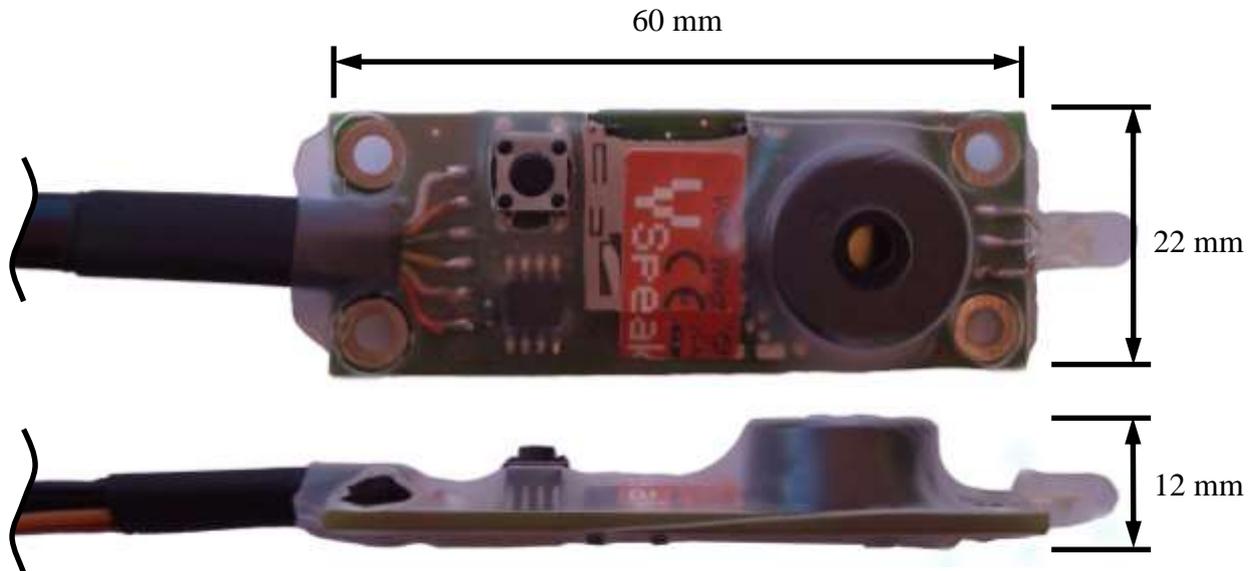# ECU converter HORNET

Manual Version 1.2

60 mm

22 mm

12 mm

Introduction

The VSpeak ECU Converter for HORNET ECUs is emulating the IO-BOARD and the TERMINAL. Data, which is shown on the STATUS DISPLAYs of the TERMINAL can be sent via telemetry to the radio. To avoid unwanted electrical effects between the ECU and RC-system the VSpeak ECU Converter is galvanically isolated via optocouplers.

The ECU Converter can interpret and transmit data from the HORNET III and older HORNET II ECU.

The VSpeak ECU Converter can be software-updated by the user.

The current version has been tested with the following ECUs/Versions:
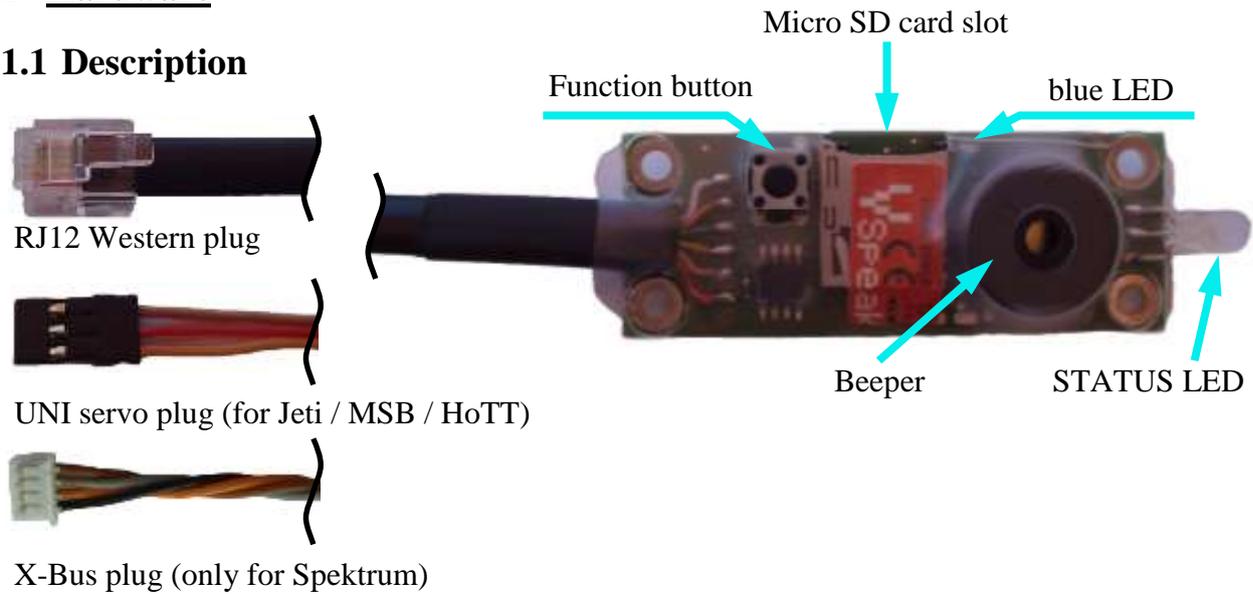
HORNET II   V7.1B

HORNET III   V2.5A

Content

1 Hardware

1.1 Description

RJ12 Western plug

UNI servo plug (for Jeti / MSB / HoTT)

X-Bus plug (only for Spektrum)

Beeper, STATUS LED and function button work like the corresponding components on the IO- BOARD (please refer to the manual of the HORNET ECU for details).

