1x Software Manual

Release 6.8

Embention

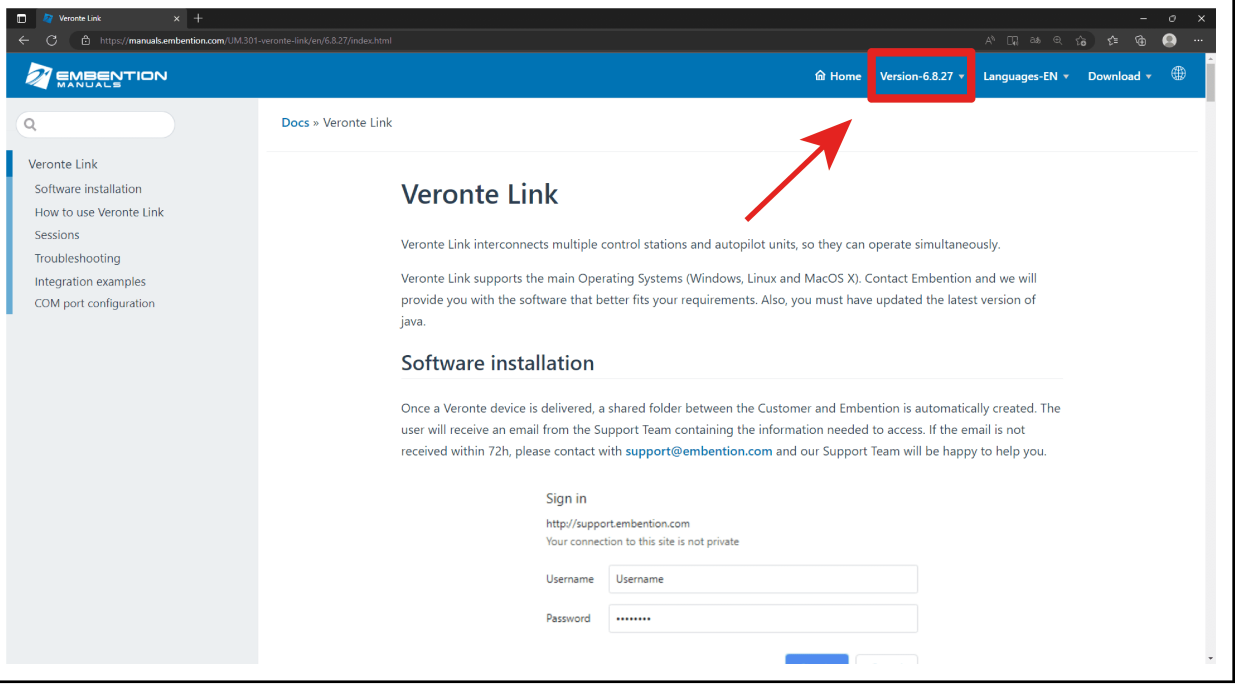
2023-09-22

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.



CHAPTER

ONE

SOFTWARE APPLICATIONS FOR VERONTE AUTOPILOT 1X

1.1 Veronte Link

Veronte Link stablishes 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.

Fore 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 commnication 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.

Veronte Terrain Provider estimates and displays the terrain height and the aircraft height, so it prevents collisions. It is executed automatically when the computer starts up, except for the first time it is used.

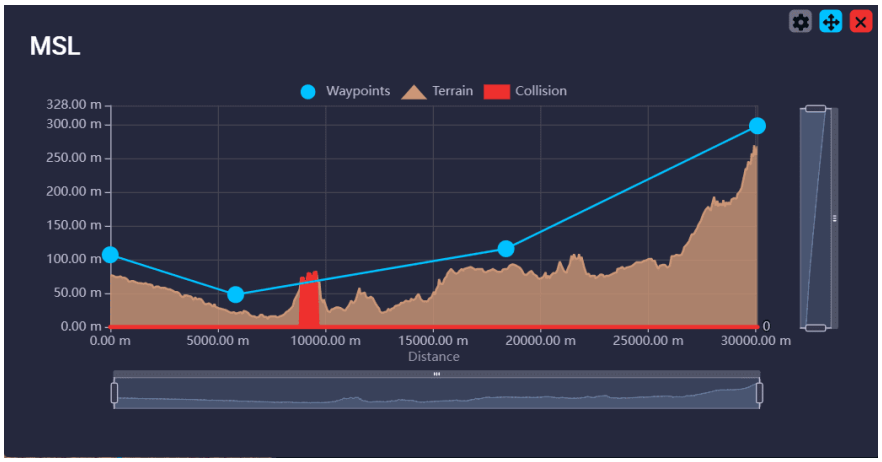


Fig. 1: **Heights example from Veronte Ops widget**

For more information about both applications, visit the Veronte Ops user manual.

1.4 Veronte HIL

Veronte HIL (Hardware In the Loop) is a simulation package for autopilots integration, developement, 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 perdorm 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 (Virtual Situational Awarness) 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.

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.

CHAPTER

TWO

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.

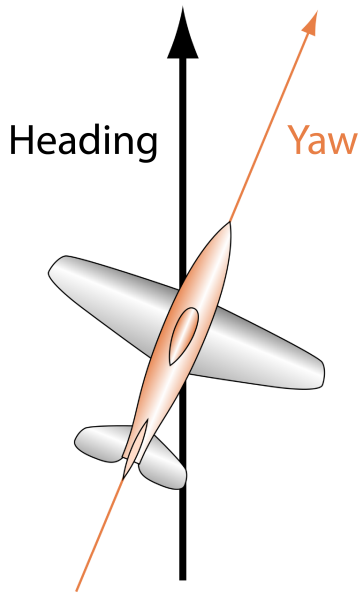


Fig. 1: **Direction names**

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:

