

VOLVO

Service Manual

Fault tracing

Section 2 (23,28)

Volvo System Tester

LH 2.4 EZ 116K

LH 3.1 EZ 116K

200/700/900

1989 -

TP 32053/1

Preliminary edition

Use this manual if you have been unable to trace the fault using the normal service manual.

This manual is a draft version, and covers both 240 and 700/900 models. It will be replaced by new 240 and 700/900 Service Manuals as they are issued. In future manuals, the System Tester will be fully integrated with other fault-tracing methods.

Place this manual in the 700/900 folder system.

Volvo Car Corporation

D. Running Test fault message table.

NOTE!

The circuit diagrams in this manual apply to the 740, 940 (not 940 SE USA/CDN) Y/M 92 and 200 Y/M 92 . Unless otherwise indicated on the diagram, 740/940 circuit diagrams apply to all engine versions.

If in any doubt, see appropriate circuit diagram wiring manual section 3(39).

LH 2.4 / LH 3.1

Unless indicated otherwise in the column, fault messages apply to both LH 2.4 and LH 3.1.

| System | Fault message | Step | Page |
|--------|---|------|------|
| LH 2.4 | Engine speed signal missing, LH #1 | GD | 46 |
| | Idle switch signal missing, LH #2 / EZ #7 | EA | 17 |
| | Idle switch status differs, LH #2 / EZ #7 | EB | 18 |
| | Power missing, LH #4 | EC | 20 |
| | Signal ground missing, LH #5 | ED | 21 |
| LH 3.1 | Air mass meter signal missing, LH #7 | EE | 22 |
| | Air mass meter signal high, LH #7 | EF | 24 |
| | Idle switch signal missing, LH #8 / EZ #7 | FA | 40 |
| | Idle switch status differs, LH #8 / EZ #7 | FB | 41 |
| | Main relay power missing, LH #9 | EG | 25 |
| | Water temperature signal missing, LH #13 | EH | 27 |
| | Power ground missing, LH #17 | ED | 21 |
| | Injection pulses missing, LH #18 | EJ | 28 |
| | Pump relay control signal missing, LH #20 | EK | 30 |
| | Main relay control signal missing, LH #21 | EL | 32 |
| | Oxygen sensor signal out of range, LH #24 | EM | 34 |
| | Load signal to EZ missing, LH #25 | EN | 35 |
| | CIS valve pulse missing, LH #33 | EP | 37 |
| | Ignition switch voltage missing, LH #35 | EQ | 39 |

NOTE!

The circuit diagrams in this manual apply to the 740 and 940 (not 940 SE USA/CDN) Y/M 92 and 200 Y/M 92. Unless otherwise indicated on the diagram, 740/940 circuit diagrams apply to all engine versions.

If in doubt, see appropriate circuit diagram wiring manual section 3(39).

EZ 116K

| Fault message | Step | Page |
|---|------|------|
| Power missing, EZ #5 | GA | 42 |
| Ignition switch voltage missing, EZ #6 | GB | 43 |
| Load signal from LH missing, EZ #8 | EN | 35 |
| Trig signal to EZ power stage missing, EZ #16 | GC | 44 |
| Engine speed signal missing, EZ #17 | GD | 46 |
| EZ ECU ground missing, EZ #20 | GE | 49 |
| Engine speed sensor signal missing, EZ #23 | GD | 46 |

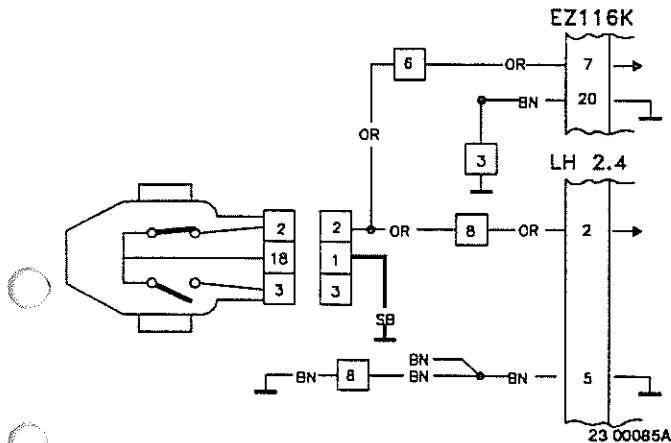
Power stage

| | | |
|--|----|----|
| Ignition pulses missing, power stage #1 | HA | 50 |
| Power stage ground missing, power stage #2 | HB | 52 |
| Voltage supply missing, power stage #4 | HC | 53 |
| Trig from EZ ECU missing, power stage #5 | GC | 44 |

EB. LH#2 / EZ#7 (LH 2.4)

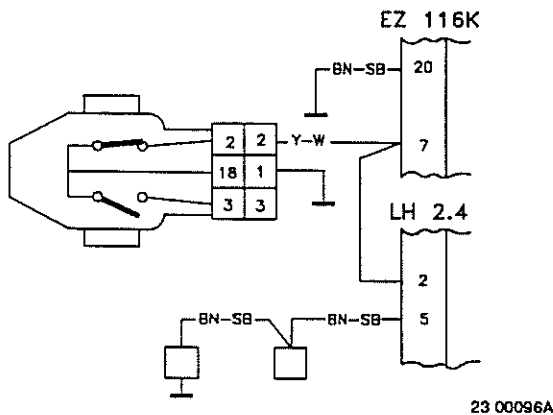
LH#2 / EZ#7 Idle switch status differs

740/940



200

LH 2.4



Conditions:

If both LH and EZK are connected, fault message will be stored if voltage varies between connections, i.e. is both above and below 1.2 V.

Causes:

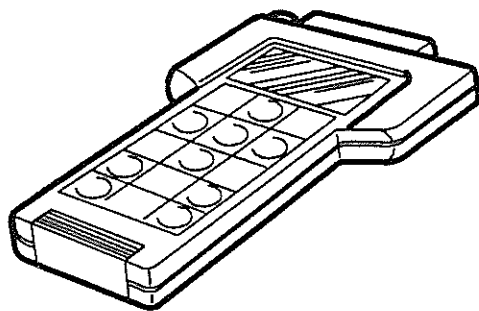
Broken wire between throttle contact and LH#2.
Broken wire between throttle contact and EZ#7.

Symptoms:

Low idling speed.
Engine starts reluctantly or not at all.
No fuel shutoff when engine braked.

NOTE!

Before checking wires, disconnect System Tester as in BA2.



08 00023

EB1

Monitor Test

- Start engine but do not depress gas pedal.
- Check display reads IDLING during Monitor Test .

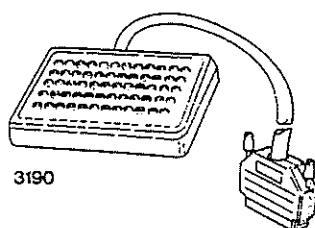
Display reads IDLING:

- Volvo System Tester, Measurement box EB2.

Display does not read IDLING:

- Check wires between LH#2 and throttle contact for breaks as in L2.

EB2

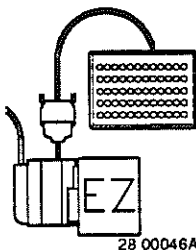
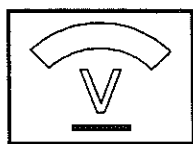
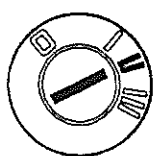


S151 183

Volvo System Tester, measurement box

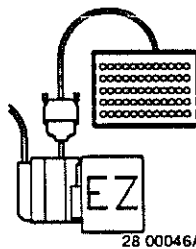
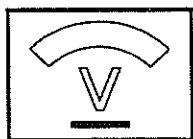
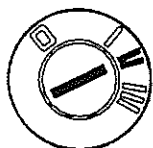
- Disconnect System Tester as in BA2.
- Connect measurement box to EZ 116K and check ground points as in K3-K4.
- Go to 'Check idle signal to EZ' EB3.

EB3



Check idle signal to EZ

- Connect EZ control unit to measurement box.
 - Replace fuses removed.
 - Ignition on.
- Connect voltmeter between EZ#7 and EZ#20.
Voltmeter should read around 0 V.



- Free throttle control so that idle switch opens.
- Voltmeter should read approx. 12 V.

If value OK:

- Check connections between EZ#7 and throttle contact for loose contacts as in L1 and L5.
- Check connections between LH#2 and throttle contact for loose contacts as in L1 and L5.

If value not OK:

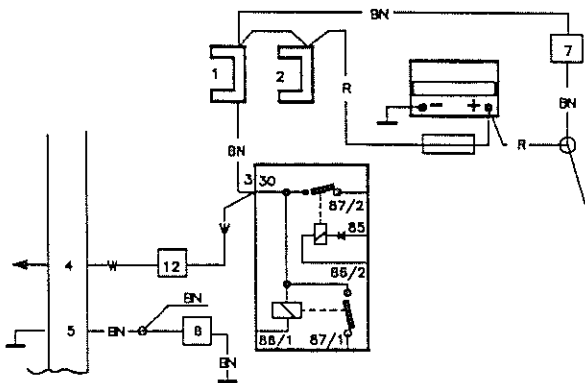
- Check wire between EZ#7 and throttle contact for breaks as in L2.

EC. LH#4

LH#4 Power missing

740/940

B230 F/FB B200 F B234 F/G B204 E



23 00086A

Conditions:

Fault message will be stored if voltage is less than 1 V.

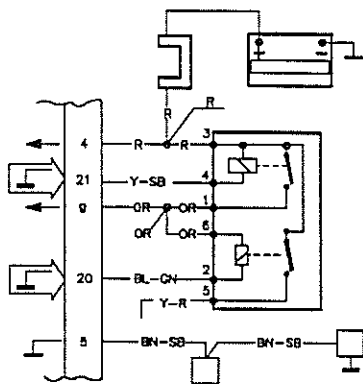
Causes:

Broken wire between LH#4 and battery

Symptoms:

Diagnostic system not working. If fault found when trying to start engine, do not start engine.

200



23 00098A

EC1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply' EC2.

EC2

Check power supply

- Connect control unit to measurement box.
 - Replace fuses.
 - Ignition on.
- Connect voltmeter between LH#4 and LH#5.

Voltmeter should show battery voltage

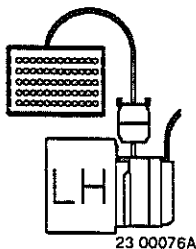
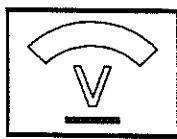
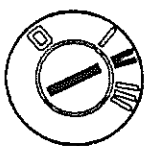
If value OK:

Intermittent fault.

- Check wire between LH#4 and battery for loose contacts as in L1 and L5.

If value not OK:

- Check wire between LH#4 and battery for breaks as in L2.

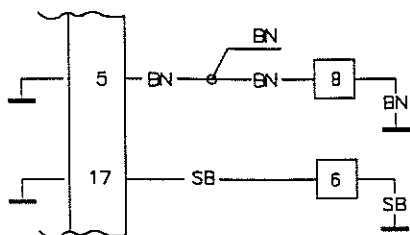


23 00076A

ED. LH #5, LH #17

LH #5 Signal ground missing

740/940



08 00087A

Conditions:

Fault message is stored if voltage is greater than 1.2 V.

Causes:

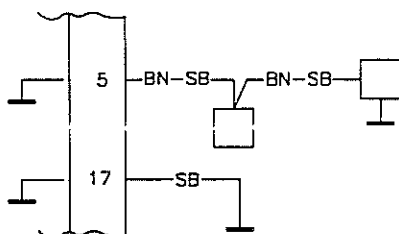
Break in ground point on intake manifold.

Symptoms:

If the fault is intermittent, the engine will stop or shudder violently.

LH #17 Power ground missing

200



23 00107A

Conditions:

Fault message will be stored if voltage is greater than 1.2 V when engine speed is less than 2500 rpm.

