DOCUMENT **1217**
REVISION **B**
May 15, 2019

Instruction Manual
Pro APF AGS
FAA Sign

Aircraft Guidance Sign AGS-LED
858-AP1 LED Series
Sizes 1, 2, 3, 4, and 5

EATON Crouse-Hinds Series
1200 Kennedy Road
Windsor, CT 06095

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

1 Table of Contents

3. List of Figures and Tables

2 Revisions

Revision Number	Issue/Reissue Number Letter	Description	Checked	Approved
A	A216-151	Initial Production Release of AGS-LED FAA Sign Manual.	OGO	05-19-2017
B	A219-063	Section 9.5: Added "If the power leg Is located…to achieve intended wind load resistance", Figure 27. Updated full module led part number for Size 4, Updated jumper settings for Table 10, 11, 12, 13, 14, 15 & 16; Table 16. Tether P/N 60984 was 60728-1, removed 62413M & 62451M from floor flange; Table 18 Updated force values, Wind speed & density of dry air.	PG	05-15-2019

4 Limited Product Warranty

Warranty

Refer to Eaton's Crouse-Hinds Airport Lighting Products Terms and Conditions for product specific warranty information.

Limited Warranty

a) The warranty period for Signs, is twenty-four (24) months from the date of installation unless otherwise agreed by Seller in writing.

b) The warranty period for LED Products is forty-eight (48) months from the documented installation completion date. This includes only the LED lighting strip itself; this excludes the driver, lens, and other electrical components. Other components are covered under the 24 month from the date of installation warranty stated above.

5 Safety Notices

This equipment is normally used or connected to circuits that may employ voltages which are dangerous and may be fatal if accidentally contacted by operating or maintenance personnel. Extreme caution should be exercised when working with this equipment. While practical safety precautions have been incorporated in this equipment, the following rules must be strictly observed:

5.1 Keep Away from Live Circuits

Operating and maintenance personnel must at all times observe all safety regulations. Do not perform maintenance or service on internal components with power ON.

DANGER

DANGER:

LOCK OUT **ELECTRICAL POWER TO THE SIGN AT ITS SOURCE BEFORE PERFORMING MAINTENANCE OR ATTEMPTING SERVICING.**

5.2 RESUSCITATION

Maintenance personnel should familiarize themselves with the technique for resuscitation found in widely published manuals of first aid instruction.

6 Safety Symbols

6.1 Danger

DANGER:

DANGER **The hazard or unsafe practice will result in severe injury or death.**

6.2 Warning

WARNING:

WARNING **The hazard or unsafe practice could result in severe injury or death.**

6.3 Caution

CAUTION:

CAUTION **The hazard or unsafe practice could result in minor injury.**

6.4 Warning: Notice

WARNING:

NOTICE **Possibly dangerous situation, goods might be damaged.**

6.5 Warning: Important

WARNING:

IMPORTANT **Helpful information.**

7 Recommended Test Equipment and Tools

There is a wide variety of tools and equipment needed to safely and correctly perform airfield lighting installation and maintenance. In addition to common tools (screwdrivers, wrenches, etc.), specialized equipment is needed to do the job.

Multimeter

One of the most important pieces of test equipment is the Multimeter. It is used to measure voltages, currents, and resistances. Almost every single maintenance task requires the use of a multimeter. A quality meter in good repair and calibration is a must because airfield lighting power distribution equipment produces non-sinusoidal waveforms. Traditional average reading meters are inaccurate and have very limited use. Checking or adjusting equipment based upon incorrect current reading may dramatically reduce lamp life and adversely affect power equipment performance.

A meter with TRUE RMS measuring capability with a current clamp-on accessory is needed to accurately measure distorted or chopped waveforms. All meter manufacturers offer TRUE RMS measuring meters.

Our recommended multimeter is the Fluke 87V or 287 with the Fluke I800 current clamp accessory.
Refer to the equipment manufacturer's manuals for the proper use, maintenance and calibration (if necessary) of all meters.

Manufacturer	Model Number
Fluke	87V, 287

Table 1. Recommended Multimeter

Voltage Detector

We recommend the Fluke P/N 1AC-A1-II, or equal, Voltage Detector. The Fluke model detects voltages ranging from 90 to 1000 VAC.

Manufacturer	Model Number
Fluke	1AC-A1-II

Table 2. Recommended Voltage Detector

Hex Head Bolt Fastening Hardware

The Crouse-Hinds Aircraft Guidance Sign features a number of hex head bolts preassembled by the OEM. In order to properly fasten and unfasten these bolts, should maintenance be necessary, the following hardware is needed:

Equipment	Socket Sizes (mm)
Square Drive Sockets	8, 10, 16, 17, and 19
Open End (or Combination) Wrenches	8, 10, 16, 17, and 19

*For M5, M6, M10, and M12 Bolts

Table 3. Recommended Socket and Wrench Sizes

Calibrated Torque Wrenches

A calibrated torque wrench is required in order to torque the bolts to the appropriate value after fastening them with the socket wrench. Calibrated torque wrenches should also be used for periodic torque checks. The torque values for hardware are listed in **Table 17, pg. 94**. The necessary torque wrenches and the recommended manufacturer are listed below:

We recommend a calibrated torque wrench (micrometer adjustable solid audible/tactile “click” impulse when torque value attained with an accuracy of +/- 4%).

Our recommended metric torque wrenches: Sturtevant Richmont P/N 810775, range 4 to 20 Nm and P/N 810777, range 20-100 Nm. Suggested English torque wrenches: Sturtevant Richmont P/N 810750, range from 30 to 150 in-lb or equal, and Sturtevant Richmont P/N 810748, range from 100 to 600 in-lb. Certificate of calibration included with suggested torque wrenches.

Manufacturer	Socket Drive Sizes (in.)	Part Number	Torque Range
Sturtevant Richmont	1/4”	810775	4 to 20 Nm
Sturtevant Richmont	3/8”	810777	20-100 Nm
Sturtevant Richmont	1/4”	810750	30 to 150 in-lb
Sturtevant Richmont	3/8”	810748	100 to 600 in-lb

Table 4. Recommended Torque Wrenches

* Note, never loosen bolts with a torque wrench.

Masonry drill bits, ½”

½” masonry drill bits are needed for drilling anchor stud holes.

Flat Level

A flat level should be used to ensure the sign and floor flanges are level. The length of the flat level should be no more than 419mm [16.5in].

Anti-Seize

Anti-seize should be used on the leg threads and floor flange threads, and on all M12 bolts on the Eaton Crouse-Hinds Aircraft Guidance Sign. We recommend using Anti-seize (marine grade preferred, Henkel/Loctite P/N 8023 or equal) with a K factor of 0.18 for fully coating the frangible coupling threads or base plate/stake hub threads. This will help facilitate removal of sheared frangible legs and for replacement/maintenance. Only use the recommended anti-seize, as other materials may wash away.

WARNING:

IMPORTANT

Failure to apply anti-seize at installation will result in improper bolt tension and difficult removal of the frangible legs from the floor flanges.

ESD Wrist Strap

A grounded ESD wrist strap when working on or handling fixture power supplies or LED strip modules. ESD wrist straps, also known as anti-static wrist straps, are used to prevent electronic equipment damage from electrostatic discharge (ESD) by safely grounding a person working with electronic equipment or at an electronic assembly facility. It consists of a band of fabric with fine conductive fibers woven into it. The fibers are usually made of carbon-filled rubber, and the strap is bound with a stainless steel clasp or plate. They are usually used in conjunction with an ESD table mat on the workbench, or a special static-dissipating plastic laminate on the workbench. We recommend ESD Products brand (http://www.esdproduct.com/esd_wrist_straps.php) or equivalent.

Screwdrivers

A #2 Phillips head screw driver for installing the Electronics Enclosure M4 Screws and Isolation Transformer's FAA L-823 Style 8 secondary receptacle retainer plate screws into one of the recommended base plates for a L-867 base.

2.5" Wrench

A 2.5" X 30" Combination Wrench, Adjustable Wrench, or an Open Ended Wrench for fastening, unfastening, and torqueing the frangible legs.

2.875" Wrench

A 2.875" Combination Wrench, Pipe Wrench, Adjustable Wrench, or an Open Ended wrench for fastening, unfastening, and torqueing the 2.875" jamb nuts.

Allen Wrenches

A set of metric Allen wrench socket drives are needed for fastening, unfastening, and torqueing the socked head cap screws in the electronics enclosure.

Most tools indicated above can be purchased from MSC Industrial Supply Co. (http://www.mscdirect.com), or McMaster-Carr (http://www.mcmaster.com)

8 General Information

8.1 General Description

Crouse-Hinds Airport Lighting Products' internally illuminated LED taxiway and runway signs provide outstanding message visibility, day or night. White on red, yellow on black, white on black, and black on yellow color combinations may be ordered with any desired message. Signs are available as single or double faced. For further information on taxiway signs and their use, consult the latest revision of FAA advisory circulars AC 150/5220-9, AC 150/5340-18, AC 150/5345-44. The LED "*AP1*" power supply can be used with either a 3 step (4.8, 5.5, 6.6A output) or 5 step (2.8, 3.4, 4.1, 5.2, 6.6A output) constant current regulator (CCR), 50 or 60 Hz. The power supply has a power factor of 0.99 in all steps, and an efficiency greater than 80% at 6.6A. The power supply is compatible with all known CCR types, has a 3.5 Crest factor to ensure compatibility with series CCRs, has a 0.88 second switch-on time, a typical initial turn on voltage of 1.5V, high frequency 400 Hz PWM to help eliminate flicker perception, and a 10k/5kA surge protection. All signs are factory illuminated for a minimum of 4 hours.

8.2 Classification of Signs

The signs covered in this manual are designed and manufactured in accordance with the requirements of FAA advisory circular AC 150/5345-44, "Specifications for Taxiway and Runway Signs", conform to the following classifications as indicated in paragraph of the above advisory.

Type L-858Y – Direction, Destination, and Boundary Sign - black legend on a yellow background.
Type L-858R - Mandatory Instruction Sign – black outline on outside edge of white legend on a red background.
Type L-858L – Taxiway and Runway Information Sign – yellow legend and border on a black background.
Type L-858B – Runway Distance Remaining Sign - white legend on a black background.

A sign may consist of multiple types of the above messages on the same legend panel.

P/N	Sizes
858S-AP11X-XX-B-X-X-X-D-L-X	Size 1 – 12 inch legend height (small body)
858S-AP12X-XX-B-X-X-X-D-L-X	Size 2 – 15 inch legend height (mid-size body)
858S-AP13X-XX-B-X-X-X-D-L-X	Size 3 – 18 inch legend height (large body)
858S-AP14X-XX-B-X-X-X-D-L-X	Size 4 – 40 inch numeral height (large body DMS numerals and AGM symbol)
858S-AP15X-XX-B-X-X-X-D-L-X	Size 5 – 25 inch numeral height (large body DMS numerals only)

FAA CAT. # Information
Class 2 -For operation from -40ºC (-40°F) to +55ºC (+131ºF)
Wind Velocity 2 – Sign for use in areas subjected to wind speed of 200 mph (322 km/h)
Wind Velocity 3 – Sign for use in areas subjected to wind speed of 300 mph (483 km/h)

8.3 Part Number Explanation:

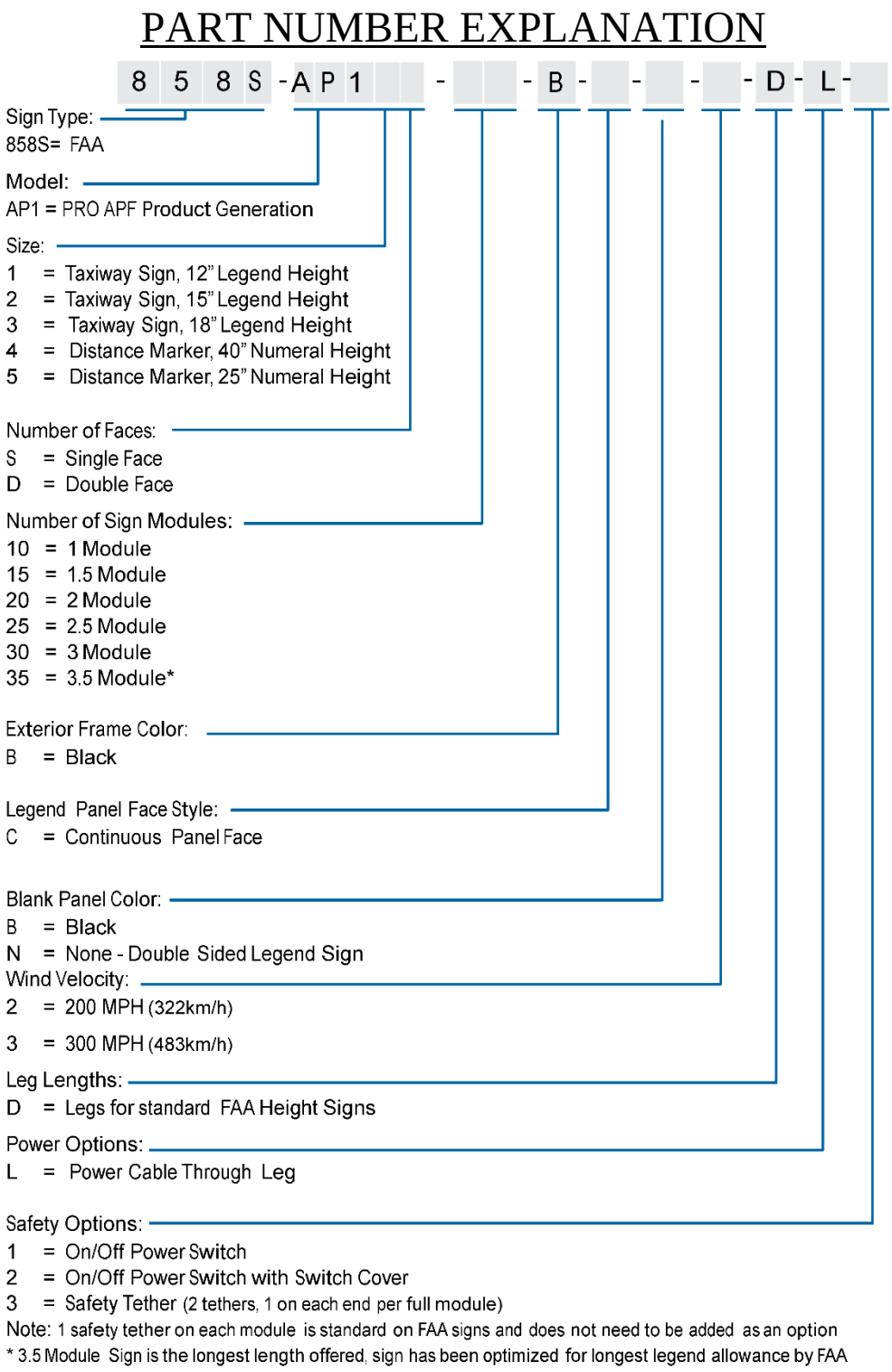


Figure 1. Part Number Explanation

9 Installation

IMPORTANT

WARNING:

Exposed Loctite 8023 Marine-grade Anti-seize may be present on and around the signs legs and mounting flanges. Take precautions to protect against contact with anti-seize, as anti-seize permanently stains clothing. For all safety precautions, the MSDS for Loctite 8023 Marine Anti-seize can be found via this link: http://www.henkel.com.

DANGER

WARNING:

Energy sources must be locked out and de-energized prior to disconnecting power cables, connecting power cables, or servicing electronics on an aircraft guidance sign. Disconnecting/connecting power cables or servicing sign electronics without locking out your energy source and de-energizing your power circuit can result in severe injury or death.

DANGER

DANGER:

TURN OFF POWER at the Constant Current Regulator for the field series loop that the sign will be installed on. LOCKOUT and DE-ENERGIZE per your procedures.

9.1. Old Sign Removal

a. If the Crouse Hinds Aircraft Guidance Sign is replacing an existing sign, the old sign will first need to be removed. After **locking-out** and **de-energizing** your power circuit, remove your old sign and its series isolation transformer from its housing, cut off any old sign anchors flush to the concrete pad as necessary.

NOTICE

WARNING:

Sign foundations/pad and their design are the responsibility of the installer and/or airport and recommendations/suggestions herein are for guidance only. Transformer housing, covers, series isolation transformers, primary connector kits, series isolation transformer secondary cable extender, series isolation consolidating harness (if required), heat shrink kits, grounding rods, and connectors, floor flange anchor studs, floor flange nuts, lock washers and other hardware are not included as part of the sign.

9.2. Guidance Sign Sizes and Installation Criteria

a. Refer to latest revision of FAA AC 150-5340-18, section 14, for, the perpendicular distance from the defined pavement edge to the near side of the sign. Similarly, see section 25 of FAA AC 150-5340-18 for runway distance location and perpendicular distance from the defined pavement edge to the near side of the sign.

9.3. Concrete Pad Reference Information

a. Concrete foundations/pads should be of adequate mass, reinforcement, and psi strength rating for the maximum sustained force on the sign body and floor flange anchors must endure at its maximum plus a safety margin. The concrete foundation/pad should be installed in soil conditions that will help facilitate drainage and foundation/pad support.

b. The floor flange anchor stud material should be ½ inch diameter 18-8 or 316 stainless steel, for use with the floor flange.

c. Concrete foundations/pads should extend at least 12” [304mm] below the local frost line. Contact your local or regional building inspector if the depth is unknown for your area. The foundation/pad should extend at least 12” [304mm] beyond the sign body to minimize damage from mowers, see **Figure 11, pg. 46,** and **Tables 6 and 7, pgs. 47** and **48**.

d. The height of the concrete foundation/pad should be set such that it does not violate the 2” [51mm] maximum height above grade to the point of frangibility per FAA Engineering Brief no. 79. The foundation/pad must be level.

9.4. Anchor Stud Installation

a. We recommend installing cast-in-place, ½" diameter 18-8 or 316 stainless steel, anchor studs during the installation of the concrete foundation/pad. The threaded portion of the anchor studs should be 1-5/8" [41mm] minimum to 1-7/8" [48mm] maximum above the top of the concrete foundation/pad. This requires that the anchor studs be installed accurately. See **Figures 19 and 24, pgs. 56 and 57,** for the floor flange hole pattern template, and **Figures 8, 9, and 10, pgs. 43, 44, and 45,** for leg spacing. The clearance slots on the floor flange are oversized for use with ½" anchor studs.

9.5. Concrete Pad Component Information

a. The concrete foundation/pad should include the series isolation transformer housing, FAA Type L-867. It is recommended that this housing **not be** located under the sign power leg to allow access to the series isolation transformer and connections for ease of troubleshooting and servicing. If the power leg is located on the top of an isolation transformer base, then a FAA type L-868 base, 24" deep should be used. This base top flange surface would be installed 3/4" above the level concrete surface, or flush with a 3/4" spacer ring on the top flange. No gasket is to be used. An AP 1852 baseplate (2 1/2" NPSM threaded hub [This is nut 2-11 1/2 NPSM thread]) shall be used to accommodate the frangible leg thread. Frangible leg grooves need to be at the same height to achieve intended wind load resistance. This housing would be on the side closest to the taxiway or runway. See **Figure 11, pg. 46,** and **Tables 6 and 7 pgs. 47 and 48,** for sign to airfield diagram.

b. A 2" [50mm] conduit elbow with threaded coupling attached at sign end would exit from the transformer housing side to the foundation/pad and be flush with the top of the concrete foundation/pad grade level centered between the floor flange bolts nearest the taxiway or runway side of the sign. See **Figure 12, pg. 49,** for conduit elbow installation information.

c. The sign as viewed will have the electronics enclosure to the left, on the "**A**" side of the sign, which is closest to the taxiway or runway side of the sign. The sign side identification is important with regards to its sign panel legend. See **Figure 11, pg. 46,** and **Tables 6 and 7 pgs. 47 and 48,** for sign to airfield diagram.

d. A grounding rod and clamp should be installed in order to ground the electronics enclosure. See **Figure 11, pg. 46,** and **Tables 6 and 7 pgs. 47 and 48,** for sign to airfield diagram.

WARNING:

NOTICE **DO NOT connect a counterpoise system to the sign ground or its grounding rod.**

DANGER

DANGER:

LOCK OUT and DE-ENERGIZE **electrical power to the series loop that will power the sign at its source before attempting any electrical connections/splices.**

9.6. Series Loop Power Connections

a. Make electrical connections to the series loop power using L-823 primary connector kits.

b. Attach the primary connectors to the appropriate size L-831 series isolation transformer. These primary connections (single pin plug or receptacle) should have heat shrink kits, applied over their connections to prevent disconnection and water from entering the cables.

c. The series isolation transformer should be placed on a brick in order to isolate the transformer from direct contact with metal, see **Figure 11, pg. 46**, and **Tables 6 and 7 pgs. 47 and 48,** for details.

d. The series isolation transformer secondary cable should then be inserted from inside the housing up the conduit elbow.

e. Using the retainers, (looks like a cupped washer with a slot), place one below the secondary cable receptacle (L-823 Style 8, ball shaped), and one above, see **Figure 40, pg. 76**. Note, the bottom cupped washer sits on the conduit elbow top inside the threaded conduit coupling and prevents the secondary cable from dropping back down the conduit. The top cupped washer prevents the secondary cable from being pulled out of the ground, allowing the sign power cord to disconnect, if a frangible event occurs. See **Figure 12, pg. 49,** for conduit elbow information.

f. If a secondary cable extension is required, use the retainer, (split clamp with screws and hex nuts), see **Figure 41, pg. 76**, for details. Note, use electrical tape around this connection.

g. Secure the retainer, flat side down towards the sign, around the secondary end (L-823 Style 7, tube shaped) that will exit the conduit elbow. The top of the secondary receptacle should be at least 1/4” [6.4mm] below the conduit elbow threaded coupling top surface.

9.7. Visual Inspection

WARNING:

IMPORTANT

Check the sign for shipping damage upon arrival and in all cases. Check for damage prior to installation.

9.8 Raising the Sign (Part 1)

9.8.1 Method 1

a. Lower the sign with the legs and flanges into place on the anchor studs, see **Figure 39 pg. 75**. Do not yet install the ½" flange nuts. Note, all sign configurations weight more than 50 lbs [22.7 kg] see **Table 19, pg. 96,** for the all the weights of specific signs. The responsibility for safely raising and lowering the product resides with the customer.

b. Plug the sign power cable plug into the secondary receptacle inside the conduit elbow, protruding through the base plate, while lowering, see **Figure 39, pg. 75**. Do not apply heat shrink tubing or tape to this connection. The power plug is designed to disconnect during a frangible event.

c. Apply Loctite 8023 marine grade anti-seize to the exposed anchor stud threads.

d. Place one ½" two-piece lock washer, part number 10030-0153, and one ½"flange nut, part number 62482, onto each anchor stud.

e. Tighten the flange nuts finger tight.

f. Follow the instructions of **Section 9.9** to finish raising the sign.

9.8.2 Method 2

a. Remove the frangible legs from the sign's leg connectors by unfastening the set screws.

b. Lower the floor flanges, with legs attached, onto the sign anchor studs. Do not yet install the ½" flange nuts.

c. Lower the sign onto the frangible legs, inserting the sign power cable into the power leg, see **Figure 38, pg. 74**. Note, all sign configurations weight more than 50 lbs [22.7 kg] see **Table 19, pg. 96,** for the all the weights of specific signs. The responsibility for safely raising and lowering the product resides with the customer.

d. Fasten and torque the M5 set screws into the leg connector, see **Table 17, pg. 94**, for torque values.

e. Plug the sign power cable into the secondary receptacle inside the conduit elbow, protruding through the base plate. Note, Do not apply heat shrink tubing or tape to this connection. The power plug is designed to disconnect during a frangible event.

f. Apply Loctite 8023 marine grade anti-seize to the exposed anchor stud threads.

g. Place one ½" two-piece lock washer, part number 10030-0153, and one ½" flange nut, part number 62482, onto each anchor stud.

h. Tighten the flange nuts finger tight.

i. Follow the instructions of **Section 9.9** to finish raising the sign.

9.9 Raising the Sign (Part 2)

a. Check **the sign itself with a long carpenter's level to be sure it is level**.

b. Make sure all flanges are in **full** contact and sit flush on the pad before tightening the flange nuts. Shim and grout as required.

c. Once the sign has been leveled, attach the sign tether, if included, to the closest anchor stud. Torque all of the flange nuts securely, see **Table 17, pg. 94,** for the appropriate torque value**.** Anchor hardware should be corrosion resistant. The sign body must not be bent or distorted due to an uneven installation procedure. (**Note**: Anchor hardware is not supplied with the sign, see pg. **97.**

d. Install a #12 AWG green yellow, or equivalent, minimum copper ground wire (not included) to the sign ground stud (stud located on bottom of the electronics enclosure and accepts #4 through #14 AWG) and the other end to the grounding rod clamp, see **Figure 11, pg. 46,** and **Tables 6 and 7 pgs. 47 and 48**.

e. If installing a sign with an ON/OFF safety switch, toggle the switch to the ON position. If installing a sign with the ON/OFF safety switch with switch cover, first lift the red switch cover, toggle the switch to the ON position, then close the switch cover.

f. Return power to series circuit, following your **lockout** procedures. Verify that the sign illuminates.

10 Maintenance and Troubleshooting

Maintenance on the Crouse-Hinds Aircraft Guidance Sign includes external bolt/nut torque checks, sign face cleaning, and (less commonly) leg replacement after frangible events. For any maintenance or troubleshooting operations that requires the removal of the electrical box cover, removal of a sign frame section, or disconnection from your guidance sign power circuit, be sure to **LOCKOUT** and **DE-ENERGIZE** your power circuit before entering the sign. If it is necessary to open the electronics enclosure, during these operations, it is imperative that the enclosure be properly closed at the completion of the operation.

WARNING

WARNING:

Failure to fully fasten the electronics enclosure lid may result in water leaking into the electronics enclosure. Water accumulation in the enclosure may lead to permanent failure of the power supply and subsequent failure of the sign.

10.1 Torque Checks & Re-torque

It is recommended to check the torque of, and re-torque if necessary, all installation flange nuts and set screws once every 60 days. Sign body bolts can also be checked for torque at this time. Recommended torque values are also listed in **Table 17, pg. 94**.

10.2 Sign Face Cleaning

The sign face exterior can be cleaned with water, isopropyl alcohol, or a mixture of water/isopropyl. It is not recommended to use any other cleaning agents.

10.3 Frangible Event Maintenance

After a frangible event, the sign legs will be broken just above their mounting bases. Before touching the sign **LOCKOUT** and **DE-ENERGIZE** your power circuit. The power cord is designed, but not guaranteed, to disconnect during a frangible event.

DANGER

***WARNING*:**

Energy sources must be locked out and de-energized prior to disconnecting power cables, connecting power cables, or servicing electronics on an aircraft guidance sign. Disconnecting/connecting power cables or servicing sign electronics without locking out your energy source and de-energizing your power circuit can result in severe injury or death.

10.3.1 Frangible Leg Replacement

a. De-energize and lockout power to the sign power circuit.

b. Using a 2.5” wrench, remove, and discard, the short leg sections from the floor flanges.

c. Unfasten the set screws at the sign leg connectors to remove, and discard, the long leg sections from the sign body.

d. Refasten the new legs into the floor flanges. Bottom out the legs, then turn an additional ¼ to ½ turn.

e. Loosen and remove the ½” flange nuts and two-piece lock washers from the anchor studs.

f. Follow the steps outlined in **Section 9.8.2, pg. 20**, to re-install the sign onto the floor flanges and sign legs.

10.4 Replacing Legend Panels

Contact Crouse-Hinds Airport Lighting for replacement legend panels. Our Sign Sizing Program can calculate legend panel spacing/size.

