Circuit Selector Switch
Type L-847
Instruction Manual
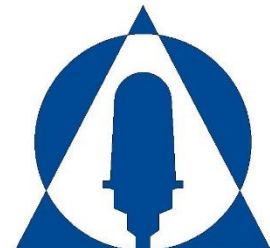
Revision 1.0
2/5/2019
MAN-PC03

Circuit Selector Switch
In accordance with:
FAA
Advisory Circular AC-150/5345-5B

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 output current of the CCR is dangerous. It is designed to work in a 6.6 Amp or 20 Amp series circuit. The input voltage to a circuit selector can be as high as 5000 volts. Check the output voltage on the nameplate of attached CCR for a true maximum circuit selector input voltage. The circuit selector switch (CSS) will shut down if the front door is opened, but remote shutoff of attached CCR may not be achieved. Ensure safety around the dead front panel.

Input Current Warning

The input current to the circuit selector switch (CSS) may be as high as 20A, dependent upon the attached CCR. Verify the output current on the CCR nameplate before working on the CSS.

Output Voltage Warning

The output voltages of a circuit selector switch are the same voltages present on the output of the attached CCR. Verify the output voltage on the CCR nameplate before working on the CSS. Never put a DMM (digital multimeter) on the output circuit to measure voltage. Doing so may cause DMM failure and/or risk of electrical shock.

Output Current Warning

The output current of a circuit selector switch is the same as current present on the output of the attached CCR. Check the output current on the CCR nameplate before working on the CSS. 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 CSS.
Only qualified service personnel should be allowed to install and service the CSS.
To ensure safety while maintaining a CSS, open all sources of electricity to the attached 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 work and 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 Circuit Selector Switch, L-847.

Changes from last Revision

- Initial Release

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1.0 Introduction

1.1 Scope

This instruction manual is provided for use with FAA type L-847 Circuit Selector Switch as covered by FAA AC-150/5345-5B and manufactured by Airport Lighting Company, Manlius, NY, USA.

1.2 Equipment Description

Circuit Selector Switch

1.2.1 Type

a. L-847-1 One circuit control

b. L-847-2 Two circuit control

c. L-847-3 Three circuit control

d. L-847-4 Four circuit control

1.2.2 Classes

Class A – Designed for indoor installation

Class B – Designed for outdoor installation

1.2.3 Ratings

Rating 1 – Designed for 6.6A, 5000V circuits

Rating 2 – Designed for 20A, 5000V circuits

1.3 Environmental Requirements

1.3.1 NEMA 4 rated. Indoor or outdoor installation.

All CSS models provided by Airport Lighting Company are painted aviation orange. All models come with mounting feet on the top and bottom of the enclosure.

1.4 Electrical Requirements

1.4.1 Input Voltage and Current

Standard supply voltage of the Circuit Selector Switch is 120VAC. While 120VAC is standard, all units are built to operate on a supply range of 100VAC to 240VAC.

When selected, the "Supply Voltage" option for Remote Control Power and Monitor Power are fed directly from the CSS input voltage. If the "Supply Voltage" option is selected, ensure that the supply is not greater than 120VAC, as greater voltages may cause damage to internal

components.

While Remote Control and Monitor input voltages are determined at time of order, it is possible to run the CSS controller inputs on any voltage, DC or AC, in the range of 24V to 120V. There is no reprogramming needed to accomplish this. However, there may be wiring changes needed. Please refer to wiring diagrams in Section 8.4 for details.

For CSS units ordered with external-voltage Remote Control and Monitor options, DC or AC voltages between the range of 24V and 120V may be used. No changes or programming is required by the installer to achieve compatibility with specific voltages.

1.5 Control Capabilities

The circuit selector switch is commanded in one of two ways. There is a three-position switch for each circuit inside the circuit selector cabinet that have the following selections:

LOCAL

OFF

REMOTE

When the operator of the three-position switch is in LOCAL, Local Mode is engaged. When the operator of the three-position switch is in REMOTE, Remote Mode is engaged. When the operator is in the OFF position, the circuit selector switch will not accept remote commands.

The OFF selection of the three-position switches inside the CSS do not affect the output power of the attached CCR.

1.5.1 Local Mode

Local mode is engaged by switching the control operator (switch) for the desired circuit to "LOCAL". **This will energize the identified circuit**. If the local CSS door switch is tripped, the identified circuit will energize once the door is closed.

1.5.2 Remote Mode

Remote mode is engaged by switching the control operator for the desired circuit to "REMOTE". This will allow the CSS controller to accept remote control inputs. The CSS controller will identify to the operator that it is ready to receive an input by illuminating an LED in the "REMOTE STATUS" section of the CSS controller. Once a command is received, the CSS controller will illuminate the corresponding LED in the "CONTROL INPUT" section.

1.5.3 Switch Status

If the CSS has been equipped with optional monitoring:

The CSS will provide an output signal that mirrors the LED in the "REMOTE STATUS" column on the CSS Controller. This monitor signal will alert the user when the three-position operator for each circuit is in "REMOTE" position.

1.5.4 Current Status

If the CSS has been equipped with optional monitoring:

The CSS will provide an output signal that mirrors the LED in the "CURRENT STATUS" column on the CSS Controller. This monitor signal will alert the user there is current flowing through each of the attached field circuits.

1.5.5 CCR Interlock

The CSS may be equipped for a CCR Interlock. The interlock is a safety feature that will cause the attached CCR to turn off when the CSS door is opened. This is achieved by using a relay that will disengage when the CSS door is opened. The relay is connected to a pair of terminal blocks that the user will connect to with a CCR control line or shutoff signal line.

2.0 Circuit Selector Switch Catalog Numbering

847- [ ] – [ ] – [ ] – [ ] [ ] [ ]

Type   Class   Rating   Remote   Monitor   CCR
                          Control   Power   Interlock
                          Power   Capable
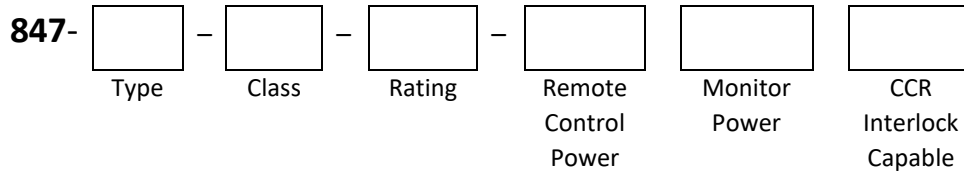
Type

1 – 1 Field Circuit   **2** – 2 Field Circuits

3 – 1 Field Circuits   **4** – 4 Field Circuits

Class

A – Indoor Rated   **B** – Outdoor Rated

Rating
Note: Rating 2 is not ETL Certified

1 – Designed for 6.6 Amp, 5kV Circuits   **2** – Designed for 20 Amp, 5kV Circuits

Remote Control Power

1 – Internal 24VDC   **2** – Supply Power   **3** – External 24V-120V
                          (Nominal: 120VAC)

Monitor Power

0 – No Monitoring   **1** – Internal 24VDC   **2** – Supply Power   **3** – External 24V-120V
                                                  (Nominal: 120VAC)

CCR Interlock Capability

0 – No Interlock Capability   **1** – CCR Interlock Ready

Prefer another option?
Contact Airport Lighting Company for custom selections.