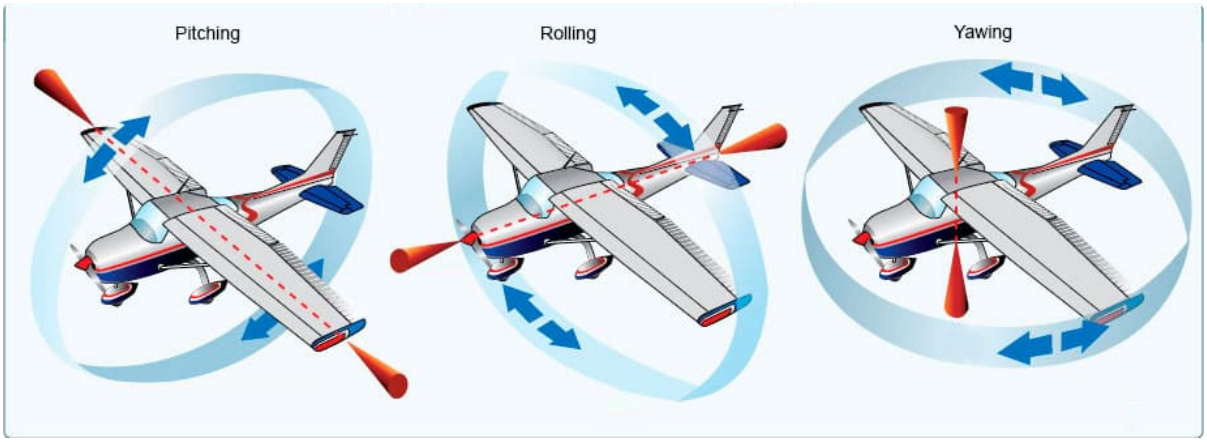


Fig. 2: **Rotation names**

CHAPTER

THREE

LISTS OF VARIABLES

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

Warning: Bit Variables displayed on 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.

3.1 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*.
- **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*.
- **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** are wrong configuration. This is indicated with a 0 in *bit 9*.
- **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.

3.2 BIT Variables

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 - 0 for not working properly, 1 for running
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 - 0 for wrong PDI configuration, 1 for running OK
10	CIO Low or C2 Error **Warning: Deprecated variable**	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
12	System power up bit error	Power up - 0 for error, 1 for OK
13	Reset and write disabled	Reset and write - 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

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Table 1 – continued from previous page

ID	Name	Description
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 core 1 usage FAIL	0 for memory overflow allocated for local variables of core 1, 1 for OK
17	Stack core 2 usage FAIL	0 for memory overflow allocated for local variables of core 2, 1 for OK
18	PDI disabled	PDI Mode - 0 for disabled, 1 for enabled
20-47	4xV Bit variables	For more information, check 4x Software Manual -> BIT
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-Magnetometer	**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 1-5	External communication I2C from device 1 to 5
65	SCI A Transmitting (Sara)	Serial Communication Interface - sara transmission
66	SCI A Receiving (Sara)	Serial Communication Interface - sara reception
67	SCI B Transmitting (Radio)	Serial Communication Interface - radio transmission
68	SCI B Receiving (Radio)	Serial Communication Interface - radio reception

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Table 1 – continued from previous page

ID	Name	Description
69	SCI C Transmitting (RS485)	Serial Communication Interface - RS485 transmission
70	SCI C Receiving (RS485)	Serial Communication Interface - RS485 reception
71	SCI D Transmitting (RS232)	Serial Communication Interface - RS232 transmission
72	SCI D Receiving (RS232)	Serial Communication Interface - RS232 reception
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 Fix	0 for error, 1 for OK
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	Sensor 3rd IMU BMI088	0 for error, 1 for OK
84	Sensor-static pressure 2 (DPS310)	0 for error, 1 for OK
85	Magnetometer 4 (MMC5883MA)	**Internal MMC5883MA magnetometer** - 0 for error, 1 for OK
86	Magnetometer 5 (External MMC5883MA)	**External MMC5883MA magnetometer** - 0 for error, 1 for OK
87	U-Blox 1	GPS module 1 state - 0 for error, 1 for OK
88	U-Blox 2	GPS module 2 state - 0 for error, 1 for OK
89	Magnetometer 6 (External RM3100)	**External RM3100 magnetometer** - 0 for error, 1 for OK
90	IMU3 ADIS16505-3 (MCBSP)	0 for error, 1 for OK
91	Magnetometer 7 (Internal RM3100)	**Internal RM3100 magnetometer** - 0 for error, 1 for OK
92	Magnetometer reserved	0 for error, 1 for OK
96-99	SCI A-D receiving error	SCI A to D - 0 for error, 1 for OK
100	Position not Fixed	GNSS data reception - 0 for not receiving, 1 for receiving (Psotition 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 1-2 not detected	Stick PPM 1 to 2 - 0 for not detecting, 1 for detecting

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Table 1 – continued from previous page

ID	Name	Description
106	Magnetic field out of bounds	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 3-4 not detected	Stick PPM 3 to 4 - 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
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*

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Table 1 – continued from previous page

ID	Name	Description
119	Not hovering guidance	Hovering guidance state - for hovering guidance disabled, 1 for enabled
120-123	Pulse 1-4 not detected	Pulse 1 to 4 detection - 0 for pulse not detected, 1 for detected
124-129	4xV Bit variables	For more information, check 4x Software Manual -> BIT
130	EFK navigation state	Extended Kalman Filter navigation state - 0 for error, 1 for running
150	External VCP state	External VCP state - 0 for error, 1 for OK
160	External var Navigation Error	External Navigation state – 0 for error, 1 for running
180	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
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
230-293	4xV Bit variables	For more information, check 4x Software Manual -> BIT
300	GNSS2 navigation down	0 for GNSS navigation OFF, 1 for GNSS navigation ON

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Table 1 – continued from previous page

ID	Name	Description
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
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	0 for error (it has a frequency < 10 Hz), 1 for OK (it has a frequency > 10 Hz)
401	GNC fail	0 for error (‘dead’), 1 for ok (‘alive’)
402	Acquisition Step Missed	0 for Acquisition step missed (it has a frequency < 990 Hz), 1 for Acquisition Task OK (it has a frequency > 990 Hz)
403	CIO Hi Overload warning	0 for Acquisition Task overload, 1 for CPU1 high Usage Ok (Acquisition Task OK)
404	GNC Realtime Error	0 GNC Step Missed, 1 for GNC Task OK
405	Reserved	0 for error, 1 for OK
480	VMC stepper direction output	0 for error, 1 for OK
481	VMC brushless driver fault	0 for error, 1 for OK
482	VMC Hall Sensor error	0 for error, 1 for OK
483	VMC Sin/Cos Sensor error	0 for error, 1 for OK
484	MC general health error	0 for health error, 1 for status 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	0 for No SRTM data, 1 for SRTM data OK
600	Wind Estimation Off	0 for disabled, 1 for enabled
700-731	Servo 1-32 Satured	0 for satured, 1 for OK

