Dear Customer, Please KEEP THIS. READ CAREFULLY

VEMS GenBoard v3.x is very flexible, with room for customization. It is possible to get a working system relatively fast, but there are important things to consider even for an assembled, cased unit. **Important Warnings - failing these will result in damage**:

- **Most ignition transformers have secondary winding GND return that MUST be grounded (to cylhead)**
- **Unplugging EC36 or EC18 while harness is powered up might cause serious ECU damage.**
- **connect all grounds** 1 GND and 4 GND5-s from Econoseal-36 (GND5 is sometimes marked as powerGND or PGND) before applying power. GND and GND5 should meet 10 .. 15cm (5 inch) from the ECM. Use strong wires (0.75-1 mm2) and don't let any chance for disconnection during operation.
- there must be a **fuse** (max 10A, or 15A for multi-injector lowZ setups) **between injector_common and +supply**
- connect the **flyback connection** directly (no fuse) to the injector_common signal. There must be no fuse between injector_common and (EC36-pin 23) flyback pin.
- **Flyback** pin (EC36-pin 23) must be connected with airwire or 30V transient diode to onboard flyback trace. This must be done on the non-assembled unit (already done on the assembled controller).
- with DVM in diode mode, **all injector outputs should measure max 1.4V between injector output (+) to injector_common (-)** , (even with injectors disconnected). With the 30V flyback, reference (connect DVM-) to the internal flyback trace (verified for the assembled controller).
- use **separate fuses for each ignition channel: 3-4A during testing, upgrade to 5A only after successful tests. 5A (RMS value!) fuse allows appr 9A peak current. Anything higher does not provide sufficient protection.**
- use a 3-5A **fuse for the WBO2 heater channel,** and 1-3A **fuse for the EC36/25 mainboard supply**
- PWM-ing MUST be disabled (injector-pwm-duty=100%, injector full duty time=25.5msec). Use highZ injectors or lowZ with current-limiting "ballast" power-resistors connected in series.

Warning: Wheel speed in, Analog in ChX(except Ch1) is ment for 0-5V only. Connecting 12V might cause damage. Applying +12V to the input by connecting a solenoid, relay, injector or ignition coil might damage the controller. Switch these pins to EC36/26 GND. When no pullup inside, apply 2k4..4k7 pullup towards EC36/28 (+5V) for ALS/launch/shiftcut activation switch/button. "Analog in ChX" is same as mcp3208 ChX (MCX). Protection is for minor static electricity (no misconnection!). Typical pinout:

EC18 pin	Function	Pullup	Protection	Note
1	Knock 1		●	Analog in CH0 if no Knock
2	Analog in CH5	●	●	
3	Analog in CH2	●	●	
4	Stepper A			
5	Stepper C			
6	Analog in CH6	●		MAP input when offboard MAP.
7	WBO2 Pump(-)			LSU4.2 pin 5
8	Wheel speed in	●	●	Unprotected Analog in CH1 when PS2 option
9	WBO2 Pump(+)			LSU4.2 pin 6
10	Stepper B			
11	Stepper D			
12	Analog in CH7	●		Sec. Trig VR when auditrigger
13	WBO2 Nernst			LSU4.2 pin1 (or LSU4.9 pin6)
14	RS-232 RX			Connect to PC's TX
15	RS-232 TX			Connect to PC's RX
16	Analog in CH1**		●	Also 2nd RS232 for GPS. Or One-wire input
17	GND			
18	WBO2 Heater(-)			LSU4.2 pin 4

** The only mcp3208 analog input where +12V can be applied via 2k7..4k7 (preferred use: on/off switching)

Order ID: Serial Number: Date:

EC36

pin23
Flyback
see the
manual !!!

3A

Sensor Ground

+12V
Switched

Common Ground
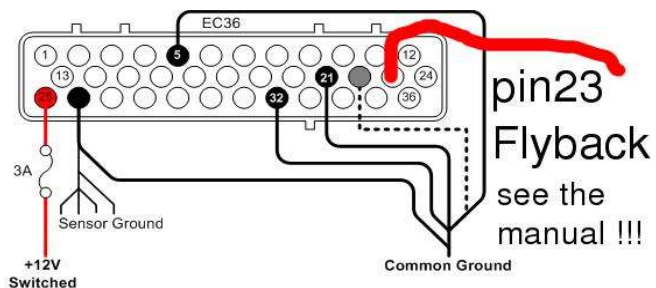
Econoseal 36 pin	Function	Note
1	TPS in	
2	MAT in	
3	P259 CH4	
4	P259 CH0	Tachometer (1k Pullup to +12V)
5	GND	
6	Inj G	
7	Inj A	
8	Inj C	
9	Inj E	
10	Ign CH7	Logic level out on 2+6 and 0
11	Ign CH4	Logic level out on 6+2, 4+4, 2+6 and 0
12	Ign CH5	Logic level out on 6+2, 4+4, 2+6 and 0
13	Secondary trigger	Hall or VR, CAM hall when auditrigger
14	CLT in	
15	P259 CH5	Fuel Relay
16	P259 CH1	
17	Inj H	
18	Inj F	
19	Inj B	
20	Inj D	
21	GND	
22	GND	
23	Flyback	
24	Ign CH6	Logic level out on 2+6 and 0
25	Supply +12V	
26	GND	
27	Primary trigger	VR or Hall
28	Supply +5V	
29	+5V for sensors	
30	P259 CH7	
31	P259 CH6	
32	GND	
33	Ign CH1	Logic level out on 4+4, 2+6 and 0
34	Ign CH2	Logic level out on 0
35	Ign CH0	Logic level out on 4+4, 2+6 and 0
36	Ign CH3	Logic level out on 0

