



PLACEPOD® VEHICLE DETECTION SENSOR INSTALLATION GUIDE

Instructions for physical installation of a PlacePod® Sensor

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1 PLACEPOD OVERVIEW

PlacePod® is a high-accuracy smart parking sensor for on-street and off-street municipal and private parking management. It solves the most mission-critical aspects of parking management: accurate, real-time vehicle detection and location of available parking spaces. The PlacePod Vehicle Counting sensor (PlacePod VC) is a wireless, in-ground sensor that provides real-time vehicle counts for parking garages and surface lots in cities, corporate and university campuses, transportation hubs, shopping centers and event facilities.

Key Features & Benefits

- Includes the industry's most accurate magnetic sensing system for vehicle detection with the combination of PNI's high-performance magnetic sensor and vehicle detection algorithms that accurately detect the presence or absence of a car in a parking space.
- Includes a built-in LoRa radio that communicates to a gateway with complete LPWAN compatibility.
- Sensors and algorithms are finely tuned for ultra-low power consumption, providing continuous vehicle detection without missing a parking event.
- Capability for wireless configuration and software updates using Bluetooth Low Energy (BLE) via PNI's mobile iOS and Android applications.
- PNI's Parking Management Application provides a software service for managing and monitoring all parking resources and data. The application is available for testing and proof of concept purposes.



Figure 1: PlacePod In-Ground



Figure 2: PlacePod Surface-Mount



Figure 3: PlacePod Vehicle Counting

2 PRE-INSTALLATION STEPS

Before the PlacePod is installed there are some prior steps that should be performed.

2.1 GATEWAY INSTALLATION

1. Ensure the LoRa Network Gateways are installed and functional.
2. Provision the PlacePod onto the LoRa Network you intend to use.
3. Perform a site survey to ensure that the RF signal is strong enough. PNI recommends having an RSSI reading of around -90dBm as a reference when no vehicle is parked on top of the parking space.
4. Activate the PlacePod so that it begins sending RF messages.

2.2 PREPARING THE PARKING SPACE

1. Clear any debris in the park space with a deck broom.
2. Using a tape measure or chalk snap-line, locate the center of the parking space.
3. Mark the center of each space using the chalk snap-line.

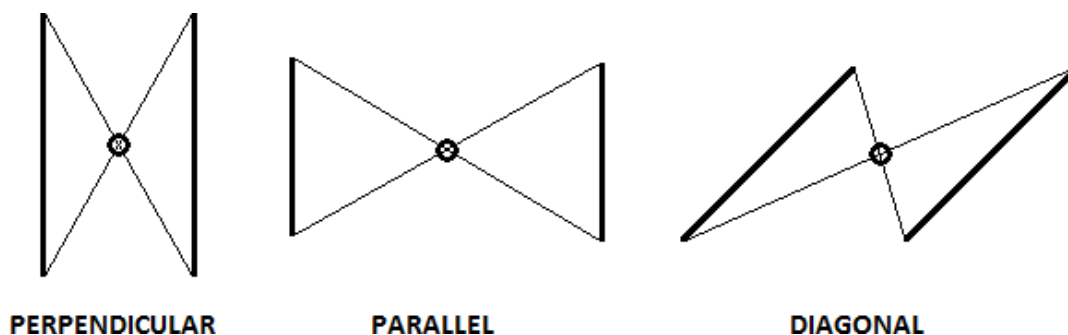


Figure 4: Align PlacePod with center of parking space

2.3 PARKING LOT MAP (RECOMMENDED)

1. Each sensor has a unique Serial Number and code located on a label on the bottom of the sensor.

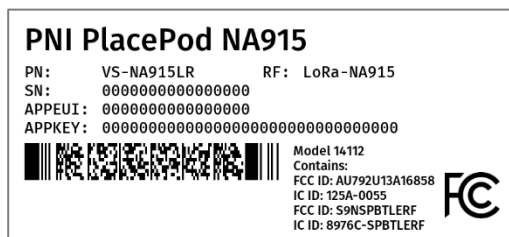


Figure 5: PlacePod identification label

2. Before placing the sensor into its hole or bonding it to the pavement surface, record the sensor's unique Serial Number at its location on the map.

