

# CONTROLLED DAMPING SUSPENSION

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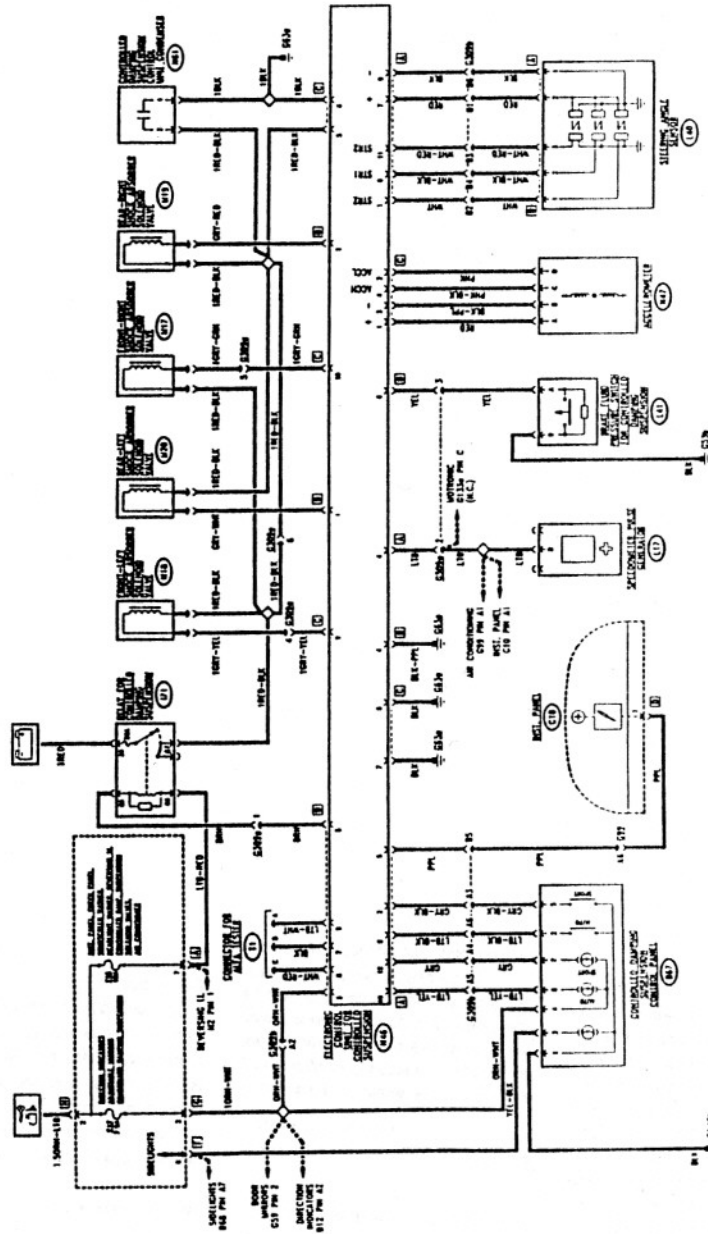
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### WIRING DIAGRAM



## GENERAL DESCRIPTION

The electronic system controlling the suspension varies the setting of the four shock absorbers, in real time, on the basis of the variations in driving and road conditions detected by the relevant sensors. This means that road holding and comfort are greatly increased.

Depending on the choice of the driver, the system operates with two different intervention procedures:

- "AUTO" which entrusts the control of the shock absorbers to the electronic system under all driving conditions;
- "SPORT" which locks the setting to "rigid" permitting high performance sports driving.

The choice between the two possibilities is made by acting on one of two buttons located on the relative control panel B67 equipped with leds which signal the selected option.

## PRINCIPLES OF OPERATION:

The electronic control unit N46 varies the setting of the suspension by acting on solenoid valves M17-M18-M19-M20 which adjust the flow of oil within the shock absorbers.

The rigidity varies in relation to the speed of the vehicle, detected by the speedometer sensor L17.

At extremely low speed (below approximately 5 km/h) the setting remains rigid, thus avoiding excessive springiness during manoeuvring or when driving on rough roads. For speeds up to approximately 30 km/h the soft setting of the steering is employed ensuring ease of driving and greater comfort, while a rigid setting controls accelerating and braking.

At higher speeds the system changes the rigidity when one of the sensors sig-

nals particular road or driving conditions, for example:

- sudden changes in direction or tight bends, through the steering angle sensor L40, which measures angles and speed of rotation of the steering wheel;
- bumps or roughness through the accelerometer N47 which detects relevant vertical accelerations;
- sudden braking detected by the brake fluid pressure switch L41, which intervenes when the pressure of the brake fluid is higher than 20 bars;
- increasing speed, detected by the speedometer sensor L17, increases the rigidity of the system (above 150 km/h, for example, it is rigid under all conditions).

## SELF-DIAGNOSIS:

The system automatically and continuously controls its own operation (self-diagnosis): any anomalies which are picked up, are signalled by the control unit via the relative warning lamp located on the instrument panel and, at the same time, the system is set to the "rigid" position whatever the option selected. The warning light will stay on, as long as the key is in the ignition, until the fault has been rectified.

It will therefore be necessary to carry out the troubleshooting as indicated below. An electronic diagnosis is also possible by connecting connector T1 to the ALFA ROMEO Tester.

During starting the warning light comes on for 2-3 seconds, then, if no malfunctions have been detected, it goes out. This makes it possible to easily check the correct operation of the system.

## FUNCTIONAL DESCRIPTION

The system is controlled by the control unit N46, located under the rear seat. The supply to the control unit is key-operated via fuse F17 (7.5 A) in fusebox G1.

The same line also supplies the control panel B67, which is in addition connected to the sidelights circuit so that the control panel is lit.

This is connected via four signals to the control unit: an ground signal (from pin 2 for the "AUTO" logic, from pin 5 for the "SPORT" logic) is sent to the control unit when the switch of the chosen option is pressed, which informs the control unit. A "feed-back" signal (at pin 6 or 7) lights up the relative warning lamp.

