# **1x Hardware Manual**

Release 4.8/1.0

Embention Sistemas Inteligentes, S.A.

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# Scope of Changes

- Version 1.0
  - Added:
    - Pegasus Serie servo integration example
    - Pegasus CAN servo integration example
  - Changed:
    - Hours of operation for Target Drone/Loitering Munition Operation in Limited Operation section

# Introduction



Veronte Autopilot 1x

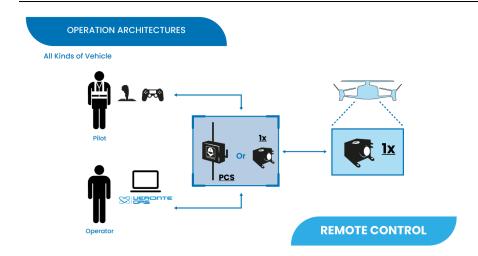
**Veronte Autopilot 1x** is a sensor-redundant control system designed to control any autonomous vehicle, either aircraft such as multirotors, helicopters, planes, VTOL, blimps, etc., as well as ground vehicles, surface vehicles or many others.

**Veronte Autopilot 1x** hardware embeds a redundant state-of-the-art suite of sensors, together with LOS and BLOS M2M datalink radio and a DAA module based on Remote ID or ADS-B, all with reduced size and weight.

Veronte Autopilot software tools are specifically designed for the operation and configuration of the Veronte Autopilot. Veronte Ops is the software employed to operate the autopilot from a user-configurable interface and 1x
PDI Builder permits configuring the autopilot and adapting it to the specific needs of the project.

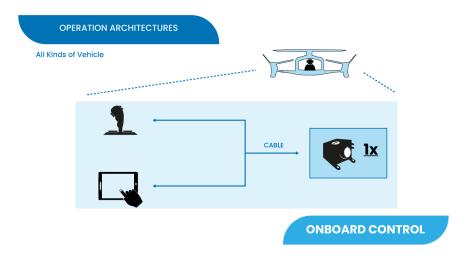
# Typical Drone Setup

**Veronte Autopilot** is compatible with both LOS and BLOS communications for the remote control of autonomous vehicles. Physical or virtual sticks can be used for taking manual or assisted manual control at any time during the operation.



# Typical eVTOL Setup

An onboard display and joystick interface are available for manned eVTOL and aerotaxi applications. Autonomous flight modes and fly-by-ware control can be configured according to the level of autonomy required.



# Main Features

- **Highly configurable**: Fully user-configurable; payload, vehicle layout, control phases, control channels, etc.
- **Custom routines**: User-selectable automatic actions, activated on system events or periodically.
  - Actions: Phase change, activate payload, move servo, go to, onboard log, parachute release, etc.
  - **Events**: Waypoint arrival, inside/outside polygon, alarm, variable range, button, etc.

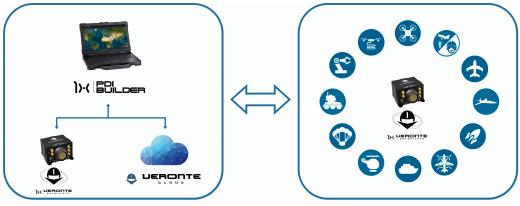
- **Telemetry & log**: Customizable telemetry and onboard log compatible with internal or external datalink modules, all with user-defined variables and recording frequency.
- **External sensor**: Support for external sensor connections: magnetometer, radar, LIDAR, RPM, temperature, fuel level, battery level, weather, etc.
- Payload & Peripheral: Transponder, secondary radios, satcom transceivers, camera gimbals, motor drivers, photo cameras, flares, parachute release systems, tracking antennas, pass through RS232, RS485 & CAN tunnel, etc.
- Redundant Configurations: Veronte Autopilot 4x is available for applications requiring redundancy and Veronte Autopilot DRx offers distributed redundancy architectures.

# Quick Start

This user manual covers the mechanical and electrical assembly.

The software user manual explains how to configure and use the **Veronte Autopilot 1x**.

**Veronte Autopilot 1x** is the main element in our Flight Control System for UAS.

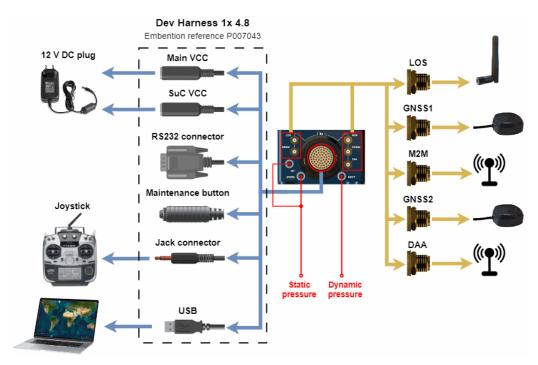




**Veronte Autopilot 1x** contains all electronics and sensors required to properly execute all the UAV functions. A Veronte-based FCS contains the following elements:

- A **Veronte Autopilot 1x** installed in a vehicle to control. This autopilot executes GNC algorithms in real time in order to accomplish the planned mission and handle the payload.
- **Veronte Ops** Software dedicated to mission planning, configuration and operation. It allows the user to monitor connected UAS in real time, to interact with them and to replay previous missions for post-flight analysis.
- An Autopilot 1x GND unit or PCS linked between Veronte Ops and Veronte Autopilot 1x. They support manual and arcade modes with conventional joysticks.

# **Basic Connection Diagram**



For further information on the Dev Harness 1x 4.8 connectors, refer to the Dev Harness 1x 4.8 - Hardware Installation section of the present manual.

# Warnings

- This user manual includes references to manuals for software applications. Select your software version to read them.
- Power out of range can cause irreversible damage to the system. Please read carefully the manual before powering the system.
- Each I/O pin withstands a maximum current of 1.65 mA. See pinout for more information.
- If the unit has an ADS-B, Remote ID and/or BLOS module activated, users must NOT power on a Veronte Autopilot 1x without a suitable antenna or 50 Ω load connected to the SSMA port.

#### **△** Caution

Do not connect this type of termination to the ports for GNSS signals, as it may damage the module.

### () Danger

Disobeying this warning may damage the Autopilot 1x unit.

# Limited Operation

Veronte Autopilot units are delivered with limited-operation installed and must be updated for enabling unlimited autonomous flight capabilities. **Operation limits** in Veronte Autopilot units can be **checked and unlocked in** Veronte Ops. For more information about this, see Platform license - Platform section of **Veronte Ops** user manual.

The different operating options available are explained below:

- **Non-Limited-Operation**: Allows fully autonomous operation with no time or distance limitation.
- Limited-Operation:
  - Allows fully autonomous flight performance in LOS (500 m) with no time limitations.
  - For BLOS operations (>500 m), there is a limitation of 30min autonomous flights. After 30min from leaving LOS (500m), only internal navigation is permited and the autopilot can not estimate its position nor fly autonomously. Past this time limit, no changes of navigation source are allowed.

## $\triangle$ Caution

External navigation methods such as VectorNav can no longer be used.

 Target Drone/Loitering Munition Operation: Allows fully autonomous flight performance with no time or distance limitation. This is restricted to 25h operation from the first startup. Once the operation time has expired the unit will not be able to restart.

If you have any questions regarding the operation capabilities and limitations please contact us at sales@embention.com.

# **Basic Connection for Operation**

The steps described below cover the basic connection of a **ground unit** necessary for operation:

1. Connect the GNSS antenna to the GNSS 1 port:



**Basic connection - Step 1** 

2. Connect the RF antenna to the LOS port:



**Basic connection - Step 2** 

3. Connect the **autopilot harness** and **power it** using the power supply:



**Basic connection - Step 3** 

4. Connect the **harness USB** to the computer and **configure Veronte Link** to detect the Autopilot 1x:

### i Note

For Veronte Link to detect a Veronte device, the corresponding port must be properly configured. For further information regarding Veronte Link connections, please refer to the Serial connection -Integration examples section of **Veronte Link** user manual.



**Basic connection - Step 4** 

# Technical

# Features

### Communications

- $^{\circ}$  2 x isolated CAN buses
- 1 x I2C bus
- 1 x USB port
- $\circ$  1 x RS 232 bus
- $^\circ$  1 x RS 485 full duplex bus
- $\circ$  1 x UART bus
- Over USB, RS 485 or RS 232 firmware update
- 1 x LOS module
- 1 x BLOS module

#### • Input / Output

- 16 x configurable input / output signals
- $^\circ$  5 x analog input signals 0 3.3 V
- $\circ$  1 x EQEP bus

#### • Power

- $^\circ\,$  6.5 36 V DC required for input power supply
- $^\circ$  1 x output power with 3.3 V, up to 100 mA
- $^\circ\,$  1 x output power with 5 V, up to 100 mA

#### Protection

- EMI shield
- $^\circ$  Against inrush current for connecting power supply

## (i) Note

The number of communication ports and signals can be increased with Veronte CEX or Veronte MEX.

# Variants

The Veronte Autopilot 1x has 3 variants:

- W/O DAA
- With Remote ID
- With ADS-B

## ADS-B module

Frequency band	1090 MHz			
Current consumption	Averaged 140 mA			
Sensitivity	-80 dBm			
RF output power	Configurable +30 dBm (1W), +27 dBm (0.5W), +24 dBm (0.25W)			
ESD protection	All lines protected			
MAVLink (baud)	115200 bps			
AERO (baud)	115200 bps (AT commands)			

# RemoteID module

Frequency	WiFi & Bluetooth bands	
Developed according to	RIN 2120-AL31 Remote identification of Unmanned Aircraft FAA Standard	
Parameters	Aircraft ID, position, altitude, and time mark	
Compatibility	FAA Remote ID Scanner App	

# Sensor Specifications

Accelerometers (3-axis each one)			
Specification	IMU 1	IMU 2	IMU 3
Range	16 g	24 g	8 g
Maximum shock	20,000 g for 0.2 ms	10,000 g/ ms	14,700 m/ sec <sup>2</sup>
Sensitivity	16,393 LSB/ (m/ sec <sup>2</sup> )	10,920 LSB/(m/ sec <sup>2</sup> )	26,756,268 LSB/(m/ sec <sup>2</sup> )
Update Time	1 ms		
Error	3 mg (RMS noise)	190 Z axis 160 X & Y axis µg/ Hz (noise density)	0.000167 X & Y axis 0.000243 Z axis (m/sec <sup>2</sup> / Hz) (noise density)
Offset	0 mg	± 20 mg	0.0196 m/ sec <sup>2</sup>

Gyroscopes (3-axis each one)					
Specification IMU 1 IMU 2 IMU 3					
Range					

Gyroscopes (3-axis each one)				
Specification	IMU 1	IMU 2	IMU 3	
	125 to 2,000 °/ sec	125 to 2,000 °/sec	2,000 °/ sec	
Sensitivity	228 to 14.2 LSB/°/ sec	262 to 16 LSB/ °/sec	655,360 to 10 LSB/ °/sec	
Update Time	1 ms			
RMS noise	0.075 °/ sec	0.1 °/ sec	0.152 °/ sec	
Offset	0 °/sec	±1°/ sec	0.14 X & Z axis 1.4 Y axis °/sec	

Magnetometers				
Specification	Magnetometer 0	Magnetometer 1	Magnetometer 2	
Range	4 G	8 G	11 G	
Sensitivity	6,842 to 1,711 LSB/G	4,096 LSB/G	0.13 mG	
Update Time	8.3 ms	12.5 ms		
RMS Noise		0.4 mG	0.3 mG	

Magnetometers			
Specification	Magnetometer Magnetom 0 1		Magnetometer 2
	3.2 X & Y axis 4.1 Z axis mG		
Offset	0 G	0 G	0 G

Static Pressure		
Specification	Sensor 1 (STATIC port)	Sensor 2 (INT port)
Range	1,000 - 120,000 Pa	30,000 - 120,000 Pa
Band Error	500 Pa	200 Pa
Resolution	1.2 to 6.5 Pa	0.5 Pa
Update Time	20 ms	31.3 ms
RMS Noise	6.5 Pa	0.35 Pa

<b>Dynamic Pressure Sensor</b>	
Specification Pitot	
Range	3 Pa (5 kt / 8 km/h sea level) to 6,900 Pa (206 kt / 382 km/h sea level)
Band Error	140 Pa

<b>Dynamic Pressure Sensor</b>	
Specification Pitot	
Resolution	25,500 Pa
Update Time	20 ms
Bias	±7 Pa

<b>GNSS Receivers</b>	
Specification	GNSS 1 & GNSS 2
Constellations	BeiDou, Galileo, GLONASS, GPS / QZSS
Concurrent GNSS	4
Bands	L2OF, L2C, E1 B/C, B2I, E5b, L1 C/A, L1OF, B1I
Position Accuracy RTK	0.01 m + 1 ppm CEP
Update Rate RTK	Up to 20 Hz
Anti-jamming	Active CW detection and removal, Onboard bandpass filter
Anti-spoofing	Advanced anti-spoofing algorithms

<b>GNSS Receivers</b>			
Specification	GNSS 1 & GNSS 2		
Advanced Functions	<ul> <li>Moving base</li> <li>GNSS-base</li> <li>estimation</li> </ul>	ed attitud	
Update Time	250 ms		
	Vertical 0.01 m		
Location Accuracy	Horizontal RTK	SBAS	1 m
		0.01 m	
Velocity Accuracy	0.05 m/s		

Temperature		
Device	Resolution	Bias
IMU 1	256 LSB/°C (16 bit)	15°C
IMU 2	8 LSB/°C	1°C
IMU 3	10 LSB/°C	5°C
MPU	-	15°C
Magnetometer 0	8 LSB/°C	-
Magnetometer 1	1.25 LSB/°C	-

Temperature		
Device	Resolution	Bias
Static pressure 1	0.01 °C	-
Static pressure 2	0.01 °C	-

# (i) Note

An external pressure sensor is required to measure below -20 °C.

# **Embedded Communications**

# LOS module

RF baudrate	115200 baud
Transmission power	19 dBm
Receiver sensitivity	-103 dBm
Frequency band	ISM 2.4 GHz
LOS range	Depends on the antenna employed and on the user's setup

# (i) Note

External modules can be used.

# **BLOS** module

RF baudrate	115200 baud	
Receiver sensitivity	-111 dBm	
Frequency band	800 MHz, 850 MHz, 900 MHz, 1.8 GHz, 1.9 GHz, 2.1 GHz	
Network	UMTS/HSPA+, GSM/(E)GPRS	
	Included	
eSIM	<b>Note</b> Its activation is optional	

# (i) Note

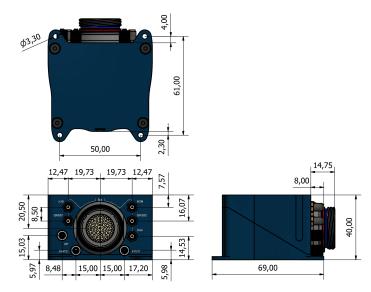
External BLOS modules, such as satellites, can be used.

# Mechanical and Electrical Specifications

Variable	Value
Weight	W/O DAA variant: 198 g With Remote ID or ADS-B: 210 g With Damping System: + 60 g
Temperature range	-40 to 65 <sup>o</sup> C
Protection rating	IP67

Variable	Value
Maximum acceleration	32 g
Voltage input	6.5 V to 36 V
Power consumption	2.2 W in maintenance mode
	2.2 W in normal mode with CPU at 98 %, internal LOS module off and BLOS module off
	2.6 W in normal mode with CPU at 98 %, internal LOS module on and BLOS module on

# Dimensions

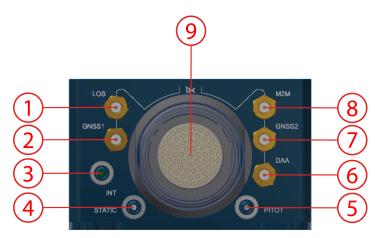


### Veronte Autopilot 1x dimensions (mm)

**M3** screws are recommended for mounting. In saline environments such as coastal and oceanic, the screw material must be stainless steel.

# Interfaces

# Connector Layout



#### Connectors

Index	Connector	
1	LOS SSMA connector	
2	GNSS1 SSMA connector	
3	Static pressure port (Int. D. 2.5 mm x Out. D. 4 mm) for static pressure sensor 2	
4	Static pressure port (Int. D. 2.5 mm x Out. D. 4 mm) for static pressure sensor 1	
5	Dynamic pressure port (Int. D. 2.5 mm x Out. D. 4 mm)	
6	ADS-B or remote ID SSMA connector Warning When using ADS-B or remote ID, there must be an adequate antenna or load connection to the DAA SMA.	

Index	Connector		
7	GNSS2 SSMA connector		
	M2M SSMA connector		
8	Warning If the BLOS module is enabled, a suitable antenna must be connected to this SSMA port. The 4G Antenna with the Embention reference P000112 is recommended.		
9	68-pin connector		

Both static pressure ports must be used for sensor redundancy (Y tubing connection is strongly recommended).

### **△** Warning

The static pressure port 4 is always used by **Autopilot 1x** to calculate speed (using the difference of pressure between ports 4 and 5), no matter which sensor is selected in configuration.

### Mating Connectors

Index	Autopilot 1x Connector	Mating Connector
1	RF antenna (SSMA Jack Female)	SSMA male Plug, low-loss cable is recommended.
2, 7		

Index	Autopilot 1x Connector	Mating Connector
	GNSS antenna (SSMA Jack Female)	<ul> <li>SSMA male Plug, low-loss</li> <li>cable is recommended.</li> <li>Active Antenna GNSS: <ul> <li>Gain min 15dB (to</li> <li>compensate signal</li> <li>loss in RF Cable)</li> </ul> </li> <li>Gain max 50 dB</li> <li>Maximum noise <ul> <li>figure 1.5dB</li> <li>Power supply 3.3V</li> <li>Max current 20 mA</li> </ul> </li> </ul>
8	M2M antenna (SSMA Jack Female)	SSMA male Plug, low-loss cable is recommended.
6	ADS-B or remote ID (SSMA Jack Female)	SSMA male Plug, low-loss cable is recommended.
9	Connector HEW.LM. 368.XLNP	Mating connector: FGW.LM.368.XLCT (Embention reference <b>P005550</b> ) Mating harnesses available on demand: • Dev Harness 1x 4.8 (Embention reference <b>P007043</b> )

Index	Autopilot 1x Connector	Mating Connector
		Veronte Harness Blue
		68P (Embention
		reference P001114)
		• HIL Harness 1x 4.8
		(Embention
		reference <b>P007740</b> )

# Hardware Installation

# Mechanical

**Veronte Autopilot 1x** is manufactured using an anodized aluminium enclosure with enhanced EMI shielding and IP protection. A high reliability connector is also provided in this version. The total weight of W/O DAA variant is 198 g and it is 210 g for versions with Remote ID or ADS-B.

### **Pressure lines**

**Veronte Autopilot 1x** has three pressure input lines, two for static pressure to determine the absolute pressure and one for pitot in order to determine the dynamic pressure.

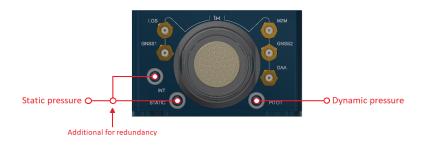
For the fittings it is recommended to use a polyurethane tube of 2.5 mm inner diameter and 4 mm outer diameter.

#### Pressure Intake

- Pressure intakes must be located in order to prevent clogging.
- Never install pressure intakes on the propeller flow.
- Design pressure tubing path in order to avoid tube constriction.
- Static Pressure
  - It is not recommended to use inside fuselage pressure if it is not properly vented.

#### • Pitot Tube

- Pitot tube must be installed facing the airflow.
- It is recommended to install it near the aircraft's x axis in order to avoid false measures during manoeuvres.
- For low-speed aircraft it is recommended at least 6.3mm tubes to prevent any rain obstruction.



# (i) Note

In case of not using an input air connector, it is recommended to remove its corresponding nut. Vibrations may move and damage intake connectors with a nut that is not fixed with a tube.

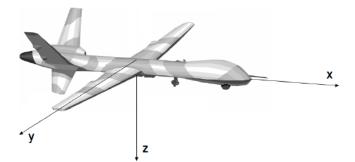
## Location

The location of **Veronte Autopilot 1x** has no restrictions. You only need to configure its relative position with respect to the centre of mass of the aircraft and the GNSS antenna. The configuration of the location of **Veronte Autopilot 1x** can be easily configured using **1x** PDI Builder.

# Orientation

The orientation of **Veronte Autopilot 1x** has no restrictions either. You only need to configure axes with respect to the aircraft body axes by means of a rotation matrix or a set of correspondences between axes. The configuration of the orientation can be easily configured using **1x PDI Builder**.

Axes are printed on the **Autopilot 1x** box. Aircraft coordinates are defined by the standard aeronautical conventions (see image below).



## Aircraft Coordinates (Standard Aeronautical Convention)

## Vibration Isolation

Although **Veronte Autopilot 1x** rejects noise and high-frequency vibration modes with electronic filters, there may be situations where external isolation is needed.

**Autopilot 1x** can be mounted in different ways in order to reject the airframe vibration, but it is recommend to use the Damping System designed for that porpuse. It covers a wide frequency range of different aircraft types.

### (i) Note

The user should take into account that wiring should be loose enough so that vibrations are not transmitted to **Autopilot 1x**.

Damping System

Embention offers the **Damping System** as a solution to isolate **Veronte Autopilot 1x** from vibrations.

### Important

Only effective with **Autopilot 1x** in horizontal position.

This damping system weighs 60 g.

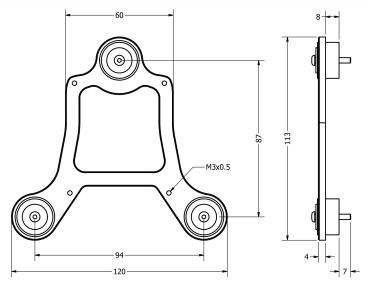


#### **Damping System**

### **△** Warning

The **Damping System** is designed for hardware version **4.8** of **Autopilot 1x**.

### Dimensions

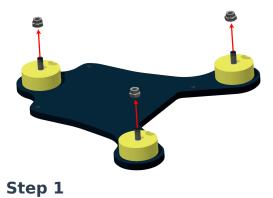


Damping system dimensions (mm)

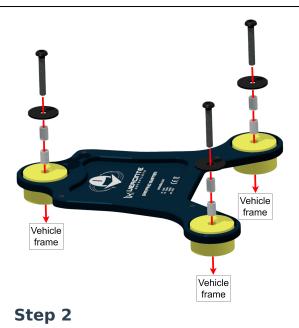
### Assembly steps

To assembly the Damping System into a vehicle with an **Autopilot 1x**, read the following steps.

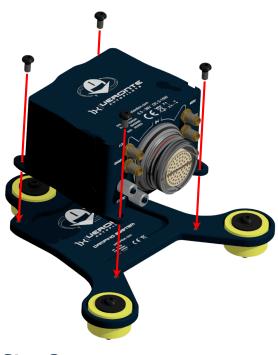
1. Remove the three nuts located under the platform.



2. Screw the platform on the aircraft frame. The included screws have M3.

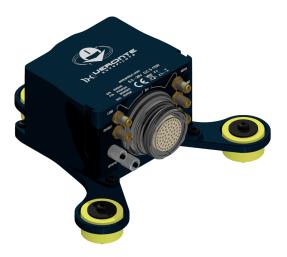


3. Screw the **Autopilot 1x** on the **Damping system**.





#### 1x Hardware Manual

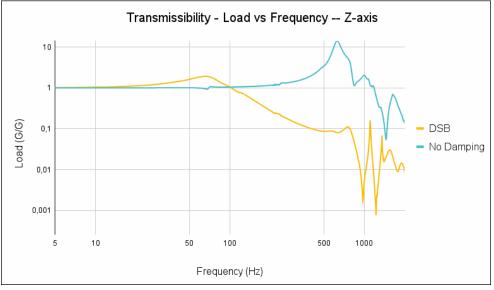


#### Result

### Vibration analysis

### • Transmissibility (Z-axis)

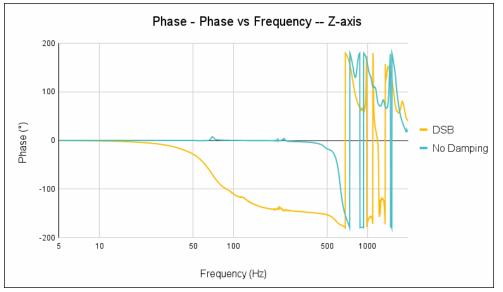
Transmissibility graph, analysis of vibrations received by **Autopilot 1x**, with and without Damping System:



Transmissibility graph

#### • Phase (Z-axis)

Phase graph, analysis of whether vibrations measured by **Autopilot 1x** are in phase or not, with and without Damping System:





# Antenna Integration

The system uses different kinds of antennas to operate that must be installed on the airframe. Here you can find some advice for obtaining the best performance and for avoiding antenna interferences.

#### Antenna Installation

- Maximize separation between antennas as much as possible.
- Keep them far away from alternators or other interference generators.
- Always isolate antenna ground panel from the aircraft structure.
- $^{\circ}\,$  Make sure the antenna is securely mounted.
- Always use high-quality RF wires minimising the wire length.
- $\circ\,$  Always follow the antenna manufacturer manual.
- SSMA connections shall be tightened applying 1Nm of torque
- For all-weather aircraft, insert SSMA lightning protectors.

#### • GNSS Antenna

- Antenna top side must point the sky.
- $\circ$  Install it on a top surface with direct sky view.
- $^\circ\,$  Never place metallic / carbon parts or wires above the antenna.
- $\circ\,$  It is recommended to install it on a small ground plane.
- $^{\circ}$  For all-weather aircraft, insert SSMA lightning protectors.

#### Recommended specifications for GNSS antennas

Specifications	Range	
Antenna frequency L1	1561.098 MHz to 1602 MHz	
Antenna frequency L2	1207.14 MHz to 1246 MHz	
Amplifier gain	17 dB to 35 dB	
	40 dB	
Out-of-band rejection	Note Higher values are preferable. 30 dB is considered the minimum acceptable value.	
Polarization	RHCP (Right-Hand Circular Polarization)	
Minimum supply voltage	2.7 V to 3.3 V	
Maximum supply current	50 mA	

## Electrical

Power

**Veronte Autopilot 1x** can use unregulated DC **(6.5V to 36V)**. Pins used for power and ground are the same for both Ground and Air configurations.

LiPo batteries between 2S and 8S can be used without regulation needs. Remaining battery level can be controlled by the internal voltage sensor and by configuring the voltage warnings by software.

For higher voltage installations, voltage regulators must be used. For dimensioning voltage regulators take into account that a blocked servo can activate regulator thermal protection.

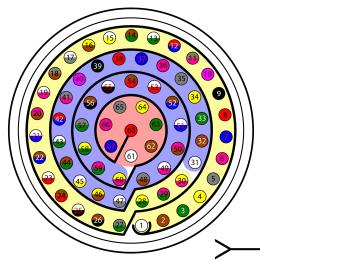
## **△** Caution

**Caution!!** Power **Veronte Autopilot 1x** out of range can cause irreversible damage to the system. Please read carefully the manual before powering the system.

**Autopilot 1x** and servos can be powered by the same or different batteries. In case of having more than one battery on the system, a single point ground union is needed to ensure a good performance. The ground signal should be isolated from other noisy ground references (e.g. engines). If all grounds need to be connected, the connection should be made on the negative pole of the battery.

It is recommendable to use independent switches for autopilot and motor/ actuators. During the system initialization, the PWM signal will be set to low level (0V), please make sure that actuators/motor connected support this behaviour before installing a single switch for the whole system.

### Pinout



**Connector for Autopilot 1x - HEW.LM.368.XLNP (frontal view)** 

## **∆** Warning

Check the pin number before connecting. The color code is repeated 3 times due to the amount of pins. First section (yellow) corresponds to pins 1-30, the second section (blue) to pins 31-60 and the third one (red) to pins 61-68. Pin number increases counterclockwise following the black line of the picture above.

PIN	Signal	Туре	Description	
1	I/O 0			
2	I/O 1	I/O	Pins for PWM or digital I/ O signals (0-3.3V).	
3	I/O 2		Protected against ESD	
4	I/O 3		I/O	and short circuit. Warning
5	I/O 4		Each pin withstands	
6	I/O 5		a maximum current of 1.65 mA.	
7	I/O 6			

PIN	Signal	Туре	Description
8	I/O 7		
9	GND	GROUND	Ground signal for actuators 1-8.
10	I/O 8		
11	I/O 9		Pins for PWM or digital I/
12	I/O 10		O signals (0-3.3V). Protected against ESD
13	I/O 11	1/0	and short circuit.
14	I/O 12	I/O	Warning Each pin withstands
15	I/O 13		a maximum current of 1.65 mA.
16	I/O 14		01 1.05 MA.
17	I/O 15		
18	GND	GROUND	Ground signal for actuators 9-16.
19	RS232 TX	Output	RS 232 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit.
20	RS232 RX	Input	RS 232 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold). Protected against ESD and short circuit.

PIN	Signal	Туре	Description
21	GND	GROUND	Ground signal for buses.
22	ANALOG_3	Input	Input 0-3.3V. Protected against ESD and short circuit.
23	ANALOG_4	Input	Input 0-3.3V. Protected against ESD and short circuit.
24	GND	GROUND	Ground signal for buses.
25	CANA_P	I/O	CANbus interface, up to 1Mbps. Protected against ESD.
26	CANA_N	I/O	Twisted pair with a 120 ohms Zo recommended. Protected against ESD.
27	4XV_WD	I/O	Reserved. Do not connect.
28	CANB_P	I/O	CANbus interface. It supports data rates up to 1 Mbps. Protected against ESD.
29	CANB_N	I/O	Twisted pair with a 120 ohms Zo recommended. Protected against ESD.
30	GND	GROUND	Ground signal for buses.
31	I2C_CLK	Output	

PIN	Signal	Туре	Description
			Clock line for I2C bus (0.3V to 3.3V). Protected against ESD and short circuit.
32	I2C_DATA	I/O	Data line for I2C bus (0.3V to 3.3V). Protected against ESD and short circuit.
33	GND	GROUND	Ground for 3.3V power supply.
34	3.3V	Power	3.3V - 100mA power supply. Protected against ESD short circuit with 100mA resettable fuse.
35	GND	GROUND	Ground for 5V power supply.
36	5V	Power	5V - 100mA power supply. Protected against ESD short circuit with 100mA resettable fuse.
37	GND	GROUND	Ground for analog signals.
38	ANALOG_0	Input	Analog input 0-3.3V. Protected against ESD and short circuit.

PIN	Signal	Туре	Description
39	ANALOG_1	Input	Analog input 0-3.3V. Protected against ESD and short circuit.
40	ANALOG_2	Input	Analog input 0-3.3V. Protected against ESD and short circuit.
41	4XV_A	I/O	Reserved. Do not connect.
42	FTS1_OUT	Output	Deadman signal from comicro. Protected against ESD and short circuit.
43	FTS2_OUT	Output	!SystemOK Bit. Protected against ESD and short circuit.
44	4XV_B	I/O	Reserved. Do not connect.
45	UARTA_TX	Input	Microcontroller UART.
46	UARTA_TX	Output	Microcontroller UART.
47	GND	GROUND	Ground signal comicro power supply.
48	V_ARB_VCC	POWER	Veronte comicro power (6.5V to 36V). Protected against ESD and reverse polarity.

PIN	Signal	Туре	Description
49	FTS3_OUT_MPU	Output	MPU alive voting signal, to use with 4xVeronte. It is a Square Wave at [100,125] Hz. Protected against ESD and short circuit.
50	OUT_RS485_P	Output	Non-inverted output from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit.
51	OUT_RS485_N	Output	Inverted output from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit.
52	IN_RS485_N	Input	Inverted input from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit.
53	IN_RS485_P	Input	Non-inverted input from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit.

PIN	Signal	Туре	Description
54	OUT_GND	GND	Ground for RS-485 bus. Warning This is not a common GND pin.
55	EQEP_A	I/O	DIGITAL output / DIGITAL input / Encoder quadrature input A (0-3.3V). Protected against ESD and short circuit.
56	EQEP_B	I/O	DIGITAL output / DIGITAL input / Encoder quadrature input A (0-3.3V). Protected against ESD and short circuit. <b>Warning</b> Only use it as digital I/O with Veronte units of Hardware version 4.5 or lower.
57	EQEP_S	I/O	DIGITAL output / DIGITAL input / Encoder quadrature input A (0-3.3V). Protected against ESD and short circuit.
58	EQEP_I	I/O	

PIN	Signal	Туре	Des	cription
			input quadrat (0-3.3V) against E	utput / DIGITAL / Encoder ture input A ). Protected SD and short ircuit.
59	GND	GROUND	Ground f	or encoders.
60	V_USB_DP	I/O		JSB data line. against ESD.
61	V_USB_DN	I/O		JSB data line. against ESD.
62	USB_SHIELD_GND	GROUND	USB cab	le shielding.
63	FTS_OUT_MPU	Output	Abort mission voting signal 1 from MPU, to use with 4x Veronte.	Bit Low (0 V) if mission OK. High (3.3V) if mission wants to be terminated. Both pins are protected against ESD and short circuit.
				Warning Each pin withstands 2.5 A of maximum current.

PIN	Signal	Туре	Description
64	FTS2_OUT_MPU	Output	Abort mission voting signal 2 from MPU, to use with 4x Veronte.
65	GND	GROUND	Veronte ground input.
66	GND	GROUND	Veronte ground input.
67	VCC	POWER	Veronte power supply
			(6.5V to 36V). Protected against ESD and reverse polarity.
68	VCC	POWER	Warning Both pins are common. They MUST be connected to the same power supply.

## **∆** Warning

**Remember!!** All GND pins are common. Note that pin 54 is not a common GND pin.

Visit the following sections to know how to wire the **Autopilot 1x** to other devices via:

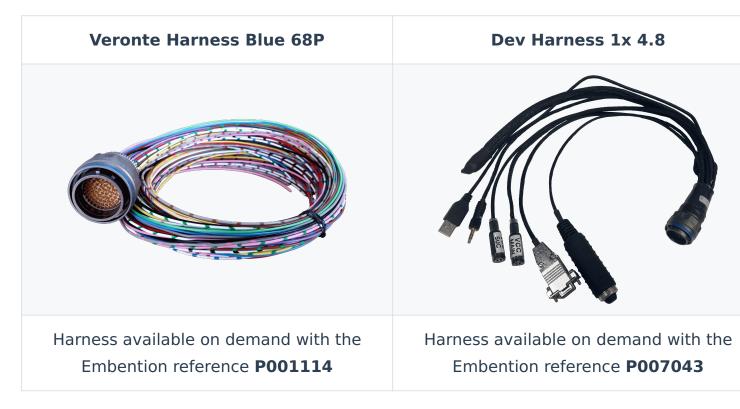
- RS232
- RS485/422
- CAN

To know the differences between version 4.5 and 4.8 (this one), read the Pinout changes from Autopilot 1x 4.5 - Troubleshooting section of the present manual.

#### Harnesses

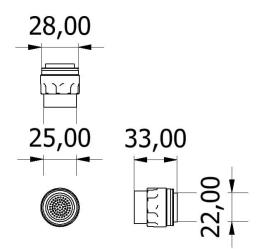
A wire harness is a structured assembly of cables and connectors used to organize and manage wiring in electrical and electronic systems. It is designed to ensure a tidy and secure installation of cables, preventing tangles, electromagnetic interference, and facilitating maintenance.

Veronte Autopilot 1x 4.8 has two compatible harnesses:



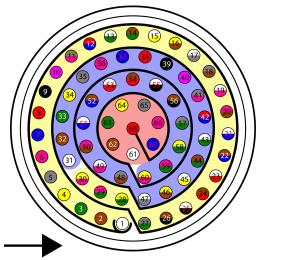
#### Dimensions

- Harness Blue 68P wire gauge: 22 AWG
- Cables length: 52 cm
- Harness plug dimensions:



Connector FGW.LM.368.XLCT dimensions (cm)

Pinout



#### Harness plug - FGW.LM.368.XLCT (frontal view)

### Veronte Harness Blue 68P

The pinout of this harness is the same as the Veronte Autopilot 1x pinout above. The **color code** of the harness wires is given below.

## **∆** Warning

Check the pin number before connecting. The color code is repeated 3 times due to the amount of pins. First section (yellow) corresponds to pins 1-30, the second section (blue) to pins 31-60 and the third one (red) to pins 61-68. Pin number increases following the black line of the pictures above: counterclockwise for the connector and clockwise for the plug.

