1x Software Manual

Release 6.12

Embention

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CONTENTS

In this manual the user can consult a brief description of all the applications created and designed to work together with the Veronte Autopilot 1x.

In addition, links are available to access the manuals for each of these applications.

Warning: Select your version before reading any user manual for software. The following image shows where to select a version from any Embention user manual.

ONE
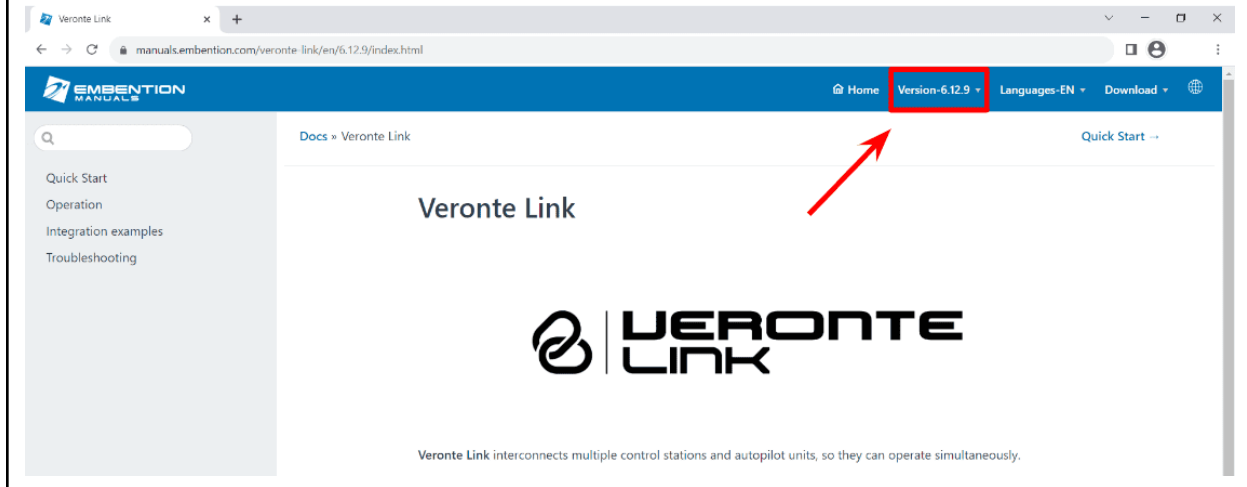
SOFTWARE APPLICATIONS

1.1 Veronte Link

Veronte Link establishes communication between a computer and any Veronte product by creating a VCP bridge. It allows to use multiple control stations and autopilots to be interconnected, operating simultaneously. **Veronte Link** also includes a post-flight viewer, to reproduce all recorded data from previous flights and generate plots and reports.

For more information, visit the Veronte Link user manual.

1.2 1x PDI Builder

1x PDI Builder is the main configuration tool to adapt a **Veronte Autopilot 1x** to a specific vehicle, including user-defined communication protocols. **1x PDI Builder** includes:

- Telemetry: real-time onboard UAV metrics, such as sensors, actuators and control states.

- Configuration: edit vehicle settings, such as servo trim, interface/port management and modes.

- Automations: actions that are automatically executed when a set of configured conditions are accomplished.

- Block Programs: **Veronte Autopilot 1x** can be programmed with a friendly-user programming language.

For more information, visit the 1x PDI Builder user manual.

1.3 Veronte Ops

Veronte Ops is the application employed to operate and monitor the vehicle during missions.

To know more, read the Veronte Ops user manual.

Veronte Terrain Provider estimates and displays the terrain height and the aircraft height, so working in conjunction with the Veronte Ops application, it helps to avoid collisions.

Fig. 1: **Heights example from Veronte Ops widget**

For more information about **Veronte Terrain Provider**, read the Veronte Terrain Provider - Additional apps section of **Veronte Ops user manual**.

1.4 Veronte HIL

Veronte HIL (Hardware In the Loop) is a simulation package for autopilots integration, development, and operator training. This software allows to extensively operate the flight system in a simulated environment, prior to executing real flight operations. Its role is to perform HIL simulations with the real autopilot hardware, allowing to use simulation applications like X-Plane, Microsoft Flight Simulator or Simulink.

For more information, visit the Veronte HIL user manual.

1.5 Veronte Updater

Veronte Updater updates all Embention products.

For more information, visit the Veronte Updater user manual.

1.6 1x PDI Calibration

1x PDI Calibration setups calibration parameters for 1x autopilots. It allows the user to calibrate sensors, servos and configure the radio module.

For more information, visit the 1x PDI Calibration user manual.

1.7 Veronte FDR

Veronte FDR manages autopilot files, it allows to download the registers generated by the autopilot and convert them to csv files. Three types of registers can be downloaded: Onboard log, Fast log and User log.

For more information, visit the Veronte FDR user manual.

1.8 Veronte VSA

Veronte VSA works using a flight simulator for representing the worldwide geographical scenarios: *lands, seas, mountains, cities, airports, airfields, heliports...* In addition, an internet connection is not necessary, so it can be operated from any location without any delays in scenario loading.

Veronte VSA displays a 3D view of the aircraft which is being piloted, while it allows to use it as a 3D PFD (Primary Flight Display) when using the first person camera view. This system allows to display custom aircraft models in the virtual environment. Planemaker tool is available for creating custom models, thereby the operator can see in the interface aircraft model.

For more information, visit the Veronte VSA user manual.

1.9 1x PDI Tuning

1x PDI Tuning allows to manage the control laws of the autopilot 1x during operation. The user can adjust each of the P (proportional) I (integral) D (derivative) gains and also the PID type (standard or parallel).

For more information, visit the 1x PDI Tuning user manual.

NOMENCLATURE

This section defines the nomenclature convention employed by the software applications.

2.1 Reference directions

- **Yaw** is the direction where the aircraft is pointing to. It does not depend on the movement, since **yaw** is aligned with the longitudinal axis of the aircraft.

- **Heading** is the movement direction projected to the ground. **Heading** does not depend on wind or **yaw** direction, it just depends on the ground and the aircraft movement.

Important: Both **Yaw** and **Heading** angles are measured in respect of the **True North**, not the Magnetic North.
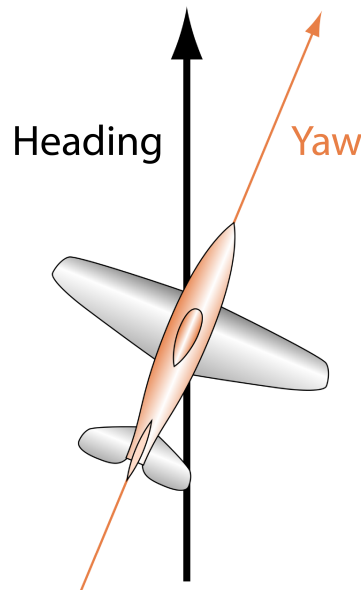

Fig. 1: **Direction names**

2.2 Axes

All signs are defined according to the international aeronautical axes convention: it is considered positive any deflection that generates positive rotational forces repect to the aerodynamic centre of the aircraft, except for "y" axis (elevator) where it is considered negative.

For example, an elevator going down will generate a positive pitch so the elevator is considered positive on low position. Main actuators rules:

Actuator	Positive	Negative
Elevator	Down	Up
Rudder	Right	Left
Right Aileron	Up	Down
Left Aileron	Down	Up
Tail Rotor	Right	Left

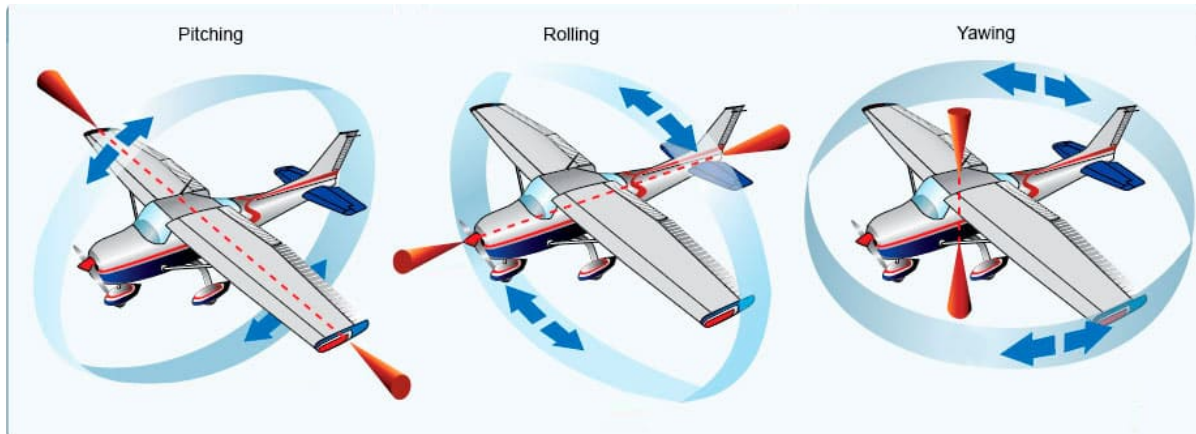In addition, rotation names are summarized in the next figure:

Fig. 2: **Rotation names**

CORE ARCHITECTURE

Veronte Autopilot 1x is equipped with a Dual-Core Microcontroller. Both cores, hereinafter called **Core 1 (C1)** and **Core 2 (C2)**, work together to perform information processing operations efficienty and to coordinate the activities of other system components.

It is crucial to understand the performance of C1 and C2 in order to properly handle Autopilot 1x tasks.

- **Core 1**: It presents the following operation threads.

  - **High**: 1kHz guaranteed. Hardware interrupt in charge of certain critical or high-priority tasks which must be executed with a constant and predictable frequency.

    Note: There is a permitted frequency fluctuation of 1%.

  - **Low**: Not guaranteed rate. In charge of non-priority tasks which tolerate non-guaranteed time consistency.

- **Core 2**: Execution rate of 400 Hz (configurable from 1x PDI Builder Veronte application).

3.1 Task distribution

Tasks distribution between processors:

Core 1		Core 2
High	Low	- Guidance, Navigation and Control (GNC) - Mission updating - Automations management - RAM writing
- Sensors reading - FTS Management - I/O management (data from peripherals to internal pre-processing queues)	- Telemetry and logs management - Communicaction management - Files management - Additional helper tasks - SD writing	

A proper comprehension of how cores manage different tasks, considering the priorities and execution rates previously explained, may be valuable to avoid delays in data processing and achieving a balanced functioning of the Veronte system.

Aspects to be considered:

- **C1 and C2 information interchange**: Cores share information through the **Cross-Core queue**, hence overfilling this queue may result in late processing of data.

- **Tasks distribution between C1 threads**: If acquisition tasks take too much processing time, C1 low task may not be executed as expected.

- **C1 High interruptions**: C1 high may interrupt C1 low task execution. In this case, C1 low will continue its execution at the same point once high priority tasks are fullfilled.

3.2 Monitoring variables

Distributing resources is decisive for the proper functioning of the system. For that reason, core-related values are monitored.

Note: For further information regarding these variables, please consult their IDs in the *Lists of variables* section of the present manual.

C1 is monitored by the following variables:

Core 1	
High	Low
- Acquisition Step Missed (*BIT 402*) - CIO Hi Overload warning (*BIT 403*) - Acquisition Task Timestep (*RVar 2047*) - Acquisition Task Maximum Timestep (*RVar 2048*) - Acquisition Task Average CPU Ratio (*RVar 2050*) - Acquisition Task Maximum CPU Ratio (*RVar 2051*) - Acquisition Task Average Time (*RVar 2052*) - Acquisition Task Maximum Time (*RVar 2053*) - Identifier of max duration step in acquisition (*UVar 399*)	- C1 Low Frequency (*BIT 400*) - IO Max Time (*RVar 2054*) - CIO Average Time (*RVar 2055*) - CIO Running Frequency (*RVar 2057*)

C2 is monitored by the following variables:

Core 2
- GNC fail (*BIT 401*)   - GNC Realtime Error (*BIT 404*)   - GNC Task Average CPU Ratio (*RVar 2094*)   - GNC Task Maximum CPU Ratio (*RVar 2095*)   - GNC Task Average Time (*RVar 2096*)   - GNC Task Maximum Time (*RVar 2097*)   - GNC Task Maximum Timestep (*RVar 2098*)   - Max Duration of Step in GNC (*RVar 2099*)   - GNC Timestep (*RVar 2903*)   - Counter for C2 system BIT (*UVar 20*)

Cross-Core queue is monitored by the following variables:

Cross-Core queue
• Cross Core Message Queue CPU Ratio (*RVar 2049*) • Cross-Core Message Queue Usage (*RVar 2056*)

LISTS OF INTEREST

This section contains all the lists with information of interest for the user.

4.1 Activation System Error bits

The **System Error** variable is indicated by *bit number 7*. This bit checks whether the system is running properly. If one of certain malfunctions occur, the **System Error** will be set as 0 and the FTS will be activated. Othwerwise, if everything is OK, it will remain as 1.

The **System Error** is triggered and set as 0 if one of the following unwanted events happens:

- **CIO low** has a frequency lower than 10 Hz. This error is indicated with a 0 in *bit 400*.

- **CIO high** has a frequency lower than 990 Hz. This error is indicated with a 0 in *bit 402*.

- **GNC** is 'dead'. This event is indicated with a 0 in *bit 401*.

- **GNC Realtime Error** because a GNC Step has been missed. This event is indicated with a 0 in *bit 404*.

- **System power up BIT error**. The initial value of this bit depends on the values of the bits listed below and represents their state at power-up. This error is indicated with a 0 in *bit 12* if any of the following errors happens:

    - **RAM allocation** is in error state due to trying to use more memory than available. This error is indicated with a 0 in *bit 8*.

    - **PDI files** have a wrong configuration. This is indicated by a 0 in *bit 9*.

    - **Main Power supply A** is in error state. This error is indicated with a 0 in *bit 117* if any of the following errors happens:

        * **Input supply voltage** is not between 6.5 and 36 V. This voltage is measured by *RVar 400*.

        * **Voltage received by Veronte through 5V port** is not between 4.75 and 5.25 V. This voltage is measured by *RVar 402*.

        * **Voltage received by Veronte through 3.6V port** is not between 3.42 and 3.78V. This voltage is measured by *RVar 404*.

- **File system manager** is in error state. This event is indicated with a 0 in *bit 6*.

- **Core 1** has a memory overflow allocated for local variables. This error is indicated with a 0 in *bit 16*.

- **Core 2** has a memory overflow allocated for local variables. This error is indicated with a 0 in *bit 17*.

- Any user bit configured as **safety bit** is 0. *User bits* are 1200 to 1499.

4.2 Status Message variables

Information about the Veronte Autopilot 1x status message is contained in the following set of bit variables.

ID	Name
5	Power error
6	File System Error
8	Memory allocation
9	PDI Error
12	System Power up BIT Error
14	FTS-1 Feedback (>=V4.5)
15	FTS-2 Feedback (>=V4.5)
16	Stack C1 usage FAIL
17	Stack C2 usage FAIL
49	CPU temperature above 398.15K
50	Sensors Error
51	Sensor-Main IMU
52	Sensor-Secondary IMU
53	Sensor-Internal Magnetometer (LIS3MDL)
54	Sensor-External magnetometer (HMR2300)
55	Sensor-External Magnetometer (LIS3MDL)
56	Sensor-Static pressure (HSC)
57	Sensor-Static pressure (MS56)
58	Sensor-Dynamic pressure (HSC)
59	Sensor-External I2C devices
60-64	Sensor-External I2C device 0-4
73	CAN-A ERROR
74	CAN-B ERROR
82	Sensor-External Magnetometer (HSCDTD008A)
83	IMU 2 BMI088
84	Sensor-Static pressure 2 (DPS310)
85	Sensor-Internal Magnetometer (MMC5883MA)
86	Sensor-External Magnetometer (MMC5883MA)
87	GNSS1 Module Error
88	GNSS2 Module Error
89	Sensor-External Magnetometer (RM3100)
90	IMU3 ADIS16505-3 (MCBSP)
91	Sensor-Internal Magnetometer (RM3100)
92	Magnetometer reserved
110	Stick Not Detected
117	Main Power Error
118	SUC Power Error
400	C1 Low Frequency
401	GNC fail
402	Acquisition step missed
403	CIO Hi Overload warning

4.3 List of Addresses

Every Embention device communicate with other devices/tools using its address through VCP.

The following list contains all these addresses:

Address	Recognized as	Description
0	Dummy for pdi builders	Dummy for pdi builder
1	Cloud	**Veronte Cloud** address
2	Vlink	Address used by **Veronte Link** app to communicate with Veronte units
2-3	App + *Address*	Veronte applications addresses. **App 2** is the one used by default by Veronte applications, although *App 3* is also available
255-511	App dynamic + *Address*	**Dynamic addresses** for Veronte applications
998	Broadcast	To **all devices** on a network
999	Address unknown	This address can be used for a device that **does not** have a **valid address** configured
1000-1777	1x v4.0 + *Address*	Specific address of an **Autopilot 1x** with **hardware version 4.0**
1778-3999	1x v4.5 + *Address*	Specific address of an **Autopilot 1x** with **hardware version 4.5**
4000-17999	1x v4.8 + *Address*	Specific address of an **Autopilot 1x** with **hardware version 4.8**
18000-19899	1x BCS + *Address*	Specific address of a **BCS** unit
19900-19999	1x v4.7. For internal use only + *Address*	Specific address of an **Autopilot 1x** with **hardware version 4.7**
20000-21999	Smart Can Isolator + *Address*	Specific address of a **Smart Can Isolator** unit
30000-31999	MC01 + *Address*	Specific address of a **MC01** unit
32000-34999	MC24 motor controller + *Address*	Specific address of a **MC24** unit
35000-39999	MC110 motor controller + *Address*	Specific address of a **MC110** unit
40000-41999	CEX + *Address*	Specific address of a **CEX** with **hardware version 1.2**
42000-43999	MEX + *Address*	Specific address of a **MEX** unit
44000-49999	CEX2 + *Address*	Specific address of a **CEX** with **hardware version 2.0**
50000-51089	Arbiter v1.0 + *Address*	Specific address of an **Arbiter** with **hardware version 1.0**
51090-51999	Arbiter v1.2 + *Address*	Specific address of an **Arbiter** with **hardware version 1.2**
52000-59999	Arbiter v1.8 + *Address*	Specific address of an **Arbiter** with **hardware version 1.8**
60000-65535	Reserved + *Address*	Reserved addresses
65536-69631	Virtual v4.0 + *Address*	Specific address of a **Virtual Autopilot 1x** with **hardware version 4.0**
69632-73727	Virtual v4.5 + *Address*	Specific address of a **Virtual Autopilot 1x** with **hardware version 4.5**
73728-77823	Virtual v4.8 + *Address*	Specific address of a **Virtual Autopilot 1x** with **hardware version 4.8**

4.4 Lists of Variables

This section shows all the variables employed by **Veronte Autopilot 1x**. All of them can be read and sent through telemetry.

These variables are clasified in two main groups:

- **System variables**: Non-writable by the user.

- **User variables**: Writable by the user, marked in the tables below as [✎].

Important: Variables labeled as "**Deprecated**" are no longer used by the system.

In order to avoid system incompatibilities, deprecated variables are only written by the autopilot when migrating a configuration from a previous version in which the variable was not obsolete. When a configuration is built from scratch, these variables must be defined by the user to be used. Thus, users are responsible for their correct assignment.

4.4.1 BIT Variables

Warning: Bit Variables displayed on **Veronte Ops** labels will be shown as Red/Green depending on its state. Red stands for 0 and Green for 1, changing the name displayed accordingly to the BIT value.

