Turbocharging system

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Turbocharging system

Basic principle of operation (see fig. D2-2)
The turbocharger is designed to increase the power and torque of the engine under certain operating conditions. This is achieved by utilizing energy from the exhaust gases to pump additional air into the engine at wide throttle openings. When this occurs, the turbocharger is applying 'boost' to the induction system.

The size of the turbocharger has been chosen to ensure a substantial increase in torque at low engine speeds. However, if not correctly controlled this would result in excessive boost pressure and power output at high speeds.

To overcome this situation a wastegate is fitted into the exhaust system between the engine and the turbocharger.

Operation of the wastegate is controlled by an electronic control unit (ECU). This unit receives information from the two knock sensors (detonation), the ignition system (engine speed), and the air pressure transducer (comparing boost and manifold pressure).

When certain conditions are sensed by the ECU, it signals to close the boost control valve. The resultant build-up of signal pressure is then applied to the wastegate diaphragm.

At a pre-set pressure the wastegate opens and allows a proportion of exhaust gas to by-pass the turbocharger. This ensures that the power of the engine is limited to a safe level.

To prevent surging of the turbocharger compressor when the throttles are suddenly closed, a dump valve is fitted into the cast air intake elbow. This assembly allows the inlet air to be recirculated from the air intake system to the compressor and relieves the boost pressure when the throttles are closed.

When the throttles are opened the dump valve is closed and boost pressure is rapidly applied to the engine.

Description of the components
Three systems form and control the turbocharging system. These are the air flow system (both inlet and exhaust), the fuel system, and the ignition system. All have their various control systems (some of which are interrelated) to ensure that they function properly and at the correct time.

This section relates to control systems and components that operate the basic turbocharging system and comprise the following.
Turbocharger assembly
Wastegate

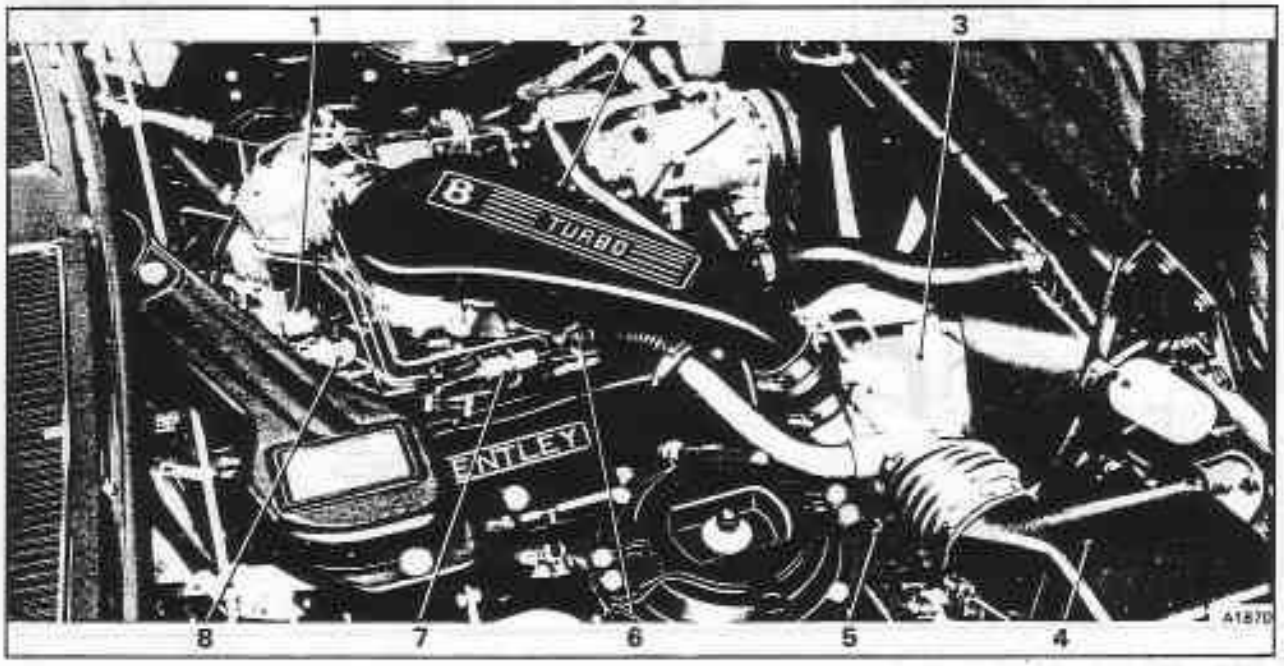


Fig. D2-1 Engine compartment details
1 Dump valve solenoid valve
2 Cast air intake elbow
3 Turbocharger assembly
4 Air intake filter housing
5 Exhaust gas wastegate (partially hidden)
6 Dump valve assembly (partially hidden)
7 Boost control solenoid valve
8 Dump valve vacuum switch

Dump valve
Dump valve vacuum switch and solenoid
Boost control ECU
Boost control valve
Knock sensors
Air pressure transducer

Turbocharger (see fig. D2-3)
The turbocharger is basically an air pump driven by the energy of the exhaust gas. The main components are the exhaust turbine, the shaft, the compressor, and the centre housing assembly.

The turbine and compressor are mounted at opposite ends of the same shaft which is supported in plain bearings within the centre housing. The compressor is contained within an aluminium alloy housing and the exhaust turbine within the cast iron housing. Both housings are bolted to the centre housing and the complete assembly is mounted via the turbine flange to the exhaust manifold.

The plain bearings that support the shaft have floating bushes which are lubricated by pressurized engine oil. The oil is also used to cool both the bearings and the centre housing assembly.

Oil seals are fitted at either end of the shaft to prevent oil leakage into the turbine or compressor housings.

Do not use an exhaust extraction system on the vehicle. Failure to observe this caution may result in a temporary leak from the turbocharger oil seal arrangement. This leak may continue for some time after the extraction equipment has been removed.

Exhaust gas wastegate (see fig. D2-4)
The exhaust gas wastegate is used to control the boost pressure by regulating the flow of exhaust gas to the turbocharger turbine. This controls the energy available for compressing inlet air.

The boost pressure is taken from a tapping at the end of the turbocharger compressor volute and acts on a diaphragm connected to the wastegate valve. As the boost pressure rises, the diaphragm acts against a spring and at a predetermined pressure the valve lifts off its seat, wasting some of the exhaust gas and limiting the boost pressure.

The boost pressure signal to the wastegate is vented to atmosphere by the boost control valve. This solenoid valve is unenergized in the open position. When it receives a signal from the electronic control

