



)) ACUMESH ((

WIRELESS RS485 NETWORK

AN **ACCUEVERGY** SOLUTION

# ACUMESH - WIRELESS METERING SYSTEM

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## SAFETY INFORMATION

Please read this manual carefully before installation, operation and maintenance of Acuvim II series meter.

The following symbols in this manual and on Acuvim II series meters are used to provide warning of danger or risk during the installation and operation of the meters.



**Electric Shock Symbol:** Carries information about procedures which must be followed to reduce the risk of electric shock and danger to personal health.



**Safety Alert Symbol:** Carries information about circumstances which if not considered may result in injury or death.



This mark indicates that this product is UL listed.

Installation and maintenance of the AcuMesh wireless metering system should only be performed by qualified, competent professionals who have received training and should have experience with high voltage and current devices.

Accuenergy shall not be responsible or liable for any damages caused by improper meter installation and/or operation.

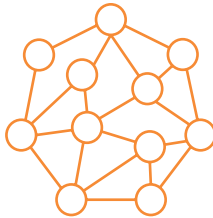
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## ACUMESH OVERVIEW

The AcuMesh wireless RS485 network solution is designed to connect energy meters and any devices by communicating with RS485 wirelessly. AcuMesh is a cost-effective solution that eliminates the need for installation of communication wires. Saving premium time, labour, and reducing the challenges of retrofit applications.



## LONGER, RELIABLE COMMUNICATION

The AcuMesh wireless system makes use of the Mesh network structure which allows each transceiver to act as extension points in the network allowing for larger range of communication. Using this Mesh arrangement for communication allows for point to multi-point communication. This solution enables automatic self-healing to optimize the communication pathway for a more reliable communication.

## APPLICATIONS

The AcuMesh wireless transceiver can be deployed in following applications:

- Power and Energy Metering in Commercial buildings, Malls
- Submetering and Tenant Billing for Entire Apartment, Condominiums
- Education Facilities and Campus
- Industrial and Factory Facilities
- Renewable Energy Generation such as Solar PV, Wind and etc
- Any network with device using RS485 communication with any protocols

## HARDWARE OVERVIEW

AcuMesh is available as two types of transceivers, these two types of transceivers have no functional difference.



Standalone transceiver that can connect to any device via RS485 or PC and gateways.



AXM-Mesh transceiver module that can only be attached to the Acuvim II series meters.

## KEY SPECIFICATIONS

	Transceiver	AXM-Mesh Module
Connection	RS485 Screw terminal, USB mini-B (power supply or configuration)	Attached to Acuvim II Power Meter
Data Rate	9600 bps	
<b>RF Properties</b>		
Operating Frequency Band	902 to 928 Mhz (900 Mhz ISM Band)	
Spread Spectrum	Frequency Hopping	
Number of Channels	64	
Transmit Power Output	24 dBm (250 MW)	
Receiver Sensitivity	-101 dBm	
Indoor/Urban Range	Up to 1000' (305 m)	
Outdoor RF Line-of-Sight Range	Up to 4 miles (6.5 km) with 2.1 dB dipole antennas	
RF Data Rate	Up to 200 kb/s	
<b>Antenna</b>		
Impedance	50 ohms unbalanced	
<b>Networking and Security</b>		
Supported Network Topologies	Mesh, point-to-point, point-to-multipoint, peer-to-peer	
Addressing Options	Personal Area Network Identifier (PAN ID) and 64-bit MAC add addresses	
Encryption	128 bit Encryption Standard (AES)	
Power Requirements	Power supply included	Directly powered by meter
Power Supply	100-240Vac 47-63Hz	NA
Receive Current	60 mA (@9V)	NA
Transmit Current	140 mA (@9V)	NA
<b>Physical Properties</b>		
Size	4.5 x 2.75 x 1.125 in. (11.4 x 7.0 x 2.9 cm)	NA
Weight	150g	NA
Operating Temperature	-40 to 85°C (Industrial)	

## INSTALLATION CHECKLIST

You'll need to confirm these details before successfully completing the installation of your AcuMesh system:

- AcuMesh wireless system requires a minimum of two transceivers to form the network.
- The RS485 network master device can be a PC, PLC, data acquisition server or gateway, e.g. AcuLink 710 Data Acquisition Server.
- The slave devices can be our Acuvim II series power meters or any other meter or sensor with RS485 port. If it is the Acuvim II meter, the AXM-Mesh transceiver module should be used, for other devices the standalone transceiver should be used.

