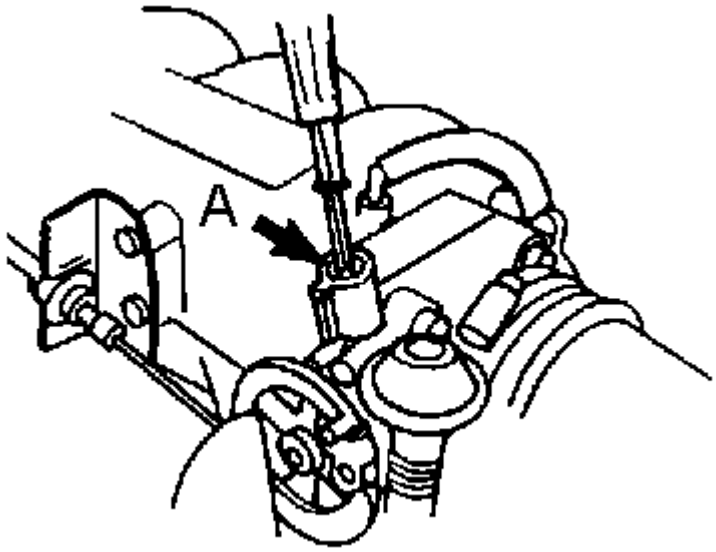
Adjustment Data

MAZDA - 323 - 1.6i - B6

Engine (general)

Item	Values	Units
Engine code	B6	
Capacity	1598	(cc)
Idle speed	850 ± 50	(rpm)
Valve clearance		
Hydraulic		
Compression pressure		
Normal	13.5	(bar)
Minimum	9.5	(bar)
Oil pressure	1.95 - 2.94/1000	(bar / rpm)
Fuel system (make & type)	EGI	
Adjustment screws (A = idle speed B = CO)	A	



Firing order	1-3-4-2	
Timing stroboscopic (before TDC)	2 ± 1/850	(° / rpm)
Vacuum advance		
Start	0 ± 3/75	(° / mmHg)
End	26 - 30/450	(° / mmHg)
Centrifugal advance		
Start	0 ± 2/1200	(° / rpm)
End	17 ± 2/3500	(° / rpm)
Ignition-coil resistance, primary	1.04 - 1.27	(ohms)
Ignition-coil resistance, secondary	6000 - 30000	(ohms)
Spark plugs (make & type)	NGK/BPR5ES11 Bosch FR7DCX	
Spark-plug gap	1.0 - 1.1	(mm)
Fuel-pump pressure	2.7 - 3.2	(bar)
CO exhaust gas	< 0.5	(%)

CO2	> 14	(%)
HC	100	(ppm)
O2	0.3 ± 0.2	(%)
Lambda	0.98-1.03	
Lambda change (Delta Lambda)	0.03	
Oil temperature during test	60	(°C)
Fast-idle speed	2500-2800	(rpm)
CO at fast-idle speed	< 0.3	(%)

Cooling system

Item	Values	Units
Cap pressure	0.75 - 1.05	(bar)
Thermostat opens at	82	(°C)
Fan on at	97	(°C)

Electrical

Item	Values	Units
Battery	50	(Ah)
Alternator	65	(A)

Brakes

Item	Values	Units
Disc thickness, front, min.	16.0	(mm)
Drum diameter, rear, max.	201	(mm)

Steering and wheel alignment

Item	Values	Units
Toe-in, front	12' ± 18'	(°)
Camber, front	-5' ± 45'	(°)
Castor, front	2° 05' ± 45'	(°)
K.P.I., front	12° 25'	(°)
Toe-in, rear	12' ± 18'	(°)
Camber, rear	-20' ± 45'	(°)

Wheels and tyres

Item	Values	Units
Tyre size	155/80R13	
Optional	175/70R13	
Front tyre pressure	2.0	(bar)
Rear tyre pressure	1.8	(bar)

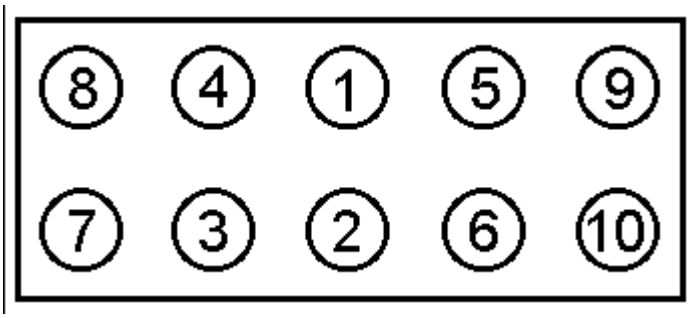
Capacities

Item	Values	Units
Engine sump, incl. filter	3.4	(l)
Manual transmission		

Gearbox refill	2.68	(l)
Cooling system	5.0	(l)

Torque settings

Item	Values	Units
Cylinder head		

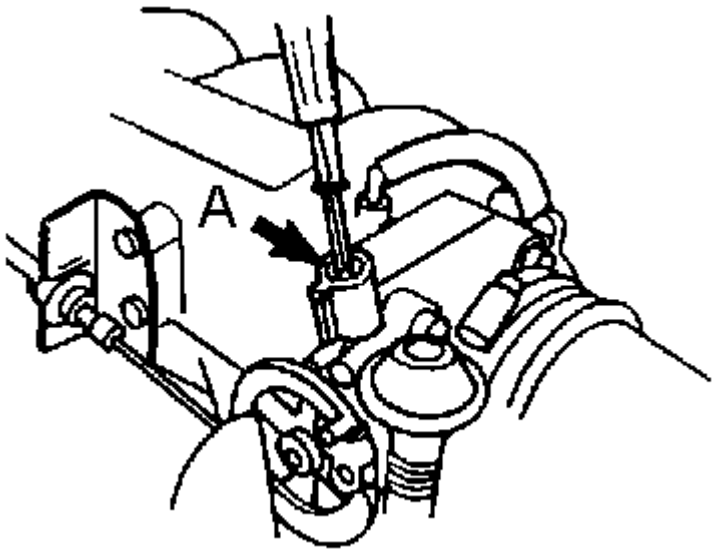


Stage 1	20-30	(Nm)
Stage 2	40-60	(Nm)
Stage 3	76-81	(Nm)
Front hub	157 - 235	(Nm)
Wheel nuts	90 - 120	(Nm)
Spark plugs	15 - 23	(Nm)

Environmental Data

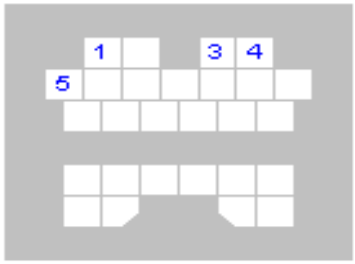
MAZDA - 323 - 1.6i - B6

Item	Values	Units
Engine code	B6	
Idle speed	850 ± 50	(rpm)
Fuel system (make & type)	EGI	
Adjustment screws (A = idle speed B = CO)	A	



Timing stroboscopic (before TDC)	2 ± 1/850	(° / rpm)
Vacuum advance		
Start	0 ± 3/75	(° / mmHg)
End	26 - 30/450	(° / mmHg)
Centrifugal advance		
Start	0 ± 2/1200	(° / rpm)
End	17 ± 2/3500	(° / rpm)
Fuel-pump pressure	2.7 - 3.2	(bar)
CO exhaust gas	< 0.5	(%)
CO2	> 14	(%)
HC	100	(ppm)
O2	0.3 ± 0.2	(%)
Lambda	0.98-1.03	
Lambda change (Delta Lambda)	0.03	
Oil temperature during test	60	(°C)
Fast-idle speed	2500-2800	(rpm)
CO at fast-idle speed	< 0.3	(%)

Error codes



Diagnostic plug

Diagnostic plug:
1 = Datalink LED tester (FEN)
3 = activation error codes (TEN)
4 = positive battery terminal (+B)
5 = ground

Read-out

-Connect LED tester to positive battery terminal and diagnostic-plug terminal 1.
-Connect diagnostic-plug terminal 3 to ground.
-Turn ignition on.
-Error codes will appear on LED tester.

Reset

-Turn ignition off.
-Disconnect negative terminal of the battery.
-Depress brake pedal for at least 5 seconds.
-Connect negative terminal of the battery.
-Verify that no error codes are displayed.

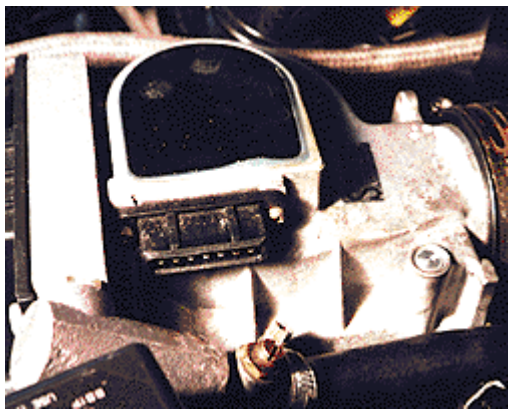
Signal

-Digit 1 (tens position): Light pulse 1.2 seconds long, 0.4 seconds pause in-between.
-Pause 1.6 seconds light-off.
-Digit 2 (units position): Light pulse 0.4 seconds long, 0.4 seconds pause in-between.
-Pause 4.0 seconds light-off.

Error codes

02 Hall sensor, no signal (SGT).
03 Hall sensor, no signal (SGC, DOHC engines).
08 Airflow meter, open or short circuit.
09 Coolant temperature sensor, open or short circuit.
10 Air temperature sensor, open or short circuit.
12 Idle and throttle wide open switch open or short circuit.
14 Absolute pressure sensor (inside ECU), open or short circuit.
15 Oxygen sensor, lean signal for longer than 86 seconds, engine speed is higher than 1500 rpm, warm engine.
17 Oxygen sensor signal does not change for 30 seconds, engine speed is higher than 1500 rpm.
26 Canister purge solenoid, open or short circuit.
34 Idle speed control valve (ISC) open or short circuit.

30. airflow meter



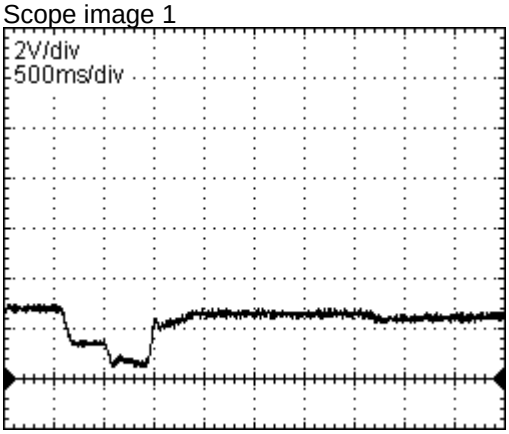
Function

The airflow meter uses an air temperature sensor and a movable vane connected to a potentiometer, which return a signal to the control unit, proportional to the temperature and volume of air entering the engine. When air enters the engine, the airflow meter closes the fuel-pump contact, activating the fuel pump.

Specifications

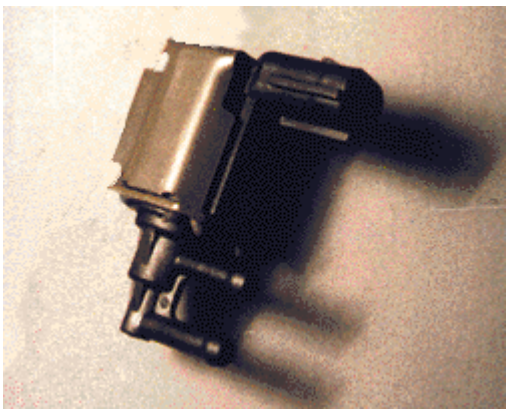
supply voltage: 5 V
output voltage: 0 - 5 V
resistance air temperature sensor: 2,000 - 3,000 ohms / 20°C
waveform information: output signal during acceleration

Scope image 1



Pins to ground: 2O

2. canister purge solenoid



Extra Info

Function

The evaporative canister is equipped with a purge solenoid valve. The control unit switches the solenoid on or off. This controls the amount of vapour purged into the inlet manifold.

