2.3L 5-CYL VIN [57]

1995 Volvo 850

1995-96 ENGINES
Volvo - 2.3L 5-Cylinder

850

* PLEASE READ THIS FIRST *

NOTE: For repair procedures not covered in this article, see ENGINE OVERHAUL - GENERAL INFORMATION article in GENERAL INFORMATION section. Repair information for this engine is not available at time of publication.

ENGINE IDENTIFICATION

Engine may be identified by using Vehicle Identification Number (VIN) stamped on a metal pad, located near lower left corner of windshield. The sixth and seventh character identifies engine model.

Engine identification number, located on left side of cylinder block below cylinder head, may be required when ordering replacement parts.

ENGINE IDENTIFICATION CODES TABLE

Engine	Code
2.3L (Turbo)	57

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

Engine is equipped with hydraulic lifters. No valve adjustment is necessary.

REMOVAL & INSTALLATION

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on other major assemblies before removal. Hood removal is not necessary, as hood opens to horizontal position. Removal and installation information for turbocharger is not available at time of publication.

FUEL PRESSURE RELEASE

Fuel Pump Pressure Release

Before disconnecting any lines, cover fuel line connector with shop towel to absorb any fuel left in line. With ignition key removed from ignition switch, reconnect relay.

ENGINE

Removal

1) Remove expansion tank cap. Raise and support vehicle. Remove splash guard and air baffle under engine. Drain all coolant by

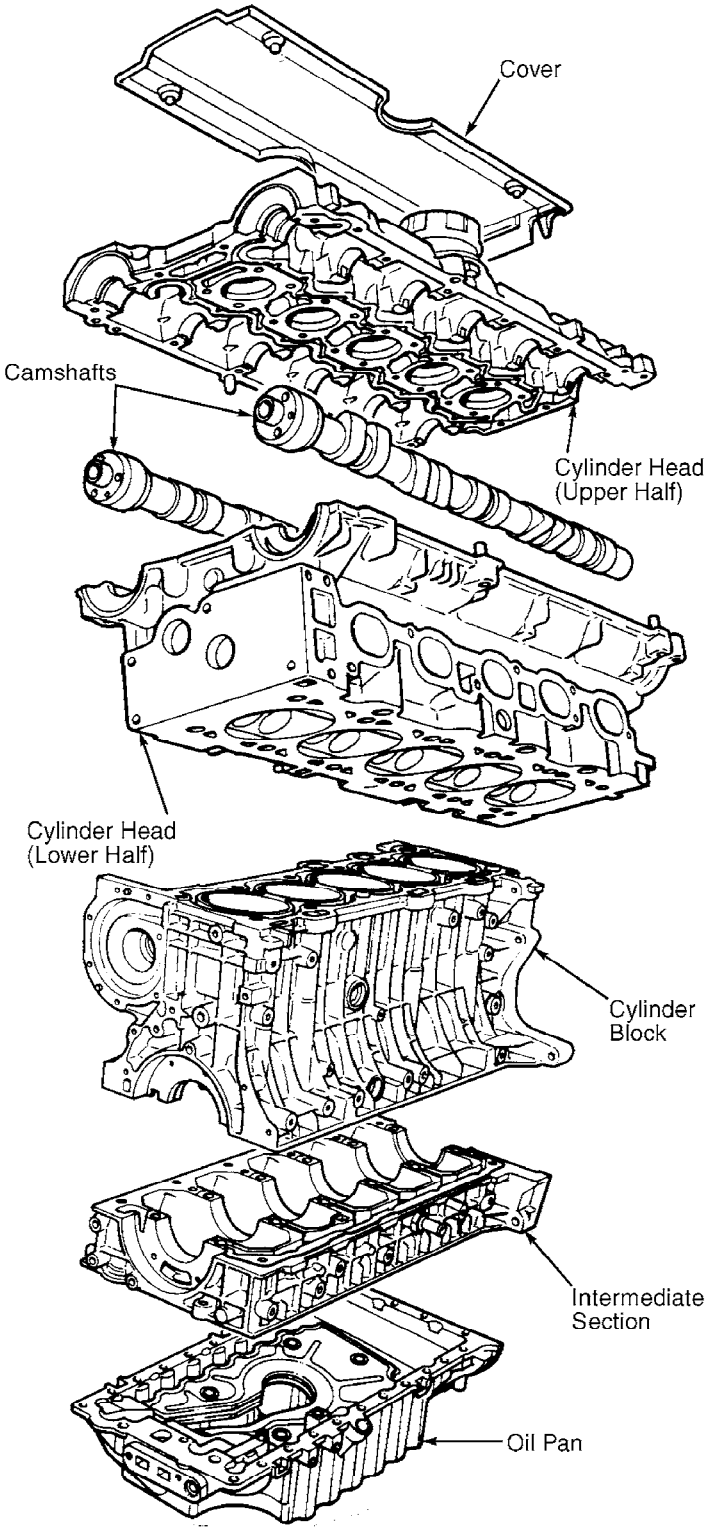


Fig. 3: Exploded View Of Engine Assembly
Courtesy of Volvo Cars of North America.

