FREEWAVE

WC20i-485 or WC20i-485-S Modular Endpoint Quick Start Guide

Thank you for purchasing the WC20i-485 or WC20i-485-S Modular Endpoint.

This **Quick Start Guide** provides brief procedures for the hardware installation and configuration of the WC20i-485 or WC20i-485-S.

Important!: It is assumed that the reader and installer have completed the FreeWave WC20i installation and setup training to follow the procedures in this document.

Note: For more detailed installation, connection, and configuration procedures, download the WC20i-485 or WC20i-485-S **User Manual** from the http://support.freewave.com/ website. Registration is required to use this website.

The basic steps are:

Included Equipment

Battery Powered WC20i

Battery Powered		
FreeWave Part #	**Qty**	**Description**
WC20i-485	1	WC20i-485 Modular Endpoint
QSG0040AA	1	Quick Start Guide

Solar Powered WC20i

The WC20i can be purchased as:

- Bundled with the solar panel.
- Solar Ready without the solar panel.

Important!: Solar Ready WC20i Endpoints DO NOT come with internal batteries.

Solar Powered		
FreeWave Part #	**Qty**	**Description**
WC20i-485-Solar	1 1	WC20i-485-S - Solar Ready WC20i-Solar - WC20i Solar Panel kit with bracket, charger, and High Capacity battery pack
WC20i-485-S	1	WC20i-485-S - Solar Ready **Note**: This is only the Solar Ready WC20i Endpoint. It does NOT include the Solar Panel kit or internal batteries.
QSG0040AA	1	Quick Start Guide

User-supplied Equipment

- Philips screwdriver
- 4-pin to USB programming cable (FreeWave Part #: WC-USB-4PIN).
- Computer for WAVECONTACT device configuration.

Power Connection

Important!: Verify the items listed in **Included** and **User-supplied Equipment** section are available before starting this procedure.

Power is supplied using either a:

Battery Connection

1. All wiring should be neat and orderly.
2. Using the Philips screwdriver, remove the four screws holding down the WC20i cover and remove the cover.

   Tip: Use the WC20i cover to hold the four screws while configuring the WC20i or when connecting or replacing the battery.
3. Verify the battery power wire is routed through the power cable hold-down clamp.

   Warning! The battery or solar power cable **MUST only be routed** through the power cable hold-down clamp and, as applicable, the solar power cable gland.

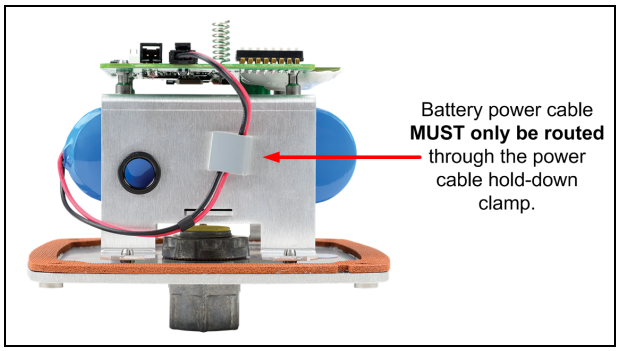

Figure 1: Battery Power Cable through the Power Cable Hold-down Clamp

4. Connect the battery power cable to the **Internal Lithium Battery** connection.
5. Connect the 4-pin to USB programming cable to the **RS232 Config / Debug** connector.
6. Connect the USB end of the 4-pin to USB programming cable to the computer.
7. If this is the first time the WC20i is installed, wait for the drivers to install.

   Important!: Depending on the computer and connection, the driver installation can take 3-6 minutes.
8. Continue with Sensor Connection (on page 2).

Solar Panel Connection

1. All wiring should be neat and orderly.
2. Using the Philips screwdriver, remove the four screws holding down the WC20i cover and remove the cover.

   Tip: Use the WC20i cover to hold the four screws while configuring the WC20i or when connecting or replacing the battery.
3. Verify the solar power cable is routed through the power cable hold-down clamp and the power cable gland. (Figure 2)

   Warning! The battery or solar power cable **MUST only be routed** through the power cable hold-down clamp and, as applicable, the solar power cable gland.

