WINDCRANE

Hardware Installation Guide

17 Jan 2023
Hardware Version 1.12 (2G/LTE-M)
for 12/24V

Note:
This document applies to WINDCRANE Mini 2G/LTE-M hardware versions 1.12r3 or later, and firmware version 1.12.088 or later. Other hardware/firmware versions may have differences in features and specifications. Refer to original installation manual supplied with the hardware for full details.

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1 Hardware Overview

WINDCRANE is a remote monitoring wind measurement and reporting system. It consists of a web data/management portal and mobile app, and a logger/telemetry device housed in a compact weatherproof enclosure that contains sensor interface circuitry, processor and cellular communications module.

The device uses GSM/LTE-M cellular networks to communicate with the WINDCRANE web portal, where system setup and data analysis/download is handled (see separate documentation for the portal and app). The GSM/LTE-M antenna is built into the enclosure. There are internal slots for microSD card and SIM cards which are typically supplied pre-installed.

Standard screw clamp terminals are used for power and input signals. Two cable glands are provided for sensor and power cabling. One gland is fitted with a sealing plug in case only one gland is used.

1.1 Enclosure

The enclosure is a weatherproof box with latching hinged lid designed to meet IP67 rating. It is supplied fitted with 2 IP68 metal cable glands for power and sensor cables. If one gland is unused, it must be sealed using the supplied blanking plug.

The enclosure should only be opened in dry, clean conditions. It is generally only necessary to open the enclosure during installation to complete the wiring, or to change the SIM card or update firmware.

1.2 Power

WINDCRANE requires 12 or 24 VDC +/-25% from a regulated DC supply rated for at least 10 W, or from a 12 or 24 V battery system. The average consumption is very low, but during GSM/LTE transmit the consumption peaks can be higher. Also allow power for accessories and sensors (AUX+ output).

1.2.1 Permanent device installation

The unit is supplied with a cable terminated with a M12 connector for fast disconnection from the power supply. If supplied cable is not used and the unit is permanently wired to the vehicle, a fuse rated ***at 500mA*** should be used in series of the positive supply (for example Littelfuse 218.500MXP) . In addition to a protection fuse, means to be able to disconnect the power from the unit using a ‘all poles’ switch / circuit breaker or cable plug. Any device used as the disconnection device must be suitable rated for the voltage and power. A switch must be approved to ***IEC 60947-3***; a circuit breaker must be approved to ***IEC 60947-2***.

Any external cables should have a temperature rating of +60°C

The protection of the equipment may be impaired if the equipment is not used as specified.

1.3 Inputs

The WINDCRANE logger is typically used with a single wind speed sensor but provides inputs for up to 4 digital pulse signals and up to 6 analogue signals.

Inputs A1-A4 are pulse frequency counter inputs for anemometers.

Inputs B1-B2 are isolated pulse inputs for 12-24 V anemometer pulse signals, and internally drive the A1-A2 inputs respectively.

Input channels D1-D3 are sampled from on-board sensors. D1 provides barometric pressure, D2 provides internal temperature, and D3 provides internal relative humidity.

Input channel D4 is a resetting counter that is triggered by the A4 input. The count is reported, and the counter is reset at the end of each data interval.

Inputs D5-D10 are general-purpose analogue inputs and can be configured for 0-3.3V, 0-10V or 0-20mA (4-20mA) signals.

Input channel D11 samples the supply voltage at the PWR+ terminal.

1.4 Antenna

WINDCRANE has an internal multi-band GSM/LTE antenna built into the front/lid of the enclosure. This gives good performance for most areas with cellular network coverage.

Take care not to obstruct the central part of the front of the enclosure (under the WINDCRANE logo) with metallic objects and do not mount the WINDCRANE in a metal cabinet, otherwise the cellular signal may be affected.

Antenna area marked in red must not be obstructed

1.5 Status Indicator LED

The WINDCRANE circuit board includes a green activity/status LED which indicates microSD card access, logging activity and communications status. This is only visible with the enclosure lid open. However, there is provision for adding an externally visible LED via PCB solder pads.