DRIVE BELT ROUTING

1995 Volvo 850

1993-96 ENGINE COOLING
Serpentine Belt Routing

850, 960

SERPENTINE BELT ROUTING

SERPENTINE BELT ROUTING

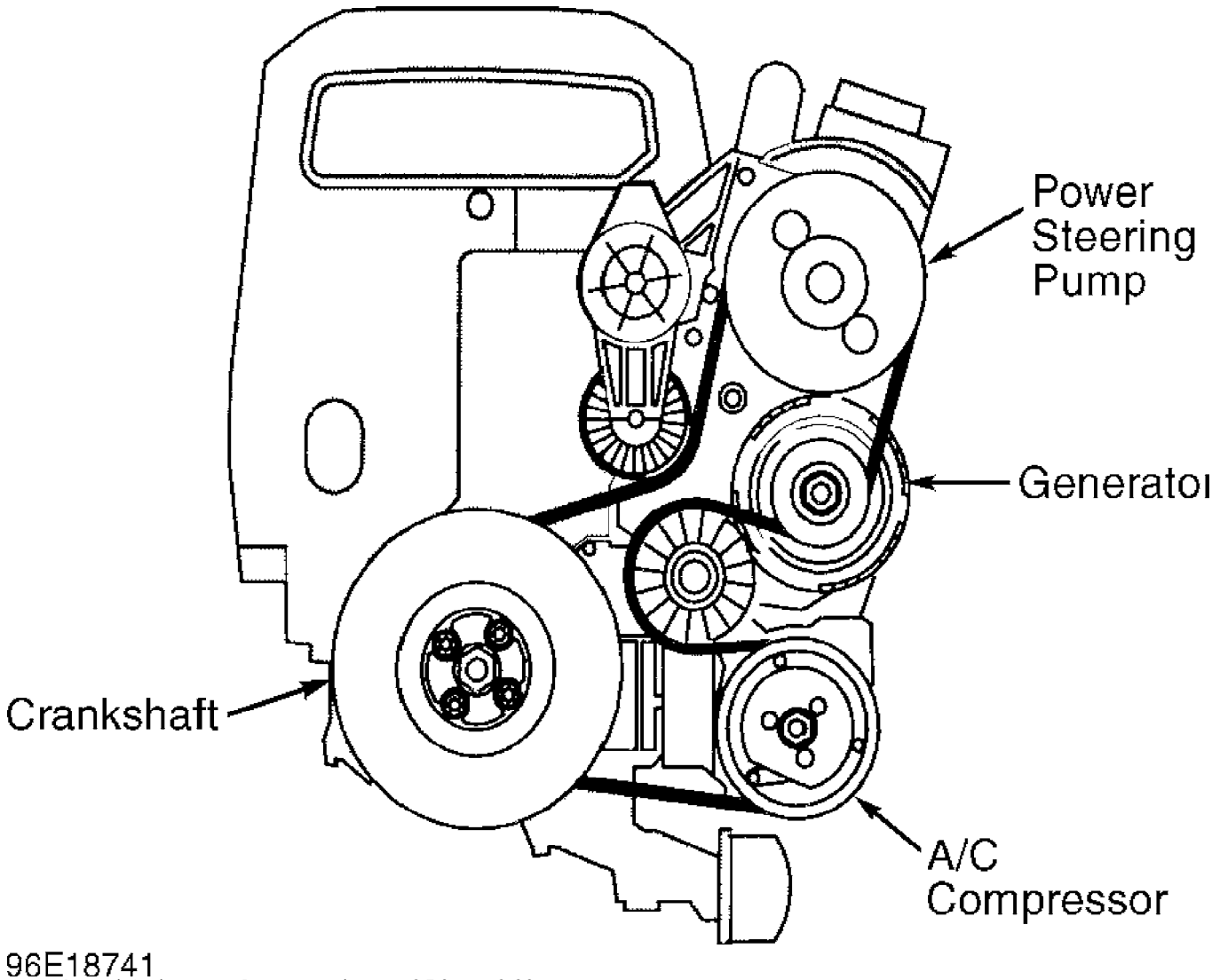


Fig. 1: Identifying Belt Routing (850 & 960)
Courtesy of Volvo Cars of North America.

SERPENTINE BELT ADJUSTMENT SPECIFICATIONS

BELT ADJUSTMENT

Application	Deflection - In. (mm)

THROTTLE CONTROLS

THROTTLE SWITCH

Checking

Open throttle slightly and listen for a click. Click indicates throttle switch opens.

Adjusting

Ensure throttle valve is closed. Loosen TPS retaining screws. Turn TPS switch clockwise slightly. Turn TPS switch back again until a click is heard. Tighten retaining screws. Recheck setting. Open throttle slightly, a click should be heard. Click indicates switch is activating.

THROTTLE LINK ROD

1) Loosen throttle link lock nut so link is separated and can spring back easily to its innermost position. Mount link in position.

NOTE: Lubricate link with petroleum jelly if needed.

2) Attach link end with ball and lock nut to throttle spindle. Ensure throttle spindle is in contact with adjusting screw "B" and pulley is seated against idle stop "C". Tighten link lock nut "A". Rotate pulley to ensure link seats against adjusting screw "B" before pulley seats against idle stop "C". See Fig. 1.

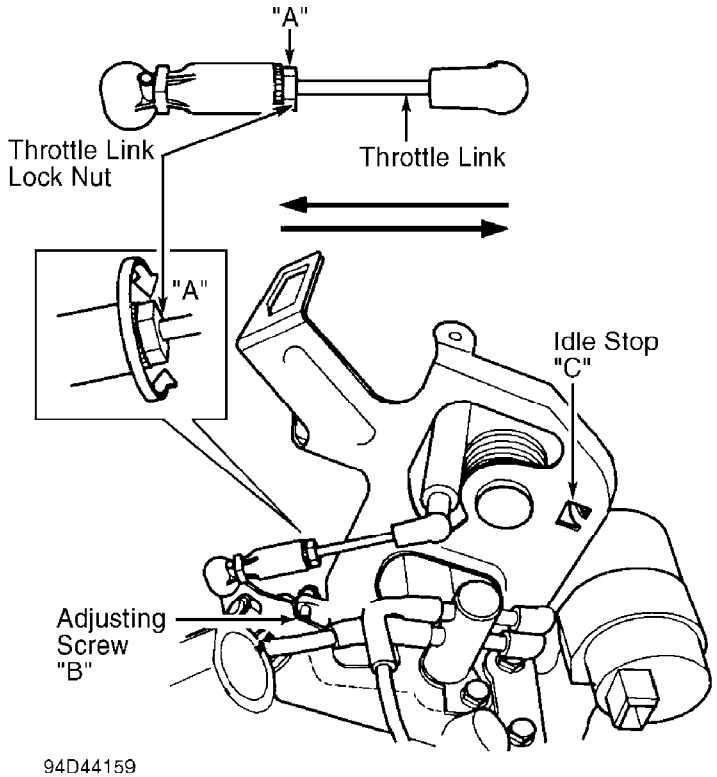


Fig. 1: Adjusting Throttle Link Rod
Courtesy of Volvo Cars of North America.

