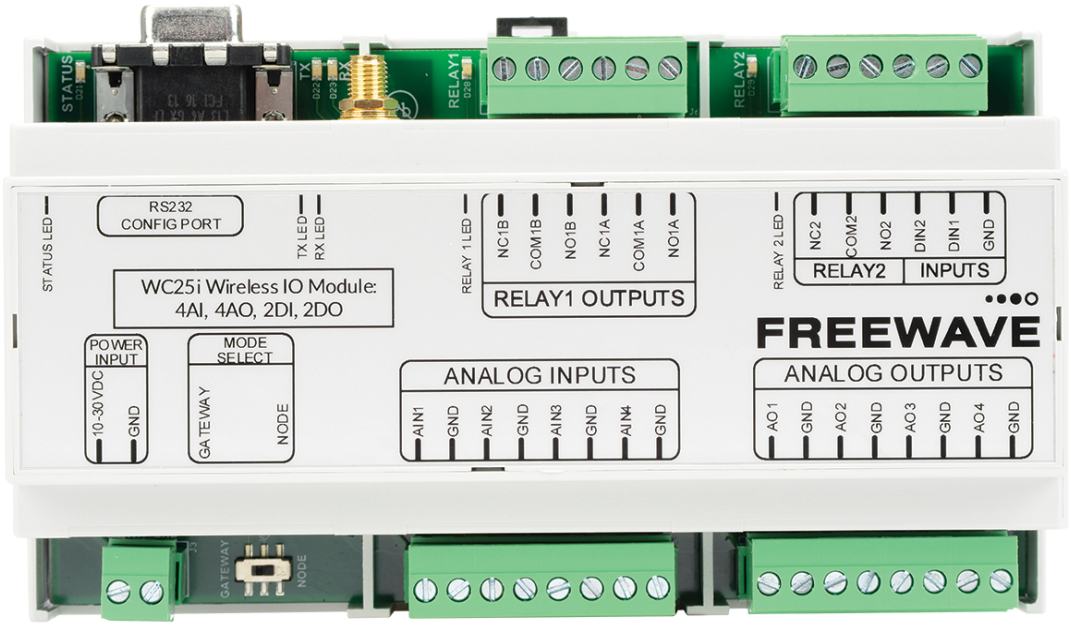
FREEWAVE

WC25i Wireless I/O Module

User & Reference Manual



Part Number: LUM0083AA
Revision: Mar-2018

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® WC25i Wireless I/O Module (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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Table of Contents

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 website.

Document	Description	FreeWave Part Number
User Manual	The User Manual provides setup, configuration, and safety information for the WC25i Wireless I/O Module.	LUM0083AA
Quick Start Guide	The Quick Start Guide provides the out-of-the-box setup of the WC25i.	QSG0041AA QSG0049AA

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.

1. Overview - WC25i Wireless I/O Module

Thank you for purchasing the WC25i Wireless I/O Module.

The WC25i Wireless I/O Module acts as a wire replacement that replicates analog and digital signals over a wireless link between a pair of Wireless I/O Modules.

The WC25i has these features:

- 4 Analog Inputs (0-20mA or 0-5V)
- 4 Analog Outputs (0-20mA or 0-5V)
- 2 Digital Inputs
- 2 Relay Outputs (1 DPDT, 1 SPDT)
- Wide range DC power input, +10 to +30VDC
- Low power consumption
- DIN rail mount with pluggable screw terminal blocks
- Status LEDs

Note: See Available Accessories (on page 77) for additional equipment.

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

2. Equipment

2.1. Included Equipment - WC25i

The WC25i package contains these items:

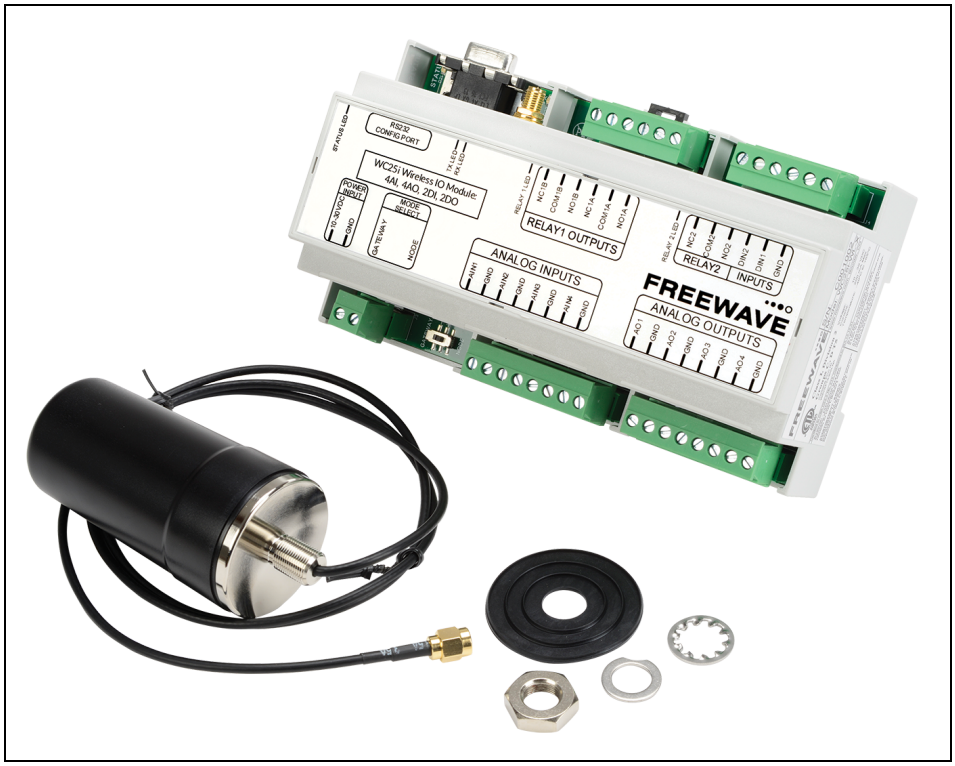


Figure 1: WC25i Included Equipment

Included Equipment - WC25i	
Qty	**Description**
1	WC25i Wireless I/O Module
1	Antenna with gasket and connecting washers
1	WC25i Quick Start Guide

2.1.1. User-supplied Equipment

- Small, flathead screwdriver
- DC Adapter Power Supply (+10 to +30VDC)
- USB to Serial DB9 programming cable (FreeWave Part #WC-USB-DB9)
- Power supply and Ground wiring

3. WC25i Connections

3.1. Connections - WC25i Wireless I/O Module

Important!: The WC25i Wireless I/O Module is configured using the **WC Toolkit**. Download the **WC Toolkit** software from http://support.freewave.com/.

The WC25i provides screw terminal connections for Analog Inputs / Outputs and Relay (Digital) Inputs / Outputs.

- Power must be provided by the Power Input screw terminals (+10 to +30VDC)
  - The WC25i power requirement at 12VDC is 25mA average plus 15mA per energized relay channel.
  - Power required for any attached devices (Analog Inputs / Outputs) is in addition to this.

These are the WC25i connections:

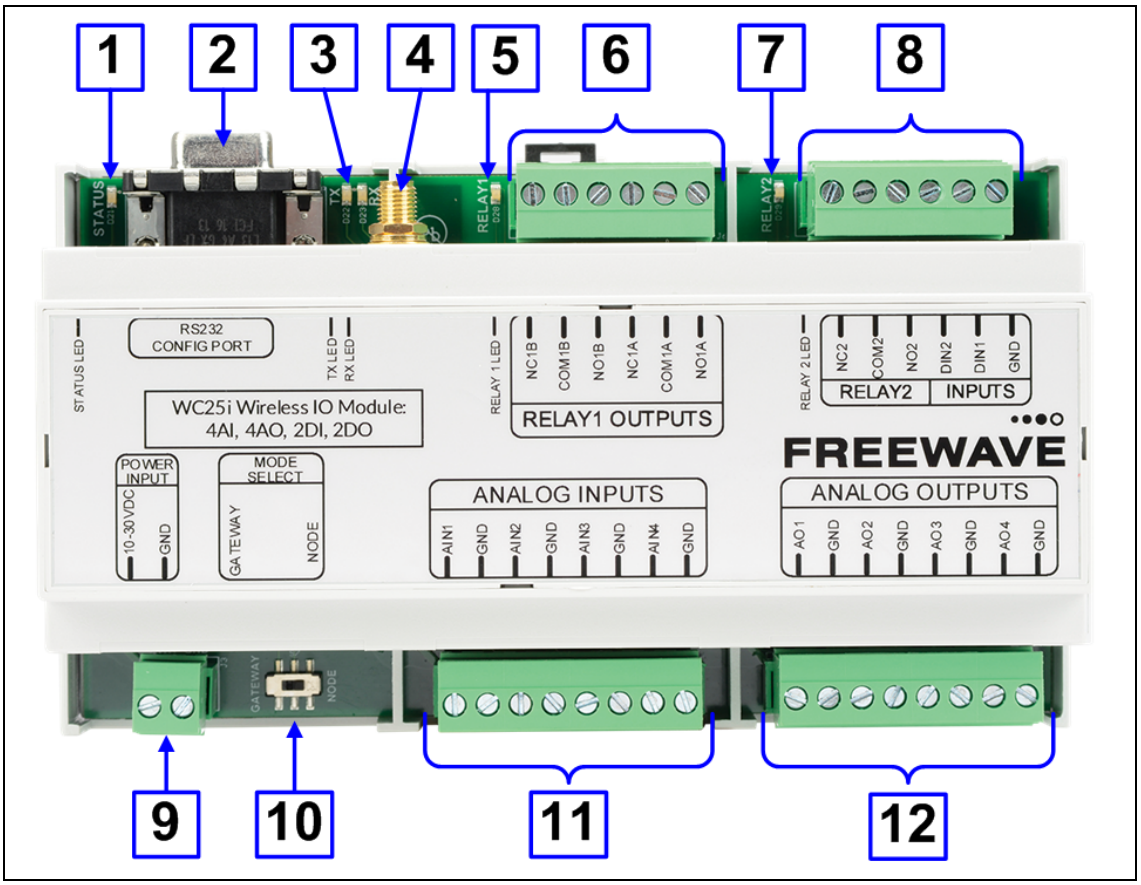


Figure 2: WC25i Wireless I/O Module Connections

WC25i Wireless I/O Module - Connections		
Location #	**Title**	**Description**
1	Status LEDs	See LEDs (on page 76) for detailed information.

WC25i Wireless I/O Module - Connections		
Location #	**Title**	**Description**
2	**RS232 Config / Debug** connector	The **RS232 Config / Debug** connector is for the USB to Serial DB9 programming cable (FreeWave Part # WC-USB-DB9).
3	Tx and Rx LEDs	See LEDs (on page 76) for detailed information.
4	Antenna Port	The antenna port is standard SMA connector. **Note**: Connect this port to a suitable 900MHz antenna.
5	Relay 1 LED	See LEDs (on page 76) for detailed information.

6	Relay 1 Outputs	**Note**: See Relay 1 Outputs (Digital) (on page 14).
		• **WC25i Single Endpoint** configuration - The two Digital Outputs are an SPDT relay and a DPDT relay.
		  • The state of the relays is controlled using Modbus write commands from the master Modbus device connected to the Gateway.
		  Tip: Alternatively, the relays can be controlled using the RSD settings on the Gateway.
		• **WC25i System** configuration - The two Digital Outputs are an SPDT relay and a DPDT relay.

7	Relay 2 LED	See LEDs (on page 76) for detailed information.

WC25i Wireless I/O Module - Connections		
Location #	**Title**	**Description**

8	Relay 2
	
	Digital Inputs
		Relay 2
		• NC2 - Closed relay connection for Channel 2.
		• COM2 - Common relay connection for Channel 2.
		• NO2 - Opened relation connection for Channel 2.
		Inputs
		Note: See Digital Inputs (on page 14).
		• **WC25i Single Endpoint** configuration - The two Digital Inputs are read and forwarded to the Gateway at the interval selected in the **Checkin Interval** list box in the Device Configuration window (on page 52).
		  • Each input is totalized and the frequency is reported.
		  • If the **State Change Checkin** list box selection is **Yes** (enabled), all readings (analog and digital) are sent to the WC45i-Gateway immediately.
		Caution: Do not enable the **State Change Checkin** list box for rapidly changing inputs.
		• **WC25i System** configuration - Whenever Digital Input 1 or Digital Input 2 is closed on one of the WC25is, Relay 1 or Relay 2 is energized on the other WC25i.

9	Power Input PWR GND	Power Source from an external power supply of +10 to +30VDC. External power ground.
10	**Gateway - Node** switch	The **Gateway - Node** switch designates the WC25i as either a Gateway or Endpoint. **Note**: The terms node and Endpoint are used interchangeably in this document.

WC25i Wireless I/O Module - Connections		
Location #	**Title**	**Description**
11	Analog Inputs	**Note**: See Analog Inputs (on page 15) to designate the WC25i as either mA or Volts. • **WC25i Single Endpoint** configuration - The four Analog Inputs (AIN1-AIN4) on the Endpoint are read and forwarded to the Gateway at the interval selected in the **Checkin Interval** list box in the Device Configuration window (on page 52). • **WC25i System** configuration - The four Analog Inputs (AIN1-AIN4) on the Endpoint are mirrored wirelessly to the four Analog Outputs (AO1-AO4) on each WC25i.

12	Analog Outputs	**Note**: See Analog Outputs (on page 15) to designate the WC25i as either mA or Volts.
		• **WC25i Single Endpoint** configuration - The four Analog Outputs (AO1-AO4) on the Endpoint are controlled using Modbus write commands from the master Modbus device connected to the Gateway.
		  • The Analog Outputs are always written in µA even when the switch is set for a 1-5V output.
		  • It is up to the PLC to convert the readings to voltage.
		• **WC25i System** configuration - The four Analog Inputs (AIN1-AIN4) on the Endpoint are mirrored wirelessly to the four Analog Outputs (AO1-AO4) on each WC25i.

3.1.1. Digital Inputs

The two Digital Inputs (DIN 1 and DIN 2) can be dry contact or voltage (must be push-pull with 30 Volts maximum).

Important!: Verify the connection to the ground bus from the module is to either the ground of the voltage device or the dry contact.

3.1.2. Relay 1 Outputs (Digital)

There are two relay outputs:

- Relay 1 Output is a DPDT
- Relay 2 Output is an SPDT.
- These relays are rated for:
  - 30 VDC @ 2 Amps
  - 250 VAC @ 0.25 Amps

3.1.3. Analog Outputs

In (Figure 3), each switch controls the output mode for a pair of outputs.

