

MOTRONIC ML4.1 SYSTEM - 4 CYLINDERS

INTRODUCTION

The Motronic ML4.1 system is an electronically-controlled combined ignition and fuel injection system. By this system it is possible to obtain optimal ignition control and fuel metering.

The use of a single electronic control unit for both the ignition and injection systems has also made it possible to make use of the signals from the same sensors, thereby simplifying the system.

FUNCTIONAL DESCRIPTION

By means of electric pump 2 and the filter, fuel is conveyed from the tank to electroinjectors 9 via the pulse damper.

The pressure regulator, in relation to the air intake pressure in the intake casing, adjusts fuel pressure in the distribution pipe so as to maintain a constant difference between fuel pressure and intake casing pressure.

When fuel pressure exceeds maximum pre-set value (3 bar), the pressure regulator provokes the return of excess fuel to the tank.

In this manner, the quantity of fuel injection depends exclusively on injection timing, set by the electronic control unit 1 with the aid of sensors suitable for the reading of characteristic engine operating data such as: r.p.m.'s, load, battery voltage, engine temperature, etc.

The quantity of air sucked in is measured by air flow meter 16 whose function is to quantify air flow and subsequently convey a signal to the electronic control unit on the basis of which exact fuel dosage is determined.

A sensor for the measurement of intake air temperature is positioned within the air flow meter.

This sensor sends a signal to the

electronic control unit so that it may compensate injection timing according to the variation in the air weight/fuel weight ratio.

Engine temperature is measured by an appropriate sensor 14 mounted with its sensitive part immersed in the coolant liquid.

It enters the intake duct from air flow meter 16 and then reaches the throttle valve. Switch 15 is installed on one of the throttle valve bodies and is composed of two microswitches, one of which has a minimum opening supplying a signal for throttle opening angle from 0° (completely closed) to 1°, and the other supplying a signal for throttle valve opening angles over 55°.

The signals conveyed by these two microswitches to the electronic control unit respectively allow fuel cut-off control during deceleration whenever the throttle valve is closed and r.p.m. exceed 1200, and the control of enrichment during acceleration when with a specific engine power requirement the air flow meter signal exceeds a pre-set increase, controlling not only fuel injection for the new requirement but also a further increase for the rapid attainment of engine r.p.m.'s required. The air by-pass circuit with the throttle valve body has a constant idle actuator 13 whose passage section, with a closed or slightly open throttle valve, determines an air flow which is not controlled by the accelerator, but by an electronic control unit signal.

Sucked in air from the filter crosses the intake casing, passes through the intake manifold and enters the cylinders.

During cold starts, the control unit controls ignition advance and injection timing.

Ignition advance is exclusively subordinate to number of r.p.m.'s and to engine temperature.

Ignition timing is the result of a value programmed within the con-

trol unit and corrected by the reading of intake air temperature, engine temperature, battery voltage and r.p.m.

The inductive type sensor proposed for the measurement of engine r.p.m. and timing 10, functions thanks to the magnetic field variation generated by the passage of the pulley teeth (phonic wheel) keyed onto the engine flywheel.

The space present on the phonic wheel created by the lack of two teeth, supplies the electronic control unit with a reference point; each side of the subsequent tooth determines the angular position of the crankshaft.

Ignition advance is obtained from a programmed diagram inside the control unit according to the number of r.p.m.s and engine load; the value thus obtained is optimized in relation to the intake air and engine temperature.

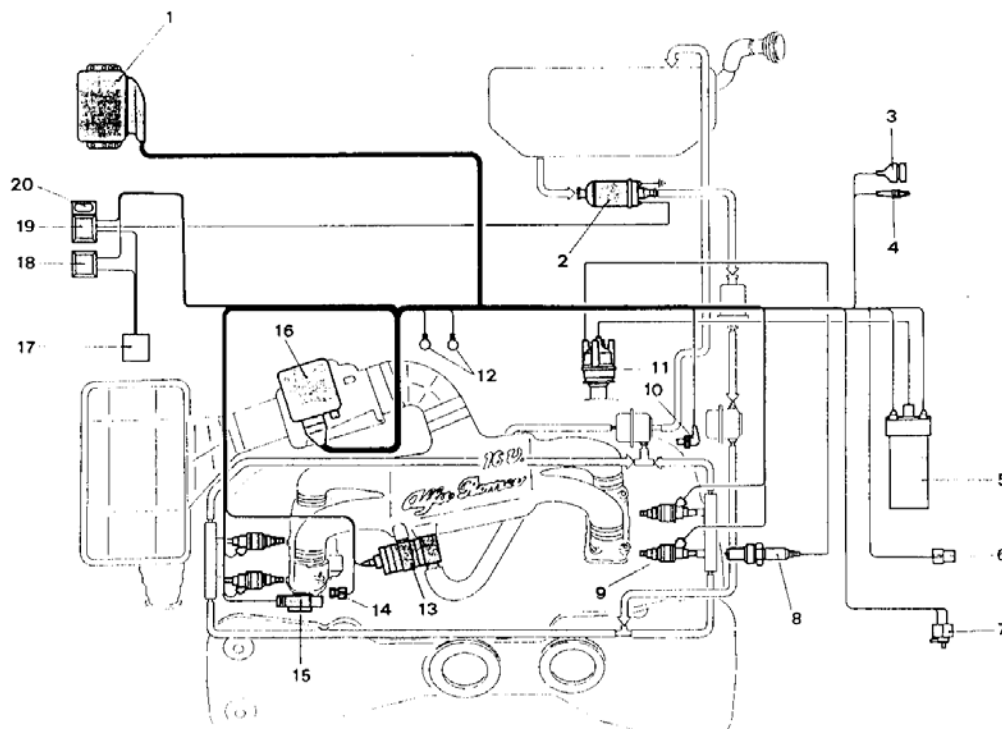
Idle speed adjustment is governed during all working phases by constant idle actuator 13.

At constant idle, the actuator has the task of taking the real r.p.m. number to nominal r.p.m. acting on the throttle valve's 4 "by-passes".

As well as controlling idle speed, actuator 13 also acts as a supplementary air slide valve and regulator for the activation of the air-conditioning system.

MOTRONIC ML4.1 SYSTEM

WIRING DIAGRAM FOR INJECTION AND EVAPORATION SYSTEMS



- | | | | |
|-----|-----------------------------------|-----|---|
| 1. | MOTRONIC unit | 12. | Centralised earthing |
| 2. | Fuel pump | 13. | Constant idle actuator |
| 3. | Lambda probe resistance connector | 14. | Engine coolant temperature sensor |
| 4. | Lambda probe signal connector | 15. | Min. and max. throttle valve opening switch |
| 5. | Ignition coil | 16. | Air flow meter |
| 6. | Lambda probe coding connector | 17. | Vehicle wiring connection |
| 7. | Emission control solenoid valve | 18. | Main injection switch |
| 8. | Spark plugs | 19. | Fuel pump switch |
| 9. | Electroinjectors | 20. | Fuel pump fuse |
| 10. | R.p.m. and timing sensor | | |
| 11. | Ignition distributor | | |

ELECTRIC CHECKS (With Alfa Romeo Tester)

TROUBLESHOOTING PROCEDURE

Possible failures affecting the Motronic System ML4.1 can be detected either by following the flashing code diagnostic procedure (see Motronic System ML4.1 Diagnostic Procedure with Use of the Flashing Code), or using the Alfa Romeo Tester C.1.0160 provided with program tape cartridge.

These two procedures allow the faults, which the Motronic E.C.U. itself is able to detect via a selfdiagnosis process, to be located.

On checking wiring and signals in output from the Motronic E.C.U., it will be advisable to perform the herein described procedure also availing of the test equipment for this purpose available at the Alfa Romeo Service Centers.

NOTE:

The troubleshooting will be mainly dealing with the system's electric/electronic diagnosis along with the sensors and actuators connected. 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, seal, intake ducts, and so on.

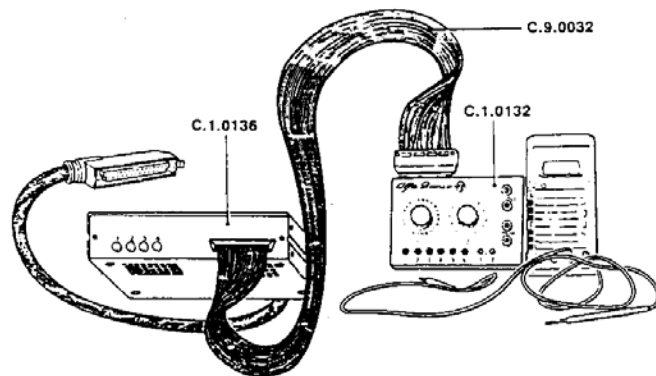
DIAGNOSIS PROCEDURE

WARNING:

Should one of the tests listed herebelow not result positive, locate the cause of the faulty condition by carrying out the troubleshooting procedure.

PRELIMINARY OPERATIONS

- Remove the ignition key.
- Disconnect the battery negative terminal.
- Disconnect the Motronic E.C.U. comb connector.
- Connect the wiring-side comb connector to the relevant connector on interface C.1.0136. **DO NOT CONNECT THE ELECTRONIC CONTROL UNIT.**
- Select 4 cylinder ML4.1 pressing key No. 3 on interface C.1.0136.
- Connect the interface to the multi-purpose test instrument C.1.0132 via cable C.9.0032.
- Reconnect negative terminal to the battery.
- Disconnect the fuel pump relay.



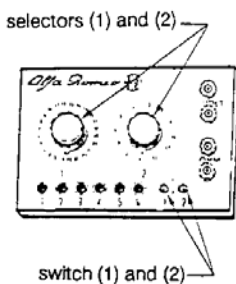
PRELIMINARY TEST

CONNECTION CHECK - PIN 8 OF ELEC. CONTROL UNIT (ANTITHEFT FUNCTION)

- Set the multimeter to 20V f.s.
- Turn the ignition key to RUN position.
- Apply the multimeter prods across pin 8 of E.C.U. connector and ground.
- Multimeter voltage reading shall be 0V (null voltage).

PRESETTING FOR TAKING MEASUREMENT IN VOLT

- Set selectors (1) and (2) to position 1.
- Set switch (1) to position 2.
- Set switch (2) to position 1.
- Connect the multimeter prods to "OHM" jacks on the diagnostic instrument.



PRELIMINARY TEST

PIN 16 GROUND AND E.C.U. PIN 19 CHECK

- Remove the ignition key.
- Set multimeter to 200 Ohm f.s.
- Set selector (1) to position 3 (Pin 16).
- Multimeter shall read < 10 Ohm.
- Set selector (1) to position 4 (Pin 19).
- Multimeter shall read < 10 Ohm.

TEST N. 1

CHECK OF THROTTLE VALVE MIN. OPENING MICROSWITCH - PIN 2 OF WIRING

- Set selector (2) to position 1.
- Set multimeter to 200 Ohm f.s.
- Multimeter shall read < 10 Ohm (with accelerator pedal released).
- Slightly apply the accelerator pedal and read infinite resistance on the multimeter.

TEST N. 2

CHECK OF THROTTLE VALVE MAX. OPENING MICROSWITCH - PIN 3 OF WIRING

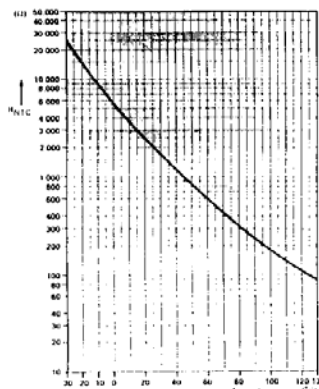
- Set selector (2) to position 1.
- Set multimeter to 200 Ohm f.s.
- Read infinite resistance on the multimeter (with accelerator pedal released).
- Press the accelerator pedal fully home and read a value < 10 Ohm on the multimeter. (Status change occurs at approx. 72° of throttle opening).

TEST N. 3

TEST OF ENGINE TEMPERATURE SENSOR - PIN 13 OF WIRING

- Set selector (2) to position 3.
- Set multimeter to 20 kOhm f.s.
- Read on the multimeter a value varying according to the temperature.

-10°C	=	9 kOhm
0°C	=	6 kOhm
+10°C	=	3.8 kOhm
+15°C	=	3 kOhm
+20°C	=	2.5 kOhm
+25°C	=	2.1 kOhm
+30°C	=	1.7 kOhm
+40°C	=	1.2 kOhm
+60°C	=	600 Ohm
+80°C	=	330 Ohm



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TEST N. 4

TEST OF AIR TEMPERATURE SENSOR - PIN 22 OF WIRING (PIN 6 GROUNDED THROUGH C.1.0136)

- Set selector (2) to position 4.
- Set multimeter to 20 kOhm f.s.
- Read, on the multimeter, an infinite resistance value.
- Press push-button (3) and read, on the multimeter, a value varying according to the temperature (see test curve No. 3).

-
- **Disconnect the battery negative terminal.**
 - **Connect the interface comb-connector C.1.0136 to the E.C.U. connector.**
 - **Connect the battery negative terminal.**
-

TEST N. 5

GROUND CHECK FOR SHIELDED CABLES - PIN 23 OF E.C.U.

- Set selector (2) to position 5.
- Set multimeter to 200 Ohm f.s.
- Read, on the multimeter, a value < 10 Ohm.

PRESETTING FOR TAKING MEASUREMENTS IN OHM

- Set selectors (1) and (2) to position 1.
- Set switch (1) to position 2.
- Set switch (2) to position 1.
- Measure battery voltage on the battery terminals with ignition key set to RUN position then take note of the value met.
- Disconnect the ignition key.
- Connect the multimeter prods across "VOLT" jacks on the diagnostic instrument.

TEST N. 6

+ 12V DIRECT CHECK - PIN 18 OF MOTRONIC E.C.U.

- Have ignition disconnected.
- Have multimeter set to 20V f.s.
- Have selector (1) set to position 1.
- Read a value ($\pm 50\text{mV}$) corresponding to the previously noted battery voltage.

TEST N. 7

KEY CONTROLLED + 12V CHECK - PIN 35 OF E.C.U.

- Set multimeter to 20V f.s.
- Set selector (1) to position 2.
- With ignition key removed, read 0V (null voltage).
- With ignition key in RUN position, read the previously noted battery voltage ($\pm 50\text{mV}$).

Turn the ignition key to "RUN" position.

TEST N. 8

GROUND CHECK - PINS 16 AND 19 OF E.C.U.

- Have ignition key set to RUN position.
- Set multimeter to 200mV f.s.
- Set selector (1) to position 3 (Pin 16).
- The multimeter shall read a voltage value < 30mV.
- Set selector (1) to position 4 (Pin 19).
- The multimeter shall read a voltage value < 30mV.

Note:

The above mentioned value may result a little bit lower than expected when cable C.9.0032 longer size is used.

TEST N. 9

CHECK OF AIR FLOW METER SUPPLY - PIN 9 OF E.C.U.

- Have ignition key set to RUN position.
- Have multimeter set to 20V f.s.
- Set selector (1) to position 6.
- The multimeter shall read a voltage value in the 4.5V to 5.5V range.

TEST N. 10

CHECK OF AIR FLOW METER POTENTIOMETER - PIN 7 OF E.C.U.

- Have ignition key set to RUN position.
- Set multimeter to 20V f.s.
- Set selector (1) to position 7.
- The multimeter shall read a voltage value in the 100mV to 300mV range.
- Manually actuate the air flow meter throttle valve and check that the voltage value gradually increases till reaching a value $\geq 4.2\text{V}$, without any intermediate fail.

TEST N. 11

CHECK OF CONSTANT IDLE SPEED ACTUATOR WIRING AND SUPPLY

- Have ignition key set to RUN position.
- Have multimeter set to 20V f.s.
- Set selector (1) to position 5.
- The multimeter shall read a voltage value in the 4V to 12V range.
- Momentarily disconnect the connector from the idle-speed actuator and check that the voltage value decreases to approx. 0V (null voltage).

Re-connect the fuel pump relay (with ignition key set to "RUN" position, the relay may be energized or met ticking).

TEST N. 12

TESTS TO BE CARRIED OUT ON ENGINE WHICH FAILS TO START

NOTE:

Make sure the preliminary test has been carried out (check of E.C.U. pin 8 connection).

TEST N. 12.1

CHECK OF INDUCTIVE SENSOR - PIN 25 OF E.C.U.

- Set multimeter to 0V f.s.
- **For making a.c. readings.**
- Set selector (1) to position 18.
- Crank the engine and read, on the multimeter, a voltage value < 1.5V.
- **Reset the multimeter for direct current readings.**

TEST N. 12.2

CHECK OF INJECTION TIME

- Have multimeter set to 2V f.s.
- Set selector (1) to position 14.
- Set switch (1) to position 1.
- Set switch (2) to position 1.
- Crank the engine for a prolonged time and read, on the multimeter, a voltage value ranging from 200mV and 1V (within 2 and 10 msec).

TEST N. 12.3

CHECK OF ELECTROINJECTOR CURRENT

- Have multimeter set to 2V f.s.
- Set selector (1) to position 13.
- Set switch (2) to position 1.
- Crank the engine for a prolonged time and read, on the multimeter, a voltage value ranging from 200mV and 260mV.

TEST N. 12.4

CHECK OF COIL CONTROL - PIN 1 OF E.C.U.

- Have multimeter set to 2V f.s.
 - Set selector (1) to position 15.
 - Set switch (1) to position 2.
 - Crank the engine for a prolonged time and read, on the multimeter, a voltage value corresponding to the cranking r.p.m.
- (e.g.: 14 mV = 210 r.p.m.
16 mV = 240 r.p.m.
18 mV = 270 r.p.m.)

TEST N. 12.5

CHECK OF FUEL CIRCUIT

- Connect a pressure gauge to the fuel distributor pipe.
- Turn the ignition key to RUN position.
- Press push-button No. 4 of the diagnostic instrument and check that fuel pressure reaches a value \geq 2.8 bar.

NOTE:

The pump is likely to be already rotating.

TESTS TO BE CARRIED OUT IF THE ENGINE STARTS

TEST N. 13

CHECK OF INDUCTIVE SENSOR POSITIVE HALF-WAVE

- Crank the engine.
- Have multimeter set to 20V f.s.
- Set selector (1) to position 11.
- With engine at idle-speed, check that the value read on the multimeter ranges from 0.7V and 1.3V.
- Accelerate and check that the value increases.

TEST N. 14

CHECK OF INDUCTIVE SENSOR NEGATIVE HALF-WAVE

- Crank the engine.
- Have multimeter set to 20V f.s.
- Set selector (1) to position 12.
- Act as stated in the previous test N. 13, checking that the value to be read is \geq the previous one.