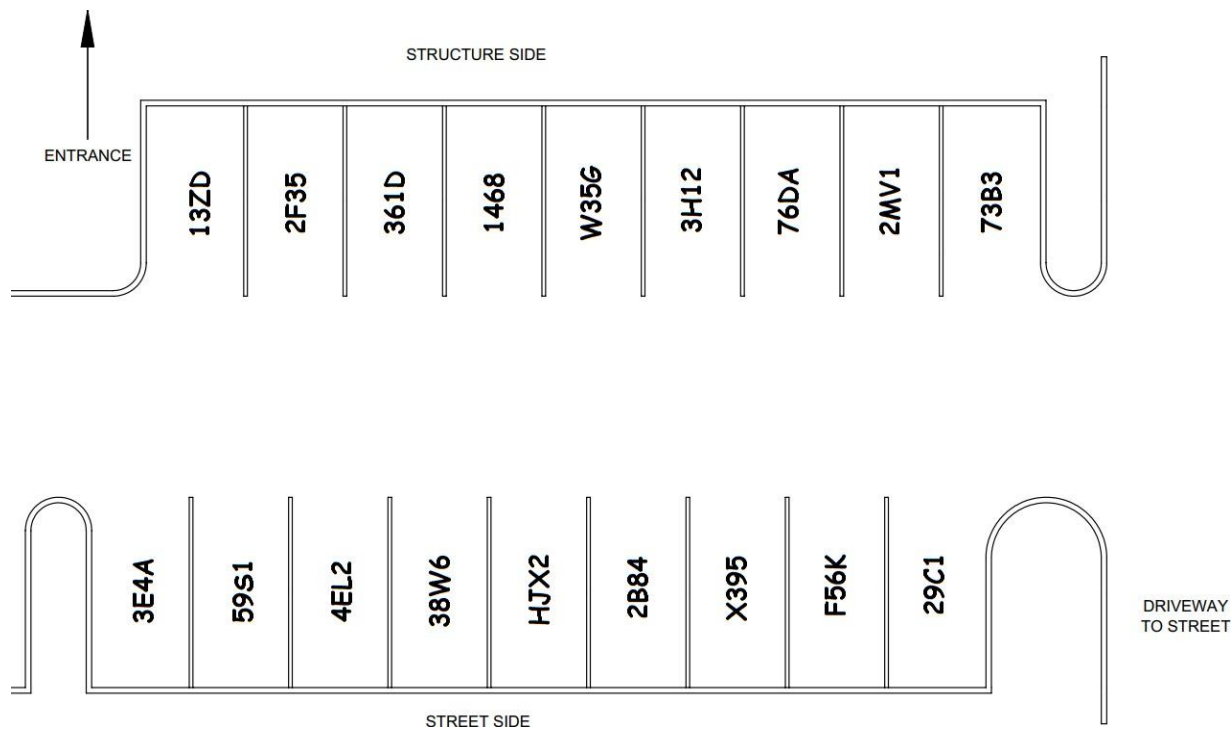


Figure 6: Sample parking map with last four digits of PlacePod serial numbers

3. Knowing the location of where each sensor is installed is useful for individual parking space monitoring as well as troubleshooting sensor performance and communication.

3 EQUIPMENT NEEDED

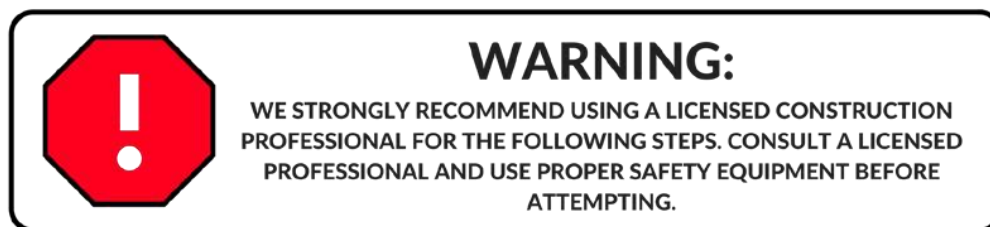
3.1 IN-GROUND SPECIFIC EQUIPMENT

- Portable core drill with 4.5-inch diameter drill bit (such as Hilti DD-150-U drill)*
- Water source for lubricating the drill site during drilling (optional)
- Wet/dry vacuum for removing extra debris from the hole area (optional)
- Torch for drying the surface after drilling (optional)
- Leveling sand for aligning the sensor in the hole (fine sand such as play sand works well)
- Epoxy Sealant and Applicator
 - Currently, PNI recommends: Fabick Pour-Pac MP-55 polyurethane epoxy, which can be ordered directly from the manufacturer:
 - <https://www.fabick.com/sealants.html>
 - Approximately 3 sensors per 2-part kit using minimum application.
 - Vehicle Counting Sensor: Approximately 1 sensor per 2-part kit using minimum application.