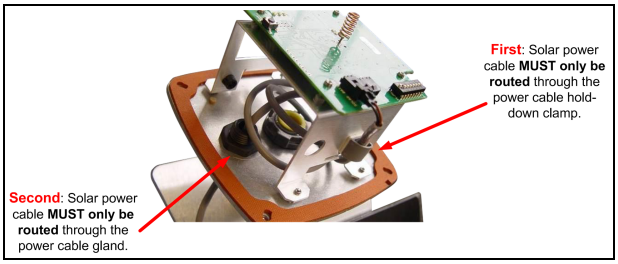

Figure 2: Solar Power Cable through the Power Cable Hold-down Clamp

4. Connect the solar power cable to the **Solar Battery** connection.
5. Connect the 4-pin to USB programming cable to the **RS232 Config / Debug** connector.
6. Connect the USB end of the 4-pin to USB programming cable to the computer.
7. If this is the first time the WC20i is installed, wait for the drivers to install.

   Important!: Depending on the computer and connection, the driver installation can take 3-6 minutes.
8. Continue with Sensor Connection (on page 2).

Sensor Connection

Modbus Sensor Connection

1. Connect the sensor terminals: (Figure 3)
   a. The **positive** Modbus terminal of the sensor is connected to the **Modbus A (+)** terminal on the WC20i Endpoint.
   b. The **negative** Modbus terminal is connected to the **Modbus B (-)** terminal of the WC20i Endpoint.
   c. The **power** Modbus terminal is connected to the **PWR** terminal of the WC20i Endpoint.
   d. The **ground** Modbus terminal is connected to the **GND** terminal of the WC20i Endpoint.

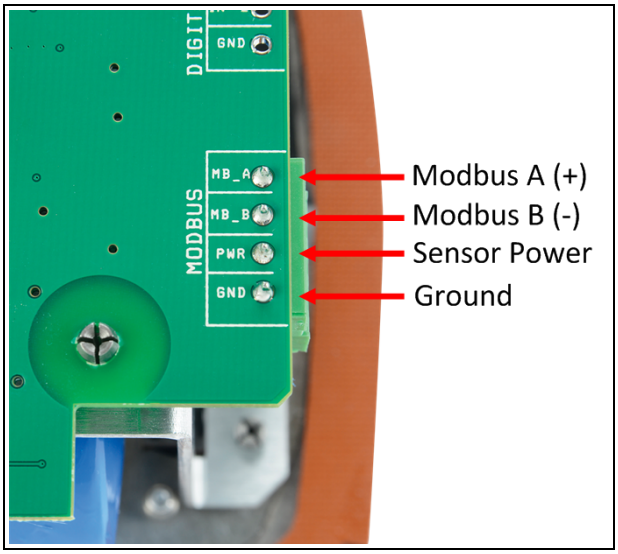

Figure 3: MB_A+ (positive), MB_B- (negative), PWR (power), and GND (ground) Sensor Connection

2. When the connection is made, continue with Sensor Cable Routing on the WC20i (on page 2).

Sensor Cable Routing on the WC20i

Important!: To ensure intrinsic safety is maintained, the installer is required to follow these procedures when connecting sensors to a WAVECONTACT Endpoint. See Figure 4 for the proper cable routing.

1. All wiring should be neat and orderly.
2. Verify the battery power wire is routed through the power cable hold-down clamp.
   See Battery Connection (on page 1).
3. Strip the cable wires to the sensor so that there is minimal exposed un-insulated wire when inserted into the screw terminal.

   Important!: For both the battery powered and solar powered WC20i, sensor wires entering the enclosure **MUST** be routed and connected as shown in Figure 4.

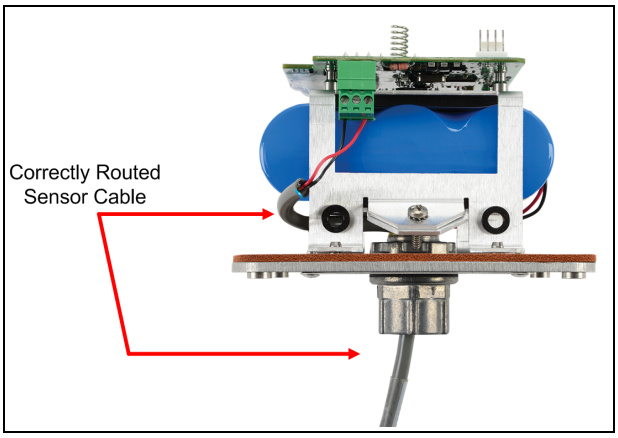

Figure 4: Correctly Routed Sensor Cable

4. Continue with WC Toolkit Installation (on page 2).
5. Continue with either:
   - WC Toolkit Installation (on page 2)
   - Configuration (on page 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.
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.