Specifications

supply voltage: 12 V
resistance: 25 - 35 ohms

Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check resistance:
Turn ignition off. Remove connector from solenoid.
Measure resistance between the two pins of the solenoid. Compare with specified resistance. Alternatively, check solenoid function by applying battery voltage to its pins. The solenoid should "click".
Check supply voltage:
Turn ignition off. Remove connector from solenoid.
Start the engine and measure voltage between one connector terminal and the negative terminal of the battery. Check the second terminal. One of the two should equal battery voltage. If not check wiring and, if present, fuse(s) and relay.

Check connection to ECU:
Turn ignition off. Remove connector from solenoid and ECU.
Measure the resistance between one of the two connector terminals and the corresponding terminal in the ECU connector. Check the other terminal. One of the two should be < 1 ohm. If not check wiring.

CANISTER PURGE SOLENOID

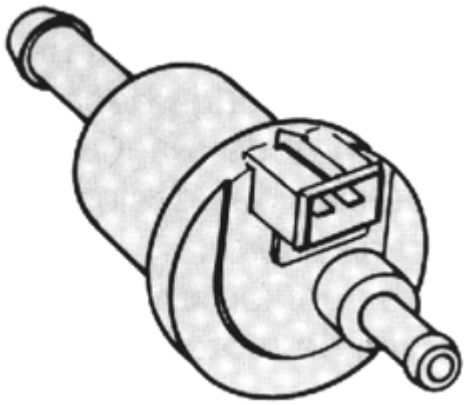
Function

The evaporative gases produced in the fuel tank are absorbed by the activated charcoal in the carbon canister. As The purge control solenoid valve opens these gases are delivered to the intake manifold for combustion purposes. The purge control solenoid valve is controlled by the control unit. The control unit operates this valve during the time the lambda control loop is active.

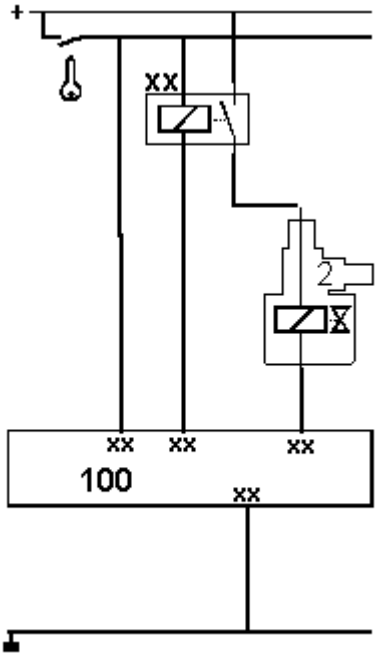
Specifications

RESISTANCE:

resistance:	± 50 ohms
supply voltage:	12 Volts
current:	± 250 mA



Electrical control



Most solenoids are normally closed. This means that the connection between the canister and the intake manifold is closed. The solenoid has a connector with two terminals. On one of those terminals is connected to the battery voltage. This supply-voltage is often switched with a relay. The other terminal leads directly to the control unit. The current through the solenoid is switched on during the time the control unit connects this terminal to ground. The voltage on this terminal is during this time 0 Volts. During the time the solenoid is switched off, the voltage on this terminal is 12 Volts. Some motormanagement systems control the amount gases delivered to the intake manifold switching the solenoid on and of with a certain duty cycle. In this case the duty-cycle depends on engine RPM and engine load.

Electrical diagnosis

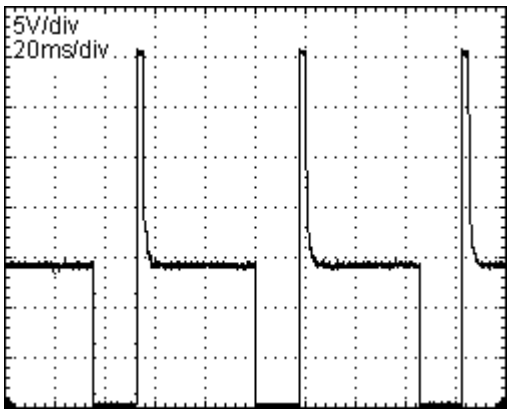
STATIC

General

- To perform this measurements the relay switching the power to the solenoid should be closed. Short circuit the switch in the relay if necessary.

Measurements

- Measure the voltage on the control unit. Use the pin which switches the solenoid.



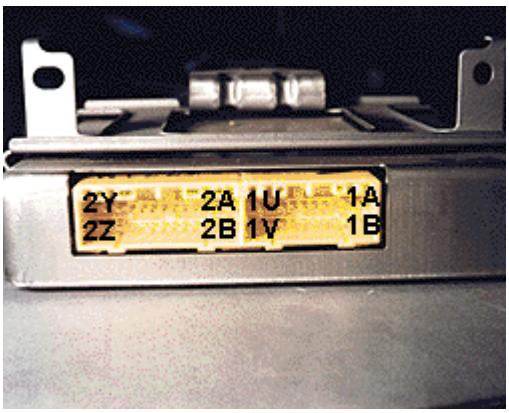
result: **12 V**

- solenoid and wiring are electrically OK

0 V

- check the relay switching the power to the solenoid
- check the wiring between the relay and the solenoid
- check the solenoid resistance
- check the wiring between the solenoid and the control unit
- check the control unit

100. control unit



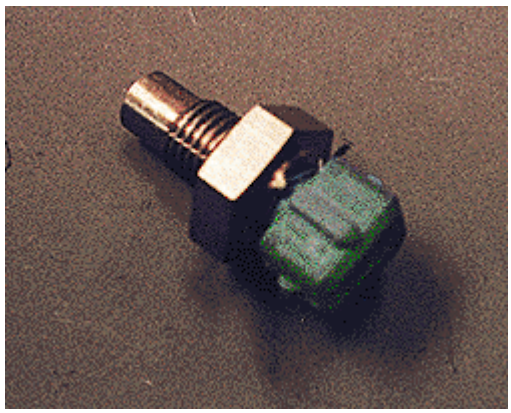
Function

The control unit receives signals from sensors that monitor various engine operating parameters. The control unit generates output signals to provide optimal air/fuel ratio, idle speed control and ignition timing.

Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
When you suspect the control unit is faulty, make sure all sensors and actuators function properly, and that signals from other control unit(s) are received properly. Next check the supply voltage and ground connections of the control unit:
Turn ignition off. Remove ECU connector.
Locate the supply voltage connections. Turn ignition on. Measure voltage between corresponding connector terminal(s) and the negative terminal of the battery. They should equal battery voltage. If not check wiring and fuse.
Turn ignition off. Locate the ground connections. Measure resistance between corresponding connector terminal(s) and the negative terminal of the battery. They should be < 1 ohm.

42. coolant temperature sensor

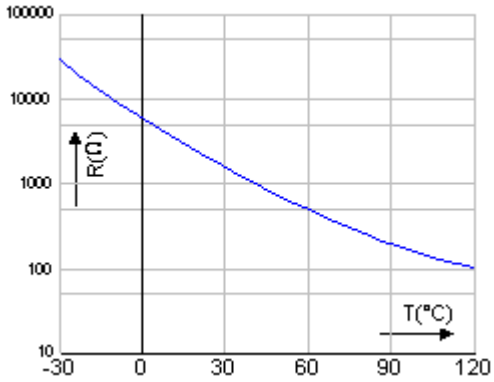


Function

The coolant temperature sensor is a temperature-sensitive resistor. Low temperature causes high resistance while high temperature causes low resistance. The control unit determines the temperature by monitoring the voltage across the sensor.

Specifications

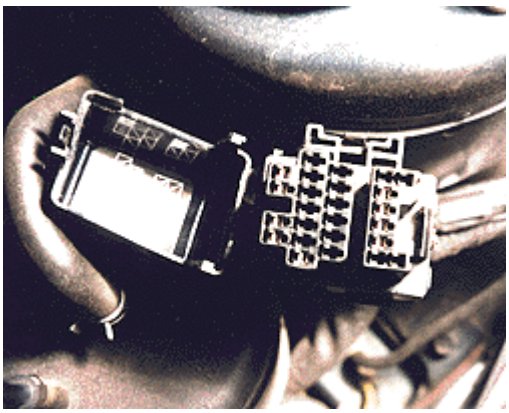
supply voltage: 5 V (connector disconnected)
resistance: 2,000 - 3,000 ohms / 20°C
resistance: 200 - 300 ohms / 90°C



Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check resistance:
Turn ignition off. Remove connector from sensor.
Measure resistance between both pins of the sensor. Compare with specified resistance.
Check supply voltage:
Turn ignition off. Remove connector from sensor.
Turn ignition on and measure voltage between both connector terminals and the negative terminal of the battery. One should be 5 V. If not check wiring then check ECU.
Check connection to ECU:
Turn ignition off. Remove connectors from sensor and ECU.
Measure the resistance between supply voltage connector terminal and the corresponding terminal in the ECU connector. It should be < 1 ohm. If not check wiring.
Check ground:
Check in schematic if ground connection is connected to a direct ground or to the ECU. When it is connected directly to ground: Turn ignition off. Remove connector from sensor and measure resistance between ground connector terminal and the negative terminal of the battery. It should be < 1 ohm. If not check wiring. When it is connected to the ECU: Turn ignition off. Remove connector from sensor and ECU. Measure resistance between ground connector terminal and the corresponding terminal in the ECU connector. It should be < 1 ohm. If not check wiring.

83. diagnostic connector



Function

This connector is used to communicate with the control unit.

Specifications

For more information on reading error codes click the error codes button on the toolbar.

3. fuel pump

Extra Info

Function

The fuel pump consists of an impeller driven by a DC motor. The fuel pump and the fuel pressure regulator maintain constant pressure at the injectors.

Specifications

supply voltage: 12 V
maximum pump pressure: 4.5 - 6.0 bar
system pressure (vacuum connected): 2.1 - 2.6 bar

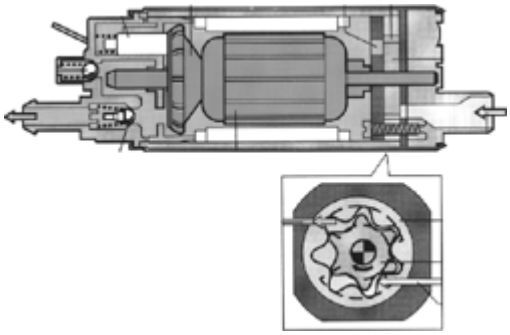
FUEL PUMP

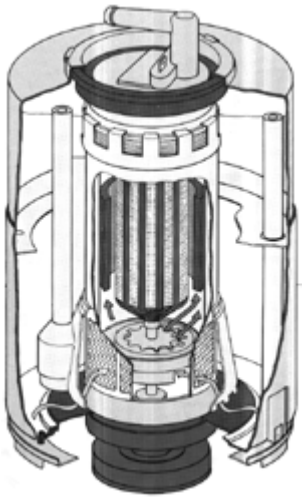
Function

The fuel pump is an electrically operated pump which lifts the fuel from the fuel tank and pumps it under pressure through a filter to the fuel rail or throttle body. The fuel runs along the injector(s) and returns to the tank via the fuel pressure regulator. Some systems use two pumps. The fuel lift pump inside the tank and the fuel pressure pump outside the tank.

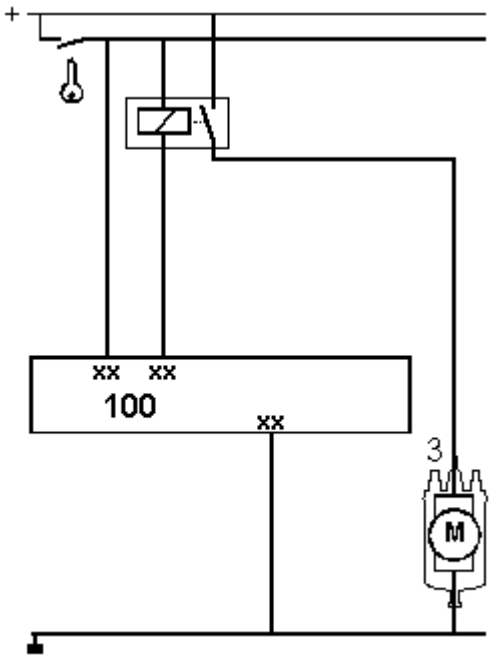
Specifications

pump pressure:	± 0,25 - 6 bars
system pressure:	± 0,6 - 1,1 bar (single-point) ± 2 - 3,5 bar (multi-point)
flow:	± 50 - 100 l/h
supply voltage:	12 Volts
current:	± 5A





Electrical control



The fuel pump is operated by a relay. The conditions the relay is closed are.