# HARDWARE INSTALLATION

Two types of Transceivers and two antenna choices.

## STANDALONE TRANSCEIVER

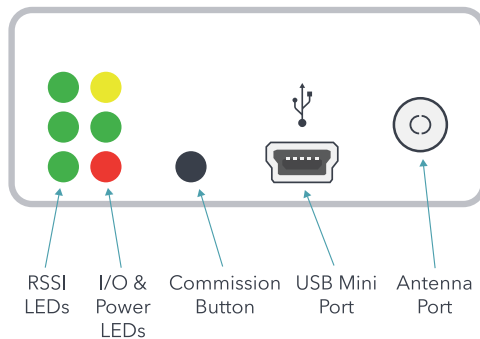
### POWER

The transceiver can easily be powered by connected it to the USB port of a computer.

The AcuMesh transceiver can also be powered using a standard power supply of 100-240Vac or from an auxiliary wall socket to be powered.

Note: When the transceiver is connected to a gateway, PLC or power meter through the RS485 port then the transceiver must be powered using the external power supply.

The AXM-MESH module is directly powered by the Acuvim II series meter that it is connected to.



### LEDs

There are two sets of LED lights on the transceiver that indicate the transceivers behaviour. The RSSI LED's indicate the signal strength of the incoming signal.

**3 LEDs ON** - Very Strong Signal

**2 LEDs ON** - Strong Signal

**1 LED ON** - Moderate Signal

**0 LED ON** - Weak Signal

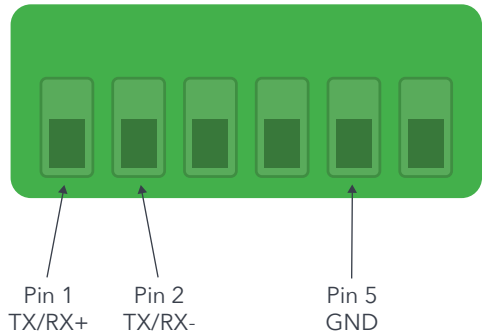
The Power LED's indicates the activity of the transceiver.

The yellow LED indicates the transceiver is transmitting data.

The green LED indicates the transceiver is receiving data, the red LED indicates the transceiver is powered on or it is communicating (the red light is on when powered, off briefly during RF transmission).



## STANDALONE TRANSCEIVER



Pin	RS485	Description
1	TX/RX+	Positive Transmission Line
2	TX/RX-	Negative Transmission Line
5	GND	Ground

## POWER CONNECTION

Connection for the 7-30Vdc power adapter.

### DIP Switch

Switch 1 should always be in the 'off' position for half-duplex communication.

Switch 2 is for full-duplex communication. This switch should not be configured as most devices only support half-duplex communication.

### RESET BUTTON

The reset button is used to reboot the transceiver. It is equivalent of power cycle the transceiver.

## AXM-MESH MODULE

### ATTACHING TO A METER - ACUVIM II CONFIGURATION:

With the AXM-Mesh module attached to the meter, the meter should be configured with the following settings to communicate:

**Protocol 2:** Mesh

**NOTE:** By changing the 'Protocol 2' setting to Mesh in the meter this will automatically change the Baud rate 2 setting in the meter to 9600 and Parity 2 to None1

If the meter does not have Mesh option in Protocol 2, please set Baud rate 2 and Parity 2 to 9600 and None1 respectively.

### CONFIGURATION WITH OTHER DEVICES:

For other meters or devices that communicate through a RS485 port, the devices must have the following settings to communicate with the transceiver:

**Baud rate:** 9600

**Parity:** None1 (Or Parity None, stop bit 1)

### NOTES:

The Acuvim II meters and any other RS485 connected devices in the network should be assigned with a unique Modbus address from 1-247.

The standalone transceiver can only be connected either via USB or via RS485 at any time.

# CONGRATULATIONS!

The AcuMesh RS485 wireless network set up is complete. You are now able to communicate wirelessly with all RS485 devices in the network. The AcuMesh wireless RS485 network is pre-configured to work out of box. No software configuration is required.

## CAUTION:

Proceed with caution to advance user setting below, you will not need to use the AcuMesh software to have the AcuMesh Wireless RS485 network working, only use the software if you have knowledge of wireless network properties.

# ADVANCED USER SETTINGS

Two types of Transceivers and two antenna choices.

