So Ya got a HE V12 that wont start.

Sit back, get a drink, and read on.

This is a write up of my experience with this awesome engine over many years. Information from Greg in France, to those on the Forum, is also part of the scribe.

This for the 5.3ltr HE V12 with the P Digital EFI system and the Lucas Ignition system **MAINLY.**

Some of this will relate to the Pre HE with the D Jetronic and Opus systems, and some will relate to the later Marelli engines. You will need to decipher what fits your engine if its outside the Lucas HE spec.

I am also basing this on "it ran when I stored it, now it does not", that is a very common question in Jaguar world now.

Methodical checking of the many systems will be needed, and if method is not followed, you will hit that proverbial "brick wall".

I will break it down as best as possible, but most of the systems rely on the others to do their thing, so they can do theirs.

Engine starting issues:

The Electrical section gets involved as many things may well be working, but in need of some refreshing. This "catch up" work will pay huge dividends as you flow through the engine running issues.

I will attempt to keep it simple, they are simple engines and systems, however I am Downunder, and rumour has it we talk odd???? If a word or phrase does not translate, Google is good, or ask on the Forum, we don't bite I am told.

Age is now a real issue with these cars, so please bear that in mind when pulling things to test, they will break easier than you think, and the wiring is really going to test you sense of humour.

When I mention A or B bank, I am referring to the engine banks of 6 cylinders. "A" bank is RH side, and "B" bank is LH side. ALSO, RH and

LH are the STANDARD Auto talk for the side of the car when sitting in the driver's seat and forward.

#1 cylinder is at the front on each bank.

The firing order of this engine is:
1A 6B 5A 2B 3A 4B 6A 1B 2A 5B 4A 3B. This is true for ALL versions af the V12 engine.

The distributor rotates Anti-Clockwise.

The Number 1 cast into the top of the distributor cap is the position for the 1A spark plug lead, and then the rest just flow around from there.

Here we go:

Fuel system:

The first thing to establish is do I have fuel AT the rail? The fuel supply system is complex, but since it WAS running, lets keep to the basics.

A fuel pressure test is always a good idea here for starters. "T" a suitable fitting into the flex hose that runs alongside the LH portion of the fuel rail. It is the one that joins the fuel rail to the LH FPR, and YES, you will need to sacrifice that hose. Attach your Fuel Pressure Gauge. Prime the fuel system, and note the pressure. You are looking for 40 +/- as a pass pressure. This indicates pressure, NOT flow quantity, which is the next paragraph.

Undo the fuel Inlet fuel pipe/hose connector on the RH FPR (Fuel Pressure Regulator) and push a length of hose, any hose will do, over that now unattached pipe/hose, and extend the other end outside the engine bay, and into a container. A helper here will be a smart idea. Turn ON the ignition, **DO NOT** crank the engine. The fuel pump will activate, and run for a few seconds. In that time, there should be a gush of fuel out of that hose, and a reasonable quantity at a fair pressure.

If this passes the test, reconnect the pipe/hose, and ensure it does not leak, as in prime the system a few times, and by that, I mean Ign ON, wait 5 seconds, Ign OFF, 3 times.

If it fails, and you have NO fuel, or just a dribble (these pumps are capable of 110psi, so an open end hose will certainly have pressure you

can “feel and see”. DO NOT reconnect that pipe/hose, you will need it in that can later, and the reason there is NO fuel, needs to be fixed.

1) Did the pump run?, YES, move on.

2) Blocked fuel filter is common, so remove the spare wheel, remove the carpets in the boot, and take the fuel spillage precautions that sit good with you. Remove the old filter, noting the direction of the flow arrow, refit the new filter the correct way around, and secure the hose clamps.

Run the flow test into that can again.

If you now have fuel, refit that pipe/hose and test for leaks.

If you still have NO fuel, read on.

Is the pump running, YES.

Its not pumping fuel though. Has the tank got fuel in it???, stranger things have happened, and is the fuel FRESH. You will need FRESH fuel at some stage, might as well be now.