PIN	Color Code	PIN	Color Code
1	White	35	Gray
2	Brown	36	Pink
3	Green	37	Blue
4	Yellow	38	Red
5	Gray	39	Black
6	Pink	40	Violet
7	Blue	41	Gray - Pink
8	Red	42	Red - Blue
9	Black	43	White - Green
10	Violet	44	Brown - Green
11	Gray - Pink	45	White - Yellow
12	Red - Blue	46	Yellow - Brown
13	White - Green	47	White - Gray
14	Brown - Green	48	Gray - Brown
15	White - Yellow	49	White - Pink
16	Yellow - Brown	50	Pink - Brown
17	White - Gray	51	White - Blue
18	Gray - Brown	52	Brown - Blue
19	White - Pink	53	White - Red

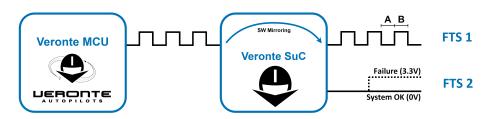
PIN	Color Code	PIN	Color Code
20	Pink - Brown	54	Brown - Red
21	White - Blue	55	White - Black
22	Brown - Blue	56	Brown - Black
23	White - Red	57	Gray - Green
24	Brown - Red	58	Yellow - Green
25	White - Black	59	Pink - Green
26	Brown - Black	60	Yellow - Pink
27	Gray - Green	61	White
28	Yellow - Green	62	Brown
29	Pink - Green	63	Green
30	Yellow - Pink	64	Yellow
31	White	65	Gray
32	Brown	66	Pink
33	Green	67	Blue
34	Yellow	68	Red

#### Dev Harness 1x 4.8

This harness has some connectors already implemented for easy operation. Below is detailed information on which pins these connectors are connected to:

Connector	PIN	Signal
Main VCC	65	GND
	66	GND
	67	VCC
	68	VCC
SuC VCC	47	GND
Suc Vec	48	V_ARB_VCC
	19	RS 232 TX
RS232 Connector	20	RS 232 RX
	21	GND
Maintenance	31	I2C_CLK
Button	32	I2C_DATA
lack Connector	18	GND
Jack Connector	55	EQEP_A
	60	V_USB_DP
USB	61	V_USB_DN
	62	USB_SHIELD_GND

## Flight Termination System (FTS)



**Flight Termination System** 

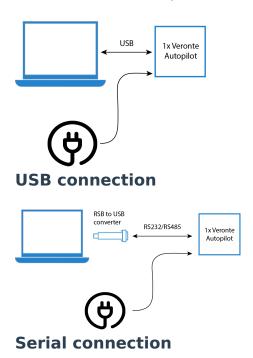
**Veronte Autopilot 1x** integrates two different FTS pins (42 and 43):

**FTS1 - Deadman (Pin 42)**: On this pin, **Autopilot 1x** outputs a square wave with  $A = \sim 5$ ms and  $B = \sim 5$ ms (3.3V). Its frequency can be higher right after the rebooting (around 300-400Hz), but A and B must be always < 8ms.

**FTS2 - !SystemOK (Pin 43)**: Its output is 0V when the system is working as expected and 3.3V when some error is detected. In detail, pin 43 goes high if A > 8ms or B > 8ms in the deadman signal sent by the Main Processor Unit (MPU).

# Software Installation

In order to configure and use **Veronte Autopilot 1x**, there are two ways to connect it to a computer: USB or serial.



To install the required software and configure **Veronte Autopilot 1x**, read the **1x Software Manual**.

An example of the configuration required for a correct communication between the PC and **Autopilot 1x** can be found in the AP communication with PC -Integration examples section of the **1x PDI Builder** user manual.

# Operation

# Types of operations

**Veronte Autopilot 1x** is an advanced system designed to enable the operation of autonomous vehicles, offering three control modes: automatic, assisted, and manual. This versatile autopilot can be used in both uncrewed and manned vehicles, integrating a **FLY-BY-WIRE** system that ensures precise and safe control at all times.

One of the main advantages of the Veronte Autopilot 1x is its configurability, allowing it to be adapted for different operational needs. Depending on the chosen configuration, the system can handle various types of takeoff, such as runway or catapult launches, among others.

Veronte Ops is the Veronte application dedicated to operating the system, providing an intuitive interface for mission management and monitoring. Additionally, for more flexibility, the system can also be operated through VCP (Veronte Communication Protocol), enabling the creation of custom control stations or integration with onboard mission computers for more specific or advanced applications.

In summary, **Autopilot 1x** stands out for its versatility, ease of integration, and customization options, offering a comprehensive solution for a wide range of autonomous vehicle applications.

In addition, for the different types of operations, the user may need to make different connections, configurations and/or integrations with external devices with **Veronte Autopilot 1x**. Therefore:

- Examples of how to make connections to Autopilot 1x such as wiring connection via CAN or with a Serial to Ethernet Converter are detailed in the Integration examples section of this manual.
- Examples of how to integrate Autopilot 1x with external devices such as datalinks are detailed in the Datalinks - Integration examples section of the present manual.

Please take a look at these sections for further explanations.

This section summarizes a list of possible options to operate an **Autopilot 1x** in different situations.

## 🖓 Тір

Most of the following diagrams can be used independently or combinated, to create redundant systems or backup solutions.

### **Operation Architectures**

**Veronte Autopilot 1x** allows for a wide variety of communication and control solutions to adapt to each mission and platform specifications.

#### Onboard Control Setup

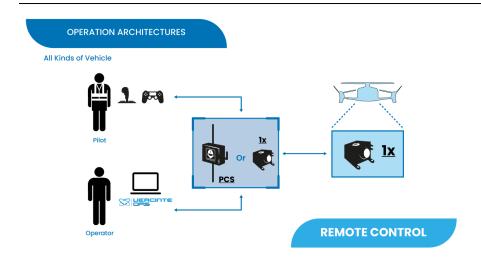
**1x** allows to control aircrafts (such as eVTOLs) by pilots on board in a flight deck. Pilots can use as controller joysticks, computers, tablets or any device able to communicate through PPM, CAN Bus, RS232 or RS485.

OPERATION ARCHITECTURES
All Kinds of Vehicle
ONBOARD CONTROL

#### Remote Control Setup

The following image shows the standard Veronte System Layout for remote operation.

#### 1x Hardware Manual

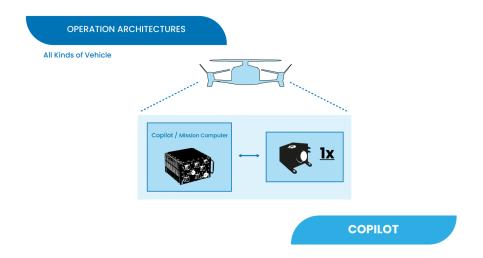


In the standard remote layout, an Operator (Internal Pilot) controls the UAV from the Ground Station using **Veronte Ops**.

Additionally, a Safety Pilot (External Pilot) is connected to the Ground Station using a radio controller. The stick commands are read by the Ground Unit and re-routed to the Air Unit. The Safety Pilot is able to take control of the flight at any point using an automation.

#### Copilot Control Setup

Veronte system allows integration with onboard mission computers for more specific or advanced applications.

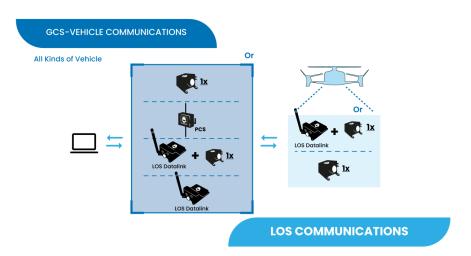


## **GCS-Vehicle Communications**

The following are some examples and possible solutions for establishing communication between the ground control station and the vehicle.

#### LOS Communications

The following diagram shows the different options of GCS and in-vehicle solutions to establish correct Line of Sight (LOS) communications between them.



Depending on the requirements and needs of their mission, users can choose as GCS:

- Autopilot 1x with its internal LOS module
- PCS
- Autopilot 1x with an external LOS Datalink
- LOS Datalink

And on the vehicle side:

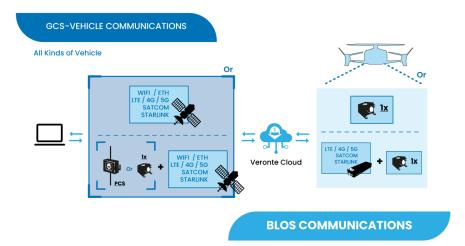
- Autopilot 1x with its internal LOS module
- Autopilot 1x with an external LOS Datalink

#### **BLOS** Communications

**Veronte Cloud** enables secure and efficient Beyond Line of Sight (BLOS) communication between the autopilot onboard a vehicle and the control station. It supports various communication methods, offering a flexible architecture to suit different operational requirements:

- Autopilot 1x Internal Module: Embedded 4G module within Autopilot 1x.
- LTE/4G/5G Module: External LTE module for wireless communication.
- Satcom Module: Satellite communications device for global coverage.

• **Starlink**: High-bandwidth, global communications module.



These communication methods can be used both at the **ground control station** and **onboard**, enabling seamless switching between methods or simultaneous use for redundancy and enhanced reliability. They can also be combined to meet specific project requirements.

#### **Control Station Connectivity Options**

The control station connects to **Veronte Cloud** through two primary methods:

Option A: Direct PC Internet Connection

The **control station PC** connects directly to the Internet for communication with **Veronte Cloud**. This can be achieved using any available means of Internet communication:

- Ethernet or Wi-Fi
- LTE/4G/5G
- Satellite Communication (Satcom)
- Starlink
- Option B: Connection via Veronte PCS/1x

The **control station PC** connects to the **Veronte PCS/1x module**, which manages the connection to the BLOS datalink module. The **PCS/1x** module supports:

- Its internal 4G module for direct connectivity.
- **External communication modules** (LTE/4G/5G, Satcom, Starlink, etc.).

This setup enhances communication reliability by leveraging Veronte's dedicated hardware for connection management and enabling the use of additional sensors integrated within the **PCS/1x** module.

#### **Onboard Connectivity Options**

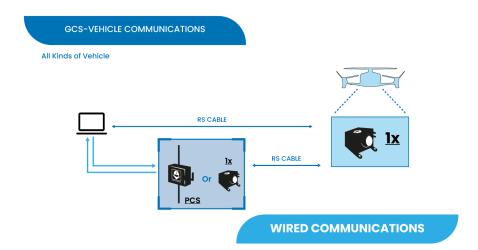
For onboard BLOS communications, **Veronte Autopilot 1x** system offers two main methods:

- Option C: Internal 4G Module in Veronte Autopilot 1x
   Autopilot 1x comes equipped with an internal 4G module that connects directly to Veronte Cloud. This option is compact and does not require additional external hardware.
- Option D: External Module Connected to Autopilot 1x
   The autopilot can integrate an external communication module (LTE/ 4G/5G, Satcom, Starlink, etc.) to enable BLOS communication with

   Veronte Cloud. This provides flexibility and allows for customization based on specific mission or environmental needs.

Wired Communications

For operations where the control station is directly connected to the onboard autopilot by cable.

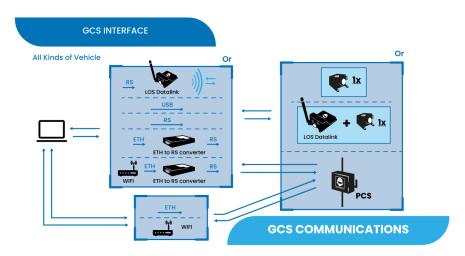


## GCS Interface

This diagram represents some of the many ways to establish communication between the different parts of a Ground Control Station setup.

## (i) Note

In a Ground Control Station setup there is usually a PC on one side and an **Autopilot 1x** with its internal LOS module, an **Autopilot 1x** with an **external LOS Datalink** or a **PCS** on the other side.



#### **Direct connection**

- The PC can directly connect a PCS via USB, RS, Ethernet or Wifi.
- The **PC** can directly connect an **Autopilot 1x** with its internal LOS module or **Autopilot 1x** with an **external LOS Datalink** via **USB/RS**.

#### **Combined connections**

Below are different connection methods that enable communication between the **PC** and an **Autopilot 1x** with its internal LOS module, an **Autopilot 1x** with an **external LOS Datalink** or a **PCS** via an additional device:

- PC connected via RS to a **LOS Datalink**, establishing a datalink connection to the other side of the GCS setup.
- Connection through an **Ethernet-to-RS converter**, i.e. Ethernet on the PC side and RS on the other side.
- The PC connects via **wifi** and the wifi modem then communicates with the other side of the GCS setup through an **Ethernet-to-RS converter**.

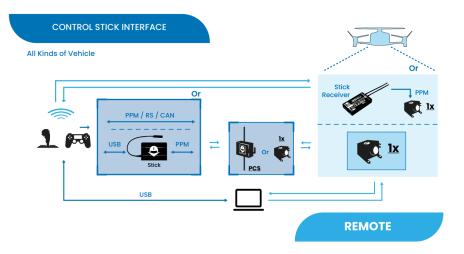
## **Control Stick Interface**

This section presents the different types of manual control from stick to the onboard autopilot.

Veronte allows for a wide variety of pilot interface solutions in order to interact with manual flight modes, assisted flight modes (arcade) or payloads.

#### Remote Control Stick

A wide variety of controllers can be used to pilot manually aircrafts, such as RC transmitters, pedals, sticks or buttons. Veronte software allows the use of any device that is detected as a remote controller by the operative system.



Although the most common way of control is to directly connect a **stick** via **PPM**, **RS** or **CAN** to a control station (**PCS/1x**) which then communicates with the onboard autopilot,

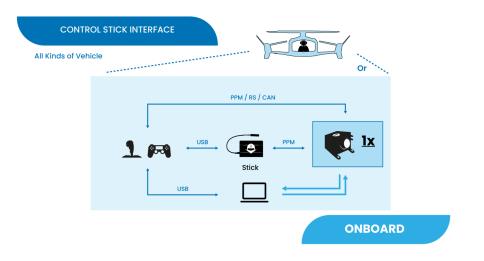
 It is possible to establish a link connection between a stick and a stick receiver integrated in the vehicle, which is connected via PPM to Autopilot 1x.

This allows for a backup manual channel when there is a main channel loss and an emergency manual landing is needed. Recommended for initial development stages where automatic landing phases are not defined yet.

- A Veronte Stick allows the connection of USB sticks to a control station (PCS/1x), converting USB to PPM. Then, the GCS communicates with the onboard autopilot for control.
- A **USB stick** can be connected directly to the **PC** to establish communication with the onboard autopilot for control.

#### **Onboard Control Stick**

In operations with pilots onboard in a flight deck (such as eVTOLs), the sticks can directly control the vehicle's **Autopilot 1x**.



Some examples are:

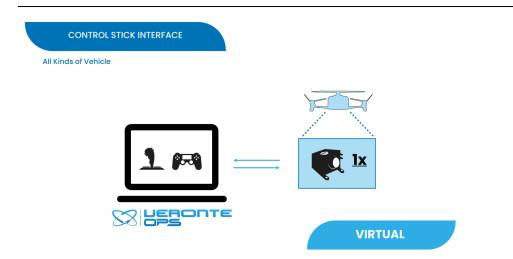
- To directly connect a stick via **PPM**, **RS** or **CAN** to the autopilot.
- To use a **Veronte Stick** that converts **USB to PPM**, allowing connection between **USB sticks** and the autopilot.
- Connect a **USB stick** to a **PC** which establishes communication with the autopilot.

#### Virtual Stick

The Virtual stick feature allows to integrate as a stick controller any device that can interface with **Autopilot 1x** (RS232, RS485, ADC, CAN...) and can provide control reference values.

While the configuration is slightly more complex, this feature allows using a wide variety of devices as flight control interfaces.

#### 1x Hardware Manual



Multiple Drones/GCS - Redundancy

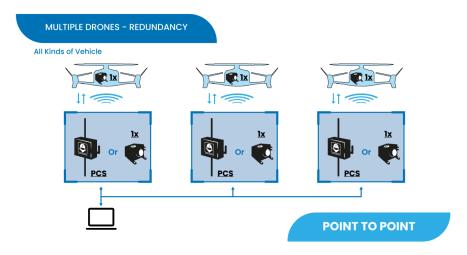
Due to Veronte's modular configuration, it is possible to integrate several onboard and ground units within the same network.

## (i) Note

Users are free to combine the different multiple drones solutions with the multiple GCS solutions.

Multiple Drones - Point to Point

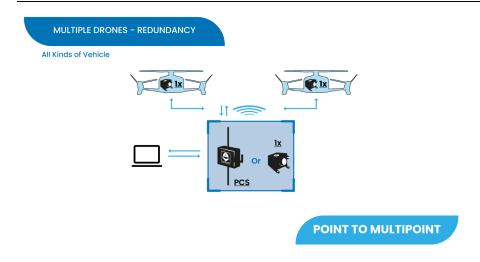
Standard multiplatorm setup.



Multiple Drones - Point to Multipoint

Managing several platforms with a single radiolink.

#### 1x Hardware Manual



#### Multiple GCS

For long range operations with several LOS stations.

MULTIPLE GCS - REDUNDANCY	
All Kinds of Vehicle	
Ethernet/Veronte Cloud	Ethernet/Veronte Cloud
	MULTIPLE CONTROL STATIONS

For remote solutions with LOS backup operator, **Veronte Cloud** allows the connection between PCs.

To correctly establish communication between the different PCs via **Ethernet** the following steps should be carried out:

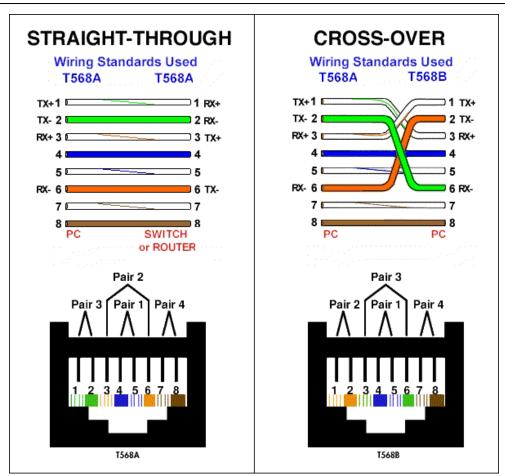
1. Make the **physical connection** with ethernet cables, the two different types of ethernet cables can be used:

#### Straight-Throught

Connect each PC to an **ethernet switch** with its Straight-Through ethernet cable (i.e. users will need 2 cables).

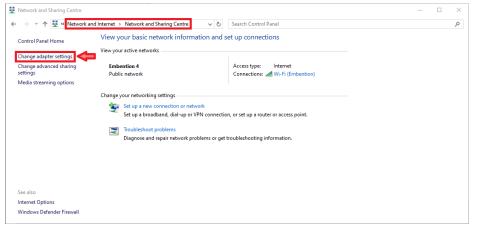
#### • Crossover

Connect the PCs directly to each other with a crossover ethernet cable.



Straight-Through vs Crossover cables

- 2. On each PC, change the ethernet adapter settings to a static IP so that both are on the same subnet. To do this:
  - In the Control Panel, go to Network and Internet.
  - Open Network and Sharing Centre menu and click Change adapter settings.



**Ethernet connection 1** 

• Select Local Area Connection, right click, and select Properties.

Network Connections	-	×
$\leftrightarrow$ $\rightarrow$ $\checkmark$ $\bigstar$ Network $\checkmark$ $\eth$ Search Network Connections		P
Organise 🔻 Disable this network device Diagnose this connection Rename this connection »	<b>.</b>	0
Conexión de red Bluetooth Not connected Bluetooth Device (Personal Area Ethernet Bluetooth Device (Personal Area Ethernet Bidge Connections Create Shortcut Rename Rename Polete Rename		
3 items 1 item selected		== 📰



• Select **IPv4** and click **Properties**.

Ethernet Properties	$\times$
Networking Sharing	
Connect using:	
🚍 Realtek PCIe GbE Family Controller	
Configure This connection uses the following items:	]
<ul> <li>Cliente para redes Microsoft</li> <li>Uso compartido de archivos e impresoras para redes M</li> <li>Programador de paquetes QoS</li> <li>Protocolo de Internet versión 4 (TCP/IPv4)</li> <li>Protocolo de multiplexor de adaptador de red de Micros</li> <li>Controlador de protocolo LLDP de Microsoft</li> <li>Protocolo de Internet versión 6 (TCP/IPv6)</li> </ul>	
Install Uninstall Properties Description Protocolo TCP/IP. El protocolo de red de área extensa predeterminado que permite la comunicación entre varias redes conectadas entre sí.	
OK Cancel	

**Ethernet connection 3** 

 Set IP address to a static IP (e.g. 192.168.0.100) and Subnet mask to 255.255.255.0. Click OK.

Important		
If on this PC the IP add	ress is set to 192.16	8.0.100, on the other
PCs, the IP address mu	st be set to <b>192.16</b>	<b>3.0.XXX</b> (e.g.
192.168.8.234), so tha		
Protocolo de Internet versión 4 (TCP/I	Pv4) Properties	×
General		
You can get IP settings assigned auton	atically if your petwork supports	
this capability. Otherwise, you need to for the appropriate IP settings.		
for the appropriate in settings.		
Obtain an IP address automatical	у	
Ouse the following IP address:		
IP address:	192.168.0.100	
Subnet mask:	255.255.255.0	
Default gateway:		
Obtain DNS server address autom	natically	
• Use the following DNS server add	resses:	
Preferred DNS server:		
Alternate DNS server:		
Validate settings upon exit	Advanced	
	OK Cancel	

**Ethernet connection 4** 

- 3. Allow **VeronteLink** to go through the Firewall on the PC that will run it, hereafter PC primary. To do so:
  - In the **Control Panel**, go to **System and Security**.

System and Security – 🗆 X					
← → → ↑ 🂊 > Control Panel → Syst	tem and Security	v Ö	Search Control Panel		P,
	Security and Maintenance Review your computer's status and resolve issues   😵 Change User Account Control settings   Troubleshoot common computer problems				
	Windows Defender Firewall Check firewall status   Allow an app through Windows Firewall				
oser Accounts	System View amount of RAM and processor speed   SAllow remote access   Launch remote assistance   See the name of this computer				
Clock and Region State of Access	Power Options Change battery settings   Change what the power buttons do   Change when the computer sleeps				
	File History Save backup copies of your files with File History   Restore your files with File History				
	Backup and Restore (Windows 7) Backup and Restore (Windows 7)   Restore files from backup				
	BitLocker Drive Encryption Manage BitLocker				
	Storage Spaces Manage Storage Spaces				
	Work Folders Manage Work Folders				
	Administrative Tools Free up disk space   Defragment and optimize your drives   🌍 View event logs   🦃 Schedule tasks				
intel	Intel(R) Computing Improvement Program				

- Windows Firewall 1
- Open Windows Defender Firewall and click on Allow an app through Windows Defender Firewall.

4	P Windows Defender Firewall						$\times$
	← → × ↑ 💣 > Control Panel > System and Security > Windows Defender Firewall 🗸 Ŏ				Search Control Panel		P
	Control Panel Home	Help protect your PC with Windows	Defender Firewall				
	through Windows Defender	Windows Defender Firewall can help prevent h through the Internet or a network.	ackers or malicious software from gaining access to your PC				
	Firewall Change notification settings	For your security, some settings are mana	aged by your system administrator.				
٩	Turn Windows Defender Firewall on or off	Domain networks	Not connected 😔				
		Private networks Not connected 🛇					
	Troubleshoot my network Guest or public networks Connected ⊘						
		Networks in public places such as airports or	coffee shops				
		Windows Defender Firewall state:	On				
		Incoming connections:	Block all connections to apps that are not on the list of allowed apps				
		Active public networks:	None				
		Notification state:	Notify me when Windows Defender Firewall blocks a new app				
	See also						
	Security and Maintenance						
	Network and Sharing Center						

### Windows Firewall 2

• Check that **Veronte Link** app is **allowed**.

→ * ↑	All Control Panel Items      Windows Defender Firewall	<ul> <li>Allowed apps</li> </ul>				~ Ō	Search Control Panel	,
	Allow apps to communicate through	Windows Defer	der Fire	ewall				
	To add, change, or remove allowed apps and port	ts, click Change sett	ngs.					
	What are the risks of allowing an app to commun	nicate?			🖓 Change setti	ngs		
	For your security, some settings are manage	ed by your system ad	lministrat	or.				
	Allowed apps and features:							
	Name	Domain	Private	Public	Group Policy	^		
	VeronteLink TCP 9535, 9991, 3114			~	Yes			
	VeronteLink UDP 9535, 9991, 3114				Yes			
	verontelink-6.exe		2		No			
	✓ verontelink-6.exe		V		No			
	✓ verontelink-6.exe				No			
	✓ verontelink-6.exe				No			
	✓ verontelink-6.exe				No			
	✓ verontelink-6.exe				No			
	✓ verontelink-6.exe				No			
	VerontePDIBuilder-6.12.62.exe	<b>v</b>	<b>V</b>	<b>v</b>	Yes			
	VeronteTerrainProvider		V	⊻	No			
	VeronteVsa-6.12.5.exe	<b>V</b>	<b>V</b>	<b>V</b>	Yes	¥		
				Details	Remove			
				AI	ow another app	·		
				_	Cano	el		

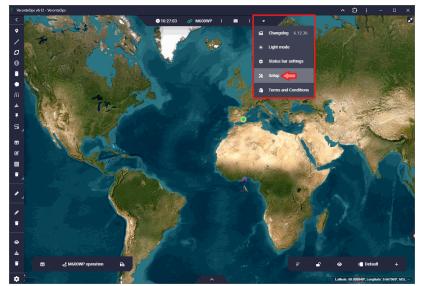
#### Windows Firewall 3

- 4. On the PC secondary, in **Veronte Ops** change the **Veronte Link Host** option setting to the **IP of the PC primary**. To do this:
  - Open Veronte Ops.
  - In the Status bar, click the arrow on the right of the bar to display a drop-down menu.



Veronte Ops - Status bar

• In it, open the **Setup** menu.



Veronte Ops - Setup menu

- Next, go to the **Veronte Link Host** settings.
- Change the IP localhost to the IP of the PC primary.

Setup	
Map settings	Veronte Link Config
Unit settings	+ Add new VLink Host
🔗 Veronte Link Host	
🖷 Style manager	× 192.168.0.100
Workspace manager	
I Operation manager	
Gimbal panel	
🛧 Import 🛛 🕁 Export	× Close

**Veronte Ops - Veronte Link Host settings** 

For more information on this settings, refer to the Setup - Veronte Ops configuration section of the **Veronte Ops** user manual

5. Finally, Autopilot 1x connected to the PC primary should be seen in the Veronte Ops open on this PC, as well as on the PC secondary. If users have any problems when trying to connect Veronte Ops to Veronte Link, refer to the Connecting to Veronte Link - Troubleshooting section of the Veronte Ops user manual.

If after following the steps described above users are not able to operate in this way, please contact support team by opening a **Ticket** in your Joint Collaboration Framework.

## Preparation for operation

Here the user will find different checklists that the Embention team considers useful to follow as a guideline before performing an operation.

#### Important

This is only an **example**, it may vary depending on the operation to be performed and the user's platform.

- 1. Hardware revision
- 2. Software revision
- 3. Functional system test
- 4. Equipment checklist

- 5. Revision and checks pre-flight
- 6. Post-flight revision

# Maintenance

## Preventive maintenance

Apart from cleaning, no extra maintenance is required to guarantee the correct operation of the **Veronte Autopilot 1x**.

In order to clean **Veronte Autopilot 1x** properly follow the next recommendations.

- Turn off the device before cleaning.
- Use a clean, soft, damp cloth to clean the unit.
- Do not immerse the unit in water to clean it.

## Software update

To update the software, an additional app is required: Veronte Updater.

### (i) Note

The file with the new software version will be shared with the customer in the **Joint Collaboration Framework** when it is requested.

For more information about the **Joint Collaboration Framework**, read its user manual.

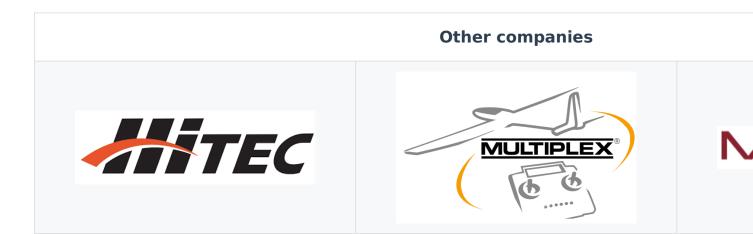
# **Compatible Devices**

# Actuators/Servos

Company	Comments
	I/O: PWM, RS485 full duplex and RS485 half duplex (reduced functions) <b>Type:</b> simplex, redundant and OPV To know how to integrate it with Veronte Autopilot 1x, read the Volz DA26 integration example
Pegasus Actuators GmbH	I/O: PWM, RS485 full duplex and CAN-BUS <b>Type:</b> simplex

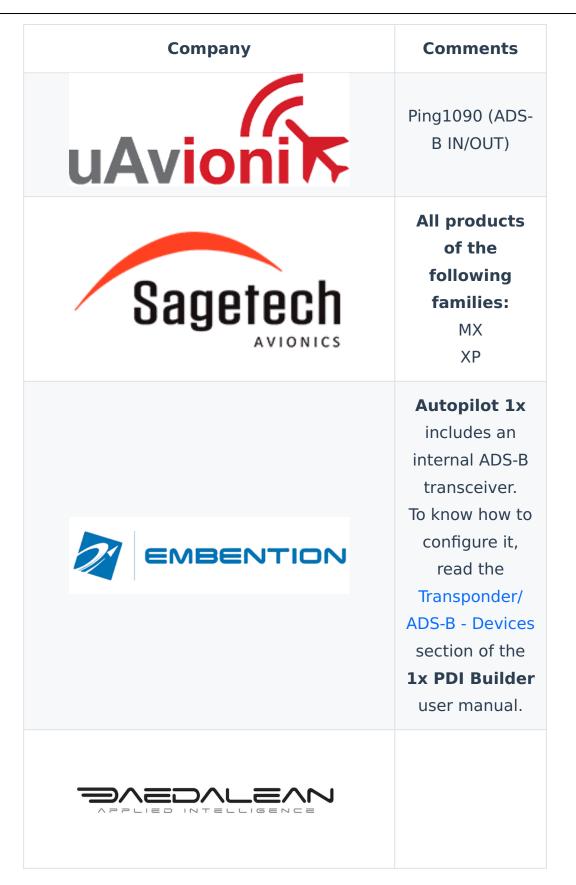
Company	Comments
	and
	redundant.
	To know
	how to
	integrate it
	with
	Veronte
	Autopilot
	1x, read
	the
	Pegasus
	PA-R-135-4
	integration
	example
	(CAN) or
	the
	Pegasus
	PA-R-135-4
	integration
	example
	(Serial)
	I/O: PWM
	and CAN-
	BUS
	Туре:
	linear
	actuator
ULIKAMOTON	and servo
ULTRAMOTION	To know
	how to
	integrate it
	with

Company	Comments
	Autopilot 1x, read the Ultra Motion integration example
<b>KST</b> DIGITAL SERVO	I/O: PWM, RS232, RS485 and CAN-BUS
<b>SAVÖX</b>	I/O: PWM, RS232, RS485 and CAN-BUS



# ADS-B

Company	Comments
	<b>Products:</b> Ping20S (ADS-B Out)



# Air Data Sensors

Company	Comments
	High Speed Pitot Sensor, read the High Speed Pitot Sensor integration example to know how to integrate it with Veronte Autopilot 1x.
<b>MGLAMONICS</b>	OAT 428:For detailedinformationon itsintegrationwithVeronteAutopilot1x, refer toOAT sensor428integrationexample



# Altimeters

Company	Comments
Minstein	<ul> <li>I/O: UD-1 (CAN-bus)</li> <li>To know how to integrate it with</li> <li>Veronte</li> <li>Autopilot 1x, read the</li> <li>Ainstein CAN Radar</li> <li>integration</li> <li>example</li> </ul>
HEXAGON	I/O: CAN-bus
optoelectronics	I/O: I2C and CAN-bus Product: LW20, SF11, SF20 To know how

Company	Comments
	to integrate
	them with Veronte
	Autopilot 1x,
	read the
	Lightware
	LW20 Lidar
	and
	Lightware
	SF20 Lidar
	integration
	examples
	I/O: PWM
	I/O: PWM Product:
	<b>Product:</b> LIDAR-Lite v3
	<b>Product:</b> LIDAR-Lite v3 To know how
	<b>Product:</b> LIDAR-Lite v3 To know how to integrate
	<b>Product:</b> LIDAR-Lite v3 To know how to integrate it with
GARMIN®	Product: LIDAR-Lite v3 To know how to integrate it with Veronte
GARMIN®	Product: LIDAR-Lite v3 To know how to integrate it with Veronte Autopilot 1x,
GARMIN	Product: LIDAR-Lite v3 To know how to integrate it with Veronte
GARMIN。	<b>Product:</b> LIDAR-Lite v3 To know how to integrate it with Veronte Autopilot 1x, read the
GARMIN	Product: LIDAR-Lite v3 To know how to integrate it with Veronte Autopilot 1x, read the Lidar Garmin

# Cameras

Company	Comments
€ octopus	
() merio	

Company	Comments
AV TO	
- RAEDALEAN	Autopilot 1x reads identified objects by their cameras.

# **Control stations**

Comments
Products:
LCS
PCS

# Datalinks

### **BLOS Communications**

Company	Comments
SKYTRAC	Broadband UAV Satcom: IMS-350 Midband UAV Datalink and GPS System: DLS-100
Control	Satellite Communications: RockBLOCK
<b>F</b> satlink	
ATMOSPHERE	Requires Veronte COM

## LOS Communications

Company	Comments
	Antenna: Tracking Systems T28
	<ul> <li>Radio module:</li> <li>SDL, read the Veronte SDL integration example to know how to integrate it with Veronte Autopilot 1x</li> <li>XDL</li> </ul>
Mugchard	<ul> <li>I/O: RS232 communication tunnel</li> <li>Microhard radio: pDDL900-ENC, read the Microhard integration</li> <li>example to know how to integrate it with Veronte Autopilot 1x</li> </ul>
DTC	I/O: RS232 communication tunnel DTC radio: SOL8SDR-C, read the DTC integration example to know how to integrate it with Veronte Autopilot 1x
SïLVUS TECHNOLOGIES	<ul> <li>I/O: RS232 communication tunnel</li> <li>Streamcaster radio: 4200E, read</li> <li>the Silvus integration example to</li> <li>know how to use it with Veronte</li> <li>Autopilot 1x</li> </ul>
DIGI	<b>Radio:</b> To know how to configure Digi radios, read its user guide and read the Digi integration example to

Company	Comments			
	know how to integrate it with			
	Veronte Autopilot 1x			

# Engines



# Jet Engines



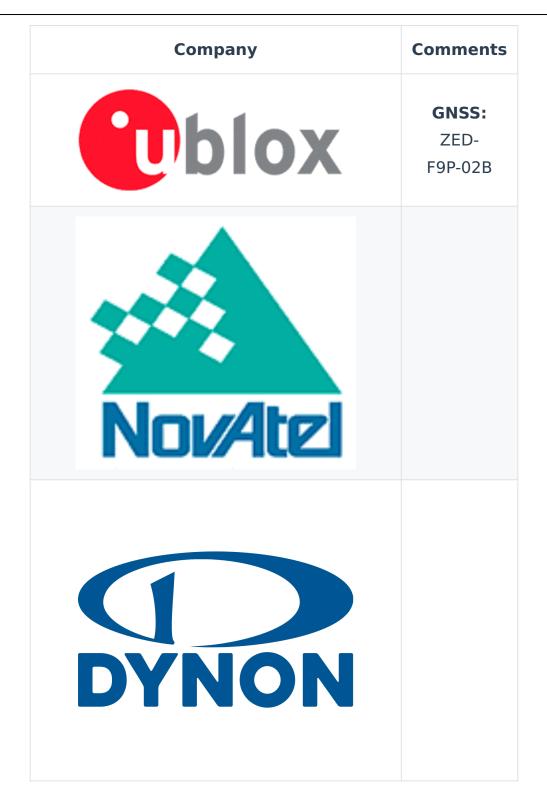
# Expansion modules

Company	Comments
	Products: CEX, read the CEX connection integration example to know how to integrate it with Veronte

Company	Comments
	Autopilot
	1x.
	MEX, read
	the MEX
	connection
	integration
	example to
	know how
	to integrate
	it with
	Veronte
	Autopilot
	1x.

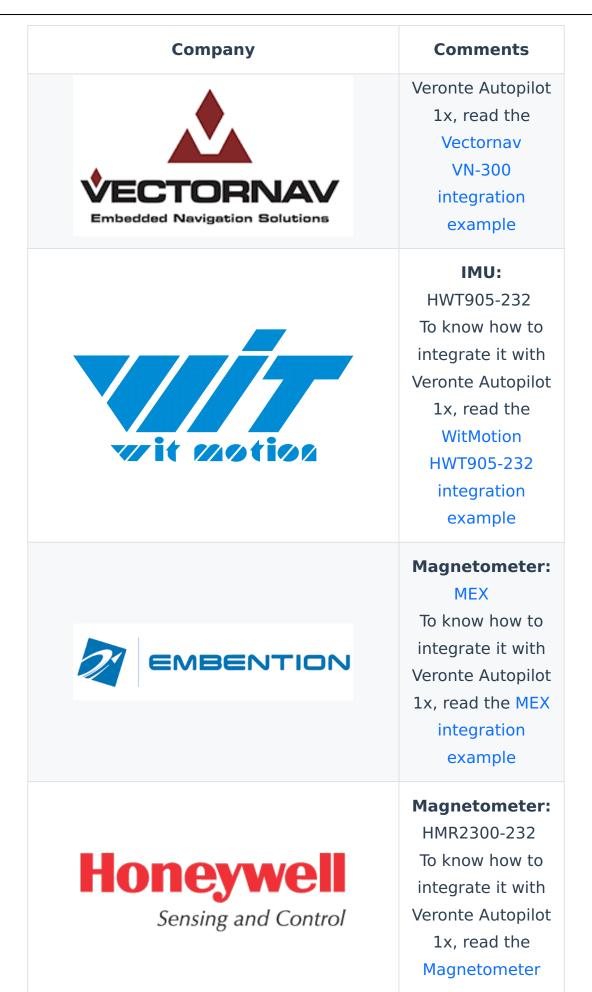
# **GNSS** Receivers

Company	Comments
Nexio	GNSS, read the NexNav GNSS integration example to know how to integrate it with Veronte Autopilot 1x.