On the VSpeak ECU Converter STATUS LED and function button has additional functions (see section 2.0 and 2.4.2).

The Micro SD card slot is used for updates.

The blue LED is blinking every second to signal the normal function of the ECU Converter.

1.2 Installation

The ECU Converter can be mounted inside the model with M3 nylon standoffs and screws or something similar. The provided LED socket can be mounted in the hull in order to see the LED from outside of the model.

1.3 Connection

The RJ12 Western plug has to be connected DIRECTLY to the "TERMINAL" socket on the HORNET ECU. Since the ECU Converter replicates the function of the IO-BOARD and the TERMINAL, you must not connect both at the same time. If you do so the ECU might show abnormal behaviour.

- For Jeti Duplex, Multiplex (and ACT) and HoTT the VSpeak ECU Converter is shipped with an 3-pin connector to connect to the telemetry port of the RC system.
- For Spektrum systems the VSpeak ECU Converter is shipped with a 4-pin connector for the X-Bus port of the telemetry module.

2 Telemetry

The voltage for the VSpeak ECU Converter is supplied by the HORNET ECU. As soon as you switch on the HORNET ECU and apply a valid signal to the throttle channel (either from the radio or a servo tester) you will get telemetry data. Otherwise no data is generated.

The telemetry of the ECU Converter can be used to switch between the systems Jeti Duplex EX, HoTT and multiplex. The ECU Converter for spectrum comes with the special XBus connector, so no switching for another telemetry system is possible here.

2.0 Selection of the telemetry system

When you turn on the Telemetry System is signaled by a LED for a period of 3 seconds. While the blue LED flickers, the STATUS LED shows the chosen telemetry system:

- green   Jeti Duplex EX
- red   Multiplex
- green (flickering)   HoTT

Double-click on the function button (similar to the double click of a computer mouse), the telemetry system can be switched. This is acknowledged by the signal generator with a short sound (frequency up and down). At the same time, the LEDs indicate the newly recruited telemetry system. To preserve safety during the selection of the telemetry system, the ECU Converter does not transmit any information until a restart. The setting is saved.

2.1 Jeti Duplex EX

2.1.1 *EX-data DC/DS-radio*

The EX-Protocol is partially backwards compatible. On older non-EX devices you get only Jetibox functions. On EX devices like the DC/DS radios and the Jeti "Profibox" you get additional data.

(VSECU … **VS***peak* **ECU** *Converter*):
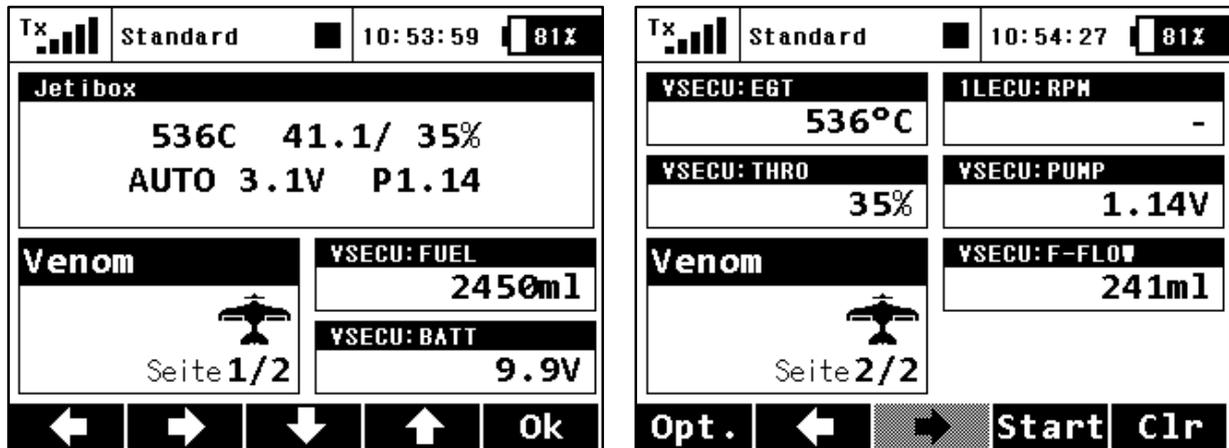
FUEL, F-FLOW, THRO not supported on HORNET II

On HORNETT II PUMP and BATT values are only updated as long as these voltages are shown on STATUS DISPLAY 1.

The EX-data IS ONLY UPDATED if the HORNET ECU is on STATUS DISPLAY 1 (after switching on the radio this display is active).

2.1.2 *Jetibox*

On the Jetibox all data of the HORNET ECU normally displayed on the TERMINAL are shown (except characters that cannot be displayed on Jeti Systems).

Furthermore you can use the Jeti-keys to edit all values available on the TERMINAL. Please refer to the HORNET ECU's manual.