Inside the small sump tank, located under the battery, is a plastic fine mesh filter, that clogs up very easily. You will need to drain the main tank, and that is done via a drain spigot at the bottom of that sump tank, then out through a rubber bung in the boot floor. Messy, but not too bad, and you will have petrol in the raw, so please be careful. If I need to explain raw fuel precautions, you should NOT be doing this task. Once the MAIN tank is drained, you can inspect the internals of the sump tank, so tap the locking ring loose, on th3 sump tank top, and lift out the pipe with the filter slid over its end. Replace that filter, Refit the pipe, and tap the locking ring back into place. If rusty muck is found in that sump tank, you will need to clean/rectify that before refitting anything, and that is well discussed on the Forum.

If that filter and tank are clean, then the pump is suspect. Pumps on the V12 are Generic, NOT Jaguar specific in any way. BMW, MERC, Ford, GM, all use this pump. Pump swap is simple, and with a drained fuel system, not too much fuel will splash around. The only caution is that most OE pumps have the Large terminal as the –ve, and the Smaller terminal as the +ve. Some replacement pumps are reversed, so PAY ATTENTION, or the pump will still run, but backwards, oops.

If the pump does **NOT** run, then this list will help.

1) The inertia switch on the "A" pillar of the driver's side of the car, may need resetting, simply lift up the plunger and push it down again. That switch "kills" the pump circuit in case of an accident.

2) Relay issues:

In the boot, alongside the battery, and behind a removable trim panel, are 2 relays. The relay in the RED socket is the main relay. The relay in the BLACK socket is the fuel pump relay. The Main relay activates the Fuel pump relay.

On the battery +ve cable, about 6" from the actual terminal, is a plastic cover. Inside that cover are 2 large Brown wires, attached with spade connectors. These connectors have a BAD habit of falling off, especially when you have more than likely been messing with the battery. One of these Brown wires is the Battery supply to the Fuel Pump relay, and the 2nd Brown wire is the battery supply to the Main relay. Ensure they are clean and inserted correctly to the spade terminals inside. Not easy to see inside that cover, but if they are not fitted correctly, the relays will not transfer power as required.

Look at the Black socket, and you will note an Orange wire. That is the Earth wire for the fuel pump relay, and is earthed by the ECU, via the timer circuit. Since the ECU can have issues with that timer circuit, I suggest carefully exposing some inner wire, and attach a length of wire to that exposed wire, and the other end to a good earth. This will remove the ECU from any control of that relay. So, as long as the Ignition is in the ON position, the fuel pump relay will be active and the pump will run continuously. PLEASE be aware of this, and take the care that is needed. Once the car is sorted and running as it was, remove that extra wire, and return the system to "safe mode".

If removing these relays from the sockets, take extreme care when pushing, new, or these, back into those sockets. The encapsulated female terminals inside the sockets can "push out" as the relay is pushed in. This is difficult to see, and many hours of frustrating diagnosis can be used up here.

Remove the fuel pump with its tin cradle intact, so as to expose the 2 terminals at the bottom. Take your DVM (Digital Volt Meter), and attach the Red probe to the +ve terminal of the pump. Attached the Black probe

to the -ve terminal of the pump. Have that helper switch ON the Ignition, and note the voltage reading on the meter. If you note battery voltage, then the relay etc is all OK, and the pump is suspect once again.

Fit the new pump, taking note of the items I mentioned above.

Now, after all this, you should have fuel as designed to the fuel rail.

EFI electrical issues:

1) Injector pulse test.

Turn ON the Ignition, take the throttle capstan, and manually rotate it to Full Throttle. You should hear the Injectors "click" once. If this occurs, you have just confirmed the signal from the TPS (Throttle Position Sensor) to the ECU is taking place, and the ECU is electrically triggering the Injectors.
This does NOT prove that the Injectors are passing any fuel, and that will come along soon.