3.0 Theory of Operation

The Circuit Selector Switch (CSS) is designed to direct the flow of constant current power to one or more airfield series circuits. The CSS can be operated in Local or Remote modes. The Local mode provides opportunity for an operator to manually control the direction of power, while the Remote mode provides the opportunity for an external signal to direct power flow.

The Circuit Selector Switch uses high-voltage vacuum relays to open and close the electrical connection fed from the attached constant current regulator. The controller inside the CSS activates the vacuum relays in a make-before-break pattern to ensure safety for equipment and users. Power is routed through a current transformer inside the CSS cabinet to provide an indication to users that power has been engaged on any of the connected field circuits.

While the CSS is not being actively commanded in Local or Remote modes, the regulator connections inside the CSS cabinet will be shorted.
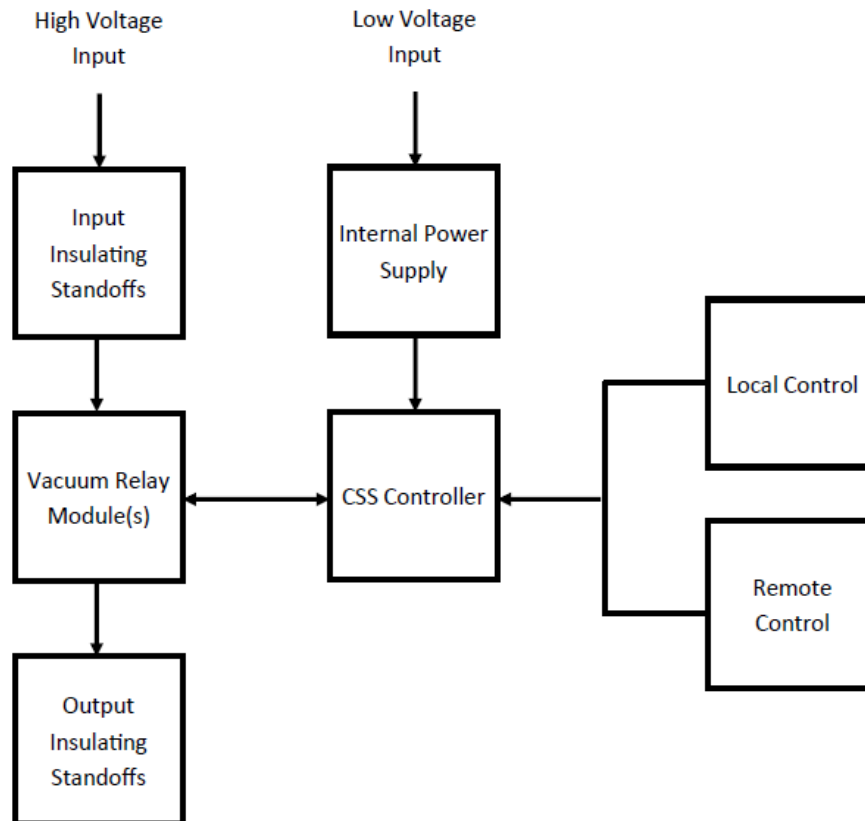
3.1 System Overview

Figure 1: Circuit Selector Switch Block Diagram

Figure 1 is a block diagram of the circuit selector switch. High voltage, constant current power is fed to the Circuit Selector Switch and connected to input insulating standoffs. The high voltage power is directed through one or more vacuum relay modules which are connected to output insulating standoffs.

Low voltage input power connects to a 24VDC power supply, which powers the internal CSS Controller. The CSS Controller is the electronic logic center of the CSS. It accepts input from Local or Remote sources to actuate internal relays, which in turns commands high-voltage vacuum relays. The CSS Controller is connected to a child-board called a CSS Relay Module, which is the electronic component that controls the coils of the vacuum relays. The CSS Relay Module has a current transformer (CT) installed on it that will detect when there is output power flowing through its designated field circuit. When the CSS Controller receives an input from the operator, it will send a signal to the CSS Relay Module to activate or deactivate the vacuum relays as needed, and power from the attached CCR will be directed to the appropriate output insulating standoffs, which are to be connected to field circuits.

3.2 Description of Main Components

3.2.1 Circuit Selector Switch Controller (CSS Controller)

The Circuit Selector Switch Controller is the self-contained electronic controller located in the top-right corner of each circuit selector switch cabinet. The face of the CSS Controller has connections that are used for inputs, monitoring options, and cabinet door switch interlocks. The CSS Controller is populated and tested based on the specifications given at time of order.

3.2.2 Circuit Selector Switch Relay Module (CSS Relay Module)

The Circuit Selector Switch Relay Module an electronic component that communicates with the CSS Controller. The Relay Module will open and close the coils of the high voltage vacuum relays as called for by the CSS Controller. It will also determine whether current is present on the corresponding field circuit through the attached current transformer. The signal for current being present is sent to the CSS Controller for integration with site systems, if equipped.

3.2.3 Insulating Standoffs

Insulating Standoffs are present in the CSS cabinet and used for high-voltage connections.

3.2.4 Local & Remote Selecting Switch

The CSS Controller will operate in either Local or Remote modes, which are enabled or disabled by operating a three-position switch inside the CSS cabinet. There is one switch for each field circuit.

3.2.5 Internal Power Supply

The electronic controls of the CSS are powered by an Internal Power Supply. The output of the supply is nominally 24VDC, which is adjusted during setup to 27VDC.

3.2.9 Fuses

The CSS comes equipped at least two (2) fuses. Due to the variability of CSS power and control options, there may or may not be a third fuse present. All fuses for the CSS are in DIN-Rail-mounted fuse blocks.

F1 is located to the left of the Internal Power Supply, adjacent to the input power connections. This fuse is for the primary-side of the Internal Power Supply.

F2, if equipped, is adjacent to F1. This fuse is used for CSS cabinets that have 120V remote control voltage.

F3 is located to the right of the of the Internal Power Supply. This fuse is used on the secondary-side of the Internal Power Supply.

