# UM.305-1x

Release 4.5

Embention

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Veronte Autopilot 1x is a miniaturized high reliability avionics system for advanced control of unmanned systems.

ONE

### **INTRODUCTION**



Fig. 1: Veronte Autopilot 1x 4.5

**Veronte Autopilot 1x** is a miniaturized high reliability avionics system for advanced control of unmanned systems. This control system embeds a set of sensors and processors together with LOS and BLOS M2M datalink radio, all with reduced size and weight.

The unique **Plug 'n Fly** control system, Autopilot ads fully autonomous control capabilities to any unmanned system for complete operation, compatible with: UAV, Drone, RPAS, USV, UGV...

**Veronte Autopilot 1x** is a miniaturized high reliability avionics system for advanced control of unmanned systems. This control system embeds a set of sensors and processors together with LOS and BLOS M2M datalink radio, all with reduced size and weight.

**4X Veronte Autopilot** is a triple redundant version of Veronte Autopilot. It includes three complete **Autopilots 1x** fully integrated with a dissimilar arbiter for detecting system failures and selecting the module in charge of control.

# QUICK START

This user manual covers the *mechanical* and *electric* assembly. The software user manual explain how to configure and use the **Veronte Autopilot 1x**.

**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 as air unit, 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 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.
- A BCS or PCS as ground unit, it is linked between Veronte software and Veronte Autopilot 1x air unit. They support manual and arcade modes with conventional joysticks.

Veronte applications are different for different software versions:

- Version 6.4 or lower: Veronte Pipe is employed as unique application to work with Veronte.
- Version 6.8 or higher: Veronte Link connects the autopilot with a computer, which uses Veronte Ops to mission planning, configuration and operation.

# 2.1 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.

# 2.2 Limited Operation Firmware

Veronte Autopilot units are delivered with limited-operation firmware installed and must be updated for enabling unlimited autonomous flight capabilities. **Operation limits** in Veronte Autopilots, with software version 6.8 or higher, it can be **checked and unlocked in** Veronte Ops. For more information, read the Veronte Ops manual.

The different operating firmware options available are explained below:

• Standard Firmware: Allows fully autonomous operation with no time or distance limitation.

- Limited-Operation Firmware: Allows fully autonomous flight performance in LOS (500m) with no time limitations. For BLOS operations (>500m) there is a limitation of 30min autonomous flights. After 30min from leaving LOS (500m) the autopilot can not estimate its position nor fly autonomously.
- **Target Drone/Loitering Munition Firmware**: allows fully autonomous flight performance with no time or distance limitation. This firmware is restricted to 50h 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 firmware capabilities and limitations please contact us at sales@embention.com.

### THREE

### **TECHNICAL**

**Veronte Autopilot 1x** is a miniaturized high-reliability avionics system for advanced control of unmanned systems. This control system embeds a set of sensors and processors together with LOS, BLOS, M2M and datalink radio, all with reduced size and weight.

### 3.1 Variants

Veronte Autopilot 1x has two variants:

- With enclosure: this variant is provided with an anodized aluminium enclosure, IP protection and an enhanced EMI shielding. A high reliability connector is also provided. The total weight is 190 g.
- **OEM:** Autopilot 1x can be provided as OEM version too, with a reduzed weight of 90g.

# 3.2 Mechanical Specifications

Variable	Value
Weight (with enclosure	190 g
and connector)	
Weight (OEM)	90 g
Minimum Temperature	-40 °C
Maximum Temperature	+55°C (No convection, ask for increased limits (up to 71°C))
Max. Internal	+85°C
Temperature	
Minimum Pressure	0 kPa
Maximum Pressure	104 kPa
Maximum Dynamic	6 kPa (Ask for increased limits (up to 50kPa))
pressure	
Protection Rating	IP67 enclosure version
Acceleration Limits (3	$\pm 2$ g to $\pm 16$ g (for sustained maneuvers, transitional higher accelerations are possible
axes)	(e.g. catapult launch). Ask for increased limits.)
Angular Velocity Limits	$\pm 125$ deg/s to $\pm$ 2000 deg/s (for sustained maneuvers, transitional higher angular
(3 axes)	velocities are possible. Ask for increased limits.)

#### 3.2.1 Dimensions



Fig. 1: With enclosure dimensions



Fig. 2: **OEM dimensions** 

### 3.3 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.

# **3.4 Electrical Specifications**

Variable	Value
Power Input Magnetic Field	6.5 V to 36 V $\pm$ 4 to $\pm$ 16 Gauss
Limits (3 axes)	
GNSS	72 channels, GPS L1C/A, GLONASS L1OF, BeiDou B1I
Datalink	410 to 480 MHz licensed or FHSS/902-928MHz FHSS/2.4 to 2.483 GHz ISM
	Band/869.5-869.75 MHz ISM Band

### 3.5 Interfaces

### 3.5.1 Connector Layout



Index	Connector
1	LOS SSMA connector
2	GNSS1 SSMA connector
3	Static pressure port (Fitting 5/64in) [for MS56 and DPS310 sensors]
4	Static pressure port (Fitting 5/64in) [for HSC sensor]
5	M2M SSMA connector
6	GNSS2 SSMA connector
7	TPDR (Transponder) SSMA connector
8	Dynamic pressure port (Fitting 5/64in)
9	68-pin connector

For the pressure ports, mating with clamped 2mm internal diameter flexible tubing is recommended.

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

### 3.5.2 Mating Connectors

Index Connector		Mating Connector
1	RF antenna	SSMA male Plug, low-loss cable is recommended.
	(SSMA Jack	
	Female)	
2,6	GNSS antenna	SSMA male Plug, low-loss cable is recommended. Active Antenna GNSS: Gain min 15dB
	(SSMA Jack	(to compensate signal loss in RF Cable) max 50dB, maximum noise figure 1.5dB, power
	Female)	supply 3.3V max current 20 mA
5	M2M antenna	SSMA male Plug, low-loss cable is recommended.
	(SSMA Jack	
	Female)	
7	TPDR antenna	SSMA male Plug, low-loss cable is recommended.
	(SSMA Jack	
	Female)	
9	Connector	Mating connector P/N: FGW.LM.368.XLCT Mating harness is available on demand.
	HEW.LM.368.X	LNP

### FOUR

### HARDWARE INSTALLATION

### 4.1 Mechanical assembly

**Veronte Autopilot 1x** is manufactured using an anodized aluminium enclosure with enhanced EMI shielding and IP protection. A high reliability connector is also provided. The total weight is 190 g for enclosure version and 90 g for OEM.

#### 4.1.1 Dimensions



Fig. 1: Veronte Autopilot 1x dimensions

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

### 4.1.2 Pressure lines

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.

**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.

#### 4.1.3 Location

The location of **Veronte Autopilot 1x** has no restrictions. It is only required to configure its relative position 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 reading the manual of the corresponding software.

### 4.1.4 Orientation

The orientation of **Veronte Autopilot 1x** has no restrictions either. It is only needed 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 reading the manual of the corresponding software.

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



Fig. 2: Aircraft Coordinates (Standard Aeronautical Convention)

#### 4.1.5 Vibration Isolation

Although **Veronte Autopilot 1x** rejects noise and high-frequency modes of vibration with electronic filters and internal mechanical filters, there might be situations where external isolation components might be needed.

Autopilot 1x can be mounted in different ways in order to reject the airframe vibration. The simplest way could be achieved by just using double-sided tape on the bottom side of Veronte. Other ways may use some external structure which could be rigidly attached to the airframe and softly attached to Veronte (e.g. foam, silent blocks, aerogel, etc).



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

In cases where mechanical isolation is not viable, it is possible to use soft engine mounts. It is also recommended when there are other sensible payloads like video cameras or for high vibration engines.

# 4.2 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 1 Nm 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.

# 4.3 Electrical

#### 4.3.1 Power

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

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

**Warning: Caution!!** Power Veronte out of the given range can cause irreversible damage to the system. Please read carefully the manual before powering the system.

Veronte 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.

### 4.3.2 Veronte Autopilot 1x I/O Signals



Fig. 3: 68 pin connector for Autopilot 1x (frontal view)

Pin	Signal	Туре	Comments
1	I/O1	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
2	I/O2	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
3	I/O3	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
4	I/O4	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit

Pin	Signal	Туре	Comments
5	I/O5	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
6	I/O6	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
7	I/O7	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
8	I/O8	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
9	GND	GROUND	Ground signal for
			actuators 1-8
10	I/O9	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
11	I/O10	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
12	I/O11	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
13	I/O12	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
14	I/O13	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
15	I/O14	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
16	I/O15	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
17	I/O16	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
L			

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Pin	Signal	Туре	Comments
18	GND	GROUND	Ground signal for
			actuators 9-16
19	RS 232 TX	Output	RS 232 Output (-13.2V
			to 13.2V Max, -5.4V to
			5.4V Typical). Protected
			against ESD and short
			circuit
20	RS 232 RX	Input	RS 232 Input (-25V to
			25V Max, -0.6V Low and
			2.4V High Threshold).
			Protected against ESD
			and short circuit
21	GND	GROUND	Ground signal for buses
22	Analog 4	Input Analog	Input 0-3V. Protected
	_		against ESD and short
			circuit
23	Analog 5	Input Analog	Input 0-3V. Protected
			against ESD and short
			circuit
24	GND	GROUND	Ground signal for buses
25	CanA P	I/O	CANbus interface, up to
			1Mbps (2.3V Typical,
			1.2V-2.3V Differential).
			Protected against ESD
26	CanA N	I/O	Twisted pair with a
			120 Zo recommended
			(2.3V Typical, 1.2V-2.3V
			Differential). Protected
			against ESD
27	GND	GROUND	Ground signal for buses
28	CANB_P	I/O	CANbus interface. It
			supports data rates up to
			1 Mbps. Protected against
			ESD
29	CANB_N	I/O	Twisted pair with a 120 Zo
			recommended. Protected
			against ESD
30	GND	GROUND	Ground signal for buses
31	I2C_CLK	Output	Clk line for I2C bus $(0.3V)$
			to 3.3V). Protected against
			ESD and short circuit
32	I2C_DATA	I/O	Data line for I2C bus
			(0.3V  to  3.3V). Protected
			against ESD and short
			circuit
33	GND	GROUND	Ground for 3.3V power
			supply

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Pin	Signal	Туре	Comments
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_1	Input	Analog input 0-3V.
			Protected against ESD
			and short circuit
39	ANALOG_2	Input	Analog input 0-3V.
			Protected against ESD
			and short circuit
40	ANALOG_3	Input	Analog input 0-3V.
			Protected against ESD
			and short circuit
41	GND	GROUND	Ground for FTS signals
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	GND	GROUND	Ground signal for safety
			buses
45	V_ARB_TX	Output	Veronte comicro UART
			output to activate safety
			mechanism. Protected
			against ESD and short
			circuit
46	V_ARB_RX	Input	Veronte comicro UART
			output to activate safety
			mechanism. Protected
			against ESD and short
		CROUND	circuit
47	GND	GROUND	Ground signal comicro
10		DOUIDD	power supply
48	V_ARB_VCC	POWER	Veronte comicro power
			(6.5V to 36V). Protected
			against ESD and reverse
			polarity

