CEX

Release 1.2

Embention

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CONTENTS

Veronte CEX (CAN Expander) stands as a powerful peripheral to ease the reduction of wire in autonomous vehicles at the time it permits to increase the number of devices in the system.

CHAPTER

ONE

INTRODUCTION

Veronte CEX makes possible to relocate and to group sensors, actuators, payloads, motor controllers, etc. enhancing the I/O connectivity in the **Veronte Autopilot 1x**. With its easy integration, **CEX** becomes a quick solution for increasing connectivity capacity and allowing wiring optimization, especially in large systems.

Fig. 1: **Veronte CEX**

1.1 Wiring Optimization

It is especially in large vehicles, where wire optimization plays a critical role permitting a significant weight reduction. This upgrade is achieved thanks to the reduction of cable length and because of the added flexibility so the right device can be installed in the right location. Another advantage of the use of **CEX** is the robustness of the CAN Bus, being resistant to electromagnetic interferences and permitting the installation of long cables with no signal loss. Furthermore, it includes redundancy with CAN bus isolation, making it fail operational even in case of a CAN bus line break.

1.2 Enhanced I/O

With the use of **CEX**, the data capacity for input and output in Veronte Autopilots is increased in a great manner. The advanced design makes possible to control several peripherals (PWM, UART, Digital Output, I2C, Analog Inputs…) through the CAN Bus. It can be used for both, expanding the I/O capacity in Veronte Autopilot, or for controlling peripherals with a robust communications protocol. In case it is needed, several **CEX** boards can be installed in the same network for increasing the number of I/O ports or because of system architecture needs.

1.3 Applications

In aviation, a field where weight means such an important agent in design, struggling with wiring is one of the most common issues faced during the vehicle design. With the use of **CEX**, not only this issue would be reduced, but a bunch of opportunities for different sensors and payload could arise:

- By adding more I/O interfaces, a more complex payload control can be achieved, improving connectivity.
- Advanced control of actuators and peripherals becomes feasible, being possible to condensate the connection of control, feedback, sensors… in a single board.
- Devices can be installed at long distances from the autopilot with no signal degradation thanks to the robustness of the CAN Bus.

CHAPTER

TWO

QUICK START

This document describes how to install and use the CEX, including its technical specifications.

2.1 System Layout

The following image shows the standard CEX system layout for operation:

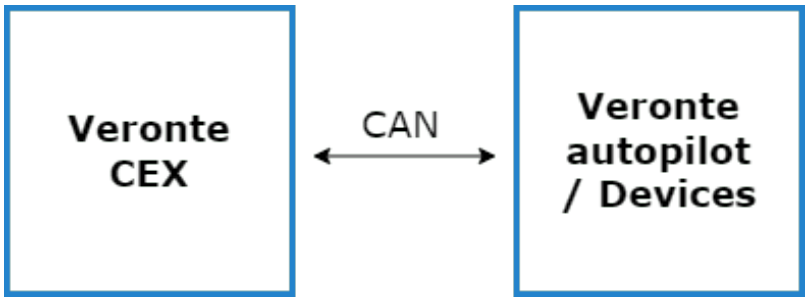

Fig. 1: **CEX standard layout**

2.2 Warnings

- Disassembling, improper installations or bad connections may invalidate the warranty. Please contact Technical Support if you suspect a faulty or defective component.
- CEX will always produce heat as a by-product of its operation. Keep in mind an adequate heat dissipation on installation.
- RS-485 has internal termination resistor.
- Pins 1 and 2 (see *Pinout*) can be powered by 2 power supplies with different voltages as they are independent. Although they do have to share the Ground.
- Do not exceed the values of any of the *Electrical specifications*.
- CEX does not integrate a termination resistance in order to allow the connection of multiple CEX or other CAN Bus devices to the same line. To do this, visit section *CAN assembly* of this manual.

2.3 Requirements

Warning: Embention provides technical support for **CEX** with firmware version 6.8 or higher. If the **CEX** owned has a 6.4 firmware version, please update it. To know how to do it, read the *Firmware Update* section.