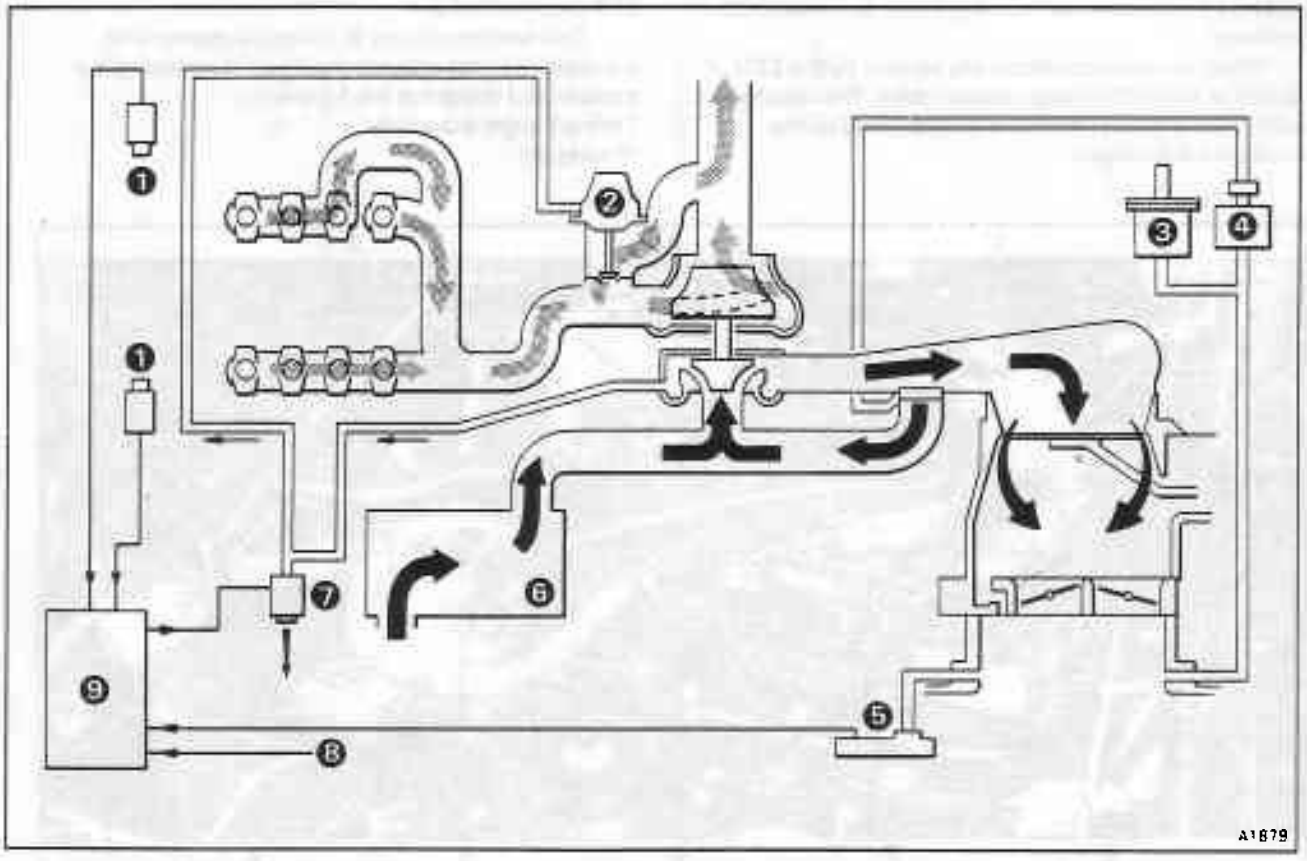


Fig. D2-2 The turbocharging system

1 Knock sensor
2 Exhaust gas wastegate
3 Dump valve vacuum switch
4 Dump valve solenoid valve
5 Air pressure transducer
6 Air intake filter housing
7 Boost control solenoid valve
8 Ignition input signal (engine speed)
9 Electronic control unit (ECU)

unit (ECU) the solenoid valve closes and allows pressure to build-up in the wastegate.

Dump valve (see fig. D2-5)
The manifold depression operated dump valve is situated in the cast air intake elbow. At low engine loads [manifold vacuum greater than 368,30 mm Hg (14.5 in Hg)] it allows air to recirculate through the intake system and back into the compressor.

At higher engine loads the dump valve closes (due to a fall in the manifold depression) and pressure builds-up in the induction system, increasing part throttle engine power and improving throttle progression on the primary chokes.

A solenoid valve operated by a vacuum switch, connects the dump valve to atmospheric pressure whenever the inlet manifold vacuum is less than 368,30 mm Hg (14.5 in Hg) and allows the dump valve to close.

When the vacuum switch and solenoid are de-energized [inlet manifold vacuum greater than 368,30 mm Hg (14.5 in Hg)], the solenoid connects the dump valve to the inlet manifold vacuum which in turn, draws the valve open.

The dump valve also acts as a relief valve if the boost pressure exceeds approximately 0,59 bar (8.5 lbf/in², 439,50 mm Hg, 17.30 in Hg).

Boost control (see fig. D2-6)
This system is controlled by an electronic control unit (ECU) situated behind the front flasher lamp on the left-hand side of the vehicle.

The function of the unit is to interpret electrical signals received from the ignition system (engine speed), the two knock sensors (detonation), and the air pressure transducer (comparing boost and manifold pressure).

When the ECU receives certain signals it operates the boost control solenoid valve. This in turn opens the wastegate to limit the amount of exhaust gas available to drive the turbocharger turbine.

Boost inhibit
This system prevents the build-up of boost pressure when the vehicle is stationary with the brakes applied, the transmission is in drive range, and the accelerator pedal depressed.

When the ECU senses that the above conditions prevail, it signals to close the boost control solenoid. The resulting build-up of pressure in the control line, opens the wastegate and prevents a build-up of the main boost pressure.

Engine knock sensors
A knock sensor is fitted between cylinders two and three of both 'A' bank and 'B' bank.

The sensor produces a small output signal when it detects detonation.

The output signal is processed by the boost control electronic control unit which then decides if detonation is present.

If detonation is present the electronic control unit

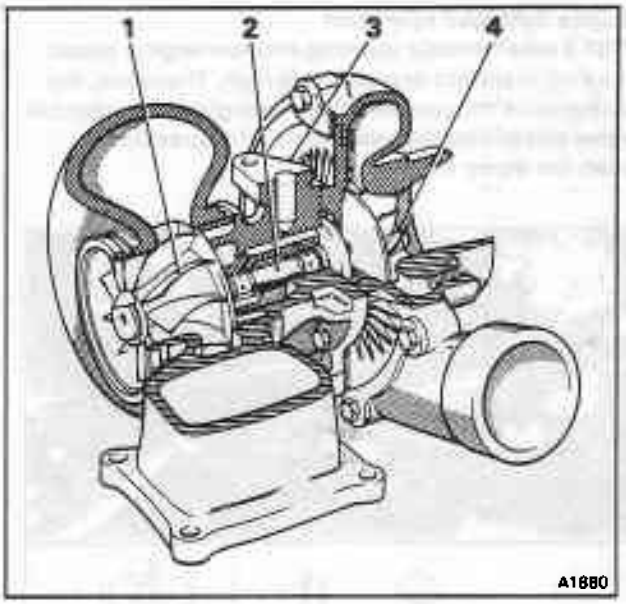


Fig. D2-3 The turbocharger assembly
1 Exhaust turbine
2 Shaft
3 Centre housing
4 Intake compressor

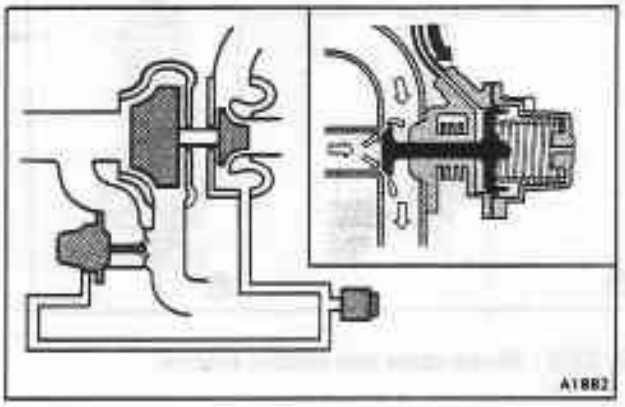


Fig. D2-4 Exhaust gas wastegate and control system

(ECU) signals to the boost control solenoid to close and control the boost pressure.

Air pressure transducer (see fig. D2-7)
The air pressure transducer is a cast aluminium block mounted on the speed control actuator at the rear of 'A' bank cylinder head.

The unit monitors induction manifold pressure, primarily for the fuel injection system. However, it also provides instantaneous boost pressure information for the knock sensing boost control system.

Modes of operation
This section comprises a brief description of the operating modes for the system.

Engine light load operation
With a small throttle opening and low engine speed the inlet manifold depression is high. Therefore, the dump valve vacuum switch de-energizes the solenoid valve and allows the inlet manifold depression to open the dump valve.

