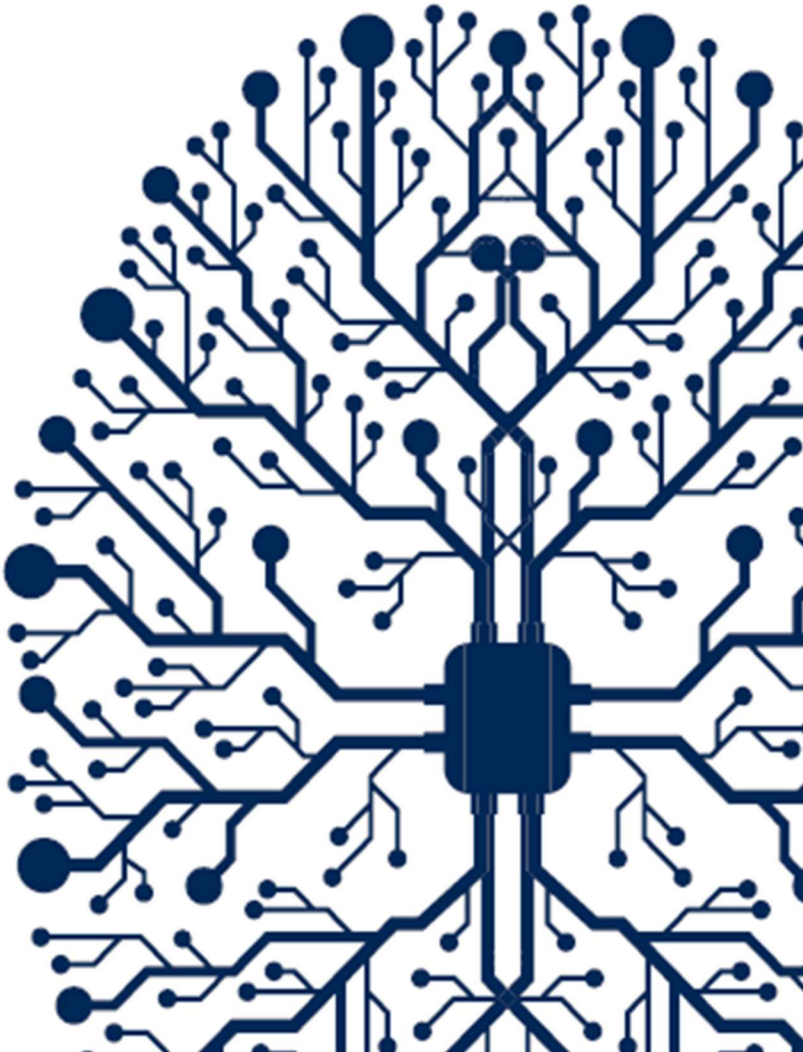
4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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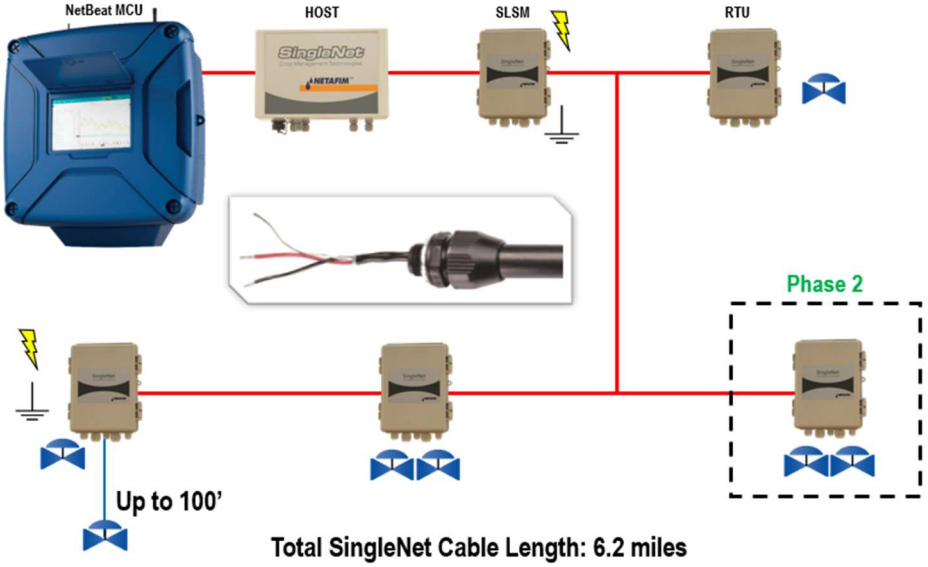
1. INTRODUCTION

1.1 Purpose

The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

1.2 Requirements

You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

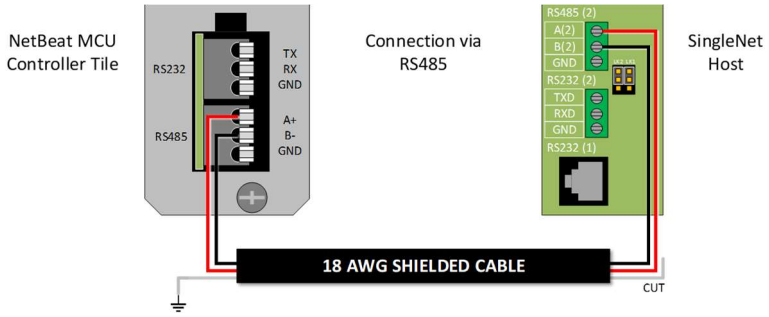
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

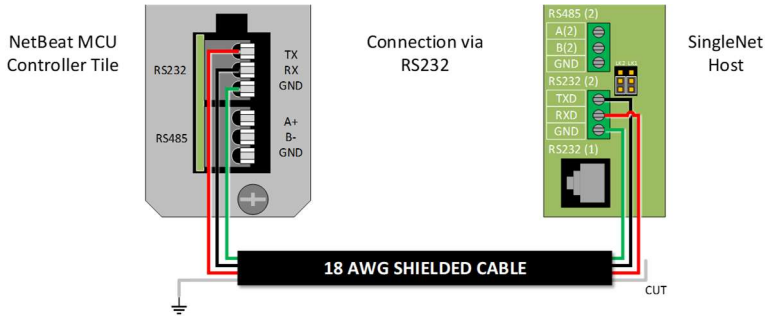
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



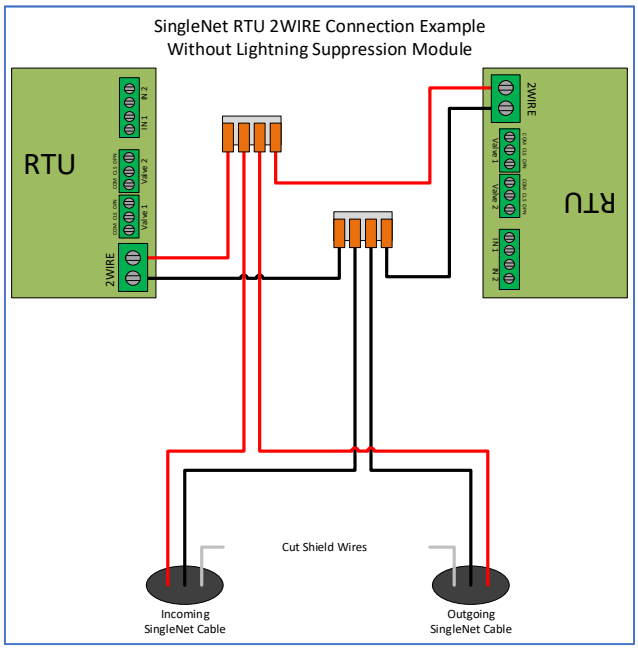
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

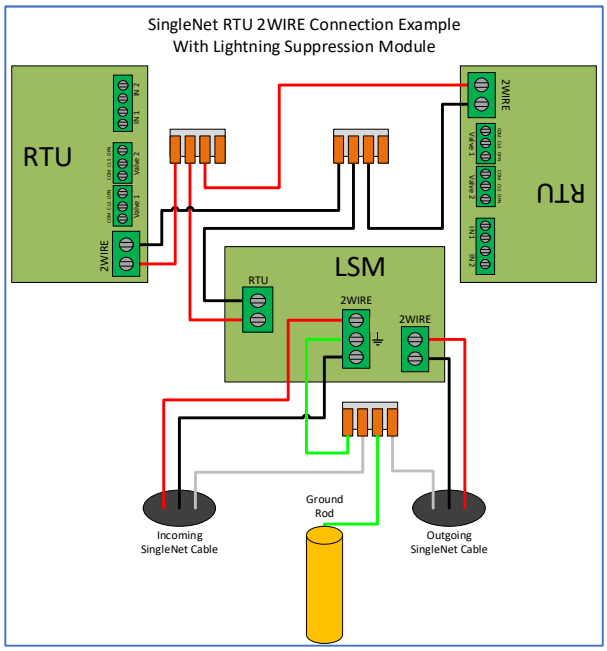


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

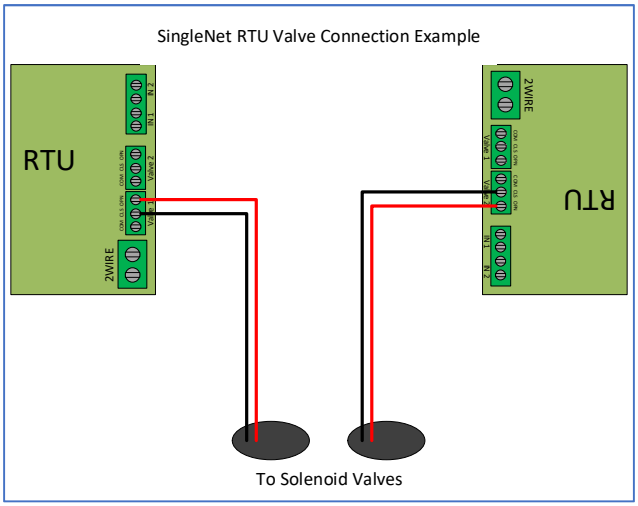
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





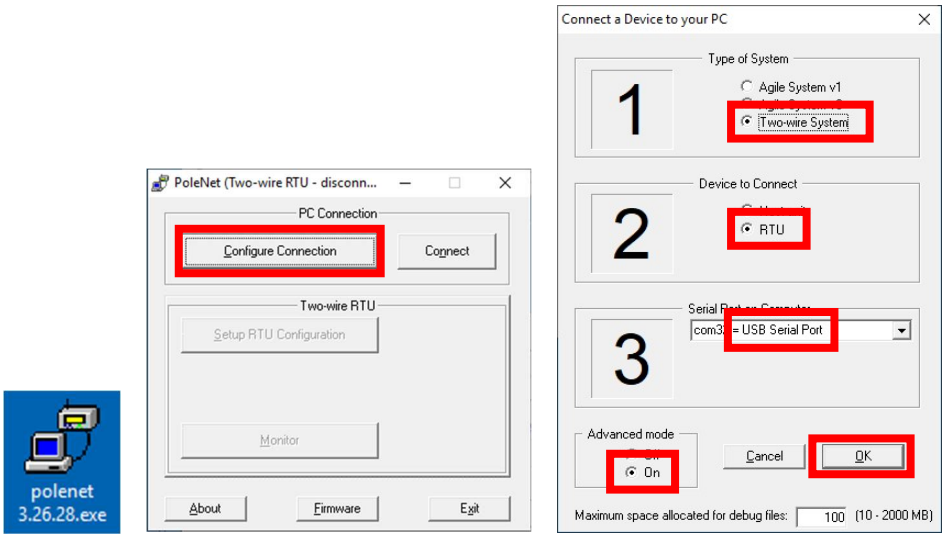
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



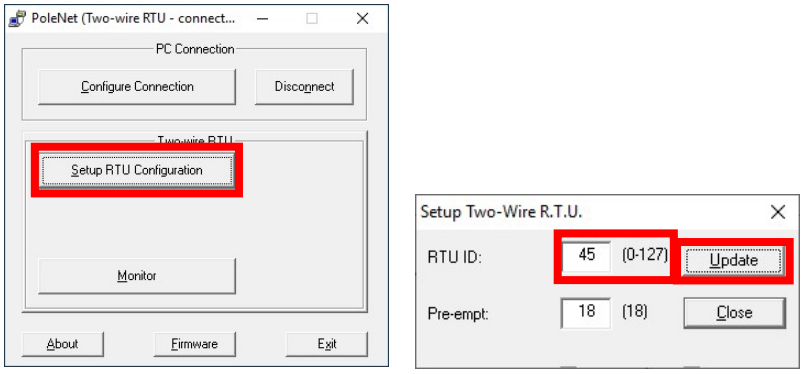
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

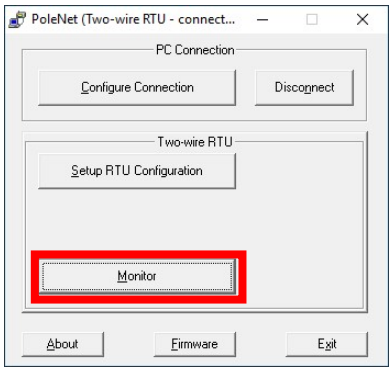


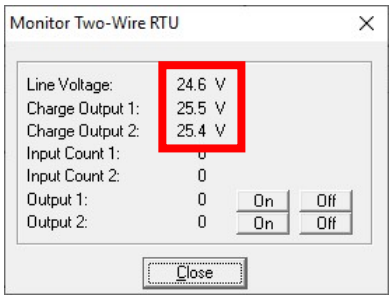
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

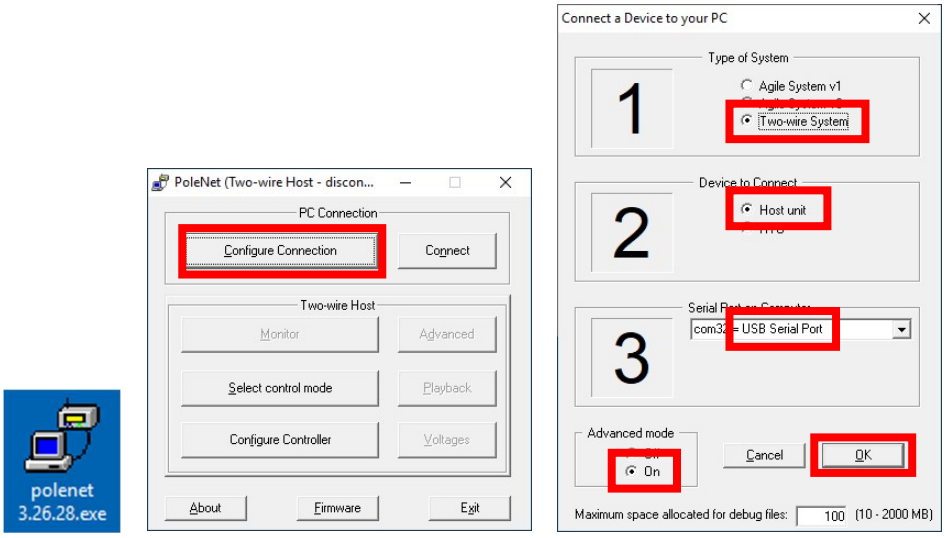
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

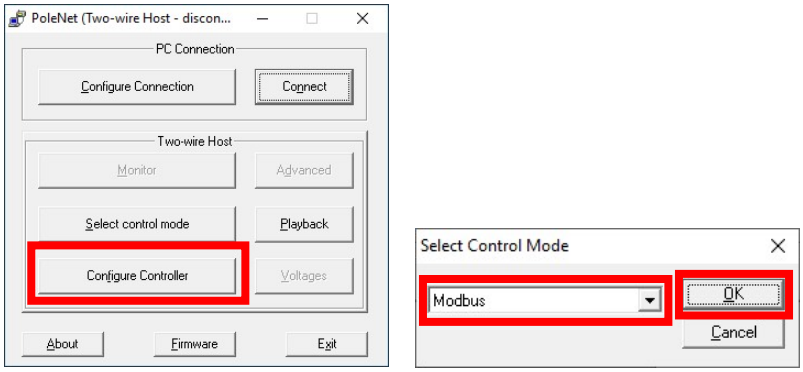
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

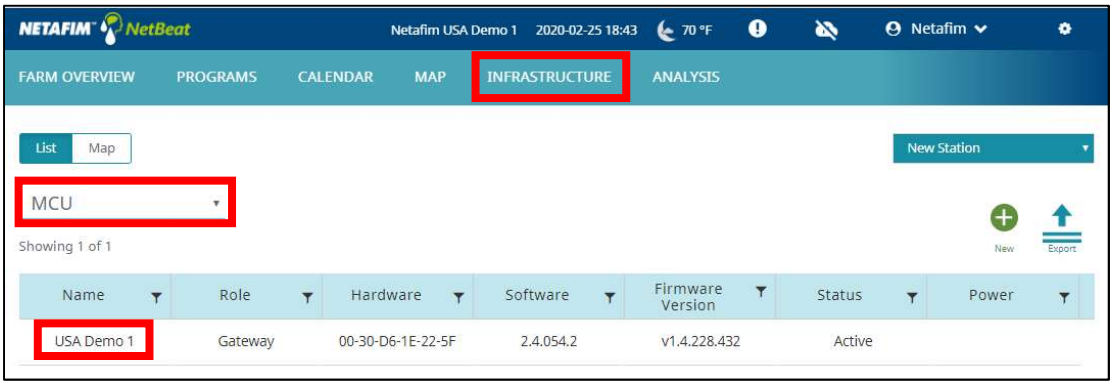
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

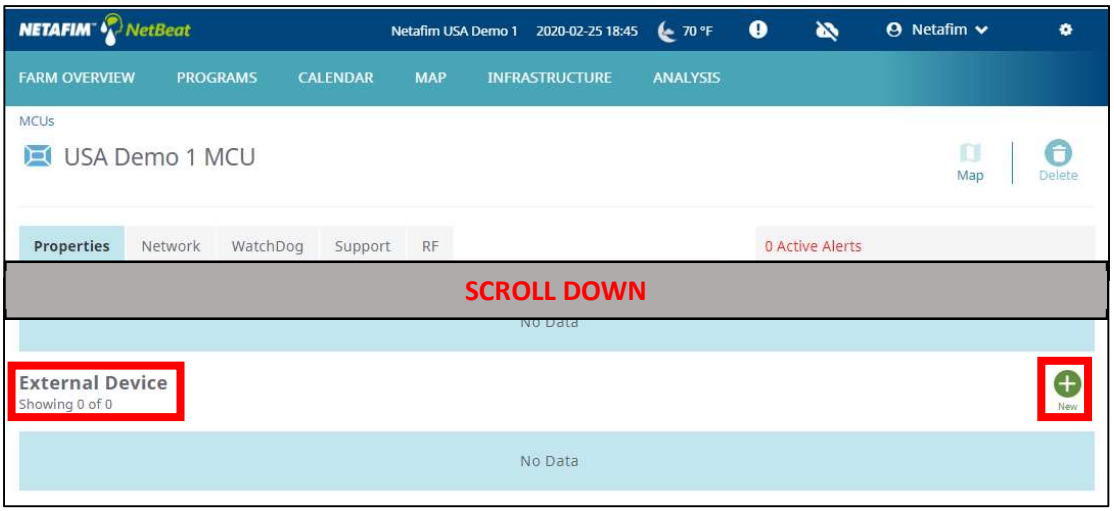
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

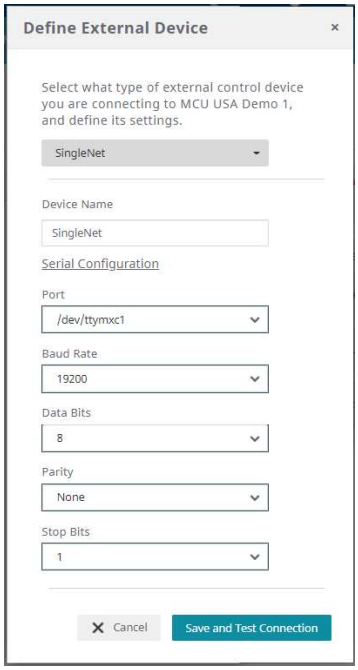


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

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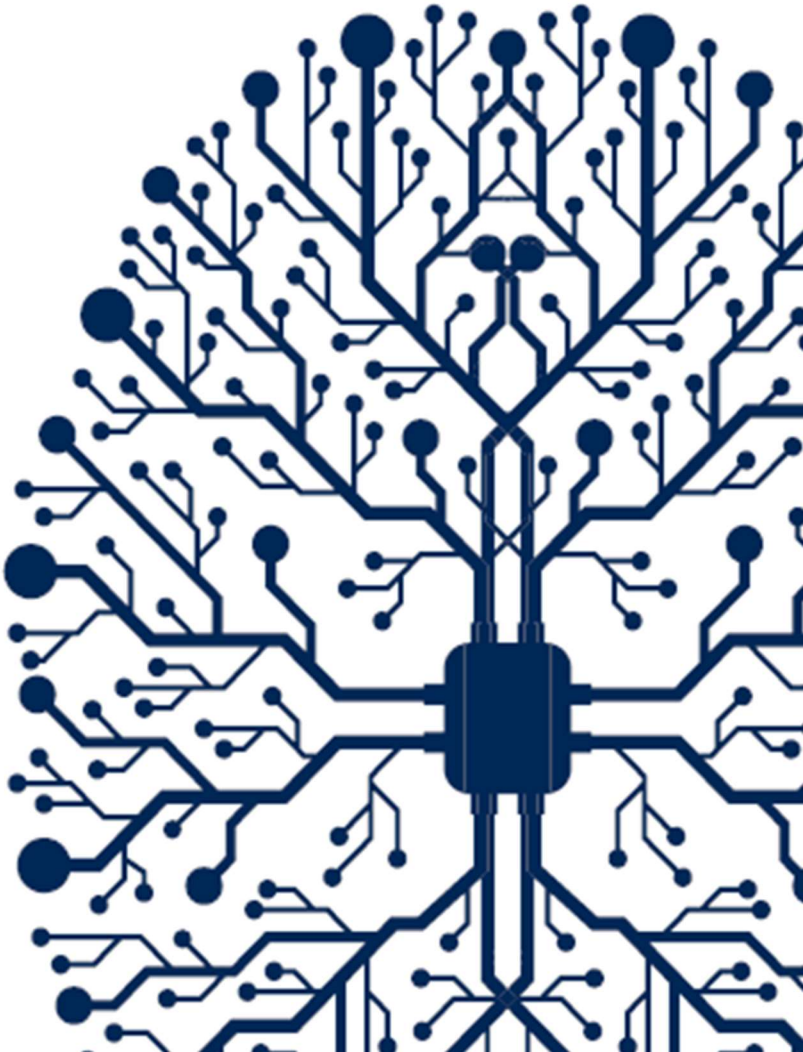