2.1.2.1 *Key assignment*
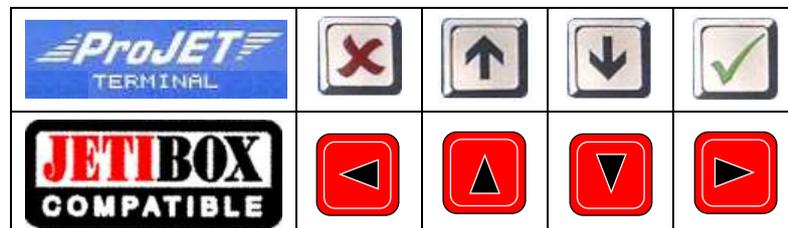
2.1.2.2 Special Characters

The TERMINAL supports some special characters which cannot be displayed on Jeti-systems. Please refer to the following table how these characters are "translated":

ProJET TERMINAL	JETIBOX COMPATIBLE	
▯	∧	battery full
▯	▭	battery normal
▯	∨	battery empty
▯	G	Glow plug defective
▯	T	Temperature sensor defective
▯	P	Pump running / Pump voltage
▯	/	switch operation
▯	C	unit "°C"
▯	M	unit "ml"
▯	∧	button "up" (eg in test menu)
▯	∨	button "down" (eg in test menu)
▯	E	button "Enterv(eg in test menu)
▯	D	
▯		"empty" Bargraph HORNET III Voltage/Fuel
▯	X	"full" Bargraph HORNET III Voltage/Fuel
▯	$	Ignition

2.1.2.3 Alarms / Parameterization

From the STATUS DISPLAY 1, the parameter display can be accessed by pressing the ▼ button down.

With the ▲ Up button the parameter display will left (..to STATUS DISPLAY 1). Within the parameter display you can scroll with the ►Right button - or - ◄Left button between the parameter groups "Alarme", „Alarmcode", "MSB Adressen" and "ECU-EX-Name".

When the desired parameter group is selected, the parameter can be changed by using ▼Down and ▲Up button.

Value changes are made with the ►Right button – or- ◄Left button.

Example of parameter selection and parameterization:
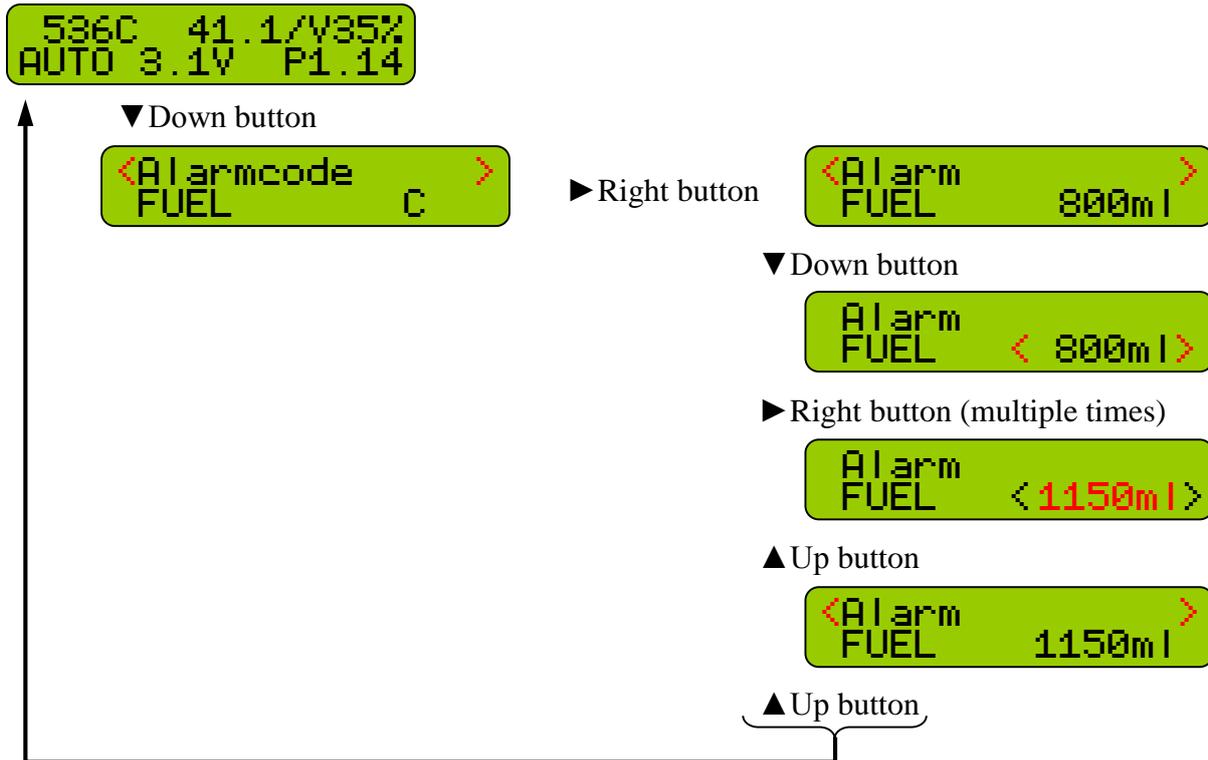
Parameter group	Parameter	Value range	Step size	Set-Value (Default)
Alarme	FUEL	10 . . . 2500 ml	10 ml	800 ml
	BATT	3.0 . . . 12.0 V	0.1 V	4.0 V
	RPM	20.000 . . . 99.900 rpm	100 rpm	20.000 rpm
Alarmcode	FUEL	A, B, C, . . . , X, Y, Z		C
	BATT			U
	RPM			V
MSB-Adressen	PUMP	OFF, 0, 1, 2, 3, . . . ,13, 14, 15		2
	FUEL			3
	EGT			4
	RPM			5
	BATT			6
	Status			7
	THRO			8
	F-FLOW			9
	FUEL-%			10
Jeti-Sensor	EX Name	VSECU, L-ECU, R-ECU, 1LECU, 2RECU		VSECU

The rotation speed monitoring is activated by reaching the AUTO status and deactivates when the pump voltage reaches 0.00V. A speed alarm can signal a "turbine flameout".

In a 2-turbine model 2 VSpeak ECU converter can be used on Jeti Systems via an expander or CentralBox. The EX names are:

"**1L**ECU" for **L**eft turbine ECU on input **1** and
"**2R**ECU" for **R**ight turbine ECU at the expander input **2**.

If a value reaches the alarm threshold, the alarm code is signaled or a speech output of the associated alarm code.

