ULPOWER
AERO ENGINES

Interactive Troubleshooting Guide

M0410 - Version 2.5

Click an engine or scroll to next page to continue

ULPOWER
AERO ENGINES

Contents:

Welcome to the ULPower troubleshooting guide 2.5

The first section covers ‘procedures to follow before first start’ this is a reminder for those who are not yet ready to start – to make sure that they have covered the basics. Your particular installation may vary slightly, and we refer you to your engine and OEM installation guides for further details.
Please keep in mind that your engine has been fully tested at factory before shipment.

The Troubleshooting guide starts immediately after and is linked between topics. You may always return to the ‘Troubleshooting Start Page’ for troubleshooting by clicking on the ULPower logo on the top right of each page.

You may also simply ‘scroll’ through the guide. If you are using this guide on a mobile phone or tablet you may need to download the Adobe Acrobat Reader to enable the links.

This document is provided as a guide. Please let us know if you find any errors or provide ideas for improvement.

The abbreviation “i.a.w. … manuals” means ‘in accordance with… manuals”
Please ALWAYS cross check with the latest installation, maintenance , operating manuals, available from
http://ulpower.com
Regards

The ULPower Team (email *info@ulpower.com*)

E&OE April 2025

BEFORE FIRST START:

During installation consult and work i.a.w. the various installation manuals

1. Battery/Oil:

Check if the battery is fully charged and oil level is sufficient

2. Calibrate senders/sensors:

Oil temperature, EGT and CHT senders using boiling water (100°C/ 212 F)

3. Check the Fuel System with a fuel flow test:

Disconnect return line and put into measuring jug
Run pump 1, collecting fuel
Measure fuel flow coming out of the return line MIN. 120 l/h or MIN. 1 liter (quart) in 30 seconds
Repeat for pump 2
Reconnect lines and check fuel pressure (3.0bar/49psi) (without starting the engine)

4. Check ECU warning lights (Check light/Battery low):

Power ON to ECU
Check light/Battery low light ON for 2 seconds, then OFF.
Disconnect Air box temp sensor – if working, the UL check light comes on. Reconnect sensor – light goes off.

5. Start-up routine with COIL checks

- Ignition coils : set coil 1 ON / coil 2 OFF
- Throttle max 30% open (normally cracked open)
- Safety check – area clear and shout 'clear prop'
- Master ON
- Main Fuel pump selected ON
- ECU ON
- Activate 'Start' - max 5 sec – wait 15 sec - repeat max. 4 times
- Engine should be running. Wait 15+ seconds, stop engine (ECU OFF)
- Repeat with coil 1 OFF / coil 2 ON. Wait 15+ seconds, stop engine
- Repeat with coil 1 ON / coil 2 ON. Leave engine running

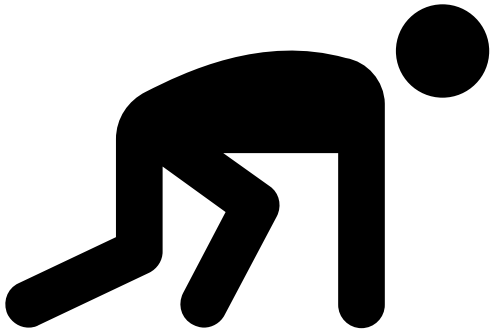
6. Other first start checks

- If possible connect with ULread .
- Visual check for oil leaks / fuel leaks / mechanical interference
- Measure oil pressure and check with instruments/readout
- Run the engine at +/- 1200 rpm until oil temp. is 60°C (140°F)
- Shutdown (switch ECU OFF, Fuel pump OFF, coil 1 OFF , coil 2 OFF Master OFF
- Adjust idle if necessary
- Allow engine to cool and 'finger test' for oil leaks.

7. Running in: Avoid full throttle (max 2800rpm/2700rpm turbo) for the first 10 hours

TROUBLESHOOTING STARTS HERE

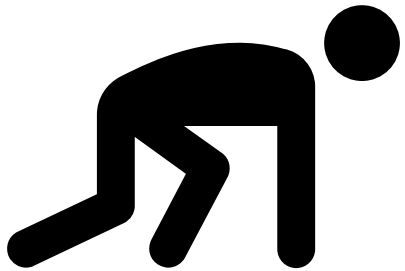
What to do if your engine won’t start or runs rough?



at first start

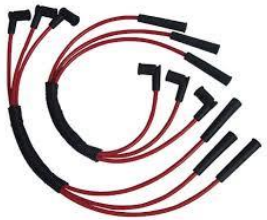
after first start

Remember to always work i.a.w. the latest manuals. If you are unsure of what action to take or unable to resolve your problem, contact your local ULPower Aero Engine dealer http://ulpower.com/en/dealers



Trouble shooting when your engine fails to start at FIRST START

Start button, Grounding & ECU connection



Ignition cables

Fuel system

Sparkplugs

Coils

ECU

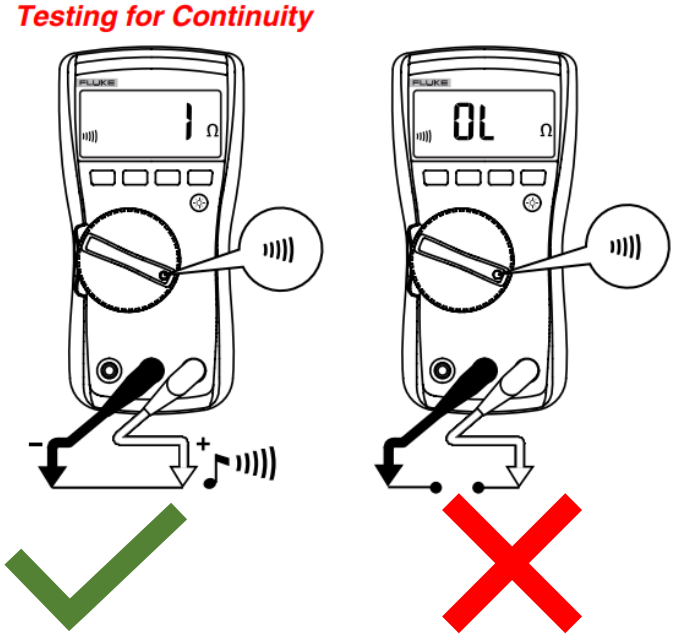
Wiring loom

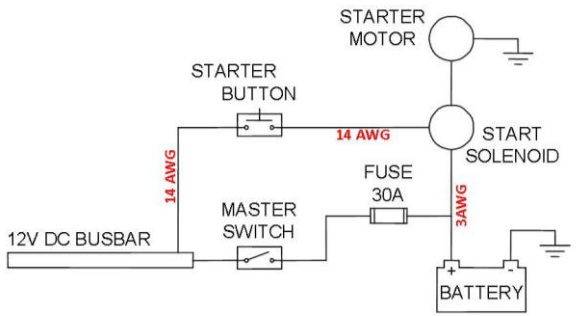
Injectors

Click text or the image above for an aspect you suspect – or, if unsure follow the sequence from left to right...

Start button, Ground cable & ECU connection

1. Check that the start button closes the circuit to the starter relay – disconnect at starter relay and check using continuity on a multimeter. Reconnect if good.
2. Check wire size at the start button (min AWG 14!)
3. Visually check for presence and connection of ground cable between the engine and the airframe.
4. Check using a multimeter check for ‘continuity’, i.e. that there is no break from engine to the negative terminal on the battery. This may require sequential readings, depending on the installation.
5. Check both ECU connectors are connected and that all wires are routed and connected i.a.w. the latest installation manual for the engine. (available from ULPower.com)

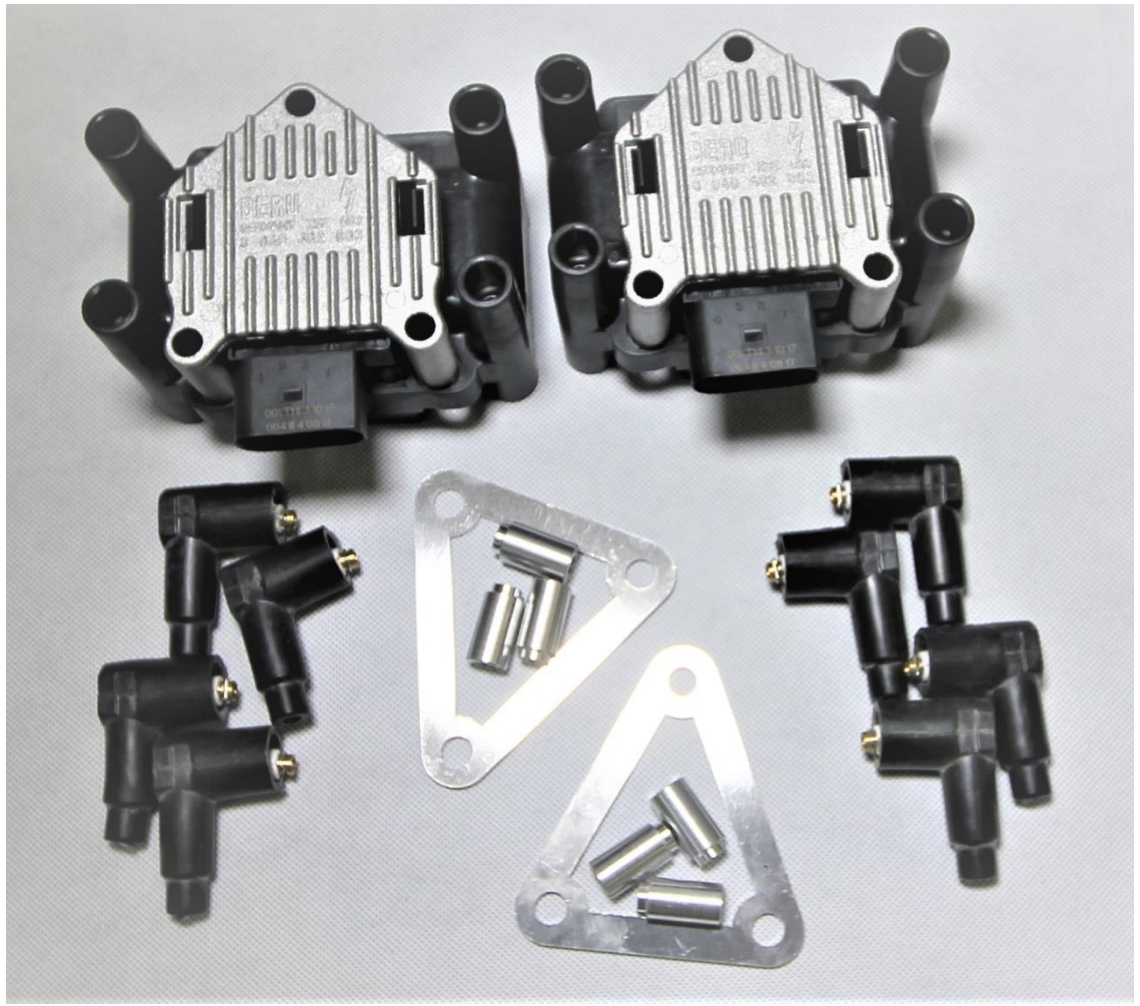




Ignition cables

Check the ignition cables and connections
(tutorial available on ulpower.news)

- Make sure that both connectors (coil side and spark plug side) are installed i.a.w. the installation manual. If not installed properly, no contact or an incorrect contact may occur.
- To check if the connectors are installed properly, pull fairly hard on both ends of the ignition cable.(coil side + sparkplug side). The connectors will remain in place if installed correctly. If they break free – REMAKE THE CONNECTION.
- Check if both connectors from the wiring loom are well connected/seated to the coil
- For 4 cylinder engines (260 and 350 series) make sure that the supplied aluminium coil bracket is installed. (Omitting the coil bracket may result in a deformed coil with loss of contact inside the coil.)



