



America

---

## **Certification Exhibit**

**FCC ID: P2SL900M  
IC: 4171B-L900M**

**FCC Rule Part: 15.247  
ISED Canada Radio Standards Specification: RSS-247**

**Project Number: 72126503**

**Manufacturer: Neptune Technology Group Inc.  
Model: L900M**

## **Manual**

## L900™ MIU Pit Installation and Maintenance Guide





**NEPTUNE**  
TECHNOLOGY GROUP



## **L900™ MIU Pit Installation and Maintenance Guide**

## Copyright

This manual is an unpublished work and contains the trade secrets and confidential information of Neptune Technology Group Inc., which are not to be divulged to third parties and may not be reproduced or transmitted in whole or part, in any form or by any means, electronic or mechanical for any purpose, without the express written permission of Neptune Technology Group Inc. All rights to design or inventions disclosed herein, including the right to manufacture, are reserved to Neptune Technology Group Inc.

The information contained in this document is subject to change without notice. Neptune reserves the right to change the product specifications at any time without incurring any obligations.

## Trademarks used in this manual

L900 and ProRead are trademarks of Neptune Technology Group Inc. ARB, E-CODER, MACH 10, and R900 are registered trademarks of Neptune Technology Group Inc. Other brands or product names are trademarks or registered trademarks of their respective holders.

## 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 instruction, 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 not 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 L900 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 +1 dBi and required impedance of 75 ohm.
- Approved Antenna type(s)
  - R900 Pit Antenna, part number 12527-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 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 +1 dBi et impédance requise de 75 ohms.
- Type (s) d'antenne approuvé
  - R900 Pit antennaaximum

L900™ MIU Pit Installation  
and Maintenance Guide

Literature No. IM L900 Pit MIU 09.17

Part No. 13381-001

Neptune Technology Group Inc.

1600 Alabama Highway 229

Tallahassee, AL 36078

Tel: (800) 633-8754

Fax: (334) 283-7293

Copyright © 2017

Neptune Technology Group Inc.

All Rights Reserved

# Contents

---

<b>Chapter 1: Product Description</b> .....	<b>1</b>
Product Description .....	2
L900 MIU Programming .....	2
RF Protocol Error Detection .....	2
RF Frequency Control Algorithm .....	2
RF Transmission Period and Randomness .....	2
Low Battery RF Emissions .....	2
<b>Chapter 2: L900 Specifications</b> .....	<b>3</b>
Electrical Specifications .....	3
Transmitter Specifications .....	3
Encoder Register Interface .....	3
Specifications - L900 MIU Pit .....	4
Environmental Conditions .....	4
Functional Conditions .....	4
Dimensions and Weight .....	4
<b>Chapter 3: General Installation Guidelines</b> .....	<b>7</b>
Tools and Materials .....	7
Safety and Preliminary Checks .....	8
Verifying/Preparing the Encoder Register .....	8
Installation of a Register (Non Pre-Wired or Potted Only) .....	9
<b>Chapter 4: Pit Installation</b> .....	<b>13</b>
Prior to Installation .....	13
Storage .....	13
Unpacking .....	13
Tools and Materials .....	14
Site Selection .....	14
L900 MIU Pit Installation .....	15
Installing the Antenna .....	16



Begin the Installation .....	17
Threading the F-Connector .....	18
Installing the Scotchlocks .....	19
Connecting the Splice Tube .....	21
Tying the Cable and Magnet Swiping the L900 MIU .....	22
Testing the Installation .....	23
<b>Chapter 5: Data Logging Extraction .....</b>	<b>25</b>
About Data Logging .....	25
Accessing Data Logging .....	25
Initializing the Data Logger .....	27
Initiating RF-Activated Data Logging .....	30
Sample Data Logging Graphs .....	31
Off-Cycle Data Extraction .....	33
R900 Belt Clip Transceiver .....	34
<b>Chapter 6: Maintenance and Troubleshooting .....</b>	<b>35</b>
Six- and Four-Wheel Encoders .....	35
Six-Wheel Encoders Normal Operation .....	35
Four-Wheel Encoders Normal Operation .....	35
Troubleshooting .....	36
Replacement Parts .....	36
<b>Chapter 7: Contact Information .....</b>	<b>37</b>
By Phone .....	37
By Fax .....	37
By Email .....	37
<b>Glossary .....</b>	<b>39</b>
 <b>Index</b>	

# Figures

---

Figure 1 – L900 MIU - Pit .....	1
Figure 2 – L900 MIU - Pit Dimensions - Front .....	5
Figure 3 – L900 MIU Pit Dimensions - Side .....	5
Figure 4 – L900 MIU Pit Antenna .....	6
Figure 5 – Wiring a Neptune Encoder Register .....	10
Figure 6 – L900 MIU Color Code for Wires .....	10
Figure 7 – Cable Threaded Around Strain Relief Posts .....	11
Figure 8 – Application of the Sealant .....	11
Figure 9 – Covering the Terminal Screws .....	12
Figure 10 – L900 MIU Kit .....	13
Figure 11 – Antenna Placement for Low Traffic Areas .....	14
Figure 12 – Antenna Placement for High Traffic Areas .....	15
Figure 13 – Inserting the Antenna into the Pit Lid .....	16
Figure 14 – Locking Nut on Antenna .....	16
Figure 15 – Securing the Locking Nut .....	16
Figure 16 – Installation Completed .....	17
Figure 17 – Black Thread Guard from Male F-Connector .....	17
Figure 18 – Seating Washer .....	17
Figure 19 – Apply Novaguard .....	18
Figure 20 – Tightening Connector .....	18
Figure 21 – Gasket and Connector .....	18
Figure 22 – Scotchlocks Connector .....	19
Figure 23 – Color Code for Wires .....	19
Figure 24 – Seating Connector Wires .....	19
Figure 25 – UR Crimping Tool .....	20
Figure 26 – Improper Connections .....	20
Figure 27 – Three Color Wires Connected .....	20
Figure 28 – Splice Tube .....	21
Figure 29 – Gray Wire in Slots .....	21
Figure 30 – Cover in Place .....	21

