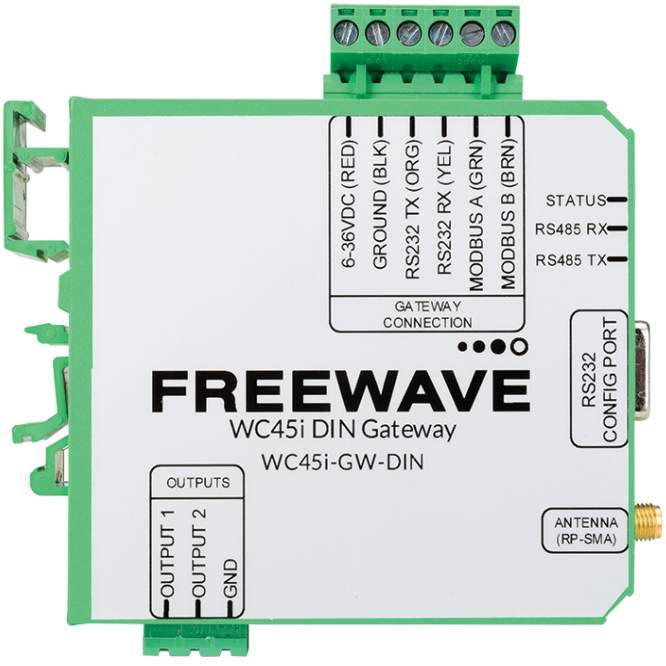
FREEWAVE

WC45i-GW-DIN Gateway

User Manual



Part Number: LUM0090AA
Revision: Jul-2017

Safety Information

The products described in this manual can fail in a variety of modes due to misuse, age, or malfunction and is not designed or intended for used in systems requiring fail-safe performance, including life safety systems. Systems with the products must be designed to prevent personal injury and property damage during product operation and in the event of product failure.

Warning! Remove power before connecting or disconnecting the interface or RF cables.

FreeWave Technologies, Inc. warrants the FreeWave® WC45i-GW-DIN Gateway (Product) that you have purchased against defects in materials and manufacturing for a period of three years from the date of shipment, depending on model number. In the event of a Product failure due to materials or workmanship, FreeWave will, at its discretion, repair or replace the Product. For evaluation of Warranty coverage, return the Product to FreeWave upon receiving a Return Material Authorization (RMA). The replacement product will remain under warranty for 90 days or the remainder of the original product warranty period, whichever is longer.

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FreeWave's Warranty does **not apply** in the following circumstances:

1. If Product repair, adjustments, or parts replacements are required due to accident, neglect, or undue physical, electrical, or electromagnetic stress.
2. If Product is used outside of FreeWave specifications as stated in the Product's data sheet.
3. If Product has been modified, repaired, or altered by Customer unless FreeWave specifically authorized such alterations in each instance in writing.

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Preface

Contact FreeWave Technical Support

For up-to-date troubleshooting information, check the **Support** page at www.freewave.com.

FreeWave provides technical support Monday through Friday, 8:00 AM to 5:00 PM Mountain Time (GMT -7).

- Call toll-free at 1-866-923-6168.
- In Colorado, call 303.381.9200.
- Contact us through e-mail at moreinfo@freewave.com.

Other WAVECONTACT Information

Use the FreeWave http://support.freewave.com/ website to download the latest version of these documents.
Registration is required to use this login.

Document	Description	FreeWave Part Number
User Manual	The User Manual provides setup, configuration, and safety information for the WC45i-GW-DIN Gateway.	LUM0090AA
Quick Start Guide	The Quick Start Guide provides the out-of-the-box setup of the device.	QSG0039AA
Application Note	Intrinsically Safe Installation	LAN5509AA
Application Note	Remote Shutdown System	LAN5510AA

Printing this Document

This document is set to print double-sided with a front cover and a back cover. Viewing this document online with a PDF viewer, may show pages intentionally left blank to accommodate the double-sided printing.

Document Styles

This document uses these styles:

- Parameter setting text appears as: **[Page=radioSettings]**
- File names appear as: **configuration.cfg**.
- File paths appear as: **C:\Program Files (x86)\FreeWave Technologies**.
- User-entered text appears as: **xxxxxxxxx**.

Caution: Indicates a situation that **MAY** cause damage to personnel, the radio, data, or network.

Example: Provides example information of the related text.

FREEWAVE Recommends: Identifies FreeWave recommendation information.

Important!: Provides crucial information relevant to the text or procedure.

Note: Emphasis of specific information relevant to the text or procedure.

Provides time saving or informative suggestions about using the product.

Warning! Indicates a situation that **WILL** cause damage to personnel, the radio, data, or network.

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1. Overview - WC45i-GW-DIN Gateway

Thank you for purchasing the WC45i-GW-DIN Gateway.

The WAVECONTACT WC45i-GW-DIN has these features:

- AES 128bit Encryption
- Class 1 Division 2 Area certification
- RS485 connection to a Modbus master device.
- Wide range DC power input: +6 to +36VDC.
- Collects and caches Modbus data from all WAVECONTACT remote devices.
- Provides configuration and status registers for remote configuration and status monitoring.
- Stores a maximum of 4700 register values from any combination of remote endpoints.
- Supports transparent Modbus mode.
- Internal Remote Shut Down (RSD) logic control option.
- Slave register re-mapping.
- Remote configuration of WAVECONTACT devices through an Ethernet gateway connection.
- Remote sensor configuration (PACTware™ and RadarMaster).
- Optional: Modbus-TCP Ethernet interface module
- Two open collector digital outputs
- DIN rail mount
- RP-SMA antenna port for connection to external 900MHz antenna
  - (FreeWave Part #: WC45-Whip)

Note: The terms node and endpoint are used interchangeably in this document.

1.1. Operation

The WC45i-GW-DIN supports all remote WAVECONTACT endpoints. This allows all remote sensor data to be available in Modbus format.

- The register data from remote sensor endpoints is available by requesting the remote endpoint's Modbus Slave ID and register address from that endpoint's register map.
- The WC45i-GW-DIN:
  - responds with the most recent copy of the data from the remote endpoint.
  - automatically times out data from a remote endpoint it stops receiving data for.

1.1.1. Remote WC45i-GW-DINs and Non-sleeping Radio Only Endpoints

- Pre-configured remote endpoints forward their set of registers to the Modbus gateway on a pre-defined schedule (1 minute to 5 minutes is typical).
  - The register data is then buffered in the gateway and can be read by the RTU at any time.
- If a Modbus request is received by the WC45i-GW-DIN for a Modbus ID and address where buffered data does NOT exist but the Modbus ID is known, the Modbus request is forwarded to the remote Modbus endpoint over the WAVECONTACT network.
  - The response is returned to the RTU.
- If a request for multiple registers is issued by the RTU **AND** if the WC45i-GW-DIN does NOT have all registered data buffered, an exception is returned.
  - The system will NOT combine buffered and transparent data within a single Modbus response.

1.1.2. Remote WC45i-GW-DIN Endpoint Re-Scan

It is possible to cause a remote WC45i-GW-DIN to re-scan for attached Modbus devices by writing to four of the gateway's configuration registers.

- This is useful to discover a Modbus device that is added to an existing Modbus endpoint.
- The scan may be initiated by one of these methods:
  - If the radio address of the gateway is known, writing this address to gateway register 3000 will result in a scan.
  - If the Modbus ID of one of the already registered devices attached to a WC45i-GW-DIN is known, a scan is started by writing the ID to gateway register 3002.

2. Equipment

2.1. Included Equipment

The package contains these items:

Included Equipment - WC45i-GW-DIN	
Qty	**Description**
1	WC45i-GW-DIN - Gateway with Modbus Interface and DIN mounting box
1	WC45i-GW-DIN Quick Start Guide

2.1.1. User-supplied Equipment

- Small, flathead screwdriver
- Mounting equipment for the WC45i-GW-DIN.
- USB to Serial DB9 programming cable (FreeWave Part #: WC-USB-DB9)
- Whip Antenna (FreeWave Part #: WC45-Whip)
- DC Adapter Power Supply (+6 to +36VDC)
- Barrel connector with Ground and Power flying leads
- Computer for WAVECONTACT device configuration.

Note: See Available Accessories (on page 89) for additional equipment.

3. Installation

3.1. Connections

Important!: The WC45i-GW-DIN Gateway is configured using the **WC Toolkit**.
Download the **WC Toolkit** software from http://support.freewave.com/.
Registration is required to use this login.

Note: The **RS232 Config / Debug** connector on the WC45i-GW **MUST** must be used for WC Toolkit access.
The Config / Debug port is accessed by a direct connection to the WC45i-GW-DIN **RS232 Config / Debug** connector port.

The WC45i-GW-DIN uses a 6-position terminal block for power and serial communications.

3.1.1. Connections - WC45i-GW-DIN

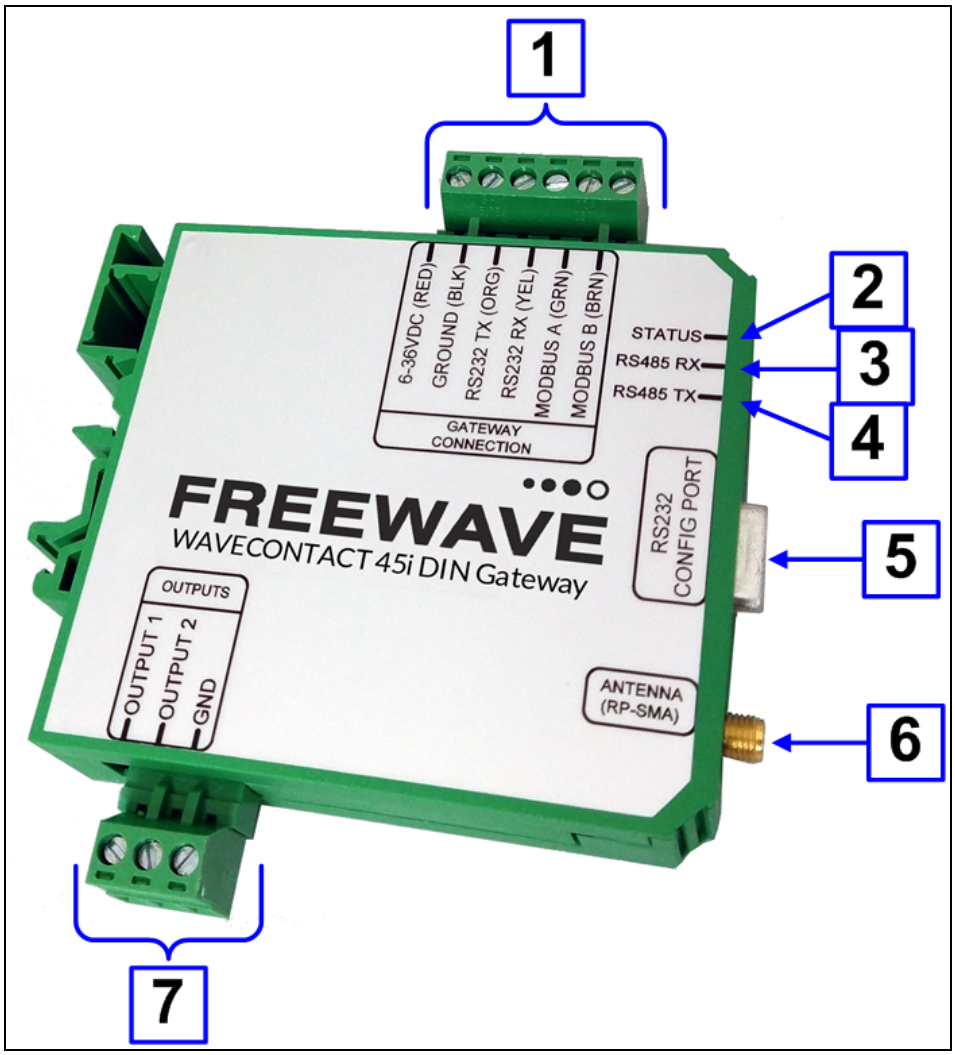


Figure 1: WC45i-GW-DIN Connections

WC45i-GW-DIN Connections		
Location #	**Title**	**Description**
1	Ground (BLK)	WC45i-GW-DIN Ground
1	Modbus B (BRN)	RS485 B 9600 Baud
1	Modbus A (GRN)	RS485 A 9600 Baud
1	RS232 TX (ORG)	RS232 Config / Debug Connector TX 9600 Baud **Note**: Only used with Ethernet Interface module.
1	+6 to +36VDC (RED)	Positive Power (+6 to +36VDC)
1	RS232 RX (YEL)	RS232 Config / Debug Connector RX 9600 Baud **Note**: Only used with Ethernet Interface module.
2	Status LED	See LEDs (on page 88) for detailed information.
3	RS232 RX LED	See LEDs (on page 88) for detailed information.
4	RS232 TX LED	See LEDs (on page 88) for detailed information.
5	RS232 **RS232 Config / Debug** connector	The **RS232 Config / Debug** connector is for the USB to Serial DB9 programming cable (FreeWave Part # WC-USB-DB9).
6	Antenna (RP-SMA)	FreeWave Part #: WC45-Whip **Note**: Use in fiberglass or plastic enclosure with direct mount to the DIN mounted card.
7	Output 1 Output 2 GND	Digital output for signaling or alarm functions. Digital output for signaling or alarm functions. **Note**: Each output is rated to 30VDC and 1 Amp. Ground

3.2. Power and Gateway Connections

Important!: Verify the items listed in the Included Equipment (on page 9) are available before starting this procedure.
It is assumed that the reader and installer have completed the FreeWave WC45i-GW-DIN installation and setup training to follow the procedures in this document.

Procedure

1. All wiring should be neat and orderly.
2. On the WC45i-GW-P-DIN-W terminal block:
   a. Connect the configuration wires of the gateway to their respective color-designated screw terminal connections.
   b. Connect the Serial end of the WC-USB-DB9 cable to the **RS232 Config / Debug** connector port and the USB connection to the computer.
   c. Use the 6-36VDC (RED) screw terminal connection to connect the Power Source from an external power supply of +6 to +36VDC.
   d. Use the GROUND (BLK) screw terminal connection to connect the External power ground.
3. Optional: If using the Remote Shutdown (RSD) and Local Digital Output Control (on page 35), wire the relay to Output 1, Output 2, and GND.

   The WC45i-GW-DIN connections are similar to Figure 2 and Figure 3:

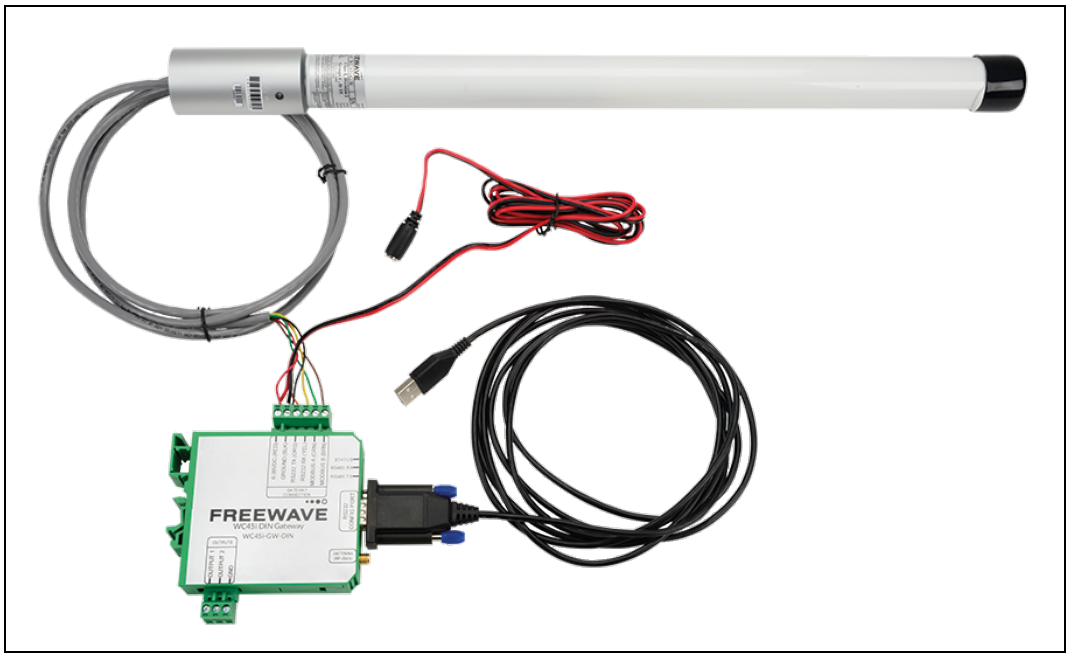


Figure 2: WC45i-GW-DIN Connections

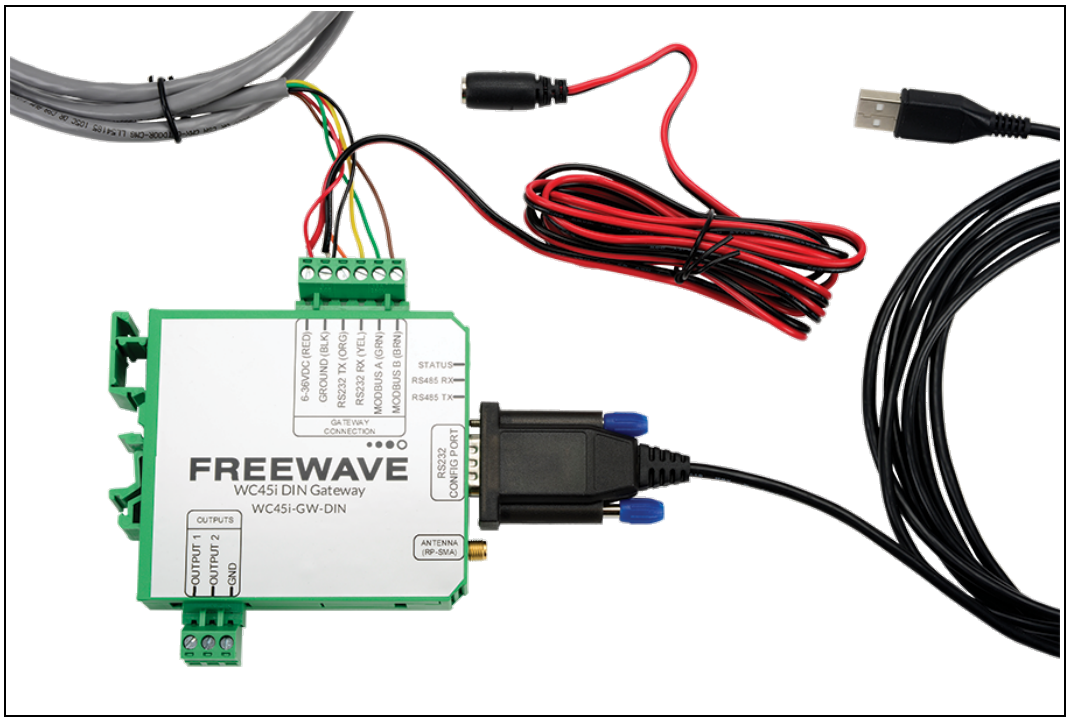


Figure 3: WC45i-GW-DIN Connections - close-up

4. If this is the first time the WC45i-GW-DIN is installed, wait for the drivers to install.

   Important!: Depending on the computer and connection, the driver installation can take 3-6 minutes.

5. Continue with Configuration (on page 15).

4. Configuration

Note: The terms node and endpoint are used interchangeably in this document.

FREEWAVE Recommends: Install and configure the **WC45i** gateway before any endpoints to ensure the endpoints have connectivity after installation.

Note: The WC45i-GW-DIN Gateway is configured using the **WC Toolkit**.
Download the **WC Toolkit** software from http://support.freewave.com/.
Registration is required to use this login.

Important!: The **RS232 Config / Debug** connector on the WC45i-GW **MUST** must be used for WC Toolkit access.
The Config / Debug port is accessed by a direct connection to the WC45i-GW-DIN **RS232 Config / Debug** connector port.

Procedure

Note: The screenshots are examples only.
The dialog boxes and windows appear differently on each computer.

1. Verify the WC Toolkit software is installed on the computer connected to the WC45i-GW-DIN.

   Note: Download the **WC Toolkit** software from http://support.freewave.com/.
   Registration is required to use this login.

2. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 4)

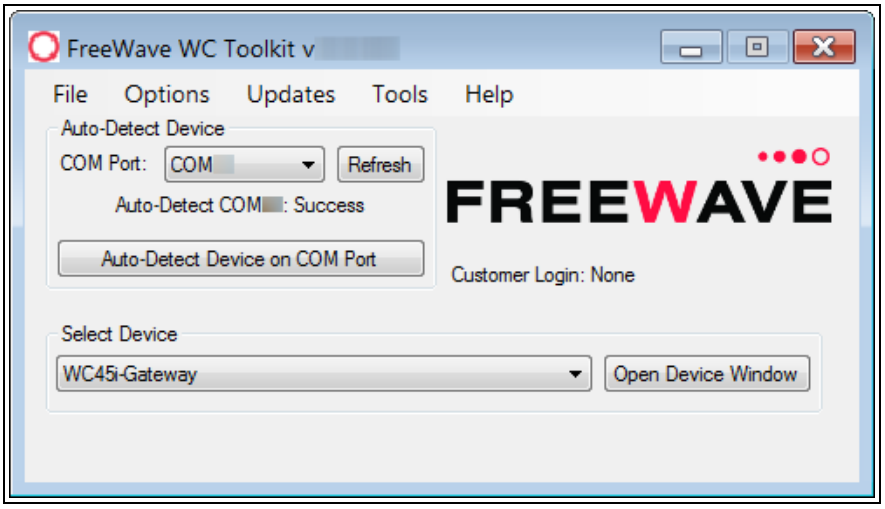


Figure 4: Select Device window

3. Click the **Refresh** button to have WC Toolkit search for and list the connected devices in **COM Port** list box.
4. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC45i-GW-DIN.
5. Click the **Auto-Detect Device on COM Port** button to have WC Toolkit connect the device to the COM Port selected in the **COM Port** list box.

   Note: Optional: Click the **Select Device** list box arrow and select the connected WC45i-Gateway device.
   Click the **Open Device Window** button to open the Device Configuration window (on page 48).

Figure 5: Select Device list box

The **Device Configuration** window opens for the selected device.

Note: See Device Configuration window (on page 48) for detailed information.

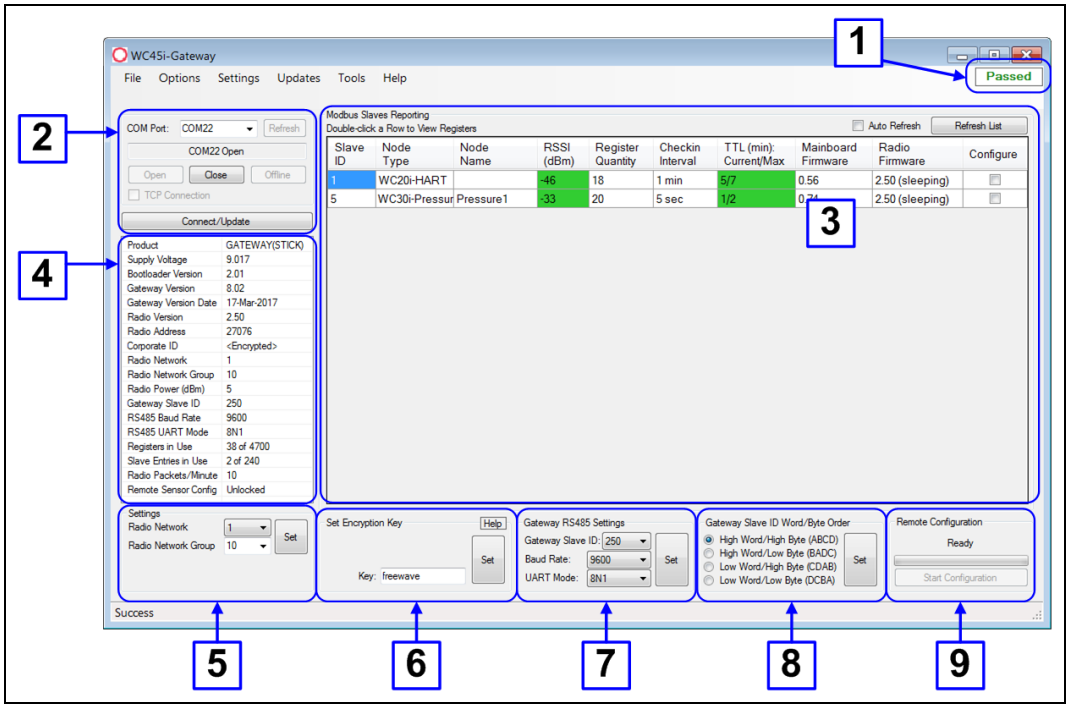


Figure 6: Device Configuration window: WC45i-Gateway

6. In the **Settings** area (#5), change these settings:

> **Note**: The **Network** settings are used to create separate networks using multiple gateways (that are in close proximity to one another).

> **Important!**: The **Radio Network** and **Radio Network Group** settings are randomly selected but MUST MATCH the existing gateway network for successful communication between the gateway and endpoint.

   a. Click the **Radio Network** list box arrow and select 0 (zero) to 7 for the assigned number.
   b. Click the **Radio Network Group** list box arrow and select 0 (zero) to 29 for the network group assigned number.
   c. Click the **Set** button to save the information.

7. In the **Set Encryption Key** area (#6):
   a. In the **Key** text box, enter the encryption key for the device using 6 to 16 characters.
   b. Click the **Set** button to save the information.

> **Important!**: A Key CANNOT contain spaces or angle brackets.
> The gateway and endpoints only communicate if they are configured with the same **Key**.
> When setting up a new network, use this same encryption Key on all the devices.

Note: When the WC45i-GW-DIN drops its network, it attempts to join networks using the same encryption **Key**.

Caution: It is possible to hide the encryption **Key** so it cannot be read.
This is the most secure option, but if the **Key** is forgotten, there is **no way to recover it**.
The **Key** must be reset on every device on the network.

8. Optional: Click the **Settings** menu and select **Set Encryption Key Unrecoverable** to permanently hide the key.

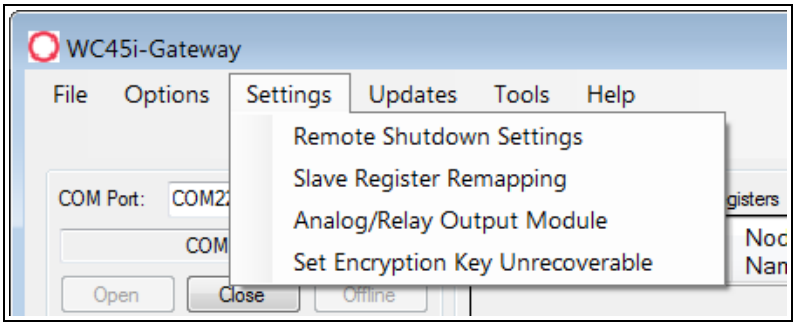
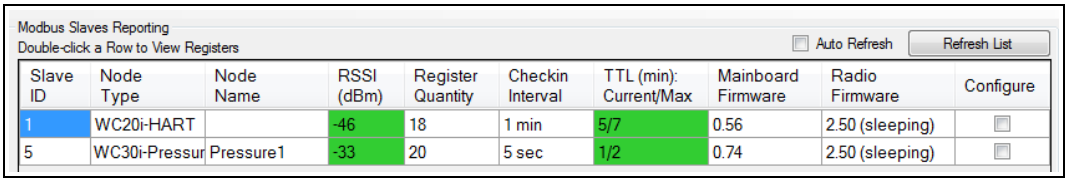


Figure 7: Settings menu > Set Encryption Key Unrecoverable

9. Click **Refresh List** button to update the **Modbus Slaves Reporting** table with all connected remote endpoints.



Slave ID	Node Type	Node Name	RSSI (dBm)	Register Quantity	Checkin Interval	TTL (min): Current/Max	Mainboard Firmware	Radio Firmware	Configure
1	WC20i-HART		-46	18	1 min	5/7	0.56	2.50 (sleeping)	
5	WC30i-Pressur	Pressure1	-33	20	5 sec	1/2	0.74	2.50 (sleeping)	

Figure 8: Modbus Slaves Reporting table

10. Configure the endpoints attached to the WC45i-GW-485.

Note: Use the Configuration procedure in the User Manual for these WAVECONTACT endpoints:
WC15i Multi-Input C1D1 Endpoint, WC20i Endpoint,
WC30i Wireless Pressure Sensor, **WC40i Modbus Endpoint**,
WC40i-COUNT Counter Endpoint, or WC40i-MB-RSD Modbus Endpoint.

11. Optional: On the endpoint, press the **Check-in** button to .
12. Verify the gateway is communicating with the endpoints.

Note: A successful connection on the WAVECONTACT endpoint is indicated with Green blinking TX and ACT lights and a red blinking light for RX.
If the connection is NOT successful, a Green blinking TX light appears for 10 seconds.

13. If applicable, continue with these other **WC45i** configuration procedures:

- Remote Endpoint Configuration (on page 31)
- Remote Shutdown (RSD) and Local Digital Output Control (on page 35)
- Slave Register Remapping (on page 39)

14. Close the WC Toolkit software.
15. Remove the WC-USB-DB9 USB to Serial DB9 programming cable from the computer and the **RS232 Config / Debug** connector port.
16. As applicable, replace the endpoint cover.
17. Mount the gateway device.

5. Gateway Event Log

The gateway keeps an internal log of events that are viewed in the Gateway Log window (on page 63) of WC Toolkit.

The **Gateway Log** window is used to log events such as reboots, remote endpoints joining and/or timing out, local RSD control events, remote configuration sessions, firmware updates, etc.

Procedure

Note: The terms node and endpoint are used interchangeably in this document.

1. Open the Device Configuration window (on page 48).
2. On the **Tools** menu, click **View Gateway Log**.

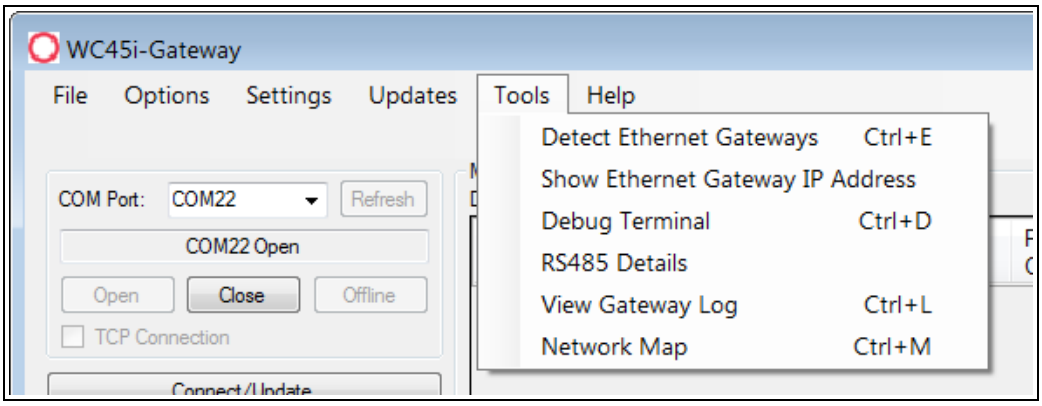


Figure 9: Tools menu > View Gateway Log

The **Gateway Log** window opens.

The **Gateway Log** tab is active.

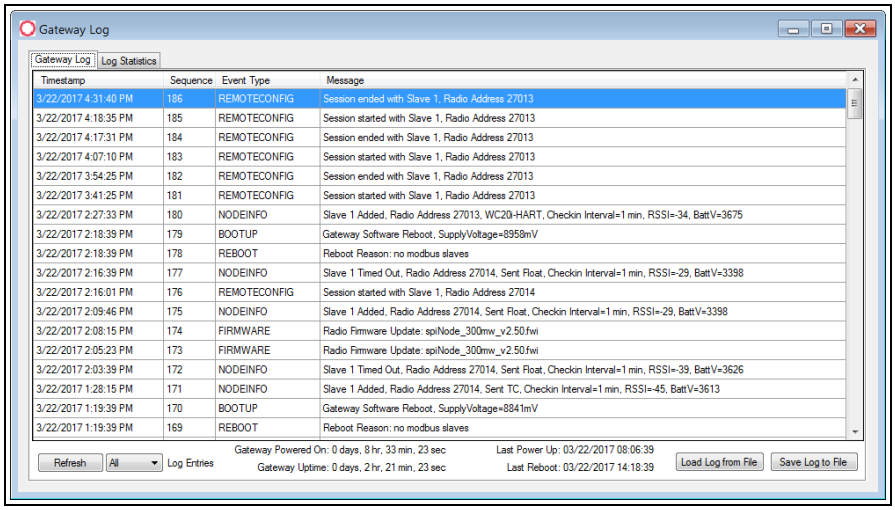


Figure 10: Gateway Log window - Gateway Log tab

3. Complete any of these options:
   - Click the **Refresh** or **Refresh List** button to update the information in the table.
   - Click the **Log Entries** list box arrow and select how many log entries to view on the **Gateway Log** tab.
   - Click the **Load Log from File** button to open the Microsoft® **Open** dialog box with the default location where the **.csv** file of the log information is saved.
   - Click the **Save Log to File** button to open the Microsoft® **Save As** dialog box with the default location to save the **.csv** file of the log information in.
4. Optional: Click the **Log Statistics** tab to view statistics about the log events.

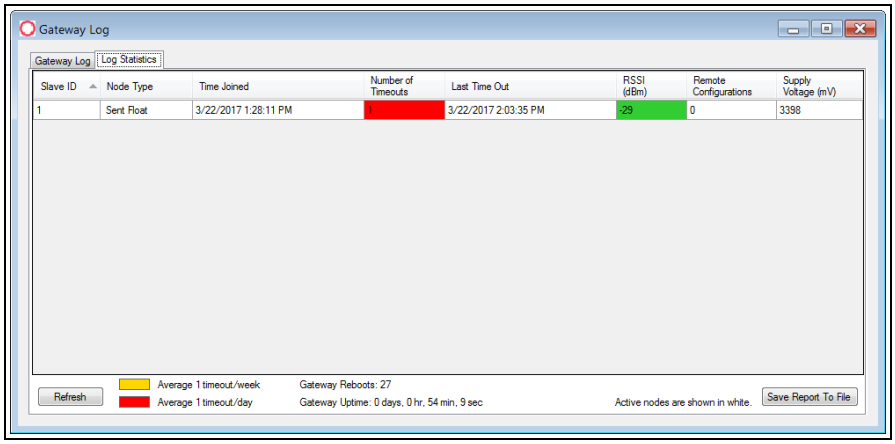


Figure 11: Gateway Log window - Log Statistics tab

5. Optional: Click the **Refresh** or **Refresh List** button to update the information in the table.
6. Optional: Click the **Save Report to File** button to open the Microsoft® **Save As** dialog box with the default location to save the CSV version of the log file in.
7. Close the **Gateway Log** window.

6. Firmware Updates

Firmware updates for both the gateway and the built-in radio are completed over:

- the RS232 Config / Debug Connector port using WC Toolkit.
- a remote TCP connection if a WC45i-GW-P Ethernet Module is used.

Note: These procedures are for both the WC45i-GW-485 and WC45i-GW-DIN devices.

6.1. Gateway Firmware Update

1. Verify the WC Toolkit software is installed on the computer connected to the WC45i-GW-DIN.

   Note: Download the **WC Toolkit** software from http://support.freewave.com/. Registration is required to use this login.

2. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 12)

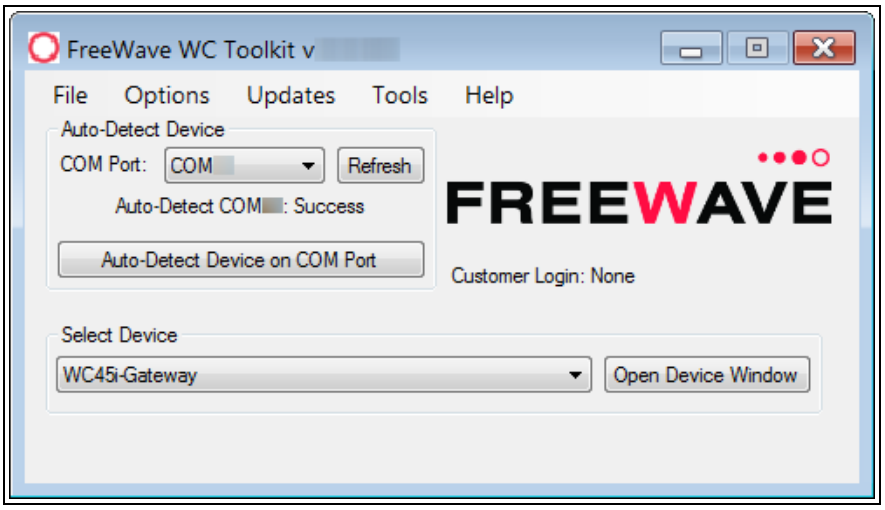


Figure 12: Select Device window

3. Click the **Refresh** button to have WC Toolkit search for and list the connected devices in **COM Port** list box.
4. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC45i-GW-DIN.
5. Click the **Auto-Detect Device on COM Port** button to have WC Toolkit connect the device to the COM Port selected in the **COM Port** list box.
   The **Device Configuration** window opens for the selected device.
6. On the **Update** menu, click **Update Gateway Firmware**.

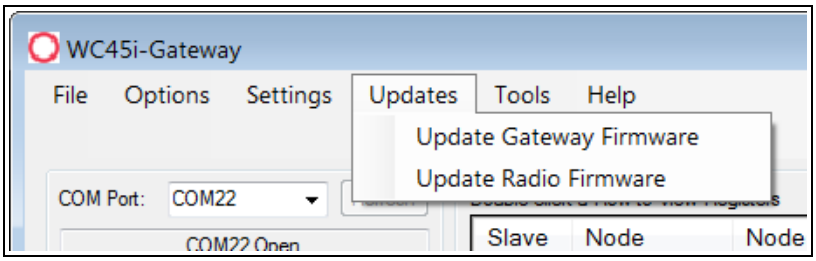


Figure 13: Updates menu > Update Gateway Firmware

The **Firmware Updates** window opens.

Note: See Firmware Updates window (on page 61) for detailed information.

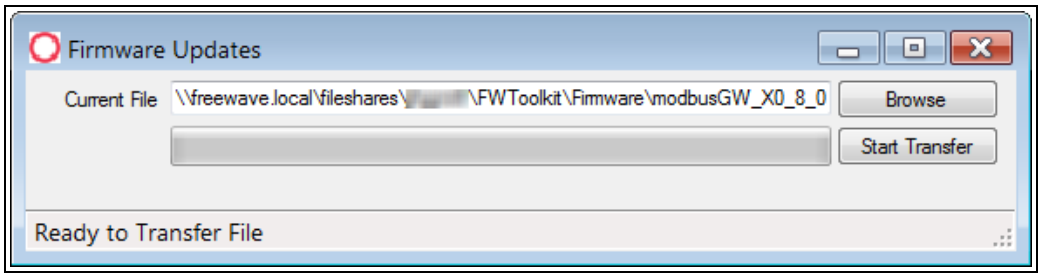


Figure 14: Firmware Updates window

Note: By default, the latest gateway firmware file is selected on the update server. When the **Update Gateway Firmware** menu is selected, the WC45i-Gateway searches for the most recent **modbusGW** file to update.

7. Click the **Start Transfer** button to load the file to the device.
8. Wait while the **Firmware Updates** progress bar shows the file transfer.

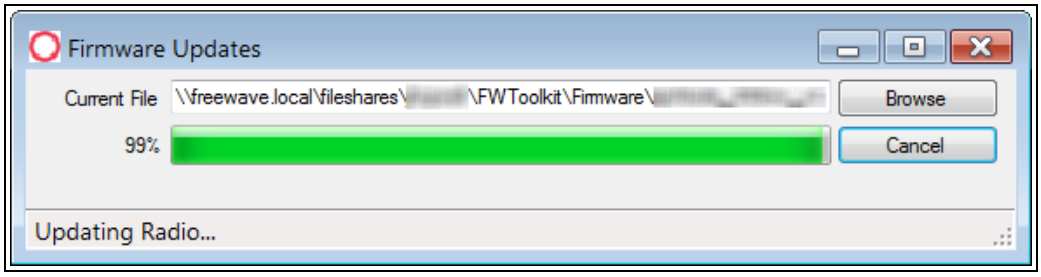


Figure 15: Progress bar of firmware update

A message appears when the firmware update is successful.

