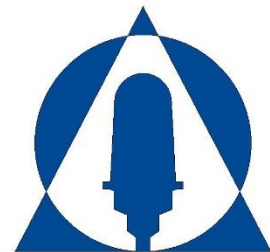


Ferroresonant Constant Current Regulator Type 828HC Instruction Manual

Revision 1.0
10/25/2019

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Airfield circuits are designed to supply a constant current series output. To power numerous devices on a constant current series circuit, the constant current regulator (CCR) will produce a high voltage across the output.

Input Voltage Warning

The input voltage for the 828HC is 120VAC. Ensure proper safety measures are taken before servicing input power.

Input Current Warning

While the input current of the 828HC is low enough to run without issue on a 15A circuit, it may be high enough to cause a hazard to personal safety. Ensure proper safety measures are taken before servicing input power.

Output Voltage Warning

The nominal output voltage of the 828HC is 76VAC. Depending upon regulatory body, this may qualify as a “low-voltage” output. Despite this, the CCR may provide output voltage in the magnitude of 5x nominal output before open circuit protection circuits are activated. Ensure the output lines of the 828HC are always populated. Always connect the male and female ends when an isolation transformer is not plugged in.

Output Current Warning

The output current of the CCR is dangerous. It is designed to work in a 6.6 Amp series loop. The CCR will shut down if there is an open circuit, but it will not turn off in a short circuit. Protective devices are designed to protect equipment, not to protect personnel.

Prior to installation or servicing

Follow all local and national electrical codes for installation and service of the CCR.

Only qualified service personnel should be allowed to install and service the CCR.

Open all sources of electricity to the CCR. Follow lock out / tag out procedures to ensure continued safety while completing work. Verify correctness of work done with a second set of eyes before re-energizing the CCR.

Guarantee

Airport Lighting Company guarantees that the equipment manufactured by Airport Lighting Company and covered by this manual has been manufactured to and will perform in accordance with application specifications. Any defect in design, materials or workmanship which may occur during proper and normal use during a period of one (1) year from date of installation or a maximum of two (2) years from date of shipment will be corrected by repair or replacement by Airport Lighting Company, with transportation costs borne by the purchaser. This guarantee covers the 828HC Ferroresonant Constant Current Regulator.

Changes from last Revision

- *First Revision*

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1.0 Introduction

1.1 Scope

This instruction manual is provided for use with the 828HC Ferroresonant Constant Current Regulator manufactured by Airport Lighting Company, Manlius, NY, USA.

1.2 Equipment Description

The 828HC is a 500W Ferroresonant Constant Current Regulator that is intended to test small circuits, isolation transformers, and fixtures. It is powered by a 120VAC service, and draws 6A nominal full load, meaning it can operate on a standard 15A circuit without issue.

It has standard L823 primary connectors to allow an operator to plug in an isolation transformer of any size up to and including 500W for testing.

The 828HC is a device that is compliant with FAA AC150/5345-10, excepting input voltage and nominal kW output capacity. It will operate to Type A, Class 1 specifications. It will operate to both listed FAA CCR Styles, in addition to a one (1) step operation, as well as seven (7) step operation. The brightness step selection is user-selectable to accommodate for all types of fixture testing.

1.3 Control Capabilities

The regulator can be controlled by various means:

- The front panel keypad/display
- Remote-control connection to internal CCR terminal blocks with 24VDC, 48VDC, or 120VAC power
- RS232 serial connection to computer

1.3.1 Front Panel Display Control

The front panel display is the go-to method of entering the CCR settings and operating the CCR in Local mode. Local mode operation allows the user to control the CCR with the press of a button, independent of calls from a remote system. This can be used for setup, diagnosis of airfield circuit problems, or troubleshooting. For more information about navigation of the CCR with the display, see *Section 4.0 How to Navigate the CCR Display and Keypad*.

1.3.2 Remote Control

Remote control is available through an input terminal block on the DCMU. While the DCMU installed allows for full parallel-input capability as required in FAA-spec CCRs, it is not connected in the 828HC. For help setting up remote control for your 828HC, please contact Airport Lighting Company.

1.3.3 RS232 Serial Connection

The 828HC allows for RS232 serial connection to be made at the DCMU. Each DCMU comes with a RS232 connector that is used to connect directly to a PC using the DCMU Configurator software. This connection is used primarily in factory setup and calibration of the CCR.