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Table 1 – continued from previous page

ID	Name	Description
800-815	PWM 1-16 GPIO Off	PWM GPIO 1-16 communication Sate - 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 1-3 Off	Received Signal Strength Indicator led state - 0 for Off, 1 for On
900-931	Virtual GPIO 1-32 Off	0 for Off, 1 for On
1000-1009	Simulation BIT 1-10 Error	0 for error, 1 for OK
1010-1113	Custom msg 1-104 Rx Error	Custom message timeout - 0 for error, 1 for OK
1120-1121	Entrance EKF GNSS 1-2 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
1122	Entrance EKF GNSS 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 press Off	DEM information considered in EKF Navigation - 0 for entrance EKF DEM OFF, 1 for ON
1180-1181	Sniffer msg 1-2 Rx Error	Sniffer receiver message - 0 for error, 1 for OK
1200-1499	User BIT 01-300 error	User bit 1 to 300 - 0 for error, 1 for OK

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Table 1 – continued from previous page

ID	Name	Description
2200	BIT Dummy Error	Bit for configurable checks - 0 for error, 1 for OK

3.3 Real Variables (RVar) - 32 Bits

ID	Name	Units/Values	Description
0	IAS (Indicated Air Speed)	m/s	Pitot-static measurement speed
1	TAS (True Air Speed)	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	Velocity vector lateral component
6	Yaw	rad	Angle around the Vertical axis of the vehicle
7	Pitch	rad	Angle around the Transverse axis of the vehicle
8	Roll	rad	Angle around the Longitudinal axis of the vehicle
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)
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

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Table 2 – continued from previous page

ID	Name	Units/Values	Description
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
28	Co-yaw	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
37	Body to NED quaternion qk	customType	Fourth component of body to NED orientation quaternion

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ID	Name	Units/Values	Description
40	RSSI	percentage **Warning: Deprecated variable**	Received Signal Strength Indicator
42	SCI-A Rx rate (4G)	bytes/s	4G link reception byte rate
43	SCI-A Tx rate (4G)	bytes/s	4G link transmission byte rate
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
59-64	COM 1-6 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	customType	Time of the week expressed with milliseconds
66	GNSS Hours in the Current Day	customType	Elapsed hours in the current day

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Table 2 – continued from previous page

ID	Name	Units/Values	Description
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
100	Desired IAS (Indicated Air Speed)	m/s	Commanded IAS from guidance
101	Desired TAS (True Air Speed)	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

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ID	Name	Units/Values	Description
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
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

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ID	Name	Units/Values	Description
145	Value used when invalid ID is tried	rad **Warning: Deprecated variable**	
146	Track direction	rad	Angle of the vector tangent to the curve at the current point on the route where the aircraft is located
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
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 down 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

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ID	Name	Units/Values	Description
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
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 GPS Time of Week	s	GNSS Time of week from external navigation source
300	Time since Hardware Start-Up	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)

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ID	Name	Units/Values	Description
304	Static Pressure	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
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

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ID	Name	Units/Values	Description
315	Magnetometer – Z Body Axis **Warning: Deprecated variable**	T	Magnetometer measurement for Z axis
322	Internal magnetometer raw X in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for X axis
323	Internal magnetometer raw Y in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for Y axis
324	Internal magnetometer raw Z in SI	T	**Internal LIS3MDL Magnetometer** raw measurement for Z axis
325	Internal 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
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 1 raw accelerometer x measurement	m/s^2	**Main IMU** raw accelerometer x measurement
331	IMU 1 raw accelerometer y measurement	m/s^2	**Main IMU** raw accelerometer y measurement
332	IMU 1 raw accelerometer z measurement	m/s^2	**Main IMU** raw accelerometer z measurement
333	IMU 1 raw gyroscope x measurement	rad/s	**Main IMU** raw gyroscope x measurement
334	IMU 1 raw gyroscope y measurement	rad/s	**Main IMU** raw gyroscope y measurement
335	IMU 1 raw gyroscope z measurement	rad/s	**Main IMU** raw gyroscope z measurement
336	IMU 1 temperature measurement	K	**Main IMU** temperature measurement

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ID	Name	Units/Values	Description
337	IMU 2 raw accelerometer x measurement	m/s^2	**Secondary IMU** raw accelerometer x measurement
338	IMU 2 raw accelerometer y measurement	m/s^2	**Secondary IMU** raw accelerometer y measurement
339	IMU 2 raw accelerometer z measurement	m/s^2	**Secondary IMU** raw accelerometer z measurement
340	IMU 2 raw gyroscope x measurement	rad/s	**Secondary IMU** raw gyroscope x measurement
341	IMU 2 raw gyroscope y measurement	rad/s	**Secondary IMU** raw gyroscope y measurement
342	IMU 2 raw gyroscope z measurement	rad/s	**Secondary IMU** raw gyroscope z measurement
343	IMU 2 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
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

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ID	Name	Units/Values	Description
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 HSC magnetometer raw X in SI	T	**External HSCDTD008A Magnetometer** raw measurement for X axis
358	External HSC magnetometer raw Y in SI	T	**External HSCDTD008A Magnetometer** raw measurement for Y axis
359	External HSC magnetometer raw Z in SI	T	**External HSCDTD008A Magnetometer** raw measurement for Z axis
360	External HSC magnetometer temperature	K	**External HSCDTD008A Magnetometer** temperature
361	IMU 3 raw accelerometer x measurement	m/s^2	**BMI088 IMU** raw accelerometer x measurement
362	IMU 3 raw accelerometer y measurement	m/s^2	**BMI088 IMU** raw accelerometer y measurement
363	IMU 3 raw accelerometer z measurement	m/s^2	**BMI088 IMU** raw accelerometer z measurement
364	IMU 3 raw gyroscope x measurement	rad/s	**BMI088 IMU** raw gyroscope x measurement
365	IMU 3 raw gyroscope y measurement	rad/s	**BMI088 IMU** raw gyroscope y measurement
366	IMU 3 raw gyroscope z measurement	rad/s	**BMI088 IMU** raw gyroscope z measurement
367	IMU 3 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	Magnetometer 5 raw measure X converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for X axis converted to SI
371	Magnetometer 5 raw measure Y converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for Y axis converted to SI

