

Subject: Diodes for ABS and TC/ABS Systems

Application: 900 and 9000 Models

CATEGORY	
Brakes	
SECTION 5	PAGE 6
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This Service Bulletin is being reissued to update the information to include 1993 models.

It may sometimes be difficult to diagnose and locate a failed diode in either the ABS or TC/ABS system. This SI describes the most common fault symptoms as well as suitable methods of fault diagnosis and diode replacement, Figure 1.

Cars Affected:

900 and 9000 Models as specified below in "Fault Diagnosis".

Parts:

Diode P/N4424172
This diode is of B4 252 GP GI type.

Special Tools:

Breakout Box P/N 88 11 006
35-pin LH Cable P/N 86 11 154
55-pin TC/ABS Cable P/N 86 11 030
Multimeter, with diode or resistance measurement.

Use the wiring diagram in Service Manual 3:2 for the relevant system when testing the circuits.

Fault Diagnosis:

The fault diagnosis section is divided into three areas:

- I **ABS M88-M91 (9000), ABS M90-M93 (900)**
Fault symptom
Fault diagnosis
- I **ABS M92 (9000), TC/ABS M92-M93 (9000),
ABS/ASR M92 (9000)**
Fault symptom
Fault diagnosis
- I **ABS M93 (9000), ABS/ASR M93 (9000)**
Fault symptom
Fault diagnosis

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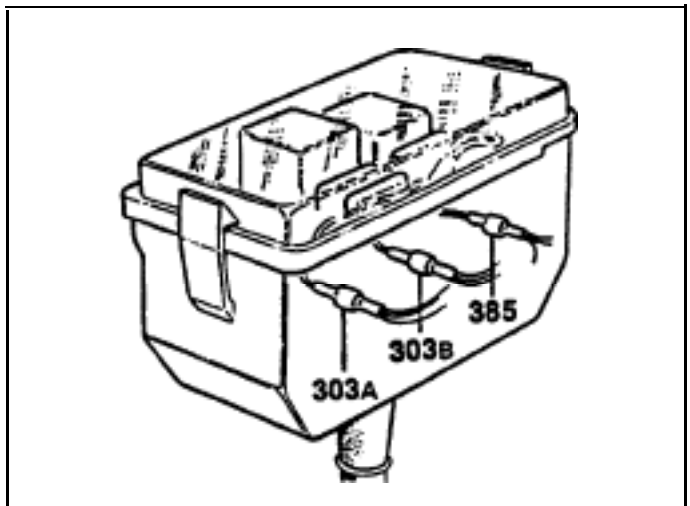
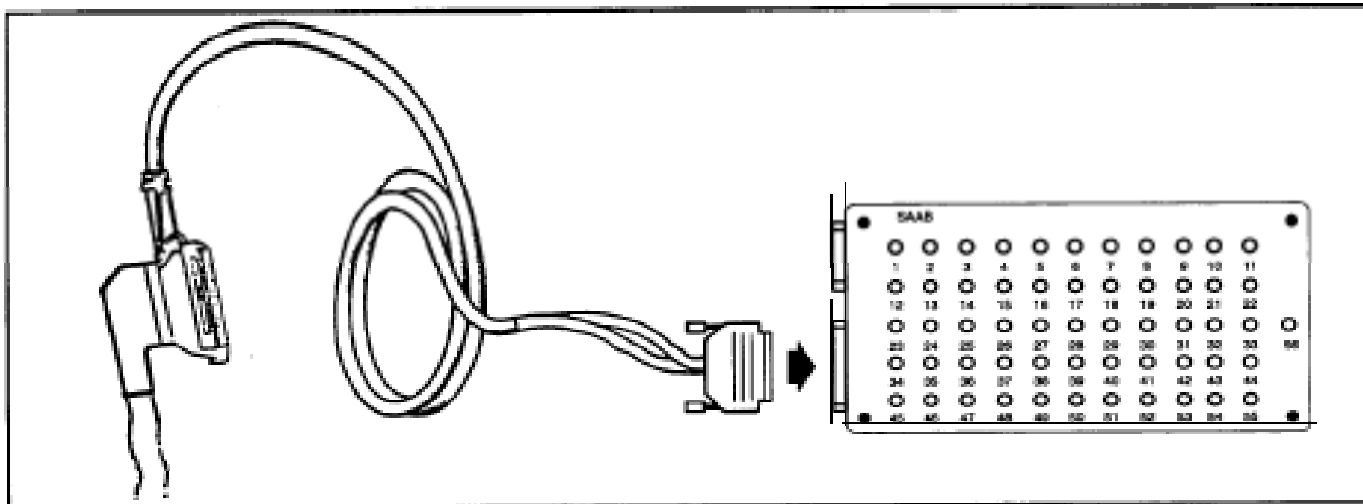