F4, if equipped, is located adjacent to F3. This fuse is used for CSS cabinets that have 24V remote control voltage.

Fuse	Characteristics	ALC Part Numbers
F1	10A, 3AB, 3AG, 1/4 x 1 ¼ L, 250V, fast acting	90-EGU002
F2	2.5A, 3AB, 3AG, 1/4 x 1 ¼ L, 250V, fast acting	82-77
F3	5A, 3AB, 3AG, 1/4 x 1 ¼ L, 250V, fast acting	82-76
F4	2.5A, 3AB, 3AG, 1/4 x 1 ¼ L, 250V, fast acting	82-77

Table 1: Fuses

4.0 Shipping & Sizing Information

4.1 Cabinet Dimensions
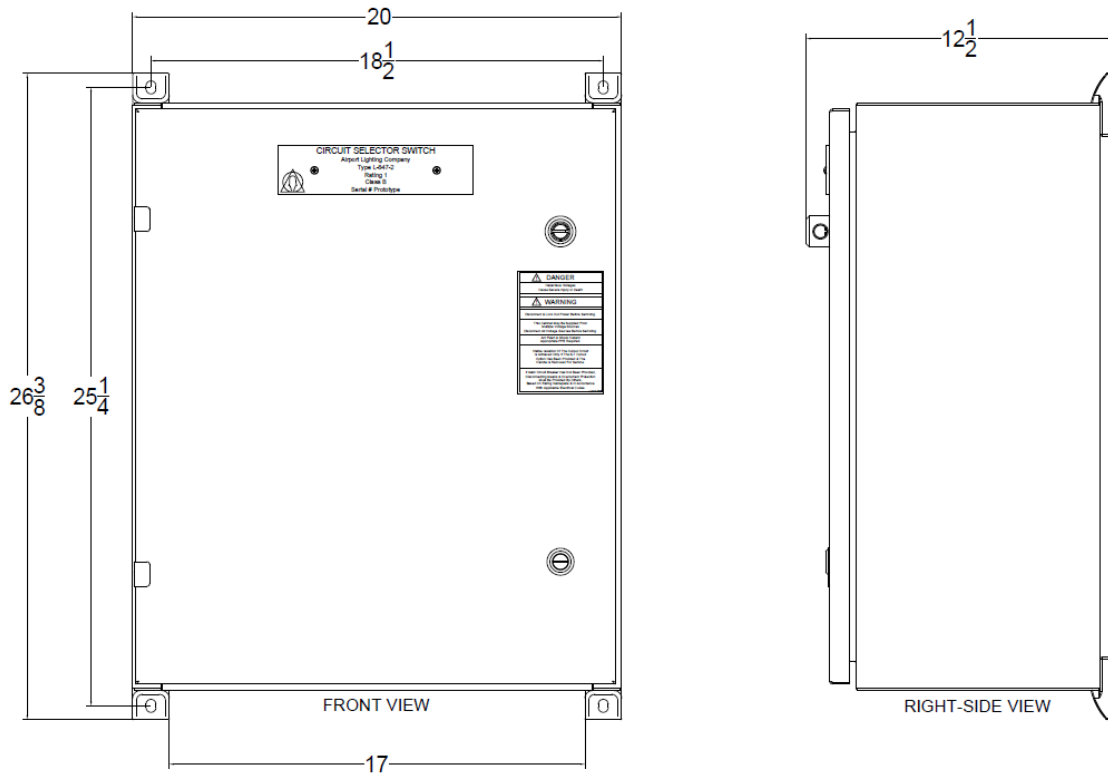
Figure 2: 847-1-x-x-xxx & 847-2-x-x-xxx Footprint
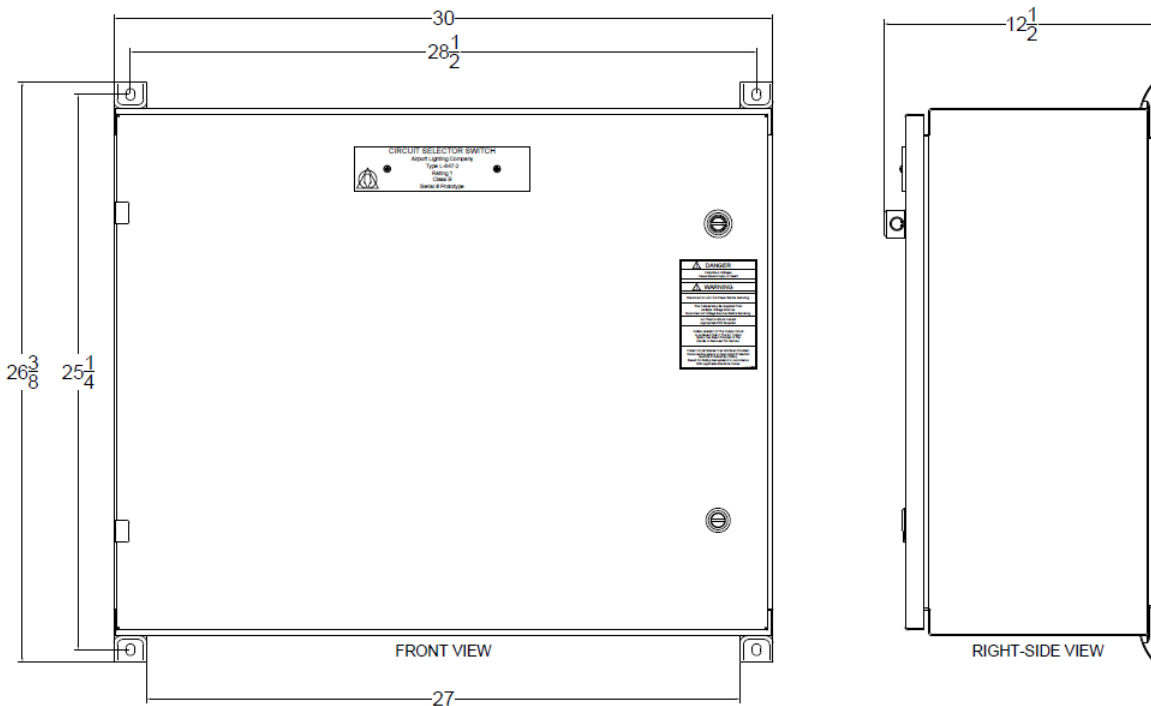
Figure 3: 847-3-x-x-xxx & 847-4-x-x-xxx Footprint

4.2 Weight & Size Information

Model	CSS Install Weight (lbs)	Install Size (W x D x H)
847-1-A-x-xxx	70	20" x 12.5" x 26.375"
847-1-B-x-xxx	69	20" x 12" x 24"
847-2-A-x-xxx	72	20" x 12.5" x 26.375"
847-2-B-x-xxx	71	20" x 12" x 24"
847-3-A-x-xxx	99	30" x 12.5" x 26.375"
847-3-B-x-xxx	98	30" x 12" x 24"
847-4-A-x-xxx	101	30" x 12.5" x 26.375"
847-4-B-x-xxx	100	30" x 12" x 24"

Table 2: Weight & Size Information

5.0 Installing the CSS

5.1 Tools Required

☐ True RMS Digital Multimeter (DMM) with:

- o Voltage probes
- o Current clamp

☐ Basic Tools:

- o SAE wrenches, including a 9/16" wrench for high voltage connections and a 7/16" wrench for removal and reinstallation of the dead-front cover
- o Screwdrivers
- o Hammer, adjustable pliers, etc. for removing knockouts and installing appropriate fittings

5.2 Installation Precheck

☐ Unpack the CSS and inspect for shipping damage.