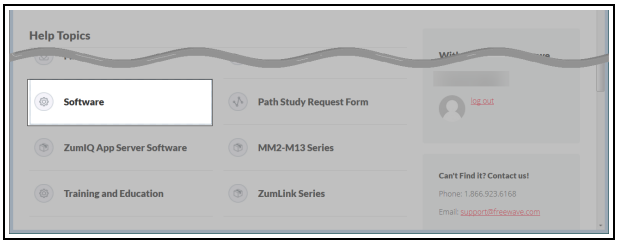

Figure 5: Help Topics window

   The **Software** window opens.
5. Click the **WAVECONTACT Toolkit** link.
   The available software appears in the window.

6. Select and click the attachment.

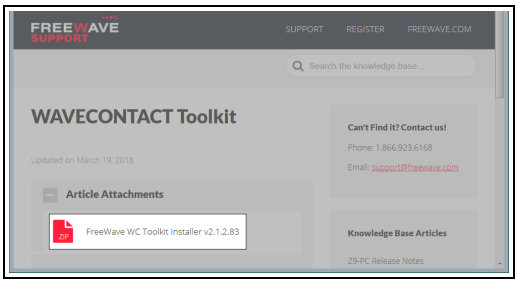

Figure 6: WAVECONTACT Toolkit window

The **Opening** dialog box opens.

> **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.
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.