MSB addresses

MSB-compliant, the addresses can be arbitrarily set between 0 and 15. Not to show values can be turned off ("OFF").
An address for double occupancy values within the ECU converter is excluded. If an address has been set, which was already associated with another value, the current is set to "OFF".

2.1.2.4 Expandermenu
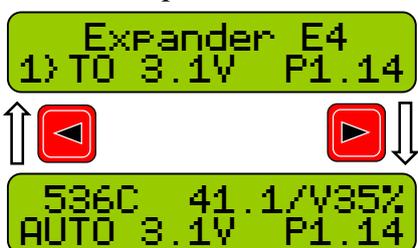
If the VSpeak ECU Converter is connected to an Expander or Centralbox and the ECU Converter display is activated with the ►Right button, the only way back to the expander menu is pressing ◄Left button in STATUS DISPLAY 1.

2.1.2.5 Display firmware

After powerup you get the startup message and version number shown in the picture for about 3 seconds.

2.1.3 Profibox - autonomous telemetry system for HORNET-ECU

Using a Jeti Profibox incl. RSat receiver and the VSpeak ECU converter the telemetry data from a HORNET ECU can be transferred completely self-sufficient to the pilot. Not only the settings using the Profibox can be made, as was shown in the previous chapters - all EX-data and the important alarms are displayed: fuel level, ECU battery voltage and minimum rotation speed are given as voice messages again.
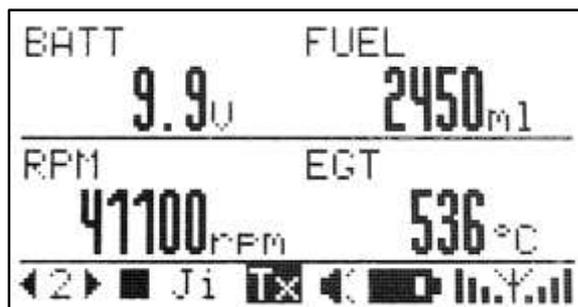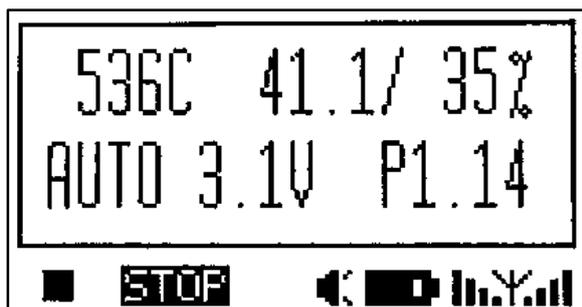
2.2 Graupner HoTT

Using the HoTT System there are 2 ways to transmit telemetry data, on the one hand as „text" and on the other hand only the pure values.

Using text mode it is possible to establish a bi-directional data transfer, meaning you can use the keys of the radio or the Smartbox in order to change/enter values in the sensor. Using speech output is not possible in this mode.

In data-mode the values are only transmitted in a fixed format in one direction. The format is defined by the sensor type. In this mode it is possible to have speech output for the sensor values.

2.2.1 Sensortype

The VSpeak ECU Converter for HoTT is a GAM (General Air Module) or a ESC sensor (Electronic Speed Controll). Please select this sensor-type on your radio or Smartbox.

2.2.2 Textdisplay

Using the text-display you can see the current HORNET-ECU data and you can also change parameters of the ECU.

ENTER → Change to input Alarms / parameters of the ECU converter (s. section 2.2.4)

Not with HORNET 2

INC+DEC

SET

ESC

Only on this screen you can change values of the HORNET-ECU (see section Key assignment)
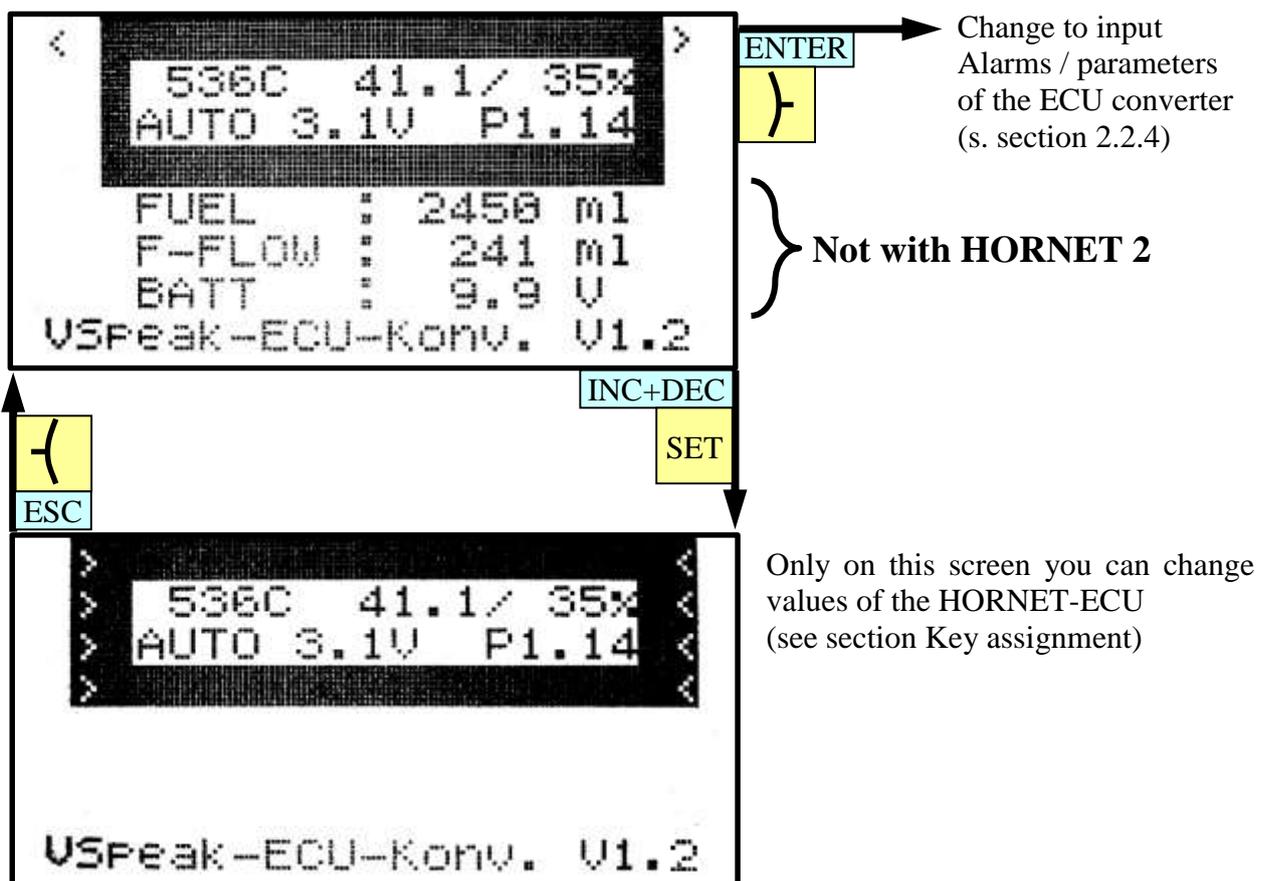
With the HoTT-keys it is possible to emulate the full functionality of the TERMINAL. For further details on the specific values please consult the manual of the HORNET ECU

