Configuring RAD-900-IFS with GW MODBUS TCP/RTU for Modbus TCP Communication

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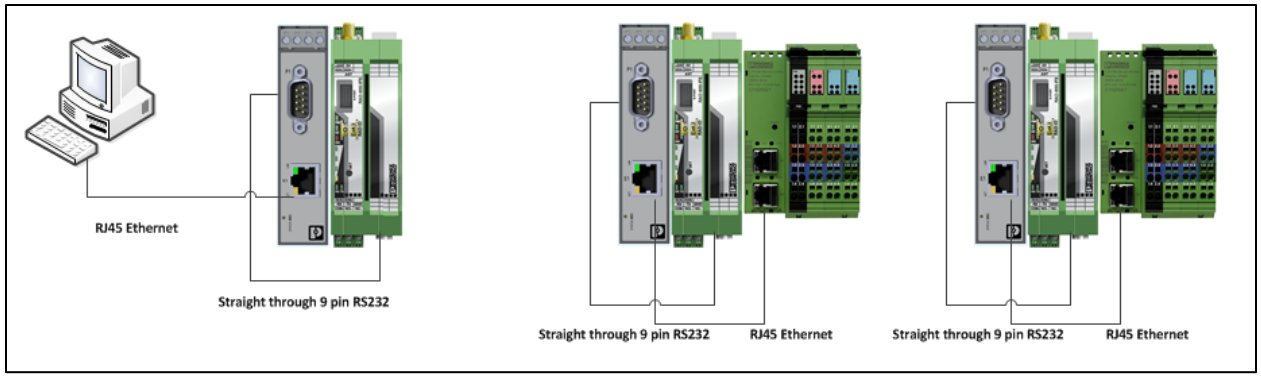
Introduction

Objectives:

This document covers configuring the RAD-900-IFS wireless module and the GW MODBUS TCP/RTU 1E/DB9 for MODBUS TCP to MODBUS TCP communication between a master station and two remote slave locations.



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Requirements:

The following hardware and software was used in the development of this procedure

- Wireless Module – 2901540 - RAD-900-IFS (Quantity 3)
- Antenna - 2885676 - RAD-ISM-900-ANT-OMNI-RPSMA (Quantity 3)
- Communication Gateway – 2702764 - GW MODBUS TCP/RTU 1E/1DB9 (Quantity 3)
- Modbus TCP Bus Coupler – 2703981 - IL ETH BK DI8 DO4 2TX-PAC (Quantity 2)
- Software
  - PSI CONF 2.60 or higher – available at www.phoenixcontact.com/catalog/2901540
  - IPAssign_v1.1.3 – available at www.phoenixcontact.com/catalog/2703981
  - Wintech Modscan 32 – available at https://www.win-tech.com/html/demos.htm
    - Note: This is a trial version

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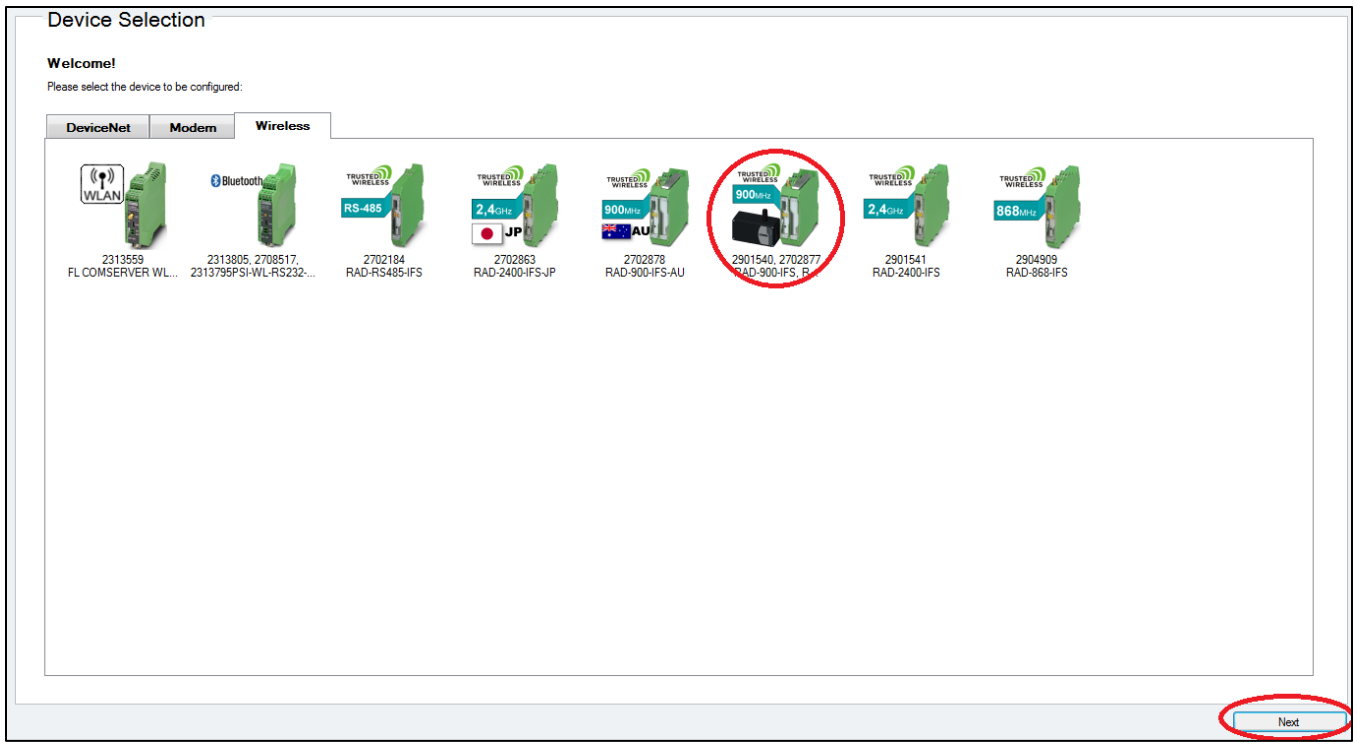
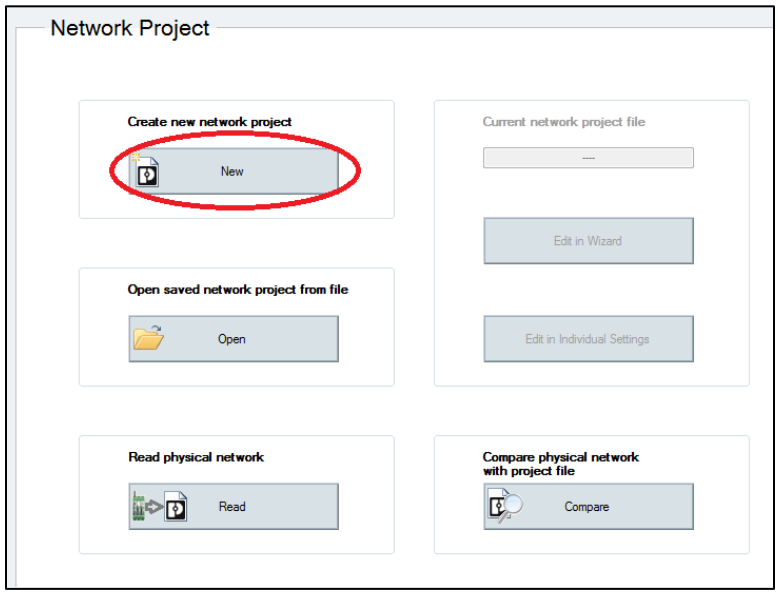
Procedure

Configuring the RAD-900-IFS wireless modules for serial communication

1. Set the yellow thumbwheels of the three RAD-900-IFS modules to 01, 02 and 03 and reference the data sheet (www.phoenixcontact.com/catalog/2901540) for power connections. Apply power to all three wireless modules.
2. Open PSI-CONF 2.60 and select the 900 MHz selection under the Wireless tab. Click ‘Next’