3.2 SURFACE MOUNT SPECIFIC EQUIPMENT

- Coarse Sand-Paper
- Adhesive and Applicator
 - Currently, PNI recommends: Superior Industries #303 Bumper Mount, which can be ordered directly from the manufacturer:
 - https://www.superior-industries.com/303_bumper_mount_product_278.html
 - Approximately 6 sensors per 2-part kit using minimum application.
- Concrete Sealer Stripper
- Hammer Drill with Mason Bit
- ¼" Self-Tapping Masonry Screws
 - Currently, PNI recommends: Wedge-Bolt 1/4" X 1 ¾" manufactured by [Powers Fastening Innovations](#). Two versions are available:
 - Part No 7701N - 410 Stainless steel @ \$1.44 each (low magnetic)
 - Part No 7206ND - Zinc plated carbon steel @ \$0.24 each

**PNI strongly recommends that drilling be done by a professional concrete and pavement drilling company, to ensure that proper safety procedures are followed.*

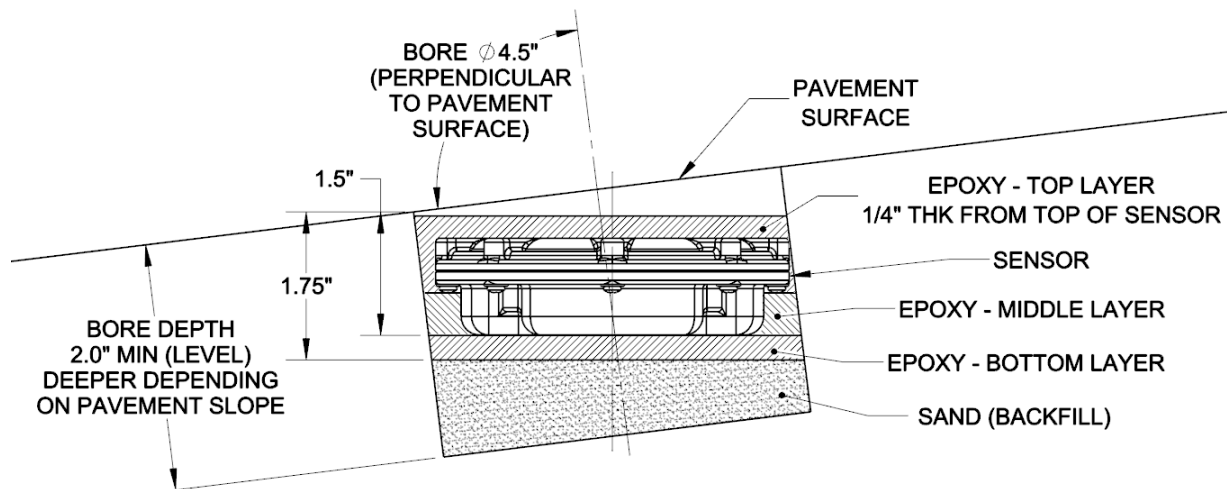


4 INSTALLATION ON GRADED SURFACES

IMPORTANT

PLEASE FOLLOW THE INSTRUCTIONS FOR THE MULTI-STEP EPOXY APPLICATION EXACTLY AS DESCRIBED DURING INSTALLATION. THE APPLICATION PROCESS IS DESIGNED TO ALLOW THE EPOXY TO FULLY ENCAPSULATE THE PLACEPOD ON THE TOP, BOTTOM AND SIDES IN ORDER TO PROVIDE LONG-TERM PROTECTION FROM MOISTURE, CHEMICAL, AND OTHER FORMS OF CONTACT DEGRADATION OVER THE INTENDED LIFETIME OF THE PRODUCT. IMPROPER INSTALLATION MAY RESULT IN SHORTENED PRODUCT LIFETIME.

