



NEPTUNE®

Neptune Technology Group Inc.



R900 MIU Quick Install Guide

ARB® Utility Management Systems™

1 General Instructions

The R900 is designed for use with multiple types of approved encoder registers: Neptune ARB III, IV, V, ProRead and E-Coder, and Sensus (Invensys) ECRII, and ECR III*. Before installing a Meter Interface Unit (MIU), the encoder registers must be correctly wired and programmed to work with the MIU.

Notes:

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

*The ECR III register is supported when programmed with the same format used in the "6 Wheel ECR II register."

To ensure that the ProRead register is programmed for three-wire mode, use the ProRead programmer and its RF/MIU 6, 8, or 10 ID TDI format. You can accomplish this using the ProRead receptacle before removing the receptacle.



For greater detailed information and installation instructions refer to the *R900 Wall and Pit Installation and Maintenance Guide (Part #12560-001)*.

2 Safety & Preliminary Checks

- 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 must have access to the water meter.
- Confirm and/or update the MIU ID number on the Site Work Order.



When installing meters, follow any guidelines issued by your company in addition to those given in this guide. Never perform an installation during a lightning storm or under excessively wet conditions.

3 Pit & Wall Site Selection

R900 Wall MIU

- For best results, Neptune recommends mounting the MIU on the outside of the building and in a location which provides a direct line-of-sight to the meter reading device.
- For best results, Neptune recommends installing the MIU approximately five feet above the ground.
- Install the MIU in a vertical and upright position.
- The preferred mounting surface for the MIU would be a flat wall, but the unit can also be mounted to a pipe.
- The selected location must 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 1 for maximum cable lengths.

R900 Pit MIU

- For best results, Neptune recommends placing the antenna through a hole in the pit lid so that the dome sits above the pit lid.
- For best results, Neptune recommends selecting a location with a direct line-of-sight to the path of the meter.
- Avoid installing the MIU behind metal fences or walls.
- Make sure there is enough room in the pit for the MIU. Because the meter position is fixed, the antenna is usually installed off-center.
- The MIU comes with an attached cable, but in some instances additional cable is required. The maximum cable length between the encoder register and MIU depends on the register's manufacturer and model. Refer to Table 1 for maximum cable lengths.

Table 1 Maximum Cable Lengths

Approved Encoder Register	Maximum Cable Length	Wire Gauge
Neptune ARB® III, IV, V*	300 feet (91 meters)	22 AWG*
Neptune ProRead*/E-Coder*	500 feet (152 meters)	22 AWG

Table 1 Maximum Cable Lengths

Approved Encoder Register	Maximum Cable Length	Wire Gauge
Networked Neptune ProRead/E-Coder**	250 feet (76 meters)	22 AWG
Sensus (Invensys) ECRII [®] , ECRIII [®] ***	200 feet (61 meters)	22 AWG

* American Wire Gauge (AWG)

** Meets manufacturer's published specification for wire length between encoder and remote receptacle. ARB, ProRead, and E-Coder are trademarks of Neptune Technology Group Inc.

ECRII and ECRIII are trademarks of Sensus (Invensys).

***The ECR III register is supported when programmed with the same format used in the "6 Wheel ECR II register."

4 Preparing the Encoder Register

The R900 MIU is designed for use with multiple types of approved encoder registers: Neptune ARB III, IV, V, ProRead, and E-Coder, and Sensus (Invensys) ECR II and ECRIII.

Before installing an MIU, the encoder registers must be correctly wired and programmed to work with the MIU.



When a ProRead encoder register (Rev. E or earlier) is used, the ProRead register must be programmed for three-wire mode. If two ProRead registers are connected to one MIU, the encoder register **must** be programmed in Network Mode. The ECR III register is supported when programmed with the same format used in the "6 Wheel ECR II register."

If the MIU is connected 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 10 ID TDI format. This can be accomplished through the ProRead receptacle before removing the receptacle.



