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4-Cylinder w/CIS-E Motronic

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★ **ALL REVISED** since last filming

CIS-E Motronic (combined fuel and ignition system), repairing

Engine code: 3A

Note

The CIS-E Motronic control unit is equipped with a fault memory system. Before performing repairs, adjustments, or troubleshooting, activate the fault memory system — see Repair Group D2 for additional information.

CAUTION

Control limits are sometimes exceeded during checking and adjustment work. These over-limits are recognized as faults by the control unit and stored in the Permanent Fault Memory.

Be sure to erase the Permanent Fault Memory system after all checking and adjustment work has been performed. See Repair Group D2.

Note

The fuel injection part of the CIS-E Motronic is handled in Repair Group 25. Components of the ignition system such as distributor, ignition coil, etc. are found in Group 28.

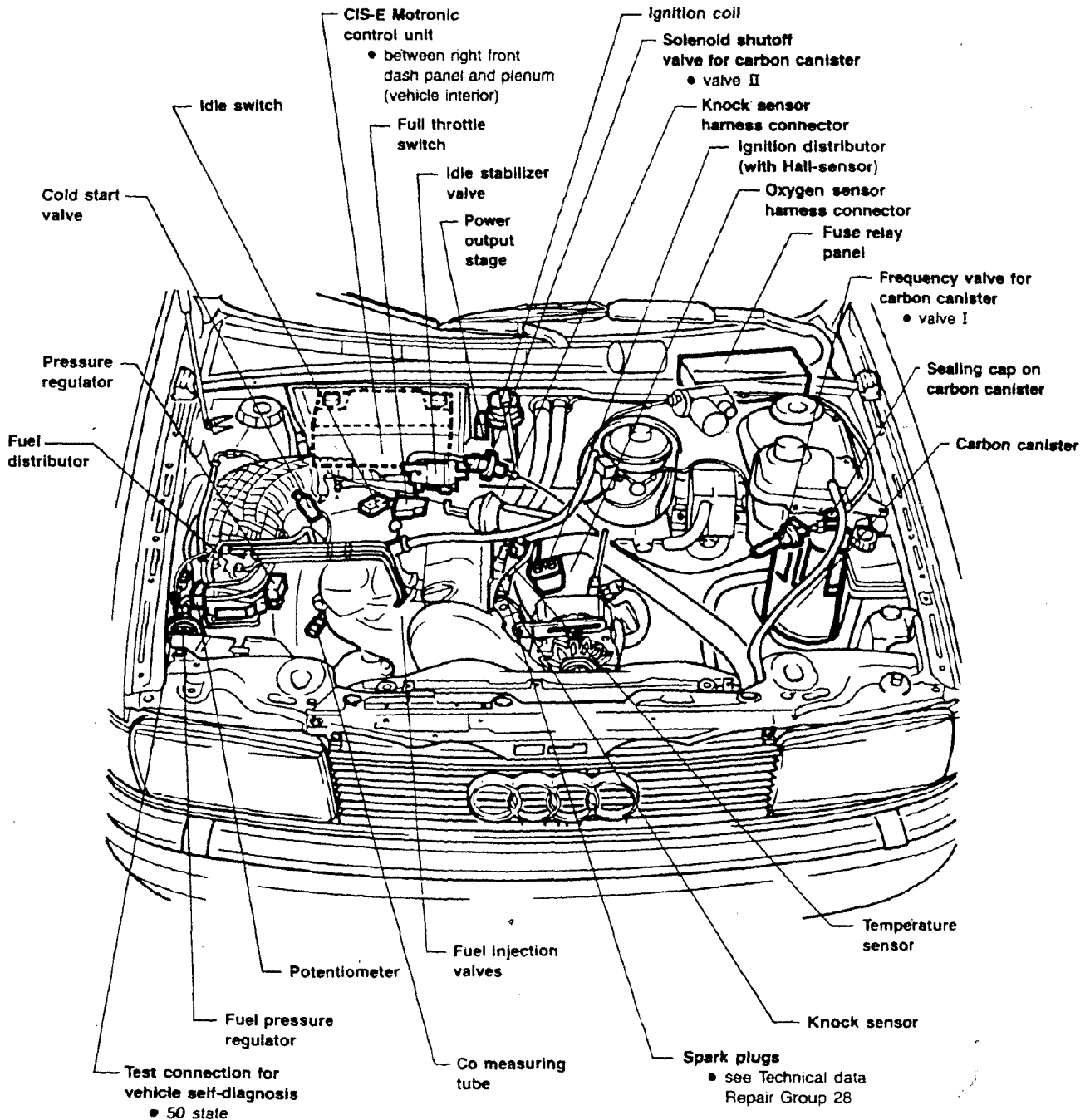
Continuous Injection System

CIS-E Motronic combined fuel and ignition system

Component location — overview

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel.



25-1101

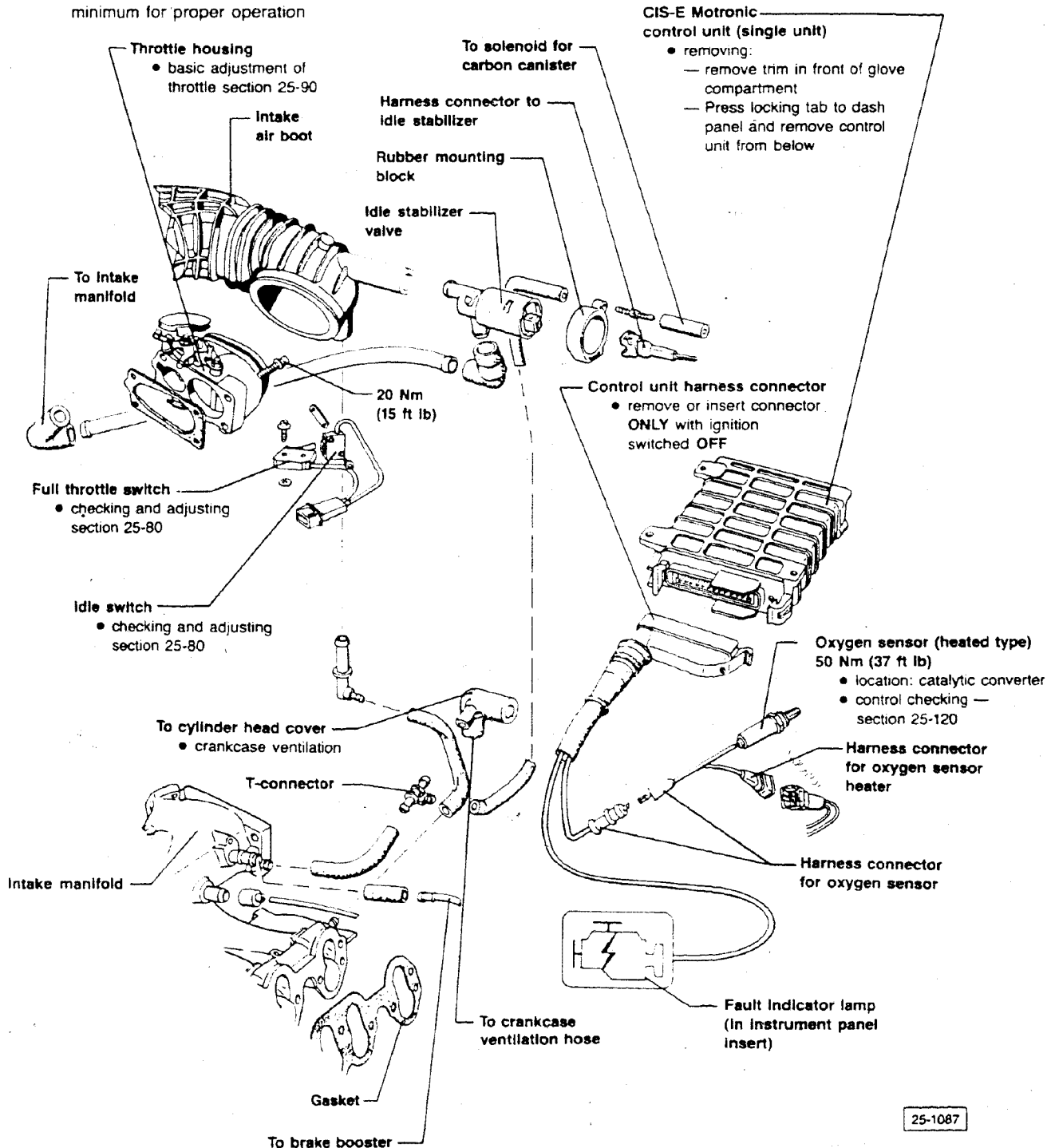
Continuous Injection System

Notes

- replace seals and o-rings
- secure hose connections with either screw clamps or new spring clamps
- electrical components require 11.5 volts minimum for proper operation

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel.