ID	Name	Description
0	Always Fail	This signal is always fail - 0 for fail, 1 for OK
1	Always OK	This signal is CIO always OK - 0 for fail, 1 for OK
2	License Check Pending	License state - 0 for license check pending, 1 for license checked
3	System Not Ready to Start	System is ready to start operating - 0 for not ready, 1 for ready
4	No Writing Telemetry	Telemetry is properly sending/receiving - 0 for no, 1 for yes
5	Power Error	Power supply state - It ill be 0 if any of the following conditions happens: - *Bit 117* is zero (power for Veronte has a failure) - *Bit 118* is zero (power for SuC has a failure)
6	File System Error	System file manager - Dependent on *File system status (UVar 96)* - 0 for error: if *File system status > 0* - 1 for running OK: if *File system status == 0*

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Table 2 – continued from previous page

ID	Name	Description
7	System Error	This bit checks whether the system is running properly. 0 for system error, 1 for system OK.
8	Memory allocation	RAM allocation - 0 for trying to use more than available memory, 1 for running
9	PDI Error	PDI files - Dependent on *PDI Error Source (UVar 50)* • 0 for wrong PDI configuration: if *PDI Error Source > 0* • 1 for running OK: if *PDI Error Source == 0*
10	CIO Low or C2 Error	CIO low or C2 failed. Bits 400 and 401 are recommended instead - 0 for CIO low or C2 failed, 1 for CIO high and C2 OK **Warning: Deprecated variable**
11	4X CAN failed	For more information, check BIT Variables - 4x Software Manual
12	System Power up BIT Error	Power up - 0 for error, 1 for OK
13	Reset and Write Disabled	Reset and non-operation PDI writes are allowed - 0 for disabled, 1 for enabled
14	FTS-1 Feedback (>=V4.5)	Flight Termination System 1, microcontroller state for hardware version 4.7 or higher - 0 for error, 1 for running OK
15	FTS-2 Feedback (>=V4.5)	Flight Termination System 2, microcontroller state for hardware version 4.7 or higher - 0 for error, 1 for running OK
16	Stack C1 usage FAIL	0 for stack overflow of core 1, 1 for OK
17	Stack C2 usage FAIL	0 for stack overflow of core 2, 1 for OK
18	PDI disabled	PDI Mode - 0 for disabled, 1 for enabled
20-46	4xV Bit variables	For more information, check BIT Variables - 4x Software Manual

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ID	Name	Description
47	4xV Watchdog Error	**Note:** For version 4.7 or higher For more information, check BIT Variables - 4x Software Manual
49	CPU temperature above 398.15K	CPU temperature warning - 0 for CPU temperature above 398.15K (125ºC), 1 for CPU temperature below 398.15K (125ºC)
50	Sensors Error	Sensors state - 0 for error, 1 for running OK Selected sensors are not working or, if external sensors have been selected, they are not connected
51	Sensor-Main IMU	0 for disabled, 1 for enabled
52	Sensor-Secondary IMU	0 for disabled, 1 for enabled
53	Sensor-Internal Magnetometer (LIS3MDL)	**Internal LIS3MDL magnetometer** - 0 for disabled, 1 for enabled
54	Sensor-External Magnetometer (HMR2300)	**External HMR2300 magnetometer** - 0 for disabled, 1 for enabled
55	Sensor-External Magnetometer (LIS3MDL)	**External LIS3MDL magnetometer** - 0 for disabled, 1 for enabled
56	Sensor-Static pressure (HSC)	HSC Static Pressure Sensor - 0 for disabled, 1 for enabled
57	Sensor-Static pressure (MS56)	MS56 Static Pressure Sensor - 0 for disabled, 1 for enabled
58	Sensor-Dynamic pressure (HSC)	HSC Dynamic Pressure Sensor - 0 for disabled, 1 for enabled
59	Sensor-External I2C devices	0 for disabled, 1 for enabled
60-64	Sensor-External I2C device 0-4	External communication I2C from device 0 to 4
65	SCI-A Transmitting (LTE/EXT. UART)	Serial Communication Interface - LTE/EXT. UART transmission
66	SCI-A Receiving (LTE/EXT. UART)	Serial Communication Interface - LTE/EXT. UART reception 0 for not receiving, 1 for receiving
67	SCI-B Transmitting (LOS)	Serial Communication Interface - LOS transmission
68	SCI-B Receiving (LOS)	Serial Communication Interface - LOS reception 0 for not receiving, 1 for receiving
69	SCI-C Transmitting (RS485)	Serial Communication Interface - RS485 transmission
70	SCI-C Receiving (RS485)	Serial Communication Interface - RS485 reception 0 for not receiving, 1 for receiving

4.4. Lists of Variables

Table 2 – continued from previous page

ID	Name	Description
71	SCI-D Transmitting (RS232)	Serial Communication Interface - RS232 transmission
72	SCI-D Receiving (RS232)	Serial Communication Interface - RS232 reception 0 for not receiving, 1 for receiving
73	CAN-A ERROR	CAN A state - 0 for error, 1 for OK
74	CAN-B ERROR	CAN B state - 0 for error, 1 for OK
75	CAN-A Warning	CAN A state - 0 for warning, 1 for OK
76	CAN-B Warning	CAN B state - 0 for warning, 1 for OK
77	Vectornav GPS not fixed	0 for not fixed, 1 for fix
78	Vectornav IMU error	0 for error, 1 for OK
79	Vectornav Mag/Press error	0 for error, 1 for OK
80	Vectornav GPS error	0 for error, 1 for OK
81	Vectornav Navigation Error	Navigation state - 0 for error, 1 for OK
82	Sensor-External Magnetometer (HSCDTD008A)	**External HSCDTD008A magnetometer** - 0 for error, 1 for OK
83	IMU 2 BMI088	0 for error, 1 for OK
84	Sensor-Static pressure 2 (DPS310)	0 for error, 1 for OK
85	Sensor-Internal Magnetometer (MMC5883MA)	**Internal MMC5883MA magnetometer** - 0 for error, 1 for OK
86	Sensor-External Magnetometer (MMC5883MA)	**External MMC5883MA magnetometer** - 0 for error, 1 for OK
87	GNSS1 Module Error	GPS module 1 state - 0 for error, 1 for OK
88	GNSS2 Module Error	GPS module 2 state - 0 for error, 1 for OK
89	Sensor-External Magnetometer (RM3100)	**External RM3100 magnetometer** - 0 for error, 1 for OK
90	IMU3 ADIS16505-3 (MCBSP)	0 for error, 1 for OK
91	Sensor-Internal Magnetometer (RM3100)	**Internal RM3100 magnetometer** - 0 for error, 1 for OK
92	Magnetometer reserved	0 for error, 1 for OK
93	SCI Expander (v4.7+)	SCI Expander for hardware version 4.7 or higher - 0 for error, 1 for OK Status of the universal asynchronous two-channel receiver and transmitter (UART/SCI)
96	SCI-A Error (LTE/EXT. UART)	SCI A (LTE/EXT. UART) state - 0 for error in this port (invalid format or configuration), 1 for OK
97	SCI-B Error (LOS)	SCI B (LOS) state - 0 for error in this port (invalid format or configuration), 1 for OK

Table 2 – continued from previous page

ID	Name	Description
98	SCI-C Error (RS485)	SCI C (RS485) state - 0 for error in this port (invalid format or configuration), 1 for OK
99	SCI-D Error (RS232)	SCI D (RS232) state - 0 for error in this port (invalid format or configuration), 1 for OK
100	Position not fixed	GNSS data reception - 0 for not receiving, 1 for receiving (Position fixed)
101	No valid SRTM at UAV position	0 for not valid, 1 for valid
102-103	CAN A-B Receiving	CAN A to B communication - 0 for not receiving, 1 for receiving
104-105	Stick PPM 0-1 not detected	Stick PPM 0 to 1 - 0 for not detecting, 1 for detecting
106	Magnetic field out of bounds (Deprecated) Warning: Deprecated variable	0 for magnetic field out of bounds, 1 for OK
107	INS navigation OFF	0 for INS navigation OFF, 1 for INS navigation ON
108-109	Stick PPM 2-3 not detected	Stick PPM 2 to 3 - 0 for not detecting, 1 for detecting
110	Stick Not Detected	Stick detection - 0 for not detected, 1 for detected
111-112	CAN A-B Transmitting	CAN signals A to B - 0 for not transmitting, 1 for transmitting
113	Iridium Ready	Iridium ready state – 0 for not ready, 1 for ready
114	No valid Geoid at UAV position	0 for not no valid geoid at UAV position, 1 for valid geoid at UAV position
115	EKF: Condition Number Error	Extended Kalman Filter state – 0 for error, 1 for running
116	Radar Altimeter CAN-RX Error	Radar Altimeter State – 0 for error, 1 for running

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Table 2 – continued from previous page

ID	Name	Description
117	Main Power Error	Main power supply A. It will be 0 (indicating error state) if any of the following errors happens: • Input supply voltage is not between 6.5 and 36 V. This voltage is measured by *RVar 400* • Voltage received by Veronte through 5V port is not between 4.75 and 5.25 V. This voltage is measured by *RVar 402* • Voltage received by Veronte through 3.6V port is not between 3.42 and 3.78V. This voltage is measured by *RVar 404*
118	SUC Power Error	Power supply for system on microchip. It ill be 0 (indicating error state) if any of the following errors happens: • Voltage received by Veronte through 3.3V port is out of range. This voltage is measured by *RVar 401* • Voltage received by Veronte SUC is out of range. This voltage is measured by *RVar 403*
119	Not hovering guidance	Hovering guidance state - for hovering guidance disabled, 1 for enabled
120-123	Pulse 0-3 not detected	Pulse 0 to 3 detection - 0 for pulse not detected, 1 for detected
✎ 124-129	4xV Bit variables	For more information, check BIT Variables - 4x Software Manual
130	EFK Navigation Error	Extended Kalman Filter navigation state - 0 for error, 1 for running
131	No magnetic field data	Bit to indicate if there is magnetic field in the SD - 0 for No Magnetic fiel data, 1 for Magnetic field data OK
132	Route not finished	0 for Route not finished, 1 for Route finished OK
150	External VCP Navigation Error	External VCP state - 0 for error, 1 for OK

Table 2 – continued from previous page

ID	Name	Description
✎ 160	External Var Navigation Error	External Navigation state – 0 for error, 1 for running
170	Selected Accelerometer Error	Selected accelerometer – 0 for error, 1 if at least one of the selected accelerometers is OK
171	Selected Gyroscope Error	Selected gyroscope – 0 for error, 1 if at least one of the selected gyroscopes is OK
172	Bias Accelerometer Satured	0 for bias satured, 1 for OK
173	Bias Gyroscope Satured	0 for bias satured, 1 for OK
✎ 180	External attitude	Kind of attitude calculation – 0 for external, 1 for internal
182	FTS Activation (>=V4.5)	Flight Termination System activation, for version 4.5 or higher - 0 for not activated, 1 for activated
183	4X Selected	Current 1x Autopilot is the one selected by the arbiter - 0 when this AP is not the selected AP, 1 when this AP is the selected one
188	BIT for static pressure sensors Error	0 for static pressure sensors error, 1 for OK
189	BIT for magnetometer sensors Error	0 for magnetometer sensors error, 1 for OK
190	Internest ultrasound position status Error	0 for internest ultrasound position error, 1 for OK
191	Internest ultrasound angle status Error	0 for internest ultrasound angle error, 1 for OK
200	GNSS1 Navigation Down	0 for GNSS navigation OFF, 1 for GNSS navigation ON
201	DGNSS1 Input Off	0 for GNSS compass or RTK not activated, 1 for one of them activated
202	DGNSS1 Navigation Off	0 for GNSS compass or RTK not activated, 1 for one of them activated
203	GNSS1 Survey In Off	GNSS compass survey or RTK OFF, 1 for one of them ON
204	No DGNSS1 Float Solution	0 for no DGNSS1 float solution nor RTK, 1 for DGNSS1 float solution or RTK
205	No DGNSS1 Fixed Solution	0 for no DGNSS1 fixed solution nor RTK, 1 for DGNSS1 fixed solution or RTK
206	DGNSS1 Relative Position Invalid	0 for invalid navigation position, 1 for valid navigation position
207	DGNSS1 not Moving baseline mode	0 for not moving baseline mode, 1 for moving baseline mode
210	DMA peripheral for SPIA A Error	DMA peripheral for SPIA A - 0 for error, 1 for OK

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ID	Name	Description
211	DMA peripheral for MCBSP A Error	DMA peripheral for MCBSP A - 0 for error, 1 for OK
✎ 230-293	4xV Bit variables	For more information, check BIT Variables - 4x Software Manual
300	GNSS2 Navigation Down	0 for GNSS navigation OFF, 1 for GNSS navigation ON
301	DGNSS2 Input Off	0 for GNSS compass or RTK not activated, 1 for one of them activated
302	DGNSS2 Navigation Off	0 for GNSS compass or RTK not activated, 1 for one of them activated
303	GNSS2 Survey In Off	GNSS compass survey or RTK OFF, 1 for one of them ON
304	No DGNSS2 Float Solution	0 for no DGNSS1 float solution nor RTK, 1 for DGNSS1 float solution or RTK
305	No DGNSS2 Fixed Solution	0 for no DGNSS1 fixed solution nor RTK, 1 for DGNSS1 fixed solution or RTK
306	DGNSS2 Relative Position Invalid	0 for invalid navigation position, 1 for valid navigation position
307	DGNSS2 not Moving baseline mode	0 for not moving baseline mode, 1 for moving baseline mode
308	SCI-E Transmitting (LTE)	SCI-E Transmitting (LTE)
309	SCI-E Receiving (LTE)	SCI-E Receiving (LTE)
310	SCI-F Transmitting (LTE Aux.)	SCI-F Transmitting (LTE Aux.)
311	SCI-F Receiving (LTE Aux.)	SCI-F Receiving (LTE Aux.)
312	SCI E Error (LTE)	SCI-E (LTE) - 0 for error, 1 for OK
313	SCI F Error (LTE Aux.)	SCI-F (LTE Aux.) - 0 for error, 1 for OK
329	3.3V Power Source	0 for error, 1 for OK
330	Jetibox COMM Error	Jetibox is communicating properly - 0 for error, 1 for OK
370-371	Smart Can Isolator A-B Domain Error	0 for error, 1 for OK
400	C1 Low Frequency	C1 Low Frequency - Dependent on *CIO Running Frequency (RVar 2057)* (C1 low frequency) • 0 for error → *CIO Running Frequency* < 10 Hz • 1 for OK → *CIO Running Frequency* > 10 Hz
401	GNC fail	0 for error ('dead'), 1 for ok ('alive') - Dependent on *Counter for C2 system (UVar 20)*

Table 2 – continued from previous page

ID	Name	Description
402	Acquisition step missed	• 0 for Acquisition step missed → C1 hi frequency fluctuation is higher than permitted (1%). • 1 for Acquisition Task OK → C1 hi frequency fluctuation is under set limits (1%).
403	CIO Hi Overload warning	C1 hi Overload - Dependent on *Acquisition Task Maximum CPU Ratio (RVar 2051)* • 0 for Acquisition Task overload → *Acquisition Task Maximum CPU Ratio > 90%* • 1 for Acquisition Task usage OK → *Acquisition Task Maximum CPU Ratio ≤ 90%* **Note:** Non-recoverable variable
404	GNC Realtime Error	• 0 if C2 frequency < configured frequency (tolerance of 6 microseconds) • 1 if C2 frequency = configured frequency (tolerance of 6 microseconds)
405	Reserved	0 for error, 1 for OK
480	MC01 Stepper direction output	0 for error, 1 for OK
481	MC01 Brushless driver fault	0 for error, 1 for OK
482	MC Hall Sensor error	0 for error, 1 for OK
483	MC Sin/Cos Sensor error	0 for error, 1 for OK
484	MC general health error	0 for health error, 1 for status OK
485	MC Current sensing error	0 for error, 1 for OK
486	MC Phase U Current Calibration Error	ADC phase U not calibrated - 0 for not calibrated, 1 for calibration OK
487	MC Phase V Current Calibration Error	ADC phase V not calibrated - 0 for not calibrated, 1 for calibration OK
488	MC Phase W Current Calibration Error	ADC phase W not calibrated - 0 for not calibrated, 1 for calibration OK
489	MC Maximum Temperature Error	Maximum power module temperature exceeded - 0 for error (exceeded), 1 for OK
490	MC Phase Error	Power module driver phase error reported - 0 for error, 1 for OK
491	MC General Driver Error	Power module driver error reported - 0 for error, 1 for OK

Table 2 – continued from previous page

ID	Name	Description
492	MC Over-current AC	Current AC side limit exceeded - 0 for error (exceeded), 1 for OK
493	MC Over-voltage advertisement	Over-voltage DC side limit advertisement exceeded - 0 for error (exceeded), 1 for OK
494	MC Over-voltage caution	Over-voltage DC side limit caution exceeded - 0 for error (exceeded), 1 for OK
495	MC Under-voltage latching	Critical under-voltage DC side limit violation - 0 for error, 1 for OK
496	MC Under-voltage non latching	Non critical under-voltage DC side limit violation - 0 for error, 1 for OK
497	MC RMS imbalance	Current AC side imbalance - 0 for error, 1 for OK
498	MC Open DC fault	Open-circuite DC side fault - 0 for error, 1 for OK
499	MC Over-current DC	Current DC side limit exceeded - 0 for error (exceeded), 1 for OK
✍ 500	Ground effect compensation variance disabled	0 for disabled, 1 for enabled
✍ 501	Ground effect compensation measurement disabled	0 for disabled, 1 for enabled
502	No SRTM data	Bit to indicate if there is SRTM in the SD - 0 for No SRTM data, 1 for SRTM data OK
503	No geoid data	Bit to indicate if there is Geoid data in the SD - 0 for No geoid data, 1 for Geoid data OK
600	Wind Estimation Off	0 for disabled, 1 for enabled
✍ 700-731	Servo 0-31 Satured	0 for satured, 1 for OK
✍ 800-815	PWM 0-15 GPIO Off	PWM GPIO 0-15 communication State - 0 for Off, 1 for On
✍ 816-819	EQEP_A-I (GPIO 17-20) Off	Input/Output State - 0 for Off, 1 for On
820-822	RSSI LED 0-2 off	Received Signal Strength Indicator led state - 0 for Off, 1 for On
✍ 823	GPIO 5 (GPIO28) Off	GPIO 5 Status (Low/High) - 0 for Off, 1 for On
✍ 824	GPIO 6 (GPIO61) Off	GPIO 6 Status (Low/High) - 0 for Off, 1 for On
✍ 825	GPIO 7 (GPIO60) Off	GPIO 7 Status (Low/High) - 0 for Off, 1 for On
✍ 826	GPIO 8 (GPIO59) Off	GPIO 8 Status (Low/High) - 0 for Off, 1 for On

Chapter 4. Lists of interest

Table 2 – continued from previous page

ID	Name	Description
✎ 827	GPIO 9 (GPIO17) Off	GPIO 9 Status (Low/High) - 0 for Off, 1 for On
✎ 828	GPIO 10 (GPIO58) Off	GPIO 10 Status (Low/High) - 0 for Off, 1 for On
✎ 829	GPIO 11 (GPIO16) Off	GPIO 11 Status (Low/High) - 0 for Off, 1 for On
✎ 830	GPIO 12 (GPIO53) Off	GPIO 12 Status (Low/High) - 0 for Off, 1 for On
✎ 831	GPIO 13 (GPIO20) Off	GPIO 13 Status (Low/High) - 0 for Off, 1 for On
✎ 832	GPIO 14 (GPI023) Off	GPIO 14 Status (Low/High) - 0 for Off, 1 for On
✎ 833	GPIO 15 (GPI051) Off	GPIO 15 Status (Low/High) - 0 for Off, 1 for On
✎ 834	GPIO 16 (GPI052) Off	GPIO 16 Status (Low/High) - 0 for Off, 1 for On
✎ 835	GPIO 17 (GPI049) Off	GPIO 17 Status (Low/High) - 0 for Off, 1 for On
✎ 836	GPIO 18 (GPI008) Off	GPIO 18 Status (Low/High) - 0 for Off, 1 for On
✎ 837	GPIO 19 (GPI011) Off	GPIO 19 Status (Low/High) - 0 for Off, 1 for On
✎ 838	GPIO 20 (GPI010) Off	GPIO 20 Status (Low/High) - 0 for Off, 1 for On
✎ 839	GPIO 21 (GPIO09) Off	GPIO 21 Status (Low/High) - 0 for Off, 1 for On
✎ 900-931	Virtual GPIO 00-31 off	Virtual GPIO 00-31 Status (Low/High) - 0 for Off, 1 for On
✎ 1000-1009	Simulation BIT 00-09 Error	0 for error, 1 for OK
1010-1113	Custom msg 0-103 Rx Error	Custom message timeout - 0 for error, 1 for OK
✎ 1120-1121	Entrance EKF GNSS1-2 OFF	GNSS 1-2 information considered in EKF Navigation - 0 for entrance EKF GNSS OFF, 1 for ON EKF GNSS OFF may be because **Position not fixed** → EKF deactivated → INSS activated

