Title: **Gateway User Manual**
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Date: **1/31/17**

NOTICE:
This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)].
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.*

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio
exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
> *(1) l'appareil ne doit pas produire de brouillage, et*
> *(2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the 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.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie 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 risques de brouillage radioélectrique à l'intention des autres utilisateurs, 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'établissement d'une communication satisfaisante.

Licence exempt

This device complies with Industry Canada licence-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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio
exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure

This equipment complies with FCC and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with the minimum distance 20cm between the radiator & human body.

This radio transmitter IC: 6872A-0421GWBH has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Skywave LTE Fle Antena 15-8324-B
704~960 MHz / 1710~2155MHz
VSWR ≤ 3.0
2.1 dBi Gain (nominal)

Gateway User Manual

The Gateway is battery powered transmitter that will be positioned outdoors to relay logs from meters in the field back to the cloud, so that the logs can be viewed and analyzed. This manual describes the basic start up for the Gateway in Debug mode to make sure everything is working correctly.

Initial startup and boot sequence:

First, plug the unit into the battery back, as shown in figure 1. The LCD should remain off, as shown in Figure 2.


Figure 1

Figure 2

Next press the "Select" button. The LCD should say "Read SD" and then enter the Boot Menu, as shown in Figure 3. If it becomes necessary to clear a Gateway's memory, or if the Gateway has been relocated, "Reset" should be pressed, and the instructions followed until this step (the Gateway's LCD displays the Boot Menu prompt). Further steps are unnecessary if unneeded. If first installing the Gateway and a test of the location's viability are desired, next press either the "Enter" or "Select" button to view the menu options. To cycle through the menu options, press "Select" and to choose a menu option, press "Enter." Press "Enter" to select the "Boot Gateway" option when the arrow points to that option, as shown in Figure 4.

Figure 3
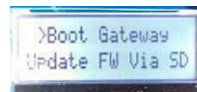
Figure 4

The Gateway will now boot, acquiring both the local time from the cellular network and the GPS location. The Gateway will display the current operation in progress on the LCD screen, as shown in Figures 5 and 6.
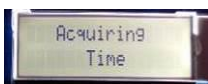
Figure 5

Figure 6

Once the boot process is complete, the Gateway will enter the Debug Menu, displayed in Figure 7 below. In order to cycle through the menu options, press the "Select" button. After the usage instructions, the first selectable menu option is "Listen Now." This option initiates a two minute scan cycle where the Gateway listens for any meters it can hear and stores the data. Figure 8 displays the "Listen Now" menu option. Pressing "Enter" will select the menu option. Selecting "Listen Now" will cause the Gateway to immediately listen for any meters it can hear in the vicinity for two minutes (default) and display the number of meters found on the LCD (Figure 9). Upon completion, the LCD will display "Complete" followed by the number of meters found in the scan and then the overall number of meters stored in the Gateway's memory.

Figure 7   Figure 8   Figure 9

The second option that should be selected when installing a Gateway is the "Send EP Data" option, shown below in Figure 10. This sends the information gathered from the scan cycle to the cloud. Using this data, the user can view the meters read by the Gateway on a map in Waterscope to ensure that the current Gateway location is optimal.

Figure 10

Debug Menu Options:

In order to verify the Gateway is programmed correctly, select the "Show GW Config" option from the menu, pictured below in Figure 11.
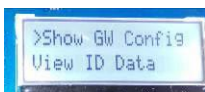
Figure 11

The "Show GW Config" option displays a list of relevant configuration settings for the Gateway. Pressing either the "Enter" or "Select" buttons while these values are being

displayed will return to the menu. The configuration settings displayed by this option include:

- The currently programmed Gateway ID (it should match the ID on the barcode of the device – Figure 12) along with the current customer ID, which should be the account ID associated with the Gateway
- The programmed broadcast hour (Figure 13), displayed in 24 hour format
- The programmed minute past the hour which the device listens for meters (Figure 14)
- The current operating mode (Figure 15)
- The listen (Figure 16) and transmit frequencies (Figure 17)
- The current URL to which the data is to be transmitted (Figures 18 and 19)
- The RSSI value in dB of the last transmission the gateway made to the cellular tower (Figure 20)
- The number of seconds which the Gateway will listen for meters each hour (Figure 21)
- The current Firmware Version (Figure 22)
- The total number of meters currently stored in the Gateway (Figure 23)
- The current time according to the Gateway (this should match the local time, as it is pulled from the network – Figure 24)
- The current date (Figure 25)
- The Gateway's current Latitude (Figure 26) and Longitude (Figure 27) coordinates. A value of 0 indicates that the Gateway was unable to get a GPS fix on its location.
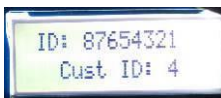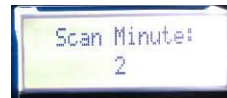
ID: 87654321 Cust ID: 4	Broadcast Hour: 1	Scan Minute: 2	Op Mode: Dynamic
Figure 12	Figure 13	Figure 14	Figure 15
Listen Freq: 918 MHz	Transmit Freq: 920 MHz	URL: t2vngatewaymeter	t2vngatewaymeter servicessciexp.c
Figure 16	Figure 17	Figure 18	Figure 19
Last Trans RSSI: 85	Listen Duration: 120 Seconds	FW version: 1.5	Total Meters: 38
Figure 20	Figure 21	Figure 22	Figure 23
Gateway Time: 14:27:46	Date: 7/1/2016	Latitude: 0	Longitude: 0
Figure 24	Figure 25	Figure 26	Figure 27
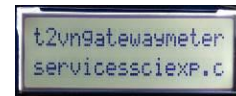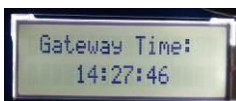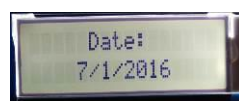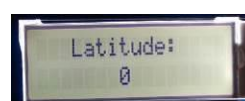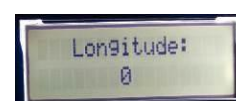
The "View ID Data" option in the debug menu (Figure 28) cycles through all of the IDs and the RSSI (received signal strength) values (Figure 29) of each meter to the Gateway in dB. The RSSI values can fall anywhere from 0 to -128 dB. As with the "Show GW Config" option, pressing either the "Enter" or "Select" buttons will exit the display.

Figure 28

Figure 29

The "Toggle LEDs" option (Figure 30) will toggle the red and green (send/receive) LEDs on the gateway on or off. Upon selecting this option, the user receives a message indicating the new LED state (Figure 31). Turning the LEDs off will marginally improve battery life.

Figure 30

Figure 31

The "Bootload via SD" option (Figure 32) allows the user to update the Gateway's Firmware from a file stored on the SD card. Gateways do not come from the factory with firmware files on the SD card. The bootload process is discussed in depth in the "Bootload" section of this document.
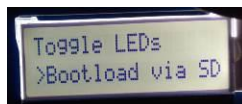

Figure 32

The "View/Set Mode" option (Figure 33) allows the user to change the Gateway's mode of operation from the debug menu instead of reprogramming the SD card. Selecting this option first displays the current Gateway mode (Figure 34), followed by a menu (Figure 35) which allows the user to either go back to the main debug menu or to select a new mode for the Gateway. Selecting "Set Mode" displays a menu of the modes of operation that are available for the Gateway to switch to(Figure 36). The Gateway has 3 modes of operation:

- Dynamic – also called "On-the-fly." In this mode, the Gateway listens for any meter it can and stores the data. If the meter was already in the Gateway's database, the Gateway will simply update the read for that meter, and if the meter is new to the database, the Gateway will add the new meter to the database. The Gateway will add meters until it reaches its memory limit of 500 meters.
- Gateway – also called "Standard" mode. In this mode, the Gateway is programmed with a specific list of meter IDs to listen for using the SD card. The Gateway will only listen for meter IDs on that list and disregard other IDs. If the

Gateway hears from all meters on the ID list during a listen period prior to the listen timeout occurring, it will stop listening to conserve battery power.

