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Modbus IO Quick Start Guide

Last Updated: June 26, 2009

Introduction: This document is intended to guide the end user through the configuration process of a Modbus IO network. For more detailed instructions on Modbus IO radios please reference the Modbus IO user manual.

Equipment requirements: (An FGR radio must have firmware 2.54 or higher and an FGRIO-S must have firmware 2.53 or higher. Any firmware version on an FGR2 or FGR2-IOS will support Modbus applications).

This Quick Start document will guide a user through the configuration process using Tool Suite. This program can be downloaded from the FreeWave website at http://www.freewave.com/phpscript/FreeWaveToolSuite3.php. In order to download the software, you will need a customer login password. If you do not have a password, or do not remember your password, please call FreeWave Customer Support at 303-381-9200, or toll-free at 1-866-923-6168.

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1). Modbus Master Setup.

The Master radio in a Modbus IO network is a standard serial FGR or FGR2 series FreeWave radio and it should be configured as a Multipoint Master.

Connect the radio to a computer that has the Tool Suite program installed on it. Open Tool Suite, click on the Configuration button, and then click 'Read Radio'. A screen like that shown in Figure 1 should appear.

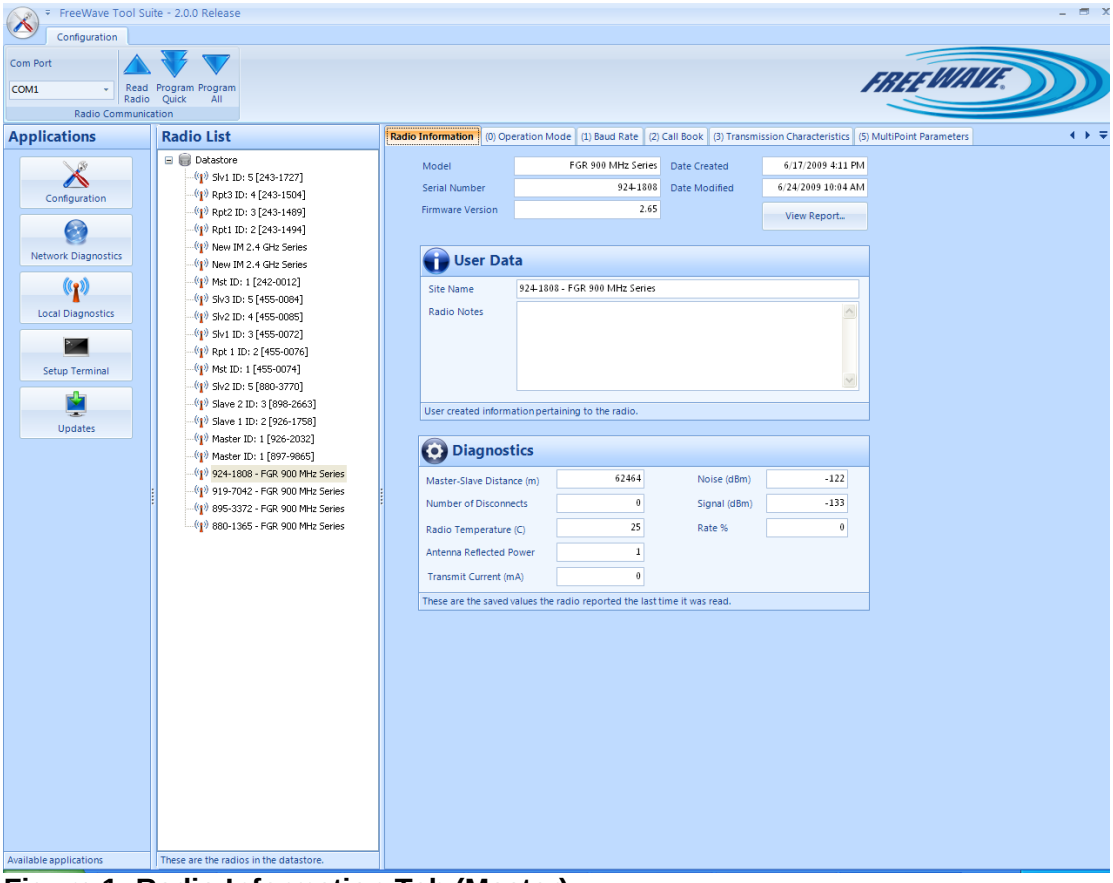

Figure 1: Radio Information Tab (Master)

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Master's Operation Mode Tab (Figure 2)

- Select "Modem Mode" (2) Point to Multipoint Master. Ethernet options should be left at the default settings.

