R450™ MIU Wall and Pit Installation and Maintenance Guide
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FCC Conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.
RF Exposure Information

This equipment complies with the FCC RF radiation requirements for uncontrolled environments. To maintain compliance with these requirements, the antenna and any radiating elements should be installed to ensure that a minimum separation distance of 20 cm is maintained from the general population.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Professional Installation

In accordance with Section 15.203 of the FCC rules and regulations, the MIU must be professionally installed by trained utility meter installers. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe B répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.
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Overview

This section provides a general description of the Neptune R450™ Meter Interface Unit (R450 MIU or MIU). The R450 MIU is a compact electronic device that collects meter reading data from an encoder register. It then transmits the data for billing. The R450 MIU is designed for use with multiple types of approved encoder registers:

- Neptune ARB® III, IV, and V
- ProRead™, ProCoder™, and E-CODER®
- Sensus (Invensys) ECR® II and ECR® III

Before installing the R450 MIU, the encoder register must be wired correctly and programmed to work with the MIU:

- When using a ProRead encoder register (Rev. E or earlier), the ProRead register must be programmed for three-wire mode.
- If using a new ProRead register (Rev. F or later), AutoDetect can recognize it, and it does not need to be programmed.
- If using an existing register, make sure all three wires are connected, and it is programmed in three-wire mode.

Figure 1 – R450™ Wall and Pit MIU
To ensure that the ProRead™ register is programmed for three-wire mode, use the ProRead programmer and its Radio Frequency (RF) / MIU 6, 8, or 10 ID Transport Driver Interface (TDI) format. Do this using the ProRead receptacle before removing the receptacle or three bare wires.

The R450 MIU is easy to install and requires a Federal Communications Commission (FCC) license to operate. For information on obtaining an FCC license, refer to “FCC Licensing,” in the ARB® N_SIGHT™ FixedBase New Customer Guide.

R450™ MIU Programming

You can upgrade and configure the MIU. At the factory, serial numbers are programmed into the MIU. Each MIU has two unique serial numbers / identification numbers (two IDs for compound units). Even numbers are for the single registers and odd numbers are for a two-networked register unit. Custom serial numbers are not available.

RF Protocol Error Detection

The RF protocol is comprised of a header, data packet, and an error detection mechanism that reduces the erroneous data.

Low Battery RF Emissions

The MIU does not produce out-of-band emissions under low battery conditions.
Chapter 2: Specifications

This chapter provides the specifications for the R450™ Wall and Pit MIU (Meter Interface unit).

Electrical Specifications

The section provides the electrical specifications.

Encoder Register Interface

This section provides the specifications for the encoder register.

Table 1 – Supported Encoder Maximum Cable Length

<table>
<thead>
<tr>
<th>Encoder</th>
<th>Cable Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neptune® ARB V(^1)</td>
<td>300 feet (91 meters)</td>
</tr>
<tr>
<td>Neptune ProRead (ARB VI), ProCoder and E-CODER (ARB VII)</td>
<td>500 feet (152 meters)</td>
</tr>
<tr>
<td>Sensus ECR II and ECR III(^2)</td>
<td>200 feet (61 meters)</td>
</tr>
<tr>
<td>Networked Neptune ProRead (ARB VI), ProCoder, and E-CODER (ARB VII)</td>
<td>250 feet (76 meters)</td>
</tr>
</tbody>
</table>

\(^1\) The length, which meets manufacturers' published specification for wire length between encoder and remote receptacle, is based on solid three-conductor wire, 22 AWG (American Wire Gauge).

\(^2\) Only specific formats of ECR III programming are compatible. Contact Neptune for details.

Specifications – R450™ Wall MIU

This section provides the specifications for the R450 Wall MIU.

Environmental Conditions

The following table shows the environmental conditions for the R450 Wall MIU.

Table 2 – Environmental Conditions

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-22(^\circ) to 149(^\circ)F (-30(^\circ) to 65°C)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40(^\circ) to 158(^\circ)F (-40(^\circ) to 70°C)</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>0 to 95% Condensing</td>
</tr>
</tbody>
</table>
Chapter 2: Specifications

Functional Specifications

The following table shows the functional specifications of the R450 Wall MIU.

Table 3 – Functional Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register Reading</td>
<td>3 - 8 digits</td>
</tr>
<tr>
<td>MIU ID</td>
<td>9 digits</td>
</tr>
</tbody>
</table>

Dimensions and Weight

The following table shows the dimensions and weight of the R450 Wall MIU.