TEST N. 15

CHECK OF ELECTROINJECTOR CURRENT

- Crank the engine.
- Have multimeter set to 2V f.s.
- Set selector (1) to position 13.
- Set switch (1) to position 1.
- Set switch (2) to position 1.
- Accelerate shortly and rapidly, checking that the maximum values read on the multimeter range from 250mV and 330mV (with engine temperature > +50°C).

NOTE:

Reading means electroinjector current in millivolt.

(e.g.: 200 mV = 2 A
300 mV = 3 A
400 mV = 4 A).

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TEST N. 16

CHECK OF INJECTION TIME

- Crank the engine without acting on the accelerator pedal.
- Have multimeter set to 2V f.s.
- Set selector (1) to position 14.
- Set switch (1) to position 1.
- Set switch (2) to position 1.
- With engine idling in steady state, the multimeter shall read 300mV, approx., corresponding to about 3 msec of ignition time.

NOTE:

With engine cold or at very low external temperature, injection time will be longer.

- During acceleration, verify enrichment by rapidly and shortly speeding up, checking that the indication on the multimeter tends to increase.
- When the engine has nearly reached steady state, press push-button No. 5 (cold engine simulation) of the diagnostic instrument and verify enrichment (with cold engine) throughout longer injection times.
- If external temperature is > 10°C, press push-button No. 6 (cold air simulation) of the diagnostic instrument and verify a small increase in voltage on the multimeter.

TEST N. 17

CHECK OF COIL CONTROL (PIN 1)

- Crank the engine.
- Have multimeter set to 2V f.s.
- Set selector (1) to position 15.
- Set switch (1) to position 2.
- Read, on the multimeter, a voltage value corresponding to the engine r.p.m.

(e.g.: 55 mV = 800 r.p.m.
70 mV = 1000 r.p.m.
200 mV = 3000 r.p.m.
270 mV = 4000 r.p.m.
340 mV = 5000 r.p.m.)

TEST N. 18

CHECK OF IGNITION ADVANCE

- Crank the engine.
- Have multimeter set to 2V f.s.
- Set selector (1) to position 17.
- Set switch (1) to position 2.
- With engine idling and in steady state, read a voltage value ranging from 40mV and 100mV, corresponding to an ignition advance of 4 thru 40 deg.
- Speed up till reaching 2000 r.p.m. and check that ignition advance increases.

TEST N. 19

CHECK OF CONSTANT IDLE-SPEED ACTUATOR OPERATION

- With engine idling, unplug temporarily the actuator connector and check that engine r.p.m. increases.
- Refit the connector and check idle-speed again.

TEST N. 20

CHECK OF E.C.U. FUNCTIONS

- With engine running at about 2000 r.p.m., press push-button No. 1 (throttle valve closed) and check fuel cut-off (decrease of r.p.m. and subsequent increases and reductions) (hunting).

TEST N. 21

CHECK OF CONNECTIONS TO AIR CONDITIONER (IF INSTALLED) - PINS 29 AND 32 OF E.C.U.

- Have multimeter set to 20V f.s.
- Set selector (1) to position 9.
- Set switch (1) to position 2.
- Crank the engine.
- Make sure that the compressor electromagnetic coupling is de-energized.
- The multimeter shall read 0V (null voltage).
- Set selector (1) to position 10.
- The multimeter shall read 0V (null voltage).
- Adjust air conditioning system so that the compressor electromagnetic coupling is energized.
- The multimeter shall read +12V (battery voltage).
- Set selector (1) to position 9.
- The multimeter shall read +12V (battery voltage).

NOTE:

Engine r.p.m. is likely to increase but not to decrease.

TEST N. 22

SPECIFIC TESTS CONCERNING VERSIONS NOT FITTED WITH LAMBDA PROBE

- Disconnect the battery negative terminal.
- Disconnect interface C.1.0136 connector from E.C.U. connector.
- Reconnect negative terminal to battery.

TEST N. 22.1

CHECK OF PRESETTING FOR OTHER DIFFERENT MARKETS

NOTE:

Presetting is carried out by inserting a relay-shaped device of different colour in the special connector (S30).

- Connect the multimeter prods to "OHM" jacks on the diagnostic instrument.
- Have multimeter set to 200 Ohm f.s.
- Read, on the multimeter, the values listed here below, at selector (2) positions 7 and 8, according to your own market presetting.

Selector position (2)	Petrol with high octane number (97 R.O.N.)	Petrol with low octane number (95 R.O.N.)
7	Infinite resistance	Resistance < 10 Ohm
8	Infinite resistance	Infinite resistance
	No device is plugged into connector S30	Red-coloured device plugged into connector S30

- Disconnect negative terminal from battery.
- Reconnect interface c.1.0136 comb-connector to E.C.U. connector.
- Reconnect negative terminal to battery.

TEST N. 22.2

CHECK OF CO POTENTIOMETER - PIN 30 OF E.C.U.

- Connect the multimeter prods to "VOLT" jacks on the diagnostic instrument.
- Have ignition key set to RUN position.
- Have multimeter set to 20V f.s.
- Set selector (1) to position 8.
- Read on the multimeter, a voltage value ranging within 0.1V and 4.9V.
- If necessary, the test can be performed more deeply by rotating the CO potentiometer and checking that the voltage value read on the multimeter continuously varies between 0.1V and 4.9V.

TEST N. 23

SPECIFIC TESTS ON VERSIONS FITTED WITH LAMBDA PROBE

- Disconnect the battery negative terminal.
- Disconnect the interface C.1.0136 comb-connector from the E.C.U. connector.
- Reconnect the battery negative terminal.

TEST N. 23.1

CHECK OF THE PRESETTING FOR OTHER DIFFERENT MARKETS

NOTE:

Presetting is carried out by inserting a relay-shaped device of different colour in the special connector (S30).

- Connect the multimeter prods to "OHM" jacks on the diagnostic instrument.
- Have multimeter set to 200 Ohm f.s.
- Read, on the multimeter, the values listed here below, at selector (2) positions 7 and 8, according to your own market presetting.

Selector position (2)	Unleaded petrol with a high octane number (95 R.O.N.)	Unleaded petrol with a low octane number (91 R.O.N.)
7	Infinite resistance	Resistance < 10 Ohm
8	Resistance < 10 Ohm	Resistance < 10 Ohm
	Yellow-ochre coloured device plugged into connector S30	Light-blue-coloured device plugged into connector S30

- Disconnect the battery negative terminal.
- Reconnect the interface C.1.0136 comb-connector to the E.C.U. connector.
- Reconnect the battery negative terminal.

TEST N. 23.2

CHECK OF LAMBDA PROBE - PIN 24 OF E.C.U.

- Connect the multimeter prods to "VOLT" jacks on the diagnostic instrument.
- Have multimeter set to 2V F.S.
- Set selector (1) to position 22.
- Crank the engine and check, with engine hot, that the r.p.m. value displayed on the multimeter, ranges from 100mV to 1V.

TEST N. 23.3

CHECK OF FUEL VAPOUR FLOW CHECK SOLENOID VALVE CONTROL - PIN 34 OF E.C.U.

- Have multimeter set to 20V f.s.
- Directly apply the multimeter prods to the solenoid valve pins.
- Crank the engine and, as it is hot, shortly accelerate and check, on the multimeter, the temporary presence of +12V (at each acceleration).

TEST N. 23.4

CHECK OF LAMBDA PROBE PRE-HEATING RESISTANCE SUPPLY

- Have multimeter set to 20V f.s.
- Crank the engine.
- Directly apply the multimeter prods to the pins of the Lambda probe pre-heating resistance.
- Multimeter reading must be +12V.
- With heating resistance connector unplugged, verify, on its pins, a resistance value (multimeter set to 200 Ohm f.s.) ranging within 3 Ohm and 20 Ohm.

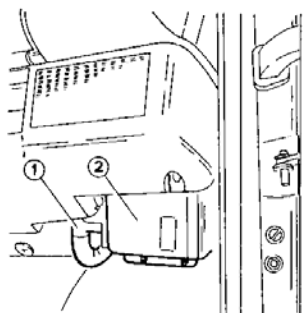
TROUBLESHOOTING PROCEDURE

WARNING:
KEEP TO TROUBLESHOOTING FLOW DIAGRAMS: THIS WILL ALLOW YOU TO CORRECTLY LOCATE ANY FAILURE. IN THIS WAY, ANY POSSIBLE, ADJUSTMENT OR FAULTY COMPONENT SHALL NOT WRONGLY JEOPARDIZE THE RESULT OF THE SUBSEQUENT TESTS.

NOTE:
This troubleshooting procedure foresees that a vehicle, engine (valves, cylinders, clearances, and so on) and ignition system (spark plugs, distributors, coils) shall be in perfect condition.

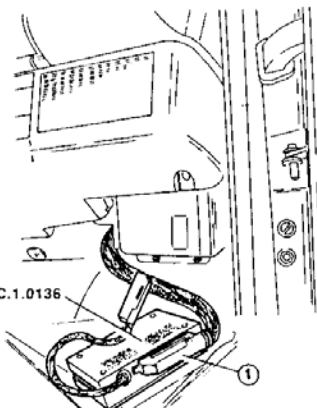
PRELIMINARY OPERATIONS

1. Turn the ignition key off.
2. Disconnect the battery negative terminal.
3. Disconnect comb 1 on Motronic E.C.U. 2.



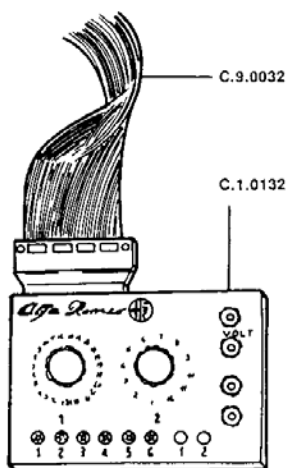
1. Motronic E.C.U. comb-connector
2. Motronic E.C.U.

4. Connect comb-connector 1 (wiring side) to the relevant connector on interface C.1.0136.
- DO NOT CONNECT THE E.C.U.**



1. Motronic E.C.U.

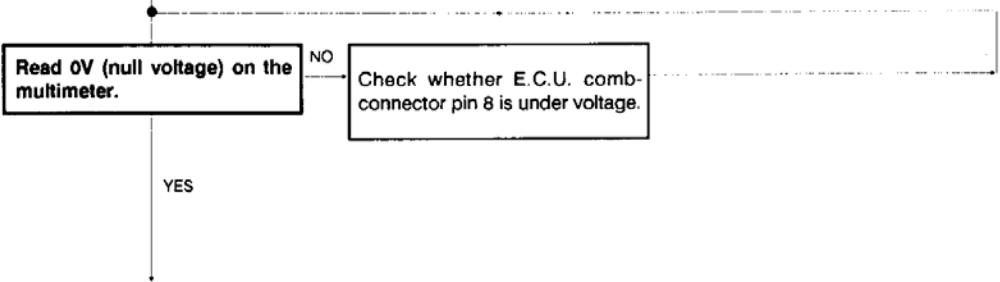
5. Select ML4.1 by pressing key No. 3 on interface C.1.0136.
6. Connect interface C.1.0136 to the multi-purpose test instrument C.1.0132 with cable C.9.0032.



7. Reconnect the battery negative terminal.
8. Disconnect the fuel pump relay.

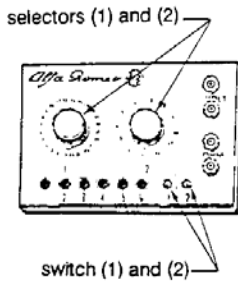
PRELIMINARY TEST - CHECK OF E.C.U. PIN 8 CONNECTION (ANTI THEFT FUNCTION)

- *Preset the multimeter for taking 20V f.s. measurements.*
- *Set ignition key to RUN position.*
- *Connect the multimeter prods across E.C.U. connector pin 8 and ground.*



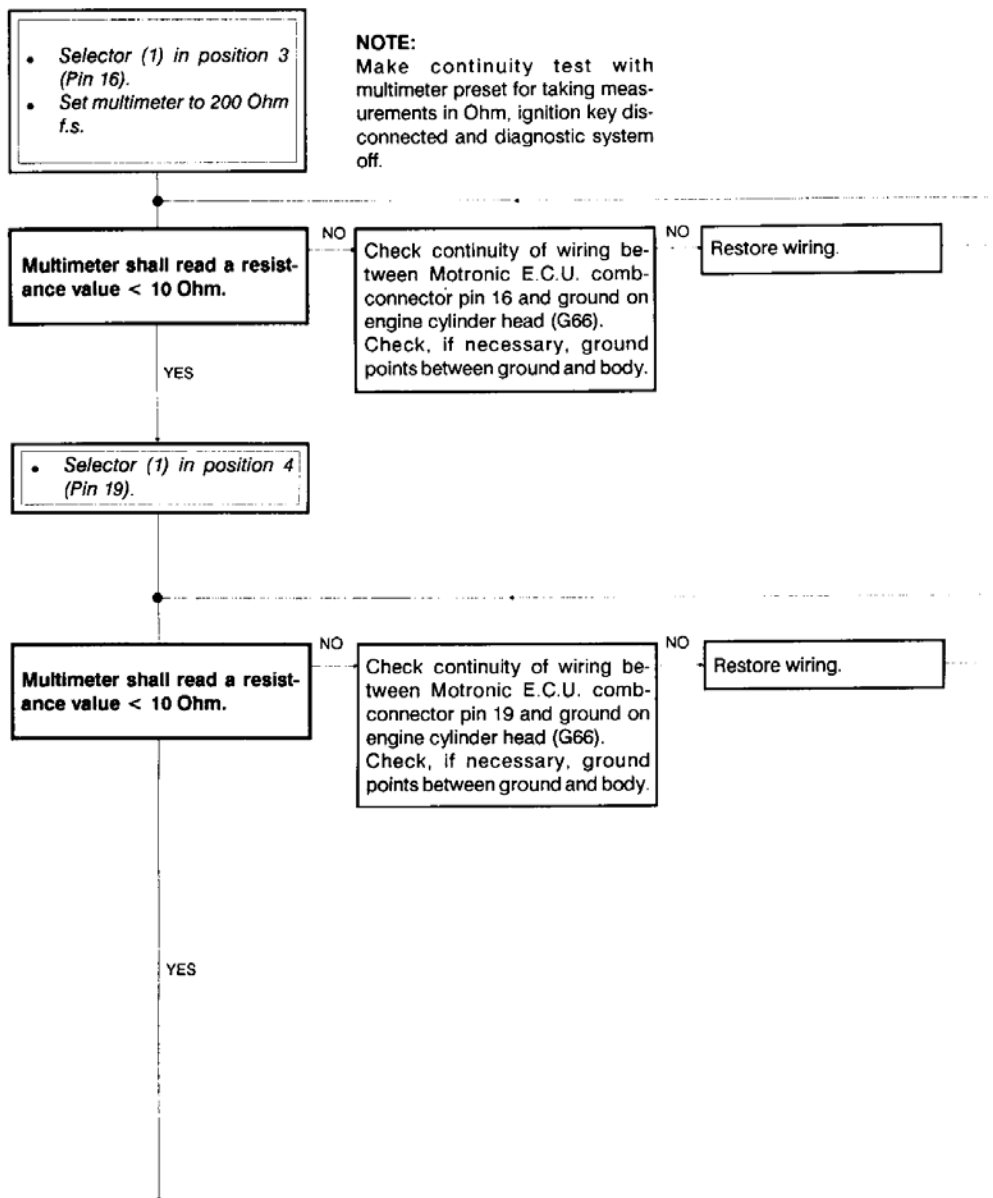
PRESETTING FOR TAKING MEASUREMENTS IN OHM

- Set selectors (1) and (2) to position 1.
- Set switch (1) to position 2.
- Set switch (2) to position 1.
- Connect the multimeter prods to "OHM" jacks on the diagnostic instrument.



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PRELIMINARY TEST - MOTRONIC E.C.U. PINS 16 AND 19 GROUND CHECK

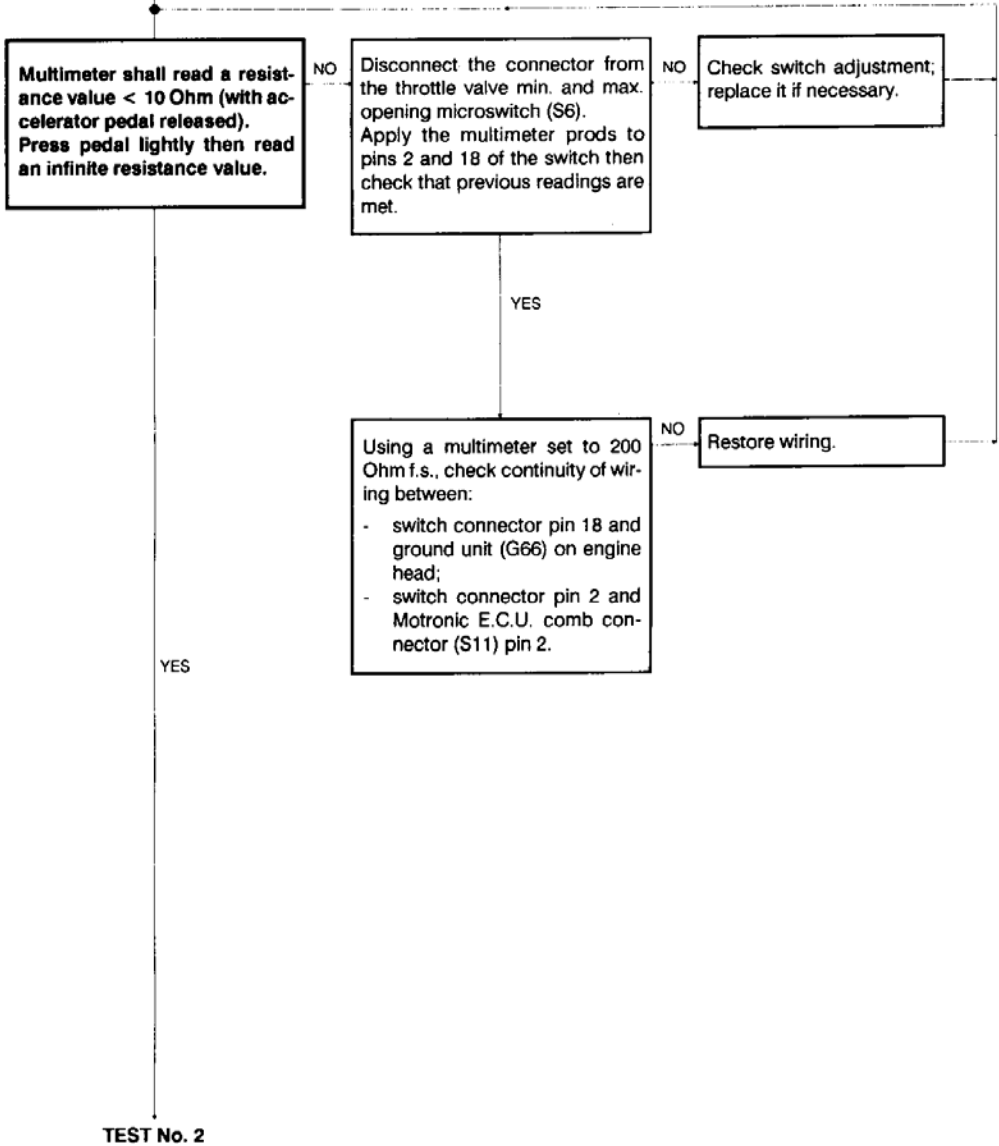


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TEST No. 1 - CHECK OF THROTTLE VALVE MIN. OPENING MICROSWITCH

- Selector (2) in position 1.
- Set multimeter to 200 Ohm f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

