

RF-V1

User Guide

Version	Date	Revision Type	Change Type	Made by
1.0	03/01/2024	Creation	-	Mauricio Alvarez
1.1	12/01/2024	Observations and formatting		Luis Fuentes
1.2	8/2/2024	Adding images, description and details		José Ulloa
1.3	29/05/2024	Modifications related to the new internal antenna		Luis Fuentes

Thank you for choosing Wiseconn Engineering products. This quick guide will provide you with the necessary information to start using the RF-V1 device you have purchased. If you need additional technical information, please do not hesitate to send an email to support@wiseconn.com.

Table of Contents

1. Warranty	4
2. Safety Instructions	4
3. Parts and pieces	6
4. Description	7
5. Specifications	8
6. Components	9
6.1. Accessories	9
6.2. Central Unit Board	10
6.2.1. Revision 005	11
6.2.2. Revision 006 and Above	13
6.3. Fuses	14
6.4. Dip Switches	16
6.4.1. Channel	16
6.4.2. Ext. Ant. (R006+ Only)	16
6.5. Status Description LEDs	16
6.6. Push Buttons	18
6.7. I/O Interfaces	19
6.7.1. Digital Inputs	19
Wiring Diagrams	20
6.7.2. SDI12	21
Compatible sensors	21
Wiring Diagram	22
6.7.3. Latching Solenoids	23
Compatible Valves	23
Wiring Diagram	24
7. Troubleshooting	25
7.1. Basic voltage measurements.	25

1. Warranty

The RF-V1 equipment comes with a 24-month Wiseconn warranty that covers all parts and components against manufacturing and material defects, provided they are used for their intended purpose and maintained according to the instructions. The warranty applies to equipment failures but does not cover installation, extreme weather events, misuse, theft or vandalism, physical or electrical damage. The warranty period starts when the Authorized Distributor delivers the product. Defective parts will be replaced with new ones of the same capacity. Non-functioning parts or any problems that may arise will not be compensated. Changing or replacing a part within the warranty period does not extend the original warranty period. All equipment submitted for warranty review will be sent to Technical Service.

It is recommended to read and save the Safety Instructions before unpacking and handling the equipment.

2. Safety Instructions

Before attempting to install, operate, maintain, or inspect the device, it is essential to read this text and all related documents thoroughly. Additionally, complete the corresponding training for installation and configuration to ensure proper use. Only use the device for its intended purpose and after acquiring complete knowledge of its safety information and instructions.

Keep all warnings and instructions for future reference.

⚠ The components inside the device do not require any kind of maintenance or manipulation, except that indicated by the Certified Installer and / or Wiseconn Support personnel. Do not disassemble any parts without guidance from qualified personnel. Always use covers, protection devices, and assembled elements in perfect technical condition.

All electrical connections, as well as all repair and maintenance tasks, may be carried out only by qualified personnel. The power supply must be disconnected to avoid the danger of material and/or personal damage, and even death by electric shock. It is important to respect all applicable electrical safety regulations and regulations at the place of use.

Do not place the equipment near sources of heat. Avoid any contact with fire.

The device is equipped with a lithium-ion battery, which, if not handled properly, is dangerous due to the possibility of overheating, combustion, deflagration and explosion, posing a risk to the user and the environment. For these reasons, toxic gasses may be released and cause burns or poisoning. Do not dispose of the battery in a fire, even if it is severely damaged or completely worn out. The battery may explode in fire. When lithium-ion batteries are incinerated, vapors and toxic materials are released.

⚠ If battery contents come into contact with skin, remove contaminated clothing and immediately flush skin with plenty of water for at least 15 minutes. If the battery fluid comes into contact with the eyes, rinse the eyes with water while holding the eye open for 15 minutes or until irritation ceases. If medical attention is required, the battery electrolyte consists of a mixture of liquid organic carbonates and lithium

salts (UN3481). The contents of the battery's open cells may cause respiratory irritation. Move to fresh air. Seek medical attention if symptoms persist.

⚠️ **WARNING!** Risk of burns. Battery fluid may be flammable if exposed to sparks or flames. The best storage location is a cool, dry place away from direct sunlight, excessive heat or cold. For optimal battery life and performance, store the battery at room temperature when not in use. For extended storage, it is recommended that the fully charged battery be stored in a cool, dry place away from the charger for best results. Batteries should not be stored completely discharged. The battery should be charged before use.

⚠️ The battery should not be disposed of with other waste, but should be treated as hazardous waste. If the outer shield is damaged, place it in a closed (non-metallic) container next to the absorbent material used to contain the leak, and use gloves to handle it. The U.S. Environmental Protection Agency (EPA) does not regulate the disposal of batteries in small quantities; large quantities are regulated under the Universal Rules of the Hazardous Waste Regulations (40 CFR PART 273). Lithium batteries are not currently collected by manufacturers for recycling. Lithium batteries are currently disposed of after use. While there are no federal regulations for the disposal of lithium batteries, individual states or localities may establish their own battery disposal policies and should be contacted for any disposal policies they may have.

3. Parts and pieces

Available versions and their part number:

