

Operation - Magneti Marelli IAW

Foreword

The Multi-Tester plus/pro software cassette is the component that gives the diagnostic equipment its unique test characteristics: All data required to make the test system operate are stored on the software cassette.

The software cassette can be easily replaced enabling the Multi-Tester plus/pro to be rapidly adapted to the trouble-shooting job at hand.

These Trouble-Shooting Instructions describe how to use the equipment on Magneti Marelli - Weber fuel injection systems type IAW.

Multi-Tester plus/pro checks all input and output signals that have bearing on the control system and can also diagnose a faulty control unit.

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System Description

General

The Magneti Marelli-Weber IAW is a fuel injection and ignition control system. The control system evaluates signals from different sensors and adjusts fuel metering and ignition accordingly. The IAW is a multi-point system with separate injectors for each cylinder, these are controlled sequentially.

Note: in order to increase the pressure in the fuel system the pump relay is activated for a specific period after the ignition is switched on. This period varies between systems and car models. If the period is very long, the Multi-Tester plus/pro may indicate an error in a static test of the pump relay signal even if it is correct.

Summary – Car Models

The following car models are equipped with Magneti Marelli IAW:

Manufacturer	Type	Engine size
Alfa Romeo	155	4*4
Ducati	748	
Ducati	916	
Ferrari	F40	
Fiat	Croma	2.0
Fiat	Tempra	1.8
Fiat	Tempra	2.0
Fiat	Tipo	1.8
Fiat	Tipo	2.0
Ford	Sapphire RS Cosworth	2.0
Ford	Sierra Cosworth	2.0
Lancia	Dedra	1.8
Lancia	Dedra	2.0
Lancia	Dedra	2.0 Turbo
Lancia	Delta	1.6
Lancia	Delta HF Integrale	
Lancia	Prisma	1.6

Please check the workshop manual to verify if the actual car is equipped with a system described in this manual.

Sensors and signals

- Air temperature sensor – measures the temperature of the air ingested.
- Coolant temperature sensor.
- Crankshaft sensor – measures rotation speed and indicates the top dead center.
- Lambda sensor – measures the oxygen content of the exhaust gases.
- Manifold air pressure sensor (MAP) – measures the pressure in the induction pipe.
- Throttle potentiometer – measures the throttle's angle.
- Timing sensor – carries information about the position of the pistons in relation to top dead center.

Control functions

- Control of injection valve(s).
- Control of tank ventilation.
- Control of idle speed.
- Ignition advance control.

Users Guide

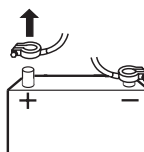
Connection of equipment

1. Preparations

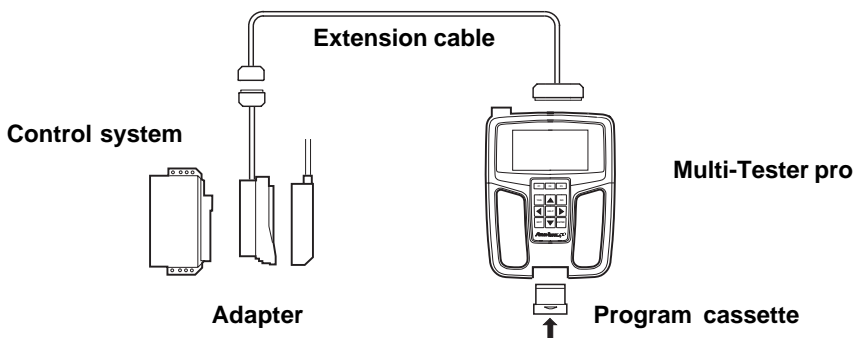
Turn off ignition!



Disconnect positive battery terminal!



2. Connect adapter and program cassette



3. Connect power supply



Starting the program

General

The program is re-started each time the power supply is interrupted and re-connected. When the supply is interrupted any faults and pre-sets recorded in memory are deleted.

At any particular moment, those keys which are not required are disabled. If such a key is pressed, the unit emits a long beep signal.

The program starts automatically when the Multi-Tester plus/pro is connected to the power supply. The unit executes steps 1 to 3 and pauses at step 5.

MULTI-TESTER *plus*

SELF-TEST OK

MULTITESTER
MAGNETIMARELLI
VER:XXXXXXXXXXXX

Working procedure

- 1. All fields in the display are tested (i.e. are illuminated) (*Multi-Tester plus only*).**

If no software cassette is installed or the cassette is incorrect, only the first and third row become illuminated. At this point the display's contrast can be adjusted. Adjust the potentiometer to right of the switch inside the cassette opening (using a small screwdriver).

- 2. The Multi-Tester plus/pro performs a self-test...**

- 3. ...and identifies the current versions of the hardware and software.**

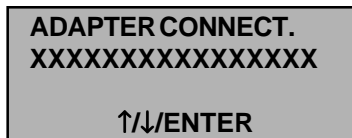
4. Snapshots (*Multi-Tester pro only*)

If the instrument contains stored snapshots, a menu for managing these is displayed.



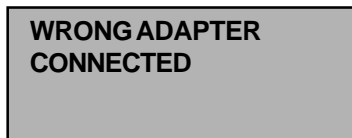
5. The adapter connected

The Multi-Tester plus/pro confirms which adapter is connected and displays this information.

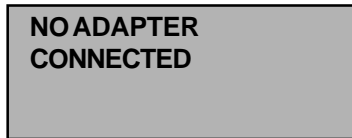


Is the information on row 2 correct?
Respond by pressing ENTER.

This message is displayed if the adapter which is connected to the Multi-Tester plus/pro is of the incorrect type, i.e. not combined with the appropriate software cassette.



If the adapter is not connected to the unit, the message NO ADAPTER CONNECTED is displayed.



6. Questions during initialization

In order for the Multi-Tester plus/pro to perform the tests correctly it needs certain data on the system. The display shows either alternatives or questions.

Alternatives

Use the up or down arrow key to select the correct alternative and then press ENTER.

Questions

Answer the questions by pressing either the YES or NO key.

ALFAROMEQ
DUCATI
FERRARI
↑/↓/ENTER

FIAT
FORD
LANCIA
↑/↓/ENTER

CROMA
TEMPRA
TIPO
↑/↓/ENTER

DEDRA
DELTA
PRISMA
↑/↓/ENTER

2 INJECTORS
4 INJECTORS
↑/↓/ENTER

TYPE SELECTION
LAMBDA SENSOR ?
YES/NO

TYPE SELECTION
RPM METER
YES/NO

TYPE SELECTION
TURBO
YES/NO

TYPE SELECTION
KNOCK SENSOR ?
YES/NO

TYPE SELECTION
AIR CONDITIONER ?
YES/NO

Identification of throttle potentiometer.

Only carried out when the answer is FORD.

The Multi-Tester plus/pro carries out this test to identify how the feed to the throttle is connected. It is either traditionally connected which gives a signal voltage which is low upon idling and high on full throttle or is inverted, and the voltage is high when idling and low on full throttle.

The test is started by your being asked to turn on the ignition.

When this has been carried out, you are asked, at the same time as the signal voltage from the throttle potentiometer is displayed, to rev the engine hard and then take your foot completely off the gas pedal.