If this test fails, the reason/s must be sorted. That list is as follows:

1) TPS is not adjusted correctly (separate write up on that), or has died (replacement write up also separate).
2) The connectors of the EFI resistor Pack needs cleaning. This Resistor Pack is located inside the engine bay, attached near the panel that is the backing for the RH headlamp. It is a Silver box, about 4" X 2", with a White Multi-pin plug inserted from the bottom. Remove that plug, remove the 2 small hex headed screws that secure the Resistor Pack to the car body. Clean the plug, and the socket extremely well. Take your time, get it clean, then refit the Resistor Pack, and re-plug the loom.
3) The EFI loom itself is shorting. This is almost guaranteed now with these engines, due to heat and age. Turn ON the Ignition, take that DVM, probe both terminals of ALL the Injectors. Black probe to Earth, Red probe on each Injector wire, one at a time. You should have 12v on all pins. This indicates that maybe, that loom is OK.
4) The Injectors are wired in 4 groups of 3. 1,3,5A 2,4,6A 1,3,5B 2,4,6B. Look down at the loom, in the bottom of the V. It runs down each side of that centre plate. If it looks oil caked, wrapping falling off, and the pigtails that travel to each Injector are hard and crispy, as opposed to, soft and pliable, you have problems. Making

your own new loom is easy and simple. There are many threads on the Forum going into this in detail.

5) Remove any of the EASY to get at spark plugs, do they look wet with fuel from the attempts to start this engine?. If so, then the Injectors are passing fuel. Lots of theories about spray patterns etc, but this is a "Port Injection" engine, so the sprayed fuel is behind the Inlet valve. Spray pattern, and volume integrity is important, but NOT to start the engine., they will affect running quality, but until you get it started, that means ZERO.

Once you have sorted all these items, and you have Injector activity with the rotation of the throttle capstan, with the Ignition ON, the presence of fuel inside the engine is needed.

Crank the engine for a few short seconds. If it fails to start, remove the easiest spark plug, and note if that plug is wettish with fuel. If so, then we have fuel inside the cylinder/s and lack the fire.

Before moving to the spark testing, I suggest a few basic items get checked very thoroughly, and they are:

1) Injection pulse signal FROM the engine TO the ECU.

This is achieved by a Coaxial (shielded in some languages) wire, that travels FROM the Ignition Amplifier, which is firmly bolted to the top of the LH Inlet manifold. It comes OUT of the rear of that amp, and travels around the rear of the engine, past the heater tap, and out through a large rubber grommet in the RH inner panel, just forward of the RH bonnet lock, and behind the Brake Booster on RHD cars. This Coax has a very fine wire inside the layers of plastic, and the woven shielding material. The fine wire breaks, and/or the casing cracks, and the thin wire earths on the woven shielding. It terminates at Pin#18 of the ECU. Without this pulse from the amp to the ECU, the ECU will not trigger the Injectors as the engine is cranked for starting. A continuity test on this inner thin wire, from the Amp to Pin #18 of the ECU is the only method of confirming that wire's integrity. Also, an Earth leakage test of that same thin wire is required, as the White inner casing can crack, and the woven shielding can earth that thin wire, and kill that pulse.

This Pin Out table will be invaluable to your diagnosis, now and into the future.

XJ-S ECU Pin out table.

Pin number:

NOTE: looking at the pins in the ECU itself, the pin numbers read from LEFT to RIGHT (ie opposite the direction to reading text)

Bottom row:

1 = not used.
2 = EARTH
3 = Fuel enrichment switches, vac & micro
4 = not used
5 = Coolant temp sensor LH thermo housing (signal wire)
6 = not used
7 = TPS (yellow/white)
8 = Connects with pin (9) and then goes to pin 4 of the resistor pack, via 2 connector splices.
9 = see 8 above
10 = not used
11 = to pin (10) of resistor pack
12 = to pin (7) of resistor pack connector splices.
13 = Unites with #14 going to pin #1 of the resistor pack.
14 = see 13 above
15 = Orange wire to pin (85) of the fuel pump relay (Earth of that relay).
16 = EARTH
17 = Start inhibit switch. Mostly known as the “neutral start switch”. The other side of the inhibit switch goes to pin (W1) of starter relay.
18 = the “shielded” wire from the ignition module. The central core (thin wire) connects here.