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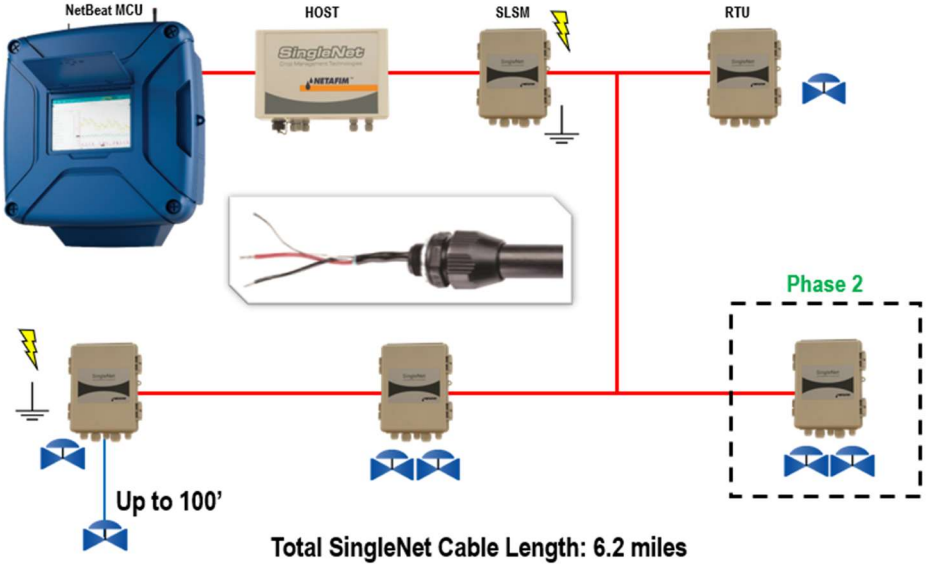

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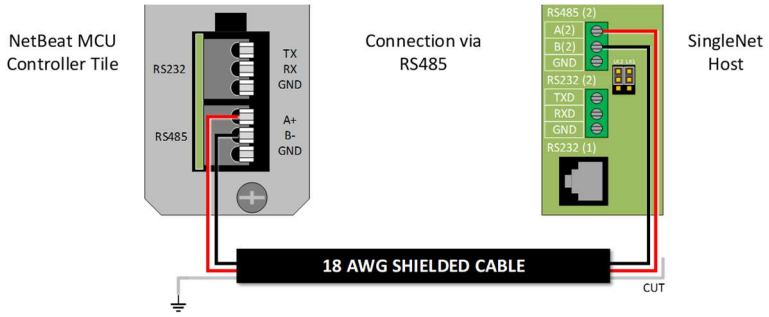
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
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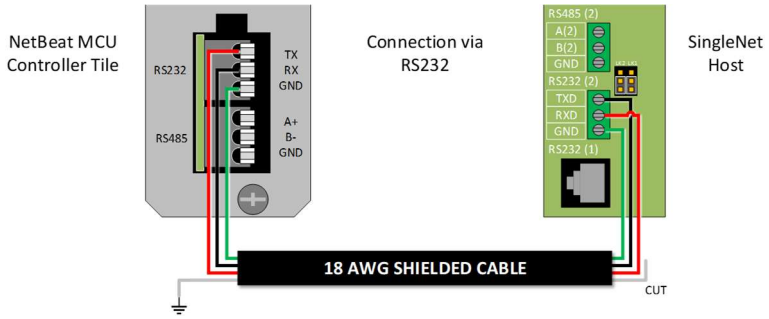
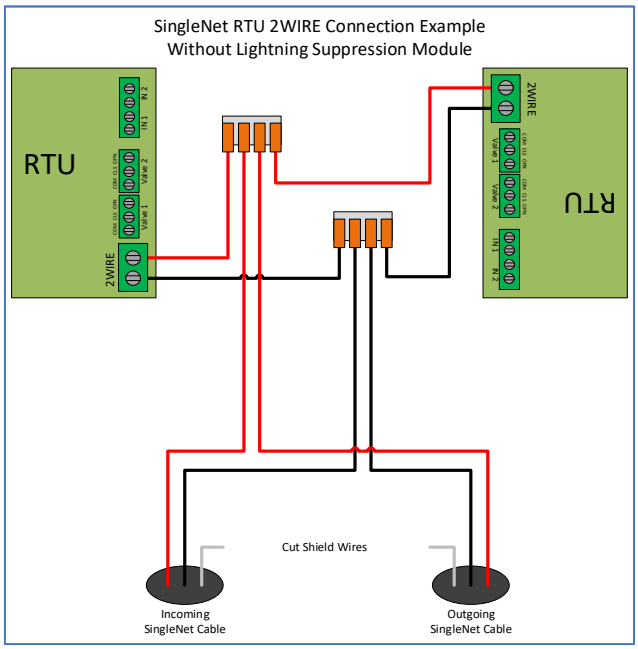
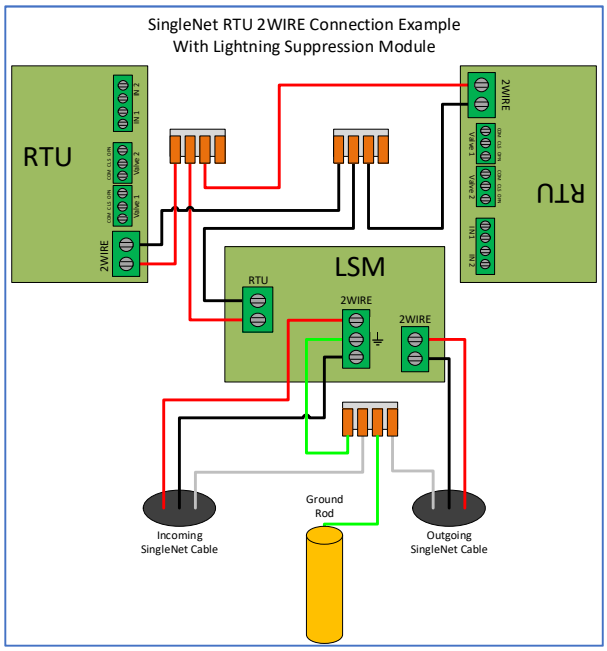


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

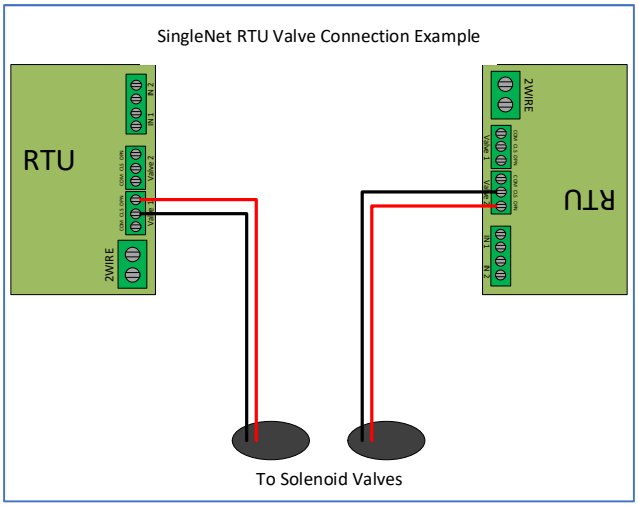
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





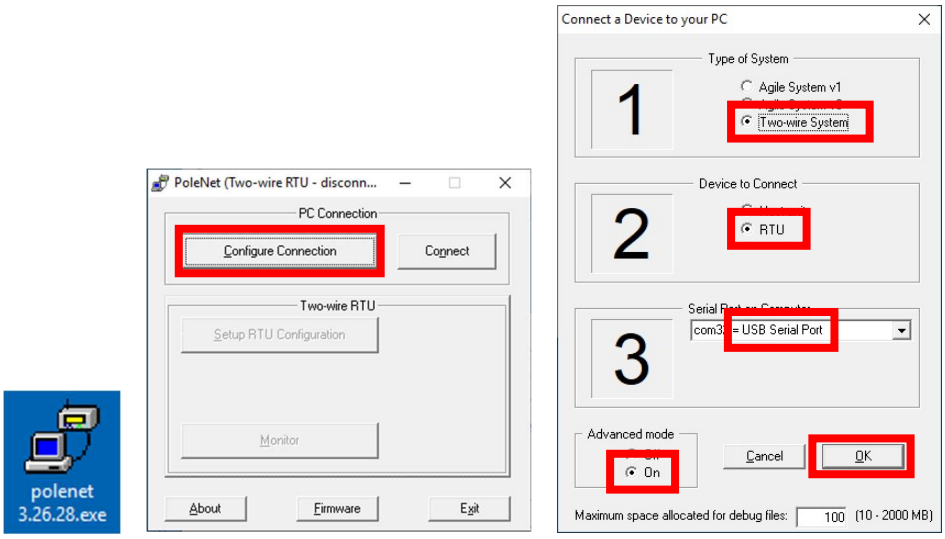
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



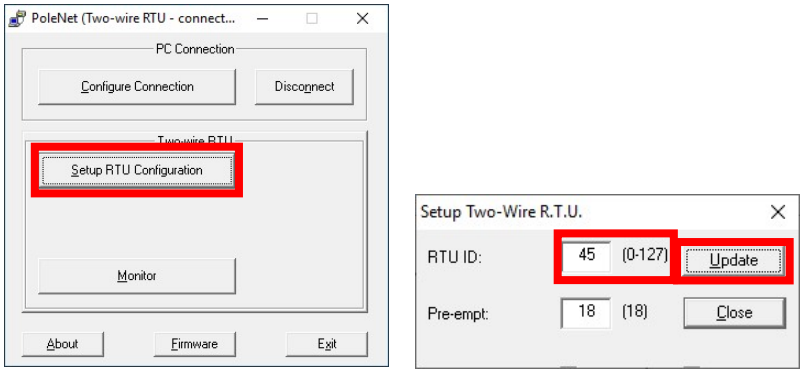
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

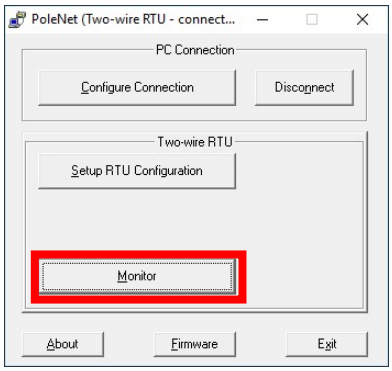


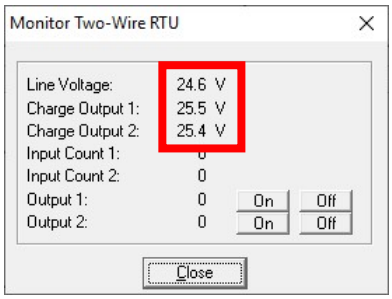
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

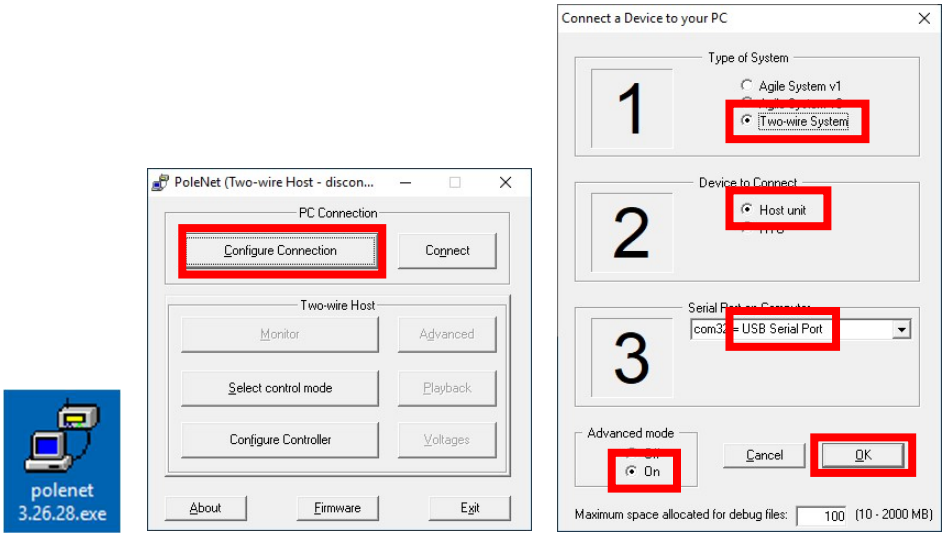
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

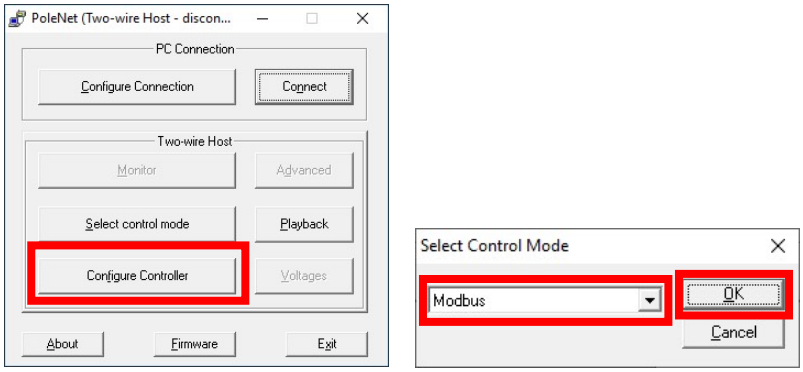
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

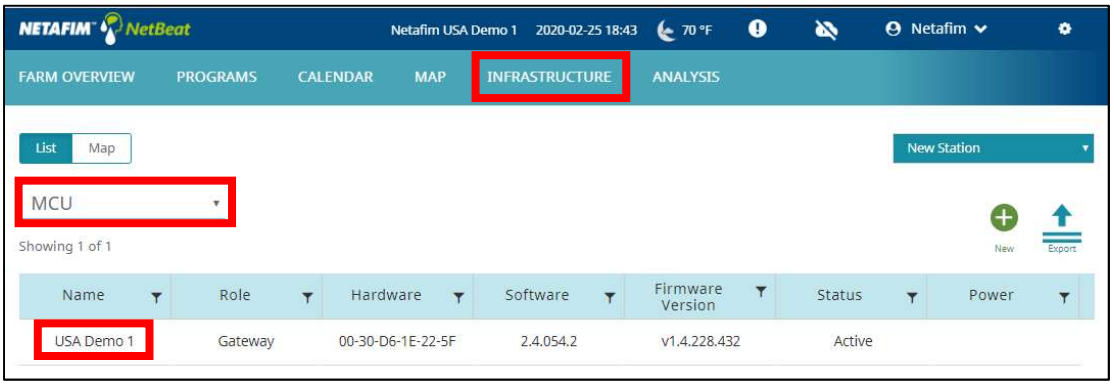
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

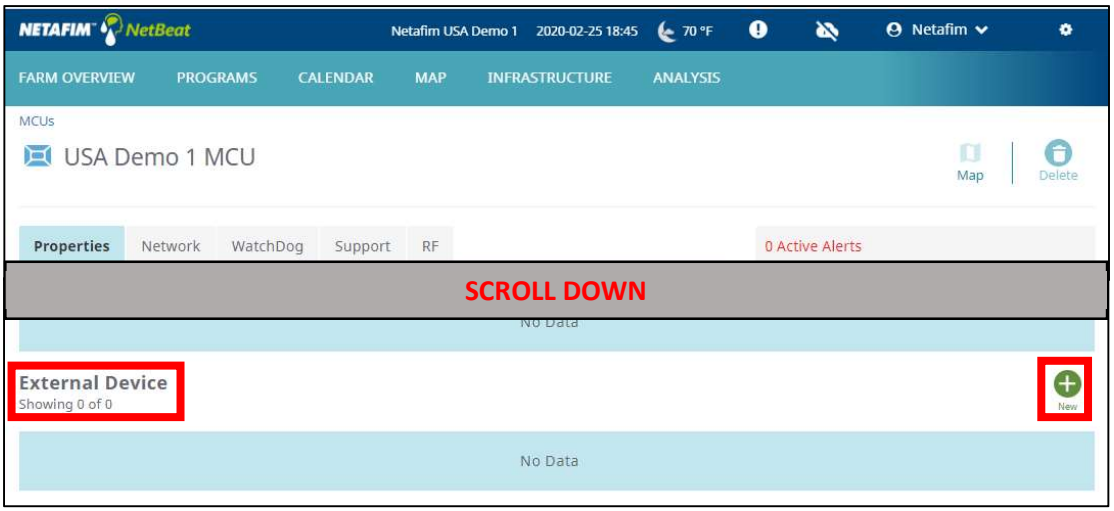
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

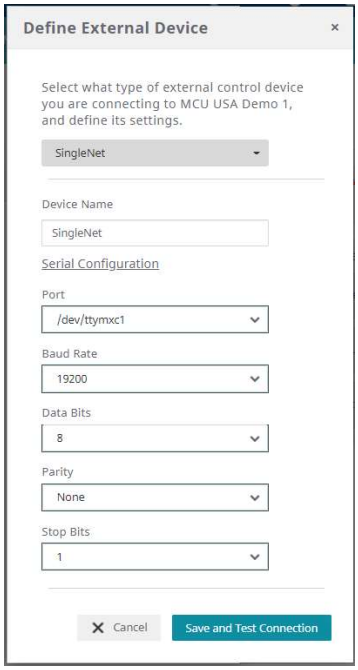


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

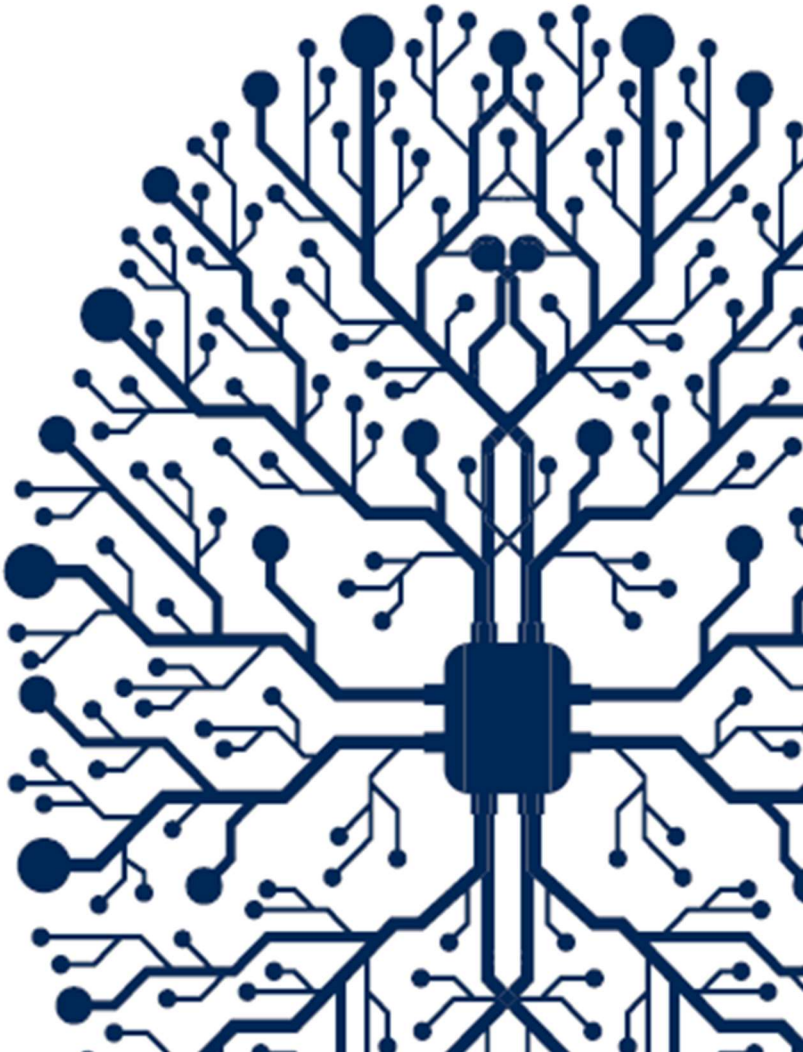
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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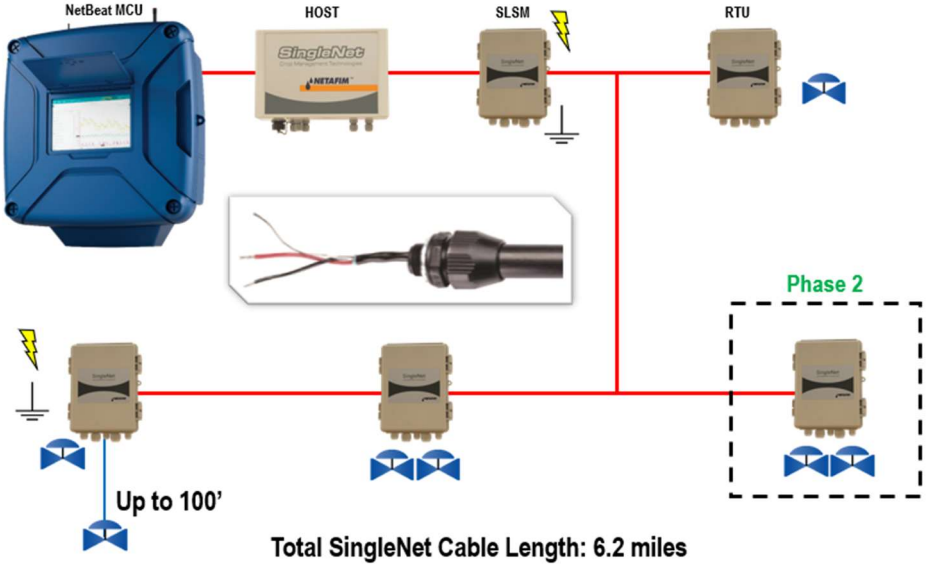
1. INTRODUCTION

1.1 Purpose

The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

1.2 Requirements

You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

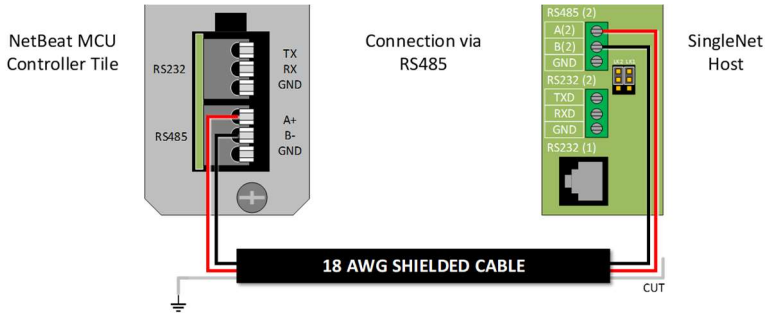
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

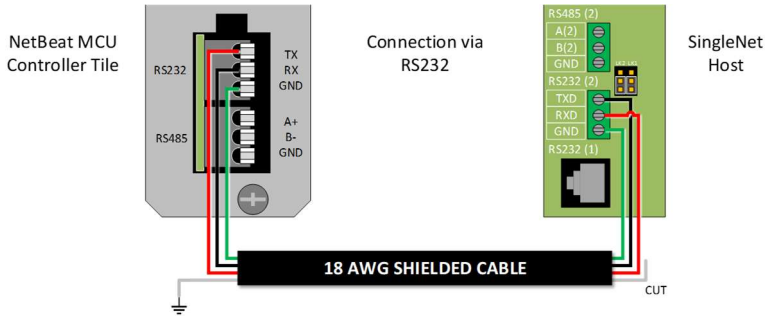
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



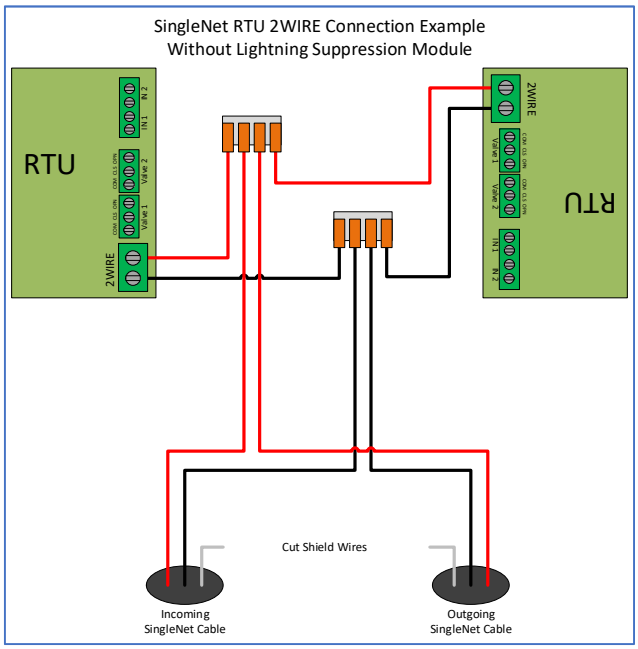
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

