Gahanna Pkwy
Columbus, Ohio 43230 USA
Telephone: (+1 614-861-1304)
Fax: +1 614-864-2069
www.adb-airfi eldsolutions.com

Document Date (12/2010)