2.0 Shipping & Sizing Information

The 828HC enclosure is sized as shown below:

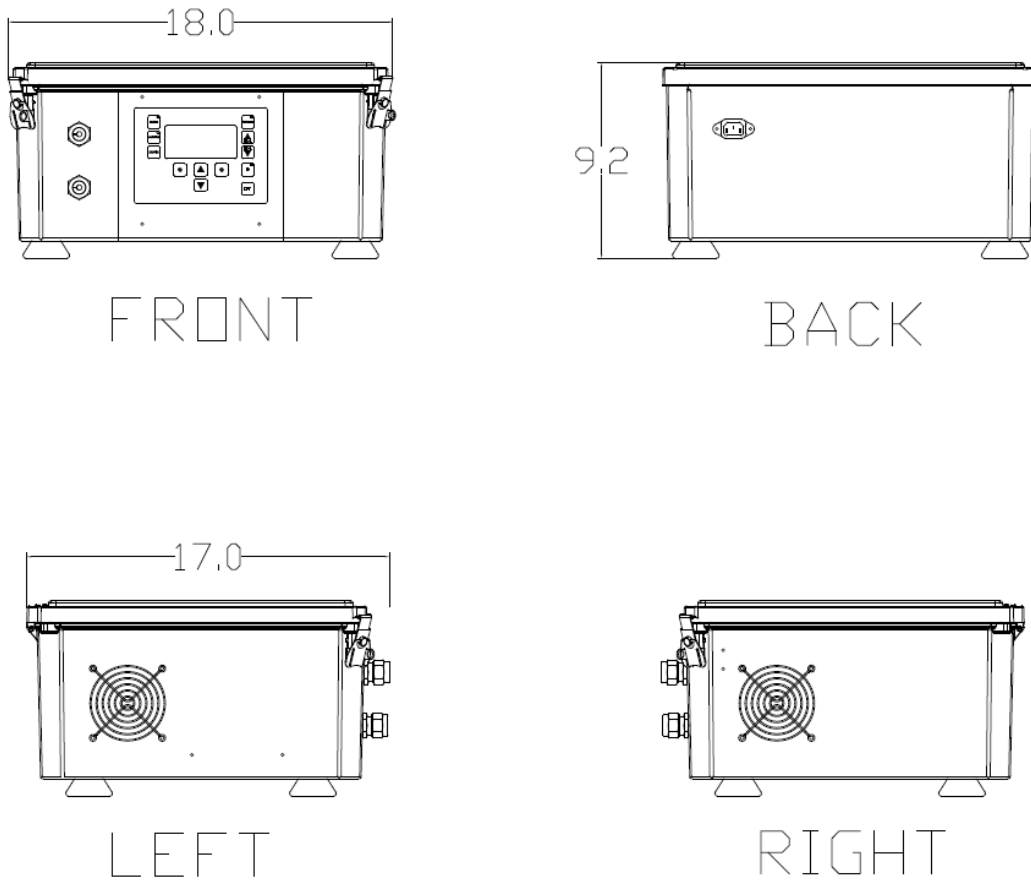


Figure 1: Cabinet Dimensions

2.1 Sizing Information

kW Rating	Install Weight	Install Size (Without Pallet)
.5	74 lbs	18"W x 17"D x 9.2"H

Table 1: Sizing Information

3.0 Installing the CCR

3.1 Installation Precheck

- Unpack the CCR and inspect for shipping damage.
- Verify that a grounded receptacle is available to power the unit.
- Using the dimensions in Section 2.0, verify the installation footprint is adequate.

3.2 Turning the CCR on for the First Time

Exercise caution at all times

It is recommended to do an initial startup of the 828HC to ensure familiarity with the controls and operation.

Before starting, review *Section 4.0 How to Navigate the CCR Display and Keypad* for information about the user interface.

Once you are familiar with the display keypad: **Connect the male and female output connections.**

With the output connections shorted, plug in the 828HC.

The CCR display screen will turn on and show you the main screen. Reference *Table 3: Main Screen Information* for a list of all information displayed.

Place a current clamp on an output wire and connect the clamp to a DMM. Using the LOCAL UP and LOCAL DOWN buttons, increment through each brightness step and verify the current output. Use the Table 2 in Section 3.3 for current references of each step.

Once the current measurements are verified, push the OFF button once to turn the CCR output off.

LEAVE THE OUTPUT CONNECTIONS SHORTED AT ALL TIMES WHEN NOT PLUGGED INTO AN ISOLATION TRANSFORMER.

3.3 Checking Current Output

The following table is a direct reference to FAA AC 150/5345-10H Section 3.3.1.1, Table 1. Once your CCR is installed, set up, and operational, you may choose to verify the measured output current with a digital multimeter (DMM) and current clamp.