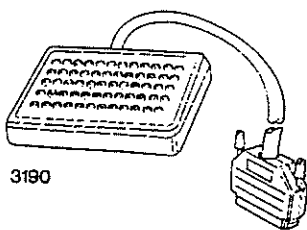
Causes:

Break in ground point on intake manifold.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall or shudder violently.



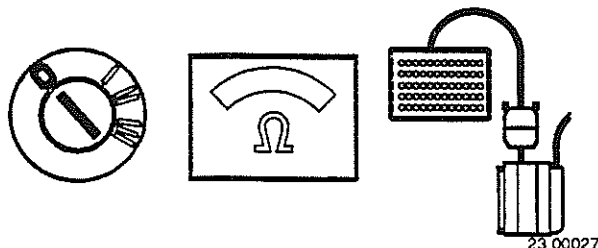
3190

S151 183

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2. Check LH#5 and LH#17 with extra care.

- Go to 'Check ground points' ED2.



23 00027

Check ground points

If value is OK when checking ground points:

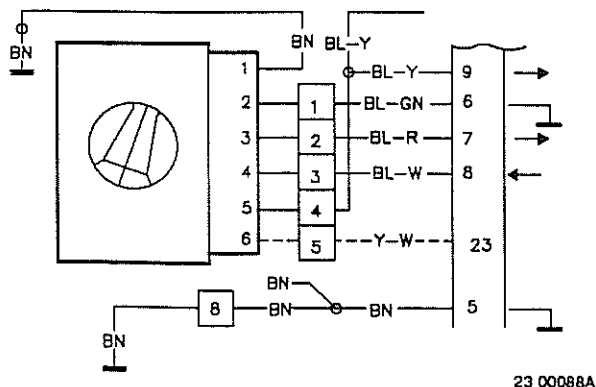
Intermittent fault.

- Check ground points and connections for loose contacts as in L1 and L5.

EE. LH#7

LH#7 Air mass meter signal missing

740/940

**Conditions:**

Fault message is stored if voltage is less than 1 V.

Causes:

Break or ground short in wire between LH7 and air mass meter.

Break or ground short inside air mass meter.

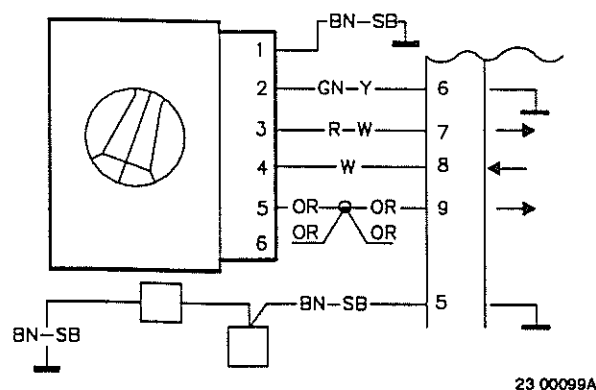
Break to power supply connection 5 on air mass meter.

Symptoms:

Engine shudders. Idling uneven.

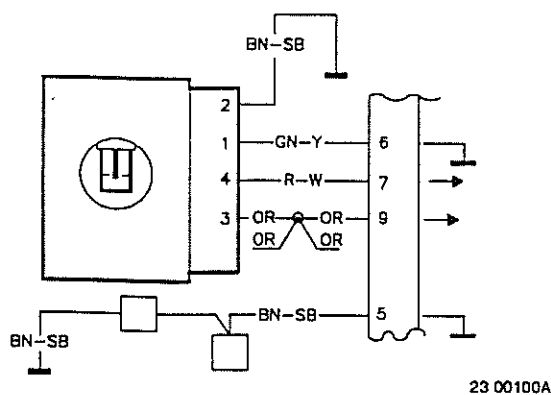
200

LH 2.4



200

LH 3.1



EE1

Volvo System Tester, measurement box

– Disconnect System Tester as in BA2.

– Connect measurement box to LH and check ground points as in K1-K2.

- Go to 'Check air mass meter and wire resistance' EE2.

EE2

Check air mass meter and wire resistance

– Ignition off.

Connect ohmmeter between LH#7 and LH#5 (ground).

LH 2.4: Ohmmeter reading should be about 4 Ω.

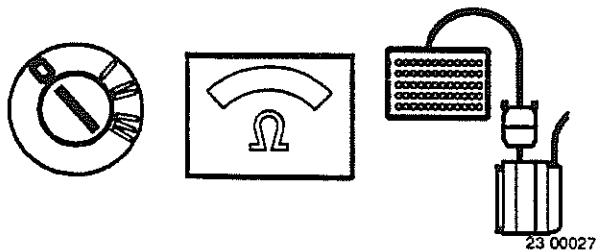
LH 3.1: Ohmmeter reading should be just on 110 Ω.

If value OK:

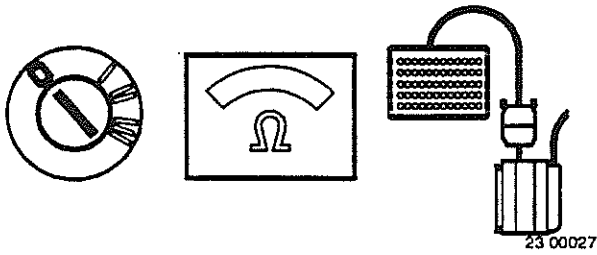
- Check resistance to ground EE3

If value not OK:

- Check wire between LH#7 and air mass meter for breaks as in L2.



EE3



Check resistance to ground

- Ignition off.
 - Disconnect air mass meter.
- Connect ohmmeter between LH#7 and LH#5 (ground).
Ohmmeter resistance should be constant.

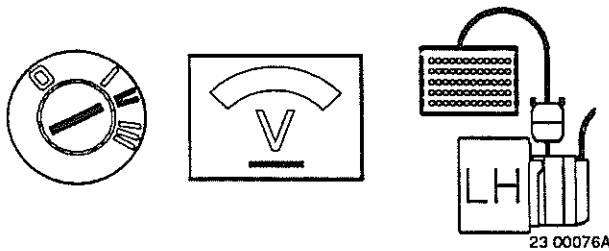
If value OK:

- Check power supply EE4.

If value not OK:

- Check wire between LH#7 and air mass meter for ground shorts as in L3.

EE4



Check power supply

- Connect control unit to measurement box and air mass meter.
- Replace fuse.
- Ignition on.

LH 2.4: Connect a voltmeter between connection 5 on the air mass meter and ground.

LH 3.1: Connect a voltmeter between connection 3 on the air mass meter and ground.

Voltmeter should show battery voltage.

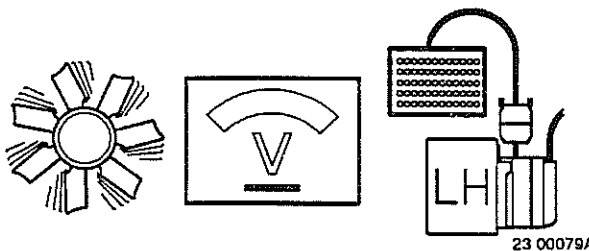
If value OK:

- Check air mass meter EE5.

If value not OK:

- Check wire between connection 5 (LH 3.1:connection 3) and system relay for breaks as in L2.

EE5



Check air mass meter

- Connect air mass meter.
 - Start engine and run until warmed up.
- Connect a voltmeter between LH#7 and LH#5 (ground).
– Take reading with motor idling but not under load.
LH 2.4: Voltmeter reading should be about 2.3 V.
LH 3.1: Voltmeter reading should be about 3.5 V.

If value OK:

Intermittent fault

- Check wire between LH#7 and air mass meter for intermittent breaks as in L1 and L5.
- Check wire between connection 5 (LH 3.1:connection 3) and system relay for loose contacts as in L1 and L5.

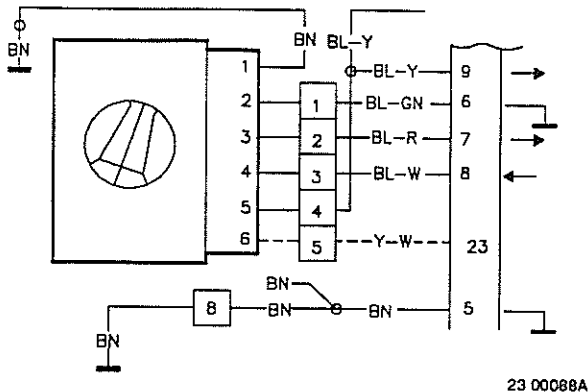
If value not OK:

- Check with new air mass meter.

EF. LH#7

LH#7 Air mass meter signal high

740/940



Conditions:

Fault message appears if voltage is greater than 6 V.

Causes:

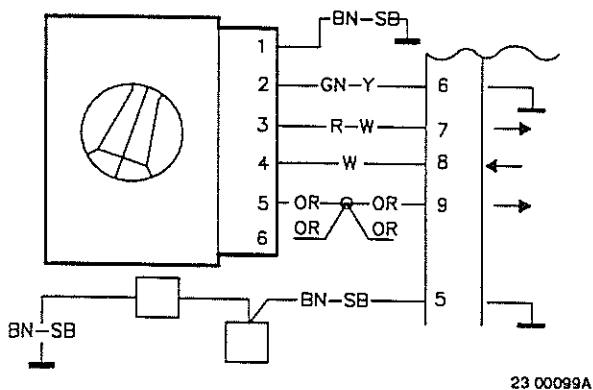
Live short in wire between LH#7 and air mass meter.
Air mass meter poorly grounded.
Live short inside air mass meter.

Symptoms:

Engine shudders, idles unevenly.

200

LH 2.4



EF1

Monitor Test

- Start engine.
 - Check load signal in Monitor Test.
- LH 2.4: Load should be around 2.3 V when engine is idling and not under load.

LH 3.1: Load should be around 3.5 V when engine is idling and not under load.

If value OK:

Intermittent fault.

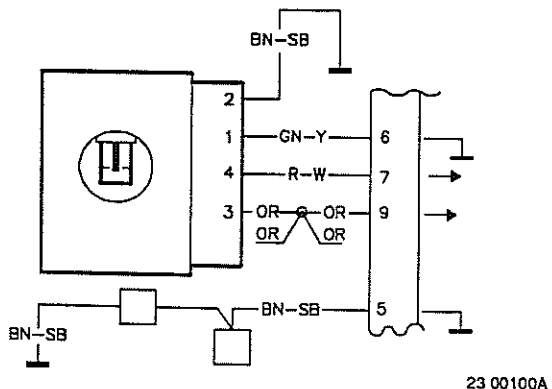
- Check air mass meter ground point and wire for loose contacts as in L1 and L5.
- Check wire between LH#7 and air mass meter for intermittent live shorts as in L4.

If value not OK:

- Check air mass meter ground point and wire for breaks as in L2.
- Check wire between LH#7 and air mass meter for live shorts as in L4.

200

LH 3.1

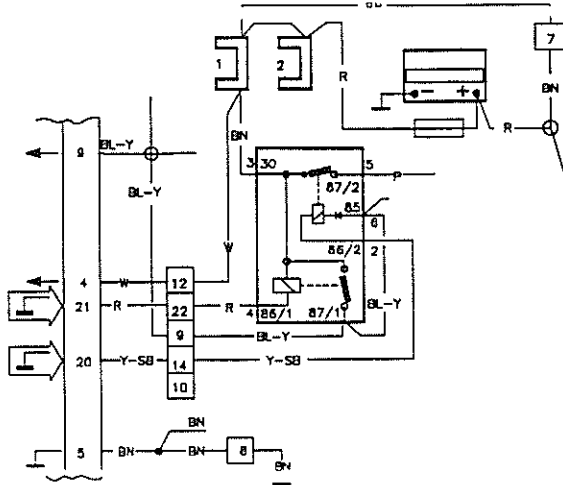


EG. LH#9

LH #9 Main relay power missing

740/940

B230 F/FB B200 F B234 F/G B204 E



23 00089A

Conditions:

Fault message appears if voltage is less than 1 V.

Causes:

Break in system relay.

