VERSION 0.5

JANUARY 8, 2021

GTW-BL100 WIRELESS GATEWAY

OPERATING INSTRUCTIONS

REVISIONS

Revision	Author	Date	Changes
0.1	J. Walz	September 29, 2020	Initial Draft
0.2	J. Walz	November 13, 2020	Added FCC Compliance Statement
0.3	J. Walz	November 23, 2020	Updated Safety and Specifications
0.4	J. Walz	December 2, 2020	Modified IC Compliance Statement
0.5	J. Walz	January 8, 2021	Updated Intended Use Section

ABBREVIATIONS

Acronym	Description
BLE	Bluetooth Low Energy
LED	Light Emitting Diode
MQTT	MQ Telemetry Transport
USB	Universal Serial Bus

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FCC COMPLIANCE AND ADVISORY STATEMENT

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not explicitly approved by Electronics4All Inc. could cause the device to cease to comply with FCC rules Part 15, and thus void the user's authority to operate the equipment.

INDUSTRY CANADA COMPLIANCE AND ADVISORY STATEMENT

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.

Son fonctionnement répond aux conditions suivantes: (1) l'appareil ne provoquera aucune interférence nocive et (2) l'appareil tolère toutes les interférences reçues, y compris les interférences qui ont pour conséquence des réactions non souhaitables.

SAFETY INFORMATION

1. Operate the device only with the specified antenna and AC/DC adapter. See the Specifications section for approved accessories.
2. The device is intended for use only in a clean and dry indoor environment.
3. Always wear personal protective equipment appropriate to the environment where the device is installed and operated.
4. In the event of an emergency, disconnect the DC power plug from the device.
5. The device contains no user serviceable parts. Do not attempt to repair the unit. See the Contact Information section for support or repair.

INSTALLATION

PROFESSIONAL INSTALLATION

The GTW-BL100 wireless gateway is designed specifically to operate within an electric power generating facility. Incorrect installation or configuration of the gateway may result in unsatisfactory performance of either the gateway or the wireless sensors paired to the gateway. As such, only authorized personnel should be permitted to install, configure, and access the wireless gateway.

INTENDED USE

The GTW-BL100 is intended to be installed and operated in an indoor industrial environment only. The wireless system is Class A equipment and may cause radio interference in residential areas.

Only authorized, trained personnel are permitted to possess, install, and operate the GTW-BL100. The device should be installed only in locations where the general public has restricted access.

The GTW-BL100 is sold directly to electric utility companies by Electronics4All Inc. and is not made available on the retail market. Resale or otherwise making the device available to the general public is not permitted.

PRODUCT DISPOSAL

The GTW-BL100 is recycled by Electronics4All Inc. See the Contact Information section to recycle the GTW-BL100.

MAINTENANCE AND CLEANING

Clean the enclosure and antenna using a clean dry cloth.

CONTACT INFORMATION

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GTW-BL100 WIRELESS GATEWAY

The GTW-BL100 Wireless Gateway is designed to receive encrypted data packets from compatible Bluetooth enabled industrial sensors and to route the data to a MQTT Broker over Ethernet.

COMPATIBLE SENSORS

Description	Model Number
BMS	BMS-1001-TH
4-20mA Current Loop Receiver	**TBD**
Wireless Thermocouple	**TBD**