Maximum Output Current	Total Step Count	Step	Nominal Output Current	Allowable Current Range	Measured Current	Displayed Current
6.6	3	B10	4.8	4.7 – 4.9		
		B30	5.5	5.4 – 5.6		
		B100	6.6	6.5 – 6.7		
6.6	5	B1	2.8	2.7 – 2.9		
		B2	3.4	3.3 – 3.5		
		B3	4.1	4.0 – 4.2		
		B4	5.2	5.1 – 5.3		
		B5	6.6	6.5 – 6.7		

Table 2: CCR Output Currents

4.0 How to Navigate the CCR Display and Keypad



Figure 2: Keypad and Display of a 240V input CCR

The CCR display will show 4 lines of information at any given time. The display communicates directly with the DCMU inside the panel. The information on the screen can be scrolled through and will cycle around as if on a rolling drum.

Figure 6 shows the main screen of the CCR; this is the first screen that will come up when the CCR is powered on. Refer to *Section 4.2 Understanding the Digital Control & Monitoring Unit (DCMU) Display* for additional information.

4.1 The CCR Keypad



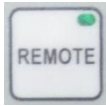
The OFF button will turn the CCR off from any brightness step in Local or Remote.



The ON button will turn the CCR on to the most previous brightness step. There is an LED on the button that will illuminate when the CCR is on.



The LOCAL UP and LOCAL DOWN buttons change the brightness step of the CCR when it is in Local mode. If LOCAL DOWN is pressed when the CCR is at Step B10 (3 step configuration) or B1 (5 step configuration), the CCR will turn off.



The REMOTE button engages or disengages the Remote Control option of the CCR. The LED in the button will illuminate if Remote is enabled. Pressing the button while already in remote will put the CCR back into Local mode.



The FAULT button has a red LED that will illuminate when a fault condition occurs. If a fault occurs, the CCR will turn off and the fault description will be displayed on the screen. Pressing the FAULT button will clear the fault code and force the CCR to attempt operation again. **DO NOT** continue to press the fault button to reset the CCR if the actual fault condition is not fixed. Doing so may cause damage to the CCR. See *Section 6.2 Faults* for information about faults and how to remediate them.



The WARNING button has a yellow LED that will illuminate when a warning condition occurs. Pressing the WARNING button will cycle through any concurrent warnings. The CCR will still operate even if there are warnings. It is recommended to identify the cause of the warning and fix them as prolonged runtime with warning conditions may cause damage to the CCR. See *Section 6.1 Warnings and Alarms* for information about warnings and alarms, and how to remediate them.



The CONFIG button is used to access multiple screens and menus. If equipped, pressing the CONFIG button once will access the “Megger Now” function. To access the configuration menu, press the CONFIG button again.

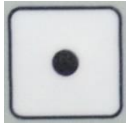
If IRMS/Megger functionality is not installed, pressing the CONFIG button once will access the configuration menu of the DCMU. See *Section 5.0 CCR Configuration* for more information.

Pressing the CONFIG button again will show the diagnostics menu, which among other information stores the most recent faults and warnings. See *Section 5.0.2 Accessing Diagnostics Menu* for more information.



The UP and DOWN buttons are the buttons that navigate the screen. If on the main screen, the information will cycle through as if on a rolling drum. If navigating the menus, you will see an arrow-cursor on

the left side of the screen. The UP and DOWN arrows control the cursor.



The DOT buttons are selector buttons. If applicable, a command will be displayed above the DOT buttons. For example, when navigating the configuration menu, the left DOT button has the word “Enter” above it and the right DOT button has the word “Exit” above it.

Pressing the corresponding button will execute the command.

4.2 Understanding the Digital Control Monitoring Unit (DCMU) Display

As stated in Sections 4.0 and 4.1, the CCR display is controlled by pushing the UP, DOWN, and DOT buttons that are located below the screen. Each screen that is displayed will scroll continuously, as if on a rolling drum. Once you attempt to navigate past the last line of information, you will be returned to the first line.

4.2.1 The Main Screen

The main screen of the display shows the most important, at-a-glance information. The following table shows all the available information on the main screen:

[Table on next page]

Current Brightness Step & Local or Remote Indication	
<i>Note: This line will not scroll</i>	
Vin – Input (Source) Voltage Measurement	lin – Input Current Measurement, if equipped. If not equipped, this line will show: "lin=-----"
Vout – The voltage reading of the connected field output circuit	Iout – The current reading of the connected field output circuit
kVAo – The kVA calculation of the connected field output circuit	kWo – the kW calculation of the connected field output circuit
*kVAi – The kVA calculation of the supply	*kWi – The kW calculation of the supply
*PFIn – Power factor calculation of the supply	*PFOut – Power factor calculation of the output
Lamps Out – Current count of lamps out, must be configured, enabled, and calibrated. If not equipped, this line will show: "Lamps Out=---"	Hz – The configured AC voltage frequency
Temperature – Displays the current temperature reading at the DCMU in centigrade	Mgr – Displays the current megger reading (if equipped). Until a megger test is run, this line will show: "Mgr=?????"
HwVer – Hardware version of the DCMU	SwVr – Software version of the DCMU

Table 3: Main Screen Information

Note: The kVAi, kWi, PFIn, and PFOut options only appear on the screen if the CCR is equipped with an input CT.

