INSTALLATION & MAINTENANCE INSTRUCTIONS

OVERWATCH HEFPD

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INTRODUCTION

Dairyland's Overwatch™ HEFPD (High-Energy Fault Protection Device) is a Class 2000 or Class 4000 AC fault protection device as defined by the American Railway Engineering and Maintenance-of-Way Association (AREMA) Communications & Signals Manual of Recommended Practices, Part 11.3.7. The Overwatch HEFPD also complies with the applicable portions of AREMA Manual Part 11.3.1 for primary lightning surge protection.

Dairyland is a leader in the field of high-energy AC fault protection, AC mitigation, and over-voltage protection with over 40 years of experience and a reputation for reliability.

Please read this entire document before beginning installation of the Overwatch HEFPD. It may also be helpful to reference the High-Energy Rail Fault Protection Application Guide or Technical Literature available at dairyland.com.

⚠ WARNING

Safety precautions during installation or service are the responsibility of those performing the work. Consult appropriate railroad or industry authority for applicable safety measures.

OPERATION

The Overwatch™ HEFPD operates as a voltage triggered switch. The trigger voltage (also known as the Voltage Break Point – V_{BP}) is the voltage at which the device will switch from its normally open state to closed (or shorted). Once the voltage has decreased below this trigger level, the Overwatch automatically returns to the open state.

INSTALLATION CONFIGURATIONS

The Overwatch HEFPD is designed to allow the user various options when installing. The installation configuration chosen will determine the AC fault current rating and the ramifications should an AC fault or lightning surge exceed product ratings. The following section provides detailed information on rail-to-ground, rail-to-rail, and isolation joint applications.

Rail-to-ground Applications

Figures 1A, 1B, and 1C are illustrations of the installation options for using an Overwatch to protect bungalow signaling equipment. A dual-channel Overwatch is installed between the tracks and the bungalow using the track signaling wires. The key difference in these configurations is where the AC fault fuse is within the connected circuit and what happens when an AC fault event exceeds the product's ratings such that failure of the high-energy suppression components (in the AC fault module) is likely. Therefore, these allowable configurations allow the user to choose what is best for their particular application.

