Engines Troubleshoot

From E30 Zone Wiki

Nightmare. Your engine won't start! Dry your eyes and pick up your tools, we'll get her going again.

Troubleshoot

The troubleshooting table is a clickable diagram to help you solve your engine woes.

START	←	charge battery		Test Inhibitor switch (Auto only)	→	Test Starter connections inc. earth strap
↓		↑		↑		↓
Does the engine crank?	→	Does the battery have 12V?	→	Diagnostic Plug Start		Starter Motor
↓		↓←	←	←↓		
test bulb on coil		Ignition Switch		green wire	→	Check for 12V at C101 pin 7
↓		↑		↑		↑
Does it glow?	→	Immobiliser or OBC?	→	bridge wire to coil		Check for 12V on ECU pin 27 → ↓
↓						↑ ↓
Does the ICV buzz with IGN on?	→	→	→	→	→	Check for 12V on DME Relay pins 87 with IGN on ↓
↓						↓ ↓
Listen for the fuel pump running and check for spark at the spark plugs	↓ ↓ →Both→	Test Blue Temp Sensor		Small red wire from battery	←	Check for 12V on DME Relay pins 86 and 30 with IGN on ↓
↓	↓ ↓	↓				↓ ↓
Sparks but no Fuel	↓ ↓	Check for air leaks		DME Relay	←	Is Pin 85 grounded with IGN on? ↓
↓	↓ ↓					↓ ↓
Check for power at Injectors	↓ →Neither→	Check Flywheel pin (Jetronic)	→	Test CPS	→	Replace ECU ← ←
↓	↓					
↓	→	Fuel pumps, but no spark	→	Check for spark from coil	→	Check Ignition Module (Jetronic)
↓				↓		↓
↓		Cam belt	←	Check Distributor and rotor		Test Coil
↓						↓
Bridge the Fuel Pump Relay	→	Connect bulb across Fuel Pump pins	→	fuel pump		Coil King lead
↓		↓				
Fuel Pump Relay		Fuel pump wire				

Solutions

Test Bulb On Coil

This is the initial test performed on all E30 engines. It involves connecting a test bulb between pin 15 (green wire) of the ignition coil and earth (ground), to confirm the presence of 12V. Using a multimeter is **not** enough; you need at least a 12V 5W bulb to get a meaningful reading. An indicator lamp with a length of cable is ideal.

The purpose of this test is to confirm that 12V is being delivered through the green wire that runs from the ignition switch to the coil. If the bulb doesn't glow, and the battery is in good condition, then the fault lies somewhere along the green wire.

Bridge Wire To Coil

If power isn't being delivered to the coil, we need to confirm that the rest of the system works fine. We can do this by supplying power directly to the coil from the battery. To do so, connect a wire to pin 15 (green wire) of the ignition coil, and then connect the other end to the battery + terminal. This should immediately power up the car circuits, making the battery light on the dash cluster light up, and the ICV should start buzzing.

If this works, you can crank the engine with the key to confirm that it starts and runs normally. If it does work, then we need to investigate the green wire, to see where it is being interrupted. For now, disconnect the wire from the battery terminal first, then from the coil.

Green Wire

The Ignition circuits are powered by a single green wire that runs through the interior of the car from the ignition switch to the ignition coil. This wire can be broken, damaged, interrupted by an immobiliser or the OBC, or simply not turned on due to a broken ignition switch. Whatever the cause, we need to test it.

To start with, disconnect the C101 plug, and use a multimeter to check for continuity between the ignition coil pin 15 and pin 7 (Motronic) or pin 8 (Jetronic) on the engine side of the engine loom. If you don't have continuity, the wire is broken somewhere in the engine bay.

From there, check for breaks inside the car, especially behind the glove box. At this point there is a two-pin socket with one green wire to each pin. If there is an OBC fitted, there will be a plug with one green wire and one green/red wire plugged into it. If there is no OBC and no immobiliser fitted, the socket should have a plug pushed into it with a short loop of green wire between its pins. If you have recently interfered with or removed the OBC, then these wires will be unplugged and the engine won't start. To solve them, either

ensure the plug is connected firmly to the OBC (if fitted), or for a guaranteed repair, cut the plug off and join the two wires.