## IMUs & Compass

Company	Comments
	IMU: VN-300 To know how to integrate it with



Company	Comments
	Honeywell HMR2300 integration
	example Magnetometer: RM3100-CB To know how to integrate it with Veronte Autopilot 1x, read the PNI RM3100 integration example

# Motor controllers / ESC

Company	Comments
	Veronte products: MC110, read the MC110 connection integration example to know how to integrate it with Veronte Autopilot 1x.

Company	Comments
	MC24, read
	the MC24
	connection
	integration
	example to
	know how
	to integrate
	it with
	Veronte
	Autopilot
	1x.
	MC01, read
	the MC01
	connection
	integration
	example to
	know how
	to integrate
	it with
	Veronte
	Autopilot
	1x.
THE SAFEST PROPULSION SYSTEM	<b>I/O:</b> PWM
	<b>I/O:</b> CAN- bus

Other Companies	Comments
Hacker Brashless Motors Industrial Solutions	
	I/O: PWM, RS232, RS485, and CAN-bus
AXi	

# Power management units

Company	Comments
	Veronte product:
	R12S
	R12F
	R24F

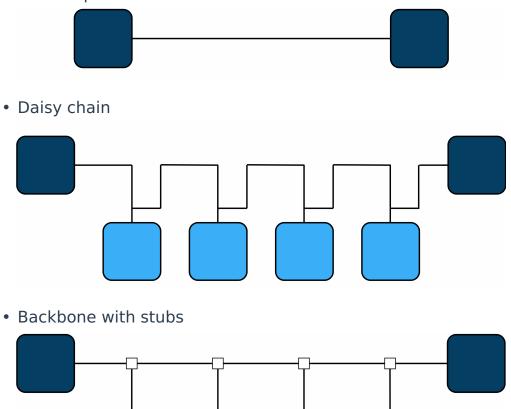
# Transmitters

Company	Comments		
Futaba	<b>Products:</b> 8J/10J/12K/14SG with 8 channels 12K/14SG with 12 channels T18SZ with 8 channels		
	Stick		

# Integration examples

# Wiring connection

• Point to point



### RS232

Point to point

This connection is recommended to establish with the computer while **1x** is commanding via CAN to Veronte MC110 or Veronte MC24, since the USB connection between the PC and the **1x** may be lost.

	ş	RS 232 TX - pin 19	RS 232 RX	External device
)><\nëëouie	Harnes	RS 232 RX - pin 20	RS 232 TX	with RS-232
De la Companya de la Comp	Autopilot Harness	GND - pin 21	GND	
	A			•••

### **RS-232 connection**

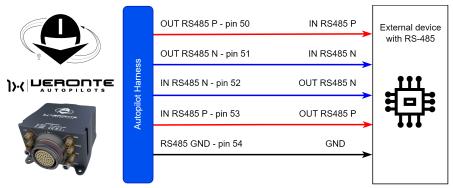
### (i) Note

Transmitter pin (TX) of one device is connected to the receiver pin (RX) of the other one, and vice versa.

### RS485/422

#### Point to point

This connection is recommended to establish with the computer while **1x** is commanding via CAN to Veronte MC110 or Veronte MC24, since the USB connection between the PC and the **1x** may be lost.



#### **RS-485 connection**

### (i) Note

Output pin (OUT) of one device is connected to the input pin (IN) of the other one.

Inverted signals (N) are connected each other; in the same way noninverted signals (P) are linked each other.

#### Daisy chain

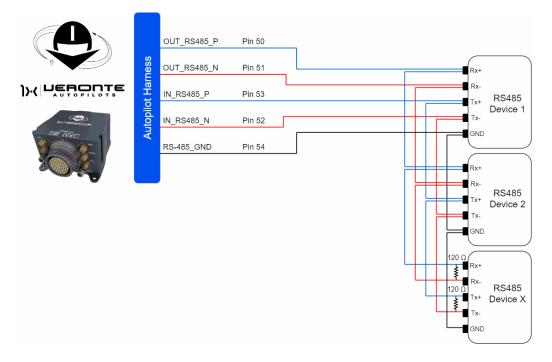
This section details the technical considerations that must be taken into account when connecting the Autopilot 1x to a chain of devices via RS485/422.

#### Full duplex

**Autopilot 1x** includes an internal resistor of 120  $\Omega$ . A second resistor is required at the end of the line (again 120  $\Omega$ ) to allow the connection of multiple devices to the same line. This resistor may be placed on cable or PCB.

Full Duplex allows devices on an RS485 network to transmit and receive data **simultaneously**, enabling continuous bidirectional communication. This mode uses **four wires**, two for sending and two for receiving, which facilitates faster and more efficient data transfer.

The following diagram shows how to connect the devices:



#### Half duplex

Half Duplex allows devices on an RS485 network to transmit and receive data, but **not at the same time**. In this mode, communication alternates between sending and receiving, using only **two wires** for both directions.

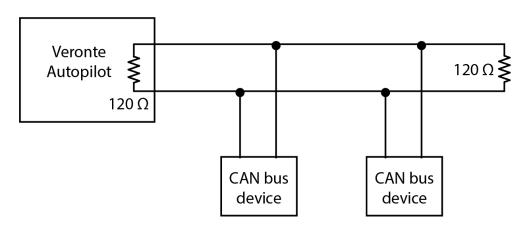
The following diagram shows how to connect the devices:

	OUT_RS485_P         Pin 50           OUT_RS485_N         Pin 51           IN_RS485_P         Pin 53           IN_RS485_N         Pin 52           RS-485_GND         Pin 54	RS485 Device 1 RS485 Device 2	
🛆 Warning			
The following m	node of connection s	hould be avoided.	
	OUT_RS485_P         Pin 50           OUT_RS485_N         Pin 51           IN_RS485_P         Pin 53           IN_RS485_N         Pin 52           RS-485_GND         Pin 54		

#### CAN

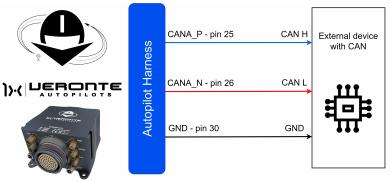
Electrical diagram of CAN bus

**Autopilot 1x** includes an internal resistor of 120  $\Omega$ . A second resistor is required at the end of the line (again 120  $\Omega$ ) to allow the connection of multiple CAN Bus devices to the same line. This resistor may be placed on cable or PCB.



#### CAN assembly example diagram

#### Point to point



#### **CAN connection**

### (i) Note

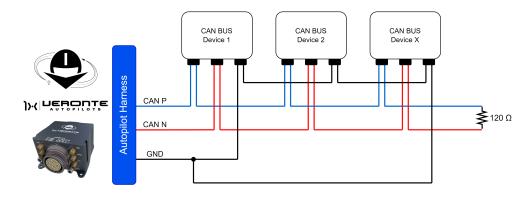
The user has the option to configure either of the two available CAN BUS lines on the Autopilot 1x: **CAN A** or **CAN B**.

The following sections detail the technical considerations to be taken into account when connecting the Autopilot 1x to a chain of devices via CAN.

#### Daisy chain

The daisy chain connection is the most common and recommended method for interconnecting multiple devices in a CAN system. This procedure involves sequentially connecting the CAN cable from one device to the next, ensuring that the total cable length is minimized to optimize network performance and reduce potential interference.

The following diagram illustrates an example of how to connect devices using this method:



### Important

A resistor has been included in the diagram, which allows the connection of more devices, as explained in the Electrical diagram of CAN bus section.

### (i) Note

The standard designation for CAN lines in devices is typically **CAN H** (**High**) and **CAN L (Low**). These designations correspond to those of the Autopilot 1x, where **CAN P (Positive)** and **CAN N (Negative)** represent the **High** and **Low** lines, respectively.

### (i) Note

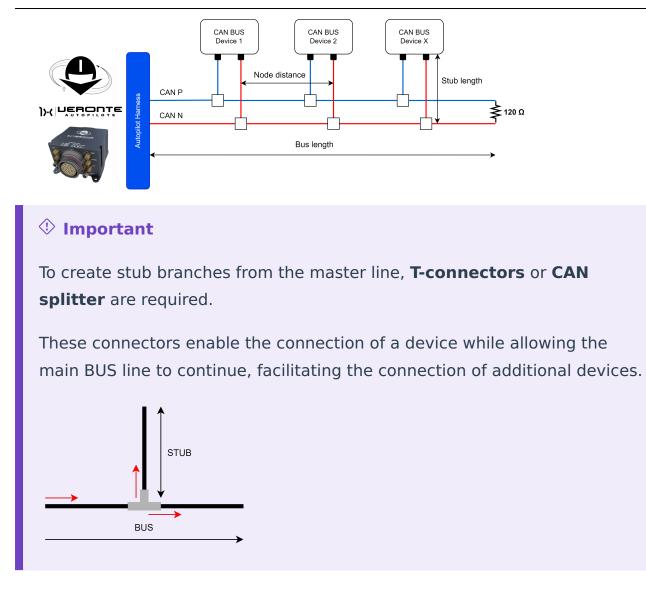
The user has the option to configure either of the two available CAN BUS lines on the Autopilot 1x: **CAN A** or **CAN B**.

#### Backbone with stubs

Another method for connecting devices via CAN is to use a master cable from which the necessary stubs will be made to connect the devices. This connection method allows the creation of stubs from the master cable to integrate each device into the CAN network.

It is important for the user to note that when connecting devices in this topology, the total length of the CAN BUS cable is limited. Exceeding this length may adversaly affect network performance and communication integrity.

The following diagram illustrates an example of how to connect devices using this method:



The CAN protocol specifications limit the distance a device can be placed from the BUS. The following table shows the distance limitations to be considered when setting up the system.

Bus	Bus	Stub	Node
Speed	Length	Length	Distance
1 Mbit/	40	0.3	40 meters
Sec	meters	meters	
500	100	0.3	100 meters
kbits/Sec	meters	meters	
100	500	0.3	500 meters
kbits/Sec	meters	meters	

Bus	Bus	Stub	Node
Speed	Length	Length	Distance
50 kbits/	1000	0.3	1000
Sec	meters	meters	meters

### **∆** Warning

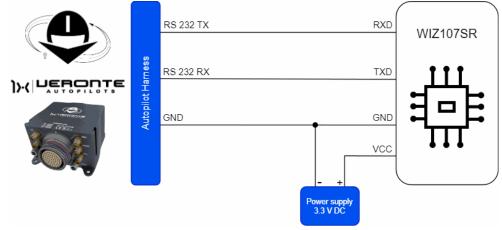
If a cable stub (un-terminated cable) or a T-connector is used to connect to the bus line, then the stub distance should not exceed **0.3 meters**.

### Serial to Ethernet Converter

This section provides the process to follow to integrate a **Serial to Ethernet Converter**, with **Veronte Autopilot 1x**. In this example, **WIZ108SR** and **WIZ107SR** converters are used.

These protocol converters transmit the data sent by serial equipment as UDP data type, and converts back the UDP data received through the network into serial data to transmit back to the equipment.

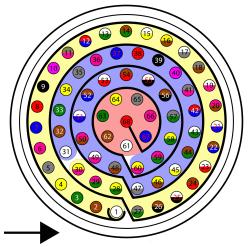
#### • WIZ107SR connection diagram:



WIZ107SR - Autopilot 1x wiring diagram

### Important

To ensure correct operation of the device, use an **external power supply** and **not to connect** it to the **3.3** line of **Autopilot 1x**. Please note that it **shares signal ground** with **Autopilot 1x**.



Autopilot 1x harness pinout

Aut	opilot 1x		107SR nector	
PIN	Signal	Color Code	PIN	Signal
19	RS 232 TX	White- Pink	3	RXD
20	RS 232 RX	Pink- Brown	7	TXD
21	GND	White- Blue	11 / 12	GND

#### **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

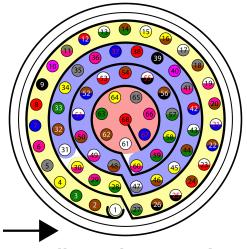
• WIZ108SR connection diagram:

		OUT_RS485_P	485+_RXD+	WIZ108SR	
)><\UËBOUIE	Harne ss	OUT_RS485_N	485RXD-		
	Autopilot Harness	IN_RS485_P IN_RS485_N OUT_GND	TXD+		GND
		ľ	ower supply 3.3 V DC		

WIZ108SR - Autopilot 1x wiring diagram

### Important

To ensure correct operation of the device, use an **external power supply** and **not to connect** it to the **3.3** line of **Autopilot 1x**. Please note that it **shares signal ground** with **Autopilot 1x**.



Autopilot 1x harness pinout

A	utopilot 1x Har		/IZ108SR onnector	
PIN	Signal	Color Code	PIN	Signal
50	OUT_RS485_P	Pink- Brown	3	485+_RXD+
51	OUT_RS485_N	White- Blue	5	485RXD-
53	IN_RS485_P	White- Red	7	TXD+
52	IN_RS485_N	Brown- Blue	9	TXD-
54	OUT_GND	Brown- Red	11 / 12	GND

#### **∆** Warning

Note that this pin 54 is not a common GND pin.

### (i) Note

This integration is done for the **WIZ108SR**, this is for a connection via **RS485** with **Autopilot 1x**. However, the process for the **WIZ107SR** device is almost the same.

Once the hardware installation is complete, follow the steps below to properly configure the connection and ensure stable communication between the devices.

#### Ethernet Connection in Windows

First, make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP address:

- 1. Connect the Ethernet cable of the WIZNet adapter, powered by 3.3V, to the Ethernet port of the PC.
- 2. Open Network and Sharing Centre menu and click Change adapter settings.

Network and Sharing Centre			-	×
← → × ↑ 📱 « Network and	d Internet > Network and Sharing Centre 🗸 💍	Search Control Panel		P
Control Panel Home	View your basic network information and se	et up connections		
Change adapter settings	View your active networks			
Change advanced sharing	Embention 4	Access type: Internet		
settings	Public network	Connections: 📲 Wi-Fi (Embention)		
Media streaming options				
	Change your networking settings			
	Set up a new connection or network Set up a broadband, dial-up or VPN connection	n, or set up a router or access point.		
	Troubleshoot problems Diagnose and repair network problems or get t	roubleshooting information.		
See also				
Internet Options				
Windows Defender Firewall				

#### **Ethernet connection 1**

3. Select Local Area Connection, right click, and select Properties.

😰 Network Connections	-		×
← → ✓ ↑ 🗐 « Net > Network ✓ ♂			P
Organise   Disable this network device Diagnose this connection Rename this connection			?
Conexión de red Bluetooth Not connected Bluetooth Device (Personal Area	:		
3 items 1 item selected		land.	

#### **Ethernet connection 2**

4. Select **IPv4** and click **Properties**.

Ethernet Properties X
Networking Sharing
Connect using:
Realtek PCIe GbE Family Controller
Configure
This connection uses the following items:
<ul> <li>Cliente para redes Microsoft</li> <li>Uso compartido de archivos e impresoras para redes M</li> <li>Programador de paquetes QoS</li> <li>Protocolo de Internet versión 4 (TCP/IPv4)</li> </ul>
Protocolo de multiplexor de adaptador de red de Micros      Controlador de protocolo LLDP de Microsoft      Protocolo de Internet versión 6 (TCP/IPv6)
Install Uninstall Properties
Description
Protocolo TCP/IP. El protocolo de red de área extensa predeterminado que permite la comunicación entre varias redes conectadas entre sí.
OK Cancel

**Ethernet connection 3** 

5. Set **IP address** to 192.168.11.X (in this example 192.168.11.8 is entered) and **Subnet mask** to 255.255.0. Click **OK**.

Protocolo de Internet versión 4 (TCP/I	P∨4) Properties	×
General		
You can get IP settings assigned auton this capability. Otherwise, you need to for the appropriate IP settings.		
Obtain an IP address automatical	ly	
Ouse the following IP address:		
IP address:	192.168.11.8	
Subnet mask:	255.255.255.0	
Default gateway:		
Obtain DNS server address autom	natically	
• Use the following DNS server add	resses:	
Preferred DNS server:		
Alternate DNS server:		
Validate settings upon exit	Advanced	
	OK Cancel	

**Ethernet connection 4** 

WIZNet software configuration

6. Open the **WIZNet Software** and select the Ethernet port with the IP assigned before in the dropdown menu.

earch ID code	_								guration Tool V1.4.2	-	Option Hel
aarched results:	Exit		Save Config	~ U		Reset Device	(t <u>S</u> )	Firmware Upload			
Mac address       Name         Type							Options	Basic settings (	k PCIe GbE Family 🔻	altek	2.168.11.8:Real
Type			tion	ork configuratio	Netwo		n	Device information		5:	arched results:
Search identification code       Subnet mask         Subnet mask       Gateway         (Max. 8 bytes)       DNS server         DNS server       DNS server         Channel #0       Status:         Serial interface:       Baud rate         Operation mode       Data bit         TCP dent       SSL TCP dent         TCP dent       SSL TCP dent         TCP dent       SSL TCP dent         TCP server       MQTT dent         TCP mixed       MQTT dent         Stop bit       1         UDP       Fix port         Fix port       Serial data packing condition         Character       00		HCP		Static				Туре	Name		Mac address
Search identification code       Gateway         Gateway       DNS server         (Max. 8 bytes)       DNS server         Channel ≠0       Status:         Status:       Serial options         Serial interface:       Baud rate         Operation mode       Ost interval         Orde TCP client       SSL TCP client         Orde TCP client       Operation mode         Orde TCP client       Operation mode         Operation mode       Operation mode         Operation mode       Operation mode         Orde TCP client       Operation mode         Operation mode       Oper				al IP	Loca			Version			
(Max. 8 bytes)       DNS server         Channel ≠0       Channel ≠0         Status:       Serial options         Serial interface:       Baud rate         Operation mode       Data bit         TCP dient       SSL TCP client         TCP dient       SSL TCP client         TCP dient       SSL TCP client         TCP server       MQTTS client         Docode       Show chars         Local port       Serial data packing condition         Local port       Serial data packing condition         Character       00         DINP broadrast       Remote host / Port				net mask	Subr		ion code	Search identificati			
Channel ≠0         Status:         Serial options         Baud rate         Baud rate         Operation mode         Operation mode         TCP client         TCP client         TCP client         TCP client         TCP client         TCP mixed         UOP         Flow control         NONE         Channel #0         Code         Show chars         Remote host / Port         DilDP broadrast				· L	idr S	Show					
Status:       Serial interface:       Baud rate       300       Inactivity tim         Serial interface:       Data bit       7       Reconnection         Operation mode       Otoperation mode       Data bit       7       Reconnection         OTCP client       SSL TCP client       Parity       NONE       TCP Keep-alweit         TCP mixed       MQTT client       Stop bit       1       TCP Keep-alweit         UDP       Cocal port       Fix port       Serial data packing condition       Retry interval         arch method       Remote host / Port       Fix port       Character       00				Server	DNS		es)	(Max. 8 byte			
Status:       Serial interface:       Baud rate       300       Inactivity tim         Serial interface:       Data bit       7       Reconnection interval         Operation mode       Data bit       7       Reconnection interval         Operation mode       Operation mode       Parity       NONE       Reconnection interval         arch ID code       Operation mode       MQTTS client       Stop bit       1       TCP Keep-alive interval         o code       Show chars       Clocal port       Fix port       Serial data packing condition       Retry interval         outple broadcast       Remote host / Port       Fix port       Operation mode       Operation								Channel #0			
Serial rate:       Inactivity ten         Operation mode       Operation mode         Operation mode       Data bit         TCP client       SSL TCP client         TCP server       MQTT client         TCP mixed       MQTTS client         Upp       Stop bit         Flow control       NONE         Inactivity ten       Content         Operation mode       MQTTS client         Upp       Flow control         NONE       Parity         Code       Show chars         Remote host / Port       Fix port         Operation mode       Character		Timer interval		5	Serial options			Status:			
Code dist      Constant     Constant	mer 65535 sec	Inactivity timer	Ψ.	300	Baud rate			Serial interface:			
CrCP cerver MQTT clent     TCP terver MQTT clent     TCP mixed MQTT clent     TCP terver MQTT cl	on	Reconnection	Ψ.	7	Data bit						
ID Server     INC Prived     MQ1T Gent     Stop bit     1       ID code     UDP     MQTTS dient     Stop bit     I       ID code     ID code     Flow control     NONE       ID code     Initial Interv     Flow control     NONE       ID code     Fix port     Serial data packing condition     Retry interv       Character     00     Initial Interv	0 ms		~	NONE	Parity						
arch ID code Fix port Character O Character Character O Character Character O Character Char	e interval	TCP Keep-alive inter	~	1							
arch ID code  Local port  Initial Interv  Retry interv  Character  O		C Enable		1							
arch method UIDP hroadrast Remote host / Port	val 00 ms	Initial Interval	- *	NONE	Flow control			Local port			arch ID code
IIDP broadcast Remote host / Port	val 0 ms	Retry interval	n	acking condition	Serial data pa	x port	Fi		Show chars		code
) UDP broadcast Size 0			00	r 0	Character						arch method
			0		Size		rt	Remote host / Por		ast	) UDP broadcas
TCP unicast Remote host 192.168.11.3			0		SIZE	68.11.3	192.1	Remote host			) TCP unicast
192.168.11.2         :         50001         Time(ms)         0			0	(	Time(ms)	000	50	Remote port	: 50001		

WIZnet software - Ethernet port selected

7. Click on the **Device Search** option to **scan** for the device.

WIZnet S2E Configuration Tool V1.4.2			- 🗆
le Option Help			
Device Search Apply Settings	Firmware Upload Reset Device	Factory Reset Save Config	Load Config Exit
92.168.11.8:Realtek PCIe GbE Family 🔻	Basic settings Options		
earched results:	Device information	Network configuration	
Mac address Name	Туре	Static	НСР
	Version	Local IP	
	Search identification code	Subnet mask	
	Show	chars Gateway	
	(Max. 8 bytes)	DNS server	
	Channel #0		
	Status:	Serial options	Timer interval
	Serial interface:	Baud rate 300 🔻	Inactivity timer 65535 sec
	Operation mode TCP dient SSL TCP dient	Data bit 7 👻	Reconnection 0 ms
	TCP dient     O SSL TCP dient     O MQTT dient	Parity NONE 🔻	interval
	TCP mixed O MQTTS dient	Stop bit 7	TCP Keep-alive interval
arch ID code	O UDP	Stop bit 1 T	🗹 Enable
	UDP		
code Show chars	O UDP	Flow control NONE *	Enable     Initial Interval     00 ms
) code Show chars	UDP	Flow control NONE  Serial data packing condition Character 00	Enable     Initial Interval     00 ms
arch ID code	Local port     Fix port	Flow control NONE   Serial data packing condition	Enable     Initial Interval     00 ms

WIZnet software - Scan for device

8. Then, if the module is properly connected to the network, it will appear in the search list. Select the **WIZ108SR** device to access its configuration.

#### **△** Caution

If the module does not appear in the list and it has been previously connected to another PC, **reboot** the module (simply unpower it and power it up again).

This is because when the **WIZ108SR** module establishes a connection to a PC's MAC address, it will only communicate with that PC unless it is rebooted.

The configuration must be as follows:

- In the **Basic Settings** tab, make sure that the Network Settings parameters are:
  - Local IP: 192.168.11.2
  - Subnet Mask: 255.255.255.0
  - Gateway: 192.168.11.1
- In the **Channel #0** tab:
  - Change the Operation mode to **UDP**.
  - Set the Local port to 5001 (for example).
  - Set the Remote host to the adapter IP previously configured in step 5 and a Remote Port, in this example port 5002 has been chosen.
  - The Serial options must match those of the Autopilot 1x, so set them as follows:
    - Baud rate: 115200
    - Data bit: 8
    - Parity: NONE
    - Stop bit: 1
  - Modify in the Serial data packing condition the size to 255 to send the data in 255 byte packets, so that each send will have more data.

Device Search Apply Settings	Firmware Upload	δ Reset Device ζ		actory leset	Save Config	Load Config	↓ Exit
2.168.11.8:Realtek PCIe GbE Family 🕶	Basic settings O	ptions					
earched results: 1	Device information			-Network configu	ration		
Mac address Name 00:08:DC:59:0C:69 WIZ108SR	Туре	WIZ1085R		Static		ICP	
	Version	4.06		Local IP	192.168	.11.2	
	Search identification	n code		Subnet mask	255.255	255.0	
		Show ch	ars	Gateway	192.168	.11.1	
	(Max. 8 byte	s)		DNS server	0.0.0	.0	
	Channel #0						
	Status:	OPEN	Seria	l options		Timer interval	
	Serial interface:	1	Baud	rate 11	.5200 -	Inactivity timer	0 sec
	Operation mode		Data	bit 8	•	Reconnection	
	TCP dient     TCP server	<ul> <li>SSL TCP dient</li> <li>MQTT dient</li> </ul>	Parit	y N	ONE -	interval	1000 ms
	O TCP mixed	MQTTS dient	Stop	bit 1	-	TCP Keep-alive inte	erval
	O UDP		L `			Enable	
earch ID code	Local port		Flow	control No	DNE 🔻	Initial Interval	0 ms
D code			Seria	l data packing con	dition	Retry interval	0 ms
earch method	5001	Fix port	d	haracter	00		
UDP broadcast	Remote host / Port			ze	255		
) TCP unicast	Remote host	192.168.11.8			233		
	Remote port	5002	T	ime(ms)	0		

WIZnet software - Device configuration

9. Finally, click **Apply Settings** to save the configuration to the device.

WIZnet S2E Configuration Tool V1.4.2				- 🗆 ×
File Option Help				
Device Search Apply Settings	Firmware Upload Reset Device	Factory Reset	Save Config Load Config	C Exit
192.168.11.8:Realtek PCIe GbE Family 🔻	Basic settings Options			
Searched results: 1	Device information	Network configuration	n	
Mac address         Name           1         00:08:DC:59:0C:69         WIZ108SR	Type WIZ1085R	Static		
	Version 4.06	Local IP	192.168.11.2	
	Search identification code	Subnet mask	255.255.255.0	
	Show o	hars Gateway	192.168.11.1	
	(Max. 8 bytes)	DNS server	0.0.0.0	
	Channel #0			
	Status: OPEN	Serial options	Timer interval	
	Serial interface: 1	Baud rate 11520	0   Inactivity time	er 0 sec
	Operation mode	Data bit 8	<ul> <li>Reconnection</li> </ul>	1000 ms
	O TCP dient O SSL TCP dient O TCP server MQTT dient	Parity NONE	▼ interval	1000
	O TCP mixed O MQTTS dient	Stop bit 1	TCP Keep-alive in	nterval
Search ID code	UDP     Local port	Flow control NONE	Enable     Initial Interva	l 0 ms
ID code	Local port	Serial data packing condition		
Search method	5001 Fix port			
UDP broadcast	Remote host / Port	Character (	00	
	Remote host 192.168.11.8	Size 2	55	
O TCP unicast	Remote port 5002	Time(ms)	D	
192.168.11.2 : 50001				

WIZnet software - Apply Settings

#### Veronte Link configuration

 Add a new UDP connection in Veronte Link and configure it with the same IP address and port as previously set in the Remote options of the WIZNet settings.

In this example:

- Address: 192.168.11.1
- Port: 5002

Type *	•
JDP configura	tion
Address	
Port	
πι	×

**Veronte Link - Connection settings** 

For more information on Veronte Link connections, please refer to the UDP connection - Integration examples section of the **Veronte Link** user manual.

1x PDI Builder configuration

11. Go to Input/Output menu  $\rightarrow$  **I/O Setup panel**.

**Bidirectionally** connect the **RS485 Producer** to a **Commgr port Consumer**, in this example it has been linked to Commgr port 3. Then, the same **Commgr port Producer**, in this case Commgr port 3, should be automatically connected to the **RS485 Consumer**:

#### (i) Note

If the **WIZ107SR** module is used, i.e. a connection is established via **RS232**, bidirectionally connect the **RS232 port** to a **Commgr port** and not the RS485 port.

Ŧ		🕂 Input / Output			) ± 0	
I/O Setup	Configuration					
CAN Setup	Priority	Producer		Consumer		
Digital Input	High 🕸	USB	$\leftrightarrow$	Commgr port 0	Q <sub>0</sub> <sup>0</sup>	Always Ok
Serial	High 🔯	Veronte LOS	$\rightarrow$	Commgr port 1	- Ø5	Always Ok
	High 🔯	External UART	$\leftrightarrow$	Commgr port 2	00	Always Ok
	High 🕸	RS232	$\rightarrow$	None	00	Always Ok
	High 👯	RS485	$\leftrightarrow$	Commgr port 3	00	Always Ok
	High 🔯	Commgr port 0	$\leftrightarrow$	USB	00	Always Ok
	High 🔯	Commgr port 1	$\leftrightarrow$	Veronte LOS	Ф°	Always Ok
	High 🔯	Commgr port 2	$\leftrightarrow$	External UART	00	Always Ok
	High 👯	Commgr port 3	$\rightarrow$	RS485	00	Always Ok
	High 🔯	Commgr port 4	$\rightarrow$	None	00	Always Ok
	High 🔯	Commgr port 5	$\rightarrow$	Serial to CAN 1	00	Always Ok
	High 🔯	RS custom message 0	$\rightarrow$	None	Ф°	Always Ok
	High 🗘	RS custom message 1	$\rightarrow$	None	00	Always Ok
	High 🔯	RS custom message 2	$\rightarrow$	None	Ø0	Always Ok
	High 👯	Tunnel 0	$\rightarrow$	None	Ø0	Always Ok
	High 🖓	Tunnel 1	$\rightarrow$	None	00	Always Ok
	High (0 <sup>0</sup>	Tunnal 2		None	202	Alwaye Ok

#### **1x PDI Builder - I/O Setup configuration**

12. Go to Input/Output menu  $\rightarrow$  Serial panel  $\rightarrow$  **RS485 tab**.

#### (i) Note

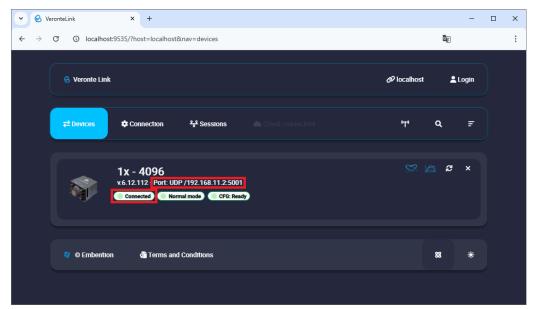
If using the **WIZ107SR** module, check the **RS232** parameters instead.

Make sure that these parameters are the same as the parameter values previously set in the **WIZNet** software.

- Baudrate: **115200**
- Length: 8
- Stop: **1**
- Parity: **Disabled**

#### **1x PDI Builder - Serial configuration**

Following these steps, **Autopilot 1x** should appear in Veronte Link as follows:



Autopilot 1x connection via UDP

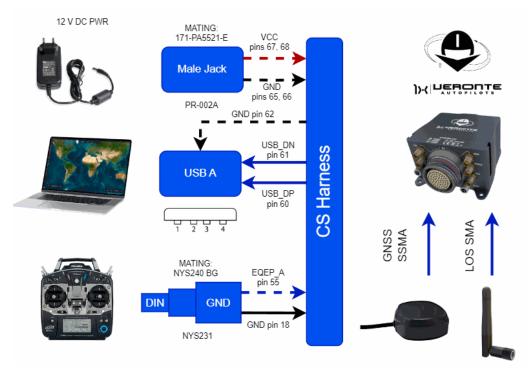
#### **External devices**

The step-by-step instructions for the following external devices will be explained in detail in the following sections:

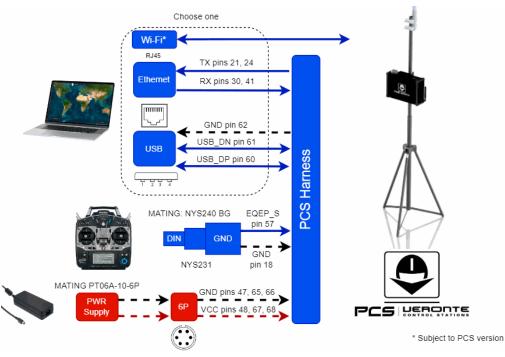
- Connection Examples
- Actuators/Servos
- Air Data Sensors
- Altimeters
- Datalinks
- GNSS Receivers
- IMUs & Compass
- RPM Sensors
- Stick
- Veronte products

# **Connection Examples**

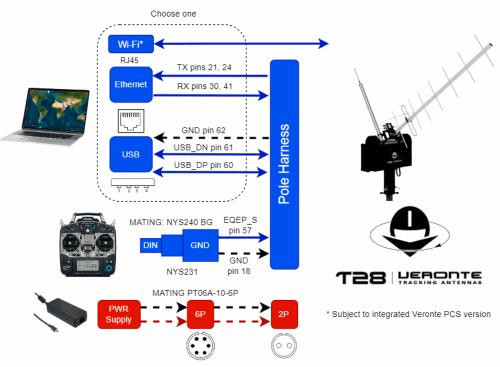
# **Ground Stations**



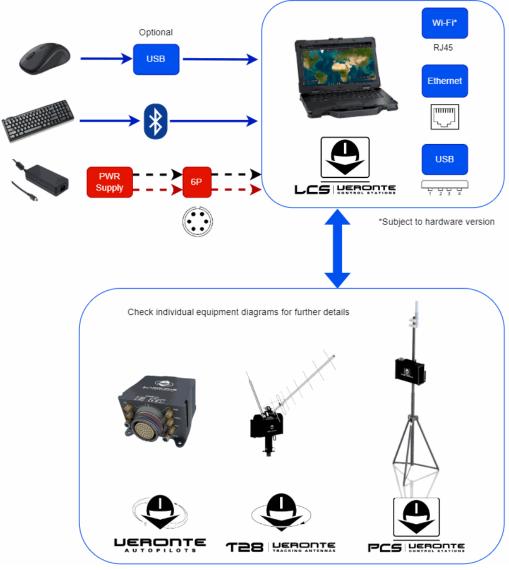
## **Basic Autopilot 1x Ground Station**



**Autopilot 1x PCS Ground Station** 



Autopilot 1x Tracker Ground Station

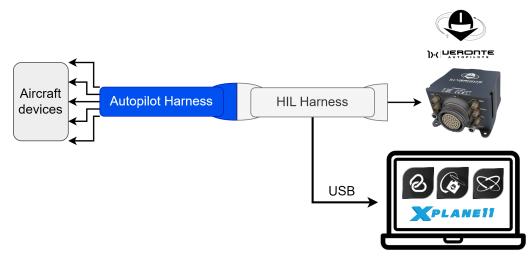


# Autopilot 1x LCS Ground Station

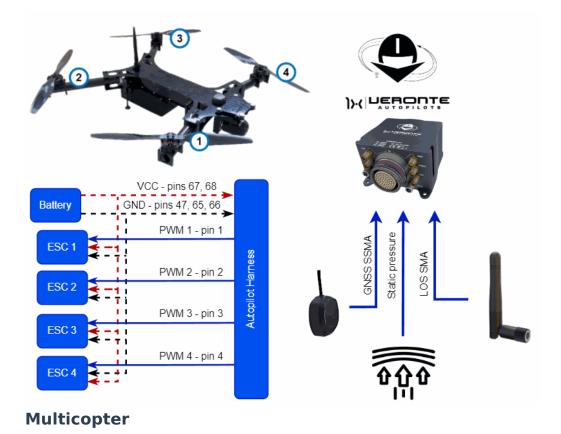
#### **△** Warning

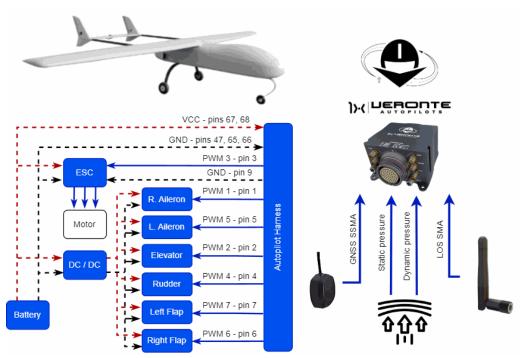
Veronte Autopilot 1x equipment harnesses have specific pin layouts. Only use their own matting connectors, do NOT mix harnesses: misuse can lead to destruction.

## Aircrafts

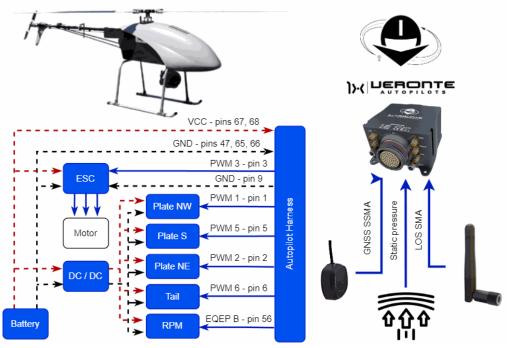


**HIL Harness** 





**Fixed Wing Airplane** 



#### Helicopter

# Actuators/Servos

The user can configure any actuator compatible with the communication interfaces.