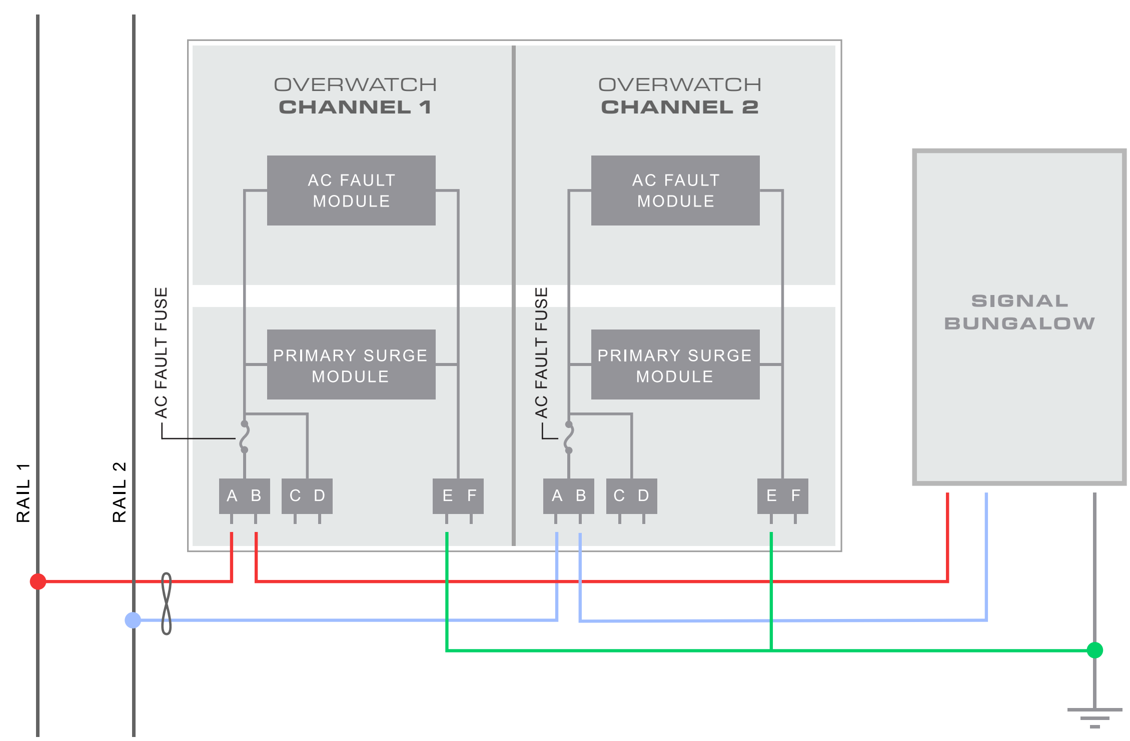

Figure 1A

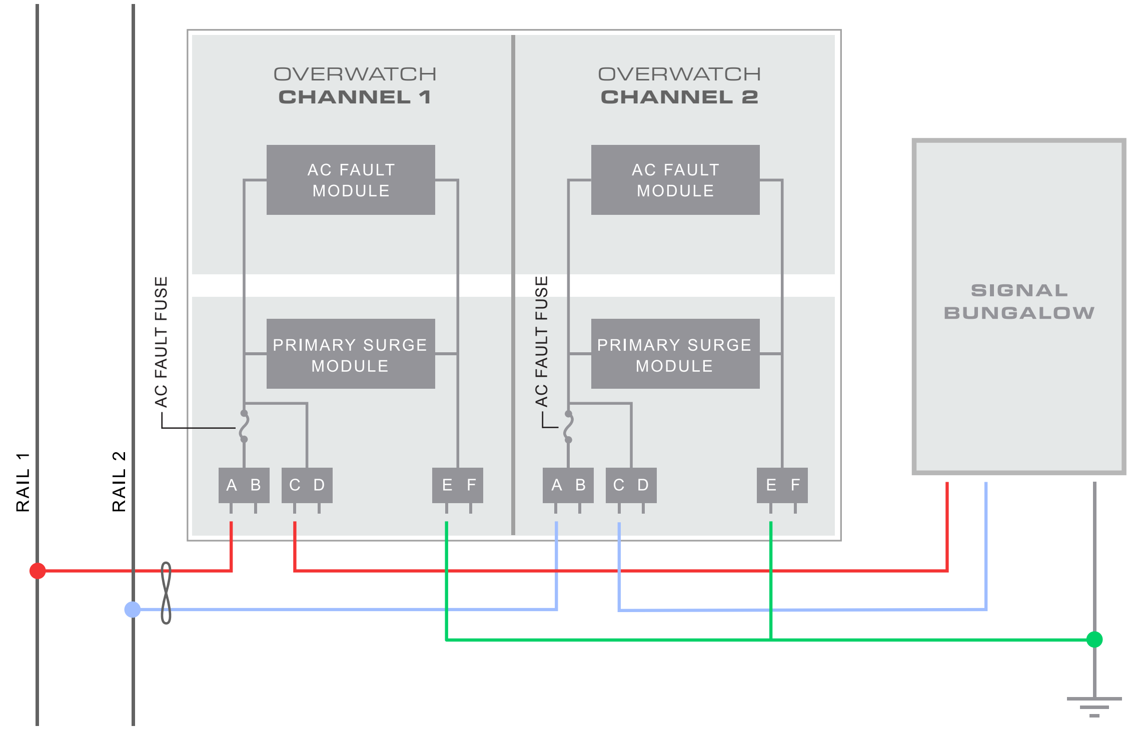

Figure 1B

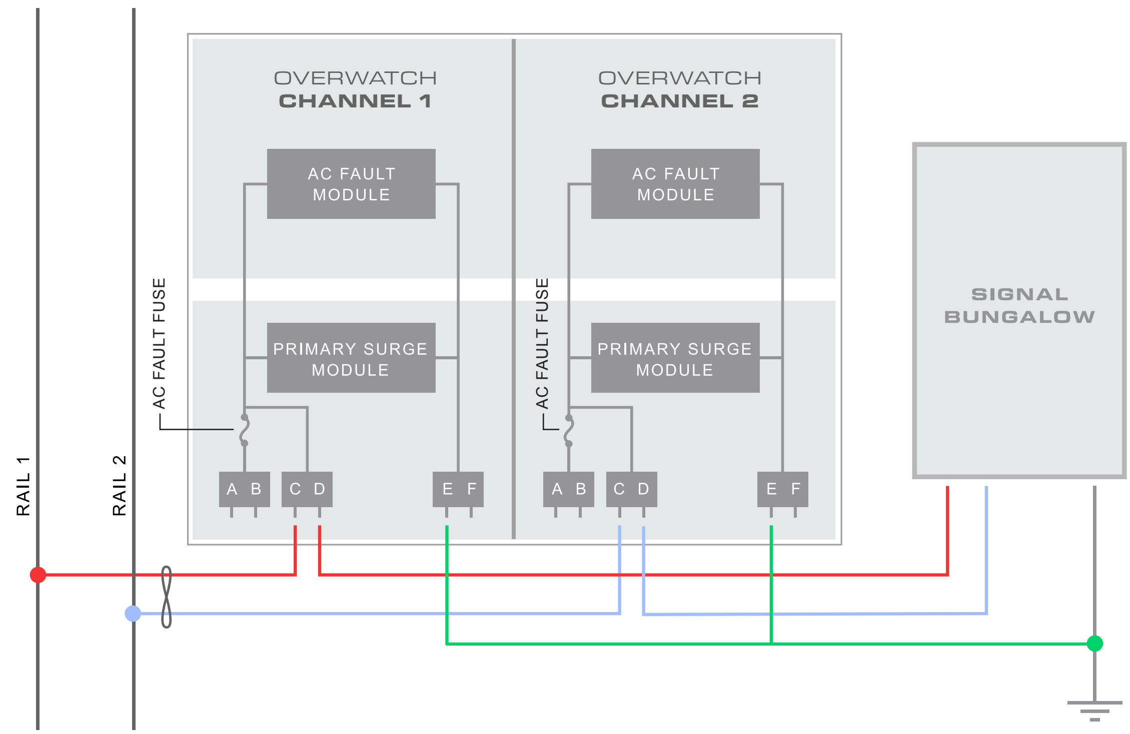

Figure 1C

Table 1 below identifies connections for a single-channel of the Overwatch. Identical connections for each channel should be used when employing a dual-channel device (as shown in the above illustrations).

TABLE 1: RAIL-TO-GROUND APPLICATION

	INCOMING FROM RAIL	TO BUNGALOW SIGNALING	TO GND	AC FAULT FUSE IN CIRCUIT?	AC FAULT RATING (AMPS)	RESULT IF AC FAULT EVENT EXCEEDS AC FAULT CURRENT RATING
Figure 1A	A	B	E or F	Yes	2000	1. AC fault fuse opens, taking the Overwatch out of circuit 2. Bungalow signaling **remains connected** to rail 3. Bungalow signaling **is subject to** excess/ additional fault energy
Figure 1B	A or B	C or D	E or F	Yes	2000	1. AC fault fuse opens, taking the Overwatch out of circuit 2. Bungalow signaling is **disconnected** from rail 3. Bungalow signaling is **protected from** excess/ additional fault energy
Figure 1C	C	D	E or F	No	4000	1. AC fault fuse does NOT open (not in circuit) 2. Bungalow signaling **remains connected** to rail 3. Possibility of low impedance rail-to-GND short if exposed to fault above 4kA/12 cycles.

4-WIRE RAIL-TO-GROUND APPLICATION

Figure 2 illustrates a basic four-wire bidirectional approach. In this application, two dual-channel devices are employed to fully protect the bungalow signaling. The rail-to-ground connection configuration options for each of the devices employed here are identical to those shown in Table 1. Shown here is only one of the three available options (equivalent to Figure 1A above).