Figure 1. ABS and TC/ABS diodes are located under the relay board in the ABS electrical distribution box.

ABS M88-91 (9000)**ABS M90-93** (900)**Table 1. Fault symptom**

Diode No. Malfunction indicated	Fault symptom
303A no continuity	The ANTILOCK warning lamp does not come on when the ignition switch is in the Start position (should normally come on when the ignition switch is turned from the Drive position to the Start position, i.e. when the +54 supply is interrupted).
303A short circuit	The ANTILOCK warning lamp comes on while the car is being driven. Fault code 1312 is obtained from the lamp-flash code. Note that no lamp-flash code will be obtained as long as the short circuit is present in the wiring.* On MI 992 9000 models the ISAT diagnostic trouble code obtained is 36522.
303B short circuit	The "30A PUMP" fuse in the main fuse box for the ABS system has blown.
One way of obtaining a lamp-flash code is to transfer the ABS control module to another car which is known not to have any harness faults (shorts).	

**Figure 2.** 35-pin cable 86 11 154 and Breakout Box 86 11 006**Diode 303A**

- Unplug the 35-pin connector from the ABS control module and connect the breakout box to the wiring harness by means of 35-pin cable 86 11 154, Figure 2. Do **not** connect the ABS control module.
 - Unplug the pump motor connector.
 - Remove the MAIN RELAY from the ABS main fuse box.
 - Measure the voltage drop across the diode by connecting the diode tester to sockets 20 and 27 on the breakout box:
 - Meter's negative lead to 20 and positive lead to 27**
 - instrument shows **<0.4V**, probable short circuit.
 - instrument shows approximately **0.5V**, diode OK.
 - instrument shows **>0.6V - OL**, probable **no continuity**.
 - Meter's positive lead to 20 and negative lead to 27**
 - instrument shows **0.OV**, short circuit in diode.
 - instrument shows **OL**, diode OK.
- In the event of no continuity or a short circuit, change the diode.

Diode 303B

1. Unplug the **35-pin** connector from the ABS control module and connect the breakout box to the wiring harness by means of **35-pin** cable 86 11 154, Figure 2. Do **not** connect the ABS control module.

2. Unplug the pump motor connector

3. Measure the voltage drop across the diode by connecting the diode tester to sockets 1 and 32 on the breakout box.

A. Meter's negative lead to 32 and positive lead to 1

- instrument shows **<0.4V**, probable short circuit.

- instrument shows approximately **0.5V**, diode OK.

- instrument shows **>0.6V - OL**, probable no continuity.

B. Meter's positive lead to 32 and negative lead to 1

- instrument shows **0.0V**, short circuit in diode.

- instrument shows **OL**, diode OK.

In the event of no continuity or a short circuit, change the diode.

ABS M92 (9000)**TC/ABSM92-M93 (9000)****ABS/ASRM92 (9000)****Table 2. Fault symptom**

Diode No. Malfunction indicated	Fault symptom
385 short circuit	The TCS CTRL warning lamp does not come on when the ignition switch is in the Drive position (should normally come on and remain on for about two seconds).
385 no continuity	The TCS CTRL warning lamp does not come on when the ignition switch is in the Start position (should normally come on when the ignition switch is turned from the Drive position to the Start position, i.e. when the +54 supply is interrupted).
303A no continuity	The TCS CTRL warning lamp does not come on when the ignition switch is in the Start position (should normally come on when the ignition switch is turned from the Drive position to the Start position, i.e. when the +54 supply is interrupted).
303A short circuit	The ANTILOCK and TCS CTRL warning lamps come on while the car is being driven. The ISAT shows diagnostic trouble code 36522.
303B short circuit	The "30A PUMP" fuse in the main fuse box for the ABS system has blown.
Important: Diode 385 is present only in cars with TC/ABS .	

