Figure B4-30

Theoretical wiring diagram

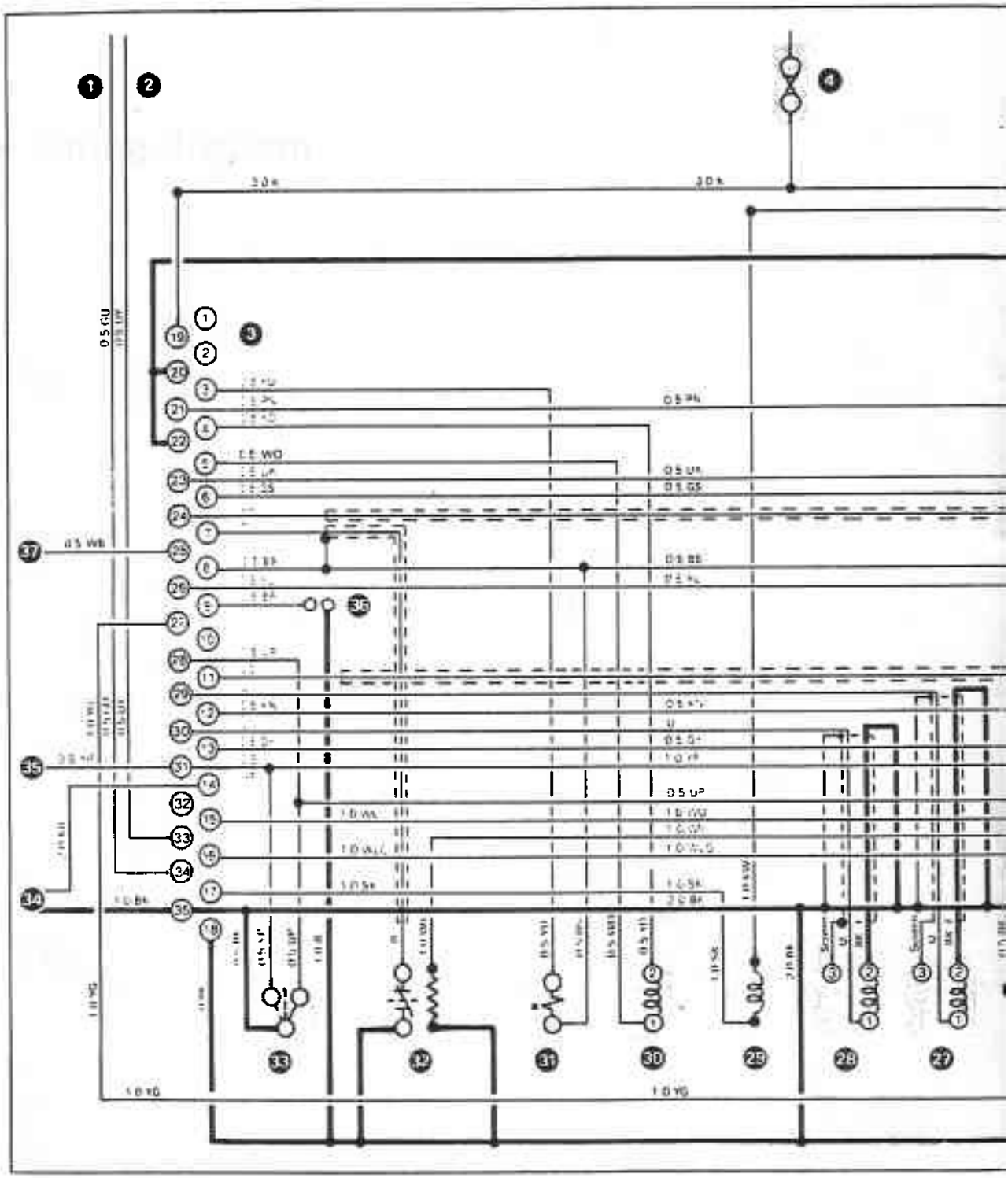
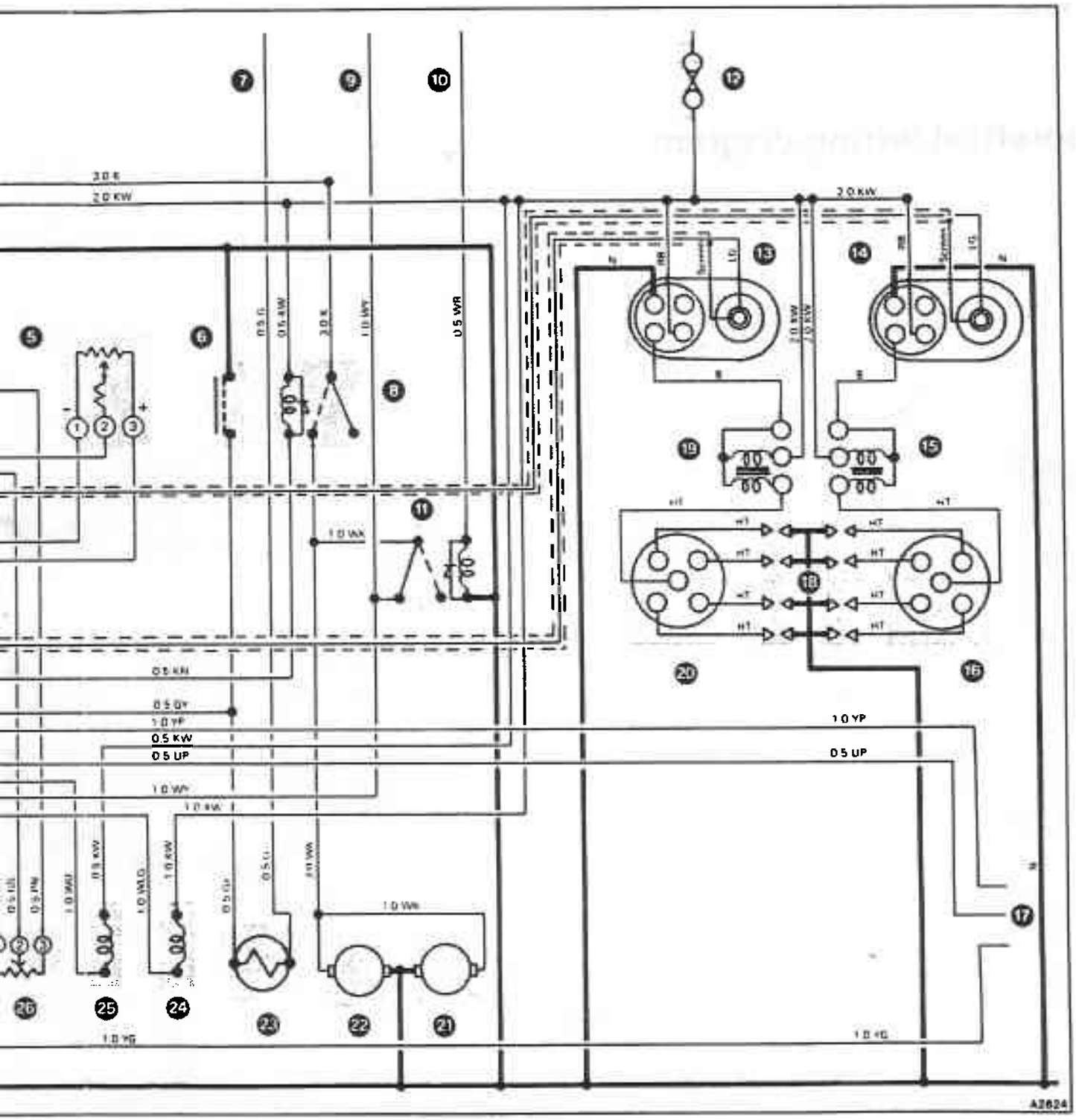


Fig. B4-30 Theoretical wiring diagram

1 Speed control ECU
2 ACU thermostat
3 K-Motronic ECU
4 Fuse B5, Fuseboard 2, 20 amp
5 Air flow sensor potentiometer
6 Diagnostic button (if fitted)
7 Warning lamps fuse
8 Fuel pump relay
9 ACU circuit relay
10 Starter relay
11 ACU control relay
12 Fuse B3, Fuseboard 1, 15 amp
13 Ignition driver module 1
14 Ignition driver module 2
15 Ignition coil 2
16 Ignition distributor 2
17 Digital EGR ECU
18 Sparking plugs
19 Ignition coil 1
20 Ignition distributor 1



