

# VOLVO

## Service Manual

Fault tracing

Repairs

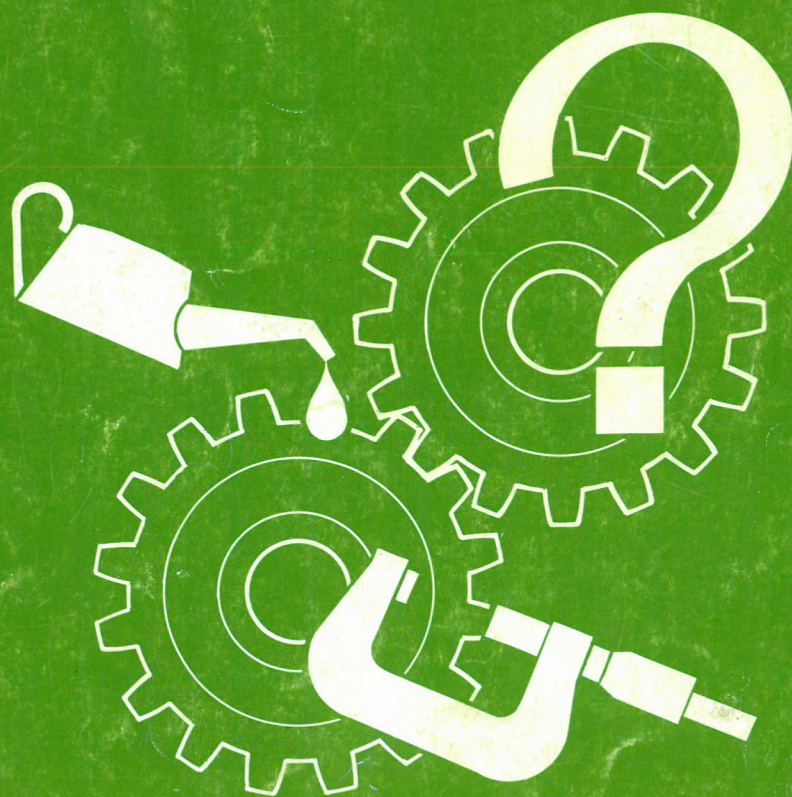
Maintenance

Section 2 (28)

EZ 116 K  
ignition system

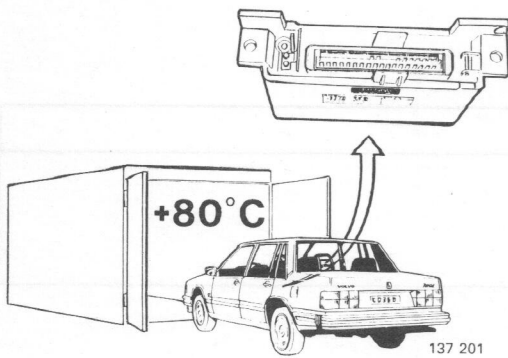
700 1989-

TP 31621/1



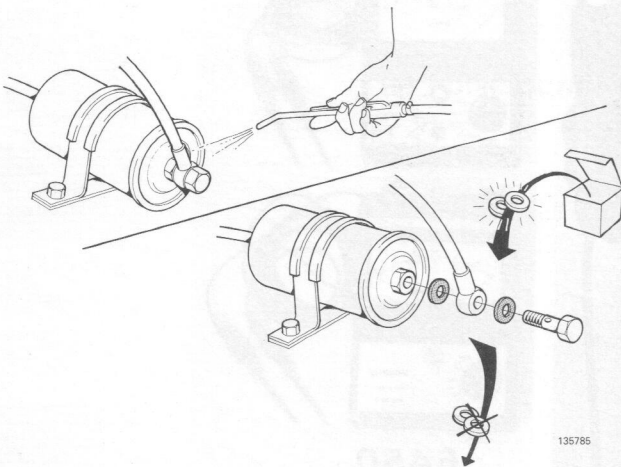
Volvo Car Corporation





### Control unit

- remove control unit if vehicle is to be stored. Control unit must not be exposed to temperatures above 80°C (176°F)
- disconnect control unit when carrying out welding repairs
- remove control unit from vehicle if welding is to be carried out near it
- do not replace a control unit without having first checked all wires and components, otherwise original fault may damage new control unit in same way.



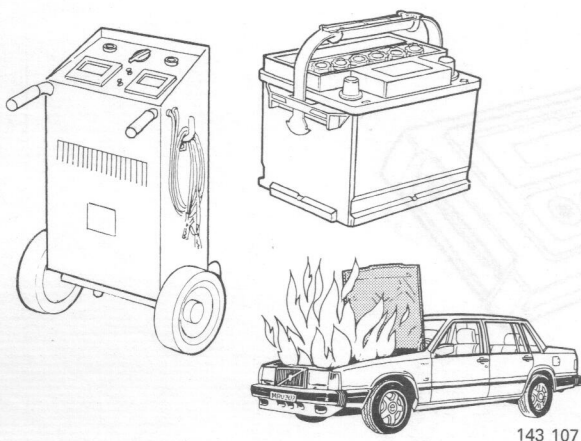
### Cleanliness

Always remove dirt from fuel lines before disconnecting them.

Clean fuel line connections before disconnecting.

### Gaskets, seals

Always install new gaskets and seals if a fuel line connection is opened.



### Battery

When testing the various components it is important that the battery voltage is normal (not too low). If necessary a battery charger may be connected during testing.

Max. permitted charging current: **15 A** and **16 V**.

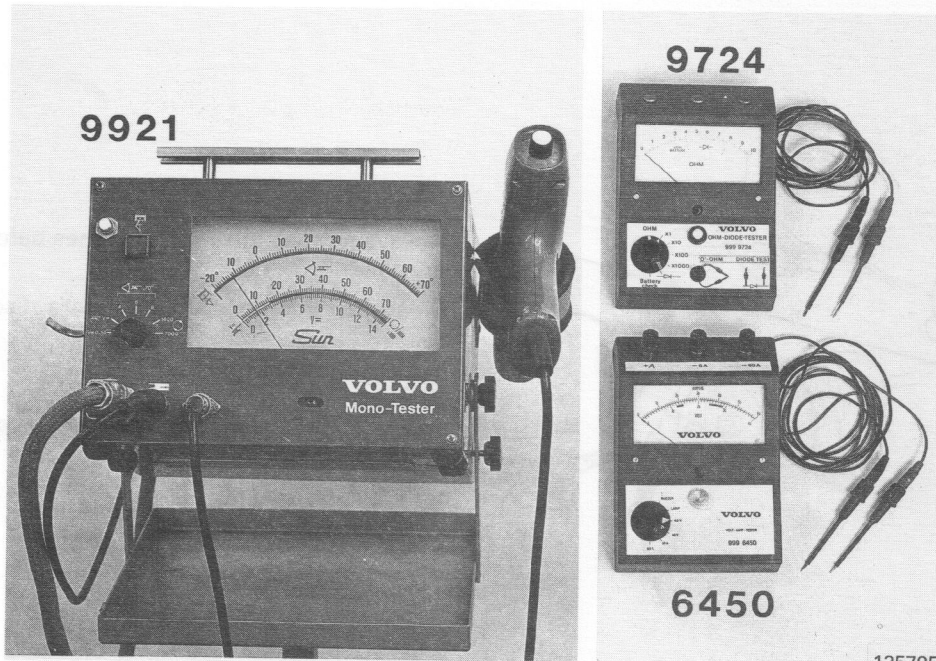
### Fire hazard

Extreme care must be taken to avoid causing sparks especially when checking the injectors.

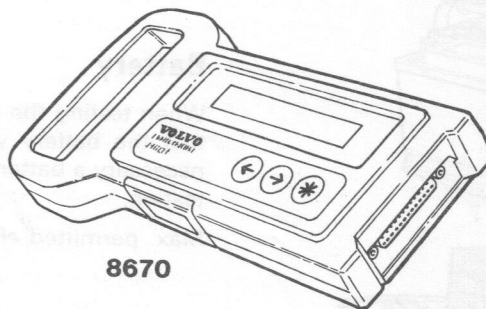


## Special tools

999-	Description – use
6450-4	<b>Volt-ammeter:</b> fault tracing
9724-0	<b>Ohm-diode tester:</b> fault tracing
9921-0	<b>Volvo Monotester:</b> adjusting ignition, idle
8670-7	<b>Diagnostic key:</b> gives a read out of fault codes



135795



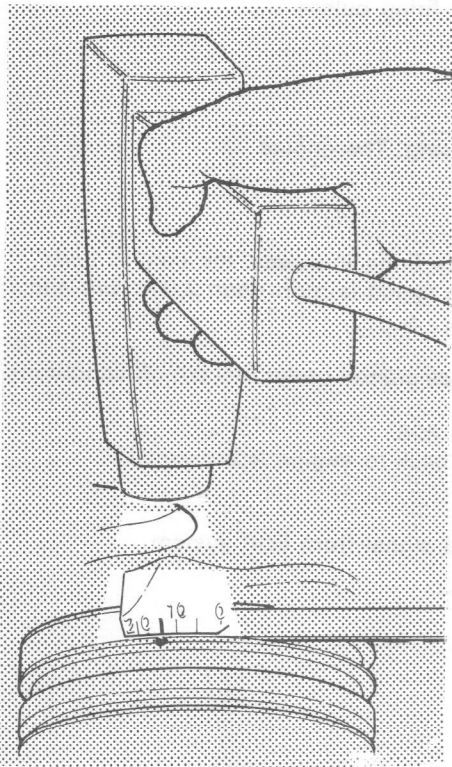
8670



## Fault tracing, EZ 116 K ignition system and self-diagnostics

### Engine

EZ 116 K ignition system is self-diagnostic. This feature is built into the control unit of the ignition system. **Note:** If the power supply (30-supply) to the control unit is lost, all the codes are erased. The system can be used for three different test functions.



144 850

### Inspection

A1

#### Start the engine and warm it up

If the engine does not start, check that fuse No. 1 is sound. If the engine still does not start, begin fault tracing with operations A5 and A6, then operations A9 to A11.