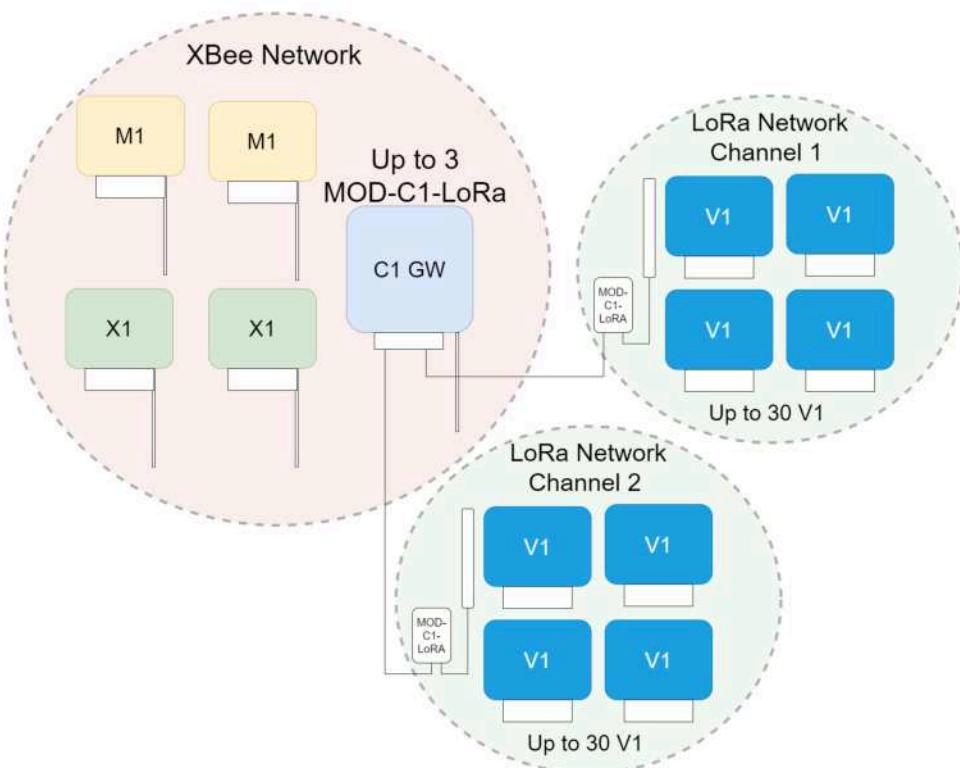
Part number	Description	Region
RF-V1-900-4LATCH-BATT	4 Latching outputs with 31200mAh battery	US/LATAM/AU
RF-V1-900-4LATCH-SOLAR	4 Latching outputs with 13000mAh battery and solar panel	US/LATAM/AU
RF-V1-868-4LATCH-BATT	4 Latching outputs with 31200mAh battery	EU
RF-V1-868-4LATCH-SOLAR	4 Latching outputs with 13000mAh battery and solar panel	EU
RF-V1-900-2LATCH-BATT	2 Latching outputs with 31200mAh battery	US/LATAM/AU
RF-V1-900-2LATCH-SOLAR	2 Latching outputs with 13000mAh battery and solar panel	US/LATAM/AU
RF-V1-868-2LATCH-BATT	2 Latching outputs with 31200mAh battery	EU
RF-V1-868-2LATCH-SOLAR	2 Latching outputs with 13000mAh battery and solar panel	EU

Unpack and inspect the unit to ensure that it has not been damaged in transit. If damage has occurred, contact your dealer. Each RF-V1 includes:

- 1x RF-V1
- 2x T brackets
- 1x Solar Panel 10 [W] (SOLAR versions only)
- 1x Solar panel bracket (SOLAR versions only)
- Spare fuses
- Screws

4. Description

The RF-V1 is a device that controls latching solenoid valves and monitors flow or pressure switch states with minimal power usage and is simple to install. The RF-V1 works as part of DropControl to provide remote valve control for RF-C1s that are connected to the DropControl 900MHz mesh network or directly to the cloud via LTE modem communication.