By default, all the transceivers are configured in the same network. The transceivers will be configured with the default network ID of 7FFF.

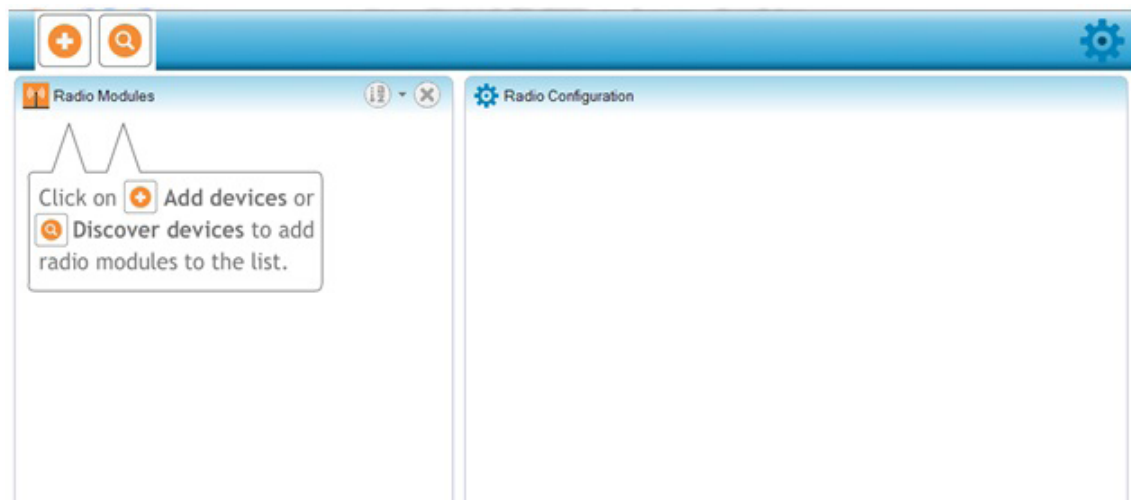
For advanced configurations such as configuring transceivers to work in a different network, our "AcuMesh" software needs to be used.

## NOTES:


A transceiver must be connected to a PC to perform any network configuration.

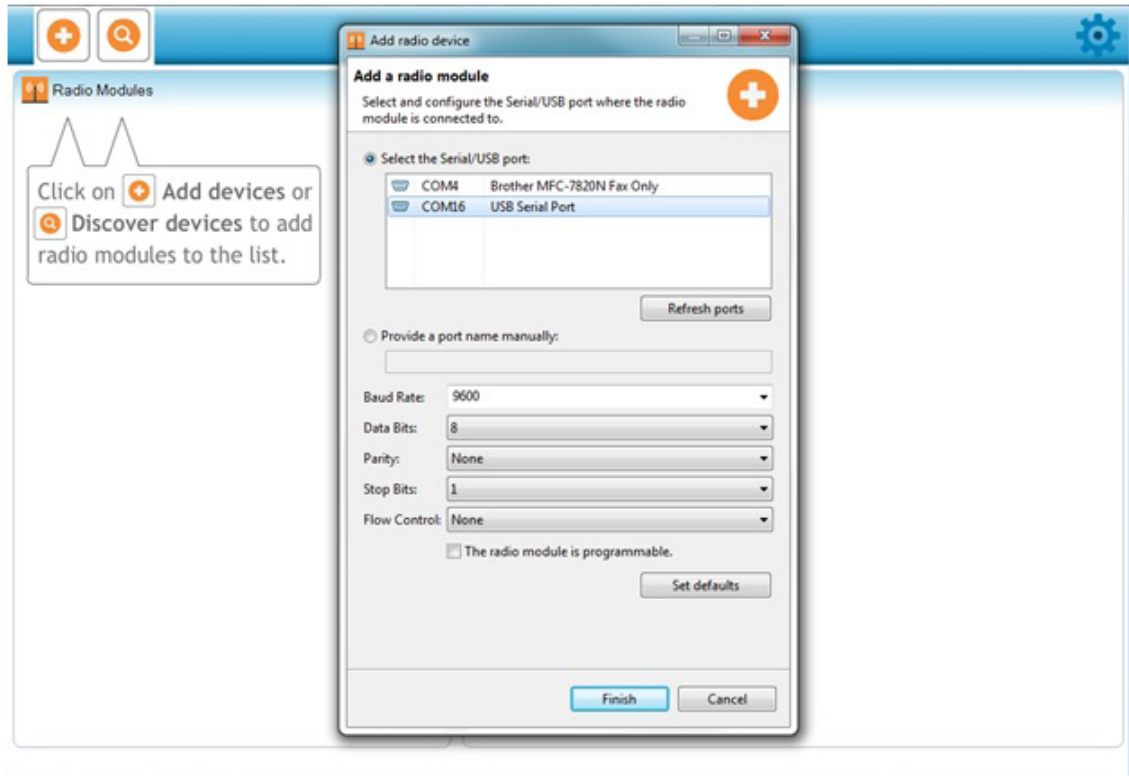
## 1. OPEN SOFTWARE:

