LE3 - JETRONIC SYSTEM

INTRODUCTION

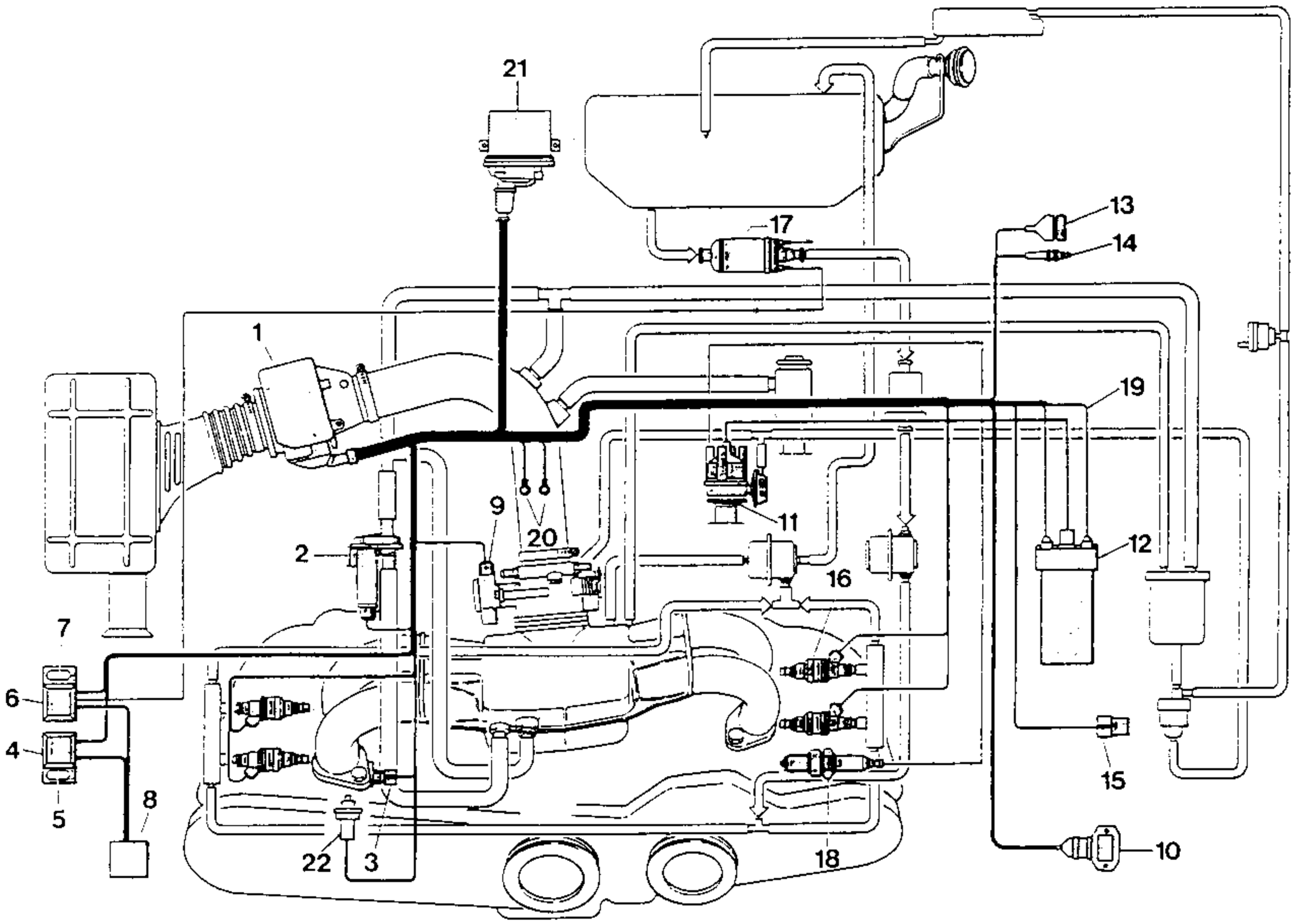
The electronic injection system LE3 - JETRONIC is an inductive discharge transistorized system CU equipped.
Ignition is ensured by an electronic ignition system with its own control unit.
Necessary units to operate various controls are collected by proper sensors which transform them into electrical signals.

These are:

- battery voltage
- accelerator throttle position signal (wholly closed or open)
- intake air temperature
- engine cooling fluid temperature
- air quantity intake from engine
- oxygen quantity in exhaust gas
- idle rpm (from distributor)

The electronic control unit (CU) collects data and calculates injectors opening time as a function of instantaneous idle and engine load conditions.
Once the calculation has been carried out, CU provides to open injectors at foreseen time.
Since difference between fuel pressure and air pressure in manifold is kept constant by a gauge, injected fuel quantity will be proportioned to supply time.
Furthermore, the injection CU is able to activate each time those actions considered most suitable with relation to particular engine situations (e.g. injector for cold start, fuel feed interruption during release phase).
The CU also controls the supply of fuel pump.