NOTICE

WARNING:

Only use OEM replacement sign legend panels. Our proprietary process replacement panels meet the photometric and wind loading requirements of FAA AC 150-5345-44K, latest revision. See Table 16, pg. 93, for legend panel replacement part information.

10.4.1 Legend Panel Replacement Procedure (Method 1) (From Non-Electronic Enclosure End)

a. Remove the top two and four bottom sets of M10 bolts and lock washers from the far side of the frame, the side opposite of the vertical frame section containing the electronics enclosure, as shown in **Figure 21, pg. 58.**

b. Remove the vertical frame section with the remaining eight M10 bolts, reflector panel, and angle brackets still attached, see **Figure 21, pg. 58.**

c. Remove the damaged legend panel as shown, see **Figure 21, pg. 58.**

d. Slide the replacement legend panel into the channel, see **Figure 22, pg. 59**

e. Replace the rain caps and vertical frame section to the original positions, see **Figure 22, pg. 59**. Fasten and re-torque the M10 bolts to the appropriate values, see **Table 17, pg. 94**.

10.4.2 Legend Panel Replacement Procedure (Method 2)

a. Remove the top four sets of M10 bolts and lock washers from the top of the frame as shown in **Figure 23, pg. 60**.

b. Carefully lift up the horizontal frame section, see **Figure 23, pg. 60**. Note, the LED strip wires are still connected. Lift carefully to avoid damage to the LED strips, lenses, and connecting wires.

WARNING

WARNING:

Lift carefully when removing the top horizontal frame section. The horizontal frame section houses soldered LED connections which can be damaged if the frame section is lifted or removed abruptly.

c. Detach the LED strip connectors, on both ends if necessary, see **Figure 24, pg. 61.**

d. Remove the top frame section from the sign.

e. Remove the damaged legend panel and replace with the new legend panel as shown, see **Figure 25, pg. 62.**

f. Replace the top frame section to the sign.

g. Reconnect the LED strip connectors.

h. Replace the rain caps and vertical frame section to the original positions, see **Figure 26, pg. 63**. Fasten and re-torque the M10 bolts to the appropriate values, see **Table 17, pg. 94.**

10.5 Troubleshooting

Follow the steps below to find the root cause of sign issues. During troubleshooting or maintenance operations, if it is necessary to open the electronics enclosure, it is imperative that the lid be properly refastened at the completion of the operation. Do not remove the captive screws from inside the lid. Replacement parts will be required for testing the different components of the sign, see **Table 16, pg. 93**, for replacement part information.

WARNING

WARNING:

Do not open the electronics enclosure while the sign is powered. Dangerous voltage may be present on the input of the power supply(s).

Contact Crouse-Hinds Airport Lighting for assistance prior to operating a failed sign. There may be dangerous voltage present on the input AC pins of the power supply.

10.5.1 Visual Inspection

DANGER

***DANGER*:**

Energy sources must be *Locked Out* and de-energized prior to opening the electronics enclosure, disconnecting power cables, reconnecting power cables, or servicing electronics on an aircraft guidance sign. Disconnecting/connecting power cables or servicing sign electronics without locking out your energy source and de-energizing your power circuit can result in severe injury or death. Note, the sign is equipped with an optional On/Off switch. Power is present at the switch terminal even when the switch is in the "Off" Position. *Lock Out* electrical power prior on the On/Off switch, if removing its guard or servicing the switch.

IMPORTANT

***WARNING*:**

Check that no voltage is present using a voltage detector.

Warning: After sign power is *locked out*; remove the cover to open the electronics enclosure. Verify all the wires are not pinched or damaged and that the wire insulation is intact. Verify the input AC is connected to the switch and/or power supply depending on the sign type. Verify the power supply (multiple or single) input connections, the LED cable(s) plugged into the power supply(s) with the correct polarity and appropriate jumper setting. See **Tables 10 - 15, 20, pgs. 86, 87, 88, 89, 90, 91** and **92** for jumper settings.

NOTICE

WARNING:

The jumpers must be placed in the correct position(s), on the appropriate sign, for proper operation.

Reconnect any cables that have become detached. Replace any damaged or burned cables, LED module(s) or damaged power supply(s). See **Table 16, pg. 93**, for replacement part information.

10.5.2 Electrical Inspection

WARNING

WARNING:

There may be dangerous voltage present on the input AC pins of the power supply on failed signs.

It is recommended that a Ferro style constant current regulator (2.8 to 6.6ARMS) with a 100W isolation transformer or a voltage limited constant DC current source be used to test failed signs to limit the input voltage.

A buzzing or humming noise coming from the isolation transformer may indicate a failed power supply or LED module. It is also an indicator of dangerous voltage on the primary and secondary sides of the transformer.

NOTICE

WARNING:

Applying a constant voltage greater than 80V (AC or DC) to the input will cause damage to the power supply.

DANGER

DANGER:

The following maintenance and troubleshooting suggestions should only performed by qualified electricians with working knowledge of airfield lighting *series* circuit power.

Dangerous/lethal voltage may be present in the electronics enclosure.

A clear plastic box container of adequate L × W × H should be placed over the electronics enclosure and temporarily held in place during troubleshooting to prevent accidental human contact with live electrical components. The box container should also be of adequate size to install/remove a current clamp when sign power is *locked out* allowing any leads connecting to a meter to run under one of the box container edges with it duct taped over the coverless electronic enclosure. Note: LED strips/leads inside the sign body have less than 60 VDC present. Components inside the electronics enclosure and power cable may have 6.6 amperes and/or 24 VAC.

10.5.3 Problem Solving Guide

Problem	Possible Cause	Corrective Action
P.1 Sign will not light	No input current from Constant Current Regulator. (Power Supply status LED is not lit)	Check power wires for current loss between electrical components and CCR. Replace faulty components as needed. See **Section 10.5.4, pg. 31,** for further explanation of action steps.
P.2 Sign will not light	Isolation Transformer is not sized properly	Replace Isolation transformer with one of the correct size. Review **Tables 10 - 15, 20, pgs. 86 - 92**, for correct transformer sizes. See **Section 10.5.6, pg. 32,** for further explanation of action steps.
P.3 Sign will not light	Open circuit in the LED strip or LED cable (Power Supply status LED is blinking or unlit)	Verify LED cable connections are properly seated in their respective receptacles; reseat if necessary. See **Figures 49 - 55, pgs. 86 - 92**, for LED wiring diagrams.
P.4 Sign will not light	Failed Power Supply (Power Supply status LED is blinking or unlit)	Remove failed power supply and replace with new power supply. See **Section 10.7.1, pg. 35**.
P.5 Sign will not light	Short circuit in LED strip or LED cable	Replace shorted LED strip(s) or LED Cable(s) with a new LED strip or LED cable. **See Section 10.6, pg. 33.**
P.6 Sign will not light	Optional ON/OFF switch is in OFF position	Turn switch to ON position.

Problem	Possible Cause	Corrective Action
P.7 Sign will not light	LED strip(s) mounted/wired incorrectly	Verify that LED Modules are mounted and wired correctly. See **Figure 32, pg. 69,** for proper LED strip and Lens mounting. See **Figures 49 - 55, pgs. 86 - 92**, for LED wiring diagrams.
P.8 Sign will not light	Wire(s) are loose or broken. Connection(s) are missing.	Verify wiring connections match the appropriate wiring diagram. See **Figures 44 -47, pgs. 81 - 84,** for electronics enclosure wiring diagrams. See **Figures 49 - 55, pgs. 86 - 92,** for LED Array Wiring diagrams.
P.9 Sign will not light	Open circuit within the LED Strip(s) (Assuming P.7 Action has been taken)	Replace shorted LED strip(s) or LED Cable(s) with a new LED strip or LED cable. See **Section 10.6, pg. 33**.
P.10 Sign Blinks/Flickers	Isolation Transformer is not sized properly	Replace Isolation transformer with one of the correct size. Review **Tables 10 - 15, 20, pgs. 86 -92**, for correct transformer sizes. See **Section 10.5.4 pg. 31,** for further explanation of action steps.
P.11 Sign Blinks/Flickers	A power supply is operating in fault condition	A power supply operating in fault condition (blinking status LED, see **Figure 48, pg. 85**) can starve the other power supplies in the same sign. Review Actions P.3 and P.4.

Problem	Possible Cause	Corrective Action
P.12 Uneven Brightness	Jumper(s) are not placed in the right location(s) for the specific sign.	Verify the jumper settings are proper with the LED strip(s) it is powering. **See Tables 10 - 15, 20, pgs. 86 -92.**
P.13 Uneven Brightness	LED strip(s) mounted/wired incorrectly	Verify that LED Modules are mounted and wired correctly. See **Figure 32, pg. 69,** for proper LED strip and Lens mounting. See LED wiring diagrams, **Figures 49 - 55, pgs. 86 - 92.**
P.14 Uneven Brightness	Open Circuit within the LED Strip(s) (Assuming P.13 Action has been taken)	Replace shorted LED strip(s) or LED Cable(s) with a new LED strip or LED cable. See **Section 10.6, pg. 33**.

10.5.4 No Input Current from the Constant Current Regulator

a. Verify that CCR current is present, by opening the Electronics Enclosure, and inspecting the power supply(s). The status LED on the power supply(s) should be lit or blinking. If not, see **Section 10.5.3, pg. 29,** for other possible action steps.
b. Use a clamp on true RMS ammeter or equivalent on any of the 16 AWG power wires to verify CCR current is supplied to power supply(s).
c. A loss of CCR current to the power supply(s) may be caused by damage to any or all of the following electronics components:
    - 16 AWG hook-up wires (inside electronics enclosure)
    - Power switch (optionally, inside the electronics enclosure)
    - the input power cable
    - isolation transformer
d. Once the current drop has been found, replace the faulty electrical component(s).
e. Repeat until all faulty electrical components have been replaced.
f. Return power to the sign. Verify that the sign illuminates.
g. If problem still persists see **Section 10.5.3, pg. 29,** for other possible action steps.

10.5.5 Isolation Transformer Information

Isolation transformers are specified and designed for incandescent lamps operating at 6.6A. Isolation transformers can only provide the power they are design to. The available power will decrease as the current is lowered due to constrained voltage inherent in the design.

The following table lists the standard transformers with de-rated power capability at each CCR step current.

		Available Power								
		Five Step					Three Step			One Step
	Rated @ 6.6A	6.6	5.5	4.1	3.4	2.8	6.6	5.5	4.8	5.5
15W	15	15	12	9	8	6	15	13	11	13
25W	25	25	20	16	13	11	25	21	18	21
45W	45	45	35	28	23	19	45	38	33	38
65W	65	65	51	40	33	28	65	54	47	54
100W	100	100	69	69	52	42	100	83	73	83
200W	200	200	158	158	103	85	200	167	145	167

Table 5. Isolation Transformer Size Explanation

10.5.6 Isolation Transformer Improperly Sized

a. Verify the isolation transformer is sized properly. See **Tables 10 - 15, 20, pgs. 86 - 92**, for prescribed transformer sizes. Note: an isolation transformer that is too small cannot provide the necessary voltage at lower current steps to run the sign. See **Section 10.5.5, pg. 32,** and **Table 5, pg. 32,** for transformer sizing explanation.
b. Note, some regulator technologies require rated load be applied for clean operation. A lightly loaded regulator paired with an undersized isolation transformer cannot provide the required voltage to run the sign at lower CCR steps.
c. If the isolation transformer is too small, remove the transformer and replace with one of appropriate size.
d. Return power to the sign. Verify that the sign illuminates.
e. If problem still persists see **Section 10.5.3, pg. 29,** for other possible action steps.

10.5.7 Verifying Jumper Settings

a. The jumper(s) must be placed in the right location(s) for the specific sign.
b. The jumpers are set depending on the size of the LED strip its powering. See **Tables 10 - 15, 20, pgs. 86 - 92**, for the proper settings.

10.6 Replacing LED Strip Assemblies

Contact Crouse-Hinds Airport Lighting for replacement LED Strip Assemblies. See **Figure 27, pg. 64,** for LED Array Wiring. See **Figures 49 - 55, pgs. 86 - 92,** for LED Wiring Diagrams. Note: Only use OEM LED strips.

NOTICE

WARNING:

Only use OEM replacement LED strips. Crouse-Hinds Airport Lighting is not responsible for potential problems or damage that may occur from using Non-OEM LEDs in the sign. See Table 16, pg. 93, for LED strip and Lens part number information.

NOTICE

WARNING:

Do not handle the LEDs with bare hands. Doing so may contaminate the LED surface or deform the LED. This may adversely affect the LED optical characteristics.

10.6.1 LED Strip Replacement Procedure

a. Lockout and de-energize power.

b. Remove the M10 bolts, washers, and rain caps from the desired top frame section, see **Figure 29, pg. 66.**

c. Carefully lift up the extrusion, see **Figure 29, pg. 66**. Note, the LED strip wires are still connected. Lift carefully to avoid damage to the LED strips, lenses, are connecting wires.

WARNING

WARNING:

Lift carefully when removing the top horizontal frame section. The horizontal frame section houses soldered LED connections. These connections are strain relieved to reduce the risk of damaging the soldered LED connections during maintenance operations. The LED connections can be damaged if the frame section is lifted or removed abruptly.

d. Detach the LED strip connectors, on both ends if necessary, see **Figure 30, pg. 67**.

e. Cut the zip ties from the wires and discard. Unscrew the 8-32 screws and detach the zip tie holders. On both sides if necessary, see **Figure 34, pg. 71**.

f. Remove the top extrusion from the sign and rotate 180°. Slide the desired LED strip assembly, lenses, and lens clips out, see **Figure 30, pg. 67**.

g. Slide the replacement LED strip into the channel, see **Figure 32, pg. 69**. Note, the lens sections are designed to break into thirds and may break at the joint whilst handling. If a lens section breaks during assembly, simply place a lens clip between the two detached sections, and continue as prescribed. See **Figure 28, pg. 65**, for all possible lens configurations.

h. Replace the zip tie holder, and screws, see **Figure 34, pg. 71**. Provide a service loop through the zip tie, using the soldered LED strip wires as shown in**, Figure 35, pg. 72**, before tightening the zip tie.

i. Rotate the horizontal frame section 180° to its original position and reconnect the previously detached wire connections, see **Figure 32, pg. 69**. Use the LED wiring diagrams, **Figures 49 - 55, pgs. 86 - 92**, if needed.

j. Lower the horizontal frame section back onto the sign, see **Figure 33, pg. 70**.

k. Reassemble the M10 bolts, flat washers, and rain caps onto the sign, see **Figure 33, pg. 70**. Tighten and re-torque the bolts. See **Table 17, pg. 94**, for torque values.

10.7 Replacing Electronics Enclosure Components

10.7.1 Power Supply Replacement Procedure

a. Lock out and de-energize power.

b. Remove the electronics enclosure cover by unfastening the M4 screws, see **Figure 42, pg. 77**. Note, do not remove the screws from the electronics enclosure cover. The screws are captive within the lid and removing them may cause damage to the enclosure.

c. Detach all wires that are connected to the power supply.

d. Unfasten and remove the three M4 socket head cap screws fastened to the power supply, see **Figure 42, pg. 77**. Remove the safety guard and/or wire P clip, if present and mounted to the power supply being worked, as well.

e. Remove the damaged power supply, see **Figure 42, pg. 77**.

f. Place the new power supply into position, see **Figure 43, pg. 78.**

g. Refasten the previously removed M4 socket head cap screws along with any wire clips or safety guards that were previously removed, see **Figure 43, pg. 78**. Note, if sign being worked contains the optional On/Off switch, the safety guard MUST be fastened back into the enclosure, and in the correct position. Re-torque screws, to the appropriate torque value, see **Table 17, pg. 94.**

WARNING

WARNING:

If the signs electronics enclosure contains the optional On/Off switch, the safety guard must be put back in the enclosure and in its original position after installing a new power supply. Failure to do so may result in injury or death.

h. Re-connect all previously detached wires. Be sure to loop the LED power cable(s) through the P-clip(s) before re-wiring. This operation is required for appropriate strain relief during a frangible event. Set the power supply jumper settings. See **Figures 44 - 47, pgs. 81 -84,** for electronics enclosure wiring diagrams. See **Tables 10-15, 20**, **pgs. 86-92** for jumper settings.

i. Refasten the electronics enclosure cover onto the sign, see **Figure 43, pg. 78**. Re-torque M4 screws, to the appropriate torque value, see **Table 17, pg. 94.**

