ACE3 Manual

ACE3 Advanced Control Equipment and I/O Box, L-827

User Manual

96A0500, Rev. G, 2024/06/28

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 C22.2 No.180:13 (R2018) regulations. The CSA 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 below, 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 manufactured by ADB SAFEGATE 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.

> **ℹ Note**
>
> See your applicable sales agreement for a complete warranty description.
>
> Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

FAA Certified products manufactured by ADB SAFEGATE

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 LED products (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). These FAA certified constant current (series) powered LED products must be installed, interfaced and powered with and through products certified under the FAA Airfield Lighting Equipment Program (ALECP) to be included in this 4 (four) year warranty. This includes, but is not limited to, interface with products such as Base Cans, Isolation Transformers, Connectors, Wiring, and Constant Current Regulators.

> **i** **Note**
> See your sales order contract for a complete warranty description.
> Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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.

Copyright Statement

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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.
	ELECTROSTATIC SENSITIVE DEVICES This equipment may contain electrostatic devices.

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.
> - CSA - C22.2 No.180:13 (R2018) Series isolating transformers for airport lighting
> - 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 Operation Safety

> ⚠️ **CAUTION**
>
> **Improper Operation**
> Do Not Operate this equipment other than as specified by the manufacturer
>
> - 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.
>
> **Failure to follow these instructions can result in equipment damage**

1.1.4 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**

1.1.5 Material Handling Precautions, ESD

<table>
<tr>
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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

</td>
</tr>
</table>

2.0 About this manual

2.1 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 ACE 3 Introduction

The ACE 3 operates either as the remote interface between the L-890 ALCMS and any controlled element in the airfield lighting vault or as the stand-alone regulator/monitor performing all L-827/L-829 functions in accordance with FAA AC 150 / 5345-10. The ACE3 is a universal device that can be used to control any type of CCR and/or controlled element regardless of the manufacturer.

3.1 Advanced Control Equipment

Compliance with Standards

FAA:	Monitoring: Certified to AC 150/5345-10 (Current Edition). ETL Certified.
	Insulation Resistance: AC 150/5340-26 Chapter 3, Section 2, para. 27.

Overview

The RELIANCE® Power ACE3 distributed control and monitoring unit (DCMU) provides full L-827/L-829 monitoring in conjunction with an Airport Lighting Control and Monitoring System (ALCMS), or it can be used as a stand-alone unit for local monitoring. The ACE3 is a universal device that can be used to control any type of constant current regulator (CCR) and/or controlled element regardless of the manufacturer. Each ACE enclosure is installed locally at each device that requires control and/or monitoring in the airfield lighting electrical vault.

The ACE3 unit can be packaged as a CCR internal mount, a Combo Box Assembly, and an I/O ACE.

- The Internal Mount ACE3 mount is integrated inside an ADB Safegate L-828 CCR. Installing the ACE unit converts it into an L-829 CCR.

- The Combo Box is an L-827 that houses the ACE3 unit, IRMS board, and CVM2 (Current and Voltage Monitoring Unit Gen. 2).

- The I/O ACE3 is used to control and monitor any non-CCR components, such as generators, ATS units, Circuit Selectors, etc.

The I/O ACE3 unit has the ability to accept a combination of up to seven (7) expansion cards, either input or output, to meet the I/O needs of the control system. Each expansion card contains eight (8) interface points, each point with its own dedicated common. This, in addition to the five (5) outputs and three (3) inputs available on the primary Default Card, allows the ACE3 to connect up to 61 outputs, 59 inputs, or a combination inputs and outputs to suit the individual control needs of the airport.

Each CCR and controllable item is connected to an ACE3. The ACE3 is a microprocessor-based module that includes all of the communication, control commands, input/output interface, and fail safe functionality for the controlled element.

Theory of Operation

The Advanced Control Equipment (ACE™) is a primary component of ADB Safegate's airfield lighting distributed control system. Distributed control technology has many advantages over traditional central control, including but not limited to: cost-effectiveness, system expandability, ease of maintenance, ease of installation, interchangeable parts, and ease of troubleshooting. In a distributed control scenario, each ACE3 unit is locally installed at or near a controllable item (CCR, Generator, ATS, etc.). Each ACE3 would, in turn, talk with the airfield lighting control network and execute remote lighting commands. Multiple ACE3 units can be daisy-chained together, making system expansion very easy.

The ACE3 is a universal device that can be used to control any type of CCR and/or controlled element regardless of the manufacturer. Printed circuit boards are mounted inside a small, rugged environmental enclosure that can be mounted on the wall or integrated into the door of an ADB Safegate L-828 CCR.

The ACE3 is ADB Safegate's third generation distributed control/monitor system. ACE3 network communications are compatible with ADB Safegate's first and second generation system. Thus ACE, ACE2, and ACE3 units can be connected on the same distributed network. The ACE3 is also backward compatible with a Liberty DCMU installation.

Communication

Each of the ACE3 units connected to a CCR or other controllable device will have a unique factory set number and a field programmable communication address. This address is used by the ADB Safegate L-890 ALCMS to direct lighting commands to the corresponding ACE3, which in turn executes the commands and returns the operational status of the element back to the ALCMS.

Each ACE3 is connected to redundant communication networks via either two RS-422 serial communication ports or two Ethernet ports located on the main printed circuit board.

The ACE network is comprised of a communications server and all the daisy-chained ACE units in the lighting vault. All ACE devices can be connected to the same network. The communications server stays in constant communication with all the different ACE units in both networks while at the same time staying in constant contact with the main ALCMS network. This communications protocol dictates that the local ACE3 store all data and parameters specific to the controlled element. This characteristic frees up the ALCMS computers from having to store the parameters for each of the controlled elements. This results in real-time communication between all ACE units and the rest of the L-890 ALCMS, even if a network connection fails in one of the ACE units.

The ACE3 also provides an 802.11 wireless networking option, which can provide a wireless communication backup and can be used for diagnostics and future mobile application interaction.

Interface

The ACE3 incorporates an input/output interface that supports full FAA L-827/L-829 CCR control monitoring capabilities. The pluggable terminal blocks provide an easy-to-service point of connection.

The latching output relays can be configured to control CCR brightness steps or simple ON/OFF control as required by the controlled element.

The input lines can be configured to monitor any external event that is determined by a discrete dry contact closure. Some examples include generator monitoring, monitoring of Automatic Transfer Switch position, and control of Circuit Selector Switch loops. In addition, the ACE3 can be optionally expanded to perform CCR input voltage and current monitoring as well as airfield circuit cable Insulation Resistance Monitoring.

Fail-safe Functionality

Each ACE3 unit provides a self-contained fail-safe feature. This feature insures default airfield lighting operation in the event of an L-890 ALCMS component failure or even a complete ALCMS failure. In addition, each ACE3 can monitor its output and verify that the proper command is executed. The fail-safe system also permits maintenance of portions of the control system without changing the operational status of the lighting system. The fail-safe system is by definition only used in the ALCMS modes and must be set up by a qualified ADB Safegate technician.

The fail-safe mode of each ACE3 unit is defined per requirements of the airport/owner. The fail-safe modes are as follows:

Latching Fail-safe Mode:

This mode is executed as follows:

- If the CCR was switched ON before the failure, it will remain ON at the same brightness level.

- If the CCR was switched OFF before the failure, it will remain OFF.

Simple Fail-safe Mode:

This mode is executed as follows:

- After a failure occurs, the CCR will switch ON to a predetermined brightness level without regard to the current step.

Smart Fail-safe Mode:

This mode is executed as follows:

- If the CCR was switched ON before the failure, it will remain ON at the same brightness level.
- If the CCR was switched OFF before the failure, it will switch ON to a predetermined brightness level.
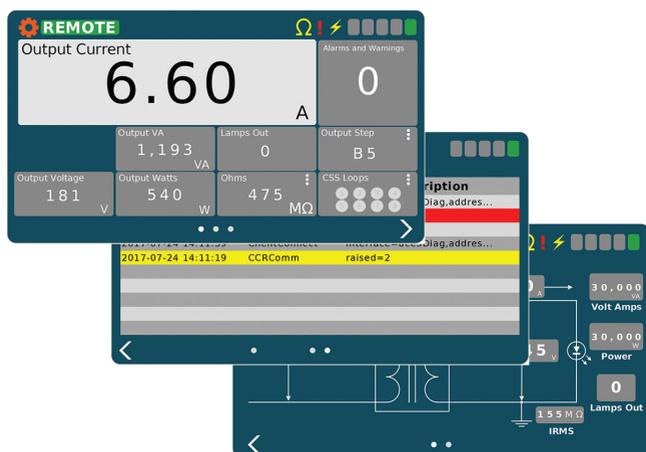
Insulation Resistance Monitoring

The ACE3 IRMS option will allow the user to test the insulation resistance of the field circuit automatically from the CCR. The user can set up an automated testing schedule to allow the circuit to be tested automatically. The IRMS data will be archived locally at the ACE3 unit, as well as forwarded to the ALCMS. This will allow the user the ability to not only view trending data on the ALCMS, but also display the trending graphs on the ACE3 display locally. This now gives an airport the ability to test, archive and view trending graphs, even if the CCR is not integrated into an ALCMS.

Graphics User Interface (GUI)

The ACE3 graphic user interface (GUI) consists of a 7-inch 800 x 480 pixel full-color LCD touchscreen. In typical modes of operation, the ACE3 will display several tiles, which contain all available output data. The user can select the individual tiles to make it more prominent on the screen. Other data available on the screen include:

- Brightness step
- Remote/Local
- Primary power present / loss of power
- Communication
- IRMS status
- CCR Cycle Count
- Total Run Time
- Run Time per Step

The ACE3 GUI also contains a localized event database to allow the user to view alarms/warnings for the individual device without the need to interface with the higher level control system

Specifications

Input Voltage:	22-28 VDC or 95 to 265 VAC, 50/60 Hz
Input Power:	12 VA maximum
Input Expansion Card:	Rated at 12-240 VAC/VDC
Output Expansion Card:	Rated at 12-240 VAC/VDC (Fused 2A)
Operating Conditions:	-10 to +55 °C (+14 to +131 °F)
Altitude:	Sea Level to 10,000 feet

Dimensions (External Mount Enclosures)

I/O:	14 × 17.5 × 8.6 in (35.56 × 44.45 × 21.84 cm)
Internal Mount:	12 × 9 × 2.8 in (30.48 × 22.86 × 7.1 cm)
Combo Box:	14 × 17.5 × 8.6 in (35.56 × 44.45 × 21.84 cm)

3.2 ACE 3 Hardware Overview

Components

Depending on the configuration, the ACE3 uses several different hardware elements to perform the necessary functions.

ACE3 Main Control Board	The control board houses all communication connections, both internal (URC4, I/O Backplane, touchscreen) and external (ALCMS). This also houses the operating system for the ACE3.
Touchscreen HMI	This displays and controls the graphical user interface (GUI) of the ACE3
CVM2	The CVM2 is the second generation current and voltage monitoring unit and is the only CVM that can connect to an ACE3. The CVM2 is backward compatible with both the ACE1 and ACE2.
IRMS board	The IRMS board enables the ACE3 to perform insulation resistance measurements.
Regulator Interface Card (blue)	This card provides the basic I/O required to control any non-integrated CCR. The card contains 6 outputs for control and 3 inputs for basic monitoring.
I/O Backplane	This expansion unit allows the addition of input and output expansion cards
Input card (yellow)	This card adds 8 optically isolated inputs to an I/O backplane
Output card (red)	This card adds 8 latching outputs to an I/O backplane

Communication

Each of the ACE3 units connected to a CCR or other controllable device will have a unique factory set number and a field programmable communication address. This address is used by the ADB Safegate L-890 ALCMS to direct lighting commands to the corresponding ACE3, which in turn executes the commands and returns the operational status of the element back to the ALCMS.

Each ACE3 is connected to redundant communication networks via either two RS-422 serial communication ports or two Ethernet ports located on the main printed circuit board.

The ACE network is comprised of a communications server and all the daisy-chained ACE units in the lighting vault. All ACE devices can be connected to the same network. The communications server stays in constant communication with all the different ACE units in both networks while at the same time staying in constant contact with the main ALCMS network. This communications protocol dictates that the local ACE3 store all data and parameters specific to the controlled element. This characteristic frees up the ALCMS computers from having to store the parameters for each of the controlled elements. This results in real-time communication between all ACE units and the rest of the L-890 ALCMS, even if a network connection fails in one of the ACE units.

The ACE3 also provides an 802.11 wireless networking option, which can provide a wireless communication backup and can be used for diagnostics and future mobile application interaction.

Connections

The ACE3 incorporates an input/output interface that supports full FAA L-827/L-829 CCR control monitoring capabilities. The pluggable terminal blocks provide an easy-to-service point of connection.

The latching output relays can be configured to control CCR brightness steps or simple ON/OFF control as required by the controlled element.

The input lines can be configured to monitor any external event that is determined by a discrete dry contact closure. Some examples include generator monitoring, monitoring of Automatic Transfer Switch position, and control of Circuit Selector Switch loops. In addition, the ACE3 can be optionally expanded to perform CCR input voltage and current monitoring as well as airfield circuit cable Insulation Resistance Monitoring.

ACE3 Spare Parts

Part Number	Description
MM00309-000-01	ACE3 DOOR MOUNT ASSEMBLY (see the Parts section)
EB00030-000-01	AC/DC CONVERTER 24V 40W
44A6006/00XX	CABLE FIBER OPTIC *XX* FEET

3.2.1 ACE 3 Main Board

The Main Printed Circuit Board is the central part of the design. It includes a microcontroller core that implements main logic and provides calculating functions.

Communication circuitry provides the interface for the redundant communication network (RCN), which is how ACE3 receives and transmits data to the ALCMS vault computer. The RCN can be either redundant serial RS-422 or redundant ethernet communication.

It contains a fiber optic interface connection for the Current Voltage Monitor (CVM) and optional Insulation Resistance Monitoring System (IRMS).

The touchscreen LCD provides a Graphic User Interface (GUI) for local control and monitoring for all controllable functions. The display is connected to the main board by a ribbon cable.

The ACE3 uses a redundant 24vdc power source to power all the electronics on the board. The Power Supply can be turned On and Off via the main power switch in the upper right corner of Figure 2.

Figure 1: ACE3 Main Board
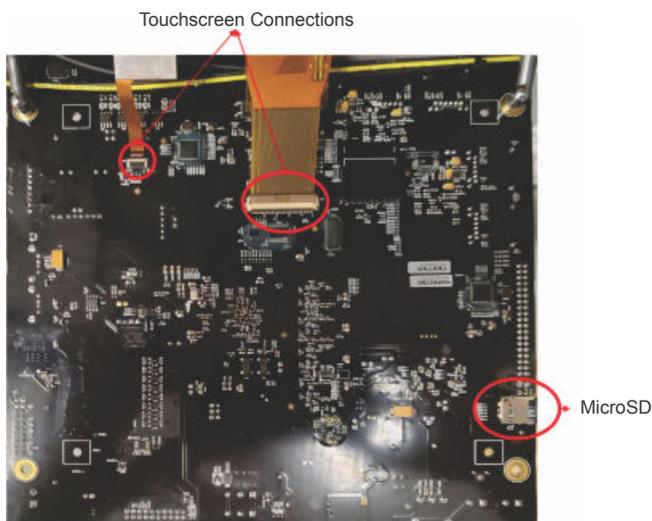
The MicroSD memory card, on the back side of the board, contains all the software for the ACE3. If an failed ACE3 unit is replaced, the MicroSD card can be removed from the failed ACE3 and placed in the new ACE3. See Figure 1.

SD Cards can only be swapped between same hardware revisions of the Main Board. If the boards have different hardware version, the ACE3 configuration should be exported to a USB thumbdrive using the HMI and then imported on the new Main Board. This is in general the recommended procedure for transferring ACE3 configurations.
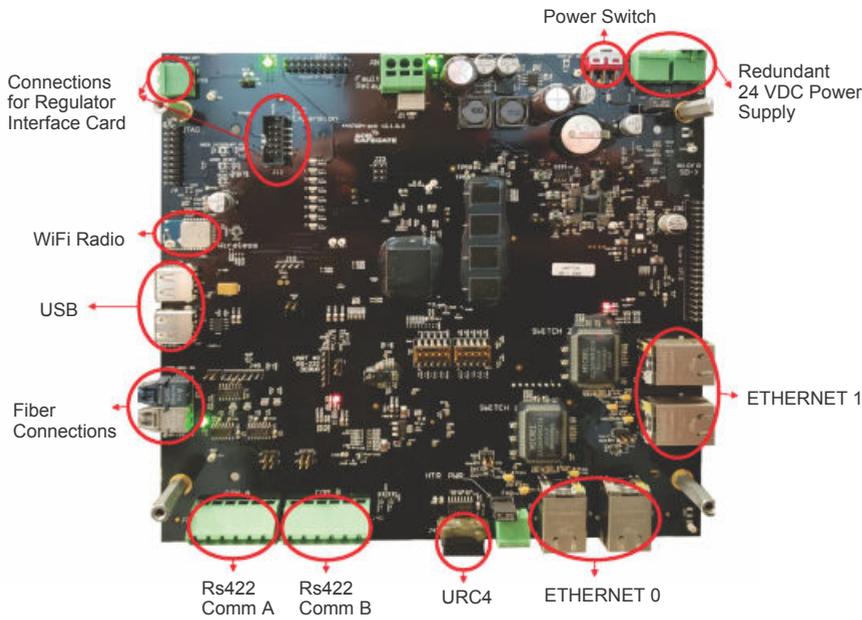
⚠️ **CAUTION**

This should only be performed with the power off.