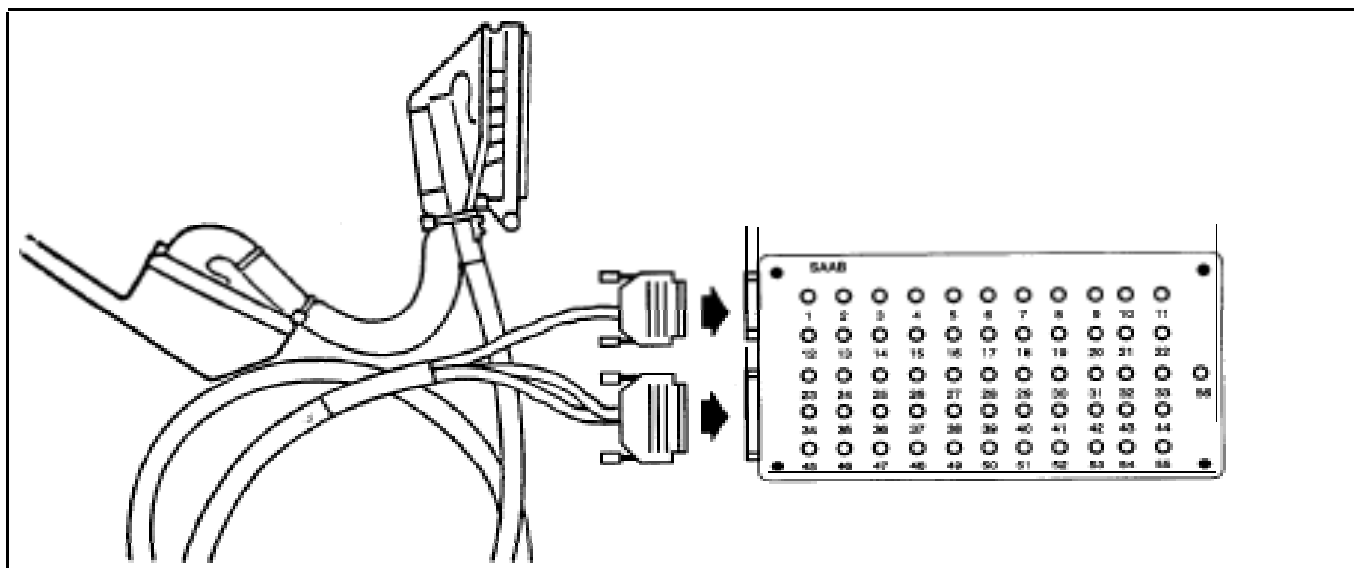


Figure 3. 55-pin cable 86 11 030 and Breakout Box 86 11 006

Diode 303A

1. Unplug the 55-pin connector from the ABS control module and connect the breakout box to the wiring harness by means of 55-pin cable 86 11 030, Figure 3. Do **not** connect the ABS control module.
2. Unplug the pump motor connector.
3. Remove the MAIN RELAY from the ABS main fuse box.
4. Measure the voltage drop across the diode by connecting the diode tester to sockets 33 and 52 on the breakout box:
 - A. **Meter's negative lead to 33 and positive lead to 52**
 - instrument shows **<0.4V**, probable short circuit.
 - instrument shows approximately **0.5V**, diode OK.
 - instrument shows **>0.6V - OL**, probable no continuity.
 - B. **Meter's positive lead to 33 and negative lead to 52**
 - instrument shows **0.0V**, short circuit in diode.
 - instrument shows **OL**, diode OK.

In the event of no continuity or a short circuit, change the diode.