WIRING DIAGRAM OF INJECTION AND IGNITION SYSTEM



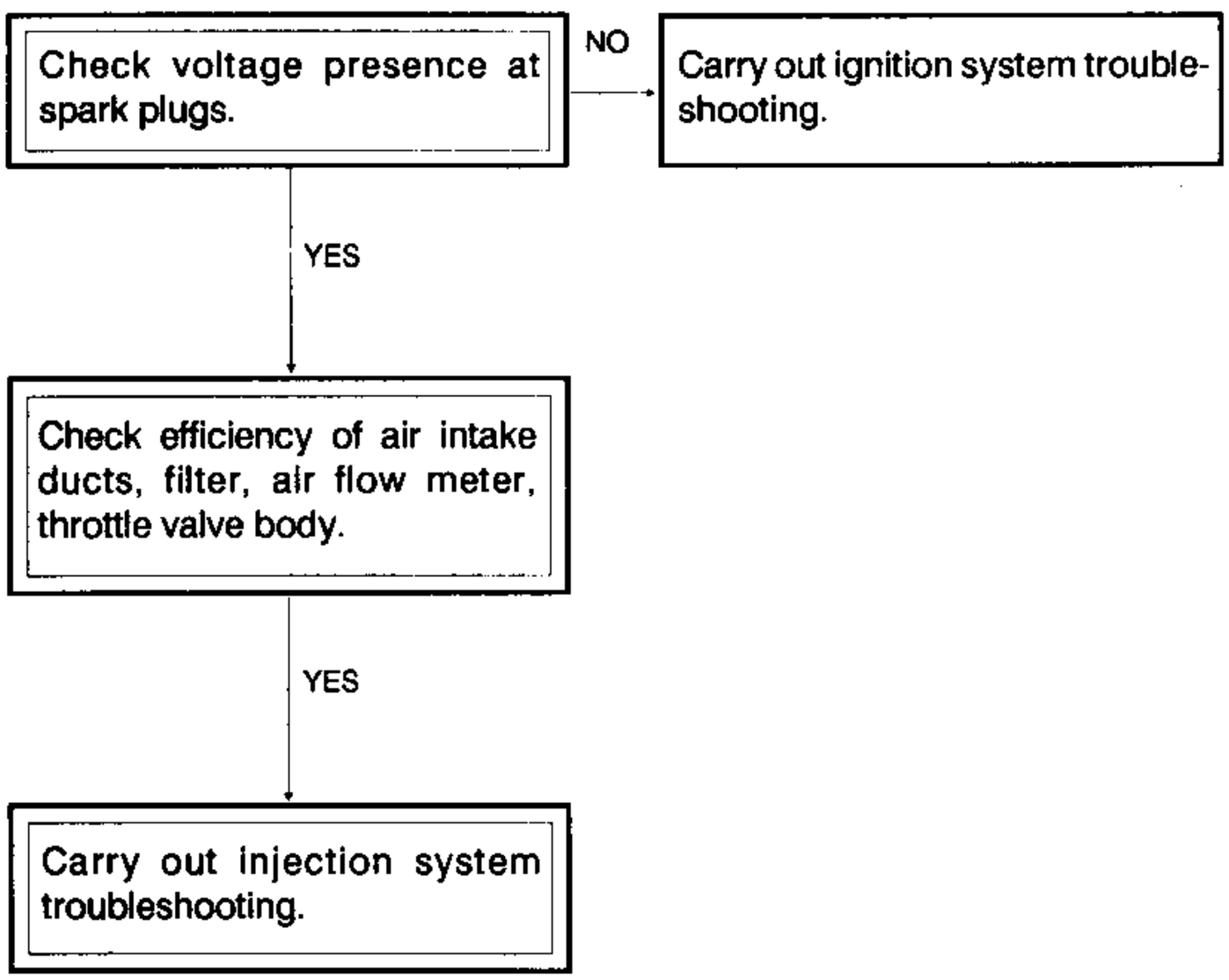
1 Air flow sensor/injection
2 Extra air solenoid valve
3 Engine cooling liquid temperature sensor
4 Main injection solenoid starter
5 Lambda probe resistance fuse (7,5 A)
6 Fuel pump solenoid starter
7 Fuel pump fuse (15 A)
8 Vehicle wiring connection
9 Min. & Max. throttle opening switch
10 Power module
11 Ignition distributor
12 Ignition coil
13 Lambda probe resistance connector
14 Lambda probe signal connector
15 Lambda probe connector
16 Injectors
17 Fuel pump
18 Spark plugs
19 Cable to detect engine rpm
20 Centralized grounds
21 Ignition CU
22 Coolant temperature thermal contact