☐ Check the CSS nameplate.

- o Verify that the Type, Rating, and Class are all correct

If the nameplate information does not match the site requirements, STOP INSTALLATION and contact Airport Lighting Company.

☐ Ensure the proper Remote Control and Monitor voltages have been ordered and the appropriate controls are in place

☐ Verify that the input wiring and all appropriate disconnects are properly sized to the load. If site-specific sizing calculations have not been made, refer to FAA Advisory Circular 150/5340-30 Design and Installation Details for Airport Visual Aids, current revision, Chapter 13 Power Distribution and Control Systems.

☐ Crimp a lug/ring terminal on the end of each high voltage connection that will be brought into the CSS. Ensure the terminals have a 3/8" hole and sized appropriately for the wire.

☐ Using the dimensions in Sections 4.1 & 4.2, verify the installation footprint is adequate.

5.3 Mounting the CSS

Refer to the cabinet dimensions indicated in Section 4 Shipping & Sizing Information to ensure there is an adequate footprint for the CSS cabinet.

Refer to the following drawings for recommended hole punch locations. It may be beneficial to punch holes in the cabinet body before the cabinet is mounted. Note: recommended punch locations are the same for Class A and Class B units.
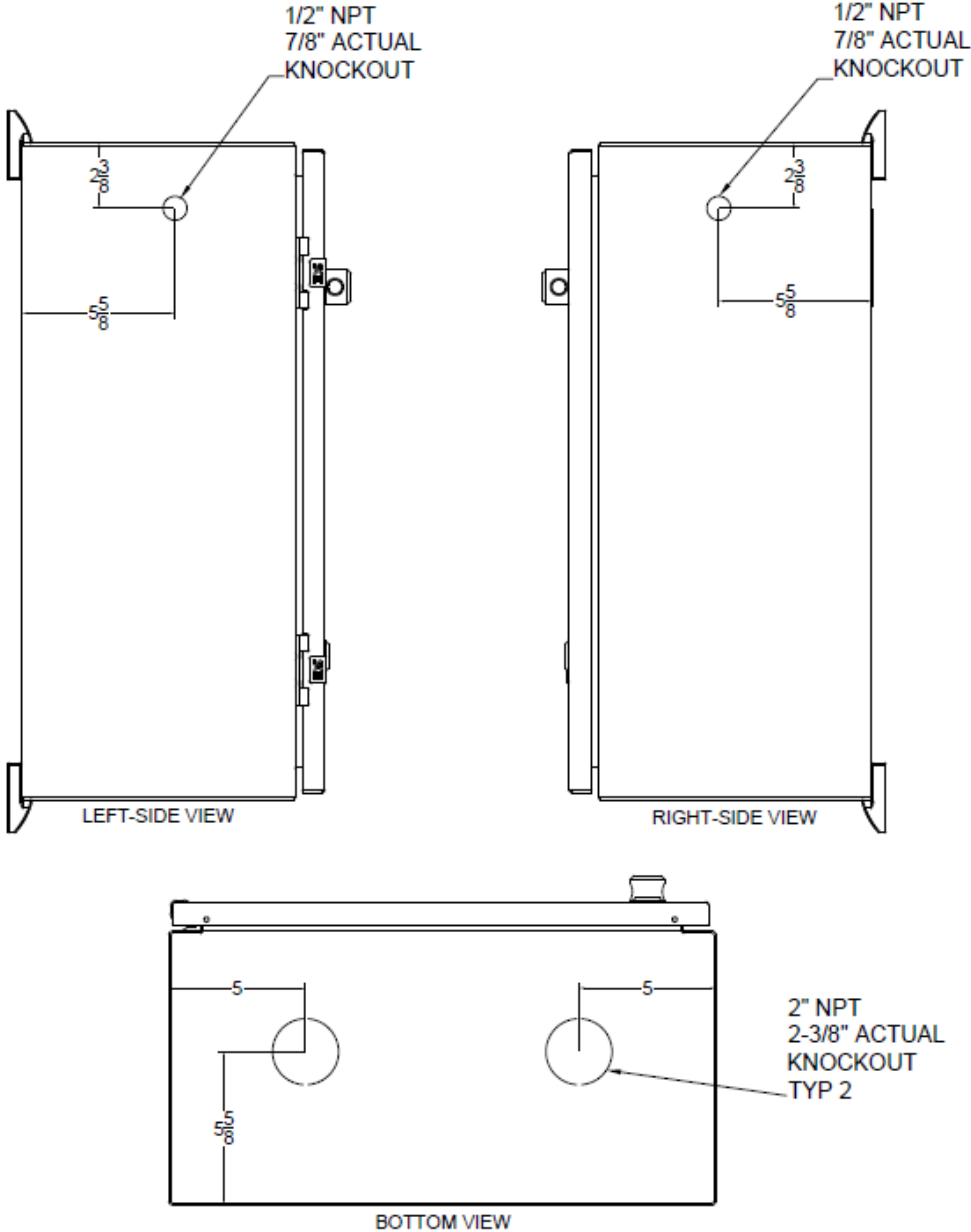
Figure 4: Recommended Hole Locations, 847-1 & 847-2
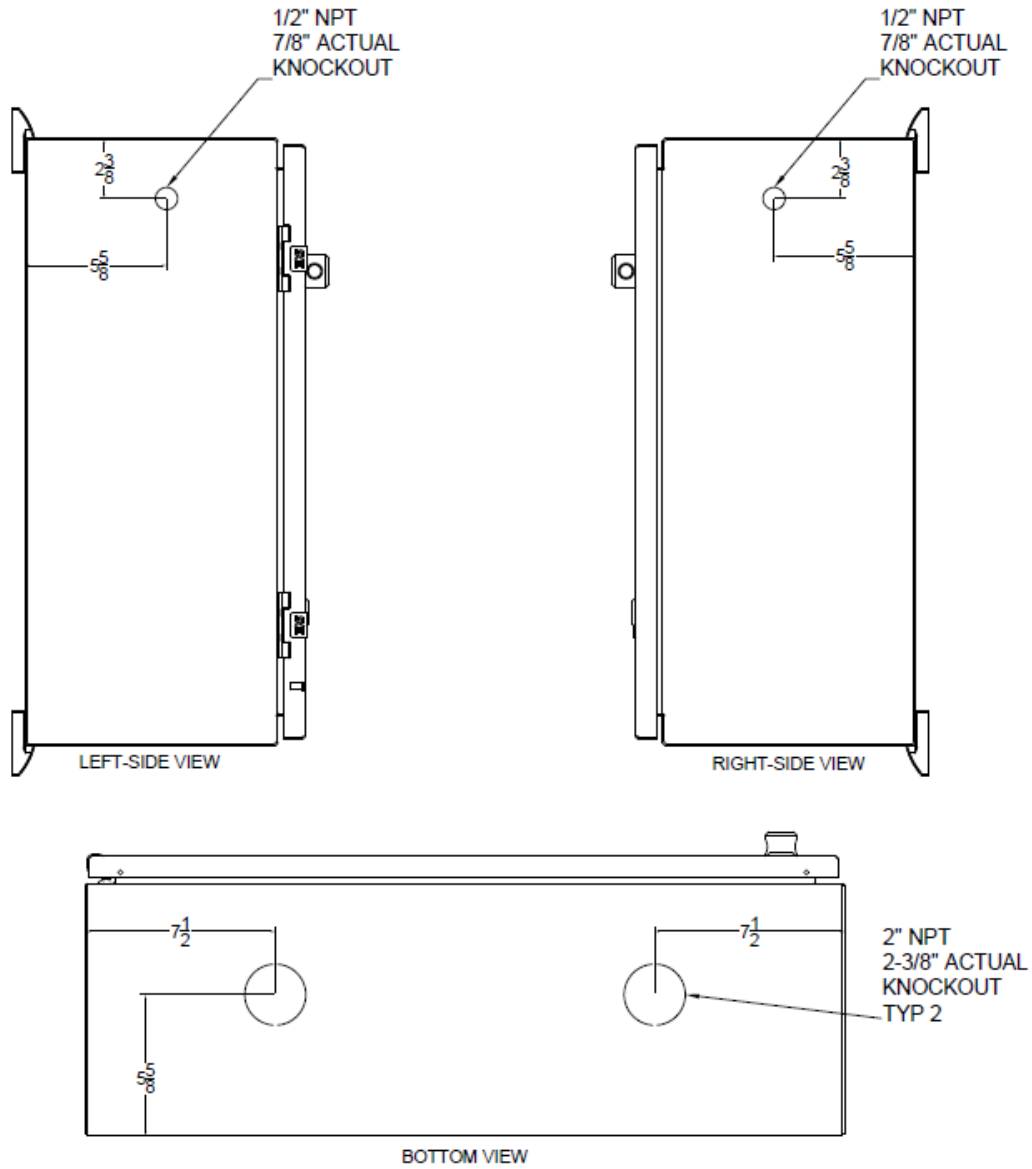
Figure 5: Recommended Hole Locations, 847-3 & 847-4