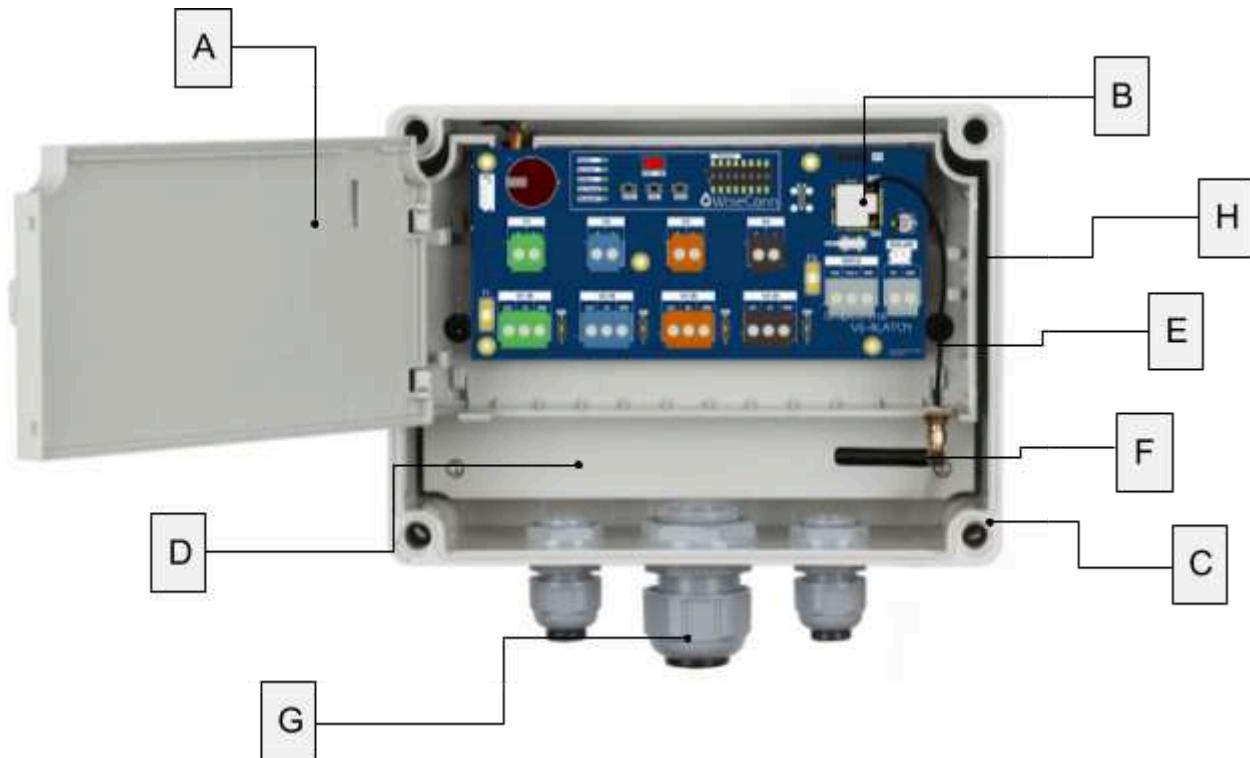
5. Specifications

Processor	RAK11720 (ARM® 32-bit Cortex®-M4F).
Radio	LoRa Point-to-Point in Star topology, 900/868 Mhz. 22dBm tx power.
Antenna	R005 : 2dBi Dipole / RP-SMA connector for an external antenna option. R006+ : 2dBi Embedded antenna/ RP-SMA connector for an external antenna option.
Dimensions	180x200x100mm (7x8x4 in).
Enclosure	IP65 outdoor rugged UV resistant polycarbonate enclosure.
User Interface	ON/OFF Switch, Buttons, DIP Switch selectors and status LEDs.
Power	BATT Versions: 31,200 mAh Lithium (Li-ion) battery. SOLAR Versions: 13,000 mAh Lithium battery, includes a 10W solar panel. Consumption of less than 30uA in sleep mode.
Inputs and outputs	4 or 2 two-wire latching solenoid outputs (4700uF capacitor charged at 16V, minimum solenoid impedance 6 Ohm). 4 Digital inputs: Counter (up to 40Hz) or discrete (9 to 24 VDC) with an integrated 12V power source (max output current: 62 mA, fused). 1 SDI12 with an integrated power source (max output current: 160 mA , fused). 1 Service and charging USB-c port.
Synchronization	Local RF synchronization every 30 seconds Sending data to the cloud every 15 minutes 2 minute alarms and alerts delay.
Expansions	GPS Module expansion slot (coming soon).
Bluetooth	Bluetooth BLE (coming soon).

6. Components

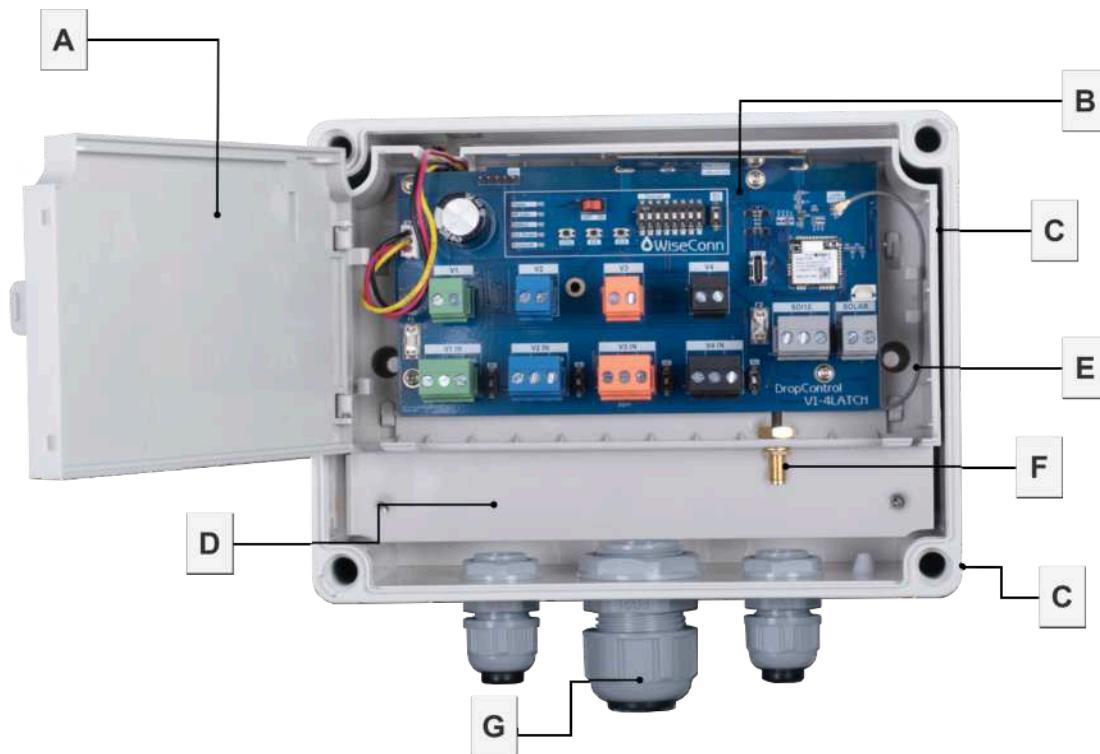
The following image describes the internal components of the RF-V1, using a 4LATCH model as an example.

6.2.1. Revision 005



ID	DESCRIPTION	Q
A	Internal enclosure	1
B	Central Unit Board	1
C	Polycarbonate Box	1
D	Ion Lithium Battery 3.7 [VDC] - 13 [Ah]/31.2 [Ah]	1
E	Pigtail IPEX MHF4 - RP-SMA 6"	1
F	1 [dBi] RP-SMA Antenna	1
G	PG21/PG16 glands	2
H	NFC Tag	1

6.2.1. Revision 006+



ID	DESCRIPTION	Q
A	Internal enclosure	1
B	Central Unit Board	1
C	Polycarbonate Box	1
D	Ion Lithium Battery 3.7 [VDC] - 13 [Ah]/31.2 [Ah]	1
E	Pigtail IPEX MHF1 - RP-SMA 6"	1
F	RP-SMA Connector	1
G	PG21/PG16 glands	2
H	NFC Tag	1