A2

#### Check ignition setting

Correct setting:

B 200 F	12°+2° btdc
B 230 F/FT/GT	
B 204 E	15°+2°
B 234 F	
B 204 FT/GT	10°+2° btdc

**Note:** The ignition cannot be adjusted.

A3

#### If the ignition setting is wrong

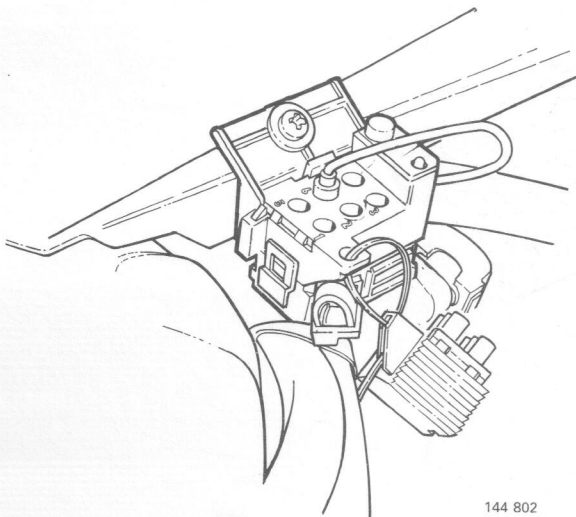
1. Check throttle switch, see operations A5 & A7.
2. Check that the wiring to the impulse sensor is correctly connected at the connector near the fire-wall, see wiring diagram.
3. Open the cover of the test connector and connect the cable to terminal 6, or connect diagnostic key 8670.

Turn on the ignition.

Select **test function 1** and call up the fault code. Press the button for more than one second and count the number of blinks. Note the number and press again in case there are more fault codes (up to three). Note the fault code(s) and check according to table (A4).

If the code 1-1-1 (no fault in memory) appears, check the fuel system.

If the light (LED) does not light when the button is depressed, or if no fault is given, see A12-19.



144 802



## Test function 1

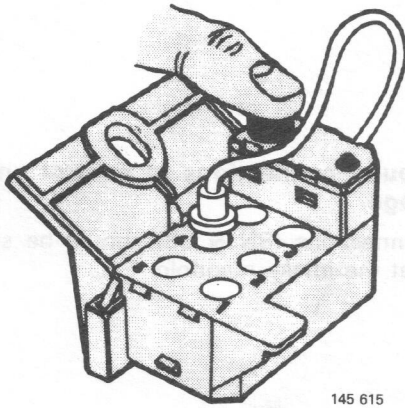
A4

- 1-1-1** No faults detected by diagnostic system.
- 1-4-2** Defective control unit. Replace.  
Engine operates in "limp home" mode.
- 1-4-3** Knock sensor signal missing or incorrect, see A28.  
"Limp home" mode is selected by control unit if it does not receive a signal from the knock sensor during a 48 revolution period at engine speeds above 3,000 rpm.
- 1-4-4** Load signal from fuel system is missing, see A24.  
Ignition setting depends on strength of signal. "Limp home" mode is selected if load signal from fuel system control unit is missing during 32 consecutive firing pulses.
- 2-1-4** Impulse sensor signal sporadically missing, see A25 & A5-6.
- 2-2-4** Engine temperature signal missing or incorrect, see A22.  
"Limp home" mode is selected by control unit if signal is missing. The engine is considered to be hot.
- 2-3-4** Throttle switch signal missing or incorrect, see A23, A5 & A7.  
Fault code is registered when, during more than 16 consecutive firing impulses, the control unit:
  - receives signals from throttle switch at same time as engine speed is more than 2,600 rpm and the load signal exceeds a predetermined limit,
  - or
  - does not receive any signal from the throttle switch during deceleration under fuel cut-off conditions.
- 2-4-1** Exhaust gas recirculation (EGR) system malfunction, see A8 & A26.  
The EGR temperature sensor senses that flow of exhaust gas back to engine is too small.
- 4-1-3** EGR temperature sensor signal missing or incorrect, see A27.  
Fault code is registered if control unit does not receive correct signal from EGR system.



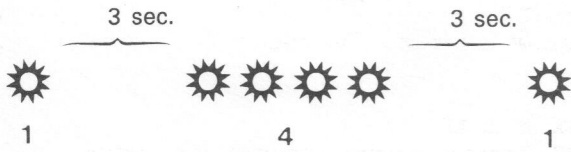
## Test function 2

A5



145 615

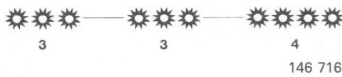
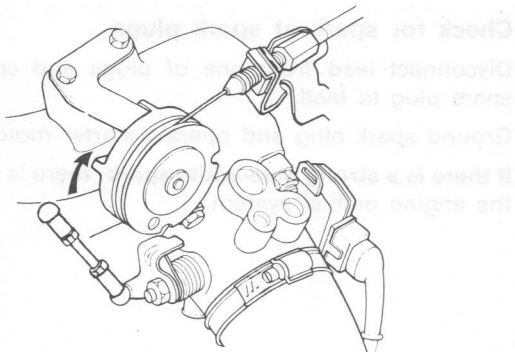
Turn on ignition. Press button on test terminal twice, each time for more than one second. The lamp should begin to flash rapidly. If it does not, see A12-19.



A6

### Operate starter motor

The lamp should go out and then start to signal code 1-4-1, signal from impulse sensor (OK!). If the diagnostic unit does not respond with a code, and continues to flash rapidly, see A25.



146 716

A7

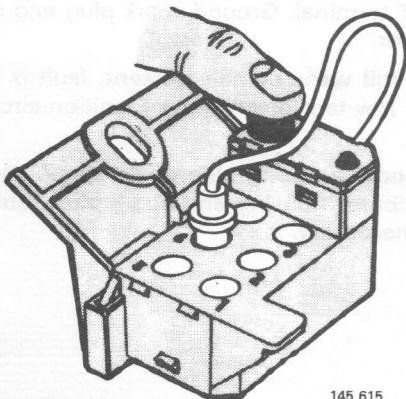
### Turn throttle in engine compartment

The lamp should go out and then start to signal code 3-3-4, throttle switch in idle position (OK!). If the diagnostic unit does not respond with a code, and continues to flash rapidly, see A23.

Turn off ignition.

## Test function 3

A8



145 615

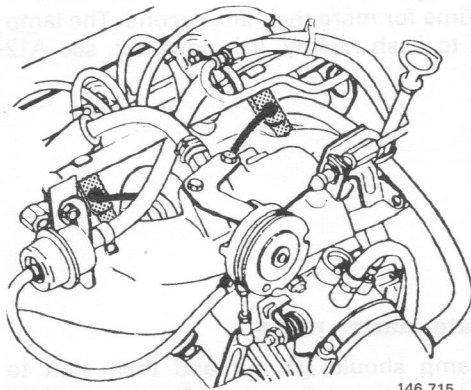
(Only USA, California)

### Turn on ignition

Press button on test terminal three times, each time for more than one second. The lamp should begin to flash at same rate as EGR converter is energised.



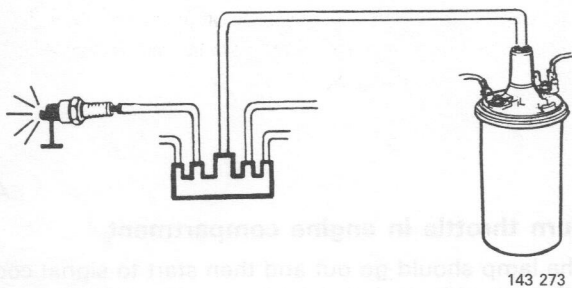
## Engine does not start



A9

### Check ground connections to control unit and power stage

Ground connections (BN & SB) should be securely tightened at the intake manifold.



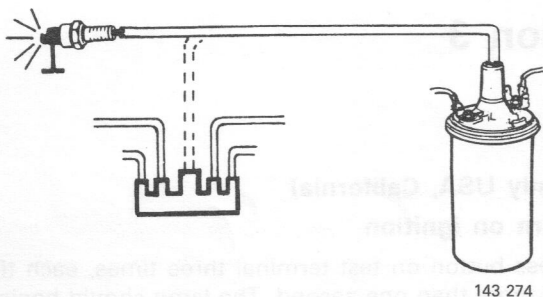
A10

### Check for spark at spark plugs

Disconnect lead from one of plugs and connect a spare plug to lead.

Ground spark plug and operate starter motor.

**If there is a strong blue-white spark:** there is a fault in the engine or fuel system.



A11

### Weak or non-existent spark:

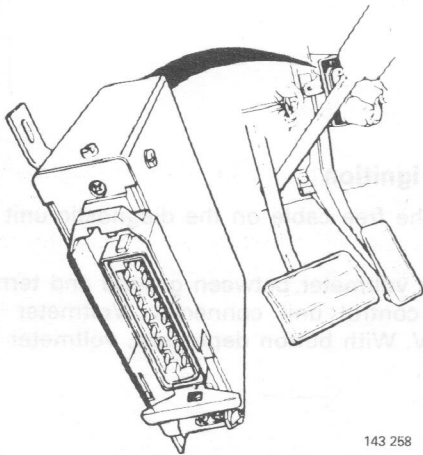
Connect spark plug cable, with plug, directly to ignition coil HT terminal. Ground spark plug and operate starter motor.

**If spark is still weak or non-existent,** fault is in ignition coil or low tension section of ignition circuit, see A12-40.

**If there is now a strong blue-white spark,** check the rotor, distributor housing and spark plug cables and replace if necessary.



## General inspection



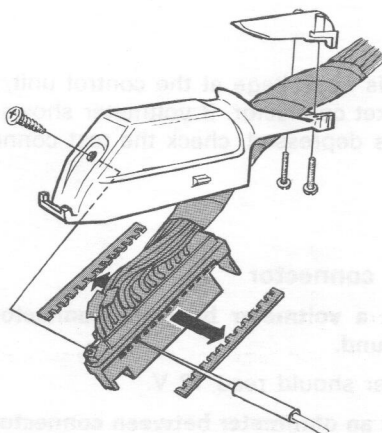
143 258

A12

### Remove connector from control unit

**IMPORTANT!** Ignition must be turned off when connector is removed or reconnected.

Remove panel under left side of instrument panel. Release catch and remove connector from control unit.



