### Issue:
This bulletin provides diagnostic information organized by symptom.

### Action:
Before using the guide, check the Symptom Matrix on the next page for the diagnostic flowchart sequence. For example, if the **engine does not crank**, work through flow charts P6, P2, P10, P11 etc… Following the flowcharts in the sequence identified will help rectify any concerns while optimizing the utilization of workshop time.

⚠️ **Caution**: When working on any vehicle ensure that exposed paintwork is protected with the appropriate fender protection covers.

### ADDITIONAL INFORMATION
 Relay codes and date stamps
 Relay date codes come in two forms:
 - Relays prior to December 1998 have the format: Letter – Number – Letter i.e. R6 K1
 - Relays post December 1998 have the format: Number – Letter – Letter i.e. 2AB

All date codes are printed in white on the top face of the relay, adjacent to the part number.

⚠️ **Fuel Systems Warning**: Working on the fuel system can result in fuel vapor being emitted into the atmosphere. Fuel vapor is extremely flammable; hence great care should be taken when working on the fuel system.
Do not smoke in the working area and ensure that there is a CO2 fire extinguisher close by. The working area must be well ventilated and extraction equipment used when appropriate. When emptying fuel, use suitable fireproof equipment and an authorized explosion-proof container.
## Symptom Matrix

<table>
<thead>
<tr>
<th>Difficult to Start</th>
<th>Does not Start</th>
<th>Symptom</th>
<th>Suspect Area</th>
<th>See Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult to start after hot soak</td>
<td>Difficult to start hot</td>
<td>Difficult to start cold</td>
<td>Engine cranks too fast/too slow</td>
<td>No complete combustion</td>
</tr>
<tr>
<td>2 3 3</td>
<td>2 2</td>
<td>Throttle (contaminated)</td>
<td>P1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ECM Relay</td>
<td>P2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 4</td>
<td>Fuel pump relay</td>
<td>P3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 7</td>
<td>Immobilizer</td>
<td>P4a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DTC ‘P1336’</td>
<td>P5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Starter relay</td>
<td>P6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Rochester valve</td>
<td>P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 7</td>
<td>Injector leak</td>
<td>P8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 4 8</td>
<td>Cylinder compression</td>
<td>P9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 1 3</td>
<td>Battery</td>
<td>P10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Park/Neutral switch</td>
<td>P11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 2 6</td>
<td>Purge valve</td>
<td>P12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 5</td>
<td>Starter motor</td>
<td>P13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 6</td>
<td>Harness</td>
<td>P14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ignition coil</td>
<td>P16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 4 4 4 5</td>
<td>Fuel pump</td>
<td>P17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 5 5 5</td>
<td>Coolant sensor</td>
<td>P18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel pressure regulator</td>
<td>P20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel lines</td>
<td>P21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spark plugs</td>
<td>P26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 6 8</td>
<td>Blocked part-load breather</td>
<td>P29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Raise hood and fit fender protection covers. Remove the intake duct.

With assistance, visually observe throttle butterfly operation as the ignition is switched 'ON' for the first time.

Throttle butterfly should fully close, then immediately open to the idle position.

Did butterfly stick closed?

Switch ignition 'OFF'.

Lightly press throttle butterfly with finger to the fully closed position. Reduce pressure on the butterfly that should then return smoothly with no indication of sticking.

Did butterfly stick closed?

Clean throttle/bore following TSB 310-06.

Inspect and clean oil from intake trunking.

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Check the date stamp on the relay. If the date stamp is between R6 K1 and R6 K8, change the relay.

The ECM relay (No. 1) is in the engine management fusebox.

Use WDS to check for DTCs. Follow any guided routine associated with stored DTCs.

Related DTCs: P1606 - EMS control relay malfunction.

END

Was a fault found and rectified?

NO

From the feature content select engine/electronic engine control, press the guided tab then select electronic engine control relay.

Alternatively you could view the EMS relay signal from the datalogger. The route is: engine system/datalogger/engine management relay (EMSR). 1 indicates that the relay is energized.

END

Was a fault found and rectified?