INTERFACES

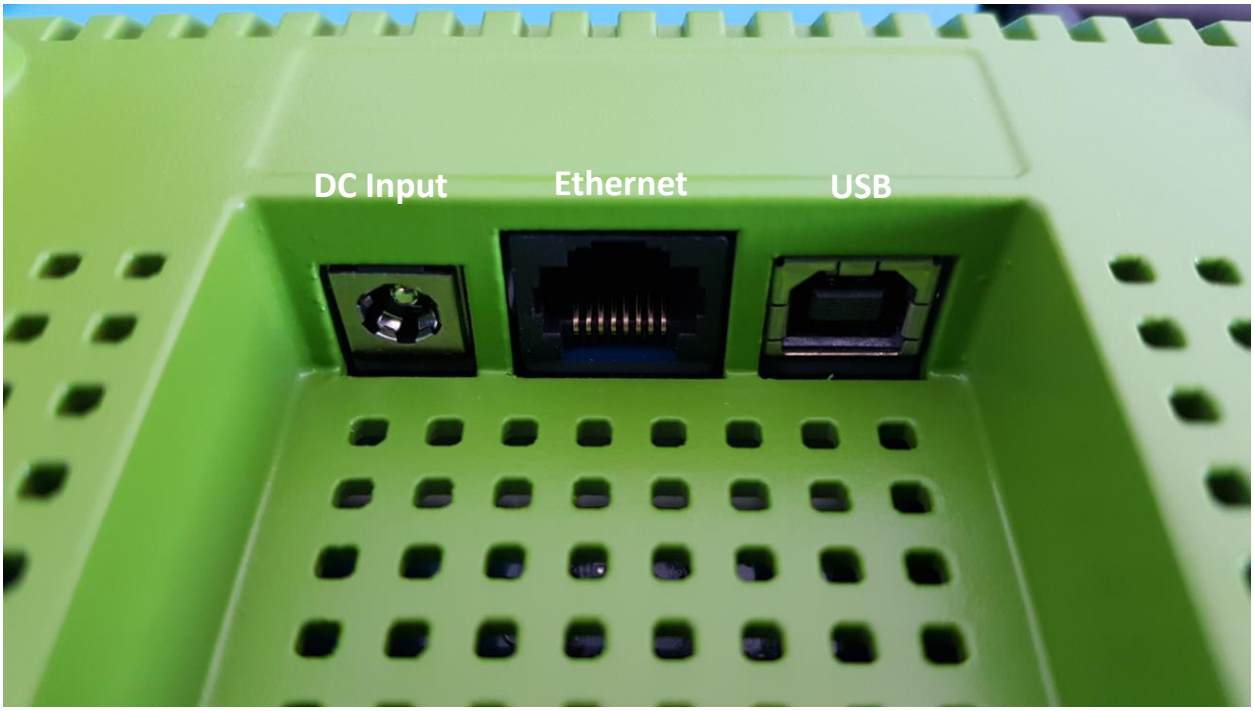
The Gateway contains 3 tactile push buttons and 4 status LEDs on the top of the unit.

Button Label	Function
PWR	Turns Gateway ON or OFF
PB1	Controls BLE pairing, see instructions for use
PB2	Controls BLE pairing, see instructions for use

LED Label	Colour	Function
PWR	Orange	Indicates the power status of the Gateway
COM (LEFT)	Red	Used to indicate status of BLE

		pairing and reception of data
COM (RIGHT)	Green	Used to indicate status of BLE pairing and reception of data
Fault	Red	Blinks every 2 seconds when a fault is detected with either the Ethernet connection or connection to the MQTT Broker. The specific fault will be displayed on the serial terminal. Automatically clears when the fault is removed.

CONNECTIONS



DC INPUT

The DC input accepts a 2.5 mm x 5.5 mm barrel plug. The Gateway is designed to be operated with the provided AC/DC power adapter (CUI Inc. SWI24-12-N-P6). Input voltage range is 7 VDC to 15 VDC.

ETHERNET

The RJ-45 jack connects to a LAN running a MQTT Broker over Ethernet TCP/IP. The Broker IP address is programmed into the Gateway using the USB connection.