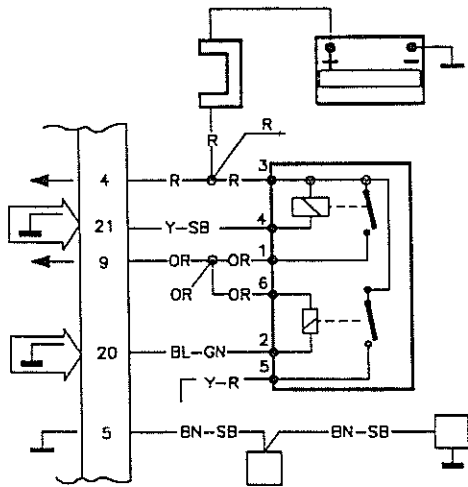
Break in wire between LH#21 and system relay.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall or shudder violently

200



23 00098A

EG1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply LH#21', EG2.

FG2

Check power supply LH#21

- Connect control unit to measurement box.
- Replace fuse.
- Ignition off.

Connect voltmeter between LH#21 and LH#5.

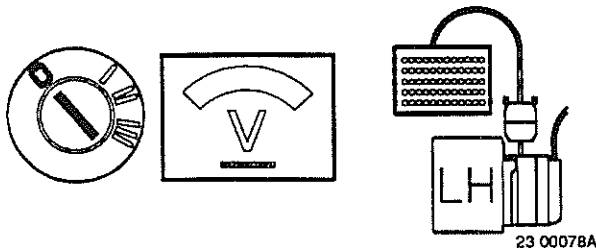
Voltmeter should show battery voltage.

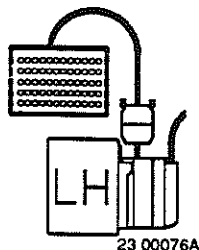
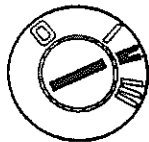
If value OK:

- Check controls LH #21 EG3.

If value not OK:

- Test system relay LH#21 EG6.





Check control LH#21

— Ignition on.

Voltmeter should read about 0.8 V.

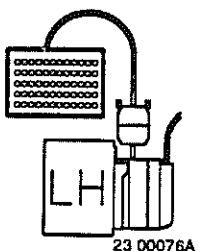
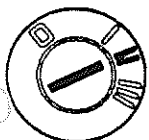
If value OK:

- Check LH#9 EG4.

If value not OK:

- Test with new control unit.

EG3



Check LH#9

— Ignition on.

Connect voltmeter between LH#9 and LH#5.

Voltmeter should show battery voltage.

If value OK:

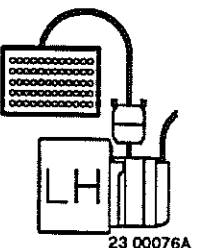
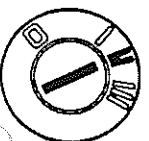
Intermittent fault.

- Check connections to LH#21 and LH#9 for loose contacts as in L1 and L5.

If value not OK:

- Test system relay LH#9 EG5.

EG4



Test system relay LH#9

— Test with new system relay.

Connect voltmeter between LH#9 and LH#5.

Voltmeter should show battery voltage.

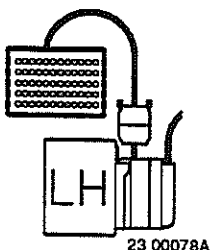
If value OK:

- System relay was sluggish

If value still not OK:

- Check wire between LH#9 and system relay for breaks as in L2.
- Refit old relay.

EG5



Test system relay LH#21

— Test with new system relay.

— Ignition off.

Connect voltmeter between LH#21 and LH#5.

Voltmeter should show battery voltage.

If value is OK:

- System relay was sluggish.

If value still not OK:

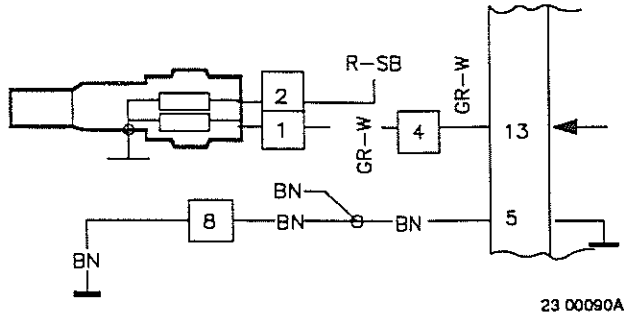
- Check wires between LH#21 and fuse via system relay for breaks as in L2.
- Refit old relay.

EG6

EH. LH#13

LH#13 Water temperature signal missing

740/940



Conditions:

Fault message is stored if voltage exceeds 4.5 V.

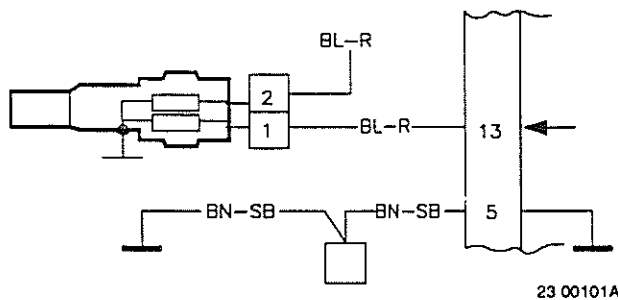
Causes:

Break in wire between LH#13 and temperature sensor.
Temperature sensor broken.

Symptoms:

Engine hard to start when warm.

200



NOTE!

Before checking wires, disconnect System Tester as in BA2.

Monitor Test

- Run engine until warm.
 - Check water temperature in Monitor Test.
- Temperature when engine warm should be around 90°C.

If temperature OK:

Intermittent fault.

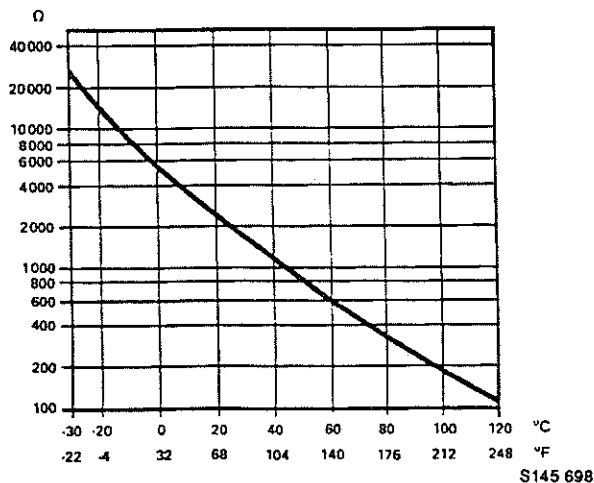
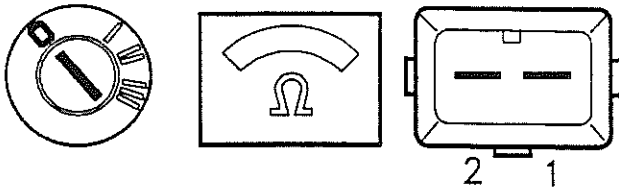
- Check connections for poor contacts as in L1 and L5.

If temperature is below 0°C:

- Check sensor resistance EH2.

If temperature wrong otherwise:

- Check connections for contact resistance as in L1 and L5.



Check resistance

— Ignition off.

Connect ohmmeter between connection 1 on temperature sensor and ground.

Ohmmeter reading should be as in diagram.

If value OK:

- Check wire between LH#13 and sensor for breaks as in L2.

If value not OK:

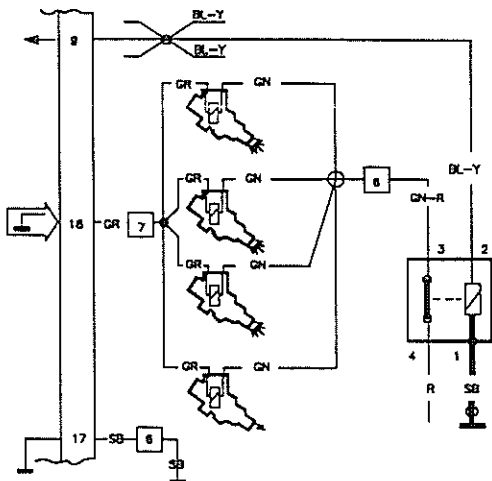
- Test with new temperature sensor.

EJ. LH#18

LH#18 Injection pulses missing

740/940

B230 F/FB B200 F B234 F/G B204E



23 00091A

Conditions:

Fault message will be stored if voltage is not below 9 volt during a given time, around 250 ms.

Fault message will not be given if fuel shut-off condition is satisfied, i.e. engine speed is over 2200 rpm and then falls below 1100 rpm, and idling contact is closed.

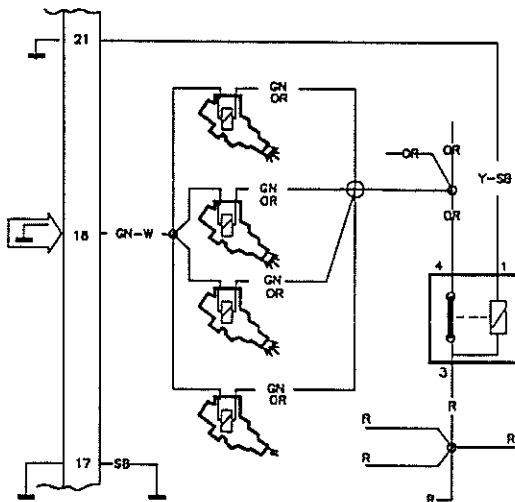
Causes:

Break or ground short in wire between LH#18 and injectors.
No power supply to injectors.
Auxiliary relay defective.

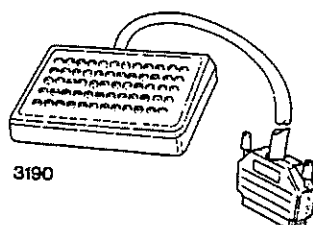
Symptoms:

Engine will not start.
If fault is intermittent, engine will stall or engine speed will fall.

200



23 00102A



3190

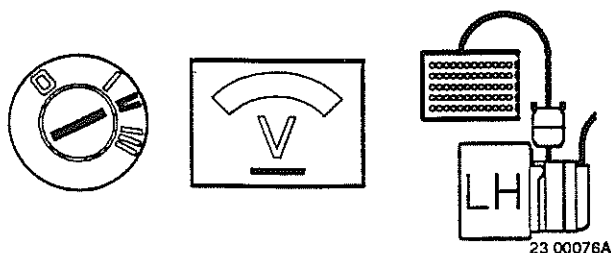
\$151 183

EJ1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply' EJ2.

EJ2



Check power supply

- Connect control unit to measurement box.
- Replace fuse.
- Ignition on.

Connect voltmeter between LH#18 and LH#17 (output ground).

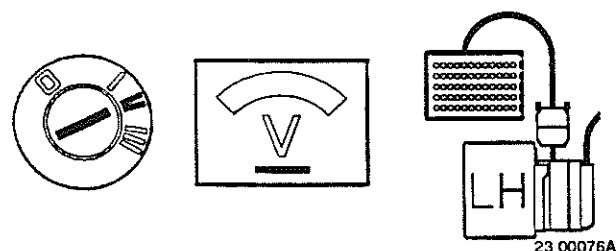
Voltmeter should show battery voltage.

If value is OK:

- Check control #18 EJ4.

If value not OK:

- Check auxiliary relay EJ3.



Check auxiliary relay

- Test with new auxiliary relay.
- Ignition on.

Connect voltmeter between LH#18 and LH#17 (output ground).

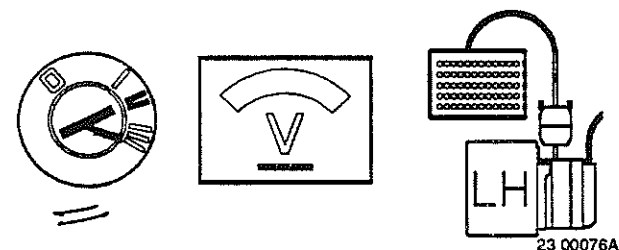
Voltmeter should show battery voltage.