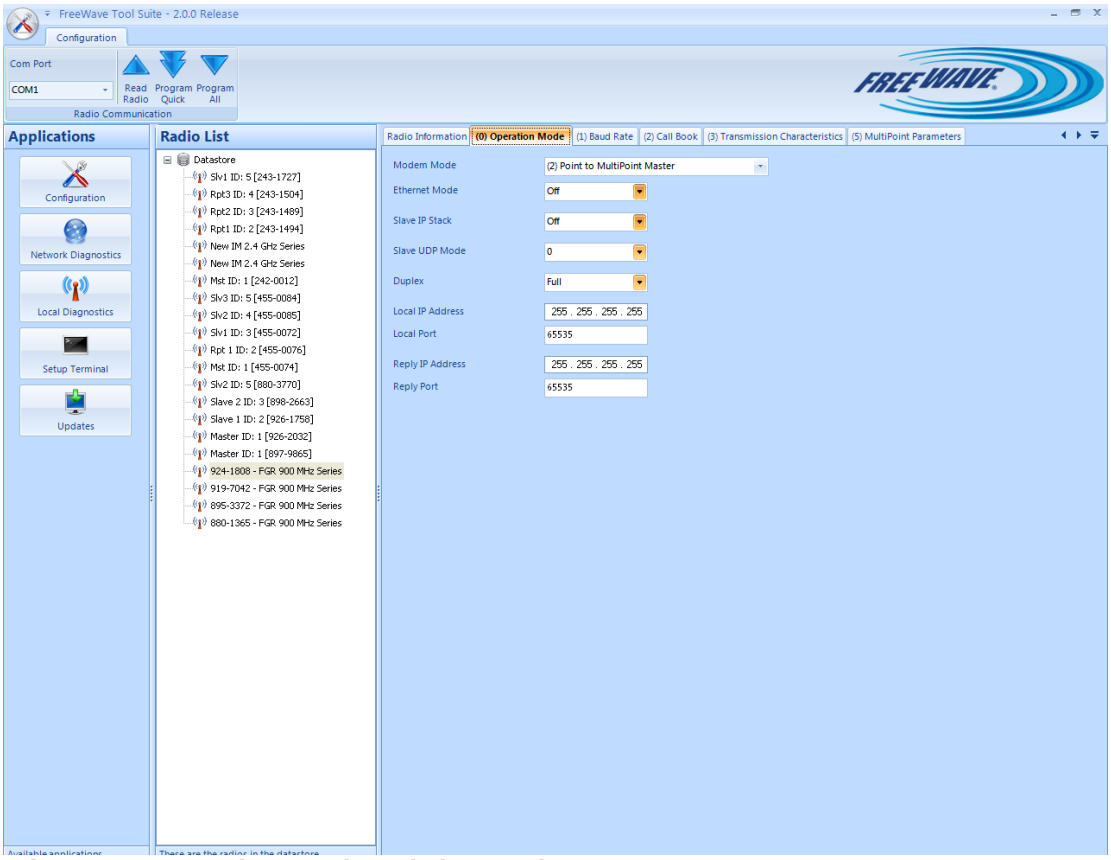

Figure 2: Operation Mode Tab (Master)

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Master's Baud Rate Tab (Figure 3)

The Master radio must have the following options set to work properly:

- "Baud Rate", "Serial Interface", "Data Parity" and "Flow Control" must match the polling host.
- "Modbus RTU" must be set to 1.
- "Turn On Delay" should be set to 0. (This may be adjusted at a later point)
- "Turn Off Delay" should be set to 4. (If using RS-485)
- If using RS-422 or RS-485 "Setup Port" must be set to "Diagnostics Only".