- The switch on the left sets both Output 1 (AO1) and Output 2 (AO2) to either mA or Volts.
- The switch on the right sets both Output 3 (AO3) and Output 4 (AO4) to either mA or Volts.
- In mA output mode, the compliance voltage is the Endpoint supply voltage.

3.1.4. Analog Inputs

The **Analog Inputs** may operate in either Current (0-20mA / 4-20mA) or Voltage (0-5V / 1-5V). The input mode is set using slide switches inside the WC25i (Figure 3).

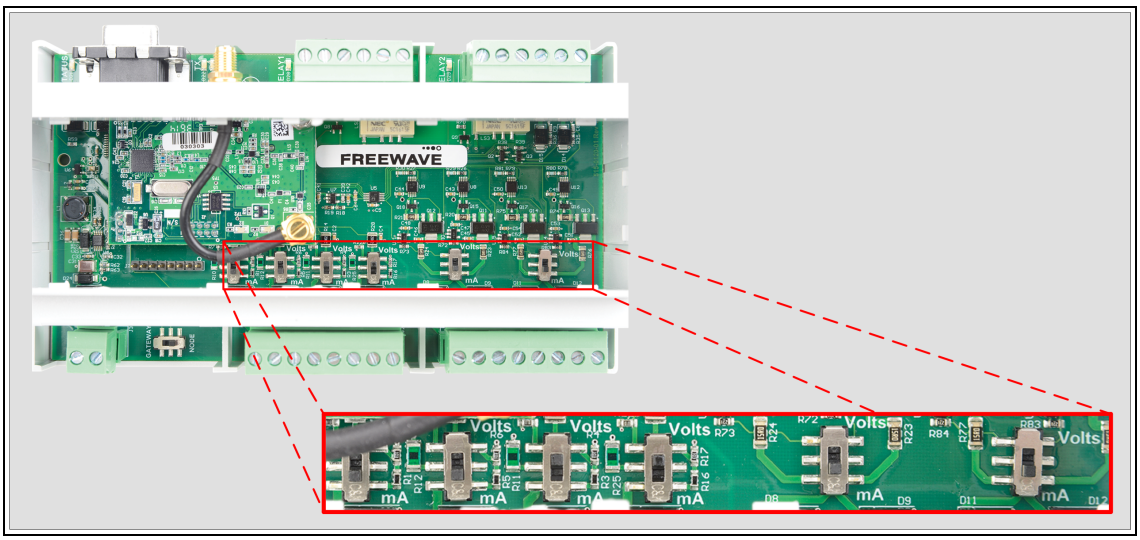


Figure 3: WC25i Switches

1. Use the Small, flathead screwdriver to remove the cover of the WC25i. The cover is held on by clips.
2. Slide the switch corresponding to the input channel to:
   - **Volts** for a Voltage Input.
   - **mA** for a Current Input.
3. Wire the analog voltage or current to the set of screw terminal connections.
4. Replace the WC25i cover.

Caution: Maximum input voltage (for either Current or Voltage input mode) is **10 Volts**. The compliance voltage for a 4-20mA device **must be** provided externally. See the Example: Analog Inputs Wiring Diagram (on page 16) for details.

Example: Analog Inputs Wiring Diagram

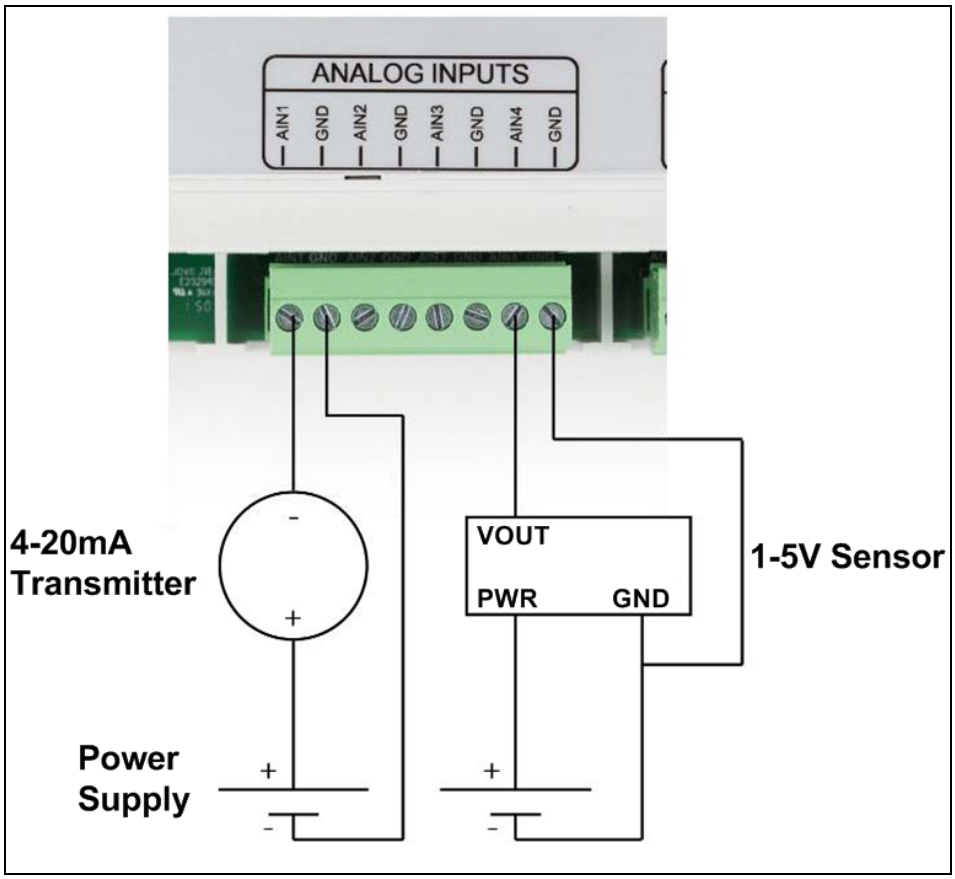


Figure 4: Example: Analog Inputs Wiring Diagram

Figure 4 is an example of a:

- 4-20mA transmitter connected to AIN1.
- 1-5V sensor connected to AIN4.

Note: Generally the same power supply used to power the WC25i is used to provide power for the attached sensors.

3.2. Hardware Installation

Important!: Verify the items listed in Equipment (on page 8) are available before starting this procedure.
It is assumed that the reader and installer have completed the FreeWave installation and setup training to follow the procedures in this document.

1. All wiring should be neat and orderly.
2. Connect the Power supply and Ground wiring to the Power Input terminal block. (#9 in Connections - WC25i Wireless I/O Module (on page 11))
3. Connect the Serial end of the WC-USB-DB9 cable to the **RS232 Config / Debug** connector port and the USB connection to the computer.
4. If this is the first time the WC25i is installed, wait for the drivers to install.

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

5. Complete these procedures:
   a. WC Toolkit Installation (on page 19)
   b. WC Toolkit Update (on page 26)
   c. Configuration - Single WC25i Endpoint (on page 29)
      or
      Configuration - WC25i System (on page 36).
6. When the WC25i configuration is completed:
   a. Connect the enclosed Antenna with gasket and connecting washers to the WC25i (Figure 5).
   b. Install the WC25i and connected antenna in a secure location.

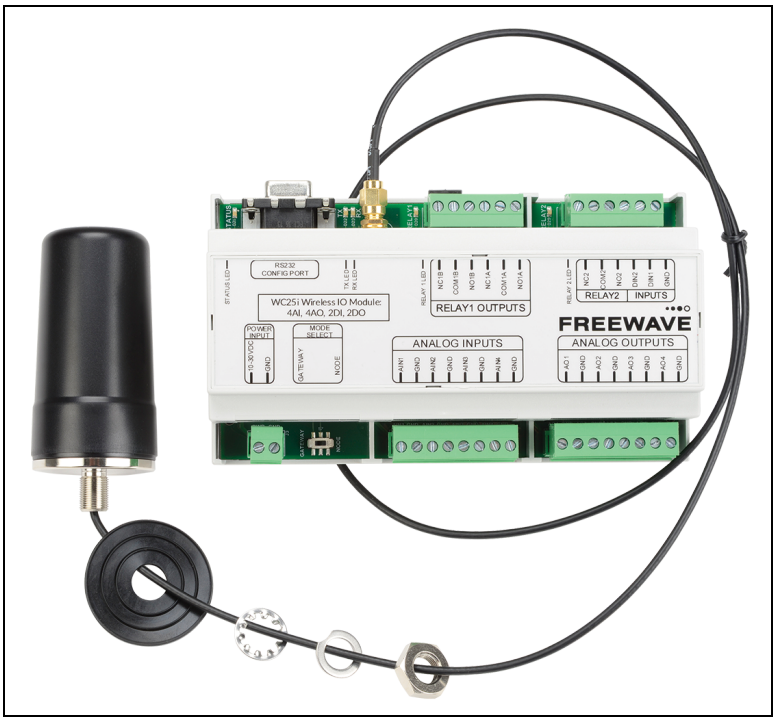


Figure 5: WC25i Connection

4. WC Toolkit Installation

Note: The images in this procedure are for Windows® 7 and/or Firefox®.
The dialog boxes and windows may appear differently on each computer.

1. Click http://support.freewave.com/.
   The **FreeWave Support** site opens.

   Important!: Registration is required to use this website.

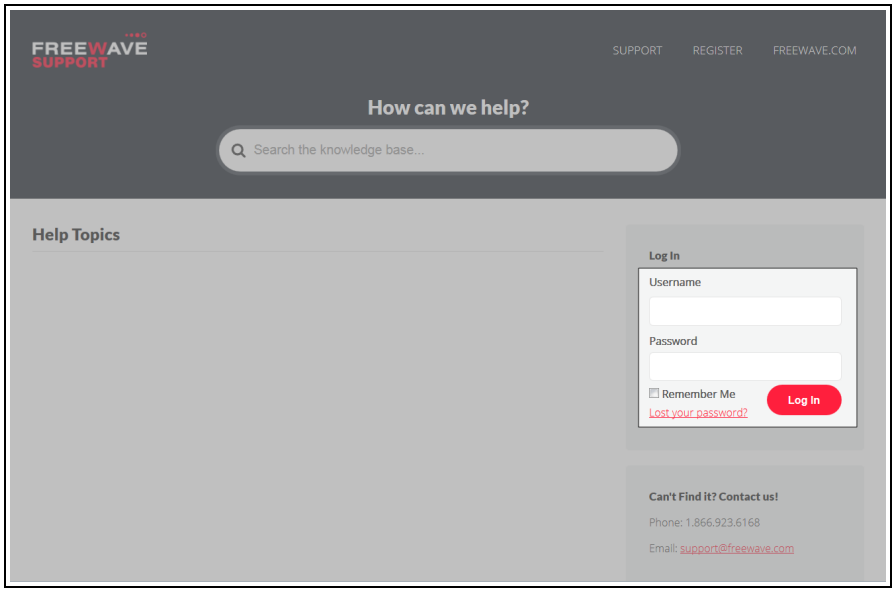


Figure 6: FreeWave Login window

2. Enter the **User Name** and **Password**.

3. Click 

.
A successful Login message briefly appears.
The **Help Topics** window opens.
4. Click the **Software** link.

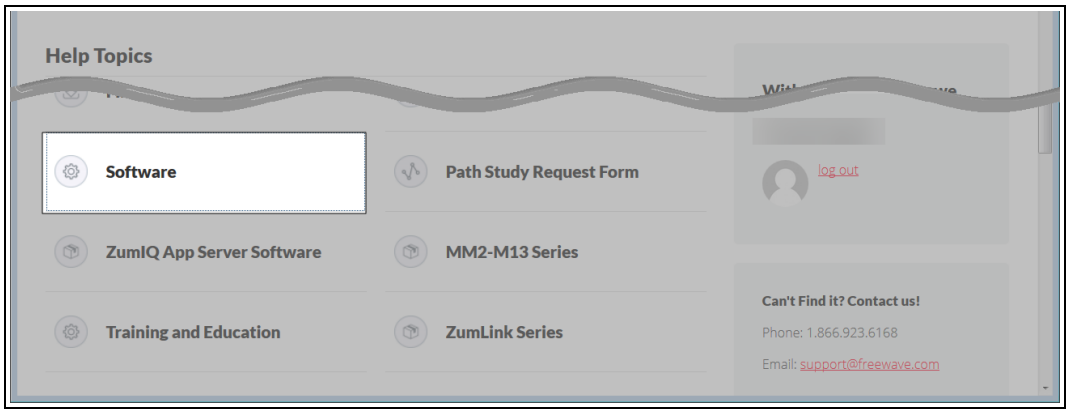


Figure 7: Help Topics window

The **Software** window opens.
5. Click the **WAVECONTACT Toolkit** link.

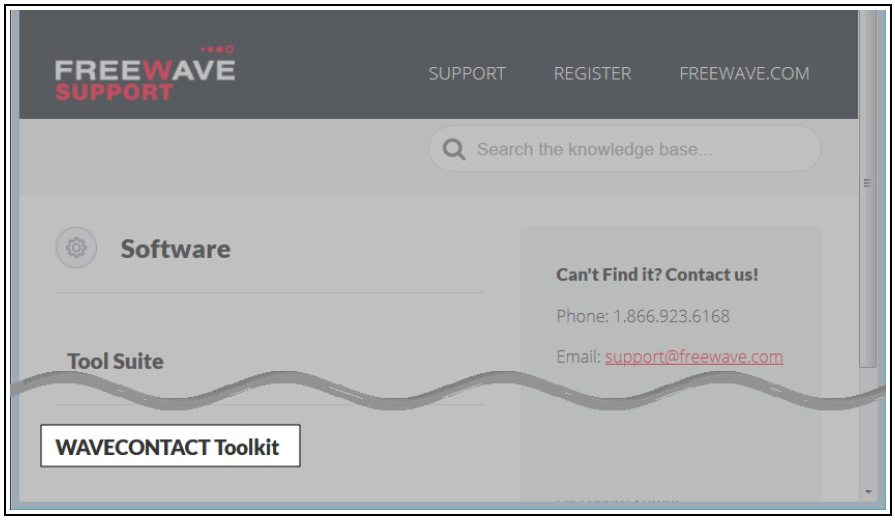


Figure 8: Software window

The available software appears in the window.
6. Select and click the attachment.

