



Figure B4-57

Bosch EZ 58F digital ignition system – test programme

Sheet 1 of 3

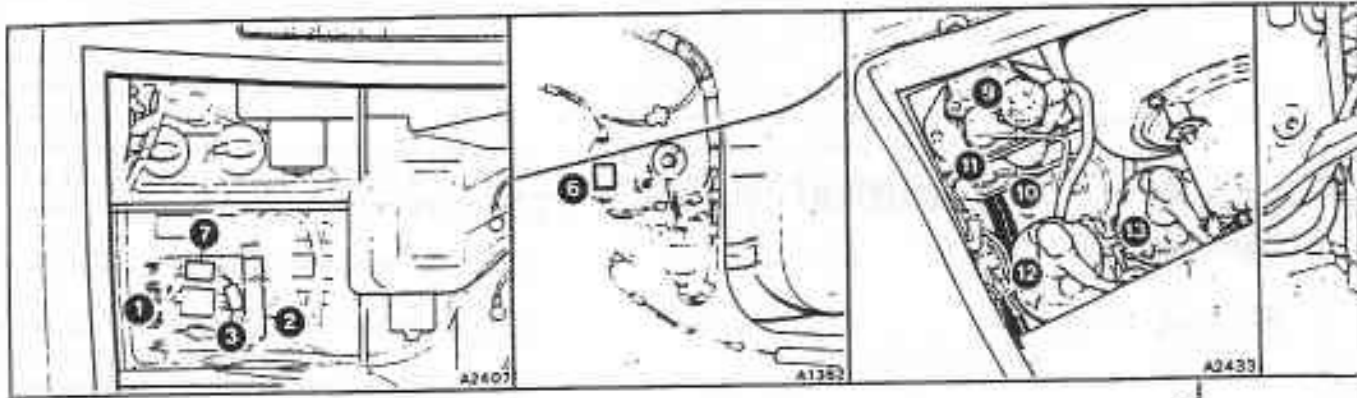
The K-Motronic engine management system

To ease diagnosis of faults the K-Motronic engine management system is sub-divided into two sections, namely the Fuel injection system (KE3-Jetronic) and the Ignition control system (EZ 58F).

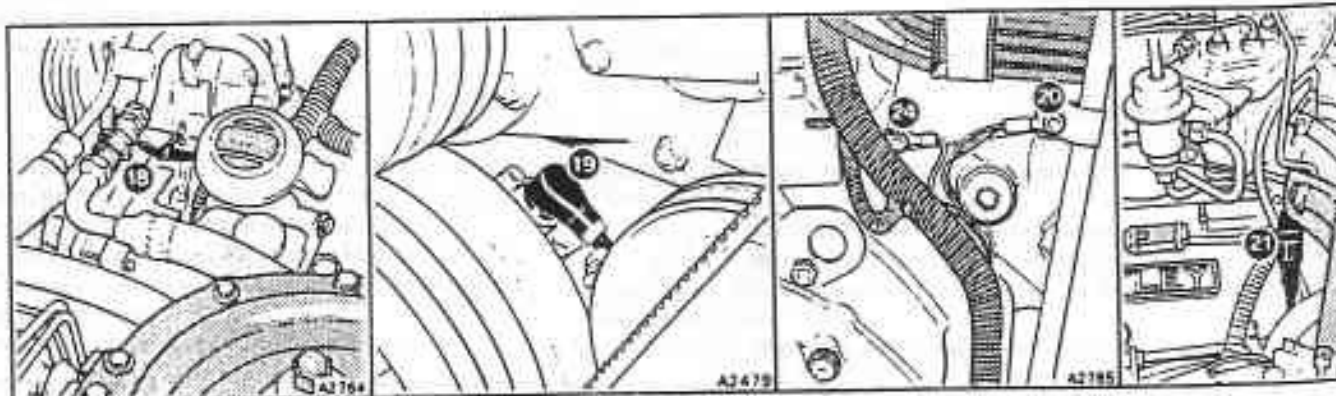
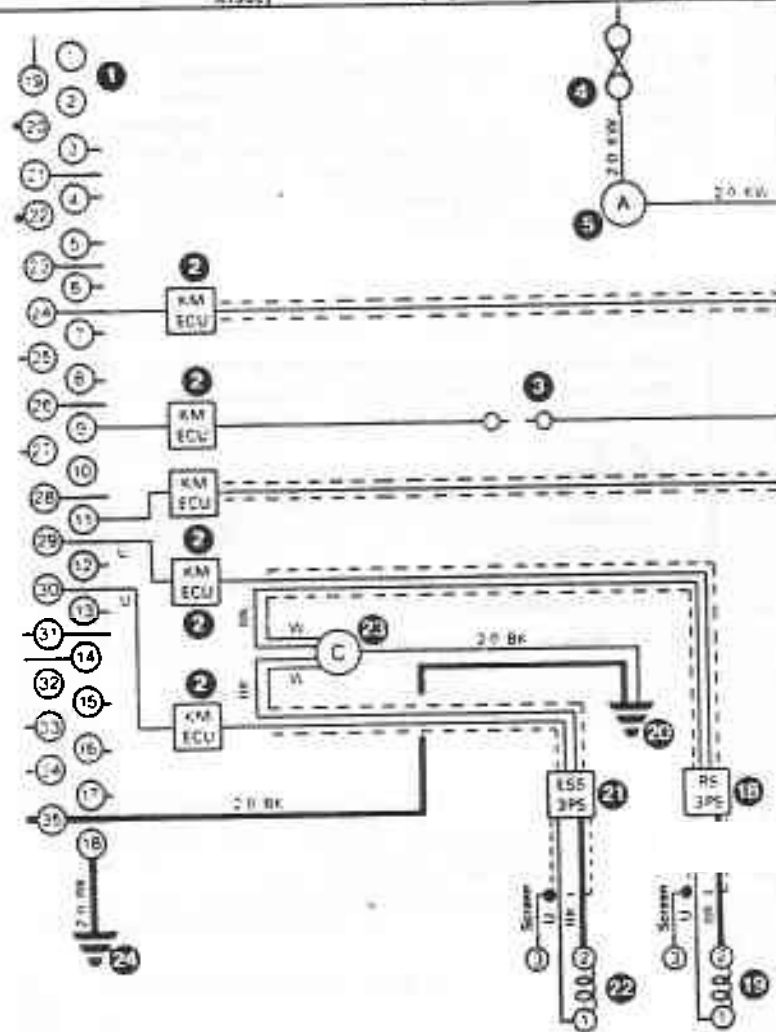
This electrical test programme contains details for testing the digital ignition control system.