A specific line connects the control unit to the instrument panel C10 (pin 3 of connector D) to which the processed malfunction signal is sent by the self-diagnosis function.

The control unit is also connected with three signals at the connector for the system diagnosis T1.

The control unit receives signals from the sensors to which it is directly connected;

- three signals from the steering angle sensor L40:
  - three leds and three photoconductive diodes measure the steering angles and transform them into impulses; the first signal (STR-Z), from pin 1B, indicates rectilinear direction and the others (STR1 and STR2), from pins 2B and 3B, send an impulse approximately every 18° of steering angle spread so that the control unit is signalled each 9°. Power supply and ground reach pins 2A and 1A respectively of the sensor.

- two signals from the accelerometer N47:

the vertical acceleration of the vehicle cause impulses to be sent to the control unit. These impulses correspond to two acceleration values: the first (ACCL) signals low acceleration (0.08g), pin D; the second (ACCH) high acceleration (0.16g), pin C. Pins B and A receive ground and supply respectively.

- a speed signal from the speedometer L17

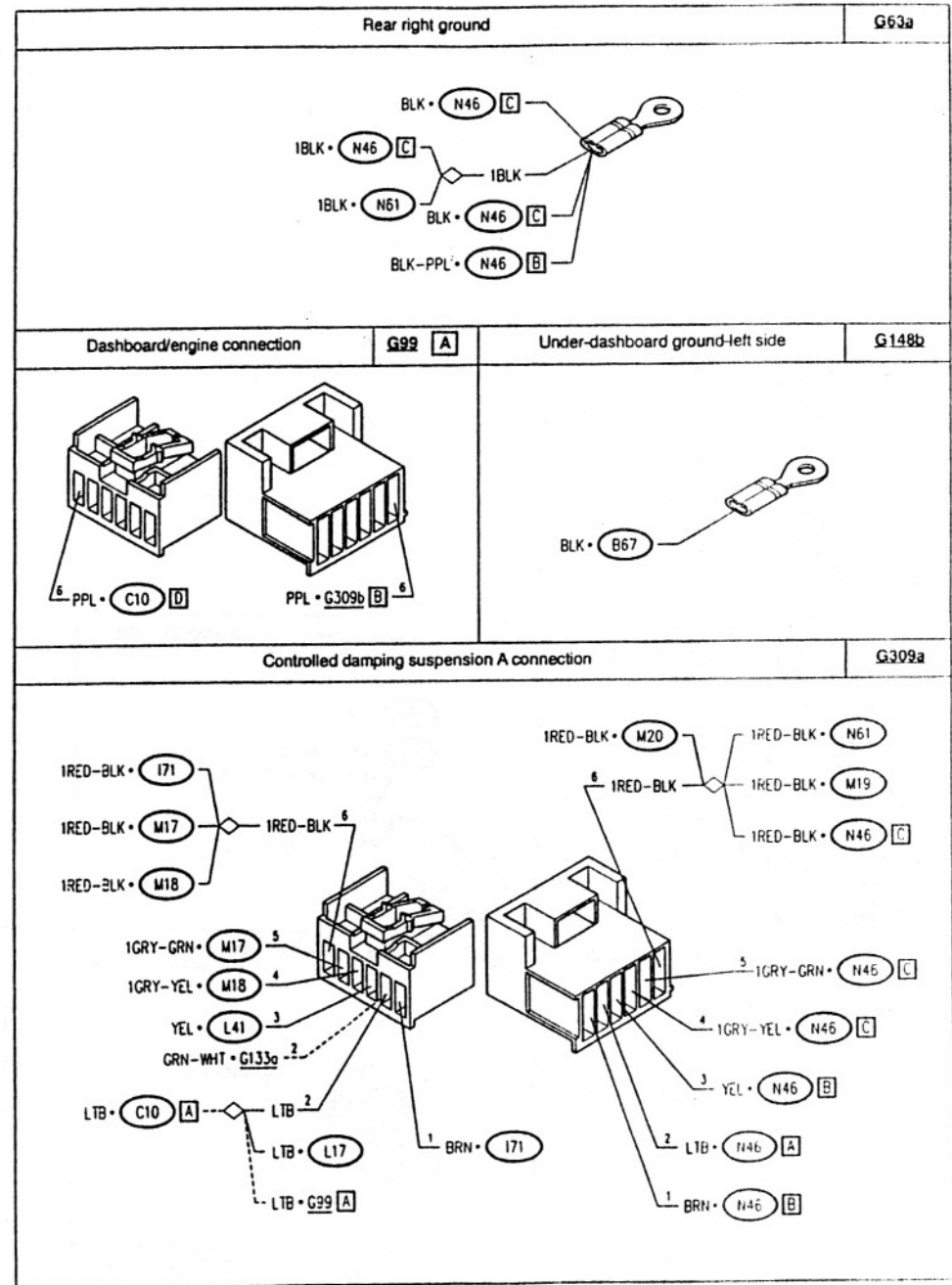
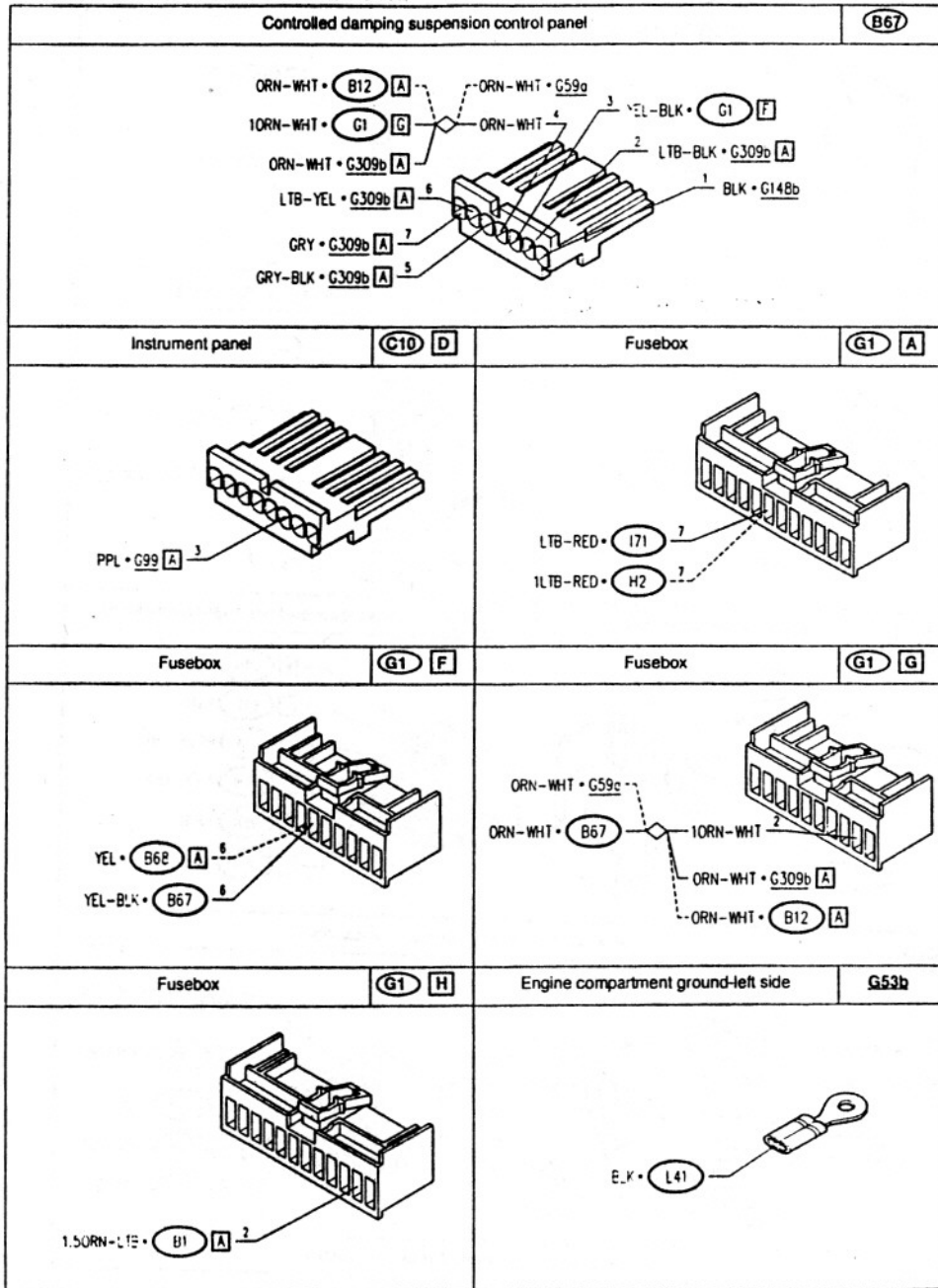
- a braking signal from the brake fluid pressure switch L41