2.3.1 Required software applications

- Veronte Link (v6.8.X).
- CEX PDI Builder (v6.8.X).
- Veronte Autopilot (v6.4.X or higher).
- Veronte Updater (v6.8.X).

CHAPTER

THREE

TECHNICAL

3.1 Dimensions

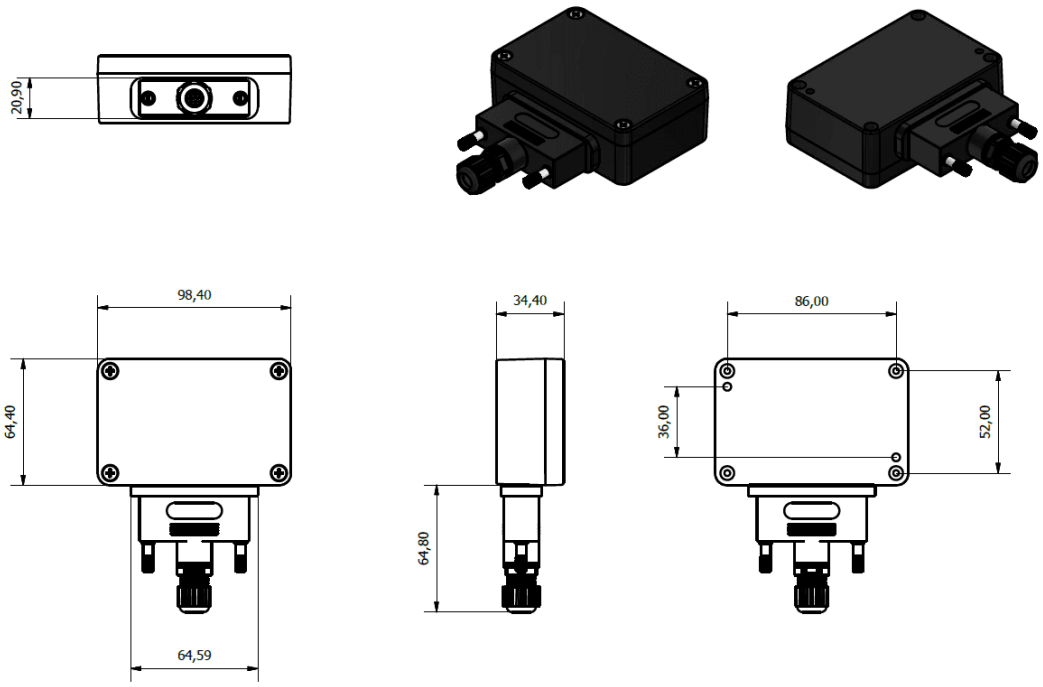

Fig. 1: **Veronte CEX dimensions**

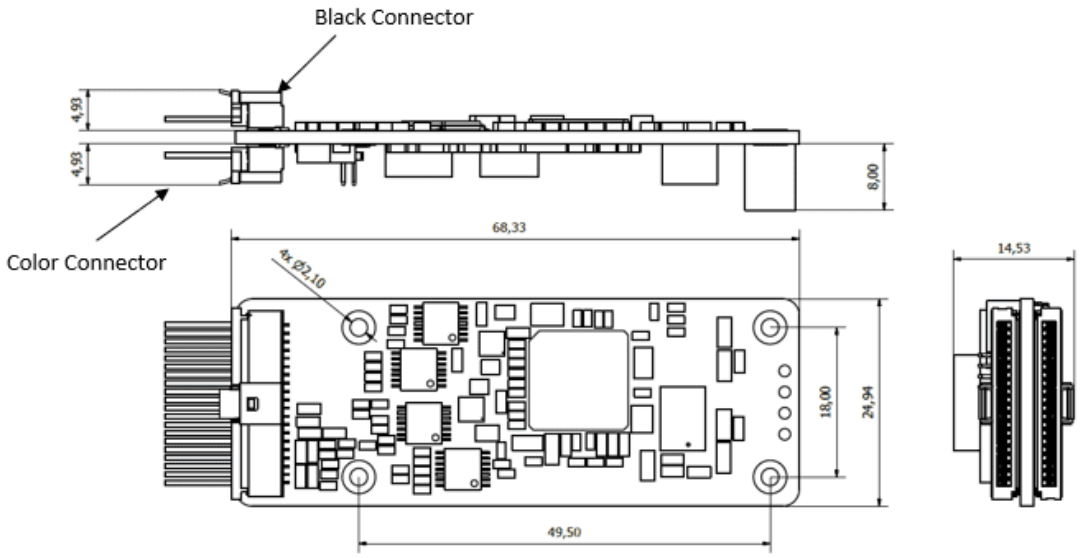

Fig. 2: **Veronte CEX OEM dimensions**

3.2 Electrical Specifications

- All inputs are ESD protected
- Double, redundant, power supply inputs.
- Input voltage/current
  - Power input: 6 V to 60 V (DC)
  - Power consumption: 3 W
- Vmax = 60 V
  - IMax: 1.5 A, Inom: 0.3 A
- CAN
  - Complies with CAN Bus 2.0 A and 2.0 B Standards
  - Opto-Isolated (4 kV)
  - Speed up to 1 Mbps
- UART
  - TTL 3.3V signals up to 115200 baud
- I2C
  - 3.3 V Signals up to 400 kHz
- 3.3 V Output
  - 100 mA fuse protected
- 5 V Output

  - 100 mA fuse protected
- PWM Output
  - Voltage is 5 V
  - Current I (oh) = 16 mA and I (ol) = -16 mA
  - Micro Edge Positioning (MEP) step size = 150 ps
- Digital Inputs (ECAP)
  - Maximum voltage = 5 V
  - Maximum input current = 2.5 mA
  - Sampling rate: up to 1 us
- Analog signals
  - Input impedance: 10 GOhm
  - Resolution
    * 0-3. V pins: 0.00080 V
    * 0-5 V pins: 0.0012 V
    * 0-12 V pins: 0.0029 V
    * 0-36 V pins: 0.0087 V

CHAPTER

FOUR

HARDWARE INSTALLATION

4.1 CAN assembly

CEX does not integrate a termination resistance in order to allow multiple CAN Expander connected to the same line. Considering **Veronte Autopilot 1x** includes one entrance resistance of 120 Ω, a second resistance needs to be placed at the end of the line (again 120 Ω).