Table 4 – Dimensions and Weight (Pit MIU)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>Refer to Chapter 2</td>
</tr>
<tr>
<td>Weight</td>
<td>1.0 lbs. (454 grams)</td>
</tr>
</tbody>
</table>

Figure 2 – Wall MIU Dimensions

R450™ MIU Wall and Pit Installation and Maintenance Guide
Specifications - R450™ Pit MIU

Environmental Conditions

The following table shows the environmental conditions for the R450 Pit MIU.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40° to 158°F (-40° to 70°C)</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>0 to 95% Condensing</td>
</tr>
</tbody>
</table>

Functional Specifications

The following table shows the functional specifications of the R450 Pit MIU.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register Reading</td>
<td>3 - 8 digits</td>
</tr>
<tr>
<td>MIU ID</td>
<td>9 digits</td>
</tr>
</tbody>
</table>

Dimensions and Weight

The following table shows the dimensions and weight of the R450 Pit MIU.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>Refer to Figure 3 and Figure 4.</td>
</tr>
<tr>
<td>Weight</td>
<td>1.0 lbs. (454 grams)</td>
</tr>
</tbody>
</table>
Chapter 2: Specifications

Figure 3 – Pit MIU Dimensions

Figure 4 – Pit MIU Antenna Dimensions
Chapter 3: General Installation Guidelines

This chapter describes tools, materials, and general installation information for the R450™ Meter Interface Unit (MIU).

Tools and Materials

The following table shows the recommended tools and materials you may need to successfully install the R450 MIU or to replace the MIU’s internal battery.

Some items may not apply to your specific installation or the list may not contain all required tools or materials.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description / Recommendation</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool Kit</td>
<td>Contains standard tools including:</td>
<td>Various installation procedures performed by the utility</td>
</tr>
<tr>
<td></td>
<td>• Assorted screwdrivers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Needle-nose pliers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wire stripper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Diagonal cutters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Electrician’s knife</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hammer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Crimping tool (P/N 5500-158)</td>
<td></td>
</tr>
<tr>
<td>Magnet</td>
<td>6 lb. force (P/N 12287-001)</td>
<td>Activating the MIU</td>
</tr>
<tr>
<td>Communication Device</td>
<td>Smartphone or tablet</td>
<td>Receive emails</td>
</tr>
<tr>
<td>Cable</td>
<td>Solid three-conductor, #22 AWG (black / green / red) P/N 6431-352</td>
<td>Connecting the MIU to the encoder register</td>
</tr>
<tr>
<td>Moisture Protection Compound</td>
<td>Novaguard sealant (P/N 96018-072)</td>
<td>Covering the exposed wires and terminal screws on the register and the MIU</td>
</tr>
</tbody>
</table>
### Safety and Preliminary Checks

Observe the following safety and preliminary checks before and during each installation:

- Verify that you are at the location specified on the site work order.
- Verify that the site is safe for you and your equipment.
- Notify the customer of your presence, and tell the customer that you need access to the water meter.
- Write in the ID number of the MIU you are about to install, if the site work order does not have an MIU ID number.
- Verify that the ID number matches the ID number on the MIU you are about to install, if the site work order already has an MIU ID number.

### Verifying / Preparing the Encoder Register

The R450 MIU is designed for use with the following encoder registers:

- ARB® III, IV, and V
- ProRead™ (ARB® VI)
- ProRead™ AutoDetect
- E-CODER® (ARB VII)
- ProCoder™
- Sensus ECR® II and Sensus ECR® III

Before installing an MIU, the encoder register must be wired correctly and programmed to work with the MIU. ProRead (ARB VI) encoder registers do not require programming.
When you use a ProRead (ARB VI) encoder register, the non-AutoDetect ProRead (ARB VI) register must be programmed for three-wire RF mode.

If connecting the MIU to a new ProRead (ARB VI) encoder register, or if a three-conductor cable is already connected to a ProRead (ARB VI) encoder register, ensure that the ProRead (ARB VI) register is programmed for three-wire mode using the ProRead (ARB VI) programmer and its RF / MIU 6, 8, or 10 ID TDI format. You can do this through the ProRead (ARB VI) receptacle before removing the receptacle.

Installing the Register (Non Pre-Wired or Potted Only)

Follow these steps to install a non-pre-wired or potted register.

1. Before wiring the pit encoder register, make sure the cable is long enough. When you complete the installation, you can remove the pit lid easily without straining the cable.
2. Connect the encoder register to the MIU using 22 AWG cable.
3. Remove the terminal screw cover from the encoder register.
4. Strip off 3/4 inch of the jacket from the cable leaving only the three insulated wires.
5. Take precautions not to nick or cut the insulation on the three wires and strip off 1/2 inch of insulation from each of the three wires.