1. Pavement angle must be taken into account when drilling the core. The depths specified in the following pages are based on a level surface. Depth measurements must be made from the lowest point on the graded surface as shown in the illustration below, particularly if the core drill rig places the core-bit perpendicular to the pavement surface.
2. When back-filling with sand, the sand needs to be as level as possible. This will allow for even layers of epoxy to be applied. The epoxy is self-leveling, therefore the bottom layer of epoxy will enable the sensor to be level once inserted into the hole.



5 IN-GROUND INSTALLATION PROCEDURE

This section outlines the steps required to physically install an in-ground PlacePod.

5.1 PREPARING THE PARKING SPACE

Refer to Section 2.2.

5.2 DRILL THE CORE

PNI recommends using a professional drilling and coring company to drill the holes for each sensor. Give them these instructions for drilling:

1. Drill a 4.5-inch diameter hole. Do not use a drill larger than 4.5 inches in diameter.
2. Drill to a minimum depth of 1.5 inches (minimum depth of 4 ½ inches for PlacePod VC sensor). Drilling completely through to the bedding layer and back-filling with sand to the 1.5 inch (4 ½ inch for PlacePod VC) depth is preferred. Note: If you do not drill through to the bedding layer, you will need an extra step to remove the core. This usually involves an impact device such as a jack-hammer or air-chisel.
3. Optional: Flush the drilling surface with water to lubricate the drill and dampen dust.



Figure 7: Drill the hole for the PlacePod

5.3 REMOVE THE CORE

Remove the core after drilling is done.

1. If drilling down to the bedding layer, the core may remain in the drill bit when it is withdrawn from the hole. Remove the core from the drill bit by tapping the side of the drill bit with a non-marring material.
2. If drilling partially into the pavement without penetrating the bedding layer, the core will have to be broken out using an impact device such as a jack-hammer or air-chisel.



Figure 8: Remove the core from the hole

5.4 PREPARE THE HOLE FOR PLACEPOD

After the core is removed, the hole needs to be cleaned out and leveled so the PlacePod sensor can be placed at the right height.

1. Remove leftover debris to make a relatively flat surface.
2. Backfill with sand to a depth of 1 ¼ inches if necessary.

WARNING! Make sure that the hole is completely dry before proceeding. If the uncured epoxy comes into contact with moisture, it will foam adversely affecting epoxy performance and adhesion.

3. Add epoxy to level the surface to 1.5 inches depth from pavement surface; Allow epoxy to harden.



Figure 9: Bottom layer of epoxy

5.5 INSERT PLACEPOD INTO THE HOLE

1. If mapping of the sensor location is being performed, record the sensor Serial Number.
2. Add a second layer of epoxy approx. 1/4 inch thick.
3. Insert the sensor into the hole so that it is seated onto the bottom of the hole, forcing the uncured epoxy up around the sides of the lower housing.
4. The ideal placement is to have the top of the sensor sit 1/4 to 3/8 of an inch below the surface of the asphalt. Place a weight on top of the sensor to prevent it from floating in the epoxy during curing.



Figure 10: Sit the PlacePod in the hole (ensure top of sensor is 0.25 inches from surface)

5.6 SEAL THE HOLE

1. Once the epoxy from the previous step has cured, remove the weight and fill the remainder of the hole with the epoxy until it is flush with the pavement surface. To reduce formation of bubbles, fill in any gaps between the sensor and the wall of the hole before covering the top of the sensor.
2. Make sure the epoxy completely covers the top of the sensor and is flush or slightly below flush with the pavement surface.

WARNING! The epoxy must not protrude above the pavement surface in order prevent vehicle weight from being transferred directly onto the sensor.