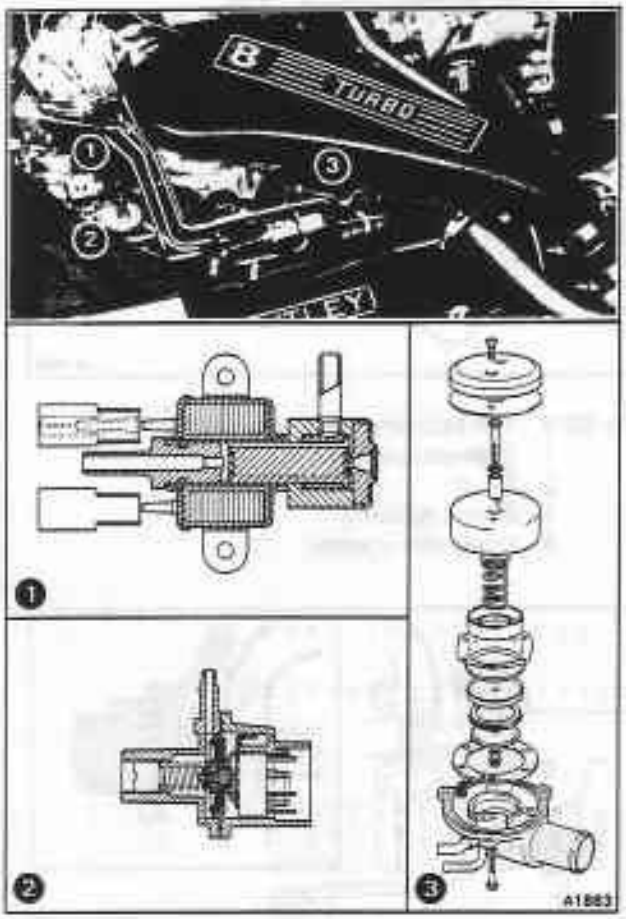


Fig. D2-5 Dump valve and control system

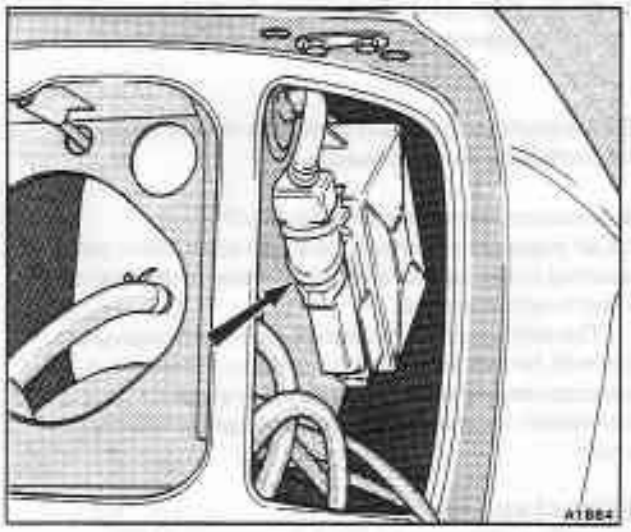


Fig. D2-6 Boost control electronic control unit (ECU)

The inlet air delivered by the turbocharger compressor to the air intake elbow is allowed to return to the compressor via the dump valve. Under these conditions there is no turbocharging effect and the engine operates in the 'conventional' naturally aspirated manner.

Engine part throttle operation (with boost)
When the throttles are partially opened to meet an increase in engine load, the inlet manifold depression will fall below 368,30 mm Hg (14.5 in Hg). Therefore, the dump valve vacuum switch energizes the solenoid valve and closes the dump valve by venting it to atmosphere.

When the dump valve closes the air recirculation pipe, air from the turbocharger compressor is retained within the induction system. This causes pressure to build-up to approximately 0,48 bar (7 lbf/in², 361,97 mm Hg, 14.25 in Hg), dependent upon the throttle openings.

The increased density of inlet air permits an increase in the volume of fuel that can be burnt in the engine (whilst maintaining the correct air/fuel ratio). This therefore, produces a correspondingly higher engine power output.

The boost pressure is also piped from the turbocharger compressor to the exhaust gas wastegate assembly via the boost control solenoid valve. Normally this valve vents the signal pressure to atmosphere. However, when the boost control electronic control unit (ECU) signals to close the solenoid to atmosphere, boost pressure builds-up in the signal line.

At a predetermined pressure the wastegate valve lifts off its seat. This allows a proportion of the exhaust gas to by-pass the turbocharger turbine limiting the speed and therefore, the power driving the turbocharger compressor. This action limits the boost pressure.

If due to malfunction, the boost pressure is not limited in the manner described, the dump valve will act as a relief valve when the pressure approaches approximately 0,59 bar (8.5 lbf/in², 439,50 mm Hg, 17.30 in Hg).

Engine full load operation
With the throttles fully opened, the inlet manifold depression is below the setting required to keep the dump valve open. Therefore, the vacuum switch activates the solenoid which vents the dump valve to atmosphere, closing the valve.

Boost pressure from the turbocharger builds-up in the induction manifold and the turbocharging effect is evident with increased engine power.

The turbocharger boost pressure is also fed to the exhaust gas wastegate assembly. At a pre-set pressure the valve is lifted from its seat and allows some exhaust gas to by-pass the turbocharger turbine. This limits the speed of the compressor and therefore, the boost pressure.

If a malfunction of a component results in excessive boost pressure, the dump valve will operate

as a relief valve at approximately 0,59 bar (8.5 lbf/in², 439,50 mm Hg, 17.30 in Hg).

In abnormal conditions, as the engine overcomes the load imposed upon it, it may be possible to detect detonation momentarily before the knock sensing system takes control.

The system comprises a knock sensor fitted to each bank of engine cylinders. The sensors produce a small signal when detonation is detected. This signal is fed to the electronic control unit for processing.

If detonation is present the electronic control unit signals to the boost control solenoid valve to close. This allows boost control signal pressure to be exerted on the wastegate diaphragm, to open the wastegate.

The speed of the turbocharger turbine and compressor is therefore limited by the operation of the wastegate.

Servicing

The information contained in this section includes
Basic system fault finding chart.
System test procedures flow charts.
Mechanical components assembly sequence.
Components removal and fitting procedures.

If a fault cannot be clearly defined, it is suggested that the following procedure is carried out before any involved fault diagnosis work is undertaken.

The procedure should be adhered to otherwise, an incorrect diagnosis may be made which could result in both lengthy and costly repairs.

Procedure

1. Check the **ignition system** and **fuel injection system**, carry out the functional checks detailed in Chapter B.
2. If a fault is apparent, refer to Chapter E for ignition system faults and Chapter B for fuel injection system faults.
3. Ensure that the exhaust emission CO reading is correct, refer to Chapter B.

If the exhaust CO reading is incorrect, carry out a compression test on the engine cylinders before adjusting the mixture strength.

Note Inhibit the operation of the fuel injection system during this test by removing the fuel injection system fuse. Also isolate the ignition system by disconnecting the flywheel sensor. Do not disconnect the HT king lead for this purpose.

Engine cylinder compression pressure 9,66 bar (140 lbf/in²) minimum @ cranking speed
Variation between cylinders must not exceed 1,034 bar (15 lbf/in²)

4. Carry out the turbocharging system flow chart test procedures.

Removal and fitting of components

When removing any parts always blank off the open connections immediately to prevent the ingress of dirt.

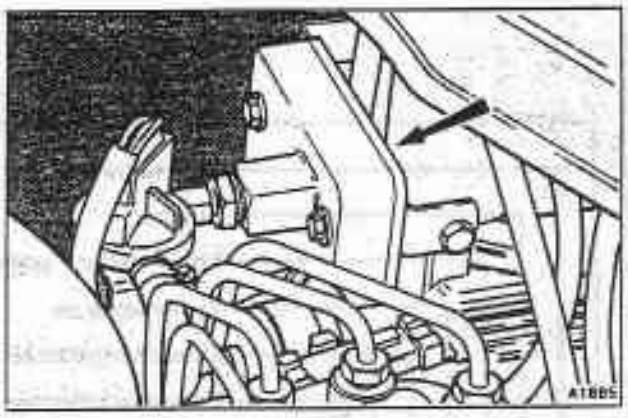


Fig. D2-7 Air pressure transducer

Turbocharger assembly – To remove and fit

1. Slacken the worm drive clip securing the air intake hose to the turbocharger intake assembly. Free the joint by twisting the hose.
2. Unscrew the worm drive clip and detach the crankcase breather pipe from the air dump pipe.
3. Slacken the worm drive clips situated at the flexible section of both the air feed and air dump pipes. Free the joints by twisting each rubber hose.
4. Unscrew the nut retaining the intake assembly to the turbocharger; collect the washer and withdraw the intake assembly.
5. Unscrew the banjo bolt from the pressure tapping on the end of the turbocharger compressor casing. Free the joint and collect the aluminium sealing washer from either side of the pipe joint faces.
6. Unscrew the two setscrews retaining the large heatshield to the top of the turbocharger assembly.
7. Unscrew the nut and collect the washer from the lower timing cover stud that retains the large heatshield lower mounting bracket. Withdraw the heatshield.
8. Unscrew the two Allen screws securing the oil feed pipe flange to the top of the turbocharger. Free the joint and discard the gasket.
9. Unscrew the two setscrews securing the oil return pipe flange to the bottom of the turbocharger. Free the joint and discard the gasket.
10. Unscrew the exhaust clamp ring, securing the turbocharger assembly to the exhaust downtake pipe.
11. Unscrew the four nuts retaining the turbocharger assembly to the exhaust mounting flange, collect the distance washers and withdraw the assembly.