25-1087

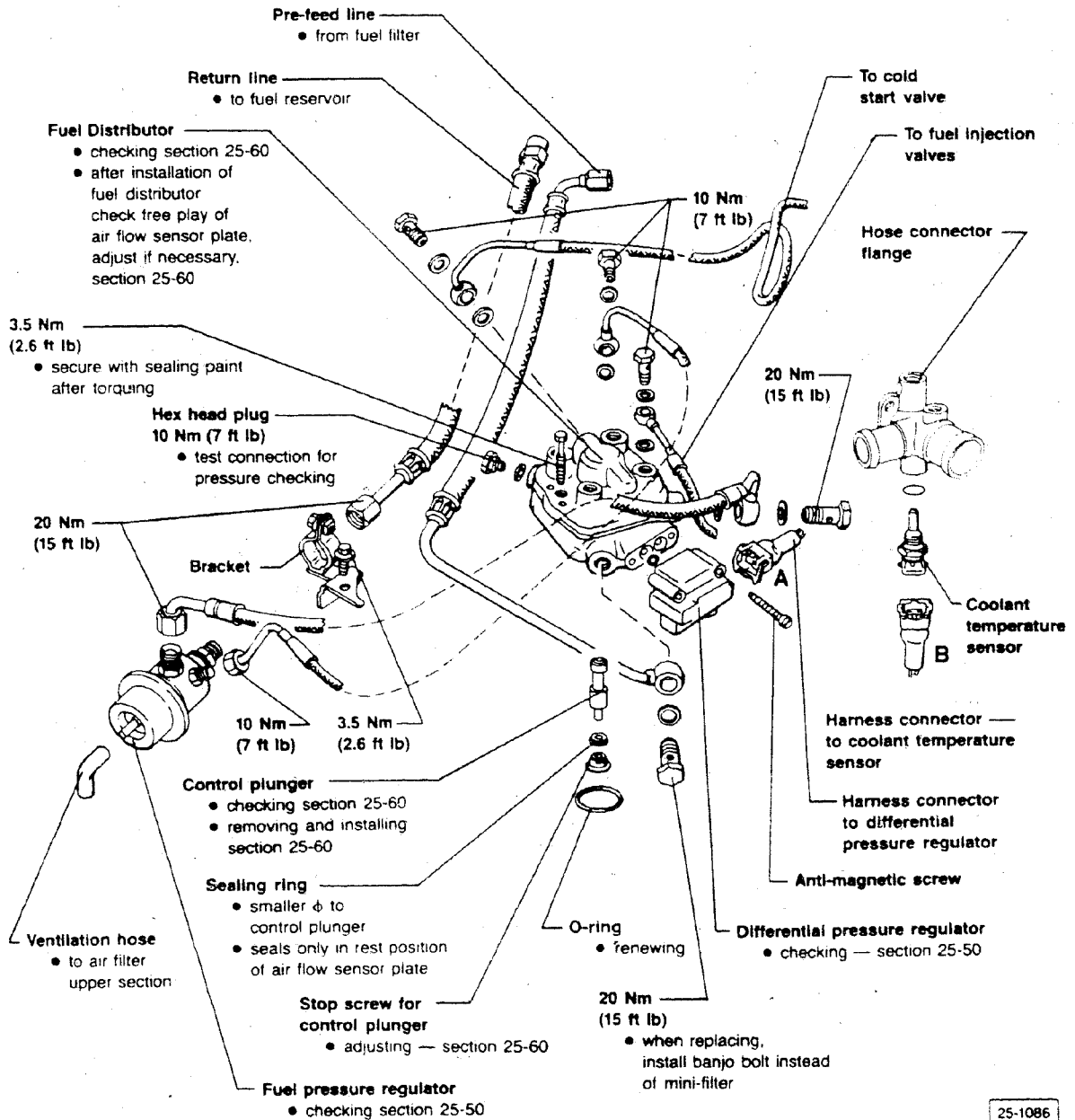
Continuous Injection System

Notes

- replace seals and o-rings
- secure hose connections with either screw clamps or new spring clamps
- electrical components require 11.5 volts minimum for proper operation

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel.



25-1086

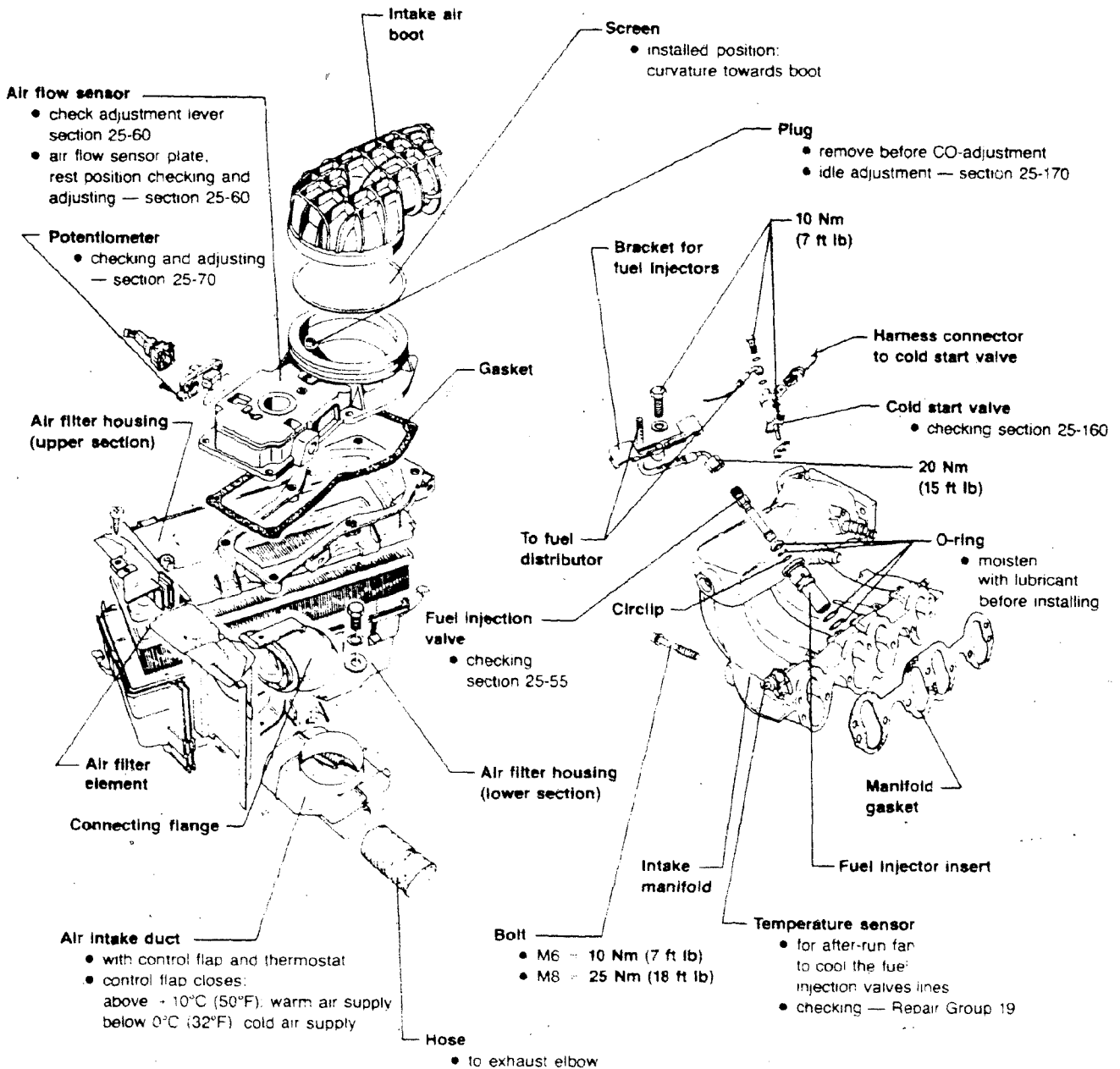
Continuous Injection System

Notes

- replace seals and o-rings
- secure hose connections with either screw clamps or new spring clamps
- electrical components require 11.5 volts minimum for proper operation

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel.



25-980

System precautions

CAUTION

Be alert when you work on the engine. High voltage can injure you and damage components.

Turn ignition OFF:

- when connecting or disconnecting tester leads to ignition system
- when connecting or disconnecting ignition wires
- when washing the engine

Don't forget about the battery:

- do not disconnect battery when engine is running
- for emergency starting use fast charge for 15 seconds only and not more than 16.5 volts
- disconnect battery and CIS-Motronic control unit when using arc, spot, or electrical welding equipment

When testing the system:

- do not apply voltage to control unit to simulate output signals
- when coil wire (terminal 4) is disconnected from distributor, always ground using jumper wire
- with high tension wire disconnected and un-grounded do not crank engine (example: compression test)

When applying heat:

- if components are heated above 80°C (175°F) from paint dryer or steam cleaner, wait for components to cool before starting engine

When towing:

- vehicles with ignition problems (or where problems may be suspected) must have the power output stage of the ignition coil disconnected

Rules of cleanliness

First:

- clean connecting points before loosening

When fuel system is open:

- do not use compressed air if you don't need it
- move vehicle only if you must
- if you cannot finish repairs, carefully cover parts with plastic or paper — not with rags

Use clean parts only:

- do not unwrap new parts before needed
- only use new parts, not loose or unwrapped parts from tool box
- lay removed parts on clean surface. Cover with plastic or paper — not with rags

Technical data

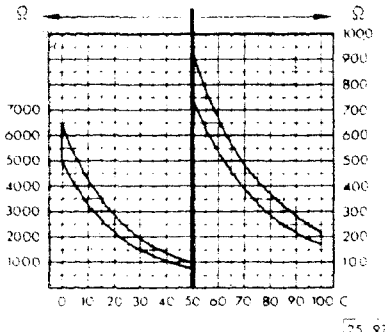
Engine code	3A	
Ignition timing*	checking value	4° to 8° Before TDC
	adjusting value	6 ± 1° Before TDC
Idle speed* (speed not adjustable, controlled by idle stabilization)	780 to 900 RPM	
CO-content*	checking value (on CO-measuring tube)	0.2 to 1.2 vol. %
	adjusting value (adjustment conducted via differential pressure regulator control current-adjustment)	0 to 5 mA (fluctuating)
CIS-E Motronic control unit Part Number	893 907 404	
RPM limit	6300 to 6500 min	
Fuel deceleration via control current reversal on differential pressure regulator		
Throttle switch, switching points	Switch I — idle switch	0.15 to 0.5 mm (0.006 to 0.020 in.) between point where switch begins operating and throttle lever stops
	Switch II — full throttle switch	10° ± 2° before full stop