Activity LED Indication	**Meaning**
Rapid flashing at power up	SD card missing or unreadable
Single short flash every 1 or 3 secs	Normal logging/sampling, data transmit OK
Double short flash every 1 or 3 secs	Normal logging, transmit failed at last attempt
On solid for approx 10 secs during comms	Data transmit completed OK
Flashing for approx 10 secs during comms	Data transmit failed (possible network/SIM problem)
On solid for more than 10 secs	Data bulk upload in progress. Do not switch off.
On solid at power up	Firmware update in progress. Do not switch off.

1.6 Micro SIM Card

The microSIM card provides cellular network access, and slides into a socket next to the antenna connector. The SIM orientation is printed onto the board next to the SIM socket. To insert a SIM, hold the SIM at the end opposite the cut off corner, with the gold-coloured contacts facing down, and gently slide the SIM into the socket and under the metal top until it stops.

If you use your own SIM, its APN parameters must be specified in the configuration file on the microSD card.

1.7 Micro SD Card

The microSD card is used for initial configuration, firmware updates, and data log files. The card socket is a push-to-eject type. To insert the card, simply slide it into the socket, with contacts facing down, until it latches into place. To remove the card, push it into to the socket slightly to unlatch it, then pull it all the way out. Be careful not to drop the card or get cards mixed up.

The microSD card holds backup log files and the SIM configuration file. See the reference section for SIM configuration details.

WINDCRANE is compatible with standard microSD cards up to 2GB capacity, formatted as FAT or FAT32. Do not use 4GB or larger SDHC cards.

1.8 Input Port Mode Jumpers

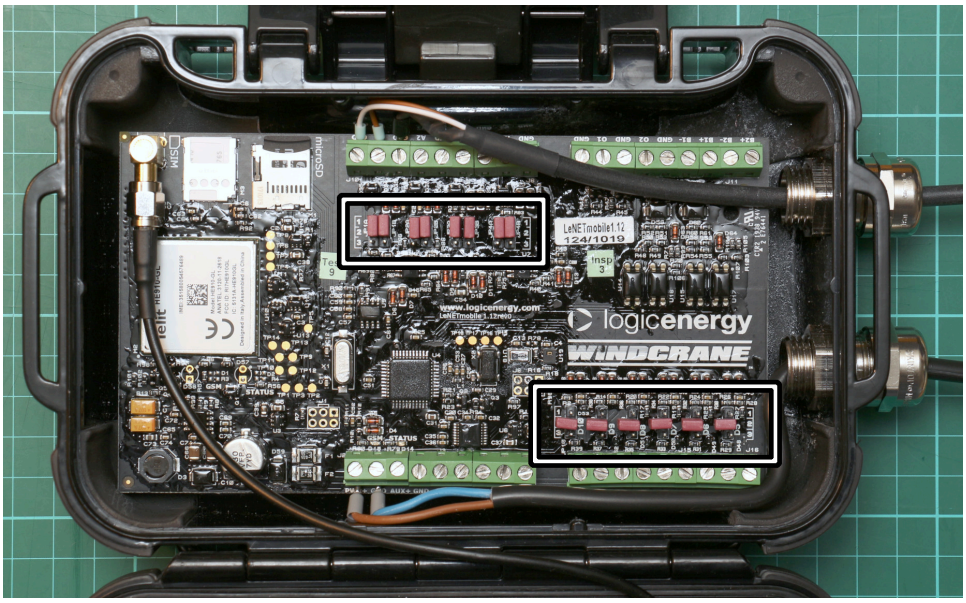
Input port jumpers are used to select the operating mode for each input by shorting together pairs of pins on the circuit board. There is a set of jumpers for each input, located near the respective input terminal. The jumpers are normally pre-set to the appropriate positions for the supplied or specified sensors.

Always power off the device before changing jumpers. Use fingers or needle nose pliers to lift off and reposition the plastic jumper caps.