2.2.2.1 Special Characters

The TERMINAL supports some special characters which cannot be displayed on HoTT system. Please refer to the following table how these characters are "translated":

ProJET TERMINAL	HoTT	
	∧	battery full
	▬	battery normal
	∨	battery empty
	G	Glow plug defective
	T	Temperature sensor defective
	P	Pump running / Pump voltage
	/	switch operation
	C	unit "°C"
	M	unit "ml"
	∧	button "up" (eg in test menu)
	∨	button "down" (eg in test menu)
	E	button "Enterv(eg in test menu)
	D	
	▬	"empty" Bargraph HORNET III Voltage/Fuel
	X	"full" Bargraph HORNET III Voltage/Fuel
	$	Ignition

2.2.2.2 Key assignment

ProJET TERMINAL	✖	⬆	⬇	✔
SMART-BOX	ESC	DEC	INC	ENTER

MX-12 MX-16 MC-16 MC-20 MC-32 ⋮	

2.2.3 Data-Display/Speech

2.2.3.1 GAM - General Air Modul
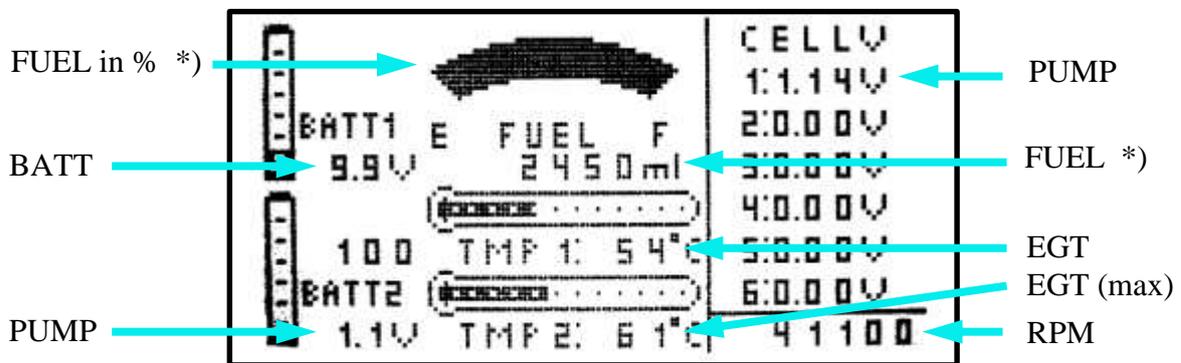
*) FUEL, and FUEL in % not on HORNET2

Since the GAM can only display temperatures up to 235°C, the temperature is divided by 10. If you see a value of 41°C on the display, you have a "real" temperature of 405-414°C.

The pump voltage is displayed as "Cell Voltage 1", ranging from 0V up to 5.10V (accuracy 20mV). It is also displayed as "Batt 2" (bigger values than 5.1V possible, accuracy 100mV).

The fuel level is shown as gauge in % and as numbers in ml. The 100% value is set at startup. The value in ml transferred during the powerup of the ECU is used as 100% value for calculation.

2.2.3.2 ESC - Electronic Speed Control

EGT (max)   BATT

EGT
FUEL in % *)

PUMP *10
FUEL *)

RPM   RPM (max)
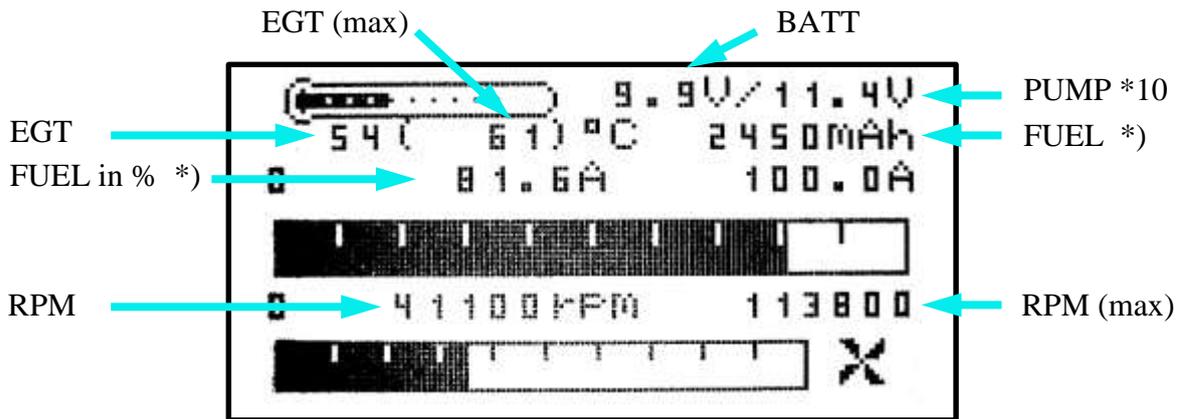
*) FUEL, and FUEL in % not on HORNET2