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ID	Name	Units/Values	Description
372	Magnetometer 5 raw measure Z converted to SI	T	**Internal MMC5883MA Magnetometer** raw measurement for Z axis converted to SI
373	Magnetometer 5 temperature	K	**Internal MMC5883MA Magnetometer** temperature
374	Magnetometer 6 raw measure X converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for X axis converted to SI
375	Magnetometer 6 raw measure Y converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for Y axis converted to SI
376	Magnetometer 6 raw measure Z converted to SI	T	**External MMC5883MA Magnetometer** raw measurement for Z axis converted to SI
377	Magnetometer 6 temperature	K	**External MMC5883MA Magnetometer** temperature
378	Magnetometer 7 raw measure X converted to SI	T	**External RM3100 Magnetometer** raw measurement for X axis converted to SI
379	Magnetometer 7 raw measure Y converted to SI	T	**External RM3100 Magnetometer** raw measurement for Y axis converted to SI
380	Magnetometer 7 raw measure Z converted to SI	T	**External RM3100 Magnetometer** raw measurement for Z axis converted to SI
381	Magnetometer 7 temperature	K	**External RM3100 Magnetometer** temperature
382	External HMR2300 raw measure X converted to SI	T	**External HMR2300 Magnetometer** raw measurement for X axis converted to SI
383	External HMR2300 raw measure Y converted to SI	T	**External HMR2300 Magnetometer** raw measurement for Y axis converted to SI
384	External HMR2300 raw measure Z converted to SI	T	**External HMR2300 Magnetometer** raw measurement for Z axis converted to SI

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ID	Name	Units/Values	Description
385	External HMR2300 temperature	K	**External HMR2300 Magnetometer** temperature
386	IMU 4 raw accelerometer x measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer x measurement
387	IMU 4 raw accelerometer y measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer y measurement
388	IMU 4 raw accelerometer z measurement	m/s^2	**ADIS16505-3 IMU** raw accelerometer z measurement
389	IMU 4 raw gyroscope x measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope x measurement
390	IMU 4 raw gyroscope y measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope y measurement
391	IMU 4 raw gyroscope z measurement	rad/s	**ADIS16505-3 IMU** raw gyroscope z measurement
392	IMU 4 temperature measurement	K	**ADIS16505-3 IMU** temperature measurement
393	Magnetometer 8 raw measure X converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for X axis converted to SI
394	Magnetometer 8 raw measure Y converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for Y axis converted to SI
395	Magnetometer 8 raw measure Z converted to SI	T	**Internal RM3100 Magnetometer** raw measurement for Z axis converted to SI
396	Magnetometer 8 temperature	K	**Internal RM3100 Magnetometer** temperature
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
500	Longitude	rad	East-West geographic coordinate

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ID	Name	Units/Values	Description
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
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

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ID	Name	Units/Values	Description
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
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

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ID	Name	Units/Values	Description
555	Sagetech MXS - Ground speed **Warning: Variable for internal use**	m/s	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
556	Sagetech MXS - Ground track **Warning: Variable for internal use**	degree	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
600-603	Temperature 1-4 **Warning: DEPRECATED VARIABLES**	K	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

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ID	Name	Units/Values	Description
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 1	customType	Correction calculated by the gimbal for the pitch control 1
655	Gimbal Pitch Correction 2	customType	Correction calculated by the gimbal for the pitch control 2
656	Gimbal Old Joint 1	customType	Auxiliar variable 1 for Gimbal control configuration
657	Gimbal Old Joint 2	customType	Auxiliar variable 2 for Gimbal control configuration
658	Cos (Gimbal Yaw)	customType	Auxiliar variable 1 for Gimbal control configuration
659	Sin (Gimbal Yaw)	customType	Auxiliar variable 2 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 1-6	rad/s	Angular speed associated to pulse captured 1-6
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

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ID	Name	Units/Values	Description
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 1-16	customType	Pulse Width Modulation signal 1 to 16
900-915	Stick Input r1 - r16	customType	Raw stick measurement from r1 to r16
950-981	Stick Input s1 - s32	customType **Warning: DEPRECATED VARIABLES**	
1000-1031	Stick Input y1 - y32	customType	Servo position commanded from stick y1 to y32
1050-1069	Control Output u1-20 Before Servo Saturation	customType	Commanded control output before saturation correction
1100-1104	Lidar 1-5 Distance	m	Variable configurable for Lidar distances 1 to 5
1105-1109	External Range Sensor 1-5 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	Clock 1-10	s	Configurable timers for automations – So clock 1 corresponds to timer 1
1320-1321	ADC 3.3V Input 1-2	V	CEX ADC 3.3 V inputs 1 and 2
1322-1323	ADC 5.0V Input 1-2	V	CEX ADC 5.0 V inputs 1 and 2

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ID	Name	Units/Values	Description
1324-1325	ADC 12.0V Input 1-2	V	CEX ADC 12.0 V inputs 1 and 2
1326-1327	ADC 36.0V Input 1-2	V	CEX ADC 36.0 V inputs 1 and 2
1328-1329	ADC vIn 1-2	V	CEX External power supplies 1 and 2
1330	PCB Temperature	K	CEX PCB Temperature (from ADC input)
1331	ADC HW Version	V	Hardware version of CEX ADC
1350-1369	4xV Real variables	-	For more information, check 4x Software Manual -> 32 VAR
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 1-4	customType	Input values from pulses
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
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

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ID	Name	Units/Values	Description
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)
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

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ID	Name	Units/Values	Description
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)
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

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ID	Name	Units/Values	Description
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)
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

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ID	Name	Units/Values	Description
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)
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 s1 - s32	customType	Configurable variable from actuator outputs to be transformed by the system
1800	Distance to Object of Interest 1	m	Spherical coordinate to object of interest 1: distance