Take care not to damage the machined faces of the turbocharger to manifold joint.

12. Fit the turbocharger by reversing the removal procedure, noting the following.
13. Ensure that the face joint surfaces between the turbocharger and exhaust manifold are clean and undamaged.
14. Torque tighten the retaining nuts to the figures given in Chapter L.
15. Before connecting the lubrication pipes, the turbocharger must be primed with clean engine oil in the following manner.

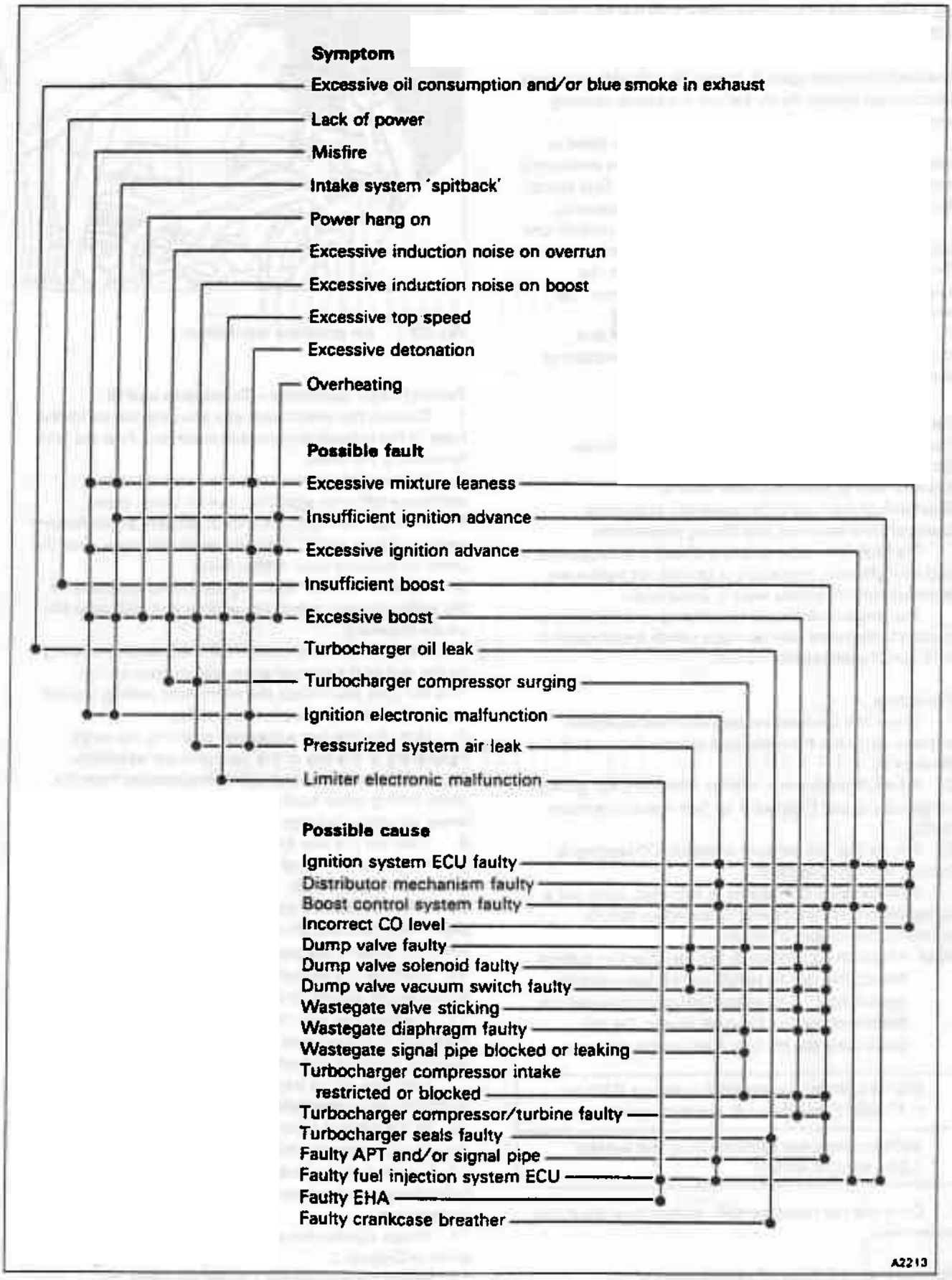


Fig. D2-8 Basic turbocharging fault diagnosis chart

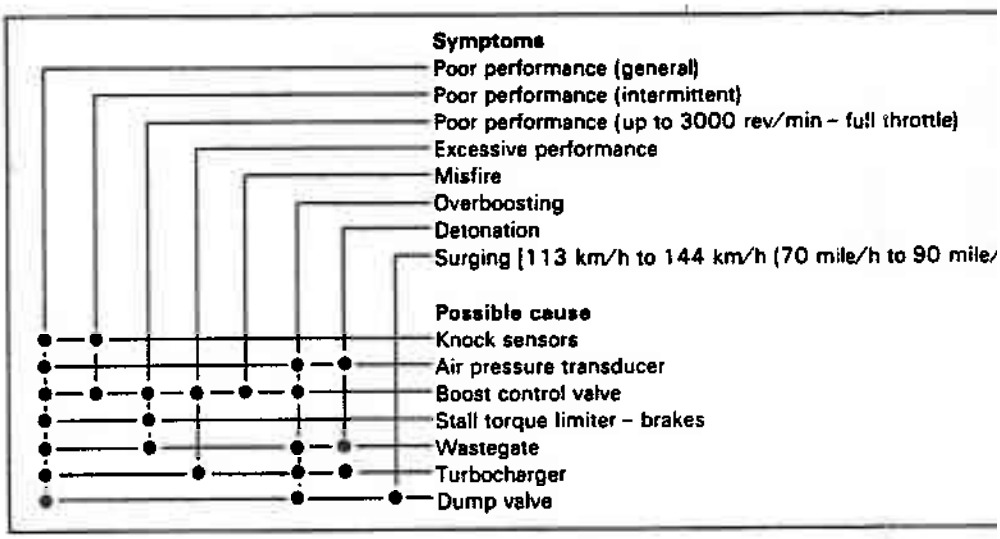
Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 1 of 5

Preliminary checks and conditions

Important
Boost control, EZ 58F digital ignition, and KE2-Jetronic are 'stand alone' systems. Consult the respective fault diagnosis to identify a possible fault and the system to which the fault relates

1. Unless a fault is absolutely obvious it is recommended that the complete fault finding procedure is carried out
2. Ensure that the battery is fully charged
3. Always use a digital multimeter to carry out electrical circuit tests
4. Always switch off the ignition when either disconnecting or connecting electrical connections
5. Always remake any connection(s) before proceeding to the next test



Visually inspect the electrical connections to the components illustrated below. Detach the multiplug from the boost control ECU and check the integrity of the 13 connections in the plug
Are these satisfactory?

NO → 1. Remake the connections
2. Replace the cables

YES

Switch on the ignition
Wait for approximately 10 seconds
Does the boost control valve 'click' continuously?
Note The valve may 'click' briefly for between 5 and 10 seconds when the ignition is switched on

NO → Disconnect the electrical plug from the boost control valve
Switch on the ignition and measure the voltage at the loom connector
Is it 10 to 13 volts?

NO → Check the cables to the boost control solenoi valve

YES

YES → Carry out checks to the air pressure transducer loom

Check the voltage on the purple/brown cable
Is it 4.9 to 5.3 volts?