When carrying out this test programme always ensure that the following conditions apply.

1. The usual workshop safety precautions are carried out.
2. The battery is in good condition.
3. Any cables or connections disconnected for a test must be re-made before proceeding to the next operation.
4. Always ensure that any faults are corrected before moving on to the next test.

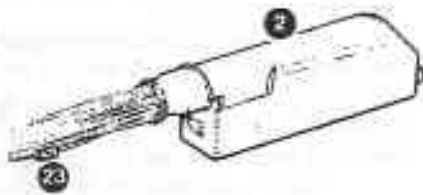


- 1 K-Motronic ECU
- 2 K-Motronic ECU multiple plug
- 3 Parameter code socket (link only required on cars not fitted with catalytic converters)
- 4 Fuse B3, fuse board 1 (15 amp)
- 5 Splice A
- 6 Main loom to valance loom plug and socket 7-way - right-hand 'A' Post
- 7 Valance loom to engine loom plug and socket 7-way - right-hand side
- 8 Splice B
- 9 Ignition driver module - group 1
- 10 Ignition driver module - group 2
- 11 Earth
- 12 Ignition coil - group 2
- 13 Ignition coil - group 1
- 14 Sparking plugs
- 15 Ignition distributor - group 2
- 16 Earth-crankcase
- 17 Ignition distributor - group 1
- 18 Ignition reference sensor 3-way plug and socket
- 19 Crankshaft reference sensor (ignition)
- 20 Earth
- 21 Engine speed sensor 3-way plug and socket
- 22 Engine speed sensor
- 23 Splice C
- 24 Earth

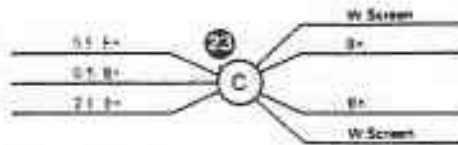




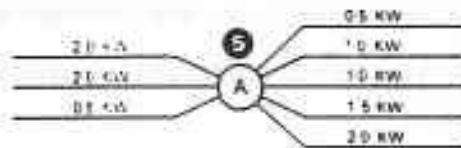
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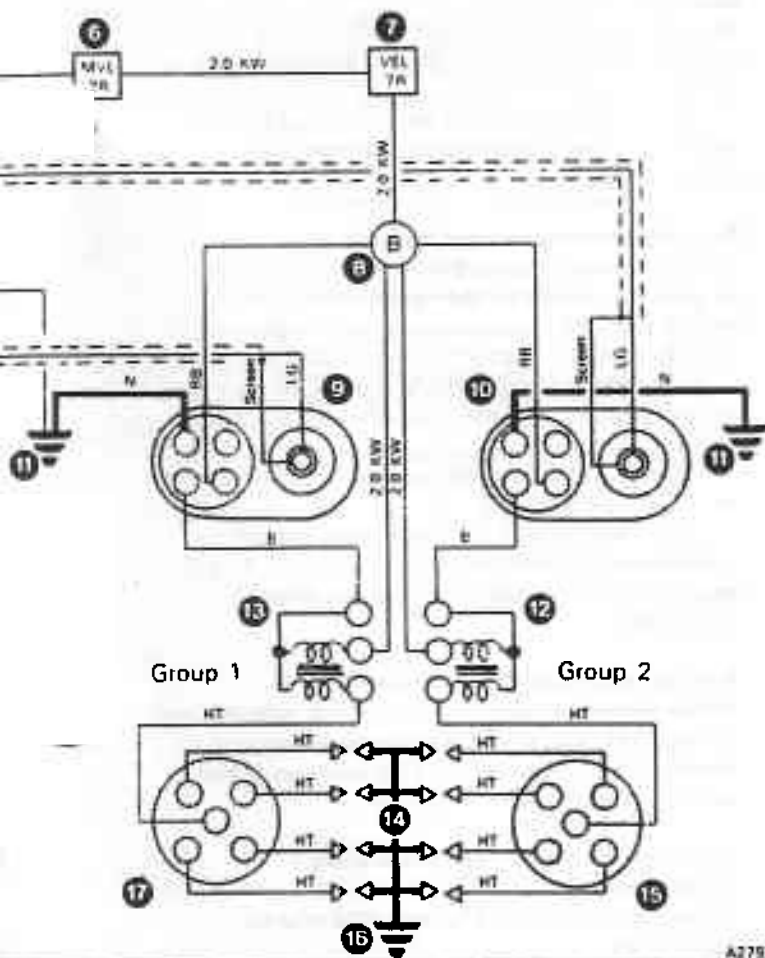
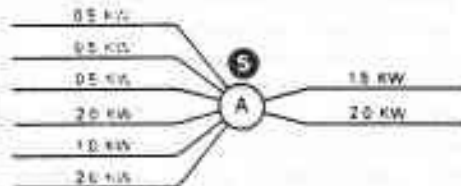
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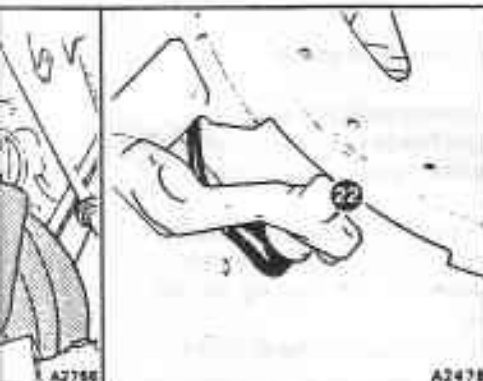
Right-hand drive cars