Open the "AcuMesh" software. The following screen will appear.

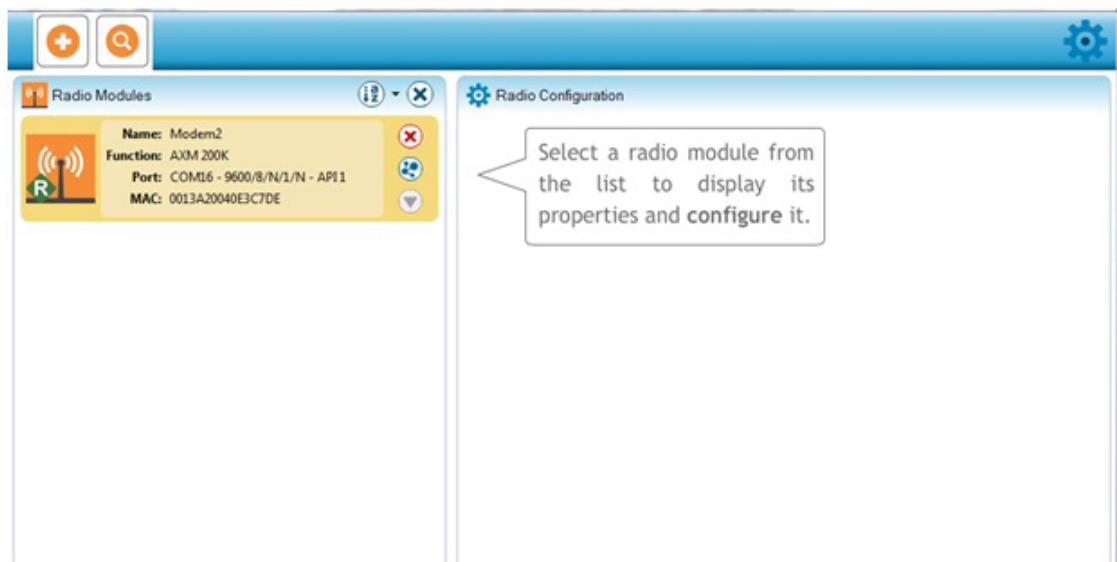


## 2. LOCATE TRANSCEIVER:

To begin, the software will need to locate the transceiver that is connected to the computer's USB port. Click on the  to discover the Com port that the transceiver is connected to. Select the Com port and click on 'Finish'.



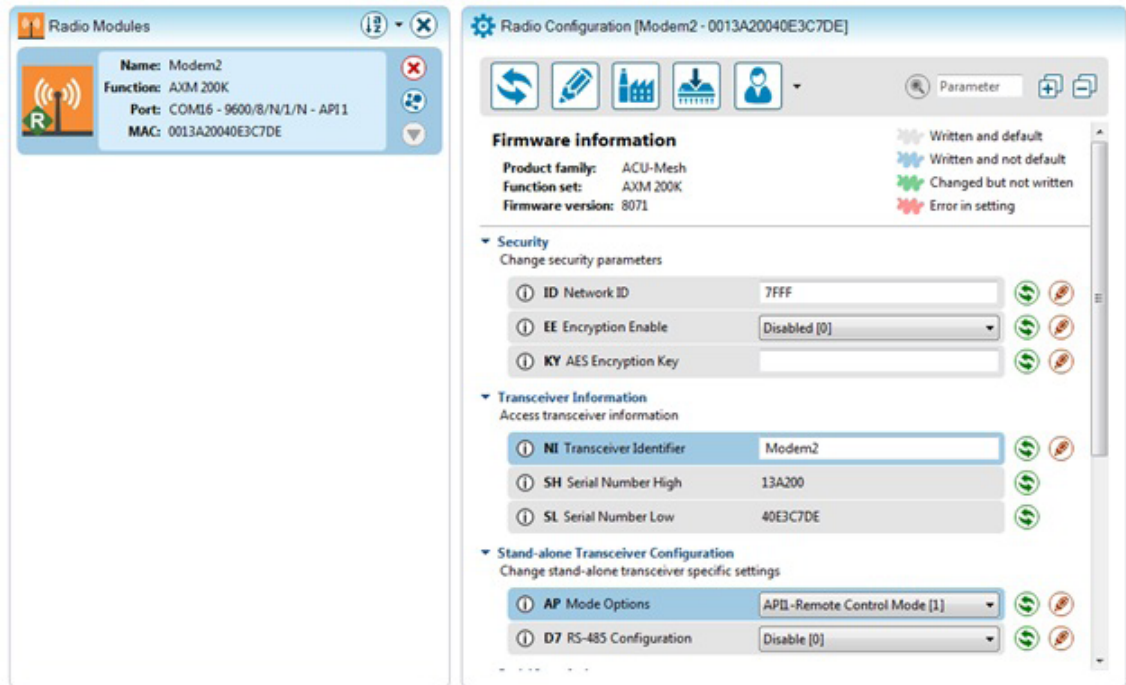
Click on the discovered transceiver to view and configure the settings related to this transceiver.