If value OK:

- Auxiliary relay was sluggish

If value still not OK:

- Check wires between LH#18 and auxiliary relay via injectors for breaks as in L2.



Check control #18

Connect voltmeter between LH#18 and LH#35 (voltage).

- Crank engine. ✖

Voltmeter reading should be less than 1 V.

If value OK:

Intermittent fault.

- Check connections between LH#18 and injectors for poor contacts and intermittent ground shorts as in L3.
- Check wires between LH#18 and auxiliary relay via injectors for poor contacts as in L1 and L5.

If value not OK:

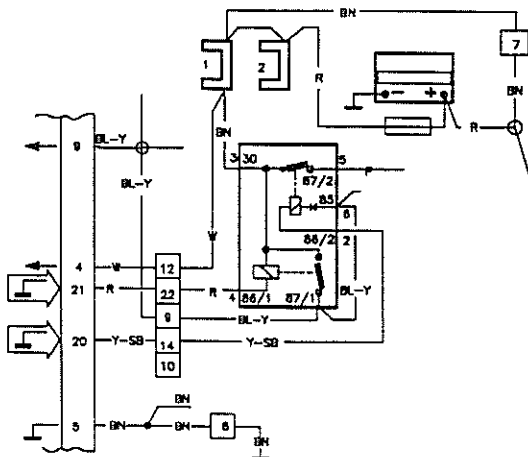
- Test with new control unit.

EK. LH#20

LH#20 Pump relay control signal missing

740/940

B230 F/FB B200 F B234 F/G B204 E



23 00089A

Conditions:

Fault message is stored if voltage is over 3 V.

Causes:

Break between LH#9 and system relay.

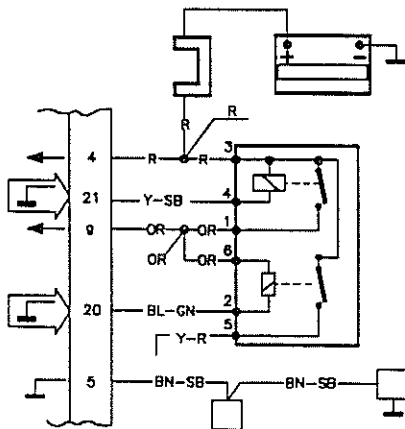
System relay defective.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall or shudder violently.

200

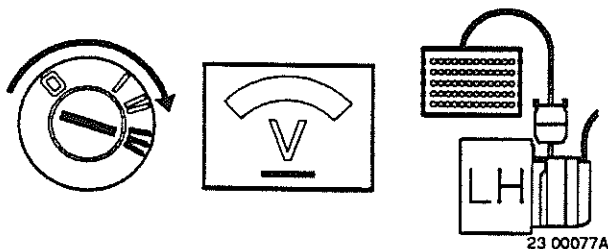


23 00098A

EK1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply' EK2.



23 00077A

EK2

Check power supply

- Connect control unit to measurement box.
- Replace fuse.

Connect voltmeter between LH#20 and LH#5.

– Try to start engine.

Voltmeter should read around 1 V when starter motor is turning or engine is running.

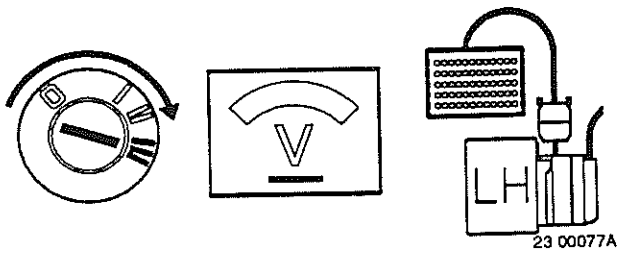
If value OK:

- Check wire to LH#9 EK4.

If value not OK:

- Test system relay EK3.

EK3



Test system relay

- Test with new system relay.
- Connect voltmeter between LH#20 and LH#5.

- Try to start engine.

Voltmeter should read around 1 V when starter motor is turning or engine is running.

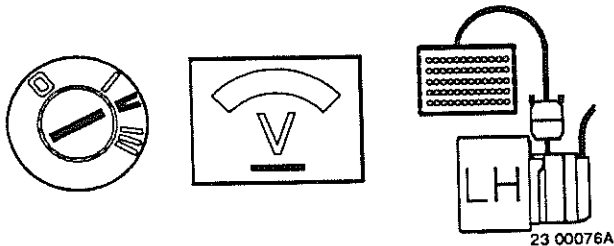
If value OK:

- System relay was sluggish.

If value still not OK:

- Check wire to LH#9 EK4.

EK4



Check wire to LH#9

- Disconnect idle valve to remove power from LH#33

- Ignition on.

Connect voltmeter between LH#9 and LH#5.

Voltmeter should show battery voltage.

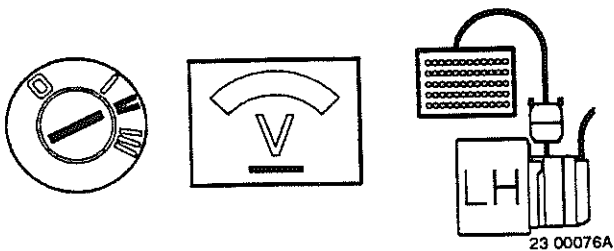
If value OK:

- Check for poor contacts in wire EK5.

If value not OK:

- Check wire between LH#9 and system relay for breaks as in L2.

EK5



Check for poor contacts in wire

- Idle valve disconnected.

- Ignition on.

Connect voltmeter between LH#9 and LH#5.

Voltmeter should show battery voltage.

Check voltage does not disappear when checking for poor contacts as in L5.

If value not OK when testing:

Intermittent break:

- Repair wiring.

If value OK:

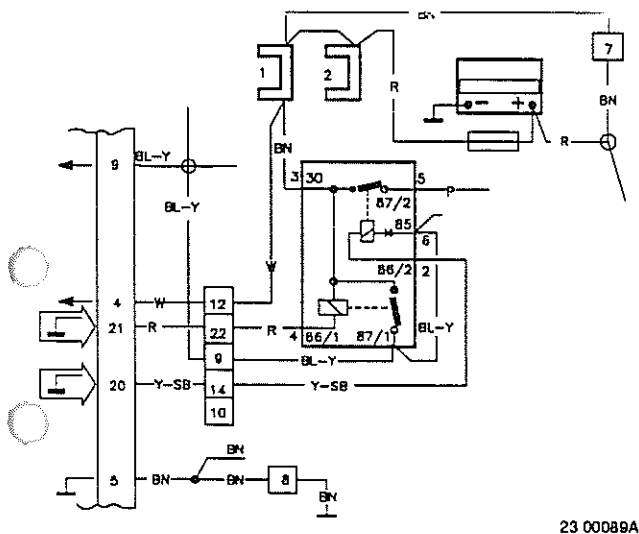
- Test with new control unit.

EL. LH #21

LH#21 Main relay control signal missing

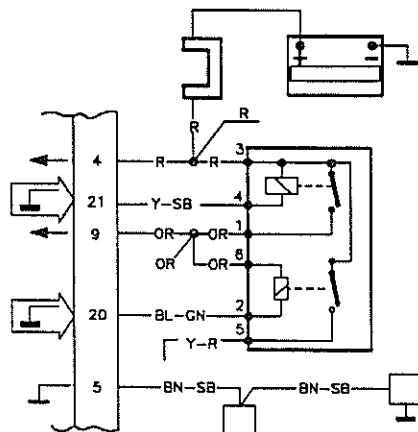
740/940

B230 F/FB B200 F B234 F/G B204 E



23 00089A

200



23 00098A

Conditions:

fault message stored if voltage is over 3 V.

Causes:

System relay defective.
Break in engine ground.

Symptoms:

Engine will not start.
If fault is intermittent, engine will stall or shudder.

EL1

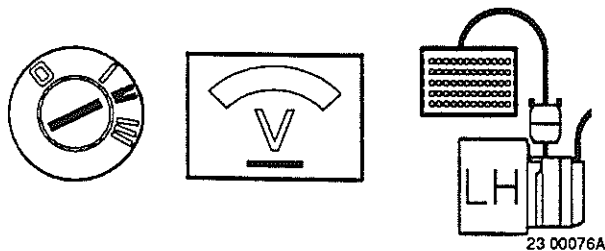
Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply' EL2.

EL2

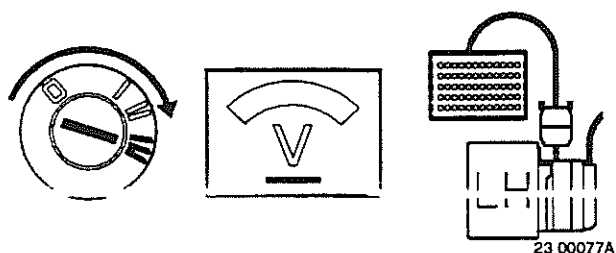
Check power supply

- Connect control unit to measurement box.
 - Replace fuse.
 - Ignition on.
- Connect voltmeter between LH#21 and LH#5 (ground).
Voltmeter should read around 0.8 V.



23 00076A

EL3



Check power supply when starting

– Try to start engine.

Voltmeter should read around 0.8 V when starter motor is turning or engine is running.

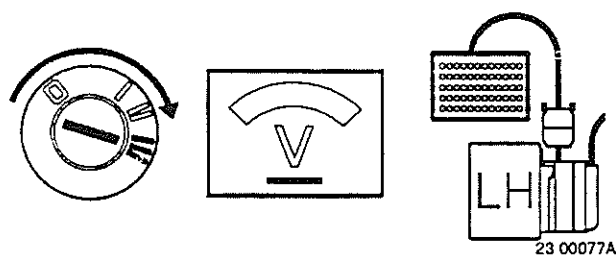
If value OK:

– Check engine ground EL5.

If value not OK:

- Check system relay EL4.

✓



Check system relay

– Test with new system relay.

Connect voltmeter between LH#21 and LH#5.

– Try to start engine.

Voltmeter should read around 1 V when starter motor is turning or engine is running.

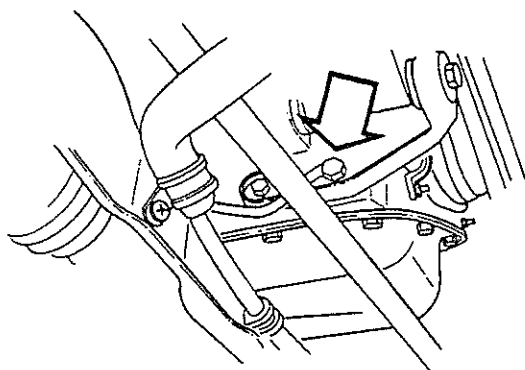
If value OK:

- System relay was sluggish.

If value still not OK:

- Check engine ground EL5.

EL4



S147 048

Check engine ground

– Check engine ground for breaks or poor contacts as in L1, L2 and L5.

If engine ground is OK:

- Test with new control unit.