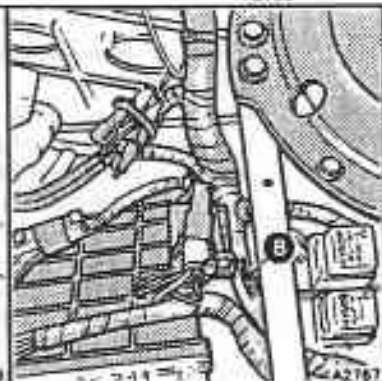
Left-hand drive cars



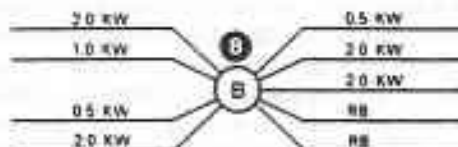
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5. Always ensure that the wiring harness plugs are securely connected.
6. Do not disconnect or connect the wiring harness 35-way multiple plug of the K-Motronic ECU with the ignition switched on.
7. If repeated or extended engine cranking periods are required for a particular engine/vehicle diagnosis, the electrical plug should be disconnected from the cold start injector.
8. Always ensure correct polarity when making cable connections.
9. Always use a good quality digital multi-meter when carrying out tests on the system.
10. Do not pierce any electrical leads or looms with test probes, etc.
11. Do not remove the high tension lead situated between the ignition coil and distributor, when the engine is running.
12. Ensure that no 'arcing' takes place between electrical connections.

Exhaust gases

When running turbocharged engines for prolonged periods within enclosed working areas, always ensure that the exhaust gases are safely removed.

Whilst direct exhaust gas ventilation is available in some workshop areas, it is inevitable that extraction hoses will have to be used in certain circumstances, particularly when the vehicle is on a ramp. In these instances, large flexible exhaust adapter shrouds must be fitted to prevent a high level of depression being applied to the exhaust turbine seal in the turbocharger.

Under no circumstances should high depression exhaust gas extraction units be applied directly to the tailpipes.

Danger - high voltage levels

Dangerously high voltage levels are present in an electronic ignition system. These levels are not only present in individual components, but also in the wiring looms, plugs, sockets, and test connections.

The primary as well as the secondary circuit are subject to these high voltages.

Therefore, whenever the system is switched on ensure that you do not touch components/circuits contained within the ignition system.

Always wear thick rubber gloves and use insulated tools as an added precaution.

Fault diagnosis

This fault diagnosis section includes.

Basic system test procedures

Electrical and electronic components fault diagnosis

It is important that prior to commencing any fault diagnosis work on the digital ignition control aspect of the K-Motronic engine management system it must be established that the mechanical functions of the engine are operating correctly, that the KE3 - Jetronic fuel injection side of the K-Motronic engine management system is operating correctly, and that the battery is in a good state of charge.

Connect an impulse tachometer and an ignition

stroboscope lamp to the engine in accordance with the manufacturer's instructions. These two functions can be accomplished by fitting a compact tester (e.g. Bosch MOT 21) to the engine.

Always use a good quality digital multi-meter to take any electrical measurements and ensure equipment suitable for testing high tension (HT) is available.

Note It is important that the test equipment used to check the ignition timing meets the following specification.

Accuracy - Ignition timing within $\pm 1^\circ$

Rotational speed within ± 10 rev/min.

When carrying out any work on the system it is essential that all workshop safety precautions are observed.

Basic fault diagnosis

The basic ignition system fault diagnosis chart given in figure B4-56 provides a list of basic symptoms and possible causes.

Some of the symptoms described could also be caused by a fuel system failure or a boost control system failure.

Detailed fault diagnosis and test procedure

The information contained in figure B4-57 provides detailed procedures for testing the ignition control system and where necessary the appropriate remedial steps to be taken when any rectification is required.

The various components of the system are shown in their locations on sheet 1, together with a wiring diagram.

Sheets 2 and 3 provide the step by step procedure for checking the system.

If any electrical fault is traced back beyond the engine loom plug and socket (see fig. B4-57, item 7), always refer to the Electrical Workshop Manual TSD 4848.

Removal and fitting of components

Before dismantling any connections and removing any components, ensure that any special precautions necessary are understood and the usual workshop safety precautions are carried out.

K-Motronic electronic control unit (ECU) -

To remove and fit

To remove and fit the K-Motronic ECU refer to page B4-46.

Ignition driver module(s) - To remove and fit

(see fig. B4-58)

Always take care when commencing any work on a driver module. If the engine has been running, sufficient time must be allowed for the module to cool before commencing work.

