Mercedes-Benz

Service

Electrical Troubleshooting Manual (USA)

Models 230, 240D, 280/280C Model Year 1974

Mercedes-Benz of North America, Inc.

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Mercedes-Benz Canada, Inc.
Service and Parts Literature

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INDEX

Component Locations

It is a general assumption that the reader is familiar with basic mechanical and electrical repair procedures and Mercedes-Benz vehicles.

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SECTION I - INTRODUCTION

This edition of the Mercedes Benz Electrical Troubleshooting Manual includes information for models 230, 240D, and 280/280C. It has been carefully designed and prepared to help the technician reduce the time needed to locate and correct electrical malfunctions.

The format has been changed somewhat from the first edition in response to field comments. Specifically, all photographs and diagrams are grouped together in section III. Section IV, V and VI contain an index of components and foldout schematic pages for the 230, 240D and 280/280C vehicles respectively. Sections I and II are essentially unchanged except for the addition of a table showing fuse number used by each circuit. As before, power buses are drawn at the top of the sheet and ground buses near the bottom. Care has been taken to arrange circuit components such that the operation of a circuit can be easily and correctly understood. Ample notes are included to assure understanding of the intended circuit operation.

Two power buses are used on the Schematic/Wiring Diagram. The "Battery Bus" is connected directly to the battery and is "hot" or energized at all times, regardless of position of the key switch. See page 6-1, section C18. Notice that the plus battery terminal is connected to the "Battery Bus" at terminal 30 in the fuse box and all other wires on the Schematic/Wiring Diagrams shown connected to the "Battery Bus" are therefore, also connected to the battery at all times. The second bus used is the "Start-Run Bus". This bus is "hot" only when the key switch is in the start or run positions. Refer to page 6-1, section B10 and trace power from the Battery Bus through the key switch to the Start-Run Bus.

All switches and other components are shown as they exist when the vehicle is "at rest." At rest means doors closed, seats unoccupied, engine off, shift lever in park or neutral, temperature stabilized at 20°C/59°F, key out of ignition, light switch off, etc. The manner in which each component operates is explained in notes on the Schematic/Wiring Diagram. Refer to page 6-4, section F16. If the oil temperature is above 17°C or 62°F the Temperature switch is closed.

When a component is shown in its entirety in one location on the Schematic/Wiring Diagram, it is outlined with a solid heavy line. When a component is used in more than one location, it is outlined with a dash-dot heavy line. For example, fuse 1 is shown with a dash-dot heavy line because it appears in several locations throughout the Diagram. On the other hand, fuse 6, page 6-3, is shown with a solid heavy line because it appears nowhere else.

All wiring between components is shown exactly as it actually exists on the vehicle. Wiring internal to complicated components (for example, the Ignition Switch or the Light Switch) has been modified to aid in understanding electrical operation. In these cases, multiple pole, multiple throw switches are shown. To properly use the Schematic/Wiring Diagram, mentally position all switch poles to the same position and then trace the current paths through the component. It is important to remember that the switches actually function precisely as shown when measured from the switch terminals. For example, the Ignition Switch (page 6-1 B10 and page 6-2 B15) is drawn as a four pole switch, each pole with four throws or positions, one each corresponding to the actual four Ignition Switch positions, Off, 1, 2, and Start. By mentally positioning all four poles to, say, Start, you see the only circuits through the Ignition Switch that are completed when the switch is actually in the Start position are terminal 30 to 50 and terminal 30 to R.

Circuits which involve transistorized parts require special troubleshooting procedures. For example, if the Safety Interlock Circuit (page 6-1, D5) does not function, first check all circuits external to the relay logic unit. Using a voltmeter, check for power at terminals 7 and 8. Ground terminal 1 and with the Ignition Key in the Start position, check that the AC/Starter Relay picks up. Using an ohmmeter, check that the Seat Switches, Buckle Switches and Starter Lockout Switch, terminals 2, 5, 6, 9, 10 on the Logic Relay connector, all show shorts to ground when the switches are operated. If all external circuits operate properly, the fault lies within the transistorized Logic Relay and it is replaced.

PROCEDURE FOR SYSTEMATIC TROUBLESHOOTING

Systematic troubleshooting should proceed through the following five steps:

1 VERIFY THE COMPLAINT

Check the complaint to be sure the problem is real. If the customer is available, ask him to demonstrate the problem to you. Road test the vehicle if necessary but in any case, get first hand knowledge of the complaint. If there are several symptoms, note them all and then look for one failure that could cause them all. It is rare for more than one failure to occur at a time.

For example, when verifying the complaint that a 280 engine overheats, you notice that 1) the auxiliary fan does not operate, 2) the kickdown solenoid does not operate, and 3) the turn signals do not operate.