Diode 303B

1. Unplug the 55-pin connector from the ABS control module and connect the breakout box to the wiring harness by means of 55-pin cable 86 11 030, Figure 3. Do **not** connect the ABS control module.
2. Unplug the pump motor connector.
3. Measure the voltage drop across the diode by connecting the diode tester to sockets 1 and 14 on the breakout box.
 - A. **Meter's negative lead to 14 and positive lead to 1**
 - instrument shows **<0.4V**, probable short circuit.
 - instrument shows approximately **0.5V**, diode OK.
 - instrument shows **>0.6V - OL**, probable no continuity.
 - B. **Meter's positive lead to 14 and negative lead to 1**
 - instrument shows **0.0V**, short circuit in diode.
 - instrument shows **OL**, diode OK.

In the event of no continuity or a short circuit, change the diode.

Diode 385

1. Unplug the 55-pin connector from the ABS control module and connect the breakout box to the wiring harness by means of 55-pin cable 88 11 030, Figure 3. Do **not** connect the ABS control module.

2. Unplug the pump motor connector.

3. Remove the MAIN RELAY from the ABS main fuse box.

4. Measure the voltage drop across the diode by connecting the diode tester to sockets 33 and 44 on the breakout box:

A. Meter's negative lead to 33 and positive lead to 44
 - instrument shows **<0.4V**, probable short circuit.
 - instrument shows approximately **0.5V**, diode OK.
 - instrument shows **>0.6V - OL**, probable no continuity.

B. Meter's positive lead to 33 and negative lead to 44
 - instrument shows **0.OV**, short circuit in diode.
 - instrument shows **OL**, diode OK.

In the event of no continuity or a short circuit, change the diode.

ABS M93 (9000)
ABS/ASR M93 (9000)

Table 3. Fault symptom

Diode No. Malfunction indicated	Fault symptom
303A short circuit	The ANTILOCK warning lamp does not come on when the ignition switch is in the Start position (should normally come on when the ignition switch is turned from the Drive position to the Start position, i.e. when the +54 supply is interrupted).
303A no continuity	The ANTILOCK warning lamp comes on only when the ignition switch is in the Start position and goes out as soon as the main relay is supplied with voltage (+54) from the ignition switch. The ANTILOCK lamp should normally remain on for 2-3 seconds after starting to show that the lamp and control module are in proper working order.
303B no continuity	The " 30A PUMP " fuse in the main fuse box for the ABS system has blown.