6.1. Accessories

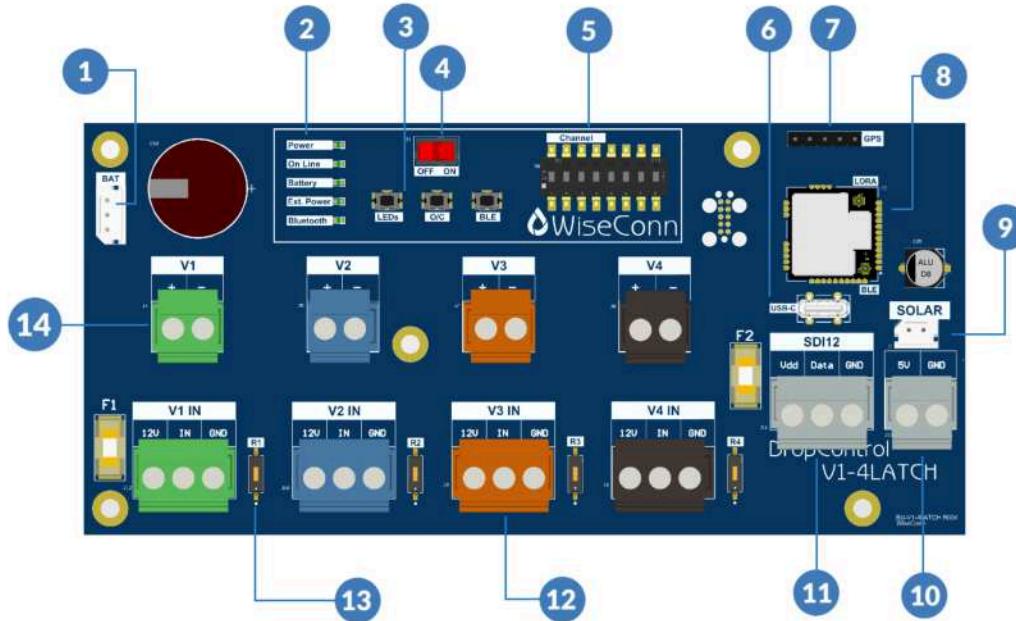
Component	Description
Mounting brackets	2 metallic mounting brackets for a pole or wall.
Solar panel (SOLAR versions)	10W External solar panel with support system
Solar panel bracket (SOLAR versions)	Mounting bracket for the included solar panel

6.2. Central Unit Board

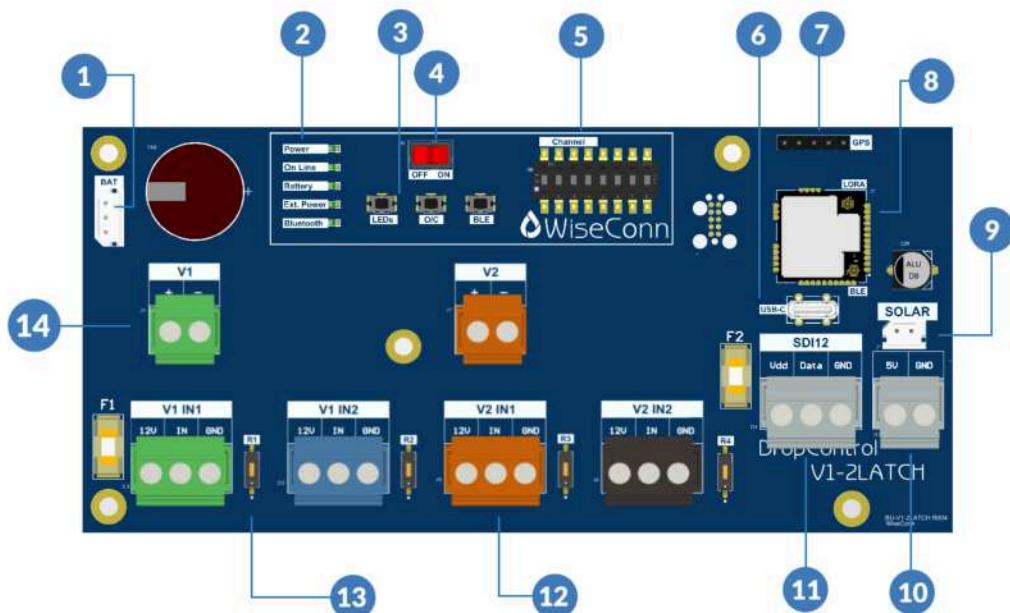
The main board of the RF-V1 has the following connectors and interfaces.

6.2.1. Revision 005

- **4LATCH models:**



- **2LATCH models:**

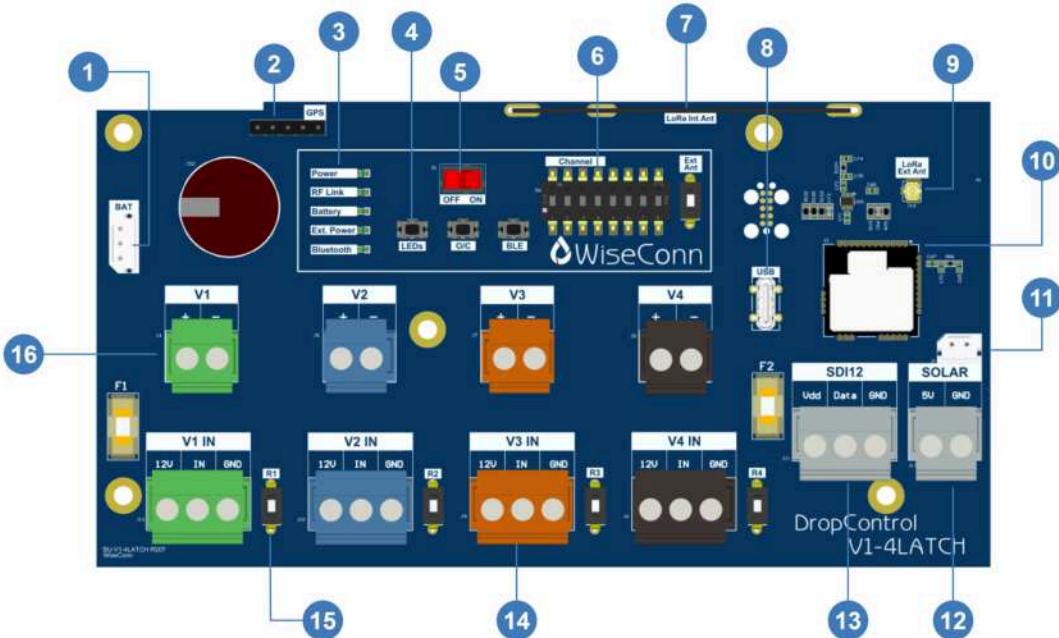


ID	DESCRIPTION
1	Battery connector
2	LED status indicators
3	UI buttons
4	On/Off switch
5	Dip Switch for channel selection
6	Service/Charge USB-C port
7	GPS module port
8	LoRa and BLE antennas
9	Solar panel connector
10	AUX solar panel connector
11	SDI12 port
12	Digital input connector
13	DI configurable resistor
14	LATCH valve connector