### 3. RADIO CONFIGURATION:


The right side of the window will display the information and settings related to the transceiver under the Radio Configuration view.

**NOTE:** To configure a remote transceiver in the network, the transceiver needs to be in “remote control mode” (More information can be found below)



#### 4. SECURITY SETTINGS:

To write a setting to the transceiver press on the  beside the parameter if it is a read and write parameter.

To read or retrieve a parameter from the transceiver press the  beside the parameter.

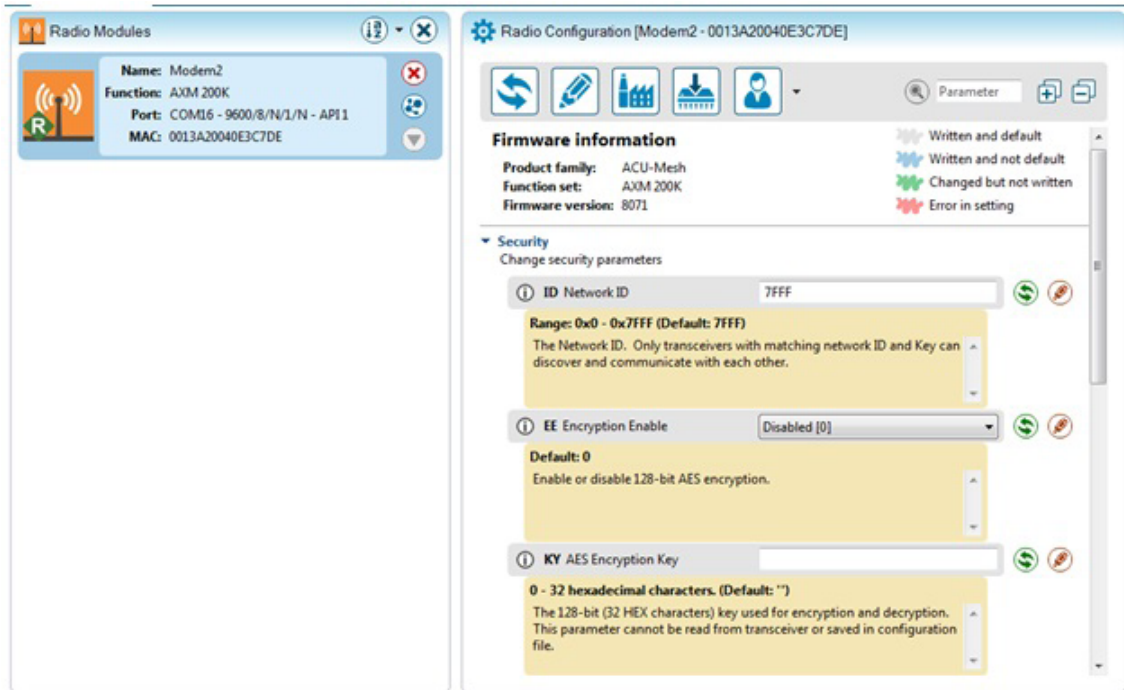
**ID Network ID:** The network or channel that the transceivers will communicate in. All transceivers need to be configured with the same Network ID to communicate with each other. Transceivers with different Network ID will not be able to join the wireless network.

