

Model # _____

The Polarization Cell Replacement (PCRH)



Operating and Installation Instructions

INTRODUCTION

The Polarization Cell Replacement for use in Hazardous Locations (PCRH) is a solid-state DC isolation/AC grounding (or coupling) device designed for use in conjunction with cathodically protected equipment located in Class I, Division 1 hazardous (classified) locations. (The less costly PCR is normally used for Class I, Division 2 and non-hazardous locations.) The PCRH is suitable for: (1) AC voltage mitigation, (2) over-voltage protection of insulated joints and similar structures and equipment, (3) DC isolation and AC grounding of cathodically protected structures. The PCRH can be used in a variety of applications, each of which require specific installation guidelines. These installation instructions cover the following common applications.

- DC isolation/AC grounding of cathodically protected structures containing electrical equipment. See Figures 1 and 2.
- Over-Voltage protection of insulated joints. See Figures 3, 4 and 5.
- AC voltage mitigation. See Figure 7. If the pedestal enclosure was ordered, also see Figure 6.

Some applications listed may not apply in some counties due to different codes and practices. If your application is not covered by these installation instructions, contact DEI. "Application Notes" for most applications are also available on the DEI website.

CERTIFICATIONS

The PCRH is Underwriters Laboratories (UL) listed for use in hazardous locations in accordance with NFPA 70, (U.S. National Electric Code) Articles 500-505 for Class I, Div. 1 and Div. 2, Groups B, C, and D or Groups C and D, depending on the enclosure type specified. The PCRH is also C-UL listed to the above classifications per Canadian code C22.2 No. 30-M1986. Over-voltage protection due to lightning also complies with the pertinent requirements of ANSI C62.11. The PCRH is also UL listed as meeting the requirements of an effective grounding path as defined in NFPA 70 Article 250.2, 250.4 (A)(5), and as suitable for the isolation of objectionable DC current from cathodically protected systems to ground as defined in Article 250.6(E). Similarly, it is C-UL listed for meeting the effective grounding path requirements of Canadian Electrical code sections 10-500, 10-806, and CSA C22.2 No. 04-M1982. The listing is valid for ambient temperatures from -45°C to +65°C. The operating temperature code is T5 (100°C).

ENCLOSURE

The standard enclosure is NEMA 4 (comparable to IP66). This same enclosure is listed by UL in the U.S. for Groups C and D, and by UL in Canada for Groups B, C, and D. Confirm that the enclosure furnished is suitable for its intended installation location. The NEMA rating is on the enclosure nameplate.

RATINGS

The system on which this PCRH is installed should be compatible with the ratings on the nameplate of the PCRH ordered. The ratings available and the ratings of this PCRH are listed as follows.

AC Fault Current Ratings (Amps AC-RMS Symmetrical)			
60 Hz Cycles	PCRH 3.7KA	PCRH 10KA	PCRH 15KA
1	6,500	20,000	35,000
3	5,000	15,000	27,000
10	4,200	12,000	21,000
30	3,700	10,000	15,000
50 Hz Cycles	PCRH 3.7KA	PCRH 10KA	PCRH 15KA
1	6,100	19,000	33,000
3	4,700	14,000	25,000
10	3,900	11,000	20,000
30	3,500	9,000	14,000

This unit:

3.7KA (60 Hz) / 3.5 KA (50 Hz)	<input type="checkbox"/>
10KA (60 Hz) / 9 KA (50 Hz)	<input type="checkbox"/>
15KA (60 Hz) / 14KA (50 Hz)	<input type="checkbox"/>

50/60 Hz Steady-State Current Ratings (Amps AC-RMS Symmetrical)	
Ambient Temp.	Standard
	45A
20°C	50A
65°C	40A

This unit:

45A	<input type="checkbox"/>
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Lightning Current Rating

All models: 100kA peak
(8 x 20 waveform)

DC Blocking Voltage

This unit:

- 3.0 V / +1.0 V (Standard)
 - 2.0 V / + 2.0 V (Optional)
 - ___ V / + ___ V (Custom)
-

The symmetrical version which blocks +/-2.0 volts will be identified by a suffix "S" in the model number after the fault current rating. A custom version will have the above blocking voltage values listed as a suffix in the model number on the nameplate.

PCRH OPTIONS AND ACCESSORIES

Any options or accessories ordered with this PCRH will be identified by a check mark in the appropriate box.

Leads

The PCRH may have been ordered with axial connected leads (ACL-L), right-angle connected leads (RACL-L), or no leads. See Figure 4 for lead connection details. All leads are ordered separately from the PCRH, but normally packaged with the PCRH. This unit was furnished with:

- ACL-L where L = _____
- RACL-L where L = _____
- No leads

If no leads were furnished, the user must make provision for attaching leads to the 1/2" x 13x5/8"L threaded stud with a connector that accommodates the 1/2" (12 mm) diameter stud.

Lead Adapter Plate Accessory

- AP-D where D = _____

Normally specified to facilitate connection across an insulated joint using the existing flange bolts. See Figures 3, 4, and 5 if this accessory was ordered.

Adapter plates are normally packaged with the PCRH.

Pipe Mounting Accessories

- PCRH with "- PM2" suffix

Specified where the user plans to mount the PCRH to a user furnished 2" schedule 40 steel pipe (O.D. = 2.375" or 60.3 mm). The PCRH comes with an aluminum backplate which is predrilled for two stainless steel U-bolts/nuts which are furnished for attaching to the pipe. The U-bolts will be packaged with the PCRH. Ordered by adding the "-PM2" suffix to any PCRH model number.

A complete pipe mounting kit may have been ordered as follows.