11 Figures and Tables

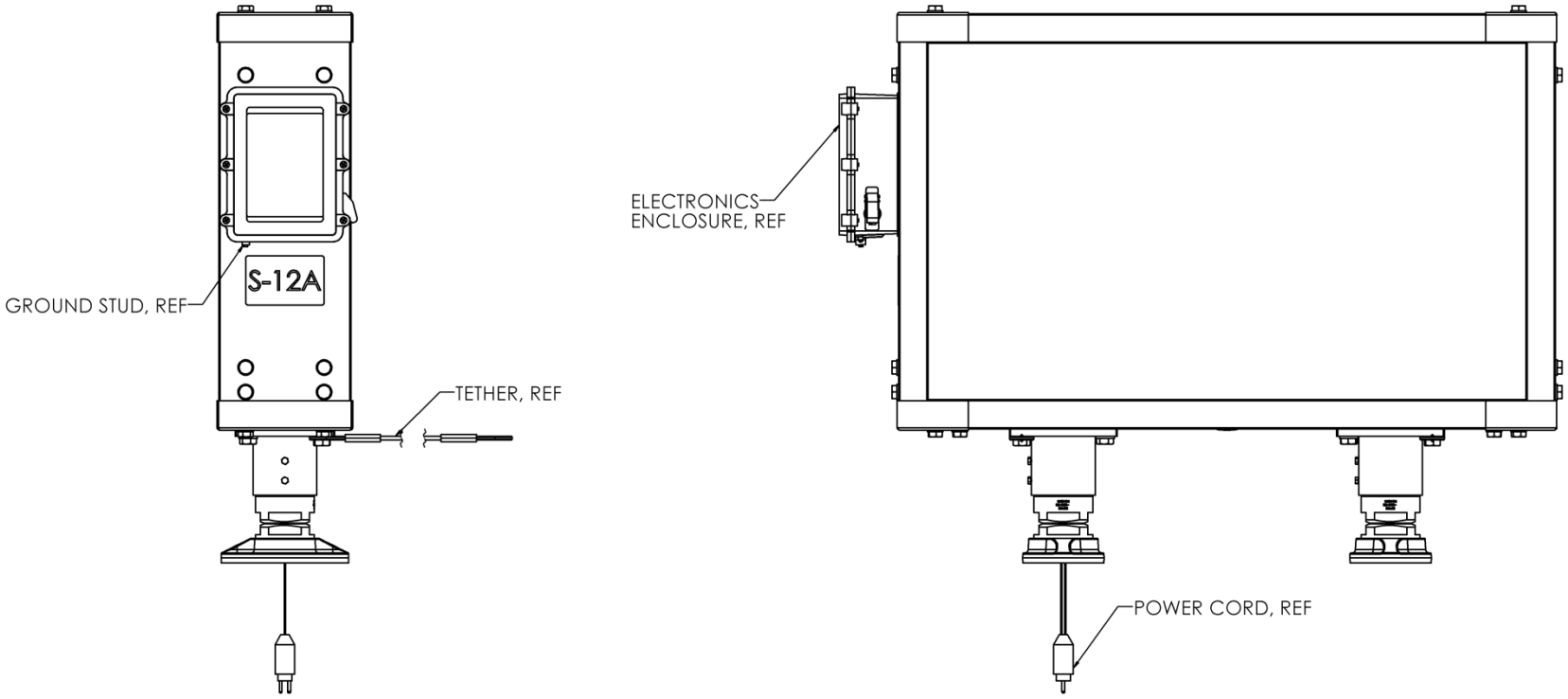


Figure 2. One Module Sign

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

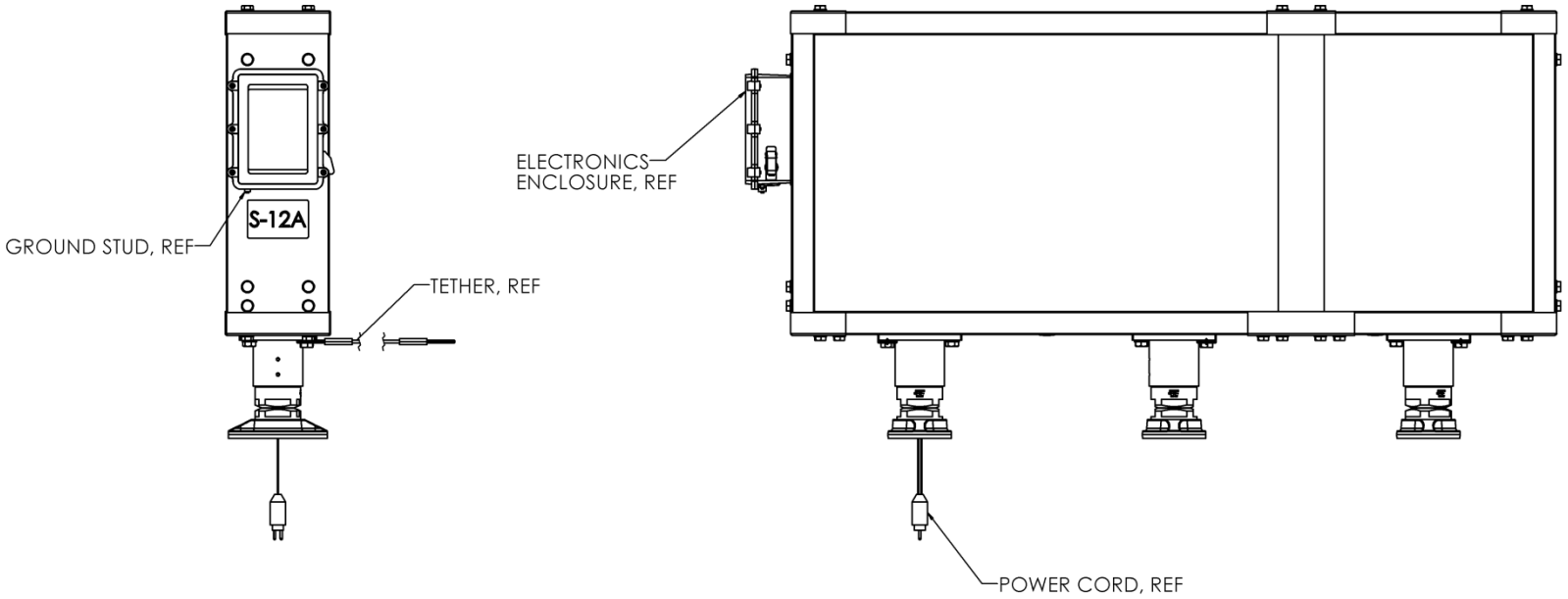


Figure 3. One and a Half Module Sign

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

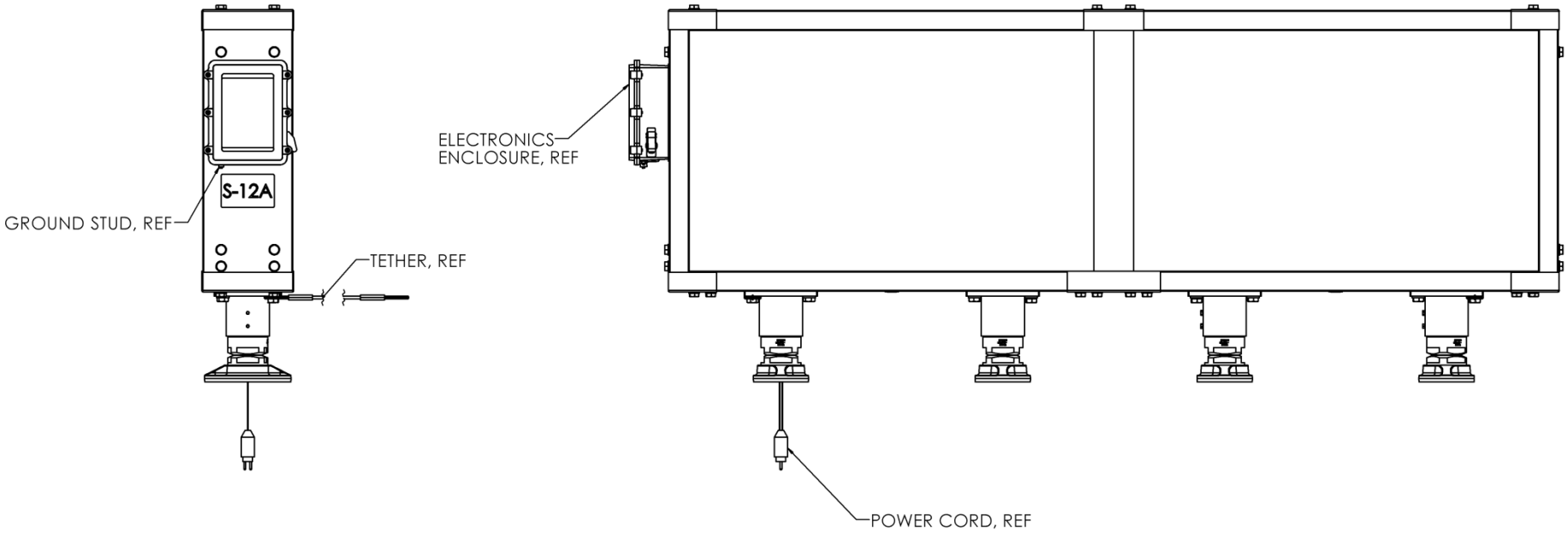


Figure 4. Two Module Sign

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

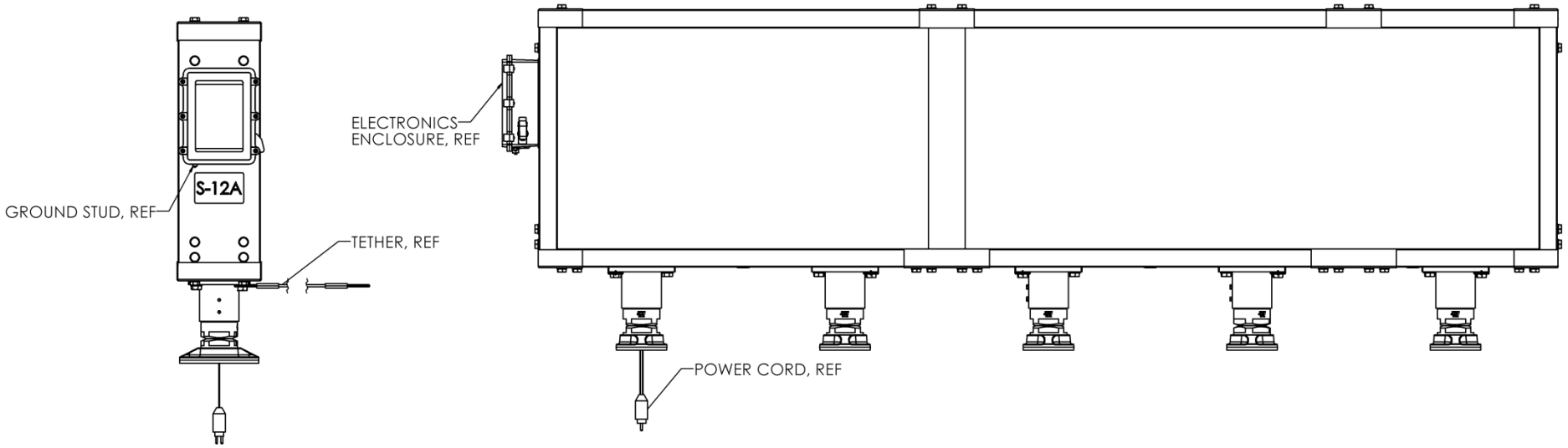


Figure 5. Two and a Half Module Sign

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

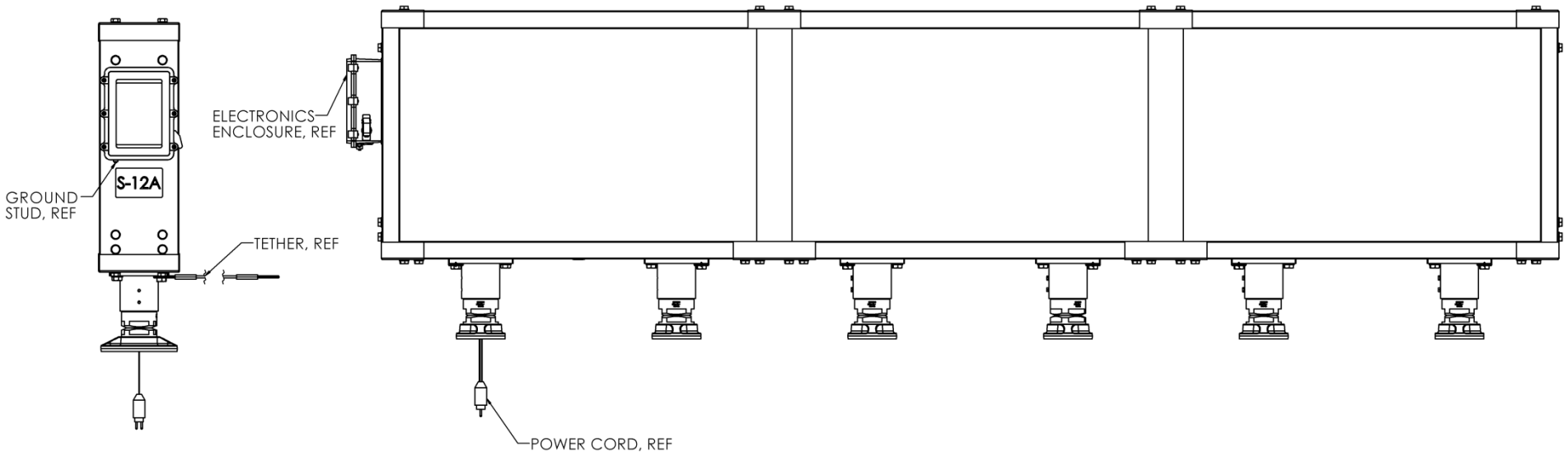


Figure 6. Three Module Sign

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

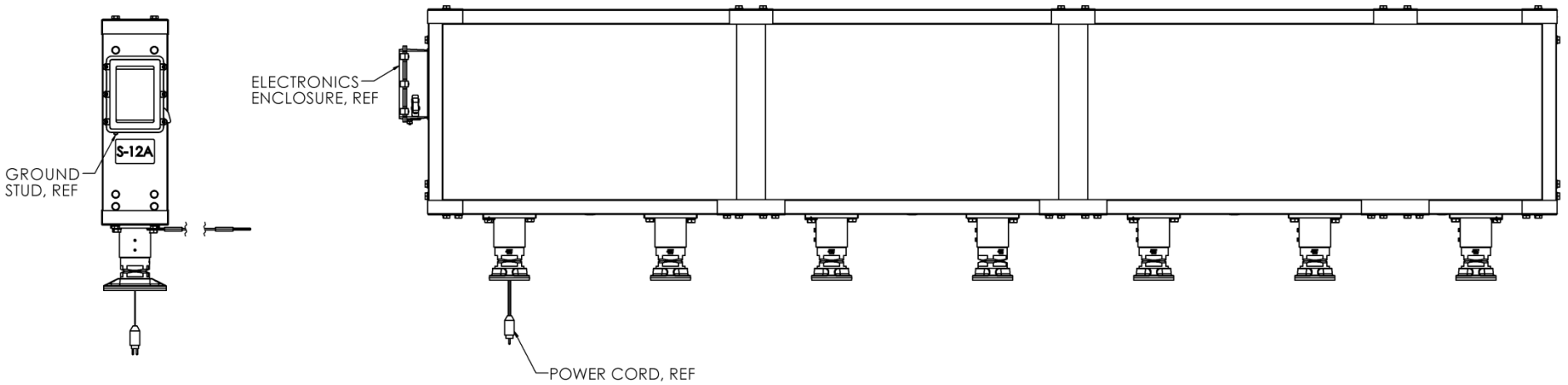


Figure 7. Three and a Half Module Sign

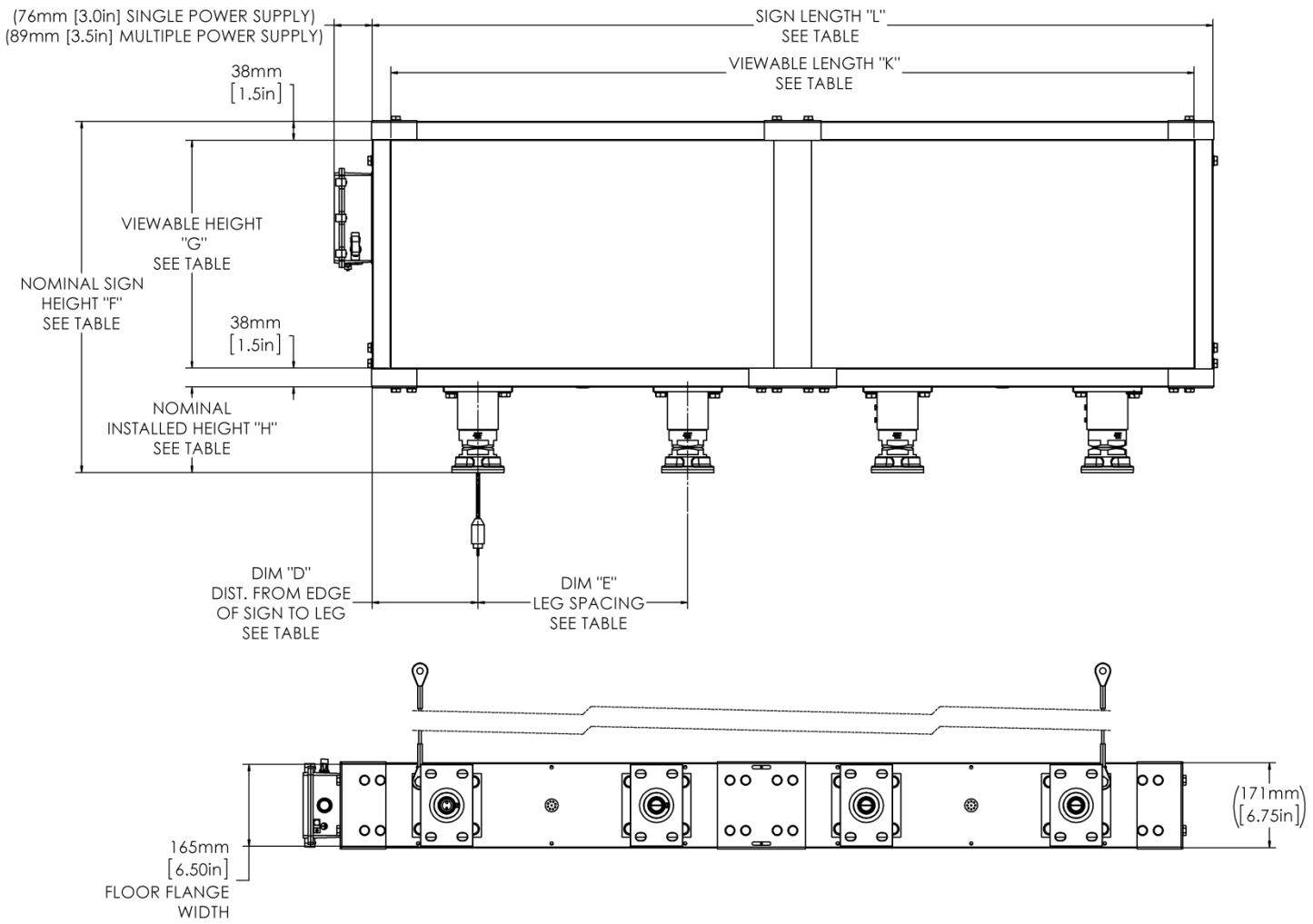


Figure 8. FAA Sizes 1, 2, 3, and 5 Sign Dimensions

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

PART NUMBER	WHERE USED (REF.)	DIM "D" SIGN EDGE TO LEG	DIM "E" LEG TO LEG SPACING	DIM "F" SIGN HEIGHT	DIM "G" VIEWABLE HEIGHT	DIM "H" INSTALLED HEIGHT	FLANGE WIDTH "W"	VIEWABLE LENGTH "K"	SIGN LENGTH "L"
858S-AP11X-10	FAA SIZE 1 (12" LEGEND HEIGHT)	8.406 [213.5]	16.688 [423.9]	27.94 (709.6)	18.125 [460.4]	6.81 [173.1]	6.5 [165.1]	30.500 [774.7]	33.500 [850.9]±.060 [1.5]
858S-AP11X-15								47.063 [1195.4]	50.063 [1271.6]±.120 [3.0]
858S-AP11X-20								63.875 [1622.4]	66.875 [1698.6]±.120 [3.0]
858S-AP11X-25								80.438 [2043.1]	83.438 [2119.3]±.180 [4.6]
858S-AP11X-30								97.250 [2470.2]	100.250 [2546.4]±.180 [4.6]
858S-AP11X-35								113.813 [2890.9]	116.813 [2967.1]±.240 [6.1]
858S-AP12X-10	FAA SIZE 2 (15" LEGEND HEIGHT)	10.156 [258.0]	20.188 [512.8]	33.94 [862.1]	24.125 [612.8]	6.81 [173.1]	6.5 [165.1]	37.500 [952.5]	40.500 [1028.7]±.060 [1.5]
858S-AP12X-15								57.563 [1462.1]	60.563 [1538.3]±.120 [3.0]
858S-AP12X-20								77.875 [1978.0]	80.875 [2054.2]±.120 [3.0]
858S-AP12X-25								97.938 [2487.6]	100.938 [2563.8]±.180 [4.6]
858S-AP12X-30								118.250 [3003.6]	121.250 [3079.8]±.180 [4.6]
858S-AP12X-35								138.313 [3513.2]	141.313 [3589.4]±.240 [6.1]
858S-AP13X-10	FAA SIZE 3 (18" LEGEND HEIGHT)	11.969 [304.0]	23.813 [604.8]	39.94 [1014.5]	30.125 [765.2]	6.81 [173.1]	6.5 [165.1]	44.750 [1136.7]	47.750 [1212.9]±.060 [1.5]
858S-AP13X-15								68.500 [1739.9]	71.500 [1816.1]±.120 [3.0]
858S-AP13X-20								92.375 [2346.3]	95.375 [2422.5]±.120 [3.0]
858S-AP13X-25								116.063 [2948]	119.063 [3024.2]±.180 [4.6]
858S-AP13X-30								140.000 [3556.0]	143.000 [3632.2]±.180 [4.6]
858S-AP13X-35								163.688 [4157.7]	166.688 [4233.9]±.240 [6.1]
858S-AP15X-10	FAA SIZE 5 (25" NUMERAL HEIGHT)	11.969 [304.0]	23.813 [604.8]	39.94 [1014.5]	30.125 [765.2]	6.813 [173.1]	6.5 [165.1]	44.750 [1136.7]	47.750 [1212.9]±.060 [1.5]

*****Units: inches [millimeters]

Figure 9. FAA Sizes 1, 2, 3, and 5 Sign Dimensions (cont'd)

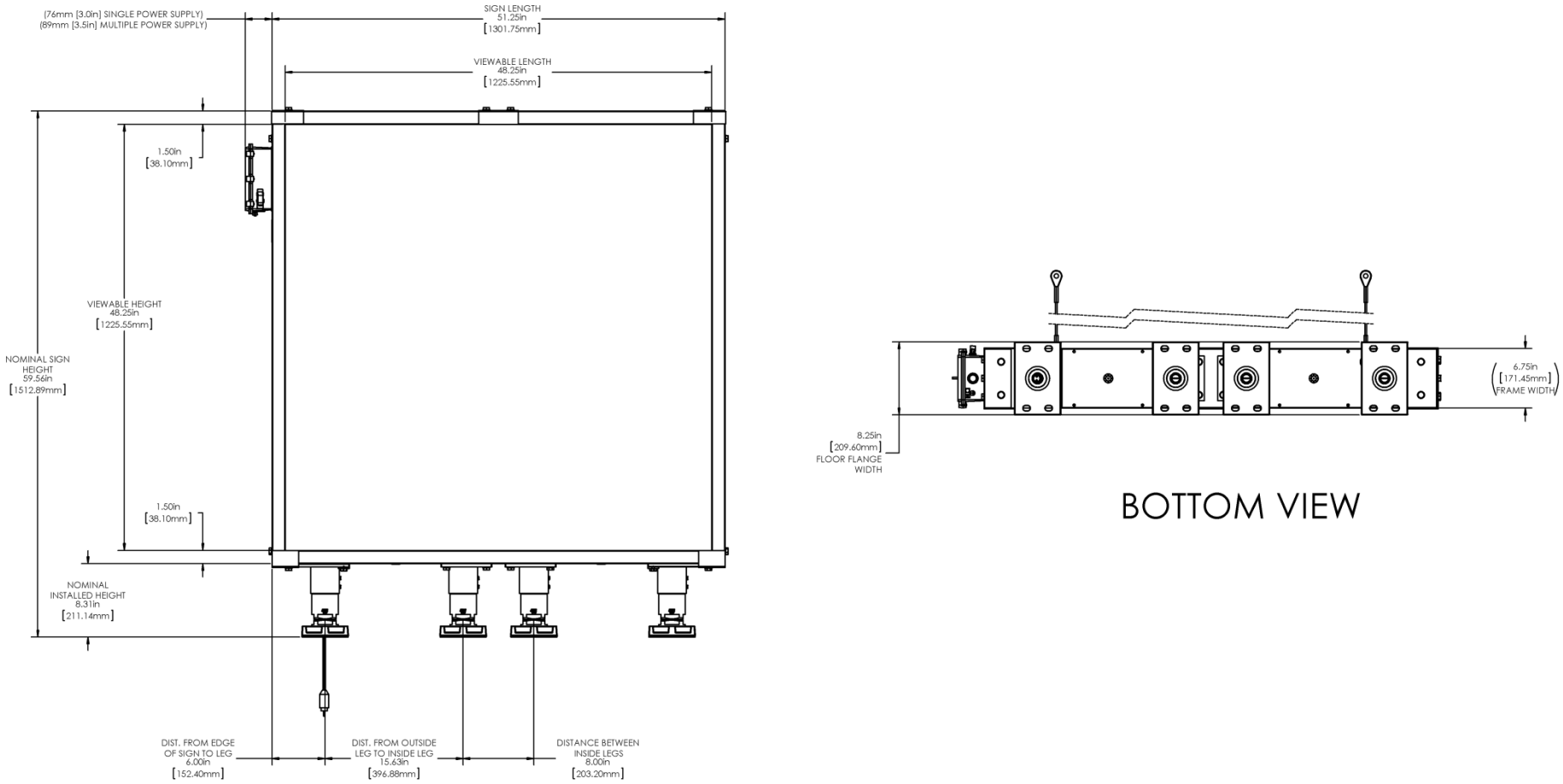


Figure 10. FAA Size 4 Distance Marker Sign Dimensions

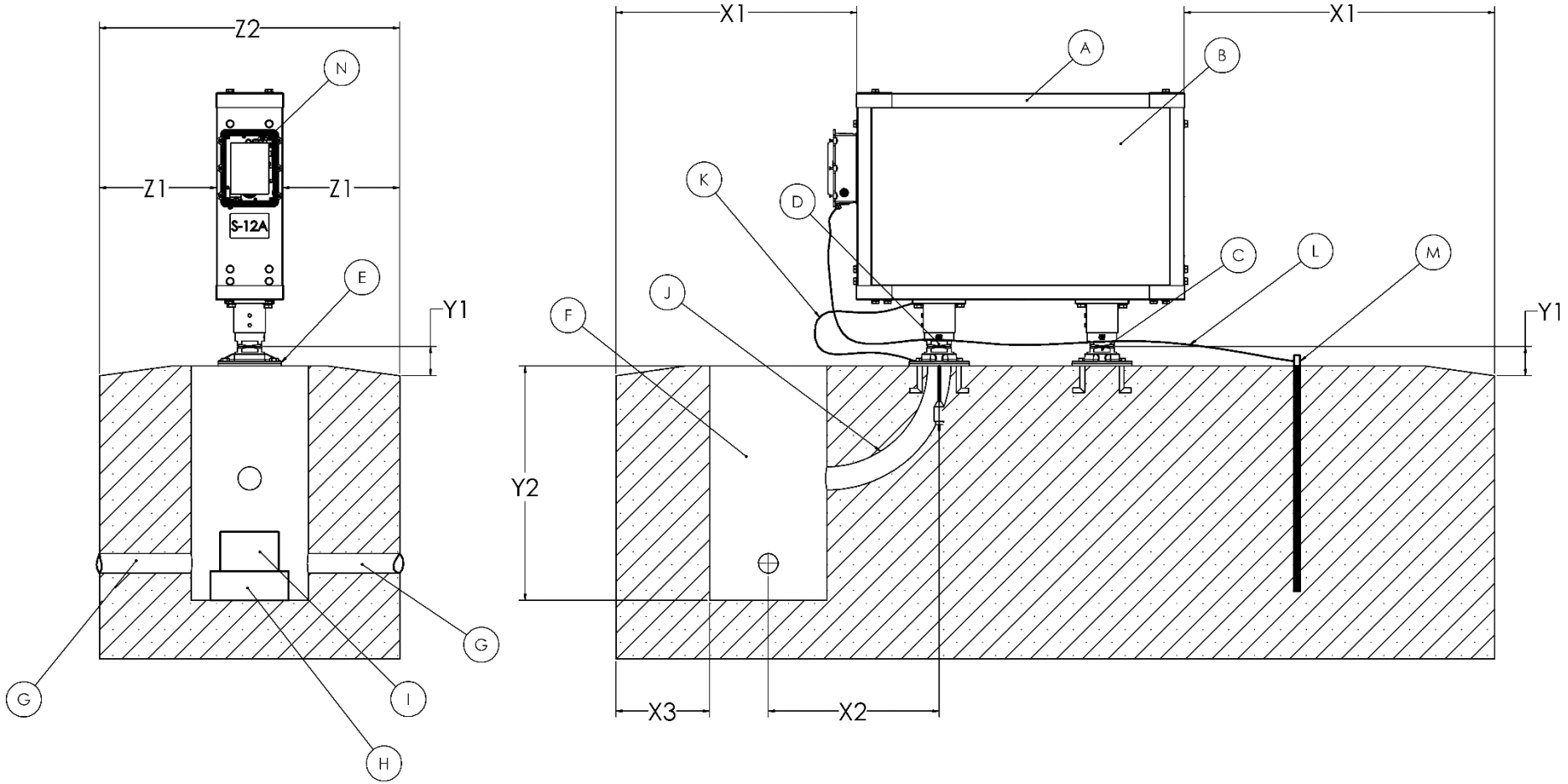


Figure 11. Recommended Transformer Housing Location & Concrete Foundation/Pad Details

Note: DO NOT install transformer housing under sign legs.

Sign Parts and Installation Components	
	Description
A	Sign Frame
B	Sign Legend Panel
C	Frangible Leg
D	Frangible Leg (Power Leg)
E	Floor Flange
F	Transformer Housing
G	2" Conduit
H	Brick
I	Isolation Transformer
J	2" Conduit Elbow, (See **Figure 12, pg. 49** for more information).
K	Tether
L	Ground Wire (Not Supplied)
M	Grounding Rod
N	Electrical Box

Table 6. Sign to Airfield Parts and Installation Components

Dimensional Measurements		
	Measurement	**Description**
X1	12IN [305MM]	Recommended Minimum Mower Clearance
X2	17.5IN [445MM]	Recommended Distance Between Conduit and Power Leg
X3	4IN [102MM]	Recommended Minimum Wall Thickness Between Transformer and Concrete
Y1	3IN [50MM]	Distance Between Grade and Frangible Groove
Y2	24IN [610MM]	Transformer Housing Height
Z1	12IN [305MM]	Recommended Minimum Mower Clearance
Z2	30.75IN [781MM]	Recommended Concrete Pad Width