THROTTLE CABLE

Turbo Engine			
Yellow	.90 (22.8)	.33 (8.3)	
Violet	1.12 (28.5)	.31 (8.0)	
Blue	1.05 (26.6)	.28 (7.0)	
Violet	1.89 (48.0)	.48 (12.3)	
2-Piston Side			
Non-Turbo Engine			
No Color	.86 (21.9)	.24 (6.0)	
White	1.29 (32.8)	.28 (7.0)	
Yellow	1.21 (30.7)	.28 (7.0)	
Lt. Green (1)	1.38 (35.0)	.58 (14.8)	
Violet	1.45 (37.0)	.44 (11.3)	
Green	1.81 (46.0)	.60 (15.3)	
Turbo Engine			
No Color	.86 (21.9)	.24 (6.0)	
White	1.29 (32.8)	.28 (7.0)	
Blue	1.04 (26.6)	.28 (7.0)	
Lt. Green (1)	1.38 (35.0)	.58 (14.8)	
No Color	1.81 (46.0)	.56 (14.2)	

(1) - Not applicable to outer spring attached to piston.

CONTROL VALVE ASSEMBLY

Removal & Installation

1) Raise and support vehicle. Remove transaxle oil pipe and drain fluid. Undo clip securing oil temperature sensor harness. Remove oil pan Torx screws and remove oil pan. Disconnect 4 valve body solenoid wire connectors, noting wire color and locations. Remove 9 control valve assembly bolts, noting length and location of bolts for installation reference. Remove control valve assembly.

2) To install, reverse removal procedure. Ensure bolts are installed in correct locations. Tighten bolts to 89 INCH lbs. (10 N. m). Install .12" (3 mm) thick bead of sealing compound on oil pan and install pan. Tighten oil pan Torx screws to 18 ft. lbs. (25 N.m).

GEAR POSITION SENSOR

NOTE: Gear position sensor may also be referred to as neutral safety switch.

Removal & Installation

1) Ensure transaxle is in "N" position and parking brake is applied. Remove battery, battery tray and air intake hose. Remove air cleaner assembly. Disconnect transaxle cable from shift rod arm. Remove shift rod arm from sensor. Note position of notch on sensor for installation reference.

2) Remove nut, washer and seal from sensor. Loosen dipstick bracket. Remove 2 bolts securing sensor to transaxle. Remove sensor from control shaft. To install, reverse removal procedure. Ensure notch on sensor is located in exact position as prior to removal. Tighten 2 sensor bolts to 18 ft. lbs (25 N.m).

SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC PROCEDURE

When performing vehicle diagnosis:

* Ensure transaxle fluid level is correct and fluid is neither contaminated nor aerated.

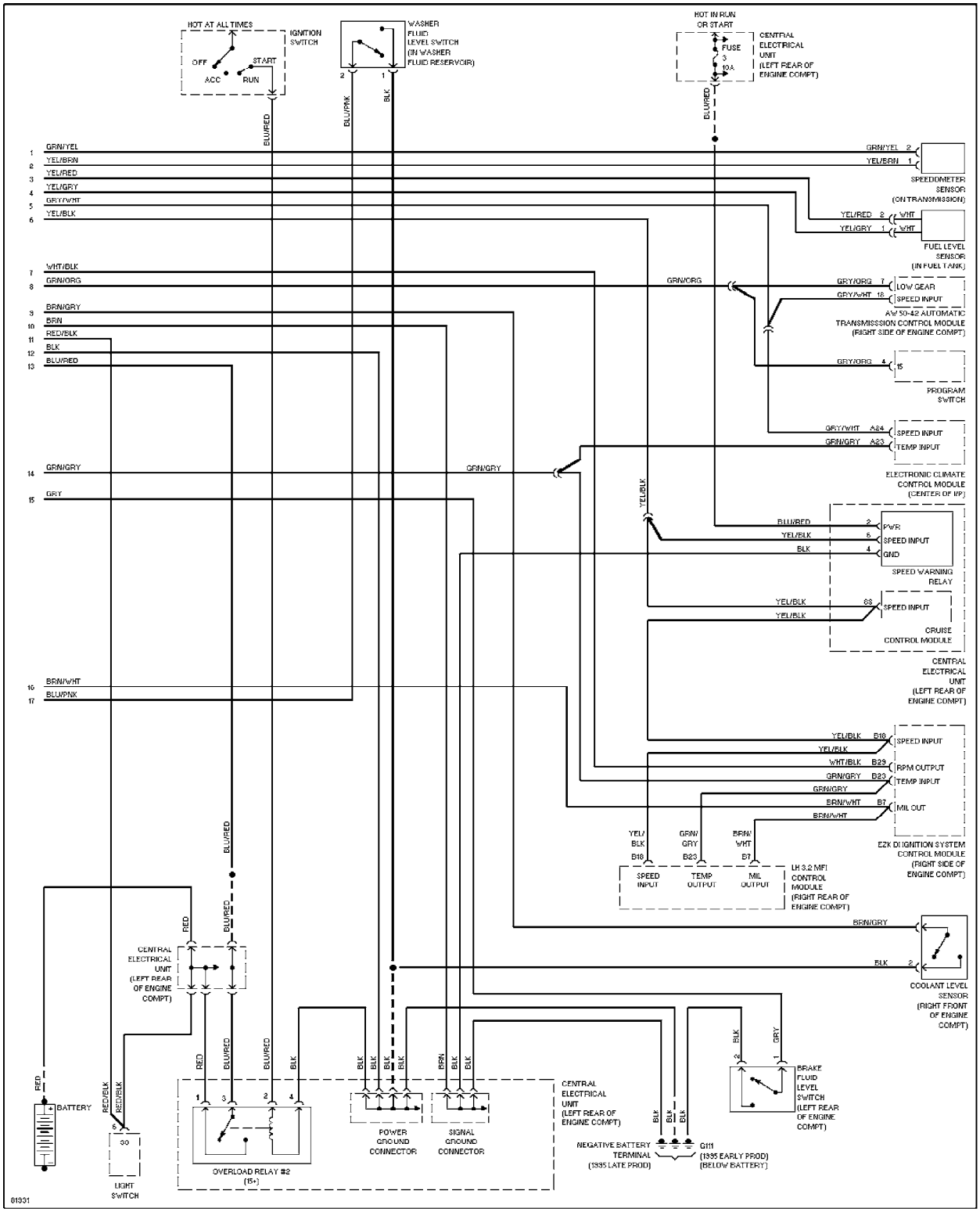


Fig. 13: Instrument Panel Wiring Diagram (1995 - With Yasaki - 2 Of 2)