3. Click on ‘New’



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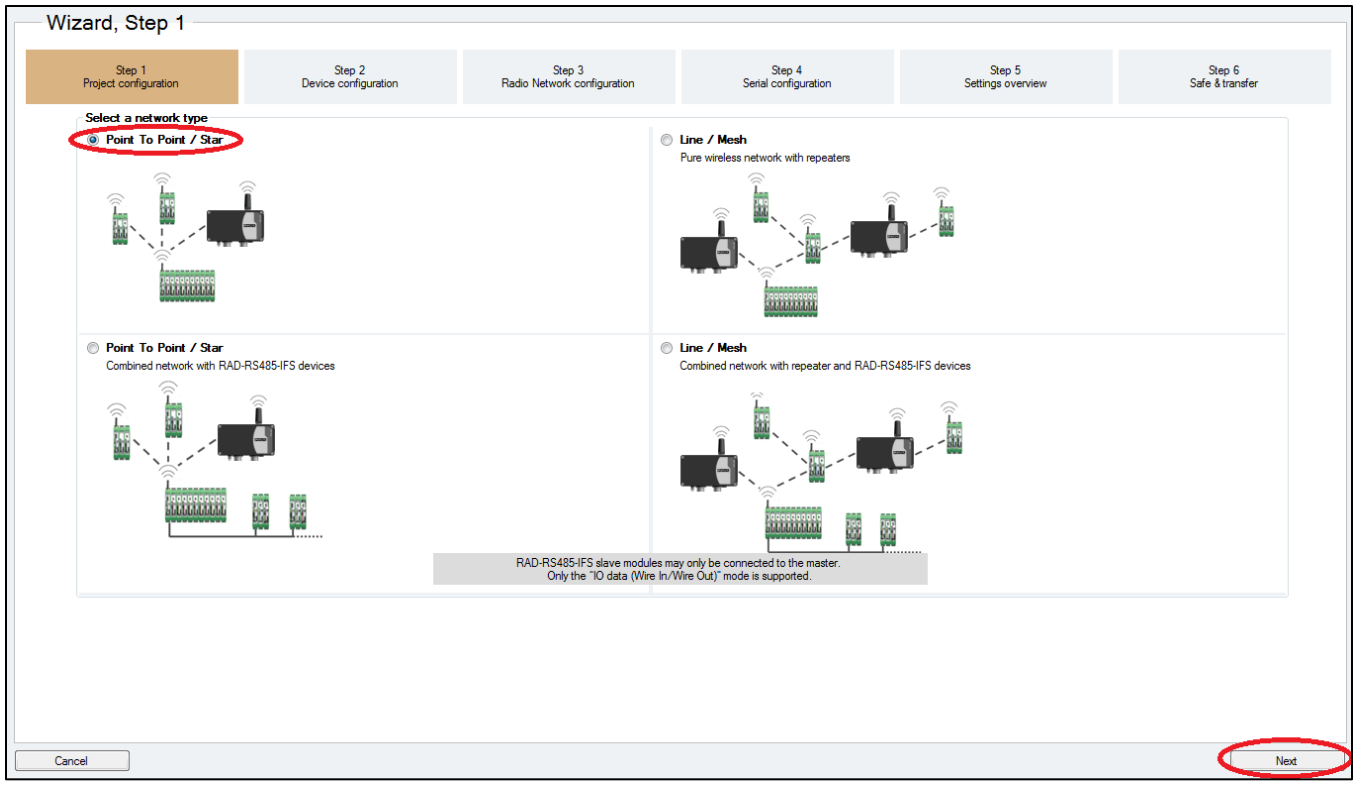
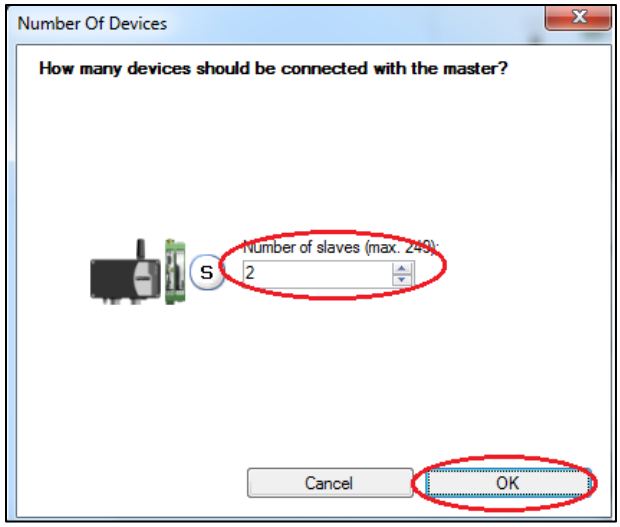
4. Select ‘Point To Point / Star’ and click ‘Next’



5. Set the number of slaves to ‘2’ and click “OK’.



6. On Wizard, Step 2, confirm information is correct and click ‘Next’.

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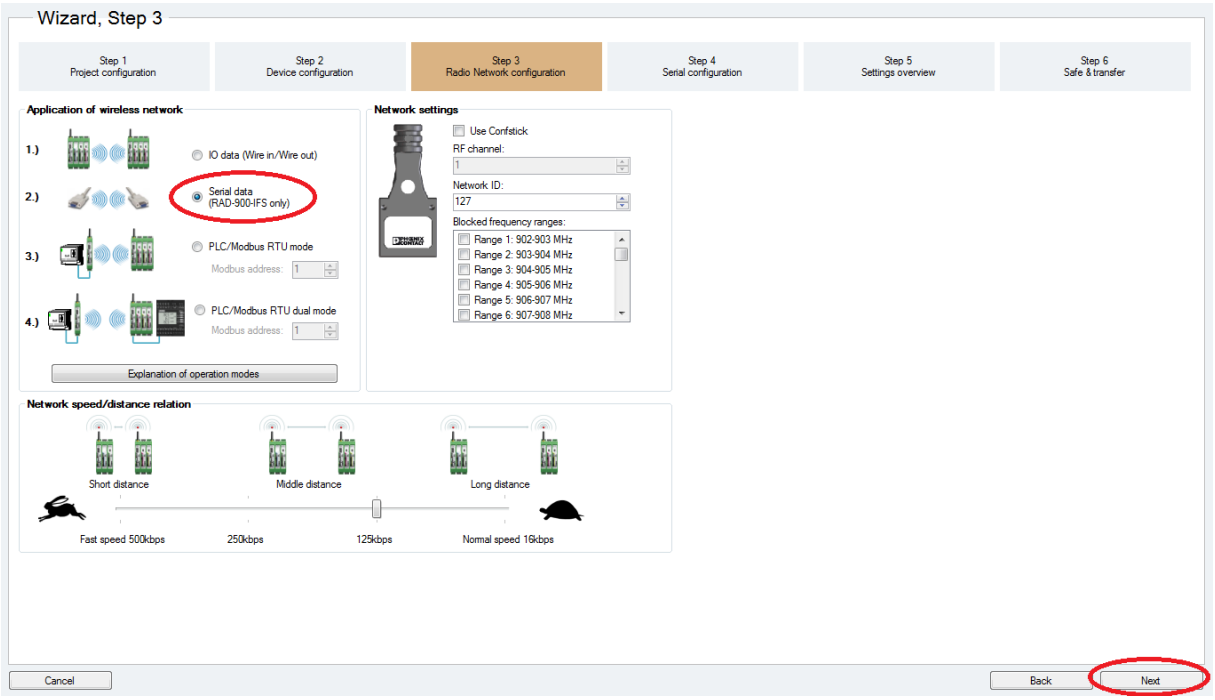
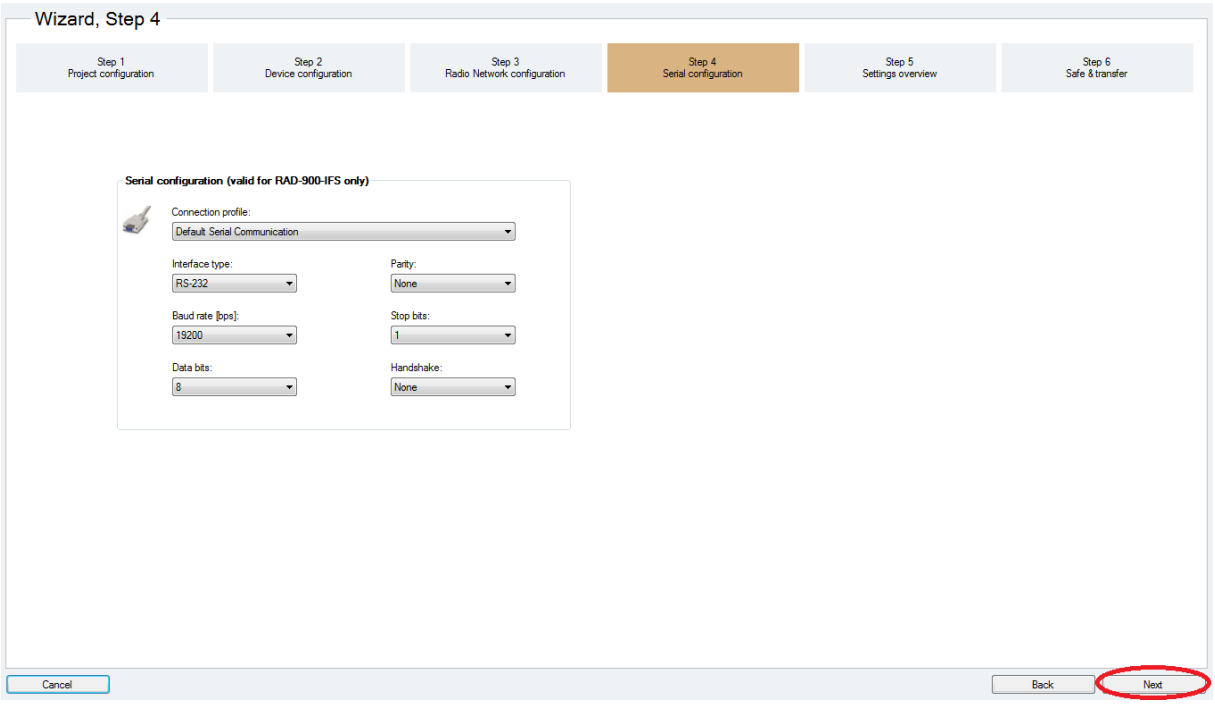
7. On ‘Wizard, Step 3’, select ‘Serial data’ Mode in the ‘Application of wireless network section’. For a simple bench test the rest of the settings can be left unchanged, but depending on the environment that the system will be installed in the “Network Settings’ and ‘Network speed/distance relation’ settings may need to be adjusted. Click ‘Next’



