

# SECTION I - INTRODUCTION

The Electrical Troubleshooting Manual is a new method of presenting electrical information for Mercedes Benz electrical servicing. It has been carefully designed and prepared to help the technician reduce the time needed to locate and correct electrical malfunctions.

All electrical circuits in the 1974 Model 450 SE and 450 SEL vehicles are diagrammed on the five page Schematic/Wiring Diagram. Components in each of twenty one circuits are grouped together and arranged so that current flow through the circuit can be easily traced and understood. For example, on the first page of the Schematic/Wiring Diagram, at the left side, you will find all components associated with the Safety Interlock Circuit. In general, power input buses are drawn at the top of the sheet and ground buses near the bottom of the sheet. In addition to the Schematic/Wiring Diagram, the ETM includes a section defining symbols used, a list of circuits and components with their vehicle location, and photographs to help locate components and identify their terminals.

Notes are provided on the Schematic/Wiring Diagram to define component operation. For example, in the Safety Interlock Circuit, the door must be open for the switch contacts to be closed. Also, the ignition key must be turned to the Run or Run (No. 2) position and then back to off before the Ignition Lock Warning Switch is closed.

When troubleshooting, first check for proper voltage at the circuit location which can be reached in the shortest time with the least amount of disassembly. Accordingly, if the Warning Buzzer does not sound, check the door switch before checking the Ignition Lock Warning Switch.

It is important to understand what voltage to expect before making a measurement. The Schematic/Wiring Diagram is organized to make this understanding easier. For example, when the Kickdown Switch is closed, one expects voltage at the Automatic Transmission Solenoid Valve because the switch connects the plus bus to the Solenoid Valve. On the other hand, when the Horn Switch is closed, one does not expect voltage at the Horns because closing the switch connects ground to the Horns.

There are only two power buses used on the 450 SE/SEL Schematic/Wiring Diagram, the "Battery Bus" and the "Start-Run Bus". The Battery Bus is connected directly to the Battery and is "hot" or energized at all times. Refer to page 1, D18 and trace this circuit from the Battery to the Battery Bus. The Start-Run Bus is energized only when the ignition key is turned to the start or run (No. 2) positions. Refer to page 1, C11 and trace power from the Battery Bus through the Ignition Switch to the Start-Run Bus. Notice that all circuits connect to the buses at the fuse box unless otherwise noted.

All switches and other components are shown as they exist when the vehicle is at rest. At rest includes doors closed, seats unoccupied, engine off, shift lever in park, temperature stabilized at 20C/59F, key out of ignition, light switch off, etc. The manner in which each switch or other component operates is noted on the Schematic/Wiring Diagram.

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 shown in more than one location, it is outlined with a dash-dot heavy line. For example, the AC/Starter relay shown on page 1, C8 is outlined with a dash-dot line because only the relay coil is shown at C 8. The remaining portions of the relay are shown on page 1, B20 and page 4, C11.

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 1, B10 and page 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.

Relays are installed in any one of several locations during manufacture. The wires leading to the relay connector are gathered together and banded with a "key" number for relay identification. Notice in Section III, figure 4, the Fuel Pump Relay is identified as key 1. Although the relay position may vary from vehicle to vehicle, the key number remains the same for a given relay function.

Circuits which involve transistorized parts require special troubleshooting procedures. For example, if the Safety Interlock Circuit (page 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 Relay Logic Relay and it is replaced.

Notice that the same fuse may be shown in several different locations on the Schematic/Wiring Diagram. Check the fuse designation list in Section II to determine all circuits energized by any one fuse.

Notice that all grounded wires are insulated with solid brown insulation.






Systematic troubleshooting should proceed through the following five steps:

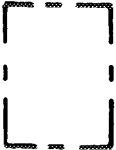



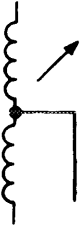

- 1st— Verify the customer complaint. Check circuit operation yourself.
- 2nd— Locate the faulty circuit on the Schematic/Wiring/Diagram. Use Section III, the Component/Circuit Locator List.
- 3rd— Analyze the circuit. By studying the circuit it is usually possible to isolate the possibly failed components to one or two—without having made any measurements on the vehicle. For example, with a verified complaint that the right rear and left front power windows do not operate, see page 3, E4, 6. An examination of the Schematic/Wiring Diagram shows that both inoperative motors are powered through fuse F15. You can easily check this fuse with a minimum of vehicle disassembly.
- 4th— Correct the failure.
- 5th— Check for proper circuit operation.

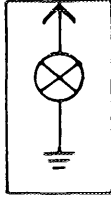




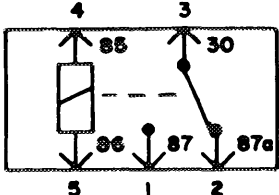
## SECTION II - STANDARD SYMBOLS AND DEFINITIONS







### 1. STANDARD SYMBOLS





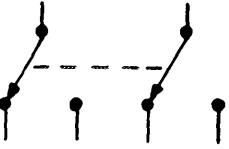

The following electrical symbols are used in the Electrical Troubleshooting Manual.

