NEPTUNE TECHNOLOGY GROUP

R900® MIU Wall and Pit Installation and Maintenance Guide

R900® MIU WALL AND PIT INSTALLATION AND MAINTENANCE GUIDE

R900® MIU Wall and Pit Installation and Maintenance Guide

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FCC Notice

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 20cm 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.

Industry Canada (IC) Statements

Section 8.4 of RSS-GEN

This Device complies with Industry Canada License-exempt RSS standard(s). Operation is subject to the following two conditions: 1) this device may not cause interference, and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

.Cet appareil est conforme aux normes RSS exonérées de licence d'Industrie Canada. L'opération est soumise aux deux conditions suivantes: 1) cet appareil ne doit pas provoquer d'interférence, et 2) cet appareil doit accepter toute interférence, y compris les interférences pouvant entraîner un fonctionnement indésirable de l'appareil.

Section 8.3 of RSS-GEN

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter IC: 4171B-L900M has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

- Maximum permissible gain of +2.1 dBi
- Approved Antenna type(s).
    - R900 Pit Antenna, part number 12527-XXX
    - High Gain R900 Pit Antenna, part number 13586-XXX
    - R900 Wall Antenna, part number 13717-000
    - Wire monopole, part number 12641-xxx

En vertu de la réglementation d'Industrie Canada, cet émetteur radio ne peut fonctionner qu'avec une antenne d'un type et un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Pour réduire les interférences radio potentielles avec d'autres utilisateurs, le type d'antenne et son gain devraient être choisis de manière à ce que la puissance rayonnée isotropiquement équivalente (e.i.r.p.) ne soit pas supérieure à celle nécessaire à une communication.

Cet Cet émetteur radio IC: 4171B-L900M a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et l'impédance d'antenne requise pour chaque type d'antenne indiqué. Les types d'antenne non inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour être utilisés avec ce périphérique.

- Gain maximal admissible de +2.1 dBi.
- Type.(s) d'antenne approuvé
    - Antenne de puits R900, numéro de pièce 12527-XXX
    - Antenne de puits à gain élevé R900, référence 13586-XXX
    - Antenne murale R900, numéro d'article 13717-00
    - Fil monopôle, numéro d'article 12641-xxx

R900® Wall and Pit MIU Installation and Maintenance Guide

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1 Product Description

This section provides a general description of the R900® meter interface unit (subsequently referred to as R900 MIU or MIU).

The R900 MIU by Neptune is a compact electronic device that collects meter reading data from an encoder register. It then transmits the data for collection by the meter reader. A walk-by handheld unit (HHU), mobile unit, or Gateway collector receives the data and stores it to be downloaded into the utility billing system for processing.

The R900 MIU is easily installed and operates within a radio frequency (RF) bandwidth which does not require an operating license. Because the R900 MIU can be mounted as far as 500 feet from the encoder register, optimum broadcast signal strength is obtainable, ensuring a high percentage of accurate, one-pass readings.

Figure 1 Wall MIU

Figure 2 Pit MIU

The R900 MIU meets FCC regulations Part 15.247, allowing higher output power and greater range. The R900 MIU uses frequency-hopping, spread-spectrum technology to avoid RF interference and enhanced security. The MIU reads the encoder registers at 15-minute intervals and transmits a mobile message that includes the meter reading data and the unique 10-digit MIU ID every 14 seconds. This allows the meter to be read by an HHU or mobile data collection unit. The MIU also transmits a high power fixed network message every seven and one-half minutes on an interleaved basis to an R900 Gateway.

The R900 MIU is designed to offer advantages to utility organizations of all sizes:

- Increases meter reading accuracy.
- Eliminates “hard-to-read” meters.
- Protects utility liability by increasing meter reader safety.
- Requires no programming.

Product Description

R900 MIU Programming

The MIU does NOT require field programming.

RF Protocol Error Detection

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

RF Frequency Control Algorithm

The MIU's frequency-hopping, spread-spectrum has a sequence of at least 50 different channels for transmitting data. Associated with the 50 channels are 50 frequencies that can be pre-selected in a pseudo random manner. These 50 frequencies are coded into the software.

The R900 MIU avoids 914 MHz to prevent collision with the Advantage probe.

RF Transmission Period and Randomness

The random period generation uses the same random seed created for the channel definition to generate the transmission randomness. The randomness algorithm is defined so that no two consecutive transmissions from two MIUs interfere with one another.

Low Battery RF Emissions

The MIU stops RF transmissions when the battery discharges below the normal operating voltage.

2 Specifications

This section provides you with the specifications for the R900 MIU.

Electrical Specifications

The power is supplied by a Lithium battery.

Transmitter Specifications

Transmit Period	• Every 14 seconds - standard mobile message • Every seven and one-half minutes - standard, high power, fixed network message
Encoder Reading	Encoder registers every 15 minutes
Transmitter Channels	50
Channel Frequency	910-920 MHz
Output Power	Meets FCC Part 15.247
FCC Verification	Part 15.247

Encoder Register Interface

Supported Encoder Maximum Cable Length

Neptune ARB® V[1]	300 feet (91 meters)
Neptune ProRead™ and E-Coder®	500 feet (152 meters)
Sensus Protocol registers	200 feet (61 meters)

[1] Meets manufacturer's published specifications for wire length between encoder and remote receptacle. The length is based on solid three conductor wire, 22 AWG.

Specifications - R900 Pit MIU

Environmental Conditions

Operating Temperature	-22° to 149°F (-30° to 65°C)
Storage Temperature	-40° to 158°F (-40° to 70°C)
Operating Humidity	0 to 100% Condensing

Functional Specifications

Register Reading	8 digits
MIU ID	10 digits

Dimensions and Weight

Dimensions	Refer to Figure 3 and Figure 4
Weight	1.0 lbs. (454 grams)

Figure 3 Pit MIU Dimensions - Diagram 1

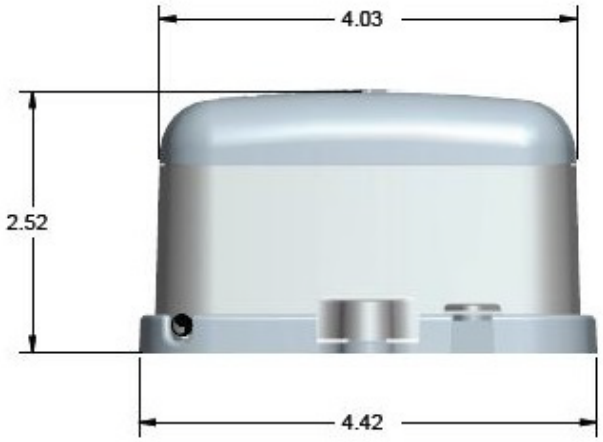

Figure 4 Pit MIU Dimensions - Diagram 2

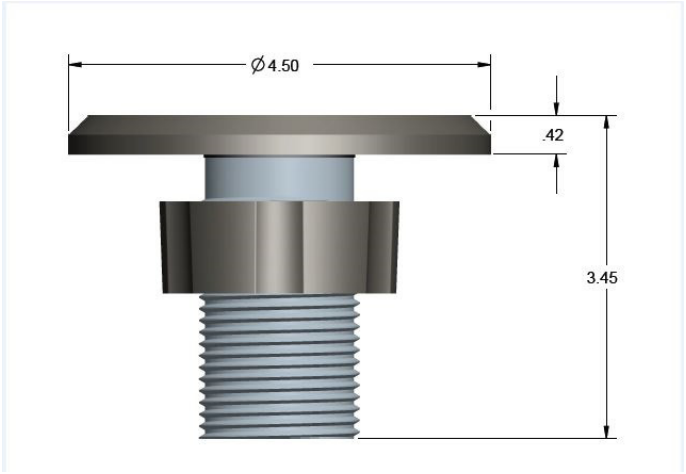

Figure 5 Pit MIU Antenna

Specifications - R900 Wall MIU

Environmental Conditions

Operating Temperature	-22° to 149°F (-30° to 65°C)
Storage Temperature	-40° to 158°F (-40° to 70°C)
Operating Humidity	0 to 100% Condensing