21 Fuel pre-pump
22 Main fuel pump
23 Check engine warning lamp (if fitted)
24 Cold start injector
25 Canister purge duty cycle valve (if fitted)
26 Air pressure transducer
27 Reference sensor – timing (front)
28 Speed sensor (rear)
29 Idle speed actuator
30 Electro-hydraulic actuator
31 Coolant temperature sensor
32 Oxygen sensor and heater (if fitted)
33 Throttle position switch
34 Overvoltage relay
35 Kick-down relay
36 Parameter code socket (K-Motronic link required on cars not fitted with catalytic converters)
37 Air injection system ECU

Fig. B4-31 Enrichment factors (excluding acceleration enrichment)

Engine coolant temperature	Stand current (mA)			After start enrichment (mA)		Warm-up enrichment (mA)	
Specification	A	B		A	B	A	B
60°C (140°F)	100	100		0	0	0	0
40°C (104°F)	100	100		2	3	0	1
20°C (69.8°F)	100	100	Start enrichment current of 20 mA to be added to the 'after start' enrichment values as follows. When cranking until (a) the engine speed exceeds 430 rev/min (b) a period of 1 second is exceeded with closed throttles. (c) a period of 2.6 seconds is exceeded with opened throttles.	12	12	5	5
16°C (60.8°F)	100	100		24	24	16	16
0°C (32°F)	100	100		44	44	30	30
−16°C (3.2°F)	100	100		61	61	38	38
−26°C (−14.8°F)	100	100		99	99	64	64

Ignition on feature
Nominal mA characteristics are highlighted in the above table and a tolerance band is not specified. Under most field/service conditions precise engine coolant temperatures will not be measured, hence starting and warm-up characteristics will be calculated from interpolated values. Stand current is an 'ignition on' feature and has a tolerance of 100±2mA.

Identification of enrichment factors should form the basis of fault diagnosis for engine starting and warm-up difficulties.

Specification A – Cars fitted with catalytic converters

Specification B – Cars without catalytic converters

A2874

Start enrichment

Start enrichment which is additional to 'after start' enrichment, is present during cranking and continues until the engine speed exceeds 430 rev/min. It consists of two basic modes.

a. With throttle plates closed.

b. With throttle plates open.

Time constants for modes a and b are 1.0 second and 2.6 seconds respectively.

The total starting enrichment consists of one fixed and two variable factors as follows.

1. Initial start enrichment current element fixed at

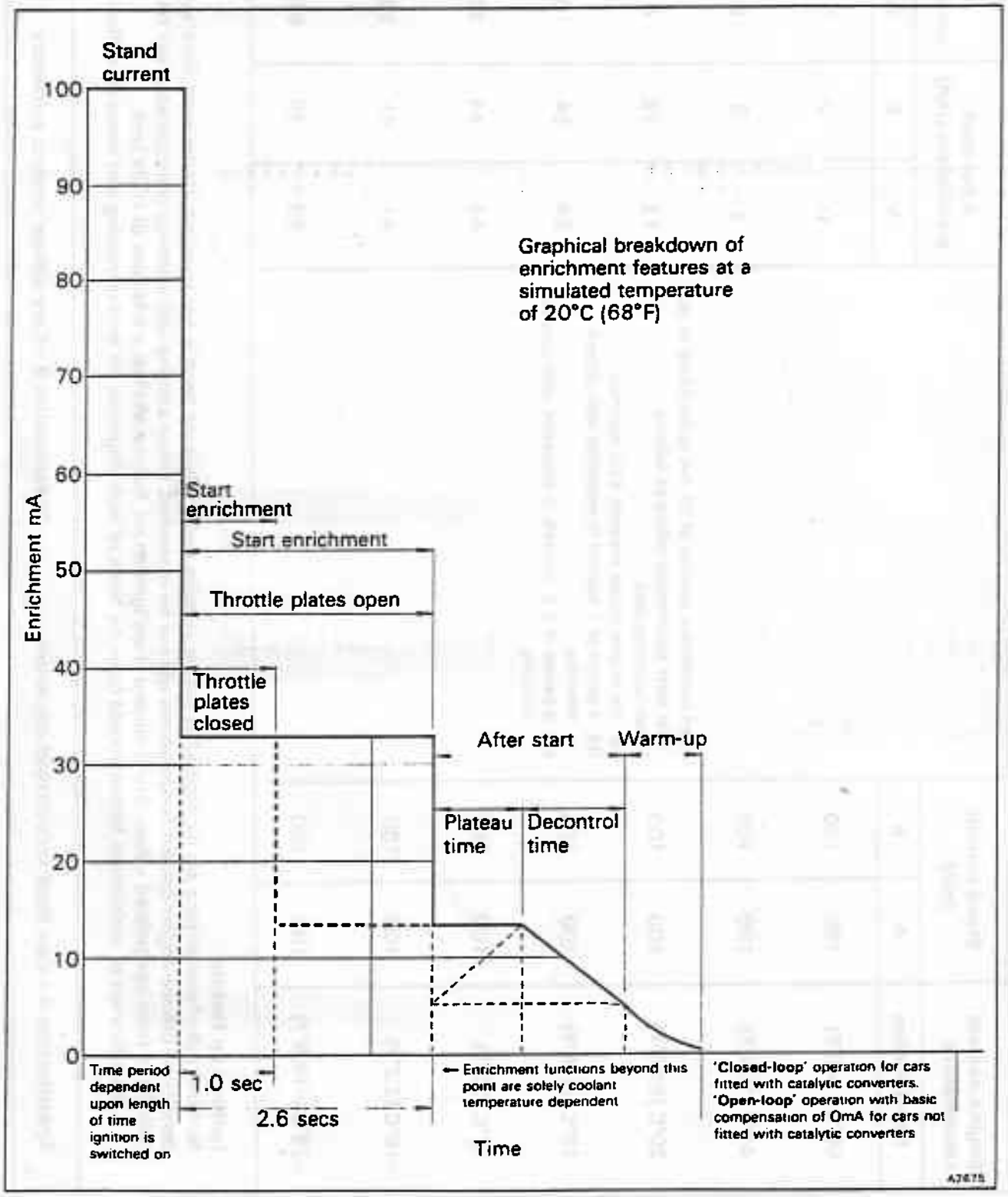


Fig. B4-32 Cold start, after start, and warm-up features

20 mA (which is added to the 'after start' enrichment) for either 1.0 or 2.6 seconds.

2. 'After start' enrichment - variable and dependent upon coolant temperature.

3. Warm-up enrichment - variable and dependent upon coolant temperature.

Figures B4-31 and B4-32 show details of the enrichment factors.

'After start' enrichment

When the engine speed exceeds 430 rev/min the K-Motronic engine management system proceeds into its 'after start' enrichment mode. This ensures smooth engine running during the initial fuel injector stabilization period. 'After start' enrichment can be further sub-divided into two basic elements, the magnitude and duration of which are solely dependent upon engine coolant temperature.

a. Plateau time

b. Decontrol time

Figures B4-31 and B4-32 show details of the enrichment factors.

Warm-up enrichment

This gradual decay of enrichment factor commences upon completion of 'after start' enrichment. Engine coolant temperatures at which warm-up enrichment finishes differ for cars with or without catalytic converters.

The engine coolant temperature at which cars fitted with catalytic converters revert to 'closed loop' operation is 40°C (104°F).

Figures B4-31 and B4-32 show details of the enrichment factors.

Cold start injection operation

The cold start injector has three basic modes of operation which are as follows.

1. Conventional cold start injector operation

Digital control enables precise cold start injector operation for all ambient temperatures. Engine coolant temperature is the most accurate method of determining the additional increase in mixture strength required from single point injection during cold starting (i.e. the cold start injector). Hence cold start injector operation is controlled by the K-Motronic ECU via inputs from the engine coolant temperature sensor.