With holes punched in the cabinet as needed, the final install footprint of the cabinet must be prepared. Use Figure 6 or 7 for mounting dimensions.

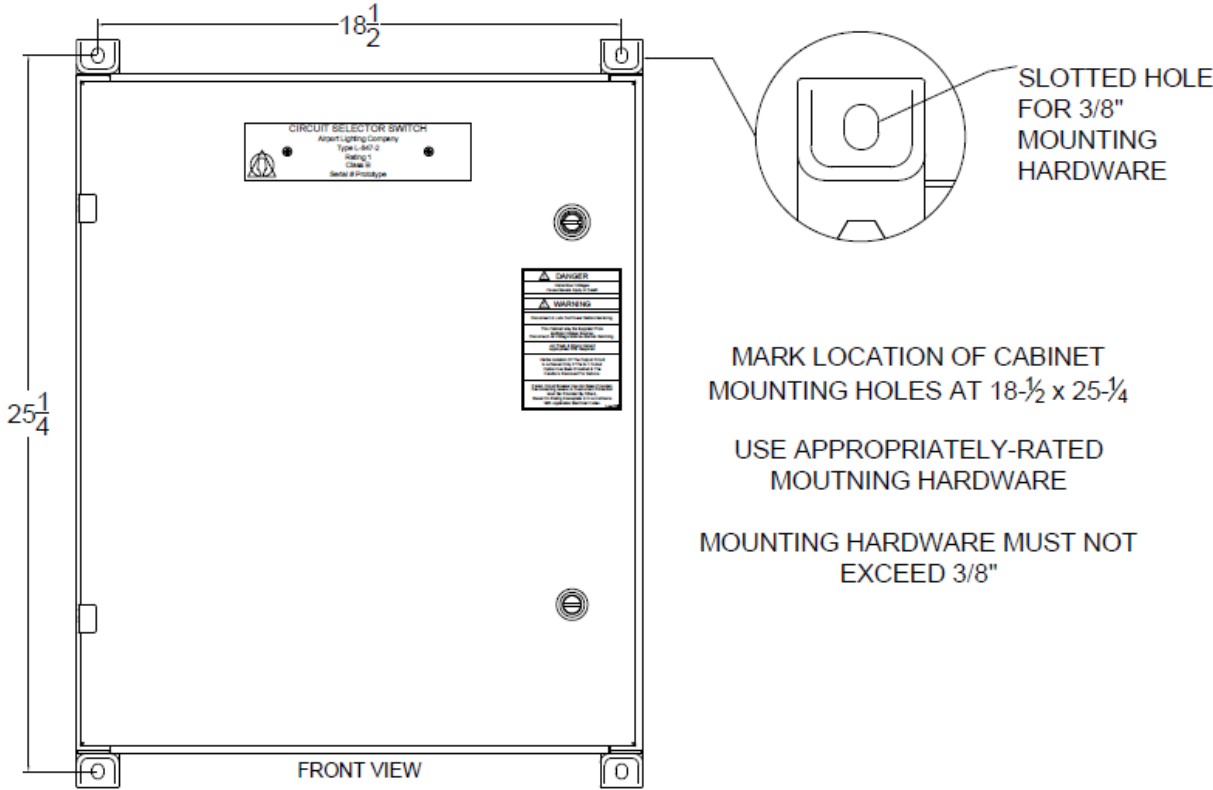Use appropriately-rated mounting hardware fasten the cabinet onto its install location.