Before wiring the encoder register, make sure the cable is long enough so that when the installation is complete, the pit lid can be removed easily without straining the cable. The ID number programmed into the register is not used. The MIU ID is the number used.

5 Wiring the Encoder Register



For more detailed instructions, refer to Neptune's *Encoder Quick Install Guide* (Part #: 12572-001).

22 American Wire Gauge (AWG) three-conductor cable must be used from the encoder register to the MIU. Refer to the following steps.

- 1 Connect the three-conductor wire to the encoder register's terminals per the manufacturer's instructions (see Neptune's *Encoder Quick Install Guide* (Part #: 12572-001), using the color code in Table 2.

Table 2 Encoder Wiring

Approved Encoder Register	Encoder Wire Color/ MIU Terminal		
Neptune ARB III, IV, V	Black / B	Green / G	Red / R
Neptune ProRead	Black / B	Green / G	Red / R
Neptune E-Coder	Black / B	Green / G	Red / R
Sensus ECR II & III*	Black / R	Green / B	Red / G

*The ECR III register is supported when programmed with the same format used in the "6 Wheel ECR II register."

- 2 Thread the cable around the strain relief posts of the encoder.
- 3 Apply sealant liberally and ensure that it encapsulates the terminal screws and exposed wires.



All encoder terminal connections that are not pre-wired and potted must be covered with Novagard (G661) or Dow[®] Corning Compound 4.

- 4 Snap the cover onto the encoder register.
- 5 Proceed to the section specified for either Pit or Wall installation.

6 Installing the R900 Wall MIU



For greater detailed information and installation instructions, refer to the *R900 Wall and Pit Installation and Maintenance Guide* (Part #: 12560-001).

Complete the following steps to install the wall MIU.

- 1 Remove the main housing from the mounting adapter.

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

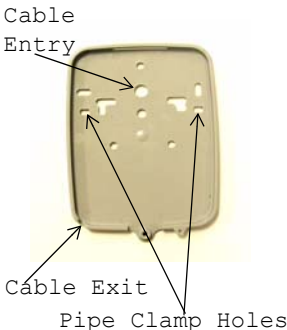


Figure 1 Wall MIU Main Housing

A variety of holes in the mounting adapter allows for a quick and easy installation:



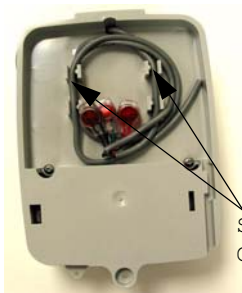
- The cable enters through the bottom or rear cable entry of the mounting adaptor.
- When the MIU replaces a receptacle, use the appropriate holes to allow reuse of the receptacle's original mounting holes. (See mounting hole configuration in Figure 2 Mounting Adapter.)
- When mounting the MIU to a pipe, use the bolt hole for pipe mounting to bolt the mounting adapter to a pipe clamp.



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

Figure 2 Mounting Adapter

- 3 Connect each individual colored wires from the Wall MIU with the appropriate colored wire from the approved encoder per the encoder wiring (see Table 2 on page 5). Repeat this step for each colored wire



Strain Relief Guides

- 4 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 3 Back of MIU.

Figure 3 Back of MIU

- 5 For bottom cable exit, store Scotchloks in the hollow cavity in the back of the MIU and guide the remaining wire through the cable exit notch at the bottom right side of the MIU as shown in Figure 4 Cable Exit Notch.



Notch

Figure 4 Cable Exit Notch.



- **Connection from the MIU to the approved encoder should be made using 22AWG three-conductor wire.**
- **Neptune requires that you use either type UR or UY Scotchlok™ gel caps to connect the pigtail from the MIU to the register wire. (Refer to Neptune's *Encoder Quick Install Guide* (Part #: 12572-001) for proper Scotchlok techniques.**

When using the Scotchlok gelcaps,

- Pair the wires according to the color chart in Table 2 on page 5.
- Slide the ends of the pair of colored wires into the gel caps as far as they can go. **Do not strip individual colored wires.**

- Then, firmly squeeze the gel cap with the appropriate crimping tool (Eclipse Tools Part #: 100-008 or Neptune Part #: 5500-158). One gel cap is used for each colored wire pair (See Figure 5 Gel Cap Connections.)