Processing of these signals by the stored logic of the control unit prepares the signals which are then sent to the solenoid valve controlling the shock absorbers (M17 front right; M18 front left; M19 rear right and M20 rear left).

In addition to the control signal coming

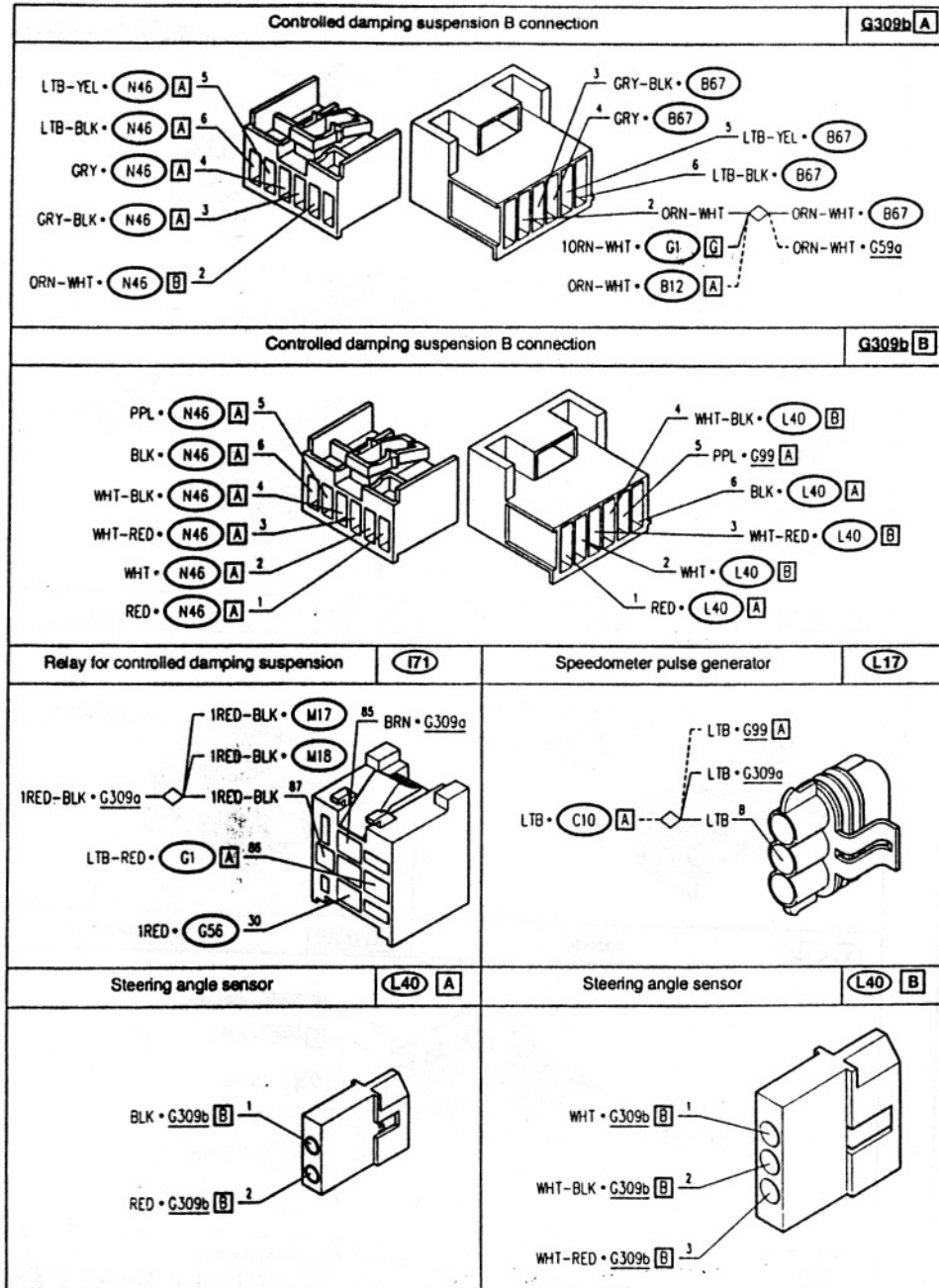
from the control unit, each solenoid valve receives current from a relative relay with incorporated 30A fuse I71, of which the coil, under key operated supply via fuse F15 (20 A) in fusebox G1, is grounded by the control unit itself in this way powering the solenoid valve with voltage from the battery. A 0.22 µF condenser N61 has been installed to avoid radio interference on the wiring.