Table 1 – continued from previous page
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Pin	Signal	Туре	Comments
49	FTS3_OUT_MPU	Output	MPU alive voting signal,
		-	to use with 4xVeronte.
			It is a Square Wave at
			[100,125] Hz. Protected
			against ESD and short
			circuit
50	OUT RS485 P	Output	Non-inverted output
50		Output	from RS485 bus (-7V
			to 12V Max -2.3V to
			2 3V Typical) Protected
			against ESD and short
			against ESD and short
51	OUT DS495 N	Output	Inverted output from
51	001_K5485_N	Output	Inverted output from
			RS485 bus (-/v to 12v
			Max, $-2.3V$ to $2.3V$
			Typical). Protected
			against ESD and short
		_	circuit
52	IN_RS845_N	Input	Inverted input from
			RS485 bus (-7V to 12V
			Max, -2.3V to 2.3V
			Typical). Protected
			against ESD and short
			circuit
53	IN_RS845_P	Input	Non-inverted output
			from RS485 bus (-7V
			to 12V Max, -2.3V to
			2.3V Typical). Protected
			against ESD and short
			circuit
54	RS-485_GND	GND	Ground for RS-485 bus
55	EQEP_A	I/O	DIGITAL output /
			DIGITAL input / Encoder
			quadrature input A (0-
			3.3V). Protected against
			ESD and short circuit
56	EQEP_B	I/O	DIGITAL output /
			DIGITAL input / Encoder
			quadrature input B (0-
			3.3V). Protected against
			ESD and short circuit
			WARNING!: Only use it
			as digital I/O with Veronte
			units of Hardware version
			4.5 or lower
57	EOEP S	1/0	DIGITAL output /
	- <		DIGITAL input / Encoder
			strobe input (0-3 3V)
			Protected against FSD
			and short circuit
	1		und bhort chicuit

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Pin	Signal	Туре	Comments
58	EQEP_I	I/O	DIGITAL output /
			DIGITAL input / Encoder
			index input A (0-3.3V).
			Protected against ESD
			and short circuit
59	GND	GROUND	Ground for encoders
60	V_USB_DP	I/O	Veronte USB data line.
			Protected against ESD
61	V_USB_DN	I/O	Veronte USB data line.
			Protected against ESD
62	V_USB_ID	I/O	Veronte USB ID line.
			Protected against ESD
			and short circuit
63	FTS_OUT_MPU	Output	Abort mission voting
			signal from MPU, to use
			with 4xVeronte. Bit Low
			(0V) if mission OK. High
			(3.3V) if mission wants to
			be terminated. Protected
			against ESD and short
			circuit
64	FTS2_OUT_MPU	Output	Abort mission voting
			signal 2 from MPU, to use
			with 4xVeronte. Bit Low
			(0V) if mission OK. High
			(3.3V) if mission wants to
			be terminated. Protected
			against ESD and short
			circuit
65	GND	GROUND	Veronte ground input
66	ND	GROUND	Veronte ground input
67	VCC	POWER	Veronte power supply
			(6.5V to 36V). Protected
			against ESD and reverse
			polarity.
			Warning: Both pins
68	VCC	POWER	are common. They
			MUST be connected to
			the same power supply.

#### Table 1 – continued from previous page

Warning: Remember!! All Veronte's GND pins are common.

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

### 4.3.3 Connector colour code:



Fig. 4: Connector HEW.LM.368.XLNP



Fig. 5: Harness plug

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

PIN	Color code	PIN	Color code
1	White	35	Gray
2	Brown	36	Pink
3	Green	37	Blue
4	Yellow	38	Red
5	Gray	39	Black
6	Pink	40	Violet
7	Blue	41	Gray – Pink
8	Red	42	Red – Blue
9	Black	43	White – Green
10	Violet	44	Brown – Green
11	Gray – Pink	45	White – Yellow
12	Red – Blue	46	Yellow – Brown
13	White – Green	47	White – Gray
continues on next page			

PIN	Color code	PIN	Color code
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
25	White – Black	59	Pink – Green
26	Brown – Black	60	Yellow – Pink
27	Grey – Green	61	White
28	Yellow – Green	62	Brown
29	Pink – Green	63	Green
30	Yellow – Pink	64	Yellow
31	White	65	Grey
32	Brown	66	Pink
33	Green	67	Blue
34	Yellow	68	Red

Table 2 – continued from previous page

### 4.3.4 Flight Termination System (FTS)



Fig. 6: 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 = -5ms and B = -5ms (3.3V). Its frequency can be higher right after the rebooting (around 300-400Hz), but A and B must be always < 8ms.

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

# SOFTWARE INSTALLATION

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



Fig. 2: Serial connection

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

SIX

# OPERATION

# 6.1 Flight Control Setups

**Veronte Autopilot 1x** allows for a wide variety of communication and control solutions to adapt to each mission and platform specifications. This section summarizes a list of recommended options to operate an **Autopilot 1x** in different situations.

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

**Note: BCS** (Basic Control Station) is a **Veronte Autopilot 1x** variant employed only as a ground control station for beginners. Nonetheless, **PCS** (Pole Control Station) is recommended due to its extended range, power and autonomy.

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



In the standard 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**.

While this is the most common setup, there is a wide variety of options, including:

- BLOS communications
- Onboard RC receivers
- Point to Multipoint configurations

### 6.2 Air Communications

Communication solutions between air and ground devices.

### 6.2.1 Line of Sight

#### 6.2.1.1 Standard setup



#### 6.2.1.2 External radiolink

For increased range, bandwidth or channels are needed



#### 6.2.1.3 Tethered



### 6.2.2 Beyond Line of Sight

#### 6.2.2.1 Internal 4G + Veronte Cloud



#### 6.2.2.2 External Internet access + Veronte Cloud

For alternative internet access



#### 6.2.2.3 External Satellite communication

For maximum reliability


#### 6.2.2.4 Remote GCS

For remote solutions with LOS backup operator



# 6.3 Ground Communications

Comunication solutions between the different GS devices

### 6.3.1 Serial interface



## 6.3.2 External Radiolink

For modular ground stations.



### 6.3.3 Wifi

For operation with laptops or tablets.



# 6.4 Manual Control Layouts

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

## 6.4.1 PPM to Ground Unit

Standard setup. Allows the usage of a single radio channel both for stick, control commands and telemetry, minimizing any potential interferences.



## 6.4.2 PPM to Air Unit

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.



## 6.4.3 USB to Software

Allows the use of any device that is detected as a remote controller by the operative system



## 6.4.4 Stick Expander

The **Veronte Stick Expander** allows for the integration of commercial flight station devices and remote controllers. In addition, **Stick Expander** enables the use of USB sticks within the Veronte ecosystem.



#### 6.4.5 Virtual Stick

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

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

## 6.5 Point to Multipoint Layouts

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

### 6.5.1 Point to Point

Standard multiplatorm setup.



## 6.5.2 Point to Multipoint with Single Ground Station

Managing several platforms with a single radiolink.



## 6.5.3 Multipoint to Point with Multiple Ground Stations

For long range operations with several LOS stations.



#### CHAPTER

## SEVEN

## MAINTENANCE

# 7.1 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.

# 7.2 Software update

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

Note: The file with the new software version will be uploaded to the FTP folder when requested by the customer.

Warning: Select your version before reading any user manual for software.

## CHAPTER

# EIGHT

## **COMPATIBLE DEVICES**

**Veronte Autopilot 1x** can be integrated with any external sensor that shares the communication interface. External sensors can be configured to be considered as part of the sensors fusion. For example, the Magnetometer Honeywell HMR2300-232 can be employed, read the datasheet to obtain more information.

Veronte software is able to detect USB devices such as *joysticks*. The buttons and axis of these devices can be read and configured to send stick information to Veronte Autopilot. In addition, virtual sticks can be defined and configured reading the manual of the corresponding software.

# 8.1 Servos / Actuators

Company	Comments
	<b>I/O:</b> PWM, RS485 full duplex and RS485 half duplex (reduced functions). <b>Type:</b> simplex, redundant and OPV.
Pegasus	
Actuators GmbH	I/O: PWM and RS485 full duplex. Type: simplex and redundant.
ULTRAMOTION	
•••	I/O PWM and CAN-BUS
	Type: lineal actuator and servo.
KST <sup>®</sup>	
DIGITAL SERVO	I/O: PWM. RS232. RS485 and CAN-bus
SAVÖX	<b>I/O:</b> PWM, RS232, RS485 and CAN-bus



# 8.2 Power Management Units

Company	Comments
	Veronte product: BEC
VISION AR TRONICS	

# 8.3 Motor Controllers / ESC

Company	Comments
	Veronte products:
	MC110
	MC24
	MC01
7-MOTOR	
THE SAFEST PROPULSION SYSTEM	I/O: PWM
	I/O: CAN-bus

Other companies	Comments
Hacker Brushless Motors Industrial Solutions	I/O: PWM, RS232, RS485 and CAN-bus
<b>KDE</b> Direct	
AXi	

# 8.4 Altimeters

Company	Comments
NIJTEN	<b>I/O:</b> UD-1 (CAN-bus)
	I/O: CAN-bus
Ill lightware	
optoelectronics	I/O: I2C and CAN-bus
GARMIN	
	I2C: PWM
	Product: LIDAR-Lite v3

# 8.5 Sensors



# 8.6 Engines



# 8.7 Jet Engines



# 8.8 ADS-B

Company	Comments
uAvioni	Products: Ping20S (ADS-B Out) Ping1090 (ADS-B IN/OUT)
Sagetech	All products of the following families: MX XP

# 8.9 Precision Landings

Company	Comments
Autonomous flights in complex environments	LOLAS landing system

# 8.10 Cameras

Company	Comments
	<b>Products:</b> Gimbal 10z Gimbal 30z
OCTOPUS ISR SYSTEMS	
UAV PAYLOAD SYSTEMS	
ASCENT VISION TECHNOLOGIES	
Next Vision STABILIZED SYSTEMS LTD	
	Autopilot 1x reads identified objects by their cameras

# 8.11 LOS Communications

Company	Comments
	Antenna: Tracker T28
microhard	
	<b>I/O:</b> RS232 communication tunnel, read the <i>Microhard integration example</i>
DTC	<b>I/O:</b> RS232 communication tunnel
SĩLVUS	
TECHNOLOGIES	<b>I/O:</b> RS232 communication tunnel <b>Streamcaster radio:</b> 4200E, read the <i>Silvus integration example</i> to know how to use it with Autopilot Veronte 1x
DIGI®	Radio: To know how to configure Digi radios, read its user guide

# 8.12 BLOS Communications

Broadband UAV satcom: IMS-350 Midband UAV Datalink and GPS System: DLS-100
Satellite communications: RockBLOCK
Requires Veronte COM

# 8.13 Control Stations

Company	Comments
	Products:
	MCS
	PCS

# 8.14 Transmitters

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

# 8.15 Expansion Modules

Company	Comments
	Products:
	Stick Expander
	CEX
	MEX

#### CHAPTER

## NINE

# **INTEGRATION EXAMPLES**

- Connection Examples
- Radios
- External Sensors
- Joysticks

# 9.1 Connection Examples

Ground station examples



Fig. 1: Basic Autopilot 1x Ground Station



Fig. 2: Autopilot 1x PCS Ground Station



Fig. 3: Autopilot 1x Tracker Ground Station



Fig. 4: Autopilot 1x MCS 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.

