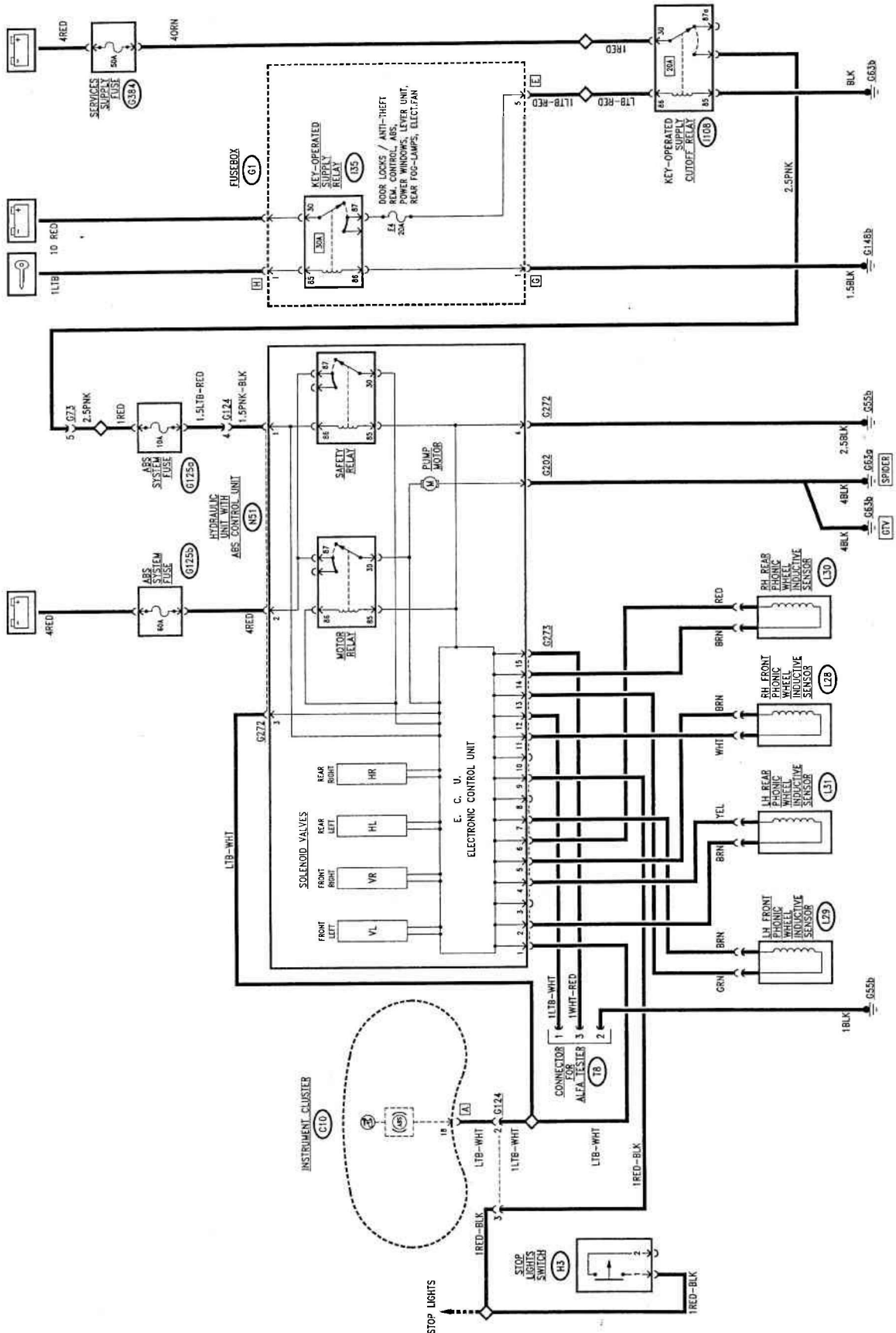


ABS SYSTEM (BOSCH 2Si)

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WIRING DIAGRAM



GENERAL DESCRIPTION

The car is equipped with an electronic wheel anti-lock system (**BOSCH 2Si**) which adjusts the braking pressure transmitted to the wheels preventing loss of road-holding under all tyre and road conditions.

The system has been designed to integrate, and not replace, the normal mechanical braking system, guaranteeing a high degree of safety in the event of a failure: in fact it operates on the same brake fluid as the conventional mechanical circuit.

