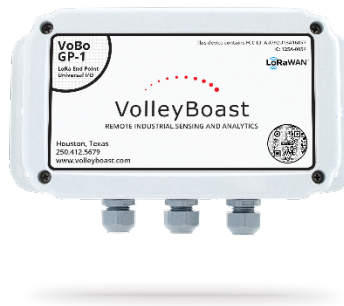**VolleyBoast**

INSTALLATION MANUAL

VoBo GP-1

The VoBo GP-1 is an industrial grade all-purpose LoRaWAN endpoint that converts wired industrial sensors and transmitters into wireless sensors. The GP-1 has the following key features:

- Provides three analog inputs, three discrete digital inputs, one "wake-up" input, one RS-485 input (for Modbus RTU devices), and one open drain output. Three entry points for sensor cables are provided. Hole plugs are provided to seal the unused entry points.
- Analog output(s) can be adjusted for gain and offset.
- IP 66, NEMA 4X rated and has an operating temperature range of -35º C to 80º C.
- Expected battery life under normal operating conditions is 2 to 4 years.
- Range is up to 10 miles line-of-site to any LoRaWAN compliant gateway.

CONTENTS

IMPORTANT

For installation assistance contact the VolleyBoast Operations team at: *support@volleyboast.com* (+1) 250-412-5679

If assistance is desired, it is best to confirm an appointment ahead of the actual installation effort.

The VolleyBoast Limited Warranty can be found in the Terms and Condition of Sale (https://volleyboast.com/documentation/latest/termsandconditions-sale) and covers only VolleyBoast supplied hardware and software for the duration of the warranty period as per the warranty terms and conditions.

WARNINGS

WARNING: Before opening the enclosure, take the appropriate antistatic precautions, such as discharging your electrostatic potential by touching a known grounded object, or using an antistatic wrist strap.

WARNING: Do not clean the device with a dry cloth, at risk of electrostatic discharge.

WARNING: To maintain the IP66 rating the enclosure cover screws must be tightened to 8.00 in-lbs. Do not overtighten the screws. The entry point fittings (cord grips or conduit fittings) must be rated IP66 or better and installed in accordance with the manufacturer's instructions.
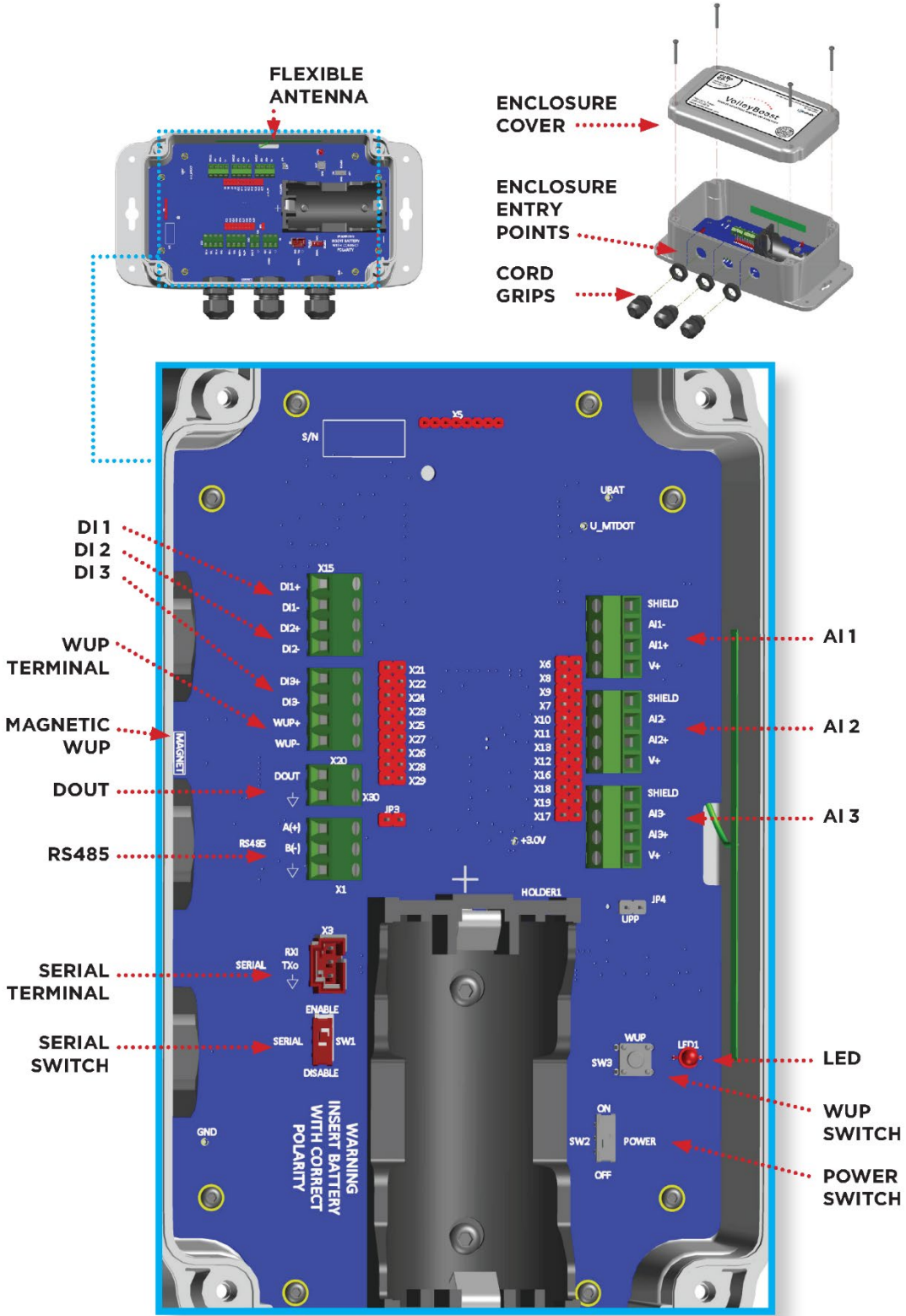
WARNING: Dispose of the battery properly according to local laws and regulations.