VEMS V3 ECU Pinouts, 6 IGBT + 2 logic level

View from back of Econoseal plugs

EC18

- 1 — Analog ch.0/Knock1 (dep. on spec)
- 2 — Analog ch.5
- 3 — Analog ch.2
- 4 — Stepper A
- 5 — Stepper C
- 6 — Analog ch.6/MAP IN (dep. on spec)
- 7 — WBO2 Pump −
- 8 — Wheel Speed Input
- 9 — WBO2 Pump +
- 10 — Stepper B
- 11 — Stepper D
- 12 — Analog ch.7/2ND VR (dep. on spec)
- 13 — WBO2 Nerst signal
- 14 — RS232 DSUB9 pin 3
- 15 — RS232 DSUB9 pin 2
- 16 — Analog ch.1/1Wire In (dep. on spec)
- 17 — Ground
- 18 — WBO2 Heater

EC36

- 1 — TPS IN
- 2 — IAT IN
- 3 — P259 ch.4
- 4 — P259 ch.0
- 5 — Ground
- 6 — Injector G ch.64
- 7 — Injector A ch.1
- 8 — Injector C ch.4
- 9 — Injector E ch.16
- 10 — Ignition output 07
- 11 — Ignition output 04 Logic level
- 12 — Ignition output 05 Logic level
- 13 — Secondary Trigger
- 14 — CLT IN
- 15 — Fuel Relay (P259 ch.5)
- 16 — P259 ch.1
- 17 — Injector H ch.128
- 18 — Injector F ch.32
- 19 — Injector B ch.2
- 20 — Injector D ch.8
- 21 — Ground
- 22 — Ground
- 23 — Flyback −See transient diode info.
- 24 — Ignition output 06
- 25 — 12v Battery
- 26 — Ground
- 27 — Primary Trigger
- 28 — +5V Supply
- 29 — TPS Supply
- 30 — P259 ch.7
- 31 — P259 ch.6
- 32 — Ground
- 33 — Ignition output 01
- 34 — Ignition output 02
- 35 — Ignition output 00
- 36 — Ignition output 03

WBO2

- 6 — WBO2 Pump +
- 4 — WBO2 Heater
- 2 — Not Connected
- 5 — WBO2 Pump −
- 3 — 12v Battery (5A Fuse)
- 1 — WBO2 Nerst signal

WBO2 pin-numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

+12V

fuse:5A

Board version= **v3.8**
Serial nr=

wbo2 pump pw zero=
wbo2 nernstdc target=

egt1 cal=
batt cal=

IGBT: 6
LCD:
PS/2:
Knock:
EGT:

Flyback:
Pri. trig:
Sec. trig:
One Wire:
MAP:
SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (internal 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.

Order ID:

VEMS V3 ECU Pinouts, 4 IGBT + 4 logic level

View from back of Econoseal plugs

EC18 connector (top rows):

- 1 — Analog ch.0/Knock1 (dep. on spec)
- 2 — Analog ch.5
- 3 — Analog ch.2
- 4 — Stepper A
- 5 — Stepper C
- 6 — Analog ch.6/MAP IN (dep. on spec)
- 7 — WBO2 Pump −
- 8 — Wheel Speed Input
- 9 — WBO2 Pump +
- 10 — Stepper B
- 11 — Stepper D
- 12 — Analog ch.7/2ND VR (dep. on spec)
- 13 — WBO2 Nerst signal
- 14 — RS232 DSUB9 pin 3
- 15 — RS232 DSUB9 pin 2
- 16 — Analog ch.1/1Wire In (dep. on spec)
- 17 — Ground
- 18 — WBO2 Heater

EC36 connector:

- 1 — TPS IN
- 2 — IAT IN
- 3 — P259 ch.4
- 4 — P259 ch.0
- 5 — Ground
- 6 — Injector G ch.64
- 7 — Injector A ch.1
- 8 — Injector C ch.4
- 9 — Injector E ch.16
- 10 — Ignition output 07
- 11 — Ignition output 04 / Logic level
- 12 — Ignition output 05 / Logic level
- 13 — Secondary Trigger
- 14 — CLT IN
- 15 — Fuel Relay (P259 ch.5)
- 16 — P259 ch.1
- 17 — Injector H ch.128
- 18 — Injector F ch.32
- 19 — Injector B ch.2
- 20 — Injector D ch.8
- 21 — Ground
- 22 — Ground
- 23 — Flyback - See transient diode info.
- 24 — Ignition output 06
- 25 — 12v Battery
- 26 — Ground
- 27 — Primary Trigger
- 28 — +5V Supply
- 29 — TPS Supply
- 30 — P259 ch.7
- 31 — P259 ch.6
- 32 — Ground
- 33 — Ignition output 01 / Logic level
- 34 — Ignition output 02
- 35 — Ignition output 00 / Logic level
- 36 — Ignition output 03

EC18

EC36

WBO2 connector:

- 6 — WBO2 Pump +
- 4 — WBO2 Heater
- 2 — Not Connected
- 5 — WBO2 Pump −
- 3 — 12v Battery (5A Fuse)
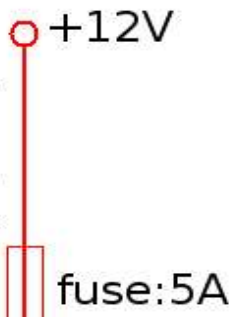- 1 — WBO2 Nerst signal

WBO2

WBO2 pin numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

+12V

fuse:5A

Board version= **v3.8**
Serial nr=

wbo2 pump pw zero=
wbo2 nernstdc target=

egt1 cal=
batt cal=

IGBT: 4   Flyback:
LCD: Pri. trig:
PS/2:   Sec. trig:
Knock: One Wire:
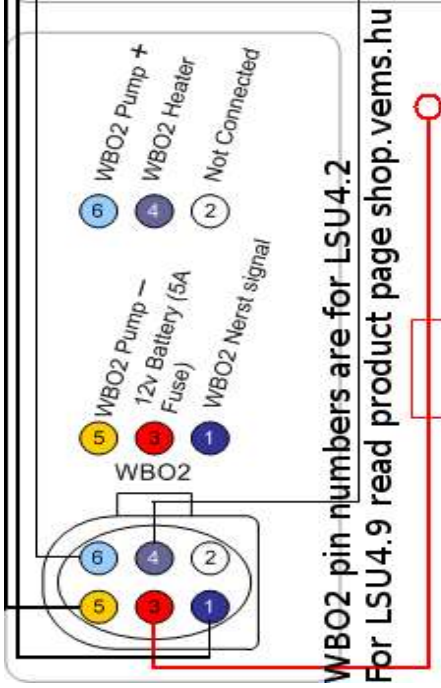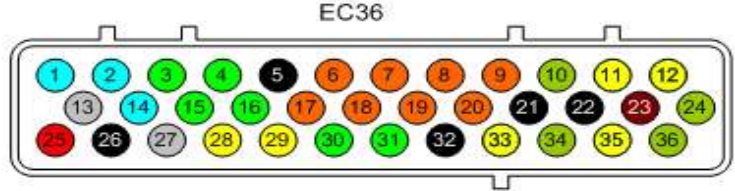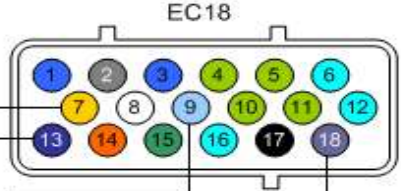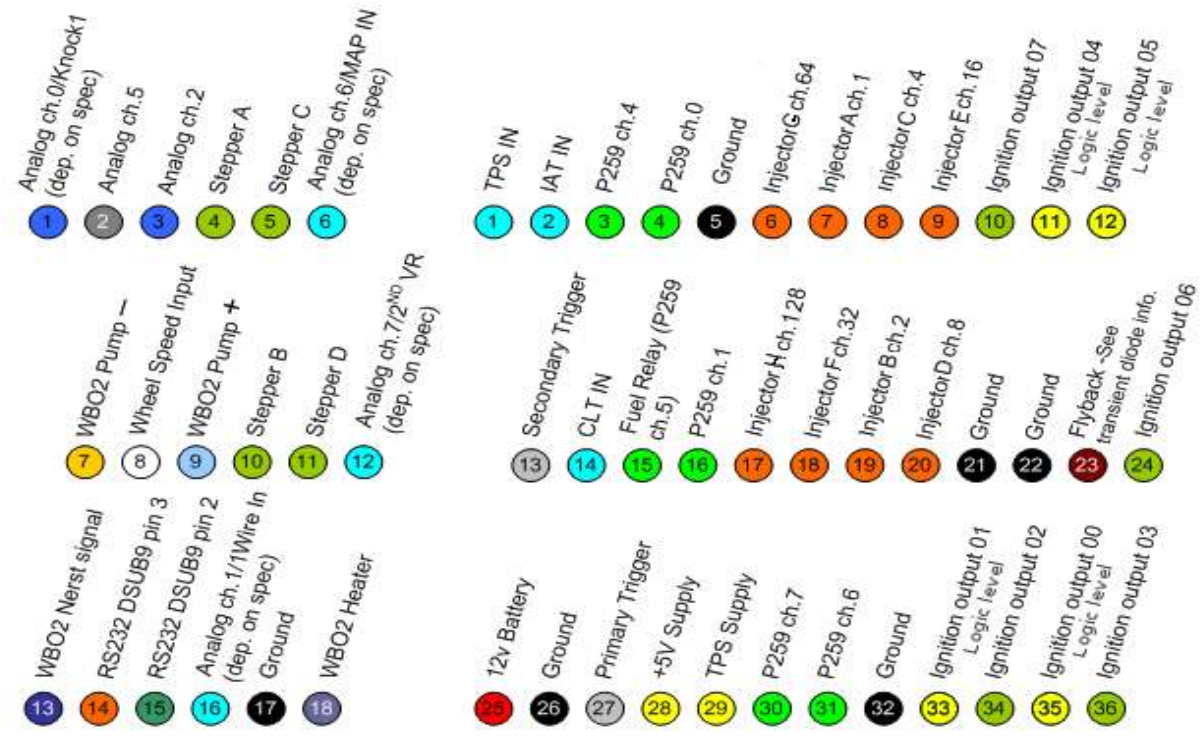EGT: MAP:
                 SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (internal 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.