**EE Encryption Enable:** This parameter is for enabling an encryption for the transceiver in the network.

**KY AES Encryption Key:** If the EE Encryption Enable parameter is enabled then an Encryption key needs to be enter. This key must be set between 0-32 characters in Hexadecimal. Every transceiver must have the Encryption Key correctly configured to join the network.



**Note:** More information can be found on each setting by clicking on the symbol besides each parameter.



## TRANSCEIVER INFORMATION:

**NI Transceiver Identifier:** This parameter is for assigning the transceiver with a name so it can be easily identified in the network when searching for transceivers. By default, no identifier is assigned to the transceivers.

**SH Serial Number High:** A read only parameter for returning the upper 32 bits of the 64 bit unique assigned address to the transceiver.

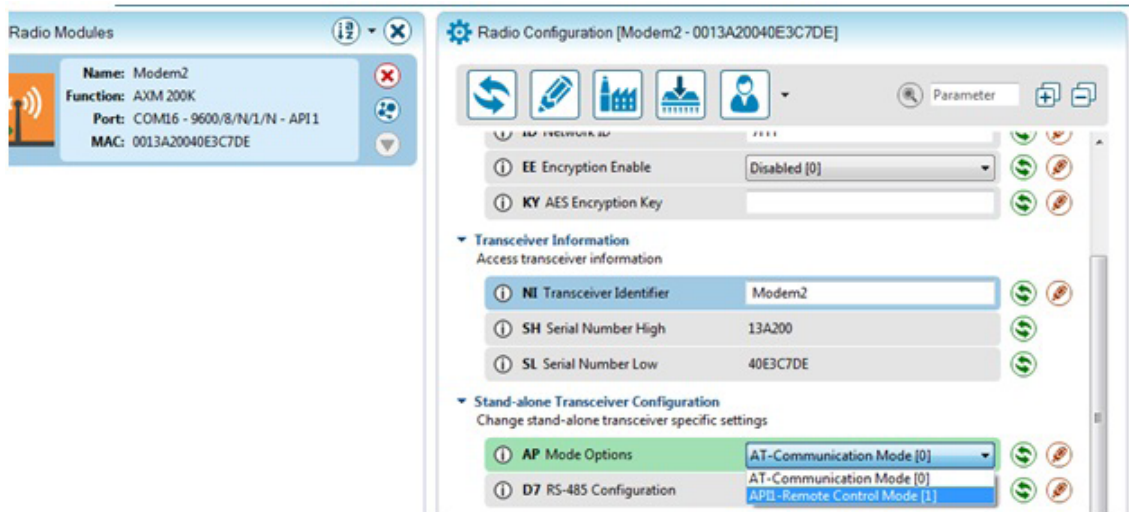
**SL Serial Number Low:** A read only parameter for returning the lower 32 bits of the 64 bit unique assigned address to the transceiver.

## STAND-ALONE TRANSCEIVER CONFIGURATION:

**AP Mode Options:** For the transceiver to communicate with other transceivers in the network this parameter must be set in 'AT-Communication Mode [0].

To configure an individual transceiver, this parameter must be set to API-Remote Control Mode[1].

**D7 RS485 Configuration:** If the transceiver is connected via a RS485 port then this parameter must be set to 'RS485 Enable High.'