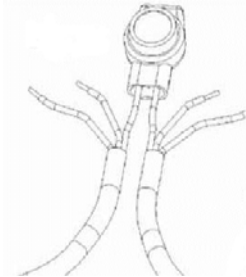


Figure 5 Gel Cap Connections



Figure 6 MIU Back Plate

- 6 Slide tongue on the top of the MIU, into the groove on the top of the MIU Mounting Adapter. (See Figure 2 Mounting Adapter.)

- 7 Secure the MIU to the Mounting Adapter using the Hi-Lo Fastener provided. (See Figure 7 Hi-Lo Fastener.)



Figure 7 Hi-Lo Fastener

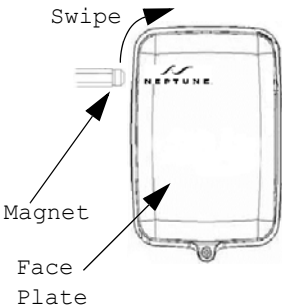


Figure 8 Activation Magnet

- 8 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 8 Activation Magnet Activation Magnet.)

- 9 Test the installation as described in the “Testing the R900 MIU Installation” on page 15.

7 Completing the R900 Wall MIU Installation

- 1 Install a seal wire or seal clip through the seal holes, if desired.
- 2 Read the MIU one more time before leaving the site to ensure MIU is transmitting.
- 3 Make sure the appropriate ID# on the MIU has been assigned to the meter setting.
 - For single register applications, use the bold-faced ID#.
 - For two register configuration, assign the (HI S/N) to one register and the (LO S/N) to the second register.

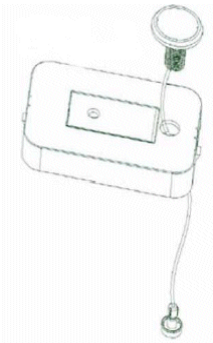


All tags are provided to aid in the elimination of transcription errors.

8 Installing the R900 Pit MIU



- For greater detailed information and installation instructions refer to the ***R900 Wall and Pit Installation and Maintenance Guide (Part # 12560-001)***
- Before wiring the encoder register, make sure the cable is long enough so that when the installation is complete, the pit lid (with MIU attached) can be removed easily without straining the cable



- 1 Feed the antenna cable and housing through the 1 3/4" hole in the meter pit lid. Slip the large plastic nut over the antenna cable and thread it onto the antenna assembly to secure it to the pit lid. Make sure the smooth side at top of threads on nut is facing upward. (See Figure 9 Pit Antenna Cable and Housing.)

Figure 9 Pit Antenna Cable and Housing

2 Place the flat black rubber washer on MIU around the male coax connection. (See Figure 10 Coax Connection.)

3 **Apply a coating of Nova-guard around the base of the "F" connector and on the flat rubber washer.**

4 Connect the coaxial cable connector to the "F" connector on the transmitter housing. This connection should be hand-tight. (See Figure 10.)

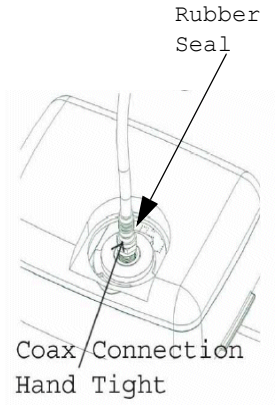
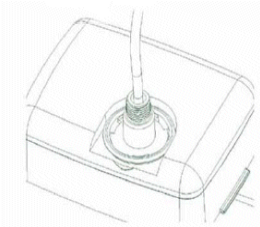


Figure 10 Coax Connection



5 Make sure the washer is properly seated. Connect the plastic connector housing to the 3-lobed black plastic latch-plate. (See Figure 11 Latch Plate.)