The ESC temperature display is limited to 235 ° C, so the turbine jet temperature is shown divided by 10, or the other way around: 54 ° C in the display corresponds to 545 ... 544 ° C (digit is rounded).

The pump power is indicated by a factor of 10, ie, 11.4V correspond to a pump voltage of 1.14V.

The tank level is displayed on the display as capacity value, ie, 2450mAh are 2450ml. On the other hand, the percentage tank level is displayed as the current, ie, 81,6A correspond to 81.6% tank level. The tank level is thus easy to read via the associated bar display. The 100% value is set at startup. The value in ml transferred during the powerup of the ECU is used as 100% value for calculation.

2.2.4 Parameterization
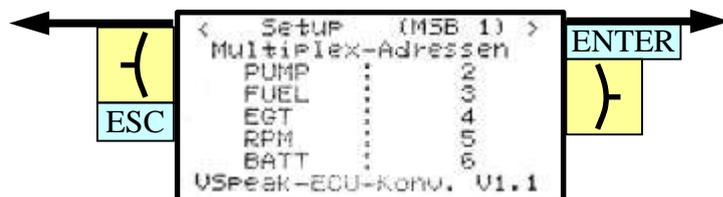
The change of sides takes place with Enter and ESC button of the SmartBox or with the appropriate buttons on the HoTT transmitter.

The parameter is selected with the INC- and DEC-buttons of the SmartBox (or the buttons oft he Hott transmitter)   „>".
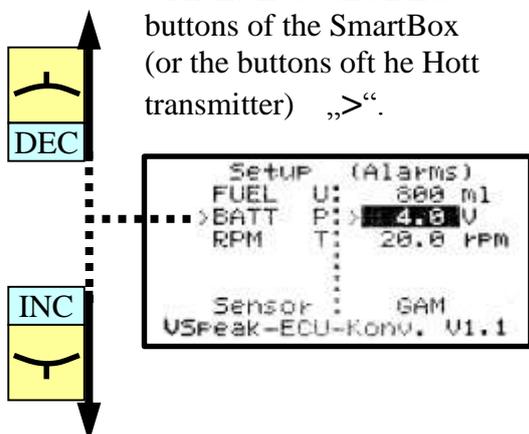
With INC+DEC or SET the value of the selected parameter is enabled for change (inverted).

With INC the value can be increased,

With DEC it can be reduced.

Stored is after INC+DEC or SET

2.2.4.1 Alarms / Sensor setting

```
   Setup  (Alarms)
   FUEL  U:     800 ml
 >BATT  P: >  4.8  V
   RPM   T:    20.0 rPm
   :
   :
   :
   Sensor :    GAM
VSpeak-ECU-Konv. V1.1
```

Settings		
Value range	Step size	Signal tone
10 . . . 2500 ml	10 ml	U
3.0 . . . 12.0 V	0.1 V	P
20.0 . . . 99.9 x 1000rpm	100 rpm	T

GAM / ESC

Upon delivery, the warning thresholds are set as shown in the picture.
If a value falls below the warning threshold, the set signal tone will sound or a speech output of the associated signal tone.
The rotation speed monitoring is activated by reaching the AUTO status and deactivates when the pump voltage reaches 0.00V. A speed alarm can thus signal a "turbine flameout"

2.2.4.2 MSB – Adresses Multiplex Sensor Bus

Upon delivery, the addresses for the display of the measured values are set as shown below:

```
 <   Setup  (MSB 1) >
  Multiplex-Adressen
   PUMP   :      2
   FUEL   :      3
   EGT    :      4
   RPM    :      5
   BATT   :      6
VSpeak-ECU-Konv. V1.1
```

```
 <   Setup  (MSB 2)
  Multiplex-Adressen
   Status :      7
   THRO   :      8
   F-FLOW :      9
   FUEL-% :     10
   :
VSpeak-ECU-Konv. V1.1
```

MSB-compliant, the addresses can be arbitrarily set between 0 and 15. Not to show values can be turned off ("OFF").
An address for double occupancy values within the ECU converter is excluded. If an address has been set, which was already associated with another value, the current is set to "OFF".

2.3 Multiplex MLink (MSB)

The MSB (Multiplex Sensor Bus) is only uni-directional. You can only see the telemetry data, but you cannot change parameters of the HORNET ECU.

2.3.1 Adress-Assignment

The VSpeak ECU Converter at delivery uses following addresses:

ProJET TERMINAL	MSB address	comment
PUMP	**2**	Pump Voltage in V
FUEL Alarm	**3**	Fuel Level in ml *)
EGT	**4**	Exhaust Gas Temperature in °C
RPM Alarm	**5**	Turbine RPM
BATT Alarm	**6**	Battery Voltage in V
Status	**7**	Turbine-Status (non on evo and royal)
THRO	**8**	Throttle Value in % *)
F-FLOW	**9**	Fuel Flow in ml *)
FUEL in percent	**10**	Fuel Level in % *)

*) FUEL, F-FLOW and Throttle not on HORNET 2

A change of address assignment and setting of alarms for FUEL, RPM, and BATT can be done with the Jeti system, for example, by using a Jetibox, (s. section 2.1.2.3)
- or by using the HoTT system with a Smartbox (see section 2.2.4.).