INJECTION AND IGNITION SYSTEMS DIAGNOSIS AND CORRECTIVE ACTIONS

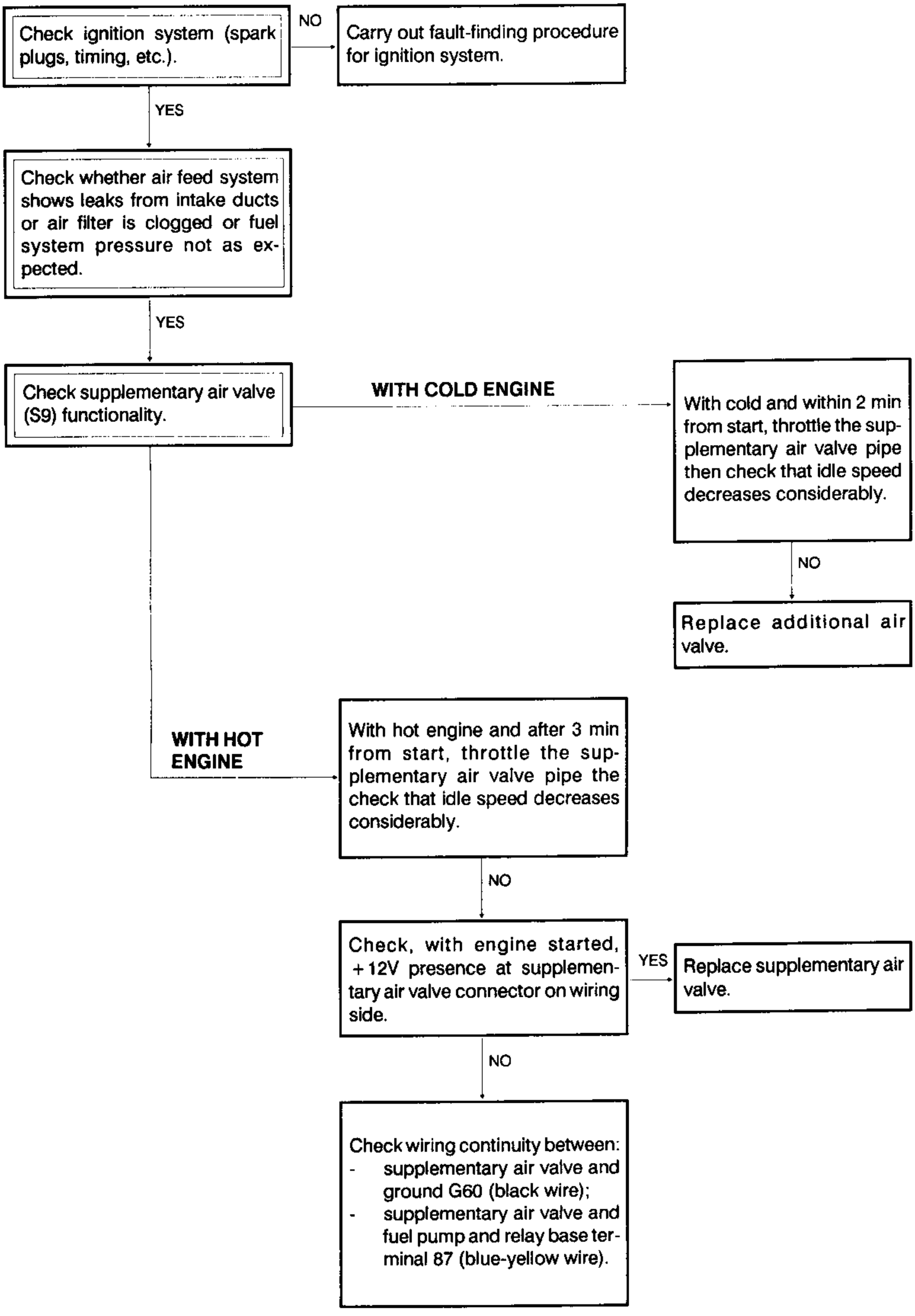
WARNING:

SHOULD ONE OF THE DIAGNOSIS TESTS LISTED HEREBELOW RESULT NOT POSITIVE, LOCATE THE CAUSE OF THE FAULTY CONDITION BY CARRYING OUT THE TROUBLESHOOTING PROCEDURE.

ENGINE FAILS TO START



ENGINE HAS DIFFICULTY IN STARTING



IDLE SPEED NOT REGULAR

Check throttle valve body flux is correct.
Check whether there are leaks from air intake ducts and air filter is clogged.

YES

Carry out ignition and injection systems troubleshooting.

IRREGULARITIES ON SPEEDING UP AND BURSTS AT RELEASE

Check whether fuel system pressure is correct and ignition system (spark plugs, timing, etc.) operates correctly.

NO → Carry out ignition system troubleshooting as well as Test N. 1 of injection system troubleshooting.

YES

Check whether there are leaks from air intake ducts.

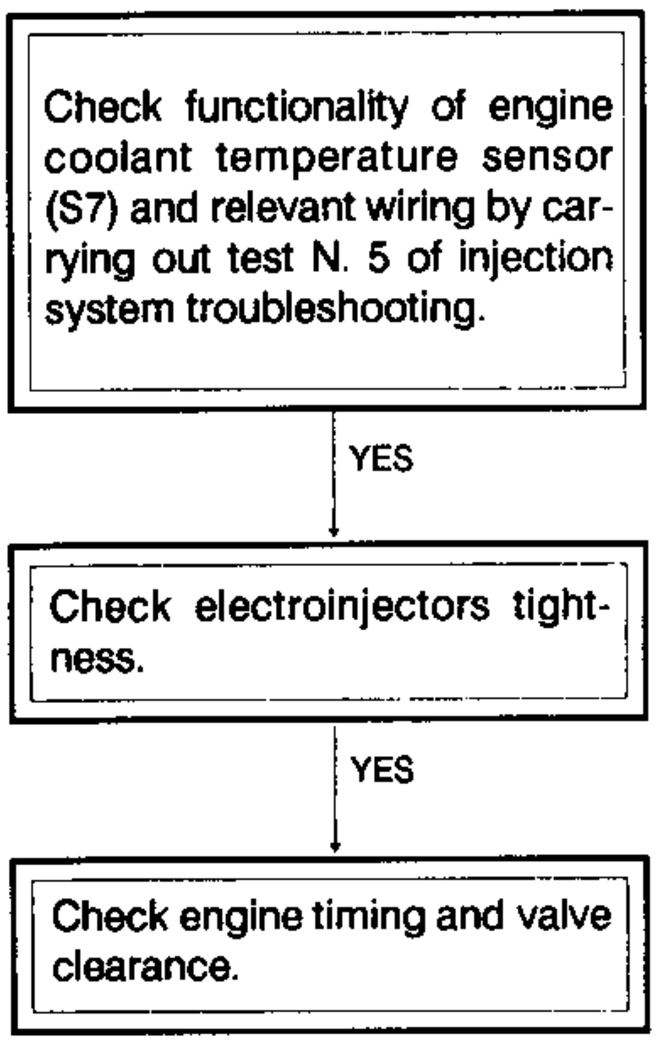
YES

Check grounds G60 efficiency.