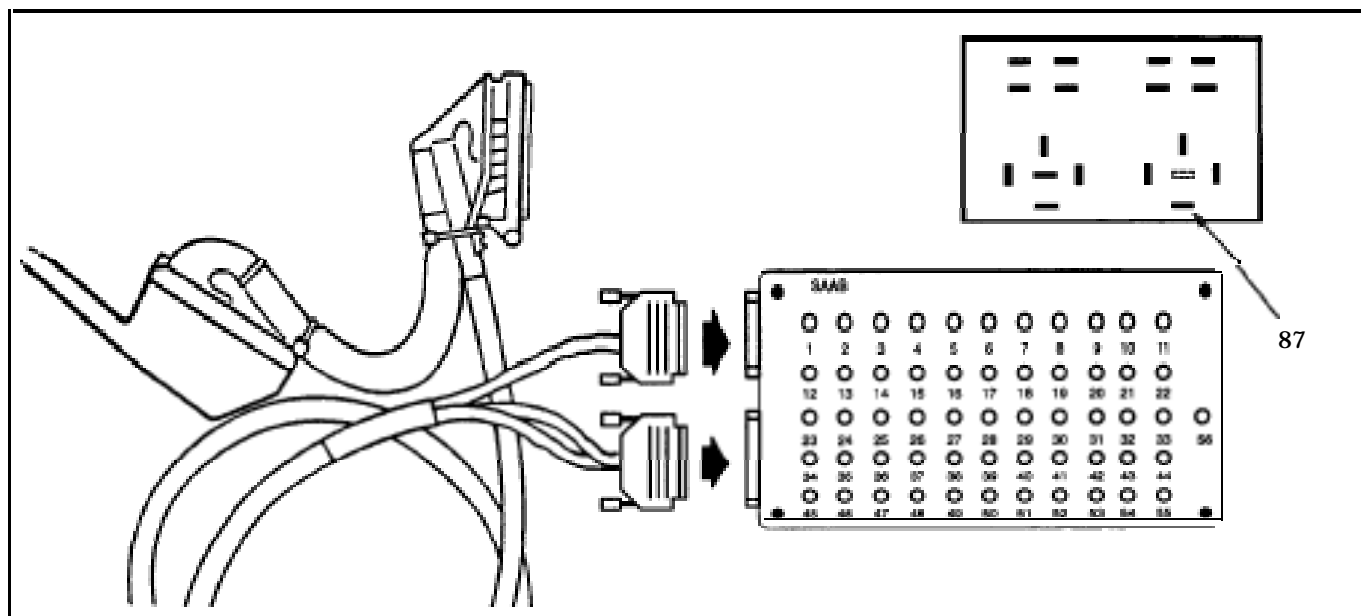


Figure 4. 55-pin cable 86 11 030 and Breakout Box 86 11 006

Diode 303A

1. Unplug the **55-pin** connector from the **ABS** control module and connect the breakout box to the wiring harness by means of **55-pin** cable 86 11 030, Figure 4. Do **not** connect the ABS control module.
2. Unplug the pump motor connector.
3. Remove the MAIN RELAY from the ABS main fuse box.
4. Measure the voltage'drop across the diode by connecting the diode tester to sockets 33 and 52 on the breakout box:

A. Meter's negative lead to 33 and positive lead to 52

- instrument shows **<0.4V**, probable short circuit.
- | instrument shows approximately **0.5V**, diode OK.
- instrument shows **>0.6V - OL**, probable no continuity.

B. Meter's positive lead to 33 and negative lead to 52

- instrument shows **0.OV**, short circuit in diode.
- | instrument shows **OL**, diode OK.

In the event of no continuity or a short circuit, change the diode.

Diode 303B

1. Unplug the **55-pin** connector from the **ABS** control module and connect the breakout box to the wiring by means of **55-pin** cable 86 11 030, Figure 4. Do **not** connect the ABS control module.
2. Unplug the pump motor connector.
3. Remove the pump relay.
4. Measure the voltage drop across the diode by connecting the diode tester to pin 87 of the pump relay holder and 1 on the breakout box.

A. Meter's negative lead to 87 and positive lead to 1

- instrument shows **<0.4V**, probable short circuit.
- | instrument shows approximately **0.5V**, diode OK.
- instrument shows **>0.6V - OL**, probable no continuity.

B. Meter's positive lead to 87 and negative lead to 1

- instrument shows **0.OV**, short circuit in diode.
- | instrument shows **OL**, diode OK.

In the event of no continuity **or a short** circuit, change the diode.

Action:

Diode Replacement

1. Remove the **ABS** main fuse box from its bracket. Undo the two screws securing the relay base and pull it up to expose the diodes. Consult Table 4 to ascertain which diode is the defective one.
2. Sever one of the diode's leads at the crimp. Remove the insulating sleeve fitted over the crimp, Figure 5.

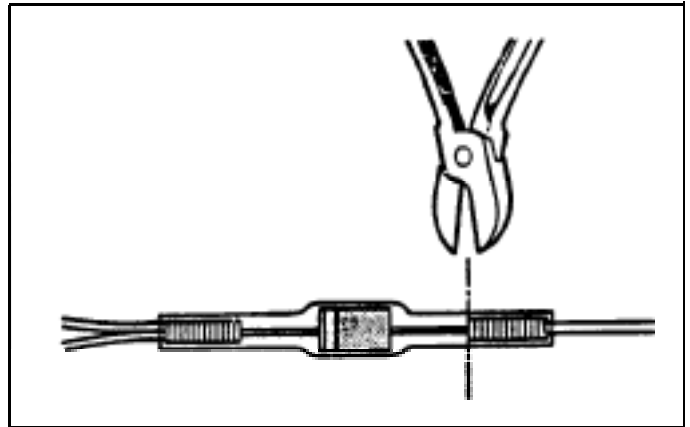


Figure 5. Sever one of the diode's leads at the crimp.

3. Solder one of the new diode's leads to the crimp. Be sure to install the new diode in the same direction as the old one, Figure 6. Compare with old diode or consult Table 4.

NOTE

Be careful to avoid heating the soldering point too long as this could damage the diode and cable insulation.