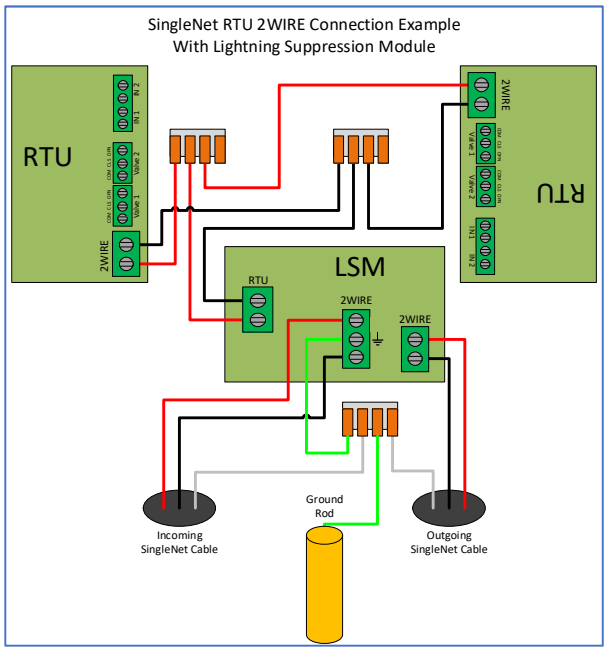


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

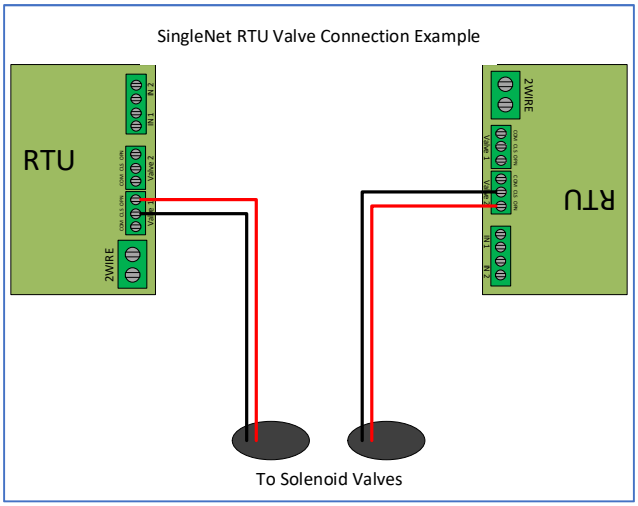
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





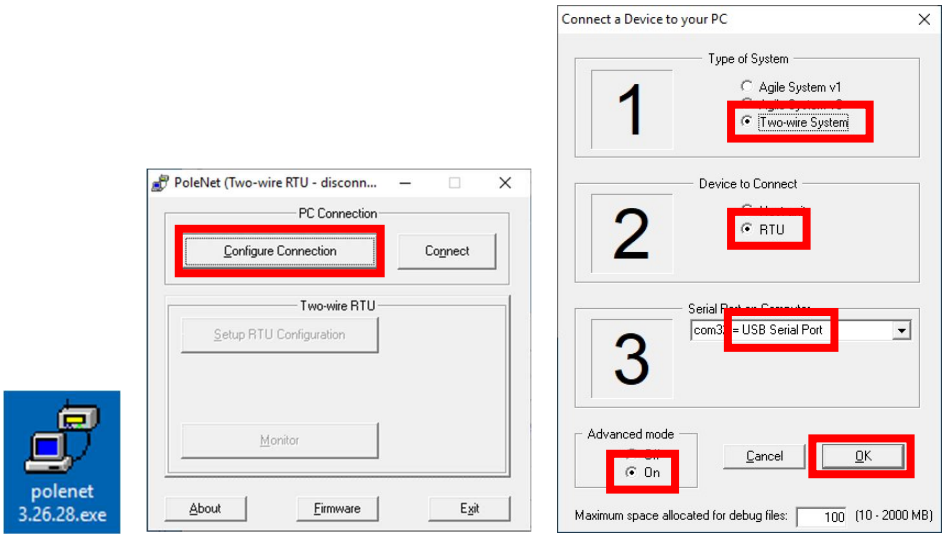
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



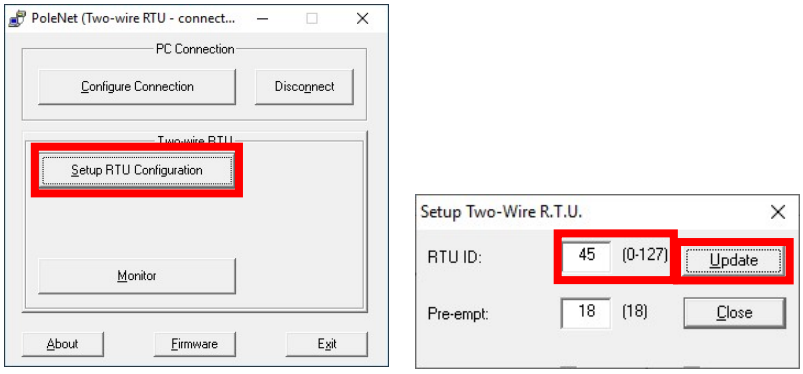
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

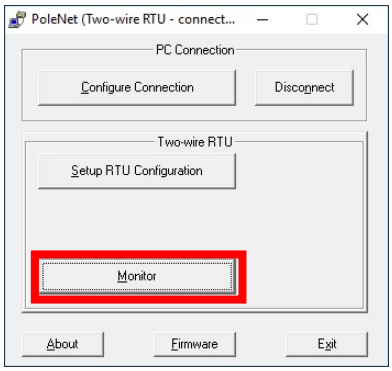


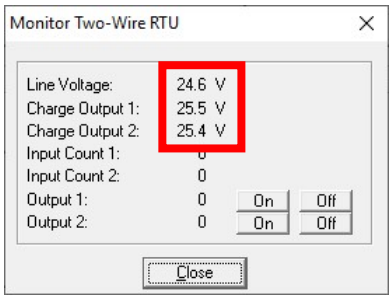
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

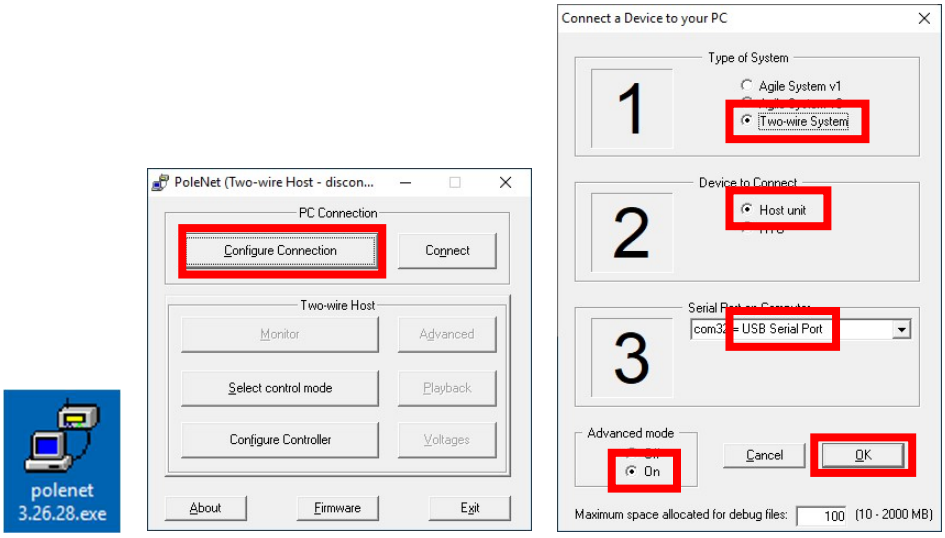
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

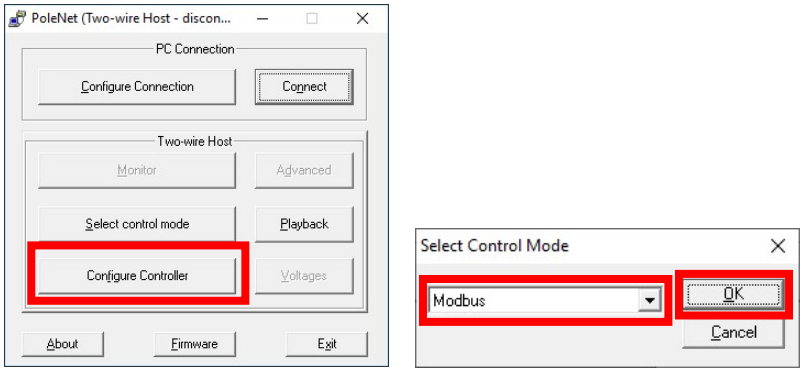
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

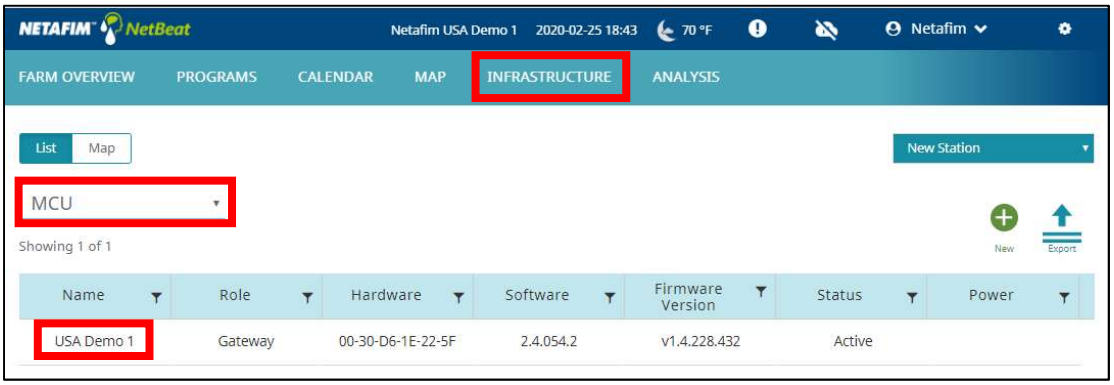
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

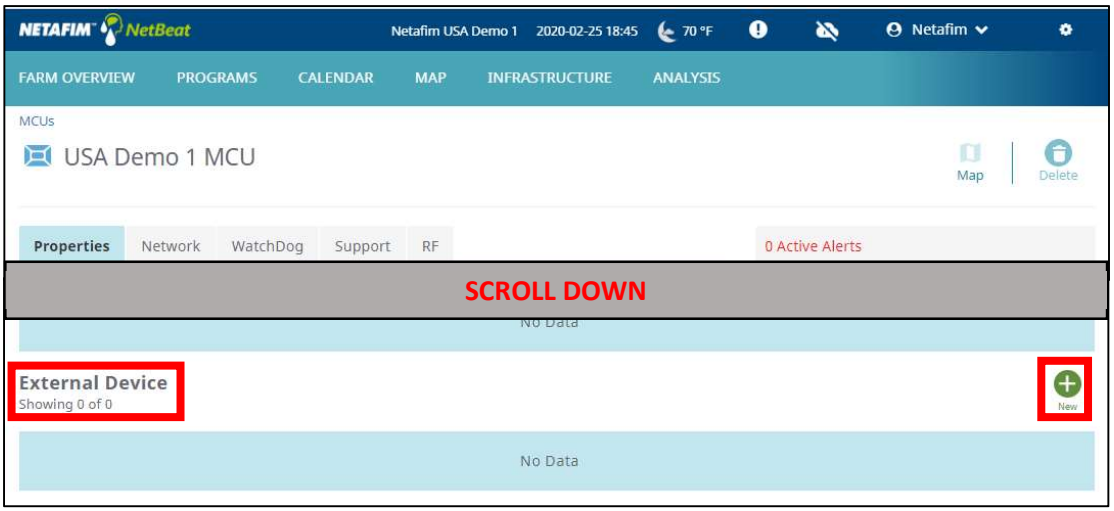
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

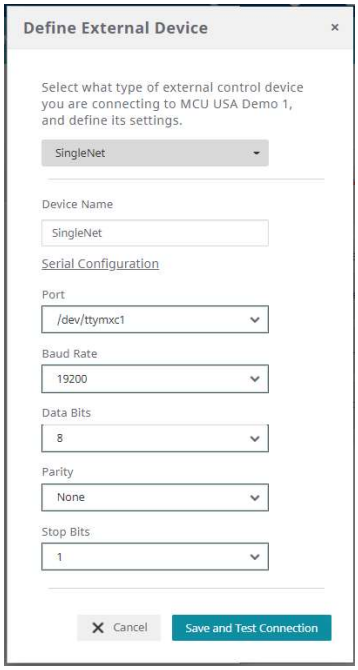


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

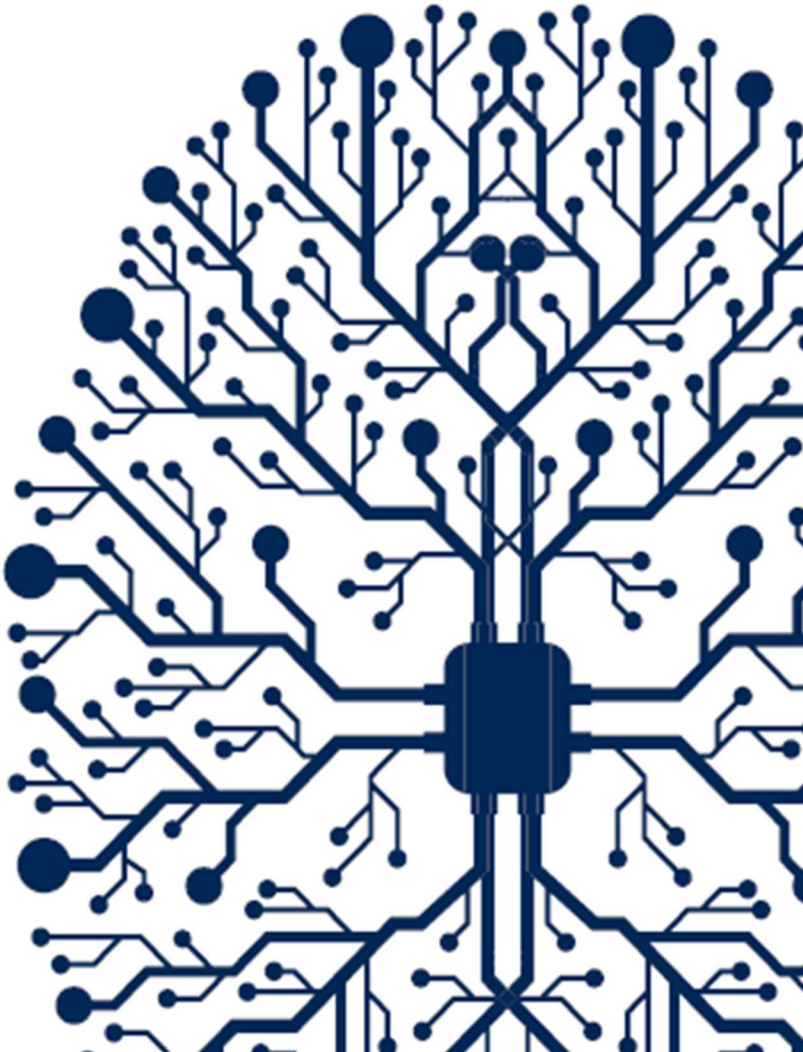
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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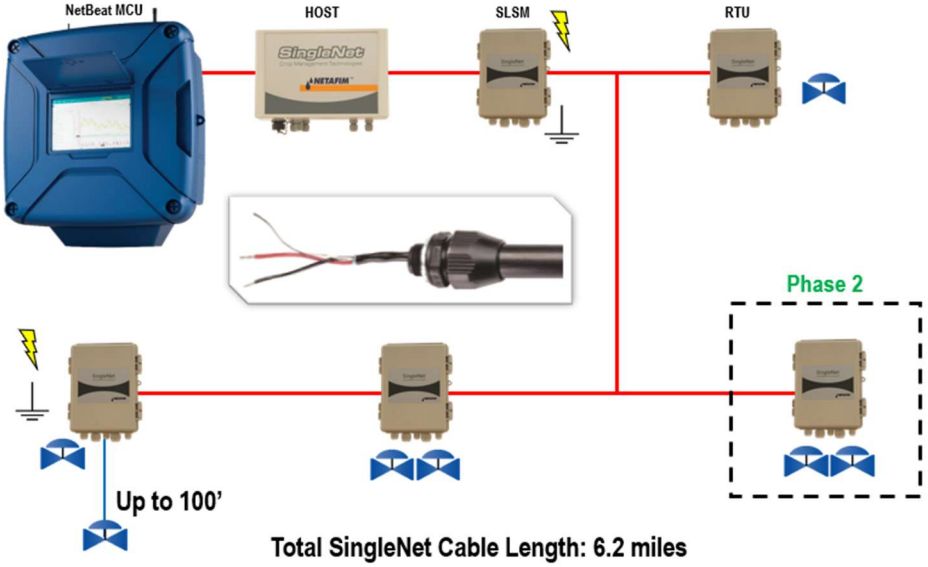
The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

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You will need…

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4. One-time internet access for Windows to download the PoleNet programming cable drivers.

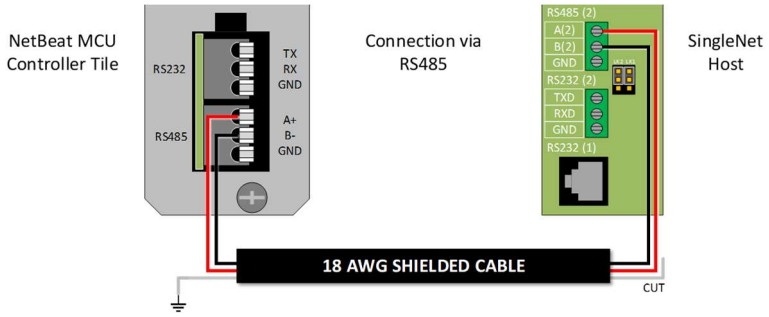
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

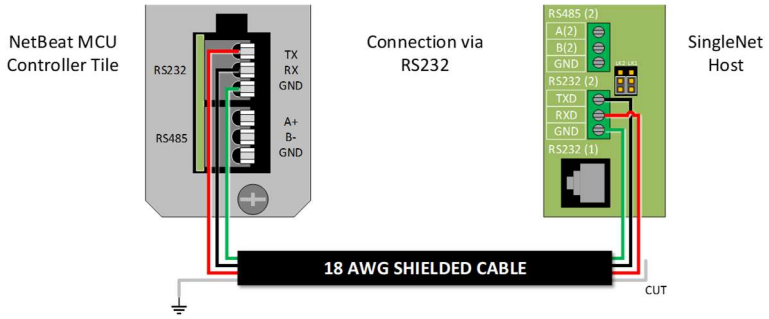
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



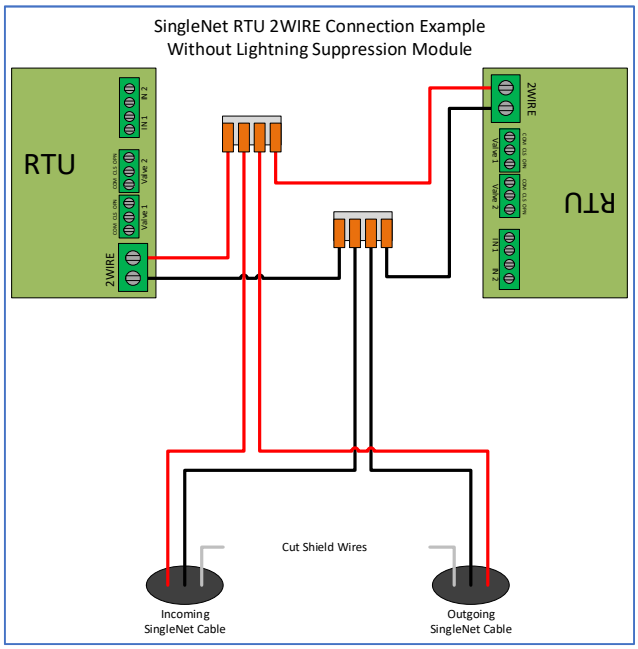
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

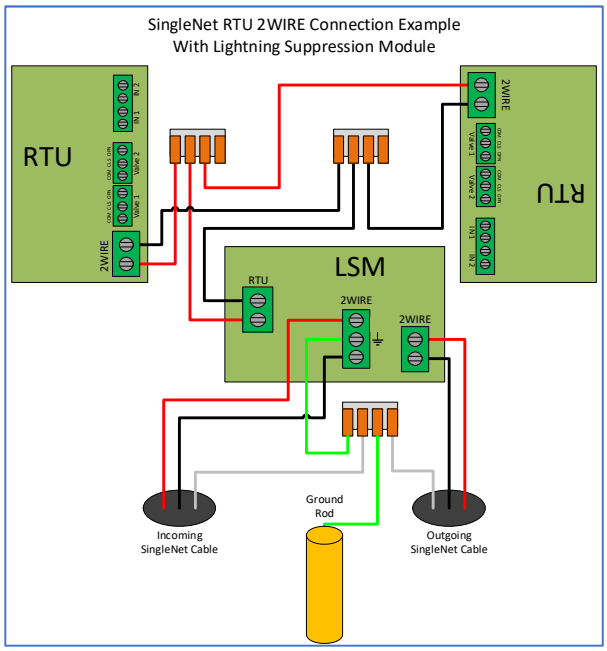


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

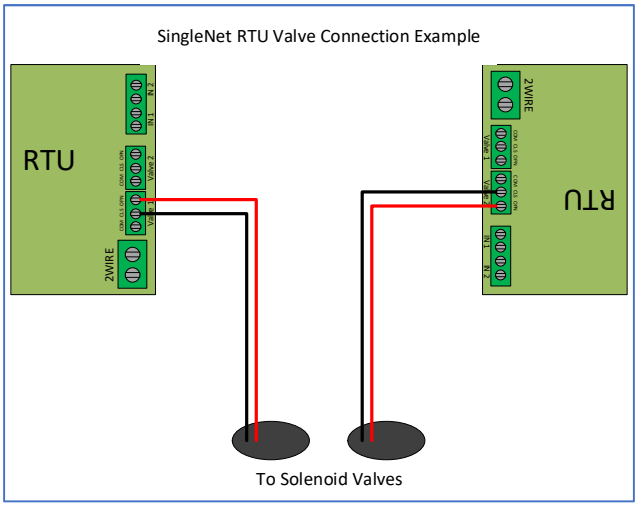
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