#### Aircraft examples



Fig. 5: Multicopter



Fig. 6: Fixed Wing Airplane



Fig. 7: Helicopter

# 9.2 Radios

### 9.2.1 Microhard internal radio

Internal Microhard radios can stablish communication between Veronte Autopilots.

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

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

#### 9.2.2.1 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:



Fig. 8: DTC radios and Autopilot 1x operation

#### • DTC + Amplifier

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:



Fig. 9: DTC + amplifier radios and 1x operation

#### 9.2.2.2 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:



Fig. 10: DTC D1804 Gecko breakout PCB

• Ethernet



Fig. 11: **RJ45 pinout T-568B** 

J4 (Ethernet) - D1804 Gecko breakout PCB		RJ45 Connector (T-568B)		
PIN N°	Signal	PIN N°	Signal	Color
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



Fig. 12: Female DC Power Jack connector

J2 (PWR) - D1804 Gecko breakout PCB		Power connector
PIN N°	Signal	Signal
1	VIN	Power +
2	VIN	
3	GND	Power -
4	GND	

The full connection should look like this:



Fig. 13: 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:



Fig. 14: DTC D1806 Gecko active breakout PCB

#### • Ethernet



#### Fig. 15: **RJ45 pinout T-568B**

J4 (Ethernet) - D1806 Gecko active breakout PCB		RJ45 Connector (T-568B)		
PIN N°	Signal	PIN N°	Signal	Color
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



Fig. 16: Female DC Power Jack connector

J2 (PWR) - D1806 Gecko active breakout PCB		Power connector
PIN N°	Signal	Signal
1	VIN	Power +
2	VIN	
3	VIN	
4	VIN	
5	VIN	
6	VIN	

J9 (GND) - D1806 Gecko active breakout PCB		Power connector
PIN N°	Signal	Signal
1	GND	Power -
2	GND	
3	GND	
4	GND	
5	GND	
6	GND	

## • Amplifier



#### Fig. 17: Amplifier AMPD5W

J8 (AMP) - D1806 Gecko active breakout PCB		AMPD5W Connector	
PIN N°	Signal	PIN N°	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 N°	Signal	PIN N°	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 N°	Signal	PIN N°	Signal
1	GND	3 & 4	Power -
2	GND		
3	GND		
4	GND		
5	GND	-	
6	GND		

The full connection should look like this:



Fig. 18: 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.



Fig. 19: DTC D1804 Gecko breakout PCB - J3 (RS232)

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



Fig. 20: Harness plug

J3 (RS232) - D1804 Gecko breakout PCB		Harness - Autopilot 1x		
PIN N°	Signal	PIN N° Signal Color		
2	RS232 RX	19	RS 232 TX	White-Pink
1	RS232 TX	20	RS 232 RX	Pink-Brown
3	GND	21	GND	White-Blue

The full connection should look like this:


Fig. 21: 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.







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

Fig. 23: Harness plug

J3 (RS232)- D1806 Geck	o active breakout PCB	Harness	- Autopilot 1x	
PIN N°	Signal	PIN N°	Signal	Color
2	RS232 RX	19	RS 232 TX	White-Pink
1	RS232 TX	20	RS 232 RX	Pink-Brown
3	GND	21	GND	White-Blue

The full connection should look like this:



Fig. 24: 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 support@embention.com.

## 9.2.2.3 DTC radio configuration

#### • First Steps





## - 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.

**Note:** The connections should look like this:



- 6. Make sure computer is set to static IP address on same subnet as radio. The following substeps clarify how to set the IP adress:
  - 1. Open network and sharing menu and click Change adapter settings.

#### UM.305-1x, Release 4.5



## Fig. 27: Ethernet connection 1

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





3. Select IPv4 and click Properties.

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

Fig. 29: 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**.

Protocolo de Internet versión 4 (TCP/I	Pv4) Properties	×
General		
You can get IP settings assigned autor this capability. Otherwise, you need to for the appropriate IP settings.	natically if your network supports ask your network administrator	
Obtain an IP address automatical	ly	
Ose the following IP address:		
IP address:	192.168.8.92	н
Subnet mask:	255.255.255.0	Н
Default gateway:		
Obtain DNS server address auton	natically	
• Use the following DNS server add	resses:	
Preferred DNS server:		
Alternative DNS server:		
Ualidate settings upon exit	Advanced	
	OK Cancel	

Fig. 30: Ethernet connection 4

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

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

Q Domo Node Finder						- 🗆	×
<u>F</u> ile <u>T</u> ools <u>H</u> elp							
C I Filter:		8					
IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	MAC Addre	ess
0.0.0.0	Eastwood	SOL8SDR	7.2.1	Enabled	CAC420C29A82EEE1	00:11:6A:03:3	C:0D
1							

Fig. 31: 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**:

Q Domo Node Finder	r					- 🗆 X
<u>F</u> ile <u>T</u> ools <u>H</u> elp						
C I Filter:			3			
IP Address	Device Type	Unit Name	<ul> <li>Version</li> </ul>	DHCP	ESN	MAC Address
0.0.0.0 W	Eastwood /eb Interface (HTTP	port 80)	7.2.1	Enabled	CAC420C29A82EEE1	00:11:6A:03:3C:0D
C.	onfigure Network					
FI	ash LED					
Re	equest Password Res	et Token				
Re	eset Password					
			ſ			
			•			
	(	SOL8SDR (00:	:11:6A:03:3C:0D)	×		
		Automatic (DHCP)				
	1	IP Address	192.168.8.95			
	:	Subnet Mask	255.255.255.0			
	t	Default Gateway	192.168.8.1			
		ОК	Cancel			

Fig. 32: Domo Node Finder - IP address configuration

To confirm the change, click the  $\mathcal{O}$  icon to update the IP address.

Q Domo Node Finder						- 0	×
<u>F</u> ile <u>T</u> ools <u>H</u> elp							
C I Filter:		8					
IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	MAC Addr	ess
뭄 192.168.8.95	Eastwood	SOL8SDR	7.2.1	Disabled	CAC420C29A82EEE1	00:11:6A:03:3	C:0D
	11						
1							

Fig. 33: Domo Node Finder - Configured IP address

**Note:** This IP address, **192.168.8.95**, is related to the radio linked to the **BCS 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.

Q Domo Node Finder							_		×
<u>File T</u> ools <u>H</u> elp									
C I Filter:			8						
IP Address	Device Type	Unit Name	•	Version	DHCP	ESN	М	AC Addr	ess
A 102 169 0.05	Freedoment	SOL8SDR		7.2.1	Disabled	CAC420C29A82EEE1	00:1	1:6A:03:	C:0D
Web Interfa	ice (HTTP port 80).								
Configure N	etwork								
Flash LED									
Request Pass	word Reset Token								
Reset Passwo	ord								

#### Fig. 34: Domo Node Finder - Open Web Browser Application

**Note:** 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.

e Login	× +				$\sim$	- 0	×
$\leftrightarrow$ $\rightarrow$ <b>C</b> A Not secure	<mark>192.168.8.95</mark> (login	Q 🖻 🛣	a 6 *	<u>«</u> *	=J (	⊻. □	:
	Username						
	Password	Login					

Fig. 35: 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.

Note: The connections should look like this:



Fig. 36: First Steps connection + amplifier

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.

Note: This is an example of the radio configuration linked to a BCS unit.

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

👓 NETNode IP Rad	lio	× +											$\sim$	_		×
$\leftarrow$ $\rightarrow$ C $\blacktriangle$	Not	secure   192.168.8.95/w	ui_global/general		07	Q	Ē	☆		Ø	*	¢	*	≁		:
סדכ		NETNode Mesh IP Radio SOL8SDR		-₩+ Single Mesh	IHz			÷ •	Wired Update	Conne e Local	ction I Unit O	Inly			Editine 1	9 🔒
Global Setup / General Settings		🧮 General Settings									6 S#	WE	⊗ C	ANCEL	C RE	FRESH
Apps		GENERAL SETTINGS			UPDATE SE	TTINGS										٦
Global Setup		Unit name USB mode	SOL8SDR GND Host	<b>~</b>	Update a	all node:	S		•	► N						
IP Settings     Q     Region & Time     Telemetry     Stranged																
Presets																
🔀 System																
Light 🛑 Dark																
€> LOGOUT []: v7.1.4																_

Fig. 37: Save or Cancel changes

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



Fig. 38: General settings configuration

💿 NETNode IP Radio		× +										`	~	-		×
$\leftrightarrow$ $\rightarrow$ G $\blacktriangle$	Not sec	cure   192.168.8.96/wui_global/gene	eral			07	Q	6 \$	6	9	*	Ś	*	⊥		:
		NETNode Mesh IP Radio		₩ Single Mesh 🕥 '''A'' 2450 M	1Hz			Ϋ Wir	ed Con	nectior					Prese	:t
		SOL8SDR_AIR		🛞 1   🕅 🧐 1 😪 1 of 16				💿 Up	late Lo	ical Uni	t Only				1	
Global Setup / General Settings		🚍 Conorol Sottingo														DEGU
🙆 Dashboard																KEON
📘 Apps		GENERAL SETTINGS				UPDATE SETTINGS										
·미네· Status		Unit name	SOL8SDR_AIR			Update all nodes			•	No					í	
😳 Global Setup	۵	USB mode	Host													
🧮 General Settings																
IP Settings     Pagion & Time						MESH SETTINGS D		FTTINGS	D IP	SETTING		REGION	R TIM	IF D	TELEMET	TRY
Telemetry									• 11			NEUTON	am			
🕺 Advanced																
🔲 Presets																
🔀 System																
Light 🛑 Dark																

**Note:** The radio related to the air unit also has its own personalised name:



- 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.

e NETNode IP Radio		× +										$\sim$	_		×
← → C ▲	Not sea	cure   192.168.8.95/wui_p	resets/mesh		07	Q	6 \$		Ø	* (		) <b>=</b> ,	$\mathbf{F}$		:
סדכ		NETNode Mesh IP Radio Sol8SDR		le Mesh 🕥 ('A') 2450 M 1 📀 0 😪 1 of 16	Hz				Wired Update	Connectio e Local Un	n it Only			Prese 1	t 🗍
Presets / Mesh Settings	~	්ද Mesh Settings :1	1 2 3 4	<b>1</b> 5 6 7 8 9	10 11	1 12	13 14 15	16 2	> ACTI					C REF	RESH
·····································	-	MESH SETTINGS			TRA	NSMITTER									
🤨 Global Setup 🔩	~	Operating mode	Single Mesh	<del>,</del> (j)	Ena	able tra	nsmitter		•	🔶 Yes					
🗉 Presets 🗳	<u>م</u>	Mesh Id			Fre	equency	,		24	50					
•& Mesh Settings		Node Id	0		Cha	annel b	andwidth		10.	.0				➡ MH:	
<ul> <li>2 Talkback / Voice</li> </ul>		Operating range	50km	<b>-</b>	Out	tput att	enuation		0					d	в
Gecurity					RF	output	port		A					-	
• Lincoders	⊽				PA	linearit	у		Hig	gh					
(iv) Streamers	0 0 0	E 🛞 COPY P	RESET 1				GENERAL SE	TTINGS	Þ UN	IT SETTING	S Þ T.	ALKBACK	/ VOICE	⊳ secur	
Light — Dark															
U v7.1.4															

Fig. 40: 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.