- 36" height - PM2K/36
- 48" height - PM2K/48

This kit includes accessory PM2 described above plus either a 36" (914 mm) or a 48" (1219 mm) long 2" galvanized steel pipe, a 4-bolt threaded pipe flange base suitable for mounting to a field fabricated concrete foundation, and four 5/8" x 12" (16 x 305 mm) galvanized anchor bolts, each with two nuts for leveling the flange base. All items in a pipe mounting kit (except for the U-bolts) will be packaged separately from the PCRH.

Pedestal Mounting Enclosure

- Pedestal-36" (Standard)
- Pedestal-___ (Optional)

Typically specified where both leads from the PCRH are connected underground (e.g., AC mitigation using gradient control wires) or a user desires to provide auxiliary protection for the PCRH and the exit leads/connections. Ordered by adding the suffix "-PED" to the PCRH model number and by ordering one of the pedestal models shown above. Pedestals are normally shipped separately from the PCRH.

GENERAL INSTALLATION INSTRUCTIONS

These general instructions apply to all applications. For specific installation instructions, refer to the figure numbers that apply to the application as noted on

the first page.

Mounting

Mount the PCRH so that the total length of lead to the connection points will be as short as possible if the PCRH is being used to provide over-voltage from lightning. All leads have inductance which will cause a significant voltage per unit of lead length when subject to lightning surge current. To minimize the voltage developed between the connection points, install the PCRH as close as practical to the required connection points and cut the lead to the shortest possible length during installation. For most insulated joint applications the PCRH can, and should, be installed with about 6 inches (≈ 150 mm) of lead. Leads typically develop 1-3 kV/ft. (approx. 3-10 kV/meter) of length; hence, the reason leads should be kept as short as possible. Lead length is not critical for limiting voltage due to 50 Hz or 60 Hz current.

Note: The PCRH enclosure is connected to the positive (+) terminal internally with a bonding jumper. Therefore, when installing, make sure that there is no electrical connection between the enclosure and the negative (-) lead. Separate grounding of the enclosure is not required when the positive lead is connected to ground. If isolation is required between the enclosure and the positive terminal, contact DEI.

Polarity

If the PCRH purchased has asymmetrical blocking characteristics and it is being connected between a cathodically protected structure and ground, connect the negative terminal of the PCRH to the cathodically protected structure and the positive terminal to ground. If being connected between two different cathodically protected systems, attach the negative terminal to the more negative structure and the positive terminal to the less negative structure, keeping in mind that the positive terminal is normally bonded internally to the metallic enclosure. Consider if the PCRH enclosure mounting could affect the cathodic protection system. The bottom of the nameplate, which is located

just above the two leads, shows the polarity of each lead. If a symmetrical version with the PCRH was furnished (designated by a suffix "S" in the model number), the polarity marks are not relevant since the unit has identical voltage blocking with either polarity.

LEAD CONNECTIONS

Leads Furnished by DEI

If leads have been furnished with the PCRH, they may or may not already be connected, depending on the type of lead connection ordered and the lead length. If leads are not already connected to the PCRH, refer to Figure 4 and connect the leads as illustrated.

Axial connected leads will normally come preinstalled to the PCRH, unless leads are longer than about 15' (\approx 4.5 meters). If not installed, rotate the entire cable with the pre-crimped connector onto the threaded bushing stud until the connector is up to the brass jam nut before attaching the other end of the lead. Then hold the connector while tightening the jam nut firmly against the end of the connector. (Do not exert torque on the bushing stud with respect to the bushing body during this procedure.) Slide the heat shrink sleeve over the jam nut and the insulating part of the bushing, and shrink in place. Tools required include vise-grips or channel locks to hold the connector, a wrench for a 1/2" nut (a 3/4" open-end wrench or equivalent), and a heat source to shrink the heat shrink sleeve.

To install right angle connected leads, install as illustrated in Figure 4 with one jam nut on each side of the cable terminal lug. Securely hold one nut while tightening the other nut. Tools required include two wrenches for a 1/2" nut.

Leads User Furnished

If leads and terminals are user furnished, a terminal with one hole that accommodates a 1/2" diameter stud will be required. Terminals are available to make a right angle or a 45° angled connection to the bushing stud. Connect as described above. Tools

required include two wrenches for a 1/2" nut.

Field Testing

Before installation, the following measurements are suggested to confirm that the steady-state conditions imposed on the PCRH will be within its ratings.

1. Measure the open-circuit DC voltage between the PCRH connection points with a multimeter. The open-circuit DC voltage measured should be within the DC blocking voltage rating of the PCRH model selected.

2. Measure the steady-state short-circuit AC-RMS current between the PCRH connection points with a clamp-on ammeter. The short-circuit AC-RMS steady-state current measured should be less than the steady-state AC current rating for the PCRH ordered.