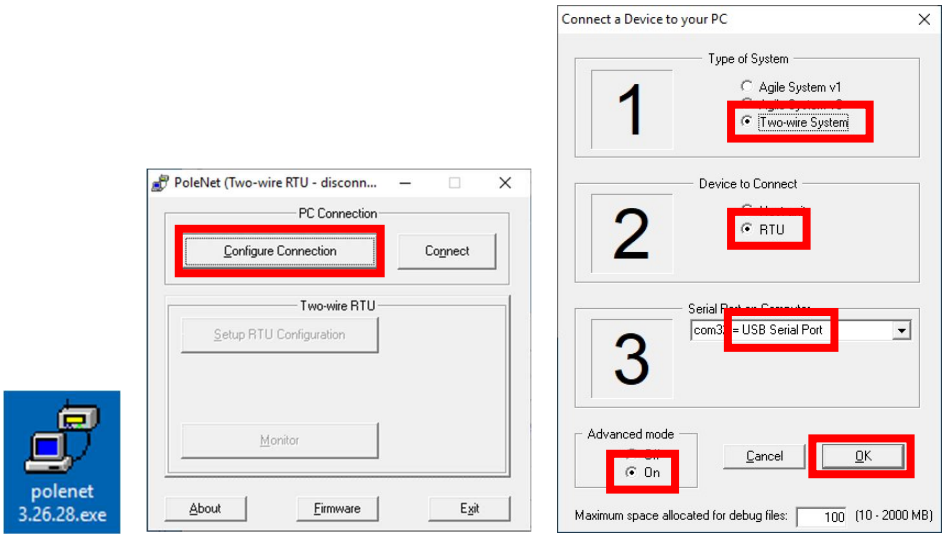
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



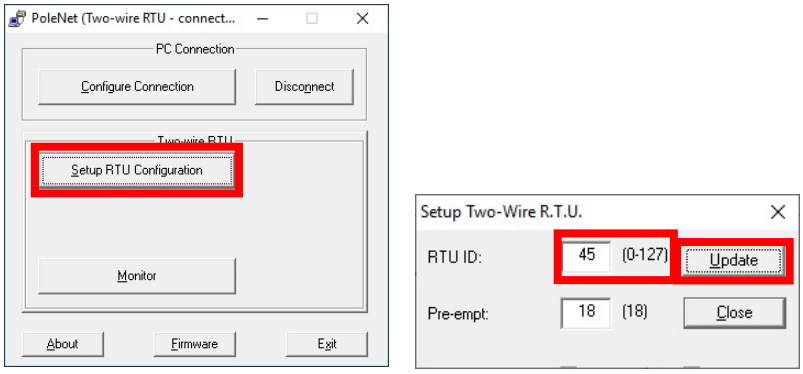
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

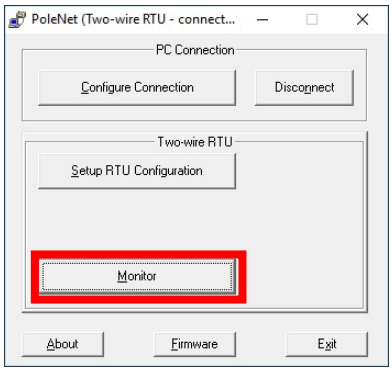


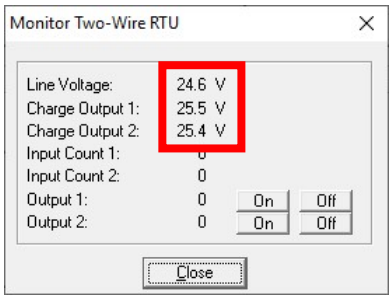
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

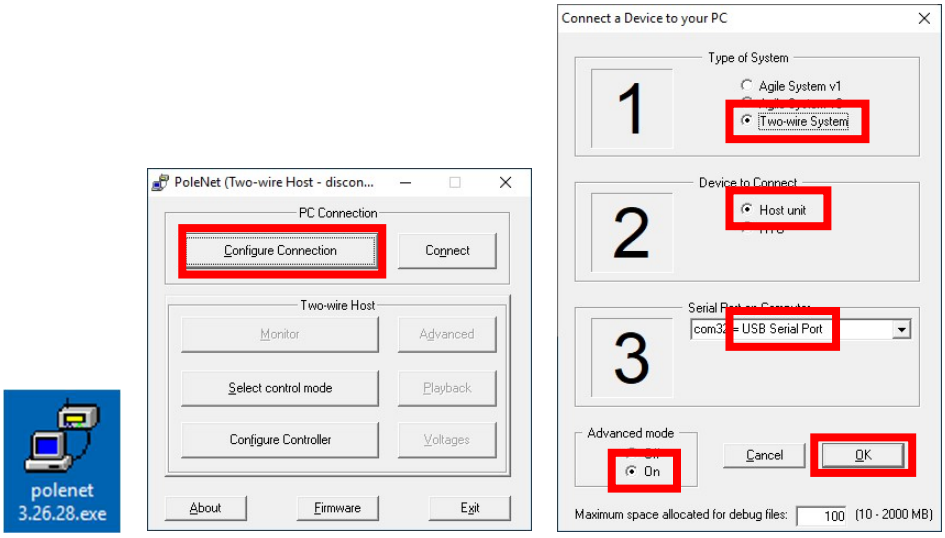
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

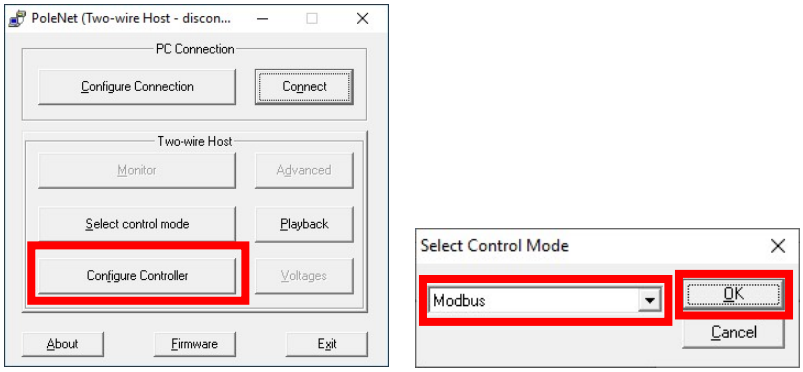
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

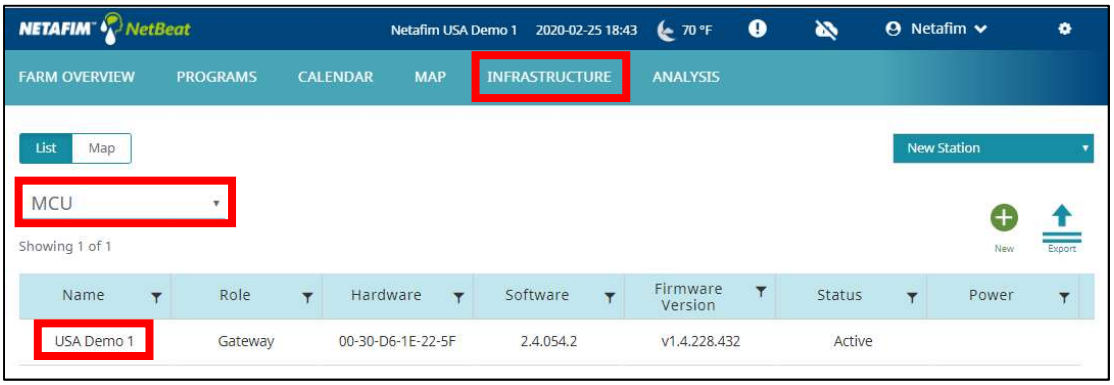
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

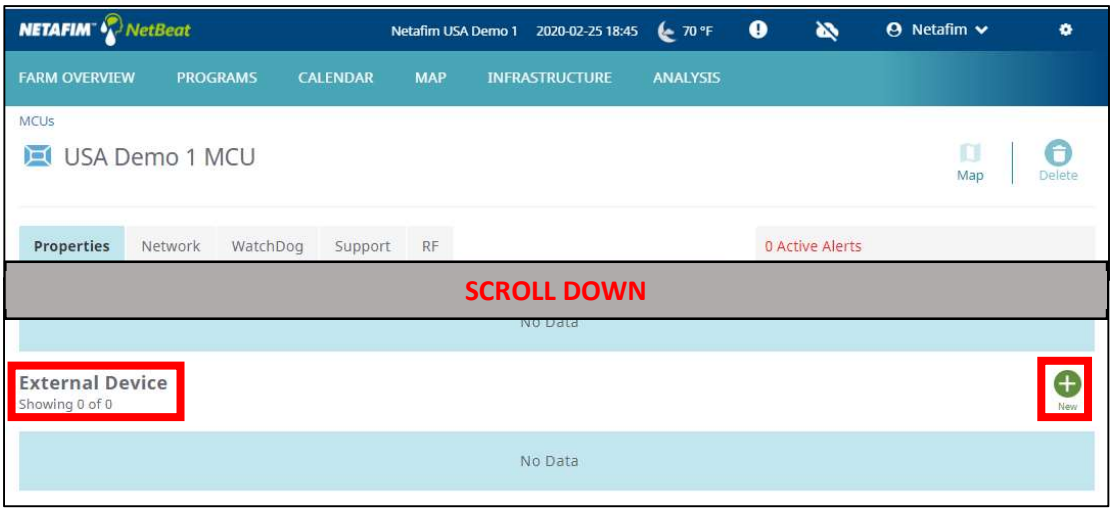
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

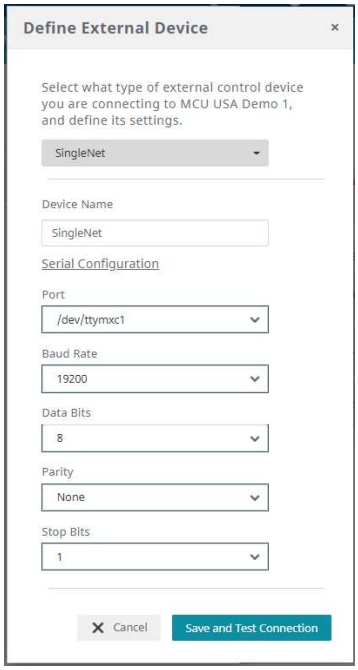


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

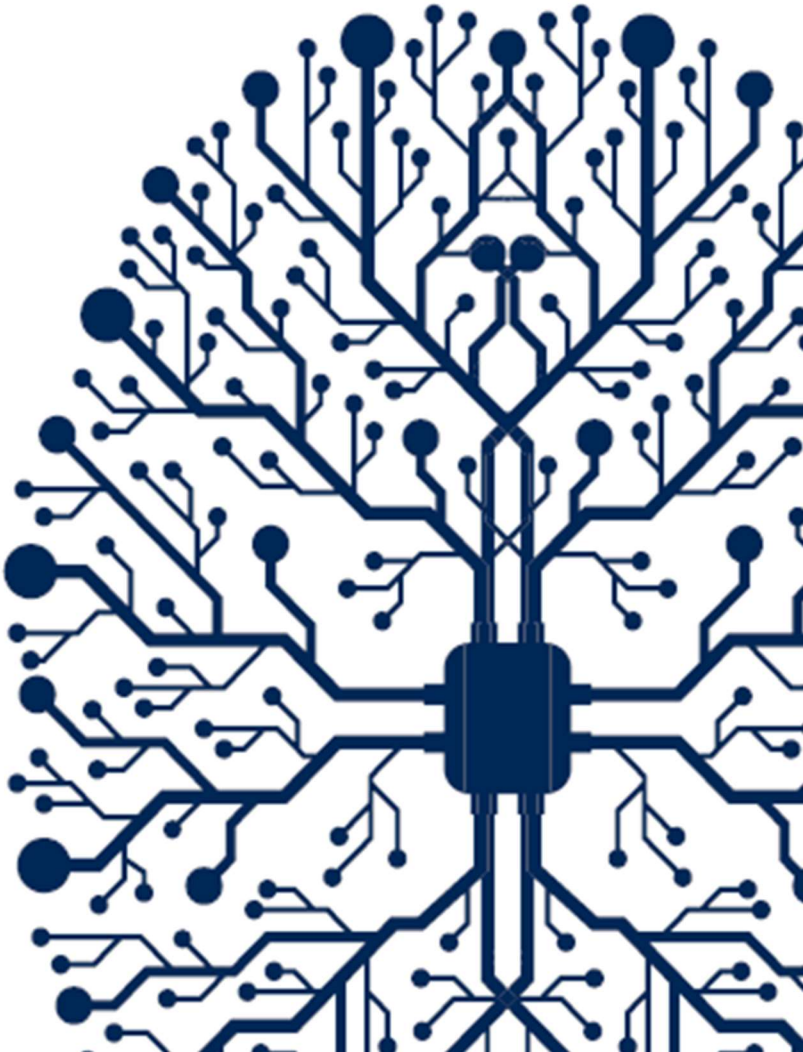
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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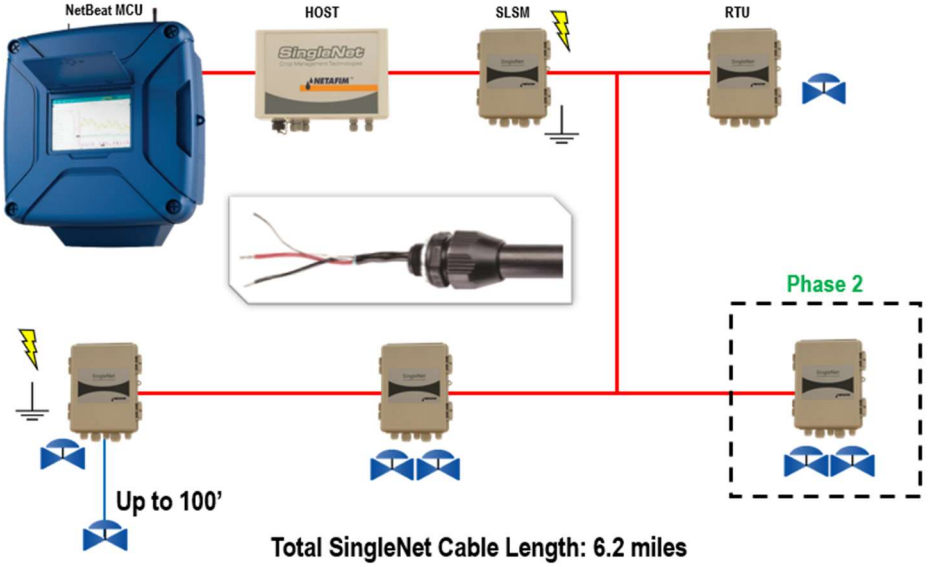
1. INTRODUCTION

1.1 Purpose

The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

1.2 Requirements

You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

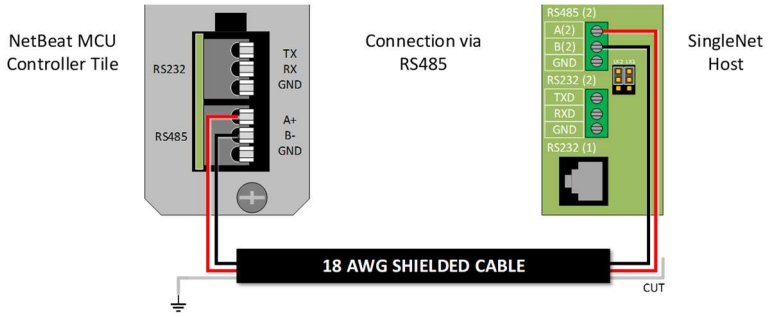
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

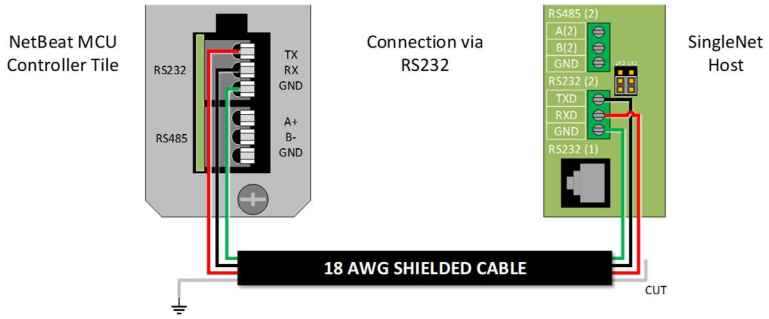
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



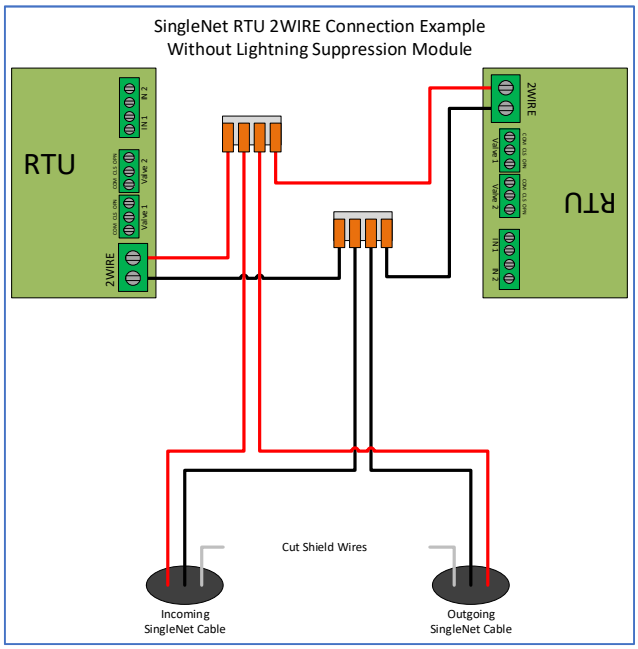
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

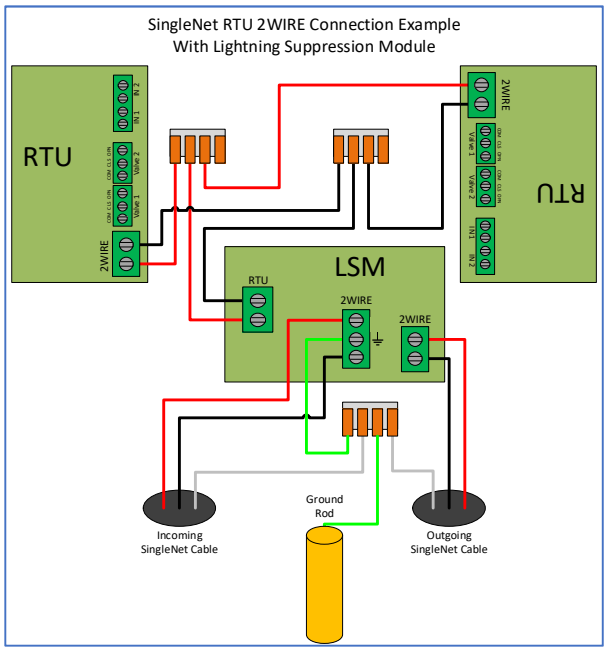


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

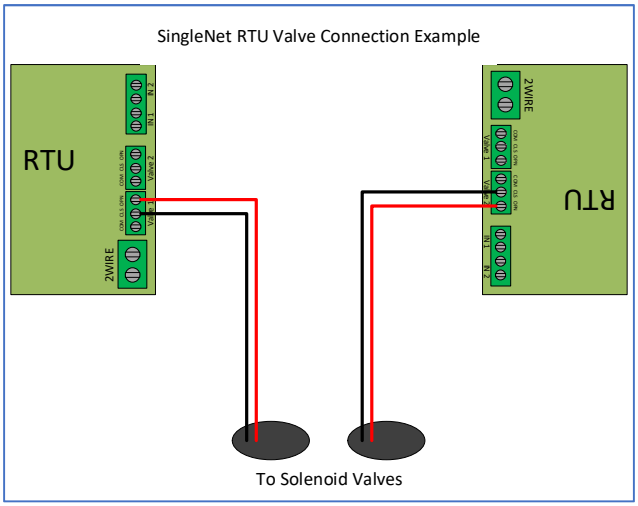
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





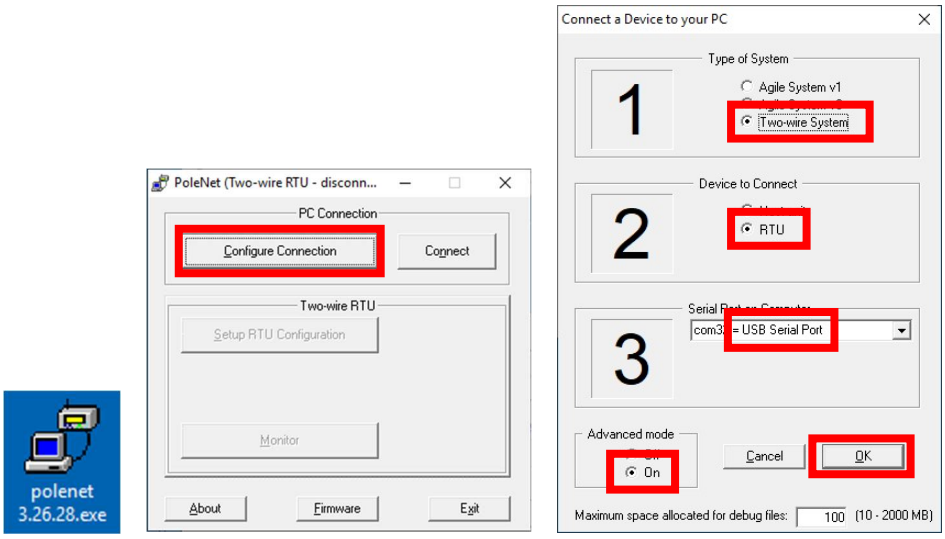
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



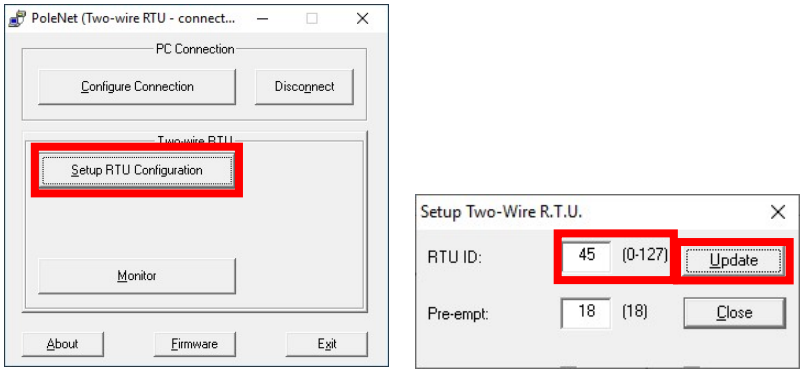
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

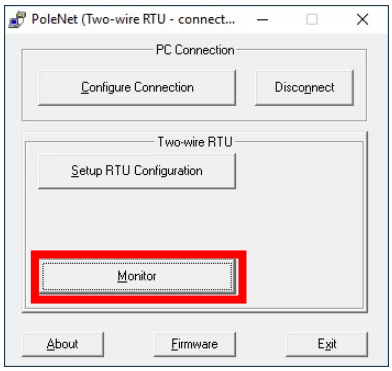


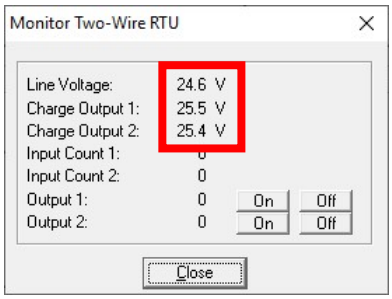
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