Table 2 – continued from previous page

ID	Name	Description
✐ 1122	Entrance EKF GNSS3 EXT OFF	External GNSS information considered in EKF Navigation - 0 for entrance EKF GNSS EXT OFF, 1 for ON
✐ 1123	Entrance EKF Internest OFF	Internest information considered in EKF Navigation - 0 for entrance EKF internest OFF, 1 for ON
✐ 1124	Entrance EKF GPSCOMPASS OFF	GNSS Compass information considered in EKF Navigation - 0 for entrance EKF GPSCOMPASS OFF, 1 for ON
✐ 1125	Entrance EKF Magnetometer OFF	Magnetometer information considered in EKF Navigation - 0 for entrance EKF magnetometer OFF, 1 for ON
✐ 1126	Entrance EKF Static press OFF	Static Pressure sensor information considered in EKF Navigation - 0 for entrance EKF static pressure OFF, 1 for ON
✐ 1127	Entrance EKF Altimeter press OFF	Altimeter information considered in EKF Navigation - 0 for entrance EKF altimeter OFF, 1 for ON
✐ 1128	Entrance EKF Radar-altimeter press OFF	Radar Altimeter information considered in EKF Navigation - 0 for entrance EKF radar-altimeter OFF, 1 for ON
✐ 1129	Entrance EKF DEM OFF	DEM information considered in EKF Navigation - 0 for entrance EKF DEM OFF, 1 for ON
✐ 1174	External IMU 0 accelerometer error	External IMU 0 accelerometer - 0 for error, 1 for OK
✐ 1175	External IMU 0 gyroscope error	External IMU 0 gyroscope - 0 for error, 1 for OK
✐ 1176	External IMU 1 accelerometer error	External IMU 1 accelerometer - 0 for error, 1 for OK
✐ 1177	External IMU 1 gyroscope error	External IMU 1 gyroscope - 0 for error, 1 for OK
✐ 1178	External magnetometer 0 error	External magnetometer 0 - 0 for error, 1 for OK
✐ 1179	External magnetometer 1 error	External magnetometer 1 - 0 for error, 1 for OK

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ID	Name	Description
📝 1180-1181	Sniffer msg 0-1 Rx Error	Sniffer receiver message 0-1 - 0 for error, 1 for OK
📝 1200-1499	User BIT 00-299 error	User bit 0 to 299 - 0 for error, 1 for OK
2200	BIT Dummy Error	Bit for configurable checks - 0 for error, 1 for OK

4.4.2 Real Variables (RVar) - 32 Bits

ID	Name	Units/Values	Description
0	IAS (Indicated Airspeed)	m/s	Pitot-static measurement speed
1	TAS (True Airspeed)	m/s	Speed relative to the airmass in which the vehicle is moving (IAS measurement corrected with Standard Atmosphere data)
2	GS (Ground Speed)	m/s	Horizontal speed, relative to the ground
3	Heading	rad	Direction in which the vehicle velocity vector is pointing
4	Flight Path Angle	rad	Angle between velocity vector and local horizontal line
5	Bank	rad	Angle around the Longitudinal Euler axis
6	Yaw	rad	Angle around the Vertical Euler axis
7	Pitch	rad	Angle around the Transverse Euler axis
8	Roll	rad	Angle around the Longitudinal Euler axis
9	Route-Guidance Tangential deviation	m	Tangencial distance to the desired position (guidance)
10	Route-Guidance Horizontal deviation	m	Horizontal distance to the desired position (guidance)
11	Route-Guidance Perpendicular deviation	m	Perpendicular distance to the desired position (guidance)

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ID	Name	Units/Values	Description
12	p (Angular Velocity - X Body Axis)	rad/s	Angular velocity around longitudinal axis
13	q (Angular Velocity - Y Body Axis)	rad/s	Angular velocity around lateral axis
14	r (Angular Velocity - Z Body Axis)	rad/s	Angular velocity around vertical axis
15	Forward Acceleration – X Body Axis	m/s^2	Acceleration in the X-axis
16	Right Acceleration – Y Body Axis	m/s^2	Acceleration in the Y-axis
17	Bottom Acceleration – Z Body Axis	m/s^2	Acceleration in the Z-axis
18	RPM	rad/s (RDS)	Revolutions per minute configurable for external sensor
19	Front Ground Velocity	m/s	GV vector X component
20	Lateral Ground Velocity	m/s	GV vector Y component
21	Velocity	m/s	Velocity vector module
22	Forward Load Factor – X Body Axis	customType	G-force in X body axis
23	Right Load Factor – Y Body Axis	customType	G-force in Y body axis
24	Bottom Load Factor – Z Body Axis	customType	G-force in Z body axis
25	Tangential Acceleration	m/s^2	Absolute acceleration for tangential direction
26	Estimated air density	kg/m^3	Estimated air density at current altitude
28	Co-Waw	rad	Acrobatic Yaw with Body Z' axis pointing to X
29	Co-Pitch	rad	Acrobatic Pitch with Body X' axis pointing to -Z
30	Co-Roll	rad	Acrobatic Roll with Y' keeping same as Y
31	Angular Acceleration - X Body Axis	rad/s^2	Acceleration around the longitudinal axis
32	Angular Acceleration - Y Body Axis	rad/s^2	Acceleration around the lateral axis
33	Angular Acceleration - Z Body Axis	rad/s^2	Acceleration around the vertical axis
34	Body to NED Quaternion qs	customType	First component of body to NED orientation quaternion
35	Body to NED Quaternion qi	customType	Second component of body to NED orientation quaternion
36	Body to NED Quaternion qj	customType	Third component of body to NED orientation quaternion

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ID	Name	Units/Values	Description
37	Body to NED Quaternion qk	customType	Fourth component of body to NED orientation quaternion
40	RSSI	percentage **Warning: Deprecated variable**	Received Signal Strength Indicator
42	SCI-A Rx Rate (LTE/EXT. UART)	bytes/s	Reception rate (in bytes per seconds) of 4G (hwv <4.7) or external UART (hwv >=4.7) communications
43	SCI-A Tx Rate (LTE/EXT. UART)	bytes/s	Transmision rate (in bytes per seconds) of 4G (hwv <4.7) or external UART (hwv >=4.7) communications
44	SCI-B Rx Rate (LOS)	bytes/s	Radio link reception byte rate
45	SCI-B Tx Rate (LOS)	bytes/s	Radio link transmission byte rate
46	SCI-C Rx Rate (RS485)	bytes/s	RS485 communication reception byte rate
47	SCI-C Tx Rate (RS485)	bytes/s	RS485 communication transmission byte rate
48	SCI-D Rx Rate (RS232)	bytes/s	RS232 communication reception byte rate
49	SCI-D Tx Rate (RS232)	bytes/s	RS232 communication transmission byte rate
50	CAN-A Tx Rate	pkts/s	CAN-A transmission packet rate
51	CAN-B Tx Rate	pkts/s	CAN-B transmission packet rate
52	CAN-A Tx skip Rate	pkts/s	CAN-A messages delayed because no mailbox is available for sending
53	CAN-B Tx skip Rate	pkts/s	CAN-B messages delayed because no mailbox is available for sending
56	Yaw Rate	rad/s	Rate of change of the yaw angle
57	Pitch Rate	rad/s	Rate of change of the pitch angle
58	Roll Rate	rad/s	Rate of change of the roll angle

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ID	Name	Units/Values	Description
59-64	COM 0-5 Parse Error Rate	messages	Each COM discard packages with these frequencies. Messages might be discarded because the calculated and the received CRC are different
65	GNSS Absolute Time Of Week Milliseconds as Unit32	customType	Time of the week expressed with milliseconds
66	GNSS Hours in the Current Day	customType	Elapsed hours in the current day
67	GNSS Minutes in the Current Hour	customType	Elapsed minutes in the current hour
68	GNSS Seconds in the Current Minute	customType	Elapsed seconds in the current minute
80	Estimated gyro bias x	rad/s	Gyro bias estimated during IMU calibration
81	Estimated gyro bias y	rad/s	Gyro bias estimated during IMU calibration
82	Estimated gyro bias z	rad/s	Gyro bias estimated during IMU calibration
83	Estimated accelerometer bias x	m/s^2	Accelerometer bias estimated during IMU calibration
84	Estimated accelerometer bias y	m/s^2	Accelerometer bias estimated during IMU calibration
85	Estimated accelerometer bias z	m/s^2	Accelerometer bias estimated during IMU calibration
90	SCI-E Rx Rate (LTE)	bytes/s	Reception rate (in bytes per seconds) of the first channel (port0) of the SCI expander (hwv >=4.7)
91	SCI-E Tx Rate (LTE)	bytes/s	Transmision rate (in bytes per seconds) of the first channel (port0) of the SCI expander (hwv>=4.7)
92	SCI-F Rx Rate (LTE Aux.)	bytes/s	Reception rate (in bytes per seconds) of the second channel (port1) of the SCI expander (hwv >=4.7)
93	SCI-F Tx Rate (LTE Aux.)	bytes/s	Transmission rate (in bytes per seconds) of the second channel (port1) of the SCI expander (hwv >=4.7)

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ID	Name	Units/Values	Description
✐ 100	Desired IAS (Indicated Airspeed)	m/s	Commanded IAS from guidance
✐ 101	Desired TAS (True Airspeed)	m/s	Commanded TAS from guidance
✐ 102	Desired GS (Ground Speed)	m/s	Commanded GS from guidance
✐ 103	Desired Heading	rad	Commanded Heading from guidance
✐ 104	Desired Flight Path Angle	rad	Commanded Flight Path Angle from guidance
✐ 105	Desired Bank	rad	Commanded Bank from guidance
✐ 106	Desired Yaw	rad	Commanded Yaw from guidance
✐ 107	Desired Pitch	rad	Commanded Pitch from guidance
✐ 108	Desired Roll	rad	Commanded Roll from guidance
✐ 112	Desired p (Angular Velocity - X Body Axis)	rad/s	Commanded angular velocity around longitudinal axis
✐ 113	Desired q (Angular Velocity - Y Body Axis)	rad/s	Commanded angular velocity around lateral axis
✐ 114	Desired r (Angular Velocity - Z Body Axis)	rad/s	Commanded angular velocity around vertical axis
✐ 115	Desired Foward Acceleration – X Body Axis	m/s^2	Commanded Forward Acceleration from guidance
✐ 116	Desired Right Acceleration – Y Body Axis	m/s^2	Commanded Right Acceleration from guidance
✐ 117	Desired Bottom Acceleration – Z Body Axis	m/s^2	Commanded Bottom Acceleration from guidance
✐ 118	Desired RPM	rad/s	Commanded RPM from guidance

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ID	Name	Units/Values	Description
✐ 119	Desired Front Ground Velocity	m/s	Commanded Front GV from guidance
✐ 120	Desired Lateral Ground Velocity	m/s	Commanded Lateral GV from guidance
✐ 121	Desired Velocity	m/s	Commanded Velocity from guidance
✐ 122	Desired Forward Load Factor – X Body Axis	customType	Commanded Forward Load Factor from guidance
✐ 123	Desired Right Load Factor – Y Body Axis	customType	Commanded Right Load Factor from guidance
✐ 124	Desired Bottom Load Factor – Z Body Axis	customType	Commanded Bottom Load Facto from guidance
✐ 125	Desired Tangential Acceleration	m/s^2	Commanded Tangential Acceleration from guidance
✐ 126	Energy Rate Error	customType	Rate of change of the Total System Energy
✐ 127	Energy Distribution Error	customType	Distribution of system energy between kinetical and geopotential energy
✐ 128	Desired Co-Yaw	rad	Commanded co-yaw from guidance
✐ 129	Desired Co-Pitch	rad	Commanded co-pitch from guidance
✐ 130	Desired Co-Roll	rad	Commanded co-roll from guidance
✐ 140	Climbing Initial Heading	rad	Heading in climbing phase (start of the route)
✐ 141	Approach Initial Heading	rad	Heading in approach phase (end of the route)
✐ 142	Headwind Direction	rad	Wind direction estimation
✐ 143	Tailwind Direction	rad	Angle of the vector that would correspond to the opposite of the Headwind vector
✐ 144	Runway Direction	rad	Runway angle

Table 3 – continued from previous page

ID	Name	Units/Values	Description
✎ 145	Elevation of current route	rad	Elevation of tangent to current route at its closest point to desired position
✎ 146	Azimuth of current route	rad	Azimuth of tangent to current route at its closest point to desired position
✎ 147	Distance to closest obstacle	m	Signed distance to closest obstacle (negative means inside)
✎ 148	Distance of obstacle repulsion	m	Distance at which the obstacles have an effect in the guidance
✎ 200	Desired North Ground Velocity	m/s	Commanded North (NED Coordinates system) GV from guidance
✎ 201	Desired East Ground Velocity	m/s	Commanded East (NED Coordinates system) GV from guidance
✎ 202	Desired Down Ground Velocity	m/s	Commanded Down (NED Coordinates system) GV from guidance
✎ 203	Desired 2D MSL (Heigh Above Mean Sea Level)	m	Commanded MSL from guidance in 2D height mode
✎ 204	Desired 2D AGL (Above Ground Level) – Height	m	Commanded AGL from guidance in 2D height mode
✎ 205	Desired 2D WGS84 Elevation (Height Over The Ellipsoid)	m	Commanded WGS84 Elevation from guidance in 2D height mode
✎ 206	Desired Longitude	rad	Commanded Longitude from guidance
✎ 207	Desired Latitude	rad	Commanded Latitude from guidance
✎ 208	Desired WGS84 Elevation (Height Over The Ellipsoid)	m	Commanded WGS84 Elevation from guidance
✎ 209	Desired MSL (Height Above Mean Sea Level) – Altitude	m	Commanded MSL Altitude from guidance

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ID	Name	Units/Values	Description
✏ 210	Desired AGL (Above Ground Level) – Height	m	Commanded AGL Altitude from guidance
✏ 250	Guidance North Position Error	m	Difference from Desired and actual north position
✏ 251	Guidance East Position Error	m	Difference from Desired and actual east position
✏ 252	Guidance Sown Position Error	m	Difference from Desired and actual down position
✏ 253	Guidance PID North Desired Velocity	m/s	Difference from Desired and actual PID north velocity
✏ 254	Guidance PID East Desired Velocity	m/s	Difference from Desired and actual PID east velocity
✏ 255	Guidance PID Down Desired Velocity	m/s	Difference from Desired and actual PID down velocity
✏ 256	Desired Velocity X Body Axis	m/s	Commanded velocity in X-axis from guidance
✏ 257	Desired Velocity Y Body Axis	m/s	Commanded velocity in Y-axis from guidance
✏ 258	Desired Velocity Z Body Axis	m/s	Commanded velocity in Z-axis from guidance
✏ 259	External Yaw	rad	Yaw from external navigation source
✏ 260	External Pitch	rad	Pitch from external navigation source
✏ 261	External Roll	rad	Roll from external navigation source
✏ 262	External Roll Rate	rad/s	Roll rate from external navigation source
✏ 263	External Pitch Rate	rad/s	Pitch rate from external navigation source
✏ 264	External Yaw Rate	rad/s	Yaw rate from external navigation source
✏ 265	External Velocity North	m/s	Velocity North from external navigation source
✏ 266	External Velocity East	m/s	Velocity East from external navigation source

Table 3 – continued from previous page

ID	Name	Units/Values	Description
✎ 267	External Velocity Down	m/s	Velocity Down from external navigation source
✎ 268	External Acceleration x Body Axis	m/s^2	Acceleration x body axis from external navigation source
✎ 269	External Acceleration y Body Axis	m/s^2	Acceleration y body axis from external navigation source
✎ 270	External Acceleration z Body Axis	m/s^2	Acceleration z body axis from external navigation source
✎ 271	External GNSS Time of Week	s	GNSS Time of week from external navigation source
300	Relative Timestamp	s	Time spent since power-on of the system
301	Used Memory Space	byte	SD used memory space
302	Free Memory Space	byte	SD free memory space
303	Dynamic Pressure	Pa	Physical measurement from Pitot (dynamic preassure)
✎ 304	Static Pressure (Deprecated)	Pa **Warning: Deprecated variable**	Physical measurement from Pitot (static preassure)
305	Internal Temperature	K	Physical measurement from internal sensors
306	External Temperature	K	Physical measurement from Veronte sensors
307	Accelerometer – X Body Axis	m/s^2	Accelerometer measurement for X axis
308	Accelerometer – Y Body Axis	m/s^2	Accelerometer measurement for Y axis
309	Accelerometer – Z Body Axis	m/s^2	Accelerometer measurement for Z axis
310	Gyroscope – X Body Axis	rad/s	Gyroscope measurement for X axis
311	Gyroscope – Y Body Axis	rad/s	Gyroscope measurement for Y axis

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ID	Name	Units/Values	Description
312	Gyroscope – Z Body Axis	rad/s	Gyroscope measurement for Z axis
✎ 313	Magnetometer – X Body Axis	T **Warning: Deprecated variable**	Magnetometer measurement for X axis
✎ 314	Magnetometer – Y Body Axis	T **Warning: Deprecated variable**	Magnetometer measurement for Y axis
✎ 315	Magnetometer – Z Body Axis	T **Warning: Deprecated variable**	Magnetometer measurement for Z axis
322	Internal LIS3MDL Magnetometer Raw X in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for X axis
323	Internal LIS3MDL Magnetometer Raw Y in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for Y axis
324	Internal LIS3MDL Magnetometer Raw Z in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for Z axis
325	Internal LIS3MDL Magnetometer Temperature	K	**Internal LIS3MDL Magnetometer** temperature
326	External LIS3MDL magnetometer raw X in SI	T	**External LIS3MDL Magnetometer** raw measurement for X axis
327	External LIS3MDL magnetometer raw Y in SI	T	**External LIS3MDL Magnetometer** raw measurement for Y axis

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ID	Name	Units/Values	Description
328	External LIS3MDL magnetometer raw Z in SI	T	**External LIS3MDL Magnetometer** raw measurement for Z axis
329	External LIS3MDL magnetometer temperature	K	**External LIS3MDL Magnetometer** temperature
330	IMU 0 Raw Accelerometer X Measurement	m/s^2	**Main IMU** raw accelerometer x measurement
331	IMU 0 Raw Accelerometer Y Measurement	m/s^2	**Main IMU** raw accelerometer y measurement
332	IMU 0 Raw Accelerometer Z Measurement	m/s^2	**Main IMU** raw accelerometer z measurement
333	IMU 0 Raw Gyroscope X Measurement	rad/s	**Main IMU** raw gyroscope x measurement
334	IMU 0 Raw Gyroscope Y Measurement	rad/s	**Main IMU** raw gyroscope y measurement
335	IMU 0 Raw Gyroscope Z Measurement	rad/s	**Main IMU** raw gyroscope z measurement
336	IMU 0 temperature measurement	K	**Main IMU** temperature measurement
337	IMU 1 Raw Accelerometer X Measurement	m/s^2	**Secondary IMU** raw accelerometer x measurement
338	IMU 1 Raw Accelerometer Y Measurement	m/s^2	**Secondary IMU** raw accelerometer y measurement
339	IMU 1 Raw Accelerometer Z Measurement	m/s^2	**Secondary IMU** raw accelerometer z measurement
340	IMU 1 Raw Gyroscope X Measurement	rad/s	**Secondary IMU** raw gyroscope x measurement
341	IMU 1 Raw Gyroscope Y Measurement	rad/s	**Secondary IMU** raw gyroscope y measurement
342	IMU 1 Raw Gyroscope Z Measurement	rad/s	**Secondary IMU** raw gyroscope z measurement
343	IMU 1 temperature Measurement	K	**Secondary IMU** temperature measurement
344	Static Pressure Sensor (MS56) Raw Measurement	Pa	Static pressure sensor MS56 raw measurement
345	Static Pressure Sensor (MS56) Temperature	K	Static pressure sensor MS56 temperature
346	Dynamic Pressure Sensor Raw Measurement	Pa	Dynamic pressure sensor raw measurement
347	Dynamic Pressure Sensor Temperature	K	Dynamic pressure sensor temperature