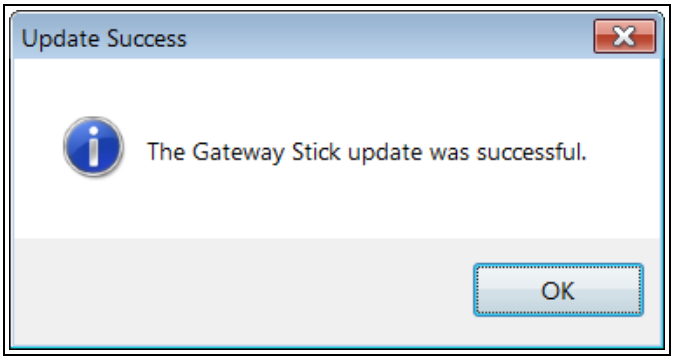


Figure 16: Successful firmware update message

9. Click **OK** to close the message.

6.2. Radio Firmware Update

1. Verify the WC Toolkit software is installed on the computer connected to the WC45i-GW-DIN.

   Note: Download the **WC Toolkit** software from http://support.freewave.com/. Registration is required to use this login.

2. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 12)

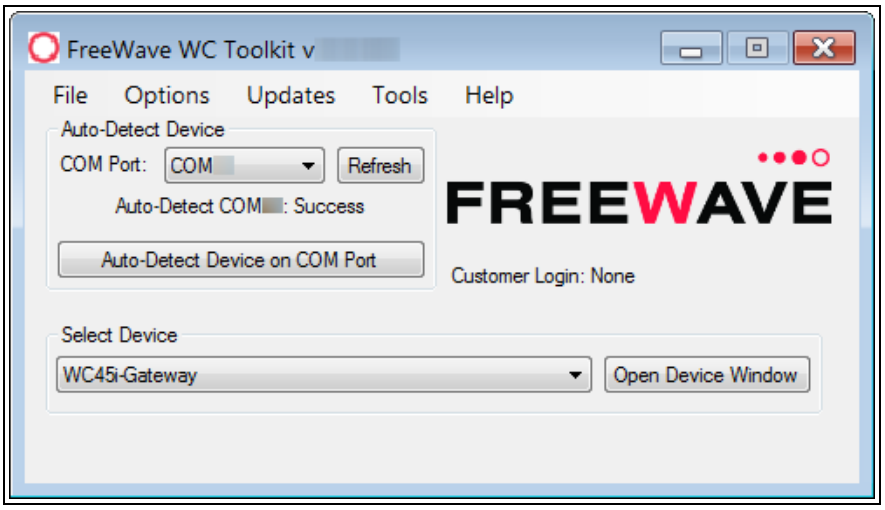


Figure 17: Select Device window

3. Click the **Refresh** button to have WC Toolkit search for and list the connected devices in **COM Port** list box.
4. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC45i-GW-DIN.
5. Click the **Auto-Detect Device on COM Port** button to have WC Toolkit connect the device to the COM Port selected in the **COM Port** list box.
   The **Device Configuration** window opens for the selected device.
6. On the **Update** menu, click **Update Gateway Firmware**.

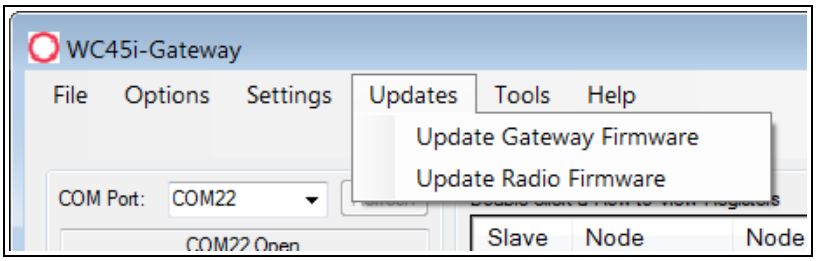


Figure 18: Updates menu > Update Radio Firmware

The **Firmware Updates** window opens.

Note: See Firmware Updates window (on page 61) for detailed information.

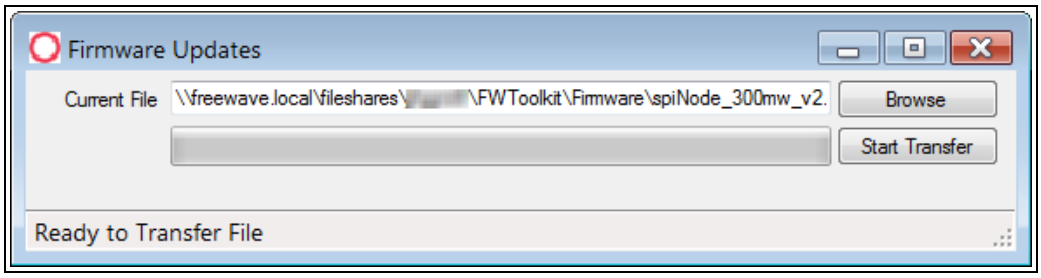


Figure 19: Firmware Updates window

Note: By default, the latest gateway firmware file is selected on the update server. When the **Update Radio Firmware** menu is selected, the WC45i-Gateway searches for the most recent **appNode** file to update.

7. Click the **Start Transfer** button to load the file to the device.
8. Wait while the **Firmware Updates** progress bar shows the file transfer.

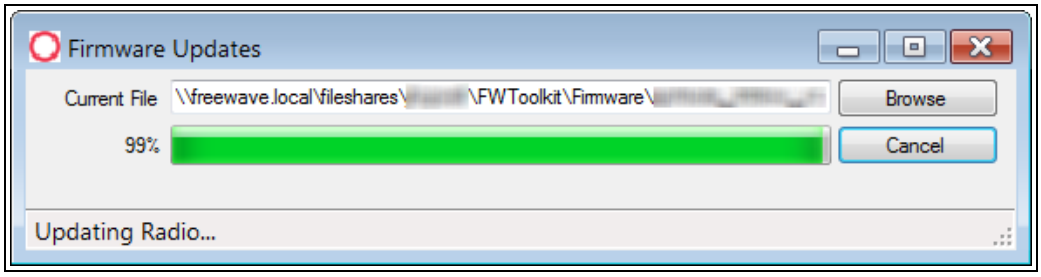


Figure 20: Progress bar of firmware update

A message appears when the firmware update is successful.

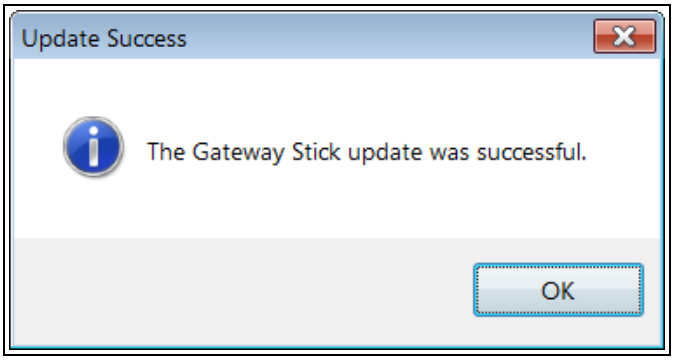


Figure 21: Successful firmware update message

9. Click **OK** to close the message.

6.3. Rescue Gateway (ARM) Bootload

Possible causes to run a **Rescue Bootload**:

- Power failure.
- Communications failure during firmware update process.
- The base LED is solid on and/or the WC Toolkit is unable to communicate with the gateway.

Procedure

1. Remove the DC power from the gateway.
2. Verify the WC Toolkit software is installed on the computer connected to the WC45i-GW-DIN.

   Note: Download the **WC Toolkit** software from http://support.freewave.com/.

3. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 12)

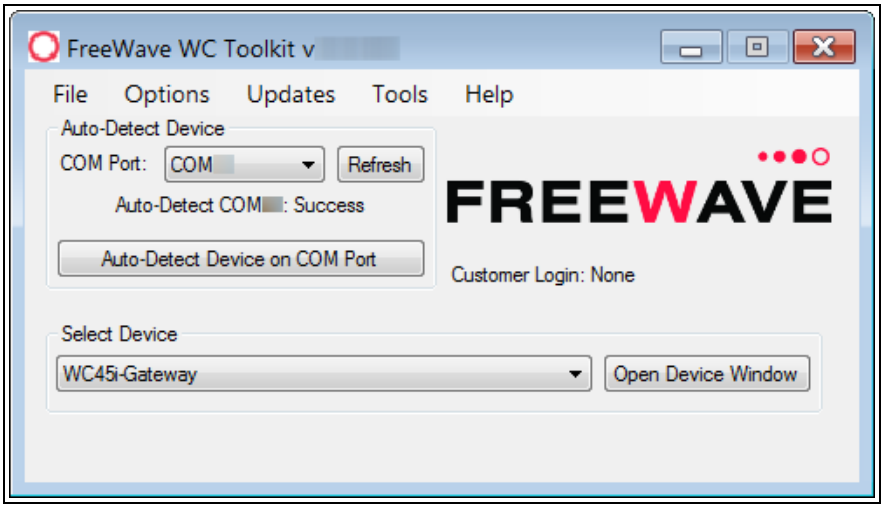


Figure 22: Select Device window

4. Click the **Refresh** button to have WC Toolkit search for and list the connected devices in **COM Port** list box.
5. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC45i-GW-DIN.
6. Click the **Auto-Detect Device on COM Port** button to have WC Toolkit connect the device to the COM Port selected in the **COM Port** list box.
   The **Device Configuration** window opens for the selected device.
7. On the **Update** menu, click **Update Gateway Firmware**.

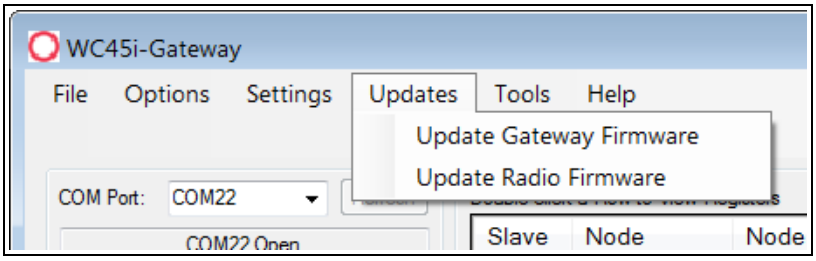


Figure 23: Updates menu > Update Gateway Firmware

The **Firmware Updates** window opens.

Note: See Firmware Updates window (on page 61) for detailed information.

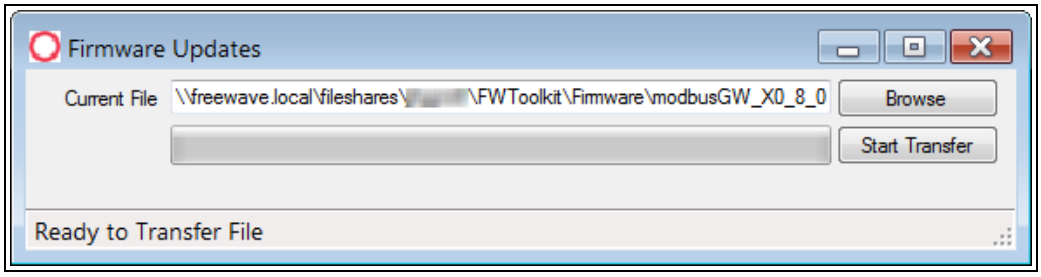


Figure 24: Firmware Updates window

Note: By default, the latest gateway firmware file is selected on the update server.
When the **Update Gateway Firmware** menu is selected, the WC45i-Gateway searches for the most recent **modbusGW** file to update.

8. Click the **Start Transfer** button to load the file to the device.
   Wait while the **Firmware Updates** progress bar shows the file transfer.

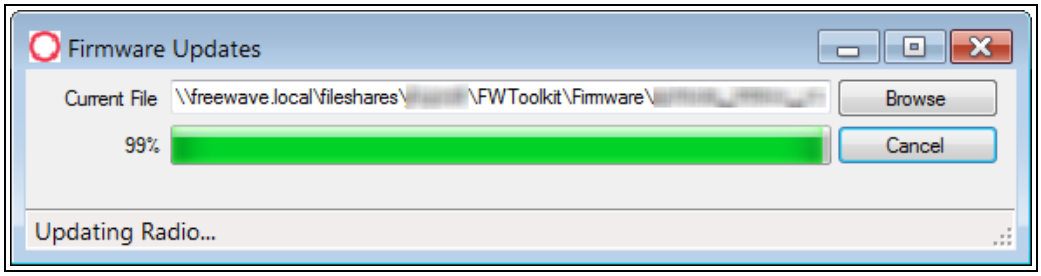


Figure 25: Progress bar of firmware update

A message appears when the firmware update is successful.

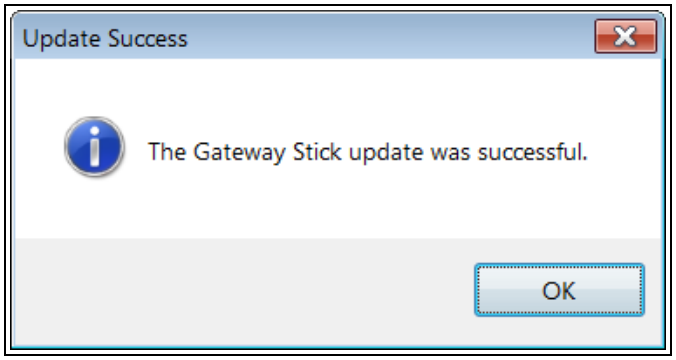


Figure 26: Successful firmware update message

9. Re-connect the DC power to the gateway.
   The firmware update process starts.

> **Note**: If the firmware update does NOT start, remove power for at least 10 seconds and re-try.

7. Remote Endpoint Configuration

The WC45i-GW-DIN Gateway allows configuration changes to be made to any of the connected WAVECONTACT remote endpoints wirelessly.

- The WC45i-GW-DIN requires an initial configuration using the Config / Debug Connector.
  - The Config / Debug port is accessed by a direct connection to the WC45i-GW-DIN **RS232 Config / Debug** connector port.

> **Note**: The WC45i-GW-DIN Gateway is configured using the **WC Toolkit**.
> Download the **WC Toolkit** software from http://support.freewave.com/.

Procedure

> **Note**: The terms node and endpoint are used interchangeably in this document.

1. Open the Device Configuration window (on page 48).
2. In the **Configure** column, select the check-box next to the endpoint to configure.

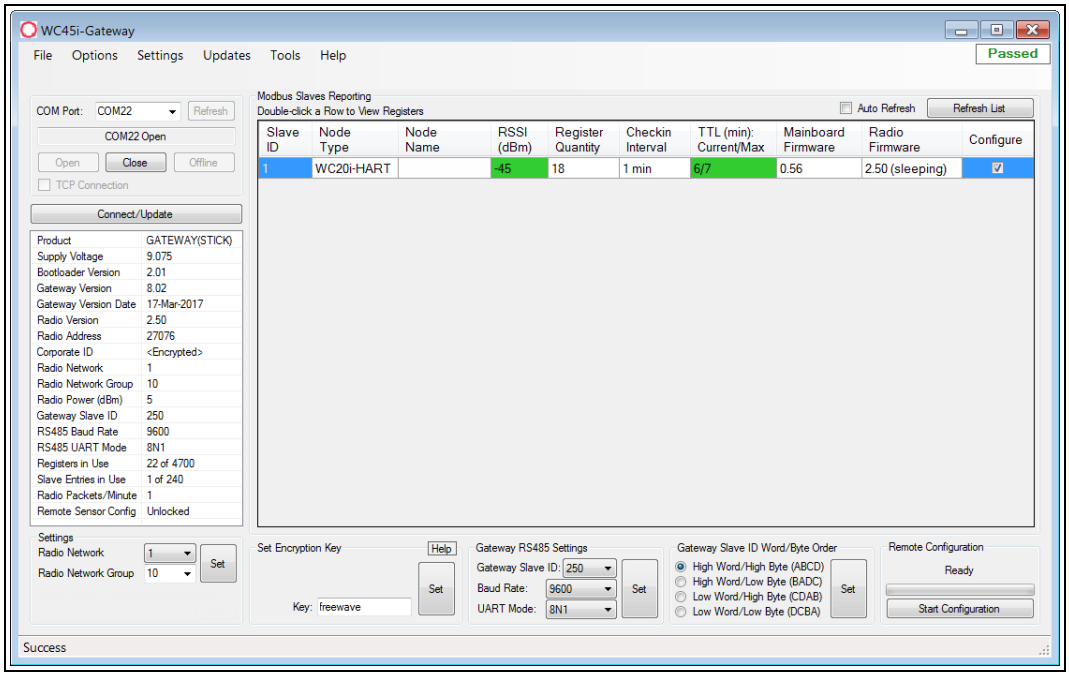


Figure 27: Detail of Endpoint in Modbus Slaves Reporting Table

3. Click the **Start Configuration** button to activate a **Remote Configuration** session.
   - If the endpoint has a **Non-Sleeping** radio, the **Remote Configuration** session is ready immediately.
   - If it is a **Sleeping** device, wait for the endpoint to either check-in or send a beacon so it can be commanded into configuration mode.
     - A WC20i Endpoint sends a beacon every 2½ minutes.
     - All other **Sleeping** endpoints send a beacon every 5½ minutes.
     - When the device has entered a **Remote Configuration** session, a message indicating the **Slave is Ready** appears.

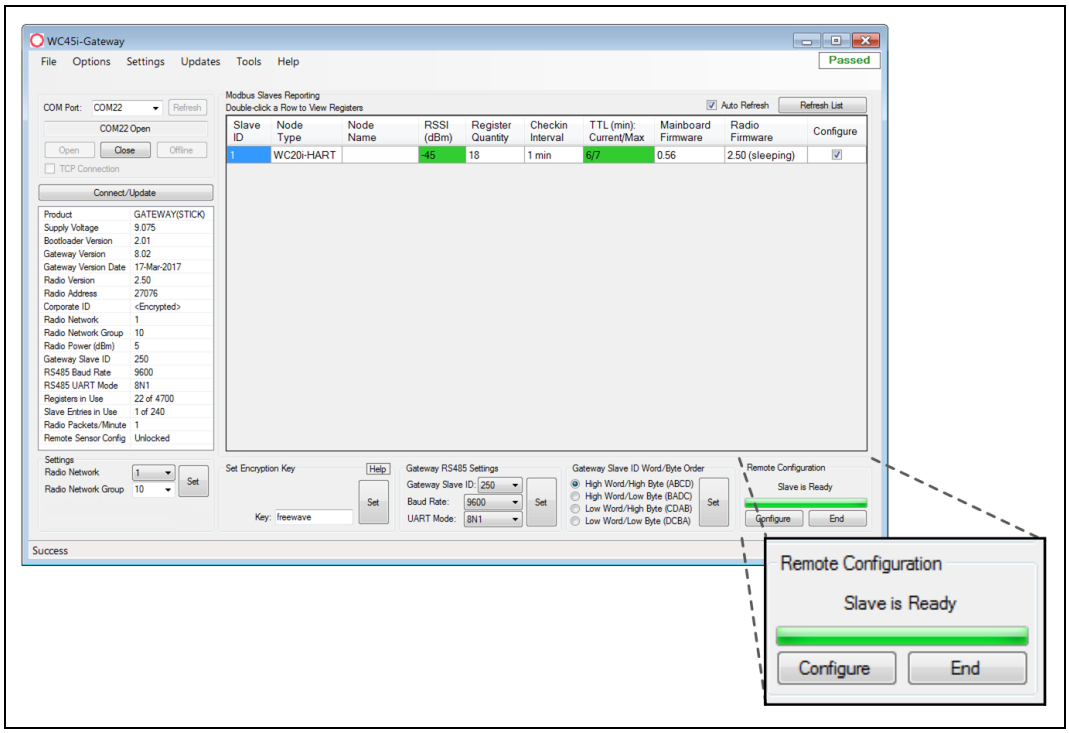


Figure 28: Remote Configuration area - Slave is Ready

4. Click the **Configure** button to open the Edit Configuration window (on page 54).

> **Important!**: The **Remote Configuration** session automatically times out after 15 minutes of inactivity and the endpoint will resume normal operation.

> **Note**: The **Edit Configuration** window is unique for the selected endpoint device. Figure 29 shows the **Edit Configuration** window for a WC20i-HART endpoint.

