1x Hardware Manual

Release 4.12/1.2

Embention Sistemas Inteligentes, S.A.

Contents

Scope of Changes	. 8
Introduction	. 9
Typical Drone Setup	. 9
Typical eVTOL Setup	10
Main Features	10
Quick Start	12
Basic Connection Diagram	13
Warnings	13
Limited Operation	14
	14
Operate in a Limited Operation Environment	14
Basic Connection for Operation	16
Technical	19
Features	19
Variants	20
ADS-B module	20
RemoteID module	20
Sensor Specifications	21
Embedded Communications	27
BLOS module	27
Mechanical and Electrical Specifications	27
Dimensions	29
Interfaces	29
Connector Layout	29
Mating Connectors	31
Hardware Installation	33
Mechanical	33
Pressure lines	33
Location	34
Orientation	34
Vibration Isolation	35
Damping System	35
Dimensions	36

Assembly steps	36
Vibration analysis	38
Antenna Integration	39
Electrical	41
Power	41
Pinout	42
Harnesses	52
Dimensions	36
Pinout	42
Veronte Harness Blue 68P	54
Dev Harness 1x 4.12	56
Flight Termination System (FTS)	57
Software Installation	58
Ethernet connection	59
Operation	62
Types of operations	62
Operation Architectures	63
Onboard Control Setup	63
Remote Control Setup	63
Copilot Control Setup	64
GCS-Vehicle Communications	64
LOS Communications	65
BLOS Communications	65
Wired Communications	67
GCS Interface	67
Control Stick Interface	68
Remote Control Stick	69
Onboard Control Stick	69
Virtual Stick	70
Multiple Drones/GCS - Redundancy	71
Multiple Drones - Point to Point	71
Multiple Drones - Point to Multipoint	71
Multiple GCS	72
Preparation for operation	78
Maintenance	80

Preventive maintenance	80
Software update	80
Compatible Devices	81
Actuators/Servos	81
ADS-B	83
Air Data Sensors	85
Altimeters	86
Cameras	88
Control stations	88
Datalinks	88
BLOS Communications	88
LOS Communications	89
Engines	90
Jet Engines	90
Expansion modules	90
GNSS Receivers	91
IMUs & Compass	93
Motor controllers / ESC	94
Power management units	96
Transmitters	96
Integration examples	97
Wiring connection	97
RS232	97
Point to point	97
RS485/422	98
Point to point	97
Daisy chain	99
Full duplex	99
Half duplex	100
CAN	101
Electrical diagram of CAN bus	101
Point to point	97
Daisy chain	99
Backbone with stubs	103
Serial to Ethernet Converter	105

Ethernet Connection in Windows	110
WIZNet software configuration	112
Veronte Link configuration	116
1x PDI Builder configuration	117
GPIO Wiring for External Loads	119
Connection Examples	120
Ground Stations	120
Aircrafts	122
Actuators/Servos	124
CAN	124
Pegasus PA-R-135-4	124
Ultra Motion	127
PWM	129
Serial	131
Pegasus PA-R-135-4	124
Volz DA26 - RS485	134
Air Data Sensors	137
High Speed Pitot Sensor	137
Required Material	137
OAT sensor 428 of MGL Avionics	140
Altimeters	142
Lidar	142
Lidar Garmin Lite v3	143
Lightware LW20 Lidar	145
Lightware SF20 Lidar	147
Radar	149
Ainstein CAN Radar	149
Datalinks	151
LOS	151
Amount of data sent via radiolink	151
DTC (Domo Tactical) radio (SOL8SDR-C model)	152
System Layout	152
Hardware Installation	153
DTC radio configuration	166
First steps	166

Point-to-Point configuration	172
Point-to-Multipoint configuration	182
DTC radio configuration in 1x PDI Builder	187
Microhard pDDL900-ENC external	187
System Layout	152
Hardware Installation	153
Microhard radio configuration	191
First steps	166
Basic radio configuration	194
Connection status radio	212
Paired radios	213
Microhard radio configuration in 1x PDI Builder	215
Microhard radio troubleshooting	215
Silvus radio (StreamCaster 4200E model)	218
System Layout	152
Hardware Installation	153
Silvus radio configuration	221
First steps	166
Basic radio configuration	194
Silvus radio configuration in 1x PDI Builder	232
Veronte SDL	232
GNSS Receivers	233
NexNav GNSS	233
IMUs & Compass	235
IMUs	235
Vectornav VN-300	235
WitMotion HWT905-232	238
Magnetometers	240
Magnetometer Honeywell HMR2300	240
RS232	241
RS485	243
MEX as Magnetometer Honeywell HMR2300	245
CAN	245
RS232	241
RS485	243

PNI RM3100	250
RPM Sensors	252
Stick	254
Veronte products	256
CEX connection	257
MC01 connection	259
MC110 connection	260
MEX connection	263
Troubleshooting	266
Maintenance mode	266
How to enter in maintenance mode	266
Using software to enter in maintenance mode	266
Forcing maintenance mode	267
Power supply	267
I2C pins	267
Half-duplex servo does not respond	268
UDP Failed Connection	269
Hardware Changelog	272
Specifications	272
Computing power	278
Sensors	279
Integrated Independent SuC / FTS	279
Communications	279
Robustness & Certification	280
Pinout changes from Autopilot 1x 4.8	280
Acronyms and Definitions	305
Acronyms	305
Definitions	311
Contact Data	312

Scope of Changes

- Version 1.0
 - Added:
 - First version issued
- Version 1.1
 - Added:
 - GPIO Wiring for External Loads integration example
- Version 1.2
 - Added:
 - Operate in a Limited Operation Environment Quick start section
 - UDP Failed Connection Troubleshooting section
 - Fixed:
 - Correspondence between pins 5, 6, and 7 and their I/O signals on the Pinout list

Introduction



Veronte Autopilot 1x

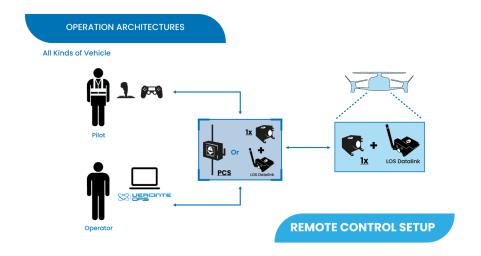
Veronte Autopilot 1x is a sensor-redundant control system designed to control any autonomous vehicle, either aircraft such as multirotors, helicopters, planes, VTOL, blimps, etc., as well as ground vehicles, surface vehicles or many others.

Veronte Autopilot 1x hardware embeds a redundant state-of-the-art suite of sensors, together with 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 **1**x **PDI Builder** permits configuring the autopilot and adapting it to the specific needs of the project.

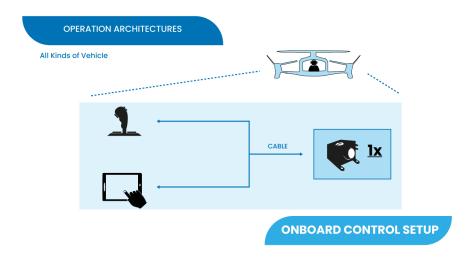
Typical Drone Setup

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 external datalink modules, all with user-defined variables and recording frequency.

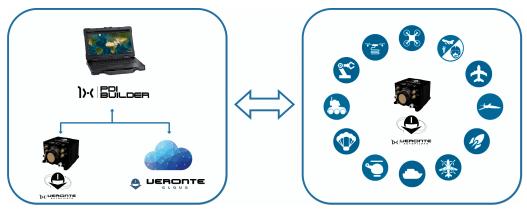
- **External sensor**: Support for external sensor connections: magnetometer, radar, LIDAR, RPM, temperature, fuel level, battery level, weather, etc.
- Payload & Peripheral: Transponder, secondary radios, satcom transceivers, camera gimbals, motor drivers, photo cameras, flares, parachute release systems, 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 1**x.

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

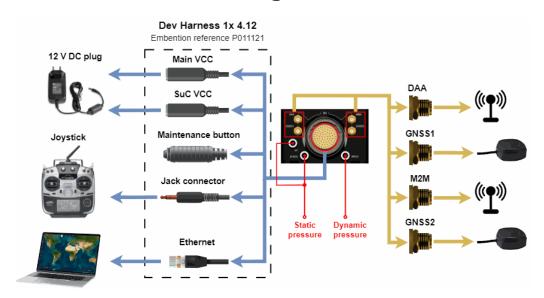


System Overview

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 4.12 connectors, refer to the Dev Harness 1x 4.12 - 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 PWM pin withstands a maximum current of 10 mA, while EQEPs configured as outputs can support 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.

⚠ Caution

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

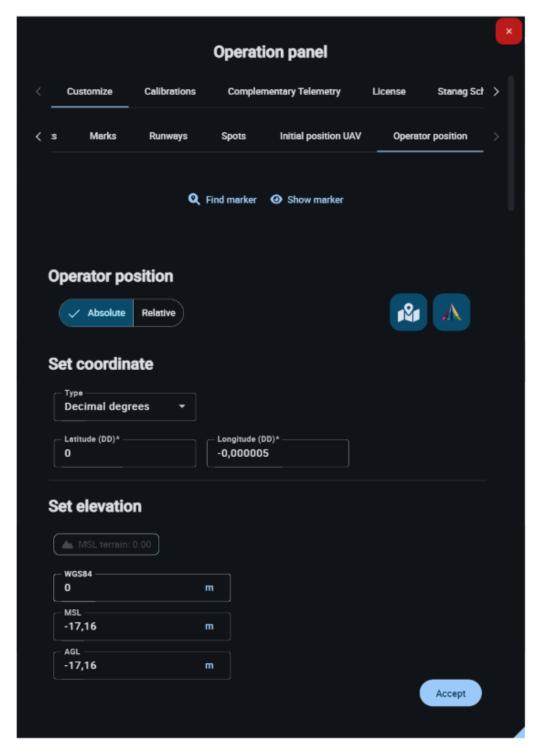
 Target Drone/Loitering Munition Operation: Allows fully autonomous flight performance with no time or distance limitation. This is restricted to 25h operation from the first startup. Once the operation time has expired the unit will not be able to restart.

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

Operate in a Limited Operation Environment

When operating under a limited license condition, users must adhere to specific time and distance limitations.

From Veronte Ops app, users can select an **Operator Position**, which is the reference point from which the distance allowed by the operating license is calculated (in this case 500 m radius).



Veronte Ops - Operator Position Panel

△ Caution

If the Operator Position is not set, the 30-minute timer will start once the autopilot gains a Position Fix.

The operator is permitted to command a flight beyond the 500-meter radius, subject to a time limit. Upon exiting this 500-meter zone, a 30-minute timer activates. The timer pauses and resets when the platform re-enters the 500-meter radius.

To ensure safe operation, it is recommended to implement an automated Return to Home command. This command should activate if the platform flies beyond the 500-meter radius for more than a customizable limit of 15–20 minutes. The 30-minute timer will reset upon the platform's re-entry into the 500-meter zone.

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 **autopilot harness** and **power it** using the power supply:



Basic connection - Step 2

3. Connect an **ETHERNET cable** to the **ETHERNET port** on the harness:



Basic connection - Step 3

4. Connect the **ETHERNET cable** 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 UDP connection - Integration examples section of **Veronte Link** user manual.



Basic connection - Step 4

Technical

Features

Buses

- ∘ 1 x Ethernet port
- 1 x UART
- ∘ 1 x UART SuC/FTS
- 1 x CAN FD bus
- 2 x CAN 2.0 bus
- o 2 x RS-232
- 2 x RS-485 full duplex bus
- ∘ 1 x I2C bus
- Over ethernet, RS-485 or RS-232 firmware update
- 1x BLOS module

Input / Output

- 8 x configurable input / output signals (5V)
- 2 x analog input signals 0 36 V
- 3 x analog input signals 0 5 V
- ∘ 1x EQUEP/4x ECAP (5V)

Power

- 2 x Redundant input power supply (8 54 V DC)
- 1 x output power with 3.3 V, up to 100 mA
- 1 x output power with 5 V, up to 100 mA

Protection

- EMI shield
- Against reverse polarity
- Against inrush current during power up
- Enhanced signal control on startup
- Enhanced power input redundancy



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

Variants

Veronte Autopilot 1x has 2 variants:

- 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 2	IMU 3
Range	24 g	8 g
Maximum shock	10,000 g/ms	14,700 m/ sec ²
Sensitivity	10,920 LSB/ (m/sec ²)	26,756,268 LSB/(m/sec ²)
Update Time	1 ms	
Error	190 Z axis 160 X & Y axis μg/ Hz (noise density)	0.000167 X &
Offset	± 20 mg	0.0196 m/ sec ²

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

Magnetometers		
Specification	Magnetometer 0	Magnetometer 2
Range	4 G	11 G
Sensitivity	6,842 to 1,711 LSB/G	0.13 mG
Update Time	8.3 ms	12.5 ms
RMS Noise	3.2 X & Y axis 4.1 Z axis mG	0.3 mG
Offset	0 G	

Static Pressure			
Specification	pecification Sensor 1 S (STATIC port) (I		
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	

Dynamic Pressure Sensor		
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	
Resolution	0.42 Pa	
Update Time	20 ms	
Bias	±7 Pa	

GNSS Receivers				
Specification		GNSS 1 & GNSS 2	GNSS 3	
Constellations		BeiDou, Galileo, GLONASS, GPS, QZSS, SBAS	GPS + SE (compatible WAAS, EG GAGAN, M	e with NOS,
Concurr	ent GNSS	4 constellations simultaneously	1	
Bands		L1 C/A, L2C, L1OF, L2OF, E1 B/C, E5b, B1I, B2I	L1 C/A (15 MHz)	75.42
RTK Support		Yes (via RTCM 3.x or PPP-RTK with SPARTN/ CLAS)	Not suppo	orted
RTK Position Accuracy		0.01 m + 1 ppm CEP	-	
SBAS	Horizontal	1 m	4 m RM	15
Position Accuracy	Vertical	1.5 m	8 m RM	1S
Velocity Accuracy		0.05 m/s	Horizontal	0.1 m/s RMS

GNSS Receivers			
Specification	GNSS 1 & GNSS 2	GNSS 3	
		Vertical	0.3 m/s RMS
Update Rate	RTK: Up to 5 Hz	4 Hz	
Anti-jamming	Active CW detection and removal, Onboard bandpass filter	-	
Anti-spoofing	Advanced anti- spoofing algorithms	-	
Advanced Functions	 RTK Moving base capable GNSS- based attitude estimation PPP-RTK (SPARTN/ CLAS) DGNSS 	 RAIM (Receiver Autonomous Integrity Monitoring) FD/FDE (Fault Detection and Exclusion) 	

GNSS Receivers		
Specification	GNSS 1 & GNSS 2	GNSS 3
Certificate	No TSO certification	TSO-C199 Class B compliance

Temperature			
Device	Resolution	Bias	
IMU 2	8 LSB/°C	1°C	
IMU 3	10 LSB/°C	5°C	
MPU	-	15°C	
Magnetometer 0	8 LSB/°C	-	
Magnetometer 2	-	-	
Static pressure 1	0.01 °C	0.8 °C	
Static pressure 2	0.01 °C	0.5 °C	

(i) Note

An external pressure sensor is required to measure below -20 $^{\circ}$ C.

Embedded Communications

BLOS module

RF baudrate	115200 baud
Receiver sensitivity	-111 dBm
Frequency band	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66 (includes support for 800, 850, 900, 1800, 1900, 2100 MHz)
Network	LTE-M, NB-IoT, EGPRS fallback
eSIM	Included Note Its activation is optional

(i) Note

External BLOS modules, such as Satcom, Starlink, 5G, etc., can be used.

Mechanical and Electrical Specifications

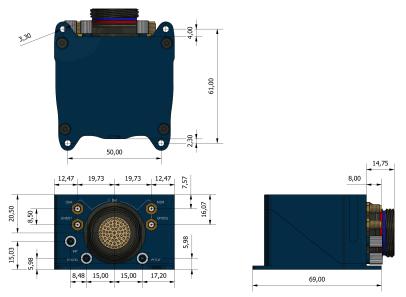
Variable	Value
Weight	Remote ID variant: 208 g ADS-B variant: 209 g With Damping System: + 60 g
Temperature range	-40 to 65 ºC

Variable	Value	
Protection rating	IP67	
Maximum acceleration	32 g	
Voltage input	2 x 8-54 V DC	
Power consumption	ADS-B variant	3.5 W in maintenance mode
		6.5 W in normal mode with CPU at 98%, BLOS module and ADS-B ON
	Remote ID variant	2.7 W in maintenance mode
		5.6 W in normal mode with CPU at 98%, BLOS module and Remote ID ON

Important

Users should note that these power consumption values will increase depending on the GNSS antennas used.

Dimensions

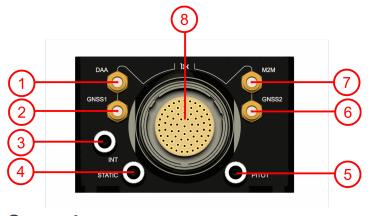


Veronte Autopilot 1x dimensions (mm)

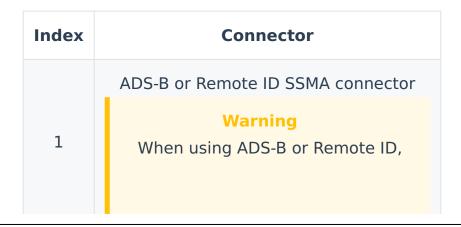
M3 screws are recommended for mounting. In saline environments such as coastal and oceanic, the screw material must be stainless steel.

Interfaces

Connector Layout



Connectors



Index	Connector
	there must be an adequate antenna or load connection to the DAA SMA.
	GNSS1 SSMA connector
2	Note This port is shared with the GNSS3 receiver.
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	GNSS2 SSMA connector
7	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.
8	68-pin connector

Both static pressure ports must be used for sensor redundancy (Y tubing connection is strongly recommended). For detailed information, refer to the Pressure lines - Hardware Installation section of this manual.



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	ADS-B or Remote ID (SSMA Jack Female)	SSMA male Plug, low- loss cable is recommended.
2, 6	GNSS antenna (SSMA Jack Female)	SSMA male Plug, low- loss cable is recommended. Active Antenna GNSS: Gain min 15dB (to compensate signal loss in RF Cable) Gain max 50 dB Maximum noise figure 1.5dB Power supply 5V Max current 20 mA
7		

Index	Autopilot 1x Connector	Mating Connector
	M2M antenna (SSMA Jack Female)	SSMA male Plug, low- loss cable is recommended.
8	Connector HEW.LM. 368.XLNP	Mating connector: FGW.LM.368.XLCT (Embention reference P005550) Mating harnesses available on demand: Dev Harness 1x 4.12 (Embention reference P011121) Veronte Harness Blue 68P (Embention reference P001114)

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 Remote ID variant is 208 g, while the variant with ADS-B weighs 209 g.

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

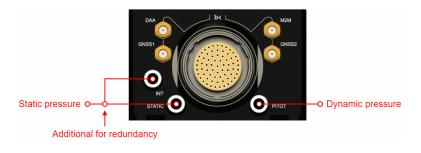
- Pressure intakes must be located in order to prevent clogging.
- Never install pressure intakes on the propeller flow.
- Design pressure tubing path in order to avoid tube constriction.

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.

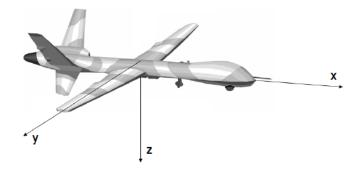
(i) Note

It can be assumed that the origin of the coordinate system of **Autopilot 1x** is on its center of mass.

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.

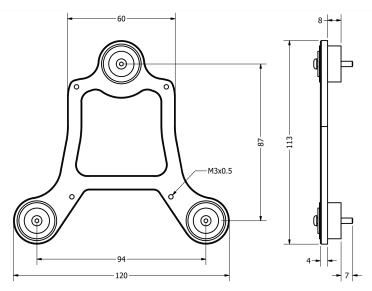


Damping System



This **Damping System** is designed for hardware versions **4.8** and **4.12** of **Autopilot 1**x.

Dimensions

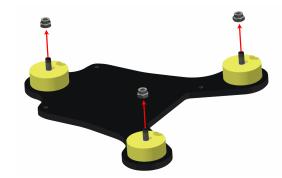


Damping system dimensions (mm)

Assembly steps

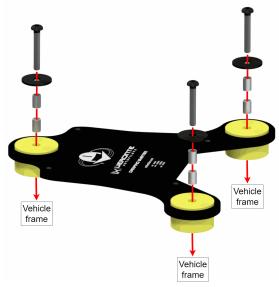
To assembly the Damping System into a vehicle with an **Autopilot 1x**, read the following steps.

1. Remove the three nuts located under the platform.



Step 1

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



Step 2

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



Step 3

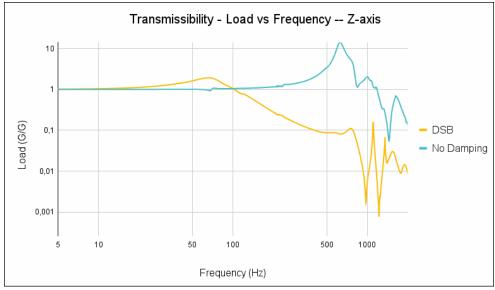


Result

Vibration analysis

Transmissibility (Z-axis)

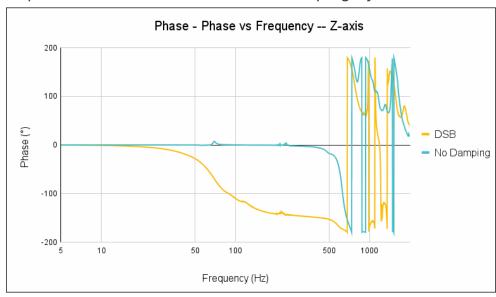
Transmissibility graph, analysis of vibrations received by **Autopilot 1x**, with and without Damping System:



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:



Phase graph

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.
- Make sure the antenna is securely mounted.
- Always use high-quality RF wires minimising the wire length.
- 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.
- Install it on a top surface with direct sky view.
- Never place metallic / carbon parts or wires **above** the antenna.
- It is recommended to install it on a small ground plane.
- For all-weather aircraft, insert SSMA lightning protectors.

Recommended specifications

Specifications	Range
Antenna	1561.098 MHz to
frequency L1	1602 MHz
Antenna	1207.14 MHz to
frequency L2	1246 MHz
Amplifier gain	17 dB to 35 dB
	40 dB
Out-of-band	Note
rejection	Higher values

Specifications	Range
	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

Ground Plane Requirements: Some antennas improve their reception
when a metal plane is added behind them, as it reflects and shapes the
antenna's radiation pattern. This plane does not need to be electrically
grounded.

GNSS Antenna

- While GNSS antennas can operate without a ground plane, adding one significantly improves performance.
- A flat metal plate of at least 15 cm diameter is recommended. Avoid diameters below 12 cm, as they can prevent signal reception entirely.
- The ground plane should be mounted directly beneath the antenna.

For technical justification, refer to the following resources:

Impact of Additional Antenna Groundplanes on RTK-GNSS
 Positioning Accuracy of UAVs

 Ground Plane Considerations for GNSS Ceramic Patch Antennas articles.

ATC Antenna

- These antennas require a ground plane to function properly.
- For the ADS-B, at an operating frequency of 1090 MHz, the typical wavelength λ is approximately 27.5 cm. Therefore, a circular ground plane with at least λ/4 radius (~7 cm) is necessary for proper operation.
- If the antenna is mounted on a large metallic surface (e.g. fuselage), no additional ground plane is needed, assuming there is
 at least 15 cm of continuous metal surrounding the antenna.

Electrical

Power

Veronte Autopilot 1x can use unregulated DC **(8V to 54V)**. 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.

A 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

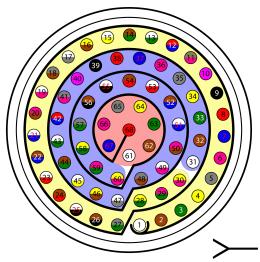
to be connected, the connection should be made on the negative pole of the battery.

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

△ Caution

If replacing an Autopilot 1x version 4.8 with a 4.12 (this one), it is strongly recommended to be aware of the differences between the pinouts of both versions. To do so, read the Pinout changes from Autopilot 1x 4.8 - Troubleshooting section of the present manual.