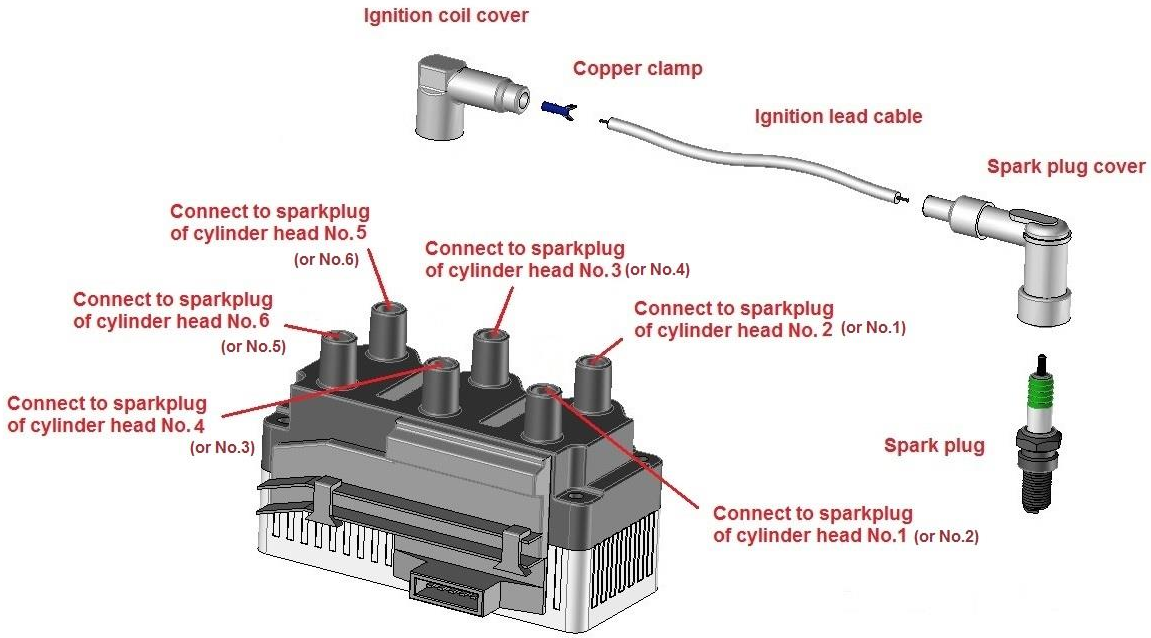
4 cylinder coils require the aluminium brackets for correct operation

Ignition cables

Check HT cable orientation (are HT cables correctly installed between cylinders/spark plugs and coils)

NOTE: for RR engines see relevant installation manuals

4 Cylinder
260/350 series



6 Cylinder
390/520 series

Fuel system

UNDERSTAND THE INSTALLATION

Normally two fuel pumps are installed, at times only one is installed. CHECK before continuing.

Depending on the installation, the main and/or auxiliary fuel pump may be commanded by the ECU via a relay.

Depending on the installation there may be a DPST switch to select pumps and/or an ‘over-ride switch’.

UNDERSTAND THE INSTALLATION YOU ARE WORKING ON BEFORE TROUBLESHOOTING.

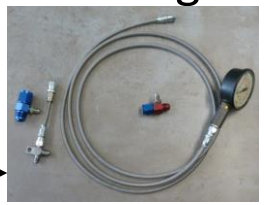
Fuel Pump Control Relay (FPCR)

With the FPCR is fitted, when switching the ECU ON: the FPCR protected pump(s) run(s). If the engine is not started, the ECU will switch off the FPCR protected pumps after 15 seconds. If this is part of your installation – CHECK it functions correctly.

Fuel system (cont...)

Check the fuel pressure – if no/insufficient pressure then:-

1. **Can you hear the pump(s)?** If not, check the electrical connection – use a multi-meter on 'DC' setting if necessary. If yes, check if they run in the right direction. (wiring direction "+" and "-")
2. **Is there FUEL to the Pumps?** Check fuel taps and that check valves are correct – and that fuel is in the selected tank. Check for blockages/restriction in the lines (kinks, collapsed lines etc)
3. **Do you have the right fuel lines?** You need 1/2"/12mm I.D. lines (-8) to the pumps to ensure sufficient volume at the intake.
4. **Are you sucking air?** Check pick-up points in the tanks and no weak spring drains that allow air to be sucked – if necessary provide fuel from a slave tank to test flow.
5. **Are you sure your instruments reading correctly?** To check pressure install a second analogue manometer in the fuel line.
   Ask your agent for the ULP oil and fuel pressure trouble shooting kit T080001



6. **Are the filters blocked?** Check pre-pump and fine post-pump filters for blockage, replace/clean if necessary.
7. **Check return line** is not compromised or closed off NOTE: min. 1/4"/6.35mm (-4), ideally 3/8"/9.5mm (-6)
8. **Pressure Regulator?** There might be a fuel pressure regulator problem (please contact your ULP agent)

TO SEE FUEL FLOW CHECK CLICK HERE

Spark plugs

How to check the spark at the plugs

- For safety reasons: always disconnect the fuel pump before running this test
- For both coils : put switch TO ON

Method 1:

- Remove 1 sparkplug and hold the spark to the “ground” (or use a new spark plug)
- Engage starter engine
- Check if there is a spark. CAUTION HIGH VOLTAGE!
  NOTE: You may not see the spark in bright sunlight (shield it for better visibility)

Method 2 (preferred method)

- Install a ‘HT ignition lead spark tester’ unit between the boot and the spark plug (you may install 4 to see all at once)

ACTION?

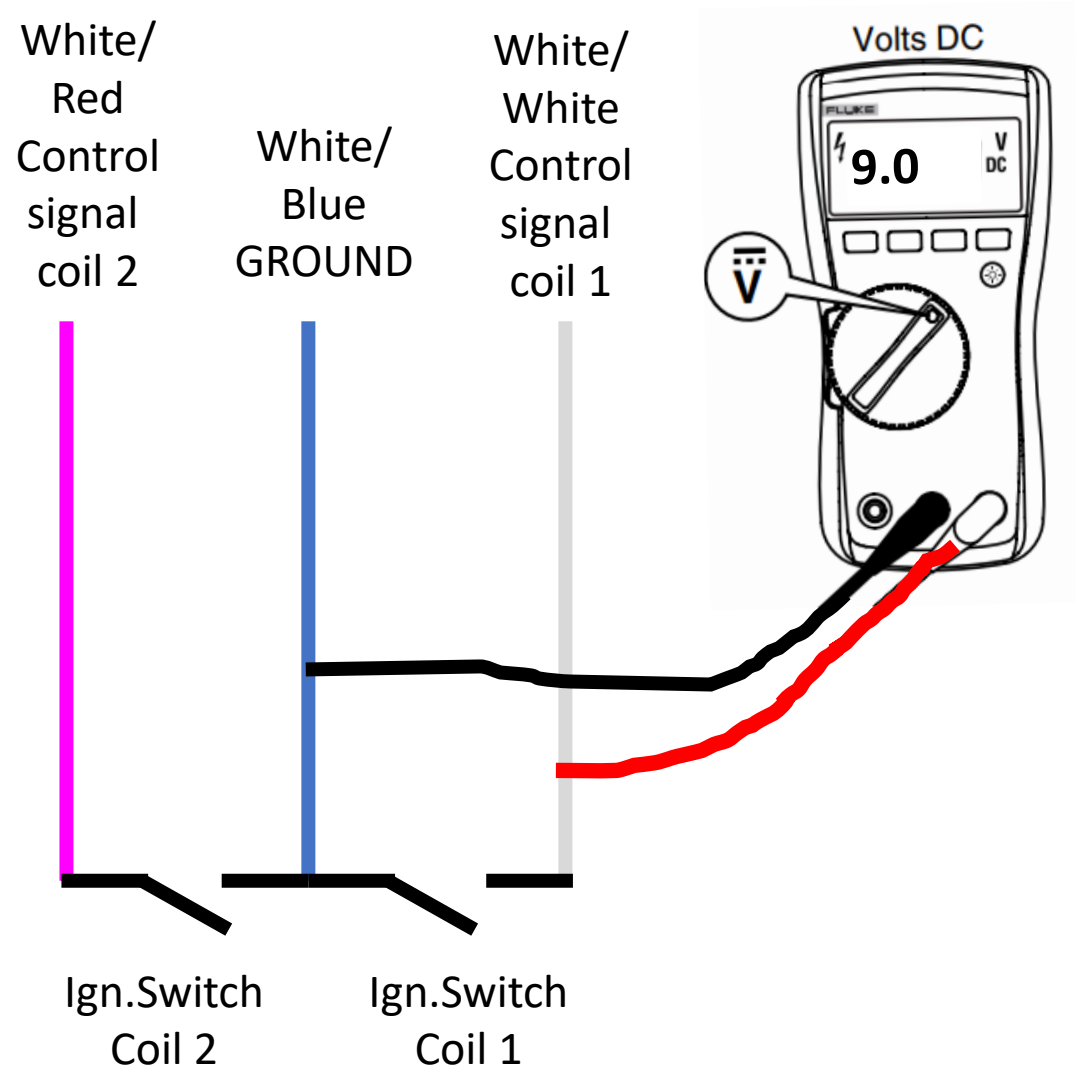
- If there is **NO** spark, go to COILS

If there **IS** a spark, go to INJECTORS

Coils

Check for a short-circuit in the wires to the coil switches

- Switch both ignition switches to ON (ie OPEN circuit) alternatively disconnect wires from switches.
- Master ON and ECU ON (NOTE ENGINE IS LIVE)
- Using a multi-meter (set to DC volts) Measure voltage between “ground” and “control signal wire” – see right.
- If you have 0v , there is a short-circuit between ground and control signal wire in the wiring loom. Check/correct/replace wiring.
- If you have 9v go to ECU troubleshooting



ECU (Engine Control Unit)

Check ECU connectors

Thread the cockpit- and engine-wiring loom onto the ECU until fully home
(red line on ECU connector must be hidden). Otherwise, this can cause poor contact and lead to very dangerous situations (sudden engine stop, engine hesitation,…)

ECU (Engine Control Unit)

Check ECU supply voltage

The ECU needs at least 10V (even during cranking) to function. If your battery is faulty or not fully charged, the ECU will not boot and remain active – consequently there will be no spark and no injector signal.