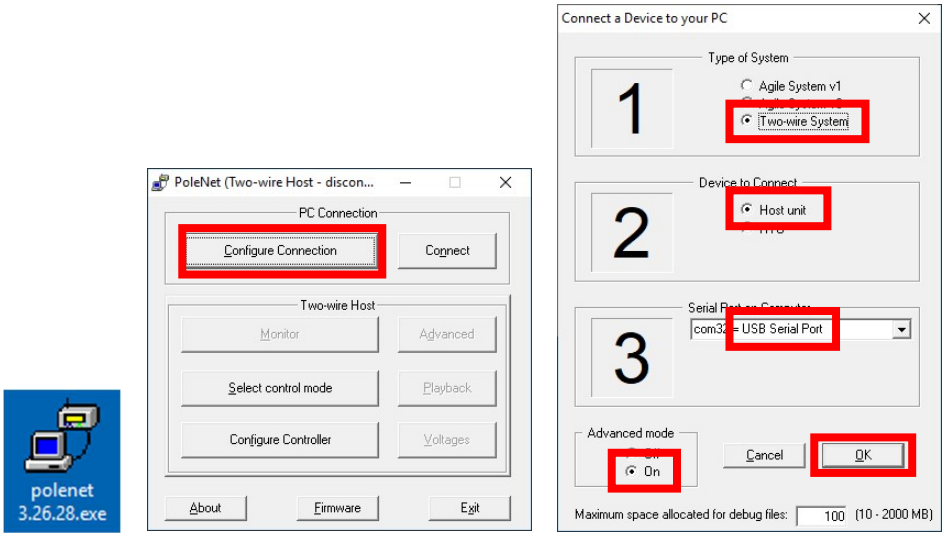
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

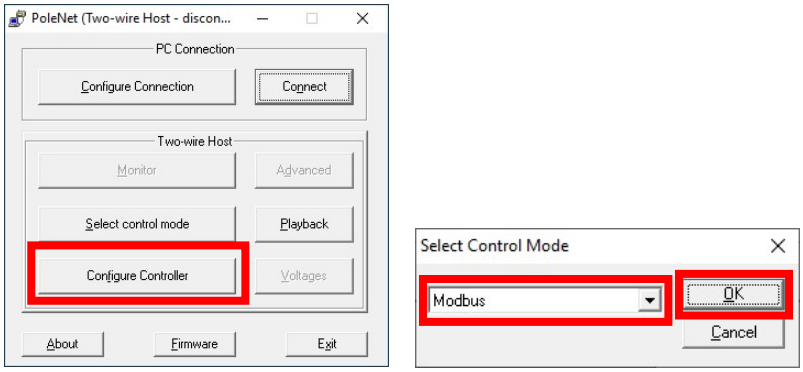
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

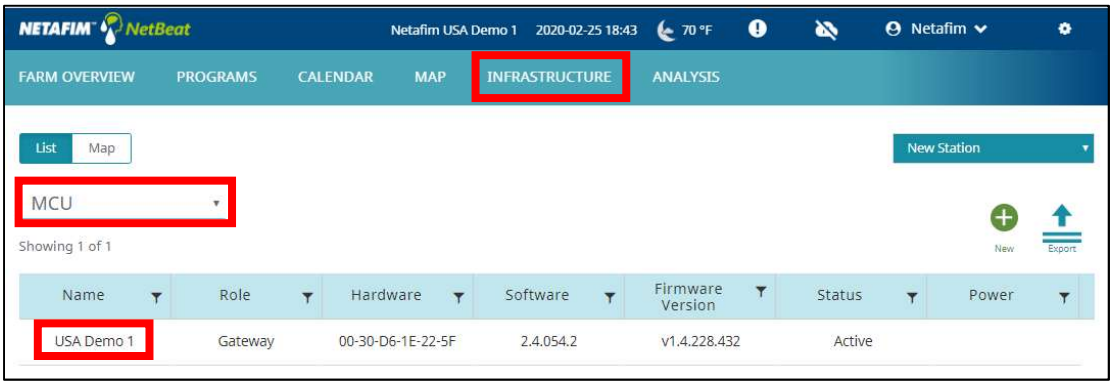
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

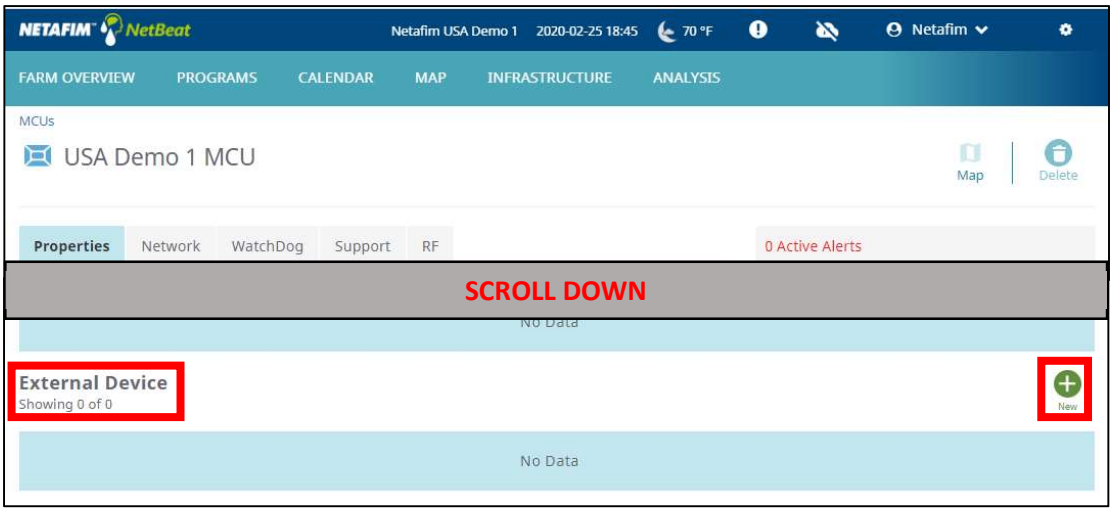
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

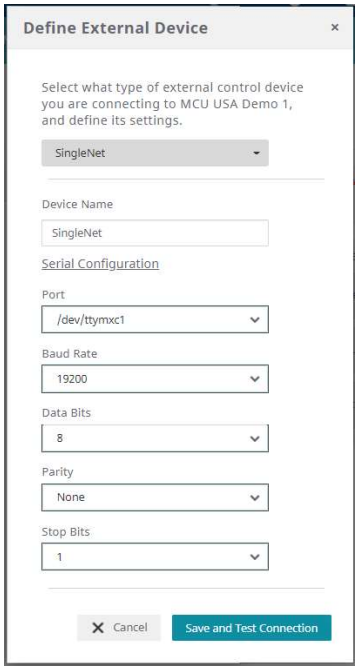


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

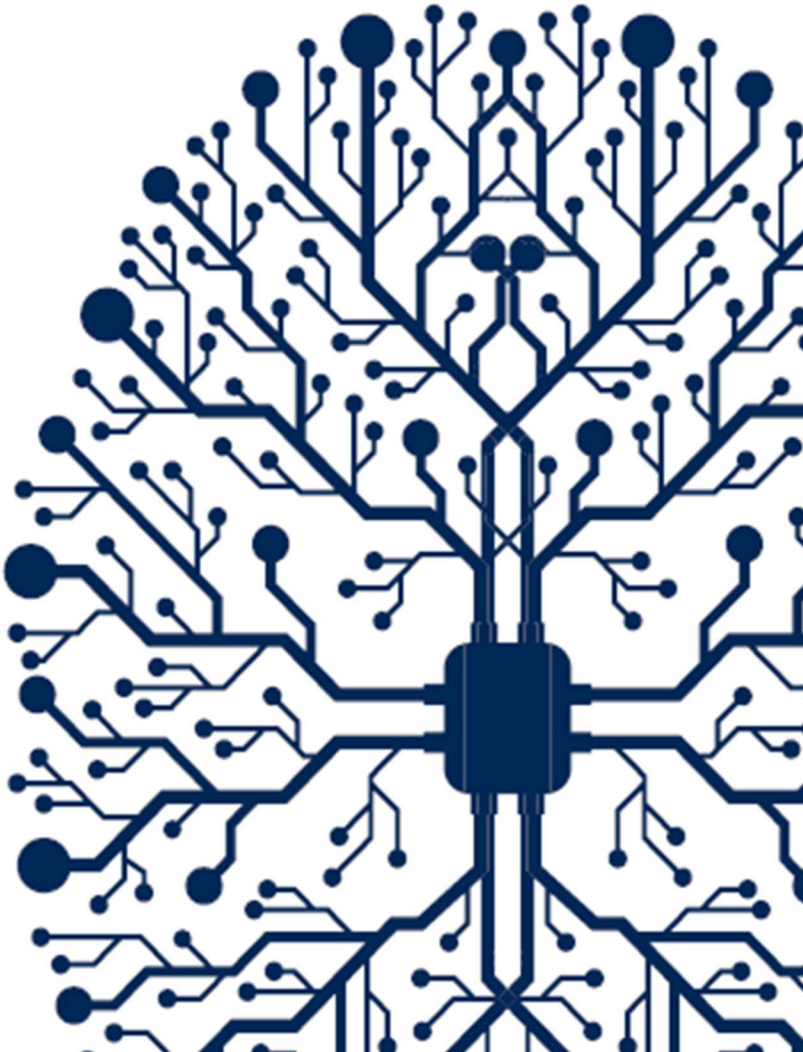
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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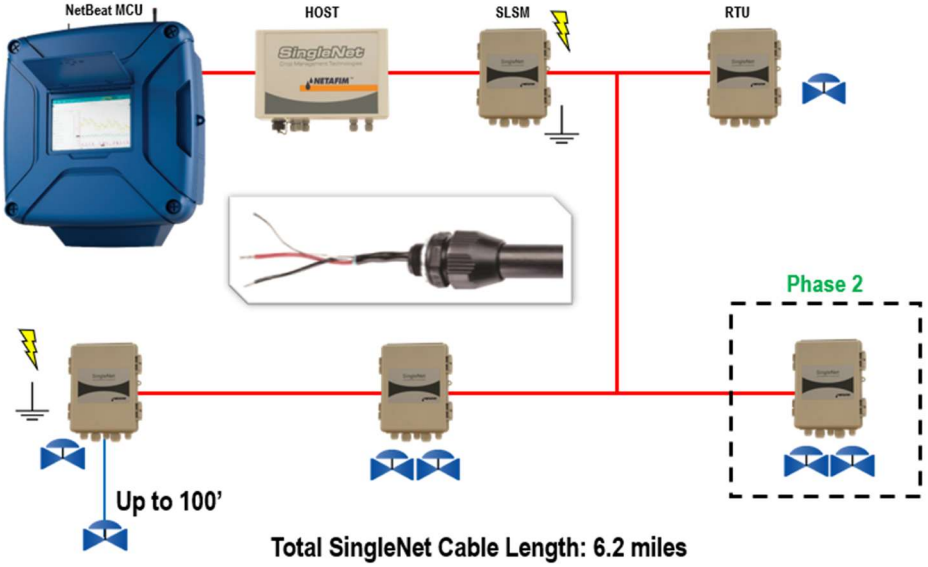

The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

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You will need…

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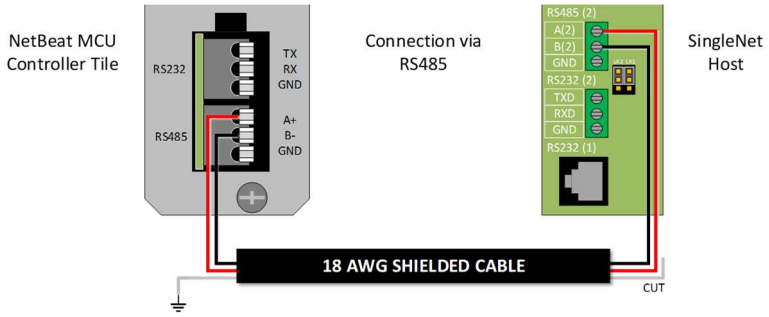
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

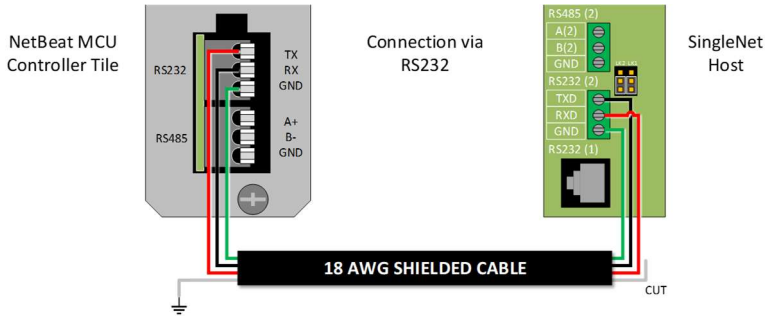
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



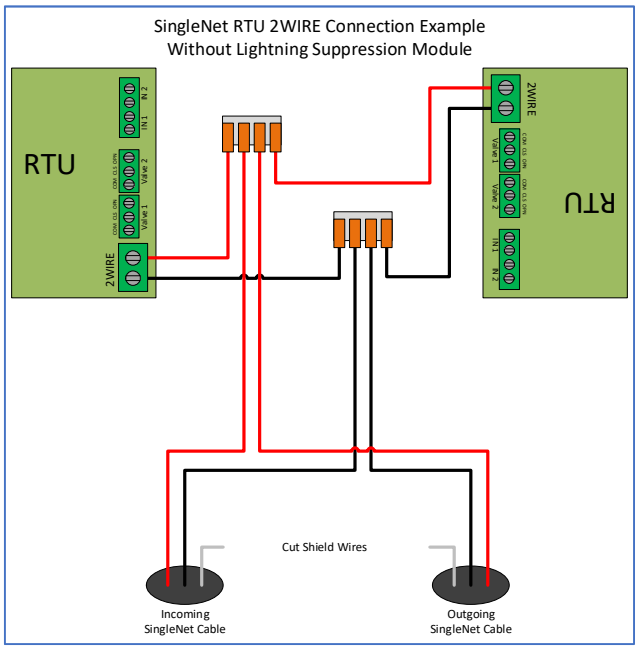
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

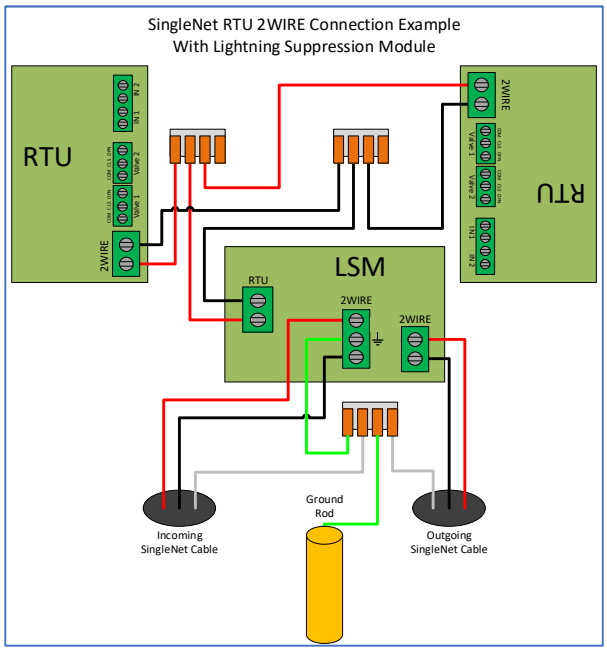


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

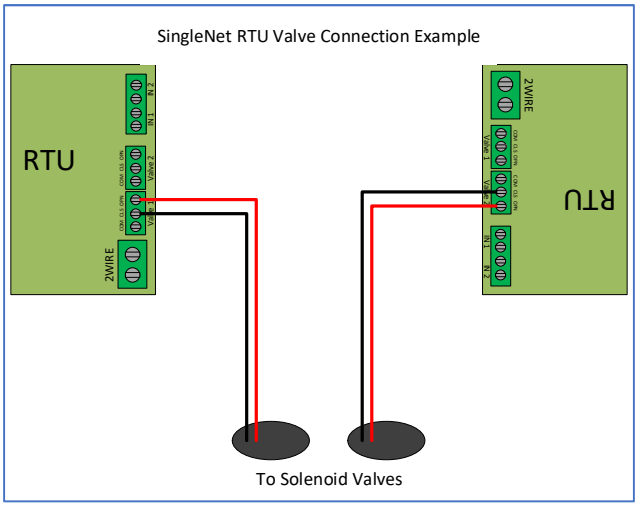
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





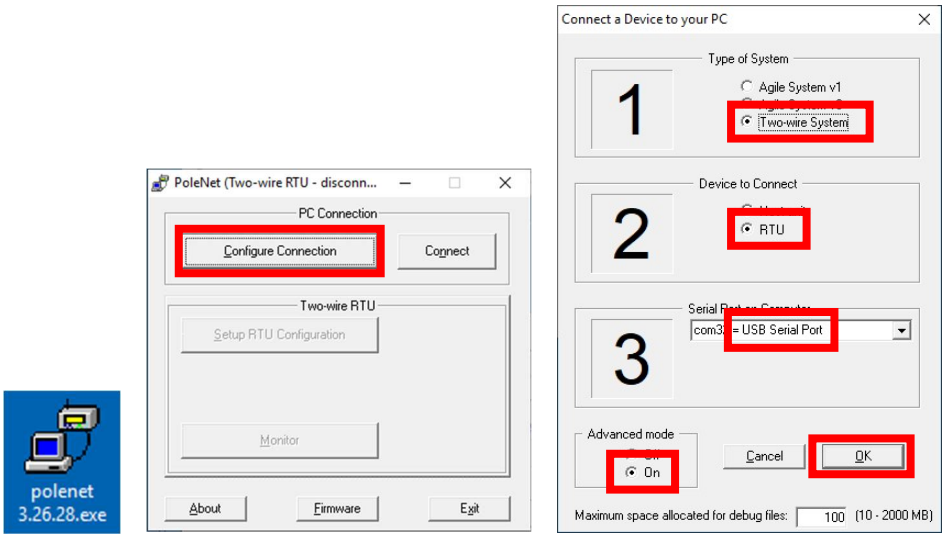
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



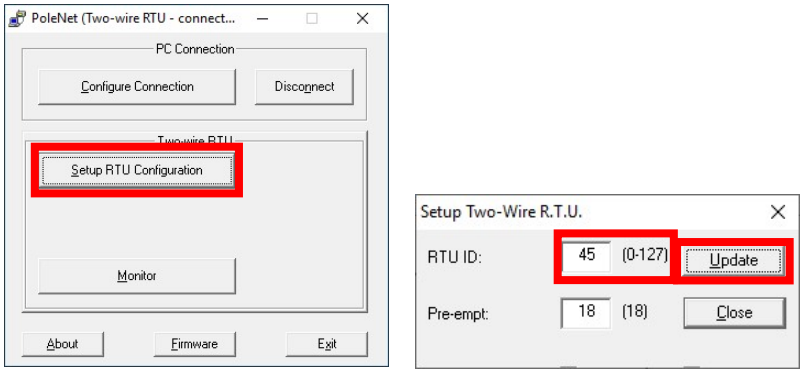
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

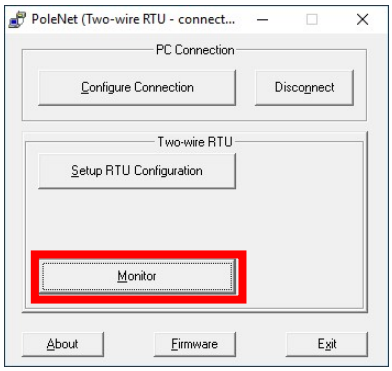


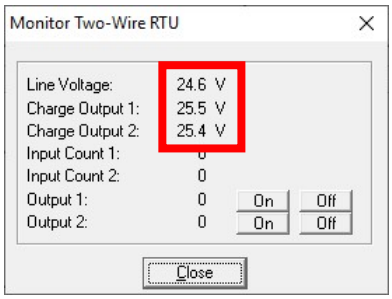
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

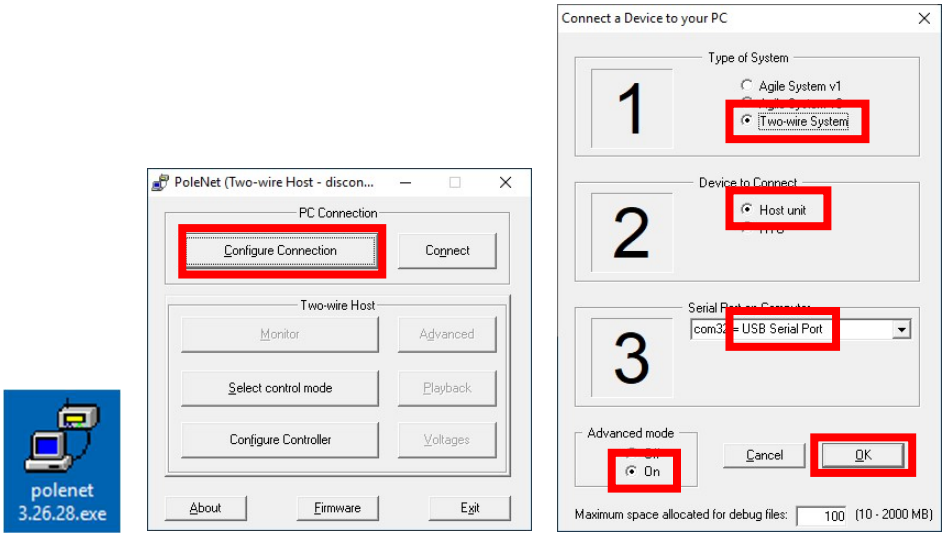
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

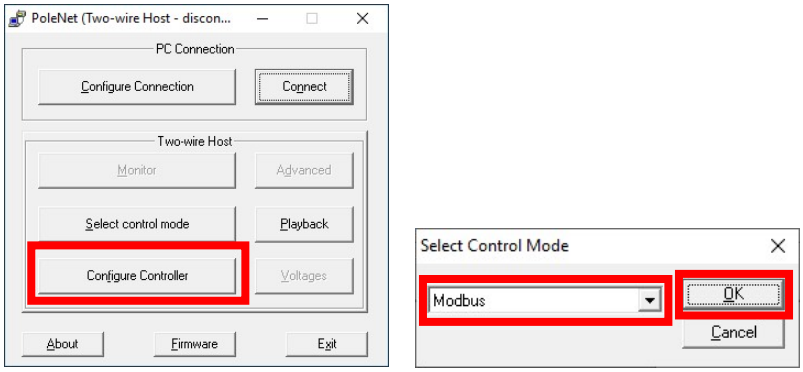
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

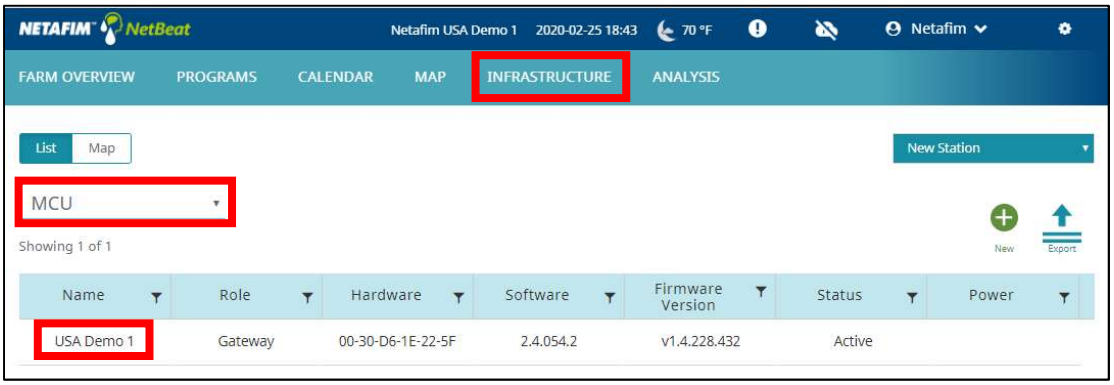
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

