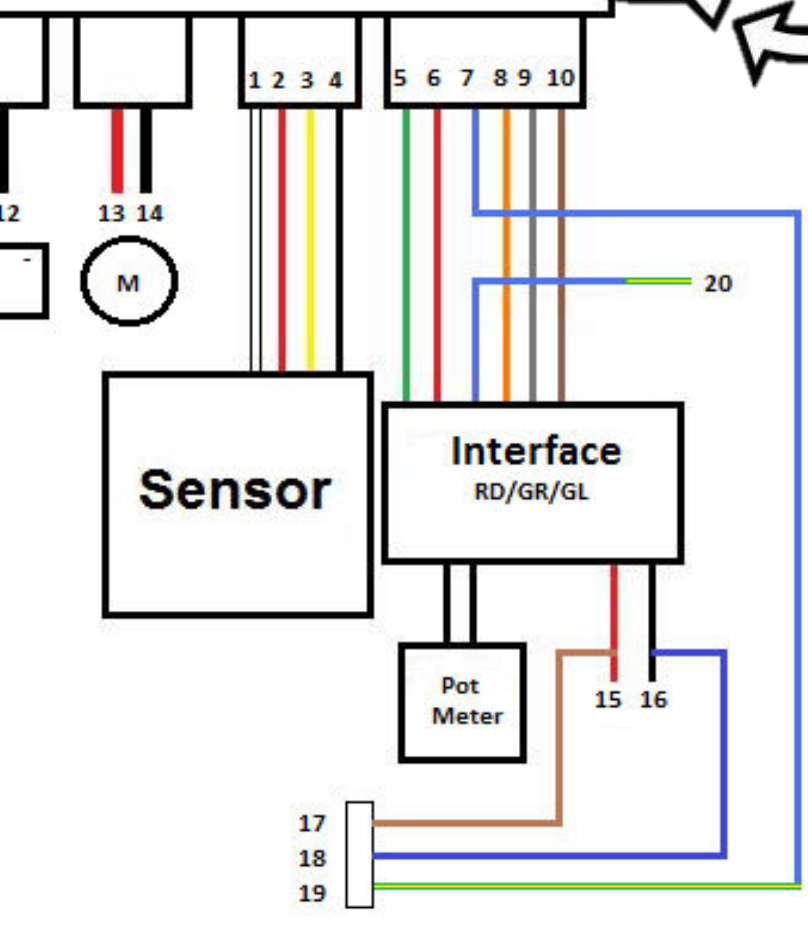
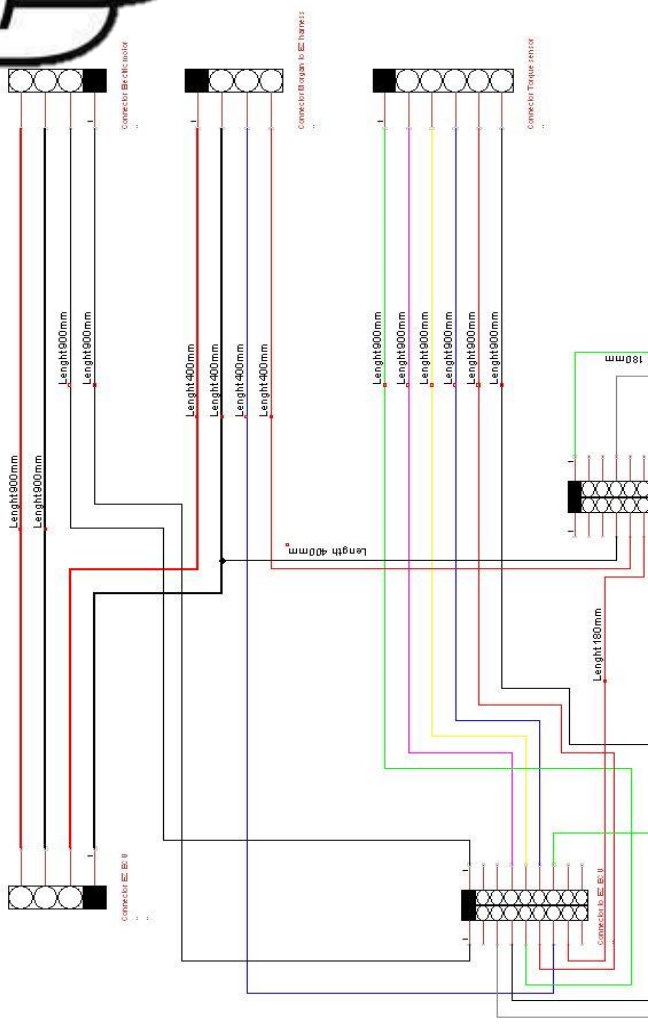
EZ ELECTRIC POWER STEERING

Troubleshooting manual

Version 5.0_mar2021





Index

1 - Wiring of a set with a potentiometer 12V Neg.

1. Connect the wire harness with the power steering ECU.
2. Connect the thick red wire (30+) via the fuse holder directly with the battery +
3. Connect the thin red wire (15+) with an ignition switched feed.
4. Connect the black wire (31-) with a suitable earth point.
5. Fit the potentiometer at a suitable location.
6. When the ignition is switched on, a click should be noticeable. The system is now operative. Check this!
7. After switching off the ignition, it takes approx. 3 sec. before the ECU switches itself off. When it does a click is noticeable.

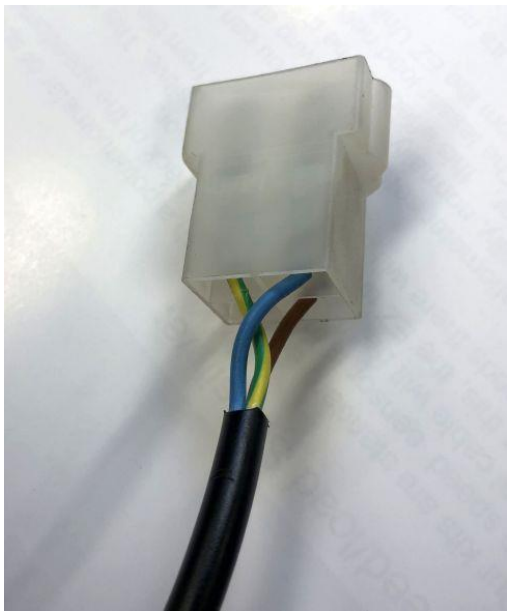
2 - Wiring of sets with a speed sensor 12V Neg.

1. Connect the wire harness with the power steering ECU.
2. Connect the thick red wire (30+) via the fuse holder directly with the battery +.
3. Connect the thin red wire (15+) with an ignition switched feed.
4. Connect the black wire (31-) with a suitable earth point.
5. Connect the speed signal sensor. With the EZ wiring harness, be sure that the colors correspond with the harness. (yellow/green, blue, brown). There is a short lead (yellow/green or blue, see note) with a connector. This is not in use when the speed signal sensor is fitted. When this sensor is disconnected, the short yellow/green wire can be plugged in the connector with the corresponding wire. Now the system is getting it's signal from the potentiometer which is still fitted in the wiring harness. This can be used for diagnostics etc.....
6. When the ignition is switched on, a click should be noticeable. The system is now operative. Check this!
7. After switching off the ignition, it takes approx. 3 sec. before the ECU switches its self off. When it does a click is noticeable.

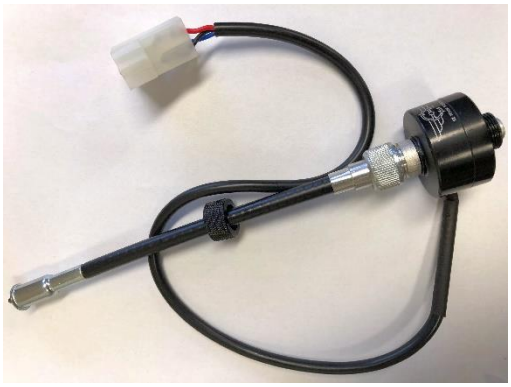
Note: We use 2 different speed sensors, a plastic one (old type) or an aluminum one (new type). They have different wire colors, see next page for more info!

Speed sensor “old type” (plastic)

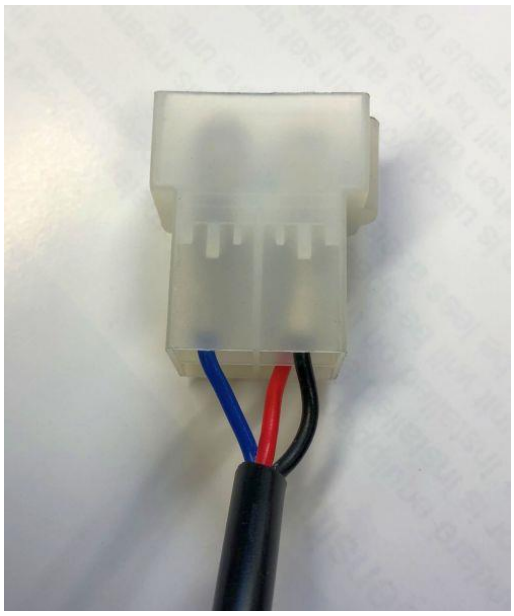
Positive:	Brown
Minus:	Blue
Signal:	Yellow/Green



Speed sensor “new type” (aluminum)



Positive:	Red
Minus:	Black
Signal:	Blue



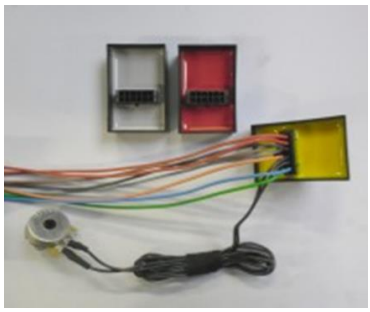
3 - Electronics

Voorbeeld van een ECU

The EZ Powersteering **E**lectric **C**ontrol **U**nit (ECU) calculates the ideal requested assistance with information from the speed of the car (speed sensor in the speedometer cable) and the steering load measured by the torsion sensor at the front of the EZ unit.