If the request has been followed and the throttle potentiometer is functioning as it should, the test is now complete. In other cases, the Multi-Tester plus/pro will show that the voltage difference between idling and full throttle is too low and you will again be asked to manoeuvre the accelerator pedal. If the throttle potentiometer does not work, then it must be dealt with before any more tests can be carried out.

NB! The test can be interrupted by pressing EXIT. Multi-tester plus/pro will then work on the assumption that the throttle potentiometer is traditionally connected, i.e. with low voltage on idling and high voltage on full throttle.

THROTTLE POT.
IDENTIFICATION
TEST
ENTER

THROTTLE TEST
TURN ON
IGNITION KEY
SKIP TEST: EXIT

THROTTLE TEST
FULL THROTTLE
#17 THROTT V
SKIP TEST: EXIT

THROTTLE TEST
RELEASE THROTTLE
#17 THROTT V
SKIP TEST: EXIT

DIFFERENCE BE-
TWEEN IDLE AND
FULLOAD TO SMALL

THROTTLE POT.
IDENTIFICATION
TEST FINISHED
ENTER

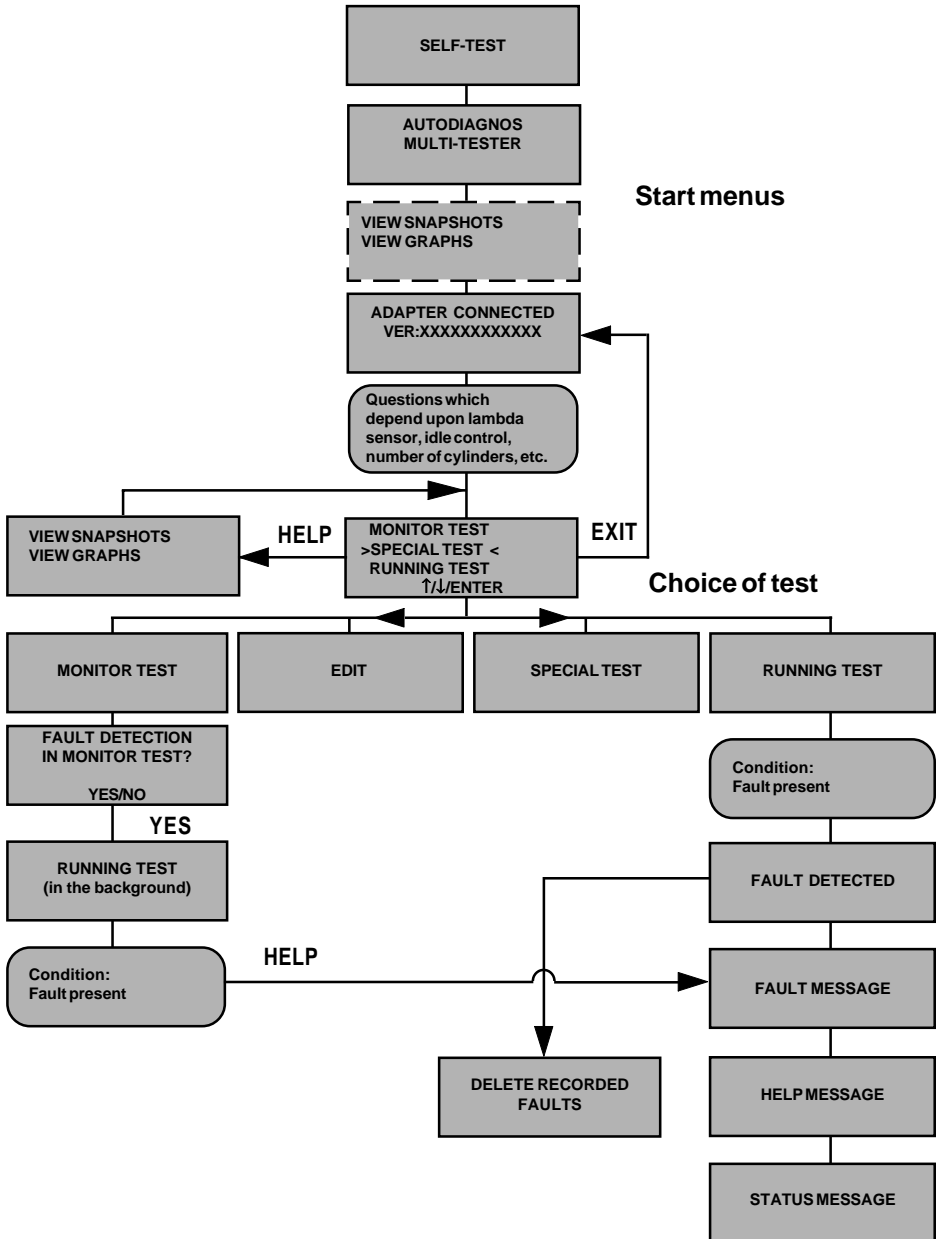
THROTTLE POT.
IDENTIFICATION
TEST ABORTED
ENTER

7. Cancel

To cancel work with the Multi-Tester plus/pro:

- Switch off engine.
- Disconnect the power cable from the unit.
- Disconnect the battery's positive terminal.
- Remove the adapter and re-connect the car's wiring harness to the control unit.
- Re-connect the battery's positive terminal.

Program structure



Programs and tests

The following types of test are available:

Monitor test Directs and displays the control system's signals without storing measured values.

Running test Records and stores faults which occur under both shorter and longer test periods.

Edit Can be used to disable fault detection on various signals.

Special tests A number of tests which are carried out in response to independent signals.

Monitor test

General

In Monitor test, values such as engine speed and coolant temperature are displayed.

Monitor test - with fault detection

This test is used to detect incorrect input and output signals to/from the various control systems. A fault is recorded if a signal deviates from its pre-programmed standard value. The fault is recorded until it is deleted manually or the power supply is interrupted.

- Up to five faults can be recorded each time Running is executed.
- Each primary fault can lead to a number of secondary faults.
- The Multi-Tester plus/pro stores all faults (primary and secondary) temporarily and offers an assessment of which is the primary fault. This is important in order to carry out repair work. Fault information is saved and displayed.
- The same fault cannot be recorded twice in succession.
- Order of priority of fault registration:
 1. Power supply
 2. Frame connections to the control system
 3. Sensor signals which affect the basic functions of the engine
 4. Other signals

Warning! If the display is to be read whilst driving the test should be performed by two people.

Monitor test

1. Monitor test

Select MONITOR TEST in the test choice menu.

2. Fault detection in Monitor test

Here you can select whether or not fault detection is run while in Monitor test. If you press YES, Running searches for faults while Monitor displays the values. If you press NO, START ENGINE shows. If you press ENTER, the list of signals is shown without the engine being started.

3. Test underway

A small T character flashes on the status row which indicates that the test is underway.

4. Fault detected

If an fault is detected, the unit emits a tone as well as a small F on the status row.

5. To inspect faults

If you press → the unit proceeds directly to the faulty signal. A small F character is displayed before the relevant pin number. If you select ← the unit proceeds to the beginning of the list of signals.