- during several seconds after switching on the ignition
- during the time the system receives RPM pulses.

The fuel pump relay is often controlled by the control unit.

The relay coil has two terminals. On one of those terminals is connected with the battery voltage. The other terminal leads directly to the control unit.

The current through the relay coil is switched on during the time the control unit connects this pin to ground. The voltage on this pin is during this time 0 Volts. During the time the relay is not switched on, the voltage on the pin is 12 Volts.

Electrical diagnosis

STATIC

General

- Turn the ignition switch "on"
- Listen to the fuel pump operating sound. The fuel pump should operate for several seconds after the ignition switch is turned "on"

Power supply

- To perform this measurements the relay switching the power to the fuel-pump should be closed. Short circuit the switch in the relay if necessary.

Measurements

- Disconnect the fuel pump connector. Measure the voltage over the fuel pump terminals in the connector. The voltage should be 12 Volts.

result: **12 V**

- replace the fuel pump

0 V

- check ground circuit
- check the wiring between the relay and the pump
- check the relay switching the power to the pump

Mechanical diagnosis

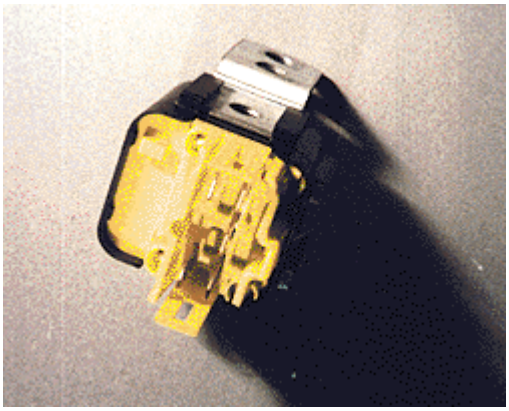
Measurements

- To perform this measurements the relay switching the power to the fuel-pump should be closed. Short circuit the switch in the relay if necessary.
- check the fuel system pressure

result:

- check the fuel level in the tank
- check the fuel pressure regulator
- check the fuel filters
- check the fuel pump
- check the fuel return circuit to the tank

91. fuel pump relay



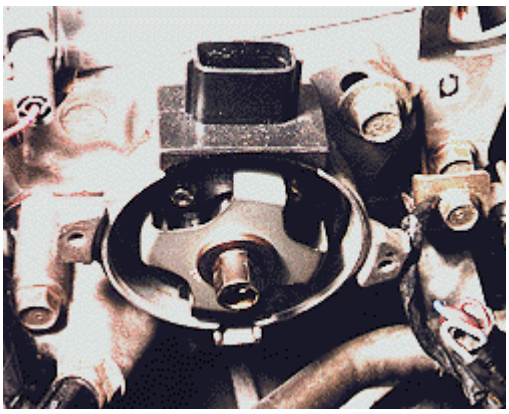
Function

The fuel pump relay switches power to the fuel pump.

Specifications

single normally opened relay with two coils.

40. Hall / MRE sensor on camshaft



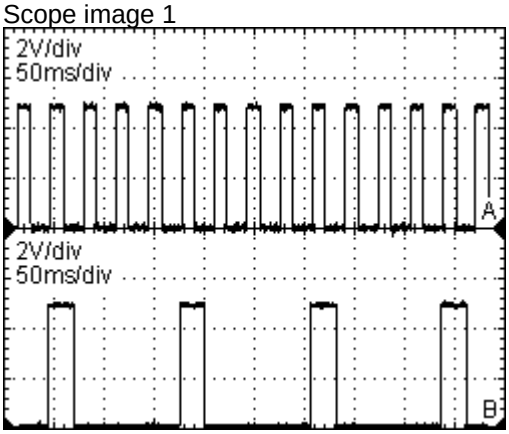
Function

The shutter blades mounted on the rotor pass through the Hall sensor, which detects the change in magnetic field and sends a signal to the control unit.

Specifications

supply voltage: 12 V
waveform information: engine running at idle
waveform A: terminal 2E
waveform B: terminal 2G

Scope image 1



Pins to ground: 2E, 2G

36. idle and throttle wide open switch

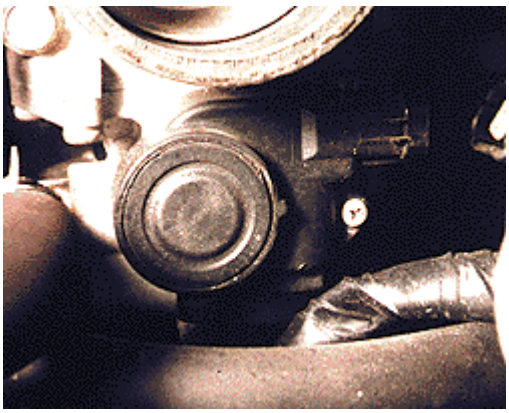
Function

The idle switch is closed when the throttle is fully closed. The throttle wide open switch is closed when the throttle is fully open.

Specifications

supply voltage idle switch: 12 V
supply voltage throttle wide open switch: 5 V
idle switch: normally closed
throttle wide open switch: normally open

6. idle speed control valve



Extra Info

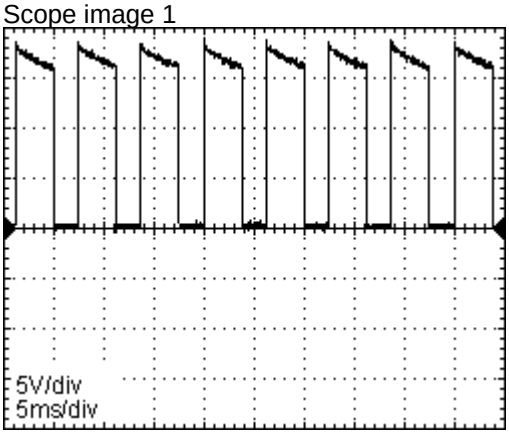
Function

The idle speed control valve regulates the by-pass airflow.

Specifications

supply voltage: 12 V
resistance coil: 10 - 15 ohms
waveform information: engine running at idle

Scope image 1



Pins to ground: 2W

Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check resistance:
Turn ignition off. Remove connector from valve.
Measure resistance between the two pins of the valve. Compare with specified resistance.
Check supply voltage:
Turn ignition off. Remove connector from valve.
Crank the engine and measure voltage between one connector terminal and the negative terminal of the battery. Check the second terminal. One of the two should equal battery voltage. If not check wiring and, if present, fuse(s) and relay.
Check connection to ECU:
Turn ignition off. Remove connector from valve and ECU.
Measure the resistance between one of the two connector terminals and the corresponding terminal in the ECU connector. Check the other terminal. One of the two should be < 1 ohm. If not check wiring.
Check valve activation:
Connect oscilloscope to the signal pin of the ECU and ground. Start the engine and compare to the scope image shown.

IDLE SPEED CONTROL VALVE

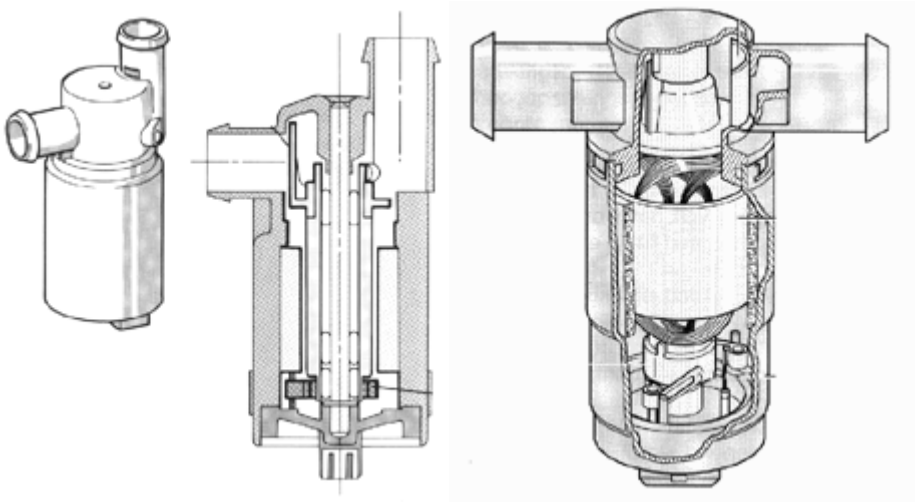
Function

The idle control valve is located in a tube bypassing the throttle. The control unit controls this device to ensure stable idling in all operating conditions.

Specifications

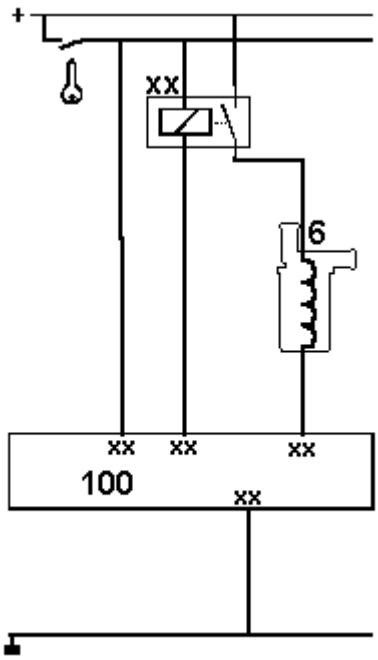
resistance coil(s):	± 20 ohms
supply voltage:	12 Volts

A rotary slide valve attached to the armature is turned to open the air bypass until the desired idle speed is obtained. The position of the armature is controlled by the force of an internal spring opposing the force of a solenoid (types with to terminals) or controlled by two solenoids energised alternately which exerts opposing forces on the armature (types with three terminals).



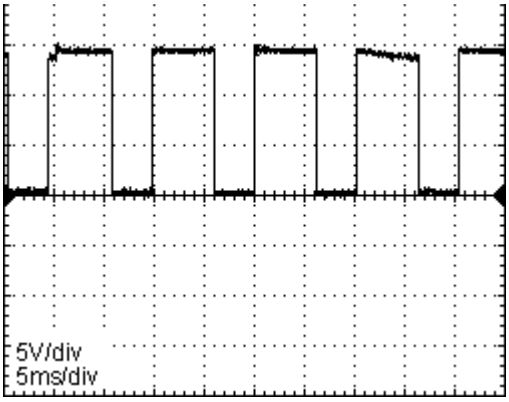
Electrical control

Types with two terminals



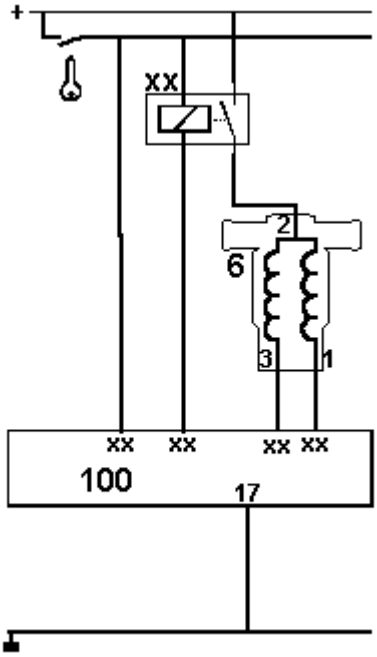
As a current flows through the coil the armature is turned against the spring force. As the current increases the airflow and the idle speed increases. If the current through the coil is switched off due to a mall functioning system, the valve is forced into a position which results in a (too) high idle speed.