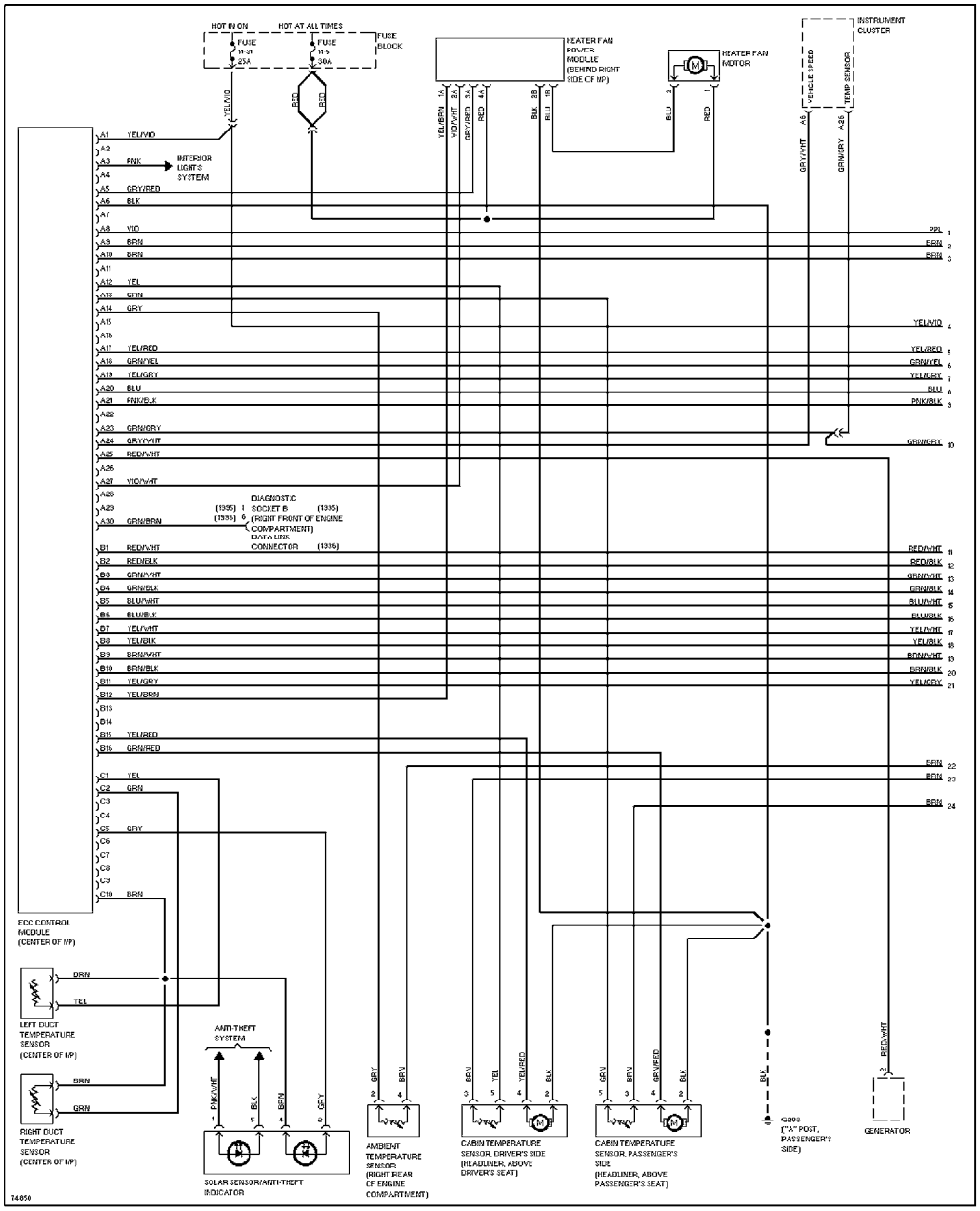
SYSTEM WIRING DIAGRAMS

1995 Volvo 850

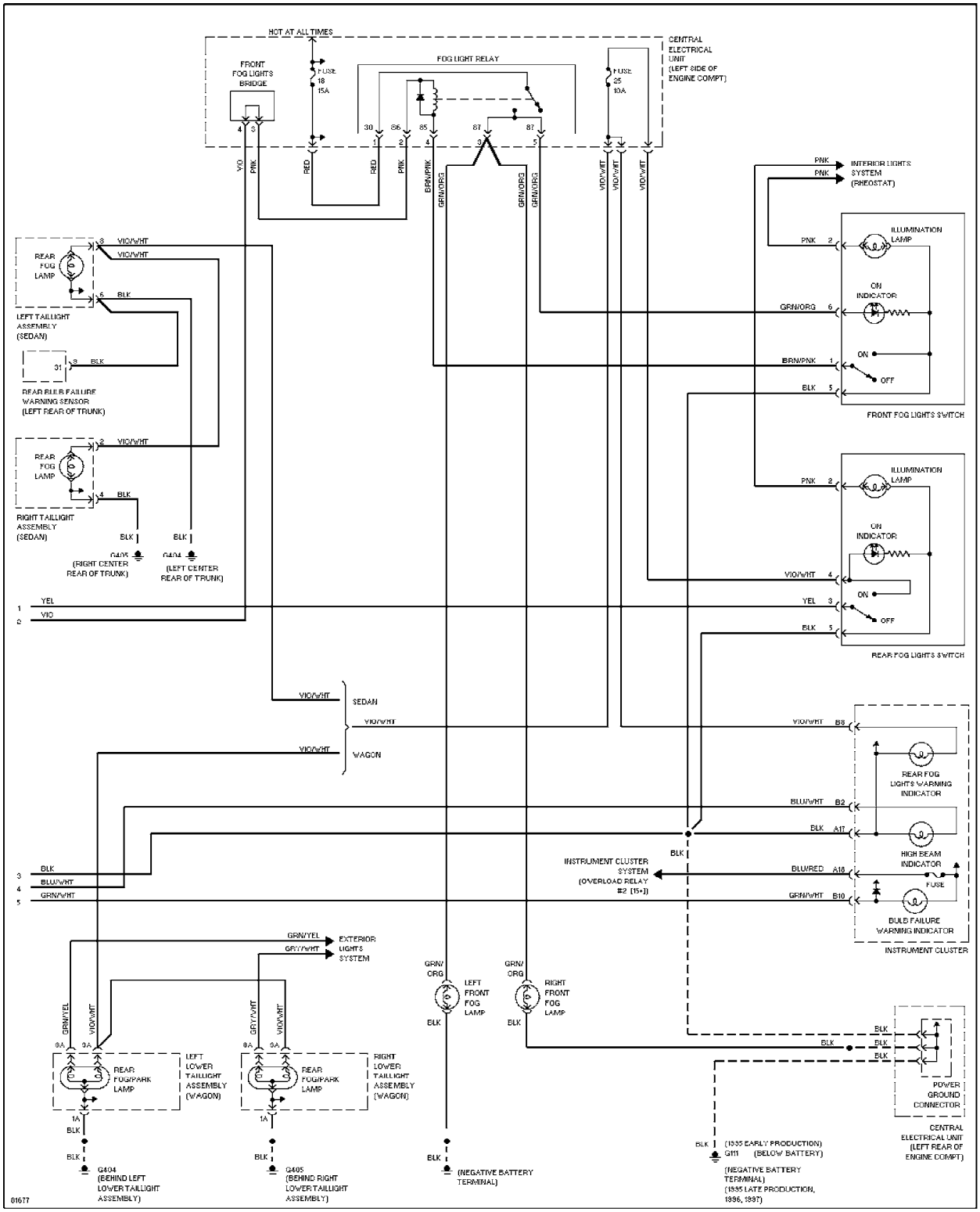
1995 System Wiring Diagrams
Volvo - 850

AIR CONDITIONING

2.3L



2.3L Turbo, Air Conditioning Circuits (1 of 2)