In section 2.0 the requisite change between the telemetry systems is described.

ProJET TERMINAL	MSB
AUTO	RUN (reg.)
AUTO-HC	RUN …
BURNER ON	PreHeat1
CAL IDLE	LearnLO
CALIBRATE	LearnHI
COOL-DOWN	Cooling
DEV.DELAY	
EMERGENCY	
FUELHEAT	PreHeat2
FUELIGNIT	Ignite…
GO IDLE	Stabilise
OFF	-OFF-
PROP IGNIT	Ignite…
RAMP DELAY	AccelrDly
RAMP-UP	acceler.
SLOW DOWN	SlowDown
STANDBY	Stby/START
STEADY	acceler.
WAIT ACC	acceler.

2.3.2 Turbine-Status

To display the turbine status there are various preset messages in the radio or in the external display. These do not match the normal ECU messages 1:1, so the closest match has been chosen. Please refer to the table on the left.

For HORNET status messages without a corresponding MSB message (grey fields in the table) the last message is shown until a new message, which can be translated, is shown.
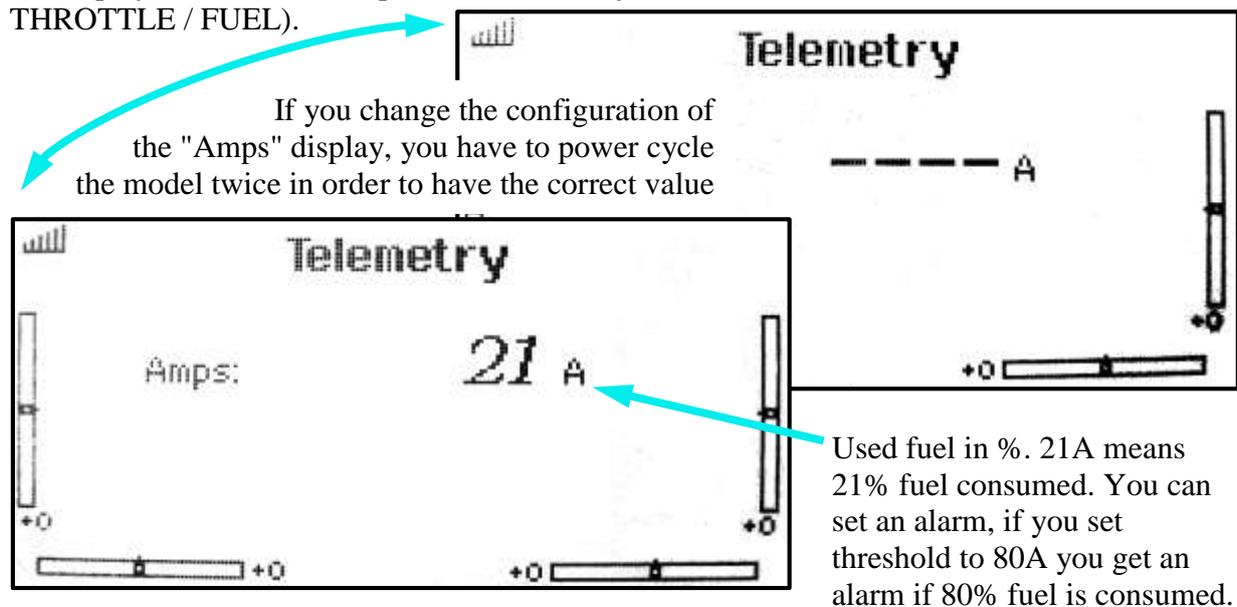
2.4 Spektrum (X-Bus)

The Spektrum Telemetry System is only uni-directional. You can only see the telemetry data, but you cannot change parameters of the HORNET ECU.

You need at least a DX9 in order to view ECU Telemetry (using JetCat Sensor). DX6, DX7s and DX8 do not support this sensor.

2.4.1 Telemetry display

FUEL

see section THROTTLE / FUEL

BATT

see section Turbine-Status

Not supported
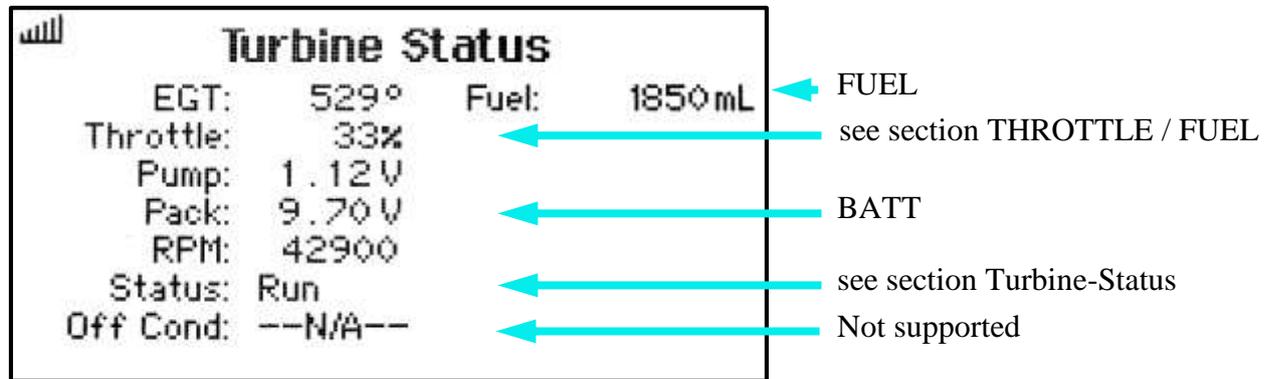
To display the fuel consumption the telemetry sensor "Curent/AMPS" is used (see section THROTTLE / FUEL).