8. On ‘Wizard, Step 4’, leave the settings at default and click ‘Next’.



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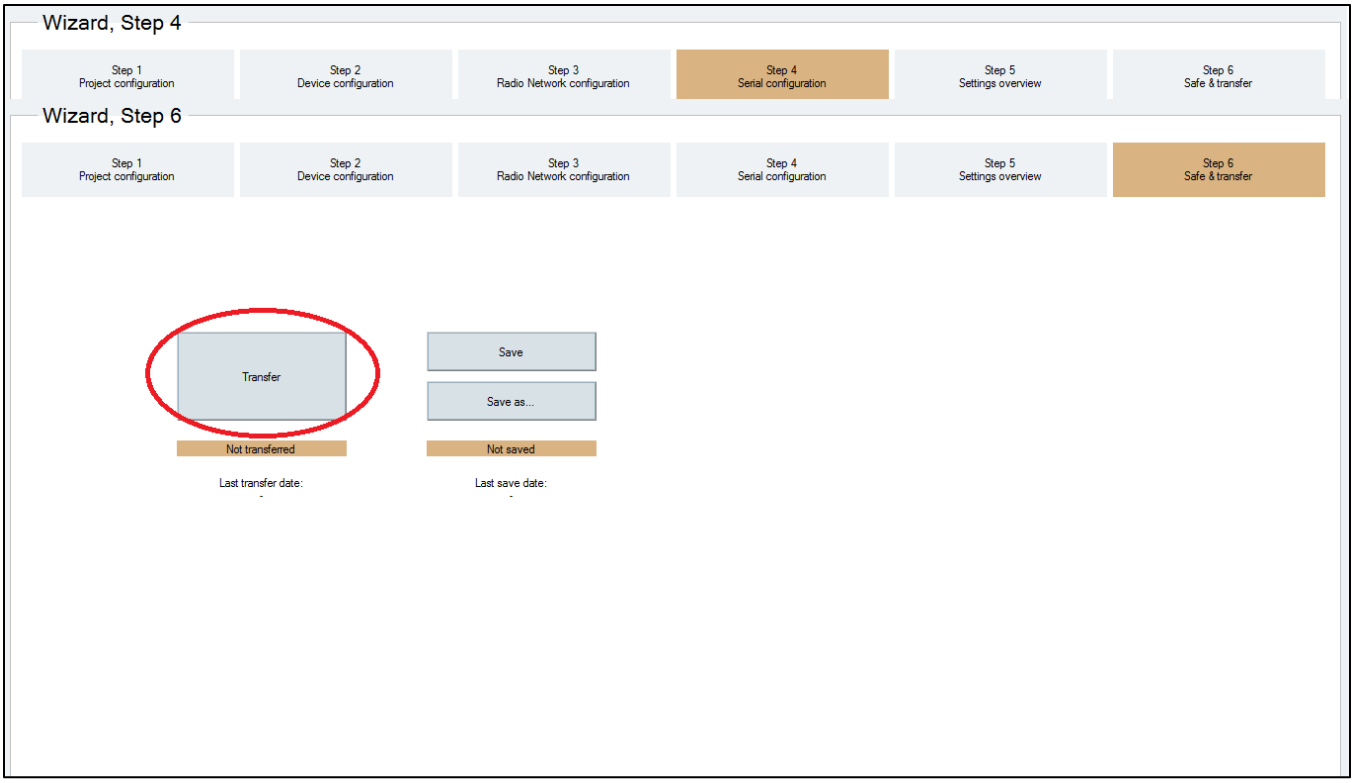
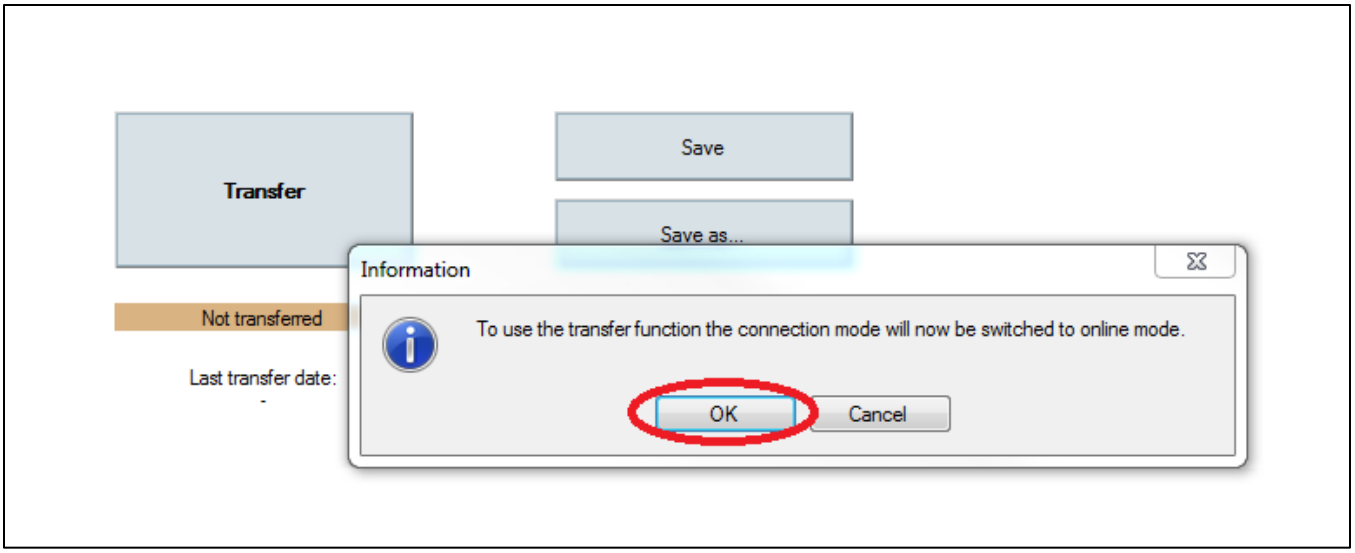
9. On ‘Wizard, Step 5’, review the data and click ‘Next’
10. On ‘Wizard, Step 6’, make sure your programming cable is connected from your computer to a wireless module. Click ‘Transfer’ to send the configuration to the wireless modules. You will be prompted to save your configuration. Choose a file location to save your program.



11. When prompted, click ‘OK’ to go online to the wireless module



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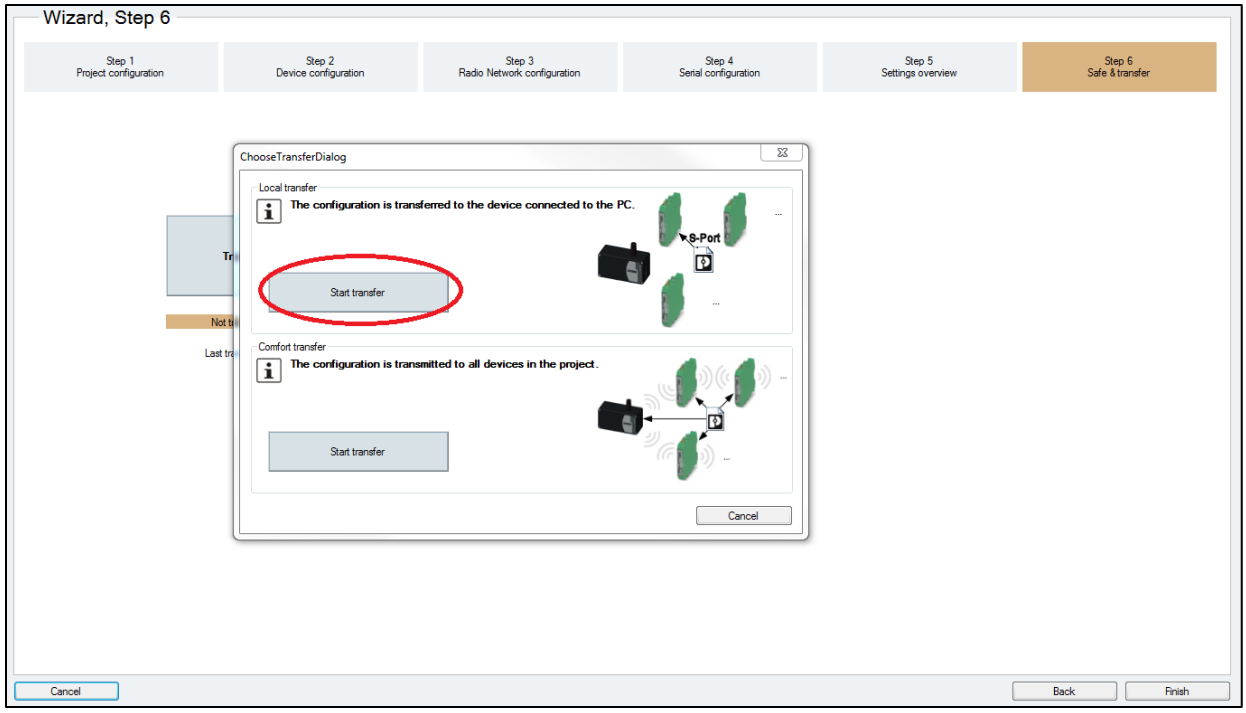
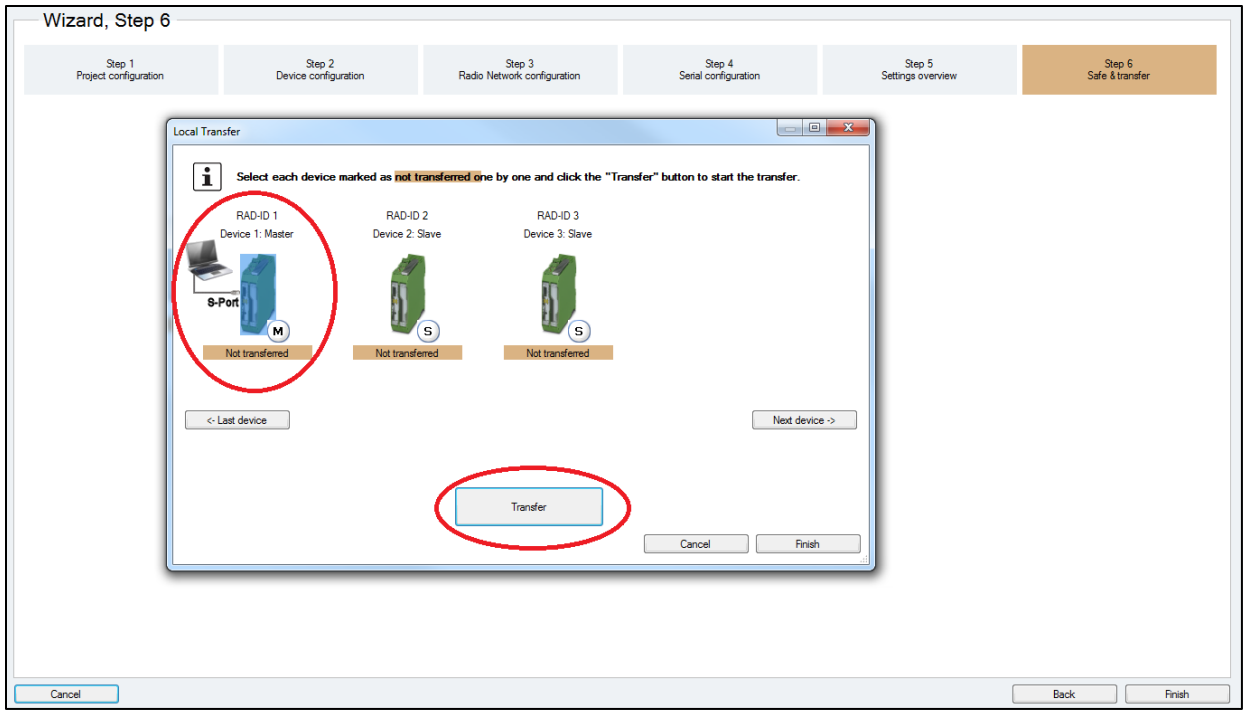
12. Click on ‘Start Transfer’ under ‘Local Transfer’ to send the configuration to each device. Once you transfer the configuration to one wireless module, move your programming cable to the next wireless module. The Transfer Window will show you which module you are connected to and which modules have had the configuration transferred. Repeat this process for all three modules until they all show ‘transferred’.