Figure 5 – Wiring Neptune Encoder Register  
Figure 6 – Encoder Wiring
6. If required, connect the three-conductor wire to the encoder register's terminals using the manufacturer's instructions. See Figure 6 on page 9.

7. Thread the cable around the strain relief posts of the encoder.

![Figure 7 - Cable Threaded Around Strain Relief Posts](image)

8. Apply sealant liberally and ensure that it encapsulates the terminal screws and exposed wires.

![Figure 8 - Application of the Sealant](image)

Neptune requires Novaguard G661 sealant or Dow Corning Compound 4. Any leak point can cause a reading failure in a submerged meter setting.
9. Snap the cover onto the encoder register.

![Figure 9 – Covering the Terminal Screws](image)

10. Run the cable to the MIU and fasten it securely.

   Do not exceed maximum cable lengths as illustrated in Table 9 on page 15.

11. If the encoder register is pre-wired and potted, use Scotchloks to connect the register to the MIU as illustrated in Figure 14 on page 17.
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Chapter 4: Installing the R450™ Wall MIU

This chapter provides information on how to install the R450™ Wall Meter Interface Unit (MIU).

Prior to Installation

This section describes tasks to complete before installing the R450 Wall MIU.

Storage

Inspect shipping containers for damage, and inspect the contents of any damaged carton prior to storage.

After completing the inspection, store the cartons in a clean, dry environment. Keep in mind the R450 MIU has an internal battery. Storage for more than one year may affect product life. Use a first-in, first-out inventory control system. See "Environmental Conditions" on page 3.

Unpacking

Handle the R450 MIU carefully; however, no additional special handling is required.

After unpacking the MIU, inspect for damage. If the MIU appears to be damaged or proves to be defective upon installation, notify your Neptune Sales Representative. If one or more items require reshipment, use the original cardboard box and packing material.

Figure 10 – R450™ Wall MIU Kit
Chapter 4: Installing the R450™ Wall MIU

Tools and Materials

Table 8 on page 8 shows the recommended tools and materials you may need to successfully install the R450 MIU.

Some items may not apply to your specific installation, or the list may not contain all required tools or materials.

Site Selection

Always follow your company’s safety practices and installation guidelines when installing an MIU. Never perform an installation during a lightning storm or under excessively wet conditions.

Installation and operation in moderate temperatures increase reliability and product life. See "Environmental Conditions" on page 3.

Follow these guidelines when selecting a location to install the R450 MIU.

R450™ Wall MIU

For selecting the location for the R450 Wall MIU, follow these guidelines.

- Mount the MIU on the outside of the building and in a location that provides a direct line-of-sight to the collector.
- Install the MIU approximately 5 feet above the ground or higher.
- Install the MIU in a vertical and upright position.
- The preferred mounting surface for the MIU is a flat wall, but you can also mount it to a pipe.
- Clear the location of all obstructions.
- Avoid installing the MIU behind metal fences or walls.
- Maximum cable length between the encoder register and MIU depends on the register’s manufacturer and model. Refer to Table 9 on the facing page for maximum cable lengths, which meets manufacturer’s published specification for wire length between encoder and remote receptacle.
Table 9 – Cable Manufacturer, Length, and Gauge

<table>
<thead>
<tr>
<th>Encoder</th>
<th>Maximum Cable Length*</th>
<th>Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neptune ARB III, IV, V</td>
<td>300 feet (91 meters)</td>
<td>22 American Wire Gauge (AWG)</td>
</tr>
<tr>
<td>Neptune ProRead (ARB VI) / E-CODER (ARB VII) / ProCoder</td>
<td>500 feet (152 meters)</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Networked Neptune ProRead / E-CODER / ProCoder</td>
<td>200 feet (61 meters)</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Sensus (Invensys) ECR II / ECR III</td>
<td>250 feet (76 meters)</td>
<td>22 AWG</td>
</tr>
</tbody>
</table>

ECR III must be programmed with the proper format.

Installing the R450™ Wall MIU

Complete the following steps to install the R450 Wall MIU.

1. Remove the main housing from the mounting adapter.

The Hi-Lo fastener for securing the main MIU housing to the adapter plate is shipped separately.

Figure 11 – Wall MIU Main Housing
A variety of holes in the mounting adapter allows for a quick and easy installation.