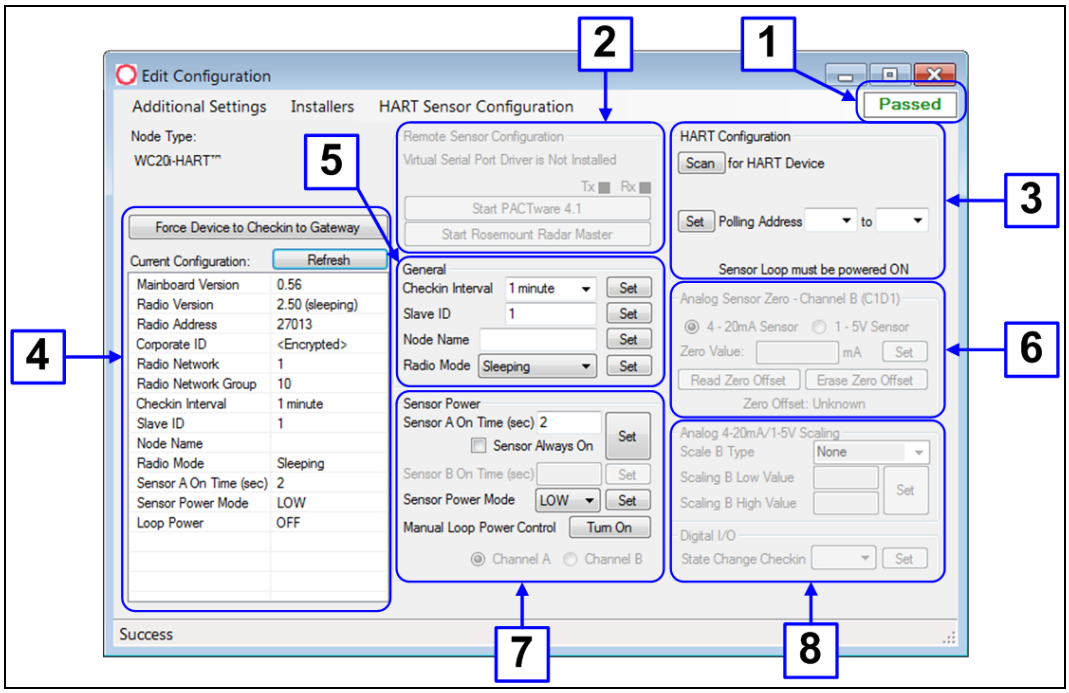


Figure 29: Edit Configuration window - WC20i-HART

5. Make any necessary changes in the active areas of the window and click the corresponding **Set** button to save the changes.
6. When finished changing the configuration, close the **Edit Configuration** window and return to the **Device Configuration** window.
7. Click the **End** button to stop the **Remote Configuration** session.
8. Optional: On the endpoint, press the **Check-in** button to .
9. Verify the gateway is communicating with the endpoints.

> **Note**: A successful connection on the WAVECONTACT endpoint is indicated with Green blinking TX and ACT lights and a red blinking light for RX.
> If the connection is NOT successful, a Green blinking TX light appears for 10 seconds.

10. Close the WC Toolkit software.
11. Remove the WC-USB-DB9 USB to Serial DB9 programming cable from the computer and the **RS232 Config / Debug** connector port.
12. As applicable, replace the endpoint cover.
13. Mount the gateway device.

8. Remote Shutdown (RSD) and Local Digital Output Control

The WC45i-GW-DIN Gateway supports Internal Logic Control capability which enables the gateway to control output relays on the WC40i-MB-RSD Modbus Endpoint or the two digital outputs on the WC45i-GW-DIN.

Note: The WC40i-MB-RSD Modbus Endpoint bundle includes the WC40i-MB and the WC40i-RSD products.

- The WC45i-GW-DIN receives data from multiple remote endpoints.
- The data is used from those remote endpoints to set the relay output on one or more remote WC40i-MB-RSD.
  - An example of the topology is shown in Figure 30.
- The WC45i-GW-DIN provides two digital outputs on the WC45i-GW-DIN.

Note: See Connections (on page 11) for port locations.

Use the Remote Shutdown Configuration (on page 37) procedure to control the output relays.

8.1. Example: WC45i-GW-DIN Topology

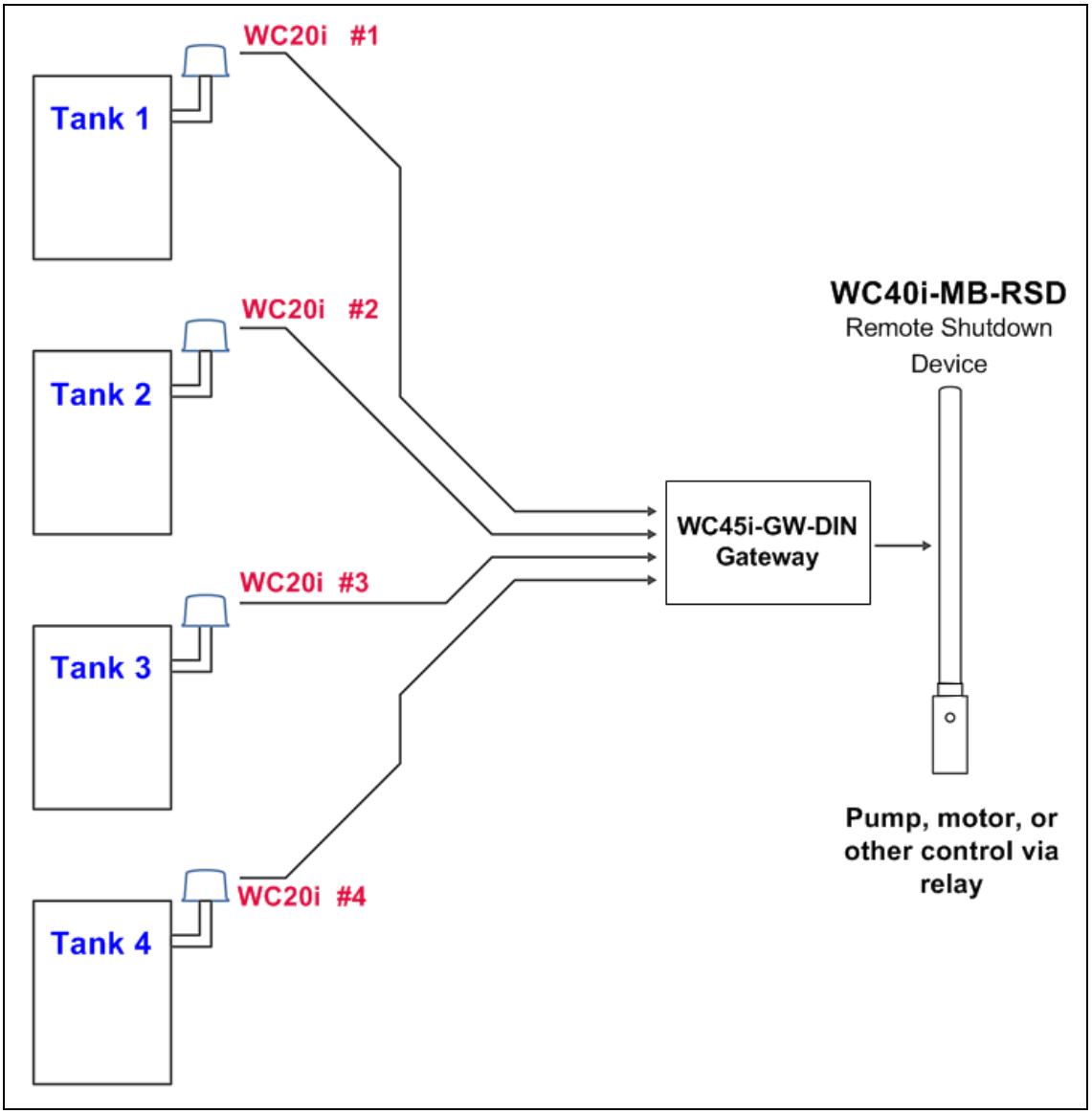


Figure 30: Example: WC45i-GW-DIN Topology

8.2. Remote Shutdown Configuration

Note: The terms node and endpoint are used interchangeably in this document.

1. Open the Device Configuration window (on page 48).
2. On the **Settings** menu, click **Remote Shutdown Settings**.

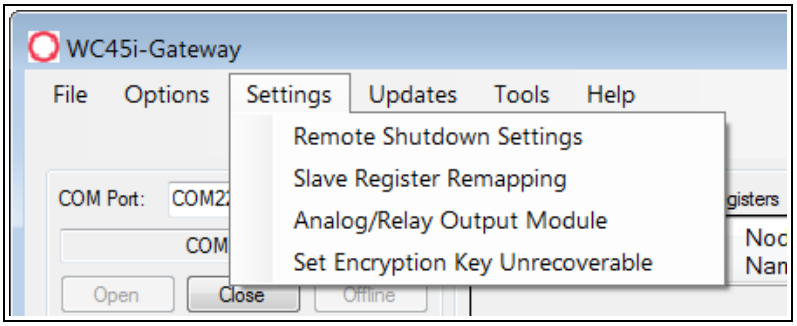


Figure 31: Settings menu > Remote Shutdown Settings

The Remote Shutdown Settings window (on page 74) opens.

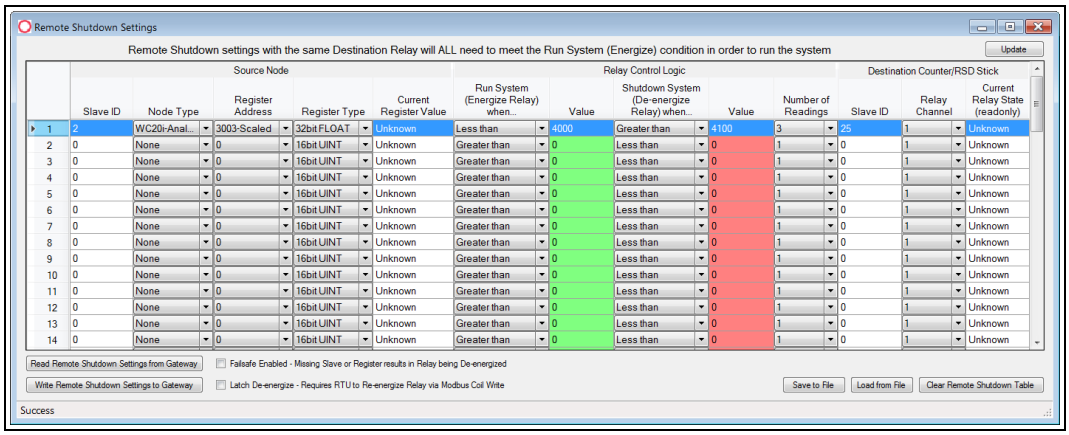


Figure 32: Remote Shutdown Settings window

3. As appropriate, complete these sections of the window:
   a. Source Node (Endpoint) area (on page 76).
   b. Relay Control Logic Section (on page 78).
   c. Destination Counter / RSD Stick Section (on page 80).
4. Click the **Write Remote Shutdown Settings to Gateway** button to store the settings in the WC45i-Gateway.
5. Optional: Click the **Failsafe Enabled** check box to require ALL rules to have valid data for the relay to be energized.

> **Important!**: If one or more of the endpoints time-out or does not exist, the relay is de-energized.
> If this option is NOT selected, then an endpoint that is not installed or fails to check in is ignored and the relay is energized using logic only from the units that are active.

6. Optional: Click the **Latch De-Energized** check box so the rules may only de-energize the relay.

> **Note**: For the relay to be energized again, a Modbus write from a PLC to the gateway for the destination WC40i-MB-RSD or WC40i-COUNT relay must occur.
> This is useful if manual intervention is required before the relay is energized after an event.
> In 8, a Modbus coil write to Slave ID 5 relay channel 1 (which is register 1) is required to energize the relay.

9. Slave Register Remapping

The gateway allows any of the remote register data to be remapped to a single block of registers available at the gateway's Slave ID.

Note: The default is 247.

- This is useful for collecting a subset of register data from multiple endpoints and making it readable in a single block of registers.
- A maximum of 750 registers can be remapped to the gateway's Slave ID starting at register 5000.

Procedure

Note: The terms node and endpoint are used interchangeably in this document.

1. Open the Device Configuration window (on page 48).
2. On the **Settings** menu, click **Slave Register Remapping**.

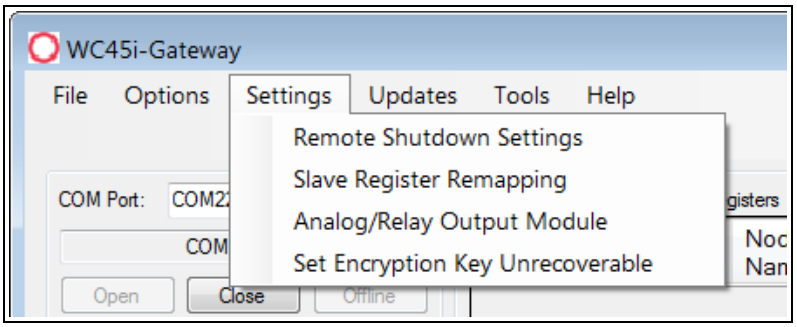


Figure 33: Settings menu > Slave Register Remapping

The Slave Register Remapping window (on page 81) opens.

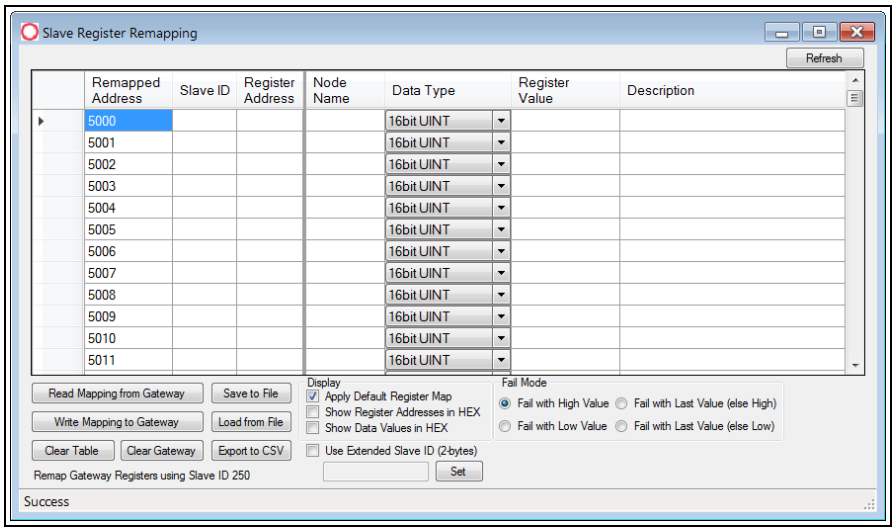


Figure 34: Slave Register Remapping window

3. In the **Slave ID** column / text box, enter the remote source endpoint Modbus Slave ID.

> **Important!**: Verify there are no duplicate Slave IDs in a given network.
> The gateway only caches one set of data for each Slave ID. A duplicate is overwritten.

4. In the **Register Address** column text box, enter the register address to map to each gateway register.

> **Note**: The **Node Name**, **Data Type**, **Register Value**, and **Description** columns are automatically filled in by the gateway once the mapping is written to the gateway.

5. Click the **Write Mapping to Gateway** button to remap the registers.

   Figure 35 shows an example of a the **Slave Register Remapping** window.

   - **Slave ID 1** is a **WC20i-AN Analog Endpoint** mapped to have sensor current, RSSI and battery voltage available at gateway registers 5000 through 5002.
   - **Slave ID 5** is NOT reporting data to the gateway so its registers are failing high.

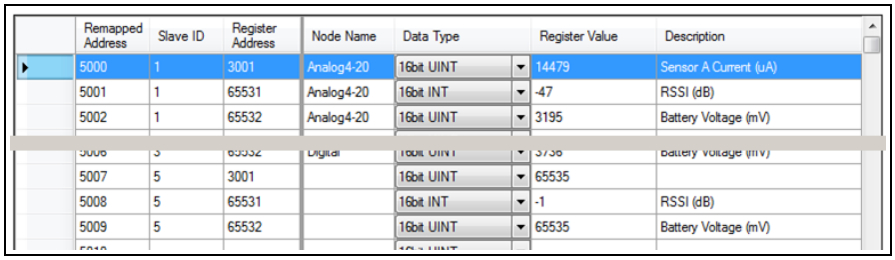


Figure 35: Example of the Slave Register Remapping window

Important!: If the gateway does NOT have data for a remapped value, it will respond with 0xFFFF, or 0x0000 for the register request.
Use the Fail Mode settings to configure this globally.

Note: 0xFFFF = 65535, 0x0000 = 0.

10. Modbus Gateway Register Map

Important!: By default, the WAVECONTACT Modbus Gateway is assigned Modbus **Slave ID** number 247.

- Only the gateway status / configuration registers are read at this address.
- All remote endpoint registers are read from the **Slave ID** and **Register Address** of the remote endpoint, unless the Slave Register Remapping (on page 39) procedure is used.
- Registers include:
  - Boolean Registers (on page 43)
  - Read / Write Registers (on page 43)
  - Read-only Registers (on page 44)

10.1. Boolean Registers

- These are 1-bit coil registers.
- They can only be written to Modbus opcode 0x05 (Write Single Coil).
- Writing 0x0000 to a coil has **NO** effect.
- To perform these resets, write a 0xFF00 to the respective coil:

Boolean Registers		
Register Number	**Register Address (Offset)**	**Description**
00001	0000	Resets the gateway and radio.
00002	0001	Resets the radio leaving the gateway on.
00003	0002	Resets all counters to zero. **Note**: See Modbus Gateway Register Map (on page 42) 2026-2031.

10.2. Read / Write Registers

- These are 16-bit read/write registers.
- They can be written to by Modbus opcode 0x06 or 0x10 (Write Single and Multiple Registers, respectively).
- They can be read with Modbus opcode 0x03 or 0x04 (Read Discrete Input and Holding Registers, respectively).
- The first three registers are identical to the previous three write coils and behave similarly.
- They will be read as 0x0000 and can be triggered by writing 0xFF00 to them.
- The remaining must be written with 16-bit values in the range specified in the Read / Write Registers (on page 43) table:

Read / Write Registers		
Register Number	**Register Address (Offset)**	**Description**
41001	1000	Resets the gateway and radio
41002	1001	Resets the radio leaving the gateway on
41003	1002	Resets all GW status counters to zero. **Note**: See Modbus Gateway Register Map (on page 42) 2026-2031.

10.3. Read-only Registers

- These are 16-bit Read-only registers.
- They can be read with Modbus opcode 0x03 or 0x04 (Read Discrete Input and Holding Registers, respectively).

Note: If the gateway has a large total number of registers approaching 4700, register 2008 should be monitored to ensure that free registers are available before adding a new endpoint.

Read-only Registers		
Register Number	**Register Address (Offset)**	**Description**
42001	2000	Upper 16 bits of SFTS GW endpoint address (the radio ID).
42002	2001	Lower 16 bits of SFTS GW endpoint address (the radio ID).
42003	2002	Upper 16 bits of Radio Firmware version number.
42004	2003	Lower 16 bits of Radio Firmware version number.
42005	2004	Upper 16 bits of gateway firmware version number.
42006	2005	Lower 16 bits of gateway firmware version number.
42007	2006	Number of slave endpoints that data is cached for this gateway.
42008	2007	Total number of registers allocated to slave devices.
42009	2008	Total number of free registers available for slave devices.
42010	2009	Bitmask for active slave IDs 15-0 (LSB is 0).
42011	2010	Bitmask for active slave IDs 31-16 (LSB is 16).
42012	2011	Bitmask for active slave IDs 47-32 (LSB is 32).
42013	2012	Bitmask for active slave IDs 63-48 (LSB is 48).
42014	2013	Bitmask for active slave IDs 79-64 (LSB is 64).
42015	2014	Bitmask for active slave IDs 95-80 (LSB is 80).
42016	2015	Bitmask for active slave IDs 111-96 (LSB is 96).
42017	2016	Bitmask for active slave IDs 127-112 (LSB is 112).
42018	2017	Bitmask for active slave IDs 143-128 (LSB is 128).
42019	2018	Bitmask for active slave IDs 159-144 (LSB is 144).
42020	2019	Bitmask for active slave IDs 175-160 (LSB is 160).
42021	2020	Bitmask for active slave IDs 191-176 (LSB is 176).
42022	2021	Bitmask for active slave IDs 207-192 (LSB is 192).
42023	2022	Bitmask for active slave IDs 223-208 (LSB is 208).

Read-only Registers		
Register Number	**Register Address (Offset)**	**Description**
42024	2023	Bitmask for active slave IDs 239-224 (LSB is 224).
42025	2024	Bitmask for active slave IDs 255-240 (LSB is 240).
42026	2025	Gateway power supply voltage in mV.
42027	2026	Radio packets received count.
42028	2027	Radio packets sent count.
42029	2028	RS-485 messages received count.
42030	2029	RS-485 messages sent count .
42031	2030	Total Modbus errors from master and slaves.
42032	2031	Modbus exceptions from slave endpoints.
42033	2032	Radio packets received / transmitted per minute. **FREEWAVE Recommends**: Less than 60
42034	2033	Radio packets per minute alert. • 0 (zero) if packets/min <= 60. • 1 if packets/min > 60.
42101	2100	Address test register. **Note**: This register always returns 2100.
42102	2101	Address test register. **Note**: This register always returns 2101.
42103	2102	Address test register. **Note**: This register always returns 2102.
43001	3000	Writes the radio address of an endpoint to this register to cause that WC45i-GW-485 to perform a scan for attached Modbus sensors.
43004	3003	Writes Modbus ID for a Modbus Client endpoint to this register to cause that remote endpoint to perform a scan for attached Modbus sensors.
44002	4001	Status of Slave ID 1. **Note**: This register returns 1 if Slave is present and 0 (zero) if Slave is not present.