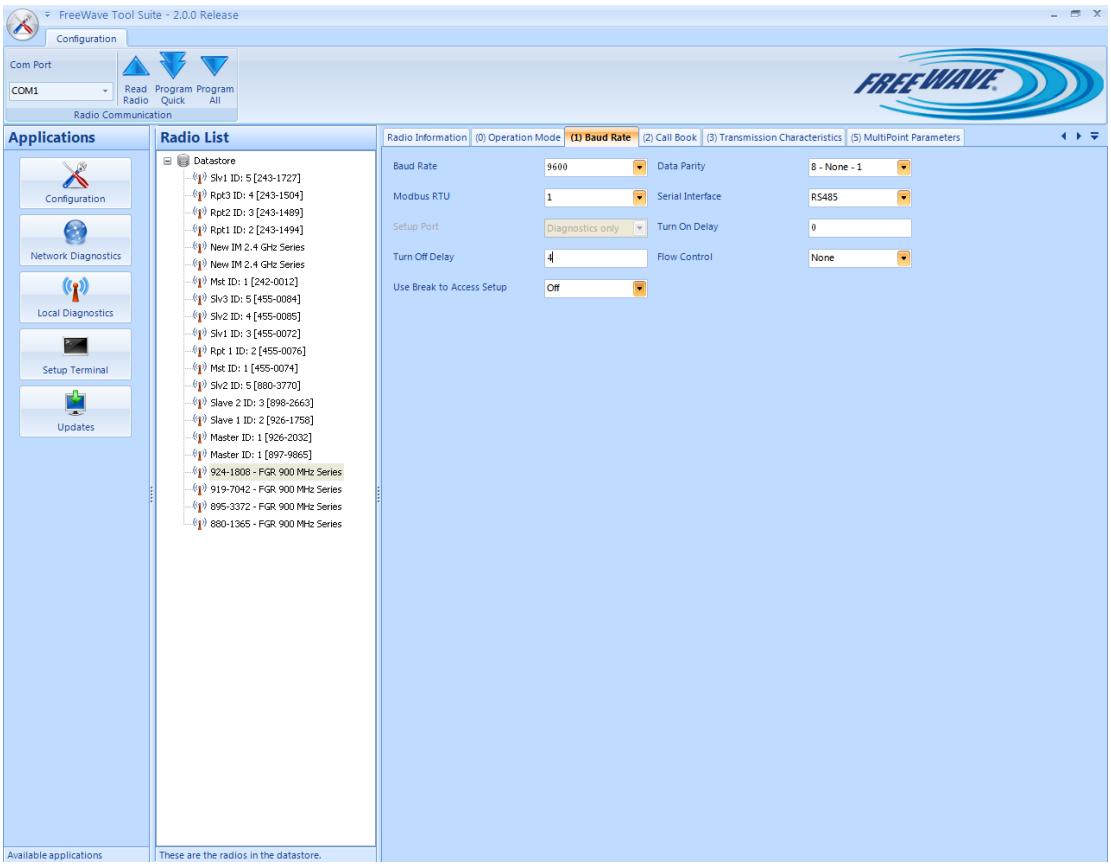

Figure 3: Baud Rate Tab (Master)

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Master's Call Book Tab
The Master's Call Book Tab is not used in Modbus IO mode.

Master's Transmission Characteristics Tab (Figure 4)

- A minimum combined packet size of 48 Bytes is required for Modbus IO (Max Packet Size of 2 and a Min Packet Size of 2). Please refer to the Modbus IO user manual for more detailed information.
- Packet sizes of 2 and 2 are recommended for optimum throughput.
- There is a relationship between the packet size and maximum reliable count rate of the Digital Input's (DI's). With Max and Min Packet Sizes of 2, up to 25Hz (at 50% duty cycle, 20msec per phase) can be counted.
- Larger packet sizes will function, but the count rate will reduce; sizes of 9 and 9 will reliably count to 10Hz (50Msec per phase).
- All other settings may remain at default.

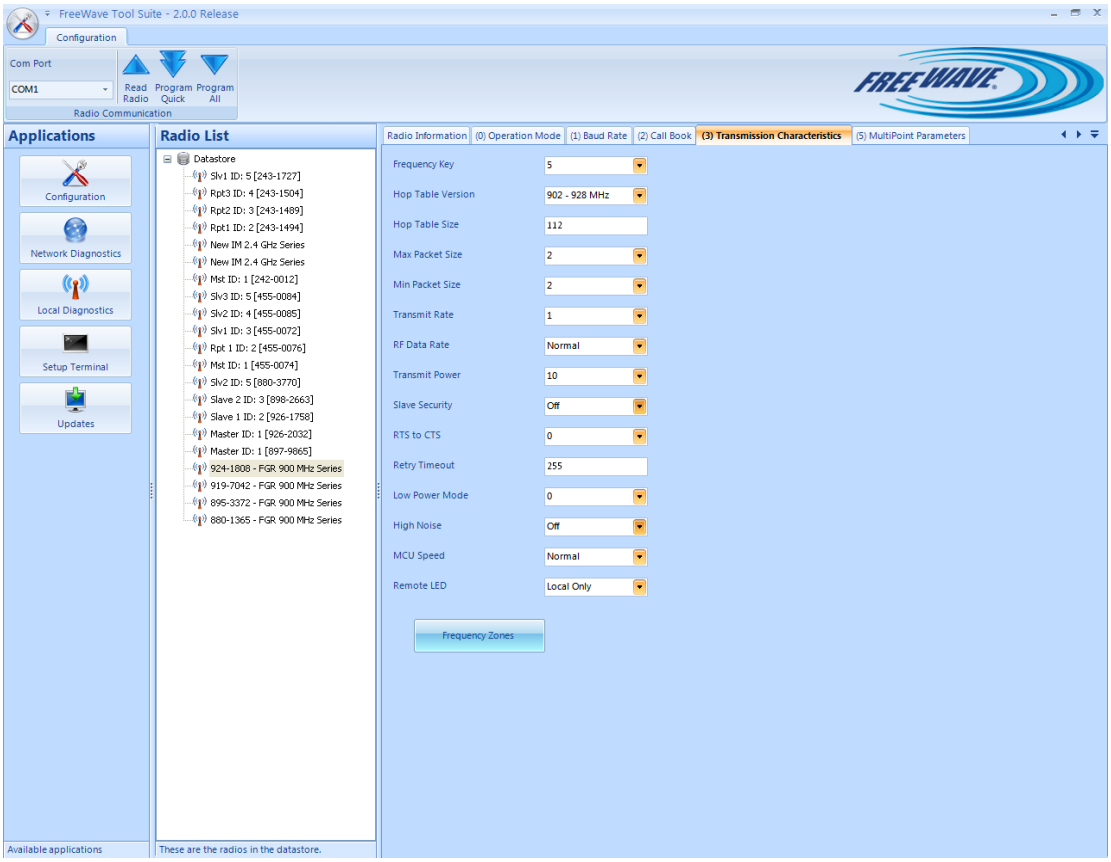

Figure 4: Transmission Characteristics Tab (Master)

Master's MultiPoint Parameters Tab (Figure 5)

- "Master Packet Repeat" should be set to "3"
- "Retry Odds" should be set to "0" (zero).
- "Network ID" should be a unique number between 0 and 4095, excluding 255.
- "Subnet ID" RX and TX should be set to 0. (Please see FreeWave User Manual for more details).
- Other settings in the MultiPoint Parameters tab are to be set at the users' discretion according to the FreeWave User Manual.