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		Pins for PWM or digital I/O signals (0-5V).
3	1/0 2		Protected against ESD and short circuit.
4	I/O 3		Warning
5	I/O 5		Each pin withstands a
6	I/O 4		maximum current of 10 mA.
7	I/O 6	I/O	
8	I/O 7		Danger The signals from pins 5 and 6 are swapped in the wiring harness, so that pin 5 corresponds to I/O 5 and pin 6 corresponds to I/O 4.
9	GND	GROUND	Ground signal for actuators 1-8.
10	ETH_RX_P	Input	Ethernet. Receiver data positive.
11	ETH_RX_P	Input	Ethernet. Receiver data negative.
12	ETH_TX_P	Output	

PIN	Signal	Туре	Description
			Ethernet. Transceiver data positive.
13	ETH_TX_N	Output	Ethernet. Transceiver data negative.
14	ETH_CHASSIS	GROUND	Ethernet chassis (this pin is electrically connected to the external cover of the ethernet cable).
15	CANFD_P	I/O	High signal of CAN FD bus interface, up to 5 Mbps (2.75 - 4.5 V). Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
16	CANFD_N	I/O	Low signal of CAN FD bus interface (0.5 - 2.25 V). Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
17	ARB_TX	NC	(SuC UART) Reserved. Do not connect.
18	GND	GROUND	Common ground.
19	RS232 1 TX	Output	RS 232 channel 1 Output (-13.2V to 13.2V Max, -5.4V to

PIN	Signal	Туре	Description
			5.4V Typical). Protected against ESD and short circuit.
20	RS232 1 RX	Input	RS 232 channel 1 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	Input 0-36V. Protected against ESD.
23	ANALOG_4	Input	Input 0-36V. Protected against ESD.
24	GND	GROUND	Ground signal for buses.
25	CANA_P	I/O	High signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
26	CANA_N	I/O	Low signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted

PIN	Signal	Туре	Description
			pair with a 120 ohms Zo recommended.
27	UART_RX	Input	Microcontroller UART.
28	CANB_P	I/O	High signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
29	CANB_N	I/O	Low signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
30	GND	GROUND	Ground signal for buses.
31	I2C_CLK	Output	Clock line for I2C bus (0.3V to 3.3V). Protected against ESD.
32	I2C_DATA	I/O	Data line for I2C bus (0.3V to 3.3V). Protected against ESD.
33	GND	GROUND	Ground for 3.3V power supply.
34	3.3V	Power	3.3V - 100mA power supply. Protected

PIN	Signal	Туре	Description
			against ESD and 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 0-5V. Protected against ESD.
39	ANALOG_1	Input	Analog input 0-5V. Protected against ESD.
40	ANALOG_2	Input	Analog input 0-5V. Protected against ESD.
41	SEL	Input	Reserved. Do not connect.
42	FTS1_OUT	Output	Deadman signal from comicro. Protected against ESD and short circuit.
43	FTS2_OUT	Output	

PIN	Signal	Туре	Description
			!SystemOK Bit. Protected against ESD and short circuit.
44	SEL	Input	Reserved. Do not connect.
45	RS232 2 TX	Output	RS 232 channel 2 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit.
46	RS232 2 RX	Input	RS 232 channel 2 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold). Protected against ESD and short circuit.
47	GND	GROUND	Ground signal comicro power supply.
48	V_ARB_VCC	POWER	Veronte comicro power (8V to 54V). Protected against ESD and reverse polarity.
49	UART_TX	Output	Microcontroller UART.
50	OUT RS485 A_P	Output	Non-inverted output from RS485 bus A. Protected against ESD.

PIN	Signal	Туре	Description
51	OUT RS485 A_N	Output	Inverted output from RS485 bus A. Protected against ESD.
52	IN RS485 A_N	Input	Inverted input from RS485 bus A. Protected against ESD.
53	IN RS485 A_P	Input	Non-inverted input from RS485 bus A. Protected against ESD.
			Ground for RS-485 buses.
54	OUT_GND	GND	Warning This is not a common GND pin.
55			DIGITAL output / DIGITAL input / Encoder quadrature input A (0-5V). Protected against ESD and short circuit.
55	EQEP_A	I/O	Warning Configured as oputput, it withstands a maximum current of 1.65 mA.

PIN	Signal	Туре	Description
56			DIGITAL output / DIGITAL input / Encoder quadrature input B (0-5V). Protected against ESD and short circuit.
30	EQEP_B	I/O	Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
57		I/O	DIGITAL output / DIGITAL input / Encoder quadrature input strobe (0-5V). Protected against ESD and short circuit.
31	EQEP_S		Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
58	EQEP_I	I/O	DIGITAL output / DIGITAL input / Encoder quadrature input index (0-5V).

PIN	Signal	Туре	Description
			Protected against ESD and short circuit.
			Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
59	GND	GROUND	Ground for encoders.
60	OUT RS485 B_P	Output	Non-inverted output from RS-485 bus B. Protected against short circuit and ESD.
61	OUT RS485 B_N	Output	Inverted output from RS-485 bus B. Protected against short circuit and ESD.
62	IN RS485 B_N	Input	Inverted input from RS-485 bus B. Protected against short circuit and ESD.
63	IN RS485 B_P	Input	Non-inverted output from RS-485 bus B. Protected against short circuit and ESD.
64	ARB_RX	NC	(SuC UART) Reserved. Do not connect.

PIN	Signal	Туре	Description
65	GND	GROUND	Veronte ground input.
66	GND	GROUND	Veronte ground input.
67	VCC	POWER	Veronte power supply
		(8V to 54V). Protected against ESD and reverse polarity.	
68	VCC	POWER	Warning Both pins are common. They MUST be connected to the same power supply.

Marning

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

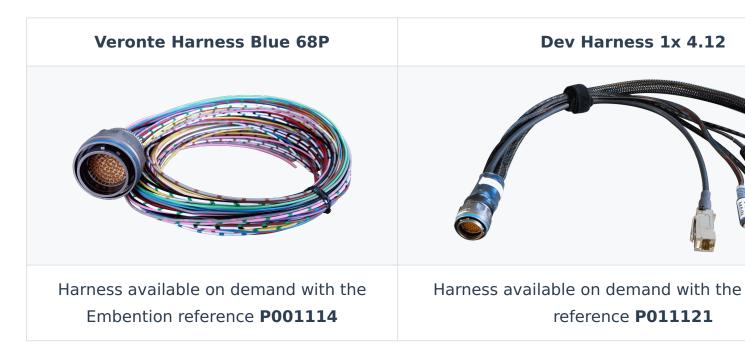
Visit the following sections to know how to wire the **Autopilot 1x** to other devices via:

- RS232
- RS485/422
- CAN

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 4.12 has two compatible harnesses:

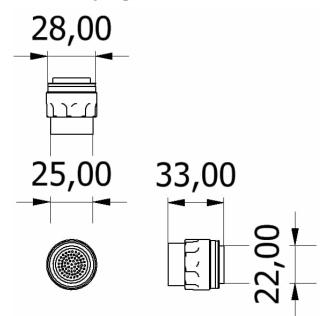


Dimensions

• Harness Blue 68P wire gauge: 22 AWG

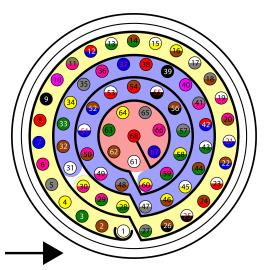
• Cables length: 52 cm

• Harness plug dimensions:



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

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

PIN	Color Code	PIN	Color Code
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
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

PIN	Color Code	PIN	Color Code
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

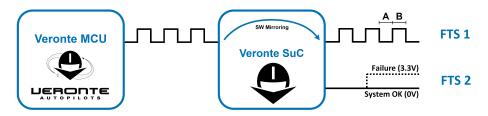
Dev Harness 1x 4.12

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
	65	GND
Main VCC	66	GND
Main VCC	67	VCC
	68	VCC
SuC VCC	47	GND

Connector	PIN	Signal
	48	V_ARB_VCC
Maintenance Button	31	I2C_CLK
Maintenance Button	32	I2C_DATA
la ala Camma atau	18	GND
Jack Connector	55	EQEP_A
	12	ETH_TX_P
ETHERNET	13	ETH_TX_N
	10	ETH_RX_P
	11	ETH_RX_N

Flight Termination System (FTS)



Flight Termination System

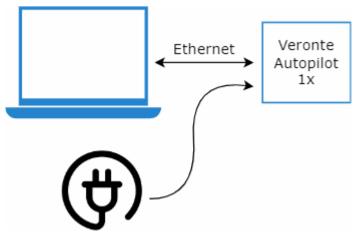
Veronte Autopilot 1x integrates two different FTS pins (42 and 43):

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.

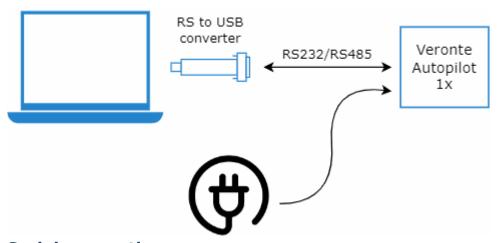
FTS2 - !SystemOK (Pin 43): Its output is 0V when the system is working as expected and 3.3V when some error is detected. In detail, pin 43 goes high if A > 8ms or B > 8ms in the deadman signal sent by the Main Processor Unit (MPU).

Software Installation

In order to configure and use **Veronte Autopilot 1x**, there are several ways to connect it to a computer such as via Ethernet or serial.



Ethernet connection



Serial connection

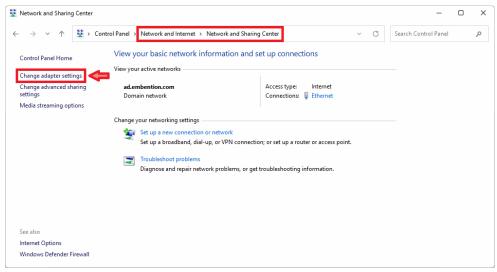
To install the required software and configure **Veronte Autopilot 1x**, read the 1x Software Manual.

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.

Ethernet connection

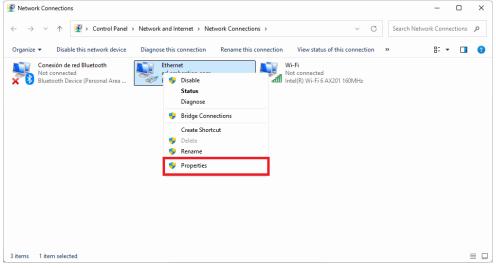
For the PC to detect **Autopilot 1x** connected via **Ethernet**, the computer must be configured with a static IP address on the same subnet as the autopilot. The following substeps clarify how to set the IP address in the **Control Panel**:

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



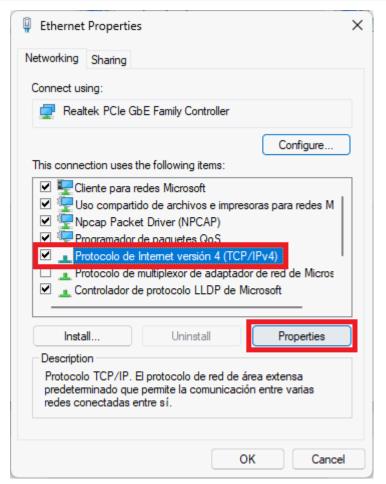
Ethernet connection 1

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



Ethernet connection 2

3. Select IPv4 and click Properties.



Ethernet connection 3

4. Set **IP address** to 10.X.Y.Z (e.g. if the IP of the **Autopilot 1x** is 10.3.23.114, set the IP 10.1.1.1) and **Subnet mask** to 255.0.0.0. Click **OK**.



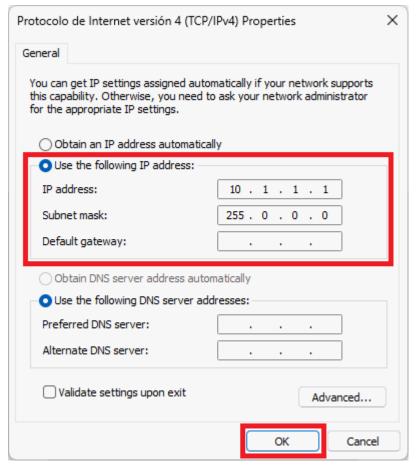
To find out the IP address of your **Veronte Autopilot 1**x:

- All Veronte Autopilots are always on the same network: 10.3.0.0
- The last two bytes depend on the hardware id. These are assigned by converting the **Autopilot 1x S/N** to **hexadecimal** and then converting the numbers in pairs back to decimal.

For example, if the S/N is 6002, converted to hexadecimal, 0x1772:

- 0x17 HEX → 23 DEC
- 0x72 HEX → 114 DEC

So the complete IP is 10.3.23.114



Ethernet connection 4

At this point, the PC should correctly detect **Autopilot 1x**.

Finally, to start working with **Autopilot 1x**, it must also be recognized in the **Veronte Link app**. To learn how to configure it, please refer to the UDP connection - Integration examples section of **Veronte Link** 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.



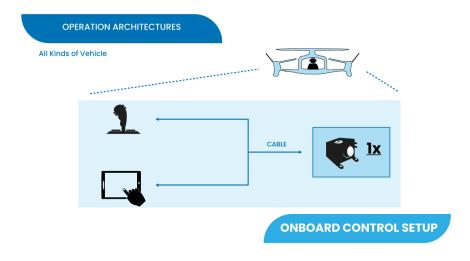
Most of the following diagrams can be used independently or combinated, to create redundant systems or backup solutions.

Operation Architectures

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

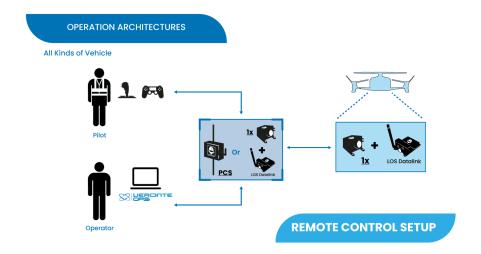
Onboard Control Setup

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.



Remote Control Setup

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

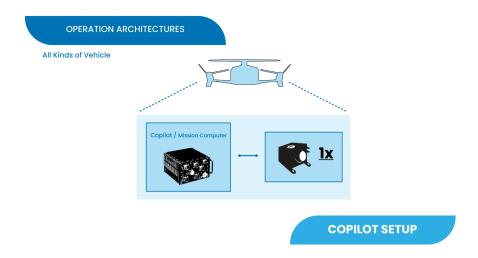


In the standard remote layout, an Operator (Internal Pilot) controls the UAV from the Ground Station using **Veronte Ops**.

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.

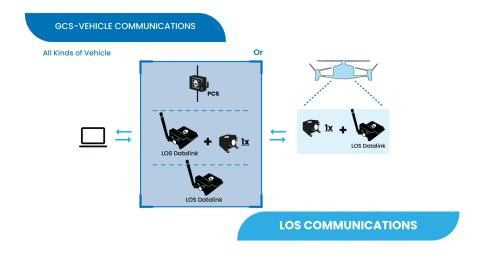


GCS-Vehicle Communications

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:

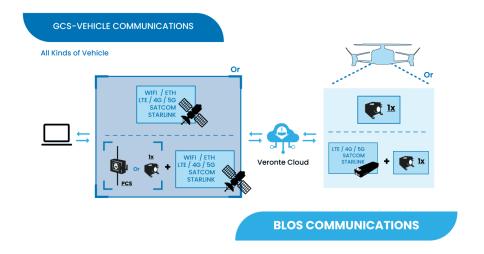
- PCS
- Autopilot 1x with an external LOS Datalink
- LOS Datalink

And on the vehicle side, an **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.

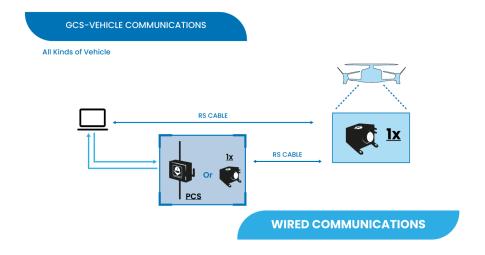
Onboard Connectivity Options

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.

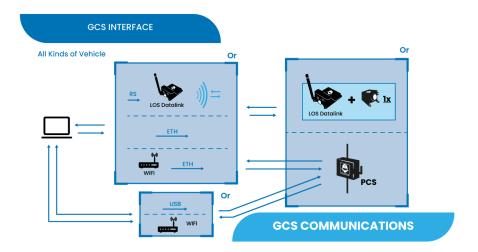


GCS Interface

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 an **external LOS Datalink** or a **PCS** on the other side.



Direct connection

- The PC can directly connect a PCS via Ethernet, USB or Wifi.
- The PC can directly connect an Autopilot 1x with an external LOS
 Datalink via Ethernet.

Combined connections

Below are different connection methods that enable communication between the **PC** and 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.
- The PC connects via **wifi** and the wifi modem then communicates with the other side of the GCS setup through **Ethernet**.

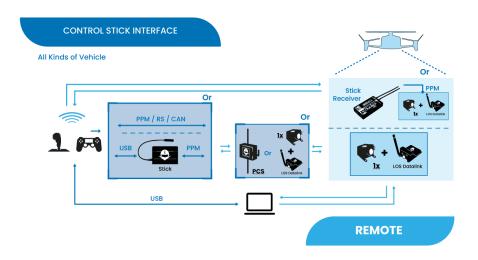
Control Stick Interface

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 + LOS Datalink**) which then communicates with the onboard autopilot,

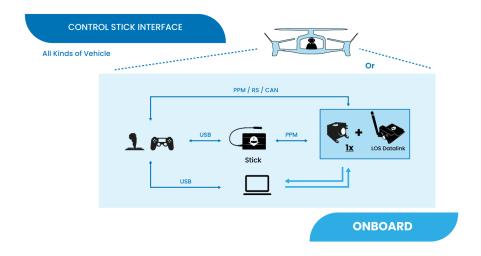
 It is possible to establish a link connection between a stick and a stick receiver integrated in the vehicle, which is connected via PPM to Autopilot 1x.

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 + LOS Datalink), 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**.



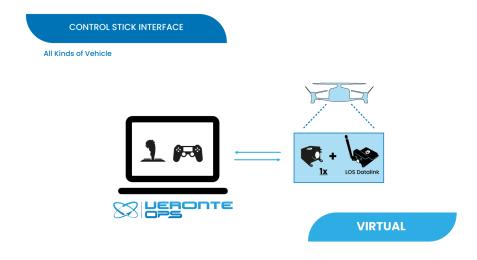
Some examples are:

- 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.



Multiple Drones/GCS - Redundancy

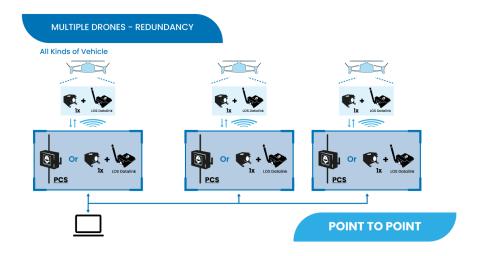
Due to Veronte's modular configuration, it is possible to integrate several onboard and ground units within the same network.



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

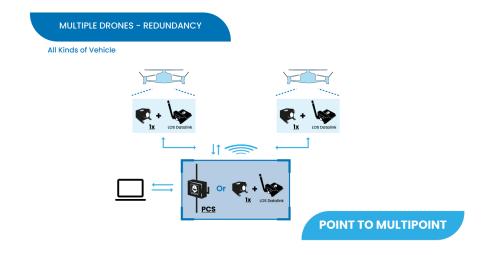
Multiple Drones - Point to Point

Standard multiplatorm setup.



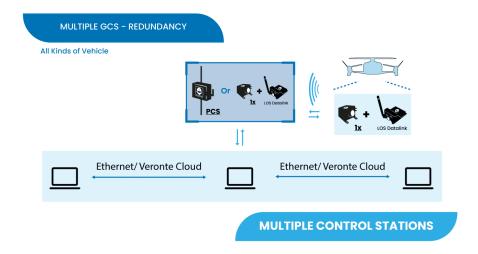
Multiple Drones - Point to Multipoint

Managing several platforms with a single radiolink.



Multiple GCS

For long range operations with several LOS stations.

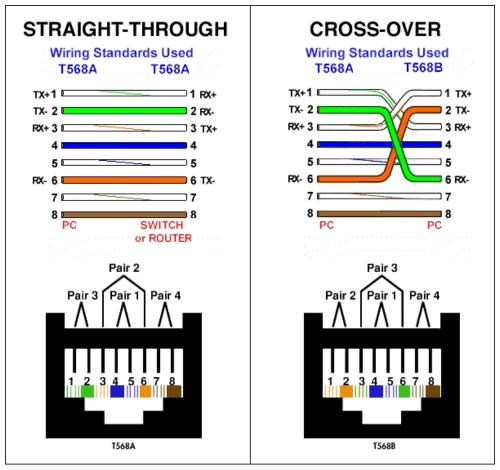


For remote solutions with LOS backup operator, **Veronte Cloud** allows the connection between PCs.

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

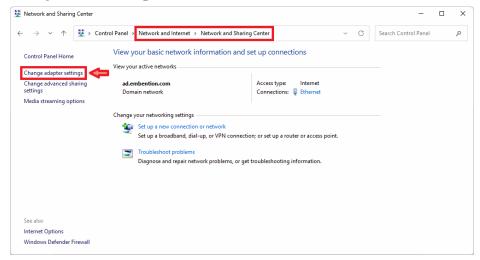
- 1. Make the **physical connection** with ethernet cables, the two different types of ethernet cables can be used:
 - Straight-Throught
 Connect each PC to an ethernet switch with its Straight-Through ethernet cable (i.e. users will need 2 cables).
 - Crossover

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



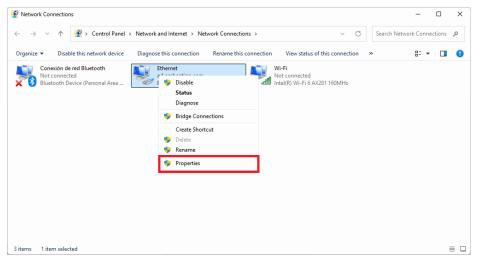
Straight-Through vs Crossover cables

- 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.



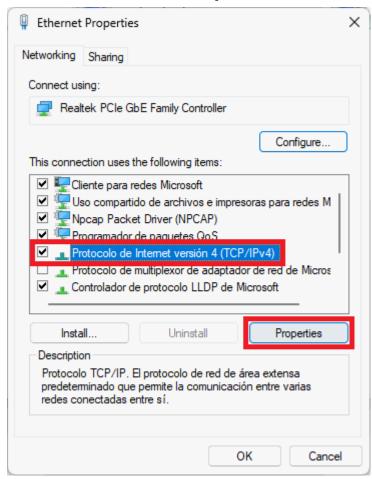
Ethernet connection 1

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



Ethernet connection 2

Select IPv4 and click Properties.

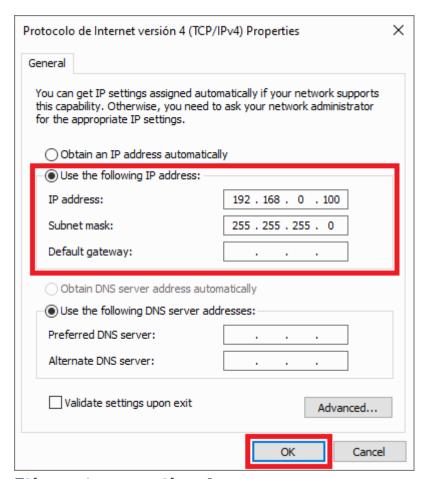


Ethernet connection 3

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

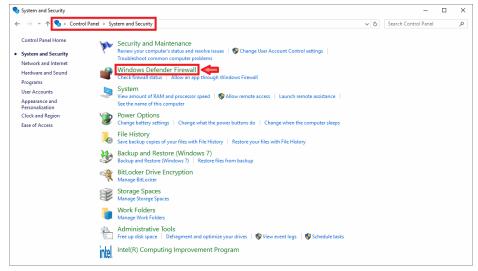
Important

If on this PC the IP address is set to 192.168.0.100, on the other PCs, the IP address must be set to **192.168.0.XXX** (e.g. 192.168.8.234), so that they are on the same subnet.



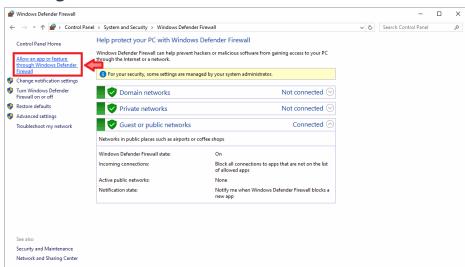
Ethernet connection 4

- 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.



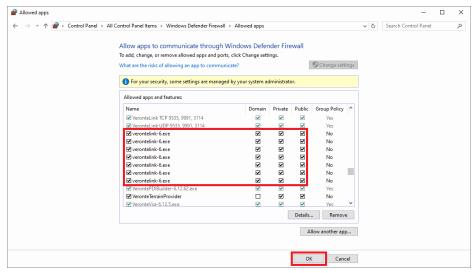
Windows Firewall 1

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



Windows Firewall 2

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



Windows Firewall 3

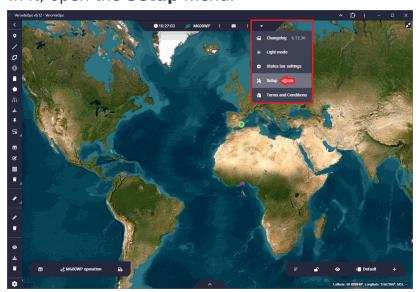
4. On the PC secondary, in **Veronte Ops** change the **Veronte Link Host** option setting to the **IP of the PC primary**. To do this:

- 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.



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
- 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.