NO

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Check 20 amp fuse (No. 7) in the luggage compartment fuse box.

Check the date stamp on the relay. If the date stamp is between R6 K1 and R6 K8, change the relay.

Use WDS to check for DTCs and follow any guided routine associated.

Related DTCs: P1230 Fuel pump relay malfunction

Was a fault found and rectified?

YES → END

NO → From the feature content, select engine system, fuel system, pumps, press the guided tab and then select the fuel injection main relay.

You can also ensure that the relay is energized by using datalogger.

Was a fault found and rectified?

YES → END

NO → If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Is the Instrument Pack (IPK) Oil, Battery and Message Centre Illuminated?

Check battery condition and power supplies/ignition circuits to IPK.

Was a fault found and rectified?

Make a note of any other symptoms that are apparent. This may help if a call to Technical Hotline is made.

Does engine crank?

Check the following flowcharts
P-14 Harness
P-16 Ignition Coil
P-26 Spark Plug
P-9 Cylinder Compression
P-32 Bore Wear

Check the following flowcharts
P-3 Fuel Pump Relay
P-17 Fuel Pump
P-20 Fuel Pressure
P-21 Fuel Lines

Does fuel pump operate Ok?

Does engine start?

Note: Ensure all three keys are available.
Check the Ignition ground at the Key Transponder Module (KTM) electrical connector FC022 pin 014.

Was a fault found and rectified?

Check continuity of the OK to Fuel Line (Orange) KTM - FC022 pin 16 and ECM - EM010 pin 6.

Note: If ECM is replaced, check that part number suffix corresponds to ECM ordered.

Call Hotline.
Lock and arm the vehicle, cycle each key in turn in the Ignition.

Do all 3 keys disable the alarm?

Do any of the 3 keys disable the alarm?

Replace faulty key. Note: Ensure correct key is ordered for specification of vehicle.

Check vehicle VIN

Is the vehicle VIN prior to V8 XJ Series - F18111 XK Series - A09737

Using Digital Multi Meter (DMM) measure Reader Exciter Coil resistance. 30 to 35 ohms at -30 to +85 Deg C.

Was reading as expected?

Replace faulty Exciter Coil.

Note: Care should be taken if testing the exciter coil to the stated temperatures.

Check the following flowcharts
P-2 ECM Relay
P-11 Park / Neutral Switch
P-6 Starter Relay
P-14 Harness
P-13 Starter Motor

Does engine start?

END.

Carry out this procedure sitting in the drivers seat.
P4a Cont.

Is the Security LED flashing repeatedly?

YES

Ensure Body Processor Module (BPM) fixing bolts are clean and tight.

NO

Using DMM check resistance of Reader Exciter Coil at KTM. Measure between FC022 pin 007 and FC022 pin 008 30 to 35 ohms at -30 to +85 Deg C.

Note: Care should be taken if testing the exciter coil to the stated temperatures.

Was a fault found and rectified?

NO

Call Hotline.

YES

Alternative route. Perform Starting System diagnostic routine on WDS.

Was a fault found and rectified?

NO

Check continuity of the Key Valid Line (Slate/Blue) between KTM - FC022 pin 009 and BPM - FC014 pin 092 (XK Series) or BPM - FC015 pin 092 (V8 XJ Series).

YES

Call DTS.

NO

Was a fault found and rectified?

YES

END.

NO

Does engine start?

YES

Call DTS.

NO
P5 - DTC P1336 Crankshaft and Camshaft Sensor Diagnostic Flowchart

**Related DTCs:**
- P1260 Security input malfunction
- P0335 CKPS Malfunction
- P1336 CKPS/CMPS range/performance
- P0340 CMPS Malfunction

**Is DTC P1336 Present?**
- **YES**
  - Check WDS for list of possible causes.
- **NO**

**Using the oscilloscope on WDS, check the crank signal.**
- **NO**
  - **Was a fault found and rectified?**
    - **YES** → **END**
    - **NO** → See P5 - Additional Information for the resistance check on the harness. This check covers crank and cam sensor.