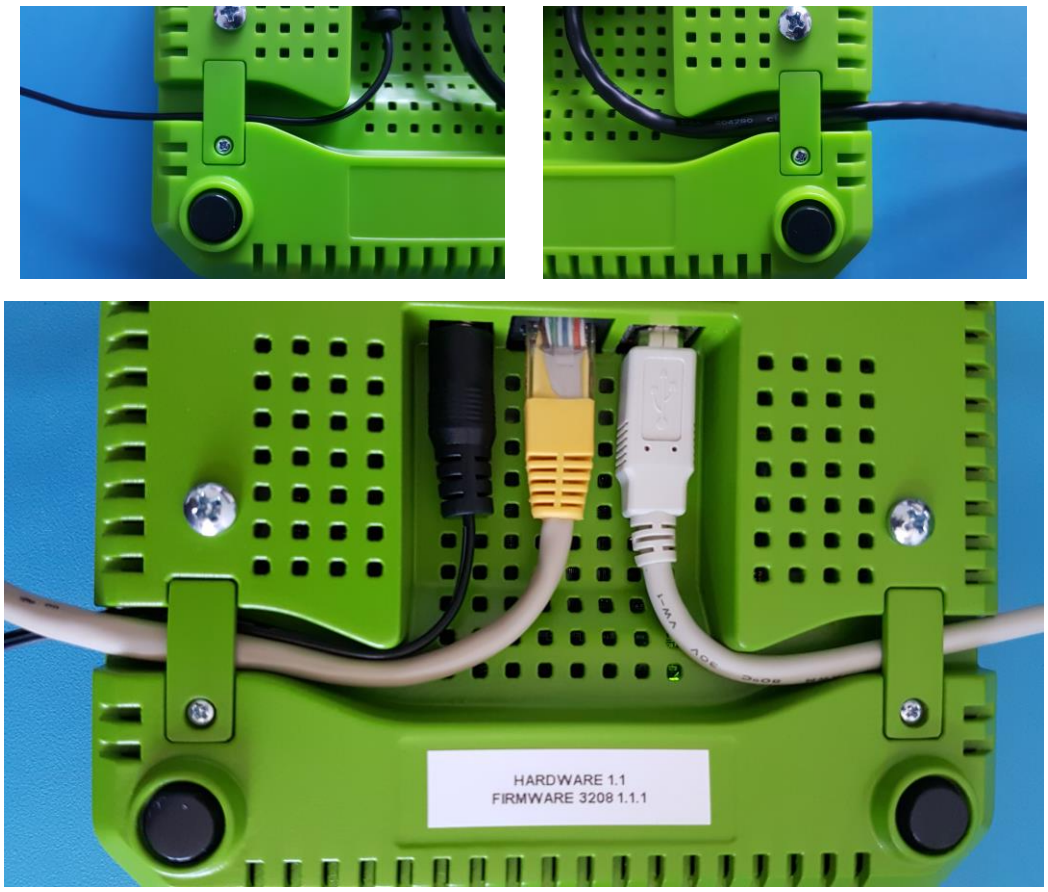
USB

The USB connection is only required to program the Gateway ID and MQTT Broker IP address into the Gateway. The Gateway may be powered from USB, so only this connection is required during

configuration. Note that some diagnostic information is also displayed over the USB connection during runtime.

HARDWARE

CABLE GUIDES



Cable guides are provided on the bottom of the unit to route and secure the DC input, Ethernet, and USB cables.

ANTENNA

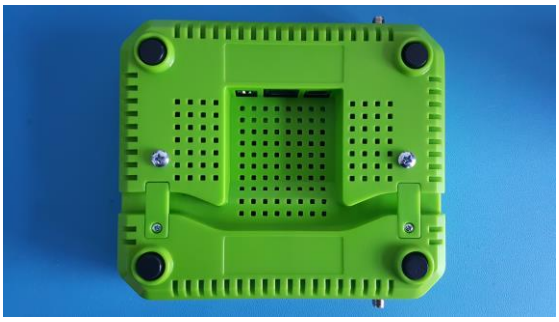
The Gateway has two antenna ports to support different wireless protocols. The GTW-BL100 only supports Bluetooth, so only the 2.4 GHz antenna is required to be connected. The 2.4 GHz antenna connection is located on the right front of the Gateway.

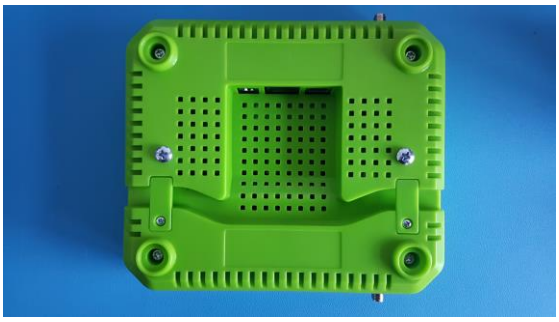
The GTW-BL100 is designed to operate with the following antenna:

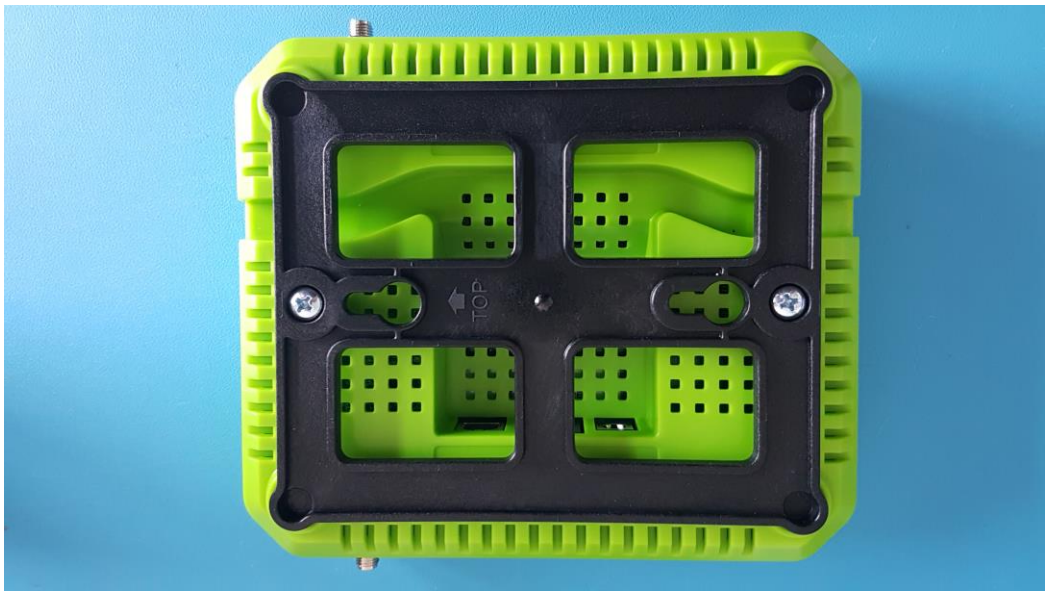
Manufacturer:	PulseLarsen Antennas
Part Number:	W1010
Frequency:	2.4 – 2.5 GHz
Gain:	2.0 dBi
Nominal Impedance:	50 Ω
VSWR:	≤ 2.0
Polarization:	Vertical
Electrical Length:	¼ Dipole
Radiation:	Omni

When adjusting the position of the antenna, it is advisable to always rotate the antenna in a clockwise direction. Rotating the antenna counterclockwise may inadvertently unscrew the antenna connector in the enclosure.

MOUNTING BRACKET







A mounting bracket is supplied that may be used to mount the Gateway to a wall or other support structure. The mounting bracket slots support 10-32 screw heads.

To secure the mounting bracket to the Gateway, remove the four (4) rubber feet and screw the bracket to the enclosure using two (2) 8-32 × ½" screws.

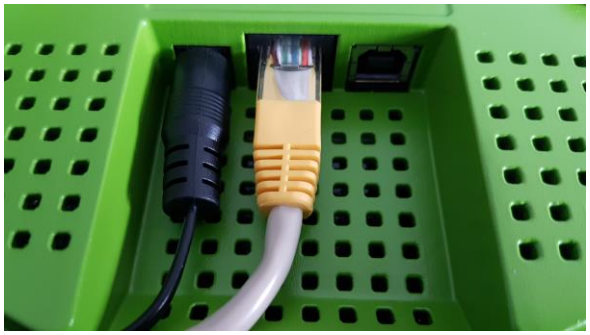
DEPLOYMENT

1. Program the Gateway (Node) ID and MQTT Broker IP address into the Gateway.

2. Connect the 2.4 GHz antenna to the Gateway.

3. Plug the DC input power to the Gateway. The gateway defaults to power ON. The orange PWR LED will turn ON, and the red Fault LED will start to blink at 2 second intervals. You may also see the red COM LED flash at 5 second intervals.

4. Plug in the Ethernet cable. The Gateway will automatically attempt to establish connection to a MQTT Broker at the IP address programmed into the Gateway. Once connection is established, the Fault LED on the front panel membrane will go out. Note that a green LED on the Gateway circuit card may be visible through the bottom of the enclosure.



5. Gateway is now ready to pair with Bluetooth sensors and to handle data traffic.

PAIRING

These instructions for pairing a Bluetooth sensor to the Gateway should be used in conjunction with the instructions included with the Bluetooth sensor.

1. Place the Gateway in Pairing Mode by pressing and releasing the PB1 pushbutton on the Gateway. The green COM LED will turn on.

2. Follow the instructions for the target Bluetooth sensor to place it in Pairing Mode.

3. If pairing was successful, the green COM LED on the Gateway will turn off. The Bluetooth sensor is now paired with the Gateway and data updates from the sensor will now be received by the MQTT Broker according to the update rate of the sensor. Note that if pairing was not successful, the green COM LED will remain on. To exit Pairing Mode without pairing a new Bluetooth sensor, press and release the PB1 pushbutton on the Gateway. The green COM LED will turn off.