MET LISTED	UL-62368-1, Third Edition CSA C22.2 No. 62368-1, Third Edition Annex Y

VOBO GP-1 COMPONENT OVERVIEW

Description of Components

|	
Cover	The VoBo GP-1 is rated to IP66. These standards require that the gasket be properly positioned, and the cover screws tightened to 8.00 in-lbs. Do not over tighten the screws.
Entry Points	The VoBo comes with three (3) cord grips installed. The cord grips are designed for securing cables (or wires) 0.105 inch to 0.315 inch in diameter. Two (2) hole plugs are provided to seal unused entry points.
Battery Holder	A D-size Underwriters Laboratories (UL) recognized lithium-thionyl chloride [Li-SOCl$_2$] primary cell is provided. Users can replace the battery with a 3.6 Volt cell by a different manufacturer. A listing of possible replacement batteries follows: • Saft LSH20 • Saft LS33600 • Tadiran TL-5930 • Tadiran TL-2300 The battery **MUST BE** installed with the correct polarity. The polarity is marked adjacent to the battery holder. The Power Switch must first be switched to the "OFF" position while inserting or removing a battery. A Velcro tie down strip is provided to ensure the battery remains in place during transportation.
Power Switch	The switch activates/deactivates the power supply (the battery). It should be in the "OFF" position when installing or removing the battery. The power slider switch can also be used to reboot the microprocessor.
LED	The LED indicates successful completion of firmware initialization after power is turned on and successful connection to the network has been made.
WUP Switch	Press this button briefly to interrupt the preprogrammed sleep/wake cycle. This will immediately initiate the programmed reading of connected sensors and transmission of payload. This is useful for checking readings while in the field or when calibrating sensors. ⚠ The WUP switch will not function if the WUP terminal circuit is closed.
MAGNETIC WUP	There is a magnetic switch directly underneath the "Magnet" label. When the enclosure cover is on, a magnet can be used to activate this switch and interrupt the preprogrammed sleep/wake cycle. This will immediately initiate the programmed reading of connected sensors and transmission of payload. A red dot has been affixed to the exterior of enclosure marking the location of the magnet. ⚠ The Magnetic WUP switch will not function if the WUP terminal circuit is closed.
AI1, AI2, AI3	Analog terminal blocks. Each is jumper configurable for reading 4-20mA, 0-5V, or 0-10V sensors/transmitters. The terminals have a user configurable power supply of 5V to