**Set the Y axis Scale to 1 volt/div.**
**Set the X axis Scale to 10 ms/div.**
**Disconnect connector EM013 and position the red probe using the correct adapter in pin 019.**
**Start or crank the engine to see a signal.**

**With the vehicle on a ramp, remove the rubber bung in the gearbox and check the crank sensor for signs of debris.**
- **NO**
  - **Was a fault found and rectified?**
    - **YES** → 
    - **NO** → If debris is present, remove the sensor and clean, also check the sensor pin ensuring that it is straight.

**Is the sensor damaged?**
- **NO**
- **YES** → Fit new sensor.
Measure the clearance between the sensor and the reluctor ring using feeler gauges. It should be measured four times every 90 degrees. The air gap between the two should be no greater than 4.5 mm at any point.

Visually check the teeth on the reluctor ring for damage and position. Refit the rubber bung.

Using the oscilloscope on WDS, check the Cam signal.

Set the Y axis Scale to 1 volt/div. Set the X axis Scale to 10 ms/div. Disconnect connector EM013 and position the red probe, using the correct adapter in pin 020. Start or crank the engine to see a signal.

Was the signal OK?

YES

Test-drive the vehicle and re-check for DTCs.

Refer to JTIS Section 303-01.

If a problem persists, check the valve timing.

Is the idle speed steady at 700 rpm in 'P'?

YES

END

NO

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

If a problem is found contact Technical Hotline.

If a problem is found contact Technical Hotline.
### Harness resistance check crank/cam sensor

<table>
<thead>
<tr>
<th>Component</th>
<th>Part Number</th>
<th>+20°C</th>
<th>+10°C ~ +50°C</th>
<th>+50°C ~ +100°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crank sensor</td>
<td>LCA 1640AE</td>
<td>950 – 1250 Ohms</td>
<td>835 – 1400 Ohms</td>
<td>1060 – 1645 Ohms</td>
</tr>
<tr>
<td>Cam sensor</td>
<td>LCA 1646AD</td>
<td>1850 – 2450 Ohms</td>
<td>1630 – 2740 Ohms</td>
<td>2065 – 3225 Ohms</td>
</tr>
</tbody>
</table>

Resistance is measured in Ohms at the engine management connector EM013:

1. Disconnect the engine management connector EM013.
2. Check the resistance between pin 019 and pin 028 (sensor ground crankshaft position sensor).
3. You should get a reading between the parameters (see table) for the relative temperature.

### Crank and Cam Sensor signals are displayed on WDS:

![Illustration 1](Image)

See Illustration 1 for an example of a good crank signal as seen on the WDS oscilloscope. **Note:** The oscilloscope was set to 1 volt/div and 10 ms/div. The gap in the waveform represents the missing tooth on the flywheel.
Illustration 2

See Illustration 2 for an example of a good cam signal as seen on the WDS oscilloscope.

Note: The oscilloscope was set to 1 volt/div and 50 ms/div.
Check 10 amp fuse (No. 5) in engine compartment fuse box. Also check 25 amp fuse (No. 3) in the engine management fusebox (passenger side bulkhead extension).

Check the date stamp on the relay, if the date stamp is between R6 K1 and R6 K8 change the relay.

The starter relay (No. 5) is located under the hood within the right hand bulkhead extension.

Use WDS to check for DTCs. Follow any guided routine associated.

Related DTCs:
P1245 Engine crank signal low voltage.
P1246 Engine crank signal high voltage.

Using WDS, carry out the crank test.

This test will check the complete starter circuit including ignition switch, transponder, exciter coil and OK to fuel signal.

Does the vehicle start?

Was a fault found and rectified?

Refer to the next number in the matrix.

YES

YES

END

NO

NO
XK Series vehicles
Raise the vehicle with a suitable jack.

V8 XJ Series vehicles
Position the vehicle on a four post ramp.

Disconnect the vacuum hose from the TPCV

Refer to JTIS section 303-13 for system schematic. Also refer to Technical Bulletins 310-01 and 310-02.

Cut and remove the ratchet straps (if necessary) to release the TPCV from the mounting bracket. If you can carry out the test without cutting the straps then do so.