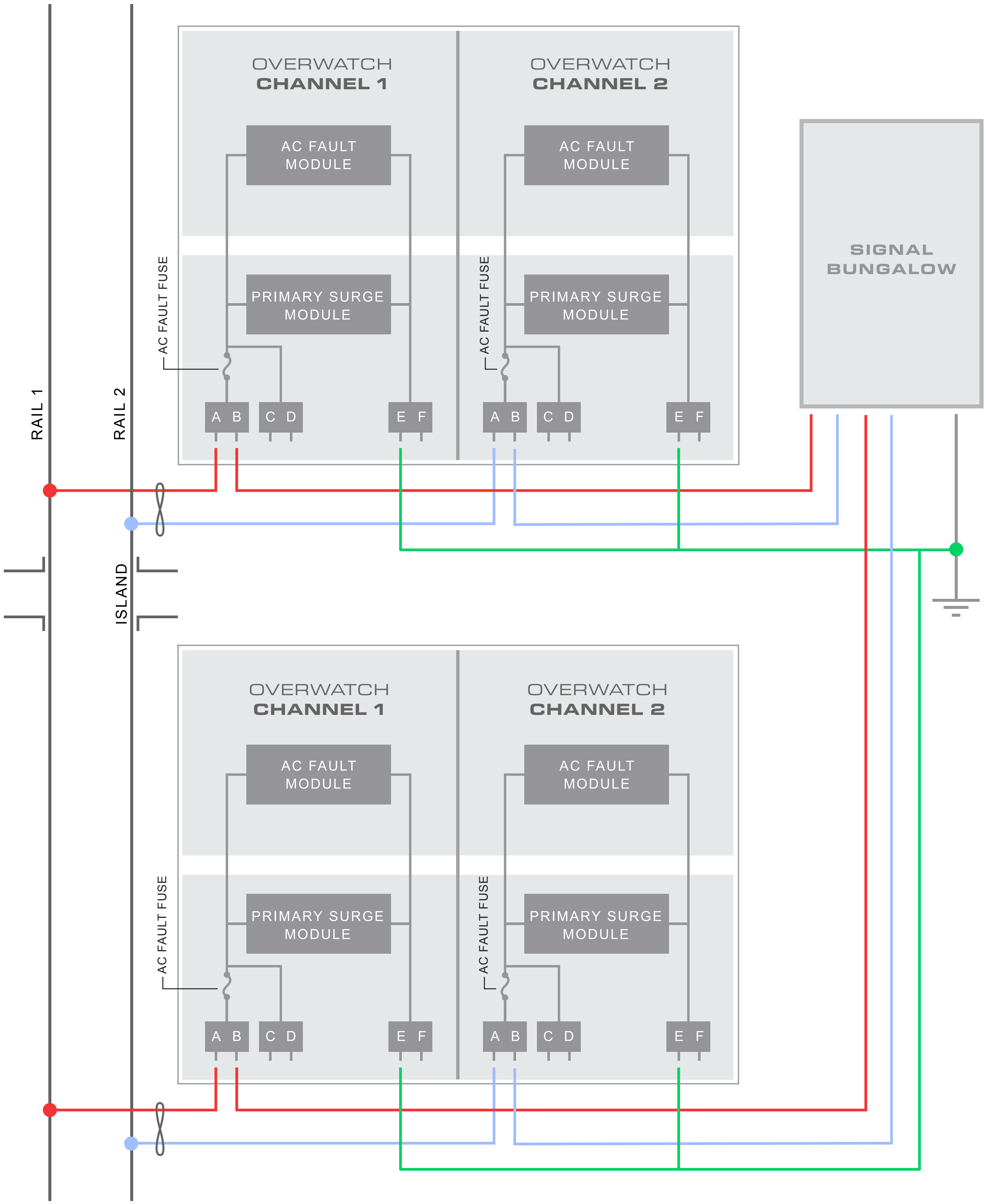

Figure 2

EQUALIZER APPLICATION — ON TRACK SIGNAL WIRES

Figures 3A, 3B, and 3C illustrate the Overwatch HEFPD installed as an equalizer. In this application, the maximum AC voltage differential seen by the bungalow signaling is 100V-AC rms (or 142V peak). If a different maximum voltage differential (trigger voltage) is desired, contact Dairyland.

Note that in some cases using two Overwatch channels – one from each rail to ground - would limit the voltage from rail-to-rail to a much lower level than using one Overwatch channel as an equalizer. With two rail-to-ground connections, overvoltage conditions will typically trigger both channels of the device, limiting the rail-to-rail voltage to approximately +/- 10% of the trigger voltage (or about 28 Volts worst case). With a single device channel connected as an equalizer, the rail-to-rail voltage will reach the full trigger voltage, or 142 Volts peak, before conduction.

Table 2 highlights the configuration options available when using the Overwatch as an equalizer. Note that the basic schematics here only require a single-channel device.

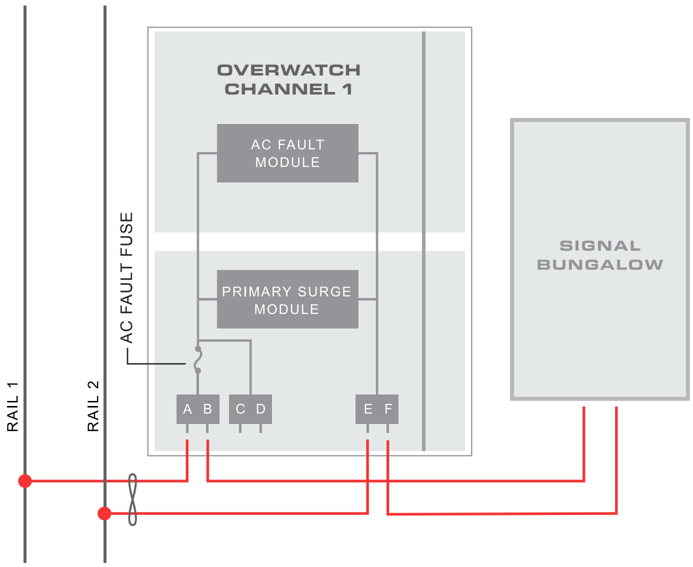

Figure 3A

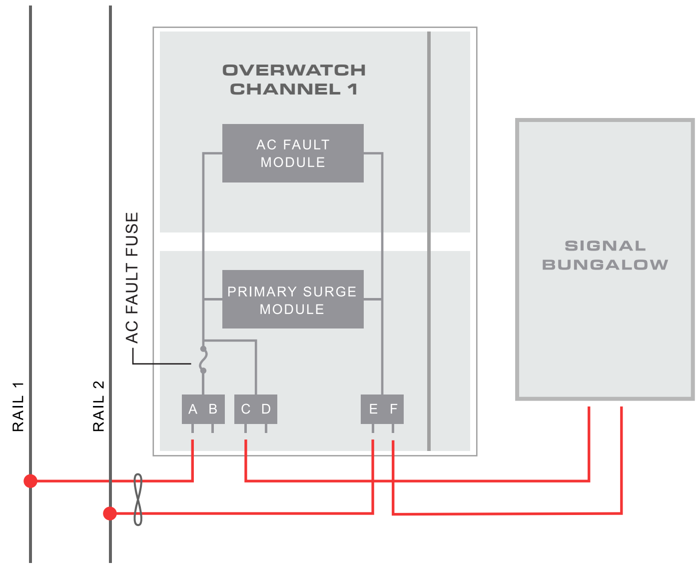

Figure 3B

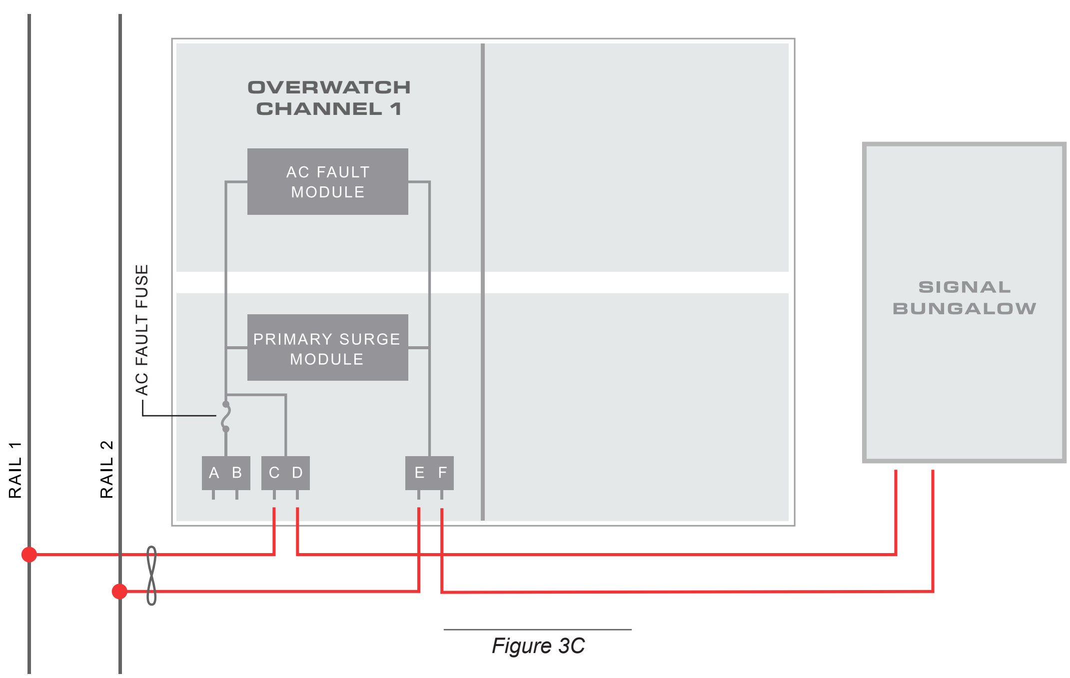

Figure 3C

TABLE 2

	INCOMING FROM RAIL	TO BUNGALOW SIGNALING	TO GND	AC FAULT FUSE IN CIRCUIT?	AC FAULT RATING (AMPS)	RESULT IF AC FAULT EVENT EXCEEDS AC FAULT CURRENT RATING
Figure 3A	A (Rail 1) E (Rail 2)	B (Rail 1) F (Rail 2)	N/A	Yes	2000	1. AC fault fuse opens, taking the Overwatch out of circuit 2. Bungalow signaling **remains connected** to both rails 3. Bungalow signaling **is exposed** to excess voltage differential
Figure 3B	A or B (Rail 1) E (Rail 2)	C or D (Rail 1) F (Rail 2)	N/A	Yes	2000	1. AC fault fuse opens, taking the Overwatch out of circuit 2. Bungalow signaling is **disconneted** from Rail 1, but **remains connected** to Rail 2
Figure 3C	C (Rail 1) E (Rail 2)	D (Rail 1) F (Rail 2)	N/A	No	4000	1. AC fault fuse does NOT open (not in circuit) 2. Possible low impedance (shorted) connection between the 2 rails