## Figures

---

Figure 31 – L900 MIU Attached to Antenna .....	22
Figure 32 – Magnet Swipe the L900 MIU .....	22
Figure 33 – HHU Home Screen .....	25
Figure 34 – N_SIGHT Main Screen .....	26
Figure 35 – Data Logger Options .....	26
Figure 36 – Reader ID Input .....	27
Figure 37 – HHU Time Confirmation .....	27
Figure 38 – Initialize RF Device .....	28
Figure 39 – L900 MIU ID Entry .....	28
Figure 40 – Capture Button .....	29
Figure 41 – Meter Size Selection .....	29
Figure 42 – Start Button .....	30
Figure 43 – Listening for Data .....	30
Figure 44 – Receiving Data .....	31
Figure 45 – Graph Button .....	31
Figure 46 – Examples of Data Logging Graphs .....	32
Figure 47 – HHU Home Screen .....	33
Figure 48 – HHU Menu Screen .....	33
Figure 49 – Off-Cycle Option .....	34

# Tables

---

Table 1 – Supported Encoder Maximum Cable Length .....	4
Table 2 – L900 MIU Pit Environmental Conditions .....	4
Table 3 – L900 MIU Pit Functional Specification .....	4
Table 4 – L900 MIU Pit Functional Specification .....	4
Table 5 – Recommended Tools .....	7
Table 6 – Recommended Materials .....	8
Table 7 – Cable Length and Manufacturer .....	15
Table 8 – Data Logging Graph Legend .....	32
Table 9 – Examples of Reading Values .....	36
Table 10 – Available Replacement Parts .....	36

This page intentionally left blank.

# Chapter 1: Product Description

---

This chapter provides a general description of the L900™ Pit meter interface unit (subsequently referred to as L900 MIU).

The L900 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, R900® Gateway collector, or LoRa® (Long Range) collector receives the data and stores it to be downloaded into the utility billing system for processing.

The L900 MIU is easily installed and operates within a radio frequency (RF) bandwidth which does not require an operating license. Because the L900 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 – L900 MIU - Pit**

The L900 MIU meets FCC regulations Part 15.247, allowing higher output power and greater range. The L900 MIU uses frequency-hopping, spread-spectrum technology to avoid RF interference and enhanced security. The L900 MIU reads the encoder registers at 15-minute intervals and transmits a mobile message that includes the meter reading data and the unique nine-digit L900 MIU ID every 20 seconds. This allows the meter to be read by an HHU or mobile data collection unit. The L900 MIU also transmits a high power fixed network message every seven and one-half minutes on an interleaved basis to an R900 Gateway.

In addition to the mobile message that is transmitted every 20 seconds and the fixed network message that is transmitted every seven and one-half minutes, the L900 MIU is capable of supporting fixed network using a LoRa network.

The fixed network message that transmits for use on a LoRa network is sent every three hours.

The L900 MIU is designed to offer advantages to utility organizations of all sizes:

- Increases meter reading accuracy.
- Eliminates infrastructure concerns and the burden of managing collection devices.
- Eliminates “hard-to-read” meters.
- Protects utility liability by increasing meter reader safety.
- Requires no programming.

---

## Product Description

This section gives an overview of the L900 MIU.

### L900 MIU Programming

The L900 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 L900 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 L900 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 L900 MIUs interfere with one another.

### Low Battery RF Emissions

The L900 MIU stops RF transmissions when the battery discharges below the normal operating voltage.

# Chapter 2: L900 Specifications

---

This chapter provides you with the specifications for the L900 MIU.

---

## Electrical Specifications

The power is supplied by a Lithium battery.

---

## Transmitter Specifications

This section provides information on transmitter specifications.

Transmit Period	<ul style="list-style-type: none"><li>• Every 20 seconds - R900<sup>®</sup> standard mobile message</li><li>• Every seven and one-half minutes - R900 standard, high power, fixed network message</li><li>• Every three hours - LoRa fixed network message</li></ul>
Encoder Reading	Encoder registers every 15 minutes
Transmitter Channels	50
Channel Frequency	902 - 928 MHz
Output Power	Meets FCC Part 15.247
FCC Verification	Part 15.109

---

## Encoder Register Interface

This section provides information on the maximum cable lengths required for different registers. See the table on the following page.



**Table 1 – Supported Encoder Maximum Cable Length**

Neptune ARB® V <sup>1</sup>	300 feet (91 meters)
Neptune ProRead™ and E-CODER®	500 feet (152 meters)
Sensus Protocol registers	200 feet (61 meters)

<sup>1</sup> 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 - L900 MIU Pit

### Environmental Conditions

This section provides the environmental specifications for the L900 MIU.

**Table 2 – L900 MIU Pit 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 Conditions

This section provides the functional specification of the L900 MIU.

**Table 3 – L900 MIU Pit Functional Specification**

Register Reading	Eight digits
L900 MIU ID	Nine digits

### Dimensions and Weight

This section provides the dimensions and weight of the L900 MIU.

**Table 4 – L900 MIU Pit Functional Specification**

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



Figure 2 – L900 MIU - Pit Dimensions - Front



Figure 3 – L900 MIU Pit Dimensions - Side

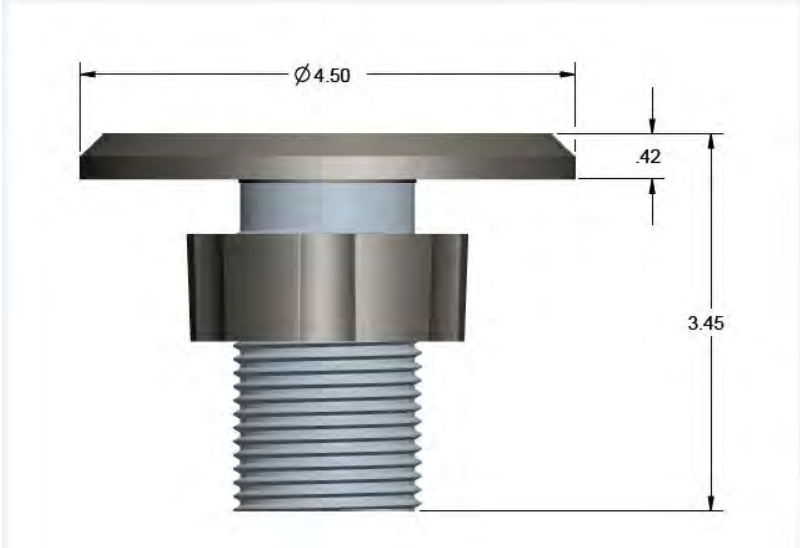


Figure 4 – L900 MIU Pit Antenna

# Chapter 3: General Installation Guidelines

---

This chapter describes tools, materials, and general installation guidelines for the L900 MIU.