You can also press HELP to display which fault has been detected in simple text. If the engine is switched off, when Monitor is re-started, you must begin from stage 1 of this section.

```

RUNNING TEST
>MONITOR TEST  <
SPECIAL TEST
↑/↓/ENTER
  
```

```

FAULT DETECTION
IN MONITOR TEST?

YES/NO
  
```

```

#23 TEMP.    2.30 V
#24 GROUND   OK
#25 HALL     PULSE
IDLE        T
  
```

```

#23 TEMP    2.30 V
#24 GROUND   OK
#25 HALL     PULSE
IDLE        T F
  
```

```

#3 LAMBDA   OK
F4 GROUND   1.25 V
#5 BATT     12.0 V
IDLE        T F
  
```

```

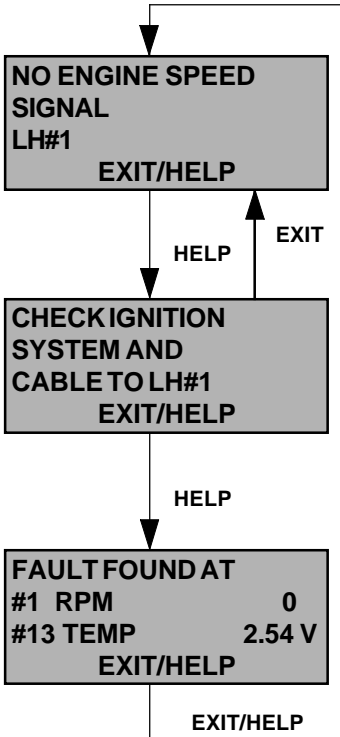
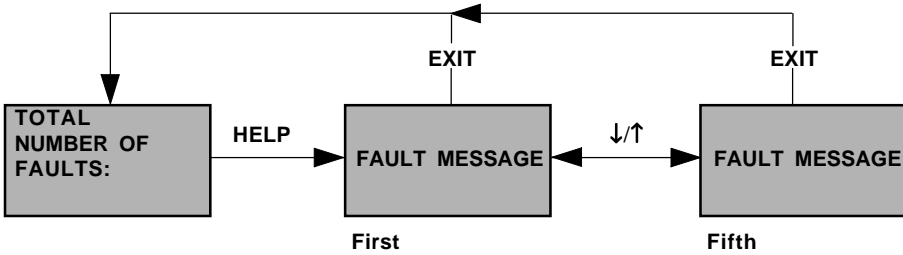
TOTAL NUMBER OF
FAULTS:      (1-5)

HELP/EXIT
  
```

Fault messages

Each fault has the following information associated with it:

- Fault message
- Help message
- Status message



Example fault message for an LH control system.

Example help message.

Example status message.
Display engine speed and voltage from coolant temperature sensor.

To delete recorded faults

1. Start

To delete faults, start from this point.

TOTAL NUMBER OF
FAULTS: (1-5)

EXIT/HELP

2. To delete faults

Depress the EXIT key for at least 5 seconds. If EXIT is not pressed within 3 seconds the unit returns to the FAULT DETECTED message automatically.

TO DELETE FAULTS
PRESS EXIT
> 5 SEC.

3. Delete faults.

All faults and all snapshots are deleted simultaneously.

FAULTS WILL BE
DELETED
5..4..3..2..1

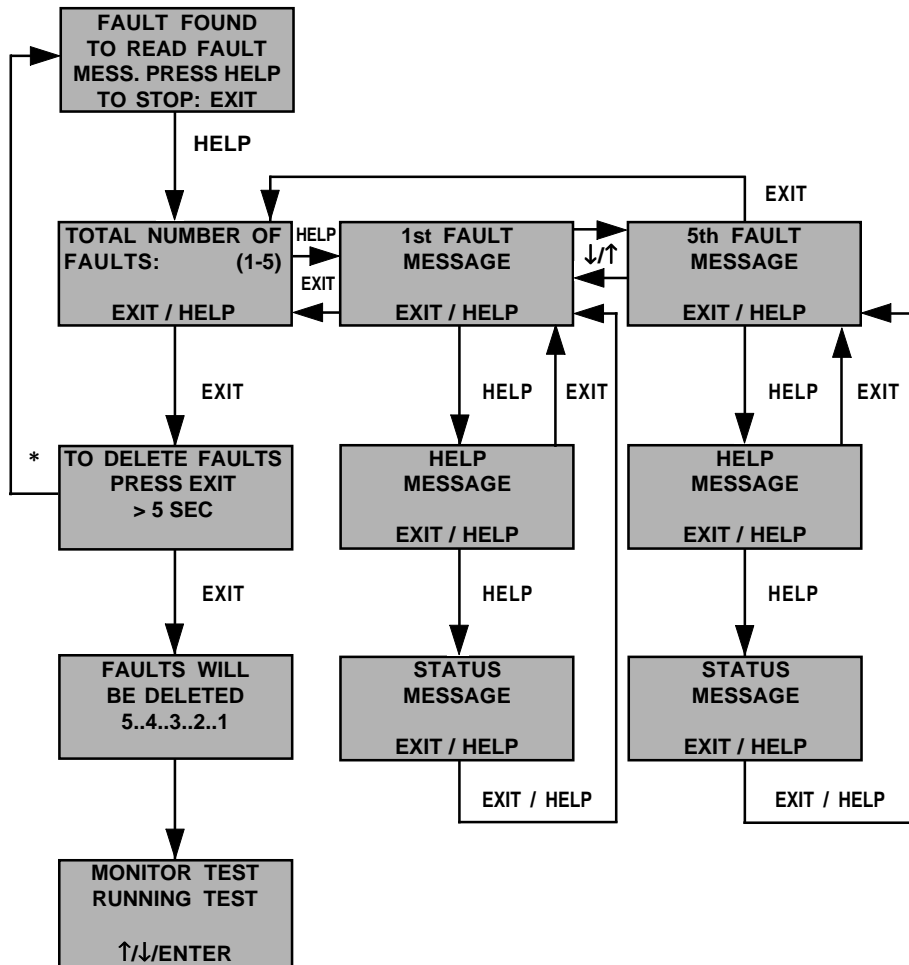
4. Exit delete

When all faults have been deleted, the instrument returns to the "Choice of test" menu.

MONITOR TEST
RUNNING TEST

↑/↓/ENTER

Fault detected



* Occurs automatically after 3 seconds

Snapshots (Multi-Tester pro only)

Automatic snapshots

When the Multi-Tester pro finds a fault, all the values in the monitor list are saved automatically as a snapshot. The Multi-Tester pro can store up to five snapshots. The number of snapshots stored is shown at the bottom of the display.

Certain parameters are displayed as mean values. Faults may be reported on the basis of instantaneous values, with the result that autosnap may not always display a faulty value even if the Multi-Tester pro indicates a fault on a particular signal.

Manual snapshots

Press ENTER to create a manual snapshot. Up to five manual snapshots can be stored. Here too, the number of snapshots stored is shown at the bottom of the display.

Viewing snapshots

To view snapshots, press EXIT, then HELP. Then move the cursor to VIEW SNAPSHOT with \uparrow/\downarrow and press ENTER. The manual snapshots appear first. The number of the current snapshot is shown at the bottom of the display. To view the next snapshot press \rightarrow . Press EXIT to quit.

To delete manual snapshots, move the cursor to DELETE SNAPSHOT with \downarrow . Press ENTER, then YES.

Running test

General

This test is used to detect incorrect input and output signals to/from the various control systems. An fault is recorded if a signal deviates from its pre-programmed standard value. The fault is recorded until it is deleted manually or the power supply is interrupted.