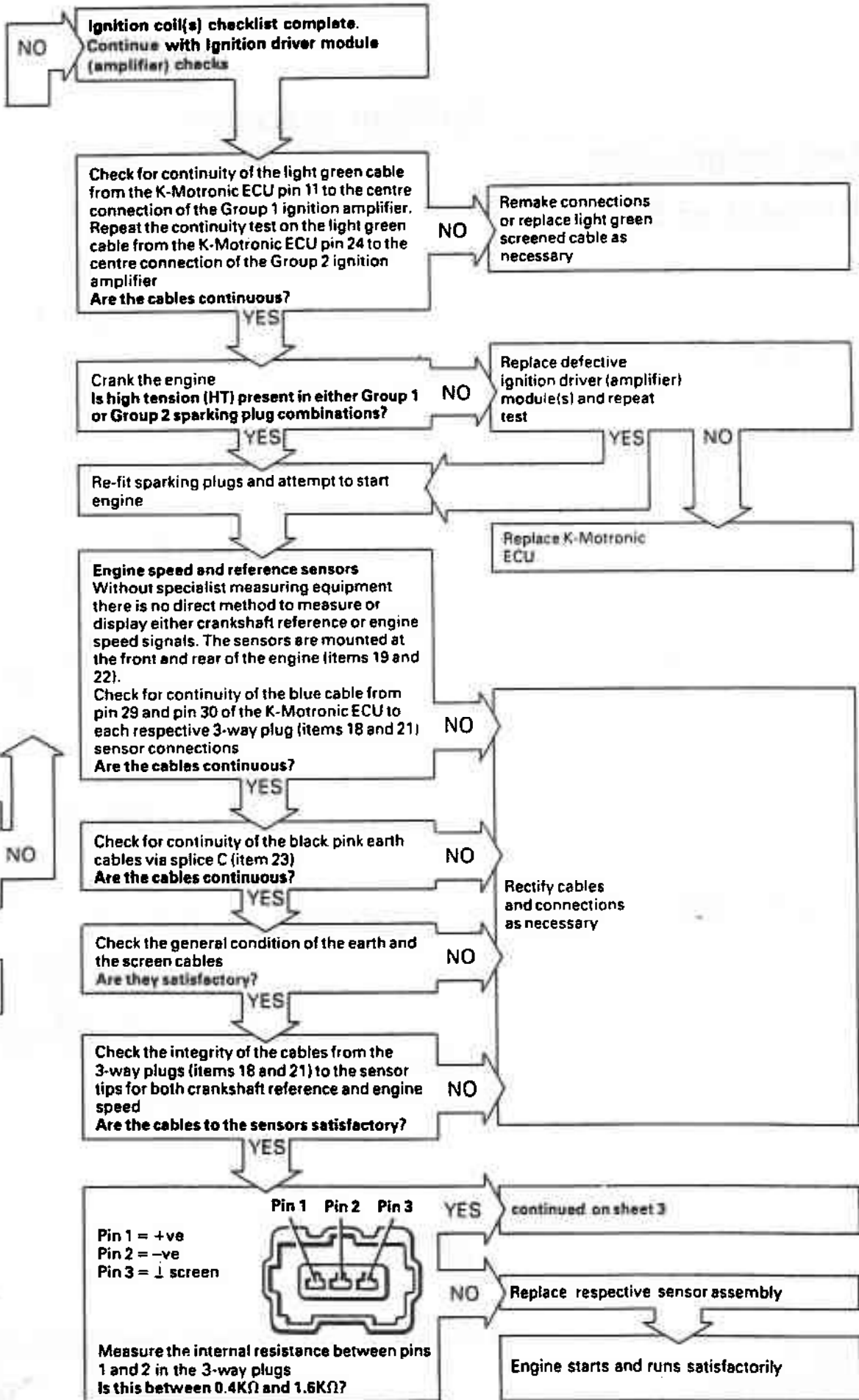
1. Carry out the usual workshop safety precautions.
2. Label the cables to the two driver modules. This will facilitate identification upon assembly (see fig. B4-29). Withdraw the four cables.
3. If only the upper driver module is to be removed, this