Do not lose or discard any jumper caps. Unused jumpers can be “parked” by fitting them on to one pin only instead of bridging two pins.

Default jumper settings are shown in the table and photo below.

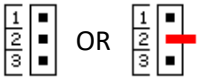
A1 – A4 anemometer inputs	Position 1-2 (Volt-free contact)
D5 – D6 wind vane inputs	Not fitted, or “parked” on single pin (0 – 3.3 V)
D7-D10 analogue inputs	Not fitted, or “parked” on single pin (0 – 3.3 V)



Input mode configuration jumper locations and default positions

1.8.1 Input Mode Jumper Positions

The table below lists the input mode jumper positions for the supported signal types and ranges.

Input Port		Mode	Jumper Position
Pulse Inputs	**A1 – A4** Anemometers or Meters / Pulses	Volt-Free (Dry Contact) Pulse (Default position)	
		Low AC (sine wave) frequency *	
Analogue Inputs	**D5 - D10**	0 – 3.3 V DC (Default position)	
		D5-D8: 0 – 10 V DC	
		D9-D10: 0 – 3.3 VDC with 10k pullup to SPW (3.3 V sensor supply) **	
		0 – 20 mA (or 4 – 20 mA)	

2 Installation

2.1 Mounting

For mobile or crawler cranes, WINDCRANE may be mounted at the jib end close to the sensor position, or elsewhere on the crane that allows cabling to the sensor and a power source.

Find a suitable mounting position that is protected against impacts and will not obstruct the operation of or access to other equipment. Orient the enclosure with glands vertically downwards if possible, and with enough space to open the enclosure lid for access to the wiring.

The WINDCRANE may be mounted to a structural member or plate using stainless steel or plastic straps through the loops/slots in the enclosure, or in a suitable cradle (not supplied). This prevents access into the enclosure, so complete any wiring first.

Take care to not obstruct the front of the enclosure under the WINDCRANE logo, as the antenna is located inside the lid. See Section 1.4 (page 4) for details.

Ensure the cable glands are tightened onto the cables after wiring. Check the lid sealing gasket is in place and not damaged, before closing the lid with the “claw” latch.

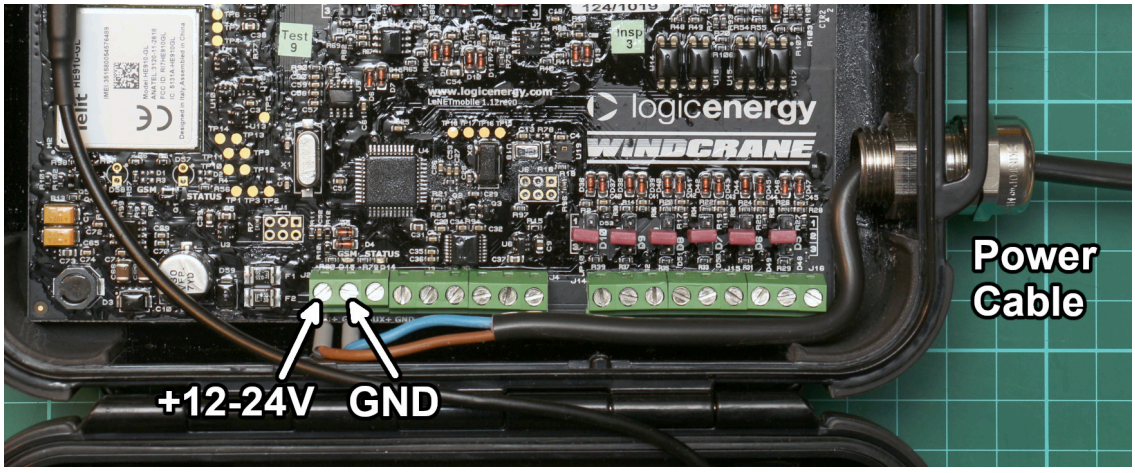
2.2 Power Wiring

For mobile or crawler cranes, the WINDCRANE should be powered from a 12-24 VDC auxiliary circuit that can provide power while the crane is operating or erected, or permanent power via a dedicated switch/breaker. The typical consumption is low enough that the WINDCRANE can be left running continuously while the crane is on site.