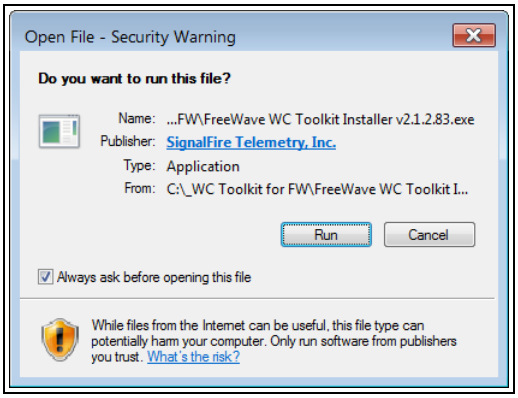

Figure 7: Open File - Security Warning dialog box

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

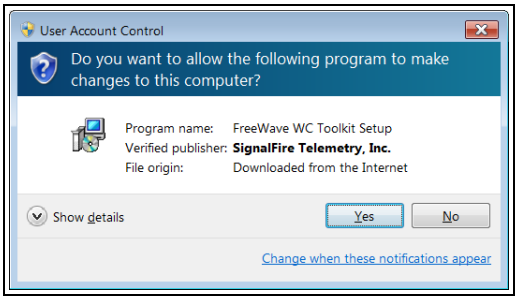

Figure 8: User Account Control dialog box

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

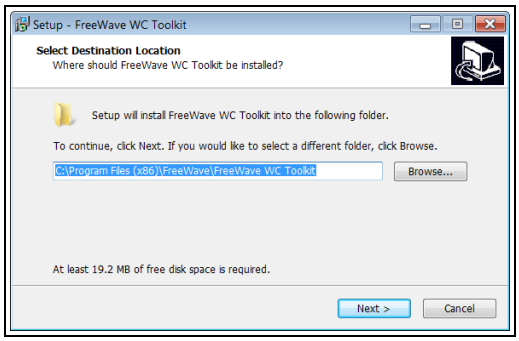

Figure 9: WC Toolkit Setup Wizard - Select Destination Location window

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

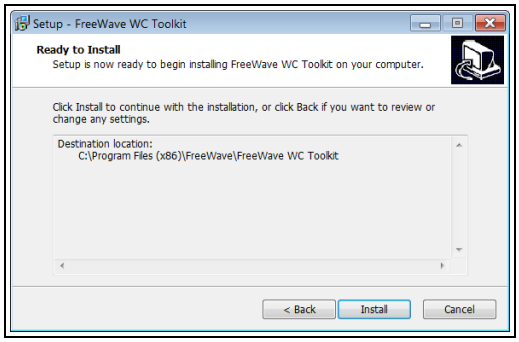

Figure 10: WC Toolkit Setup Wizard - Ready to Install window

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

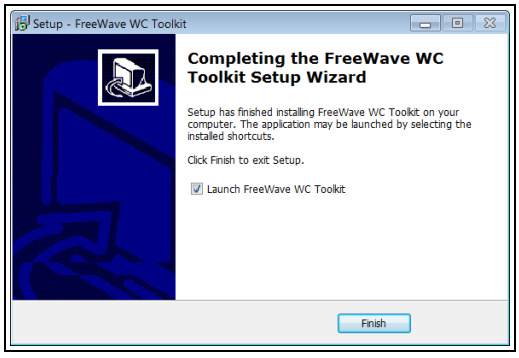

Figure 11: WC Toolkit Setup Wizard - Installation Complete window

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

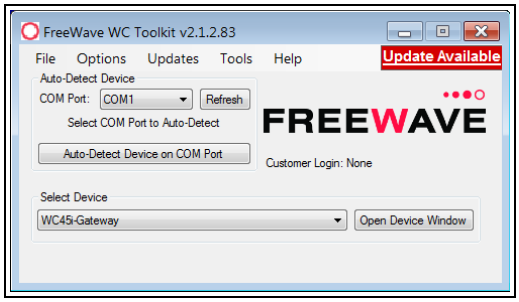

Figure 12: WC Toolkit - Update Available message

18. Continue with the WC Toolkit Update (on page 4) procedure.

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 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 13)

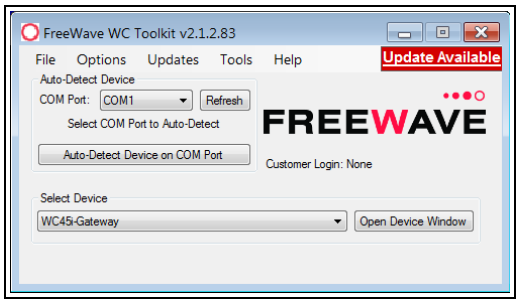

Figure 13: WC Toolkit - Update Available message

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

Figure 14: Click the Update Available message link

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

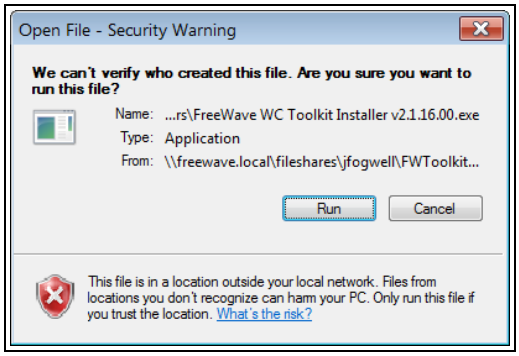

Figure 15: Open File - Security Warning dialog box

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

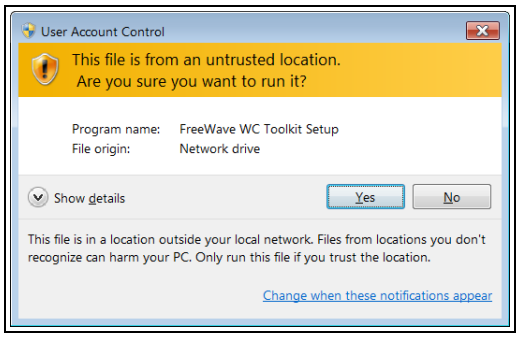

Figure 16: User Account Control dialog box

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 17)

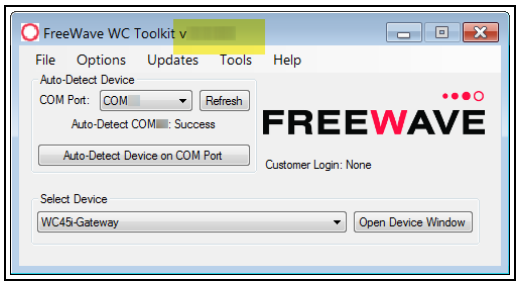

Figure 17: Select Device window

5. Continue with Configuration of the WC20i-485 or WC20i-485-S.

Configuration

Important!: The WC20i-485 or WC20i-485-S Endpoint must be configured with a list of Modbus registers to be read from the attached sensor using the WC Toolkit application prior to installation.