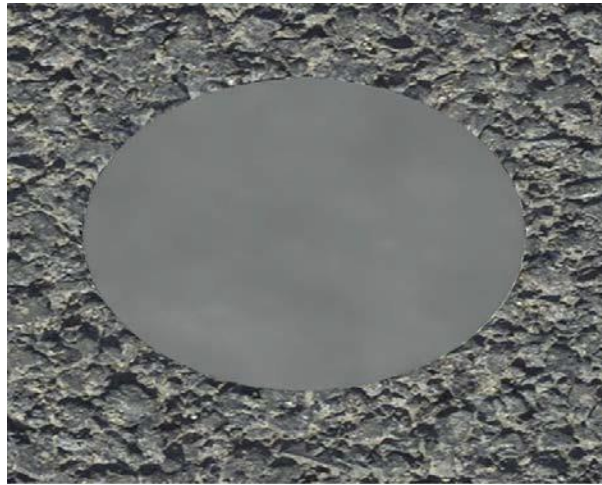


Figure 11: Seal the PlacePod in the hole with sealant

5.7 PREPARE THE HOLE FOR PLACEPOD VC

After the core is removed, the hole needs to be cleaned out and leveled so the PlacePod sensor can be placed at the right height.

1. Remove leftover debris to make a relatively flat surface.
2. Backfill with sand to a depth of 4 ¼ inches if necessary.

WARNING! Make sure that the hole is completely dry before proceeding. If the uncured epoxy comes into contact with moisture, it will foam adversely affecting epoxy performance and adhesion.

3. Add epoxy to level the surface to 1.5 inches depth from pavement surface; Allow epoxy to harden.

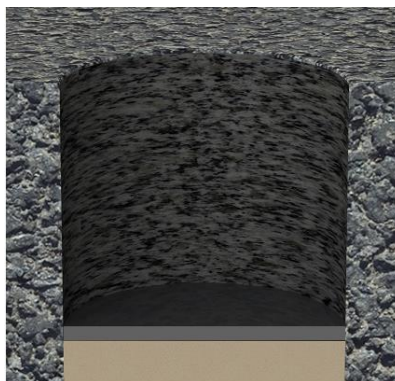


Figure 12: Bottom layer of epoxy

5.8 INSERT PLACEPOD VC INTO THE HOLE

1. Apply second layer of epoxy about 1 inch thick, do not let it cure.

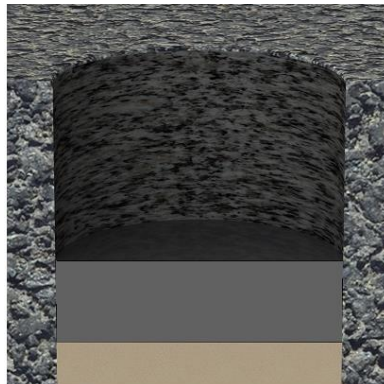


Figure 1: Second layer of epoxy

2. Insert the sensor into the hole so that it is seated onto the bottom of the hole, forcing the uncured epoxy up around the sides of the lower housing.



Figure 24: PlacePod VC seated in the hole

3. The ideal placement is to have the top of the sensor sit 1/4 to 3/8 of an inch below the surface of the asphalt. Place a weight on top of the sensor to prevent it from floating in the epoxy during curing.

5.9 SEAL THE HOLE FOR PLACEPOD VC

1. Once the epoxy from the previous step has cured, remove the weight and fill the remainder of the hole with the epoxy until it is flush with the pavement surface. To reduce formation of bubbles, fill in any gaps between the sensor and the wall of the hole before covering the top of the sensor.
2. Make sure the epoxy completely covers the top of the sensor and is flush or slightly below flush with the pavement surface.

6 SURFACE MOUNT INSTALLATION PROCEDURE

This section will outline the steps required to physically install a surface mount PlacePod.

6.1 PREPARING PARKING SPOT

1. Clear any debris in the park space with the deck broom.
2. Clean center of parking space(s) using locally available asphalt/concrete cleaner and stiff bristle scrub brush.
3. If necessary, remove sealer from the pavement surface in the area where the sensor is to be placed and repeat steps 1 & 2 above.
 - a. This is necessary for longer lasting bond.
 - b. Sealant layer can de-laminate from pavement while remaining attached to the sensor housing.
4. Mark the center of each space using the chalk snap-line.