Rates of cold start injection are preset and dependent upon four engine coolant temperature sites. Values of coolant temperature experienced in service between the four sites are calculated by direct interpolation. Coolant temperatures beyond site four −26°C (−14.8°F) which is shown as the last site, are

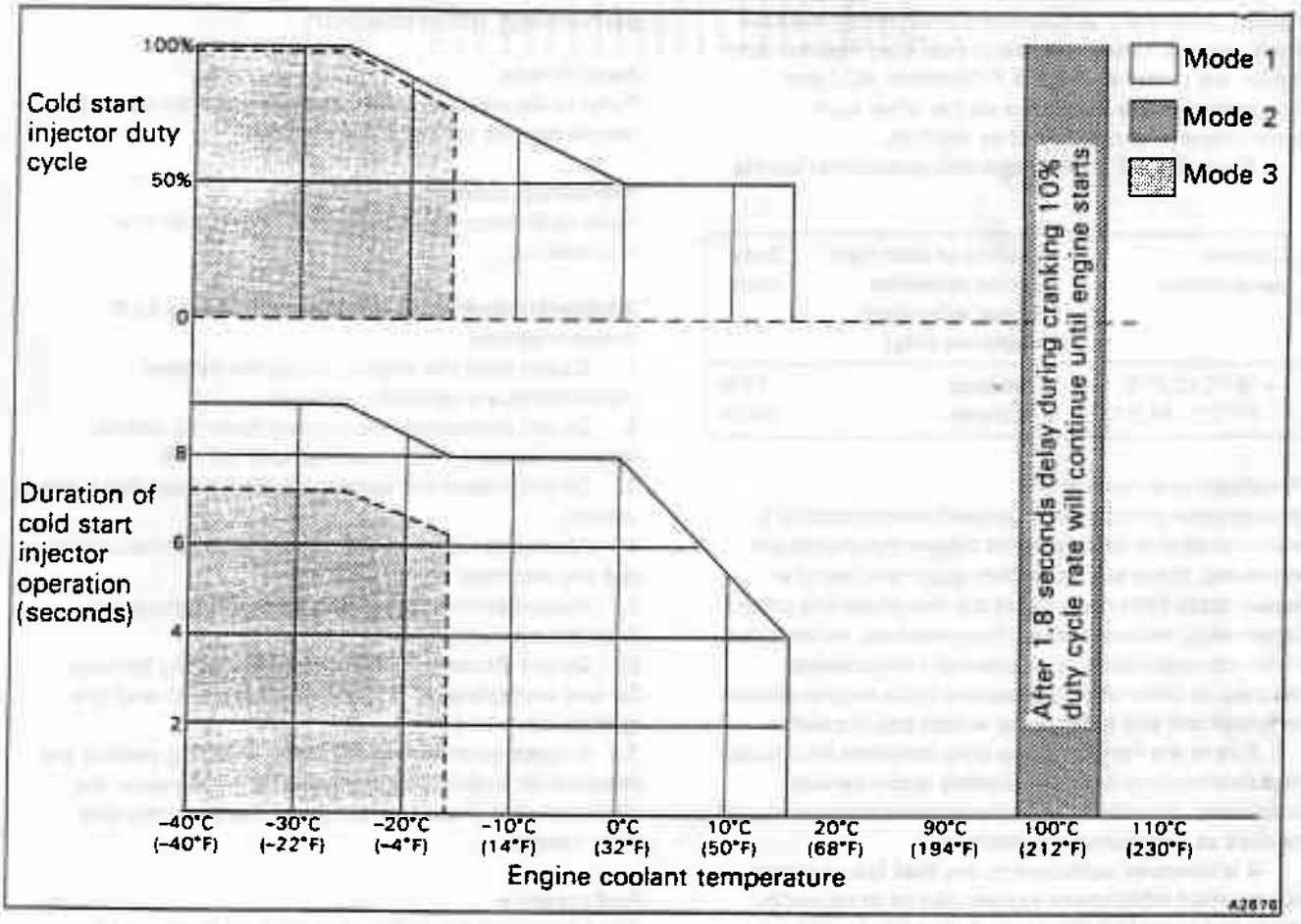


Fig. B4-33 Cold start injector operation

extrapolated at the −26°C (−14.8°F) site value.

Duty cycle control of the cold start injector voltage supply provides additional flexibility, matching cold start injection much closer to engine starting requirements.

Coolant temperature sites	Duration of cold start injector operation	Duty cycle
16°C (60.8°F)	4 seconds	50%
0°C (32°F)	8 seconds	50%
−16°C (3.2°F)	8 seconds	80%
−26°C (−14.8°F)	9 seconds	100%
Note For this mode of operation the cold start injector only functions whilst the engine is cranking		

2. Cold start injector function for 'hot' engine starting
When the engine coolant temperature approaches 100°C (212°F) and an engine cranking period exceeds 1.8 seconds, the cold start injector is energized and provides fuel injection into the induction manifold at a 10% duty cycle rate. This fuel flow supplements fuel from the main injectors resulting from air sensor plate deflection.

This feature provides hot engine starting assistance during adverse operating conditions.

3. 'After start' cold start injector operation
At engine coolant temperatures below −16°C (3.2°F) further 'after start' assistance is provided by the cold start injector. Time periods and cold start injector duty cycles are preset within the K-Motronic ECU and commence at the same time as the 'after start' enrichment period provided by the EHA.

Figure B4-33 provides graphic operational details.

Coolant temperature	Duration of cold start injector operation (during 'after start' assistance only)	Duty cycle
−16°C (3.2°F)	6 seconds	75%
−26°C (−14.8°F)	7 seconds	100%

Acceleration enrichment
Acceleration enrichment is present when specific K-Motronic engine management trigger thresholds are exceeded, these are dependent upon the rate of air sensor plate deflection. Once the threshold rate of air sensor plate movement has been reached, an increase in mA corresponding to acceleration enrichment reaches its peak value (dependent upon engine coolant temperature) and fades away within one second.

Due to the fast response time, accurate in-vehicle measurements will not be possible under service conditions. Therefore, the following information should be used as approximate guidelines.

It is however, sufficient to say that failure of the acceleration enrichment system can be detected by either unacceptable flat spots during the engine warm-up phase (cars fitted with catalytic converters) or poor acceleration response (cars not fitted with catalytic converters).

An instant functional check can be achieved by 'blipping' the throttle with the vehicle stationary. This should result in corresponding pulses in mA readings over the following range of engine coolant temperatures.

On cars fitted with catalytic converters, acceleration enrichment commences at an engine coolant temperature of 16°C (3.2°F), coolant temperatures below this result in higher levels of acceleration enrichment.

On cars not fitted with catalytic converters, a small amount of acceleration enrichment is present at engine coolant temperatures above 60°C (140°F).

Below this value acceleration enrichment factors increase with decreasing engine coolant temperatures in a similar manner on all cars.

Effect of engine coolant temperature on the digital ignition system
During the engine warm-up phase improved combustion efficiency is achieved with additional ignition advance. Refer to the ignition control system section for details.

Fuel injection system - Workshop servicing information

Health risks
Refer to Section A3, General information for health risk details relating to fuel and engine oils.

Workshop safety precautions
Refer to Section A3, General information for this information.

Additional information when working on the KE3 - Jetronic system
1. Do not start the engine unless the battery connections are securely fastened.
2. Do not disconnect the battery from the vehicle electrical system when the engine is running.
3. Do not charge the battery whilst it is installed in the vehicle.
4. Always remove the K-Motronic ECU before carrying out any electrical welding work.
5. Always ensure that all 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.

Fuel pressure
The fuel injection system contains fuel that may be pressurized to 6,3 bar (91.3 lbf/in²). Therefore, to reduce