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ID	Name	Units/Values	Description
1801	Azimuth to Object of Interest 1	rad	Spherical coordinate to object of interest 1: azimuth
1802	Elevation to Object of Interest 1	rad	Spherical coordinate to object of interest 1: elevation
1803	Distance to Object of Interest 2	m	Spherical coordinate to object of interest 2: distance
1804	Azimuth to Object of Interest 2	rad	Spherical coordinate to object of interest 2: azimuth
1805	Elevation to Object of Interest 2	rad	Spherical coordinate to object of interest 2: elevation
1806	Distance to Object of Interest 3	m	Spherical coordinate to object of interest 3: distance
1807	Azimuth to Object of Interest 3	rad	Spherical coordinate to object of interest 3: azimuth
1808	Elevation to Object of Interest 3	rad	Spherical coordinate to object of interest 3: elevation
1809	Distance to Object of Interest 4	m	Spherical coordinate to object of interest 4: distance
1810	Azimuth to Object of Interest 4	rad	Spherical coordinate to object of interest 4: azimuth
1811	Elevation to Object of Interest 4	rad	Spherical coordinate to object of interest 4: elevation
1812	Distance to Object of Interest 5	m	Spherical coordinate to object of interest 5: distance
1813	Azimuth to Object of Interest 5	rad	Spherical coordinate to object of interest 5: azimuth
1814	Elevation to Object of Interest 5	rad	Spherical coordinate to object of interest 5: elevation
1815	Distance to Object of Interest 6	m	Spherical coordinate to object of interest 6: distance
1816	Azimuth to Object of Interest 6	rad	Spherical coordinate to object of interest 6: azimuth

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ID	Name	Units/Values	Description
1817	Elevation to Object of Interest 6	rad	Spherical coordinate to object of interest 6: elevation
1818	Distance to Object of Interest 7	m	Spherical coordinate to object of interest 7: distance
1819	Azimuth to Object of Interest 7	rad	Spherical coordinate to object of interest 7: azimuth
1820	Elevation to Object of Interest 7	rad	Spherical coordinate to object of interest 7: elevation
1821	Distance to Object of Interest 8	m	Spherical coordinate to object of interest 8: distance
1822	Azimuth to Object of Interest 8	rad	Spherical coordinate to object of interest 8: azimuth
1823	Elevation to Object of Interest 8	rad	Spherical coordinate to object of interest 8: elevation
1824	Distance to Object of Interest 9	m	Spherical coordinate to object of interest 9: distance
1825	Azimuth to Object of Interest 9	rad	Spherical coordinate to object of interest 9: azimuth
1826	Elevation to Object of Interest 9	rad	Spherical coordinate to object of interest 9: elevation
1827	Distance to Object of Interest 10	m	Spherical coordinate to object of interest 10: distance
1828	Azimuth to Object of Interest 10	rad	Spherical coordinate to object of interest 10: azimuth
1829	Elevation to Object of Interest 10	rad	Spherical coordinate to object of interest 10: elevation
1830	Distance to Object of Interest 11	m	Spherical coordinate to object of interest 11: distance
1831	Azimuth to Object of Interest 11	rad	Spherical coordinate to object of interest 11: azimuth
1832	Elevation to Object of Interest 11	rad	Spherical coordinate to object of interest 11: elevation

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ID	Name	Units/Values	Description
1833	Distance to Object of Interest 12	m	Spherical coordinate to object of interest 12: distance
1834	Azimuth to Object of Interest 12	rad	Spherical coordinate to object of interest 12: azimuth
1835	Elevation to Object of Interest 12	rad	Spherical coordinate to object of interest 12: elevation
1836	Distance to Object of Interest 13	m	Spherical coordinate to object of interest 13: distance
1837	Azimuth to Object of Interest 13	rad	Spherical coordinate to object of interest 13: azimuth
1838	Elevation to Object of Interest 13	rad	Spherical coordinate to object of interest 13: elevation
1839	Distance to Object of Interest 14	m	Spherical coordinate to object of interest 14: distance
1840	Azimuth to Object of Interest 14	rad	Spherical coordinate to object of interest 14: azimuth
1841	Elevation to Object of Interest 14	rad	Spherical coordinate to object of interest 14: elevation
1842	Distance to Object of Interest 15	m	Spherical coordinate to object of interest 15: distance
1843	Azimuth to Object of Interest 15	rad	Spherical coordinate to object of interest 15: azimuth
1844	Elevation to Object of Interest 15	rad	Spherical coordinate to object of interest 15: elevation
1845	Distance to Object of Interest 16	m	Spherical coordinate to object of interest 16: distance
1846	Azimuth to Object of Interest 16	rad	Spherical coordinate to object of interest 16: azimuth
1847	Elevation to Object of Interest 16	rad	Spherical coordinate to object of interest 16: elevation
1848	Distance to Object of Interest 17	m	Spherical coordinate to object of interest 17: distance

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ID	Name	Units/Values	Description
1849	Azimuth to Object of Interest 17	rad	Spherical coordinate to object of interest 17: azimuth
1850	Elevation to Object of Interest 17	rad	Spherical coordinate to object of interest 17: elevation
1851	Distance to Object of Interest 18	m	Spherical coordinate to object of interest 18: distance
1852	Azimuth to Object of Interest 18	rad	Spherical coordinate to object of interest 18: azimuth
1853	Elevation to Object of Interest 18	rad	Spherical coordinate to object of interest 18: elevation
1854	Distance to Object of Interest 19	m	Spherical coordinate to object of interest 19: distance
1855	Azimuth to Object of Interest 19	rad	Spherical coordinate to object of interest 19: azimuth
1856	Elevation to Object of Interest 19	rad	Spherical coordinate to object of interest 19: elevation
1857	Distance to Object of Interest 20	m	Spherical coordinate to object of interest 20: distance
1858	Azimuth to Object of Interest 20	rad	Spherical coordinate to object of interest 20: azimuth
1859	Elevation to Object of Interest 20	rad	Spherical coordinate to object of interest 20: elevation
1860	Distance to Object of Interest 21	m	Spherical coordinate to object of interest 21: distance
1861	Azimuth to Object of Interest 21	rad	Spherical coordinate to object of interest 21: azimuth
1862	Elevation to Object of Interest 21	rad	Spherical coordinate to object of interest 21: elevation
1863	Distance to Object of Interest 22	m	Spherical coordinate to object of interest 22: distance
1864	Azimuth to Object of Interest 22	rad	Spherical coordinate to object of interest 22: azimuth