Four sensors, located on the four wheels, inform the electronic control unit of the speed of each wheel continuously, thereby recording locking situations affecting the wheels, skidding and loss of grip.


In these situations, the control unit suitably operates the solenoid valves that modulate the pressure in the hydraulic circuit, eliminating wheel locking and bringing the car back to the limit of roadholding, which means that the braking distance is reduced to a minimum, without losing control of steering.

The **modulating solenoid valves** are, in this version of the system, four, one for each wheel.

Components

The system comprises:

- four magnetic induction sensors which read the speed of the wheels: **L28; L29; L30; L31**.
- the integrated electronic and hydraulic control unit **N51**, which houses the following:
 - the electronic control module (CPU)
 - the four solenoid valves
 - the brake fluid pump
 - a safety relay
 - a pump control relay
- the connector for self-diagnosis **T8**
- the brake switch **H3** (the same that turns on the stop lights) which signals the system the braking condition.

The ABS includes a self-diagnosis system which continually monitors all the system parameters and components: in the event of a failure or fault, the system cuts itself off automatically leaving the conventional servo-assisted mechanical braking system operational: the driver is alerted of this situation by a special warning light  on the instrument cluster (**C10**).

Connecting to the diagnosis connector (**T8**) located next to the control unit, it is possible to use the signals of the "flashing code" to quickly locate the faulty component (see "Fault-finding").

The connector **T8** can also be used to connect to the ALFA ROMEO Tester.

FUNCTIONAL DESCRIPTION

System supply:

With a line protected by wander fuse **G125a** (10A) the key- operated voltage - leading from relay **I108** and from fuse **G384** - supplies pin 1 of connector **G272** of the ABS hydraulic unit **N51**, and from here it supplies the safety relay and energizes the coil: this way the relay supplies with battery voltage -leading from pin 2 of **G272** and from the line protected by fuse **G125b** (60A) - the electronic module and the coil of the engine relay: following a command from the electronic module, this operates the pump motor which delivers the pressure of the brake fluid to the wheels.

The electronic module and relays are earthed by pin 4 of connector **G272**, while the pump is earthed by connector **G202**.

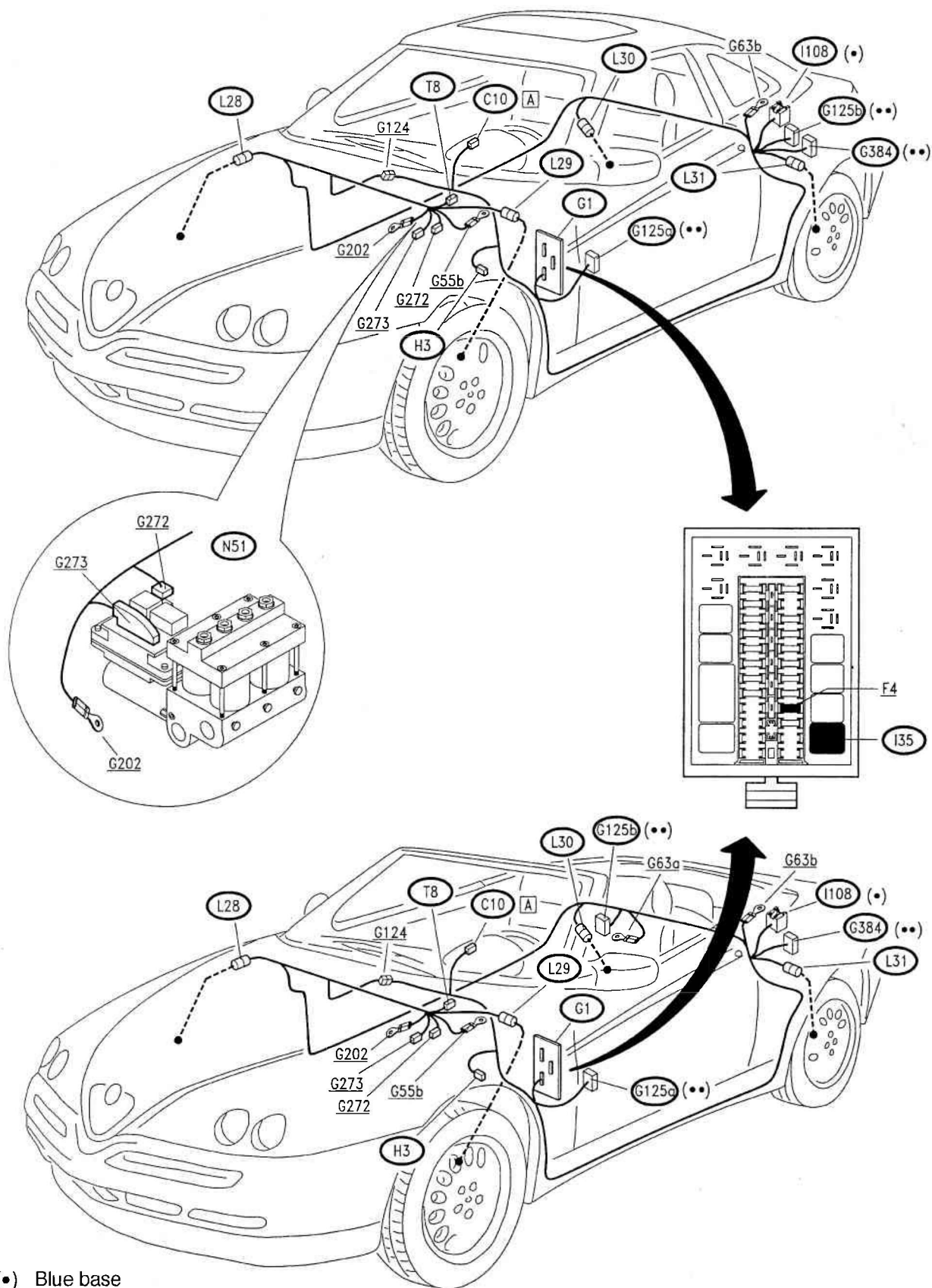
Sensors and solenoid valves:

Directly inside the control unit **N51**, the module is connected with three adjustment solenoid valves, which modulate the pressure on the brakes of the four wheels; outside, through connector **G273**, it is connected with the four sensors **L28 - L29 - L30 - L31** which signal the speed of the single wheels, and with the brake switch **H3**, which sends a consent signal: in fact the ABS system cannot come into operation if the brake pedal is not pressed.

Self-diagnosis:

When the control unit detects problems through the self- diagnosis function, it sends a signal to the instrument cluster **C10** which turns on the ABS warning light: this signal depends on a failure of the electronic module -pin 1 of connector **G273**- or on the hydraulic control - pin 3 of **G272**. The diagnosis connector **T8**, allows connection of the control unit with the ALFA ROMEO Tester or "reading" of the flashing code (see "Fault-finding").

LOCATION OF COMPONENTS



(•) Blue base
(••) Black fuseholder

Connector for ALFA TESTER (Motronic and ALFA ROMEO CODE)		(T1)	
2.0 T.S. 16v		3.0 V6	
<p>1WHT-RED • G133b 3 1BLK • G60 2 1LTB-WHT • (S11) 1</p>	<p>1WHT-RED • G133b 3 1BLK • G131b 2 1LTB-YEL • (S11) 1</p>		
Connector for ALFA TESTER (airbag)	(T3)	Connector for ALFA TESTER (anti-theft device)	(T7)
<p>WHT-RED • R22 3 BLK • R22 1BLK • G381 BLK 2 M2.10.4 BLK • G381 2 LTB-WHT • R22 LTB-WHT 1 PPL-WHT • G380 M2.10.4 LTB-WHT • R22 1</p>	<p>LTB-WHT • N45 A 3 BLK • G53a 2</p>		
Connector for ALFA TESTER (ABS)		(T8)	
<p>1WHT-RED • G273 3 1BLK • G55b 2 1LTB-WHT • G273 1</p>			
Diagnosis connector for ALFA ROMEO TESTER (automatic hood)		(T13)	
<p>1WHT-BLU • N81 B 3 BLK-PPL • G400a BLK • N81 D BLK • N81 D BLK • N81 D 1BLK 2</p>			

FAULT-FINDING

AUTOMATIC CHECK UPON IGNITION: when the car is started the "ABS warning light" on the instrument cluster turns on for appr. 2 secs., then it goes off meaning that the system is working properly. If the warning light stays on, carry out diagnosis using the flashing code, as mentioned previously.