4. To un-pair a Bluetooth sensor from the Gateway, follow the instructions for the Bluetooth sensor.

RESET

The Gateway or BMS may be reset at any time by pressing and holding both the PB1 and PB2 buttons for at least 4 seconds. Bluetooth sensors will need to be re-paired after a Gateway reset.

GATEWAY CONFIGURATION

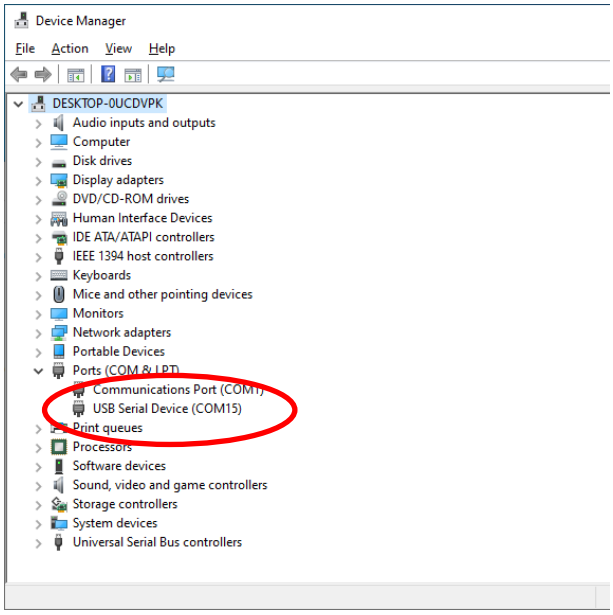
The Gateway ID and MQTT Broker IP are set via a USB interface to a PC. A serial terminal program (e.g. Tera Term, Hercules) is required. Download links are provided below.

Tera Term: https://ttssh2.osdn.jp/index.html.en

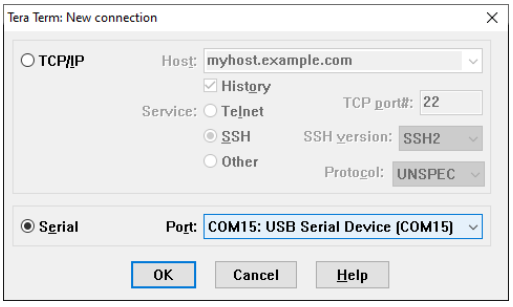
Hercules: https://www.hw-group.com/software/hercules-setup-utility

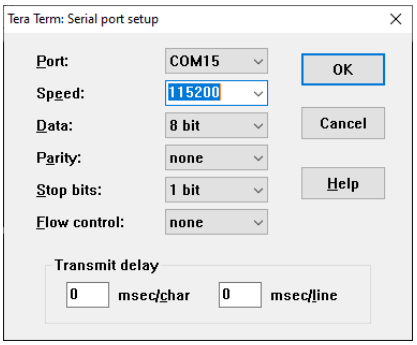
SET-UP

1. Plug in the USB cable to the Gateway. The Ethernet and DC Input connections are not required. Connect the USB cable to the PC. The USB connection will automatically enumerate as a Virtual (Serial) COM Port. No additional drivers should be required. The Gateway should be visible as a "USB Serial Device" in the PC's Device Manager (Windows 10). Note the COM port number assigned by the OS.

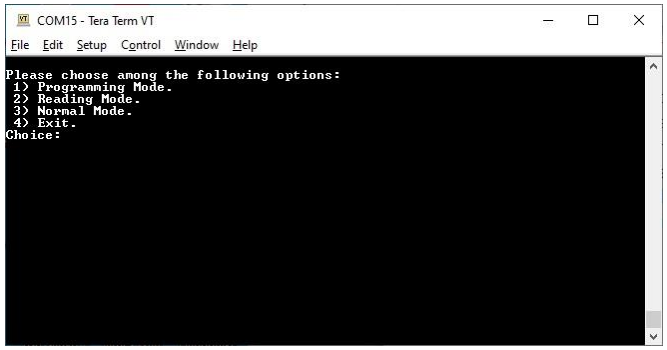


2. Open the serial terminal program. The following images are for Tera Term. Select "Serial", and select the COM Port number for the Gateway. Under "Setup", set the serial port speed to 115200. The default values for data width, parity, stop bits, and flow control should remain as shown.