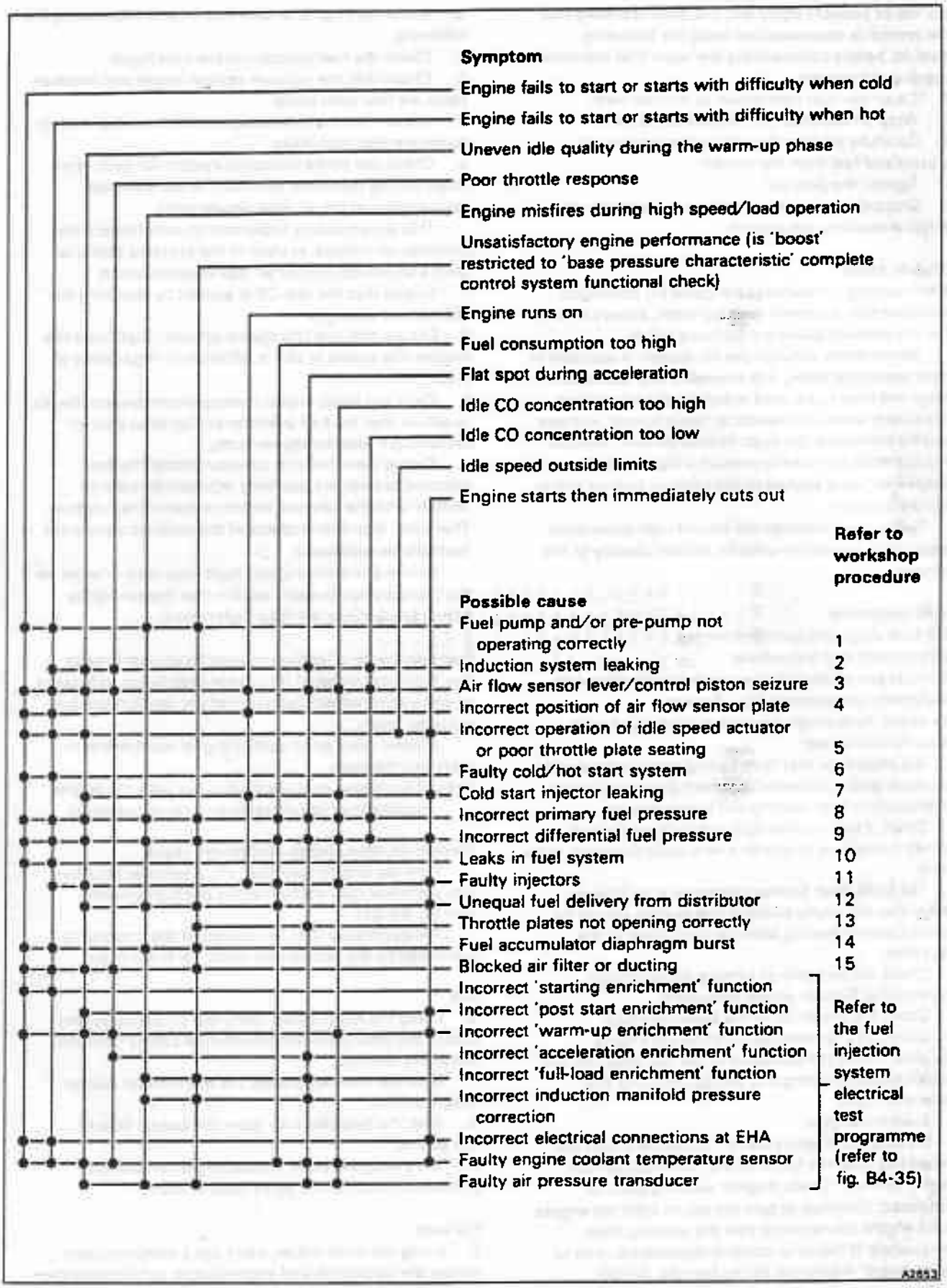


Fig. B4-34 Basic KE3-Jetronic fault diagnosis chart

the risk of possible injury and fire, always ensure that the system is depressurized using the following method, before commencing any work that will entail opening the system.

1. Clean the inlet connection to the fuel filter.
2. Wrap an absorbent cloth around the joint.
3. Carefully slacken the pipe nut to release any pressurized fuel from the system.
4. Tighten the pipe nut.
5. Discard the absorbent cloth in accordance with health and safety regulations.

Exhaust gases

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

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 'ramp bound'. In these specific instances, the 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.

Fault diagnosis

This fault diagnosis section includes.

Basic system test procedures
Electrical and electronic components fault diagnosis
Mechanical components fault diagnosis
'On-board' fault diagnosis coding (cars fitted with catalytic converters).

It is important that fault finding is carried out in the sequence given to prevent incorrect diagnosis which could result in both lengthy and costly repairs.

Often, a mechanical fault has sufficiently well defined symptoms to enable a very rapid diagnosis to be made.

The **basic fault finding procedure** is as follows, noting that any faults found in one system should be rectified before moving onto the next stage of the procedure.

1. Check the integrity of all hose and electrical connections. Tighten where necessary.
2. Check the condition of the sparking plugs.
3. Carry out a compression test on the engine cylinders. Inhibit the operation of the fuel injection and ignition systems during this test by removing the respective fuses.
4. Start the engine.

On cars fitted with catalytic converters, turn the ignition key from the LOCK to the RUN position and observe that the 'Check Engine' warning panel is illuminated. Continue to turn the key to start the engine. As the engine starts check that the warning lamp extinguishes. If the lamp remains illuminated, refer to the 'on-board' diagnostic listing (see fig. B4-36).

5. Ensure that the engine is running on all eight cylinders.
6. Allow the engine to fully warm-up, whilst noting the following.

a. Check the fuel injection system for leaks.
b. Check that the vacuum system hoses and pressure pipes are free from leaks.
c. Check that the crankcase emission control system hoses are free from leaks.
d. Check the entire induction system for audible air leaks, paying particular attention to components downstream of the air flow sensor plate.

This is particularly important on cars fitted with catalytic converters, in view of the systems ability to learn and provide limited air leak compensation.

7. Ensure that the idle CO is correct by checking the idle mixture strength.
8. Ensure that the idle speed actuator stabilizes the engine idle speed at 580 ± 20 rev/min regardless of load.
9. Carry out basic engine management system checks to ensure that the fuel injection and ignition control systems are functioning correctly.

During manufacture, components of the fuel injection system are precisely adjusted in order to comply with the relevant emission control regulations. Therefore, alterations to any of the settings should not normally be necessary.

Before commencing any fault diagnosis or work on the fuel injection system, ensure that the workshop safety precautions are fully understood.

Fuel injection and ignition system functional checks

The following series of functional checks are necessary to ensure the correct definition of the ignition and fuel systems 'maps'.

Always use a good quality digital multi-meter to carry out the tests.

Note The checks must be carried out with the engine stabilized at its normal operating temperature.

Throttle position switch - continuity check

1. With the engine switched off, disconnect the four way electrical plug to the throttle position switch (see fig. B4-37).
2. Always ensure that movement of the throttles is controlled by the accelerator pedal for these tests.

Idle

3. Using the multi-meter, carry out a continuity test across the black/pink and blue/purple cables from the switch as follows.
4. With the throttles closed the multi-meter buzzer should sound.
5. With the throttles fully open the buzzer should not sound.
6. The switching point should be just off the idle position and confirmed by an audible click.

Full load

7. Using the multi-meter, carry out a continuity test across the black/pink and yellow/purple cables from the switch as follows.
8. With the throttles closed the multi-meter buzzer

Figure B4-35

Fuel injection system – electrical test programme – fault diagnosis chart

Sheet 1 of 2

Bosch KE3-Jetronic fuel injection system electrical test programme

Electro-hydraulic actuator (EHA) – measuring internal resistance
Remove the multiple plug from the K-Motronic ECU. Measure the resistance between pins 4 and 5 (yellow/orange and white/orange). The reading should be between 18 and 22 ohms.
Is the reading within specification?

NO → Test for continuity or an earth fault in the cables from pins 4 and 5 in the loom socket to the EHA 2 pin plug. If the wiring is found to be satisfactory, the EHA is faulty.

YES ↓

Coolant temperature sensor – measuring internal resistance
Remove the multiple plug from the K-Motronic ECU. Measure the resistance between pins 3 and 8 (yellow/blue and black/slate).
See illustration A for the correct reading.
Is the reading within specification?

NO → If the resistance measured is 'infinity' test for an open circuit in the cables from pins 3 and 8. If zero ohms, check for a short circuit across the coolant temperature sensor. If the resistance measured is outside the specification given in illustration A, the coolant temperature sensor is faulty.
Note If the 2 way connector to the coolant temperature sensor becomes either disconnected or short circuit the 'Check Engine' warning panel on the facia will illuminate and the K-Motronic engine management system will resort to its limp home mode(see blink codings).

YES ↓

Operation of the throttle position switch – idle mode
Remove the multiple plug from the K-Motronic ECU. Carry out a continuity test between pins 26 and 35 (black/purple and black/pink).
Throttle plates closed - buzzer is audible
Throttle plates open - buzzer stops (switching point just off the idle position and identified by an audible 'click').
Are the readings within specification?

NO → Test for continuity directly at the throttle position switch. If the switch is still outside the specification, it is faulty or or incorrectly adjusted. Also check the throttle linkage for sticking. If the switching function is satisfactory, test for an open circuit in the cables.

YES ↓

Operation of the throttle position switch – Full throttle mode
Remove the kick-down relay (to prevent feed back). Remove the multiple plug from the K-Motronic ECU. Carry out a continuity test between pins 31 and 35 (yellow/purple and black/pink).
Throttle plates closed - no buzzer
Throttle plates open - buzzer is audible (switching point at 72° throttle plate rotation no audible 'click').
Are the readings within specification?