Using a multi-meter set to DC Volts, measure the voltage at the battery terminals (min. 12 V)

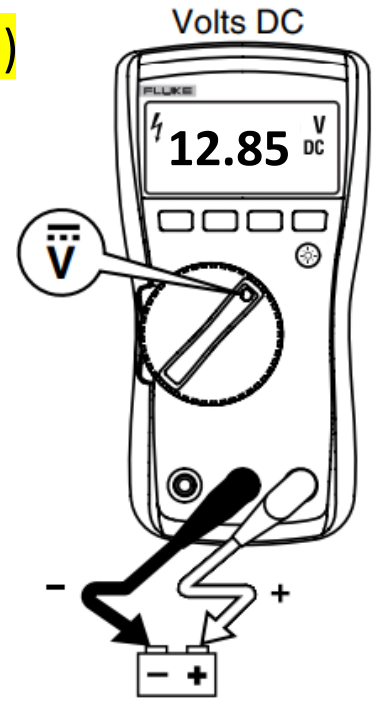
- If not ok , change battery and try to start engine again.
- If ok , disconnect both coils for safety reasons. Master ON and ECU ON (NOTE ENGINE IS LIVE)

Measure voltage between "+" and "-" on the ECU wiring loom coming from the cockpit.

TIP: Ideally use a Multi-meter which will record minimum voltage.

Engage the starter of the engine and check for voltage drop to the ECU.

If the voltage drops below 10v during cranking, relocate battery closer to the engine and/or use larger section wires. (see installation manual for more details)



Cockpit Wiring

How to check a possible wiring problem on the cockpit side

Instruments or bad wiring in the cockpit can disturb the ECU

Either

Use the ULPower TROUBLE SHOOTING WIRING LOOM (T080003) by removing the small connector from the ECU and replace with the troubleshooting loom

or

- Disconnect ALL wires from the ECU-cockpit harness
- Insulate all wires (green, browns, grey yellow), white shrink sleeve to avoid contact with each other or ground.
- Use a separate fully charged battery (do **not** connect two batteries together)
- Connect the blue shrink sleeved wire to the battery NEGATIVE (-) side
- Connect the red shrink sleeved wire to the battery POSITIVE (+) side

Then (NOTE ENGINE IS LIVE)

Try to start the engine. If the engine starts, the problem is in the cockpit side. Check/correct/replace wiring as necessary.

If engine is still not starting, consider replacing the coils

Troubleshooting wiring loom T080003

Injectors

How to check if the injectors work

- Use the ULP injector trouble shooting kit (T080002) (shown right)
- For safety reasons : disconnect both connectors from the coils
- Disconnect a connector from the injector on cylinder 1.
- Connect the trouble shooting kit
- Master ON and ECU ON (NOTE ENGINE IS LIVE)
- Keep the additional injector close to your ear.
- Engage the starter of the engine
- Listen to hear “click – click – click”
- If no : it means that there is no signal coming from the ECU or damaged cable/loom – try another injector…
- If yes : there is a signal coming from the ECU.
    - The installed injector is possibly blocked and may have to be replaced.

If you have been through all of the above steps and still cannot identify the issue, contact your ULPower dealer .

Troubleshooting after first start

RPM

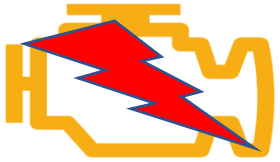
Black Smoke, High Fuel Consumption, Sooty plugs

Oil Pressure

Oil Temp

Oil Leaks/ consumption

Loss of Compression



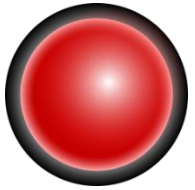
Detonation

Fuel Pump failure

CHT variations

EGT variations

Regulator/ Voltage drops

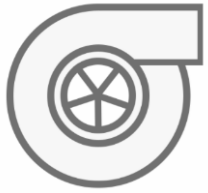


ULP Check Light

Starter problem

Noise / vibration

Fuel pressure



Turbo engine

Note: some installation errors (*see trouble shooting at first start*) only appear at a later stage. Please also go through trouble shooting at first start, if required.

RPM

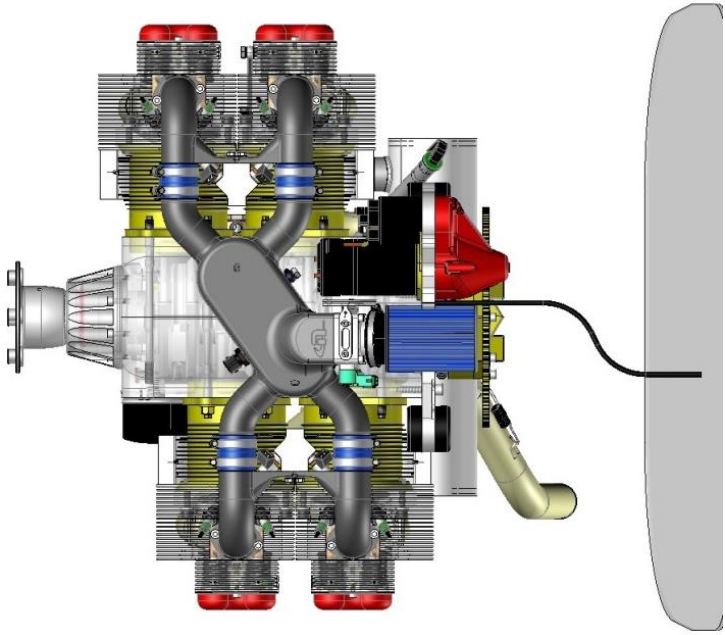
What if your engine runs out of control/ RPM unstable

DOES THE ULP CHECK LIGHT COMES UP ?
If yes, find out with ULRead which sensor is causing it. Check connections,
Identify and replace the sensor/connector or repair/replace loom if damaged. Test again.

If not, continue below

CHECK THROTTLE CABLE
As per the installation manual, the throttle cable should never be installed ‘taut’ or ‘tight’ from the engine to the firewall. Always install it with some slack. (see IM)

NB: If the throttle cable is installed under tension, the ECU may consider the engine movement (caused by vibrations pulling and releasing the throttle cable very small amounts) as a ‘request’ for continuous acceleration and therefore an increase in fuel injection, resulting in a rough running engine and/or black smoke.



Good

RPM

CHECK FOR ‘FALSE’ AIR/COLLAPSED LINES/OTHER SUCTION SIDE ISSUES

If the cylinder can suck air into the fuel system, or any other aspect of the fuel/air system that can affect mixture occurs it will cause inconsistent RPM readings. (increase/decrease):-

- Inspect the small hose between the airbox/manifold and the fuel pressure regulator for fit/damage.
- Check the same hose banjo eye at the airbox/manifold for torque/connection.
- Check torque on the two M6 bolts at manifold inlet tubes at each cylinder head
- Remove the air filter and check if both screws and throttle axle are still in place
- Check fuel line size, routing, condition and connections are i.a.w. manuals
- Ensure that the fuel return line is free of obstruction (check valve not stuck/incorrectly installed)
- Check filters
- Check for condition/fit of sensor connectors on airbox/manifold
- Check that fuel drains/seals are not allowing air to enter the system (eg Gascolator?)
- Check fuel tanks are not unported (the pick up pulling air from the tanks)
- Check fine screen on Pressure regulator (note only for advanced users)
- See here for more ideas

The points below are additional for the turbo engines

RPM

RPM above 2750 ? (RPM limiter)

- Is the maximum RPM above 2750 (engine stutter) ? The max. RPM is limited to 2750 RPM (by the ECU).
  - Adjust the pitch of the propeller
  - Verify that the turbo pressure is in the normal range and stable

Turbo pressure to high ?

- If the turbo pressure is too high (> 1.4 bar/20.3 PSI) the over boost limiter will be activated (engine stutter).
  - Inspect the hose between the boost controller and connection at the throttle (turbo pressure)
  - Check the hose between the ECU and connection point at the throttle (turbo pressure)
  - Inspect the hose between the boost controller and wastegate
  - Check and clean the small airfilter on the wastegate and boost controller
  - Measure the voltage (12V) on the boost controller (see further)
  - Verify the electrical wiring between the ECU and boost controller
  - Inspect the intake tubes from airfilter –> turbo –> intercooler –> throttle
  - Check if the wastegate is not stuck (remove exhaust tube to verify this)

Click HERE for specific turbo throuble shooting

Black smoke / black spark plugs / high fuel consumption

DOES THE ULP CHECK LIGHT COMES UP ?

If yes, find out with ULRead which sensor is causing it. Check connections.
Identify and replace the sensor/connector or repair/replace loom if damaged. Test again.

If not, first check for bad contact in ignition wires connections to the spark plug cap and the coilplug cap .
After that continue below for 'sensor faults that may not cause a ULP check light'

- **TPS (THROTTLE POSITION SENSOR) PROBLEM**

If the TPS values are between 0.3 V (throttle closed) and 4.7 V (Wide Open Throttle) but the sensor is not working properly, resulting in an incorrect fuel/air mixture.