COMPONENTS AND CONNECTORS



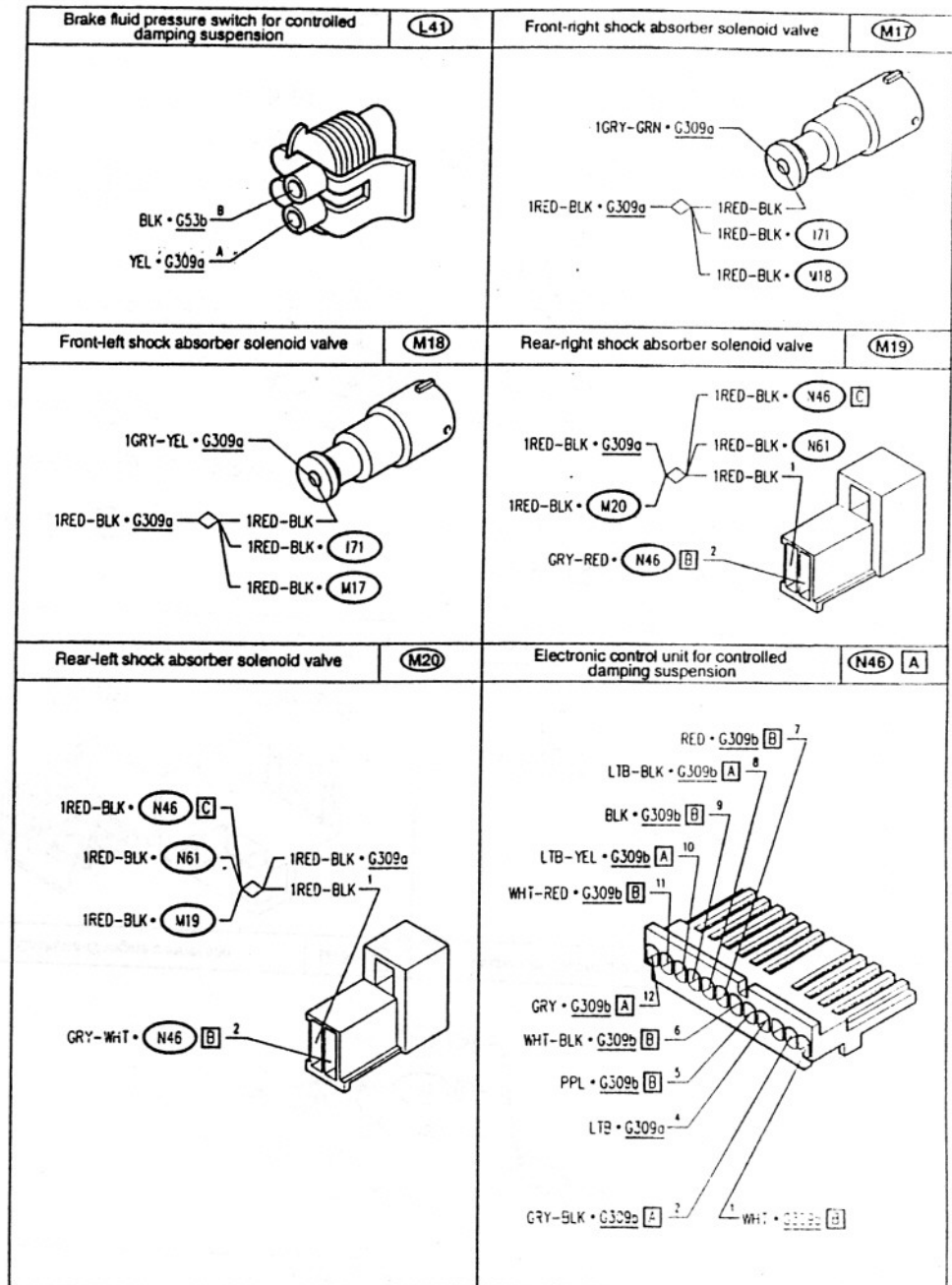
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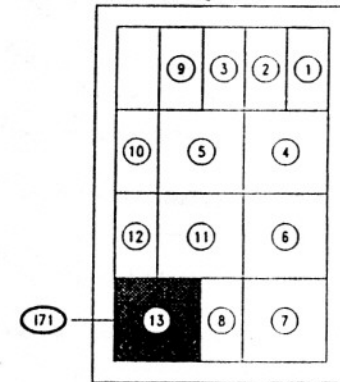
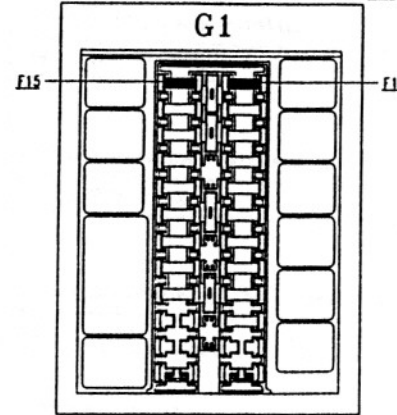
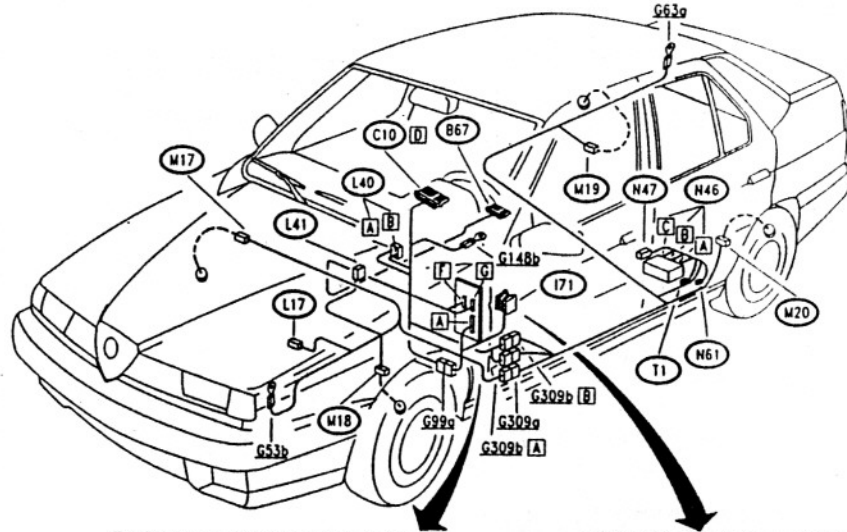