3. Enter 'z' (Lowercase Z) in the terminal window. The Configuration Menu will be displayed.



4. Select option '1' for Programming Mode. Options will be displayed for programming the Gateway (Node) ID and the Broker IP address.

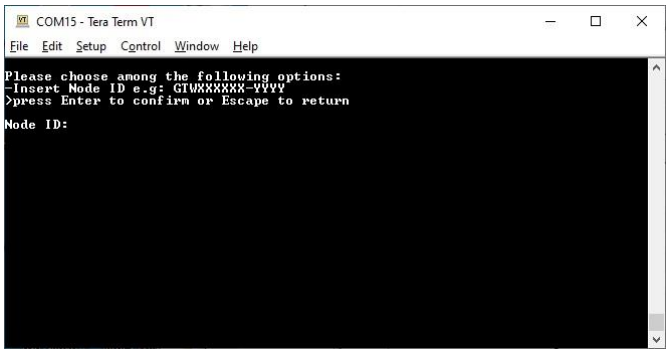
PROGRAMMING GATEWAY ID

Select option '1' from the Programming Mode menu to program the Gateway ID. The Gateway ID must follow the following format:

GTWXXXXXX-YYYY

Where X and Y are numbers. Press [ENTER] to save the new Gateway ID, or [ESC] to exit without saving.

The Gateway will save the new Node ID in non-volatile memory. In order to apply any changes, the Gateway must be reset.



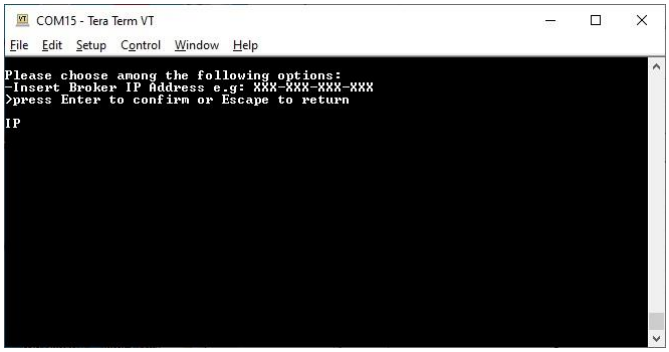
PROGRAMMING BROKER IP ADDRESS

Select option '2' from the Programming Mode menu to program the Broker IP Address. The IP address must be entered in the following format:

XXX.XXX.XXX.XXX

Only the IPv4 address format is accepted. Press [ENTER] to save the new Broker IP address, or [ESC] to exit without saving.

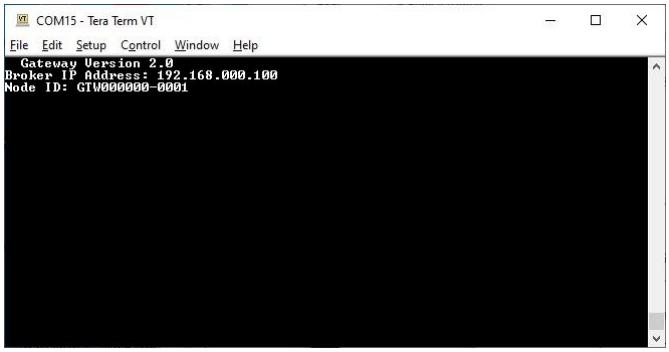
The Gateway will save the new Broker IP address in non-volatile memory. In order to apply any changes, the Gateway must be reset.



READING GATEWAY ID AND BROKER IP ADDRESS

To view the current Gateway ID and Broker IP address, select option '2' (Reading Mode) from the Configuration Menu. The Gateway ID and Broker IP address will be displayed.

The terminal window will automatically return to the Configuration Menu after 10 seconds.