Read-only Registers		
Register Number	**Register Address (Offset)**	**Description**
44003	4002	Status of Slave ID 2. **Note**: This register returns 1 if Slave is present and 0 (zero) if Slave is not present.
44241	4240	Status of Slave ID 240. **Note**: This register returns 1 if Slave is present and 0 (zero) if Slave is not present.

11. WC Toolkit Software Environment

The WC Toolkit software environment uses these windows to configure all WAVECONTACT devices:

11.1. Device Configuration window

The **Device Configuration** window is used to configure the settings on the WC45i-GW-DIN.

If one or more remote endpoints are configured with the correct network settings they send their data to the gateway.

- The gateway shows the endpoint type, endpoint name, RSSI signal strength, programmed endpoint check-in interval, the Time To Live (TTL), and the endpoints radio and main firmware versions.

Access and Window Description

1. Verify the WC Toolkit software is installed on the computer connected to the WC45i-GW-DIN.

   Note: Download the **WC Toolkit** software from http://support.freewave.com/. Registration is required to use this login.

2. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 36)

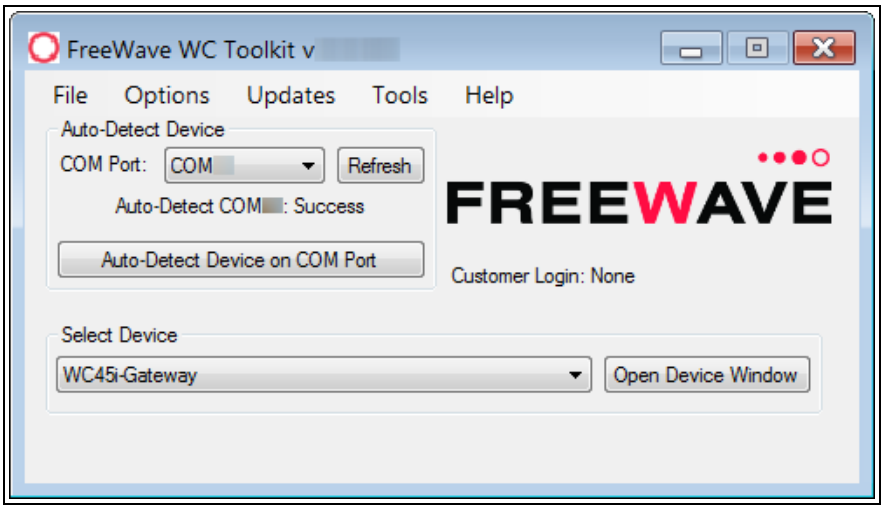


Figure 36: Select Device window

3. Click the **Refresh** button to have WC Toolkit search for and list the connected devices in **COM Port** list box.
4. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC45i-GW-DIN.
5. Click the **Auto-Detect Device on COM Port** button to have WC Toolkit connect the device to the COM Port selected in the **COM Port** list box.

   Note: Optional: Click the **Select Device** list box arrow and select the connected WC45i-Gateway device.

   The **Device Configuration** window opens for the selected device.

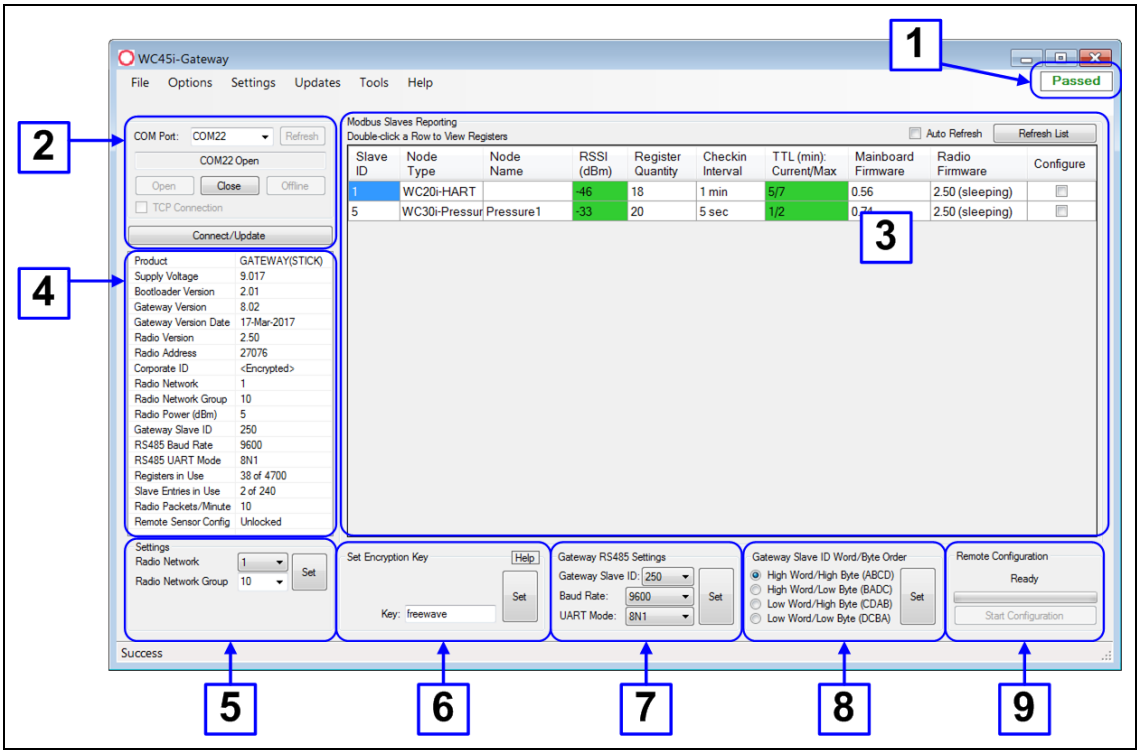


Figure 37: Device Configuration window: WC45i-Gateway

Device Configuration window: WC45i-GW-DIN		
Control Area	**Control Title**	**Control Description**
	Set button	Click the **Set** button to save the information.
1 - 1 - **Status of Last Operation** text boxtext box		The **1 - Status of Last Operation text box** text box indicates whether the last command from the WC Toolkit to the connected device is **Active** or has **Passed**. **Note**: This information is read-only.
2 - **Serial Port Settings** area		The **Serial Port Settings** area shows the connected COM port and is used to re-connect to the COM port if the connection is lost.
2 - **Serial Port Settings** area	**COM** text box	The **COM** text box shows the COM port the WAVECONTACT device is connected to. **Note**: This information is read-only.
2 - **Serial Port Settings** area	**Open** button	Click the **Open** button to re-connect the WAVECONTACT device to the COM port.
2 - **Serial Port Settings** area	**Close** button	Click the **Close** button to disconnect the WAVECONTACT device from the COM port.

Device Configuration window: WC45i-GW-DIN		
Control Area	**Control Title**	**Control Description**
2 - **Serial Port Settings** area	**Offline** button	Click the **Offline** button to disconnect the WAVECONTACT device from the COM port but continue to configure the device offline.
2 - **Serial Port Settings** area	**TCP Connection** check box	**Note**: The **TCP Connection** check box is only available for the WC45i-GW-P Ethernet Module.
2 - **Serial Port Settings** area	**Connect / Update** button	Click the **Connect / Update** button to re-connect to the COM port of the WAVECONTACT device.
3 - **Modbus Slaves Reporting** table		The **Modbus Slaves Reporting** table shows all connected remote endpoints. **Note**: This information is read-only. See the Modbus Slaves Reporting table (on page 52) for detailed information about the table.
4 - WC45i-GW-485 **Information** area		The **Information** area of the **Device Configuration** window shows connection information about the WC45i-GW-DIN. **Note**: This information is read-only.
5 - **Settings** area		The **Settings** area is used to define the radio mode and radio network.
5 - **Settings** area	**Radio Network** list box	Click the **Radio Network** list box arrow and select 0 (zero) to 7 for the assigned number. **Note**: The default value is 1. **Important!**: The **Radio Network** and **Radio Network Group** settings are randomly selected but MUST MATCH the existing gateway network for successful communication between the gateway and endpoint.

Device Configuration window: WC45i-GW-DIN		
Control Area	**Control Title**	**Control Description**
5 - **Settings** area	**Radio Network Group** list box	Click the **Radio Network Group** list box arrow and select 0 (zero) to 29 for the network group assigned number. **Note**: The default value is 10. **Important!**: The **Radio Network** and **Radio Network Group** settings are randomly selected but MUST MATCH the existing gateway network for successful communication between the gateway and endpoint.
6 - **Set Encryption Key** area		The **Set Encryption Key** area is used to activate and define the encryption key for the WC45i-GW-DIN.
6 - **Set Encryption Key** area	**Help** button	Click to open the Encryption **Help** message.
6 - **Set Encryption Key** area	**Key** text box	In the **Key** text box, enter the encryption key for the device using 6 to 16 characters. **Important!**: A Key CANNOT contain spaces or angle brackets. The gateway and endpoints only communicate if they are configured with the same **Key**.
7 - **Gateway RS485 Settings** area		The **Gateway RS485 Settings** area is used to define the RS485 settings and communication timing. **Note**: The gateway has registers that are read for diagnostics. They are not often used except when remapping Modbus data. When remapping, read all data from this Slave ID.
7 - **Gateway RS485 Settings** area	**Gateway Slave ID** list box	Click the **Gateway Slave ID** list box arrow and select the Modbus Slave ID for the gateway.
7 - **Gateway RS485 Settings** area	**Baud Rate** list box	Click the **Baud Rate** list box arrow and select the baud rate for the RS485 Modbus port.
7 - **Gateway RS485 Settings** area	**UART Mode** list box	Click the **UART Mode** list box arrow and select the number of data bits, parity, and stop bits used with the RS485 Modbus port.
8 - **Gateway Slave ID Word / Byte Order** area		The **Gateway Slave ID Word / Byte Order** area is used to set communication timing by selecting one of the byte order options for transmission of Modbus data. .

Device Configuration window: WC45i-GW-DIN		
Control Area	**Control Title**	**Control Description**
8 - **Gateway Slave ID Word / Byte Order** area	**High Word / High Byte (ABCD)** option button	Select the **High Word / High Byte (ABCD)** option button to transmit the Modbus data in a High Word / High Byte order.
8 - **Gateway Slave ID Word / Byte Order** area	**High Word / Low Byte (BACD)** option button	Select the **High Word / Low Byte (BACD)** option button to transmit the Modbus data in a High Word / Low Byte order.
8 - **Gateway Slave ID Word / Byte Order** area	**Low Word / High Byte (CDAB)** option button	Select the **Low Word / High Byte (CDAB)** option button to transmit the Modbus data in a Low Word / High Byte order.
8 - **Gateway Slave ID Word / Byte Order** area	**Low Word / Low Byte (DCBA)** option button	Select the **Low Word / Low Byte (DCBA)** option button to transmit the Modbus data in a Low Word / Low Byte order.
9 - **Remote Configuration** area		The **Remote Configuration** area is used to start and end a **Remote Configuration** session.

9 - **Remote Configuration** area	**Start Configuration** button	Click the **Start Configuration** button to activate a **Remote Configuration** session.
		• If the endpoint has a **Non-Sleeping** radio, the **Remote Configuration** session is ready immediately.
		• If it is a **Sleeping** device, wait for the endpoint to either check-in or send a beacon so it can be commanded into configuration mode.
		  • A WC20i Endpoint sends a beacon every 2½ minutes.
		  • All other **Sleeping** endpoints send a beacon every 5½ minutes.
		  • When the device has entered a **Remote Configuration** session, a message indicating the **Slave is Ready** appears.

9 - **Remote Configuration** area	**Configure** button	Click the **Configure** button to open the Edit Configuration window (on page 54).
9 - **Remote Configuration** area	**End** button	Click the **End** button to stop the **Remote Configuration** session.

11.1.1. Modbus Slaves Reporting table

Device Configuration window: Modbus Slaves Reporting table	
Control Title	**Control Description**
Auto Refresh check box	Select the **Auto Refresh** check box to automatically update the information in the table every 10 seconds.

Device Configuration window: Modbus Slaves Reporting table	
Control Title	**Control Description**
Refresh List button	Click the **Refresh** or **Refresh List** button to update the information in the table.
Slave ID column	The **Slave ID** column / text box shows the remote source endpoint Modbus **Slave ID** selected in the **Settings** area of the **Device Configuration** window.
Node Type column	The **Node Type** column shows the type of endpoint attached to the WC45i-Gateway.
Node Name column	The **Node Name** column / text box shows the name assigned to the endpoint in the **Settings** area of the **Device Configuration** window.
RSSI (dbm) column	The **RSSI (dbm)** column / text box shows the signal strength received from the endpoint to its neighbor (e.g., a neighbor could be the gateway if it is not hopping). **Example**: The RSSI is adjusted so if a 500mW device is communicating to a 40mW device the RSSI is shown as being equal in both directions at the lower signal strength. **Notes** • All communications are bi-directional so messages are needed in both directions for communications. • The RSSI and TTL values are color coded (green, yellow, orange, red) to indicate the relative link quality of an endpoint. Red=Bad link, Yellow=OK link, Green=Good link.
Register Quantity column	The **Register Quantity** column shows the number of Modbus register data points available the endpoint has reported to the gateway.
Checkin Interval column	The **Checkin Interval** column shows the check-in time selected in the **Checkin Interval** list box of the **Settings** area of the **Device Configuration** window.
TTL (min): Current / Max column	The **TTL Current** is set to the **TTL Max** each time an update is received from that endpoint. • The **TTL Current** indicates the number of minutes remaining until the endpoint is timed out of the gateway if no updates are received. • The **TTL Max** indicates the maximum TTL for that endpoint. **Note**: The RSSI and TTL values are color coded (green, yellow, orange, red) to indicate the relative link quality of an endpoint. Red=Bad link, Yellow=OK link, Green=Good link.
Mainboard Firmware column	The **Mainboard Firmware** column shows the version of firmware currently installed on the mainboard of the gateway.
Radio Firmware column	The **Radio Firmware** column shows the version of radio firmware currently installed on the endpoint.
Configure column	In the **Configure** column, select the check-box next to the endpoint to configure.

11.2. Edit Configuration window

The **Edit Configuration** window is used to configure individual endpoints in the network.

Access and Window Description

1. Open the Device Configuration window (on page 48).
2. In the **Configure** column, select the check-box next to the endpoint to configure.
3. Click the **Start Configuration** button to activate a **Remote Configuration** session.

   When the device has entered a **Remote Configuration** session, a message indicating the **Slave is Ready** appears.

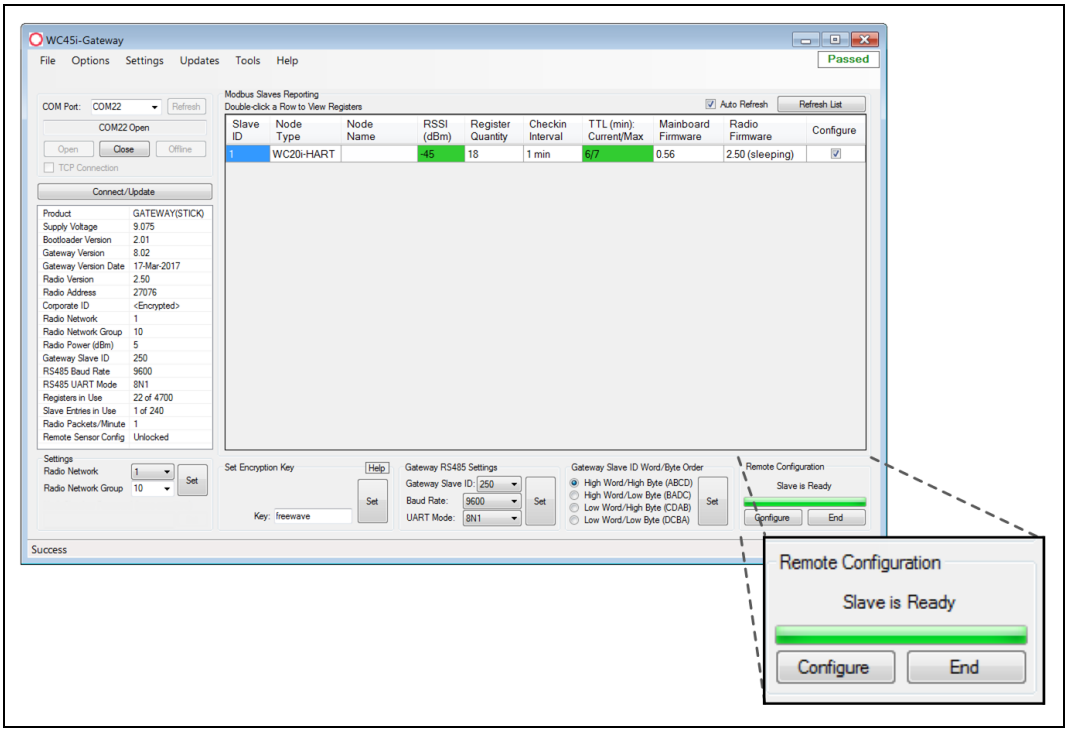


Figure 38: Remote Configuration area - Slave is Ready

4. Click the **Configure** button to open the **Edit Configuration** window.

The **Edit Configuration** window opens with device-specific control options depending on the connected sensor:

- Edit Configuration window - General Sensor (on page 55)

11.2.1. Edit Configuration window - General Sensor

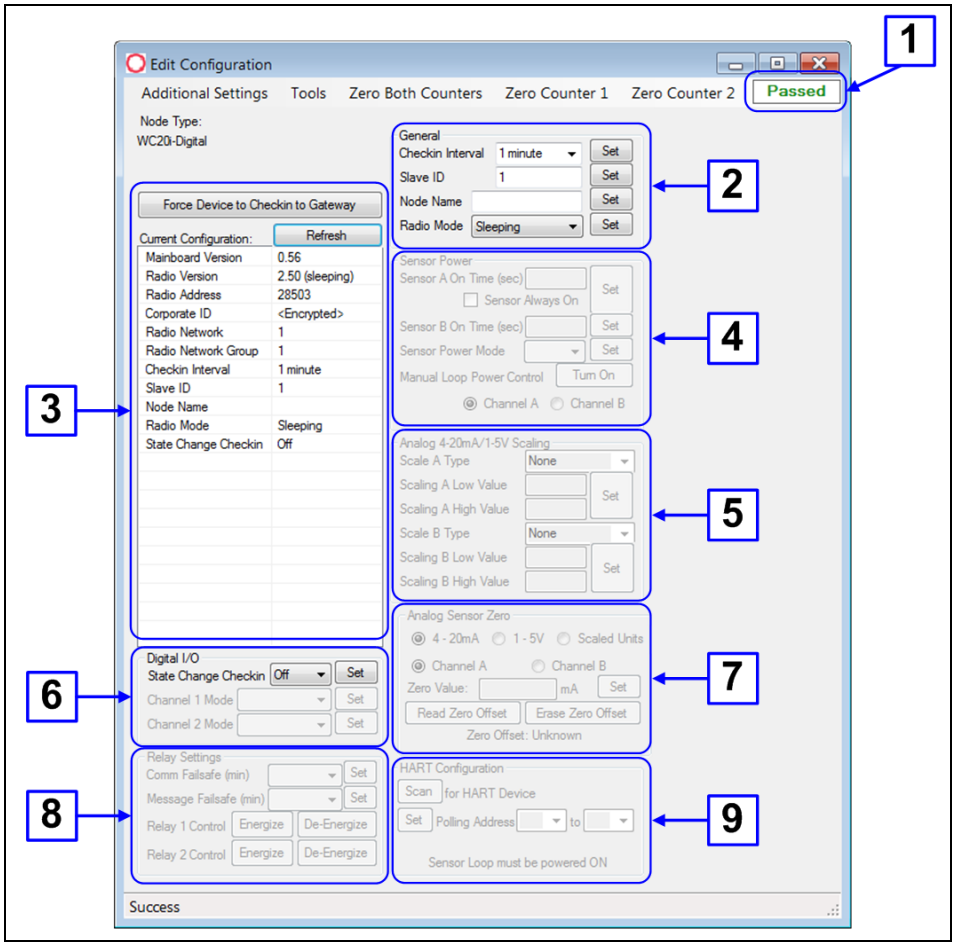


Figure 39: Edit Configuration window

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
	Set button	Click the **Set** button to save the information.
1 - **Status of Last Operation** text box		The **1 - Status of Last Operation text box** text box indicates whether the last command from the WC Toolkit to the connected device is **Active** or has **Passed**. **Note**: This information is read-only.
2 - **General** area	**Checkin Interval** list box	Click the **Checkin Interval** list box arrow and select how often the endpoint wakes up, reads the sensor values, and transmits the data to the gateway.