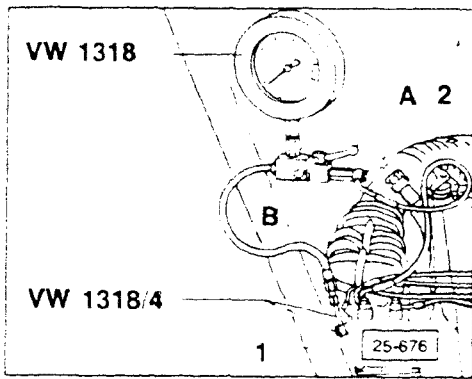
*Observe test and adjustment conditions — see Engine settings, section 25-170 "

Continuous Injection System

Technical data

System pressure	6.1 to 6.5 bar (88 to 94 psi) gauge pressure
Differential pressure	approximately 0.3 to 0.5 bar (4 to 7 psi) below system pressure
1 — harness connector removed from differential pressure regulator	
2 — harness connector reconnected to differential pressure regulator ■ activate starter for about three seconds	approximately 1.3 to 1.6 bar (19 to 23 psi) below system pressure
Residual pressure	
after at least 10 minutes	3.3 bar (47.8 psi) gauge pressure
after at least 20 minutes	3.2 bar (46.4 psi) gauge pressure
Fuel injector(s)	
opening pressure	3.7 to 4.8 bar (54 to 70 psi) gauge pressure
Injection quantity tolerance within a set of injector(s):	
idle measurement (position 1 of 1348/1) at 20 ml fuel quantity	maximum 2.0 ml
full throttle measurement (position 2 of 1358/1) at 80 ml fuel quantity	maximum 8.0 ml

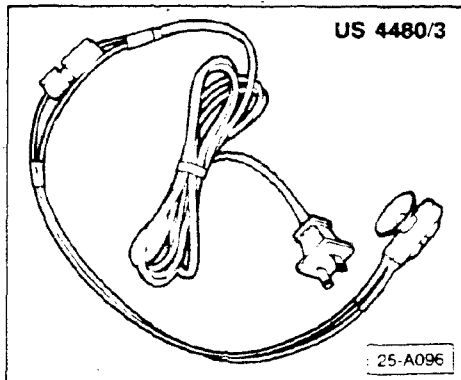
Differential pressure regulator resistance	15 to 25 ohms
 <p>Temperature sensor resistance between terminals</p> <p>Example 1: 2500 ohms at 20°C (68°F) Example 2: 200 ohms at 100°C (212°F)</p>	
Cold start valve resistance	approximately 10 ohms



Fuel pressure, checking

Connecting VW1318 pressure tester

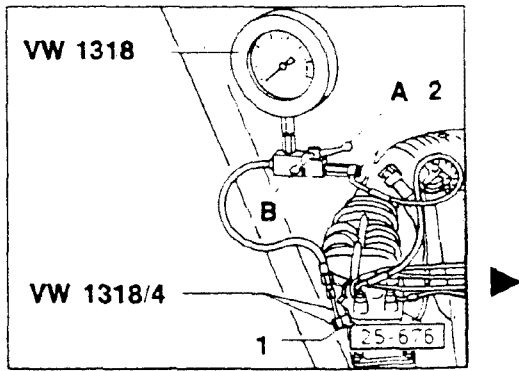
- connector pressure tester **VW1318** to measuring location **1** on fuel distributor using adaptor **VW1318/4**
- connect bolt and line **2** from cold start valve to pressure tester
- turn pressure tester valve to the closed position:
 - A = opened
 - B = closed



Connecting remote control US4480/3

- remove fuel pump relay from fuse relay panel (position **10**)
- switch **US4480/3** to **OFF** position
- jump the relay socket with remote control **US4480/3**

Continuous Injection System



System pressure, checking

Check these first:

- fuse 13 **OK**
- fuel pump **OK** (checking, Group 20)

Always use new sealing rings. Observe the safety precautions, section 25-30.

- open valve on pressure tester **VW1318** and activate remote control **US4480/3**
 - 6.1 to 6.5 bar (89 to 94 psi) gauge pressure

If system pressure too high:

- remove return hose from differential pressure regulator (to return line) and place in a container (to catch any discharged fuel)

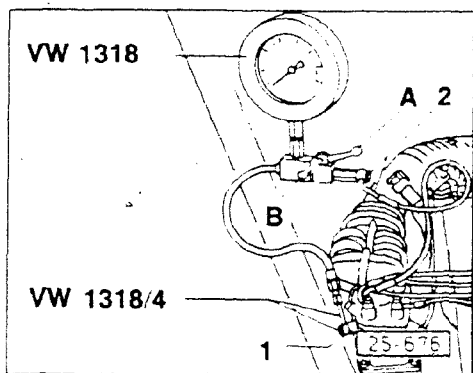
- repeat previous test

If system pressure **OK** now:

- check return line for obstructions or pinching, repair as necessary

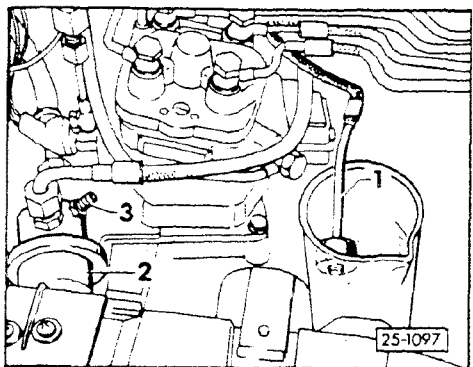
If system pressure too high:

- replace fuel pressure regulator



Differential pressure part I, checking

- close valve on **VW1318** pressure tester
- disconnect harness connector from differential pressure regulator
- activate remote control **US4480/3**
 - pressure must be 0.3 to 0.5 bar (4.3 to 7.3 psi) **BELOW** system pressure previously observed on gauge

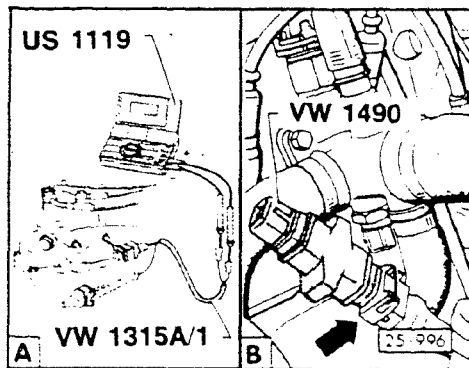


- If pressure difference **NOT OK**
- disconnect small diameter fuel line 1 from fuel pressure regulator 2 and place in a beaker
 - plug opening 3 on fuel pressure regulator
 - switch **ON** remote control **US4480/3** for one minute and measure quantity of discharged fuel:
 - 130 to 150 CCs

If **NO**

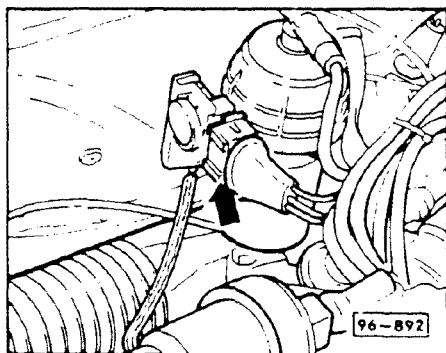
- replace differential pressure regulator
- reconnect fuel line 1 to fuel pressure regulator

Continuous Injection System



Differential pressure part II, checking

- connect multimeter **US1119** to differential pressure regulator. (see A)
- remove harness connector from coolant temperature sensor and insert 15K ohm side of bridge adaptor **VW1490** into harness connector, (see B)

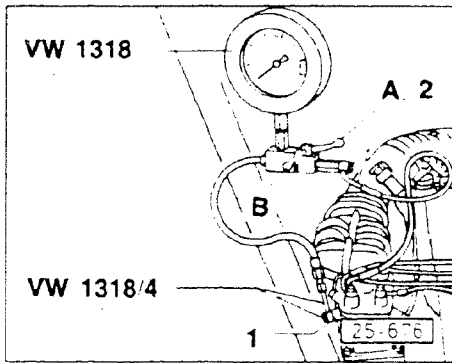


- remove harness connector from power output stage of ignition coil (**arrow**)
- activate starter for approximately 5 seconds, do **NOT** turn **OFF** ignition
- switch **ON** remote control **US4480/3**
 - pressure must be 1.3 to 1.6 bar (18.9 to 23.2 psi) **BELOW** system pressure previously observed on gauge
 - control current must be approximately 110 mA

If pressure difference and control current **NOT OK**

- perform electrical checks, section 25-180
or
- replace control unit

Continuous Injection System



Residual pressure, checking

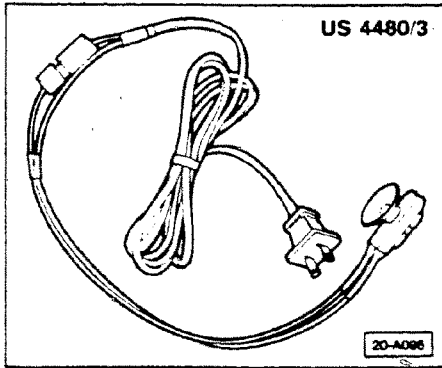
Note

This procedure is required only for hot start problems.