Fit a recommended vacuum pump to the TPCV vacuum connection.

Operate the vacuum pump to evacuate the TPCV to a vacuum of 0.5 bar.

Does the partial vacuum decay to zero in more than 2 seconds?

YES

XK Series vehicles
Reconnect the vacuum hose, refit the wheel arch liner and refit the roadwheel.

V8 XJ Series vehicles
XJV8 re-connect the vacuum hose.

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

NO

XK Series vehicles
Support the front of the vehicle and remove the left front road wheel, remove the wheel arch liner and the TPCV is located to the rear of the wheel arch.

V8 XJ Series vehicles
The TPCV is located under the vehicle with the charcoal canister.

If the vacuum decays in less than 2 seconds replace the faulty TPCV with a new Unit and re-test.

Did this cure the problem?

YES

END

NO

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Road test the vehicle for 10 minutes ensuring that the engine is up to normal operating temperature.

Drive the vehicle into the workshop and ensure that it is away from any drafts.

The hood must be kept closed to keep the heat in the engine compartment.

Position the gear selector lever in 'P' and apply the handbrake.

Hold the engine speed at 2000 rpm for 1 minute, release the throttle and let the engine idle for five seconds. Switch the ignition off.

Allow the vehicle to stand for 60 minutes.

Start the engine without any throttle assistance.

Did the engine start within 1 second?

NO → Contact Technical Hotline for further assistance.

YES → END
The compression test should be carried out with the engine at normal operating temperature.

Disconnect the air flow meter connector, the air cleaner box and the full-load breather pipe. Remove the securing screws that hold the intake trunking to the throttle assembly and remove the trunking.

Remove the ignition coil covers, disconnect the ignition coil connectors. Remove the ignition coil retaining screws and remove all ignition coils.

Remove the spark plugs.

Fit a calibrated compression gauge to each cylinder in turn and carry out the following procedure.

1. Switch the ignition 'ON' and wait 10 seconds.
2. Depress the throttle pedal to the floor. (This will enable fuel cut off).
3. Crank the engine over until the maximum reading is achieved on the gauge (approx. 8 seconds).

Record your results for each cylinder and compare them to the figures in the next box.

Were the compression figures good?

YES

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

NO

Contact Technical Hotline before any work is carried out on the engine.

AJ26
97 MY 4.0l 160 psi.
98 MY 4.0l 165 psi.
98/99 MY 4.0l SC 140 psi.

Note: Cylinder to cylinder variation should be no more than 10%.
These figures are not pass or fail but typical values to expect.
Ensure that all electrical loads are switched off.

Carry out a heavy rate discharge test on the battery, or if available, use the Jaguar recommended battery tester (Midtronics 490, Administration Bulletin 1-112).

Was the battery found to be in good condition?

If problems persist refer to the next number in the matrix. If there are no further steps contact Technical Hotline.

If the battery continues to lose charge, carry out testing on the charging circuits and generator.

Did this cure the problem?

Refer to JTIS section 414-02 Diagnosis and Testing.

This TSB affects 1999 Model Year vehicles, but the quiescent drain test applies to all vehicles.

Refer to TSB 414-06 Intermittent Discharged Battery and follow the quiescent drain process.

Did this cure the problem?

Fill out the quiescent drain report form and contact Technical Hotline.

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

END
Ensure that the gear selector lever is in the 'P' or 'N' position.

Use WDS and check for DTCs. Follow any guided routine associated.

From the feature content, select engine system, press the datalogger tab and log 'P/N' switch. Monitor the switch while moving the gear selector lever between 'P' and 'N'.

Rectify or replace component as necessary.

Related DTCs:
P1516 Gear change P/N driving malfunction
P1517 Engine cranking P/N malfunction

Refer to the next number in the matrix, P13 Starter Motor Diagnostic Flowchart.

Was a fault found?

Yes: Refer to WDS help text to check for correct operation.

No: Does the engine start?

Yes: END

No:
Certain fuel system faults will disable the EVAP system operation and must be repaired prior to any testing.