NO → (same as above)

YES ↓

K-Motronic ECU ignition feed
Remove the multiple plug from the K-Motronic ECU. Measure the voltage between pins 14 and 35 (pink/blue and black/pink). Briefly operate the starter motor. The reading should be between 8 and 15 volts.
Is the reading within specification?

YES → **K-Motronic ECU permanent voltage feed**
Remove the multiple plug from the K-Motronic ECU. Measure the voltage between pins 19 and 35 (pink and black/pink) as follows.
Ignition off – 12 to 15 volts
Ignition on – 12 to 15 volts
Cranking – 8 to 15 volts
Are the readings within specification?

YES → **Voltage supply for th potentiometer**
Remove the 3 pin con potentiometer. Switch measure the voltage a (black/slate) and pin 3 connector. This should 5.0 volts.
Is the reading within

NO ↓

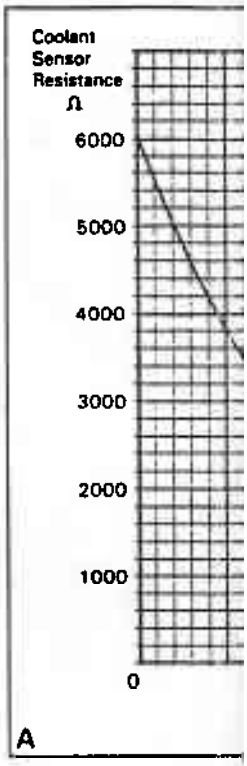
Trace the pink/blue cable back from pin 14 in the K-Motronic ECU plug and check for an open circuit.
Check the over voltage relay for correct functioning. Check for fuse integrity.

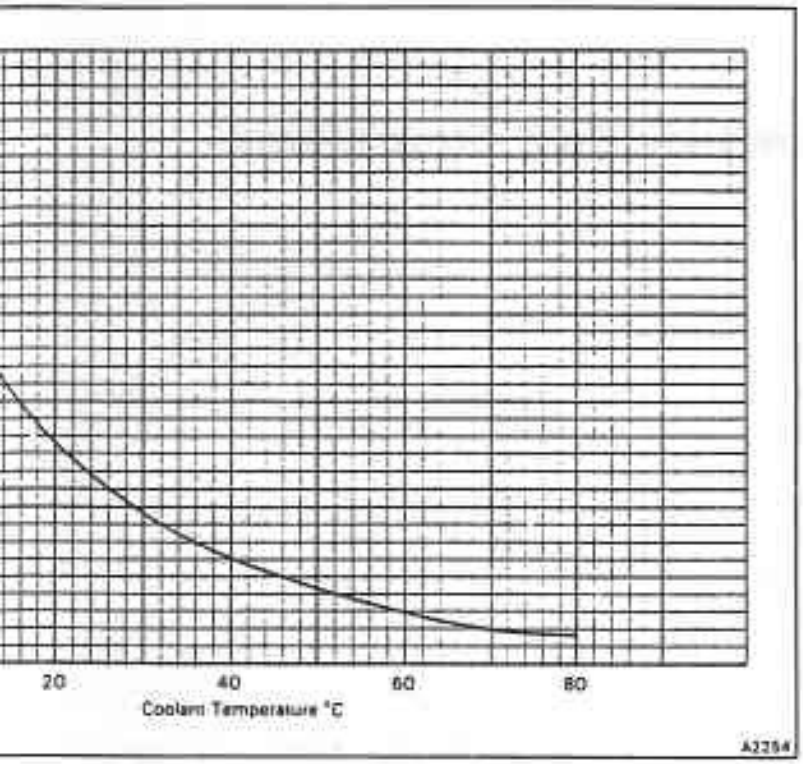
NO ↓

Trace the pink cable back from pin 19 in the K-Motronic ECU plug.
Check for an open circuit (including fuse B5 on fuseboard 2 (20 amp)). Check the vehicle isolator switch and the battery (state of charge etc.).

N ↓

Switch on the ignition 4.5 and 5.0 volts direc ECU pins 8 and 26 (bl yellow/blue). If the rea satisfactory, test for an cables between the po
If the reading is still specification the ECU i





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.

airflow sensor

ctor from the
n the ignition and
oss pin 1
blue/yellow) in the
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pecification?

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d test for between
y at the K-Motronic
k/slate and
ng is now
pen circuit in the
ntiometer and ECU.
ıtside the
faulty.

YES

Using the multi-meter probes measure the voltage across pin 1 (black/slate) and pin 2 (blue/pink) with the ignition switched on. Slowly depress the airflow sensor plate. The voltage reading should progressively increase from a base line of zero volts (with increasing airflow sensor plate deflection) up to a maximum of between 4.5 and 5.0 volts.
Is the reading within specification?

YES

Continued on sheet 2

NO

If the reading is outside the specification, replace the airflow sensor potentiometer

Figure B4-35

Fuel injection system – electrical test programme – fault diagnosis chart

Sheet 2 of 2

Continued from sheet 1

Stand current
Connect a digital multi-meter in series with the EHA using the special adapter RH 9893, switch on the ignition. Note that the stand current should remain constant at 100 ± 2mA whilst the ignition is switched on. This should also result in an audible buzz as both the pre and main fuel pumps energize for approximately 1 second.
Is the reading within specification?

NO

YES

Starting, after start, and warm-up enrichment
Connect a digital multi-meter in series with the EHA using the special adapter RH 9893. Start the engine whilst observing the multi-meter reading. Consult the enrichment factors charts (fig. B4-31). Cross check the start, after start, and warm-up factors with the vehicle's coolant temperature.
Note Refer to note regarding coolant temperatures at the bottom of figure B4-31.
Are readings within specification?

NO

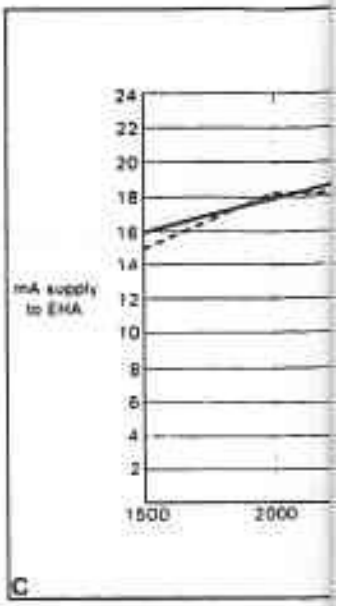
YES

Stabilized engine operating conditions – hot idle
With the engine running at idle speed (580 ± 20 rev/min) and an engine coolant temperature of at least 80°C (176°F), check the supply of milliamps to the EHA.
Cars not fitted with catalytic converters
Supply is fixed at a nominal value of 0mA ± 1mA.
Cars fitted with catalytic converters
Supply should oscillate about a median of 0mA with a band width of ± 3mA.
Is the reading within specification?

NO

YES

If the reading is outside the specification (and all preceding tests in the programme have been successfully carried out), the K-Motronic ECU is faulty.
If no reading is obtained, check for an open or short circuit in the leads from pins 4 and 5 (yellow/orange and white/orange) on the K-Motronic ECU to the EHA
Rectify leads and/or replace the K-Motronic ECU