Order ID:

VEMS V3 ECU Pinouts, 2 IGBT + 6 logic level

View from back of Econoseal plugs

EC18 top section labels:
1. Analog ch.0/Knock1 (dep. on spec)
2. Analog ch.5
3. Analog ch.2
4. Stepper A
5. Stepper C
6. Analog ch.6/MAP IN (dep. on spec)
7. WBO2 Pump −
8. Wheel Speed Input
9. WBO2 Pump +
10. Stepper B
11. Stepper D
12. Analog ch.7/2ND VR (dep. on spec)
13. WBO2 Nernst signal
14. RS232 DSUB9 pin 3
15. RS232 DSUB9 pin 2
16. Analog ch.1/1Wire In (dep. on spec)
17. Ground
18. WBO2 Heater

EC36 labels:
1. TPS IN
2. IAT IN
3. P259 ch.4
4. P259 ch.0
5. Ground
6. Injector G ch.64
7. Injector A ch.1
8. Injector C ch.4
9. Injector E ch.16
10. Ignition output 07 Logic level
11. Ignition output 04 Logic level
12. Ignition output 05 Logic level
13. Secondary Trigger
14. CLT IN
15. Fuel Relay (P259 ch.5)
16. P259 ch.1
17. Injector H ch.128
18. Injector F ch.32
19. Injector B ch.2
20. Injector D ch.8
21. Ground
22. Ground
23. Flyback - See transient diode info.
24. Ignition output 06 Logic level
25. 12v Battery
26. Ground
27. Primary Trigger
28. +5V Supply
29. TPS Supply
30. P259 ch.7
31. P259 ch.6
32. Ground
33. Ignition output 01 Logic level
34. Ignition output 02 Logic level
35. Ignition output 00 Logic level
36. Ignition output 03

EC18

EC36

WBO2 connector:
- 6 WBO2 Pump +
- 4 WBO2 Heater
- 2 Not Connected
- 5 WBO2 Pump −
- 3 12v Battery (5A Fuse)
- 1 WBO2 Nernst signal

WBO2

WBO2 pin numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

+12V

fuse:5A

Board version= **v3.8**
Serial nr=

wbo2 pump pw zero=
wbo2 nernstdc target=

egt1 cal=
batt cal=

IGBT: 2
LCD:
PS/2:
Knock:
EGT:

Flyback:
Pri. trig:
Sec. trig:
One Wire:
MAP:
SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (internal 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.
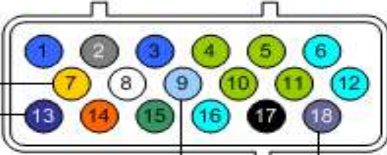
Order ID:

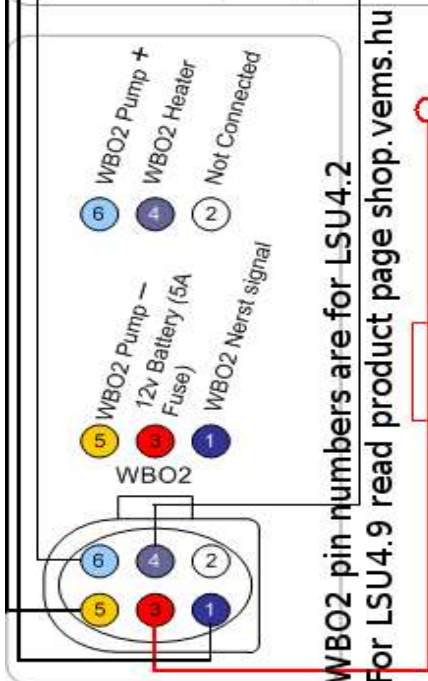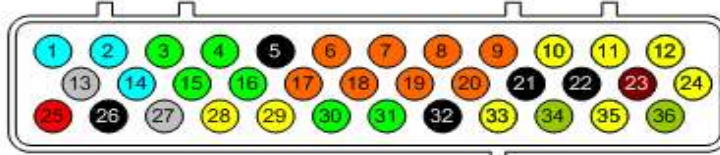# VEMS V3 ECU Pinouts, 0 IGBT + 8 logic level