---

## Tools and Materials

Table 5 below and Table 6 on the next page show the recommended tools and materials you need to successfully install the L900 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 5 – Recommended Tools**

Item	Description/Recommendations	Use
Tool Kit	Contains standard tools including: <ul style="list-style-type: none"><li>• Assorted screwdrivers</li><li>• Needle-nose pliers</li><li>• Wire stripper</li><li>• Diagonal cutters</li><li>• Electrician's knife</li><li>• Hammer</li><li>• Crimping tool (Part # 5500-158)</li></ul>	Performs various installation procedures.
Magnet	6 lb. force (Part # 12287-001)	Magnet swipe the L900 MIU.

**Table 6 – Recommended Materials**

Item	Description/Recommendation	Use
Cable	Solid 3 Conductor #22 AWG (black/green/red) Part # 6431-352	Connect L900 MIU to encoder register.
Moisture Protection Compound	Novaguard sealant Part# 96018-072	Cover exposed wires and terminal screws on register and L900 MIU.
Scotchloks	Part# 8138-125	Connect replacement pit L900 MIU to encoder register.
Site Work Order	Documentation provided by your utility	Receive and record 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 them you need access to the water meter.
- Write in the ID number(s) of the L900 MIU you are about to install, if the site work order does not have an L900 MIU ID number.
- Verify that the ID number(s) matches the ID number(s) on the L900 MIU you are about to install, if the site work order already has a L900 MIU ID number.

---

## Verifying/Preparing the Encoder Register

The L900 MIU is designed for use with the following encoder registers:

- ARB V
- ProRead

- ProRead AutoDetect
- E-CODER
- MACH 10
- Competitive registers using Sensus which include: Sensus ECRIII, ICE, iPerl, OMNI, and electronic registers; also Hersey/Mueller Translator, Badger ADE, and HR ELCD

Before installing an L900 MIU, the encoder register must be correctly wired and/or programmed to work with the L900 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 L900 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/L900 MIU 6, 8, or 10 ID TDI format. This can be accomplished through the ProRead receptacle before it is removed.

---

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

Before wiring the pit encoder register, consider the following.

1. 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 L900 MIU.
3. Remove the terminal screw from the encoder register.
4. Strip  $\frac{3}{4}$ -inch insulation from the cable jacket, leaving only the three insulated wires.
5. Take precautions not to nick or cut the insulation on the three wires, strip off  $\frac{1}{2}$ -inch of insulation from each of the three wires.

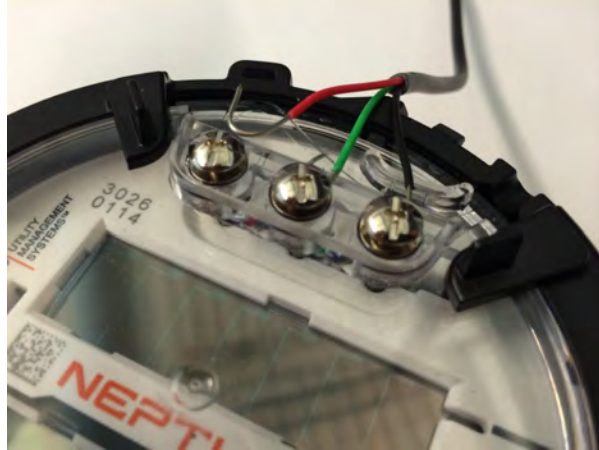


Figure 5 – Wiring a Neptune Encoder Register

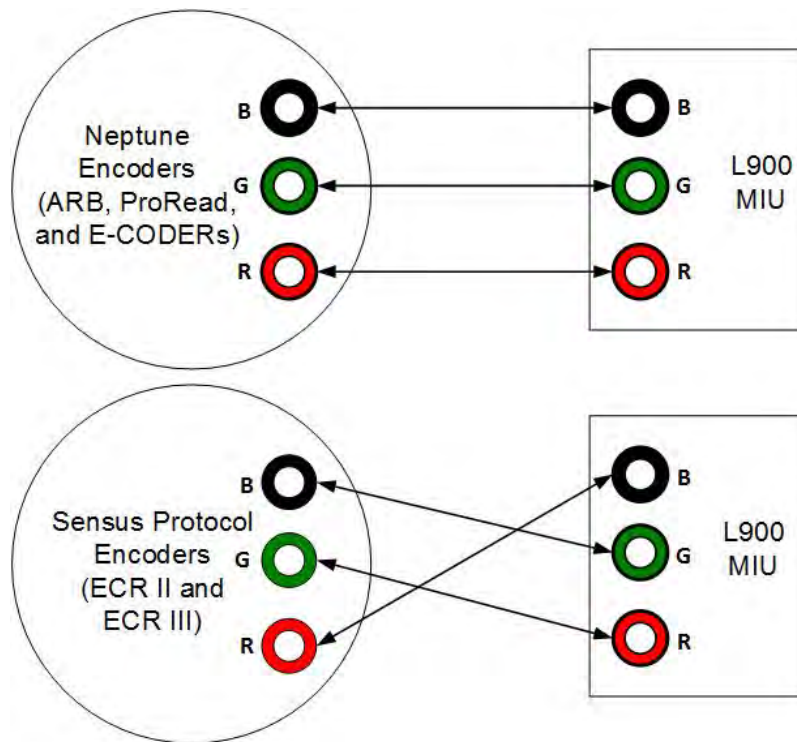


Figure 6 – L900 MIU Color Code for Wires

6. If required, connect the three conductor wires to the encoder register's terminal per the manufacturer's instructions. See Figure 5 and Figure 6.

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



**Figure 7 – Cable Threaded Around Strain Relief Posts**

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



Neptune requires Novagard G661 sealant or Dow Corning compound 4.



**Figure 8 – 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 9 below.



**Figure 9 – Covering the Terminal Screws**

10. Run the cable to the L900 MIU and fasten it securely.



Do not exceed maximum cable lengths as defined in Table 1 on page 4. If the encoder register is prewired and potted, use Scotchlocks for connecting the register to the L900 MIU.

# Chapter 4: Pit Installation

---

This chapter describes storage and unpacking instructions, preliminary tests, tools, materials, site selection, and pit installation of the L900 MIU.

---

## Prior to Installation

### Storage

Upon receipt, inspect shipping containers and contents for damage prior to storage. After the inspection is complete, store the cartons in a clean, dry environment. Keep in mind that the L900 MIU has an internal battery. Storage for more than one year can 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 L900 MIU must be handled carefully; however, no additional special handling is required.

After unpacking the L900 MIU, inspect it for damage. If the L900 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 10 – L900 MIU Kit

## Tools and Materials

Table 5 on page 7 and Table 6 on page 8 show the recommended tools and materials you need to successfully install the L900 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 L900 MIU. Never perform an installation during a lightening storm or under excessively wet conditions.