If a car does not have a good speed signal or it drives better with a simulated speed signal, we have added a controller in the wiring harness, this is the little black box.

This controller simulates some necessary signals and also a speed signal. Until 2020, the small black controllers have a colored inlay (red, yellow, grey, white) with a potentiometer (1meg/Lin A). From 2020 onwards, the small black controllers have a colored inlay (red, yellow, grey, white) with a potentiometer (47k/Log B).



Controllers with grey, red or yellow inlay (until 2020)

Controllers with grey, red or yellow sticker (from 2020)

Sometimes the controller breaks down due to high voltage spikes in the electrical system. If the controller is broken, the power steering may not work at all or not strong enough.

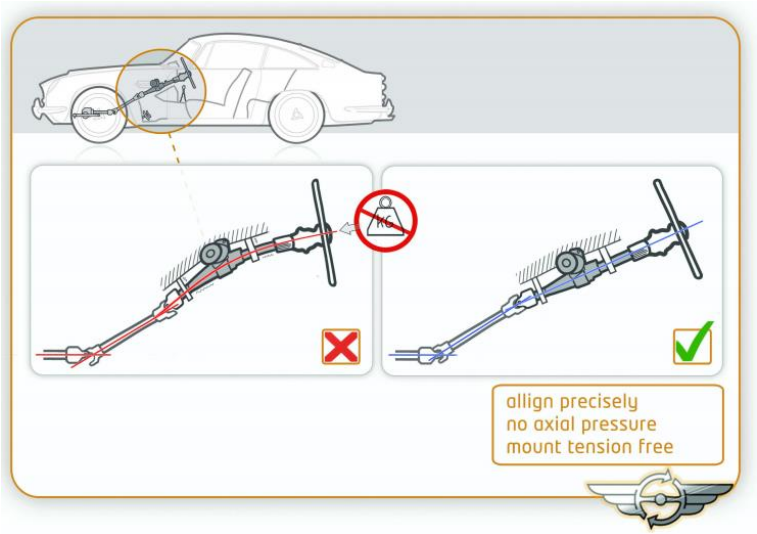
To check this, you can use a test lamp or test LED.

If you switch on the ignition and turn the potentiometer (rheostat) anti-clockwise (to the left) for maximum support, now you can measure between the car's ground/earth and the controller's blue wire. There should be a flashing light visible. If you turn the potentiometer to the right, the flashing speed will increase.

If the test lamp does not light-up at all, check whether the controller receives 12 Volts on the thin red wire. If there is 12 Volts, the controller is broken and you must replace it.

4 - Quick reference for installation

When installing the EZ Electric Power Steering unit (EZ-unit) column ensure that everything is precisely aligned so no oscillating shafts or shafts that are mounted with too much tension. Both items can worsen the self-centering effect of the steering.



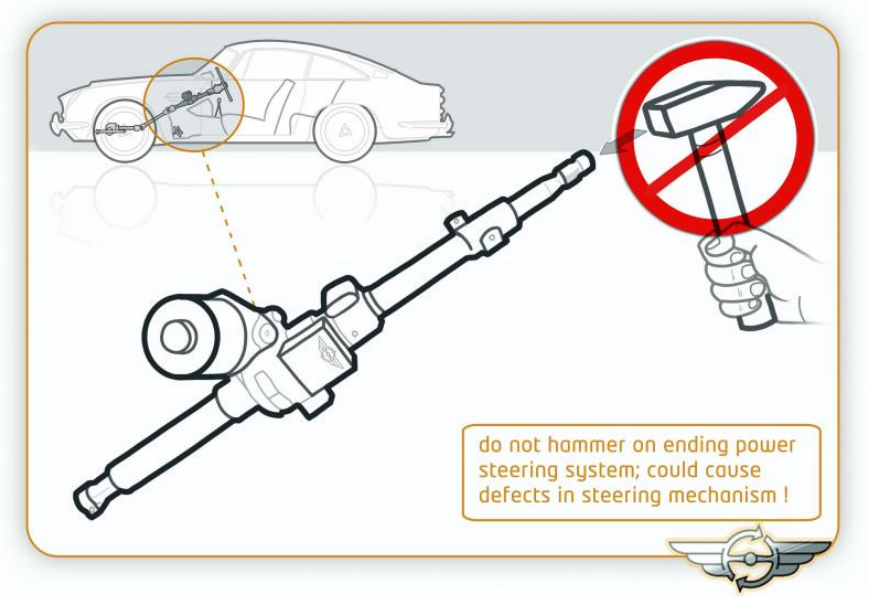
When the new steering column is being fitted hand tighten all the bolts and check if everything turns smoothly before tightening to required Torque, use torque tightening table below:

Torque tightening values in Nm.

	Alu	**8.8**	**10.9**	**12.9**
M6	6	11	16	19
M8	15	27	40	47
M10	25	54	79	93
M12	45	93	137	160

The system works with a torsion bar into the unit, this measures the amount of torque/load on the steering shaft while steering, the torque sensor measures this and sends a voltage to the ECU. The ECU uses this signal together with the speed signal to control the electric motor from the EZ-unit.

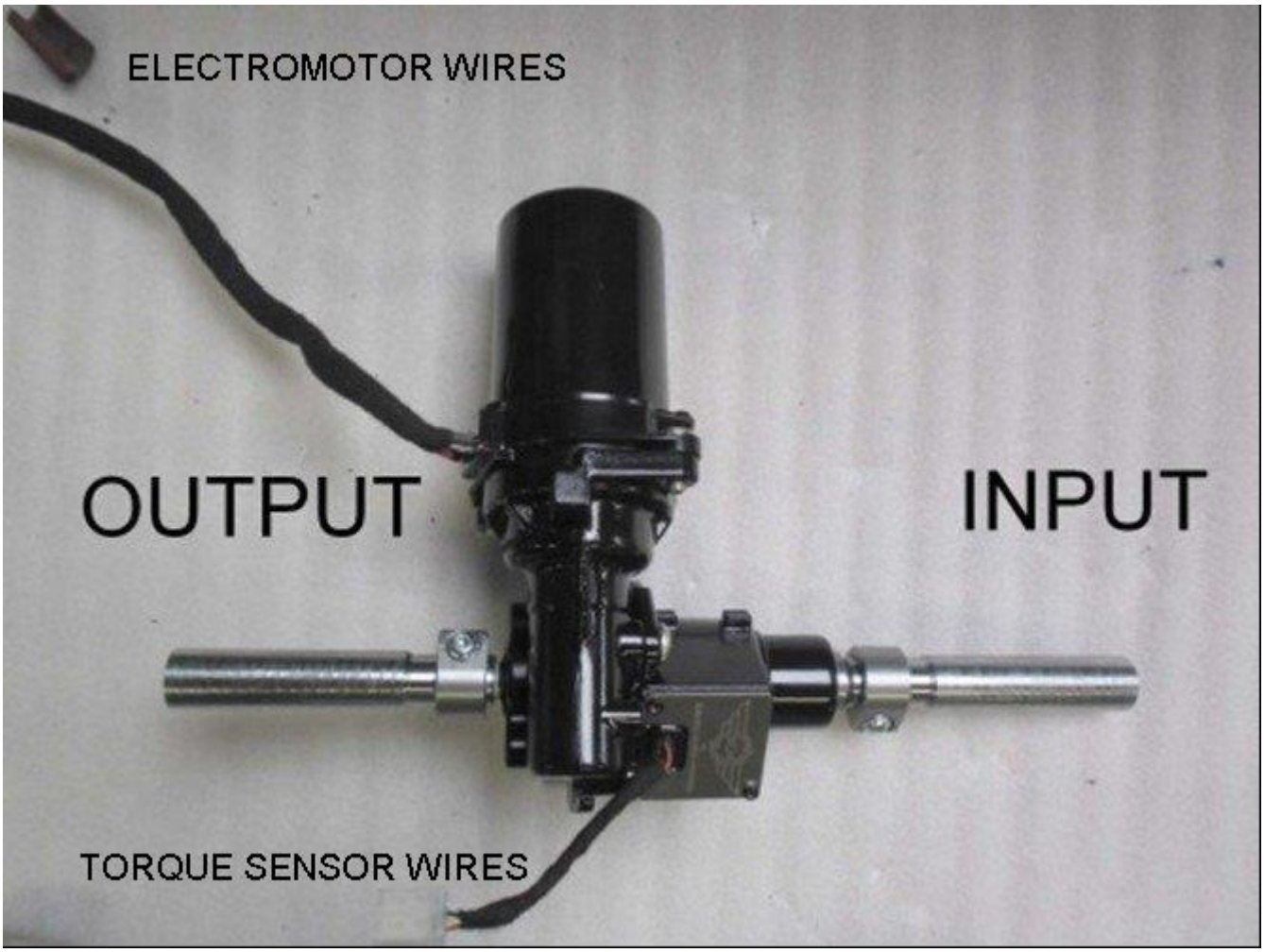
It's very important that the input shaft is NEVER hit with a hammer or being put under a load (radial/axial) while fitting, this will change the torque sensor settings and will cause the steering to be heavier to one side, or the unit will not work at all!



5 - Voltage

The basic EZ-unit, is **a 12V** system with **negative earth!**. There are extra wiring sets available, so that the kit will work with a 6V or 24V system and/or positive earth. Check your vehicle setup before fitting the EZ-unit.