- **INLET AIR TEMPERATURE SENSOR (ATS) PROBLEM**

If the ATS values are reading between -20°C and +80°C the check light will not come up. However, if the sensor is not working properly (reading an incorrect temperature) the fuel/air mixture will not be correct.
If you do not have ATS values reported on your instruments, you can use ULRead to get the values.

- **OIL TEMPERATURE SENSOR (OTS) PROBLEM**

If the OTS values are reading between -30°C and +140°C the check light will not come up. However, if the sensor is not working properly (reading an incorrect temperature) the fuel/air mixture will not be correct.

Black smoke / black spark plugs / high fuel consumption

Install ULRead to find out which sensor is misreading/not working correctly.

- Replace the TPS, ATS or OTS, if necessary

- **AIR PRESSURE SENSOR (APS) PROBLEM/INSTALLATION ISSUE**

Inspect line condition, looking for cracks, kinks, connection issues.
Make sure that the line is not blocked.

<u>Naturally aspirated engines :</u>

If the APS (installed in the ECU) is not reading the air pressure 'at the entry to the air filter' an incorrect fuel/air mixture will occur.

<u>Turbo engines :</u>

The air pressure sensor measures the turbo pressure at the throttle. Verify the connection between the ECU and turbo pressure measurement location.

Do not blow into the line when connected. Do not attempt to open the ECU

NOTE: Your engine ecu-map is set to run a little rich at idle (for easier starting and cold running), consequently 'black' spark plugs may be seen if inspected immediately after a period of 'idling'. To check mixture is accurate: -
Run the engine on the ground at +/- 2300 rpm for three minutes. Stop the engine using the ECU switch. (do not throttle down to idle first). Allow engine to cool and check spark plugs. If the spark plugs are grey / clear, the mixture is correct.

Oil pressure

- If you do not read positive oil pressure on start up, shut down your engine and investigate.
- Oil Pressure may be higher than usual when starting in very cold conditions, due to the viscosity of the oil. Allow oil pressure to stabilize with temperature.
- The oil pressure sensor has to be compatible with your instrument. Sometimes calibration is needed.
- We advise to install an analogue manometer (or ask your ULP agent for the oil and fuel pressure trouble shooting kit)
- Adjust the parameters on your instrument, or change the sensor until logged values are
- very close to/equal the manometer reading.
- If the oil temperature is too high, the oil pressure will drop. We advise to keep the oil temperature below 105°C (221°F).
- Use of the wrong type of oil may not only affect oil pressure but damage your engine.

NOTE: A well-functioning engine doesn't always need a high oil pressure. A high oil flow is as important as the oil is not only a way to lubricate your engine but also to cool it down.

Oil temperature too high

FAULTY SENSOR/FAULTY GAUGE

- Immerse the sensor in boiling water to check if the read-out is correct. (boiling water = +/- 100° c)
- Calibrate the senor and adjust your instrument or replace it if necessary

LOW OIL LEVEL

Fill up to the maximum level as read on your dipstick

INLET AIR TEMPERATURE IS TOO HIGH

If the air filter is taking in hot air due to its location inside the engine compartment, the engine temperature will rise, and consequently the oil temperature will rise also.
NOTE: max inlet air temperature = ambient air temperature + 10 °C
Under normal operating circumstances, the max. intake temperature is 40°
Consider bringing fresh air from outside the cowling, for example using a NACA duct and the ULP air inlet box (K0600001 / K0600002), and scat hose the filter to fit inside to bring fresh, cooler air to the air filter.

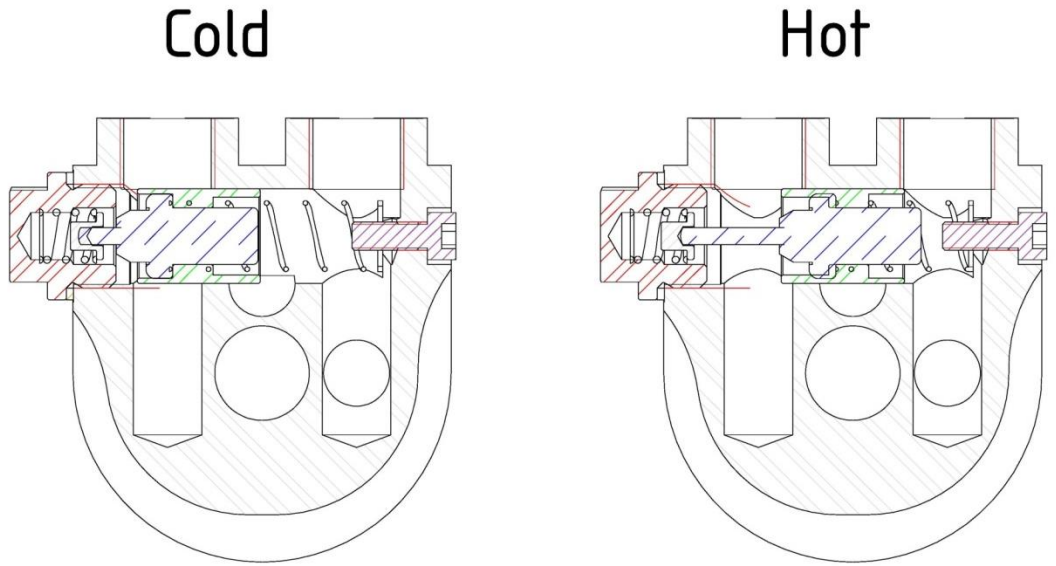
Oil temperature too high

INSUFFICIENTLY WORKING OIL COOLER

- Not only the oil cooler size but also the location of the oil cooler is important.
- Install the oil cooler as low as possible under the engine centre line. This ensures that the incoming air is not deviated by the turbulence around the propeller.
- Close all gaps around the cooler
- Incoming air must find an easy way out. Make sure there is no interference with the air coming through the cylinder heads and create an escape-way out of the engine room that is big enough. See installation manual for a testing procedure. Your oil cooler installation works fine if there is a delta T of at least 15°C (27°F°) (measurements at the entrance of the cooler and on the outlet)

THERMOSTAT STUCK/NOT WORKING

- If the thermostat sticks in the ‘open’ condition the engine may run cooler than expected.
- If the thermostat sticks in the ‘closed’ condition the engine may run hotter than expected.
- Consider taking thermostat housing temperature measurements



CHT: There is a big difference between cylinders

FAULTY SENSOR OR INCORRECT SETTINGS ON INSTURMENTS

- Immerse the sensor in boiling water to check if the read-out is correct. (+/- 100C)
- Calibrate the senor and adjust your instrument / replace if necessary

NO SPARK OR NO FUEL INJECTION

- check ignition system or spark plug
- check fuel injector

RAM AIRBOXES NEED MODIFICATION

- An equal amount of fresh air is required to ALL cylinder heads. Sometimes you need to modify the ram airboxes to achieve this. Check that baffle seals (if installed) are fitting correctly.

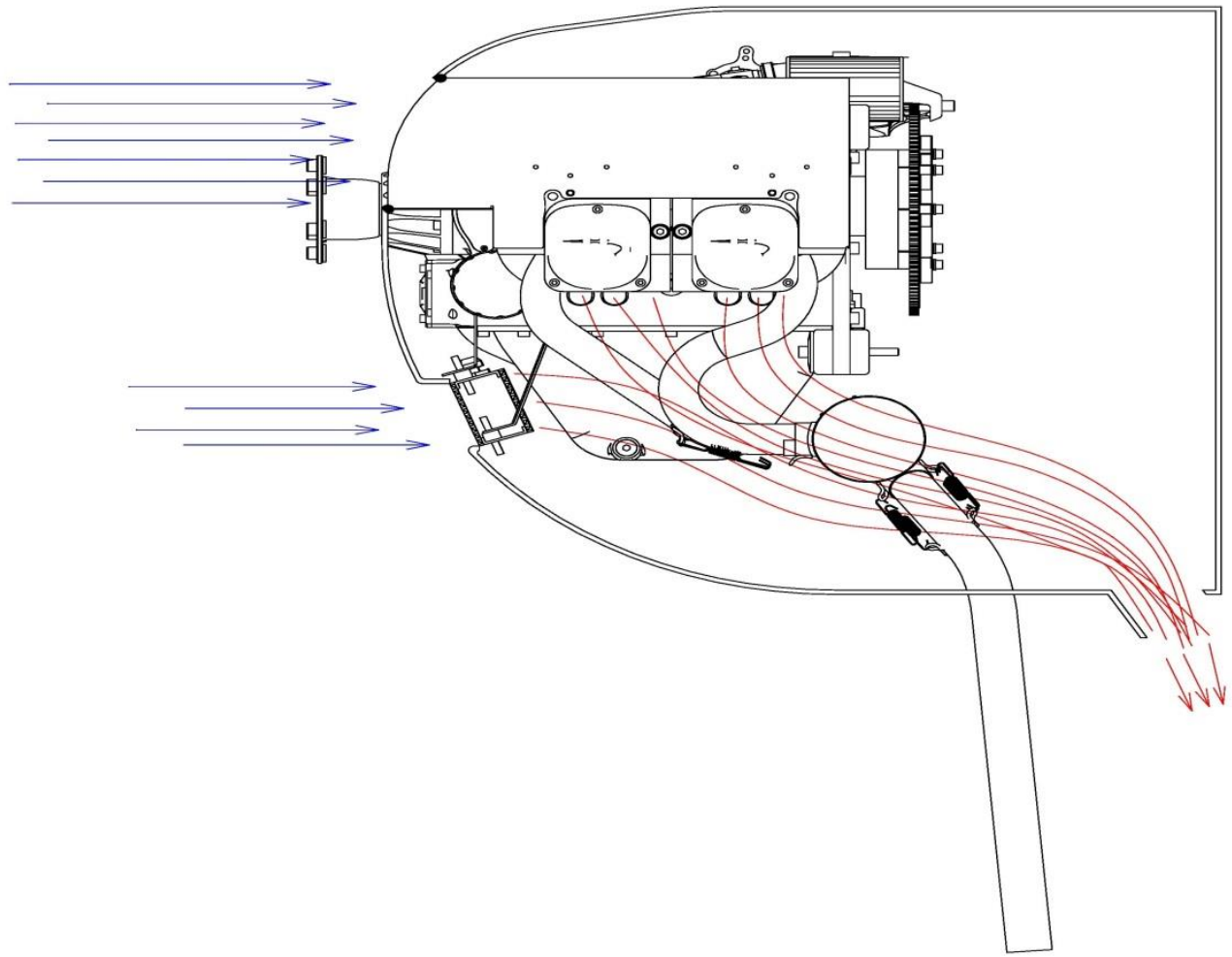
BAD VALVE CLEARANCE SETTING

- Check clearance and adjust i.a.w. latest manuals.