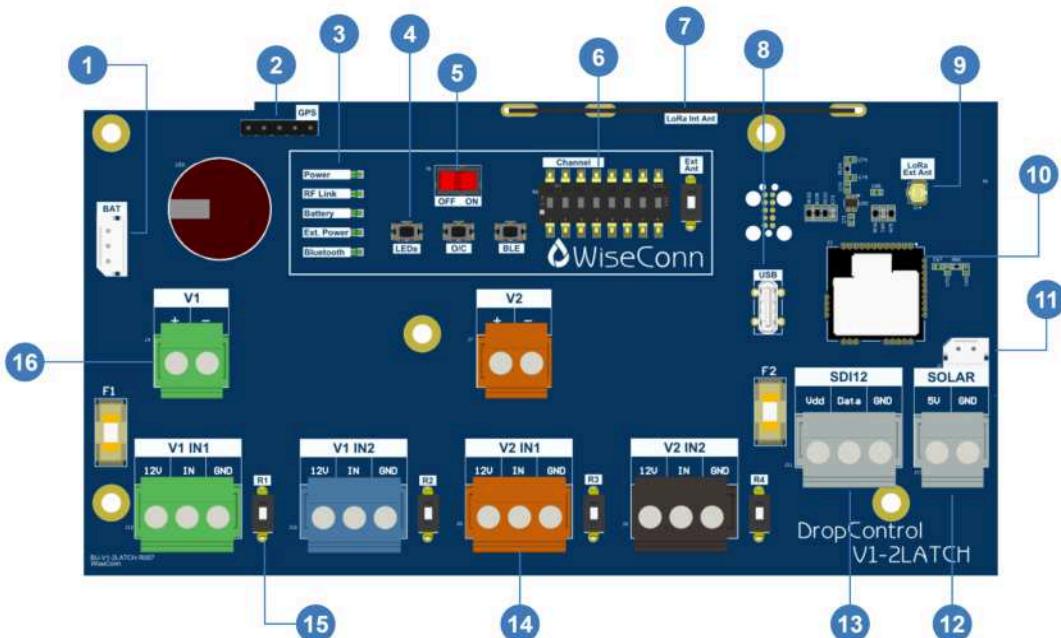
6.2.2. Revision 006 and Above

Incluir vista general

- **4LATCH models:**



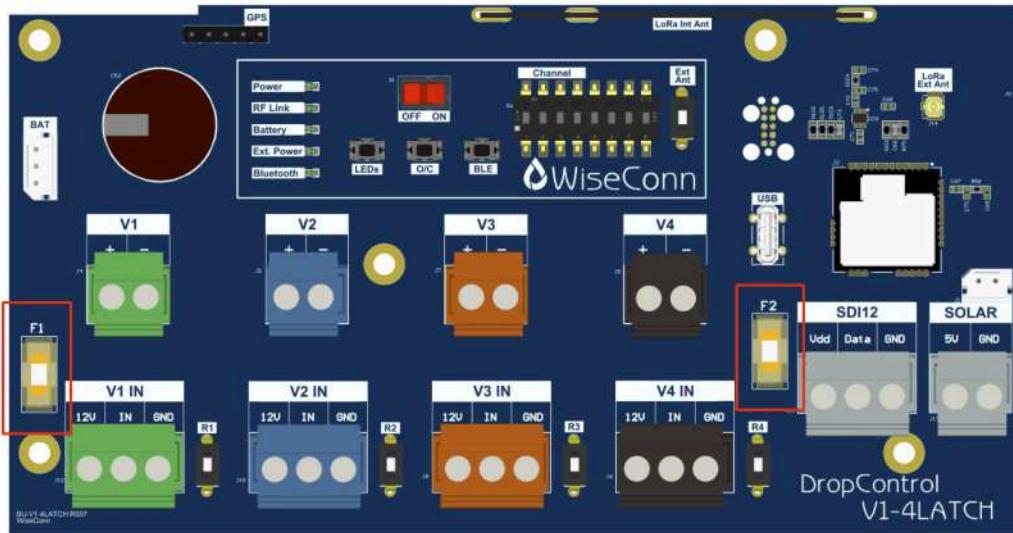
- **2LATCH models:**



ID	DESCRIPTION
1	Battery connector
2	GPS module port
3	LED status indicators
4	UI buttons
5	On/Off switch
6	Dip Switch for channel selection
7	LoRa Embedded Antenna
8	Service/Charge USB-C port
9	I-PEX MHF I connector for external antenna
10	Main module
11	Solar panel connector
12	AUX solar panel connector
13	SDI12 port
14	Digital input connector
15	DI configurable resistor
16	LATCH valve connector