Figure 11 Latch Plate

6 Slide the black conical-shaped gasket down the cable until it engages the connector housing. (See Figure 12 Rubber Seal.)

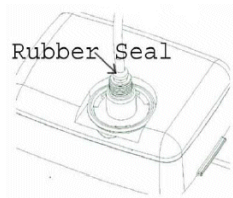
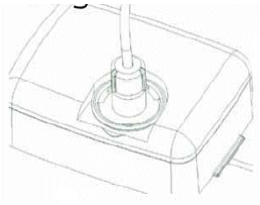


Figure 12 Rubber Seal



7 Tighten the connector nut onto the threaded portion of the connector housing. This connection should be hand-tight. Do not use pliers. (See Figure 13 Connector Housing.)

Figure 13 Connector Housing

8 For flooded pit or deep vault installations:

- Use the included cable tie to hang the MIU from the antenna tube.
(See Figure 14 Cable Tie.)

Or,

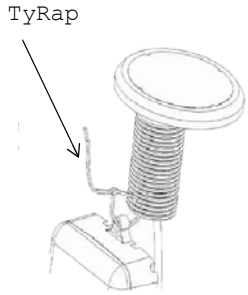


Figure 14 Cable Tie

For shallow residential pits:

- Position MIU in base of meter box as shown for the shallow residential pit settings. (See Figure 15 Pit Installation.)

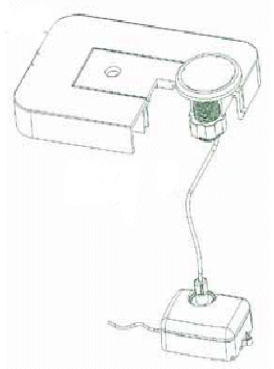
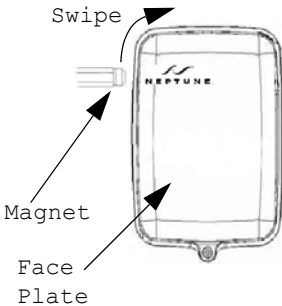


Figure 15 Pit Installation



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



- 9 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 16 Activation Magnet.)

Figure 16 Activation Magnet

9 PIT MIU Installation - Retrofit Applications Only

- 1 Complete steps 1 through 9 outlined in "Installing the R900 Pit MIU" on page 9 to install the MIU through the lid.
- 2 Use 3M Scotchlok Type UR connector to connect the MIU wires to the encoder wires.

- 3 Hold the Scotchlok connector between index finger and thumb with the red cap facing down. (See Figure 17.).



Figure 17 Scotchlok Connector

- 4 Take a non-stripped black wire from the pigtail and a non-stripped black wire from receptacle/MIU and insert wires into the Scotchlok connector until fully seated in connector. (See Figure 18.)

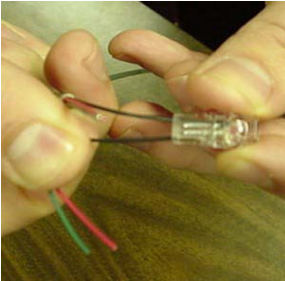


Figure 18 Seating Connector Wires

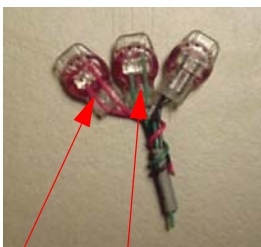


Do not strip colored insulation from wires, or strip and twist bare wires prior to inserting in connector. Insert insulated colored wires directly into the Scotchlok connector.

- 5 Place the connector red cap side down between the jaws of the UR crimping tool as shown in Figure 19. Refer to Table 2 on page 5 for a list of the manufacturers and part numbers.