If you change the configuration of the "Amps" display, you have to power cycle the model twice in order to have the correct value

Used fuel in %. 21A means 21% fuel consumed. You can set an alarm, if you set threshold to 80A you get an alarm if 80% fuel is consumed.

2.4.2 THROTTLE / FUEL

Fuel consumption is converted into % and the level is displayed in the current/Amps display. The 100% value is set at startup. The value in ml transferred during the powerup of the ECU is used as 100% value for calculation. So after powerup you get a consumption of 0% (0A).

You can change the value displayed on "Amps" and "JetCat" by double-clicking the button on the VSpeak ECU Converter. Please refer to the table below.

The Display-change will be acknowledged by a short beep, frequency rising and falling.

		JetCat display **Throttle**	Current display **Ampere**	LED
Double click	1	Throttle: 0 … 100%	**Consumption**: 0 … 100 A	
	2	Throttle: 0 … 100%	- - - -	
	3	**Consumption**.: 0 … 100%	- - - -	

2.4.3 Turbine-Status

ProJET TERMINAL	SPEKTRUM.
AUTO	Run
AUTO-HC	
BURNER ON	Pre Heat 1
CAL IDLE	Learn LOW
CALIBRATE	Learn HIGH
COOL-DOWN	Slow Down
DEV.DELAY	
EMERGENCY	
FUELHEAT	Pre Heat 2
FUELIGNIT	Ignite
GO IDLE	Stabilize
OFF	Off
PROP IGNIT	Ignite
RAMP DELAY	Acceleration Delay
RAMP-UP	Accelerate
SLOW DOWN	SlowDown
STANDBY	Wait for RPM
STEADY	Accelerate
WAIT ACC	Accelerate

To display the turbine status there are various preset messages in the radio. These do not match the normal ECU messages 1:1, so the closest match has been chosen. Please refer to the table on the left.

For HORNET status messages without a corresponding Spektrum message (grey fields in the table) the last message is shown until a new message, which can be translated, is shown.

2.5 HORNET 2 - Limitations

If you connect a HORNET 2 to the VSpeak ECU converter, there are some limitations:

- There will be no values for fuel level, fuel flow and throttle transmitted. These values are set to "0". Thus no alarm can be generated for FUEL.
- Battery and Pump Voltage are only refreshed, if the following symbols are on the HORNET STATUS DISPLAY in front of the voltage.

  - Battery Voltage: ▉ , ▉ or ▊
  - Pump Voltage: ▉

3 Update

The processor on the ECU Converter contains a SD bootloader with a version counter.

If firmware updates are available they will be sent via mail. The data-files attached to the e-mail have to be copied to the Micro SD card (formatted FAT or FAT16), this card has to be inserted into the ECU Converter and the power has to be switched on. The boot loader will recognize the new software version and will install it (blue LED "flickers") and is then up to date.

4 Accessories

A micro SD card is NOT included in the package. For updates only Micro-SD cards with a maximum capacity of 2GB are supported. You can obtain a matching card at www.vspeak-modell.de.

Western-cables can be obtained at www.reichelt.de and many other stores.

5 Technical data

Power supply	3,5 … max. 12V from HORNET ECU
Power usage	~20 mA (at 5V from HORNET ECU)
Telemetry connection	3,5 … max. 9V from receiver, pulse amplitude min 2,7V
Dimensions	60 x 22 x 12 mm
Weight	12 g (incl. connection cables)
Connections	RJ12 Western plug (cable length ~ 25 cm) UNI servo plug (cable length ~ 30 cm) Jeti / HoTT / MSB X-Bus plug (cable length ~ 28 cm) Spektrum

6 Instructions for disposal

Equipment marked with the symbol should not be disposed of within household waste.

7 EG Declaration of Conformity

Manufacturer

CE

>VSpeak-Modellbau (Volker Weigt)
>Priestewitz

We hereby declare that the product

>VSpeak ECU Converter

complies with the following European directives:

2004/108/EC	EMC Directive
2006/95/EC	Low Voltage Directive (LVD)
2011/65/EC	Restriction of Hazardous Substances (RoHS)

The presumption of conformity is taken by applying the following harmonized standards:

EN60065	Audio-, video- and similar electronic aparatus - Safety requirements
EN60332	Tests on electric and optical fibre cables under fire conditions
EN60950	Information technology equipment - Safety
EN61000-6-1	Electromagnetic compatibility (EMC)
EN61000-6-3	
EN55022	Information technology equipment - Radio disturbance characteristics

Priestewitz, 2014/08/01

....
Signature
Volker Weigt
Managing Director

8 Version history

Vers.	Date	Comment
1.0	08.2014	first retail version (Jeti Duplex EX)
	09.2014	also HoTT, Multiplex MSB and Spektrum
1.1	02.2015	Spektrum: **no changes since** Version 1.0 Jeti: up to 5 EX-Sensornames can be chosen HoTT: Data transmission as GAM or ESC-Sensor **Change between** Jeti, HoTT and Multiplex possible Jeti, HoTT, Multiplex: Alarms FUEL, BATT and RPM settable MSB-adresses can be changed with the Jeti- or HoTT-System
1.2	08.2015	HoTT, Multiplex MSB: **no changes since** Version 1.1 Jeti: Adjusting the baud rate to new REX receivers Spektrum: Display Fuel capacity in ml

9 Contact

Volker Weigt

www.VSpeak-Modell.de

mail: **volker.weigt@vspeak-modell.de**