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

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

· Frequency: Set the desired transmission frequency. 2450 MHz recommended.

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

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

Usually used when working with power amplifiers which must have excellent shoulder performance to operate, or for improved adjacent channel performance.

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

← → C ▲ Not se	ecure   192.168.8.96/wui_presets/me	sh	<b>o-</b> Q 🖻 ·	* 🕫 🖇 🤅 🛊 .	⊻ □
DTC	NETNode Mesh IP Radio Sol8SDR_AIR	-₩r Single Mesh 🐠 ('႙') 2450 M - 🛞 1 📀 1 😪 1 of 16	Hz 😲 V	Wired Connection Jpdate Local Unit Only	Preset 1
esets / Hesh Settings ② Dashboard ■ Apps	-ಹಿ. Mesh Settings :1	< 1 2 3 4 5 6 7 8 9	10 11 12 13 14 15 16 >		C REFRESH
II Status ▽	MESH SETTINGS		TRANSMITTER		
© Global Setup	Operating mode Mesh Id	Single Mesh 🛛 🗸 🚺 1	Enable transmitter Frequency		
<ul> <li>&amp; Mesh Settings</li> <li>Unit Settings</li> <li>Talkback / Voice</li> </ul>	Node Id Operating range	1 <b></b> 50km	Channel bandwidth Output attenuation	10.0 0	➡ MHz dB
Gecurity Encoders ♥	Advanced Settings	●● No	RF output port PA linearity	A High	
(+)) Streamers Data System	🕄 🛞 COPY PRES	<b>11</b>	¢ GENERAL SETTINGS	♦ UNIT SETTINGS   ♦ TALKBACK / VOIC	
System V					

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

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

👓 NETNode IP Radio		×				~ -		$\times$
← → C ▲ N	ot secure	e   192.168.8.95/wui_presets/mesh		<b>6-</b>	2 🛧 🗟 🤣 🜟	C 🗯 坐		:
DTC	=	NETNode Mesh IP Radio SOL8SDR_GND	-\\\- Single Mesh ( '\R') 2450 Mi 🛞 1 📀 0 < 1 of 16	łz ∵ ⊙	Wired Connection Update Local Unit Only		Preset 1	
Presets / Mesh Settings		And Sottings 1					$\sim \Delta$	u I
🙆 Dashboard			2 3 4 5 6 7 8 9	10 11 12 13 14 15 16		9 OANOLL		<b>"</b>
県 Apps	▽							
·네 <mark>네·</mark> Status	⊽	MESH SETTINGS		TRANSMITTER				
🔯 Global Setup	⊽	Operating mode	Single Mesh 🗸 🚺	Enable transmitter	Yes			
🔲 Presets		Mesh Id	1	Frequency	2450			
•😋 Mesh Settings		Node Id	0	Channel bandwidth	10.0		▼ MHz	
Unit Settings		Operating range	50km -	Output attenuation	0		dB	

Fig. 42: 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, GPS antenna or other device.

🚥 NETNode IP Radio	× +			~ -	
$\leftrightarrow$ $\rightarrow$ C $\blacktriangle$ Not	secure   192.168.8.95/wui_presets/unit		॰ ९ 🖻 🖈 🗟 🔇	* * * ±	•
DTC	NETNode Mesh IP Radio SOL8SDR_GND	-₩+ Single Mesh 💿 ('Ҳ') 2450 MHz @ 1 📀 0 << 1 of 16	<ul> <li>Wired Connection</li> <li>Update Local Unit O</li> </ul>	nly	Preset 🗋 1 🏮
Presets / Unit Settings	🖽 Unit Settinas :1				C REFRESH
🐼 Dashboard 🔋 Apps 🛛 ▽	,	< 1 2 3 4 5 6 7 8 9 10 11 12 13 14	14 15 16 > ACTIVATE1		
·비비· Status 🗢	UNIT SETTINGS				
😳 Global Setup 🗢	External power 🧼	Yes			
🔲 Presets 🗠	LED	Dn			
⊷گر" Mesh Settings الله Unit Settings	MAC/VLAN filter Off	<u> </u>			
2 Talkback / Voice 3 Security	COPY PRESET 1		♦ GENERAL SETTINGS ♦ MESH SI	ETTINGS 🕨 TALKBACK / VOICE	
udio ♥					
(••) Streamers 🗢					
©\$ <sup>©</sup> Advanced					
🔀 System 🗢					
Light 🛑 Dark					
<b>€&gt;</b> LOGOUT					
🚺 v7.14					

### Fig. 43: Unit settings configuration

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

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👓 NETNode IP Ra	dio		×	+																		$\sim$	_		×	
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	_	N	ETNode	Mesh IP	Radio				Alle Sinn	1le Mesh	(igi)	2450 MH	17				÷	Wired	Conne	oction				Pro	et 🏠	
		sc	)L8SDR	_GND	nuuro				www.comg	1 📀 (	0 ~ 1	l of 16	12					) Updat	e Loca	il Unit (	Inly			1		
Presets / Data / RS232 #1				70 41 .1																					FEDEOU	
🙆 Dashboard			RSZ	5Z #1 : I									10 11	10	17 1	. 15	10	<b>1</b> 07							EFRESH	
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··· <b>미</b> 마 Status	⊽		RS232	#1 SETTING	S								NETW	ORK SE	TTINGS											
😳 Global Setup	⊳		Data	mode			UDP					•	IP a	ddres	s			19	.168.8	.96						
Presets	۵		Baud	rate			115200					<b>_</b>	Mult		addre			22	25.0.0.						i)	
•ໍ່&ູ່ Mesh Settings			Parit	y			None						IP pr	ort				42	2391							
Unit Settings			Stop	bits			1					<u> </u>	IP TO	DS uro	gent					No						
Security			Low I	atencv				/es																		
Encoders	⊽		Data	active								-														
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RS232 #1																										
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- \* **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 the Veronte software:.

**Note:** The data is assumed to be 8 bits.

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

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

• NETNode IP Radio	5	× +					~ -		×
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Presets / Data / RS232 #1	-	NETNode Mesh IP Radio Sol8SDR_AIR	<b>-₩</b> Single ∰ 1	Mesh 🜒 ('A') 2450 MH 📀 1 < 1 of 16	z (	<ul> <li>Wired Connection</li> <li>Update Local Unit Only</li> </ul>		Preset 1	
🐼 Dashboard 🔋 Apps	₽	₩ K32J2 #1:1	< 1 2 3 4	56789	10 11 12 13 14 15 16			KEF RESI	
·····································	⊽	RS232 #1 SETTINGS			NETWORK SETTINGS				
🗐 Global Setup	⊽	Data mode	UDP	<b>~</b>	IP address	192.168.8.95 <			
🔲 Presets	۵	Baud rate	115200	<b></b>		225.0.0.1		<u>(</u>	
• 🆧 Mesh Settings		Parity	None	<b>~</b>	IP port	42391 <			
2 Talkback / Voice		Stop bits	1	<b>-</b>	IP TOS urgent	●● No			
🔒 Security		Low latency	🥌 Yes						
Encoders	₽	Data active		<b>(i)</b>					
<ul> <li>kulto</li> <li>((*) Streamers</li> <li>Data</li> <li>Services</li> <li>RS232 #1</li> <li>RS485</li> <li>Advanced</li> </ul>	▶ 4	E 🛞 COPY PRE	SET1				▷ DATA SERVICE	S ⊘ RS485	
🔀 System	▽								P

Fig. 45: RS232 #1 air unit configuration

4. System  $\rightarrow$  Maintenance: This menu allows to import and export radio configurations.

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:		, 1	⊥	*	Ś	*	Ø		☆	Ê	Q	07				tem/maintenance	58.8.95/wui_sys	ure   192.16	ot secu	A No	→ C 🖌	∢
Ĥ	Preset 1				nlu	tion	Connec	Wired	ų ė				MHz	<sup>(</sup> Å <sup>1)</sup> 2450	ingle Mesh 🕥		ı IP Radio	IETNode Mesh	NE			
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		JN	s JSO	TINGS A	W SET	VIE															Information	
3	E				file	drop	ect or	se		file	ttings	P2MP se									License	4
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Fig. 46: 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:

1																~			~
••• NETNode IP Rad	lio	×	+													Ŷ			^
$\leftarrow$ $\rightarrow$ C A	Not	secure   192.	168.8.95/wui_	_system/m	naintenance	e			07	Q	Ē	☆		6	K (		$\mathbf{F}$		:
		NETNode Me	sh IP Radio			Ally Single N	Mach 🗊 🕚	R <sup>1)</sup> 2450 MH	7			÷	Wirod C	onnocti	'n			Drog	t
	-	SOL8SDR_GN	ID			🌚 1		1 of 16	12				Update	Local Ur	nit Only			1	
System / Maintenance																			
🙆 Dashboard		🚹 Mainte	nance																
. Adds		UPDATE DEV	VICF						SETTINGS										
··III· Status		Liconco	file	<b>co</b>	lact ar dran f	filo		~	Cottings	file			ofa	e and (	7 icon			1	~
🙆 Global Setup		LICENSE	Ine						settings	s nie				s_ynu_i	7.jsun			'	
Presets													Ļ		IMPOR	I SETTIN	GS FILE	_	-
X System	۵	Upgrade	file	se	lect or drop f	file		B						U	EXPOR	T SETTIN	IGS FILE	_	_
i Information															VIEW S	ETTINGS	AS JSON		
C License									P2MP se	ettings	file		sele	ect or d	op file			(	≥
Maintenance									(Point to	o Multip	oint)								
Calibration Tools																			
		MISCELLAN	EOUS																
Light 🛑 Dark		Status fi	le		Đ	XPORT STATUS	S FILE												
<b>€&gt;</b> LOGOUT					VIE	EW STATUS AS	JSON												
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:L: V/-1-4																			
															INFOR	MATION	▶ LICE	NSE ⊳	TOOLS

Fig. 47: Configuration selected

#### - Paired radios

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

\* Domo Node Finder software

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

Q	Domo Node Fir	nder				_		×
<u>F</u> ile	<u>T</u> ools <u>H</u> elp							
S	Filter:			3				
	IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	MAC Addre	ess
((-))	192.168.8.96	Eastwood	SOL8SDR_AIR	7.2.1	Disabled	CAC420C29A8	00:11:6A:03:3	C:
묾	192.168.8.95	Eastwood	SOL8SDR_GND	7.1.4	Disabled	30AA208030B5	00:11:6A:02:B	0:F6



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

- $\cdot$   $\blacksquare$  icon for the radio that is wiredly connected to the PC.
- $\cdot$  (••) icon for the radio that is connected by link.