The idle control valve has a connector with two terminals. On one of those terminals is connected to the battery voltage. This supply-voltage is often switched with a relay. The other terminal leads directly to the control unit. The current through the coil is switched on during the time the control unit connects this terminal to ground. The voltage on this terminal is during this time 0 Volts. During the time the current through the coil is switched off, the voltage on this terminal is 12 Volts.

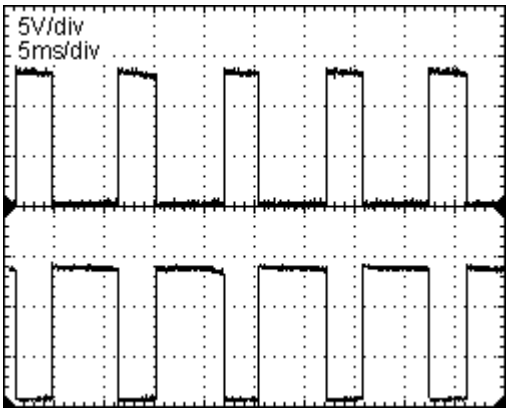


The control unit controls the current through the coil switching the current on and off with a certain duty cycle. The current increases as the duty-cycle increases. The duty cycle varies between approx. 35% (valve closed) and 85% (valve opened). Nominal idle speed is obtained when slightly open.

Three terminal types



The two coils inside this type of idle speed control valve are connected with the supply voltage using one common terminal. The other two terminals lead directly to the control unit. The control unit switches the current through the solenoid on and off alternately with a duty cycle between 35 and 85%.



Electrical diagnosis

STATIC

- To perform this measurements the relay switching the power to the idle control valve should be closed. Short circuit the switch in the relay if necessary.

  Measurements:

  Disconnect the connector and

DYNAMIC TESTS THREE TERMINAL TYPES

- Remove the idle control valve but leave the electrical connections in place. Fully open or close the rotating plunger. Switch on the ignition.

measure the resistance of the coil(s). The nominal value is app. 20 ohms.

- Check the relay switching the power to the idle control valve
- Check the wiring between the relay and the idle control valve
- Check the wiring between the idle control valve and the control unit
- Check the control unit

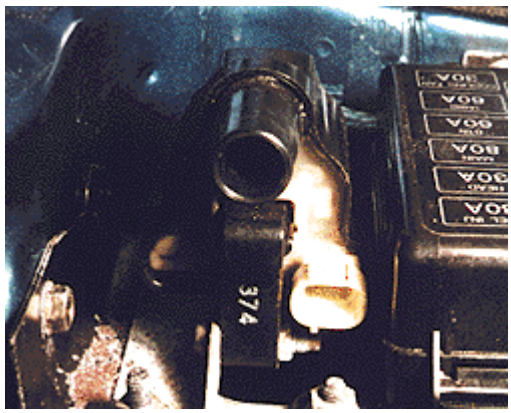
result:

- Switch on the ignition. The rotating plunger must move to a position equivalent to app. 50% opening, and remain there.

Mechanical diagnosis

- Check the air chamber on air leakage.
- Check engine on air leaks into the intake system.
- Remove the idle control valve. The plunger should rotate or move easily. Clean if necessary.

11. ignition coil



Extra Info

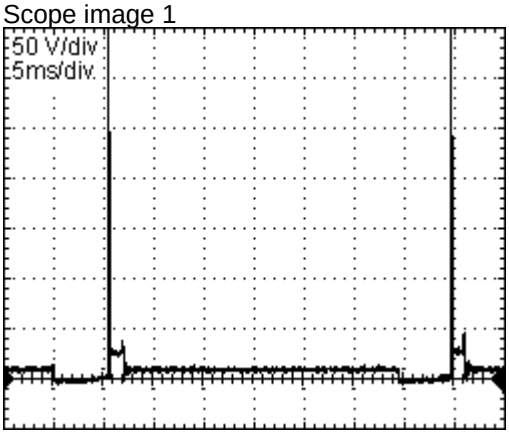
Function

The ignition coil stores energy when current is passed through the coil primary. When the current is switched off a high voltage is induced in the coil secondary.

Specifications

supply voltage: 12 V
resistance primary coil: 0.5 - 1.5 ohms
resistance secondary coil: 10,000 - 16,000 ohms
waveform information: engine running at idle

Scope image 1



Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check resistance primary coil:
Turn ignition off. Remove connectors from ignition coil.
Measure resistance between supply voltage connector pin and primary switching connector pin of the ignition coil.
Compare with specified resistance.
Check resistance secondary coil:
Turn ignition off. Remove connectors from ignition coil.
Measure resistance between central lead terminal and primary switching connector pin. Compare with specified resistance.
Check supply voltage:
Turn ignition off. Remove connectors from ignition coil.
Turn ignition on and measure voltage between supply voltage connector terminal and the negative terminal of the battery. It should equal battery voltage. If not check wiring and, if present, fuse(s) and relay.
Check connection to ignition module:
Turn ignition off. Remove connector from ignition coil and ignition module.
Turn ignition on and measure resistance between primary switching connector terminal and corresponding terminal in ignition module connector. It should be < 1 ohm. If not check wiring.
Check ignition signal:
Connect oscilloscope to the ignition module pin corresponding to the primary switching wire of the ignition coil and ground. Start the engine and compare to the scope image shown.

IGNITION COIL

Function

The ignition coil transforms the battery voltage into the high voltage needed to create a spark.

The ignition coil consists of an electromagnet (the primary coil) and a high voltage coil (secondary coil).

By switching the current through the primary coil on, a magnetic field is induced. The moment the current is switched of, the magnetic field suddenly disappears.

This change of magnetic field creates an induction voltage in the secondary coil, high enough to ionise the mixture. The ionised mixture is a conductor and a current flows through the spark plug.

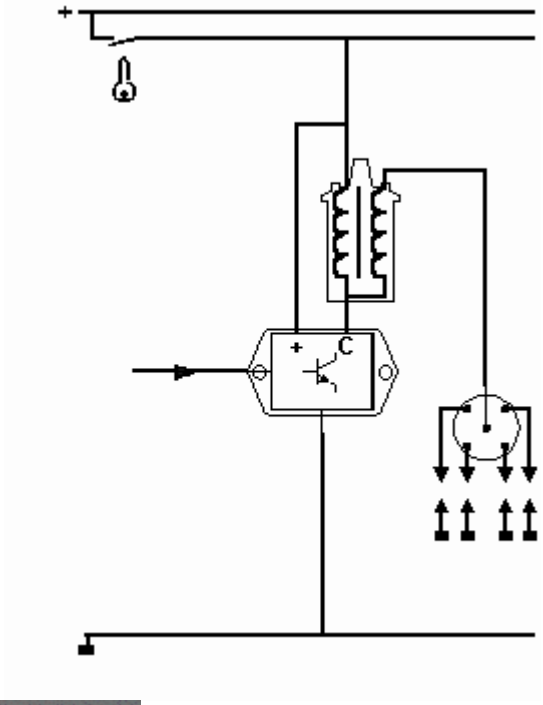
Specifications

RESISTANCE:	
primary:	± 0,3 - 2 ohms
secondary	± 5k - 20k ohms
supply voltage:	12 V
current limited at:	± 7A

Systems with a distributor

Ignition coils used in combination with a distributor consists of one primary and one secondary coil.

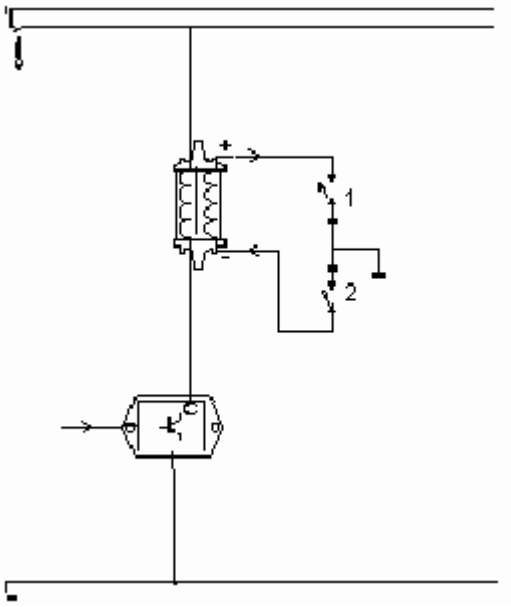
The high voltage, induced in the secondary coil is connected to one of the spark plugs



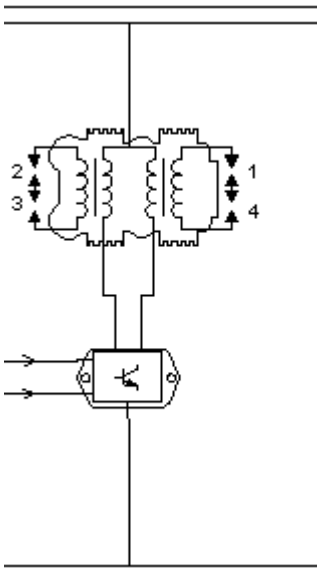
selected by the distributor.

Wasted spark ignition coils

The secondary coil has two ends. In a normal ignition coil one of those ends delivers the high
The other end is connected to either the positive (15) or the negative (1) terminal of the prir
In a wasted spark ignition coil both ends are connected to a spark plug. Therefore both spark
will spark at the same time.

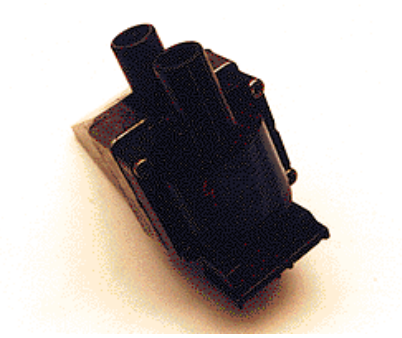


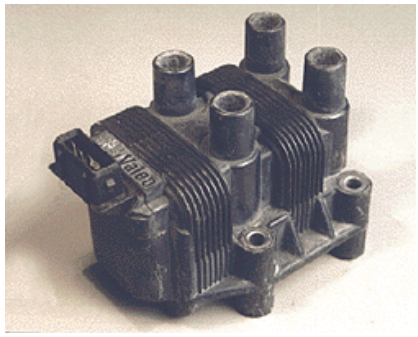
wasted spark ignition coil on 2- cylinder 4-stroke engine



a wasted spark ignition coil on a 4- cylinder 4-str

To supply the four spark plugs of an 4 cylinder engine, two ignition coils are needed. The pic
below (left) shows an ignition coil for two spark plugs. The ignition coil in the right picture
incorporates two of those. This ignition coil supplies four spark plugs.

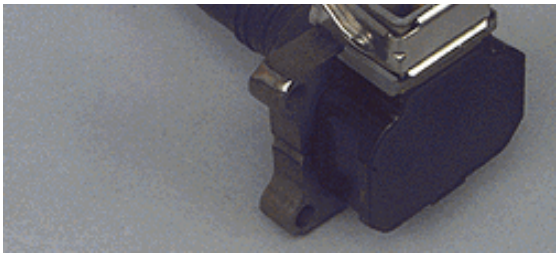


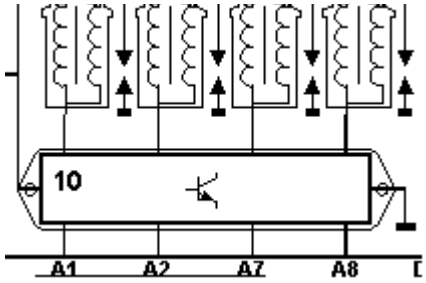


Sequential ignition

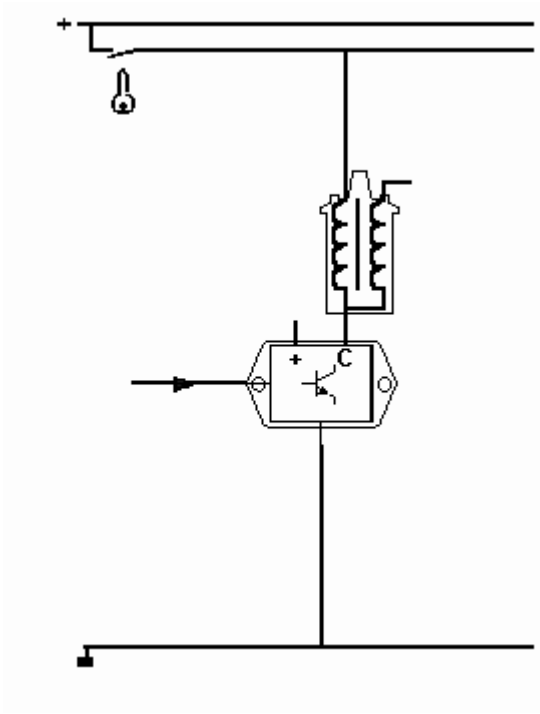
Sequential ignition systems are distributor less ignition systems using one ignition coil per
cylinder.