4.2.2 Navigating Menus

The menus of the CCR are set up as a collection of folders within folders, similar to a file cabinet. By using the UP, DOWN, and DOT buttons, it is possible to scroll through folder selections, and open a folder with its own options and sub-folders.



Figure 3: The Configuration Menu

Figure 3 shows the main configuration menu. While navigating the menus the top line, in this case “Config”, and the bottom line, in this case “Enter” and “Exit”, will not scroll upon pressing the UP or DOWN buttons.

Above each DOT button, on the fourth line, are commands that can be executed by the corresponding DOT button.

As you can see, the second and third lines have arrows. The ↓ (down arrow) on the third line is showing you that there are additional options to look at. Pressing the DOWN button will scroll through the options.

The → (right arrow) is a cursor for the menu. Upon scrolling up or down, the option next to the → cursor will change. When you have reached the menu you’d like to open, use the Enter button to navigate to the next sub-folder.

5.0 CCR Configuration

The Airport Lighting Company CCR has multiple field-configurable options. While these options may be changed during initial setup, generally with the advice of an Airport Lighting Company representative or with the help of this manual, the day-to-day use of the configuration menu is not anticipated.

Review Sections 4.0 through 4.2 before continuing.

As stated in *Section 4.2.2 Navigating Menus*, the CCR configuration menu is set up in a “nested folder” setup, like a file cabinet or the files on your computer. To understand the method of navigating referenced in this manual, see the below example of a block flow diagram that navigates to the option for brightness step count:

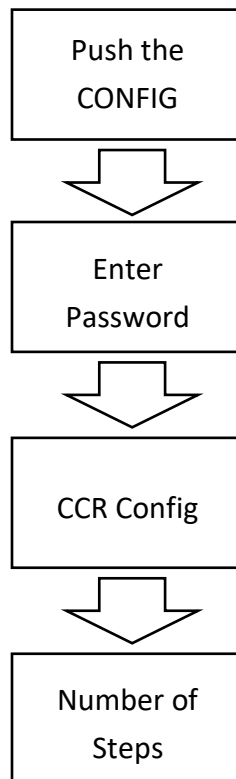


Figure 4: Block Flow of Menu Navigation

The established way to designate the above navigation in plain text is:

Push the CONFIG button > Enter Password > CCR Config > Number of Steps

This manual will reference the plain text navigation style. For subsequent menu references in this manual, the steps “Push the CONFIG button” and “Enter Password” will be omitted.

5.0.1 Accessing the Configuration Menu

From the CCR main screen, press the CONFIG button once.

You will be prompted for a password. The password on all Airport Lighting Company CCRs is “9999”. Use the UP and DOWN buttons to change the number above the ↑ up arrow cursor. Press the right DOT button to advance to the next digit. Once the password is entered, push the left DOT button to advance to the menu.

5.0.2 Accessing the Diagnostics Menu

From the CCR main screen, press the CONFIG button until you see the “Enter Password” screen. Press the CONFIG button once more, for a total of two (2) times.

While most of the options within this menu will be used only by Airport Light Company representatives during troubleshooting, there are menus that contain logs of the 10 most recent Faults and Warnings, as well as a run-time log.

The Run-time log can be found by navigating to:

Diagnostics Menu > Operations

The Fault and Warning logs can be found, respectfully, by navigating to:

Diagnostics Menu > Faults / Warnings

5.1 Common CCR Configuration Changes

This section will go over the most common CCR changes that may be warranted in-field. Note that configuration beyond the options covered in this section may cause problems with the normal operation of the CCR. Exercise caution when changing options. For assistance or clarification regarding options within the configuration menu, contact Airport Lighting Company.

5.1.1 Changing the Step Count of the CCR

The CCR will be factory-configured to the brightness step count that is ordered. It may be determined in-field that the factory-configured step count is not appropriate for the applicable circuit and a brightness step count changeover is required.

Note: Follow all appropriate FAA Advisory Circular documentation. Refer to product-specific

Advisory Circulars to determine the CCR step count requirement.

To change the step count, navigate to:

Configuration Menu > CCR Config > Number of Steps > [1, 3, 5, 7]

The most common step counts are 3 and 5. Upon changing the step count, the CCR main screen will reflect the accurate step-count nomenclature. 3 step CCRs identify the step counts as B10, B30, and B100, while 5 step CCRs identify the step counts as B1, B2, B3, B4, and B5.