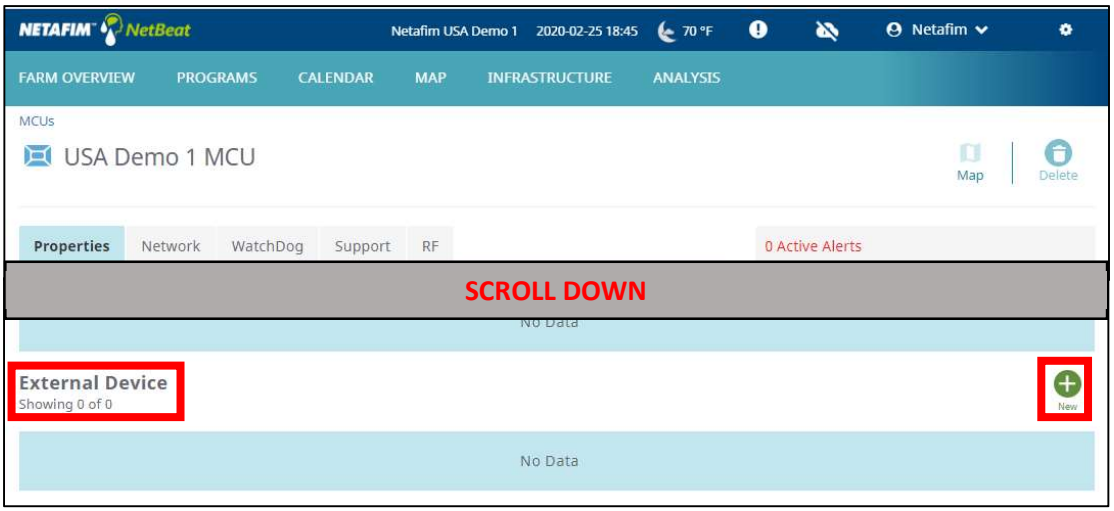
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

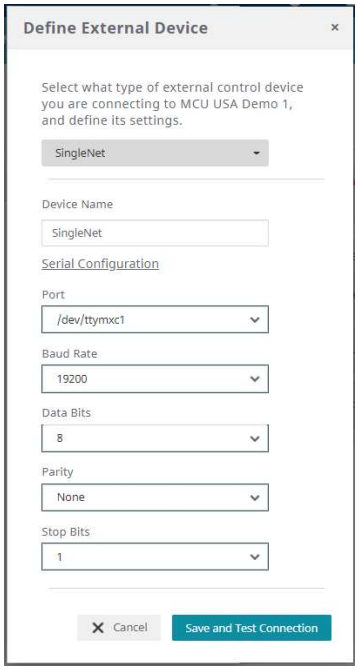


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

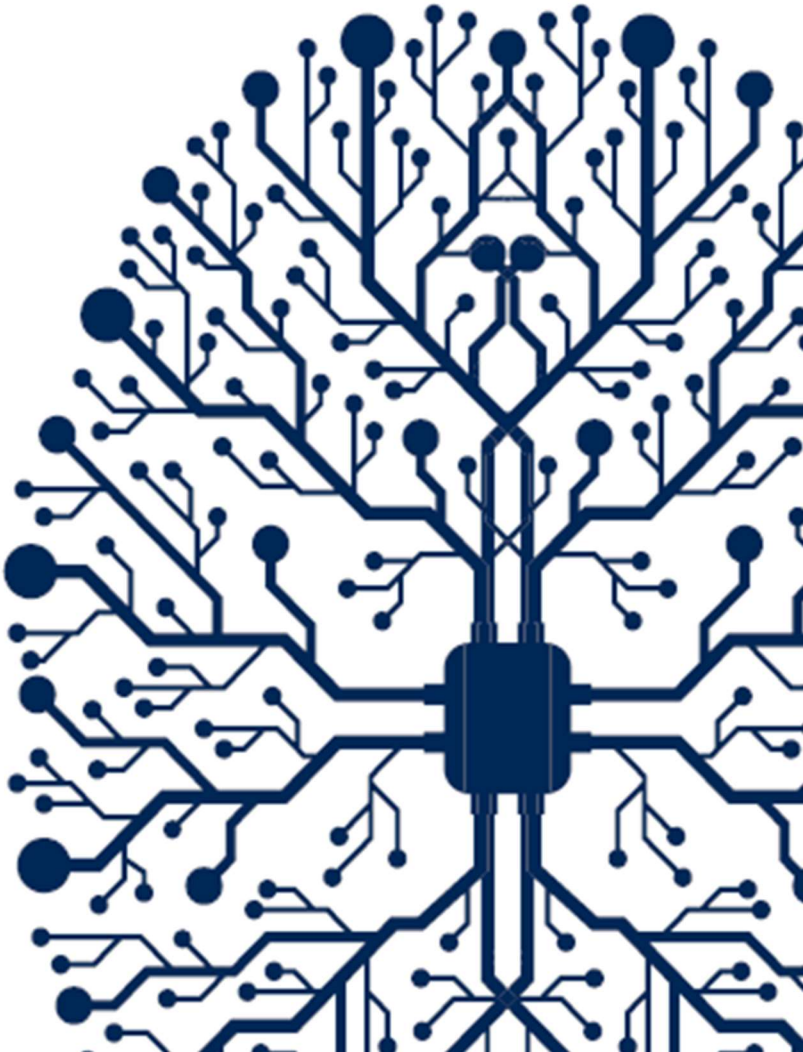
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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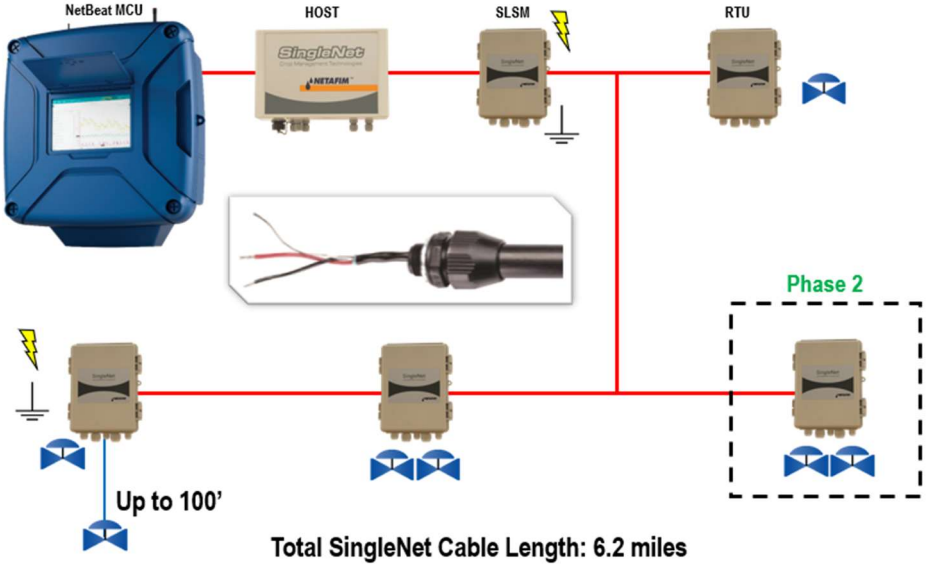
1. INTRODUCTION

1.1 Purpose

The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

1.2 Requirements

You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

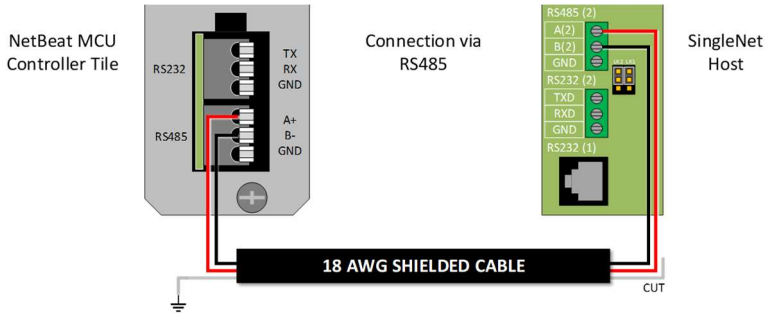
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

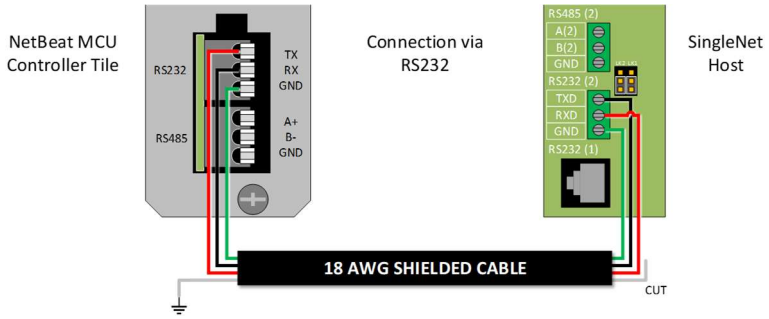
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



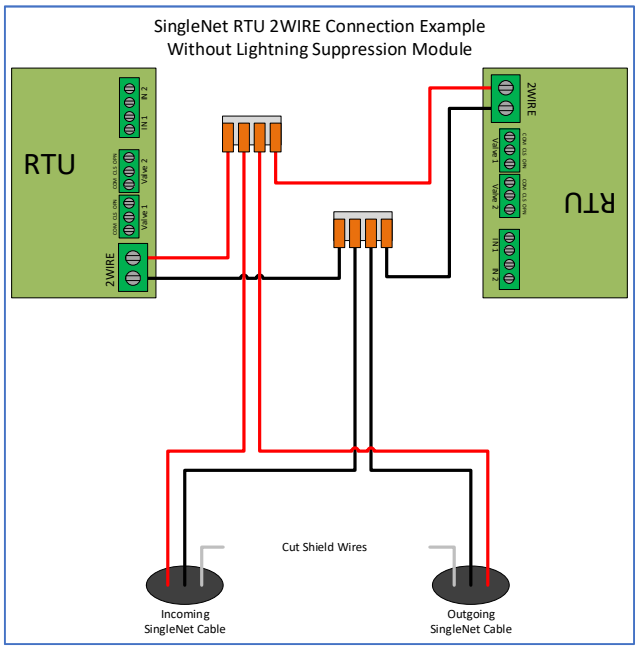
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

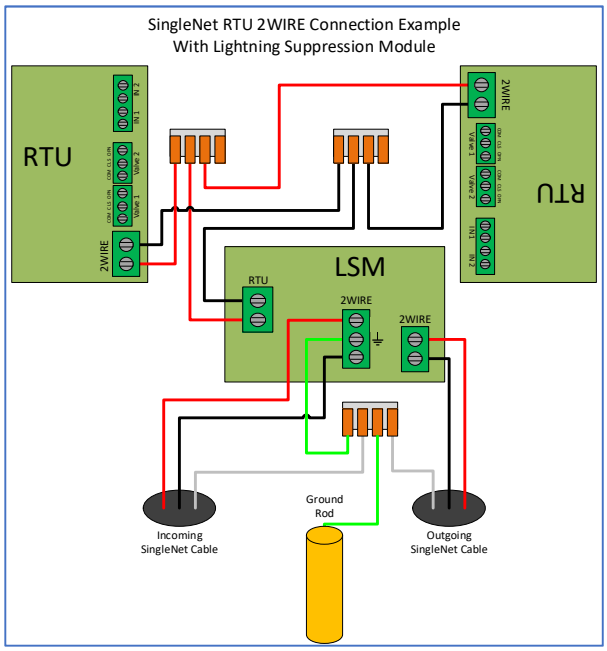


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

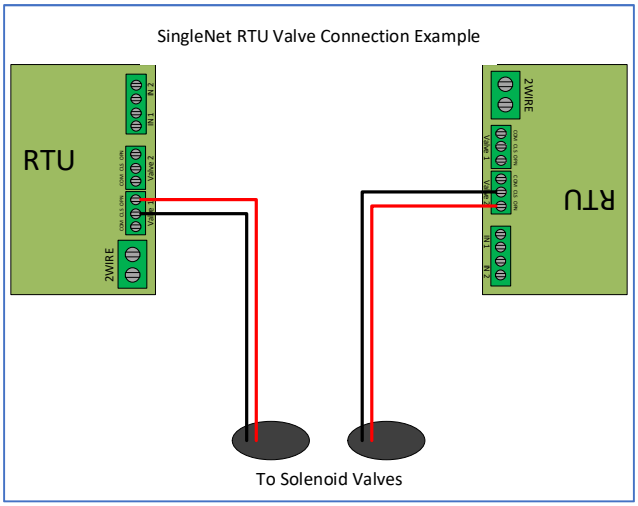
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





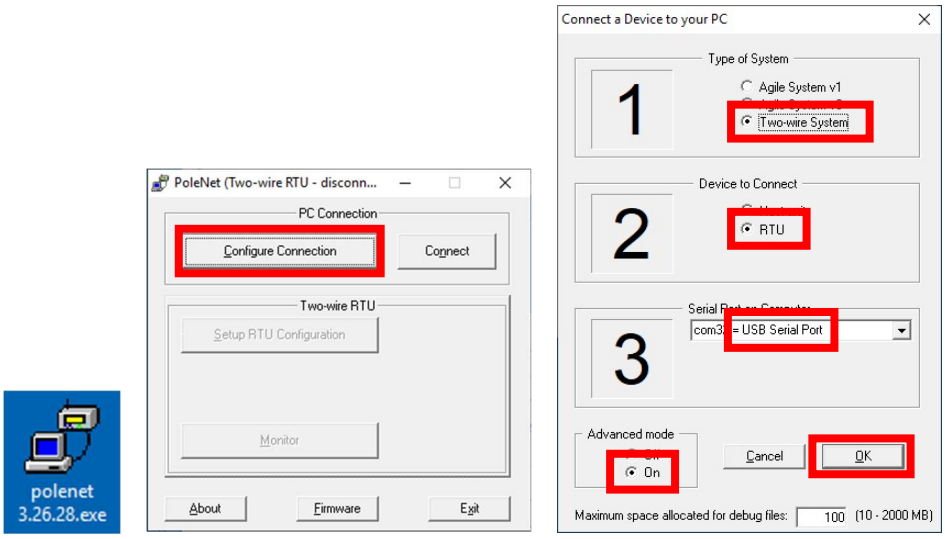
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



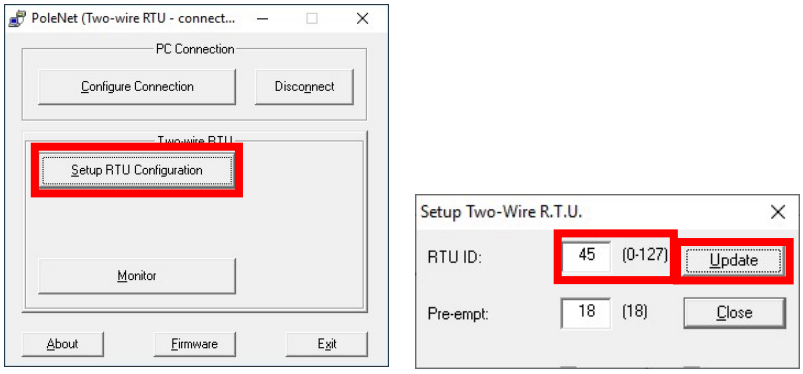
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

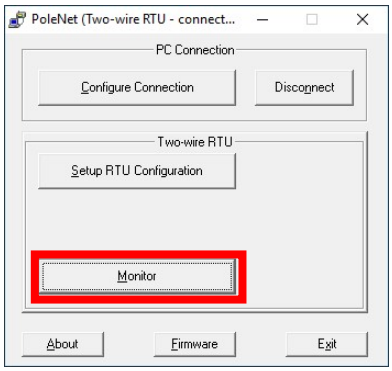


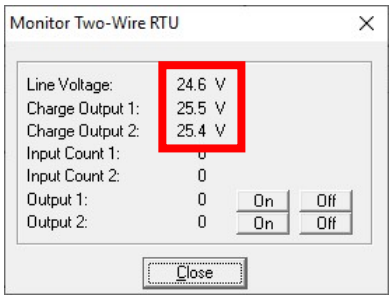
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

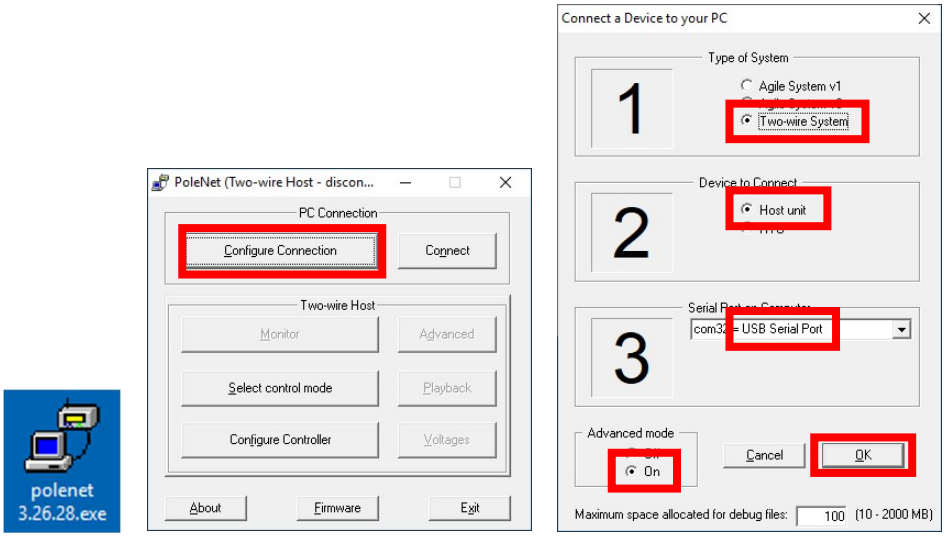
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

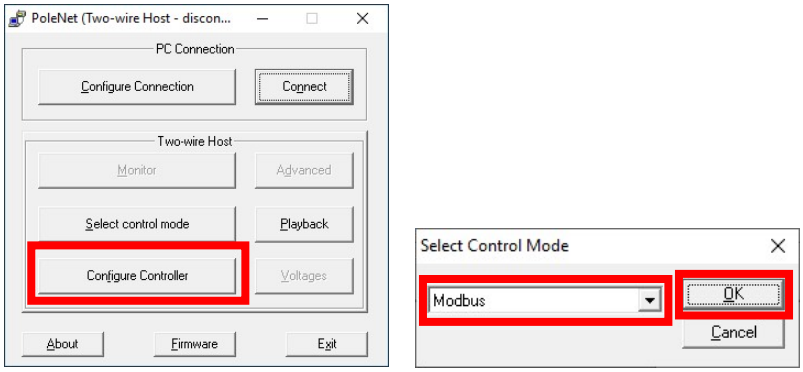
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

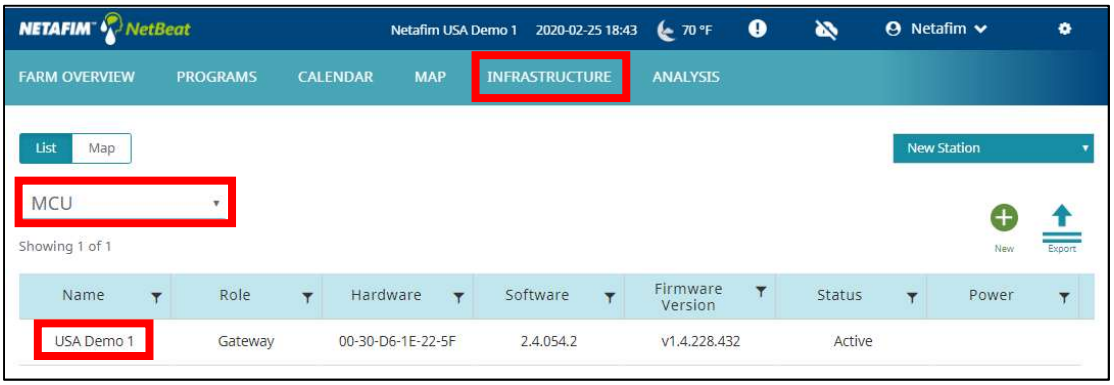
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

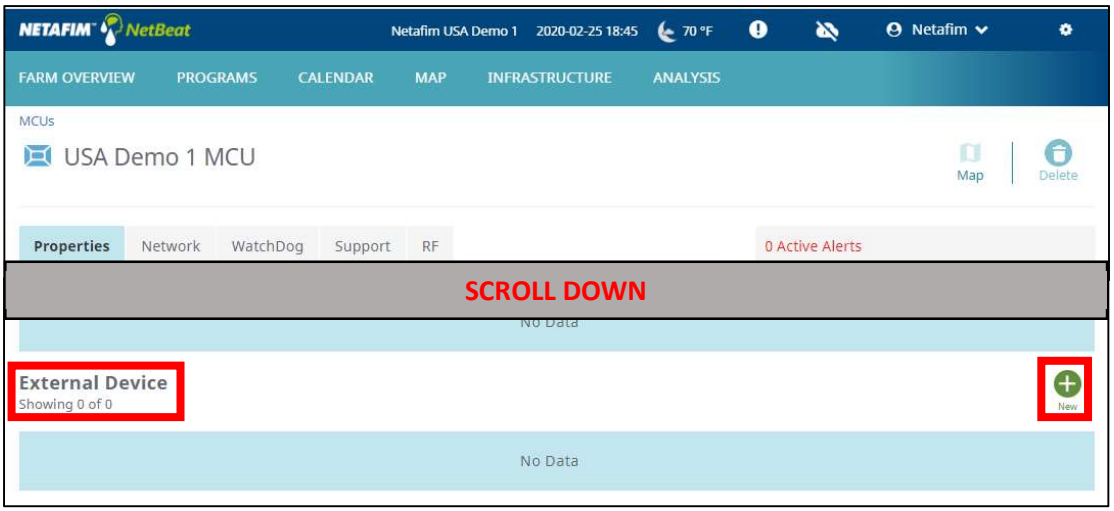
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