CHT : all temperatures are too high

Similar as to “oil temperature too high” (see here)
The installation of the ram air baffles is very important.

- Make sure that enough air can reach the air boxes.
- Close all gaps around the air boxes. That way the airflow is forced to go over the cylinder / cylinder heads.
- Incoming air must find an easy way out. Make sure there is no interference with the air coming through the oil cooler and create an escape-way out of the engine room that is big enough.
- See installation manual for a testing procedure.



EGT: Big difference between cylinders

FAULTY SENSOR OR INCORRECT SETTINGS ON INSTURMENTS

- Immerse the sensor in boiling water to check if the read-out is correct. (+/- 100C)
- Calibrate the senor and adjust your instrument / replace if necessary

NO SPARK OR NO FUEL INJECTION

EGT is the best parameter to check if the cylinders are working properly. If the EGT value drops out completely and fast, there is no spark or fuel injection

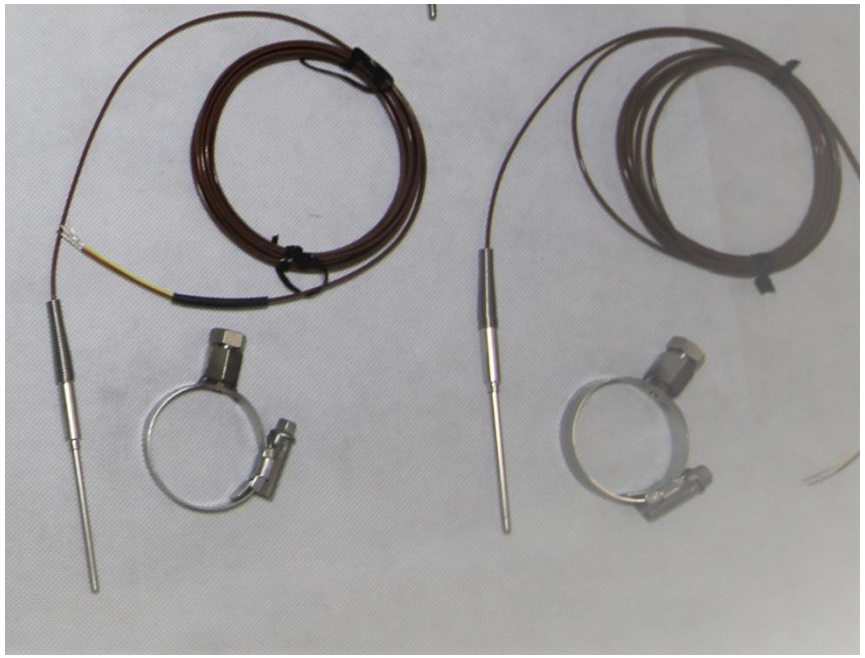
- check ignition system or spark plug
- check fuel injector

BAD VALVE CLEARANCE SETTING

- Check clearance and adjust i.a.w. latest manuals.

BAD CONTACT IN THE INGNITION WIRE CONNECTORS

- Check if sparkplug and coil plug are properly connected.
  Go to "ignition cables" for more info and/or check ulpower.news tutorial



Detonation

INCORRECT TYPE OF FUEL : Using fuel with an inferior octane ratio (wrong fuel or old/badly stored fuel) can lead to detonation.
Temperatures inside the cylinder heads rise quickly with a total engine failure as result.
Please read the latest engine manual/SB to know about the minimum octane ratio that is required for your engine.

MIXTURE TOO LEAN: Your ULPower engine is an injection engine. Due to continuous and copious amounts` of fresh fuel (+/- 120liters/hour) pumped through across the fuel rail, there is no risk of vapor lock or icing . However, if air is sucked by the fuel pump, it will lead to a lean mixture and higher temperatures and risk of detonation. How to prevent air suction ?

- Make sure the suction line to the fuel pump can never (whatever attitude your plane is in) suck air from the fuel tanks.
- Make sure fuel tank pickups cannot unport
- Use a fuel header tank where appropriate
- See here for more details on air entering the system

INLET AIR TEMPERATURE TOO HIGH: If the inlet air temperature is too high (max inlet air temperature = ambient air temperature + 10 °C), you not only lose a lot of power but the cylinder head temperature and the oil temperature rise. As a result of this, the detonation risk rises.

- Consider bringing fresh air from outside the cowling, for example using a NACA duct and the ULP air inlet box (K0600001 / K0600002), and scat hose for the filter to fit inside to bring fresh, cooler air to the engine.

Regulator: no power output or voltage drop

No electrical power output

BAD CONNECTION BETWEEN ALTERNATOR AND REGULATOR

Insufficient wire sizing, damaged wires and poor connections can result in increased resistance. This may lead to burned contacts / failure. Check wire, both connectors and replace if necessary

ALTERNATOR FAILURE

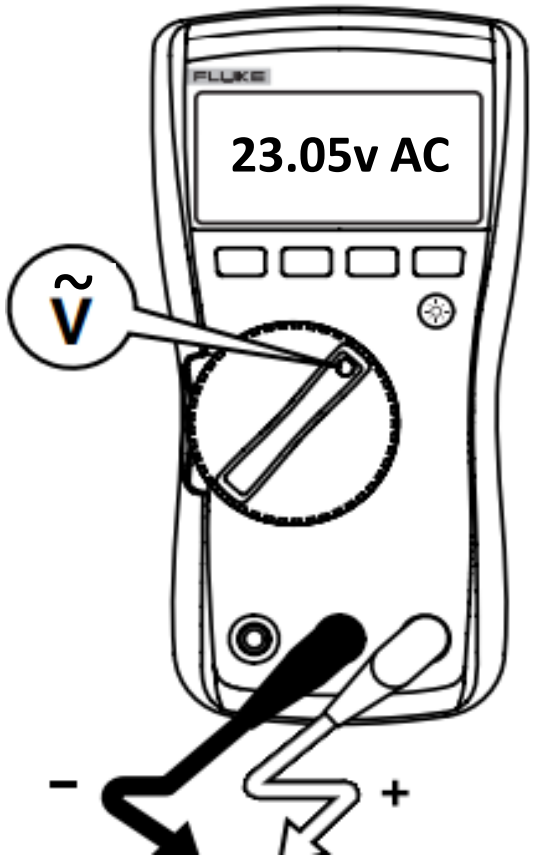
Both (30A and 50A) alternators are 3 phase AC generators.

How to check the 3 phases :

- Disconnect the 3 pin connector on the alternator wiring
- Run the engine (usual safety conditions apply)
- Carefully measure the voltage between wire 1 and 2 ; 1 and 3 ; 2 and 3 at different rpm settings
- All values should be approximately the same at each setting:-

RPM	30A alternator	50A alternator
1000	+/- 23 v	+/- 17 v
2000	+/- 50 v	+/- 34,5 v
2900	+/- 65 v	+/- 52 v

Replace the alternator if not all 3 values are +/- equal

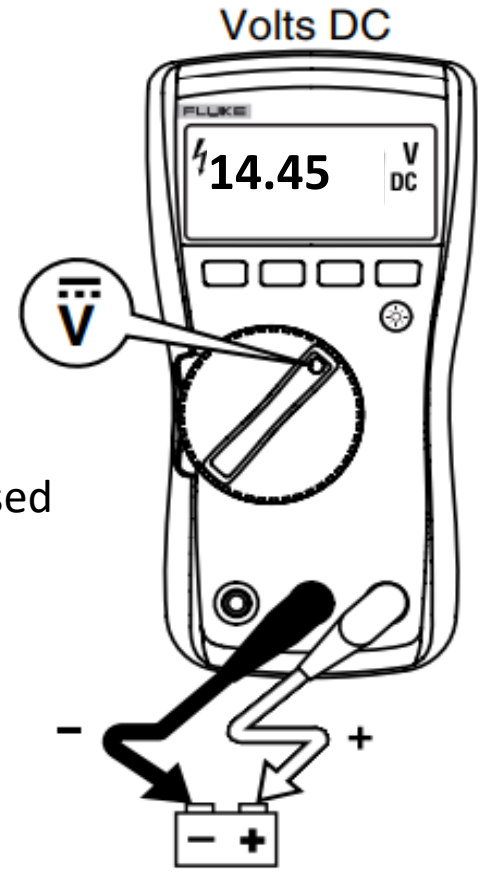


Regulator: no power output or voltage drop

REGULATOR FAILURE

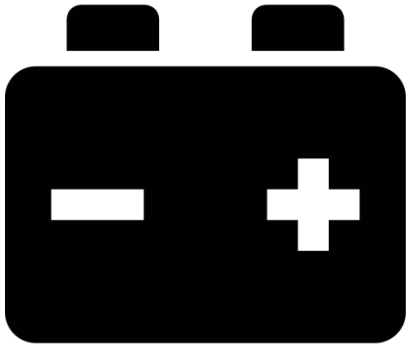
Never run the engine if the regulator is disconnected from the battery !!!!!!

- Output power (volts) depends on RPM (see alternator output)
- Measure across the battery +ve and –ve terminals with a voltmeter on ‘Volts DC’ whilst the regulator is connected and the engine is running
- A fully charged battery should read 14.3 – 14.5 V. (min. 12,7V is required before start up)



VOLTAGE DROP ON REGULATOR

Field experience has shown that in most cases a voltage drop on the regulator is generally caused by a poor battery. Replace the battery and retest.