View from back of Econoseal plugs

EC18 pin labels (1–12 top rows):
1. Analog ch.0/Knock1 (dep. on spec)
2. Analog ch.5
3. Analog ch.2
4. Stepper A
5. Stepper C
6. Analog ch.6/MAP IN (dep. on spec)
7. WBO2 Pump −
8. Wheel Speed Input
9. WBO2 Pump +
10. Stepper B
11. Stepper D
12. Analog ch.7/2ND VR (dep. on spec)
13. WBO2 Nerst signal
14. RS232 DSUB9 pin 3
15. RS232 DSUB9 pin 2
16. Analog ch.1/1Wire In (dep. on spec)
17. Ground
18. WBO2 Heater

EC36 pin labels:
1. TPS IN
2. IAT IN
3. P259 ch.4
4. P259 ch.0
5. Ground
6. Injector G ch.64
7. Injector A ch.1
8. Injector C ch.4
9. Injector E ch.16
10. Ignition output 07 Logic level
11. Ignition output 04 Logic level
12. Ignition output 05 Logic level
13. Secondary Trigger
14. CLT IN
15. Fuel Relay (P259 ch.5)
16. P259 ch.1
17. Injector H ch.128
18. Injector F ch.32
19. Injector B ch.2
20. Injector D ch.8
21. Ground
22. Ground
23. Flyback -See transient diode info.
24. Ignition output 06 Logic level
25. 12v Battery
26. Ground
27. Primary Trigger
28. +5V Supply
29. TPS Supply
30. P259 ch.7
31. P259 ch.6
32. Ground
33. Ignition output 01 Logic level
34. Ignition output 02 Logic level
35. Ignition output 00 Logic level
36. Ignition output 03 Logic level

EC18

EC36

WBO2:
6. WBO2 Pump +
4. WBO2 Heater
2. Not Connected
5. WBO2 Pump −
3. 12v Battery (5A Fuse)
1. WBO2 Nerst signal

WBO2 pin numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

+12V

fuse:5A

Board version= **v3.8**
Serial nr=

wbo2 pump pw zero=
wbo2 nernstdc target=

egt1 cal=
batt cal=

IGBT: 0
LCD:
PS/2:
Knock:
EGT:

Flyback:
Pri. trig:
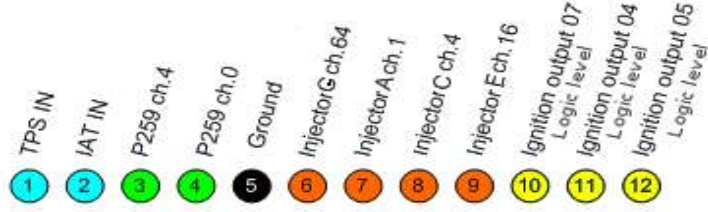Sec. trig:
One Wire:
MAP:
SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (internal 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.
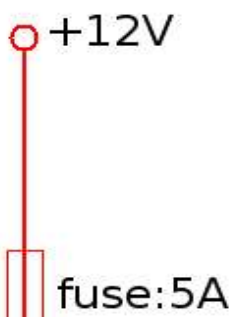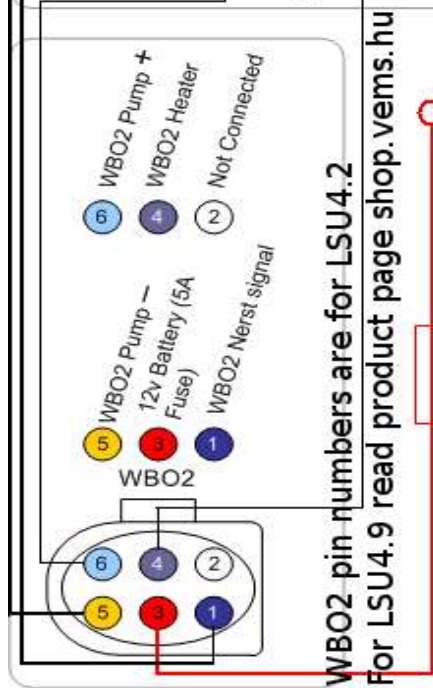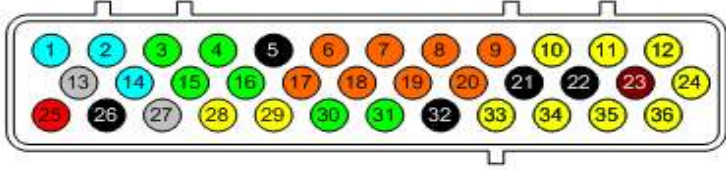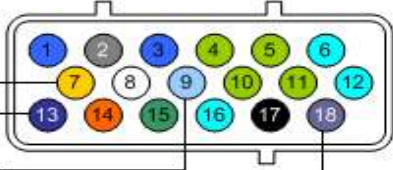
Order ID:

VEMS V3 ECU Pinouts

View from back of Econoseal plugs

EC18 (top row labels):
1 Analog ch.0/Knock1 (dep. on spec)
2 Analog ch.5
3 Analog ch.2
4 Stepper A
5 Stepper C
6 Analog ch.6/MAP IN (dep. on spec)
7 WBO2 Pump −
8 Wheel Speed Input
9 WBO2 Pump +
10 Stepper B
11 Stepper D
12 Analog ch.7/2ND VR (dep. on spec)
13 WBO2 Nernst signal
14 RS232 DSUB9 pin 3
15 RS232 DSUB9 pin 2
16 Analog ch.1/1Wire In (dep. on spec)
17 Ground
18 WBO2 Heater

EC36 (labels):
1 TPS IN
2 IAT IN
3 P259 ch.4
4 P259 ch.0
5 Ground
6 InjectorG ch.64
7 InjectorA ch.1
8 InjectorC ch.4
9 InjectorE ch.16
10 Ignition output 07
11 Ignition output 04
12 Ignition output 05
13 Secondary Trigger
14 CLT IN
15 Fuel Relay (P259 ch.5)
16 P259 ch.1
17 InjectorH ch.128
18 InjectorF ch.32
19 InjectorB ch.2
20 InjectorD ch.8
21 Ground
22 Ground
23 Flyback -See transient diode info.
24 Ignition output 06
25 12v Battery
26 Ground
27 Primary Trigger
28 +5V Supply
29 TPS Supply
30 P259 ch.7
31 P259 ch.6
32 Ground
33 Ignition output 01
34 Ignition output 02
35 Ignition output 00
36 Ignition output 03

+12V

WBO2 pin numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

WBO2 (upper connector):
6 WBO2 Pump +
4 WBO2 Heater
2 Not Connected

WBO2 (lower connector):
5 WBO2 Pump −
3 12v Battery (5A Fuse)
1 WBO2 Nernst signal

fuse:5A

Board version=v3.6
Serial nr=
pump-=
wbo2 pump pw zero=
wbo2 nernstdc target=
pump+=   mV/200 Ohm
egt1 cal=
batt cal=
AREF=4.9V
(C103=1nF, no D100)