Headlight Circuit (2 of 2)

HORN

L - WIRING DIAGRAMS article.

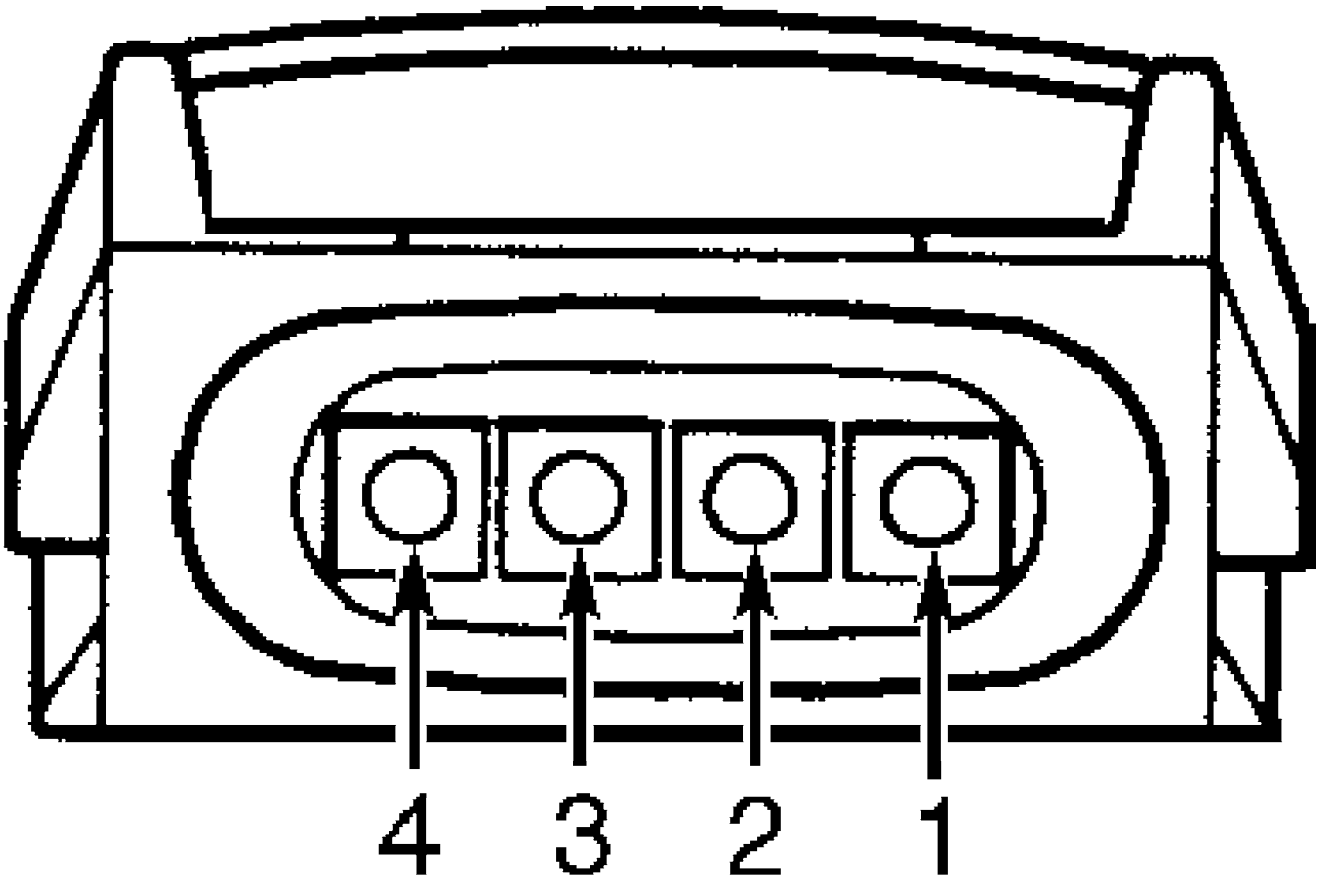


Fig. 4: MAF Sensor & Power Stage Connector Terminals
Courtesy of Volvo Cars of North America.