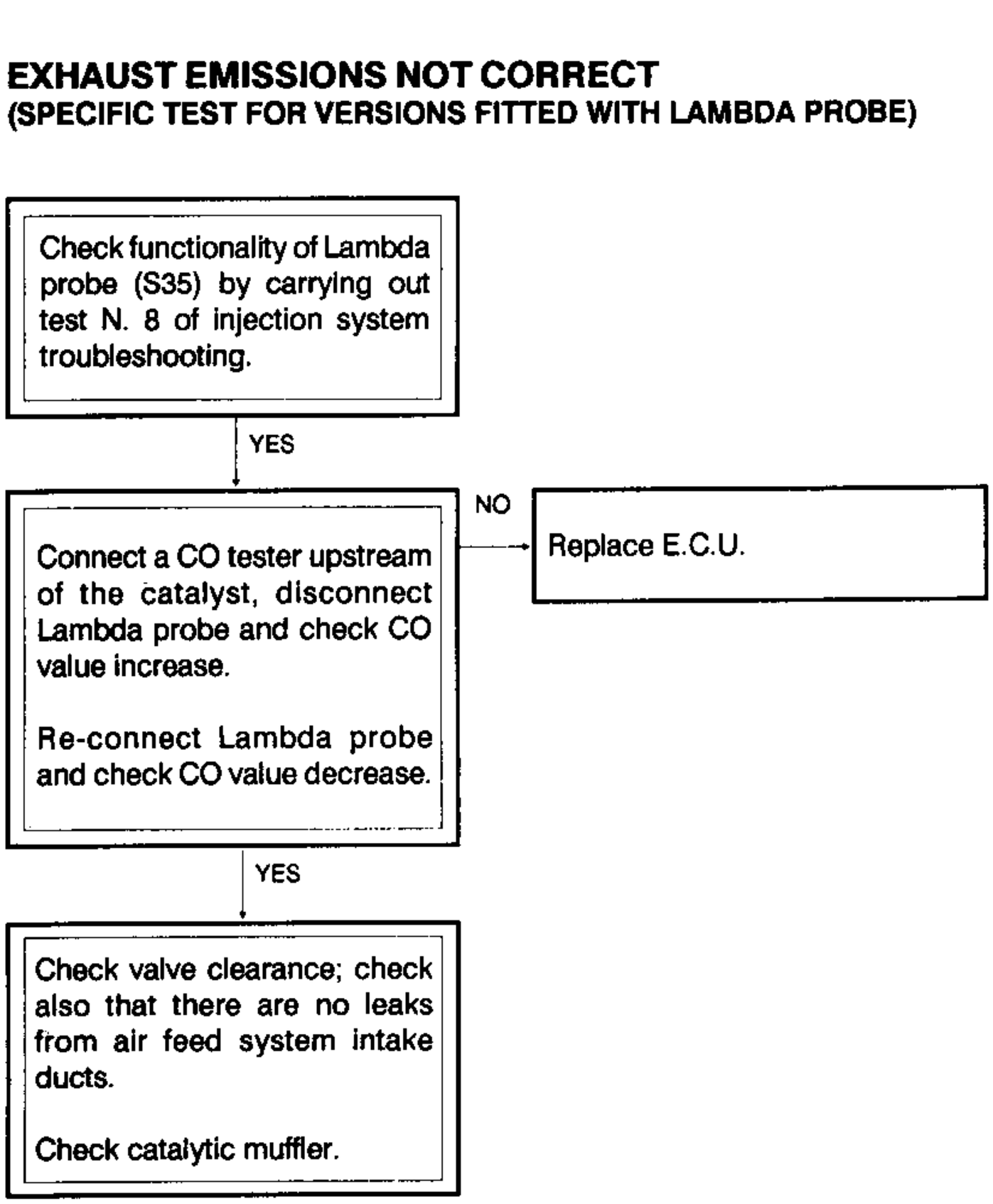
YES

Check efficiency of throttle valve min. and max. opening switch as stated in the injection system troubleshooting Procedure N. 4.

TOO MUCH FUEL CONSUMPTION



EXHAUST EMISSIONS NOT CORRECT (SPECIFIC TEST FOR VERSIONS FITTED WITH LAMBDA PROBE)



INJECTION SYSTEM TROUBLESHOOTING

NOTE:

THIS TROUBLESHOOTING WILL BE MAINLY DEALING WITH THE SYSTEM'S ELECTRIC/ELECTRONIC DIAGNOSIS ALONG WITH THE SENSORS AND ACTUATORS CONNECTED TO IT.

SHOULD A FAULTY CONDITION PERSIST AT THE END OF THE TESTS, IT WILL BE NECESSARY TO CHECK THE MAIN MECHANICAL UNITS SUCH AS VALVES, CYLINDERS, COUPLINGS, SEALS, INTAKE DUCTS, AND SO ON.

TEST No. 1 - CHECK OF FUEL PUMP CONTROL

Check fuel circuit pressure.
- **Connect a pressure gauge across the fuel circuit.**
- **Crank the engine for a prolonged time: the pressure gauge shall read 2.8 thru 3.2 bar.**

NOTE:
The pump shall go on rotating for a few seconds even with only ignition key set to RUN position.

NO → During a start, check +12V presence on fuel pump (P18a) terminals.

NO → Check fuse G4 (15 A) integrity.

YES → Check wiring continuity between fuel pump negative terminal (black wire) and ground on boot floor.

YES → Disconnect ignition key.
- Disconnect injection E.C.U. comb connector.
- Connect comb connector pin 12 to ground.
- Set ignition key to RUN position.

YES → Check that fuel pump relay is energized.

YES → Check whether fuel pump relay is rotating.

NO → Check the circuit downstream of the fuel pump relay from terminal 87 to the fuel pump, as well as the relay terminal 30 circuit.

NO → Restore cabling.

YES → Replace fuel pump relay.