6.3. Fuses

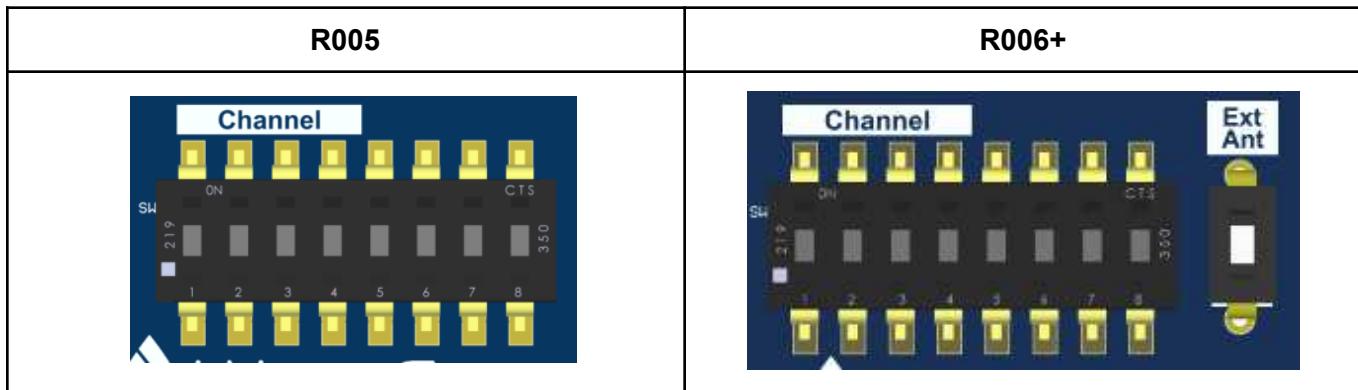
All RF-V1 models have the following fuses. All the fuses are located in the front of the board, for both 2LATCH and 4LATCH.



Fuse	Current	Fuse model
F1	62 mA	Littelfuse Inc. 0451.062NRL
F2	160 mA	Littelfuse Inc. 0453.160MR

6.4. Dip Switches

The internal user interface of all RF-V1 has the following DIP Switches depending on the revision of the PCB. If a DIP switch position is modified, the node must be restarted for the changes to take effect.



6.4.1. Channel

ON-OFF combination for each network. All the nodes in a network must have the same network channel to synchronize (including the MOD-LORA).

The valid network channels, with their respective frequency and bandwidth are shown in the tables below

RF-V1-900 Versions

US/LA		
Position	Freq [MHz]	Bw [kHz]
"00000001"	902.5	500
"00000011"	903.1	500
"00000101"	903.7	500
"00000111"	904.3	500
"00001001"	904.9	500
"00001011"	905.5	500
"00001101"	906.1	500
"00001111"	906.7	500
"00010001"	907.3	500
"00010011"	907.9	500
"00010101"	908.5	500

AU		
Position	Freq [MHz]	Bw [kHz]
"00000000"	915.5	500
"00000010"	916.1	500
"00000100"	916.7	500
"00000110"	917.3	500
"00001000"	917.9	500
"00001010"	918.5	500
"00001100"	919.1	500
"00001110"	919.7	500
"00010000"	920.3	500
"00010010"	920.9	500
"00010100"	921.5	500

"00010111"	909.1	500
"00011001"	909.7	500
"00011011"	910.3	500
"00011101"	910.9	500
"00011111"	911.5	500
"00100001"	912.1	500
"00100011"	912.7	500
"00100101"	913.3	500
"00100111"	913.9	500
"00101001"	914.5	500
"00101011"	915.1	500
"00101101"	915.7	500
"00101111"	916.3	500
"00110001"	916.9	500
"00110011"	917.5	500
"00110101"	918.1	500
"00110111"	918.7	500
"00111001"	919.3	500
"00111011"	919.9	500
"00111101"	920.5	500
"00111111"	921.1	500
"01000001"	921.7	500
"01000011"	922.3	500
"01000101"	922.9	500
"01000111"	923.5	500
"01001001"	924.1	500
"01001011"	924.7	500
"01001101"	925.3	500
"01001111"	925.9	500
"01010001"	926.5	500
"01010011"	927.1	500

"00010110"	922.1	500
"00011000"	922.7	500
"00011010"	923.3	500
"00011100"	923.9	500
"00011110"	924.5	500
"00100000"	925.1	500
"00100010"	925.7	500
"00100100"	926.3	500
"00100110"	926.9	500
"00101000"	927.5	500

RF-V1 868 Versions

EU		
Position	Freq [MHz]	Bw [kHz]
"00000000"	865.15	250
"00000010"	865.45	250
"00000100"	865.75	250
"00000110"	866.05	250
"00001000"	866.35	250
"00001010"	866.65	250
"00001100"	866.95	250
"00001110"	867.25	250
"00010000"	867.55	250
"00010010"	867.85	250
"00010100"	868.15	250
"00010110"	868.45	250
"00011000"	869.85	250
"00011010"	863.5	500
"00011100"	864.1	500
"00011110"	864.7	500
"00100000"	865.3	500
"00100010"	865.9	500
"00100100"	866.5	500
"00100110"	867.1	500
"00101000"	867.7	500
"00101010"	868.3	500

Note that even though the central unit board is the same for the 900 and 868 versions, the region is a non configurable factory setting.

6.4.2. Ext. Ant. (R006+ Only)

Selects the antenna used by the LoRa transceiver. By selecting OFF (lower position), the transceiver will use the embedded antenna, and with ON, the transceiver will use the antenna connected to the I-PEX MHF 1 connector shown in (9).

6.5. Status Description LEDs

The internal user interface of all RF-V1 have the following leds.



Indicator	Behavior	Description
Power	Solid	Device is energized, configured and operating correctly.
	Blinking	1 second flash: Device booting.
Online / RF Link	Solid	Connected to MOD-Lora
	Blinking	Trying to connect to MOD-Lora
Battery (Switch ON)	Solid	Over 50% battery charge
	Blinking	Under 50% battery charge flashes every 1 second. Under 10%, flashes 200 ms every 1 second.
Battery (Switch OFF)	Solid	Full Charge
	Blinking	Battery charging
EXT.Power	Solid	USB or external power connected and charging
	OFF	No USB or external power detected (not charging)
Bluetooth	N/A	N/A



The internal UI has a power saving feature. Therefore, they will turn off after 120 seconds. To reactivate the LEDs, press the LED's button to turn the LEDs on again.

6.6. Push Buttons

The internal user interface of all RF-V1 has the following buttons.