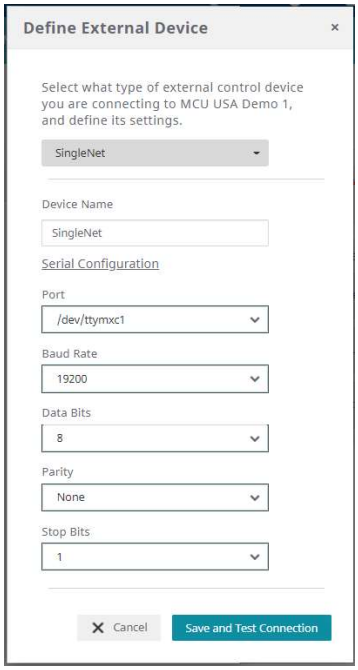


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

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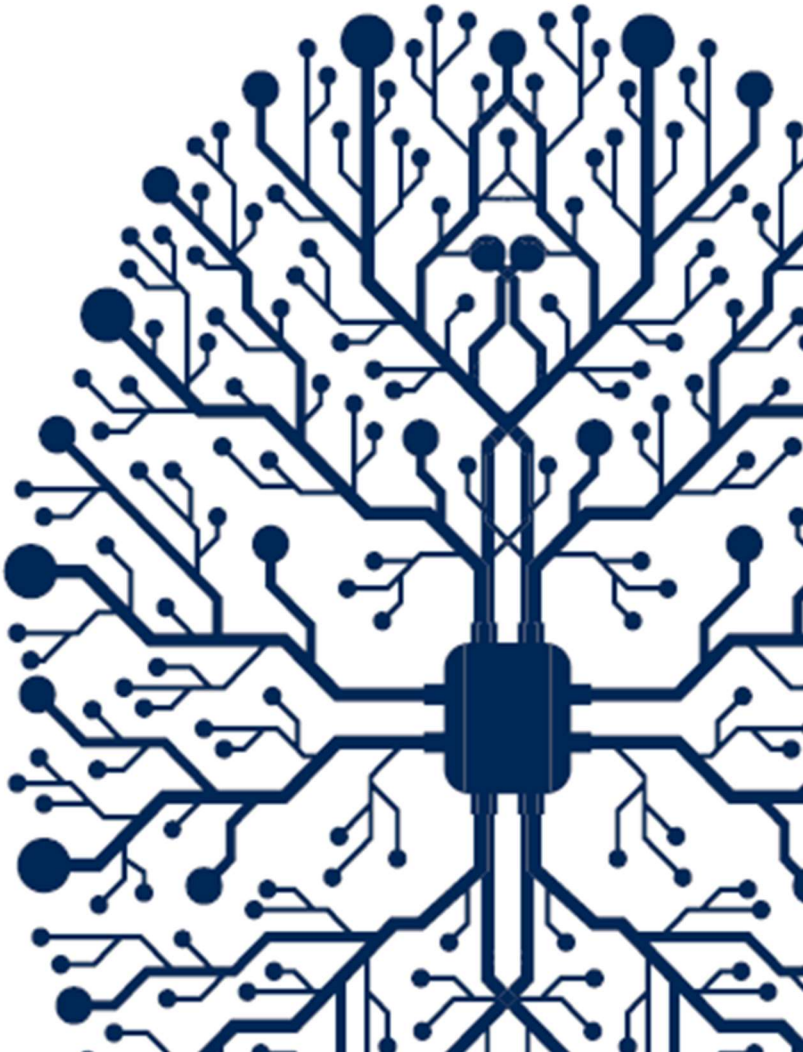

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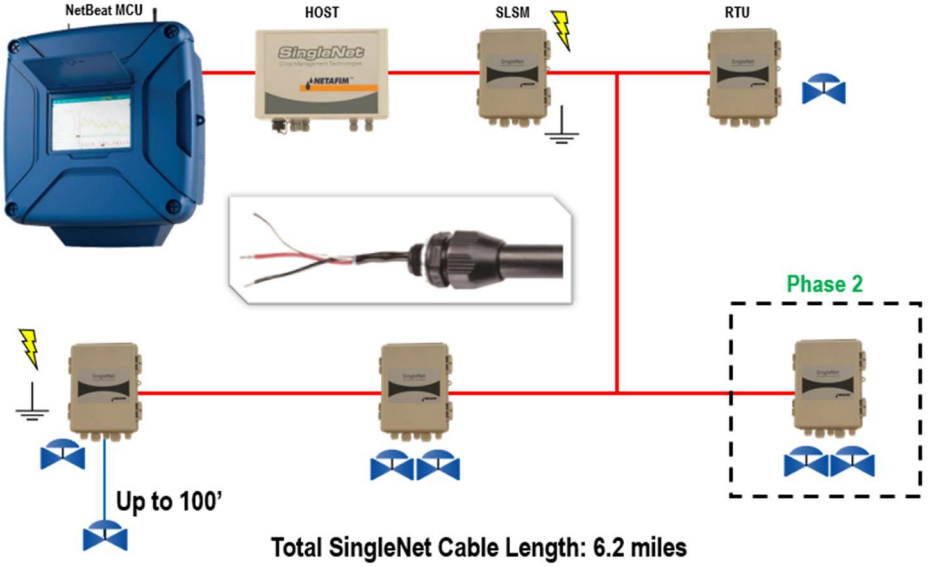

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The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

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You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

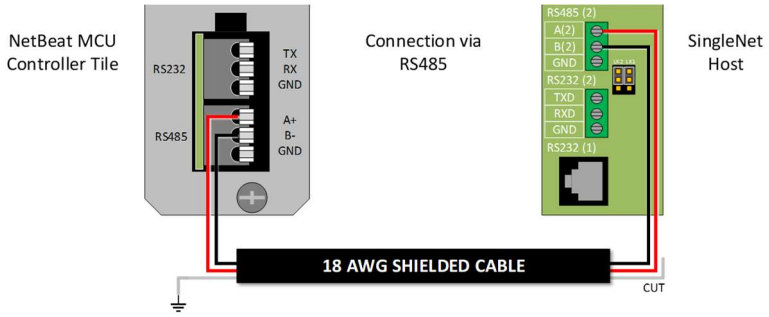
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

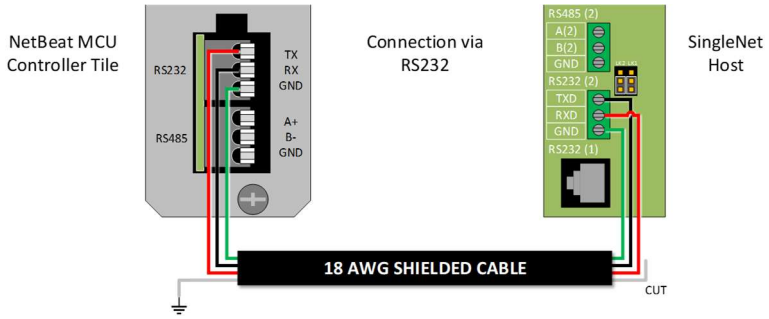
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



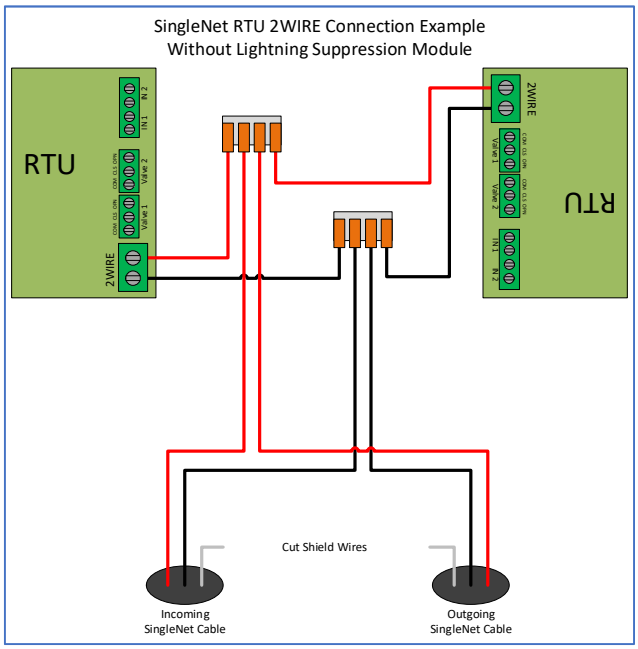
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

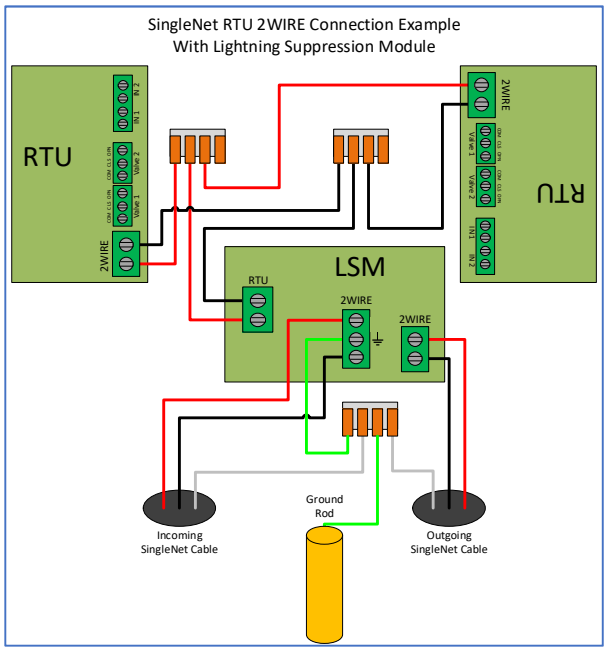


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

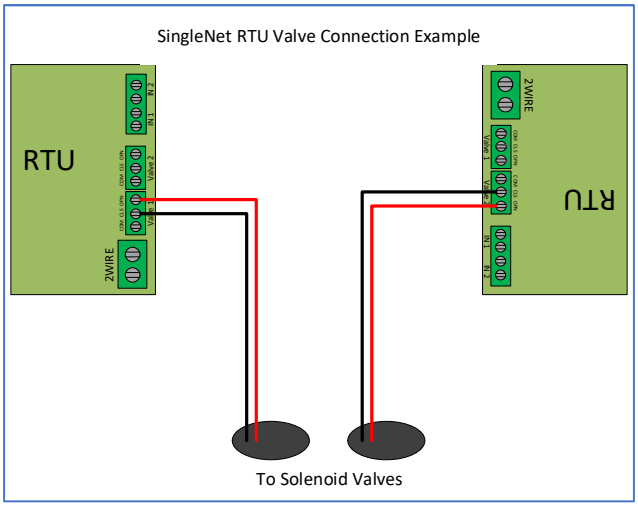
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





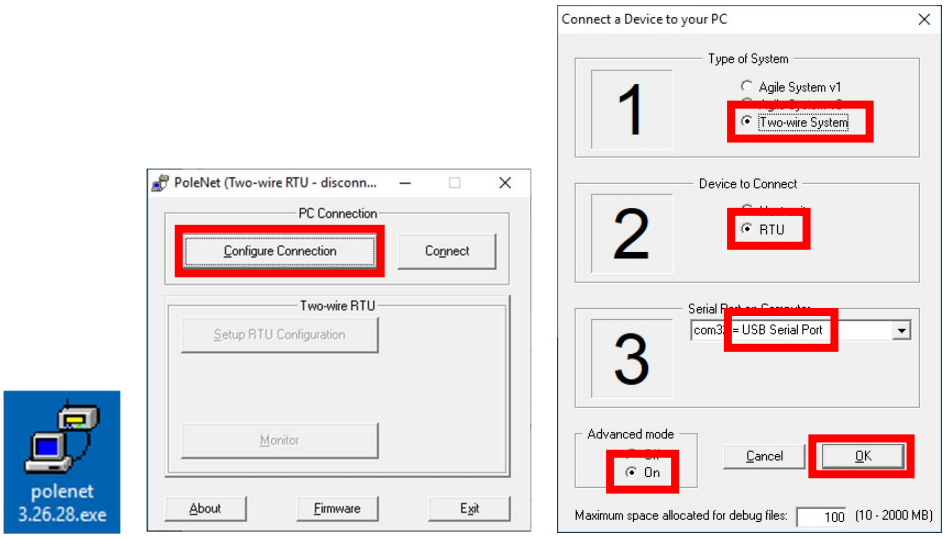
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



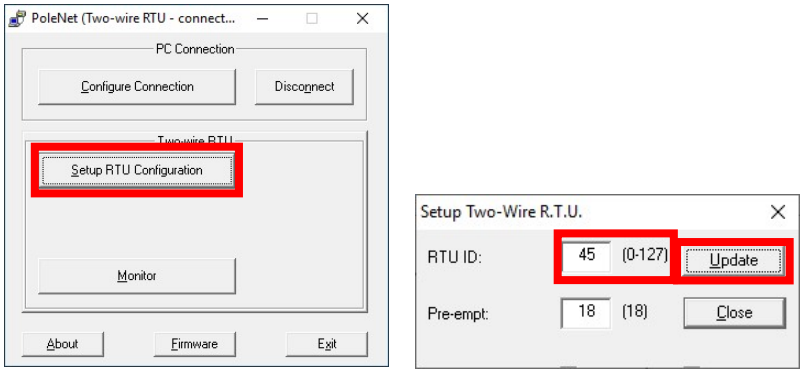
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

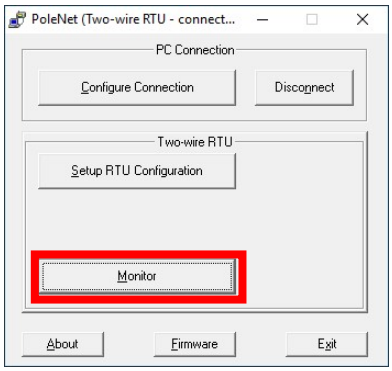


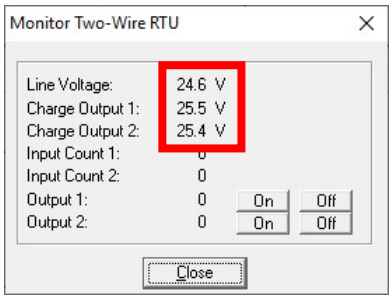
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

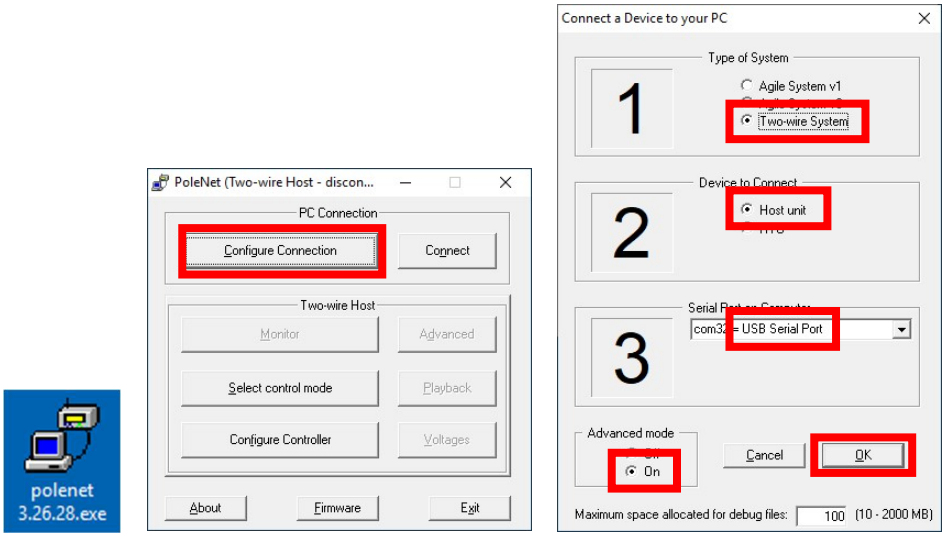
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

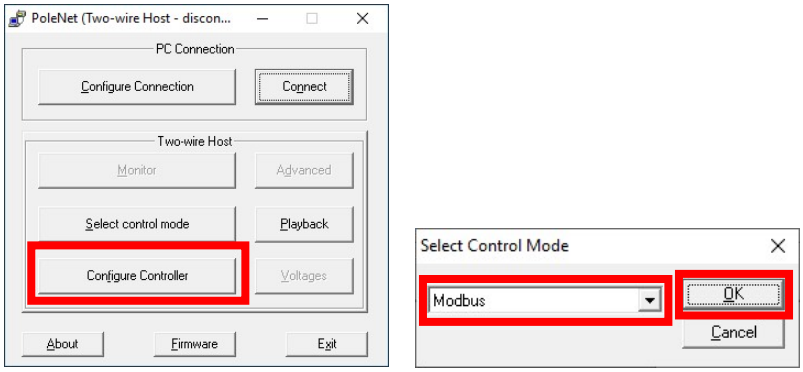
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

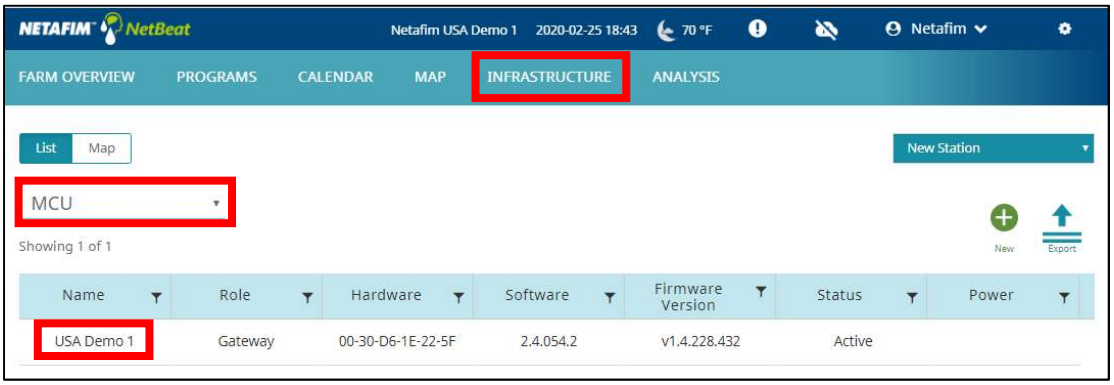
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

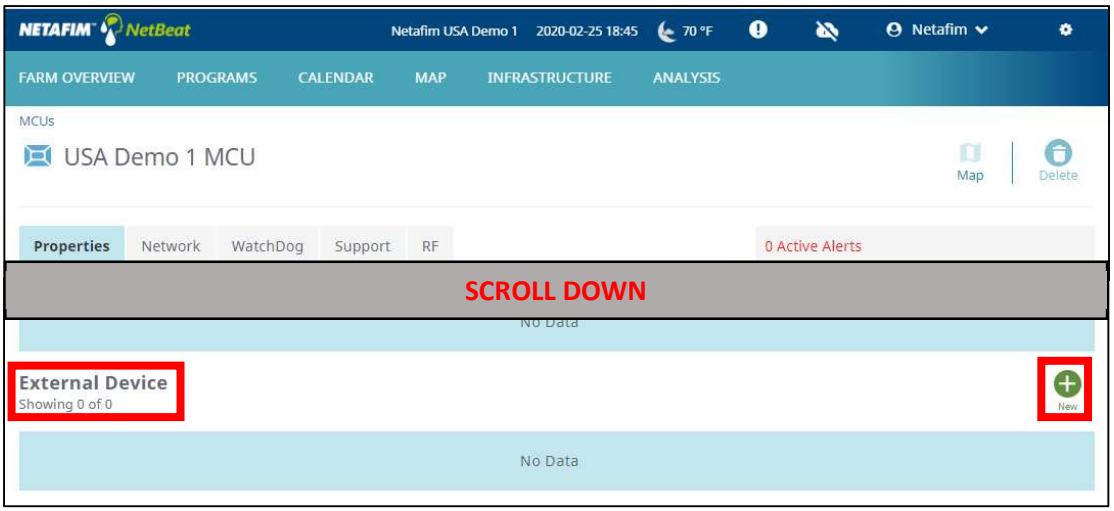
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

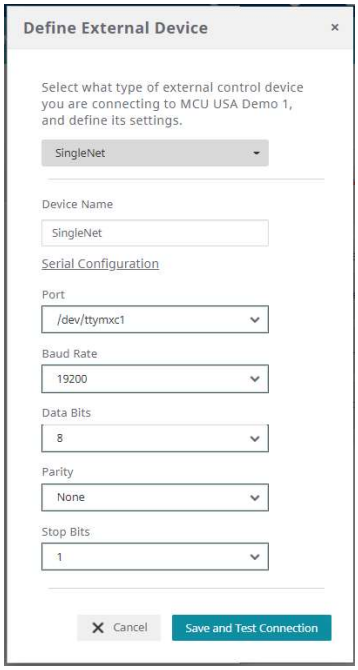


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

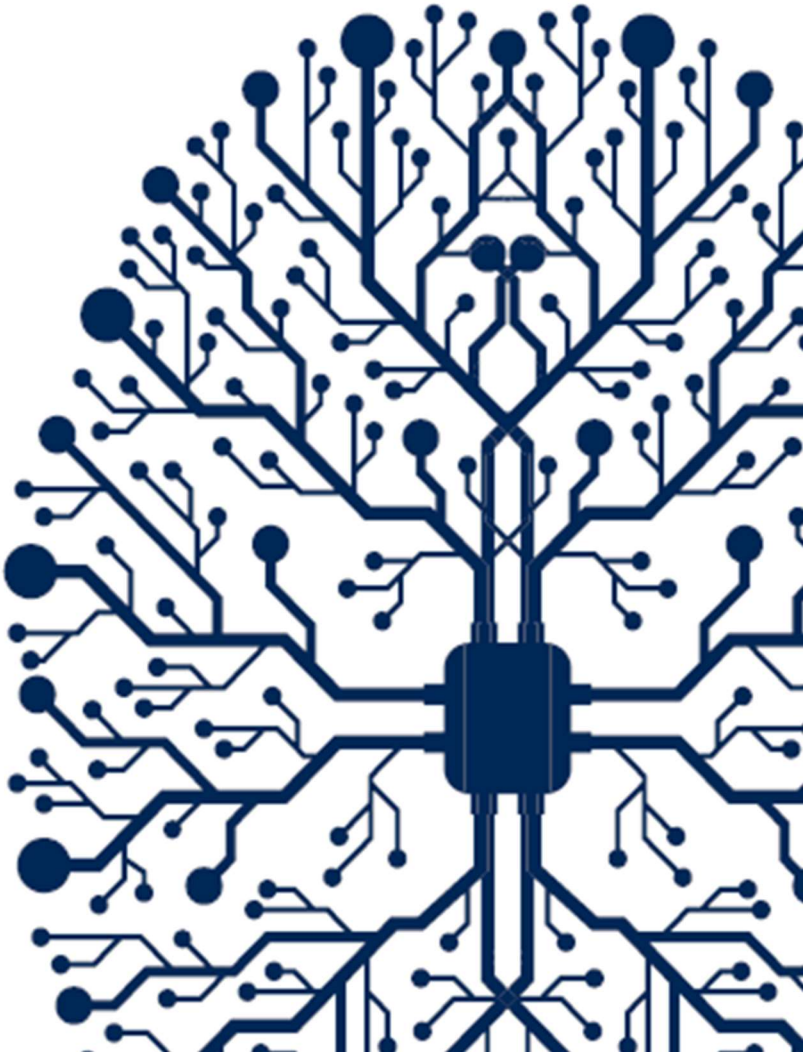
a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system

4 – SingleNet Configuration (Modbus)

Digital Farming Technical Support

2/25/2020



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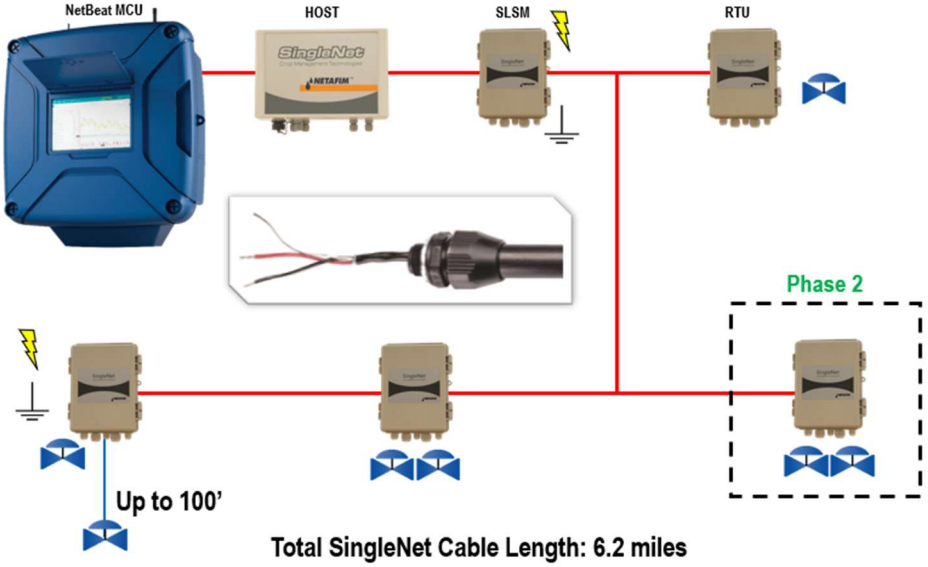
1. INTRODUCTION

1.1 Purpose

The purpose of this document is to teach you how to wire and configure the SingleNet RTU Host to the NetBeat MCU. SingleNet is a 2-wire remote terminal unit product that allows the user to connect an additional 256 digital outputs and 256 digital inputs to the NetBeat MCU. SingleNet does not support analog inputs.