#### \* Web Browser control application

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

👓 NETNode IP Radio		× or NETNode IP Radio	× +	•							~	- □	×
← → C ▲	Not sec	ure   192.168.8.96				07	QÊ	\$	Ø 👌	e (	*	⊻ □	:
		NETNode Mesh IP Radio		₩ Single Mesh 🕥	('A') 2450 MHz		<b>i</b> 0	ver radio l	ink			Preset	
		SOL8SDR_AIR		<u>∰</u> 1 ♥1	≪5 2 of 16		<b>O</b> U	odat Loc:	al Unit Unly			<u> </u>	
Dashboard		UNIT INFORMATION	> EDIT	Notwork Status	$\mathbf{\hat{h}}$		▶ GO TO SPEC	TRA	ACTIVE F	RESET			
🙆 Dashboard		Unit name SOL8S	DR_AIR						Prese	1			-
🔋 Apps		IP address 192.1	68.8.96	Networ	k OK: A mesh	has been formed.							
··비· Status		Voltage	12.0 V		2 Active N	Nodes.			POPULA	PAGES			
🔯 Global Setup		Temperature	54 ºC					_	⊅ Pre	sets/Mes	h Settin	gs	
Presets		Tx retries	0	Apps Bar	<u> </u>		CE 12	<b></b>	₽ Sta	us/Spect			
System	⊳	MESH INFORMATION	STATUS	·····		N 00 TO 0			D Cal	s/ factica bration	ai uispia	у	
0 oystelli		Mesh ID		Streaming Capt	ure	0 60 10 3	TREATING STA		⊳ Glo	oal Setup	/Genera	l Settings	
Light 💶 Dark		Node ID		01		VIDEO 2			D Sys	tem/Calit tem/Main	oration I Itenance	ools 9	
	E	Total nodes	2 of 16	Video Off		Video	Nff	1	⊅ Sys	tem/Tool			
😕 admin		Occupancy 📃					011		D Glo	oal Setup sets/Unit	/IP Setti Setting	ngs °	
€> LOGOUT			LOCATE							Jeto, onit	octany		
		REMUTE NUDES											
<b>□</b> : v7.2.1		⊘ 00: SOL8SDR_GND ⊿											
		$\rightarrow$											
			S (1)	Security Status		▷ GO T	D SECURITY SE						

Fig. 49: 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  $\rightarrow$  Tactical Display: Here the user can check the connection and the quality of the signal connection of both radios:



Fig. 50: 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.

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

1. **Presets**  $\rightarrow$  **Mesh Settings**: The **Node ID** must be different for each node in the mesh.

💿 NETNode IP Radio		× 🧒 NETNode IP Radio	🗙 📔 📼 NETNode IP Radio	×   +		~	- 🗆 ×
← → C ▲ N	ot secure	192.168.8.95/wui_presets/mesh			•• 🖻 🛱	a 🛛 🗱 🔇 🗯 🗐	± ∎ :
	- 1	NETNode Mesh IP Radio	We Single Mesh	(°¦≹') 2450 MI	Hz 🕂 W	ired Connection	Preset
		SUL8SUR_GNU	\V U	∞ 5 OF ID	ŪŪ	poate Local Unit Uniy	•••
Presets / Mesh Settings		->* Mach Sattings 1	<b>♠</b>				C REERESH
🙆 Dashboard		• •••• Heall bettings •1	· • • • • • • •	7 0 0	10 11 10 17 1/ 15 10 \		
📮 Apps	⊽		< <u>1</u> 2 3 4 5 b	/ 8 9	10 11 12 13 14 15 16 >		
··비 <mark>비·</mark> Status	⊽	MESH SETTINGS			TRANSMITTER		
🤨 Global Setup	⊽	Operating mode	Single Mesh	<b>-</b> (i)	Enable transmitter	💶 Yes	
🔲 Presets	۵	Mesh Id	1		Frequency	2450	
• & Mesh Settings		Node Id	0		Channel bandwidth	10.0	➡ MHz
2 Talkback / Voice		Operating range	50km	•	Output attenuation	0	dB
Gecurity		Advanced Settings	●■ No		RF output port	A	<b>•</b>
Audio	⊽				PA linearity	High	<b>•</b>
((•)) Streamers	⊽						
😝 Data	ᢦ	COPY PRES	ET 1		Ø GENERAL SETTINGS Ø I	JNIT SETTINGS ▷ TALKBACK / VOICE	▷ SECURITY
🔅 Advanced	⊽						
🔀 System	▽						
Light Dork							

Fig. 51: Mesh settings ground configuration

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← → C ▲ Not sec	ure   192.168.8.96/wui_presets/mesh			07	₿☆		0	* «	* 3	:1 .√	. 🗆	:
Prosets / Mech Settings	NETNode Mesh IP Radio Sol8SDR_AIR	- ₩ Single Mesh 💿 'X' 245 - 🛞 1 💿 1 🗠 3 of 10	D MHz i		🖸 0v ) Up	ver radi odate L	o link ocal Uni	t Only			Preset 1	Û
🐵 Dashboard	🌓 🖧 Mesh Settings :1		. 10 11	10 17 1/ 15	10 \					CEL	C REF	RESH
🔋 Apps 🗢 🗢		< 12 3 4 5 6 7 8	J IU II	12 13 14 15	10 >							
-ı <mark>  </mark> I- Status 🗢	MESH SETTINGS		TRANS	MITTER								
🤨 Global Setup 🗢	Operating mode	Single Mesh 🛛 🗸 🚺	Enat	ole transmitter		-	Yes					
🗉 Presets 🛛 🗠	Mesh Id	1	Freq	uency		2450						
• & Mesh Settings	Node Id	1	Char	nnel bandwidth		10.0					▼ MH	z
Talkback / Voice	Operating range	50km 🗸	Outp	ut attenuation		0					d	IB
🔒 Security	Advanced Settings	●■ No	RFo	utput port		A					-	
U Audio ✓			PA li	nearity		High					-	
(↔) Streamers 🗢												
Data 🗢	🐻 😣 COPY PRES	ETT		▷ GENERAL SETTI	NGS ⊳U	INIT SE	TTINGS		KBACK / V	OICE	⊳ secuf	RITY
to a state of the												
💦 System 🗢 🗸												

Fig. 52: Mesh settings air configuration

SETNode IP Radio	X   🜚 NETNode IP Radio	× 💿 NETNode IP Radio	× +	<b>6</b>	* = 6 * 6	× - • ×
	NETNode Mesh IP Radio SOL8SDR_BASE	+#+ Single Mesl 🚳 1 📀	1 🕐 ('Ҳ') 2450 MH 2 < 3 of 16	iz 🕻	<ul> <li>Over radio link</li> <li>Update Local Unit Only</li> </ul>	Preset 🚺 1 🍑
Presets / Mesh Settings	ిషి Mesh Settings :1	< 1 2 3 4 5	67891	10 11 12 13 14 15 16	SAVE (	⊘ CANCEL <b><i>Ç</i> refresh</b>
···비· Status ~ 영 Global Setup ~	MESH SETTINGS Operating mode	Single Mesh	<b>-</b> (i)	TRANSMITTER Enable transmitter	🐠 Yes	
Presets	Mesh Id Node Id	1 2		Frequency Channel bandwidth	2450 10.0	MHz
<ul> <li>Pathback / Voice</li> <li>An Security</li> <li>Encoders</li> </ul>	Operating range Advanced Settings	50km •• No	<b></b>	Output attenuation RF output port	0 A	dB 
↓     Audio       ↓     Audio       (••)     Streamers       ↓     Data       ↓     Advanced	🔋 🛞 Copy Pres	<b>ध।</b>		PA linearity ▷ GENERAL SETTINGS	High d unit settings d talki	BACK / VOICE   SECURITY
Light 🛑 Dark						

Fig. 53: Mesh settings base configuration

In the figures above, the user can see that the node ID is displayed at the top of the application at all times.

2. Data  $\rightarrow$  RS232 #1: The Multicast data mode must be configured. This data mode allows a single node to send RS232/RS485 data to multiple nodes in the system. And it also creates a unicast data return channel.

The radio linked to the BCS unit is configured as the 'Point' that sends the commands.

💿 NETNode IP Radio		× 🥶 NETNode IP Radio	🗙 📔 🥶 NETNode IP Radio	×   +			∨ – □ ×
← → C ▲ N	lot secur	re   192.168.8.95/wui_presets/data/port	:0		<b>0-</b>	* 🗟 🔗 卷 🔇	3 <b>*</b> ≕ ± □ :
DTC		NETNode Mesh IP Radio SOL8SDR_GND	₩₩ Single Mesh 📢 🎯 1 📀 O	) ('A') 2450 MH 3 of 16	Hz \∀ ⊙	Wired Connection Update Local Unit Only	Preset 🔒
Presets / Data / RS232 #1		😂 R\$232 #1∶1					🛞 CANCEL 📿 REERESH
🙆 Dashboard			< 1 2 3 4 5 6	789	10 11 12 13 14 15 16	> ACTIVATE 1	
県 Apps	⊽						
·비 <mark>비·</mark> Status	⊽	RS232 #1 SETTINGS			NETWORK SETTINGS		
🤨 Global Setup	▽	Data mode	Multicast source	-	IP address	255.255.255.255	
🔲 Presets	۵	Baud rate	115200		Multicast address	225.0.0.1 •	
∙ໍ≿ູ່ Mesh Settings		Parity	None	<b></b>	IP port	42391	
Unit Settings Settings Settings		Stop bits	1		IP TOS urgent	🍉 No	
🔒 Security		Low latency	●■ No				
Encoders	~	Data active	•	i			
(•) Streamers	⊽						
😝 Data	۵	🐻 🛞 COPY PRE	SET 1				▷ DATA SERVICES ▷ RS485
Services RS232 #1							
<ul> <li>▶ RS485</li> </ul>							
😂 🛱 Advanced	⊽						
🔀 System	▽						

Fig. 54: RS232 #1 ground configuration

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

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

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

💿 NETNode IP Radio		× 💿 NETNode IP Radio	K om NETNode IP Radio	×   +			~ -	- 0	×
← → C ▲ Not	secure	192.168.8.96/wui_presets/data/port0			07	🖻 🛧 🗟 🤣 🌟 🤇	: <b>*</b> ≣ 9	2 🔲	:
DTC		NETNode Mesh IP Radio Sol8sDr_AIR		sh 🜒 ('A') 2450 MHz ) 1 🔏 3 of 16	•	Over radio link Update Local Unit Only		Preset 1	
Presets / Data / RS232 #1		DC070 #1.1							оц
<ul> <li>Dashboard</li> <li>Apps</li> </ul>		₩ K32J2 #1.1	< 🚺 2 3 4 5	678910	11 12 13 14 15 16 >			NET NE	on
··III· Status		RS232 #1 SETTINGS		N	IETWORK SETTINGS				
<ul> <li>Global Setup</li> <li>Presets</li> <li>Mesh Settings</li> <li>Unit Settings</li> <li>Talkback / Voice</li> <li>Security</li> <li>Encoders</li> <li>Audio</li> <li>Streamers</li> <li>Data</li> <li>Services</li> <li>RS232 #1</li> <li>RS485</li> <li>Advanced</li> <li>System</li> </ul>	a a a a b a	Data mode Baud rate Parity Stop bits Low latency Data active	Multicast sink TE200 None 1 • No •		IP address Multicast address IP port IP TOS urgent	192.168.8.95 225.0.0.1 42391 • No	Þ DATA SERVICI		
Light 🌰 Dark 2 admin 3 ct> LOGOUT 0 v7.2.1									