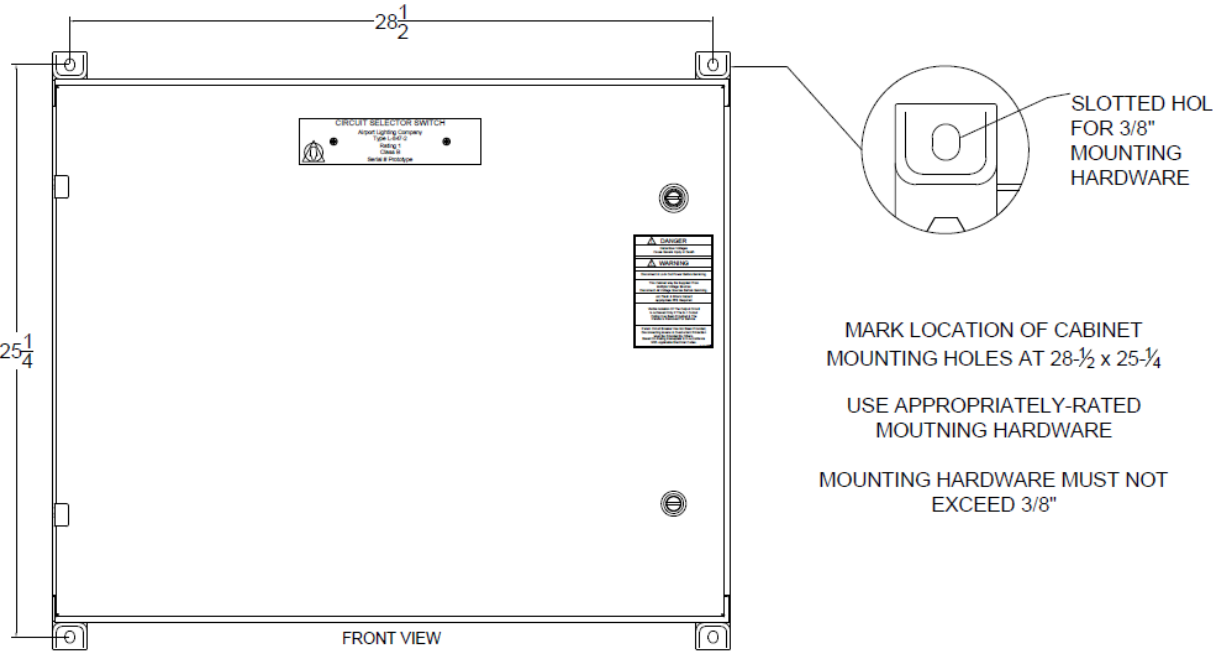*Figure 6: 847-1,2-x-x-xxx Mounting Dimensions*

Figure 7: 847-3,4-x-x-xxx Mounting Dimensions

5.4 Terminating CSS Connections

Follow all necessary lock out / tag out procedures

Open the CCR and CSS supply circuits and lock out during installation

Connect all fittings on the CSS cabinet as needed. Route wires to their appropriate locations.

Remove the dead-front panel in the bottom of the cabinet. Connect the high voltage input feed from the CCR to the R1 and R2 insulating standoffs.

Connect the high voltage field circuit output leads to the appropriate pair of insulating standoffs. The standoffs are labeled in pairs for each designated circuit. Due to the series nature of airfield power circuits, polarity is not a concern.

Ensure tightness of connections. Once all high-voltage connections have been made, reinstall the dead-front panel.

Connect the low voltage input power to the L and LN terminal blocks and attach a ground if present. The CSS provides two ground locations: one is a terminal-block level connection that may be used with ground conductors up to 12AWG. The second is a lug in the top-right corner of the cabinet which may be used for ground conductors up to 4AWG. Use of the lug is recommended on every installation.

To connect Remote Control

Each CSS will come with a CR terminal block in addition to a C# block for each output circuit. On CSS units with Internal control power, the CR block is fused and will provide either 24V or 120V supply power. On CSS units with External control power, the CR block will be used to land Neutral/Common.

The numbered C blocks are the blocks used for engaging the associated circuit. For the control wire to engage Circuit 1, land on C1. For the control wire to engage Circuit 2, land on C2, etc.
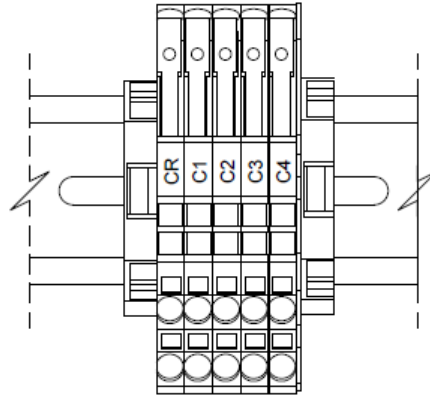
Figure 8: Example of an 847-4 Control Terminal Block

5.4.1 To connect Optional Monitor

When selected, the CSS will come with terminal blocks to allow for two types of monitoring. There is a monitor to notify the user or control system when any of the Local, Off, Remote switches are in Remote. There is also a monitor to notify the user or control system when current is detected on any of the attached field circuits.

When installed, the CSS will have an MR terminal block in addition to a MS# and MC# block for each output circuit. On CSS units with Internal monitor power, the MR block will provide either 24V or 120V supply power. On CSS units with External monitor power, the MR block will be used to land Neutral/Common.

The numbered MS blocks are used for identifying when the Local, Off, Remote switch is in remote, one connection per switch. The numbered MC connections are used for identifying when output current is present. Land monitor wires per circuit on the corresponding MS and MC number terminal blocks.
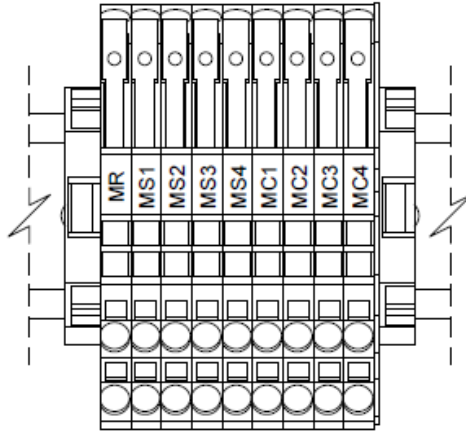
Figure 9: Example of an 847-4 Monitor Terminal Block

5.4.2 To connect Optional CCR Interlock

When selected, the CSS will come with an additional relay that can be used to deactivate an attached CCR. The Interlock relay is labeled ILKR and the contacts used to connect to the CCR are labeled ILK1 and ILK2.