ACROSS RAIL ISOLATION JOINTS: AC FAULT MITIGATION

Figures 4A and 4B illustrate the Overwatch HEFPD installed across a rail isolation joint. In some situations, it can be very effective to shunt AC fault currents to ground via an adjacent, non-signaled section of track. An Overwatch installed across isolation joints can help accomplish this. AC modeling by specialized consulting firms can determine the best approach to take regarding rail system fault protection, including the placement and rating of the Overwatch devices.

Table 3 highlights the configuration options available when connecting the Overwatch across isolation joints.

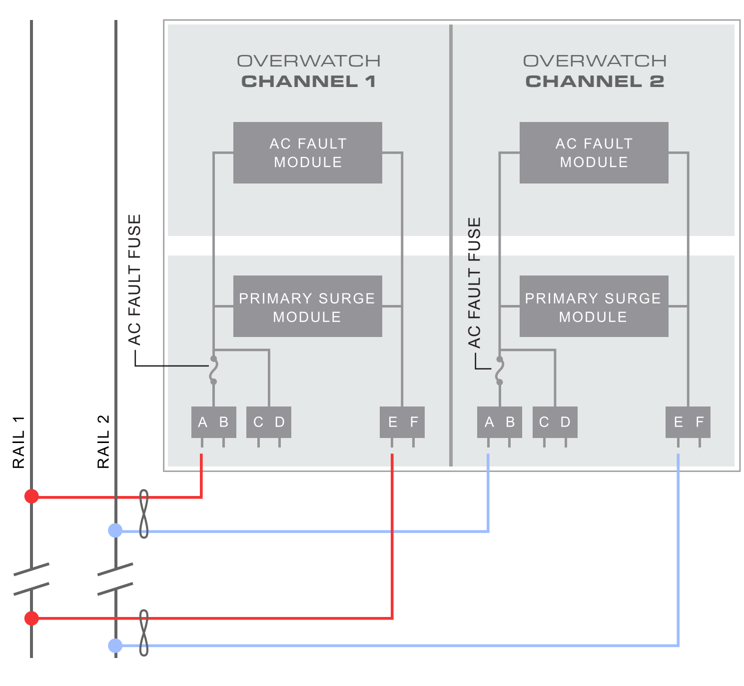

Figure 4A

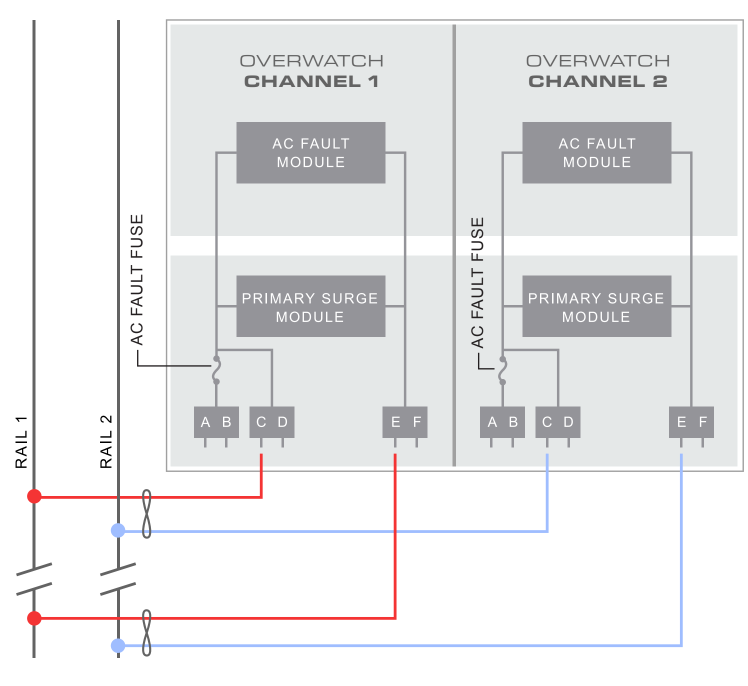

Figure 4B

TABLE 3

	RAIL: SIDE 1 OF ISOLATION JOINT	RAIL: SIDE 2 OF ISOLATION JOINT	TO GND	AC FAULT FUSE IN CIRCUIT?	AC FAULT RATING (AMPS)	RESULT IF AC FAULT EVENT EXCEEDS AC FAULT CURRENT RATING
Figure 4A	A or B	E or F	N/A	Yes	2000	1. AC fault fuse opens, taking the Overwatch out of circuit 2. The Overwatch no longer provides shunting around isolation joint – permanent open
Figure 4B	C or D	E or F	N/A	No	4000	1. AC fault fuse does NOT open (not in circuit) 2. Possible low impedance (shorted) connection across the isolation joint

PRE-INSTALLATION CHECKLIST

The Overwatch HEFPD acts to ground or divert electrical hazards that exceed the trigger voltage. During an electrical hazard, additional wiring will accumulate additional voltage seen by the protected equipment. To maximize the protection the Overwatch is providing, the following are recommended.

- Connection from the Overwatch to signal equipment or from the Overwatch to ground should use short, heavy gauge wire. The Overwatch terminals accept #6 AWG to 1/0 wire. The terminals can be removed to permit 5/16" ring terminal wire termination if desired.
- The maximum recommended wire length using Duplex #6 AWG (typical of track wire) is 10 ft from the Overwatch to signaling equipment ground, especially in rail-to-ground applications.
- The mounting location of the Overwatch should consider keeping wire lengths as short as possible.
- For a rail-to-ground application, ensure that the grounding rods and wires are in good repair. Reference AREMA C&S Manual part 11.4.1 for best practices.

INSTALLATION PROCEDURE

Mounting: The Overwatch is designed for Wayside Class B outdoor installation per AREMA part 11.5.1*.

(* The Overwatch meets all parts of 11.5.1 with the exception of cold storage temperature.)

1. Ensure awareness of any and all safety precautions required. Safety is the responsibility of the installer.
2. If the Overwatch is to be used for signal equipment protection, record pertinent signal circuit parameters before disassembling or disconnecting wires.
3. Using a flat head screwdriver, unlock the enclosure door and familiarize yourself with the internal connection points. A detailed explanation of these connection points and the ramifications of the connection configuration chosen can be found in an earlier section (or in the High-Energy Rail Fault Protection Application Guide).
4. After determining the connection configuration to be used, prepare the bottom wall of the enclosure for conduit entry. Conduit hardware is the responsibility of the installer. Ensure that conduit entry points will allow for adequate wire training for the size and stiffness of the wires for your application. Use caution when punching conduit holes not to damage the internal Overwatch hardware circuitry. Conduit entry is only permitted in the area designated by the label on the bottom of the unit.
5. Mount the Overwatch to a sturdy structure at the four (4) slotted holes at the corners of the enclosure using 5/16" hardware. Due to the weight of the device, it is not recommended to mount to a round pole using U-bolts. Ensure adequate spacing for maintenance such that the door can be fully opened and there are no obstructions for the conduit.