Installation and operation in moderate temperatures increase reliability and product life. See "L900 MIU Pit Environmental Conditions" on page 4.

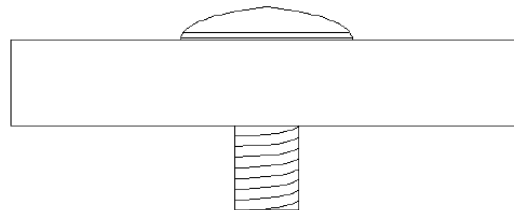
Follow these guidelines when selecting a location to install the L900 MIU.

- For best results, select a location where there is no chance that another object can be set over the antenna.
- Avoid installing the L900 MIU behind metal fences or walls.
- Make sure the pit location gives adequate room for installing both the L900 MIU and the pit antenna.



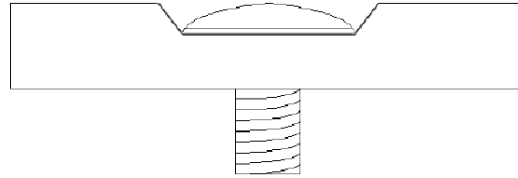
For maximum performance, the flange of the pit antenna needs to be located above the pit lid.

- For maximum performance, Neptune recommends that pit antennas be installed above the lid as illustrated in Figure 11.



**Figure 11 – 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 12.
- Recessing the installation reduces the range of the antenna.



**Figure 12 – Antenna Placement for High Traffic Areas**

- For best results, Neptune recommends installing the L900 MIU in a location that provides a direct line of site to the path of the meter reader.
- Although the L900 MIU has a cable already attached (2 feet or 6 feet), some installations can require additional cable. In these cases, the maximum cable length between the encoder register and L900 MIU depends on the register's manufacturer and model. Refer to Table 7 for maximum cable lengths.

**Table 7 – 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 Register	200 feet (61 meters)

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

---

## L900 MIU Pit Installation

The following section describes how to install a single L900 MIU in a pit location.



Select a location for the L900 MIU that meets the recommendations in "Site Selection" on page 14.

## Installing the Antenna



**Figure 13 – Inserting the Antenna into the Pit Lid**

1. Insert the antenna cable and housing through the 1¾-inch hole in the meter pit lid. See Figure 13.



**Figure 14 – Locking Nut on Antenna**

2. Thread the locking nut onto the antenna (unthreaded end towards lid). See Figure 14.



**Figure 15 – Securing the Locking Nut**

3. Hand tighten the nut securely to the lid. See Figure 15.



**Figure 16 – Installation Completed**

Figure 16 shows a completed installation of the antenna.

### Begin the Installation



**Figure 17 – Black Thread Guard from Male F-Connector**

Complete the following steps to install the L900 MIU in a pit.

1. Remove black plastic thread protector cap from the male F-connector on the L900 MIU.



**Figure 18 – Seating Washer**

2. Place the flat black rubber washer around the male F-connector on the L900 MIU as shown in Figure 18.



Figure 19 – Apply Novaguard

3. Apply a coating of Novaguard around the base of the F-connector and on the flat rubber washer. See Figure 19.
4. Using a torque wrench, connect the coaxial cable connector to the F-connector on the L900 MIU/housing, tightening it to 15 inch-pounds.



Antenna connection should have Novaguard applied inside the connector.

### Threading the F-Connector



Figure 20 – Tightening Connector

Complete the following steps to thread the F-connector.

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  $\frac{1}{4}$  turn to the right as shown in Figure 20.
3. Slide the black cone-shaped gasket down the cable until it seats against the connector housing.



Figure 21 – Gasket and Connector

4. Slide the 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 21.
6. Finger-tighten the connector to depress cone-shaped rubber gasket.

This seals the coax cable from moisture intrusion.

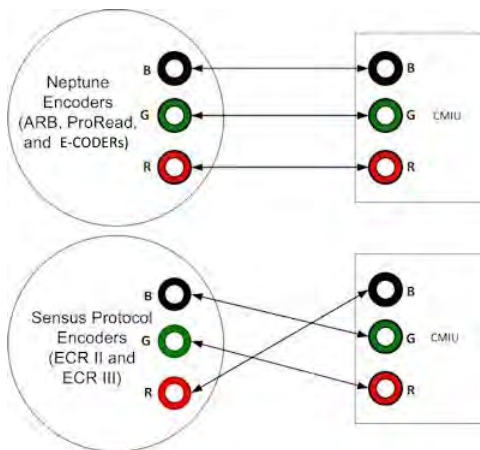
## Installing the Scotchloks



**Figure 22 – Scotchloks Connector**

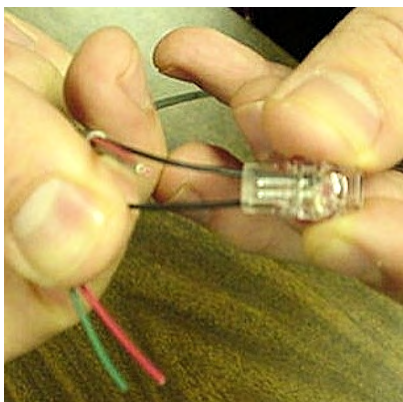
Complete the following steps to install the Scotchloks.

1. Complete steps outlined in "L900 MIU Pit Installation" on page 15 to install the L900 MIU through the lid.
2. Use 3M Scotchloks type UR connector to connect the L900 MIU wires to the encoder wires.
3. Hold the Scotchloks connector between the index finger and thumb with the red cap facing down. See Figure 22.



**Figure 23 – Color Code for Wires**

4. Pair the wires according to the color diagram. See Figure 23.



**Figure 24 – Seating Connector Wires**

5. Take a non-stripped black wire from the pigtail and a non-stripped black wire from the L900 MIU and insert wires into the Scotchloks connector until fully seated in the connector. See Figure 24.





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



Figure 25 – UR Crimping Tool

6. Place the connector (red cap side down) between the jaws of the UR crimping tool as shown in Figure 25.

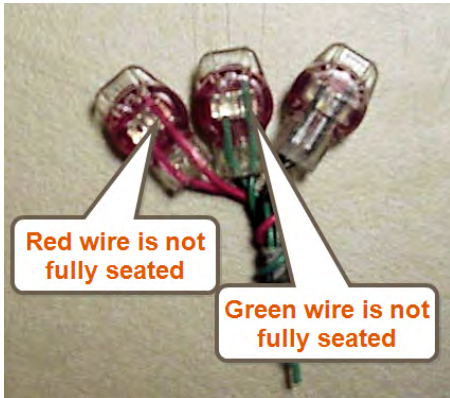


Figure 26 – Improper Connections

7. Check to ensure the wires are still fully seated before crimping the connector. Figure 26 illustrates improper connections due to wires not fully seated.