Functional Specifications

Register Reading	8 digits
MIU ID	10 digits

Dimensions and Weight

Dimensions	Refer to Figure 6 and Figure 7
Weight	1.0 lbs. (454 grams)

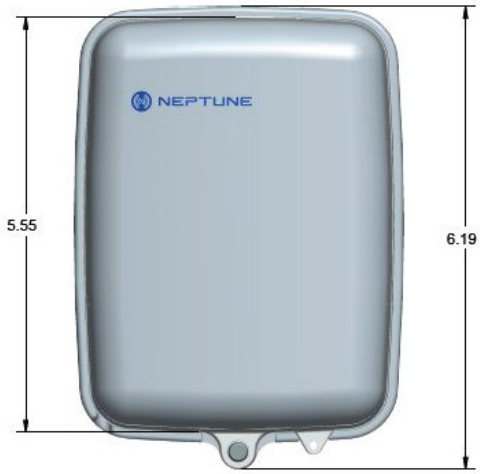

Figure 6 Wall MIU Dimensions - Front

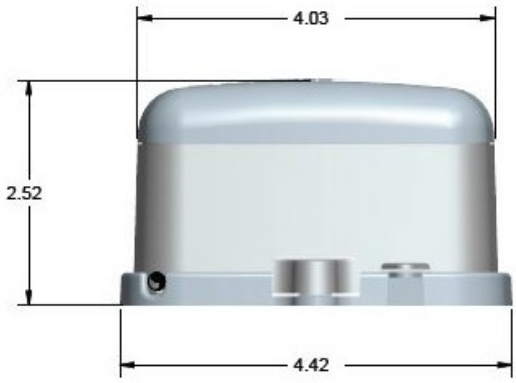

Figure 7 Wall MIU Dimensions - Side

3 General Installation Guidelines

This section describes tools, materials, and general installation information for the R900 MIU.

Tools and Materials

Tables 1 and 2 show the recommended tools and materials you need to successfully install the R900 MIU.

It is possible that some items do not apply to your specific installation, or the list does not contain all required tools or materials.

Table 1 Recommended Tools

Item	Description/Recommendations	Use
Took Kit	Contains standard tools including: • Assorted screwdrivers • Needle-nose pliers • Wire stripper • Diagonal cutters • Electrician's knife • Hammer • Crimping tool Part # 5500-158	Various installation procedures performed by the utility.
Magnet	6 lb. force Part # 12287-001	Activating the MIU.

Table 2 Recommended Materials

Item	Description/Recommendation	Use
Cable	Solid 3 conductor #22 AWG (black/ green/red) Part # 6431-352	Connecting MIU to encoder register.
Moisture Protection Compound	Novaguard sealant Part # 96018-072	Covering exposed wires and terminal screws on register and MIU.
Scotchloks	Part # 8138-125	Connecting wall MIU or replacement pit MIU to encoder register.
Site Work Order	Documentation provided by your utility.	Receiving and recording information about the work site.

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(s) 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(s) matches the ID number(s) on the MIU you are about to install, if the site worker already has an MIU ID number.

Verifying/Preparing the Encoder Register

The R900 MIU is designed for use with the following encoder registers:

- ARB V
- ProRead
- ProRead AutoDetect
- E-Coder
- Competitive registers using Sensus which include: Sensus ECRII, ICE, iPerl, OMNI and electronic register; also Hersey/Mueller Translator, Badger ADE, and HR E|LCD.

Before installing an MIU, the encoder register must be correctly wired and/or programmed to work with the MIU. E-Coder registers do not require programming.

When a ProRead encoder register is used, the non-AutoDetect ProRead register must be programmed for three-wire mode.

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

Installation of a Register (Non Pre-Wired or Potted Only)

1. Before wiring the pit encoder register, make sure the cable is long enough. When the installation is complete, the pit lid can be removed easily without straining the cable.
2. Use only 22 AWG cable to make the connection from the encoder register to the MIU.
3. Remove the terminal screw cover from the encoder register.
4. Strip off ¾ inch of jacket from the cable, leaving only the three insulated wires.
5. Taking precautions not to nick or cut the insulation on the three wires, strip off ½ inch of insulation from each of the three wires.

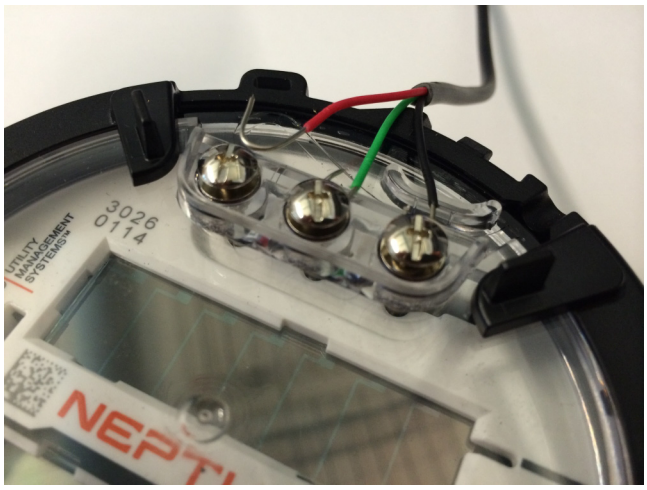

Figure 8 Wiring a Neptune Encoder Register

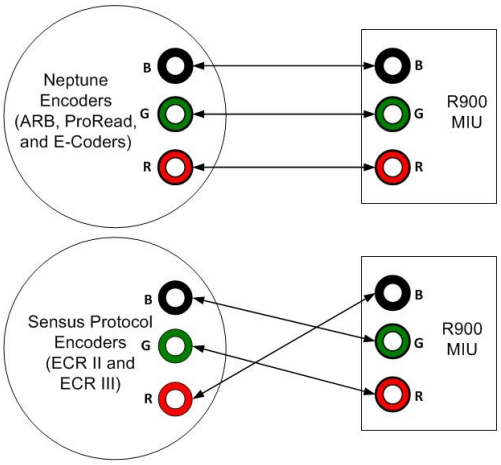

Figure 9 MIU Color Code for Wires

6 If required, connect the three conductor wires to the encoder register's terminals per the manufacturer's instructions. See Figure 8 and Figure 9.

7 Thread the cable around the strain relief posts of the encoder. See Figure 10.

Figure 10 Cable Threaded Around Strain Relief Posts

8 Apply sealant liberally and ensure that it encapsulates the terminal screws and exposed wires. See Figure 11.

Neptune requires Novaguard G661 sealant or Dow Corning compound 4.

Figure 11 Application of the Sealant

Any leak point can cause a reading failure in a submerged meter setting.

9 Snap the cover onto the encoder register. See Figure 12.

Figure 12 Covering the Terminal Screws

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

- Do not exceed maximum cable lengths as defined in Table 4 on page 20.
- If the encoder register is pre-wired and potted, use Scotchloks for connecting the register to the MIU.

4 Wall Installation

This chapter describes storage and unpacking instructions, preliminary tests, tools, materials, site selection, and wall installation of the R900 MIU.

Prior to Installation

Any existing network registers must be reprogrammed.

The R900 MIU is not capable of being networked.

Storage

Upon receipt, inspect shipping containers for damage, and inspect the contents of any damaged cartons prior to storage.

After the inspection is complete, store the cartons in a clean, dry environment. Keep in mind that the R900 MIU has an internal battery. Storage for more than one year may affect product life. Be sure to use a first-in first-out inventory control system. See “Environmental Conditions” on page 4.