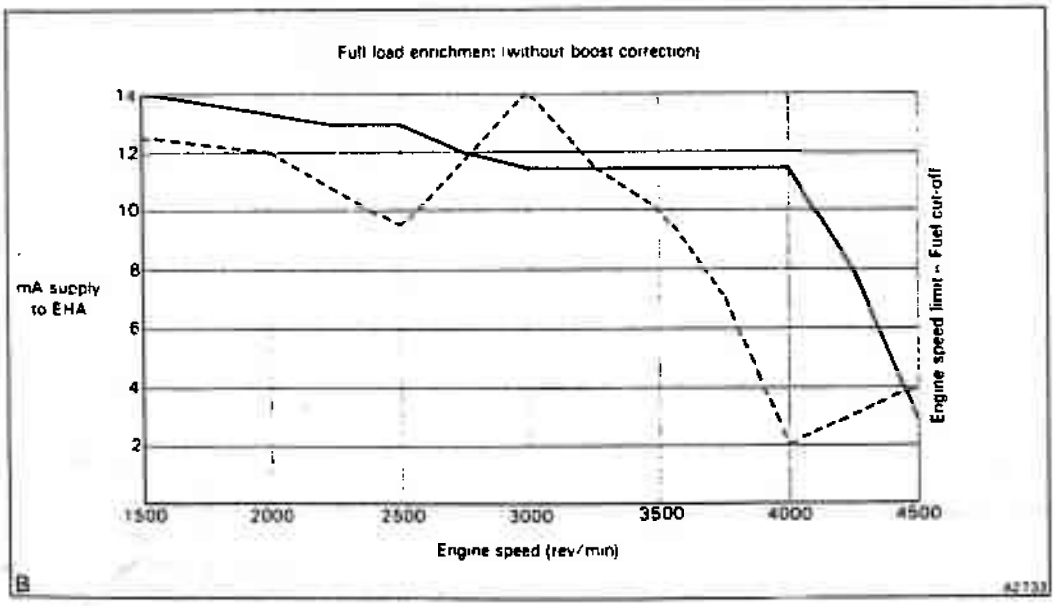


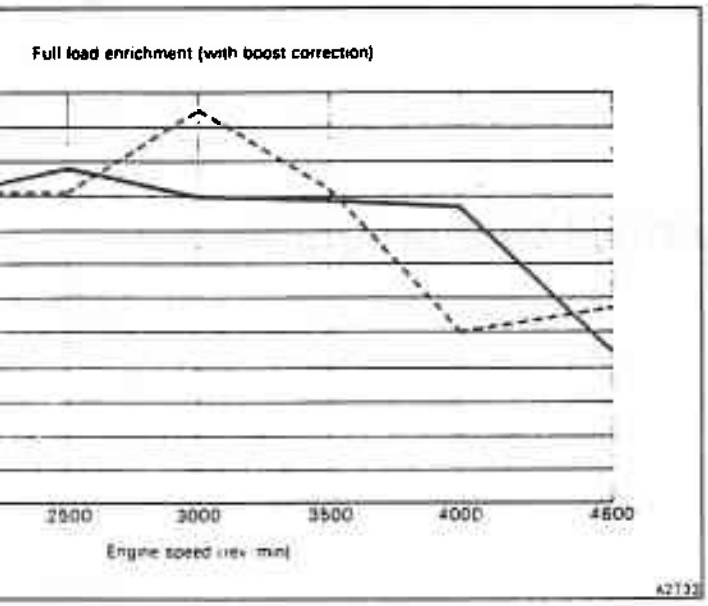
Full load enrichment (without correction)
Due to plausibility constraints w
K-Motronic ECU, if loss of full lo
is suspected it must be checked
vehicle operation. Fit an analogu
such that the meter reading can
by a front seat passenger. Using
leads and the adapter RH 9893
meter in series with the EHA. D
K-Motronic air pressure transdu
illustration D. Complete a full th
start acceleration and monitor th
EHA, along with engine speed fi
vehicle tachometer. Cross check
the test against the appropriate
map, see illustration B.
Due to the slow response of a
meter only consider the salient
points on the full load character
Is the range of values within

YES

Full load enrichment (with bo correction)
Ensure that the pipe has been r
the K-Motronic air pressure tran
Repeat the previous test. Cha
curve should now include boost
see illustration C.
Is the range of values within

YES

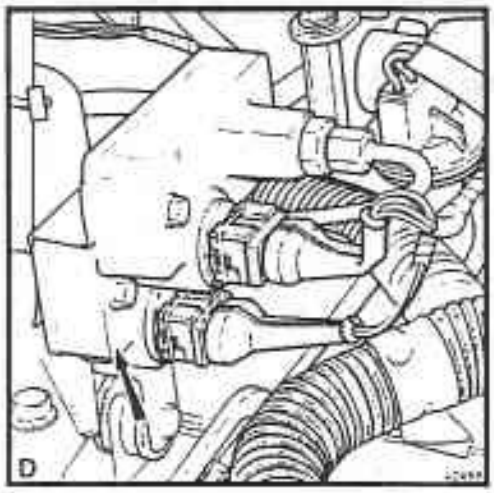




The mA values on graphs B and C are nominal and should only be used as a guideline for transient measurements.

Valid for ambient air temperatures of up to 25°C (77°F).

—— Cars fitted with catalytic converters
- - - - Cars not fitted with catalytic converters



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sducer (APT).
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correction,

pecification?

NO

Disconnect the multiple plug from the K-Motronic ECU. Check for throttle postion switch integrity, black/pink – pin 35, yellow/purple – pin 31, and blue/purple – pin 28. Also check the operation of the throttle position switch by using the accelerator pedal to operate the linkage. Ensure full load and idle map actuation.

Trace both the blue/purple and the yellow/purple leads beyond the K-Motronic engine management system for possible failure modes refer to TSD 4848.

Is a failure confirmed?

NO

YES

NO

Check for continuity of cables from the air pressure transducer to the K-Motronic ECU (with both plugs disconnected)

APT	Cable colour	K-Motronic ECU
Pin 1	black/pink	Pin 35
Pin 2	green/slate	Pin 6
Pin 3	purple/brown	Pin 21

Are they continuous?

NO

Rectify as necessary

YES

Check the boost control system
Refer to the appropriate flow chart in Chapter D.
Does the system function correctly?

NO

YES

To complete this test programme check the idle mixture strength and the operation of the idle speed actuator. Refer to the appropriate pages of Chapter B.

K-Motronic fuel injection system electrical test programme

Electro-hydraulic actuator (EHA) – measuring internal resistance
Remove the multiple plug from the K-Motronic PCME. Measure the resistance between pins 4 and 5 (yellow/orange and white/orange). The reading should be between 18 and 22 ohms.
Is the reading within specification?

NO → Test for continuity or an earth fault in the cables from pins 4 and 5 in the loom socket to the EHA 2 pin plug. If the wiring is found to be satisfactory, the EHA is faulty.

YES ↓

Coolant temperature sensor – measuring internal resistance
Remove the multiple plug from the K-Motronic PCME. Measure the resistance between pins 3 and 8 (yellow/blue and black/slate).
See illustration A for the current reading.
Is the reading within specification?

NO → If the resistance measured is 'infinity' test for an open circuit in the cables from pins 3 and 8. If zero ohms, check for a short circuit across the coolant temperature sensor. If the resistance measured is outside the specification given in illustration A, the coolant temperature sensor is faulty.
Note If the 2 way connector to the coolant temperature sensor becomes either disconnected or short circuit the 'CHECK ENGINE' warning panel on the facia will illuminate and the K-Motronic engine management system will resort to its limp home mode (see blink codings)

YES ↓

Operation of the throttle position sensor - Idle mode
Remove the multiple plug from the K-Motronic PCME. Carry out a continuity test between pins 28 and 35 (black/purple and black pink).
Throttle plates closed - buzzer is audible
Throttle plates open - buzzer stops (switching point just off the idle position and identified by an audible 'click').
Are the readings within specification?

NO → Test for continuity directly at the throttle position sensor. If the sensor is still outside the specification, it is a faulty or incorrectly adjusted. Also check the throttle linkage for sticking. If the switching function is satisfactory, test for an open circuit in the cables.

YES ↓

Operation of the throttle position sensor - Full throttle mode
Remove the kick-down relay (to prevent feed back). Remove the multiple plug from the K-Motronic PCME. Carry out a continuity test between pins 31 and 35 (yellow/purple and black/pink).
Throttle plates closed - no buzzer
Throttle plates open - buzzer is audible (switching point at 72° throttle plate rotation no audible 'click').
Are the readings within specification?

NO → (as above)

YES ↓

K-Motronic PCME ignition feed
Remove the multiple plug from the K-Motronic PCME. Measure the voltage between pins 14 and 35 (pink/blue and black/pink). Briefly operate the starter motor. The reading should be between 8 and 15 volts.
Is the reading within specification?

NO → Trace the pink/blue cable back from pin 14 in the K-Motronic PCME plug and check for an open circuit.
Check the over voltage relay for correct functioning. Check for fuse integrity.

YES →

K-Motronic PCME permanent voltage feed
Remove the multiple plug from the K-Motronic PCME. Measure the voltage between pins 19 and 35 (pink and black/pink) as follows.
Ignition off – 12 to 15 volts
Ignition on – 12 to 15 volts
Cranking – 8 to 15 volts
Are the readings within specification?

NO → Trace the pink cable from pin 19 in the K-Motronic PCME plug.
Check for an open circuit (including the fuse). Check the vehicle isolator (if fitted) and the battery (state of charge etc.).