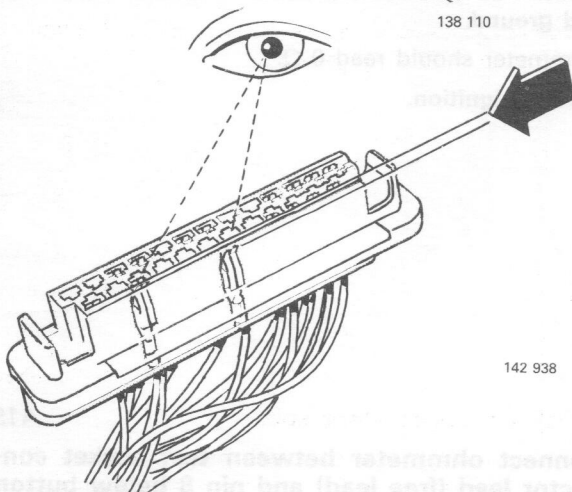
138 110

A13

### Remove protective cover from connector

**IMPORTANT!** Never test terminals from front. This could result in damage to the terminals and make any faults worse.

Terminals should be tested through holes in side of connector. Do not use **excessive** force. Terminals are numbered on side of connector.

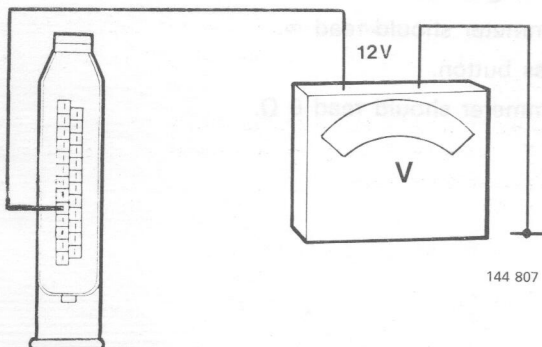


142 938

A14

### Check that no terminal contacts have been pushed down in connector

Poor contacts may result if any of the contact sleeves have been pushed down.



144 807

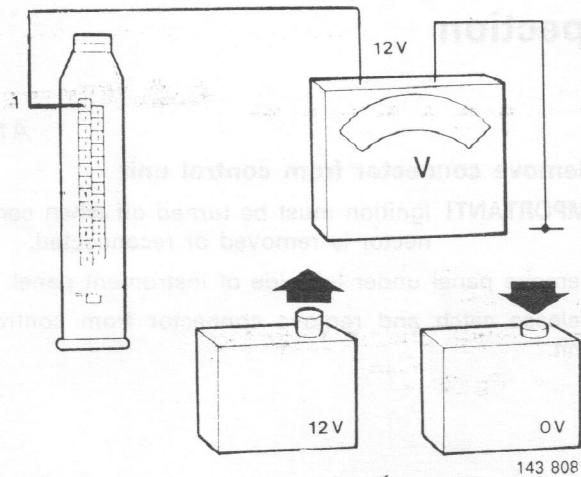
A15

### Check 30-supply

Connect a voltmeter between terminal 5 (BN) of control unit connector and ground. Voltmeter should read 12 V.

If there is no reading, check wire from control unit connector to 30-supply of fusebox.





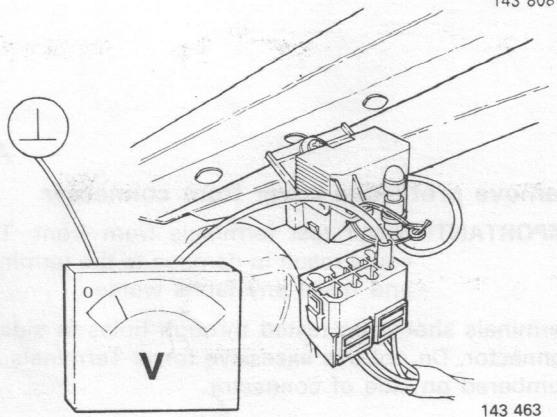
## Check test terminals

A16

### Turn on ignition

Connect the free cable on the diagnostic unit to terminal 6.

Connect a voltmeter between ground and terminal 1 (Y-R) in control unit connector. Voltmeter should show 12 V. With button depressed, voltmeter should show 0 V.



A17

If there is no voltage at the control unit, measure at test socket connector. If voltmeter shows 12 V when button is depressed, check the test connector.

A18

### At test connector

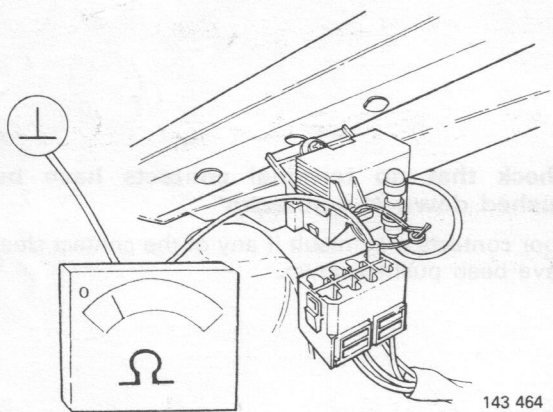
Connect a voltmeter between connector blue wire and ground.

Voltmeter should read 12 V.

Connect an ohmmeter between connector black wire and ground.

Ohmmeter should read 0  $\Omega$ .

Turn off ignition.



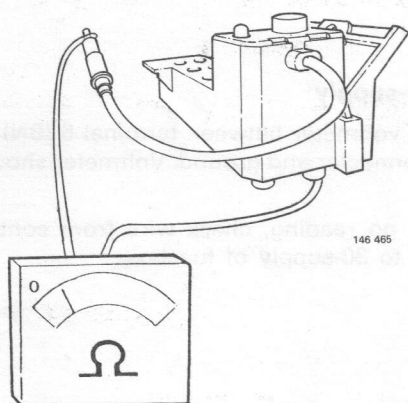
A19

Connect ohmmeter between test socket connector lead (free lead) and pin 8 below button on diagnostic unit

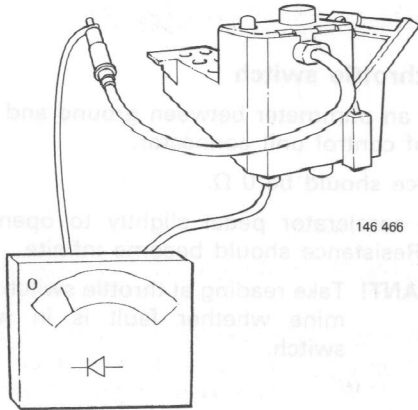
Ohmmeter should read  $\infty$ .

Press button.

Ohmmeter should read 0  $\Omega$ .







**Connect a diode tester between test socket LED and selector lead.**

Connect red probe of tester to pin below LED and black probe to selector lead.

If tester gives a reading LED is OK.

If tester gives no reading, replace test socket.

A20

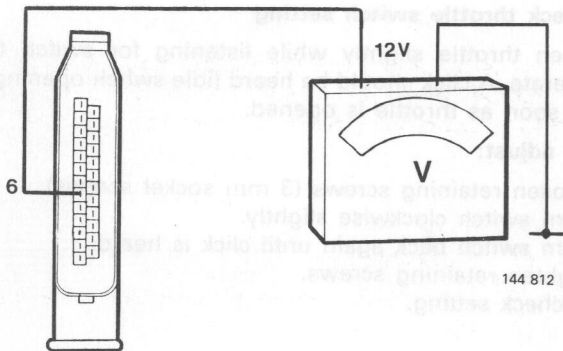
**Check voltage to control unit**

**Turn on ignition**

Connect a voltmeter between terminal 6 (BL) in control unit connector and ground.

Voltmeter should read 12 V.

Turn off ignition.

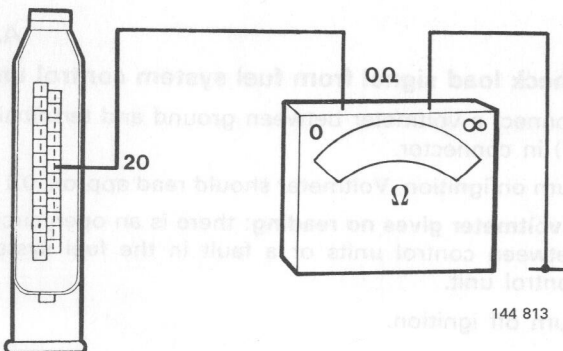


A21

**Check control unit ground connection**

Connect an ohmmeter between ground and terminal 20 (BN), and 14 (SB).

Resistance should be 0 Ω.



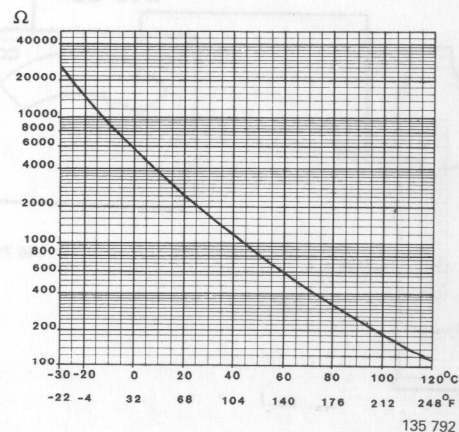
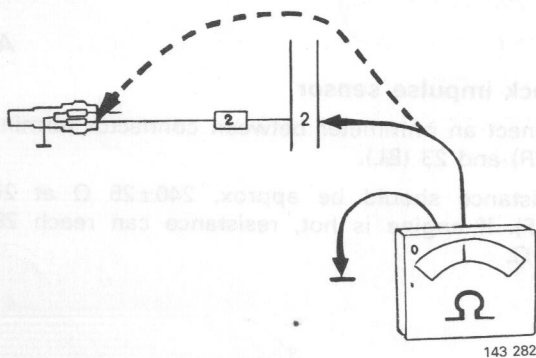
A22

**Check temperature sensor**

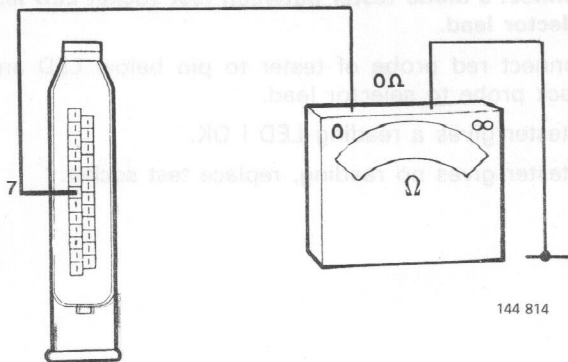
Connect an ohmmeter between terminal 2 and ground.