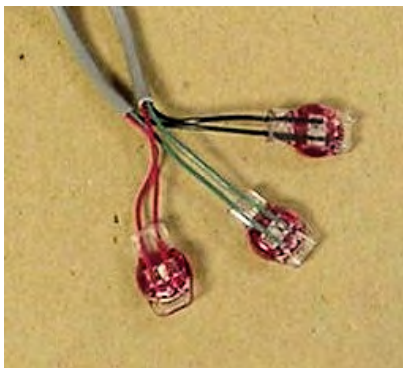


Figure 27 – Three Color Wires Connected

8. Squeeze the connector firmly with the proper crimping tool until you hear a pop and gel leaks out of the end of the connector.
9. Repeat steps two through seven for each color wire. See Figure 27.
10. After all three color wires have been connected, go to "Testing the Installation" on page 1 to ensure proper connections and the L900 MIU is functioning properly.

## Connecting the Splice Tube

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

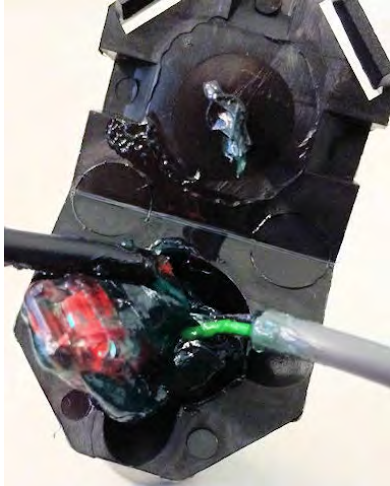


Figure 28 – Splice Tube

1. Take all three connected Scotchloks and push into the splice tube until fully encapsulated by the silicone grease. See Figure 28

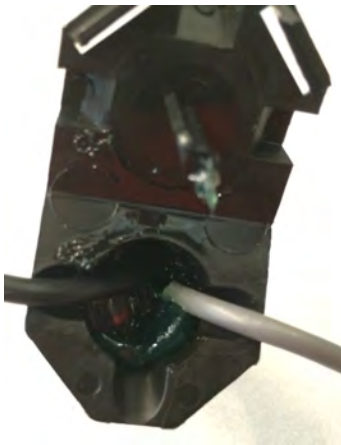


Figure 29 – Gray Wire in Slots

2. Separate each gray wire and place in the slots on each side as shown in Figure 29.



Figure 30 – Cover in Place

3. Snap cover closed to finish the installation as shown in Figure 30.

## Tying the Cable and Magnet Swiping the L900 MIU

Complete the following steps to tie the cable and magnet swipe the L900 MIU.



Figure 31 – L900 MIU Attached to Antenna

1. Place the L900 MIU in the pit location using the following suggestions.
  - In a shallow pit application, you can place the L900 MIU beside the meter.
  - In deep pit applications, use a cable tie to suspend the L900 MIU from the antenna shaft, as shown in Figure 31.



Be careful not to lodge the L900 MIU between the meter box and any components inside the box.

Make sure the L900 MIU is placed in such a way that it does not lodge itself when the pit lid is removed.



Figure 32 – Magnet Swipe the L900 MIU

2. Swipe the L900 MIU with a magnet.
  - Position the magnet against the left side of the L900 MIU directly in line with the Neptune logo.
  - Move the magnet up and over the top left corner of the L900 MIU. See Figure 32.

---

## Testing the Installation

If the L900 MIU is connected to an E-CODER register or another register with an eight-digit output, the L900 MIU will transmit an eight-digit read. For example, read 12345678 (E-CODER or other eight-digit register output).

To test the installation, complete the following steps.



To avoid RF signal saturation of the HHU, position yourself at least two to three feet from the L900 MIU.

1. Power up the HHU test device and start the testing programs provided.
2. When the L900 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:
  - Magnet swipe the L900 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.
  - Magnet swipe the L900 MIU. (See Step 1.)



If a problem still exists, contact your Neptune sales representative.

This page intentionally left blank.

# Chapter 5: Data Logging Extraction

## About Data Logging



The L900 MIU is capable of storing interval data for data logging. The L900 MIU is activated using the Trimble® Nomad® and R900® Belt Clip Transceiver (R900 BCT) and is explained in more detail in the following section.

The L900 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 L900 MIU which in turn sends the data intervals to the R900 BCT and are saved in the HHU.

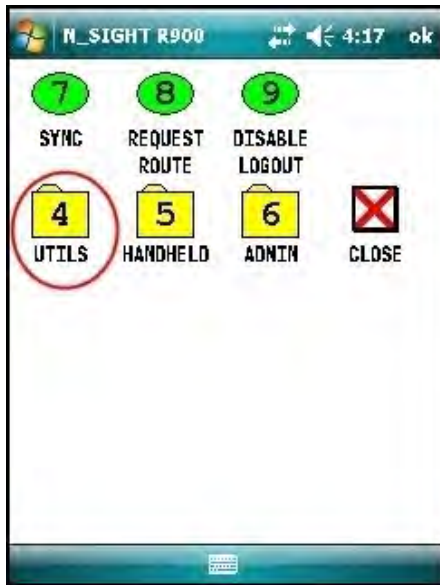
## Accessing Data Logging

Complete the following steps for data logging.

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

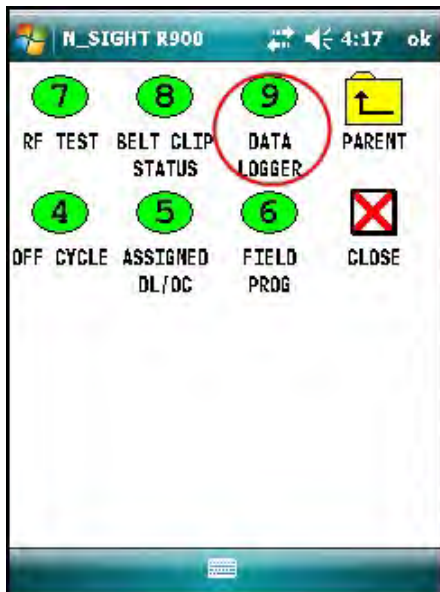


Figure 33 – HHU Home Screen



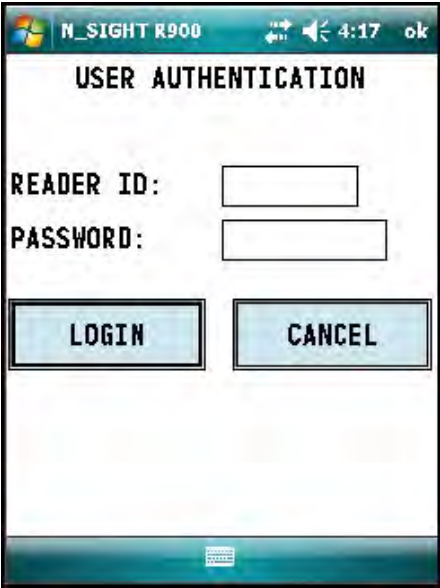
2. From the HHU Menu screen, click **UTILS** (option 4). See Figure 34.