## CAN

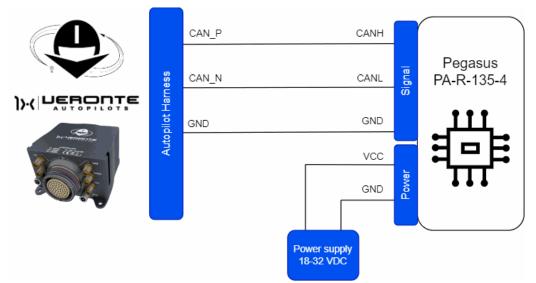
Pegasus PA-R-135-4



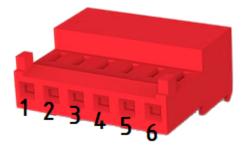
Pegasus PA-R-135-4 servo

**Pegasus PA-R-135-4** micro-low-profile servo is currently the world's smallest professional servo-actuator of its class.

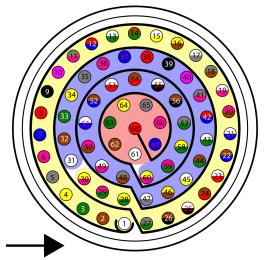
The setup to be performed by the user should be as follows:



Pegasus PA-R-135-4 - Autopilot 1x wiring diagram



# Pegasus PA-R-135-4 Tyco MTA100 connector pinout



Autopilot 1x harness pinout

Autopilot 1x Harness		R- Tyco	asus PA- 135-4 MTA100 nnector	
PIN	Signal	gnal Color Code		Signal
25	CANA_P	White- Black	3	CANH
28	CANB_P	Yellow- Green	J	CANIT
26	CANA_N	Brown- Black	1	CANL
29	CANB_N	Pink- Green	I	CANL
30	GND	Yellow- Pink	6	GND

## (i) Note

CAN A and CAN B buses are equivalent and can be used interchangeably for the integration of this device.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

## **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the hardware integration of the device has been completed, it will be necessary to proceed with the **software integration**. To do this, follow the steps detailed in the Pegasus - Integration examples section of the **1x PDI Builder** user manual.

**Ultra Motion** 



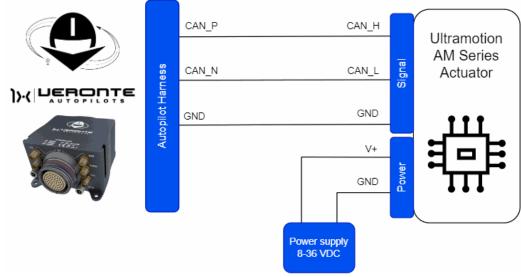
**Ultra Motion servo** 

**Ultra Motion** servo is a high-precision actuator designed for demanding applications, with BLDC electronic control and non-contact absolute position feedback.

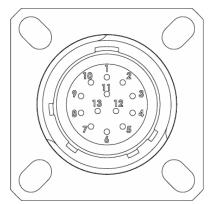
This device can be integrated with **Autopilot 1x** via **CAN 2.0B protocol** to ensure robust and efficient communication in the system.

The setup to be performed by the user should be as follows:

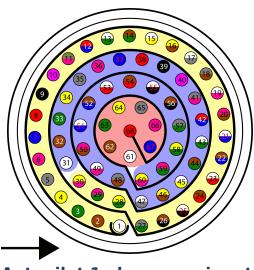
#### 1x Hardware Manual



Ultra Motion - Autopilot 1x wiring diagram



**Ultra Motion - Pinouts for Signal connector on AM series actuators** 



Autopilot 1x harness pinout

Autopilot 1x Harness			Ultra	a Motion Connect	-
PIN	Signal	Color Code	PIN	Signal	Color Code
25	CANA_P	White- Black	7		Pod
28	CANB_P	Yellow- Green		CAN_H	Red
26	CANA_N	Brown- Black	9	CANL	
29	CANB_N	Pink- Green	9	CAN_L	White
30	GND	Yellow- Pink	8	GND	Black

# (i) Note

CAN A and CAN B buses are equivalent and can be used interchangeably for the integration of this device.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

#### **∆** Warning

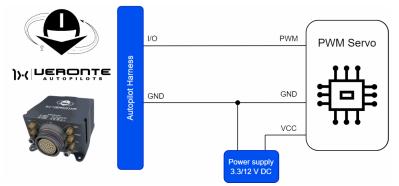
**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the hardware installation has been completed, the user can find the explanataion for the software installation in the Ultra Motion - Integration examples section of the **1x PDI Builder** user manual.

#### PWM

This section details the process of integrating a **PWM servomotor** with **Autopilot 1x**.

The connection diagram between the two devices should look like this:

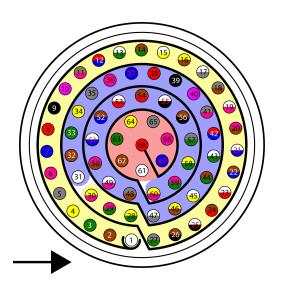


PWM - Autopilot 1x wiring diagram

#### Important

Note that this servo must be connected to an **external power supply**, **sharing signal ground** with **Autopilot 1x**.

The **PWM servo** must be connected to one of the available I/O pins of **Autopilot 1x**.



# Autopilot 1x harness pinout

Autopilot 1x Harness						
PIN	Signal	Color Code				
1	I/O0	White				
2	I/01	Brown				
3	I/O2	Green				
4	I/O3	Yellow				
5	I/O4	Gray				
6	I/O5	Pink				
7	I/O6	Blue				
8	I/07	Red				
9	GND	Black				
10	I/O8	Violet				
11	I/O9	Gray-Pink				
12	I/010	Red-Blue				
13	I/011	White-Green				
14	I/012	Brown-Green				
15	I/013	White-Yellow				
16	I/014	Yellow-Brown				
17	I/015	White-Gray				

## **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the hardware connection is made, it is necessary to **configure** the **I/O** pin used. Since these **I/O** pins are **preconfigured** as **GPIO**, they must be set as **PWM**.

To do so, refer to and follow the steps described in the PWM - Integration examples section of the **1x PDI Builder** user manual.

Serial

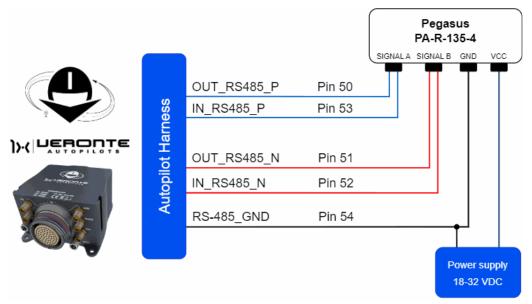
Pegasus PA-R-135-4



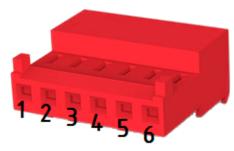
Pegasus PA-R-135-4 servo

**Pegasus PA-R-135-4** micro-low-profile servo is currently the world's smallest professional servo-actuator of its class.

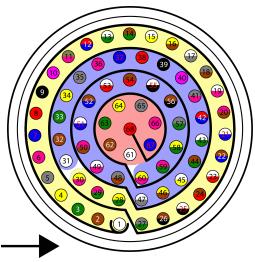
The setup to be performed by the user should be as follows:



Pegasus PA-R-135-4 - Autopilot 1x wiring diagram



Pegasus PA-R-135-4 Tyco MTA100 connector pinout

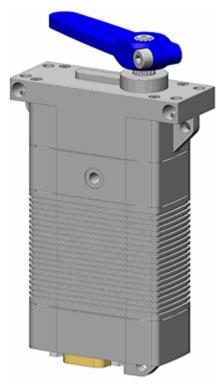


Autopilot 1x harness pinout

A	utopilot 1x Har	R- Tyco	asus PA- 135-4 MTA100 nnector		
PIN	Signal Color Code		PIN	Signal	
50	OUT_RS485_P	Pink- Brown	3	SINGAL	
53	IN_RS485_P	White- Red	5	A	
51	OUT_RS485_N	White- Blue	1	SIGNAL	
52	IN_RS485_N	Brown- Blue	T	В	
54	OUT_GND	Brown- Red	6	GND	

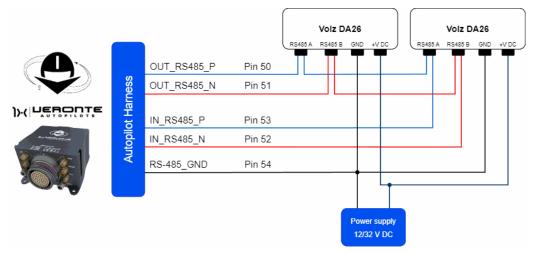
Once the hardware integration of the device has been completed, it will be necessary to proceed with the **software integration**. To do this, follow the steps detailed in the Pegasus - Integration examples section of the **1x PDI Builder** user manual.

#### Volz DA26 - RS485



#### Volz DA26

The following wiring connection is recommended for a **RS485 half-duplex** connection between **Volz DA26** servos and **Veronte Autopilot 1x**:



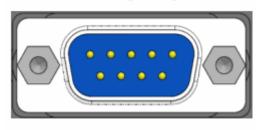
#### Volz DA26 - Autopilot 1x wiring connection

The above diagram is made for the case where 2 **Volz DA26** servos are connected, however, the connection is the same in case the user wants to connect only one or as many servos as the bus allows.

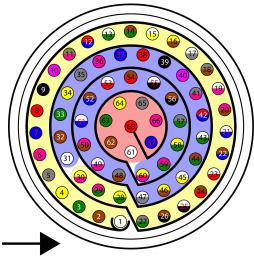
# () Important

Note that this servo must be connected to an **external power supply**, **sharing signal ground** with **Autopilot 1x**.

1 2 3 4 5



6 7 8 9 Volz DA26 connector pinout



Autopilot 1x harness pinout

A	utopilot 1x Har	Volz DA26 Connector		
PIN	Signal Color Code		PIN	Signal
50	OUT_RS485_P	Pink- Brown		RS 485 A (Non-
53	IN_RS485_P	White- Red	1	inverting Input/ Output)

A	utopilot 1x Har	Volz DA26 Connector		
PIN	Signal Color Code		PIN	Signal
51	OUT_RS485_N	White- Blue	2	RS 485 B (Inverting
52	IN_RS485_N	Brown- Blue	Z	Input/ Output)
E /		Brown-	7	GND (1)
54	OUT_GND	Red	8	GND (2)

## **∆** Warning

Note that this pin 54 is not a common GND pin.

## (i) Note

If users encounter any problems during wiring, please check the Halfduplex servo does not respond - Troubleshooting section of this manual.

Once the hardware integration of the device has been completed, it will be necessary to proceed with the **software integration**. To do this, follow the steps detailed in the Volz DA26-RS485 - Integration examples section of the **1x PDI Builder** user manual.

# Air Data Sensors

## High Speed Pitot Sensor



**High Speed Pitot Sensor** 

This section explains how to install the **High Speed Pitot Sensor** with an **Autopilot 1x** and configure it, so **1x** measures the air speed from the electrical signals of **High Speed Pitot Sensor**.

#### **Required Material**

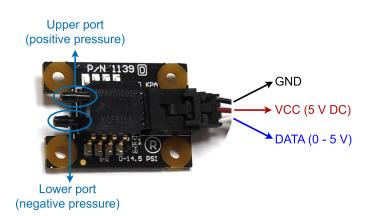
- Veronte Autopilot 1x with hardware version 4.8.
- High Speed Pitot Sensor.
- Veronte Harness CS for 1x v4.8 with Embention reference P001114.
- Power supply for 1x (6.5 36 V DC).
- Power supply for **High Speed Pitot Sensor** (5 V DC).
- Pneumatic tubing, with 3 mm of outer diameter and 1 mm of inner. Silicone material is recommended.
- Two T-connectors for the tubing.

## **∆** Warning

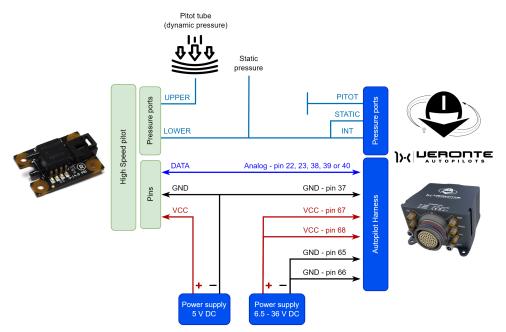
Take caution when connecting the pressure ports. This sensor only measures a positive pressure differential, so the sensor might be damaged if it reverse connected.

Ensure that the upper port is always at an equal or higher pressure than the lower port.

Connect the pneumatic tubes and wires according to the following diagrams:

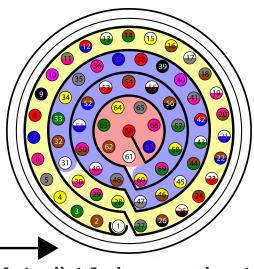


#### High Speed Pitot Sensor - Autopilot 1x connections diagram



#### High Speed Pitot Sensor - Autopilot 1x connections diagram

The analog pin defines which analog variable is used for configuration.



Autopilot 1x harness pinout

Autopilot 1x Harness			-	Speed Sensor
PIN	Signal Color Code		Signal	Color Code
38	ANALOG_0	Red		
39	ANALOG_1	Black		
40	ANALOG_2	Pink		
22	ANALOG_3	Brown - Blue	DATA	White
23	ANALOG_4	White - Red		
37	GND	Blue	GND	Black

#### **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the **High Speed Pitot Sensor** is connected, air speed measurements can be monitored with **1x PDI Builder** using the variables ADC0 to ADC4. The integration of this device with **Autopilot 1x** as far as the software is concerned is explained in the High Speed Pitot Sensor - Integration examples section of **1x PDI Builder** user manual.

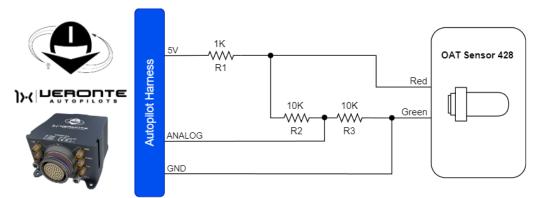
## OAT sensor 428 of MGL Avionics



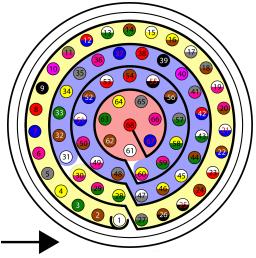
**OAT sensor 428** 

The **OAT sensor 428** of MGL Avionics is an analogical temperature sensor that measures temperatures from -55°C to 150°C. It changes the voltage according to the temperature measured and therefore the connection to the autopilot is performed using the ADC pins.

The following resistors and wiring are necessary to connect an **OAT sensor 428** to the **Autopilot 1x**:



OAT sensor - Autopilot 1x wiring diagram



# Autopilot 1x harness pinout

Autopilot 1x Harness						
PIN	Signal	Color Code				
36	5V	Pink				
37	GND	Blue				
38	ANALOG_0	Red				
39	ANALOG_1	Black				
40	ANALOG_2	Pink				
22	ANALOG_3	Brown - Blue				
23	ANALOG_4	White - Red				

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once connected the **OAT sensor**, the temperature can be monitored with **1x PDI Builder** using the variables ADC0 to ADC4.

The integration of this device with **Autopilot 1x** is explained in the OAT Sensor - Integration examples section of the **1x PDI Builder** user manual.

# Altimeters

## Lidar

The integration between **Veronte Autopilot 1x** and a lidar is performed using a variety of interfaces depending on the lidar device. The most common interfaces are I2C or analog although serial or CAN bus can also be used if the lidar is compatible.

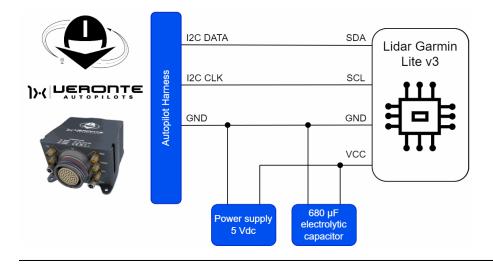
Lidar Garmin Lite v3



Lidar Garmin Lite v3

# Lidar Garmin Lite v3 sensor integrates with Autopilot 1x via I2C

connection.

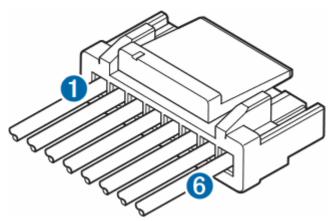


#### Lidar Garmin Lite v3 - Autopilot 1x wiring diagram

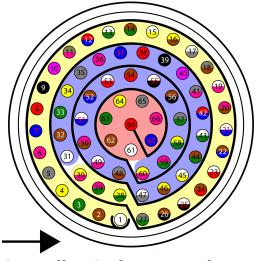
# () Important

To ensure correct operation of the device, it is recommended to use an **external power supply** and **not to connect** it to the **3.3-5 V** lines of **Autopilot 1x**.

Please note that it **shares signal ground** with **Autopilot 1x**.



Lidar Garmin Lite v3 connector



Autopilot 1x harness pinout

Autopilot 1x Harness		Lidar Garmin Lite v3 Connector			
PIN	Signal	Color Code	PIN	Signal	Color Code
31	I2C_CLK	White	4	I2C SCL	Green
32	I2C_DATA	Brown	5	I2C SDA	Blue
35	GND	Gray	6	Ground (-)	Black

#### **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the lidar is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the Lidar Garmin Lite v3 -Integration examples section of the **1x PDI Builder** user manual.

Lightware LW20 Lidar



Lightware LW20 Lidar

**Lightware LW20 Lidar** sensor integrates with **Autopilot 1x** via **I2C** connection.

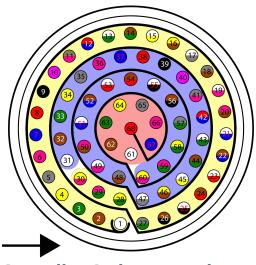
SSS	I2C DATA	SDA SCL	Lightware LW20 Lidar
Autopilot Harness		GND VCC wer supply 5 V DC	

#### Lightware LW20 Lidar - Autopilot 1x wiring diagram

## () Important

To ensure correct operation of the device, it is recommended to use an **external power supply** and **not to connect** it to the **3.3-5 V** lines of **Autopilot 1x**.

Please note that it **shares signal ground** with **Autopilot 1x**.



Autopilot 1x harness pinout

Autopilot 1x Harness			Lig	htware I Lidar	_W20
PIN	Signal	Color Code	PIN	Signal	Color Code
31	I2C_CLK	White	2	SCL	White
32	I2C_DATA	Brown	1	SDA	Yellow
35	GND	Gray	8	GND	Black

#### **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once **Lightware LW20 Lidar** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x** by referring to the Lightware LW20 Lidar - Integration examples section of the **1x PDI Builder** user manual.

Lightware SF20 Lidar



Lightware SF20 Lidar

**Lightware SF20** Lidar sensor integrates with **Autopilot 1x** via **I2C** connection.

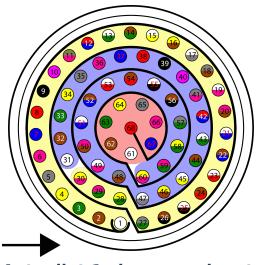
988 8	I2C DATA	SDA SCL	Lightware SF20 Lidar
Autopilot Harness	GND Po	GND VCC wer supply 5 V DC	

#### Lightware SF20 Lidar - Autopilot 1x wiring diagram

## () Important

To ensure correct operation of the device, it is recommended to use an **external power supply** and **not to connect** it to the **3.3-5 V** lines of **Autopilot 1x**.

Please note that it **shares signal ground** with **Autopilot 1x**.



Autopilot 1x harness pinout

Autopilot 1x Harness		Lightware SF20 Lidar			
PIN	Signal	Color Code	PIN	Signal	Color Code
31	I2C_CLK	White	2	SCL	White
32	I2C_DATA	Brown	1	SDA	Yellow
35	GND	Gray	8	GND	Black

## **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once **Lightware SF20 Lidar** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x**. Since this setup is the same as for the **Lightware LW20**, please refer to the Lightware LW20 Lidar - Integration examples section of the **1x PDI Builder** user manual.

#### Radar

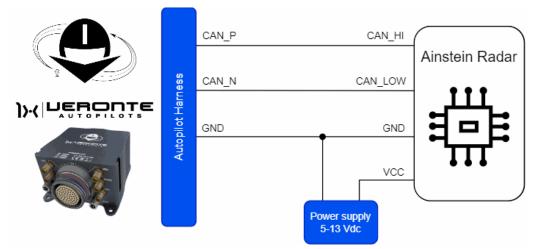
Radar altimeters are common devices on aircrafts.

Ainstein CAN Radar



## Ainstein CAN Radar sensor integrates with Autopilot 1x via CAN

#### connection.

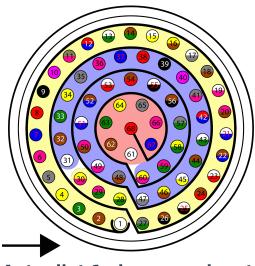


#### Ainstein CAN Radar - Autopilot 1x wiring diagram

#### () Important

To ensure correct operation of the device, it is recommended to use an **external power supply** and **not to connect** it to the **5 V** line of **Autopilot 1x**.

Please note that it **shares signal ground** with **Autopilot 1x**.



Autopilot 1x harness pinout

Autopilot 1x Harness			Ainstein CAN Radar		
PIN	Signal	Color Code	PIN	Signal	Color Code
25	CANA_P	White- Black	2	CAN_HI	Green
28	CANB_P	Yellow- Green	Z		
26	CANA_N	Brown- Black	3	CAN_LOW	White
29	CANB_N	Pink- Green	J		
30	GND	Yellow- Pink	4	Ground	Black

# (i) Note

CAN A and CAN B buses are equivalent and can be used interchangeably for the integration of this device.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

#### **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once **Ainstein CAN Radar** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x** by referring to the Ainstein CAN Radar - Integration examples section of the **1x PDI Builder** user manual.

# Datalinks

## LOS

Amount of data sent via radiolink

Regardless of the radio used, the amount of telemetry data that can be sent by radiolink is limited.

#### () Important

Refer to the Data Transmission section of the **1x Software Manual** for information on the amount of data that can be sent.

Digi radio (as internal radio)

Internal Digi radios can establish communication between Veronte Autopilots 1x.

The necessary configuration of Digi radios for proper communication between them and **1x** is described in the Digi internal radio - Integration examples section of the **1x PDI Builder** manual.

DTC (Domo Tactical) radio (SOL8SDR-C model)

#### System Layout

It is possible to operate DTC radios in two different ways, with or without amplifiers.

#### • DTC

The following image shows the standard connection between **DTC** radios and **Autopilot 1x** for operation:



DTC radios and Autopilot 1x operation

## • DTC + Amplifier

#### (i) Note

Amplifier information: **AMPD5W** model, 5W Linear RF Power Amplifier.

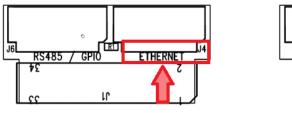
The following image shows the standard connection between **DTC** radios, amplifiers and **Autopilot 1x** for operation:



Hardware Installation

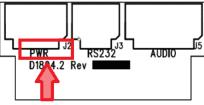
Depending on the action to be taken, different hardware installations are possible:

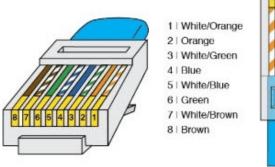
1. To **configure a DTC radio** it is required to carry out the installation of the ethernet and power connection:



DTC D1804 Gecko breakout PCB

• Ethernet





ge :/Green	
e/Blue n e/Brown	
n	

# RJ45 pinout T-568B

J4 (Ethernet) - D1804 Gecko breakout PCB		RJ45 Connector (T-568B)		
PIN	Signal	PIN	Signal	Color Code
1	Ethernet MDIP0	1	TX+	Orange- White
2	Ethernet MDIN0	2	TX-	Orange
3	Ethernet MDIP1	3	RX+	Green- White
4	Ethernet MDIN1	6	RX-	Green

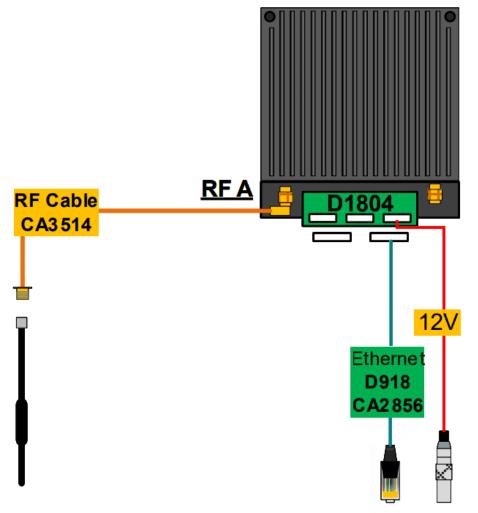
# • Power supply



# Female DC Power Jack connector

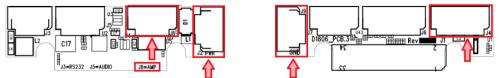
J2 (PWR) - D1804 Gecko breakout PCB		Power Connector
PIN	Signal	Signal
1	VIN	Power +
2	VIN	FOWER +
3	GND	Power -
4	GND	rower -

The full connection should look like this:



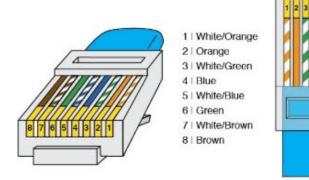
2. To **configure a DTC + amplifier radio** it is required to carry out the

installation of the ethernet, power and amplifier connection:



## DTC D1806 Gecko active breakout PCB

## • Ethernet



## RJ45 pinout T-568B

J4 (Ethernet) - D1806 Gecko Active Breakout PCB		RJ45 Connector (T-568B)		
PIN	Signal	PIN	Signal	Color Code
1	Ethernet MDIP0	1	TX+	Orange- White
2	Ethernet MDIN0	2	TX-	Orange
3	Ethernet MDIP1	3	RX+	Green- White

#### 2025-05-14

D18	J4 (Ethernet) - D1806 Gecko Active Breakout PCB		RJ45 Connector (T-568B)	
PIN	Signal	PIN	Signal	Color Code
4	Ethernet MDIN1	6	RX-	Green

• Power supply



## Female DC Power Jack connector

<

J2 (PWR) - D1806 Gecko Active Breakout PCB		Power Connector
PIN	Signal	Power Signal
1	VIN	Power +
2	VIN	
3	VIN	
4	VIN	

J2 (PWR) - D1806 Gecko Active Breakout PCB		Power Connector
PIN	Signal	Power Signal
5	VIN	
6	VIN	

J9 (GND) - D1806 Gecko Active Breakout PCB		Power Connector
PIN Signal		Power Signal
1	GND	
2	GND	
3	GND	Power -
4	GND	Power -
5	GND	
6	GND	

• Amplifier



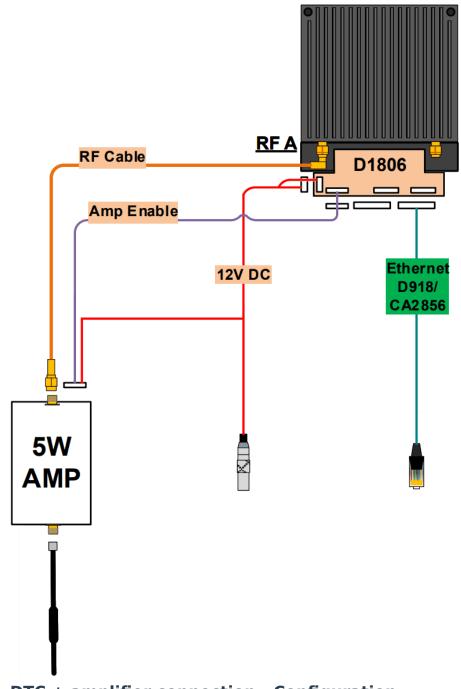
Amplifier AMPD5W

J8 (AMP) - D1806 Gecko Active Breakout PCB			1PD5W nnector
PIN	Signal	PIN	Signal
1	5V_SDA	6	5V_SDA
2	GND	3	GND
4	5V_SCL	5	5V_SCL
7	PA_TDD	7	PA_TDD

Gec	J2 (PWR) - D1806 Gecko Active Breakout PCB		IPD5W Inector
PIN	Signal	PIN	Signal
1	VIN		Power +
2	VIN		
3	VIN	1&	
4	VIN	2	
5	VIN		
6	VIN		

J9 (GND) - D1806 Gecko Active Breakout PCB			PD5W nector
PIN	Signal	PIN	Signal
1	GND		
2	GND		
3	GND	3 & 4	Power -
4	GND		
5	GND		
6	GND		

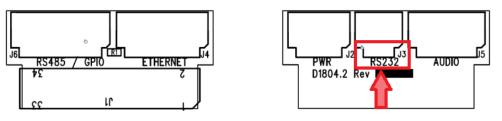
The full connection should look like this:



## **DTC + amplifier connection - Configuration**

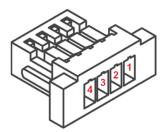
3. To **connect a DTC radio to a Veronte Autopilot 1x** the following installation must be carried out:

As, the connection of a **DTC** radio to a **Veronte Autopilot 1x** must be made via **RS-232**, the connection will be the same as in the configuration case (1), but adding the wiring to RS-232 port.

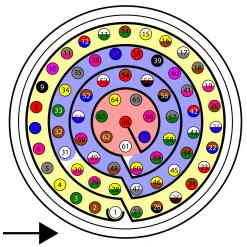


## DTC D1804 Gecko breakout PCB - J3 (RS232)

This RS-232 should be connected to the RS-232 of **Autopilot 1x** harness.



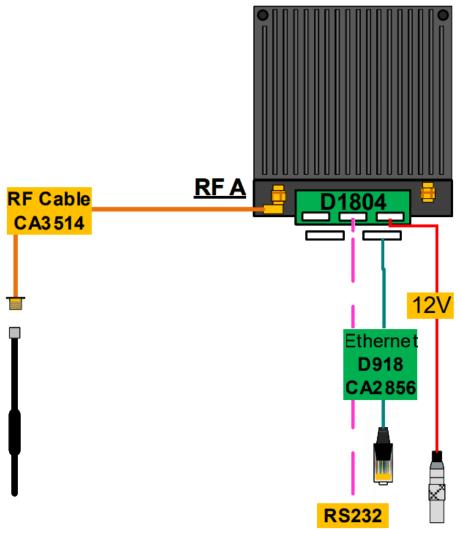
J3 (RS232) pinout of female connector



Autopilot 1x harness pinout

J3 (RS232) - D1804 Gecko Breakout PCB		Autopilot 1x Ha		Harness
PIN	Signal	PIN	Signal	Color Code
2	RS232 RX	19	RS232 TX	White- Pink
1	RS232 TX	20	RS232 RX	Pink- Brown
3	GND	21	GND	White- Blue

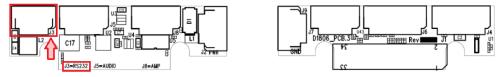
The full connection should look like this:



**DTC connection - Veronte Autopilot 1x** 

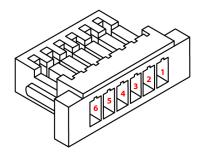
4. To **connect a DTC + amplifier radio to a Veronte Autopilot 1x** the following installation must be carried out:

As, the connection of a **DTC** radio to a **Veronte Autopilot 1x** must be made via **RS-232**, the connection will be the same as in the configuration case (2), but adding the wiring to RS-232 port.

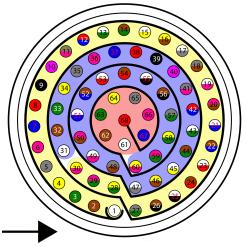


DTC D1806 Gecko active breakout PCB - J3 (RS232)

This RS-232 should be connected to the RS-232 of **Autopilot 1x** harness.



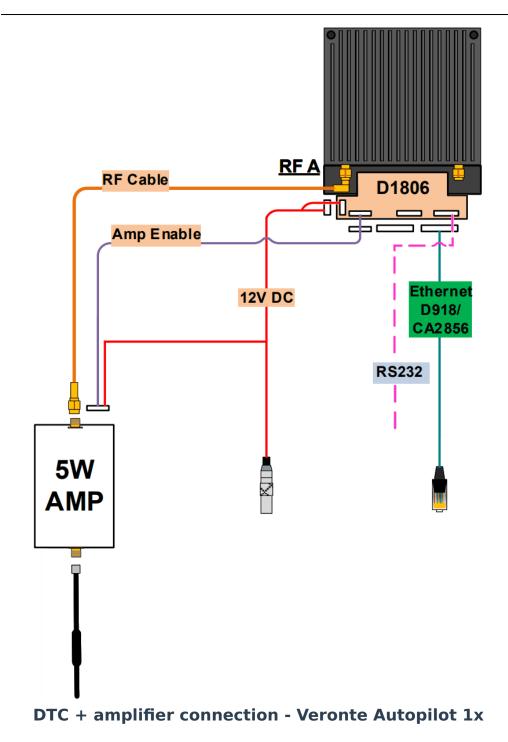
J3 (RS232) pinout of female connector



Autopilot 1x harness pinout

D18	RS232) - 06 Gecko e Breakout PCB	Autopilot 1x Harnes				
PIN	Signal	PIN	Signal	Color Code		
2	RS232 RX	19	RS232 TX	White- Pink		
1	RS232 TX	20	RS232 RX	Pink- Brown		
3	GND	21	GND	White- Blue		

The full connection should look like this:



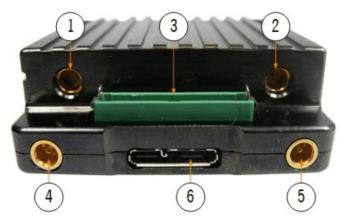
# **△** Caution

It is also possible to **calibrate** the **power output** of **DTC** radios and **DTC** + amplifier radios.

However, the radios are shipped with a factory calibration, it is **strongly recommended to not modify this calibration**. If the user wishes to modify it, please contact the support team (create a ticket in the customer's **Joint Collaboration Framework**; for more information, see Tickets section of the JCF manual).

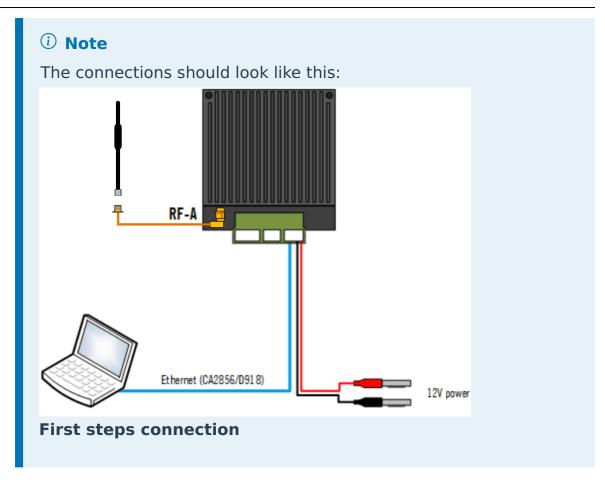
# DTC radio configuration

First steps



## **DTC ports**

- DTC without amplifier
  - <sup>1.</sup> Connect to 1 an SMP to SMA RF cable (this is the default transmit output).
  - 2. Connect this SMA RF cable to a 2.4 GHz antenna.
  - 3. Connect to (3) the **D1804 Gecko breakout PCB** supplied with the unit.
  - 4. Connect J2 (**PWR**) of the **D1804 PCB** to 12V power.
  - In order to access the web browser control application, connect J4 (ETHERNET) of the D1804 PCB to a PC or network Ethernet port via CA2856 and D918.

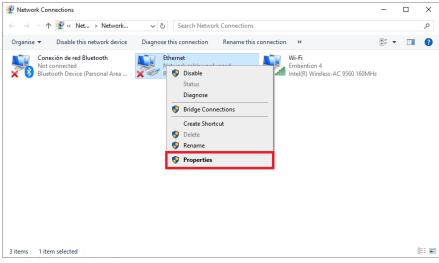


- Make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP address in the Control Panel:
  - 1. Open Network and Sharing Centre menu and click Change adapter settings.

Network and Sharing Centre			- 0	$\times$
$ ightarrow ~ \uparrow 1 bracka arrow Network a$				م
Control Panel Home	View your basic network information	and set up connections		
Change adapter settings	View your active networks			
change advanced sharing ettings Media streaming options				
	Change your networking settings			
		nection, or set up a router or access point.		
		or get troubleshooting information.		
See also				
Internet Options				
Windows Defender Firewall				

#### **Ethernet connection 1**

2. Select Local Area Connection, right click, and select Properties.



**Ethernet connection 2** 

3. Select IPv4 and click Properties.

Ethernet Properties	(
Networking Sharing	
Connect using:	
🕎 Realtek PCIe GbE Family Controller	
Configure This connection uses the following items:	
<ul> <li>Cliente para redes Microsoft</li> <li>Uso compartido de archivos e impresoras para redes M</li> <li>Programador de paquetes QoS</li> <li>Protocolo de Internet versión 4 (TCP/IPv4)</li> <li>Protocolo de multiplexor de adaptador de red de Micros</li> <li>Controlador de protocolo LLDP de Microsoft</li> <li>Protocolo de Internet versión 6 (TCP/IPv6)</li> </ul>	
Install Uninstall Properties	
Description Protocolo TCP/IP. El protocolo de red de área extensa predeterminado que permite la comunicación entre varias redes conectadas entre sí.	
OK Cancel	

**Ethernet connection 3** 

 Set IP address to 192.168.8.YY (e.g. if the IP of the radio is 192.168.8.95, set the IP 192.168.8.92) and Subnet mask to 255.255.255.0. Click OK.