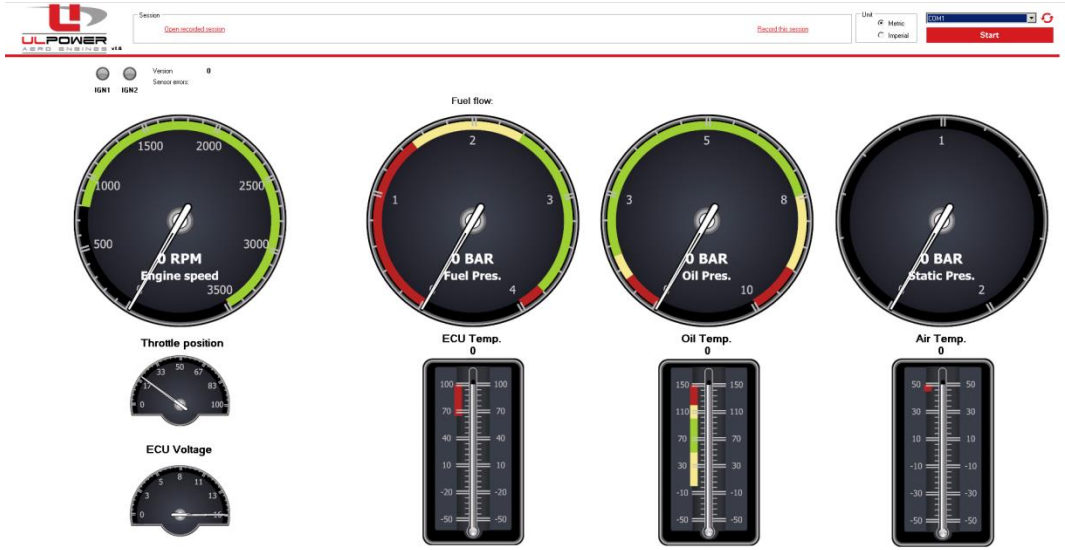
ULP check light comes up

ECU "OFF" If your ECU is "off", the LED is off (you may have a test button to test your LEDs function)

ECU "ON" If there is a sensor failure TPS , oil temperature, inlet air temperature, altitude temperature or crankshaft position sensor the ULP check light will be illuminated, indicating a sensor disconnection or failure.

- Install "ULRead" on your PC and use the "ULRead CABLE" to find out which sensor is causing the error.

Procedure:
connect PC to ECU
Power "ON" to ECU
Activate the ULRead PROGRAM
Indications on your PC screen are visible
Find out which sensor failed and replace.

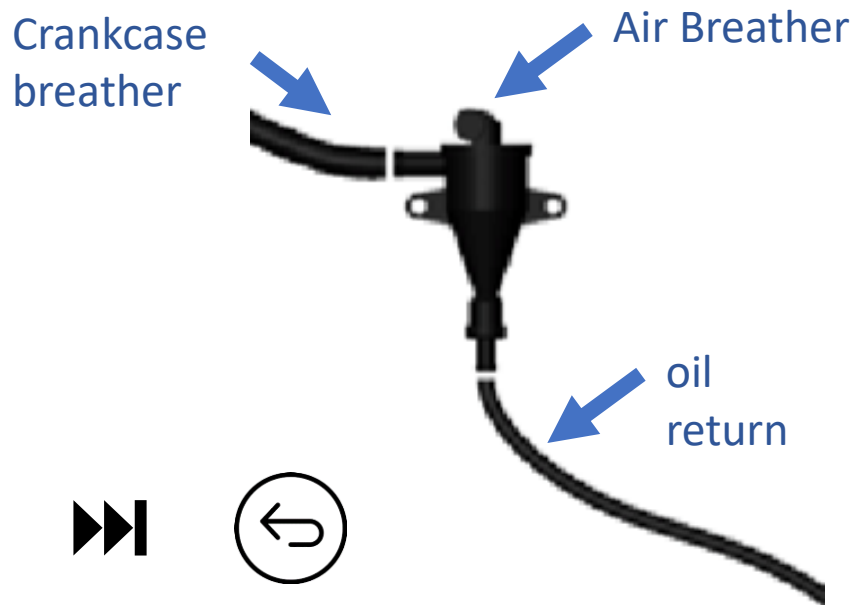


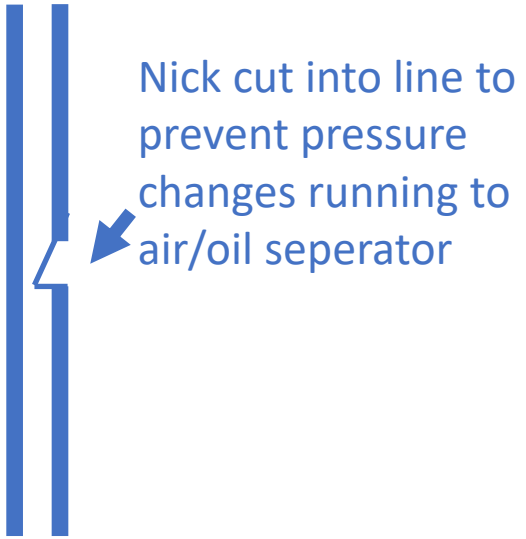
If you have a turbo engine AND check light is ON + power reduction, click here

Oil leaks/Consumption

OIL/AIR BREATHER LINES BLOCKED

Under normal circumstances, a mixture of air and oil is pushed through the crankcase breather line into the oil/air separator as part of the normal venting of the crankcase. The oil flows back into the oil sump trough the oil return line. Avoid ‘loops’, blockage or misrouting of either of these lines, as this can cause oil to leak.
Air leaves the separator through the air breather line. For safety reasons, we advise to install an air breather vent line yourself. Make sure this line cannot touch the muffler or can get blocked for some reason and is installed in such a way that there is no ‘suction’ or pressure on the line. If the air cannot escape it may lead to high pressure in the engine. Likewise, if there is suction on the line (routed to a low-pressure zone without appropriate ‘line nick’) crankcase pressure may drop. In either case you may experience oil leaks as a result of these conditions.





Oil leaks/Consumption

SEALING PROBLEM

Oils seals on the front and the rear of the crankshaft or O-rings can get damaged.

- clean the engine thoroughly
- Run the engine and try to find out the exact location of the oil leak.
- Change the seal i.a.w. the latest maintenance manuals

OIL CONSUMPTION: The engine will only CONSUME oil when oil can enter the combustion chamber. Check compression for piston/ piston rings – procedure here – cracked pistons/damaged piston rings can lead to increased oil consumption. Sometimes this can be reflected in spark plug condition and oil coming out of the oil/air separator air breather line.

TURBOCOMPRESSOR:

The oil supply is on top of the turbo compressor, the return (to the crankcase via scavenge pump) at the bottom. Make sure these lines are not blocked and protected from heat. If the return is blocked, oil can pushed through the bearings of the compressor and enter the air intake. If the supply is blocked, this will lead to failure of the turbo compressor (no lubrication). Always use the original ULPower oil lines.

High oil consumption should be reported to ULPower before further flights.

Compression loss

Check the compression i.a.w. the latest manuals using an appropriate differential cylinder pressure tester/leak-down tester.
In most cases you can hear air escaping

1. Into crankcase (piston/piston rings)
2. Into exhaust (exhaust valve)
3. Into admission (inlet valve)

BAD VALVE CLEARANCE SETTING

When a valve doesn't close completely, exhaust gasses may burn the valve
Adjust clearance i.a.w. the latest maintenance manual.

BUILD UP OF LEAD DEPOSIT

100LL AVGAS contains TEL (Tetra Ethyl Lead). Consequently, when running on 100LL, lead deposits may build up on the valves and valve seats. If the valves / valve seats become contaminated, they may not close properly, resulting in a loss of compression.

- Remove the cylinder heads
- Clean the valve and valve seats carefully.
- Re install the cylinder heads i.a.w. the latest manuals, always use new cylinder gaskets.

Field experience has shown that MOGAS and other suitable unleaded fuels results in a much cleaner combustion chamber.

Compression loss

PARTIALLY BURNED VALVE

Lead deposits may prevent the valve from closing completely. When there is no longer contact between the valves and the valve seats, there is no heat transfer between the valve and the valve seats, consequently the exhaust valves are no longer cooled down. These exhaust gasses can burn away the exhaust valve.

- Check valve and replace if necessary
- Remachine/lap the valve seats as required, i.a.w. the maintenance manuals.

PISTON PROBLEM

A cracked or pitted piston and/or damaged piston rings can also result in compression loss. This can increase blow-by gasses in the crankcase and result in oil being pushed into to the oil/air separator, and leaks.

- Check pistons, piston rings and cylinder

If you have been through all of the above steps and still cannot identify the issue, contact your ULPower dealer .

Fuel pump is not working normally

Anti return valve in fuel pump is blocked / Return line is blocked

NOTE: As described in the installation manual, the return line must not be shut off even with a ‘fuel off tap’ (such as a duplex fuel tap) to allow the fuel rail to breathe. After a flight , the engine is hot but fresh fuel is in the fuel circuit. After shutting down the engine, the heat from the engine warms up the fuel inside the lines.

If the return line has been shut off, fuel cannot “escape” resulting in pressures of up to 30 bar. Such high pressure pushes the rubber anti-return valve in the fuel pump and can ‘jam’ or ‘block’ the system. On the next engine run, the fuel pump may not be able to unblock this condition. Consequently, the pump makes a strange noise and there is little or no fuel pressure in the fuel lines.