Table 7. Sign to Airfield Dimensions

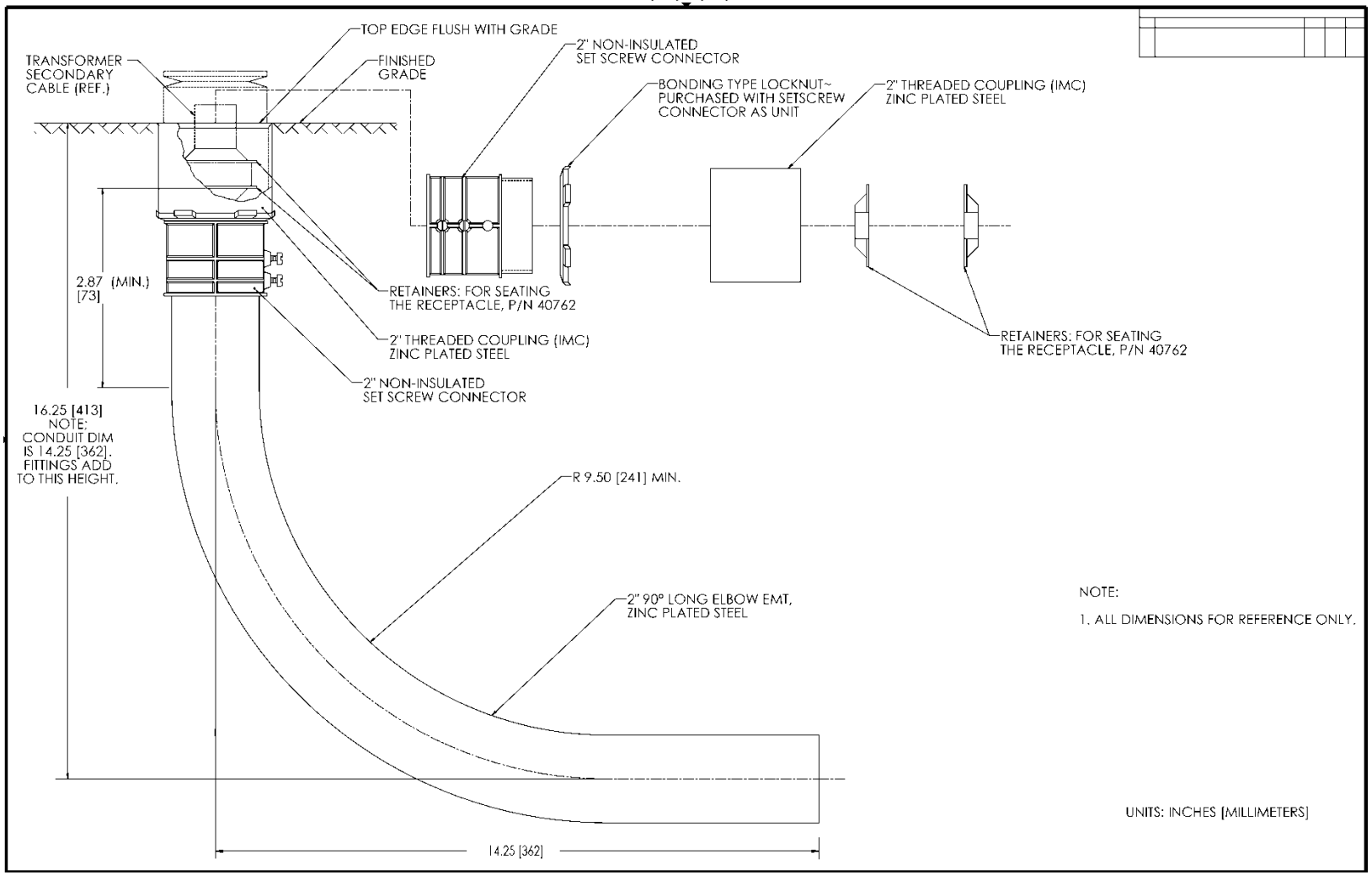


Figure 12. Conduit Elbow Information

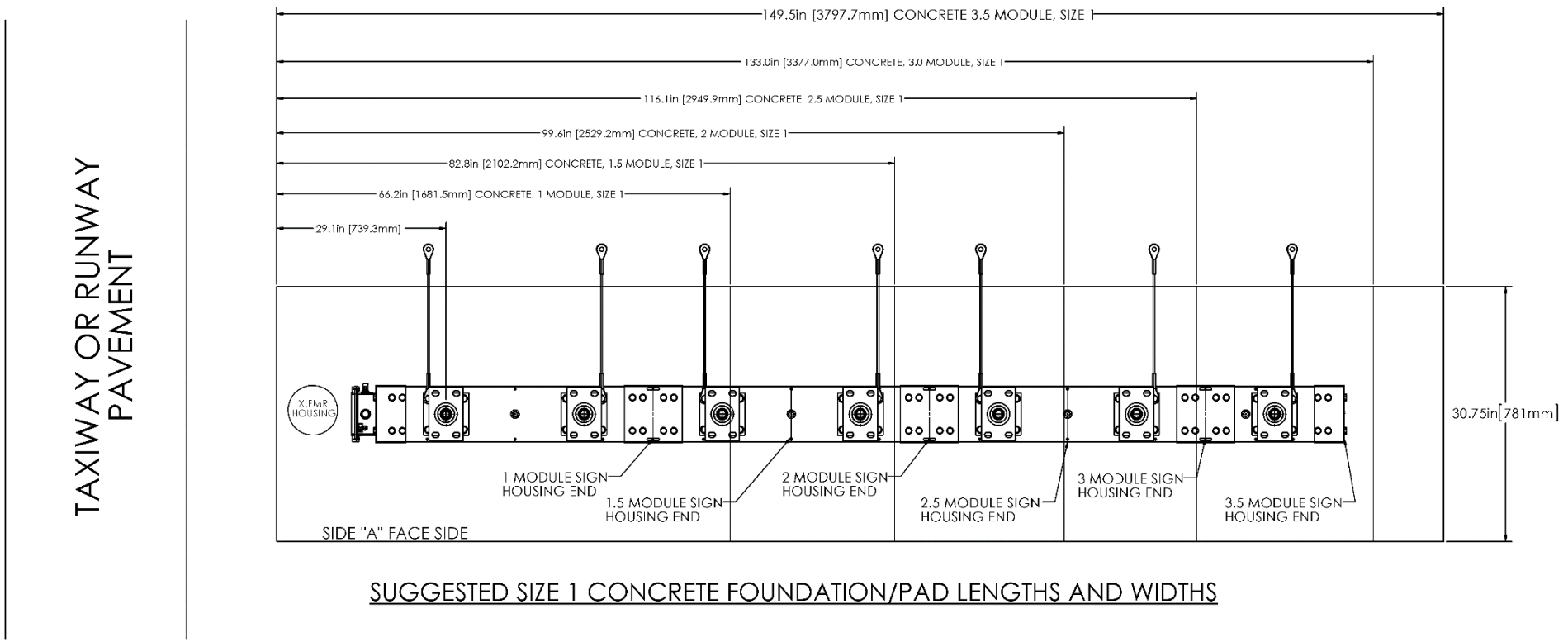


Figure 13. Concrete Foundation/Pad Configurations, FAA Size 1 Signs

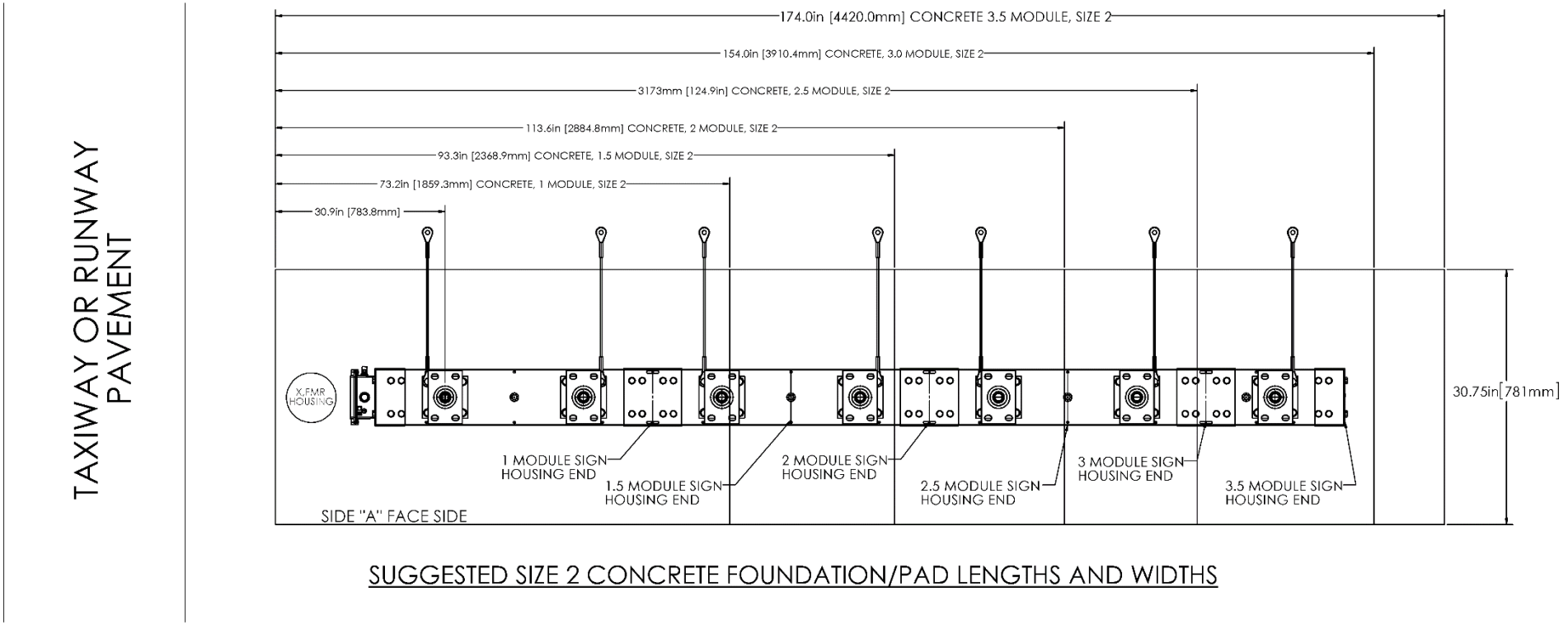


Figure 14. Concrete Foundation/Pad Configurations, FAA Size 2 Signs

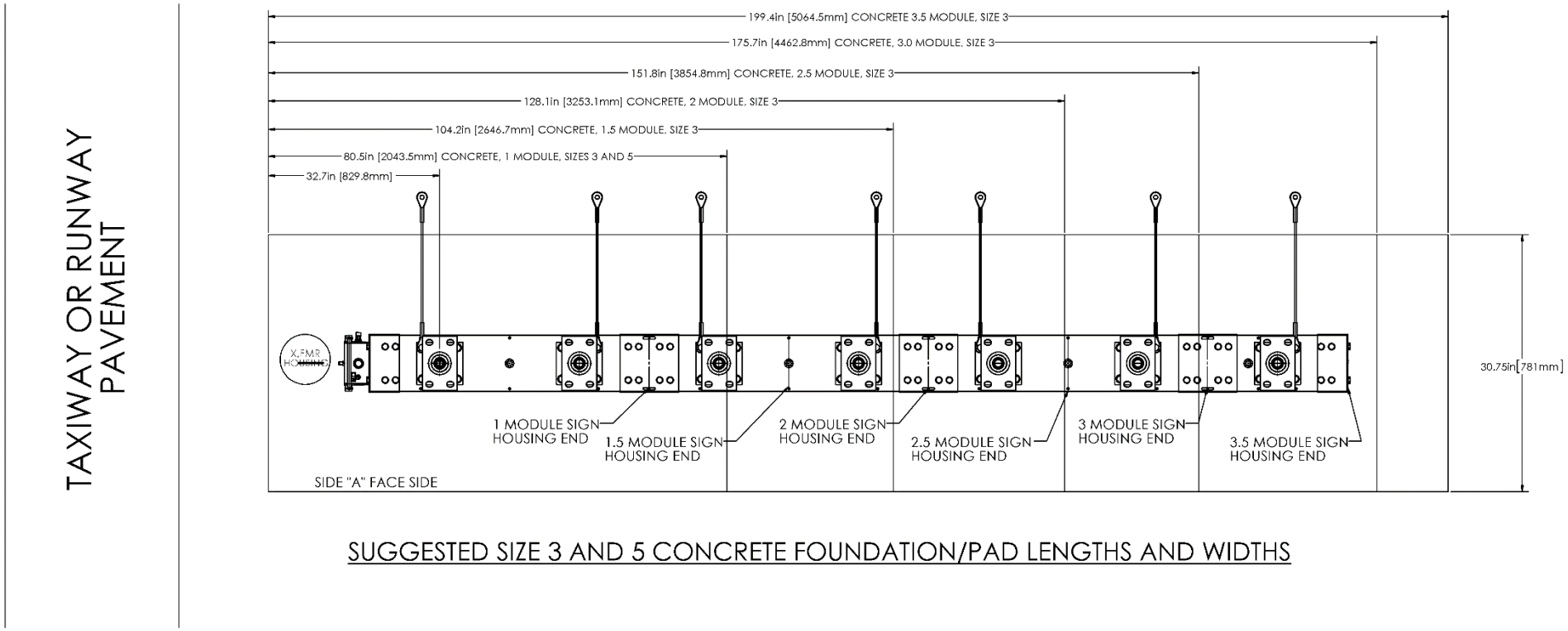


Figure 15. Concrete Foundation/Pad Configurations, FAA Size 3 and 5 Signs

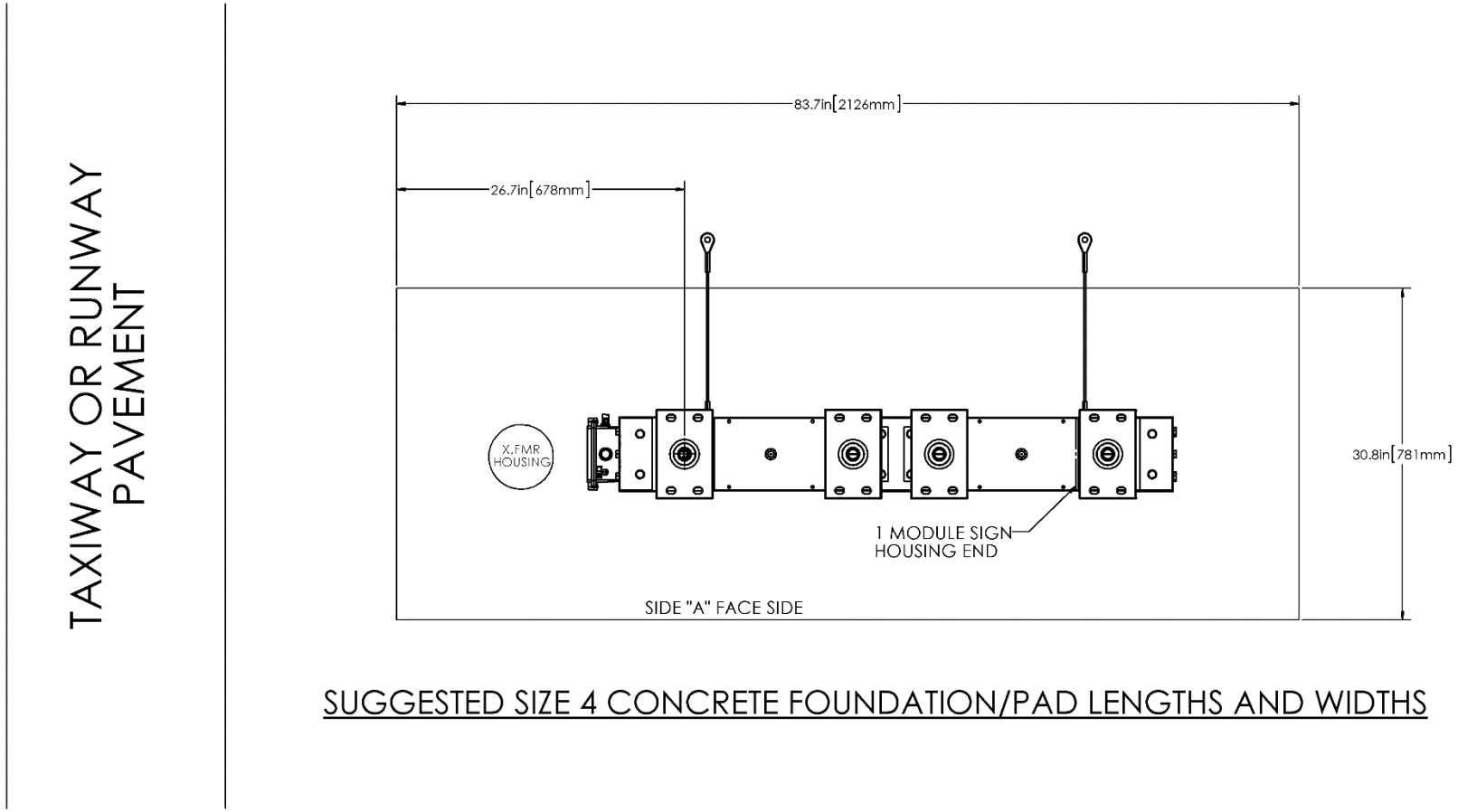


Figure 16. Concrete Foundation/Pad Configuration, FAA Size 4 Signs

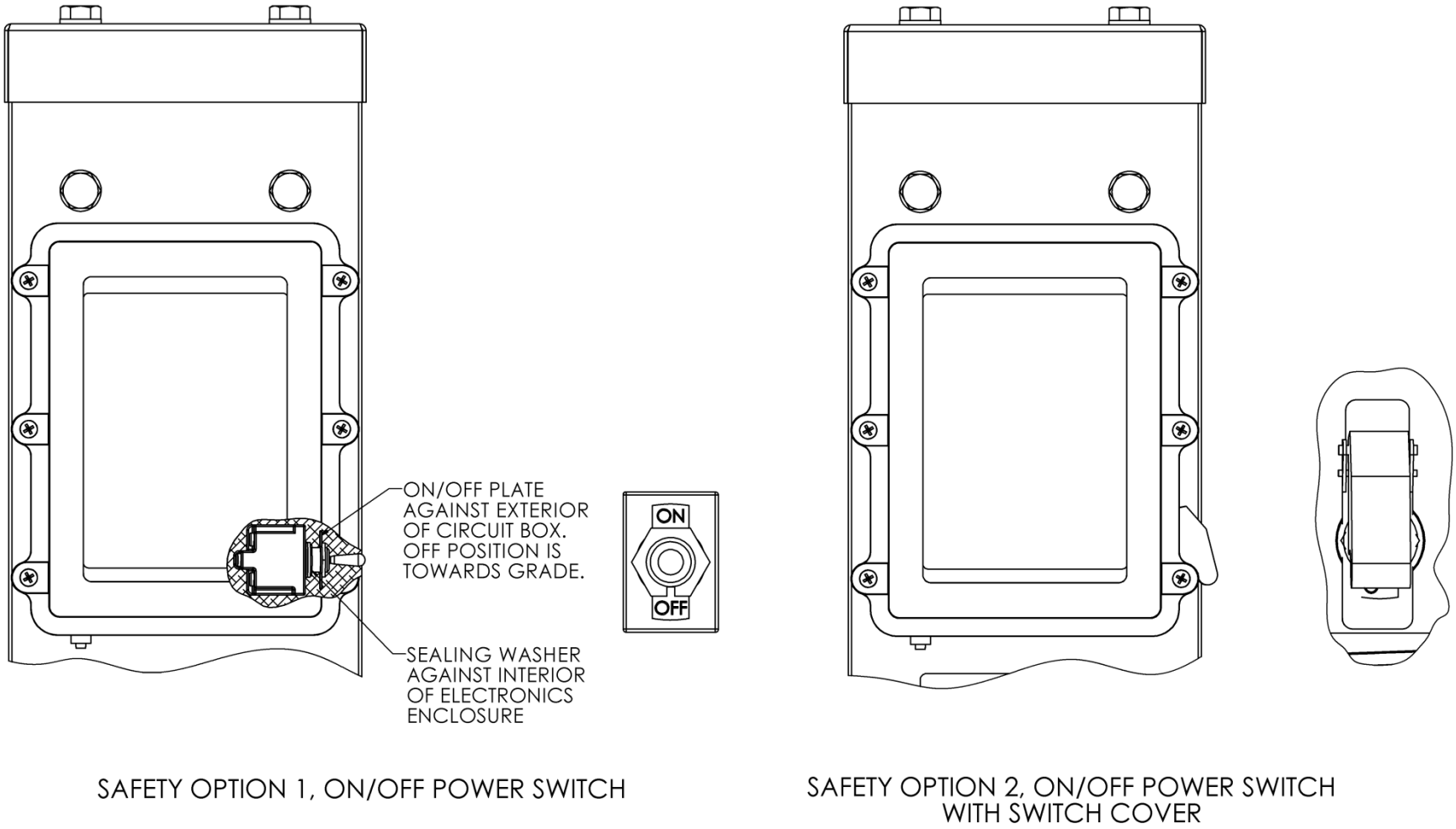
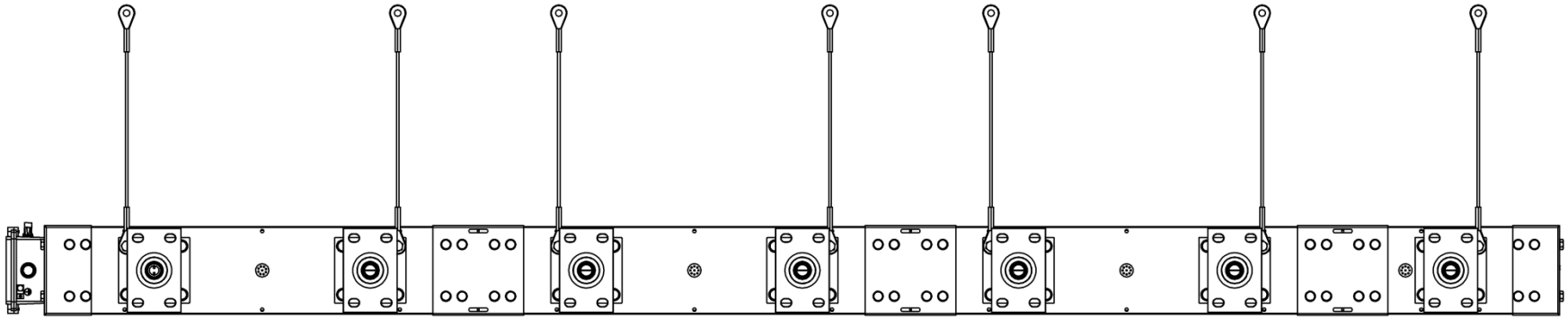
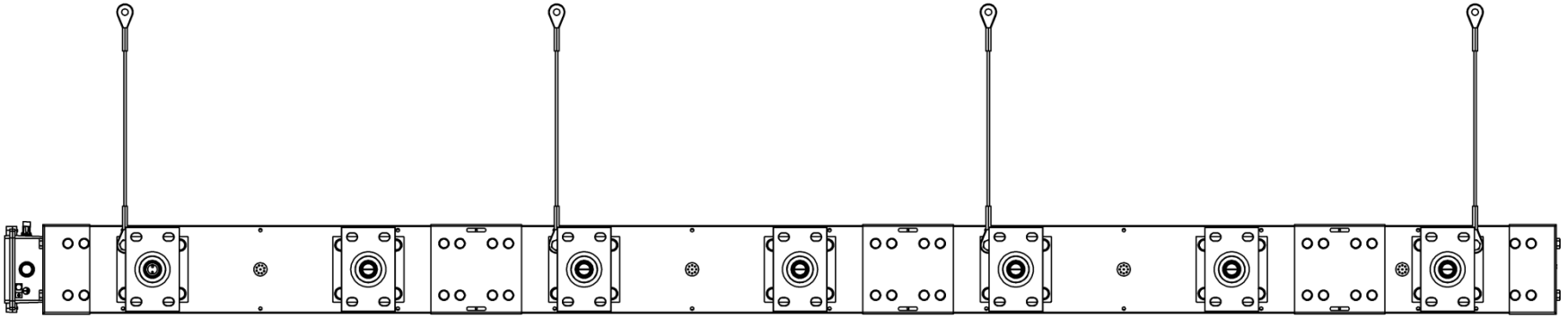