YES →

Voltage supply for the airflow sensor potentiometer
Remove the 3 pin connector from the potentiometer. Switch on the ignition and measure the voltage across pin 1 (black/slate) and pin 3 (yellow/blue) in the connector. This should be between 4.5 and 5.0 volts.
Is the reading within specification?

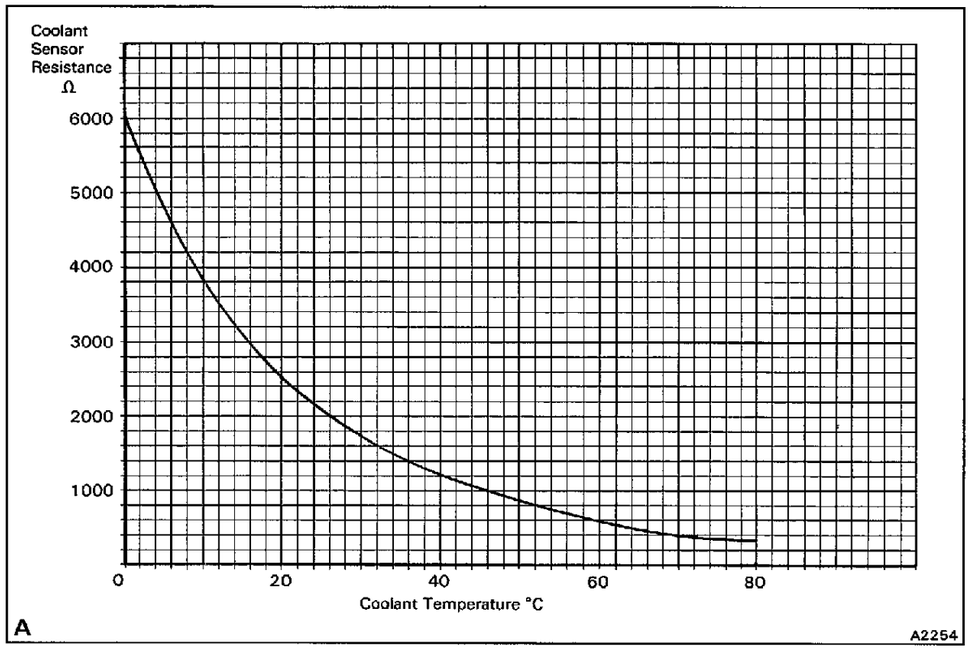
NO → Switch on the ignition and test for between 4.5 and 5.0 volts directly at the K-Motronic PCME pins 8 and 26 (black/slate and yellow/blue). If the reading is now satisfactory, test for an open circuit in the cables between the potentiometer and PCME.
If the reading is still outside the specification the PCME is faulty.

YES →

Using the multi-meter probes measure the voltage across pin 1 (black/slate) and pin 2 (blue/pink) with the ignition switched on. Slowly depress the airflow sensor plate. The voltage reading should progressively increase from a base line of zero volts (with increasing airflow sensor plate deflection) up to a maximum of between 4.5 and 5.0 volts.
Is the reading within specification?

NO → If the reading is outside the specification, replace the airflow sensor potentiometer.

YES → **Continued on sheet 2**



Continued from sheet 1

Stand current
Connect a digital multi-meter in series with the EHA using the special adapter RH 9893, switch on the ignition. Note that the stand current should remain constant at 100 ± 2mA whilst the ignition is switched on. This should also result in an audible buzz as the fuel pump energizes for approximately 1 second
Is the reading within specification?

NO

If the reading is outside the specification (and all preceding tests in the programme have been successfully carried out), the K-Motronic PCME is faulty.
If no reading is obtained, check for an open or short circuit in the leads from pins 4 and 5 (yellow/orange and white/orange) on the K-Motronic PCME to the EHA
Rectify leads and/or replace the K-Motronic PCME

YES

Starting, after start, and warm-up enrichment
Connect a digital multi-meter in series with the EHA using the special adapter RH 9893
Start the engine whilst observing the multi-meter reading. Consult the enrichment factors charts (fig. B2-28). Cross check the start, after start, and warm-up factors with the vehicle's coolant temperature
Note Refer to note regarding coolant temperatures at the bottom of figure B2-28
Are readings within specification?

NO

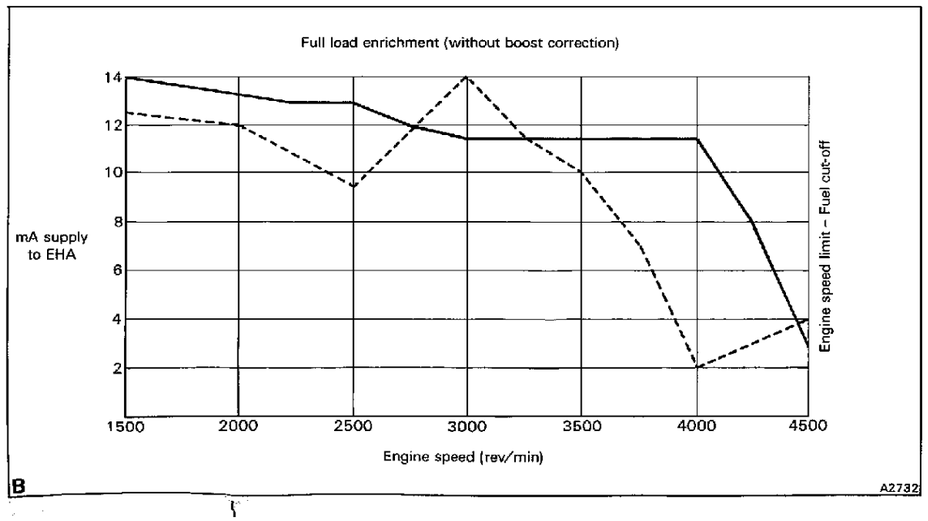
YES

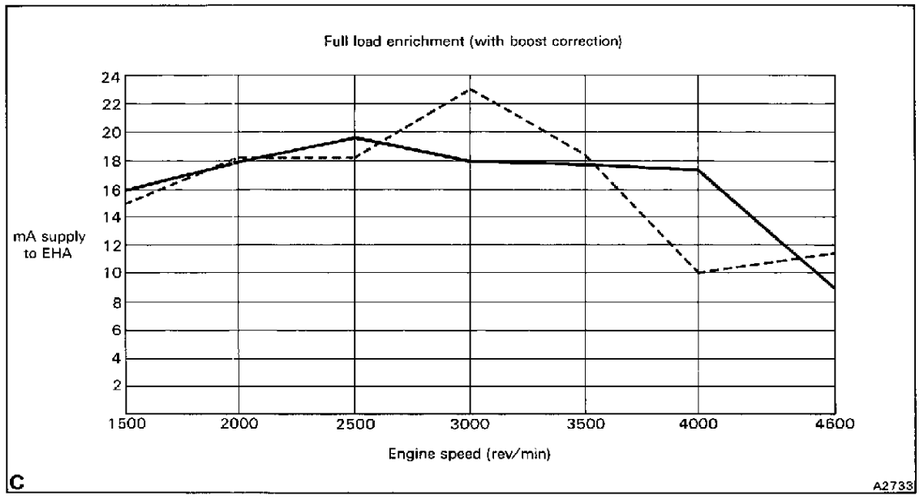
Stabilized engine operating conditions – hot idle
With the engine running at idle speed (580 ± 20 rev/min) and an engine coolant temperature of at least 80°C (176°F), check the supply of milliamps to the EHA (refer to fig. B2-36).
Is the reading within specification

YES (Turbocharged)

YES (Naturally aspirated)

To complete this test programme check the idle mixture strength and the operation of the idle speed actuator. Refer to the appropriate pages of Chapter B.





Full load enrichment (without boost correction)
Due to plausibility constraints within the K-Motronic PCME, if loss of full load enrichment is suspected it must be checked during actual vehicle operation. Fit an analogue mA meter such that the meter reading can be observed by a front seat passenger. Using extension leads and the adapter RH 9893 connect the meter in series with the EHA. Disconnect the K-Motronic air pressure transducer (APT) see illustration D. Complete a full throttle standing start acceleration and monitor the mA to the EHA, along with engine speed indicated by the vehicle tachometer. Cross check the results of the test against the appropriate full load mA map, see illustration B.
Due to the slow response of an analogue meter only consider the salient numerical points on the full load characteristic curve.
Is the range of values within specification?