Figure B4-57

Bosch EZ 58F digital ignition system – test programme

Sheet 2 of 3



Ignition coils
sealing plug located
as sealing compound

NO

YES

0.75

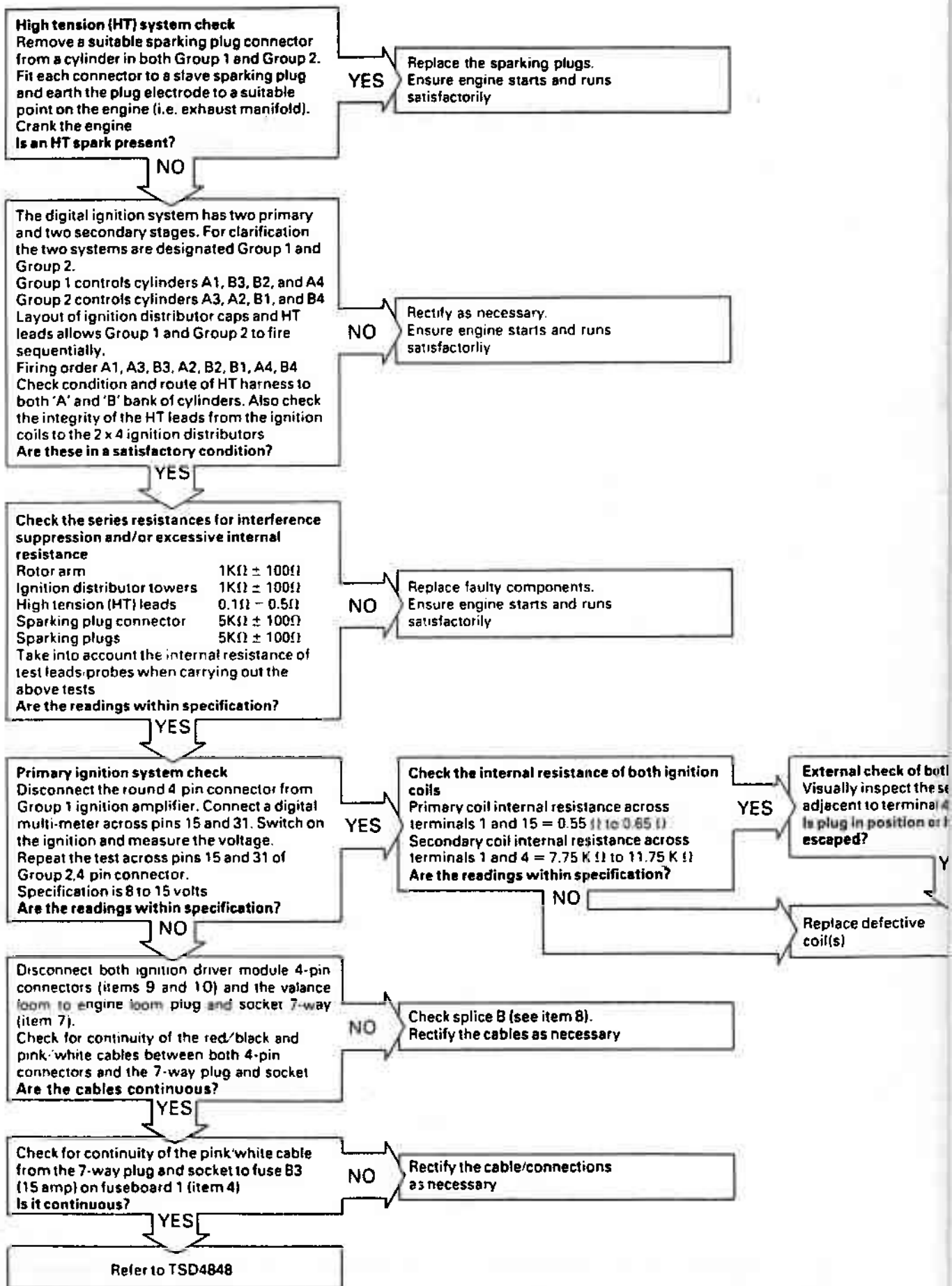




Figure B4-57

Bosch EZ 58F digital ignition system – test programme

Sheet 3 of 3

Check the voltage for the airflow sensor potentiometer. Switch on the ignition and test for voltage across pin 1 (black/slate) and pin 2 (yellow) in the connector. This should be between 4.5 and 5.0 volts within specification?

NO

Switch on the ignition and test for between 4.5 and 5.0 volts directly at the K-Motronic ECU pins 8 and 26 (black/slate and yellow/blue). If the reading is now satisfactory, test for an open circuit in the cables between the potentiometer and ECU. If the reading is still outside the specification the ECU is faulty

With the ignition switched on, use multi-meter probes to measure the voltage across pin 1 (black/slate) and pin 2 (yellow) in the connector. The reading should progressively increase as the airflow sensor plate is deflected. The voltage should be between 4.5 and 5.0 volts within specification?

YES

Check Ignition timing – Idle map
Both primary and secondary throttle plates closed and engine coolant stabilized at normal operating temperature. Ignition timing should be
Cars fitted with catalytic converters $8^{\circ} \pm 1^{\circ}$ btdc at 580 ± 20 rev/min
Cars not fitted with catalytic converters $6^{\circ} \pm 1^{\circ}$ btdc at 580 ± 20 rev/min
Is this correct?

YES

Check Ignition timing – Part load map
Disconnect the throttle position switch 3-way electrical connection, the engine management system will resort to its part load map. Ensure that the engine coolant has stabilized at its normal operating temperature. Ignition timing should be
Cars fitted with catalytic converters $27^{\circ} \pm 1^{\circ}$ btdc at 2000 ± 20 rev/min
Cars not fitted with catalytic converters $14^{\circ} \pm 1^{\circ}$ btdc at 2000 ± 20 rev/min
Is this correct?

If the reading is outside the specification, the airflow sensor potentiometer is faulty.

NO

Parameter code socket
Check parameter coding pin across K-Motronic pins 9 and 18 for continuity
Note
Cars fitted with catalytic converters, open circuit no link (not continuous)
Cars not fitted with catalytic converters, earth continuous link fitted (continuous)
Is this correct?

YES

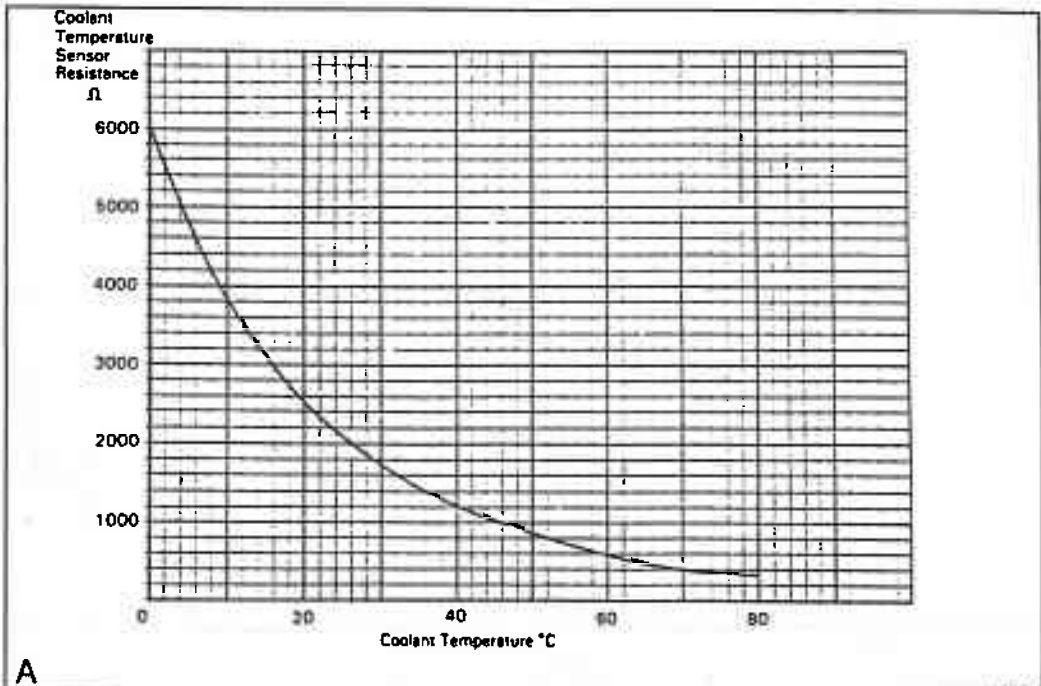
Cars not fitted with catalytic converters, carry out a continuity check on the individual cables as follows.
Check the black/purple cable from pin 9 to the parameter code socket.
Check the black link cable.
Check the black earth cable from the socket to the right-hand valance earth (item 11). Rectify as necessary.
Repeat parameter code socket continuity test
Is this now correct?