Ensure that the system is mechanically operational:
1. Check to see if the EVAP canister is blocked or saturated.
2. Check to see if the purge line is blocked.
3. Check to see if the purge line is damaged or leaking.
4. Check the vacuum system.

Use WDS and check for DTCs. Follow any guided routine associated.

Related DTCs:
- P0442 EVAP System leak detected.
- P0444 EVAP valve open circuit.
- P0445 EVAP Valve short circuit.
- P0447 CCV valve open circuit.
- P0448 CCV valve short circuit.

For any additional information and a system schematic refer to JTIS section 303-13.

Purge will be disabled if the battery has been disconnected and adaptive fuel metering values have been lost. Purge will not operate again until the vehicle has relearned its adaptive fuel metering values or if a fuel vapor leak is detected within the vapor system.
Were any DTCs stored?

YES

Ensure that there is 12 volts at the purge valve connector. If not, rectify as necessary.

NO

Check the continuity of the purge valve. If the reading is not between 25 & 40 ohms, replace the valve.

Check for any signs of corrosion of the purge valve connector, if corrosion is present replace the valve and connector. Refer to flowchart P14 for harness repairs.

Was the problem rectified?

YES

END

NO

B
Using WDS, select engine system from the content model, press the datalogger tab and log the following signals:
EVAPR  Evaporative purge valve
VSS  Vehicle speed
TPS  Throttle position sensor
STFT1 Short term fuel trim bank 1
STFT2 Short term fuel trim bank 2

Drive the vehicle until it reaches normal operating temperature, as the purge valve opens EVAPR increases.

To check for leaks, remove the vacuum pipe from the purge valve and with the engine running, connect a vacuum gauge.

The absolute pressure should be less than 0.5 bar at idle. If not, replace the pipe and inspect the tee pieces for blockages.

Check the run off pipe between the purge valve and the inlet manifold for leaks. Rectify or replace as necessary, then re-test.

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Check 25 amp fuse (No.3) found in engine management fusebox, and 10 amp fuse (No.5) found in engine compartment fusebox.

At this point, if no fault has been found, the circuit prior to the starter motor is deemed to be in good order. Remove the starter motor and carry out a starter motor bench test.

Refer to JTIS section 303-06.

Was the starter motor found to be faulty?

YES

Replace the component as described on JTIS section 303-06.

END

NO

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Using WDS, check for DTCs.

If areas of the harness are damaged, a DTC should be stored, if not, visually check the relevant suspected area.

Check for signs of corrosion in the connectors, backed out pins or damaged pins.

If a problem is found with the harness in the areas of the throttle, speed control or ABS you must contact Technical Hotline.

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

Always use the recommended Jaguar harness repair kit 418-S065 and 418-S411.

If a problem is found refer to the Jaguar Wiring Harness Repair guide. Publication Number JTP 586 (part of repair kit.)
Use WDS and check for DTCs. Follow any guided routine associated.

Related DTCs:
P0300 Random misfire detected
P0301 to P0308 Misfire detected on the relevant cylinder
P0351 to P0358 Cylinder malfunction on the relevant cylinder
P1367 Ignition monitor (module 1)
P1368 Ignition monitor (module 2)

Was a fault found and rectified?

YES → END

NO →

Remove the engine covers and visually check for signs of corrosion, damage and signs of tracking (burn marks) around the coils.

If any faults are found, remove the component and thoroughly clean, dry or replace. Re-test to see if the fault/misfire has been rectified.

Refer to JTIS section 303-07.
Has the misfire been found and rectified?

- **YES**
  - END

- **NO**
  - Move the suspect coil to another cylinder and retest.

  Did the misfire move to the cylinder that the coil was moved to?

  - **YES**
    - Replace the component.
  
  - **NO**
    - If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Fit a calibrated fuel pressure gauge to the fuel rail adapter valve.

Drive the vehicle under the following conditions:
1 - At idle in 'P'.
2 - 50 Km/h (30 mph) flat road, steady speed.
3 - 80 Km/h (50 mph) flat road, steady speed.

Was fuel pressure 38 psi +/- 5 psi 2.6 bar?

Briefly run engine at wide open throttle and note the fuel pressure.