Each ignition coil is controlled by the control unit individually.





Electrical control



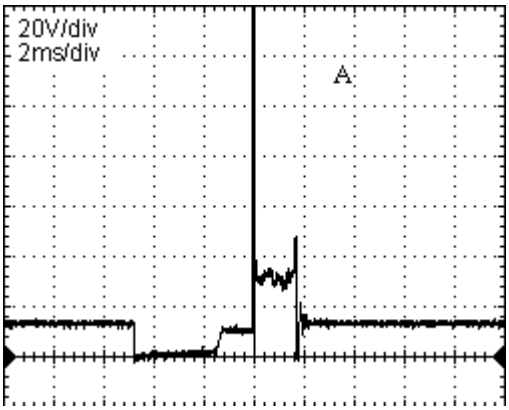
A current through the primary coil induces a magnetic field. The moment the current is switched of, the magnetic field suddenly disappears. This change of magnetic field induces an induction voltage and causes a spark.

The amperage before switching the current off should be high enough to create a high change of magnetic field the moment the current is switched off.

Therefore the current through the primary coil is controlled electronically.

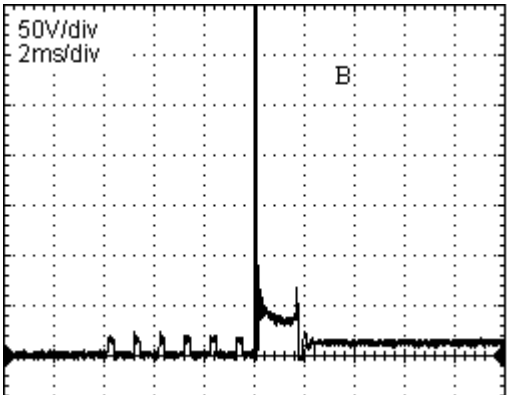
The ignition module is supplied with a current limited circuit. Using this in combination with a low resistance ignition coil the amperage does not depend on the battery voltage.

During the time the current is switched off, the voltage over the ignition module is 12 Volts. The moment the current is switched on, the voltage drops to 0 Volts. From this moment on the current increases until the limiting value is reached.



The oscilloscope images A and B gives you an example of the primary voltage measured on two different current limiting circuits.

By increasing the voltage over the ignition module, the voltage over the primary coil decreases. This causes a limited current in oscilloscope image A.



The ignition module in oscilloscope image B switches the current on and off to limit the current.

Electrical diagnosis

STATIC

To perform this measurements the ignition should be switched on.

Measurements:

- Measure the primary and secondary resistance of the ignition coil.
- Measure the voltage on the positive terminal of the ignition module.

The voltage should be equal to the battery voltage.

result: **Voltage is lower than battery voltage.**

- disconnect positive terminal and repeat measurement

result: **Voltage is equal to battery voltage.**

- check primary resistance of the ignition coil
- check ignition module
- check wiring between ignition module and ignition module.

result **Voltage is still lower than battery voltage.**

- check ignition lock
- check wiring between ignition lock and ignition coil

DYNAMIC

Start the engine and measure the primary voltage using an oscilloscope.

result: **0 V**

- check power supply.

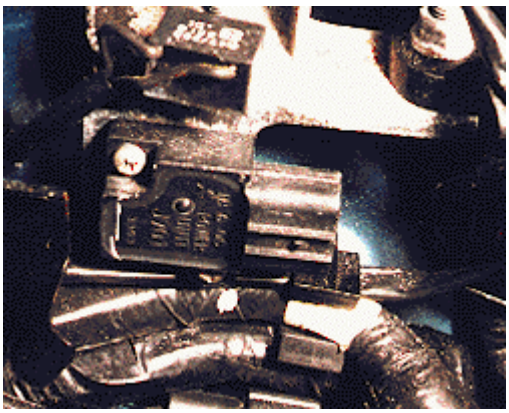
12 V

- check ignition module

Mechanical diagnosis

Not available for this subject !

10. ignition module



Extra Info

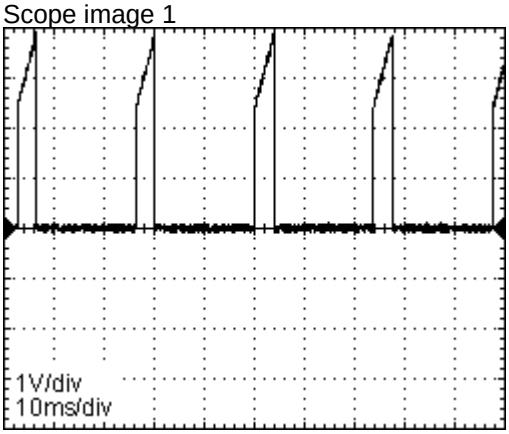
Function

The ignition module receives its input signal(s) from the control unit and switches the current through the coil primary circuit on and off.

Specifications

supply voltage: 12 V
waveform information: engine running at idle

Scope image 1



Pins to ground: 1G

IGNITION MODULE

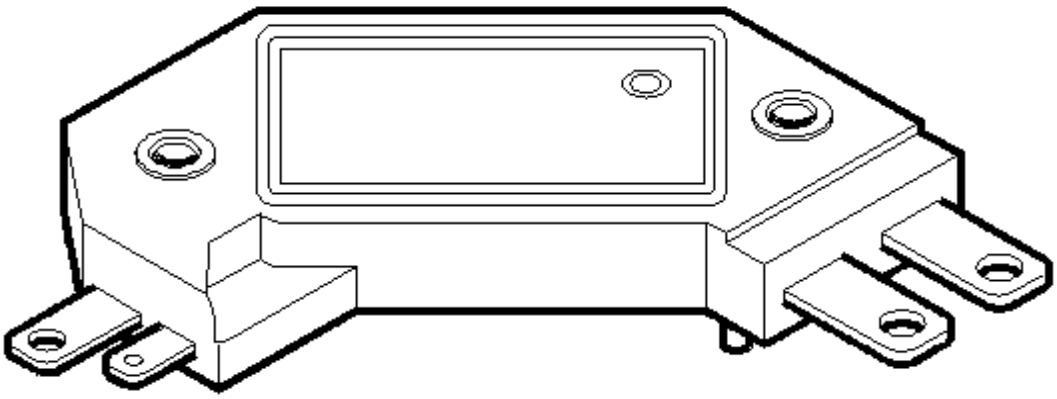
Function

The ignition module switches the current through the primary ignition coil on and off. The ignition module charges the ignition coil during the time the current is switched on. The moment the ignition module switches the current 'off' the ignition coil induces an induction voltage which causes the spark.

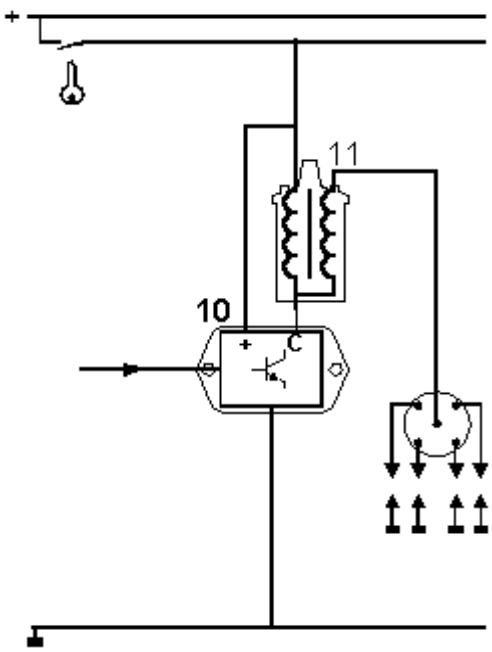
An ignition module switches the current on and off according to an input signal. This input is delivered by the control unit. On older systems the input signal is delivered by an inductive, Hall or opto-coupled sensor mounted in the distributor.

Specifications

resistance	-
supply voltage	-



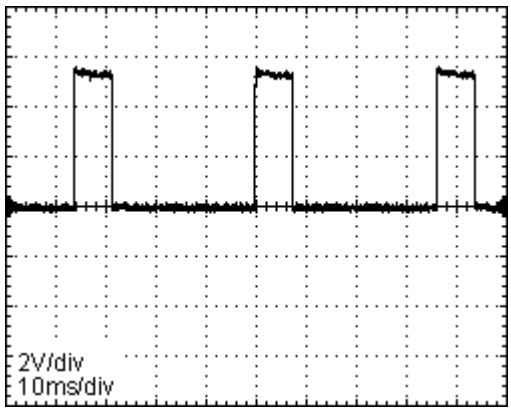
Electrical control



The connector of the ignition module has several terminals. The following terminals are used on common ignition modules.

- a terminal connected with the ignition coil. By this terminal the current through the ignition coil is switched on and of.
- a terminal connected with the supply voltage (12 Volts)
- a terminal connected with ground.
- terminal(s) to receive the input signal. If the input signal is delivered by an inductive sensor two terminals are needed.

The output voltage of an inductive sensor is delivered by an internal coil. This coil induces an almost sine wave output voltage. If the input signal is delivered by an Hall-sensor or opto-coupler three terminals are needed. Two of those three terminals are used to supply the sensor. The supply voltage is either 5 or 12 Volts. The third terminal receives the output signal from the sensor. The output voltage of these sensors is a square wave signal.



Addition terminals are possible. For example to send out a RPM signal to the revolution counter. Sometimes the input signal is delivered by a sensor while the ignition timing is controlled by the control unit. In this case the received input signal from the sensor is converted into a square wave signal by the ignition module and send out to the control unit. The control unit receiving this signal computes this input information and other input information from various engine parameters and sends out a new square wave signal to the ignition module. This signal is used by the ignition module to switch the current through the primary ignition coil on and off.

During the time the input signal for the ignition module is 'high' the current is switched 'on'. The moments this input signals falls to 'low' the current is switched 'off'. This moment the spark will appear

Electrical diagnosis

- Start the engine and measure (using an oscilloscope) the input signal delivered by the control unit or input sensor. The square wave signal or sine wave signal from a inductive sensor should be visible.

signal not OK:

- Disconnect the ignition module's connector and check the wiring between the ignition module and the control unit or input sensor.
- replace the ignition module if the signal appears on the disconnected connector and disappears on the connected connector.

If the output signal remains invisible the failure is not in the component.

signal OK:

- check the power supply of the ignition module.
- check the primary voltage using an ignition oscilloscope or normal oscilloscope with a suitable probe.
- check the wiring between the ignition module and the ignition coil.

The voltage should be nearly 0 Volt during the period the ignition module receives an 'high' input voltage from the sensor or control unit.

Mechanical diagnosis

- Remove the auxiliary air valve without disconnecting the connector.
- Turn the ignition on and make sure that the valve closes as the heating element heats-up the bi-metallic strip.