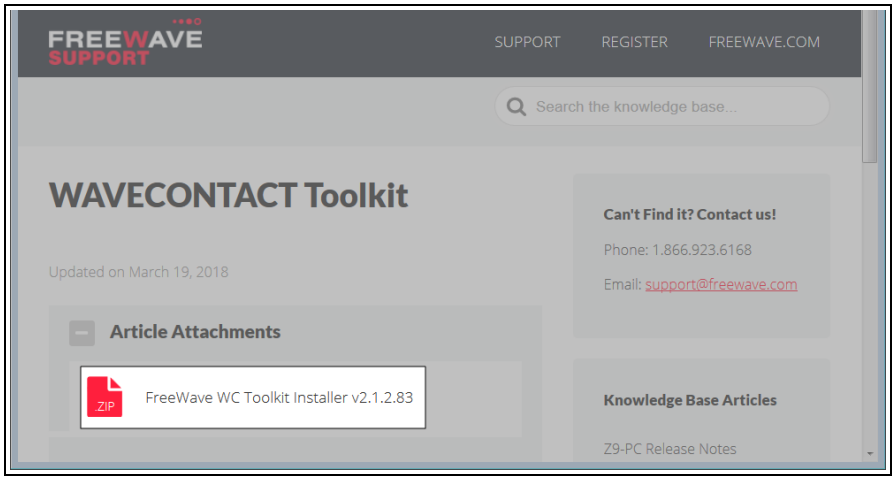


Figure 9: WAVECONTACT Toolkit window

The **Opening** dialog box opens.

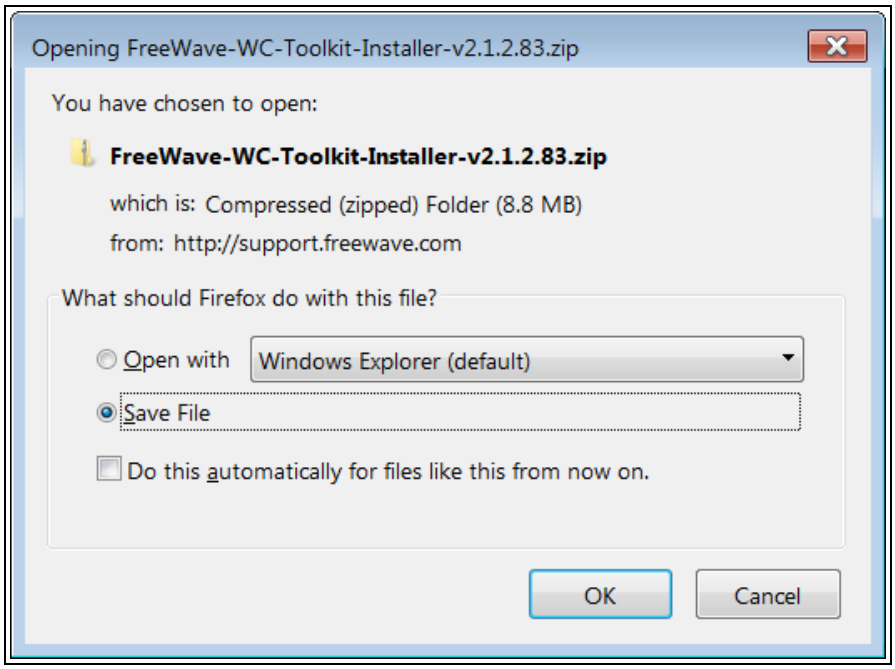


Figure 10: WC Toolkit Opening dialog box

Note: This procedure shows Firefox® dialog boxes.
Other browsers will have different dialog boxes and procedures.

7. Click **OK**.
   The **Enter name of file to save to** dialog box opens.

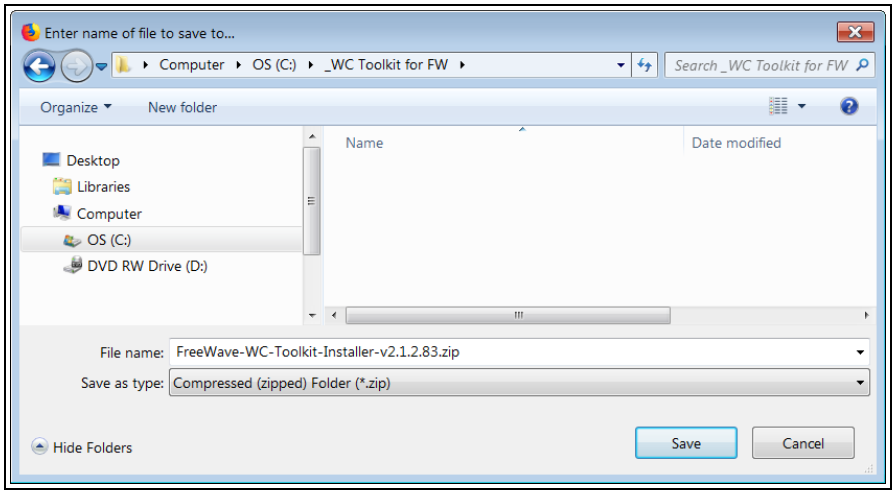


Figure 11: Enter name of file to save to dialog box

8. Search for and select a location to save the **.zip** file to and click **Save**.
   The **Enter name of file to save to** dialog box closes.
9. Open a Windows® Explorer window and find the location where the **.zip** file was saved.
10. Double-click the **.zip** file.
11. Extract the **.exe** file from the **.zip** file into a parent location.
12. Double-click the **.exe** file to run the WC Toolkit installer.
    The **Open File - Security Warning** dialog box opens.

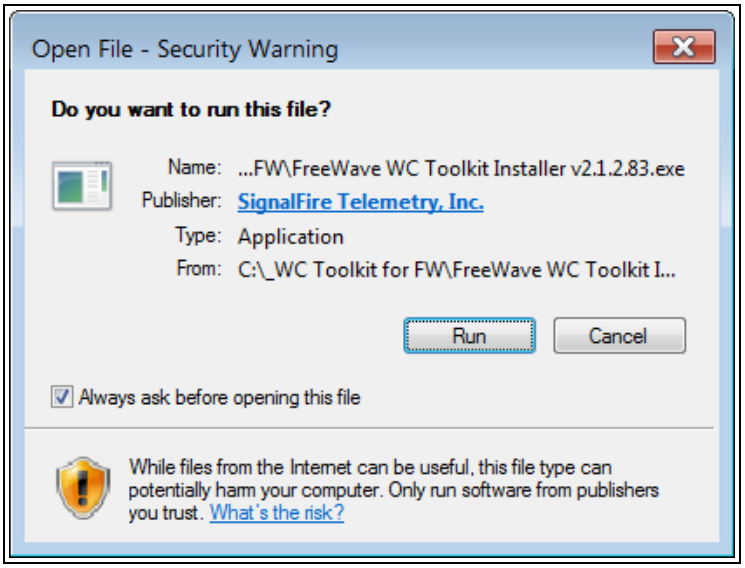


Figure 12: Open File - Security Warning dialog box

13. Click **Run**.
    The **User Account Control** dialog box opens.

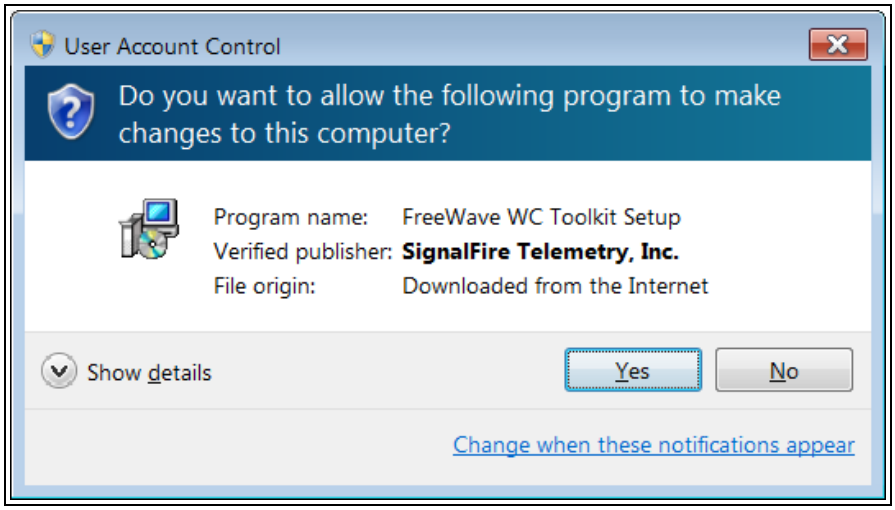


Figure 13: User Account Control dialog box

14. Click **Yes**.
    The **WC Toolkit Setup Wizard** starts.

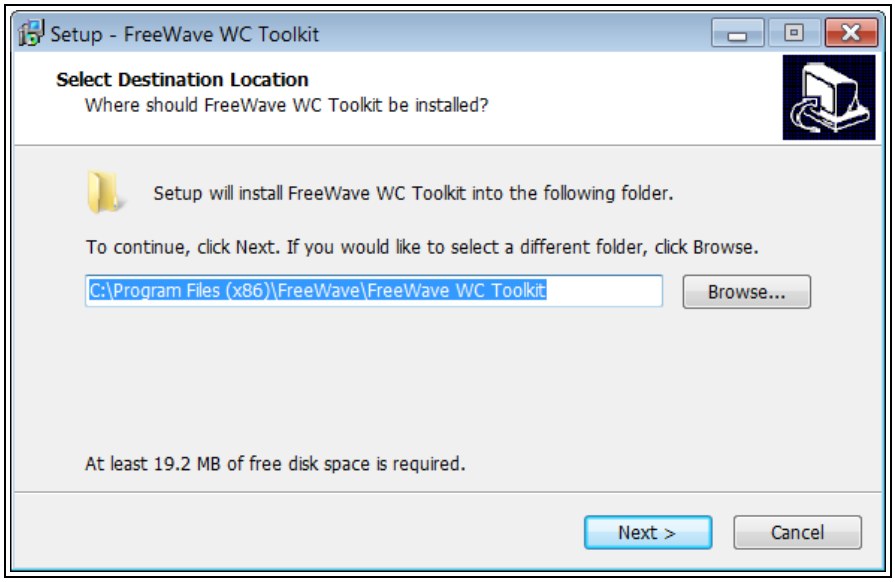


Figure 14: WC Toolkit Setup Wizard - Select Destination Location window

15. Click **Next** to continue.
    The **Ready to Install** window opens.

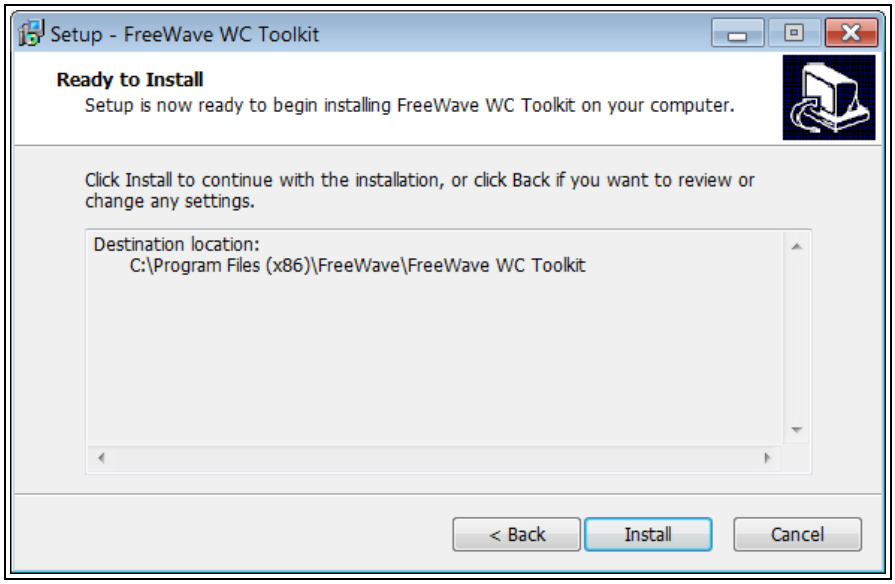


Figure 15: WC Toolkit Setup Wizard - Ready to Install window

16. Click **Install**.
    The install process is very quick.
    The **Installation Complete** window opens.

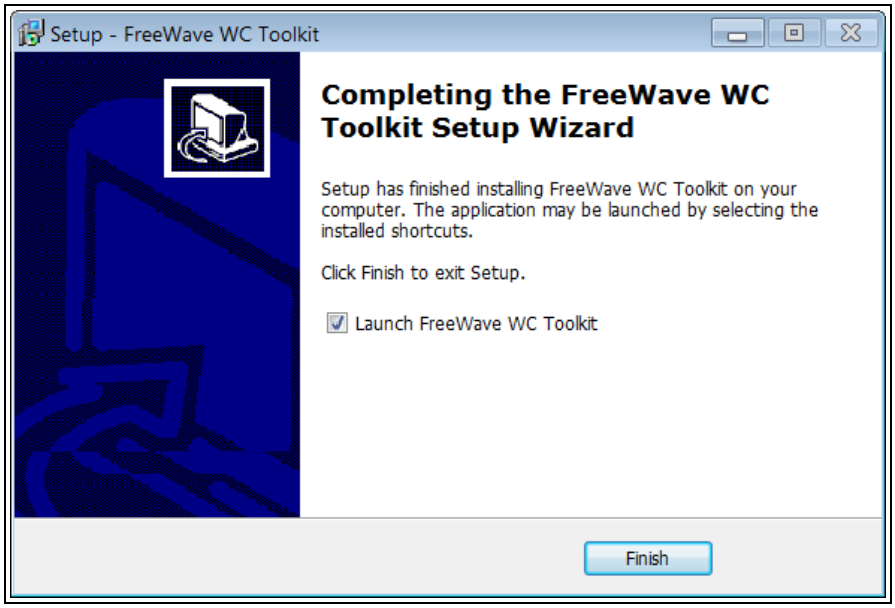


Figure 16: WC Toolkit Setup Wizard - Installation Complete window

17. Click **Finish** to open WC Toolkit.
    An **Update** message appears in the WC Toolkit window is an update is available.

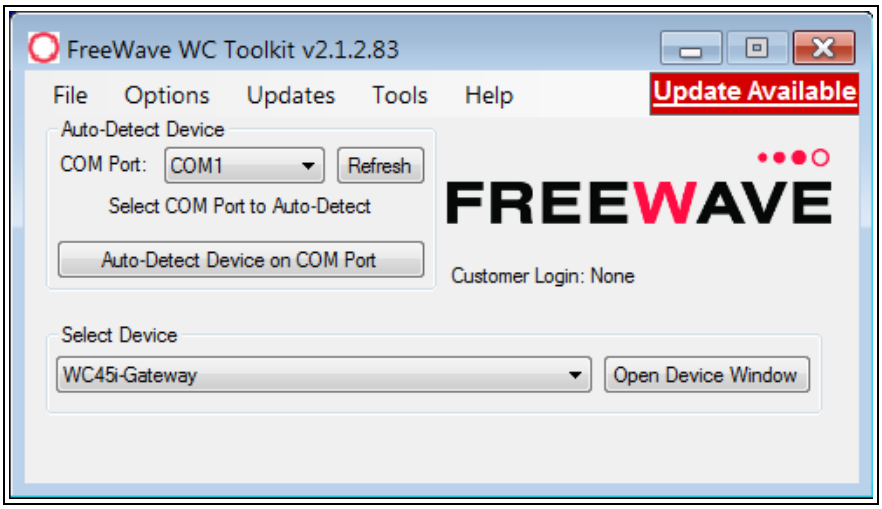


Figure 17: WC Toolkit - Update Available message

18. Continue with the WC Toolkit Update (on page 26) procedure.

5. WC Toolkit Update

If the WAVECONTACT device is connected to the internet, WC Toolkit automatically searches for an update for either the WC Toolkit itself or the connected device's firmware.