6 - Troubleshooting



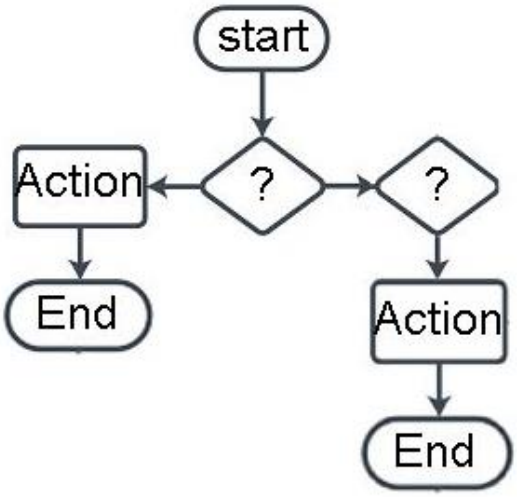
To prevent mistakes it's important to identify the input and output side. As shown on the above photo. The input side is located at the sensor side. the output side is at the opposite side. The input side is where the steering wheel is mounted, the output side is connected to the steering box.

a. How to read the troubleshooting flowchart

- Start or End or end of the troubleshooting process

- Decision making during the troubleshooting process

- Action, check or measurement during troubleshooting process



b. Index troubleshooting flowchart

Troubleshooting **1**	EZ-unit doesn't work at all.
Troubleshooting **2**	Difference in assistance steering between left or right.
Troubleshooting **3**	Not enough assistance from power steering unit.
Troubleshooting **4**	Horn doesn't function correct.
Troubleshooting **5**	Steering wheel vibrates.
Troubleshooting **6**	Intermittent failure EZ-unit.
Troubleshooting **7**	Too much assistance at all times

Necessary tools for troubleshooting:

LED display tester

Voltage tester

This flowcharts is based on 12V negative earth! **>>Use measurement sheet to collect data!<<**

1 EZ-UNIT DOESN'T WORK AT ALL

1.1 Does ECU click after engaging ignition?

- YES → **1.2** Does it click 3 sec. after the ignition has been turned off?
  - YES → **1A** System OK. Check Amp, see point 3.2
  - NO → **1.3**
- NO → **1.3**

1.3
Measure voltage at ECU (30+). And check ignition plus (15+), this should be between 11.5 volt and max.15 volt. Preferable to do this measurement with engine running. Measure in connector at ECU. **(see page 22)**

1.4 Both less than 11,5V or more than 15V?

- YES → **1.5** Fuses power supply OK?
  - YES → **1B** Check connectors, wiring, crimps, wiring cracks, earth points and battery conditions
    - **6V system:** Check function from 6V-12V converter, voltage above must be between 13V - 14,5V. Together with 12V battery condition
    - **12V system:** Check battery condition and generator/ alternator charge voltage (13V-14,5V)
    - **24V system:** Check battery condition and generator/ alternator charge voltage (26V-28V)
    - **Pos. earth:** Check ignition switched earth and correct function from relay.
  - NO → **1C** Try to locate cause and replace fuse.
- NO → **1.6**

1.6
Check ignition switched plus (15+). The voltage must be min. 11,5V and max. 15V. The system turns off when the voltage gets underneath 11,5V. **Preferred to measure with running engine, users engaged (headlights) and turning the steering wheel.**.
Also use ECU earth to measure this voltage. **(see page 23)**

1.7 Higher than 11,5V and below max. 15V?

- YES → **1.8**
- NO → **1D**

1.8
Check controller signals, use a LED test light to do this. Watch the polarity from the LED during testing, too prevent faulty measurements. Measure inside connector
(see picture 1 and pages 24 & 25)

1D
Check:
-connectors
-crimps with wiring
-battery voltage
-earth connections
-alternator/generator charge voltage

NOTE:
If all voltage checks are OK and the ECU doesn't respond or click, replace the ECU.

1.9 - Green wire:
Switch on the ignition and measure from the green wire to controller earth. LED will flash rapidly (look carefully, it flashes so fast that it almost looks like it is turned on continuously)

1.11 - Blue wire:
Switch on the ignition and measure from the blue wire to controller earth

Flash frequency must change while turning the potentiometer.

or

1.12

Systems with a speed sensor:

Measure at the green/yellow **or** blue wire inside connector **(see picture 2)**

Flash frequency must change depending on the vehicle speed. **Vehicle must move to get a signal pulse!**

1.10 Signal OK?

- YES
- NO → **1E**

1E
Check:
- 15+ in connector of controller, see 1.6
- Check earth of controller

When all OK, replace connector

Continue on next page!

1.13
Pulse signal OK?

NOTE:
When LED is continuously on (systems with a speed sensor, move the car to be sure that the sensor is in off position) check controller earth.

All OK ? Replace controller!

NO

1F

Systems with potentiometer:
- Replace controller

Contact EZ Powersteering at workshop@ezpowersteering.nl

1G

Systems with speed sensor:
-Check speed sensor plus (12V brown or red wire). Measure to earth
- Check signal inside connector (green/yellow or blue wire) / Plus is also ignition switched, do not forget to turn on the ignition!
-When plus and earth are OK, replace speed sensor
-When there is no plus, check harness and controller, or diagnose; this plus is also ignition switched. Use a bypass wire from 15+ to the speed sensor to get a plus at the speed sensor.
-Vehicle must move to get a signal pulse!

YES

2 DIFFERENCE IN STEERING ASSISTANCE BETWEEN LEFT AND RIGHT.

2.1
Measure torque sensor signals. The system works with a 5V or 8V sensor voltage, depends on which set is used. There are 2 signal wires and an earth. Measure from sensor signal to earth, voltage must be between 2,45V and 2,55V. **(see page 26)**

2.2
Torque signal OK?

YES

2A
Signal OK, but still there is a deviation in assistance to the left or right then there is a mechanical defect.

Contact EZ Powersteering at workshop@ezpowersteering.nl

NOTE:
*When contacting EZ powersteering **always** communicate **the production number** !*

*see **picture 3** for an example!*

NO

2B

- Check if input shaft isn't fitted under tension (axial and radial).This causes a wrong readout from the torque sensor.
- Be sure the input shaft isn't hit with a hammer during installing. This will cause the unit to be internally misaligned and needs to be reset.
-To re-adjust the system to correct position contact EZ Powersteering at workshop@ezpowersteering.nl

NOTE:
*When contacting EZ Powersteering **always** communicate the **production number, measured values and color wire measured!***

>>>> Use the measurement sheet! <<<<

3 NOT ENOUGH ASSISTANCE FROM POWER STEERING UNIT.

3.1
- Check position from the potentiometer (Turn the button all the way counter clockwise (left) for the lightest position/max. assistance)
- Measure amp. from system over 30+ wire.

3.2
Is max. Amp about 10A or less under full steering load?

YES

3A
System is in emergency mode:
- Check outgoing signals from controller, see point 1.8
- Replace controller.

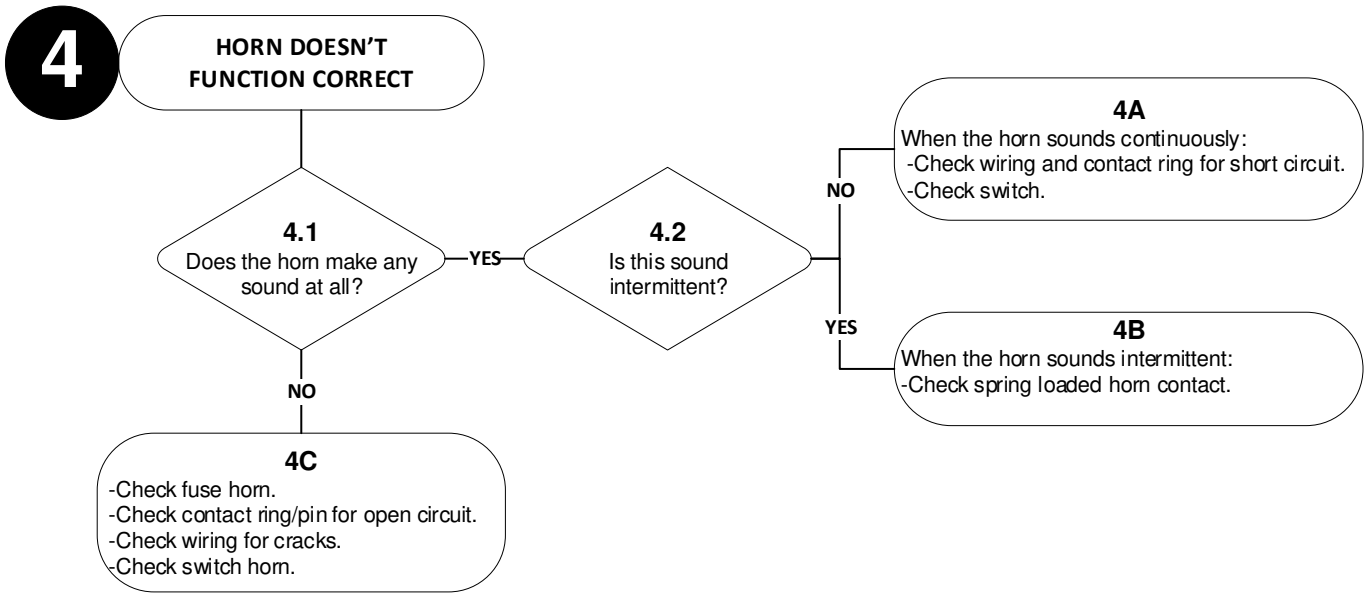
Contact EZ Powersteering at workshop@ezpowersteering.nl

NOTE:
*When contacting EZ powersteering **always** communicate **the production number** !*

NO

3B
If the max. amp is about 35/40A there is a mechanical cause.