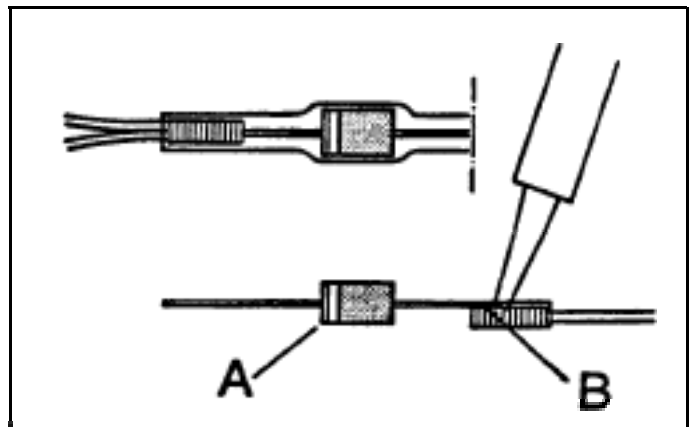


Figure 6. A – New diode
B – Soldered joint

4. Cut off the remaining lead of the defective diode at the other crimp. Remove the insulating sleeve fitted over the crimp, Figure 7.

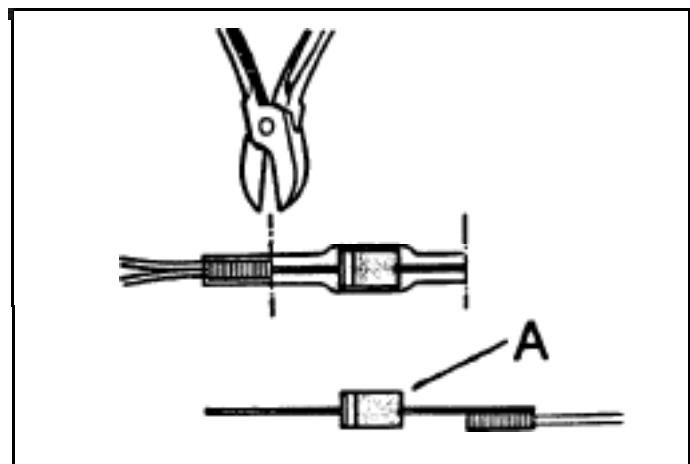


Figure 7. A – New diode

5. Solder the remaining lead of the new diode to the other crimp, Figure 8.

NOTE

Be careful to avoid heating the soldering point too long as this could damage the diode and cable insulation.

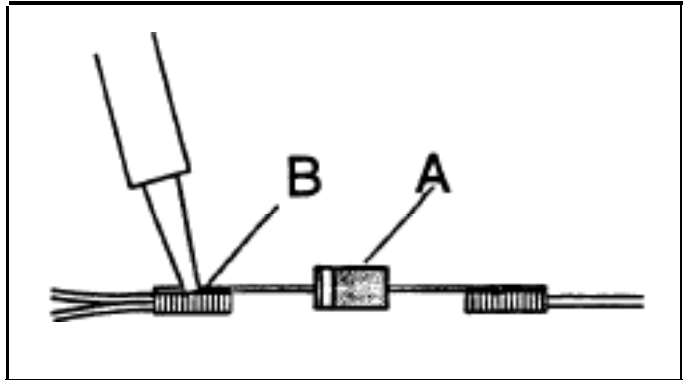


Figure 8. A – New diode
B – Soldered joint

8. Insulate the soldered joints and the diode by means of insulating tape, Figure 9.

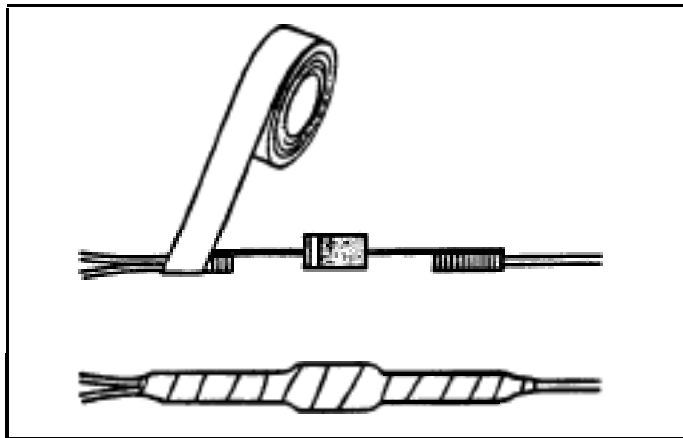


Figure 9. Insulate the soldered joints and diode.