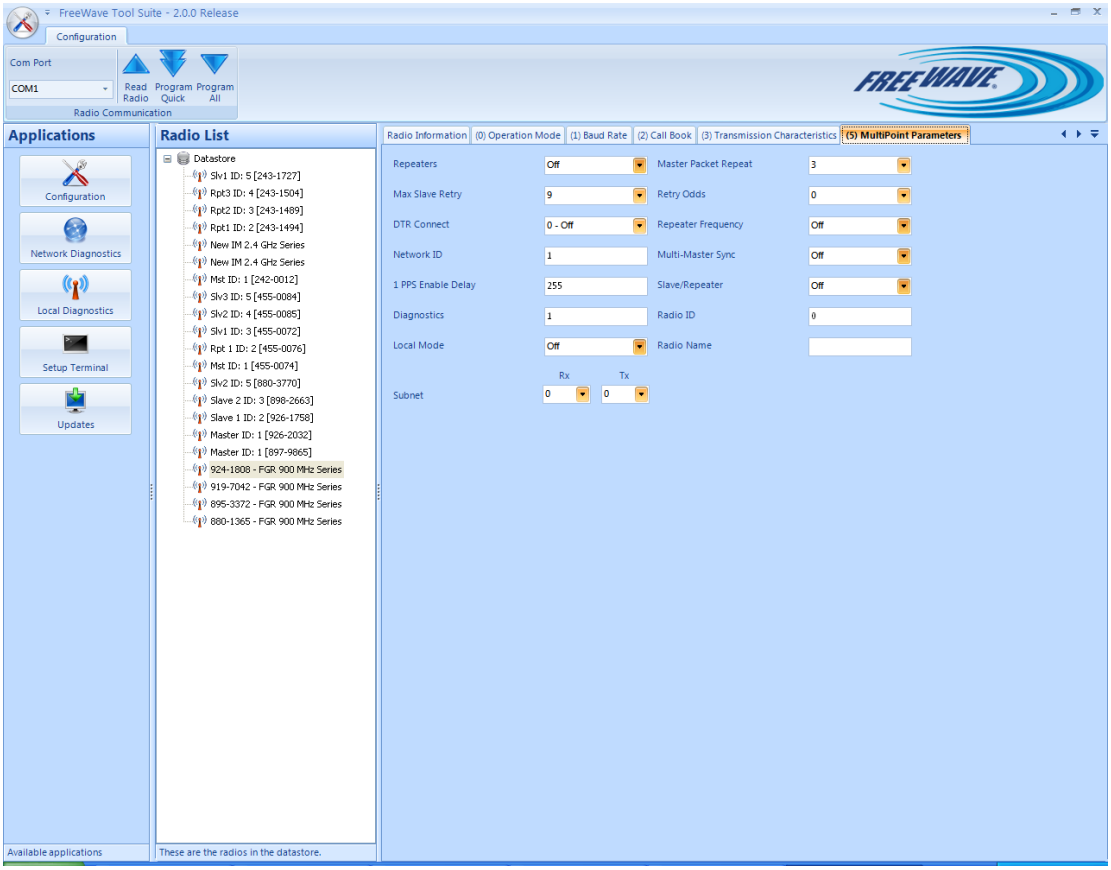

Figure 5: MultiPoint Parameters Tab (Master)

2). Modbus IO Slave.

Open Tool Suite, click on the Configuration button, and then click 'Read Radio'. A screen like that shown in Figure 6 should appear.