YES

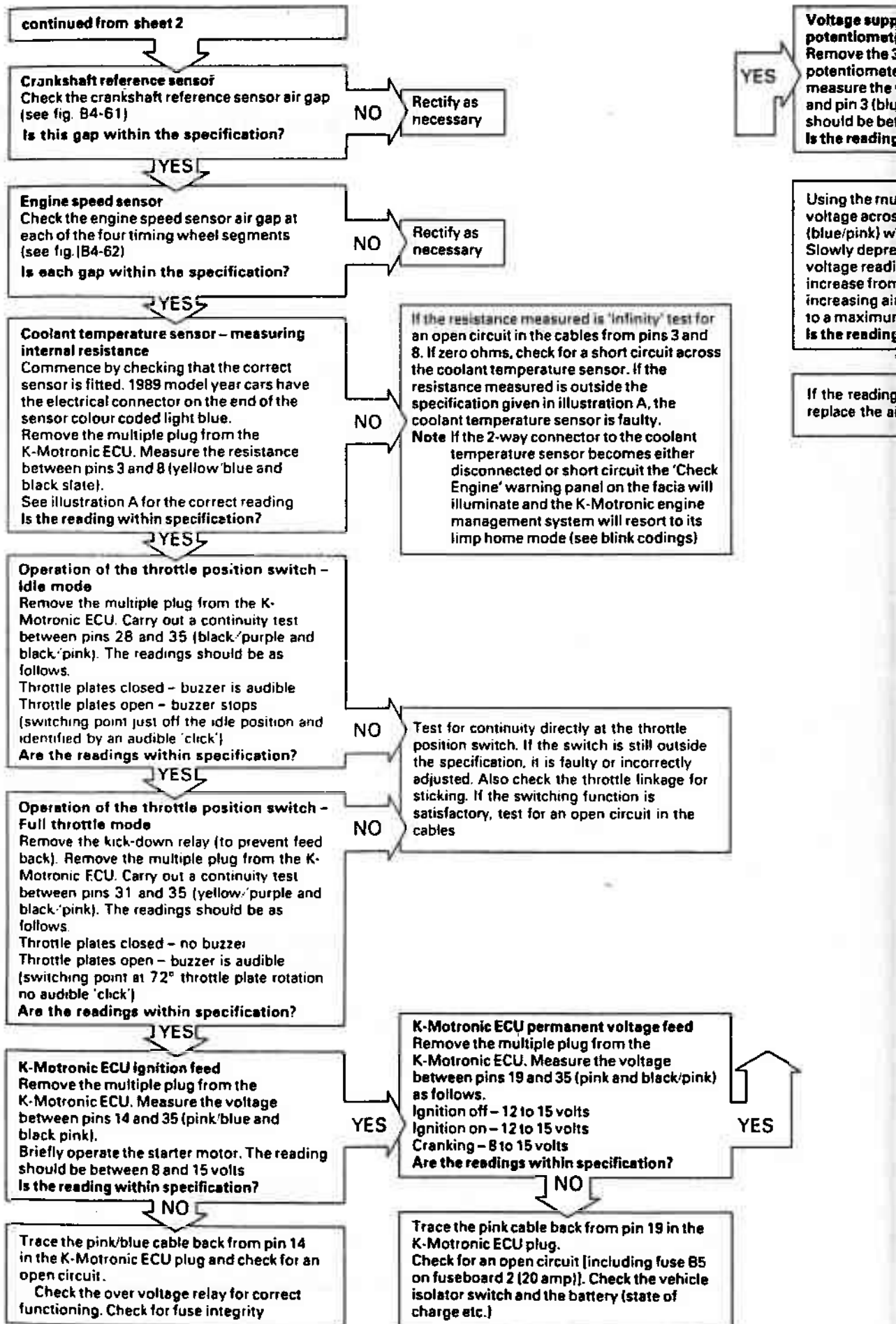
NO

Replace K-Motronic ECU

Test completed



A



can be achieved by unscrewing the mounting screws and lifting the module from the mounting bracket.

If however, the lower driver module or both modules are to be removed, this is best achieved by removing the screws that retain the mounting bracket to the bulkhead. The mounting bracket with both modules attached can then be withdrawn as an assembly.

4. Fit the modules by reversing the procedure, noting that each module should be fitted with the thin clear film still in position on the base of the unit.

Non-silicone heat transfer compound (HTC 700G) should be applied across the back face of the mounting bracket.