5.1.2 Calibrate Zeros

This command will have the CCR find a zero threshold in the input AC voltage. It is required when making equipment changes to the CCR, or when a part is replaced. **Before completing this calibration:** put the CCR in Local Mode and turn the output off.

Configuration Menu > CCR Config > Calibrate > Zeros > [Execute]

6.0 Warnings, Alarms, and Faults

The CCR will automatically determine when conditions exist that cause a warning, alarm, or fault within the CCR itself, or the circuit that it's connected to.

Warnings and alarms will cause the yellow light on the WARNING button on the CCR display to turn on. Pressing the button will cycle through any currently-active warnings and alarms. They will be displayed on line 1 of the screen.

Faults will cause the red light on the FAULT button on the CCR display to turn on. Pressing the button will cycle through any currently-active faults. They will be displayed on line 1 of the screen. A history of the 10 most recent warnings and faults can be found in the Diagnostics Menu, for more information refer to *Section 5.0.2 Accessing the Diagnostics Menu*.

6.1 Warnings and Alarms

When the CCR determines a warning or setpoint alarm, it will engage the indicator light and the warning will be shown on line 1 of the CCR display. The CCR **will continue to operate** in the event of a warning. Although the CCR will continue operation, warning conditions must still be noted and fixed.

Allowing the CCR to operate in a warning state may cause problems for efficiency, general safety, and longevity of equipment.

Due to the test-bench nature of the 828HC, an "Output Shorted" or "Low VA" warning may be anticipated depending upon equipment being powered by the CCR.

For a complete table of warnings and alarms, contact Airport Lighting Company.

6.2 Faults

When the CCR determines a fault has occurred, it will engage the red indicator light on the FAULT button and the fault will be shown on line 1 of the CCR display. The CCR **will not continue to operate** in the event of a fault. All fault conditions must be addressed to resume normal operation of the CCR.

For a complete table of faults, contact Airport Lighting Company.

7.0 Troubleshooting

Always maintain safe working conditions by using appropriate personal protective equipment (PPE) where necessary.

Follow all lock out / tag out procedures as necessary.

If the problem you're experiencing is not listed in this section, or if the included steps to fix do not address the issue, contact Airport Lighting Company.

7.1 Troubleshooting Chart

Fully read the description and steps to fix thoroughly before completing work. Complete all steps to ensure a proper fix. For more information, contact Airport Lighting Company.

Problem	Likely Cause(s)	Steps to Fix
The CCR will not turn on.	<ul style="list-style-type: none"> - CCR supply voltage feeder is not on. - Blown fuses within the CCR - The control transformer is not providing 12VAC - Faulty DCMU 	<ul style="list-style-type: none"> - Check to see if the CCR feeder supply breaker has tripped. - Verify the supply voltage with a DMM - With all power off, verify the integrity of the electrical connections. - Check the CCR fuses - With power on, check the control transformer voltage - Replace DCMU if a spare is available.
Display is blank / the CCR display buttons don't work.	<ul style="list-style-type: none"> - There is a bad connection between the DCMU and the CCR display 	<ul style="list-style-type: none"> - First, see if the CCR operates in Remote mode. If it doesn't, refer to "The CCR will not turn on." - If the CCR operates in Remote mode, try unplugging and reconnecting display cable at either end.

Problem	Likely Cause(s)	Steps to Fix
All DCMU LEDs are flashing at the same time	<ul style="list-style-type: none"> - The internal DCMU power supply card is shorting. - The internal DCMU power supply card capacitors discharged. 	<ul style="list-style-type: none"> - If all of the DCMU LEDs are flashing on and off simultaneously, it is likely that there is a component drawing more power from the DCMU than it's designed to provide. To determine if this is true, complete the following steps: <ul style="list-style-type: none"> - Turn off power to the CCR. Wait for power to completely discharge by monitoring the LEDs. Once they are all off, power is no longer present. - Unplug the serial cable connected to the left side of the DCMU, and the firing card. The thumbscrews need to be loosened before removal. - Reapply power to the CCR. If the issue persists, replace the DCMU if a spare is available. - If the issue is resolved with the serial cable disconnected, replace the serial cable, firing card, and megger card (if installed) one at a time to determine the cause of the problem.