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ID	Name	Units/Values	Description
1865	Elevation to Object of Interest 22	rad	Spherical coordinate to object of interest 22: elevation
1866	Distance to Object of Interest 23	m	Spherical coordinate to object of interest 23: distance
1867	Azimuth to Object of Interest 23	ra	Spherical coordinate to object of interest 23: azimuth
1868	Elevation to Object of Interest 23	rad	Spherical coordinate to object of interest 23: elevation
1869	Distance to Object of Interest 24	m	Spherical coordinate to object of interest 24: distance
1870	Azimuth to Object of Interest 24	rad	Spherical coordinate to object of interest 24: azimuth
1871	Elevation to Object of Interest 24	rad	Spherical coordinate to object of interest 24: elevation
1872	Distance to Object of Interest 25	m	Spherical coordinate to object of interest 25: distance
1873	Azimuth to Object of Interest 25	rad	Spherical coordinate to object of interest 25: azimuth
1874	Elevation to Object of Interest 25	rad	Spherical coordinate to object of interest 25: elevation
1875	Distance to Object of Interest 26	m	Spherical coordinate to object of interest 26: distance
1876	Azimuth to Object of Interest 26	rad	Spherical coordinate to object of interest 26: azimuth
1877	Elevation to Object of Interest 26	rad	Spherical coordinate to object of interest 26: elevation
1878	Distance to Object of Interest 27	m	Spherical coordinate to object of interest 27: distance
1879	Azimuth to Object of Interest 27	rad	Spherical coordinate to object of interest 27: azimuth
1880	Elevation to Object of Interest 27	rad	Spherical coordinate to object of interest 27: elevation

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ID	Name	Units/Values	Description
1881	Distance to Object of Interest 28	m	Spherical coordinate to object of interest 28: distance
1882	Azimuth to Object of Interest 28	rad	Spherical coordinate to object of interest 28: azimuth
1883	Elevation to Object of Interest 28	rad	Spherical coordinate to object of interest 28: elevation
1884	Distance to Object of Interest 29	m	Spherical coordinate to object of interest 29: distance
1885	Azimuth to Object of Interest 29	rad	Spherical coordinate to object of interest 29: azimuth
1886	Elevation to Object of Interest 29	rad	Spherical coordinate to object of interest 29: elevation
1887	Distance to Object of Interest 30	m	Spherical coordinate to object of interest 30: distance
1888	Azimuth to Object of Interest 30	rad	Spherical coordinate to object of interest 30: azimuth
1889	Elevation to Object of Interest 30	rad	Spherical coordinate to object of interest 30: elevation
1890	Distance to Object of Interest 31	m	Spherical coordinate to object of interest 31: distance
1891	Azimuth to Object of Interest 31	rad	Spherical coordinate to object of interest 31: azimuth
1892	Elevation to Object of Interest 31	rad	Spherical coordinate to object of interest 31: elevation
1893	Distance to Object of Interest 32	m	Spherical coordinate to object of interest 32: distance
1894	Azimuth to Object of Interest 32	rad	Spherical coordinate to object of interest 32: azimuth
1895	Elevation to Object of Interest 32	rad	Spherical coordinate to object of interest 32: elevation
2000	RX Packet Error Rate (on board)	decimal	Value rating RX packets and expected RX packets, given as % error

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ID	Name	Units/Values	Description
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
2040-2042	Tunnel Producer Receive Frequency 1-3	Hz	Tunnel producer 1-3 receives data at this frequency
2043-2045	Tunnel Consumer Send Frequency 1-3	Hz	Tunnel consumer 1-3 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 task
2048	Acquisition Task Maximum Timestep	s	Maximum period to execute the acquisition task
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 time of the acquisition task
2051	Acquisition Task Maximum CPU Ratio	percentage	Maximum % of CPU time of the acquisition task
2052	Acquisition Task Average Time	s	Average time for acquisition task
2053	Acquisition Task Maximum Time	s	Maximum time for acquisition task
2054	CIO Max Time	s	Maximum acquisition time from Core Input/Output

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ID	Name	Units/Values	Description
2055	CIO Average Time	s	Average acquisition time from Core Input/Output
2056	Cross-Core Message Queue Usage	%	Percentage of communication employed between both microprocessors
2057	CIO Running Frequency	Hz	C1 low frequency
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
2200	Curve Length Covered	m	Total distance from current mission length covered
2201	Curve Length	m	Total distance from current mission length

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ID	Name	Units/Values	Description
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
2250-2259	Reserved 1-10	customType	System reserved variables
2300-2302	Joint 1-3 of Gimbal 1	rad	Variables for Gimbal 1 configuration – Angles sent to gimbal as Yaw (1), Pitch (2) and Roll (3)
2303-2305	Joint 1-3 of Gimbal 2	rad	Variables for Gimbal 2 configuration – Angles sent to gimbal as Yaw (1), Pitch (2) and Roll (3)
2330	VMC Control Loop Period	s	MC01 control loop period
2331	VMC Control Loop Maximum Period	s	MC01 maximum control loop period
2332	VMC Control Loop Duration	s	MC01 control loop average execution time
2333	VMC Control Loop Maximum Duration	s	MC01 control loop maximum average execution time
2334	VMC Control Loop CPU Usage Ratio	%	MC01 CPU usage ratio
2335	VMC Control Loop Maximum CPU Usage Ratio	%	MC01 maximum CPU usage ratio
2336-2338	VMC U-V-W Phase Current	customType	MC01 U-V-W phase current
2339	VMC Electrical Angle	rad	MC01 electrical angle
2340	VMC Mechanical Angle	rad	MC01 mechanical angle
2341	VMC Mechanical Angular Speed	rad/s	MC01 mechanical angular speed
2342	VMC Desired Mechanical Angle	rad	MC01 desired mechanical angle
2343	VMC Position Controller Output	rad/s	MC01 position PDI output
2344	VMC Desired Mechanical Angular Speed	rad/s	MC01 desired mechanical angular speed