EL5

○

○

EM. LH #24

LH#24 Oxygen sensor signal out of range

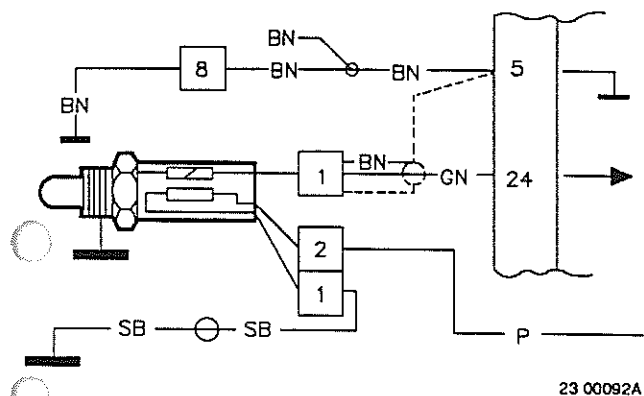
740/940

B230F/FB/FT

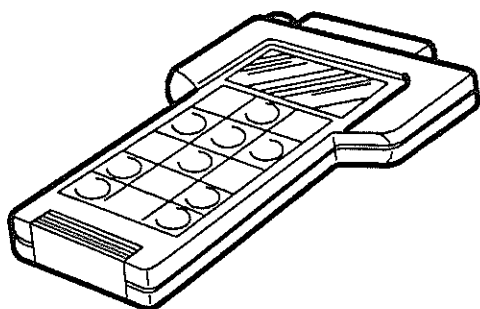
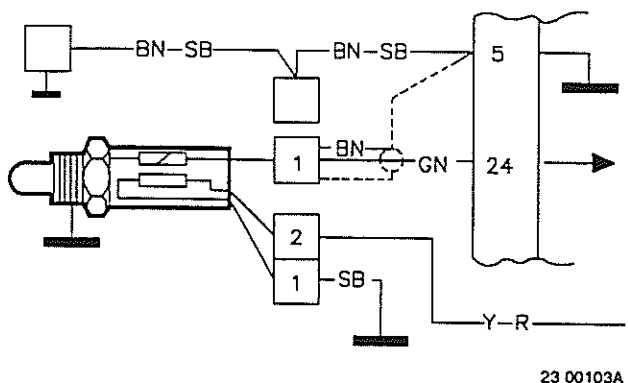
B200 F

B234 F

B204 E



200



08 00023

Conditions:

Fault message is stored if difference in voltage between high and low signal has been less than 0.3 V for over 10 seconds.

Reading is not made if engine speed is over 2500 rpm, if the idling contact is closed, fuel is shut off or engine temperature is below 70° C.

Causes:

Ground short or voltage in wire between LH#24 and lambda sonde.

Break in wire to lambda sonde power supply.

Symptoms:

High fuel consumption

NOTE!

Before checking wires, disconnect System Tester as in BA2 before taking readings.

EM1

Monitor Test

— Check lambda sonde signal in Monitor Test.

Signal should vary between low (<0.2V) and high (>0.7 V) about every two seconds.

If signal OK:

- Check connections for poor contacts as in L1 and L5.

If signal is constant at around 0 V:

- Check wire between LH#24 and lambda sonde for ground shorts as in L3.

If signal is constant at around 0.5 V:

- Check wire between lambda sonde and fuse for breaks as in L2.

If signal is constant at over 1.0 V:

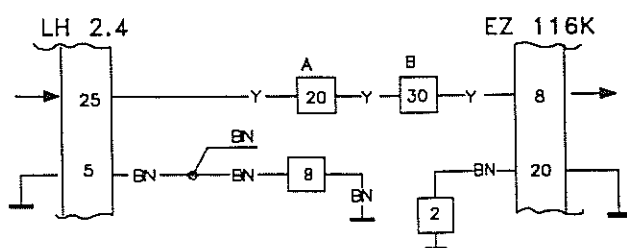
- Check wire between LH#24 and lambda sonde for live shorts as in L4.

EN. LH#25, EZ#8

LH#25 Load signal missing

EZ#8 Load signal missing

740/940



23 00093A

Conditions:

Fault message is stored if voltage is less than 2.5 V for 40 ms.

No reading taken if conditions for fuel shutoff are met, i.e. engine speed is over 2200 rpm and then falls below 1100 rpm and idling contact is closed.

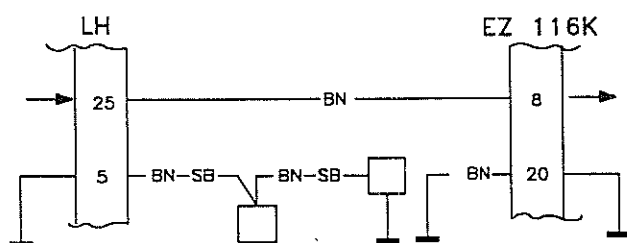
Causes:

Break or ground short between LH#25 and EZ#8.

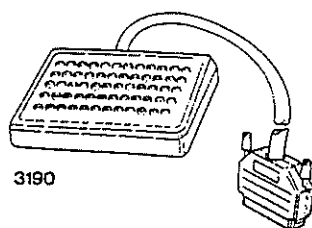
Symptoms:

No obvious ones.

200



23 00104A



3190

S151 183

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground points as in K3-K4.
- Go to 'Check load signal on EZK' EN2.

EN;

EN2

Check load signal on EZK

- Connect control unit to measurement box.
- Replace fuse.
- Ignition on.

Connect voltmeter between EZ#8 and EZ#20 (ground).

Voltmeter should read 200-500 mV.

If value OK:

Intermittent fault.

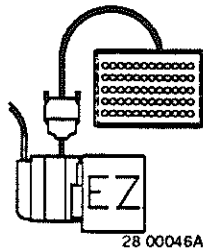
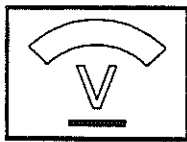
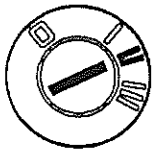
- Check connections for poor contacts and intermittent ground shorts as in L1, L3 and L5.

If value around 7 V:

- Check wire between control units for breaks as in L2.

If value is around 0 V:

- Check wire resistance to ground EN3.



EN3

Check wire resistance to ground

- Ignition off.
- Remove fuse from battery (740 940 780: no.1, 760: no.31, 240: in engine compartment (-90) or no.6 (91-)).
- Disconnect both control units.

Connect ohmmeter between EZ#8 and EZ#20 (ground).

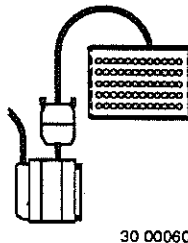
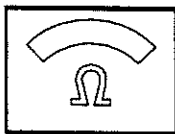
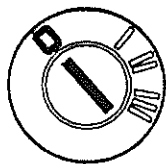
Ohmmeter should show constant resistance.

If value OK:

- Test with new control unit.

If value not OK:

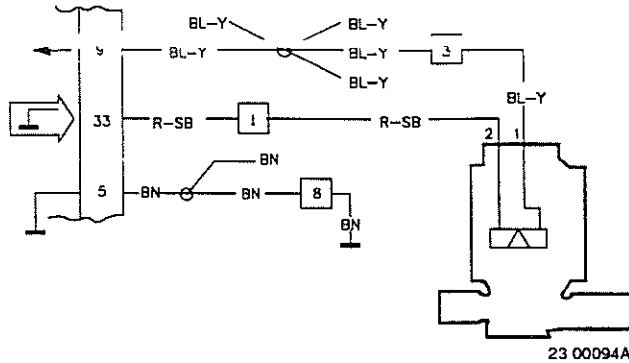
- Check wires between control units for ground shorts as in L3.



EP. LH#33

LH#33 CIS valve pulse missing

740/940



Conditions:

Fault message is stored if voltage is less than 2.5 V for 300 ms.

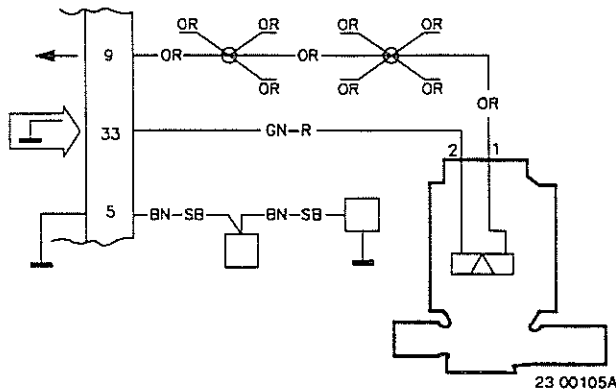
Causes:

Break or ground short between LH#33 and valve
Break or ground short in idling valve.

Symptoms:

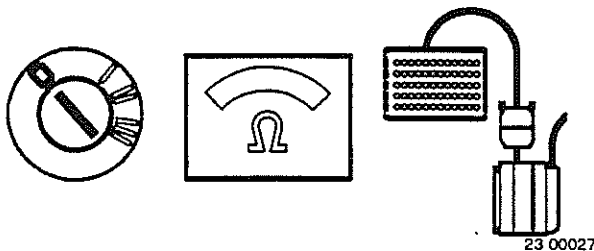
Low idling speed.

200



Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check wire and valve resistance' EP2.



Check wire and valve resistance

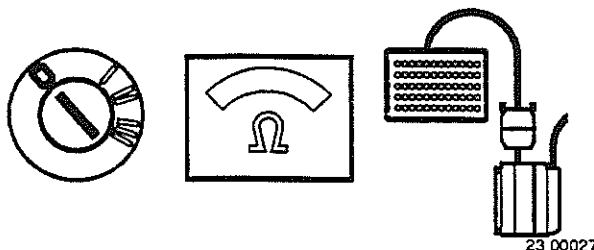
- Ignition off.
- Connect ohmmeter between LH#33 and LH#9.
- Ohmmeter should read around 8Ω.

If value OK:

- Check wire resistance to ground EP3.

If value not OK:

- Go to 'check valve resistance' EP6.



Check wire resistance to ground

- Ignition off.
- Disconnect idle valve.
- Connect ohmmeter between LH#33 and LH#5 (ground).
- Ohmmeter should show constant resistance.

If value OK:

- Check signal to valve EP4.

If value not OK:

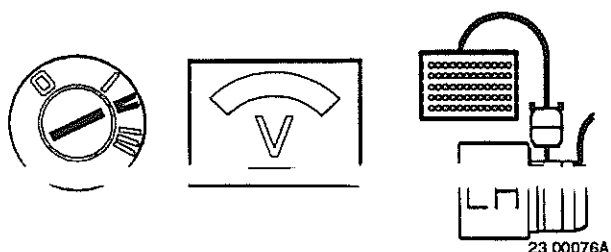
- Check wires between control units for ground shorts as in L3.

EP1

EP2

EP3

EP4



Check power supply

- Connect control unit to measurement box.
- Connect idle valve.
- Replace fuse.
- Ignition on.

meter should show battery voltage.

Voltmeter should show battery voltage.

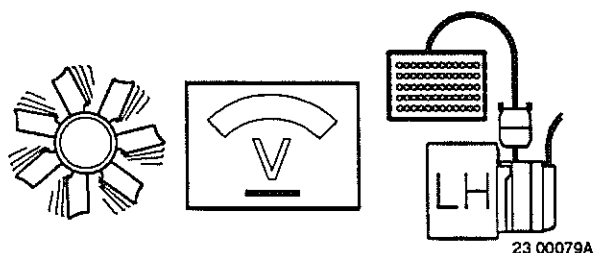
If value OK

- Check control #33 EP5.

If value not OK:

- Check wire between LH#33 and valve and between LH#9 and valve for breaks as in L2.

EP5



Check control #33

- Start engine and allow to idle.

Voltmeter should read 7-10 V.

If value OK:

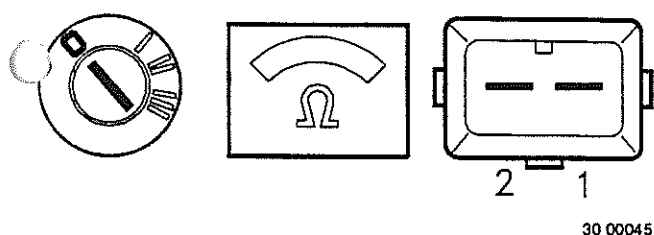
Intermittent fault.

- Check connections for poor contacts as in L1 and L5.

If voltage does not drop:

- Test with new control unit.

EP6



Check valve resistance

- Ignition off.
- Disconnect idle valve.

Connect ohmmeter between connections 1 and 2 on valve.

Ohmmeter should read around 8Ω.

If value OK:

- Check wire between LH#33 and valve and between LH#9 and valve for breaks as in section L2.