Table 3 – continued from previous page

ID	Name	Units/Values	Description
348	Static Pressure Sensor (HSC) Raw Measurement	Pa	Static pressure sensor 0 raw measurement
349	Static Pressure Sensor (HSC) Temperature	K	Static pressure sensor 0 temperature
350	Vectornav Message Frequency	Hz	External navigation source VectorNav sends messages with this frequency
351	Vectornav Raw Acc X Measurement	m/s^2	Raw accelerometer X measurement from external navigation source VectorNav
352	Vectornav Raw Acc Y Measurement	m/s^2	Raw accelerometer Y measurement from external navigation source VectorNav
353	Vectornav Raw Acc Z Measurement	m/s^2	Raw accelerometer Z measurement from external navigation source VectorNav
354	Vectornav Raw Gyr X Measurement	rad/s	Raw gyroscope X measurement from external navigation source VectorNav
355	Vectornav Raw Gyr Y Measurement	rad/s	Raw gyroscope Y measurement from external navigation source VectorNav
356	Vectornav Raw Gyr Z Measurement	rad/s	Raw gyroscope Z measurement from external navigation source VectorNav
357	External HSCDTD008A Magnetometer Raw X in SI	T	**External HSCDTD008A Magnetometer** raw measurement for X axis
358	External HSCDTD008A Magnetometer Raw Y in SI	T	**External HSCDTD008A Magnetometer** raw measurement for Y axis
359	External HSCDTD008A Magnetometer Raw Z in SI	T	**External HSCDTD008A Magnetometer** raw measurement for Z axis
360	External HSCDTD008A Magnetometer Temperature	K	**External HSCDTD008A Magnetometer** temperature
361	IMU 2 Raw Accelerometer X Measurement	m/s^2	**BMI088 IMU** raw accelerometer x measurement

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ID	Name	Units/Values	Description
362	IMU 2 Raw Accelerometer Y Measurement	m/s^2	**BMI088 IMU** raw accelerometer y measurement
363	IMU 2 Raw Accelerometer Z Measurement	m/s^2	**BMI088 IMU** raw accelerometer z measurement
364	IMU 2 Raw Gyroscope X Measurement	rad/s	**BMI088 IMU** raw gyroscope x measurement
365	IMU 2 Raw Gyroscope Y Measurement	rad/s	**BMI088 IMU** raw gyroscope y measurement
366	IMU 2 Raw Gyroscope Z Measurement	rad/s	**BMI088 IMU** raw gyroscope z measurement
367	IMU 2 Temperature Measurement	K	**BMI088 IMU** temperature measurement
368	Static Pressure Sensor (DPS310) Raw Measurement	Pa	Static pressure sensor DPS310 raw measurement
369	Static Pressure Sensor (DPS310) Temperature	K	Static pressure sensor DPS310 temperature
370	Internal Magnetometer MMC5883MA Raw Measure X Converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for X axis converted to SI
371	Internal Magnetometer MMC5883MA Raw Measure Y Converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for Y axis converted to SI
372	Internal Magnetometer MMC5883MA Raw Measure Z Converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for Z axis converted to SI
373	Internal Magnetometer MMC5883MA Temperature	K	**Internal MMC5883MA Magnetometer** temperature
374	External Magnetometer MMC5883MA Raw measure X Converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for X axis converted to SI
375	External Magnetometer MMC5883MA Raw measure Y Converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for Y axis converted to SI
376	External Magnetometer MMC5883MA Raw measure Z Converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for Z axis converted to SI
377	External Magnetometer MMC5883MA Temperature	K	**External MMC5883MA Magnetometer** temperature

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ID	Name	Units/Values	Description
378	External Magnetometer RM3100 Raw Measure X Converted to SI	T	**External RM3100 Magnetometer** raw measurement for X axis converted to SI
379	External Magnetometer RM3100 Raw Measure Y Converted to SI	T	**External RM3100 Magnetometer** raw measurement for Y axis converted to SI
380	External Magnetometer RM3100 Raw Measure Z Converted to SI	T	**External RM3100 Magnetometer** raw measurement for Z axis converted to SI
382	External Magnetometer HMR2300 Raw Measure X Converted to SI	T	**External HMR2300 Magnetometer** raw measurement for X axis converted to SI
383	External Magnetometer HMR2300 Raw Measure Y Converted to SI	T	**External HMR2300 Magnetometer** raw measurement for Y axis converted to SI
384	External Magnetometer HMR2300 Raw Measure Z Converted to SI	T	**External HMR2300 Magnetometer** raw measurement for Z axis converted to SI
385	External Magnetometer HMR2300 Temperature	K	**External HMR2300 Magnetometer** temperature
386	IMU 3 Raw Accelerometer X Measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer x measurement
387	IMU 3 Raw Accelerometer Y Measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer y measurement
388	IMU 3 Raw Accelerometer Z Measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer z measurement
389	IMU 3 Raw Gyroscope X Measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope x measurement
390	IMU 3 Raw Gyroscope Y Measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope y measurement
391	IMU 3 Raw Gyroscope Z Measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope z measurement
392	IMU 3 Temperature Measurement	K	**ADIS16505-3 IMU** temperature measurement
393	Internal Magnetometer RM3100 Raw Measure X Converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for X axis converted to SI

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ID	Name	Units/Values	Description
394	Internal Magnetometer RM3100 Raw Measure Y Converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for Y axis converted to SI
395	Internal Magnetometer RM3100 Raw Measure Z Converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for Z axis converted to SI
400	Power Input	V	Voltage received by Veronte
401	Power Comicro 3.3V	V	Voltage received by Veronte through 3.3V port
402	Power 5V	V	Voltage received by Veronte through 5V port
403	SUC Power Input	V	Voltage received by Veronte SUC
404	Power 3.6V	V	Voltage received by Veronte through 3.6V port
405	CPU Temperature	K	Internal computer temperature
406	External IMU 0 raw accelerometer x measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
407	External IMU 0 raw accelerometer y measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
408	External IMU 0 raw accelerometer z measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
409	External IMU 0 raw gyroscope x measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
410	External IMU 0 raw gyroscope y measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
411	External IMU 0 raw gyroscope z measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
412	External IMU 0 temperature measurement	K	Saves the temperatures of this external sensor in raw form, as received from custom messages

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ID	Name	Units/Values	Description
413	External IMU 1 raw accelerometer x measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
414	External IMU 1 raw accelerometer y measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
415	External IMU 1 raw accelerometer z measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
416	External IMU 1 raw gyroscope x measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
417	External IMU 1 raw gyroscope y measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
418	External IMU 1 raw gyroscope z measurement	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
419	External IMU 1 temperature measurement	K	Saves the temperatures of this external sensor in raw form, as received from custom messages
420	External magnetometer 0 raw measurement X	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
421	External magnetometer 0 raw measurement Y	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
422	External magnetometer 0 raw measurement Z	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
423	External magnetometer 0 temperature	K	Saves the temperatures of this external sensor in raw form, as received from custom messages
424	External magnetometer 1 raw measurement X	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages

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ID	Name	Units/Values	Description
425	External magnetometer 1 raw measurement Y	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
426	External magnetometer 1 raw measurement Z	m/s^2	Saves the measurements of this external sensor in raw form, as received from the custom messages
427	External magnetometer 1 temperature	K	Saves the temperatures of this external sensor in raw form, as received from custom messages
500	Longitude	rad	East-West geographic coordinate
501	Latitude	rad	North-South geographic coordinate
502	WGS84 Elevation (Height Over the Ellipsoid)	m	Elevation over WGS84 reference frame
503	MSL (Height Above Mean Sea Level) – Altitude	m	Altitude over the Mean Sea Level
504	AGL (Above Ground Level) – Height	m	Height Above Ground Level – Dependent on external sensors or own models with considerable error
505	North Ground Velocity	m/s	Ground Velocity component in the North direction (NED Coordinates system)
506	East Ground Velocity	m/s	Ground Velocity component in the East direction (NED Coordinates system)
507	Down Ground Velocity	m/s	Ground Velocity component in the resultant axis from North-East (NED Coordinates system)
508	Sensor IAS (Indicated Air Speed)	m/s	Pitot-static measurement speed
509	Angle of Attack – AoA	rad	Angle between reference body line and flow direction vector
510	Sideslip	rad	Angle between the flow direction vector and the longitudinal axis of the vehicle

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ID	Name	Units/Values	Description
511	GNSS1 MSL	m	Mean sea level (MSL) measurement provided by GPS 1
512	GNSS1 AGL	m	Above ground level (AGLevel) measurement provided by GPS 1
513	GNSS2 MSL	m	Mean sea level (MSL) measurement provided by GPS 2
514	GNSS2 AGL	m	Above ground level (AGLevel) measurement provided by GPS 2
📝 551	Sagetech MXS - Longitude decimal part	degree **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
📝 552	Sagetech MXS - Longitude fractional part	degree **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
📝 553	Sagetech MXS - Latitude decimal part	degree **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message

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ID	Name	Units/Values	Description
✎ 554	Sagetech MXS - Latitude fractional part	degree **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
✎ 555	Sagetech MXS - Ground speed	m/s **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
✎ 556	Sagetech MXS - Ground track	degree **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
✎ 560	ADS-B Out / Squawk	-	ADS-B Squawk code, 4 digits that allow the operator to inform about its status

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ID	Name	Units/Values	Description
600-603	Temperature 0-3	K ⬚Warning: Deprecated variables	Variables to be configured with external temperature sensors
610	North Position EKF Variance	m^2	North position Extended Kalman Filter variance
611	East Position EKF Variance	m^2	East position Extended Kalman Filter variance
612	Down Position EKF Variance	m^2	Position variance component in the resultant axis from North-East
613	North Velocity EKF Variance	m^2/s^2	North velocity Extended Kalman Filter variance
614	East velocity EKF Variance	m^2/s^2	East velocity Extended Kalman Filter variance
615	Down Velocity EKF Variance	m^2/s^2	Velocity variance component in the resultant axis from North-East
✎ 650	Gimbal Command Yaw	customType	Yaw sent to the gimbal
✎ 651	Gimbal command Pitch	customType	Pitch sent to the gimbal
✎ 652	Gimbal Stick Yaw	customType	Yaw received from the joystick controlling the gimbal
✎ 653	Gimbal Stick Pitch	customType	Pitch received from the joystick controlling the gimbal
✎ 654	Gimbal Pitch Correction 0	customType	Correction calculated by the gimbal for the pitch control 0
✎ 655	Gimbal Pitch Correction 1	customType	Correction calculated by the gimbal for the pitch control 1
✎ 656	Gimbal Old Joint 0	customType	Auxiliar variable 0 for Gimbal control configuration
✎ 657	Gimbal Old Joint 1	customType	Auxiliar variable 1 for Gimbal control configuration

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ID	Name	Units/Values	Description
✎ 658	Cos (Gimbal Yaw)	customType	Auxiliar variable 0 for Gimbal control configuration
✎ 659	Sin (Gimbal Yaw)	customType	Auxiliar variable 1 for Gimbal control configuration
✎ 660	Gimbal Yaw Radian	customType	Auxiliar variable for Gimbal control configuration
✎ 661	Veronte Gimbal Yaw Output	customType	Yaw value the gimbal is sending as output
✎ 662	Veronte Gimbal Pitch Output	customType	Pitch value the gimbal is sending as output
✎ 663	Gimbal Phi(z)	customType	Auxiliar variable phi for Gimbal control configuration
✎ 664	Gimbal Theta(y)	customType	Auxiliar variable theta for Gimbal control configuration
✎ 665	Gimbal Psi(x)	customType	Auxiliar variable psi for Gimbal control configuration
✎ 666	Veronte Gimbal Roll Output (Degrees)	customType	Roll value the gimbal is sending as output
700-705	RPM 0-5	rad/s	Angular speed associated to pulse captured 0-5
750	Selected Controller Time step	s	PID selected time step
751	Selected Controller Derivative Filtered Error	customType	PID selected derivative filtered error
752	Selected Controller Proportional Action	customType	PID selected proportional action
753	Selected Controller Derivative Action	customType	PID selected derivative action
754	Selected Controller Integral Input	customType	PID selected integral input
755	Selected Controller Integral Action	customType	PID selected integral action
756	Selected Controller Anti-windup Input	customType	PID selected anti-windup input
757	Selected Controller Derivative Error	customType	PID selected derivative error
800-815	PWM 0-15	customType	Pulse Width Modulation signal 0 to 15

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ID	Name	Units/Values	Description
✎ 900-915	Stick Input r0 - r15	customType	Raw stick measurement from r0 to r15
✎ 950-981	Stick Input s0 - s31	customType **Warning: Deprecated variables**	
✎ 1000-1031	Stick Input y0 - y31	customType	Servo position commanded from stick y0 to y31
✎ 1050-1069	Control Output u0-u19 Before Servo Saturation	customType	Commanded control output before saturation correction
✎ 1100-1104	Lidar 0-4 Distance	m	Variable configurable for Lidar distances 0 to 4
✎ 1105-1109	External Range Sensor 0-4 Measure	m	Variable configurable for external range sensors
✎ 1200	Route-Guidance Distance	m	Shortest distance to desired path (perpendicular distance)
✎ 1201	Radar AGL (Above Ground Level) – Height	m	Radar altimeter measure
✎ 1202	Radar Speed Down	m/s	Radar speed
✎ 1203	External Rotation for Follow Route	rad	Relative vector rotation when using Follow Route
1204	Time to Impact with Obstacles	s	Time calculated with Distance to Obstacle and travel speed
1300-1309	Timer 0-9	s	Configurable timers for automations
1320-1321	ADC 3.3V Input 0-1	V	CEX ADC 3.3 V inputs 0 and 1
1322-1323	ADC 5.0V Input 0-1	V	CEX ADC 5.0 V inputs 0 and 1
1324-1325	ADC 12.0V Input 0-1	V	CEX ADC 12.0 V inputs 0 and 1
1326-1327	ADC 36.0V Input 0-1	V	CEX ADC 36.0 V inputs 0 and 1
1328-1329	ADC vIn 0-1	V	CEX External power supplies 0 and 1
1330	PCB Temperature	K	CEX PCB Temperature (from ADC input)

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ID	Name	Units/Values	Description
1331	ADC HW Version	V	Hardware version of CEX ADC
✏️ 1350-1369	4xV Real variables	-	For more information, check Real Variables - 4x Software Manual
1400	Velocity - X Body Axis	m/s	Velocity on X-axis
1401	Velocity - Y Body Axis	m/s	Velocity on Y-axis
1402	Velocity - Z Body Axis	m/s	Velocity on Z-axis
1403	Estimated Dynamic Pressure	Pa	Dynamic pressure sensor raw measurement
1404	Barometric Pressure at Sea Level (QNH)	Pa	Introduced value for QNH
1450-1453	Captured Pulse 0-3	customType	Input values from pulses
1484	External IMU 0 accelerometer reception frequency	Hz	Reception frequencies of measurements from External IMU 0 accelerometer
1485	External IMU 0 gyroscope reception frequency	Hz	Reception frequencies of measurements from External IMU 0 gyroscope
1486	External IMU 1 accelerometer reception frequency	Hz	Reception frequencies of measurements from External IMU 1 accelerometer
1487	External IMU 1 gyroscope reception frequency	Hz	Reception frequencies of measurements from External IMU 1 gyroscope
1488-1489	External magnetometer 0-1 reception frequency	Hz	Reception frequencies of measurements from External magnetometer 0-1
1490	Internest Raw X Distance	m	Raw measurements for X-axis internest distance
1491	Internest Raw Y Distance	m	Raw measurements for Y-axis internest distance
1492	Internest Raw Z Distance	m	Raw measurements for Z-axis internest distance
1493	Internest Raw Angle	rad	Raw measurements for internest angle
1494	Internest Raw XY standard Deviation	m	Raw measurements for XY axis internest standard deviation
1495	Internest Raw Z standard Deviation	m	Raw measurements for Z-axis internest standard deviation
1496	Internest Raw Angle standard Deviation	rad	Raw measurements for internest angle standard deviation

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ID	Name	Units/Values	Description
1497	Internest Position Update Frequency	Hz	Frequency to update internest position
1500	GNSS1 Absolute Time of Week	s	Data from GNSS1 module: Time of week
1501	GNSS1 ECEF Position X	m	Data from GNSS1 module: ECEF (Earth-Centered Earth-Fixed coordinate system) X position
1502	GNSS1 ECEF Position Y	m	Data from GNSS1 module: ECEF (Earth-Centered Earth-Fixed coordinate system) Y position
1503	GNSS1 ECEF Position Z	m	Data from GNSS1 module: ECEF (Earth-Centered Earth-Fixed coordinate system) Z position
1504	GNSS1 Longitude	rad	Data from GNSS1 module: Longitude
1505	GNSS1 Latitude	rad	Data from GNSS1 module: Latitude
1506	GNSS1 Height Above Ellipsoid (WGS84)	m	Data from GNSS1 module: Height Above Ellipsoid (WGS84)
1509	GNSS1 PDOP (Dilution of Precision of Position)	customType	Data from GNSS1 module: PDOP – Relation between user position error and satellite position error
1510	GNSS1 Accuracy	m	Data from GNSS1 module: Accuracy
1511	GNSS1 Horizontal Accuracy Estimate	m	Data from GNSS1 module: Horizontal accuracy
1512	GNSS1 Vertical Accuracy Estimate	m	Data from GNSS1 module: Vertical accuracy
1513	GNSS1 Velocity North	m/s	Data from GNSS1 module: Velocity in North direction (NED Coordinates system)
1514	GNSS1 Velocity East	m/s	Data from GNSS1 module: Velocity in East direction (NED Coordinates system)

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ID	Name	Units/Values	Description
1515	GNSS1 Velocity Down	m/s	Data from GNSS1 module: Velocity in Down direction (NED Coordinates system)
1516	GNSS1 Speed Accuracy Estimate	m/s	Data from GNSS1 module: Speed accuracy
1517	GNSS1 Related Base Longitude	rad	Data from GNSS1 module: RTK Base longitude
1518	GNSS1 Related Base Latitude	rad	Data from GNSS1 module: RTK Base latitude
1519	GNSS1 Related Base WGS84 Altitude	m	Data from GNSS1 module: RTK Base WGS84 altitude
1520	GNSS1 Related Base to Rover Azimuth	rad	Data from GNSS1 module: RTK Base-Rover vector azimuth (Spherical coordinates system)
1521	GNSS1 Related Base to Rover Elevation	rad	Data from GNSS1 module: RTK Base-Rover vector elevation (Spherical coordinates system)
1522	GNSS1 Related Base to Rover Distance	m	Data from GNSS1 module: RTK Base-Rover vector distance (Spherical coordinates system)
1523	GNSS1 Related Base to Rover Accuracy	m	Data from GNSS1 module: RTK Base-Rover vector accuracy
1524	GNSS1 Survey in Accuracy	m	Data from GNSS1 module: RTK Base accuracy when base knows it is fixed in a particular position/td>
1525	GNSS1 Related Base to Rover North	m	Data from GNSS1 module: RTK Base-Rover vector North (NED Coordinate system)
1526	GNSS1 Related Base to Rover East	m	Data from GNSS1 module: RTK Base-Rover vector East (NED Coordinate system)
1527	GNSS1 Related Base to Rover Down	m	Data from GNSS1 module: RTK Base-Rover vector Down (NED Coordinate system)