The ACE3 main board contains two USB ports that provide backup/restore functions, as well as an interface for firmware upgrades.

Figure 2: ACE3 Main Board

The ACE3 has a connection for interfacing to the Universal Regulator Controller, 4th edition (URC4). Connections for interfacing to the Regulator Interface Card (RIC) are provided for controlling and monitoring CCRs that do not contain a URC4 card.

The ACE3 contains a 802.11 Wi-Fi radio interface. An external antenna is connected to the U.FL connector on the Wi-Fi radio chip.

Part Number	Description
44A7694	PCB ASSY, ACE3 Control PCB

3.2.2 ACE 3 IO Expansion Backplane

The expansion backplane is used when the need for more discrete I/O is needed than the Regulator Interface Card provides. The backplane has eight (8) slots for expansion cards. The Regulator Interface Card is required for the backplane to operate.

Figure 3: Expansion Backplane
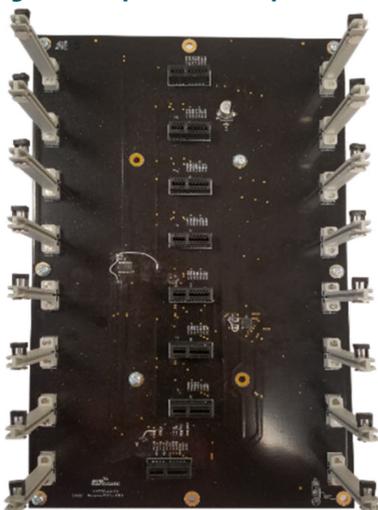
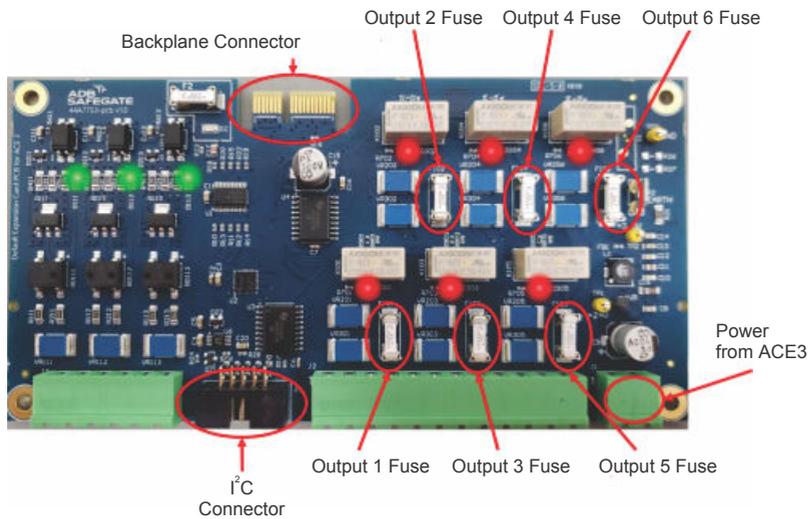| Part Number	Description
44A7742	ACE3 I/O BACKPLACE PCBA

3.2.3 ACE 3 IO Regulator Interface Card

The Regulator Interface Card is used to control and monitor any CCR that does not contain a URC4 board.

The base Regulator Interface Card contains six (6) outputs and three (3) inputs, for interfacing to the external control terminal block in a CCR. All inputs are optically isolated. All outputs have a 2A fuse. The fuse is a SMD style fuse, ex. Littelfuse 0160002.MR. A spare fuse and fuse tester is provided beside the backplane connector. LED indicators are provided as visual indication of IO status.

The I^{2}C connector and power connector are used when connecting the RIC card to the ACE3 Main Board. When used with the expansion backplane, this allows the ACE3 to communicate and power the other expansion cards present on the expansion backplane.

Figure 4: Regulator Interface Card

Part Number	Description
44A7753	PCB ASSY, Regulator Interface Card

3.2.4 ACE 3 IO Output Card (red)

The output card is used with the expansion backplane to add additional output capability to the ACE3.

The output card contains eight (8) latching outputs. All outputs have a 2A SMD fuse. All outputs have independent commons for controlling devices with differing voltage sources. LED indicators are provided as visual indication of IO status.

Figure 5: Output Card
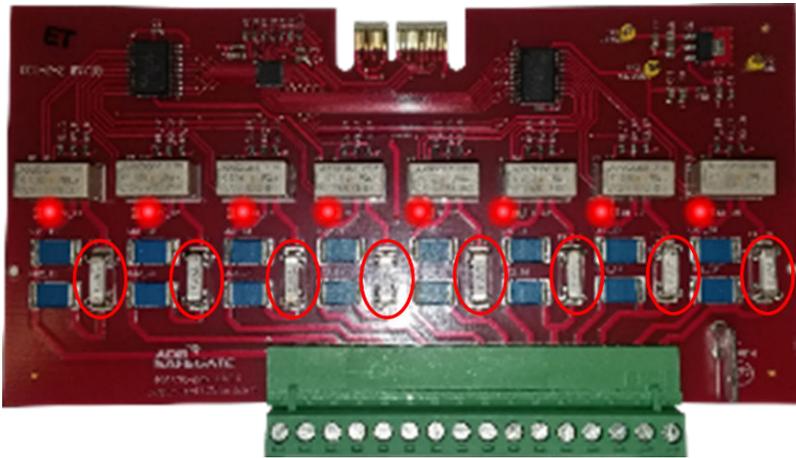
Part Number	Description
44A7705	ACE3 I/O CAGE OUTPUT CARD PCBA

3.2.5 ACE 3 IO Input Card (yellow)

The Input card is used with the expansion backplane to add additional Input capability to the ACE3.

The input card contains eight (8) optically isolated inputs. All inputs have independent commons for monitoring devices with differing voltage sources. LED indicators are provided as visual indication of IO status.
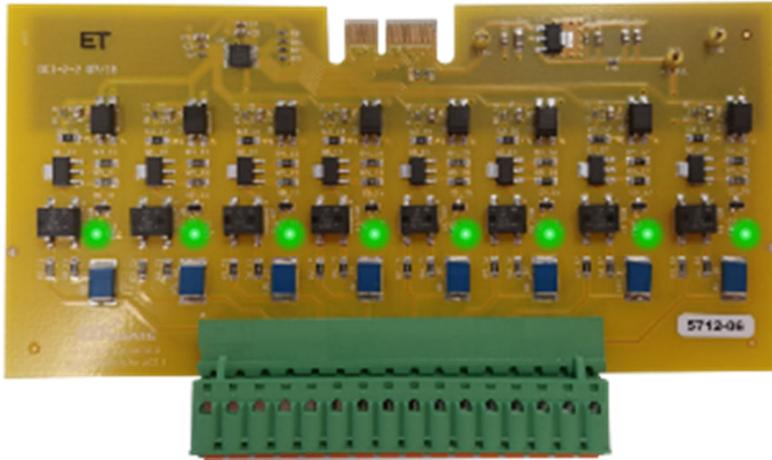
Figure 6: Input Card

Part Number	Description
44A7704	ACE3 I/O CAGE INPUT CARD PCBA

3.2.6 ACE 3 Current and Voltage Monitor, 2nd edition (CVM2)

The CVM2 is a device the connects to the output of a constant current regulator and actively monitors the current and voltage being produced by the CCR.

Figure 7: CVM2 Assembly

Figure 8: CVM2 connections

The CVM2 is the latest generation monitoring module. This module is backward compatible with all previous versions of CVMs and can be used as a direct replacement.

For connections to an ACE1 or ACE2, a single fiber connection is provided to interface the CVM2 with the LOM card.

Figure 9: CVM2 Connections to ACE 1 and ACE2
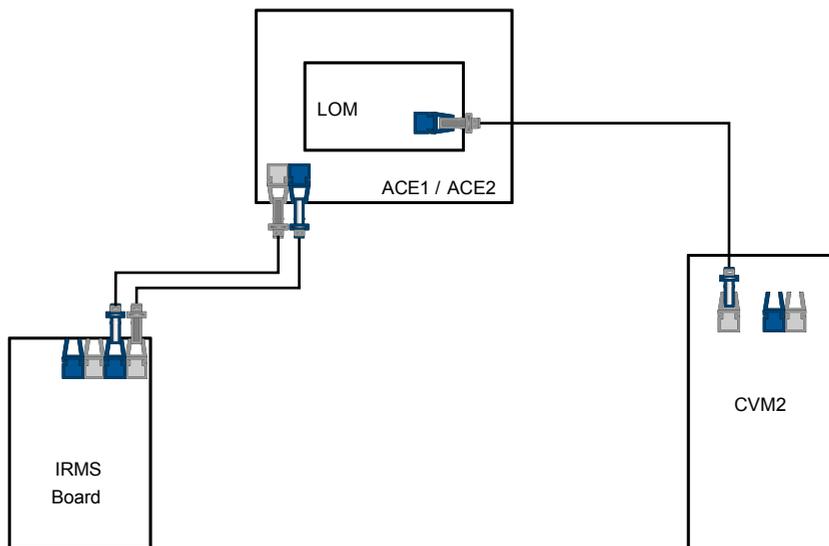
For connections to an ACE3, a dual fiber connection is provided, which will interface to the IRMS board, or directly to the ACE3 main board.

Figure 10: CVM2 Connections to ACE3

3.3 ACE3 Software Overview

Graphics User Interface (GUI)

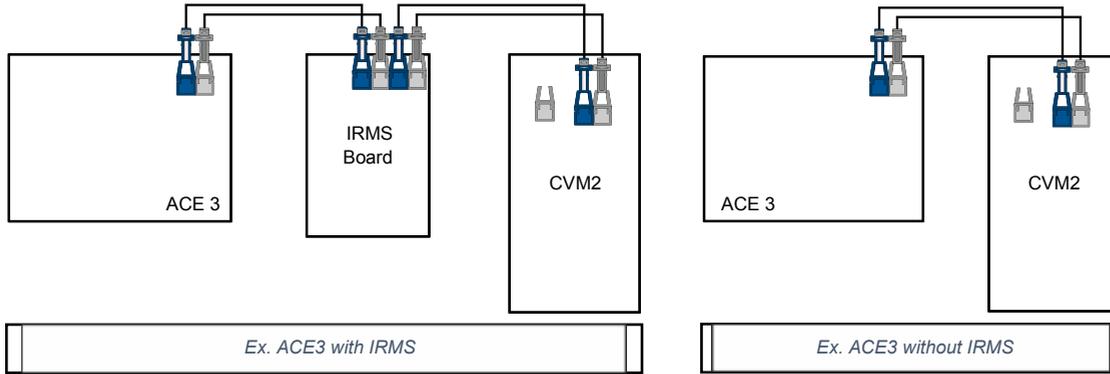The ACE3 graphic user interface (GUI) is displayed on a 7-inch 800 x 480 pixel full-color LCD touchscreen. In typical modes of operation, the ACE3 will display several tiles, which contain all available output data. The user can select the individual tiles to make it more prominent on the screen. Other data available on the main screen include:

- Brightness step (Control and Status)
- Remote/Local
- Circuit ON status
- IRMS (Settings and Status)
- Active Alarms and Warnings
- CSS (Settings and Status)
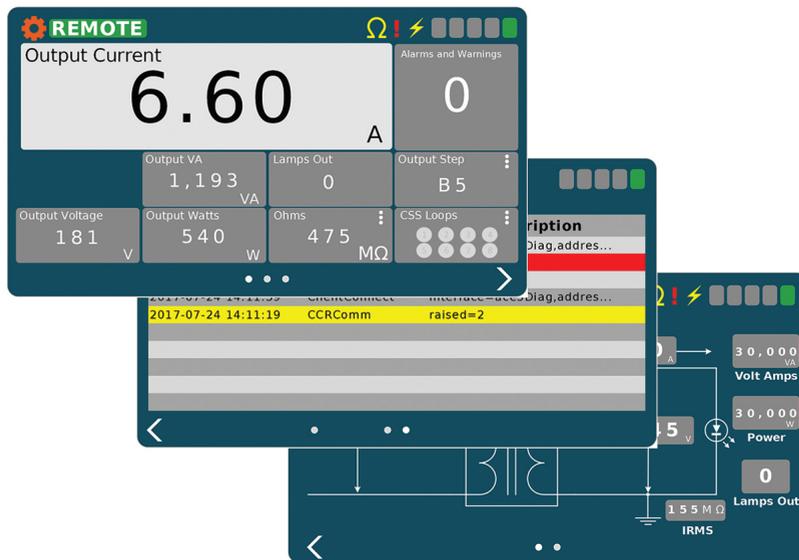
The ACE3 also contains a localized event database to allow the user to view alarms/warnings for the individual device without the need to interface with the higher level control system

Failsafe Functionality

Each ACE3 unit provides a self-contained failsafe feature. This feature insures default airfield lighting operation in the event of an L-890 ALCMS component failure or even a complete ALCMS failure. The failsafe system also permits maintenance of portions of the control system without changing the operational status of the lighting system. The failsafe system is by definition only used in the ALCMS modes and must be set up by a qualified ADB Safegate technician. See Fail-safe Functionality for the failsafe modes.

Insulation Resistance Monitoring [Optional]

The ACE3 IRMS option will allow the user to test the insulation resistance of the field circuit automatically from the CCR. The user can set up an automated testing schedule to allow the circuit to be tested automatically. The IRMS data will be archived locally at the ACE3 unit, as well as forwarded to the ALCMS. This will allow the user the ability to not only view trending data on the ALCMS, but also display the trending graphs on the ACE3 display locally. This now gives an airport the ability to test, archive and view trending graphs, even if the CCR is not integrated into an ALCMS.

4.0 ACE 3 Installation

4.1 Mounting Instructions

Combo Box, I/O Box Mounting Dimensions

Mount four 1/4-20 studs on the wall near the CCR or equipment to be monitored or controlled by the ACE3.

> **ℹ Note**
> Place the ACE near the CCR.

ACE 3 Remote Mount Cable Entry

> **ℹ Note**
> All conduit and wiring must only enter the ACE3 enclosure through the bottom or through the top access plate. This facilitates quick maintenance and replacement of the ACE3 unit.

Figure 11: Remote Mount dimensions and cable entry

ACE3 ASSEMBLY PLACED OVER 1/4-20 TPI STUDS
FOR MOUNTING TO ENCLOSURE
4X Ø.31 THRU

12
308 mm

16.75
425.24 mm

17.5

Combo Box

14.3

9

KNOCKOUT PATTERN ON BOTTOM
OF ENCLOSURE FOR CONDUIT
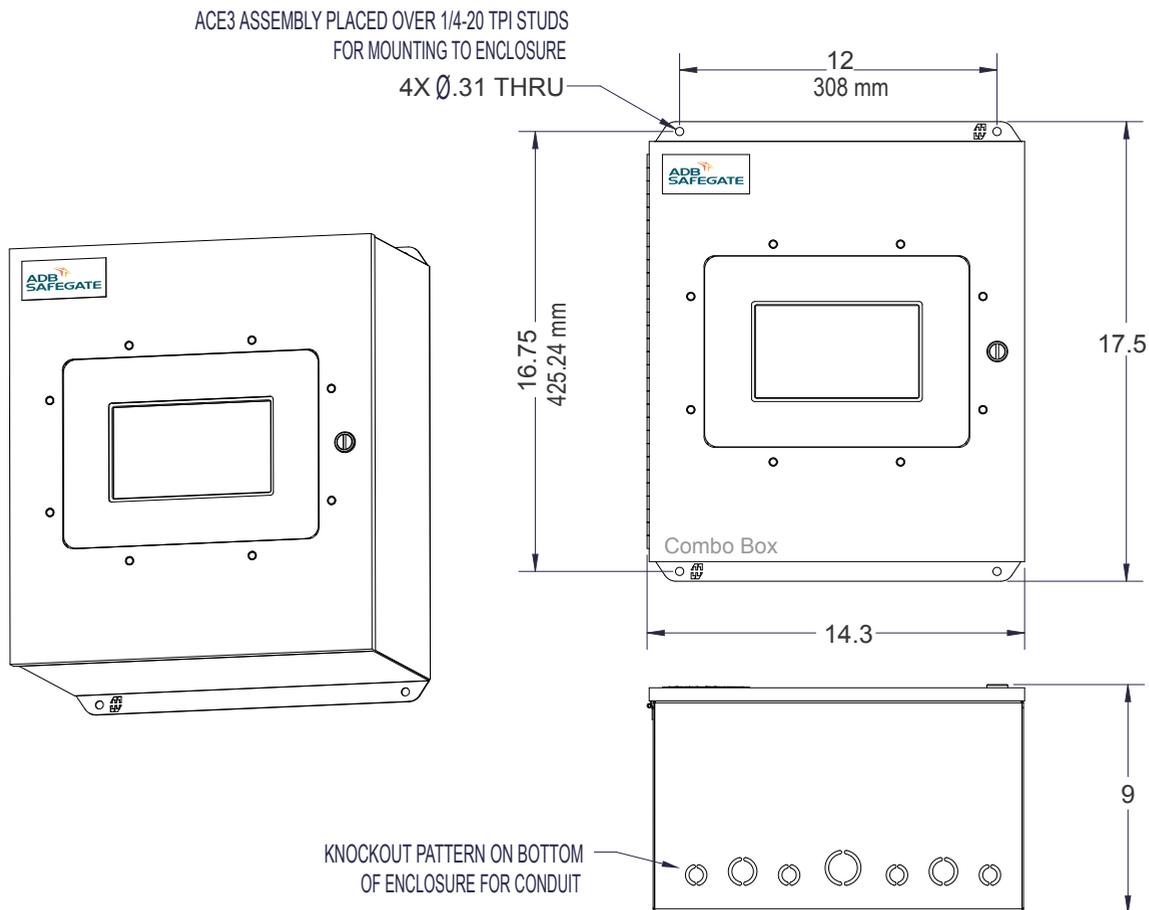
> ⚠️ **CAUTION**
> DO NOT drill enclosure holes because metal shavings can damage the electronics.