If this doesn't work, start tracing the green wire from this point and look for an interruption. Immobiliser fitters love cutting into this wire to make their products work, so if you have an immobiliser then cut it out and join the two ends of the green wire back together.

If your journey goes all the way back to the ignition switch, check for continuity between the ignition switch and the C101. If you can't find it, check the interior wiring again. If you have continuity, then the ignition switch itself is at fault.

Charge Battery

The car battery isn't like the power cell in your phone or TV remote. It's not designed to trickle out a steady flow of power over a long time; instead its job is to supply a massive kick of juice for a very limited amount of time; a new battery will survive possibly 30 seconds of continual engine cranking, but no more than that. In this way, it's more like a shot of tequila than a pint of beer; powerful, but gone in an instant.

A full battery should read 12.6V, not 12V. A battery reading 12.1V is only at 25%, and while this may be enough to crank the engine, you should consider this a warning; either something's draining the battery, or the cells inside are dying. Below 12V, and you've got issues.

Batteries can be restored, but they respond much better to slow, trickle charges than to massive power surging charges. Jump- or bump-starting will instantly supply 13.7V-14.4V to the battery at up to 90A - that's a massive amount of juice to hit a dead battery with, and you risk damaging the battery if you do this repeatedly.

Much better is a normal plug-in charger, and if you can find a trickle charger that is even better. Slow charging in a cool, well-ventilated environment (not hot, not cold, definitely not freezing) will your battery the best chance of charging.

Always follow the instructions on your battery charger, and be careful.

Diagnostic Plug Start

The diagnostic plug is a connector in your engine loom that allows you to measure certain engine parameters. One of its cooler features is the ability to engage the starter without the use of a key, bypassing all the internal wiring.

To do so, make sure the car is braked and in neutral gear. Have the ignition circuits on, either with the ignition key or using the bridged coil method. Open the cap to the diagnostic plug, and locate pins 11 and 14.

Making sure no loose clothing, cables or tools are near the engine, use a thick wire to connect pins 11 and 14 of the diagnostic plug. The starter should engage immediately, and will crank for as long as the two pins are connected.

If this makes the starter spin, then you need to investigate the wiring that activates the starter from the key. This is usually a black or a black/yellow wire, which immobiliser and alarm fitters usually cut into when installing their products. Trace those wires back from the starter motor into the car behind the glove box, and repair any breaks or cuts you find.

If this method does not make the engine crank, the issue is with either the battery, the starter motor or the wiring between the two. Shut off the electrics immediately, and investigate all the connectors on the starter motor as well as the two battery terminals and the main battery earth point. If necessary, undo each terminal and brighten up the wiring face (where the wiring screws on) with a metal file.

If you cannot get the starter to spin or engage, the unit is likely to be at fault. However, these units are not known to fail often, and they are a real pain to replace, so check thoroughly before committing yourself to a starter motor swap.

Bridge DME Relay

The DME relay is just like any other relay. It switches power to the ECU circuits when the ignition is turned on.

The DME sits in a cluster of three relays in the engine compartment, covered by a black plastic hood. It is the only five-pin relay in that box.

To bridge the DME relay, remove the relay from its socket, and then locate pins 30, 87 and 87 (yes, two 87s) in the socket. Link all three of them together with short lengths of wire, ensuring they have a good connection to the terminals in the socket. Try to start the car.

The aim here is to supply power directly to the ECU, bypassing any cutouts or immobilisers along the way. If bridging the relay makes the engine start, then the relay itself is at fault (and is a known weak link in the engine management system).

Bridge Fuel Pump Relay

The fuel pump relay is another relay in the engine compartment, covered by a black plastic hood. It is identified by the green/purple wire going to its base.

First, remove the fuel pump relay from its socket, and link together pins 30 and 87 with a short length of wire. You should easily hear the fuel pump whirring away under the rear seat of your E30.

If you can, then you should ensure that power is reaching pins 85 and 86 of the fuel pump relay socket, by using a 12V 5W bulb. If power is present, then expect your fuel pump relay to be faulty, but if it's not then you need to find out why. Test for power on pin 87 of the DME relay.

If you can't hear the pump running, then you need to confirm that power is getting to the pump by linking a bulb across the fuel pump.