	24VDC. The terminal blocks accept 28-16AWG stranded or solid wires. Wire strip length should be 0.2 in (5-6 mm).
DI1, DI2, DI3	Discrete input terminals. Use DI3 for pulse counting. Any of the discrete inputs may be used for monitoring switches. The discrete terminals can be individually configured to act as dry contact or voltage. The terminal blocks accept 28-16AWG stranded or solid wires. Wire strip length should be 0.2 in (5-6 mm).
WUP Terminal	Can be used to generate an alert when a switch position is changed. The terminal blocks accept 28-16AWG stranded or solid wires. Wire strip length should be 0.2 in (5-6 mm).
DOUT	An open drain output terminal. Used to communicate with external devices.
RS485	An RS-485 terminal. Used for communicating with Modbus RTU devices.
SERIAL	A RS232/UART terminal. Used for recovering logged data and performing local configuration of the VoBo. Contact Volley Boast if you would like to purchase a USB to RS232 cable that connects to the UART terminal.
SERIAL Switch	The switch used to enable or disable communication with the processor through the Serial terminal.
X6 thru X19	Jumpers used to configure analog terminals.
X21 thru X29	Jumpers used to configure DI1 thru DI3 terminals.
X5	JTAG connection. Not for customer use.
JP4	The Jumper can be closed to connect the shield circuit to ground. Normally it is left open.
JP3	Jumper can be closed to add a Termination Resistor (143 ohms) to the RS-485 circuit.

⚠️ The WUP button and Magnetic switch only function when the WUP I/O terminal is not in a closed position.

SETTING UP
Arranging the Jumpers

Each input terminal is associated with a set of jumpers. Note: the jumpers are not positioned directly in front of their associated terminal. The terminals and their associated jumpers are shown below. The position of the jumpers is indicated for the various sensor types. The red boxes indicate which pins should be connected (i.e., closed) with a jumper.
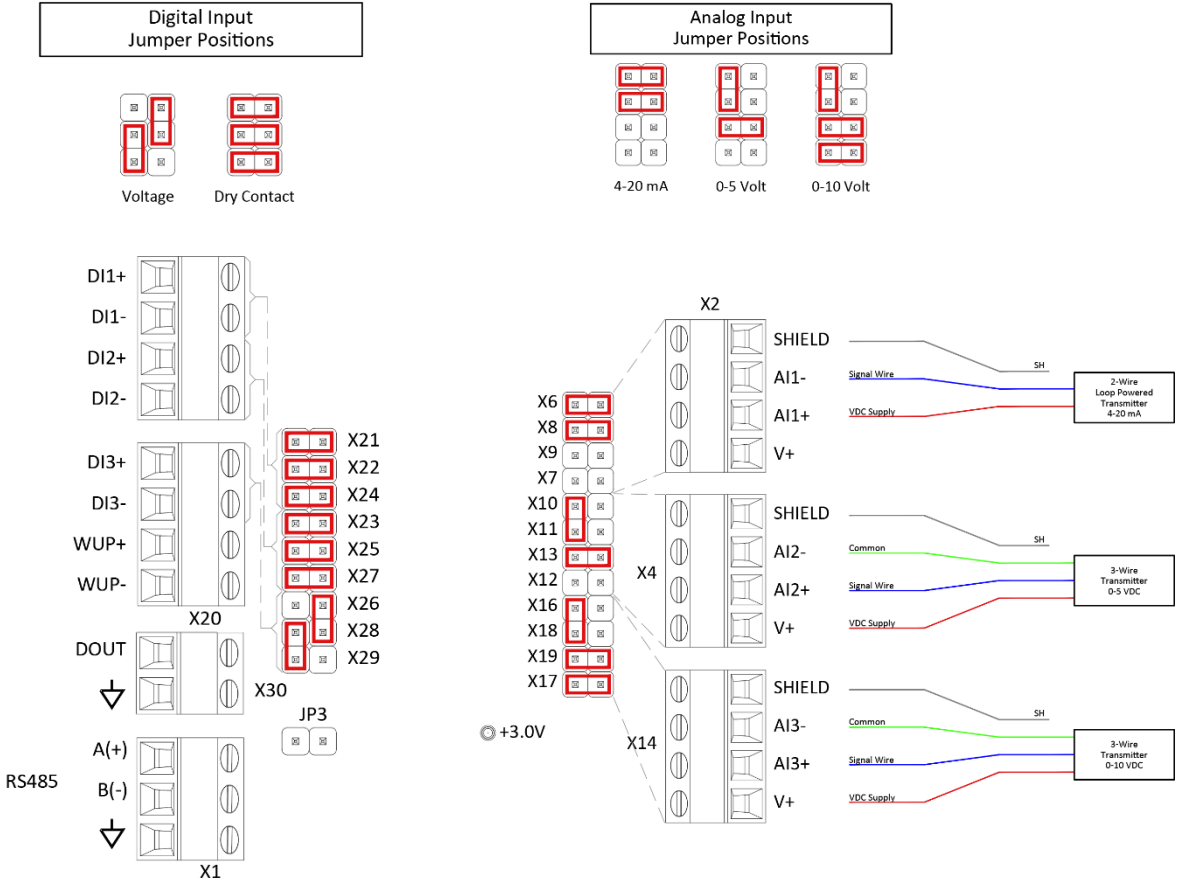
Discrete Terminals (Digital Input)