1. Recommended conduit size: 1" (rigid is preferred).

2. RECOMMENDED MOUNTING HARDWARE: UNISTRUT OPTIONAL: 1/4 wall anchors on flat surface. If surface is not flat use shims in any gap to prevent any deformation of back panel.

3. Refer to ACE3-XXXXXXXXXXXX for quantity of leads per product spec – For all power and COM inputs and output, refer to 43A4827 for connections of power supply leads inside of enclosure (120v).

4. High voltage leads connected to field at CCR output and output to field, refer to ACE3-XXXXXXXXXXXX for quantity of leads per product spec, refer to 43A4827 for connections.

5. Maximum ACE3-XXXXXXXXXXXX weight - 27 pounds.
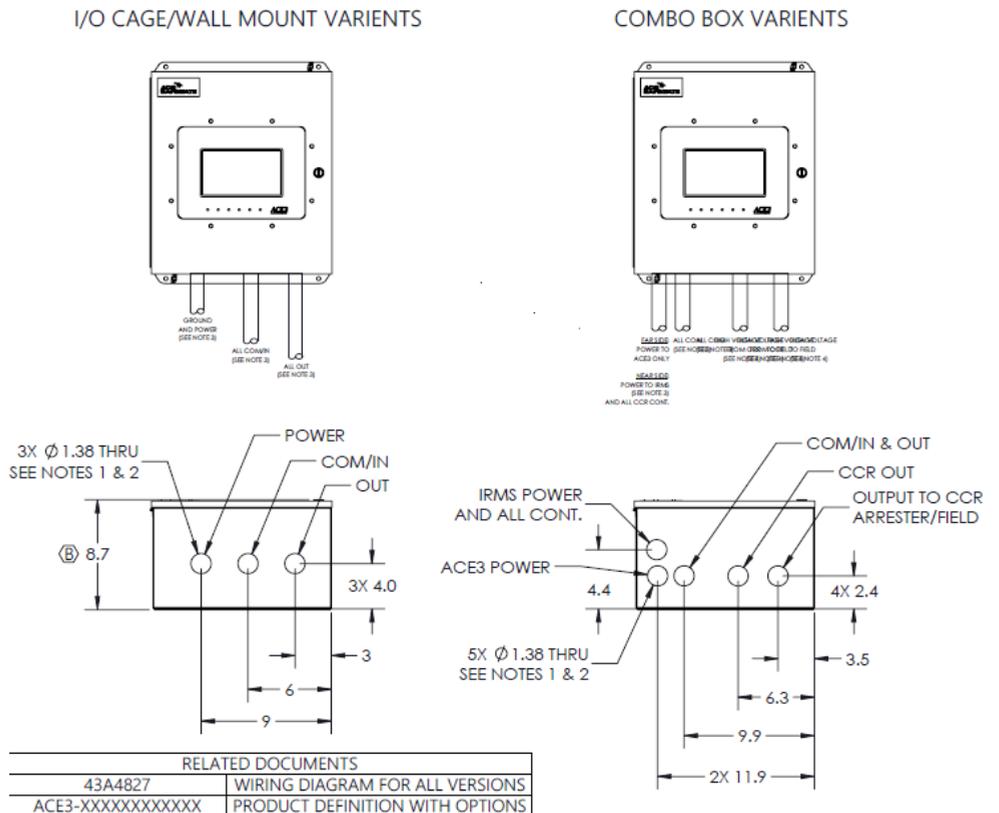
4.2 ACE 3 Cable Entry

> ℹ️ **Note**
> All conduit and wiring must only enter the ACE3 enclosure through the bottom or through the top access plate. This facilitates quick maintenance and replacement of the ACE3 unit.

> ⚠️ **CAUTION**
> DO NOT drill enclosure holes because metal shavings can damage the electronics.

Figure 12: Remote/Wall Mount cable entry

> ## ℹ Note
>
> RECOMMENDED CONDUIT SIZE & LOCATIONS SHOWN FOR REFERENCE ONLY: (DIMENSIONS DEPICTED FOR 1" RIGID CONDUIT)

4.3 ACE3 Wiring Communication

Serial (Belden 9842 or Equivalent)

The serial communication for the ACE3 is daisy-chained from one ACE3 to the next. To ensure communication redundancy, the communication lines should be wired in opposing directions.

Figure 13: Example

Using the recommended Belden 9842, the communication should be terminated using the example below.

Wire Color	ACE
Blue	1 (RX+)
White / Blue	2 (RX-)
Orange	3 (TX-)
White/ Orange	4 (TX+)
Shield	5
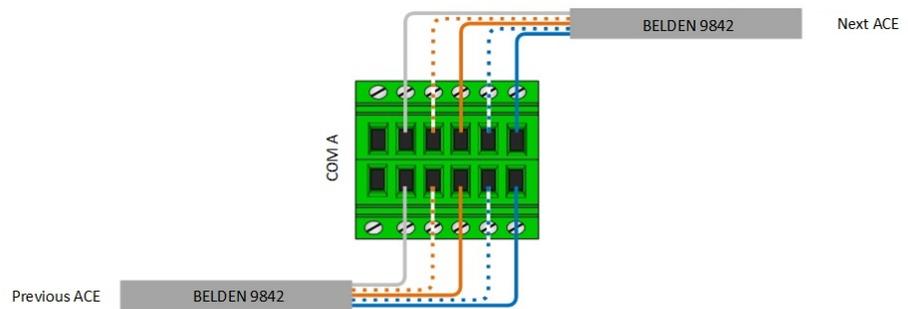
Ethernet (CAT5 or better)

Ethernet communication can be connected in one of two ways, dedicated or daisy-chained.

Figure 14: Dedicated Ethernet Example

Figure 15: Daisy-chained Example

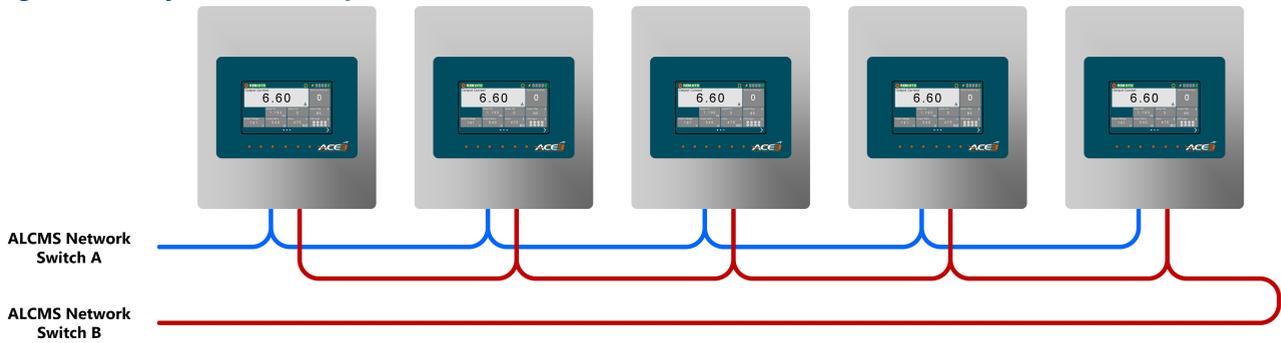**ALCMS Network Switch A**

ALCMS Network Switch B

• All ethernet communication cables shall be terminated using RJ-45 connectors using a T-568A Pinout.

Figure 16: Example Pin out

Wire Color	
White / Green	TX+
Green	TX-
White/ Orange	RX+
Blue	NC
White / Blue	NC
Orange	RX-
White / Brown	NC
Brown	NC
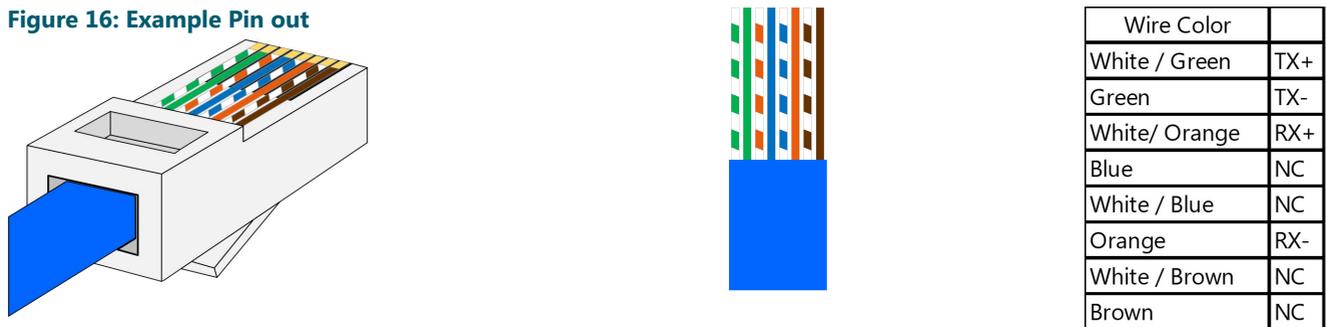
CCR Connections

Figure 17: Combo Box

CT Feedback Monitoring Input (If Applicable)

Remote/Local Monitoring Input

Primary Power Monitoring Input

120VAC Power From CCR (IRMS)

120VAC UPS Power (ACE)

TB1 inside CCR

Figure 18: Combo Box (Separate CC)

Figure 19: CSS wiring using IO Backplane
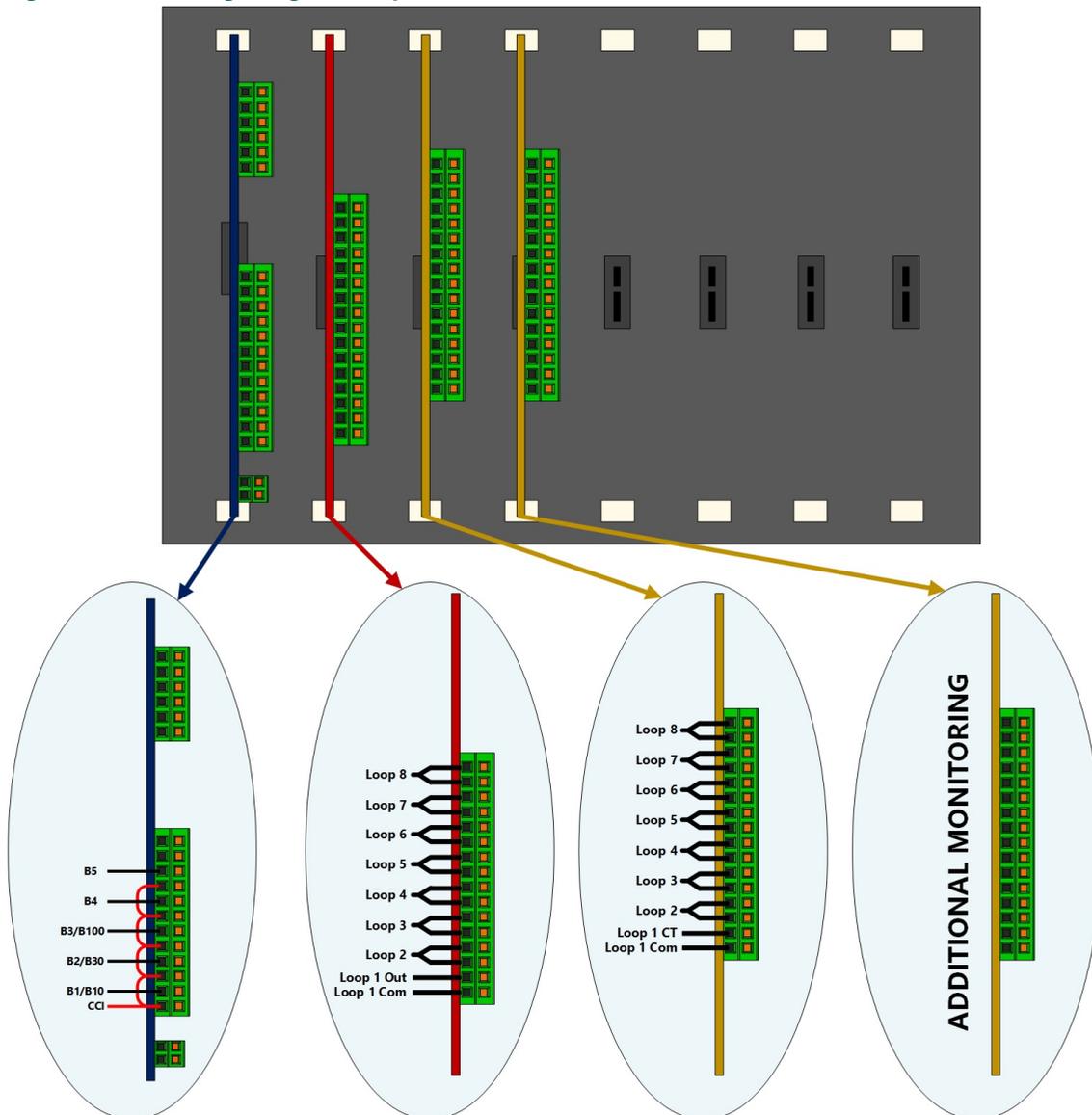
Figure 20: CSS wiring on Integrated CCR using 4x4 Regulator Interface Card

Loop 4 CT
Loop 4 Com
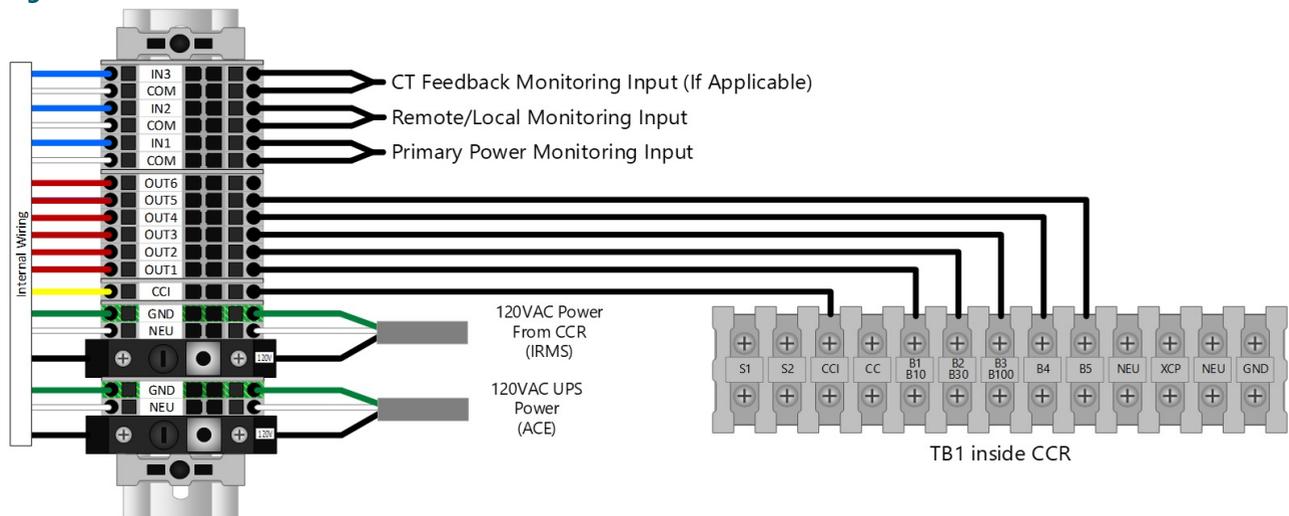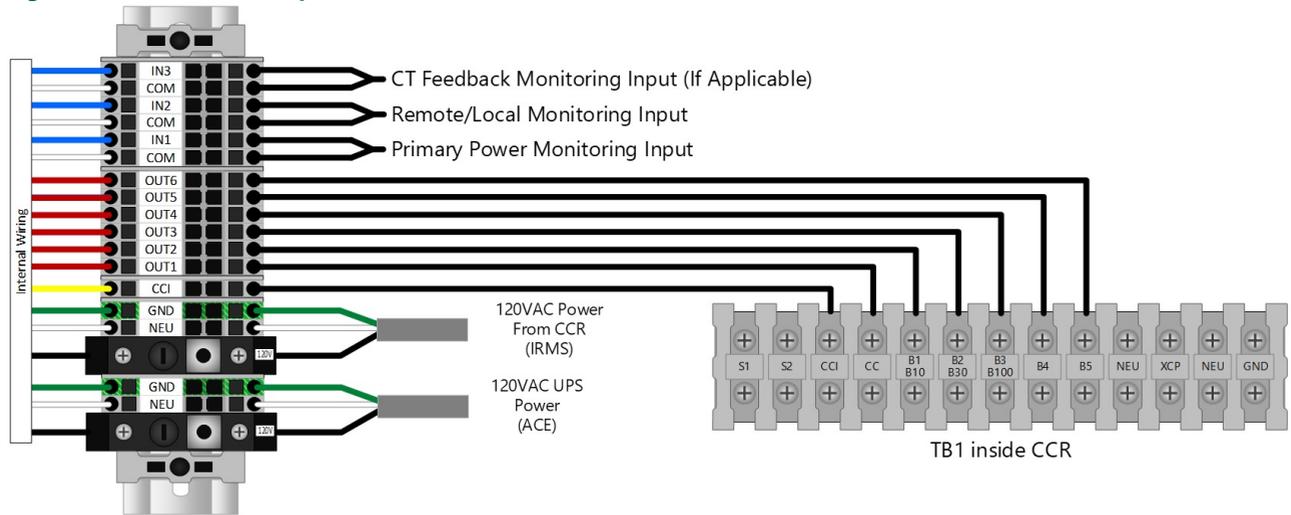Loop 3 CT
Loop 3 Com
Loop 2 CT
Loop 2 Com
Loop 1 CT
Loop 1 Com