Problem	Likely Cause(s)	Steps to Fix
<p>Regulated current is less than 2.8 and cannot be increased</p>	<ul style="list-style-type: none"> - Solid state relay (SSR) has failed. - The output current calibration is not correct. 	<ul style="list-style-type: none"> - Using a DMM, verify the output current. If the current measured on the DMM does not match the CCR displayed current, refer to <i>Section 7.3.1</i>. - If the output current calibration is correct, the issue may be with the SSR. Disconnect power from the CCR. At the SSR, disconnect one of the inductor lines, IND A or IND B, that are connected to the contact side of the SSR. Use a DMM to check the SSR contact – it should be normally open. If it isn't, the SSR was damaged. Contact Airport Lighting Company.
<p>Output current is too low for the selected brightness step</p>	<ul style="list-style-type: none"> - The output current needs to be recalibrated. - The CCR is overloaded. 	<ul style="list-style-type: none"> - Using a DMM, verify the output current. If the current measured on the DMM does not match the CCR displayed current, refer to <i>Section 7.3.1</i>. - To see if the CCR is overloaded with the connected circuit, complete the following steps: - Put the CCR in Local mode, and then disconnect CCR supply power. Connect the male and female outputs. Re-energize the CCR, and turn it on to the first brightness step. If the CCR continues to present the fault, contact Airport Lighting Company. If the problem resolves itself, it is likely that the test circuit is overloading the CCR.

7.2 Restoring Known Good Settings

The CCR includes two (2) different sets of stored information. Each set includes a configuration and calibration setting that the CCR may be returned to, if options are mistakenly changed while in-field.

The “Factory” setting will restore the CCR to a blank-slate condition, and each part of the CCR will require manual reconfiguration. The “Known Good” setting will restore the CCR to the configuration that is saved by Airport Lighting Company during the factory setup and testing procedure. Please note that unless saved, field-made changes will not be retained if “Known Good” settings are restored.

7.2.1 Restoring a Known Good Configuration

If you experience problems after changing the settings of the CCR after it is in field, and wish to return it to the Airport Lighting Company-setup settings, navigate to the following menu option:

Configuration Menu > System Commands > Known Good Settings > Restore Config > [Execute]

This will have the CCR return to the most recent saved configuration. The CCR will ship with a factory-saved configuration that may be overwritten in field. Note: this will not affect the CCR calibration. This is useful for instances where an option was enabled or disabled, and it is unknown what setting it was.

7.2.2 Restoring a Known Good Calibration

If the CCR is presenting problems with the measurements displayed on-screen vs verified field measurements, it may be helpful to restore the Airport Lighting Company-setup calibration. To do so, navigate to the following menu option:

Configuration Menu > System Commands > Known Good Settings > Restore Calib > [Execute]

This will have the CCR return to the previously setup-and-saved calibration. The CCR will ship with a factory-saved calibration that may be overwritten in field. Note: this will not affect the CCR configuration.

7.3 Completing In-Field Recalibrations

This section is intended to provide information on how to recalibrate the output current, output voltage, input current, and input voltage.

In-field recalibrations should be completed only upon necessity. Changing the calibration values may result in hazardous conditions within the circuit or damage to equipment.

7.3.1 How to Determine if Recalibration is Needed

If you suspect that the CCR measurements are not accurately reflecting the actual conditions of CCR input or output, complete the following steps:

To Verify Output Current

- ❑ Connect a known, calibrated current clamp to a known, calibrated digital multimeter (DMM) and place the clamp on one leg of the output circuit wire.
- ❑ Put the CCR into Local mode and turn it on to the first brightness step.
- ❑ Check the DMM-measured value against the CCR-measured value. Due to a difference in the fidelity of measuring in the different equipment, you may see a slight difference. Log the measured numbers.
- ❑ Put the CCR on the highest brightness step. Log the measured numbers.
- ❑ If the numbers are consistently more than .5 amps different, you may want to consider recalibration.

To Verify Output Voltage

- ❑ Put the CCR into Local mode and turn the output power off.
- ❑ Open the CCR door and pull the door switch plunger toward you laterally to bypass the safety interlock.
- ❑ Turn the CCR on to any brightness step.
- ❑ Using voltage probes on a known, calibrated DMM, measure the AC voltage across V1 and V2 on the 11-pin firing card terminal block by probing the screw heads. Multiply the measured voltage by the “V1-V2 Output Voltage Measurement Factor” provided on the CCR Datasheet at the end of this manual. If the factor is not available, contact Airport Lighting Company.

- If the calculated voltage is not within 5% of the CCR-displayed output voltage, you may want to consider recalibration.

To Verify Input Voltage

- Put the CCR into Local mode and turn the output power off.
- Open the CCR door and pull the door switch plunger toward you laterally to bypass the safety interlock.
- Turn the CCR on to any brightness step.
- Using voltage probes on a known, calibrated DMM, measure the input voltage. It may be measured at the contactor, at the power-side fuse block, or on the control transformer. Log the measured numbers.
- Put the CCR on the highest brightness step. Log the measured numbers.
- If the numbers are consistently more than 5% different, you may want to consider recalibration.