Unpacking

As with all precision electronic instruments, the R900 MIU should be handled 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 requires reshipment, use the original cardboard box and packing material.

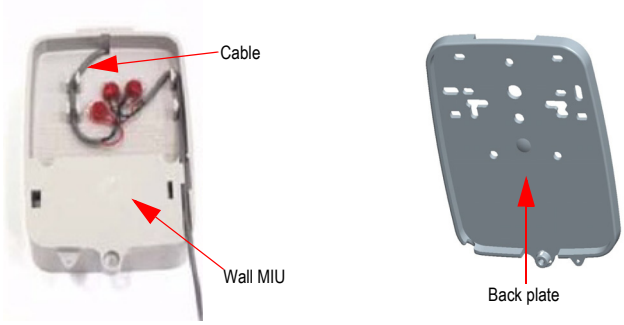

Figure 13 R900 Wall MIU Kit

Tools and Materials

Tables 1 and 2 on page 7 show the recommended tools and materials you need to successfully install the R900 MIU.

It is possible that some items do not apply to your specific installation, or the list does 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 4.

Follow these guidelines when selecting a location to install the R900 MIU:

- For best results, Neptune recommends mounting the MIU on the outside of the building and in a location that provides a direct line-of-sight to the path of the meter reading device.
- For best results, Neptune recommends the MIU be installed approximately five feet above the ground.
- The MIU must be installed in a vertical and upright position.
- The preferred mounting surface for the MIU is a flat wall, but it can also be mounted to a pipe.
- The selected location should be clear of all obstructions.
- Avoid installing the MIU behind metal fences or walls.
- The maximum cable length between the encoder register and MIU depends on the register's manufacturer and model. Refer to Table 3 for maximum cable lengths.

Table 3 Cable Lengths and Manufacturers

Encoder Register	Maximum Cable Lengths
Neptune ARB V*	300 feet (91 meters)
Neptune ProRead / E-Coder	500 feet (152 meters)
Sensus Protocol registers	200 feet (61 meters)

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

Installing the R900 Wall MIU

Removing the Main Housing

Complete the following steps to install the wall MIU.

1 Remove the main housing from the mounting adapter.

Figure 14 Wall MIU Main Housing

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

2 Study Figure 15 and the location requirements, then decide how to install the MIU and mount the adapter with set screw positioned at bottom.

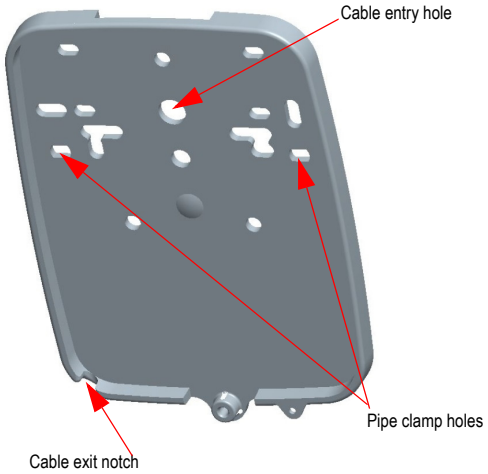

Figure 15 Mounting Adapter

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. See Figure 15.
- When mounting the MIU to a pipe, use the bolt hole for pipe mounting to bolt the mounting adapter to a pipe clamp.

Applying the Scotchloks

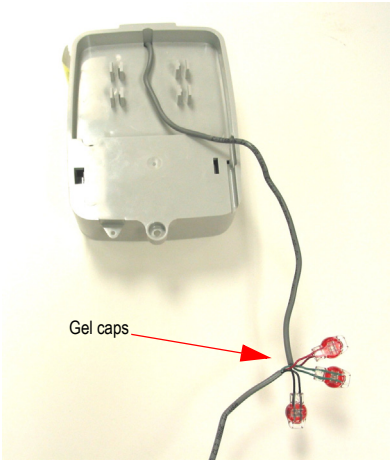

Figure 16 Gel Cap Connections

1 Using Scotchloks Gel Caps, connect the register wires to the pigtail from the MIU. See Figure 16.

2 Pair the wires according to the color diagram in Figure 17.

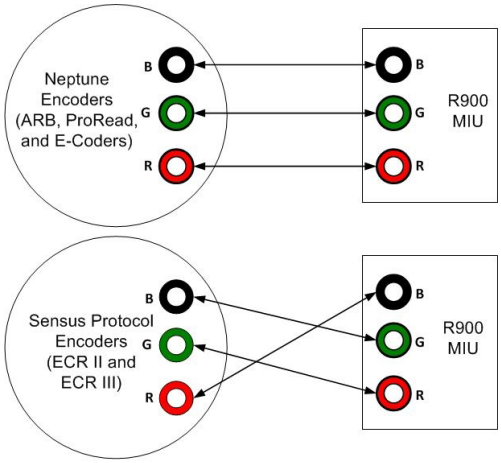

Figure 17 MIU Color Code for Wires

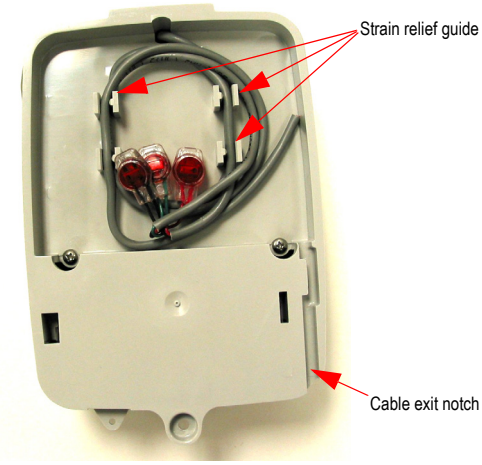

Figure 18 Cable in Back of Mounting Adapter

3 Slide the pared wires into the grooves provided until they seat into the back of the gel cap.

4 Using an appropriate crimping tool, firmly squeeze the gel cap to ensure a good connection.

5 Repeat this process until all connections are complete.

6 For rear cable entry, store excess wire and Scotchloks in the hollow cavity in the back of the MIU using the strain relief guides as shown in Figure 18.

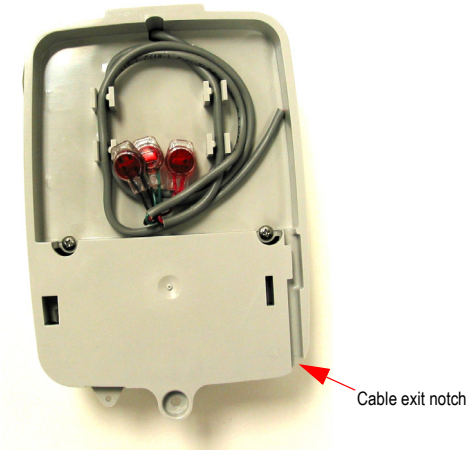

Figure 19 Cable Exit Notch

7 Next, continue to guide the remaining wire through the cable exit notch at the bottom right side of the MIU as shown in Figure 19.

Activating and Completing the Installation

Figure 20 Securing Mounting Adapter

1 Slide the tongue on the top of the MIU into the groove on the top of the mounting adapter.

2 Secure the MIU to the mounting adapter using the set screw. See Figure 20.

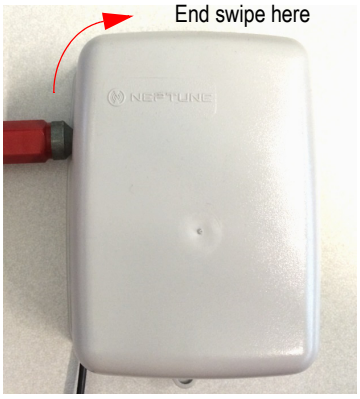

Figure 21 Activating the MIU

3 Position the magnet against the left side of the MIU directly in line with the Neptune logo, and swipe it bringing it from the side and around the corner to the top to activate the MIU. See Figure 21.