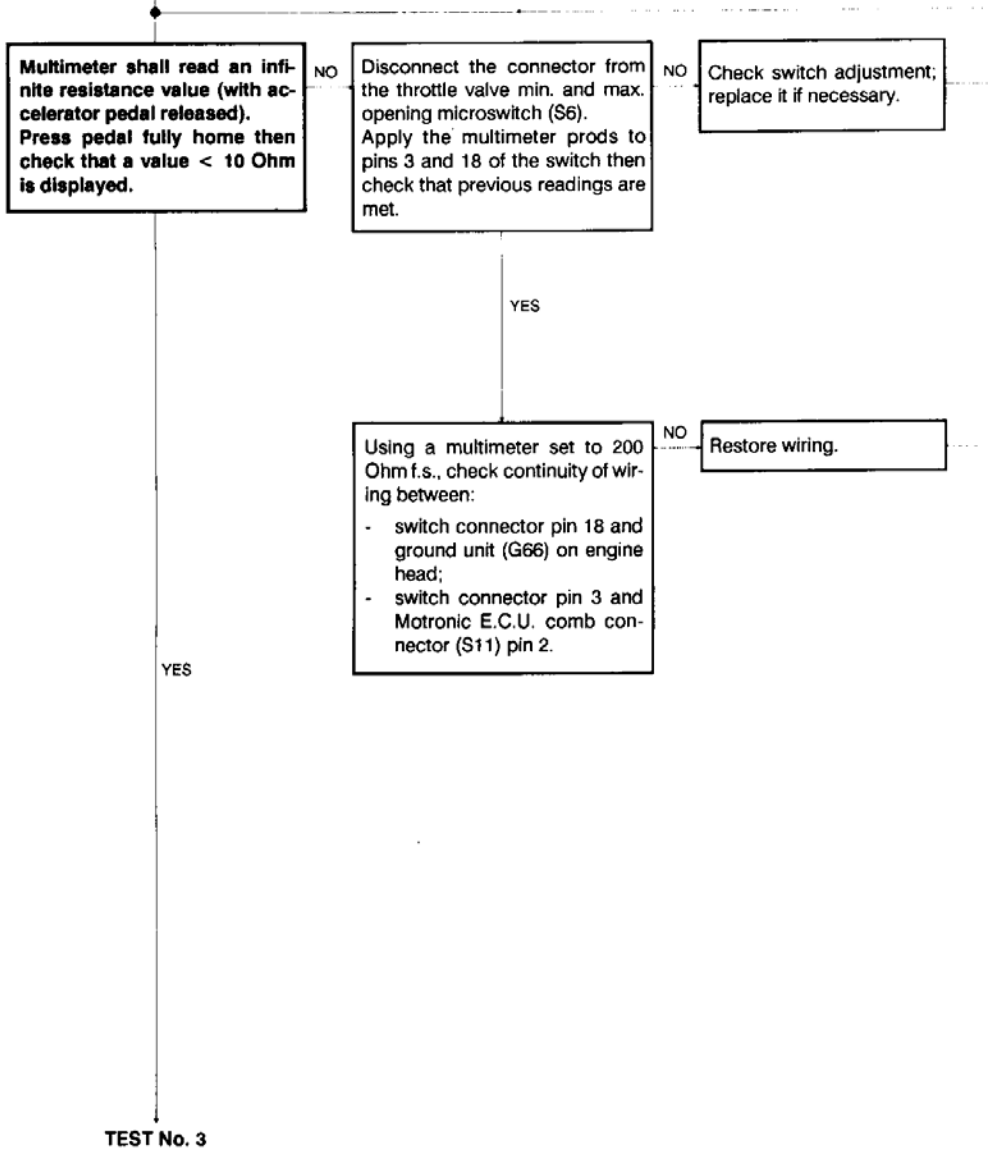


MOTRONIC ML4.1 SYSTEM

TEST No. 2 - CHECK OF THROTTLE VALVE MAX. OPENING MICROSWITCH

- Selector (2) in position 2.
- Set multimeter to 200 Ohm f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

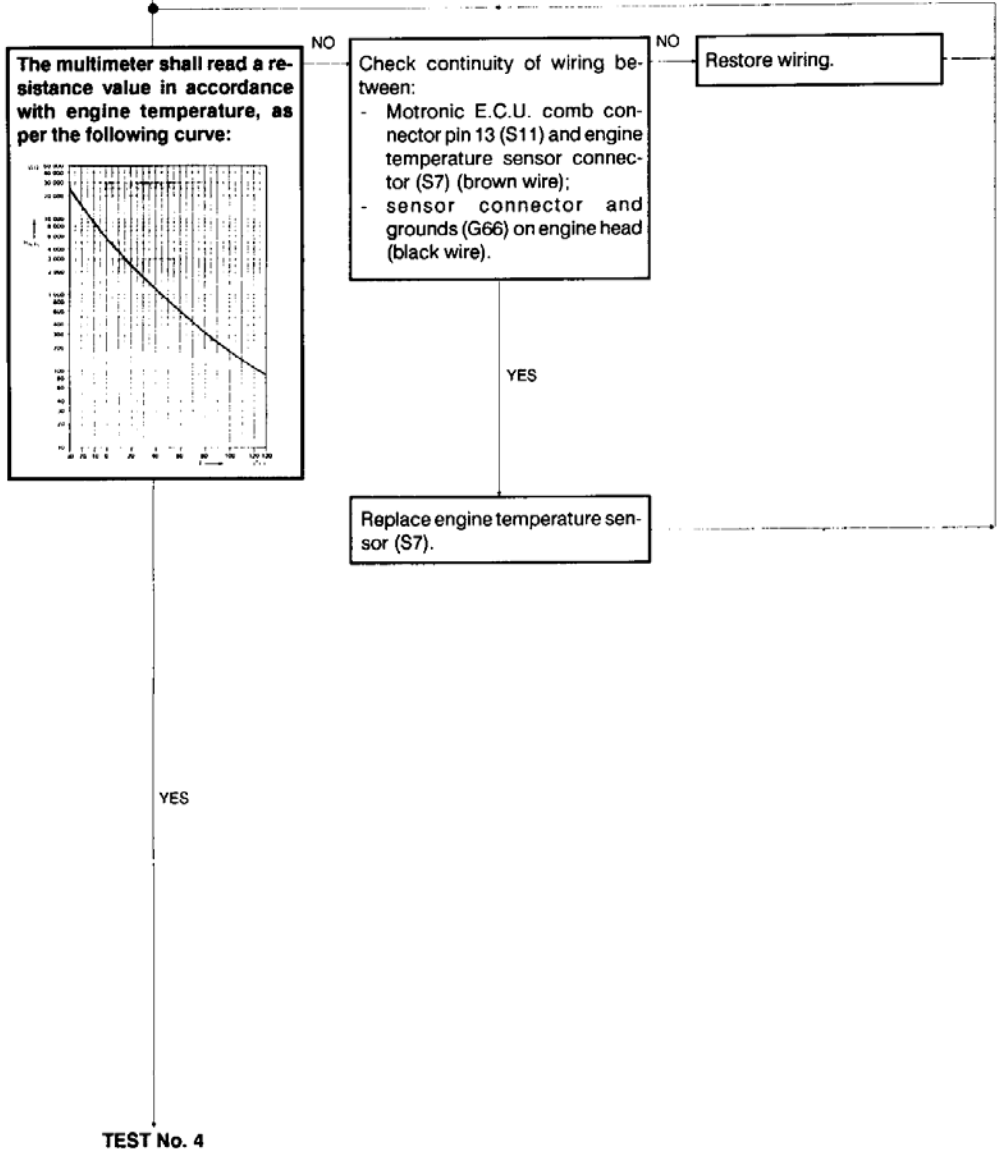


MOTRONIC ML4.1 SYSTEM

TEST No. 3 - ENGINE TEMPERATURE SENSOR CHECK

- Selector (2) in position 3.
- Set multimeter to 200 Ohm f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

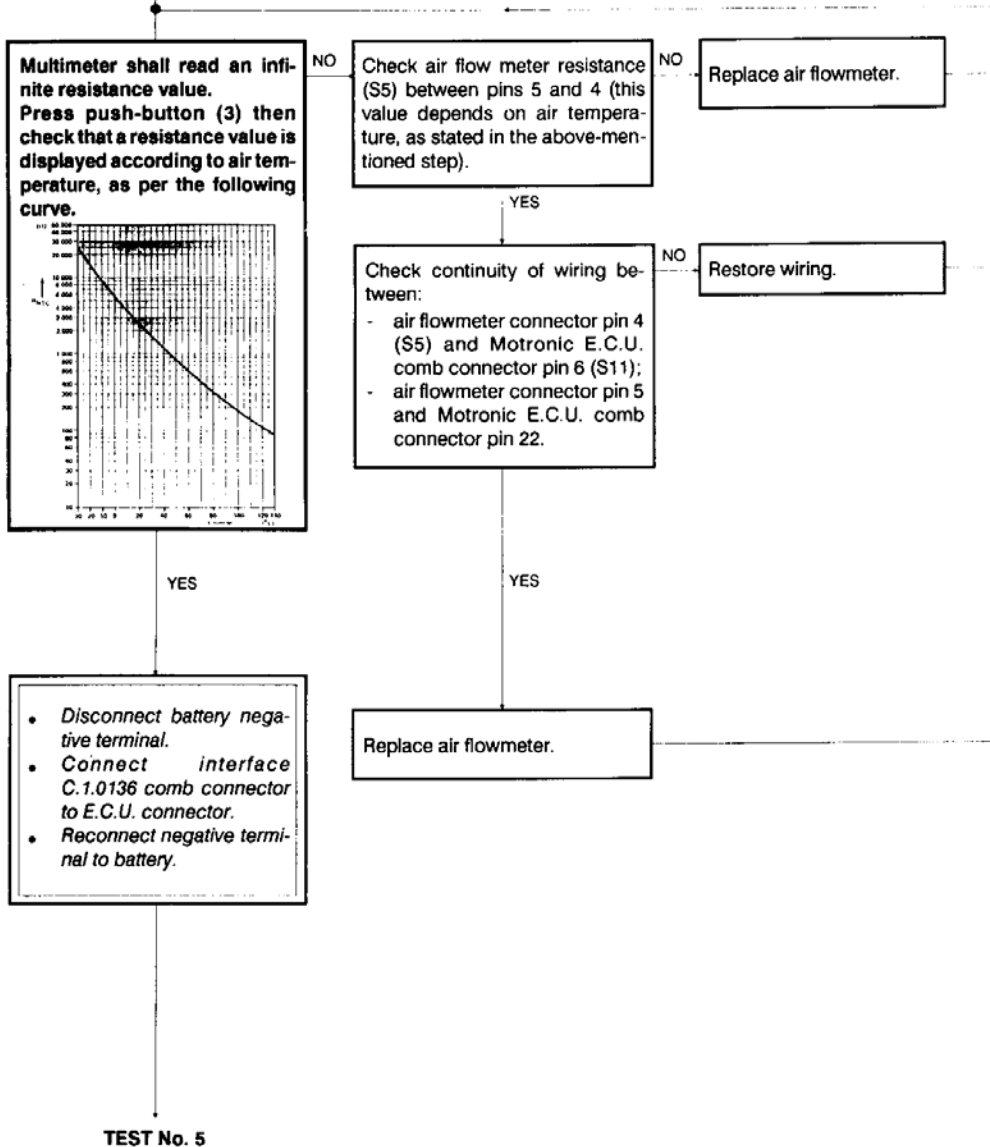


MOTRONIC ML4.1 SYSTEM

TEST No. 4 - AIR TEMPERATURE SENSOR CHECK

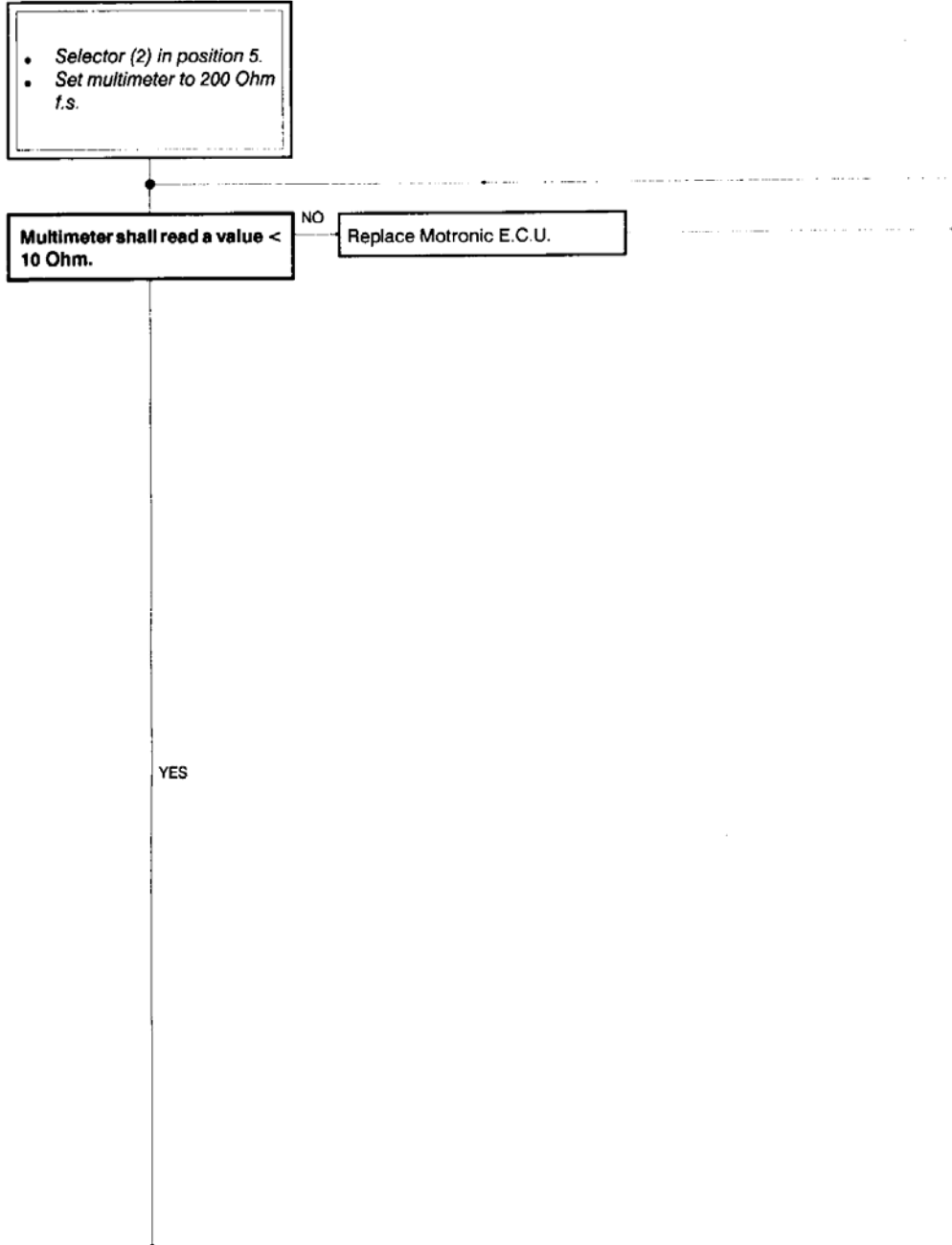
- Selector (2) in position 4.
- Set multimeter to 20 kOhm.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



MOTRONIC ML4.1 SYSTEM

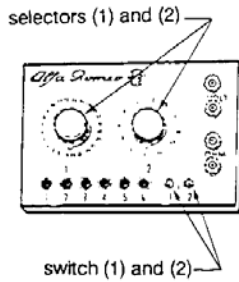
TEST No. 5 - GROUND CHECK FOR SHIELDED CABLES



MOTRONIC ML4.1 SYSTEM

PRESETTING FOR TAKING MEASUREMENTS IN VOLT

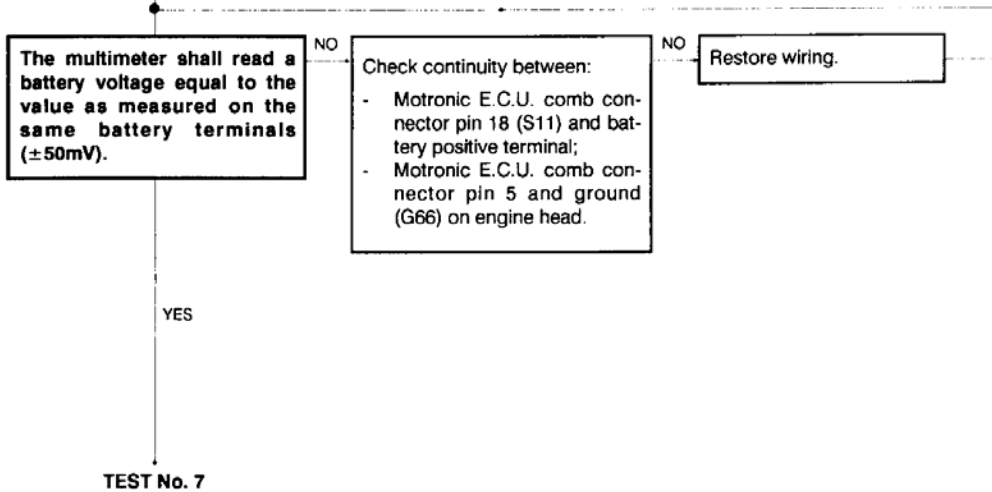
- Set selectors (1) and (2) to position 1.
 - Set switch (1) to position 2.
 - Set switch (2) to position 1.
- Measure battery voltage on its terminals with ignition key set to RUN position and take note of the value met.
 - Disconnect the ignition key.
 - Connect the multimeter prods across "VOLT" jacks of the diagnostic instrument.