Figure 34 – N\_SIGHT Main Screen



3. Click **DATA LOGGER** (option 9). See Figure 35.

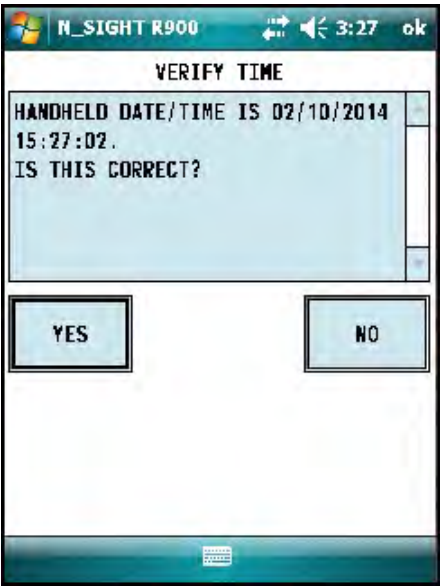
Figure 35 – Data Logger Options



- 4. Type your reader ID and password (if applicable) for the host software. Click **LOGIN**. See Figure 36.


Figure 36 – Reader ID Input

### Initializing the Data Logger

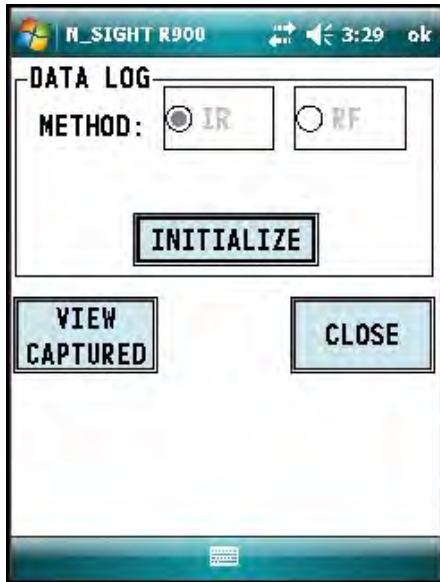


- 1. Verify the time is correct, and click **YES**. See Figure 37.

Figure 37 – HHU Time Confirmation

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



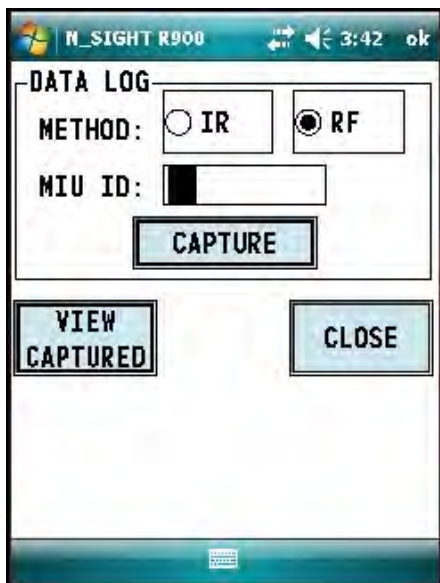


2. The Initialize Device screen appears if you are not connected or you are not in range of your R900 BCT. Click **INITIALIZE**. See Figure 38.

Figure 38 – Initialize RF Device



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

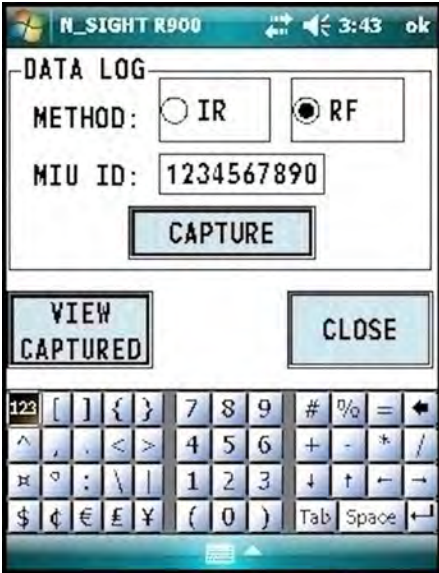


3. Select **RF** and type the L900 MIU ID. See Figure 39.

Figure 39 – L900 MIU ID Entry

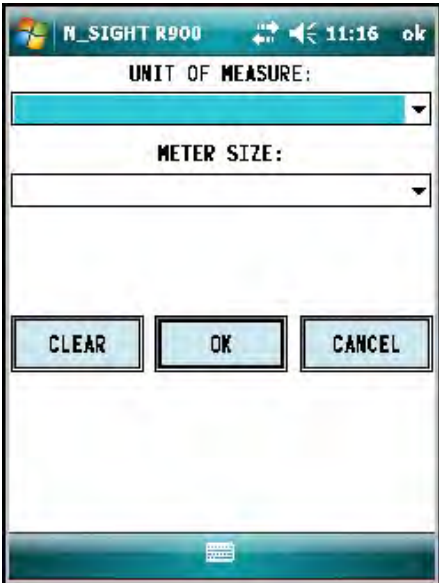


You can type the L900 MIU ID with the number pad keys or expand the on-screen keyboard.



4. After you type the L900 MIU ID, click **CAPTURE**. See Figure 40.

Figure 40 – Capture Button



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 41.

Figure 41 – Meter Size Selection

## Initiating RF-Activated Data Logging

Complete the following steps to initiate RF-activated data logging.