The outputs are DC latching in nature. For example, the Aquative DC latching solenoid (Netafim PN: 35500-002000) or a generic DC latching relay (Netafim PN: 00107-005450).

The digital inputs work with dry contact and open collector style sensors like a pulse output flow meter or float switch. The digital inputs have a minimum pulse width of 125ms and a max frequency of 1 Hz.

1.2 Requirements

You will need…

1. A Windows PC (or Mac with virtual Windows)
2. The latest PoleNet software (available for download from https://shwca.se/netafim-digital-farming)
3. A PoleNet programming cable (Netafim PN: 00035-014780). This cable ships with every SingleNet Host
4. One-time internet access for Windows to download the PoleNet programming cable drivers.

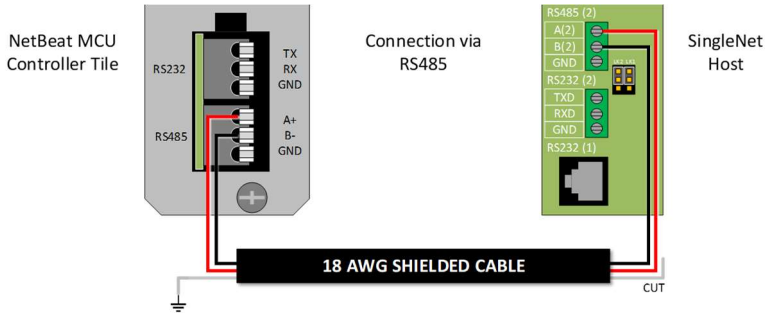
1.3 Version

VERSION	DATE	AUTHOR	NOTES
1.0	2020-02-25	Garan Keeler	Original Draft

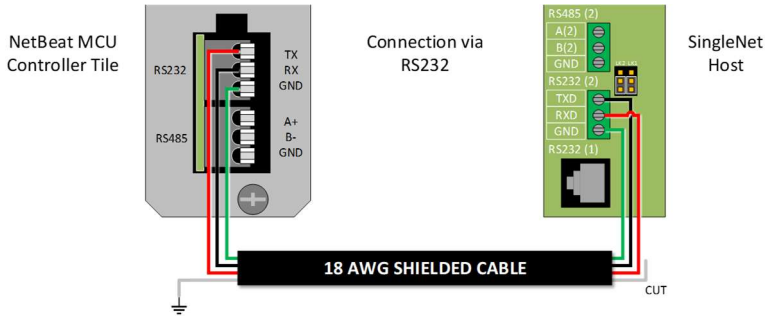
3. SINGLENET

3.1 SingleNet Host Wiring

1. Connect the SingleNet Host to the NetBeat MCU with an 18 AWG shielded cable, the bare wire wrapped around the shielding (also referred to as the shield or drain wire) is not to be used as a conductor.
    a. For RS485 (recommended), you need a two conductor, shielded cable
        i. MCU RS485 A connects to SingleNet Host RS485 (2) A
        ii. MCU RS485 B connects to SingleNet Host RS485 (2) B
        iii. MCU RS485 GND connects to nothing
        iv. Attach the shield wire to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the upper position



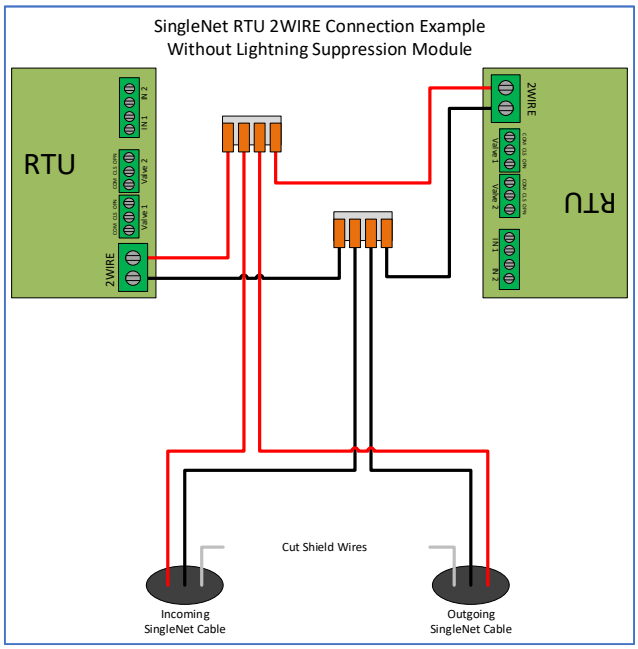
    b. For RS232, you need a three conductor, shielded cable
        i. MCU RS232 **TX** connects to SingleNet Host RS232 (2) **RX**
        ii. MCU RS232 **RX** connects to SingleNet Host RS232 (2) **TX**
        iii. MCU RS232 **GND** connects to SingleNet Host RS232 (2) **GND**
        iv. Attach the shield to the MCU enclosure earth ground, cut the shield on the SingleNet side
        v. SingleNet Host jumpers LK1 and LK2 are in the lower position

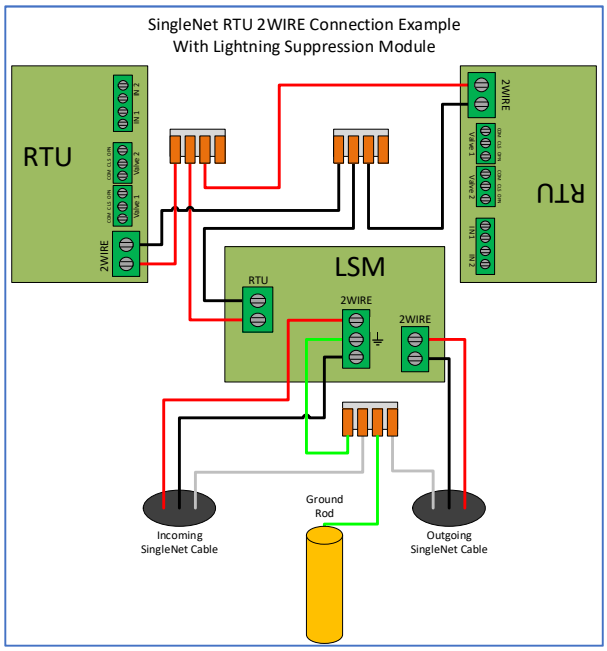


2. Connect the Lightning Suppression Card
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. Connect SingleNet Host **2WIRE** terminal to Lightning Suppression Card **Controller (Output)** terminal
        i. Use SingleNet cable removed from poly conduit
        ii. Disconnect Host 2WIRE plug until system is ready for testing
    c. Connect Lightning Suppression Card **Line (Input)** terminal to RTU(s) **2WIRE** terminal
        i. Use SingleNet cable in poly conduit
3. Connect 12vDC power to Host

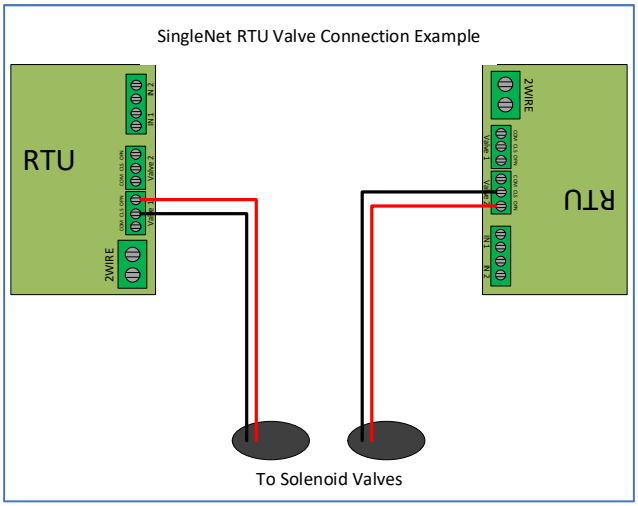
3.2 SingleNet RTU Wiring

1. Connect SingleNet cable to RTU 2WIRE terminal
    a. 2WIRE connections are not polarity specific, but we recommend keeping wire colors consistent to aid with troubleshooting
    b. If daisy chaining RTU's together, we recommend splicing wires with wire nuts or lever nuts, don't use the RTU 2WIRE terminal as a splice for large wire (18 AWG or smaller is okay).
    c. In RTU's with a lightning suppression module (LSM), connect the LSM to a ground rod and insert the ground rod in wet soil (under a air vent or pressure regulating pilot works best).





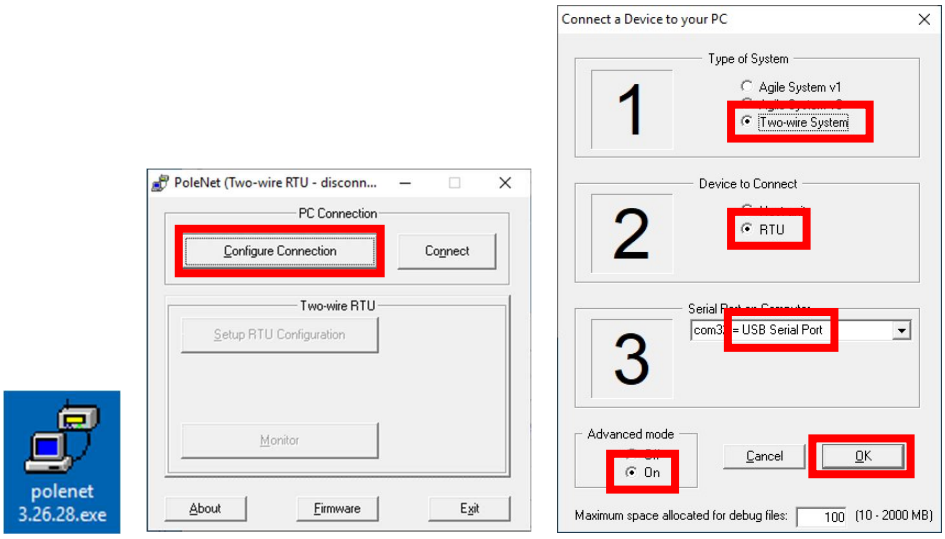
2. Connect the RTU inputs and outputs
    a. Valve 1 & 2 wire colors are marked near the terminal



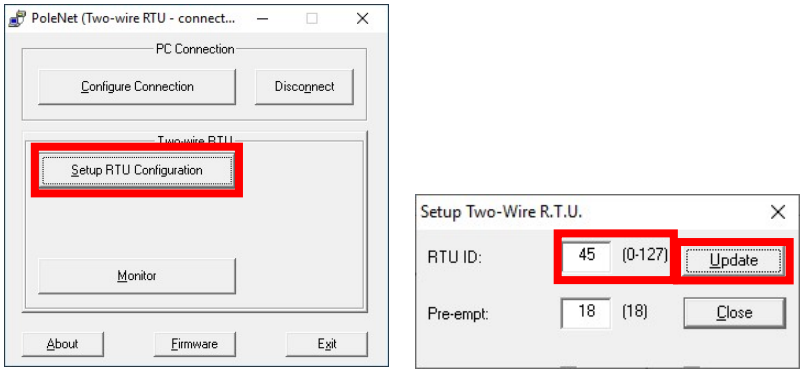
    b. In1 & 2 terminals are not polarity specific
3. After all RTU's are wired, use volt meter in continuity mode to check 2WIRE path for short
4. **Connect Host 2WIRE plug ONLY when system is ready for testing**

3.3 SingleNet RTU Programming

1. Connect PoleNet programming cable to a SingleNet RTU
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **RTU**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**

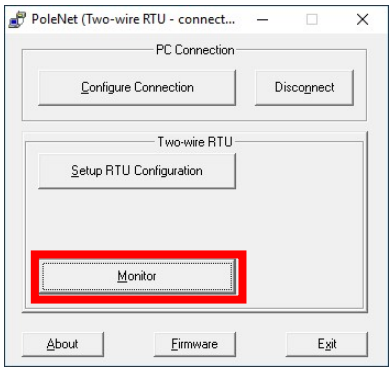


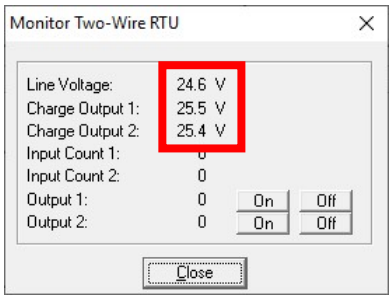
3. Program the RTU
    h. Click **Connect**
        i. If you get a Connection Lost error, verify the RTU has power from the Host
    i. Click **Setup RTU Configuration**
        i. **RTU ID:** Assign a unique ID and record on your map or configuration sheet
        ii. **Pre-empt:** 18
        iii. Click **Update**



    j. Click **Monitor**
        i. Verify **Line Voltage:** ~ 24-30 V (if less than this, verify the RTU has power from the Host)
        ii. Verify **Charge Output 1:** Should be close to Line Voltage

iii. Verify **Charge Output 2:** Should be close to Line Voltage





iv. Test Output 1
    1. Click **On** next to Output 1
        a. Output 1: 0 should change to 1
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound
            i. If Charge Output voltage does not drop or solenoid/relay does not make a sound then check your wiring or replace solenoid/relay.
    2. Click **Off** next to Output 1
        a. 1 should change to 0
        b. Charge Output 1 voltage should drop and recharge
        c. Solenoid or relay should make a click sound

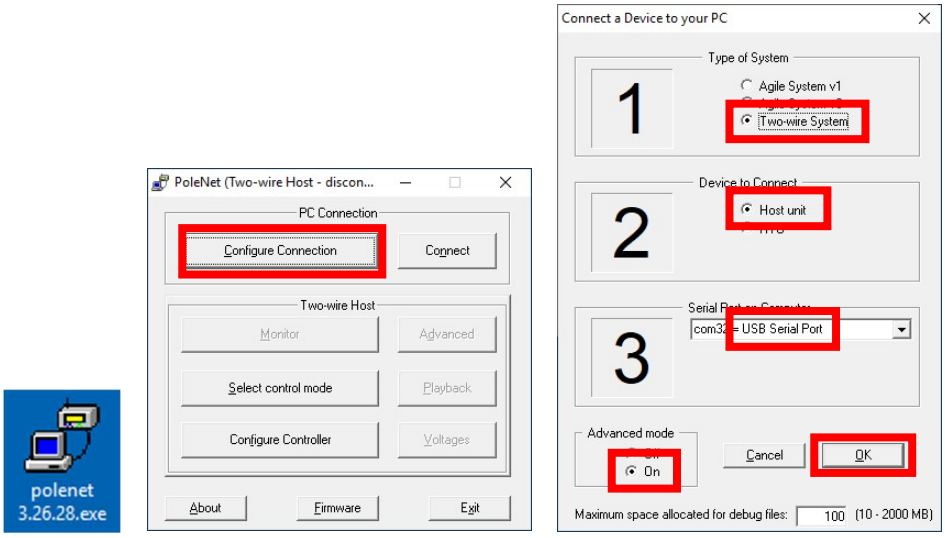
v. **Repeat** step iv for Output 2 if applicable

vi. Click **Close**

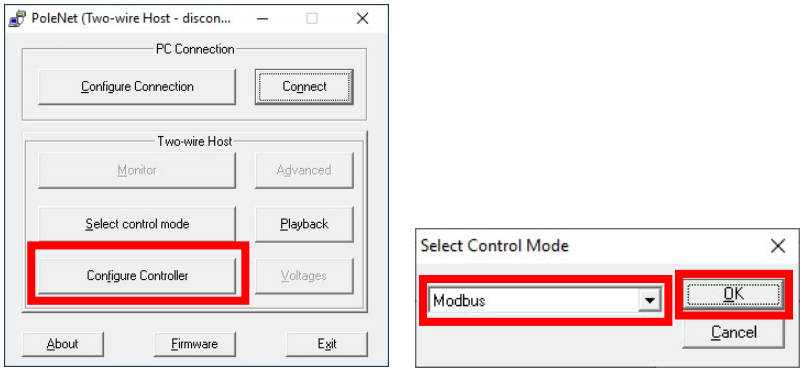
4. Click **Disconnect**
5. **Disconnect** PoleNet programming cable from RTU
6. **Repeat** steps 1 through 5 for any remaining RTU's

3.5 SingleNet Host Programming

1. Connect PoleNet **programming cable** to the SingleNet Host
2. Start PoleNet
    a. Open PoleNet software, "**polenet.exe**"
    b. Click **Configure Connection**
    c. Step 1 – Choose **Two-wire System**
    d. Step 2 – Choose **Host unit**
    e. Step 3 – Choose **USB Serial Port**
        i. If you don't see the USB Serial Port, ask your I.T. professional for help
    f. Turn Advanced mode **On**
    g. Click **OK**



3. Click **Connect**
4. Click **Select control mode**
    a. Choose **Modbus**
    b. Click **OK**



5. Capture RTU's
    a. Click **Monitor**
    b. Verify that all **RTU ID's** are present in the **Unit** column. If RTU's are missing…
        i. Verify wire connections at that RTU
        ii. Use PoleNet to verify correct RTU ID at that RTU
    c. Click **Capture**

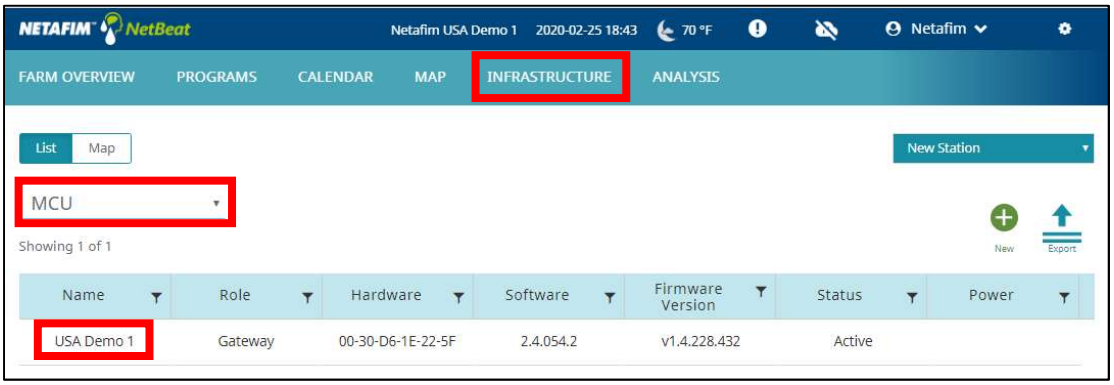
d. Click **Yes** to acknowledge warning
e. Click **OK** to acknowledge confirmation
f. Verify that all RTU ID's say **Yes** in **Capt** column
g. Click **Close**

6. Click **Disconnect**
7. Disconnect PoleNet **programming cable** from SingleNet Host

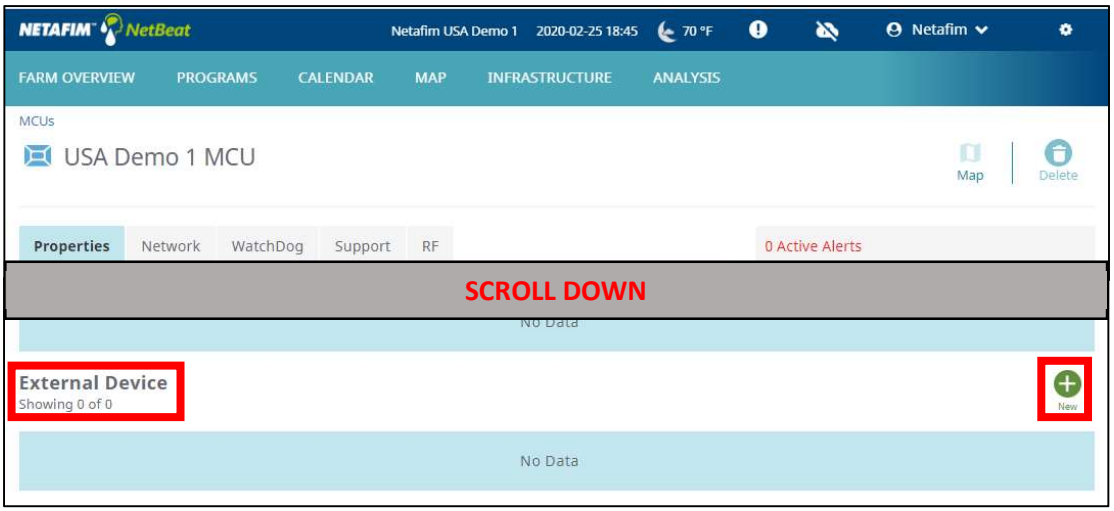
4. NETBEAT MCU

4.1 Adding a SingleNet Host to NetBeat

1. Log into the NetBeat MCU
   a. Remotely through the Internet by browsing to https://netbeat.netafim.com
   b. Locally by connecting to the same network as the MCU and browsing to http://msc-sm2-imx6dl
   c. By connecting to the MCU's Wi-Fi hotspot, NetBeat_-XX-XX-XX-XX-XX-XX (Password: password), and browsing to http://19.168.1.1
2. Navigate to **Infrastructure** > **MCU** and select the **desired MCU**

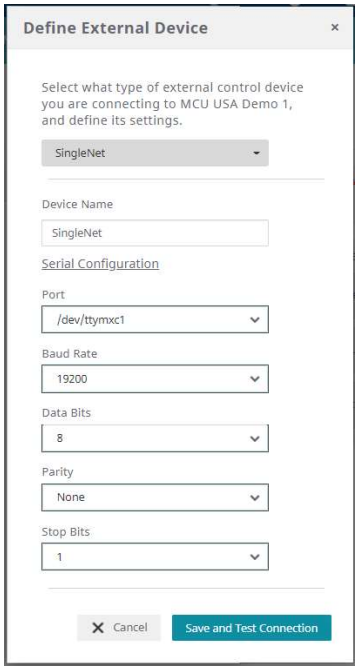


3. Scroll down to **Components** > **External Devices** and click **New**



4. Define the new External Device
   a. Select **SingleNet** from the gray dropdown box

b. Enter a **Device Name**
c. Choose a Port
    i. If SingleNet Host is connected via **RS232**, select **/dev/ttymxc1**
    ii. If SingleNet Host is connected via **RS485**, select **/dev/ttymxc3**
d. Click **Save and Test Connection**



5. If successful, you will see the new SingleNet device and the corresponding number of RTU's will appear in the **Connected Inputs/Outputs** column

a. If you see 0 Connected Inputs/Outputs, verify your wiring to the SingleNet Host and try again.

6. You may now define connections to devices using your SingleNet RTU system