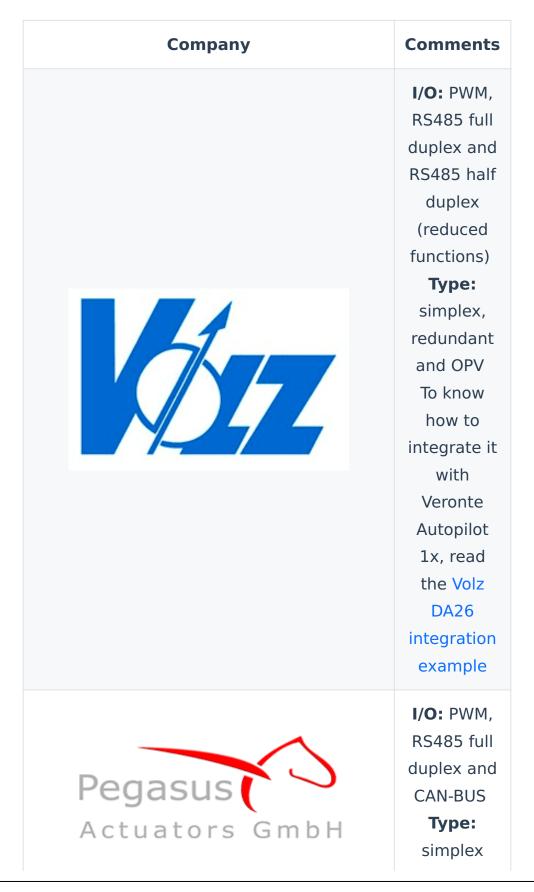
(i) Note

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
Company	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)
ULTRAMOTION	I/O: PWM and CAN- BUS Type: linear actuator and servo To know how to integrate it with

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

Other companies





ADS-B

Company	Comments
	Products:
	Ping20S
	(ADS-B Out)

Company Comments uAvioni K Ping1090 (ADS-B IN/ OUT) All products of the Sagetech following families: MX XΡ **Autopilot** 1x includes an internal ADS-B transceiver. To know how to configure EMBENTION it, read the Transponder/ ADS-B -**Devices** section of the 1x PDI **Builder** user manual

Air Data Sensors

Company	Comments
EMBENTION	High Speed Pitot Sensor, read the High Speed Pitot Sensor integration example to know how to integrate it with Veronte Autopilot 1x
MGLAVIONICS	oAT 428: For detailed information on its integration with Veronte Autopilot 1x, refer to OAT sensor 428 integration example



Altimeters

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

Company	Comments
	SF11, SF20
	To know
	how to
	integrate
	them with
	Veronte
	Autopilot
	1x, read the
	Lightware
	LW20 Lidar
	and
	Lightware
	SF20 Lidar
	integration
	examples
	I/O: PWM
	Product:
	LIDAR-Lite
	v3
	To know
	how to
	integrate it with
GARMIN ®	
	Veronte
	Autopilot
	1x, read the Lidar
	Garmin Lite
	v3
	integration
	example
	Схаттріс

Cameras

Company	Comments
○ OCTOPUS	
(a) Merio	
APTO	
Next Vision	
WANDAL AN	Autopilot 1x reads identified objects by their cameras

Control stations

Company	Comments
	Products:
EMBENTION	LCS
	PCS

Datalinks

BLOS Communications

Company	Comments
SKYTRAC	Broadband UAV Satcom: IMS-350 Midband UAV Datalink and GPS System: DLS-100
Ground Control	Satellite Communications: RockBLOCK
s atlink	

Company	Comments
ATMOSPHEAE	Requires Veronte COM

LOS Communications

Company	Comments
EMBENTION	Antenna: Tracking Systems T28 Radio module: SDL, read the Veronte SDL integration example to know how to integrate it with Veronte Autopilot 1x XDL, read the XDL24 integration examples to know how to integrate it with Veronte
Mulgohard	Autopilot 1x I/O: RS232 communication tunnel Microhard radio: pDDL900-ENC, read the Microhard integration example to know how to integrate it
סדכ	 with Veronte Autopilot 1x I/O: RS232 communication tunnel DTC radio: SOL8SDR-C, read the DTC integration example to know how to integrate it with Veronte Autopilot 1x
STLVUS TECHNOLOGIES	I/O: RS232 communication tunnel Streamcaster radio: 4200E, read

Company	Comments
	the Silvus integration example to know how to use it with Veronte Autopilot 1x
DIGI."	Radio: To know how to configure Digi radios, read its user guide

Engines







Jet Engines





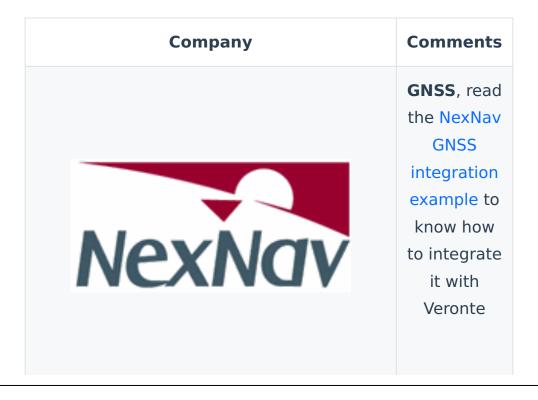


Expansion modules

Company	Comments
EMBENTION	Products: CEX, read the CEX connection integration example to

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

GNSS Receivers



Company	Comments
	Autopilot 1x
Coblox	GNSS: ZED- F9P-02B
Nov4tel	

IMUs & Compass

Comments Company **IMU:** VN-300 To know how to integrate it with Veronte Autopilot 1x, read the Vectornay VN-300 Embedded Navigation Solutions integration example **IMU:** HWT905-232 To know how to integrate it with Veronte Autopilot 1x, read the WitMotion wit matian HWT905-232 integration example **Magnetometer:** MEX To know how to integrate it with MBENTION Veronte Autopilot 1x, read the MEX integration example **Magnetometer:** Honeywe HMR2300-232 To know how to Sensing and Control integrate it with

Company	Comments
	Veronte Autopilot 1x, read the Magnetometer Honeywell HMR2300 integration example
POSITIONING NAVIGATION INTELLIGENCE	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
EMBENTION	integration
	example to
	know how
	to integrate
	it with
	Veronte
	Autopilot

Company	Comments
	1x
	MC01, read the MC01 connection integration example to know how to integrate it with Veronte Autopilot 1x
T-MOTOR THE SAFEST PROPULSION SYSTEM	I/O: PWM
Currawong	I/O: CAN- bus

Other Companies	Comments
Hacker Brushless Motors Industrial Solutions	
CONTROL KDE Direct	I/O: PWM, RS232, RS485, and CAN-bus
AX	

Power management units

Company	Comments
	Veronte product:
~	R12S
EMBENTION	R12F
	R24F
VISION AIR TRONICS	

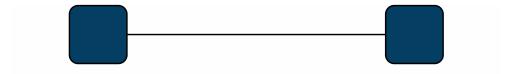
Transmitters

Company	Comments		
Futaba	Products: 8J/10J/12K/14SG with 8 channels 12K/14SG with 12 channels T18SZ with 8 channels		
(MBENTION	Stick		

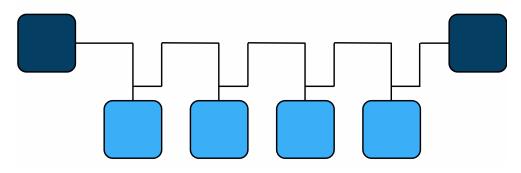
Integration examples

Wiring connection

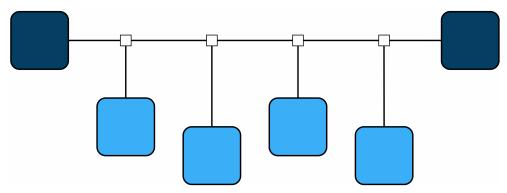
• Point to point



• Daisy chain



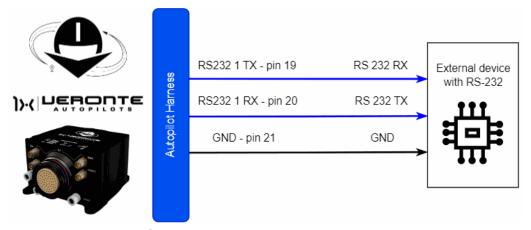
· Backbone with stubs



RS232

Point to point

This connection is recommended to establish with the computer while $\mathbf{1x}$ is commanding via CAN to Veronte MC110.



RS-232 connection

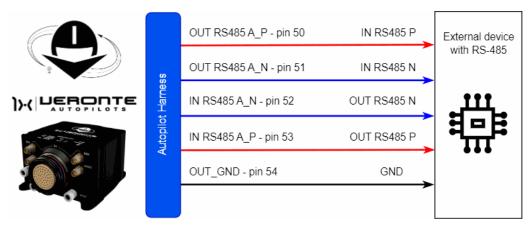
(i) Note

- Transmitter pin (TX) of one device is connected to the receiver pin (RX) of the other one, and vice versa.
- The user has the option to configure either of the two available RS-232 lines on Autopilot 1x: RS 232 1 or RS 232 2. For more information about these pins, refer to the Pinout Hardware Installation section of the present manual.

RS485/422

Point to point

This connection is recommended to establish with the computer while **1x** is commanding via CAN to Veronte MC110.



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 non-inverted signals (P) are linked each other.

 The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: RS 485 A or RS 485 B. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

Daisy chain

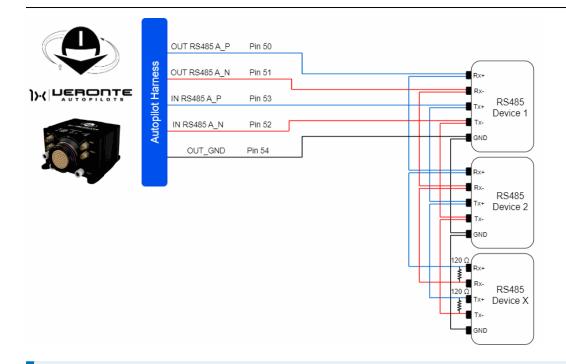
This section details the technical considerations that must be taken into account when connecting the Autopilot 1x to a chain of devices via RS485/422.

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:



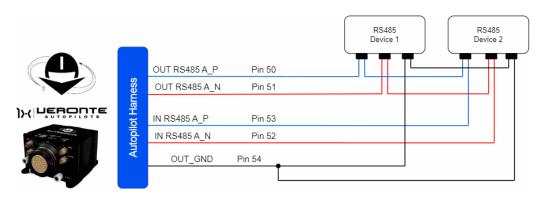
(i) Note

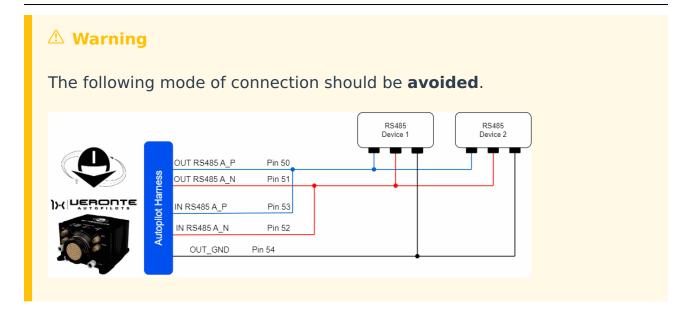
The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: **RS 485 A** or **RS 485 B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

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:





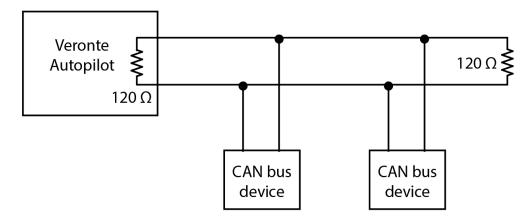
(i) Note

The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: **RS 485 A** or **RS 485 B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

CAN

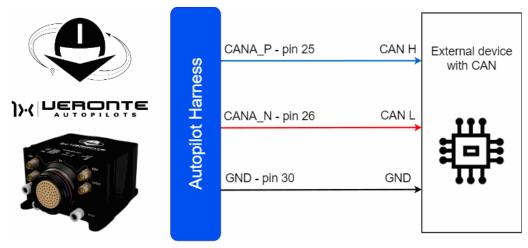
Electrical diagram of CAN bus

Autopilot 1x includes an internal resistor of 120 Ω . A second resistor is required at the end of the line (again 120 Ω) 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

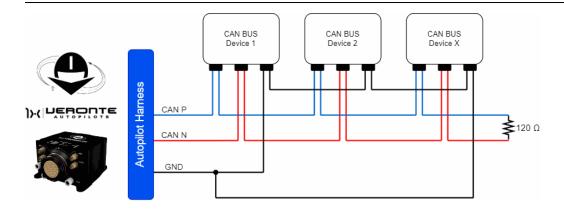
The user has the option to configure either of the two available CAN BUS lines on the Autopilot 1x: **CAN A** or **CAN B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

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 user has the option to configure either of the two available CAN
 BUS lines on the Autopilot 1x: CAN A or CAN B. For more information
 about these pins, refer to the Pinout Hardware Installation section of
 the present manual.
- The standard designation for CAN lines in devices is typically CAN H
 (High) and CAN L (Low).

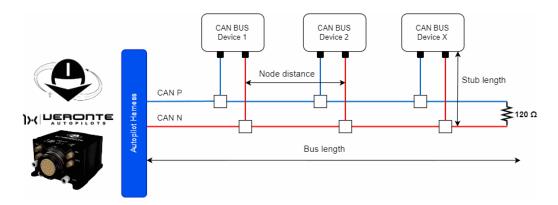
These designations correspond to those of the Autopilot 1x, where **CAN P (Positive)** and **CAN N (Negative)** represent the **High** and **Low** lines, respectively.

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.

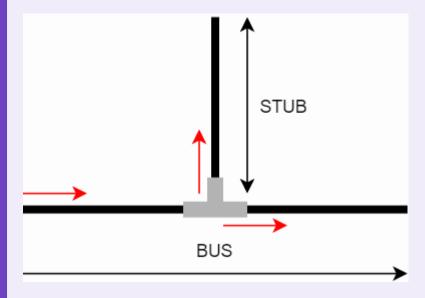
The following diagram illustrates an example of how to connect devices using this method:



! Important

To create stub branches from the master line, **T-connectors** or **CAN splitter** are required.

These connectors enable the connection of a device while allowing the main BUS line to continue, facilitating the connection of additional devices.



(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**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

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	
50 kbits/	1000	0.3	1000
Sec	meters	meters	meters

Marning

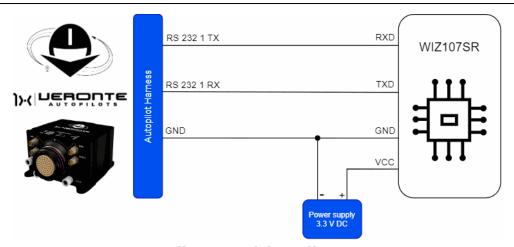
If a cable stub (un-terminated cable) or a T-connector is used to connect to the bus line, then the stub distance should not exceed **0.3 meters**.

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.

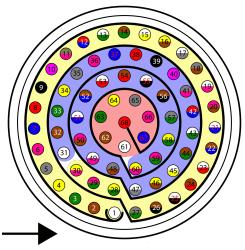
• **WIZ107SR** connection diagram:



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



Autopilot 1x harness pinout

Autopilot 1x Harness		WIZ107SR Connector		
PIN	Signal	Color Code	PIN	Signal
19	RS232 1 TX	White- Pink	3	RXD

Autopilot 1x Harness		WIZ107SR Connector		
PIN	Signal	Color Code	PIN	Signal
20	RS232 1 RX	Pink- Brown	7	TXD
21	GND	White- Blue	11 / 12	GND

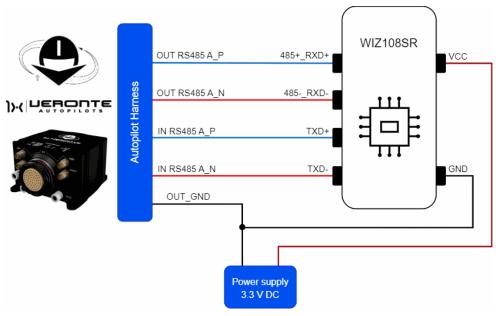
(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

△ Warning

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

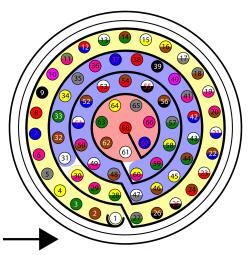
• WIZ108SR connection diagram:



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



Autopilot 1x harness pinout

Autopilot 1x Harness			WIZ108SR Connector	
PIN	Signal	Color Code	PIN	Signal
50	OUT RS485 A_P	Pink- Brown	3	485+_RXD+
51	OUT RS485 A_N	White- Blue	5	485RXD-
53	IN RS485 A_P	White- Red	7	TXD+
52			9	TXD-

Autopilot 1x Harness		WIZ108SR Connector		
PIN	Signal	Color Code	PIN	Signal
	IN RS485 A_N	Brown- Blue		
54	OUT_GND	Brown- Red	11 / 12	GND

(i) Note

The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: **RS 485 A** or **RS 485 B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

⚠ Warning

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

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

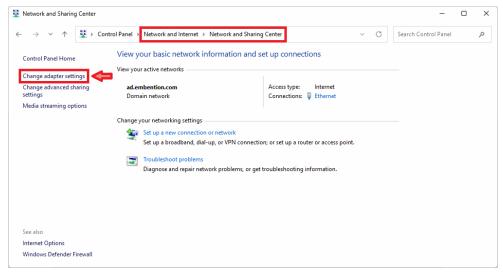
(i) Note

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.

Ethernet Connection in Windows

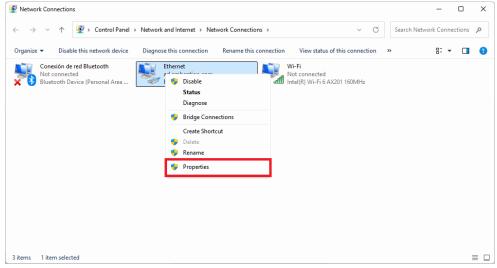
First, make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP address:

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



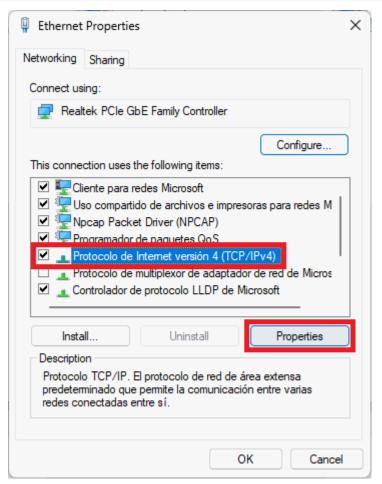
Ethernet connection 1

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



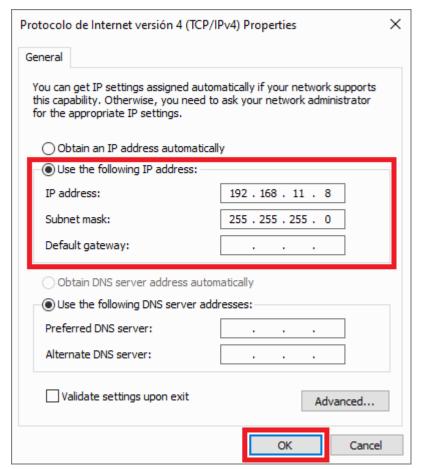
Ethernet connection 2

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



Ethernet connection 3

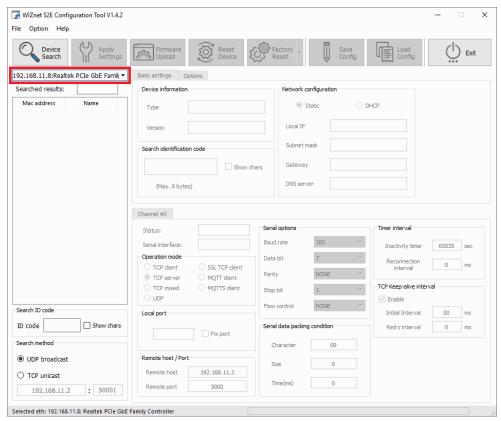
5. Set **IP address** to 192.168.11.X (in this example 192.168.11.8 is entered) and **Subnet mask** to 255.255.255.0. Click **OK**.



Ethernet connection 4

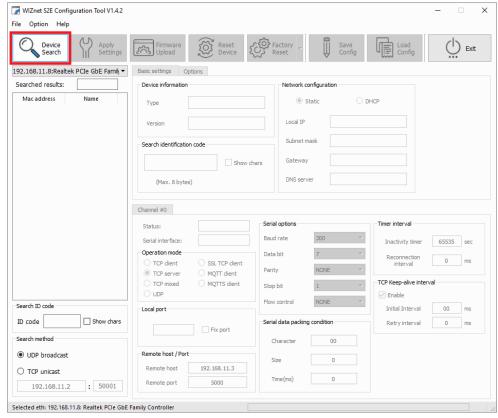
WIZNet software configuration

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



WIZnet software - Ethernet port selected

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



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.

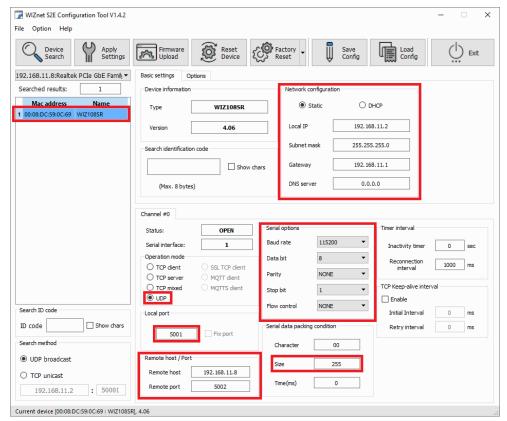
△ Caution

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.

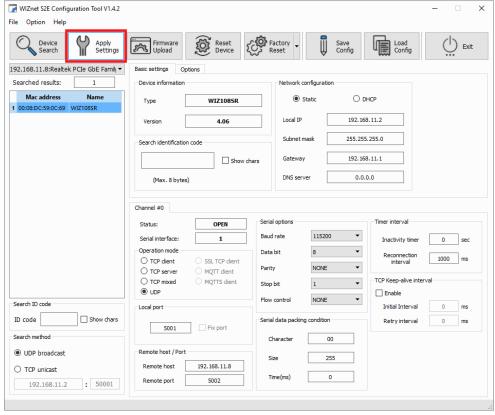
The configuration must be as follows:

- 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.



WIZnet software - Device configuration

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



WIZnet software - Apply Settings

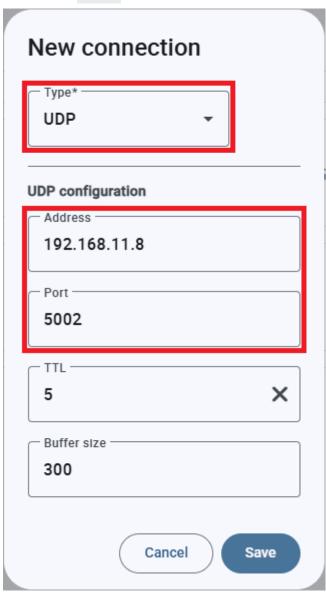
Veronte Link configuration

10. 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



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.

If the connection fails, please check UDP Failed Connection - Troubleshooting section of this manual.

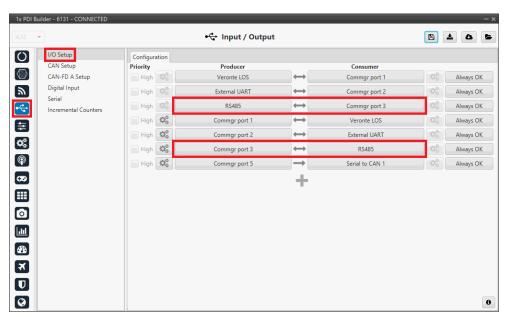
1x PDI Builder configuration

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.



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.

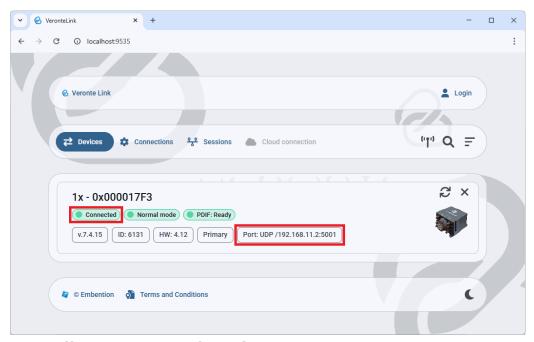
• Baudrate: **115200**

Length: 8Stop: 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

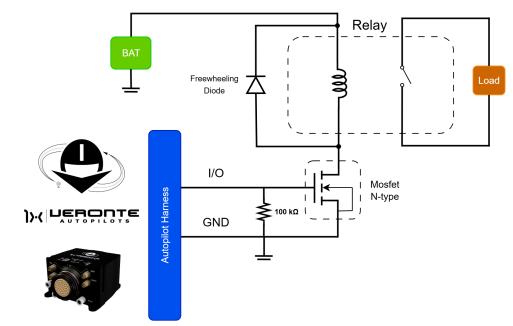
- Stick
- Veronte products

GPIO Wiring for External Loads

Besides their use in communication buses, the I/O pins are frequently used as GPIOs to control external devices like relays, lights, or solenoids.