YES → Injection E.C.U. is likely to be faulty.

Go on with diagnosis.

NO → Check electric circuit consisting of:
- fuel pump relay terminal 85 and ground = 0V;
- fuel pump relay terminal 86 and ground = 12V.

NO → Restore wiring of fuel pump relay terminals 85 and 86.

YES → Check fuel filter and whether there are throttlings along the ducts.

YES → Check pressure regulator efficiency.

YES → Replace fuel pump.

YES → Remove ground connections from E.C.U. comb connector pin 12.

TEST No. 2

TEST No. 2 - GROUND CHECK (E.C.U. PINS 4 AND 5)

Set multimeter to 200 Ohm f.s.
Ignition key must be OFF.
Disconnect injection E.C.U. comb connector.

Check continuity between:
- **E.C.U. S1 comb connector pin 4 and ground G60;**
- **E.C.U. S1 comb connector pin 5 and ground G60.**

NO →

Restore wiring between:
- E.C.U. S1 comb connector pin 4 and ground G60;
- E.C.U. S1 comb connector pin 5 and ground G60.

Check also grounds G60 functionality.

YES

TEST No. 3

TEST No. 3 - CHECK OF CONNECTION TO R.P.M. SIGNAL (E.C.U. PIN 1)

Set multimeter to 200 Ohm f.s.
Ignition key must be OFF.
Disconnect injection E.C.U. comb connector.

Check wiring continuity between E.C.U. S1 comb connector pin 1 and ignition coil A8 terminal 1.

NO → Restore wiring

YES

TEST No. 4

TEST No. 4 - CHECK OF THROTTLE VALVE MIN. AND MAX. OPENING SWITCH (E.C.U. PINS 15 AND 14)

Set multimeter to 200 Ohm f.s.
Ignition key must be OFF.
Disconnect injection E.C.U. comb connector.

↓

Connect the multimeter prods to E.C.U. comb connector pin 15 and ground.
The multimeter shall read a resistance value < 10 Ohm.
Press the accelerator pedal: the multimeter shall read an infinite resistance value.

NO → Check min. opening switch adjustment and efficiency.

↓ YES

Check continuity between:
- black wire on switch S6 connection and ground G60.

NO → Restore wiring.

↓ YES

Check continuity between:
- White wire on switch S6 connection and E.C.U. comb connector pin 15: it must not be broken or short circuited and shall not interfere with other wires.

NO → Restore wiring.

↓ YES

Connect the multimeter prods to E.C.U. comb connector pin 14 and ground.
The multimeter shall read an infinite resistance value.
Press the accelerator pedal fully home: the multimeter shall read a resistance value < 10 Ohm.

NO → Check max. opening switch adjustment and efficiency.

↓ YES

Check continuity between: yellow wire on switch S6 connection and E.C.U. comb connector pin 14: it must not broken or short circuited and shall not interfere with other wires.

NO → Restore wiring.

↓ YES

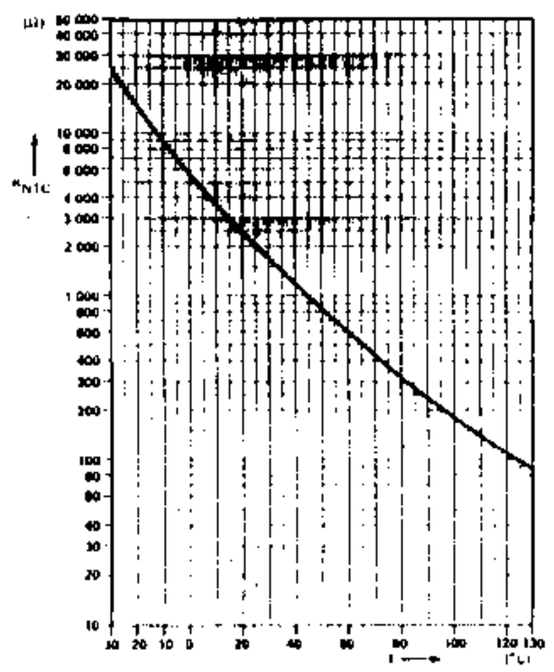
TEST No. 5

TEST No. 5 - CHECK OF ENGINE COOLANT TEMPERATURE SENSOR (E.C.U. PIN 8)

Set multimeter to 20kOhm f.s.
Have ignition key OFF.
Disconnect injection E.C.U.

↓

Check a resistance value between E.C.U. comb connector pin 8 and ground, varying according to engine coolant temperature, as per the following curve.



↓

NO → Check wiring continuity between:
- E.C.U. S1 comb connector pin 8 and brown wire on temperature sensor S7 connection;
- ground G60 and black wire on sensor S7 connection.

NO → Restore wiring.

YES ↓

Replace engine coolant temperature sensor S7.

↓

YES

↓

TEST No. 6

TEST No. 6 - CHECK OF ELECTROINJECTORS CIRCUIT

Set multimeter to 200 Ohm f.s.
Ignition key must be OFF.
Disconnect injection E.C.U. comb connector.

Check resistance between E.C.U. S1 comb connector pin 3 and fuel pump relay terminal 87. Read 3 thru 5 Ohm.

NO → Disconnect all the electroinjectors by unplugging the relevant connectors.
Measure the resistance at the end of every injector: it must be in the 14 to 18 Ohm range.

NO → Replace faulty electroinjector.

YES

Check, on every electroinjector connector (WIRING SIDE), that pins are connected, one to the fuel pump relay terminal 87 and the other to the E.C.U. comb connector pin 3.

NO → Restore cabling.

YES

TEST No. 7

TEST No. 7 - CHECK OF E.C.U. PINS 2 AND 7 + 12V

Set multimeter to 20V f.s.
Disconnect injection E.C.U. comb connector.