- make you sure the fuel return line cannot be shut off.
- Rectify your installation
- Change the fuel pump

Fuel supply is restricted

Check that there is a supply of fuel to the pump (fuel tap/fuel lines,etc)

Check filters

Electrical connections:

Check that the FPCR (Fuel Pump Control Relay) is working (replace if necessary)

Check electrical installation including switch function

Starter problem

THE STARTER SOLENOID ENGAGES BUT STARTER MOTOR DOES NOT RUN

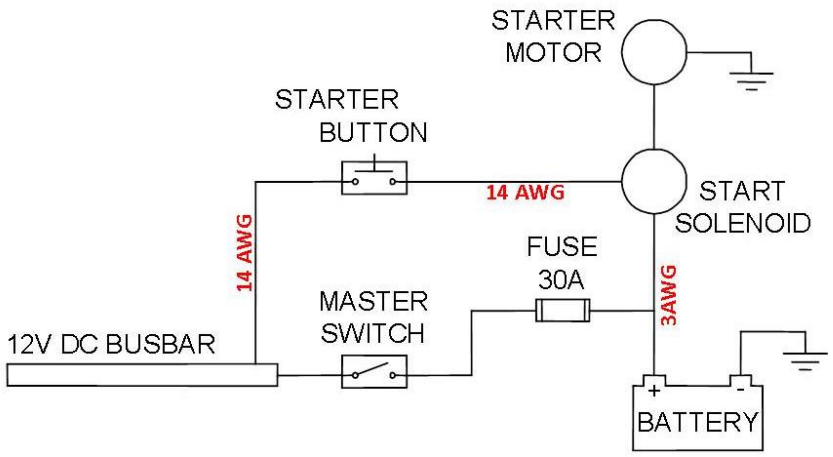
Battery low: check with new fully charged battery

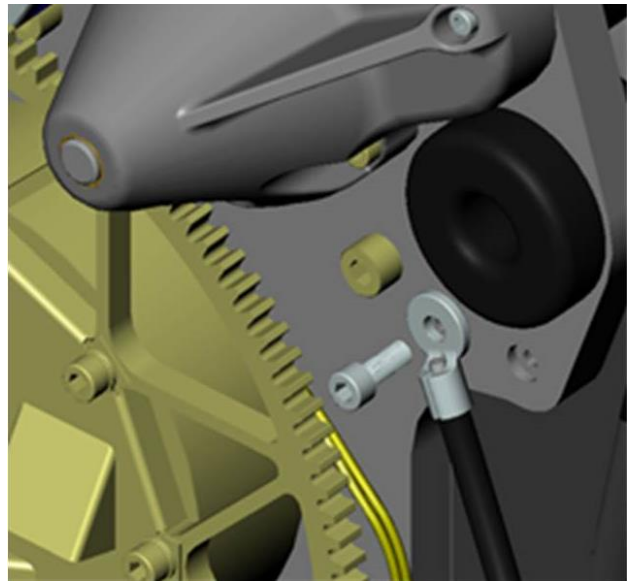
Bad grounding : check that the starter is properly grounded

Bad connection +12V : Check 3AWG wire from battery to starter

Blocked engine : turn the prop by hand to find out if the crankshaft turns smoothly.

If all above is ok, the starter is probably defective





Starter problem

THE STARTER SOLENOID DOES NOT ENGAGE

Bad contact : check that the wires are properly connected

Bad insulation: check that both connections on the starter are properly insulated to prevent short circuit

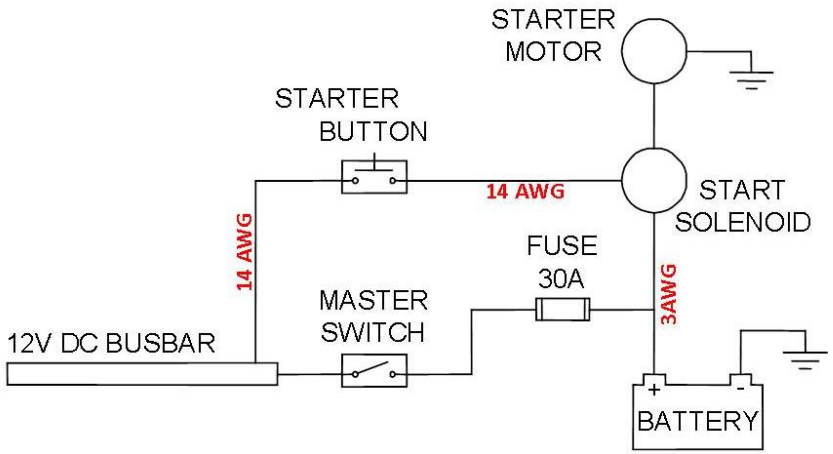
Bad grounding : check that the starter is properly grounded

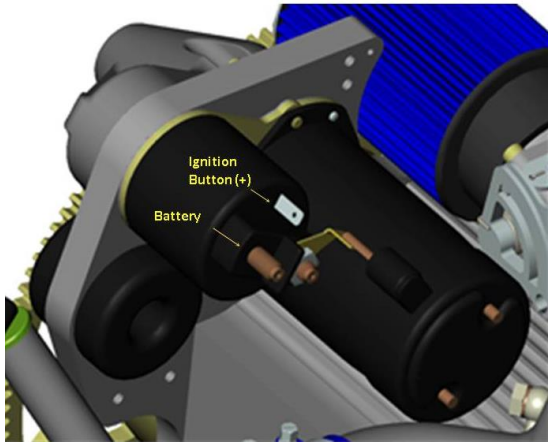
Starter button: use a good quality starter button (5A)

Wire size too small:

As described in the installation manual, the wiring between the starter button and the starter solenoid, and the starter button and the 12V busbar must be at least AWG14

The starter solenoid requires a lot of amps (up to 35A) , especially on a hot start, engaging the solenoid will be a problem if the wires are too small.





Abnormal engine noise / vibration

Visual inspection :
Check if the engine mount rubbers and the engine mount bolt torque are ok.
Check propeller condition, balance and tracking
Look for cracks in the alternator fan (have you complied with related service bulletins)
Check if the alternator bolt has not loosened.

One cylinder not firing (correctly)
Check if there is a big difference in EGT values.

Bad valve clearance
Adjust valve clearance in accordance with the maintenance manual

Detonation

Loosened prop flange bolt

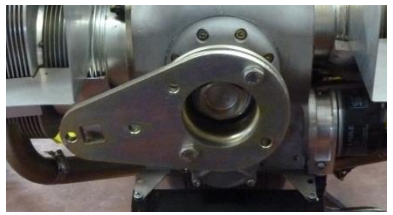
Abnormal engine noise / vibration

ONLY FOR ENGINE WITH SERIAL NUMBER BELOW 193802

Check the torque of te propeller flange bolt.

1. Unscrew the M6 screw using a 3mm Allen key.

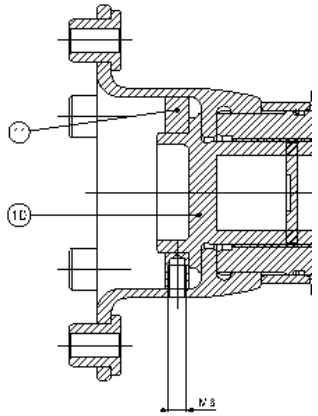
2. Remove the locking plate. Use an M6-bolt to pull out the plate.



3. Attach the propeller flange holder to the prop flange with M14 bolts

4. Torque the bolt to 300 Nm while holding the prop flange. (right hand thread)

5. Place the locking plate over the hex top of the bolt. Find out if the existing M6 hole in the locking plate correspond with the M6 hole in the flange. If not, move the ring through 60° (one flat) on the bolt.



5a. IF the M6 holes do not match, drill a hole ø5 through the locking plate and cut M6 thread until just touching the bottom of the hole.

6. Reinstall M6x15 grub screw until head is about 0.5mm below surface, using Loctite 243 and lock the screw again by punching 2 dimples

IF YOUR ENGINE SERIAL NUMBER IS ABOVE 193801 CLICK HERE

Tools Needed

3mm Allen Key	Loctite 243
T063006 Flange holder (incl. first service kit)	[5mm drill]
2 x M14 bolts	[M6 tap]
Torque wrench (300Nm) socket 40 mm	

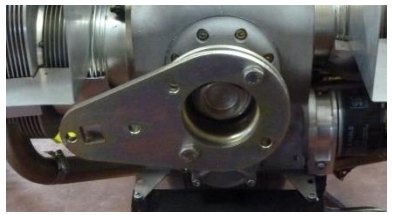
Abnormal engine noise / vibration

ONLY FOR ENGINES WITH SERIAL NUMBER ABOVE 193801

Check the torque of te propeller flange bolt.

1. Unscrew the M5 screw using a 2,5mm Allen key.

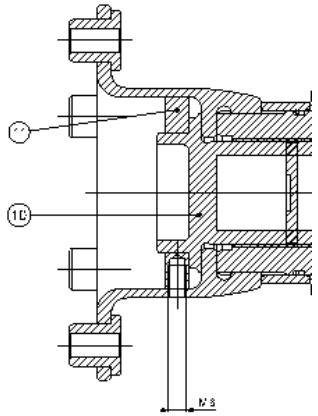
2. Remove the locking plate. Use an M6-bolt to pull out the plate.



3. Attach the propeller flange holder to the prop flange with M14 bolts

4. Torque the bolt to 300 Nm while holding the prop flange. (right hand thread)

5. Place the locking plate over the hex top of the bolt. Find out if the existing M5 hole in the locking plate correspond with the ø 5 hole in the flange. If not, move the ring through 60° (one flat) on the bolt.



5a. IF the holes don't match , use a 5 mm drill to center the hole in the hole of the locking plate (+/- 2 mm depth). Drill a hole ø 4,25 through the locking plate (till the drill touches the steel bolt)and cut M5 thread until just touching the bottom of the hole.

6. Reinstall M5x16 grub screw until head is about 0.5mm below surface, using Loctite 243 and lock the screw again by punching 2 dimples

Tools Needed

2,5mm Allen Key	Loctite 243
T063006 Flange holder (incl. first service kit)	[4,25mm drill]
2 x M14 bolts	
Torque wrench (300Nm) (socket 40mm)	[M5 tap]

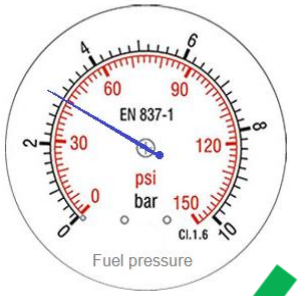
IF YOUR ENGINE SERIAL NUMBER IS BELOW 193802 CLICK HERE

Abnormal fuel pressure

The installed fuel pressure regulator regulates the fuel pressure to 3 bar above inlet manifold pressure.
The best way to test this is to measure the fuel pressure while starting up the fuel pumps without starting the engine. This value should be 3 bar and stable. When starting the engine and in flight, the measured value can fluctuate between 2,4 and 3,4 bar. (39 and 49 PSI) depending on the throttle position/ambient pressure.