It is important to note that each **I/O pin** has a **maximum current output** of **1.65 mA**, as they are designed for data signals, not for directly powering devices.

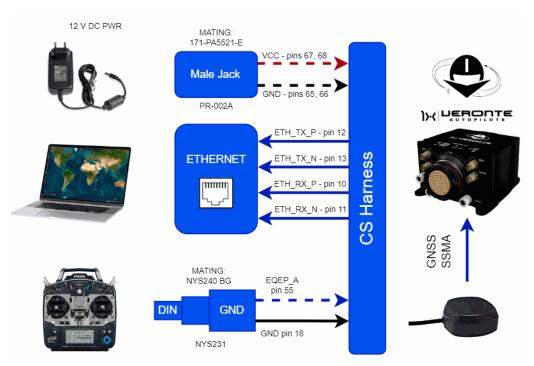
Due to this current limitation, an intermediate circuit is required to handle higher-power loads. The solution recommended is to use an N-type MOSFET as an electronic switch. The following diagram shows the recommended circuit for driving a relay:



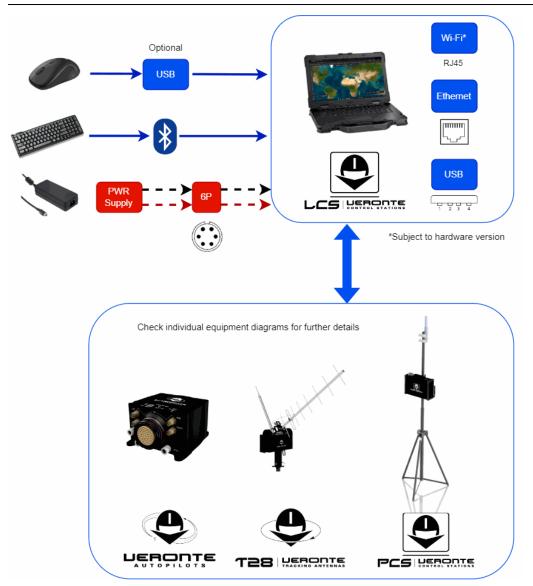
Circuit for driving a Relay

Connection Examples

Ground Stations



Basic Autopilot 1x Ground Station

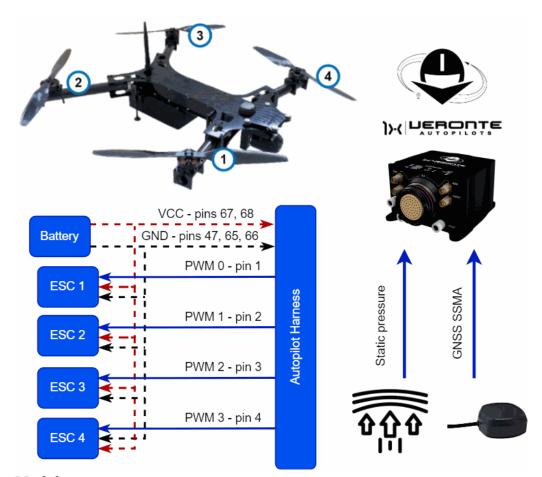


Autopilot 1x LCS Ground Station

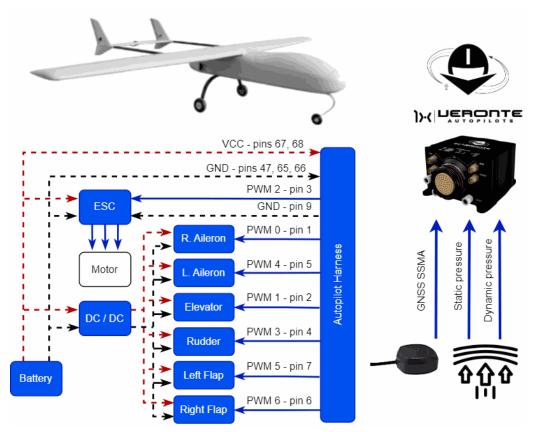
△ Warning

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

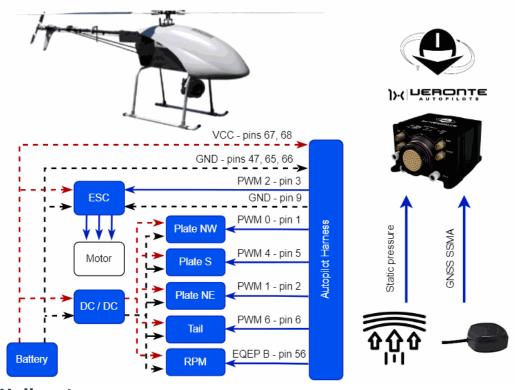
Aircrafts



Multicopter



Fixed Wing Airplane



Helicopter

Actuators/Servos

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

CAN

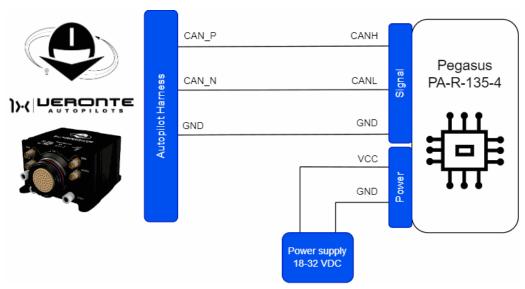
Pegasus PA-R-135-4



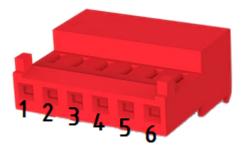
Pegasus PA-R-135-4 servo

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

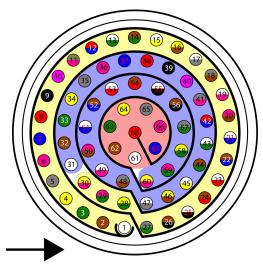
The setup to be performed by the user should be as follows:



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	Color Code	PIN Signal	
25	CANA_P	White- Black		CANH
28	CANB_P	Yellow- Green	3	CANH
26	CANA_N	Brown- Black	1	CANL

Aut	topilot 1x Harness		R- Tyco	asus PA- 135-4 MTA100 nnector
PIN	Signal	Color Code	PIN	Signal
29	CANB_N	Pink- Green		
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

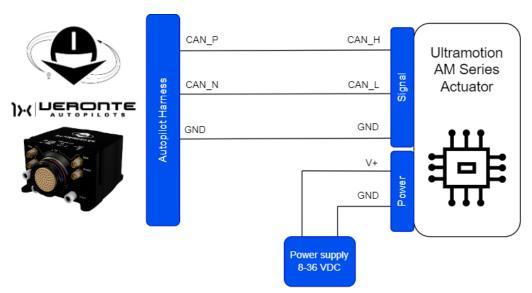


Ultra Motion servo

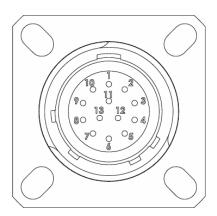
Ultra Motion servo is a high-precision actuator designed for demanding applications, with BLDC electronic control and non-contact absolute position feedback.

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

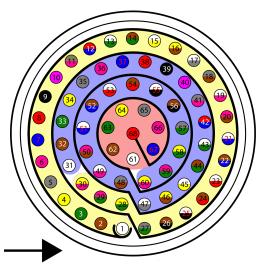
The setup to be performed by the user should be as follows:



Ultra Motion - Autopilot 1x wiring diagram



Ultra Motion - Pinouts for Signal connector on AM series actuators



Autopilot 1x harness pinout

Autopilot 1x Harness			Ultra	Motion Connect	
PIN	Signal	Color Code	PIN	Signal	Color Code
25	CANA_P	White- Black	7	CAN H	Red
28	CANB_P	Yellow- Green	,	CAN_II	Neu
26	CANA_N	Brown- Black	9	CANLL	White
29	CANB_N	Pink- Green	9	CAN_L	wille
30	GND	Yellow- Pink	8	GND	Black



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

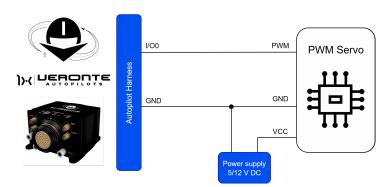
Remember!! In **Autopilot 1x**, all GND pins are common. Note that pin 54 is not a common GND pin.

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:

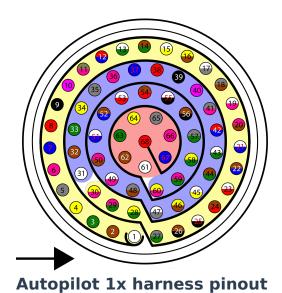


PWM - Autopilot 1x wiring diagram

! Important

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

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



Autopilot 1x Harness					
PIN	Signal Color Code				
1	1/00	White			
2	I/O1	Brown			
3	1/02	Green			
4	1/03	Yellow			
5	1/04	Gray			
6	1/06	Pink			
7	1/05	Blue			
8	1/07	Red			
9	GND	Black			

Marning

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

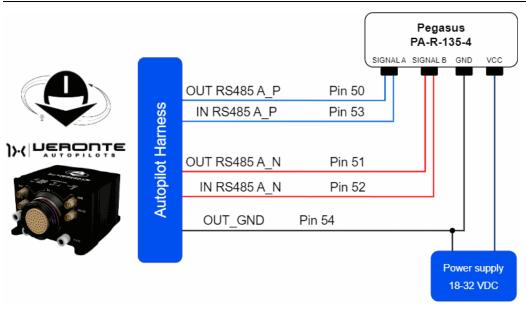
Pegasus PA-R-135-4



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.

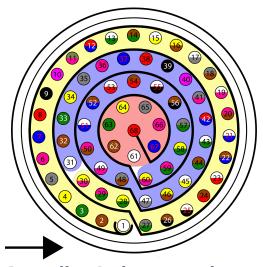
The setup to be performed by the user should be as follows:



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



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



Autopilot 1x harness pinout

Autopilot 1x Harness			R- Tyco	asus PA- 135-4 MTA100 nnector
PIN	Signal	Color Code	PIN	Signal
50	OUT RS485 A_P	Pink- Brown	3	CINICAL A
53	IN RS485 A_P	White- Red	3	SINGAL A
51	OUT RS485 A_N	White- Blue	1	SIGNAL B
52	IN RS485 A_N	Brown- Blue	T	SIGNAL D
54	OUT_GND	Brown- Red	6	GND

(i) Note

The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: **RS 485 A** or **RS 485 B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

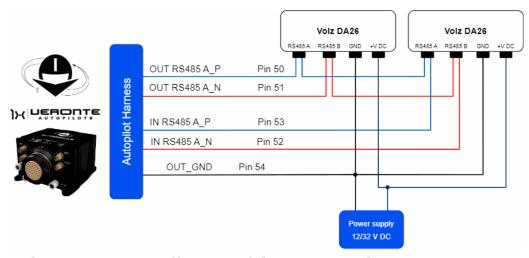
Once the hardware integration of the device has been completed, it will be necessary to proceed with the **software integration**. To do this, follow the steps detailed in the Pegasus - Integration examples section of the **1x PDI Builder** user manual.

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**:



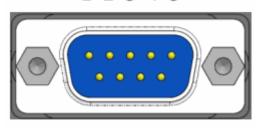
Volz DA26 - Autopilot 1x wiring connection

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.

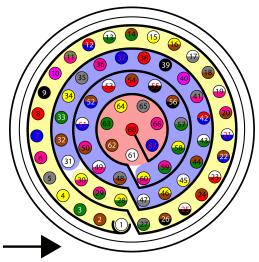
! Important

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





6 7 8 9 Volz DA26 connector pinout



Autopilot 1x harness pinout

Autopilot 1x Harness		Volz DA26 Connector		
PIN	Signal	Color Code	PIN	Signal
50	OUT RS485 A_P	Pink- Brown	1	RS 485 A (Non- inverting
53				Input/ Output)

Autopilot 1x Harness			olz DA26 connector	
PIN	Signal	Color Code	PIN	Signal
	IN RS485 A_P	White- Red		
51	OUT RS485 A_N	White- Blue	2	RS 485 B (Inverting
52	IN RS485 A_N	Brown- Blue		Input/ Output)
54	OUT CND	Brown- 7	7	GND (1)
54	OUT_GND	Red	8	GND (2)

Marning

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

(i) Note

- The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: RS 485 A or RS 485 B. For more information about these pins, refer to the Pinout Hardware Installation section of the present manual.
- 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

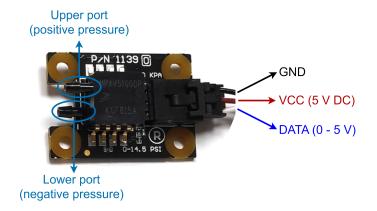
- **Veronte Autopilot 1x** with hardware version 4.12.
- High Speed Pitot Sensor.
- Veronte Harness Blue 68P with Embention reference P001114.
- Power supply for **1x** (8 54 V DC).
- Power supply for High Speed Pitot Sensor (5 V DC).
- Pneumatic tubing, with 3 mm of outer diameter and 1 mm of inner. Silicone material is recommended.
- Two T-connectors for the tubing.

⚠ Warning

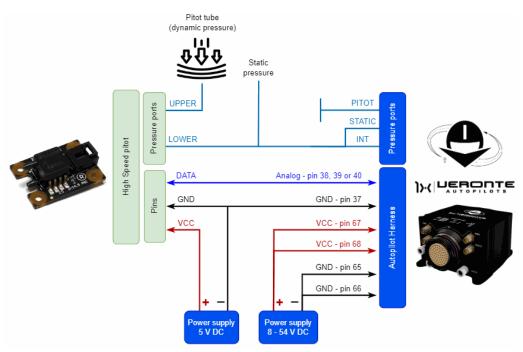
Take caution when connecting the pressure ports. This sensor only measures a positive pressure differential, so the sensor might be damaged if it reverse connected.

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:

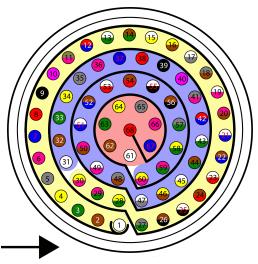


High Speed Pitot Sensor - Autopilot 1x connections diagram



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			_	eed Pitot nsor
PIN	Signal	Color Code	Signal	Color Code
38	ANALOG_0	Red		White
39	ANALOG_1	Black	DATA	
40	ANALOG_2	Pink		
37	GND	Blue	GND	Black

Important

In addition to the analog pins listed in the table above, pins 22 and 23 are also analog pins that can be connected; however, since they have a higher full scale $(0-36\ V)$, the resolution is worse, so we do not recommend it.

Marning

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.

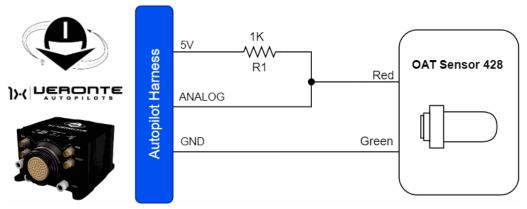
OAT sensor 428 of MGL Avionics



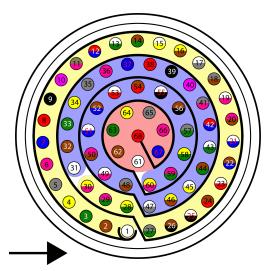
OAT sensor 428

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 1**x:



OAT sensor - Autopilot 1x wiring diagram



Autopilot 1x harness pinout

Autopilot 1x Harness				
PIN Signal Color Cod				
36	5V	Pink		
37	GND	Blue		
38	ANALOG_0	Red		
39	ANALOG_1	Black		
40	ANALOG_2	Pink		

Autopilot 1x Harness			
PIN	Signal	Color Code	
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

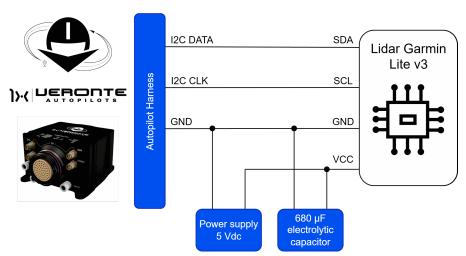
The integration between **Veronte Autopilot 1x** and a lidar is performed using a variety of interfaces depending on the lidar device. The most common interfaces are I2C or analog although serial or CAN bus can also be used if the lidar is compatible.

Lidar Garmin Lite v3



Lidar Garmin Lite v3

Lidar Garmin Lite v3 sensor integrates with **Autopilot 1x** via **I2C** connection.

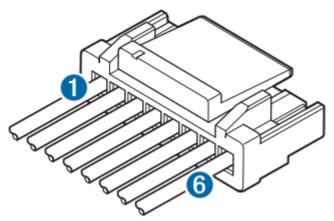


Lidar Garmin Lite v3 - Autopilot 1x wiring diagram

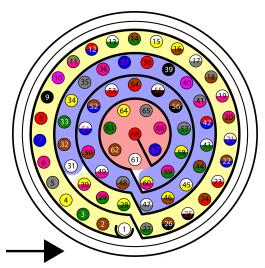
Important

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 1**x.



Lidar Garmin Lite v3 connector



Autopilot 1x harness pinout

Auto	topilot 1x Harness		Autopilot 1x Harness v3 Conn		ar Garmiı 3 Connec	
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.

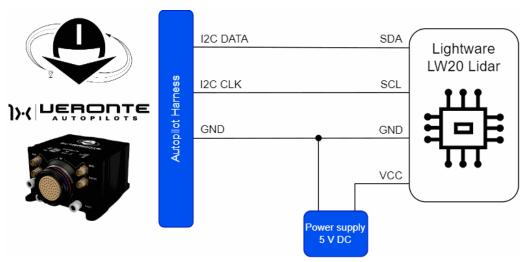
Once the lidar is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the Lidar Garmin Lite v3 - Integration examples section of the **1x PDI Builder** user manual.

Lightware LW20 Lidar



Lightware LW20 Lidar

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

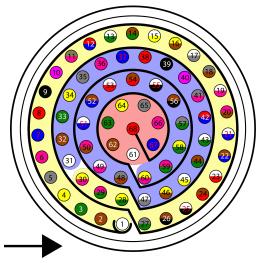


Lightware LW20 Lidar - Autopilot 1x wiring diagram

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 1**x.



Autopilot 1x harness pinout

Autopilot 1x Harness		Lig	htware l 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

Marning

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

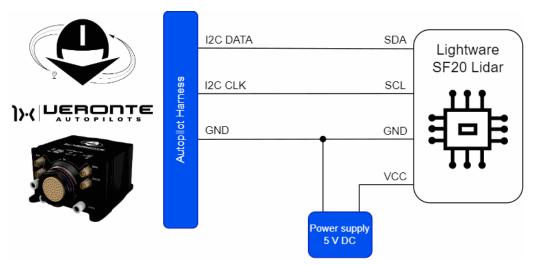
Once **Lightware LW20 Lidar** is connected, the user must proceed to its software installation with **Veronte Autopilot 1x** by referring to the **Lightware LW20 Lidar** - **Integration examples** section of the **1x PDI Builder** user manual.

Lightware SF20 Lidar



Lightware SF20 Lidar

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

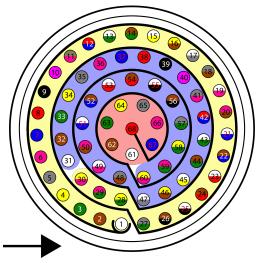


Lightware SF20 Lidar - Autopilot 1x wiring diagram

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 1**x.



Autopilot 1x harness pinout

Autopilot 1x Harness		Lig	jhtware S Lidar	SF20	
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

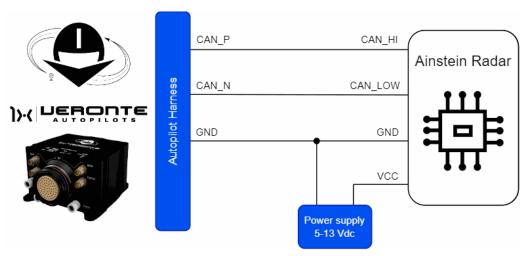
Radar altimeters are common devices on aircrafts.

Ainstein CAN Radar



Ainstein CAN Radar

Ainstein CAN Radar sensor integrates with **Autopilot 1x** via **CAN** connection.

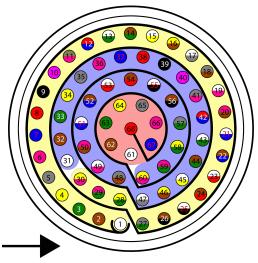


Ainstein CAN Radar - Autopilot 1x wiring diagram

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		Ain	stein CAN F	Radar	
PIN	Signal	Color Code	PIN	Signal	Color Code
25	CANA_P	White- Black	2	CAN_HI	Green
28	CANB_P	Yellow- Green			
26	CANA_N	Brown- Black	3	CANLLOW	White
29	CANB_N	Pink- Green		CAN_LOW	vviiite

Autopilot 1x Harness		Ainstein CAN Radar			
PIN	Signal	Color Code	PIN	Signal	Color Code
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.

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:

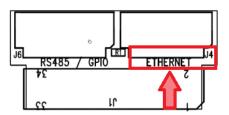


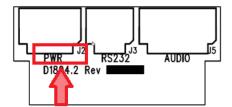
DTC + amplifier radios and 1x operation

Hardware Installation

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

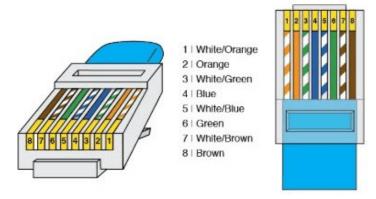
1. To **configure a DTC radio** it is required to carry out the installation of the ethernet and power connection:





DTC D1804 Gecko breakout PCB

• Ethernet



RJ45 pinout T-568B

D18	thernet) - 04 Gecko ikout PCB	R	J45 Conn (T-568	
PIN	Signal	PIN	Signal	Color Code
1	Ethernet MDIP0	1	TX+	Orange- White
2	Ethernet MDIN0	2	TX-	Orange

D18	thernet) - 04 Gecko ikout PCB	R	RJ45 Connecto (T-568B)	
PIN	Signal	PIN	Signal	Color Code
3	Ethernet MDIP1	3	RX+	Green- White
4	Ethernet MDIN1	6	RX-	Green

• Power supply

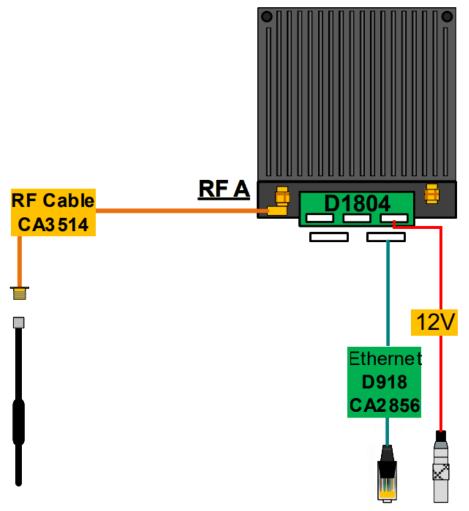


Female DC Power Jack connector

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

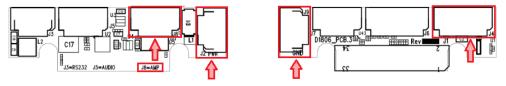
D180	PWR) - 94 Gecko eakout PCB	Power Connector
PIN	Signal	Signal
4	GND	

The full connection should look like this:



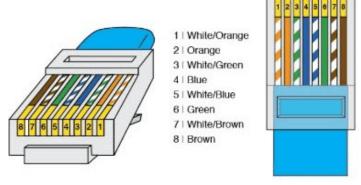
DTC connection - Configuration

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

D18	thernet) - 06 Gecko Active akout 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) - D1806 Gecko Active Breakout PCB		Power Connector	
PIN Signal		Power Signal	
1	VIN		
2	VIN		
3	VIN	Dowor	
4	VIN	Power +	
5	VIN		
6	VIN		

J9 (GND) Active E	Power Connector	
PIN	Signal	Power Signal
1	GND	Power -
2	GND	

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

Amplifier



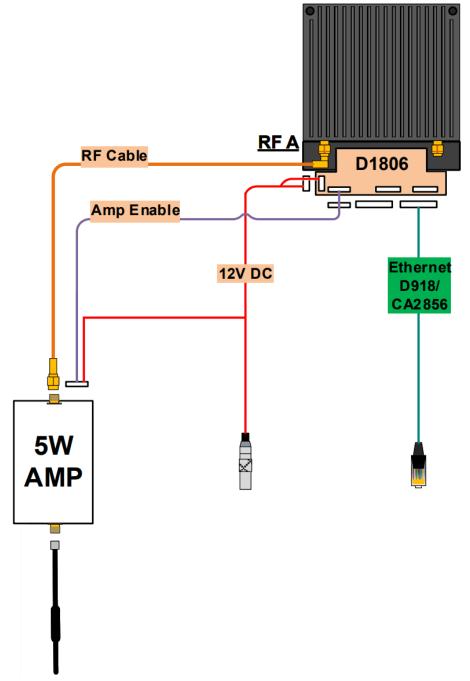
Amplifier AMPD5W

J8 (AMP) - D1806 Gecko Active Breakout PCB		AMPD5W Connector	
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

J2 (PWR) - D1806 Gecko Active Breakout PCB		AMPD5W Connector	
PIN	PIN Signal		Signal
1	VIN	1 & 2	Power +
2	VIN		
3	VIN		
4	VIN		
5	VIN		
6	VIN		

J9 (GND) - D1806 Gecko Active Breakout PCB		AMPD5W Connector	
PIN	Signal	PIN	Signal
1	GND		Power -
2	GND		
3	GND	3 &	
4	GND	4	
5	GND		
6	GND		

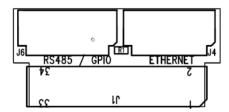
The full connection should look like this:

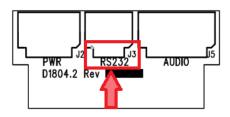


DTC + amplifier connection - Configuration

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

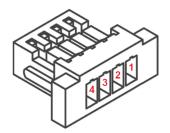
As, the connection of a **DTC** radio to a **Veronte Autopilot 1x** must be made via **RS-232**, the connection will be the same as in the configuration case (1), but adding the wiring to RS-232 port.