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
2 - **General** area	**Slave ID** text box	In the **Slave ID** column / text box, enter the remote source endpoint Modbus Slave ID. **Important!**: Verify there are no duplicate Slave IDs in a given network. The gateway only caches one set of data for each Slave ID. A duplicate is overwritten.
2 - **General** area	**Node Name** text box	In the **Node Name** text box, enter a name for the endpoint using a maximum of 10 characters.
2 - **General** area	**Radio Mode** list box	Click the **Radio Mode** list box arrow and select either **Sleeping** or **Non-Sleeping**.
3 - WC45i-GW-485 **Information** area		The **Information** area of the **Device Configuration** window shows connection information about the WC45i-GW-DIN. **Note**: This information is read-only.
3 - WC45i-GW-485**Information** area	**Force Device to Checkin to Gateway** button	Click the **Force Device to Checkin to Gateway** button to force the endpoint to send data to the WC45i-GW-485, WC45i-GW-AN, or WC45i-GW-DIN.
3 - WC45i-GW-485**Information** area	**Refresh** button	Click the **Refresh** button to update the information in this area.
4 - **Sensor Power** area	**Sensor A On Time (sec)** text box	In the **Sensor On time (sec)** text box, enter the number of seconds the sensor powers on before its value is read. **FREEWAVE Recommends**: Accept the default **Sensor On time (sec)** value of 2 seconds for most devices. However, radar sensors often require a longer warm-up time.
4 - **Sensor Power** area	**Sensor Always On** check box	Select the **Sensor Always On** check box to make the sensor always have power no matter what type of power source is connected to the device. **Note**: Having the **Sensor Always On** selected is useful for rapid data collection on a sensor that has a long warm-up time. However, it will shorten the battery life **dramatically** unless a **Solar Powered WC20i** is used.

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
4 - **Sensor Power** area	**Sensor B On Time (sec)** text box	In the **Sensor B On Time (sec)** text box, enter the number of seconds a second sensor powers on before its value is read.
4 - **Sensor Power** area	**Sensor Power Mode** list box	Click the **Sensor Power Mode** list box arrow and select either HIGH or LOW volts for the WC20i. **Note**: HIGH outputs 18.5 volts to the sensor and LOW outputs 12.5 volts. LOW results in longer battery life but some sensors require a higher voltage. In 4-20mA mode HIGH is automatically selected and is the only option. It will supply a minimum of 13.5V to the sensor at full load.
4 - **Sensor Power** area	**Manual Loop Power Control** button	Click the **Manual Loop Power Control** button to send power to the sensor so the sensor can be configured. **Note**: The loop times out after a short time if it is not shut off.
4 - **Sensor Power** area	**Channel A** option button	Select the **Channel A** option button to assign the changed settings to Channel A in a 2-channel device.
4 - **Sensor Power** area	**Channel B** option button	Select the **Channel B** option button to assign the changed settings to Channel B in a 2-channel device.
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scale A Type** list box	Click the **Scale A Type** list box arrow and select either a 4-20mA or 1-5V sensor to scale to an engineering unit equivalent (e.g., 4-20mA = 0-1000 PSI). **Note**: If **None** is selected, there is no scaling of the analog readings to engineering units.
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scaling A Low Value** text box	In the **Scaling A Low Value** text box, manually enter the sensor's lower range value. **Note**: By default, the **Scaling A Low Value** corresponds with the lowest reading from the sensor, either 4mA or 1V, depending on the selection in the **Scale A Type** list box.

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scaling A High Value** text box	In the **Scaling A High Value** text box, manually enter the sensor's upper range value. **Note**: By default, the **Scaling A High Value** corresponds with the highest reading from the sensor, either 20mA or 5V, depending on the selection in the **Scale A Type** list box.
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scaling B Type** list box	Click the **Scale A Type** list box arrow and select either a 4-20mA or 1-5V sensor to scale to an engineering unit equivalent (e.g., 4-20mA = 0-1000 PSI). **Note**: If **None** is selected, there is no scaling of the analog readings to engineering units.
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scaling B Low Value** text box	In the **Scaling A Low Value** text box, manually enter the sensor's lower range value. **Note**: By default, the **Scaling A Low Value** corresponds with the lowest reading from the sensor, either 4mA or 1V, depending on the selection in the **Scale A Type** list box.
5 - **Analog 4-20mA / 1-5V Scaling** area	**Scaling B High Value** text box	In the **Scaling A High Value** text box, manually enter the sensor's upper range value. **Note**: By default, the **Scaling A High Value** corresponds with the highest reading from the sensor, either 20mA or 5V, depending on the selection in the **Scale A Type** list box.
6 - **Digital I/O** area	**State Change Checkin** list box	Click the **State Change Checkin** list box arrow and select **Yes** to check on a change of state at the input rather than waiting for the check in time to expire.
6 - **Digital I/O** area	**Channel 1 Mode** list box	Click the **Channel 1 Mode** list box arrow and select either INPUT (analog or digital) or OUTPUT (relay control) for Channel 1.
6 - **Digital I/O** area	**Channel 2 Mode** list box	Click the **Channel 2 Mode** list box arrow and select either INPUT (analog or digital) or OUTPUT (relay control) for Channel 2.
7 - **Analog Sensor Zero** area	**4-20mA** option button	Select the **4-20mA** option button to apply the designated sensor reading entered in the **Zero Value** text box when using a 4-20mA input.

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
7 - **Analog Sensor Zero** area	**1-5V** option button	Select the **1-5V** option button to apply the designated sensor reading entered in the **Zero Value** text box when using a 1-5V input.
7 - **Analog Sensor Zero** area	**Scaled Units** option button	Select the **Scaled Units** option button to scale to an engineering unit equivalent (e.g., 4-20mA = 0-1000 PSI).
7 - **Analog Sensor Zero** area	**Channel A** option button	Select the **Channel A** option button to assign the changed settings to Channel A in a 2-channel device.
7 - **Analog Sensor Zero** area	**Channel B** option button	Select the **Channel B** option button to assign the changed settings to Channel B in a 2-channel device.
7 - **Analog Sensor Zero** area	**Zero Value** text box	In the **Zero Value** text box, enter what the sensor should be reading.
7 - **Analog Sensor Zero** area	**Read Zero Offset** button	Click the **Read Zero Offset** button to force the sensor to use the setting in the **Zero Value** text box.
7 - **Analog Sensor Zero** area	**Erase Zero Offset** button	Click the **Erase Zero Offset** button to erase the value entered in the **Zero Value** text box.
8 - **Relay Settings** area	**Comm Failsafe (min)** list box	Click the **Comm Failsafe (min)** list box arrow and select the time to set the outputs to a de-energized state if the link is lost with the gateway after a set time. **Note**: This setting is used for **Remote Shutdown Device**.
8 - **Relay Settings** area	**Message Failsafe (min)** list box	Click the **Message Failsafe (min)** list box arrow and select the time .
8 - **Relay Settings** area	**Relay 1 Control** or **Relay 2 Control Energize** button	Click the **Relay 1 Control** or **Relay 2 Control Energize** button to manually test (energize) the relays.
8 - **Relay Settings** area	**Relay 1 Control** or **Relay 2 Control De-Energize** button	Click the **Relay 1 Control** or **Relay 2 Control De-Energize** button to manually test (de-energize) the relays.

Edit Configuration window - WC45i-GW-485		
Control Area	**Control Title**	**Control Description**
9 - **HART Configuration** area	**Scan** button	Click the **Scan** button to scan for the HART ID and show it in the first **Polling Address** list box so it can be changed later using this same window. **Important!**: The HART ID **must be set to 1** for the WC20i to communicate with the HART sensor.
9 - **HART Configuration** area	**Polling Address** list boxes	Click the second **Polling Address** list box arrow and select the new HART ID to change the HART sensor to.

11.3. Firmware Updates window

The **Firmware Updates** window is used to access and transfer the update file for the WC45i-GW-485.

Access and Window Description

1. Open the Device Configuration window (on page 48).
2. On the **Updates** menu, click either **Update Gateway Firmware** or **Update Radio Firmware**.

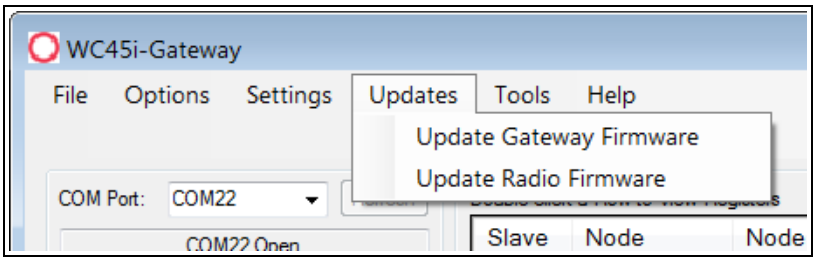


Figure 40: Updates menu

The **Firmware Updates** window opens.

11.3.1. Update Gateway Firmware menu - Firmware Updates window

Note: By default, the latest gateway firmware file is selected on the update server.
When the **Update Gateway Firmware** menu is selected, the WC45i-Gateway searches for the most recent **modbusGW** file to update.

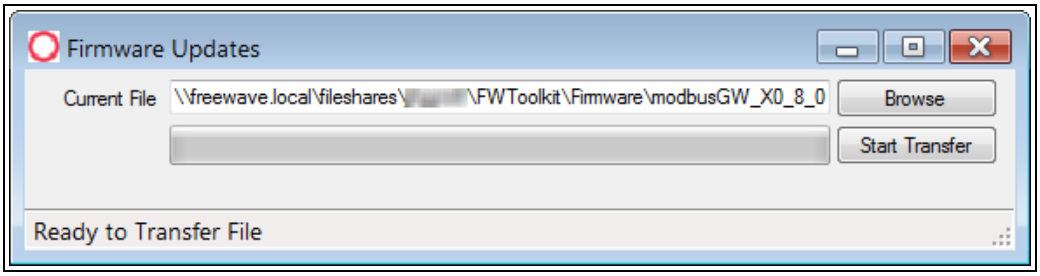


Figure 41: Update Gateway Firmware menu - Firmware Updates window

11.3.2. Update Radio Firmware menu - Firmware Updates window

Note: By default, the latest gateway firmware file is selected on the update server.
When the **Update Radio Firmware** menu is selected, the WC45i-Gateway searches for the most recent **appNode** file to update.

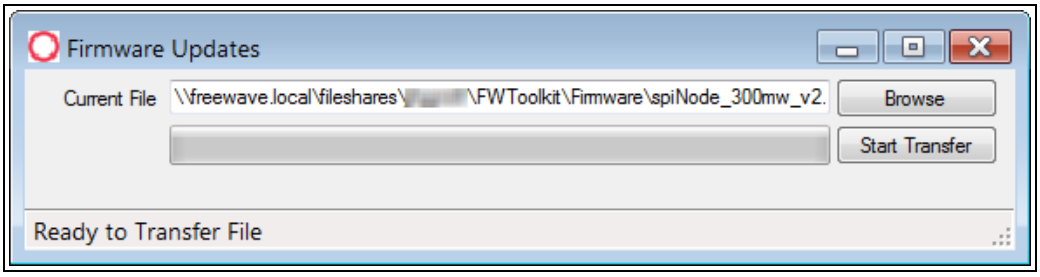


Figure 42: Update Radio Firmware menu - Firmware Updates window

Firmware Updates window	
Control Title	**Control Description**
Current File text box	The **Current File** text box shows the selected file location of the update file. **Note**: By default, the latest gateway firmware file is selected on the update server.
Browse button	Click to open the **Open** dialog box. Use the dialog box to search for and select the update file.
Start Transfer button	Click the **Start Transfer** button to load the file to the device.

11.4. Gateway Log window

The **Gateway Log** window is used to log events such as reboots, remote endpoints joining and/or timing out, local RSD control events, remote configuration sessions, firmware updates, etc.

There are two tabs in the window:

- Gateway Log tab (on page 64)
- Log Statistics tab (on page 66)

Access and Window Description

1. Open the Device Configuration window (on page 48).
2. On the **Tools** menu, click **View Gateway Log**.

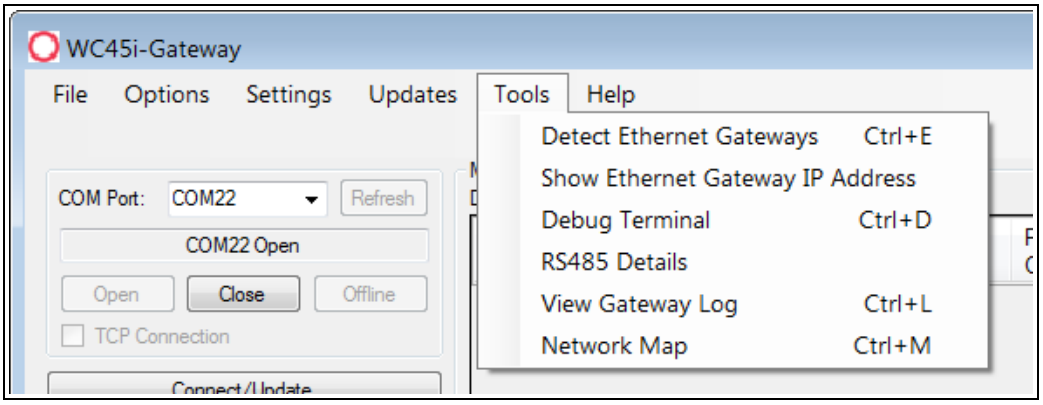


Figure 43: WC45i-GW-485 Modbus Gateway > Tools menu > View Gateway Log

The **Gateway Log** window opens.
The **Gateway Log** tab is active.

There are two tabs in the window:

- Gateway Log tab (on page 64)
- Log Statistics tab (on page 66)

11.4.1. Gateway Log tab

Note: The information in this tab is read-only.

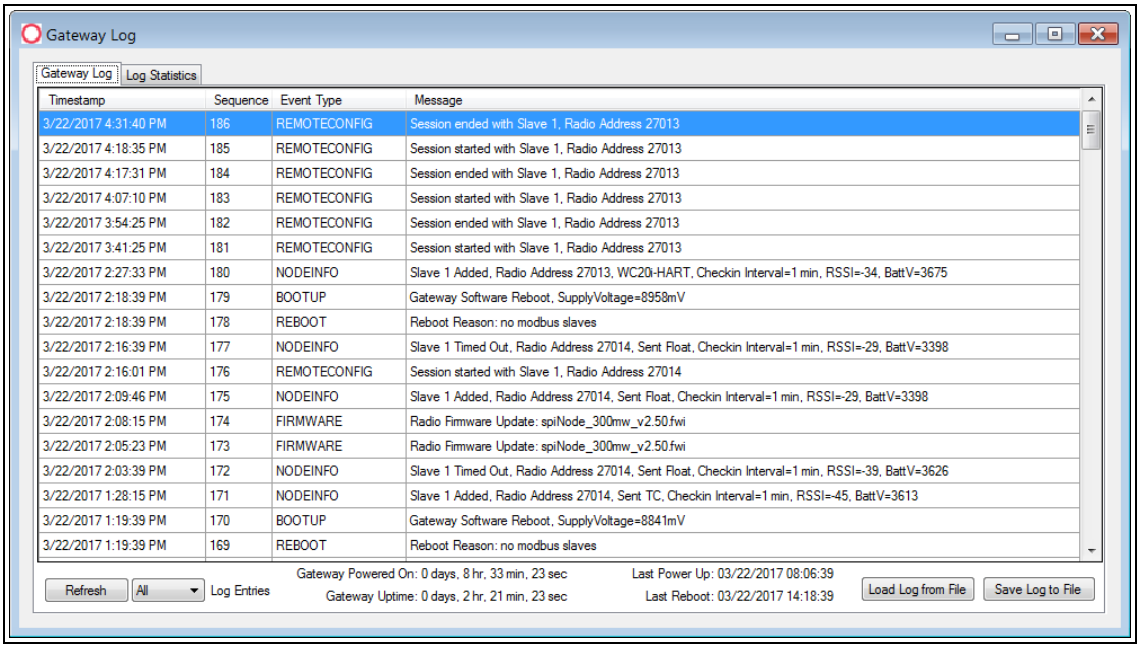


Figure 44: Gateway Log window - Gateway Log tab

Gateway Log window - Gateway Log tab		
Control Area	**Control Title**	**Control Description**
Gateway Log table	**Timestamp** column	The **Timestamp** column shows the date and time of the event.
Gateway Log table	**Sequence** column	The **Sequence** column shows the count number assigned to the event in the order it happened.
Gateway Log table	**Event Type** column	The **Event Type** column shows the name of the event. **Important!**: FreeWave internal use only.
Gateway Log table	**Message** column	The **Message** column shows a description of the **Event Type** activity. **Important!**: FreeWave internal use only.
	Refresh button	Click the **Refresh** or **Refresh List** button to update the information in the table.
	Log Entries list box	Click the **Log Entries** list box arrow and select how many log entries to view on the **Gateway Log** tab. **Note**: The default value is 100.

Gateway Log window - Gateway Log tab		
Control Area	**Control Title**	**Control Description**
	Gateway Powered On text box	The **Gateway Powered On** text box shows how long the gateway has had continuous power.
	Gateway Uptime text box	The **Gateway Uptime** text box shows the time the gateway has been active since the last reboot.
	Last Power Up text box	The **Last Power Up** text box shows the date and time when the gateway power supply was started.
	Last Reboot text box	The **Last Reboot** text box shows the date and time when the gateway was rebooted.
	Load Log from File button	Click the **Load Log from File** button to open the Microsoft® **Open** dialog box with the default location where the **.csv** file of the log information is saved.
	Save Log to File button	Click the **Save Log to File** button to open the Microsoft® **Save As** dialog box with the default location to save the **.csv** file of the log information in.

11.4.2. Log Statistics tab

The **Log Statistics** tab shows statistics about the log events.

The information in the **Log Statistics** table can be saved as a CSV file to view in a spreadsheet program.

Note: The information in this tab is read-only.
The terms node and endpoint are used interchangeably in this document.

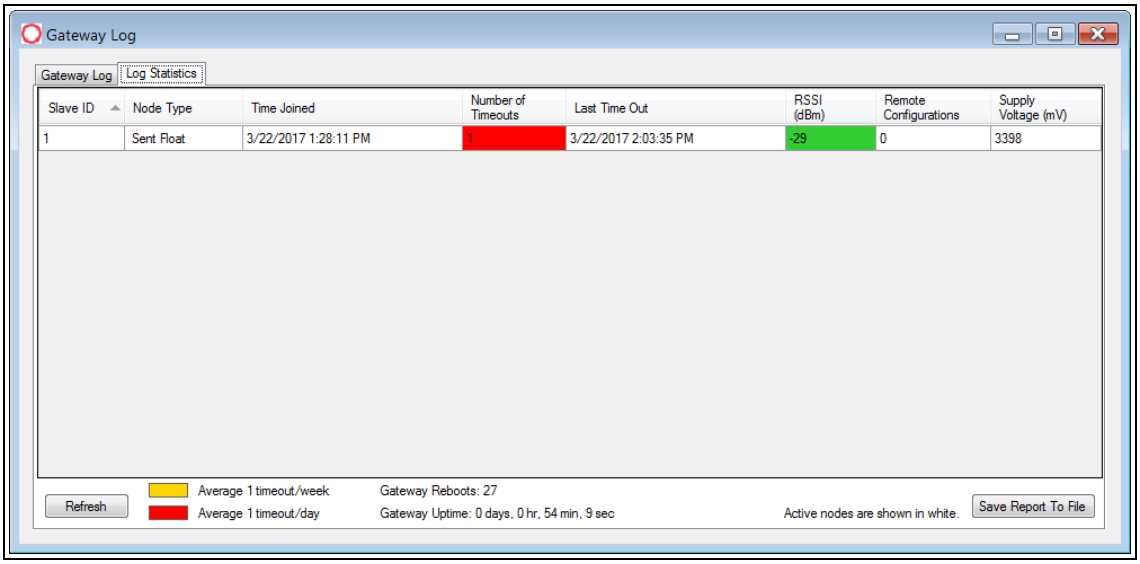


Figure 45: Gateway Log window - Log Statistics tab

Gateway Log window - Log Statistics tab		
Control Area	**Control Title**	**Control Description**
Log Statistics table	**Slave ID** column	The **Slave ID** column / text box shows the remote source endpoint Modbus **Slave ID** selected in the **Settings** area of the **Device Configuration** window.
Log Statistics table	**Node Type** column	The **Node Type** column shows the type of endpoint attached to the WC45i-Gateway.
Log Statistics table	**Time Joined** column	The **Time Joined** column shows when the endpoint was connected to the gateway.
Log Statistics table	**Number of Timeouts** column	The **Number of Timeouts** column shows the number of times the endpoint has timed out since connected to the gateway.
Log Statistics table	**Last Time Out** column	The **Last Time Out** column shows date and time of the last timeout for the attached endpoint.