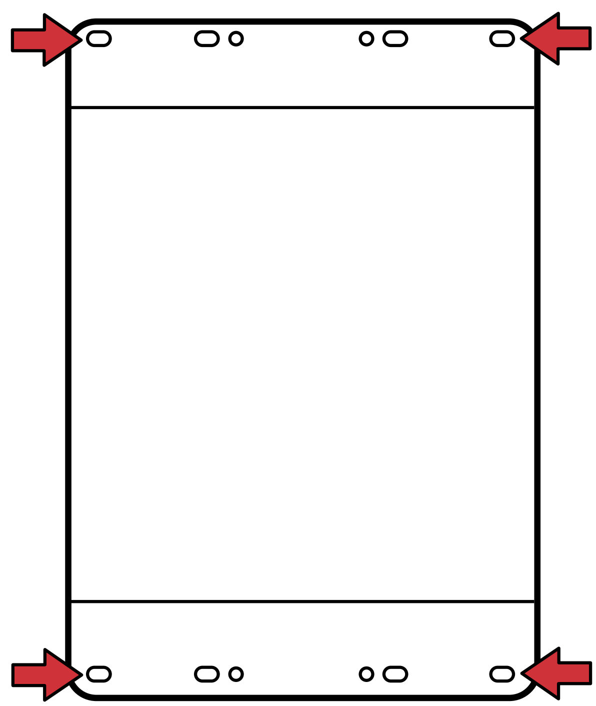

Figure 5

6. If this installation is a retrofit to an existing site, the installer is responsible for any disassembly and/or rewiring of the site. If using existing track wire, the use of splices or other junctions between the track and the Overwatch or between the Overwatch and signaling equipment or ground is not recommended.
7. The enclosure should be grounded using the grounding stud found inside the lower left corner of the enclosure.
8. Strip the wires and run them through the conduit, roughly orienting them near their intended connection point (A – F). Writable space is provided on the decal below each terminal to help identify connections.
   a. To use the provided terminals, insert the stripped end of the wire in the terminal and tighten with a ¼” Allen wrench.

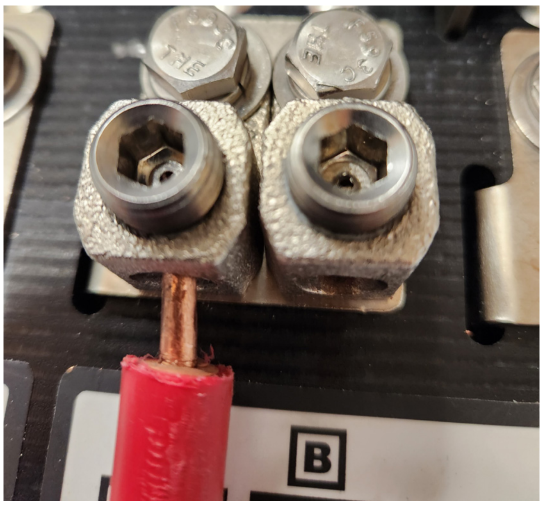

Figure 6

b. Alternatively, a user supplied ring terminal may be used. Note, this must be a heavy-duty ring terminal to handle high-energy fault events. To use a ring terminal, remove the bolt attaching the terminal lug to the bus using a ½” socket. Using that same hardware, place the ring terminal on the bus and attach with the 5/16” bolt and washers that were just removed. Torque to 12 ft-lbs.

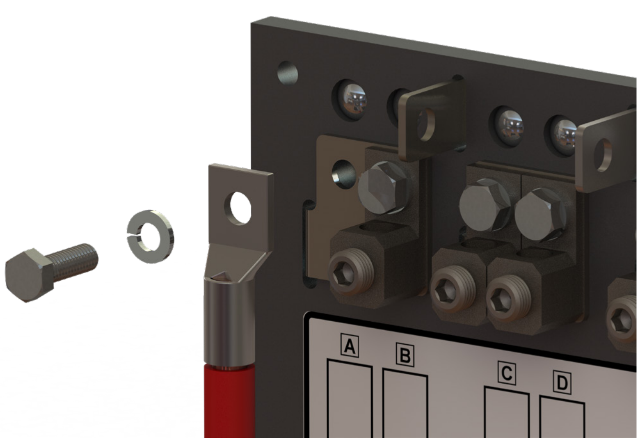

Figure 7

9. Ensure completion of conduit fittings and any other site-specific items.
10. To ensure the Overwatch is installed appropriately and that it will not interfere with track signaling, compare signal circuit parameters to what they were prior to installation.
11. Finally, latch the enclosure door closed with a large flat screwdriver and secure with a padlock.

MAINTENANCE PROCEDURE

The following maintenance procedure is appropriate to perform in these situations:

- Prior to installation of the Overwatch HEFPD to ensure no damage in shipping and handling.
- During routine inspections as dictated by the railroad operator.
- When any abnormal situations are present, such as suspected failure of signaling equipment or other site-related issues with the track signal circuit.

For a dual-channel device, the following checks should be performed on each channel individually.

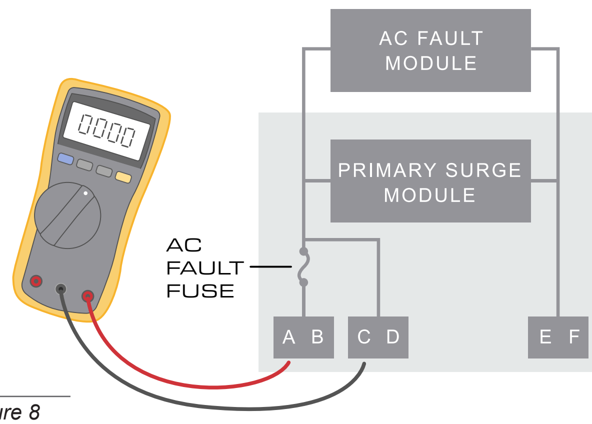

Figure 8

1. Temporarily disconnect signal wires from all terminals (A – F). It may be helpful to tag each wire to identify its connection to ease reconnection.
2. Set Digital Multi-Meter (DMM) to resistance, 1kOhm range. Polarity of DMM leads is not important for the following checks.
3. To test the AC fault fuse:
   a. Short the DMM test leads together to measure null resistance. If greater than 1 Ohm, stop and debug or use a different meter.
   b. Measure from A/B to C/D. This is measuring across the AC fault fuse.
   c. If the resistance is similar to the null resistance, the AC fault fuse is considered OK.

d. If the resistance is greater than 1 Ohm, the AC fault fuse has opened and is no longer of service.

e. Replace the fuse module. See fuse module replacement procedure in the next section.

4. To test the primary surge module:

a. Short the DMM test leads together to measure null resistance. If greater than 1 Ohm, stop and debug or use a different meter. Do this prior to each of the measurements noted below.

b. Measure from C/D to Test Point 1.

c. Measure from C/D to Test Point 2.

d. Measure from C/D to Test Point 3.

e. Measure from C/D to Test Point 4.

f. If all measurements are similar to the null resistance, the primary surge module circuit is considered OK.

g. If any of these four (4) measurements are above 1 Ohm, the primary surge suppressor circuit has been damaged and should be replaced.

h. Replace the fuse module. See fuse module replacement procedure in the next section.