- The pre-configured set of registers is automatically read from the Modbus sensor device and forwarded 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 is available to be read by the RTU at any time.

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.

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

STOP **Warning!** Debug and configuration information is available if the 4-pin to USB programming cable is connected to the **RS232 Config / Debug** connector using the debug port on the main board. The USB converter cable (FreeWave Part #WC-USB-4PIN) must be used for this interface. Debug and configuration is done using the WC Toolkit.

STOP **Warning!** Only connect to the Config / Debug connector port in a safe area! **AVERTISSEMENT**: Branchez le port de déboggage que dans une zone secure.

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 WC20i.

2. Verify the Gateway is installed and configured before continuing with the Endpoint configuration.
3. Connect the WC-USB-4PIN - 4-pin to USB programming cable to the computer and the WC20i.
4. Open the **WC Toolkit** software.
   The **Select Device** window opens.
5. 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.
6. Click the **COM Port** list box arrow and select the COM port on the computer associated with the connected WC20i-485 or WC20i-485-S.
7. 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.

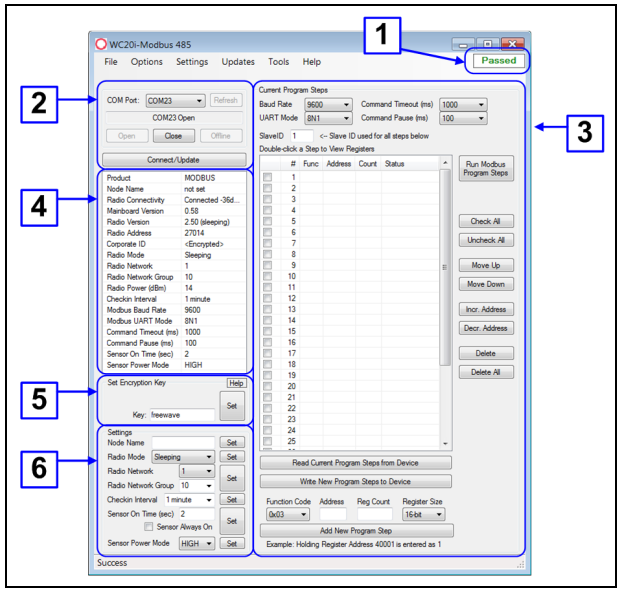

Figure 18: Device Configuration window: WC20i-485 or WC20i-485-S

8. 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 WC20i 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.

9. Optional: Click the **Settings** menu and select **Set Encryption Key Unrecoverable** to permanently hide the key.
10. 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 the existing Gateway network for successful communication between the Gateway and Endpoint.

   a. Optional: In the **Node Name** text box, enter a name for the Endpoint using a maximum of 10 characters.
   b. Click the **Set** button to save the information.
   c. Click the **Radio Mode** list box arrow and select either **Sleeping** or **Non-Sleeping**.

> **Important!**: Use **Non-Sleeping** option ONLY if there is a solar kit attached to the WC20i. See Included Equipment (on page 1) for additional information.

   d. Click the **Radio Network** list box arrow and select 0 (zero) to 7 for the assigned number.
   e. 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 the existing Gateway network for successful communication between the Gateway and Endpoint.

   f. Click the **Set** button to save the information.
   g. Click the **Checkin Interval** list box arrow and select how often the Endpoint wakes up, reads the sensor values Modbus device, and transmits the register data to the Gateway.
   h. Click the **Set** button to save the information.
   i. In the **Sensor On time (sec)** text box, enter the number of seconds power is applied to the Modbus sensor prior to data collection.

> **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.

> **Note**: See the sensor manufacturer's documentation for more information on warm-up time for the specific sensor.

   j. Optional: 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.

> **Caution**: 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.

   k. Click the **Set** button to save the information.
   l. Optional: 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.

   m. Click the **Set** button to save the information.
11. On the WC20i, press the **Check-in** button to apply power to the configured sensor, read the sensor values, and send the collected sensor data to the Gateway.
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.