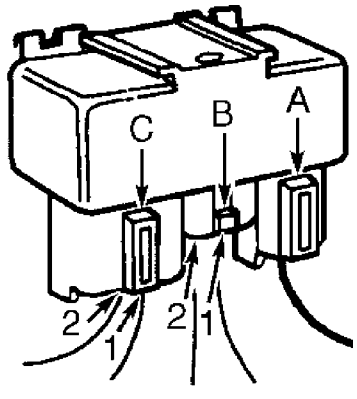


Fig. 5: Fan Controlled (FC) Relay Connector Terminals
Courtesy of Volvo Cars of North America.

terminal No. 2 and ground. If voltmeter reads about 5 volts, go to step 6). If voltmeter reads about zero volts, go to next step. If voltmeter reads more than about 5 volts, check wiring between A/C pressure sensor connector terminal No. 2 and ECM terminal B9 for a short to voltage.

5) Turn ignition off. Disconnect A/C pressure sensor. Ensure ECM connector terminals are clean and free of oxidation. Repair as necessary. Reconnect ECM. Turn ignition on. Connect voltmeter between A/C pressure sensor connector terminal No. 2 and ground. If voltmeter reads about 5 volts, cause of code is poor contact in ECM connector. If voltmeter does not read about 5 volts, check wiring between A/C pressure sensor connector terminal No. 2 and ECM terminal B9 for an open circuit.

6) Turn ignition off. Reconnect A/C pressure sensor. Start engine and idle for 15 seconds. Turn A/C and blower on. If A/C APPROVED parameter displays YES on Volvo Scan Tool (998-8686), cause of code is poor contact in A/C pressure sensor connector. If parameter displays NO, retest using new A/C pressure sensor.

7) If fault is permanent and signal is too low, turn ignition off. Disconnect A/C pressure sensor. Turn ignition on. Connect voltmeter between A/C pressure sensor connector terminal No. 2 and ground. If voltmeter reads about 5 volts, retest using new A/C pressure sensor. If voltmeter does not read about 5 volts, check wiring between A/C pressure sensor connector terminal No. 2 and ECM terminal B9 for a short circuit to ground.

8) If fault is intermittent and signal is too high, check A/C pressure sensor and ECM connectors for loose connection or contact resistance. Check wiring between A/C pressure sensor connector terminal No. 1 and ECM terminal B28 for an intermittent open circuit. Also check wiring between A/C pressure sensor connector terminal No. 2 and ECM terminal B9 for an intermittent open circuit or short circuit to ground.

9) If fault is intermittent and signal is too low, check wiring between A/C pressure sensor connector terminal No. 2 and ECM terminal B9 for an intermittent short circuit to ground. Repair as necessary.

Code 2-3-1 (Long Term Fuel Trim Partial Load) Or
Code 2-3-2 (Long Term Fuel Trim Idling)

1) Check for other codes. If Code 3-1-5 is stored, perform testing on that code first. If Code 3-1-5 is not stored, go to next step.

2) Check status message on Volvo Scan Tool (998-8686). If status message reads LOWER LIMIT, go to step 8). If status message reads UPPER LIMIT, go to next step.

3) Turn ignition on. Connect voltmeter between MAF sensor connector terminals No. 2 and 4. If voltmeter reads .1-.2 volt, go to next step. If voltmeter does not read .1-.2 volt, test using new MAF sensor.

4) Check for air leakage in intake system. Repair as necessary. If air leakage in intake system is not present, go to next step.

5) Check for air leakage in exhaust system. If there is no air leakage, go to next step. If there is air leakage, repair as necessary.

6) Check fuel and residual pressure. If fuel and residual pressure are okay, go to next step. If fuel and residual pressure are not okay, repair as necessary.

7) Connect breakout box to ECM and check ground connections. See COMPUTERIZED ENGINE CONTROLS in I - SYSTEM/COMPONENT TESTS article. Reconnect ECM. Repair as necessary.

8) If status message reads LOWER LIMIT, turn ignition on. Connect voltmeter between MAF sensor connectors terminals No. 2 and 4.

sensor connector terminal No. 3 and ground. If voltmeter reads about 5 volts, code was caused by poor terminal contact. If voltmeter does not read about 5 volts, check wiring between acceleration sensor connector terminal No. 3 and ECM terminal B32 for an open circuit.

11) Turn ignition on. Reconnect acceleration sensor connector. Erase code. Start engine and run at idle. If code does not reoccur, source of code is poor contact in acceleration sensor connector. Repair as necessary. If code reoccurs, retest using new acceleration sensor.

12) If fault is permanent and signal is too low, turn ignition off. Disconnect acceleration sensor. Turn ignition on. Connect voltmeter between acceleration sensor connector terminal No. 3 and ground. If voltmeter reads about 5 volts, retest using new acceleration sensor. If voltmeter does not read about 5 volts, check wiring between acceleration sensor connector terminal No. 3 and ECM terminal B32 for a short circuit to ground.

13) If fault is intermittent and signal is too high, check acceleration sensor and ECM connectors for poor terminal contact. Repair as necessary. Check wiring between acceleration sensor connector terminal No. 1 and ECM terminal B1 for an intermittent open or short circuit to ground. Check wiring between acceleration sensor connector terminal No. 2 and ECM terminal B28 for an intermittent open circuit. Check wiring between acceleration sensor connector terminal No. 3 and ECM terminal B32 for an intermittent short circuit to voltage or intermittent open circuit.

14) On vehicles with A/C, also check wiring between A/C pressure sensor connector terminal No. 3 and ECM terminal B29 for an intermittent short circuit to ground. On vehicles without A/C, check prerouted wiring between connector No. 3 for A/C pressure sensor and ECM terminal B29 for an intermittent short circuit to ground.

15) If fault is intermittent and signal is too low, check wiring between acceleration sensor connector terminal No. 3 and ECM terminal B32 for an intermittent short circuit to ground.