- The cable enters through the bottom or rear cable entry of the mounting adapter.
- When the MIU replaces a receptacle, use the appropriate holes to allow reuse of the receptacle's original mounting holes.
- When mounting the MIU to a pipe, use the bolt hole for pipe mounting to bolt the mounting adapter to a pipe clamp.

2. Study Figure 12 and the location requirements, and then decide how to install the MIU.

![Figure 12 – Mounting Adapter](image)

3. Install the MIU and mount the adapter with the Hi-Lo fastener positioned at the bottom.

4. Connect each individual colored wire from the wall MIU with the appropriate colored wire from the approved encoder (see Figure 6 on page 9). Repeat this step for each colored wire.
5. For rear cable entry, store excess wire and Scotchloks™ in the hollow cavity in the back of the MIU using the strain relief guides.

![Figure 13 – Back of MIU](image)

6. For bottom cable exit, store Scotchloks in the hollow cavity in the back of the MIU. Guide the remaining wire through the cable exit notch at the bottom right side of the MIU.

- Use 22 AWG three-conductor wire to connect the MIU to the approved encoder.
- Use type UR or UY Scotchlok gel caps to connect the pigtail from the MIU to the register wire. Refer to Neptune’s R450™ Quick Install Guide (P/N 12856-001) for proper Scotchlok techniques.

When using the Scotchlok gelcaps:
- Pair the wires according to the color chart in Figure 6 on page 9.
- Slide the ends of the pair of colored wires into the gel caps as far as they can go. Do not strip individual colored wires.
- Firmly squeeze the gel cap with the appropriate crimping tool (Eclipse Tools P/N 100-008 or Neptune P/N 5500-158). One gel cap is used for each colored wire pair.

![Figure 14 – Gel Cap Connections](image)
7. Slide the tongue on the top of the MIU into the groove on the top of the MIU mounting adapter.

![Figure 15 – MIU Back Plate](image)

8. Secure the MIU to the mounting adapter using the Hi-Lo fastener provided.

![Figure 16 – Hi-Lo Fastener](image)

9. Activate the MIU. Refer to section entitled "Activating and Testing the R450™ MIU" on page 25.
Chapter 5: Installing the R450™ Pit MIU

This chapter provides information on how to install the R450™ Pit Meter Interface Unit (MIU).

Prior to Installation

This section describes tasks to be completed before installing the R450 Pit MIU.

Storage

Inspect shipping containers for damage, and inspect the contents of any damaged carton prior to storage.

After the inspection is complete, store the cartons in a clean, dry environment. Keep in mind that the R450 MIU has an internal battery. Storage for more than one year may affect product life. Use a first-in, first-out inventory control system. See "Environmental Conditions" on page 3.

Unpacking

Handle the R450 MIU carefully; however, no additional special handling is required.

After unpacking the MIU, inspect the MIU for damage. If the MIU appears to be damaged or proves to be defective upon installation, notify your Neptune Sales Representative. If one or more items require reshipment, use the original cardboard box and packing material.

Figure 17 – R450™ Pit MIU Kit
Chapter 5: Installing the R450™ Pit MIU

Tools and Materials

Table 8 on page 8 shows the recommended tools and materials you need to successfully install the R450 MIU.

Some items may not apply to your specific installation, or the list may not contain all required tools or materials.

Site Selection

Always follow your company’s safety practices and installation guidelines when installing an MIU. Never perform an installation during a lightning storm or under excessively wet conditions.

Installation and operation in moderate temperatures increase reliability and product life. See “Environmental Conditions” on page 3.

Follow these guidelines when selecting a location to install the R450 Pit MIU.

*R450™ Pit MIU*

- Select a location free from all potential obstructions.
- Place the antenna through a hole in the pit lid.
- Avoid installing the MIU behind metal fences or walls.
- Make sure there is enough room in the pit for the MIU. The antenna is usually installed off-center because the meter position is fixed.
- The MIU comes with an attached cable, but in some instances, additional cable is required. The maximum cable length between the encoder register and the MIU depends on the register's manufacturer and model. Refer to Table 10 on the facing page for maximum cable lengths.
- When installing in a high-traffic area, Neptune recommends that the dome of the antenna be recessed in the pit lid.

*Figure 18 – Antenna Placement for High-Traffic Areas*
Recessing the installation reduces the range of reception.

- When installing in a low-traffic area, the dome of the antenna can rest on top of the lid.