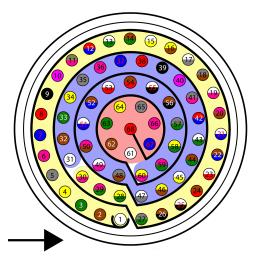


DTC D1804 Gecko breakout PCB - J3 (RS232)

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



J3 (RS232) pinout of female connector



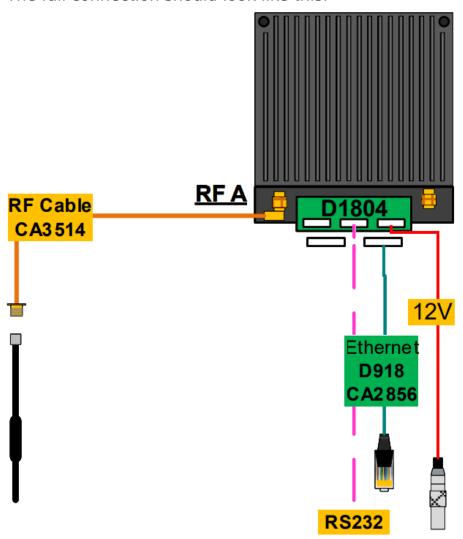
Autopilot 1x harness pinout

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

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

The full connection should look like this:

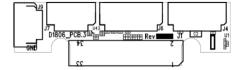


DTC connection - Veronte Autopilot 1x

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

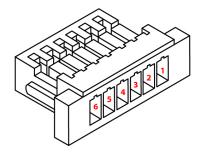
As, the connection of a **DTC** radio to a **Veronte Autopilot 1x** must be made via **RS-232**, the connection will be the same as in the configuration case (2), but adding the wiring to RS-232 port.



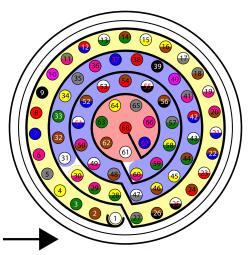


DTC D1806 Gecko active breakout PCB - J3 (RS232)

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



J3 (RS232) pinout of female connector



Autopilot 1x harness pinout

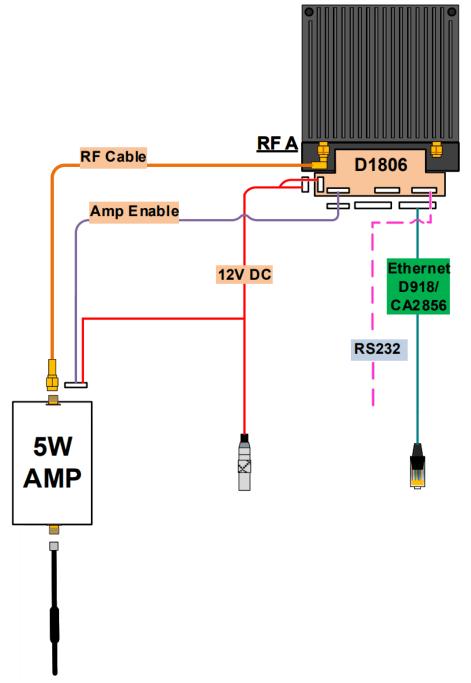
J3 (RS232) - D1806 Gecko Active Breakout PCB		Auto	pilot 1x I	Harness
PIN	Signal	PIN	Signal	Color Code
2	RS232 RX	19	RS232 1 TX	White- Pink
1	RS232 TX	20		

J3 (RS232) - D1806 Gecko Active Breakout PCB		Autopilot 1x Harness		
PIN	Signal	PIN	Signal	Color Code
			RS232 1 RX	Pink- Brown
3	GND	21	GND	White- Blue

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

The full connection should look like this:



DTC + amplifier connection - Veronte Autopilot 1x

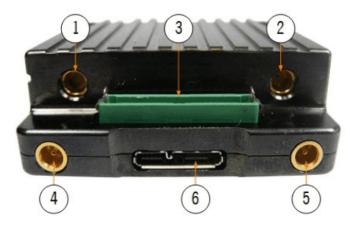
△ Caution

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

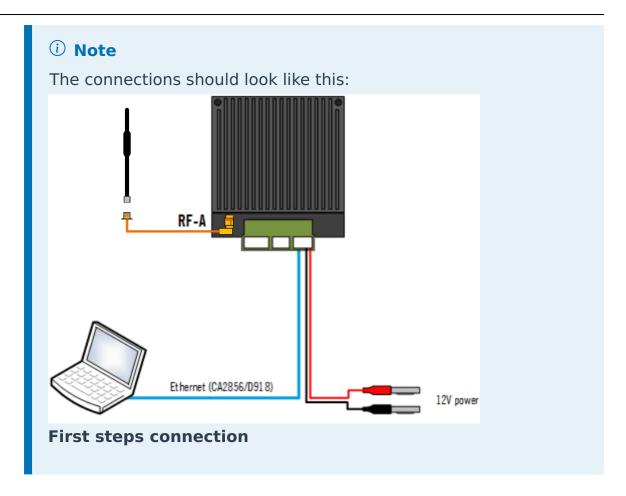
First steps



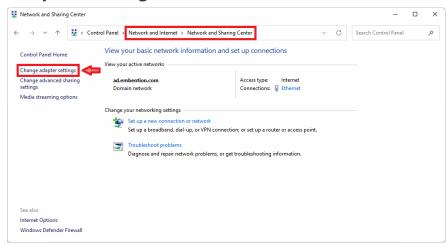
DTC ports

DTC without amplifier

- 1. 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.
- 5. 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.

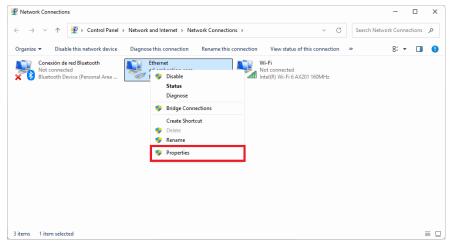


- 6. Make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP address in the **Control Panel**:
 - 1. Open **Network and Sharing Centre** menu and click **Change** adapter settings.



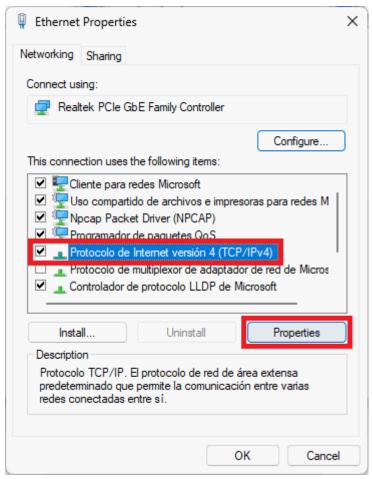
Ethernet connection 1

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



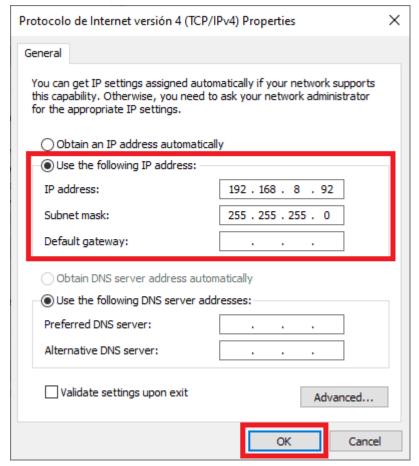
Ethernet connection 2

3. Select IPv4 and click Properties.



Ethernet connection 3

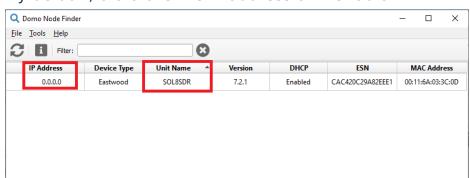
4. Set **IP address** to 192.168.8.YY (e.g. if the IP of the radio is 192.168.8.95, set the IP 192.168.8.92) and **Subnet mask** to 255.255.255.0. Click **OK**.



Ethernet connection 4

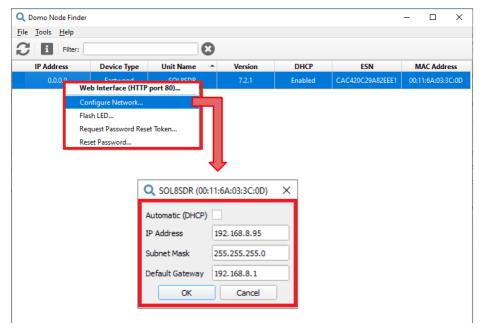
- 7. First, it is necessary to have the '**Domo Node Finder**' software installed.
- Open **Domo Node Finder** and the connected radios will appear here as SOL8SDR.





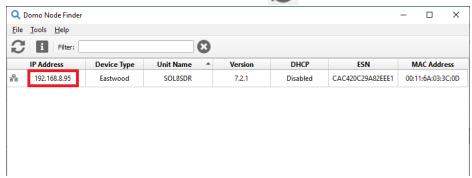
Domo Node Finder - Default IP address

9. 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:



Domo Node Finder - IP address configuration

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

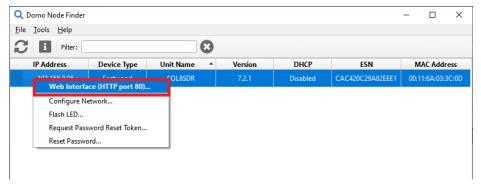


Domo Node Finder - Configured IP address

(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 right-click 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.

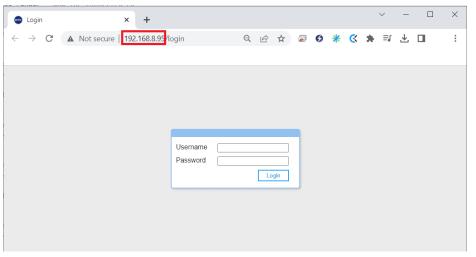


Domo Node Finder - Open Web Browser Application



Although the application should work with any web browser, **DTC** recommends the use of Internet Explorer, Google Chrome or Firefox.

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



Domo Node Finder - Open Web Browser Application

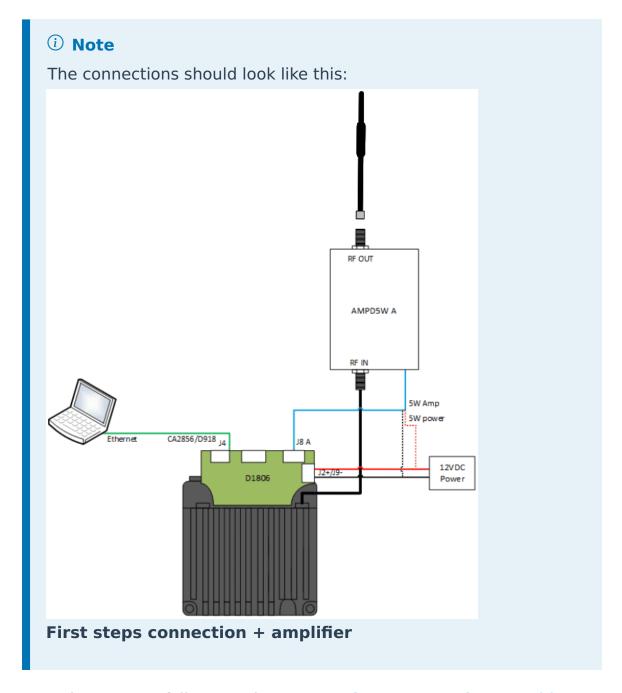
12. Click **Login** and the web browser control application will open.

DTC with amplifier

- 1. 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.
- 4. 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.

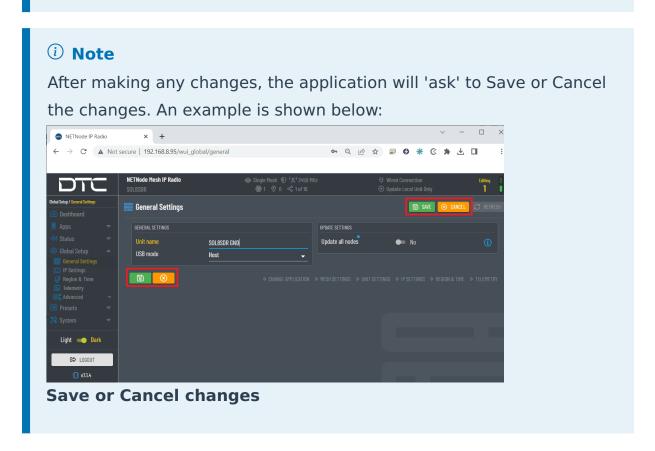
Point-to-Point configuration

Basic radio configuration

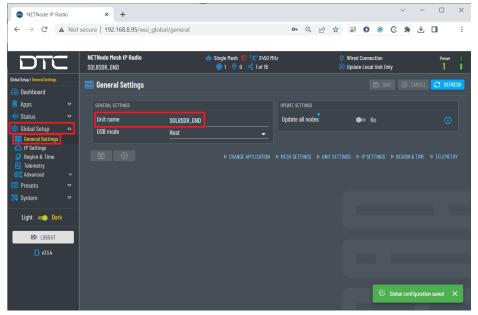
Once the website has been accessed, follow the steps below which show the parameters that need to be modified for a correct operation and pairing of the radios.

(i) Note

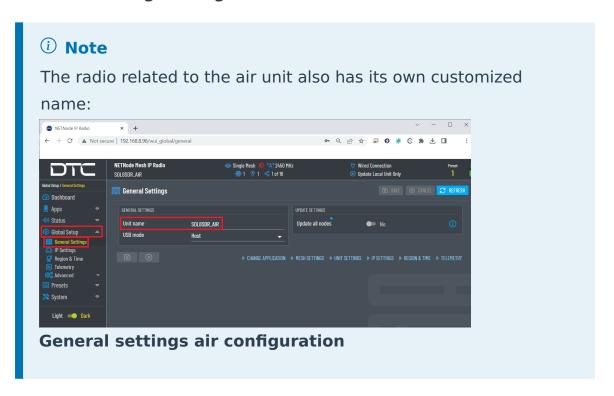
This is an example of the radio configuration linked to a **ground** unit.



 Global Setup → General Settings: To easily identify each radio in a mesh, the user can rename the radio as desired:



General settings configuration

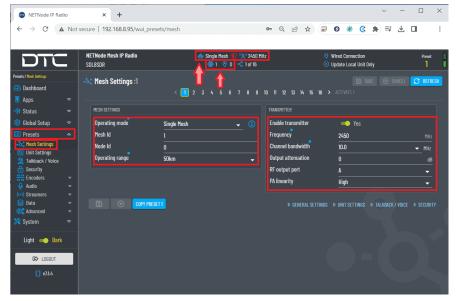


2. Presets.

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.



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.

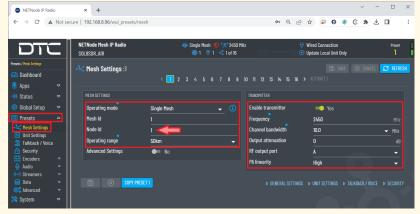
△ Warning

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). O 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

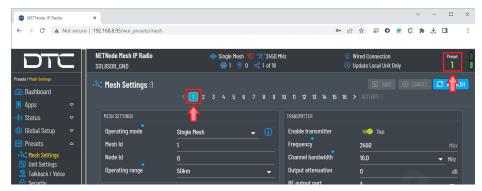
To ensure proper communication between the two radios, the radio linked to the **air unit must have these same 'Mesh settings' except for the Node Id**, as each node in the mesh has its own Id (starting with Id 0):



Mesh settings air configuration

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.

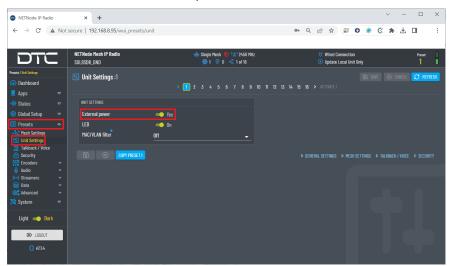


Current preset configuration

• Unit Settings:

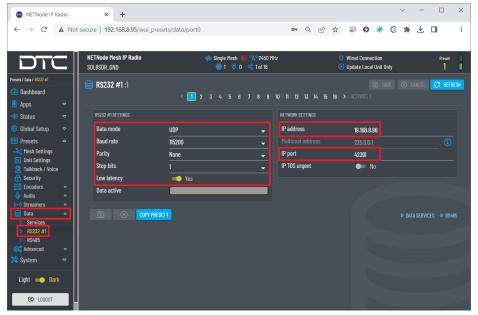
External Power Enable: There is an external power output which can be used to supply 12VDC (1A) to an external device.

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



Unit settings configuration

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



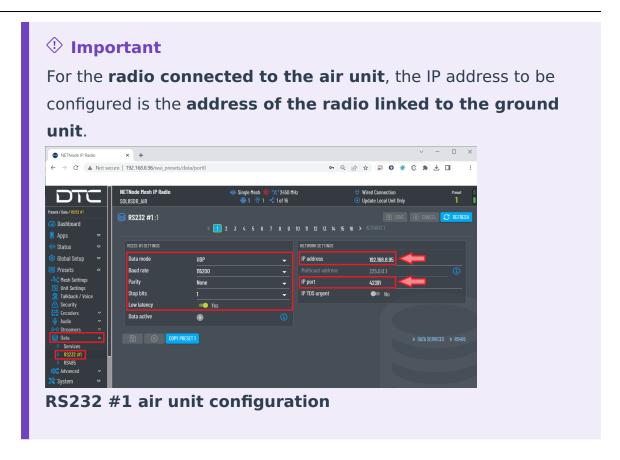
RS232 #1 configuration

- **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

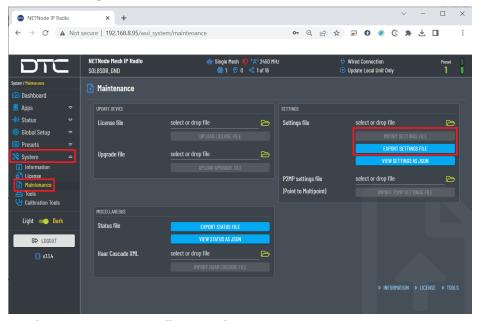
The data is assumed to be 8 bits.

- Low latency: Low latency will minimise delay at the expense of bitrate, so if set, data transfer 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 bein
 - 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**.



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

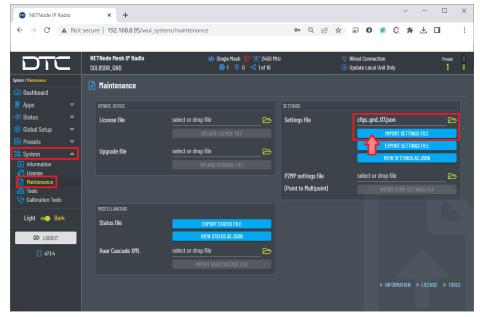


Maintenance configuration

To **import** a configuration into the radio, it is first necessarry to choose a configuration from the local storage by clicking on the 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:



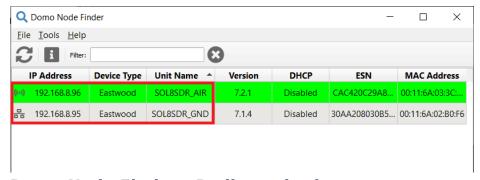
Configuration selected

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:



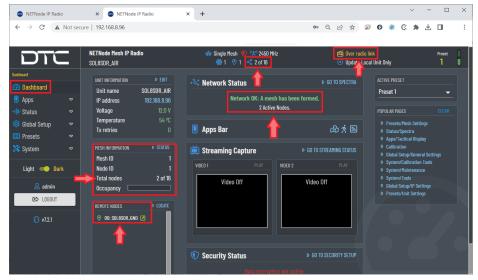
Domo Node Finder - Radios paired

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

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

Web Browser control application

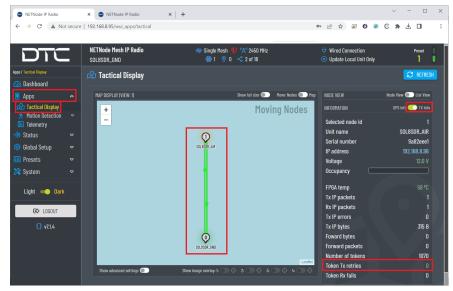
When two radios are paired, this can be seen/checked directly in the 'Dashboard' of both radios.



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.

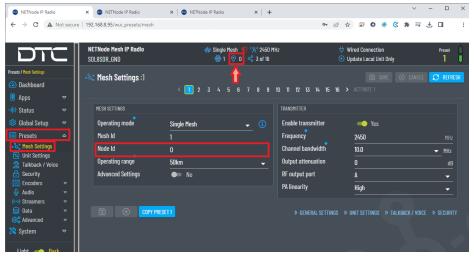
Radio configuration

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

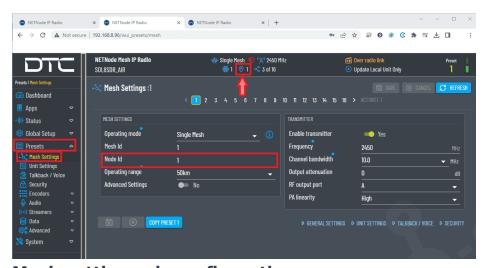
(i) Note

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

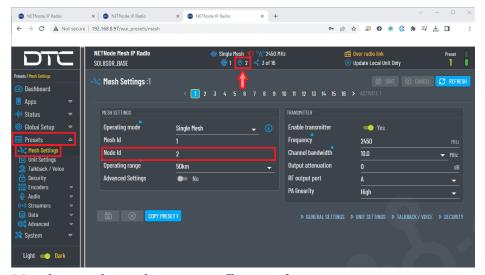
 Presets → Mesh Settings: The Node ID must be different for each node in the mesh.



Mesh settings ground configuration



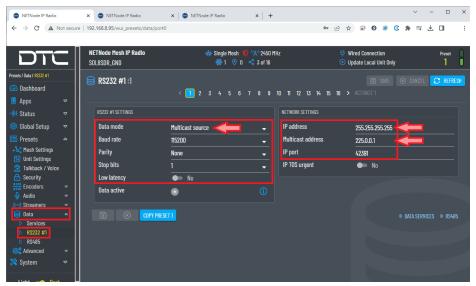
Mesh settings air configuration



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 → 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.

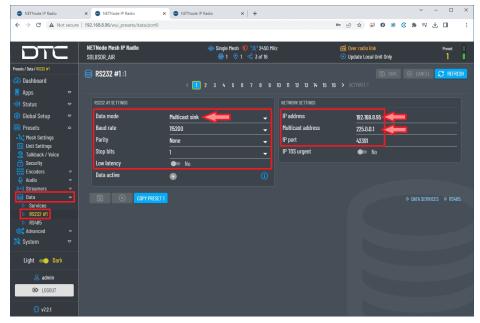


RS232 #1 ground configuration

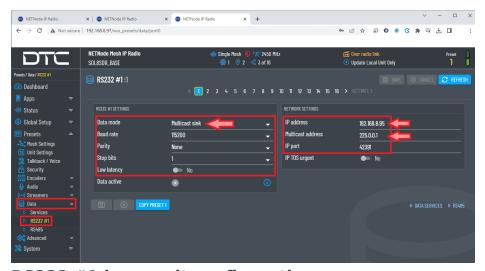
- Data mode: Multicast source must be selected.
- **IP address**: To send the data to all receivers the IP address must set to **255.255.255.255**.
- Multicast address: It must be the same for all radios, avoiding the 244.0.0.X address range.

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:



RS232 #1 air unit configuration



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.