2 LOCATE THE FAULT ON THE SCHEMATIC

Use the 280/280C index to locate the circuits you found inoperative on the Schematic. In this example, locate the auxiliary fan circuit on page 6-3, the kickdown circuit, also on page 6-3, and the turn signal circuit on page 6-2.

3 ANALYZE THE CIRCUIT

Analyzing the symptoms requires careful thought. No two cases are alike. In this example you might notice that all three faulty circuits are supplied through fuse 4.

4 CORRECT THE FAILURE

In this example, replace the fuse to correct the failure. In most cases, fuses fail because they have been overloaded, not from old age or some other reason. To correct the reason for the fuse failure, you must isolate and test each circuit which is fed through fuse 4. The fuse usage chart in the vehicle fuse box or the listing in Section II tells you that the auxiliary fan circuit, the kickdown solenoid, and the turn signal circuit are the only circuits supplied by fuse 4. Good procedure in this case calls for replacing the fuse and, if the engine is still hot after your test run, check that the auxiliary fan does run. If the engine is not hot, a check of the Schematic shows that if you disconnect the Engine Temperature Switch or the Refrigerant Temperature Switch and short the lead to ground, the fan will operate. If the fuse does not fail at this point you might next press the accelerator to the floor closing the kickdown switch. If the fuse is still OK, turn the Turn Signal on which will energize the remaining circuit supplied through fuse 4. Assume, in this example, that the fuse fails only when the combi switch is set for a right turn. A look at the schematic, page 6-2 tells you the short to ground which is drawing high current in between the combi switch R wire (connector C 106, terminal 8) and the front right and rear right turn lights or perhaps involves the black and green wire which goes to terminal R on the Flasher Switch. Good procedure is to split a circuit in half if practical, to isolate a fault. Assume you disconnect C 104, replace the fuse again and this time the fuse does not fail. Notice the circuit index lists C 104 under Turn Signal and Flasher. The Component Location column describes C 104's location as "under dash—driver's side" and refers to photograph 3-15 for precise location.

You know the short is between C 104, terminal 7, and the rear right turn signal light. Your next step could be to reconnect C 104 and disconnect the connector which plugs into the rear right light unit. The fuse again does not fail. You know now the short is within the rear right light unit. Assume upon taking the unit apart a short is found and removed.

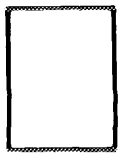
5 CHECK FOR PROPER CIRCUIT OPERATION

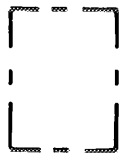
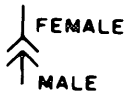
Good practice requires that you check all parts of the circuit you have tested. Check not only the turn signal circuit, but the auxilliary fan and kickdown switch for proper operation.

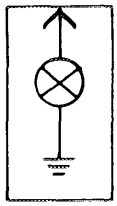
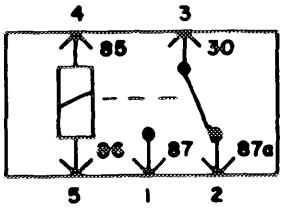
SECTION II - STANDARD SYMBOLS AND DEFINITIONS

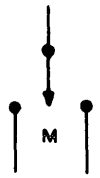
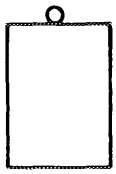
1. STANDARD SYMBOLS

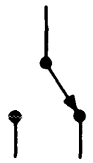
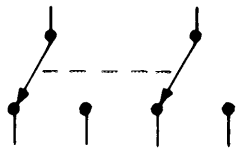
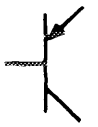
The following electrical symbols are used in the Electrical Trouble-shooting Manual.

Temperature switch	
Capacitor	
Clutch, electric	
Coil	
Component, shown complete in one position on Diagram	

Component, shown in more than one position on Diagram	
Connector	
Diode	
Fuse	
Electric gauge	
Ground or chassis	

Ground shown elsewhere	
Light bulb	
Motor, permanent magnet	
Motor, series field	
Spark gap	
Relay (contacts as shown with no voltage applied to coil)	

Relay coil, time delay	
Relay coil, two windings	
Switch, momentary (Returns to center off position when released)	
Resistor, fixed value	
Resistor, variable value	
Screw terminal	

Solenoid valve	
Switch, normally closed	
Switch normally open	
Switch, one pole, two positions	
Switch, two poles, two positions (Dashed line indicates the two poles move together)	
Transistor	

2. WIRE SIZE AND COLOR

Wire size and insulation color is shown on the Schematic/Wiring Diagram as an aid in locating specific wires. Wire size, (crossection area) is shown in millimeters square, 0.5, 0.75, 1.0, 1.5, 2.5, 4.0, 6.0, 10, 25 and 35. The first color shown on the Diagram is the base or overall insulation color. Second and third colors, if any, designate striping. Solid brown insulation is used exclusively for wires that are grounded.