TEST No. 6 - +12V DIRECT CHECK TO MOTRONIC E.C.U.

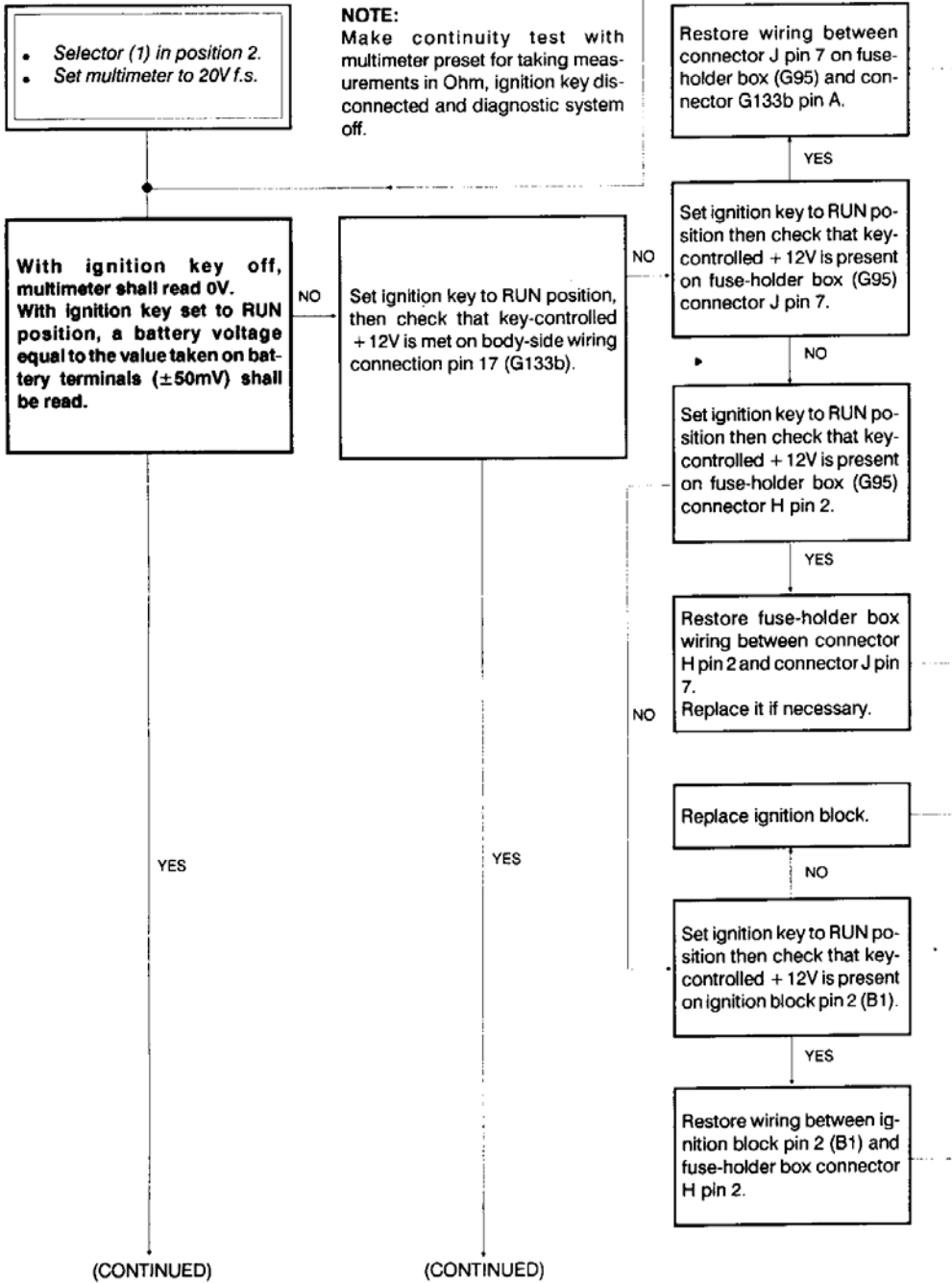
- Ignition key off.
- Set multimeter to 20V f.s.
- Selector (1) in position 1.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

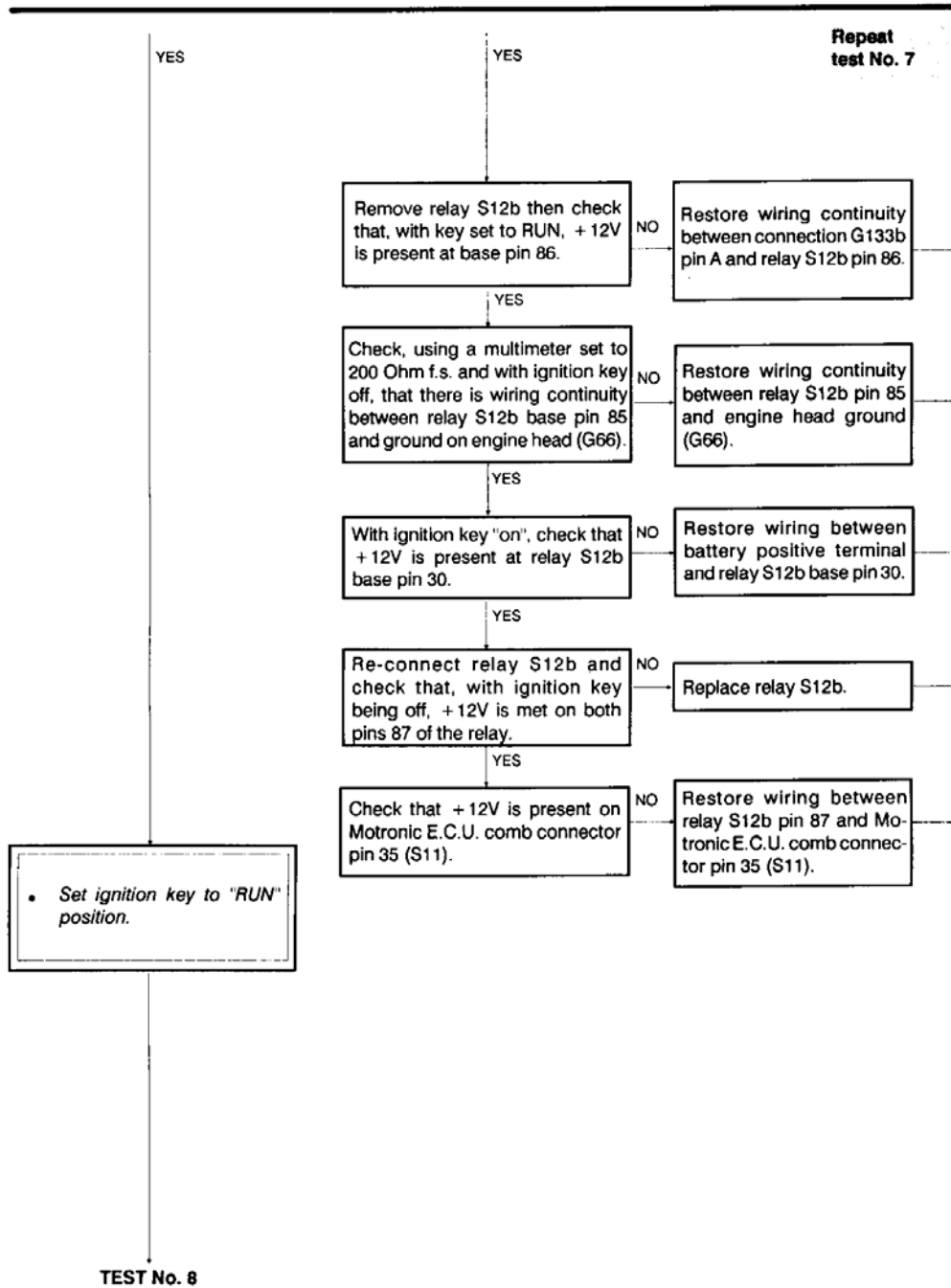


MOTRONIC ML4.1 SYSTEM

TEST No. 7 - KEY-CONTROLLED + 12V CHECK (MASTER RELAY)

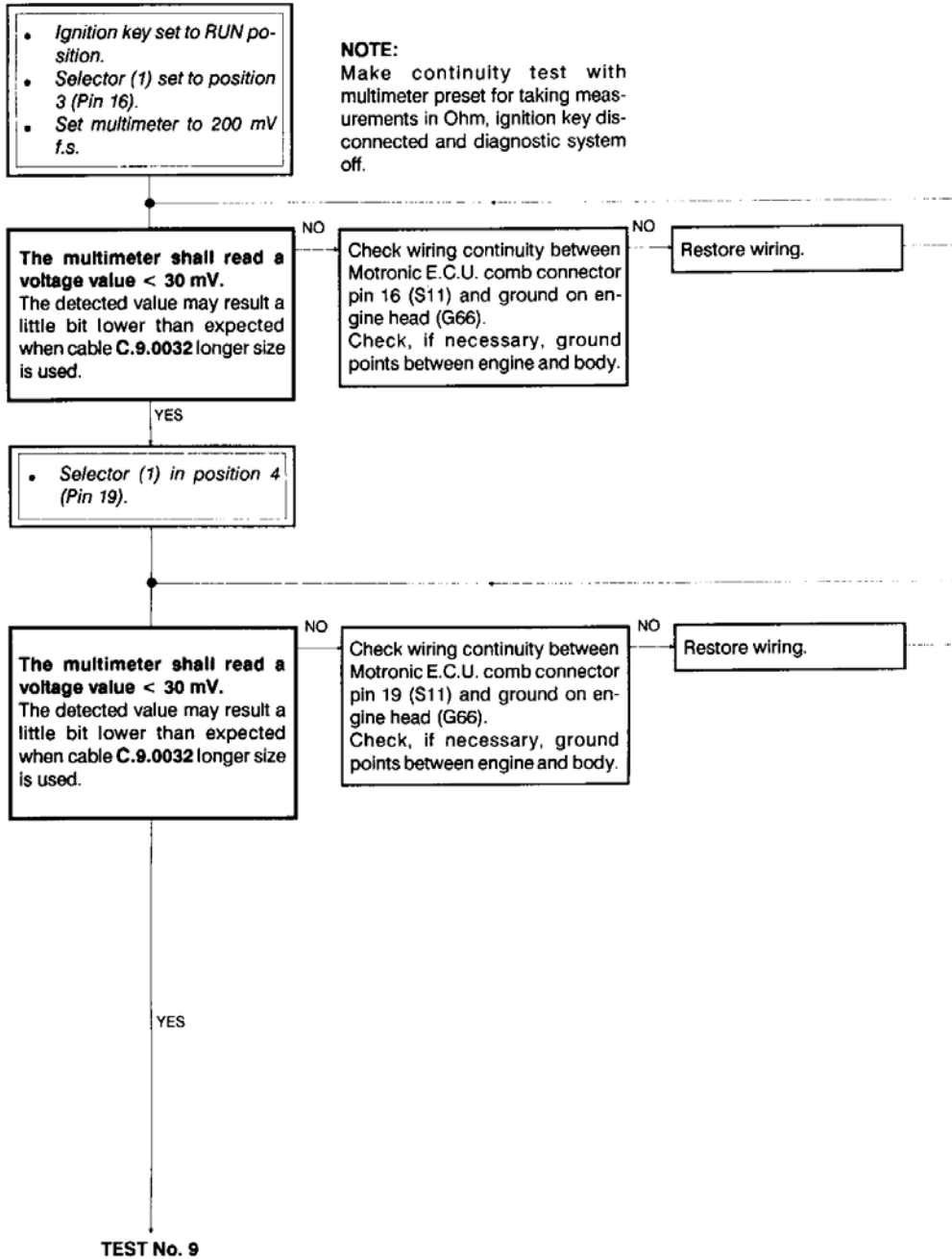


MOTRONIC ML4.1 SYSTEM



MOTRONIC ML4.1 SYSTEM

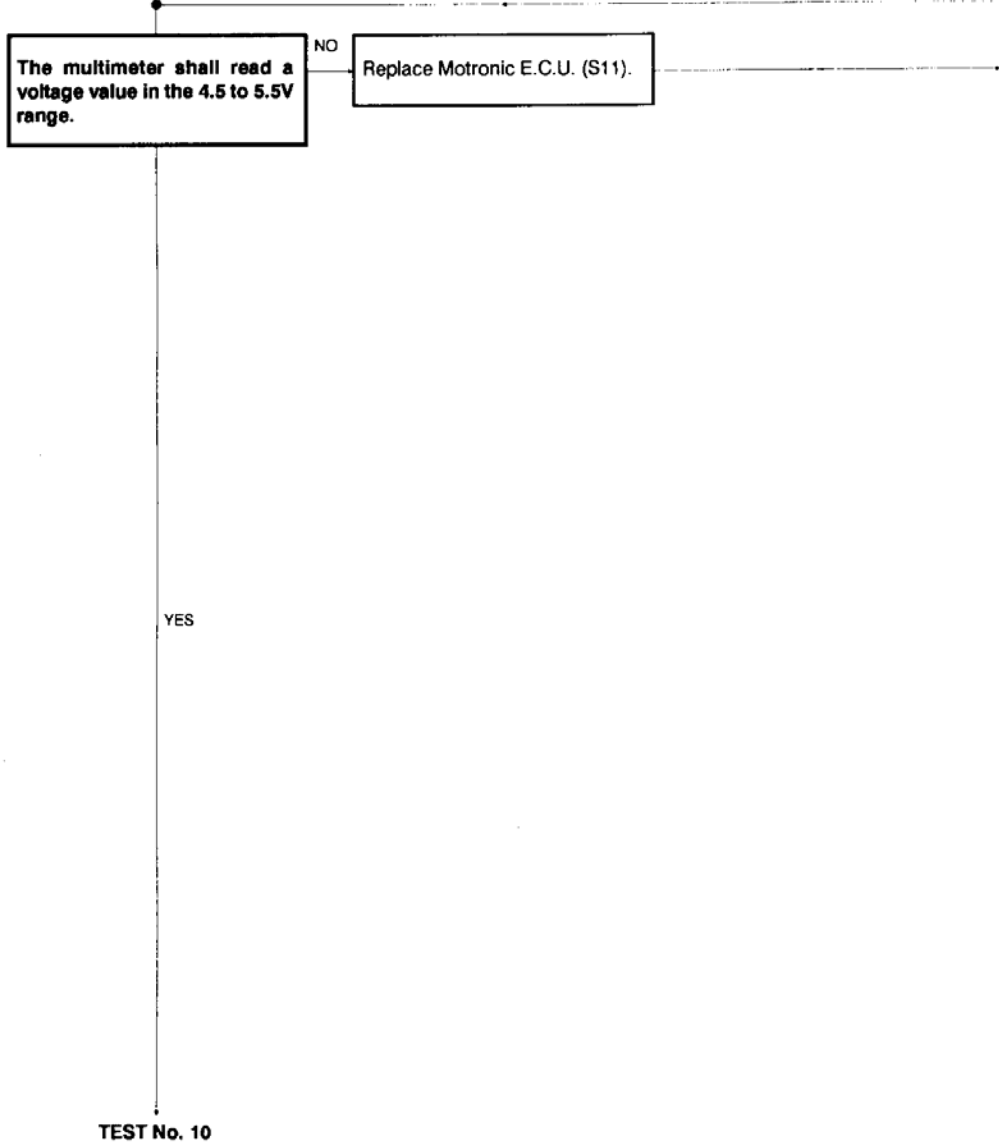
TEST N. 8 - CHECK OF MOTRONIC E.C.U. PINS 16 AND 19 GROUND



MOTRONIC ML4.1 SYSTEM

TEST No. 9 - CHECK OF AIR FLOWMETER SUPPLY

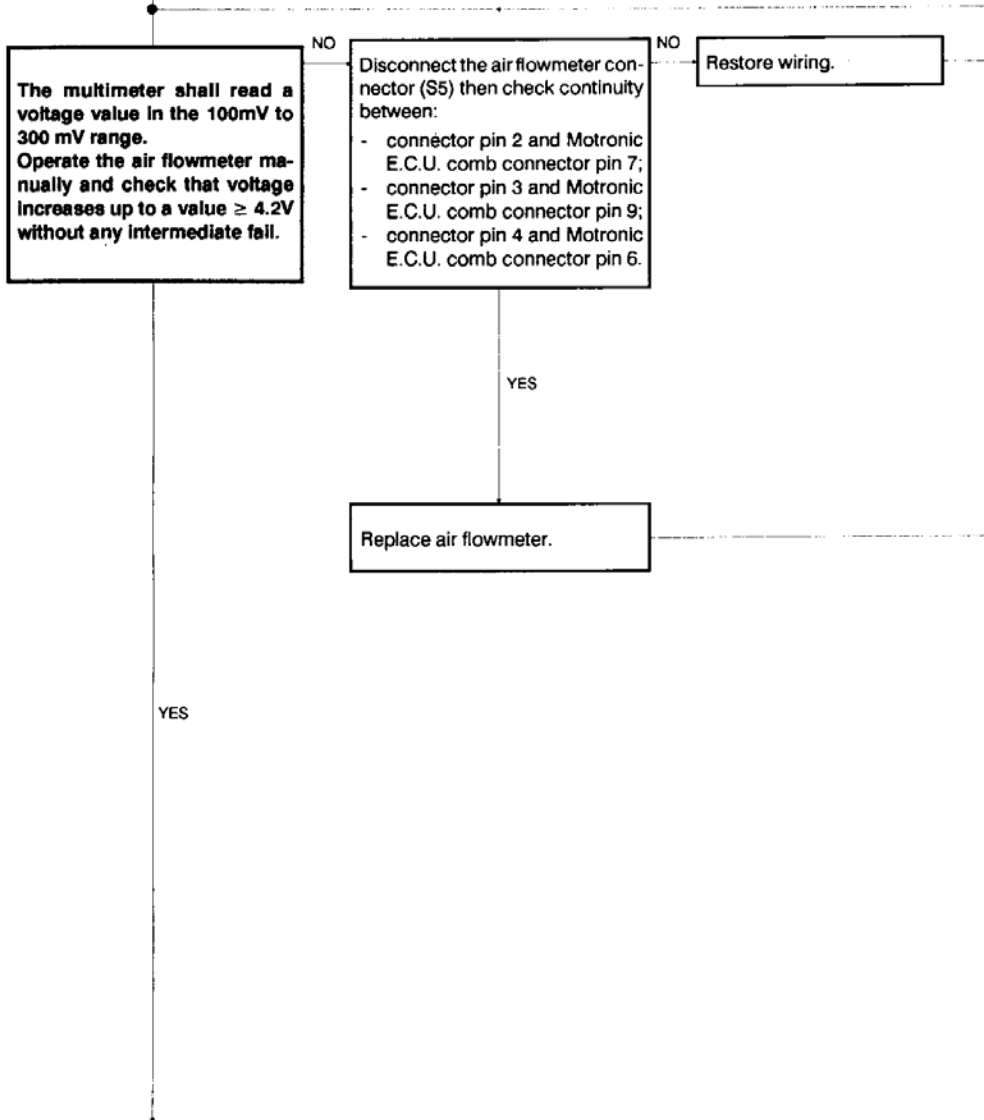
- Ignition key set to RUN position.
- Selector (1) set to position 6.
- Set multimeter to 20V f.s.