Ignition coil(s) - To remove and fit (see figs. B4-58 and B4-59)

1. Carry out the usual workshop safety precautions.
2. Label all cables fitted to the coils to assist identification upon assembly. Note the route each cable takes.
3. Withdraw the high tension (HT) cable from the centre of each coil.
4. Withdraw the plastic protective cover from the top of each coil. These covers clip into position and can be difficult to remove.
5. Unscrew the retaining nuts and remove the cables from the positive and negative terminals of each coil (see fig. B4-58).
6. Locate the two setscrews in the rear section of the front right-hand wing. These screws retain the mounting bracket for the coils (see fig. B4-59). Unscrew the setscrews and carefully withdraw both coils and mounting bracket as one assembly.
7. Fit the coils by reversing the removal procedure. Ensure the cables are positioned as found (see Operation 2). Badly routed cables can cause interference with other signals.

Ignition distributors - To remove and fit

1. Carry out the usual workshop safety precautions.
2. Make note of the cable runs from the distributor caps to the sparking plugs. This is to facilitate assembly.
3. Withdraw the cable connectors from the sparking plugs and free the leads from the guide clips on the engine rocker covers.
4. Unscrew the setscrew and release the metal guide clip from the rear of each cylinder head.
5. Free the ignition coil high tension (HT) lead from the centre of each distributor cap. This can be achieved by firmly grasping the cable connector where it enters the distributor cap and whilst twisting the connector carefully pull it upwards. Do not pull the cable.
6. Slacken the two securing screws retaining each distributor cap. Turn each shaped securing stud to free it from the distributor base. Carefully withdraw each cap in an upwards direction.
7. Turn the engine in the direction of rotation until the distributor rotor arms point in the direction shown in figure B4-60. Also ensure that the timing pointer is aligned with the TDC mark on the front damper assembly.
8. Unscrew the main distributor base assembly securing

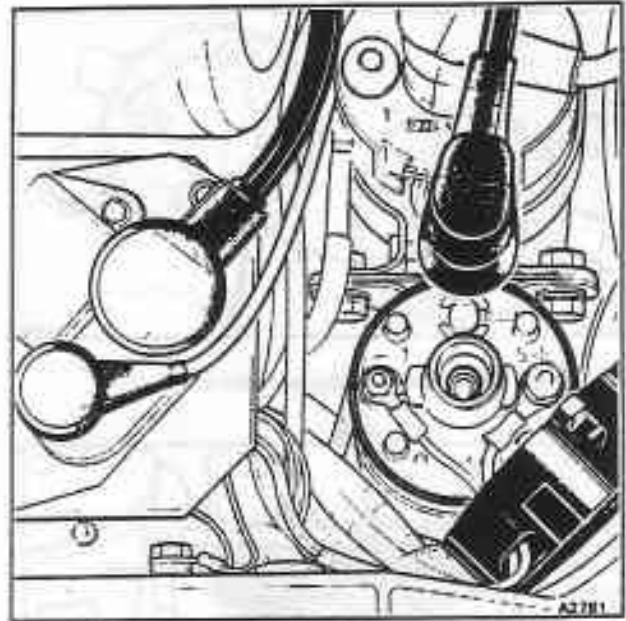


Fig. B4-58 Ignition driver modules (amplifiers) and coils

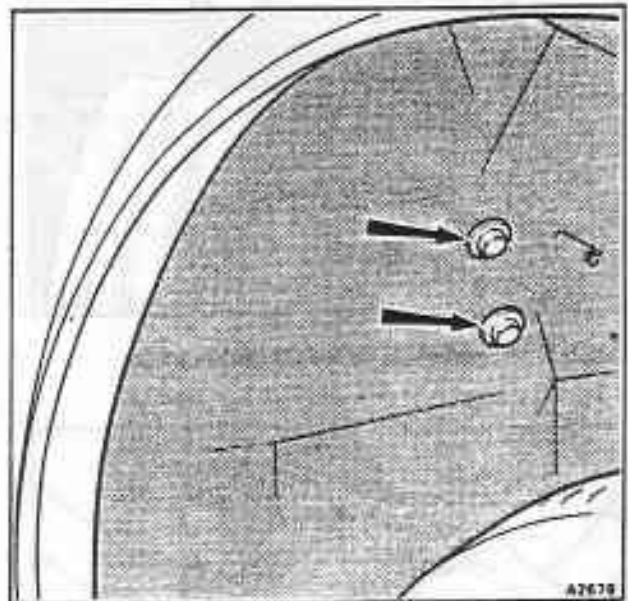


Fig. B4-59 Ignition coils mounting bracket retaining screws

setscrew and lift the base from the crankcase.

9. To fit the distributor assembly reverse the dismantling procedure noting the following points.

Ensure that when the distributor assembly is fitted, the centre of the rotor arms align with the timing marks (see fig. B4-60) at TDC, with A1 cylinder on its firing stroke.

Ensure that the rubber sealing ring fitted around the distributor pedestal is in good condition and lubricated with Palmolive grease or its equivalent.

Ensure that the base assembly securing setscrew is not overtightened.