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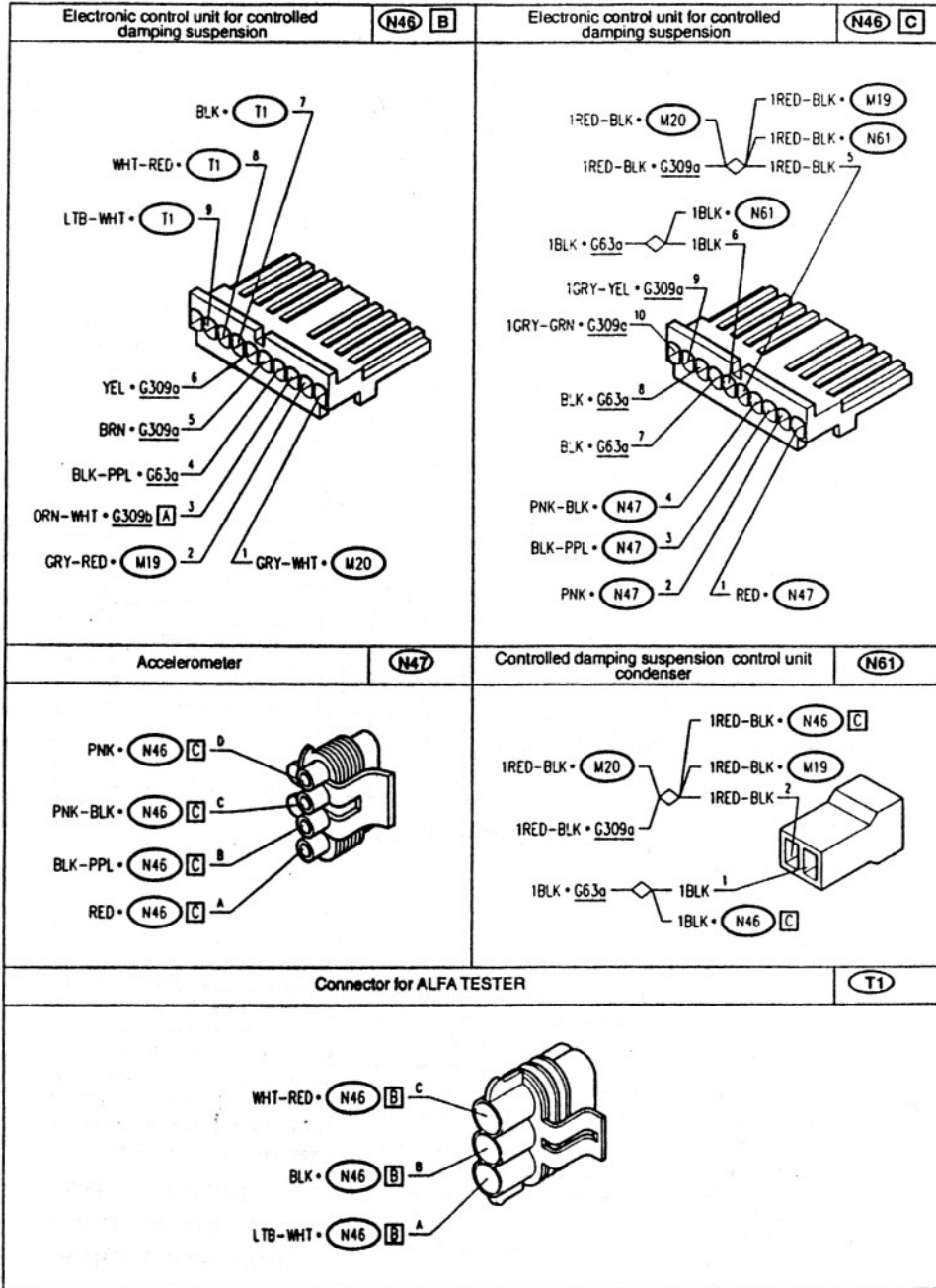
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LOCATION OF COMPONENTS



From chassis N 30.733  
Up to chassis N 30.732  
I71 = BROWN relay holder



CONTROLLED DAMPING SUSPENSION

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**TROUBLESHOOTING USING THE SELF-DIAGNOSIS FUNCTION**

The self diagnosis function with which this system is equipped signal any anomalies or malfunctions affecting one of the system components of the system through the illumination of a warning lamp in the instrument panel.