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

13. Continue with Modbus Program Steps Configuration (on page 6).
14. Close the WC Toolkit software.
15. Remove the WC-USB-4PIN 4-pin to USB programming cable from the computer and the WC20i.
16. As applicable, replace the Endpoint cover.
17. Install the WC20i using the **Direct Mount to Sensor with Short Conduit** procedure in the WC20i-485 or WC20i-485-S Modular Endpoint User Manual (FreeWave Part #: LUM0093AA).

18. If this is a WC20i-485-S installation, follow the tank level manufacturer's installation procedures for the selected solar mounting kit listed in **Available Accessories** in the WC20i-485 or WC20i-485-S Modular Endpoint User Manual (FreeWave Part #: LUM0093AA).

Modbus Program Steps Configuration

Important!: The register set to poll on each check-in must be defined using the **Current Program Steps** area of the **Device Configuration window**.

A program step consists of one of these Modbus operation codes:

- **0x01** for MODBUS_READ_COIL (limit: 1 coil)
- **0x02** MODBUS_READ_INPUT (limit: 1 input)
- **0x03** for MODBUS_READ_HOLDING_REGISTERS
- **0x04** for MODBUS_READ_INPUT_REGISTERS
- **0x05** for MODBUS_WRITE_SINGLE_COIL

Note: A maximum of 34 program steps can be programmed.
Any response from a Modbus device (data or exception) is forwarded to the Modbus Gateway and cached.

1. Open the **Device Configuration** window.
2. In the **Current Program Steps** area (# 3):
   a. Click the **Read Current Program Steps from Device** button to view the current Program Steps in the table.
   b. Optional: Click the **Baud Rate** list box arrow and select the baud rate for the RS485 Modbus port.
   c. Optional: Click the **UART Mode** list box arrow and select the number of data bits, parity, and stop bits used with the RS485 Modbus port.
   d. Optional: Click the **Command Timeout (ms)** list box arrow and select the number of mS the device waits for a response from the attached Modbus device before it times out the request.
   e. Optional: Click the **Command Pause (ms)** list box arrow and select the number of mS the device pauses between each Modbus transaction.
   f. In the **Slave ID** column / text box, enter the remote source Endpoint Modbus Slave ID.

      Important!: Each remote device connected to the Gateway MUST have a unique Modbus Slave ID (1-240). 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.

   g. Optional: Complete any of the procedures described in the WC20i-485 / WC20i-485-S User Manual to create, change, delete, or re-order Program Steps (downloaded from http://support.freewave.com/).
3. Click the **Write New Program Steps to Device** button to save the changes to the WC20i every time the Program Steps are changed.
4. Click the **Run Modbus Program Steps** button to run the Program Steps to poll the Modbus device on each check-in.
5. On the WC20i, press the **Check-in** button to apply power to the configured sensor, read the sensor values, and send the collected sensor data to the Gateway.
6. 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.
7. Close the WC Toolkit software.
8. Remove the WC-USB-4PIN 4-pin to USB programming cable from the computer and the WC20i.
9. As applicable, replace the Endpoint cover.
10. Install the WC20i using the **Direct Mount to Sensor with Short Conduit** procedure in the WC20i-485 or WC20i-485-S Modular Endpoint User Manual (FreeWave Part #: LUM0093AA).
11. If this is a WC20i-485-S installation, follow the tank level manufacturer's installation procedures for the selected solar mounting kit listed in **Available Accessories** in the WC20i-485 or WC20i-485-S Modular Endpoint User Manual (FreeWave Part #: LUM0093AA).

Learn More

For additional product information about the WC20i-485 or WC20i-485-S Modular Endpoint, visit www.freewave.com.

For additional product information or assistance, contact a local reseller, or contact FreeWave Technologies, Inc. at 303-381-9200 or 1-866-923-6168, or by email at moreinfo@freewave.com.

The WC20i-485 or WC20i-485-S complies with FCC Part 15 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 WC20i-485 or WC20i-485-S must be professionally installed and is only approved for use when installed in devices produced by FreeWave or third party OEMs with the express written approval of FreeWave Technologies, Inc. Changes or modifications should not be made to the device.

FreeWave Technologies, Inc.
5395 Pearl Parkway, Suite 100
Boulder CO 80301
www.freewave.com

Local: 303-381-9200
Toll Free: 1-866-923-6168
Fax: 303-786-9948

FREEWAVE