- Up to five faults can be recorded each time Running is executed.
- Each primary fault can lead to a number of secondary faults.
- The Multi-Tester plus/pro stores all faults (primary and secondary) temporarily and offers an assessment of which is the primary fault. This is important in order to carry out repair work. Fault information is saved and displayed.
- The same fault cannot be recorded twice in succession.
- Automatic test restart when the engine is restarted (appropriate for long-term tests).
- Signal values cannot be studied.
- Order of priority of fault registration:
 1. Power supply
 2. Frame connections to the control system
 3. Sensor signals which affect the basic functions of the engine
 4. Other signals

Warning! If the display is to be read whilst driving the test should be performed by two people.

An fault can be recorded the moment Running starts. The Multi-Tester plus/pro emits a beep and the letter **F** is displayed when an fault is detected. Instructions for retrieving the fault from memory together with a description of fault, help and status messages are described in the “Fault messages” section.

Edit

Edit can be used to turn off the error diagnosis for signals which for some reason are not connected to the interface. This may occur if you are testing a different year model of the car than the one that was available when developing the program for the actual control system.

At the start all signals are switched on. When the operator answers the introductory questions, Multi-Tester plus/pro shuts out non-relevant signals.

Error diagnosis for other signals can be switched on and off. Press ENTER to change the signal's status. When you press HELP, more information on the actual signal is displayed.

All changes will be erased when the Multi-Tester plus/pro is disconnected from power.

Note

If error diagnosis is disconnected, this can lead to other errors being reported. For example, if error diagnosis for a main ground or power supply is disconnected, then signals that depend on them can be reported as faulty.

A rectangular box with a black border and a light gray background. The word "EDIT" is centered in the box in a bold, black, sans-serif font.

EDIT

A rectangular box with a black border and a light gray background. The text "#XX GROUND" is on the left and "ON" is on the right, both in a bold, black, sans-serif font.

#XX GROUND ON

A rectangular box with a black border and a light gray background. The text "#XX GROUND" is on the left and "OFF" is on the right, both in a bold, black, sans-serif font.

#XX GROUND OFF

Special Tests

Special tests allows detailed study of certain signals.

The following functions are provided for Special Tests.

Graphical display (Multi-Tester pro only)

- All signals that are presented in the form of voltage (V) in Monitor mode are displayed graphically.
- Press \uparrow/\downarrow to reach the required signal and press ENTER.
- To see all functions press HELP. To return, press any key.

The timebase of the X-axis is shown bottom right on the display. It is marked with a black square. To reduce/increase the timebase, press \leftarrow/\rightarrow . The shortest timebase is 2 seconds and the longest is 1024 seconds.

The amount above the Y-axis indicates the scaling. Pressing F3 toggles the highlight between the scale factor and the offset bottom left on the display. Depending on which is highlighted, the setting is changed by pressing \uparrow/\downarrow . The minimum and maximum values for the scaling are 200 mV and 15 000 mV, and for the offset 0 V and 14 V.

The offset moves the curve in the Y-direction.

- Min/max is displayed top right on the display and applies to the curve currently displayed. When a snapshot has been taken, min/max is replaced by new values.

Snapshot (Multi Tester pro only)

There are two ways of taking a snapshot in graphical mode:

- Press F1. Curve drawing stops. Press ENTER to take a snapshot. To return, press F1 or F2.
- Press F2. A new curve is drawn to the end of the X-axis, where it stops. Press ENTER to take a snapshot. To return, press F1 or F2.

To view snapshots, press EXIT twice, then press HELP. Move the cursor to VIEW GRAPHS with \uparrow/\downarrow and press ENTER. The current snapshot and the number of snapshots stored are shown at the top of the display. Press \rightarrow to view the next snapshot. Press EXIT to quit.

To delete graphical snapshots, move the cursor to ERASE GRAPHS with \downarrow . Press ENTER, then YES.

The program for the IAW system includes the following special tests:

Static test

Checks the signals when the ignition is on but the engine is not running.

>STATIC TEST

Continuous static test

Static test that is carried out continuously.

>CONT. STAT.TEST

Throttle test

Tests the throttle potentiometer.
Checks signal levels and continuity.

>THROTTLE TEST

Lambda sensor

Displays signal voltage from the lambda sensor and the minimum and maximum values.

>LAMBDA SENSOR

Battery

Displays the battery voltage and the minimum and maximum values.

>BATTERY

Throttle potentiometer

Displays the signal voltage from the throttle potentiometer and the minimum and maximum values.

>THROTTLE POT.

Coolant temperature sensor

Displays the signal voltage from the coolant temperature sensor and the minimum and maximum values.

>COOLANT TEMP

Air temperature sensor

Displays the signal voltage from the air temperature sensor and the minimum and maximum values.

>AIR TEMP

Manifold air pressure

Displays the signal voltage from the manifold air pressure sensor and the minimum and maximum values.

>MAP

>SENSOR POWER

Sensor power

Displays the power voltage to the throttle potentiometer and inlet pressure sensor and the minimum and maximum values.

Static test

Continuous static test

These tests detect incorrect input and output signals from the control unit when the ignition is on but the engine is not running.

A fault is registered if any signal differs from the pre-programmed standard value. The fault will be held in memory until it is erased manually or until the power is broken.

Starting condition for the test:

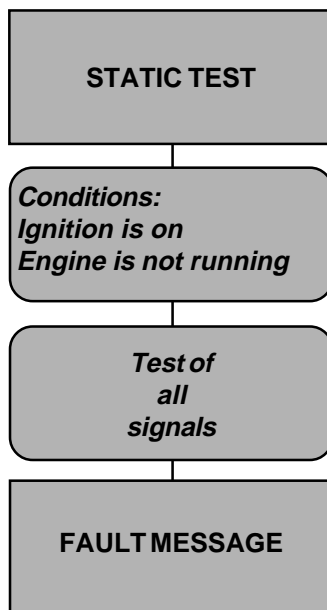
- The ignition should be on.
- The engine should not be started.

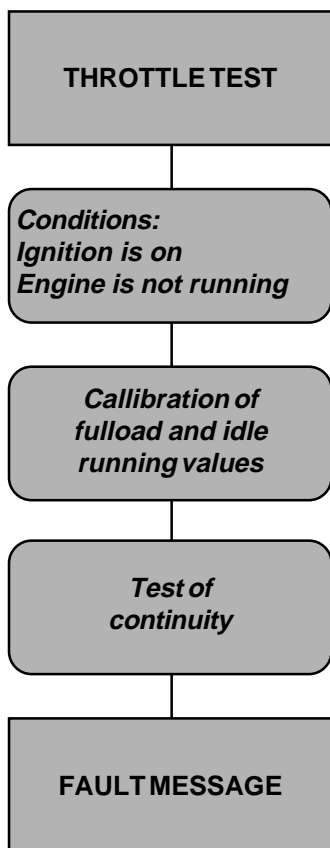
If the ignition is off, you will be asked to turn it on. If the engine is started the test will not be carried out and the program will return to the special tests menu.

After all the signals are controlled, the text NO FAULTS FOUND appears on the display or if any faults are located then FAULTS EXIST will appear.

If the continuous static test is selected, then all signals will be tested continuously until EXIT is pressed, the ignition is switched off or the engine is started.

If faults are found then this will appear on the display. To view these faults press HELP.





Throttle test

This test involves a comprehensive check of the signal levels of the throttle potentiometer and the condition of the potentiometer pathways. The test can for example detect signal interruptions that originate from a bad carbon path.