An **Update Available** message appears if an update is available.

> **Note**: An **Update Available** message also appears in the Device Configuration window (on page 52) for any connected WAVECONTACT device when an update is available for that device.
> The update procedure is the same for the device and WC Toolkit.

1. Open the **WC Toolkit** software.
   The **Update Available** message appears in the window. (Figure 18)

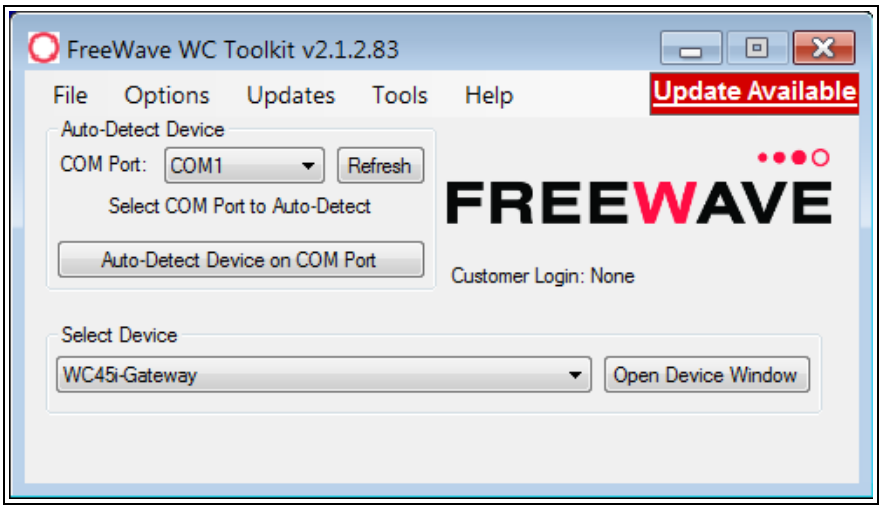


Figure 18: WC Toolkit - Update Available message

2. Click the **Update Available** message link.

Figure 19: Click the Update Available message link

The **Open File - Security Warning** dialog box opens.

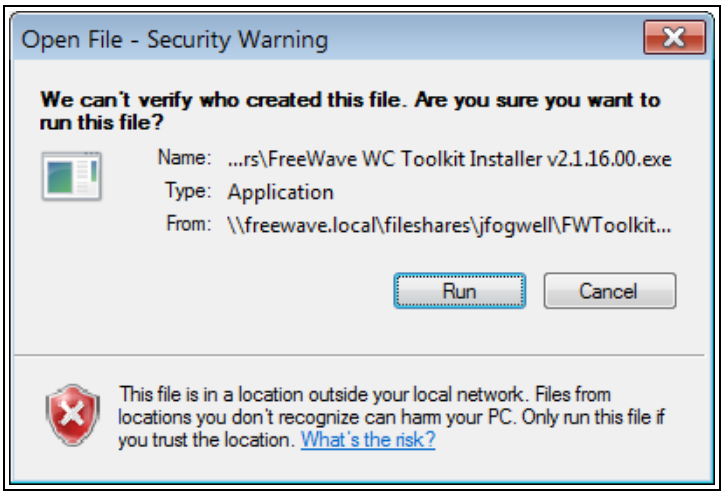


Figure 20: Open File - Security Warning dialog box

3. Click **Run**.
   The **User Account Control** dialog box opens.

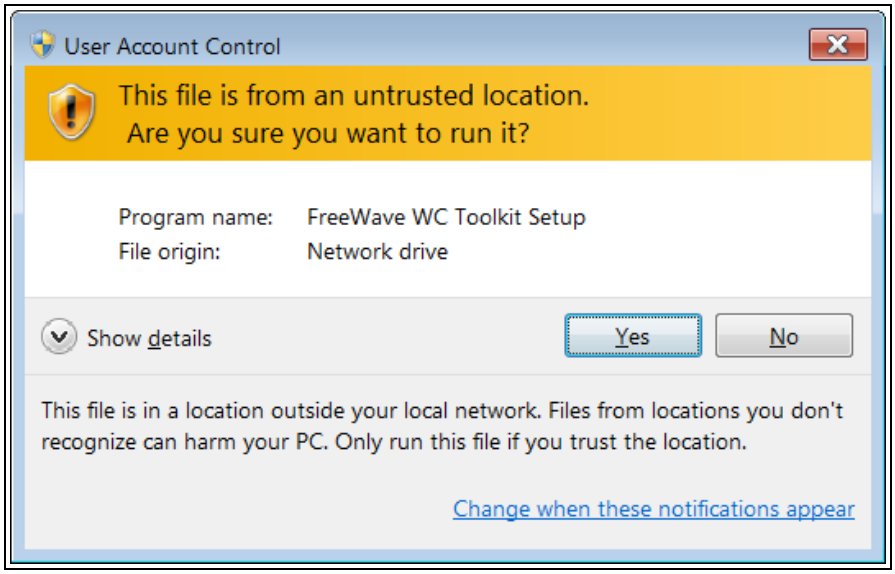


Figure 21: User Account Control dialog box

4. Click **Yes**.
   The WC Toolkit update process is very quick.
   When the update is completed, WC Toolkit re-opens the **Select Device** window showing the updated software version in the WC Toolkit window. (Figure 22)

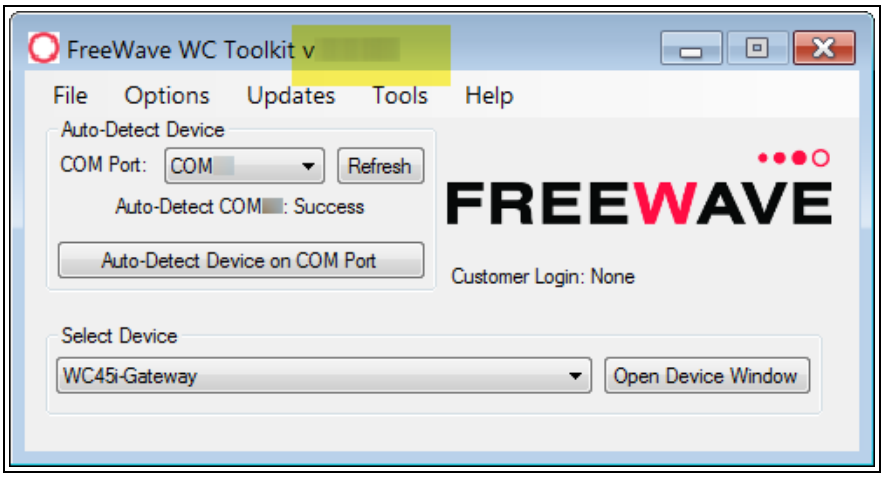


Figure 22: Select Device window

5. Continue with Configuration of the WC25i.

6. Configuration - Single WC25i Endpoint

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.

Important!: The WC25i Wireless I/O Module is configured using the **WC Toolkit**.
Download the **WC Toolkit** software from http://support.freewave.com/.

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 WC25i.

   Note: See WC Toolkit Installation (on page 19) and WC Toolkit Update (on page 26).

2. On the WC25i, slide the **Gateway - Node** switch to the **Node** side. (Connections - WC25i Wireless I/O Module (on page 11), #10)
3. Connect the Power supply and Ground wiring to the Power Input terminal block.
4. Power cycle the Endpoint (slave) WC25i for the change to take effect.
5. Connect the Serial end of the WC-USB-DB9 cable to the **RS232 Config / Debug** connector port and the USB connection to the computer.
6. Open the **WC Toolkit** software.
   The **Select Device** window opens.(Figure 23)

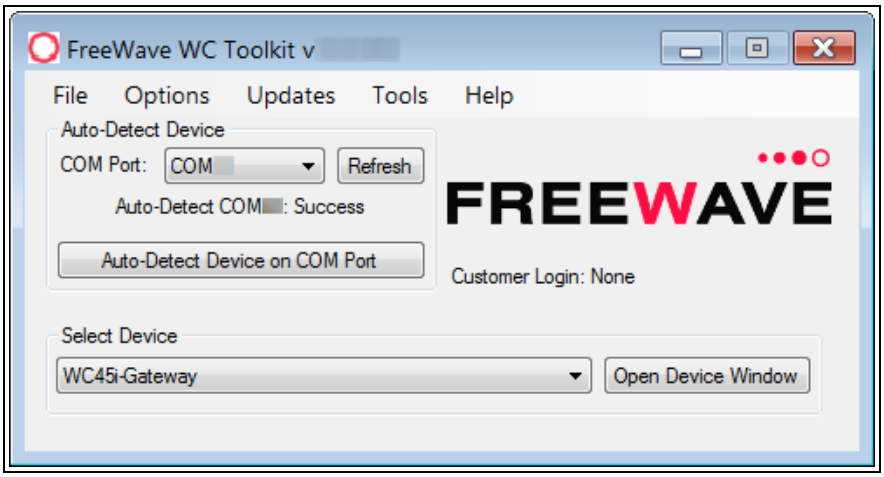


Figure 23: Select Device window

7. Click the **Refresh** button to have WC Toolkit search for and list the available COM ports reported by Windows and connected devices in the **COM Port** list box.
8. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC25i.
9. 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 WC25i device.

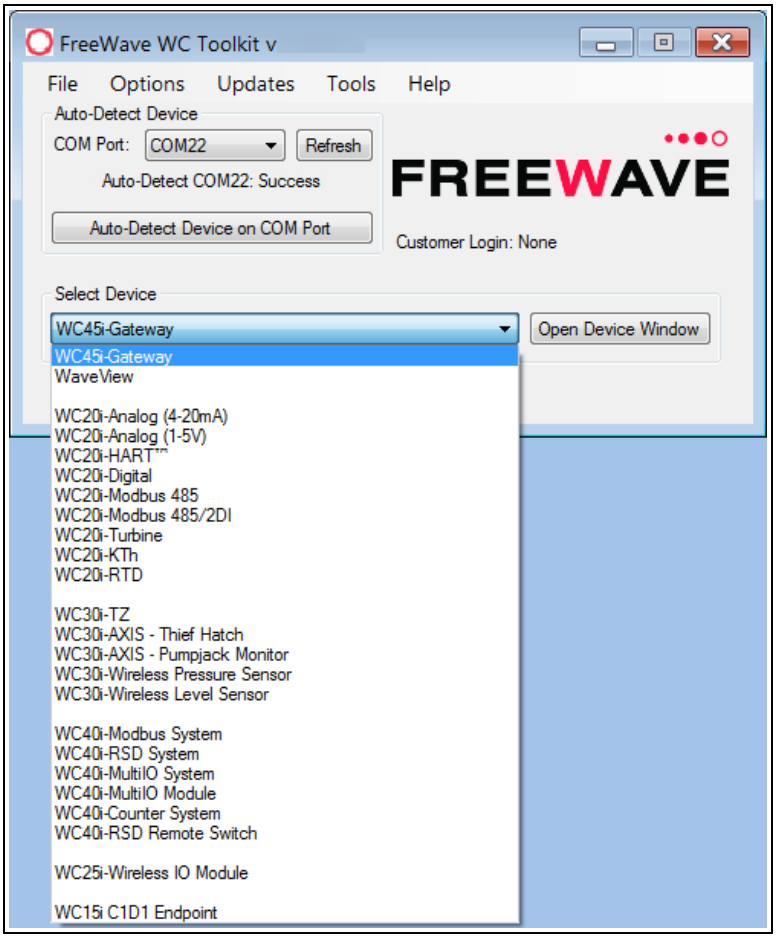


Figure 24: Select Device list box

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

Note: See Device Configuration window (on page 52) for detailed information.

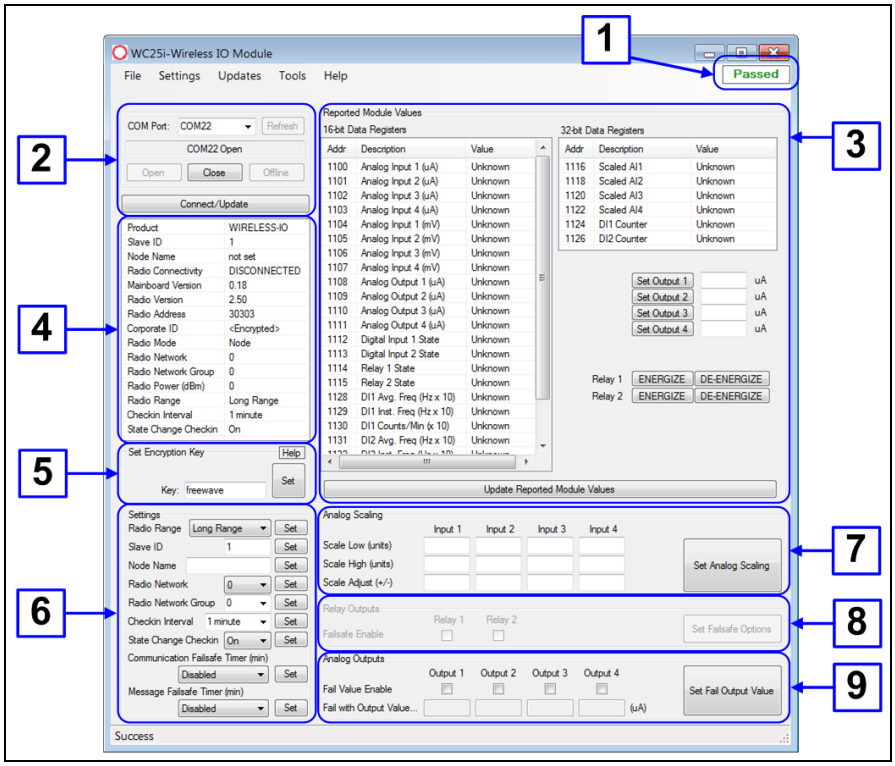


Figure 25: Device Configuration window: WC25i

10. In the **Reported Module Values** area (#3):
    a. In the **Set Output 1 to 4** text boxes, enter the number of milliamps to assign to the Analog Outputs.