Prot	ocolo de Internet versión 4 (TCP/I	Pv4) Properties	×
Ger	neral		
th	ou can get IP settings assigned auton is capability. Otherwise, you need to r the appropriate IP settings.		
_	○ Obtain an IP address automatical	y	_
IF	Use the following IP address: —		
н.	IP address:	192.168.8.92	
	Subnet mask:	255.255.255.0	
L	Default gateway:		
	Obtain DNS server address autom	natically	
	Use the following DNS server add	resses:	
	Preferred DNS server:		
	Alternative DNS server:		
	Validate settings upon exit	Advanced	
		OK Cancel	

**Ethernet connection 4** 

- 7. First, it is necessary to have the '**Domo Node Finder**' software installed.
- 8. Open **Domo Node Finder** and the connected radios will appear here as SOL8SDR.

By default, 0.0.0.0 is the IP address of the radio:

<b>Q</b> Domo Node Finder						- 🗆	×
<u>File T</u> ools <u>H</u> elp							
C I Filter:							
IP Address	Device Type	Unit Name	<ul> <li>Version</li> </ul>	DHCP	ESN	MAC Add	ress
0.0.0.0	Eastwood	SOL8SDR	7.2.1	Enabled	CAC420C29A82EEE1	00:11:6A:03	:3C:0D
0.0.0.0	Eastwood	SOL8SDR	7.2.1	Enabled	CAC420C29A82EEE1	00:11:6A:03	:3C:0E

## Domo Node Finder - Default IP address

To configure the IP address, right-click the IP address and select
 Configure Network to disable the DHCP setting and set the following static IP address:

Q Domo Node Finder					- 🗆	×
<u>F</u> ile <u>T</u> ools <u>H</u> elp						
G Filter:		3				
IP Address Device Type	Unit Name	<ul> <li>Version</li> </ul>	DHCP	ESN	MAC Add	ess
0.0.0 Estruced Web Interface (HT	TP port 80)	7.2.1	Enabled	CAC420C29A82EEE1	00:11:6A:03:	BC:0D
Configure Network Flash LED Request Password F Reset Password	 Reset Token	192.168.8.95 255.255.255.0	×			

## **Domo Node Finder - IP address configuration**

To confirm the change, click the  $\bigcirc$  icon to update the IP address.

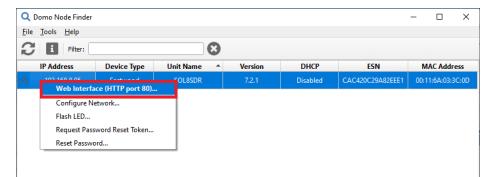
C Domo Node Finder Eile Iools Help Filter:					
					– 🗆 ×
C Filter:					
	8				
IP Address Device Type Unit Name	*	Version	DHCP	ESN	MAC Address
몸 192.168.8.95 Eastwood SOL8SDR					

## **Domo Node Finder - Configured IP address**

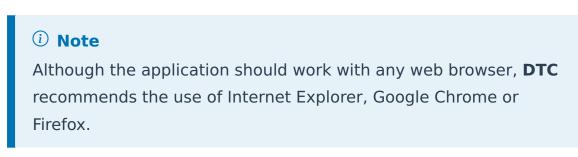
## (i) Note

This IP address, **192.168.8.95**, is related to the radio linked to the **ground unit**. For the radio linked to the **air unit**, the IP address should be **192.168.8.96**.

10. To open the DTC web browser control application, users can rightclick the IP address and select WEB Interface (HTTP port 80), double-click on the IP address or enter the IP address of the SOL8SDR-C on the address bar of a web browser.



#### **Domo Node Finder - Open Web Browser Application**



An authentication required dialogue box will open. Leave the
 Username blank and enter the Password as Eastwood.

👓 Login	× +							$\checkmark$	-	×
$\leftrightarrow$ $\rightarrow$ C (	Not secure   192.168.8.95	login	Q	€ ☆	2	*	Ø	* ⊒	₹	:
		Username Password								
			[	Login						

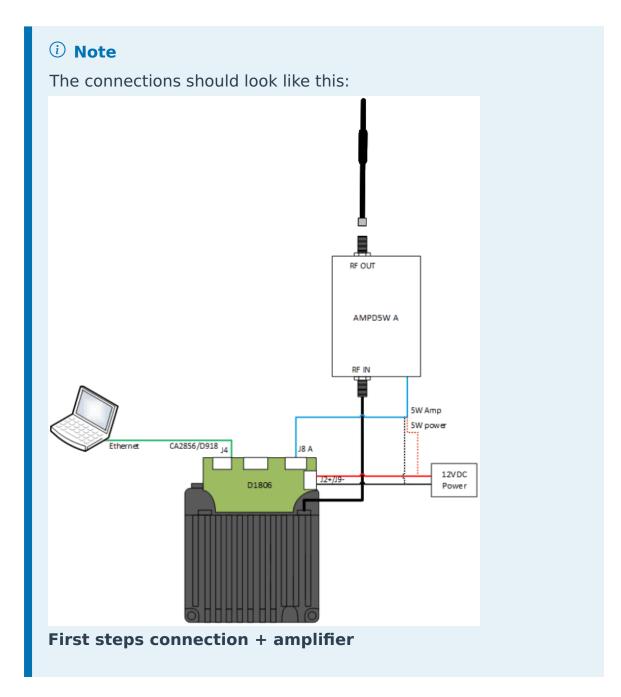
**Domo Node Finder - Open Web Browser Application** 

12. Click Login and the web browser control application will open.

#### • DTC with amplifier

- <sup>1.</sup> Connect to 1 an SMP to SMA RF cable (this is the default transmit output).
- 2. Connect this **SMA RF cable** to the amplifier **RF IN port**.
- 3. Connect a 2.4 GHz antenna to the amplifier **RF OUT port**.
- <sup>4.</sup> Connect to (3) the **D1806 Gecko active breakout PCB**.

- 5. Connect J4 (**ETHERNET**) of the **D1806 PCB** to a PC or network Ethernet port via CA2856 and D918.
- 6. Connect J2 (PWR) and J9 (GND) of the D1806 PCB to 12V power.
- 7. Connect J8 (**AMP**) of the **D1806 PCB** to the control cable from the amplifier connector.



8. Now the steps to follow are the same as from step 6. of a DTC without amplifier, described above.

#### Point-to-Point configuration

#### • Basic radio configuration

Once the website has been accessed, follow the steps below which show the parameters that need to be modified for a correct operation and pairing of the radios.

## (i) Note

This is an example of the radio configuration linked to a **ground** unit.

## (i) Note

After making any changes, the application will 'ask' to Save or Cancel the changes. An example is shown below:

DIC	NETNode Mesh IP Radio Solasdr		₩r Single Mesh 🕥 <sup>(</sup> 'Å') 2450 M							Editing
obal Setup / General Settings	🧮 General Settings					[	🐻 SAVE	⊗ CA	NCEL	
	GENERAL SETTINGS			UPDATE SETTINGS						
	Unit name	SOL8SDR GND		Update all node	s	•=	No			
	USB mode	Host	•							
Light 🥌 Dark										
€> LOGOUT										
Cer LUGUUT										

1. Global Setup  $\rightarrow$  **General Settings**: To easily identify each radio in a mesh, the user can rename the radio as desired:

🐵 NETNode IP Ra	dio	× +				~	- 🗆 ×
← → C /	Not	secure   192.168.8.95/wui_g	global/general		•• Q 🖻 ☆	a 🖇 🛠 🛤	± ∎ :
DTC		NETNode Mesh IP Radio SOL8SDR_GND		₩ Single Mesh 🜒 (**) 2450 MHz 🛞 1 📀 0 🗠 1 of 16		<ul> <li>Wired Connection</li> <li>Update Local Unit Only</li> </ul>	Preset 🔒 1 🏮
obal Setup / General Settings		🧱 General Settings					ICEL 📿 REFRESH
🛛 Apps		GENERAL SETTINGS			UPDATE SETTINGS		
II <sup>.</sup> Status		Unit name	SOL8SDR_GND		Update all nodes	en No	
🔋 Global Setup	۵	USB mode	Host				
🧱 General Settings							
🧕 Region & Time							
Telemetry							
Presets							
😵 System							
Light 🥌 Dark							
€> LOGOUT							
<b>∏</b> v7.14							
:[]: 1////4							
						🔗 Global configu	uration saved $\times$

General settings configuration

i) Note							
The radio	o related	to the	air uni	t also has	s its ow	n custon	nized
name:							
NETNode IP Radio	× +				~	- □ ×	
← → C ▲ Not secu	re   192.168.8.96/wui_global/ge	neral		• ର୍ଜ	* 🗟 🖇 🤇	***	
שדכ	NETNode Mesh IP Radio Sol8SDR_AIR		▶ Single Mesh 🐠 (%) 2450 M - ఈ 1 📀 1 🔩 1 of 16		Wired Connection Update Local Unit Only	Preset 1	
lobal Setup / General Settings	🧮 General Settings					CANCEL 📿 REFRESH	
🗓 Apps 🗢	GENERAL SETTINGS			UPDATE SETTINGS			
🕪 Status 🗢	Unit name	SOL8SDR_AIR		Update all nodes	no No	(1)	
🕸 Global Setup 🛆 🧮 General Settings	USB mode	Host					
IP Settings     Q Region & Time     Telemetry						& TIME 👂 TELEMETRY	
🞯: Advanced 🗢 🖃							
😤 System 🗢							
Light 🛑 Dark							
	setting	_					

2. Presets.

 Mesh Settings: Some of the parameters configured in this menu are always displayed at the top of the application.

#### **▲** Caution

It is recommended that software for all devices in a Mesh network should be at the same version to avoid potential compatibility issues.

$\times$
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Mesh settings configuration

- Operation mode: Select Single Mesh.
- Mesh ID: The Mesh ID must be the same on all units in the Mesh network. The Mesh ID tells the unit which network it belongs to, for example, all NETNodes on Mesh ID 1 will communicate with each other. The Mesh ID must be set to a non-zero value.
- Node Id: The node ID must be unique in the Mesh network for each device.

## (i) Note

A node can automatically reassign its Node ID at power up if it finds a conflict with an existing node.

- **Operating range**: A larger range allows the Mesh network to operate over a bigger distance at the expense of bitrate.
- Enable transmitter: Set the checkbox to switch the RF power on.
- Frequency: Set the desired transmission frequency. 2450
   MHz recommended.

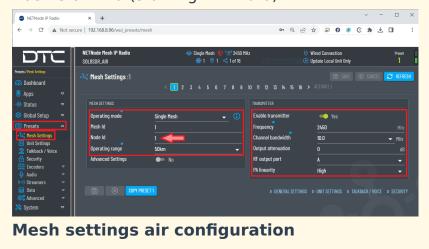
#### **△** Warning

Be careful when choosing the frequency. The user may see interference with the Wifi frequency band, consult the radio spectrum.

- Channel bandwith: Select the desired bandwidth from the drop-down list. Lower bandwidths provide greater range at the expense of data throughput. 10 MHz is recommended.
- Output attenuation: The level of attenuation in dB that is applied to the output (from 0 to 32). 0 dB of attenuation is recommended
- **RF output port**: The transmitter has two COFDM antennas, A and B. **A is selected as the output antenna by default**, but the user can select A or both if required.
- PA linearity: High linearity improves the COFDM shoulder performance at the expense of power consumption.
   Usually used when working with power amplifiers which must have excellent shoulder performance to operate, or for improved adjacent channel performance.

## 🛆 Warning

To ensure proper communication between the two radios, the radio linked to the **air unit must have these same 'Mesh settings' except for the Node Id**, as each node in the mesh has its own Id (starting with Id 0):



# Moreover, there are up to **16 different preset configurations that** can be setup.

All these settings are made for preset 1, which is highlighted with a blue background in the 'Mesh settings' tab to indicate that it is active. In addition, a '**preset indicator**' with the current present is always displayed at the top right of the application, as shown in the figure below.

NETNode IP Radio		×					<ul> <li>□</li> </ul>
← → C ▲	Not secure	e   192.168.8.95/wui_presets/mesh			0-	e 🖈 🗟 🛛 🜟 (	3 * 🕹 🖬
		NETNode Mesh IP Radio Sol8SDR_GND		iingle Mesh 🜒 <sup>(</sup> 🛞 1 💿 0 🗹	Hz	<ul> <li>Wired Connection</li> <li>Update Local Unit Only</li> </ul>	Preset 1
esets / Mesh Settings		St Mark Orwings 1					
🖄 Dashboard		୍ୟୁ Mesh Settings :1			 10 11 12 13 14 15		
🔋 Apps				4 5 0 7	10 11 12 10 14 15	NO P ACTIVATE I	
III Status		MESH SETTINGS	1 C		TRANSMITTER		
👶 Global Setup		Operating mode	Single Mesh		Enable transmitter	🥌 Yes	
🔲 Presets		Mesh Id			Frequency	2450	
🖧 Mesh Settings		Node Id	0		Channel bandwidth	10.0	✓ MHz
<ul> <li>Unit Settings</li> <li>Talkback / Voic</li> </ul>	e	Operating range	50km		Output attenuation		
A Security					RF output port	Δ.	

**Current preset configuration** 

• Unit Settings:

**External Power Enable**: There is an external power output which can be used to supply 12VDC (1A) to an external device.

This could be a camera, GNSS antenna or other device.

NETNode IP Radio	× +		× -	□ ×
← → C ▲ Not	secure   192.168.8.95/wui_presets/un	it	॰ ९ 🖻 🖈 🗟 👂 卷 🛃	
DTC	NETNode Mesh IP Radio SOL8SDR_GND	-₩k-Single Mesh 💿 '%' 2450 MHz 	💛 Wired Connection 💿 Update Local Unit Only	Preset
Presets / Unit Settings	🖽 Unit Settings :1			C REFRESH
🙆 Dashboard 🔋 Apps 🛛 🗢		< 1 2 3 4 5 6 7 8 9 10 11 12 13		
네나 Status 🗢	UNIT SETTINGS			
🕸 Global Setup 🗢	External power	e Yes		
🔲 Presets 🗢		- On		
-&: Mesh Settings	MAC/VLAN filter	Off 🛛 🗸		
Z Talkback / Voice	COPY PRESET 1			
Encoders 🗢				▷ SECURITY
U Audio ♥ (•) Streamers ♥				
🗧 Data 🛛 🗢				_
©‡ Advanced				
X system V				
Light 🥌 Dark				
G> LOGOUT				
0 v7.1.4				

**Unit settings configuration** 

3. **Data**  $\rightarrow$  **RS232 #1**: In this menu the parameters of the RS232 port and the network settings are configured:

NETNode IP R	adio	×	+													~	-		×
← → C	A No	t secure   192.	.168.8.95/	wui_presets	s/data/poi	rt0			07	Q	Ê	☆		Ø ¥	¢	*	₹		:
	- 1	NETNode Me	esh IP Radio	)			ngle Mesh 🕚	( <sup>(</sup> Å <sup>1)</sup> 2450 Mi	Hz			Ϋ́	Wired C	onnection	I			Preset	Û
סדם	-	SOL8SDR_GN	ID				1 0 0	🔏 1 of 16					Update	Local Unit	Only				Ū
Presets / Data / RS232 #1		📄 RS232	#1-1															C REF	RESH
🙆 Dashboard			π1+1		۲ 🗖	23	456		10 11 12	13 1	4 15	16 >							REON
📒 Apps					· 🗖														
ս <mark>վ</mark> ի Status		RS232 #1 S	ETTINGS						NETWORK	SETTINGS									
🗐 Global Setup		Data mo	ide		UDP				IP addre	ess			19.1	68.8.96					
🔲 Presets		Baud rat	te		115200				Multicas					.0.0.1					
-🍇 Mesh Settings		Parity			None				IP port				423	91					
Unit Settings 2 Talkback / Voice		Stop bit:	s						IP TOS u	ırgent			۲	∍ No					
🔒 Security		Low late	incy		Yes														
Encoders	⊽ ⊽	Data act	tive																
((+)) Streamers	⊽ ⊽																		
😝 Data	۵		8	COPY PRESET 1															
<ul> <li>Services</li> <li>RS232 #1</li> </ul>																			
<ul> <li>RS485</li> </ul>																			
🔅 Advanced																			
🔀 System																			
Light 🦛 Dark																			
€⇒ LOGOUT																			

**RS232 #1 configuration** 

- Data mode: UDP option is recommended. UDP packets are sent out and the system does not expect a reply. There is no way that the sending device can tell if the data arrived at the destination.
- The value of the **Baud rate**, **Parity** and **Stop Bits** parameters must be the same as those configured in **1x PDI Builder**.

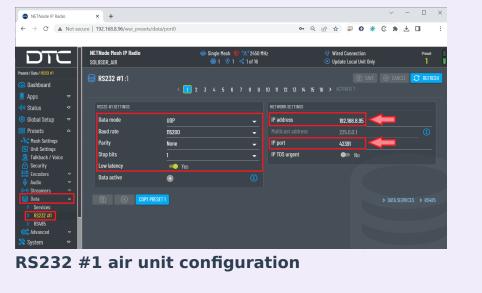
#### (i) Note

The data is assumed to be 8 bits.

- Low latency: Low latency will minimise delay at the expense of bitrate, so if set, data tranfer will be less prone to bursts. Yes is recommended.
- IP address: This should be the address of the radio receiving the data on the other end of the RS-232.
   In this case, as the radio connected to the ground unit is being configured, the IP of the radio linked to the air unit will be set.
- IP port: This set an IP port to and from which the data will be transferred. It must be the same for both radios.

## () Important

For the **radio connected to the air unit**, the IP address to be configured is the **address of the radio linked to the ground unit**.

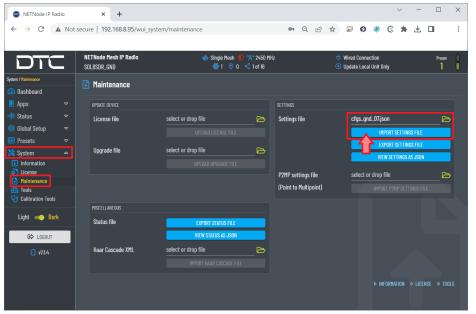


4. System → Maintenance: This menu allows to import and export radio configurations.

💿 NETNode IP Rad	io	× +				~	- 0	×
$\leftrightarrow$ $\rightarrow$ C A	Not	secure   192.168.8.95/wui_sy	stem/maintenance		<b>07</b> Q 🖻 🕁	a 🖇 🛠 🛤	⊻ □	:
סדכ		NETNode Mesh IP Radio Sol8SDR_GND	₩r Single Mesh 戦 🚳 1 📀 O			<ul> <li>Wired Connection</li> <li>Update Local Unit Only</li> </ul>	Preset 1	() U
System / Maintenance		Aaintenance						
🙆 Dashboard								
🔋 Apps		UPDATE DEVICE			SETTINGS			
··비· Status		License file	select or drop file	B	Settings file	select or drop file	B	
😳 Global Setup								
Presets		Upgrade file	select or drop file	B		EXPORT SETTINGS	FILE	
System	۵	upgrade nie				VIEW SETTINGS AS	JSON	
License					P2MP settings file	select or drop file	B	
Maintenance					(Point to Multipoint)	IMPORT P2MP SETTIN		
Tools Q <sup>2</sup> Calibration Tools								
		MISCELLANEOUS						
Light 🥌 Dark		Status file	EXPORT STATUS FILE					
€> LOGOUT			VIEW STATUS AS JSON					
🚺 v7.14		Haar Cascade XML	select or drop file	B				

#### Maintenance configuration

To **import** a configuration into the radio, it is first necesarry to choose a configuration from the local storage by clicking on the  $\searrow$  icon. Then, the 'import button' will already be available (colored in blue) to click on and consequently import the selected configuration. An example is shown below:



**Configuration selected** 

#### Paired radios

Once both radios have been configured with these settings, they should be paired. Therefore, if we connect them to the power supply and only one of them to the computer, we can access the Domo Node Finder software or directly the Web Browser control application to check if they are correctly paired.

#### • Domo Node Finder software

When 2 radios are paired, they will both appear here:

Q	Domo Node Fir	nder				_		$\times$					
<u>F</u> ile	<u>T</u> ools <u>H</u> elp												
I	IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	MAC Addre	ss					
((•))	192.168.8.96	Eastwood	SOL8SDR_AIR	7.2.1	Disabled	CAC420C29A8	00:11:6A:03:3	C:					
몲	192.168.8.95	Eastwood	SOL8SDR_GND	7.1.4	Disabled	30AA208030B5	00:11:6A:02:B	):F6					

#### **Domo Node Finder - Radios paired**

As can be seen in the figure above, the connection type of each radio is indicated with different icons:

- Real icon for the radio that is wiredly connected to the PC.
- (••) icon for the radio that is connected by link.

#### • Web Browser control application

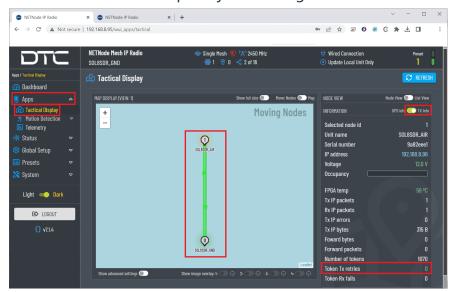
When two radios are paired, this can be seen/checked directly in the '**Dashboard**' of both radios.

NETNode IP Radio		× 💿 NETNode		× +			-	-				-	
÷ → C ▲	Not secu	ure   192.168.8.96			•	9 6 4		0 3	< (<	*	₹		
	_ 1	NETNode Mesh IP R	- P -			<i></i>							A
DTC		SOL8SDR_AIR	adio			🖬 Over ra						Preset	
bboard	_	UULUUUN_AIK						,					
🗅 Dashboard		UNIT INFORMATION		🚽 🔩 Network Status 👖					RESET				
		Unit name	SOL8SDR_AIR	Natural OV-	A mesh has been formed			Prese	:1			•	
Apps		IP address Voltage	192.168.8.96 12.0 V		Active Nodes.								
II Status		voitage Temperature	12.U V 54 °C					POPULA					
Global Setup		Tx retries		🔋 Apps Bar	· 🏠	@x™			sets/Me tus/Spei				
Presets									os/Tactio				
🕇 System		MESH INFORMATION	♦ STATUS	📋 Streaming Capture		) STREAMING STATUS			ibration bal Setuj	n/Conor	al Satti	0.00	
		Mesh ID	1	VIDED 1 PLA	r VIDEO 2				tem/Cali	ibration			
Light 🧠 Darl	(	Node ID Total nodes	1 2 of 16						:tem/Mai :tem/Too				
🙎 admin		Occupancy	2 01 10	Video Off	Vide	o Off			bal Setu				
€> LOGOUT									sets/Uni	it Settin			
		REMOTE NODES	> locate										
		📀 00: SOL8SDR_GN	ID 🔼										
		U											
				Security Status	⊳ G0	TO SECURITY SETUP							
				Data en									

**Radios paired - Dashboard** 

Furthermore, it can be seen that the above figure is related to the radio that is connected by link, as it is indicated at the top of the application with the label Over radio link.

Apps → Tactical Display: Here the user can check the connection and the quality of the signal connection of both radios:



**Radios paired - Tactical Display** 

 Map display: The color of the link between nodes indicates the quality of the signal. The colors range from green (reliable link) to red (unreliable link). If no link is displayed, it means that communication has been lost.

- **TX info**: TX info should be selected to check the quality of the signal connection.
  - Token Tx retries: In a Mesh network, transmission is arbitrated by passing a token between nodes. This tab displays the number of token retries that have been needed for each node. It must be 0 with occasional 1 for a proper communication.

# **△** Caution

Higher values will have an undesirable effect on system performance. If problems occur, check for interference and that there is no other Mesh system operating on the same or adjacent frequency.

Point-to-Multipoint configuration

It is possible that the user wants to make a point-to-multipoint radio connection, i.e. there will be one radio sending commands to several radios, so there will be at least 3 radios.

The following is the configuration required for this type of connection.

## Radio configuration

The modifications to be made to the basic configuration explained above for the point-to-point application are detailed below.

## i Note

This example has been made with 3 radios (3 nodes in a mesh).

 Presets → Mesh Settings: The Node ID must be different for each node in the mesh.

#### 1x Hardware Manual

🐵 NETNode IP Radio	×	🐵 NETNode IP Radio	× 😄 NETNode IP Radio	×   +		~	>
← → C ▲ Not	secure   192	2.168.8.95/wui_presets/mesh			<b>07</b> 🖄	☆ 🗟 Ø 米 🤇 🛸 🗐	* □
סדכ		ETNode Mesh IP Radio DL8SDR_GND	-₩+ Single Mesh 	⑦ 「尖 <sup>1</sup> 2450 MI ≪ 3 of 16		Wired Connection Update Local Unit Only	Preset 🔒
resets / Hesh Settings		<b>\$ Mesh Settings</b> :1	< 1 2 3 4 5 6		10 11 12 13 14 15 16		L 📿 REFRESH
III Status s Global Setup s	~	MESH SETTINGS Operating mode	Single Mesh	<b>•</b> (i)	TRANSMITTER Enable transmitter	••• Yes	
Presets	-	Mesh Id Node Id	1		Frequency Channel bandwidth	2450 10.0	MHz
<ul> <li>Unit Settings</li> <li>2 Talkback / Voice</li> <li>G Security</li> </ul>		Operating range Advanced Settings	50km		Output attenuation RF output port		✓ MHz dB
Encoders	⊽	Auvanceu settings	•• NO		PA linearity	A High	<b>•</b>
Data -	♥ ♥	🗧 🙁 Сору р	RESET 1		♦ GENERAL SETTINGS ©		
System s	~						



👦 NETNode IP Radio		× 😁 NETNode IP Radio	× 💿 NETNode IP Radio	×   +			✓ - □ ×
← → C ▲ N	lot secure	192.168.8.96/wui_presets/mesh			<b>07</b>	🖈 🗟 🧐 🌟 🔇	* ≅ ≛ 🛛 💠
	- 1	NETNode Mesh IP Radio		👤 ('A') 2450 MH	lz (	💼 Over radio link	Preset
	- 11	SOL8SDR_AIR	@1 📀	1 🔏 3 of 16		Update Local Unit Only	1 🖡
Presets / Mesh Settings		🖧 Mesh Settings :1	4				CANCEL 📿 REFRESH
🙆 Dashboard		•0, nesil settings :	< 1 2 3 4 5 6	789	10 11 10 17 1/ 15 10		V GANGEL
🔋 Apps			< 1 2 3 4 5 6	0 / 8 9	10 11 12 13 14 15 16	AGTIVALE I	
·네 <mark>네·</mark> Status	⊽	MESH SETTINGS			TRANSMITTER		
🤨 Global Setup		Operating mode	Single Mesh		Enable transmitter	🥌 Yes	
🔲 Presets	۵	Mesh Id			Frequency	2450	MHz
• 🗞 Mesh Settings		Node Id			Channel bandwidth	10.0	▼ MHz
Unit Settings		Operating range	50km		Output attenuation		dB
🔒 Security		Advanced Settings	●■ No		RF output port		<b></b>
Encoders	<b>⊽</b>				PA linearity	High	<b></b>
((•)) Streamers	÷						
Data 🗧		🔁 🛞 COPY PRES	ETT		▶ GENERAL SETTINGS		ACK / VOICE ▷ SECURITY
Contract Advanced	▼						K l
🔀 System	▽						

## Mesh settings air configuration

🥶 NETNode IP Radio	>	💿 NETNode IP Radio	× 🐵 NETNode IP Radio	× +			✓ - □
÷ → C ▲	Not secure   1	92.168.8.97/wui_presets/mesh			ত প্র	* 🗟 Ø \star 🤇 🛊	≕ ⊻ □
DTO		NETNode Mesh IP Radio SOL8SDR_BASE		esh 💿 ('ဣ') 2450 MH 📀 2 🧠 3 of 16		9 Over radio link ) Update Local Unit Only	Preset 1
esets / Mesh Settings Dashboard Apps		💐 Mesh Settings :1	< 🚺 2 3 4 5	6789	10 11 12 13 14 15 16		ANCEL 🥃 REFRESI
II Status		MESH SETTINGS			TRANSMITTER		
🔋 Global Setup		Operating mode	Single Mesh	<b>-</b> (1)	Enable transmitter	🥌 Yes	
Presets	6	Mesh Id			Frequency	2450	
🗞 Mesh Settings		Node Id			Channel bandwidth	10.0	▼ MHz
🔟 Unit Settings 2 Talkback / Voic	e	Operating range	50km		Output attenuation		
🔒 Security		Advanced Settings	●■ No		RF output port	A	
Encoders	0 0				PA linearity	High	-
(•••) Streamers Data Streamers Data	⊽ ⊽	🗟 🙁 Copy pre	SET 1		▷ GENERAL SETTINGS		
🖇 System	⊽						
Light 🛑 Dai	-k						

Mesh settings base configuration

In the figures above, the user can see that the node ID is displayed at the top of the application at all times. 2. **Data**  $\rightarrow$  **RS232 #1**: The **Multicast** data mode must be

configured. This data mode allows a single node to send RS232/RS485 data to multiple nodes in the system. And it also creates a unicast data return channel. The **radio linked to the ground unit** is configured as the 'Point' that sends the commands.

	_ □	ETNode Mesh IP Radio		(m)			
DTC		)L8SDR_GND	₩ Single Mesh ဈ 🎯 1 📀 O			Wired Connection Update Local Unit Only	Preset 1
ets / Data / RS232 #1		RS232 #1:1					
Dashboard			< 1 2 3 4 5 6	7 8 9	10 11 12 13 14 15 16 >		
Apps	▽						
Status	⊽	RS232 #1 SETTINGS			NETWORK SETTINGS		
Global Setup	⊽	Data mode	Multicast source	-	IP address	255.255.255.255	
Presets	۵	Baud rate	115200		Multicast address	225.0.0.1	
💐 Mesh Settings		Parity	None	—	IP port	42391	
Unit Settings		Stop bits	1		IP TOS urgent	-12031	
Talkback / Voice		Low latency	No				
Encoders							
Audio		Data active	•				
•)) Streamers	▼						
📄 Data	•	🗟 🛞 COPY PRES	ET 1				
<ul> <li>Services</li> <li>RS232 #1</li> </ul>							
<ul> <li>RS485</li> </ul>							
Advanced	<b>.</b>						

RS232 #1 ground configuration

- Data mode: Multicast source must be selected.
- IP address: To send the data to all receivers the IP address must set to 255.255.255.255.
- Multicast address: It must be the same for all radios, avoiding the 244.0.0.X address range.

The address must be different from any multicast streaming and data channels.

Then, the **radios linked to the air and base units** receive those commands:

NETNode IP Radio	lot secure	×  NETNode IP Radio 192.168.8.96/wui_presets/data/port	X O NETNode IP Radio	×   +	∞ છે ☆ 🖉 🖉 🛠 🤇 🗯 🗉	: Ł □
סדכ		NETNode Mesh IP Radio SOL8SDR_AIR		sh 🜒 <sup>(</sup> ,№) 2450 MHz ) 1    ≪3 3 of 16	🗃 Over radio link ⓒ Update Local Unit Only	Preset 1
eets / Data / RS232 #1		😂 RS232 #1:1				CEL 📿 REFRES
) Dashboard		S K9292 #1:1	( 11 2 3 4 5	6 7 8 9 10 11 12 13		
Apps						
- Status		RS232 #1 SETTINGS		NETWORK SETTING	65	
Global Setup		Data mode	Multicast sink	🚽 🛛 IP address	192.168.8.95	
Presets		Baud rate	115200	🕳 🛛 Multicast addı	ress 225.0.0.1	
😋 Mesh Settings 🕘 Unit Settings		Parity	None	🚽 🛛 IP port	42391	
Talkback / Voice		Stop bits		🚽 🛛 IP TOS urgent	🌨 No	
Security		Low latency	●■ No			
Encoders		Data active	۲			
)) Streamers						
Data Services		🗟 😣 COPY PRE	SET 1			
RS232 #1						
RS485 Advanced						
System						
Light 🥌 Dar						
🔒 admin						
€> LOGOUT						
🚺 v7.2.1						



NETNode IP Radio		× 🛛 🌚 NETNode IP Radio	× 💿 NETNode IP Radio	× +			~	- 0	
← → C ▲ Not	secure	192.168.8.97/wui_presets/data/port0				⊶ 🖻 ☆ 🗟 🧿 🗰	🤇 🗯 ≕	± □	
DTC		NETNode Mesh IP Radio Sol8SDR_BASE		Mesh 🜒 ('\R') 2450 MHz 📀 2 😪 3 of 16		<ul> <li>Over radio link</li> <li>Update Local Unit Only</li> </ul>		Preset 1	
Presets / Data / RS232 #1		😂 RS232 #1:1						C REF	RESH
密 Dashboard			< 🚺 2 3 4	567891	D 11 12 13 14 15 16				
🔋 Apps									
III Status		RS232 #1 SETTINGS			NETWORK SETTINGS				
📴 Global Setup		Data mode	Multicast sink		IP address	192.168.8.95 关			
🗐 Presets		Baud rate	115200		Multicast address	225.0.0.1			
🖧 Mesh Settings		Parity	None		IP port	42391			
<ul> <li>Unit Settings</li> <li>Talkback / Voice</li> </ul>		Stop bits			IP TOS urgent	🗪 No			
🔒 Security		Low latency	🗪 No						
Encoders		Data active	•						
(••) Streamers									
📄 Data		🗟 🛞 COPY PRESET	1						
<ul> <li>Services</li> <li>RS232 #1</li> </ul>									
RS485									
🔅 Advanced									
😤 System									

RS232 #1 base unit configuration

- **Data mode**: **Multicast sink** must be selected.
- IP address: The IP address of the radio linked to the ground unit is set.
- Multicast address: It must be the same for all radios, avoiding the 244.0.0.X address range.

The address must be different from any multicast streaming and data channels.

#### Paired radios

Once the radios have been configured with these settings, they should be paired. Therefore, if we connect them to the power supply and only one of them to the computer, we can access the Domo Node Finder software or directly the Web Browser control application to check if they are correctly paired.

#### Domo Node Finder software

When 3 radios are paired, they will appear here:

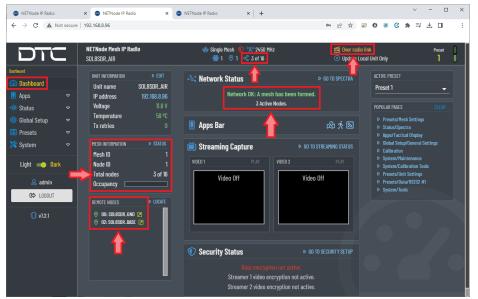
omo Node Finder						– 🗆 ×
<u>T</u> ools <u>H</u> elp						
Filter:	8					
IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	MAC Address
192.168.8.96	Eastwood	SOL8SDR_AIR	7.2.1	Disabled	C7567B594F59B442	00:11:6A:03:2E:BD
192.168.8.97	Eastwood	SOL8SDR_BASE	7.2.3	Disabled	F23EC5B3E6007F2B	00:11:6A:03:90:35
192.168.8.95	Eastwood	SOL8SDR_GND	7.2.3	Disabled	9831779126A5B531	00:11:6A:03:92:25
	i Filter: IP Address 192.168.8.96 192.168.8.97	Filter:       IP Address     Device Type       192.168.8.96     Eastwood       192.168.8.97     Eastwood	Filter:     Image: Constraint of the second se	Filter:       IP Address     Device Type     Unit Name     Version       192.168.8.96     Eastwood     SOL8SDR_AIR     7.2.1       192.168.8.97     Eastwood     SOL8SDR_BASE     7.2.3	Filter:       IP Address     Device Type     Unit Name     Version     DHCP       192.168.8.96     Eastwood     SOL8SDR_AIR     7.2.1     Disabled       192.168.8.97     Eastwood     SOL8SDR_BASE     7.2.3     Disabled	IP Address     Device Type     Unit Name     Version     DHCP     ESN       192.168.8.96     Eastwood     SOL8SDR_AIR     7.2.1     Disabled     C7567B594F59B442       192.168.8.97     Eastwood     SOL8SDR_BASE     7.2.3     Disabled     F23EC5B3E6007F2B

#### **Domo Node Finder - 3 radios paired**

As can be seen in the figure above, there is 1 radio wiredly connected to the PC and 2 radios connected by link.

#### • Web Browser control application

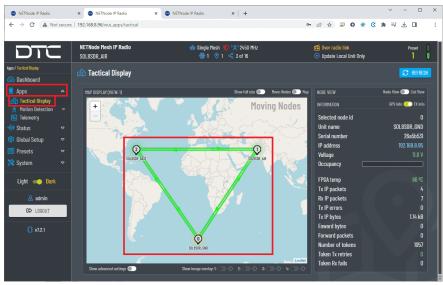
When 3 radios are paired, this can be seen/checked directly in the '**Dashboard**' of the three radios.



**Radios paired - Dashboard** 

Furthermore, it can be seen that the above figure is related to a radio that is connected by link, as it is indicated at the top of the application with the label Over radio link.