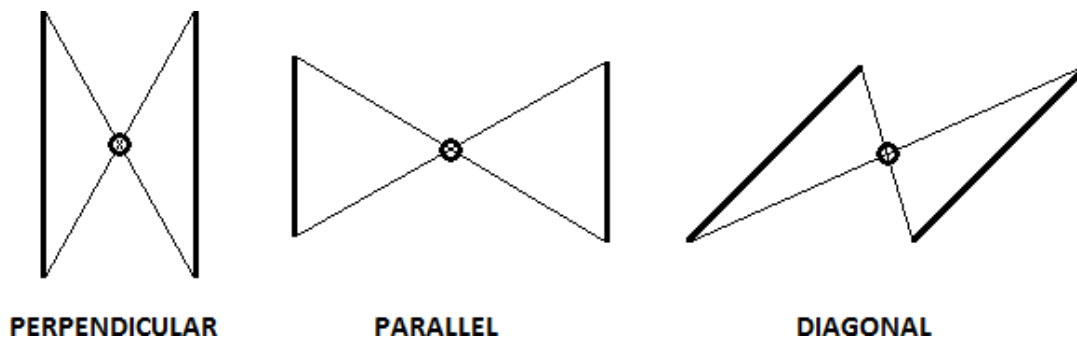


Figure 15: Align PlacePod with center of parking space

If you intend to screw the PlacePod down to the pavement, follow the steps below.

Note: To optimize signal strength orient the sensor in the middle of the space such that the arrow (inside the half circle next to the "P") points towards the nearest gateway.

5. Place the PlacePod Surface Mount hole pattern, provided at the end of this document, at the center of the spot and mark each screw hole location. Alternatively you can use the PlacePod housing to mark the holes through the housing. ONLY mark the holes through the housing, do NOT drill the holes through the housing.
6. Use the Hammer Drill to drill the screw holes. Do NOT drill the holes through the PlacePod sensor as the vibration and shock from the drill can damage the components inside the sensor.

6.2 PREPARING PLACEPOD FOR ADHESIVE

1. Using coarse sand-paper, lightly sand the bottom gray portion of the housing, scuffing the surface.

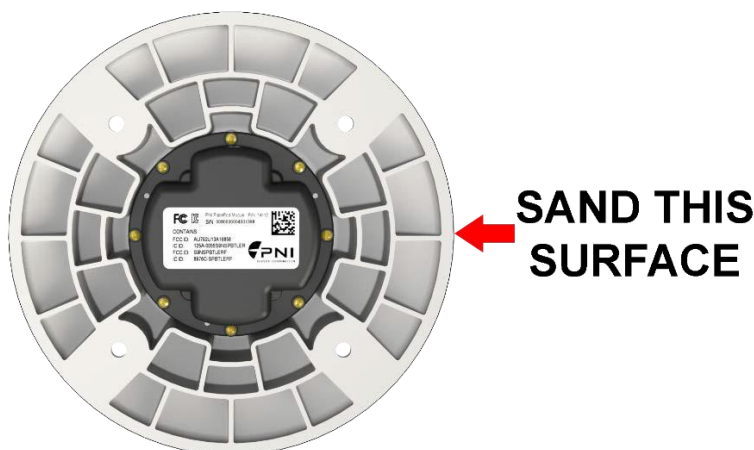


Figure 16: Sand gray part of housing to scuff surface

2. Wipe off any residual particulates from the sanding.

6.3 INSTALL PLACEPOD WITH ADHESIVE

1. If mapping of the sensor location is being performed, record the Serial Number.
2. At minimum, apply a 1/8" to 1/4" bead of adhesive around the outer and inner rings of the PlacePod.
3. If desired, adhesive can be applied to the ribs and to the sensor lower housing (black) areas NOT covered by the label.

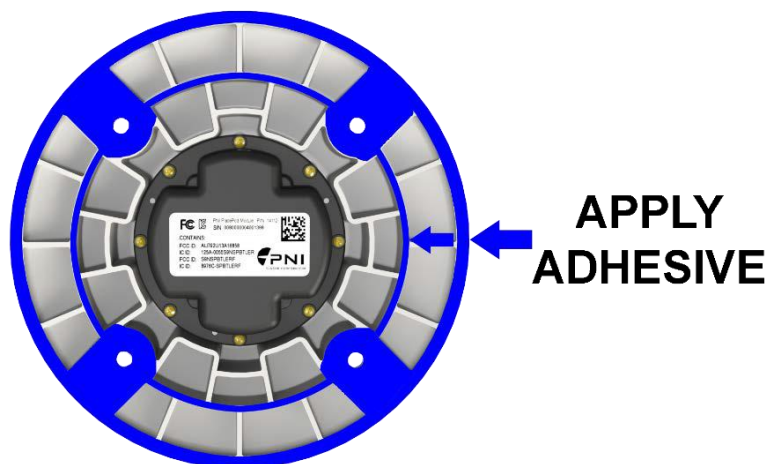


Figure 17: Apply adhesive to outer ring and any additional ribs of the gray housing