Loop 4 Out
Loop 4 Com
Loop 3 Out
Loop 3 Com
Loop 2 Out
Loop 2 Com
Loop 1 Out
Loop 1 Com
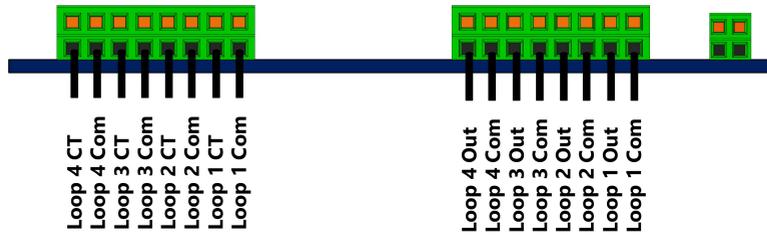
4.4 Internal Mounting used on CCRs

List of CCRs and their manuals

- CSF 96A0451 w/ACE3
- CCT 96A0505 w/ACE3
- LT8/9 Thy CCR 96A0483
- LT8/9 Ferro CCR 96A0488

4.5 Associated Documents

Table 1: CCR Final Test Procedure using RATS 103A0295

Document Name	Document Number
ACE3 Product Drawing	ACE3-XXXXXXXXXXXX
ACE3 Assembly	44A7733
ACE3 Display Drawing	44A7755
ACE3 Stand Alone Wire Diagram	43A4827
ACE3 Stand Alone User Manual	96A0500, this manual
CSF with ACE3 User Manual	DM00002
CCT with ACE3 User Manual	96A0505
Service Bulletin ACE3 Upgrade from USB	ALN179
Service Bulletin ACE3 replacing ACE	ALN180

5.0 Graphic User Interface (GUI)

The ACE3 graphic user interface (GUI) consists of a 7-inch 800 x 480 pixel full-color LCD touchscreen. In typical modes of operation, the ACE3 will display several tiles, which contain all available output data. The user can select the individual tiles to make it more prominent on the screen. Other data available on the screen include:

- Brightness step

- Remote/Local

- Primary power present / loss of power

- Communication

- IRMS status

- CCR Cycle Count

- Total Run Time

- Run Time per Step

The ACE3 GUI also contains a localized event database to allow the user to view alarms/warnings for the individual device without the need to interface with the higher level control system.

HMI Screen Map

Main
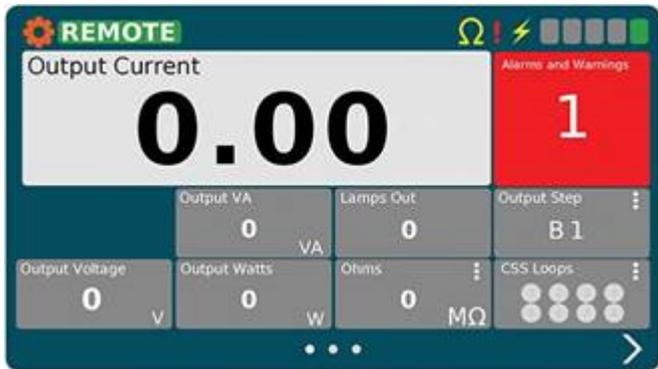- Amp Meter (Optional)
- Output Chiclets (Optional)
- Input / Output Diagram (Optional)
- Regulator Interface Card/IO Card Cage (Optional)

Legend
- Implemented
- Menu Category
- Not Designed & Not Implemented
- Designed & Not Implemented

Status

CCR

ACE

Alarms/Events
- Alarms/Warnings
- Events

Hour/Cycle Counts
- Hour/Cycle Counts

Waveform (optional)
- Waveform

Miscellaneous
- Temperatures
- IRMS History (Optional)

Configuration
- Misc CCR Config
- Delays
- Current Set Points
- IO CCR Alarm Config (Optional)
- CSS Loop Config (Optional)

Measurement Calibration
- Current/Voltage Calibration

Configuration
- Misc ACE Config
- Set Date/Time
- LAN Config
- Wireless Config
- Idle Timeout/ Backlight config

Failsafe Config
- Failsafe Config

To Output VA Calibration

To Feature Enable

From Measurement Calibration

Output VA Calibration
- Calibration Wizard

Lamps Out Calibration
- Lamps Out Thresholds
- Calibration Wizard

AGLAS Manual Logoff
- Manual Logoff Wizard

IRMS Config
- IRMS Thresholds
- IRMS Schedule

From Failsafe Config

Feature Enable
- Feature Enable
- Alarms Enable 1
- Alarms Enable 2
- Warnings Enable

About
- Serial Number & Versions
- Firmware Update Store/Restore Config Reset/Reboot
- License Info
- Factory Defaults

Main Display

The main screen is the first usable screen (not the splash screen) the user sees after starting the ACE3 (except when in L828 Display mode). The page is laid out with a header at the top and the body below it. The body contains a large display which shows the primary item being monitored.
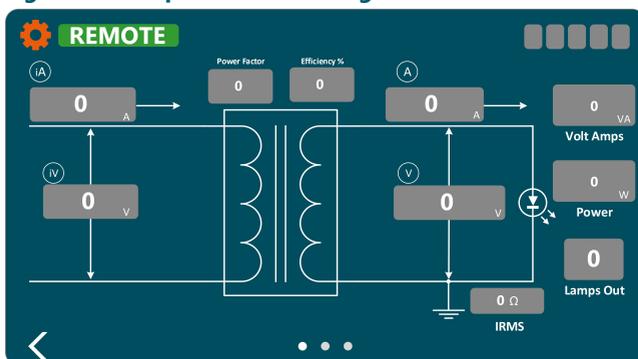
There are four views associated with the main screen which can be shown or hidden based on the ACE3 configuration.

Figure 21: Output Current Gauge

This view is shown when the ACE3 mode is "CCR" and the display mode is L828 or when the "Display Analog Current Gauge" feature is enabled.

**Figure 22: Output View and Diagram View**

These views are shown when the ACE's mode is "CCR". The first view shows all of the output power related applications. The second view contains input power (if enabled) and output power values arranged on an electrical diagram. If the ACE's mode is "IO" neither the Output View nor the Diagram View will be displayed.

Figure 23: IO Card Cage View
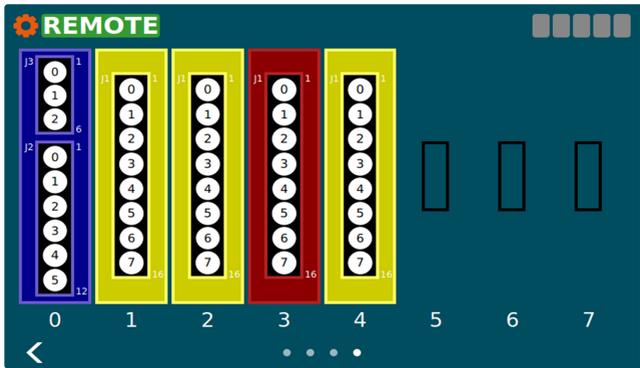
This view is shown when an IO card cage is installed. It shows what type of card is installed in which slot. Blue = Regulator Interface Card, red = output card, yellow = input card. These colors correspond to the actual color of the PCB. If the ACE's Mode is "IO" the outputs on the Regulator Interface Card and output cards can be toggled by touching the circle corresponding to the channel. The user will have to be in control before they can change the output. Touching an output while not in control causes the "Override Control" popup to be opened asking the user to take control. The channels on the output cards will turn red and input cards will turn green when the channel has gone high.

Figure 24: Regulator Interface Card View
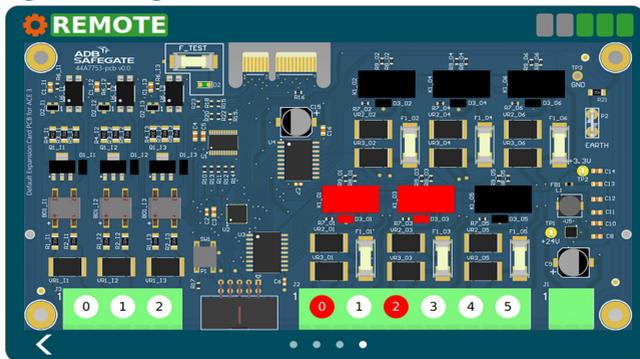
This view is shown when only the Regulator Interface Card is installed with no card cage. If the ACE's Mode is "IO" the outputs on the Regulator Interface Card can be toggled by touching the circle corresponding to the channel. The user will have to be in control before they can change the output. Touching an output while not in control causes the "Override Control" popup to be opened asking the user to take control. The board components, LED, and channel indicator on the card will turn red for outputs and green for inputs when activated.

**Figure 25: Regulator Interface Card View (4x4 Card)**
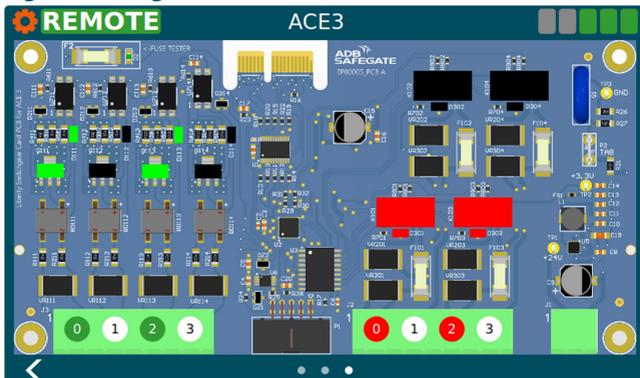
This view is shown when only the 4x4 Regulator Interface Card is installed in a URC4 integrated CCR. The user will have to be in control before they can change the output. Touching an output while not in control causes the "Override Control" popup to be opened asking the user to take control. The board components, LED, and channel indicator on the card will turn red for outputs and green for inputs when activated.

The user can switch between pages by using the navigation arrows at the bottom left and right of the screen. A page indicator located at the bottom center of the screen shows which page the user is on.

5.1 Menu Screen

Menu Overview
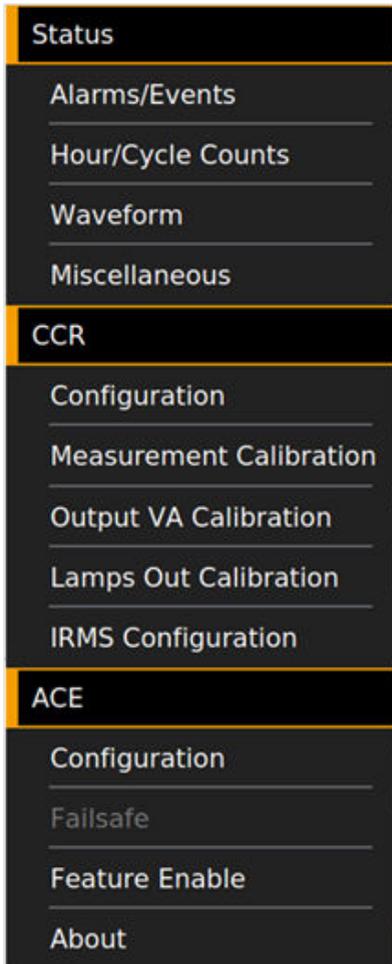
The menu will allow the user to navigate away from the main screen to various status and config screens. It is broken down into three sections "Status", "CCR", and "ACE". Under each section will be screens related to the section title.

The menu will slide out from the left of the screen when the user presses the ⚙ icon. The menu will slide back off the screen after the user has touched somewhere outside of the menu. Selecting an item from the menu will replace the main screen with the chosen screen. The menu icon ⚙ will change to a left pointing arrow ◖ indicating you can go back from the newly opened screen.

Status

<u>Alarms/Events</u> – This will display the Alarms/Warnings/Events pages

<u>Hours/Cycle Counts</u> – This will display the built-in Hour/Cycle counter

<u>Waveform</u> – This will display a graphical representation of the input and output electrical characteristics

<u>Miscellaneous</u> – This page displays the internal temperature page and IRMS Viewer page

CCR

<u>Configuration</u> – This displays the page used for configuring CCR parameters

<u>Measurement Calibration</u> - This displays the page used for calibrating the output measurement of the CCR

<u>Output VA Calibration</u> - This displays the page used for calibrating the VA measurement of the CCR

<u>Lamps Out Calibration</u> - This displays the page used for calibrating Lamps Out

<u>IRMS Configuration</u> - This displays the page used for configuring IRMS schedule and parameters

ACE

<u>Configuration</u> – This displays the page used for configuring ACE parameters
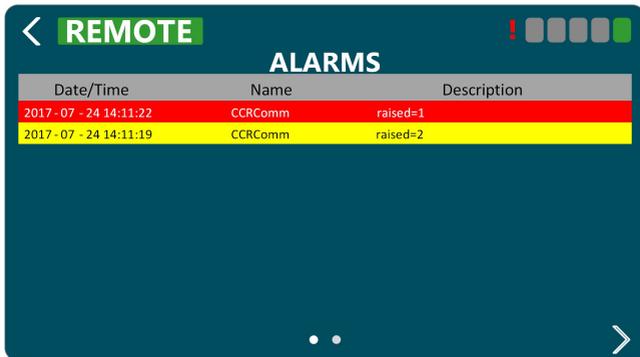
<u>Failsafe</u> - This displays the page used for configuring failsafe parameters

<u>Feature Enable</u> - This displays the page used for enabling/disabling features, as well as enabling/disabling desired warnings and alarms

<u>About</u> – This page displays serial number and firmware information, as well as backup and restore functions

5.1.1 Alarms View

Figure 26: Alarms and Warnings Screen (Alarms View)

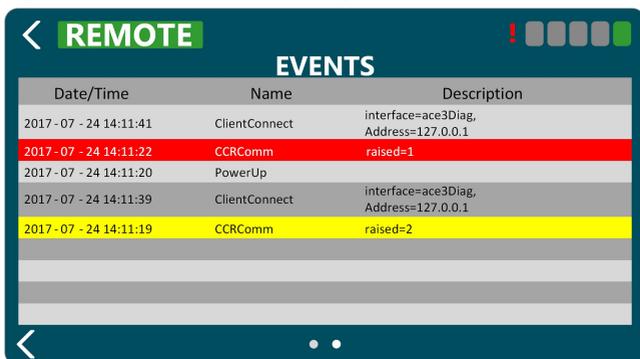The Alarms and Warnings Screen will show all currently active alarms (red) and warnings (yellow).

Columns are follows:

- Date/Time - The date/time the alarm/warning occurred
- Name - The name of the alarm/warning
- Description - A user friendly description of the alarm/warning

The Alarm View shows the user the current alarms and warnings. Alarms/warnings that are cleared will not be shown on this screen. The list of alarms/warnings will be sorted by date/time.

5.1.2 Events View

Figure 27: Alarms and Warnings Screen (Events View)

On the Alarms and Warning screen the event view shows a history of alarms (red), warnings (yellow), and events (grey).
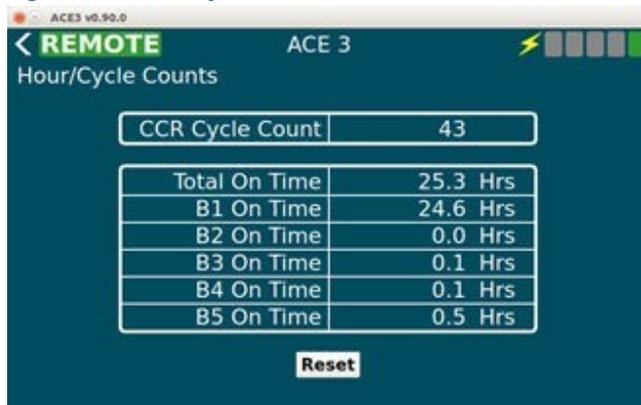
Columns are follows:

- Date/Time - The date/time the alarm/warning/event occurred.