NOTE: The supply circuit must be fused for safety with a 500 mA T (time-delay / slow-blow) fuse.

Run a supply cable of at least 0.34 mm^2 (22 AWG) through the gland nearest the enclosure hinge and to the supply terminals and wire up as follows:

Supply negative / 0 V	GND terminal (next to PWR+ terminal)
Supply positive / 12 - 24V	PWR+ terminal

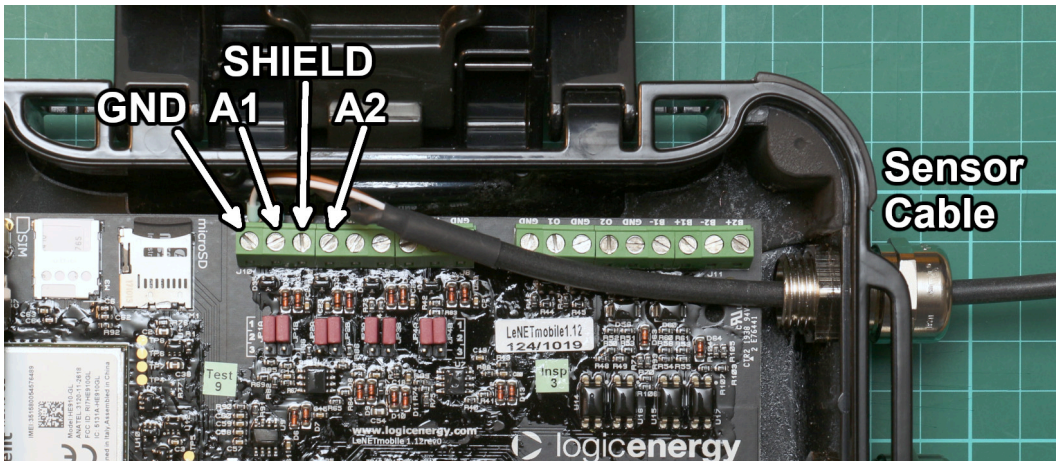


Typical power supply wiring

2.3 Sensor Wiring

Sensor wiring depends on the specific sensors being used. For a single anemometer with a volt-free contact type output (e.g. reed switch sensor), wire as follows:

Sensor return / common / negative	GND terminal (next to A1 terminal)
Sensor output signal	A1 terminal (or A2 for secondary sensor)
Cable shield / screen	GND terminal (any adjacent GND)



Typical wiring for reed switch type sensor(s)

For two sensors, connect the secondary sensor signal to A2 terminal. Connect the common/ground and cable shield to adjacent GND terminals.

For switch type sensors (reed switch or open collector NPN), the input mode jumpers must be set to the “Volt-Free Contact” position.

Some sensors have a low-voltage AC sine wave output. These are wired in the same way as above, but the corresponding input mode jumpers must be set to the “Low-voltage AC Sine Wave” mode.

Refer to Section 1.8.1 on page 6 for jumper positions.

3 Specifications

3.1 Power Supply

Supply voltage range	12 - 24 VDC ±25% Input protection by TVS diodes and resettable fuses.
Power consumption	5 mA at 24 V average typical (depends on data amounts and cellular network conditions, excluding AUX+)

3.2 Auxiliary Supply Outputs

Sensor excitation supply (SPW terminals)	3.3 VDC, max 20 mA total load
Aux supply output	350 mA max load, supplied from PWR+ supply terminal via resettable fuse.