- switch **ON** remote control **US4480/3** for approximately five seconds
- observe pressure drop on **VW1318**, minimum pressure should be:
 - 3.3 bar (48 psi) after 10 minutes
 - 3.2 bar (46 psi) after 20 minutes

If the pressure drop is greater:

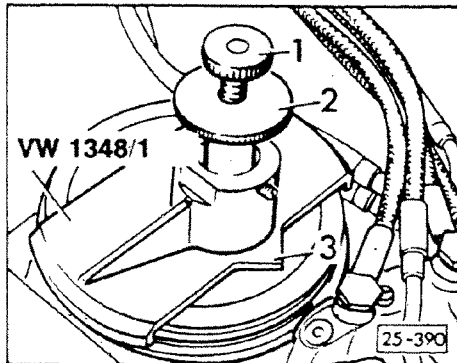
- check fuel pump check valve (see Group 20)
- check air flow sensor plate free play, section 25-60
- check sealing rings in fuel distributor, replace if necessary



Injection quantity, comparative measurement

Check this first:

- fuse 13 OK
- remove fuel pump relay from fuse relay panel (position 10)
- connect remote control **US4480/3**
- remove injector bracket
- remove fuel injectors from seats and insert into openings of fuel analyzer **VW1348/2B**



Note

Carefully route the fuel lines to avoid pinching and bending.

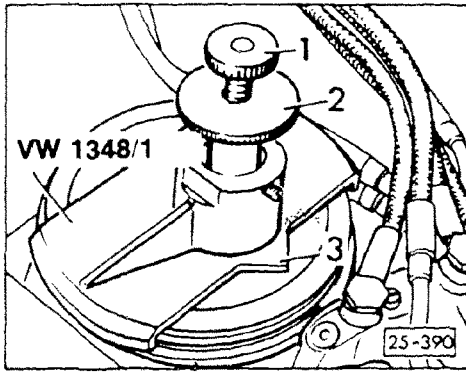
- remove intake air boot

Note

Before installing tool **VW1348/1**, pull slide **2** up to the upper stop. Place the tool centrally on the edge of the air flow sensor. Edge **3** must point in the direction of the fuel distributor.

- install tool **VW1348/1**
- push slide **2** down to stop
- rotate adjusting screw **1** until the base of the magnet contacts the sensor plate mounting screw (sensor plate in rest position)
- pull slide **2** of adjuster up to first stop position (idle setting)
- switch **ON** remote control **US4480/3**
- turn adjusting screw **1** counter-clockwise until beginning of fuel spray is seen at tip of one injector
- drain test analyzer (injection valves can remain inserted)

Continuous Injection System



Idle speed fuel injection quantity, measuring

- lift adjusting slide 2 to first stop (simulated idle)
- switch **ON** remote control **US4480/3** until fuel level of one measuring tube reaches 20 ml level
- note injector spray patterns
 - must be even and cone shaped
 - **ALL** injectors should have the same spray pattern

If one valve is not spraying in a cone shape, lift sensor plate briefly and repeat test.

- compare amounts of fuel for all injectors (hold test analyzer level while observing)
- permissible difference between fuel quantities in all of the tubes must **NOT** be more than:
 - 2.0 ml **maximum**

If fuel quantity in tubes differs between a high and low of more than 2.0 ml:

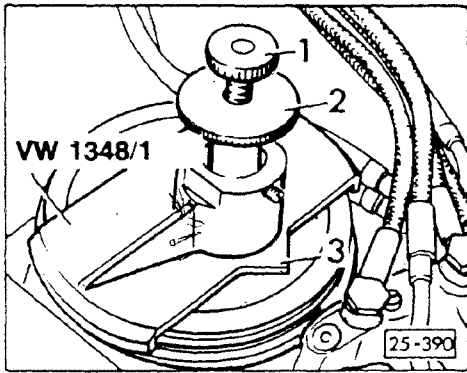
- interchange those two injectors and repeat the test

If difference of injected fuel did **NOT** change after interchanging the injectors:

- check for a pinched fuel line, or the possibility of a defective fuel distributor, repair as necessary

If difference of injected fuel **DOES** change after interchanging the injectors:

- replace those fuel injectors



Full throttle fuel injection quantity, measuring

- empty fuel analyzer (injection valves may remain inserted)
- lift adjusting slide 2 to last stop (simulated full throttle)
- switch **ON** remote control **US4480/3** until fuel level on scale of one measuring tube reaches 80 ml
- note injector spray pattern
 - must be even and cone shaped
 - **ALL** injectors should have the same spray pattern

If **NO**

- briefly lift up sensor plate once, fully, and repeat test
- compare amount of fuel for all injectors (keep analyzer tubes level while observing)
 - permissible difference between fuel quantity in all tubes must **NOT** be more than: 8.0 ml

If fuel quantity in tubes differs between a high and low of more than 8.0 ml:

- interchange those two injectors and repeat the test

If difference of injected fuel did **NOT** change after interchanging the injectors:

- check for a pinched fuel line, or the possibility of a defective fuel distributor, repair as necessary

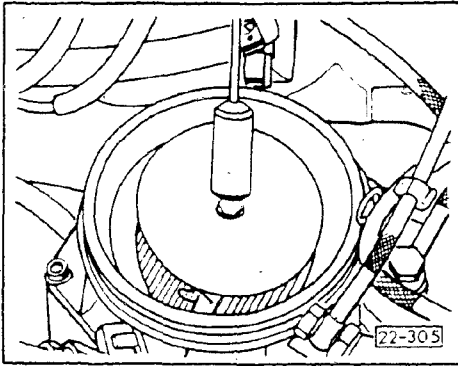
If difference of injected fuel **DOES** change after interchanging the injectors:

- replace those fuel injectors

Immediately after measuring, test injectors for leakage as follows:

- place sensor plate in rest position
- switch **ON** remote control **US4480/3** for approximately two minutes
 - injectors must **NOT** drip

Airflow sensor, checking

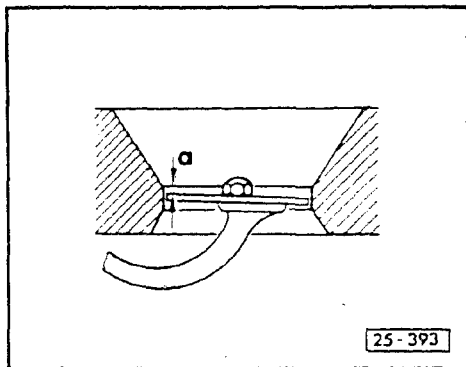


Sensor plate lever/control plunger, checking

- actuate starter for 10 seconds (with coil wire disconnected and grounded) or activate remote control **US 4480/3** for 10 seconds (see section 25-50 for connecting remote control)
- using pliers or a magnet, lift sensor plate through entire range of lever and control plunger travel
 - an even resistance must be felt
- move sensor plate quickly from raised position to rest position
 - **NO** resistance should be felt

If **YES**

- replace air flow sensor
- if sensor plate lever is hard to move upward, but moves freely downward
 - control plunger is sticking
- replace fuel distributor



Air flow sensor plate rest position, checking/adjusting

Checking

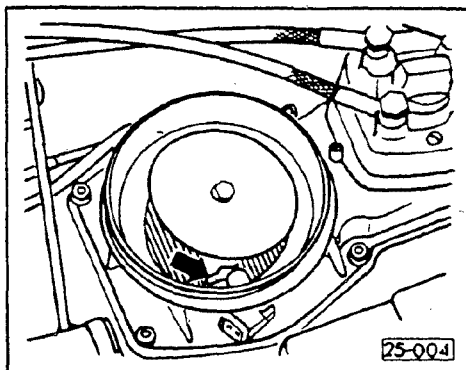
- upper edge of air flow sensor plate must be below lower edge of air cone
 - $a = 1.9$ to 3.0mm (0.075 to 0.118 in)

Adjusting

- raise air flow sensor plate
- adjust position of sensor plate by bending wire clip (**arrow**)

Note

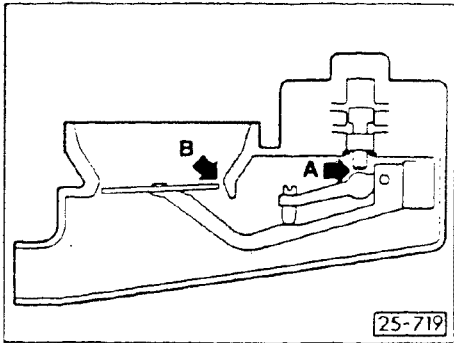
You should try to achieve the smaller setting (1.9mm) if at all possible.



CAUTION

Do not scratch venturi of air flow sensor.
Do not bend leaf spring.

Continuous Injection System



Air flow sensor plate free play, checking

Note

Free play is noted between the control plunger and sensor plate lever (arrow A). It is measured on the side of the air flow sensor facing the fuel distributor (arrow B).