Bulb Across Fuel Pump

If you've followed the steps this far, you should be supplying power directly to the fuel pump. If the pump's not working, we need to know the power's getting there. This means getting access to it.

Lift up your rear seats, unbolt the seat belt clips and lift up the carpet. You should see one or two inspection hatches, depending on the vehicle. Unscrew the inspection hatch underneath the drivers seat, and you will see the fuel pump and sender underneath.

The sender is screwed into the pump with four bolts, and has its own electrical connection. IGNORE this connector; you want the plug to the pump itself. Simply pull it off the pump, and connect your 12V 5W bulb across the terminals inside the plug. When you crank the engine, the bulb should glow.

If the bulb glows but the pump does not work, then the pump is at fault and needs to be repaired or replaced.

If it does not glow, and you have followed all the preceding steps, then the wire between the fuel pump relay and the pump is damaged.

To examine the wire, look for the green/purple wire which emerges from the duct from the bottom of the fusebox, behind the steering column on LH drive, goes across to behind the top of the speaker panel, down behind the front of the panel, and then the back of the LH sill to the fuel pump.

12V At ECU

If linking and bridging relays has still not given you a confirmed 12V at the green wire, then we need to ensure that the ECU is receiving its power signals. In this case, we have to gain access to the ECU which is bolted under the dashboard, underneath the steering column.

This involves removing the kick panel under the steering column and unbolting the 4 screws that hold the ECU in place. Once you've wrestled it out, unclip its connector and get your trusty 12V 5W bulb ready.

For Motronic cars, connect the bulb between pin 18 and ground. This is a direct connection to the battery, and if you have no power here then you need to check the wiring between the two, especially at the C101 plug. Next check pin 27. If you are not getting power on this pin, then you are not receiving power from the ignition switch. Finally check pin 37. This switch receives power from the DME relay, so if the DME relay is bridged then this pin must be getting power. If not, check your bridge or the battery.

If you're not sure whether you have the right pins, check the ECU pinouts.

Ignition Switch

If you've managed to start the car from the Diagnostic plug, then it's time to investigate the ignition switch.

First thing to do is to check you have a good +12v signal coming out of the ignition switch when you try to start the engine. Connect your 12V 5W test light between ground and the yellow/black wire at the socket where the ignition switch plugs into the main loom at the steering column. If you don't get a good supply from there (test light does not light up brightly), your switch is most likely faulty.

If you do get a good bright light, get in behind the glove box and find the plug where you can split the black/yellow wire (this is where the auto loom plugs in- its purpose is to isolate the starter if not in park or neutral). Check that the connection is good and then connect the test light on the motor side of the plug and check that it lights brightly when attempting to start.

If this checks out, the next point is the C101 plug. Undo it and check the connection at pin 18 for corrosion or damage. Clean and then re-check with the test light on the engine side for good supply through C101.

Hopefully now you will have found your fault as the only bit left is the wire between C101 and the starter solenoid, and this is unlikely to be faulty given the fact that the car swings over readily from the diagnostic socket. But check it anyway, clean the terminal on the starter and hopefully it will be good to go!

Check for Spark

Your engine won't fire if there's no spark. The only way you can do this is with a spark plug, so either remove one from the engine or use a spare.

Firstly, connect your spark plug to any of the HT leads and rest it on the rocker cover in such a way that it's grounded. Now crank the engine. You should see two sparks for every revolution of the engine.

If this doesn't happen, remove the HT lead and connect the spark plug directly to the coil via the King Lead. This time when you crank, the spark plug should spark with a high frequency.

If you get a spark from the coil but not from the HT leads, then remove your distributor cover and rotor arm for inspection. While they are removed, crank the engine to confirm that the cam is rotating while the engine spins. If the cam isn't spinning, then prepare for the worst; a broken cam belt. If the cam does spin, then replace the distributor cover and rotor arm for new.

If you're not getting a spark from the coil, then you need to test the coil or replace it with a known working one. If you still don't see a spark, then you need to investigate the wiring linking the coil to the battery and to earth. If you're absolutely certain that all the components are fine but there's still no spark, then the CPS is most likely to blame. If the CPS checks out ok, the absolute last resort is a dead ECU.