TEST No. 10 - CHECK OF AIR FLOW METER POTENTIOMETER

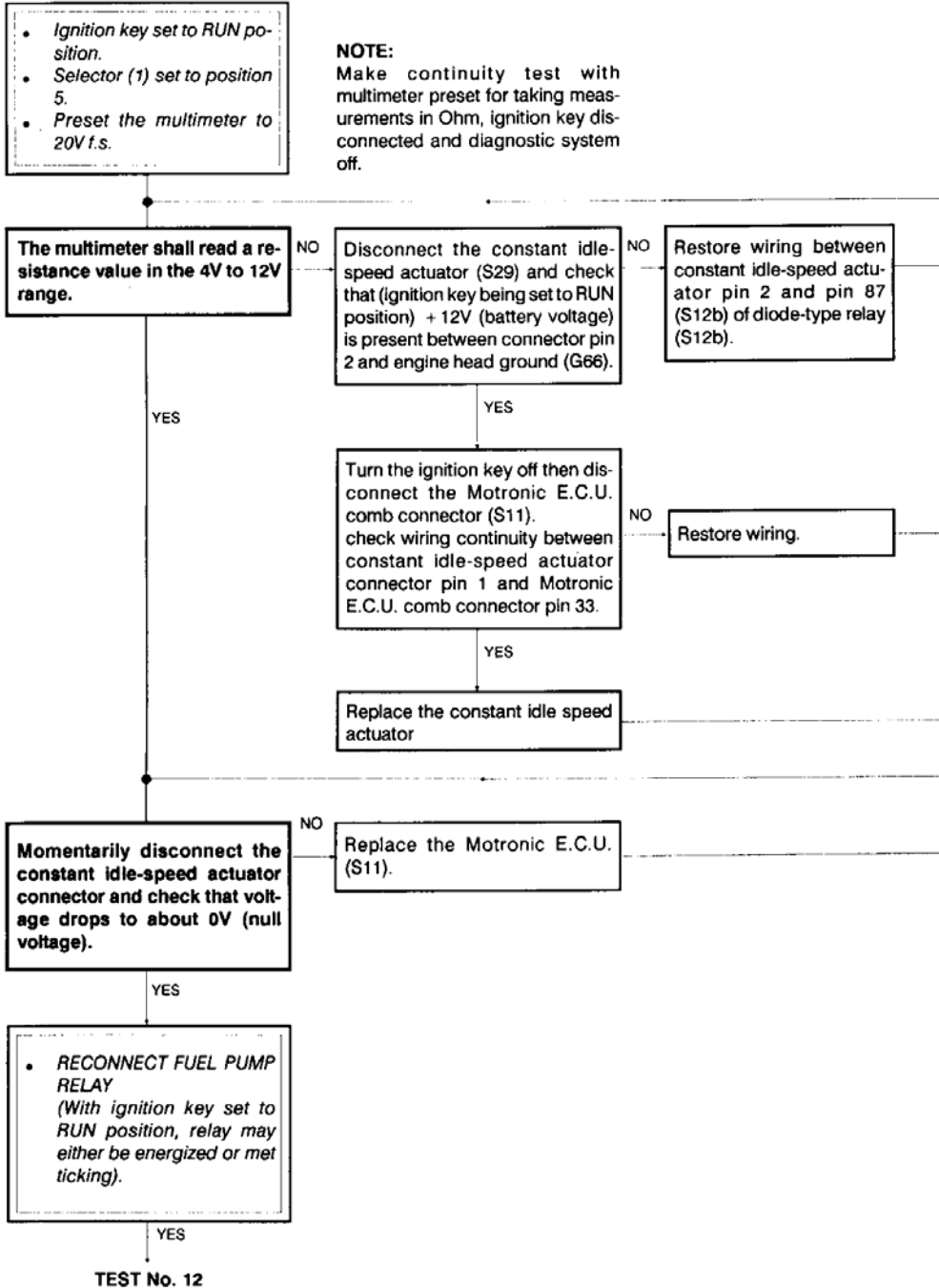
- Ignition key set to RUN position.
- Set multimeter to 20V f.s.
- Set selector (1) to position 7.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



MOTRONIC ML4.1 SYSTEM

TEST N. 11 - CHECK OF CONSTANT IDLE-SPEED ACTUATOR WIRING AND SUPPLY



MOTRONIC ML4.1 SYSTEM

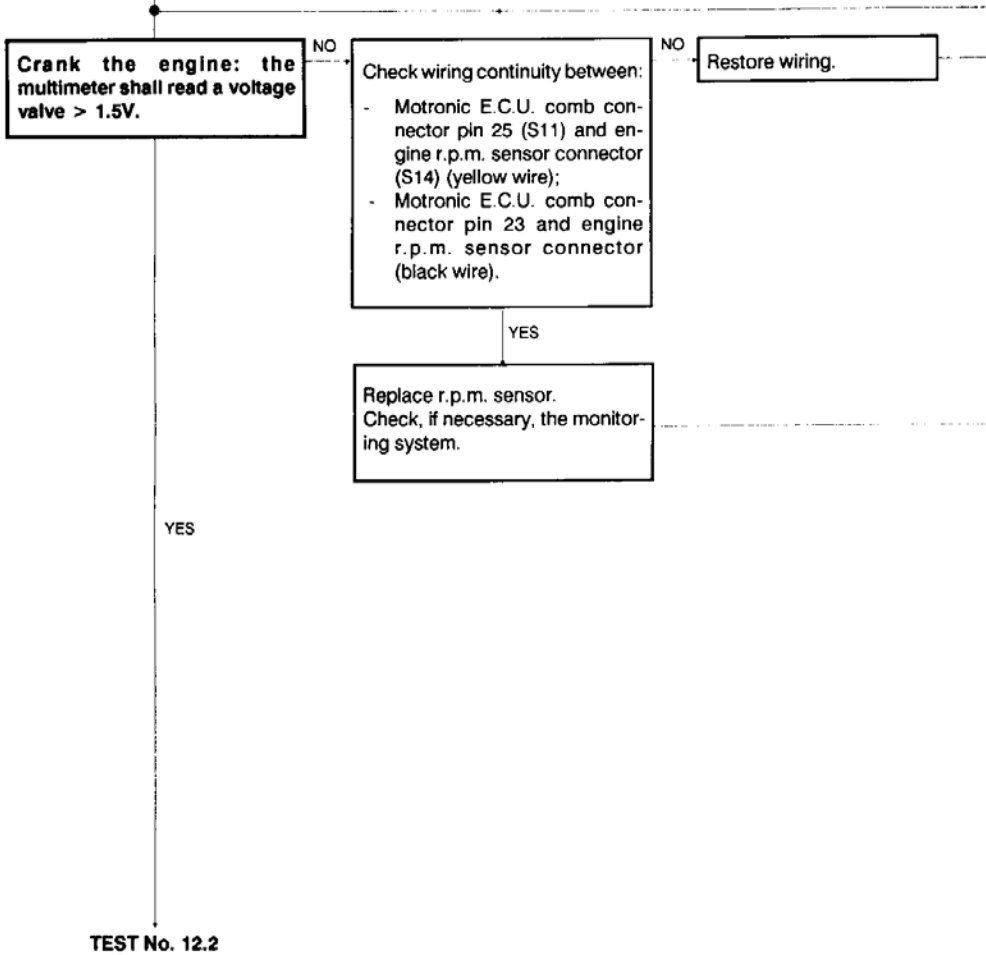
TEST No. 12 TESTS TO BE CARRIED OUT ON ENGINE WHICH FAILS TO START

NOTE: Make sure the preliminary test has been carried out (check of E.C.U. pin 8 connection).

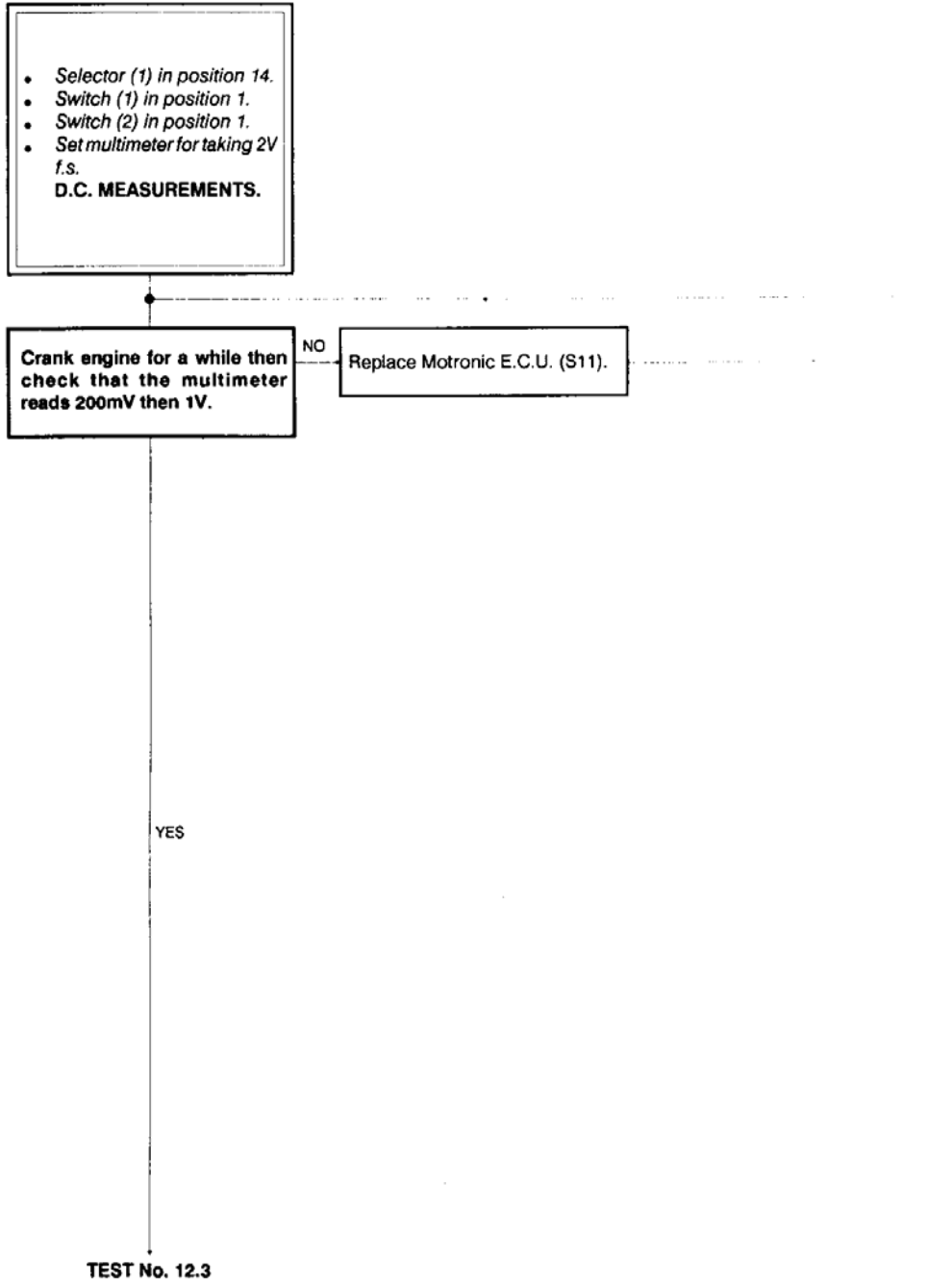
TEST No. 12.1 - INDUCTIVE SENSOR CHECK

- Selector (1) in position 1B.
- Set multimeter for taking 20V f.s. A.C. MEASUREMENTS.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



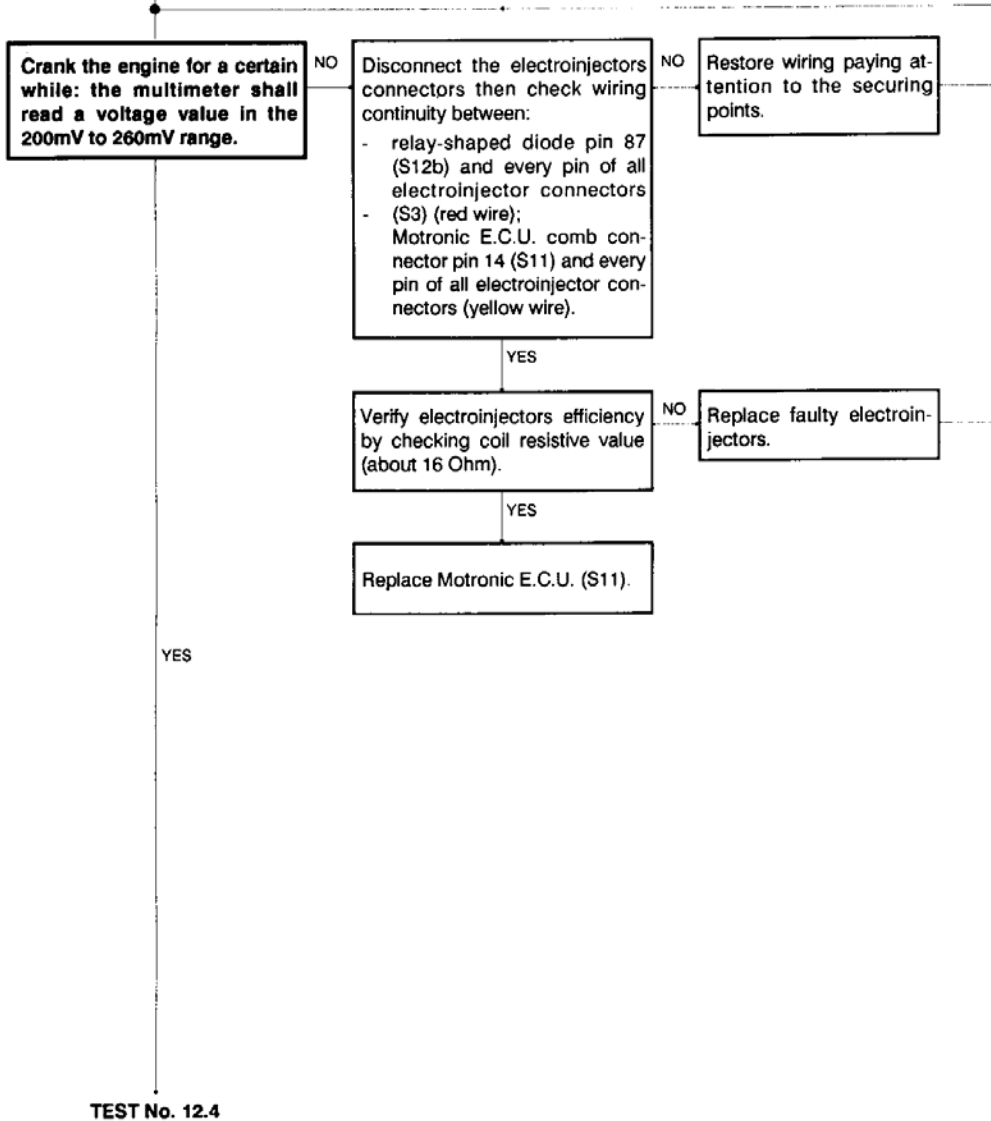
TEST No. 12.2 - INJECTION TIME CHECK



TEST No. 12.3 - CHECK OF ELECTROINJECTORS CURRENT

- Selector (1) set to position 13.
- Switch (2) set to position 1.
- Set the multimeter for taking measurements in 2V f.s.