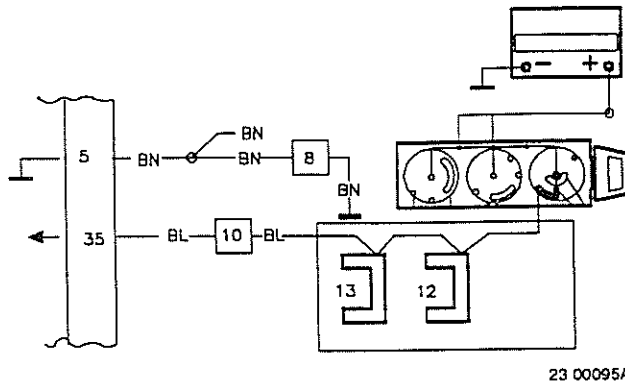
If value not OK:

- Test with new idle valve.

EQ. LH #35

LH#35 Ignition switch voltage missing

740/940

**Conditions:**

If EZK and power stage are connected to System Tester fault message will be generated if voltage on EZ#6, Power stage #4 and LH#35 differs.

Causes:

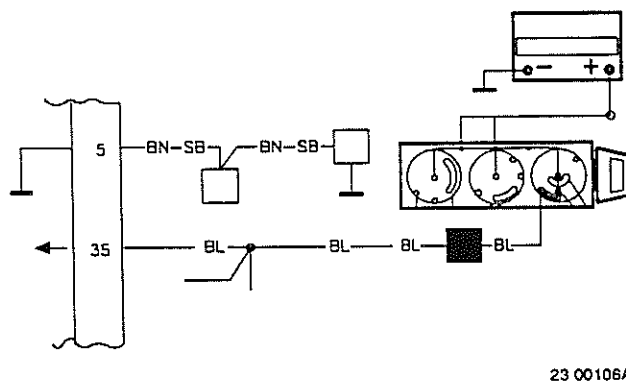
Break in wire between LH#35 and ignition switch.

Symptoms:

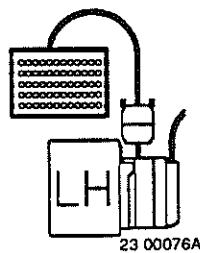
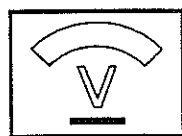
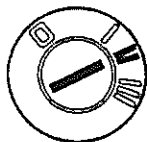
Engine will not start.

No symptoms if fault intermittent.

200

**Volvo System Tester, measurement box**

- Disconnect System Tester as in BA2.
- Connect measurement box to LH and check ground points as in K1-K2.
- Go to 'Check power supply' EQ2.

**Check power supply**

- Connect control unit to measurement box
- Replace fuse.
- Ignition on.

Connect voltmeter between LH#35 and LH#5 (ground).

Voltmeter should show battery voltage. ✓

- Check that voltmeter shows battery voltage even when starter motor is turning or engine is running. ✓

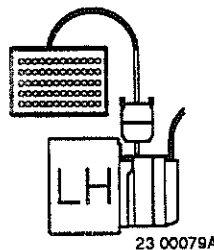
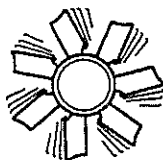
If both values OK:

Intermittent fault.

- Check connections between LH#35 and ignition switch for poor contacts as in L1 and L5.

If value not OK:

- Check wire between LH#35 and ignition switch for breaks as in L2.

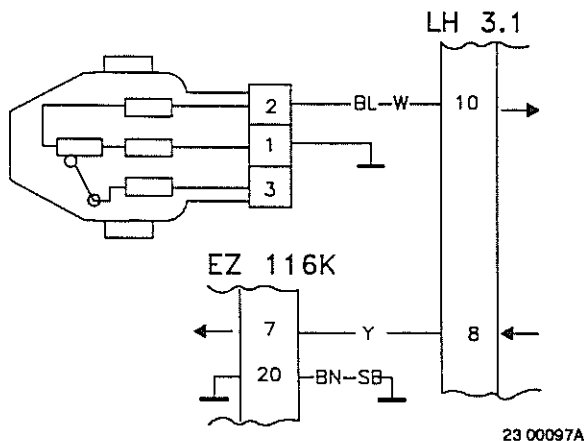


F. Fault-tracing LH 3.1

FA. LH#8 / EZ#7 (LH 3.1)

LH#8 / EZ#7 Idle switch signal missing

200 LH 3.1

**Conditions:**

Fault message is stored if the voltage is greater than 1.2V at both LH #10 and LH#8 when starting the Running Test.

Causes:

Break in throttle sensor ground connection.
Broken throttle sensor.

Symptoms:

Idling problem.
No fuel shut-off when engine braked.

NOTE!

Before checking wires, disconnect System Tester as in BA2.

FA1

Monitor Test

- Start engine but do not depress gas pedal.
- Check that System Tester shows IDLING during Monitor Test.

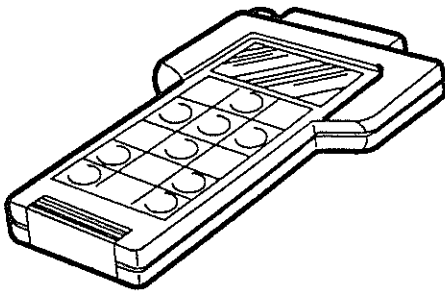
If IDLING:

Intermittent fault.

- Check throttle position sensor ground points for loose contacts as in L1 and L5.

If IDLING does not appear:

- Check ground point FA2.



FA2

Check ground point

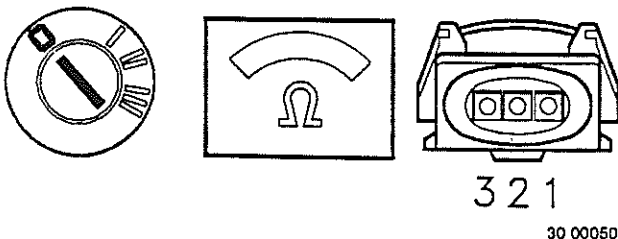
- Ignition off.
 - Disconnect throttle position sensor.
- Connect ohmmeter between connection 1 and ground.
Ohmmeter should read about 0 ohm.

If value OK:

- Test with new throttle position sensor.

If value not OK:

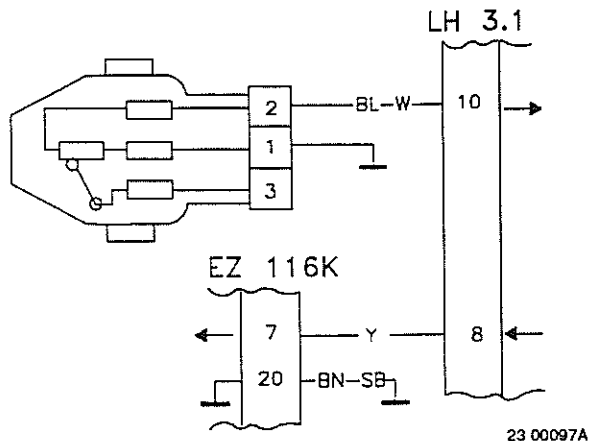
- Check ground point and wire for breaks as in L2.



FB. LH#8 / EZ#7 (LH 3.1)

LH#8 / EZ#7 Idle switch status differs

200 LH 3.1



Conditions:

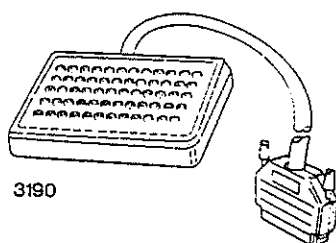
Fault message appears if voltage varies between LH#8 and EZ#7, i.e. fluctuates above and below 1.2 V.

Causes:

Break in wire between LH #8 and EZ #7.

Symptoms:

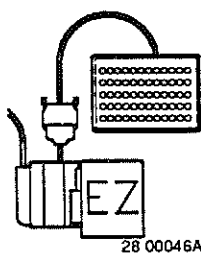
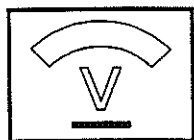
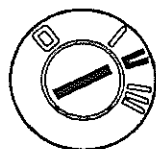
Idling problems.



S151 183

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground points as in K3-K4.
- Continue with Check signals FB2.



Check signals

- Connect control unit to measurement box.
- Replace fuse.
- Ignition on.

Connect voltmeter between EZ#7 and EZ#20 (ground).

Voltmeter should read about 0 V in idling position and over 4 V in full load position.

If both values are OK:

Intermittent break.

- Check wire between EZ#7 and LH#8 for loose contacts L1 and L5.

If voltmeter reads 0 V both times:

- Check wire between EZ#7 and LH #8 for breaks as in L2.

FB1

FB2

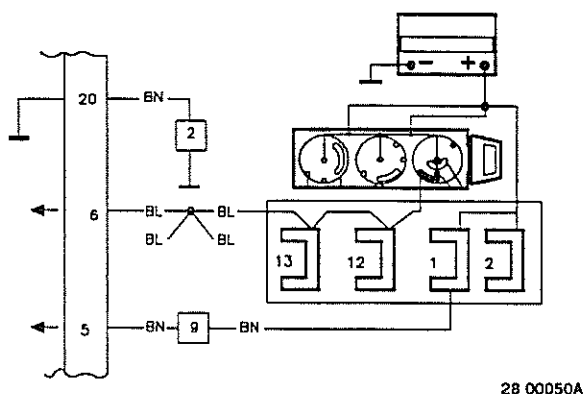
G. Fault-tracing EZ 116K

GA. EZ#5,

EZ#5 Battery voltage missing

740/940

B230 F/FB B200 F B234 F/G B204 E



Conditions:

Fault message appears if voltage is less than 1 volt.

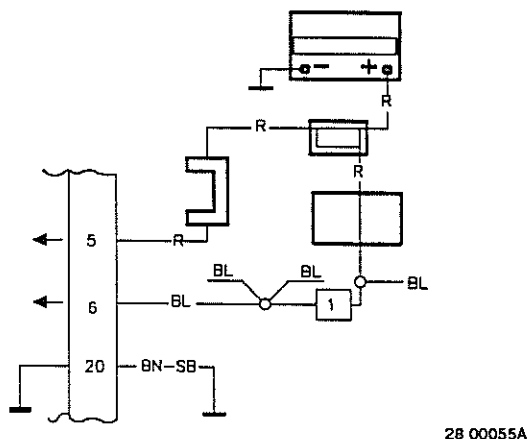
Causes:

Break in wire between EZ#5 and battery.

Symptoms:

Engine will not start. If break is intermittent, engine stops or shudders violently.

200



GA1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground point as in K3-K4.
- Go to 'Check power supply' GA2.

GA2

Check power supply

- Connect control unit to measurement box.
- Replace fuse.
- Ignition on.

Connect voltmeter between EZ#5 and EZ#20.

Voltmeter should show battery voltage.

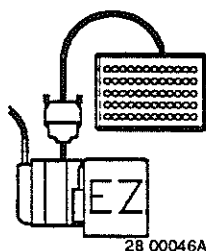
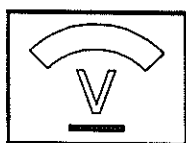
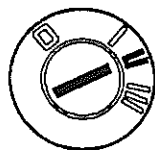
If value OK:

Intermittent break.

- Check connections between EZ#5 and battery for loose contacts as in L1 and L5 .

If value not OK:

- Check wire between EZ#5 and battery for breaks as in L2.