167. increased fuel pressure solenoid

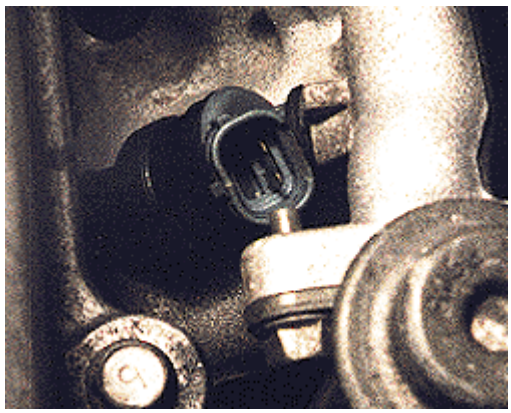
Function

The vacuum solenoid (P.R.C.) regulates the connection between the fuel pressure regulator and the inlet manifold vacuum. The vacuum solenoid is activated by the control unit at air temperatures above 20°C, at engine speeds below 1500 rpm, and with the idle switch closed.

Specifications

supply voltage: 12 V
resistance: 35 - 45 ohms

1. injector



Extra Info

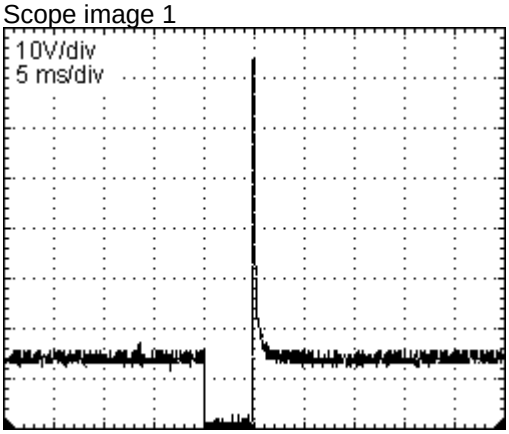
Function

A fuel injector is an electrically operated solenoid valve which is powered by the control unit. The fuel injector injects fuel into the inlet manifold.

Specifications

supply voltage: 12 V
resistance: 13 - 17 ohms
waveform information: engine running at idle

Scope image 1

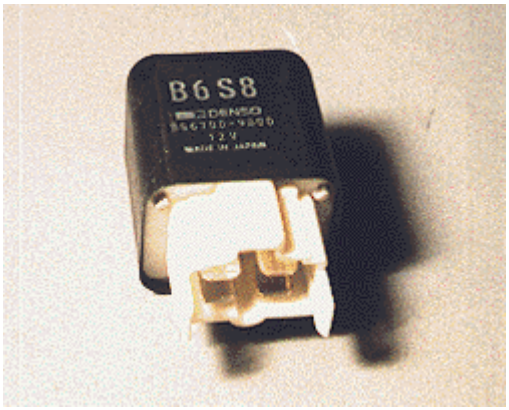


Pins to ground: 2U, 2V

Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check resistance:
Turn ignition off. Remove connector(s) from injector(s). Measure resistance between the two pins of the injector. Compare with specified resistance.
Check supply voltage:
Turn ignition off. Remove connector(s) from injector(s). Crank the engine and measure voltage between one connector terminal and the negative terminal of the battery. Check the second terminal, one of the two should equal battery voltage. If not check wiring and, if present, fuse(s) and relay or power supply control unit.
Check connection to ECU:
Turn ignition off. Remove connector(s) from injector(s) and ECU. Measure the resistance between one of the two connector terminals and the corresponding terminal in the ECU connector. Check the other terminal. One of the two should be < 1 ohm. If not check wiring.
Check injector activation:
Connect oscilloscope to one of the signal wire pin(s) of the ECU and ground. Start or crank the engine and compare to the scope image shown.

90. main relay



Function

Switches power to sensors, actuators and / or control unit.

Specifications

single normally opened relay.

Diagnosis

Check connector(s): Inspect the connector(s) and if necessary clean or fix them to make sure the connection is good.
Check relay:
Turn ignition off. Remove relay from relay box.
Connect the input of the coil to battery voltage and the output of the coil to ground. The relay should click. If not replace relay.
Check the switch of the relay. Measure the resistance between the input of the switch and the output(s). When coil connected the resistance should be < 1 ohm. When coil disconnected resistance should be infinite. If not replace relay.
Check supply voltage:
Turn ignition off. Remove relay from relay box.
Turn ignition on. Connect a circuit tester between the input terminal of the coil or between the input terminal of the switch in the relay box and the negative terminal of the battery. The tester should light up. If not check wiring and, if present, fuse(s) and second relay.
Check connection to ECU:
Turn ignition off. Remove relay from relay box and remove connector from ECU.
Measure the resistance between the output terminal(s) of the switch in the relay box and the corresponding terminal(s) in the ECU connector. It should be < 1 ohm. If not check wiring.
Check connection to ground:
Turn ignition off. Remove relay from relay box. Measure the resistance between the output terminal of the coil and the negative battery terminal. It should be < 1 ohm. If not check wiring.

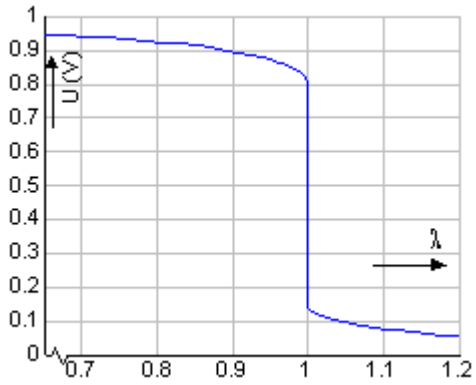
37. oxygen sensor

Function

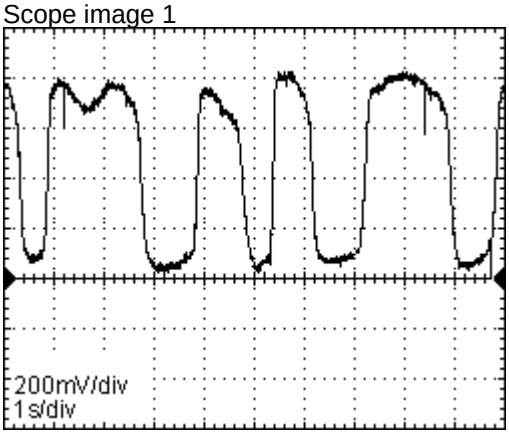
The oxygen sensor is exposed to exhaust gas flow. It monitors the oxygen content of the exhaust gases. A low oxygen content (rich mixture) increases the output voltage of the sensor. In this way a constantly updated air/fuel ratio is returned to the control unit.

Specifications

output voltage: 200 - 850 mV
waveform information: hot engine running at idle



Scope image 1



Pins to ground: 2N

Overhaul data - Cylinder block

MAZDA - B6 16V

General cylinder block data			
Cylinder block height	221.5	mm	
Cylinder bore			
Bore			
Standard	78.006 - 78.013	mm	
1st Oversize	78.256 - 78.263	mm	
2nd Oversize	78.506 - 78.513	mm	
Cylinder bore ovality			
Limit	0.019	mm	
Taper			
Limit	0.019	mm	
Pistons			
Piston diameter			
Standard	77.954 - 77.974	mm	
1st Oversize	78.211 - 78.217	mm	
2nd Oversize	78.461 - 78.467	mm	
Measuring point	18.1	mm	**below oil-scraper ring groove**
Piston rings			
Height 1st compression ring	1.47 - 1.49	mm	
1st Compression ring gap	0.15 - 0.30	mm	
Limit	1.0	mm	
2nd Compression ring gap	0.15 - 0.30	mm	
Limit	1.0	mm	
Oil-scraper ring gap	0.20 - 0.70	mm	
Limit	1.0	mm	
Side clearance 1st compression ring	0.030 - 0.065	mm	
Limit	0.15	mm	
Side clearance 2nd compression ring	0.030 - 0.065	mm	
Limit	0.15	mm	
Connecting rod			
Center distance of big and small end bore	132.85 - 132.95	mm	
Big end bore	48.000 - 48.016	mm	
Big end bore width	21.838 - 21.890	mm	
Big end bearing radial clearance	0.028 - 0.068	mm	
Limit	0.10	mm	
Big end, end play	0.110 - 0.262	mm	

✸ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder block

MAZDA - B6 16V

Limit	0.30	mm
Small end bore	19.943 - 19.961	mm
Radial play in small end	0.013 - 0.037	mm
Crankshaft		
Max. crankshaft swing		
Limit	0.04	mm
Number of bearings	5	
Main journal diameter, standard	49.938 - 49.956	mm
Limit	49.904	mm
Main journal diameter, 1st Undersize	49.704 - 49.708	mm
Limit	49.652	mm
Main journal diameter, 2nd Undersize	49.454 - 49.458	mm
Limit	49.402	mm
Max. main journal taper		
Limit	0.05	mm
Max. main journal ovality		
Limit	0.05	mm
Main bearing clearance		
Standard	0.018 - 0.036	mm
Limit	0.10	mm
Crankshaft end play	0.080 - 0.282	mm
Limit	0.30	mm
Crank-pin diameter		
Standard	44.940 - 44.956	mm
Limit	44.908	mm
1st Undersize	44.690 - 44.706	mm
Limit	44.658	mm
2nd Undersize	44.440 - 44.456	mm
Limit	44.408	mm
3rd Undersize	44.190 - 44.206	mm
Limit	44.158	mm
Max. pin journal ovality		
Limit	0.05	mm
Max. pin journal taper		
Limit	0.05	mm
Big-end bearing radial clearance	0.028 - 0.068	mm

✸ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder block

MAZDA - B6 16V

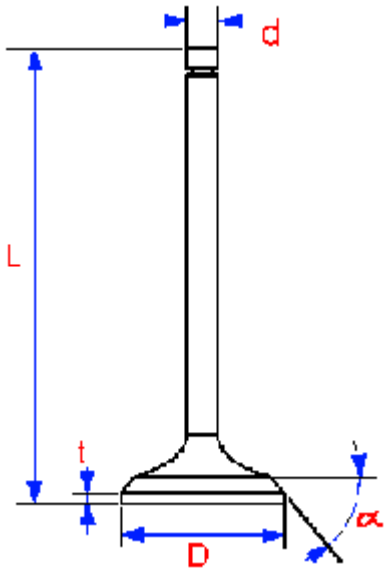
Thickness crankshaft thrust halfring		
Standard	2.500 - 2.550	mm
1st Oversize	2.625 - 2.675	mm
2nd Oversize	2.750 - 2.800	mm
Oil pump		
Type		**trochoid**
Clearance inside rotor - outside rotor	0.02 - 0.16	mm
Limit	0.20	mm
Clearance outside rotor - pump housing	0.09 - 0.18	mm
Limit	0.22	mm
Axial play outside rotor - pump housing	0.03 - 0.11	mm
Limit	0.14	mm

✸ Data from secondary source; No manufacturer's information

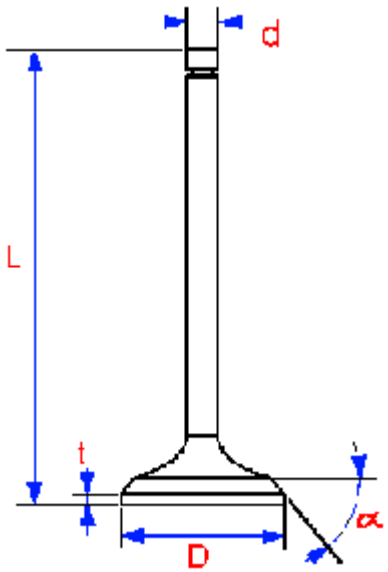
Overhaul data - Cylinder head

MAZDA - B6 16V

General cylinder head data		
Cylinder head height		
New	107.4 - 107.6	mm
Warpage cylinder head fitting face		
Limit	0.15	mm
Max. grinding allowance	0.20	mm
Valves		
Valve dish diameter (D)		



Intake	29.4 - 29.6	mm
Outlet	23.4 - 23.6	mm
Valve length (L)		



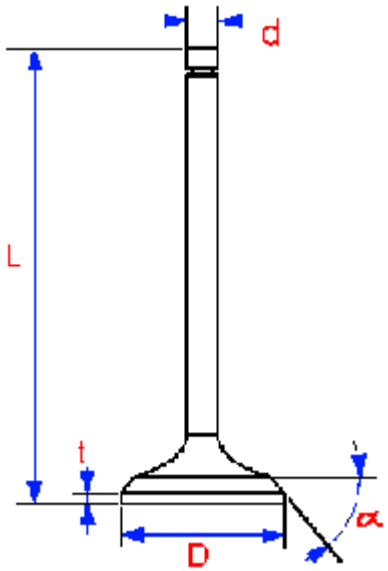
✷ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder head