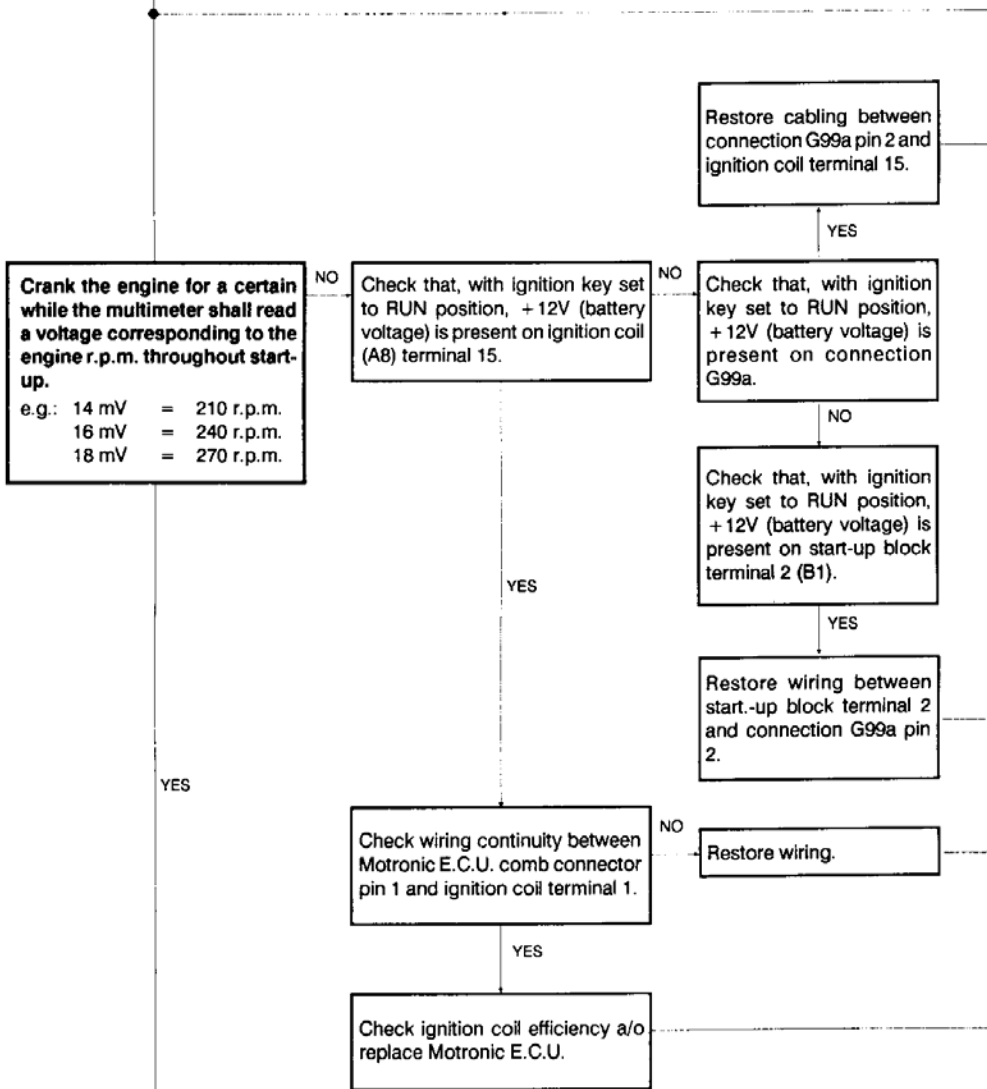
NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 12.4 - CHECK OF COIL CONTROL

- Selector (1) in position 15.
- Switch (1) in position 2.
- Set multimeter to 2V f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 12.5

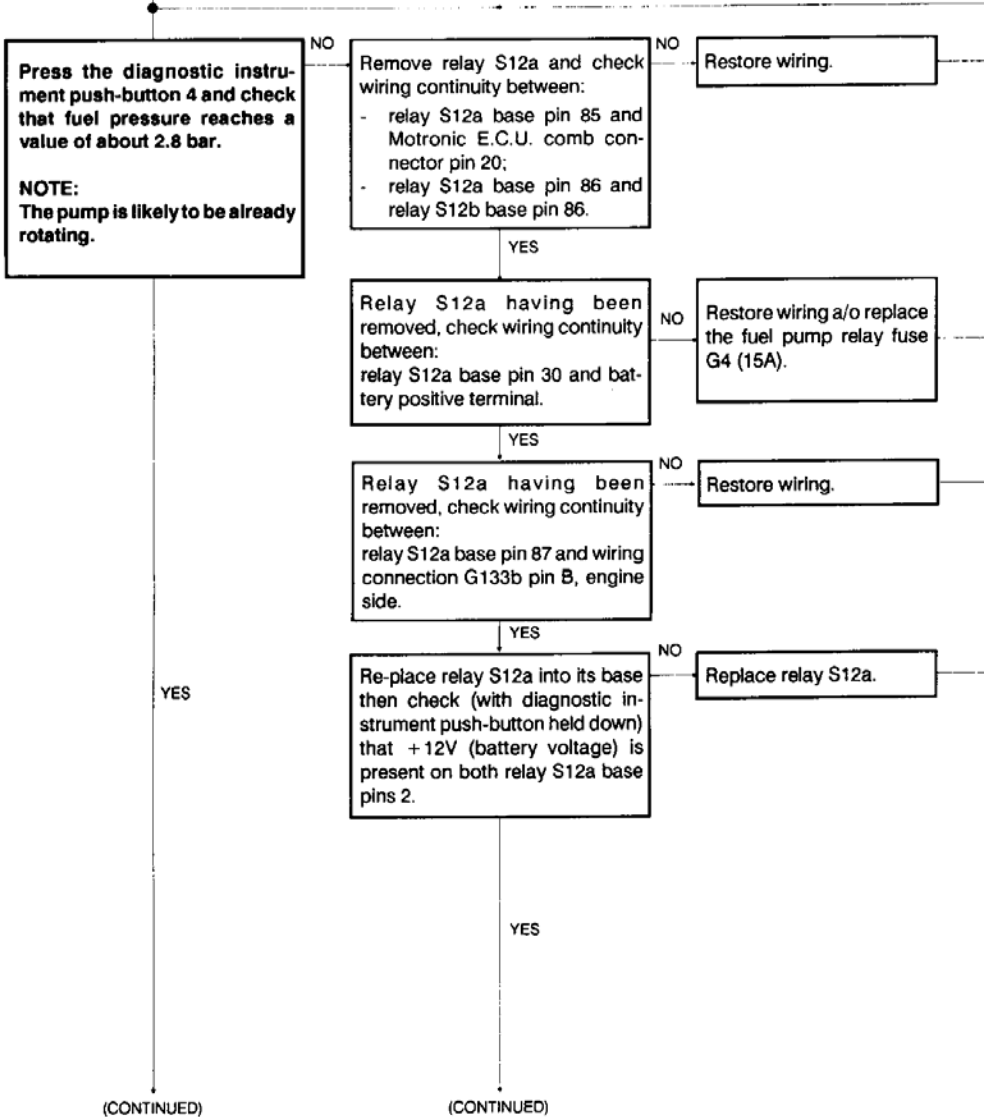
MOTRONIC ML4.1 SYSTEM

TEST No. 12.5 - CHECK OF FUEL CIRCUIT

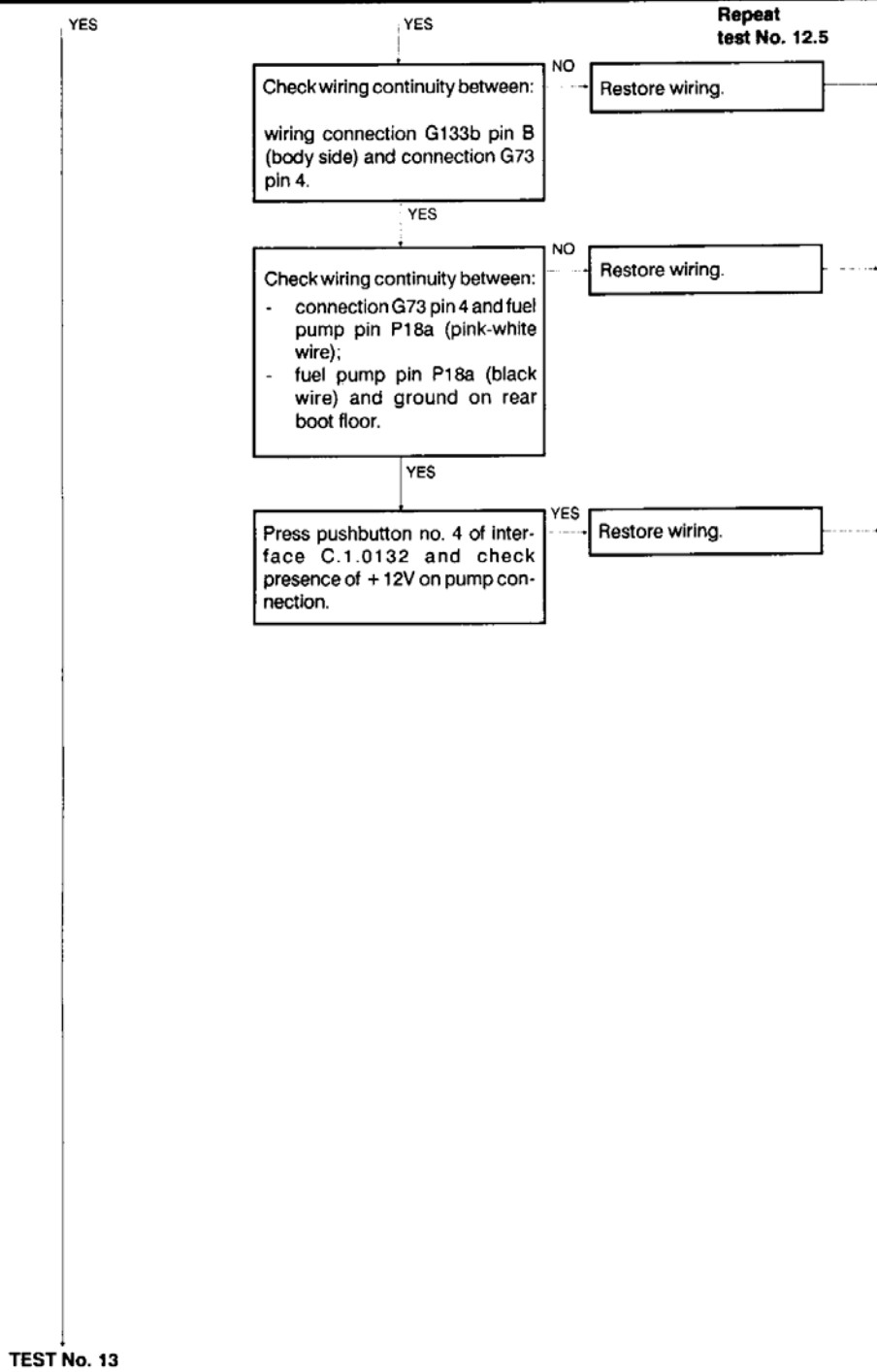
- Connect a pressure gauge to the fuel distributor pipe.
- Ignition key set to RUN position.

NOTE:

Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



SISTEMA MOTRONIC ML4.1

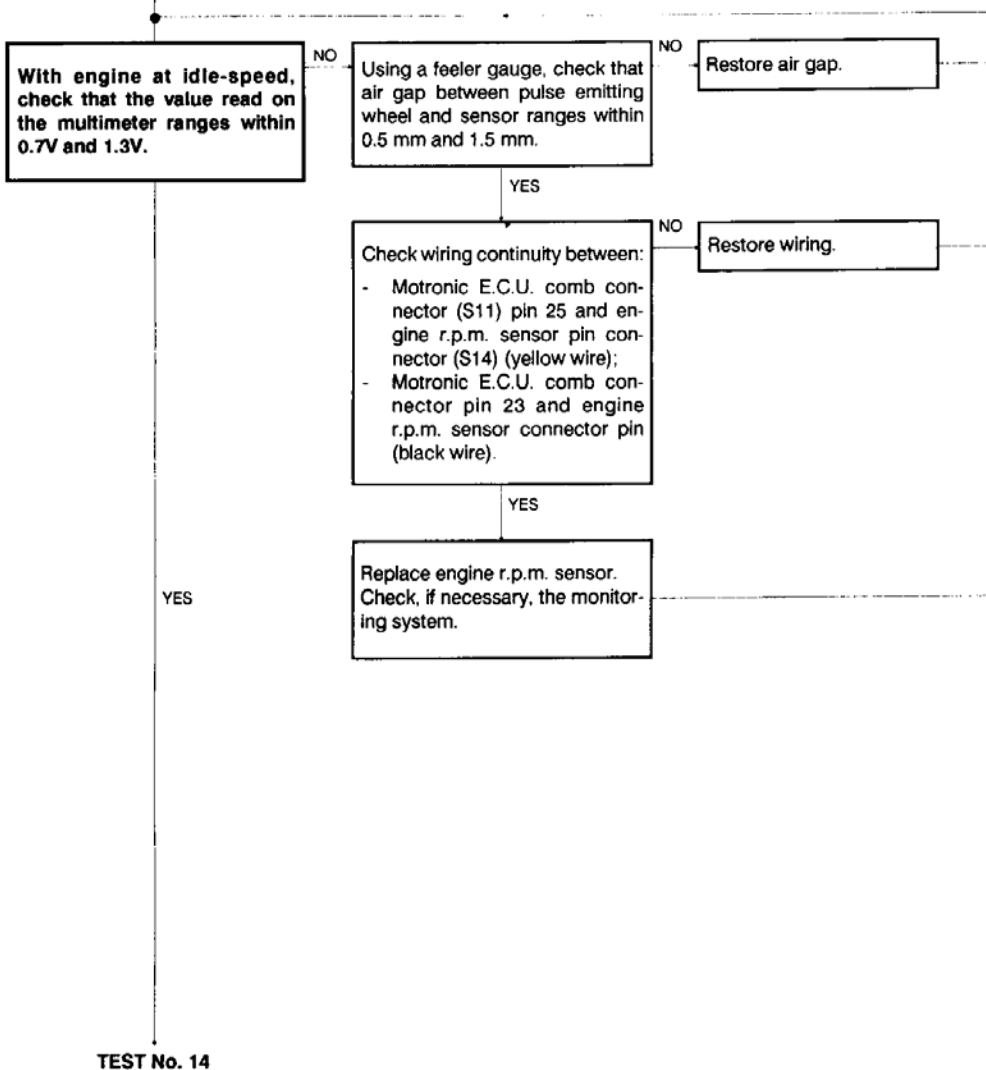


TESTS TO BE CARRIED OUT IF THE ENGINE STARTS

TEST No. 13 - CHECK OF INDUCTIVE SENSOR POSITIVE HALF-WAVE

- Crank the engine.
- Selector (1) in position 11.
- Set multimeter to 20V f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 14 - CHECK OF INDUCTIVE SENSOR NEGATIVE HALF-WAVE

- Crank the engine.
- Selector (1) in position 12.
- Set multimeter to 20V f.s.

With engine at idle-speed, check that the value read on the multimeter ranges within 0.7V and 1.3V. Speed up and check that the value displayed is \geq the one previously read (Test N. 13).

NO
Make sure test N. 13 was correctly carried out.
The above condition having been met, check air gap and sensor adjusting mechanism (replace it if necessary).

YES

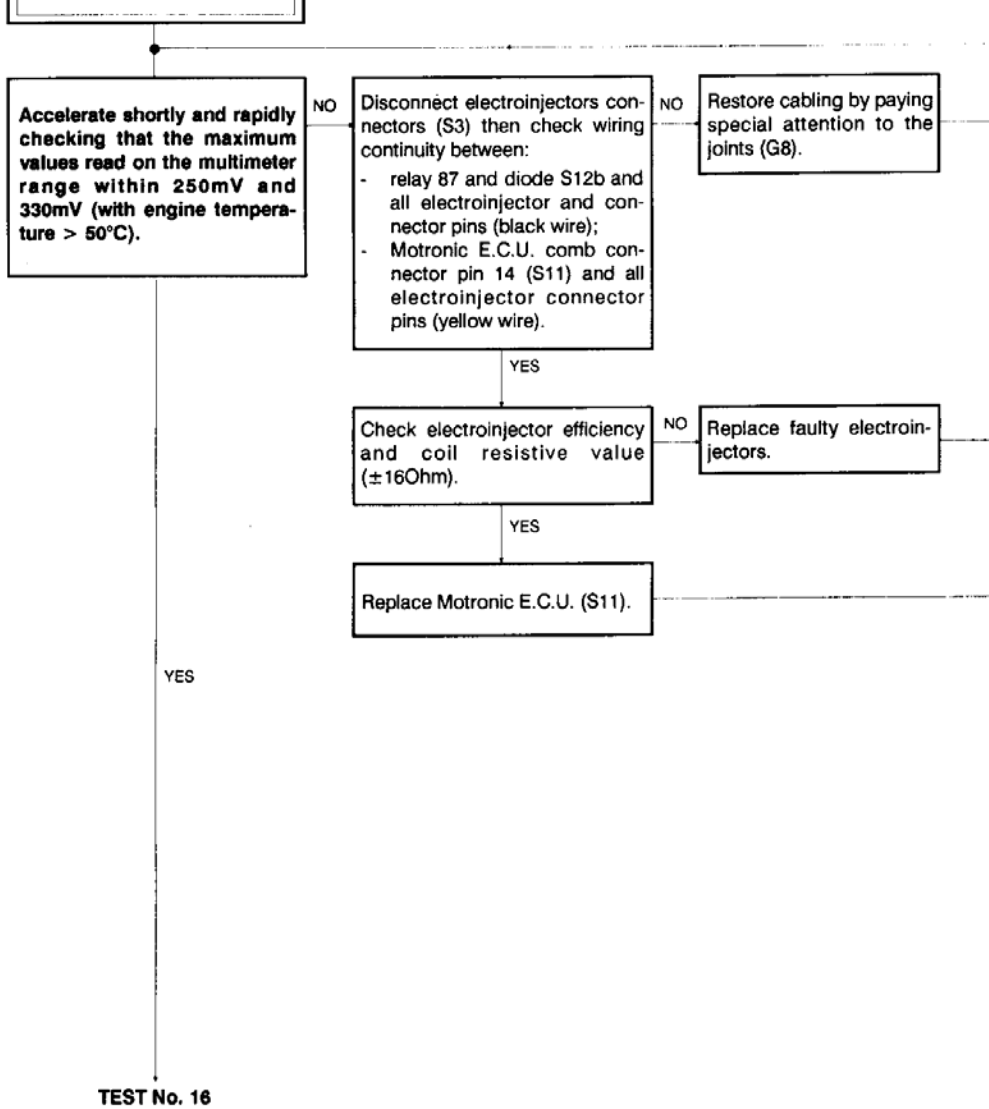
TEST No. 15

TEST No. 15 - CHECK OF ELECTROINJECTOR CURRENT

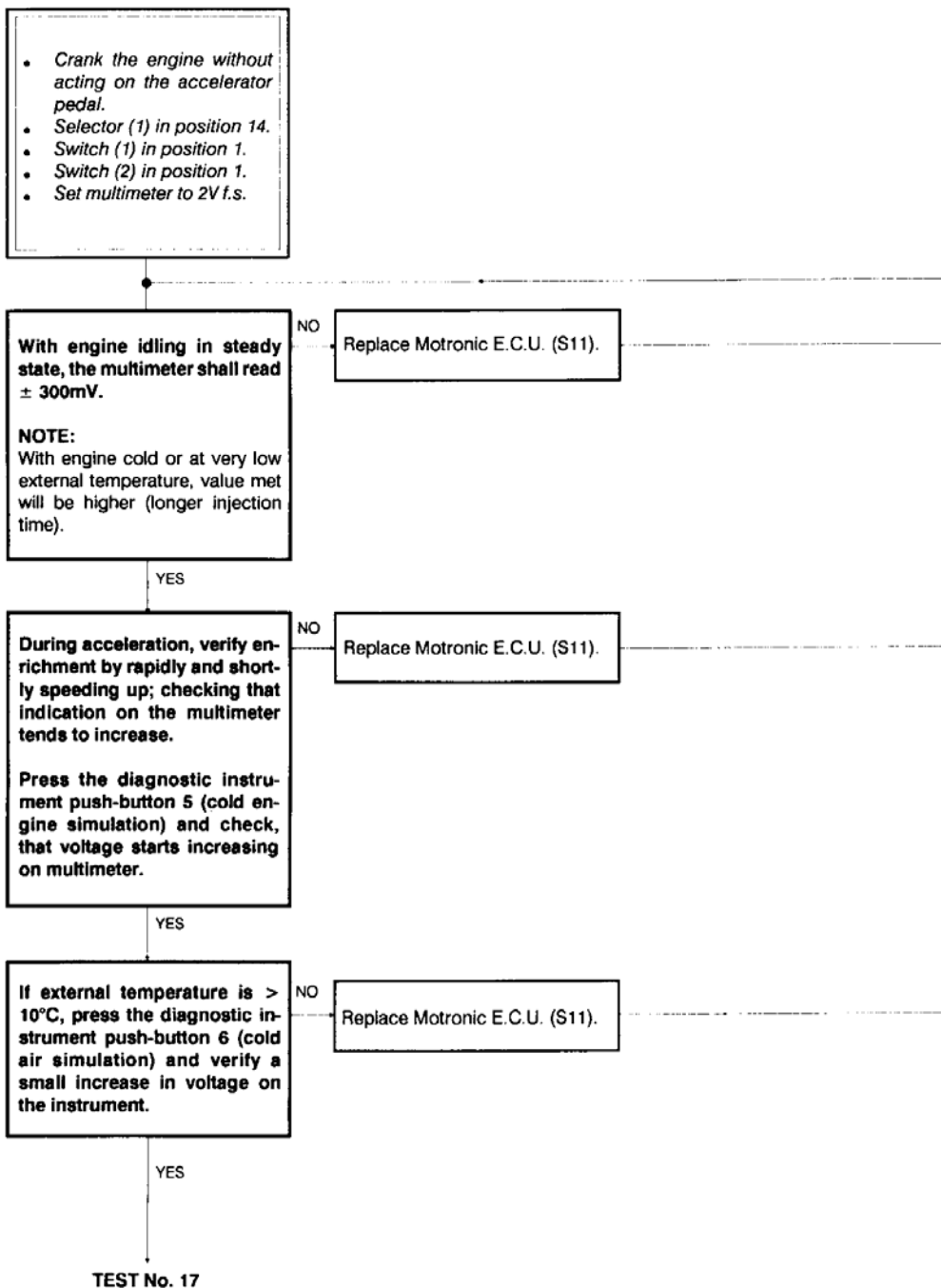
- Crank the engine.
- Selector (1) in position 13.
- Switch (1) in position 1.
- Switch (2) in position 1.
- Set multimeter to 2V f.s.