NO → Check the boost control valve

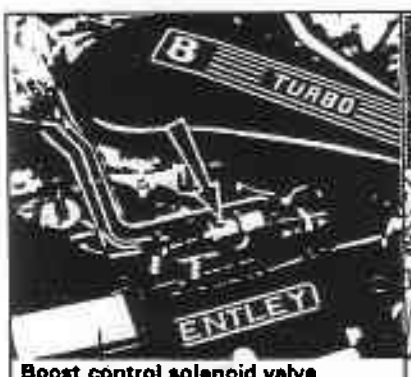
YES

Check for cable continuity between the black cable and earth
Is it continuous?

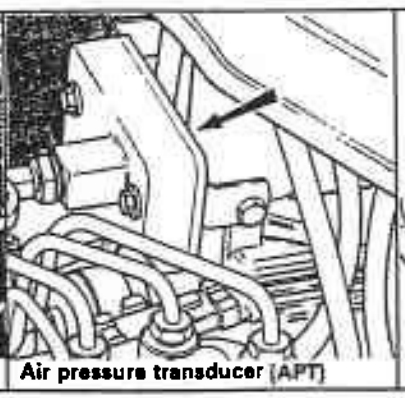
YES → Check the air pressure transducer

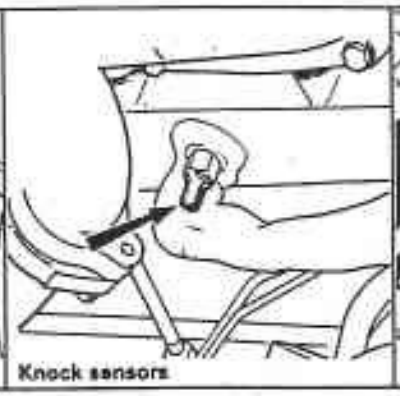
NO

Rectify faulty cable



Boost control solenoid valve


Air pressure transducer (APT)


Knock sensors


Boost control ECU

Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 2 of 5

Boost control system air pressure transducer (APT)

Identify the boost control APT (see item A)
Carefully withdraw the rubber moulding from the APT electrical plug (see item A) for the duration of the test
Do not remove the plug
Connect a multimeter between the purple/brown cable in the plug and earth
Switch on the ignition and measure the voltage
Is it 4.9 to 5.3 volts?

NO → **Is the reading zero volts?**

NO → Replace the KE2-Jetronic fuel injec ECU

YES → Withdraw the plug from the APT
Check for cable continuity between the purple/brown cable in the plug and pin 16 in the fuel injection ECU plug (see item D)
Is it continuous?

YES → Replace the KE2-Jetronic fuel injec ECU

NO → Rectify faulty cable

YES → Withdraw the plug from the APT
Check for cable continuity between the black cable in the plug and the body earth (see item B)
Is it continuous?

NO → Rectify faulty cable

YES → **Is the voltage drop on the cable less than 0.05 volts?**

NO → Rectify faulty cable

YES → Do not remove the plug from the APT
Start and run the engine at idle speed
Measure the voltage between the green/slate cable in the plug and earth
Is it 0.7 to 1.0 volts?

NO → Rectify faulty cable

YES → Withdraw the plug from the APT
Check for cable continuity between the green/slate cable in the plug and pin 10 in the boost control ECU plug (see item C)
Is it continuous?

NO → Rectify faulty cable

YES → Disconnect the metal manifold feed pipe from the APT
Do not remove the plug
Switch on the ignition and measure the voltage between the green/slate cable in the plug and earth
Is it 2.2 to 2.8 volts?

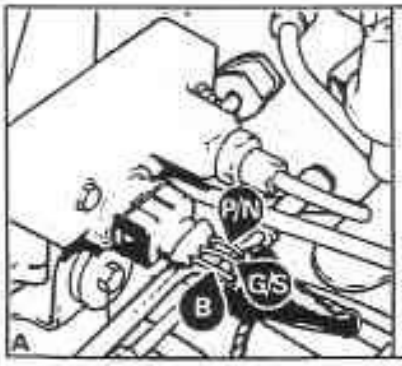
YES → Check for a 'crimped' or blocked signal hose from the induction manifold to the APT
Is it satisfactory?

YES → Check that the metal signa pipe is or leaking
Is it satisfactory?

NO → Rectify the pipe

NO → Clean out or replace the hose

NO → Replace the APT



A

Identification of air pressure transducers (APT)

Early 1987 model year cars have one APT fitted for both the boost control and fuel injection systems.

Late 1987 and all 1988 model year cars have two APTs fitted one for the boost control system and one for the fuel injection system. Both APTs have three cables connected to them via a rubber plug. The colours of the three cables in each loom are similar.

To identify the APTs warm-up the engine and allow it to run at the idle speed setting. Remove the rubber electrical plug from each APT in turn. When the plug is removed from the APT connected to the fuel injection system, the engine will run rich (lumpy) and the rev/min will decrease. The boost control system APT is the one that remains connected during this alteration in engine idle speed conditions.


B

ion system

not blocked

YES → Replace the boost control ECU

Switch on the ignition
Wait for approximately 10 seconds
Is the boost control valve 'clicking' continuously?

NO → System operating satisfactorily

YES → Retest the system

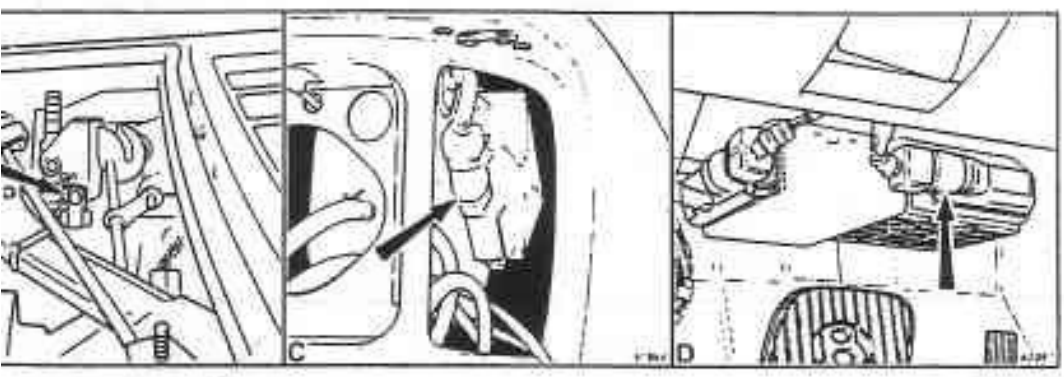


Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 3 of 5

Boost control solenoid valve

Remove the two hoses from the adapter on the boost control solenoid valve
Connect a clean hose to one of the hose connections on the adapter (see item A)
Blow down the hose
Does air only escape from the open connection on the adapter and not from the screened vent port?

NO → Replace the boost control valve

YES ↓

Leave the hoses as in the previous test
Switch on the ignition
Blow down the hose
Does air now escape from both the open connection on the adapter and the screened vent port?

NO → Replace the boost control valve

YES ↓

Identify the boost control system air pressure transducer (APT) (refer to sheet 2 of 5)
Withdraw the plug from the APT
Switch on the ignition
Is the boost control solenoid valve 'clicking'?

NO → Withdraw the plug from the air pressure transducer
Switch on the ignition
Is the voltage on the green/slate cable more than 3.6 volts?

NO → Disconnect the electrical connecti air pressure transducer, the boost ECU (see item C), and the KE2-. (see item D)
Check for cable continuity betwee the air pressure transducer and p KE2-Jetronic ECU, and pin 10 or control ECU
Are these continuous?

YES ↓

Measure the resistance of the bo solenoid valve
Is it 26 to 27Ω?

YES ↓

Change the ECU
Retest the system
Is it now satisfactory?