When the jumpers are arranged for dry contact, and the circuit between the positive and negative terminal is closed (ex. reed switch) or opened the circuit will report its state in the payload. When the jumpers are arranged in the voltage position, the circuit will report the presence of an externally applied voltage across the positive and negative terminals. Note: Pulse counting should be done through the DI3 terminal. Contact VolleyBoast to obtain pulse counting software.

Note: jumpers X21, X22, and X24 correlate to DI1, X23, X25, and X27 correlate to DI2, and X26, X28, and X29 correlate to DI3.

WUP Terminal

The WUP terminal accepts a dry contact switch. It will initiate the VoBo's routine as soon as the circuit changes from open to closed, or vice versa.

RS-485 Terminal
The RS-485 terminal has one jumper (JP3). Closing jumper JP3 adds a 143 Ohm termination resistor to the circuit.

Jumper JP4
When Jumper JP4 is closed it connects the Shield circuit to the Ground circuit.

Field Installation

⚠ **Do not remove or replace sensors or cabling unless the Power Switch is set to "Off" position.**

⚠ **The VoBo GP-1 must be installed a minimum of 20 cm away from personnel.**

Turn the POWER switch to the OFF position.

Remove any unnecessary cord grips. Install the provided hole plug into the unused hole by inserting the plug into the cord grip nut and tighten it to a torque of 33-38 in.lbs.

Ensure the sensor wires are stripped to 0.2 in (5-6 mm). Insert the sensor cable into the cord grip. The cord grips accept cable diameters of between 0.105 inch and 0.315 inch. The VoBo GP-1 cord grip sealing nut should be tightened to a torque of 33-38 in.lbs.

The VoBo GP-1 should be mounted on a secure, rigid surface capable of supporting the VoBo and sensor cables.   Use 4 - #8 pan head machine bolts or wood screws, depending upon the material of the mounting surface, to attach the VoBo to the surface. If mounting to a wood surface, the screws should be one inch in length.   If mounting in a location that would subject the VoBo to corrosive elements, use stainless or galvanized screws/bolts.

⚠ **To maintain the VoBo GP-1 IP66 protection, the entry points to the device must be sealed so they are watertight.**

Connect the sensor wires as described below.

Analog Sensors

The table below provides the maximum analog terminal current output (total):

Voltage Setting (V)	5	6	8	10	12	14	16	18	20	22	24
Max Current (mA)	228	181	127	98	80	67	58	51	45	41	37

⚠️**Drawing current from the analog terminal blocks in greater amounts may damage the VoBo.**

4-20mA sensor
- Two-wire loop powered sensor: insert the VDC supply wire (typically red) in the AI+ and the signal wire (typically black) in AI- of the analog input terminal block. Bare or shield goes into SH.

Voltage sensors
- Insert the VDC supply wire (typically red) in the V+ and the signal out (typically black) wire in AI+, and the ground wire in AI- of the analog input terminal block.

Discrete Sensors (Switches, pulse counters, etc.)
- Insert the plus and minus wires in the D+ and D- connections.

Modbus RTU Sensor
The VoBo has an RS-485 serial port for Modbus RTU sensors. It is programmed to pick up and transmit up to 41 16-bit registers.

The VoBo Modbus RTU communication parameters are "8N1".

Data bits = 8

Parity = N

Stop bits = 1

The VoBo can transmit Modbus sensor data for sensors powered both externally as well as by the VoBo. In both powering scenarios, the signal wires are connected to the RS-485 terminal. A Modbus sensor can be powered through one of the VoBo's analog terminals.