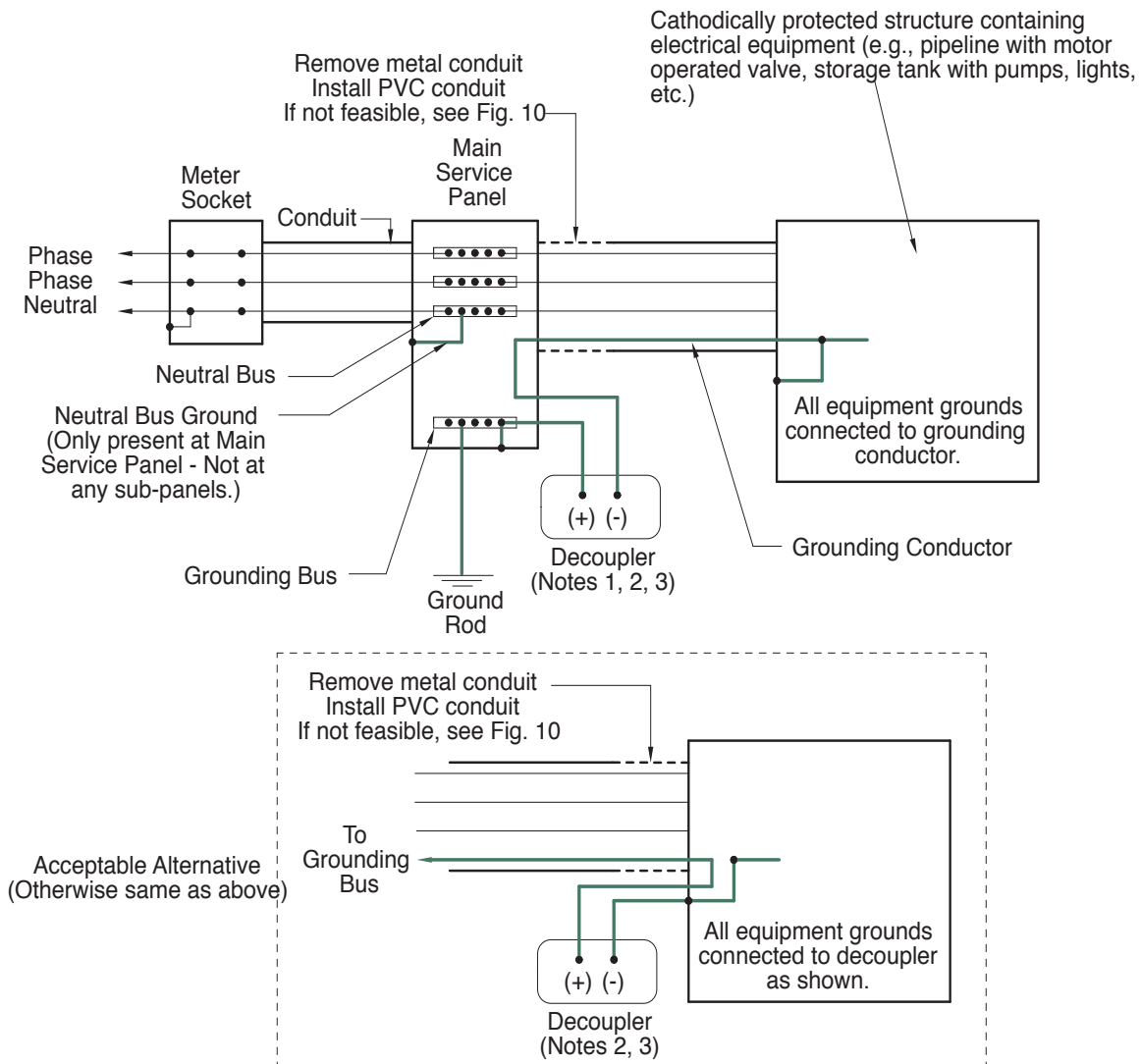
3. After installation, the DC voltage across the PCRH terminals can be measured to confirm that the expected value of cathodic protection voltage exists, assuming the cathodic protection system is ON. (The voltage measured with a voltmeter will be less than the actual cathodic protection voltage because it is not being measured with respect to a reference cell.)

4. After installation, the steady-state AC current through the PCRH leads can again be measured. The current measured should be comparable to the value measured prior to installation since the AC impedance of the PCRH is negligible (i.e., about 10 milliohms at 60 Hz).

5. If the cathodic protection system is ON, one can check the leakage current through the PCRH as follows, if desired. Connect a DC Hall Effect current measurement device over the PCRH negative lead to read the leakage current. The value of current measured at normal cathodic protection voltages should be negligible.

If any measurements do not produce the expected results, contact DEI.

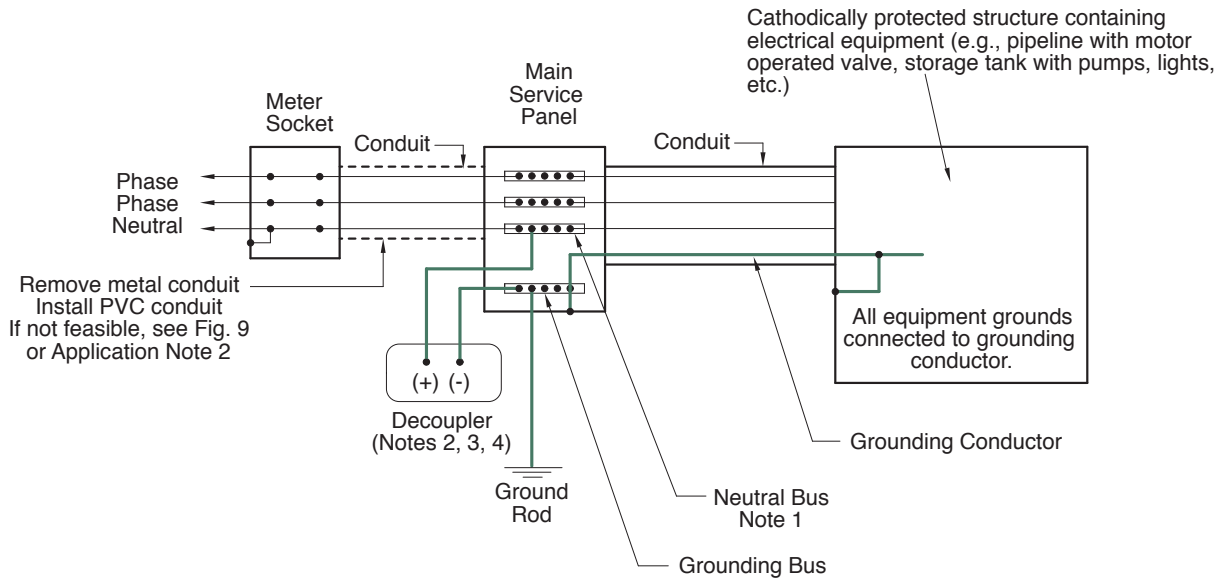
FIGURE 1 Typical Installation to Provide DC Isolation and AC Grounding for Cathodically Protected Structure Containing Electrical Equipment