Top row:

19 = TPS (Yellow/Black) and picking up a splice wire to the coolant temp sensor in the LH thermo housing.
20 = TPS (Yellow/Pink) and picking up a splice that goes to the air temp sensor (one side).
21 = Air temp sensor 2nd wire.

22 = Power (12v) to ALL injectors, via 4 splices. This power is supplied by pin (87) of the main relay, and travels ON to pin (22) of the ECU as the “power IN” to the ECU.
23 = not used
24 = not used
25 = not used
26 = To pin C1/C4 of starter relay.
27 = Pin (6) of resistor pack with a splice of pin (28).
28 = See above (27)
29 = Pin (8) of resistor pack.
30 = Pin (5) of resistor pack.
31 = Pin (3) of resistor pack with a splice of pin (32).
32 = See above (31).
33 = not used.
34 = EARTH
35 = EARTH

The earths are all interconnected and terminate at one of the bolts alongside the battery. There are also Earth wires bolted to rear of the RH inlet manifold. In addition the engine earth wires are CRITICAL, and I DO NOT use the Jag set up. I use a dedicated Earth battery type cable (eye to eye style) from the engine to the body/chassis DIRECT. (See also point #7 below of the “Spark and/or lack of” testing section).

2) CTS (Coolant Temp Sensor)

Located in the alloy housing that is the backing for the LH thermostat. It has an EFI 2 pin connector on top of it, with 2 wires. The CTS is old now, and they do go legs up for no sensible reason, and they will stop a V12 running with conviction.
Example: Perfectly normal running V12, unplug the CTS, = DEAD V12, it’s that simple.
The wires are well known to separate from the terminals inside that rubber plug, so take your time, check it very carefully.
Also, the signal wire splices with another for the TPS, somewhere near the A/C cooler area, and that splice is also known to separate, thus killing the V12. Do a continuity test on those wires using the above Pin out, that’s the only proper way.
If the wires test OK, simply bridge the 2 terminals inside that plug. I use a simple paper clip, taking care not to short it on any nearby metal. This “fools” the ECU into thinking the engine is at Normal operating temp, and will allow a start up, if the fuel is present inside the cylinder. The

CTS sensor is Generic Bosch, again used in GM, Ford, Merc, SAAB, Volvo etc etc, and are a huge $20 or so.

Care is needed with the CTS, and the ATS (Air Temp Sensor) plugs. They look identical, and will plug into either sensor, but that will not allow a start of the engine. The CTS is a Prime signal to the ECU, the ATS is a trimmer. The ATS being unplugged or inoperative will NOT prevent a start, it will affect later running integrity, but it aint running yet. I have had a few that have been wrongly plugged, and much hair pulled trying to find the no start issue, after many hands have played with the car. The Pin out chart is the saviour here.

The ATS is located in the LH air cleaner trumpet.

Spark and/or lack off testing:

This a frustrating section for some, but it need not be, just slow down, take your time.

1) Remove the easiest spark plug lead, locate a spare old spark plug, any will do, and plug it into the end of that lead. Lay the spark plug on any metal item close by, crank the engine, and note the spark colour and intensity. You are looking for a FAT Blue CRACK of a spark. Anything short of this will not start this engine.

Reason:

Most markets have this engine with 12.5:1 comp ratio, the others have 11.5:1, so HI Comp in any understanding. The higher the Comp ratio, the stronger that spark needs to be to operate in those conditions.

If you have that required spark, it should be running. So, lets delve further on the assumption that you DO NOT have a good, or any spark.