If the warning light does not turn on, carry out **test J**.

Fault-Finding using the Flashing Code

The self-diagnosis system with which this system is fitted, makes it possible to quickly locate a faulty component following the instructions of a **FLASHING CODE**, which is activated as follows:

- earth the line of pin 1 of connector **T8**

- power the ABS control unit **N51** ("key-operated" supply")

Read the sequence of flashes on the "ABS warning light" on the instrument panel **C10**:

- for three times code "12" appears, meaning correct operation: if this does not occur, carry out **test J**
- the codes of the errors memorised appear (each repeated three times): carry out the test given in the following table
- code "12" appears for another three times, indicating the end of the sequence

NOTE: Resetting the memorised code is obtained by disconnecting the line of pin 1 of **T8** and engaging the ignition switch 20 times (or using the ALFA ROMEO Tester)

Error Codes Table

CODE	FAULT	CARRY OUT TEST
12	Start and end of diagnosis	—
No code (*)	Control unit and self-diagnosis fault	A
16	Faulty LH front solenoid valve (VL)	Check the impedance of the solenoid valve (1.5÷2.5 Ω) and the condition of the connections between the control unit and the solenoid valve; if necessary change the solenoid valve
17	Faulty RH front solenoid valve (VR)	Check the impedance of the solenoid valve (1.5÷2.5 Ω) and the condition of the connections between the control unit and the solenoid valve; if necessary change the solenoid valve
19	Faulty safety relay	B
25	Incorrect number of phonic wheel teeth	Change the phonic wheel concerned see Group 33 "BRAKES")
26	Faulty LH rear solenoid valve (HL)	Check the impedance of the solenoid valve (1.5÷2.5 Ω) and the condition of the connections between the control unit and the solenoid valve; if necessary change the solenoid valve
27	Faulty RH rear solenoid valve (HR)	Check the impedance of the solenoid valve (1.5÷2.5 Ω) and the condition of the connections between the control unit and the solenoid valve; if necessary change the solenoid valve
35	Faulty pump motor	C
37	Faulty brake switch (H3)	D
39	Faulty LH front sensor (L29)	Check the impedance of the sensor (appr.1 kΩ); change it if necessary. Then carry out the next test E .
41	LH front sensor (L29) not connected	E
42	Faulty RH sensor (L28)	Check the impedance of the sensor (appr. 1kΩ); change it if necessary. Then carry out the next test F .
43	RH front sensor (L28) not connected	F
44	Faulty LH rear sensor (L31)	Check the impedance of the sensor (appr. 1kΩ); change it if necessary. Then carry out the next test G .
45	LH rear sensor (L31) not connected	G
46	Faulty RH rear sensor (L30)	Check the impedance of the sensor (appr. 1kΩ); change it if necessary. Then carry out the next test H .
47	RH rear sensor (L30) not connected	H
48	Insufficient supply voltage	I
55	Faulty electronic control unit	Change the control unit, contained in N51
56	Operating error in diagnosis	-

(*) if the warning light is not working, see **test J**

PRELIMINARY SYSTEM CHECK		TEST A	
TEST PROCEDURE		RESULT	CORRECTIVE ACTION
A1	CHECK FUSES	OK ►	Carry out step A2
	- Check the intactness of wander fuses G125a and G125b	OK ►	Change fuses - G125a (10A) - G125b (60A)
A2	CHECK RELAYS	OK ►	Carry out step A3
	- Check the two relays in unit N51	OK ►	Change the relays if faulty
A3	CHECK VOLTAGE	OK ►	Carry out step A4
	- Check for 12 V at pin 2 of G272	OK ►	Restore the wiring between pin 2 of G272 and branch terminal board G56
A4	CHECK VOLTAGE	OK ►	Carry out step A5
	- Turn the key and check for 12 V at pin 1 of G272	OK ►	Restore the wiring between pin 1 of G272 and the fuse box G1 , through fuse G125a , and relay I108
A5	CHECK EARTH	OK ►	Carry out step A6
	- Check that G202 is earthed	OK ►	Restore the wiring between G202 and earth G63
A6	CHECK EARTH	OK ►	CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER OR USING THE FLASHING CODE
	- Check that pin 4 of G272 is earthed	OK ►	Restore the wiring between pin 4 of G272 and earth G55b