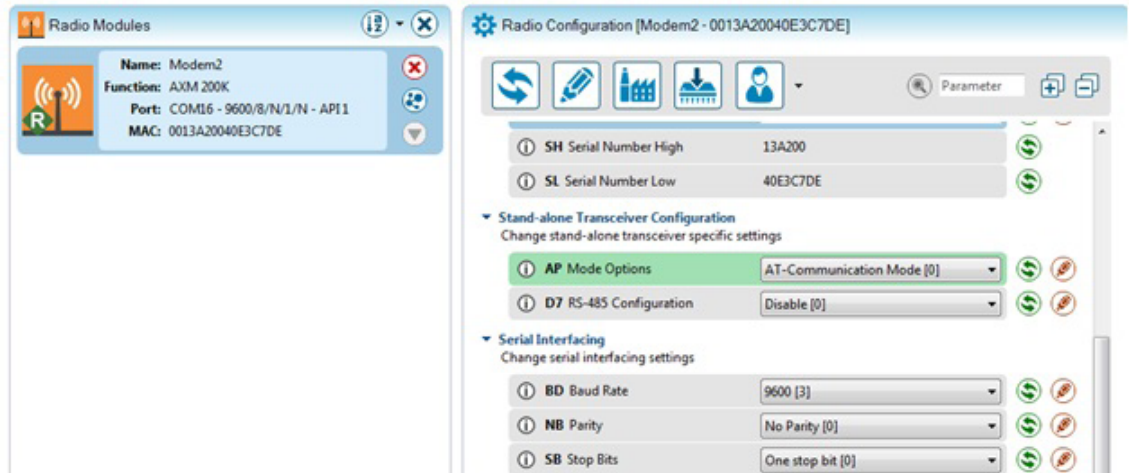



## SERIAL INTERFACING:

**BD Baud Rate:** The baud rate for serial communication between the serial port of the module and the host. Default setting is 9600.

**NB Parity:** Parity for the serial communication. Default is None 1.

**SB Stop Bits:** Number of stop bits used in the serial communication. Default is one stop bit.

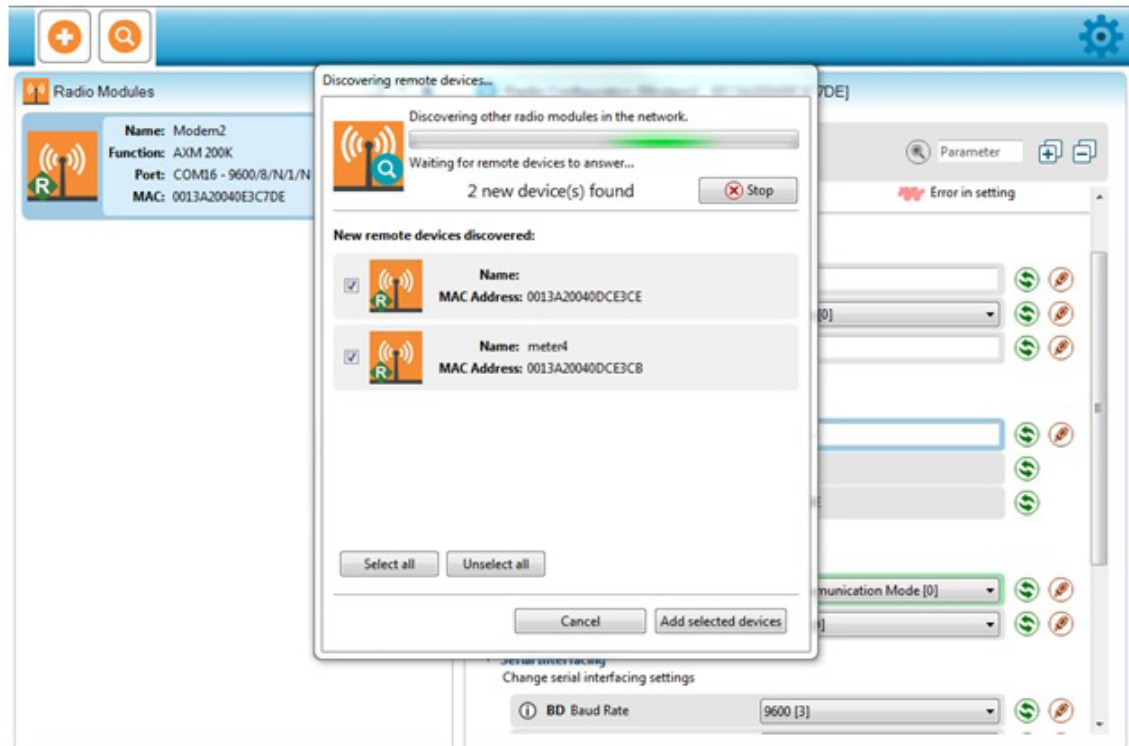


To discover other transceivers within the network press the  besides the transceiver that is connected to the computer's USB port under the 'Radio Modules' menu.

All the remote devices that are in the same network as this transceiver that are found will appear in the pop up box. Press 'Add Selected Devices'.

Once added, these remote devices will appear under the local standalone transceiver and will be denoted as remote modules.

**NOTE:** By default these remote modules will be identified by their MAC Address.



To configure the settings for the remote modules, select the remote module you wish to configure and its information will load under the radio configuration view.