YES ↓

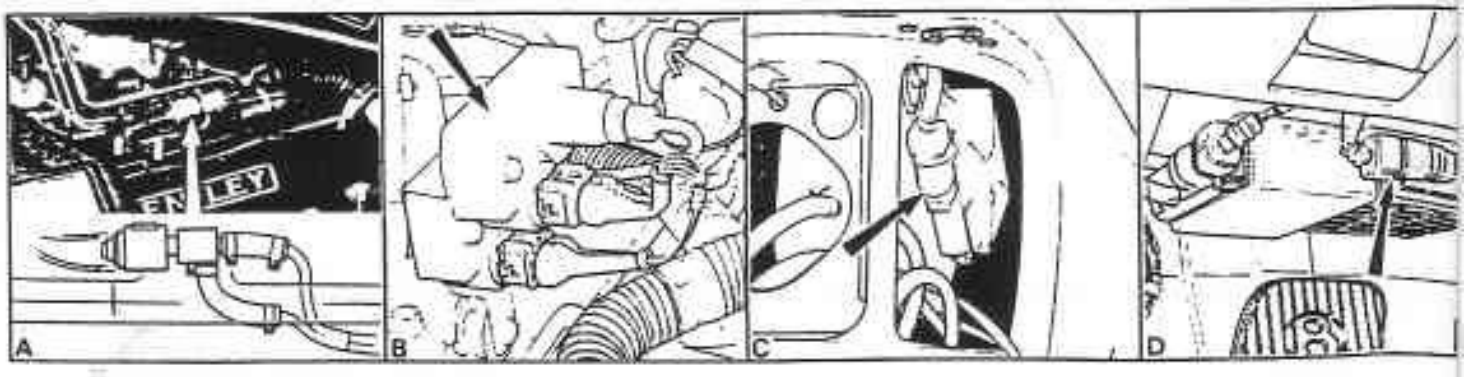
Boost control system working sa

YES ↓

Boost control solenoid valve working satisfactorily

YES ↓

Change the boost control system ECU and retest the system



ons to the
control
etronic ECU

n pin 2 on
n 19 on the
the boost

NO → Rectify faulty cables

st control

NO → Change the boost control solenoid valve

NO → Check the brake lamps, automatic speed control, and knock sensing systems

isfactorily

Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 4 of 5

Wastegate

Ensure that there is no blockage of the following
1. Wastegate signal pipe
2. Compressor to boost control valve signal pipe
3. Compressor signal pipe tapping on the turbocharger compressor

Are these components free from obstruction?

NO → Eliminate the blockage or replace the respective component

YES

Remove the hose from the boost control valve that feeds air to the wastegate.
Fit the Mityvac pump RH 12495.
Apply 0,41 bar (12 in Hg) of air pressure to the wastegate signal pipe and listen carefully for the wastegate to operate.
Does the wastegate open when the air pressure is applied and close again when the pressure is released?

NO → Remove the wastegate
Inspect the valve and diaphragm for sticking and/or damage (including a ruptured diaphragm)

YES

Wastegate operates satisfactorily
Proceed to check the dump valve system

Dump valve

Disconnect and blank the vacuum hose to dump valve vacuum switch. Disconnect th vacuum hose from the dump valve at the induction manifold. Connect the Mityvac pump RH 12495 to the induction manifold hose connection.
Start the engine.
Is the dump valve closed?

YES

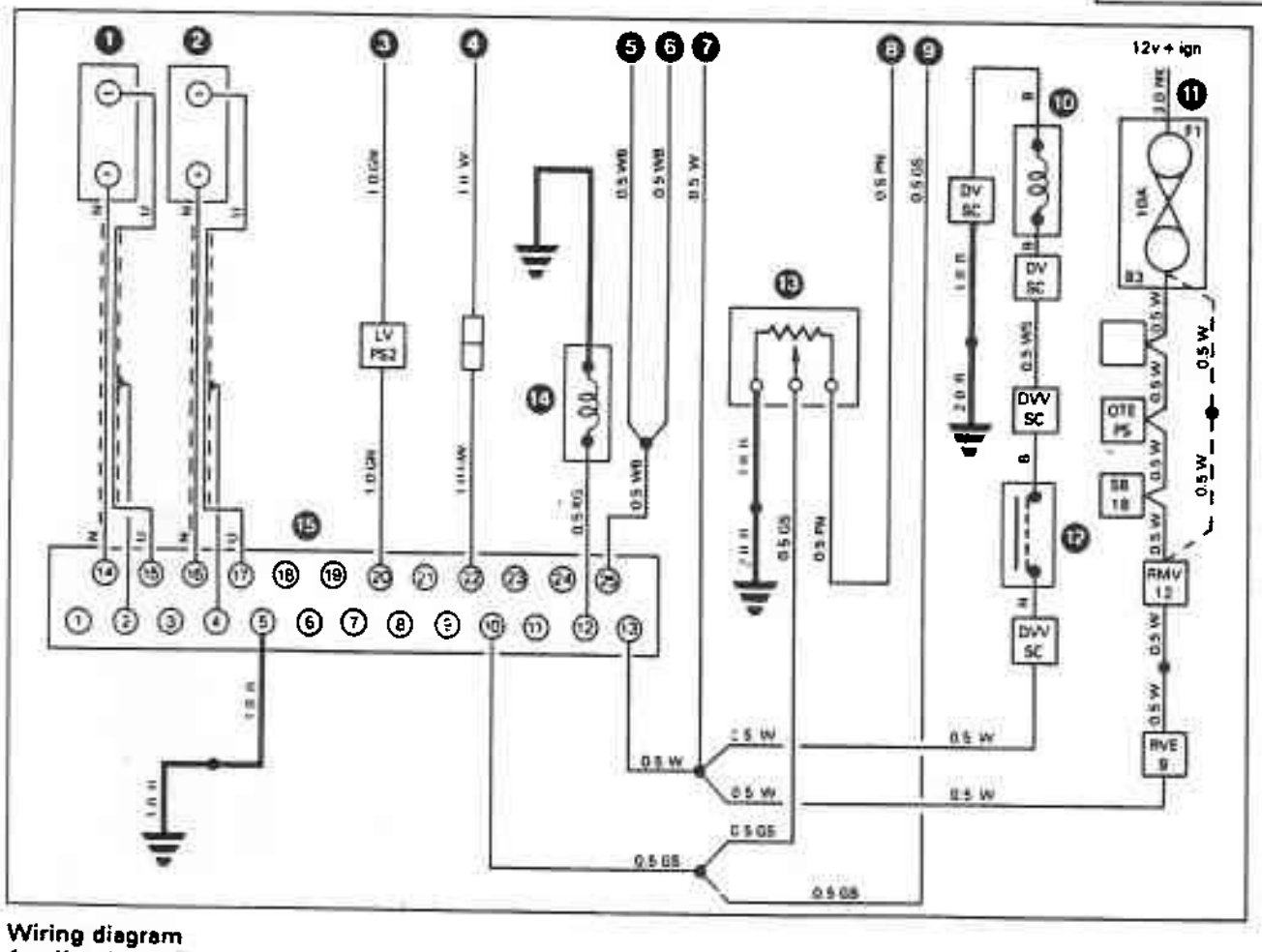
Apply a vacuum of 0.5 bar (15 in Hg)
Does the valve open rapidly (audible 'click') between 0,4 bar and 0,47 bar (1 in Hg and 14 in Hg)?

YES

Slowly release the vacuum
Does the valve close as the vacuum fall below 0.42 bar (12.5 in Hg)?