    > **Example**: For 8 milliamps, enter 8000 in the **Set Output 1 to 4** text boxes.

    b. Click the **Relay 1** or **Relay 2 Energize** button to manually test (energize) the relays.
    c. Click the **Relay 1** or **Relay 2 De-Energize** button to manually test (de-energize) the relays.
11. In the **Set Encryption Key** area (#5), change these settings:
    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 WC25i 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.

12. Optional: Click the **Settings** menu and select **Set Encryption Key Unrecoverable** to permanently hide the key.
13. In the **Settings** area (#6), 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 selected by the user but MUST MATCH between each pair of WC25is for the WC25is to communicate.
See WAVECONTACT Network Frequencies (on page 64) for additional information.

a. Click the **Radio Range** list box arrow and select either **Long Range** or **Short Range**.
b. Click the **Set** button to save the information.
c. In the **Slave ID** column / text box, enter the remote source Endpoint Modbus Slave ID.

Note: Each remote device connected to the Gateway MUST have a unique Modbus Slave ID (1-240). See: Modbus Registers - WC25i (on page 47)

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.

d. Click the **Set** button to save the information.
e. Optional: In the **Node Name** text box, enter a name for the Endpoint using a maximum of 10 characters.
f. Click the **Set** button to save the information.
g. Click the **Radio Network** list box arrow and select 0 (zero) to 7 for the assigned number.
h. Click the **Set** button to save the information.
i. Click the **Radio Network Group** list box arrow and select 0 (zero) to 29 for the network group assigned number.

Important!: The **Radio Network** and **Radio Network Group** settings are selected by the user but MUST MATCH between each pair of WC25is for the WC25is to communicate.
See WAVECONTACT Network Frequencies (on page 64) for additional information.

j. Click the **Set** button to save the information.
k. 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.

l. Click the **Set** button to save the information.

m. 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.

n. Click the **Set** button to save the information.

o. Click the **Communication Failsafe Timer (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 the set time.

p. Click the **Set** button to save the information.

q. Click the **Message Failsafe Timer (min)** list box arrow and select the time since a valid Modbus coil write message or Analog Output write has been sent from the Modbus master through the Gateway.

> **Caution**: If a time is selected in the **Message Failsafe Timer (min)** list box, the time entered **must be set higher** than the Modbus Coil Write and Analog Output Write frequency of the Modbus master device.

r. Click the **Set** button to save the information.

14. Optional: In the **Analog Scaling** area (#7), customize the reported Analog Input to engineering units.
    a. In the **Scale Low (units)** text boxes, manually enter the **Input 1 to 4** lower range value.
    b. In the **Scale High (units)** text boxes, manually enter the **Input 1 to 4** upper range value.
    c. In the **Scale Adjust (+/-)** text box, enter an offset to add to or subtract from the reported scaled value.
    d. Click the **Set Analog Scaling** button to save the information.
15. Optional: In the **Relay Outputs** area (#8), click either the **Failsafe Enabled Relay 1** or **Relay 2** check boxes to set the relay to the un-energized state if there is a communication error (loss of communications).
16. Click the **Set Failsafe Options** button to save the information.
17. Optional: In the **Analog Outputs** area (#9):
    a. Click the **Fail Value Enable** check box for **Output 1 to 4** to enable the milliamp value entered in the associated **Fail with Output Value** text box.
    b. In the **Fail with Output Value** column / text box, enter the milliamp value the WC25i must reach to stop receiving the control signal.
    c. Click the **Set Fail Output Value** button to save the information.
18. 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.

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

19. Optional: Continue with:
    - Digital Input Debounce (on page 43)
    - Digital Input State Latch (on page 45)
20. Close the WC Toolkit software.
21. Remove the WC-USB-DB9 USB to Serial DB9 programming cable from the computer and the **RS232 Config / Debug** connector port.
22. Install the WC25i and connected antenna in a secure location.

7. Configuration - WC25i System

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.

- For each pair of WC25is:
  - One WC25i must be designated as the Gateway (master).
  - One must be designated as the Endpoint (slave).

Important!: The WC25i Wireless I/O Module is configured using the **WC Toolkit**.
Download the **WC Toolkit** software from http://support.freewave.com/.

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 WC25i.

   Note: See WC Toolkit Installation (on page 19) and WC Toolkit Update (on page 26).

2. Verify the Gateway is installed and configured before continuing with the Endpoint configuration.
3. Select one of the WC25i devices and verify the **Gateway - Node** switch is toward the **Gateway** side. (Connections - WC25i Wireless I/O Module (on page 11), #10)

4. On the other WC25i, slide the **Gateway - Node** switch to the **Node** side.
5. Connect the Power supply and Ground wiring to the Power Input terminal block.
6. Power cycle the Endpoint (slave) WC25i for the change to take effect.
7. Connect the Serial end of the WC-USB-DB9 cable to the **RS232 Config / Debug** connector port and the USB connection to the computer.
8. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 26)

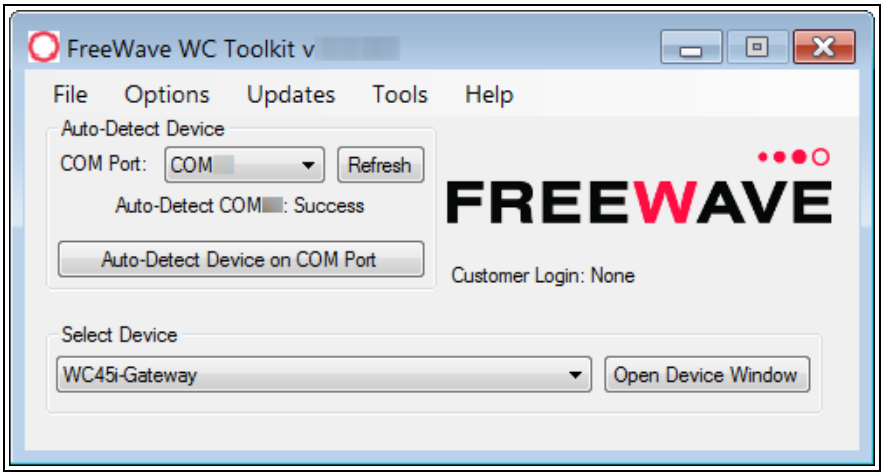


Figure 26: Select Device window

9. Click the **Refresh** button to have WC Toolkit search for and list the available COM ports reported by Windows and connected devices in the **COM Port** list box.
10. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC25i.
11. 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 WC25i device.

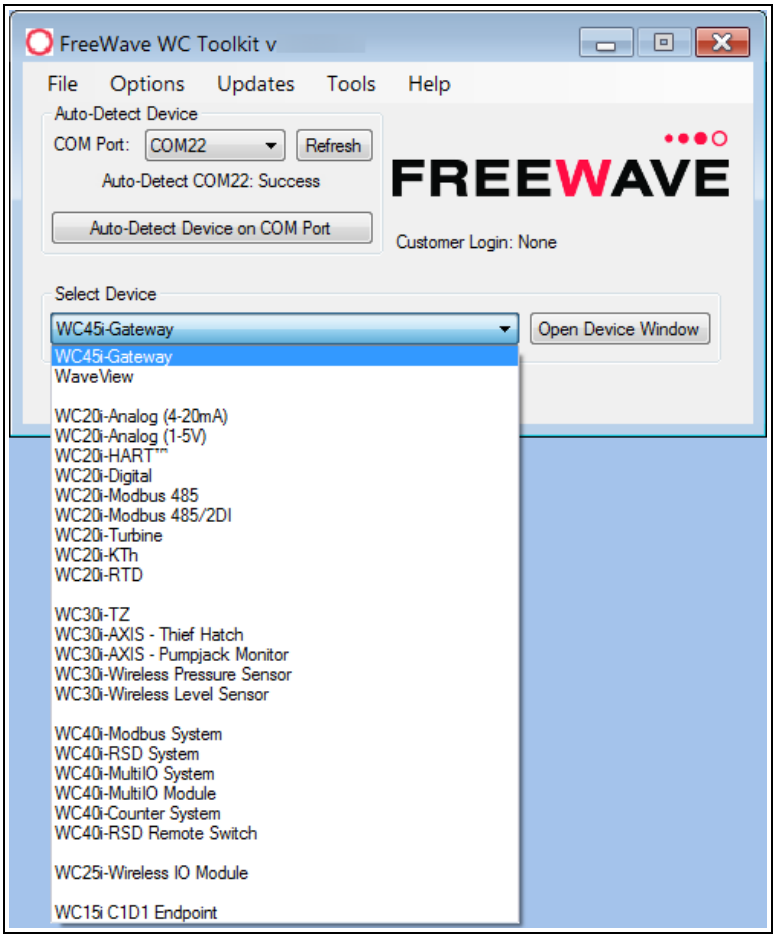


Figure 27: Select Device list box

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

Note: See Device Configuration window (on page 52) for detailed information.

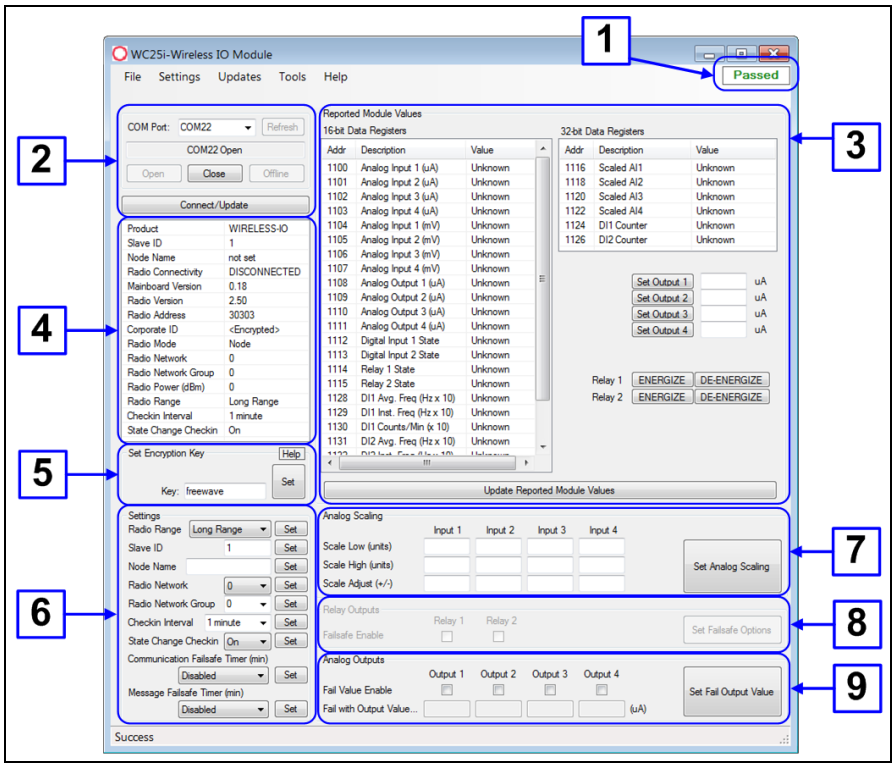


Figure 28: Device Configuration window: WC25i

12. In the **Reported Module Values** area (#3)
    a. In the **Set Output 1 to 4** text boxes, enter the number of milliamps to assign to the Analog Outputs.
    b. Click the **Relay 1** or **Relay 2 Energize** button to manually test (energize) the relays.
    c. Click the **Relay 1** or **Relay 2 De-Energize** button to manually test (de-energize) the relays.
13. In the **Set Encryption Key** area (#5), change these settings:
    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 WC25i 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.

14. Optional: Click the **Settings** menu and select **Set Encryption Key Unrecoverable** to permanently hide the key.
15. In the **Settings** area (#6), 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 selected by the user but MUST MATCH between each pair of WC25is for the WC25is to communicate.
> See WAVECONTACT Network Frequencies (on page 64) for additional information.

a. Click the **Radio Range** list box arrow and select either **Long Range** or **Short Range**.
b. Click the **Set** button to save the information.
c. Optional: In the **Slave ID** column / text box, enter the remote source Endpoint Modbus Slave ID.

> **Note**: Each remote device connected to the Gateway MUST have a unique Modbus Slave ID (1-240). See: Modbus Registers - WC25i (on page 47)

> **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.

d. Click the **Set** button to save the information.
e. Optional: In the **Node Name** text box, enter a name for the Endpoint using a maximum of 10 characters.
f. Click the **Set** button to save the information.
g. Click the **Radio Network** list box arrow and select 0 (zero) to 7 for the assigned number.
h. Click the **Set** button to save the information.
i. Click the **Radio Network Group** list box arrow and select 0 (zero) to 29 for the network group assigned number.

> **Important!**: The **Radio Network** and **Radio Network Group** settings are selected by the user but MUST MATCH between each pair of WC25is for the WC25is to communicate.
> See WAVECONTACT Network Frequencies (on page 64) for additional information.

j. Click the **Set** button to save the information.
k. 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.
l. Click the **Set** button to save the information.
m. 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.
n. Click the **Set** button to save the information.

o. Click the **Communication Failsafe Timer (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 the set time.

p. Click the **Set** button to save the information.

q. Click the **Message Failsafe Timer (min)** list box arrow and select the time since a valid Modbus coil write message or Analog Output write has been sent from the Modbus master through the Gateway.

> **Caution**: If a time is selected in the **Message Failsafe Timer (min)** list box, the time entered **must be set higher** than the Modbus Coil Write and Analog Output Write frequency of the Modbus master device.

r. Click the **Set** button to save the information.

16. Optional: In the **Analog Scaling** area (#7), customize the reported Analog Input to engineering units.
    a. In the **Scale Low (units)** text boxes, manually enter the **Input 1 to 4** lower range value.
    b. In the **Scale High (units)** text boxes, manually enter the **Input 1 to 4** upper range value.
    c. In the **Scale Adjust (+/-)** text box, enter an offset to add to or subtract from the reported scaled value.
    d. Click the **Set Analog Scaling** button to save the information.
17. Optional: In the **Relay Outputs** area (#8), click either the **Failsafe Enabled Relay 1** or **Relay 2** check boxes to set the relay to the un-energized state if there is a communication error (loss of communications).
18. Click the **Set Failsafe Options** button to save the information.
19. Optional: In the **Analog Outputs** area (#9):
    a. Click the **Fail Value Enable** check box for **Output 1 to 4** to enable the milliamp value entered in the associated **Fail with Output Value** text box.
    b. In the **Fail with Output Value** column / text box, enter the milliamp value the WC25i must reach to stop receiving the control signal.
    c. Click the **Set Fail Output Value** button to save the information.
20. 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.