Contact EZ Powersteering at workshop@ezpowersteering.nl



5 **STEERING WHEEL VIBRATES**

-Swap Red/black wires from servo motor. These can be changed over inside connector at ECU. **See page 27 for more information**

6 **INTERMITTENT FAILURE EZ-UNIT**

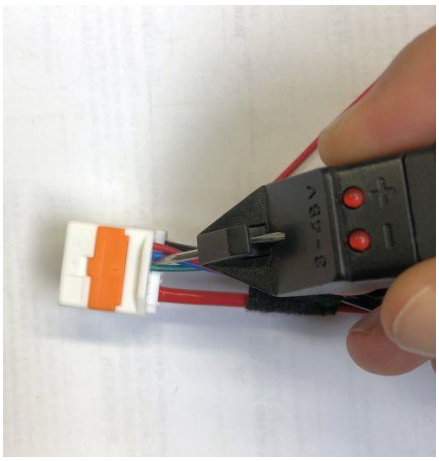
-Check 15+, see point 1.3
-Check 30+, especially when moving the cables, see point 1.3
-Unit turns off while vehicle stands still, see point 1.9

7 **TOO MUCH ASSISTANCE AT ALL TIMES**

-Check if there is a speed signal, see point 1.8

d. Pictures referred to in flowchart

Picture 1

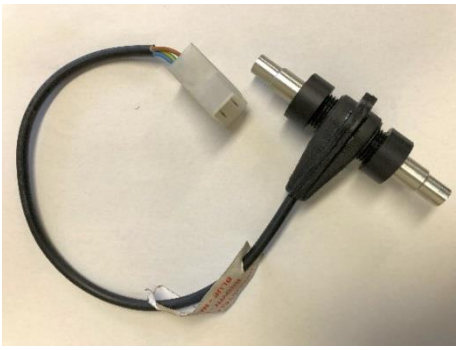


These pictures shown above are just for reference. In real-time situation you will use the most reachable connector for measuring.

return to flowchart

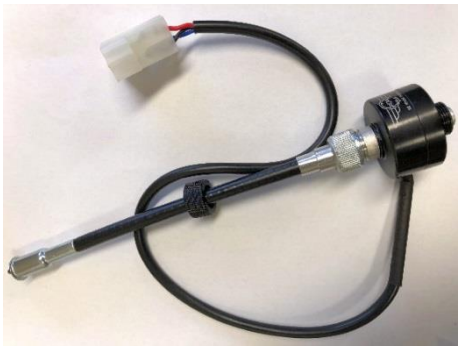
Picture 2

Speed sensor “old type” (plastic)

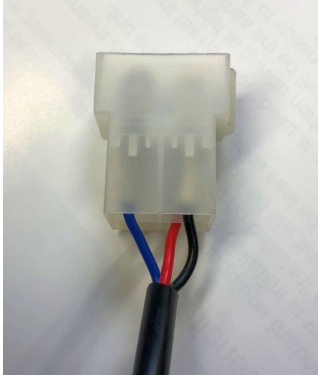


Positive:	Brown
Minus:	Blue
Signal:	Yellow/Green

Speed sensor “new type” (aluminum)

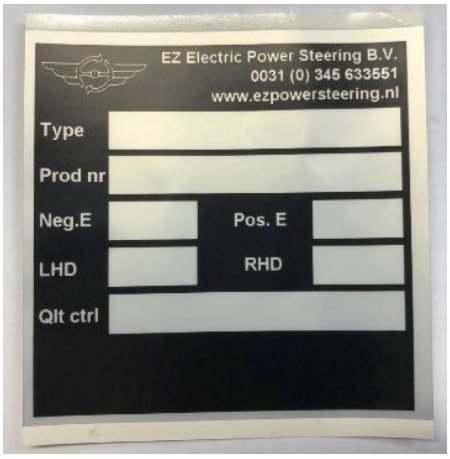


Positive:	Red
Minus:	Black
Signal:	Blue



return to flowchart

Picture 3



See this label on steering column unit for production number.

If production number not visible communicate invoice number as alternative.

return to flowchart

e. Measurement sheet

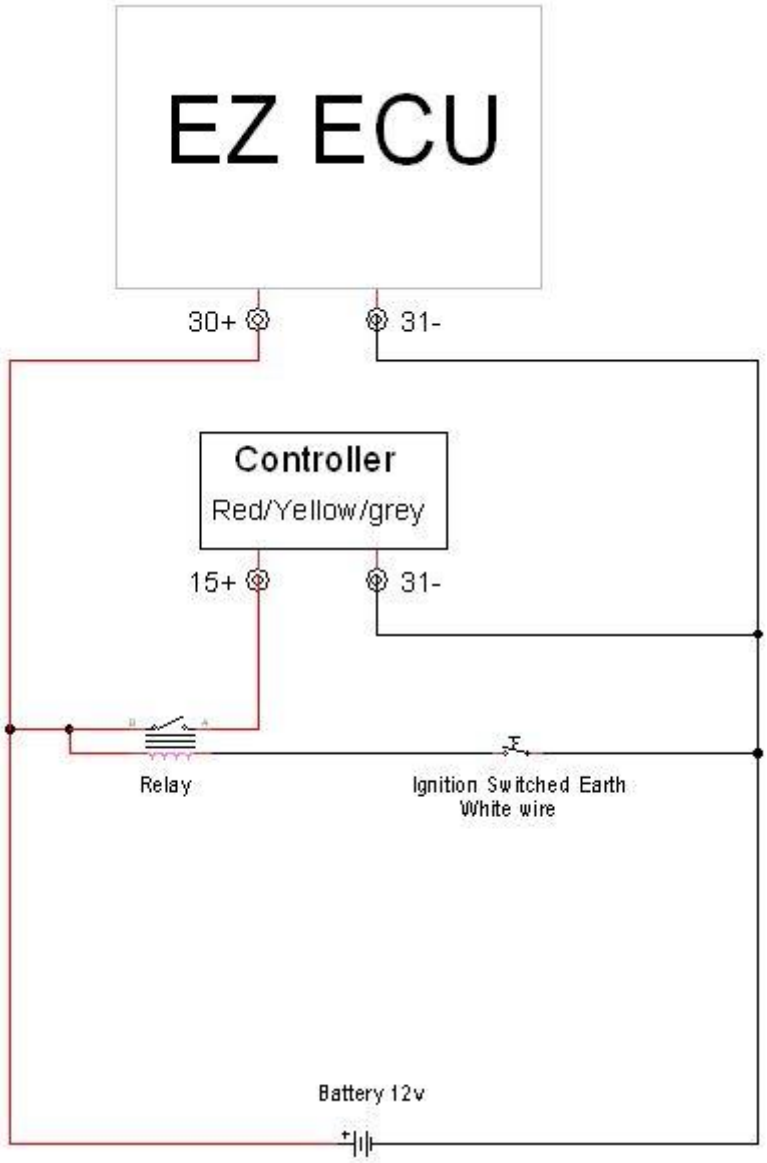
Measurement sheet for troubleshooting		
Production number of EZ-set ?		
Set with speed sensor ?		Y / N
Brand / type of car ?		
Positive or negative earth ?		Positive / Negative
Position steering wheel LHD or RHD?		LHD / RHD
1.1	Does ECU click ?	Y / N
1.4	Measured value ?	_____V
1.5	Fuse OK ?	Y / N
1.7	Measured value ?	_____V
1.9	LED signal test, Green wire OK?	Y / N
1.10	Signal OK ?	Y / N
1.11	LED signal Blue wire OK? (system with potentiometer)	Y / N
1.12	LED signal green/yellow or blue wire OK? (system with speed sensor)	Y / N
1.13	Pulse signal OK ?	Y / N
2.1	Sensor signal measured values	Feed wire voltage_____V Signal wire, white _____V Signal wire, yellow _____V
2.2	Torque signal OK ?	Y / N
3.2	Measured value ?	_____A

As mentioned in flowchart, for efficient troubleshooting use measurement sheet when contacting EZ Powersteering!

If the production number of EZ unit is **not** visible please provide the **invoice** number.

return to flowchart

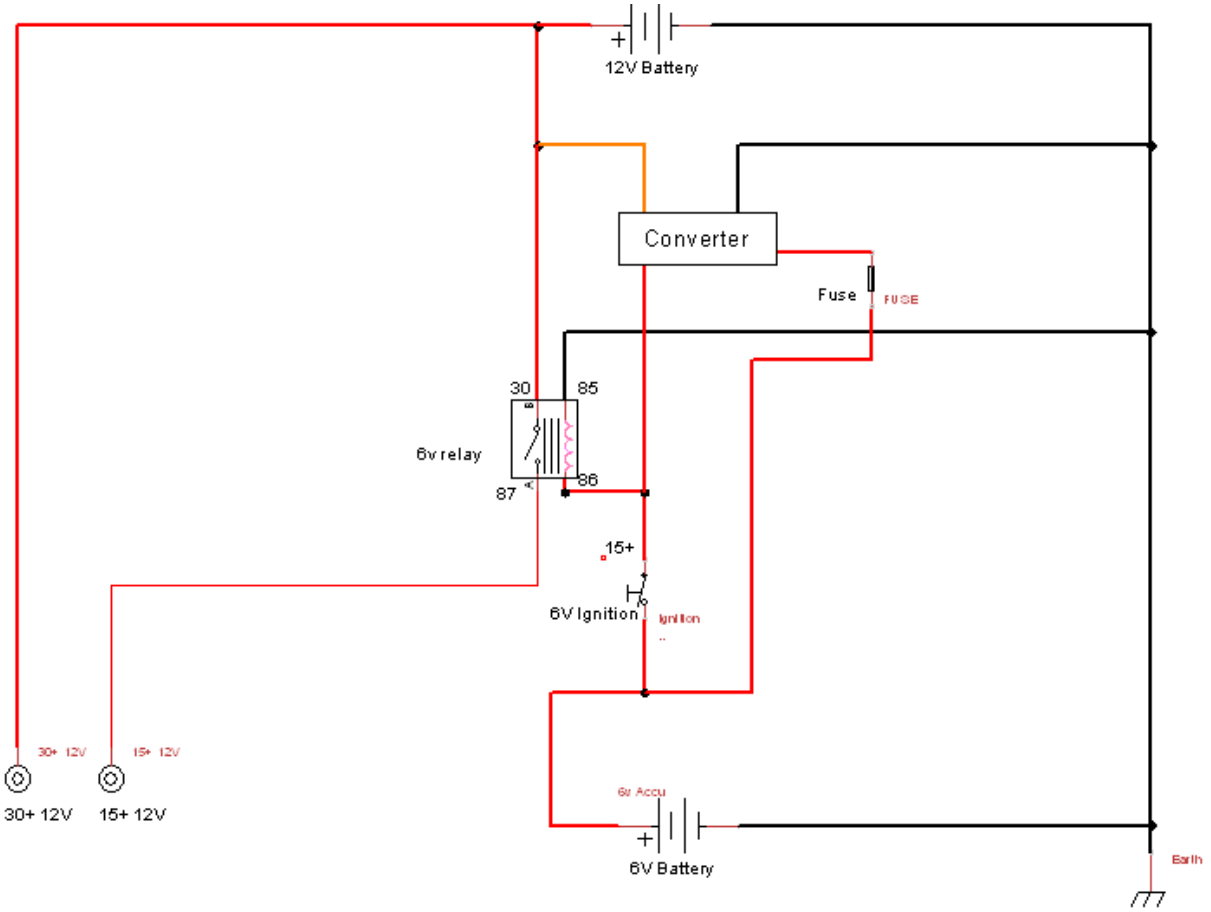
7 - Positive earth 12V



When you have a positive earth car, the EZ-unit wire harness has an extra relay which switches the 15+. Keep in mind, that at an positive earth car, the Battery+ is connected to the chassis!