Have ignition key set to RUN position, then check +12V presence between E.C.U. comb connector pin 2 and ground.

NO → Have ignition key set to RUN position, then check +12V presence between supervisory relay base terminal 30 and ground G60.

NO → Have ignition key set to RUN position, then check +12V presence between supervisory relay base terminals 86 and 85.

YES → Check wiring continuity between supervisory relay base pin 86 and pin 7 on fuse-holder box connection J.

YES → Check wiring continuity between supervisory relay base pin 86 and ground G60.
If necessary, restore wiring and check that ground G60 is intact.

NO → check +12V presence between supervisory relay base terminal 87 and ground G60.

NO → Restore vehicle wiring between battery positive terminal and supervisory relay base terminal 87.

YES → Replace supervisory relay.

YES → Restore wiring between supervisory relay base terminal 30 and E.C.U. comb connector.

YES

Have ignition key set to RUn position, then check +12V presence between E.C.U. comb connector pin 7 and ground.

NO → Restore wiring between E.C.U. comb connector pins 2 and 7.

YES

TEST No. 8

TEST No. 8 - CHECK OF LAMBDA PROBE (E.C.U. PIN 13)
(SPECIFIC TEST FOR VERSIONS FITTED WITH LAMBDA PROBE)

Connect comb connector on wiring side to E.C.U.
Set multimeter to 20V f.s.
Start engine.

↓

Check, with engine started, +12V presence at Lambda probe pre-heating resistance (S35) terminals.

NO → Check fuse G4 (7.5 A) integrity. NO ⇢ Restore, if necessary, the pre-heating resistance wiring.

YES ↓

- **Disconnect Lambda probe preheating resistance connector.**
- **Set multimeter to 200 Ohm f.s.**
- **Check functionality of pre-heating resistance: the measured value shall be in the 3 to 20 Ohm range.**

NO → Replace Lambda probe assy.

YES ↓

- **Set multimeter to 2V f.s.**
- **Withdraw the Lambda probe connector cap (wiring side).**
- **Check, with engine in steady state and idle-speed, that the multimeter reads 30mV thru 1V between Lambda probe connection point and ground.**

NO → Replace Lambda probe.

YES ↓

- **Have ignition key OFF.**
- **Disconnect E.C.U. comb connector.**
- **Check continuity between comb connector pin 13 (wiring side) and Lambda probe connection point.**

NO → Restore cabling.

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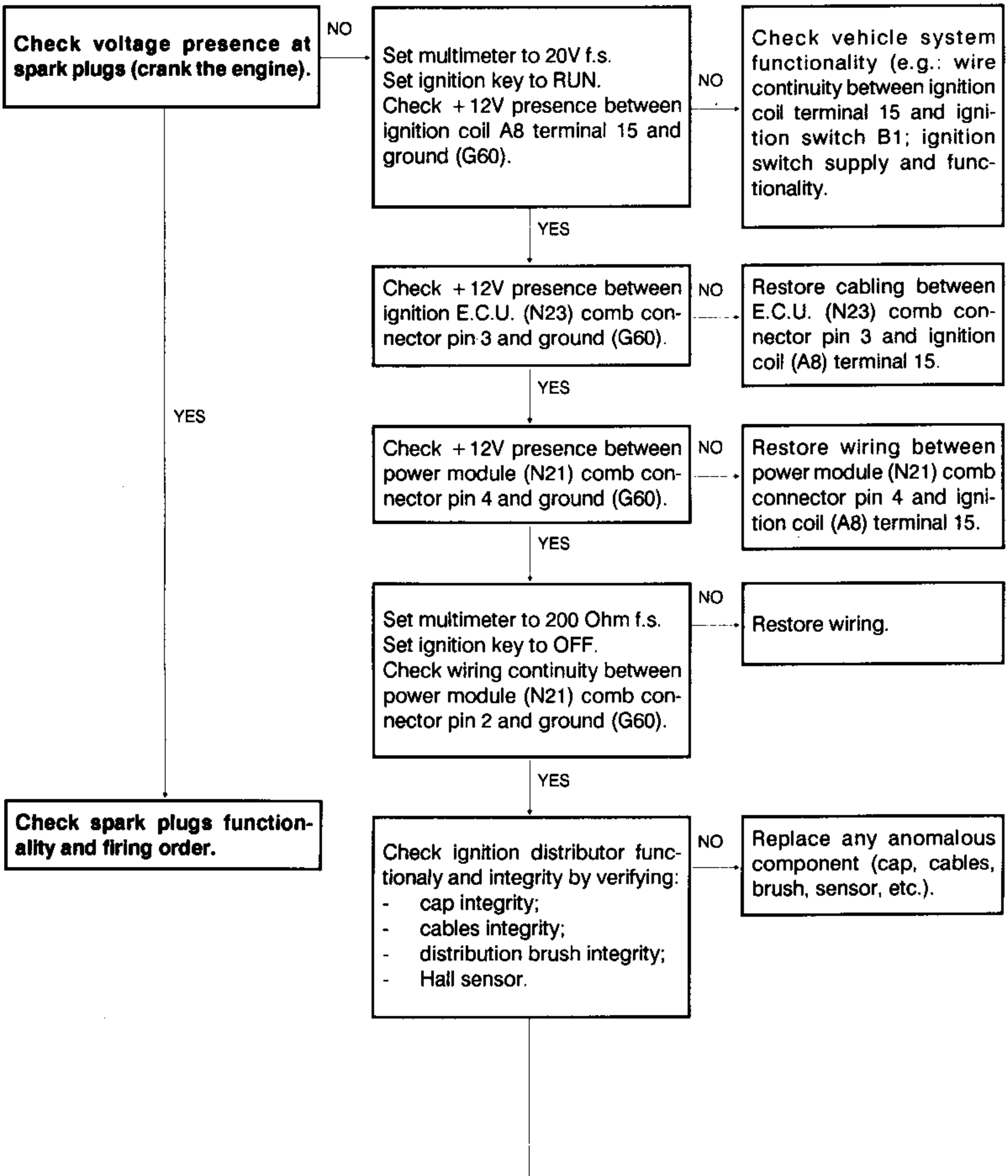
ENGINE FAILS TO START