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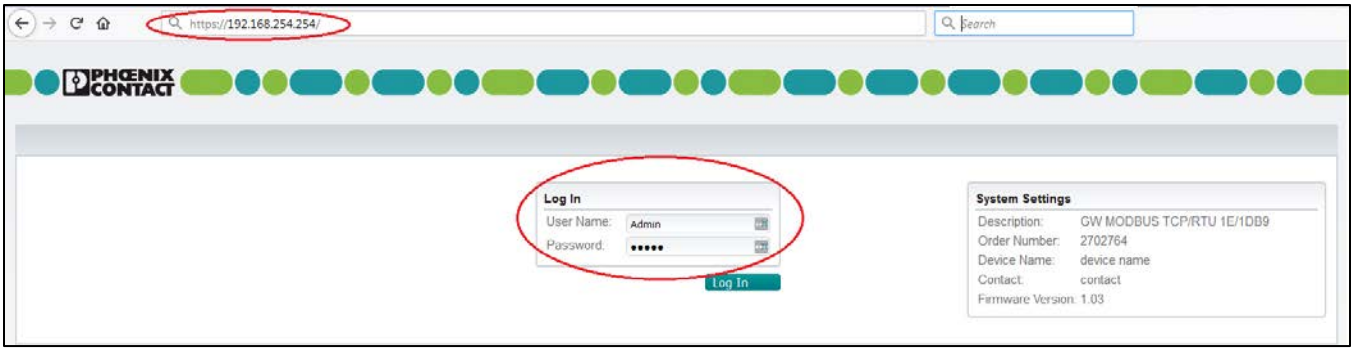
13. Once you have sent the configuration to each wireless module, the wireless network configuration is complete. The 4 vertical RF Link LEDs on the wireless modules should illuminate. On the master wireless module (Yellow Thumbwheel on 01) should have one amber LED illuminated (assuming there is more than one slave wireless module in the network) and depending on the antennae on the slave wireless modules, there should be an amber and module green LEDs illuminated.

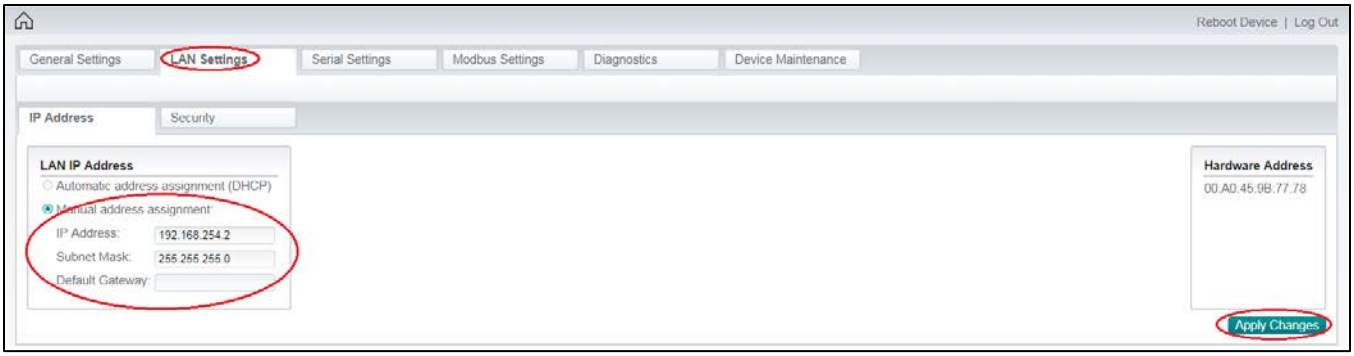
The wireless network configuration is complete and is set up for transparent serial communication.

Configuring the two GW MODBUS TCP/RTU 1E/DB9 module for Modbus RTU to TCP communication

1. The GW MODBUS TCP/RTU 1E/DB9 comes with a default IP address of 192.168.254.254. Set your computer's IP address in the same network as the GW MODBUS TCP/RTU 1E/DB9 (192.168.254.XXX). Reference the data sheet for power connections and apply power to all three gateways.
2. For the GW MODBUS TCP/RTU 1E/DB9 that will be connected to the master RAD-900-IFS wireless module (yellow thumbwheel 01), there is no configuration needed. The default settings of the GW MODBUS TCP/RTU 1E/DB9 are compatible with the settings made on the master RAD-900-IFS.
3. Connect a standard straight through RJ45 Ethernet cable from your computer to the LAN port of the GW MODBUS TCP/RTU 1E/DB9 that will be connected to the RAD-900-IFS module with yellow thumbwheel address 02. Open an Internet browser and navigate to the webpage by typing in 192.168.254.254 in the address bar. Login with User Name 'Admin' and password 'admin'.



4. Next, navigate to the 'LAN Setting' tab and change the IP Address to 192.168.254.2. Click 'Apply Changes'. You will need to re-login at the new IP address once the change is made.



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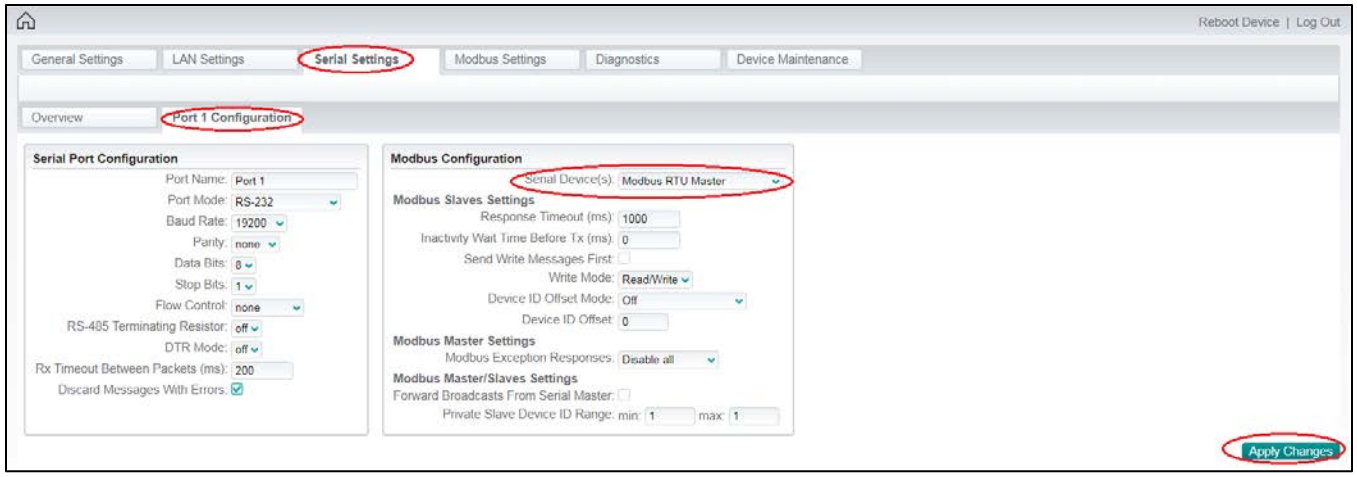
5. Next, navigate to the ‘Serial’ Settings’ tab and then to the ‘Port 1 Configuration’ tab. Change the ‘Serial Device(s)’ drop down to ‘Modbus RTU Master’. This is configuring the GW MODBUS TCP/RTU 1E/DB9 to interpret the serial data on the serial port as coming from a Modbus RTU Master device. Click ‘Apply Changes’.



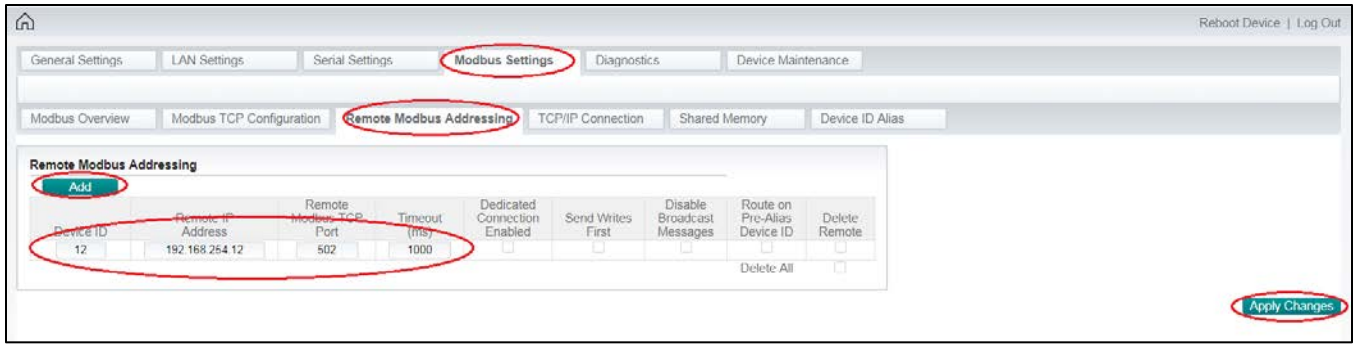
6. Next, navigate to the ‘Modbus Settings’ tab and then to the ‘Remote Modbus Addressing’ tab. Since the communication coming from the RAD-900-IFS wireless module is Modbus RTU and has no IP detail, we need to map the Modbus RTU serial data to the correct IP address. In this setup, we will be linking a Modbus RTU packet destined for Modbus ID 12 to Modbus TCP device 192.168.254.12 so any packet with Modbus ID 12 coming from the serial port of the RAD-900-IFS module will be sent to IP address 192.168.254.12.