7.3.2 Calibrating Output Current

Before continuing, refer to *Section 7.3.1 How to Determine if Recalibration is Needed*. If it is determined that recalibration is required, complete the following steps fully to ensure the most accurate results. Read all steps before beginning. Contact Airport Lighting Company for additional information as needed.

Note: a resistor load bank, such as can be provided by Airport Lighting Company, is recommended to provide a purely-resistive load to the CCR during calibration. Ideally, the CCR should be loaded at 100% of its kW rating for the most accurate calibration.

- Before doing a full recalibration, complete a “Calibrate Zeros” of the CCR. Refer to *Section 5.1.2 Calibrate Zeros*. Once the Calibrate Zeros is done, check to see if the reading discrepancy still exists. If it does, continue.
- Connect a known, calibrated current clamp to a known, calibrated digital multimeter (DMM) and place the clamp on the output circuit wire.
- Connect a load bank to the CCR.
- Put the CCR into Local mode.
- Navigate to the following menu, but do not enter the “Output Current” screen yet:

Configuration Menu > CCR Config > Calibrate > Output Current

- The LOCAL UP and LOCAL DOWN arrows will still operate while in the menu, allowing for easier calibration. Put the CCR on the lowest brightness step.
- Once the CCR is on the lowest brightness step, push the left DOT button to enter the “Output Current” screen.
- Check the DMM-measured current value. Use the UP and DOWN arrows below the screen to adjust the calibration value. Once the values match, push the left DOT button to accept.
- Put the CCR on the highest brightness step, while staying in the calibration menu.
- Check the DMM-measured current value. Use the UP and DOWN arrows below the screen to adjust the calibration value. Once the values match, push the left DOT button to accept.
- Cycle through the brightness steps, and verify the new calibration with the DMM. If the calibration is now acceptable, push the right DOT button until you’re asked to Record Changes, to which you need to execute Yes.
- If the calibration needs additional fine-tuning, complete the calibration procedure again.
- If the calibration procedure does not yield acceptable results, you may want to restore a known good calibration. Refer to *Section 7.2.2 Restoring a Known Good Calibration* for more information.

7.3.3 Calibrating Output Voltage

Before continuing, refer to *Section 7.3.1 How to Determine if Recalibration is Needed*. If it is determined that recalibration is required, complete the following steps fully to ensure the most accurate results. Read all steps before beginning. Contact Airport Lighting Company for additional information as needed.

Note: a resistor load bank, such as can be provided by Airport Lighting Company, is recommended to provide a purely-resistive load to the CCR during calibration. Ideally, the CCR should be loaded at 100% of its kW rating for the most accurate calibration.

- Before doing a full recalibration, complete a “Calibrate Zeros” of the CCR. Refer to *Section 5.1.2 Calibrate Zeros*. Once the Calibrate Zeros is done, check to see if the reading discrepancy still exists. If it does, continue.
- Connect a load bank to the CCR.

- Put the CCR into Local mode.
- Open the CCR door and pull the door switch plunger toward you laterally to bypass the safety interlock.
- Locate the V1 and V2 wires that connect to the firing card through an 11-position green, removable terminal block. This calibration requires measuring AC voltage across those two screwheads while the CCR is on, while the terminal block is plugged in.
- Navigate to the following menu, but do not enter the “Output Voltage” screen yet:

Configuration Menu > CCR Config > Calibrate > Output Voltage

- The LOCAL UP and LOCAL DOWN arrows will still operate while in the menu, allowing for easier calibration. Put the CCR on the lowest brightness step.
- Once the CCR is on the lowest brightness step, push the left DOT button to enter the “Output Voltage” screen.
- Using voltage probes on a known, calibrated DMM, measure the AC voltage across V1 and V2 on the 11-pin firing card terminal block. Multiply the measured voltage by the “V1-V2 Output Voltage Measurement Factor” provided on the CCR Datasheet at the end of this manual. If the factor is not available, contact Airport Lighting Company.
- Use the UP and DOWN arrows below the screen to adjust the calibration value to the calculated value. Once the values match, push the left DOT button to accept.
- Put the CCR on the highest brightness step, while staying in the calibration menu.
- Once again, multiply the DMM-measured voltage by the V1-V2 Output Voltage Measurement Factor. Use the UP and DOWN arrows below the screen to adjust the calculated value. Once the values match, push the left DOT button to accept.
- Cycle through the brightness steps, and verify the new calibration. If the calibration is now acceptable, push the right DOT button until you’re asked to Record Changes, to which you need to execute Yes.
- If the calibration needs additional fine-tuning, complete the calibration procedure again.
- If the calibration procedure does not yield acceptable results, you may want to restore a known good calibration. Refer to *Section 7.2.2 Restoring a Known Good Calibration* for more information.