Starting condition for the test:

- The ignition has to be turned on.
- The engine should not be running.

If the ignition is off, you will be asked to turn it on. If the engine is started, the test will not be carried out and the program will return to the special tests menu.

Firstly, a calibration is carried out for the Multi-Tester plus/pro pre-programmed values for full load and idle running. This is to guarantee the Multi-Tester plus/pro function as its values can differ for different vehicles. You will be asked to give full throttle and then release the accelerator completely.

Then you will have to press down the accelerator slowly. A check is now being carried out to control that there is no break in signal from the throttle potentiometer. If the accelerator is depressed too quickly during this part of the test, you will be asked to release it and slowly depress the accelerator again.

If faults are found then this will appear on the display. To view these faults press HELP.

Lambda sensor

This test demonstrates the signal voltage of the lambda sensor.

The test displays the actual value together with the minimum and maximum values recorded. This makes it possible to check that the sensor is working and swings between extreme positions 0 and 1 V approx.

Starting condition for this test:

- The engine has to be running.

If not, you will be asked to start it.

This test will continue until EXIT is pressed or until the engine is stopped.

Battery

This test demonstrates the voltage level of the car's battery.

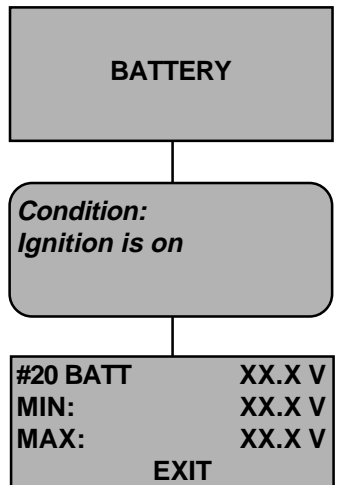
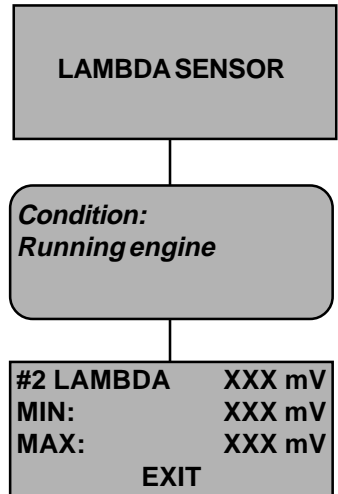
The test displays the actual value together with the minimum and maximum values recorded. This enables the battery voltage during for example the starting phase to be measured.

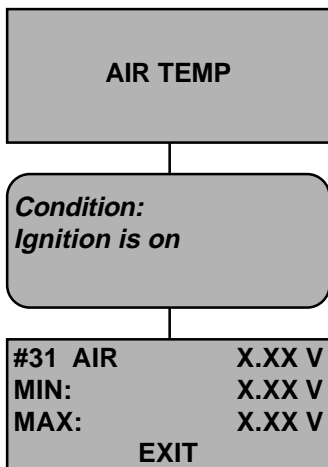
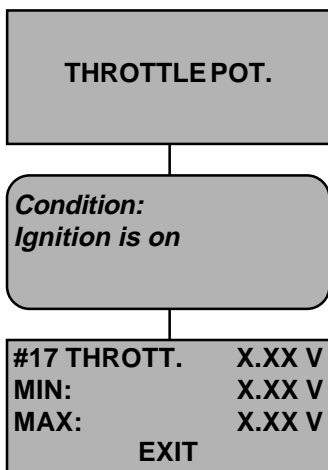
Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.





Throttle potentiometer

This test demonstrates the signal voltage of the throttle potentiometer.

The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.

Air temperature sensor

This test demonstrates the signal voltage of the air temperature sensor.

The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.

Coolant temperature sensor

This test demonstrates the signal voltage of the coolant temperature sensor.

The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.

Manifold air pressure (MAP)

This test demonstrates the signal voltage of the manifold air pressure sensor.

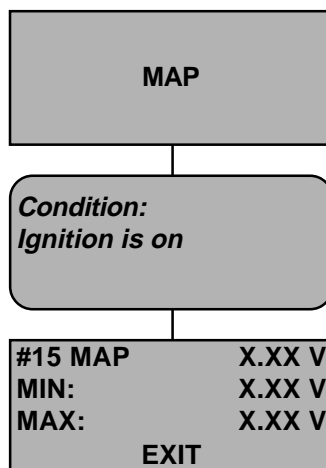
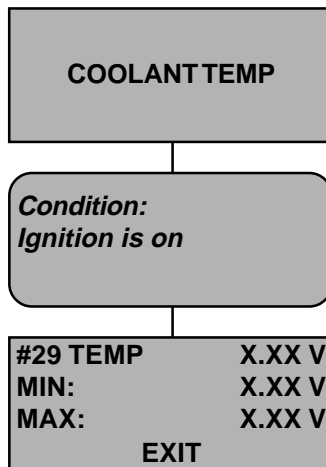
The test displays the actual value together with the minimum and maximum values recorded.

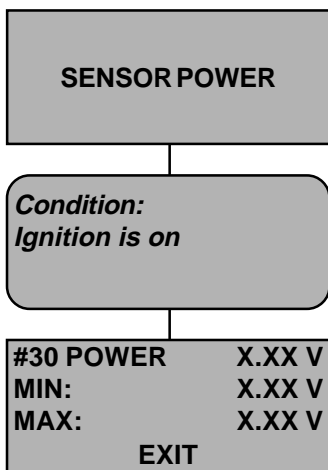
Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.





Sensor power

This test demonstrates the power voltage to the throttle potentiometer and inlet pressure sensor (MAP).

The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.

Trouble-Shooting Procedure

General

Many faults can be detected by using the Multi-Tester plus/pro (with the appropriate software cassette) only. As an additional aid, each software cassette has a dedicated troubleshooting manual.

However, when troubleshooting, the following points should be observed:

- Faults of intermittent character, e.g. faulty switch contacts, are often difficult to observe in the workshop. In such cases, those components which are considered potential causes of the fault should be swapped out, each in turn, followed on each occasion with a test drive with the Multi-Tester plus/pro connected.
- **NB:** the fault rate for control units is relatively low. More likely causes of failure are harness connectors, cabling, sensors or switches.
- Whenever resistance or voltage supply measurements are being taken at the harness connector by the control unit, the Autodiagnos Break-out Box (A0201/A0202) and associated Break-out Box adapter should be used to avoid destroying the harness connector's sheathing. This is to ensure good electrical contact and to avoid damage to or a short circuit across the harness connector's sheathing.

The troubleshooting manuals include two chapters important to troubleshooting.


The *Fault Tracing* chapter includes a brief signal description for each pin and three columns (the pin number means the number in the control unit's harness connector). The three columns enumerate the quantities to be checked by the various tests. In the rightmost column the corresponding section in the *Locating Faults* chapter is also included (see figure below).

Pin 3 Ground to crankshaft sensor		
MONITOR	SPECIAL	RUNNING
"#3 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults
		▶ 3


In the *Locating faults* chapter, the working procedure for locating faults is included.