- The Thick red wire (30+) needs to be connected to the chassis.
- The thin red wire (15+) is connected with the relay (pin 87).
- The black wire is connected via the fuse holder directly to battery min.
- The White wire is connected to an ignition switched earth
- Be sure to check the earth connection from the ECU against the housing. If there is one, be sure to isolate the EZ ECU from the chassis when installing.

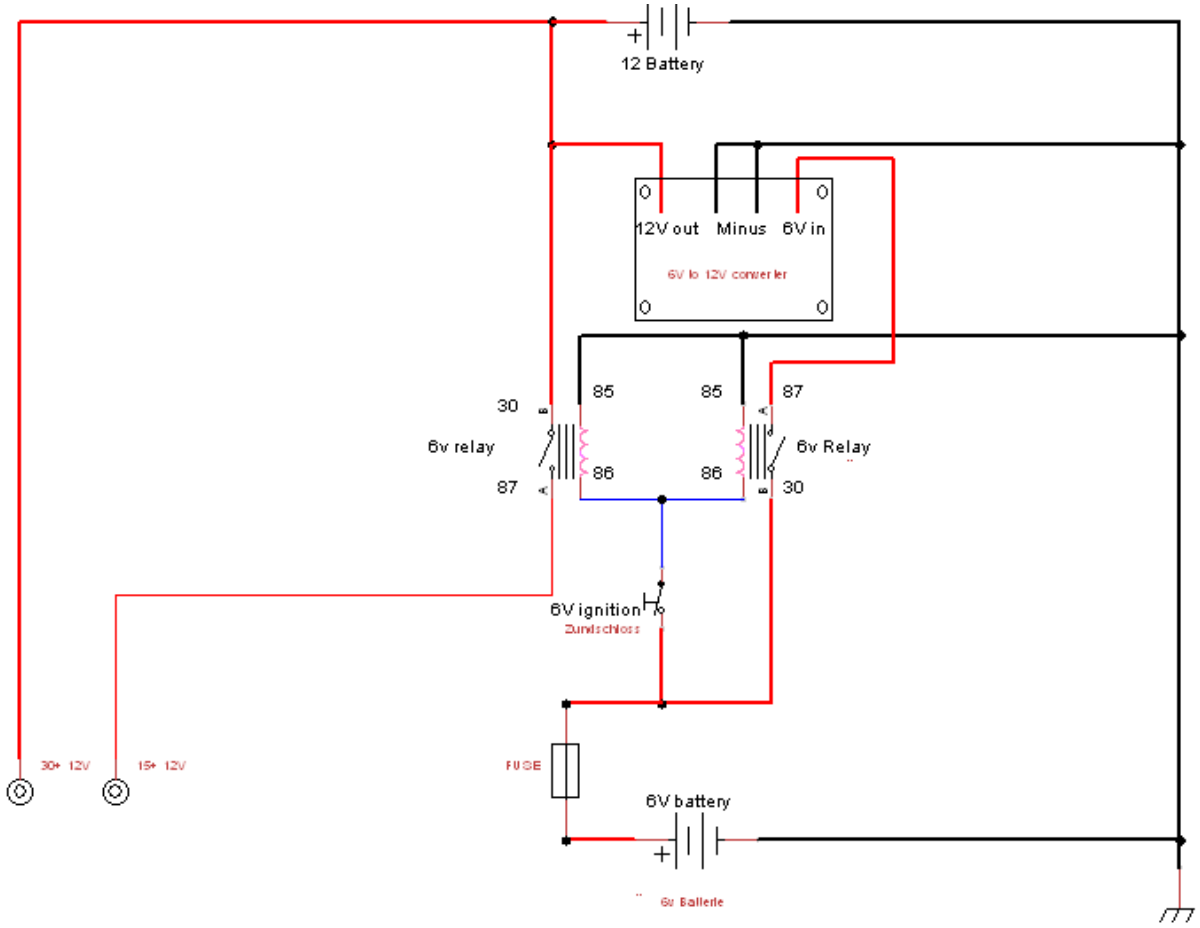
8 - 6V-12V, 1 relay Negative earth



When the vehicle has a 6V system, its needed to install a 12V battery to feed the EZ-unit with 12V. This 12V battery is charged by a 6V-12V converter, be sure that the outgoing voltage from the converter is higher than 12V.

The 6V relay switches the ignition switched plus (15+) for the EZ controller. This 6V relay is controlled by an 6V ignition switched plus, this ignition switched plus also switches the converter on/off.

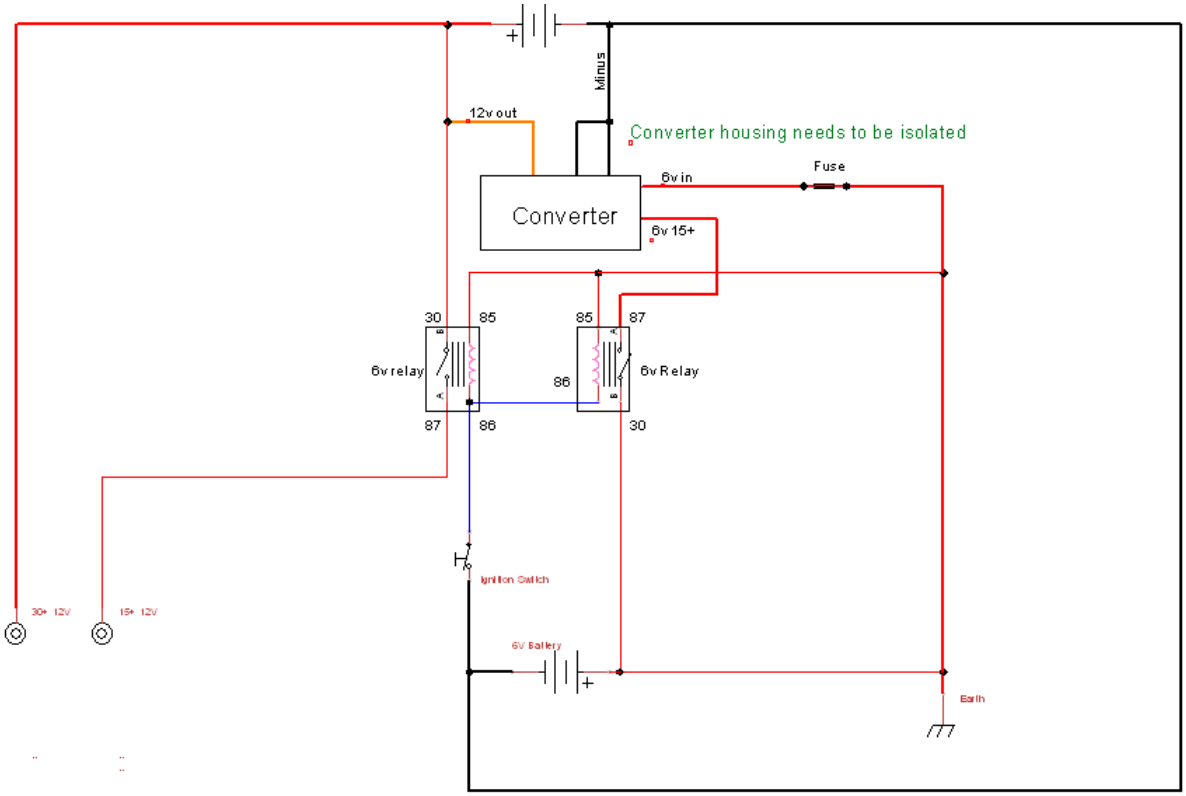
9 - 6V-12V, 2 relays negative earth



When the vehicle has a 6V system, its needed to install a 12V battery to feed the EZ-unit with 12V. This 12V battery is charged by a 6V-12V converter, be sure that the outgoing voltage from the converter is higher than 12V.The 6V relay switches the ignition switched plus (15+) for the EZ controller. This 6V relay is controlled by an 6V ignition switched plus,

From the two 6V relays, 1 switches the ignition switched 12V plus. The other relay switches the 6V plus to the converter (this is only needed when the converter hasn't got an ignition switched connection). Both relay are switched by a 6V ignition switched plus.