   Click the ‘Add’ button and set the

   Device ID to 12

   Remote IP Address to 192.168.254.12

   Click Apply Changes



The configuration for the first GW MODBUS TCP/RTU 1E/DB9 is now complete.

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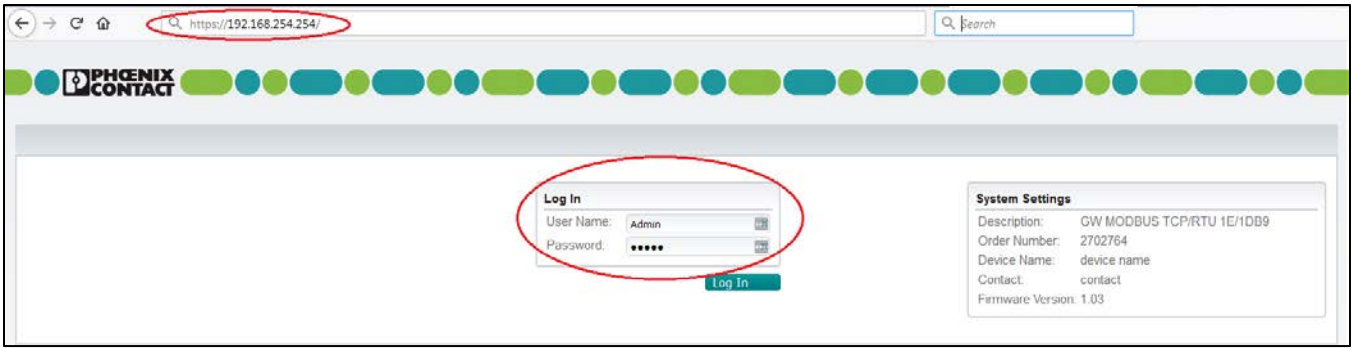
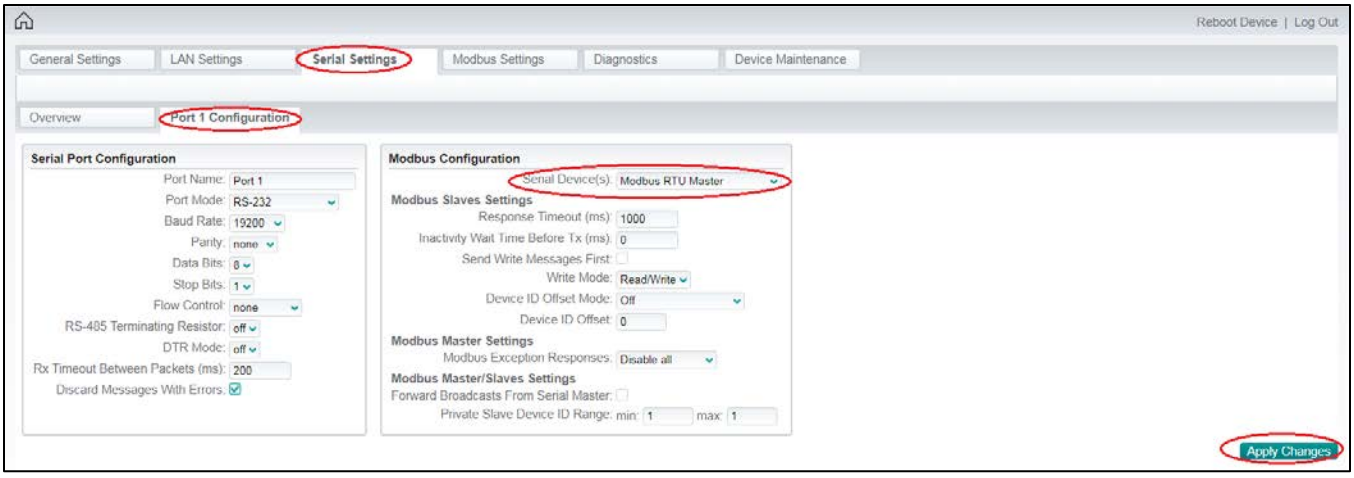
7. Connect a standard straight through RJ45 Ethernet cable from your computer to the LAN port of the GW MODBUS TCP/RTU 1E/DB9 that will be connected to the RAD-900-IFS module with yellow thumbwheel address 03. Open an Internet browser and navigate to the webpage by typing in 192.168.254.254 in the address bar. Login with User Name ‘Admin’ and password ‘admin’.



8. Navigate to the ‘LAN Setting’ tab and change the IP Address to 192.168.254.3. Click ‘Apply Changes’. You will need to re-login at the new IP address once the change is made.

9. Navigate to the ‘Serial’ Settings’ tab and then to the ‘Port 1 Configuration’ tab. Change the ‘Serial Device(s)’ drop down to ‘Modbus RTU Master’. This is configuring the GW MODBUS TCP/RTU 1E/DB9 to interpret the serial data on the serial port as coming from a Modbus RTU Master device. Click ‘Apply Changes’.



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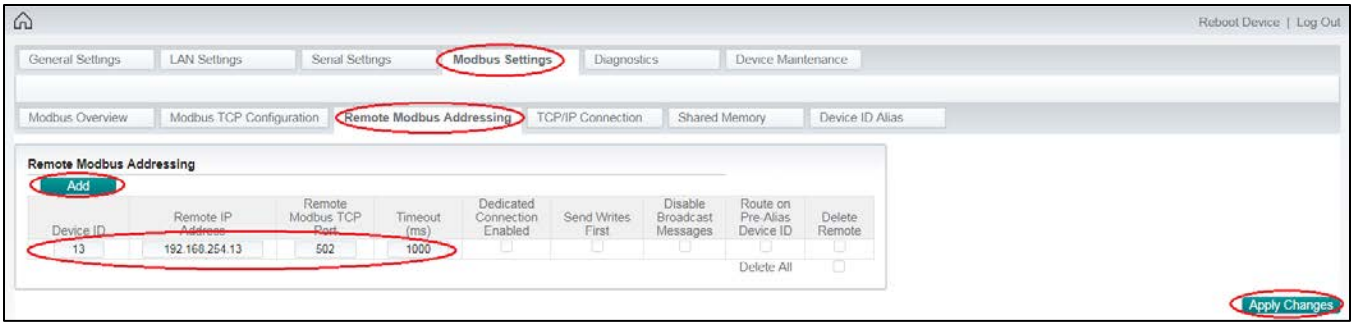
10. Navigate to the ‘Modbus Settings’ tab and then to the ‘Remote Modbus Addressing’ tab. Since the communication coming from the RAD-900-IFS wireless module is Modbus RTU and has no IP detail, we need to map the Modbus RTU serial data to the correct IP address. In this setup, we will be linking a Modbus RTU packet destined for Modbus ID 13 to Modbus TCP device 192.168.254.13 so any packet with Modbus ID 13 coming from the serial port of the RAD-900-IFS module will be sent to IP address 192.168.254.13.

    Click the ‘Add’ button and set the

    Device ID to 13

    Remote IP Address to 192.168.254.13

    Click Apply Changes



The configuration for this GW MODBUS TCP/RTU 1E/DB9 is now complete.

Configuring the IL ETH BK DI8 DO4 2TX-PAC

1. Plug in a straight through RJ45 cable from your computer to the IL ETH BK DI8 DO4 2TX-PAC. Launch IPAssign_v1.1.3. Reference the data sheet for power connections and apply power to both IL ETH BK DI8 DO4 2TX-PAC modules. The modules come with a default IP setting of BootP. IPAssign is a free BootP server. Step through the IPAssign wizard and assign the IL ETH BK DI8 DO4 2TX-PAC an IP of 192.168.254.12.