Testing the Installation

To test the installation, complete the following steps.

1 Power up the HHU test device and start the testing programs provided.

To avoid RF signal saturation of the HHU, do one of the following:
- **Position yourself at least two to three feet from the MIU.**
- **Remove the antenna from the HHU.**

2 When the MIU is installed correctly, its ID number(s) and meter reading(s) appear on the display of the HHU. Verify the correct meter reading(s) by comparing it to the meter's dial. If the reading(s) is the same, proceed to the next section.

3 If a meter reading does not appear on the HHU display, or the meter reading in the HHU display is not the same as the reading on the meter's dial:

- Reactivate the MIU using the magnet.
- Verify all electrical connections.
- Test the installation again.

4 If a ProRead encoder register is used:

- Ensure the unit is programmed in three-wire mode.
- Verify all electrical connections.
- Reactivate the MIU. (See Step 1).

If a problem still exists, contact your Neptune Sales Representative.

Figure 22 Install Seal Wire

5 To complete the installation, install a seal wire or seal clip through the seal holes at the bottom of the main housing. See Figure 22.

6 Verify that the requirements of the site work order have been met and that you have recorded all information.

7 Clean up the installation site before leaving.

5 Pit Installation

This section describes storage and unpacking instructions, preliminary tests, tools, materials, site selection, and pit installation of the R900 MIU.

Prior to Installation

Storage

Upon receipt, inspect shipping containers for damage and inspect the contents of any damaged cartons prior to storage.

After the inspection is complete, store the cartons in a clean, dry environment. Keep in mind that the R900 MIU has an internal battery. Storage for more than one year may affect product life. Be sure to use a first-in first-out inventory control system. See “Environmental Conditions” on page 4.

Unpacking

As with all precision electronic instruments, the R900 MIU must be handled carefully; however, no additional special handling is required.

After unpacking the MIU, inspect it 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 requires reshipment, use the original cardboard box and packing material.

Figure 23 R900 Pit MIU Kit

Tools and Materials

Table 1 and Table 2 on page 8 show the recommended tools and materials you need to successfully install the R900 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 4.

Follow these guidelines when selecting a location to install the R900 MIU:

- For best results, Neptune recommends selecting a location where there is no chance that another object can be set over the antenna.
- Avoid installing the MIU behind metal fences or walls.
- Make sure the pit location gives adequate room for installing both the MIU and the pit antenna.

For maximum performance, the flange of the pit antenna needs to be located above the pit lid.

- For maximum performance, Neptune recommends that pit antennas be installed above the lid as illustrated in Figure 24.

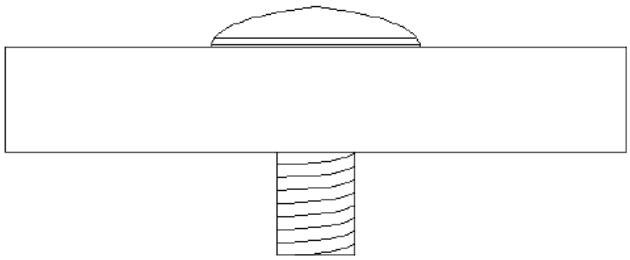

Figure 24 Antenna Placement for Low Traffic Areas

- When installing in a high traffic area, Neptune recommends that the dome of the antenna be recessed in the pit lid as shown in Figure 25.
- Recessing the installation reduces the range of the installation.

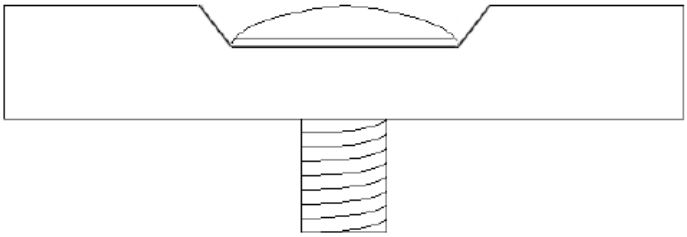

Figure 25 Antenna Placement for High Traffic Areas

- For best results, Neptune recommends that the MIU be installed in a location that provides a direct line of site to the path of the meter reader.
- Although the MIU has a cable already attached (either six feet or 25 feet long), some installations can require additional cable. In these cases, the maximum cable length between the encoder register and MIU depends on the register's manufacturer and model. Refer to Table 4 for maximum cable lengths.

Table 4 Cable Length and Manufacturer

Encoder Register	Maximum Cable Length
Neptune ARB V*	300 feet (91 meters)
Neptune ProRead / E-Coder	500 feet (152 meters)
Sensus Protocol registers	200 feet (61 meters)

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

Pit MIU Installation

The following section describes how to install a single R900 MIU in a pit location.

Select a location for the MIU that meets the recommendations in “Site Selection” on page 19

Installing the Antenna

Figure 26 Inserting Antenna into the Pit Lid

1 Insert the antenna cable and housing through the 1¾ inch hole in the meter pit lid. See Figure 26.

Figure 27 Locking Nut on Antenna

2 Thread the locking nut onto the antenna (smooth end towards lid). See Figure 27.

Figure 28 Securing the Locking Nut

3 Hand tighten the nut securely to the lid. See Figure 28.

Figure 29 Installation Complete

4 Figure 29 shows a completed installation of the antenna.

Begin the Installation

Figure 30 Black Thread Guard from Male F-Connector

1 Remove black plastic thread protector cap from the male “F” connector on the MIU.

Figure 31 Seating Washer

2 Place the flat black rubber washer around the male “F” connector on the MIU as shown in Figure 31.

L

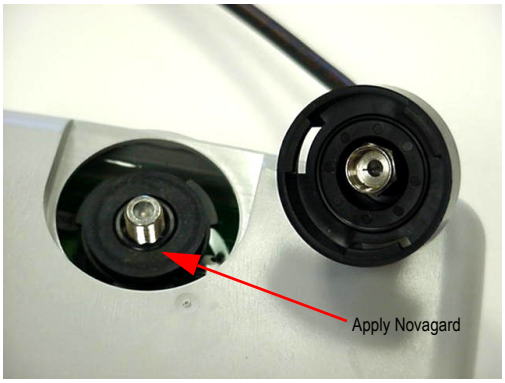

Figure 32 Connector Cables

3 Apply a coating of Novaguard around the base of the “F” connector and on the flat rubber washer.

Antenna connection should have Novagard applied inside the connector.

4 Using a torque wrench, connect the coaxial cable connector to the “F” connector on the MIU/register housing, tightening it to 15 inch-pounds.

Threading the F Connector

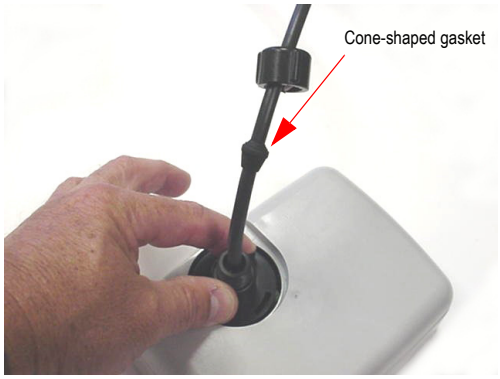

Figure 33 Tightening Connector and Latchplate

1 Make sure the flat washer is properly seated, and then connect the black plastic cable connector housing to the three-lobed plastic latch plate.