28 00046A

GB. EZ#6

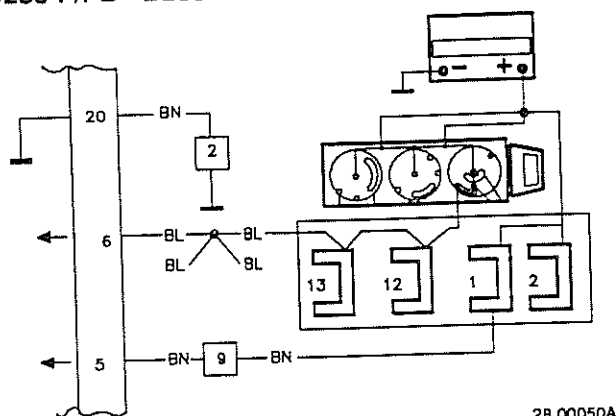
EZ#6 Ignition switch voltage missing

740/940

B230 F/FB B200 F

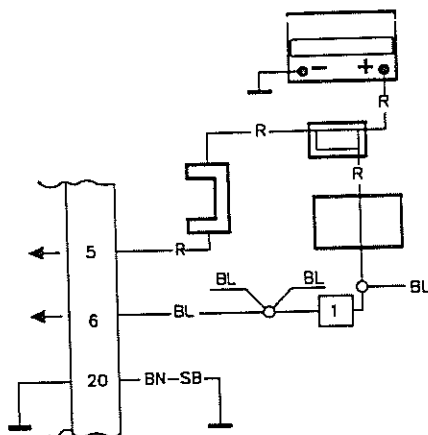
B234F/G

B204 E

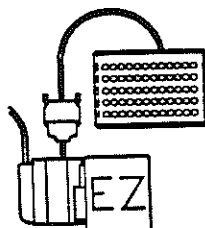
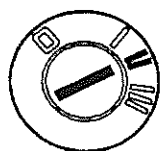


28 00050A

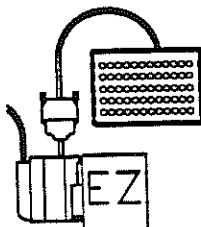
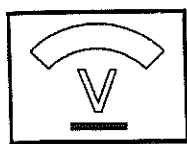
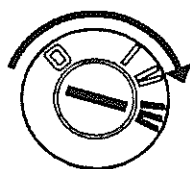
200



28 00055A



28 00046A



28 00047A

Conditions:

Fault message appears if voltage does not exceed 6 volts within 10 seconds of starting Running Test. If LH and power stage are connected to the System Tester, a fault message will also appear stating that the voltage at EZ #6, LH #35 and power stage #4 varies.

Causes:

Break in wire between EZ#6 and ignition switch.

Symptoms:

Engine will not start.

If break is intermittent, engine will stall immediately or engine speed will fall dramatically.

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground point as in K3-K4.
- Go to 'Check power supply' GB2

GB1

Check power supply

- Connect control unit to measurement box.
- Replace fuse.
- Ignition on.

Connect voltmeter between EZ#6 and EZ#20.

Voltmeter should show battery voltage.

GB2

Check that voltmeter shows battery voltage even when starter motor is turning or engine is running.

If both values OK:

Intermittent break.

- Check connections between EZ#6 and ignition switch for loose contacts as in L1 and L5.

If value not OK:

- Check wire between EZ#6 and ignition switch for breaks as in L2.

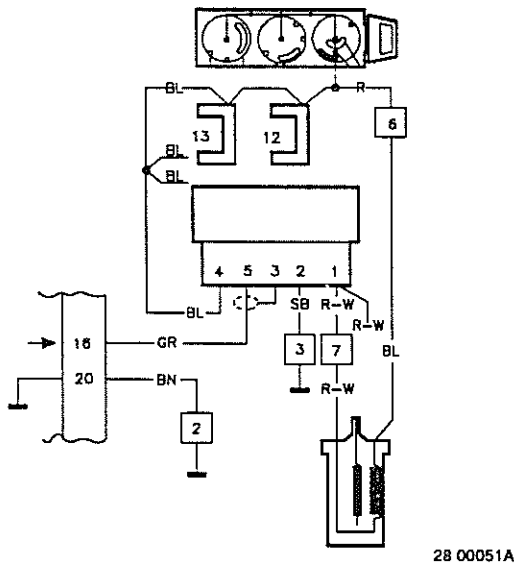
GC. EZ#16, Power stage #5

EZ #16 Trig signal to EZ power stage missing

Power stage #5 Trig from EZ ECU missing

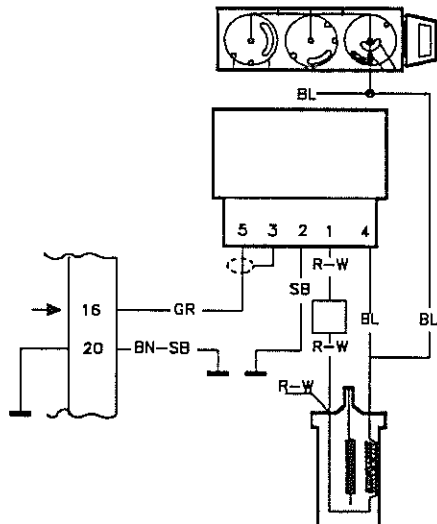
740/940

B230 F/FB B200 F B234 F/G B204 E

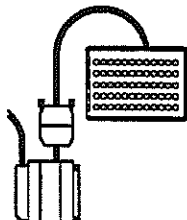
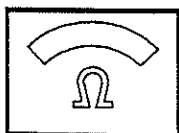
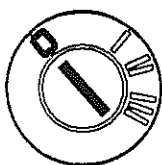


28 00051A

200



28 00056A



30 00060A

Conditions:

Fault message is stored if voltage does not exceed 2.5 volts in a given time: this time varies with engine speed, and is about 300 ms at idling speed.

Causes:

Break or ground short in wire between EZ#16 and power stage #5.

Symptoms:

Engine will not start

If fault is intermittent, engine will stall or shudder violently.

GC1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground points as in K3-K4.
- Go to 'Check resistance to ground' GC2.

GC2

Check resistance to ground

- Ignition off.
- Disconnect power stage.
- Connect ohmmeter between EZ#16 and EZ#20 (ground).
- Ohmmeter resistance should remain constant.

If value OK:

- Check ignition pulses on control unit GC3.

If value not OK:

- Check wire between EZ#16 and power stage for ground shorts as in L3.

GC3

Check ignition pulses on control unit

- Connect control unit to measurement box.
- Disconnect power stage.
- Replace fuse.
- Crank engine.

Connect voltmeter between EZ#16 and EZ#20 (ground).

Voltmeter should read at least 250 mV.

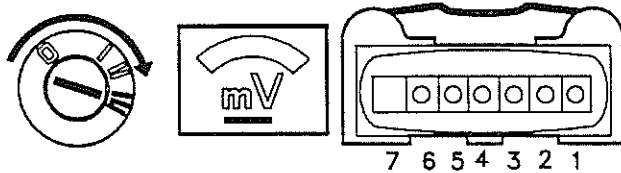
28 00048A

If value is OK:

- Check ignition pulses on power stage GC4.

If value is not OK:

- Test with new control unit.



30 00116A

GC4

Check ignition pulses at power stage

- Disconnect power stage.

Connect voltmeter between connections 5 and 2 (ground) at power stage.

- Crank engine.

Voltmeter should read at least 250 mV.

If value is OK:

- Test with new power stage.

If value is not OK:

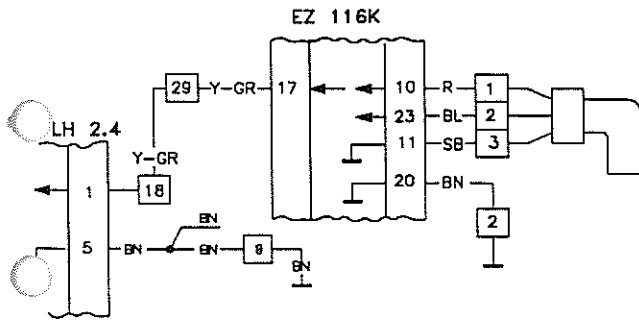
- Check wire between EZ#16 and power stage for breaks as in L2.

GD. LH#1, EZ#17, EZ#23

LH #1 Engine speed signal missing

EZ #17 Engine speed signal missing

740/940



28 00052A

Conditions:

Fault message is stored if the voltage has not exceeded 9 V within a certain time; this time varies with the engine speed, and is around 200 ms at idling speed. When starting even if there is a power supply from the ignition switch but the engine speed signal is less than 9 V after 10 seconds.

Causes:

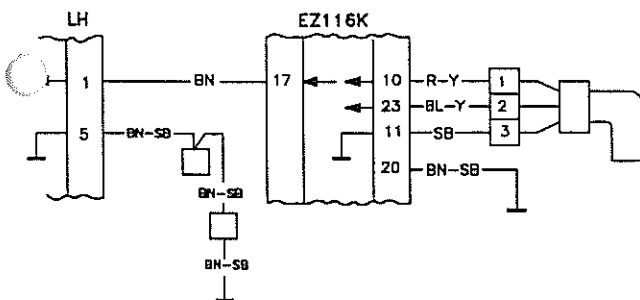
Break or ground short in wire between control units.
Break or short in wires from engine speed sensor.
Engine speed sensor defective.

Symptoms:

Engine will not start.
If fault is intermittent, engine stalls or shudders violently.

EZ #23 Engine speed sensor signal missing

00



28 00054A

Conditions:

Engine speed over 1500 rpm and idle switch not closed.
Fault message is stored if voltage does not exceed 2.5 V within a certain time; this time varies with the engine speed, and is around 120 ms when idling.

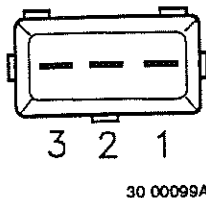
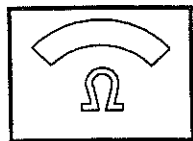
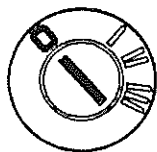
Causes:

Break or ground short in wires from engine speed sensor.
Contact resistances in connections.
Engine speed sensor defective.

Symptoms:

Engine will not start.
If fault is intermittent, engine will stall or shudder violently.

GD1



Check engine speed sensor

– Ignition off.

Connect an ohmmeter between 1 and 2 on the pulse sensor.

Engine speed sensor 1 389 567-7 (earlier version):

Ohmmeter should read about 240 Ω but not more than 400 Ω with engine warm.

Engine speed sensor 3 547 847-8 (later version):

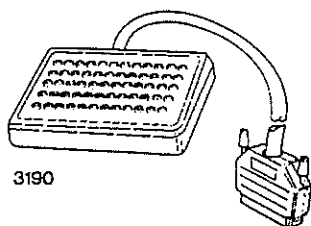
Ohmmeter should read around 170 Ω but not more than 350 Ω with engine warm.

If value OK:

- Volvo System Tester, measurement box GD2.

If value not OK:

- Test with new engine speed sensor.



S151 183

Volvo System Tester, measurement box

– Disconnect System Tester as in BA2.

– Connect measurement box to EZK and check ground points as in K3-K4.

- Go to 'Check engine speed signal' GD4.

GD.

GD3

Check pulse sensor signal

- Connect control unit to measurement box.
- Replace fuse.

Connect a voltmeter between EZ#10 and EZ#23.

- Crank engine.
- Voltmeter reading should be at least 500 mV (AC).

If value OK:

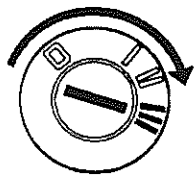
1. Fault message EZ#23:

Intermittent fault.

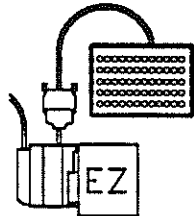
- Check wires between pulse sensor and control unit for loose contacts as in L1 and L5.
2. Fault message EZ#17 or LH#1:
- Check engine speed signal, EZK GD4.

If value not OK:

- Check wires between pulse sensor and control unit for breaks or ground shorts as in L2 and L3.



30 00039



28 00049A

GD4

Check engine speed signal, EZK

Connect voltmeter between EZ#17 and EZ#20 (ground).

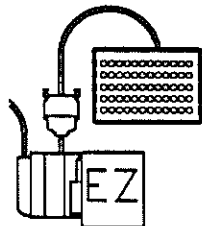
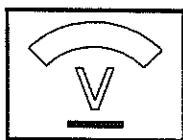
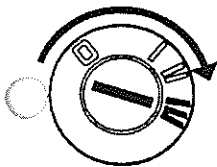
- Crank engine.
- Voltmeter should read 6-9 V.

If value OK:

- Check wire between control units for breaks as in L2.