Ohmmeter should give a reading that corresponds to graph.

**If reading is incorrect:** take reading at sensor to determine whether fault is in sensor or wire. Replace sensor or wire.



A23



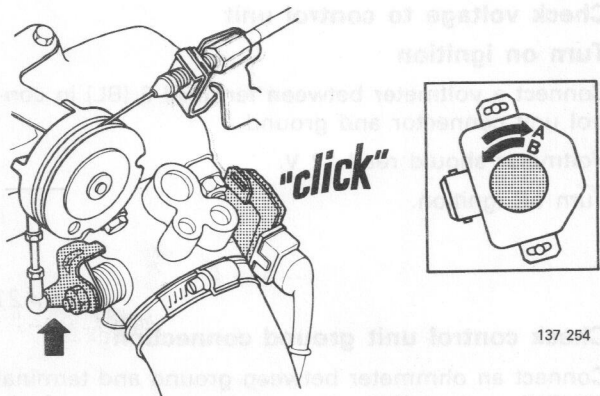
**Check throttle switch**

Connect an ohmmeter between ground and terminal 7 (OR) of control unit connector.

Resistance should be 0 Ω.

Depress accelerator pedal slightly to open throttle switch. Resistance should become infinite.

**IMPORTANT!** Take reading at throttle switch to determine whether fault is in wiring or switch.



**If necessary:**

**Check throttle switch setting**

Open throttle slightly while listening for switch to operate. A click should be heard (idle switch opening) as soon as throttle is opened.

**To adjust:**

Loosen retaining screws (3 mm socket screws).

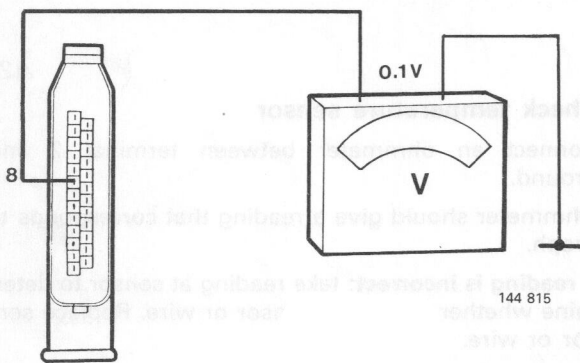
Turn switch clockwise slightly.

Turn switch back again until click is heard.

Tighten retaining screws.

Recheck setting.

A24



**Check load signal from fuel system control unit**

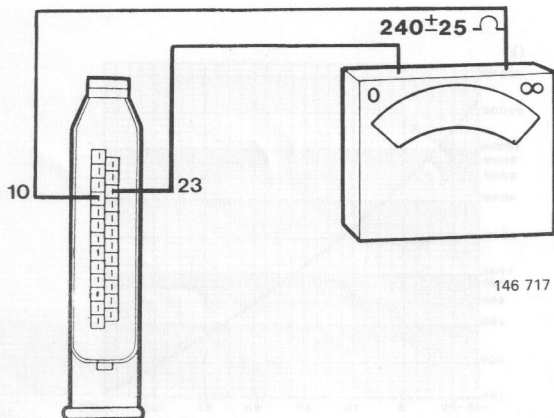
Connect a voltmeter between ground and terminal 8 (Y) in connector.

Turn on ignition. Voltmeter should read approx. 0.1 V.

**If voltmeter gives no reading:** there is an open circuit between control units or a fault in the fuel system control unit.

Turn off ignition.

A25

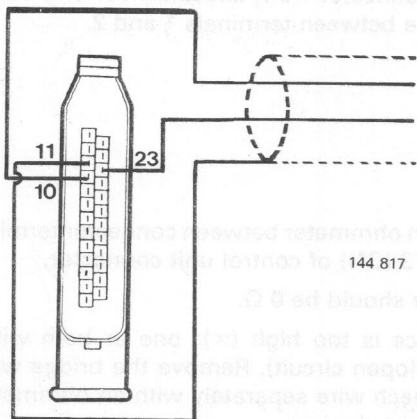


**Check impulse sensor**

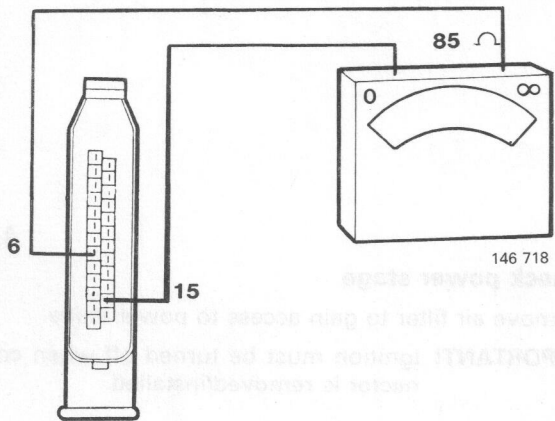
Connect an ohmmeter between connector terminals 10 (R) and 23 (BL).

Resistance should be approx.  $240 \pm 25 \Omega$  at 20°C (68°F). If engine is hot, resistance can reach 280–300 Ω.





Check that screen/shield is connected to terminal 11.

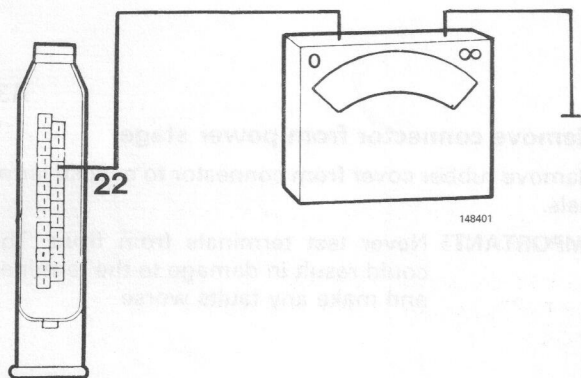


**Check EGR converter**

Connect an ohmmeter between connector terminals 6 (BL) and 15 (R-GN).

Resistance should be 84  $\Omega$ .

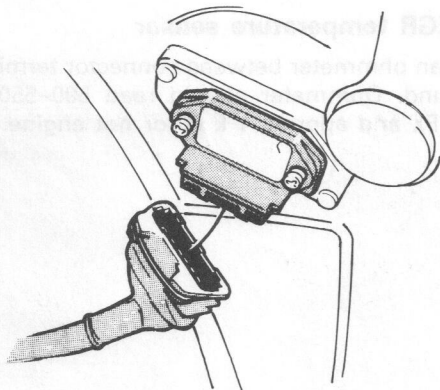
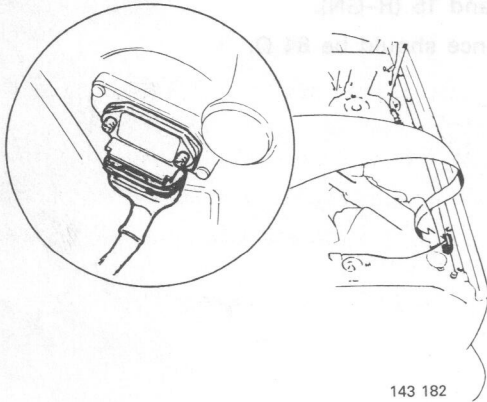
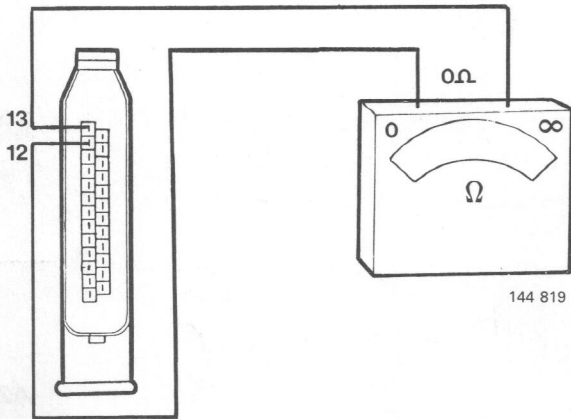
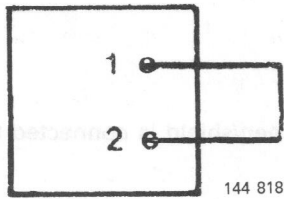
A26



**Check EGR temperature sensor**

Connect an ohmmeter between connector terminal 22 and ground. Ohmmeter should read 500–550  $\Omega$  at 20°C (68°F), and approx. 1 k  $\Omega$  for hot engine.

A27



A28

**Check wiring to knock sensor**

Remove connector from knock sensor and connect a bridge wire between terminals 1 and 2.

Connect an ohmmeter between connector terminals 12 (SB) and 13 (GN) of control unit connector.

Resistance should be 0 Ω.

If resistance is too high (∞): one or both wires are damaged (open circuit). Remove the bridge wire and measure each wire separately with an ohmmeter. Replace damaged wires.

If wires are undamaged, install a new knock sensor. Tightening torque: 20 Nm (±5 Nm) 15±4 ft. lb).

Reconnect knock sensor connector.

**Reconnect connector.**

**Connect connector to control unit.**

A27

**Check power stage**

Remove air filter to gain access to power stage.