> **FREEWAVE Recommends**: Install and configure the **WC45i** Gateway before any Endpoints to ensure the Endpoints have connectivity after installation.

21. Optional: Continue with:
    - Digital Input Debounce (on page 43)
    - Digital Input State Latch (on page 45)
22. Close the WC Toolkit software.
23. Remove the WC-USB-DB9 USB to Serial DB9 programming cable from the computer and the **RS232 Config / Debug** connector port.
24. Install the WC25i and connected antenna in a secure location.

8. Digital Input Debounce

Use the Digital Input Debounce window (on page 60) to designate the digital input **Debounce Time** to accurately total Digital Input counts.

Note: The **Debounce Time** is useful when using contacts that may produce extra counts when they close.

Example: A typical value for a dry contact is 100mS. Any extra counts due to contact bounce within the **Debounce Time** setting are ignored.

Procedure

1. Open the Device Configuration window (on page 52).
2. On the **Settings** menu, click **Digital Input Debounce**.

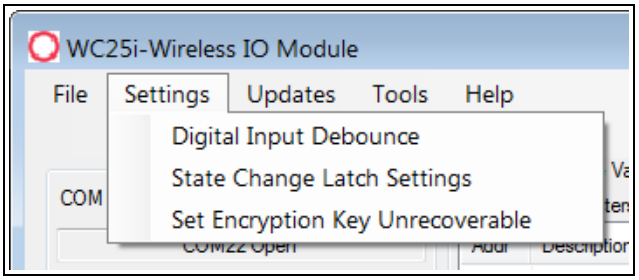


Figure 29: Settings menu > Digital Input Debounce

The **Digital Input Debounce** window opens.

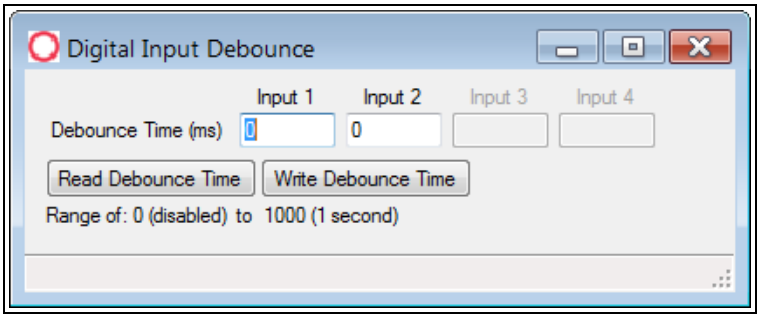


Figure 30: Digital Input Debounce window

3. In the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes, enter the time (in mS) during which possible multiple triggers are treated as a single event.

   Note: This is typically used when mechanical contacts are used to generate the input signal.

4. Click the **Read Debounce Time** button to read the current debounce settings. This information appears in the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes.
5. Click the **Write Debounce Time** button to save the time entered in the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes to the WC25i.
6. Close the **Digital Input Debounce** window.
7. Close the WC Toolkit software.
8. Remove the WC-USB-DB9 USB to Serial DB9 programming cable from the computer and the **RS232 Config / Debug** connector port.

9. Digital Input State Latch

The **State Latch** feature is used where a fast transition sensed by the WC25i may happen too quickly to be read by the WC45i-Gateway.

The state of one or both of the digital inputs is latched to a value for a configurable number of seconds.

Example: If the **Input Channel 1** list box is set to **Latch Closed (1)** for the **3** seconds entered in the **Input Channel 1 or 2 Seconds** text box, then any close sensed on the digital input is reported as closed for 3 seconds even in the input opens in less than 3 seconds.

Procedure

1. Open the Device Configuration window (on page 52).
2. On the **Settings** menu, click **State Change Latch Settings**.

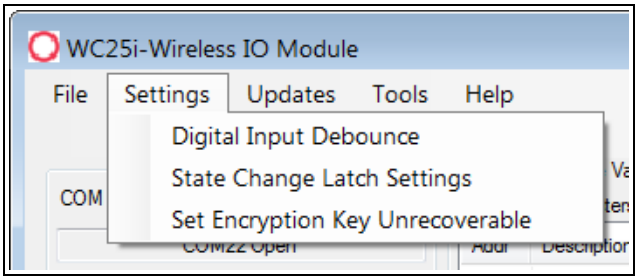


Figure 31: Settings menu > State Change Latch Settings

The State Change Latch Settings window (on page 62) opens.

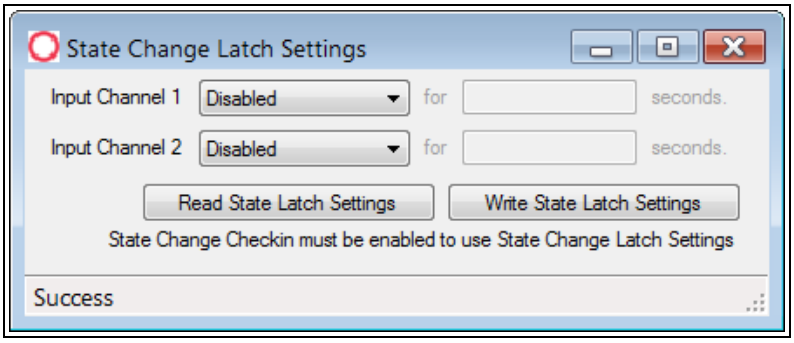


Figure 32: State Change Latch Settings window

3. Click the **Read State Latch Settings** button to read the current state of the latch settings.
4. Click the **Input Channel 1** or **Input Channel 2**list box arrow and select either **Latch Open (0)** or **Latch Closed (1)**.
5. In the **Input Channel 1** or **Input Channel 2 Seconds** text boxes, enter the number of seconds the latch remains open or closed.
6. Click the **Write State Latch Settings** button to write (save) the changed latch settings.
7. Close the **State Change Latch Settings** window.

10. Modbus Registers - WC25i

The WC25i sends data to a WC45i-Gateway.

Every check-in period, the sensors are read and data is sent to the Gateway. The Gateway saves the data under the set Modbus ID in 16-bit registers.

- The data sent to the Gateway is available at the Gateway in registers where it is read by a Modbus RTU master device.
- The Endpoint must have a unique (to the network it is in) Modbus Slave ID.
  - The Gateway uses this Slave ID to store its unique data.

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

Note: This data is accessible at the same Slave ID as the connected Modbus device.

- Coils (0xxxx) (on page 48)
- Holding Registers (4xxxx) (on page 48)

10.1. Coils (0xxxx)

WC25i - Coils (0xxxx)				
Register Number	**Register Address**	**Function Code**	**Register Type**	**Description**
00102	101	05	Write Only	Relay 1 Coil
00103	102	05	Write Only	Relay 2 Coil
00112	111	05	Write Only	Counter 1 Reset Coil
00113	112	05	Write Only	Counter 2 Reset Coil

10.2. Holding Registers (4xxxx)

WC25i - Holding Registers (4xxxx)				
Register Number	**Register Address**	**Function Code**	**Register Type**	**Description**
40122	121	06,	Write Only	Relay 1 Pulse • 0 = Off • 1 – 255 = Pulse Time (sec)
40123	122	06,	Write Only	Relay 2 Pulse
41101	1100	03, 04	Read Only	AI1: Current Reading • Unsigned int • µA
41102	1101	03, 04	Read Only	AI2: Current Reading
41103	1102	03, 04	Read Only	AI3: Current Reading
41104	1103	03, 04	Read Only	AI4:Current Reading
41105	1104	03, 04	Read Only	AI1:Voltage Reading • Unsigned int • mV
41106	1105	03, 04	Read Only	AI2:Voltage Reading
41107	1106	03, 04	Read Only	AI3:Voltage Reading
41108	1107	03, 04	Read Only	AI4:Voltage Reading
41109	1108	03, 04, 06	Read / Write	AO1: Current Output • Unsigned int • µA
41110	1109	03, 04, 06	Read / Write	AO2: Current Output
41111	1110	03, 04, 06	Read / Write	AO3: Current Output
41112	1111	03, 04, 06	Read / Write	AO4: Current Output

WC25i - Holding Registers (4xxxx)				
Register Number	**Register Address**	**Function Code**	**Register Type**	**Description**
41113	1112	03, 04	Read Only	DI1: State • Unsigned int • 1 = Closed • 0 = Open
41114	1113	03, 04	Read Only	DI2: State
41115	1114	03, 04	Read Only	Relay 1 State • Unsigned int • 1 = ON • 0 = OFF
41116	1115	03, 04	Read Only	Relay 2 State
41117	1116	03, 04	Read Only	AI1:Scaled Reading • Float • High Word
41118	1117	03, 04	Read Only	AI1:Scaled Reading • Float • Low Word
41119	1118	03, 04	Read Only	AI2:Scaled Reading
41120	1119	03, 04	Read Only	AI2:Scaled Reading
41121	1120	03, 04	Read Only	AI3:Scaled Reading
41122	1121	03, 04	Read Only	AI3:Scaled Reading
41123	1122	03, 04	Read Only	AI4:Scaled Reading
41124	1123	03, 04	Read Only	AI4: Scaled Reading
41125	1124	03, 04	Read Only	DI1: Total Counts • Unsigned int • High Word
41126	1125	03, 04	Read Only	DI1:Total Counts • Unsigned int • Low Word
41127	1126	03, 04	Read Only	DI2:Total Counts • Unsigned int • High Word
41128	1127	03, 04	Read Only	DI2:Total Counts • Unsigned int • Low Word

WC25i - Holding Registers (4xxxx)				
Register Number	**Register Address**	**Function Code**	**Register Type**	**Description**
41129	1128	03, 04	Read Only	DI1:Average Frequency • (Hz x 10)
41130	1129	03, 04	Read Only	DI1:Instantaneous Frequency • (Hz x 10)
41131	1130	03, 04	Read Only	DI1:Counts per minute (x 10)
41132	1131	03, 04	Read Only	DI2:Average Frequency • (Hz x 10)
41133	1132	03, 04	Read Only	DI2: Instantaneous Frequency • (Hz x 10)
41134	1133	03, 04	Read Only	DI1:Counts per minute (x 10)

11. WC Toolkit Software Environment

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

- Device Configuration window (on page 52)
- Digital Input Debounce window (on page 60)
- State Change Latch Settings window (on page 62)

11.1. Device Configuration window

The **Device Configuration** window is used to configure the settings on the WC25i Wireless I/O Module.

Access and Window Description

1. Verify the WC Toolkit software is installed on the computer connected to the WC25i.

   Note: See WC Toolkit Installation (on page 19) and WC Toolkit Update (on page 26).

2. Verify the Gateway is installed and configured before continuing with the Endpoint configuration.
3. Select one of the WC25i devices and verify the **Gateway - Node** switch is toward the **Gateway** side. (Connections - WC25i Wireless I/O Module (on page 11), #10)
4. On the other WC25i, slide the **Gateway - Node** switch to the **Node** side.
5. Connect the Power supply and Ground wiring to the Power Input terminal block.
6. Power cycle the Endpoint (slave) WC25i for the change to take effect.
7. Connect the Serial end of the WC-USB-DB9 cable to the **RS232 Config / Debug** connector port and the USB connection to the computer.
8. Open the **WC Toolkit** software.
   The **Select Device** window opens. (Figure 33)

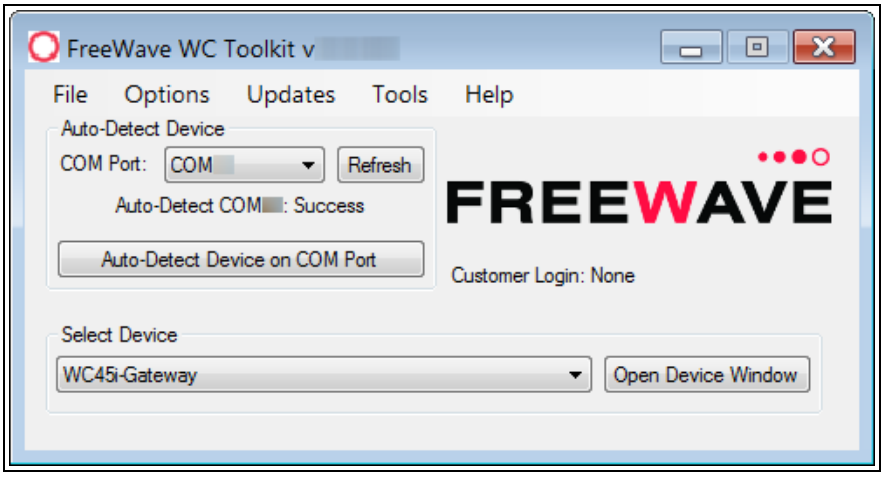


Figure 33: Select Device window

3. Click the **Refresh** button to have WC Toolkit search for and list the available COM ports reported by Windows and connected devices in the **COM Port** list box.
4. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC25i.
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 WC25i device.

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

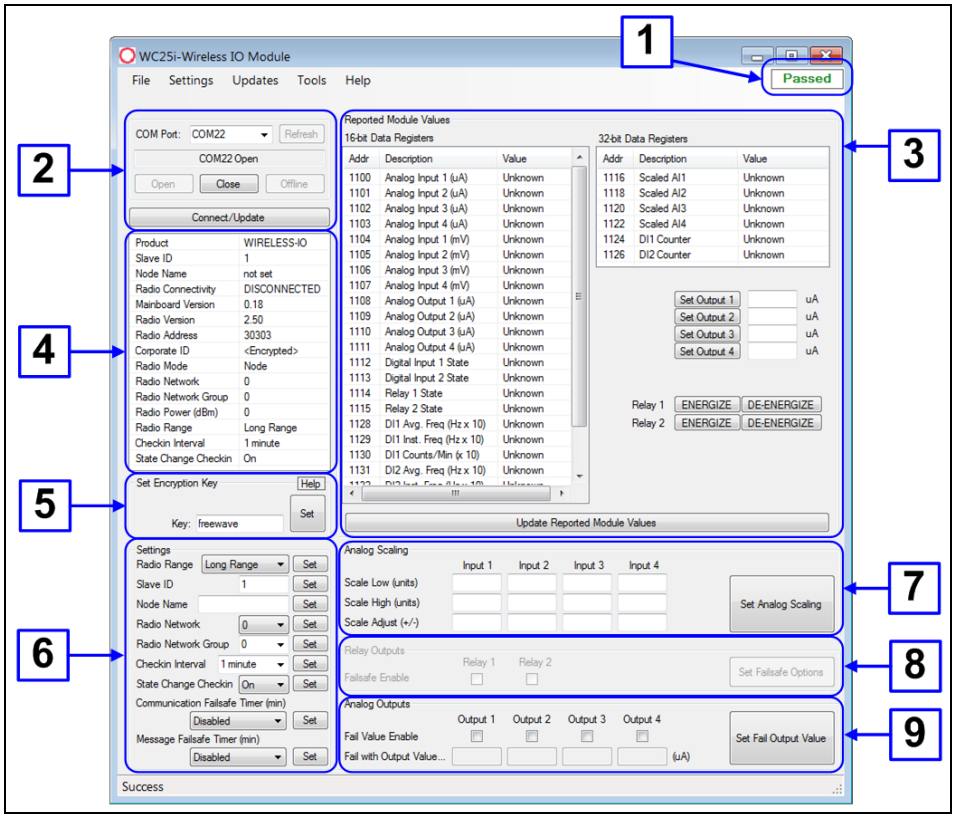


Figure 34: Device Configuration window: WC25i

Device Configuration window: WC25i		
Control Area	**Control Title**	**Control Description**
1 - **Status of Last Operation** text box		The **Status of Last Operation** text box indicates whether the last command from the WC Toolkit to the connected device is **Active** or has **Passed**. **Note**: A **Firmware Update Available** message appears in this text box when the WC Toolkit has detected that a newer version of firmware is available for download than what is installed on the device. **Note**: This information is read-only.