Apps → Tactical Display: Here the user can check the connection and the quality of the signal connection of the radios:



**Radios paired - Tactical Display** 

For more information on the configuration of **DTC** radios, please refer to the **DTC** documentation.

DTC radio configuration in 1x PDI Builder

The necessary configuration of **DTC** radio in **1x PDI Builder** is described in the External radios - Integration examples section of the **1x PDI Builder** manual.

Microhard pDDL900-ENC external

System Layout

It is possible to operate Microhard radios in two different ways, with or without amplifiers.

• Microhard

The following image shows the standard connection between **Microhard** radios and **Autopilot 1x** for operation:



## • Microhard + Amplifier

## i Note

Amplifier information: **DDL900 Amplifier** model, 10W Linear Amplifier.

The following image shows the standard connection between **Microhard** radios, amplifiers and **Autopilot 1x** for operation:



Microhard + amplifier radios and Autopilot 1x operation

## Hardware Installation

First, it is necessary to carry out the wiring of the **power** connector with the **4pin power cable** supplied with the **Microhard** radio and with the power connector of the amplifier:



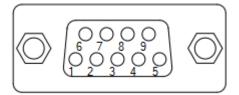
Female DC Power Jack connector

			Power Jack Connector	
	PIN	Signal	Signal	
RADIO	RED	Vin+ 9-30V	Power +	
AMPLIFIER	1	DC 24-30V		
RADIO	BLACK	Vin-	Power -	
AMPLIFIER	2	GND		

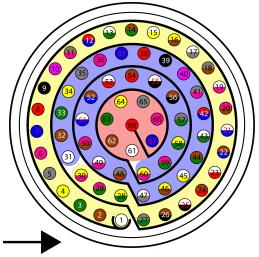
# () Danger

The specified supply voltage range for **Microhard** radios + amplifier is different from that of just **Microhard** radios. Please take this into account when powering.

Then, to physically connect the **Microhard** radio to **Veronte Autopilot 1x** for **operation**, connect an **RS-232** connector between the RS-232 port of the radio and the RS-232 of **Autopilot 1x** harness.



## Serial port of Microhard radio



Autopilot 1x harness pinout

	al port - hard radio	Aut	opilot 1x	Harness
PIN	Signal	PIN	Signal	Color Code
2	RXD	20	RS 232 RX	Pink- Brown
3	TXD	19	RS 232 TX	White- Pink
5	GND	21	GND	White- Blue

## Microhard radio configuration

### First steps



### **Microhard ports**

### Microhard without amplifier

- 1. Connect a suitable 900 MHz **antenna** to the **ANT1/MAIN** connector.
- Connect to the 4-pin molex power connector the 4-pin power cable supplied with the unit.
- 3. Connect the power connector that has been previously wired with the cable to either 12V or 24V power.

Then, once the radio is fully booted, the **Power LED** indicator (the one next to the power symbol) will be **solid blue**.

4. To access the radio's WebUI for configuration, connect the **LAN** port (**not the WAN port**) to a PC, using an Ethernet cable.

The connections should look like this:



**First steps connection** 

5. To open the **Microhard** WebUI, open a browser and enter the IP address of the radio into the address bar.

## (i) Note

If users have problems accessing the **Microhard** radio WebUI, it may be because the PC's network connection settings (IP address and subnet of the adapter) are not configured properly. For further details, consult Microhard radio troubleshooting section below.

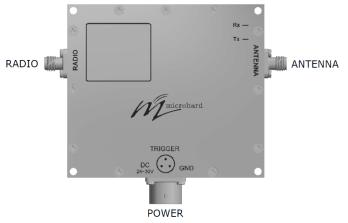
- 6. The website will then ask for a **Username** and **Password**. Enter the factory defaults:
  - Username: admin
  - Password: admin

<ul> <li>✓ S 192.168.168.1/cgi-bin/webif/sys</li> </ul>	+ – – ×
← → C () 192.168.168.1 cgi-t	oin/webif/system-info.sh 🛧 🗟 🗿 🖸 💐 🖬 🗄
	Sign in
	http://192.168.168.1 Your connection to this site is not private
	Username
	Password
	Sign in Cancel

### **Open WebUI**

- 7. Click **Sign In** and the WebUI will open.
- 8. Once successfully logged in for the first time, the WebUI will force a password change.

## Microhard with amplifier



#### **Amplifier ports**

- 1. Connect to the ANT1/MAIN connector of the radio a SMA RF cable.
- 2. Connect this **SMA RF cable** to the amplifier **RADIO** port. Connect a suitable 900 MHz **antenna** to the amplifier **ANTENNA** port.
- 3. Connect to the **4-pin molex power connector** of the radio the **4-pin power cable** supplied with the unit.
- 4. Plug to the **POWER** port of the amplifier, the power connector supplied with it.
- Connect the power connector that has been previously wired with the radio cable and the amplifier connector to 24V power.
   Then, once the radio is fully booted, the Power LED indicator (the one next to the power symbol) will be solid blue.
- 6. Now the steps to follow are the same as **from step 4. of a Microhard without amplifier**, described above.



The connections should look like this:

First steps connection + amplifier

For more information on the configuration of **Microhard** radios, please refer to the **Microhard** documentation.

### Basic radio configuration

Once the website has been accessed, follow the steps below which show the parameters that need to be modified for a correct **point-to-point** configuration and pairing of the radios.

## () Important

This example describes the parameters to be entered for both the radio linked to the 1x ground unit and the radio linked to the 1x air unit.

If the values are common to both radios configurations, only one of them will be detailed.

## i Note

After making any changes, the application will 'ask' to Submit or Cancel the changes. An example is shown below:

all Settings - pDDL924 Administrat ×	+	- 0
→ C ▲ Not secure 192.168.4	.4/cgi-bin/webif/system-settings.sh	
10a		101
m	icrohard	010101010
	1010101	010010101
	Firewall Serial Diag Admin	
nmary Settings Services I	Aaintenance Reboot	
stem Settings		
System Settings		
Host Name	MH_pDDL900_ENC	
Description	GND configuration	
Console Timeout (s)	[30 ~ 65535] 0-Disable	
CFG Reset to Default Button	● Enable ○ Disable	
System Log Server IP/Name	0.0.0.0 0.0.0.0-Disable	
System Log Server Port	514 Default: 514	
lime Settings		
Current Date(yyyy-mm-dd)	2022-09-22	
Current Time(hh:mm:ss)	15:07:46	
Date and Time Setting Mode	Local Time O NTP	
Date (yyyy-mm-dd)	2022-09-22	
Time (hh:mm:ss)	15:07:46	
		Submit « Cano

### 1. System

- Maintenance: From this menu, users can export (backup) and import (restore) configurations.
  - Backup Configurations: The radio configuration can be backed up to a file at any time using the Backup Configuration feature.
  - Restore Configurations: Using this option, a previously 'backed up' configuration can be uploaded to the radio.

### (i) Note

A password can be added to backup and restore files. If the password is lost, files that have been backed up with a password cannot be restored.

Maintenance - pDDL924 Admin	× +			-	D X
← → C ▲ Not secure 192	2.168.168.1/cgi-bin/webif/syste	m-upgrade.sh			:
System Network Wireles Summary Settings Service			10101	0101 1010	0101
System Maintenance	· · · · ·				
Version Information					
Product Name	Hardware Type	Build Version	Build Date	Build Time	
pDDL924	1.0	v1.3.0 build 1046	2022-09-22	14:05:13	
Firmware Upgrade Erase Current Configurations					_
Firmware Image	Choose File No fil	e chosen			
Upgrade	Upgrade Firmware				
Reset to Default Configurations	5				
Reset to Default Configuration	Reset to Default	OWipeout data and logs			
Security for Configurations					
Set Password 0		Update			
Backup Configurations					
Configuration File Name	MicrohardpDDL924	config			
Backup	Backup Configuration	ins			
Restore Configurations					
Select Configuration File	Choose File No fil	e chosen			
Check Configuration File	Check Configuration	ı File			
			Copyright © 2	014-2022 Microhard.	pDDL924

### System Maintenance

To **import** (restore) a configuration into the radio, it is first necessary to choose a configuration from the local storage by clicking on Choose File.

Then, once the configuration is loaded, click on the Check Configuration File button.

Maintenance - pDDL924 Admin	× +			-	□ ×
$\leftrightarrow$ $\rightarrow$ $\mathcal{C}$ $\land$ Not secure 192.	168.168.1/cgi-bin/webif/system-	-upgrade.sh		0	:
System Network Wireless	nicrohard s Firewall Serial Dia s Maintenance Reboot		10101	1010	0101
Version Information					
Product Name	Hardware Type	Build Version	Build Date	Build Time	
pDDL924	1.0	v1.3.0 build 1046	2022-09-22	14:05:13	
Firmware Upgrade					
Erase Current Configurations	Keep All Configuration	s 🗸			
Firmware Image	Choose File No file of	chosen			
Upgrade	Upgrade Firmware				
Reset to Default Configurations					
Reset to Default Configuration	Reset to Default	OWipeout data and logs			
Security for Configurations					
Set Password 0		Update			
Backup Configurations					
Configuration File Name	MicrohardpDDL924.co	nfig			
Backup	Backup Configurations				
Restore Configurations					
Select Configuration File	Choose File MH_pD	DL9GND.config d			
Check Configuration File	Check Configuration Fi				
			Copyright © 20	14-2022 Microhard.	pDDL924

System Maintenance - Restore Configuration 1

After that, if the file is correct, a new window will appear to restore this configuration.

	dmin × +			- 0
→ C ▲ Not secure	192.168.168.1/cgi-bin/webif/sys	tem-upgrade.sh		
nmary Settings Ser estem Maintenance			101011	<b>0101</b> 01010 101010 101010 101010
Version Information Product Name	Hardware Type	Build Version	Build Date	Build Time
-001004	1.0	v1.3.0 build 1046	2022-09-22	14:05:13
pDDL924	1.0	V1.3.0 Build 1040	2022 09 22	14.03.13
pDDL924 Restore Configuration Configuration Verified Config file Name Generated Vendor Product Hardware Type		IC_Gnd.config 7:55 MDT 2022 hard.	1012 09 12	14.03.13

System Maintenance - Restore Configuration 2

Finally, the WebUI will reloaded to applied the configuration.

S Maintenance - pDDL924 Admin	× +			- 🗆 ×
$\leftrightarrow$ $\rightarrow$ X ( $\triangle$ Not secure 192	.168.168.1/cgi-bin/webif/system-u	pgrade.sh		<b>0</b> :
System Network Wireles		101010 J Admin	1010	<b>1010</b> 101 10101 10101 10101
Summary Settings Service	es Maintenance Reboot			
System Maintenance				
Version Information				
Product Name	Hardware Type	Build Version	Build Date	Build Time
pDDL924	1.0	v1.3.0 build 1046	2022-09-22	14:05:13
Please wait about 3 minutes. The	web interface may reload succe	ssfully.		
			Copyright © 2014	-2022 Microhard. pDDL924

**System Maintenance - Restore Configuration 3** 

## () Error

If the restored configuration has a different IP address assigned to the radio, users may have to change again the **adapter settings** on the PC to be able to access the WebUI with the new IP address of the radio.

 Summary: This screen is displayed immediately after the initial login, showing a summary and status of all radio functions on a single display.

This information includes system status, LAN network information and settings, version information, radio connection status, etc.

C A Not secure	192 168 8 4/coi	hin/wehif/system	info.sh?interval=2	0			
, O A not seture	1321100.0.4/Cgl	on, weon, system					
m	mic	rohar	d	10101	10	10	<b>101</b> 0101 010101 010100
em Network Wire	eless Firew	all Serial I	Diag Admin	D.1.D		- 4	0 101
	Court of all an a state of the or	enance Rebo					
stem Information							
ystem Information							
Host Name	MH_pl	DDL900_ENC		Description		GND configur	ration
Product Name	pDDL9	924		System Date		2022-09-22	15:09:00
Hardware Version	Rev A			System Uptime		1:01	
Software Version	v1.3.0			Build Date		2022-09-22	
Software Build	1046			Build Time		14:05:13	
AN Status							
MAC Address	00:0F	92:0C:C1:E9					
IP Address	192.1	58.8.4		Connection Type		static	1
Subnet Mask	255.2	55.255.0		Gateway		192.168.8.1	
AN Status							
MAC Address	00:0F	:92:0D:C1:E9					
IP Address	N/A			Connection Type		dhcp	
Subnet Mask	N/A			Gateway		N/A	
Primary DNS	N/A			Secondary DNS		N/A	
F Status							
General Status							
General Status			_				
MAC Address Ope	eration Mode	letwork ID	Compatibility Mode	Bandwidth	Frequency	Tx Power	Encryption Type
00:0F:92:FC:B7:4E Mas	ter p	DDL	N/A	1 MHz	915 MHz	30 dBm	AES-128
Traffic Status							
Receive Bytes	Rec	eive Packets	Tra	nsmit Bytes		Transmit Pack	ets
	0		809	9.339KB		9084	
0B					S	top Refreshing	Interval: 20(in secon
OB							

### **System Information**

 Settings: To easily identify each radio in a mesh, the user can rename the radio as desired by configuring the Host Name and Description parameters:

✓ III Settings - pDDL924 Administrat × +  $\times$ C A Not secure 192.168.8.4/cgi-bin/webif/system-settings.sh ←  $\rightarrow$ : 101010101010101010 microhard 1010 rk Wireless Firewall Serial Diag Admin System ry Settings Services Maintenance Rebo System Settings System Settings Host Name MH\_pDDL900\_ENC Description GND configuration Console Timeout (s) 30 ~ 65535] 0-Disable 120 CFG Reset to Default Button ● Enable ○ Disable 0.0.0.0 0.0.0.0-Disable System Log Server IP/Name System Log Server Port 514 Default: 514 Time Settings Current Date(vvvv-mm-dd) 2022-09-22 14:58:31 Current Time(hh:mm:ss) Date and Time Setting Mode ● Local Time ○ NTP 2022-09-22 Date (yyyy-mm-dd) Time (hh:mm:ss) 14:58:31 Submit « Cancel « System Settings - GND unit

Embention Sistemas Inteligentes, S.A.

Settings - pDDL924-AES256 Ad	+		-		×
← → C ▲ Not secure 192.168.8.	5/cgi-bin/webif/system-settin	gs.sh			:
	crohard irewall Serial Diag aintenance Reboot	10/01010101	01	010	1
Host Name	MH_pDDL900_ENC				
Description	Air configuration				
Console Timeout (s)	120	[30 ~ 65535] 0-Disable			
CFG Reset to Default Button	Enable O Disable				
System Log Server IP/Name	0.0.0.0	0.0.0-Disable			
System Log Server Port	514	Default: 514			
Time Settings					
Current Date(yyyy-mm-dd)	2022-09-22				
Current Time(hh:mm:ss)	14:39:37				
Date and Time Setting Mode	Local Time O NTP				
Date (yyyy-mm-dd)	2022-09-22				
Time (hh:mm:ss)	14:39:37				
		Subr	nit «	Cancel	**

System Settings - Air unit

2. **Network**  $\rightarrow$  **LAN**: Ethernet LAN port of the radio is for connecting devices to a local network.

By default, this port has a static IP address, and also, it is running a DHCP server to provide IP addresses to devices that are connected to the physical LAN port (directly or through a switch).

ill LAN - pDDL924	Administrative × +			– 🗆 X
< → C ▲M	lot secure 192.168.8.4/cgi-bin/we	bif/network-lan-summary.sh		
System Netwo Status LAN W/ Network LAN C LAN Interfaces S	N DHCP Routes Ports	Serial Diag Admin	101010101	01010101 101010 101010 10101
No. Name	Static IP Address	Connection Type	DHCP Server	Config
	192.168.8.4	static	On	Edit
Add				
				Submit « Cancel «

#### LAN Interfaces Settings

By selecting the Edit or Add buttons, the LAN network interface can be configured or additional LAN interfaces can be created.

#### LAN Configuration:

.III LAN - pDDL924 Administrative ×	+	- 🗆 X
- → C ▲ Not secure 192.168	.8.4/cgi-bin/webif/network-lan-edit.sh?editname=lan	• •
System Network Wireless	icrohard Firewall Serial Diag Admin Ites Ports Device List	0101010101 0101010 01010101 010101
Network LAN Configuration		
LAN Configuration		
Spanning Tree (STP)	Off •	
IGMP Snooping	On 🗸	
Connection Type	Static IP 🗸	
IP Address	192.168.8.4	
Netmask	255.255.255.0	
Default Gateway	192.168.8.1	
Default Route	Yes 🗸	
DNS Mode	Manual 🗸	
Primary DNS		
Secondary DNS		
LAN DHCP		
DHCP Server	Enable 🗸	
Start IP Address 0	192.168.8.100	
Number of Address 👀	150	
Lease Time (in minutes) 0	720	
Alternate Gateway		
Preferred DNS server		
Alternate DNS server		
WINS/NBNS Servers		
WINS/NBT Node Type	none 🗸	
		Submit « Cancel «

LAN Configuration - Ground unit

→ C ▲ Not secure 192.168	8.5/cgi-bin/webif/network-lan-edit.sh?editname=lan	0
stem Network Wireless atus LAN WAN DHCP Rou		<b>10101</b> 01010 010101010 101010101010101010
letwork LAN Configuration		
Spanning Tree (STP)	Off 🗸	
IGMP Snooping	On 🗸	
Connection Type	Static IP 🗸	
IP Address	192.168.8.5	
Netmask	255.255.255.0	
Default Gateway	192.168.8.1	
Default Route	Yes 🗸	
DNS Mode	Manual 🛩	
Primary DNS		
Secondary DNS		
LAN DHCP		
DHCP Server	Enable 🗸	
Start IP Address 0	192.168.8.100	
Number of Address 0	150	
Lease Time (in minutes) 0	720	
Alternate Gateway		
Preferred DNS server		
Alternate DNS server		
WINS/NBNS Servers		
WINS/NBT Node Type	none 🗸	
		Submit « Cancel

LAN Configuration - Air unit

 Connection Type: To determine whether the radio will obtain an IP address from a DHCP server on the connected network or whether a static IP address will be entered. Select the Static IP option for this point-to-point configuration.

Since the Static IP option has been chosen, the following fields must also be entered.

- **IP Address**: A valid IPv4 address for the network used must be entered in this field.
  - For the radio linked to the ground unit ⇒ 192.168.8.4 has been entered.
  - For the radio linked to the **air** unit ⇒ **192.168.8.5** has been entered.
- Netmask: The Network Mask for the network must be entered. The default netmask 255.255.255.0 is normally left.
- Default Gateway: If the radio is integrated into a network that has a defined gateway, then, as with other hosts on the network, the IP address of this gateway will be entered in this field.

In case the user is using a **PCS**, **192.168.8.1** should be set here.

• **Default Route**: This parameter allows the user to set this interface as the default route in the routing table.

In cases where the LAN is the primary connection, this would be set to **Yes**.

## Important

Once the IP Address has been changed, users will have to type the new address in the browser in order to continue with the configuration.

**LAN DHCP**: A radio can be configured to provide Dynamic Host Control Protocol (DHCP) service to all connected devices (wired or wireless).

LAN - pDDL924 Administrative ×	+	-	- 0	×
← → C ▲ Not secure 192.168.	8.4/cgi-bin/webif/network-lan-edit.sh?editname=lan			:
System Network Wireless	Firewall Serial Diag Admin	010	1010	1 0 1 2
LAN Configuration				
Spanning Tree (STP) IGMP Snooping Connection Type IP Address Netmask Default Gateway Default Gateway Default Route DNS Mode Primary DNS Secondary DNS	Off ~       On ~       Static IP ~       192.168.8.4       255.255.265.0       192.168.8.1       Yes ~       Manual ~			
DHCP Server Start IP Address • Number of Address • Lease Time (in minutes) • Alternate Gateway Preferred DNS server Alternate DNS server WINS/NBNS Servers WINS/NBT Node Type	Enable          192.168.8.100         150         720			
		Submit «	Cance	«

LAN DHCP

 DHCP Server: Enables/Disables the DHCP service for devices connected to the LAN port. Therefore, devices that are connected to the physical Ethernet LAN ports will be assigned an IP by the radio.

## **△** Caution

Before enabling this service, check that there are no other devices, either wired or wireless, with an active DHCP Server service.

## ♀ Hint

At this point, if **Enabled** and if users have previously set the PC to the static IP address on the same subnet of the radio, they can now change the **adapter settings** back to "Obtain an IP address automatically". Consequently, users will no longer have to change this setting on the PC every time they want to access the radio's WebUI.

	-		erties		×
eneral Alternative Cont	figuration				
You can get IP settings a his capability. Otherwise or the appropriate IP se	e, you need to				
Obtain an IP addres	s automatica	lly			
- Use the following IP	address: —				
IP address:					
Subnet mask:					
Default gateway:					
Obtain DNS server a	address autor	matically			
Ose the following DI	NS server add	tresses: —			
Preferred DNS server:					
Alternative DNS serve	r:				
Validate settings up	oon exit		A	dvanced	

- Start IP Address: Select the starting DHCP address from which IP addresses will be assigned. The first octets of the subnet will be pre-set based on the LAN IP configuration, and cannot be changed. We enter here 192.168.8.100.
- Number of Address: Set the maximum number of IP addresses that can be assigned by the radio. By default, 150 (this is an integer value).

- Lease Time (in minutes): The DHCP lease time is the amount of time before a new request for a network address must be made to the DHCP Server. Defaults to 720 minutes.
- 3. **Wireless**  $\rightarrow$  **RF**: Allows to configure the radio module.

### () Important

Ensure that the **RF Band**, **Channel Bandwidth** and **Frequency-Channel** are set the same on each module.

III RF - pDDL924 Administrative Co 🗙	+	- 🗆 X
→ C ▲ Not secure 192.168	8.4/cgi-bin/webif/wireless-rf.sh	
111	icrohard firewall Serial Diag Admin	01010101010101 010101010101010101010101
Wireless Configuration		
RF Configuration		
Radio	● On ○ Off	
RF Band	900MHz •	
Channel Bandwidth	1MHz V	
900MHz Channel	13 - 915 MHz V	
Symbol Rate	🔾 Fast 🔍 Normal	
Tx Power	30 dbm 🗸	
Wireless Distance	3000 (m)	
EM Interference	High 🗸	
Operation Mode	Master 🗸	
TX Rate	Auto (recommended) 🗸	
Ceiling Rate		
Extended Addressing	ON V	
Network ID	pDDL	
Encryption Type	AES-128 🗸	
Encryption Key	•••••	
Show password		
RF Serial Port Configuration		
Serial Port TX Rate	Normal Rate 🗸	
		Submit « Cancel «

Wireless Configuration - Ground unit

RF - pDDL924-AES256 Administ	+		-		×
← → C ▲ Not secure 192.168.8	.5/cgi-bin/webif/wireless-rf.sh				÷
112	crohard	1010101010	01	010	1
RF Configuration					_
Radio RF Band Channel Bandwidth 900MHz Channel Symbol Rate T x Power Wireless Distance EM Interference Operation Mode T X Rate Ceiling Rate Extended Addressing Network ID Encryption Type Encryption Key Show password RF Serial Port Configuration	● On Off 900MHz ▼ 1MHz ▼ 13 - 915 MHz ▼ Fast ● Normal 30 dbm ♥ 3000 (m) High ▼ Slave ▼ Auto (recommended) ▼ ON ▼ PODL AES-128 ▼ 				
Serial Port TX Rate	Normal Rate 🗸				
					_
		Sub	omit «	Cancel	*

**Wireless Configuration - Air unit** 

#### **RF Configuration**:

- **Radio**: Turns the radio module on/off.
- **RF Band**: Select the desired RF band to work, 900 MHz or 2.4 GHz. In this case, we select **900 MHz**.
- Channel Bandwidth: Select the channel bandwidth from the list.
   Generally a larger channel has higher throughput, at the cost of sensitivity, while a smaller channel tends to be more robust, but at the cost of throughput. 1 MHz is recommended.

#### $\triangle$ Caution

Refer to the radio specifications (**Microhard** documentation) in order to see the relationship and performance between channel bandwidth, throughput and sensitivity.

900 MHz Channel: Set the Channel-Frequency. The frequency displayed is the center frequency and is available in 1 MHz increments. The values shown will vary with the Channel Bandwidth selected above. 13-915 MHz is recommended.

## Important

- This value must be **the same on each unit in a network**.
- The noise floor of the specified channel will dramatically affect the link quality, it is essential to select the cleanest channel for superior performance.
- Tx Power: This setting establishes the transmit power level that will be presented to the antenna connector of the radio. Select **30 dbm** here.

### **▲** Caution

For bench or proximity testing, it is best to use a lower power setting to avoid RF saturation.

• **Wireless Distance**: This parameter allows users to set the expected distance the wireless signal should travel.

The radio sets various internal timeouts to account for this travel time. Longer distances will require a higher setting, and shorter distances may work better if the setting is reduced. **3000 m** is set.

 Operation Mode: A radio in Master mode can provide a wireless data connection to multiple slaves/remotes.

And, in **Slave** mode, it can maintain a wireless connection, i.e. to a Master.

- For the radio linked to the ground unit ⇒ Master mode must be selected.
- For the radio linked to the **air** unit ⇒ Slave mode must be selected.
- **TX Rate**: This setting determines the type of modulation and, in turn, the rate at which the data will be transferred wirelessly.

The default and **recommended** setting for both Master and Slave units is '**Auto**'.

In 'Auto', the unit will transfer data at the highest possible rate depending on the receiving signal strength (RSSI).

Network ID: Each radio module network must have a unique Network
 ID. In this case, pDDL has been entered.

# Important

This Network ID must be configured **the same in each unit on the network**.

### **RF Serial Port Configuration**:

- Serial Port TX Rate: When using Ethernet and Serial data,
  - If the volume of serial data is high ⇒ Normal Rate (default option)
  - If the volume of **Ethernet data** is high  $\Rightarrow$  High Rate (compressed).
- Serial → Settings: This menu allows configuring the serial device server for the serial communications port. Data from the serial device can be brought into the IP network via TCP, UDP or multicast; it can also come out of the radio network on another radio serial port.

### Port Configuration:

Juli Settings - pDDL924 Administrat ×	+ – 🗆 X
← → C ▲ Not secure 192.168	.8.4/cgi-bin/webif/comport-com2.sh
System Network Wireless Status Settings	icrohard 10101010101010101010101010101010101010
Serial Port Configuration	
Port Configuration	
Port status	Data 🗸
Port Mode	R\$232 V
Escape Sequence	Disabled 🗸
Data Baud Rate	115200 🗸
. Data Format	8N1 🗸
Data Mode 🔍	🔿 Seamless 🖲 Transparent
Character Timeout	24
Maximum Packet Size	266
No-Connection Data 🔍	O Disable 🖲 Enable
MODBUS TCP Status	Disable O Enable
IP Protocol Config	TCP Server
TCP Configuration	
Server Mode	● Monitor ○ Polling
Polling Timeout (seconds)	10
Local Listening port	20002
Incoming Connection	5
Timeout(seconds)	<u>ح</u>
Fast Recovery 🔍	● Disable ○ Enable
	Submit « Cancel «

#### **Port Configuration - Ground unit**

Settings - pDDL924-AES256 Ad	+		_	ПХ
all octaings publicat Accesso Act A				
$\leftarrow$ $\rightarrow$ C ( $\triangle$ Not secure 192.168.	8.5/cgi-bin/webif/comport-com2.sh			:
111	icrohard Firewall Serial Diag Admin	10101010101	010	0101
Port status	Data 🗸			
Port Mode	R\$232 ¥			
Escape Sequence	Disabled V			
Data Baud Rate	115200 🗸			
Data Format	8N1 -			
Data Mode 0	○ Seamless ● Transparent			
Character Timeout	24			
Maximum Packet Size	266			
No-Connection Data 🛈	O Disable 🖲 Enable			
MODBUS TCP Status	Disable      Enable			
IP Protocol Config	TCP Client	-		
TCP Configuration				
Remote Server IP Address	192.168.8.4			
Remote Server port	20002			
Outgoing Connection				
Timeout(seconds)	5			
Fast Recovery 0	💿 Disable 🔾 Enable			
		Subm	iit « Ca	ancel «

**Port Configuration - Air unit** 

- Port status: Select the operating state of the serial port. By default,
   Data.
- **Port Mode**: **RS232** must be selected.
- **Data Baud Rate**: The serial baud rate is the rate at which the modem should communicate with the connected local asynchronous device.

### () Important

It must match the one configured in the **1x PDI Builder** software  $\rightarrow$  **115200**.

 Data Format: This setting determines the format of the data on the serial port. It is the set of Data Bits, Parity and Stop Bits parameters.

#### Important

It must match those configured in the 1x PDI Builder software

 $\rightarrow$  **8N1** (8 data bits, No parity, and 1 Stop bit).

- **Data Mode**: This setting defines the framing of the serial output data.
  - In Transparent mode (default), the received data will exit the radio quickly.
  - In Seamless mode, the serial port server will add a gap between data frames to comply with a specified protocol.

In this case, **Transparent** mode is selected.

- Character Timeout: Defaults to 24 characters.
- Maximum Packet Size: Defines the size of the buffer that the serial server will use to receive data from the serial port.
   When the server detects that the Character Timeout criterion has been met, or the buffer is full, it packs the received frame and transmits it.
   It must be 266, as this is the maximum packet size supported by Veronte Communication Protocol (VCP).
- **IP Protocol Config**: This setting determines which protocol the serial server will use to transmit serial port data over the radio network.
  - For the radio linked to the **ground** unit  $\Rightarrow$  **TCP Server**.
  - For the radio linked to the **air** unit  $\Rightarrow$  **TCP Client**.

**TCP Configuration**: The protocol selected in the IP Protocol Config field will determine which configuration options appear in this configuration menu.

- In the TCP Server mode, the radio series will not initiate a session, but will wait for a Client to request a session. The unit will 'listen' on a specific TCP port.
  - If a session is established, data will flow from the Client to the Server, and, if present, from the Server to the Client.
  - If a session is not established, both Client serial data and Server serial data, if present, will be discarded.

Settings - pDDL924 Administrat	+		-		×
← → C ▲ Not secure 192.16	.8.4/cgi-bin/webif/comport-com2.sh				:
System Network Wireless Status Settings Serial Port Configuration Port Configuration	icrohard Firewall Serial Diag Admin	1010101010	10	10101	
Port status	Data 🗸				-
Port Status Port Mode	RS232 V				
Escape Sequence	Disabled V				
Data Baud Rate	115200 ~				
Data Format	8N1 ~				
Data Mode 🔍	<ul> <li>Seamless          <ul> <li>Transparent</li> </ul> </li> </ul>				
Character Timeout	24				
Maximum Packet Size	266				
No-Connection Data 0	O Disable 🖲 Enable				
MODBUS TCP Status	Disable O Enable				
IP Protocol Config	TCP Server 🗸				
TCP Configuration					_
Server Mode	Monitor O Polling				
Polling Timeout (seconds)	10				
Local Listening port	20002				
Incoming Connection	5				
Timeout(seconds)					
Fast Recovery 0	Disable O Enable				
		5	Submit «	Cancel	«

#### **TCP Configuration - Ground unit**

- Server Mode: Monitor is recommended.
- Local Listening port: The TCP port on which the server listens.
   Allows a TCP Client to create a TCP connection to transport data from the serial port. 20002 should be set.
- Incoming Connection Timeout (seconds): Establishes when the TCP Server will terminate the TCP connection if the connection is in an idle state. It is recommended 5 seconds.
- When **TCP Client** mode is selected and data is received on its serial port, the radio takes the initiative to find and connect to a remote TCP server.

The TCP session is terminated by this same unit when the data exchange session is completed and the connection timeout has expired.

If a TCP connection cannot be established, data is discarded from the serial port.

Settings - pDDL924-AES256 Ad X	+ – 🗆 X
← → C ▲ Not secure 192.168	.8.5/cgi-bin/webif/comport-com2.sh
System Network Wireless Status Settings Serial Port Configuration Port Configuration	icrohard
Port status	Data 🗸
Port Mode	RS232 V
Escape Sequence	Disabled •
Data Baud Rate	115200 🗸
Data Format	8N1 🗸
Data Mode 🔍	O Seamless  Transparent
Character Timeout	24
Maximum Packet Size	266
No-Connection Data 🔍	O Disable  Enable
MODBUS TCP Status	Disable      Enable
IP Protocol Config	TCP Client
TCP Configuration	
Remote Server IP Address	192.168.8.4
Remote Server port	20002
Outgoing Connection	5
Timeout(seconds)	
Fast Recovery 💿	● Disable ○ Enable
	Submit « Cancel «

**TCP Configuration - Air unit** 

Remote Server IP Address: Enter an IP address of a TCP server which is ready to accept serial port data over a TCP connection. Users must set the IP adddress of the radio defined as Master, in this case, the IP address of the radio linked to the ground unit ⇒
 192.168.8.4.

Connection status radio

- Network → Status: Provides an overview of the currently configured network interfaces, including the Connection Type (Static/DHCP), IP Address, Net Mask, Default Gateway, DNS, and IPv4 Routing Table.
- Wireless → Status → General Status: Shows the MAC address of the current radio, the Operating Mode (Master, Slave etc), the Network ID being used, Channel Bandwidth and Frequency information and the type of security used.
- Serial → Status: This window displays a number of status items that help to visualize the operation, statistics and troubleshooting of the RS232 port.

## (i) Note

That is, the connection status with **Veronte Autopilot 1x**.

- Port Status: Shows whether the RS232 port has been enabled in the configuration.
- Baud Rate: The current baud rate used to interact with the connected device.
- Connect As: This shows the type of IP Protocol Config chosen (TCP, UDP, SMTP, PPP, etc).
- Connect Status: Shows if there is a current connection / if the port is active.
- Receive bytes/packets
- Transmit bytes/packets

In addition, to check the connection status between the **Autopilot 1x** and the radio, users can simply look at the LED indicators on the radio:

- When the **TX LED** turns **red**, that indicates that the modem is transmitting data over the radio.
- When the **RX LED** turns **green**, it indicates that the moden is synchronized and has received valid packets.

### Paired radios

Once both radios are configured with these settings, they should be paired.

Therefore, by connecting both to the power supply, users can check that they are paired by simply observing the **RSSI LEDs**, they should be in a **solid green**. The more LEDs ilumitated  $\Rightarrow$  the stronger the link.

Moreover, users can access the radio's WebUI to check it in the following menu:

## (i) Note

If they are correctly linked, by connecting only one of the radios to the PC, users will be able to access the WebUI of both radios.

 $\textbf{Wireless} \quad \rightarrow \quad \textbf{Status}: \text{The Status window provides an overview of all}$ 

wireless or radio settings and connections.

	JII Status - pDDL924 Ac	dministrativ ×	JI Status - pDDL9	24-AES256 Admi 🗙	+				- [	- x
÷	→ C ▲ Not s	ecure 192.168.8.4	4/cgi-bin/webif/s	tatus-rf.sh						:
Syst Stat			croha rewall   Seri	_	101 nin	0101	101	01	010	101 010 101 10
	reless Interfaces Status	5								
	General Status	Operation Mode	Network ID	Compatibility Mode	Bandwidth	Frequency	Tx I	Power En	cryption Type	
	00:0F:92:FC:B7:4E	MASTER	pDDL	N/A	1 MHz	915 MHz	30 (	dBm AE	S-128	
	Traffic Status									
	Receive Bytes		Receive Packets		Transmit Bytes			mit Packets		
	227.263KB		270		94.273KB		796			
	Connection Info (1	.)								
	MAC Address	Tx Modulatio	on	Rx Modulation	SNR	(dB)	RSSI (dBm)	Signal Leve	RSSI Grap	bh
	00:0F:92:FC:B5:E9	9 64-QAM FEC	5/6	64-QAM FEC 5/6	60		-37	.adĪ	<b>H</b>	
							Copyright ©	) 2014-2022 I	Microhard. p	DDL924

Wireless Status

- Traffic Status shows statistics on transmitted and received data.
- Connection Info displays information about all wireless connections. The MAC address, TX & RX Modulation, Signal to Noise ratio (SNR), Signal Strength (RSSI), and a graphical representation of the signal level or quality, as well as a RSSI Graph Link. By clicking on , a new window with the RSSI Graph Link will be displayed:

all Status - pDDL924 Administrativ × all RSSI - pDDL924 Administrative × all Status - pDDL924-AES256 Adm ×   + ×
→ C (▲ Not secure 192.168.8.4/cgi-bin/webif/graphs-rssi.sh?if=00:0F:92:FC:B5:E9
System Network Wireless Firewall Serial Diag Admin
RSSI Graph - 00:0F:92:FC:B5:E9
RSSI -39 dBm History: Min -44 Max -30 -25 dBm
^
-75 dBm
Copyright © 2014-2022 Microhard. pDDL924

Wireless Status - RSSI Graph Link

Microhard radio configuration in 1x PDI Builder

The necessary configuration of **Microhard** radio in **1x PDI Builder** is described in the External radios - Integration examples section of the **1x PDI Builder** manual.

Microhard radio troubleshooting

If the user has problems accessing the radio's WebUI, try setting the computer to the static IP address on the same subnet as the radio.