Notes:

1. Decoupler = PCR or SSD models by DEI. UL listed per NFPA 70, Article 250.2, 250.4(A)(5), 250.6(E) and 500-505. All decoupler models Canadian Standards Association (CSA) certified per section 10 -500. All decouplers listed for use in Ordinary and Class I, Division 2 hazardous locations.
2. Observe polarity marks when installing the decoupler if polarity marks are provided
3. Do not install the decoupler in series with the secondary neutral. This is not allowed per electric codes.
4. After installation, temporarily remove the (+) lead at the decoupler and test to assure that there is no electrical continuity between the (-) terminal and the neutral bus in the main service panel. Then reattach the (+) decoupler lead. (Note, if continuity exists in the above test and the facility has telephone service, contact the local phone company as they often have a parallel connection between the power utility grounding system and a users grounding system that can be interrupted.
5. If there is any question as to proper installation procedures for a given application, call DEI for assistance.

FIGURE 2 Non-typical Installation to Provide DC Isolation and AC Grounding for Cathodically Protected Structure Containing Electrical Equipment



Notes:

1. The screw in the neutral bus must be removed so that the neutral bus is only connected to the ground bus and the service panel enclosure through the decoupler. This installation procedure only applies for decoupling at the main service panel.
2. Decoupler = PCR or SSD models by DEI. UL listed per NFPA 70, Article 250.2, 250.4(A)(5), 250.6(E) and 500-505. All decoupler models Canadian Standards Association (CSA) certified per section 10-500. All decouplers listed for use in Ordinary and Class I, Division 2 hazardous locations.
3. Observe polarity marks when installing the decoupler if polarity marks are provided.
4. Do not install the decoupler in series with the secondary neutral. This is not allowed per electric codes.
5. After installation, temporarily remove the (+) lead at the decoupler and test to assure that there is no electrical continuity between the (-) terminal and the neutral bus in the service panel. Then reattach the (+) decoupler lead. (Note, if continuity exists in the above test and the facility has telephone service, contact the local phone company as they often have a parallel connection between the power utility grounding system and a users grounding system that can be interrupted.)
6. If there is any question as to proper installation procedures for a given application, call DEI for assistance.