There are multiple ways to connect the interlock. Read all following instructions to ensure comprehension. Due to the nature of electrical interlocks, safety is always a priority. Consult with the plan engineer for specific intended installation details.

Option 1 for connecting the Interlock:

When used with Airport Lighting Company CCRs, it is possible to use the Interlock to remove power to the CCR's **CC** terminal. On CCR's with controller firmware 1.05 and newer, there is a CCR configuration option called "CC as Enable" which, when engaged, will allow the CSS door interlock to engage or disengage the output power on the CCR. In this scenario, the CC wire is run into the CSS, and then out either to the control system or back to the CCR. When the CSS door is opened, the CC line is opened, and the attached CCR will be unable to receive commands. If implemented, the CCR will turn off output power when the CSS door is opened and immediately turn on output power when the CSS door is closed. **THIS OPTION WILL TURN POWER ON ONCE THE CSS DOOR IS CLOSED.**

Option 2 for connecting the Interlock:

The CSS Interlock may be used to remove power from the CCR's **CCI** terminal. In this scenario, the CCI wire is run into the CSS, and then out to the control system for commanding. When the CSS door is opened, the CCI line is opened, and the attached CCR will be unable to receive commands. **THIS OPTION <u>MAY</u> NOT TURN OFF CCR LOCAL OPERATION.**
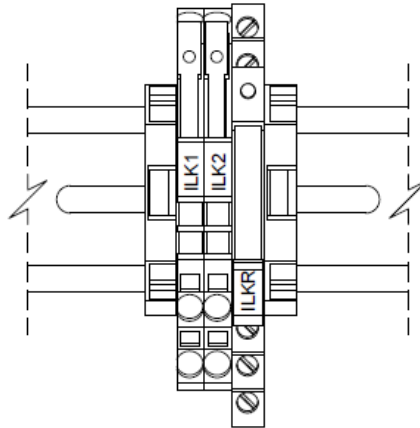
Figure 10: Example of a CCR Interlock Terminal Block

Consult your CCR manufacturer to determine the most ideal way to connect the interlock.

5.5 Turning the CSS on for the First Time

Use all required personal protection equipment while completing work on or around live circuits

Exercise caution at all times

Open the DIN rail-mounted fuse holder labeled F1.

Turn on the power to the CSS at the supply disconnect.

Using a digital multimeter (DMM), verify the input voltage. Nominal supply input voltage for the CSS is 120V but can operate on ranges between 100V to 240V. Note that the CSS control and monitor input power is limited to 120V. If the "Supply Power" option is selected for control or monitoring, the CSS input power must be no greater than 120V between terminals L and LN.

Once supply voltage is verified, close the F1 fuse holder to energize the system.

5.6 System Check

Completion of this section is recommended for each install.

Follow all necessary lock out / tag out procedures

Open the CCR supply circuit and lock out during installation

Before running a system check, ensure power to the attached CCR is not active.

The CSS System Check tests will verify that the control wiring is connected properly. With the CSS door open, pull the door switch plunger out toward you. This will engage a bypass that allows for testing.

Turn each three-position switch to the Remote position, starting with S1. Each LED in the REMOTE STATUS column will illuminate, starting at the bottom, when its corresponding switch is put in Remote. S1 will illuminate the bottom LED, S2 the second up, S3 the third up, and S4 the top. If monitoring has been installed, verify that the monitor outputs are correct. Once verified, turn all switches to the Off position.

Engage the control input for Circuit 1. Ensure the bottom LED in the CONTROL INPUT column illuminates. Repeat this step for each Circuit.

If the CCR Interlock has been installed, push and pull the CSS door switch plunger as needed to verify the attached CCR will turn off output power when the CSS door is opened.

Ensure all high-voltage connections are reviewed by multiple sets of eyes to ensure each wire is installed on the correct insulating standoff.

5.7 Initial Operation

Once the CSS has gone through its System Check, it is time to complete the Initial Operation of the circuit selector. It is recommended to close the CSS door and use the Remote Control connections to complete this testing.

For safety purposes, hearing and vision protection is recommended during Initial Operation.

Turn on the attached CCR and verify that its output is shorted. If needed, consult the CCR manufacturer for clarification.

Engage the Remote Control for Circuit 1. Complete a visual inspection of the field circuit to ensure its equipment is energized. Disengage the Circuit 1 Control.

Repeat for each Circuit in the CSS.

Once each circuit has been successfully tested, the CSS is ready to be used.

6.0 Options

The Circuit Selector Switch offers two (2) non-standard options: Monitoring, and CCR Interlock Capability.

6.1.1 Monitoring

The CSS Monitoring option will provide an output signal for each field circuit indicating:

- □ The field circuit is capable of being commanded remotely, referred to as "Switch in Remote"

- □ The field circuit is carrying current, referred to as "Circuit Current"

Each monitor option will provide an output voltage when active. The output voltage is determined at time of CSS selection. The output of Switch in Remote is a mirror of the LED illumination in the "REMOTE STATUS" column on the CSS Controller. The output of the Circuit Current reading is a mirror of the LED illumination in the "CURRENT STATUS" column.

To connect internally-fed monitor connections: the CSS will come equipped with one power line and a connection line for each field circuit. The power line for both sets of monitor contacts is located on the MR terminal block. For Switch in Remote monitoring, the terminals are labeled MS1, MS2, MS3, and MS4 as applicable. For Circuit Current monitoring, the terminals are labeled MC1, MC2, MC3, and MC4 as applicable.

To connect externally-fed monitor connections: Connect the external voltage source no higher than 120V to the MR terminal block. For Switch in Remote monitoring, the terminals are labeled MS1, MS2, MS3, and MS4 as applicable. For Circuit Current monitoring, the terminals are labeled MC1, MC2, MC3, and MC4 as applicable.

6.1.2 CCR Interlock

The CCR Interlock option provides a pair of terminal blocks and Interlock relay which offers a dry contact that may be used to disconnect the control line of a CCR. The relay contact offers a 250VAC/6A capacity. As described in Section 5.4.2, there are two (2) primary methods of connecting the Interlock:

- □ When the CSS is paired with an Airport Lighting Company CCR, it is possible to engage the "CC as Enable" option in firmware 1.05 and newer. Enabling this option on the CCR will

cause the CC input to carry a master On or Off command. When "CC as Enable" is engaged on the CCR, the yellow screw-in jumper between terminal blocks CC and B1 must be removed.

- o In the case of internal control-powered CCRs: install a wire on the CCI or +24 terminal block as applicable and connect the wire to CSS terminal block ILK1. Install a wire on CSS terminal block ILK2 and connect it to the CC terminal block on the CCR.