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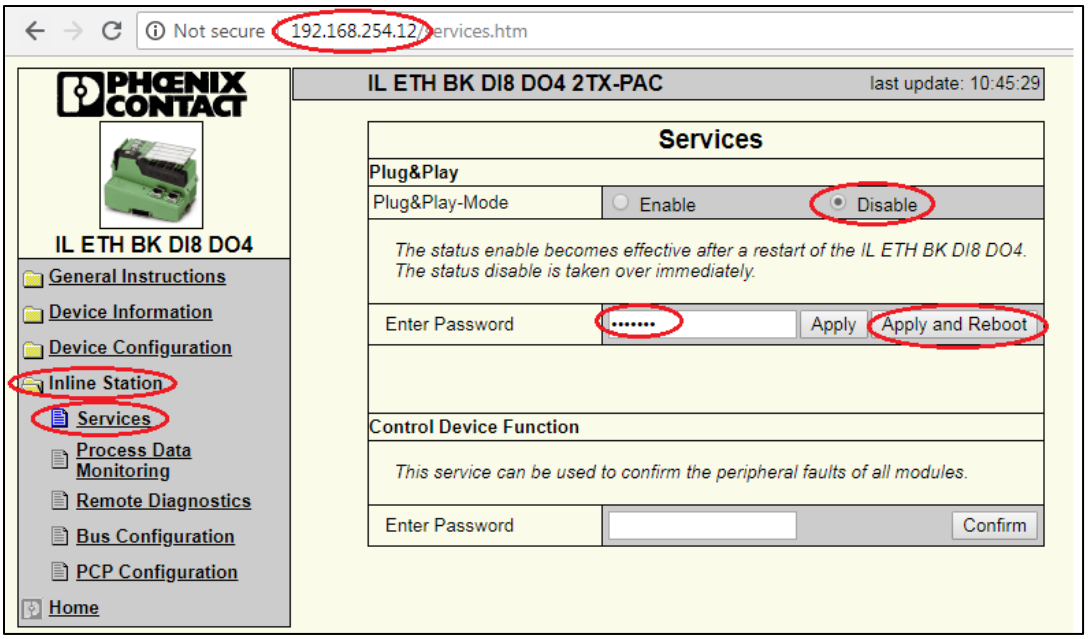
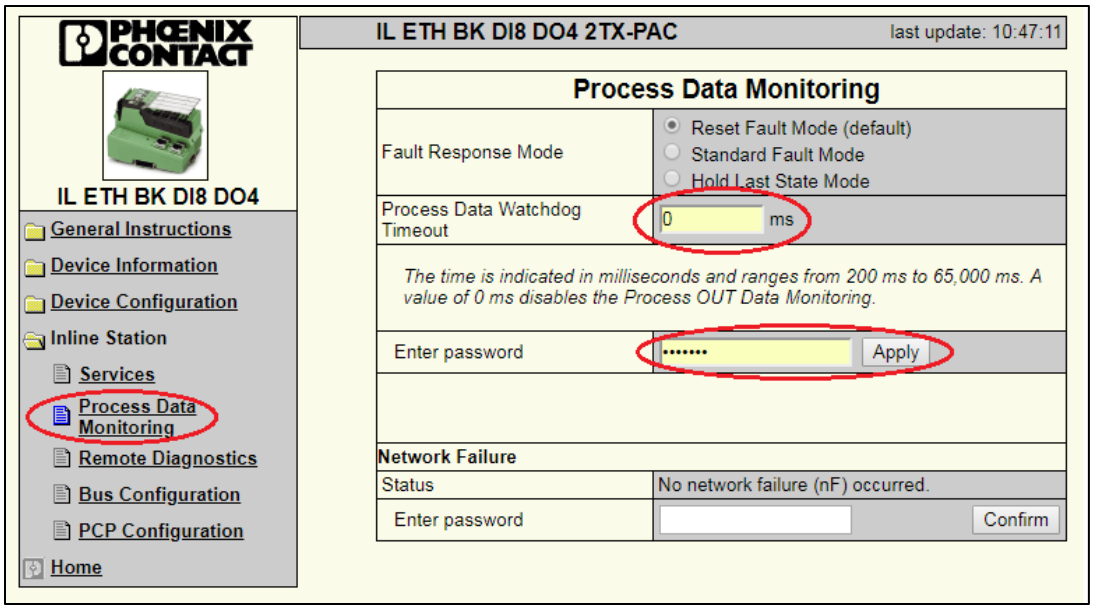
2. Once an IP address has been assign, open an Internet browser and navigate to IP address 192.168.254.12. Navigate to the ‘Inline Station’ folder and to the ‘Services’ menu. Click the ‘Disable’ setting for “Plug&Play-Mode’. Enter a password of ‘private’ and click ‘Apply and Reboot’. Disabling the Plug&Play mode puts the module into a full run mode which allows for reading and writing of all I/O points. If the Plug&Play mode is left enabled, reading of I/O points is possible but writing to outputs is not possible.



3. Next, navigate to the ‘Process Data Monitoring’ menu. Configure the ‘Process Data Watchdog Timeout’ to 0. Enter a password of ‘private’ and click ‘Apply’. This disables the watchdog timer on the module. This can be enabled if the application requires, but in this example this function is disabled.



The configuration for this IL ETH BK DI8 DO4 2TX-PAC is now complete.

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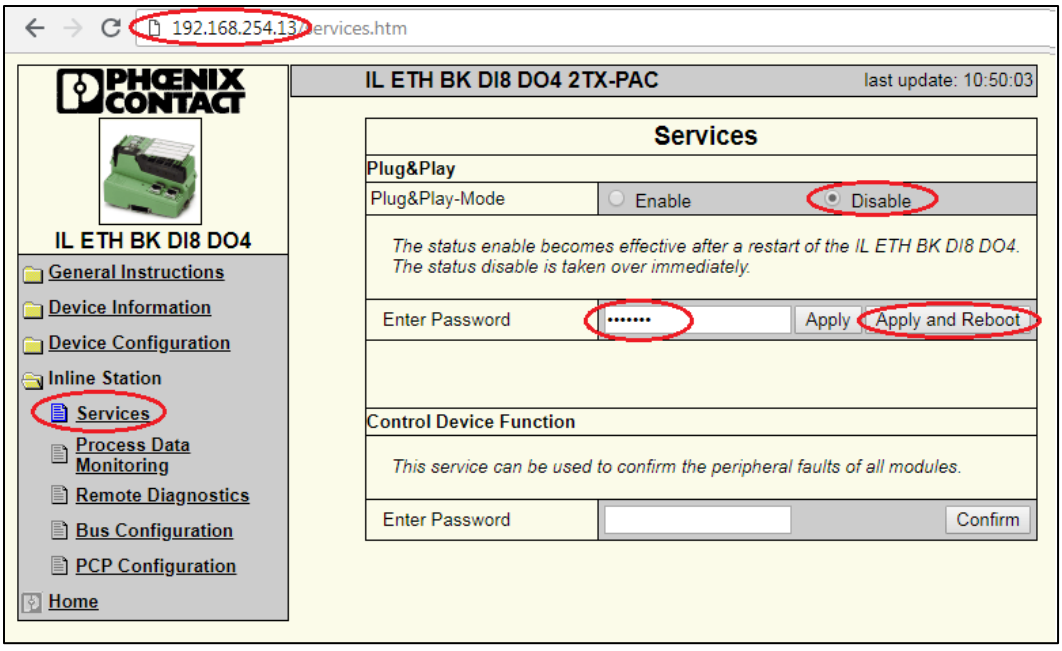
4. Plug in a straight through RJ45 cable from your computer to the second IL ETH BK DI8 DO4 2TX-PAC. Launch IPAssign_v1.1.3. The IL ETH BK DI8 DO4 2TX-PAC modules come with a default IP setting of BootP. IPAssign is a free BootP server. Step through the IPAssign wizard and assign the IL ETH BK DI8 DO4 2TX-PAC an IP of 192.168.254.13.

5. Once an IP address has been assign, open an Internet browser and navigate to IP address 192.168.254.13. Navigate to the 'Inline Station' folder and to the 'Services' menu. Click the 'Disable' setting for "Plug&Play-Mode'. Enter a password of 'private' and click 'Apply and Reboot'. Disabling the Plug&Play mode puts the module into a full run mode which allows for reading and writing of all I/O points. If the Plug&Play mode is left enabled, reading of I/O points is possible but writing to outputs is not possible



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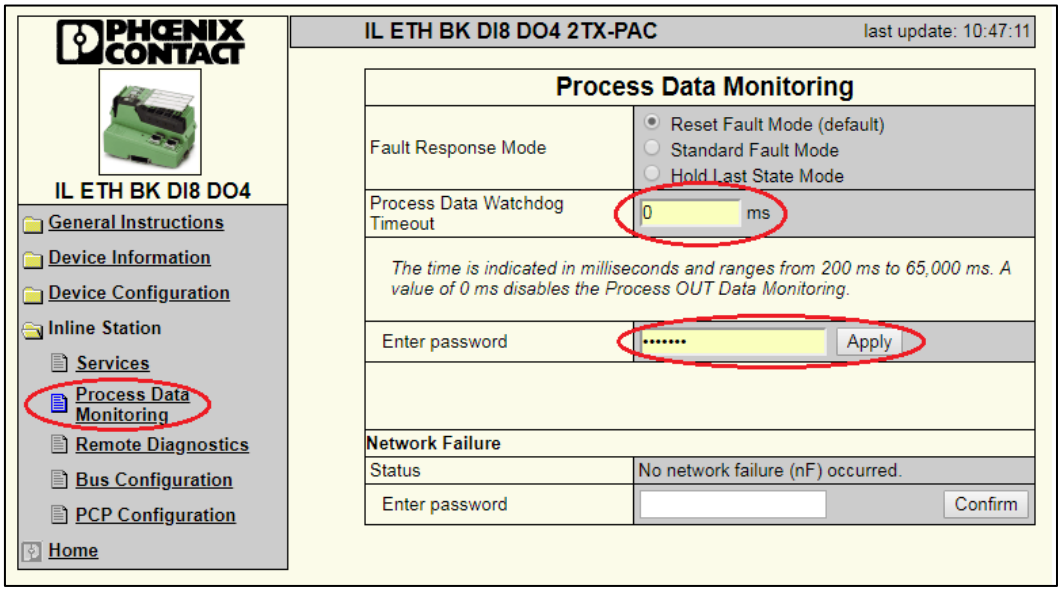
6. Next, navigate to the ‘Process Data Monitoring’ menu. Configure the ‘Process Data Watchdog Timeout’ to 0. Enter a password of ‘private’ and click ‘Apply’. This disables the watchdog timer on the module. This can be enabled if the application requires, but in this example this function is disabled.



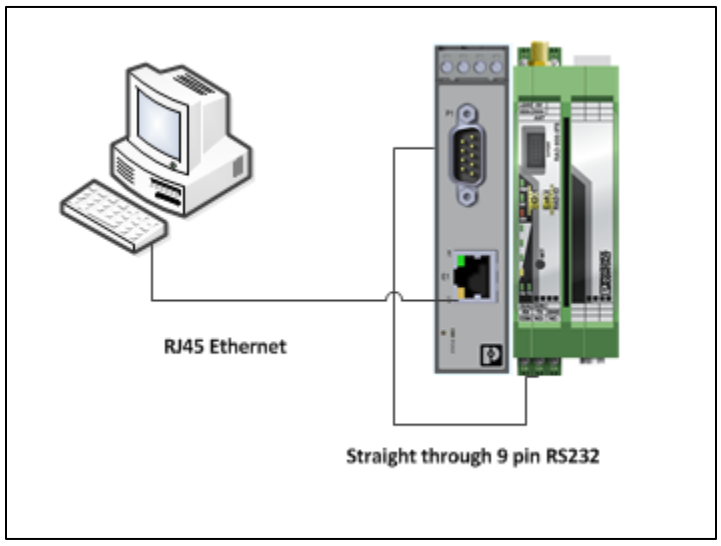
The configuration for this IL ETH BK DI8 DO4 2TX-PAC is now complete.