FIGURE 3 Typical Installation for Insulated Joint Protection

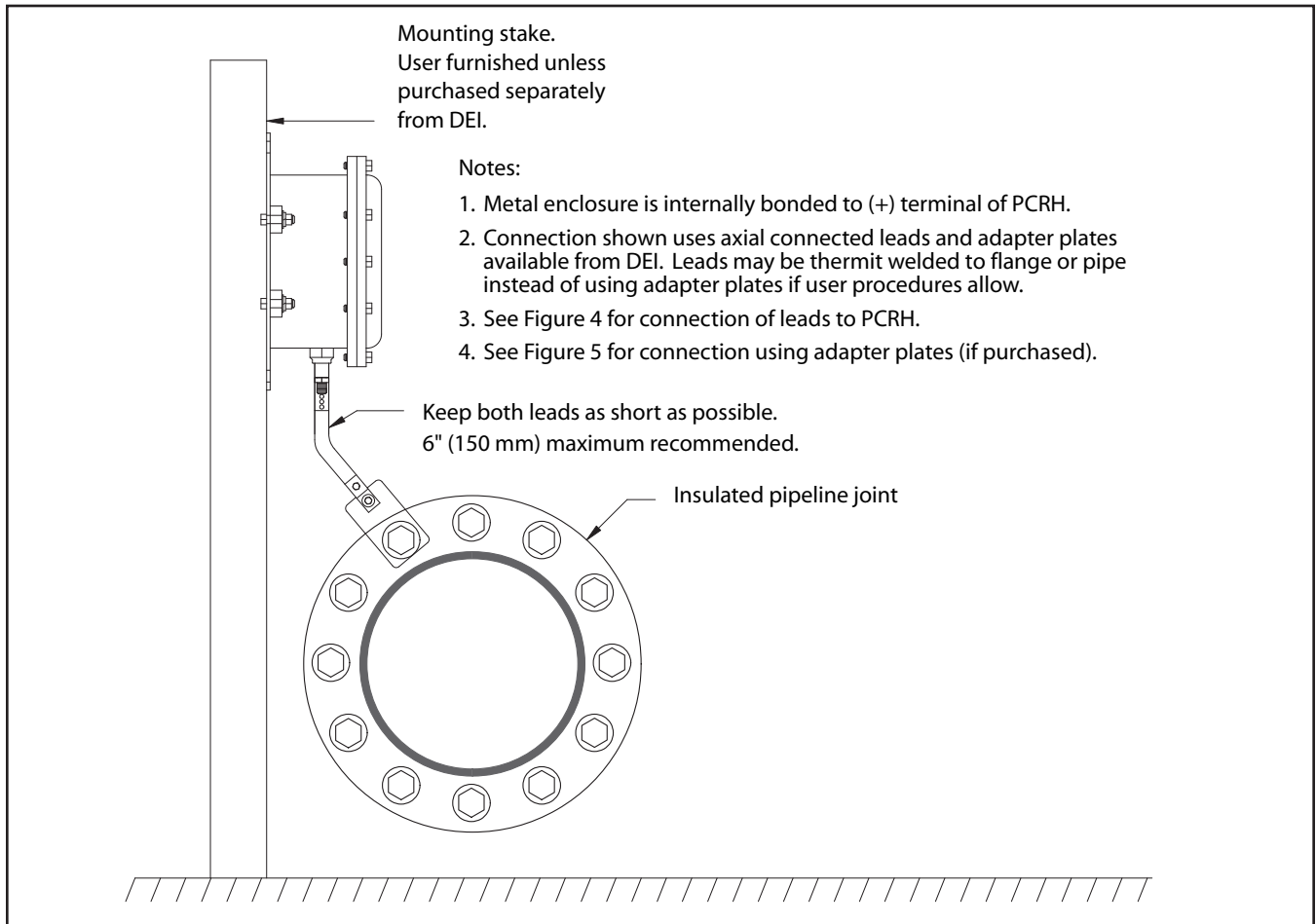


FIGURE 4 PCRH Lead Connection Options

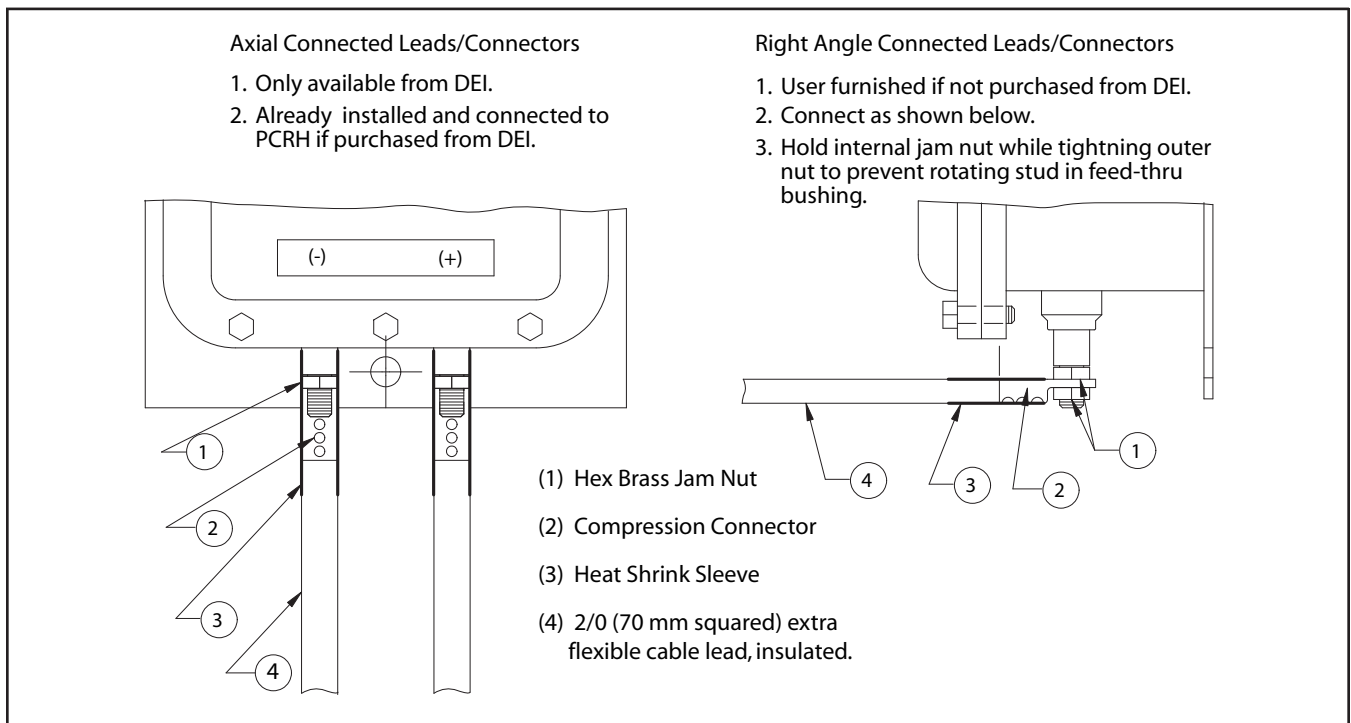