Was fuel pressure:
- **Naturally Aspirated engine**
  - 43 psi ± 5 psi (3 bar)?
- **Supercharged engine**
  - 52 psi ± 5 psi (3.5 bar)?

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
P18 - ECT Sensor Diagnostic Flowchart

Using WDS, check for stored DTCs and follow any guided routine associated.

Was a fault found and rectified?

YES → END

NO → Using WDS, select engine system/datalogger tab/engine coolant temperature sensor. Start the engine from cold and monitor the engine warm-up cycle.

Did the engine warm up as it should?

YES → You should see a steady constant rise in temperature.

NO → If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

Check the coolant level and check for contaminated coolant. Test the thermostat.

Was a mechanical fault found?

YES → Replace or rectify faulty component and re-test for correct operation.

END

NO → If there is a problem with the harness one of related DTCs will be stored in the ECM. A visual check of the ECT connector and pins would be recommended. Also check the ECM connector.

Related DTCs:
- P0116 ECTS Range/performance
- P0117 ECTS Sense circuit high voltage (low coolant temp)
- P0118 ECTS Sense circuit low voltage (high coolant temp)
- P0125 ECTS Response

For information refer to P14 - Harness Diagnostic Flowchart.
Start the engine from cold and allow it to get to normal operating temperature and then back to ambient temperature. Check for DTCs.

Refer to P18 - Additional Information

Start the engine and monitor the coolant temperature using WDS datalogger. When a temperature you wish to test is reached, switch the ignition off and disconnect the ECT sensor. Using a multimeter, measure the resistance across pins 1 and 2. Test the sensor when cold, mid temperature then warm.

Was a fault found and rectified?

Go to the next step in the matrix.

Rectify or replace as necessary.

Was the problem rectified?

END
P18 – Additional Information

Engine coolant temperature sensor/resistance relationship

<table>
<thead>
<tr>
<th>Engine coolant temperature °C</th>
<th>Resistance K ohms</th>
<th>Voltage V</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>9.20</td>
<td>4.05</td>
</tr>
<tr>
<td>0</td>
<td>5.90</td>
<td>3.64</td>
</tr>
<tr>
<td>10</td>
<td>3.70</td>
<td>2.89</td>
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<tr>
<td>20</td>
<td>2.50</td>
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<tr>
<td>90</td>
<td>0.25</td>
<td>0.65</td>
</tr>
<tr>
<td>100</td>
<td>0.19</td>
<td>0.55</td>
</tr>
</tbody>
</table>
Using the Datalogger on WDS, check the long term fuel trim (LTFT1 & 2).

Typical values range between ±7%. Values outside of this range may suggest a fuel related problem.

For values >+7% adaption, fuel is added to compensate for lean running. This could be low fuel pressure. For values >-7%, fuel is reduced to compensate for rich running. This could be high fuel pressure.

Fit a calibrated fuel pressure gauge to the schrader valve on the fuel rail, then carry out the following tests.

Switch the ignition to position 2.

The fuel pump is switched off after 2 seconds unless the engine is running so you may have to cycle the ignition a few times to prime the system.

Was a fault found and rectified?

NO

If the fuel pressure remains higher than 43 psi...

C

If the fuel pressure is lower than 38 psi...

A

Does the fuel pressure rise to 43 psi (3 bar) and then drop back to 38 psi (2.6 bar) ± 5 psi?

YES

B

Related DTCs:
P0171 A bank combustion to lean
P0172 A bank combustion to rich
P0174 B bank combustion to lean
P0175 B bank combustion too rich

NO

Was a fault found and rectified?

YES

END

Connect WDS. Check for DTCs and follow any guided routine associated.

Refer to TSB 310-04

Related DTCs:
P0171 A bank combustion to lean
P0172 A bank combustion to rich
P0174 B bank combustion to lean
P0175 B bank combustion too rich
End

Replace the regulator and re-test.

Does fuel pressure read 38 psi (2.6 bar)

YES

Check for sufficient fuel in tank. Position the vehicle on a ramp and visually check the fuel pipes for signs of damage. Check the fuel filter for signs of blockage.