Connect the RX, TX, and Ground wires of the Modbus sensor to the respective RS-485 terminals. If the VoBo is powering the sensor, connect the voltage supply wire to an analog V+ terminal and the shield wire to the SH terminal.

Note: Closing jumper JP3 allows for reading multiple Modbus devices. JP3 is normally left open when reading a single device. Custom programming is required to read multiple Modbus devices.

Once the jumpers are configured and the sensors installed, turn the "POWER" slider switch to "ON".

Check LED for status. The LED will light green for 1 second following successful initialization of the VoBo. The LED will briefly flash green each time the VoBo attempts to join the network. The LED will light green for 1 second upon successfully joining the network and receiving a confirmation back from the gateway. The LED will light red for 1 second if it fails to join the network after 10 attempts. The LED flashes red if the VoBo fails to receive an acknowledgement back from the Gateway (after it has joined and sent a payload).

Press the WUP button to send another payload to confirm connectivity and transmission. Note the LED only functions upon powering up the VoBo.

From this point forward the payload and sensor readings should be sent to your LoRaWAN network server and, assuming it is set up, you should be able to ascertain the sensor readings from the network.

Attach the VoBo cover with the provided screws. The screws should be tightened to 8 in-lbs. Holding the screwdriver with just your thumb and first two fingers and then torqueing the screwdriver seems to approximate 8 in-lbs.

Note: if you want to test the VoBo at different locations for connectivity/signal strength, the VoBo is programmed to transmit temperature and battery voltage without connecting to external sensors. The Network Server will likely report signal strength from the endpoint. In this manner you can assess the quality of connectivity at different locations.

Problems? Contact VolleyBoast at: _support@volleyboast.com_

Maintenance

User maintenance requirements of the VoBo GP-1 is limited to replacing a depleted battery with a fresh battery. Please contact VolleyBoast if any issues arise with respect to the performance of the VoBo HL-1.

REGULATORY INFORMATION
47 CFR Part 15 Regulation Class B Devices

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.

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

FCC Interference Notice

Per FCC 15.19(a)(3) and (a)(4) 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.

FCC Grant

FCC Part 15	
FCC Identifier:	AU792U13A16857
Equipment Class:	Digital Transmission System
Notes:	MTDOT-915
FCC Rule Parts:	15C
Approval:	Single Modular
Frequency Range:	902.3-914.9
Output Watts:	0.0772

Output power is conducted. This transmitter is a hybrid per FCC 15.247(f) and FCC KDB 453039. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures.

Industry Canada Class B Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Reglement Canadien sur le matériel brouilleur.

This device complies with Industry Canada license-exempt RSS standard(s). The operation is permitted for the following two conditions:
1. The device may not cause interference.
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*
2. *L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

Industry Canada

Specification/ Cahier des Charges	Issue/ Édition	From Frequency/ De Fréquences	To Frequency/ Á Fréquences	Emmission Designation/ Designation D'émission	Minimum Power	Maximum Power
RSS247	1.0	902.3 MHz	914.9 MHz	GXDXX	77.2 mW	77.2 mW

Certification Number/No. de Certification	125A-0054
	Modular Approval/Approbation modulaire
Model/Modèle	MTDOT-915

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the Industry Canada issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements and procedures issued by Industry Canada. The equipment for which this certificate is issued shall not be manufactured, imported distributed, leased, offered for sale or sold unless the equipment complies with the applicable technical specifications and procedures issued by Industry Canada.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci- dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en 12pecificati par le bureau de délivrance d'Industrie Canada et 12pecifica des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le 12pecifi 12pecificati est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux 12pecificat d'Industrie Canada. Le matériel à l'égard duquel le 12pecifi 12pecificati est délivré ne doit pas être fabriqué, importé, distribué, loué, mis en vente ou vendu à moins d'être conforme aux 12pecificat et aux 12pecifications techniques applicable publiées par Industrie Canada.

REVISION HISTORY

Revision Date	Section	Revision
2021.05.14		Original Issue of DCM-001-A4
2021.06.28		Correct minor typos

Contact Information

(+1) 250-412-5679
info@volleyboast.com
www.volleyboast.com/
2000 North Loop West, Suite 120
Houston, TX 77018