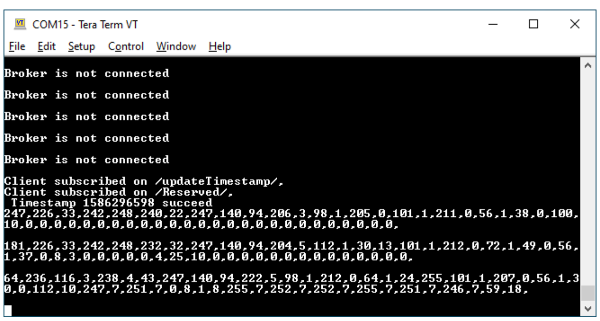


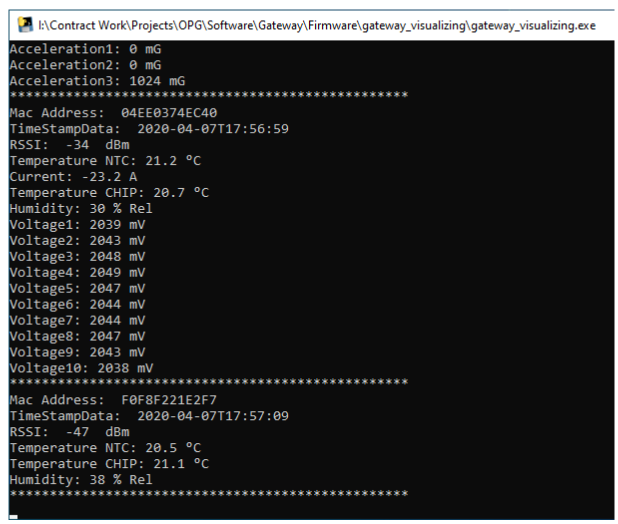
MESSAGE SIMULATION

The Gateway contains a mode where it will continuously send simulated messages to the Broker. These messages can be used to test network operation. The messages are simulated wireless sensor data from a Battery Management System (BMS) and an Asset Tracker (AT).

MESSAGE SIMULATION MODE SET-UP

1. Read the entire procedure before starting.
2. Configure the Gateway and associated applications as instructed in the previous section (Set-Up Instructions).
3. Press and hold the PB1 and PB2 buttons on the Gateway for 5 seconds. The PWR LED should go out.
4. Only release the PB1 button (PB2 is still held down). The PWR LED and Fault LEDs should turn ON, and the red COM LED should start to flash at a fast rate.
5. Release the PB2 button. The red COM LED should stop flashing and go solid red. The Fault LED on the Gateway should turn off.
6. Data should start to appear on both the serial terminal (if connected), and the VA window. The serial terminal displays the raw data, and the VA displays the formatted data.





7. The Gateway will continue to post messages indefinitely. In order to disable message simulation, press and hold the PB1 and PB2 buttons for 5 seconds. The PWR LED should go out. Then release both buttons simultaneously.

SPECIFICATIONS

Parameter	Description
Power	
Overvoltage Category	1
Supply Voltage	7.00 DC to 15.00 VDC (2.5 × 5.5 mm Barrel Jack)
Supply Current	65 mA @ 12.00 VDC, 25 °C Ambient
Protection	Over-Voltage and Over-Current Protection
Environmental	
Protection Rating	IP30
Pollution Degree	2
Operating Temperature	-40 °C to 75 °C
Storage Temperature	-40 °C to 85 °C
Permissible Humidity	20 % to 85 % (Operation and Storage)
Maximum Altitude	2000 m
Radio	
Wireless Processor	• 48 MHz Arm Cortex M4F Processor • 2.4-GHz RF Transceiver Compatible with BLE 5.0 • Output Power up to +5 dBm with Temperature Compensation • Receiver Sensitivity: -105 dBm, 125 kbps
Security	• AES 128- and 256-bit Crypto Accelerator • ECC and RSA Public Key Hardware Accelerator • SHA2 Accelerator (Full Suite Up to SHA-512) • True Random Number Generator (TRNG)
Communication Range	300 m Line of Sight (Depending on Bluetooth Sensor)
Interface and I/O	
Communication Ports	• MQTT over TCP/IP Ethernet RJ45 • USB 2.0 Debugging Interface
MQTT Broker IP Address	User Programmable
Indicators	Top Fascia Membrane (Red, Green, and Orange LEDs)

User Interface	Top Fascia Membrane (3 Push Buttons)
Mechanical	
Dimensions (Enclosure)	152 mm (L) x 129 mm (W) x 40 mm (H)
Weight	250 g
Certifications	
FCC	2AXVKGTW01
Industry Canada	26661-GTW01
Safety	61010-1
Accessories	
Antenna	PulseLarsen Antennas W1010
AC/DC Adapter	CUI Inc. SWI24-12-N-P6
Rubber Feet	3M SJ-5012