Figure 17. Sign Safety Options 1 and 2



SAFETY OPTION 3, (2 TETHERS, 1 ON EACH END PER FULL MODULE)
3.5 MODULE SHOWN



SAFETY OPTION 4, (1 TETHER ON EACH MODULE)
3.5 MODULE SHOWN

Figure 18. Sign Safety Options 3 and 4

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

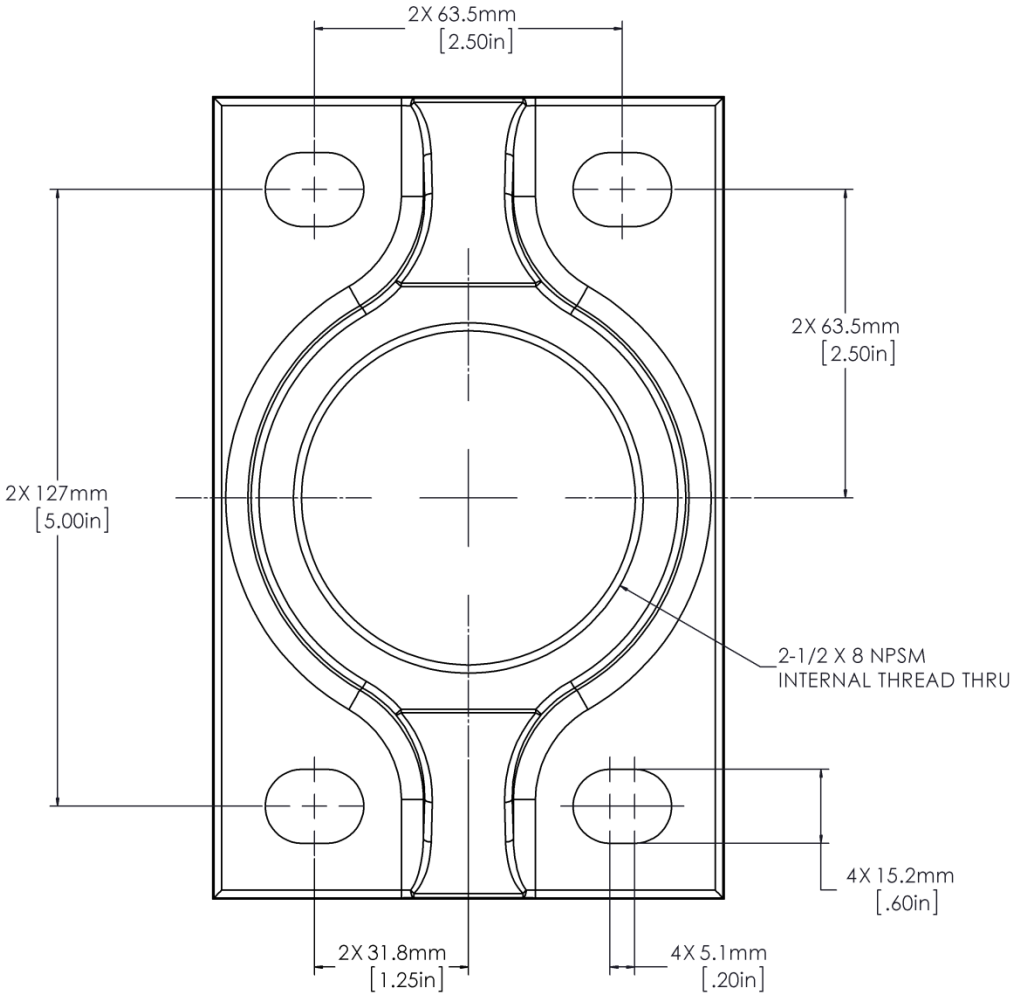


Figure 19. FAA Size 1, 2, 3, and 5 Floor Flange Hole Pattern

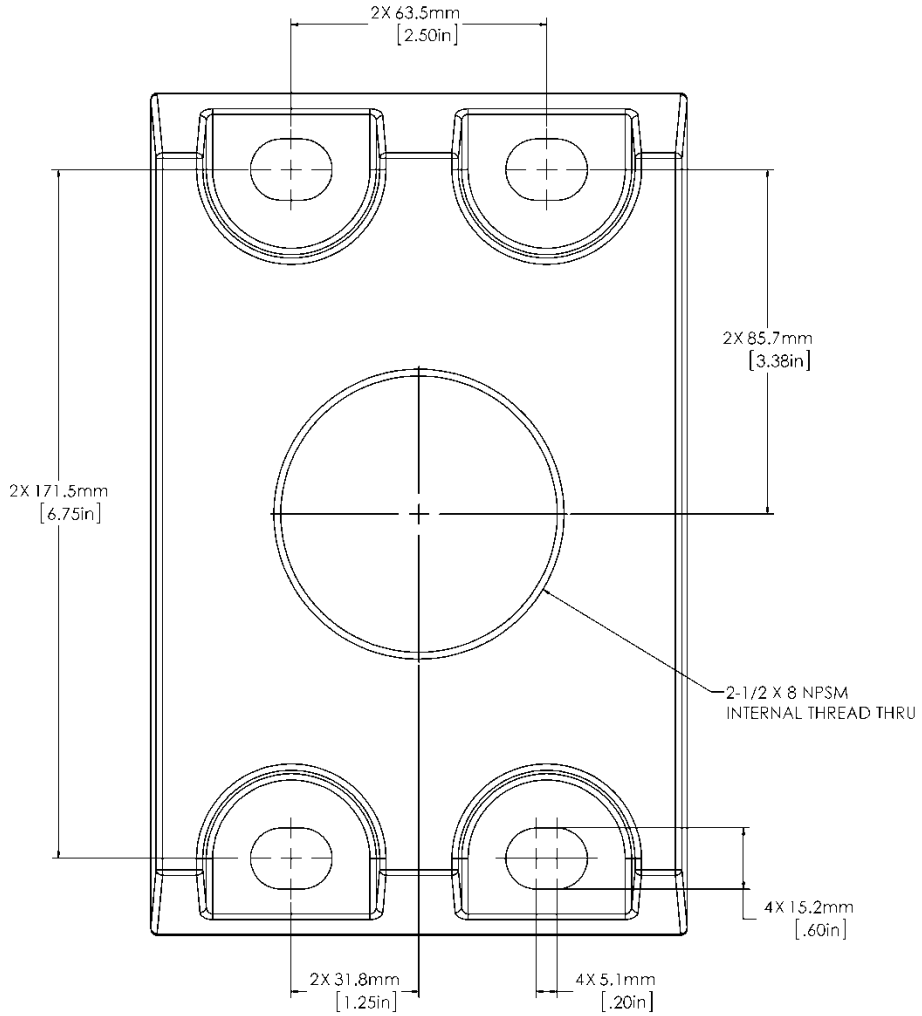


Figure 20. FAA Size 4 DMS Floor Flange Hole Pattern

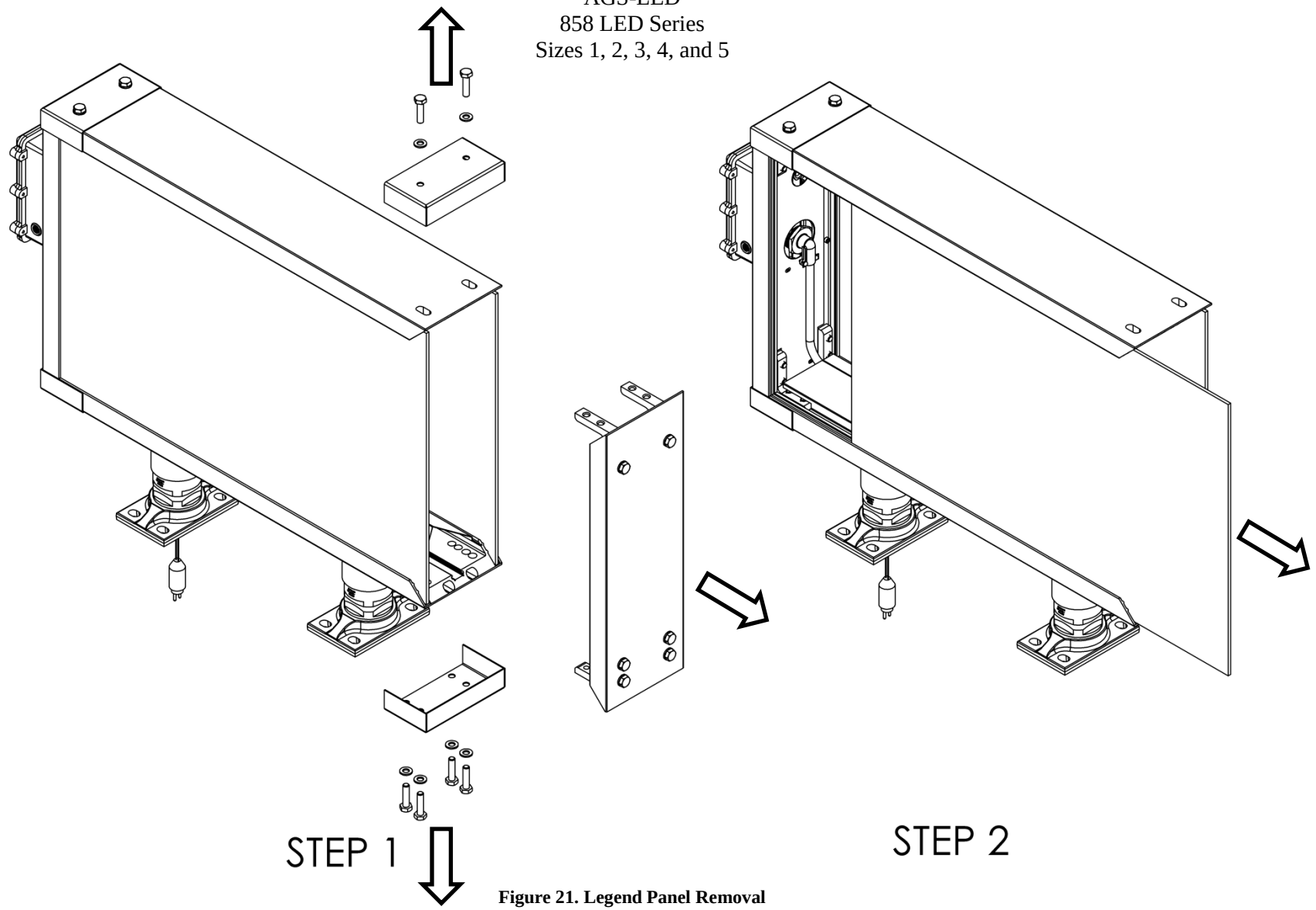


Figure 21. Legend Panel Removal

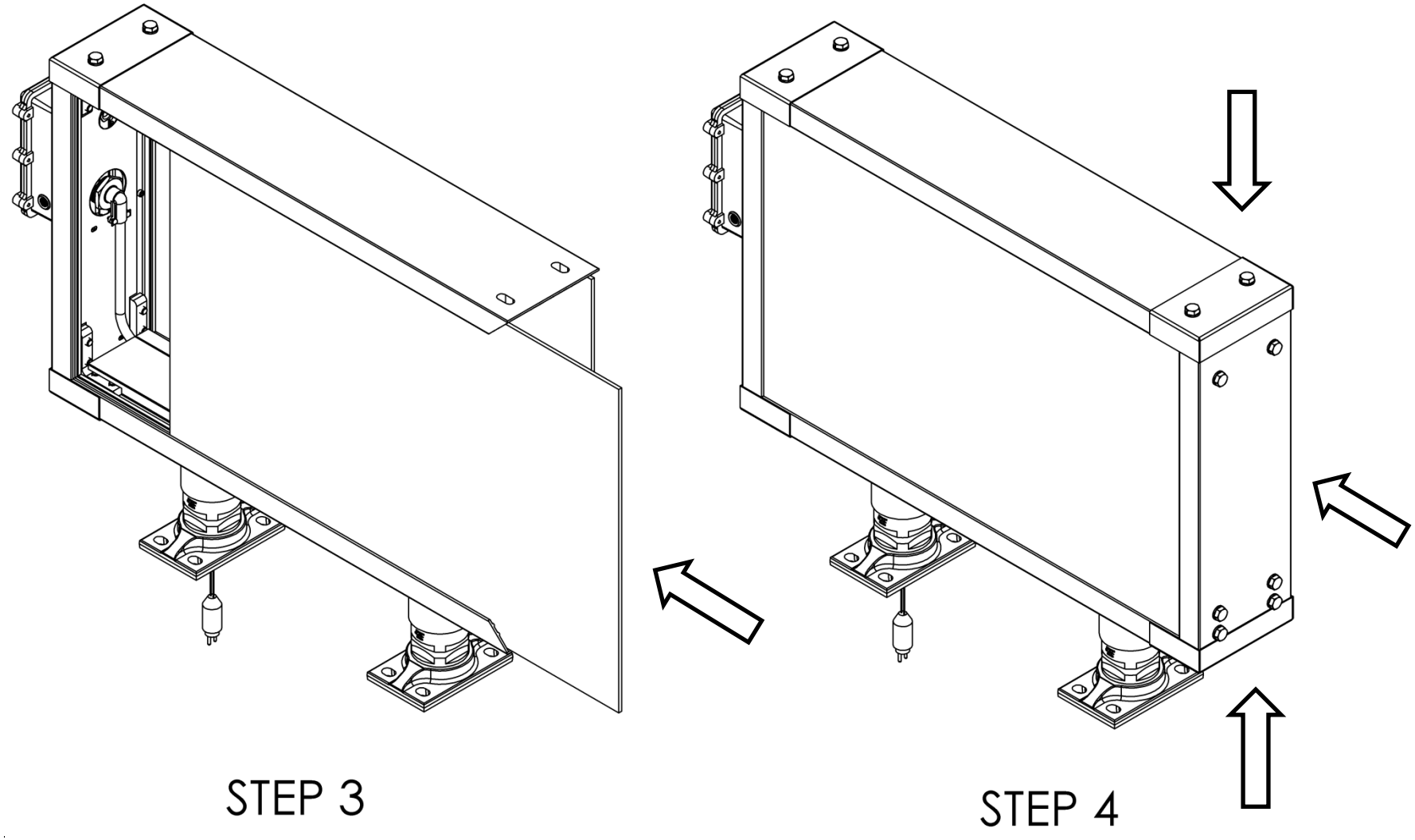


Figure 22: Legend Panel Replacement

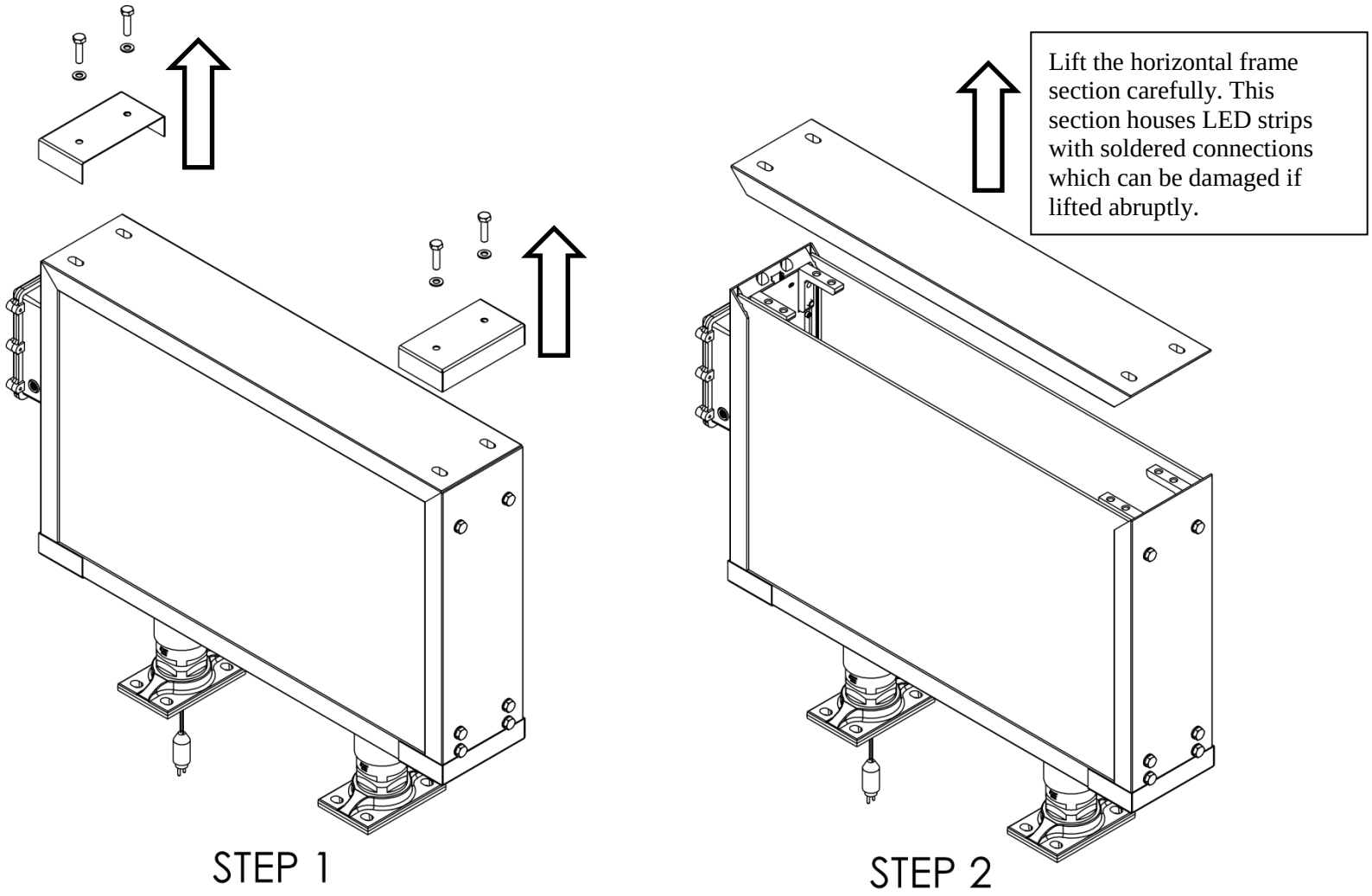


Figure 23. Legend Panel Removal (Alternate Method)

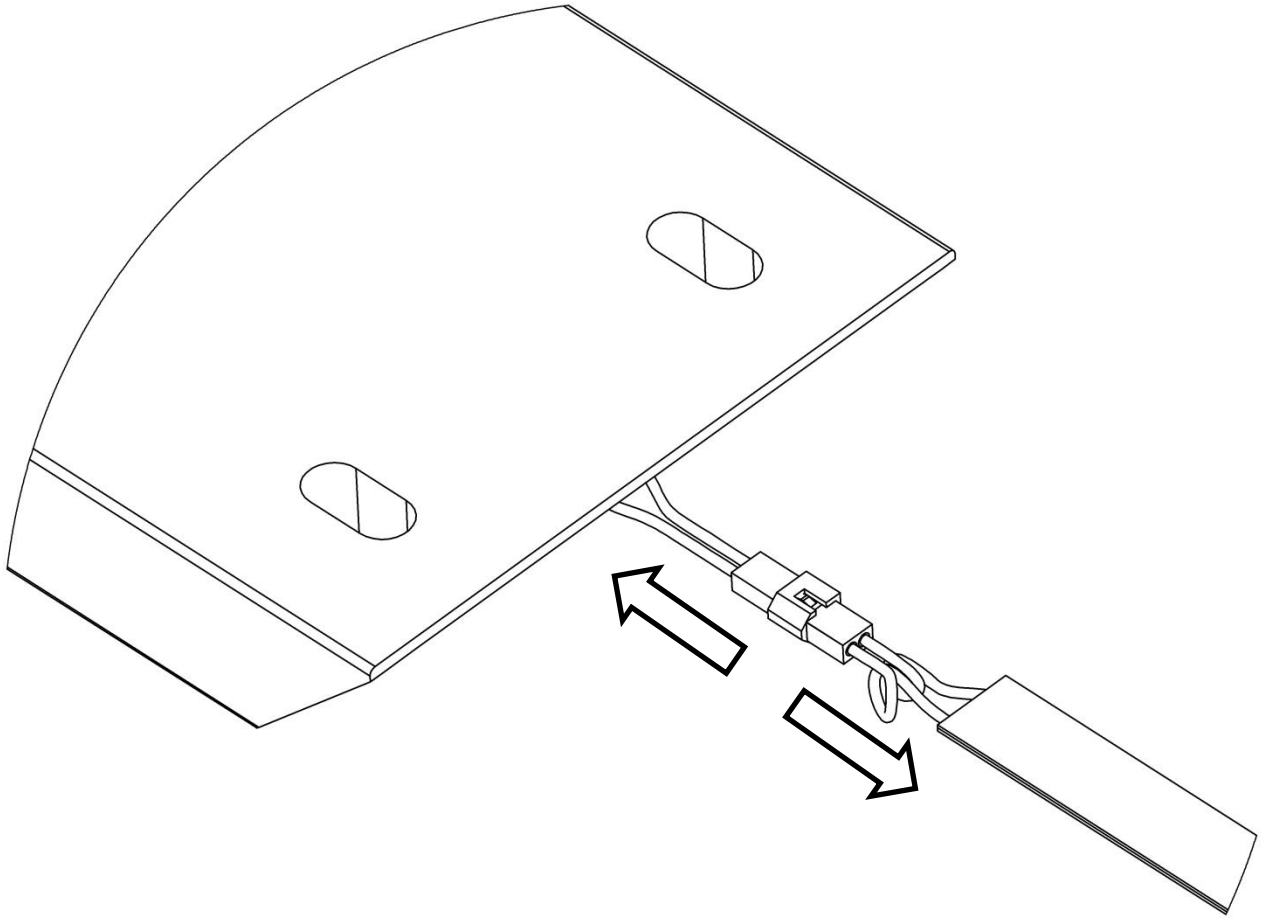


Figure 24. Legend Panel Replacement (Alternate Method) LED Strip Detachment

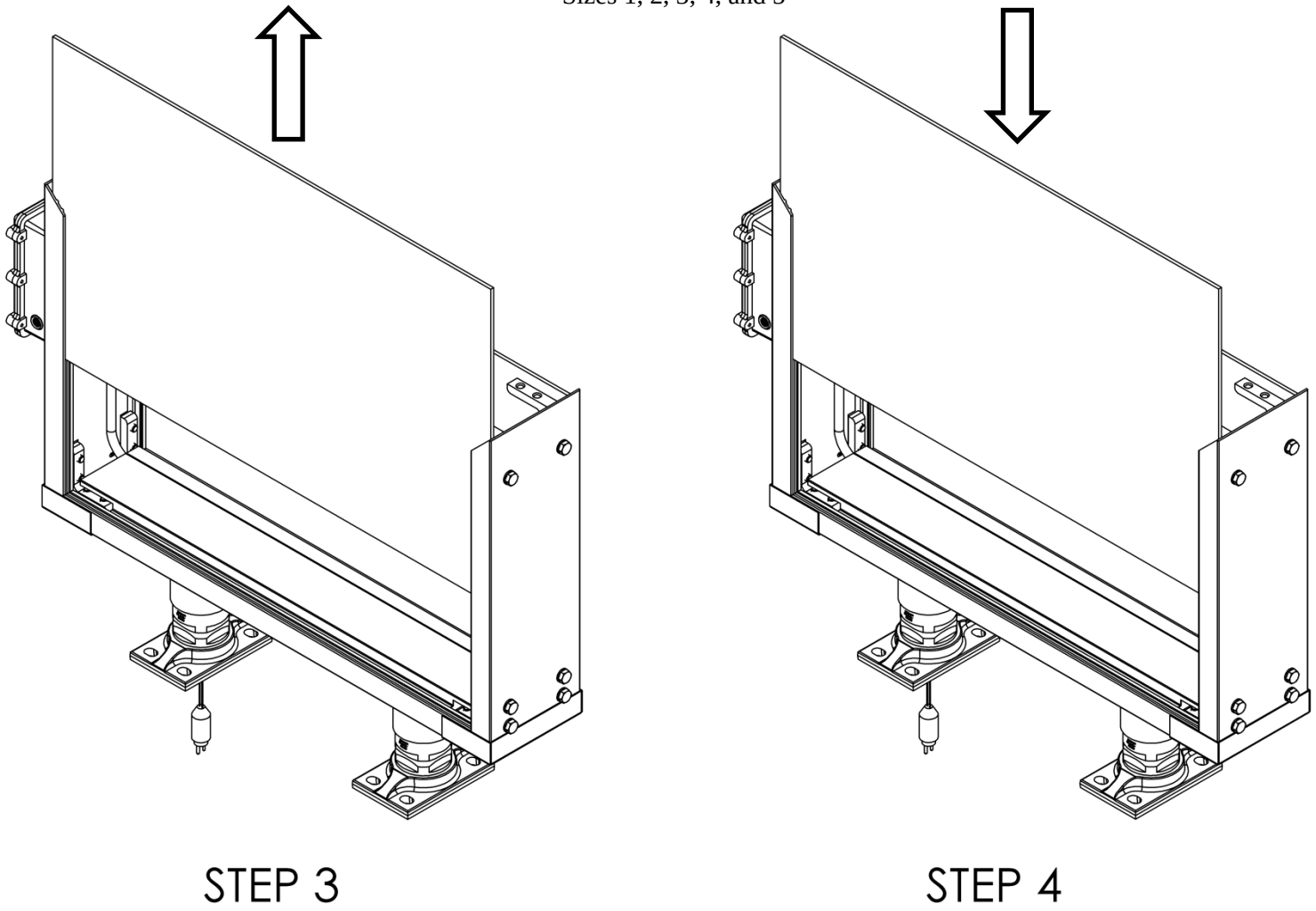


Figure 25. Legend Panel Replacement (Alternate Method)

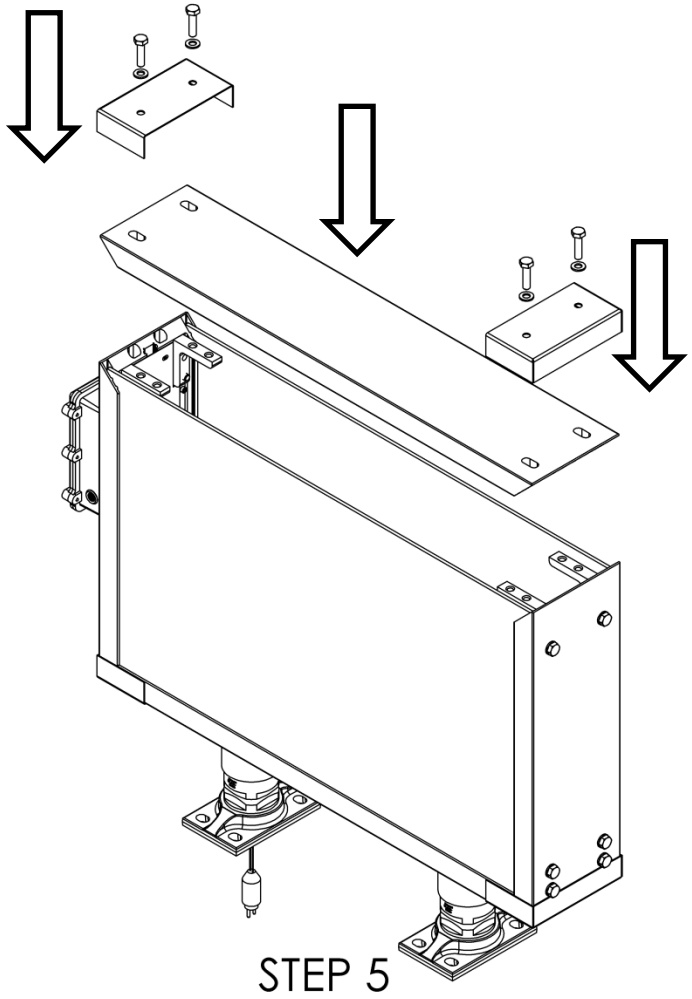
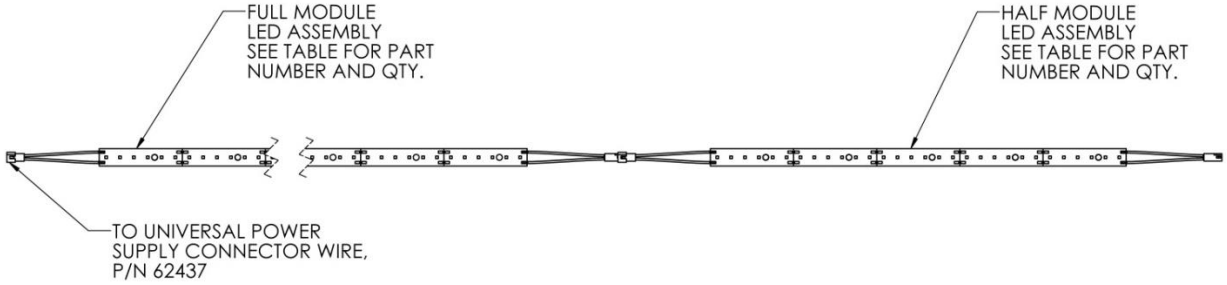


Figure 26. Legend Panel Replacement (Alternate Method) cont'd Part 2

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5



SIGN PART NUMBER	SIGN DESCRIPTION	FULL MODULE LED PART NUMBER	FULL MODULE LED QTY.	HALF MODULE LED PART NUMBER	HALF MODULE LED QTY.
858S-AP11X-10-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 1	62440-180-10	1	-	-
858S-AP11X-15-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 1 1/2	62440-180-10	1	62440-180-05	1
858S-AP11X-20-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 2	62440-180-10	2	-	-
858S-AP11X-25-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 2 1/2	62440-180-10	2	62440-180-05	1
858S-AP11X-30-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 3	62440-180-10	3	-	-
858S-AP11X-35-X-X-X-X-D-X-X	FAA SIZE 1 (12 in. LEGEND) LEGEND, 3 1/2	62440-180-10	3	62440-180-05	1
858S-AP12X-10-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 1	62440-240-10	1	-	-
858S-AP12X-15-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 1 1/2	62440-240-10	1	62440-240-05	1
858S-AP12X-20-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 2	62440-240-10	2	-	-
858S-AP12X-25-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 2 1/2	62440-240-10	2	62440-240-05	1
858S-AP12X-30-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 3	62440-240-10	3	-	-
858S-AP12X-35-X-X-X-X-D-X-X	FAA SIZE 2 (15 in. LEGEND) LEGEND, 3 1/2	62440-240-10	3	62440-240-05	1
858S-AP13X-10-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 1	62440-300-10	1	-	-
858S-AP13X-15-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 1 1/2	62440-300-10	1	62440-300-05	1
858S-AP13X-20-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 2	62440-300-10	2	-	-
858S-AP13X-25-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 2 1/2	62440-300-10	2	62440-300-05	1
858S-AP13X-30-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 3	62440-300-10	3	-	-
858S-AP13X-35-X-X-X-X-D-X-X	FAA SIZE 3 (18 in. LEGEND) LEGEND, 3 1/2	62440-300-10	3	62440-300-05	1
858S-AP14X-10-X-X-X-X-D-X-X	FAA SIZE 4 (40" LEGEND HEIGHT)	62440-480-10	2	62440-300-05	2
858S-AP15X-10-X-X-X-X-D-X-X	FAA SIZE 5 (25" LEGEND HEIGHT)	62440-300-10	1	-	-

Figure 27. LED Array Wiring

Purchase as part number 62438-_ _ _ -_ _-K. Consists of one LED Strip, lenses and clips for the LED strip. Use above 62240 dash numbers to complete blanks in the 62438 part number sequence.

Instruction Manual
AGS-LED
858 LED Series
Sizes 1, 2, 3, 4, and 5

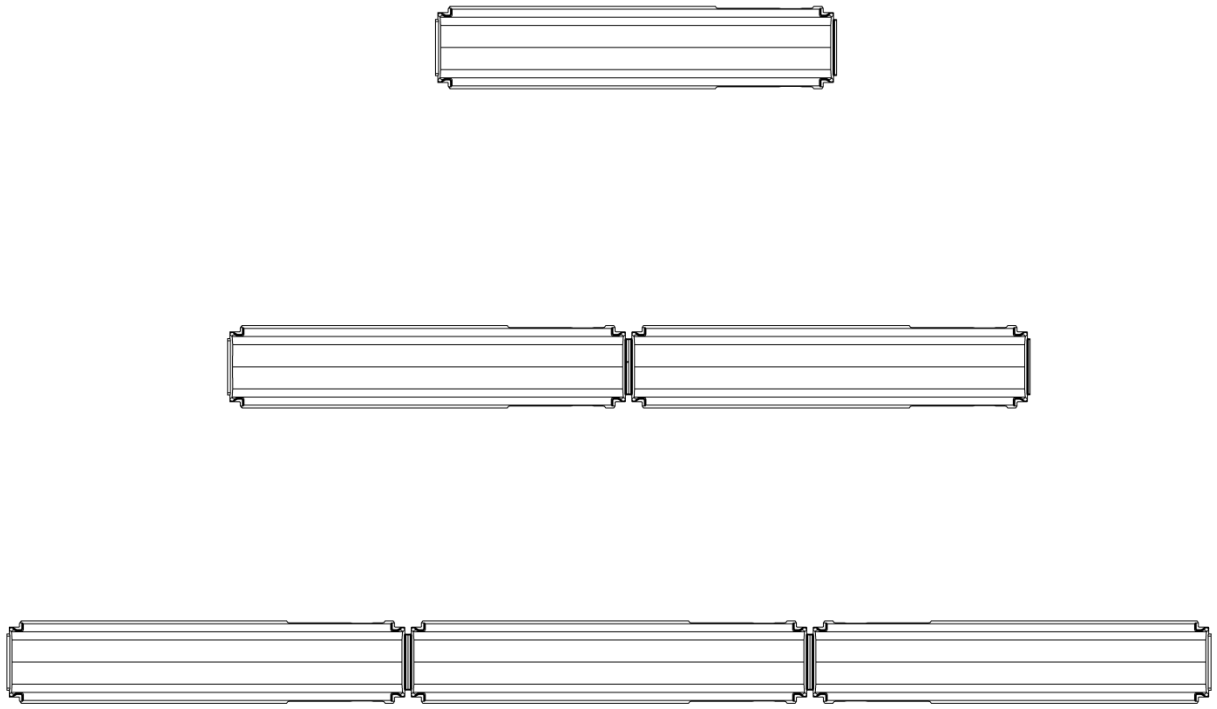


Figure 28. Possible Lens Configurations

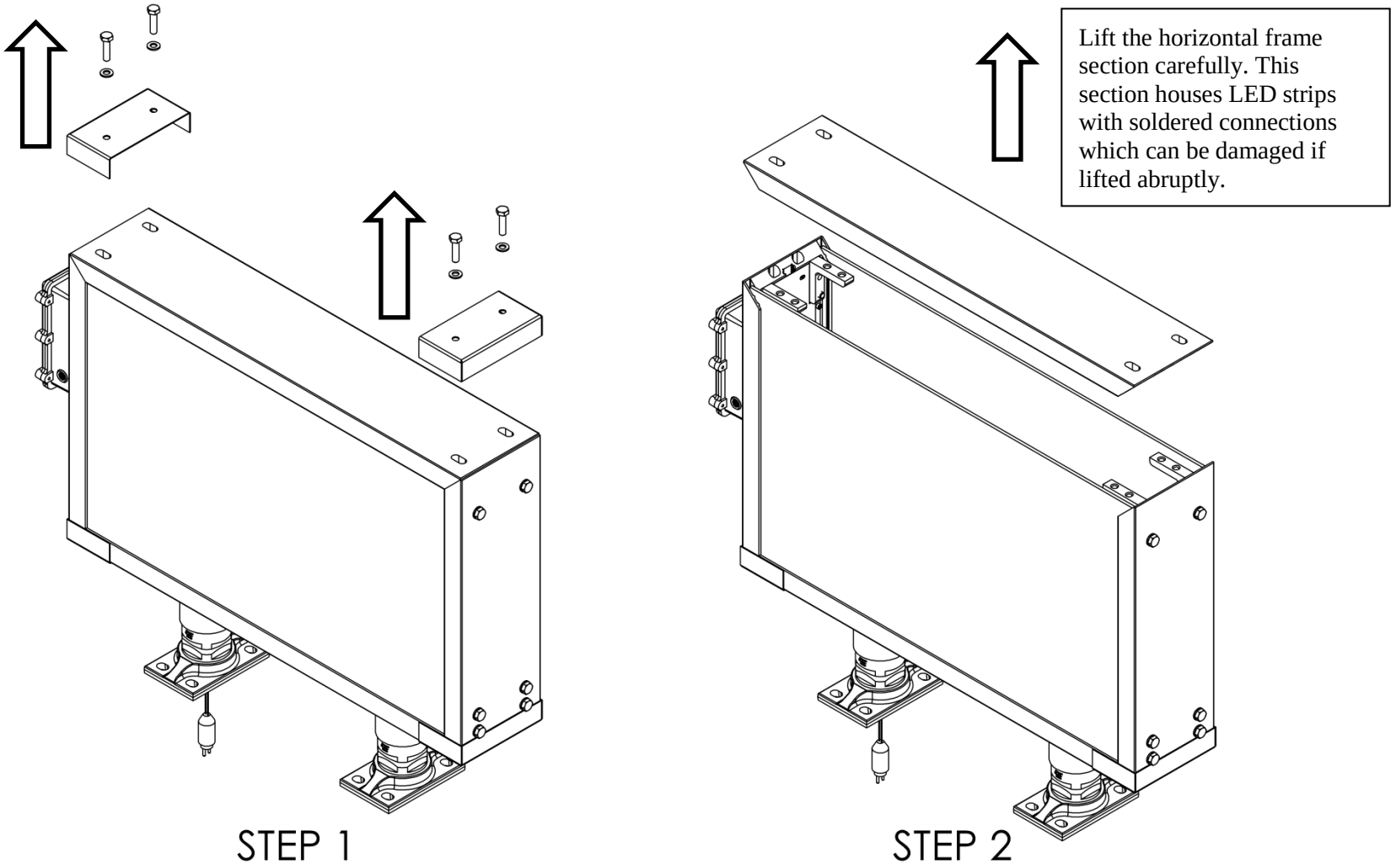


Figure 29. LED Strip Removal

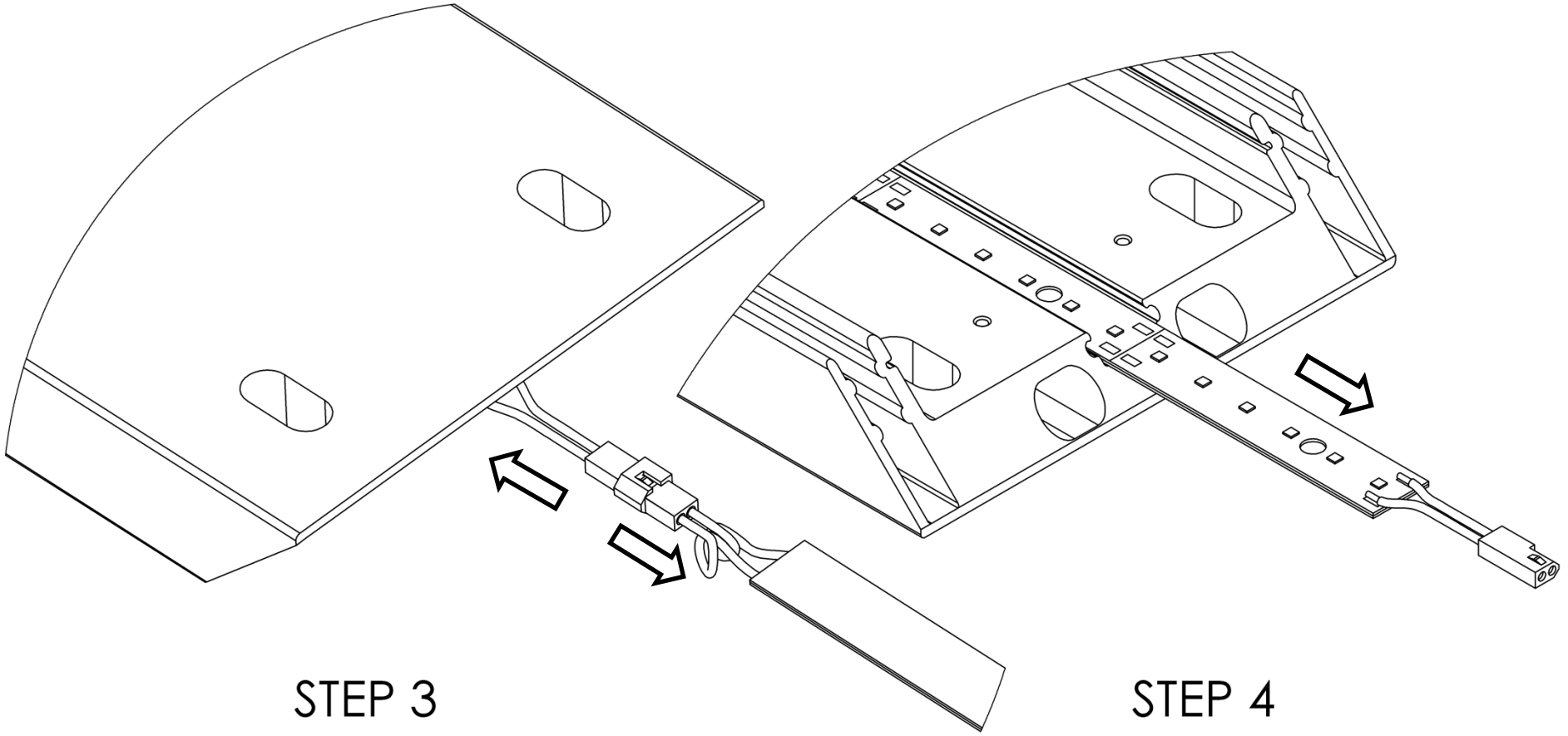


Figure 30. LED Strip Removal (cont'd)