2 Tighten the connector by making a ¼ turn to the right as shown in Figure 33.

3 Slide the black cone-shaped gasket down the cable until it seats against the connector housing.

Figure 34 Black Cone-Shaped Gasket and Connector

4 Slide black plastic female-threaded connector down the coax cable.

5 Seat on top of cone-shaped rubber gasket and thread onto the three-lobed plastic latch plate as shown in Figure 34.

6 Finger tighten the connector to depress cone-shaped rubber gasket. This seals the coax cable from moisture intrusion.

Installing the Scotchloks

Figure 35 Scotchloks Connector

1 Complete steps one through nine outlined in “Pit MIU Installation” on page 21 to install the MIU through the lid.

2 Use 3M Scotchloks type UR connector to connect the MIU wires to the encoder wires.

3 Hold the Scotchloks connector between index finger and thumb with the red cap facing down. See Figure 35.

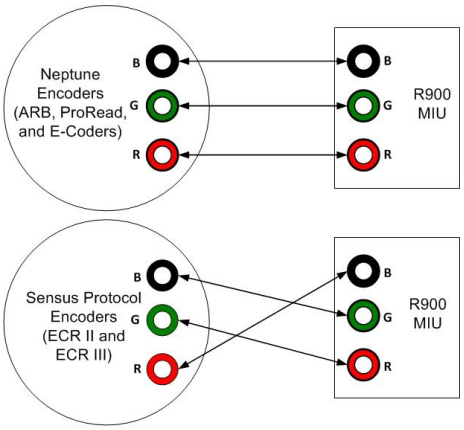

Figure 36 MIU Color Code for Wires

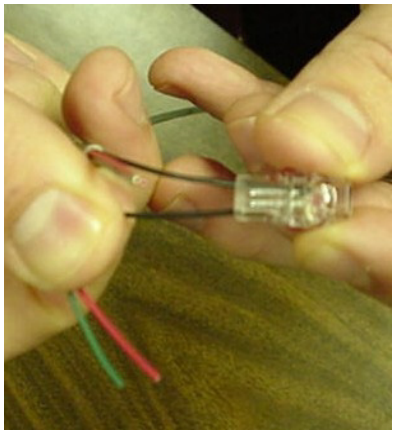

Figure 37 Seating Connector Wires

4 Take a non-stripped black wire from the pigtail and a non-stripped black wire from the receptacle/MIU and insert wires into the Scotchloks connector until fully seated in connector. See Figure 37.

Do not strip colored insulation from wires, or strip and twist bare wires prior to inserting in connector. Insert insulated colored wires directly into the Scotchloks connector.

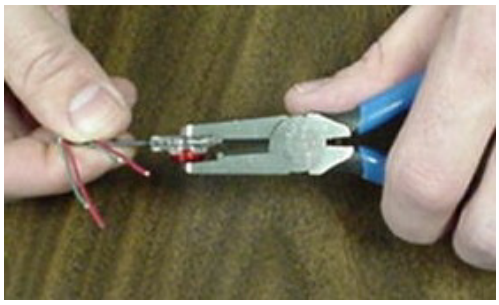

Figure 38 UR Crimping Tool

5 Place the connector (red cap side down) between the jaws of the UR crimping tool as shown in Figure 38.

Figure 39 Improper Connections

6 Check to ensure the wires are still fully seated in the connector before crimping the connector. Figure 39 illustrates improper connections due to wires not fully seated.

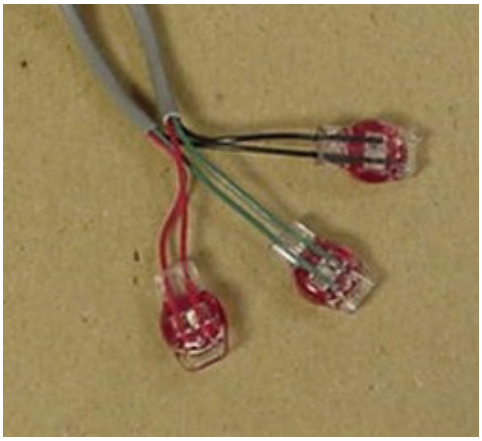

Figure 40 Three Color Wires Connected

7 Squeeze the connector firmly with the proper crimping tool until you hear a pop and gel leaks out the end of the connector.

8 Repeat steps two through six for each color wire. See Figure 40.

9 After all three color wires have been connected, read the encoder register to ensure proper connections and the receptacle/MIU is functioning properly.

Connecting the Splice Tube

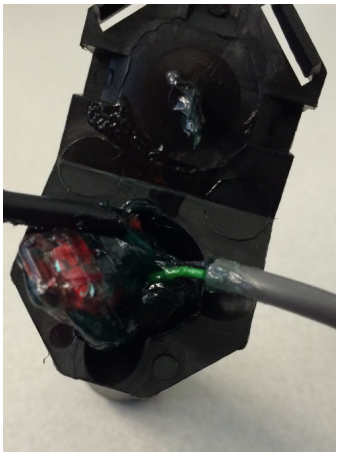

Figure 41 Splice Tube

To finish the installation of the Scotchloks, complete the following steps to install the connector king splice tube.

1 Take all three connected Scotchloks and push into the splice tube until fully encapsulated by the silicone grease. See Figure 41.

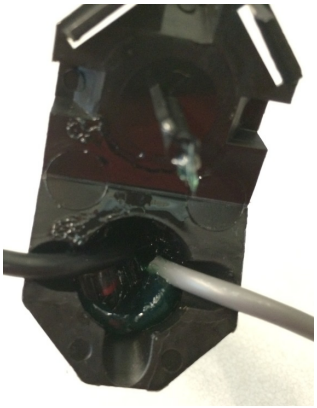

Figure 42 Gray Wire in Slots

2 Separate each gray wire and place in the slots on each side as shown in Figure 42.

Figure 43 Cover in Place

3 Snap cover closed to finish the installation as shown in Figure 43.

Tying the Cable and Activating the MIU

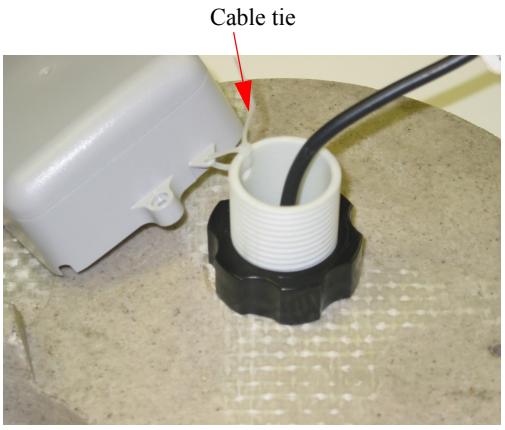

Figure 44 Attaching MIU to Antenna Shaft

1 Place the MIU in the pit location, using the following suggestions:

- In shallow pit application, you can place the MIU beside the meter.

Be careful not to lodge the MIU between the meter box and any components inside the box.

- In deep pit applications, use a cable tie to suspend the MIU from the antenna shaft, as shown in Figure 44.

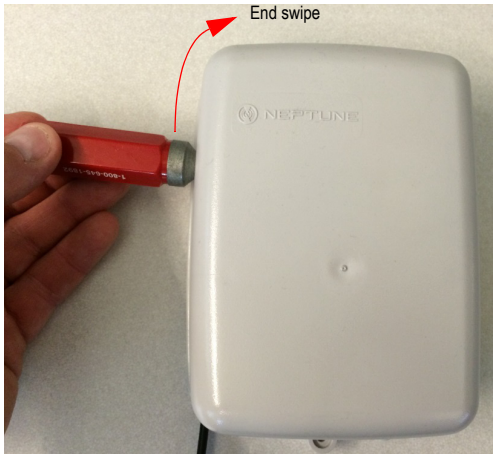

Figure 45 Activating the MIU

Make sure the MIU is placed in such a way that it does not lodge itself when the pit lid is removed.

2 Position the magnet against the left side of the MIU directly in line with the Neptune logo, as shown, and swipe it bringing it from the side and around the corner to the top to activate the MIU. See Figure 45.