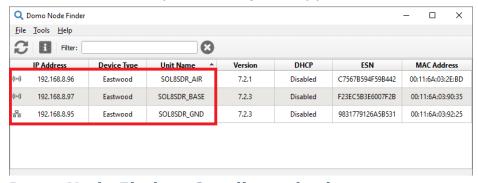
Paired radios

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:

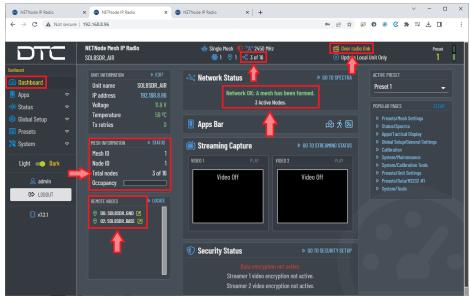


Domo Node Finder - 3 radios paired

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

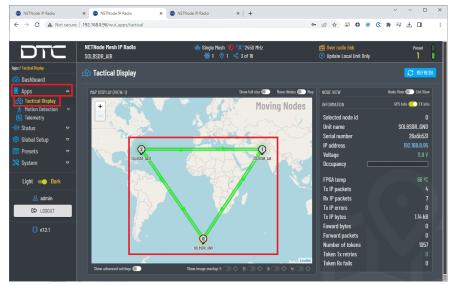
When 3 radios are paired, this can be seen/checked directly in the '**Dashboard**' of the three radios.



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.

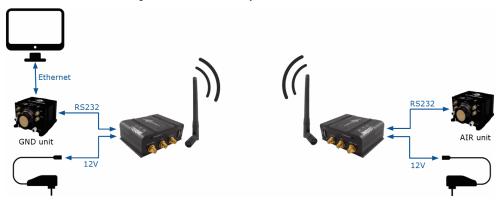
Microhard pDDL900-ENC external

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 radios and Autopilot 1x operation

Microhard + Amplifier



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 **4- pin power cable** supplied with the **Microhard** radio and with the power connector of the amplifier:



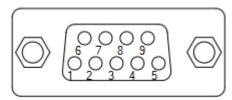
Female DC Power Jack connector

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

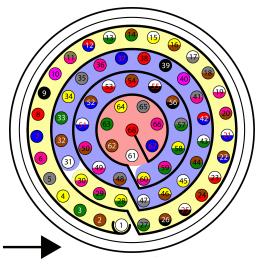
① Danger

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

Serial port - Microhard radio		Autopilot 1x Harness			
PIN	Signal	PIN	Signal	Color Code	
2	RXD	20	RS 232 1 RX	Pink- Brown	
3	TXD	19	RS 232 1 TX	White- Pink	
5	GND	21	GND	White- Blue	

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

Microhard radio configuration

First steps

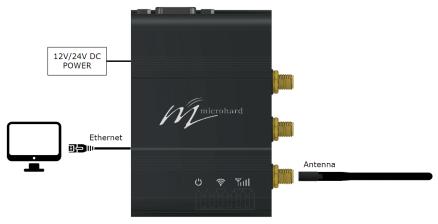


Microhard ports

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:



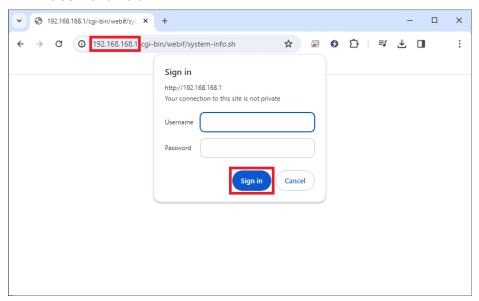
First steps connection

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

(i) Note

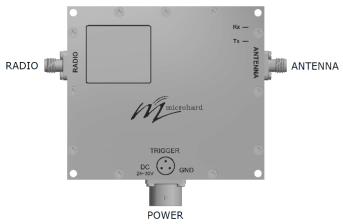
If users have problems accessing the **Microhard** radio WebUI, it may be because the PC's network connection settings (IP address and subnet of the adapter) are not configured properly. For further details, consult Microhard radio troubleshooting section below.

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



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.
- 5. 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.

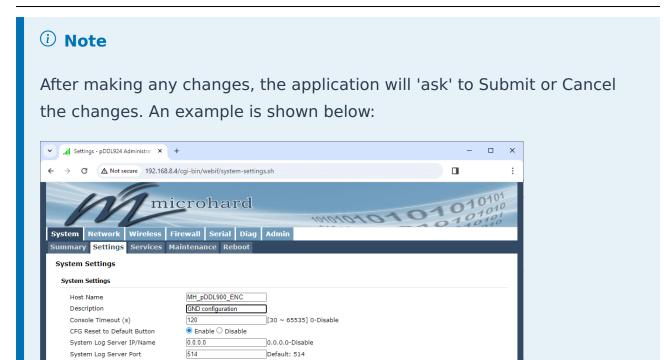
Basic radio configuration

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.



Submit or Cancel changes

2022-09-22

15:07:46 ● Local Time ○ NTP

2022-09-22

15:07:46

1. System

Time Settings

Current Date(yyyy-mm-dd)
Current Time(hh:mm:ss)

Date and Time Setting Mode

Date (yyyy-mm-dd) Time (hh:mm:ss)

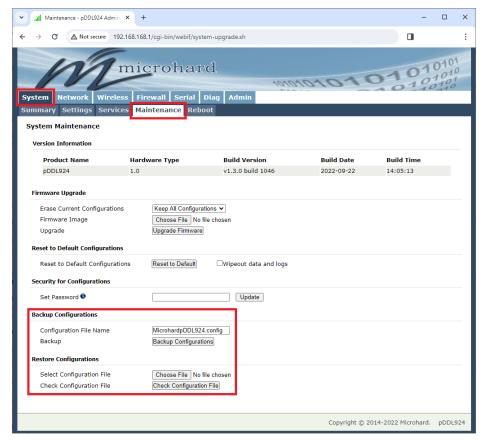
 Maintenance: From this menu, users can export (backup) and import (restore) configurations.

Submit « Cancel «

- 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

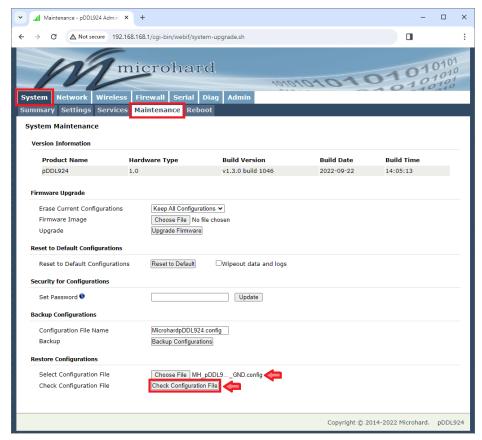
A password can be added to backup and restore files. If the password is lost, files that have been backed up with a password cannot be restored.



System Maintenance

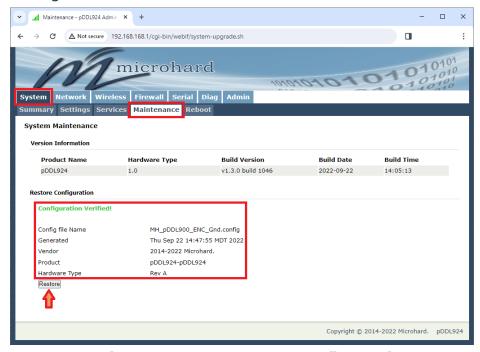
To **import** (restore) a configuration into the radio, it is first necessary to choose a configuration from the local storage by clicking on Choose File.

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



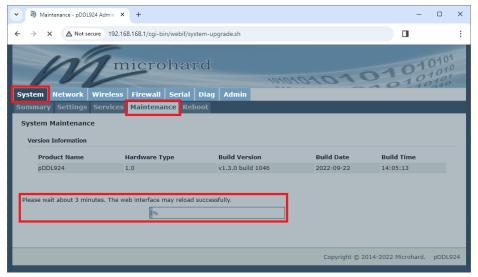
System Maintenance - Restore Configuration 1

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



System Maintenance - Restore Configuration 2

Finally, the WebUI will reloaded to applied the configuration.



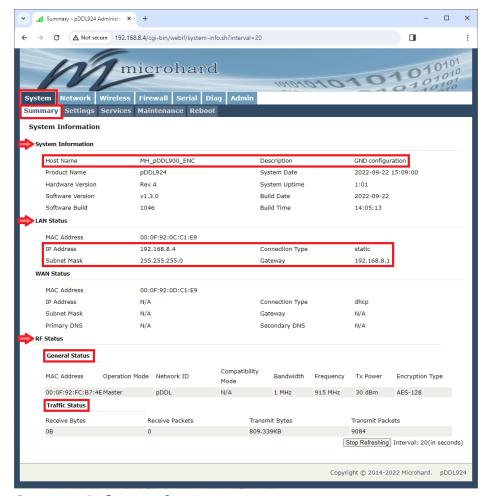
System Maintenance - Restore Configuration 3

① 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.

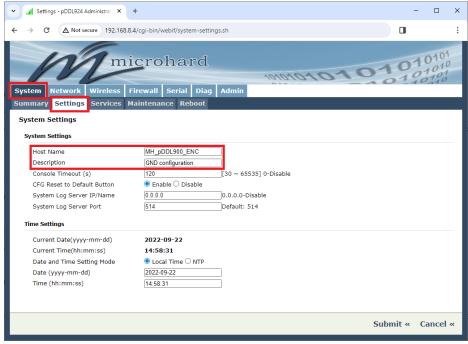
 Summary: This screen is displayed immediately after the initial login, showing a summary and status of all radio functions on a single display.

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

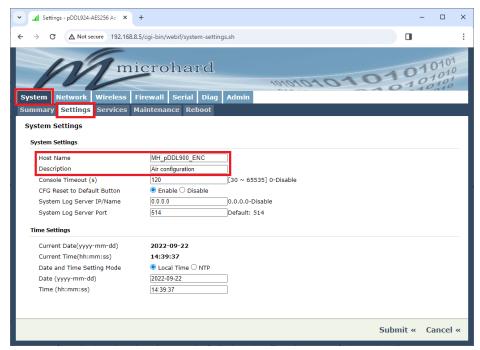


System Information

 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:



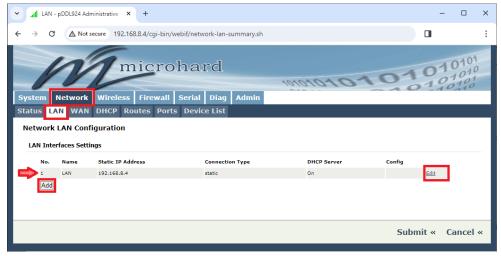
System Settings - GND unit



System Settings - Air unit

 Network → LAN: Ethernet LAN port of the radio is for connecting devices to a local network.

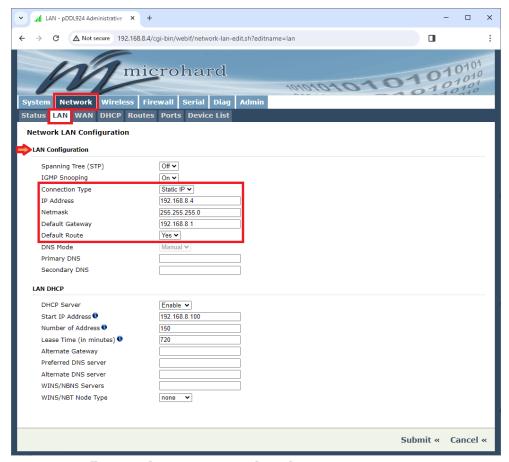
By default, this port has a static IP address, and also, it is running a DHCP server to provide IP addresses to devices that are connected to the physical LAN port (directly or through a switch).



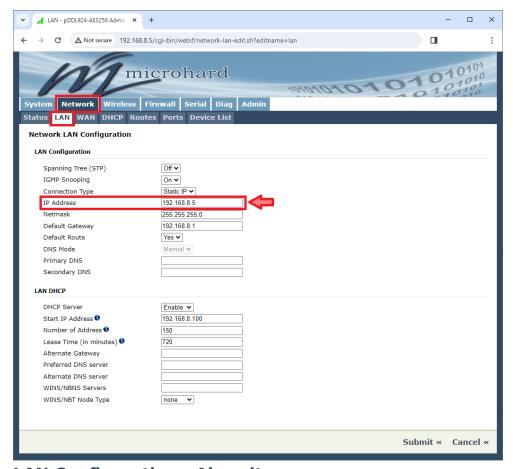
LAN Interfaces Settings

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

LAN Configuration:



LAN Configuration - Ground unit



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.

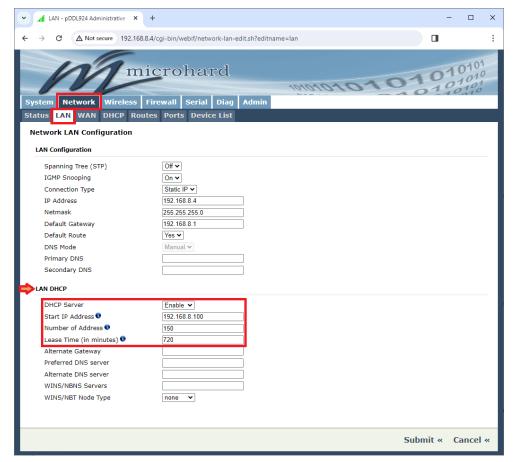
Since the Static IP option has been chosen, the following fields must also be entered.

- IP Address: A valid IPv4 address for the network used must be entered in this field.
 - For the radio linked to the **ground** unit \Rightarrow **192.168.8.4** has been entered.
 - For the radio linked to the **air** unit \Rightarrow **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).

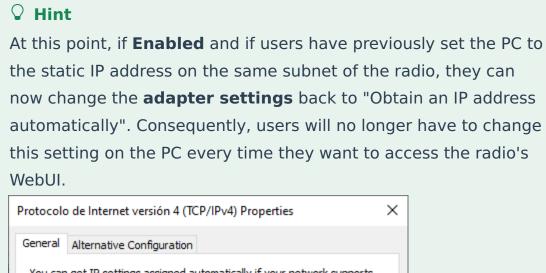


LAN DHCP

 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.



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 automatically Use the following IP address: IP address: Subnet mask: Default gateway: Obtain DNS server address automatically Use the following DNS server addresses: Preferred DNS server: Alternative DNS server: ☐ Validate settings upon exit Advanced... Cancel Adapter settings - IP address automatically

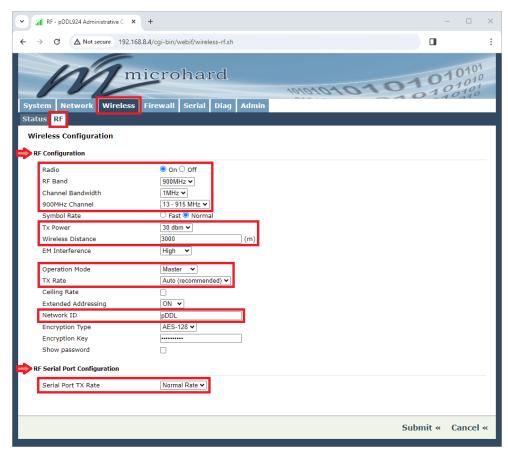
- Start IP Address: Select the starting DHCP address from which IP addresses will be assigned. The first octets of the subnet will be pre-set based on the LAN IP configuration, and cannot be changed. We enter here 192.168.8.100.
- Number of Address: Set the maximum number of IP addresses that can be 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.

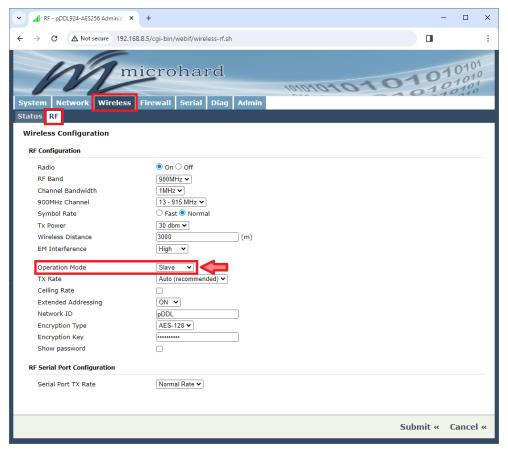
3. **Wireless** \rightarrow **RF**: Allows to configure the radio module.

! Important

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



Wireless Configuration - Ground unit



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.

△ 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.

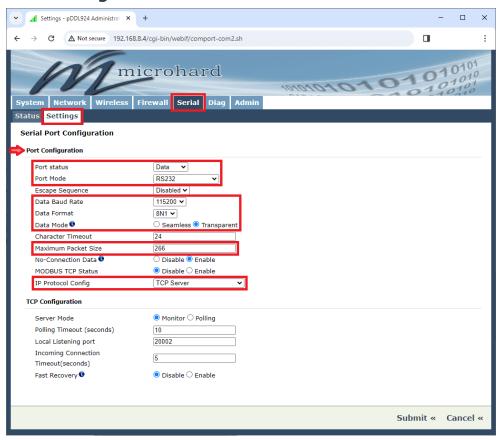
! Important

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

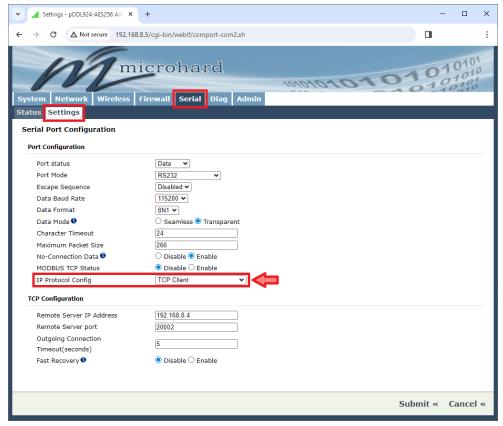
RF Serial Port Configuration:

- 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).
- 4. 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:



Port Configuration - Ground unit



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

- **→ 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

→ **8N1** (8 data bits, No parity, and 1 Stop bit).

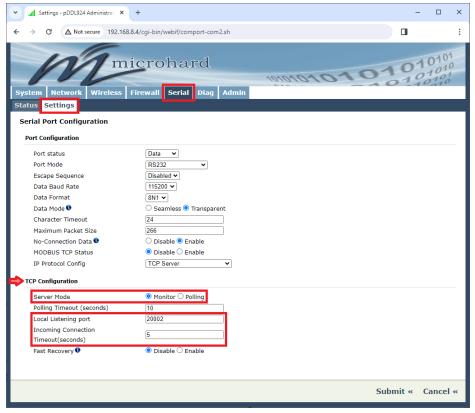
- **Data Mode**: This setting defines the framing of the serial output data.
 - In Transparent mode (default), the received data will exit the radio quickly.
 - In Seamless mode, the serial port server will add a gap between data frames to comply with a specified protocol.

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.

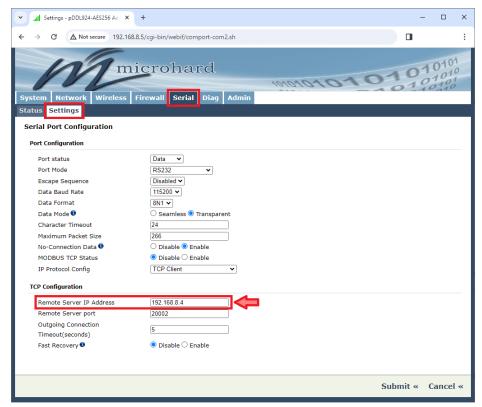


TCP Configuration - Ground unit

- 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.



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.

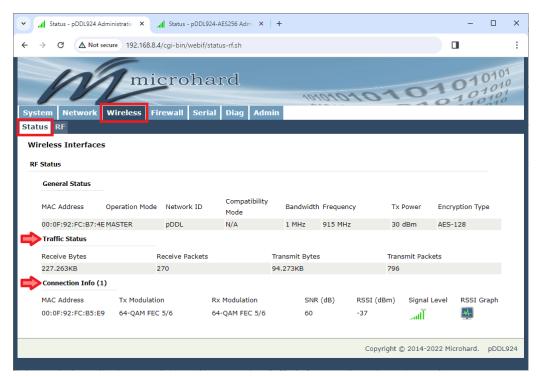
Therefore, by connecting both to the power supply, users can check that they are paired by simply observing the **RSSI LEDs**, they should be in a **solid green**. The more LEDs ilumitated \Rightarrow the stronger the link.

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.

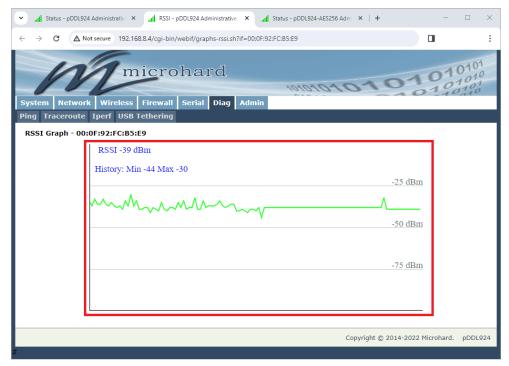
Wireless → **Status**: The Status window provides an overview of all wireless or radio settings and connections.



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:



Wireless Status - RSSI Graph Link

Microhard radio configuration in 1x PDI Builder

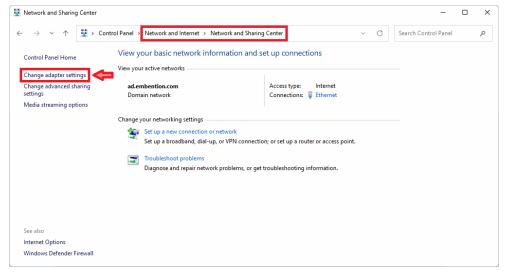
The necessary configuration of **Microhard** radio in **1x PDI Builder** is described in the External radios - Integration examples section of the **1x PDI Builder** manual.

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.

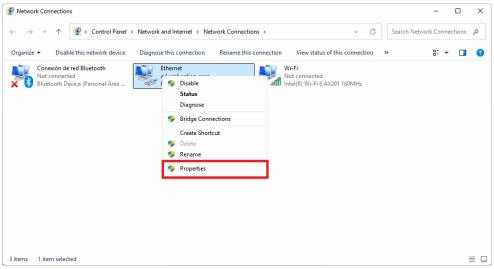
The following steps clarify how to set the IP address in the **Control Panel**:

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



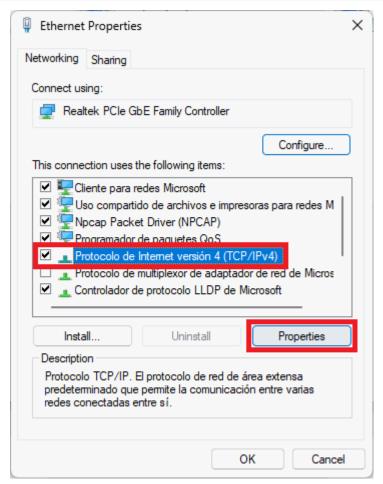
Ethernet connection 1

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



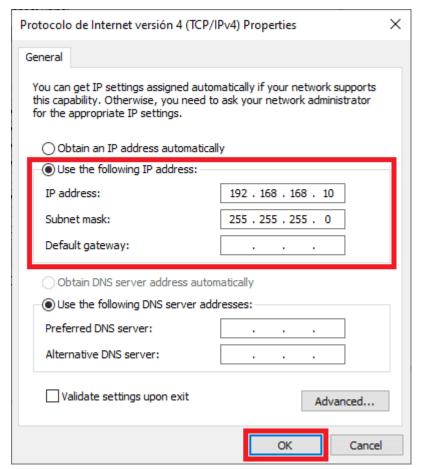
Ethernet connection 2

Select IPv4 and click Properties.



Ethernet connection 3

4. 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**.



Ethernet connection 4

Silvus radio (StreamCaster 4200E model)

System Layout

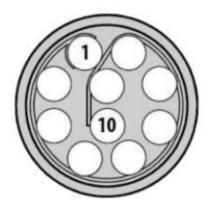
The following image shows the standard connection between **Silvus** radios and **Autopilot 1x** for operation:



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)

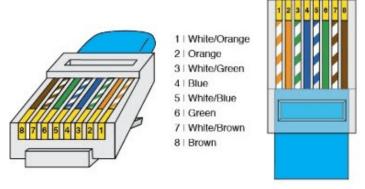
Power supply



Female DC Power Jack connector

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

Ethernet

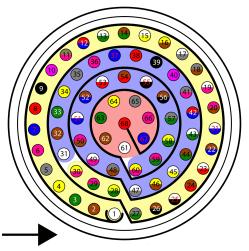


RJ45 pinout T-568B

Co	PRI port Connector - Silvus Radio		J45 Conn (T-568	
PIN	Signal	PIN	Signal	Color Code
4	ETH0_MX2N (RX-)	6	RX-	Green
5	ETH0_MX2P (RX+)	3	RX+	Green- White
6	ETHO_MX1P (TX+)	1	TX+	Orange- White
10	ETHO_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		
PIN	Signal	PIN	Signal	Color Code
7	RS232_RXD	19	RS 232 1 TX	White- Pink
8	RS232_TXD	20	RS 232 1 RX	Pink- Brown
9	GND	21	GND	White- Blue

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

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.
- Connect power supply to power port on PRI cable.
- 3. Connect non-forked female side of PRI cable to radio's PRI port.