10 - 6V-12V, Positive earth

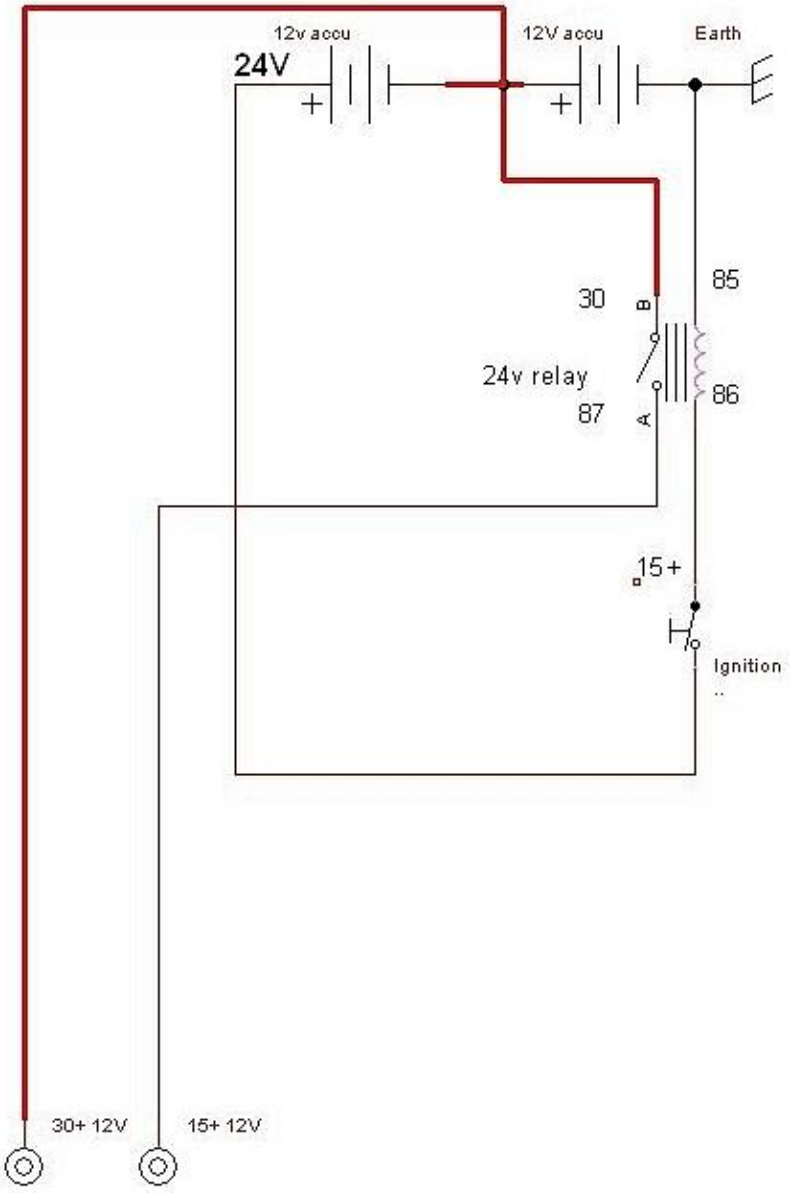


When the vehicle has a 6V system, its needed to install a 12V battery to feed the EZ-unit with 12V. This 12V battery is charged by a 6V-12V converter, be sure that the outgoing voltage from the converter is higher than 12V.

Both 6V relays are switched by an ignition switched earth. One relay switches the ignition switched plus (15+) for the EZ-unit. The other relay controls the 6V plus to the converter.

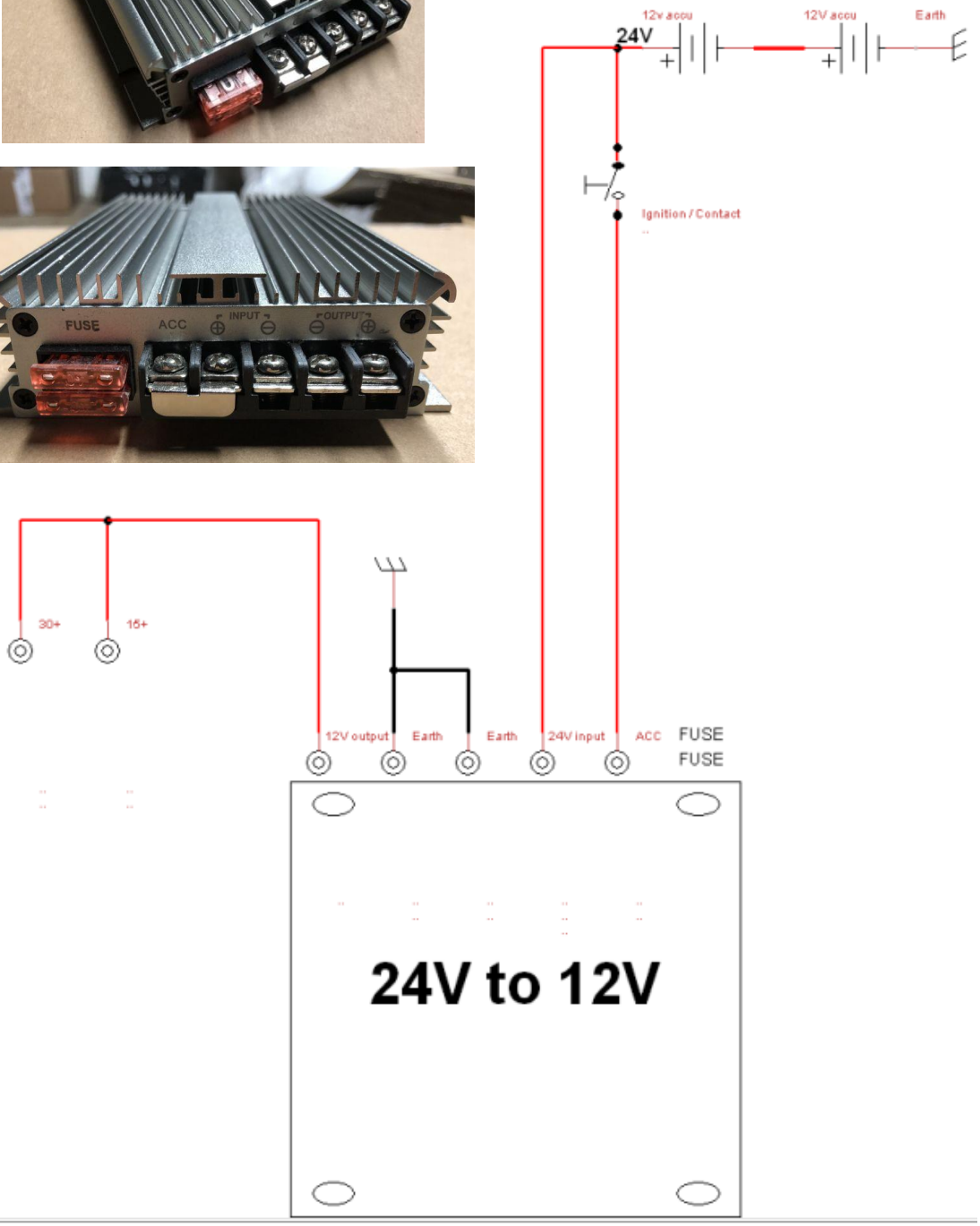
Important for a positive earth vehicle is that the convertor is isolated from the chassis, to prevent short circuit. The housing from the converter is connected with the minus connection.

11 - 24V-12V System - 1 battery setup

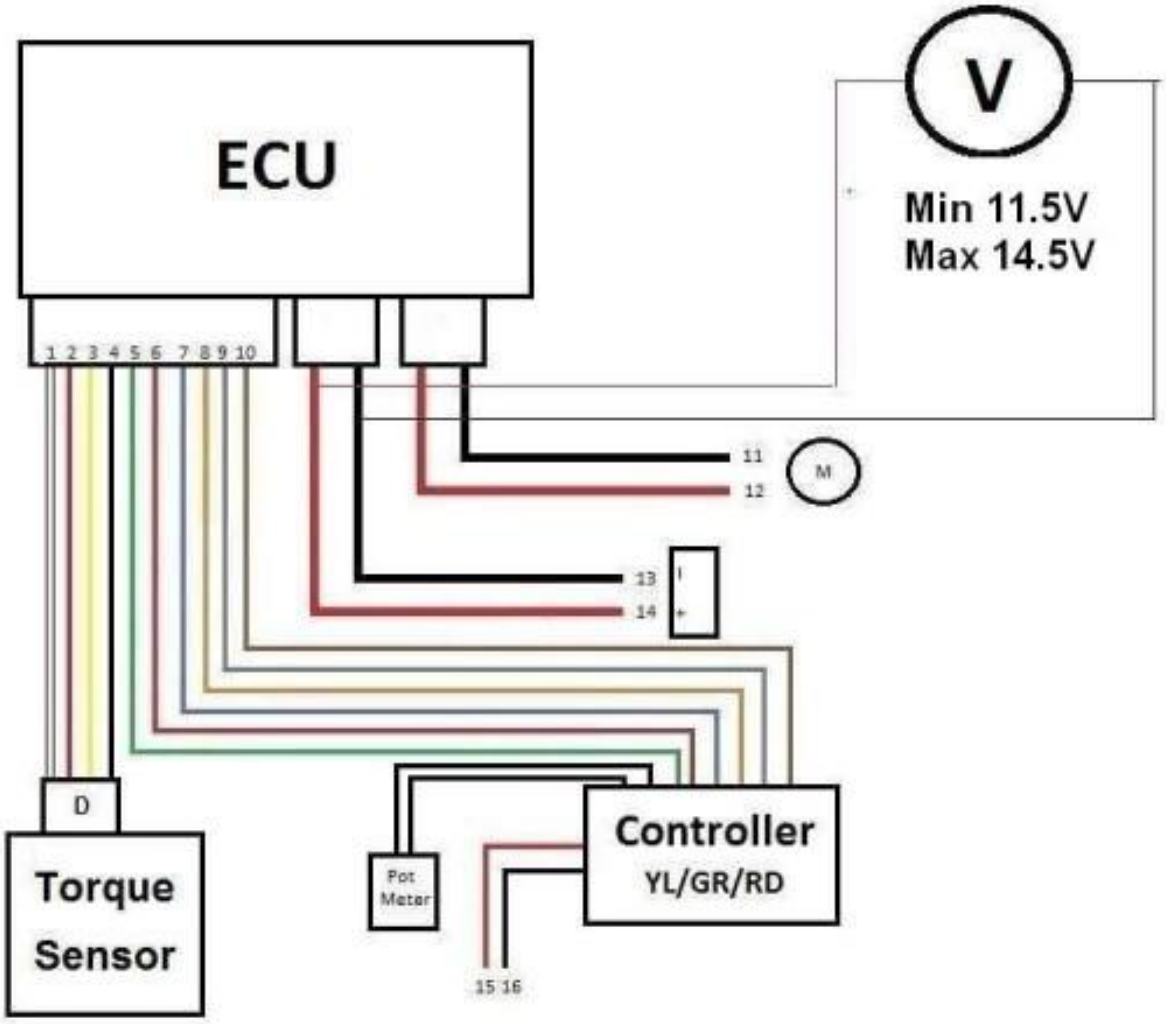


When the vehicle has a 24V system, the EZ-unit is connected to one battery, the ignition switched 12V plus is switched by a 24V relay which is controlled by a 24V ignition switched plus. This way of providing 12 Volt can affect the lifetime of your batteries. As an alternative you can also choose the option of the 24V-12V converter, the price of this convertor is € 175. See next page for pictures and electrical scheme.