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ID	Name	Units/Values	Description
1528	GNSS1 Position Frequency	Hz	Data from GNSS1 module: Position frequency
1529	GNSS1 Jamming Indicator	%	Jaming indicator from U-Blox device 1 for GNSS
1600	GNSS2 Absolute Time of Week	s	Data from GNSS2 module: Time of week
1601	GNSS2 ECEF Position X	m	Data from GNSS2 module: ECEF (Earth-Centered Earth-Fixed coordinate system) X position
1602	GNSS2 ECEF Position Y	m	Data from GNSS2 module: ECEF (Earth-Centered Earth-Fixed coordinate system) Y position
1603	GNSS2 ECEF Position Z	m	Data from GNSS2 module: ECEF (Earth-Centered Earth-Fixed coordinate system) Z position
1604	GNSS2 Longitude	rad	Data from GNSS2 module: Longitude
1605	GNSS2 Latitude	rad	Data from GNSS2 module: Latitude
1606	GNSS2 Height Above Ellipsoid (WGS84)	m	Data from GNSS2 module: Height Above Ellipsoid (WGS84)
1609	GNSS2 PDOP (Dilution of Precision of Position)	customType	Data from GNSS2 module: PDOP – Relation between user position error and satellite position error
1610	GNSS2 Accuracy	m	Data from GNSS2 module: Accuracy
1611	GNSS2 Horizontal Accuracy Estimate	m	Data from GNSS2 module: Horizontal accuracy
1612	GNSS2 Vertical Accuracy Estimate	m	Data from GNSS2 module: Vertical accuracy
1613	GNSS2 Velocity North	m/s	Data from GNSS2 module: Velocity in North direction (NED Coordinates system)
1614	GNSS2 Velocity East	m/s	Data from GNSS2 module: Velocity in East direction (NED Coordinates system)

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ID	Name	Units/Values	Description
1615	GNSS2 Velocity Down	m/s	Data from GNSS2 module: Velocity in Down direction (NED Coordinates system)
1616	GNSS2 Speed Accuracy Estimate	m/s	Data from GNSS2 module: Speed accuracy
1617	GNSS2 Related Base Longitude	rad	Data from GNSS2 module: RTK Base longitude
1618	GNSS2 Related Base Latitude	rad	Data from GNSS2 module: RTK Base latitude
1619	GNSS2 Related Base WGS84 Altitude	m	Data from GNSS2 module: RTK Base WGS84 Altitude
1620	GNSS2 Related Base to Rover Azimuth	rad	Data from GNSS2 module: RTK Base-Rover vector azimuth (Spherical COordinates system)
1621	GNSS2 Related Base to Rover Elevation	rad	Data from GNSS2 module: RTK Base-Rover vector elevation (Spherical COordinates system)
1622	GNSS2 Related Base to Rover Distance	m	Data from GNSS2 module: RTK Base-Rover vector distance (Spherical COordinates system)
1623	GNSS2 Related Base to Rover Accuracy	m	Data from GNSS2 module: RTK Base-Rover vector accuracy
1624	GNSS2 Survey in Accuracy	m	Data from GNSS2 module: RTK Base accuracy when base knows it is fixed in a particular position/td>
1625	GNSS2 Related Base to Rover North	m	Data from GNSS2 module: RTK Base-Rover vector North (NED Coordinate system)
1626	GNSS2 Related Base to Rover East	m	Data from GNSS2 module: RTK Base-Rover vector East (NED Coordinate system)
1627	GNSS2 Related Base to Rover Down	m	Data from GNSS2 module: RTK Base-Rover vector Down (NED Coordinate system)

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ID	Name	Units/Values	Description
1628	GNSS2 Position Frequency	H	Data from GNSS2 module: Position frequency
1629	GNSS2 Jamming Indicator	%	Jaming indicator from U-Blox device 2 for GNSS
✎ 1700-1731	Actuator Output s0 - s31	customType	Configurable variable from actuator outputs to be transformed by the system
✎ 1800	Distance to Object of Interest 0	m	Spherical coordinate to object of interest 0: distance
✎ 1801	Azimuth to Object of Interest 0	rad	Spherical coordinate to object of interest 0: azimuth
✎ 1802	Elevation to Object of Interest 0	rad	Spherical coordinate to object of interest 0: elevation
✎ 1803	Distance to Object of Interest 1	m	Spherical coordinate to object of interest 1: distance
✎ 1804	Azimuth to Object of Interest 1	rad	Spherical coordinate to object of interest 1: azimuth
✎ 1805	Elevation to Object of Interest 1	rad	Spherical coordinate to object of interest 1: elevation
✎ 1806	Distance to Object of Interest 2	m	Spherical coordinate to object of interest 2: distance
✎ 1807	Azimuth to Object of Interest 2	rad	Spherical coordinate to object of interest 2: azimuth
✎ 1808	Elevation to Object of Interest 2	rad	Spherical coordinate to object of interest 2: elevation
✎ 1809	Distance to Object of Interest 3	m	Spherical coordinate to object of interest 3: distance
✎ 1810	Azimuth to Object of Interest 3	rad	Spherical coordinate to object of interest 3: azimuth

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ID	Name	Units/Values	Description
✎ 1811	Elevation to Object of Interest 3	rad	Spherical coordinate to object of interest 3: elevation
✎ 1812	Distance to Object of Interest 4	m	Spherical coordinate to object of interest 4: distance
✎ 1813	Azimuth to Object of Interest 4	rad	Spherical coordinate to object of interest 4: azimuth
✎ 1814	Elevation to Object of Interest 4	rad	Spherical coordinate to object of interest 4: elevation
✎ 1815	Distance to Object of Interest 5	m	Spherical coordinate to object of interest 5: distance
✎ 1816	Azimuth to Object of Interest 5	rad	Spherical coordinate to object of interest 5: azimuth
✎ 1817	Elevation to Object of Interest 5	rad	Spherical coordinate to object of interest 5: elevation
✎ 1818	Distance to Object of Interest 6	m	Spherical coordinate to object of interest 6: distance
✎ 1819	Azimuth to Object of Interest 6	rad	Spherical coordinate to object of interest 6: azimuth
✎ 1820	Elevation to Object of Interest 6	rad	Spherical coordinate to object of interest 6: elevation
✎ 1821	Distance to Object of Interest 7	m	Spherical coordinate to object of interest 7: distance
✎ 1822	Azimuth to Object of Interest 7	rad	Spherical coordinate to object of interest 7: azimuth
✎ 1823	Elevation to Object of Interest 7	rad	Spherical coordinate to object of interest 7: elevation

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ID	Name	Units/Values	Description
✎ 1824	Distance to Object of Interest 8	m	Spherical coordinate to object of interest 8: distance
✎ 1825	Azimuth to Object of Interest 8	rad	Spherical coordinate to object of interest 8: azimuth
✎ 1826	Elevation to Object of Interest 8	rad	Spherical coordinate to object of interest 8: elevation
✎ 1827	Distance to Object of Interest 9	m	Spherical coordinate to object of interest 9: distance
✎ 1828	Azimuth to Object of Interest 9	rad	Spherical coordinate to object of interest 9: azimuth
✎ 1829	Elevation to Object of Interest 9	rad	Spherical coordinate to object of interest 9: elevation
✎ 1830	Distance to Object of Interest 10	m	Spherical coordinate to object of interest 10: distance
✎ 1831	Azimuth to Object of Interest 10	rad	Spherical coordinate to object of interest 10: azimuth
✎ 1832	Elevation to Object of Interest 10	rad	Spherical coordinate to object of interest 10: elevation
✎ 1833	Distance to Object of Interest 11	m	Spherical coordinate to object of interest 11: distance
✎ 1834	Azimuth to Object of Interest 11	rad	Spherical coordinate to object of interest 11: azimuth
✎ 1835	Elevation to Object of Interest 11	rad	Spherical coordinate to object of interest 11: elevation
✎ 1836	Distance to Object of Interest 12	m	Spherical coordinate to object of interest 12: distance

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ID	Name	Units/Values	Description
✎ 1837	Azimuth to Object of Interest 12	rad	Spherical coordinate to object of interest 12: azimuth
✎ 1838	Elevation to Object of Interest 12	rad	Spherical coordinate to object of interest 12: elevation
✎ 1839	Distance to Object of Interest 13	m	Spherical coordinate to object of interest 13: distance
✎ 1840	Azimuth to Object of Interest 13	rad	Spherical coordinate to object of interest 13: azimuth
✎ 1841	Elevation to Object of Interest 13	rad	Spherical coordinate to object of interest 13: elevation
✎ 1842	Distance to Object of Interest 14	m	Spherical coordinate to object of interest 14: distance
✎ 1843	Azimuth to Object of Interest 14	rad	Spherical coordinate to object of interest 14: azimuth
✎ 1844	Elevation to Object of Interest 14	rad	Spherical coordinate to object of interest 14: elevation
✎ 1845	Distance to Object of Interest 15	m	Spherical coordinate to object of interest 15: distance
✎ 1846	Azimuth to Object of Interest 15	rad	Spherical coordinate to object of interest 15: azimuth
✎ 1847	Elevation to Object of Interest 15	rad	Spherical coordinate to object of interest 15: elevation
✎ 1848	Distance to Object of Interest 16	m	Spherical coordinate to object of interest 16: distance
✎ 1849	Azimuth to Object of Interest 16	rad	Spherical coordinate to object of interest 16: azimuth

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ID	Name	Units/Values	Description
✏ 1850	Elevation to Object of Interest 16	rad	Spherical coordinate to object of interest 16: elevation
✏ 1851	Distance to Object of Interest 17	m	Spherical coordinate to object of interest 17: distance
✏ 1852	Azimuth to Object of Interest 17	rad	Spherical coordinate to object of interest 17: azimuth
✏ 1853	Elevation to Object of Interest 17	rad	Spherical coordinate to object of interest 17: elevation
✏ 1854	Distance to Object of Interest 18	m	Spherical coordinate to object of interest 18: distance
✏ 1855	Azimuth to Object of Interest 18	rad	Spherical coordinate to object of interest 18: azimuth
✏ 1856	Elevation to Object of Interest 18	rad	Spherical coordinate to object of interest 18: elevation
✏ 1857	Distance to Object of Interest 19	m	Spherical coordinate to object of interest 19: distance
✏ 1858	Azimuth to Object of Interest 19	rad	Spherical coordinate to object of interest 19: azimuth
✏ 1859	Elevation to Object of Interest 19	rad	Spherical coordinate to object of interest 19: elevation
✏ 1860	Distance to Object of Interest 20	m	Spherical coordinate to object of interest 20: distance
✏ 1861	Azimuth to Object of Interest 20	rad	Spherical coordinate to object of interest 20: azimuth
✏ 1862	Elevation to Object of Interest 20	rad	Spherical coordinate to object of interest 20: elevation

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ID	Name	Units/Values	Description
1863	Distance to Object of Interest 21	m	Spherical coordinate to object of interest 21: distance
1864	Azimuth to Object of Interest 21	rad	Spherical coordinate to object of interest 21: azimuth
1865	Elevation to Object of Interest 21	rad	Spherical coordinate to object of interest 21: elevation
1866	Distance to Object of Interest 22	m	Spherical coordinate to object of interest 22: distance
1867	Azimuth to Object of Interest 22	ra	Spherical coordinate to object of interest 22: azimuth
1868	Elevation to Object of Interest 22	rad	Spherical coordinate to object of interest 22: elevation
1869	Distance to Object of Interest 23	m	Spherical coordinate to object of interest 23: distance
1870	Azimuth to Object of Interest 23	rad	Spherical coordinate to object of interest 23: azimuth
1871	Elevation to Object of Interest 23	rad	Spherical coordinate to object of interest 23: elevation
1872	Distance to Object of Interest 24	m	Spherical coordinate to object of interest 24: distance
1873	Azimuth to Object of Interest 24	rad	Spherical coordinate to object of interest 24: azimuth
1874	Elevation to Object of Interest 24	rad	Spherical coordinate to object of interest 24: elevation
1875	Distance to Object of Interest 25	m	Spherical coordinate to object of interest 25: distance

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ID	Name	Units/Values	Description
✎ 1876	Azimuth to Object of Interest 25	rad	Spherical coordinate to object of interest 25: azimuth
✎ 1877	Elevation to Object of Interest 25	rad	Spherical coordinate to object of interest 25: elevation
✎ 1878	Distance to Object of Interest 26	m	Spherical coordinate to object of interest 26: distance
✎ 1879	Azimuth to Object of Interest 26	rad	Spherical coordinate to object of interest 26: azimuth
✎ 1880	Elevation to Object of Interest 26	rad	Spherical coordinate to object of interest 26: elevation
✎ 1881	Distance to Object of Interest 27	m	Spherical coordinate to object of interest 27: distance
✎ 1882	Azimuth to Object of Interest 27	rad	Spherical coordinate to object of interest 27: azimuth
✎ 1883	Elevation to Object of Interest 27	rad	Spherical coordinate to object of interest 27: elevation
✎ 1884	Distance to Object of Interest 28	m	Spherical coordinate to object of interest 28: distance
✎ 1885	Azimuth to Object of Interest 28	rad	Spherical coordinate to object of interest 28: azimuth
✎ 1886	Elevation to Object of Interest 28	rad	Spherical coordinate to object of interest 28: elevation
✎ 1887	Distance to Object of Interest 29	m	Spherical coordinate to object of interest 29: distance
✎ 1888	Azimuth to Object of Interest 29	rad	Spherical coordinate to object of interest 29: azimuth

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ID	Name	Units/Values	Description
✎ 1889	Elevation to Object of Interest 29	rad	Spherical coordinate to object of interest 29: elevation
✎ 1890	Distance to Object of Interest 30	m	Spherical coordinate to object of interest 30: distance
✎ 1891	Azimuth to Object of Interest 30	rad	Spherical coordinate to object of interest 30: azimuth
✎ 1892	Elevation to Object of Interest 30	rad	Spherical coordinate to object of interest 30: elevation
✎ 1893	Distance to Object of Interest 31	m	Spherical coordinate to object of interest 31: distance
✎ 1894	Azimuth to Object of Interest 31	rad	Spherical coordinate to object of interest 31: azimuth
✎ 1895	Elevation to Object of Interest 31	rad	Spherical coordinate to object of interest 31: elevation
2000	RX Packet Error Rate (on board)	decimal	Value rating RX packets and expected RX packets, given as % error
2001	TX Packet Error Rate (on board)	decimal	Value rating TX packets and expected TX packets, given as % error
2002	Computed RX pkt/s Used for RX PER	messages	Packages per second received to the UAV configured in communication statistics
2003	Remote RX pkt/s Used for TX PER	messages	RX packages per second received and computed through communications
2004	Computed TX pkt/s Used for TX PER	messages	Packages per second transmitted to the UAV configured in communication statistics
2005	Remote TX pkt/s Used for RX PER	messages	TX packages per second received and computed through communications
✎ 2019	Stick RX Rate	Hz	Number of stick messages received per second
2020	Position Fix Time	s	Time spend with GNSS without losing fix

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ID	Name	Units/Values	Description
2040-2042	Tunnel Producer Receive Frequency 0-2	Hz	Tunnel producer 0-2 receives data at this frequency
2043-2045	Tunnel Consumer Send Frequency 0-2	Hz	Tunnel consumer 0-2 receives data at this frequency
2046	Max Duration of Step in CIO	s	Longest time duration from a step in CIO
2047	Acquisition Task Timestep	s	Average period to execute the acquisition thread
2048	Acquisition Task Maximum Timestep	s	Maximum period to execute the acquisition thread
2049	Cross Core Message Queue CPU Ratio	percentage	% of time of CPU that CIO waits for inter-core communications queue to be emptied
2050	Acquisition Task Average CPU Ratio	percentage	Average % of CPU 1 time spent in the acquisition thread
2051	Acquisition Task Maximum CPU Ratio	percentage	Maximum % of CPU time spent in the acquisition thread
2052	Acquisition Task Average Time	s	Average time for acquisition thread
2053	Acquisition Task Maximum Time	s	Maximum time for acquisition thread
2054	CIO Max Time	s	Maximum time of CIO thread
2055	CIO Average Time	s	Average aMaximum time of CIO thread
2056	Cross-Core Message Queue Usage	%	Percentage of communication employed between both microprocessors
2057	CIO Running Frequency	Hz	C1 low running frequency (Veronte Autopilot 1x and MC) **Note:** Only for MC

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Chapter 4. Lists of interest

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ID	Name	Units/Values	Description
2058	CIO Min Running Frequency	Hz	Minimum assured frequency of low priority task **Note:** Only for MC
2094	GNC Task Average CPU Ratio	percentage	Average % of CPU time of GNC task
2095	GNC Task Maximum CPU Ratio	percentage	Maximum % of CPU time of GNC task
2096	GNC Task Average Time	s	Average time spent on GNC task
2097	GNC Task Maximum Time	s	Maximum time spent on GNC task
2098	GNC Task Maximum Timestep	s	Maximum execution period for GNC task
2099	Max Duration of Step in GNC	s	Maximum duration of one step in GNC
2100	Gyroscope Based on Accelerometer – X Body Axis	rad/s	Gyroscope measurements obtained from accelerometer X-axis data
2101	Gyroscope Based on Accelerometer – Y Body Axis	rad/s	Gyroscope measurements obtained from accelerometer Y-axis data
2102	Gyroscope Based on Accelerometer – Z Body Axis	rad/s	Gyroscope measurements obtained from accelerometer Z-axis data
2103	Acceleration North	m/s^2	Acceleration in the North direction (NED Coordinates System)
2104	Acceleration East	m/s^2	Acceleration in the East direction (NED Coordinates System)
2105	Acceleration Down	m/s^2	Acceleration in the Down direction (NED Coordinates System)
2112	Estimated Dem	m	Altitude given by the estimated Digital Elevation Model

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ID	Name	Units/Values	Description
2200	Curve Length Covered	m	Total distance from current mission length covered
2201	Curve Length	m	Total distance from current mission length
2202	Curve Length Pending	m	Total distance from current mission length not covered yet
2203	Curve Parameter Covered	customType	Total length covered from current mission according to parameter selected
2204	Curve Parameter Range	customType	Total length from current mission according to parameter selected
2205	Curve Parameter Pending	customType	Total length from current mission to be covered according to parameter selected yet
2206	Curve horizontal curvature	customType	Horizontal curvature of the current curve
2250-2259	Reserved 0-9	customType	System reserved variables
✐ 2300-2302	Joint 0-2 of Gimbal 0	rad	Variables for Gimbal 0 configuration – Angles sent to gimbal as Yaw (0), Pitch (1) and Roll (2)
✐ 2303-2305	Joint 0-2 of Gimbal 1	rad	Variables for Gimbal 1 configuration – Angles sent to gimbal as Yaw (0), Pitch (1) and Roll (2)
✐ 2330	Control Loop Period	s	MC control loop period
✐ 2331	Control Loop Maximum Period	s	MC maximum control loop period
✐ 2332	Control Loop Duration	s	MC control loop average execution time
✐ 2333	MC Control Loop Maximum Duration	s	MC control loop maximum average execution time
✐ 2334	Control Loop CPU Usage Ratio	%	MC CPU usage ratio
✐ 2335	MC Control Loop Maximum CPU Usage Ratio	%	MC maximum CPU usage ratio
✐ 2336-2338	MC U-V-W Phase Current	A	MC U-V-W phase current

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ID	Name	Units/Values	Description
2339	MC Electrical Angle	rad	MC electrical angle
2340	MC01 Mechanical Angle	rad	MC01 mechanical angle
2341	MC Mechanical Angular Speed	rad/s	MC mechanical angular speed
2342	MC01 Desired Mechanical Angle	rad	MC01 desired mechanical angle
2343	MC01 Position Controller Output	rad/s	MC01 position PDI output
2344	MC Desired Mechanical Angular Speed	rad/s	MC desired mechanical angular speed
2345	MC Desired Mechanical Angular Speed After Speed Limiter	rad/s	MC desired mechanical angular speed after speed limiter
2346	MC Speed Controller Output	A	MC speed controller output
2347-2348	MC Alpha-Beta Current	A	MC alpha and beta current after Clarke transformation
2349-2350	MC Actual Direct Current	A	MC actual direct current
2351	MC Desired Direct Current	A	MC desired direct current
2352	MC Desired Quadrature Current	A	MC desired quadrature current
2353	MC Direct Voltage From Controller Output	V	MC direct voltage from controller output
2354	MC Quadrature Voltage From Controller Output	V	MC quadrature voltage from controller output
2355-2356	MC Alpha - Beta Voltage From Current Controller Output	V	MC Alpha - Beta voltage from current controller output
2357-2358	MC01 Desired Clarke Alpha-Beta current	customType	MC01 desired Clarke currents
2359-2361	MC01 U-V-W Phase Space Vector Generator Output	customType	MC01 phase time constants
2362-2364	MC01 U-V-W Phase PWM Duty Cycle	percentage	MC01 U-V-W Phase PWM duty cycle