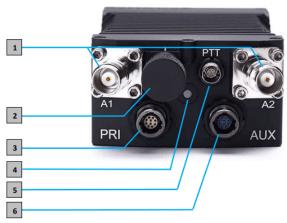


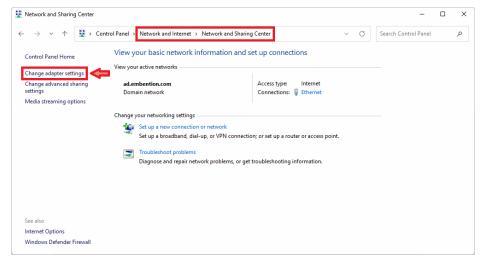
Figure 3 StreamCaster 4200E Ruggedized Enclosure

- 1 RF Channels 1-2 Connectors [TNC Female]
- Power Switch [15-Position Rotating]
- 3 Power (EB Version Only, 9-20V), Ethernet, and Serial Port Connector [ODU GK0YAR-P10UC00-000L]
- Bi-Color Status LED
 - Red Radio is in the process of booting up
 - Flashing Green Radio is fully booted but not wirelessly connected to any other radio
 - Green Radio is wirelessly connected to at least one other radio

Silvus connectors

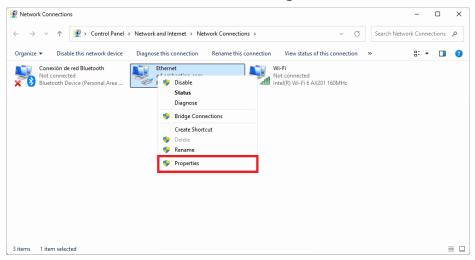
- 4. When looking at the rotary multi position switch from the top, pull the knob towards you while rotating the knob towards the 1 position.
 - This turns radio on. LED indicator will turn to fix red.
- 5. In order to access the StreamScape graphical user interface (GUI), connect Ethernet (RJ45) connector of PRI cable to Ethernet port of laptop/computer.
- 6. Make sure computer is set to static IP address on same subnet as radio.

 The following substeps clarify how to set the IP address:
 - Open Network and Sharing Centre menu and click Change adapter settings.



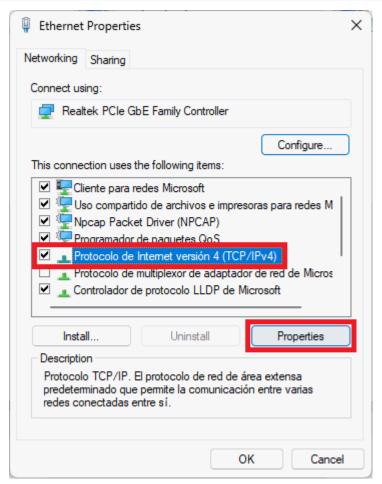
Ethernet connection 1

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



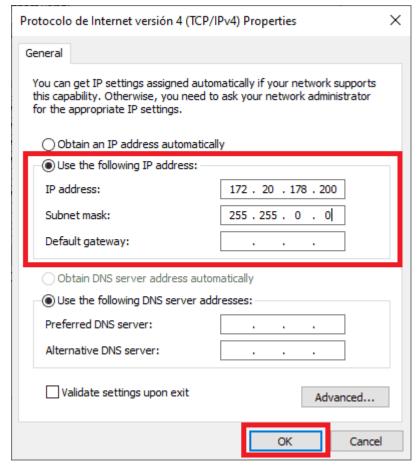
Ethernet connection 2

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



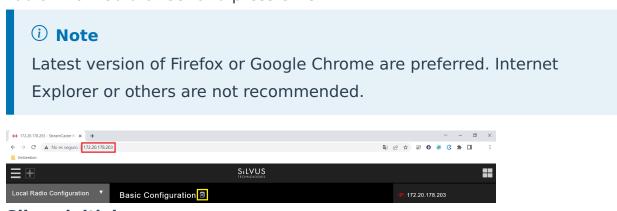
Ethernet connection 3

4. 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**.



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

9. 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.

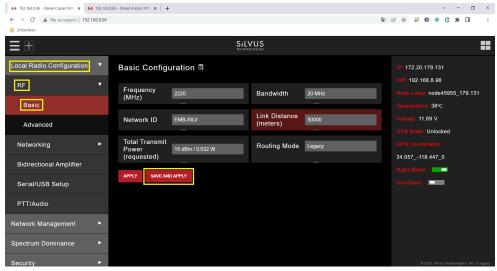
(i) Note

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.



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

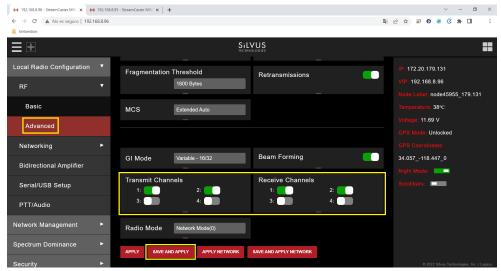
Be careful when choosing the frequency. The user may see interference with the Wifi frequency band, consult the radio spectrum.

• **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.

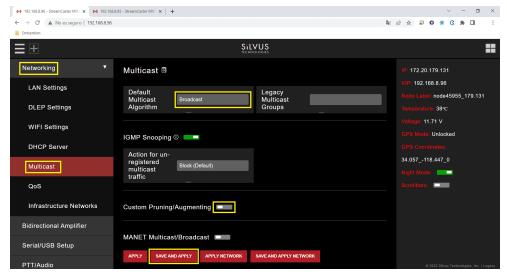
A radio with a given Network ID will only communicate with other radios with the same Network ID.

- 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.



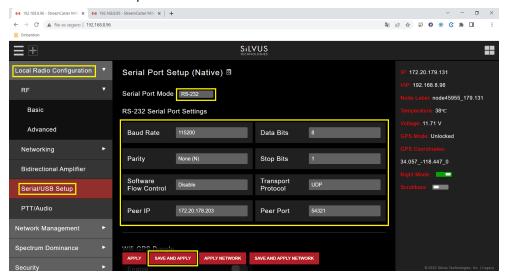
Advanced configuration panel

- 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.



Multicast panel

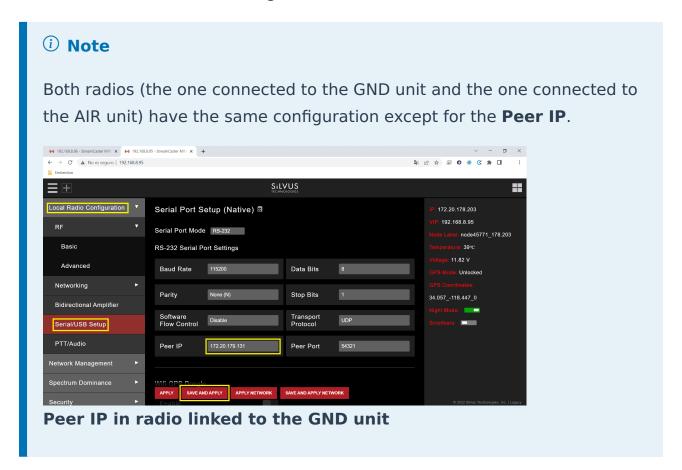
- Default Multicast Algorithm: Broadcast.
- Custom Pruning/Augmenting: Disable.
- 4. Serial/USB Setup



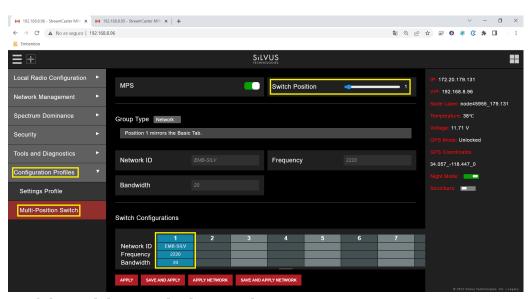
RS-232 settings

- 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.



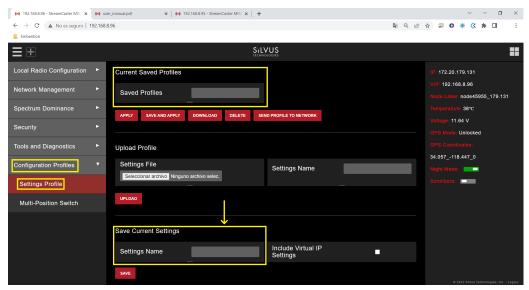
In addition to these settings, different configurations can be stored in the same radio, on the **Multi-Position Switch** panel. The user can select the one that will work, with the radio's switch position.



Multi-Position Switch panel

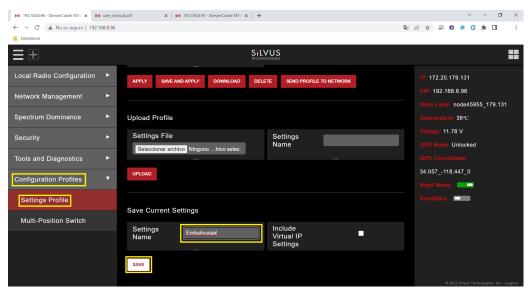
In this example only one configuration has been created.

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.

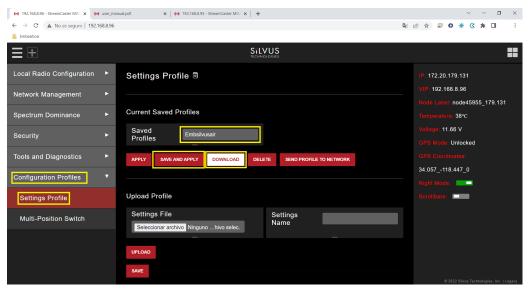


Settings Profile panel

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



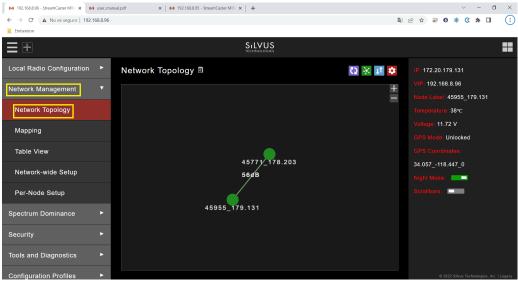
Save settings



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.

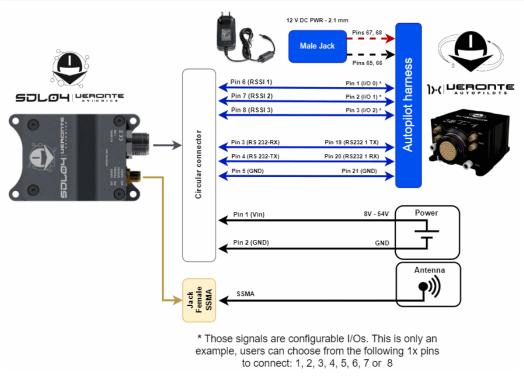


Operation diagram

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.



Connections diagram

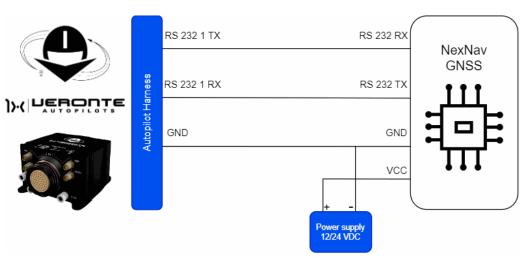
GNSS Receivers

NexNav GNSS



NexNav GNSS

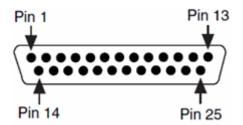
NexNav GNSS sensor integrates with Autopilot 1x via RS232 connection.



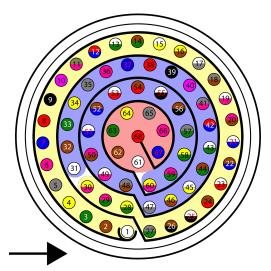
NexNav GNSS - Autopilot 1x wiring diagram

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

Autopilot 1x Harness		NexNav GNSS Connector		
PIN	Signal	Color Code	PIN	Signal
19	RS232 1 TX	White- Pink	20	RS-232 RX, Port 1
20	RS232 1 RX	Pink- Brown	7	RS-232 TX, Port 1
21	GND		10	

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

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

Marning

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

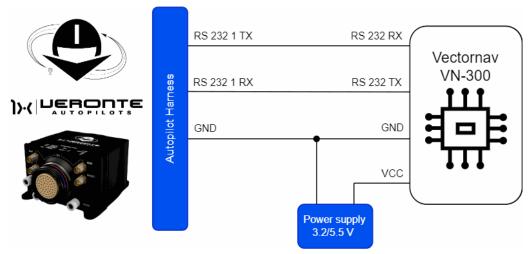
IMUs

Vectornay VN-300



Vectornay VN-300

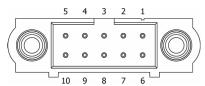
Vectornav VN-300 is an **external IMU** that can be connected via **RS-232** (serial interface) to **Veronte Autopilot 1x**.



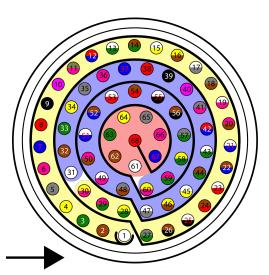
Vectornav VN-300 - Autopilot 1x wiring diagram

Important

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



Vectornav VN-300 connector pinout



Autopilot 1x harness pinout

Autopilot 1x Harness		VectorNav VN-300 Connector		
PIN	Signal	Color Code	PIN	Signal
19	RS232 1 TX	White- Pink	1	RX1
20	RS232 1 RX	Pink- Brown	2	TX1
21	GND	White- Blue	5	GND

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

△ Warning

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

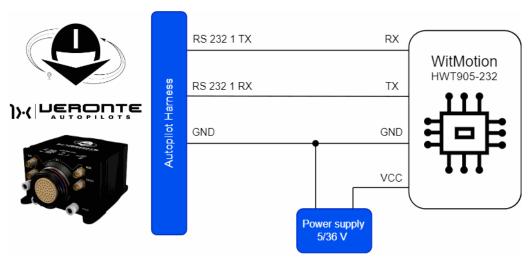
Once the IMU is connected, the user must proceed to its software integration with **Veronte Autopilot 1x** by referring to the Vectornav VN-300 - Integration examples of the **1x PDI Builder** user manual.

WitMotion HWT905-232



WitMotion HWT905-232

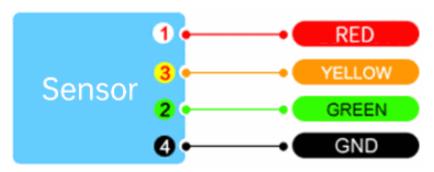
Vectornav VN-300 is an **external IMU** that can be connected via **RS-232** (serial interface) to **Veronte Autopilot 1x**.



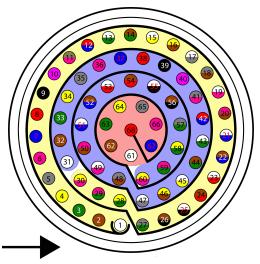
WitMotion HWT905-232 - Autopilot 1x wiring diagram

Important

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



WitMotion HWT905-232 connector pinout



Autopilot 1x harness pinout

	Autopilot 1x Harness Connect			232	
PIN	Signal	Color Code	PIN	Signal	Color Code
19	RS232 1 TX	White- Pink	2	RX	Green
20	RS232 1 RX	Pink- Brown	3	TX	Yellow
21	GND	White- Blue	4	GND	Black

(i) Note

The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.



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.

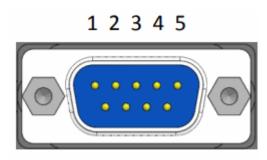
Magnetometers

Magnetometer Honeywell HMR2300



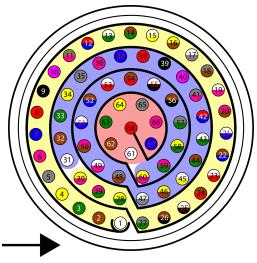
Magnetometer Honeywell HMR2300

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

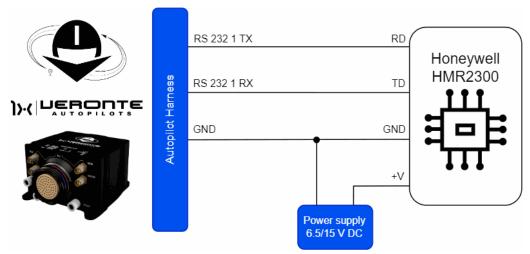
Magnetometer Honeywell HMR2300 connector pinout



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:

Autopilot 1x Harness		Ho	netometer neywell 1R2300 nnector	
PIN	Signal	gnal Code Pil		Signal
19	RS232 1 TX	White- Pink	3	RD
20	RS232 1 RX	Pink- Brown	2	TD
21	GND	White- Blue	5	GND

(i) Note

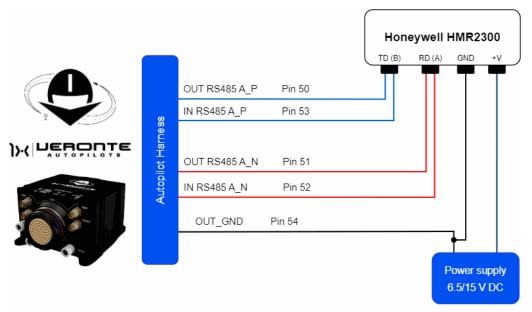
The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

△ 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:

Autopilot 1x Harness		Magnetometer Honeywell HMR2300 Connector		
PIN	Signal	Color Code	PIN	Signal
50	OUT RS485 A_P	Pink- Brown	2	TD (B) Transmit
53	IN RS485 A_P	White- Red		Data, RS-485 (B+)
51	OUT RS485 A_N	White- Blue	3	RD (A) Receive

Autopilot 1x Harness		Н	gnetometer oneywell IMR2300 onnector	
PIN	Signal	Color Code	PIN	Signal
52	IN RS485 A_N	Brown- Blue		Data, RS-485 (A-)
54	OUT_GND	Brown- Red	5	GND

⚠ Warning

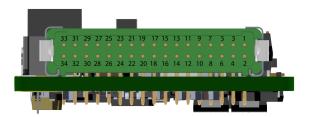
Note that this pin 54 is not a common GND pin.

(i) Note

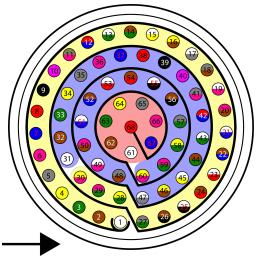
- The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: RS 485 A or RS 485 B. For more information about these pins, refer to the Pinout Hardware Installation section of the present manual.
- If users encounter any problems during wiring, please check the 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 nnector
PIN	Signal	Color Code	PIN	Signal
25	CANA_P	White-Black	22	CAN A (P)

A	Autopilot 1x Harness			MEX nnector
PIN	Signal	Color Code	PIN	Signal
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)
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	
10	RS232 1	White- Pink	16	RS-232 (A) RX	
19	TX		19	RS-232 (B) RX	
20	20 RS232 1 RX	Pink- Brown	15	RS-232 (A) TX	
20			18	RS-232 (B) TX	
21	GND	White- Blue	17	GND	



The user has the option to configure either of the two available RS-232 lines on the Autopilot 1x: **RS 232 1** or **RS 232 2**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

⚠ 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 A_P	Pink- Brown	33	IN RS-485 (P)

Autopilot 1x Harness			MEX Connector	
PIN	Signal	Color Code	PIN	Signal
51	OUT RS485 A_N	White- Blue	31	IN RS-485 (N)
52	IN RS485 A_N	Brown- Blue	32	OUT RS-485 (N)
53	IN RS485 A_P	White- Red	30	OUT RS-485 (P)
54	OUT_GND	Brown- Red	34	RS-485 GND

△ Warning

Note that, in ${f Autopilot}\ {f 1x}$, this pin 54 is not a common GND pin.

(i) Note

- The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: RS 485 A or RS 485 B. For more information about these pins, refer to the Pinout Hardware Installation section of the present manual.
- If users encounter any problems during wiring, please check the Halfduplex servo does not respond - Troubleshooting section of this manual.

! Important

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

PNI RM3100

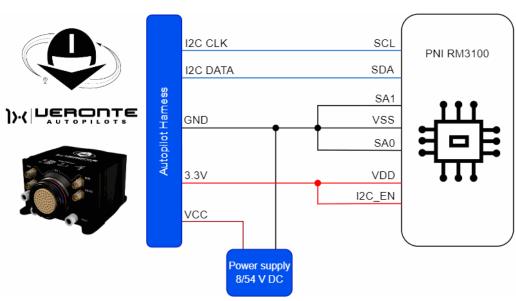


PNI RM3100-CB

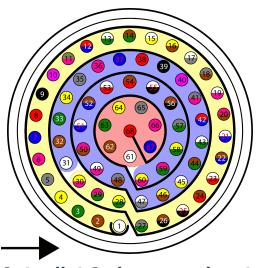
PNI RM3100-CB magnetometer must be connected to Autopilot 1x via I2C.

Important

This integration example is described for the **RM3100-CB**.



PNI RM3100-CB - Autopilot 1x wiring diagram



Autopilot 1x harness pinout

Autopilot 1x Harness		PNI RM3100-CB Connector		
PIN	Signal	Color Code	PIN	Signal
31	I2C_CLK	White	1	SCL
32	I2C_DATA	Brown	3	SDA
33	GND	Green	4	VSS Ground
			2	SA1 Bit 1 of slave address
			7	SA0 Bit 0 of slave address
34	3.3V	Yellow	8	VDD Supply Voltage

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

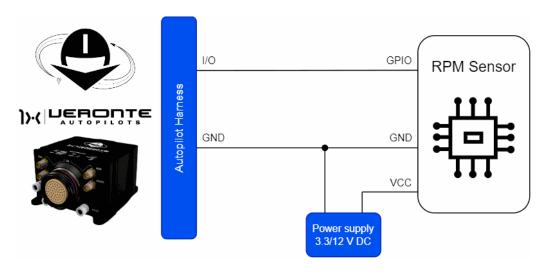
⚠ Warning

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.

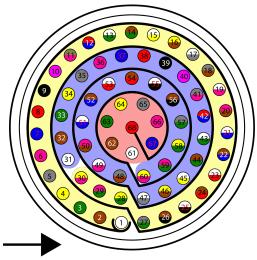
RPM Sensors

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

Autopilot 1x Harness				
PIN	Signal	Color Code		
1	1/00	White		
2	I/O1	Brown		
3	1/02	Green		
4	1/03	Yellow		
5	1/04	Gray		
6	1/06	Pink		
7	1/05	Blue		
8	1/07	Red		
9	GND	Black		

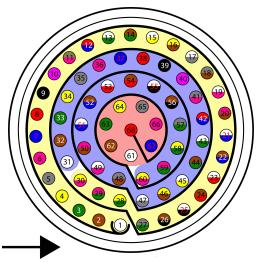
Autopilot 1x Harness			
PIN	Signal	Color Code	
55	EQEP_A	White-Black	
56	EQEP_B	Brown-Black	
57	EQEP_S	Gray-Green	
58	EQEP_I	Yellow-Green	
59	GND	Pink-Green	

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

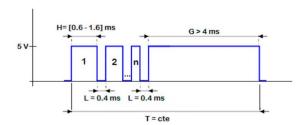
Veronte Autopilot 1x is compatible with joysticks that use PPM, CAN bus, USB, Serial, etc.

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



Autopilot 1x harness pinout

Autopilot 1x Harness			
PIN	Signal	Color Code	
1	1/00	White	
2	1/01	Brown	
3	1/02	Green	
4	1/03	Yellow	
5	1/04	Gray	
6	1/06	Pink	
7	1/05	Blue	
8	1/07	Red	
9	GND	Black	
55	EQEP_A	White-Black	
56	EQEP_B	Brown-Black	
57	EQEP_S	Gray-Green	
58	EQEP_I	Yellow-Green	
59	GND	Pink-Green	

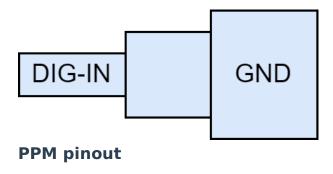


PPM signal

△ 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 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.

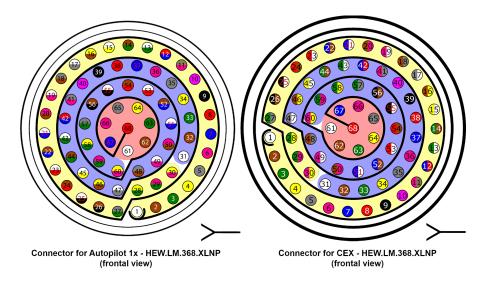
Veronte products

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:



Autopilot 1x Connector			CE	X Conne	ctor
PIN	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		CEX Connector		ctor
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.

Marning

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.

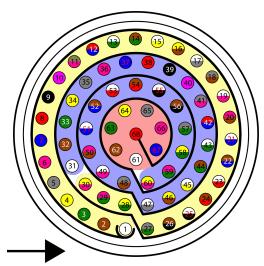
However, any connections made must be **consistent** with the **configuration** made at software level in 1x PDI Builder and CEX PDI Builder.