- Name - The name of the alarm/warning/event.

- Data - Information pertaining to the event.

The event view shows the time an alarm or warning started and the time it stopped. Entries which are for started alarms/warnings will be colored red or yellow. Alarms/warnings will have grayed out text and will not be red or yellow when the condition causing them has ended. General informational events will not be colored and will have regular text.

The event view is reachable by navigating right on the Alarms and Warnings Screen.

5.1.3 Status Menu – Hours/Cycle Count

Figure 28: Hour/Cycle Count Screen

CCR Cycle Count	43

Total On Time	25.3 Hrs
B1 On Time	24.6 Hrs
B2 On Time	0.0 Hrs
B3 On Time	0.1 Hrs
B4 On Time	0.1 Hrs
B5 On Time	0.5 Hrs

Note

Only the hour counters per step and cycle count will be tracked.

The Hour/Cycle Count screen will consist of one view. This view shows how long the CCR has been on in each step and how many times the CCR was cycled (turned from off to on). At the bottom of the screen there is a reset button which will send a command to reset all statistics.

5.1.4 Status Menu – Waveform

Figure 29: Wave Form Screen
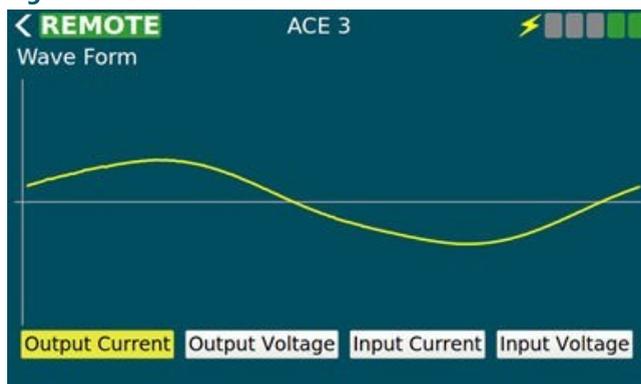
The wave form screen displays a wave form for:

- Output Current

- Output Voltage

- Input Current

- Input Voltage

The data will be in the shape of the wave and won't give exact measurements to the user. There are buttons along the bottom to turn on and off each wave form allowing the user to select which data they wish to view. The display a wave form screen will only update a few times a second to give the user an idea what the wave form looks like but **CANNOT** replace an oscilloscope.

5.1.5 Status Menu – Miscellaneous

Figure 30: Status Menu – Miscellaneous

The Miscellaneous screen will contain small items which don't warrant their own page. Logical groups will be broken out into separate views on the miscellaneous page.

The Temperature view displays ambient temperature in both Celsius and Fahrenheit values. It also shows the min and max ambient temperature since the device was started. This information is not persisted through power cycles.

Figure 31: Status Menu – Miscellaneous
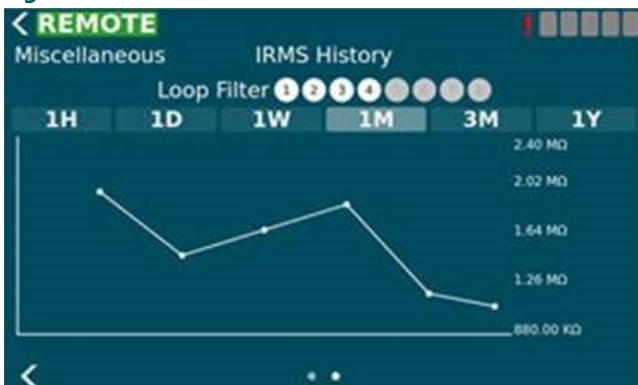
The IRMS History view allows the user to query IRMS data from the past and display it in a graph form so the user can notice trends. The user can select duration of 1 hour to 1 year. If a circuit selector is enabled a loop filter will appear at the top of the view and can be used to filter data based on loops which are being monitored.

5.1.6 CCR Menu - Configuration

The CCR Configuration screen is a set of views used to configure items related to CCR operation. This screen is disabled if the Mode configuration item on the ACE Info Configuration Screen is not set to "CCR" which indicates the ACE 3 is attached to a CCR.

5.1.6.1 Screen 1

The first page has parameters which give general information about the CCR the ACE is attached to.

- Display Mode - This modifies how the HMI presents itself to the user. L828 mode shows the Output Current gauge View only.

- Control Type - How the attached regulator is controlled

- ALCS Enabled - Indicates an ALCS system is connected to the ACE to monitor and control it. Checking this allows the ACE to enter into the failsafe mode when there are not controlling clients.

- Regulation Type - The type of regulator the ACE is connected to. This is disabled when the "Control Type" is "Integrated".

- CCR Class - CCR output current rating. This is disabled when the "Control Type" is "Integrated".

- Total Steps - The max number of steps for the CCR. This is disabled when the "Control Type" is "Integrated".

- CCR Size (W) - The size of the CCR in watts. This is disabled when the "Control Type" is "Integrated".

- CCR Extra IO – This enables communication to the IO backplane for a non-IO ACE mode. ACE mode is set in the ACE configuration menu.

Figure 32: CCR Configuration Screen 1
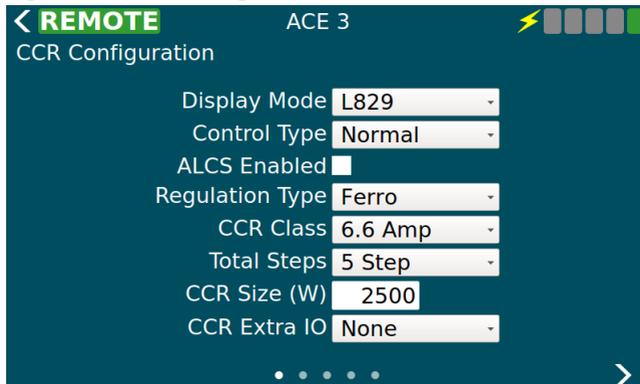
The following table describes the configurable parameters on view 1:

Control	Value	Description
Display Mode	L828	Shows the analog ammeter gauge only
	L829	Shows the full user interface
	ALCS	Currently the same as L829
Control Type	Integrated	ACE is integrated with URC4 and uses serial AIP to control the CCR
	Normal	ACE uses a Default Card to control the CCR
	Separate CC	ACE uses a Default Card and has an IO reserved to CC line
	Binary	Not Implemented yet, will be binary step control
ALCS Enabled	True	Failsafe, as configured, will be enforced Commanded step is displayed in step bars (upper right)
	False	Failsafe is disabled Reported step is displayed in step bars (upper right)
Regulation Type	Ferro	CVM2 will use Ferro Lamps Out Algorithm Lamps Out Calibration will be two phase
	Thyristor	CVM2 will use Thyristor Lamps Out Algorithm Lamps Out Calibration will be three phase
CCR Class	6.6	For 6.6 amp series circuits
	20	For 20 Amp series circuits
Total Steps	3 Step	The CCR has three steps B10, B30, B100
	5 Step	The CCR has five steps B1 - B5
CCR Size (W)	Watts	Sets open circuit voltage set point to 120% value Sets over load voltage set point to 110% value

CCR Extra IO	None	ACE doesn't monitor extra IO slots
	Standard	ACE monitors for output in slot 4, input in slot 6
	Extended	ACE monitors for output in slots 4 & 5, input in slots 6 & 7

Figure 33: CCR Configuration Screen 1 for 20A CCRs

5.1.6.2 Screen 2

The Timings view allows the user to change various delays and timeouts. These timings are for operations such as changing the step or alarm conditions such as how long to stay in a 5% over current condition before generating the Over Current Alarm.

Figure 34: CCR Configuration Screen 2

The following table describes the configurable parameters on view 2:

Step Delay	milliseconds	Amount of time to pause between steps when changing CCR step
Startup Delay	milliseconds	Amount of time to pause between off and step 1
Open Circuit Time	milliseconds	Amount of time before open circuit is declared
Over Current 5% Time	milliseconds	Amount of time 5% over before over current is declared
Over Current 25% Time	milliseconds	Amount of time 25% over before over current is declared

5.1.6.3 Screen 3

The Current Set Point view allows the user to change the expected min/max/nominal currents for each step as well as the over current set points for the 5% and 25% over current conditions.
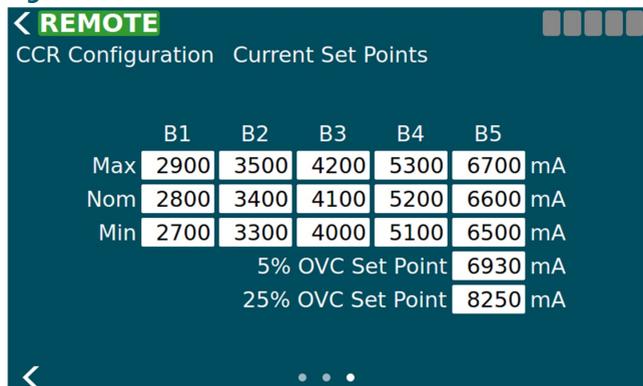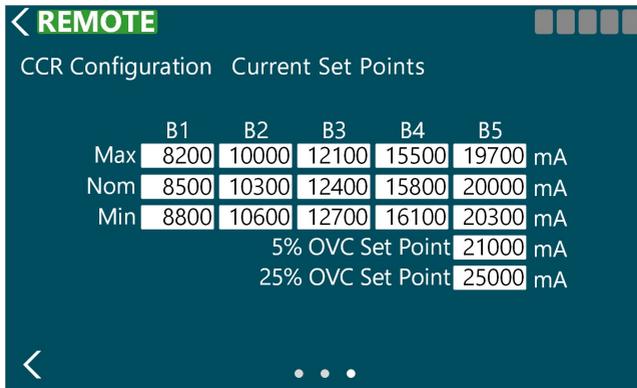
Figure 35: Current Set Point

Figure 36: Current Set Point for 20A CCRs

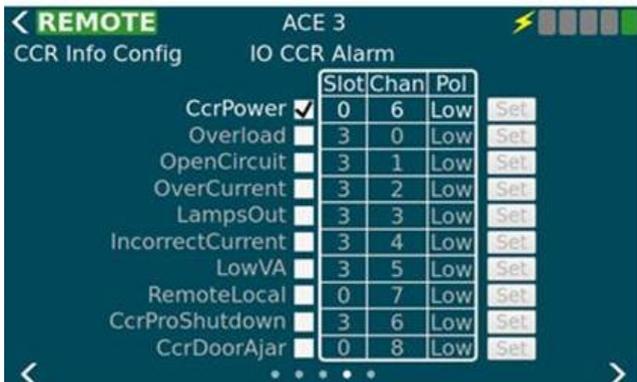|	B1	B2	B3	B4	B5	
Max	8200	10000	12100	15500	19700	mA
Nom	8500	10300	12400	15800	20000	mA
Min	8800	10600	12700	16100	20300	mA
5% OVC Set Point					21000	mA
25% OVC Set Point					25000	mA

5.1.6.4 Screen 4

The IO CCR Alarm view allows the user to configure alarms to be generated when the state of an input channel changes. The following information is displayed on the page and some things can only be changed when in advanced mode.

- Enabled - If this alarm will be generated based on input state changes.

- Slot - (only in advanced mode) The slot the card occupies in the IO card cage.

- Channel - (only in advanced mode) The channel on the card to monitor for this alarm.

- Polarity- (only in advanced mode) Determines if the alarm is generated when the input channel goes low or high. None of the changes will take effect until the "Set" button has been pressed next to each alarm (default low).

Figure 37: I/O CCR Alarm

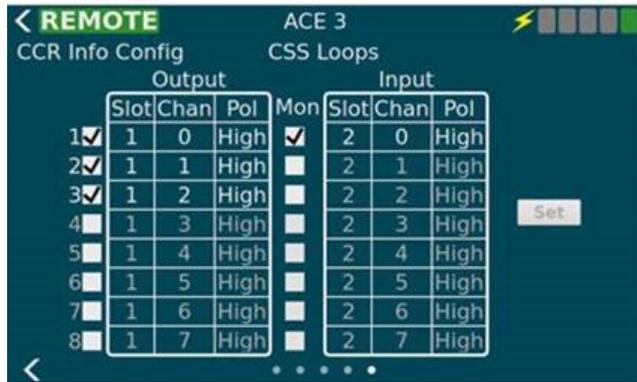|		Slot	Chan	Pol	
CcrPower	✔	0	6	Low	Set
Overload	☐	3	0	Low	Set
OpenCircuit	☐	3	1	Low	Set
OverCurrent	☐	3	2	Low	Set
LampsOut	☐	3	3	Low	Set
IncorrectCurrent	☐	3	4	Low	Set
LowVA	☐	3	5	Low	Set
RemoteLocal	☐	0	7	Low	Set
CcrProShutdown	☐	3	6	Low	Set
CcrDoorAjar	☐	0	8	Low	Set

5.1.6.5 Screen 5

The CSS Loops View is used to set the various config parameters for CSS loop setup. This view will only be available if the "Circuit Selector" feature is enabled on the Feature Enable page. It allows the user to configure the following parameters for each loop.

- Enabled - If this loop is installed

- Output Slot - (only in advanced mode) The slot the card occupies in the IO card cage

- Output Channel - (only in advanced mode) The channel on the card to set for this loop

- Output Polarity - (only in advanced mode) Active high or low

- Monitored - Determines if the IO line is monitored which enables the input config parameters below

- Input Slot - (only in advanced mode) The slot the card occupies in the IO card cage

- Input Channel - (only in advanced mode) The channel on the card to set for this loop

- Input Polarity - (only in advanced mode) Active high or low (default high)

None of the changes will take effect until the "Set" button has been pressed.

Figure 38: CSS Loops

Note

Enabled output slots must be consecutive.

Note

These values are read only if the "cssAdvancedConfig" is absent (default) or set to false in the ace.ini file. If the "cssAdvancedConfig" is set to true then the **slot, channel, polarity** can be edited. A current clamp and True RMS multimeter are required to perform this calibration.

5.1.7 CCR Menu – Measurement Calibration

The Calibration screen is used to calibrate the Output Voltage, Output Current, Input Voltage, and Input Current. The calibrate button at the bottom becomes active when one or more complete units of calibration values have been filled in.
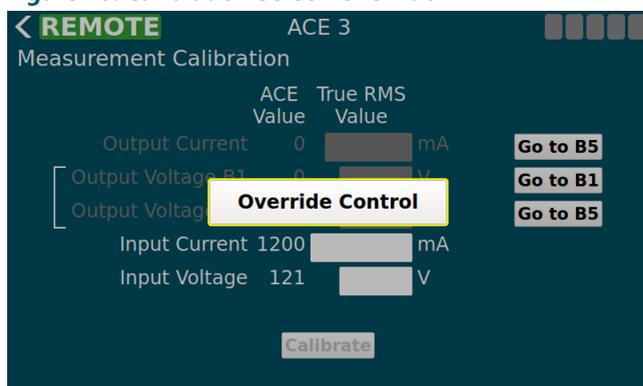
Figure 39: Calibration Screen
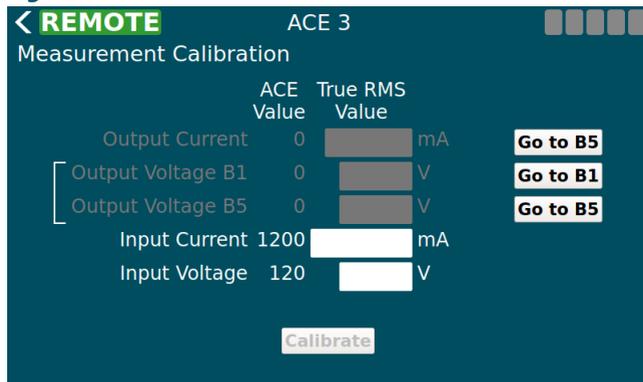
You will need a True RMS Multimeter and a current clamp.

1. Ensure the CCR switch is in Remote.

2. On the ACE3 screen, select **Go to B5**.

3. Select **Overide Control**. (see Figure 40)

4. Using your True RMS multimeter and test leads, measure the input voltage of the CCR and input the value in the **Input Voltage** box.

5. Using your True RMS multimeter and current clamp, measure the input current of the CCR and input the value in the **Input Current** box.

6. Using your True RMS multimeter and current clamp, measure the output current of the CCR and input the value in the **Output Current** box.

7. After a calibration value has been entered a red "X" appears next to it allowing the user to reset that value if they want to calibrate again.

8. Select **Calibrate**.

The ACE Value column displays the currently reported value until the True RMS Value column has been filled in. The ACE Value column will then stop updating until the calibrate button is 'pressed' or the value is reset with the red "X".