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ID	Name	Units/Values	Description
2345	VMC Desired Mechanical Angular Speed After Speed Limiter	rad/s	MC01 desired mechanical angular speed after speed limiter
2346	VMC Speed Controller Output	customType	MC01 speed PDI output
2347-2348	VMC Clarke Alpha-Beta Current	customType	MC01 alpha and beta current after Clarke transformation
2349-2350	VMC Park Direct-Quadrature Current	customType	MC01 currents after park transformation
2351-2352	VMC Desired Park Direct-Quadrature Current	customType	MC01 desired park currents
2353-2354	VMC Park Direct-Quadrature Current Controller Output	customType	MC01 current PIDs outputs
2355-2356	VMC Clarke Alpha-Beta Current from Park Controller Output	customType	MC01 Clarke alpha-beta currents from park controller output
2357-2358	VMC Desired Clarke Alpha-Beta current	customType	MC01 desired Clarke currents
2359-2361	VMC U-V-W Phase Space Vector Generator Output	customType	MC01 phase time constants
2362-2364	VMC U-V-W Phase PWM output	percentage	MC01 PWM outputs
2365	VMC Encoder Raw Angle	rad	MC01 encoder raw measured angle
2366	VMC Stepper Output Frequency	Hz	MC01 stepper output frequency
2367	VMC Mechanical Angle Error	rad	MC01 mechanical angle error
2368-2370	VMC U-V-W Phase BEMF	V	MC01 U-V-W phase electromechanical force
2371	VMC Input Current	A	DC bus current estimation
2372	VMC Input Command Value	customType	Speed input rate from source (CAN or PWM)
2373-2374	VMC ADC in 1-2 (MC110)	V	System reserved variables
2375	Board Temperature (MC110)	K	Board temperature
2376	Power Module Temperature (MC110)	K	IGBT filtered temperature
2377	External Temperature (MC110)	K	Motor temperature
2378	Input Power (MC110)	V	DC bus voltage
2379-2380	U-V Phase Hall current sensor (MC110)	customType	System reserved variables

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ID	Name	Units/Values	Description
2381	Virtual and estimator angle difference	rad	Angle offset value from estimated and commanded angle to close control loop.
2400-2419	Control Output u1-20	customType	Control output 1 to 20 after servo saturation
2500-2519	Stick Input u1-u20	customType	Intermediate values from stick used for arcade mode
2600-2619	Stick Input d1-d20	customType	Intermediate values from stick used for arcade mode - delta values
2700-2739	Operation Guidance 1-40	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

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ID	Name	Units/Values	Description
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
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 **Warning: Deprecated variable**	s	Time-lapse since the vehicle finished Standby
2905	Total Flight Distance **Warning: Deprecated variable**	m	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 1-20	s	Time-lapse spent by the vehicle in phase 1 to 20
3000-3031	Simulation Variable 1-32	customType	Variables used for Simulation data

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ID	Name	Units/Values	Description
3100-3399	User Variable 01-300 (Real - 32 Bits)	customType	Free variables for the user to use
4100	Zero	customType	Constant value 0
4101	Rvar Disabled	customType	Disabled variable

3.4 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 1 **Warning: Variable for internal use**	Internal ADC pin 1
3-7	ADC 1-5	Direct reading of ADC pin 1-5
8-18	Internal ADC 7-17 **Warning: Variable for internal use**	Internal ADC pin 7-17
19	Current envelope	Index pointing to the used envelope
20	Counter for C2 system BIT	Index for number of cycles from Core 2
21	Total memory for blocks allocation	Total words available for blocks **Note:** 1 word = 2 bytes
22	Memory used for blocks allocation	Words used for blocks in allocator **Note:** 1 word = 2 bytes
23	SRTM source at UAV's position	Index for the SRTM source type
50	PDI Error Source	Index for PDI error source identification
51	Operation error source	Index for operation error source identification

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ID	Name	Description
54-75	4xV Integer variables	For more information, check 4x Software Manual -> 16 VAR
80	Detour calculation identifier	Index for a route change
81	Approach calculation identifier	Index for the approach calculation route
82	Climb calculation identifier	Index for the climb calculation route
83	Cruise calculation identifier	Index for the cruise calculation route
84	Rendezvous calculation identifier	Index for the rendezvous calculation route
85	Taxi calculation identifier	Index for the taxi calculation route
86	VTOL calculation identifier	Index for the VTOL calculation route
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
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
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

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ID	Name	Description
115	GNSS1 Jamming Status	Output from GPS 1 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
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
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	Index showing section
202	Last Achieved Section	Index showing sections achieved
203	Track Stage	Index showed when a route change happens

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ID	Name	Description
204	Current patchset ID	Index showing the patchset
303-305	HMR2300 Magnetometer Raw Measurement X-Y-Z	External HMR2300 magnetometer raw measurements
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	Identifier of maximum duration step in acquisition
400	Internest raw status	Internest raw status
401	Navigation source	Index pointing to the primary navigation source
402	Raw position source identifier	GPS identifier selected as main
403	Selected static pressure sensor **Warning: Deprecated variable**	Static pressure sensor selection
404	Selected dynamic pressure sensor	Dynamic pressure sensor selection
405	Selected primary accelerometer	Primary accelerometer selection
406	Selected primary gyroscope	Primary gyroscope selection
409	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
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
454-456	CAN to Serial 1-3 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	COM1-6 packet discarded	Discared packets at COM 1 to 6

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ID	Name	Description
490	Number of moving objects detected	Number of moving objects 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 (Higher-Lower 16 bits)	Global configuration state (crc) of files
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
501	System reserved 1 **Warning: DEPRECATED VARIABLE on v6.2**	4x veronte selected
550-557	Reserved 1-8	System reserved variables for Gimbal
600-615	PPM channel 1-16 output	CEX PPM channel outputs
620	Jetibox max successfully parsed message	**Note: CEX variable**

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Table 3 – continued from previous page

ID	Name	Description
710	ADS-B OUT - Squawk Code **Warning:** • **Variable for internal use** (custom message for transpoder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	ADS-B Squak 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.

