WHIN-WAN GATEWAY USER MANUAL

WABASH HEARTLAND INNOVATION NETWORK

1281 WIN HENTSCHEL BOULEVARD

SUITE 2161

WEST LAFAYETTE, IN 47906

WHIN.ORG

The WHIN-WAN Gateway wirelessly collects all essential data from Davis ISS (Integration Sensor Suite) and/or Davis Soil Moisture/Temperature Station and push it securely to the cloud via LoRaWAN. The data can then be accessed on your phone, tablet, and computer.

Includes a 5-watt solar panel and a rechargeable 6-volt backup battery encased in a weather-resistant housing.

FCC ID: 2A9LS-WX-WW-R1

TECHNICAL AND FUNCTIONAL SYSTEM SPECIFICATIONS

RF Frequency	902.3 – 914.9MHz (ISM)
Operating Temperature Range	-40C to 60C (-40F to 140F)
Weight	7.65 lbs.; 3.47 kg
Wireless Range	Up to 9 miles
Battery Type	6 Volt/12 Amp Hr. Lead-Acid (VRLA) https://www.power-sonic.com/wp-content/uploads/2022/01/PS-Summary-Specification-Sheet-2.pdf
Solar Charging	Integrated 5W solar panel and charging circuit
Case Material	Rugged ASA Plastic
Certification	FCC ID: 2A9LS-WX-WW-R1
Data Storage	16 GByte on uSD

FCC 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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 or more of the following 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and all

person. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

INSTALLATION

The enclosure for the WHIN-WAN Gateway is the Davis Heavy Duty Solar Power Kit (6612). Refer to the Davis Solar Power Kits User Manual for installation instructions.

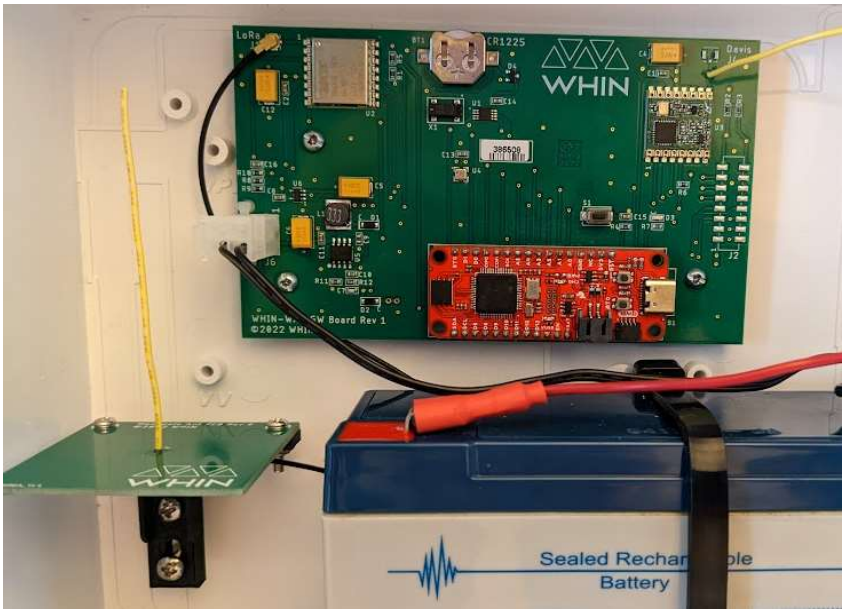
https://cdn.shopify.com/s/files/1/0515/5992/3873/files/07395-326_IM_06612_06614.pdf

The enclosure should not be farther than about 100 yards from associated Davis ISS or Soil Moisture stations.

WHIN-WAN GW CONFIGURATION

Configuration is most easily done before installation, so is best done in an office or lab.

1. Connect the PC's USB to USB (type-C) on red daughter board. The USB device should enumerate as virtual comm port. Start "Tera Term" or similar serial port program.



2. From the serial port terminal, enter the password (contact WHIN for password) to enable the Command Line Interface (CLI). A message that says "CLI enabled…" will appear.

3. From the serial port terminal:

    a. Use the command "deveui" to retrieve the DevEUI.

    b. Use the command "joineui" to set your JoinEUI (AppEUI),

c. Use the command “nwkkey” to set your NwkKey (AppKey).

```
deveui
deveui=01 02 03 04 05 06 07 08

joineui 00250C0000010001
joineui=00 25 0c 00 00 01 00 01

nwkkey 043EEF6721E8848D468598E34F6CB1B7
nwkkey=04 3e ef 67 21 e8 84 8d 46 85 98 e3 4f 6c b1 b7
```

4. Configure the Davis station addresses. Normally there will be an ISS with station address of 1, and a soil moisture station with station address of 2. Use the CLI commands “iss” and “sm” set these addresses as shown below. If either the ISS or soil moisture station is not present, then an address of 0 should be used.

```
iss 1
iss=1

sm 2
sm=2
```

CONFIRM OPERATION

There are two LEDs that will blink once a second when power is first applied. The blinking blue LED indicates that the WHIN-WAN GW has not yet joined the LoRaWAN network. When the WHIN-WAN GW has joined the network the LED will be off. The blinking green LED indicates that WHIN-WAN GW has not yet found the Davis ISS or soil moisture stations. When all configured Davis stations have been found, the green LED will be off.

Press button S1 on the green WHIN-WAN GW board to send the Health Report (LoRaWAN port 90) to the cloud.

Below is an example of a decoded Health Record (port 90):

- Firmware major rev: 0
- Firmware minor rev: 13
- Battery Voltage: 7.1 Volts
- ISS Percent RC: 98 %
- SM Percent RC: 100 %
- SD Card Available: 15.1 GB
- Avg RSSI: -18 dBm
- Avg SNR: 7 dB
- CRC Errors: 0
- ACK Tries: 8
- Davis RSSI Threshold: -50

Contact WHIN for information on decoding port 90 uplink messages.

A WHIN-WAN Gateway is limited to two joins per day, so if the WHIN-WAN Gateway is not joining it may be because it has already joined twice today. To reset the join count, press button S1. Then press the RST button on the STM32 board to attempt to join again.

REMOTELY MODIFY SETTINGS

Contact WHIN for information on changing the WHIN-WAN Gateway settings remotely using downlink messages.

RETRIEVING FILES FROM THE SD CARD

Raw data received for the Davis ISS or soil moisture stations can be retrieved by booting the WHIN-WAN Gateway to USB Mass Storage Device Mode. To do this follow the following steps.

1. Connect USB to PC.
2. Open serial terminal program and enter CLI password.
3. Enter the following command and argument:

   After using this command, the next time the STM32 boots, it will run firmware for USB Mass Storage device.

4. Press the RST button on the STM32 board. The device will boot to USB MSD firmware, and the blue LED will be on continuously.
5. Allow several 10s of seconds for the device to open the drive.
6. Data is organized by year. Copy the folders you want. This will likely take more than 10 minutes or more to complete.
7. When all data has been copied, press the RST button again on the STM32 board to return to normal WHIN-WAN Gateway firmware. (Note: If there is no USB activity for 60 minutes, the STM32 will reset itself and return to normal firmware.)

REVISION HISTORY

REV 0

Draft

REV 1

First release

REV 2

Added FCC radiation exposure warning