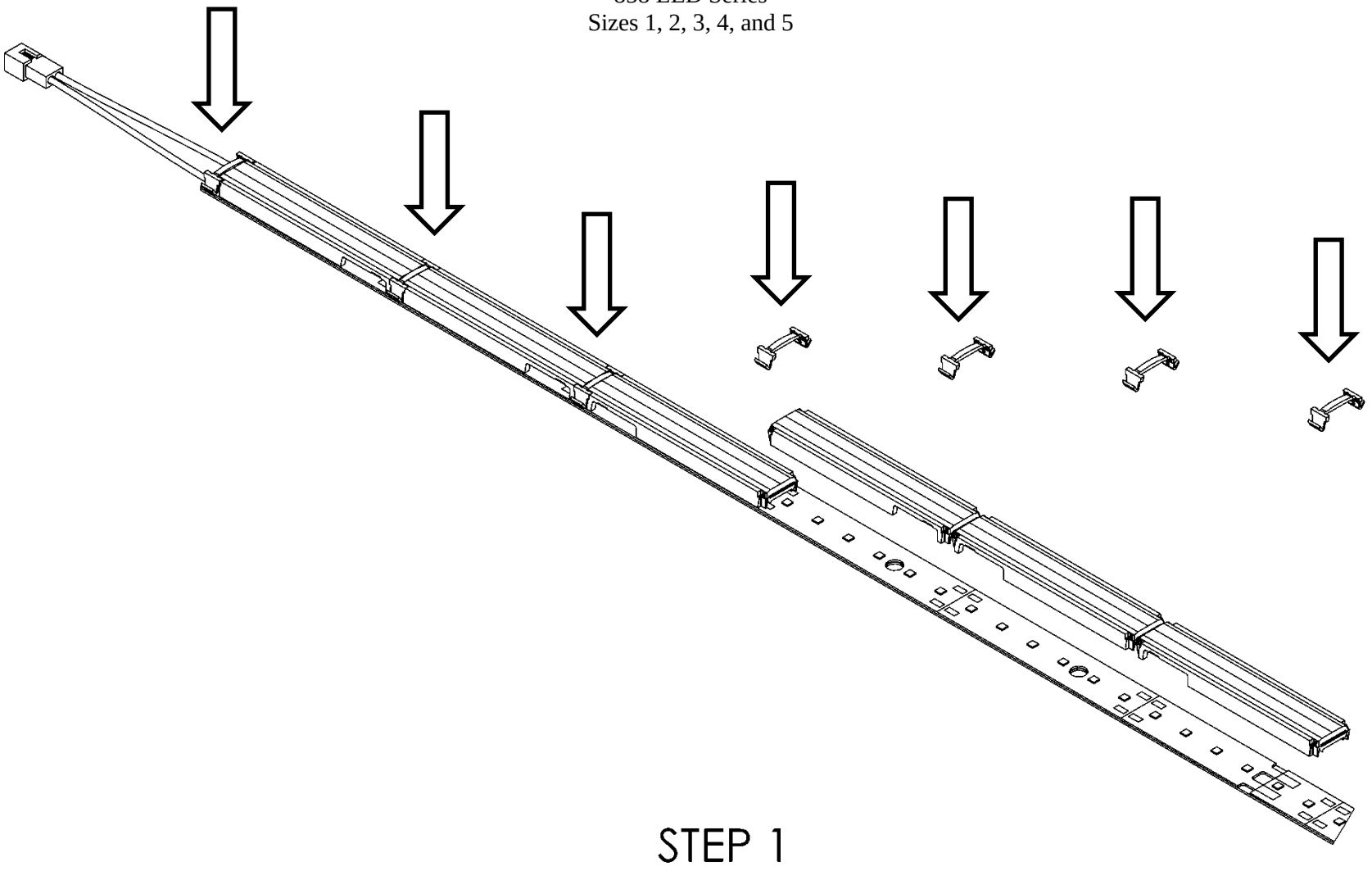


Figure 31. LED Strip to Lens Connection

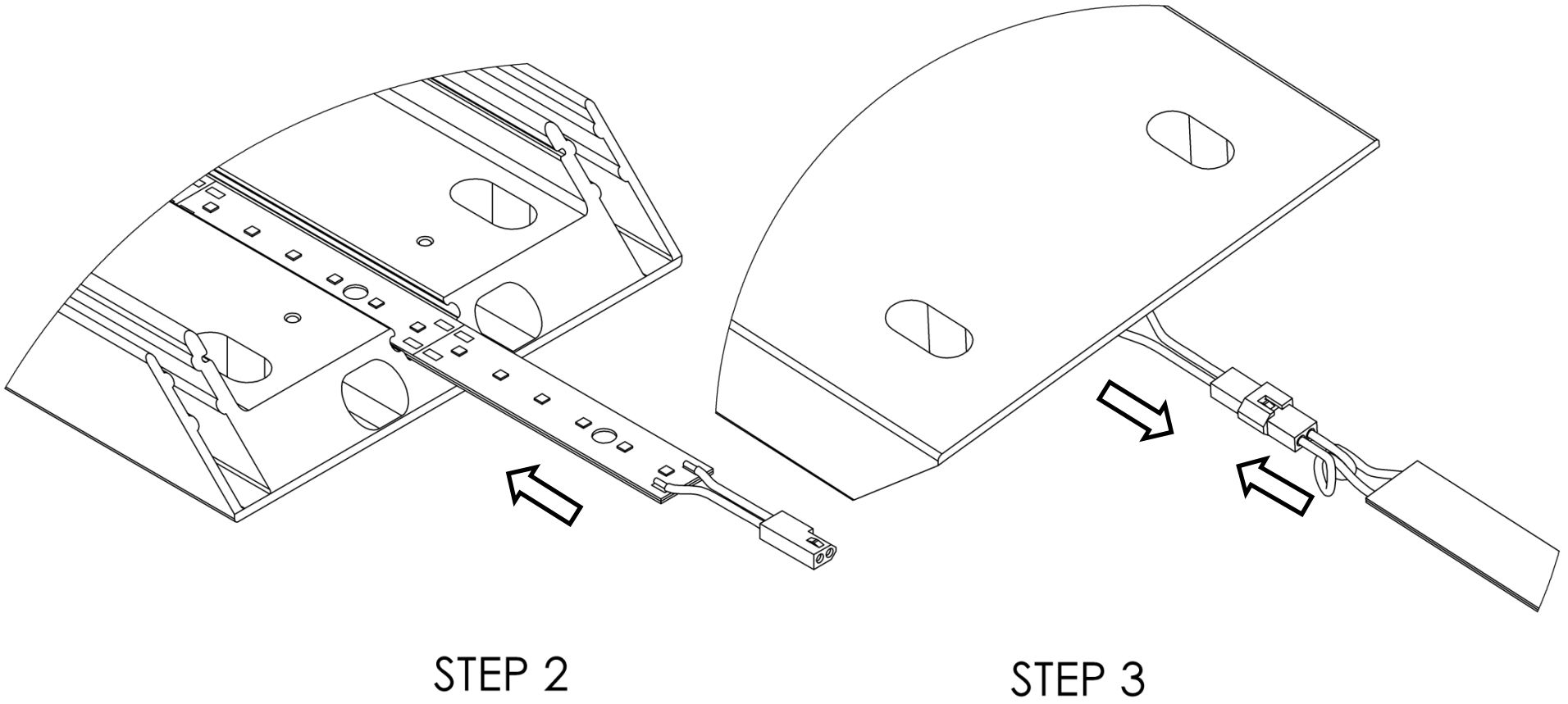


Figure 32. LED Strip Replacement

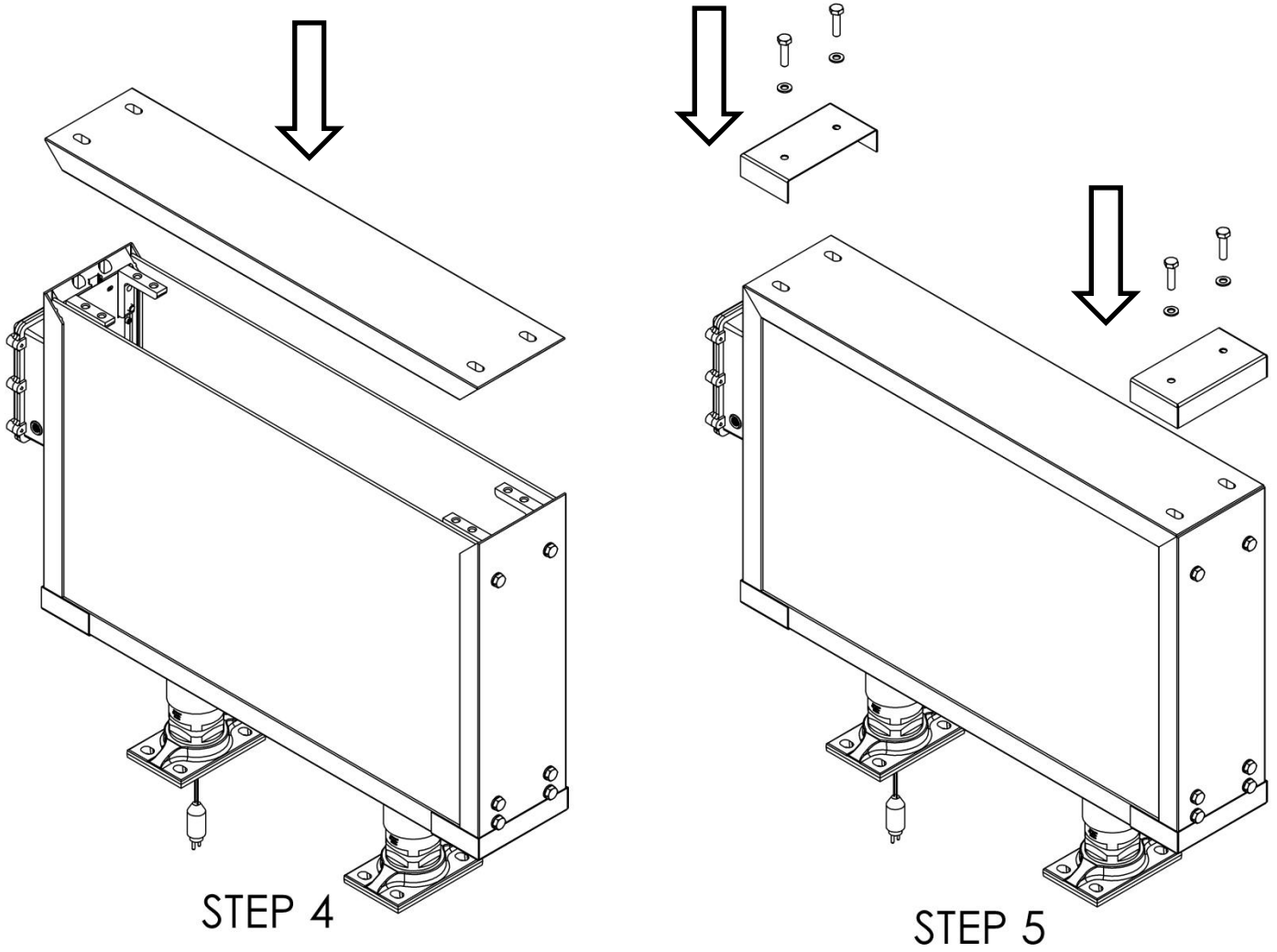


Figure 33. LED Strip Replacement (cont'd)

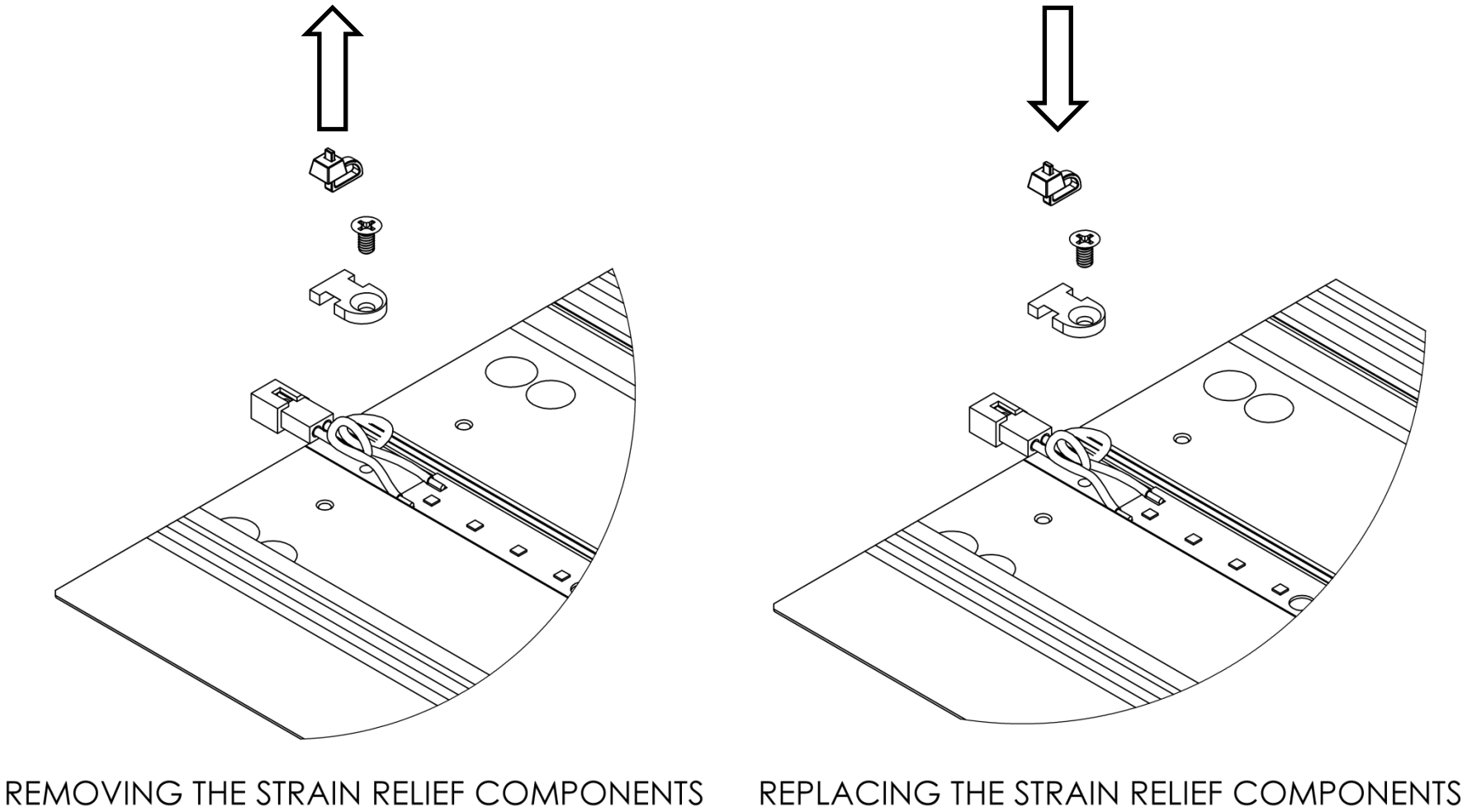


Figure 34. Strain Relief Service Loop Assembly

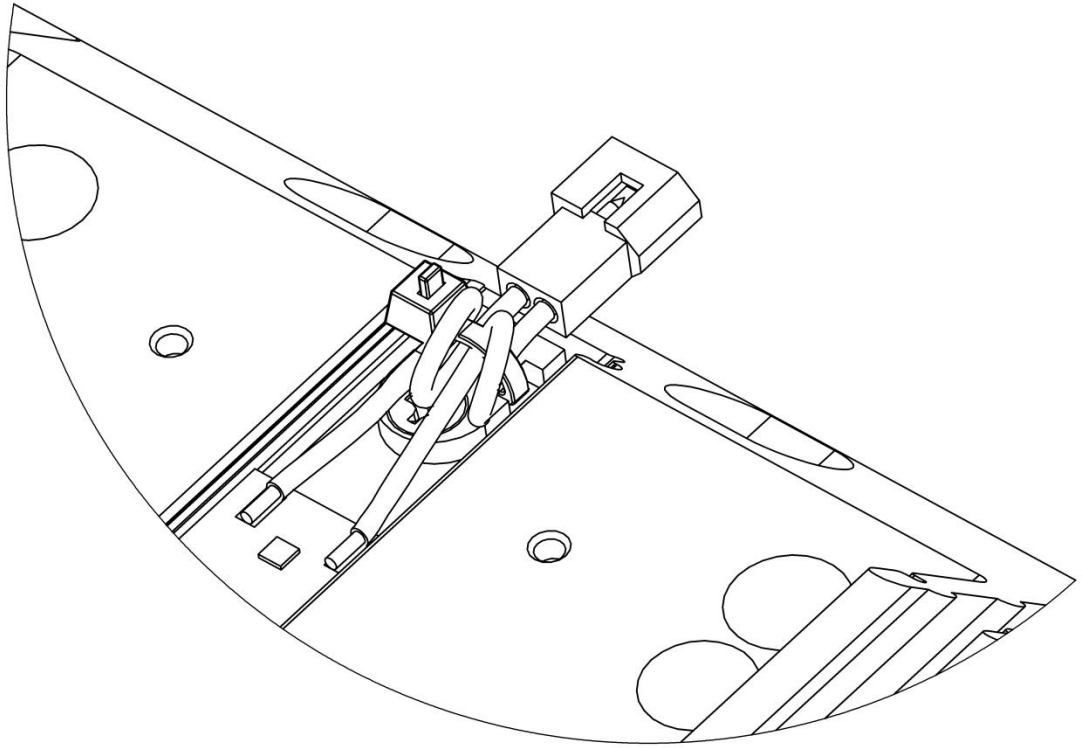


Figure 35. Strain Relief Service Loop

Figure 36. Post Frangible Event

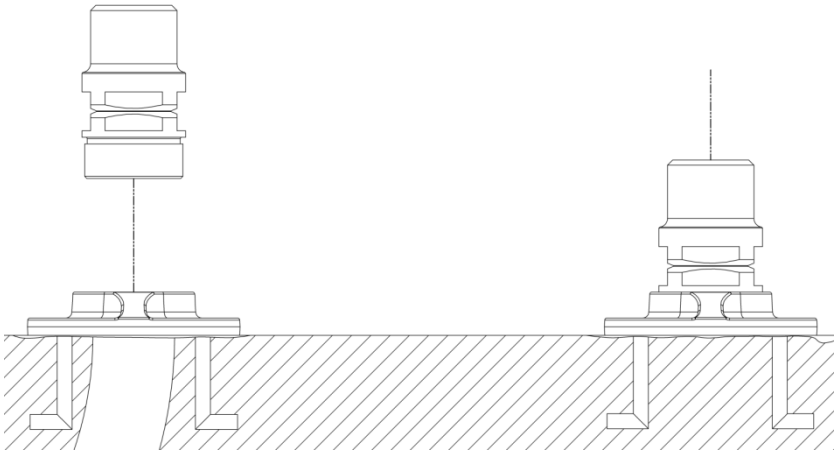


Figure 37. Frangible Event Leg Replacement

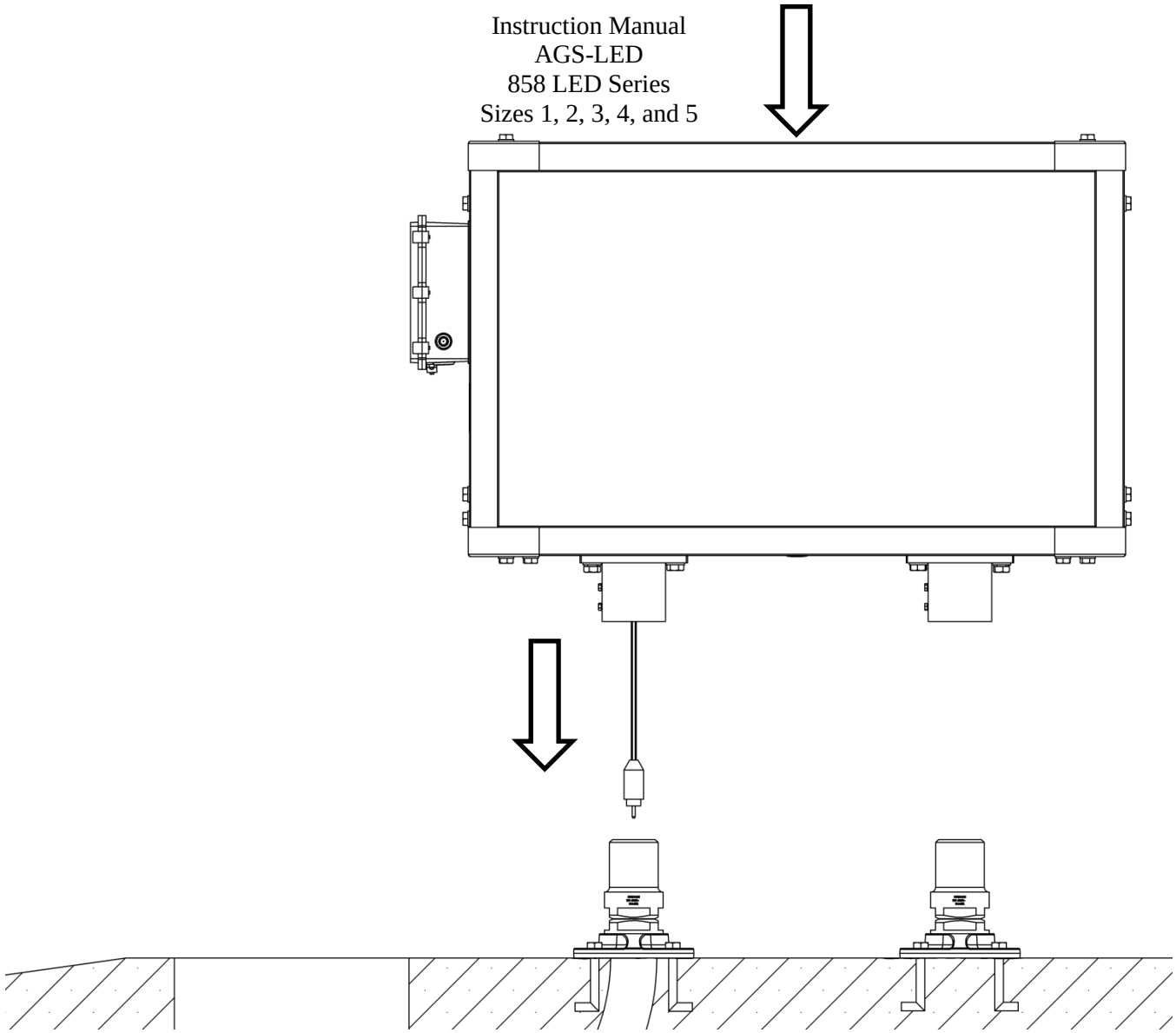


Figure 38. Frangible Event Maintenance (Internal Power Cord)

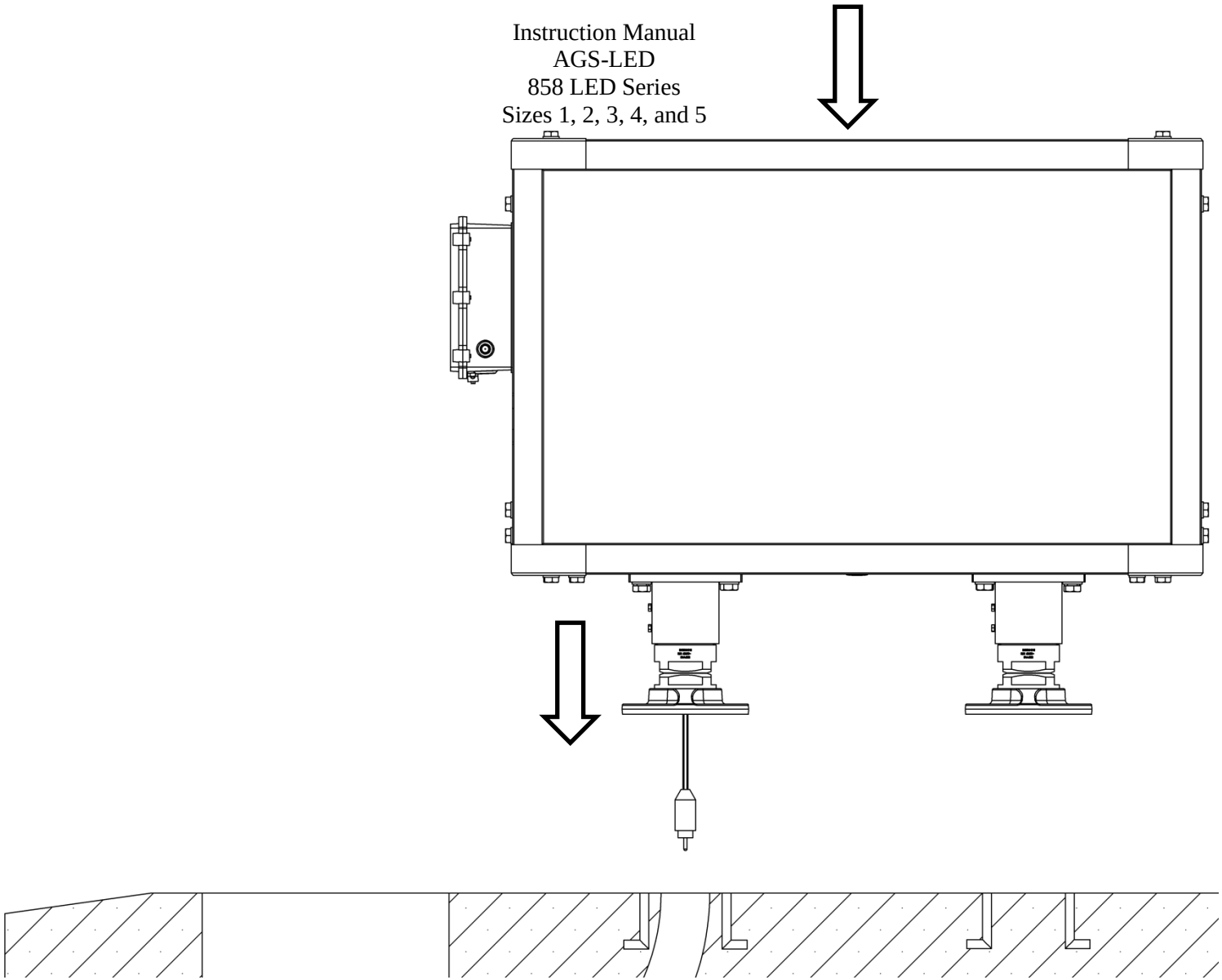


Figure 39. Frangible Event Maintenance Alt. (Internal Power Cord Alternate)

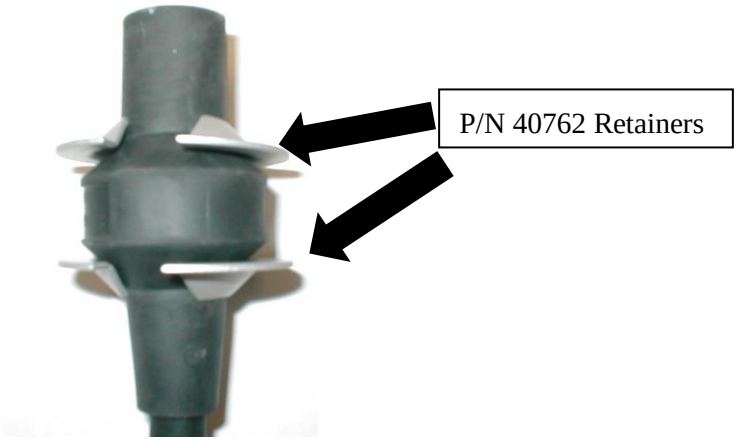


Figure 40. Retainers For Series Isolation Transformer Secondary Receptacle

For use in a 2-inch conduit elbow at the pavement to prevent the secondary receptacle cord from slipping down the elbow and to prevent pullout if power cord frangible coupling break occurs.