NO

Start the engine and run at idle (in 'P') until warm.

A

B

C

D

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

With engine still running, raise the engine speed to approx 2000 rpm and hold for 2 seconds.

Does the fuel pressure read 38 psi (2.6 bar)?

YES

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

Replace the regulator and re-test.

NO

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

Replace the regulator and re-test.

NO

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

Replace the regulator and re-test.

NO

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

Replace the regulator and re-test.

NO

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?

YES

The fuel pressure should rise to 43 psi (3 bar) then drop back to 38 psi (2.6 bar) ± 5 psi.

Replace the regulator and re-test.

NO

Check vac pipe for kinks, splits, fit and vacuum, rectify if necessary.

Alternatively, if a calibrated vacuum pump gauge is available then carry out the following.

Remove the vacuum pipe from the regulator and blank the pipe to prevent an air leak. Connect vacuum pump to the regulator, start engine and run at idle (700 rpm in 'P').

Does fuel pressure read 43 psi (3 bar) ± 5 psi?
Apply a vacuum of 600 mbar to simulate manifold depression.

Does fuel pressure drop to approx 38 psi (2.6 bar)?

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.

Diaphragm in regulator inoperative.

Replace component and re-test.
**P21 - Fuel Lines Diagnostic Flowchart**

1. Position the vehicle on a ramp and visually check the fuel pipes for signs of damage.

2. Check the fuel filter for signs of a blockage.

3. Fit a calibrated fuel pressure gauge then start the engine.

4. Go to flowchart P20 fuel pressure regulator

   - Refer to TSB 310-04

5. **Was the regulator at fault?**

   - **YES**
   - **END**

6. **NO**

   - Using WDS, check for DTCs and follow any guided routine associated.

7. **Related DTC**

   - P1230 - Fuel pump relay malfunction

8. **Was a problem found and rectified?**

   - **YES**
   - **END**

   - **NO**

   - A
From the feature content, select engine system/fuel system, press the guided tab then select pumps.

Was a problem found and rectified?

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Ensure that you always check JEPC for the correct part numbers.

For spark plug specifications refer to JTIS section 303-07, Ignition, Engine - Specification

If a spark plug is suspected to be faulty, remove the plug and visually check the ceramic area for cracks. Check the electrode gap and condition. If the plug is found to be dirty, use a spark plug cleaner. If the spark plug is damaged, replace it. Re-gap the plug to the specified clearance and install. Finally re-test.

Refer to TSB 303-44 spark plug corona. When re-installing spark plugs, the recommended torque figure is between 25-29 Nm (5.6-6.5 lb/ft).

If problems persist, proceed to the next diagnostic flowchart (see matrix). If there is no next step, contact Technical Hotline.
Open the hood and fit the fender protection covers.

On N/A engines, release and remove the engine cover from the left hand cylinder bank.

Release the part-load breather retaining clip allowing the pipe connector to be disconnected from the breather stub.

Using a hand held pin chuck (recommended tool, Snap On YA 806), carefully pass a 2.5 mm (0.098 in) drill bit into the breather stub and through the restrictor. Slowly rotate the drill to clear any deposits.

When the drill can be rotated freely, all deposits have been cleared from the restrictor.

Withdraw the drill bit from the restrictor and pipe stub.

Note: In no circumstances must a power drill be used, it should always be rotated by hand. The drill bit should never exceed 2.5 mm (0.098 in).
Reconnect the breather pipe connector to the breather stub checking first that the two O-rings are in place in the connector.

Refit the engine cover where applicable.

Where this operation is undertaken for the first time, identify that the procedure has been undertaken (so that it is not repeated, except at routine service intervals) by applying a neat spot of white paint on the left hand suspension turret.

**XK Series**
Between the dome shaped plastic cover and the inner spring pan retaining nut, nearest the engine.

**V8 XJ Series**
Between the two dome-headed nuts.

Remove the fender protection covers and close the hood.

END

Note: The information in this flowchart has been taken from Service Action S474. Use the chart in conjunction with Service Action S474 Technical Bulletin 600-03.