N.B.: during starting, the warning light will come on for 2 - 3 seconds, then, if

no anomaly has been found, it will go out confirming that the entire system is functioning correctly.

On the other hand, if an anomaly has been detected, the warning lamp stays on until the fault has been rectified.

The component affected by the anomaly is not however indicated and it is therefore necessary to carry out all the relevant tests (from TEST A to TEST F)

If the fault persists, or is not adequately indicated, look for a fault in the control

unit N46 (TEST H) or in the control panel B67 (TEST G).

If the warning light does not come on for 2-3 seconds during starting, carry out TEST I.

NOTE: in addition to this troubleshooting it is possible to rapidly identify any faults by connecting up to the control unit N46 using the ALFA ROMEO Tester (see relevant publications)

TROUBLESHOOTING TABLE

Malfunction	Component										Test	
	E15	F17	I71	N47	M17+M20	L41	L17	L40	B67	N46		C10
Suspension relay	•		•								•	A
Accelerometer				•							•	B
Solenoid valves					•							C
Braking sensor						•						D
Speedometer sensor							•					E
Steering sensor								•		•		F
Control panel		•							•	•		G
Electronic control unit		•								•		H
Warning lamp on instrument panel										•	•	I

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TROUBLESHOOTING

CHECK SUSPENSION RELAY		TEST A	
TEST PROCEDURE	RESULT	CORRECTIVE ACTION	
A1 CHECK FUSE	OK	Carry out step A2	
- Check for damage of fuse incorporated in the suspension relay I71	OK	Replace fuse (20A)	
A2 CHECK FUSE	OK	Carry out step A3	
- Check for damage of fuse F15 in fusebox G1	OK	Replace fuse (10A)	
A3 CHECK RELAY	OK	Carry out step A4	
- Check for correct functioning of relay I71	OK	Replace relay I71	
A4 CHECK VOLTAGE	OK	Carry out step A5	
- Check for 12 V at pin 30 of relay I71	OK	Restore wiring between pin 30 of I71 and branch terminal board G56 (RED)	
A5 CHECK VOLTAGE	OK	Carry out step A6	
- Engage the ignition key and check for 12 V at pin 86 of I71	OK	Restore wiring between pin 86 of I71 and pin A7 of G1 (LTB-RED)	
A6 CHECK CONTINUITY	OK	Carry out step A7	
- Check continuity between pin 85 of I71 and pin B5 of control unit N46	OK	Restore wiring between pin 85 of I71 and pin B5 of N46, across pin 1 of connector G309a (BRN)	
A7 CHECK SIGNAL	OK	Carry out test B	
- With ignition key engaged, check for ground signal (0V) at pin B5 of control unit N46	OK	Check and if necessary replace control unit N46	

CHECK ACCELEROMETER TEST B

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>B1</b> CHECK "ACCH" SIGNAL	<input checked="" type="radio"/>	Carry out step B2
- Separate the accelerometer N47 from the control unit N46; place it on the bottom of the vehicle and, leaving it connected, rotate the ignition key: • check that when subjecting it to a light knock (e.g. letting a ball-bearing fall on the accelerometer), a variation in voltage is detected (from 1 to 5 V) at pin C4 of control unit N46	<input checked="" type="radio"/>	Carry out step B2
	<input type="radio"/>	Carry out step B3
<b>B2</b> CHECK "ACCL" SIGNAL	<input checked="" type="radio"/>	Carry out test C
- Proceeding as for the previous step, check for a variation in voltage at pin C2 of control unit N46	<input checked="" type="radio"/>	Carry out test C
	<input type="radio"/>	Carry out step B3
<b>B3</b> CHECK VOLTAGE	<input checked="" type="radio"/>	Carry out step B5
- Engage the ignition key and check for a difference in voltage of at least 5 V between pins A and B of accelerometer N47	<input checked="" type="radio"/>	Carry out step B5
	<input type="radio"/>	Carry out step B4
<b>B4</b> CHECK VOLTAGE	<input checked="" type="radio"/>	Restore wiring between: • pin C1 of N46 and pin A of N47 (RED) • pin C3 of N46 and pin B of N47 (BLK-PPL)
- Engage the ignition key and check for a difference in voltage of at least 5 V between pins C1 and C3 of control unit N46	<input checked="" type="radio"/>	Restore wiring between: • pin C1 of N46 and pin A of N47 (RED) • pin C3 of N46 and pin B of N47 (BLK-PPL)
	<input type="radio"/>	Check and if necessary replace electronic control unit N46
<b>B5</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Replace accelerometer N47
- Check continuity between: • pin C4 of N46 and pin C of N47 • pin C2 of N46 and pin D of N47	<input checked="" type="radio"/>	Replace accelerometer N47
	<input type="radio"/>	Restore wiring between: • pin C4 of N46 and pin C of N47 (PNK-BLK) • pin C2 of N46 and pin D of N47 (PNK)