![Antenna Placement for Low-Traffic Areas](Image)

**Figure 19 – Antenna Placement for Low-Traffic Areas**

- Neptune recommends installing the MIU in a location that provides a direct line-of-sight path to the meter reader.
- Although the MIU has an attached cable (either 6 feet or 25 feet long), some installations can require additional cable. In these cases, the maximum cable length between the encoder register and the MIU depends on the register's manufacturer and model. Refer to Table 10 for maximum cable lengths, which meets manufacturer's published specification for wire length between encoder and remote receptacle.

<table>
<thead>
<tr>
<th>Encoder Register</th>
<th>Maximum Cable Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neptune ARB III, IV, and V*</td>
<td>300 feet (91 meters)</td>
</tr>
<tr>
<td>Neptune ProRead (ARB VI) / E-CODER (ARB VII) / ProCoder</td>
<td>500 feet (152 meters)</td>
</tr>
<tr>
<td>Invensys ECR II and ECR III</td>
<td>200 feet (61 meters)</td>
</tr>
<tr>
<td>Networked Neptune ProRead (ARB VI) / E-CODER (ARB VII) / ProCoder</td>
<td>250 feet (76 meters)</td>
</tr>
</tbody>
</table>

* Meets manufacturer’s published specification for wire length between the encoder and remote receptacle.

Before wiring the encoder register, make sure the cable is long enough so when the installation is complete, the pit lid (with MIU attached) can be removed easily without straining the cable.
Connecting the Antenna

Complete the following steps to connect the antenna.

1. Insert the antenna cable and housing through the 1-3/4-inch hole in the meter pit lid.
2. Slip the large plastic nut over the antenna cable and thread it onto the antenna assembly to secure it to the pit lid.
3. Make sure the smooth side at the top of the threads on the nut is facing upward.

If you are replacing an existing antenna, be sure to clean any dirt, debris, or dielectric grease from the latch plate on the MIU housing.
4. Align the F connector center conductor and insert the antenna connector into the three-lobed plastic latch plate of the MIU housing.

![Figure 22 – F Connector](image)

5. Push in and turn clockwise until the antenna connector is properly seated on the three-lobed black plastic latch plate.

![Figure 23 – Connect Antenna to MIU Housing](image)
Installing the R450™ Pit MIU

Complete one of the following tasks.

- For a flooded pit or deep vault installations, use the cable tie to hang the MIU from the antenna tube.

![Cable tie](image)

Figure 24 – Cable Tie

- For shallow residential pits, position the MIU in the base of the meter box. Carefully coil the pit antenna cable in the pit prior to reinstalling the pit lid.

![Pit Installation](image)

Figure 25 – Pit Installation

Do not lodge the MIU between the meter box and any components inside the box. When connecting an R450 MIU to an AMR Permalog unit, be sure to use the supplied cable tie to hang the MIU from the antenna shaft.

Proceed to "Activating and Testing the R450™ MIU" on page 25.
Chapter 6: Activating and Testing the R450™ MIU

This chapter provides information on activating and testing the R450™ Meter Interface Unit (MIU).

Activating the MIU

Position the magnet against the left side of the MIU and in line with the Neptune logo. Swipe it upward from the side and around the corner to the top to activate the MIU.

During the 30 seconds before the configuration transmission, the MIU acquires the strongest R450 Data Collector (R450 DC) for that location.

- The MIU transmits its configuration packet to the collector approximately 30 seconds following the magnet swipe.
- The MIU sends the register reading to the collector approximately 15 seconds following the configuration packet.
- When the collector receives the configuration packet, the host sends an email or Short Message Service (SMS) confirmation to the installer. This allows for verification of a successful installation and placement of the MIU.

Figure 26 – Magnet Activation of the MIU
The following is an example of the email text.

Subject: 1224/G/–89/US 29/MIU Config
MIU RSSI .............. Pass [-93]
Collector RSSI .......... Pass [-89]
Register ............. Valid Read
Collector .......... US 29
Signal/Noise .......... 37
Noise ................. 126
MIU ID ............... 110001224

The subject line of the email provides a quick summary of the detailed information. The table below provides a breakdown of the highlights of the email.

**Table 11 – Config Email Subject Line Breakdown**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1224</td>
<td>Last four digits of the MIU ID.</td>
</tr>
<tr>
<td>G</td>
<td>Valid Read. There are three types of reads:</td>
</tr>
<tr>
<td></td>
<td>• G = Valid Read</td>
</tr>
<tr>
<td></td>
<td>• B = Bad Read</td>
</tr>
<tr>
<td></td>
<td>• N = No Register</td>
</tr>
<tr>
<td>-89</td>
<td>R450 DC Received Signal Strength Indicator (RSSI)</td>
</tr>
<tr>
<td>US 29</td>
<td>Data Collector Name</td>
</tr>
</tbody>
</table>

**RSSI Values and ARB® N_SIGHT® FixedBase System Capabilities**

Received Signal Strength (RSSI values) is a key indicator of the ARB® N_SIGHT® FixedBase System health as well as the communication capabilities of the MIU to and from the R450 DC.