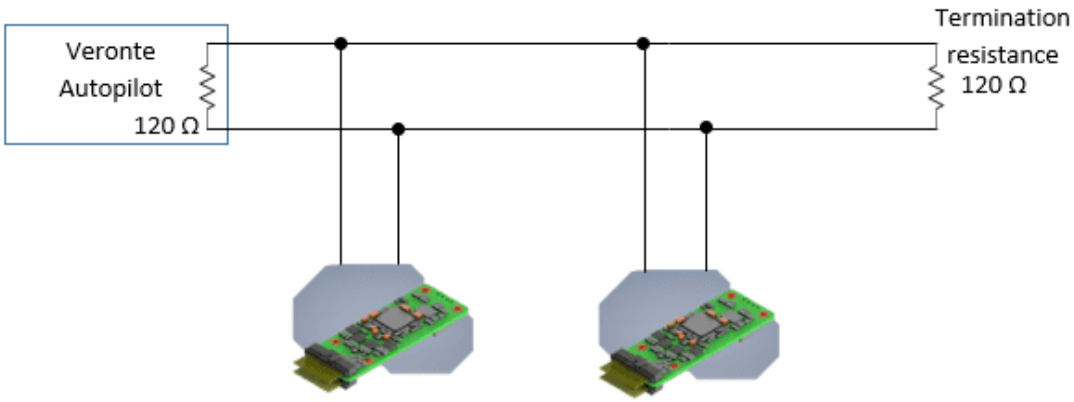

Fig. 1: **CAN assembly diagram example**

4.2 Pinout

4.2.1 Veronte CEX version

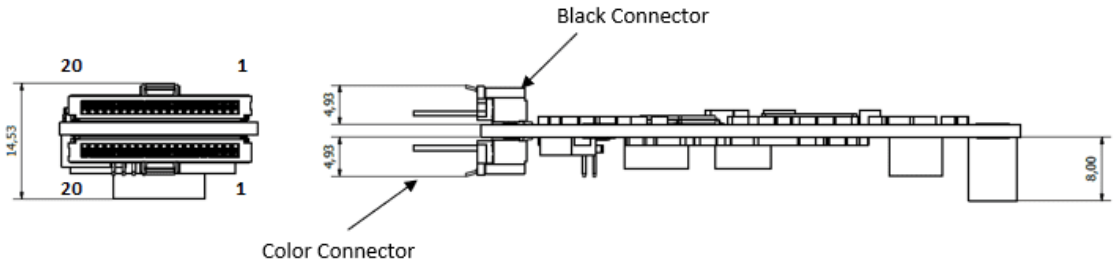

Fig. 2: **Veronte CEX pinout**

Danger: Please note the colour code of the 2 connectors as wrong connections can result in permanent damage of **CEX**.

Connector A (Colored) - T1M-20-T-SH-L		
PIN Nº	I/O	Color
1	Power supply 1	Brown
2	Power supply 2	Red
3	GND	Orange
4	CAN A (H)	Yellow
5	CAN A (L)	Green
6	CAN B (L)	Blue
7	CAN B (H)	Purple
8	UART A (TX)	Gray
9	UART A (RX)	White
10	GND	Black
11	UART B (TX)	Brown
12	UART B (RX)	Red
13	GND	Orange
14	I2C SCL	Yellow
15	I2C SDA	Green
16	GND	Blue
17	3.3 V(0.1 A max)	Purple
18	GND	Gray
19	5 V (0.1 A max)	White
20	GND	Black

Connector B (Black) - T1M-20-T-SH-L	
PIN Nº	I/O
1	PWM 1
2	PWM 2
3	PWM 3
4	PWM 4
5	PWM 5
6	PWM 6
7	PWM 7
8	PWM 8
9	ECAP 1
10	ECAP 2
11	ECAP 3
12	ECAP 4
13	ANALOG 1 (3.3 V)
14	ANALOG 2 (3.3 V)
15	ANALOG 3 (5 V)
16	ANALOG 4 (5 V)
17	ANALOG 5 (12 V)
18	ANALOG 6 (12 V)
19	ANALOG 7 (36 V)
20	ANALOG 8 (36 V)

4.2.2 Veronte CEX OEM version

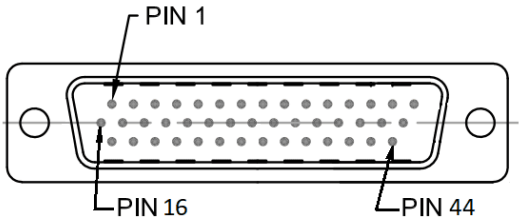

Fig. 3: **Veronte CEX OEM version - 780-M44-103L001 connector**

PIN Nº	I/O	PIN Nº	I/O
1	PWM 1	23	GND
2	PWM 2	24	Power supply 1
3	PWM 3	25	Power supply 2
4	PWM 4	26	GND
5	PWM 5	27	CAN A (H)
6	PWM 6	28	CAN A (L)
7	PWM 7	29	CAN B (L)
8	PWM 8	30	CAN B (H)
9	GND	31	232_TX
10	ECAP 1	32	232_RX
11	ECAP 2	33	GND
12	ECAP 3	34	RX+
13	ECAP 4	35	RX-
14	GND	36	TX-
15	ANALOG 1 (3.3V)	37	TX+
16	ANALOG 2 (3.3V)	38	GND
17	ANALOG 3 (5V)	39	I2C SCL
18	ANALOG 4 (5V)	40	I2C SDA
19	ANALOG 5 (12V)	41	3.3V (0.1 A max)
20	ANALOG 6 (12V)	42	GND
21	ANALOG 7 (36 V)	43	5V (0.1 A max)
22	ANALOG 8 (36 V)	44	GND

CHAPTER

FIVE

SOFTWARE INSTALLATION

5.1 Firmware Update

To update the **CEX** firmware from version 6.4 to 6.8, an additional app is required, Veronte Updater.