**IMPORTANT!** Ignition must be turned off when connector is removed/installed.

A30

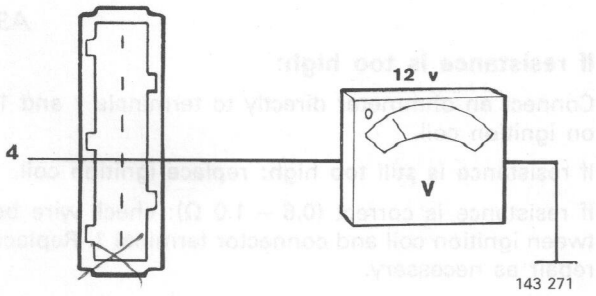
**Remove connector from power stage**

Remove rubber cover from connector to expose terminals.

**IMPORTANT!** Never test terminals from front. This could result in damage to the terminals and make any faults worse.



A31



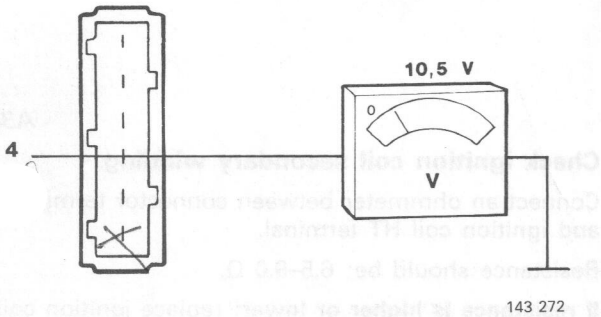
**Turn on ignition**

**Check voltage to power stage and ignition coil**

Connect a voltmeter between ground and connector terminal 4, and then between ground and terminal 15 of ignition coil.

Voltage should be in both cases: approx. 12 V.

A32



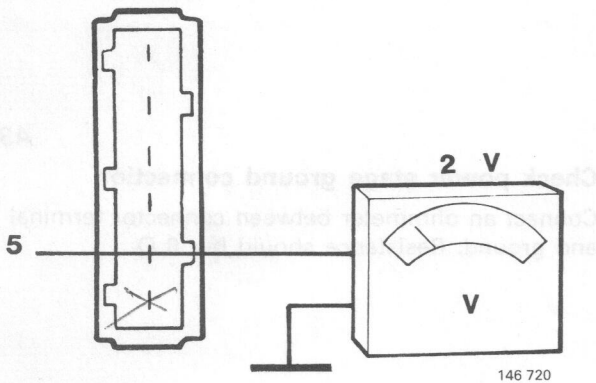
**Operate starter motor and check voltage**

Voltage should be at least 10.5 V.

**If voltage is too low:** check battery and charging system.

**No voltage:** check wire (BL) from central electrical unit to ignition coil and power stage. Repair/replace as required.

A33



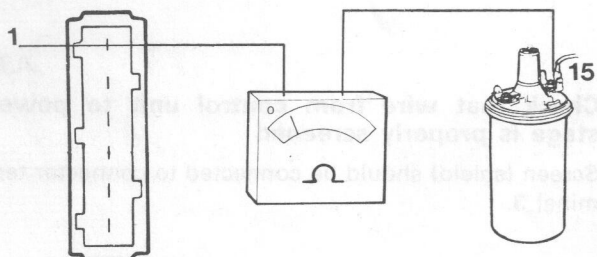
**Check that power stage receives signals from control unit**

Connect a voltmeter between terminal 5 and ground. Note voltmeter reading while operating starter motor.

Voltmeter should show a pulsating reading between 0 and approx. 2 V.

**Voltmeter shows correct reading:** check with a new power stage.

A34



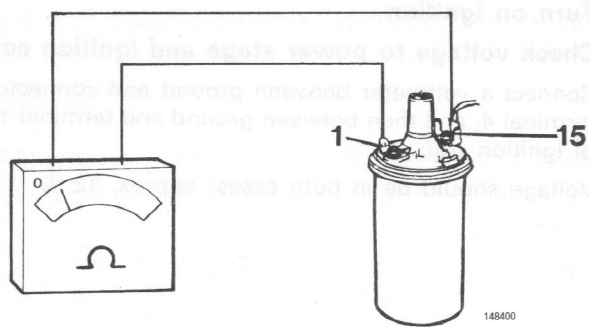
**Check ignition coil primary winding**

Connect an ohmmeter between connector terminal 1 and terminal 15 on ignition coil.

Resistance should be: 0.6 – 1.2  $\Omega$ .

**If resistance is too low:** replace ignition coil.

A35



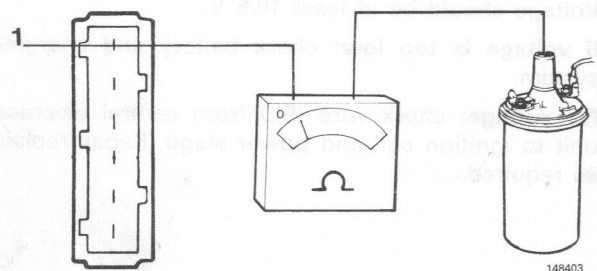
**If resistance is too high:**

Connect an ohmmeter directly to terminals 1 and 15 on ignition coil.

If resistance is still too high: replace ignition coil.

If resistance is correct (0.6 – 1.0 Ω): check wire between ignition coil and connector terminal 1. Replace/repair as necessary.

A36



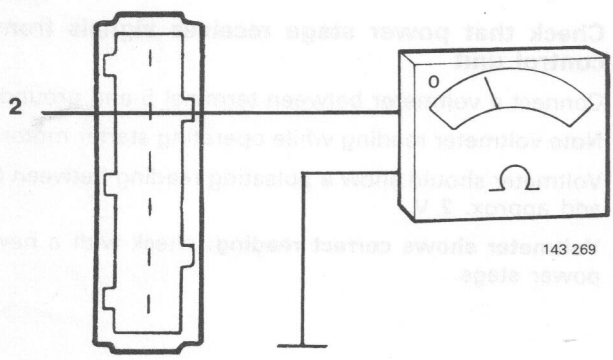
**Check ignition coil secondary winding**

Connect an ohmmeter between connector terminal 1 and ignition coil HT terminal.

Resistance should be: 6.5–9.0 Ω.

**If resistance is higher or lower:** replace ignition coil.

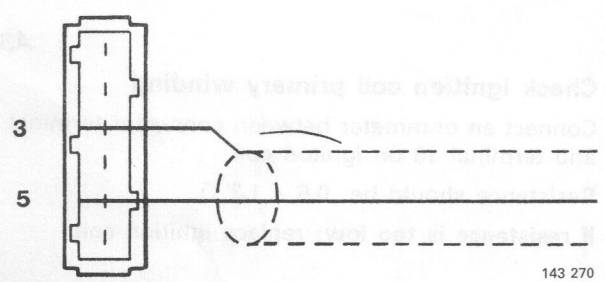
A37



**Check power stage ground connection**

Connect an ohmmeter between connector terminal 2 and ground. Resistance should be: 0 Ω.

A38

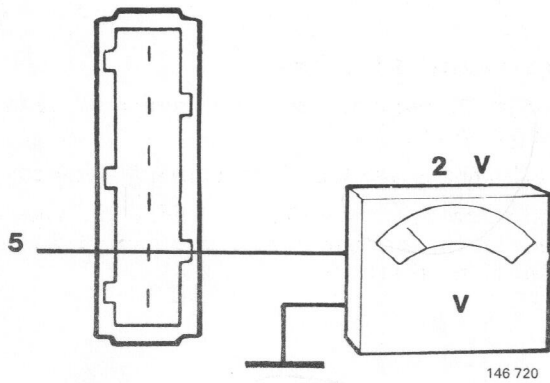


**Check that wire from control unit to power stage is properly screened**

Screen (shield) should be connected to connector terminal 3.



A39



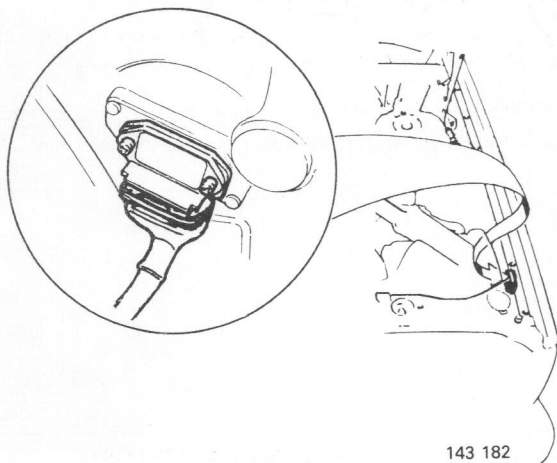
**Check that power stage receives signal from control unit**

Connect a voltmeter between connector terminal 5 and ground.

Note voltmeter reading while operating starter motor.

Voltmeter should show a pulsating reading between 0 and approx. 2 V.

**Voltmeter shows correct reading:** check with a new power stage.



A40

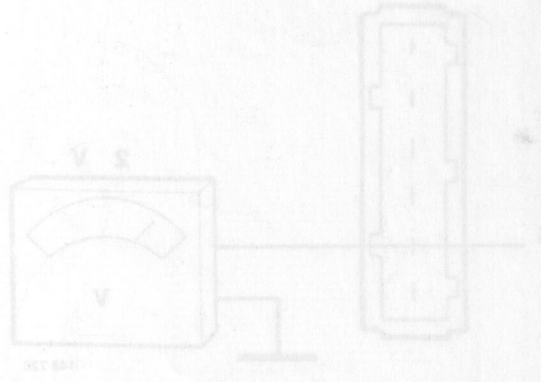
**Turn off ignition**

**Reconnect/install:**

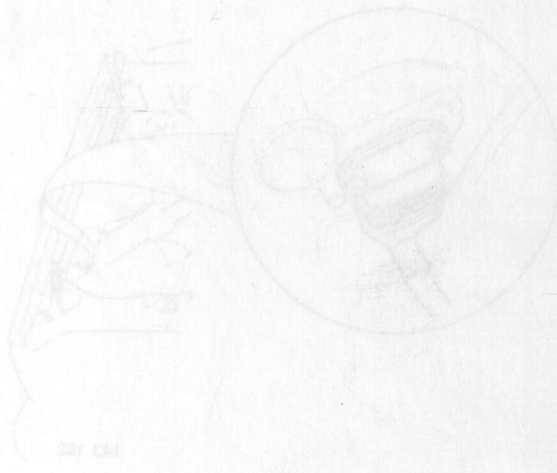
- power stage connector
- air filter
- air mass meter and hoses

Check that all clips have been tightened. Erase all fault codes.