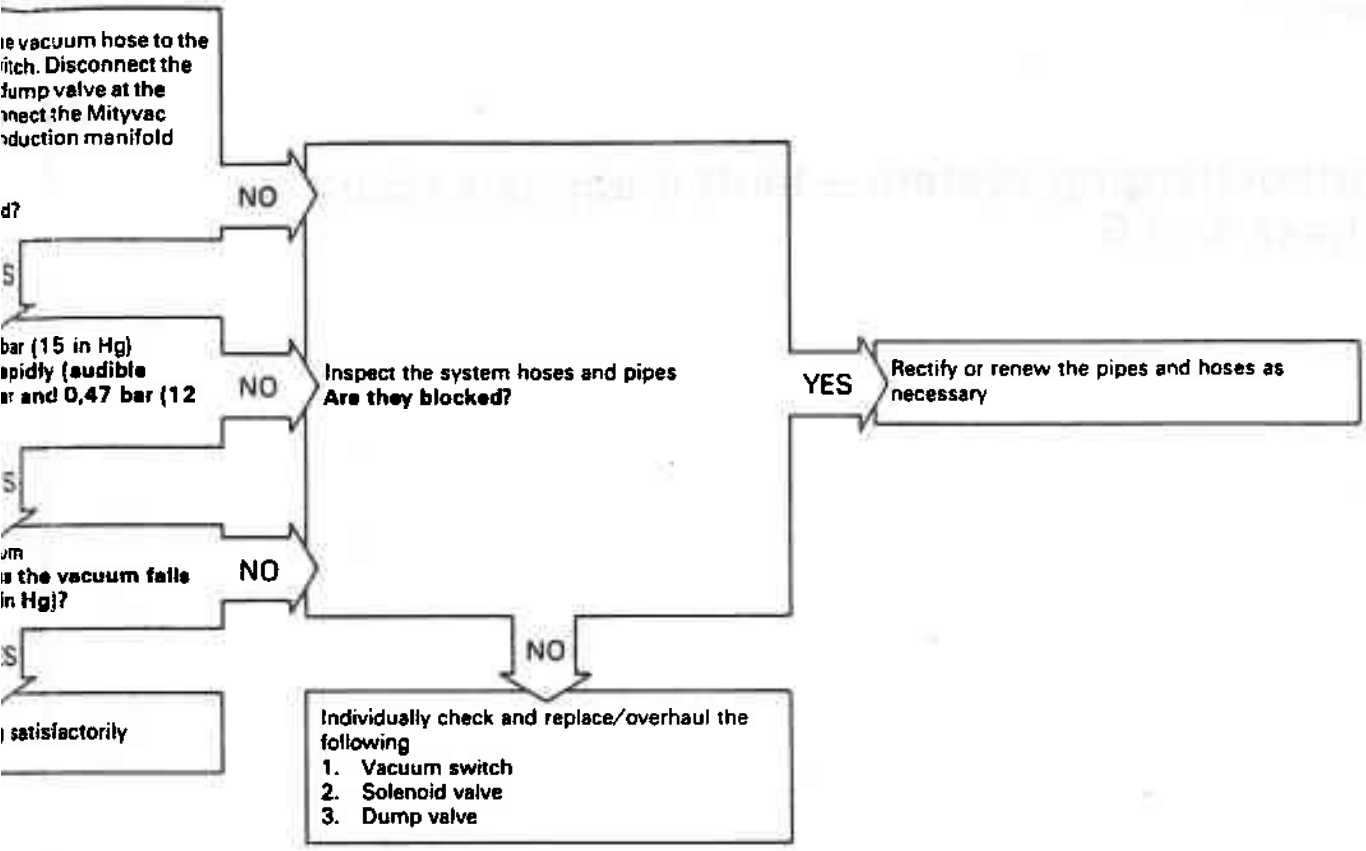
YES

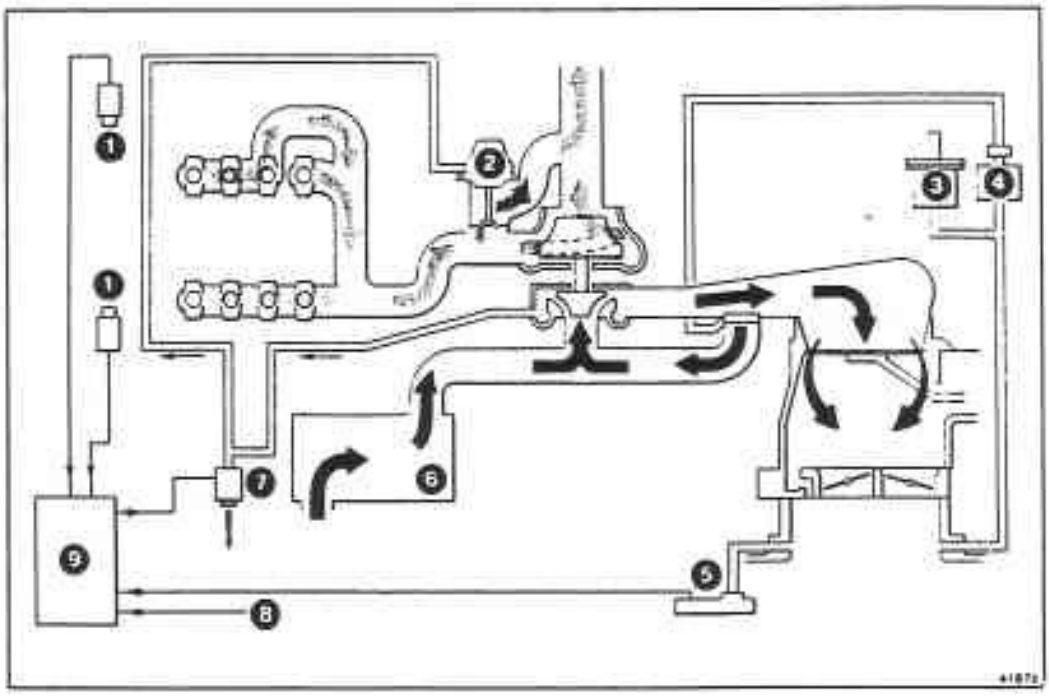
Dump valve is operating satisfactorily



Wiring diagram

1 Knock sensor – A bank
2 Knock sensor – B bank
3 From braking system
4 From speed control system
5 From fuel injection system ECU
6 From ignition system ECU
7 To ignition system ECU
8 To fuel injection system ECU
9 To fuel injection system ECU
10 Purge control solenoid (if fitted)
11 Fuse
12 Purge control vacuum switch (if fitted)
13 Air pressure transducer
14 Boost control solenoid
15 Boost control system ECU





The turbocharging system

1 Knock sensor
2 Exhaust gas wastegate
3 Dump valve vacuum switch
4 Dump valve solenoid valve
5 Air pressure transducer
6 Air intake filter housing
7 Boost control solenoid valve
8 Ignition input signal (engine speed)
9 Electronic control unit (ECU)

Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 5 of 5

Brake lamps, Cruise control, and Knock sensors

The boost control system switches to base pressure and hence naturally aspirated performance if
1. The brakes are applied (stall torque limiting function)
2. The cruise control is activated

Switch on the ignition
Are the brake lamps illuminated without depressing the brake pedal?
YES → Refer to Workshop Manuals TSD 4700 (Chapter G) or TSD 4701 and rectify the fault
NO

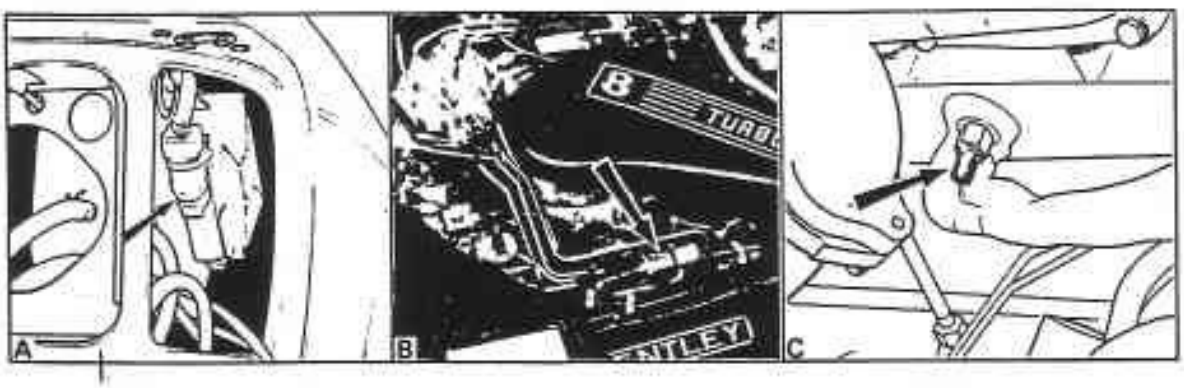
Switch on the ignition
Depress the brake pedal and measure the voltage at pin 20 of the boost control ECU (see item A)
Is it 10 to 13 volts?
NO → Check the stop lamps circuit refer to Workshop Manual TSD 4701
YES

Disconnect pin 22 (cruise control) from the boost control ECU. **Insulate the wire very carefully.** Retest the vehicle
Has the performance improved?
YES → Check for a fault in the cruise control system
NO