Testing the Installation

If the R900 MIU is connected to an E-Coder register or another register with an 8 digit output, the R900 MIU will transmit an 8 digit read. For example, read 12345678 (E-Coder or other 8 digit register output).

To test the installation, complete the following steps.

1 Power up the HHU (with HHIU) and put in the RF test mode.

To avoid RF signal saturation of the HHU, position yourself at least two to three feet from the MIU.

2 When the MIU is installed correctly, its ID number(s) and meter reading(s) appear on the display of the HHU. Verify the correct meter reading(s) by comparing it to the meter's dial. If the readings are the same, proceed to the next section.

3 If a meter reading does not appear on the HHU display, or the meter reading on the HHU display is not the same as the reading on the meter's dial, do one of the following:

- Reactivate the MIU using the magnet.
- Verify all electrical connections.
- Verify registers are programmed correctly.
- Test the installation again.

4 If a ProRead encoder register is used:

- Ensure the unit is programmed in three-wire mode.
- Verify all electrical connections.
- Reactivate the MIU (see step 1).

Activating the MIU with a magnet is recommended, but not a mandatory step. The R900 automatically checks every eight (8) hours for the presence of a register. If one is detected, the MIU wakes up and starts transmitting.

If a problem still exists, contact your Neptune Sales Representative.

6 Data Logging Extraction

About Data Logging

The R900 MIU is capable of storing interval data for data logging. The R900 MIU is activated using the Trimble Nomad and R900 Belt Clip Transceiver (BCT) and is explained in more detail in the following section.

The R900 MIU stores consumption in hourly intervals for a rolling total of 96 days. This is equal to 2,304 hourly intervals of consumption. The data logging data is extracted through RF activation. The RF activation allows the utility workers to visit the location and extract the data without physically interacting with the meter itself. This limits the worker's exposure to animals or other dangerous situations. The extraction process, once started, takes approximately 30 seconds. The activation is done through the HHU connected to the R900 BCT via bluetooth. The activation signal is sent by the R900 BCT to the R900 MIU which in turn sends the data intervals to the R900 BCT and are saved in the HHU.

Accessing Data Logging

Complete the following steps for data logging.

1 From the host software home screen on the HHU, click **MENU**. See Figure 46.

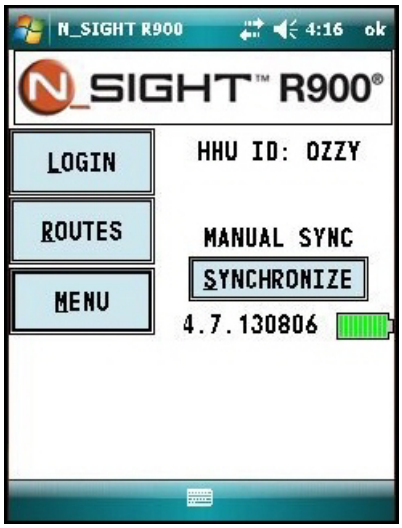

Figure 46 HHU Home Screen

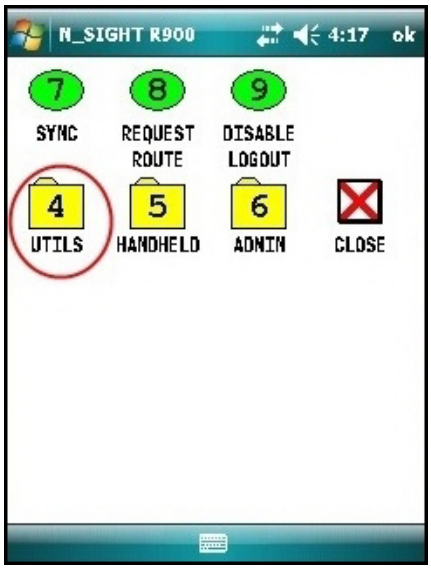

Figure 47 N_SIGHT R900 Menu Screen

2 From the HHU Menu screen, click **UTILS** (option 4). See Figure 47.

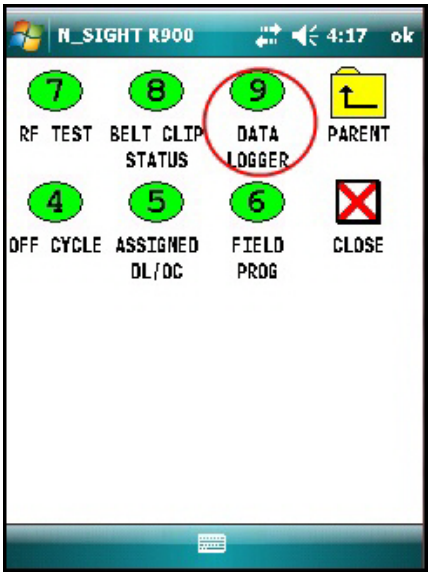

Figure 48 Data Logger Option

3 Click **DATA LOGGER** (option 9). See Figure 48.

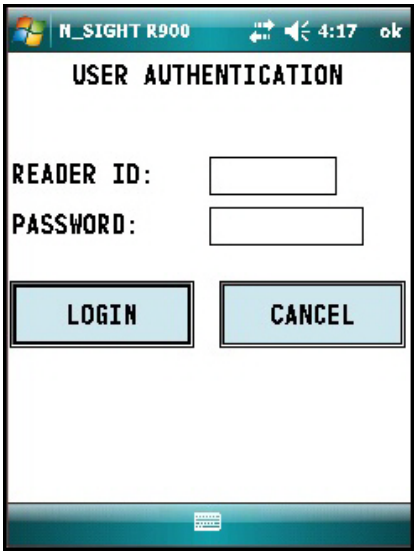

Figure 49 Reader ID Input

4 Type your reader ID and password (if applicable) for the host software. Click **LOGIN**. See Figure 49.

Initializing the Data Logger

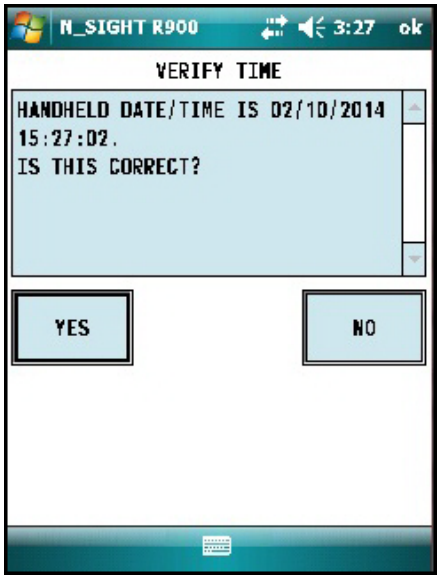

Figure 50 HHU Time Confirmation

1 Verify the time is correct, and click **YES**. See Figure 50.

The HHU must be synchronized prior to data logging in order to set the clock.

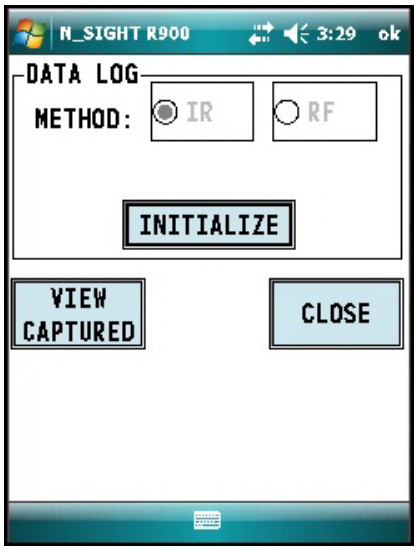

Figure 51 Initialize RF Device

2 The Initialize Device screen appears if you are not connected or you are not in range of your R900 BCT. **Click INITIALIZE.** See Figure 51.

You must initialize the R900 BCT each time you attempt to data log.