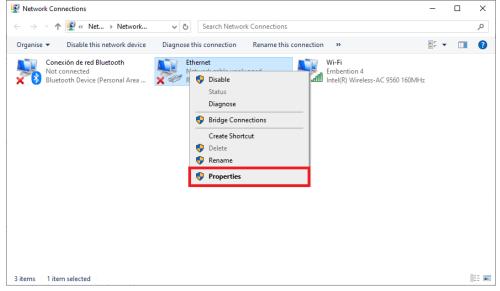
The following steps clarify how to set the IP address in the **Control Panel**:

1. Open Network and Sharing Centre menu and click Change adapter settings.

Network and Sharing Centre			-	$\times$
← → × ↑ 辈 « Network and	Internet > Network and Sharing Centre 🗸 🖑	Search Control Panel		٩
Control Panel Home	View your basic network information and se	et up connections		
Change adapter settings	View your active networks			
Change advanced sharing settings Media streaming options	Embention 4 Public network	Access type: Internet Connections: 📶 Wi-Fi (Embention)		
	Change your networking settings			
	Set up a new connection or network Set up a broadband, dial-up or VPN connection	n, or set up a router or access point.		
	Troubleshoot problems Diagnose and repair network problems or get t	oubleshooting information.		
See also				
Internet Options Windows Defender Firewall				

**Ethernet connection 1** 

2. Select Local Area Connection, right click, and select Properties.



**Ethernet connection 2** 

3. Select **IPv4** and click **Properties**.

Ethernet Properties	×
Networking Sharing	
Connect using:	
🚍 Realtek PCIe GbE Family Controller	
Configure	
This connection uses the following items:	
🗹 🏪 Cliente para redes Microsoft 🛛 🔺	]
🗹 🟆 Uso compartido de archivos e impresoras para redes M	
Programador de paquetes Qo.S	
Protocolo de Internet versión 4 (TCP/IPv4)	
Protocolo de multiplexor de adaptador de red de Micros	
Controlador de protocolo LLDP de Microsoft	
Protocolo de Internet versión 6 (TCP/IPv6)	
< >>	
Install Uninstall Properties	
Description	
Protocolo TCP/IP. El protocolo de red de área extensa predeterminado que permite la comunicación entre varias redes conectadas entre sí.	
OK Cancel	

**Ethernet connection 3** 

 Set IP address to 192.168.168.YY (e.g. if the IP of the radio is 192.168.168.1, set the IP 192.168.168.10) and Subnet mask to 255.255.255.0. Click OK.

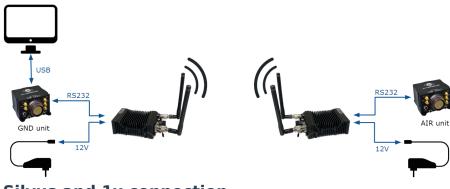
Protocolo de Internet versión 4 (TCP/IPv4) Properties			
General			
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.			
Obtain an IP address automatical	ly		
Our of the following IP address:		11	
IP address:	192 . 168 . 168 . 10		
Subnet mask:	255.255.255.0		
Default gateway:			
Obtain DNS server address auton	natically		
• Use the following DNS server add	resses:		
Preferred DNS server:			
Alternative DNS server:			
Validate settings upon exit	Advanced		
	OK Cancel		

**Ethernet connection 4** 

Silvus radio (StreamCaster 4200E model)

### System Layout

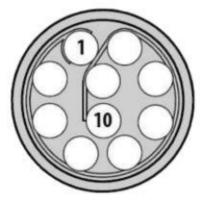
The following image shows the standard connection between **Silvus** radios and **Autopilot 1x** for operation:



Silvus and 1x connection

Hardware Installation

A wiring configuration of the PRI cable connected to the PRI port of the radio is required, in order to connect to the power supply, ethernet and RS-232.



# PRI port connector (mounted in radio)

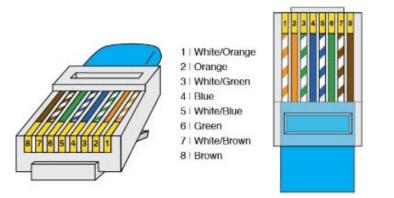
• Power supply



### Female DC Power Jack connector

PRI port Connector - Silvus Radio		Power Connector
PIN	Signal	Signal
2	GND IN	Power -
3	VCC IN	Power +

#### • Ethernet

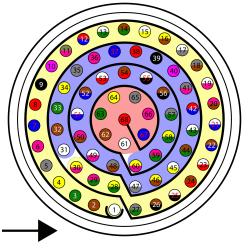


## RJ45 pinout T-568B

PRI port Connector - Silvus Radio		RJ45 Connector (T-568B)		
PIN	Signal	PIN	Signal	Color Code
4	ETH0_MX2N (RX-)	6	RX-	Green
5	ETH0_MX2P (RX+)	3	RX+	Green- White
6	ETH0_MX1P (TX+)	1	TX+	Orange- White
10	ETH0_MX1N (TX-)	2	TX-	Orange

#### • RS-232

The RS-232 from the PRI cable should be connected to the RS-232 of **Autopilot 1x** harness.



Autopilot 1x harness pinout

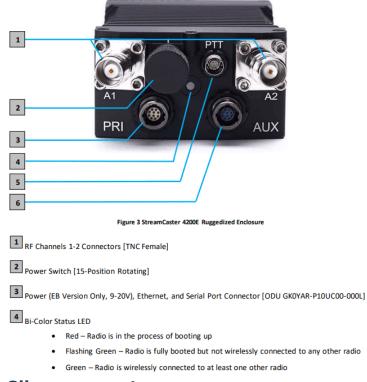
PRI port Connector - Silvus Radio		Autopilot 1x Harness		Harness
PIN	Signal	PIN	Signal	Color Code
7	RS232_RXD	19	RS 232 TX	White- Pink
8	RS232_TXD	20	RS 232 RX	Pink- Brown
9	GND	21	GND	White- Blue

## Silvus radio configuration

This section shows a basic configuration of the **Silvus** radio.

#### First steps

- 1. Connect antennas (or attenuators) with male TNC ends to 2 RF ports.
- 2. Connect power supply to power port on PRI cable.
- 3. Connect non-forked female side of PRI cable to radio's PRI port.



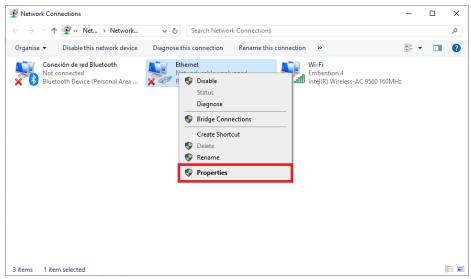
### **Silvus connectors**

- 4. When looking at the rotary multi position switch from the top, pull the knob towards you while rotating the knob towards the 1 position. This turns radio on. LED indicator will turn to fix red.
- 5. In order to access the StreamScape graphical user interface (GUI), connect Ethernet (RJ45) connector of PRI cable to Ethernet port of laptop/computer.
- Make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP address:
  - 1. Open Network and Sharing Centre menu and click Change adapter settings.

Network and Sharing Centre			-	$\times$
← → × ↑ 辈 « Network and	Internet > Network and Sharing Centre V さ	Search Control Panel		P
Control Panel Home	View your basic network information and s	et up connections		
Change adapter settings	View your active networks			
Change advanced sharing settings Media streaming options	Embention 4 Public network	Access type: Internet Connections: 📲 Wi-Fi (Embention)		
	Change your networking settings			
	Set up a new connection or network Set up a broadband, dial-up or VPN connectio	n, or set up a router or access point.		
	Troubleshoot problems Diagnose and repair network problems or get t	roubleshooting information.		
See also				
Internet Options				
Windows Defender Firewall				

### **Ethernet connection 1**

2. Select Local Area Connection, right click, and select Properties.



**Ethernet connection 2** 

3. Select IPv4 and click Properties.

Ethernet Properties	<		
Networking Sharing			
Connect using:			
Realtek PCIe GbE Family Controller			
Configure			
This connection uses the following items:			
Cliente para redes Microsoft Uso compartido de archivos e impresoras para redes M Programador de paquetes QoS			
Protocolo de Internet versión 4 (TCP/IPv4)			
<ul> <li>Controlador de protocolo LLDP de Microsoft</li> </ul>			
Protocolo de Internet versión 6 (TCP/IPv6)			
Install Uninstall Properties			
Description			
Protocolo TCP/IP. El protocolo de red de área extensa predeterminado que permite la comunicación entre varias redes conectadas entre sí.			
OK Cancel			

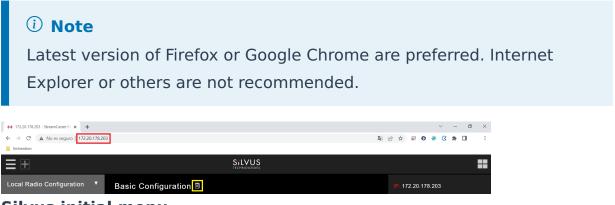
### **Ethernet connection 3**

 Set IP address to 172.20.XX.YY (e.g. if the IP of the radio is 172.20.178.203, set the IP 172.20.178.200) and Subnet mask to 255.255.0.0. Click OK.

Protocolo de Internet versión 4 (TCP/I	Pv4) Properties	$\times$	
General			
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.			
Obtain an IP address automatical	ly		
Use the following IP address:			
IP address:	172 . 20 . 178 . 200		
Subnet mask:	255.255.0.0		
Default gateway:			
Obtain DNS server address auton	natically		
• Use the following DNS server add	resses:		
Preferred DNS server:			
Alternative DNS server:			
Validate settings upon exit	Advanced		
	OK Cancel		

**Ethernet connection 4** 

- 7. Wait for LED indicator to turn to blinking green.
- 8. Access **StreamScape** GUI in web browser. To access, enter IP address of radio into web browser and press enter.



#### Silvus initial menu

 User manual can be accessed by clicking the book icon in the GUI (Next to Basic Configuration in the previous screenshot).

### Basic radio configuration

Once the website has been accessed, follow the steps below which show the parameters that need to be modified for correct operation and pairing of the radios.

## (i) Note

This is an example of the radio configuration linked to a 1x air unit.

## (i) Note

After making changes to each window, it is important to click on "Save and apply".

### 1. Basic Configuration.

●•● 192.168.8.96 - StreamCaster MIM × ●	● 192.168.8.95 - StreamCaster MIN ×   +	~ - <b>a</b> ×
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Embention		
$\equiv \pm$	SiLVUS tichnoloois	=
Local Radio Configuration	Basic Configuration	IP: 172.20.179.131
RF	v	VIP: 192.168.8.96
	Frequency 2220 Bandwidth 20 MHz	Node Label: node45955_179.131
Basic		Temperature: 38°C
Advanced	Network ID EMB-SILV Link Distance 50000 (meters)	Voltage: 11.69 V
		GPS Mode: Unlocked
Networking	Total Transmit Power 15 dBm / 0.032 W Routing Mode Legacy (requested)	GPS Coordinates: 34.057 -118.447 0
Bidirectional Amplifier		Night Mode:
Serial/USB Setup	APPLY SAVE AND APPLY	Scrolibars:
PTT/Audio		
Network Management	•	
Spectrum Dominance	•	
Security		© 2022 Silvus Technologies, Inc. 11 edacy

#### **Basic configuration panel**

• **Frequency (MHZ)**: This defines the frequency of the signal. There is a drop-down menu for frequency selection. We recommend 2220 MHz.

Warning
Be careful when choosing the frequency. The user may see interference with the Wifi frequency band, consult the radio spectrum.

• **Bandwith**: This defines the RF bandwidth of the signal. Default value.

• **Network ID**: Network ID allows for clusters of radios to operate in the same channel, but remain independent.

A radio with a given Network ID will only communicate with other radios with the same Network ID.

- Link Distance (meters): Set to an approximate maximum distance between any two nodes in meters. It is important to set the link distance to allow enough time for packets to propagate over the air. It is recommended to set the link distance 10-15% greater than the actual maximum distance.
- Total Transmit Power (requested): This defines the total power of the signal (power is divided equally between the radio antenna ports).
   Set the appropriate power for each application. The power that has been set is small, as it is sufficient for our tests.
- Routing Mode: As Large Network mode requires a license and is not available outside USA, we set Legacy mode.
- 2. Advanced configuration.

6+8 192.168.8.96 - StreamCaster MIM × 6+8	192.168.8.95	- StreamCaster MIM ×   +	~ - <b>a</b> ×
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Local Radio Configuration	•	Fragmentation Threshold Retransmiss	sions
RF		1600 Bytes	VIP: 192.168.8.96
		_	Node Label: node45955_179.131
Basic		MCS Extended Auto	Temperature: 38°C
			Voltage: 11.69 V
Advanced			GPS Mode: Unlocked
Networking			GPS Coordinates:
		GI Mode Variable - 16/32 Beam Formin	ing
Bidirectional Amplifier			Night Mode:
Serial/USB Setup		Transmit Channels Receive Cha	annels Scrolibars:
PTT/Audio		3: 4: 3:	4:
Network Management	•	Radio Mode Network Mode(0)	
Spectrum Dominance	•	APPLY SAVE AND APPLY APPLY NETWORK SAVE AND APPLY NETWORK	etwork
Security	•		© 2022 Silvus Technologies, Inc.   Legacy

#### **Advanced configuration panel**

- Transmit/Receive Channels: Allows user to enable or disable each channel on the radio for TX/RX (each RF port is a channel).
   We have enabled both channels.
- 3. Networking. Multicast.

#### 1x Hardware Manual

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	SILVUS TECHNOLOGIES	=
Networking <b>v</b>	Multicast 🗉	IP: 172.20.179.131
LAN Settings		VIP: 192.168.8.96
	Default Legacy Multicast Multicast	Node Label: node45955_179.131
DLEP Settings	Algorithm Groups	Temperature: 38°C
WIFI Settings		Vollage: 11.71 V
ů	IGMP Snooping 🛈 📃	GPS Mode: Unlocked
DHCP Server	Action for un-	GPS Coordinates:
Multicast	registered	34.057118.447_0
	multicast traffic	Night Mode:
QoS		Scrollbars:
Infrastructure Networks	Custom Pruning/Augmenting	
Bidirectional Amplifier		
Serial/USB Setup	MANET Multicast/Broadcast	
	APPLY SAVE AND APPLY APPLY NETWORK SAVE AND APPLY NETWORK	
PTT/Audio		© 2022 Silvus Technologies, Inc.   Legacy

#### **Multicast panel**

- **Default Multicast Algorithm**: Broadcast.
- Custom Pruning/Augmenting: Disable.
- 4. Serial/USB Setup

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_															
				S	ILVUS CHNOLOGIES										
Local Radio Configuration	ration Serial Port Setup (Native) 🗉						IP: 172.20.179.131								
RF				_				VIP: 192.168.8.96							
		Serial Port Mod	e RS-232							node45	i955_1	79.131			
Basic		RS-232 Serial F	RS-232 Serial Port Settings						Temperature: 38°C						
Advanced										71 V					
Advanced		Baud Rate	115200	_	Data Bits	8				Unlocke	d				
Networking															
		Parity	None (N)		Stop Bits	1		34.057118.447_0							
Bidirectional Amplifier															
Serial/USB Setup		Software Flow Control	Disable		Transport Protocol	UDP									
PTT/Audio		Peer IP	172.20.1	78.203	Peer Port	54321									
Network Management	•														
Network Management															
Spectrum Dominance	►	Wifi-GPS Dong	e												
Security	•	APPLY SAVE A	ND APPLY	APPLY NETWORK	SAVE AND APPLY NET	WORK			62	122 Silvus 1	fechnolog	ies, Inc.   L	legacy		

**RS-232 settings** 

- Serial Port Setup: RS-232.
- RS-232 Serial Port Settings
  - The value of the Baudrate, Data Bits, Parity and Stop Bits parameters must be the same as those configured in 1x PDI Builder.
  - **Software Flow Control**: Disable.
  - Transport Protocol: We recommend UDP. If no data loss can be tolerated, change this setting to TCP on the radio corresponding to the 1x air unit.

 Peer IP: This should be the IP address of the radio on the other end of the RS-232. In this example, we must set the IP address of the radio linked to the ground unit.

# (i) Note

Both radios (the one connected to the GND unit and the one connected to the AIR unit) have the same configuration except for the **Peer IP**.

≣用	SiLVUS Memodoars	
	TECINOLOGIES	
ocal Radio Configuration	Serial Port Setup (Native) 🛛	IP: 172.20.178.203
RF •	, Serial Port Mode RS-232	VIP: 192.168.8.95
	Senar Fult Mode RS-232	Node Label: node45771_178.203
Basic	RS-232 Serial Port Settings	Temperature: 39°C
Advanced	Baud Rate 115200 Data Bits 8	Voltage: 11.82 V
		GPS Mode: Unlocked
Networking	Parity None (N) Stop Bits 1	GPS Coordinates:
Bidirectional Amplifier		34.057118.447_0
Serial/USB Setup	Software Transport UDP Protocol	Scrollbars:
Serial/OSB Setup		
PTT/Audio	Peer IP 172.20.179.131 Peer Port 54321	
letwork Management		
pectrum Dominance	Wifi-GPS Dongle	

In addition to these settings, different configurations can be stored in the same radio, on the **Multi-Position Switch** panel. The user can select the one that will work, with the radio's switch position.

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<b>= +</b>			STL	VUS									
Local Radio Configuration  Network Management	MPS			Switch Posit	ion	•	1		VIP: 19	20.179.1	96		
Spectrum Dominance	Group Type Network									ibel: noc ature: 38 : 11.71 V		ob_179.1	31
Security	Position 1 mirrors the	Basic Tab.								de: Unio	ocked		
Tools and Diagnostics	Network ID			Frequency					34.057	ordinate -118.44 ode:	_0		
Settings Profile	Bandwidth									irs: 🗔			
Multi-Position Switch	Switch Configurations												
	Network ID Frequency Bandwidth	D	3	4	5	6	7						
	APPLY SAVE AND APPL	APPLY NETWORK	SAVE AND A	PPLY NETWORK						0 2022 5	ivus Tecl	inologies, In	ic.   Legacy

**Multi-Position Switch panel** 

In this example only one configuration has been created.

With the above settings the configuration is finished. Furthermore, this configuration can be saved and downloaded in the **Settings Profile** window of the Configuration Profiles section.

(+) 192.168.8.96 - StreamCaster MIM ×	🜒 user_manual.pdf 🛛 🗙 🕪 192.168.8.95 - StreamCaster MIM 🗴 🕇 🕂				~	-	٥	×
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Embention								
<b>= +</b>	SiLVUS TICINOIODIS							
Local Radio Configuration	Current Saved Profiles				79.131			
Network Management	Saved Profiles				8.8.96 node4	5955_1	79.131	
Spectrum Dominance					: 38°C			
Sacurity	APPLY SAVE AND APPLY DOWNLOAD DELETE SEND PROFILE TO NETWORK				64 V			
Security					Unlock	ed		
Tools and Diagnostics	Upload Profile							
Configuration Profiles	Settings File				.447_0			
	Settings he Settings Name Seleccionar archivo Ninguno archivo selec.							
Settings Profile								
Multi-Position Switch	UPLOAD							
	Save Current Settings							
	Settings Name Include Virtual IP Settings							
	SAVE			 0 2	022 Silvus	Technologie		gacy

# **Settings Profile panel**

Before downloading the configuration, it is necessary to save it.

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<b>=</b> +		=
Local Radio Configuration 🕨	APPLY SAVE AND APPLY DOWNLOAD DELETE SEND PROFILE TO NETWORK	IP: 172.20.179.131
Network Management		VIP: 192.168.8.96
		Node Label: node45955_179.131
Spectrum Dominance	Upload Profile	Temperature: 38°C
Security •	Settings File Settings	Voltage: 11.78 V
Security	Seleccionar archivo Ningunohivo selec.	GPS Mode: Unlocked
Tools and Diagnostics		GPS Coordinates:
Configuration Profiles	UPLOAD	34.057118.447_0
Configuration Profiles		Night Mode:
Settings Profile	Save Current Settings	Scrollbars:
Multi-Position Switch		
	Settings Include Virtual IP	
	Name Virtual IP Settings	
	SAVE	
		© 2022 Silvus Technologies, Inc.   Legacy

#### Save settings

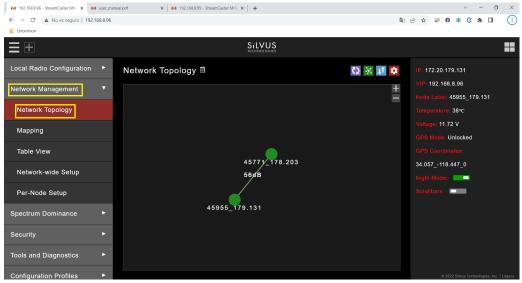
#### 1x Hardware Manual

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Local Radio Configuration	► Settings Profile			72.20	.179.	131			
Network Management	·								
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Spectrum Dominance	Current Saved Profiles				re: 3	B°C			
Security	Saved Embsilvusair				1.66 \	/			ľ
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Tools and Diagnostics	APPLY SAVE AND APPLY DOWNLOAD DELETE SEND PROFILE TO NETWORK								
		34.057118.447_0							ľ
Configuration Profiles					9:	-			ľ
Settings Profile	Upload Profile								
Multi-Position Switch	Settings File Settings Name								
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**Download settings** 

After configuring both radios with these settings they should be paired. Therefore, if we connect them to the power supply, when we switch them on, the LED will turn from fix red to fix green, this indicates that it is connected to at least one radio. Also, if we connect only one of them to the computer, we can access the **StreamScape** GUI of both.

And, in the **Network Topology** window of the Network Management section, we can see the link between them.



**Connection between radios** 

Silvus radio configuration in 1x PDI Builder

The necessary configuration of **Silvus** radio in **1x PDI Builder** is described in the External radios - Integration examples section of the **1x PDI Builder** manual.

Veronte SDL

**SDL** radio module has its own user manual, click here to read it.

This section shows how to connect and configure a **SDL** (any variant) with an **Autopilot 1x air unit** and an **Autopilot 1x ground unit**. The following diagram summarizes the flight communication system between a 1x ground unit and a 1x air unit installed on an aircraft.

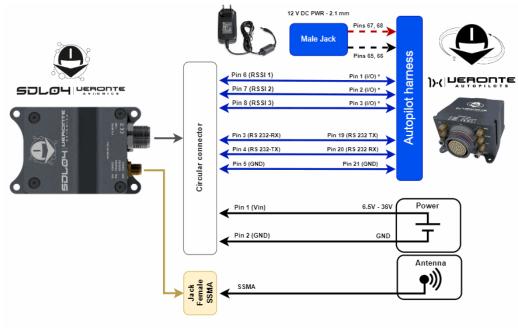


# **Operation diagram**

First of all, **Autopilots 1x** and **SDL** require software configuration:

- To configure Autopilots 1x, use 1x PDI Builder by reading External radios
   Integration examples section of the 1x PDI Builder user manual.
- To configure **SDL**, read the following sections of the **SDL** user manual:
  - To know the basics and start configuring it: Software Installation.
  - To configure according to the application requirements: Veronte Autopilot 1x - Integration examples.

Once all devices have been configured, the electrical connections can be established with the following figure, which shows the required connections according to 1x pinout, and SDL pinout.



\* Those signals are configurable I/Os, so they can be connected to the following 1x pins instead: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16 or 17 (NOT 9)

## **Connections diagram**

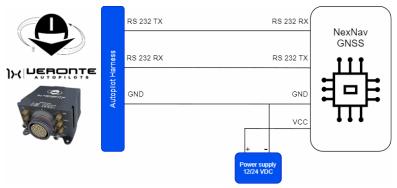
# **GNSS** Receivers

# NexNav GNSS



#### **NexNav GNSS**

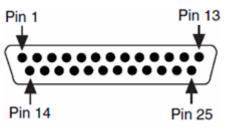
#### NexNav GNSS sensor integrates with Autopilot 1x via RS232 connection.



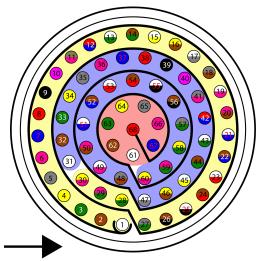
NexNav GNSS - Autopilot 1x wiring diagram

# () Important

Note that it must be connected to an **external power supply**, **sharing signal ground** with **Autopilot 1x**.



**NexNav GNSS connector pinout** 



Autopilot 1x harness pinout

Aut	opilot 1x	Harness		xNav GNSS onnector
PIN	Signal	Color Code	PIN	Signal
19	RS 232 TX	White- Pink	20	RS-232 RX, Port 1
20	RS 232 RX	Pink- Brown	7	RS-232 TX, Port 1
21	GND		10	

Aut	opilot 1x	Harness		xNav GNSS connector
PIN	Signal	Color Code	PIN	Signal
		White- Blue		RS-232 Ground

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

The software installation of this device with **Autopilot 1x** is explained in the NexNav GNSS - Integration examples section of the **1x PDI Builder** user manual.

# IMUs & Compass

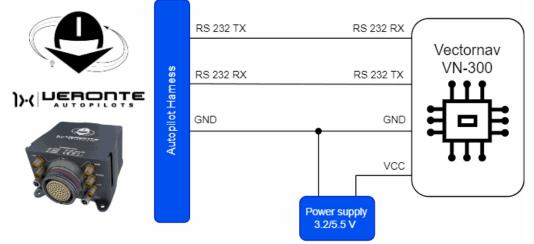
IMUs

Vectornav VN-300



Vectornav VN-300

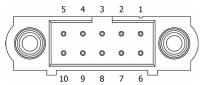
**Vectornav VN-300** is an **external IMU** that can be connected via **RS-232** (serial interface) to **Veronte Autopilot 1x**.



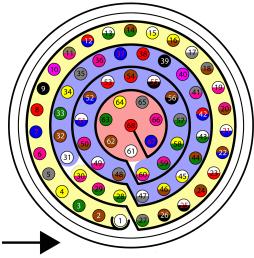
#### Vectornav VN-300 - Autopilot 1x wiring diagram

# () Important

Note that it must be connected to an **external power supply**, **sharing signal ground** with **Autopilot 1x**.



Vectornav VN-300 connector pinout



Autopilot 1x harness pinout

Aut	Autopilot 1x Harness			Nav VN-300 nnector
PIN	Signal	Color Code	PIN	Signal
19	RS 232 TX	White- Pink	1	RX1
20	RS 232 RX	Pink- Brown	2	TX1
21	GND	White- Blue	5	GND

## **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

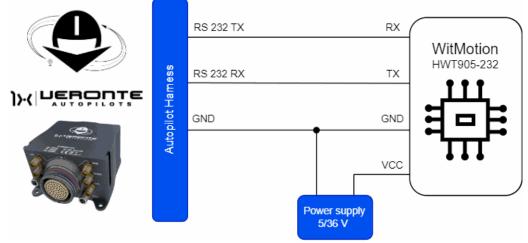
Once the IMU is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the Vectornav VN-300 - Integration examples of the **1x PDI Builder** user manual.

WitMotion HWT905-232



WitMotion HWT905-232

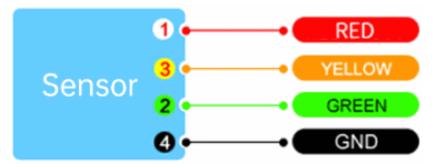
**Vectornav VN-300** is an **external IMU** that can be connected via **RS-232** (serial interface) to **Veronte Autopilot 1x**.



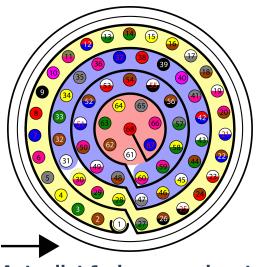
WitMotion HWT905-232 - Autopilot 1x wiring diagram

# () Important

Note that it must be connected to an **external power supply**, **sharing signal ground** with **Autopilot 1x**.



#### WitMotion HWT905-232 connector pinout



Autopilot 1x harness pinout

	Autopilot Harnes		ŀ	WitMotion HWT905-232 Connector					
PIN	Signal	Color Code	PIN	Signal	Color Code				
19	RS 232 TX	White- Pink	2	RX	Green				
20	RS 232 RX	Pink- Brown	3	ТХ	Yellow				
21	GND	White- Blue	4	GND	Black				

## **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the IMU is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the WitMotion HWT905-232 - Integration examples of the **1x PDI Builder** user manual.

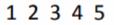
## Magnetometers

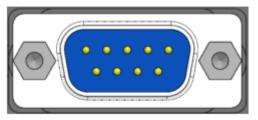
Magnetometer Honeywell HMR2300



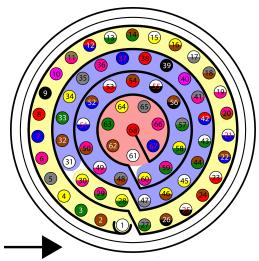
Magnetometer Honeywell HMR2300

Magnetometer Honeywell HMR2300 is an external magnetometer that can be connected to Veronte Autopilot 1x via RS232 or RS485 (serial interfaces).





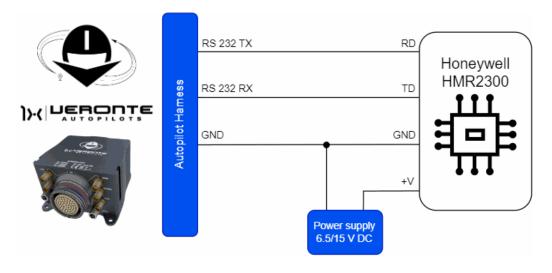
6 7 8 9 Magnetometer Honeywell HMR2300 connector pinout



Autopilot 1x harness pinout

Connections via **RS232** and **RS485** interfaces are explained separately.

RS232



# Magnetometer Honeywell HMR2300 (RS232) - Autopilot 1x wiring diagram

For proper operation via **RS232**, the connection between **Magnetometer Honeywell HMR2300** and **Autopilot 1x** pins should be like this:

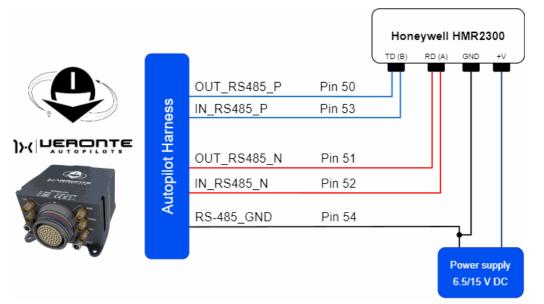
Auto	Autopilot 1x Harness		Ho	etometer neywell 1R2300 nnector
PIN	Signal	Color Code	PIN	Signal
19	RS 232 TX	White- Pink	3	RD
20	RS 232 RX	Pink- Brown	2	TD
21	GND	White- Blue	5	GND

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the **Magnetometer Honeywell HMR2300** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x** by referring to the Magnetometer Honeywell HMR2300 (RS232) - Integration examples of the **1x PDI Builder** user manual.

## RS485



# Magnetometer Honeywell HMR2300 (RS485) - Autopilot 1x wiring diagram

For proper operation via **RS485**, the connection between **Magnetometer Honeywell HMR2300** and **Autopilot 1x** pins should be like this:

A	Autopilot 1x Harness			netometer neywell 1R2300 nnector
PIN	Signal	Color Code	PIN	Signal
50	OUT_RS485_P	Pink- Brown	2	TD (B) Transmit
53	IN_RS485_P	White- Red	2	Data, RS-485 (B+)
51	OUT_RS485_N	White- Blue	3	RD (A) Receive Data,

A	Autopilot 1x Harness			netometer neywell 4R2300 nnector
PIN	Signal	Color Code	PIN Signal	
52	IN_RS485_N	Brown- Blue		RS-485 (A-)
54	OUT_GND	Brown- Red	5	GND

# **△** Warning

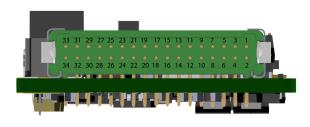
Note that this pin 54 is not a common GND pin.

# (i) Note

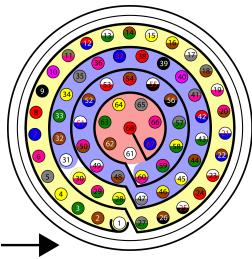
If users encounter any problems during wiring, please check the Halfduplex servo does not respond - Troubleshooting section of this manual.

Once the **Magnetometer Honeywell HMR2300** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x** by referring to the Magnetometer Honeywell HMR2300 (RS485) - Integration examples of the **1x PDI Builder** user manual.

MEX as Magnetometer Honeywell HMR2300



#### **MEX connector pinout**



Autopilot 1x harness pinout

MEX can be used as an external magnetometer Honeywell HMR2300 connected to Veronte Autopilot 1x via serial (RS232/RS485) or CAN interfaces.

Connections via CAN, RS232 and RS485 interfaces are explained separately.

#### CAN

For proper operation via **CAN**, the connection between **MEX** and **Autopilot 1x** pins should be like this:

A	Autopilot 1x Harness			MEX onnector
PIN	Signal	Color Code	PIN	Signal
25	CANA_P	White-Black	22	CAN A (P)
26	CANA_N	Brown-Black	23	CAN A (N)
28	CANB_P	Yellow- Green	20	CAN B (P)
29	CANB_N	Pink-Green	21	CAN B (N)

A	Autopilot 1x Harness			MEX nnector
PIN	Signal	Color Code	PIN	Signal
30	GND	Yellow-Pink	24	CAN GND

# (i) Note

If only CAN A or CAN B has been configured in the software for communications, only the corresponding pins must be connected.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

# Important

Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **MEX** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

However, any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and MEX PDI Builder.

#### RS232

For proper operation via **RS232**, the connection between **MEX** and **Autopilot 1x** pins should be like this:

Autopilot 1x Harness		MEX	Connector	
PIN	Signal	Color Code	PIN	Signal
19	RS 232	White-	16	RS-232 (A) RX
19	ТХ	Pink	19	RS-232 (B) RX
20	RS 232	Pink- Brown	15	RS-232 (A) TX
20	RX		18	RS-232 (B) TX
21	GND	White- Blue	17	GND

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

# Important

Integration is possible by connecting the RS-232(A) or RS-232(B) from **MEX** to the RS232 of **Autopilot 1x**.

However, any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and MEX PDI Builder.

### RS485

For proper operation via **RS485**, the connection between **MEX** and **Autopilot 1x** pins should be like this:

Autopilot 1x Harness			MEX	Connector
PIN	Signal	Color Code	PIN	Signal
50	OUT RS485_P	Pink- Brown	33	IN RS-485 (P)
51	OUT RS485_N	White- Blue	31	IN RS-485 (N)
52	IN RS485_N	Brown- Blue	32	OUT RS-485 (N)
53	IN RS485_P	White- Red	30	OUT RS-485 (P)
54	OUT_GND	Brown- Red	34	RS-485 GND

# **∆** Warning

Note that, in **Autopilot 1x**, this pin 54 is not a common GND pin.

# Important

Any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and MEX PDI Builder.

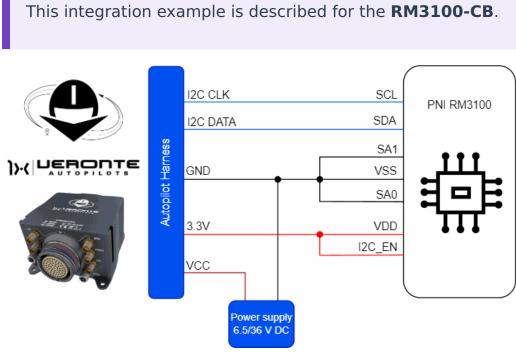
#### **PNI RM3100**



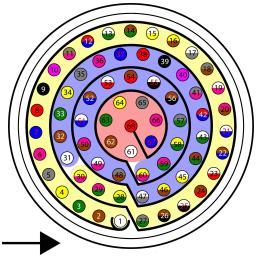
#### PNI RM3100-CB

**Important** 

PNI RM3100-CB magnetometer must be connected to Autopilot 1x via I2C.



PNI RM3100-CB - Autopilot 1x wiring diagram



# Autopilot 1x harness pinout

Autopilot 1x Harness			RM3100-CB Connector	
PIN	Signal	Color Code	PIN	Signal
31	I2C_CLK	White	1	SCL
32	I2C_DATA	Brown	3	SDA
	GND Green 2 7	4	VSS Ground	
33		Green	2	SA1 Bit 1 of slave address
		7		
34	3.3V	Yellow	8	VDD Supply Voltage

Aut	Autopilot 1x Harness			RM3100-CB Connector
PIN	Signal	Color Code	PIN	Signal
			5	I2C_EN I2C enable pin (HIGH = I2C)

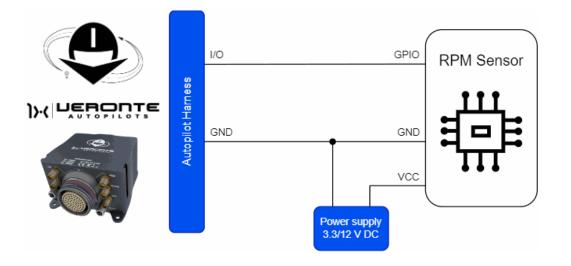
# **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

Once the magnetometer is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the PNI RM3100 - Integration examples section of the **1x PDI Builder** user manual.

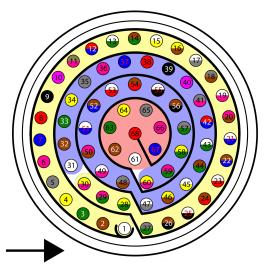
# **RPM Sensors**

RPM sensors typically use different types of wiring depending on their technology and application. However, most RPM sensors, such as Hall effect, optical, or inductive sensors, generally have the following connection:



# **RPM Sensors - Autopilot 1x wiring diagram**

RPM sensor must be connected to one of the available I/O pins of **Autopilot 1x**.