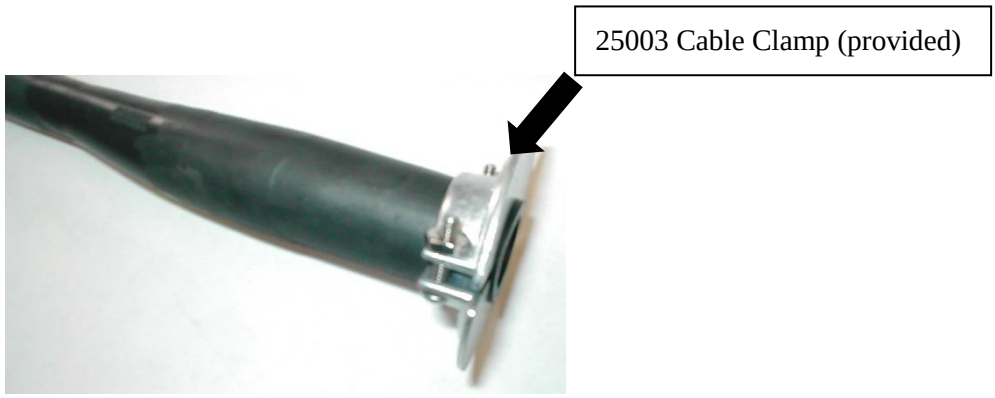


Figure 41. Cable Clamp For Series Isolation Transformer Secondary Receptacle Extension

For use in a 2-inch conduit elbow at the pavement to prevent the secondary receptacle *extension* cord from slipping down the elbow and to prevent pullout if power cord frangible coupling break occurs.

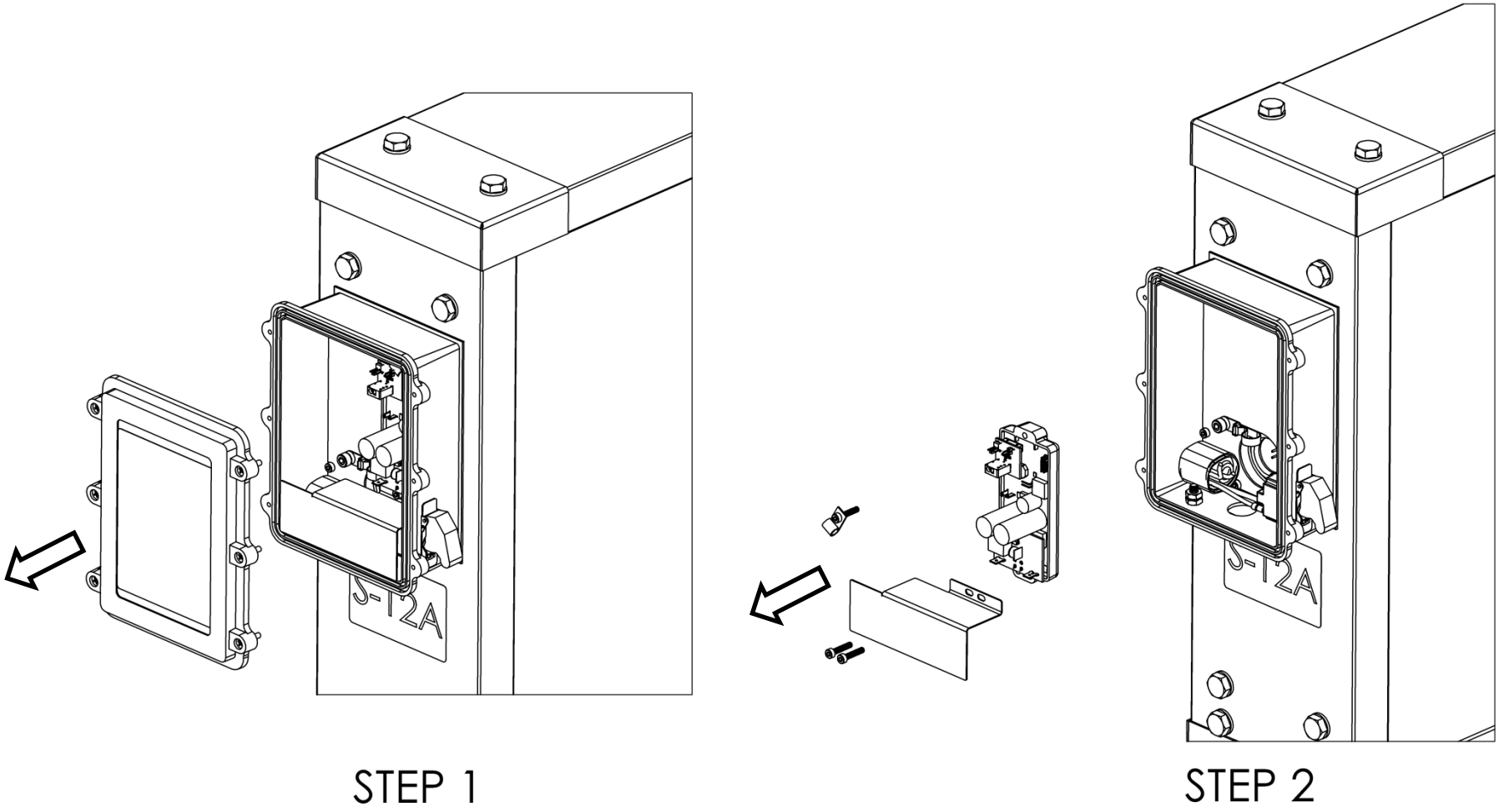


Figure 42. Power Supply Removal

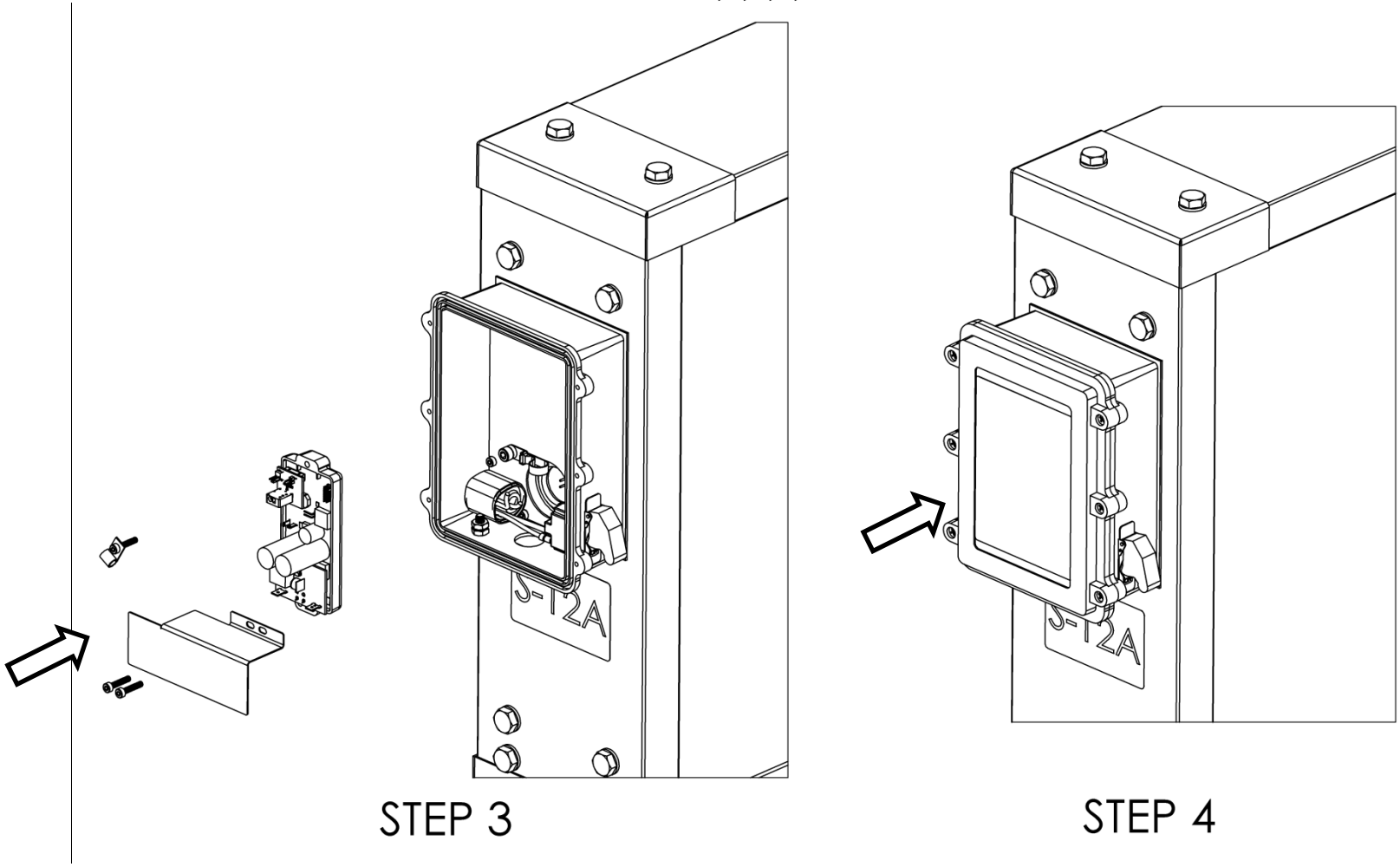


Figure 43. Power Supply Replacement

ELECTRONICS ENCLOSURE WIRING DIAGRAMS FOR FAA SIGNS WITHOUT SWITCH		
Sign Part Number	**Sign Description**	**Wiring Diagram**
858S-AP11X-10-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 1 MODULE	A
858S-AP11X-15-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 1 1/2 MODULE	A
858S-AP11X-20-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 2 MODULE	A
858S-AP11X-25-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 2 1/2 MODULE	A
858S-AP11X-30-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 3 MODULE	A
858S-AP11X-35-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 3 1/2 MODULE	A
858S-AP12X-10-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 1 MODULE	A
858S-AP12X-15-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 1 1/2 MODULE	A
858S-AP12X-20-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 2 MODULE	A
858S-AP12X-25-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 2 1/2 MODULE	A
858S-AP12X-30-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 3 MODULE	A
858S-AP12X-35-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 3 1/2 MODULE	A
858S-AP13X-10-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 1 MODULE	A
858S-AP13X-15-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 1 1/2 MODULE	A
858S-AP13X-20-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 2 MODULE	A
858S-AP13X-25-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 2 1/2 MODULE	A
858S-AP13X-30-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 3 MODULE	A
858S-AP13X-35-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 3 1/2 MODULE	A
858S-AP14X-10-X-X-X-D-X	FAA, SIZE 4 DISTANCE MARKER (40 in. NUMERAL)	A
858S-AP15X-10-X-X-X-D-X	FAA, SIZE 5 DISTANCE MARKER (25 in. NUMERAL)	A

Table 8. Electronics Enclosure Wiring Configurations for FAA Signs Without Switch

ELECTRONICS ENCLOSURE WIRING DIAGRAMS FOR FAA SIGNS WITH SWITCH		
Sign Part Number	**Sign Description**	**Wiring Diagram**
858S-AP11X-10-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 1 MODULE	B
858S-AP11X-15-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 1 1/2 MODULE	B
858S-AP11X-20-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 2 MODULE	B
858S-AP11X-25-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 2 1/2 MODULE	B
858S-AP11X-30-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 3 MODULE	B
858S-AP11X-35-X-X-X-D-X	FAA, SIZE 1 (12 in. LEGEND), 3 1/2 MODULE	B
858S-AP12X-10-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 1 MODULE	B
858S-AP12X-15-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 1 1/2 MODULE	B
858S-AP12X-20-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 2 MODULE	B
858S-AP12X-25-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 2 1/2 MODULE	B
858S-AP12X-30-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 3 MODULE	B
858S-AP12X-35-X-X-X-D-X	FAA, SIZE 2 (15 in. LEGEND), 3 1/2 MODULE	B
858S-AP13X-10-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 1 MODULE	B
858S-AP13X-15-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 1 1/2 MODULE	B
858S-AP13X-20-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 2 MODULE	B
858S-AP13X-25-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 2 1/2 MODULE	B
858S-AP13X-30-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 3 MODULE	B
858S-AP13X-35-X-X-X-D-X	FAA, SIZE 3 (18 in. LEGEND), 3 1/2 MODULE	B
858S-AP14X-10-X-X-X-D-X	FAA, SIZE 4 DISTANCE MARKER (40 in. NUMERAL)	B
858S-AP15X-10-X-X-X-D-X	FAA, SIZE 5 DISTANCE MARKER (25 in. NUMERAL)	B