FIGURE 5 Connection to Bolted-Type Insulated Joint using Adapter Plates

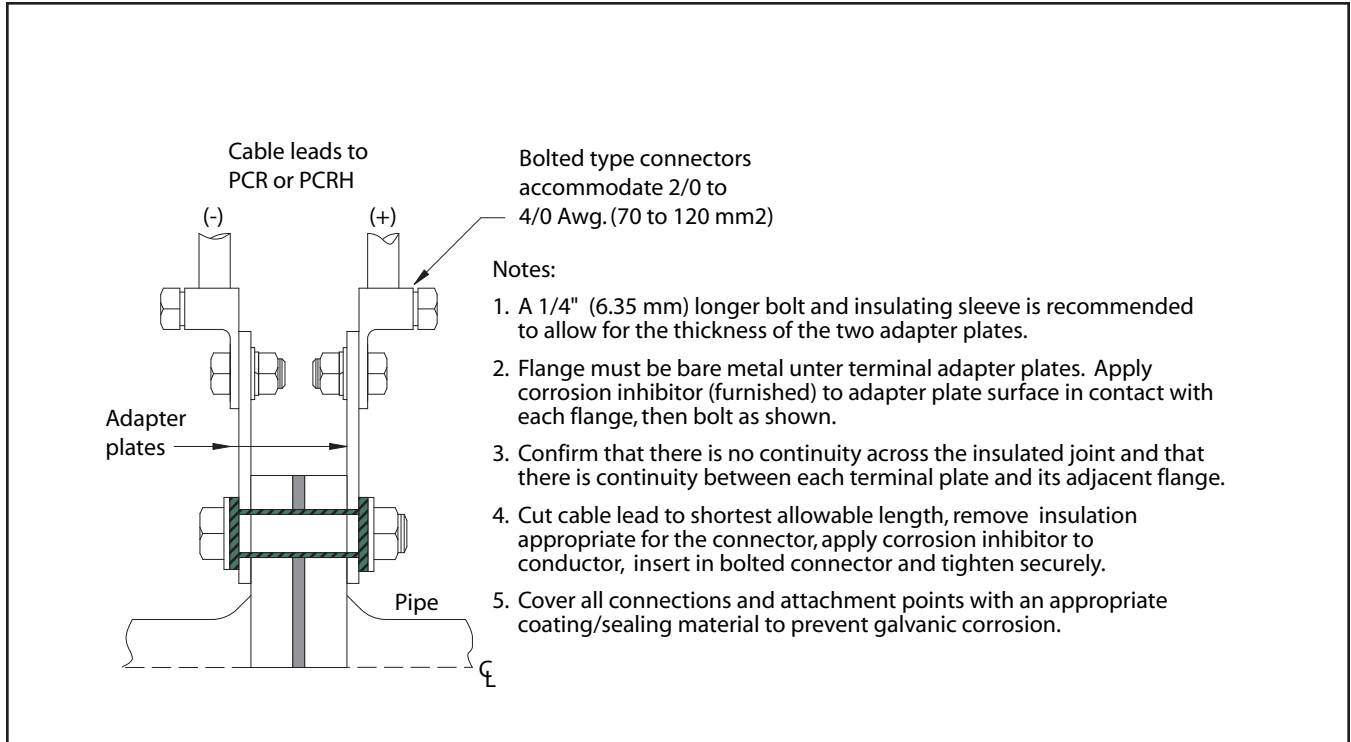


FIGURE 6 PCRH Mounted in Pedestal Enclosure

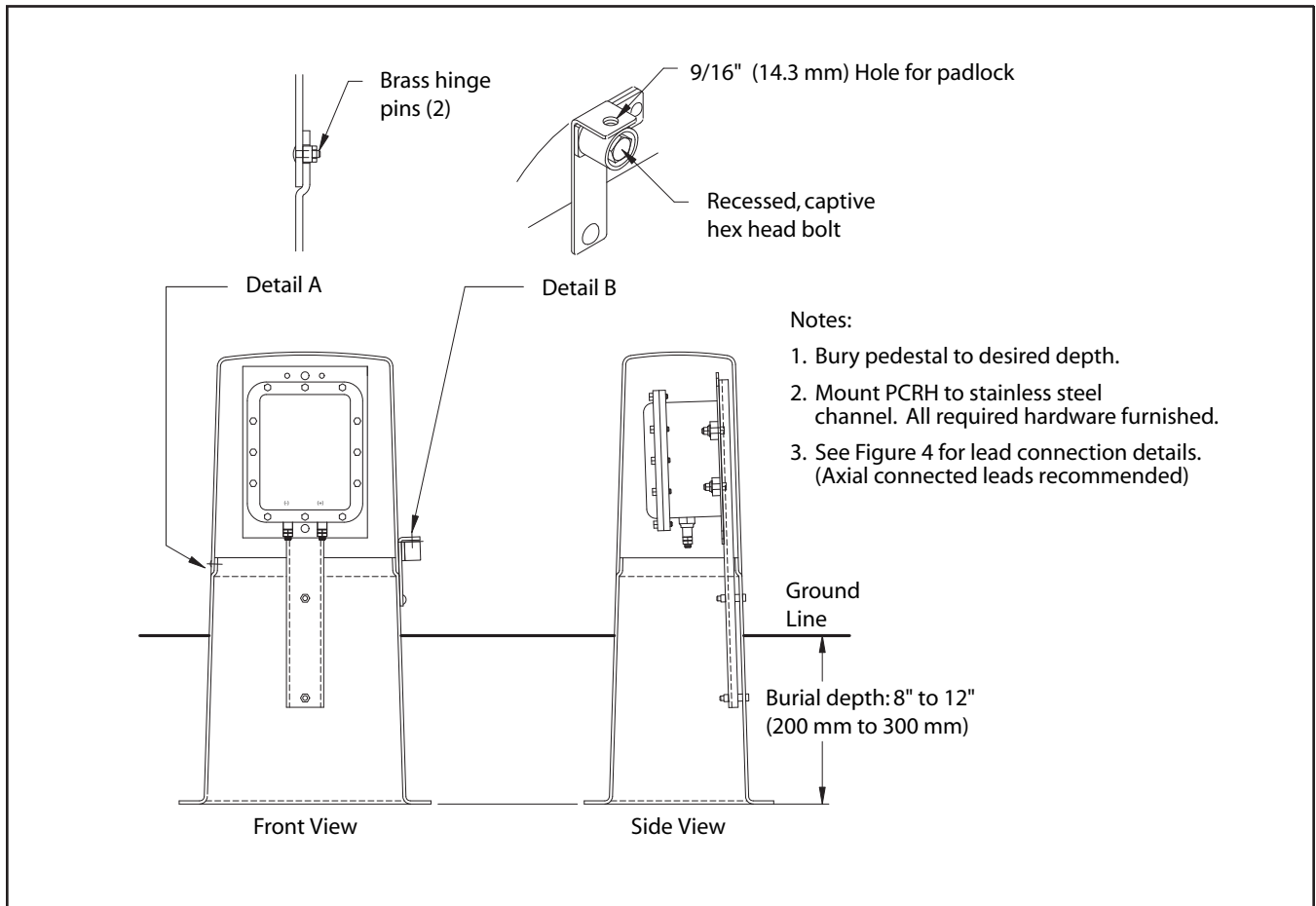