NO

Disconnect the multiple plug from the K-Motronic PCME. Check for throttle postion switch integrity, black/pink – pin 35, yellow/purple – pin 31, and blue/purple – pin 28. Also check the operation of the throttle position sensor by using the accelerator pedal to operate the linkage. Ensure full load and idle map actuation.
Trace both the blue/purple and the yellow/purple leads beyond the K-Motronic engine management system for possible failure modes refer to either TSD 5002 or TSD 5136.
Is a failure confirmed?

YES

NO

Check for continuity of cables from the air pressure transducer to the K-Motronic PCME (with both plugs disconnected)

APT	Cable colour	K-Motronic PCME
Pin 1	black/pink	Pin 35
Pin 2	green/slate	Pin 6
Pin 3	purple/brown	Pin 21

Are they continuous?

NO

Rectify as necessary

YES

YES

Full load enrichment (with boost correction)
Ensure that the K-Motronic air pressure transducer (APT) has been re-connected.
Repeat the previous test. Characteristic curve should now include boost correction, see illustration C.
Is the range of values within specification?

NO

YES

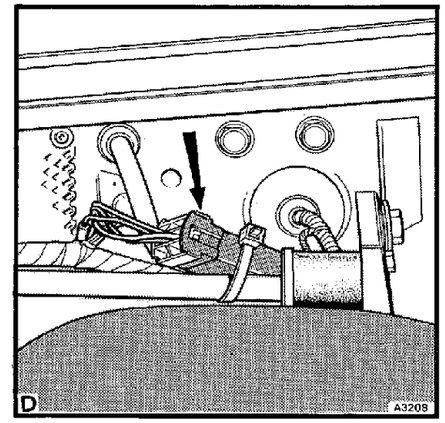
Check the boost control system
Refer to the appropriate flow chart in Chapter D.
Does the system function correctly?

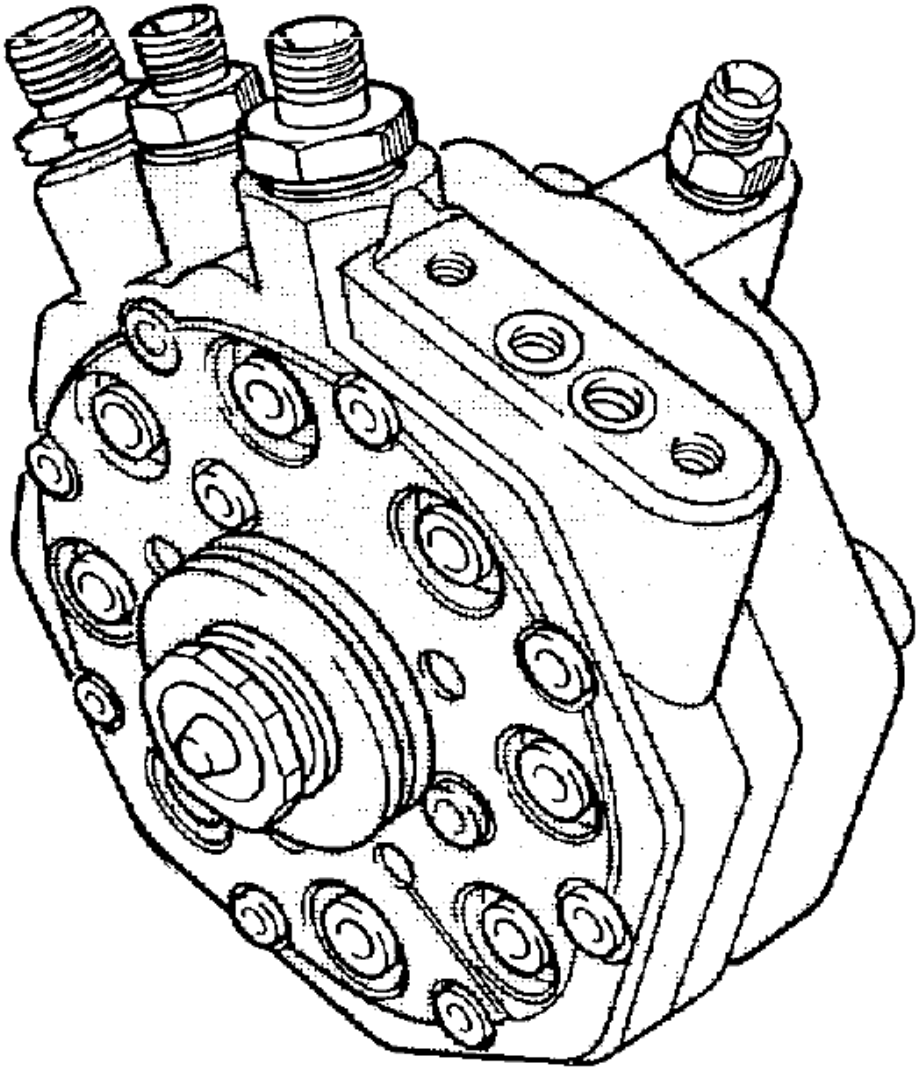
NO

YES

To complete this test programme check the idle mixture strength and the operation of the idle speed actuator. Refer to the appropriate pages of Chapter B.

The mA values on graphs B and C are nominal and should only be used as a guideline for transient measurements.
Valid for ambient air temperatures of up to 25°C (77°F).
Turbocharged cars
—— fitted with catalytic converters
Turbocharged cars
---- not fitted with catalytic converters





Fuel Distributor - Removed

Blink code	'Check Engine' panel illuminated	Dot matrix message	Fault description	System method of recognition	Limp home facility
2.3.1.2.	Yes	COOLANT TEMP SIGNAL	Coolant temperature sensor output outside operating range	Coolant temperature less then -46°C (-50.8°F) or more than +186°C (+ 366.8°F)	K-Motronic PCME provides EHA with mA compensation equivalent to + 80°C (176°) coolant temperature for all operational modes other than starting which is set to + 20°C (68°F)
2.2.3.2.	Yes	AIR FLOW SIGNAL	Incorrect air flow signal	Volumetric air flow rate outside pressure upper and lower threshold limits (i.e. less than 5 m^3hr or more than 1020 m^3/hr)	Ignition and fuelling switched to full load map or idle map respectively
2.1.2.1.	No	IDLE MODE SWITCH	Idle switch fault, idle control maps not recognised	Idle switch closed. Air flow greater than 166 m^3/hr with switch closed for more than 0.3 seconds	Ignition and fuelling switched to part load map
2.1.2.3.	Yes	FULL LOAD SWITCH	Full load switch fault Full load control maps not recognised	Full load switch closed but PCME recognises part load engine operation for more than 0.3 seconds	Ignition and fuelling switched to part load map
2.1.1.3.	Yes	ENGINE SPEED SENSOR	Engine speed sensor and/or connection to the PCME defective. Air sensor plate mechanism or fuel distributor plunger stuck	Ignition switched on, volumetric air flow rate more than 5 m^3/hr but no engine speed signal	None
4.4.3.1.	No	IDLE SPEED CONTROL	Idle speed actuator connecting plug open or short circuit	End stage within K-Motronic PCME	Engine idle speed may drift from the controlled 580 ± 20 rev/min. Normal engine operation under all conditions except idle mode
2.3.4.2.	Yes	LAMBDA SENSOR FAILURE	Lambda sensor and/or connection failure	End stage within K-Motronic PCME	System resorts to open-loop engine operation
2.3.4.1.	Yes	LAMBDA OUTSIDE LIMITS	Lambda control outside threshold limits	EHA current is less than - 14 mA or more than + 21 mA for more than 2 minutes	Once threshold limits are exceeded, further compensation/correction is not available and engine control system effectively resorts to open-loop
2.3.4.3.	No	MIXTURE CONTROL LEAN	Basic idle mixture strength adjustment on mixture control unit set to its lean limit	Adaptive Lambda pre-control increases EHA current more than 10 mA	Engine management system will continue to compensate until threshold limit of + 21 mA is exceeded
2.3.4.4.	No	MIXTURE CONTROL RICH	Basic idle mixture strength adjustment on mixture control unit set to its rich limit	Adaptive Lambda pre-control reduces EHA current more than - 5 mA	Engine management system will continue to compensate until threshold limit of - 14 mA is exceeded
4.3.1.2.	Yes	SPARK TIMING SENDOR	Engine reference sensor and/or its connection to the PCME defective	Synchronisation lost	Dependent upon PCME data update prior to engine reference sensor failure