4. To optimize signal strength, orient the sensor in the middle of the space such that the arrow points towards the nearest gateway.
5. Place the sensor on the ground and press down on it firmly.
6. If desired, apply an additional bead of adhesive around the seam of the sensor and the pavement.

Note: If you intend to also screw the PlacePod down, ensure that you align the PlacePod with the pre-drilled screw holes.

6.4 INSTALL PLACEPOD WITH SCREWS

1. Use the PlacePod hole pattern diagram below to mark your pre-drilled screw holes.
2. Align the PlacePod in the center of the parking space with the pre-drilled screw holes.
3. Screw the PlacePod down with the Masonry Screws and hand tighten. Do not over-tighten the screws as this can damage the PlacePod housing.

Note: Drilling dimensions - Drill bit size is determined by screw manufacturer.

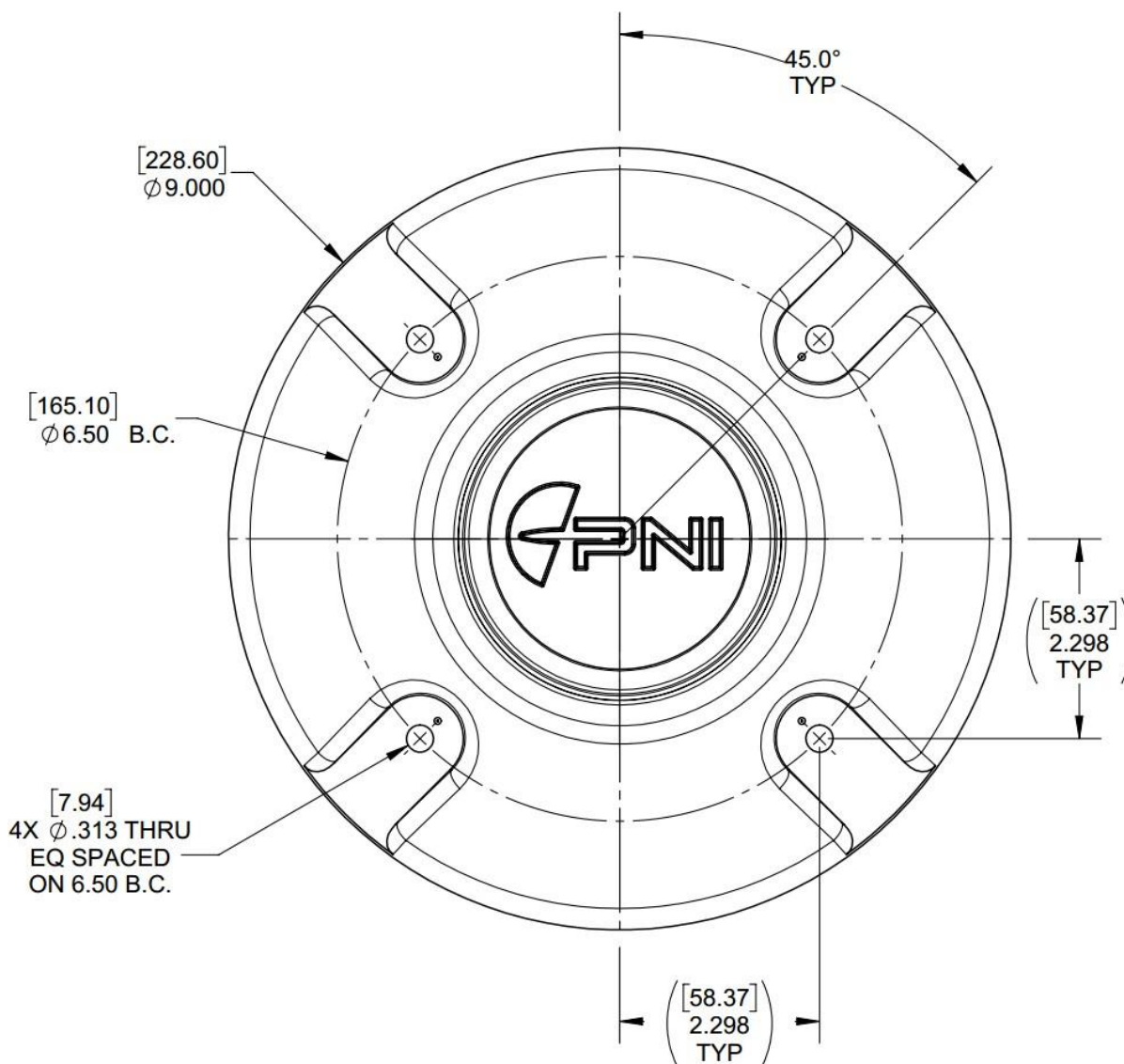


Figure 18: Hole Pattern and Drill Dimensions

7 POST-INSTALLATION STEPS

After the PlacePod has been successfully installed there are some additional steps that should be taken.

1. Verify that the PlacePod is communicating with the LoRa network.
2. Calibrate the PlacePod sensor for the empty parking space. This is important and required for each sensor. If calibration is not properly performed the PlacePod will not accurately detect vehicles.



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DO NOT OPEN THE PLACEPOD SENSOR. THE PLACEPOD SENSOR IS SHIPPED READY TO ACTIVATE AND INSTALL. THE SENSOR SHOULD NOT BE OPENED FOR ANY REASON. OPENING THE SENSOR VOIDS THE PRODUCT WARRANTY.

Warranty and Limitation of Liability – PlacePod Vehicle Detection Sensor (“Product”). PNI Sensor (“PNI”) manufactures its Products from parts and components that are new or equivalent to new in performance. PNI warrants that each Product to be delivered hereunder, if properly used, will, for 90 days following the date of shipment be free from defects in material and workmanship and will operate in accordance with PNI’s published specifications and documentation for the Product in effect at time of order. Any Product that is non-functional and unresponsive to firmware and software updates will be considered failed hardware units and will be replaced at no charge. This warranty includes 90 days of debugging maintenance for customers that use the PNI Parking Management Software to manage PNI’s Product.