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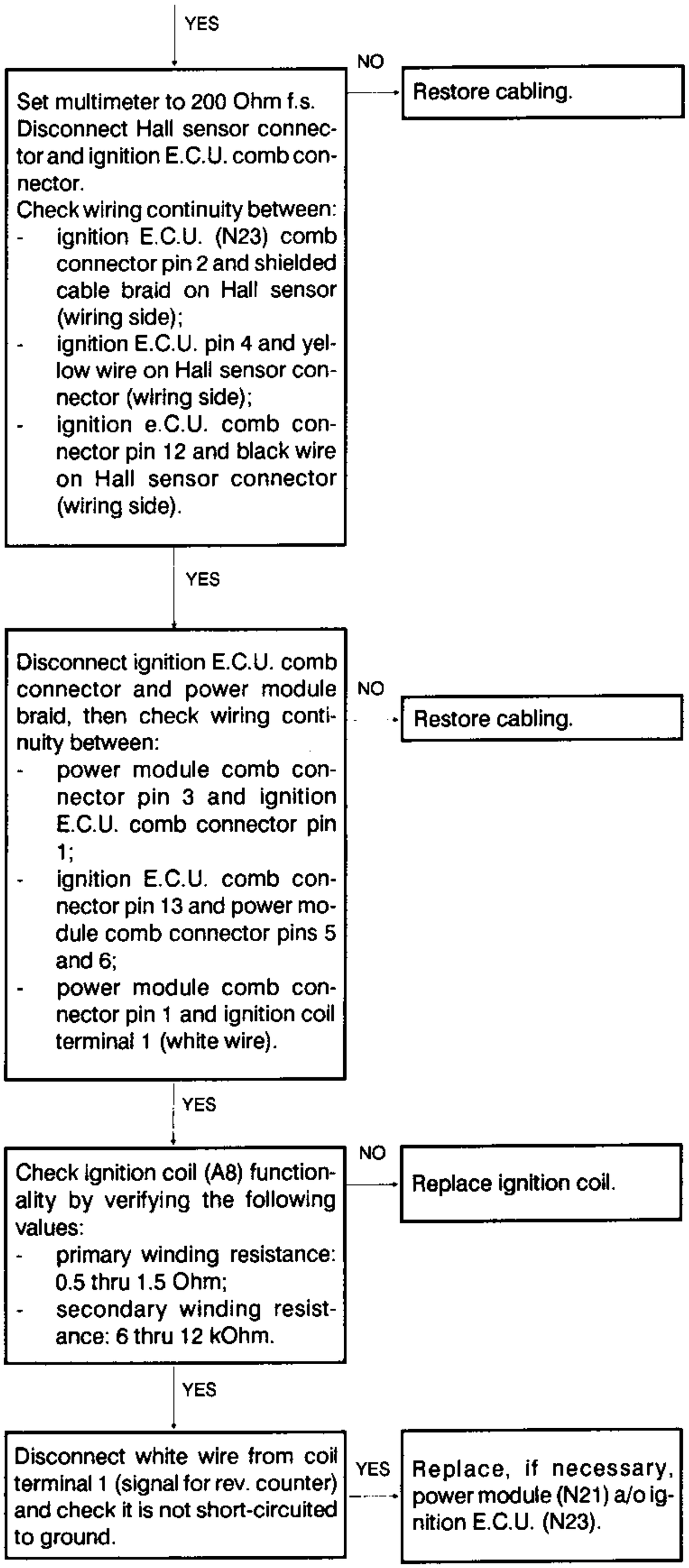

YES
NO
Set multimeter to 200 Ohm f.s.
Disconnect Hall sensor connector and ignition E.C.U. comb connector.
Check wiring continuity between:
- ignition E.C.U. (N23) comb connector pin 2 and shielded cable braid on Hall sensor (wiring side);
- ignition E.C.U. pin 4 and yellow wire on Hall sensor connector (wiring side);
- ignition e.C.U. comb connector pin 12 and black wire on Hall sensor connector (wiring side).
Restore cabling.
YES
Disconnect ignition E.C.U. comb connector and power module braid, then check wiring continuity between:
- power module comb connector pin 3 and ignition E.C.U. comb connector pin 1;
- ignition E.C.U. comb connector pin 13 and power module comb connector pins 5 and 6;
- power module comb connector pin 1 and ignition coil terminal 1 (white wire).
NO
Restore cabling.
YES
Check ignition coil (A8) functionality by verifying the following values:
- primary winding resistance: 0.5 thru 1.5 Ohm;
- secondary winding resistance: 6 thru 12 kOhm.
NO
Replace ignition coil.
YES
Disconnect white wire from coil terminal 1 (signal for rev. counter) and check it is not short-circuited to ground.
YES
Replace, if necessary, power module (N21) a/o ignition E.C.U. (N23).

CHECK OF SPARK ADVANCE VARIATION

TEST No. 1

Connect stroboscope and check:
- **with cold engine, an advance value greater than expected;**
- **with hot engine, the expected advance value.**

YES → In case a variation is met out of the stated values, adjust advance value according to the relevant procedure.