IGBT: Flyback:
LCD: Pri. trig:
PS/2:   Sec. trig:
Knock: One Wire:
EGT: MAP:
               SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (**optional** 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.
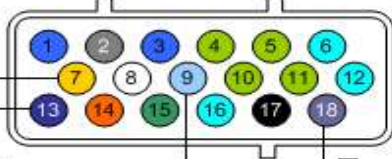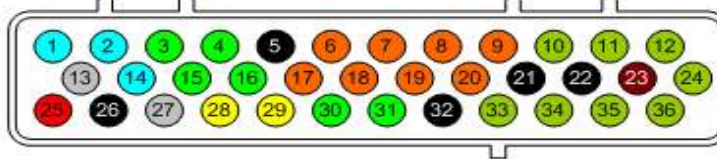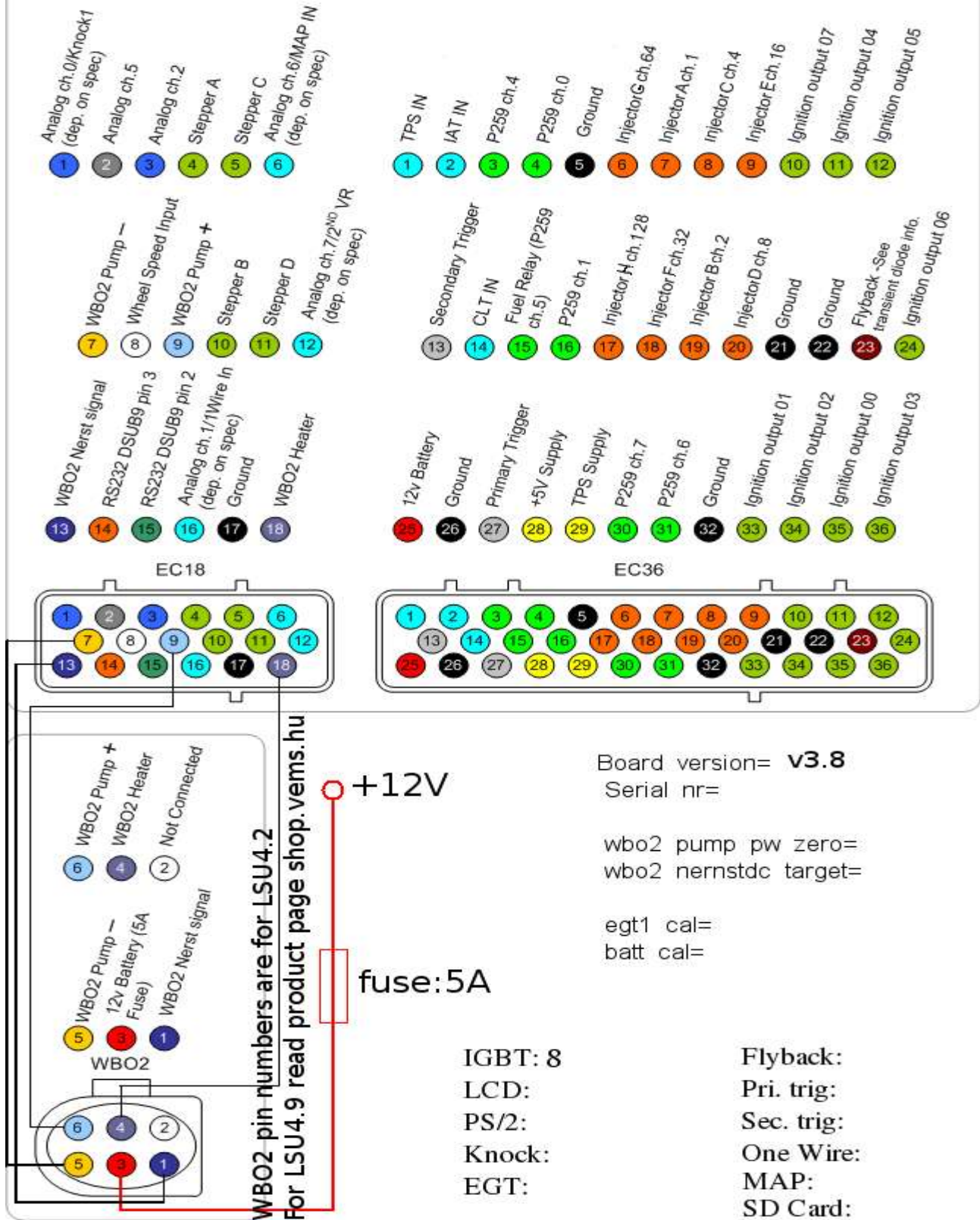
Order ID:

VEMS V3 ECU Pinouts, 8 IGBT + 0 logic level

View from back of Econoseal plugs

EC18 connector (top rows):

- 1 — Analog ch. 0/Knock1 (dep. on spec)
- 2 — Analog ch.5
- 3 — Analog ch.2
- 4 — Stepper A
- 5 — Stepper C
- 6 — Analog ch.6/MAP IN (dep. on spec)
- 7 — WBO2 Pump −
- 8 — Wheel Speed Input
- 9 — WBO2 Pump +
- 10 — Stepper B
- 11 — Stepper D
- 12 — Analog ch.7/2ND VR (dep. on spec)
- 13 — WBO2 Nernst signal
- 14 — RS232 DSUB9 pin 3
- 15 — RS232 DSUB9 pin 2
- 16 — Analog ch.1/1Wire In (dep. on spec)
- 17 — Ground
- 18 — WBO2 Heater

EC36 connector:

- 1 — TPS IN
- 2 — IAT IN
- 3 — P259 ch.4
- 4 — P259 ch.0
- 5 — Ground
- 6 — Injector G ch.64
- 7 — Injector A ch.1
- 8 — Injector C ch.4
- 9 — Injector E ch.16
- 10 — Ignition output 07
- 11 — Ignition output 04
- 12 — Ignition output 05
- 13 — Secondary Trigger
- 14 — CLT IN
- 15 — Fuel Relay (P259 ch.5)
- 16 — P259 ch.1
- 17 — Injector H ch.128
- 18 — Injector F ch.32
- 19 — Injector B ch.2
- 20 — Injector D ch.8
- 21 — Ground
- 22 — Ground
- 23 — Flyback –See transient diode info.
- 24 — Ignition output 06
- 25 — 12v Battery
- 26 — Ground
- 27 — Primary Trigger
- 28 — +5V Supply
- 29 — TPS Supply
- 30 — P259 ch.7
- 31 — P259 ch.6
- 32 — Ground
- 33 — Ignition output 01
- 34 — Ignition output 02
- 35 — Ignition output 00
- 36 — Ignition output 03

EC18

EC36

WBO2 pin-numbers are for LSU4.2
For LSU4.9 read product page shop.vems.hu

+12V

fuse:5A

WBO2 connector:
- 6 — WBO2 Pump +
- 4 — WBO2 Heater
- 2 — Not Connected
- 5 — WBO2 Pump −
- 3 — 12v Battery (5A Fuse)
- 1 — WBO2 Nerst signal