1. Click START to initiate RF-activated data logging. See Figure 42.



Figure 42 – Start Button

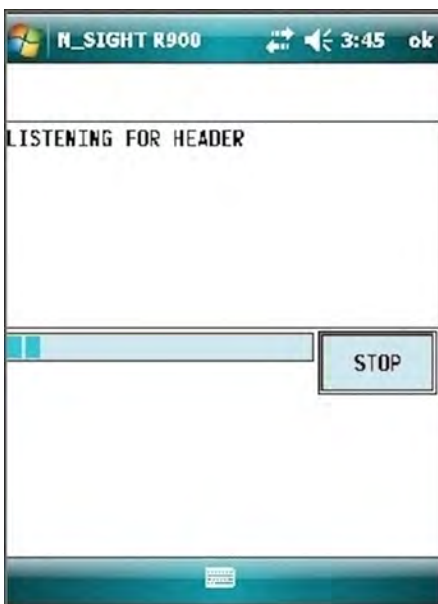
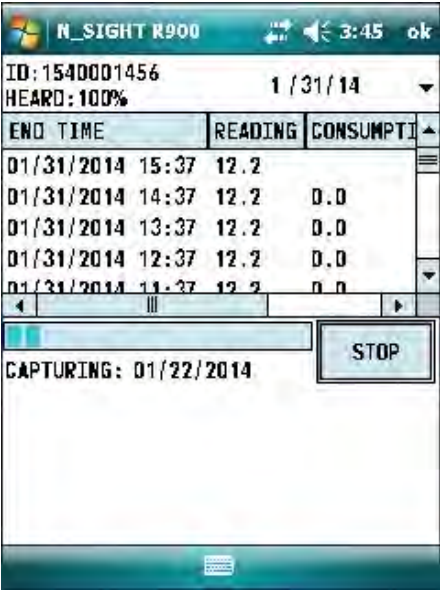


Figure 43 – Listening for Data

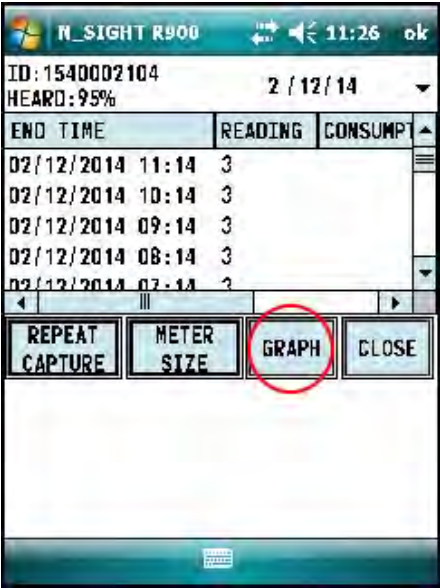


The R900 BCT activates the L900 MIU and listens for the data logger to start transmitting. See Figure 43.



The data appears on the screen. See Figure 12.

Figure 44 – Receiving Data



- 1. After the data logging process is completed, choose the meter size (see Step 5 on page 33).
- 2. Click **GRAPH** (see Figure 43) to display the data in a graph. Examples of graphs are shown in Figure 46 on the next page.

The HHU processes and saves the data. After closing the data logging screen, the unit performs a backup.

Figure 45 – Graph Button

### Sample Data Logging Graphs

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

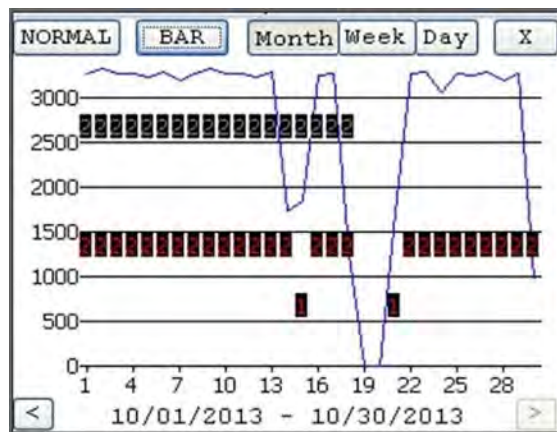
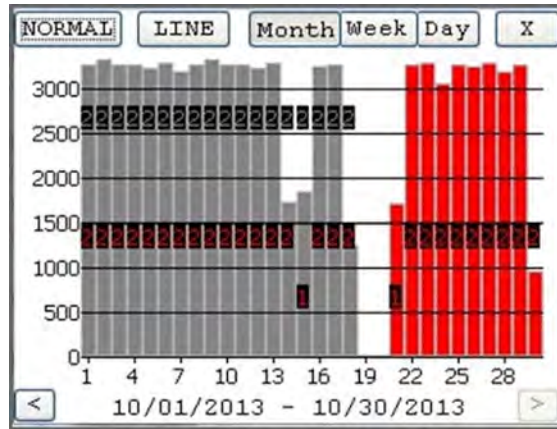


Figure 46 – Examples of Data Logging Graphs

Table 8 – 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.

1. From the host software home screen on the HHU, click **MENU**. See Figure 47.



Figure 47 – HHU Home Screen

2. From the HHU Menu screen, click **UTILS** (option 4). See Figure 48.

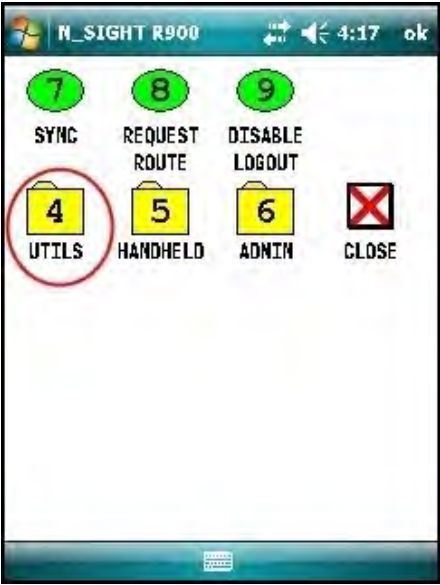
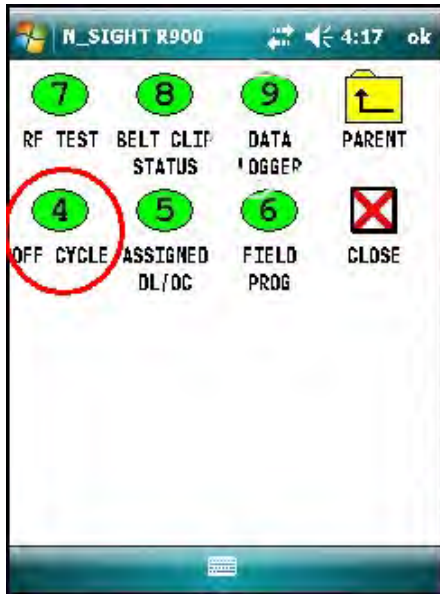


Figure 48 – HHU Menu Screen



3. Click **OFF CYCLE** (option 4). See Figure 49.

Figure 49 – Off-Cycle Option

4. Type the read ID and/or the password.
5. Click **LOGIN**.
6. Confirm date and time are correct.
7. Click **YES**.

## R900 Belt Clip Transceiver

To pair with R900 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 L900 MIU ID.
4. Click **CAPTURE**.