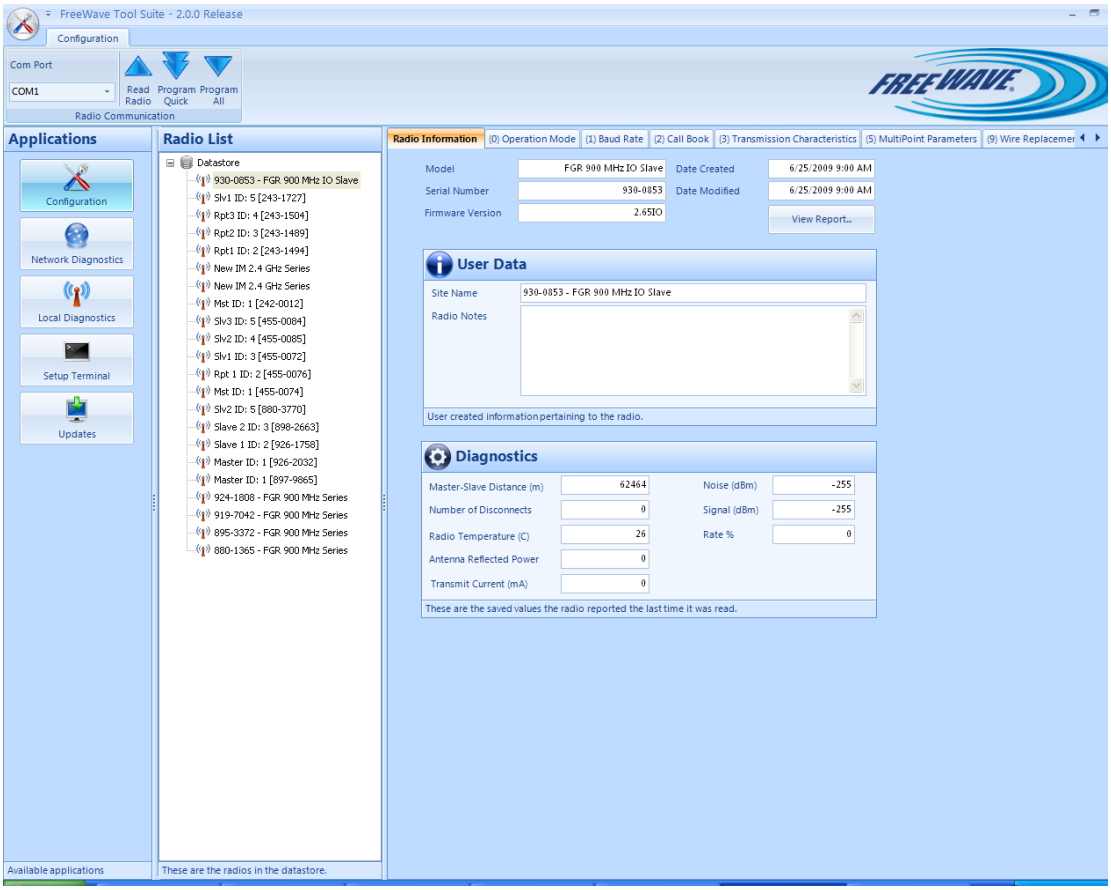

Figure 6: Radio Information Tab (Slave)

Slave's Operation Mode Tab (Figure 7)

- Select "Modem Mode" (3) Point to Multipoint Slave. DO NOT select "(E) FGRIO Slave (NON-MODBUS)".

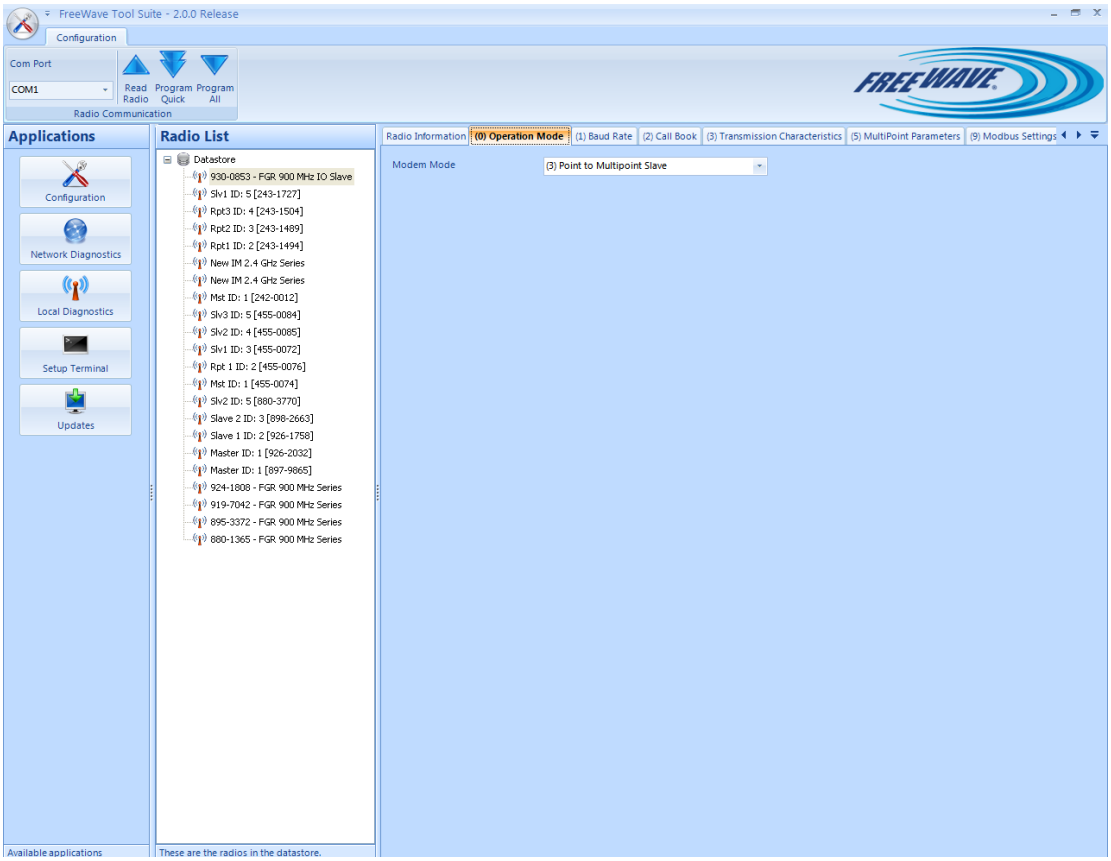

Figure 7: Operation Mode Tab (Slave)

Slave's Baud Rate Tab (Figure 8)

The Slave radio must have the following options set to work properly:

- "Baud Rate", "Serial Interface," "Data Parity" and "Flow Control" must match the polling host.
- "Modbus RTU" must be set to 1.
- "Turn On Delay" should be set to 0. (This may be adjusted at a later point)
- "Turn Off Delay" should be set to 4. (If using RS-485)
- If using RS-422 or RS-485 "Setup Port" must be set to "Diagnostics Only".