Device Configuration window: WC25i		
Control Area	**Control Title**	**Control Description**
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 Port** list box	Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC25i.
2 - **Serial Port Settings** area	**Refresh** button	Click the **Refresh** button to have WC Toolkit search for and list the available COM ports reported by Windows and connected devices in the **COM Port** list box.
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.
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	**Connect / Update** button	Click the **Connect / Update** button to re-connect to the COM port of the WAVECONTACT device. **Note**: When the connection is made to the IP Address, full access to the Gateway is available as if a direct serial connection is used. This includes full remote configuration capability.
3 - **Reported Module Values** area		The **Reported Module Values** area shows the reported data values from the attached sensor. **Note**: This information is read-only.
3 - **Reported Module Values** area	**16-bit Data Registers** scroll box	The **16-bit Data Registers** scroll box lists the data or values for each 16-bit register. **Note**: This information is read-only.
3 - **Reported Module Values** area	**32-bit Data Registers** table	The **32-bit Data Registers** scroll box lists the data or values for each 32-bit register. **Note**: This information is read-only.

Device Configuration window: WC25i		
Control Area	**Control Title**	**Control Description**
3 - **Reported Module Values** area	**Set Output 1 to 4** text boxes	In the **Set Output 1 to 4** text boxes, enter the number of milliamps to assign to the Analog Outputs. **Example**: For 8 milliamps, enter 8000 in the **Set Output 1 to 4** text boxes.
3 - **Reported Module Values** area	**Relay 1** or **Relay 2 Energize** button	Click the **Relay 1** or **Relay 2 Energize** button to manually test (energize) the relays.
3 - **Reported Module Values** area	**Relay 1** or **Relay 2 De-Energize** button	Click the **Relay 1** or **Relay 2 De-Energize** button to manually test (de-energize) the relays.
4 - WC25i **Information** area		The **Information** area of the **Device Configuration** window shows connection information about the connected WAVECONTACT device. **Note**: This information is read-only.
5 - **Set Encryption Key** area		The **Set Encryption Key** area is used to activate and define the encryption key for the WAVECONTACT device.
5 - **Set Encryption Key** area	**Help** button	Click to open the Encryption **Help** message.
5 - **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**.
5 - **Set Encryption Key** area	**Set** button	Click the **Set** button to save the information.
6 - **Settings** area		The **Settings** area is used to define the radio mode and radio network. **Note**: See the Settings area (on page 56) for detailed information about the settings.

Device Configuration window: WC25i		
Control Area	**Control Title**	**Control Description**
7 - **AnalogScaling** area		In the **Analog Scaling** area (#7), customize the reported Analog Input to engineering units. **Note**: See the Analog Scaling area (on page 59) for detailed information about the settings.
Relay Outputs area -	**Failsafe Enabled Relay 1** or **Relay 2** check boxes	In the **Relay Outputs** area (#8), click either the **Failsafe Enabled Relay 1** or **Relay 2** check boxes to set the relay to the un-energized state if there is a communication error (loss of communications). **Note**: If either check box is NOT selected and there is a communication error, then the Relay is left as-is.
	Set Failsafe Options button	Click the **Set Failsafe Options** button to save the information.
Analog Outputs area	**Fail Value Enable Output 1 to 4** check boxes	Click any of the applicable **Fail Value Enable Output 1 to 4** check boxes to stop receiving the control signal when the WC25i reaches the designated milliamps entered in the associated **Fail with Output Value** text box.
	Fail with Output Value text box	In the **Fail with Output Value** column / text box, enter the milliamp value the WC25i must reach to stop receiving the control signal.
	Set Fail Output Value button	Click the **Set Fail Output Value** button to save the information.

11.1.1. Settings area

The **Settings** area is used to define the radio mode and radio network.

Device Configuration window: Settings area	
Control Title	**Control Description**
Set button	Click the **Set** button to save the information.
Radio Range list box	Click the **Radio Range** list box arrow and select either **Long Range** or **Short Range**. • **Long Range**: Select **Long Range** if the distance to reach another device is **greater than** 50 feet. • **Short Range**: Select **Short Range** if the distance to reach another device is **less than** 50 feet. **Note**: The default value is Long Range.

Device Configuration window: Settings area	
Control Title	**Control Description**
Node Name text box	Optional: In the **Node Name** text box, enter a name for the Endpoint using a maximum of 10 characters.
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 selected by the user but MUST MATCH between each pair of WC25is for the WC25is to communicate. See WAVECONTACT Network Frequencies (on page 64) for additional information.
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. The options are: • 5 seconds • 15 seconds • 1 minute • 2 minutes • 4.5 minutes • 10 minutes • 15 minutes • 30 minutes • 60 minutes **Note**: The default value is 5 seconds.
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. **Caution**: Do not enable the **State Change Checkin** list box for rapidly changing inputs. **Note**: The default value is No.

Device Configuration window: Settings area	
Control Title	**Control Description**
Communication Failsafe Timer (min) list box	**Important!**: In the event of a loss of communication between the Endpoint and the Gateway, it may be desirable for the outputs to go to a fail state. This is accomplished by setting either the **Communication Failsafe Timer (min)** list box or the **Message Failsafe Timer (min)** list box or both. Click the **Communication Failsafe Timer (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 the set time. • If the Endpoint losses its wireless communications link to the Gateway for greater than the designated time, any failsafe enabled relay is put into a de-energized state. • The relay remains in this safe state until a Modbus command is sent to the Gateway to energize the coil. • In addition any failsafe enabled Analog Otput is set to its configured fail value until a new value is written from the PLC.
Message Failsafe Timer (min) list box	**Important!**: In the event of a loss of communication between the Endpoint and the Gateway, it may be desirable for the outputs to go to a fail state. This is accomplished by setting either the **Communication Failsafe Timer (min)** list box or the **Message Failsafe Timer (min)** list box or both. Click the **Message Failsafe Timer (min)** list box arrow and select the time since a valid Modbus coil write message or Analog Output write has been sent from the Modbus master through the Gateway. **Caution**: If a time is selected in the **Message Failsafe Timer (min)** list box, the time entered **must be set higher** than the Modbus Coil Write and Analog Output Write frequency of the Modbus master device. **Note**: Any Analog Output **with** a fail value enabled will go to the fail value at boot. Any Analog Output **without** a fail value will go to 0 (zero) at boot

11.1.2. Analog Scaling area

In the **Analog Scaling** area (#7), customize the reported Analog Input to engineering units.

Example: For a 0-1000 PSI sensor, set the **Scale Low (units)** list box to 0 (zero) and the **Scale High (units)** list box to 1000.
The scaled value is shown in the **Device Configuration** window and reported to the Gateway as a floating point number.

Device Configuration window: Analog Scaling area	
Control Title	**Control Description**
Scale Low (units) list box	In the **Scale Low (units)** text boxes, manually enter the **Input 1 to 4** lower range value.
Scale High (units) list box	In the **Scale High (units)** text boxes, manually enter the **Input 1 to 4** upper range value.
Scale Adjust (+/-) list box	Optional: In the **Scale Adjust (+/-)** text box, enter an offset to add to or subtract from the reported scaled value.
Set Analog Scaling button	Click the **Set Analog Scaling** button to save the information.

11.2. Digital Input Debounce window

The **Digital Input Debounce** window is used to designate the digital input **Debounce Time** to accurately total Digital Input counts.

Note: The **Debounce Time** is useful when using contacts that may produce extra counts when they close.

Example: A typical value for a dry contact is 100mS. Any extra counts due to contact bounce within the **Debounce Time** setting are ignored.

Access and Window Description

1. Open the Device Configuration window (on page 52).
2. On the **Settings** menu, click **Digital Input Debounce**.

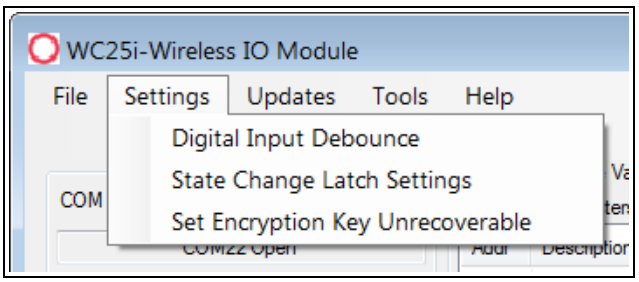


Figure 35: Settings menu > Digital Input Debounce

The **Digital Input Debounce** window opens.

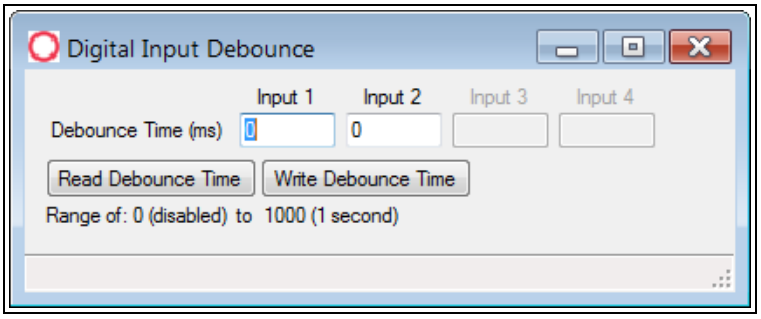


Figure 36: Digital Input Debounce window

Digital Input Debounce window	
Control Title	**Control Description**
Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4 text boxes	In the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes, enter the time (in mS) during which possible multiple triggers are treated as a single event. **Note**: This is typically used when mechanical contacts are used to generate the input signal.
Read Debounce Time button	Click the **Read Debounce Time** button to read the current debounce settings. This information appears in the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes.
Write Debounce Time button	Click the **Write Debounce Time** button to save the time entered in the **Debounce Time (ms) Input 1, Input 2, Input 3, or Input 4** text boxes to the WC25i.

11.3. State Change Latch Settings window

The **State Latch** feature is used where a fast transition sensed by the WC25i may happen too quickly to be read by the WC45i-Gateway.

The state of one or both of the digital inputs is latched to a value for a configurable number of seconds.

Example: If the **Input Channel 1** list box is set to **Latch Closed (1)** for the **3** seconds entered in the **Input Channel 1 or 2 Seconds** text box, then any close sensed on the digital input is reported as closed for 3 seconds even in the input opens in less than 3 seconds.

The **State Change Latch Settings** window is used to define the latch settings.

Access and Window Description

1. Open the Device Configuration window (on page 52).
2. On the **Settings** menu, click **State Change Latch Settings**.

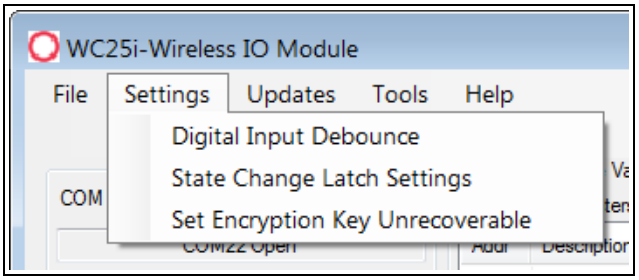


Figure 37: Settings menu > State Change Latch Settings

The **State Change Latch Settings** window opens.

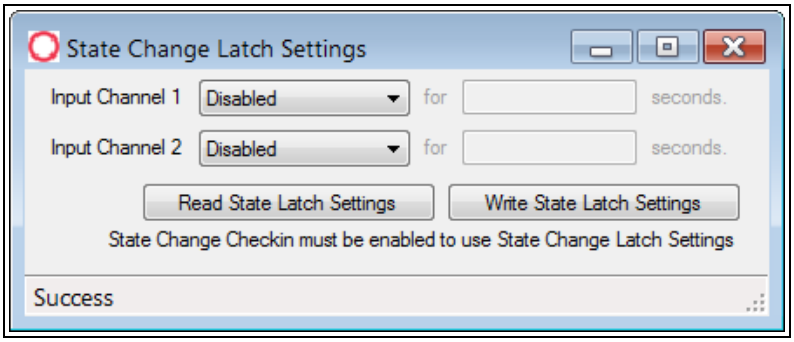


Figure 38: State Change Latch Settings window

State Change Latch Settings window	
Control Title	**Control Description**
Input Channel 1 or 2 list boxes	Click the **Input Channel 1** or **Input Channel 2**list box arrow and select either **Latch Open (0)** or **Latch Closed (1)**.

State Change Latch Settings window	
Control Title	**Control Description**
Input Channel 1 or 2 Seconds text boxes	In the **Input Channel 1** or **Input Channel 2 Seconds** text boxes, enter the number of seconds the latch remains open or closed.
Read State Latch Settings button	Click the **Read State Latch Settings** button to read the current state of the latch settings.
Write State Latch Settings button	Click the **Write State Latch Settings** button to write (save) the changed latch settings.

12. WAVECONTACT Network Frequencies

The frequencies used by the WAVECONTACT network vary depending on the **Radio Network** and **Radio Network Group** selected in the Device Configuration window (on page 52).

Example: Using the Radio Network Group Selection: 0, 1, 2, or 3 (on page 65) table, the **Radio Network** and **Radio Network Group** settings of 0 (zero) and 0 (zero) (respectively) uses the frequencies between 908.20 and 918.20.
The **Radio Network** and **Radio Network Group** settings of 0 (zero) and 2 (respectively) uses 905.00 to 915.00.

12.1. Radio Network Group Selection: 0, 1, 2, or 3

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 0, 1, 2, or 3.