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

# Chapter 6: Maintenance and Troubleshooting

---

This chapter takes you through maintenance and troubleshooting procedures for the L900 MIU.

---

## Six- and Four-Wheel Encoders

### Six-Wheel Encoders Normal Operation

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



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 L900 MIU adds an additional two zeros on the end to provide an eight-digit reading to the host software.

---

### Four-Wheel Encoders Normal Operation

If the odometer reads 1234, the display should show 1 2 3 4 0 0 0 0.



The L900 MIU 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 9 – Examples of Reading Values**

Reading Value	Definition	Troubleshooting
.....	Failure to retrieve reading	<ul style="list-style-type: none"> <li>Usually indicates a cut wire. Check the connection between the register and L900 MIU.</li> <li>If using a non-autodetect ProRead register, verify that it has been programmed for three-wire mode.</li> </ul>
????????	<ul style="list-style-type: none"> <li>Indicates an ambiguous, bad read</li> <li>Replaces ----- and HHHHHHHH</li> </ul>	

## Replacement Parts

Table 10 lists the available replacement parts for the L900 MIU.

**Table 10 – 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
Scotchlocks (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

## Chapter 7: Contact Information

---

Within North America, Neptune Customer Support is available Monday through Friday, 7:00 AM to 5:00 PM 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. 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](mailto:hhsupp@neptunetg.com).

This page intentionally left blank.

# Glossary

---

## A

---

### **antenna (pit)**

L900 MIU antenna used for pit installations.

## C

---

### **conical-shaped gasket**

Cone-shaped rubber gasket on antenna cable used to seal cable at top of connector housing.

### **connector housing**

Black plastic 1/4-turn connector for waterproofing antenna cable connection to L900 MIU pit.

### **connector nut**

Black plastic nut used to depress conical-shaped gasket and seal antenna cable at the top of connector housing.

## F

---

### **flat washer**

Washer used to seal cable connector housing to L900 MIU pit.

## L

---

### **L900 MIU**

Term used for meter interface unit.

### **LoRa**

Term that stands for Long Range; a technology that uses unlicensed spectrum below 1GHz along with a form of direct sequence spread spectrum modulation that provides signal detection below the noise level.

### M

---

#### **main housing**

Main body of the L900 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 3-conductor wire.

### MIU

See L900 MIU.

### N

---

#### **Novaguard sealant**

Moisture protection compound.

### P

---

#### **potting**

Covering of an electronic or electrical device to protect it from the surrounding environment.

### R

---

#### **register read time**

Default time for all registers is 15 minutes. Custom time is not available.

**S**

---

**Scotchloks**

Gel caps used to connect the register to the pigtail from the L900 MIU.

**seal wire**

Wire inserted into the seat holes adjacent to the main housing fastner screw. This seal must be broken to remove the main housing from the mounting adapter.

**serial number**

Unique identification number given to each L900 MIU at the factory. Custom serial numbers are not available.

**splice tube**

Device used to join two pieces of wire.

**strain relief posts**

Posts located on the encoder register and the back of the main L900 MIU housing.

**T**

---

**terminal screw**

Screws on the encoder register face that are used to connect and anchor the three (3) conductor wire to the register.

**terminal screw cover**

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

**transmission time**

Time between L900 MIU transmissions. The default is approximately fourteen (14) seconds. Custom time is not available.

This page intentionally left blank.

## A

### access

data logging 25

HHU home screen 25

### activate

L900 MIU 25

with magnet 22

with Nomad 25

active L900 MIU 7

### antenna

cable 16

shaft 22

## B

battery 3

black cone-shaped gasket 18

## C

cable 3, 8

22 AWG 4, 9

maximum length 3

coaxial cable 18

color diagram, wire 19

conditions, functional 4

conductor wire 4, 10

### connector

female-threaded 18

housing 18

Scotchloks 19

contact information 37

by email 37

by fax 37

by phone 37

crimping tool 7, 20

## D

data logging 25

extraction 25

graphs 31

RF activated 30

dimensions 4

## E

E-CODER 4, 9

electrical specifications 3

encoder register interface 3

### encoders

four wheel 35

six wheel 35

environmental conditions 4

### extraction

data logging 25

off-cycle data 33

## F

FCC 3

frequency hopping 1



functional conditions 4

## G

gasket 18

graphs, data logging 31

## H

HHU menu screen 26

high traffic 15

## I

installation guidelines 7

## L

L900 MIU 7

- product description 1

- specifications 3

latch plate 18

locking nut 16

LoRa 1, 3

## M

magnet 7, 26-28

magnet (illus) 22

maintenance 35

materials 7

## N

Novaguard sealant 8, 18

## O

odometer 35

on-screen keyboard 29

operating humidity 4

## P

pit antenna 14

preliminary checks 8

prewired 12

product description 1

ProRead 4, 8

## R

recommended materials 8

recommended tools 7

register

- install 9

- potted only 9

## S

safety

- checks 8

- practices 14

Scotchlocks 8, 12, 19

sealant 11

specifications 3

- electrical 3

- environmental 4

- functional 4

- transmitter 3
- splice tube 21
- spread spectrum 1
- strain relief posts 11
- swipe, L900 MIU with magnet 22

## T

- temperature
  - operating 4
  - storage 4
- terminal screw 9
- tool kit 7
- tools 7
- transmitter specifications 3
- troubleshooting 35

## W

- weight 4
- wires, color-coded diagram 19

This page intentionally left blank.



**Neptune Technology Group Inc.**

1600 Alabama Highway 229

Tallassee, AL 36078

USA

Tel: (800) 633-8754

Fax: (334) 283-7293

**Neptune Technology Group (Canada) Ltd.**

7275 Alabama Highway 229

Mississauga, Ontario

L5N 5M9

Canada

Tel: (905) 858-4211

Fax: (905) 858-0428

**Neptune Technology Group Inc.**

Ejército Nacional No. 418

Piso 12, Desp. 1201-1202

Col. Chapultepec Morales

Delegación Miguel Hidalgo

11570 México, Distrito Federal

T: (525) 55203 5294 / (525) 55203 5708

**NEPTUNE**  
TECHNOLOGY GROUP