5. To test the AC fault module:

a. Short the DMM test leads together to measure null resistance. If greater than 1 Ohm, stop and debug or use a different meter.

b. Measure from C/D to E/F. This should be an open circuit.

c. If the measurement is below the Mega-Ohm range, it is likely that the AC fault module circuit has been damaged. In this case, contact Dairyland Electrical Industries for further troubleshooting or to order a replacement unit.

6. Upon successful completion of these checks, reconnect all wires per the installation procedures.

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FUSE MODULE REPLACEMENT PROCEDURE

1. Inspect bungalow ground connections and repair as needed.
2. Attach grounding jumper (from product enclosure to bungalow ground).
3. Disconnect the wires from the fuse module terminals A-F. See Figure 9, Items '1'.
4. Using ½" wrenches, loosen and remove the hardware connecting the fuse module to the upper bus work. NOTE POSITION OF THE FUSE MODULE BUS WORK RELATIVE TO THE UPPER BUS WORK. See Figure 9, Items '2'.
5. Using a 7/16" socket, loosen and remove the 4 screws holding the fuse module backplate to the enclosure brackets. See Figure 9, Items '3'.
6. Remove the fuse module from the enclosure.
7. Install new fuse module.
8. Insert the 4 corner screws for the backplate, but do not tighten. Items '3'. Apply the included thread locker on these screws before installing.
9. Install and tighten the hardware for the bus work (Items '2'). Tighten to 130 in-lbs.
10. Tighten the 4 corner screws for the backplate (Items '3'). Tighten to 77 in-lbs.
11. Reinstall the wires A-F per the initial installation. Tighten terminal set screw (Items '1') to 10 ft-lbs.
12. Remove grounding jumper.

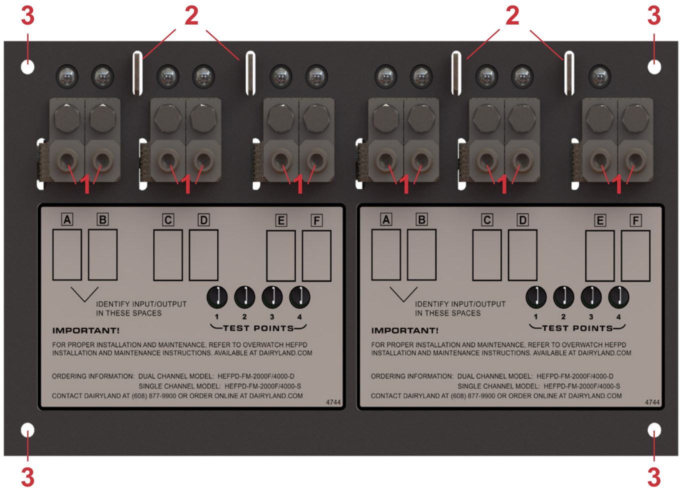
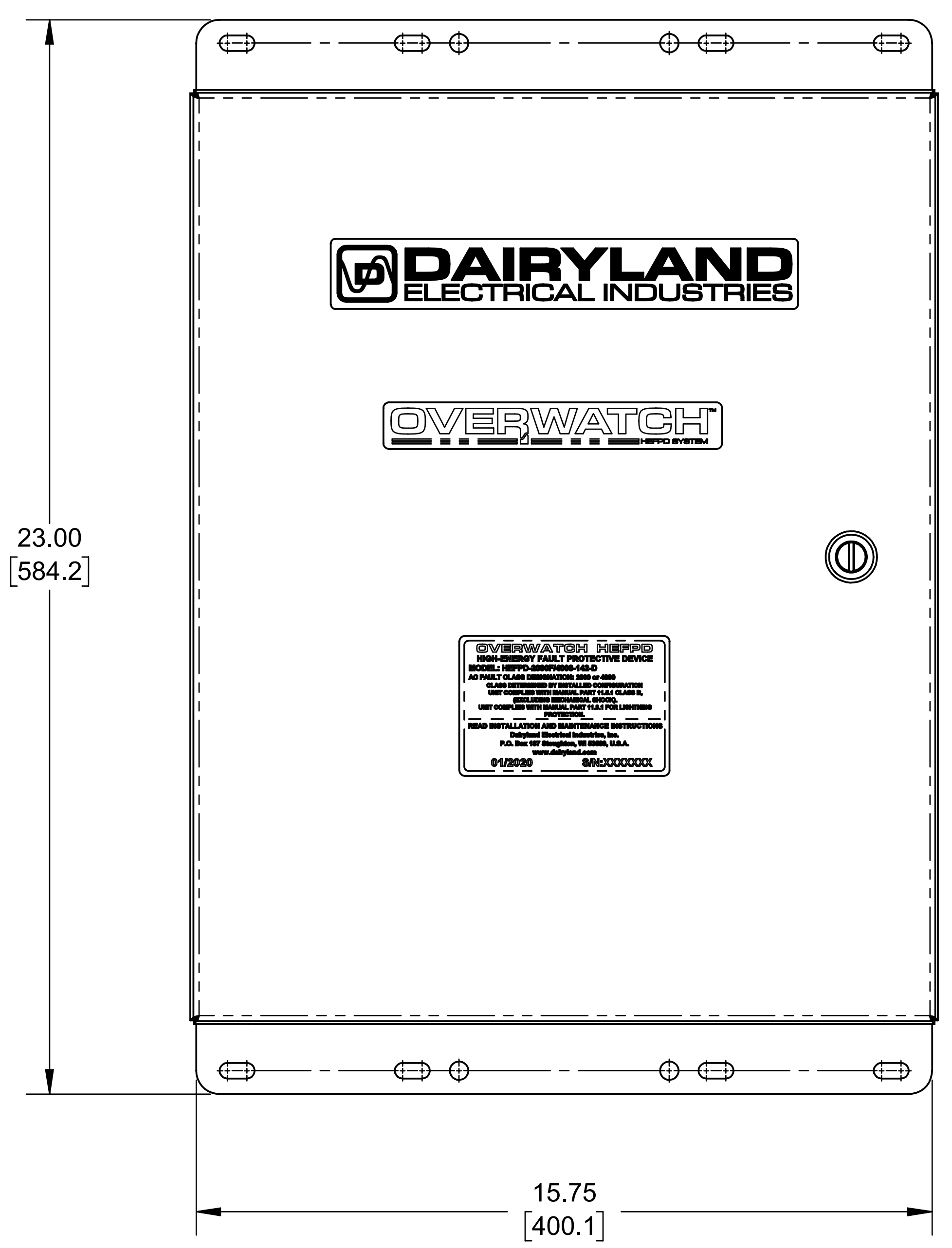
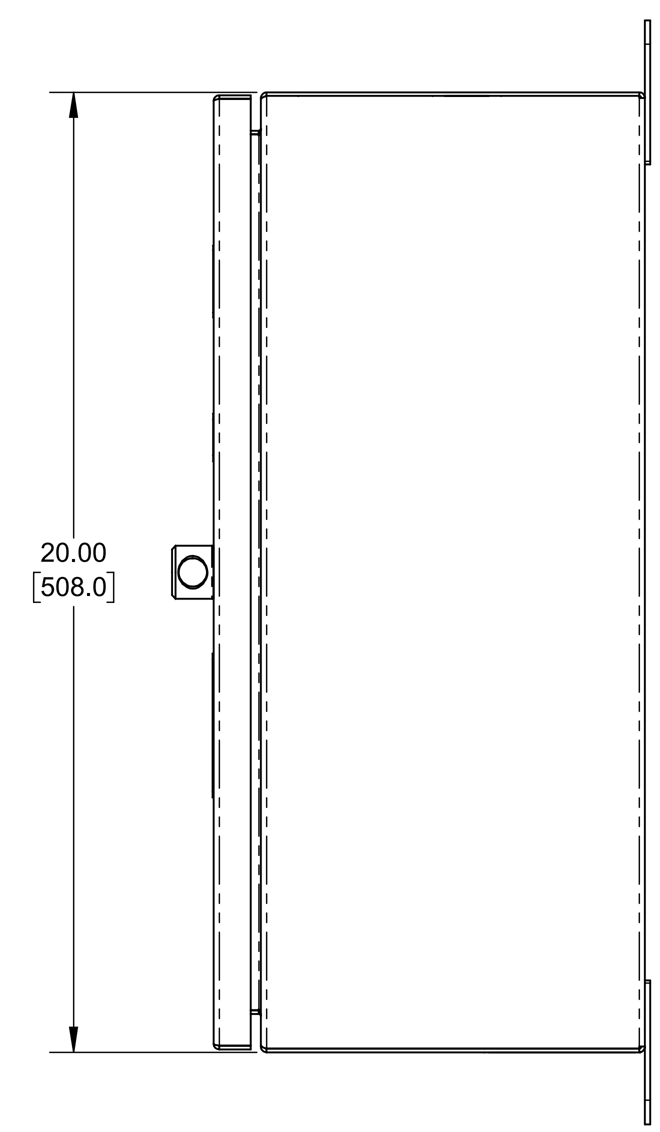
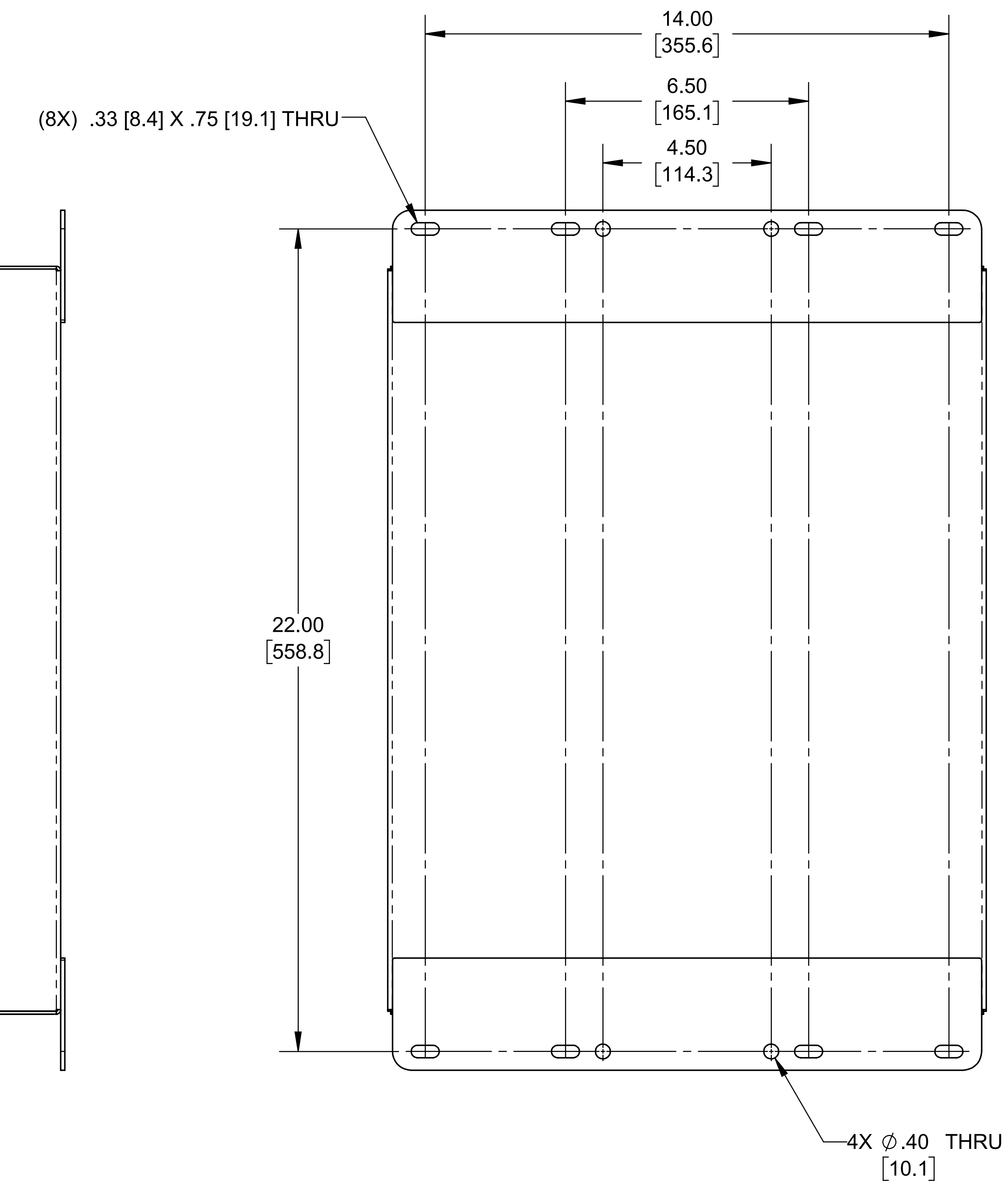