Radio Network selection	Radio Network Group selection: 0 or 1	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 2 or 3	Low Frequency	High Frequency
0	**0**	908.20	918.20	0	**2**	905.00	915.00
1	**0**	908.40	918.40	1	**2**	905.20	915.20
2	**0**	908.60	918.60	2	**2**	905.40	915.40
3	**0**	908.80	918.80	3	**2**	905.60	915.60
4	**0**	909.00	919.00	4	**2**	905.80	915.80
5	**0**	909.20	919.20	5	**2**	906.00	916.00
6	**0**	909.40	919.40	6	**2**	906.20	916.20
7	**0**	909.60	919.60	7	**2**	906.40	916.40
0	**1**	909.80	919.80	0	**3**	906.60	916.60
1	**1**	910.00	920.00	1	**3**	906.80	916.80
2	**1**	910.20	920.20	2	**3**	907.00	917.00
3	**1**	910.40	920.40	3	**3**	907.20	917.20
4	**1**	910.60	920.60	4	**3**	907.40	917.40
5	**1**	910.80	920.80	5	**3**	907.60	917.60
6	**1**	911.00	921.00	6	**3**	907.80	917.80
7	**1**	911.20	921.20	7	**3**	908.00	918.00

12.2. Radio Network Group Selection: 4, 5, 6, or 7

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 4, 5, 6, or 7.

Radio Network selection	Radio Network Group selection: 4 or 5	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 6 or 7	Low Frequency	High Frequency
0	**4**	908.20	918.20	0	**6**	905.00	915.00
1	**4**	908.40	918.40	1	**6**	905.20	915.20
2	**4**	908.60	918.60	2	**6**	905.40	915.40
3	**4**	908.80	918.80	3	**6**	905.60	915.60
4	**4**	909.00	919.00	4	**6**	905.80	915.80
5	**4**	909.20	919.20	5	**6**	906.00	916.00
6	**4**	909.40	919.40	6	**6**	906.20	916.20
7	**4**	909.60	919.60	7	**6**	906.40	916.40
0	**5**	909.80	919.80	0	**7**	906.60	916.60
1	**5**	910.00	920.00	1	**7**	906.80	916.80
2	**5**	910.20	920.20	2	**7**	907.00	917.00
3	**5**	910.40	920.40	3	**7**	907.20	917.20
4	**5**	910.60	920.60	4	**7**	907.40	917.40
5	**5**	910.80	920.80	5	**7**	907.60	917.60
6	**5**	911.00	921.00	6	**7**	907.80	917.80
7	**5**	911.20	921.20	7	**7**	908.00	918.00

12.3. Radio Network Group Selection: 8, 9, 10, 11

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 8, 9, 10, or 11.

Radio Network selection	Radio Network Group selection: 8 or 9	Low Frequency	High Frequency		Radio Network selection	Radio Network Group selection: 10 or 11	Low Frequency	High Frequency
0	**8**	908.20	918.20		0	**10**	905.00	915.00
1	**8**	908.40	918.40		1	**10**	905.20	915.20
2	**8**	908.60	918.60		2	**10**	905.40	915.40
3	**8**	908.80	918.80		3	**10**	905.60	915.60
4	**8**	909.00	919.00		4	**10**	905.80	915.80
5	**8**	909.20	919.20		5	**10**	906.00	916.00
6	**8**	909.40	919.40		6	**10**	906.20	916.20
7	**8**	909.60	919.60		7	**10**	906.40	916.40
0	**9**	909.80	919.80		0	**11**	906.60	916.60
1	**9**	910.00	920.00		1	**11**	906.80	916.80
2	**9**	910.20	920.20		2	**11**	907.00	917.00
3	**9**	910.40	920.40		3	**11**	907.20	917.20
4	**9**	910.60	920.60		4	**11**	907.40	917.40
5	**9**	910.80	920.80		5	**11**	907.60	917.60
6	**9**	911.00	921.00		6	**11**	907.80	917.80
7	**9**	911.20	921.20		7	**11**	908.00	918.00

12.4. Radio Network Group Selection: 12, 13, 14, 15

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 12, 13, 14, or 15.

Radio Network selection	Radio Network Group selection: 12 or 13	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 14 or 15	Low Frequency	High Frequency
0	**12**	908.20	918.20	0	**14**	905.00	915.00
1	**12**	908.40	918.40	1	**14**	905.20	915.20
2	**12**	908.60	918.60	2	**14**	905.40	915.40
3	**12**	908.80	918.80	3	**14**	905.60	915.60
4	**12**	909.00	919.00	4	**14**	905.80	915.80
5	**12**	909.20	919.20	5	**14**	906.00	916.00
6	**12**	909.40	919.40	6	**14**	906.20	916.20
7	**12**	909.60	919.60	7	**14**	906.40	916.40
0	**13**	909.80	919.80	0	**15**	906.60	916.60
1	**13**	910.00	920.00	1	**15**	906.80	916.80
2	**13**	910.20	920.20	2	**15**	907.00	917.00
3	**13**	910.40	920.40	3	**15**	907.20	917.20
4	**13**	910.60	920.60	4	**15**	907.40	917.40
5	**13**	910.80	920.80	5	**15**	907.60	917.60
6	**13**	911.00	921.00	6	**15**	907.80	917.80
7	**13**	911.20	921.20	7	**15**	908.00	918.00

12.5. Radio Network Group Selection: 16, 17, 18, or 19

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 16, 17, 18, or 19.

Radio Network selection	Radio Network Group selection: 16 or 17	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 18 or 19	Low Frequency	High Frequency
0	**16**	908.20	918.20	0	**18**	905.00	915.00
1	**16**	908.40	918.40	1	**18**	905.20	915.20
2	**16**	908.60	918.60	2	**18**	905.40	915.40
3	**16**	908.80	918.80	3	**18**	905.60	915.60
4	**16**	909.00	919.00	4	**18**	905.80	915.80
5	**16**	909.20	919.20	5	**18**	906.00	916.00
6	**16**	909.40	919.40	6	**18**	906.20	916.20
7	**16**	909.60	919.60	7	**18**	906.40	916.40
0	**17**	909.80	919.80	0	**19**	906.60	916.60
1	**17**	910.00	920.00	1	**19**	906.80	916.80
2	**17**	910.20	920.20	2	**19**	907.00	917.00
3	**17**	910.40	920.40	3	**19**	907.20	917.20
4	**17**	910.60	920.60	4	**19**	907.40	917.40
5	**17**	910.80	920.80	5	**19**	907.60	917.60
6	**17**	911.00	921.00	6	**19**	907.80	917.80
7	**17**	911.20	921.20	7	**19**	908.00	918.00

12.6. Radio Network Group Selection: 20, 21, 22, 23

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 20, 21, 22, or 23.

Radio Network selection	Radio Network Group selection: 20 or 21	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 22 or 23	Low Frequency	High Frequency
0	**20**	908.20	918.20	0	**22**	905.00	915.00
1	**20**	908.40	918.40	1	**22**	905.20	915.20
2	**20**	908.60	918.60	2	**22**	905.40	915.40
3	**20**	908.80	918.80	3	**22**	905.60	915.60
4	**20**	909.00	919.00	4	**22**	905.80	915.80
5	**20**	909.20	919.20	5	**22**	906.00	916.00
6	**20**	909.40	919.40	6	**22**	906.20	916.20
7	**20**	909.60	919.60	7	**22**	906.40	916.40
0	**21**	909.80	919.80	0	**23**	906.60	916.60
1	**21**	910.00	920.00	1	**23**	906.80	916.80
2	**21**	910.20	920.20	2	**23**	907.00	917.00
3	**21**	910.40	920.40	3	**23**	907.20	917.20
4	**21**	910.60	920.60	4	**23**	907.40	917.40
5	**21**	910.80	920.80	5	**23**	907.60	917.60
6	**21**	911.00	921.00	6	**23**	907.80	917.80
7	**21**	911.20	921.20	7	**23**	908.00	918.00

12.7. Radio Network Group Selection: 24, 25, 26, 27

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 24, 25, 26, or 27.

Radio Network selection	Radio Network Group selection: 24 or 25	Low Frequency	High Frequency	Radio Network selection	Radio Network Group selection: 26 or 27	Low Frequency	High Frequency
0	**24**	908.20	918.20	0	**26**	905.00	915.00
1	**24**	908.40	918.40	1	**26**	905.20	915.20
2	**24**	908.60	918.60	2	**26**	905.40	915.40
3	**24**	908.80	918.80	3	**26**	905.60	915.60
4	**24**	909.00	919.00	4	**26**	905.80	915.80
5	**24**	909.20	919.20	5	**26**	906.00	916.00
6	**24**	909.40	919.40	6	**26**	906.20	916.20
7	**24**	909.60	919.60	7	**26**	906.40	916.40
0	**25**	909.80	919.80	0	**27**	906.60	916.60
1	**25**	910.00	920.00	1	**27**	906.80	916.80
2	**25**	910.20	920.20	2	**27**	907.00	917.00
3	**25**	910.40	920.40	3	**27**	907.20	917.20
4	**25**	910.60	920.60	4	**27**	907.40	917.40
5	**25**	910.80	920.80	5	**27**	907.60	917.60
6	**25**	911.00	921.00	6	**27**	907.80	917.80
7	**25**	911.20	921.20	7	**27**	908.00	918.00

12.8. Radio Network Group Selection: 28 or 29

In the Device Configuration window (on page 52), these are the **High** and **Low Frequencies** when the **Radio Network Group** list box selection is 28 or 29.

Radio Network selection	Radio Network Group selection: 28 or 29	Low Frequency	High Frequency
0	**28**	908.20	918.20
1	**28**	908.40	918.40
2	**28**	908.60	918.60
3	**28**	908.80	918.80
4	**28**	909.00	919.00
5	**28**	909.20	919.20
6	**28**	909.40	919.40
7	**28**	909.60	919.60
0	**29**	909.80	919.80
1	**29**	910.00	920.00
2	**29**	910.20	920.20
3	**29**	910.40	920.40
4	**29**	910.60	920.60
5	**29**	910.80	920.80
6	**29**	911.00	921.00
7	**29**	911.20	921.20

Appendix A: Technical Specifications

WC25i Wireless I/O Module Technical Specification	
Specification	**Description**
Transmitter	
Frequency	902-928 MHz, FHSS, license-free ISM band compliant with FCC Part 15SMA connector
Networks	Up to 65,520 separate networks
Range	Up to 3 miles line of sight (depending on antenna)
Relay Outputs	30 VDC, 60W
Over the Air Rate	10kbps
Receiver	
Digital Inputs	• Dry contact or 30 volts max (push-pull) • 2kHz maximum frequency
Analog Inputs	0-24 mA, 0-10 V
Power Requirements	
Power	+10 to +30VDC • 25mA average @12V no relays energized • Additional 15mA maximum for each energized relay plus any analog output current
Radio Power	300mW

WC25i Wireless I/O Module Technical Specification	
Specification	**Description**
General Information	
Operating Temperature	-40°C to +65°C -104°F to +149°F
Weight	453 g 1 lb
Safety Rating	• Class I Division 2 Certified Groups C&D, Temperature Code T5. • Certified to CSA C22.2 No. 213 • Conforms to ISA 12.12.01

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 76).
- 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 WC25i Wireless I/O Module uses a Green blinking Status LED to indicate the WC25i is running.

- The Status LED indicates the signal strength between the WC25i and its module pair.
- When the Endpoint is connected to its paired module, it will blink a link quality code every 3 seconds.
- The TX / RX LEDs indicate radio messages to / from the module.

Status LEDs	Description
Green blinking	Indicates the WC25i is running. • 3 Blinks = Strong Signal • 2 Blinks = Good Signal • 1 Blink = Weak Signal
Intermittent blink Green	Blinks 1 time per second if it is NOT connected to another module.
Relay LED	
Solid green	Each Relay has an active green LED when the relay is energized.

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-SFTS-300LNA.

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.

IC Notifications

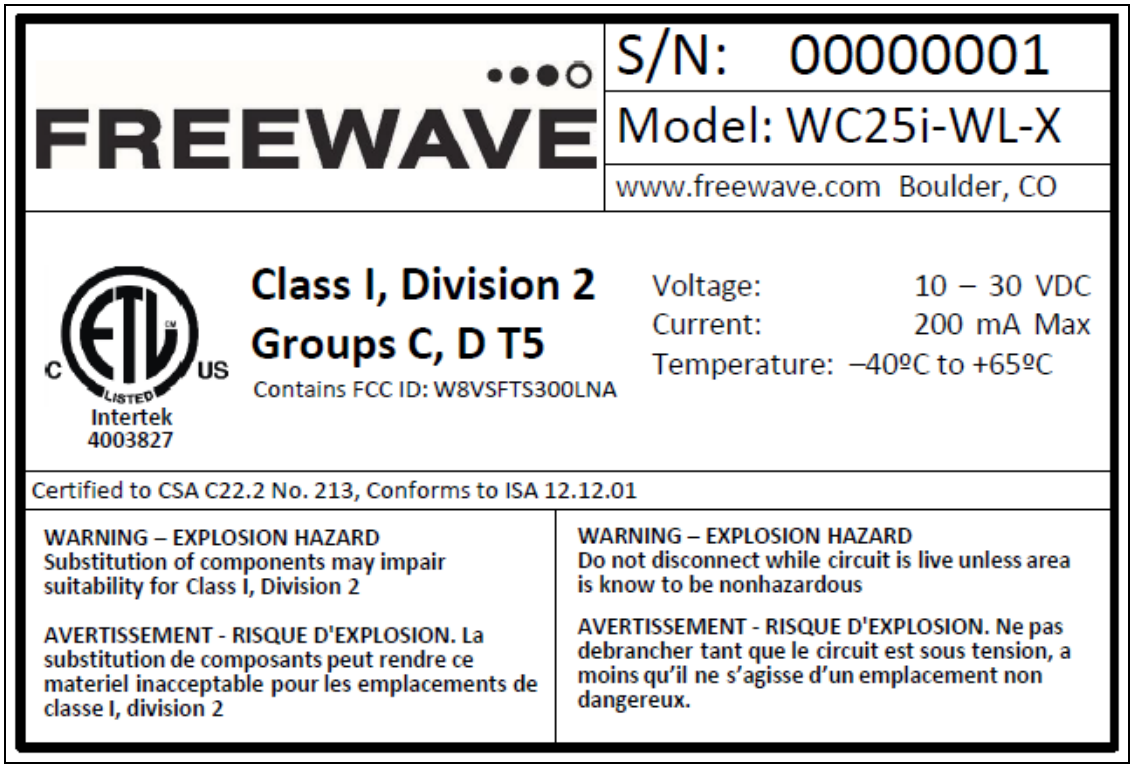
Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a maximum (or lesser) gain approved for this transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically 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.

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



WC25i-WirelessIO-ETL C1D2-FCC-Label

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WC25i Wireless I/O Module Hazardous Location Certification

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.

FREEWAVE