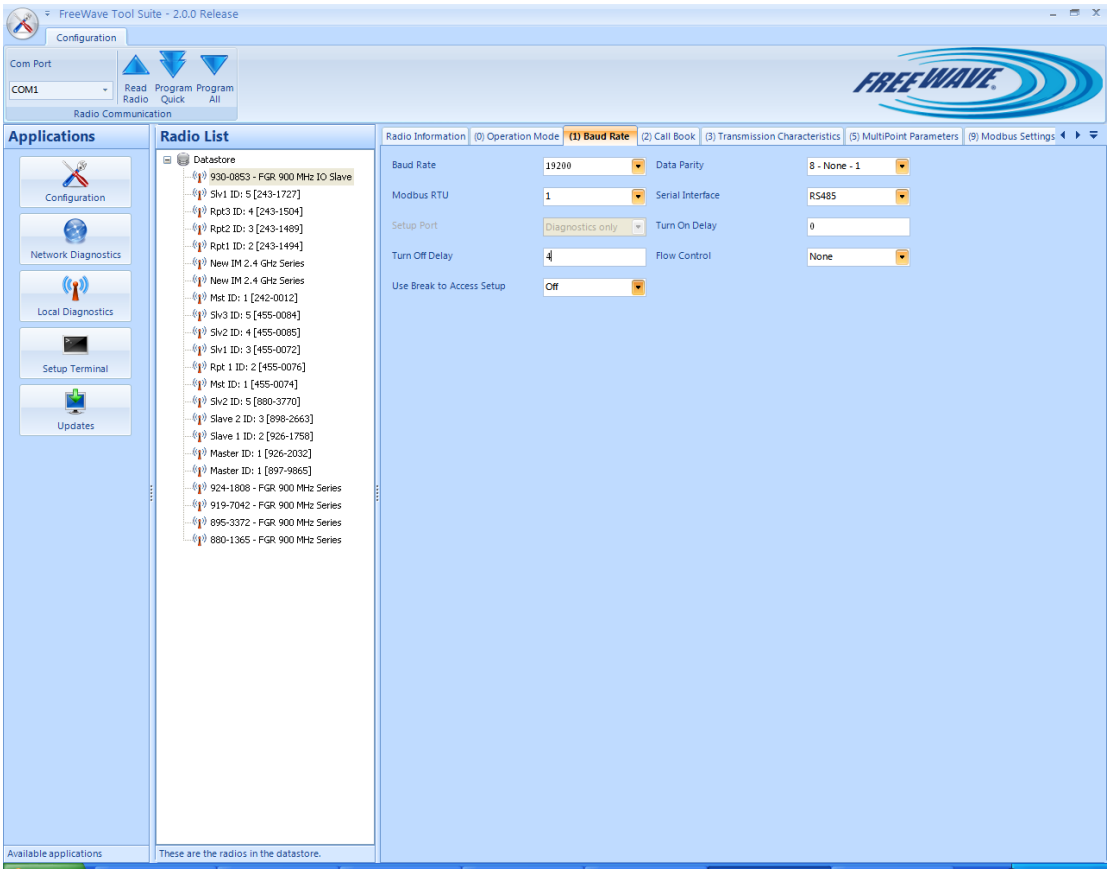

Figure 8: Baud Rate Tab (Master)

Slave's Call Book Tab

The Slave's Call Book Tab is not used in Modbus IO mode.

Slave's Transmission Characteristics Tab (Figure 9)

- Set "Frequency Key", "Hop Table Version" and "Hop Table Size" to match the Master.
- Set "Max" and "Min Packet Sizes" to match the Master.
- Other settings in the Transmission Characteristics tab are to be set at the users' discretion according to the FreeWave User Manual.