Push Button	Description
 O/C	Pressing the O/C button for 4 seconds will locally open or close all of the RF-V1's latching solenoid interfaces.
 LEDs	The internal UI has a power saving feature. Therefore, they will turn off after 120 seconds. To reactivate the LEDs, press the LED's button to turn the LEDs on again.
 BLE	Not currently used.

6.7. I/O Interfaces

The following section describes the I/O interfaces of the RF-V1.

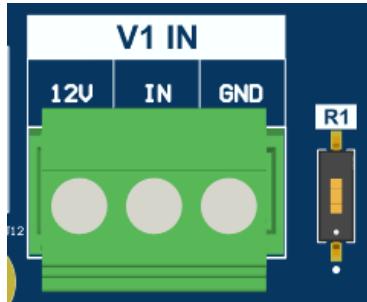
6.7.1. Digital Inputs

All RF-V1 models have 4 digital input interfaces for discrete and pulse based devices. By default IN has a high impedance ($>5M$ Ohm), but a 30k Ohm pull-down can be activated by toggling R1 to the on position if the connected device requires a higher current for polarization purposes.

Depending on whether the RF-V1 model has 4 or 2 latching outputs, the terminal names are as follows:

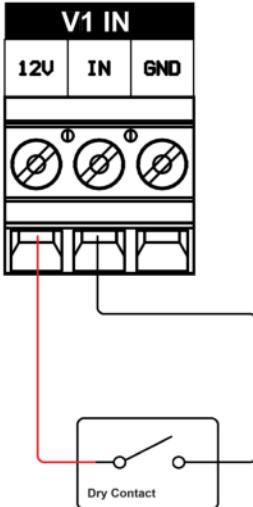
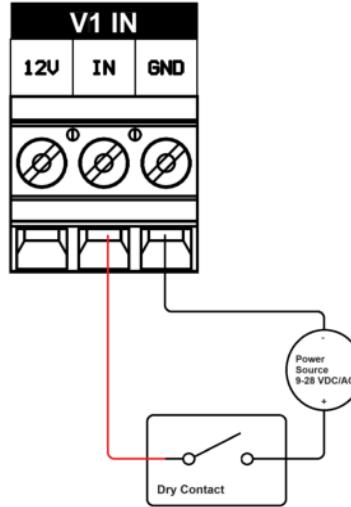
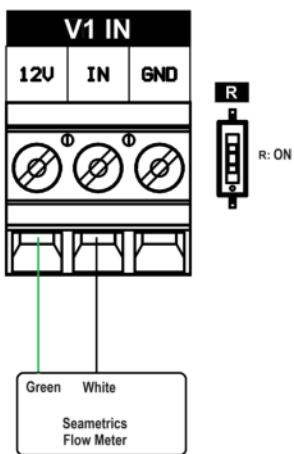
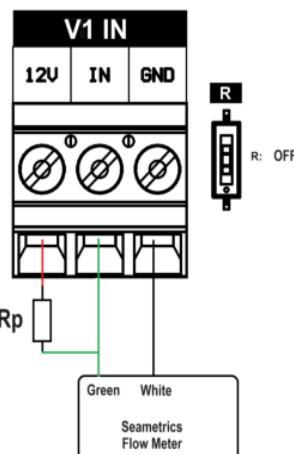
Outputs	Inputs	Associated Output
4LATCH	V1 IN	V1
	V2 IN	V2
	V3 IN	V3
	V4 IN	V4
2LATCH	V1 IN1	V1
	V1 IN2	V1
	V2 IN1	V2
	V2 IN2	V2

The following images use V1 IN as an example, but the same configuration applies to the other inputs



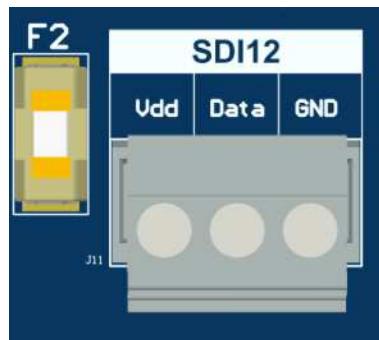
Group	Terminal	Description
V1 IN	12V	Output: 12 [VDC] (max output current: 62 mA, fused).
	IN	Digital Input: Counter (up to 40Hz) or discrete (9 to 24 VDC).
	GND	GND
	R1	30k Ohm pull-down resistor enable

Wiring Diagrams

Passive Input, Internal Power Supply	Passive Input, External Power Supply
	
Open collector (source mode)	Open collector (sink mode)
 <p>Not recommended. May significantly reduce the battery duration</p> <p>Rp value is dependent on the sensor</p>	

6.7.2. SDI12

The RF-V1 features a standard compatible SDI12 interface, with a 12V output to supply the SDI12 sensor or other devices. The SDI12 interface supports 1 probe and up to 40 variables.



Group	Terminal	Description
SDI12	Vdd	Output: 12 [VDC] (max output current: 160 mA, fused).
	Data	SDI12 Data
	GND	GND

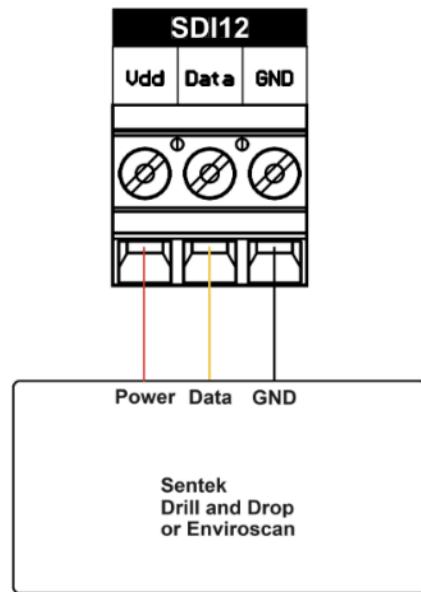
Compatible sensors

Although the SDI12 interface includes standard commands for reading data from sensors, the following sensors have been tested and confirmed to work without issues.