NETNode IP Radio	coguro	X    NETNode IP Radio X	NETNode IP Radio × +				×	- 0	×
	secure	192.106.6.97/wd_presets/data/porto				· E x @ V *	S 24 -4		:
DTC		NETNode Mesh IP Radio SOL8SDR_BASE	₩ Single Mesh 🐠 (Å) @ 1 📀 2 😪 3	2450 MHz of 16		<ul> <li>Over radio link</li> <li>Update Local Unit Only</li> </ul>		Preset 1	Ĵ
Presets / Data / RS232 #1 Presets / Data / RS232 #1 Presets / Dashboard Presets / Data / RS232 #1 Presets / Data / Data / RS232 #1 Presets / Data	Þ	⊜ RS232 #1:1	< 1 2 3 4 5 6 7	891(	0 11 12 13 14 15 16			L 📿 REFRES	SH
··네나 Status		RS232 #1 SETTINGS			NETWORK SETTINGS				
<ul> <li>Global Setup</li> <li>Presets</li> <li>% Mesh Settings</li> <li>Unit Settings</li> <li>Talkback / Voice</li> <li>Security</li> </ul>		Data mode Baud rate Parity Stop bits Low latency	Multicast sink 15200 None 1 No	• • •	IP address Multicast address IP port IP TOS urgent	192.168.8.95 225.0.0.1 42391 No			
Audio     Audio     (••) Streamers     Data     Services     R5232 #1     R5485     R\$485     R\$485     S\$\$ Advanced     System	0 0 <b>0</b>	Data active	•				♦ DATA SER	VICES Þ RS485	



- \* Data mode: Multicast sink must be selected.
- \* IP address: The IP address of the radio linked to the BCS 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:

Q	Q Domo Node Finder - 🗆 🗙									
<u>F</u> ile	<u>T</u> ools <u>H</u> elp									
C	i Filter:		8							
	IP Address	Device Type	Unit Name 🔺	Version	DHCP	ESN	M	AC Addr	ess	
((*))	192.168.8.96	Eastwood	SOL8SDR_AIR	7.2.1	Disabled	C7567B594F59B442	00:1	1:6A:03:2	2E:BD	
((*))	192.168.8.97	Eastwood	SOL8SDR_BASE	7.2.3	Disabled	F23EC5B3E6007F2B	00:1	1:6A:03:	90:35	
몲	192.168.8.95	Eastwood	SOL8SDR_GND	7.2.3	Disabled	9831779126A5B531	00:1	1:6A:03:	92:25	

Fig. 57: 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.



Fig. 58: 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  $\rightarrow$  Tactical Display: Here the user can check the connection and the quality of the signal connection of the radios:



Fig. 59: Radios paired - Tactical Display

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

## 9.2.2.4 DTC radio configuration in autopilot

The necessary configuration of **Veronte Autopilot 1x** for DTC radios require different applications, according to the software version:

6.8 or higher: use 1x PDI Builder reading its user manual. Go to Integration examples -> External radios section.

# 9.2.3 Silvus radio (StreamCaster 4200E model)

# 9.2.3.1 System Layout

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





## 9.2.3.2 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.



Fig. 61: PRI port connector (mounted in radio)

• Power supply



#### Fig. 62: Female DC Power Jack connector

PRI port connect	Power connector	
Pin number	Signal	Signal
2	GND IN	Power -
3	VCC IN	Power +

# • Ethernet



Fig. 63: **RJ45 pinout T-568B** 

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

## • RS-232

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



Fig. 64: Harness plug

PRI port connecto	or - Silvus radio	Harness - Autopilot 1x			
PIN N°	Signal	PIN N°	Signal	Color	
7	RS232_RXD	19	RS 232 TX	White-Pink	
8	RS232_TXD	20	RS 232 RX	Pink-Brown	
9	GND	21	GND	White-Blue	

## 9.2.3.3 Silvus radio configuration

This section shows a basic configuration of the Silvus radio.

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



RF Channels 1-2 Connectors [TNC Female]

2 Power Switch [15-Position Rotating]

Bower (EB Version Only, 9-20V), Ethernet, and Serial Port Connector [ODU GK0YAR-P10UC00-000L]

4 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

#### Fig. 65: 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 adress:
  - 1. Open network and sharing menu and click Change adapter settings.



## Fig. 66: Ethernet connection 1

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




3. Select IPv4 and click Properties.

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

Fig. 68: 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**.

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

Fig. 69: 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.

**Note:** Latest version of Firefox or Google Chrome are preferred. Internet Explorer or others are not recommended.

▶ 17220.178.203 - StreamCaster M × +				~	· _	0	×
← → C ▲ No es seguro 172.20.178.203	3	N 6 1	2 🕫 (	э \star	* *		:
Embention							
$\equiv \oplus$	SILVUS TECHNOLOGIES						
Local Radio Configuration Basic Configuration			172.20.1	78.203			



- 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.

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

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

#### 1. Basic Configuration.

(••) 192.168.8.96 - StreamCaster MIM × (••)	192.168.895 - StreamCaster MIN 🗙 🕂	~ - <b>0</b> ×
← → C ▲ No es seguro   192.10	58.8.96 BR E	3 🖈 🗟 Ø 🗰 🤇 🛱 🔲 🛛 🤅
Embention		
	SILVUS TECHNOLOGIES	=
Local Radio Configuration	Basic Configuration	IP: 172.20.179.131
RF	•	VIP: 192.168.8.96
	Frequency 2220 Bandwidth 20 MHz	Node Label: node45955_179.131
Basic		Temperature: 38°C
	Network ID EMB-SILV End Distance 50000	Voltage: 11.69 V
Advanced	(inelets)	GPS Mode: Unlocked
Networking	► Total Transmit Power 15 dBm / 0.032 W Routing Mode Legacy	
Bidirectional Amplifier	(requested)	34.057118.447_0
Biullectional Ampliner		Night Mode:
Serial/USB Setup		Scrollbars:
PTT/Audio		
Network Management	•	
Spectrum Dominance	•	
Security		© 2022 Silvus Technologies, Inc.   Legacy

Fig. 71: 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.

(••) 192.168.8.96 - StreamCaster MIM 🗙 (••	192.168.8.9	5 - StreamCaster MIM 🗙   🕂							~	- 0	×
$\leftrightarrow$ $\rightarrow$ C ( $\blacktriangle$ No es seguro   192.1	68.8.96					S E	2 🕁 🗟	0 米	🤆 🔇 1	H 🗆 🗌	:
Embention											
			Si	LVUS INOLOGIES							
Local Radio Configuration	•	Fragmentation <sup>-</sup>	Threshold	Retransmissions	_		IP: 172.2	).179.13	31		
RF	•		1600 Bytes				VIP: 192.	168.8.9	6		
								el: node	45955	_179.13	1
Basic		MCS	Extended Auto					ure: 38°	с		
			_					1.69 V			
Advanced								e: Unlo	cked		
Networking	•										
Didirectional Amplifier		GI Mode	Variable - 16/32	Beam Forming			34.057	18.447	_0		
Bidirectional Ampliner			-		_			le: 📃			
Serial/USB Setup		Transmit Chanr 1:	nels 2: <b></b>	Receive Channels	2:			s: 🗔			
PTT/Audio		3:	4:	3:	4:						
Network Management	•	Radio Mode	Network Mode(0)								
Spectrum Dominance	•	APPLY SAVE AND	DAPPLY APPLY NETWORK	SAVE AND APPLY NETWORK							
Security	•							© 2022 Silv	us Techno	logies, Inc.	Legacy

2. Advanced configuration.

Fig. 72: 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.

(••) 192.168.8.96 - StreamCaster MIM × (••) 192.168.8	895 - StreamCaster MII/ 🗴   🕇	~ - <b>0</b> ×
← → C ▲ No es seguro   192.168.8.96	\$e)	🖻 🖈 🗟 Ø 🜟 🔇 🗯 🔲 🛛 🗄
📕 Embention		
	SILVUS TECHNOLOGIES	=
Networking <b>v</b>	Multicast 🗉	IP: 172.20.179.131
LAN Settings		VIP: 192.168.8.96
LAN Octangs	Default Multicast Broadcast Multicast	Node Label: node45955_179.131
DLEP Settings	Algorithm Groups	Temperature: 38°C
WIEL Sottingo		Voltage: 11.71 V
WIFI Settings	IGMP Snooping ()	GPS Mode: Unlocked
DHCP Server		GPS Coordinates:
	Action for un- registered	34.057118.447_0
Multicast	multicast traffic	Night Mode:
QoS		Scrollbars:
Infrastructure Networks	Custom Pruning/Augmenting	
Bidirectional Amplifier		
Serial/USB Setup	MANET Multicast/Broadcast	
PTT/Audio	APPLY SAVE AND APPLY APPLY NETWORK SAVE AND APPLY NETWORK	© 2022 Silvus Technologies, Inc.   Legacy

Fig. 73: Multicast panel

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

(••) 192.168.8.96 - StreamCaster MIM 🗙 (••)	192.168.8	.95 - StreamCaster MIM 🗙 📙 🕂		~ - <b>□</b> ×
← → C ▲ No es seguro   192.16	58.8.96		e <sub>e</sub>	🖻 🖈 🗟 🤣 💥 🔇 🗰 🗄 🗄
Embention				
		S		=
Local Radio Configuration	•	Serial Port Setup (Native) 🖻		IP: 172.20.179.131
RF	•			VIP: 192.168.8.96
		Serial Port Mode RS-232		Node Label: node45955_179.131
Basic		RS-232 Serial Port Settings		Temperature: 38°C
Adversed				Voltage: 11.71 V
Advanced		Baud Rate 115200	Data Bits 8	GPS Mode: Unlocked
Networking	•			GPS Coordinates:
		Parity None (N)	Stop Bits 1	34.057118.447_0
Bidirectional Amplifier				Night Mode:
Serial/USB Setup		Software Flow Control	Transport Protocol	Scrollbars:
PTT/Audio		Peer IP 172.20.178.203	Peer Port 54321	
Network Management	•			
Spectrum Dominance	•	WIFI-GPS Donate APPLY SAVE AND APPLY APPLY NETWORK	SAVE AND APPLY NETWORK	
Security		Enable		© 2022 Silvus Technologies, Inc.   Legacy

Fig. 74: 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 the Veronte software:.
  - \* 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 GND unit.