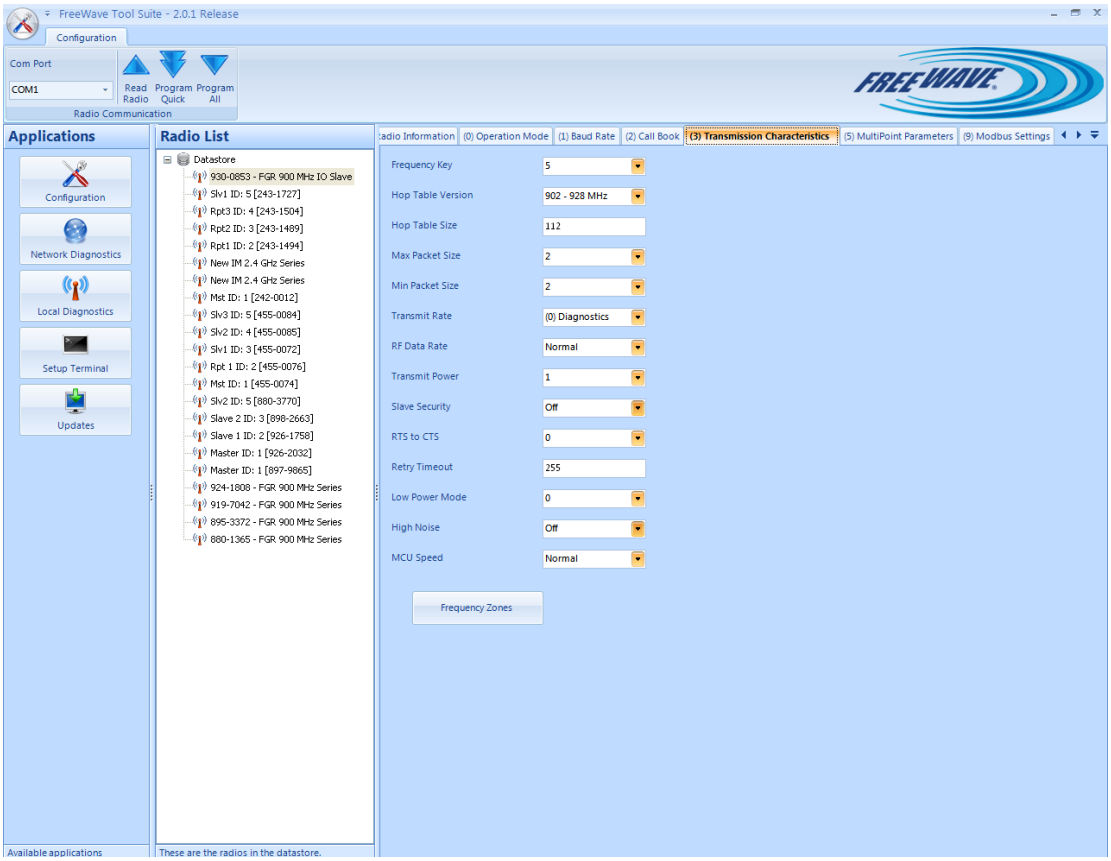

Figure 9: Transmission Characteristics Tab (Slave)

Slave's MultiPoint Parameters Tab (Figure 10)

- Set “Master Packet Repeat” to “3”.
- Set “Retry Odds” to 0 (zero).
- Set “Network ID” to match the Master.
- “Subnet ID” RX should be set to 0 (zero) and TX should be set to F.
- Other settings in the MultiPoint Parameters tab are to be set at the users’ discretion according to the FreeWave User Manual.

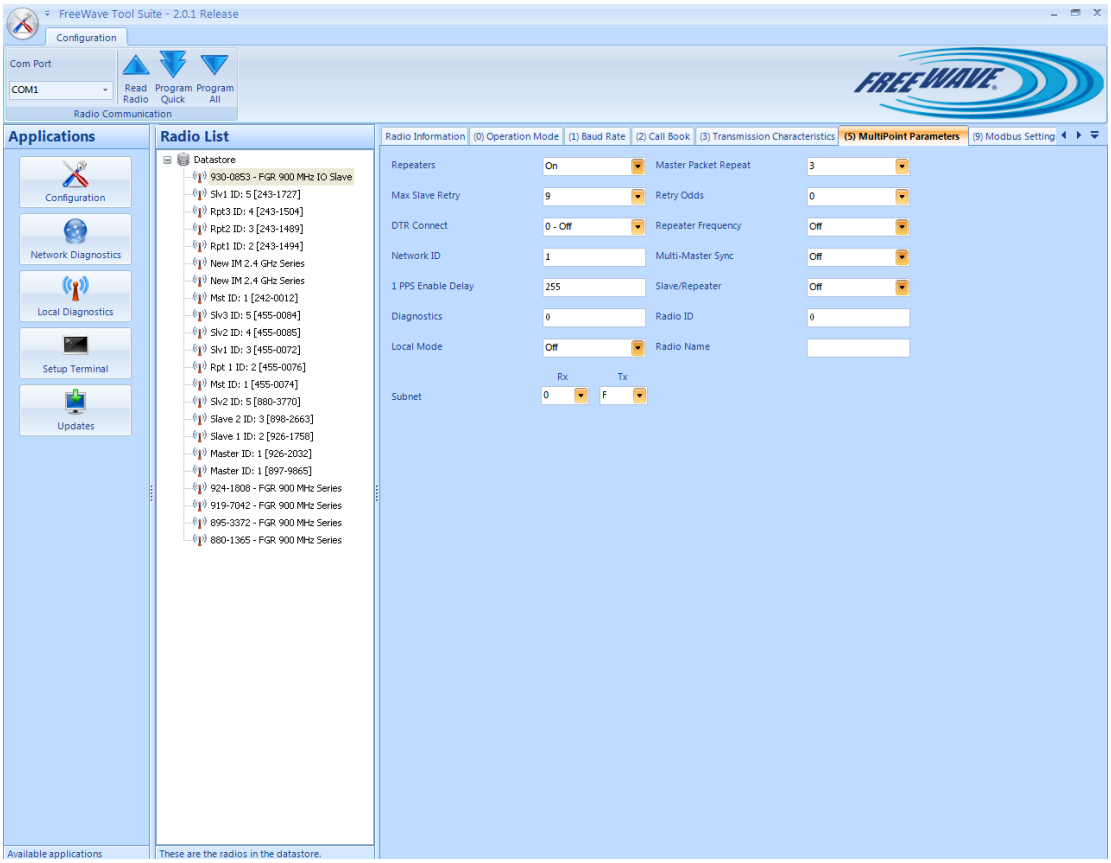

Figure 10: MultiPoint Parameters Tab (Figure 10)

Slave’s Modbus Settings Tab (Figure 11)