WBO2

Board version= **v3.8**
Serial nr=

wbo2 pump pw zero=
wbo2 nernstdc target=

egt1 cal=
batt cal=

IGBT: 8   Flyback:
LCD: Pri. trig:
PS/2:   Sec. trig:
Knock: One Wire:
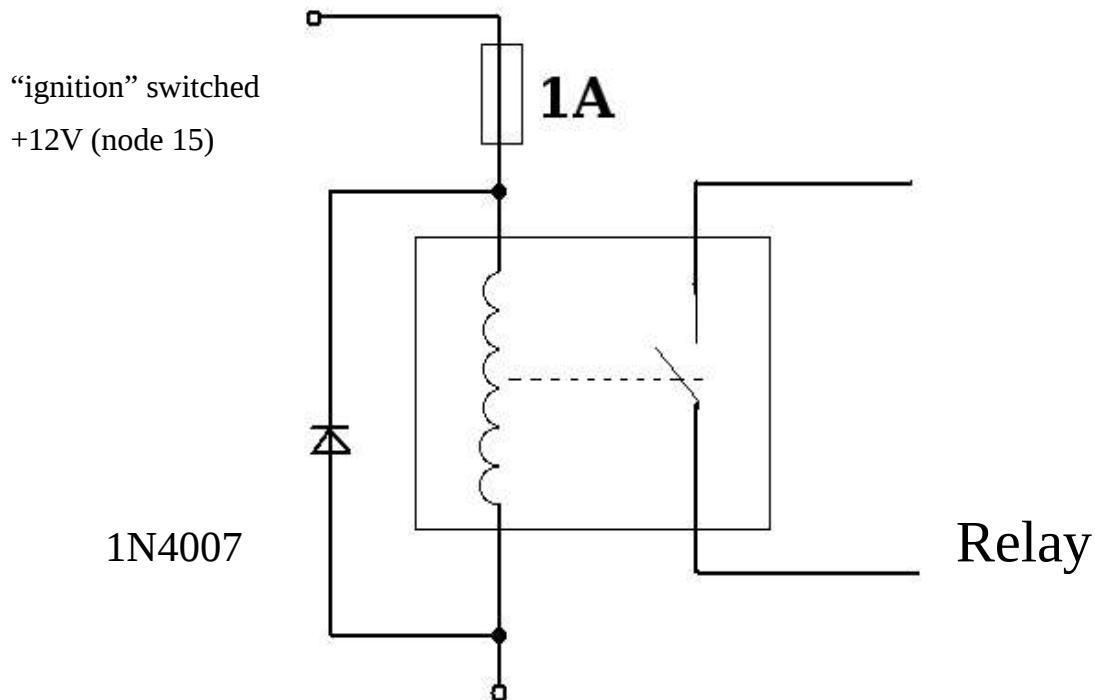EGT: MAP:
                 SD Card:

EC18/13 WBO2 nernst: LSU4.2/pin1 or LSU4.9/pin6 (internal 27k nernstpullup to +5V, verify by DVM).
Disclaimer: this information is for convenience only, not enough for an install. Consider the webshop product page and web documentation before installing. Add your own notes.

Order ID:

Relay connection

"ignition" switched

+12V (node 15)

1N4007

Relay

- Preferrably ign IGBT output
- or injector output
- or stepper output
- (or low current "P259" output as a last chance)

Rescue1 kit

- **3x1n4007 1A throughole diode. Used across iac valve, relay, solenoid, cathode (stripe-marked) to +12V.**
- **0805 SMD resistors**: appr 15 values, 4..6 pieces of each. 104 (means 10*10^4) = 1003 (100*10^3)=100kOhm
- **ES2J/ER2J 2A 600V fast SMB** (surface mount, rather big) **diodes** (optional) Normally not needed
- optional: unidirectional transient suppression diode (black, bigger than 1n4007) 1k5E30 is 30V, 1k5E18 is 18V (across supply. Cathode to +12V). NOT to be used in the flyback path of a controller that already has 30V flyback internally
- red,yellow,black,brown,brown striped throughole resistor is 2.4kOhm. Pullup (or between LCD contrast and GND)

Rescue2 - **capacitors and 2 zener diodes**

Capacitors don't have text on them, so -if ever needed- ways to tell their value:

- measure with DVM that can measure capacitance
- measure by applying 50..60 Hz sinewave with 10k limiting resistor and measure AC voltage across the resistor, than calc.
- **keying by number, size** (0603 not used, 0805 is small, 1206 is bigger), capacitors :
- **Rescue2 v0.07**:

- ~~3*1n 0805 50V~~
- 3*10n 0805 50V
- 4*100n 0805 50V
- 5*220n 0805 50V
- ~~2*1u 0805 25V (tall)~~
- ~~2*2.2u 0805 16V (tall)~~
- ~~1*10u 1206 25V~~
- 2*1u 1206 50V

- Update this printed list when using some capacitors, to keep track. www.vems.hu/wiki/ for more info