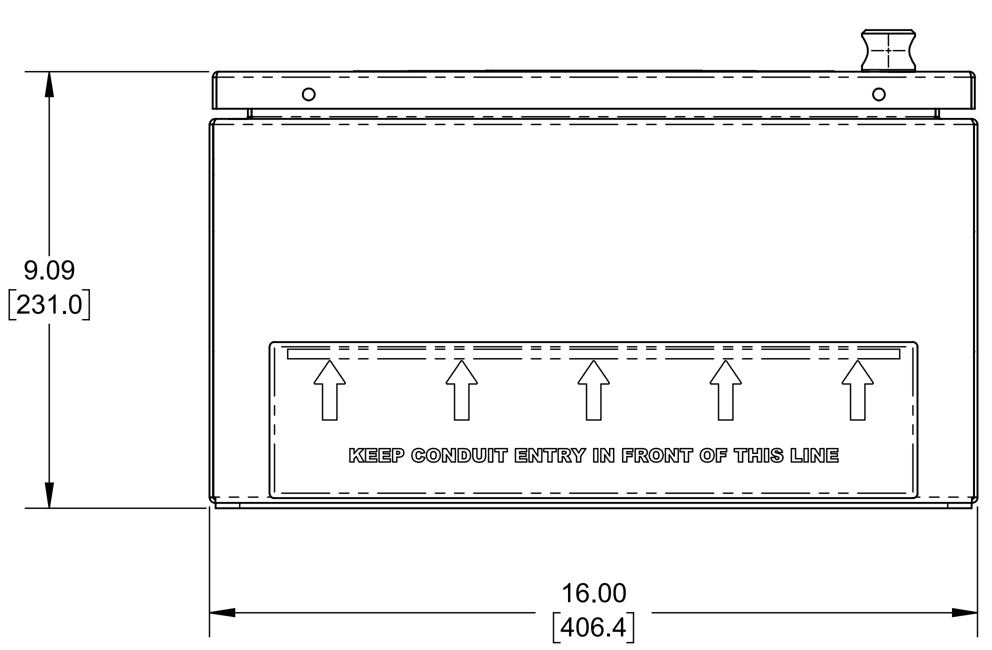
Figure 9

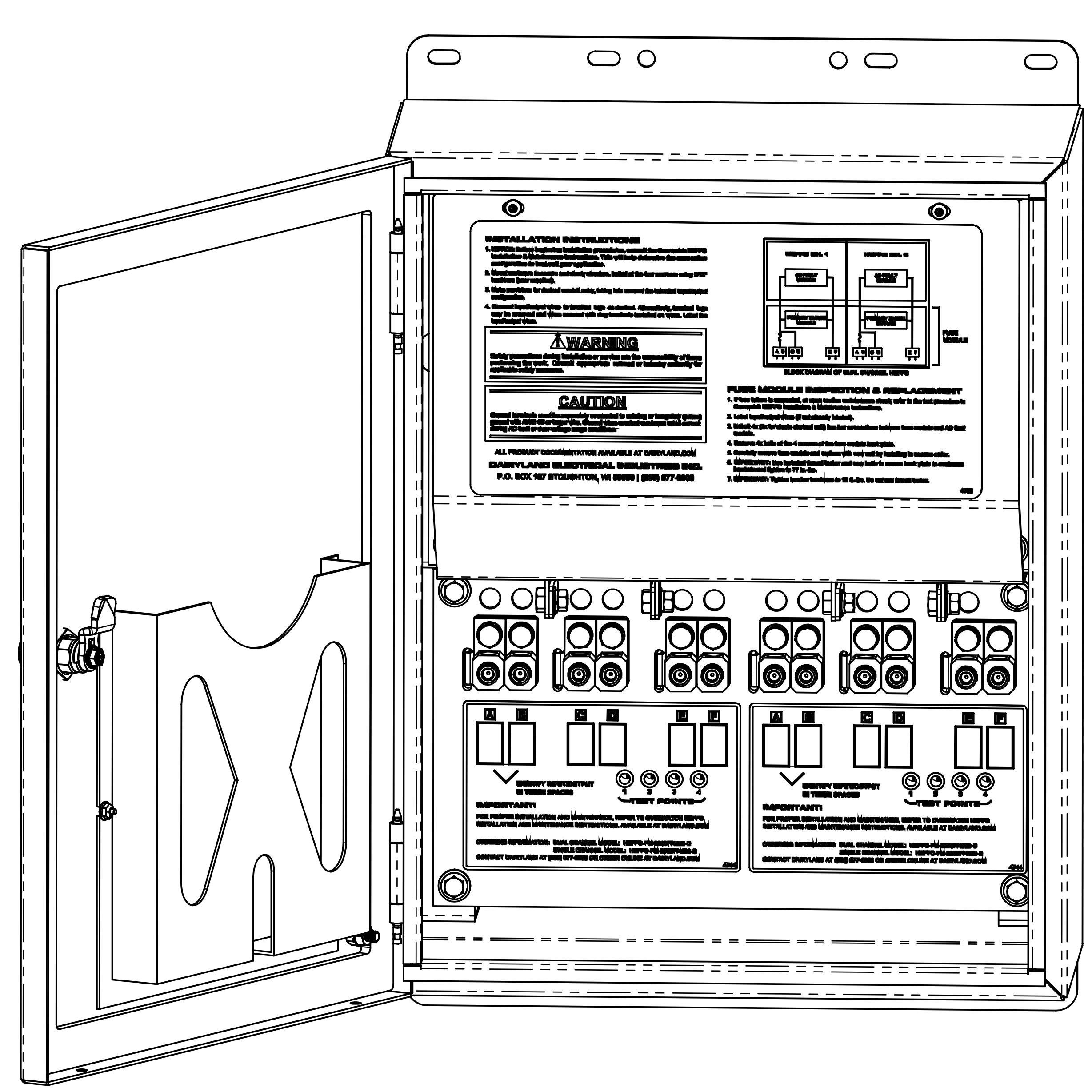
Figure 10

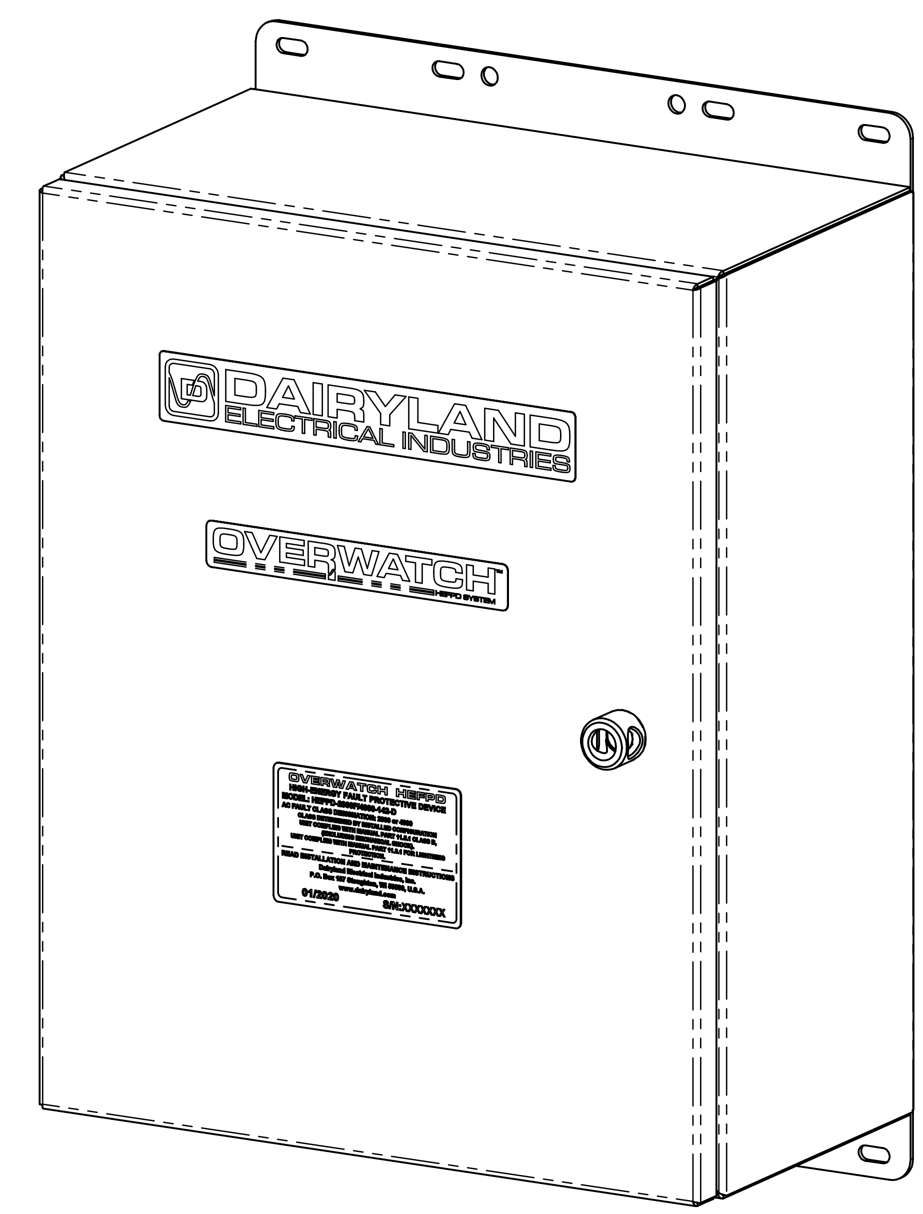












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