Code 4-5-1 (Misfire Cylinder No. 1),
Code 4-5-2 (Misfire Cylinder No. 2),
Code 4-5-3 (Misfire Cylinder No. 3),
Code 4-5-4 (Misfire Cylinder No. 4),
Code 4-5-5 (Misfire Cylinder No. 5),
Code 5-4-2 (Misfire More Than One Cylinder),
Code 5-4-3 (Misfire At Least One Cylinder),
Code 5-5-1 (Misfire Cylinder No. 1, TWD Damage),
Code 5-5-2 (Misfire Cylinder No. 2, TWC Damage),
Code 5-5-3 (Misfire Cylinder No. 3, TWC Damage),
Code 5-5-4 (Misfire Cylinder No. 4, TWC Damage),
Code 5-5-5 (Misfire Cylinder No. 5, TWC Damage),
Code 5-4-4 (Misfire More Than One Cylinder, TWC Damage), Or
Code 5-4-5 (Misfire At Least One Cylinder, TWC Damage)

1) Check for other trouble codes. If any other trouble codes are stored, perform diagnosis for other codes first. If no other codes are stored, go to next step.

2) Read off all other misfiring codes. If Code 5-4-2 and/or Code 5-4-4 are stored, misfiring has occurred in more than one cylinder. If misfiring occurred in several cylinders, go to step 6). If misfiring occurred in one cylinder, go to next step.

3) Check all spark plugs, cylinder compression, cooling system, ignition wiring, and distributor cap and rotor. Repair as necessary. If all components are okay, use Volvo Scan Tool (998-8686) and check flywheel. Start engine and run at idle. Read off values on scan tool for FLY ADAP B, FLY ADAP C, FLY ADAP D, and FLY ADAP E. If readings are -97 to +97, check wiring and injector connectors. If any readings are incorrect, check RPM sensor tip and hole down by flywheel/connecting flange for damage, scratches, and metal particles.

ohmmeter does not read 27-37 ohms, check wiring between TC control valve connector terminal No. 2 and ECM terminal B41 for an open circuit.

6) Turn ignition off. Reconnect TC control valve. Turn ignition on. Erase code. Start engine. Floor accelerator a couple of times. If fault remains, code will return within one minute. If code returns, retest using new TC control valve. If code does not return, code is caused by poor contact in TC control valve connector. Repair as necessary.

7) Check TC control valve and ECM connectors for loose connection or contact resistance. Also check wiring between TC control valve connector terminal No. 2 and ECM terminal B41 for an intermittent short circuit to voltage.

8) Check TC control valve and ECM connectors for loose connection or contact resistance. Check wiring between TC control valve connector terminal No. 2 and ECM terminal B41 for an intermittent open circuit or short circuit to ground. Also check wiring between TC control valve connector terminal No. 1 and main relay connector terminal No. 3 for an intermittent open circuit.

Code 5-4-1 (EVAP Signal)

1) Check status message on Volvo Scan Tool (998-8686). If fault is permanent and signal is too high, go to step 2). If fault is PERMANENT, SIGNAL TOO LOW, go to step 3). If fault is INTERMITTENT, SIGNAL TOO HIGH, go to step 7). If fault is INTERMITTENT, SIGNAL TOO LOW, go to step 8).

2) Turn ignition off. Disconnect EVAP valve. Connect ohmmeter between EVAP valve connector terminals No. 1 and 2. If ohmmeter reads about 26 ohms, check wiring between EVAP valve connector terminal No. 2 and ECM terminal A39 for a short circuit to voltage. If ohmmeter does not read 26 ohms, retest using new EVAP valve.

3) Turn ignition off. Disconnect EVAP valve. Turn ignition on. Connect voltmeter between EVAP valve connector, terminal No. 1, and ground. If voltmeter reads battery voltage, go to next step. If voltmeter does not read battery voltage, check wiring between EVAP valve connector terminal No. 1 and main relay connector terminal No. 3 for an open circuit.

4) Turn ignition off. Wait about 2 seconds. Disconnect EVAP valve. Connect ohmmeter between EVAP valve connector terminal No. 2 and ground. If ohmmeter reads 25-40 k/ohms, go to next step. If ohmmeter reads infinite resistance, go to step 6). If ohmmeter reads about zero ohms, check wiring between EVAP valve connector terminal No. 2 and ECM terminal A39 for a short circuit to ground.

5) Turn ignition off. Disconnect EVAP valve connector. Connect ohmmeter between EVAP valve connector terminals No. 1 and 2. If ohmmeter reads about 26 ohms, code is caused by poor contact in EVAP and/or ECM connector. Repair as necessary. If ohmmeter does not read about 26 ohms, retest using new EVAP valve.

6) Turn ignition off. Disconnect EVAP valve connector. Disconnect ECM. Ensure ECM connector terminals are clean and make good terminal contact. Repair as necessary. Connect ohmmeter between EVAP valve connector terminal No. 2 and ground. If ohmmeter reads 25-40 k/ohms, code is caused by poor contact at ECM connector. If ohmmeter does not read 25-40 k/ohms, check wiring between EVAP valve connector terminal No. 2 and ECM terminal A39 for an open circuit.

7) If fault is intermittent and signal is too high, check wiring between EVAP valve connector terminal No. 2 and ECM terminal A39 for an intermittent short circuit to voltage. Repair as necessary.

8) If fault is intermittent and signal is too low, check EVAP valve and ECM connector for loose connection or contact resistance. Check wiring between EVAP valve connector terminal No. 1 and main relay connector terminal No. 3 for an intermittent open circuit. Also check wiring between EVAP valve connector terminal No. 2 and ECM

E - THEORY/OPERATION - TURBO

1995 Volvo 850

1995 ENGINE PERFORMANCE
Volvo - Theory & Operation

850 - Turbo

INTRODUCTION

This article covers basic description and operation of engine performance-related systems and components. Read this article before diagnosing vehicles or systems with which you are not completely familiar.

AIR INDUCTION SYSTEM

TURBOCHARGERS

Turbo models use a water-cooled turbocharger, mounted directly to exhaust manifold, with a wastegate assembly attached to rear of turbine housing. Turbocharger consists of a turbine/compressor assembly, oil supply system and wastegate. Other components include impellers, impeller shaft, bearings and impeller housings.

The safety valve of system is a pressure-actuated wastegate that prevents excessive intake boost pressure. The wastegate is controlled by the turbo control valve. This 3-port solenoid valve monitors boost pressure and prevents turbo lag. The control valve is activated by turbo control unit, which receives signals from throttle position sensor, fuel injection ECU and turbo pressure sensor.