7.3.4 Calibrating Input Voltage

Before continuing, refer to *Section 7.3.1 How to Determine if Recalibration is Needed*. If it is determined that recalibration is required, complete the following steps fully to ensure the most accurate results. Read all steps before beginning. Contact Airport Lighting Company for additional information as needed.

Note: a resistor load bank, such as can be provided by Airport Lighting Company, is recommended provide a purely-resistive load to the CCR during calibration. Ideally, the CCR should be loaded at 100% of its kW rating for the most accurate calibration.

- ❑ Before doing a full recalibration, complete a “Calibrate Zeros” of the CCR. Refer to *Section 5.1.2 Calibrate Zeros*. Once the Calibrate Zeros is done, check to see if the reading discrepancy still exists. If it does, continue.
- ❑ Connect a load bank to the CCR.
- ❑ Put the CCR into Local mode.
- ❑ Open the CCR door and pull the door switch plunger toward you laterally to bypass the safety interlock.
- ❑ Navigate to the following menu, but do not enter the “Input Voltage” screen yet:

Configuration Menu > CCR Config > Calibrate > Input Voltage

- ❑ The LOCAL Up and LOCAL Down arrows will still operate while in the menu, allowing for easier calibration. Put the CCR on the lowest brightness step.
- ❑ Once the CCR is on the lowest brightness step, push the left DOT button to enter the “Input Voltage” screen.
- ❑ Using voltage probes on a known, calibrated DMM, measure the input voltage. It may be measured at the contactor, at the power-side fuse block, or on the control transformer.
- ❑ Check the DMM-measured value. Use the UP and DOWN arrows below the screen to adjust the calibration value. Once the values match, push the left DOT button to accept.
- ❑ Put the CCR on the highest brightness step, while staying in the calibration menu.
- ❑ Check the DMM-measured value. Use the UP and DOWN arrows below the screen to adjust the calibration value. Once the values match, push the left DOT button to accept.

- Cycle through the brightness steps, and verify the new calibration with the DMM. If the calibration is now acceptable, push the right DOT button until you're asked to Record Changes, to which you need to execute Yes.
- If the calibration needs additional fine-tuning, complete the calibration procedure again.
- If the calibration procedure does not yield acceptable results, you may want to restore a known good calibration. Refer to *Section 7.2.2 Restoring a Known Good Calibration* for more information.

8.0 Additional Information

8.1 Replaceable Parts

ALC Part Number	Description
282-10002	Snubber
282-10005	Contactora MOV
282-10030	Front Panel Display Assembly
55-00201	Interlock Switch
82-45	Display Cable
82-46	Current Transformer 100:.1
82-60	DCMU, WBC-910-03
82-61	DCMU/Firing Card Cable
82-72	Firing Card
82-76	Glass Fuse, 1 ¼" x ¼", 5A 250V
82-93	Solid State Relay, 50A
82-87	12V Control Transformer
82-92	20A Contactora
82-508	Input Power Cord
99-00203	828HC Rubber Foot
82-505	Fan, 24VDC, 92mm
82-506	Fan Guard, Wire Frame, 92mm
82-401m	8AWG Male Primary Cable
82-401f	8AWG Female Primary Cable

8.2 Glossary of Terms

A, a – Ampere
AC – Alternating Current (power), Advisory Circular (standards)
ALC – Airport Lighting Company
BCD – Binary Coded Decimal
C – Celsius
CCR – Constant Current Regulator
CS – Current Sensor
CSS – Circuit Selector Switch
CT – Current Transformer
DC – Direct Current
DCMU – Digital Control & Monitoring Unit
DMM – Digital multimeter
FAA – Federal Aviation Administration
FLA – Full Load Amperage
FR – Ferroresonant
Hz – Hertz
IRMS – Insulation Resistance Monitoring System
kv – kilovolt
kW – kilowatt
LED – Light Emitting Diode
LO – Lamp Out
PF – Power Factor
PLC – Programmable Logic Controller
PM – Preventative Maintenance
SSR – Solid State Relay
V, v – Voltage
VA – Volt Amp
VAC, vac – AC Voltage
VDC, vdc – DC Voltage
W – Watt
Xfmr – Transformer

8.3 CCR Menu Navigation Flowchart

The included flowchart is designed to accompany a user when navigating the CCR menus. For information about accessing and using the menu, refer to *Section 4.0 How to Navigate the CCR Display and Keypad* and *Section 5.0 CCR Configuration*.

[Attached]

8.4 CCR Datasheet

The included datasheet contains CCR-specific information that is gathered during testing. It also has the model and serial numbers of various equipment.

[Attached]