FAULTY SAFETY RELAY	TEST B
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
B1	CHECK RELAY	OK ▶	Carry out step B2
	– Check that the safety relay is working properly (in group N51)	OK ▶	Change the relay
B2	CHECK VOLTAGE	OK ▶	Carry out step B3
	– Check for 12 V at pin 87 of the safety relay	OK ▶	In this case breaks of the connection between G272 and the safety relay are likely. Change group N51
B3	CHECK VOLTAGE	OK ▶	Carry out step B4
	– Turn the key and check for 12 V at pin 86 of the safety relay	OK ▶	In this case breaks of the connection between G272 and the safety relay are likely. Change group N51
B4	CHECK VOLTAGE	OK ▶	Change the motor relay (also see test C)
	– Turn the key and check for 12V at pin 86 of the motor relay	OK ▶	Change group N51

FAULTY PUMP MOTOR		TEST C	
TEST PROCEDURE		RESULT	CORRECTIVE ACTION
C1	CHECK RELAY	OK ►	Carry out step C2
	– Check the correct operation of the motor relay (in group N51)	OK ►	Change the relay, contained in N51
C2	CHECK VOLTAGE	OK ►	Carry out step C3
	– Check for 12 V at pin 87 of the motor relay	OK ►	In this case breaks are likely in the connection between G272 and the motor relay. Change group N51
C3	CHECK VOLTAGE	OK ►	Carry out step C4
	– Turn the key and check for 12 V at pin 86 of the motor relay	OK ►	Check the safety relay (see test B). If not, breaks are likely in the connection between the safety relay and the motor relay. Change group N51
C4	CHECK EARTH	OK ►	Carry out step C5
	– Check for 0 V at pin (-) of the pump motor	OK ►	In this case breaks are likely in the connection between pin (-) of the pump motor and G202 . Change group N51
C5	CHECK PUMP	OK ►	If necessary , check the brake hydraulic circuit. (see Group 33 "BRAKES")
	– Bridge pins 30 and 87 of the motor relay. Check that the pump motor is working properly	OK ►	Change group N51 , complete with pump motor

FAULTY BRAKE SWITCH	TEST D
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
D1 CHECK STOP LIGHTS – Check that the stop lights are working properly	<input checked="" type="radio"/> OK ► <input type="radio"/> OK ►	Carry out step D2 Change the stop lights switch H3 , or proceed as described in the "STOP LIGHTS" section
D2 CHECK VOLTAGE – With the pedal pressed, check for 12 V at pin 9 of G273	<input checked="" type="radio"/> OK ► <input type="radio"/> OK ►	Check and if necessary change the electronic control unit contained in N51 Restore the wiring between pin 9 of G273 and H3

LH FRONT SENSOR NOT CONNECTED	TEST E
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
E1 CHECK OPEN CIRCUIT – Turn the key and check for an open circuit between pins 7 and 13 of G273	<input checked="" type="radio"/> OK ► <input type="radio"/> OK ►	Carry out step E2 Carry out step E3
E2 CHECK CONTINUITY – Disconnect the sensor L29 and check for continuity between the sensor and pin 7 of G273 , and between the sensor and pin 13 of G273	<input checked="" type="radio"/> OK ► <input type="radio"/> OK ►	Check and if necessary change the sensor L29 . Restore the wiring between L29 and G273
E3 CHECK OPEN CIRCUIT – Disconnect the sensor L29 and check for an open circuit between pins 7 and 13 of G273 (wiring side)	<input checked="" type="radio"/> OK ► <input type="radio"/> OK ►	Check and if necessary change sensor L29 . Restore the wiring eliminating the short circuit between the cables connecting L29 with G273

RH FRONT SENSOR NOT CONNECTED	TEST F
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	TEST PROCEDURE	RESULT	CORRECTIVE ACTION
F1	CHECK OPEN CIRCUIT	(OK) ►	Carry out step F2
	– Turn the key and check for an open circuit between pins 5 and 11 of G273	(OK) ►	Carry out step F3
F2	CHECK CONTINUITY	(OK) ►	Check and if necessary change the sensor L28 .
	– Disconnect the sensor L28 check for continuity between the sensor and pin 5 of G273 , and between the sensor and pin 11 of G273	(OK) ►	Restore the wiring between L28 and G273
F3	CHECK OPEN CIRCUIT	(OK) ►	Check and if necessary change the sensor L28 .
	– Disconnect the sensor L28 and check for an open circuit between pins 5 and 11 of G273 (wiring side)	(OK) ►	Restore the wiring eliminating the short circuit between the cables connecting L28 with G273