If boost pressure exceeds safe limits, engine damage may result. The wastegate opens when exhaust pressure exceeds a predetermined limit and allows exhaust gases to by-pass compressor. Turbocharger operation requires a large quantity of clean oil to prevent bearing failure. Engine oil pressure provides constant lubrication to system.

At idle and light throttle, turbo engine operates like a standard engine. When more power is required, exhaust gases from exhaust manifold enter turbocharger's turbine housing and flow through turbine blades. Exhaust flow and turbine speed increase as throttle opens and RPM increases. Impeller turns with turbine and forces air into compressor housing and intake manifold. As impeller and turbine speed increases, boost pressure also increases.

COMPUTERIZED ENGINE CONTROLS

850 turbo models use a Motronic 4.3 injection and electronic ignition system, equipped with self-diagnostic capabilities.

Systems use an Electronic Control Unit (ECU) that receives input from engine monitoring sensors. These sensors include camshaft sensor, coolant temperature sensor, oxygen sensor, knock sensor, mass airflow meter/sensor, timing pick-up and throttle switch. ECU uses these input signals to control air/fuel mixture for emission control, fuel economy and good driveability. Ignition and fuel controls are provided by a single ECU.

CONTROL UNITS

Electronic Control Unit (ECU) provide precise control of fuel, ignition and turbo operation. System has self-diagnostic capabilities.

The noid light is an excellent "quick and dirty" tool. It can usually be hooked to a fuel injector harness fast and the flashing light is easy to understand. It is a dependable way to identify a no-pulse situation.

However, a noid light can be very deceptive in two cases:

* If the wrong one is used for the circuit being tested. Beware: Just because a connector on a noid light fits the harness does not mean it is the right one.
* If an injector driver is weak or a minor voltage drop is present.

Use the Right Noid Light

In the following text we will look at what can happen if the wrong noid light is used, why there are different types of noid lights (besides differences with connectors), how to identify the types of noid lights, and how to know the right type to use.

First, let's discuss what can happen if the incorrect type of noid light is used. You might see:

* A dimly flashing light when it should be normal.
* A normal flashing light when it should be dim.

A noid light will flash dim if used on a lower voltage circuit than it was designed for. A normally operating circuit would appear underpowered, which could be misinterpreted as the cause of a fuel starvation problem.

Here are the two circuit types that could cause this problem:

* Circuits with external injector resistors. Used predominately on some Asian & European systems, they are used to reduce the available voltage to an injector in order to limit the current flow. This lower voltage can cause a dim flash on a noid light designed for full voltage.
* Circuits with current controlled injector drivers (e.g. "Peak and Hold"). Basically, this type of driver allows a quick burst of voltage/current to flow and then throttles it back significantly for the remainder of the pulse width duration. If a noid light was designed for the other type of driver (voltage controlled, e.g. "Saturated"), it will appear dim because it is expecting full voltage/current to flow for the entire duration of the pulse width.

Let's move to the other situation where a noid light flashes normally when it should be dim. This could occur if a more sensitive noid light is used on a higher voltage/amperage circuit that was weakened enough to cause problems (but not outright broken). A circuit with an actual problem would thus appear normal.

Let's look at why. A noid light does not come close to consuming as much amperage as an injector solenoid. If there is a partial driver failure or a minor voltage drop in the injector circuit, there can be adequate amperage to fully operate the noid light BUT NOT ENOUGH TO OPERATE THE INJECTOR.

If this is not clear, picture a battery with a lot of corrosion on the terminals. Say there is enough corrosion that the starter motor will not operate; it only clicks. Now imagine turning on the headlights (with the ignition in the RUN position). You find they light normally and are fully bright. This is the same idea as noid light: There is a problem, but enough amp flow exists to operate the headlights ("noid light"), but not the starter motor ("injector").

How do you identify and avoid all these situations? By using the correct type of noid light. This requires that you understanding

WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES

1995 Volvo 850

1995-96 WHEEL ALIGNMENT
Volvo - Specifications & Procedures

850

* PLEASE READ FIRST *

NOTE: Prior to performing wheel alignment, perform preliminary visual and mechanical inspection of wheels, tires and suspension components. See PRE-ALIGNMENT INSTRUCTIONS in WHEEL ALIGNMENT THEORY/OPERATION article.

RIDING HEIGHT ADJUSTMENT

Before adjusting alignment, check riding height. Riding height must be checked with vehicle on level floor and tires properly inflated. Bounce vehicle several times and allow suspension to settle.

Visually inspect vehicle for signs of abnormal height from front to rear or side to side. Check passenger and luggage compartments for extra heavy items and remove if present. Riding height between left and right side of vehicle should vary less than 1" (25.4 mm).

JACKING & HOISTING

FLOOR JACK OR HOIST

The following illustration indicates areas (parts) of underbody and frame used to raise and support vehicle with either floor jack or hoist. These points are indicated by shaded areas on frame. See Fig. 1.

EMERGENCY JACKING

Those points designated on body outline are designed for use with vehicle's jack and are indicated by circular dots. See Fig. 1. If floor jack or hoist is employed, extreme care should be exercised to avoid damaging outer body shell.

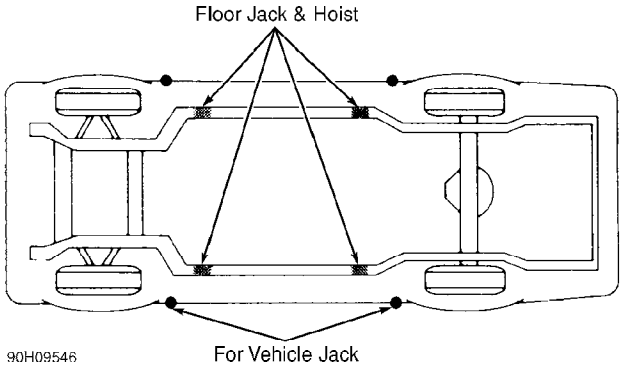


Fig. 1: Jacking & Hoisting Points (Typical)

WHEEL ALIGNMENT PROCEDURES