Check these first:

- rest position of sensor plate **OK**
- CO adjustment **OK**
- activate starter for 10 seconds (with coil wire disconnected and grounded) or remote control **US 4480/3** for 10 seconds (to energize the fuel pump)
- slightly lift air flow sensor until resistance is felt
 - minimum clearance: 1.0mm (0.039 in)
 - maximum clearance (up to venturi cone): 3.0mm (0.118 in)

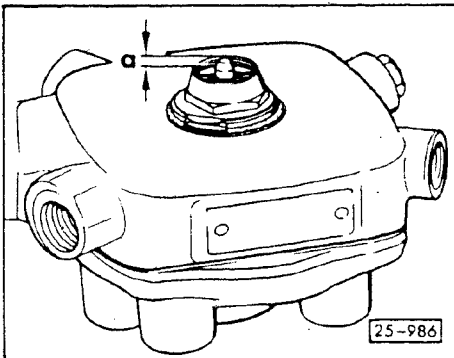
If clearance **NOT OK**

- perform sensor plate free play adjusting with control plunger stop screw as follows:

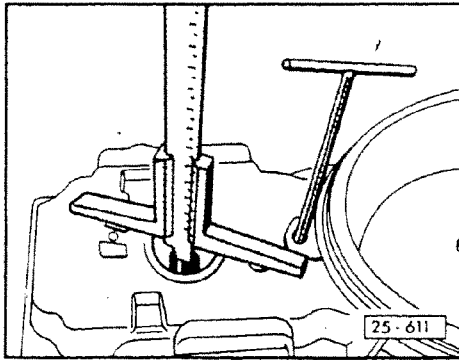
Sensor plate free play adjusting with control plunger stop screw

Varying measurement "a":
(distance "a" = approximately 0.6mm [0.024 in] between stop screw and collar of hex nut)

- turn stop screw clockwise:
clearance gets larger
- turn stop screw counter-clockwise:
clearance gets smaller
- 1/4 turn of stop screw:
approximately 1.3mm (0.05 in) difference on sensor plate
- after adjusting free play, check idle speed,



Continuous Injection System

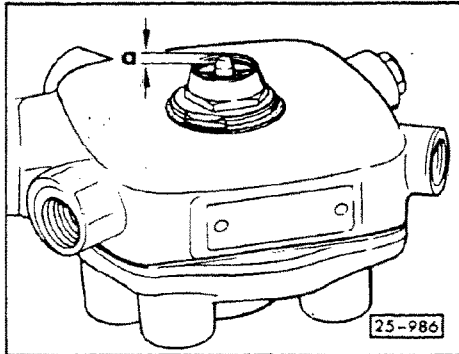


Sensor plate lever, basic adjustment

Note

Always perform basic adjustment of lever when replacing fuel distributor or air flow sensor plate.

- check distance between contact surfaces for fuel distributor on air flow sensor and roller for sensor plate lever, if necessary adjust via mixture adjustment screw
 - $18.8\text{mm} \pm 0.1\text{mm}$ (0.73 ± 0.004 in)

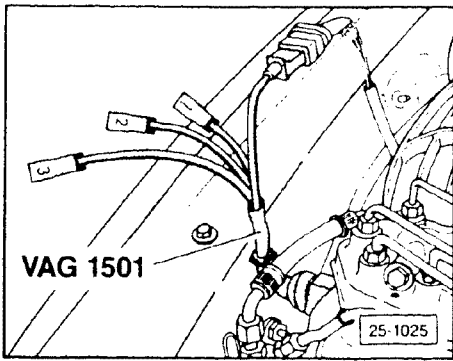


Control plunger, removing/installing

- note measurement "a" before removing stop screw
- remove stop screw and detach control plunger
- clean control plunger with gasoline before installing
- check sealing ring of stop screw for damage, replace if necessary (smaller diameter of sealing ring points to control plunger)
- turn stop screw back in to measurement "a"
- check and adjust rest position and clearance of sensor plate

CAUTION

Mechanical cleaning of control plunger is **NOT** permitted. If after cleaning with solvent, the control plunger is scored or sticking, the entire fuel distributor should be replaced.



Airflow sensor potentiometer, checking/adjusting

Requirement

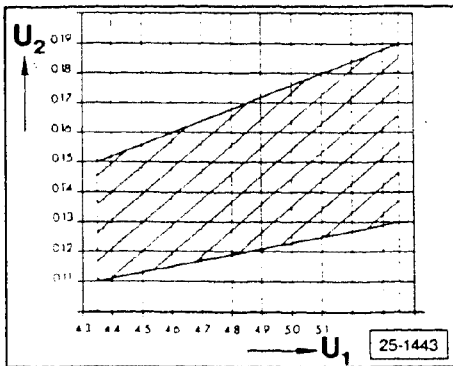
- idle stabilizer valve OK
- all possible vacuum leaks eliminated
- disconnect potentiometer harness connector and connect **VW 1501** test adaptor between potentiometer and harness connector
- switch multimeter **US 1119** to 20 volt range and connect to terminals 1 and 3 (U_1 voltage) of **VW 1501** adaptor
- switch **ON** ignition
 - must be 4.35 to 5.35 volts

If NO

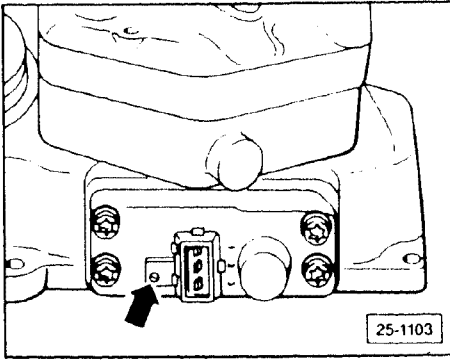
- check wiring between Motronic control unit and potentiometer using wiring diagram, repair as necessary

If wiring OK

- replace Motronic control unit
- switch multimeter **US 1119** to 2 volt range and connect to terminals 2 and 2 (U_2 voltage) of **VW 1501** adaptor
- switch **ON** ignition (but do **NOT** start engine)
 - U_2 voltage must fall within shaded area of graph



Continuous Injection System

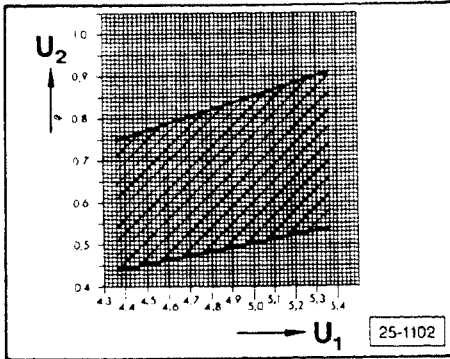


If **NO**

- remove sealing compound covering head of potentiometer trim screw

CAUTION

Do **NOT** damage the trim screw when scraping away the sealing compound.



- adjust U_2 voltage via trim screw (**arrow**), while observing multimeter, until required voltage is obtained

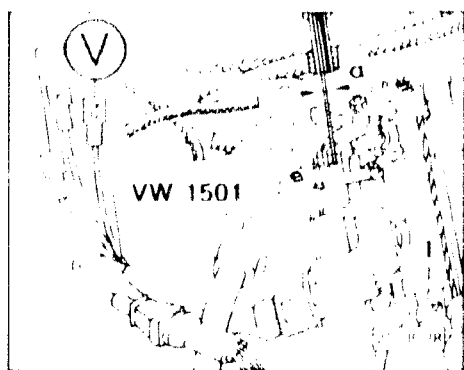
- start engine and observe U_2 voltage
 - must fall within shaded area of graph

If the U_2 voltage does **NOT** fall within the graph

- the U_2 reading is being influenced by another fault condition; possibly a vacuum leak that was overlooked
- potentiometer/airflow sensor plate assembly is faulty
- control unit or related wiring is faulty

If U_2 adjustment **NOT** possible

- replace airflow sensor plate/potentiometer assembly



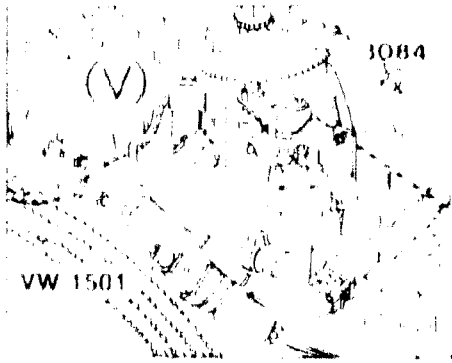
Idle and full throttle switches, checking

- connect test adapter **VW1501** between the throttle switch and the throttle switch harness connector

Idle switch, checking and adjusting

- connect multimeter **US1119** to test connectors **1** and **2** (of test adapter **VW1501**), set meter to DC voltage
 - switch **ON** ignition
 - throttle closed: 0 volt
 - throttle opened slightly: approximately battery voltage
 - open throttle and close slowly. at the same time check the change over point of the idle switch using a feeler gauge between the switch roller and the throttle lever stop
 - change over point gap
 - a 0.15 to 0.5mm (0.006 to 0.020 in) before idle stop
- if NO**
- adjust change-over point gap "a" by moving idle switch 1
 - switch **OFF** ignition

Continuous Injection System



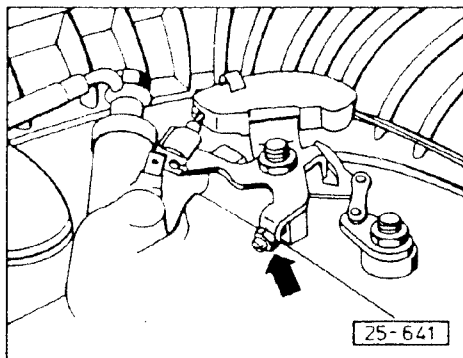
Full throttle switch, checking and adjusting

- connect multimeter US 1119 between test connectors 2 and 3 (ol test adaptor VW1501)
 - switch **ON** ignition
 - throttle closed, approximately battery voltage
 - throttle completely open, 0 volts
 - fasten pointer for protractor **3084** to adjuster for accelerator cable, using a rubber band (**arrow**)
 - screw protractor **3084** onto throttle shaft (unscrew nut on throttle shaft if necessary)
 - push throttle lever to full open (at stop limit) and zero the pointer and disc
 - close throttle to approximately 20%, then slowly move toward full throttle position until full throttle switch engages (0 volts shown on meter)
 - 10% - 2% before contacting full throttle limit stop
- if **NO**
- adjust change-over point by moving full throttle switch 1

Note

Roller on throttle lever must contact the diagonal of the lever from the full throttle switch

Throttle valve basic adjustment



Note

The stop screw is set at the factory and should not be moved. If the screw position has been altered, check the basic adjustment as follows:

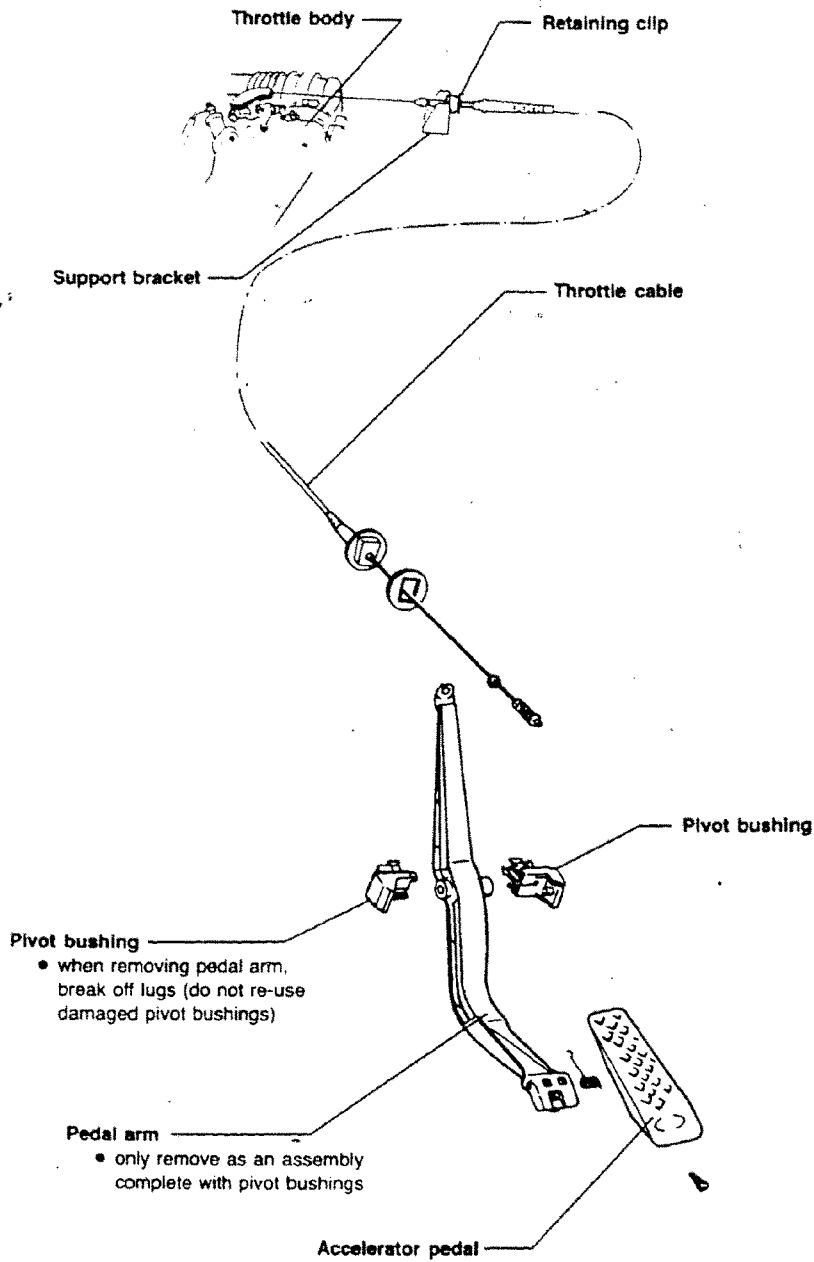
- loosen tensioning nut (**arrow**)
- turn throttle stop screw counter-clockwise until a gap occurs between stop and screw
- turn screw (**arrow**) in until it touches stop

Note

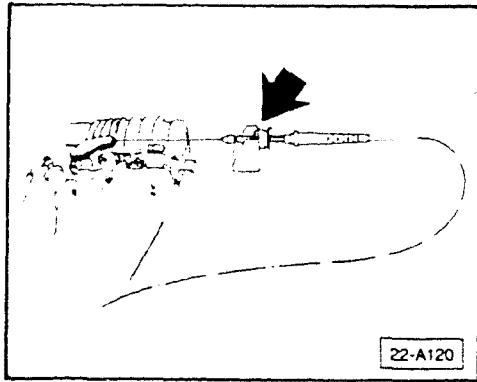
Determine the exact stop point of the limit screw by placing a thin piece of paper between the limit screw and stop. Tug on the paper while turning the screw, when you can just withdraw the paper:

- turn screw clockwise an additional 1/2 turn
- check throttle switch adjustment

Continuous Injection System



20-556



Throttle cable, adjusting

- Adjusting: with the accelerator pedal fully depressed; the throttle valve lever should **just reach** the full throttle position (maximum of 1mm (0.040 in) of play at the throttle lever)

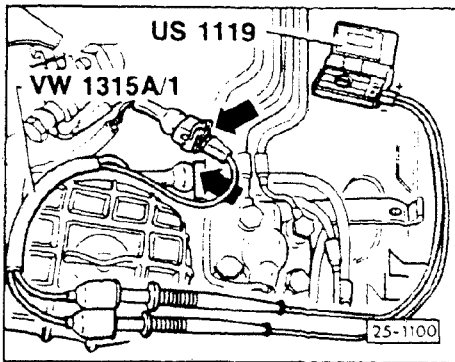
If NO

- adjust cable by inserting the retaining clip (**arrow**) at the support bracket until the adjustment description is obtained
- removing:
 - disconnect cable at pedal arm support bracket and throttle valve lever
 - break off lugs from inside the passenger compartment (do not reuse damaged cables) and take cable out through the engine compartment

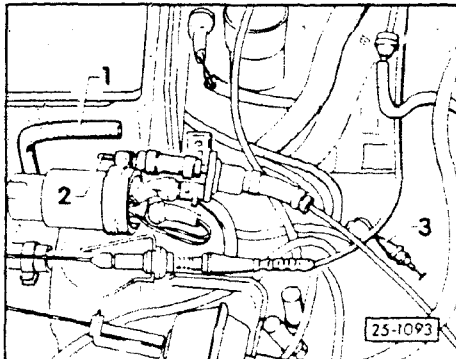
Oxygen sensor control, checking

Check these first:

- engine oil 80°C (176°F) minimum
- idle adjustment OK
- exhaust system between catalytic converter and cylinder head must be tight and free of leakage
- voltage supply to oxygen sensor heater OK
- coolant temperature sensor OK, checking, section 25-80 test step 8



- activate "vehicle self diagnosis," see Repair Group D2
- connect multimeter US 1119 and test adapter 1315A/1 to differential pressure regulator
- let engine idle for at least 2 minutes
- record control current



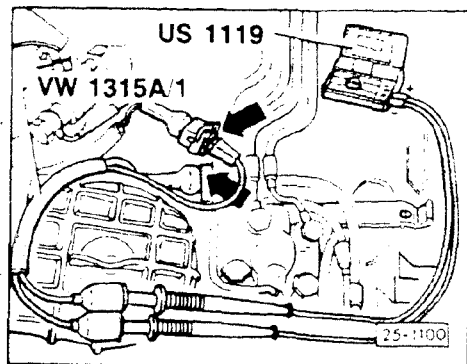
- remove hose 1 from connection piece 2
 - control current must increase

If NO

- disconnect the oxygen sensor harness connector and hold wire 3 to ground for approximately 20 seconds
 - if the control current changes:
- replace the oxygen sensor

If control current does not change:

- perform electrical check, section 25-180-3
- or
- replace control unit
- erase permanent fault memory, see Repair Group D2 for additional information



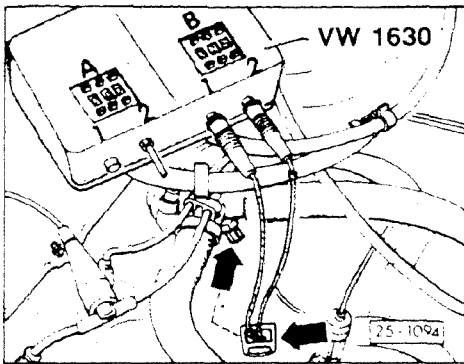
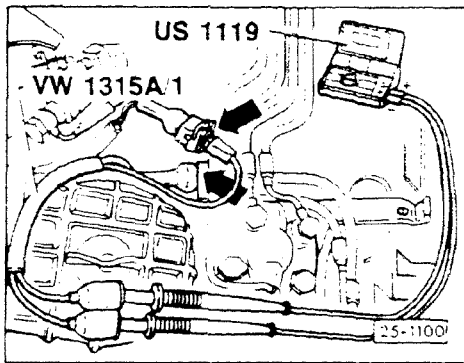
Starting enrichment, checking

Check these first:

- engine oil 70°C (158°F) minimum
- no faults stored in fault memory, see Repair Group D2 for additional information
- connect multimeter **US 1119** and adaptor **VW1315A/1** to differential pressure regulator
- remove harness connector from power output stage of ignition coil
- remove fuse **13**
- activate starter
 - control current must drop to 35 to 45 mA, and remain at this value for 3 seconds maximum, then change to approximately 0 mA

If **NO**

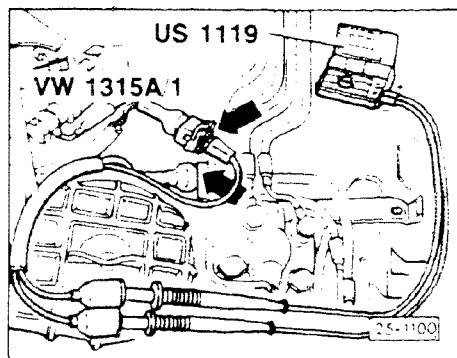
- perform electrical check, section 25-180-3
or
- replace control unit



Engine restart, warmup and acceleration enrichment, checking

Check these first:

- engine oil 70°C (158°F) minimum
 - no faults stored in fault memory, see Repair Group D2 for additional information
 - connect multimeter **US 1119** and adaptor **VW1315A/1** to differential pressure regulator
 - disconnect oxygen sensor harness connector
 - disconnect coolant temperature sensor harness connector
 - connect test leads from adjustable resistance box **VW 1630** to harness connector for coolant temperature sensor
 - set resistance to 2500 ohms
 - start engine
 - control current should reach 15 to 23 mA in approximately six to nine seconds, then slowly drop to 9 to 11 mA
 - open throttle completely using short jerky motions, then reclose throttle
 - control current must increase briefly to 6 mA minimum
- If **NO**
- perform electrical check, section 25-180-3 or
 - replace control unit
 - erase permanent fault memory, see Repair Group D2



Deceleration fuel shut-off, checking

Check these first:

- engine oil 70°C (158°F) minimum
- no faults stored in fault memory, see Repair Group D2 for additional information

- connect multimeter **US 1119** and adaptor **VW1315A/1** to differential pressure regulator
- switch **ON** ignition
 - control current must indicate positive (+)

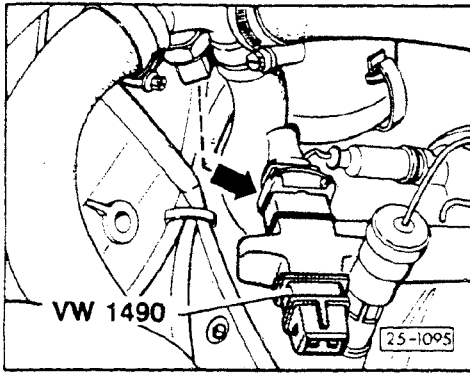
If **NO**

- reverse the test leads
- start engine and momentarily raise engine speed above 3000 RPM
- close throttle in jerky motions
 - control current must momentarily indicate negative (-)

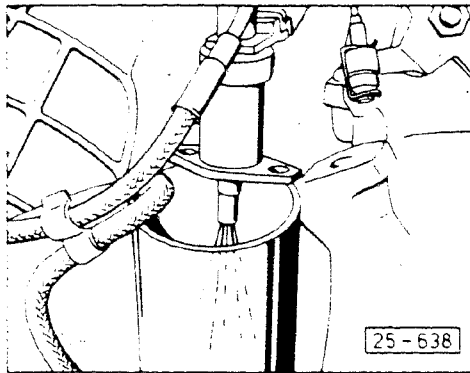
If **NO**

- perform electrical check, section 25-180-3
or
- replace control unit

Cold start valve, checking



- remove harness connector from the power output stage of the ignition coil
- disconnect coolant temperature sensor harness connector
- insert 15 K ohm side of bridge adaptor **VW1490** into coolant temperature sensor harness connector (**arrow**)



- remove cold start valve and place into a measuring beaker
- activate starter
 - cold start valve must spray in a uniform cone shape for 7 seconds
- carefully dry off the tip (jet) of the cold start valve
- after one minute the tip of the valve **MUST** still be dry

If the valve did **NOT** spray

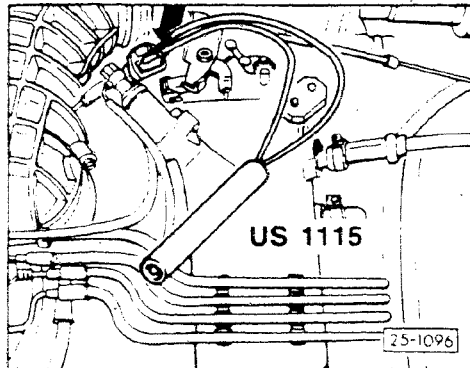
- disconnect the cold start valve harness connector
- connect multimeter **US1119** to terminals of the cold start valve and measure the resistance
 - approximately 10 ohms

If **NO**

- replace cold start valve
- connect LED tester **US1115** to the cold start valve harness connector
- activate starter
 - **US1115** must light up for approximately 7 seconds

If **NO**

- perform electrical check, section 25-180-3
or
- replace the control unit



Engine settings

Preparations for checking/adjusting

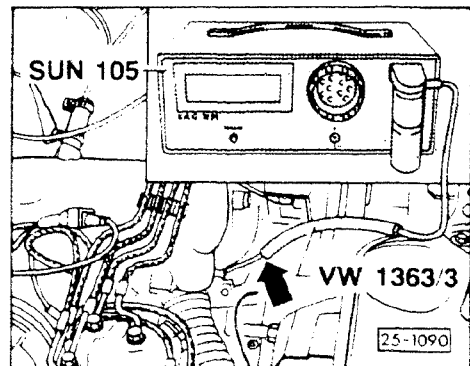
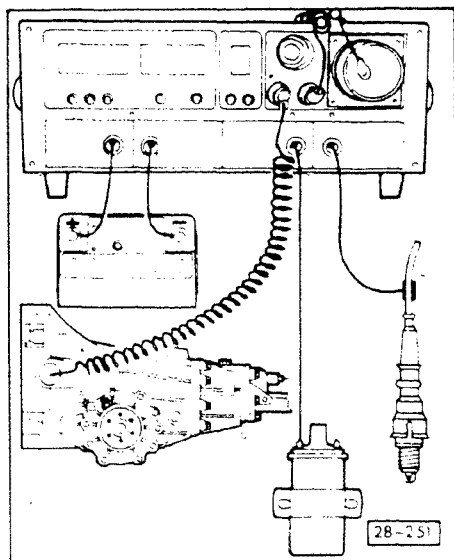
Always activate fault memory before checking engine settings, see Repair Group D2 for additional information

If **no** faults are stored

- check ignition timing, idle speed (not adjustable) and CO content sections 25-170-3 and -4 if adjustments are necessary begin here

Check these first:

- engine oil 80°C (176°F) minimum
- all electrical consumers switched **OFF**; radiator fan must **NOT** be running during checking and adjustment
- A/C switched **OFF**
- disconnect any pressure measuring devices
- if any injection lines were loosened or replaced, raise the engine speed above 3000 RPM several times and let idle for at least two minutes
- exhaust system must not leak
- oxygen sensor control **OK**
- switch **OFF** ignition
- connect engine tester **VW1367** for ignition timing and RPM display

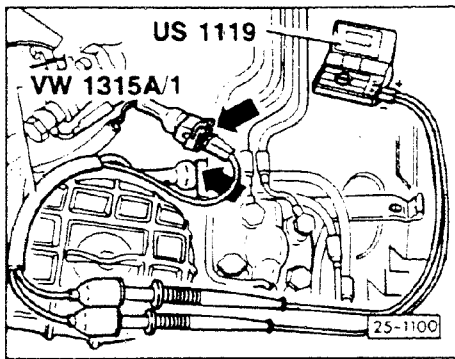


- connect CO tester **SUN 105** (or EPA equivalent) using adapter **VW1363/3** on CO measuring tube

Note

Hose must fit snugly on CO-measuring tube to minimize measurement errors.

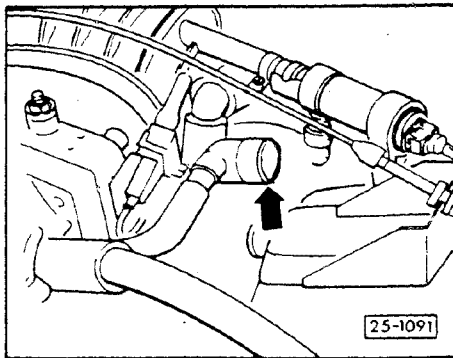
Continuous Injection System



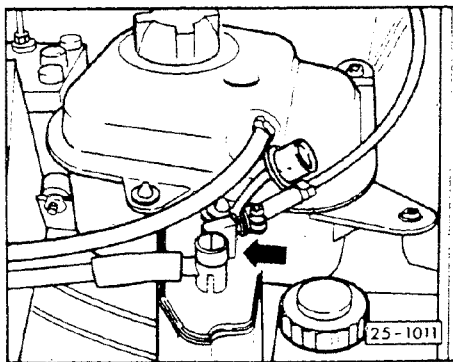
- connect multimeter **US1119** and test adapter **1315A/1** to differential pressure regulator
- switch **ON** ignition
 - control current must indicate positive (+)

If **NO**

- reverse the test probes



- remove crankcase housing breather hose from cylinder head cover and vent it to atmosphere
- remove crankcase housing breather hose from breather housing (cylinder block), and vent to atmosphere



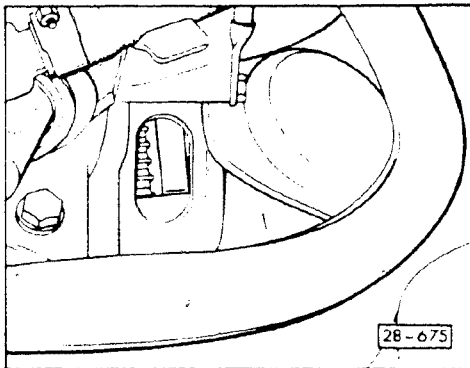
- remove sealing cap (**shaded**) from charcoal canister

CAUTION

Ignition timing, idle speed and CO are inter-related and **MUST** be checked and adjusted **TOGETHER**.

Ignition timing, checking and adjusting

- start engine and let idle
- check ignition timing, timing point will be displayed directly on engine tester **VW1367** or use strobe light method



Ignition timing mark (on flywheel) for use with stroboscope method of checking

checking value: 4° to 8° Before TDC
adjusting value: 6° ± 1° Before TDC

- adjust if necessary

Note

To loosen the distributor, remove the tamper proof seal (cap) covering the distributor clamp bolt. When you have finished making adjustments and have re-torqued the bolt (18 ft lb), install a new seal.