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ID	Name	Units/Values	Description
2365	MC01 Encoder Raw Angle	rad	MC01 encoder raw measured angle
2366	MC01 Stepper Output Frequency	Hz	MC01 stepper output frequency
2367	MC Mechanical Angle Error	rad	MC mechanical angle error
2368-2370	MC U-V-W Phase BEMF	V	MC U-V-W phase electromechanical force
2371	MC Input Current DC side	A	MC input current DC side
2372	MC Input Normalized Command Speed	customType	MC input normalized command speed
2373-2374	MC ADC in 0-1	V	System reserved variables
2375	MC Logic Board Temperature	K	MC logic board temperature
2376	MC Power Module Temperature	K	MC IGBT filtered temperature
2377	MC Motor Temperature	K	MC Motor temperature
2378	MC Input Voltage DC side	V	MC DC bus voltage
2379-2380	MC U-V Phase Hall current sensor	customType	System reserved variables
2381	MC Virtual and estimator angle difference	rad	MC Angle offset value from estimated and commanded angle to close control loop
2382	MC Low speed estimator angle	rad	MC Low speed observer estimated angle
2383	MC High speed estimator angle	rad	MC High speed observer estimated angle
2384	MC Low speed estimator speed	rad/s	MC Low speed observer estimated mechanical speed
2385	MC High speed estimator speed	rad/s	MC High speed observer estimated mechanical speed
2400-2419	Control Output u0-19	customType	Control output 0 to 19 after servo saturation
2500-2519	Stick Input u0-u19	customType	Intermediate values from stick used for arcade mode

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ID	Name	Units/Values	Description
✏️ 2600-2619	Stick Input d0-d19	customType	Intermediate values from stick used for arcade mode - delta values
2700-2739	Operation Guidance 00-39	customType	Configurable values used in different guidances – Position or values or vectors
2800	Wind Velocity North	m/s	Wind velocity vector pointing North direction (NED Coordinate system)
2801	Wind Velocity East	m/s	Wind velocity vector pointing East direction (NED Coordinate system)
2802	Wind Velocity Down	m/s	Wind velocity vector pointing Down direction (NED Coordinate system)
2803	Wind Velocity North Estimation Covariance	m/s	Wind velocity vector pointing North direction (NED Coordinate system) estimation covariance
2804	Cross North-East Wind Velocity Estimation Covariance	m/s	Wind velocity vector pointing cross North-East direction (NED Coordinate system) estimation covariance
2805	Wind Velocity Estimation Uncertainty (Element 2-0)	m/s	2-0 element from covariance matrix in wind estimation
2806	Wind Velocity Estimation Uncertainty (Element 0-1)	m/s	0-1 element from covariance matrix in wind estimation
2807	Wind Velocity Estimation Uncertainty (Element 1-1)	m/s	1-1 element from covariance matrix in wind estimation
2808	Wind Velocity Estimation Uncertainty (Element 2-1)	m/s	2-1 element from covariance matrix in wind estimation
2809	Wind Velocity Estimation Uncertainty (Element 0-2)	m/s	0-2 element from covariance matrix in wind estimation
2810	Wind Velocity Estimation Uncertainty (Element 1-2)	m/s	1-2 element from covariance matrix in wind estimation
2811	Wind Velocity Estimation Uncertainty (Element 2-2)	m/s	2-2 element from covariance matrix in wind estimation
2812	Wind Azimuth Angle	degree	Wind estimated azimuth
2813	Wind Velocity in North-East plane	m/s	Horizontal wind velocity

4.4. Lists of Variables

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ID	Name	Units/Values	Description
2830-2893	Setup real 00-63	customType	Setup variable 00-63
✎ 2900	MSL Right from Actual QNH and Pressure Measurement	m	Mean Sea Level obtained from Actual QNH and current Pressure Measurement
✎ 2901	MSL for ISA and Pressure Measurement	m	Mean Sea Level calculated for ISO International Standard Atmosphere and Pressure Measurement
2902	Time Since Entering Current Phase	s	Time-lapse considered since entering the current phase
2903	GNC Timestep	s	Task execution period from GNC
2904	Total Flight Time	s **Warning: Deprecated variable**	Time-lapse since the vehicle finished Standby
2905	Total Flight Distance	m **Warning: Deprecated variable**	Distance covered by the vehicle in all mission length
2906	Reception Frequency of Simulated Navigation Data	Hz	Frequency at which the system receives Simulation Navigation Data
2907	Reception Frequency of External Navigation Data	Hz	Frequency at which the system receives External Navigation Data
2908-2927	Time in Phase 0-19	s	Time-lapse spent by the vehicle in phase 0 to 19
✎ 3000-3031	Simulation Variable 0-31	customType	Variables used for Simulation data
✎ 3100-3399	User Variable 00-299 (Real - 32 Bits)	customType	Free variables for the user to use
4100	Zero	customType	Constant value 0
4101	Rvar Disabled	customType	Disabled variable

4.4.3 Integer Variables (UVar) - 16 Bits

ID	Name	Description
0	Actuator Mode	Index pointing to the flight mode in use
1	Phase Identifier	Index pointing to the active phase
2	Internal ADC 0 **Warning: Variable for internal use**	Internal ADC pin
3-7	ADC 0-4	Direct reading of ADC pins
8-18	Internal ADC 1-11 **Warning: Variable for internal use**	Internal ADC pins
19	Current envelope (deprecated) **Warning: Deprecated variable**	Index pointing to the used envelope
20	Counter for C2 system	C2 counter to monitor if Core 2 is alive
21	Total memory for blocks allocation (low part)	Total words available for blocks (low part). It is stored in two parts because the size can be a number up to 32 bits but the uvars are stored in variables of 16, so to get the true size the user would have to put together both the low and the high part **Note:** 1 word = 2 bytes

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| ID	Name	Description
22	Total memory for blocks allocation (high part)	Total words available for blocks (high part). It is stored in two parts because the size can be a number up to 32 bits but the uvars are stored in variables of 16, so to get the true size the user would have to put together both the low and the high part **Note:** 1 word = 2 bytes
23	Memory used for blocks allocation (low part)	Words used for blocks in allocator (low part). It is stored in two parts because the size can be a number up to 32 bits but the uvars are stored in variables of 16, so to get the true size the user would have to put together both the low and the high part **Note:** 1 word = 2 bytes
24	Memory used for blocks allocation (high part)	Words used for blocks in allocator (high part). It is stored in two parts because the size can be a number up to 32 bits but the uvars are stored in variables of 16, so to get the true size the user would have to put together both the low and the high part **Note:** 1 word = 2 bytes
25	SRTM source at UAV's position	Index for the SRTM source type: • 0: Processing • 1: Invalid • 2: 90-meter resolution in equator • 3: 30-meter resolution in equator
50	PDI error source	Index for PDI error source identification For further information, consult the *List of PDI errors*
51	Operation error source	Index for operation error source identification

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ID	Name	Description
53	4XV Veronte ID	ID of this AP in a redundant (0-3) to compare with the selected CAP For more information, check Integer Variables - 4x Software Manual
54	4XV Veronte CAP	Current Autopilot 1x selected For more information, check Integer Variables - 4x Software Manual
✎ 55-75	4xV Integer variables	For more information, check Integer Variables - 4x Software Manual
80	Detour calculation identifier	Counter of number of times a route change has been calculated
81	Approach calculation identifier	Counter of number of times Approach guidance has been calculated
82	Climb calculation identifier	Counter of number of times Climb guidance has been calculated
83	Cruise calculation identifier	Counter of number of times Cruise guidance has been calculated
84	Rendezvous calculation identifier	Counter of number of times Rendezvous guidance has been calculated
85	Taxi calculation identifier	Counter of number of times Taxi guidance has been calculated
86	VTOL calculation identifier	Counter of number of times VTOL guidance has been calculated
90	Version Major	Major software version
91	Version Minor	Minor software version
92	Version Revision	Revision software version
95	UAV address	UAV address
96	File system status	State error for DFS2 FS For further information, consult the *List of File system errors*
97	Number of registered partitions on DFS2 File System	Number of registered partitions on DFS2 File System
100	GNSS1 Number of Satellites Used in Solution	Number of satellites used in solution
101-102	GNSS1 rejected-accepted RTCM 1005	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1005
103-104	GNSS1 rejected-accepted RTCM 1077	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1077
105-106	GNSS1 rejected-accepted RTCM 1087	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1087
107-108	GNSS1 rejected-accepted RTCM 1127	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1127

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ID	Name	Description
109-110	GNSS1 rejected-accepted RTCM 1230	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1230
111-112	GNSS1 rejected-accepted RTCM 4072	Number of RTCM rejected by wrong CRC - correctly received by Ublox 4072
113	GNSS1 rejected RTCM unknown type	Number of RTCM unknown rejected by wrong CRC
114	GNSS1 week	GNSS1 week
115	GNSS1 Jamming Status	Output from GPS 1 jamming/interference monitor • 0 = unknown or feature disabled • 1 = ok $\Rightarrow$ no significant jamming • 2 = warning $\Rightarrow$ interference visible but fix Ok • 3 = critical $\Rightarrow$ interference visible and no fix
150	GNSS2 Number of Satellites Used in Solution	Number of Satellites Used in Solution
151-152	GNSS2 rejected-accepted RTCM 1005	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1005
153-154	GNSS2 rejected-accepted RTCM 1077	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1077
155-156	GNSS2 rejected-accepted RTCM 1087	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1087
157-158	GNSS2 rejected-accepted RTCM 1127	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1127
159-160	GNSS2 rejected-accepted RTCM 1230	Number of RTCM rejected by wrong CRC - correctly received by Ublox 1230
161-162	GNSS2 rejected-accepted RTCM 4072	Number of RTCM rejected by wrong CRC - correctly received by Ublox 4072
163	GNSS2 rejected RTCM unknown type	Number of RTCM unknown rejected by wrong CRC
164	GNSS2 week	GNSS2 week

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ID	Name	Description
165	GNSS2 Jamming Status	Output from GPS 2 jamming/interference monitor • 0 = unknown or feature disabled • 1 = ok ⇒ no significant jamming • 2 = warning ⇒ interference visible but fix Ok • 3 = critical ⇒ interference visible and no fix
200	Radar Altimeter State	Index for the radar altimeter state
201	Current Section	ID of current patch being executed by the autopilot
202	Last Achieved Section	ID of last patch completed by the autopilot
203	Track Stage	Index of type of tracked route • 0: No route • 1: Route from mission • 2: Commanded route
204	Current patchset ID	Index showing the patchset • 0: Approach • 1: Climb • 2: Route • 3: Taxi • 4: VTOL • 5: Rendezvous • 6: Detour
205	Amount of laps done	Number of laps completed on the route
310-311	Iridium sent-received	Number of packets succesfully sent/received
398	VectorNav Mode	Index showing external source VectorNav mode
399	Identifier of max duration step in acquisition **Warning: Variable for internal use**	Identifier of maximum duration step in CIO
400	Internest raw status	Internest raw status

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ID	Name	Description
401	Navigation source	Index pointing to the primary navigation source • 1: Internal navigation • 2: Simulated navigation (IRX source) • 3: External navigation using VCP • 4: External navigation using dedicated variables • 5: External navigation from Vectornav VN-300
402	Raw position source identifier	GPS identifier selected as main
✎ 403	(Deprecated) Selected static pressure sensor **Warning: Deprecated variable**	Static pressure sensor selection
404	Selected dynamic pressure sensor	Dynamic pressure sensor selection
405	Selected primary accelerometer (deprecated) **Warning: Deprecated variable**	Primary accelerometer selection
406	Selected primary gyroscope (deprecated) **Warning: Deprecated variable**	Primary gyroscope selection
✎ 409	(Deprecated) Selected magnetometer **Warning: Deprecated variable**	Magnetometer selection
410	Selected stick priority table	Stick priority table selection
425	Identifier of max duration step in GNC	Step with maximum duration
426	Group of user bits selected for CBIT	Index pointing to the selected **list of safety bits**. This is the group of user bits selected to be computed with system CBIT

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ID	Name	Description
449	Configured system errors that had triggered	Bitarray containing the errors that can trigger the System Error
450	CAN-A Tx errors	CAN A communication errors in transmission
451	CAN-A Rx errors	CAN A communication errors in reception
452	CAN-B Tx errors	CAN B communication errors in transmission
453	CAN-B Rx errors	CAN B communication errors in reception
454-459	CAN to Serial 0-5 frames dropped	Lost messages during CAN to Serial transformations
460-461	First-Last file Periodic log	First-Last file of the periodic log
462-463	First-Last file Event log	First-Last file of the event log
464-465	First-Last file Fast log	First-Last file of the fast log
480-485	COM0-5 packet discarded	Discared packets at COM 0 to 5
490	Number of moving obstacles detected	Number of moving obstacles detected
491-492	Veronte static cfg CRC(no Operation) of files (Higher-Lower 16 bits)	Veronte static cfg CRC (no Op.) of files
493-494	Veronte static cfg CRC(no Operation) of memory (Higher-Lower 16 bits)	Veronte static cfg CRC (no Op.) of memory
495-496	Global configuration state (crc) of files-memory (Higher-Lower 16 bits)	Global configuration state (crc) of files and memory
497	Config manager status (flash / sd / maintenance mode)	Configuration manager status
498-499	Global configuration state (crc) of files-memory	Global configuration state (crc) of files and memory
✎ 550-557	Reserved 0-7	System reserved variables for Gimbal
600-615	PPM channel 0-15 output	CEX PPM channel outputs
620	Jetibox max successfully parsed message	——————————— **Note: CEX variable** ———————————

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ID	Name	Description
710	ADS-B OUT - Squawk Code	ADS-B Squawk code, 4 digits that allow the operator to inform about its status This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

> **Warning:**
> - **Deprecated variable**
> - If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

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ID	Name	Description
711	ADS-B OUT - ICAO	ADS-B ICAO, 4 ASCII characters assigned by aircraft authority as an identifier This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

Warning:

- **Deprecated variable**

- If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

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ID	Name	Description
712	ADS-B OUT - Ident	Index indicating whether the identification is enabled or disabled. This is the identification of the UAV at the request of ATC This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

Warning:

- **Deprecated variable**

- If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

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ID	Name	Description
713	ADS-B OUT - Mode	Index of ADS-B mode: *IN*, *OUT* or *BOTH* This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.
	Warning: • **Deprecated variable** • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	

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ID	Name	Description
714-721	ADS-B OUT - Call sign 0-7 **Warning:** • **Deprecated variable** • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	ADS-B Call sign, 9 ASCII characters used by operator to be identified during communication These variables are closely related to the management of communications between transponders and Veronte Autopilot 1x.
730	(Deprecated) Ping1090 - Sequence number **Warning:** **Deprecated variable**	

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ID	Name	Description
741	(Deprecated) Sagetech MXS - Hemisphere data status **Warning:** • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	Sagetech variable, used by block to parse variables for GPS Navigation Data Message

Table 4 – continued from previous page

ID	Name	Description
742	(Deprecated) Sagetech MXS - Ground track **Warning:** - **Variable for internal use** (custom message for transponder) - If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	Sagetech variable, used by block to parse variables for GPS Navigation Data Message

Table 4 – continued from previous page

ID	Name	Description
743	(Deprecated) Sagetech MXS - Air speed **Warning:** • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	Sagetech variable, used by block to parse variables for GPS Navigation Data Message

Table 4 – continued from previous page

ID	Name	Description
750	ADS-B Out / ICAO High	ADS-B ICAO, 4 ASCII characters assigned by aircraft authority as an identifier
	Warning: • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

Table 4 – continued from previous page

ID	Name	Description
751	ADS-B Out / ICAO Low	ADS-B ICAO, 4 ASCII characters assigned by aircraft authority as an identifier This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x. **Warning:** • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

Table 4 – continued from previous page

ID	Name	Description
752	ADS-B Out / Emitter Type	Type/category of ADS-B emitter This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.
	Warning: • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	

Table 4 – continued from previous page

ID	Name	Description
753-760	ADS-B Out / Call Sign 0-7	ADS-B Call sign, 9 ASCII characters used by operator to be identified during communication This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.
	Warning: • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	

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Table 4 – continued from previous page

ID	Name	Description
761	ADS-B Out / Type	Model of ADS-B transponder
		This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

> **Warning:**
> - **Variable for internal use** (custom message for transponder)
> - If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

Table 4 – continued from previous page

ID	Name	Description
762	ADS-B Out / Control	Index of ADS-B control: *OFF*, *ADS-B IN*, *ADS-B OUT* or *BOTH* (ADS-B IN and OUT) This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

Warning:

- **Variable for internal use** (custom message for transponder)

- If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

Table 4 – continued from previous page

ID	Name	Description
763	ADS-B Out / Squawk	ADS-B Squawk code, 4 digits that allow the operator to inform about its status This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.

> **Warning:**
> - **Variable for internal use** (custom message for transponder)
> - If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly

Table 4 – continued from previous page

ID	Name	Description
764	ADS-B Out / Ident	Index indicating whether the identification is enabled or disabled. This is the identification of the UAV at the request of ATC This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x.
	Warning: • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	

Table 4 – continued from previous page

ID	Name	Description
765	ADS-B Out / Custom	Variable for internal use for ADS-B Out This variable is closely related to the management of communications between transponders and Veronte Autopilot 1x. **Warning:** • **Variable for internal use** (custom message for transponder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly
800	MC Fault Id	Index of the MC error **Warning:** Deprecated variable
801	MC Input Control Mode	Index of the MC control input mode: • 1: PPM • 2: CAN • 3: both modes active (CAN priority)

continues on next page

Table 4 – continued from previous page

ID	Name	Description
802	MC Actual Control Machine State	State of motor controller: • 0: Motor stop and driver disabled • 1: Calibration of ADC reading • 2: Initial alignment procedure • 3: Open loop procedure • 4: Speed mode
✎ 900-909	Simulation variable 00-09	Variables used for simulation data
✎ 1000-1299	User Variable 00-299 (Unsigned Integer - 16 bits)	Free variables for user
2000	Uvar Disabled	Disabled variable
2001	Zero	Variable with constant 0 value

4.4.4 Features Variables - 64 Bits
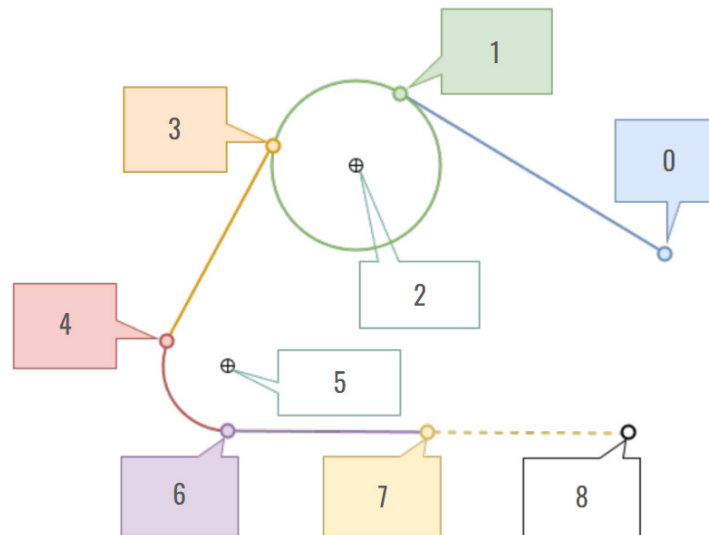
Fig. 1: **Landing route - Features variables**

ID	Name	Form	Units	Description
0	Approach Initial Point	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **0** in *Landing capture*.
1	Approach Loiter Start	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **1** in *Landing capture*.
2	Approach Loiter Center	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **2** in *Landing capture*.
3	Approach Loiter Finish	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **3** in *Landing capture*.
4	Approach Headturn Start	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **4** in *Landing capture*.
5	Approach Headturn Center	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **5** in *Landing capture*.
6	Approach Headturn Finish	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **6** in *Landing capture*.
7	Approach Touch Point	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **7** in *Landing capture*.
8	Approach Runway End	[lon, lat, height]	[rad, rad, m]	Landing Guidance Variable. Point **8** in *Landing capture*.