**NOTE:** The settings for the remote modules are identical to that of the local transceiver.

**Radio Modules**

- Name: Modem2  
Function: AXM 200K  
Port: COM16 - 9600/8/N/1/N - AP11  
MAC: 0013A20040E3C7DE
- 2 remote modules
- Name: [redacted]  
Function: AXM 200K  
MAC: 0013A20040DCE3CE
- Name: meter4  
Function: AXM 200K  
MAC: 0013A20040DCE3CB

**Radio Configuration [ - 0013A20040DCE3CE ]**

**Firmware information**

- Product family: ACU-Mesh
- Function set: AXM 200K
- Firmware version: 8071

**Security**

Change security parameters

- ID Network ID: 7FFF
- EE Encryption Enable: Disabled [0]
- KY AES Encryption Key: [ ]

**Transceiver Information**

Access transceiver information

- NI Transceiver Identifier: [ ]
- SH Serial Number High: 13A200
- SL Serial Number Low: 40DCE3CE

**Stand-alone Transceiver Configuration**

Change stand-alone transceiver specific settings

- AP Mode Options: AT-Communication Mode [0]
- D7 RS-485 Configuration: CTS flow control [1]

**Radio Modules**

- Name: Modem2  
Function: AXM 200K  
Port: COM16 - 9600/8/N/1/N - AP11  
MAC: 0013A20040E3C7DE
- 2 remote modules
- Name: Acuvim II  
Function: AXM 200K  
MAC: 0013A20040DCE3CE
- Name: meter4  
Function: AXM 200K  
MAC: 0013A20040DCE3CB

**Radio Configuration [ Acuvim II - 0013A20040DCE3CE ]**

**Firmware information**

- Product family: ACU-Mesh
- Function set: AXM 200K
- Firmware version: 8071

**Security**

Change security parameters

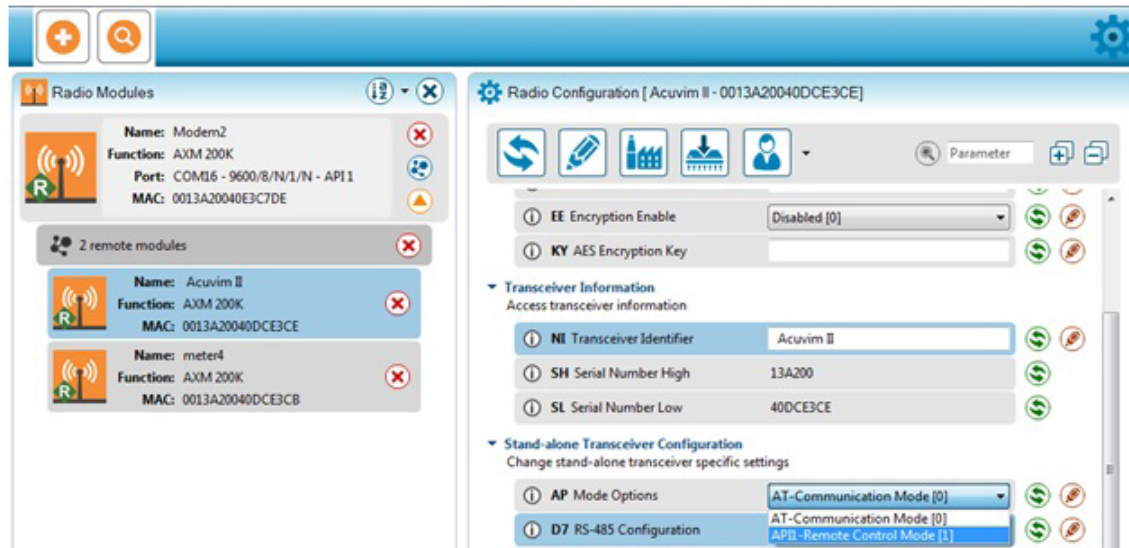
- ID Network ID: 7FFF
- EE Encryption Enable: Disabled [0]
- KY AES Encryption Key: [ ]

**Transceiver Information**

Access transceiver information

- NI Transceiver Identifier: Acuvim II
- SH Serial Number High: 13A200
- SL Serial Number Low: 40DCE3CE

**NOTE:** If you change the Network ID setting of a remote module, it will lose connection and will be lost immediately. In such case, the network setting in the local transceiver needs to be modified with this Network ID so that the local and remote modules can communicate.



To configure a remote module from default settings:

- Modify the network ID in the remote transceiver
- Modify the network ID in the local transceiver after connection between the remote transceiver has been lost in the preceding step. Industrial and Factory Facilities
- Discover remote transceiver again