Figure 40: Calibration Screen Override

Figure 41: Calibration Screen with the red X shown
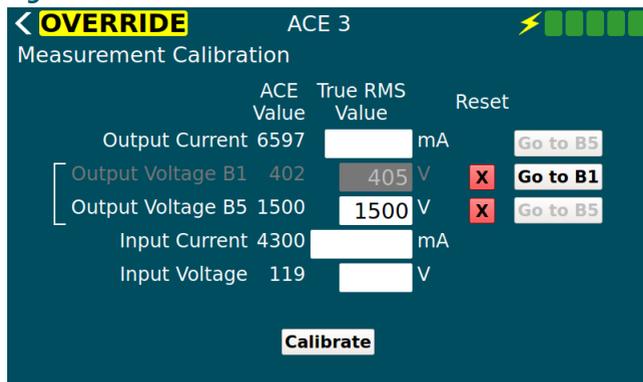

5.1.8 CCR Menu – VA Calibration

The first page of the Output VA Calibration provides a box to adjust the settling time for each step that the ACE3 will wait before taking readings. This will allow any circuit noise that occurs during step change to settle before measuring.
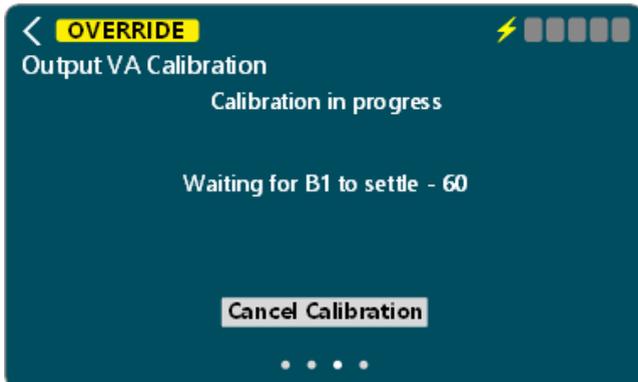
Once the value has been set, select the button to move to the next page

The second page is where the calibration can begin. Be aware that the CCR will energize and cycle through all available steps.
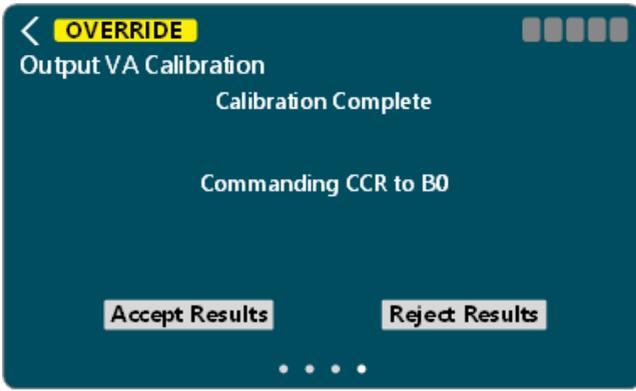
Press **Start Calibration** to begin
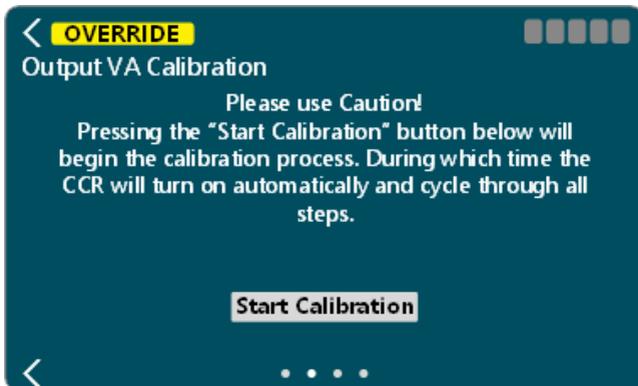
During calibration, the user will be given the ability to cancel the calibration operation, if necessary.

Once the calibration has completed the measurements at all steps, it will give you the ability to **Accept Results** or **Reject Results**.
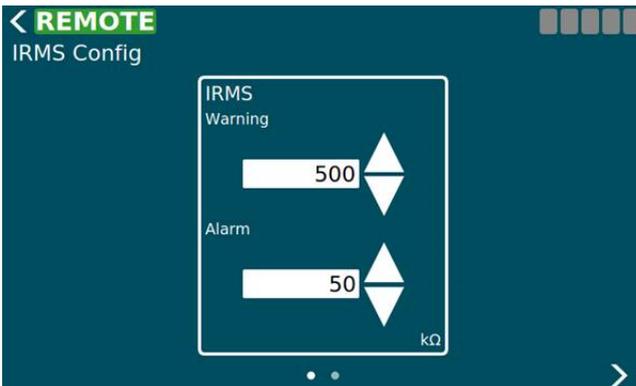
One the results have been accepted or rejected. The calibration will complete.

Select the [<] to return to the main screen

5.1.9 CCR Menu – IRMS Configuration

The IRMS config page allows the user to configure thresholds for IRMS alarms and warning as well as set two megging schedules.

The controls on the thresholds page allow the user to either increment or decrement the alarm/warning thresholds by one Kilo-ohm using the up/down arrows or the user can touch the value bringing up a num pad. From there they can select any value within the allowable range. Note that the alarm value must be lower than or the same as the warning.
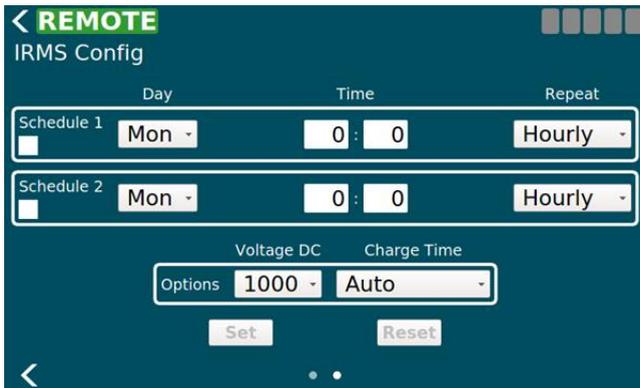
The controls on the scheduling page allow the user to setup the initial delay and the reoccurring interval as well as some additional options.

- Enable checkbox: This is used to enable and disable each IRMS schedule independently.

- Day: This is the day of this week to start the schedule. If the day is in the past then a meg will start immediately and then run again once the next reoccurring period has passed.

- Hour & Minute: The hour and minute for the initial delay. If the time is in the past then a meg will start immediately and then run again once the next reoccurring period has passed.

- Repeat: This is the repeat interval to run the meg after the initial delay has passed. Possible values are listed in the IRMS Schedule Repeat Table.

- Voltage: This is the maximum voltage the IRMS test will attempt to run at. Depending on the quality of the circuit the max may never be reached. This voltage is used for both megging schedules. Possible values are listed in the IRMS Schedule Voltage Table. Values may be set to 50, 500, or 1000 volts.

- Charge Time: The charge time is how long to charge the IRMS equipment to the desired max voltage before starting the test. Possible values are listed in the IRMS Schedule Charge Table. Note: The continuous option is not available due to a design decision.

Once the user has modified a field it will no longer be updated with changes until the user presses "Set" or "Reset". The "Set" button sends all currently displayed values while the "Reset" button removes any modifications the user has made and will refresh everything with what is currently reported.

Megging Immediately

To start a meg immediately, return to the ACE3 main screen. Press the ellipsis icon in the IRMS window.
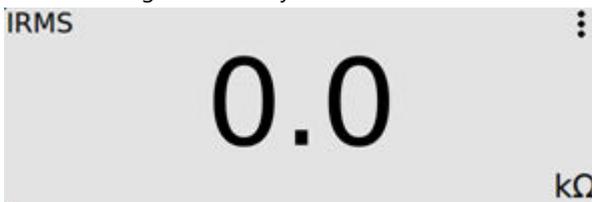

1. Click the green arrow to start a meg check. (active if no meg is in progress) (greyed out during a meg in process). A yellow Ω icon will appear at the top of the ACE3 screen while megging is in progress.

2. Click the red box to stop the meg check. (active if a meg is in progress) (greyed out if no meg is in process)

5.1.10 CCR Menu – Lamps Out Calibration

The first view allows the user to set the lamps out thresholds before a warning and/or alarm is generated. Setting these to 0 turns the alarm and warning off. The warning value can never be greater than the alarm. The numpad or the increment decrement arrows can both be used to change the value(s). Changes to the screen take effect immediately.
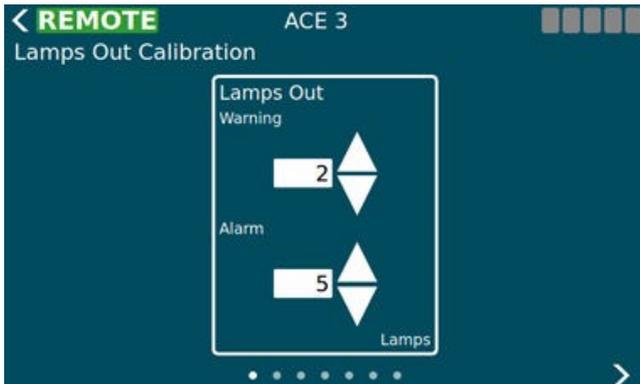

The remaining views act as a wizard. The first three views can be navigated by the user however if the user wishes to start an actual calibration then they must have control of the ACE 3 and they no longer have the ability to navigate through the wizard. They will be allowed to cancel the calibration at any time which will take them back to the first view.
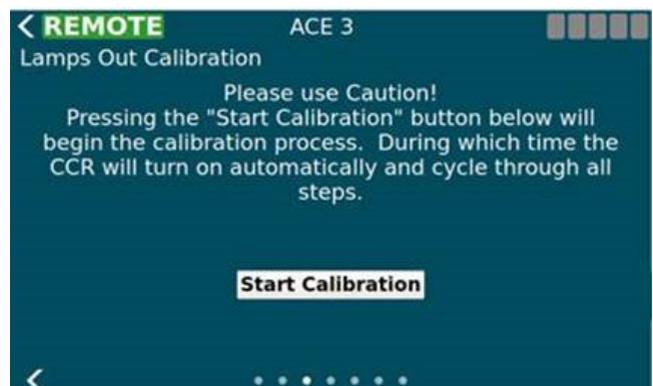
The calibration consists of two phases. The first is calibrating the existing circuit. The second is pulling a set number of lamps and calibrating again.

After calibration is complete the user can accept the results or reject them. Accepting saves the results to the ACE 3 and they will be used going forward.

Once the calibration has started, the ACE3 will command the CCR on to each brightness step, taking measurements at each step, for the duration of the configured settle time per step.
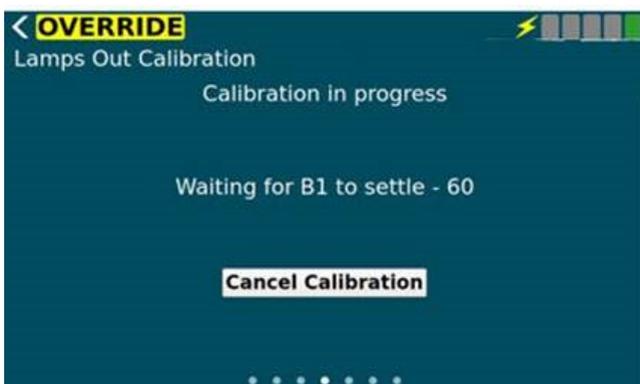
After the initial measurement phase, the user will need to pull the appropriate number of lamps*.
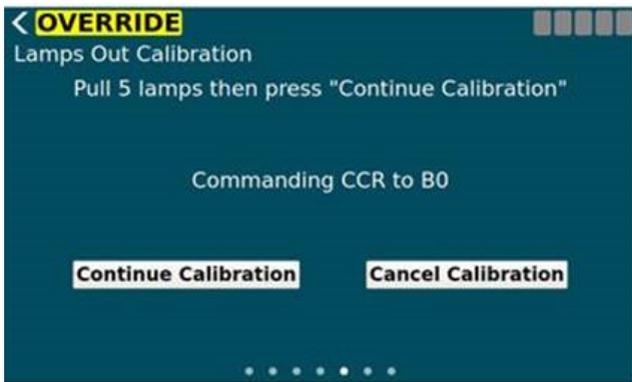
> ⚠️ **CAUTION**
>
> *Make sure the CCR is De-Energized

Press **Continue Calibration** after the lamps have been pulled.

Once the calibration continues, the ACE3 will command the CCR on to each brightness step, taking measurements at each step, for the duration of the configured settle time per step.
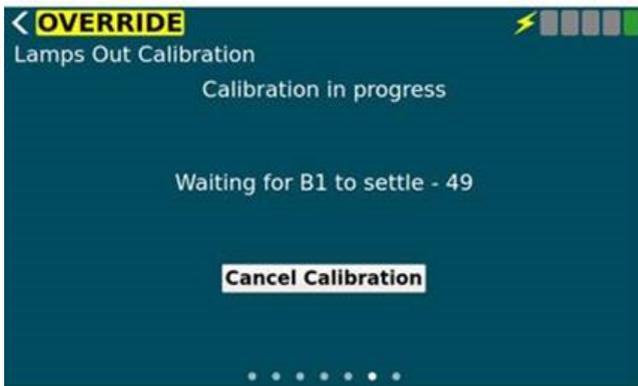
Once the calibration has completed the measurements at all steps, it will give you the ability to **Accept Results** or **Reject Results**.
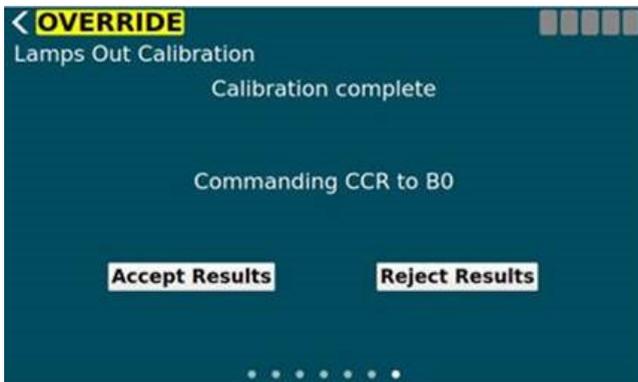
One the results have been accepted or rejected. The calibration will complete.

Select the [<] to return to the main screen

5.1.11 ACE Menu - Configuration

The ACE Info Config screen has a set of views which allow the user to configure various parameters of the ACE 3. The first view is a set of miscellaneous items which setup the ACE 3.

- Name - The name of the ACE 3. This will be displayed in the header bar.

- Mode - This determines how the ACE 3 is setup. Is it connected to a CCR or is it IO only, etc...

- Port A (enabled, Baud, Address) - A checkbox to enable or disable port A (legacy ACE protocol), the baud rate, and the multi-drop address. This is only used when in ALCS mode.

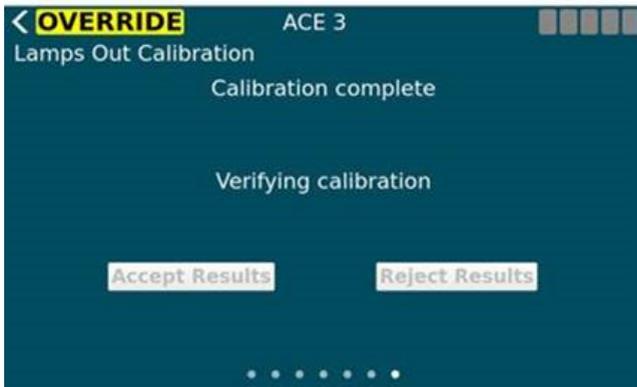- Port B (enabled, Baud, Address) - A checkbox to enable or disable port B (legacy ACE protocol), the baud rate, and the multi-drop address. This is only used when in ALCS mode.
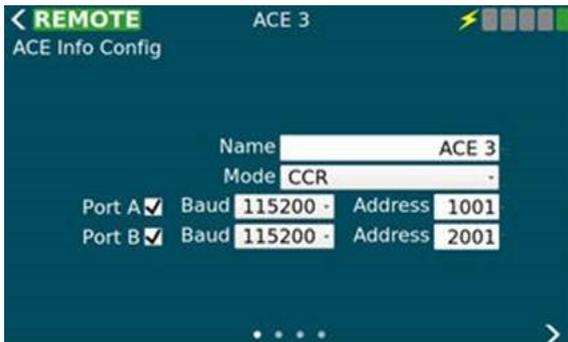
The second view allows the user to set the date and time. The date and time are set in UTC time. The user can also see the current date/time on the ACE 3. To enabled NTP (Network Time Protocol) the user can check the box at the bottom of the view and specify a NTP server. The ACE 3 will then use NTP to get it's time from that point on. Unchecking the box turns off the use of NTP.

The network configuration views allow the user to configure both the LAN interfaces as well as the wireless interface.

The third view allows the user to configure the two local area network (LAN) connections. Once the user has made all desired modifications they can press the "Set" button to **store** the new configuration or the "Reset" button to **erase** all local changes and use the existing configuration.