These values are associated with the **Uplink**, the ability of the R450 DC to hear reading information from the MIU, and the **Downlink**, the ability of the MIU to hear instructions from the R450 DC.
The MIU Config email provides feedback on the RSSI values between the MIU and the collector following MIU Activation. Depending on the RSSI values recorded, the system indicates the following values:

- Pass
- Marginal
- Fail

It is important to note that RSSI values in the Pass range are required for both the Uplink and the Downlink to ensure full, two-way capabilities of the MIU as part of the N_SIGHT host software.

Table 12 – Collector RSSI Uplink

<table>
<thead>
<tr>
<th>RSSI Description</th>
<th>RSSI Values</th>
<th>Result in Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>RSSI &gt;= -105</td>
<td>Reliable daily readings and profile data</td>
</tr>
<tr>
<td>Marginal</td>
<td>-115 &lt;= RSSI &lt; -105</td>
<td>Occasionally missed daily readings and profile data</td>
</tr>
<tr>
<td>Fail</td>
<td>RSSI &lt; -115</td>
<td>Very poor readings performance</td>
</tr>
</tbody>
</table>

Table 13 – MIU RSSI Downlink

<table>
<thead>
<tr>
<th>RSSI Description</th>
<th>RSSI Value</th>
<th>Result in Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>RSSI &gt;= -95</td>
<td>Full capability</td>
</tr>
<tr>
<td>Marginal</td>
<td>-105 &lt;= RSSI &lt; -95</td>
<td>Occasional two-way capability - not reliable</td>
</tr>
<tr>
<td>Fail</td>
<td>RSSI &lt; -105</td>
<td>MIU not capable of two-way communications</td>
</tr>
</tbody>
</table>

Other Sample Configuration Emails

**RSSI Validation Test Failed**

If an MIU fails the validation test for RSSI during the installation process, you receive an email or SMS showing a Marginal or Failed RSSI value. In the following example email, note the Failed downlink value (-107) as well as the Marginal uplink value (-107).
The installer receives this email if the configuration has failed.

Subject: 0042/G/-107/ Collector One/MIU
Config
MIU <- Coll............. Failed[-107]
Coll <- MIU............. Marginal[-107]
Register.............. Valid Read
Collector............. Collector One
Signal/Noise.......... 23
Noise................... 130
MIU id.................. 110500042
================================

Register Test Failed

If an MIU fails the error-check test on the register read during the installation process, you receive the email below. This indicates that there is a problem with the wiring to the register.

Subject: 1776/B/-117/Collector Four/MIU
Config
MIU <- Coll............... Failed[-109]
Coll <- MIU............... Failed[-117]
Register.............. Register Connectivity Problem
Collector............. Collector Four
Signal/Noise........... 13
Noise................... 130
MIU id.................. 110181776
================================
Completing the Activation

Do one of the following:

- If a valid register connection and acceptable RSSI values are reported, proceed to "Completing the R450™ MIU Installation" on page 31.
- If the MIU does not report acceptable RSSI values, reposition the MIU.
- If the register connection is returned as invalid, proceed to "Troubleshooting" on page 33.
- If no connection is established, relocate to the alternate wall location or higher elevation, and try again.
This page intentionally left blank.
Chapter 7: Completing the R450™ MIU Installation

This chapter provides the steps to complete the installation of the R450™ MIU.

Final Steps

Complete the following steps:

1. Install a seal wire or seal clip through the seal holes.
2. Make sure the appropriate ID number on the MIU has been assigned to the meter setting.
   - For single register applications, use the bold-faced ID number.
   - For two-register configuration, assign the HI S/N to one register and the LO S/N to the second register.

Tags are provided to attach to the MIU, which helps to eliminate transcription errors.

Checklist

Before leaving the installation site, do the following.

- Record the MIU ID for each register.
- Verify that you have followed all requirements of this guide.
- Verify that you have recorded all required information.
- Clean up any installation debris.
- Verify that the requirements of the site work order have been completed.
- Inform the customer that you have completed your work. If you were unable to finish, inform the customer when you are coming back to complete the project.
Chapter 8: Troubleshooting

This chapter provides information on how to resolve issues during the installation process.