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
25	CANA_P	White- Black	9	CAN	White
28	CANB_P	Yellow- Green	9	(P)	
26	CANA_N	Brown- Black	8	CAN	Cray
29	CANB_N	Pink- Green	0	(N)	Gray

Autopilot 1x harness			MC01 connector		
PIN	Signal	Color code	PIN	Signal	Color
30	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.

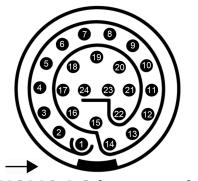
⚠ Warning

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

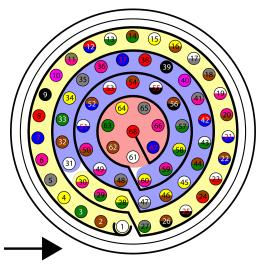
Once **MC01** has been properly wired with the **Autopilot 1x**, users can proceed to the software integration detailed in the MC01 - Integration examples section of the **1x PDI Builder** user manual.

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 arness	
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			_	MC110 arness
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

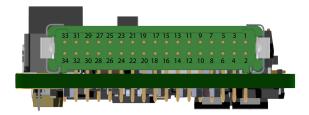
Integration is also possible by connecting CAN A of the **Autopilot 1x** to CAN B of the **MC110** and vice versa, i.e. it does not necessarily have to be CAN A-CAN A or CAN B-CAN B.

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

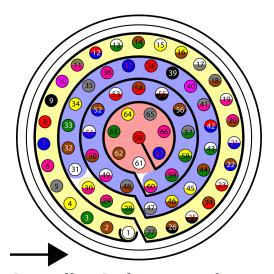
MEX connection

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 nector	
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			_	MEX 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.



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 1**x
- 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.

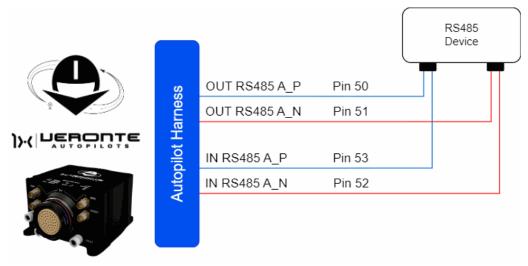
(i) Note

Dev Harness 1x 4.12 (Embention reference P011121) 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:

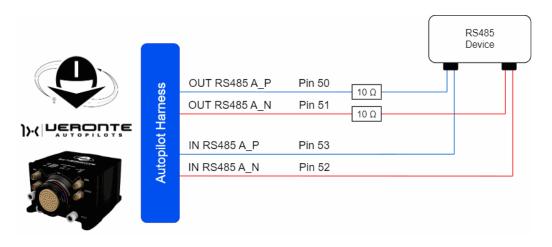


Normal connection between 1x and servo

(i) Note

The user has the option to configure either of the two available RS-485 lines on the Autopilot 1x: **RS 485 A** or **RS 485 B**. For more information about these pins, refer to the Pinout - Hardware Installation section of the present manual.

Sometimes this connection does not work, because the servo has not enough transmission power. In this case, a couple of 10 Ω resistors may solve the problem. Both resistors have to be placed at the trasmission line of the **Autopilot 1x**.



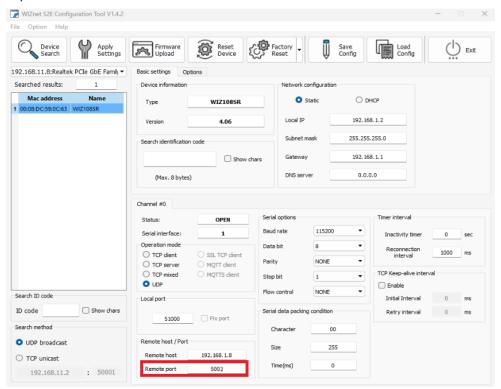
Resistors connection between 1x and servo

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).

UDP Failed Connection

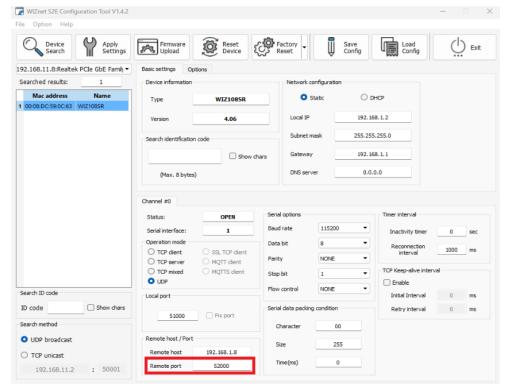
If setting up the autopilot with an RS-485 connection via UDP on port 5002, and it is not detected by **Veronte Link**, please check the following steps:

1. Open Wiznet Software and check Remote Port.



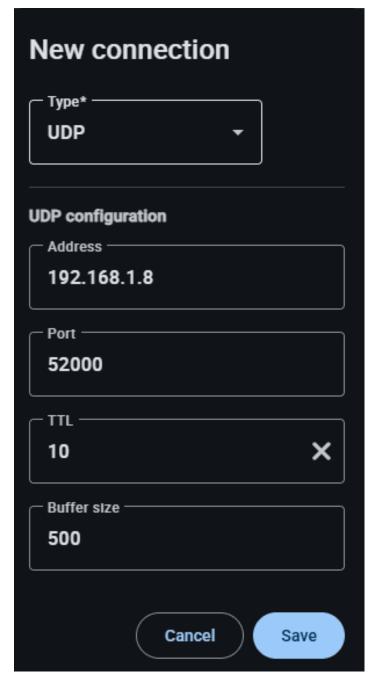
WIZnet Configuration Panel

2. Change Remote Port 5002 to a different port. In this example, Remote Port 52000 is selected.



WIZnet Configuration Panel

3. Afterward, configure the UDP Connection in **Veronte Link** with the same parameter value.



UDP Connection Panel

4. Click on Save.

Hardware Changelog

Hereby are described the main differences between the latest release of the **Veronte Autopilot 1x** hardware (v **4.12**) and the previous commercial version (v **4.8**).



Specifications

Mechanical			
	4.8	4.12	
Mating connector	Circular mating connector with 68 pins		
Enclosure	Anodized aluminum		
Weight	W/O DAA variant: 198 g Remote ID variant: 210g ADS-B variant: 210g	Remote ID variant: 208g ADS-B variant: 209g	
Dimensions	76 x 65 x 40 mm		

Mechanical			
	4.8 4.12		
Protection rating	IP	67	
Mounting	M3 screws		
Temperature range (no convection)	-40 to 65 ºC		
Pressure port	SMC M5 series system. Usable with 2.5 x 4 mm polyurethane		
RF connectors	SSMA jack female		

I/O (on base hardware - expansion boards available)			
	4.8 4.12		
Vin	2 x (6.5 - 36 V) DC	2 x (8 - 54 V) DC	
Vout	5 & 3.3 V		
GNSS antenna power supply	3.3V 5V		
PWM / GPIO	Up to 16 (3.3V)	Up to 8 (5V)	
RS232	1 x	2 x	

I/O (on base hardware - expansion boards available)			
	4.8	4.12	
RS485	1 x	2 x	
CAN bus	2 x CAN 2.0 buses	2 x CAN 2.0 buses 1 x CAN FD bus	
I2C		1 x	
FTS	Deadman output (GPIO) Dedicated power supply Independent datalink inpu		
ADC	5 x signals 3.3 V	3 x signals 5 V 2 x signals 36 V	
EQEP		1 x	
UART	1 x	2 x	
USB	1 x	-	
Ethernet	-	1 x	
LOS module	1 x	-	
BLOS module	1 x	1 x	

Sensors			
	4.8 4.12		
Number of static pressure sensors	2		
Static pressure range	-	120,000 Pa 120,000 Pa	
Static pressure band error	_	00 Pa 00 Pa	
Static pressure resolution	1) 1.2 to 6.5 Pa 2) 0.5 Pa		
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	140 Pa		
Dynamic pressure resolution	0.42 Pa		
Number of accelerometers (3 axis each)	3 2		
Accelerometer range	1) ±16 g 2) ±24 g 3) ±8 g	2) ±24 g 3) ±8 g	

Sensors			
4.8		4.12	
Accelerometer max. shock	1) 20,000 for 0.2 ms 2) 10,000 g/ms 3) 14,700 m/s ²	2) 10,000 g/ms 3) 14,700 m/s ²	
Accelerometer sensitivity	1) 16,393 LSB/(m/s ²) 2) 10,920 LSB/(m/s ²) 3) 26,756,268 LSB/(m/s ²)	2) 10,920 LSB/(m/s²) 3) 26,756,268 LSB/(m/s²)	
Number of gyroscopes (3 axis each)	3	2	
Gyroscope range	1) 125 to 2,000 °/ s 2) 125 to 2,000 °/ s 3) 2,000 °/s	2) 125 to 2,000 º/s 3) 2,000 º/s	
Gyroscope sensitivity	1) 228 to 14.2 LSB/º/s 2) 262 to 16 LSB/ º/s 3) 655,360 to 10 LSB/º/s	2) 262 to 16 LSB/º/ s 3) 655,360 to 10 LSB/º/s	
Number of magnetometers	3	2	

Sensors			
	4.8		
Magnetometer range	0) 4 gauss1) 8 gauss2) 11 gauss	0) 4 gauss2) 11 gauss	
Magnetometer sensitivity	0) 6,842 to 1,711LSB/gauss1) 4,096 LSB/gauss2) 0.13 mgauss	0) 6,842 to 1,711LSB/gauss2) 0.13 mgauss	
Number of GNSS units	2	3	
GNSS constellations	1) & 2) BeiDou, Galileo, GLONASS, GPS/QZSS	1) & 2) BeiDou, Galileo, GLONASS, GPS, QZSS, SBAS 3) GPS + SBAS (compatible with WAAS, EGNOS, GAGAN, MSAS)	
Concurrent GNSS constellations	1) & 2) Up tp 4 constellations simultaneously	1) & 2) Up tp 4 constellations simultaneously 3) 1	
GNSS bands	1) & 2) L1 C/A, L2C, L1OF, L2OF, E1 B/C, E5b, B1I, B2I	1) & 2) L1 C/A, L2C, L1OF, L2OF, E1 B/C, E5b, B1I, B2I 3) L1 C/A (1575.42 MHz)	

Sensors			
	4.12		
RTK Suport	1) & 2) Yes (via RTCM 3.x or PPP- RTK with SPARTN/ CLAS)	1) & 2) Yes (via RTCM 3.x or PPP- RTK with SPARTN/ CLAS) 3) Not supported	
RTK Position Accuracy	1) & 2) 0.01 m + 1 ppm CEP	1) & 2) 0.01 m + 1 ppm CEP 3) -	
Update Rate	1) & 2) RTK: Up to 5 Hz	1) & 2) RTK: Up to 5 Hz 3) 4 Hz	
Certificate	1) & 2) No TSO certification	1) & 2) No TSO certification3) TSO-C199 Class B compliance	

Computing power

- Ram x 2: The available system memory (RAM) has been doubled (2x). This allows for more complex operations, larger mission profiles, and improved multitasking performance.
- Enhanced Processing Performance: Featuring an upgraded processor and an enhanced system architecture, the overall computing performance has been increased by over 25%. This provides more processing power for advanced navigation filters, onboard calculations, and future capabilities.

Sensors

• **Enhanced GNSS modules**: Which deliver higher precision and robustness, more accurate GNSS heading, improved jamming and spoofing detection, and enhanced RTK performance with better error reporting.

- Added 3rd GNSS module with TSO C199 approval: A third, independent GNSS module has been incorporated, meeting FAA standards for TSO-C199. This adds a critical layer of redundancy and certified performance for demanding operations.
- **Enhanced magnetometer** isolation: The magnetometer has been physically and electrically isolated from other onboard systems. This change significantly reduces magnetic interference, resulting in a more stable and reliable heading.

Integrated Independent SuC / FTS

A fully independent FTS / SuC module has been integrated directly into the hardware. This system is designed to provide a reliable safety mechanism that is segregated from the main autopilot functions.

- Compliance with Light-UAS.2511 Containment: Designed in accordance with EASA Light-UAS.2511 standards for containment, ensuring the aircraft can be commanded to remain within a defined operational volume.
- Independent datalink input: The FTS operates on a dedicated power supply and utilizes an independent datalink input. This ensures its availability even in the event of a main power or primary datalink failure.
- Includes a comprehensive suite of self-tests to verify the health and readiness of the termination system before flight.

Communications

- Enhanced LTE communications.
- Internal LOS module replaced by dedicated external LOS input. This new architecture allows users to connect a wider range of high-performance external LOS datalinks, offering greater flexibility and potentially improved RF performance by isolating the radio from onboard electronics.

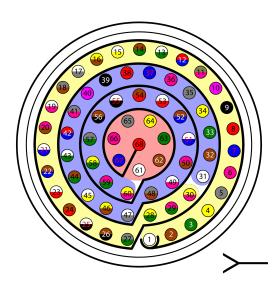
Robustness & Certification

This version introduces significant improvements to the hardware's physical and electrical resilience, along with key compliance updates.

- Enhanced Mechanical & Electrical Robustness: Autopilot 1x features a more robust physical construction, providing superior resistance to vibrations and shocks. Enhanced internal isolation has also been implemented to protect components and reduce interference.
- Upgraded Power System Protection: Includes enhanced protection
 against inrush current during power up, reverse polarity on all inputs, and
 an improved power input redundancy scheme.
- Internal GNSS module with TSO compliance
- Enhanced Signal Control on Startup: To prevent unintended activation of motors or other actuators during the power-on or reset sequence, all configurable I/O pins are protected against high-impedance (floating) states. Each pin is equipped with a hardware pull-down resistor, ensuring it maintains a safe, known-low state until actively driven by the autopilot software.

Pinout changes from Autopilot 1x 4.8

The pinout for the 4.12 version features several important changes from the 4.8. 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 1/O 0 1/O	1/0 0		4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.		
1				Warning Each pin withstands a maximum current of 1.65 mA .		
\triangle			I/O signal Protected ESD and circu Warnit Each withsta maximum	4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.		
				Warning Each pin withstands a maximum current of 10 mA.		
2	I/O 1	I/O	4.8: PWM / Digital I/			
					Protecte ESD a	O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a			

PIN	Signal	Туре	Description
			maximum current of 1.65 mA .
			4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 10 mA.
			4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
3	I/O 2	I/O	Warning Each pin withstands a maximum current of 1.65 mA .
			4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
			Warning Each pin

PIN	Signal	Туре	Description
			withstands a maximum current of 10 mA .
			4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
4	I/O 3	I/O	Warning Each pin withstands a maximum current of 1.65 mA .
			4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 10 mA.
5	I/O 4	I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.

PIN	Signal	Туре	Description
			Warning Each pin withstands a maximum current of 1.65 mA .
			4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 10 mA.
		I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
6	4.8: I/O 5		Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: I/O 6		4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short

PIN	Signal	Туре	Description
			circuit.
			Warning Each pin withstands a maximum current of 10 mA.
			4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
7	4.8: I/O 6	1/0	Warning Each pin withstands a maximum current of 1.65 mA .
\triangle		I/O	4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
	4.12: I/O 5		Warning Each pin withstands a maximum current of 10 mA.
8	I/O 7	I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against

PIN	Signal	Туре	Description
			ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
			4.12: PWM / Digital I/O signal (0-5V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 10 mA.
9	GND	GROUND	Ground signal for actuators 1-8

PIN	Signal	Туре	Description
10 <u>•</u>	4.8: I/O 8	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ETH_RX_P	4.12: Input	4.12: Ethernet. Receiver data positive.
11	4.8: I/O 9	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ETH_RX_N	4.12: Input	4.12: Ethernet. Receiver data negative.
12 <u>^</u>	4.8: I/O 10	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V).

PIN	Signal	Туре	Description
			Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ETH_TX_P	4.12: Output	4.12: Ethernet. Transceiver data positive.
13	4.8: I/O 11	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ETH_TX_N	4.12: Output	4.12: Ethernet. Transceiver data negative.
14	4.8: I/O 12	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.

PIN	Signal	Туре	Description
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ETH_CHASSIS	4.12: GROUND	4.12: Ethernet chassis (this pin is electrically connected to the external cover of the ethernet cable).
15 ♠	4.8: I/O 13	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: CANFD_P	4.12: I/O	4.12: High signal of CAN FD bus interface, up to 5 Mbps (2.75 - 4.5 V). Protected against ESD. Twisted pair with a 120 ohms Zo recommended.

PIN	Signal	Туре	Description
16 <u>↑</u>	4.8: I/O 14	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: CANFD_N	4.12: I/O	4.12: Low signal of CAN FD bus interface (0.5 - 2.25 V). Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
	4.8: I/O 15	4.8: I/O	4.8: PWM / Digital I/ O signal (0-3.3V). Protected against ESD and short circuit.
17			Warning Each pin withstands a maximum current of 1.65 mA .
	4.12: ARB_TX	4.12: NC	

PIN	Signal	Туре	Description
			4.12: (SuC UART) Reserved. Do not connect.
18	GND	GROUND	Common ground.
19	4.8: RS 232 TX	Output	4.8: RS 232 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit.
	4.12: RS232 1 TX		4.12: RS 232 channel 1 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit.
20	4.8: RS 232 RX	Input	4.8: RS 232 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold). Protected against ESD and short circuit.
	4.12: RS232 1 RX		4.12: RS 232 channel 1 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold).

PIN	Signal	Туре	Description
			Protected against ESD and short circuit.
21	GND	GROUND	Ground signal for buses.
22		Input Analog	4.8: Input 0-3.3V . Protected against ESD.
	ANALOG_3		4.12: Input 0-36V . Protected against ESD.
23		Input Analog	4.8: Input 0-3.3V . Protected against ESD.
	ANALOG_4		4.12: Input 0-36V . Protected against ESD.
24	GND	GROUND	Ground signal for buses.
25	CANA_P	I/O	High signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
26	CANA_N	I/O	Low signal of CAN 2.0 bus interface, up

PIN	Signal	Туре	Description
			to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
27	4.8: 4XV_WD	4.8: I/O	4.8: Reserved. Do not connect.
<u> </u>	4.12: UART_RX	4.12: Input	4.12: Microcontroller UART.
28	CANB_P	I/O	High signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
29	CANB_N	I/O	Low signal of CAN 2.0 bus interface, up to 1 Mbps. Protected against ESD. Twisted pair with a 120 ohms Zo recommended.
30	GND	GROUND	Ground signal for buses.
31	I2C_CLK	Output	Clk line for I2C bus (0.3V to 3.3V). Protected against ESD
32	I2C_DATA	I/O	Data line for I2C bus (0.3V to 3.3V).

PIN	Signal	Туре	Description
			Protected against ESD
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		4.8: Input 0-3.3V . Protected against ESD.
<u> </u>		4.12: Input 0-5V . Protected against ESD.	
39 <u>^</u>	ANALOG_1	Input	4.8: Input 0-3.3V . Protected against ESD.

PIN	Signal	Туре	Description
			4.12: Input 0-5V . Protected against ESD.
40	ANALOG_2	Input	4.8: Input 0-3.3V . Protected against ESD.
\triangle	ANALOG_2		4.12: Input 0-5V . Protected against ESD.
41	4.8: 4XV_A	4.8: I/O	4.8: Reserved. Do not connect.
\triangle	4.12: SEL	4.12: Input	4.12: 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	4.8: 4XV_B	4.8: I/O	4.8: Reserved. Do not connect.
\triangle	4.12: SEL	4.12: Input	4.12: Reserved. Do not connect.

PIN	Signal	Туре	Description
	4.8: UARTA_TX	4.8: Output	4.8: Microcontroller UART.
45 <u></u>	4.12: RS232 2 TX	4.12: Output	4.12: RS 232 channel 2 Output (-13.2V to 13.2V Max, -5.4V to 5.4V Typical). Protected against ESD and short circuit.
	4.8: UARTA_RX	4.8: Input	4.8: Microcontroller UART.
46	4.12: RS232 2 RX	4.12: Input	4.12: RS 232 channel 2 Input (-25V to 25V Max, -0.6V Low and 2.4V High Threshold). Protected against ESD and short circuit.
47	GND	GROUND	Ground signal comicro power supply
48	V_ARB_VCC	POWER	4.8: Veronte comicro power (6.5V to 36V). Protected against ESD and reverse polarity.

PIN	Signal	Туре	Description
			4.12: Veronte comicro power (8V to 54V). Protected against ESD and reverse polarity.
49	4.8: FTS3_OUT_MPU	4.8: Output	4.8: MPU alive voting signal, to use with 4xVeronte. It is a Square Wave at [100,125] Hz. Protected against ESD and short circuit.
	4.12: UART_TX	4.12: Output	4.12: Microcontroller UART.
50	4.8: OUT_RS485_P	Output	4.8: Non-inverted output from RS485 bus. Protected against ESD.
\triangle	4.12: OUT RS485 A _P		4.12: Non-inverted output from RS485 bus A . Protected against ESD.
51	4.8: OUT_RS485_N	Output	4.8: Inverted output from RS485 bus. Protected against ESD.

PIN	Signal	Туре	Description
	4.12: OUT RS485 A _N		4.12: Inverted output from RS485 bus A . Protected against ESD.
52	4.8: IN_RS485_N	Input	4.8: Inverted input from RS485 bus. Protected against ESD.
	4.12: IN RS485 A _N		4.12: Inverted input from RS485 bus A . Protected against ESD.
53	4.8: IN_RS485_P	Input	4.8: Non-Inverted input from RS485 bus. Protected against ESD.
	4.12: IN RS485 A _P		4.12: Non-Inverted input from RS485 bus A . Protected against ESD.
			Ground for RS-485 bus.
54	GND	OUT_GND	Warning This is not a common GND pin.
	EQEP_A	I/O	4.8: DIGITAL output / DIGITAL

PIN	Signal	Туре	Description
			input / Encoder quadrature input A (0-3.3V). Protected against ESD and short circuit.
55			4.12: DIGITAL output / DIGITAL input / Encoder quadrature input A (0-5V). Protected against ESD and short circuit.
			Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
56 ⚠ EQEP_B	EQEP_B	I/O	4.8: DIGITAL output / DIGITAL input / Encoder quadrature input B (0-3.3V). Protected against ESD and short circuit.
			4.12: DIGITAL output / DIGITAL input / Encoder quadrature input B (0-5V). Protected

PIN	Signal	Туре	Description
			against ESD and short circuit.
			Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
		I/O	4.8: DIGITAL output / DIGITAL input / Encoder quadrature input strobe (0-3.3V). Protected against ESD and short circuit.
57	EQEP_S		4.12: DIGITAL output / DIGITAL input / Encoder quadrature input strobe (0-5V). Protected against ESD and short circuit.
			Warning Configured as oputput, it withstands a maximum current of 1.65 mA.

PIN	Signal	Туре	Description
58 ♠	EQEP_I	I/O	4.8: DIGITAL output / DIGITAL input / Encoder quadrature input index (0-3.3V). Protected against ESD and short circuit.
			4.12: DIGITAL output / DIGITAL input / Encoder quadrature input index (0-5V). Protected against ESD and short circuit.
			Warning Configured as oputput, it withstands a maximum current of 1.65 mA.
59	GND	GROUND	Ground for encoders
60 <u></u>	4.8: V_USB_DP	4.8: I/O	4.8: Veronte USB data line. Protected against ESD.
	4.12: OUT RS485 B _P	4.12: Output	4.12: Non-inverted output from RS485 bus B. Protected

PIN	Signal	Туре	Description
			against ESD and short circuit.
	4.8: V_USB_DN	4.8: I/O	4.8: Veronte USB data line. Protected against ESD.
61	4.12: OUT RS485 B _N	4.12: Output	4.12: Inverted output from RS485 bus B. Protected against ESD and short circuit.
	4.8: USB_SHIELD_GND	4.8: GROUND	4.8: USB cable shielding.
62	4.12: IN RS485 B _N	4.12: Input	4.12: Inverted input from RS485 bus B. Protected against ESD and short circuit.
63 <u>↑</u>	4.8: FTS_OUT_MPU	4.8: Output	4.8: Abort mission voting signal 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.

PIN	Signal	Туре	Description
	4.12: IN RS485 B _P	4.12: Input	4.12: Non-inverted input from RS485 bus B. Protected against ESD and short circuit.
64 <u>↑</u>	4.8: FTS2_OUT_MPU	4.8: Output	4.8: 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.
	4.12: ARB_RX	4.12: NC	4.12: (SuC UART) Reserved. Do not connect.
65	GND	GROUND	Veronte ground input
66	GND	GROUND	Veronte ground input
67	VCC	POWER	4.8: Veronte power supply (6.5V to 36V). Protected against ESD and

Warning

reverse polarity.

Pins 67 and 68 are common.

PIN	Signal	Туре	Description
	VCC POWER		They MUST be connected to the same power supply.
68 <u>↑</u>		POWER	4.12: Veronte power supply (8V to 54V). Protected against ESD and reverse polarity.
		Warning Pins 67 and 68 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.

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
CAP	Capture Module

Acronym	Description
СЕР	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
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
TKO	Take Off Phase
TX	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