Note: For further information regarding Landing guidance, please refer to Landing - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
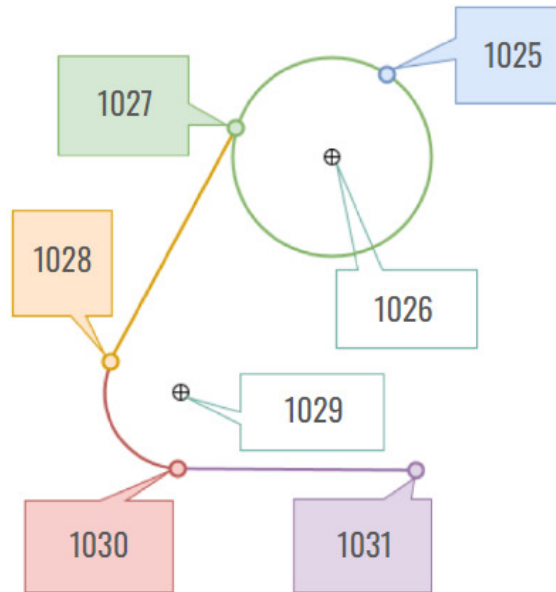
Fig. 2: **Climbing route - Features variables**

ID	Name	Form	Units	Description
1025	Climb First Loiter Point	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1025** in *Climbing capture*.
1026	Climb Loiter Center	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1026** in *Climbing capture*.
1027	Climb Start Loiter	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1027** in *Climbing capture*.
1028	Climb Finish Headturn	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1028** in *Climbing capture*.
1029	Climb Headturn Center	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1029** in *Climbing capture*.
1030	Climb Start Headturn	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1030** in *Climbing capture*.
1031	Climb Initial Point	[lon, lat, height]	[rad, rad, m]	Climbing Guidance Variable. Point **1031** in *Climbing capture*.

Note: For further information regarding Climbing guidance, please refer to Climb - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
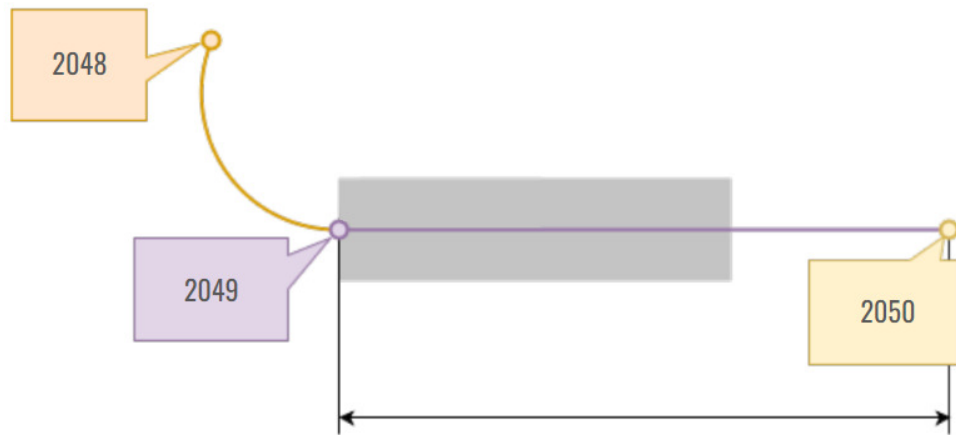
Fig. 3: **Taxi route - Features variables**

ID	Name	Form	Units	Description
2048	Taxi Initial Point	[lon, lat, height]	[rad, rad, m]	Taxi Guidance Variable. Point **2048** in *Taxi capture*.
2049	Taxi Runway First Point	[lon, lat, height]	[rad, rad, m]	Taxi Guidance Variable. Point **2049** in *Taxi capture*.
2050	Taxi Runway Final Point	[lon, lat, height]	[rad, rad, m]	Taxi Guidance Variable. Point **2050** in *Taxi capture*.

Note: For further information regarding Taxi guidance, please refer to Taxi - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
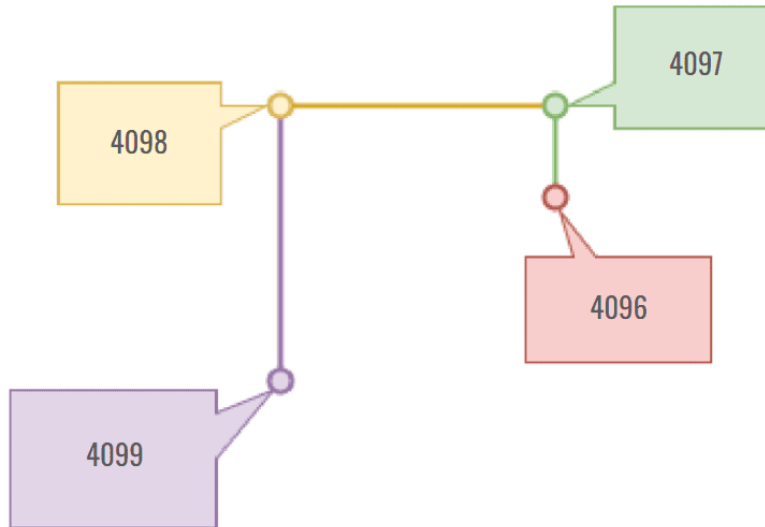
Fig. 4: **VTOL route - Features variables**

ID	Name	Form	Units	Description
4096	Vtol 00	[lon, lat, height]	[rad, rad, m]	VTOL Initial point. Point **4096** in *VTOL route capture*.
4097	Vtol 01	[lon, lat, height]	[rad, rad, m]	VTOL Translate Start. Point **4097** in *VTOL route capture*.
4098	Vtol 02	[lon, lat, height]	[rad, rad, m]	VTOL Translate End. Point **4098** in *VTOL route capture*.
4099	Vtol 03	[lon, lat, height]	[rad, rad, m]	VTOL End point. Point **4099** in *VTOL route capture*.

Note: For further information regarding VTOL guidance, please refer to VTOL - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.

ID	Name	Form	Units	Description
3072 - 3075	Smooth 00 - 03	[lon, lat, height]	[rad, rad, m]	Smooth Feature Variable.
5120 - 5124	Detour 00 - 04	[lon, lat, height]	[rad, rad, m]	Detour Feature Variables.
6144	Runway Loiter	[lon, lat, height]	[rad, rad, m]	Runway Guidance Variable.
6145	Runway Touch Point	[lon, lat, height]	[rad, rad, m]	Runway Guidance Variable.
6146	Runway End Position	[lon, lat, height]	[rad, rad, m]	Runway Guidance Variable.
7168 - 7169	Gimbal Pointing 00 - 01	[lon, lat, height]	[rad, rad, m]	Gimbal Pointing.
8192	UAV position	[lon, lat, height]	[rad, rad, m]	UAV position.
8193	Current phase	[lon, lat, height]	[rad, rad, m]	Current phase.
8194	Desired position	[lon, lat, height]	[rad, rad, m]	Desired position.
8195	Value used when invalid ID is tried	[lon, lat, height]	[rad, rad, m]	Auxiliar feature - Not valid for users.
8196	Track position	[lon, lat, height]	[rad, rad, m]	Closer point in route to the current desired position.
8197	Operator position	[lon, lat, height]	[rad, rad, m]	Operator position.
8198	Start waypoint in current route	[lon, lat, height]	[rad, rad, m]	Start waypoint in current route.
8199	End waypoint in current route	[lon, lat, height]	[rad, rad, m]	End waypoint in current route.
9216 - 9235	Phase 00 - 19	[lon, lat, height]	[rad, rad, m]	Phase.
10240 - 10247	Inflight Reference Point 00 - 07	[lon, lat, height]	[rad, rad, m]	Absolute or relative reference position useful during mission.
11264 - 11327	Obstacle Sensor 00 - 63	[lon, lat, height]	[rad, rad, m]	Obstacle Sensor.
12288	Rendezvouz 00	[lon, lat, height]	[rad, rad, m]	Start point For further information, please refer to Rendezvous - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
12289	Rendezvouz 01	[lon, lat, height]	[rad, rad, m]	Rendezvous relative point For further information, please refer to Rendezvous - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
12290	Rendezvouz 02	[lon, lat, height]	[rad, rad, m]	Docking relative point For further information, please refer to Rendezvous - Guidance blocks of **Block Programs** section of the **1x PDI Builder** user manual.
13312	Moving Obstacles 00 - 15	[lon, lat, height]	[rad, rad, m]	Moving Obstacle.

4.5 Navigation Variables

The following variables of the **Autopilot 1x** take part in the **navigation** performance.

- **Bit variables**:

ID	Name
101	*No valid SRTM at UAV position*
114	*No valid Geoid at UAV position*

- **Real variables**:

ID	Name
0	*IAS (Indicated Airspeed)*
1	*TAS (True Airspeed)*
2	*GS (Ground Speed)*
3	*Heading*
4	*Flight Path Angle*
5	*Bank*
6	*Yaw*
7	*Pitch*
8	*Roll*

- **Integer variables**:

ID	Name
25	*SRTM source at UAV's position*

- **Feature variables**:

ID	Name
8192	*UAV position*

4.6 List of PDI Errors

The following table explains the list of possible errors from Veronte applications.

Note: The decimal value of the *PDI Error Source (UVar 50)* represents the PDI error ID listed in the following table.

Code	Nº	Explanation
pdi_ok	0	No errors detected
pdi_gpio	1	GPIOs function configuration
pdi_odt_pool_sz	2	Incorrect pool size in on-demand telemetry
pdi_telemetry_alloc	3	Could not allocate new telemetry vector
pdi_channelmgr	10	Channel manager configuration
pdi_sara	15	SARA sim type oor
pdi_vblk_sensrtm	16	Block for SRTM sensor
pdi_arcx	23	Arcade axis set of options

Code	Nº	Explanation
pdi_msg8_consumer_hi	24	Custom message consumer cannot be used in HI unless it is an external sensor
pdi_modes	27	Stick configuration modes
pdi_blkekfstp	41	Static pressure to EKF adapter block
pdi_gnss_blocks	45	GNSS constellations configuration (more than allowed)
pdi_cansuite_gpio	47	CAN suite gpio
pdi_vrng	48	Range sensors
pdi_fmset	50	Custom message set
pdi_pwm	54	Pwm configuration
pdi_sniffer	63	Sniffer wires configuration
pdi_sniffer_read_only	64	Read-only variable selected in sniffer
pdi_fmsgc_read_only	65	Read-only variable selected in serial message consumer
pdi_canmsgc_read_only	66	Read-only variable selected in CAN message consumer
pdi_vref_read_only	67	Read-only vref variable
pdi_obstacle	68	Incorrect type of obstacle
pdi_obsense	69	Obstacle sensing mode or type oor
pdi_marks	71	Incorrect type of mark
pdi_fmsg_p	74	Custom message producers msg id oor
pdi_fmsg_c	75	Custom message consumers process parser oor
pdi_fmsgcan_c	76	CAN custom msg consumer msg id oor
pdi_telem	77	Telemetry configuration
pdi_sci	81	SCI config error
pdi_events	82	Invalid event
pdi_actions	83	Actmgr - List of actions
pdi_evact	84	Actmgr - List of related events and actions
pdi_cmd_not_allowed	85	Commands not allowed
pdi_wrapper	86	Wrapper range configuration incorrect
pdi_xpc_can_in	87	XPC for CAN messages input filters size ok
pdi_xpc_can_out	88	XPC for CAN messages output filters size ok
pdi_xpc_can_ser	89	XPC for CAN messages serialtocan size ok
pdi_xpc_can_gpio	90	XPC for CAN messages virtual gpios size ok
pdi_xpc_can_map	91	XPC for CAN messages and check their priority and connections
pdi_xpc_u8_map	92	XPC for u8 messages and check their priority and connections
pdi_internest	93	Internest version in rage
pdi_internest1	94	Internest max_range_vbase in rage
pdi_internest2	95	Internest max_range_vexplore in rage
pdi_ecap	101	Capture
pdi_cappulse	116	ECAP pulse consumers
pdi_i2cdevs	117	I2C external devices
pdi_lossy_resize	120	Lossy resize error
pdi_rvector_resize	121	Rvector resize error
pdi_asciiparser	122	ASCII parser invalid configuration
pdi_telemetry_exceeded	123	Telemetry size exceeded
pdi_hi_3210_rx_tout	154	HI-3210 rx cannot be configured
pdi_hi_3210_tx_tout	155	HI-3210 tx cannot be configured
pdi_cmd_rdvzset	176	Rendezvous command base_yaw oor
pdi_cmd_taxiget	183	Taxi guidance block error. Could be invalid runway or invalid initial point
pdi_cmd_gtrack1	188	Invalid detour command
pdi_cmd_gtrack2	189	Invalid guidance block configuration
pdi_cmd_speed	192	Cruise speed command

Table 5 – continued from previous page

Code	Nº	Explanation
pdi_cmd_gtrack	193	Invalid detour command
pdi_cmd_gtrkset	194	Track request command
pdi_cmd_stksrcr	208	Get stick raw channels from selected source
pdi_cmd_vtolset	212	VTOL request command
pdi_ini_nok	213	Cannot change to a phase different from INI with System BIT not OK and out of PDI mode
pdi_cmd_nav	215	Navigation command
pdi_cmd_gpio	218	GPIO command
pdi_cmd_gpio1	219	GPIO command
pdi_cmd_gpio2	220	GPIO command
pdi_cmd_gpio3	221	GPIO command
pdi_cmd_phase	222	Commanded phase is out of range
pdi_cmd_gimbal1	224	Gimbal commands
pdi_cmd_gimbal	225	Gimbal commands
pdi_cmd_var	235	Variable set command
pdi_reset	239	Reset CPU IRX
pdi_acc2filt	257	Bosch IMU BMI088 (IMU2) Accelerometer filter
pdi_imu3_filter	258	ADIS16505 IMU filter not in range [0,6]
pdi_imu3_filter_bw	259	ADIS16505 IMU filter not compatible with Bandwidth limit
pdi_cansuite_in	288	CAN suite producer for veronte
pdi_cansuite_out	289	CAN suite consumer for veronte
pdi_cfg_can	290	CAN cfg
pdi_resize_can_cex	291	CEX CAN cfg
pdi_resize_can_commex	292	COMMEX CAN cfg
pdi_jeti_and_lift	293	Trying to configure jeti and lift (not enough memory)
pdi_srtm_calib	500	Tried to calibrate SRTM without valid SRTM data for current point
pdi_jid	501	Invalid feature
pdi_canid	502	Invalid CAN id
pdi_cfgid_mode0	503	Invalid Cfgid PDI (number of PDIs does not match)
pdi_cfgid_mode1	504	Invalid Cfgid PDI mode
pdi_cmd_mgr	505	Expected command size does not match
pdi_cmd_mgr1	506	Expected command size does not match
pdi_cancfg	507	Invalid CAN configuration
pdi_decimator	508	Invalid decimator
pdi_sci_cfg	509	Invalid SCI configuration
pdi_field1	510	Maximum ID of real variable exceeded
pdi_field2	511	Maximum ID of user variable exceeded
pdi_field3	512	Maximum ID of bit variable exceeded
pdi_field4	513	Maximum number of decimals for real variable exceeded
pdi_field5	514	Overflow for real variable detected
pdi_field6	515	Incorrect CRC field
pdi_field7	516	Field matcher number of bits outside range
pdi_field8	517	Field maximum skippable bits exceeded
pdi_field9	518	Maximum ID of real variable saved as string exceeded
pdi_field10	519	Field type out of range
pdi_flogic	520	Invalid event composition (Flogic)
pdi_flogic1	521	Invalid event composition (Flogic)
pdi_flogic2	522	Invalid event composition type
pdi_fref	523	Invalid type of position reference
pdi_irxtable	524	Invalid 3Dtable mode or vector is non-decreasing

Code	Nº	Explanation
pdi_limit	525	Invalid limit event type
pdi_lsm6ds3_cfg	526	Accelerometer/Gyroscope settings outside range
pdi_pdi_ver	527	Incompatible PDI version, there are some PDI files in Veronte from a different version. Try mi
pdi_rvarsensor	528	Id for Rvar out of range for Rvarsensor
pdi_stickrawtrans0	529	K value in stick outside range [-100, 100] or 0
pdi_stickrawtrans1	530	Maximum value read from stick for Configured range exceeded [4095]
pdi_stickrawtrans2	531	Maximum value read from stick for Raw stick trim exceeded [4095]
pdi_stickrawtrans3	532	Invalid transformation type for stick
pdi_stickcfg3	536	Invalid destination of stick device data
pdi_tllhcompressed	537	Longitude/Latitude outside range [-pi,pi]/[-0.5pi,0.5pi]
pdi_tunpatchset0	538	Patch selected as first has not been enabled
pdi_tunpatchset1	539	Patch selected as next has not been enabled
pdi_tunpatchset2	540	Patchtype point has not been enabled
pdi_tunpatchset3	541	Patchtype line has not been enabled
pdi_tunpatchset4	542	Patchtype orthodrome has not been enabled
pdi_tunpatchset5	543	Patchtype arc has not been enabled
pdi_tunpatchset6	544	Patchtype ellipse has not been enabled
pdi_tunpatchset8	546	No patchtype has been enabled
pdi_Ubxcfgnav5	547	Dynmodel out of range or incorrect UTC time
pdi_Ubxcfgnavx5	548	Maximum acceptable AssistNow Autonomous orbit error outside range [5, 1000]
pdi_Ubxcfgport	549	Port (for Ubx?) is neither SPI nor SCI
pdi_Ubxcfgrate	550	Invalid Ublox configuration rate
pdi_Ubxcfgsbas	551	Maximum number of SBAS prioritized tracking channels exceeded [3]
pdi_atunarray0	552	Invalid Tunarray index
pdi_atunarray1	553	Invalid Tunarray size
pdi_Ubxcfgtmode3	554	Error in receiver mode, neither enabled nor disabled
pdi_Uclk	555	Invalid chrono event
pdi_Uvarsensor	556	Id for Uvar out of range for Uvarsensor, or desired frequency too low (<1Hz)
pdi_Uclkmgr	557	Maximum number of event user chronos exceeded
pdi_varinit0	558	Maximum array size exceeded on initial values for user variables
pdi_varinit1	559	Initialized variable is unwritable
pdi_vref0	560	Maximum ID of Rvar variable exceeded in Vref
pdi_vref1	561	Maximum ID of Uvar variable exceeded in Vref
pdi_vref2	562	Maximum ID of Bvar variable exceeded in Vref
pdi_vref3	563	Invalid type of variable in Vref
pdi_xclkcfg0	564	Period time non positive in event
pdi_xclkcfg1	565	Invalid period mode
pdi_xclkcfg2	566	Chrono position direction not correctly normalized
pdi_xclkcfg3	567	Invalid type of chrono
pdi_blk_batch	570	Maximum allowed block nesting depth exceeded [6] or incorrect number of inputs/outputs for
pdi_blk_ifelse	571	Error in the connections for block if/else
pdi_blk_switch	572	Error in the connections for block switch
pdi_blk_switch0	573	Invalid switch/ifelse/phase block configuration
pdi_blkmgr	574	Invalid block manager configuration
pdi_pinmux	576	Invalid switch/ifelse/phase block output configuration
pdi_blk_switchmap	577	Invalid mapping to cases in switch/phase block
pdi_accellimit	579	Envelope's falling or rising edge is out of accepted limits
pdi_circle	583	Circle radius is less than or equal to 0
pdi_height	584	Height type is neither relative nor absolute