After the MIU Is Wired

After the MIU is wired, follow these steps to troubleshoot an invalid register reading or connection, for example B or N in the MIU Config email.

1. Check the wiring connections (terminal screws, Scotchloks™) to ensure they are connected properly.
2. If the register is a non-prewired and potted register, check that the silicone is applied correctly.
3. If the register is a Rev. E or older, check to ensure it is programmed in a three-wire RF format using a field programmer.
4. If the problem continues, replace the register.

Troubleshooting Low RSSI: Tips and Techniques for New Installations

Received Signal Strength Indicator (RSSI) is a measurement of the power present in a received radio signal. Neptune uses this measurement during the installation process to determine if a collector is strongly receiving from an MIU. The following table lists the values that Neptune considers acceptable, marginal, or failed.

**Table 14 – MIU RSSI Downlink**

<table>
<thead>
<tr>
<th>RSSI Description</th>
<th>RSSI Value</th>
<th>Result in Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>RSSI &gt;= -95</td>
<td>Full capability</td>
</tr>
<tr>
<td>Marginal</td>
<td>-105 &lt;= RSSI &lt; -95</td>
<td>Occasional two-way capability – not reliable</td>
</tr>
<tr>
<td>Fail</td>
<td>RSSI &lt; -105</td>
<td>MIU not capable of two-way communications</td>
</tr>
</tbody>
</table>

**Table 15 – Collector RSSI Uplink**

<table>
<thead>
<tr>
<th>RSSI Description</th>
<th>RSSI Values</th>
<th>Result in Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>RSSI &gt;= -105</td>
<td>Reliable daily readings and profile data</td>
</tr>
<tr>
<td>Marginal</td>
<td>-115 &lt;= RSSI &lt; -105</td>
<td>Occasionally missed daily readings and profile data</td>
</tr>
<tr>
<td>Fail</td>
<td>RSSI &lt; -115</td>
<td>Poor readings performance</td>
</tr>
</tbody>
</table>
During the installation process, you receive an email with the RSSI value to determine if the location of the MIU is acceptable. If the RSSI value is either at the upper limit of the marginal range or is a failed RSSI, try these tips and techniques.

**Outside Wall MIU**

- Relocate the MIU to a higher installation level (for example, higher than 4 feet above ground level).
- Relocate the MIU near the corner of a house or building.

**Inside Wall MIU Installation (Basement or Other Area)**

- Check the RSSI value at the meter location.
- Check the RSSI value at or near a basement window, if available.
- Check the RSSI value in the floor joist.
- Choose the best RSSI value for installing the MIU.
- If no RSSI value is acceptable, relocate the MIU outside, if possible.

**Pit MIU Installation**

- Reorient the pit antenna.
- Check the antenna connection to the MIU.

**Troubleshooting Low RSSI: Tips and Techniques for Existing Installations**

This section provides tips and techniques to troubleshoot low RSSI for existing installations.

**Outside Wall or Basement MIU Installations**

- Check the RSSI values and try to relocate the MIU to a better location.
- Replace the MIU if necessary.

**Pit MIU Installations**

- Check the RSSI values and reorient the pit antenna.
- Check the antenna connection to the MIU.
- Replace the pit antenna.
- Replace the MIU, if necessary.
Replacement Parts

The following table lists the available replacement parts for the R450 MIU.

**Table 16 – Available Replacement Parts**

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid three-conductor wire, 22 AWG (1000 ft.)</td>
<td>6431-352</td>
</tr>
<tr>
<td>Dow Corning #4 Compound (5.3 oz tube)</td>
<td>96018-064</td>
</tr>
<tr>
<td>GE Novaguard (4cc Packet)</td>
<td>96018-072</td>
</tr>
<tr>
<td>Scotchlok (UG)</td>
<td>8138-125</td>
</tr>
<tr>
<td>Mounting adapter</td>
<td>12539-001</td>
</tr>
<tr>
<td>Fastener screw</td>
<td>8328-302</td>
</tr>
<tr>
<td>Magnet</td>
<td>12287-001</td>
</tr>
</tbody>
</table>
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Chapter 9: Contact Information

Within North America, Neptune Customer Support is available Monday through Friday, 7:00 A.M. to 5:00 P.M. Central Standard Time by telephone, email, or fax.

By Phone

To contact Neptune Customer Support by phone, complete the following steps.