MAZDA - B6 16V

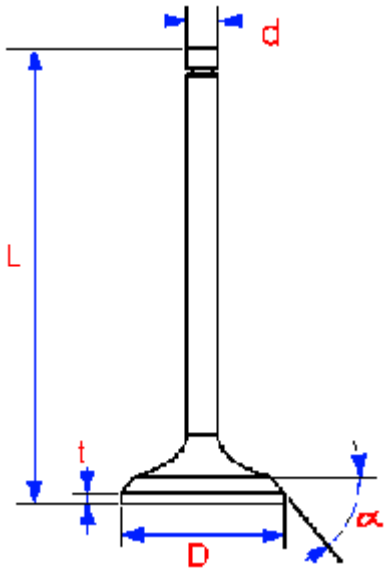
Intake new	103.84	mm
Limit	103.34	mm
Outlet new	104.94	mm
Limit	104.44	mm

Valve stem diameter (d) intake



Standard	5.970 - 5.985	mm

Valve stem diameter (d) outlet



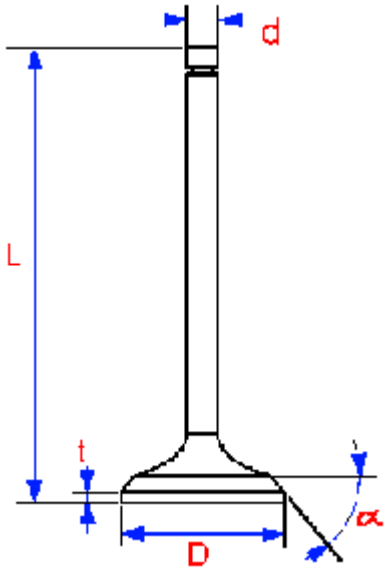
Standard	5.965 - 5.980	mm

✷ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder head

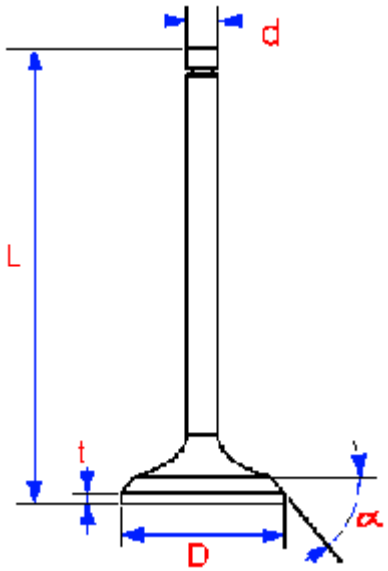
MAZDA - B6 16V

Valve seat angle



Intake	45	°
Outlet	45	°

Valve dish thickness (t)



Intake	0.9	mm
Outlet	1.0	mm

Valve springs

Length unladen

Intake	46.12	mm
Outlet	42.86	mm

Min. force at prescribed length 1

✸ Data from secondary source; No manufacturer's information

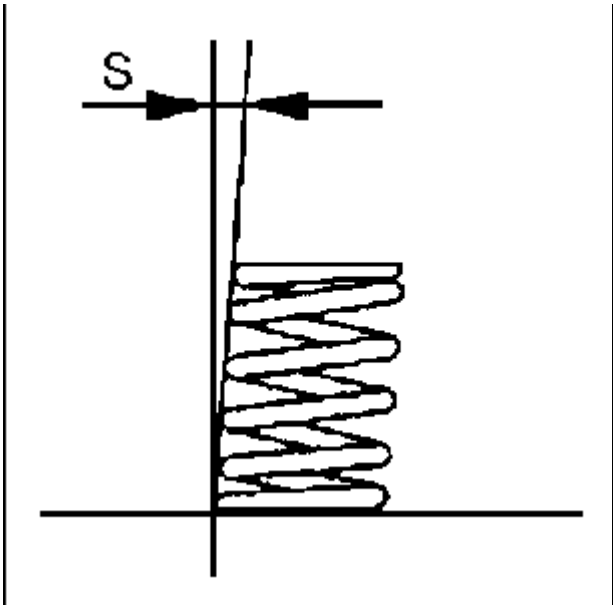
Overhaul data - Cylinder head

MAZDA - B6 16V

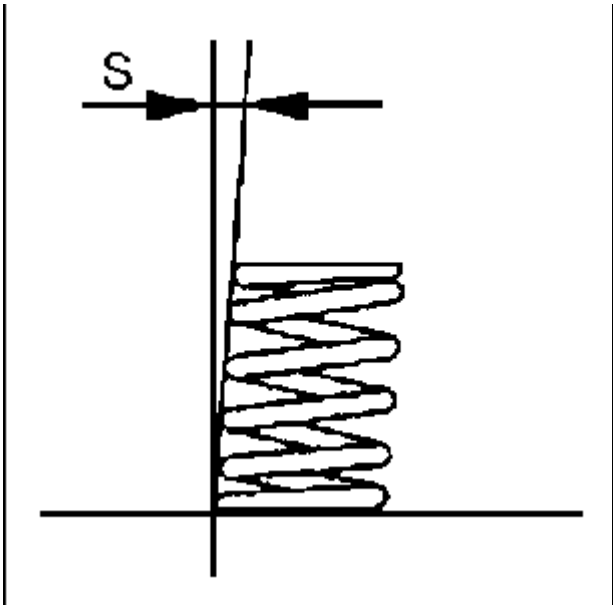
Intake	39 mm: 205 - 232	N
Outlet	38 mm: 133 - 151	N

Inclination(s)

Intake	1.61	mm



Outlet	1.50	mm

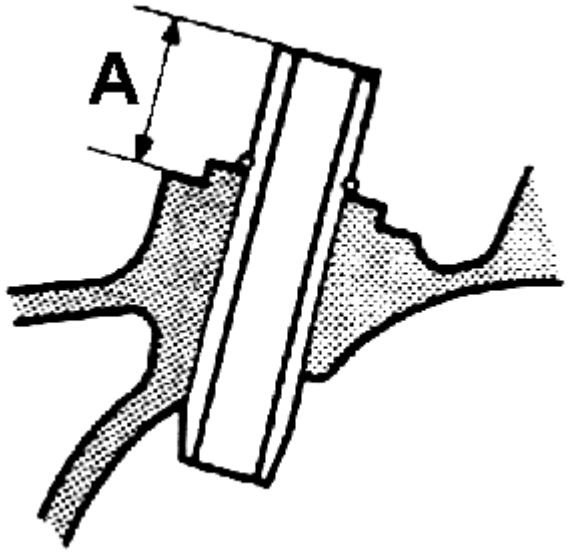


Valve guides

✸ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder head

MAZDA - B6 16V

Fitting height		
		
Intake	A = 16.8 - 17.4	mm
Outlet	A = 16.8 - 17.4	mm
Inner diameter, standard	6.01 - 6.03	mm
Clearance between valve stem and guide		
Intake	0.025 - 0.060	mm
Limit	0.20	mm
Outlet	0.030 - 0.065	mm
Limit	0.20	mm
Valve seats		
Seating angle (Я)		
Intake	45	°
Outlet	45	°
Seating size (A)		
Intake	0.8 - 1.4	mm
Outlet	0.8 - 1.4	mm
Rockers		
Rocker-arm diameter	18.959 - 18.980	mm
Rocker-bore diameter	19.000 - 19.033	mm
Rocker radial play	0.020 - 0.074	mm
Limit	0.10	mm
Camshaft		
Camshaft journal diameter, standard		
1st Bearing	43.440 - 43.460	mm

✸ Data from secondary source; No manufacturer's information

Overhaul data - Cylinder head

MAZDA - B6 16V

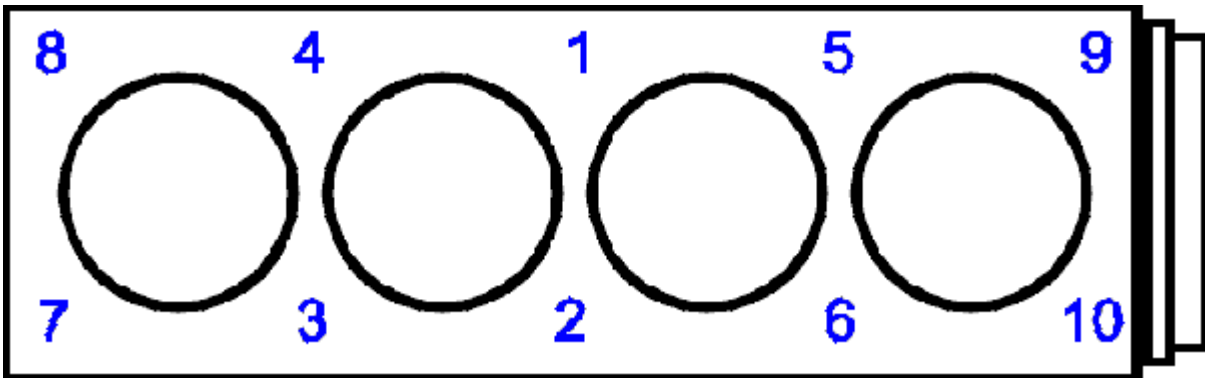
2nd Bearing	43.425 - 43.450	mm
3rd Bearing	43.410 - 43.435	mm
4th Bearing	43.425 - 43.450	mm
5th Bearing	43.440 - 43.460	mm
Camshaft bearing radial clearance		
1st Bearing	0.040 - 0.075	mm
2nd Bearing	0.035 - 0.080	mm
3rd Bearing	0.050 - 0.095	mm
4th Bearing	0.035 - 0.080	mm
5th Bearing	0.040 - 0.075	mm
Limit	0.15	mm
Camshaft end play	0.04 - 0.13	mm
Limit	0.15	mm
Max. camshaft swing		
Limit	0.03	mm
Total camheight		
Intake new	35.829	mm
Intake min.	35.629	mm
Outlet new	35.659	mm
Outlet min.	35.459	mm

✸ Data from secondary source; No manufacturer's information

Torque settings

MAZDA - B6 16V

Cylinder-head bolts



Stage 1	20 - 30	Nm
Stage 2	40 - 60	Nm
Stage 3	76 - 81	Nm
Main bearing cap	54 - 59	Nm
Connecting-rod bearing cap	50 - 54	Nm
Camshaft-bearing cap	7.8 - 11	Nm
Camshaft sprocket	49 - 61	Nm
Crankshaft sprocket	108 - 118	Nm
Valve cover	4.8 - 8.8	Nm
Flywheel	96 - 103	Nm
Drive plate	96 - 103	Nm
Intake manifold	19 - 25	Nm
Oil pump	19 - 25	Nm
Water pump	19 - 25	Nm
Oil-sump	7.8 - 11	Nm
Spark plug	15 - 23	Nm

✸ Data from secondary source; No manufacturer's information

Lubricants and Fluids

MAZDA - 323 - 1.6i - B6

Engine		
Motor oil API SG	Below 0 °C	SAE 5W-30
Motor oil API SG	From -25 °C to 30 °C	SAE 10W-30
Motor oil API SG	Above -25 °C	SAE 10W-40
Motor oil API SG	Above -25 °C	SAE 10W-60
Motor oil API SG	Above -10 °C	SAE 20W-40
Motor oil API SG	Above -10 °C	SAE 20W-50
Cooling system		
Coolant	All temperatures	
Manual transmission (2WD)		
Gear oil API GL-4	All temperatures	SAE 75W-90
Gear oil API GL-5	All temperatures	SAE 75W-90
Manual transmission (4WD)		
Gear oil API GL-4	All temperatures	SAE 75W-90
Gear oil API GL-5	All temperatures	SAE 75W-90
ATF Dexron II	All temperatures	
Automatic transmission		
ATF Dexron II	All temperatures	
ATF M-III	All temperatures	
Transfer box		
Gear oil API GL-5	Above -15 °C	SAE 90
Gear oil API GL-5	Below -1 °C	SAE 80W
Differential, rear (4WD)		
Gear oil API GL-5	Above -15 °C	SAE 90
Gear oil API GL-5	Below -1 °C	SAE 80W
Power steering		
ATF Dexron II	All temperatures	
ATF M-III	All temperatures	
Brakes system		
Brake fluid DOT 3	All temperatures	
Air conditioning		
Refrigerant R134a		
Compressor oil PAG, ISO 46		