1) Remove the coil HT lead from the distributor cap centre post, insert that spark plug in that lead, and test again. This confirms the coil/s are doing their job. If that spark is STRONG, then the distributor cap, and rotor are suspect, so I strongly suggest renewing them.
The HT leads themselves are subject to enormous loads and abuse, so new good quality leads every 5 years or so is a good idea.
The spark plugs on the HE are very reliable for about 40000kms, but fuel quality does have an effect on that. I run NGK BPR6EF, and they are a projected nose spark plug, which places the spark out in the open, as

apposed to inside the casing on the BR6EF style. The spark plugs MUST be gapped at 0.025", and Anti-Seize used on the threads.
If you have been attempting to start this engine without success, the plugs may be "glazed", and that will reduce the spark integrity. Replacing them will be a good idea.

2) Turn ON the Ignition, attach your DVM Red lead to the +ve of the Ignition coil, and the Black lead to Earth. You should have battery voltage. Get the helper to crank that engine, and watch the DVM carefully. It will drop maybe 1V, but anymore, and the electrical section of the Ignition switch is in need of a contact clean. Age again, is responsible for this. It is simple enough, and well documented in the Forum.

3) Inside the Ignition Amplifier (Black box) on the LH Inlet manifold is a Module. It is a GM unit, and readily available from GM in some markets, or Aftermarket in others. I use Echlin brand when needed. They fail, from age and Ignition coil issues, such as shorting, or coil old age, and heat.

Whilst inside that Amp, look in one corner, and you will see a Condensor, a small round tin can looking item, held in place with a small Phillips screw, and a single wire coming out of one end. Remove that screw, unplug the wire from the Module, throw the condensor away. They were a "noise suppressor" and they regularly leak to earth, and since they are connected to a +ve terminal of the Module, do reek havoc with the spark and Ignition system in general. There will be NO new noises in the car due to this item being gone.

4) Ignition coils/s.
The HE has 2, linked +ve to +ve and -ve to -ve. The prime coil is in the V, just aft of the distributor. The 2nd is mounted out the front of the radiator on the LH side. They are a 1.2 Ohm coil each, and when linked provide about 0.6 Ohm. A single coil replacement is available from Jaguar. I use a Universal Electronic Ignition Coil with an Impedance of 0.75 Ohms, and the engine, amp. module is happy. If the coil Impedance, either the original 2 coil set up, or any replacement exceeds 0.9Ohms approx, for any length of time, the module inside that amp is under excess load.

5) There is a 2 wire lead that travels from the base of the distributor TO the Ign Amp. It passes through a rubber grommet in the distributor base. These 2 wires are known to break INSIDE that grommet. Mine did, and it really took some finding. Continuity testing is the only way. Remove the

distributor cap, and flash shield. Follow the 2 wires inside the distributor to the reluctor coil. They are soldered to that reluctor. Unplug the end of that lead from the amp, now Ohm test the individual leads from the solder joint to the plug. Wiggle the lead around at the grommet, as sometimes the fault can make and break with movement. Replacement is simple, and the hole can be filled with RTV as a sealing plug.

6) General wiring in and around the coil etc. These will be very sad by now, so new terminals at least, will be a good move, but sometimes, a new section of wire is needed. This gets complicated, as trying to find a suitable, still pliable, section of wire to get back to, gets harder with age.

7) Engine earth strap/s. The V12 has 2, located around the LH engine mount. 1 is engine to cradle, and the 2nd is cradle to chassis. They are an open braided strap, and get very caked with Steer fluid that leaks from the nearby cooler coil.
This Earth path is critical on this engine. I run a single dedicated earth cable from the engine direct to the chassis.

After all this, the engine should now start and run, BUT, as I said at the start, but the quality of this running will be determined by other factors. A lot of them will be specific to your market, some of which are O2 sensors, Cat Convertors, Emission items fitted, etc.

If it still fails to start, then a repeat of the above steps may be needed. These are very simple engines, as are the systems that run them. Previous “fiddling” will cause some grief, and should be repaired to Jaguar spec prior to delving into too many outside factors.

Aftermarket alarms/immobilisers/etc are well known to reek havoc on any car, and for some reason, the V12 suffers more. If the car is fitted with such an item, I strongly suggest removing it and restoring the systems to “Standard” first and foremost.