Figure 19 UR Crimping Tool



red and green wires
-- not fully seated

- 6 Check to ensure that the wires are still fully seated in the connector before crimping the connector. Figure 20 illustrates improper connections due to wires not fully seated.

Figure 20 Improper Connections

- 7 Squeeze the connector firmly with the proper crimping tool until you hear a pop and gel oozes out the end of the connector.
- 8 Repeat steps 2 through 6 for each color wire. (See Table 3.)
- 9 Once all three color wires have been connected, read the encoder register to ensure proper connections and the receptacle/MIU is functioning properly. (See Figure 21.)

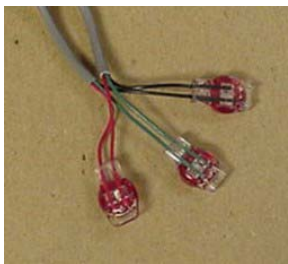


Figure 21 Three Color Wires Connected

Table 3 Color Code for Wires

Approved Encoder Register	MIU Wire Color/ Encoder Terminal		
Neptune ARB [®] V	Black / B	Green / G	Red / R
Neptune ProRead (ARB [®] VI)	Black / B	Green / G	Red / R
Neptune E-Coder (ARB [®] VII)	Black / B	Green / G	Red / R
Sensus (Invensys) ECR II	Black / R	Green / B	Red / G
Sensus (Invensys) ECR III	Black / R	Green / B	Red / G

Connecting the Splice Tube

To complete the installation of the Scotchloks, complete the following steps to install the Connector King Splice Tube.

Splice Tube



- 1 Take all 3 connected Scotchloks and push into the splice tube until fully encapsulated by the silicone grease. (See Figure Figure 22.)

Figure 22 Splice Tube

- 2 Separate each gray wire and place in the slots on each side as shown in Figure 23.



Figure 23 Gray Wires in Slots



- 3 Snap cover closed to finish the installation as shown in Figure 24.

Figure 24 Cover in Place

10 Testing the R900 MIU Installation

After the MIU has been installed and wired, follow these steps to verify that the MIU is working properly.

- 1 Power up the handheld unit (HHU) test device to start the testing program provided.



To avoid RF signal saturation of the HHU, position the receiver at least 2 to 3 feet from the MIU. In a densely saturated area, removing the antenna from the handheld can assist with readings.

- 2 When the MIU is installed correctly, its MIU ID# and a meter-reading appears on the HHU's display within one minute. Verify that this is the correct meter reading by comparing it to the meter's dial.

Note: All registers return 6 digits, except for E-Coders which return 8 digits.*

- 3 If a meter reading does not appear on the HHU's display or the meter reading in the HHU's 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 (repeat steps 1 and 2).

* E-Coders return 8 digits when connected to a second generation R900 or later MIU.

- 4 If using a ProRead Encoder Register (Rev E or earlier):
 - Ensure the unit is programmed in three-wire mode.
 - Verify all electrical connections.
 - Reactivate the MIU using the magnet



If a problem still exists, contact your Neptune representative.

11 Checklist

Before leaving the installation site, be sure to:

- Record MIU ID for each register.
- Verify that you have followed all requirements of this Quick Install Guide.
- Verify that you have recorded all required information.
- Clean up any installation debris.
- Verify that the requirements of the site work order have been completed.

12 Contact Information

Within the United States, Neptune Support is available Monday through Friday, 8:00 AM to 7:00 PM Eastern Standard Time, by telephone or fax.

To contact Technical Support by phone, call 1-800-645-1892. If all support technicians are helping other customers, your call is routed to the Neptune Support voice mail system. Please leave your name, the name of your company, your company's Personal Identification Number (PIN), and your telephone number. Your call is returned within business hours in the order it was received.

To contact technical support by fax, send a description of your problem to 1-334-283-7497. Please include on the fax cover sheet the best time of day for a support technician to contact you. To contact technical support by E-mail, send your letter to the following address: hhsupp@neptunetg.com.



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