1. Call (800) 647-4832.
2. Select one of the following options:
   - Press 1 if you have a Technical Support Personal Identification Number (PIN).
   - Press 2 if you do not have a Technical Support PIN.
3. Type the six-digit PIN and press #.
4. Select one of the following options.
   - Press 2 for Technical Support.
   - Press 3 for maintenance contracts or renewals.
   - Press 4 for Return Material Authorization (RMA) for Canadian accounts.

You are directed to the appropriate team of Customer Support Specialists. The specialists are dedicated to you until the issue is resolved to your satisfaction. When you call, be prepared to give the following information:

- Your name and utility or company name
- A description of what occurred and what you were doing at the time
- A description of any actions taken to correct the issue

By Fax

To contact Neptune Customer Support by fax, send a description of your problem to (334) 283-7497. Please include the best time of day for a Support Specialist to contact you on the fax cover sheet.

By Email

To contact Customer Support by email, send your email message to support@neptunetg.com.
antenna (pit)

MIU antenna used for pit installations.

AWG

American Wire Gauge.

Downlink

Ability of the MIU to hear instructions from the R450™ DC.

FCC

Federal Communications Commission.

main housing

Main body of the MIU that attaches to the mounting adapter.

main housing fastener screw

Set screw (Hi-Lo fastener) that holds the main housing to the mounting adapter.

maximum cable length

Length set by the manufacturer for the wire between the encoder and the remote receptacle. The specifications for this length are based on a solid three-conductor wire.
Glossary

MIU

Meter Interface Unit.

**mounting adapter**

Back plate of the MIU that is attached to the wall.

**R**

**register read time**

Default time is once an hour for ProRead and 15-minute intervals for E-CODER® (ARB® VII). Custom time is not available.

**RF**

Radio Frequency.

**RSSI**

Received Signal Strength Indicator. It is a measurement of the power present in a received radio signal.

**S**

**Scotchlok™ Butt Connector UR**

UR connector accepts two or three solid copper conductors for butt splicing. The connector is filled with a sealant to provide moisture resistance.

**Scotchlok™ Butt Connector UY**

Small size of the UY connector reduces the splicing bundle O.D. to a minimum. The connector’s two ports accept two solid copper conductors. The connector is filled with a sealant to provide moisture resistance.

**Scotchlok™ Tap Connector UG**

Sealed two-wire connector for solid copper, air core, or filled cable. The connector is filled with a sealant to provide moisture resistance.
seal wire
Wire inserted into the seal holes, adjacent to the main housing fastener screw. This seal must be broken to remove the main housing from the mounting adapter.

serial number
Unique identification number given to each MIU at the factory. The default value is the last one programmed plus one. Custom serial numbers are not available.

SMS
Short Message Service.

strain relief posts
Posts located on the encoder register and the back of the main MIU housing.

T

TDI
Transport Driver Interface format.

terminal screw cover
Plastic cover on the encoder register that protects the terminal screws and exposed wires.

terminal screws
Screws on the encoder register face that are used to connect and anchor the three-conductor wire to the register.

transmission time
Time between MIU transmissions. The maximum number is four times per day; the minimum number is one time per day. Custom time is not available.

U

Uplink
Ability of the R450 DC to hear reading information from the MIU.
This page intentionally left blank.
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  safety and preliminary checks 8
  tool and materials 7
  verifying and preparing encoder register 8
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  protocol 2
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  holes 31
  wire 31
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<th>Dimensions and Weight</th>
<th>Electrical</th>
<th>Environmental</th>
<th>Functional</th>
<th>Wall MIU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit</td>
<td>19</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Temperature</td>
<td>3, 5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Wall</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

| Strain Relief Posts                                  | 10, 17                |             |                |             |           |

<table>
<thead>
<tr>
<th>T</th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TDI</td>
<td>2, 9</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Terminal Screw</td>
<td>9, 11</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Three-Conductor Cable</td>
<td>9, 10, 17</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Three-Wire Mode</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Tools and Materials</td>
<td>Pit 20</td>
<td>Wall 14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transcription Errors</td>
<td>31</td>
<td></td>
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</tr>
<tr>
<td>Troubleshooting</td>
<td>33</td>
<td></td>
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</tr>
<tr>
<td>Inside Wall MIU</td>
<td>34</td>
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| U                                                     |                       |             |                |             |           |
| Unpacking                                             | Pit 19                | Wall 13     |                |             |           |
| Uplink                                                | 27                    |             |                |             |           |

| W                                                     |                       |             |                |             |           |
| Wall Installation                                     | Site Selection 14     |             |                |             |           |
| Wiring, Encoder                                       | 9                     |             |                |             |           |
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