Figure 42: ACE Info Config Screen (network Config)
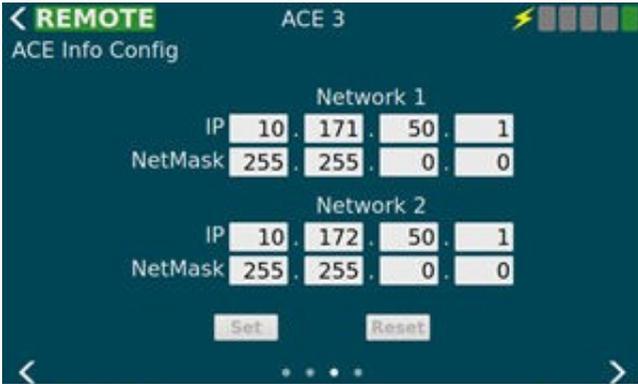
The fourth view allows the user to configure the Wireless connection located on the ACE 3. To use the WIFI interface the user must select the "Enable WIFI" checkbox at the top of the view. The network security will always be WPA2-Personal and cannot be changed from the GUI. The user can browse the broadcast SSID's and choose one by pressing the left arrow button or type in a hidden SSID directly in the "SSID" text area. The passphrase text area allows the user to type in their password. If they wish to see what they have typed they can check the "Show Passphrase" checkbox on the left hand side of the screen.

5.1.12 ACE Menu – Failsafe

The Failsafe Config screen is used to setup how the ACE 3 handles failsafe conditions. It determines when entering failsafe how the step, loops, and output cards should be set. Output Card is populated only when there are cards detected.

Figure 43: Failsafe Config Screen
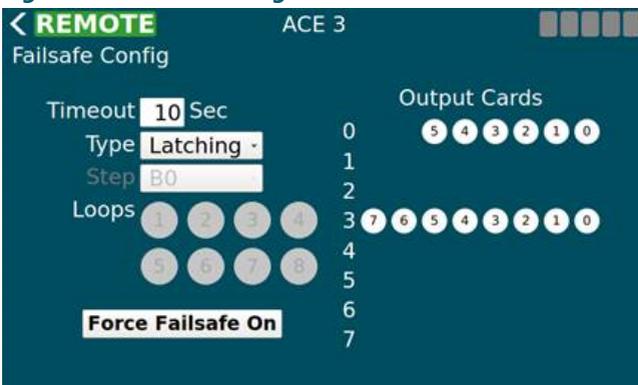
The button at the bottom can force failsafe on and off even if the ACE 3 is not in a failsafe situation.

The fail-safe mode of each ACE3 unit is defined per requirements of the airport/owner. The fail-safe modes are as follows:

- **Latching Fail-safe Mode**:

  This mode is executed as follows:

    - If the CCR was switched ON before the failure, it will remain ON at the same brightness level.
    - If the CCR was switched OFF before the failure, it will remain OFF.

- **Simple Fail-safe Mode:**

  This mode is executed as follows:

    - After a failure occurs, the CCR will switch ON to a predetermined brightness level without regard to the current step.

- **Smart Fail-safe Mode**:

  This mode is executed as follows:

    - If the CCR was switched ON before the failure, it will remain ON at the same brightness level.
    - If the CCR was switched OFF before the failure, it will switch ON to a predetermined brightness level.

5.1.13 ACE Menu – Feature Enable

The Feature Enable screen is used to enable or disable features, alarms, and warnings one at a time by checking the box next to the feature/alarm/warning name. These changes take effect immediately and are stored.

Disabling an alarm or warning prevents that alarm/warning from showing up on the alarm page and the corresponding event(s) will not be generated.

5.1.14 ACE Menu – About

The first view on the About screen displays the serial number and version info of installed modules. Using three fingers and swiping up will add a column next to the version info to display the build number for trouble shooting purposes.

Figure 44: About Screen
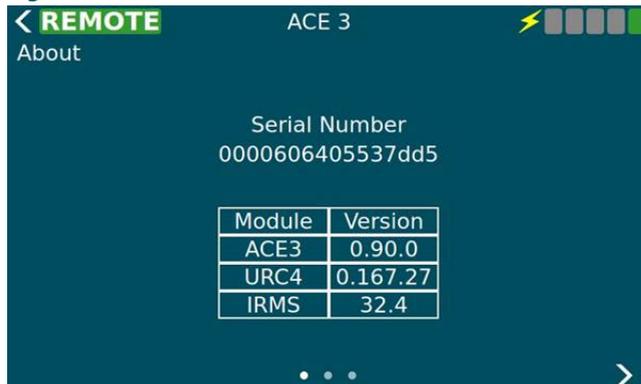
The second view is a collection of buttons which do system maintenance activities. On this view the user can upgrade the software from a USB device, restart the ACE 3 software only, restart the entries ACE 3 device, backup the ACE 3 (config, calibration data, logs, database) to a USB device, restore the ACE 3 (config, calibration data, logs, database) from a USB device.

Figure 45: About Screen Menu

The third view shows any licensing info such as the LGPL license and any other related info. This information comes from a text file so it can be customized by the legal department. There is no limit on the length of the text since this view's contents are scrollable.

Figure 46: About Screen Disclaimer
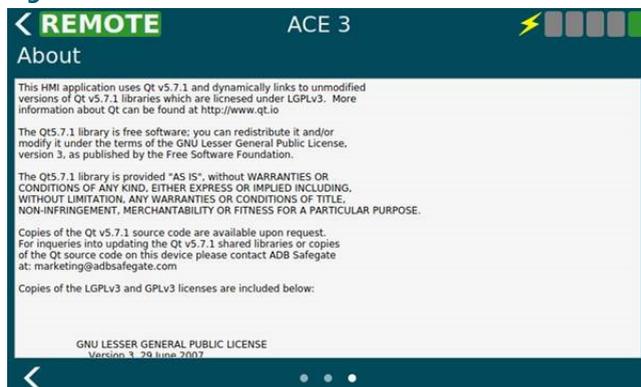
6.0 Maintenance

6.1 Startup

As the ACE 3 starts it will show a splash screen while it starts the OS along with the Core Engine and HMI. Once they are started the main HMI screen will be displayed and it will stay there until the user directs it otherwise.

During startup the HMI will connect to via the diagnostic interface. All status and configuration of the ACE 3 and CCR will be received and sent using this interface. If the connection fails or is closed the HMI will continually try to reconnect.

6.2 Running

When the display software is in the running state its main function will be to keep the information on the current screen up to date via the diagnostic interface and await user interaction. For most screens the HMI will stay on the screen for a configurable amount of time (default is 1 minute) after which it will return to the first view of the main screen. The exception being any configuration related screen can be displayed indefinitely since some configuration activities may take longer than 1 minute to complete. If the user is already on the main screen with the Output Power Application when the 1 minute inactivity timer expires the Output Current Application will be restored. If the Output Current Application was already displayed then there will be no change.

6.3 Communication Failure

The display software can enter its comm fail state when it loses communication to the core engine. In this case the display will visually indicate via a control mode indicator in the top left that it has lost communication with Core Engine. It will continually attempt to regain communication and once it does it will remove the visual indication of the comm loss and exit the comm fail state.

6.4 Shutdown

The display will not do any special activities on shutdown since all of the status and configuration data is kept in the core engine or the attached board(s) such as the URC4 board. When the operating system is shutdown the application will attempt to disconnect from Core Engine and exit properly so as to not cause issues for the collocated software.

7.0 Troubleshooting

7.1 ACE3 Troubleshooting Procedures

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i **Note**

Before beginning, remember that improper or incorrect wiring is the cause of most problems. Check all the wiring for loose connections or possible electrical shorts/opens. Also Check for blown fuses.

Troubleshooting procedures for the Advanced Control Equipment (ACE3) are in this section.

Problem	Possible Cause	Corrective Action
ACE3 Front Display is not illuminated	• No power • ACE3 ribbon cable not secure • Power not correctly hooked up.	Make sure the ACE3 Main printed circuit board is receiving 120 VAC at the main power, terminal block. Make sure all wire connections are secure. Make sure the ACE3 Main Printed circuit board On/Off switch is On. If the main power LED on the input/output printed circuit board is illuminated, make sure the ribbon cable that connects the front panel display to the ACE3 processor board is secure.
Lamps out board LEDs are not flashing	• No power • 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 ACE3 off. Check the integrity of the header connection on the lamps out board. Turn the power to the ACE3 on. If the problem still persists, contact the ADB Safegate Service representative. Reseat the PC board.
Modified CONFIG data is not being saved	• Loose connection on Main Board with Non-Volatile Memory.	Turn off power to ACE3 and open enclosure. Check to make sure it is secure.
The Failsafe screen doesn't show all the I/O cards.	• Loose connection on I/O Board • Bad I/O Board	Output board is populated only when there are boards detected or working properly. Move the board to another position or switch with another to see if that fixes the issue. Replace the output board.

ACE3 doesn't work in remote	• Combo Box
	  • Loose connection to the regulator interface card
	• Integrated
	  • Loose connection to the URC4 card
		Check connection from the ACE3 to the Regulator Interface Card
		Check connection from the ACE3 to the URC4 Card

ACE3 doesn't control regulator in a certain steps	• Blown Fuse	Check the fuse that corresponds to the affected output
Incorrect current alarm	• Measured output outside of tolerance • CCR not going to commanded step • CVM reading incorrectly	Using a true RMS multimeter, measure the output of the CCR. If the measurement matches the ACE3 display, adjust the output of the CCR to the correct settings. If the upper and lower thresholds need changed, this can be done under CCR - Configuration (page 3) Check fuses on the Regulator Interface Card Replace CVM2

Output current is 0.00 A when the regulator is ON (Combo Box)	• If using CVM only
	  • CVM not enabled
	• If using CVM and IRMS
	  • CVM not enabled
	  • IRMS not enabled
		Under ACE - Feature Enable
		  • CVM only
		    • Make sure the CVM box is selected
		  • CVM and IRMS
		    • Make sure both the CVM and IRMS boxes are selected

IRMS error messages	• No power to the IRMS board • Fiber connection is disconnected or damaged	Check wiring and power to the IRMS board Check fiber connection seating Check fiber connection color coding Check fiber for damage or excessive bending

8.0 ACE3 Wiring Diagrams

Figure 47: ACE3 power option: 120VAC - 43A4827 4 of 5
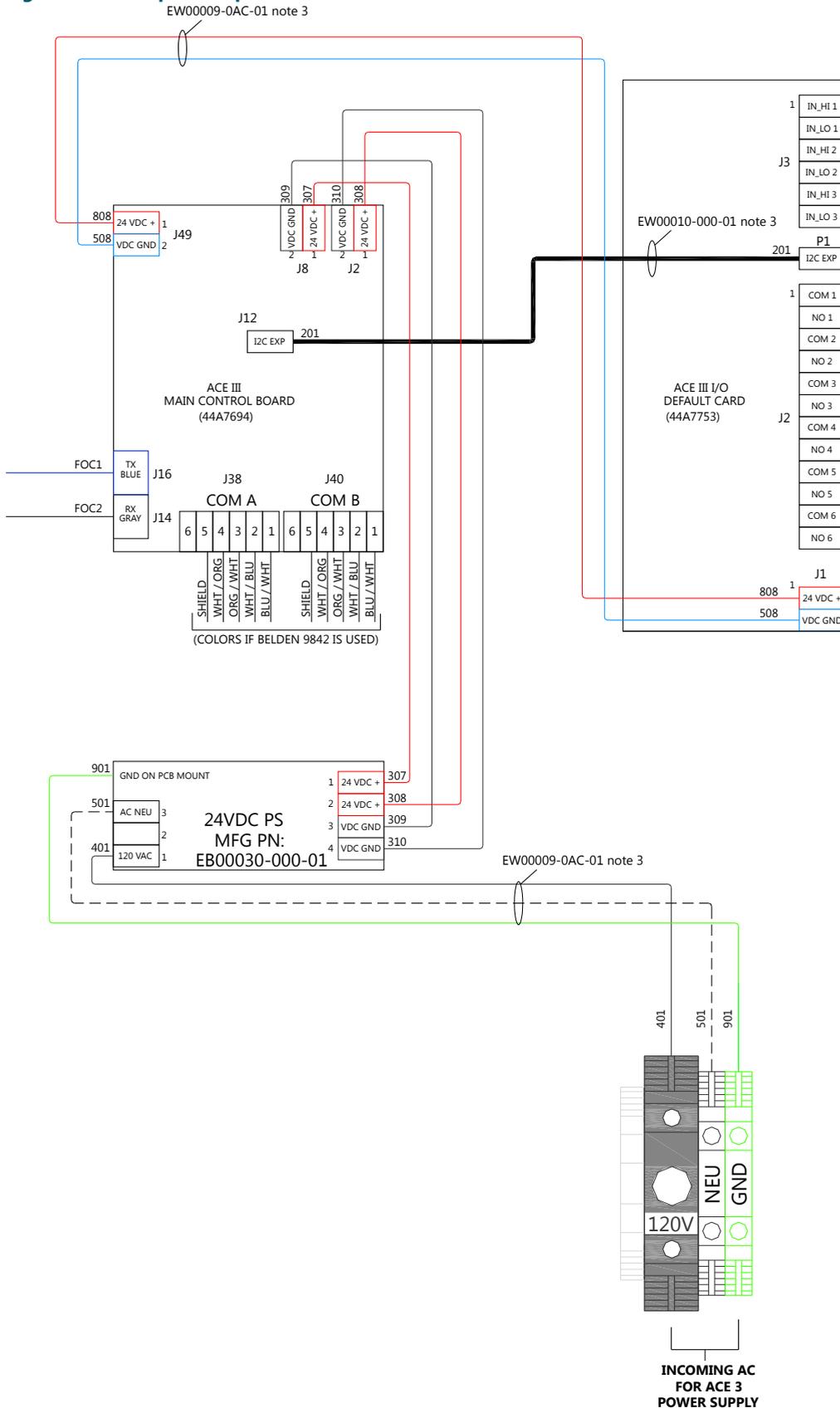
Figure 48: ACE3 power option: 24VDC - 43A4827 5 of 5
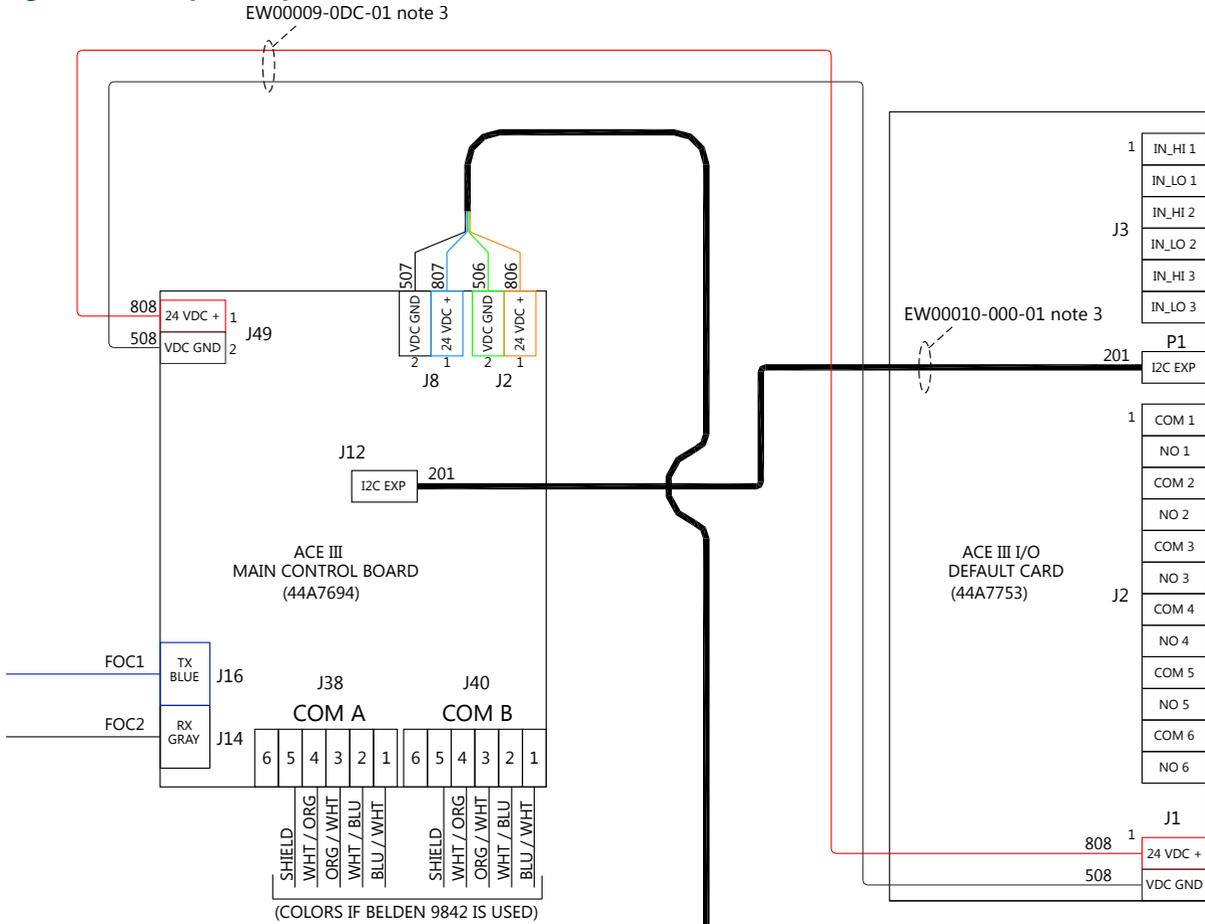
NOTES:

1. ALL CHANGES MUST BE APPROVED BY ADB ENGINEERING.

2. (FOC) FIBER-OPTIC INTERFACE CABLES.