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Table 3 – continued from previous page

ID	Name	Description
711	ADS-B OUT - ICAO **Warning:** • **Variable for internal use** (custom message for transpoder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	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.

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Table 3 – continued from previous page

ID	Name	Description
712	ADS-B OUT - Ident **Warning:** • **Variable for internal use** (custom message for transpoder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	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.

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Table 3 – continued from previous page

ID	Name	Description
713	ADS-B OUT - Mode **Warning:** • **Variable for internal use** (custom message for transpoder) • If the user modifies this variable, it is not guaranteed that the transponder will continue to function correctly	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.

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Table 3 – continued from previous page

ID	Name	Description
714-721	ADS-B OUT - Call sign 1-8 **Warning:** • **Variable for internal use** (custom message for transpoder) • 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.

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ID	Name	Description
730	Ping1090 - Sequence number **Warning: Variable for internal use** (custom message for Ping1090 transpoder)	
741	Sagetech MXS - Hemisphere data status **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
742	Sagetech MXS - Ground track **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
743	Sagetech MXS - Air speed **Warning: Variable for internal use**	Sagetech variable, used by block to parse variables for GPS Navigation Data Message
800	VMC Fault Id	Index of the VMC error
801	VMC Control Mode	Index of the VMC control mode: 0 fail_safe, 1 PPM, 2 CAN
900-909	Simulation variable 1-10	Variables used for simulation data

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Table 3 – continued from previous page

ID	Name	Description
1000-1299	User Variable 1-300 (Unsigned Integer - 16 bits)	Free variables for user
2000	Uvar Disabled	Disabled variable
2001	Zero	Variable with constant 0 value

3.5 List of PDI errors

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

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
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_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

Table 4 – continued from previous page

Code	Nº	Explanation
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_cmd_rdvzset	176	Rendezvous command base_yaw oor
pdi_cmd_taxiget	183	Taxi guidance request command
pdi_cmd_gtrack1	188	Invalid detour command
pdi_cmd_gtrack2	189	Invalid guidance block configuration
pdi_cmd_speed	192	Cruise speed command
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 mo
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_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

Table 4 – continued from previous page

Code	Nº	Explanation
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
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. T
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
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

Table 4 – continued from previous page

Code	Nº	Explanation
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/output
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	578	Invalid type of desired velocity smoothing
pdi_accellimit1	579	Maximum permitted falling acceleration per axis is less than the minimum allowed accele
pdi_accellimit2	580	Maximum permitted rising acceleration per axis is less than the minimum allowed accele
pdi_accellimit3	581	Maximum permitted falling jerk per axis is less than the minimum allowed jerk in each ax
pdi_accellimit4	582	Maximum permitted rising jerk per axis is less than the minimum allowed jerk in each ax
pdi_circle	583	Circle radius is less than or equal to 0
pdi_height	584	Height type is neither relative nor absolute
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
pdi_sysid	596	Incorrect system identification block configuration
pdi_tsched	597	Empty table scheduler PID
pdi_iir	599	Invalid cutoff frequencies for IIR2 filter in sensor
pdi_iir3	600	Invalid cutoff frequencies for 3D IIR2 filter in sensor
pdi_usre2	601	User configured variance less than minimum variance allowed if in device mode
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

Table 4 – continued from previous page

Code	Nº	Explanation
pdi_mixarray	622	Error in mixarray construction (possibly there is not enough RAM memory to store all th
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 write-only
pdi_tuntrait	625	Error trying to resize an array out of its maximum size
pdi_asuite	626	Selected sensor (accelerometer, gyroscope or dynamic pressure) is not valid in this hardw
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_addvec	631	Error in the connections for block Add
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
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
pdi_vblk_rnxr1	641	Error in the connections for block(s) Multiply/Add Elements/Norm or invalid subfunction
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 numerato
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
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 mailb
pdi_stickvar_cfg	665	Decimate time is higher than the minimum period or number of stick virtual inputs excee
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 m
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

Table 4 – continued from previous page

Code	Nº	Explanation
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 i
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 vecto
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 Contr
pdi_vblk_senstp	685	Error in pressure sensor block, could be that the selected pressure sensor in invalid in the
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 hardwa
pdi_mdg_gain	694	Error for block Madgwick Gain Computer
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 genaration 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

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Code	Nº	Explanation
pdi_unescape	730	Error in escape itport
pdi_initial_alignment	731	The internal AHRS or EKF navigation estimation algorithm could not compute an initial
pdi_fft_block_disable	732	The FFT block is temporarily disabled in this version
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_cfgmr_length	32000	Unexpected size of PDI or command
pdi_check_test	0xFFFFError	ID for given pdi check.

CHAPTER

FOUR

SOFTWARE CHANGELOG

This section presents the changes between the previous software version of Veronte Autopilot, **v.6.4**, and the current software version, **v.6.8**.

The main features of this new software release are described below.

Veronte Pipe has been divided into 8 Tools:

- *Veronte Link*: Interconnect multiple control stations and autopilot units.
- *1x PDI Builder*: Parametrize the autopilot for a specific vehicle.
- *Veronte Ops*: Operate and monitor the vehicle during the mission.
- *Veronte HIL*: Perform HIL simulations with the real autopilot hardware.
- *Veronte Updater*: Manage system updates.
- *1x PDI Calibration*: Setup calibration parameters in the autopilot.
- *1x PDI Tuning*: Tune autopilot control laws during the real flight.
- *Veronte FDR*: Manage autopilot files.

More Flexibility & Customization

- New control blocks
- Navigation configurable as blocks
- Extended compatibility for external devices and sensors
- Added memory management options
- Veronte Ops Compatibility with Windows, Linux & MAC
- Large network of simultaneous vehicles and GCS

Enhanced Reliability

- Better separation between different kinds of PDI files
- Restricted access to files by personnel role
- Dedicated tools for engineers and operators
- PDI file lock

Extended Simulation Environment

- HIL simulation using X-Plane, Microsoft Flight Simulator or Simulink
- HIL Simulation using sensors or navigation
- Dedicated HIL Simulation tool

- Updated SIL Simulator