4.38  
 Check that power stage receives signal from control unit  
 Connect a voltmeter between connector terminal 5 and ground  
 Note voltmeter reading while operating starter motor  
 Voltmeter should show a pulsating reading between 0 and approx. 2 V.  
 Voltmeter shows correct reading: check with a new power stage.



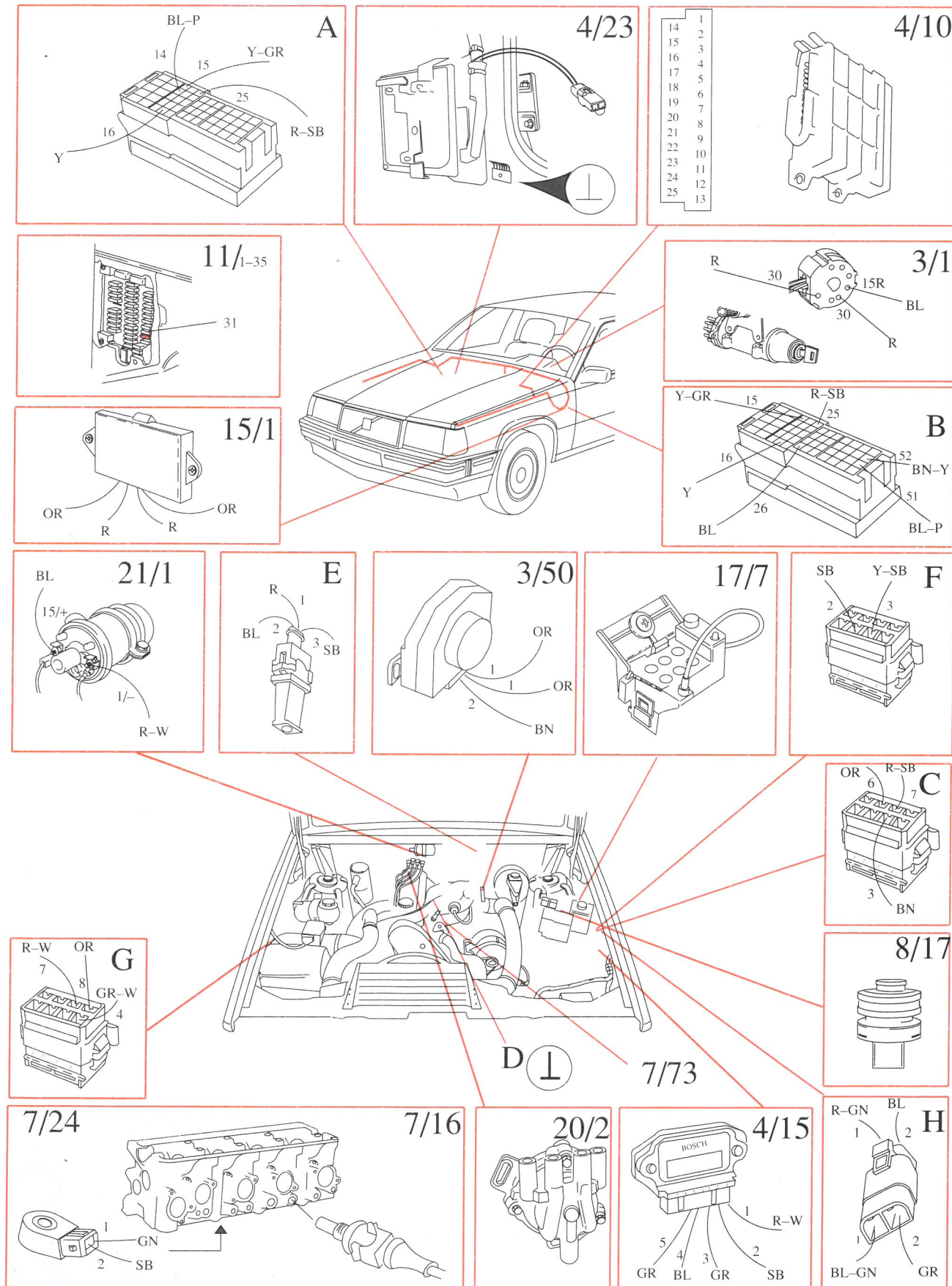
Turn off ignition  
 Reconnect/install:  
 - power stage connector  
 - air filter  
 - air mass meter and hoses  
 Check that all clips have been tightened. Tighten all fuel codes.