LH REAR SENSOR NOT CONNECTED	TEST G
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	TEST PROCEDURE	RESULT	CORRECTIVE ACTION
G1	CHECK OPEN CIRCUIT	(OK) ►	Carry out step G2
	– Turn the key and check for an open circuit between pins 4 and 2 of G273	(OK) ►	Carry out step G3
G2	CHECK CONTINUITY	(OK) ►	Check and if necessary change the sensor L31 .
	– Disconnect the sensor L31 and check for continuity between the sensor and pin 4 of G273 , and between the sensor and pin 2 of G273	(OK) ►	Restore the wiring between L31 and G273
G3	CHECK OPEN CIRCUIT	(OK) ►	Check and if necessary change the sensor L31 .
	– Disconnect the sensor L31 and check for an open circuit between pins 4 and 2 of G273 (wiring side)	(OK) ►	Restore the wiring eliminating the short circuit between the cables connecting L31 with G273

RH REAR SENSOR NOT CONNECTED	TEST H
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
H1 CHECK OPEN CIRCUIT – Turn the key and check for an open circuit between pins 6 and 14 of G273	<input type="radio"/> OK ► <input checked="" type="radio"/>	Carry out step H2
	<input checked="" type="radio"/>	Carry out step H3
H2 CHECK CONTINUITY – Disconnect the sensor L30 and check for continuity between the sensor and pin 6 of G273 , and between the sensor and pin 14 of G273	<input type="radio"/> OK ► <input checked="" type="radio"/>	Check and if necessary change the sensor L30 .
	<input checked="" type="radio"/>	Restore the wiring between L30 and G273
H3 CHECK OPEN CIRCUIT – Disconnect the sensor L28 and check for an open circuit between pins 6 and 14 of G273 (wiring side)	<input type="radio"/> OK ► <input checked="" type="radio"/>	Check and if necessary change the sensor L30 .
	<input checked="" type="radio"/>	Restore the wiring eliminating the short circuit between the cables connecting L30 with G273

INSUFFICIENT SUPPLY VOLTAGE	TEST I
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TEST PROCEDURE	RESULT	CORRECTIVE ACTION
I1 CHECK VOLTAGE – Check that the battery voltage is 12V	<input type="radio"/> OK ► <input checked="" type="radio"/>	Carry out step I2
	<input checked="" type="radio"/>	Restore the correct voltage recharging or changing the battery A1
I2 CHECK VOLTAGE – Check for a voltage of 12 V at pin 2 of G272	<input type="radio"/> OK ► <input checked="" type="radio"/>	Carry out step I3
	<input checked="" type="radio"/>	Restore the wiring between pin 2 of G272 and the battery A1 , through fuse G125b
I3 CHECK VOLTAGE – With the key turned, check for a voltage of 12 V at pin 1 of G272	<input type="radio"/> OK ► <input checked="" type="radio"/>	CONTINUE DIAGNOSIS USING THE ALFA ROMEO TESTER
	<input checked="" type="radio"/>	Restore the wiring between pin 1 of G272 and the fusebox G1 , through fuse G125a , and relay I108

"ABS" WARNING LIGHT NOT WORKING (fails to turn on for faults)	TEST J
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	TEST PROCEDURE	RESULT	CORRECTIVE ACTION
J1	CHECK CONTINUITY	OK ▶	Carry out step J2
	- Check the continuity between pin 12 of G273 and pin 3 of connector T8 and between pin 15 of G273 and pin 1 of T8	OK ▶	Restore the wiring between G273 and connector T8
J2	CHECK EARTH SIGNAL	OK ▶	Change the instrument cluster C10
	- Turn the key and check for, 0V for a few seconds at pin B3 of the instrument cluster C10	OK ▶	Carry out step J3
J3	CHECK EARTH SIGNAL	OK ▶	Restore the wiring between G273 and C10 Also check the wiring between pin 3 of G272 and C10
	- Turn the key and check for, 0V for a few seconds at pin 1 of G273	OK ▶	Change the control unit contained in N51