Fault tracing

Pin 1 Ground

MONITOR	SPECIAL	RUNNING
"#1 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults  1


Pin 2 Signal from lambda sensor (only certain models)

MONITOR	SPECIAL	RUNNING
"#2 LAMBDA" (mV)	Lambda sensor: display of power variation.	Check of power variation. Conditions: <ul style="list-style-type: none"> - engine at operating temperature - not idle or full load - revs < 2500 rpm. See chapter Locating Faults  2

Pin 2 Signal from CO-potentiometer (some models)

MONITOR	SPECIAL	RUNNING
"#2 CO-POT" (V)	Not tested.	Not tested.

Pin 3 Ground to crankshaft sensor

MONITOR	SPECIAL	RUNNING
"#3 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults  3

Pin 4 Signal from crankshaft sensor

MONITOR	SPECIAL	RUNNING
"#4 RPM"	Not tested.	Continuous pulse check. See chapter Locating Faults

▶ 4

Pin 5 Ground to timing sensor

MONITOR	SPECIAL	RUNNING
"#5 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults

▶ 5

Pin 7 Engine speed signal to revolution counter

MONITOR	SPECIAL	RUNNING
"#7 REVS" (PULSE/----)	Not tested.	Not tested. See chapter Locating Faults

▶ 6

Pin 9 Signal from CO-potentiometer (only certain models)

MONITOR	SPECIAL	RUNNING
"#9 CO-POT" (V)	Not tested.	Not tested.

Pin 9 Signal from MAP sensor (only certain models)

MONITOR	SPECIAL	RUNNING
"#9 MAP" (V)	Not tested.	Not tested. See chapter Locating Faults

▶ 7

Pin 10 Control signal to main relay

MONITOR	SPECIAL	RUNNING
"#10RELAY" (ON/OFF)	Static test: check of control signal level.	Continuous check av control signal level. See chapter Locating Faults ▶ 8

Pin 11 Ground to sensors

MONITOR	SPECIAL	RUNNING
"#11 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults ▶ 9

Pin 12 Control signal to engine control lamp

MONITOR	SPECIAL	RUNNING
"#12 LAMP" (ON/OFF)	Not tested.	Not tested. See chapter Locating Faults ▶ 10

Pin 15 Signal from MAP sensor

MONITOR	SPECIAL	RUNNING
"#15MAP" (V)	Static test: check of signal level. MAP: display of power variation.	Not tested. See chapter Locating Faults ▶ 11

Pin 16 Control signal to wastegate control

MONITOR	SPECIAL	RUNNING
"#16WASTEG" (ON/OFF)	Static test: check of voltage level (only Lancia).	Not tested. See chapter Locating Faults ▶ 12

Pin 17 Signal from throttle potentiometer

MONITOR

"#17 THROTT" (V)

SPECIAL

Throttle test: check of signal level and continuity.
Throttle pot.: display of voltage variation.

RUNNING

Continuous check of continuity.
Desired values:
Idle 0.1–0.7 V
Full load: 4.2–5.0 V

See chapter
Locating Faults ▶ **13**

Pin 18 Control signal to injection valve No. 4

MONITOR

"#18 INJ" (ms)

SPECIAL

Static test: check of voltage level.

RUNNING

Continuous pulse check.

See chapter
Locating Faults ▶ **14**

Pin 19 Ground

MONITOR

"#19 GROUND"
(OK/ERR)

SPECIAL

Static test: check of ground level.

RUNNING

Continuous check of ground level.
Desired value: 0 V

See chapter
Locating Faults ▶ **1**

Pin 20 Power feed from main relay

MONITOR

"#20 BATT" (V)

SPECIAL

Static test: check of voltage level.

RUNNING

Continuous check of voltage level.
Desired value: 12–14 V

See chapter
Locating Faults ▶ **15**

Pin 21 Control signal to air conditioner

MONITOR

"AC" (Status)

SPECIAL

Not tested.

RUNNING

Not tested.

Pin 23 Signal from timing sensor

MONITOR	SPECIAL	RUNNING
"#23 TIMING" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults ▶ 16

Pin 24 Ground to ignition amplifier

MONITOR	SPECIAL	RUNNING
"#24 GROUND" (OK/ERR)	Static test: check of ground level.	Continuous check of ground level. Desired value: 0 V See chapter Locating Faults ▶ 17

Pin 25 Control signal to ignition amplifier

MONITOR	SPECIAL	RUNNING
"#25 IGN" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults ▶ 18

Pin 28 Control signal to fuel pump relay

MONITOR	SPECIAL	RUNNING
"#28 RELAY" (ON/OFF)	Static test: check of control signal level.	Continuous check of control signal level. See chapter Locating Faults ▶ 19

Pin 29 Signal from coolant temperature sensor

MONITOR	SPECIAL	RUNNING
"#29 TEMP" (V)	Static test: check of signal level. Coolant temp: display of power variation.	Continuous check of signal level. Desired value when engine at operating temperature: 0.7 V See chapter Locating Faults ▶ 20

Pin 30 Power feed to sensors

MONITOR	SPECIAL	RUNNING
"#30 POWER" (V)	Static test: check of voltage level. Sensor power: display of power variation.	Continuous check of voltage level. Desired value: 5 V See chapter Locating Faults ▶ 21

Pin 31 Signal from air temperature sensor

MONITOR	SPECIAL	RUNNING
"#31 I-AIR" (V)	Static test: check of signal level. Air temp: display of power variation.	Continuous check of signal level. Desired value at 20°C: 0.8–1.3 V See chapter Locating Faults ▶ 22

Pin 32 Control signal to injection valve No. 2

MONITOR	SPECIAL	RUNNING
"#32 INJ" (ms)	Static test: check of voltage level.	Continuous pulse check. See chapter Locating Faults ▶ 14

Pin 33 Control signal to injection valve No. 3

MONITOR	SPECIAL	RUNNING
"#33 INJ" (ms)	Static test: check of voltage level.	Continuous pulse check. See chapter Locating Faults ▶ 14

Pin 34 Control signal to idle speed correction valve

MONITOR	SPECIAL	RUNNING
"#34 ISC" (%)	Not tested.	Continuous pulse check. See chapter Locating Faults ▶ 23

Pin 35 Control signal to injection valve No. 1

MONITOR

"#35 INJ" (ms)

SPECIAL

Static test: check of voltage level.

RUNNING

Continuous pulse check.

See chapter
Locating Faults ▶ **14**

Locating faults

1

Check of grounding connection to IAW, pin 1

These connections are the grounding connection for the control unit.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance between Break-out Box, pin 1 and 19 respectively and ground. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

2

Check of signal from lambda sensor to IAW, pin 2

This is an input signal to the control unit from the Lambda sensor. It is only found on cars fitted with catalytic converters and is used for the fine adjustment of the ratio of fuel to air to approx. 1:14.6 (by weight). This ratio is called lambda = 1.

The following test conditions must be met as the Multi-Tester plus/pro checks that the lambda sensor signal oscillates between 0 and 1 V:

- Engine temperature must exceed +70°C
- No idling – because some sensors normally cool down after long periods of idling and oscillation ceases.
- No full throttle – the sensor signal then becomes constant at approx. 1V
- No fuel cut-off – the sensor signal then becomes constant at approx. 0 V
- Engine speed below 2500 rpm.

1. Check the pre-heating of the sensor (if fitted) by measuring the voltage at the sensor connector while the engine is running.

Desired value: 12–14 V

2. Check the resistance in the heating coil by disassembling the connector for the pre-heater and measuring the resistance. Desired value: 2–20 Ω

Possible cause of fault: Lambda sensor.