FIGURE 7 Typical Installation for AC Voltage Mitigation

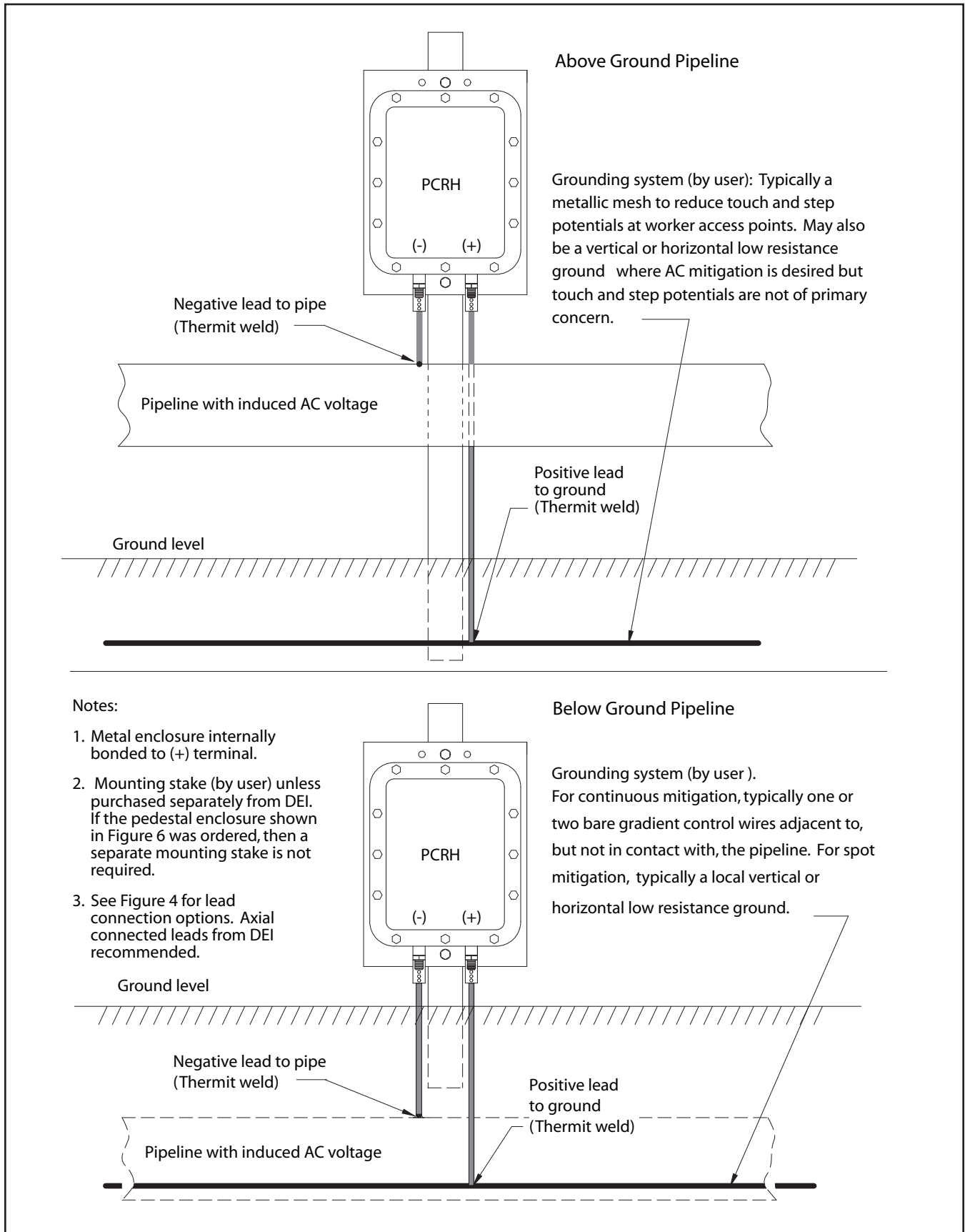
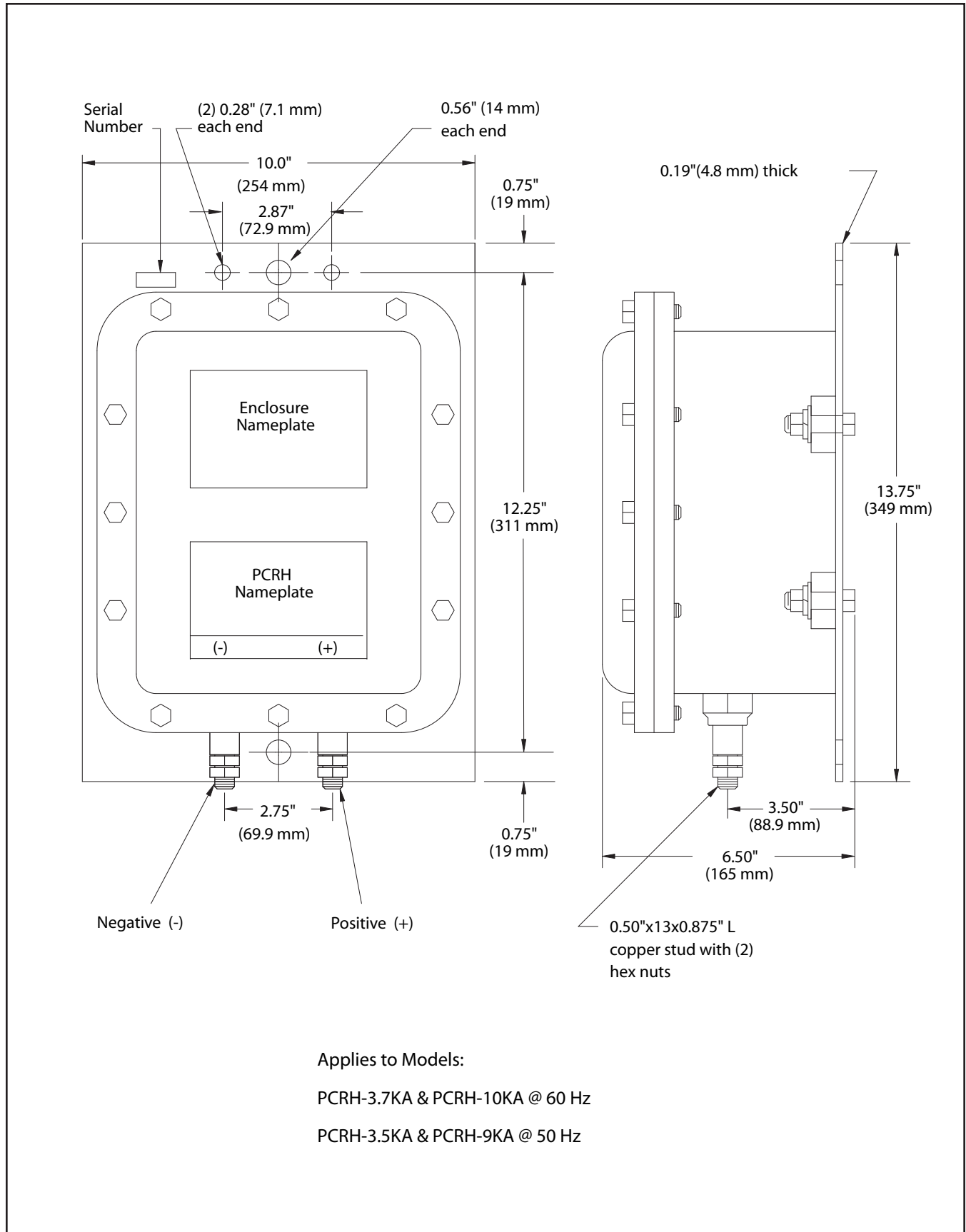
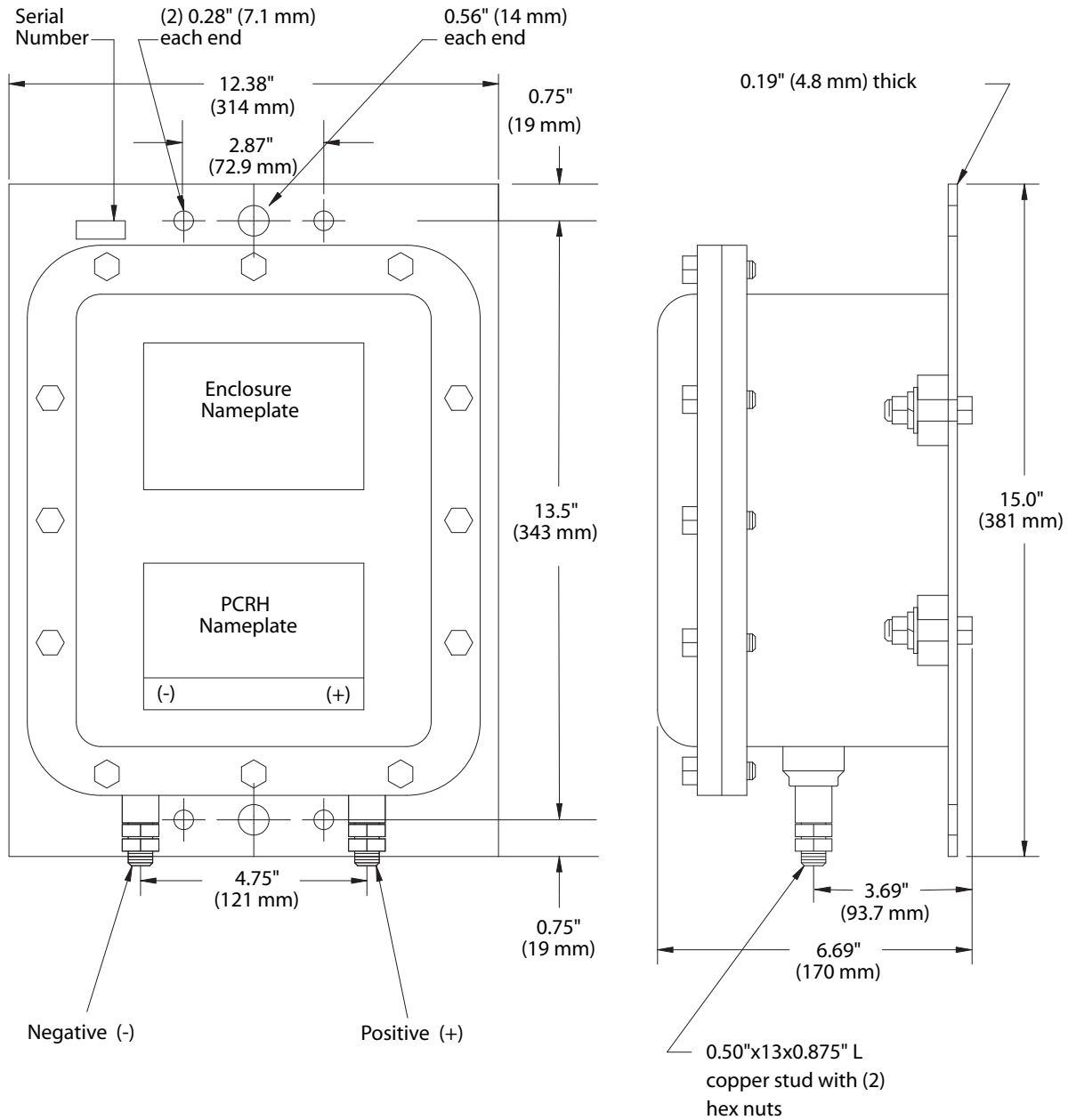


FIGURE 8A PCRH Outline Dimensions



Applies to Models:
 PCRH-3.7KA & PCRH-10KA @ 60 Hz
 PCRH-3.5KA & PCRH-9KA @ 50 Hz

FIGURE 8B PCRH Outline Dimensions



Applies to Models:

PCRH-15KA @ 60 Hz

PCRH-14KA @ 50 Hz