- o In the case of external control-powered CCRs: install a constant-voltage wire in the control system at the same voltage and phasing as used to control the CCR. Connect the wire to the CSS terminal block ILK1. Install a wire on the CSS terminal block ILK2 and connect it to the CC terminal block on the CCR.

When installed, opening the CSS door will force the CCR into a controlled shutdown, and display a warning on the screen stating, "Output Disabled". Once the CSS door is closed, the CCR will return to its most recent commanded state.

- □ The CSS door Interlock may be used to remove power from the CCI control line of the attached CCR. When the CSS is paired with an Airport Lighting Company CCR, this option will not disengage CCR output power when the CCR is operating in Local mode. Check with the CCR manufacturer to establish the most desirable way to engage a CSS door interlock.

    - o In the case of internal control-powered CCRs: Connect the CCI line of the CCR directly to the ILK1 terminal block in the CSS. Install a wire to the ILK2 terminal block in the CSS and connect it to the control system CCI input.

    - o In the case of external control-powered CCRs: Connect the N line from the control system to the ILK1 terminal block in the CSS. Install a wire to the ILK2 terminal block in the CSS and connect it to the N terminal block in the CCR.

With either Interlock option, testing while running the CCR in a short circuit is recommended to verify correct operation.

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.

The troubleshooting table and guides in this section include potential fixes for problems that may arise. 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 CSS will not turn on.	- CSS supply voltage feeder is not on. - Blown fuses within the CSS. - The Internal Power Supply has failed to output correct voltage. - Faulty CSS Controller.	- Check to see if the CSS 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 CSS fuses, refer to *Section 3.2.9 Fuses* for more information. - With power on, check the Internal Power Supply voltage on the + and – points on the blue terminal block. The output should be 27VDC. - Replace CSS Controller if a spare is available.
The CCR is not operating in a short circuit when the CSS is not being commanded	- There is a cross of high-voltage lines in the CSS.	- Turn off power to the attached CCR and the CSS. - Beginning with the CCR, trace the high voltage lines to the CSS. Ensure they are placed on the R1 and R2 insulating standoffs.

Problem	Likely Cause(s)	Steps to Fix
The wrong field circuit is being energized when the CSS is activated	- There is a cross of high-voltage lines in the CSS.	- Turn off power to the attached CCR and the CSS. - Follow each attached field circuit from its vault intrusion point to the CSS. Ensure 1) that each field circuit is attached to its identified insulating standoff and 2) that there is not a bridge of multiple field circuits through the CSS.
High voltage vacuum relays are not operating	- Loose or severed wires. - Faulty vacuum relays. - Faulty CSS Controller.	- Turn off power to the attached CCR and the CSS. - Verify that all multi-conductor wire headers are fully seated in the CSS Controller and on each CSS Relay Module. - Verify the integrity of the solder connections on the bottom of the vacuum relays. - Ensure the CSS Controller is receiving 27VDC from the Internal Power Supply.
The monitoring outputs are not correctly indicating status	- The wiring for the CSS Monitor is incorrect. - A voltage greater than 120V was applied to the Monitor circuitry.	- Refer to Section 5.4.1 to verify monitor wiring. - Turn S1 to Remote mode. Using a digital multimeter (DMM), meter the voltage between MR and MS1. Ensure it is below 120V.
CCR Interlock does not operate as desired	- The wiring for the CSS Interlock is incorrect. - The Interlock Relay is damaged.	- Refer to Section 5.4.2 to verify interlock wiring. - Open pull the door interlock switch plunger out toward you while monitoring the ILKR relay. When the switch plunger is pulled out, the relay will illuminate the top-facing LED. When the switch plunger is in normal "door open" state, the LED will not be illuminated.

Problem	Likely Cause(s)	Steps to Fix
CSS is not receiving remote commands	- Loose or missing wiring. - Faulty three-position switch.	- With CSS power on, pull the door interlock switch out toward you. This will engage a safety bypass for testing purposes. - Turn the operator for S1 to Local. Listen for an audible click of the Relay Module. Look for an illuminated LED in the "CONTROL INPUT" column on the CSS Controller. - Repeat this step for all switches. - If the CSS operates as desired, put each switch operator in Remote. Verify that there is an LED illuminated in the "Remote Status" column for each circuit. - If all "Remote Status" LEDs light as desired, verify the integrity and correctness of the Remote Control wiring entering the CSS. - If any of the LEDs do not light as desired when turning applicable switches to Remote, contact Airport Lighting Company.

Table 3: Troubleshooting Table

8.0 Additional Information

8.1 Preventative Maintenance

The Airport Lighting Company CSS will require minimal preventative maintenance (PM). Please refer to Advisory Circular 150/5340-26 for details regarding all types of airfield equipment. The attached PM list is designed from AC 150/5340-26 and inclusive of additional Airport Lighting Company-recommended procedures, which may be copied and distributed to maintenance personnel.

[Attached]

Semi-Annual CSS PM Task List

☐ Complete an exterior visual inspection of the CSS. Look for dents, scratches, and rust. Complete spot touch-ups as needed

☐ General housekeeping; wipe down the CSS as needed to prevent dust buildup.

☐ Complete an operation test by successively testing each field circuit in Local mode, one at a time. Open the door, turn S1 to Local, and close the door. Repeat as needed.

☐ With CSS power disconnected: complete an interior visual inspection. Check for dust on the CSS controller and Internal Power Supply. Wipe down components as needed.

☐ If large amounts of dust are present, consider using electronics compressed-gas duster to blow out dust from CSS components. Vacuum / wipe up any dust.

☐ Complete a visual inspection of all high-voltage connections. Look for loose wires, terminal or wire degradation, etc. Tighten bolts and replace fittings as needed.

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 Replacement Parts

The following list of parts is a basic list of recommended spare components as well as a list of components may be readily changed in field. For a more thorough list of parts or questions about service, contact Airport Lighting Company.

Part Number	Description
90-EGU002	F1 Fuse, 10A
82-77	F2 & F4 Fuse, 2.5A
82-76	F3 Fuse, 5A
55-00201	Door Interlock Switch
90-EDW001	Internal Power Supply, 24V
90-470001	CSS Controller
90-470004	Insulating Standoff
290-470001	High Voltage Relay Module
90-GCSA02	Cabinet Mounting Feet, 4/pkg

8.4 Wiring Diagram

Attached is a wiring diagram for your circuit selector switch. Wiring diagrams are inclusive of all options, but individual per quantity of circuits. For wiring diagrams beyond the one included, contact Airport Lighting Company.

[Attached]