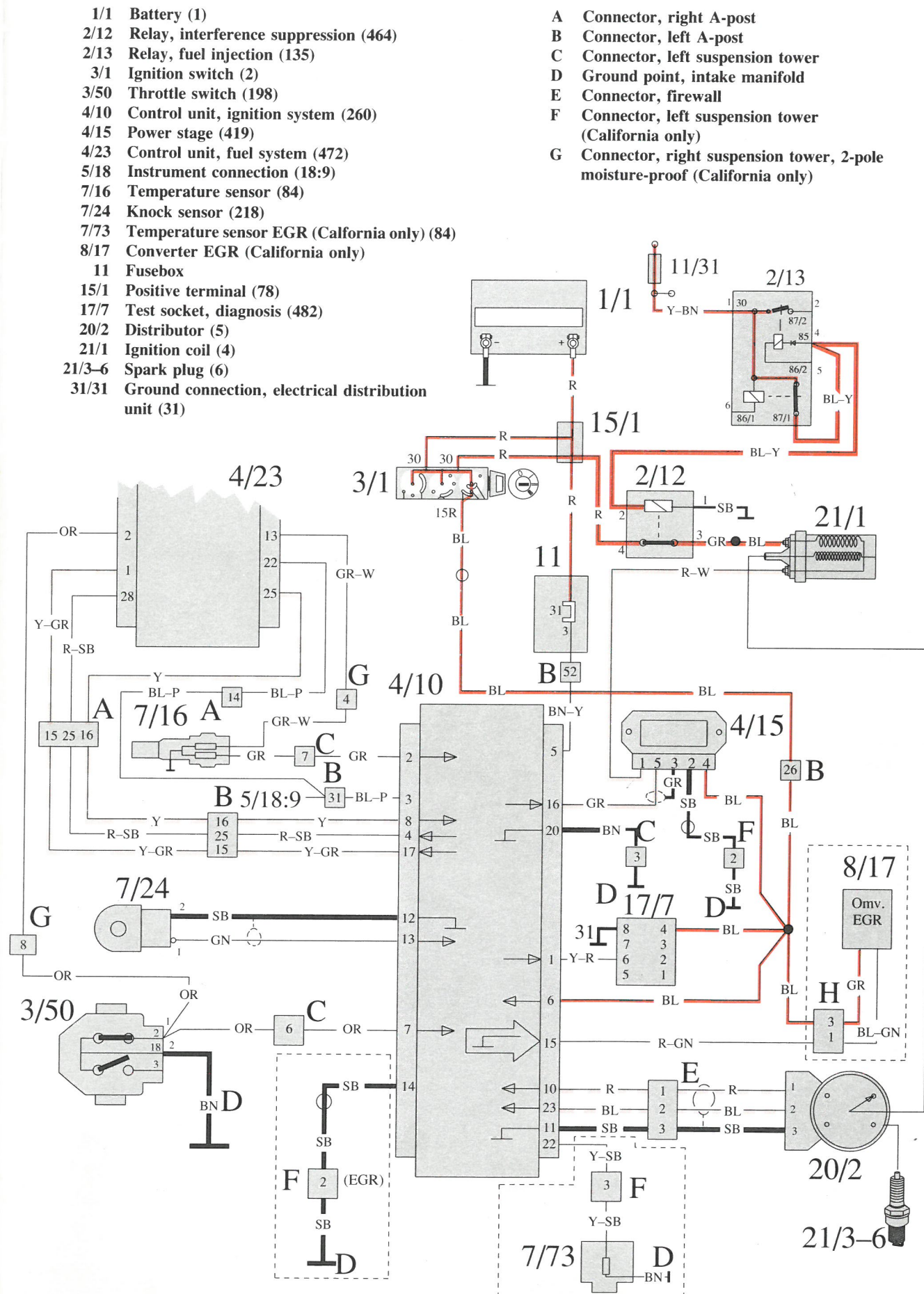
150000  
 150000



# EZ 116 K ignition system, B 230 FT

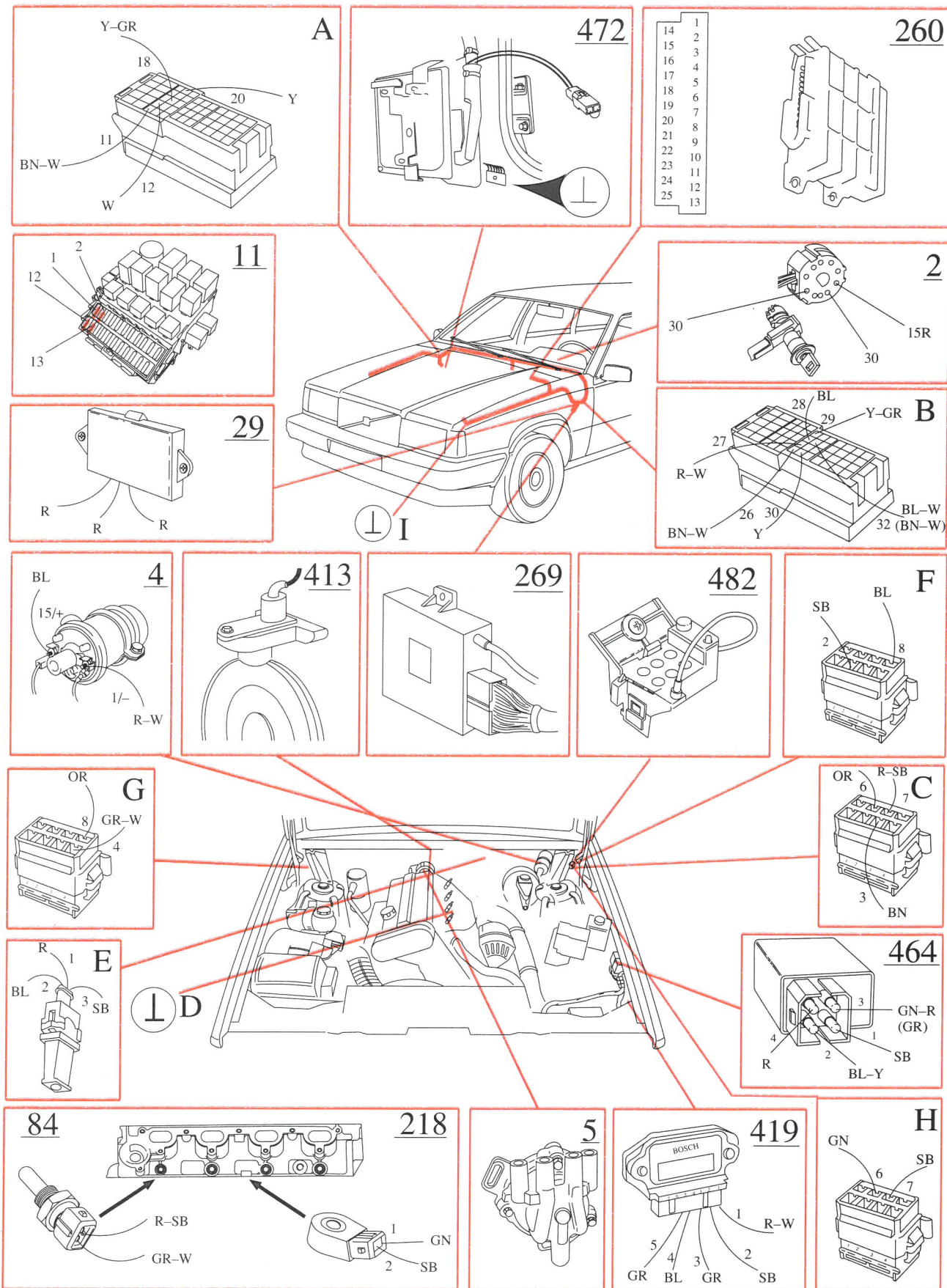


# EZ 116 K ignition system, B 230 FT

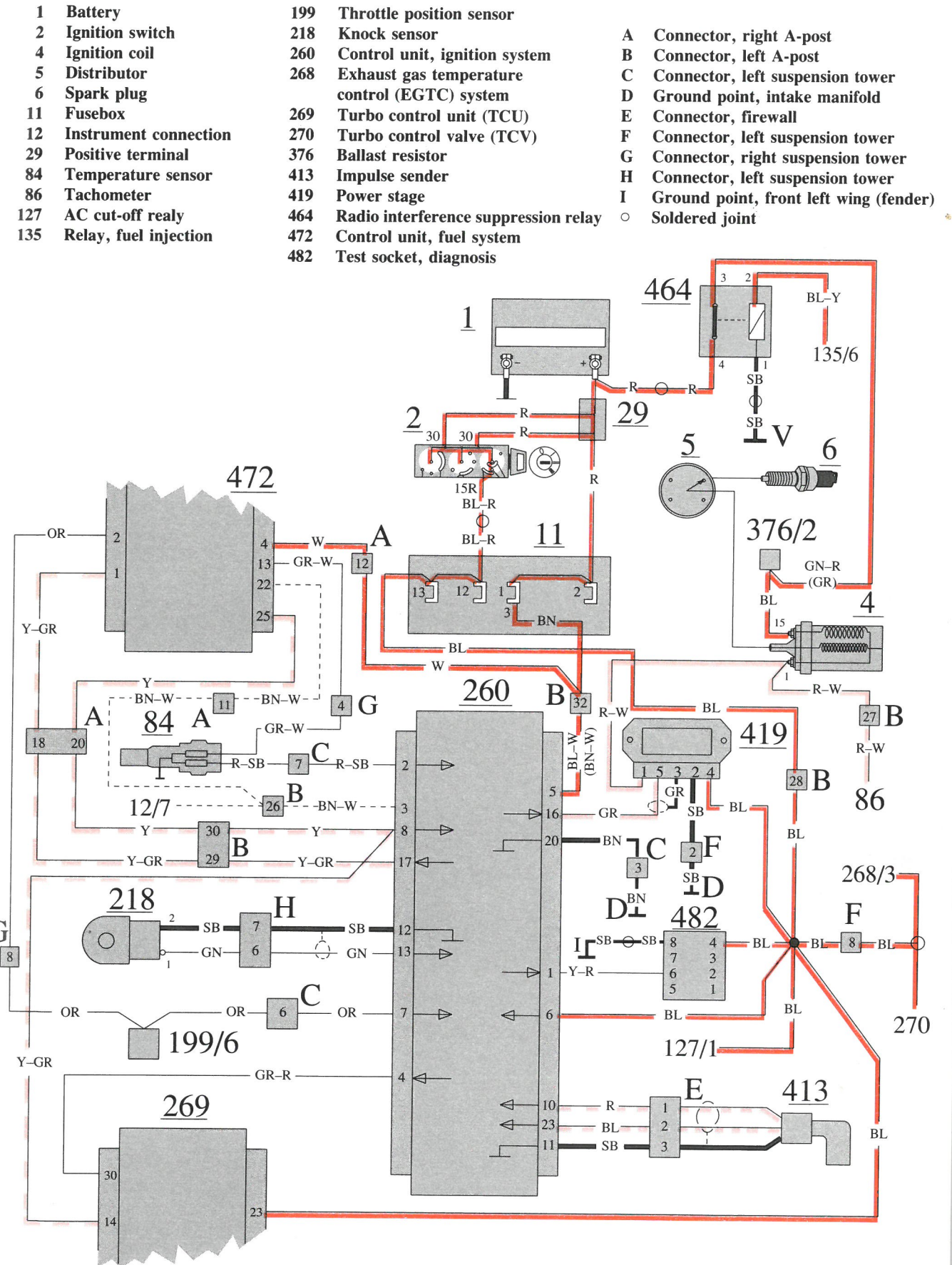




# EZ 116 K ignition system, B 204 FT/GT

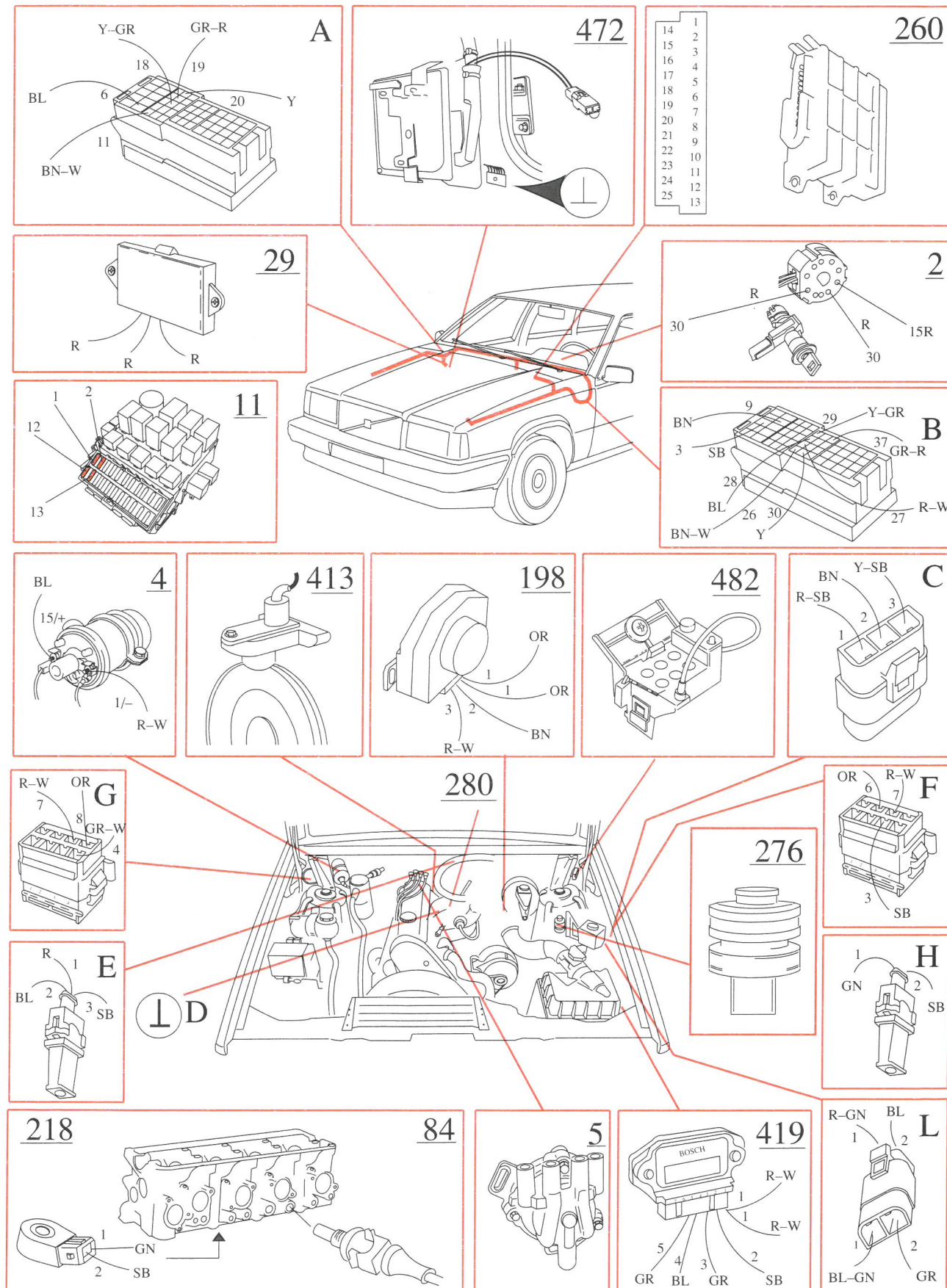


# EZ 116 K ignition system, B 204 FT/GT

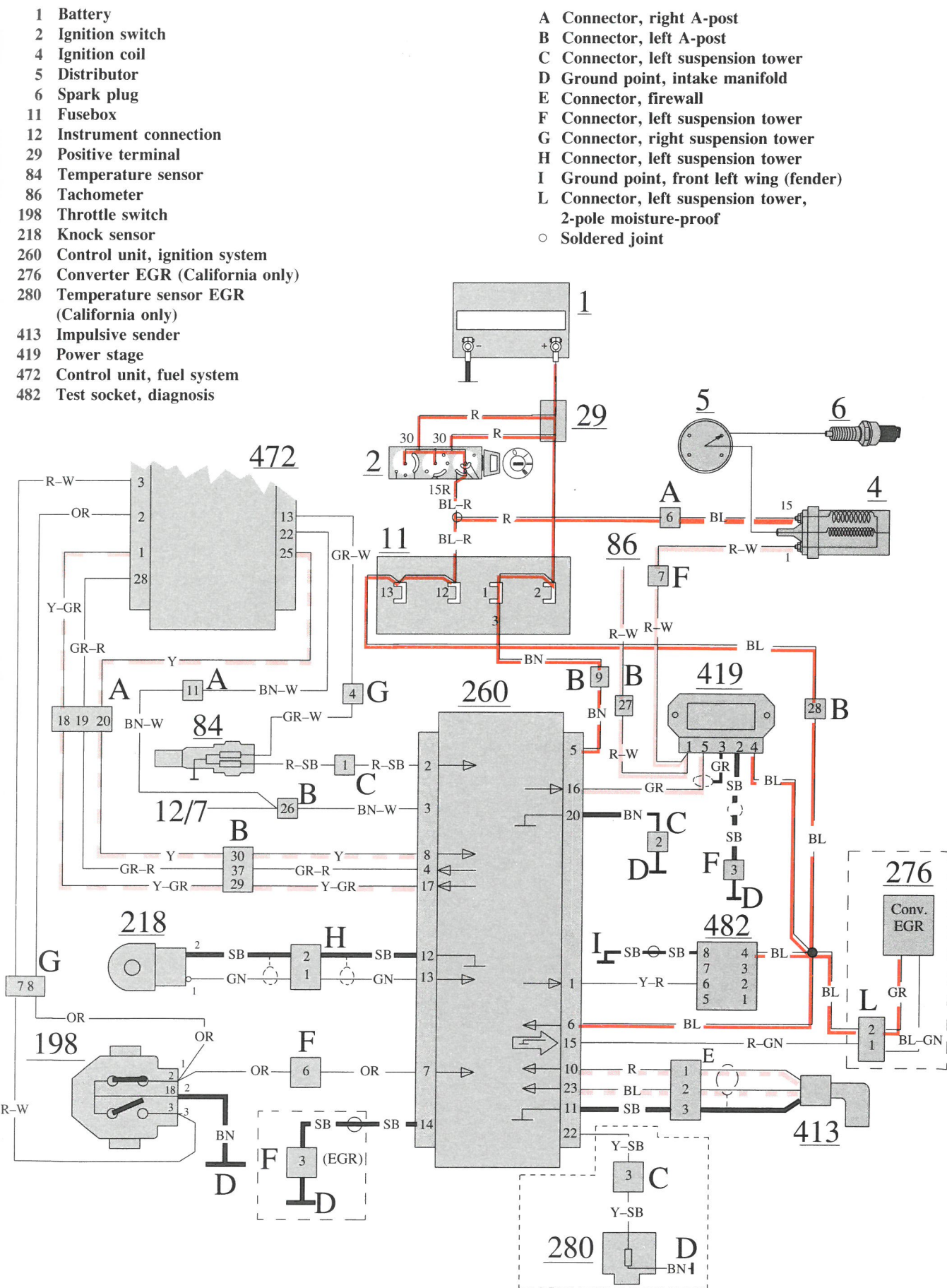




# EZ 116 K ignition system, B 230 F



# EZ 116 K ignition system, B 230 F

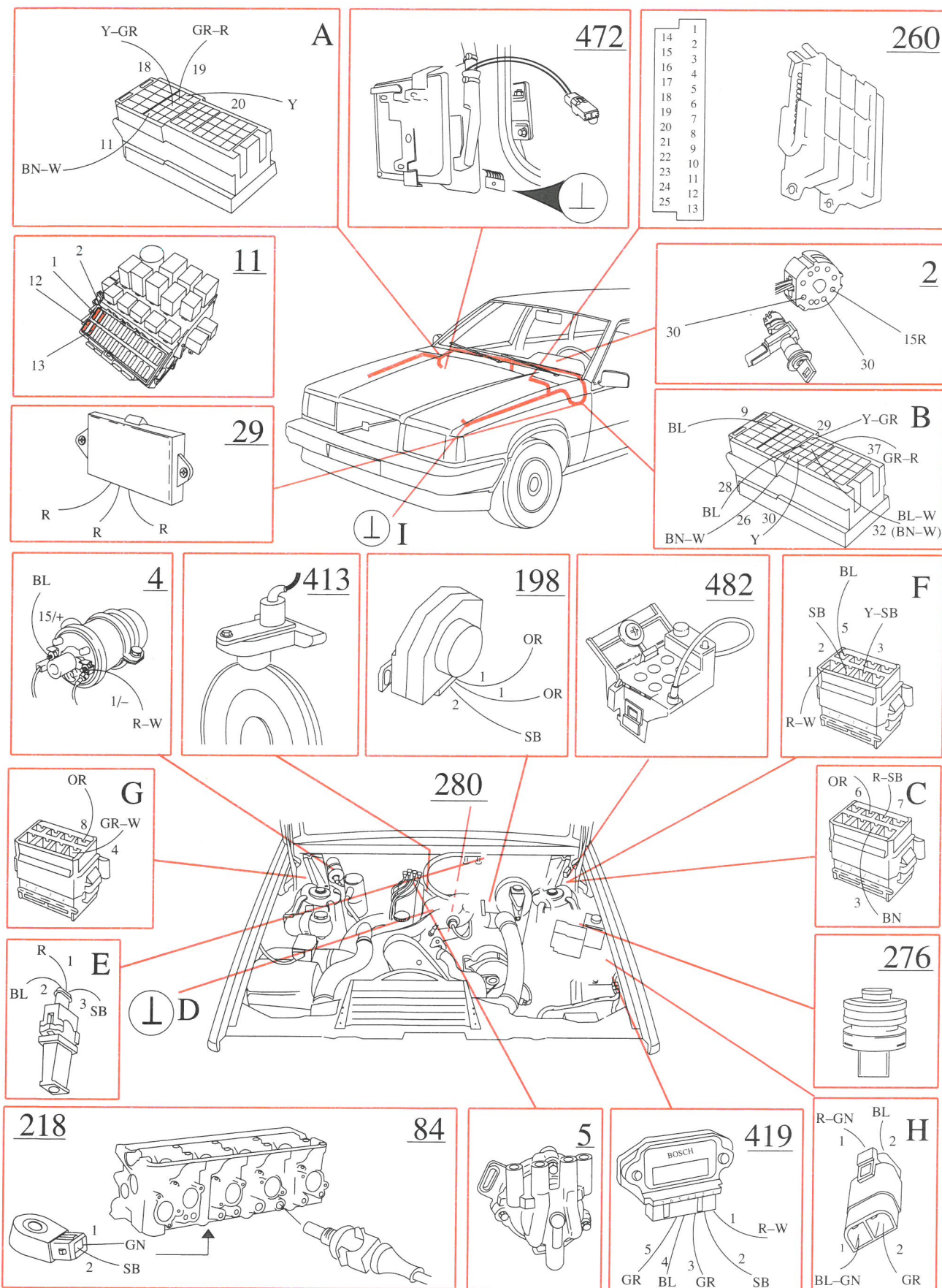


- 1 Battery
- 2 Ignition switch
- 4 Ignition coil
- 5 Distributor
- 6 Spark plug
- 11 Fusebox
- 12 Instrument connection
- 29 Positive terminal
- 84 Temperature sensor
- 86 Tachometer
- 198 Throttle switch
- 218 Knock sensor
- 260 Control unit, ignition system
- 276 Converter EGR (California only)
- 280 Temperature sensor EGR (California only)
- 413 Impulsive sender
- 419 Power stage
- 472 Control unit, fuel system
- 482 Test socket, diagnosis

- A Connector, right A-post
- B Connector, left A-post
- C Connector, left suspension tower
- D Ground point, intake manifold
- E Connector, firewall
- F Connector, left suspension tower
- G Connector, right suspension tower
- H Connector, left suspension tower
- I Ground point, front left wing (fender)
- L Connector, left suspension tower, 2-pole moisture-proof
- Soldered joint



# EZ 116 K ignition system, B 230 FT/GT



# EZ 116 K ignition system, B 230 FT/GT

- 1 Battery
  - 2 Ignition switch
  - 4 Ignition coil
  - 5 Distributor
  - 6 Spark plug
  - 11 Fusebox
  - 12 Instrument connection
  - 29 Positive terminal
  - 84 Temperature sensor
  - 198 Knock sensor
  - 260 Control unit, ignition system
  - 276 Converter EGR (California only)
  - 280 Temperature sensor EGR (California only)
  - 413 Impulse sender
  - 419 Power stage
  - 472 Control unit, fuel system
  - 482 Test socket, diagnosis
- A Connector, right A-post
  - B Connector, left A-post
  - C Connector, left suspension tower
  - D Ground point, intake manifold
  - E Connector, firewall
  - F Connector, left suspension tower
  - G Connector, right suspension tower
  - H Connector, left suspension tower, 2-pole moisture-proof
  - I Ground point, front left wing (fender)
  - o Soldered joint

