

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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 🔌	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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



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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

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- 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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

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PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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.
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- 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

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- 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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

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 - b. Verify that all RTU ID's are present in the Unit column. If RTU's are missing...
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- d. Click Yes to acknowledge warning
- e. Click **OK** to acknowledge confirmation
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- g. Click Close
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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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 X	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

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- 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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 X	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 X	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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.

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You will need...

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- 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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 🔌	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 🔌	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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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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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA	Demo 1 2020-02	25 18:43	€ 70 °F	0	2	9 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New S	tation	•
MCU Showing 1 of 1	×									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	т	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-E	06-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	0 🔌	\rm O Netafim 🗸	۰	
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS USA Der	mo 1 MCU						Мар	Delete
Properties N	letwork WatchDo	og Support	RF			0 Active Alerts		
SCROLL DOWN								
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 🗸	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel 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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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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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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration <u>Monitor</u>		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1:	24.6 V 25.5 V 25.4 V 0 0	On Off
<u>About</u>	Exit		<u>C</u> lose	

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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon PC Connection	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host Monitor	Advanced	Serial Proton Serial Port	-
-	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced modeCancel	к
olenet 26.28.exe	About Eirmware	Exit	Maximum space allocated for debug files: 100 (1	0 - 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Salact Control Made	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus	- <u>UK</u>

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA I	Demo 1 2020-02	-25 18:43	3 🌜 70 °F	0	2	🙁 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New 5	itation	•
MCU Showing 1 of 1	*									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-D	6-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	()	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	9 X	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS I USA Der	mo 1 MCU						Мар	Delete
Properties	Jetwork WatchD	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel Save and Test Connection	
1	

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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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

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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).



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)
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- 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
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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

	Connect a Device to your PC X
	Type of System
🎤 PoleNet (Two-wire RTU - disconn — 🗌 🗙	Device to Connect
PC Connection Cognect	2
Two-wite RTU	Serial Fact - Communication Communication
	Advanced mode Cancel
26.28.exe	Maximum space allocated for debug files: 100 (10 · 2000 MB)

- 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

🄊 PoleNet (Two-wire RTU - connect — 🗌 🗙		
PC Connection		
Configure Connection Discognect		
Twowire BTU		
Setup RTU Configuration		
	Setup Two-Wire R.T.U.	×
Monitor	RTU ID: 45 (0-127)	Update
	Pre-empt: 18 (18)	<u>C</u> lose
<u>A</u> bout <u>E</u> irmware E <u>x</u> it		

- 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

PC Connection				
Configure Connection	Disconnect	Monitor Two-Wire R	TU	×
Two-wire RTU Setup RTU Configuration Monitor		Line Voltage: Charge Output 1: Charge Output 2: Input Count 1: Input Count 2: Output 1: Output 2:	24.6 V 25.5 V 25.4 V 0 0 0	
About Eirmware	E <u>x</u> it		<u>C</u> lose]

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- 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

			Connect a Device to your PC	×
			Type of System	
	PoleNet (Two-wire Host - discon	- 🗆 X	Device to Connect	
	<u>C</u> onfigure Connection	Connect	2	
	Two-wire Host	Advanced	Serial Part or Corrector	•
- <u>-</u>	Select control mode	<u>P</u> layback	3	
J.	Configure Controller	⊻oltages	Advanced mode	
olenet 26.28.exe	<u>A</u> bout <u>F</u> irmware	Exit	Maximum space allocated for debug files: 100 (10) • 2000 MB)

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

PC Connection			
Configure Connection	Connect		
Two-wire Host			
Monitor	Advanced		
Select control mode	<u>P</u> layback	Select Centrel Mode	
Configure Controller	⊻oltages	Select Control Mode	
		Modbus 👻	

- 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 (Password: password), and browsing to http://19.168.1.1
- 2. Navigate to Infrastructure > MCU and select the desired MCU

	Beat		Netafim USA	Demo 1 2020-02	25 18:43	€ 70 °F	0	2	9 Neta	fim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCT	URE	ANALYSIS					
List Map									New S	tation	•
MCU Showing 1 of 1	×									() New	Export
Name	r Role	▼ Hard	ware 🔻	Software	Ŧ	Firmware Version	Ŧ	Status	Ŧ	Power	Ŧ
USA Demo 1	Gateway	00-30-E	06-1E-22-5F	2.4.054.2		v1.4.228.43	2	Active			

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

	tBeat	0	Netafim USA	\ Demo 1 2020-02-25 18:45	🌜 70 °F	Ø 🔌	\rm O Netafim 🗸	۰
FARM OVERVIEW	PROGRAMS	CALENDAR	МАР	INFRASTRUCTURE	ANALYSIS			
MCUS USA Der	mo 1 MCU						Мар	Delete
Properties N	letwork WatchDo	og Support	RF			0 Active Alerts		
			:	SCROLL DOWN	I			
				NO Data				
External Devi Showing 0 of 0	ce							H New
				No Data				

- 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

efine External Device	×
Select what type of external control device you are connecting to MCU USA Demo 1, and define its settings.	
SingleNet 👻	
Device Name	
SingleNet	
Serial Configuration	
Port	
/dev/ttymxc1 🗸	
Baud Rate	
19200 🗸	
Data Bits	
8 ~	
Parity	
None 🗸	
Stop Bits	
1 ~	
X Cancel 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

External Device Showing 1 of 1							H New	Export
Device Name	Ŧ	Device Type	Ŧ	Connected Inputs/Outputs	Ŧ	Status		Ŧ
SingleNet		singlenet		2		Active		

- 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