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

5.2 Connection and Configuration

There are two ways to make the connection to configure **CEX**: via **Veronte Autopilot 1x** or direct connection.

- **Via Autopilot 1x**

  It is usual to have a **CEX** in a system that does not allow to directly connect **CEX** to a PC. In that situation, it is possible to configure an **Autopilot 1x** that is connected via CAN with **CEX**. To be able to establish a connection between **1x PDI Builder** and **CEX**, please see the Integration Examples section of the **CEX PDI Builder** manual.

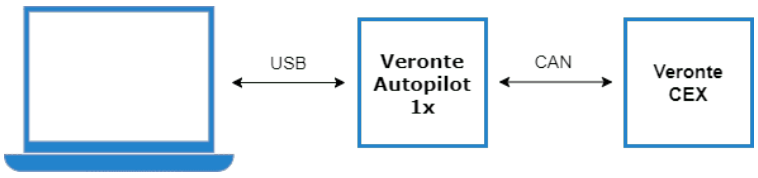

Fig. 1: **CEX connection through Veronte Autopilot 1x**

- **Direct Connection**

  By default **CEX** can establish VCP communications over its SCI-A and SCI-B ports. Using any of these connection, it will be possible to connect it to a PC.

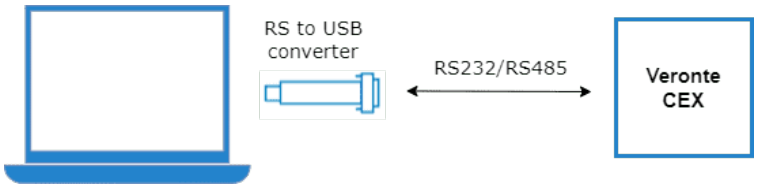

Fig. 2: **Direct CEX connection**

The CEX software configuration is explained in the CEX Software Manual.

CHAPTER

SIX

MAINTENANCE

6.1 Preventive maintenance

Apart from cleaning, no extra maintenance is required to guarantee the correct operation of the **CEX**.

In order to clean **CEX** properly follow the next recommendations.

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

CHAPTER

SEVEN

INTEGRATION EXAMPLES

Examples of how to set up a configuration for CEX can be seen in the CEX PDI Builder user manual.

CHAPTER

EIGHT

TROUBLESHOOTING

If a mistake was made when building the configuration and the communication with the device has been lost, it is possible to force the device to boot into maintenance mode in order to modify its configuration. For **forcing Maintenance mode**, create a loopback on both I2C pins (I2C SCL and I2C SDA signals). When powered, **CEX** will boot in maintenance mode.

CHAPTER

NINE

ACRONYMS AND DEFINITIONS

ARINC	Aeronautical Radio, Inc.
BEC	Battery Eliminating Circuit
CAN	Controller Area Network
CAP	Capture Module
CEX	CAN Expander
COM	Communications
DC	Direct Current
ECAP	Enhanced CAP
EQEP	Enhanced Quadrature Encoder Pulse sensor
ESC	Electronic Speed Control
ESD	ElectroStatic Discharge
GND	Ground
GPIO	General Purpose Input/Output
I/O	Input/Output
I2C	Inter-Integrated Circuit
JTAG	Joint Test Action Group
Mbps	Megabits Per Second
MEP	Micro Edge Positioning
MPU	Micro-Processor Unit
OEM	Original Equipment Manufacturer
PCB	Printed Circuit Board
PDI	Parameter Data Items
PPM	Pulse Position Modulation
PWM	Pulse Width Modulated signal
RPM	Revolutions Per Minute
RS-232	Recommended Standard 232
RS-485	Recommended Standard 485
SCI	Serial Communications Interface
SCL	Serial Clock line
SDA	Serial Data line
SN	Serial Number
SW	Software
UART	Universal Asynchronous Receiver Transmitter
VCP	Virtual Communication Port

CHAPTER

TEN

CONTACT DATA

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

Embention contact data is as follows:

Email: support@embention.com

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