Autopilot 1x harness pinout

A	Autopilot 1x Harness				
PIN	Signal	Color Code			
1	I/O0	White			
2	I/01	Brown			
3	I/O2	Green			
4	I/O3	Yellow			
5	I/O4	Gray			
6	I/O5	Pink			
7	I/O6	Blue			
8	I/07	Red			
9	GND	Black			

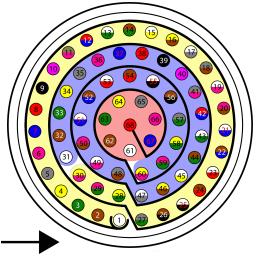
A	Autopilot 1x Harness				
PIN	Signal	Color Code			
10	I/O8	Violet			
11	I/O9	Gray-Pink			
12	I/O10	Red-Blue			
13	I/011	White-Green			
14	I/012	Brown-Green			
15	I/013	White-Yellow			
16	I/014	Yellow-Brown			
17	I/015	White-Gray			
55	EQEP_A	White-Black			
56	EQEP_B	Brown-Black			
57	EQEP_S	Gray-Green			
58	EQEP_I	Yellow-Green			
59	GND	Pink-Green			

Once the **hardware installation** is complete, to properly integrate the device with **Autopilot 1x** follow the steps detailed in the RPM Sensors - Integration examples section of the **1x PDI Builder** user manual.

# Stick

**Veronte Autopilot 1x** is compatible with joysticks that use PPM, CAN bus, USB, Serial, etc.

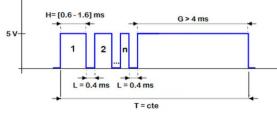
If the PPM level is 3.3V, the following **Autopilot 1x** pins can be used:



Autopilot 1x harness pinout

A	Autopilot 1x Harness				
PIN	Signal	Color Code			
1	I/O0	White			
2	I/01	Brown			
3	I/O2	Green			
4	I/O3	Yellow			
5	I/O4	Gray			
6	I/O5	Pink			
7	I/O6	Blue			
8	I/07	Red			
9	GND	Black			
10	I/08	Violet			
11	I/O9	Gray-Pink			

Autopilot 1x Harness				
PIN	Signal	Color Code		
12	I/010	Red-Blue		
13	I/011	White-Green		
14	I/012	Brown-Green		
15	I/013	White-Yellow		
16	I/014	Yellow-Brown		
17	I/015	White-Gray		
55	EQEP_A	White-Black		
56	EQEP_B	Brown-Black		
57	EQEP_S	Gray-Green		
58	EQEP_I	Yellow-Green		
59	GND	Pink-Green		

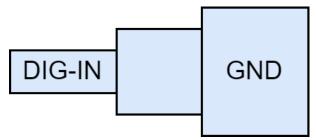




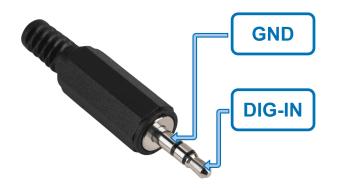
# **△** Caution

PPM signal must be into the **Veronte Autopilot 1x** voltage ranges. Some joysticks may need an adaptation board, please ask our team to check compatibility.

Connector for harness is provided with 3.5mm stereo plug connector as follows:



**PPM** pinout



#### **PPM connector**

- To use the joystick with **PPM** in the system, connect the PPMout of the trainer port to a digital input of **Veronte Autopilot 1x** and configure that digital input according to the PPM Stick - Integration examples section of the **1x PDI Builder** user manual.
- When using a USB joystick, the software installation with Autopilot 1x is detailed in the USB joystick - Integration examples section of the 1x PDI Builder user manual.
- For joysticks with signals **different from PPM or USB**, read the Virtual Stick Integration examples section of the **1x PDI Builder** user manual.

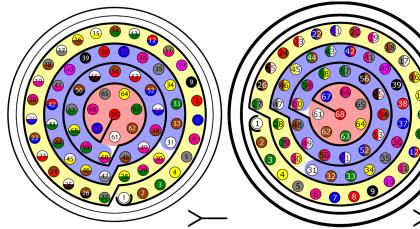
# Veronte products

This section explains how integrate **Autopilot 1x** with Veronte products.

# **CEX** connection

When communication is established between the PC and the **CEX** using the **Veronte Autopilot 1x** as a tunnel, the connection between the **CEX** and **Autopilot 1x** is via **CAN**.

The pin connection between the two devices should be like this:



Connector for Autopilot 1x - HEW.LM.368.XLNP (frontal view)

Connector for CEX - HEW.LM.368.XLNP (frontal view)

Autopilot 1x Connector			<b>CEX Connector</b>			
PIN	IN Signal Color Code		PIN	Signal	Color Code	
25	CANA_P	White- Black	5	CAN (A) P	Gray	
26	CANA_N	Brown- Black	6	CAN (A) N	Pink	
28	CANB_P	Yellow- Green	8	CAN (B) P	Red	
29	CANB_N	Pink- Green	9	CAN (B) N	Black	
30	GND		7		Blue	

Autopilot 1x Connector			<b>CEX Connector</b>		
PIN	Signal	Color Code	PIN	Signal	Color Code
		Yellow- Pink		CAN GND	

# (i) Note

If only CAN A or CAN B has been configured in the software for communications, only the corresponding pins must be connected.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

# **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

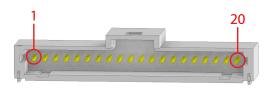
# Important

Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **CEX** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

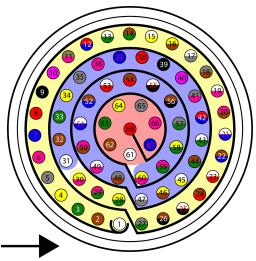
However, any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and CEX PDI Builder.

# MC01 connection

For proper operation via **CAN**, the connection between **MC01** and **Autopilot 1x** pins should be like this:



**MC01** connector pinout



Autopilot 1x harness pinout

Autopilot 1x harness		MC01 connector			
PIN	PIN Signal Color code		PIN	Signal	Color code
25	CANA_P	White- Black	9	CAN	White
28	CANB_P	Yellow- Green	9	(P)	
26	CANA_N	Brown- Black	8	CAN	Gray
29	CANB_N	Pink- Green	0	(N)	

Α	Autopilot 1x harness			MC01 connector		
PI	N	Signal	Color code	PIN	Signal	Color code
3	0	GND	Yellow- Pink	10	GND	Black

# (i) Note

CAN A and CAN B buses are equivalent and can be used interchangeably for the integration of this device.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

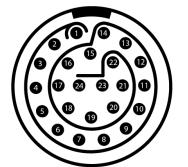
## **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

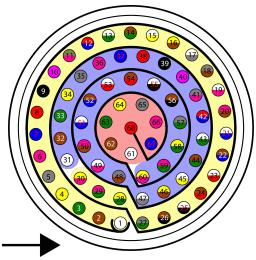
Once **MC01** has been properly wired with the **Autopilot 1x**, users can proceed to the software integration detailed in the MC01 - Integration examples section of the **1x PDI Builder** user manual.

# MC24 connection

For proper operation via **CAN**, the connection between **MC24** and **Autopilot 1x** pins should be like this:



MC24 connector pinout



Autopilot 1x harness pinout

Autopilot 1x harness			MC24 connector		
PIN	Signal	Color code	PIN	Signal	
25	CANA_P	White- Black	5	CANA_P	
26	CANA_N	Brown- Black	6	CANA_N	
28	CANB_P	Yellow- Green	18	CANB_P	
29	CANB_N	Pink- Green	7	CANB_N	

Autopilot 1x harness			MC24 connector	
PIN	Signal	Color code	PIN	Signal
30	GND	Yellow- Pink	24	CAN_GND

# (i) Note

If only CAN A or CAN B has been configured in the software for communications, only the corresponding pins must be connected.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

# **△** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

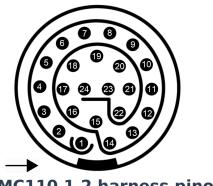
# Important

Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **MC24** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

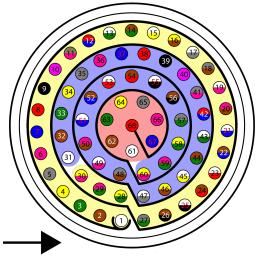
However, any connections made must be **consistent** with the **configuration** made at software level. For this, refer to the MC110/MC24 - Integration examples section of the **1x PDI Builder** user manual.

# MC110 connection

For proper operation via **CAN**, the connection between **MC110 hardware version 1.2** and **Autopilot 1x** pins should be like this:



MC110 1.2 harness pinout



Autopilot 1x harness pinout

Autopilot 1x harness			MC110 harness		
PIN	Signal	Color code	PIN	Signal	
25	CANA_P	White- Black	5	CANA_P	
26	CANA_N	Brown- Black	6	CANA_N	

Auto	Autopilot 1x harness		MC110 harness	
PIN	Signal	Color code	PIN	Signal
28	CANB_P	Yellow- Green	18	CANB_P
29	CANB_N	Pink- Green	7	CANB_N
30	GND	Yellow- Pink	24	CAN_GND

#### (i) Note

If only CAN A or CAN B has been configured in the software for communications, only the corresponding pins must be connected.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

#### **△** Warning

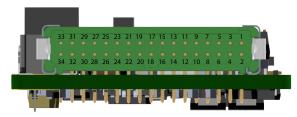
**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin. [!IMPORTANT] Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **MC110** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

However, any connections made must be **consistent** with the **configuration** made at software level. For this, refer to the MC110/MC24 - Integration examples section of the **1x PDI Builder** user manual.

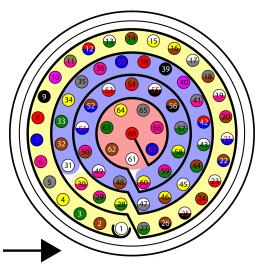
#### **MEX** connection

When communication is established between the PC and the **MEX** using the **Veronte Autopilot 1x** as a tunnel, the connection between the **MEX** and **Autopilot 1x** is via **CAN**.

The pin connection between the two devices should be like this:



**MEX connector pinout** 



Autopilot 1x harness pinout

Autopilot 1x harness		MEX connector		
PIN	Signal	Color code	PIN	Signal
25	CANA_P	White- Black	22	CAN A (P)
26	CANA_N	Brown- Black	23	CAN A (N)

Autopilot 1x harness			4EX nector	
PIN	Signal	Color code	PIN	Signal
28	CANB_P	Yellow- Green	20	CAN B (P)
29	CANB_N	Pink- Green	21	CAN B (N)
30	GND	Yellow- Pink	24	CAN GND

### (i) Note

If only CAN A or CAN B has been configured in the software for communications, only the corresponding pins must be connected.

For more information on CAN connection, please visit CAN - Wiring connection section of this manual.

#### **∆** Warning

**Remember!!** In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

### Important

Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **MEX** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

However, any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and MEX PDI Builder.

# Troubleshooting

In case of any issue with software, read the Troubleshooting section of the **1x PDI Builder** user manual.

### Maintenance mode

**Maintenance mode** is the main recovery mode that Veronte system puts at the user disposal. The main use of **maintanance mode** is to solve issues related to the current configuration, mainly related with communication or memory writting issues.

While in **maintenance mode**, **all communications channels are enabled** by default, so it is possible to connect **Veronte Autopilot 1x** through any of its configuration interfaces, regardless of its current configuration. Thus allowing to re-establish communications with it in case they have been lost for any reason.

### 🖓 Тір

It is heavily recommended to always use **maintenance mode** to load a new configuration that is very different from the current one.

### 🛆 Warning

**Autopilot 1x** might enter in **maintenance mode** if a problem with the power supply is detected upon boot up (voltage or current is out of range).

How to enter in maintenance mode

There are two ways to enter in **maintenance mode**: by software or hardware (forcing it).

Using software to enter in maintenance mode

To enter in **maintenance mode** by software, read the Maintenance Mode -Troubleshooting section of the **1x PDI Builder** user manual.

#### Forcing maintenance mode

There are two ways to force the maintenance mode: using **power supply** or using the **I2C pins**.

#### Power supply

In order to active **maintenance mode**, power cycle the **Veronte Autopilot 1x** repetively with periods of 700 ms (with a margin range between 380 and 965 ms). After 30 cycles, the autopilot will enter in **maintenance mode**.



How to power cycle an autopilot

I2C pins

To enter in **maintenance mode** with **I2C**:

- 1. Unplug Veronte Autopilot 1x
- 2. Connect both I2C pins each other
- 3. Then, power up Autopilot 1x
- 4. Finally disconnect both pins

Both pins are I2C\_CLK (number 31) and I2C\_DATA (number 32) according to the pinout.

#### (i) Note

**Dev Harness 1x 4.8** (Embention reference P007043) has already included a button with this 2 pins to easily enter maintenance mode.

The procedure is the same as for the pins, but instead of connecting and disconnecting the pins, press and release the button.

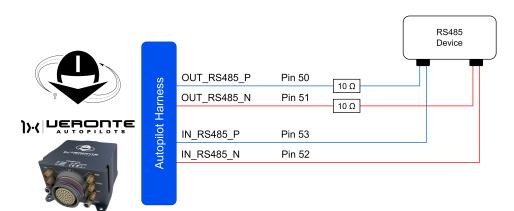
### Half-duplex servo does not respond

Any servo with half duplex RS-485 should communicate with **Autopilot 1x** following the connection diagram:

				RS485 Device
	SS	OUT_RS485_P	Pin 50	
	rne:	OUT_RS485_N	Pin 51	
	Autopilot Harness	IN RS485 P	Pin 53	
berentering	utop	 IN_RS485_N	Pin 52	
A CONTRACTOR	A			

#### Normal connection between 1x and servo

Sometimes this connection does not work, because the servo has not enough transmission power. In this case, a couple of 10  $\Omega$  resistors may solve the problem. Both resistors have to be placed at the trasmission line of the **Autopilot 1x**.



#### **Resistors connection between 1x and servo**

If the couple of resistors does not solve the issue, the user should contact the support team (create a ticket in the customer's **Joint Collaboration Framework**; for more information, see Tickets section of the **JCF** manual).

# Hardware Changelog

Hereby are described the main differences between the latest release of the **Veronte Autopilot 1x** hardware (v **4.8**) and the previous commercial version (v **4.5**).



# Specifications

Mechanical			
	4.5 4.8		
Mating connector	Circular mating connector with 68 pins		
Enclosure	Anodized aluminum		
Weight	190 g	198 g	
Dimensions	78 x 63 x 40 mm	76 x 65 x 40 mm	
Protection rating	IP67		
Mounting	M4 screws	M3 screws	
	-40 to 65 ºC		

Mechanical			
	4.5	4.8	
Temperature range (no convection)			
Pressure port	2.4 mm	SMC M5 series system. Usable with 2.5 x 4 mm polyurethane	
RF connectors (LOS/BLOS/ GNSS)	SSMA jack female		

Sensors			
	4.5	4.8	
Number of static pressure sensors	3	2	
Static pressure range	<b>0)</b> 0 - 103,000 Pa <b>1)</b> 1,000 - 120,000 Pa <b>2)</b> 30,000 - 120,000 Pa	<ol> <li>1,000 -</li> <li>120,000 Pa</li> <li>30,000 -</li> <li>120,000 Pa</li> </ol>	
Static pressure band error	<ol> <li>0) 1,030 Pa</li> <li>1) 500 Pa</li> <li>2) 200 Pa</li> </ol>	<b>1)</b> 500 Pa <b>2)</b> 200 Pa	

Sensors			
	4.5	4.8	
Static pressure resolution	<ol> <li>0) 25 Pa</li> <li>1) 1.2 to</li> <li>6.5 Pa</li> <li>2) 0.5 Pa</li> </ol>	<ol> <li>1.2 to 6.5</li> <li>Pa</li> <li>0.5 Pa</li> </ol>	
Number of dynamic pressure sensors	1		
Dynamic pressure range	3 Pa (5 kt 8 km/h sea level) to 6,900 Pa (206 kt 382 km/ h sea level)		
Dynamic pressure band error	0.01 %		
Dynamic pressure resolution	25,500 Pa		
Number of accelerometers (3 axis each)	2	3	
Accelerometer range	<b>1)</b> ±16 g <b>2)</b> ±24 g	<ol> <li>±16 g</li> <li>±24 g</li> <li>±8 g</li> </ol>	
Accelerometer max. shock	<ol> <li>20,000</li> <li>for 0.2 ms</li> <li>10,000</li> <li>g/ms</li> </ol>	<ol> <li>20,000 g</li> <li>for 0.2 ms</li> <li>10,000 g/ ms</li> </ol>	

Sensors			
	4.5	4.8	
		<b>3)</b> 14,700 m/	
Accelerometer sensitivity	<ol> <li>1) 16,393</li> <li>LSB/(m/s<sup>2</sup>)</li> <li>2) 10,920</li> <li>LSB/(m/s<sup>2</sup>)</li> </ol>	<ol> <li>1) 16,393</li> <li>LSB/(m/s<sup>2</sup>)</li> <li>2) 10,920</li> <li>LSB/(m/s<sup>2</sup>)</li> <li>3)</li> <li>26,756,268</li> <li>LSB/(m/s<sup>2</sup>)</li> </ol>	
Number of gyroscopes (3 axis each)	2	3	
Gyroscope range	<ol> <li>1) 125 to</li> <li>2,000 ⁰/s</li> <li>2) 125 to</li> <li>2,000 ⁰/s</li> </ol>	<ol> <li>1) 125 to 2,000 º/s</li> <li>2) 125 to 2,000 º/s</li> <li>3) 2,000 º/s</li> </ol>	
Gyroscope sensitivity	<ol> <li>228 to</li> <li>14.2 LSB/º/ s</li> <li>262 to</li> <li>16 LSB/º/s</li> </ol>	<ol> <li>228 to</li> <li>14.2 LSB/º/s</li> <li>262 to 16 LSB/º/s</li> <li>655,360 to</li> <li>10 LSB/º/s</li> </ol>	
Number of magnetometers	2	3	
Magnetometer range	<ol> <li>4 gauss</li> <li>8 gauss</li> </ol>		

Sensors			
	4.5	4.8	
		<ol> <li>0) 4 gauss</li> <li>1) 8 gauss</li> <li>2) 11 gauss</li> </ol>	
Magnetometer sensitivity	<ol> <li>6,842 to</li> <li>711 LSB/ gauss</li> <li>4,096</li> <li>LSB/gauss</li> </ol>	<ul> <li><b>0)</b> 6,842 to</li> <li>1,711 LSB/</li> <li>gauss</li> <li><b>1)</b> 4,096 LSB/</li> <li>gauss</li> <li><b>2)</b> 0.13</li> <li>mgauss</li> </ul>	
Number of GNSS units		2	
GNSS constellations	BeiDou, GLONASS, GPS	BeiDou, Galileo, GLONASS, GPS/QZSS	
Concurrent GNSS constellations	Up to 2	Up to 4	
GNSS bands		1B/C, B2l, E5b, L1OF, B1l	
Position accuracy RTK	0.025 m + 1 ppm CEP	> 0.01 m + 1 ppm CEP	
Update rate	8 Hz	up to 20 Hz	

I/O (on base hardware - expansion boards available)			
	4.5	4.8	
Vin	2	2 x (6.5 - 36 V) DC	
PWM / GPIO		Up to 16	
RS232		1 x	
RS485	1 x		
Vout	5 & 3.3 V		
FTS	Deadman output (GPIO)		
CAN bus	2 x		
ADC		5 x	
EQEP	1 x		
I2C	1 x		
UART	1 x (FTS - SuC)	1 x Microcontroller (i.e. external datalink)	
USB	1 x		

### Architecture and Computing Power

Veronte Autopilot 1x 4.8 and 4.5 share the same internal architecture, powered by the same dual core microprocessor from the Texas Instruments EP (Enhanced Performance) series.

## Line of Sight Communications

Veronte Autopilot 1x 4.5 had the possibility to install internal datalinks from Microhard (Pico Series), available in 2.4 GHz, 900 MHz and 400 MHz. In the new version (4.8), this datalink has been replaced by a short range module for testing, configuration and telemetry download.

Embention has decided to replace the 1W Microhard datalink for the following reasons:

- As per past experience, each aircraft manufacturer has different datalink needs, so Embention has preferred that customers can have more flexibility choosing the appropriate brand, model and frequency.
- By removing the Microhard modules, there is now more space to include better sensors with extended accuracy.
- Reducing the power of the internal RF module from the autopilot permits to reduce electromagnetic interferences.
- Reducing the power consumption also reduces the heat dissipation needs on the autopilot and improves performance in warm environments.

Thus, Autopilot 1x 4.8 internal datalink has been replaced by Digi XBee **®** 3 PRO Zigbee 3.0, a 2.4 GHz short range module. This module has the mission to allow the integration and PDI tuning of the autopilot into the customer's platform. An external datalink (Microhard or others) can be installed in the additional UART port available in 4.8.

Performance for Digi XBee® 3 PRO Zigbee 3.0		
Data rate	RF 250 kbps, serial up to 1 Mbps	
Indoor/urban range	Up to 300 ft (90 m)	

### Performance for Digi XBee® 3 PRO Zigbee 3.0

Outdoor/RF line-of-sight range	Up to 2 miles (3200 m)
Transmit power	+19 dBm
Receiver sensitivity (1% PER)	-103 dBm normal model

Features		
Frequency band	ISM 2.4 GHz	
	DSSS (Direct	
Interference	Sequence	
immunity	Spread	
	Spectrum)	

Networking and Security		
Protocol	Zigbee 3.0	
Encryption	128/256 bit AES	
Reliable packet delivery	Retries / acknowledgements	
IDS		

Networking and Security		
	PAN ID and	
	addresses, cluster	
	IDs and endpoints	
	(optional)	
Channels	16 channels	

### New Features

One of our fundamentals at Embention is the continuous evolution of our products and services. The UAM sector is evolving everydays and new needs and technical requirements are demanded almost every week. For this reason, in order to help our customers to achieve their goals, Embention has released a new version of its hardware, with the following features.

- Enhanced sensor accuracy and reliability: Dead reckoning navigation is a critical tool for degraded GNSS scenarios, the new sensors in Veronte Autopilot 1x are significantly more accurate than previous ones. These enhanced sensors allows to improve the navigation estimation during the standard operation and in GNSS denied navigation.
- Improved RTK and GNSS heading: New GNSS sensors in Veronte Autopilot 1x are significantly better in various aspects (supported constellations, accuracy, number of concurrent constellations and frequency).

The positioning accuracy has improved from 0.025 m + 1 ppm to 0.01 m + 1 ppm CEP, it also improves RTK and GNSS heading estimation.

- Enhanced high-temperature hardware design and production materials: In order to offer the best performances in extreme scenarios and to pass more demanding quality and environmental tests.
   New materials are used in PCB manufacturing. These new fibers have better performance in heat conditions, extending the lifetime of the product.
- Additional failure detection means: Development of failure detection algorithms and redundant hardware.

The new PCB design includes additional signals for failure detection that can communicate each one of the autopilot cores with the arbiter. Also, the internal CAN Bus network has been modified to enhance robustness.

- Short-range 2.4 GHz LOS included in all units: Short range communications module included, in order to facilitate system integration. This module is based on Digi Xbee and permits to have an independent link for telemetry download and configuration.
- **BLOS module with extended coverage**: BLOS communications and UTM capabilities through a physical or eSIM card.
- Extended GNSS-denied navigation capabilities: Flexible and custom Kalman filters, high precision IMU sensors and several tools in order to build safety automations if GNSS is lost.

Inertial navigation highly depends on the IMU accuracy, which has been significantly improved with the new setup.

• Internal Remote ID or ADS-B with IN/OUT: Extended collaborative sense and avoid capabilites, allowing the compliance of new FAA unmanned operation requirements.

WIFI and Bluetooth modules have been integrated to enable Remote ID communications. This module can be replaced by a 1W ADS-B IN & OUT module if preferred.

- Embedded global DEM, geoid, magnetic and gravity fields: Advanced custom possibilites for the user during the map configuration, in order to carry out high-accuracy operations in the safest way possible. Worldwide terrain altitude and magnetic field are included in Veronte Autopilot 1x.
- Internal enclosure pressure port: A new pressure port has been included for measuring the pressure inside the autopilot.

# Collaborative Sense & Avoid and UTM

Some of the most important aeronautical authorities in the world have been very clear about the future lines in the certification process: all aircraft have to have collaborative detection capabilities. For example, the American FAA has expressed in several documents that a Remote ID system for drone identification and detection for smaller drones. For larger drones, it is expected that the ADS-B technology will prevail.

# Remote ID

Remote ID is a young technology based on personal area networks (Bluetooth) and local area networks (WiFi). The system is emitting a constant signal with the ID of the drone and its positioning at each moment. Users can see the track of the operation and customers have the ability to configure the information shown.

Frequency	WiFi & Bluetooth bands
Developed according to	RIN 2120-AL31 Remote identification of Unmanned Aircraft FAA Standard
Parameters	Aircraft ID, position, altitude and time mark
Compatibility	FAA Remote ID Scanner App

To comply with the final rule of Remote Identification of Unmanned Aircraft (Part 89), manufacturers need to produce standard Remote ID drones and meet the requirements of this rule by September 16th, 2022.

Embention's Remote ID is being adapted in order to be in complicance with Active Standard ASTM F3411 requirements, developed by subcommittee F38.02.

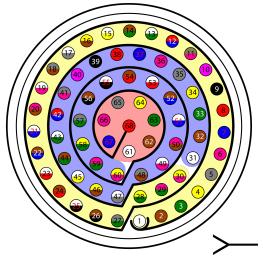
## ADS-B

Internal ADS-B with IN & OUT capabilities is another option in order to reach the collaborative detection capabilities and to enhance the fleet management performance.

Frequency band	1090 MHz
Current consumption	Averaged 140 mA
Sensitivity	-80 dBm
RF output power	Configurable + 30 dBm (1W), + 27 dBm (0.5 W), + 24 dBm (0.25 W)
ESD protection	All lines protected
MAVlink (baud)	115200 bps
AERO (baud)	115200 bps (AT commands)

## Pinout changes from Autopilot 1x 4.5

The pinout for 4.5 and 4.8 versions are very similar, but they have several differences. To prevent any confusion, the following table shows the pinout for both versions. The different pins are marked with  $\triangle$ , all the rest have the same function.



### 68 pin connector for both versions

PIN	Signal	Туре	Description
1	I/O0	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
2	I/O1	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
3	I/O2	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
4	I/O3	I/O	PWM / Digital I/O signal (0-3.3V). Protected against

PIN	Signal	Туре	Description
			ESD and short circuit
5	I/O4	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
6	I/O5	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
7	I/O6	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
8	I/O7	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
9	GND	GROUND	Ground signal for actuators 1-8
10	I/O8	I/O	PWM / Digital I/O signal (0-3.3V). Protected against

PIN	Signal	Туре	Description
			ESD and short circuit
11	I/O9	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
12	I/O10	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
13	I/011	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
14	I/012	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
15	I/O13	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
16	I/O14	I/O	PWM / Digital I/O signal (0-3.3V).

PIN	Signal	Туре	Description
			Protected against ESD and short circuit
17	I/O15	I/O	PWM / Digital I/O signal (0-3.3V). Protected against ESD and short circuit
18	GND	GROUND	Ground signal for actuators 9-16
19	RS 232 TX	Output	RS 232 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit
20	RS 232 RX	Input	RS 232 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold). Protected against ESD and short circuit
21	GND	GROUND	Ground signal for buses
22	ANALOG_3	Input Analog	Input 0-3.3V. Protected against

PIN	Signal	Туре	Description
			ESD and short circuit
23	ANALOG_4	Input Analog	Input 0-3.3V. Protected against ESD and short circuit
24	GND	GROUND	Ground signal for buses
25	CANA_P	I/O	CANbus interface, up to 1Mbps (2.3V Typical, 1.2V-2.3V Differential). Protected against ESD
26	CANA_N	I/O	Twisted pair with a 120 ohms Zo recommended (2.3V Typical, 1.2V-2.3V Differential). Protected against ESD
27	4.5: GND	4.5: GROUND	4.5: Ground signal for buses
Â	4.8: 4XV_WD	4.8: I/O	4.8: Reserved. Do not connect
28	CANB_P	I/O	CANbus interface. It supports data

PIN	Signal	Туре	Description
			rates up to 1 Mbps. Protected against ESD
29	CANB_N	I/O	Twisted pair with a 120 ohms Zo recommended. Protected against ESD
30	GND	GROUND	Ground signal for buses
31	I2C_CLK	Output	Clk line for I2C bus (0.3V to 3.3V). Protected against ESD and short circuit
32	I2C_DATA	I/O	Data line for I2C bus (0.3V to 3.3V). Protected against ESD and short circuit
33	GND	GROUND	Ground for 3.3V power supply
34	3.3V	POWER	3.3V - 100mA power supply. Protected against ESD short circuit with 100mA resettable fuse

PIN	Signal	Туре	Description
35	GND	GROUND	Ground for 5V power supply
36	5V	POWER	5V - 100mA power supply. Protected against ESD short circuit with 100mA resettable fuse
37	GND	GROUND	Ground for analog signals
38	ANALOG_0	Input	Analog input 0-3.3V. Protected against ESD and short circuit
39	ANALOG_1	Input	Analog input 0-3.3V. Protected against ESD and short circuit
40	ANALOG_2	Input	Analog input 0-3.3V. Protected against ESD and short circuit
41	4.5: GND	4.5: GROUND	4.5: Ground for FTS signals
Â	4.8: 4XV_A	4.8: I/O	4.8: Reserved. Do not connect

PIN	Signal	Туре	Description
42	FTS1_OUT	Output	Deadman signal from comicro. Protected against ESD and short circuit
43	FTS2_OUT	Output	!SystemOK Bit. Protected against ESD and short circuit
44	4.5: GND	4.5: GROUND	4.5: Ground signal for safety buses
	4.8: 4XV_B	4.8: I/O	4.8: Reserved. Do not connect
45 ①	4.5: V_ARB_TX	4.5: Output	<ul> <li>4.5: Veronte</li> <li>comicro UART</li> <li>output to activate</li> <li>safety</li> <li>mechanism.</li> <li>Protected against</li> <li>ESD and short</li> <li>circuit</li> </ul>
	4.8: UARTA_TX	4.8: Output	4.8: Microcontroller UART
<b>46</b> ⊥∕́⊥	4.5: V_ARB_RX	4.5: Input	4.5: Veronte comicro UART output to activate

PIN	Signal	Туре	Description
			safety mechanism. Protected against ESD and short circuit
	4.8: UARTA_RX	4.8: Input	4.8: Microcontroller UART
47	GND	GROUND	Ground signal comicro power supply
48	V_ARB_VCC	POWER	Veronte comicro power (6.5V to 36V). Protected against ESD and reverse polarity
49	FTS3_OUT_MPU	Output	MPU alive voting signal, to use with 4xVeronte. It is a Square Wave at [100,125] Hz. Protected against ESD and short circuit
50	OUT_RS485_P	Output	Non-inverted output from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against

PIN	Signal	Туре	Description
			ESD and short circuit
51	OUT_RS485_N	Output	Inverted output from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit
52	IN_RS485_N	Input	Inverted input from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit
53	IN_RS485_P	Input	Non-inverted input from RS485 bus (-7V to 12V Max, -2.3V to 2.3V Typical). Protected against ESD and short circuit
54	OUT_GND	GND	Ground for RS-485 bus Warning This is not a common GND pin.

PIN	Signal	Туре	Description
55	EQEP_A	I/O	DIGITAL output / DIGITAL input / Encoder quadrature input A (0-3.3V). Protected against ESD and short circuit
56		DIGITAL output / DIGITAL input / Encoder quadrature input B (0-3.3V). Protected against ESD and short circuit	
90	EQEP_B	I/O	Warning Only use it as digital I/O with Veronte units of Hardware version 4.5 or lower.
57	EQEP_S	I/O	DIGITAL output / DIGITAL input / Encoder strobe input (0-3.3V). Protected against ESD and short circuit

PIN	Signal	Туре	Description
58	EQEP_I	I/O	DIGITAL output / DIGITAL input / Encoder index input A (0-3.3V). Protected against ESD and short circuit
59	GND	GROUND	Ground for encoders
60	V_USB_DP	I/O	Veronte USB data line. Protected against ESD
61	V_USB_DN	I/O	Veronte USB data line. Protected against ESD
62 ①	4.5: V_USB_ID	4.5: I/O	<ul><li>4.5: Veronte USB</li><li>ID line. Protected</li><li>against ESD and</li><li>short circuit</li></ul>
	4.8: USB_SHIELD_GND	4.8: GROUND	4.8: USB cable shielding
63	FTS_OUT_MPU	Output	Abort mission voting signal from MPU, to use with 4xVeronte. Bit Low (0V) if mission OK. High (3.3V) if mission

PIN	Signal	Туре	Description
			wants to be terminated. Protected against ESD and short circuit
64	FTS2_OUT_MPU	Output	Abort mission voting signal 2 from MPU, to use with 4xVeronte. Bit Low (0V) if mission OK. High (3.3V) if mission wants to be terminated. Protected against ESD and short circuit
65	GND	GROUND	Veronte ground input
66	GND	GROUND	Veronte ground input
67	VCC	POWER	Veronte power
			supply (6.5V to 36V). Protected against ESD and reverse polarity.
			Warning Both pins are common. They MUST be

PIN	Signal	Туре	Description
68	VCC	POWER	connected to the same power supply.

### **∆** Warning

**Remember!!** All GND pins are common. Note that pin 54 is not a common GND pin.

# Acronyms and Definitions

### Acronyms

Acronym	Description
16 VAR	16 Bits variables (Integers)
32 VAR	32 Bits variables (Reals)
ADC	Analog to Digital Converter
ADSB	Automatic Dependent Surveillance- Broadcast
AGL	Above Ground Level
AoA	Angle of Attack
ARC	Arcade Mode
AUTO	Automatic Mode
BIT	Bit Variables
BLOS	Beyond Line Of Sight
CAN	Controller Area Network
САР	Capture Module

Acronym	Description
CEP	Circular Error Probability
СМВ	Climb Phase
CRU	Cruise Phase
DAA	Detect And Avoid
DC	Direct Current
DGPS	Differential GPS
ECAP	Enhanced CAP
ECEF	Earth Centered - Earth Fixed
EGNOS	European Geostationary Navigation Overlay Service
(E)GPRS	Enhanced Data Rates for GSM Evolution
EKF	Extended Kalman Filter
EQEP	Enhanced Quadrature Encoder Pulse
ESC	

Acronym	Description
	Electronic Speed Controller
eVTOL	Electric Vertical Take Off and Landing
FCS	Flight Control System
FHSS	Frequency Hopping Spread Spectrum
FLR	Flare Phase
FTS	Flight Termination System
GIS	Geographical Information System
GND	Ground
GNSS	Global Navigation Satellite Systems
GPIO	General Purpose Input Output
GPS	Global Positioning System
GS	Ground Speed
GS	Ground Segment
GSM	

Acronym	Description
	Global System for Mobile Communications
	communications
HLD	Hold Phase
HSPA+	High Speed Packet Access Plus
HUM	Hardware User Manual
I2C	Inter-Integrated Circuit
IAS	Indicated Air Speed
ID	Identification
Int. D.	Internal Diameter
IMU	Inertial Measurement Unit
ISM	Industrial Scientific and Medical
LED	Light-Emitting Diode
LND	Landing Phase
LOS	Line Of Sight
M2M	Machine To Machine
MSL	Mean Sea Level

Acronym	Description
OPV	Optionally Piloted Vehicle
Out. D.	Outer Diameter
PCS	Pole Control Station
PFD	Primary Flight Display
PID	Proportional Integral Derivative
PPM	Pulse Position Modulation
PWM	Pulse Width Modulation
QNH	Barometric atmospheric pressure adjusted to sea level
QZSS	Quasi-Zenith Satellite System
RC	Radio Control Mode
RF	Radio Frequency
RPAS	Remotely Piloted Aircraft System
RPM	

Acronym	Description
	Revolutions Per Minute
RS 232	Recommended Standard 232
RS 485	Recommended Standard 485
RX	Reception
SMA	SubMiniature Version A Connector
SSMA	Miniature-SMA
STB	Standby Phase
SU	Servo-Output matrix
TAS	True Air Speed
ТКО	Take Off Phase
ТХ	Transmission
UART	Universal asynchronous receiver-transmitter
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle

Acronym	Description
UMTS	Universal Mobile Telecommunications System
US	Output-Servo matrix
VTOL	Vertical Take Off and Landing
WGS 84	World Geodetic System 84
WP	Waypoint

## Definitions

- **Control Phase:** The operation is divided into phases in which the UAV has a specific performance. Each of this phases is called a control phase.
- **Control Channel:** It is each of the signals used to control a behaviour or action.
- **Control Mode:** It is possible to make a manual control of the UAV by stick, assisted control and fully automatic control.
- Actuator: It is a mechanic device to provide force to move or "act" another mechanical device.

# Contact Data

For support-related inquiries, customers have access to a dedicated portal through the Joint Collaboration Framework. This platform facilitates communication and ensures traceability of all support requests, helping us to address your needs efficiently.

For other questions or general inquiries, you can reach us via email at sales@embention.com or by phone at (+34) 965 115 421