NO ↓

Disconnect, with engine in steady state, the engine coolant temperature thermal contact (L25) connector and read the advance value.
Connect the thermal contact brown-white wire to ground and check an advance variation as to the previously read value.

NO → Disconnect ignition E.C.U. (N23) comb connector.
Check wiring continuity between ignition E.C.U. comb connector pin 7 and thermal contact brown.white wire.

NO → Restore wiring.

YES ↓

Replace ignition E.C.U. (N23).

YES ↓

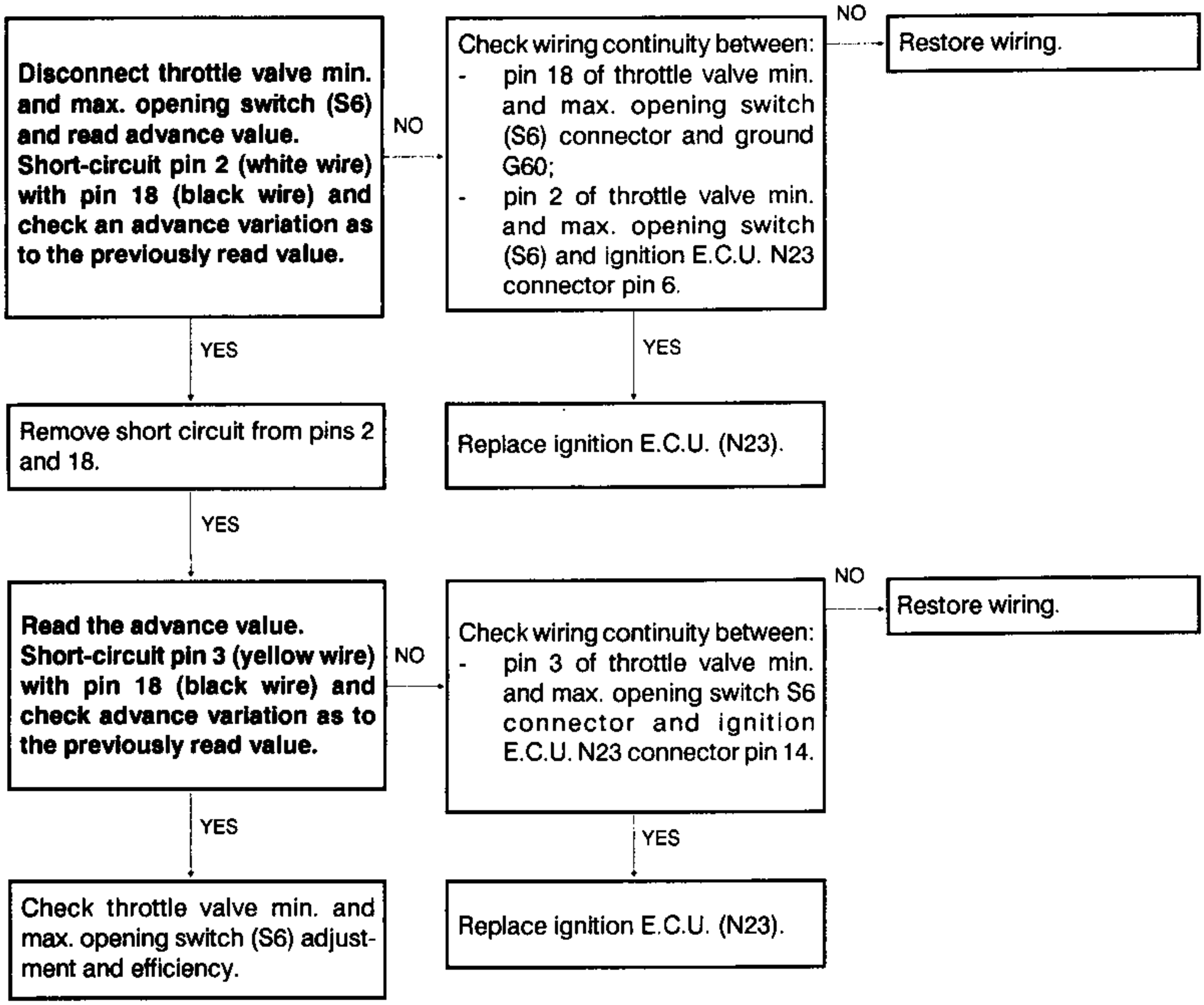
Check thermal contact (L25) functionality as follows:
- **with hot engine, note about 0 Ohm between sensor and ground;**
- **with cold engine, note an infinite resistance between sensor pin and ground.**

NO → Replace thermal contact (L25).

YES ↓

TEST No. 2

TEST No. 2


Disconnect throttle valve min. and max. opening switch (S6) and read advance value.
Short-circuit pin 2 (white wire) with pin 18 (black wire) and check an advance variation as to the previously read value.
NO
Check wiring continuity between:
- pin 18 of throttle valve min. and max. opening switch (S6) connector and ground G60;
- pin 2 of throttle valve min. and max. opening switch (S6) and ignition E.C.U. N23 connector pin 6.
NO
Restore wiring.
YES
Replace ignition E.C.U. (N23).
YES
Remove short circuit from pins 2 and 18.
YES
Read the advance value.
Short-circuit pin 3 (yellow wire) with pin 18 (black wire) and check advance variation as to the previously read value.
NO
Check wiring continuity between:
- pin 3 of throttle valve min. and max. opening switch S6 connector and ignition E.C.U. N23 connector pin 14.
NO
Restore wiring.
YES
Replace ignition E.C.U. (N23).
YES
Check throttle valve min. and max. opening switch (S6) adjustment and efficiency.