3.3 Input Ports

3.3.1 A1-A4 Anemometer Inputs

Volt-free contact input mode (jumpers in position 1-2)

Maximum open-circuit voltage	3.3 V (from WINDCRANE via 10k Ohm pull-up resistor)
Maximum closed-circuit current to GND	500 uA
Maximum closed-circuit voltage	1.0 V
Measurable frequency range	1 Hz to 3 kHz (minimum 100 us pulse width)

Low-voltage AC Sine Wave input mode (jumpers in position 2-3)

AC voltage range (symmetrical about GND)	100 mV to 12 V (peak) sine wave
Measurable frequency range	1 Hz to 200 Hz

3.3.2 B1-B2 Anemometer Inputs

Opto-isolated passive pulse inputs, which are internally mapped to the A1-A2 anemometer inputs respectively. These inputs can be driven from a digital pulse output sensor or PLC digital output.

ON input voltage (between B1+ and B1-)	8 V (1.25 mA min) to 32 V (5.5 mA max)
OFF input voltage (between B1+ and B1-)	0 V to 5 V (0.8 mA max)
Isolation voltage (to GND terminals)	300 V peak
Measurable frequency range	1 Hz to 3 kHz (minimum 100 us pulse width)

3.3.3 D5-D6 Wind Vane Inputs

2 inputs for potentiometer wind vanes. Inputs are sampled at 1 Hz. Data is reported as unit vector average over the preceding data interval, in degrees heading (0 to 359.9). Input signal configurable as:

0 to 3.3 V mode (using SPW sensor power)	Mode jumper not fitted, or “parked” on single pin
0 to 10 V mode (15 k Ohm input resistance)	Mode jumper in position 1-2
0 to 20 mA (165 Ohm burden resistance)	Mode jumper in position 2-3

3.3.4 D7-D8 Analogue Inputs

2 general-purpose analogue inputs. Inputs are sampled at 1 Hz. Data is reported as linear average of samples over the preceding data interval.

0 to 3.3 V mode (high impedance input)	Mode jumper not fitted, or “parked” on single pin
0 to 10 V mode (15 k Ohm input resistance)	Mode jumper in position 1-2
0 to 20 mA (165 Ohm burden resistance)	Mode jumper in position 2-3

3.3.5 D9-D10 Analogue Inputs

2 general-purpose analogue inputs with optional 10k Ohm bridge resistor for thermistor or volt-free contact. Inputs are sampled at 1 Hz. Data is reported as linear average of samples over the preceding data interval.

0 to 3.3 V mode (high impedance input)	Mode jumper not fitted, or “parked” on single pin
0 to 3.3 V range, with 10k Ohm pullup to SPW (3.3 V) to suit 10k NTC thermistor, or volt-free status contact.	Mode jumper in position 1-2
0 to 20 mA (165 Ohm burden resistance)	Mode jumper in position 2-3

3.3.6 D1 Barometric Pressure Sensor

The barometric pressure sensor is mounted internally on the WINDCRANE circuit board. The enclosure has a waterproof pressure vent to equalise atmospheric pressure. However, there may be a small pressure differential inside the enclosure. The pressure is sampled at 1 Hz and reported as the average over the preceding data interval.

Measurement range	500 hPa to 1100 hPa (500 to 1100 mBar)
Pressure resolution	1 Pa (0.01 mB)
Accuracy	±4 hPa (over -10 to +50 °C)

3.3.7 D2 Temperature and D3 Humidity

The temperature and humidity sensors are mounted internally on the circuit board. They are intended only for information and will not accurately reflect ambient atmospheric conditions due to the sealed enclosure.

The temperature and humidity are sampled at 1 Hz and reported as the average over the preceding data interval.

Temperature measurement range	-40°C to +85°C (-30°C to +60°C operating range)
Temperature resolution	0.1°C
Temperature accuracy	±1°C
Humidity measurement range	0% to 100% RH non-condensing
Humidity resolution	1% RH
Humidity accuracy	±3% RH (over 20% to 80% range)

3.3.8 D11 Supply Voltage Monitor

The D11 input channel is connected to the power supply input terminal PWR+. It is sampled at 1 Hz and reported as the average over the preceding data interval.