Type	Variables	Brand - Sensor Model
Weather	Temperature and Humidity	Meter Group (Decagon) - VP-4
Weather	Temperature, Humidity and Pressure	Metergroup - Atmos 14
Soil	Soil Moisture	Hydrascout - HSTI
Soil	Soil Moisture	GroPoint - GroPoint Profile Probe
Soil	Soil Moisture	Aquaflex - SI 162
Soil	Soil Moisture	Meter Group (Decagon) - Teros 11/12
Soil	Soil Moisture	Meter Group (Decagon) - Teros 21
Soil	Soil Moisture	Meter Group (Decagon) - GS3
Soil	Soil Moisture	Meter Group (Decagon) - 5TE
Soil	Soil Nutrients	Nutrisens - Nutrisens SDI12
Soil	Soil Moisture	Sentek - EnviroScan
Soil	Soil Moisture	Sentek - Drill&Drop
Soil	Soil Moisture	AquaCheck - Classic / Subsurface
Soil	Soil Moisture	EnviroPro - EP100G / EP100GL

Soil	Water Potential	Flora Pulse - uTensiometer
Soil	ORP	SWAP - ORP-40-4-D
Irrigation	Water pH	Ponsel - PPHRB
Irrigation	Water electrical conductivity	Ponsel - PC4EB
Irrigation	Water electrical conductivity	Meter - ES-2
Plant	Temperature	Dynamax - SAP IP-IRT
Plant	Fruit Diameter	Bio Instruments - FI-xT-SDI12
Plant	Trunk Diameter	Bio Instruments - DE-1T-SDI12
Plant	Leaf Temperature	Bio Instruments - LT-1T-SDI12

Wiring Diagram

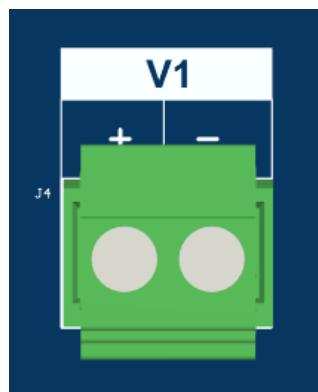


6.7.3. Latching Solenoids

The RF-V1 has 4 latching outputs for solenoid valves in the 4LATCH version and 2 in the 2LATCH version. The latch is created by switching the output of a 4700uF capacitor that has been charged to 16V, with a current of up to 1.5A.

Model	Related Output
4LATCH	V1
	V2
	V3
	V4
2LATCH	V1
	V2

The following images use V1 IN as an example, but the same configuration applies to the other outputs



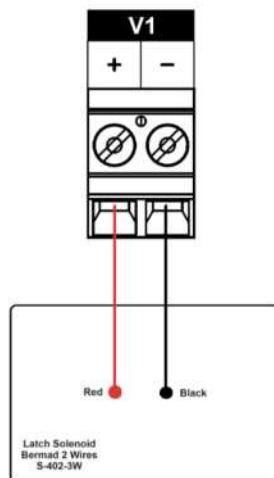
Group	Terminal	Description
V1	+	Solenoid valve output +
	-	Solenoid valve output -

Compatible Valves

The following valves were tested and configured to work with the latching solenoid output:

- Bermad 2 Wires (S-402-3W)
- Netafim Aquative (12V)
- Baccara latch solenoid
- Bermad 2 wires 982 (S-982-3W)

Wiring Diagram

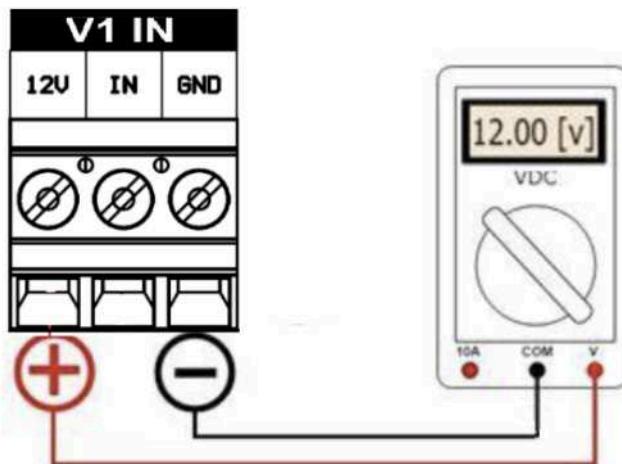


7. Troubleshooting

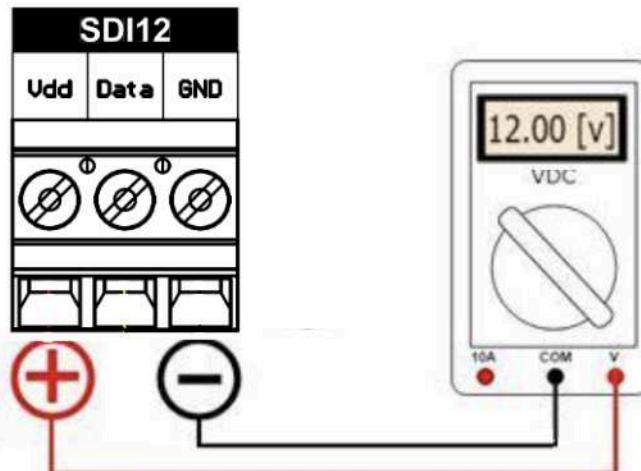
7.1. Basic voltage measurements.

The 2 power supplies are fixed 12VDC.

DI Power supply: To validate if the power supply of the node is delivering the appropriate voltage value. This output power source is constant on 12V. (always is ON)



SDI12 Power supply:: In this block it is only possible to validate if the power supply is enabled and working properly. This output power source when enabled is constant on 12V.



FCC:

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.

FCC Caution:

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

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.

FCC RF Radiation Exposure Statement:

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

ISED:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/recepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.

Pour se conformer aux exigences de conformité CNR 102 RF exposition, une distance de séparation d'au moins 20 cm doit être maintenue entre l'antenne de cet appareil et toutes les personnes.