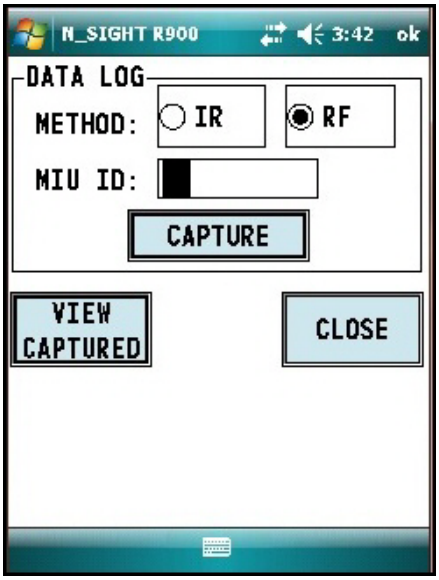

Figure 52 Enter MIU ID Entry

3 Select **RF** and type the MIU ID. See Figure 52.

You can type the MIU ID with the number pad keys or expand the on-screen keyboard.

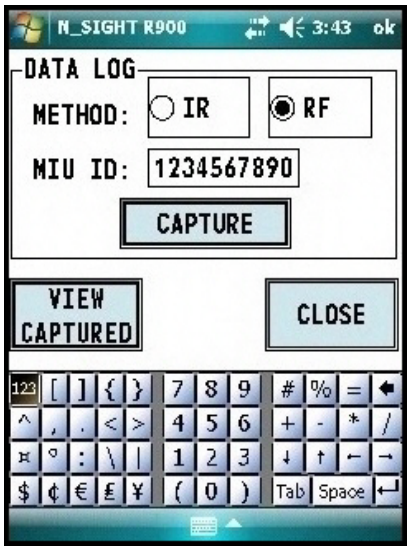

Figure 53 Capture Button

4 After you type the MIU ID, click **CAPTURE**. See Figure 53.

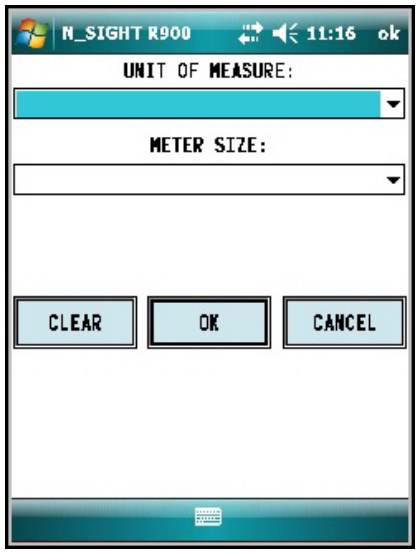

Figure 54 Meter Size Selection

5 You are prompted to provide meter size and unit of measure. You can type this information now and click **OK** or after the data logging has completed. See Figure 54.

Initiating RF Activated Data Logging

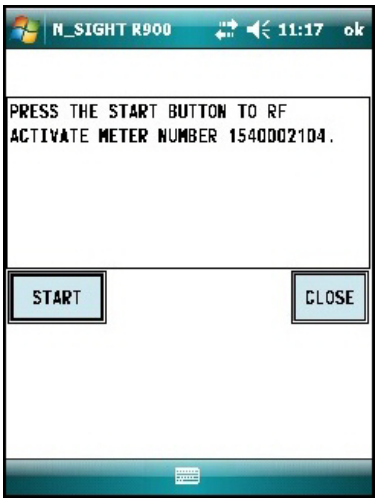

Figure 55 Start Button

1 Click **START** to initiate RF activated data logging. See Figure 55.

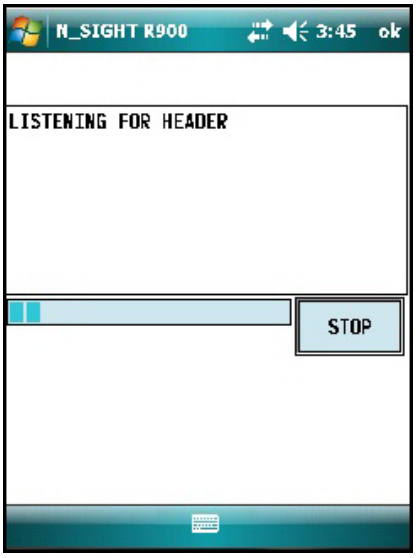

Figure 56 Listening for Data

2 The R900 BCT activates the R900 and listens for the data logger to start transmitting. See Figure 56.

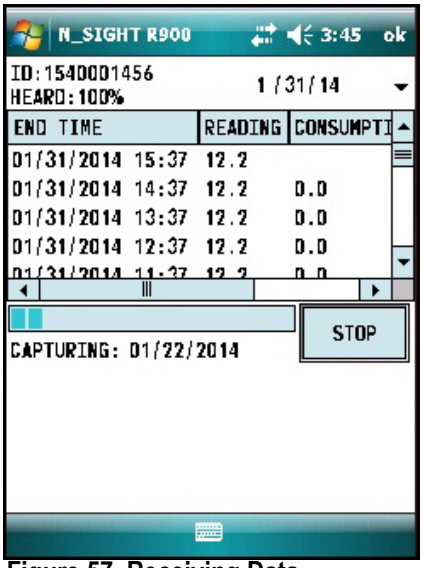

Figure 57 Receiving Data

3 The data received is displayed on the screen. See Figure 57.

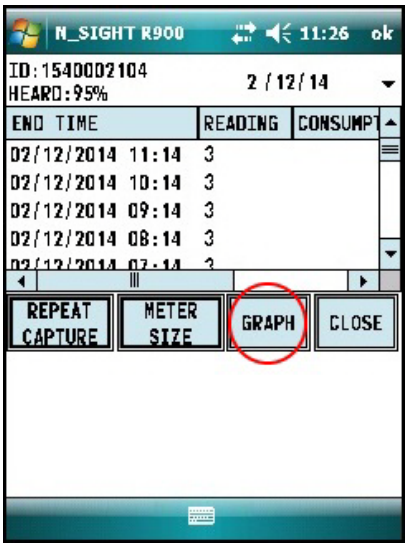

Figure 58 Graph Button

4 After the data logging process is completed, you can choose the meter size (see Step 5 on page 33).

5 Click **GRAPH** (see Figure 58) to display the data in a graph. Examples of graphs are shown in Figure 59 on page 36.

6 The HHU processes and saves the data.

7 After closing the data logging screen, the unit performs a backup.

Sample Data Logging Graphs

The following are two examples of the graphs that can be produced with data logging.

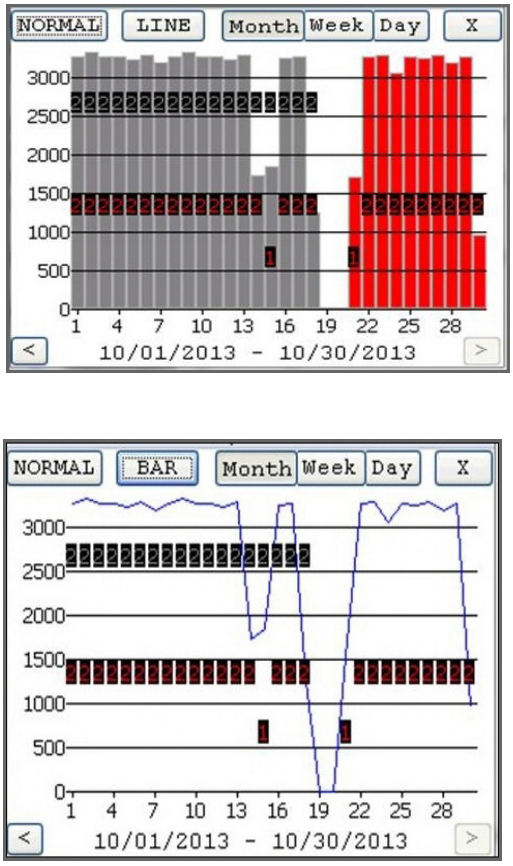

Figure 59 Examples of Data Logging Graphs

Table 5 Data Logging Graph Legend

Color Code	Description
1 red	Intermittent Leak
2 red	Continuous Leak
1 gray	Minor Backflow
2 gray	Major Backflow
Blue bars	No Flags
Red bars	Leak
Gray bars *	Backflow
* If the Backflow flag and the Leak flag appear at the same time, Backflow (Gray bars) has precedence over Leak,.	