12 - 24V-12V System with ACC-2 battery setup



13 - Voltage check, flowchart point 1.3

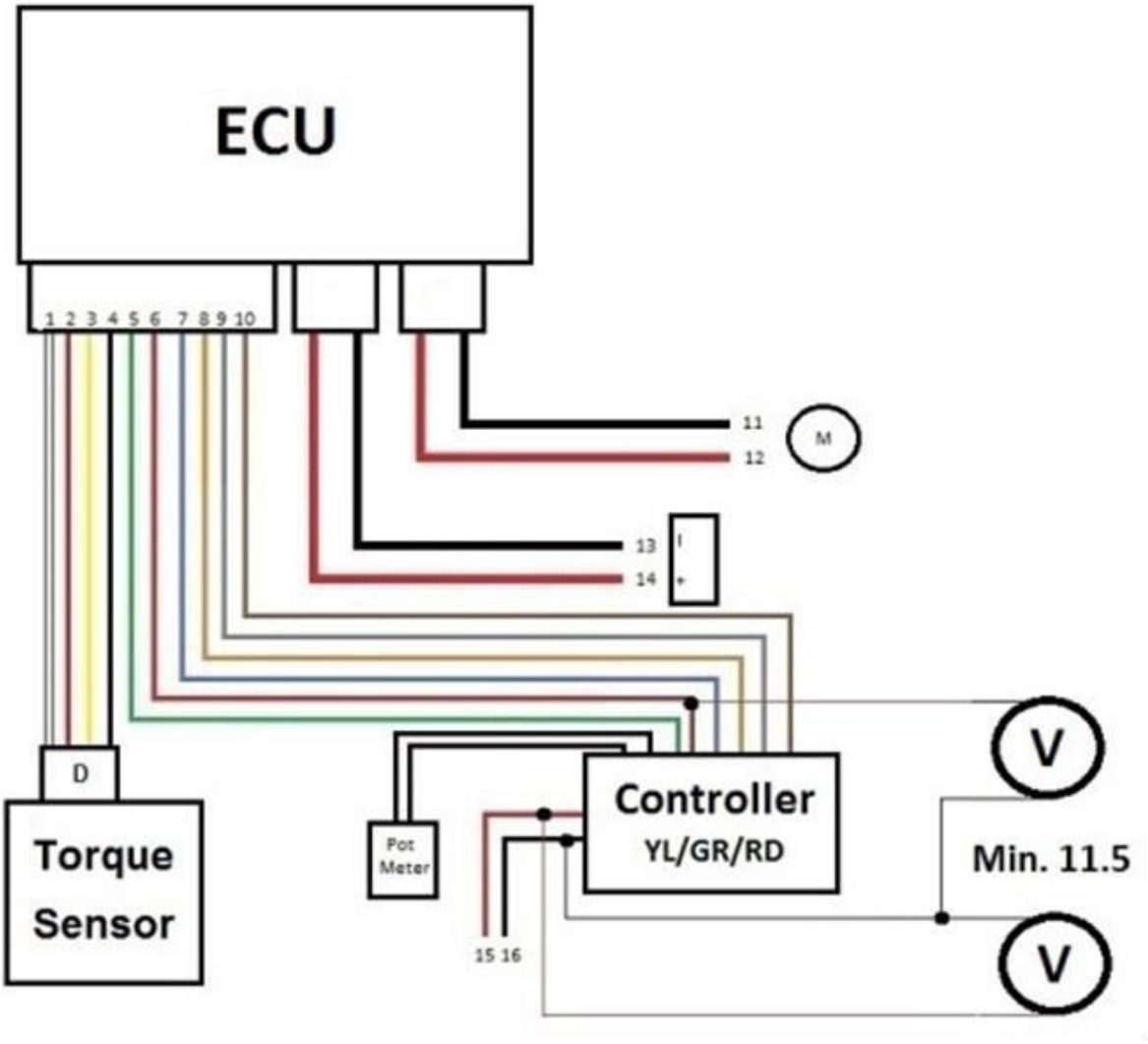


Use a Voltmeter and measure voltage at ECU (30+)

Measure inside the power supply connector to the ECU between the red and the black wire! Preferred to measure this voltage with engine running and electrical users engaged (heater, defroster, etc.)and turn the steering wheel. Voltage must stay between minimum 11.5V and max. 14.5V.

return to flowchart

14 - Voltage check, flowchart point 1.6



Use a voltmeter and measure voltage at the ignition switched plus (15+)

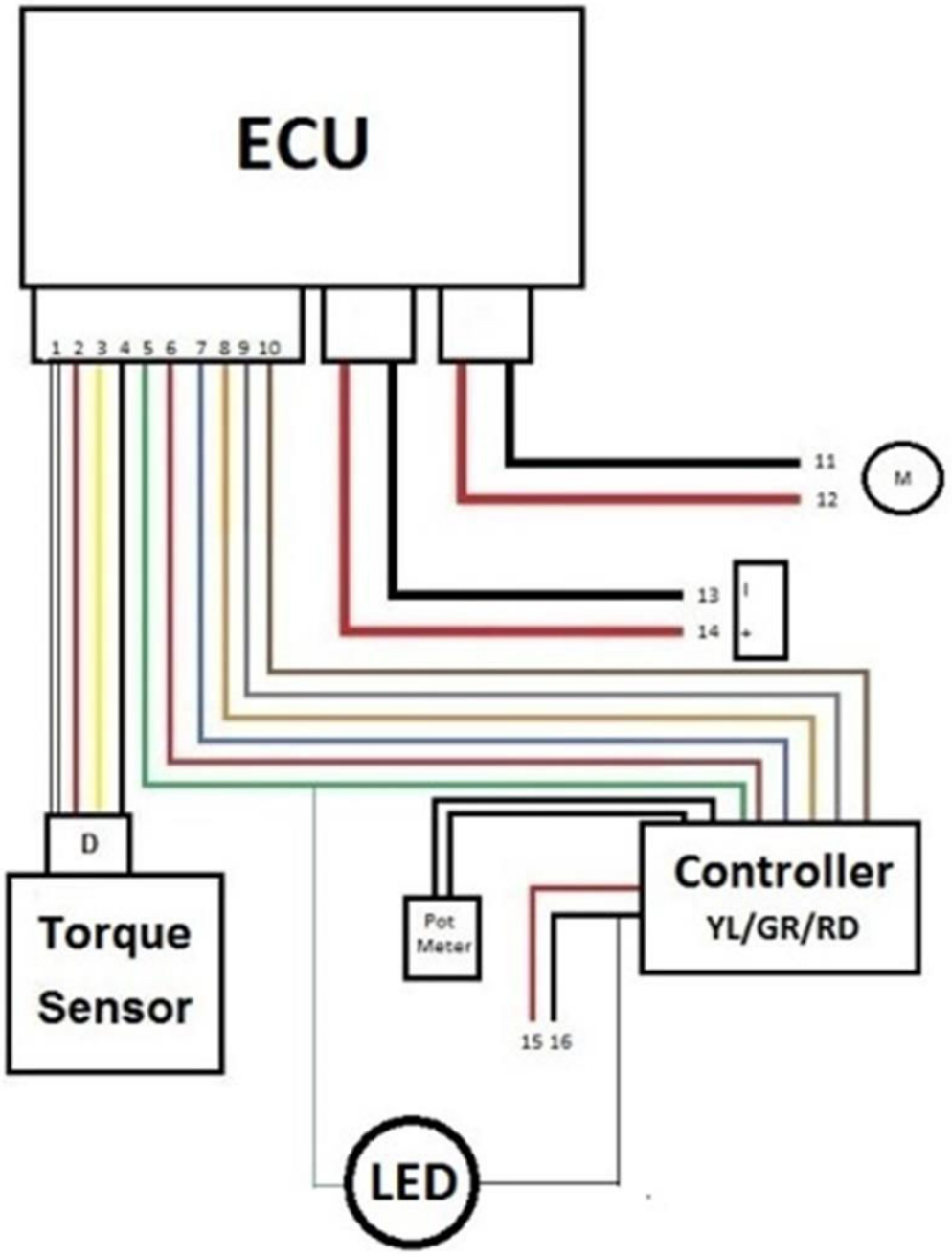
Voltage must be between min. 11.5V and max. 15V. When the voltage drops underneath the 11.5V the system turns off. Preferred to measure this with **engine running, electrical users engaged** (heater, defroster, etc.) and turn the steering wheel. Especially older cars with a generator instead of an alternator can have difficulties to retain this voltage at idle. There is an electronic device available, which can maintain the right voltage in these cases.

The ignition switched plus is used to switch on the controller and the ECU. The small controller sends out the 15+ signal for the main ECU. Be sure that they both get the right voltage!