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- "Modbus Mode" must be enabled, allowing the user to make changes with respect to the Modbus IO slave.
- "Modbus Address Size" lists 8bit or 16bit Modbus addressing options.
  NOTE: 16bit Modbus addressing requires Firmware of 2.65IO or higher.
- "Modbus ID" is a selectable value from 1-246 in 8bit addressing, or 1 to 65535 in 16bit addressing.
- "Sensor Power Default" states the default output of the sensor power pin at power-on. Options are 'On' or 'Off'.
- "AI1 User Offset" and "AI2 User Offset" are user-entered values to subtract from the AI1 and AI2 MSW (Most Significant Word) measurements to provide zero-shifted versions of AI1 and AI2. See the Modbus user manual for further information.
- "DI 1 Pullup" and "DI 2 Pullup" control power-up states of the internal resistor (10Kohms) connected to the DIs. They can pull up, such as when using a closed-contact-to-GND switch input, pull down so that unused inputs read "0" as DIs or ~0 as auxiliary analogs, or float to not load analog inputs.
- "DI 1 Counter Edge" and "DI 2 Counter Edge" options are Rising or Falling Edge.
- "Clear Cntr 1 on Read" and "Clear Cntr 2 on Read" will clear the count on the given Digital Input immediately after Reading if the setting is 'On'. This prevents loss of counts which could occur between a Read operation and a later Clear operation. NOTE: Clear on Read **only** works when both 16bit registers are read together in a single Modbus poll.
- "Digital Out 1 Default" and "Digital Out 2 Default" control the state of the digital output defaults invoked on loss of communication.
  - Output ON = energized (Contact to ground is closed)
  - Output OFF = not energized (Contact open)
  - No Change = if communication is lost, do not change state.
- "Default Delay" is a value set is in .28 second increments. This sets the delay between the loss of communication and the time when the radio enters the default condition.

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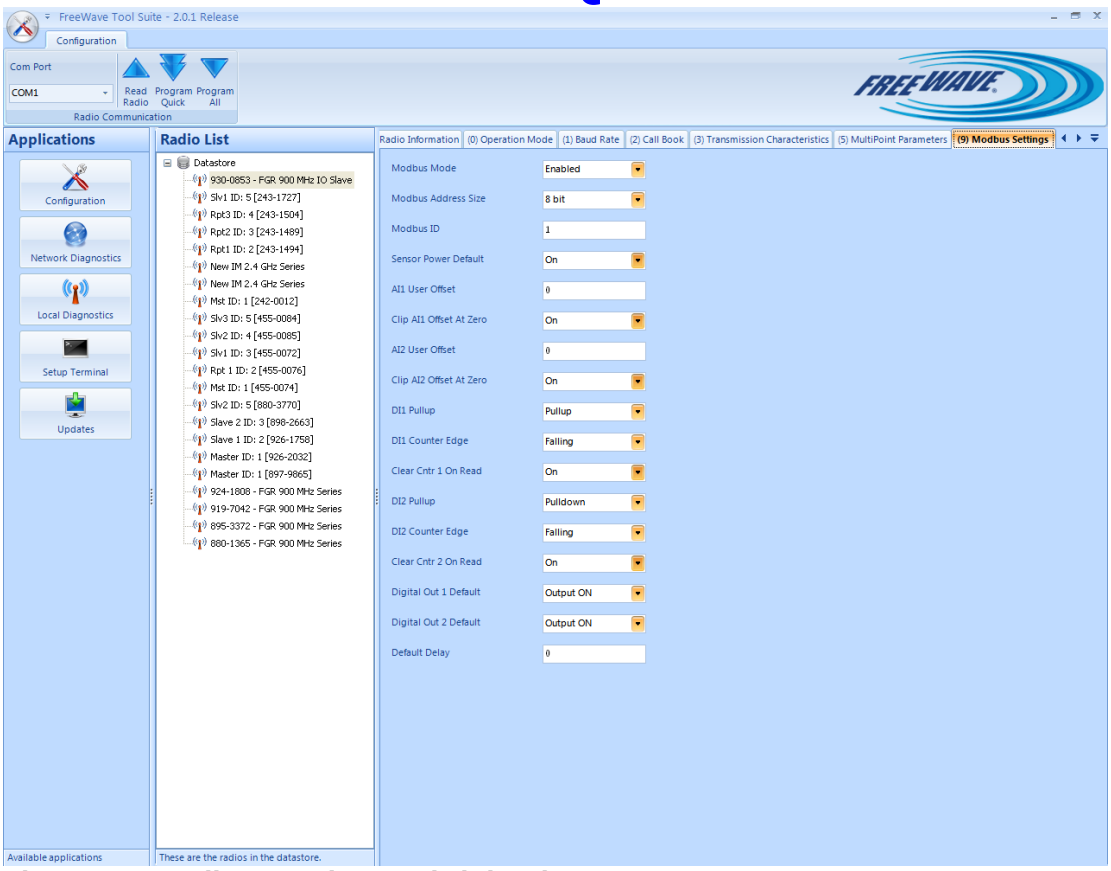

Figure 11: Modbus Settings Tab (Slave)

Please refer to the FreeWave Modbus IO User Manual for specific details on each setting.

FreeWave provides Technical Support, Monday through Friday 8:00AM to 5:00PM, Mountain Time (GMT-7). Call toll-free at 1-866-923-6168 or 303-381-9200 or email at moreinfo@freewave.com.