3. Run the engine until it reaches operating temperature and keep the revs at about 2500 rpm. Enter the special test LAMBDA SENSOR and observe the fluctuations of the lambda sensor signals between 0 and 1 V. The signal should oscillate about once a second. Oscillations of longer duration indicate that the sensor may be polluted and should be replaced.
4. Turn the ignition off and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
5. Measure the resistance between Break-out Box, pin 2 and ground. If the reading is approximately $0\ \Omega$ the sensor has short circuited and is no longer functioning. Repeat the measurement at the sensor connector to determine whether the short circuit is in the sensor or in the cable between the sensor and the control unit.

3

Check of grounding connection to crankshaft sensor from IAW, pin 3

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between Break-out Box, pin 3 and ground. Desired value: 0 V

Possible cause of fault: Wiring or connectors.

4

Check of signal from crankshaft sensor to IAW, pin 4

This is an input signal to the control unit from the crankshaft sensor. It carries information about the engine speed and the top dead center.

1. Check the clearance between the sensor and the ring gear (see workshop manual) and that the teeth are clean.
2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between Break-out Box, pin 4 and 3 respectively and the crankshaft sensor. Desired value in both cases: $0\ \Omega$

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 4 and 3.
Desired value: 600–800 Ω
Possible cause of fault: crankshaft sensor.
5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
6. Start the engine and check that pulses are received at Break-out Box, pin 4 (use oscilloscope or similar).
Possible cause of fault: Sensor, dirt between teeth, wiring or connectors.

5

Check of grounding connection to timing sensor from IAW, pin 5

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between Break-out Box, pin 5 and ground. Desired value: 0 V
Possible cause of fault: Wiring or connectors.

6

Check of engine speed signal to revolution counter from systnamn, pin 7

This is an output signal from the control unit, carrying engine speed information e. g. for the the car's revolution counter.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and check (use oscilloscope or similar) that pulses are received at Break-out Box, pin 7.
Possible cause of fault: Wiring, connectors or control unit.

7

Check of signal from MAP sensor to IAW, pin 9

This is an input signal to the control unit from the manifold absolute pressure sensor, carrying information about the engine load.

1. Check that the vacuum hose is in good condition and is connected to the pressure sensor.
2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between Break-out Box, pin 9 and MAP sensor, pin 3 (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 30 and MAP sensor, pin 1. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

5. Measure the resistance between Break-out Box, pin 11 and MAP sensor, pin 2. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

6. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

7. Start the engine and measure the voltage between Break-out Box, pin 30 and ground. Desired value: 5 V

Possible cause of fault: Sensor or control unit.

8

Check of control signal to main relay from IAW, pin 10

This is an output signal from the control unit. The signal is grounded to activate the main relay. There can be several reasons if the signal cannot be found, among others:

- Break in the wiring or connectors.
- A defective or absent main input signal to the system, such as:
 - voltage supply
 - grounding connection
- Faulty control unit, although this is most unlikely as the failure rate for control units is very low.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance between Break-out Box, pin 10 and main relay (see workshop manual). Desired value: 0 Ω .

Possible cause of fault: Wiring and connectors.

9

Check of grounding connection to sensor from IAW, pin 11

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between Break-out Box, pin 11 and ground. Desired value: 0 V

Possible cause of fault: Wiring or connectors.

10

Check of control signal to engine control lamp from IAW, pin 12

This is an output signal from the control unit to the engine control lamp. The lamp is lit when the control unit detects a fault in the engine or a faulty sensor signal.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between Break-out Box, pin 12 and engine control lamp. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

11

Check of signal from MAP sensor to IAW, pin 15

This is an input signal to the control unit from the manifold absolute pressure sensor, carrying information about the engine load.

1. Check that the vacuum hose is in good condition and is connected to the pressure sensor.
2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between Break-out Box, pin 15 and MAP sensor, pin 1 / C (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 30 and MAP sensor, pin 3 / A. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

5. Measure the resistance between Break-out Box, pin 11 and MAP sensor, pin 2 / B. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

6. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

7. Start the engine and measure the voltage between Break-out Box, pin 30 and ground. Desired value: 5 V

Possible cause of fault: Sensor or control unit.

12

Check of control signal to wastegate control from IAW, pin 16

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Lancia: Measure the resistance between Break-out Box, pin 16 and 20. Desired value: 40 Ω

Others: Measure the resistance between Break-out Box, pin 16 and fuel pump relay, pin 87. Desired value: 20–50 Ω

If incorrect reading:

Repeat the measurement directly on the wastegate control to determine whether the break is in the wastegate control or in the wiring.

13

Check of signal from throttle potentiometer to IAW, pin 17

When this fault is reported it is most likely that the potentiometer's conductor is faulty. The throttle potentiometer must be replaced.

Check the wiring and connectors to the throttle potentiometer as follows:

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.

2. Measure the resistance between Break-out Box, pin 17 and throttle potentiometer, pin 2 / B (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

3. Measure the resistance between Break-out Box, pin 30 and throttle potentiometer, pin 1 / A. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 11 and throttle potentiometer, pin 3 / C. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

5. Measure the resistance between Break-out Box, pin 17 and 11. Desired value: 0–700 Ω

Possible cause of fault: Throttle potentiometer.

6. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

7. Turn the ignition on and measure the voltage between Break-out Box, pin 30 and 11. Desired value: 5 V

Possible cause of fault: Ground connection, throttle potentiometer or control unit.

14

Check of control signals to injection valves from IAW, pin 18, 32, 33 and 35

This is an output signal from the control unit to the injection valves to control fuel metering.

1. Turn the ignition on and measure the power feed to the injection valve.
Desired value: 12–14 V

Possible cause of fault: Wiring, connectors or the main relay.

2. Check the opening pulse by measuring the voltage across the injection valves using a test lamp (measure from the rear of one of the connectors on any injector). At low rpm the lamp should flash and it should maintain a constant light at higher rpm. If incorrect:

Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit. Repeat corresponding measurement between Break-out Box, pin 18, 32, 33 and 35 respectively and 1.

3. In the case of a suspected break between Magneti Marelli IAW, pin 18, 32, 33 and 35 respectively and the injector, carry out the following measurement:

Turn the ignition off and disconnect the connector from the control unit. Measure the resistance between Break-out Box, pin 18, 32, 33 and 35 respectively and the terminal on the injector's connector (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance across each individual injector with the injector connector terminal removed (i.e. directly on the injectors).
Desired value: 2–4 Ω

Possible cause of fault: Injector.

Note

The test is disconnected during fuel cut-off.

Injector failure can also be of a mechanical nature (lining, etc.). Such faults are not registered by Multi-Tester plus/pro. In this case a flow check must be carried out on each injector.

15

Check of power feed from main relay to IAW, pin 20

1. Measure the voltage at the main relay's positive pole, pin 30 (see workshop manual). Desired value: 12–14 V

Possible cause of fault: Wiring or connectors.

2. Turn the ignition on and measure the voltage at main relay, pin 86 (terminal 15, see workshop manual). Desired value: 12–14 V

Possible cause of fault: Wiring, connectors or ignition switch.