Gateway Log window - Log Statistics tab		
Control Area	**Control Title**	**Control Description**
Log Statistics table	**RSSI (dbm)** column	The **RSSI (dbm)** column / text box shows the signal strength received from the endpoint to its neighbor (e.g., a neighbor could be the gateway if it is not hopping). **Example**: The RSSI is adjusted so if a 500mW device is communicating to a 40mW device the RSSI is shown as being equal in both directions at the lower signal strength. **Notes** • All communications are bi-directional so messages are needed in both directions for communications. • The RSSI and TTL values are color coded (green, yellow, orange, red) to indicate the relative link quality of an endpoint. Red=Bad link, Yellow=OK link, Green=Good link.
Log Statistics table	**Remote Configurations** column	The **Remote Configurations** column shows the total number of times the device has been configured remotely.
Log Statistics table	**Supply Voltage (mV)** column	The **Supply Voltage (mV)** column shows the last reported supply voltage to the endpoint from the battery or solar panel.
	Refresh button	Click the **Refresh** or **Refresh List** button to update the information in the table.

Gateway Log window - Log Statistics tab		
Control Area	**Control Title**	**Control Description**
	Average timeout / week text box	The **Average timeout / week** text box shows the average number of timeouts in a week for an endpoint since a reboot. **Notes** • A timeout is when an endpoint's TTL, shown in the Device Configuration window (on page 48), goes to 0 (zero) and the data is deleted from the gateway. • This number does not reset. • This time (in minutes) = the **Checkin Interval** list box selection * 5 + 2 minutes.  The bar to the left of the text provides a visual depiction of the average timeout (Red=Bad, Yellow=OK, Green=Good). **Example**: If 1 minute is selected in the **Checkin Interval** list box AND the gateway does NOT get an update within 7 minutes (1*5+2=7), it will timeout the data and increment the timeout count by 1.
	Average timeout / day text box	The **Average timeout / day** text box shows the average number of timeouts in a day for an endpoint since a reboot. • A timeout is when an endpoint's TTL, shown in the Device Configuration window (on page 48), goes to 0 (zero) and the data is deleted from the gateway. • This number does not reset. • This time (in minutes) = the **Checkin Interval** list box selection * 5 + 2 minutes.  The bar to the left of the text provides a visual depiction of the average timeout (Red=Bad, Yellow=OK, Green=Good). **Example**: If 1 minute is selected in the **Checkin Interval** list box AND the gateway does NOT get an update within 7 minutes (1*5+2=7), it will timeout the data and increment the timeout count by 1.
	Gateway Reboots text box	The **Gateway Reboots** text box shows the number of times the gateway has rebooted since it was activated.
	Gateway Uptime text box	The **Gateway Uptime** text box shows the time the gateway has been active since the last reboot.

Gateway Log window - Log Statistics tab		
Control Area	**Control Title**	**Control Description**
	Save Report to File button	Click the **Save Report to File** button to open the Microsoft® **Save As** dialog box with the default location to save the CSV version of the log file in.

11.5. (RegisterView) Slave 1 window

The **(RegisterView) Slave 1** window is used to view additional details about the selected endpoint, including the register data from the remote endpoint.

Access and Window Description

1. Verify the Configuration (on page 15) procedure is completed.
2. Double-click one of the endpoint rows in the **Modbus Slaves Reporting** table. The **(RegisterView) Slave 1** window opens.

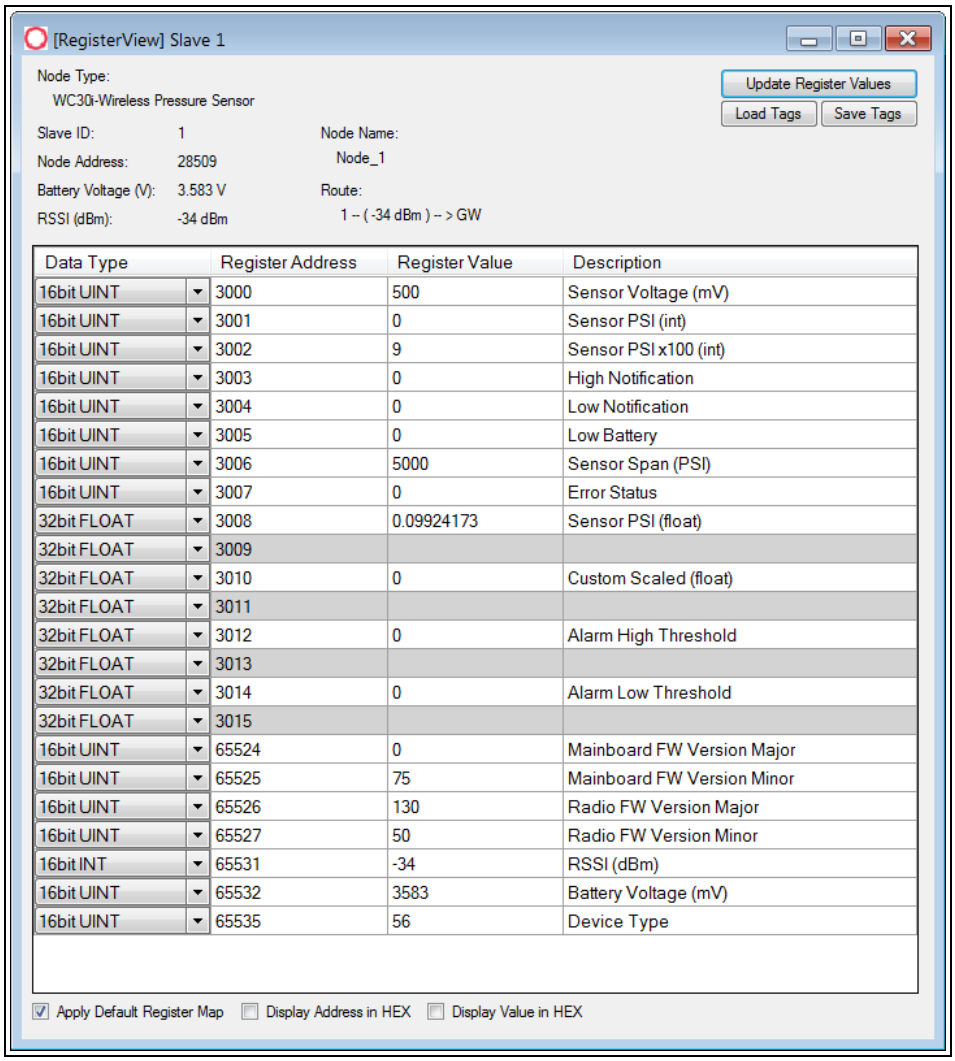


Figure 46: (RegisterView) Slave 1 window

(RegisterView) Slave 1 window	
Control Title	**Control Description**
Update Register Values button	Click the **Update Register Values** button to update the information in the table.
Load Tags button	Click the **Load Tags** button to open the Microsoft® **Open** dialog box with the default location where the **.regtag** version of the log files are saved.
Save Tags button	Click the **Save Tags** button to open the Microsoft® **Save As** dialog box with the default location to save the **.regtag** version of the log file in.
Slave ID text box	The **Slave ID** column / text box shows the remote source endpoint Modbus **Slave ID** selected in the **Settings** area of the **Device Configuration** window. **Note**: This information is read-only.
Node Name text box	The **Node Name** column / text box shows the name assigned to the endpoint in the **Settings** area of the **Device Configuration** window. **Note**: This information is read-only.
Node Address text box	The **Node Address** text box shows the unique radio address assigned to the radio. **Note**: This information is read-only.
Battery Voltage (V) text box	The **Battery Voltage (V)** text box shows the battery voltage of the endpoint. **Note**: This information is read-only.
Route text box	The **Route** text box shows the route the packet used to get to the gateway. **Example**: Figure 46 shows one hop and the RSSI of the hop. **Note**: This information is read-only.

(RegisterView) Slave 1 window	
Control Title	**Control Description**
RSSI (dbm) text box	The **RSSI (dbm)** column / text box shows the signal strength received from the endpoint to its neighbor (e.g., a neighbor could be the gateway if it is not hopping). **Note**: This information is read-only. **Example**: The RSSI is adjusted so if a 500mW device is communicating to a 40mW device the RSSI is shown as being equal in both directions at the lower signal strength. **Note**: All communications are bi-directional so messages are needed in both directions for communications.
Data Type list box column	The **Data Type** list box column shows the data type for the identified endpoint and its data register. **Notes** • When the endpoint is automatically identified by the gateway, the **Data Type** list box column is read-only and cannot be changed. • If the **Data Type** is NOT known, click the **Data Type** list box arrow and select the data format for the Modbus register. • If the **Apply Default Register Map** check box is cleared, the **Data Type** options are available. The options are: • 16bit UINT • 32bit UINT • 32bit INT • 32bit FLOAT • 32bit UINT (Enron) • 32bit INT (Enron) • 32bit FLOAT (Enron) **Important!**: The **Data Type** text box **cannot** be changed when it is identified by the gateway.
Register Address column	The **Register Address** column shows the register address set by the endpoint that is sending the data to the gateway.
Register Value column	The **Register Value** column shows data that the endpoint is sending in.
Description column	The **Description** column shows information describing the data at this **Register Address**.

(RegisterView) Slave 1 window	
Control Title	**Control Description**
Apply Default Register Map check box	Click the **Apply Default Register Map** check box to have the gateway auto-detect the endpoint register information. Clear the check box to manually select the endpoint register information. **Note**: By default, when the gateway recognizes the connected endpoint type, the **Apply Default Register Map** check box is selected.
Display Address in HEX check box	Click the **Display Address in HEX** check box to view the **Register Address** column information as hexadecimal values.
Display Value in HEX check box	Click the **Display Value in HEX** check box to view the **Register Value** column information as hexadecimal values.

11.6. Remote Shutdown Settings window

The **Remote Shutdown Settings** window is used to control output relays on the WC40i-MB-RSD Modbus Endpoint or WC40i-COUNT.

Access and Window Description

1. Open the Device Configuration window (on page 48).
2. On the **Settings** menu, click **Remote Shutdown Settings**.

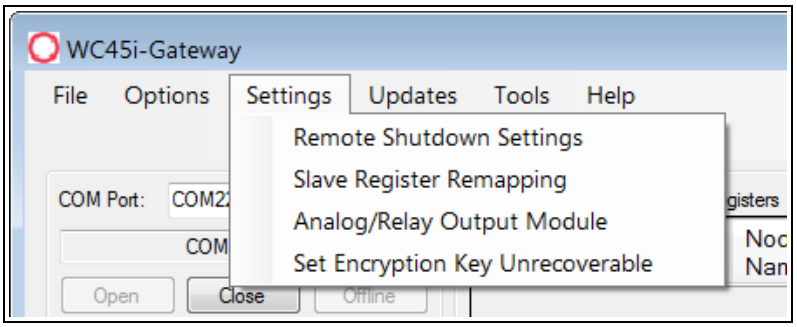


Figure 47: WC45i-GW-485 Modbus Gateway Settings menu > Remote Shutdown Settings

The **Remote Shutdown Settings** window has these sections:

- Source Node (Endpoint) area (on page 76)
- Relay Control Logic Section (on page 78)
- Destination Counter / RSD Stick Section (on page 80)

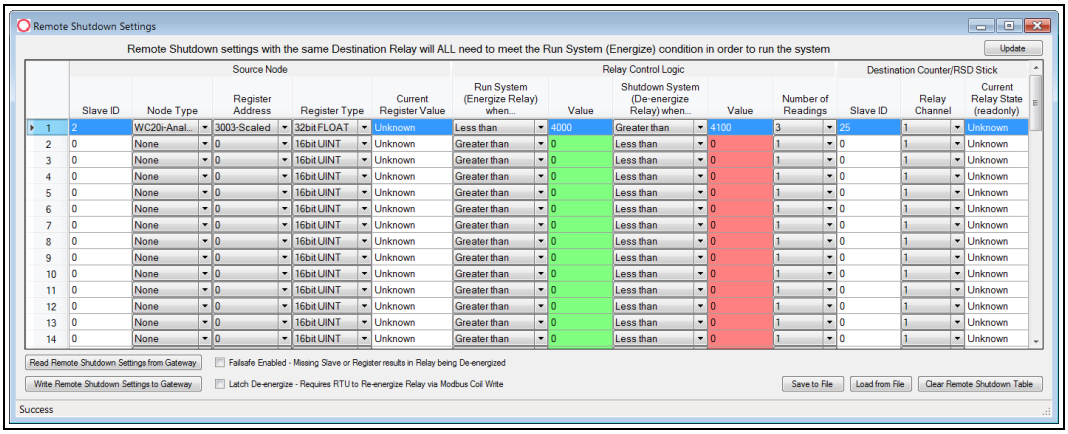


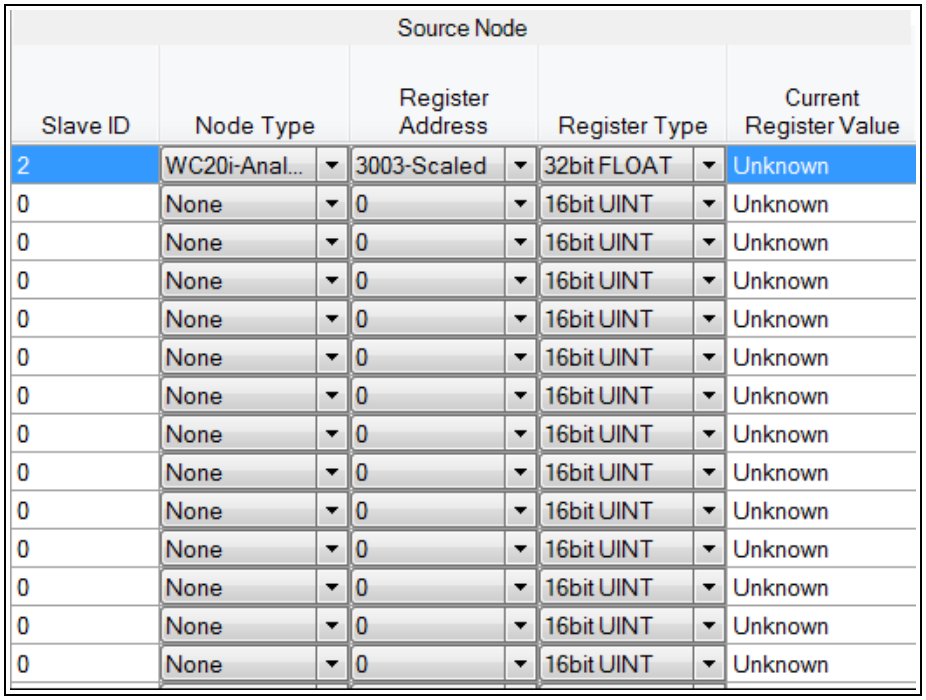
Figure 48: Remote Shutdown Settings window

Remote Shutdown Settings window	
Control Title	**Control Description**
Update button	Click the **Update** button to refresh the information in the **Current Register Value** column and the **Current Relay State** column.

Remote Shutdown Settings window	
Control Title	**Control Description**
Remote Shutdown Settings table	See these sections for detailed descriptions: • Source Node (Endpoint) area (on page 76) • Relay Control Logic Section (on page 78) • Destination Counter / RSD Stick Section (on page 80)
Read Remote Shutdown Settings from Gateway button	Click the **Read Remote Shutdown Settings from Gateway** button to retrieve the stored settings from the WC45i-Gateway.
Write Remote Shutdown Settings to Gateway button	Click the **Write Remote Shutdown Settings to Gateway** button to store the settings in the WC45i-Gateway.
Failsafe Enabled	Click the **Failsafe Enabled** check box to require ALL rules to have valid data for the relay to be energized. • If one or more of the endpoints time-out or does not exist, the relay is de-energized. • If this option is NOT selected, then an endpoint that is not installed or fails to check in is ignored and the relay is energized using logic only from the units that are active.
Latch De-Energized check box	Click the **Latch De-Energized** check box so the rules may only de-energize the relay. • For the relay to be energized again, a Modbus write from a PLC to the gateway for the destination WC40i-MB-RSD or WC40i-COUNT relay must occur. • This is useful if manual intervention is required before the relay is energized after an event. • In 8, a Modbus coil write to Slave ID 5 relay channel 1 (which is register 1) is required to energize the relay. **Note**: See the **WC40i-COUNT Counter Endpoint** or WC40i-MB-RSD Modbus Endpoint User Manual for a detailed register map.
Save to File button	Click the **Save to File** button to open the Microsoft® **Save As** dialog box with the default location to save the **.rsd** file in.
Load from File button	Click the **Load from File** button to open the Microsoft® **Open** dialog box with the default location to load the **.rsd** file from.
Clear Remote Shutdown Table button	Click the **Clear Remote Shutdown Table** button to clear the table of custom configuration settings and return to the default configuration information.

11.6.1. Source Node (Endpoint) area

The **Source Node (Endpoint) area** is used to select the source register for the logic rule.



Source Node				
Slave ID	Node Type	Register Address	Register Type	Current Register Value
2	WC20i-Anal...	3003-Scaled	32bit FLOAT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown
0	None	0	16bit UINT	Unknown

Figure 49: Source Node (Endpoint) area

Source Node (Endpoint) area - WC45i-GW-485	
Column	**Description**
Slave ID column	The **Slave ID** column / text box shows the remote source endpoint Modbus **Slave ID** selected in the **Settings** area of the **Device Configuration** window. **Note**: This information is read-only.
Node Type column / list box	Click the **Node Type** list box arrow and select the type of remote endpoint. • The list box contains a list of the standard WAVECONTACT remote endpoints. **Note**: Select **Custom** for manual data entry.
Register Address column / list box	Click the **Register Address** list box arrow and select the register address for the data to use for the logic. **Important!**: If **Custom** was select in the **Node Type** column, manually enter the register address.

Source Node (Endpoint) area - WC45i-GW-485	
Column	**Description**
Register Type column / list box	If **Custom** was select in the **Node Type** column / list box, click the **Register Type** list box arrow and select the correct data type. **Note**: The correct **Register Type** is automatically selected unless a **Custom Node Type** is used.
Current Register Value column	The **Current Register Value** column shows the value of the selected source data register. **Note**: Click the **Update** button to refresh the information in the **Current Register Value** column and the **Current Relay State** column.

11.6.2. Relay Control Logic Section

The **Relay Control Logic Section** is used to set the trigger thresholds for the selected source data register.

Relay Details

- The **Normal** state of the relay is the de-energized state.
  - This state should be used to set the controlled system (pump, motor, etc.) in the safe or off state.

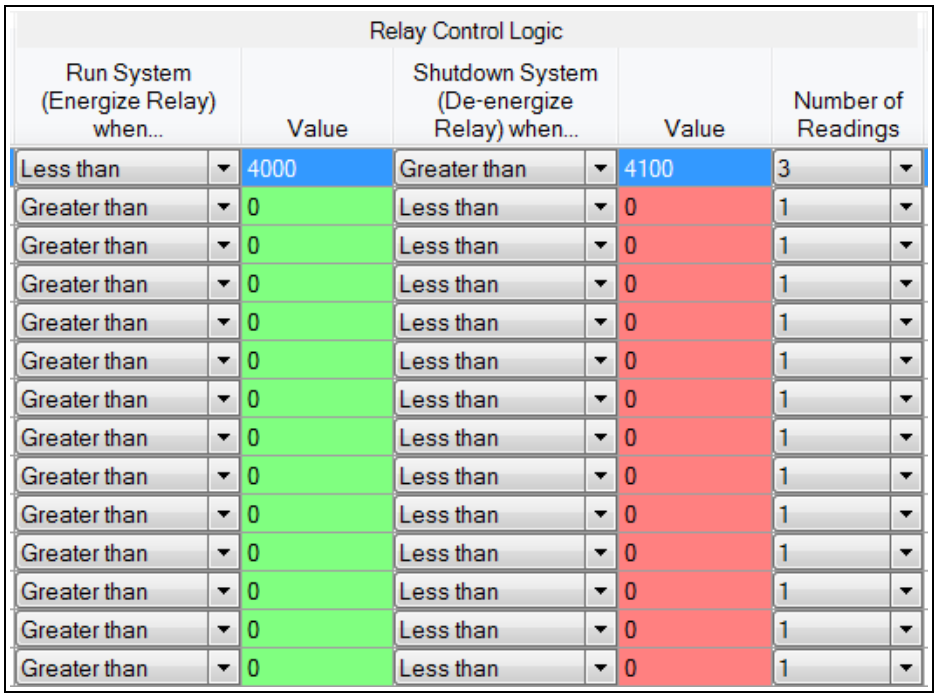


Figure 50: Relay Control Logic Section

Relay Control Logic Section - WC45i-GW-485	
Columns	**Description**
Run System (Energize Relay) column / list box	Click the **Run System (Energize Relay)** list box arrow and select the logic operand to use for the energize logic evaluation.
Value column / text box	In the **Value** column text box, enter the value that the relay is energized at. **Note**: The **Energized** state is the normal operating state of the relay.