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

(••) 192.168.8.96 - StreamCaster MIN 🗙 (••) 1	192.168.8.95 - StreamCaster MIN × +	~ - <b>0</b> ×
← → C ▲ No es seguro   192.168	3.8.95 🖏 🖻	) 🖈 🗟 🤣 🗰 🔇 🛣 🖬 🛛 🗄
Embention		
	SILVUS	=
Local Radio Configuration	▼ Serial Port Setup (Native) ◙	IP: 172.20.178.203
RF	V Carial Dark Made an ann	VIP: 192.168.8.95
	Serial Port Mode RS-232	Node Label: node45771_178.203
Basic	RS-232 Serial Port Settings	Temperature: 39⁰C
		Vollage: 11.82 V
Advanced	Baud Rate 115200 Data Bits 8	GPS Mode: Unlocked
Networking	,	
-	Parity None (N) Stop Bits 1	34.057118.447_0
Bidirectional Amplifier		Night Mode:
Carial/UCD Catur	Software Transport UDP	Scrollbars:
Serial/USB Setup		
PTT/Audio	Peer IP 172.20.179.131 Peer Port 54321	
Network Management		
Spectrum Dominance	Vill-CDC Dongle	
Security	APPLY SAVE AND APPLY APPLY NETWORK SAVE AND APPLY NETWORK	

Fig. 75: Peer IP in radio linked to the GND 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.

(••) 192.168.8.96 - StreamCaster MIM ×	♦● 192.168.8.95 - StreamCaster MIM × +	~ - a ×
← → C ▲ No es seguro   1	2.168.8.96	🕸 Q 🖻 🕁 📾 💋 🜟 🤇 🗯 🔲 🛛 🗄
Embention		
$\equiv \pm$	SILVUS HERMOIDUES	
Local Radio Configuration	MPS Switch Position	IP: 172.20.179.131
Network Management		VIP: 192.168.8.96
		Node Label: node45955_179.131
Spectrum Dominance	Group Type Network	Temperature: 38°C
Convritu	Position 1 mirrors the Basic Tab.	Voltage: 11.71 V
Security		GPS Mode: Unlocked
Tools and Diagnostics		GPS Coordinates:
	Network ID EMB-SILV Frequency 2220	34.057118.447_0
Configuration Profiles		Night Mode:
Settings Profile	Bandwidth 20	Scrollbars:
Multi-Position Switch		
Multi-Position Switch	Switch Configurations	
		7
	Network ID EMB-SILV	
	Frequency 2220	
	APPLY SAVE AND APPLY APPLY NETWORK SAVE AND APPLY NETWORK	
		© 2022 Silvus Technologies, Inc.   Legacy

Fig. 76: Multi-Position Switch panel

In this example only one configuration has been created.

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

(••) 192.168.8.96 - StreamCaster MIN 🗙 (••) u	ıser_manual.pdf x   ♠ 192.168.8.95 - StreamCaster MIM x   +		~ - O ×
← → C ▲ No es seguro   192.168	3.8.96	5. C. L.	☆ 🗟 🗳 🗶 🤇 🗯 🔲 💠
Embention			
≣⊞	SiL	<b>∕US</b> Niodies	=
Local Radio Configuration 🕨	Current Saved Profiles		IP: 172.20.179.131
Network Management			VIP: 192.168.8.96
g	Saved Profiles		Node Label: node45955_179.131
Spectrum Dominance			Temperature: 38°C
Poourity .	APPLT SAVE AND APPLT DOWNLOAD DELETE SET	ND PROFILE TO NETWORK	Voltage: 11.64 V
Security			GPS Mode: Unlocked
Tools and Diagnostics	Upload Profile		GPS Coordinates:
			34.057118.447_0
Configuration Profiles	Settings File	Settings Name	Night Mode:
Settings Profile	Seleccionar archivo Ninguno archivo selec.		Scrollbars:
Multi-Position Switch	UPLGAD		
	Save Current Settings		
	Settings Name	Settings	
	SAVE		
			© 2022 Silvus Technologies, Inc.   Legacy

Fig. 77: Settings Profile panel

(••) 192.168.8.96 - StreamCaster MIM × (••)	user_manual.pdf x 40 192.168.8.95 - StreamCaster MIN x +	~ - ¤ ×
← → C ▲ No es seguro   192.16	8.8.96	🖻 🎓 🗟 🤣 🕊 🔇 🛊 🔲 🛛 🗄
Embention		
	SiLVUS TECHNOLOGIES	=
Local Radio Configuration	APPLY SAVE AND APPLY DOWNLOAD DELETE SEND PROFILE TO NETWORK	IP: 172.20.179.131
Network Management	>	VIP: 192.168.8.96
		Node Label: node45955_179.131
Spectrum Dominance	Upload Profile	Temperature: 38°C
		Voltage: 11.78 V
Security	Settings File     Settings     Name	GPS Mode: Unlocked
Tools and Diagnostics	Seleccionar archivo Ningunohivo selec.	
Tools and Diagnostics		
Configuration Profiles	VPLOAD	34.057118.447_0
		Night Mode:
Settings Profile		Scrollbars:
	Save Current Settings	
Multi-Position Switch	Settings	
	Name Virtual IP	
	Settings	
	SAVE	

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

#### Fig. 78: Save settings

(••) 192.168.8.96 - StreamCaster MIN 🗙 (••)	user_manual.pdf x   № 192.168.8.95 - StreamCaster MIN x   +	~ - O ×
← → C ▲ No es seguro   192.1	8.8.96	🗟 🖻 🛧 🗟 🤣 ¥ 🤇 🌲 🔲 🛛 🔅
Embention		
Local Radio Configuration	Settings Profile	IP: 172.20.179.131
Network Management		VIP: 192.168.8.96
Network Management		Node Label: node45955_179.131
Spectrum Dominance	Current Saved Profiles	Temperature: 38℃
Socurity	Saved	Voltage: 11.66 V
Security	Profiles	GPS Mode: Unlocked
Tools and Diagnostics	APPLY SAVE AND APPLY DOWNLOAD DELETE SEND PROFILE TO NETWORK	GPS Coordinates:
Configuration Profiles		34.057118.447_0
Configuration romos		Night Mode:
Settings Profile	Upload Profile	Scrollbars:
Multi-Position Switch	Settings File Settings	
	Seleccionar archivo Ningunohivo selec.	
	UPLOAD	
	SAVE	
		© 2022 Silvus Technologies, Inc.   Legacy

Fig. 79: 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.

(••) 192.168.8.96 - StreamCaster MIM × (••) user_ma	nual.pdf 🗙 🙌 192.168.8.95 - StreamCaster MIM 🗙 🕂	~ - • ×
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L Embention		
<b>≡ +</b>	SILVUS ticiniologits	=
Local Radio Configuration	Network Topology 🛛 🔯 🔀 🚺 🔯	IP: 172.20.179.131
Network Management	+	VIP: 192.168.8.96
		Node Label: 45955_179.131
Network Topology		Temperature: 38°C
Manning		Vollage: 11.72 V
маррину		GPS Mode: Unlocked
Table View		GPS Coordinates:
	45771_178.203	34.057118.447_0
Network-wide Setup	56¢B	Night Mode:
Per-Node Setup		Scrollbars:
Spectrum Dominance	45955_179.131	
Security ►		
Tools and Diagnostics		
Configuration Profiles		© 2022 Silvus Technologies, Inc.   Legacy

Fig. 80: Connection between radios

#### 9.2.3.4 Silvus radio configuration in autopilot

The necessary configuration of **Veronte Autopilot 1x** for Silvus radios require different applications, according to the software version:

6.8 or higher: use 1x PDI Builder reading its user manual. Go to Integration examples -> External radios section.

**6.4 or lower:** use **Veronte Pipe** reading the Veronte Autopilot manual. Go to Veronte Autopilot -> Silvus Radio Configuration.

# 9.3 External Sensors

## 9.3.1 OAT sensor 428 of MGL Avionics



Fig. 81: OAT sensor 428

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

### 9.3.1.1 Hardware installation

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



Fig. 82: OAT sensor wiring



Fig. 83: Harness pinout

Autopilot 1x Connections			
Pin number	Signal	Harness wire colour	
36	5V	Pink	
37	GND	Blue	
38	ANALOG_1	Red	

### 9.3.1.2 Software installation

Once connected the **OAT sensor**, the temperature can be monitored with Veronte software using the variables ADC1 to ADC5.

The necessary configuration of **Veronte Autopilot 1x** for OAT sensors require different applications, according to the software version:

6.8 or higher: use 1x PDI Builder reading its user manual. Go to 1x PDI Builder manual -> Integration Examples.

# 9.4 Joysticks

To use the joystick in the system, connect the PPMout of the trainer port to a digital input of Veronte Autopilot 1x and configure that digital input in the corresponding software.

If the PPM level is 3.3V, pins 1-8, 10-17 and 55-58 pins can be used.

Veronte is compatible with standard Pulse Positon Modulation (PPM) signals, Futaba radios between 8 and 12 channels are recommended.



Fig. 84: Futaba T10 Joystick

Pin	Designation	Connector
SHIELD	Ground	
1	$V_{encoder}$	
2	PPM <sub>out</sub>	
3		
4	V <sub>enc2</sub>	
5	VBATTERY	
6	Unknown	
Pin	Designation	Connector
1	NC	

PIN	Designation	Connector
1	NC	
2	Ground	
3	<b>PPM</b> out	30 20 10
4	VBATTERY	60 50 40
5	$V_{encoder}$	
6		

Fig. 85: Futaba T10 pinout





As default, channel 8 is reserved for manual / auto switch. High level is used for automatic flight and low level for manual control. This channel can be configured on Veronte software.

**Warning:** Caution!! PPM signal must be into the Veronte voltage ranges. Some joysticks may need an adaptation board, please ask our team to check compatibility.

Veronte connector for CS is provided with 3.5mm stereo plug connector as follows:



Fig. 87: PPM pinout



Fig. 88: **PPM connector** 

### CHAPTER

# TROUBLESHOOTING

In case of any issue with software, read the Troubleshooting section of the manual for the corresponding software.

Warning: Select your select a version from ar	version before reading any user manual for software. The following image shows where to by Embention user manual.
Versite Link x +     C      A https://manualkembention.com/UM30     D      Employmentation	- o x 1-veronte-lint/en/6.8.27/indec.ttml A C A & C & S & S & A C A & C & S & S & A Home Version-6.8.27 * Languages-EN * Download *
Veronte Link         Software installation         How to use Veronte Link         Sessions         Toubleshooting         Integration examples         COM port configuration	Decs > Veronte Link         Veronte Link         When the interconnects multiple control stations and autopilot units, so they can operate simultaneously.         Werone Link supports the main Operating Systems (Windows, Linux and MacOS X). Contact Embention and we will provide you with the software that better fits your requirements. Also, you must have updated the latest version of java.         Software installation         Nore a Veronte device is delivered, a shared folder between the Customer and Embention is automatically created. The user will receive an email from the Support Team containing the information needed to access. If the email is not received within 72h, please contact with support@embention.com and our Support Team will be happy to help you.         Sign in         Mp://Support.embention.com         Username         Username         Username         Issuerd         Intername         Dessuerd

# 10.1 Maintenance mode

Maintenance mode is the main troubleshooting tool that Veronte Autopilot 1x puts at the user disposal. While in maintenance mode, all communication channels are enabled by default, so it is possible to connect with Autopilot 1x through any of its configuration interfaces, no matter its current configuration.