<u>Fuel pressure not stable (3 bar – 43 PSI) before starting the engine</u>

- When the pressure is not stable this might be an indication that filter (pre and/or fine filter) is clogged
- If filters are fine, check solutions below



<u>Fuel pressure too high</u>

- There might be a bad sensor : check with an analogue manometer
- Return line is too small, clogged, obstructed
- When both pumps are running together, it is possible to have a higher fuel pressure

<u>Fuel pressure too low</u>

- There might be a bad sensor : check with an analogue manometer
- If there is no problem with the sensor, remove the return line and check if the fuel flow is ok. (1 liter / 30 sec)
- If not there might be a filter or fuel pump problem .
- Or the fuel pressure regulator might be defective

Turbo engine

Trouble shoot below is an addition for the turbo engine

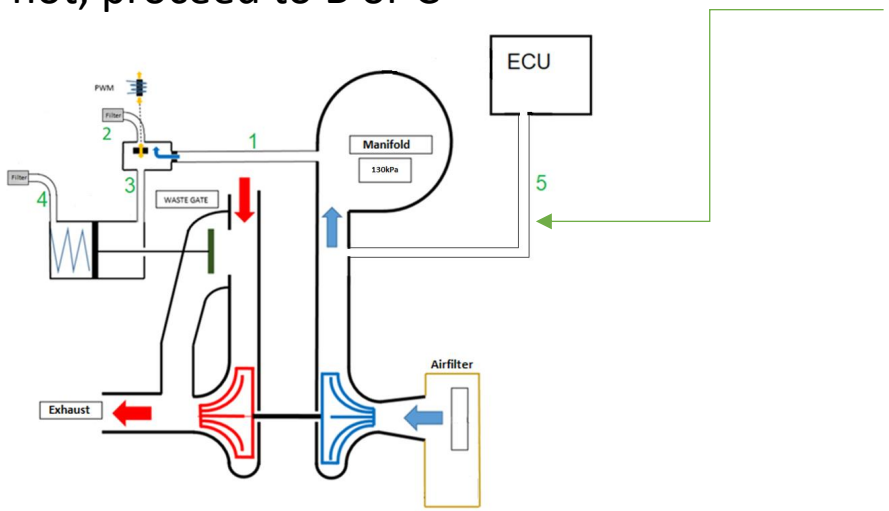
1. DOES THE ULP CHECK LIGHT COME UP ?

If yes, find out with ULRead which sensor is causing it. Check connections.
At sea level, engine off, turbo pressure must be equal to the ambient pressure
Identify and replace the connector or repair/replace loom if damaged. Test again.

2. CONNECT ULREAD AND RUN ENGINE AT 2300 RPM :

A. Does the checklight come up (after +- 1 second) and no turbo pressure <u>but</u> ambient pressure reading on ULRead ?

If yes, this indicates a break in the hose (nr. 5) between the ECU and turbo pressure and ECU. Fix/replace this hose. If not, proceed to B or C

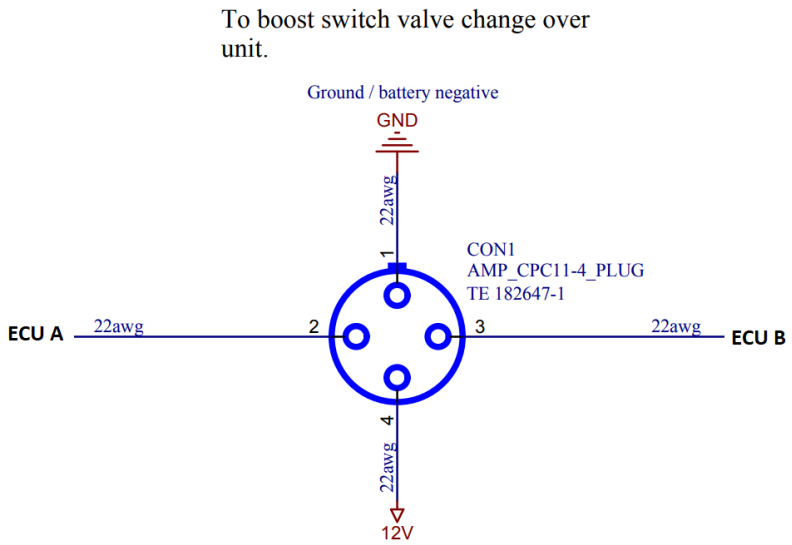


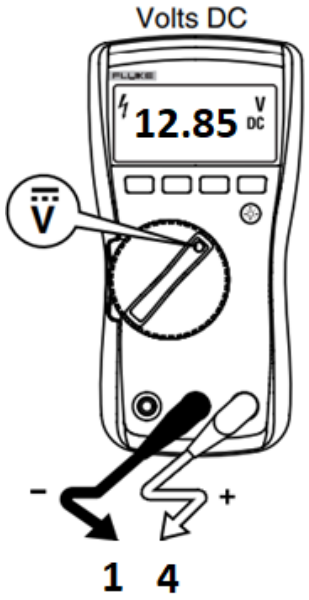
Turbo engine

B. Turbo pressure < 1.3 bar (38.39 inHg) (1/2) AND NO CHECKLIGHT

This means a there is a decrease in engine power:

- Check the (electrical) connection between the ECU and boost controller
- Check the voltage at the boost control valve
  This must be equal to the battery voltage

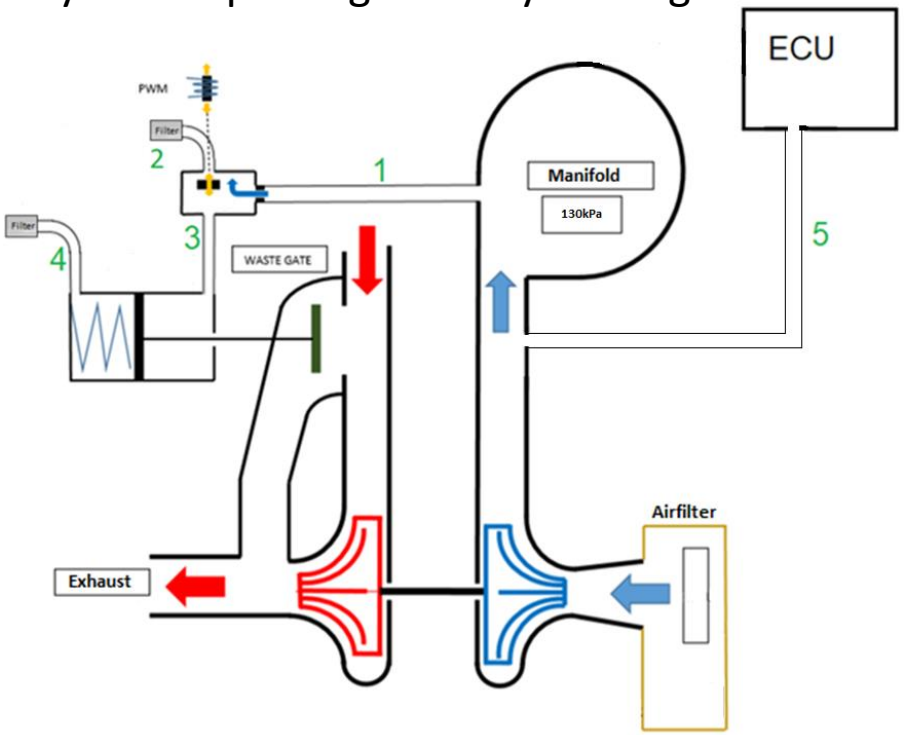




Turbo engine

B. Turbo pressure < 1.3 bar (38.39 inHg) (2/2) AND NO CHECKLIGHT

- Hose 1 can be blocked or open
- Filter 2 (on boost controller) can be blocked (clean this filter).
- **Make sure that filter 2 and filter 4 (on wastegate) are connected with ambient air.**
- Check that the wastegate isn't stuck open when engine is not running (remove exhaust tube to verify)
- Check that the turbo is working correctly
  - Remove the inlet and check that the compressor wheel is rotating freely while spinning it with your finger
  - Check the oil supply/return of the turbo
  - Verify that there is no obstruction in air intake or at the intercooler



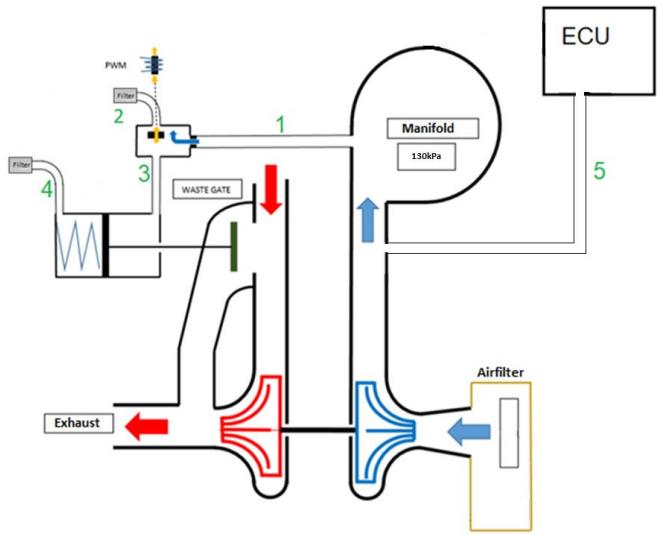
Turbo engine

C. Turbo pressure > 1.4 bar (41.3 inHg) AND CHECKLIGHT IS FLASHING

Turbo pressure overboost will eventually leads to the activation of the turbo pressure limiter. This limiter is activated at a turbo pressure of 1.4 bar (41.3 inHg). The engine power will be reduced (around 50%).

- Check the pneumatic system :
    - Hose 3 can be blocked or open
- Check that the wastegate is working properly (not stuck in closed position)

Always lower the throttle (RPM) of the engine immediately when overboost occurs !



Revision

Revision 2.1 (2019-09-01)

Slide 7 : Start button, Ground cable and ECU connection
ADDED POINT 2: check wire size

Slide 8 : link to tutorial ulpower.news

Slide 20: Black smoke / black spark plugs / high fuel consumption
ADDED “bad connection wiring spark plug / coil plug

Slide 27: EGT Big difference between the cylinders
ADDED “bad connection wiring spark plug / coil plug

Slide 37 : Starter problem added

Slide 38 : Abnormal noise / vibration added

Revision

Revision 2.1 (2020-01-01)

Slide 40 : added socket size
Slide 41 : added socket size
Made revision pages visible

Revision 2.2 (2020-11-01)

Slide 17 : added abnormal fuel pressure logo
Slide 42 : Abnormal fuel pressure text added

Revision 2.3 (2022-04-01)

Slide 20 : RPM fluctuations turbo engine
Slide 44-47 : Add special section turbo

Revision 2.4 (2023-02-01)

Slide 44-47 : Add check light information

Revision 2.5 (2025-04-01)

Slide 14 : ECU wiring loom connectors