Idle speed checking, NOT adjustable

Read idle RPM directly on **VW1367**

- start engine and let idle
 - engine speed must be 780-900 RPM

If NO

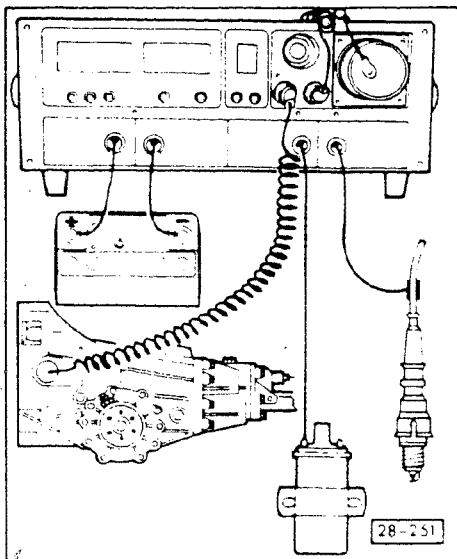
- check intake air system for leaks
- check airflow sensor potentiometer, adjust if necessary

- start engine and let idle
 - engine speed must be 780-900 RPM

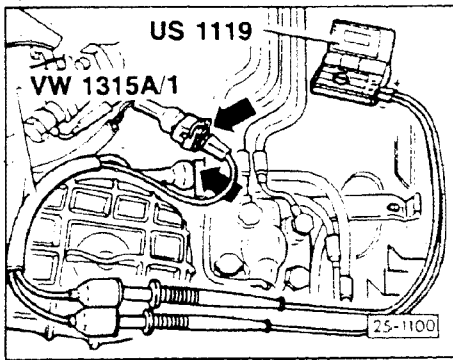
- switch **ON** A.C.
 - idle speed must increase by approximately 70 RPM

If NO

- perform electrical check, section 25-180-2



Continuous Injection System



CO, checking and adjusting

(primary check)

- check the CO content by reading mA output on **US1119** multimeter
 - 0 to 5 mA (**must** fluctuate)

If **NO**, or does **NOT** fluctuate

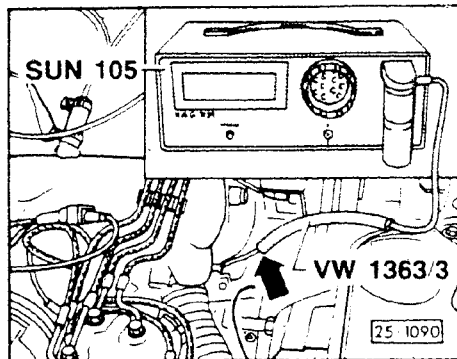
- check the oxygen sensor control system, section 25-120

(secondary check)

- read CO content directly on **SUN 105** (or EPA equivalent)
 - 0.2 to 1.2% by volume

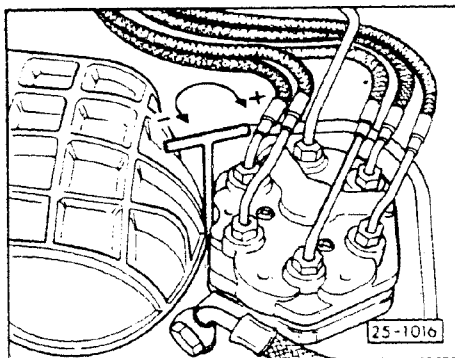
If flash codes **2343** or **2344** were stored or the CO content is outside of the tolerance range; adjust CO content as follows:

- switch **OFF** ignition
- remove rubber boot from mixture control unit
- **LIGHTLY** center punch mixture adjusting screw plug
- drill 2.5 mm (3/32 in) hole in center of plug approximately 3.5 to 4.0 mm (9/64 to 5/32 in) deep
- screw in 3 mm (1/8 in) sheet metal screw
- remove plug/screw, using pliers
- reinstall rubber boot
- start engine, repeat primary and secondary CO checks, adjust as follows



CAUTION

Do not press down on the adjustment wrench during adjustment, do not accelerate the engine with the adjustment tool in place. Remove the tool after each adjustment and briefly accelerate the engine before reading the CO value.



- turning clockwise: CO increases
- turning counterclockwise: CO decreases

- when primary and secondary CO adjustment specifications have been obtained, install new plug in CO adjustment hole

CIS-E Motronic electrical checks

Check these first:

- battery OK
 - fuses 24 and 28
 - fuse 12 OK (California ONLY)
- Perform the following checks using multimeter **US1119**.

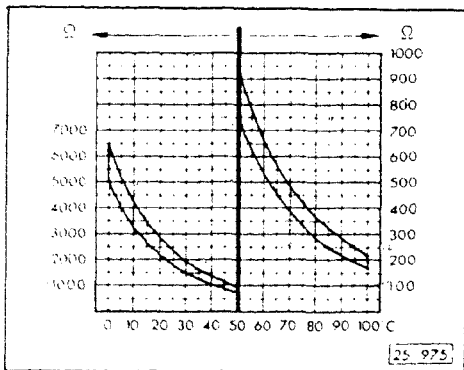
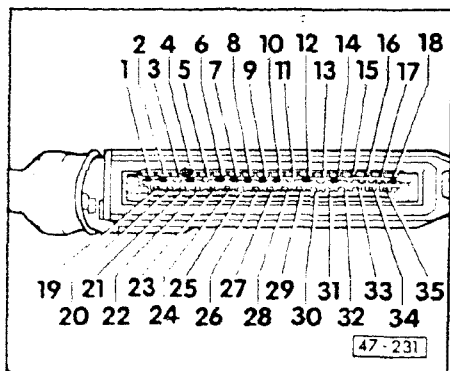
CAUTION

Switch the multimeter to the appropriate range and units before connecting the test probes, to avoid possible damage to sensitive circuitry.

Note

The values given are valid for an ambient temperature range of 0° to +40°C (32° to 104°F)

- if the measured values deviate from the specified values, determine the errors using the appropriate wiring diagram
- before replacing suspected components check associated wires and connections



CAUTION

Disconnect the CIS-E Motronic control unit harness connector **ONLY** with the ignition switched **OFF!**

Do **NOT** insert the multimeter probes into the harness connector terminals. Use jumper wires constructed from local supply using terminals that are identical to those used in the harness connector!

Temperature sensor diagram: test step 8

Example 1: 2500 ohms (@ 20°C (68°F))

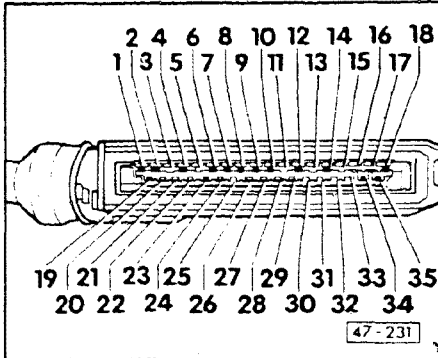
Example 2: 200 ohms (@ 100°C (212°F))

Note

Resistance varies depending on coolant temperature.

Continuous Injection System

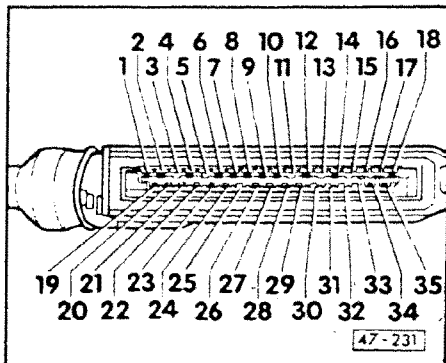
CIS-E Motronic electrical checks



Terminal numbering for CIS-E Motronic control unit harness connector

Test range: voltage measurement			
Test step	Connection terminal	• Test conditions - Additional work	Specified values
1	14 + 35	• ignition ON	approximately battery voltage
2	17 + 35	• ignition ON	approximately battery voltage
3*	32 + 35	• ignition ON - A/C ON	approximately battery voltage
4*	33 + 35	• ignition ON - A/C ON	approximately 1 V below battery voltage
5	19 + 35	• ignition ON	approximately battery voltage
6	California version ONLY 13 + 35 connected 13 + 35 connected	• ignition ON • ignition ON - insert fuse in fuel pump relay	fault lamp must light up fault lamp must light up
Test range: resistance measurement			
7	4 + 5		15 to 25 ohms
8	3 + 35		see chart 25-975, section 25-180-1
9	31 + 35	• throttle closed • throttle completely open	open continuity
10	28 + 35	• throttle closed - throttle open	continuity open
11	49 state version ONLY 18 + 35		continuity
12	13 + 35 13 + 35	- insert fuse in fuel pump relay - ground test connector for vehicle self diagnosis	continuity continuity
13	14 + 16		approximately 10 ohms
14	14 + 15		30 to 60 ohms

CIS-E Motronic electrical checks



Terminal numbering for CIS-E Motronic control unit harness connector

Test range: resistance measurement			
Test step	Connection terminal	• Test conditions – Additional work	Specified values
15	30 + 35 30 + 21	– remove harness connector from Hall sensor (ignition distributor) – connect terminal 1 + 2 to Hall sensor – connect terminal 2 + 3 to Hall sensor	continuity continuity
16	11 + 35	– remove terminal from power output stage of coil and ground center contact	continuity
17	6 + 8	– separate knock sensor harness connector – connect terminals 1 + 2 – connect terminals 1 + 3	open continuity continuity
18	7 + 35	– separate harness connection to oxygen sensor and connect wire to control unit to ground	continuity
19	23 + 26	• sensor plate in rest position	approximately 5k ohms
20	26 + 35		approximately 4k ohms
21	vehicles with standard transmission 34 + 35 vehicles with auto transmission 34 + 35	• selector lever in P or N position – insert working points	continuity open
22	12 + 35	– remove fuel pump relay (relay position 10) and ground terminal 47 of fuse/relay panel	continuity