NOTE:

Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 16 - CHECK OF INJECTION TIME



TEST No. 17 - CHECK OF COIL CONTROL

- Crank the engine.
- Selector (1) in position 15.
- Switch (1) in position 2.
- Set multimeter to 2V f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

The multimeter shall read a voltage corresponding the engine r.p.m.
e.g.: 70 mV = 1000 r.p.m.
200 mV = 3000 r.p.m.

NO

Disconnect coil connect and repeat test N. 16 checking that the stated voltage value is still met.

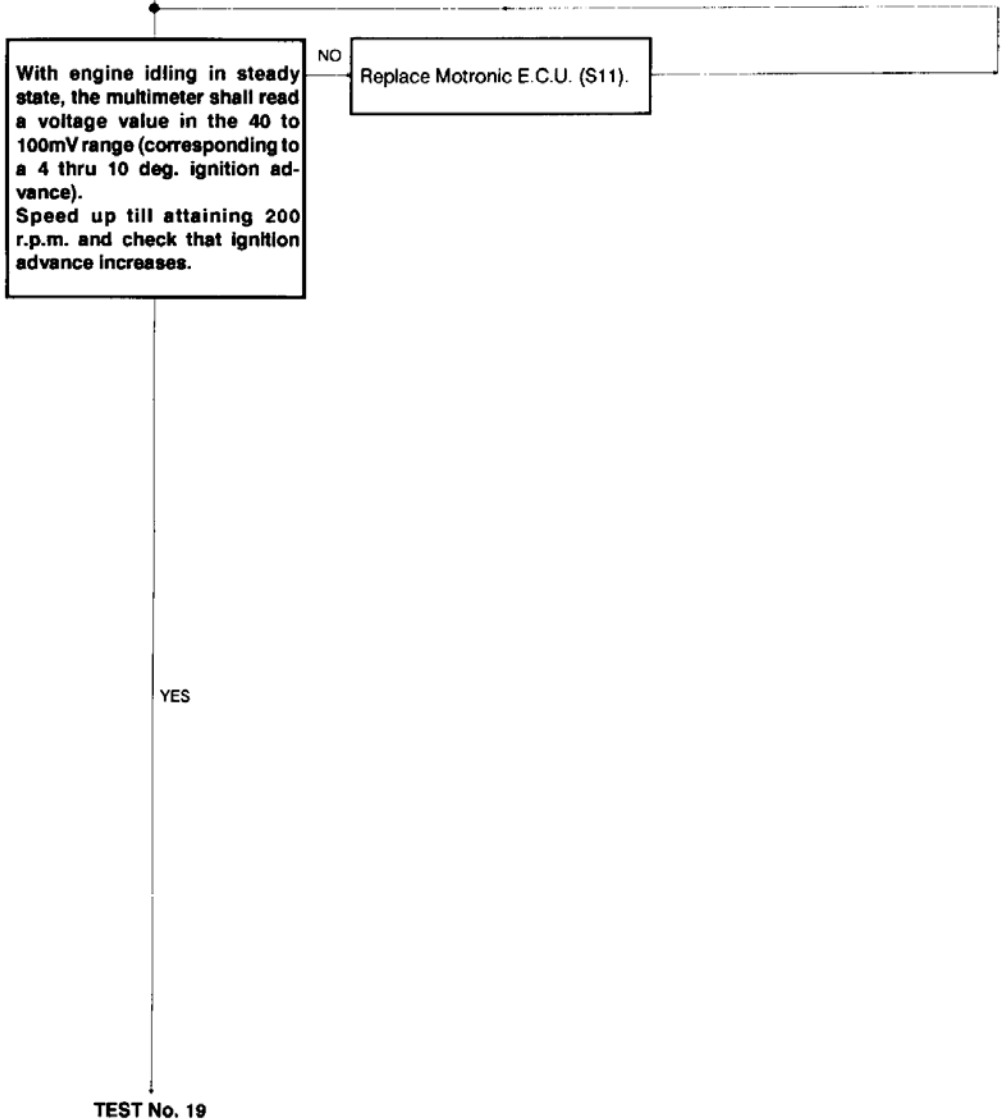
YES

TEST No. 18

TEST No. 18 - CHECK OF IGNITION ADVANCE

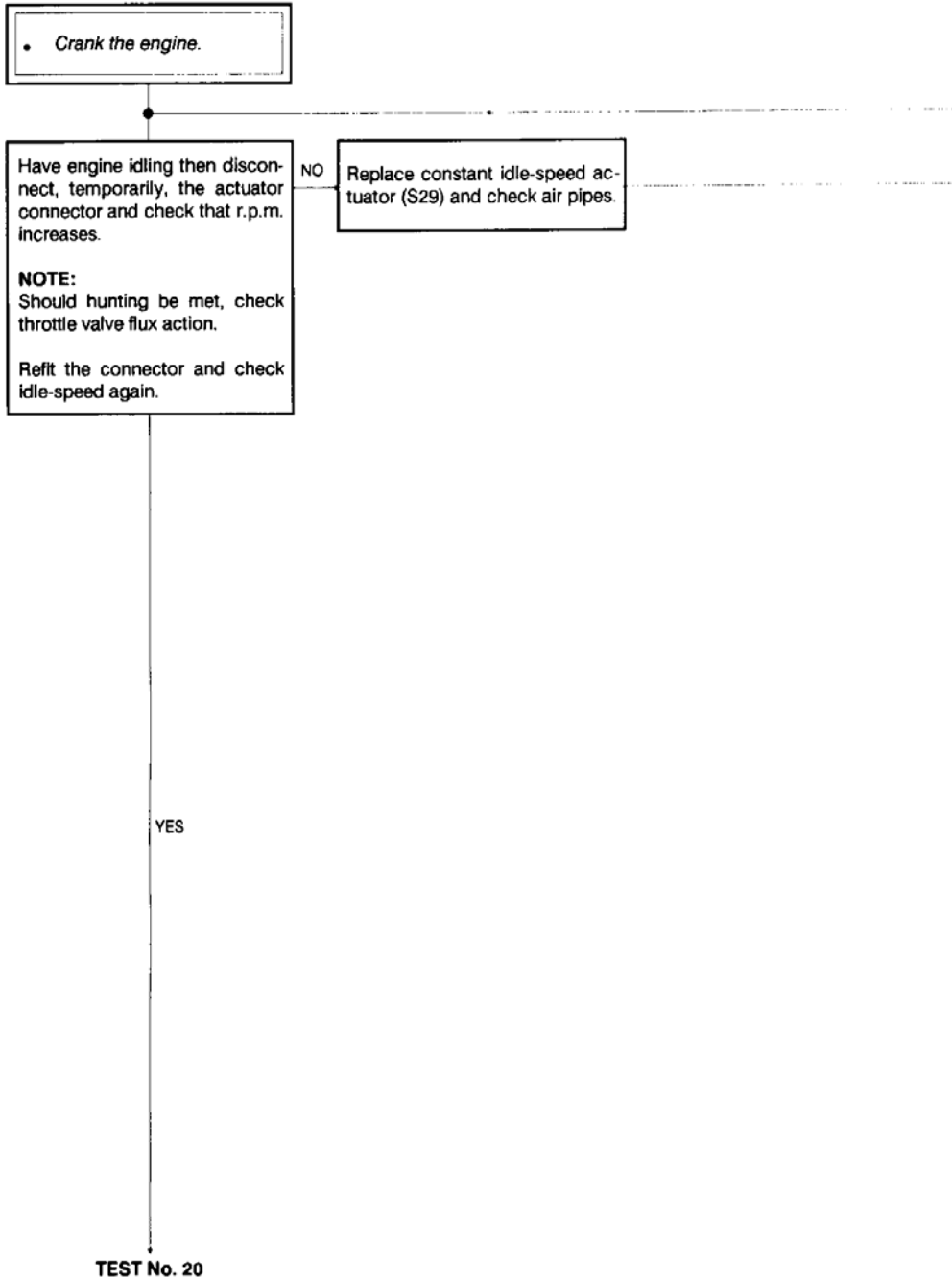
- Crank the engine.
- Selector (1) in position 17.
- Switch (1) in position 2.
- Set multimeter to 2V f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



MOTRONIC ML4.1 SYSTEM

TEST No. 19 - CHECK OF CONSTANT IDLE-SPEED ACTUATOR OPERATION

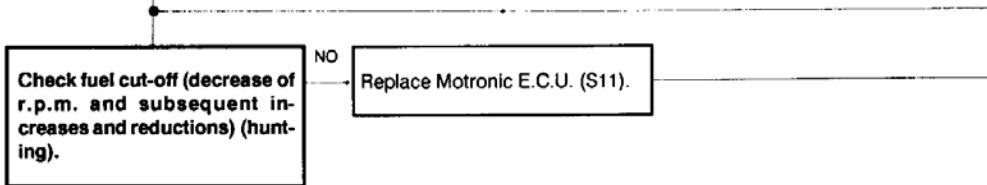


MOTRONIC ML4.1 SYSTEM

TEST No. 20 - CHECK OF E.C.U. FUNCTIONS

• *With engine running at about 2000 r.p.m. press the diagnostic instrument push-button N. 1 (throttle valve closed).*

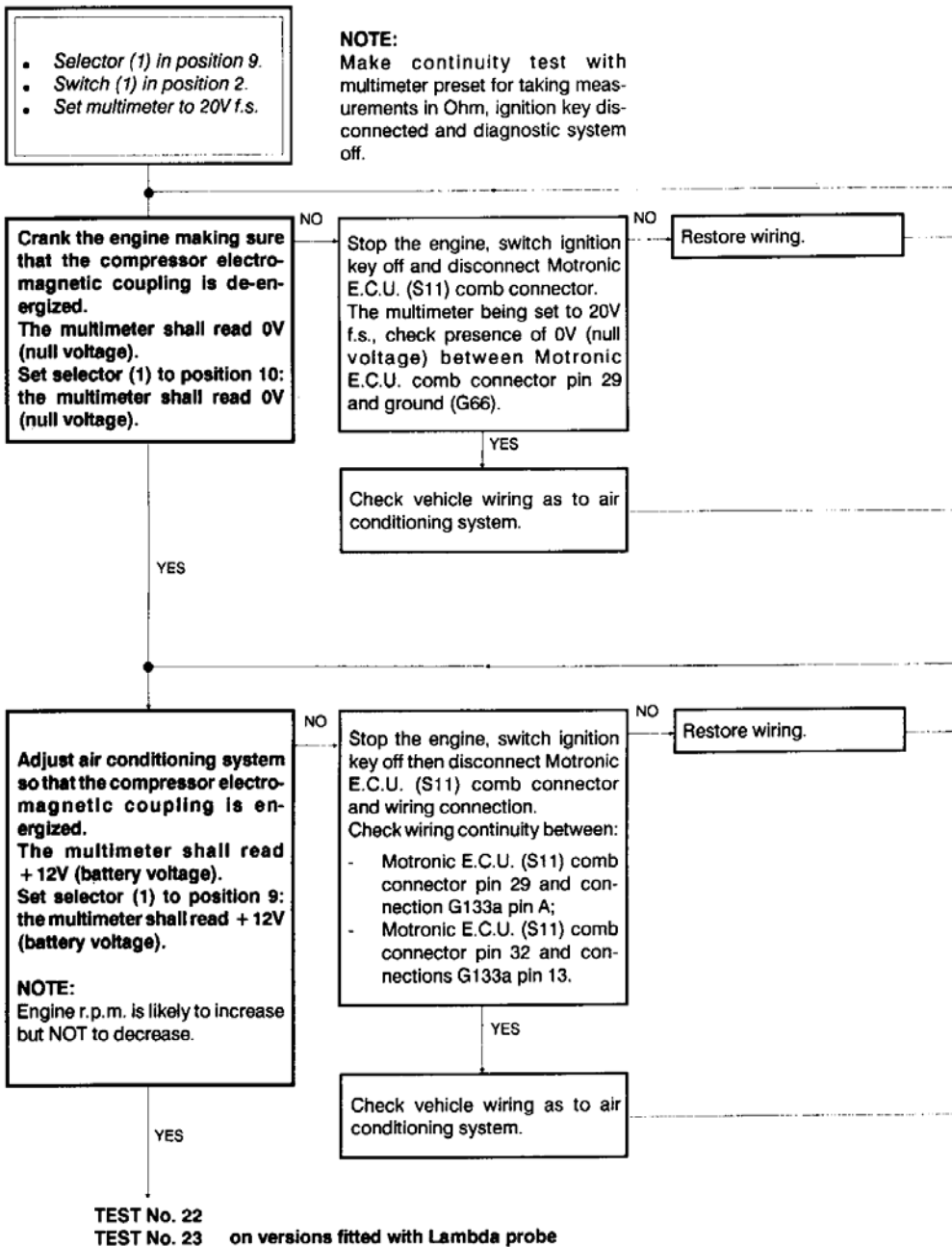
NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 21

MOTRONIC ML4.1 SYSTEM

TEST N. 21 - CHECK OF CONNECTIONS TO AIR CONDITIONER (IF INSTALLED)



MOTRONIC ML4.1 SYSTEM

TEST No. 22 - SPECIFIC TESTS ON VERSIONS NOT FITTED WITH LAMBDA PROBE

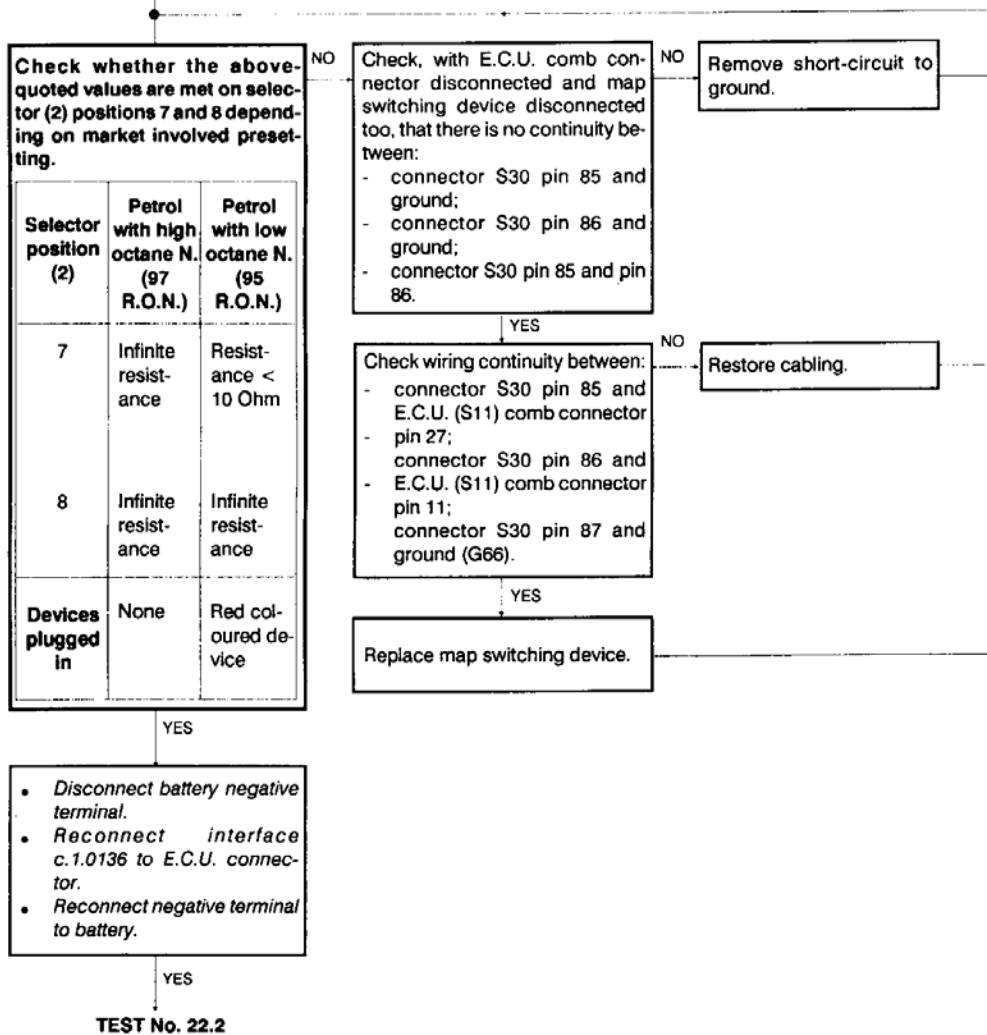
- Disconnect the battery negative terminal.
- Disconnect interface C.1.0136 connector from E.C.U. connector.
- Reconnect negative terminal to battery.

TEST No. 22.1 - CHECK OF PRESETTING FOR OTHER DIFFERENT MARKETS

NOTE: Presetting is carried out by inserting a relay-shaped device of different color into the special connector (S30).