When the voltage is higher than max. 15V the system will shut off and there is the possibility that the controller will get damaged. Be sure to check the voltage regulator from your charging system when this voltage is to high!

return to flowchart

15 - Signal check, flowchart point 1.09 (green wire)

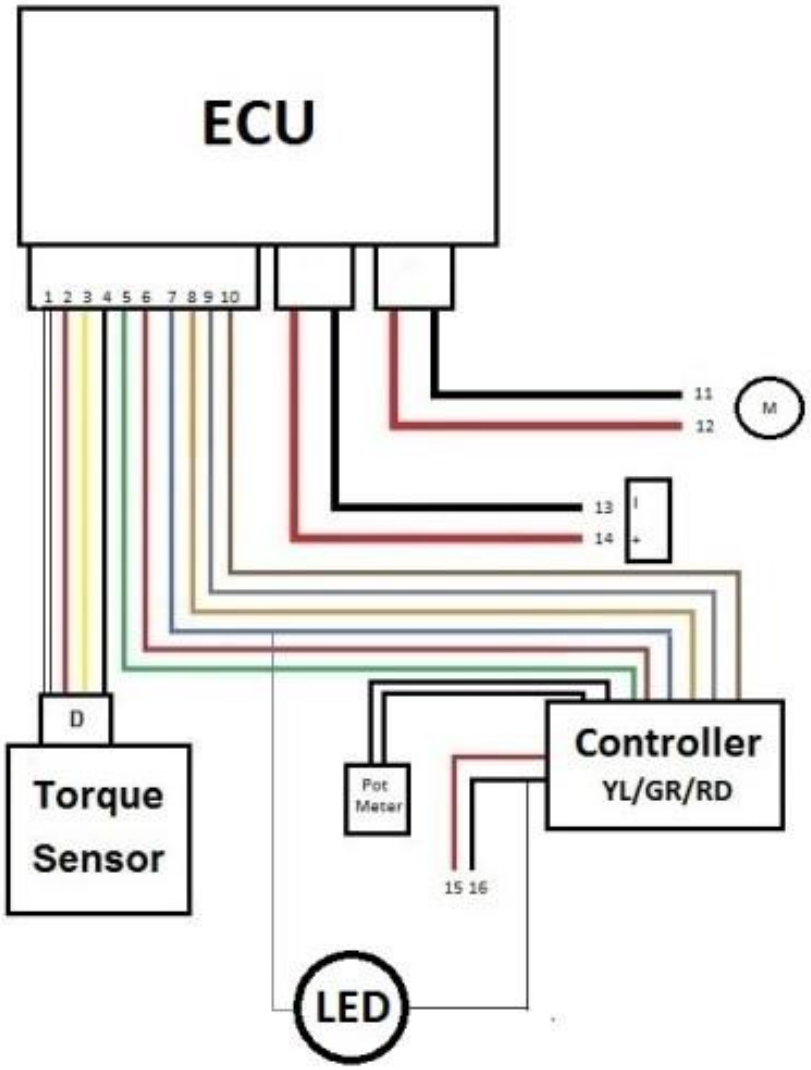


Controller signal check

Switch on the ignition and measure from the green wire to controller earth. LED tester must flash rapidly!

return to flowchart

16 - Signal check, flowchart point 1.11 & 1.12



Blue Wire, speed signal

Switch on ignition and measure from blue wire to controller earth. Systems with a speed sensor, measure at the green/yellow or blue wire inside connector.

SYSTEMS WITH A POTENTIOMETER: (BLUE WIRE):
Flash frequency must change while turning the potentiometer.

SYSTEMS WITH A SPEEDSENSOR (GREEN/YELLOW or BLUE WIRE):
Flash Frequency must change depending on the vehicle speed. Vehicle must move to get a signal!

When the system turns off after standing still for a while and turns on when the vehicle starts moving, replace the controller by a gray or white inlayed controller.

NOTE: *The new type speed sensors do not use the green/yellow wire anymore. These are replaced by a blue wire!*

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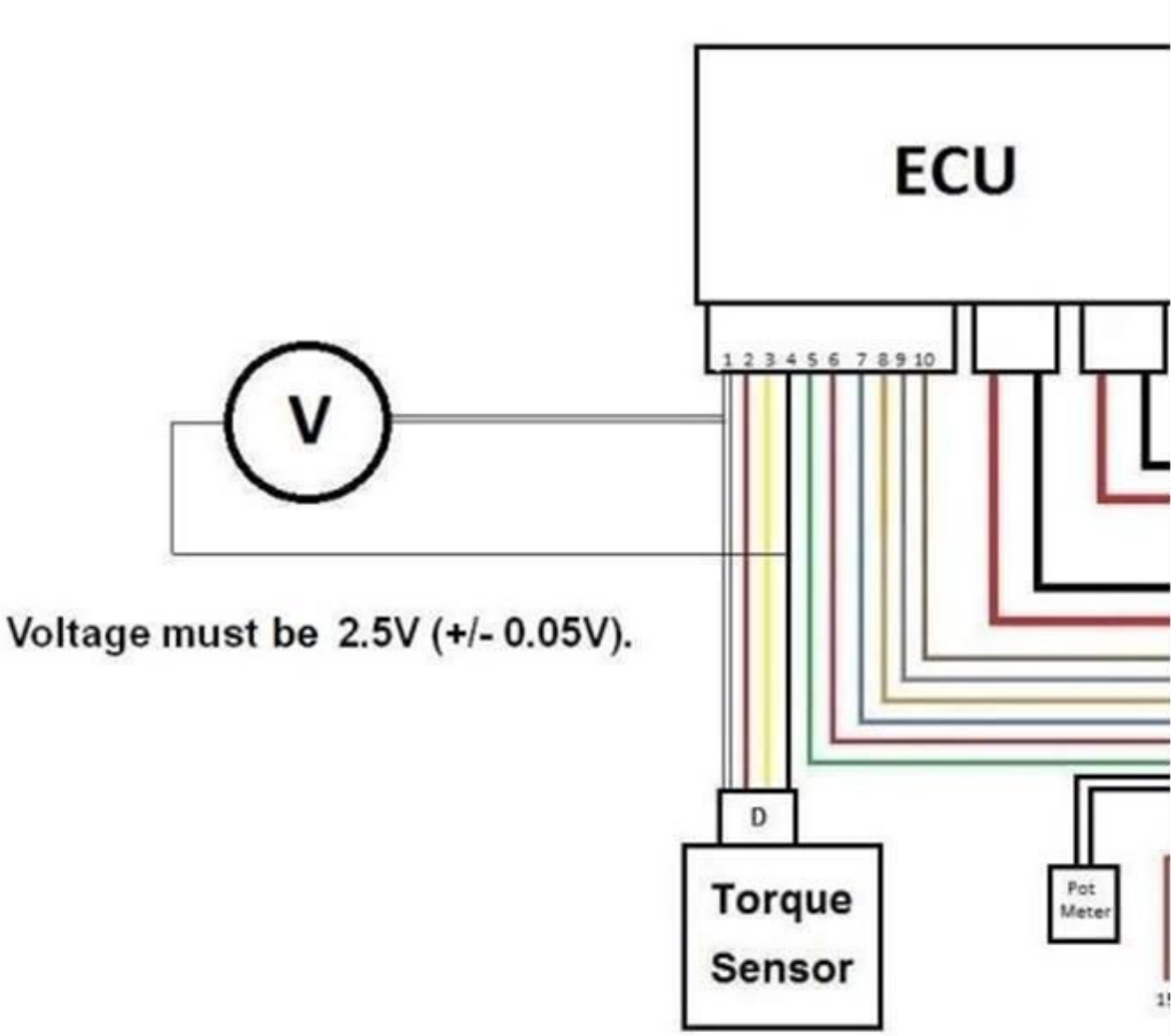
17 - Torque sensor voltage, flowchart point 2.1



Normally there are 4 wires, but there are exceptions!

RED : 5V or 8V, Plus
BLACK : Earth.
YELLOW : Signal wire, measure 2.45V to 2.55V to sensor earth.
WHITE : Signal wire, measure 2.45V to 2.55V to sensor earth.

If measured values are out of range, it's possible to achieve minor adjustments with a small potentiometer at the torque sensor (depending on the system!).

Contact for further instructions EZ Powersteering at workshop@ezpowersteering.nl and refer to this chapter.

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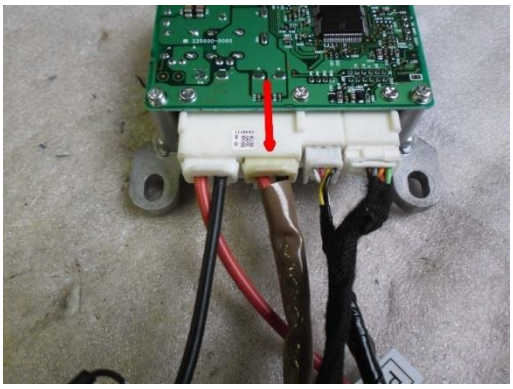
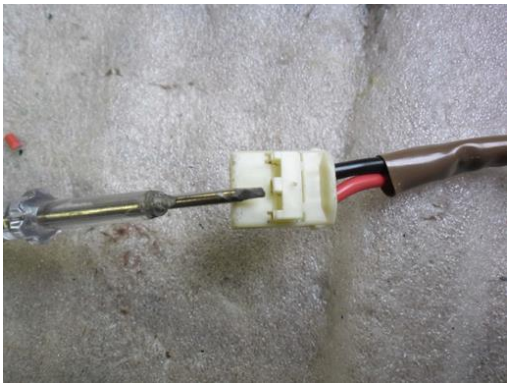
18 - Additional information steering wheel vibrates

When the issue occurs that after replacement from the ECU , the EZ-unit doesn't function OK and the steering wheel is juddering/ vibrates. This is caused by the fact the electric motor turns the wrong direction. This can easily be solved by switching the wires in the connector from the motor.

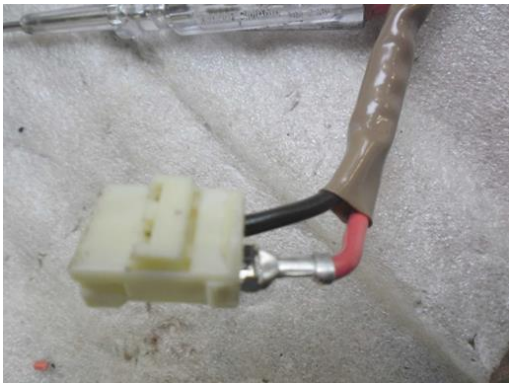


Locate the right connector in the ECU .



Once the connector is removed, use a screwdriver to lift the clip in the housing to unlock it.

Use a small screwdriver to push back the clip inside the housing. Pull the connector from the housing at the same time.



Do the same with the other connector/wire and change location inside the housing, Push the connectors back and push down the clip to lock them inside the housing.

Fit the connector into the ECU and test the system again!

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Notes :