Table 5 – continued from previous page

Code	Nº	Explanation
pdi_heightabs	585	Invalid absolute height type
pdi_rwy	586	Invalid runway preferred type
pdi_driver	588	Problem in Driver block configuration
pdi_mwk	592	Gyroscope measurement error
pdi_opinctrl	593	Invalid PID controller input type
pdi_pid	594	Invalid PID integral configuration (tau must be ≥ 0)
pdi_prediction	595	Error in the Model Prediction Control algorithm. Prediction Horizon out of range or zero diag
pdi_sysid	596	Error ID for given pdi check
pdi_tsched	597	Error ID for given pdi check
pdi_dwma	598	Error ID for given pdi check
pdi_iir	599	Error ID for given pdi check
pdi_butterworth	600	Error ID for given pdi check
pdi_usre2	601	Error incorrect user sensor variance
pdi_ubxcfgtp5	603	Ublox time pulse configuration
pdi_cfgmgr_load_secure	604	Error loading secure mode
pdi_cfgmgr_finit	605	Error PDI files
pdi_cfgmgr_timeout	606	Error, timeout while loading PDIs
pdi_invalidrotmat	607	Invalid rotation matrix (cannot be inverted)
pdi_apsel	608	Number of autopilots for redundancy less than 3
pdi_vblk_apsel	609	Invalid block AP selection configuration|channel exceeds maximum number
pdi_vblk_arcade_bounce	610	Error in the connections for block Arcade Bounce
pdi_vblk_arcade_extend	611	Error in the connections for block Arcade Extend
pdi_vblk_btor	612	Error in the connections for bool to real block
pdi_vblk_bound	613	Error in the connections for block Bound
pdi_rldcfg0	614	Invalid dynamic pressure EKF entrance configuration
pdi_smoothvar	615	Smoother error
pdi_ubx_tout0	616	Could not receive ACKs from UBlox
pdi_ubx_tout1	617	Could not receive polling from Ublox
pdi_ubx_nack	618	A Ublox configuration message was rejected by a Ublox device (GNSS)
pdi_guid_pid	619	Invalid type of guidance controller
pdi_cmd_leg	620	Guidance uses an invalid runway or site
pdi_mixarray	622	Error in mixarray construction (possibly there is not enough RAM memory to store all the bloc
pdi_xrtable	623	Invalid number of entries for XrTable
pdi_blk_varset	624	Block trying to write in an invalid variable, possibly the selected variable is not user writable
pdi_tuntrait	625	Error trying to resize an array out of its maximum size
pdi_asuite	626	Selected dynamic pressure sensor is not valid in this hardware version
pdi_xpcmap	627	Invalid producer/consumer in I/O connections
pdi_blk_arraysplit	628	Invalid block: array of less than 2 elements cannot be split
pdi_blk_array	629	Bundle block error, it must have more than one input and the input sizes must be one
pdi_vblk_varget	630	Invalid ID for block Read Real
pdi_vblk_vec_ops	631	Error in either; Vector: Add, Subtract, Cross product, Matrix rotation or Matrix product
pdi_autotune	633	Invalid maximum duration of autotuning process or invalid number of stages for FFT
pdi_vblk_azeld1	634	Error in the connections for block azeld -> xyz
pdi_vblk_azeld	635	Error in the connections for block xyz -> azeld
pdi_vblk_dot	636	Error in the connections for block Dot Product
pdi_vblk_enctrl	637	Error in the connections for block Energy Control or invalid conversion factor from speed diffe
pdi_vblk_bnxb1	638	Error in the connections for block(s) AND/OR
pdi_vblk_r1xr1	639	Error in the connections for block x or invalid subfunction for the block
pdi_vblk_r2xr1	640	Error in the connections for block x+y or invalid subfunction for the block

Code	Nº	Explanation
pdi_vblk_rnxr1	641	Error in the connections for block(s) Multiply/Add Elements/Norm or invalid subfunction for t
pdi_vblk_iir	642	Error in the connections for block IIR Filter or invalid parameters for the transfer function
pdi_vblk_kmultvec	643	Error in the connections for block Scale
pdi_vblk_manual	644	Error in the connections for block Manual or invalid stick control channel
pdi_vblk_minmax	645	Error in the connections for block(s) Min/Max
pdi_vblk_mix	646	Error in the connections for block MIX or invalid mix control channel
pdi_vblk_movern	647	Error in the connections for block MIX Move
pdi_vblk_not	648	Error in the connections for block NOT
pdi_vblk_phase	649	Default case does not exist for block Phase Switch
pdi_vblk_tsched	651	Error in the connections for block T-Sched PID
pdi_vblk_pid	652	Invalid configuration or connection of a PID block
pdi_vblk_poly	653	Error in the connections for block Polynomial
pdi_vblk_posset	654	Error in the connections for block Write Feature or Fid is not user writable
pdi_vblk_predictive	655	Error in the connections for block Predictive Control or number of elements for numerator/den
pdi_vblk_ramp	656	Error in the connections for block Ramp or rise time/settling time less than (or equal to) 0
pdi_vblk_matvec	657	Error in the connections for block Linear Transformation or matrix size unmatched to the expe
pdi_vblk_rtable3d	658	Error in the connections for block 3D Table Interpolation
pdi_vblk_rtob	659	Error in the connections for block Real to Bool
pdi_vblk_rtou	660	Error in the connections for block Real to Integer
pdi_vblk_runwrap	661	Error in the connections for block [-pi,pi] Unwrap
pdi_vblk_utor	662	Error in the connections for block Integer to Real
pdi_vblk_relthis	663	Error in the connections for block Relative Vector
pdi_cancfg1	664	Number of mailboxes dedicated to rx exceeds maximum [32] or the filter applied to mailbox su
pdi_stickvar_cfg	665	Decimate time is higher than the minimum period or number of stick virtual inputs exceeds ma
pdi_vblk_gimbal	666	Error in the connections for block Gimbal
pdi_vblk_hysteresis	667	Error in the connections for block Hysteresis
pdi_vblk_arctrim	668	Error in the connections for block Arc Trim or control vector unmatched to expected size
pdi_blockprog	669	Incomplete set of LSB bits or with bit holes for execution mask or slot is not within the mask
pdi_vblk_n2b	670	Error in the connections for block NED to Body/Body to NED
pdi_vblk_pwm	671	Error in the connections for block PWM or PWM id exceeds maximum
pdi_vblk_stick	672	Error in stick block, connections, dimensions of matrices or stick sources could be wrong
pdi_vblk_u2s	673	Error in actuator block, connections or dimensions of matrices could be wrong
pdi_vblk_interp	674	Error in vector interpolation block, connections or sizes could be wrong, also the points in the
pdi_vblk_ratelim	678	Error in the connections for block Rate limiter
pdi_vblk_clock	679	Unable to reset the clock timer in block Clock
pdi_vblk_mult_varget	680	Unable to initialize output vector or invalid variable id in block Read Multiple Reals
pdi_vblk_mult_varset	681	Error in the connections for block Write Multiple Bits/Write Multiple Reals or input vector diff
pdi_vblk_pid_static	682	Unable to subscribe autotune in block PID
pdi_vblk_quatctrl	683	Set of configurable variables cannot be 0 or outside their range in block Quaternion Control
pdi_vblk_senstp	685	Error in pressure sensor block, could be that the selected pressure sensor in invalid in the curre
pdi_vblk_sengnss	686	Error for block GNSS sensor
pdi_vblk_ekfpos	687	Error for block EKF position
pdi_vblk_ekfvel	688	Error for block EKF Velocity
pdi_vblk_ekfmis	689	Error for block EKF Misalignment
pdi_vblk_drnmis	690	Error for block EKF GNSS compass
pdi_vblk_senrel	691	Error for block Relative position (Sensors)
pdi_vblk_ekfdem	692	Error for block EKF Terrain Height.
pdi_vblk_senmag	693	Error in magnetometer sensor block, the selected might be invalid in your current hardware or
pdi_mdg_gain	694	Error for block Madgwick Gain Computer

Table 5 – continued from previous page

Code	Nº	Explanation
pdi_vblk_senalt	696	Error for block Altimeter
pdi_vblk_ekfalt	697	Error for block EKF Altitude
pdi_vblk_ekfvdn	698	Error for block EKF Velocity Down
pdi_vblk_nav	699	Error for block Navigation
pdi_e2acc	700	Error for variance increment due to high acceleration
pdi_vblk_ekfsplit	701	Error for block EKF Split
pdi_vblk_fft	703	Error ID for block FFT
pdi_vblk_ecu	705	Error ID for block ECU control
pdi_vblk_fuzzy	706	Error ID for block Fuzzy Logic Controller
pdi_vblk_guidance	707	Input of guidance block could not be connected
pdi_vblk_sysid	709	Error ID for block System Identification
pdi_cex_pwm	710	Error ID for CEX pwm arbitration, src ID greater than pulses array
pdi_cex_esc_tm	711	Error ID for CEX ESC period
pdi_cex_mcu_tm	712	Error ID for CEX MCU period
pdi_vblk_climb	713	Incorrect climb block operation
pdi_vblk_leg	714	Incorrect leg block operation
pdi_flyto	715	Incorrect fly to command (non-existing patch)
pdi_vblk_approach	716	Incorrect approach block operation
pdi_vblk_yawing	717	Incorrect yawing block configuration
pdi_vblk_siggen	718	Incorrect signal generation configuration
pdi_vblk_pnav	719	Incorrect PNAV guidance configuration
pdi_vblk_genex	720	Incorrect GENEX guidance configuration
pdi_vblk_modpnav	721	Incorrect ModPNAV guidance configuration
pdi_blk_lib	722	Incorrect library
pdi_vblk_ewma	723	Incorrect EWMA block configuration
pdi_uarray_resize	724	Incorrect uarray resize
pdi_oprvar	725	Incorrect operation/setup rvar configuration
pdi_block_const	726	Error in block const
pdi_block_posget	727	Error in block posguet
pdi_block_pnavbase	728	Error in block pnav base
pdi_block_arcade0	729	Error in block arcade
pdi_unescape	730	Error in escape itport
pdi_initial_alignment	731	The internal AHRS or EKF navigation estimation algorithm could not compute an initial orien
pdi_fft_block_disable	732	The FFT block is temporarily disabled in this version
pdi_vblk_acclim	733	Error in block acceleration limiter
pdi_ewma_avgvar	734	Error in EWMA average/variance time constants
pdi_sensor_fusion	735	Time constants for sensor fusion algorithm are incorrect
pdi_oprng	736	Error in operation range configuration
pdi_oprng_check	737	Error in operation range check
pdi_vgeoref	738	Error in vgeoref configuration
pdi_notch_filter	739	Incorrect notch filter parameters
pdi_notch_frequency	740	Incorrect notch filter frequency
pdi_geoid_version	741	Incorrect geoid version in SD
pdi_vblk_integrator	742	Error in the connections for block Integrator
pdi_vblk_derivative	743	Error in the connections for block Derivative
pdi_wrapper_ref	744	Incorrect envelope range (minimum must be less or equal than maximum)
pdi_sensor_fusion_sel	745	Selected gyroscopes or accelerometers are invalid in this hardware or the default sensor is not a
pdi_volume_id	746	Incorrect volume identifier
pdi_fload_missing	747	Missing file from file system

Code	Nº	Explanation
pdi_event_log	770	Maximum number of fields reached
pdi_onboard_log	771	Maximum number of fields reached
pdi_fast_log	772	Maximum number of fields reached
pdi_arbitration	10000	Error ID for Arbitration cfg
pdi_arbitration_can	10001	Error ID for Arbitration_can cfg
pdi_arbitration_can1	10002	Error ID for Arbitration_can cfg
pdi_arb_cfg0	10003	Error ID for Arb cfg preferred ap oor
pdi_arb_cfg1	10004	Error ID for Arb cfg method oor(out of range)
pdi_arb_cfg2	10005	Error ID for Arb cfg tmin oor
pdi_arb_cfg3	10006	Error ID for Arb cfg hysteresis oor
pdi_ap_nvars	10007	Error ID for Autopilot nvars oor
pdi_apcfg_nvars	10008	Error ID for Autopilot cfg nvars oor
pdi_jetibox	10009	Error ID for sci identifier of Jetibox cfg oor
pdi_jetibox_fmsgcmd	10010	Error ID for jetibox fmsg cmd oor
pdi_arb_init_time	10011	Error ID for Arbiter Power Init Time less than 0
pdi_arb_varcfg	10013	Incorrect arbiter variable configuration
pdi_hs_base_can_id	15000	High speed telemetry invalid Base CAN Id
pdi_hs_tm_nvars	15001	High speed telemetry number of variables too big
pdi_vmc_motor	20000	Motor cfg is not valid
pdi_vmc_control_mode	20001	Control mode is invalid
pdi_vmc_encoder_nbits	20002	Number of bits for encoder is invalid
pdi_mc_vmotor	20003	Virtual motor cfg invalid
pdi_mc_smo	20004	Slide Mode Observer cfg invalid
pdi_mc_control	20005	Control cfg invalid
pdi_mc_fault_detection	20006	Fault detection cfg invalid
pdi_mangle_rate	20007	Invalid filter time constant
pdi_low_pll	20008	Invalid cut-off frequency
pdi_ex_ussa76_cmd	20009	Invalid period to send external USSA76 calibration command
pdi_cfgmr_length	31999	Unexpected size of PDI or command
pdi_cfg_file	32000	Error on PDI or command (subtract 32000 to know the Id)
pdi_check_test	0xFFFF	Error ID for given pdi check.

4.7 List of File System Errors

Integer variable *File system status (UVar 96)* represents several **DFS2 FS-related error states**, as each of its 16 bits indicates a specific error condition.

Fig. 5: **File system status**

Below is a list of potential error conditions associated with each bit:

ID	Error description
0	Index sector is not correct (1 if not correct - 0 if correct)
1	Error initializing SD (1 if not correct - 0 if correct)
2	Nun& partition bigger than allowed (1 if bigger - 0 if not)
3	No more descriptor available (1 if not available - 0 if available)
4	The descriptor of a file was not correct (CRC failed) (1 if fail - 0 if not)
5	The new descriptor couldn't be created (1 if not created - 0 if created)
6	Error updating the file size (1 if error updating - 0 if no error)
7	Error formatting because of system description size (1 if error formatting - 0 if not)
8	Error formatting driver not initialized (1 if error formatting - 0 if not)
9	Error formatting maximum partition number overpassed (1 if error formatting - 0 if not)
10	Error formatting not able to write index sector (1 if error formatting - 0 if not)
11	Error formatting partition not enabled (1 if error formatting - 0 if not)
12	Error writing the index for the log controller (1 if error formatting - 0 if not)
13	File was destroyed but was not closed or had pending requests (1 if not closed or pending requests - 0 if closed or had no pending requests)
14	Unable to read a sector (1 if unable - 0 if able)

FIRMWARE CHANGELOG

This section presents the changes between firmware versions of Veronte Autopilot 1x.

5.1 6.12.58

This section presents the changes between the previous firmware version of Veronte Autopilot 1x, **v.6.8.126**, and this firmware version, **v.6.12.58**.

Improved Flight Functionalities

- Geofencing with any shape

- New variable for distance to the closest obstacle

- Runway and spot positions are now accessible in PID blocks

- Count laps in a given closed patchset

- Signed patch curvature computation

Enhanced Blocks & Customization

- Extended support for external IMUs

- New numerical derivative block

- New integral derivative block

- New vector subtract block

- New vector cross-product block

- New Notch filter for IMUs

- Enhanced acceleration limit block

- Flight envelope moved to cruise guidance block

- Incremented serial over CAN and CAN Input/Output filters

Improved Altitude and Magnetic Field

- Enhanced magnetic field and geoid management onboard

- Geoid and estimated terrain height configuration separated

- Coarse and fine SRTM meshes deleted from PDI

Safety

- Position and velocity EKF adapters are now more robust

- Dedicated file for PDI error storage

- Support for formatting specific partitions on DFS2

- Configurable ranges for real operation variables

- Variable sharing for respect in 4x more robust

5.2 6.12.68

This section presents the changes between the previous firmware version of Veronte Autopilot 1x, **v.6.12.58**, and this firmware version, **v.6.12.68**.

Added

- BCS - System OK variable support

Improved

- GNSS Compass feature

- Extended response from System Status Manager

- Sniffer status bits management

- BCS - Optimised control and management of variables

5.3 6.12.92

This section presents the changes between the previous firmware version of Veronte Autopilot 1x, **v.6.12.68**, and this firmware version, **v.6.12.92**. For further details, please consult the Service Bulletin nº 0003.

Added

- Veronte SIL for Linux

- New PDI Error: **pdi_wrapper, ID 86**. It is triggered by the "wrapper class" (bounds a real number to the given limits) when the configured minimum limit is greater than the configured maximum limit

Improved

- The first order filter of the external commanded pressure USSA has been removed. The commanded pressure is now already filtered when the desired pressure is injected to the 1x air unit

- External command for atmospheric USSA calibration (from ground to air unit):

  - Now, it is calculated with the mean value of all active static pressure sensors for 5 seconds

  - In order to send the calculated command from the 1x ground unit, it is required to have position fixed and geoid data valid

- To decrease numerical errors in intertial navigation, velocity state in navigation is now double precision

- To avoid instabilities in the Extended Kalman Filter, the minimum variance of the relative position input block has been changed to 10e-4

- DEM calibration now computes an offset for the SRTM data so the estimated AGL equals the desired one for the current point of the UAV

- 8 bits checksum field on Custom Message feature is now applying a mask from the configured number of bits

- Order of application of acceleration and velocity limits in the envelope. Now the acceleration limits have more priority

- Optimisation in the readings of the Geoid, SRTM and magnetic field maps from the Internal Memory so that the number of readings from the Internal Memory is reduced

- Dynamic pressure measurement bounded to be equal or higher than 0 to prevent problems when computing its square root in the IAS computation

- Events are now only checked after the initialization of the sensors is finished. Also, the reading of the GPIO ports have been moved to be done before the execution of the blocks.

  Both changes prevent the execution of events using uninitialized states from the blocks computation or from the GPIOs

- In the transition from external navigation to internal, the position and velocity states are always kept in the transition. The EKF covariance matrix is initialized in the transition to its configured initial values

- Old static pressure user calibration set to zero, as it cannot be modified by an external tool

- CAN Custom Messages Producer initialization behavior

- GNSS compass: now GNSS position block considers as a rover any Ublox receiver that does not have enabled the RTCM messages 1005 or 4072

- GPIOs initialization in maintenance mode to avoid undesired behavior

5.4 6.12.112

This section presents the changes between the previous firmware version of Veronte Autopilot 1x, **v.6.12.92**, and this firmware version, **v.6.12.112**. For further details, please consult the Service Bulletin nº 0005 and Service Bulletin nº 0005 Rev.B.

Added

- PDI errors for maximum number of logs fields reached: pdi_event_log (ID 770), pdi_onboard_log (ID 771) and pdi_fast_log (ID 772).

- SIL example is provided with a new block to simulate VectorNAV navigation messages.

Improved

- Signal splitter behavior. If one of the consumers is not available, the available one will still consume the input signal.

- CPU temperature bit is now true when temperature is below maximum allowed temperature.

- Now the guidance is not restarted by default when changing the autopilot mode from "Manual" to "Auto", or when changing the selected autopilot in a 4x configuration.

> **Warning:** To keep the correct behavior, the block configuration should be set so that the guidance block is not executed when the autopilot is in "Manual" mode.
>
> This way, when the autopilot switches to "Auto" mode and the guidance block is executed again, the guidance will be restored as usual.

- RM3100 magnetometer is now being calibrated using the board temperature to interpolate the calibration parameters.

- ADS-B variables are not anymore user-writable.

- Position set and yaw set commands (IDs 201 and 202) are now only accepted if the UAV is in the initial phase.

- High priority thread CPU ratio performance to avoid a different behavior depending on the hardware version.

- DFS2 driver is now committing reliable values onto its BIT.

- Moving grid maps (used for geoid and magnetic field) are no longer reset due to negative increments of the grid position in the longitude direction.

- AGL calibration is now applied when there is no SRTM data available.

- Check for RX custom messages reception is now initialized as "False".

- Small increments in position close to the south pole are now computed properly.

- HIL sensor is now sending only IMU messages at high frequency to reduce CIO workload.

- RPM are now computed properly.

- 1xVeronte address is now also stored in case of a memory formatting error.

- Position and yaw commands are now rejected in PDI mode to avoid generating a System error.

- Serial over CAN can now work simultaneously on both CAN channels with Input/Output filters.

- CAN termination resistors are now set to HIGH by default on hardware versions higher than:
    - Veronte Autopilots: 1x - W/O DAA 4.8 → P006982 - B001037
    - Veronte Autopilots: 1x - Remote ID → P006142 - B001039
    - Veronte Autopilots: 1x - ADS-B → P006143 - B001040
    - Veronte Autopilot BCS 4.8 → P006417 B001053
    - Veronte Autopilots: 4x - w/o DAA 1.8 → P006984 - B000905
    - Veronte Autopilots: 4x - Remote ID 1.8 → P006146 B001055
    - Veronte Autopilots: 4x - ADS-B 1.8 → P006147 - B000335