We also recommend changing the other diode (or the two remaining diodes) by repeating points 2 through 6 above.

Install the relay base and put the ABS main fuse box back in place. Check that the three fuses in the ABS main fuse box are intact.

Check the operation of the diodes by turning the ignition switch to the Drive position.

If the diodes are correctly connected, the **ANTILOCK** lamp and the **TCS CTRL** lamp, if equipped, should light up at the same time as the ignition is switched on.

Check the pump motor by depressing the brake pedal a few time until the pump starts. When it stops, check that the pump fuse in the ABS main fuse box is intact and that the **ANTILOCK** lamp and the **TCS CTRL** lamp, if equipped, have gone out.

If any diode has been installed in the wrong direction, a description of the fault symptom for the relevant diode will be found in Table 3.

Clear any fault codes that have been generated. Start the engine and check that the warning lamps go out shortly afterwards.

Checking that the diodes are correctly connected.

Turn the ignition switch to the Drive position and check whether the ANTILOCK (diode 303A) and TCS CTRL (diode 385) warning lamps light up.

NOTE

Operation of the warning lamps as described below presupposes that full accumulator pressure is present in the system.

Table 4. Checking that the diodes are correctly connected.














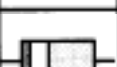


Variant	Diode	Diode correctly connected	Diode incorrectly connected
900 ABS M90-93	303A	ANTILOCK lights up and goes out after 2-3 seconds.	ANTILOCK does not light up. May flash on briefly before Drive position reached.
	303B	Normal pump operation.	Pump fuse in ABS main fuse box blown, pump motor does not start.
9000 ABS M88-92	303A	ANTILOCK lights up and goes out after 2-3 seconds.	ANTILOCK does not light up.
	303B	Normal pump operation.	Pump fuse in ABS main fuse box blown, pump motor does not start.
900 TCS M92-93 9000 ASR M92	303A	ANTILOCK lights up and goes out after 2-3 seconds.	ANTILOCK does not light up, until after 2-3 seconds and then remains lit. TCS CTRL also remains lit.
	303B	Normal pump operation.	Pump fuse in ABS main fuse box blown, pump motor does not start.
	385	TCS CTRL lights up and goes out after 2-3 seconds.	TCS CTRL does not light up.
9000 M93 9000 ASR M93	303A	ANTILOCK lights up and goes out after 2-3 seconds.	ANTILOCK does not light up.
	303B	Normal pump operation.	Pump fuse in ABS main fuse box blown, pump motor does not start.

Diode connections

Direction of current flow



Table 5. Diodeconnections

Variant	Lead connected	Diode 303A	Lead connected	Lead connected	Diode 303B	Lead connected	Lead connected	Diode 385	Lead connected
ABS 900 M90-93	Yellow/White		White + White	Yellow + Blue		Black			
ABS 9000 M88-92	Yellow/White		White + White	Yellow + Blue		Black			
ABS 9000 M93	Yellow/White		White + White	Yellow + Yellow		Black			
TCS 9000 M92	Yellow/White		White + White	Yellow + Yellow		Black	Yellow + White		Blue + Blue
TCS 9000 M93	Yellow/White		White + White	Yellow + Blue		Black	Yellow + White		Blue + Blue
ASR 9000 M92	Yellow/White		White + White	Yellow + Yellow		Black			
ASR 9000 M93	Yellow/White		White + White	Yellow		Black			

Warranty:

For warranty repairs, use failure coding 36585 (if diode 303A) / 36586 (if diode 303B) / 36587 (if diode 385)-64-0-01-01. Time allowance is 0.4 hours for diagnostic steps (enter as straight time) and labor op. no. 38680 (0.2 hours for 900 and 9000).