CHECK SHOCK ABSORBER SOLENOID VALVES TEST C

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>C1</b> CHECK SOLENOID VALVES	<input checked="" type="radio"/>	Carry out step C2
- Check for an impedance of approximately 3-3.3 Ω at the terminals of the solenoid valves M17, M18, M19, M20	<input checked="" type="radio"/>	Carry out step C2
	<input type="radio"/>	Replace the faulty solenoid valve(s)
<b>C2</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out step C3
- Check continuity between pin 87 of relay I71 and pin C5 of control unit N46	<input checked="" type="radio"/>	Carry out step C3
	<input type="radio"/>	Restore wiring between pin 87 of I71 and pin C5 of control unit N46, across pin 6 of connector G309a and the solders (RED-BLK)
<b>C3</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out step C4
- Check continuity between pin 87 of relay I71 and solenoid valves (terminal with RED-BLK wire)	<input checked="" type="radio"/>	Carry out step C4
	<input type="radio"/>	Restore wiring between: • pin 87 of I71 and solenoid valve M18, across the solder (RED-BLK) • pin 87 of I71 and solenoid valve M17, across the solder (RED-BLK) • pin 87 of I71 and solenoid valve M20, across pin 6 of connector G309a and the solders (RED-BLK) • pin 87 of I71 and solenoid valve M19, across pin 6 of connector G309a and the solders (RED-BLK)
<b>C4</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out step C5
- Check continuity between pin C9 of control unit N46 and solenoid valve M18	<input checked="" type="radio"/>	Carry out step C5
	<input type="radio"/>	Restore wiring between pin C9 of control unit N46 and solenoid valve M18, across pin 4 of connector G309a (GRY- YEL)
<b>C5</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out step C6
- Check continuity between pin C10 of control unit N46 and solenoid valve M17	<input checked="" type="radio"/>	Carry out step C6
	<input type="radio"/>	Restore wiring between pin C10 of control unit N46 and solenoid valve M17, across pin 5 of connector G309a (GRY- GRN)
<b>C6</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out step C7
- Check continuity between pin B1 of control unit N46 and solenoid valve M20	<input checked="" type="radio"/>	Carry out step C7
	<input type="radio"/>	Restore wiring between pin B1 of control unit N46 and solenoid valve M20 (GRY-WHT)
<b>C7</b> CHECK CONTINUITY	<input checked="" type="radio"/>	Carry out test D
- Check continuity between pin B2 of control unit N46 and solenoid valve M19	<input checked="" type="radio"/>	Carry out test D
	<input type="radio"/>	Restore wiring between pin B2 of control unit N46 and solenoid valve M19 (GRY-RED)

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CONTROLLED DAMPING SUSPENSION

CHECK BRAKING SENSOR TEST D

CHECK STEERING SENSOR TEST F

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
D1	CHECK SENSOR	OK	Carry out step D2
	- Check for a resistance of approximately 2200 Ω between pin A and B of sensor L41	OK	Replace sensor L41
D2	CHECK SENSOR	OK	Carry out step D3
	- Fully depress the brake pedal and check for a short circuit between pins A and B of sensor L41	OK	Replace sensor L41
D3	CHECK GROUND	OK	Carry out step D4
	- Check that pin B of L41 is grounded	OK	Restore wiring between pin B of L41 and ground G53b (BLK)
D4	CHECK CONTINUITY	OK	Carry out test E
	- Check continuity between pin A of L41 and pin B6 of N46	OK	Restore wiring between pin A of L41 and pin B6 of N46, across pin 3 of connector G309a (YEL)

NOTE: Check that the steering is aligned correctly before carrying out this test (see "REPAIR MANUAL - MECHANICAL UNITS", Group 21)

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
F1	CHECK "STRZ" SIGNAL	OK	Carry out step F2
	- With the wheels perfectly aligned, engage the ignition key and check for 0V at pin A1 of control unit N46. Check for a variation in voltage when rotating the steering wheel.	OK	Carry out step F4
F2	CHECK "STR1" SIGNAL	OK	Carry out step F3
	- With the wheels perfectly aligned, engage the ignition key and check for voltage of 3-5 V at pin A6 of control unit N46. Rotating the steering wheel check that the voltage decreases to 0 V every 18° and vice-versa.	OK	Carry out step F8
F3	CHECK "STR2" SIGNAL	OK	Carry out test H
	- With the wheels perfectly aligned, engage the ignition key and check for a voltage of 0 V at pin A11 of control unit N46. Rotating the steering wheel check that the voltage increases to 3-5 V every 18° and vice-versa.	OK	Carry out step F9
F4	CHECK VOLTAGE	OK	Carry out step F7
	- Engage the ignition key and check for a difference in voltage of at least 5 V between pins A1 and A2 of sensor L40	OK	Carry out step F5
F5	CHECK VOLTAGE	OK	Restore wiring between: • pin A7 of N46 and pin A2 of N47, across pin B1 of connector G309b (RED) • pin A9 of N46 and pin A1 of N47, across pin B6 of connector G309b (BLK)
	- Engage the ignition key and check for a difference in voltage of at least 5 V between pins A7 and A9 of control unit N46	OK	Carry out step F6
F6	CHECK SENSOR	OK	Check and if necessary replace electronic control unit N46
	- Engage the ignition key and, disconnecting sensor L40, check for a difference in voltage lower than 5 V between pins A1 and A2 of sensor L40	OK	Replace sensor L40

CHECK SPEEDOMETER SIGNAL TEST E

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
E1	CHECK SPEEDOMETER	OK	Carry out step E2
	- Check for correct functioning of the speedometer on the instrument panel C10	OK	Refer to the fault diagnosis relative to the speedometer in the section "Instrument Panel"
E2	CHECK SIGNAL	OK	Carry out test F
	- Check for a speedometer signal by proceeding as follows: • connect pins C and A of sensor L17 respectively to 12V and ground • insert the shaft of an electric motor in the sensor • check that, varying the speed of the electric motor, the signal reaching pin A4 of control unit N46 varies in frequency between 1 and 7.5 V	OK	Restore wiring between pin B of L17 and pin A4 of N46, across pin 2 of connector G309a and the solder (LTB)

(continues)



CHECK STEERING SENSOR TEST F

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>F7</b> CHECK CONTINUITY - Check continuity between pin A1 of N46 and pin B1 of L40	<input checked="" type="radio"/> OK	Replace sensor L40
	<input type="radio"/> <del>OK</del>	Restore wiring between pin A1 of N46 and pin B1 of L40, across pin B2 of connector G309b (WHT)
<b>F8</b> CHECK CONTINUITY - Check continuity between pin A6 of N46 and pin B2 of L40	<input checked="" type="radio"/> OK	Replace sensor L40
	<input type="radio"/> <del>OK</del>	Restore wiring between pin A6 of N46 and pin B2 of L40, across pin B4 of connector G309b (WHT-BLK)
<b>F9</b> CHECK CONTINUITY - Check continuity between pin A11 of N46 and pin B3 of L40	<input checked="" type="radio"/> OK	Replace sensor L40
	<input type="radio"/> <del>OK</del>	Restore wiring between pin A11 of N46 and pin B3 of L40, across pin B3 of connector G309b (WHT-RED)