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**, it is possible to perform actions such as force the load of a new configuration file or format the SD card.

If at some point the communication with **Autopilot 1x** is lost, it is possible to use **maintenance mode** to go back to a previous state of the configuration (as long as it was exported previously), format the SD card to start over or update the unit's firmware.

**Tip:** It is heavily recommended to always use **maintenance mode** to load a new configuration that is very different from the current one.

## **10.2** How to enter in maintenance mode

There are two ways to enter in maintenance mode: using software or forcing it.

### 10.2.1 Using software to enter in maintenance mode

To enter in **maintenance mode** using software, read the maintenance mode section of the manual for the corresponding software.

### 10.2.2 Forcing maintenance mode

There are two ways to force the maintenance mode: using power supply or using the I2C pins.

#### 10.2.2.1 Using the power supply to force maintenance mode

When communication with the unit is lost, it is possible to active maintenance mode by power input.

In order to active **maintenance mode**, power cycle the **Veronte Autopilot 1x** repetively with a period of 1 second. After 30 cycles, the autopilot will enter in **maintenance mode**.

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).

#### Fig. 1: How to power cycle an autopilot

#### 10.2.2.2 Using the I2C pins to enter in maintenance mode

To enter in **maintenance mode** with I2C, connect both I2C pins each other, then power up the **Veronte Autopilot 1x**. Both pins are I2C\_CLK (number 31) and I2C\_DATA (number 32) according to the *pinout*.

# 10.3 Pinout changes from Autopilot 1x 4.8

The pinout for 4.5 and 4.8 versions are very similar, but they have several differences. To prevent any confusion, the following table shows the pinout for both versions. The different pins are marked with  $\triangle$ , all the rest have the same function.



Fig. 2: 68 pin connector for both versions

Pin	Signal	Туре	Comments
1	I/O1	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
2	I/O2	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
3	I/O3	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
4	I/O4	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
5	I/O5	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit

Pin	Signal	Туре	Comments
6	I/O6	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
7	I/O7	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
8	I/O8	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
9	GND	GROUND	Ground signal for
			actuators 1-8
10	I/O9	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
11	I/O10	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
12	I/O11	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
13	I/O12	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
14	I/O13	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
15	I/O14	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
16	I/O15	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
17	I/O16	I/O	PWM / Digital I/O signal
			(0-3.3V). Protected
			against ESD and short
			circuit
18	GND	GROUND	Ground signal for
			actuators 9-16

Table 1 – continued from previous page

Pin	Signal	Туре	Comments
19	RS 232 TX	Output	RS 232 Output (-13.2V
			to 13.2V Max, -5.4V to
			5.4V Typical). Protected
			against ESD and short
			circuit
20	RS 232 RX	Input	RS 232 Input (-25V to
			25V Max, -0.6V Low and
			2.4V High Threshold).
			Protected against ESD
			and short circuit
21	GND	GROUND	Ground signal for buses
22	Analog 4	Input Analog	Input 0-3.3V. Protected
			against ESD and short
			circuit
23	Analog 5	Input Analog	Input 0-3.3V. Protected
			against ESD and short
24		CROUND	circuit
24	GND	GROUND	Ground signal for buses
25	CanA P	1/0	CANDUS Interface, up to
			1 2V 2 2V Differential)
			Protected against ESD
26	Can A N	1/0	Twisted pair with a 120
20		10	ohms Zo recommended
			(2.3V  Typical - 1.2V-2.3V)
			Differential) Protected
			against ESD
	4 5: GND	4 5: GROUND	4.5. Ground signal for
27	4.5. 610	4.5. 000000	huses
27	4.8:4XV WD	4.8: I/O	4.8: Reserved Do not
			connect
28	CANB P	I/O	CANbus interface. It
			supports data rates up to
			1 Mbps. Protected against
			ESD
29	CANB_N	I/O	Twisted pair with a 120
			ohms Zo recommended.
			Protected against ESD
30	GND	GROUND	Ground signal for buses
31	I2C_CLK	Output	Clk line for I2C bus (0.3V
			to 3.3V). Protected against
			ESD and short circuit
32	I2C_DATA	I/O	Data line for I2C bus
			(0.3V  to  3.3V). Protected
			against ESD and short
		CDOUND	círcuit
33	GND	GROUND	Ground for 3.3V power
			supply

Table 1	<ul> <li>– continued</li> </ul>	from	previous	page
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Pin	Signal	Туре	Comments
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
- 27	CND	CROUND	100mA resettable fuse
3/	GND	GROUND	Ground for analog signals
38	ANALOG_1	Input	Analog input 0-3.3V.
			and short sirewit
20		Input	Analog input 0.2.2V
39	ANALOO_2	Input	Protected against ESD
			and short circuit
40	ANALOG 3	Input	Analog input 0-3 3V
10		input	Protected against ESD
			and short circuit
	4 5 GND	4 5. GROUND	4 5: Ground for FTS
41	4.5. 6112	4.5. GROOND	signals
	4.8: 4XV A	4.8: I/O	4.8: 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
	4.5: GND	4.5: GROUND	4.5: Ground signal for
44			safety buses
	4.8: 4XV_B	4.8: I/O	4.8: Reserved. Do not
			connect
	4.5: V_ARB_TX	4.5: Output	4.5: Veronte comicro
45			UART output to activate
			safety mechanism.
			Protected against ESD
			and short circuit
	4.8: UARIA_1X	4.8: Output	4.8: Microcontroller
	4.5: V_ARB_RX	4.5: Input	4.5: Veronte comicro
40			UAKI output to activate
			safety mechanism.
			and short circuit
	4.8: UARTA RX	4.8: Input	4.8: Microcontroller
		1.01 mput	UART
L			

Table	1 – c	ontinued	from	previous	page
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Pin	Signal	Туре	Comments
47	GND	GROUND	Ground signal comicro
			power supply
48	V_ARB_VCC	POWER	Veronte comicro power
			(6.5V to 36V). Protected
			against ESD and reverse
			polarity
49	FTS3_OUT_MPU	Output	MPU alive voting signal,
			to use with 4xVeronte.
			It is a Square Wave at
			[100,125] Hz. Protected
			against ESD and short
			circuit
50	OUT_RS485_P	Output	Non-inverted output
			from RS485 bus (-7V
			to 12V Max, -2.3V to
			2.3V Typical). Protected
			against ESD and short
51	OUT DC495 N	0.1.1	
51	001_R3485_N	Output	Inverted output from $PS485$ bus (7V to 12V)
			$\begin{array}{c} \text{RS465 bus } (-7 \text{ to } 12 \text{ V}) \\ \text{Max}  2.3 \text{ V}  \text{to } 2.3 \text{ V} \end{array}$
			Typical) Protected
			against ESD and short
			circuit
52	IN RS845 N	Input	Inverted input from
32		input	RS485 bus (-7V to 12V
			Max. $-2.3V$ to $2.3V$
			Typical). Protected
			against ESD and short
			circuit
53	IN_RS845_P	Input	Non-inverted output
		_	from RS485 bus (-7V
			to 12V Max, -2.3V to
			2.3V Typical). Protected
			against ESD and short
			circuit
54	RS-485_GND	GND	Ground for RS-485 bus
55	EQEP_A	I/O	DIGITAL output /
			DIGITAL input / Encoder
			quadrature input A (0-
			3.3V). Protected against
			ESD and short circuit
56	EQEP_B	0/1	DIGITAL output /
			DIGITAL input / Encoder
			quadrature input B (0-
			5.5 v). Protected against
			ESD and snort circuit
			wAKININU!: Unly use it as digital I/O with Varanta
			units of Hardware version
			4 5 or lower
			4.5 UI 10WEI

Table	<ol> <li>1 – continued</li> </ol>	from	previous	page
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Pin	Signal	Туре	Comments
57	EQEP_S	I/O	DIGITAL output /
			DIGITAL input / Encoder
			strobe input (0-3.3V).
			Protected against ESD
			and short circuit
58	EQEP_I	I/O	DIGITAL output /
	-		DIGITAL input / Encoder
			index input A (0-3.3V).
			Protected against ESD
			and short circuit
59	GND	GROUND	Ground for encoders
60	V_USB_DP	I/O	Veronte USB data line.
			Protected against ESD
61	V USB DN	I/O	Veronte USB data line.
			Protected against ESD
	A 5. V USB ID	4 5 · 1/0	4.5. Veronte USB ID
62	4.5. 4_05b_1b	4.5.10	line Protected against
02			FSD and short circuit
	4 8 USB SHIELD	4 8. GND	4 8. USB cable shielding
63	FTS OUT MPU		Abort mission voting
05	115_001_0010	ouipui	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
64	FTS2 OUT MPU	Output	Abort mission voting
	1102_001_001	output	signal 2 from MPU, to use
			with 4xVeronte. Bit Low
			(0V) if mission OK. High
			(3.3V) if mission wants to
			be terminated. Protected
			against ESD and short
			circuit
65	GND	GROUND	Veronte ground input
66	GND	GROUND	Veronte ground input
67	VCC	POWER	Veronte power supply
			(6.5V to 36V). Protected
			against ESD and reverse
			polarity.
			Warning: Both pins
68	VCC	POWER	are common. They
			MUST be connected to
			the same power supply.

### Table 1 – continued from previous page

Warning: Remember!! All GND pins are common.

### CHAPTER

## **ELEVEN**

# **ACRONYMS AND DEFINITIONS**

# 11.1 Acronyms

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
CMB	Climb Phase
CRU	Cruise Phase
DC	Direct Current
DGPS	Differential GPS
ECAP	Enhanced CAP
ECEF	Earth Centered – Earth Fixed
EGNOS	European Geostationary Navigation Overlay Service
EKF	Extended Kalman Filter
ESC	Electronic Speed Controller
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
HLD	Hold Phase
HUM	Hardware User Manual
I2C	Inter-Integrated Circuit

	Table 1 – continued from previous page
IAS	Indicated Air Speed
ID	Identification
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
OPV	Optionally Piloted Vehicle
PFD	Primary Flight Display
PID	Proportional Integral Derivative
PPM	Pulse Position Modulation
PWM	Pulse Width Modulation
QNH	Barometric atmospheric pressure adjusted to sea level
RC	Radio Control Mode
RF	Radio Frequency
RPAS	Remotely Piloted Aircraft System
RPM	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
SUM	Software User Manual
TAS	True Air Speed
ТКО	TakeOff Phase
TX	Transmission
UART	Universal asynchronous receiver-transmitter
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
US	Output-Servo matrix
VTOL	Vertical TakeOff and Landing
WGS 84	World Geodetic System 84
WP	Waypoint

**T** . I. I . . . . .1.6

# **11.2 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.

### CHAPTER

## TWELVE

# **CONTACT DATA**

You can contact Embention if you need further help and support.

Embention contact data is as follows:

Email: support@embention.com

Telephone: (+34) 965 421 115

Address: Polígono Industrial Las Atalayas, C/ Chelín, Nº 16, CP 03114, Alicante (España).