3. POWER WIRES FOR BOTH ACE 3 AND DEFAULT CARD ARE PROVIDED BY EW00009-0XX-01. SEE WIRE KIT EW00008-XXX-01 FOR ALL REFERENCED WIRE ASSEMBLIES. THE FOLLOWING WIRES AT NOT INCLUDED IN AC VERSIONS OF THIS KIT:
309 & 310, 18 AWG, BLACK, 600V, 105c
307 & 308, 18 AWG, RED, 600V, 105c

4. ACE & IRMS FUSES ARE: 3.2A, 250V, SB (SAS #47A0181).

5. GROUND ACE COMBO BOX CHASSIS USING 12AWG GROUND WIRE (89A0163/5) FOR WIRE **904**, FOLLOWING THE DIAGRAMS BELOW:

6. **CVM & IRMS** CONNECTIONS WILL BE **WIRED REMOTELY** IN **"WALL MOUNT"** & **"REMOTE"** UNITS. INCLUDING **FIBER OPTICS, INPUT POWER, GROUNDING & OUTPUTS.**

7. 44A6437 STEP DOWN TRANSFORMER WILL BE MOUNTED EXTERNALLY. NOT INSIDE COMBO BOX ITSELF. NOT INCLUDED IN 6.6 AMP VERSIONS
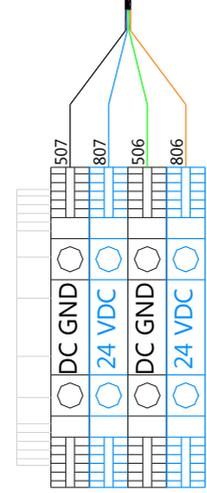
9.0 Parts

Ordering Code   ACE3 - X X X X D X X 1 0 0 0 1

Type
C = Combo box
I = I/O

Input Power
D = 24 VDC
A = 95-265 VAC

Field Current
6 = 6.6 A
2 = 20 A
0 = I/O ACE3 Only

Output Monitoring
N = None
C = CVM[1]
I = IRMS[1]
B = Both CVM and IRMS[1]

D

Input Expansion Modules
0-7[2]

Output Expansion Modules
0-7[2]

Notes
[1]   Only available with Combo Box Type
[2]   Total number of Input and Output cards cannot exceed 7
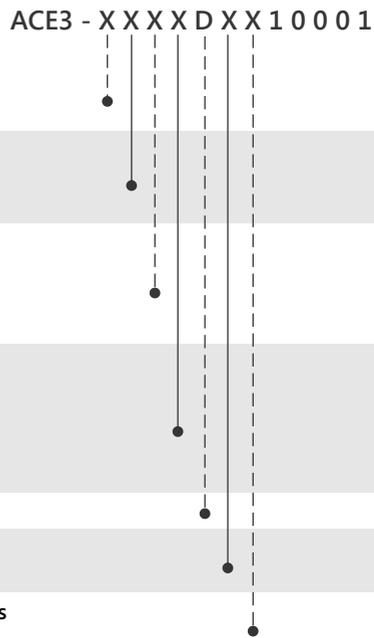
Figure 49: ACE3 Assembly 44A7733

AC/DC CONVERTER 24V 40W
EB00030-000-01
Orient 4 Conductor Connection To The Right

Pcb Assy, ACE3 Control Pcb
44A7694

Display Mounting Plate
60A4665

Cover, ACE 3 Door Mount
MM00309-000-01

Touchscreen Bezel Assy.
44A7755
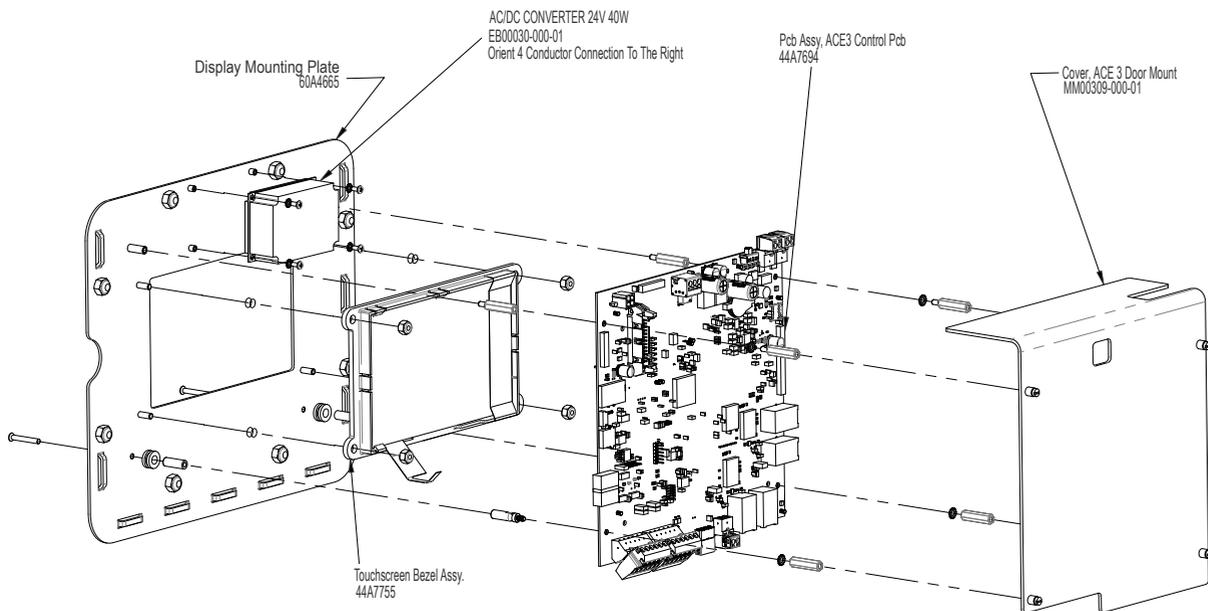
Combo Box

Table 2: Combo Box Parts

Description	Part Number
ACE III ASSEMBLY	44A7733/XX
PCB ASSY, IRMS-LI (LOW IMPEPANCE)	44A6397
ACE3 I/O DEFAULT CARD PCBA	44A7753
CVM/FCS RPLCMNT KIT, 6.6A 30KW CCF, CCT	44A7772-XX
CURRENT TX ASSY, DUAL CVM 20A TO 6.6	44A6437/1
ACE 3 DEFAULT CARD BRACKET	60A4745
LEAD MOUNTING PLATE - ACE III INTEGRATED	60A3158/X
ACE 3 DEFAULT CARD BRACKET	60A4745
SD CARD FOR MAIN BOARD HW REV. 44A7694	AK00022-000-01
SD CARD FOR MAIN BOARD HW REV. FOR 44A7694-001-01	AK00022-000-02
SD CARD FOR MAIN BOARD HW REV. FOR EP00095-001-01	AK00022-000-03

Figure 50: ACE3 Combo Box Diagram

ACE3 STAND ALONE ENCLOSURE
56A0691

ACE III ASSEMBLY
44A7733/XX

CABLE TIE MOUNT, PUSH, 0.25" HOLE, NY6-6
MF00001-000-01

ACE3 STAND ALONE ENCLOSURE
56A0691

ACE3 STAND ALONE BACKPLATE
60A4738

ACE 3 Regulator Interface Card Bracket
60A4745

ACE3 I/O Regulator Interface Card PCBA
44A7753

CVM BRACKET
60A4737

CVM/FCS RPLCMNT KIT, 6.6A 30KW CCF, CCT
44A7772/XX

PCB ASSY, IRMS-LI (LOW IMPEDANCE)
44A6397

DIN Rail x 6"
60A4432/30

TERM BLOCK END CLAMP
72A0217/1

END COVER FOR ST2.5, D-ST 2.5
F255

TERMINAL BLOCK 600V,20A,#28-12AWG,ST2.5
F253

Ground Terminal Block, 600V, 20A, CUL Li
F254

FUSE HOLDER RAIL MOUNT W/NEON
47A0159/2

ACE3 LEAD MOUNTING PLATE
60A3158/X

ACE3 LEAD INSULATING PLATE
60A3158/7

COVER, ACE3 HIGH VOLTAGE
60A4739

Figure 51: ACE3 I/O Box Diagram
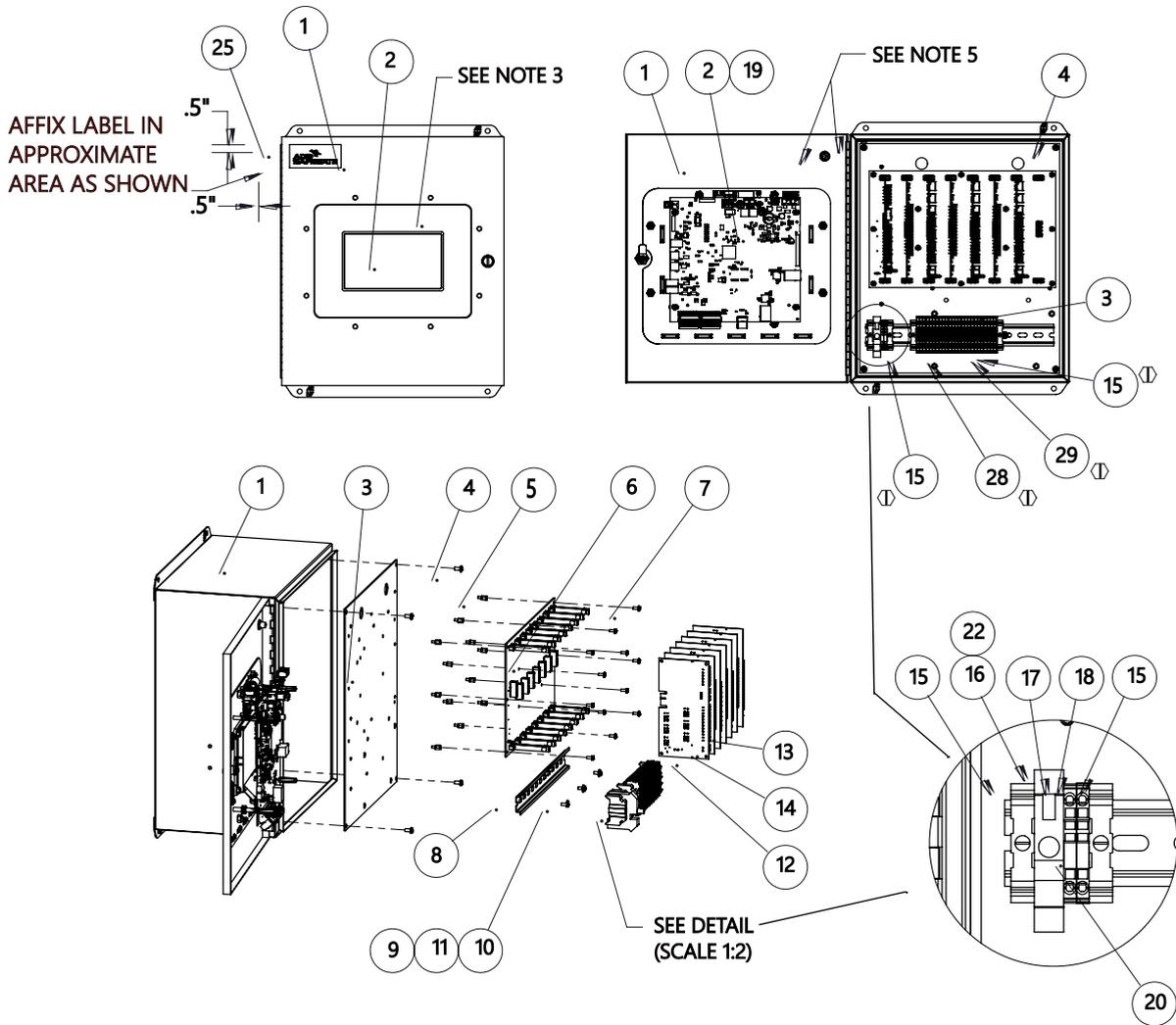
ACE3 I/O Box Parts

Item Number	Part Number	Description	IO ACE	Notes
1	56A0691	ACE3 STANDALONE ENCLOSURE	1	
2	44A7733/XX	ACE III ASSEMBLY	1	
3	60A4738	ACE3 STANDALONE BACKPLATE	1	
4	64A0177/6	10-32 X 3/8 PAN HD PHIL	4	
5	66A0129/5	STANDOFF HEX M-F 1/4 X 6-32 X 5/16 LG	12	
6	44A7742	ACE3 I/O BACKPLANE PCBA	1	
7	64A0957/06	6-32 X 3/8 PAN HD PHIL W/EXT WASH ZN PL	12	
8	60A4432/40	DIN Rail x 12"	1	
9	64A0191/6	8-32 X 3/8 PAN HD PHIL	3	
10	66A0038/4	#8 INT LOCKWASHER	3	
11	66A0015/15	#8 FLATWASHER	3	
12	44A7753	ACE3 I/O DEFAULT CARD PCBA	1	
13	44A7704	I/O CAGE INPUT CARD	X	4, 6
14	44A7705	I/O CAGE OUTPUT CARD	X	4, 6
15	72A0217/1	TERM BLOCK END CLAMP	4	⬡
16	47A0159/2	FUSE HOLDER RAIL MOUNT W/NEON	X	
17	F253	TERMINAL BLOCK 600V,20A,#28-12AWG,ST2.5	X	
18	F254	Ground Terminal Block, 600V, 20A, CUL Li	X	
19	EB00001-000-01	WIFI ANT, DUAL BAND DIPOLE, 2.4, 9-6GHZ	1	
20	EB00002-005-01	TERMINAL BLOCK LABEL PHNX# 0809557	3	
21	EW00008-IXX-01	I/O CAGE WIRING KIT	1	1
22	47A0181	3.2A FUSE	X	
23	63A0126	CABLE TIE MOUNT	4	
24	65A0347/2	8-32 NYLON INSERT NUT 18-8 SS	4	
25	42A0513	ADB LABEL	1	
26	89A0163/5	12AWG UL1015 65/30 GRN/Y TRCR 600V 105C	1	5
27	70A0195	TERM RING 12-10AWG #10 INSUL	2	5
28	EB00037-005-01	TERMINAL BLOCK, 5.2mm, 3 POS., GRAY	25	⬡
29	EB00041-004-01	TERMINAL BLOCK, END PLATE, 3POS, ORANGE	1	⬡

Notes:

1. EW00008-IAC for AC option, EW00008-IDC for DC Option

2. 44A7733/XX is fastened to 56A0691 via 8 1/4"-20TPI nuts included with 44A7733/XX

3. Affix label 42A0671 after assembly of 44A7733/XX onto 56A0691

4. The quantity of 44A7704 & 44A7705 cannot exceed a combined quantity of 7

5. Cut 89A0163/5 to 10"±.5 length, strip ends and crimp 70A0195 to terminate each end - see Wiring Diagram

6. Place all output cards first (towards left), then input cards

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

Technical Support – Global
Customers in Europe, the Middle East, Africa or Asia Pacific are more than welcome to our portal for technical support. 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. In the Americas, we also offer live technical support.

Live Technical Support – Americas
If at any time you have a question or concern about your product, contact ADB SAFEGATE's US-based technical support specialists, available 24 hours a day, seven days a week, to assist you via phone.
ADB SAFEGATE Americas Technical Service & Support (US & Canada) :**+1-800-545-4157**
ADB SAFEGATE Americas Technical Service & Support (Canada): **+1-905-631-1597**
ADB SAFEGATE Americas Technical Service & Support (International): **+1-614-861-1304**

We can also be reached via email during regular business hours:
Airfield and Gate: **techservice.us@adbsafegate.com**
Gate: **gateservice.us@adbsafegate.com**

We look forward to working with you!

Before You Call
When you have an airfield lighting or system control system problem, prior to calling, please ensure the following:

- Review the product's manual and troubleshooting guide.

- Be located with the product ready to troubleshoot.

- Have all necessary information available: airport code/company name, customer id number, contact phone number/email address, product/part number.

- Have a *True RMS* meter available and any other necessary tools.

When calling about an issue with Safedock A-VDGS, we can serve you better if you collect the following information before you call:

- Relevant information regarding the issue you are calling about, such as gate number, flight number, aircraft type and time of the event.

- What, if any, actions have been taken to resolve the issue prior to the call.

- If available, provide a CCTV recording of the incident to aid in aligning the information from the Safedock log file.
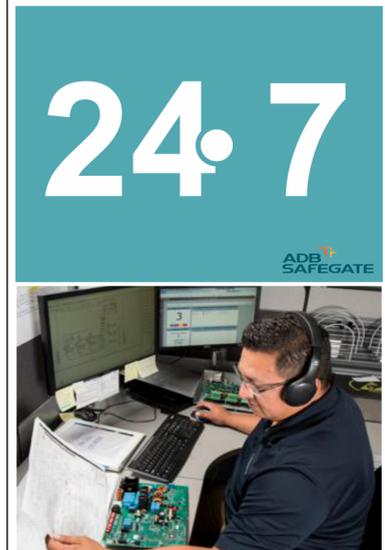
ℹ️ **Note**

For more information, see www.adbsafegate.com, contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Europe: +32 2 722 17 11
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106
Middle East and Africa: +971 4 452 7575

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.

ADB SAFEGATE

Powering Your Airport Performance from Approach to Departure

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