Table 9. Electronics Enclosure Wiring Configurations for FAA Signs With Switch

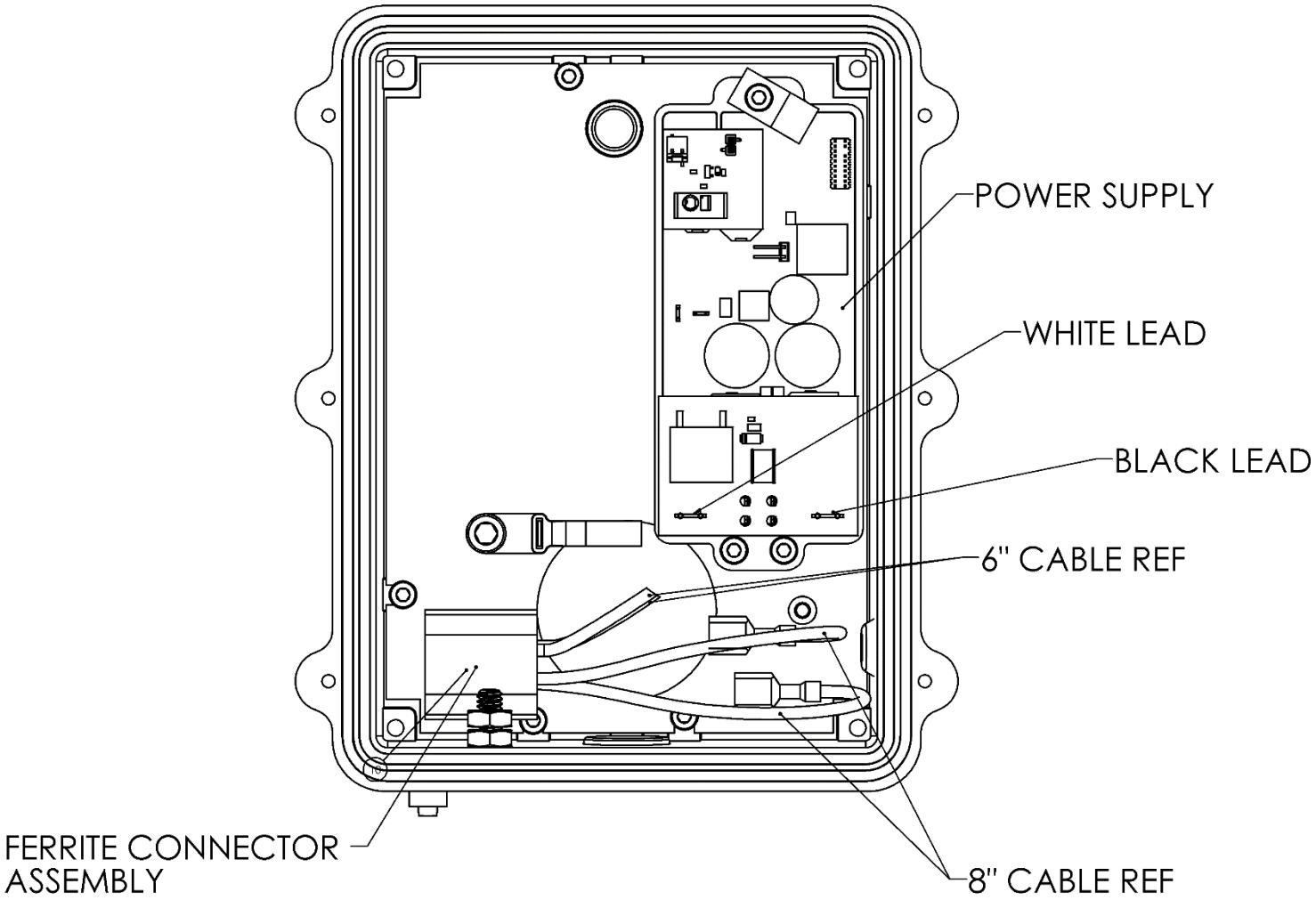


Figure 44. Electronics Enclosure Diagram A

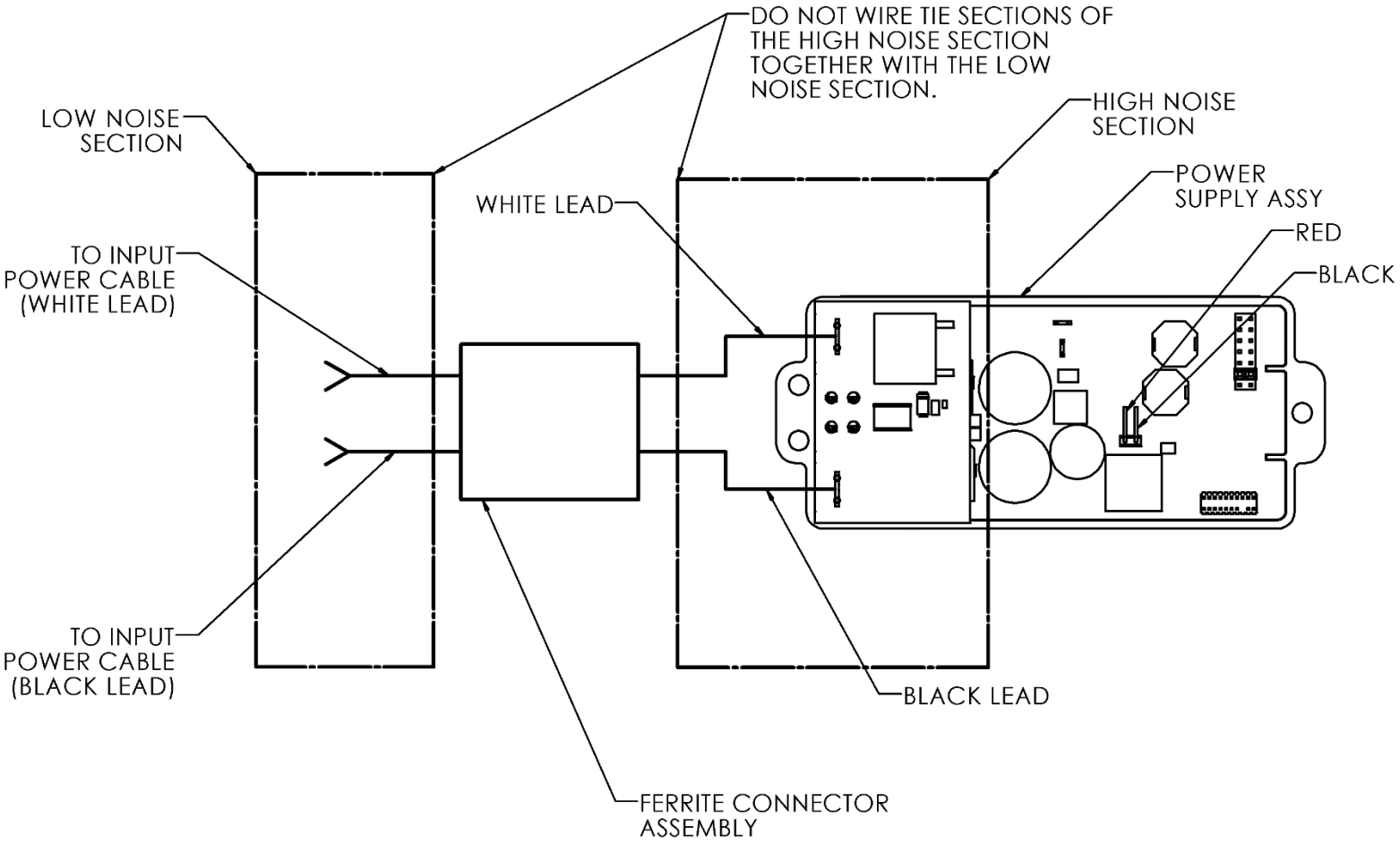


Figure 45. Electronics Enclosure Wiring Diagram A

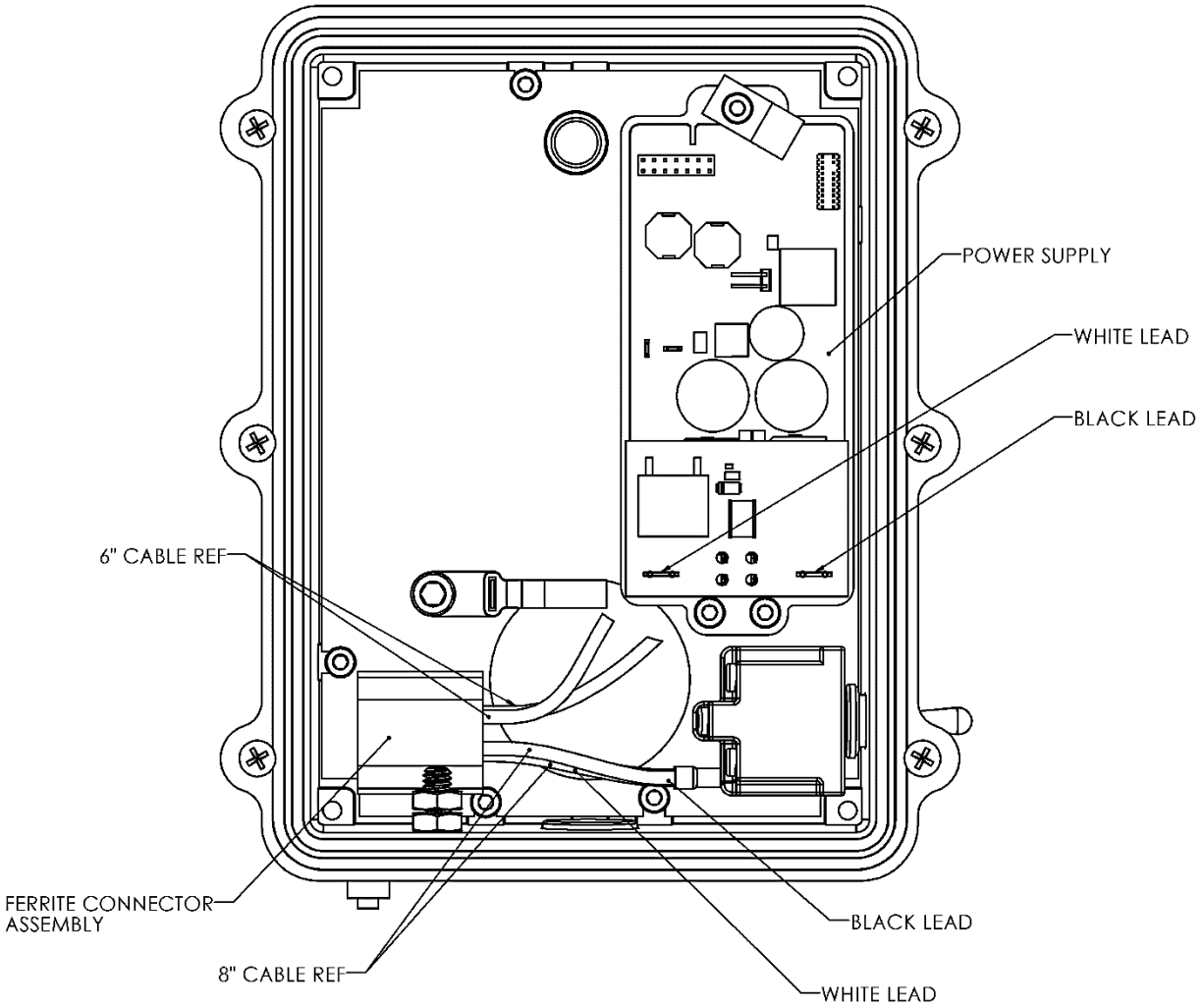


Figure 46. Electronics Enclosure Diagram B

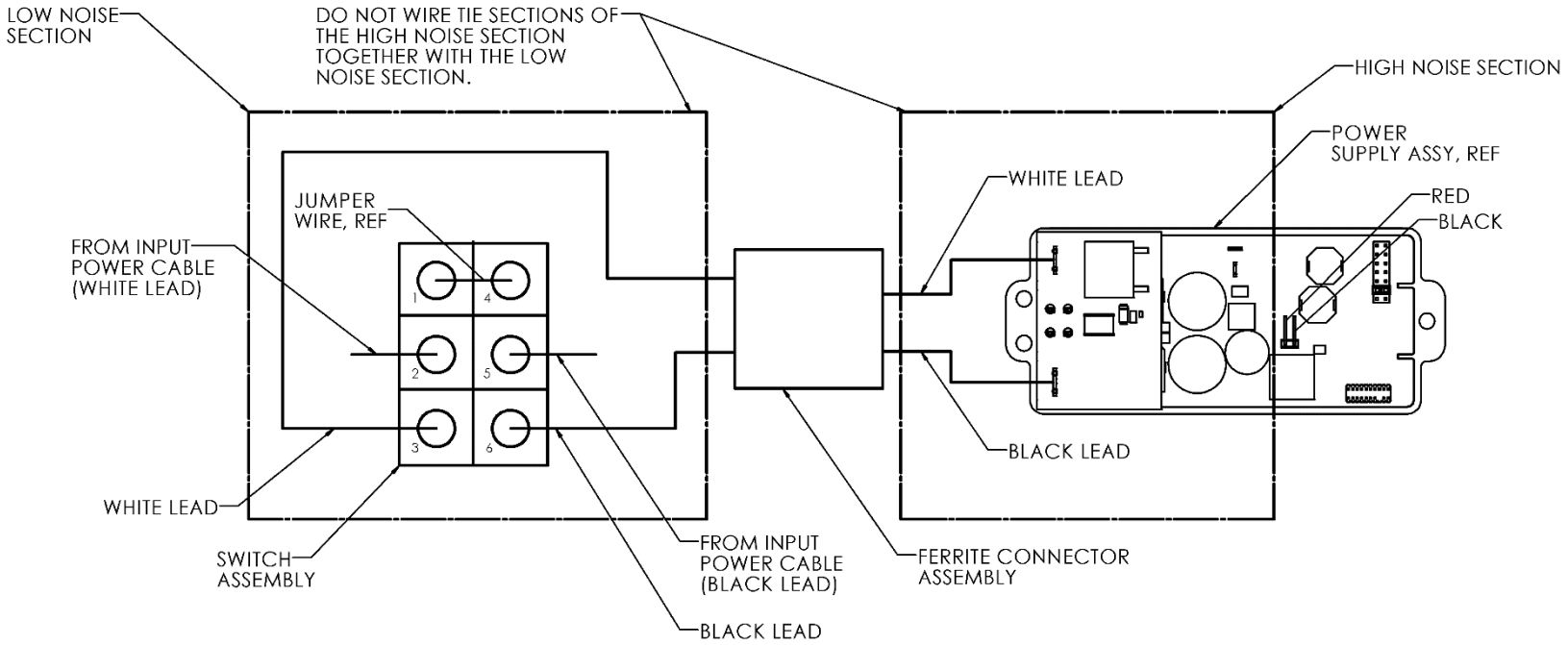


Figure 47. Electronics Enclosure Wiring Diagram B

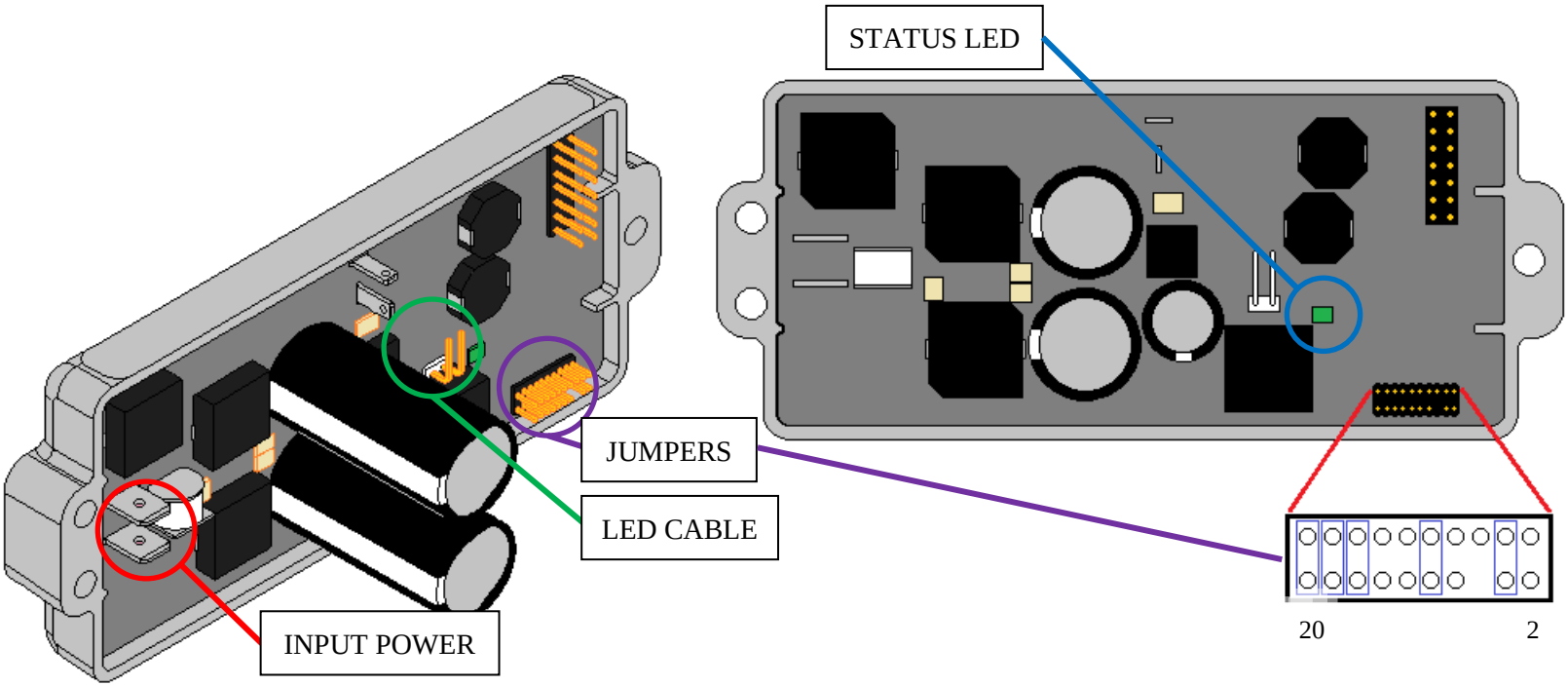


Figure 48. Power Supply Connectors and Jumper Locations

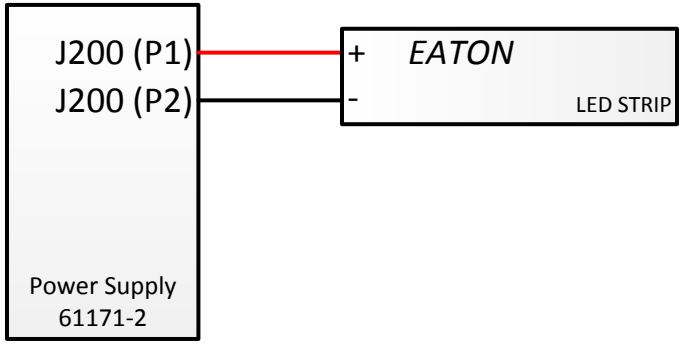


Figure 49. FAA 1 MOD LED Wiring Diagram

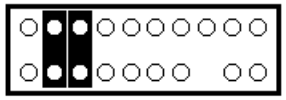
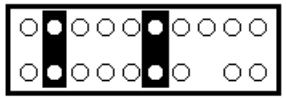
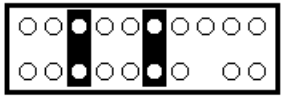
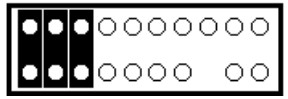
	Size 1	Size 2	Size 3 & 5	Size 4
Jumper Setting				
Typical VA (6.6A)	10.1VA	11.8VA	13.1VA	22.4VA
Isolation Transformer (5.5A)*	10/15W	10/15W	25W	45W
Isolation Transformer (3 Step)*	10/15W	25W	25W	45W
Isolation Transformer (5 Step)*	25W	30/45W	30/45W	65W

Table 10. FAA 1 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

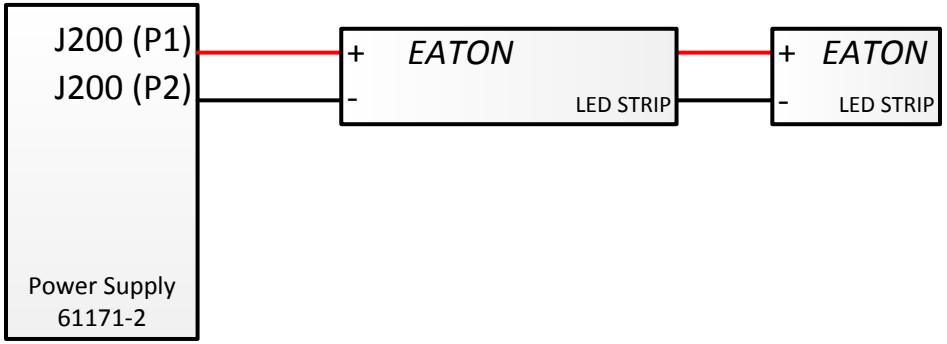


Figure 50. FAA 1.5 MOD, LED Wiring Diagram

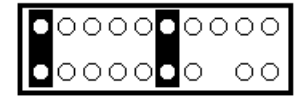
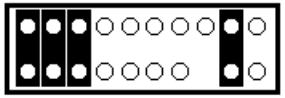
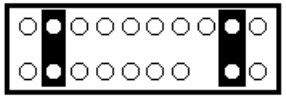
	Size 1	Size 2	Size 3
Jumper Setting			
Typical VA (6.6A)	11.4VA	13.7VA	15.4VA
Isolation Transformer (5.5A)*	10/15W	25W	25W
Isolation Transformer (3 Step)*	25W	25W	25W
Isolation Transformer (5 Step)*	30/45W	30/45W	30/45W

Table 11. FAA 1.5 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

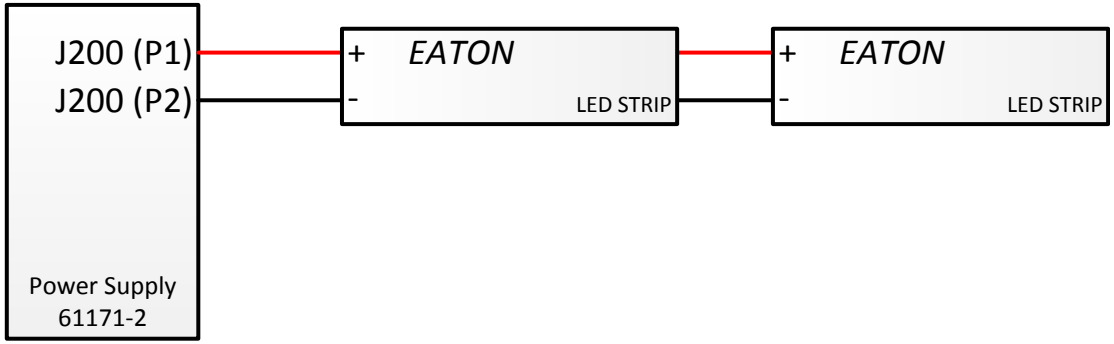


Figure 51. FAA 2 MOD, LED Wiring Diagram

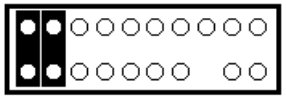
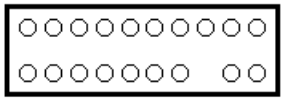
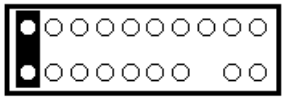
	Size 1	Size 2	Size 3
Jumper Setting	 20 2	 20 2	 20 2
Typical VA (6.6A)	12.8VA	16.3VA	18.7VA
Isolation Transformer (5.5A)*	25W	25W	25W
Isolation Transformer (3 Step)*	25W	25W	30/45W
Isolation Transformer (5 Step)*	30/45W	30/45W	30/45W

Table 12. FAA 2 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

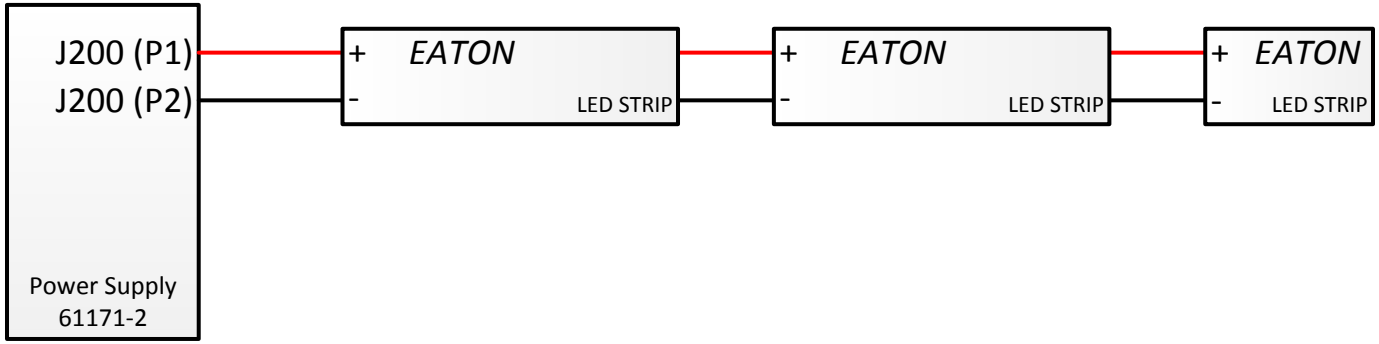


Figure 52. FAA 2.5 MOD, LED Wiring Diagram

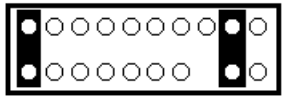
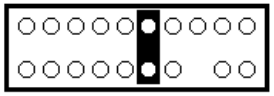
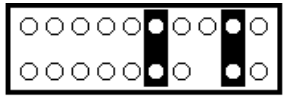
	Size 1	Size 2	Size 3
Jumper Setting	 20 2	 20 2	 20 2
Typical VA (6.6A)	14.0VA	18.0VA	21.0VA
Isolation Transformer (5.5A)*	25W	25W	30/45W
Isolation Transformer (3 Step)*	25W	25W	30/45W
Isolation Transformer (5 Step)*	30/45W	30/45W	65W

Table 13. FAA 2.5 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit

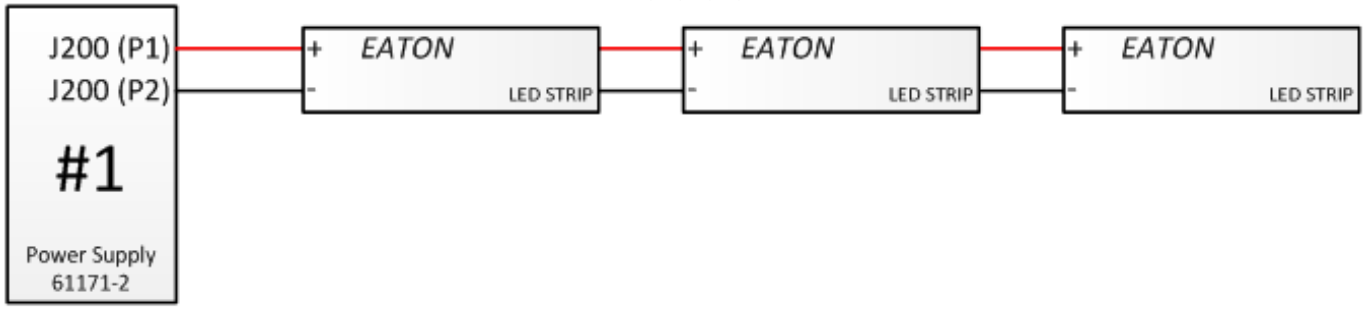


Figure 53. FAA 3 MOD, LED Wiring Diagram

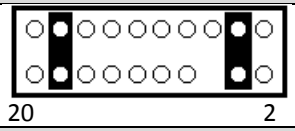
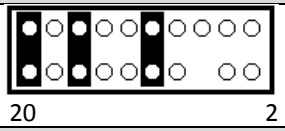
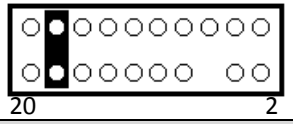
	Size 1	Size 2	Size 3
Jumper Setting			
Typical VA (6.6A)	15.4VA	20.7VA	24.2VA
Isolation Transformer (5.5A)*	25W	25W	30/45W
Isolation Transformer (3 Step)*	25W	30/45W	30/45W
Isolation Transformer (5 Step)*	30/45W	65W	65W

Table 14. FAA 3 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

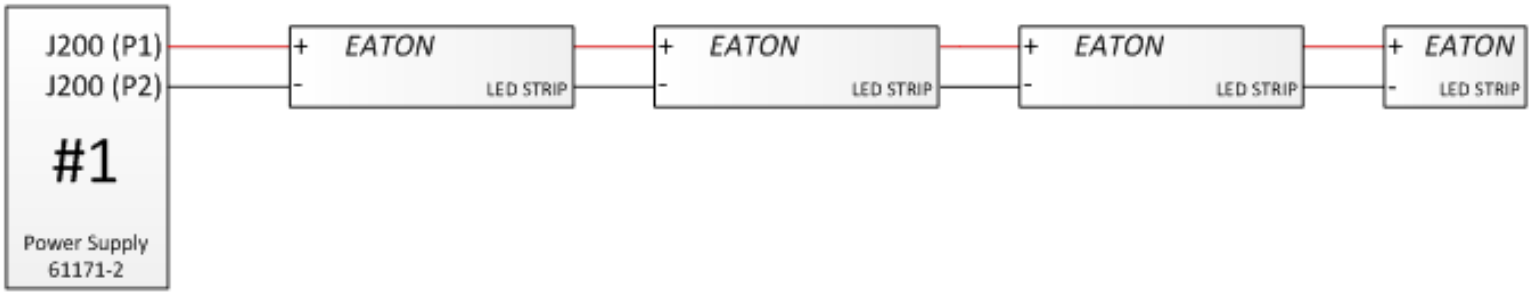


Figure 54. FAA 3.5 MOD, LED Wiring Diagram

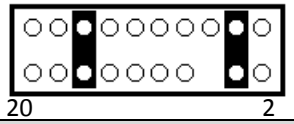
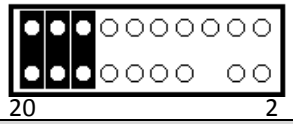
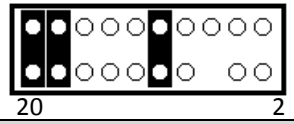
	Size 1	Size 2	Size 3
Jumper Setting			
Typical VA (6.6A)	16.6VA	22.4VA	26.6VA
Isolation Transformer (5.5A)*	25W	30/45W	30/45W
Isolation Transformer (3 Step)*	25W	30/45W	30/45W
Isolation Transformer (5 Step)*	30/45W	65W	65W

Table 15. FAA 3.5 MOD Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

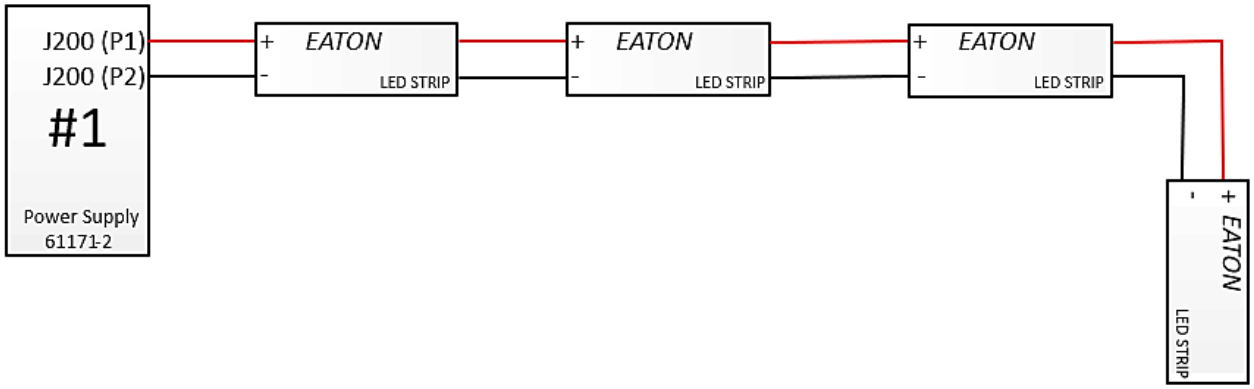


Figure 55. FAA Size 4 (DMS), LED Wiring Diagram

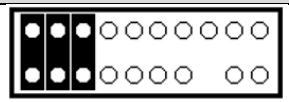
	Size 4
Jumper Setting	 20 2 Single & Double Faced
Typical VA (6.6A)	22.4VA
Isolation Transformer (5.5A)*	30/45W
Isolation Transformer (3 Step)*	30/45W
Isolation Transformer (5 Step)*	65W

Table 20. FAA DMS Jumper Settings and Apparent Power

* Isolation transformer for number of steps on a CCR. 5.5A is a dedicated sign circuit.

DESCRIPTION	PART NUMBER	WHERE USED
Frangible Leg	62473-180-D 62473-240-D 62473-300-D 62473-180-D-3 62473-240-D-3 62473-300-D-3	FAA Size 1 Signs, Mode 2 FAA Size 2 Signs, Mode 2 FAA Size 3 Signs, Mode 2 FAA Size 1 Signs, Mode 3 FAA Size 2 Signs, Mode 3 FAA Size 3 Signs, Mode 3
Power Supply (located inside electronics box)	61171-2	All Sizes
Sign Face Panel (w/Legend)	62421-X	Contact Factory with legend information
Blank Panel	62421-X	All Sizes
LED Cable – UPS to LED Strip	62437-X	All Sizes
M10 Hex Head Bolt	10000-0578	All Sizes
M12 Hex Head Bolt	21738	All Sizes
Main Power Ferrite Connector Assembly	62433-1 62433-2	All Sizes, without switch option All Sizes, with switch option
Floor Flange	62413 62451	FAA Size 4 Signs FAA Size 1, 2, 3, and 5 Signs
½” Flange Nut	62482	All Sizes
½” Lock Washer	10030-0153	All Sizes
LED and Lens Kit	62438-XXX-XX-K	All Sizes
Lenses	10037-0985	All Sizes
Lens Clips	10037-0986	All Sizes
LED Strips	62440-180-05 62440-180-10 62440-240-05 62440-240-10 62440-300-05 62440-300-10 62440-480-10	See **Figure 27, pg. 64** for where used information
Tether	60984	All Sizes, See **Figure 1, pg. 15**, for Tether Options.

Table 16. Spare Parts List

Fastener Size	Fastener Type	Location on Sign	Torque [N-m]	Torque [ft-lb]	Torque [in-lb]	Tolerance [%]
M4	Flat Head Screw	Electronics Enclosure Cover	2.0	1.5	18	+10/-0
M5	Socket Head Cap Screw	Electronics Enclosure Mounting to Sign	1.7	1.3	15	+10/-0
M4	Socket Head Cap Screw	Electronics Enclosure Electrical Components	2.0	1.5	18	+10/-0
M6	Socket Head Cap Screw	Electronics Enclosure Electrical Components	8.1	6.0	72	+10/-0
M6	Hex Head Cap Screw	Angle and Support Brackets Inside Sign	8.1	6.0	72	+10/-0
M10	Hex Head Cap Screw	Sign Body Extrusions	26.8	19.8	237	+10/-0
M12	Hex Head Cap Screw	Leg Plates on Bottom of Sign Body, Sign mounting anchor stud, safety tether mounting anchor studs	54.2	40.0	480	+10/-0
1/2”	Flange Nuts	Anchor Studs	62.1	45.8	550	+10/-0
M5	Hex Head Cap Screws	Leg Connector	4.3	3.2	38	+10/-0

Table 17. Torque Values

Sign Size/# Mod	Force in Lbs	Force in Newtons
FAA Size 1, 1.0 Module	3,204	720
FAA Size 1, 1.5 Module	4,787	1,076
FAA Size 1, 2.0 Module	6,450	1,456
FAA Size 1, 2.5 Module	8,048	1,808
FAA Size 1, 3.0 Module	9,669	2,174
FAA Size 1, 3.5 Module	11,267	2,533
FAA Size 2, 1.0 Module	5,134	1,154
FAA Size 2, 1.5 Module	7,677	1,726
FAA Size 2, 2.0 Module	10,341	2,325
FAA Size 2, 2.5 Module	12,906	2,901
FAA Size 2, 3.0 Module	15,503	3,485
FAA Size 2, 3.5 Module	18,068	4,062
FAA Size 3, 1.0 Module	7,540	1,695
FAA Size 3, 1.5 Module	11,290	2,538
FAA Size 3, 2.0 Module	15,190	3,415
FAA Size 3, 2.5 Module	18,963	4,263
FAA Size 3, 3.0 Module	22,776	5,120
FAA Size 3, 3.5 Module	26,548	5,968
FAA Size 4 DMS	12,851	2,889
FAA Size 5 DMS	7,497	1,605

Table 18. Estimated Max Sustained Force on the Sign Body (Does Not Include Safety Margin), Mode 2

Derived from: $C_d = \frac{F_d}{\frac{1}{2}\rho V^2 A}$

F_d (Max Sustained Force) → See **Table 18**
A (Area of Sign Face) → Varies depending on Sign Size and # of Modules

V (Max Wind Speed) = 107.3 m/s
ρ (density of dry air at 20°C) = 1.2047 kg/m^3
C_d (Coefficient of Drag for 1.0 and 1.5 Modules) = 1.16
C_d (Coefficient of Drag for 2.5, 3.0, and 3.5 Modules) = 1.17

		Modules					
		1	1.5	2	2.5	3	3.5
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
		(kg.)	(kg.)	(kg.)	(kg.)	(kg.)	(kg.)
Size	1	80	110	135	170	190	225
		(36)	(50)	(61)	(77)	(86)	(102)
	2	100	135	170	205	240	275
		(45)	(61)	(77)	(93)	(109)	(125)
	3	120	165	205	250	290	335
		(54)	(75)	(93)	(132)	(132)	(152)
	4	190					
		(86)					
	5	120					
		(54)					

Table 19. AP1 Sign Approximate Weights

12 Installation Hardware Accessories Technical Information

Sign to Airfield Fastening Hardware

Anchor bolts or some other fastening hardware is needed to fasten the sign to the airfield. We recommend Strong-Tie®, Strong Bolt 2® Series, ½", 316 Stainless Steel anchor studs for anchoring the Eaton Crouse-Hinds sign to the concrete pad.

For **Strong-Tie® Strong Bolt 2® Anchor Studs** installation instructions, refer to the Strong Bolt 2® link on the following webpage:
http://www.strongtie.com/products/anchorsystems/order/download.html?source=anchosystemshp

Flange Nuts

18-8 Stainless Steel "flange nuts" ½"-13 UNC, are needed for securing the sign to the anchor studs. Use this in place of the nut supplied with the Strong Anchor studs, Eaton p/n 62482.

2-piece Lock-Washers

½" Stainless Steel 2-piece lock-washers are needed to prevent the ½" flange nuts from loosening. Use oversized ½" Heico 2-piece lock washers or Nord-Lock 2-piece lock washers, Eaton p/n 10030-0153.

Grounding Wire

12 AWG green yellow grounding extension wire is supplied with the sign to extend sign grounding wire to adjacent grounding rod. This wire may be replaced with a grounding wire of a different color, as long as the new wire is at least 12 AWG, or equivalent, minimum.

Heat Shrink Kit

Heat Shrink Kits are recommended for retention of series circuit primary field connections. See the Crouse-Hinds Sales Catalog for our "HSK" Heat Shrink Kit.

Conduit Elbow

A 2" [50mm] conduit elbow is recommended to be installed between the Isolation Transformer Housing and the power leg. This will prevent the housing from being installed directly under the sign, allowing ease of maintenance of the isolation transformer.