CHECK CONTROL PANEL TEST G

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>G1</b> CHECK FUSE - Check for damage of fuse F17 in fusebox G1	<input checked="" type="radio"/> OK	Carry out step G2
	<input type="radio"/> <del>OK</del>	Replace fuse (7.5A)
<b>G2</b> CHECK VOLTAGE - Check for 12 V at pin 4 of panel B67	<input checked="" type="radio"/> OK	Carry out step G3
	<input type="radio"/> <del>OK</del>	Restore wiring between pin 4 of B67 and pin G2 of G1, across the solder (ORN-WHT)
<b>G3</b> CHECK GROUND - Check for 0 V at pin 1 of panel B67	<input checked="" type="radio"/> OK	Carry out step G4
	<input type="radio"/> <del>OK</del>	Restore wiring between pin 1 of B67 and ground G148b (BLK)

(continues)

CHECK CONTROL PANEL TEST G

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>G4</b> CHECK LIGHTING - Check that, with sidelights on, the panel lights up	<input checked="" type="radio"/> OK	Carry out step G6
	<input type="radio"/> <del>OK</del>	Carry out step G5
<b>G5</b> CHECK VOLTAGE - With sidelights on, check for 12 V at pin 3 of B67	<input checked="" type="radio"/> OK	Replace panel B67
	<input type="radio"/> <del>OK</del>	Restore wiring between pin 3 of B67 and pin F6 of G1 (YEL-BLK)
<b>G6</b> CHECK SIGNAL - Pressing the "AUTO" button, check for a ground signal (0V) at pin A8 of control unit N46	<input checked="" type="radio"/> OK	Carry out step G7
	<input type="radio"/> <del>OK</del>	Carry out step G8
<b>G7</b> CHECK SIGNAL - Pressing the "SPORT" button, check for a ground signal (0V) at pin A2 of control unit N46	<input checked="" type="radio"/> OK	Carry out step G10
	<input type="radio"/> <del>OK</del>	Carry out step G9
<b>G8</b> CHECK SIGNAL - After pressing the "AUTO" button, check for a ground signal (0V) at pin 2 of panel B67	<input checked="" type="radio"/> OK	Restore wiring between pin A8 of N46 and pin 2 of B67, across pin A6 of connector G309b (LTB-BLK)
	<input type="radio"/> <del>OK</del>	Replace the panel B67
<b>G9</b> CHECK SIGNAL - After pressing the "SPORT" button, check for a ground signal (0V) at pin 5 of panel B67	<input checked="" type="radio"/> OK	Restore wiring between pin A2 of N46 and pin 5 of B67, across pin A3 of connector G309b (GRY-BLK)
	<input type="radio"/> <del>OK</del>	Replace panel B67

(continues)

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CHECK CONTROL PANEL TEST G

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>G10</b> CHECK LED WARNING LAMPS - Check that, pressing the "AUTO" or "SPORT" buttons, the relative led lights up	OK ► Carry out test H  <del>OK</del> ► Carry out step G11	
<b>G11</b> CHECK SIGNAL - Pressing the "AUTO" button, check for 0 V at pin 6 of panel B67 Pressing the "SPORT" button, check for 0 V at pin 7 of panel B67	OK ► Replace panel B67  <del>OK</del> ► Carry out step G12	
<b>G12</b> CHECK SIGNAL - Pressing the "AUTO" button, check for 0 V at pin A10 of control unit N46 Pressing the "SPORT" button, check for 0 V at pin A12 of control unit N46	OK ► Restore wiring between pin 6 of B67 and pin A10 of N46, across pin A5 of connector G309b (LTB-YEL) Restore wiring between pin 7 of B67 and pin A17 of N46, across pin A4 of connector G309b (GRY)  <del>OK</del> ► Check and if necessary replace control unit N46	

CHECKING POWER SUPPLY TO CONTROL UNIT TEST H

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>H1</b> CHECK FUSE - Check for damage of fuse F17 in fusebox G1	OK ► Carry out step H2  <del>OK</del> ► Replace fuse (7.5A)	
<b>H2</b> CHECK VOLTAGE - Check for 12 V at pin B3 of control unit N46	OK ► Carry out step H3  <del>OK</del> ► Restore wiring between pin B3 of N46 and pin G2 of G1, across pin A2 of connector G309b and the solder (ORN-WHT)	
<b>H3</b> CHECK GROUND - Check that pins B4, C6, C7, and C8 of control unit N46 are grounded (0 V)	OK ► If all the preceding tests have been carried out, check and if necessary replace the control unit N46  <del>OK</del> ► Restore wiring between: <ul style="list-style-type: none"> <li>• pin B4 of N46 and ground G63a (BLK-PPL)</li> <li>• pin C6 of N46 and ground G63a, across the solder (BLK)</li> <li>• pin C7 of N46 and ground G63a (BLK)</li> <li>• pin C8 of N46 and ground G63a (BLK)</li> </ul>	

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CONTROLLED DAMPING SUSPENSION

SUSPENSION SYSTEM MALFUNCTION WARNING LIGHT NOT WORKING TEST I

TEST PROCEDURE	RESULT	CORRECTIVE ACTION
<b>I1</b> CHECK WARNING LAMP - Engage the ignition key and check that "suspension system malfunction" warning lamp comes on on the instrument panel C10: the warning lamps stays on	OK ► Carry out all the tests from TEST A to TEST F. If no malfunction is detected, replace the control unit N46  <del>OK</del> ► Carry out step I2	
<b>I2</b> CHECK GROUND SIGNAL - Engage the ignition key and for a few seconds, check for a signal of 0 V at pin D3 of instrument panel C10	OK ► Replace the relative warning lamp on the instrument panel C10  <del>OK</del> ► Carry out step I3	
<b>I3</b> CHECK CONTINUITY - Check continuity between pin D3 of C10 and pin A5 of N46	OK ► Check and if necessary replace control unit N46  <del>OK</del> ► Restore wiring between pin D3 of C10 and pin A5 of N46, across pin A6 of connector G99 and pin B5 of connector G309b (PPL)	