Capacities

MAZDA - 323 - 1.6i - B6

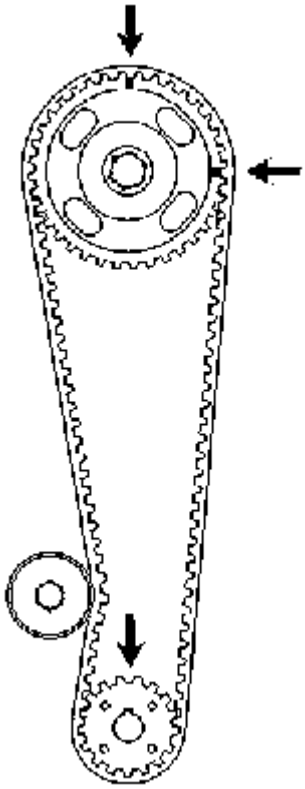
Item	Values	Units
Engine sump, incl. filter	3.4	(l)
Manual transmission		
Gearbox refill	2.68	(l)
Cooling system	5.0	(l)

Timing

MAZDA - 323 - 1.6i - B6

General

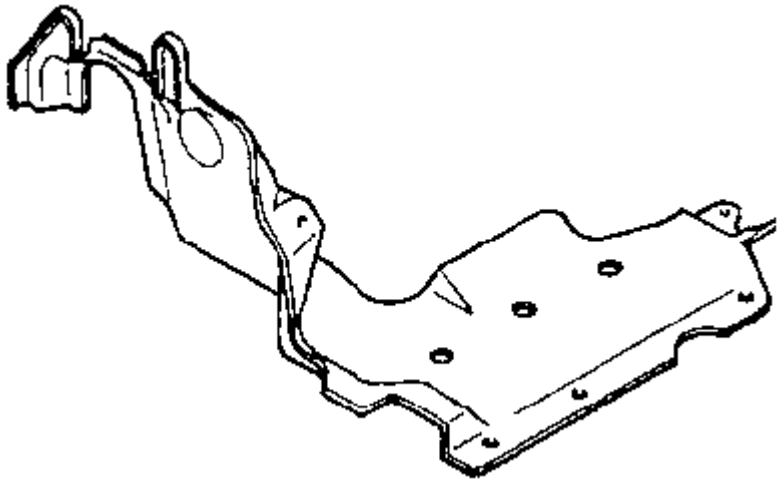
Item	Note
Always check the timing marks before timing belt removal	



Before disconnecting the battery cable, check the audio system anti-theft code

Removal

Item	Note
Disconnect the battery earth cable	
Remove the lower engine cover	



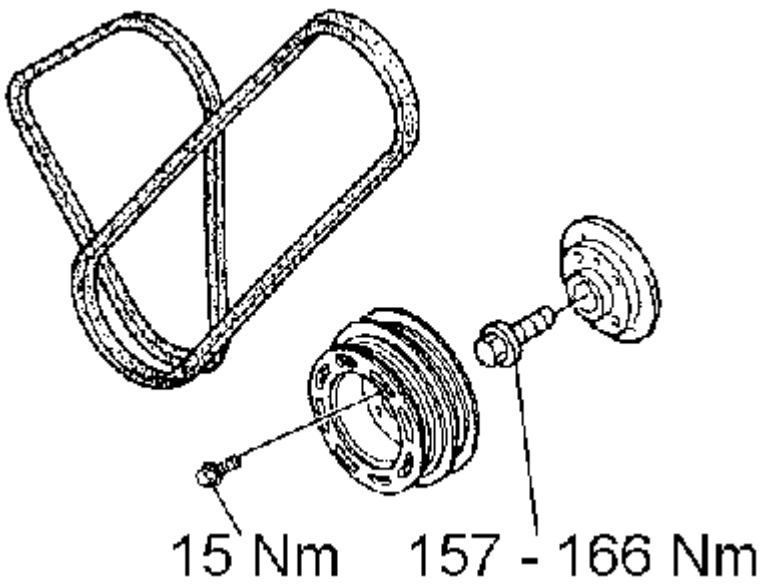
Remove the power steering pump belt

Remove the alternator belt

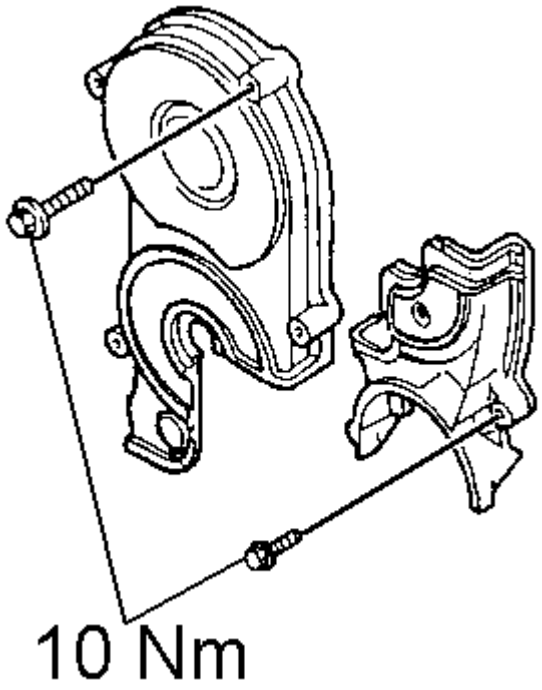
Remove the water pump pulley

Remove the crankshaft pulley

Remove the timing belt guide plates



Remove both timing-belt covers



Loosen the tensioner

Push the tensioner pulley away from the timing belt

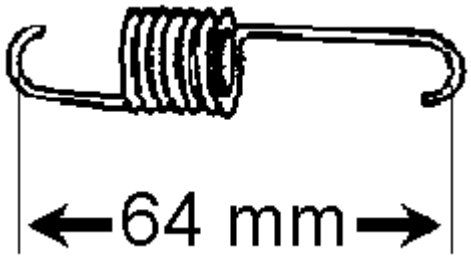
Tighten the tensioner

Remove the timing belt

Remove the tensioner

Check the tensioner and idler pulleys, renew if necessary

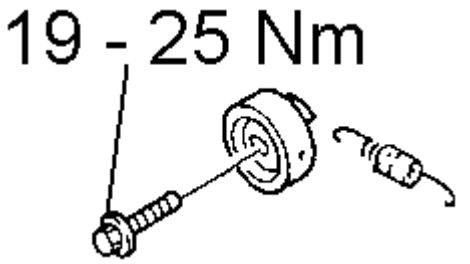
Check the free length of the spring	64 mm



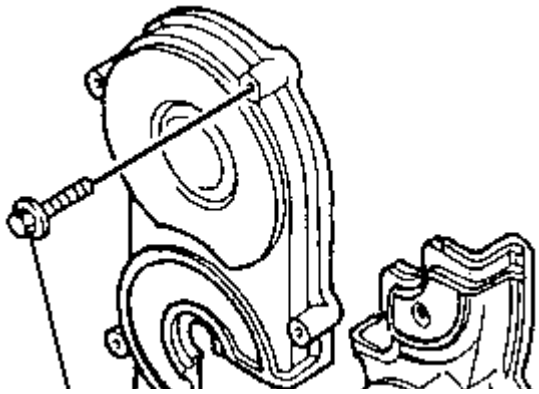
If out of specification, replace with a new one

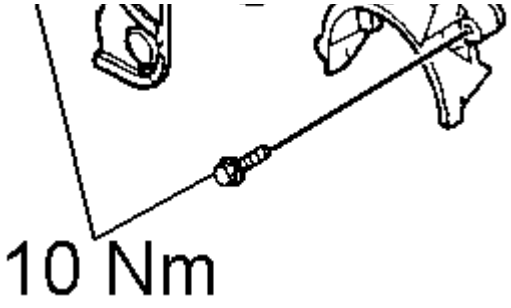
Installation

Item	**Note**
Refit the tensioner	
Refit the tensioner spring	



Push the tensioner pulley away from the timing belt	
Tighten the tensioner	19 - 25 Nm
Check the timing marks	
Fit the timing belt	
Turn the engine 2 rotations clockwise	
Check the timing marks	
Loosen the tensioner	
Tighten the tensioner	
Turn the engine 2 rotations clockwise	
Check the timing marks	
Measure the timing belt deflection	
The tension is set at a deflection of:	11 - 13 mm / 98 N
Turn the engine 2 rotations clockwise	
Check the timing marks and tension again	
Refit the timing belt covers	10 Nm



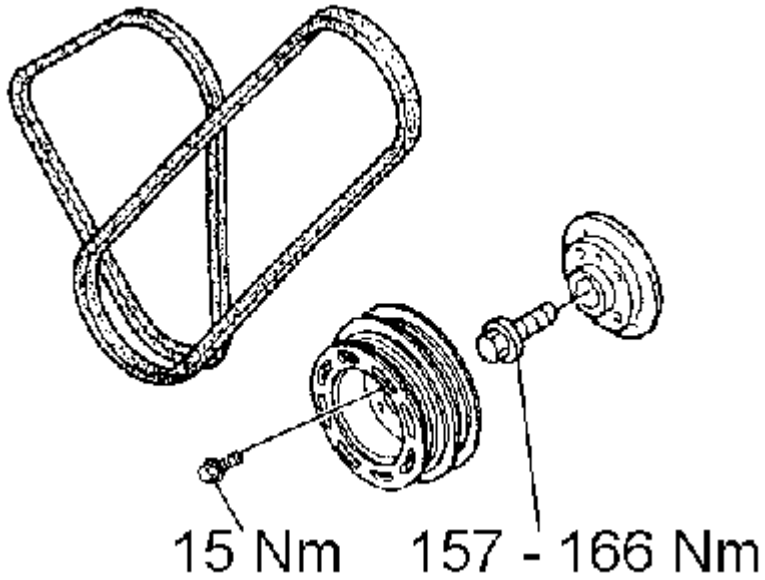


Refit the crankshaft pulley 15 Nm

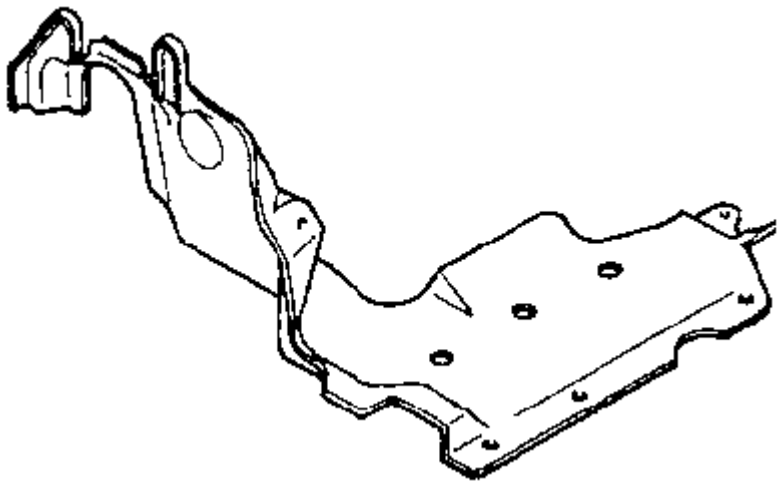
Refit the water pump pulley

Fit the alternator belt

Refit the power steering pump belt



Refit the engine cover



Reconnect the battery earth cable

Torque settings

Item	Note
Tensioner pulley:	19 - 25 Nm
Crankshaft pulley centre bolt	157 - 166 Nm
Crankshaft pulley:	15 Nm
Timing-belt covers:	10 Nm

Water-pump pulley bolts	10 Nm

Special tools

Item	Note
There are no special tools required	