3. Turn the ignition off and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.

4. Measure the resistance of the cable between Break-out Box, pin 10 and main relay pin 85 if the car is a Ford, Fiat Croma or Lancia (only certain models). For the others measure between main relay, pin 85 (see workshop manual) and ground. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

5. Measure the resistance of the cable between Break-out Box, pin 20 and main relay, pin 87. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

6. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

7. Turn the ignition on and measure the voltage between Break-out Box, pin 20 and ground. Desired value: 12–14 V

Possible cause of fault: Main relay.

Note

The terminal 15 supply provides the stop signal for the test program in Multi-Tester plus/pro. This means that a missing signal is interpreted as the engine being switched off. Nevertheless a faulty signal will be detected at the start of the test.

16

Check of signal from timing sensor to IAW, pin 23

This is an input signal to the control unit from the timing sensor.

1. Check the clearance between the sensor and the ring gear (see workshop manual) and that the teeth are clean.
2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between Break-out Box, pin 23 and 5 respectively and the timing sensor. Desired value in both cases: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 23 and 5.
Desired value: 700–1200 Ω

Possible cause of fault: Timing sensor.

5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
6. Start the engine and check the pulses from the sensor (use oscilloscope or similar).

Possible cause of fault: Sensor, dirt between teeth, wiring or connectors.

17

Check of grounding connection to ignition amplifier from IAW, pin 24

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between Break-out Box, pin 24 and ground. Desired value: 0 V

Possible cause of fault: Wiring, connectors, ignition amplifier or control unit.

18

Check of control signal to ignition amplifier from IAW, pin 25

This is an output signal from the control unit to the ignition amplifier.

Control unit sends ignition pulses to control the ignition amplifier.

There can be several causes if the signal cannot be found:

- Break in the wiring or connectors.
 - A defective or absent main input signal to the system such as:
 - Crankshaft sensor
 - Timing sensor
 - Voltage supply
 - Grounding connection.
 - Faulty control unit, although this is most unlikely as the failure rate for control units is very low.
1. Turn the ignition on and measure the voltage between ignition amplifier, pin 4 and 2. Desired value: 12 V

Possible cause of fault: Ignition switch, cable between ignition amplifier's positive pole and main relay, cable between ignition amplifier's grounding pole and ground or connectors.

2. Turn the ignition off and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.

3. Measure the resistance of the cable between Break-out Box, pin 25 and ignition amplifier, pin 6. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance of the cable between Break-out Box, pin 24 and ignition amplifier, pin 3. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

6. Crank the engine and check using a test lamp that pulses are received at Break-out Box, pin 25.

Possible cause of fault: Crankshaft sensor, timing sensor or control unit.

19

Check of control signal to fuel pump relay from IAW, pin 28

This is a control signal from the control unit. The signal is grounded to activate the pump relay after the engine has been turned over on the starter. There can be several reasons if a signal cannot be found, among others:

- Break in the wiring or connectors.
 - A defective or absent main input signal to the system, such as:
 - ground connection
 - power feed
 - crankshaft sensor
 - Faulty control unit, although this is most unlikely as the failure rate for control units is very low.
1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
 2. Measure the resistance of the cable between Break-out Box, pin 28 and fuel pump relay pin 85 (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

3. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
4. Turn the ignition on and measure the voltage between fuel pump relay pin 86 and ground. Desired value: 12 V

Possible cause of fault: Wiring or connectors.

20

Check of signal from coolant temperature sensor to IAW, pin 29

This is an input signal to the control unit from the coolant temperature sensor (type NTC with a negative temperature coefficient).

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance between Break-out Box, pin 29 and coolant temperature sensor, pin 2 (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

3. Measure the resistance between Break-out Box, pin 11 and coolant temperature sensor, pin 1. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between Break-out Box, pin 29 and 11.

Desired values: **engine temperature** **resistance (Ω)**

0°C	10k
20°C	2500–4000
80°C	200–500

Possible cause of fault: Coolant temperature sensor.

21

Check of power to sensors from IAW, pin 30

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between Break-out Box, pin 30 and 11. Desired value: 5 V

Possible cause of fault: Wiring, connectors, sensors or control unit.

22

Check of signal from air temperature sensor to IAW, pin 31

This is an input signal to the control unit from the air temperature sensor (type NTC with a negative temperature coefficient).

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance between Break-out Box, pin 31 and air temperature sensor, pin 2 (see workshop manual). Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

3. Measure the resistance between Break-out Box, pin 11 and air temperature sensor, pin 1. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between between Break-out Box, pin 31 and 11.

Desired values: **air temperature** **resistans (Ω)**

0°C	10k
20°C	2500–4000

Possible cause of fault: Air temperature sensor.

23

Check of control signal to idle speed correction valve from IAW, pin 34

The idling speed correction valve (ISR or ISC) is controlled by an output signal from the control unit which affects a coil in the correction valve. The signal has a steady frequency and the pulse ratio varies between approximately 25 % and 75 %. When this value increases the rpm increases, for example when the engine is cold or when the AC compressor is on.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Disconnect the cable from the ISC valve (see workshop manual). Measure the resistance in the cable between Break-out Box pin 34 and the connector. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

3. Measure the resistance of the cable between ISC valve and fuel pump relay. Desired value: 0 Ω

Possible cause of fault: Wiring or connectors.

4. Measure the resistance between the valve's contacts. Desired value: 6–9 Ω

Possible cause of fault: ISC valve.

5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
6. Connect the ISC valve again. Start the engine and check if pulses appear on Break-out Box, pin 34 (use oscilloscope or similar).

Possible cause of fault: ISC valve or control unit.

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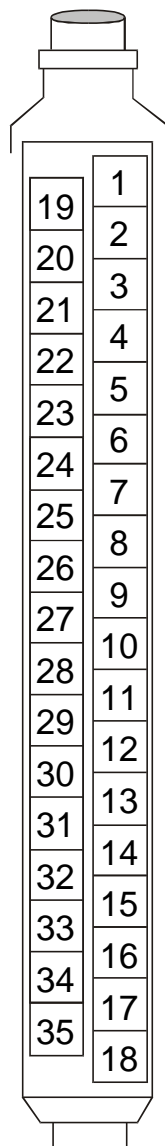
Interface – Signal Locations

1. Ground
2. Signal from lambda sensor*
3. Ground to crankshaft sensor
4. Signal from crankshaft sensor
5. Ground to timing sensor
6. Knocksensor*
7. Control signal to tankventilation/idle speed, revolution counter/trip computer
8. Diagnosis
9. Signal from CO-potentiometer/MAP*
10. Control signal to main relay*
11. Ground to sensors
12. Control signal to engine control lamp*
13. Ignition adjust*
14. Ignition adjust/ABS*
15. Signal from manifold air pressure sensor, MAP
16. Control signal to waste gate control
17. Signal from throttle potentiometer
18. Control signal to injection valve No. 4
19. Ground
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22. Knocksensor*
23. Signal from timing sensor
24. Ground to ignition amplifier
25. Control signal to ignition amplifier
26. Control signal to ignition amplifier*
27. Diagnosis
28. Control signal to pump relay
29. Signal from coolant temperature sensor
30. Power to sensors
31. Signal from air temperature sensor
32. Control signal to injection valve No. 2
33. Control signal to injection valve No. 3
34. Control signal to idle speed
35. Control signal to injection valve No. 1

* Only certain systems

Note: Connector viewed from below.

Wiring harness



Wiring Diagram

This wiring diagram is an example. Check in the relevant workshop manual for the diagram of the car you are working with.