The color code used in this Manual is somewhat different from the code used in Mercedes Benz documents prepared in Germany. All color codes used in the Manual are two letter, selected to closely relate to the English word they represent. Notice that lower case letters are used.

COLOR	CODE USED IN ETM	GERMAN EQUIVALENT
White	wt	ws
Green	gn	gn
Brown	br	br
Yellow	yl	ge
Gray	gy	gr
Pink	pk	rs
Blue	bu	bl
Red	rd	rt
Black	bk	sw
Ivory	iv	el
Natural	nt	nf
Violet	vi	vi

Example:

Wire designation: 1.5 gy/rd
Wire size: 1.5 mm^2
Insulation base color: gray
Insulation strip color: red

3. FUSE DATA

The maximum current carrying capacity of fuses is coded according to the color of the porcelain fuse body as follows:

yellow – 5 amperes
white – 8 amperes
red – 16 amperes
blue – 25 amperes

The exact position of those fuses mounted outside the main fuse box varies from vehicle to vehicle due to manufacturing convenience. The component Location List, Sections IV, V and VI, specifies the general location of a particular fuse, such as "left fender." To determine which fuse of several is the one you require, identify it by the color of the wires leading to its terminals.

Notice that the radio and power antenna fuses are usually housed in the same fuse box. This fuse box can be identified by a screw lid rather than a snap-on lid.

Proper fuse sizes are as follows:

1	– 8a	12	– 8a
2	– 16a	13	– 8a
3	– 8a	14	– 8a (3)
4	– 8a	15	– --
5	– 8a (1)	16	– --
6	– 5a	17	– 16a
7	– 8a	18	– 16a
8	– 8a	19	– 16a (2)
9	– 8a	20	– 16a
10	– 8a	21	– 8a
11	– 8a	22	– 8a

(1) This position not used on 280/280C

(2) If vehicle equipment includes both heated rear window and electric roof, this fuse is 25 amperes.

(3) 2 amperes on 280/280C

The following table lists the fuse number used by various circuits on each vehicle.

	Fuse Number		
	230	240D	280/ 280C
Air Conditioning			
A/C blower motor	F21	F21	F21
A/C clutch	F22	F22	F22
Heater blower motor	F 6	F 6	F 6
Auxiliary Fan	F4/F20	F20	F4/F20
Choke Heating	F 4	—	F 3
Cigar Lighter	F 2	F 2	F 2
Clock	F 1	F 1	F 1
Fuel Gauge	F 5	F 5	F 3
Heated Rear Window	F19	F19	F19
Horns	F 2	F 2	F 2
Idle Fuel Cutoff	F1/F4		F 3
Kickdown	F 3	F 3	F 4
Light Circuits			
A/C Control light	F 6	F 6	F 6
Ash tray	F 7	F 7	F 7
Backup	F 5	F 5	F 3
Brake system warning	F 5	F 5	F 3
Dome, front	F 1	F 1	F 1
Dome, rear	F 1	F 1	F 1
Fog (Perimeter)	F11	F11	F11
Gear selector	F 7	F 7	F 7
Glove box	F 5	F 5	F 3
Head	F9/F10/ F11/F12	F9/F10/ F11/F12	F9/F10/ F11/F12
Instrument cluster	F 7	F 7	F 7
Low Fuel warning	F 5	F 5	F 3
Marker	F7/F8	F7/F8	F7/F8
Standing	F1/F7/ F8	F1/F7/ F8	F1/F7/ F8
Stop	F 5	F 5	F 3
Tail	F7/F8	F7/F8	F7/F8
Trunk	F 1	F 1	F 1
Radio	F14	F14	F14
Antenna	F13	F13	F13
Sliding roof	F19	F19	F19
Turn signal/flasher	F1/F4	F1/F4	F1/F4
Windows	F4/F17/ F18	F4/F17/ F18	F4/F17/ F18
Windshield wiper/ washer	F 2	F 2	F 2

4. RELAY KEY CODE DESIGNATION

Since the exact position of relays varies due to manufacturing convenience, the harness leading to each relay is tagged as a means of identifying each relay. The following listing identifies the key numbering system.

Key Number	Function
1	Fuel pump
2	Cold Start Valve
3	Fuel Injection
4	A/C Starter
5	Change-over Valve
6	Auxiliary fan
7	
8	Aux. Fan Cutout
9	
10	Windows Hot start Temperature Switch (Choke Heating) Choke Pre-resistance

5. CONNECTOR LIST

C101 Backup lights/kickdown switch
C102 Impulse trigger (Trigger points)
C103 Fuel injection circuit
C104 Rear harness circuits
C105 Charge-start circuit (3 or 4 terminal)
C106 Combination switch
C107 Electric window circuit
C108 Electric window circuit
C109 Reading light
C110 Rear dome light
C111 Hot start circuit
C112 Wiper motor
C113 Blower switch
C114 Choke Heater