- Repeater – In this mode, the Gateway turns on at a specified time, listens for meters, and re-transmits any valid meter packets it hears. The Gateway will listen on the Listen frequency and transmit on the Transmit frequency, both of which are programmed using the configuration file on the SD card.

Figure 33

Figure 34

Figure 35
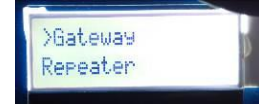
Figure 36

Updating Device Firmware:

Periodically, firmware updates will be released for the Gateway to add functionality or fix bugs on the device. These files will be sent out to administrative personnel who will then distribute the updates. The Gateway uses the SD card to store the new Firmware file. In order to remove the SD card from the device, first push the SD card into its slot, then release it. The SD card should pop out and allow it to be removed. (Figures 37, 38, and 39)
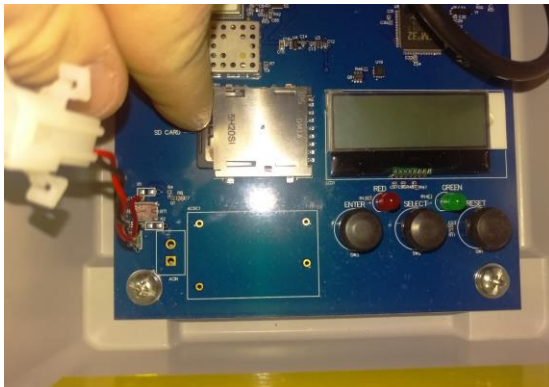

Figure 37
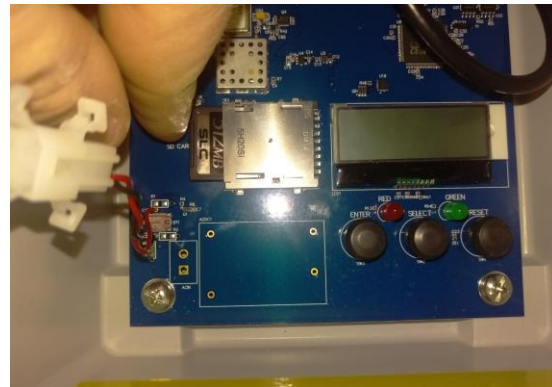
Figure 38
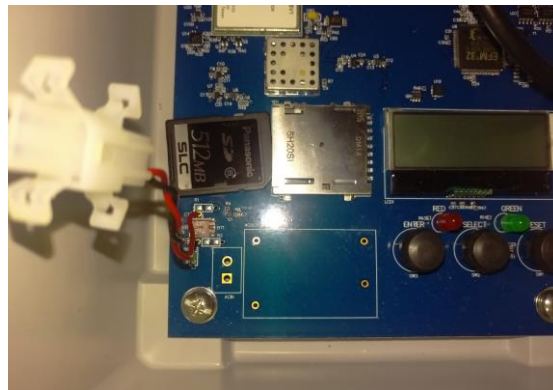
Figure 39

The SD card must then be inserted into an SD card reader on a computer. Before loading the new firmware files onto the SD card, the old Firmware files must first be deleted. Select the files named "Gateway_FW_x.xx.hex" and "Firmware.crc" and delete them from the SD card. (Figure 39) If those files don't exist, move on to the next step.

Figure 40

Next, copy the new firmware files onto the SD card. An alternative approach is to create a new configuration file for the Gateway using the Configurator program, put the file on a new SD card and preload the Firmware on that card. This way all the operator has to do is swap out SD cards and tell the Gateway to update its Firmware.

After the new Firmware files are on the SD card, the card should then be inserted back into the SD card slot on the Gateway. The card should be inserted until a click is heard, then once released the card should sit neatly inside the SD card slot (Figure 41)

Figure 41