Relay Control Logic Section - WC45i-GW-485	
Columns	**Description**
Shutdown System (De-Energize Relay) column / list box	Click the **Shutdown System (De-Energize Relay)** list box arrow and select the logic operand to use for the de-energize logic evaluation. **Important!**: By default, this selection is automatically the opposite of the selection for the **Run System (Energize Relay)** column. **Note**: The de-energized state is the SAFE state of the relay.
Value column / text box	In the **Value** column text box, enter the value that the relay is de-energized at. **Note**: The de-energized state is the SAFE state of the relay.
Number of Readings column / list box	Click the **Number of Readings** list box arrow and select the number of check-in packets that must be received in a row that are above (or below) the logic threshold for the de-energize condition.  This is useful so that a single reading does not cause a shut-down of the endpoint. • The default is 1 where each check-in will cause the rule to be evaluated and acted on. • A single reading that satisfies the run system (energize) condition will cause the relay to energize.

11.6.3. Destination Counter / RSD Stick Section

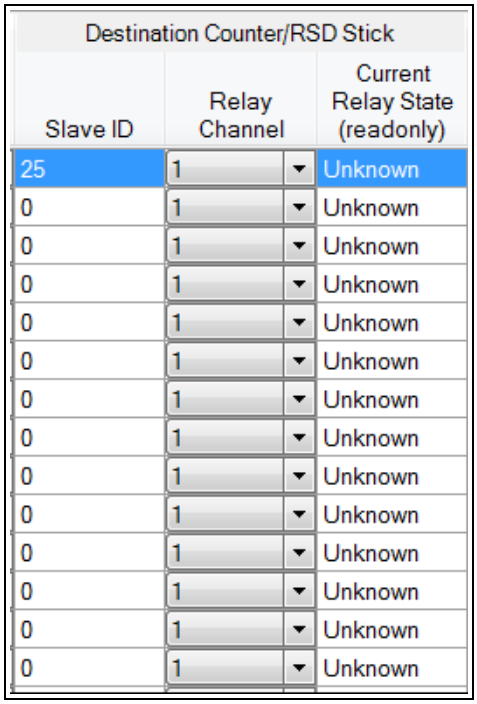


Figure 51: Destination Counter / RSD Stick Section

Destination Counter / RSD Stick Section - WC45i-GW-485	
Column	**Description**
Slave ID column	• This is the **Slave ID** of the destination WC40i-MB-RSD Modbus Endpoint or the **Slave ID** of the gateway (default 247) for the local digital output ports. **Note**: This information is read-only.
Relay Channel column / list box	Click the **Relay Channel** list box arrow and select the relay channel or digital output to switch.
Current Relay State column	The **Current Relay State** column shows the last value of the relay or digital output as reported to the gateway. **Note**: Click the **Update** button to refresh the information in the **Current Register Value** column and the **Current Relay State** column.

11.7. Slave Register Remapping window

The gateway allows any of the remote register data to be remapped to a single block of registers available at the gateway's Slave ID.

Note: The default is 247.

- This is useful for collecting a subset of register data from multiple endpoints and making it readable in a single block of registers.
- A maximum of 750 registers can be remapped to the gateway's Slave ID starting at register 5000.

The **Slave Register Remapping** window is used to remap the remote register data to a single block of registers available at the gateway's Slave ID.

Access and Window Description

1. Open the Device Configuration window (on page 48).
2. On the **Settings** menu, click **Slave Register Remapping**.

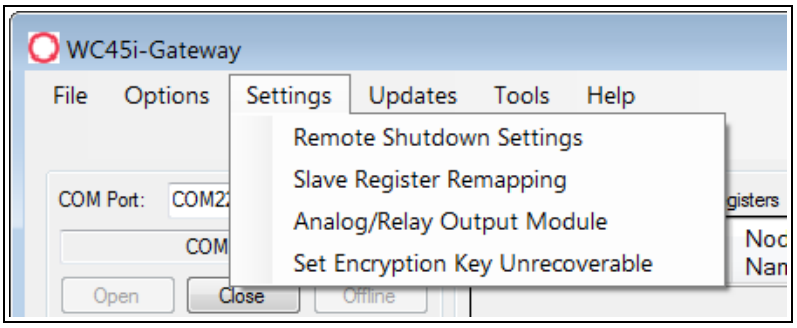


Figure 52: Settings menu > Slave Register Remapping

The **Slave Register Remapping** window opens.

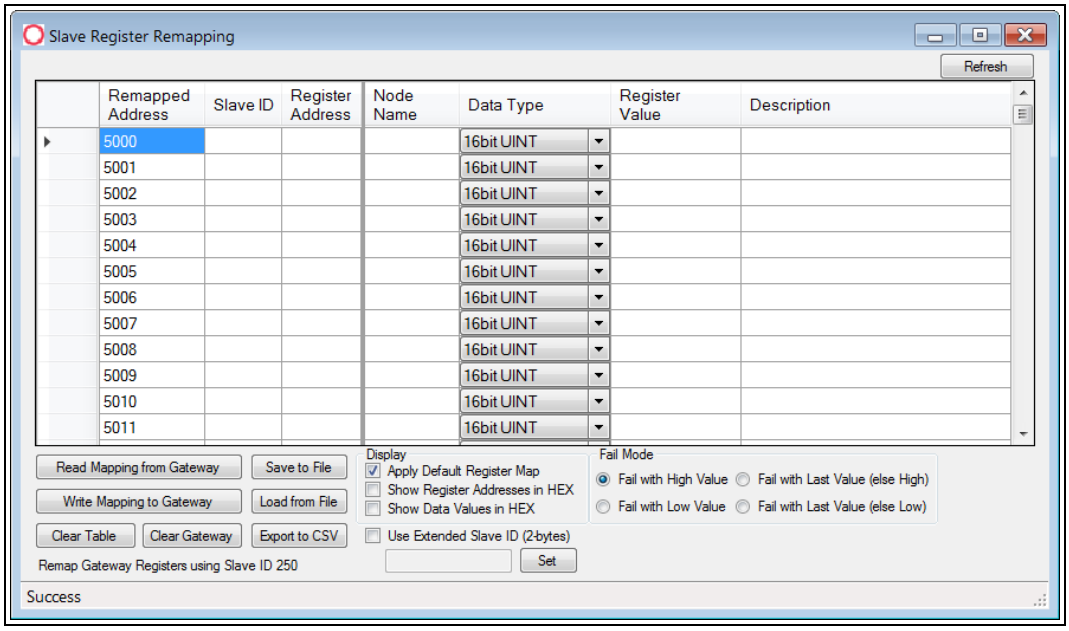


Figure 53: Slave Register Remapping window

Slave Register Remapping window		
Control Area	**Control Title**	**Control Description**
	Refresh button	Click the **Refresh** or **Refresh List** button to update the information in the table.
Slave Register Remapping table	**Remapped Address** column	The **Remapped Address** column shows the Modbus address for the remapped register.
Slave Register Remapping table	**Slave ID** column	The **Slave ID** column / text box shows the remote source endpoint Modbus **Slave ID** selected in the **Settings** area of the **Device Configuration** window.
Slave Register Remapping table	**Register Address** column	In the **Register Address** column text box, enter the register address to map to each gateway register. **Note**: The **Node Name**, **Data Type**, **Register Value**, and **Description** columns are automatically filled in by the gateway once the mapping is written to the gateway.
Slave Register Remapping table	**Node Name** column	The **Node Name** column / text box shows the name assigned to the endpoint in the **Settings** area of the **Device Configuration** window.

Slave Register Remapping window		
Control Area	**Control Title**	**Control Description**
Slave Register Remapping table	**Data Type** list box column	The **Data Type** list box column shows the data type for the identified endpoint and its data register. **Notes** • When the Data Type is automatically identified by the gateway, the **Data Type** list box column is read-only and cannot be changed. • If the **Data Type** is NOT known, click the **Data Type** list box arrow and select the data format for the Modbus register. **Important!**: The **Data Type** text box **cannot** be changed when it is identified by the gateway.
Slave Register Remapping table	**Register Value** column	The **Register Value** column shows data that the endpoint is sending in.
Slave Register Remapping table	**Description** column	The **Description** column shows information describing the data at this **Register Address**.
	Read Mapping from Gateway button	Click the **Read Mapping to Gateway** button to read the current registers.
	Write Mapping from Gateway button	Click the **Write Mapping to Gateway** button to remap the registers.
	Clear Table button	Click the **Clear Table** button to reset any changes made in the window to its defaults.
	Clear Gateway button	Click the **Clear Gateway** button to clear any settings written to the gateway.
	Save to File button	Click the **Save to File** button to open the Microsoft® **Save As** dialog box with the default location to save the **.remap** file.
	Load from File button	Click the **Load from File** button to open the Microsoft® **Open** dialog box with the default location to load the **.remap** file from.
	Export to CSV button	Click the **Export to CSV** button to open the Microsoft® **Save As** dialog box with the default location to save the **.csv** file in.
Display area	**Apply Default Register Map** check box	**Note**: By default, when the gateway recognizes the connected endpoint type, the **Apply Default Register Map** check box is selected.

Slave Register Remapping window		
Control Area	**Control Title**	**Control Description**
Display area	**Show Register Addresses in HEX** check box	Click the **Show Register Addresses in HEX** check box to view the **Register Address** column information as hexadecimal values.
Display area	**Show Data Values in HEX** check box	Click the **Show Data Values in HEX** check box to view the **Register Value** column information as hexadecimal values.
Display area	**Use Extended Slave ID (2-bytes)** check box	Click the **Use Extended Slave ID (2-bytes)** check box to activate the **Use Extended Slave ID (2-bytes)** text box. • When this check box is NOT selected, the Modbus address of the gateway is 8 bits in length. • When with the check box selected, the Modbus address of the gateway is 16 bits in length and equal to the value entered in the **Use Extended Slave ID (2-bytes)** text box.
Display area	**Use Extended Slave ID (2-bytes)** text box	In the **Use Extended Slave ID (2-bytes)** text box, enter any number from 0 to 4095 to designate the 16 bit Modbus address of the gateway.
Display area	**Set** button	Click the **Set** button to save the information.
Fail Mode area	**Fail Mode with High Value** option button	Select the **Fail Mode with High Value** option button to return a Modbus value of 65535 when polling of the end device fails.
Fail Mode area	**Fail with Last Value (else High)** option button	Select the **Fail with Last Value (else High)** option button to return the last value polled from the end device if there was never any data for that register or if the gateway reboots or is re-powered. **Note**: If no successful poll has yet occurred, returns 65535.
Fail Mode area	**Fail Mode with Low Value** option button	Select the **Fail Mode with Low Value** option button to return a Modbus value of 0 (zero) when polling of the end device fails.
Fail Mode area	**Fail with Last Value (else Low)** option button	Select the **Fail with Last Value (else Low)** option button to return the last value polled form the end device if there was never any data for that register or if the gateway reboots or is re-powered. **Note**: If no successful poll has yet occurred, returns 0 (zero).

Appendix A: Technical Specifications

Technical Specification: WC45i-GW-DIN Gateway	
Specification	**Description**
Transmitter	
Frequency	902-928 MHz license-free ISM band compliant with FCC Part 15
Range	3 miles or more, depending on placement
Networks	Up to 64 separate networks receiver
Sensitivity	-105dB
Interfaces	
Data Interface	RS-485 Modbus RTU, or Modbus-TCP, RS 232 for configuration. **Note**: All readings are converted to Modbus registers and stored in the gateway.
Internal Diagnostics	• Line voltage • Signal Strength • Error conditions • Internal event logging
Power Requirements	
Power	+6 to +36VDC
Radio Power	500 mW
General Information	
Operating Temperature	-40°C to 85°C

Technical Specification: WC45i-GW-DIN Gateway	
Specification	**Description**
Humidity	0% - 100% condensing
Antenna Type	Omnidirectional
Antenna Gain	5dB
Weight	2.8 lbs
Enclosure	Weather-tight, integrated electronics and antenna, NEMA 3R
Safety Rating	Non-incendive, Class 1 Division 2 Groups C and D, T5

Appendix B: Connection Troubleshooting

Verify the connection between the gateway and endpoint:

- Check the LEDs on the endpoint.
  - If LEDs don't indicate linked, double check radio settings.
  - See LEDs (on page 88).
- If the endpoint is linking, use the 4-pin to USB programming cable to connect to gateway and examine the endpoints reporting to that gateway.
- If the endpoints are reporting in, double check that the Modbus IDs and registers are correct in the Modbus master.

Appendix C: LEDs

- The WC45i-GW-DIN has three LEDs available for field diagnostics.
- The RS485 TX / RX LEDs blink in response to RS485 traffic.

Note: On the WC45i-GW-DIN, RS485 TX / RX LEDs blink in response to RS485 traffic.

Status LEDs	Description
Slow Flash (3 second pause)	System is running and in communication with radio network.
Fast Flash (0.5 second pause)	System is running but no network found.
Solid On	System Fault needs service or rescue bootload.

Appendix D: Available Accessories

These accessories are available from FreeWave for the WAVECONTACT products.

Available Accessories	
FreeWave Part #	**Description**
WC-USB-DB9	USB to Serial DB9 programming cable
WC45-Whip	Whip Antenna Suitable for use in fiberglass or plastic enclosure with direct mount to DIN mounted card.
WC45-PM	Panel Mount Antenna Mount outside of an enclosure.

Appendix E: FreeWave Legal Information

Export Notification

FreeWave Technologies, Inc. products may be subject to control by the Export Administration Regulations (EAR) and/or the International Traffic in Arms Regulations (ITAR). Export, re-export, or transfer of these products without required authorization from the U.S. Department of Commerce, Bureau of Industry and Security, or the U.S. Department of State, Directorate of Defense Trade Controls, as applicable, is prohibited. Any party exporting, re-exporting, or transferring FreeWave products is responsible for obtaining all necessary U.S. government authorizations required to ensure compliance with these and other applicable U.S. laws. Consult with your legal counsel for further guidance.

FCC Notifications

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference and 2) this device must accept any interference received, including interference that may cause undesired operation.

The content of this guide covers FreeWave Technologies, Inc. models sold under FCC ID: W8V-GWDIN.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of these measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Important!: Only the supplied coil antenna, which is permanently soldered to the PCB, may be used. This antenna has a maximum gain of 3dB.

The WC45i-GW-DIN device has been designed to operate with these antennas:

- San Jose Technology Inc. Model EEH-915
- Nearson Model: S467XX-915S

These antennas have a maximum gain of 5.8dBi.

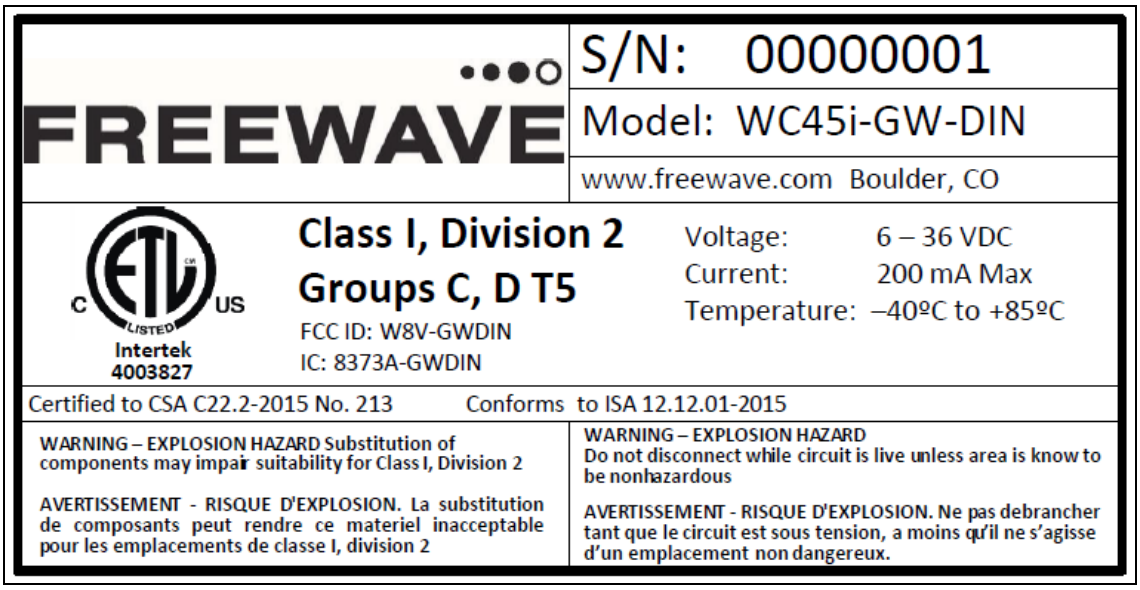
Important!: Antennas not included in this list or having a gain greater than 5.8dBi are strictly prohibited for use with this device.
The required antenna impedance is 50 ohms.

FCC Notification of Power Warning

The WC45i-GW-DIN Gateway covered in this document has a maximum transmitted output power of +14dBm.

The antennas used MUST provide a separation distance of at least 20 cm from all persons and MUST NOT be co-located or operate in conjunction with any other antenna or transmitter.

Important!: This label MUST BE visible when the WAVECONTACT product is installed.



WC45i-GW-DIN-ETL C1D2-FCC-IC Label

IC Notifications

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a maximum (or lesser) gain approved for this transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.r.i.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industri e Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d' un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les ri sques de brouillage radioélectrique à l'intention des autres utilisat eurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établisseme nt d'une communication satisfaisante.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Ce dispositif est conforme aux normes permis-exemptes du Canada RSS d'industrie. L'opération est sujette aux deux conditions suivantes : (1) ce dispositif peut ne pas causer l'interférence, et (2) ce dispositif doit accepter n'importe quelle interférence, y compris l'interférence qui peut causer le fonctionnement peu désiré du dispositif.

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WC45i-GW-DIN Hazardous Location Certification

Important!: The WC45i-GW-DIN Gateway is rated Class 1 Division 2 non-incendive.

Warning! EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE COMPONENTS UNLESS POWER HAS BEEN DISCONNECTED OR THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.
AVERTISSEMENT : RISQUE D'EXPLOSION. NE PAS RETIRER OU REMPLACER LES COMPOSANTS QUE L'ALIMENTATION EST DÉBRANCHÉ OU ZONE EST LIBRE DE CONCENTRATIONS IGNITIBLE.

Warning! EXPLOSION HAZARD Substitution of components may impair suitability for Class I, Division 2.
AVERTISSEMENT - RISQUE D'EXPLOSION. La substitution de composants peut rendre ce materiel inacceptable pour les emplacements de classe I, division 2.

Warning! EXPLOSION HAZARD Do not disconnect while circuit is live unless area is known to be nonhazardous.
AVERTISSEMENT - RISQUE D'EXPLOSION. Ne débranchez pas lorsque le circuit est en direct , sauf si la zone est connue pour être nonhazardous.

Warning! The Wireless IO Module must be installed in a suitable enclosure for intended environment.
AVERTISSEMENT - Le module IO sans fil doit être installé dans une enceinte appropriée pour l'environnement prévu.

Warning! All wring methods must be in accordance with the NEC.
AVERTISSEMENT - Toutes les méthodes de Essorez doivent être en conformité avec la NEC.

Product Safety

Warning! Remove power before connecting or disconnecting the interface or RF cables.

Warning! Use of this equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.
The use of any parts not supplied by the manufacturer violates the safety rating of the equipment.

AVERTISSEMENT: L'utilisation de cet équipement d'une manière non spécifiée par le fabricant peut nuire à la protection fournie par l'équipement.
L'utilisation de pièces non fournies par le fabricant est contraire à la cote de sécurité de l'équipement.

Warning! Perform the Configuration steps in a safe location only.
AVERTISSEMENT: Suivez les étapes de cette section (Configuration) dans un endroit sûr uniquement.

FREEWAVE