Start the engine
Check the operation of the boost control valve (see item B)
Is it 'clicking' at random?
YES → Disconnect the knock sensor connectors, one at a time (see item C)
Start the engine
Measure the voltage on the pink/green cable at the boost control valve plug
Is it greater than 9 volts and is the valve not 'clicking'?
NO → Check the condition and conti knock sensor cables. Note the **Are they continuous and in condition?**
NO → Rectify faulty cables
YES → Replace knock sensor(s)
NO

Start and run the engine at idle speed
Measure the voltage on the pink/green cable at the boost control valve plug
Is it less than 5 volts?
YES → Check the integrity of knock sensor cables at the pin connectors
Check pins, substitute knock sensors, and ensure protective sleeves are securely fastened
NO

Start the engine with the transmission in park
Increase the engine speed to between 3000 and 3500 rev/min
Measure the voltage of the pink/green cable at the boost control valve plug
Is it less than 5 volts?
NO → System operating satisfactorily



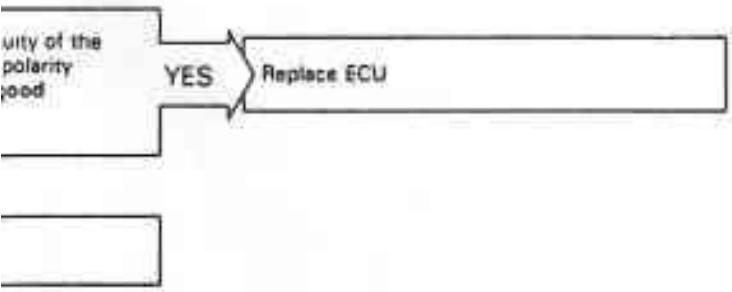

uity of the
polarity
good
YES
Replace ECU

Figure D3-9

Turbocharging system – fault diagnosis chart Sheet 1 of 5

Preliminary checks and conditions

Important

1. Unless a fault is absolutely obvious it is recommended that the complete fault finding procedure is carried out
2. Ensure that the battery is fully charged
3. Always use a digital multimeter to carry out electrical circuit tests
4. Always switch off the ignition when either disconnecting or connecting electrical connections
5. Always remake any connection(s) before proceeding to the next test

Symptoms	Possible cause
Poor performance (general)	Knock sensors
Poor performance (intermittent)	Air pressure transducer
Excessive performance	Boost control valve
Misfire	Stall torque limiter – brakes
Overboosting	Wastegate
Detonation	Turbocharger
Surging [113 km/h to 144 km/h (70 mile/h to 90 mile/	Dump valve

Visually inspect the electrical connections to the components illustrated below. Detach the multiplug from the boost control ECU and check the integrity of the 15 connections in the plug
Are these satisfactory?

NO → 1. Remake the connections 2. Replace the cables

YES

Switch on the ignition
Wait for approximately 10 seconds
Does the boost control valve 'click' continuously?
Note The valve may 'click' briefly for between 5 and 10 seconds when the ignition is switched on

NO → Disconnect the electrical plug from the boost control valve
Switch on the ignition and measure the voltage at the loom connector
Is it 10 to 13 volts?

NO → Check the cables to the boost control solenoi valve

YES → Carry out checks to the air pressure transducer loom

YES

Check the voltage on the purple/brown cable
Is it 4.9 to 5.3 volts?

NO → Check the boost control valve

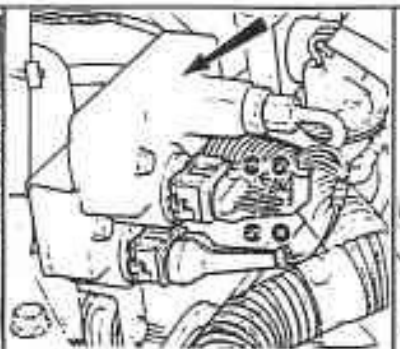
YES

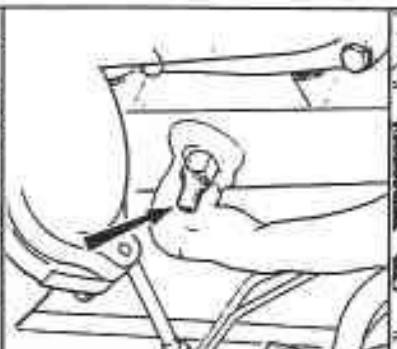
Check for cable continuity between the black cable and earth
Is it continuous?

YES → Check the air pressure transducer

NO → Rectify faulty cable

Boost control solenoid valve


Air pressure transducer (APT)


Knock sensors

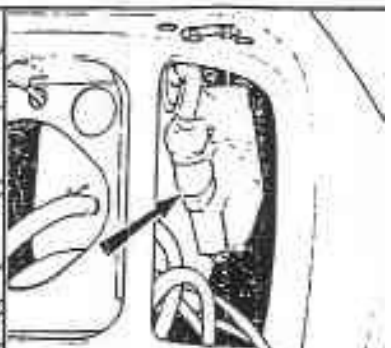

Boost control ECU

Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 1 of 5

Figure D2-9

Turbocharging system – fault diagnosis chart Sheet 2 of 5

Boost control system air pressure transducer (APT)

Identify the boost control APT (see item A)
Carefully withdraw the rubber moulding from the APT electrical plug (see item A) for the duration of the test
Do not remove the plug
Connect a multimeter between the purple/brown cable in the plug and earth
Switch on the ignition and measure the voltage
Is it 4.9 to 5.3 volts?

NO → **Is the reading zero volts?**

NO → Replace the KE2-Jetronic fuel injec ECU

YES → Withdraw the plug from the APT
Check for cable continuity between the purple/brown cable in the plug and pin 16 in the fuel injection ECU plug (see item D)
Is it continuous?

YES → Replace the KE2-Jetronic fuel injec ECU

NO → Rectify faulty cable

YES → Withdraw the plug from the APT
Check for cable continuity between the black cable in the plug and the body earth (see item B)
Is it continuous?

NO → Rectify faulty cable

YES → **Is the voltage drop on the cable less than 0.05 volts?**

NO → Rectify faulty cable

YES → Do not remove the plug from the APT
Start and run the engine at idle speed
Measure the voltage between the green/slate cable in the plug and earth
Is it 0.7 to 1.0 volts?

NO → Rectify faulty cable

YES → Withdraw the plug from the APT
Check for cable continuity between the green/slate cable in the plug and pin 10 in the boost control ECU plug (see item C)
Is it continuous?

NO → Rectify faulty cable

YES → Disconnect the metal manifold feed pipe from the APT
Do not remove the plug
Switch on the ignition and measure the voltage between the green/slate cable in the plug and earth
Is it 2.2 to 2.8 volts?

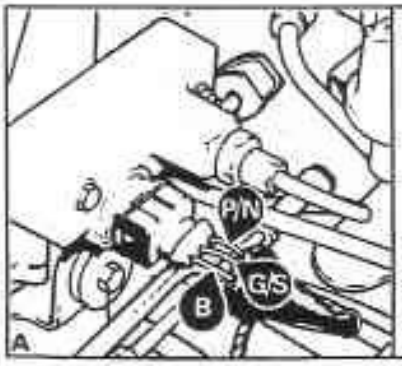
YES → Check for a 'crimped' or blocked signal hose from the induction manifold to the APT
Is it satisfactory?

YES → Check that the metal signa pipe is or leaking
Is it satisfactory?

NO → Rectify the pipe

NO → Clean out or replace the hose

NO → Replace the APT



A

Identification of air pressure transducers (APT)

Early 1987 model year cars have one APT fitted for both the boost control and fuel injection systems.

Late 1987 and all 1988 model year cars have two APTs fitted one for the boost control system and one for the fuel injection system. Both APTs have three cables connected to them via a rubber plug. The colours of the three cables in each loom are similar.

To identify the APTs warm-up the engine and allow it to run at the idle speed setting. Remove the rubber electrical plug from each APT in turn. When the plug is removed from the APT connected to the fuel injection system, the engine will run rich (lumpy) and the rev/min will decrease. The boost control system APT is the one that remains connected during this alteration in engine idle speed conditions.


B

ion system

not blocked

YES → Replace the boost control ECU

Switch on the ignition
Wait for approximately 10 seconds
Is the boost control valve 'clicking' continuously?

NO → System operating satisfactorily

YES

Retest the system