Off Cycle Data Extraction

Off cycle reads are 96 days of daily reads. These are to allow utilities to retrieve move out reads or monitor vacant usage to prevent theft.

To navigate to off cycle, complete the following steps.

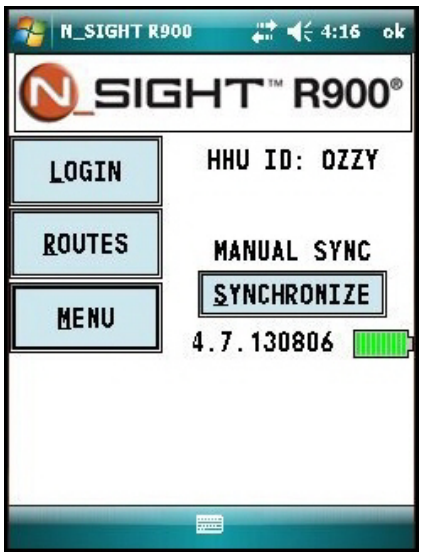

Figure 60 HHU Home Screen

1 From the host software home screen on the HHU, click **MENU**. See Figure 60.

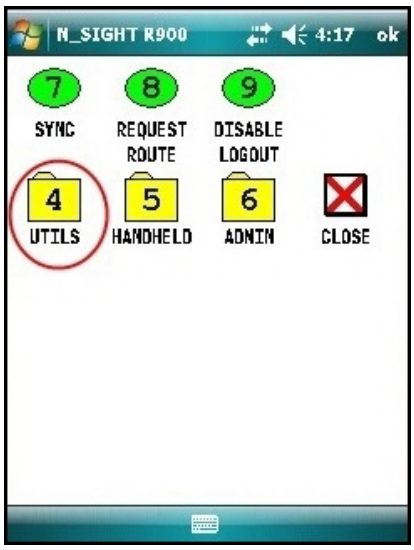

Figure 61 HHU Menu

2 From the HHU Menu screen, click **UTILS** (option 4). See Figure 61.

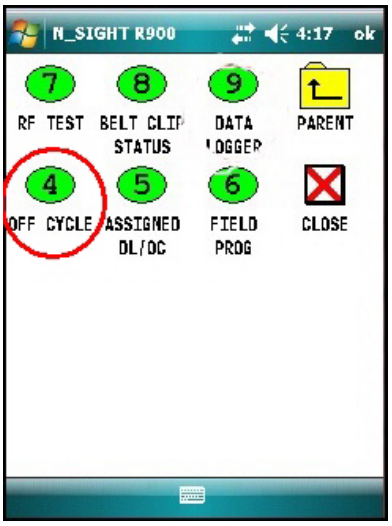

Figure 62 Off Cycle Option

3 Click **OFF CYCLE** (option 4). See Figure 48

4 Type the read ID and/or the password.

5 Click **LOGIN.**

6 Confirm date and time are correct.

7 Click **YES**.

Belt Clip Transceiver

To pair with the belt clip transceiver (BCT), complete the following steps.

1 Change date if you have a specific day to target.

2 Click **INITALIZE** to pair with R900 BCT.

3 Type the **MIU ID**.

4 Click **CAPTURE**.

The reads come in just like the data logger reads. Data logger has 96 days of hourly reads and off cycle has 96 days of daily reads.

7 Maintenance and Troubleshooting

This section takes you through maintenance and troubleshooting procedures for the R900 MIU.

Six and Four Wheel Encoders

Six-Wheel Encoder Normal Operation

If the odometer reads 123456, the display should show 1 2 3 4 5 5 0 0.

Note that the sixth digit displayed is a five if the last digit on the odometer is five through nine. The sixth digit is a zero if the last digit on the odometer is zero through four. The R900 adds an additional two zeros on the end to provide an eight digit reading to the host software.

Four-Wheel Encoder Normal Operation

If the odometer reads 123456, the display should show 1 2 3 4 0 0 0 0.

The R900 adds an additional four zeros on the end to provide an eight digit reading to the host software.

Troubleshooting

This section provides examples of possible reading values and what they indicate.

Table 6 Examples of Reading Values

Reading Value	Definition	Troubleshooting
::::::::	Failure to retrieve reading.	• Usually indicates a cut wire. Check the connection between the register and MIU. • If using a non-autodetect ProRead register, verify that it has been programmed for three wire mode.
????????	Indicates an ambiguous, bad read. Replaces -------- and HHHHHHHH.	

Table 6 Examples of Reading Values

Reading Value	Definition	Troubleshooting
MMMMMMMM	Indicates out of range reading (>99999999), diagnostic code from the MIU.	• Error code indicating that no meter reading history is available. • Swipe the MIU with a magnet to force the MIU to read the register.
UUUUUUUU	Indicates undefined out of range reading, corrupt valve.	

Replacement Parts

Table 7 lists the available replacement parts for the R900 MIU.

Table 7 Available Replacement Parts

Part Name	Part Number
Solid 3 conductor wire, 22 awg (1000 ft.)	6431-352
Dow Corning #4 compound (5.3 oz tube)	96018-064
GE Novaguard (4cc packet)	96018-072
Scotchloks (UG)	8138-125
Mounting Adapter for ProRead Register	12539-001
Mounting Bracket for E-Coder Register	13443-000
Fastener Screw	8328-302
Magnet	12287-001
Antenna	12527-000
Flat Washers	8340-054

8 Contact Information

Within North America, Neptune Customer Support is available Monday through Friday, 7:00 AM to 5:00 PM Eastern 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 Enter the six digit PIN number 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 on the fax cover sheet the best time of day for a Support Specialist to contact you/

By Email

To contact Customer Support by email, send your email message to hhsupp@neptunetg.com.

Notes:

Glossary

antenna (pit)	The MIU antenna used for pit installations.
conical-shaped gasket	The cone-shaped rubber gasket on antenna cable used to seal cable at top of connector housing.
connector housing	The black plastic 1/4-turn connector used to waterproof antenna cable connection to pit MIU.
connector nut	The black plastic nut used to depress conical-shaped gasket and seal antenna cable at the top of connector housing.
flat washer	The washer used to seal cable connector housing to pit MIU.
main housing	The main body of the MIU that attaches to the mounting adapter.
main housing fastener screw	The set screw (Hi-Lo fastener) that holds the main housing to the mounting adapter.
maximum cable length	The 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 3-conductor wire.
MIU	Meter Interface Unit.
mounting adapter	The back plate of the MIU that is attached to the wall.
register read time	The default time for all registers is 15 minutes. Custom time is not available.
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	A unique identification number given to each MIU at the factory. The default value is the last programmed plus one. Custom serial numbers are not available.
strain relief posts	Posts located on the encoder register and the back of the main MIU housing.

terminal screw cover	The plastic cover on the encoder register that protects the terminal screws and exposed wires.
terminal screws	The screws on the encoder register face that are used to connect and anchor the three (3) conductor wire to the register.
transmission time	The time between MIU transmissions. The default is approximately fourteen (14) seconds. Custom time is not available.

Index

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NEPTUNE TECHNOLOGY GROUP

TAKE CONTROL

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IM R900 MIU 10.15 Part No. 12560-001