This warranty does not cover wear and tear due to normal use, or damage to the Product as the result of improper installation, misuse, neglect of care, alteration, vandalism, theft, accident, or unauthorized repair.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE. PNI NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY.

If any Product furnished hereunder fails to conform to the above warranty, Customer’s sole and exclusive remedy and PNI’s sole and exclusive liability will be, at PNI’s option, to repair, replace, or credit Customer’s account with an amount equal to the price paid for any such Product which fails during the applicable warranty period provided that (i) Customer promptly notifies PNI in writing that such Product is defective and furnishes an explanation of the deficiency; (ii) such Product is returned to PNI’s service facility at Customer’s risk and expense; and (iii) PNI is satisfied that claimed deficiencies exist and were not caused by improper installation, misuse, neglect of care, alteration, vandalism, theft, accident, or unauthorized repair. If a Product is defective, transportation charges for the return of the Product to Customer within the United States and Canada will be paid by PNI. For all other locations, the warranty excludes all costs of shipping, customs clearance, and other related charges. PNI will have a reasonable time to make repairs or to replace the Product or to credit Customer’s account. PNI warrants any such repaired or replacement Product to be free from defects in material and workmanship on the same terms as the Product originally purchased.

Except for the breach of warranty remedies set forth herein PNI shall have no liability for any indirect or speculative damages (including, but not limited to, consequential, incidental, punitive and special damages) relating to the use of or inability to use this Product, whether arising out of contract, negligence, tort, or under any warranty theory, or for infringement of any other party’s intellectual property rights, irrespective of whether PNI had advance notice of the possibility of any such damages, including, but not limited to, loss of use, revenue or profit. In no event shall PNI’s total liability for all claims regarding a Product exceed the price paid for the Product. PNI neither assumes nor authorizes any person to assume for it any other liabilities.