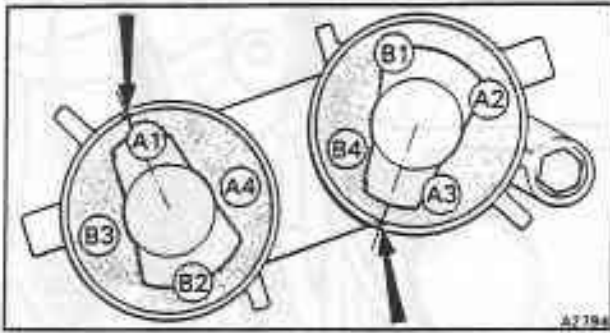


Fig. B4-60 Position of distributor rotor arms

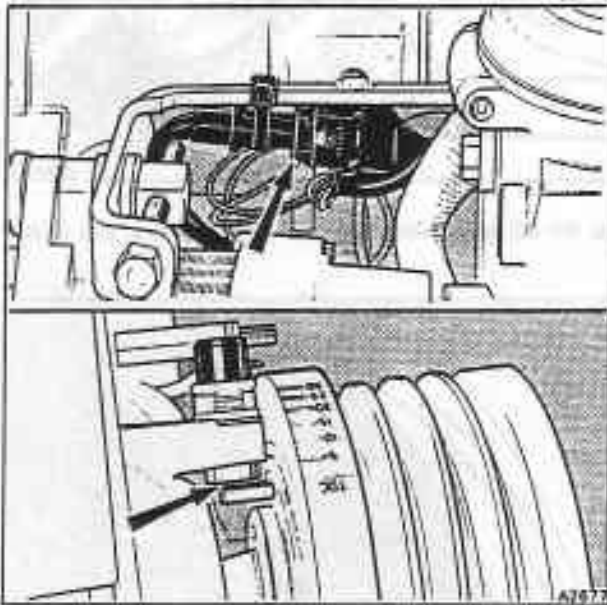


Fig. B4-61 Crankshaft reference sensor air gap

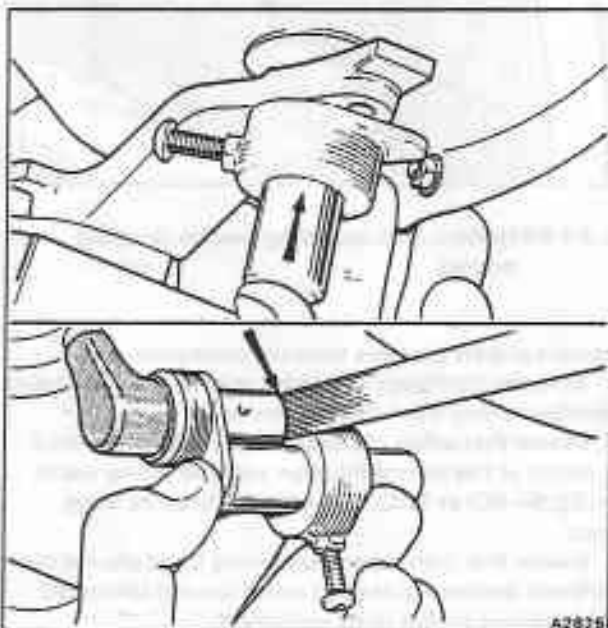


Fig. B4-62 Engine speed sensor air gap

Ensure that each distributor cap is correctly located in its base before securing it with the two screws.

The ignition timing is pre-programmed and is not adjustable. Under no circumstances must any attempt be made to rotate the ignition distributor housing.

Crankshaft reference sensor - To remove and fit (see fig. B4-61)

Under no circumstances must the sensor be dropped onto or knocked against a hard surface.

1. Carry out the usual workshop safety precautions.
2. Note the run of the sensor cable and where it is secured by plastic Insulok clips. This is to facilitate assembly.
3. Disconnect the 3-way connector (see fig. B4-57, item 18).
4. Cut the plastic Insulok clips and free the cable.
5. Unscrew the Allen screw securing the sensor assembly to the front cover.
6. Withdraw the sensor and collect any shims fitted between the assembly and the front cover.
7. Ensure that the sensor trigger pin fitted into the rear face of the damper assembly is clean.
8. Fit the sensor by reversing the removal procedure.
9. Using stainless steel feeler gauges measure the air gap between the trigger pin and the sensor. This gap should be between 0,89 mm and 1,27 mm (0.035 in and 0.050 in). Adjust the gap as necessary by means of shim washers fitted between the sensor assembly and the front cover.
10. Check the run of the sensor cable. Note that the cable should be reasonably taut. Any free play in the cable must be clipped on the bracket adjacent to the 3-way connector situated on top of the engine.
11. Slowly rotate the engine to confirm that the sensor cable does not foul any moving parts (drive belts, crankshaft damper, pulley, etc.).
12. Check the ignition timing making reference to figure B4-57, Electrical test programme.

Engine speed sensor - To remove and fit (see fig. B4-62)
Under no circumstances must the sensor be dropped onto or knocked against a hard surface.

1. Carry out the usual workshop safety precautions.
2. Note the run of the sensor cable and where it is secured by plastic Insulok clips. This is to facilitate assembly.
3. Disconnect the 3-way connector (see fig. B4-57, item 21).
4. Cut the plastic Insulok clips and free the cable.
5. Unscrew the setscrew securing the sensor to its mounting bracket.
6. Withdraw the sensor. Collect any shims that may be fitted between the sensor and the mounting bracket.
7. Ensure that one of the segments is in line with the sensor hole in the bottom cover.
8. Fit the setting tool RH 12207 through the hole. Ensure that the collar/plate assembly of the setting tool sits on the sensor mounting bracket and that the depth pillar is pushed firmly into contact with the segment (see fig. B4-62). Tighten the locking screw.
9. Withdraw the setting tool and place it against the



sensor (see fig. B4-62).

10. Using stainless steel feeler gauges measure the air gap between the end of the sensor and the collar/plate assembly on the setting tool. This gap should be between 0,89 mm and 1,27 mm (0.035 in and 0.050 in). Adjust the gap as necessary by means of shim washers fitted between the sensor and its mounting bracket.

11. Repeat the air gap measuring technique on all four segments.

12. Ensure that the rubber grommet fitted into the bottom cover is in good condition.

13. Fit the sensor (and any shims) to the mounting bracket. Ensure that the sensor fits correctly through the rubber grommet.

14. Check the route of the sensor cable. Note that the cable should be reasonably taut. Any free play in the cable must be clipped at the top of the engine.

15. Check the sensor and the ignition timing, making reference to figure B4-57, Electrical test programme.