- Connect the multimeter prods to "OHM" jacks of the diagnostic instrument.
- Set multimeter to 200 Ohm f.s.

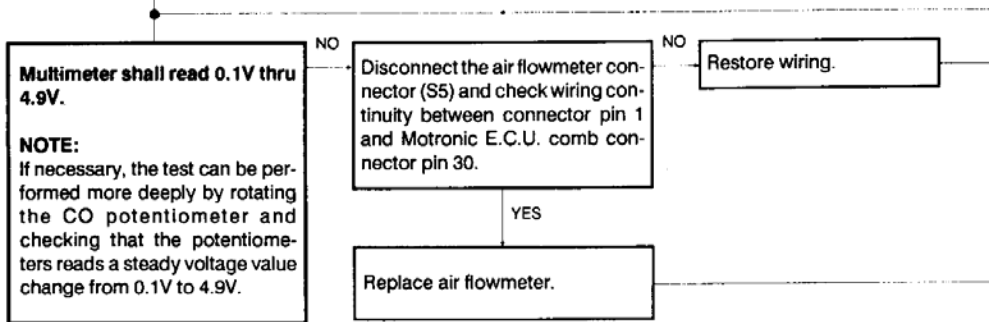
NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 22.2 - CHECK OF CO POTENTIOMETER ON AIR FLOWMETER

- Connect the multimeter prods to the diagnostic instrument "VOLT" jacks.
- Ignition key set to RUN position.
- Selector (1) in position 8.
- Set multimeter to 20V f.s.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



MOTRONIC ML4.1 SYSTEM

TEST No. 23 - SPECIFIC TESTS ON VERSIONS FITTED WITH LAMBDA PROBE

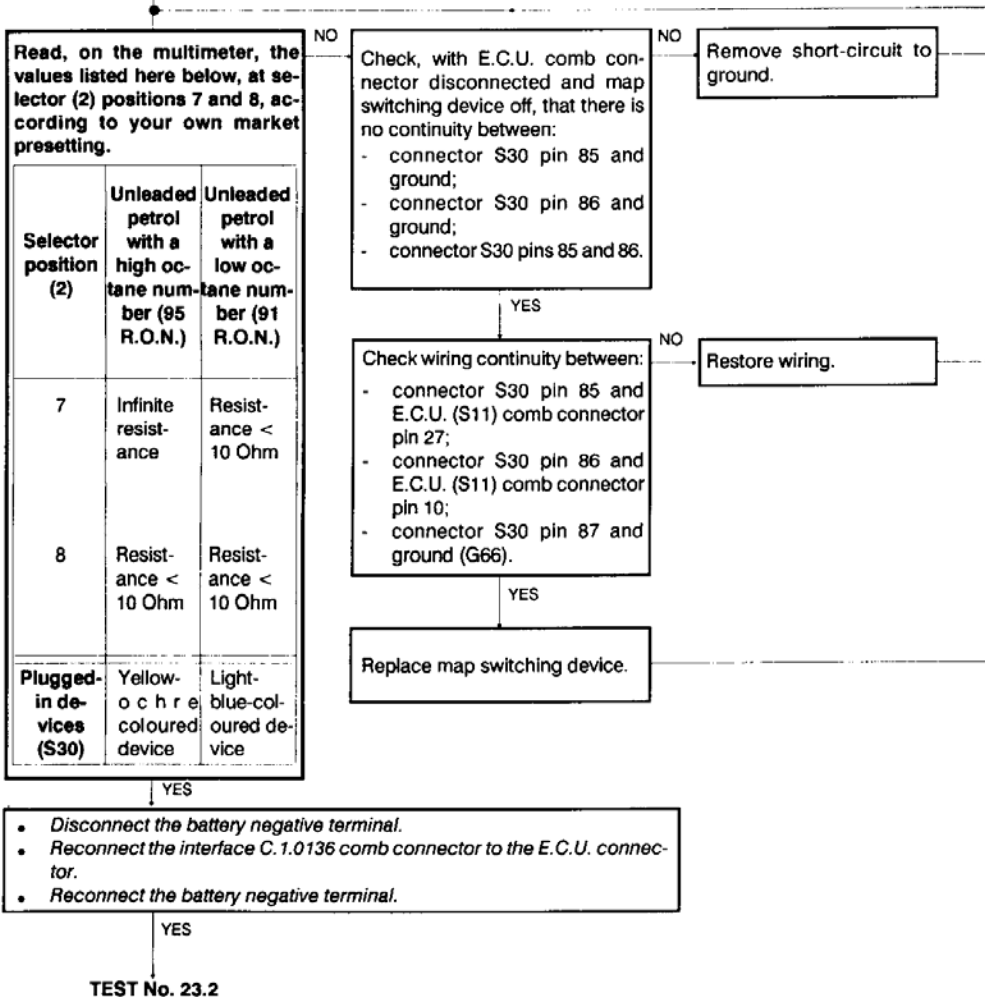
- Disconnect the battery negative terminal.
- Disconnect the interface C.1.0136 comb connector from the E.C.U. connector.
- Reconnect the battery negative terminal.

TEST No. 23.1 - CHECK OF THE PRESETTING FOR OTHER DIFFERENT MARKETS

NOTE: Presetting is carried out by inserting a relay-shaped device of different colour in the special connector (S30).

- Connect the multimeter prods to "OHM" on the diagnostic instrument.
- Multimeter set to 200 Ohm f.s.

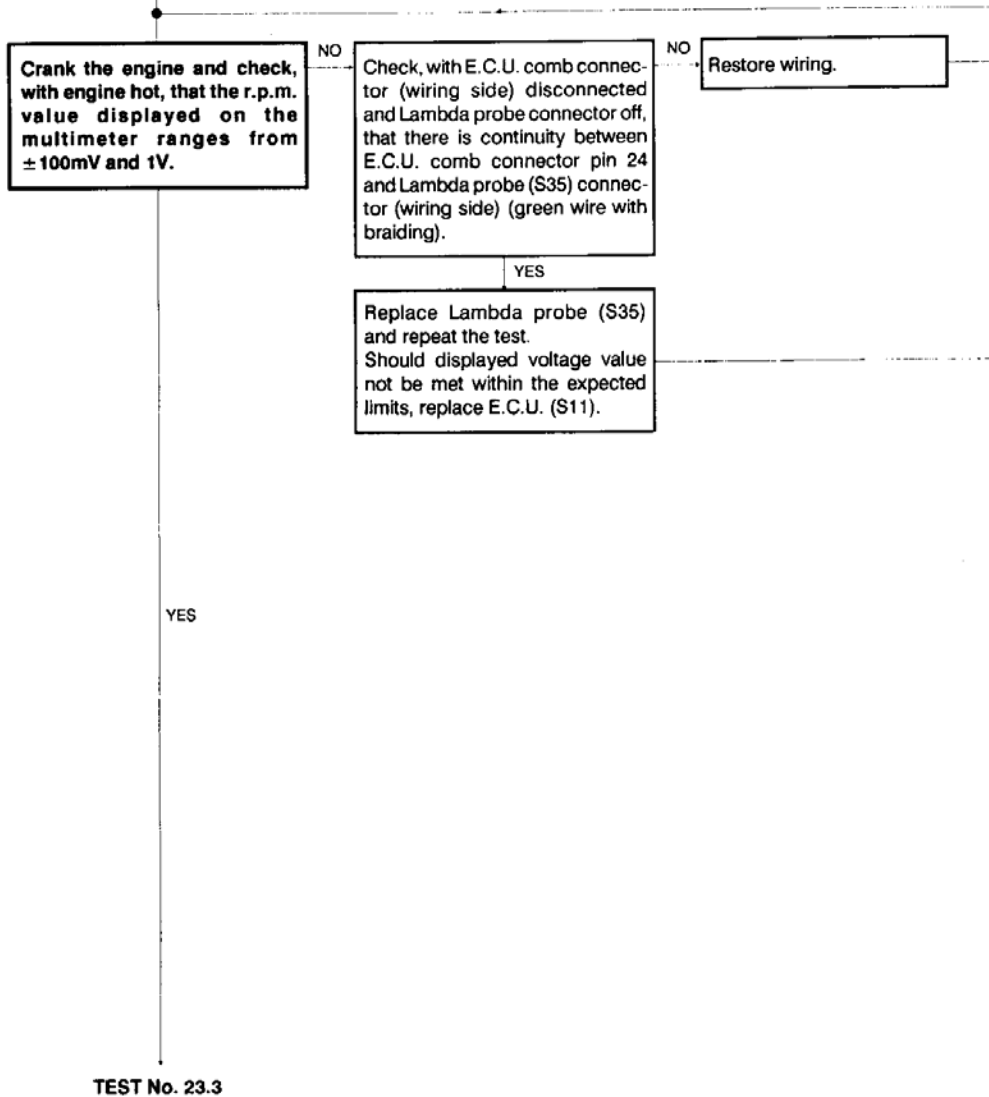
NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



TEST No. 23.2 - CHECK OF LAMBDA PROBE - PIN 24 OF E.C.U.

- Connect the multimeter to "VOLT" jacks on the diagnostic instrument.
- Multimeter set to 2V f.s.
- Set selector (1) to position 22.

NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.

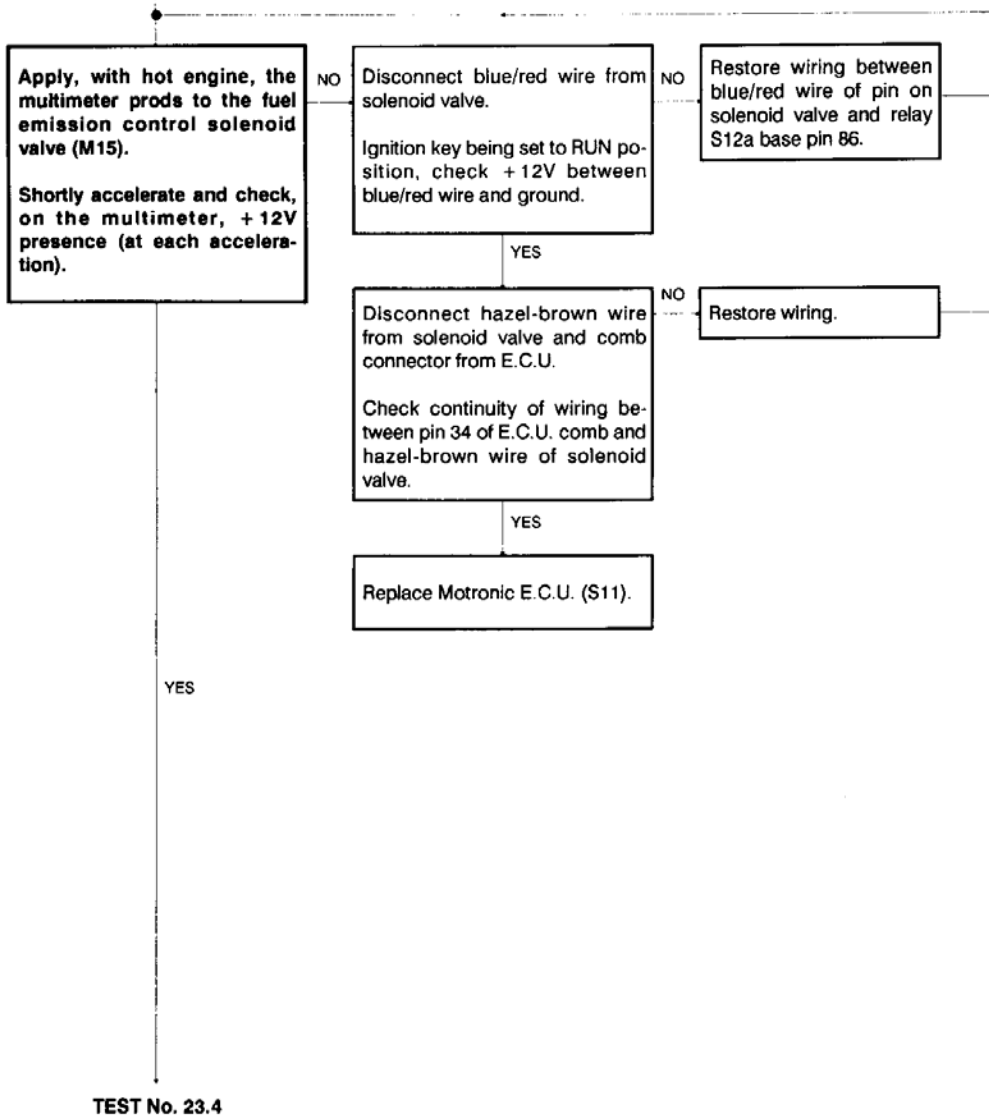


MOTRONIC ML4.1 SYSTEM

TEST No. 23.3 - CHECK OF FUEL VAPOUR FLOW CHECK SOLENOID VALVE CONTROL - PIN 34 OF E.C.U.

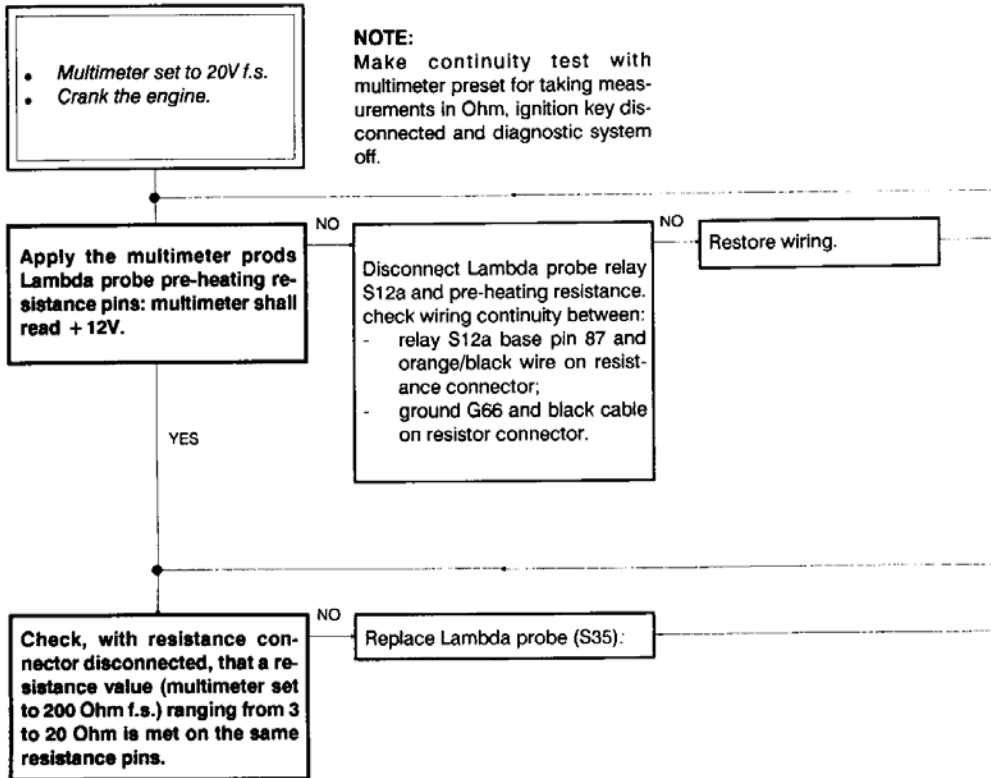
- *Multimeter set to 20V f.s.*
- *Crank the engine.*

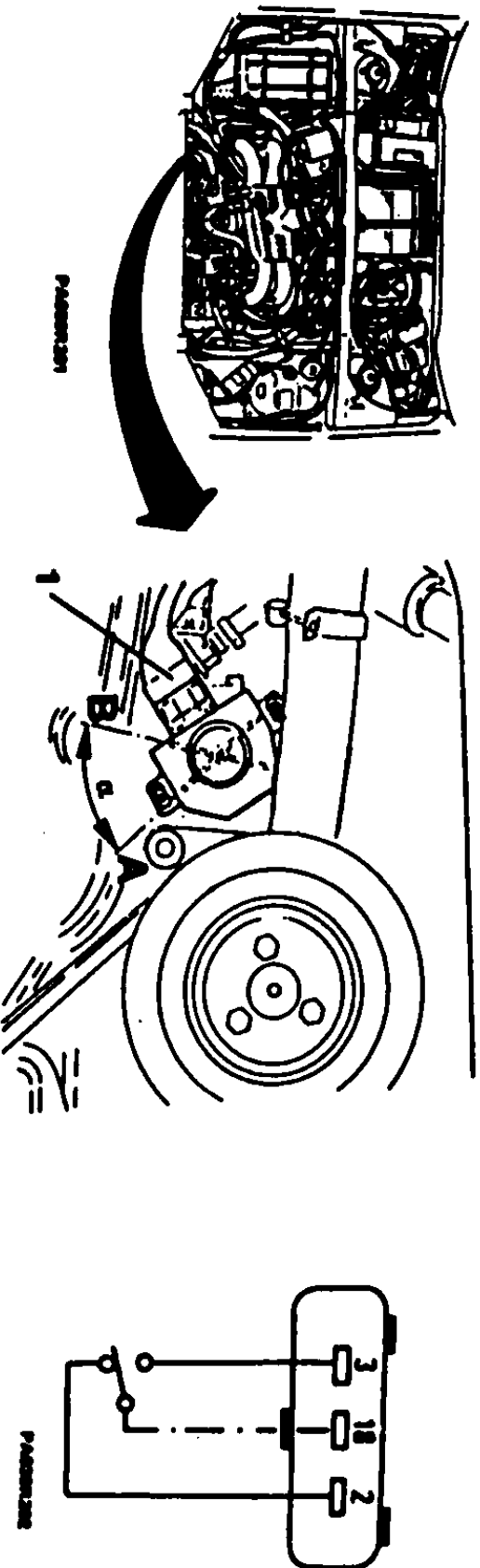
NOTE:
Make continuity test with multimeter preset for taking measurements in Ohm, ignition key disconnected and diagnostic system off.



MOTRONIC ML4.1 SYSTEM

TEST No. 23.4 - CHECK OF LAMBDA PROBE PRE-HEATING RESISTANCE SUPPLY





Figuur 4.59: Gasklepschakelaar afstellen

- A Stationairstand (weerstand penne 2-18: 0 ohm)(weerstand penne 3 en 18: oneindig)
- B Deellaststand (weerstand penne 2 en 18 bij α : oneindig)(weerstand penne 3 en 18 bij α : 0 ohm)
- α $55^\circ \pm 4^\circ$

Afstellen

- Zie figuur 4.59: Neem de driepolige steker los en meet de weerstanden aan de schakelaar op de penne 2 en 18 en de penne 3 en 18 bij de bijbehorende gasklepstanden.