Making the physical connections

In this setup, there are three stations, the master station, slave station 1 and save station 2. Connect an antenna to each wireless module and make the physical connections for the data cables for each station shown below.

Master Station

1. Connect a RJ45 cable from the computer to GW MODBUS TCP/RTU 1E/DB9 with IP address 192.168.254.254.
2. Connect a Straight through RS232 cable from GW MODBUS TCP/RTU 1E/DB9 to RAD-900-IFS with yellow thumbwheel of ‘01’.



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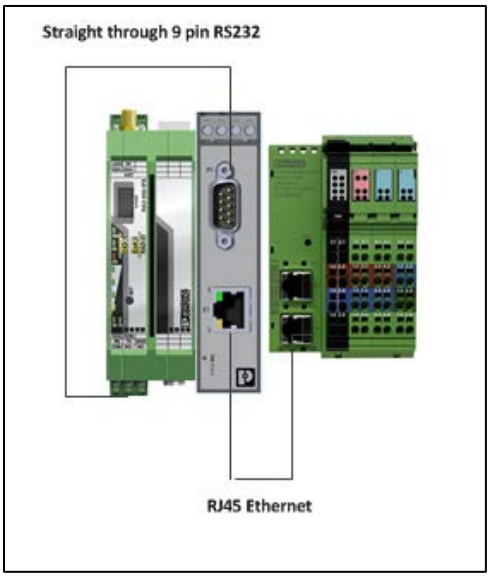
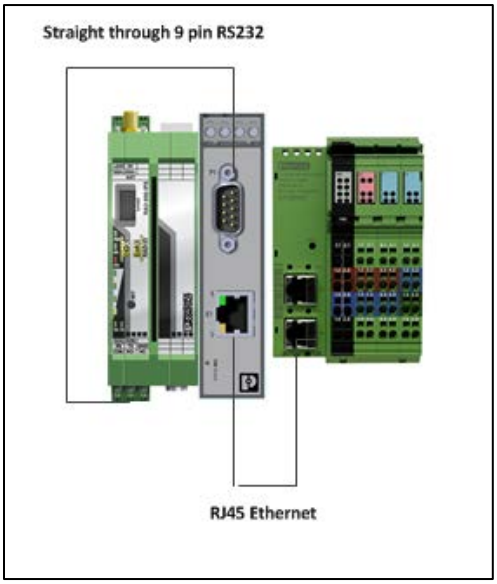
Slave Station 1

1. Connect a Straight through RS232 cable from GW MODBUS TCP/RTU 1E/DB9 with IP address 192.168.254.2 to RAD-900-IFS with yellow thumbwheel of ‘02’.
2. Connect a RJ45 cable from computer to GW MODBUS TCP/RTU 1E/DB9 with IP address 192.168.254.2 to the IL ETH BK DI8 DO4 2TX-PAC configured with IP address 192.168.254.12



Slave Station 2

1. Connect a Straight through RS232 cable from GW MODBUS TCP/RTU 1E/DB9 with IP address 192.168.254.3 to RAD-900-IFS with yellow thumbwheel of ‘03’.
2. Connect a RJ45 cable from computer to GW MODBUS TCP/RTU 1E/DB9 with IP address 192.168.254.3 to the IL ETH BK DI8 DO4 2TX-PAC configured with IP address 192.168.254.13



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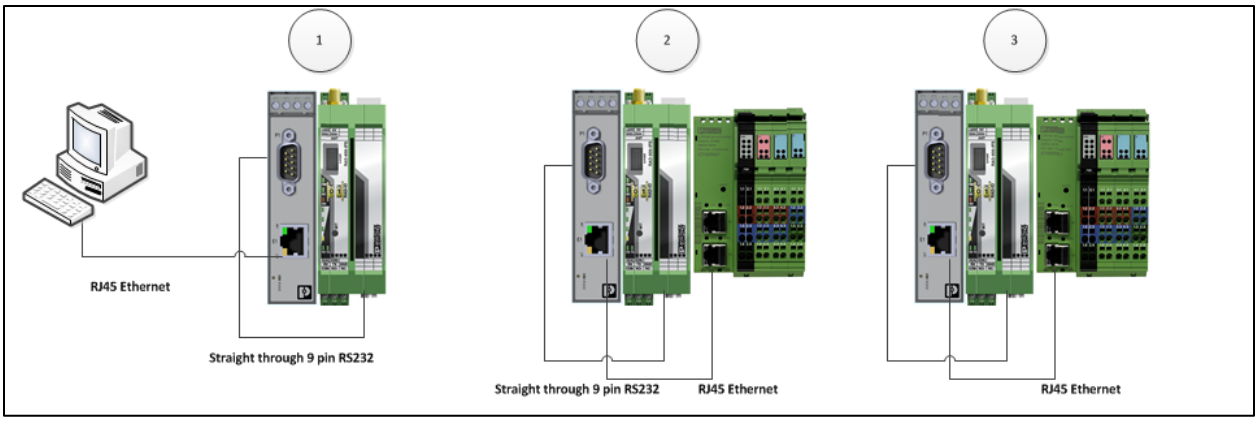
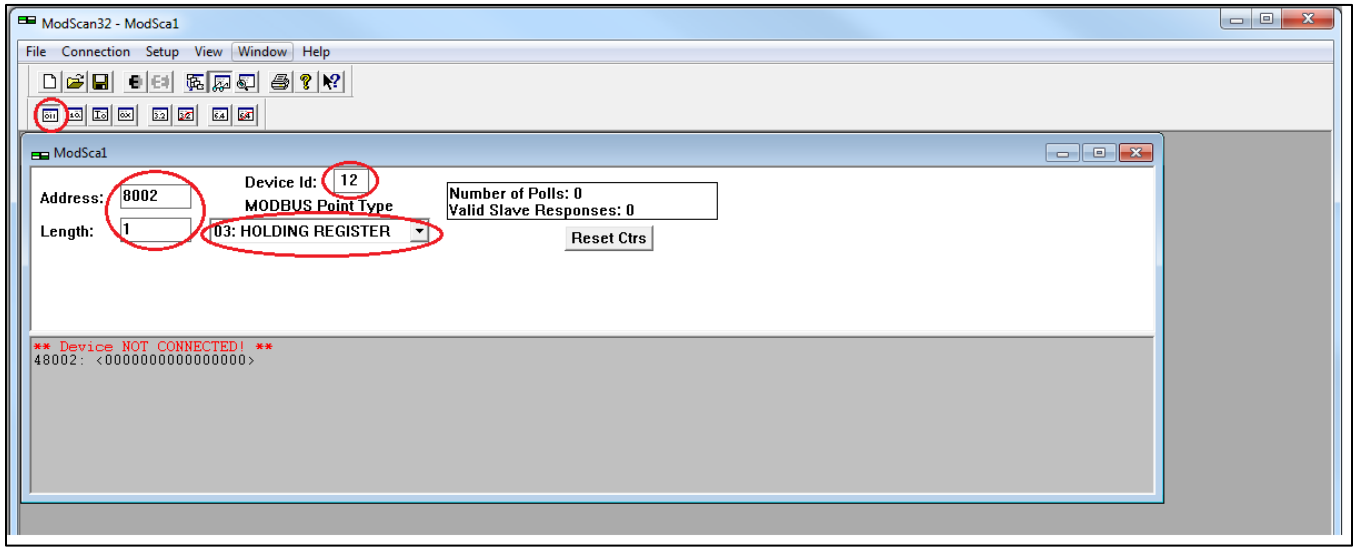
Your setup is complete and you are ready to verify communication. Your network layout should match the drawing below.



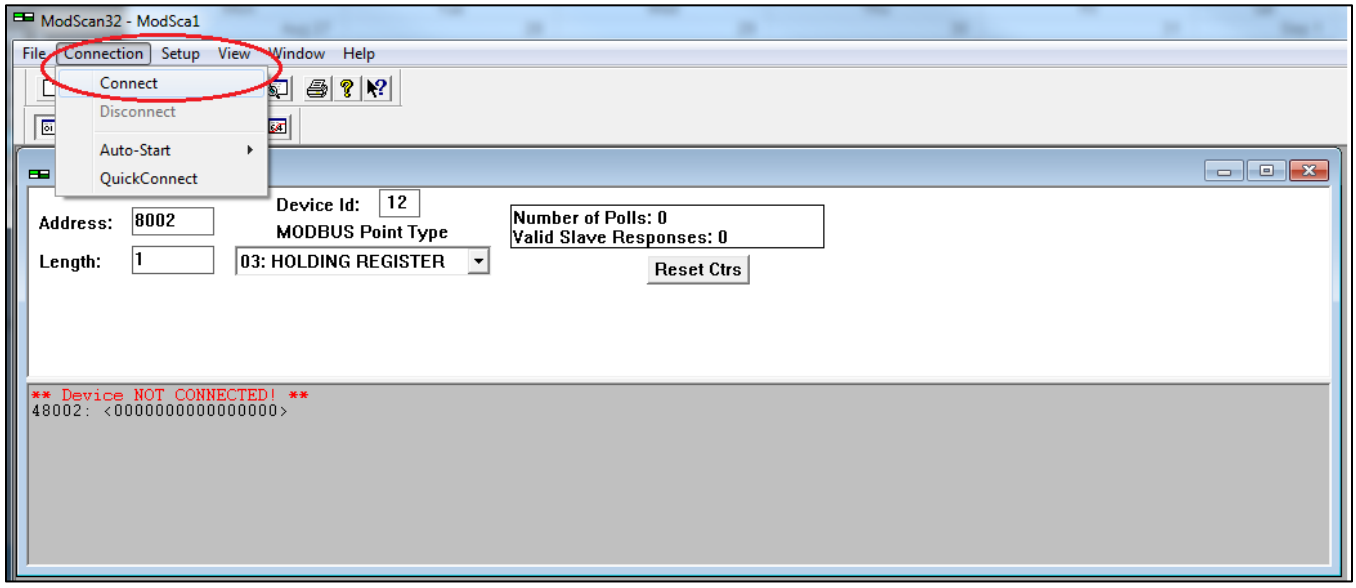
	1	2	3
GW MODBUS TCP/RTU 1E/DB9	192.168.254.254	192.168.254.2	192.168.254.3
RAD-900-IFS	01	02	03
IL ETH BK DI8 DO4 2TX-PAC		192.168.254.12	192.168.254.13