If value not OK:

- Check wire between control units for ground shorts as in L3.



28 00047A

GE. EZ#20

EZ #20 EZ ECU ground missing

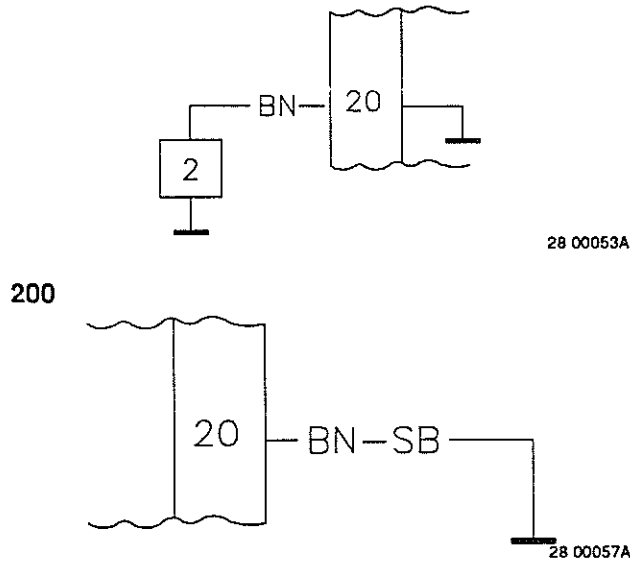
740/940

B230 F/FB

B200 F

B234 F/G

B204 E



Conditions:

Fault message if voltage is over 1.2 Volt.

Causes:

Break between EZ#20 and ground point on inlet pipe.
Ground point poorly connected.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall immediately or shudder violently.

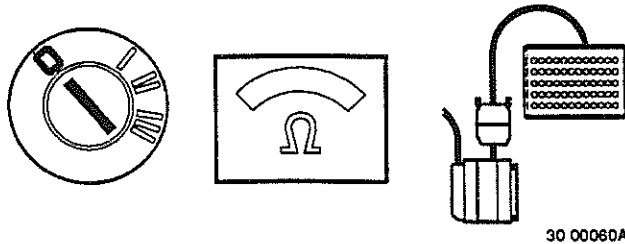
GE1

Volvo System Tester, measurement box

- Disconnect System Tester as in BA2.
- Connect measurement box to EZK and check ground points as in K3-K4.
- Go to 'Check ground point' GE2.

GE2

Check ground point



If value is OK when checking ground point:

Intermittent fault.

- Check ground point and connections for intermittent breaks as in L1 and L5.

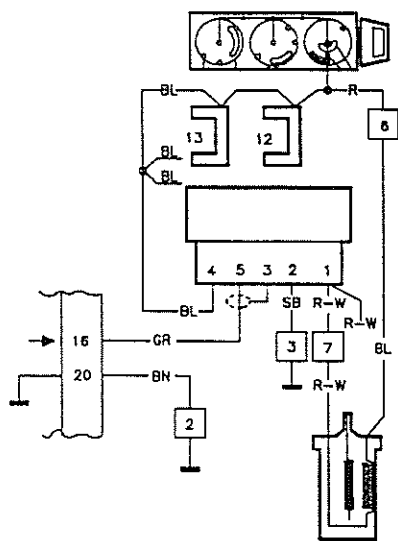
H. Fault-tracing: power stage

HA. Power stage #1

Power stage #1 Ignition pulses missing

740/940

B230 F/FB B200 F B234 F/G B204 E



28 00051A

Conditions:

Fault message is stored if voltage does not exceed 7 volts within 200 ms.

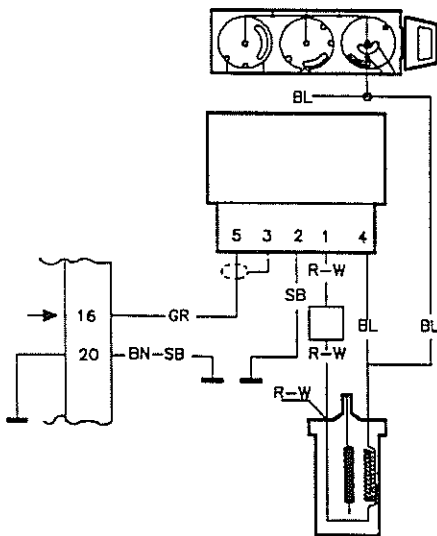
Causes:

Ground short in wire between connection 1 on power stage and ignition coil.
Fault in power stage
Short in ignition coil.
Ground short in wire to engine speed counter.
Short in engine speed counter.

Symptoms:

Engine will not start
If fault is intermittent, engine stalls immediately or shudders violently.

200



28 00056A

HA1

Volvo System Tester

- Disconnect System Tester as in BA2.
- Go to 'Check resistance to ground' HA2.

HA2

Check resistance to ground

- Ignition off.
 - Disconnect wire to -1 on ignition coil.
 - Disconnect power stage and control units.
- Connect ohmmeter to wire which was connected to -1 on ignition coil and ground.

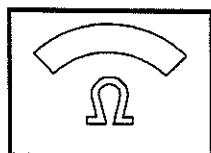
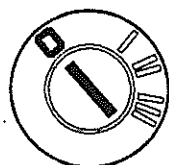
Ohmmeter should show constant resistance.

If value OK:

- Check wire HA3.

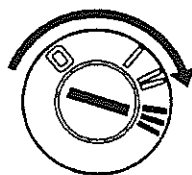
If value not OK:

- Check wire between power stage and ignition coil for ground shorts as in L3.
- Check wire to engine speed counter and engine speed counter for ground shorts as in L3.



30 00118A

HA3



30 00117A

Check signal

- Connect control units and power stage.
- Replace fuse.
- Disconnect -1 from ignition coil.

Connect voltmeter to wire which was connected to -1 on ignition coil and ground.

- Crank engine.

Voltmeter should read about 250 mV.

If value OK:

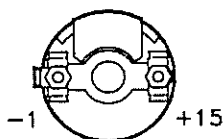
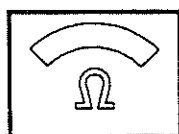
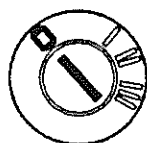
- Check ignition coil HA4.

If value not OK:

- Test with new power stage.



HA4



30 00114A

Check ignition coil.

- Ignition off.
- Disconnect ignition coil.

Connect ohmmeter between -1 and 15+ on ignition coil.

Ohmmeter should read about 2 ohm.

If value OK:

Intermittent fault.

- Check wire between connection 1 on power stage and -1 on ignition coil for intermittent ground shorts as in L1 and L5.

If value not OK:

- Test with new ignition coil.



HB. Power stage #2

Power stage #2 Power stage ground missing

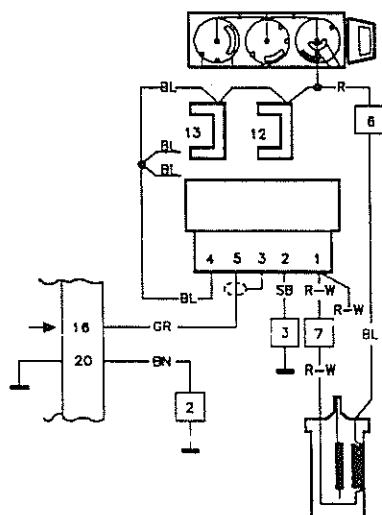
740/940

B230 F

B200 F

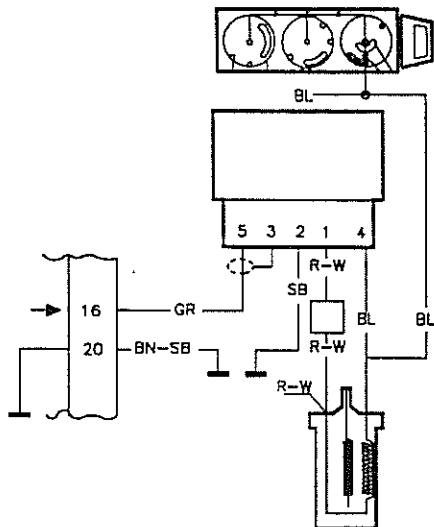
B234 F/G

B204 E

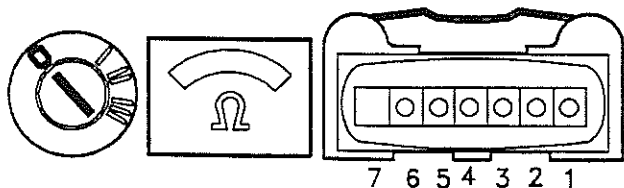


28 00051A

200



28 00056A



30 00113A

Conditions:

Fault message if voltage is over 1.2 Volt.

Causes:

Break between connection 2 on power stage and ground point on inlet pipe.

Poorly connected ground point.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall immediately or shudder violently.

HB1

Volvo System Tester

— Disconnect System Tester as in BA2.

- Go to 'Check ground point' HB2

HB2

Check ground point

— Ignition off.

Connect ohmmeter between connection 2 on power stage and ground.

Ohmmeter should read about 0 ohm.

If value OK:

Intermittent break.

- Check ground point and connections for loose contacts as in L1 and L5.

If value not OK:

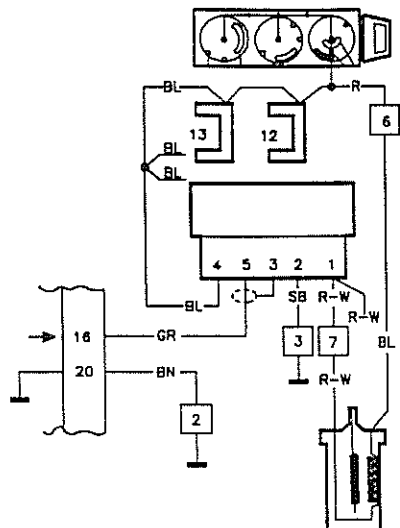
- Check ground point and wires for breaks as in L2.

HC. Power stage #4

Power stage#4 Voltage supply missing

740/940

B230 F/FB B200 F B234 F/G B204 E



28 00051A

Conditions:

Fault message appears if voltage does not exceed 1 V on starting Running Test or if voltage on power stage #4, EZ#6 and LH#35 differs.

Causes:

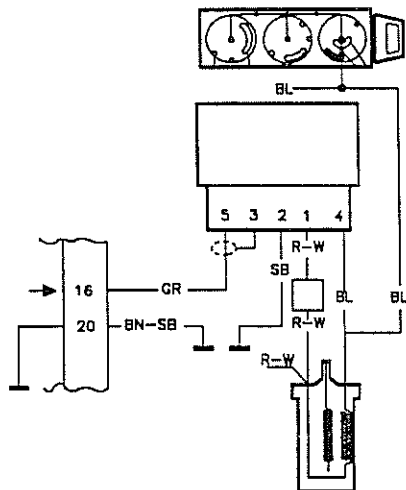
Break in wire to connection 4 on power stage.

Symptoms:

Engine will not start.

If fault is intermittent, engine will stall immediately or shudder violently.

200



28 00056A

Volvo System Tester

- Disconnect System Tester as in BA2.
- Connect control unit.
- Replace fuse.
- Go to 'Check power supply' HC2

HC1

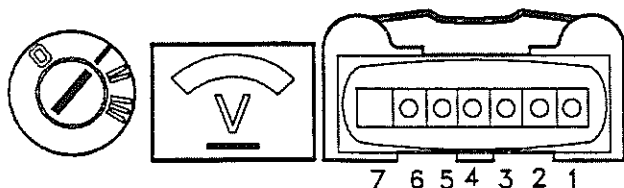
Check power supply

- Disconnect power stage.
- Ignition on.

Connect voltmeter between connection 4 on power stage and ground.

Voltmeter should show battery voltage.

HC2



30 00115A

Check that voltmeter continues to show battery voltage even when cranking engine.

If values OK:

Intermittent break.

- Check connections between connection 4 and ignition switch for loose contacts as in L1 and L5.

If values not OK:

- Check wire between connection 4 and ignition switch for breaks as in L2.