Voltage measurement range	0 V to 33 V (9 V to 30 V operating range)
Voltage accuracy	Approx 2% of full scale

3.4 Cellular Connectivity

Integrated certified cellular modem module provides global 2G/GSM and 4G/LTE-M (Cat-M) connectivity.

4G / LTE Cat-M Bands (MHz)	FDD B1(2100), B2(1900), B3(1800), B4(AWS1700), B5(850), B8(900), B12(700), B13(700), B18(800), B19(800), B20(800), B26(850), B28(700)
2G / GSM / GPRS Bands (MHz)	B2(PCS1900), B3(DCS1800), B5(GSM850), B8(GSM900)
Regulatory approvals	PTCRB, GCF, RED, FCC/IC, RCM FCC ID: RI7ME910C1WW IC: 5131A-ME910C1WW
Network approvals	Jate, Telec, CCC, AT&T, Verizon, NTT DoCoMo, Deutsche Telekom, Anatel, Telstra, Ifetel, Rogers, Telus, US Cellular
Max transmit power	LTE-M/FDD: 23 dBm (200 mW) GSM/GPRS/EDGE: 33 dBm (2 W)

3.5 Data Handling

Anemometer input sampling	A1-A4 inputs act as pulse frequency counters with 1 sec gate/sampling period. Data reported as max gust, average speed, and standard deviation of speed. A4 pulse count is reported as channel D4. Counter is reset after end of each data interval.
Analogue input sampling	Analogue inputs sampled at 1Hz. Data reported as linear average of samples over data interval (D5/D6 wind vane inputs reported as unit vector average).
Data interval/reporting	Data interval is typically 10 minutes, synchronised to midnight UTC (data points are calculated/reported at 00:00, 00:10 etc. Data sets are automatically transmitted to WINDCRANE data portal at end of each interval and logged to internal memory card as local backup.
WINDCRANE logger configuration	Cellular network configuration via SD card setup file. Data/sensor setup via WINDCRANE web portal.

3.6 Mechanical

Enclosure dimensions	215 x 130 x 65 mm (HxWxD), excl cables
Weight	650 g (excluding cables)
Enclosure materials/ratings	PC/ABS shell with TPE bumpers and gasket 304 Stainless steel fixings Designed to meet IP67 rating, -29°C to +60°C operating
Cable entry glands	2no M16 nickel-plated brass cable glands, IP68, 4.5 mm to 10.0 mm cable diameter Designed to operate with typical anemometers
Environmental Operating temperature Equipment environment Maximum operating relative humidity Designed to work at altitudes up to Designed for pollution degree Enclosure	All components RoHS compliant -29°C to +60°C Wet environment Outside enclosure 100% Inside enclosure 95% non-condensing 11,700 meters 2 Designed to meet IP67 rating

3.7 Regulatory Approvals and User Information

This equipment complies with FCC 47 CFR Parts 2, 15B, 22, 24, 27
FCC ID: 2A9L4WINDCRANE
Contains FCC ID: RI7ME910C1WW (Cellular modem module)

This equipment complies with:
EN 61326-1: 2021
ETSI EN 301 489-1: V2.2.3 (2019-11), EN 301 489-52 V1.2.1 (2021-11), EN 301 511: V12.5.1 (2017-03), EN 301 908-1: V15.1.1 (2021-09)
ICES-003: Issue 7: 2020
ISED RSS-132: Issue 3 (2013-01), RSS-133: Issue 6 (2013-01) + A1 (2018-01), RSS-GEN: Issue 3 (2015-07), RSS-130: Issue 2 (2019-02), RSS-139: Issue 3 (2015-07)

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.

Modification statement

Logic Energy Ltd has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

FCC Part 15 Class A Digital Device

NOTE: 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.

Exposure to radio frequency energy:

The radiated output power of this device meets the limits of FCC/IC radio frequency exposure limits. This device should be operated with a minimum separation distance of 50 cm (20 inches) between the equipment and a person's body.