Verifying communication with Modscan32

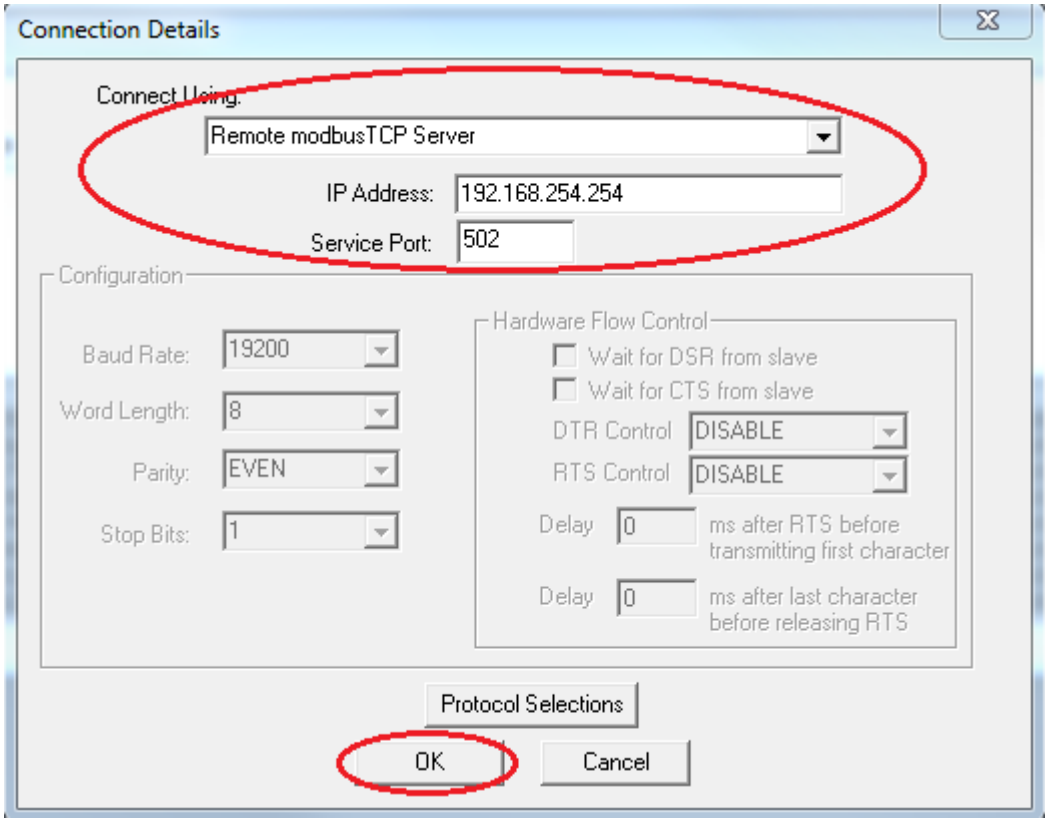
1. Launch Modscan32 on the computer connected to the Master Station's GW MODBUS TCP/RTU 1E/DB9.
2. Verify your computer has a unique IP address in the same network as the GW MODBUS TCP/RTU 1E/DB9's and IL ETH BK DI8 DO4 2TX-PAC (192.168.254.XXX).
3. Make the following settings in the 'ModSca1' window.
    a. Device Id: 12
    b. MODBUS Point Type: 03: Holding Register
    c. Address: 8002
    d. Length: 1



4. Click on the ‘Connection’ drop down and click ‘Connect’.



5. Configure the ‘Connect Using’ drop down for ‘Remote Modbus TCP Server’ and the ‘IP Address’ for the Master GW MODBUS TCP/RTU 1E/DB9 (192.168.254.254). Click ‘OK’.



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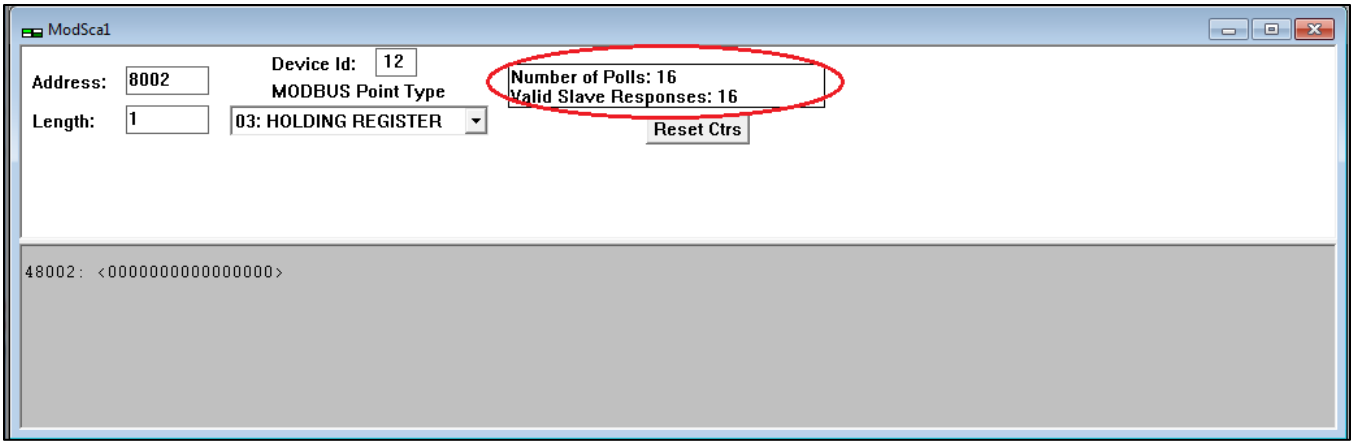
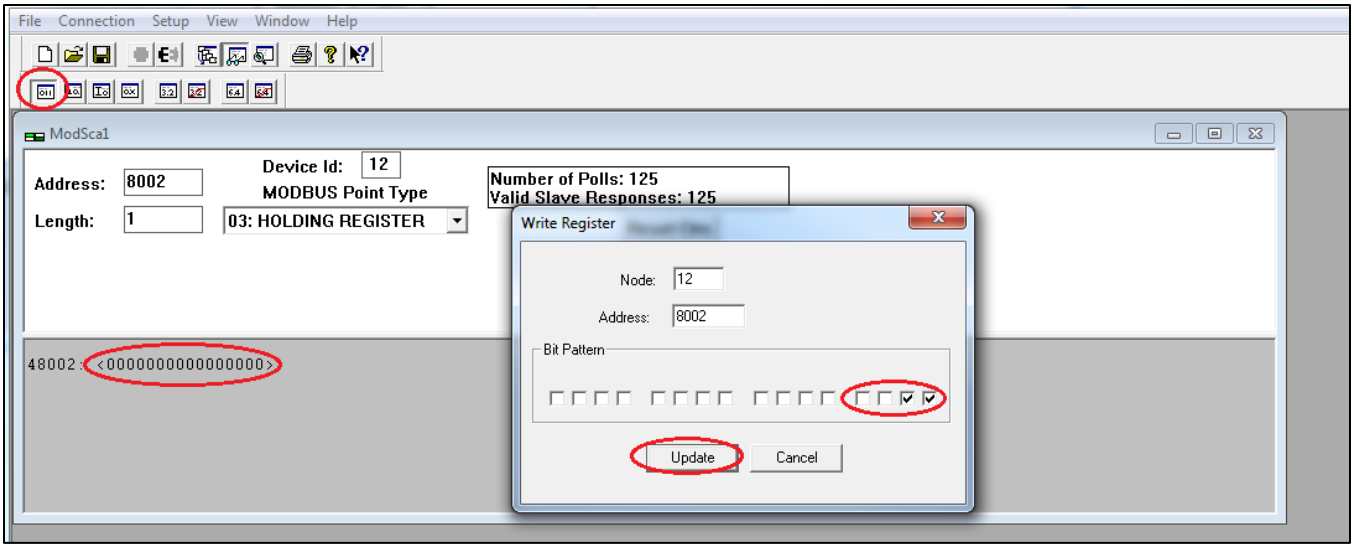
6. A connection to the IL ETH BK DI8 DO4 2TX-PAC with IP address 192.168.254.12 should now be established. The ‘Number of Polls’ and ‘Valid Slave Responses’ should be incrementing continuously.



7. Make sure the Binary view is selected in Modscan and then double click on the 0’s next to 48002. You can then toggle the output register of the IL ETH BK DI8 DO4 2TX-PAC at IP 192.168.254.12. Once you check the boxes in the ‘Write Register’ window and click ‘Update’, an LED on the IL ETH BK DI8 DO4 2TX-PAC should illuminate.



8. Click on File, New to open a new connection window. Follow the same steps for the second IL ETH BK DI8 DO4 2TX-PAC with ID 13.
9. Your setup is complete and Modbus TCP to TCP communication has been established.

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Disclaimers and notes

1. The purpose of this document is to provide basic configuration settings to show communication. Each application has different requirements and those need to be discussed before implementing any solution.
2. The setup described in this document, whether being simulated with Modscan or with a standard PLC, will only pass Modbus data from one point to another. There is no way to pass standard TCP data (access web managers, ping etc) over this wireless link.
3. In this setup, Modbus communication is the only protocol supported. A poll-response, round robin polling scheme is recommended as best practice.
4. This setup was a point to multi-point setup in a bench test environment. The addition of repeaters and RF interference can cause added latency and should be expected. If there are concerns about these items a temporary installation should be tested.
5. The installation of these components in a real application is at the discretion of the user.

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