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

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

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

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

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 CODES

Wire size and insulation color is shown on the Schematic/Wiring Diagram as an aid in locating specific wires. Wire size, (crosssection area) is shown in millimeters square, 0.5, 0.75, 1.0, 1.5, 2.5, 4.0, 6.0, 10, 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 gr/rd  
Wire size: 1.5 mm<sup>2</sup>  
Insulation base color: gray  
Insulation strip color: red

## 3. FUSE DESIGNATION AND AMPERAGE

### Fuse 1 (8A)

Clock  
Four way flasher  
Light switch  
Radio antenna  
Reading light  
Rear dome light  
Trunk light  
Turn Signals

### Fuse 2 (16A)

Air conditioning thermostat  
Horns

### Fuse 3 (16A)

Air conditioner blower motor



Fuse 4 (8A)  
 Backup lights  
 Brake lights  
 Brake system warning lights  
 Change-over valve  
 Cold start circuit  
 Cruise control  
 Fuel gauge  
 Fuel pump  
 Fuel warning light  
 Glove box light  
 Kickdown switch  
 Cold start valve  
 Temperature gauge  
 Tach  
 Turn signal  
 Window relay

Fuse 5 (8A)  
 Lights—right tail, right front marker,  
 left rear marker, license plate, right  
 rear marker, gear shift light

Fuse 6 (8A)  
 Cigar lighter  
 Hot start device

Fuse 7 (8A)  
 Lights, left tail, left front marker

Fuse 8 (16A)  
 Auxiliary fan  
 High beam flasher  
 Window washer  
 Window wiper

Fuse 9 (8A)

Fuse 10 (16A)  
 Heated Rear window  
 Sliding roof

Fuse 11 (8A)  
 Headlight, left low beam

Fuse 12 (8A)  
 Headlights, right high beam, high beam  
 indicator

Fuse 13 (8A)  
 Headlights, left low beam, fog lights

Fuse 14 (8A)  
 Headlight, right low beam

Fuse 15 (16A)  
 Window motors, right front, left rear

Fuse 16 (16A)  
 Window motors, left front, right rear

Fuse (2A)  
 Radio

#### 4. RELAY KEY DESIGNATION AND LOCATION

Key Number	Function	Location
1	Fuel pump	fuse box
2	Cold Start Valve	fuse box
3	Fuel Injection	under dash pass. side
4	A/C Starter	fuse box
5	Change-over Valve	left kick panel
6	Auxiliary fan	left kick panel
7		
8	Aux. Fan Cutout	left kick panel
9		
10	Windows	left kick panel
	Hot start	under dash, pass. side, console side

#### 5. CONNECTOR LIST

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

# SECTION III - COMPONENT/CIRCUIT LOCATOR LIST

In Section III, electrical components are grouped by the electrical circuit in which they are used. Components that are used in more than one circuit are listed in each. For example, the AC/Starter relay is listed in four circuits: the Air Conditioning circuit, the Charge-Start circuit, the Fuel Injection circuit, and the Safety Interlock circuit. Following each component is the vehicle location where that component is found. Figure references for a Locator Photograph and a Terminal Identifier Photograph are given in those cases where such information will help in troubleshooting.

Circuits designated include:

	<u>Schematic Location</u>
Air Conditioning Control	4, D12
Backup Light Circuit	4, D19
Brake Light Circuit	4, D20
Charge-Start Circuit	1, D17
Control Lights	2, G10
Cruise Control	4, D23
Fuel Injection System	5, D10
Glove Box Light	2, D1
Heated Rear Window	5, D19
Horns	3, D24
Ignition Circuit	1, D25
Instrument Cluster Circuits	3, D21
Interior & Trunk Lights	3, D15
Kickdown Circuit	3, D10
Light Switch	2, D15
Radio	1, D11
Safety Interlock Circuit	1, D6
Sliding Roof	2, C25
Turn Signals	2, C5
Windows	3, D6
Windshield Wiper/Washer	4, D5

COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	LOC. PHOTO SEC. 4
AIR CONDITIONING CONTROL (4, D12)			
AC clutch	front, AC compressor		
AC/Starter relay (key 4)	fuse box	4	8
AC thermostat	console		
Auxiliary fan	front of radiator	10-10	
Auxiliary fan separation relay(key 8)	left kick panel	2	8
Auxiliary fan relay (key 6)	left kick panel	2	8
Blower motor	R,H,S under dash		
Blower motor pre-resistors	right side fire wall	18-2	19
Blower motor switch	center console		18
Changeover Valve	center fire wall	5-9	
Changeover valve relay (key 5)	left kick panel	2	8
Fuse 2	fuse box		7
Fuse 3	fuse box		7
Fuse 4	fuse box		7
Fuse 8	fuse box		7
Temperature switch-engine, 100°C/212°F	engine, top front	21-2	
Temperature switch-refrig. 62°C/144°F	receiver-dryer	10-11	
BACKUP LIGHTS (4, D19)			
Switch	transmission, left side	11-1	
Fuse 4	fuse box		7
Lights C104 (12 terminal)	under dash, drivers side	1-7	4
CHARGE-START CIRCUIT (1, D17)			
AC/Starter relay (key 4)	fuse box	4	8
Alternator	engine, front right		
Battery	engine, right front		
Charge indicator light	instrument cluster		
Regulator	front of battery grd. strap		
Starter	engine, left rear		
C105 (3 Terminal)	under battery plate		

COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	LOC. PHOTO SEC. 4
CONTROL LIGHTS (2, G10)			
AC thermostat lights Blower switch light Flasher switch light Heater control lights Instrument cluster lights Rheostat, dimmer			
CRUISE CONTROL/ BRAKE LIGHTS (4, D20)			
Amplifier Brake light switch Brake lights Cruise control switch Fuse 4 Speed sensor Throttle actuator C104 (12 terminal)	under dash, driver's side under dash, top brake pedal  top center console fuse box under dash, driver's side right fender, near hood spring under dash, driver's side	1-7	7 4
FUEL INJECTION SYSTEM (5, D10)			
AC/Starter relay (key 4) Air temperature sensor Cold start valve Cold start valve relay (key 2) Electronic control unit Fuel injection relay (key 3) Fuel injection valves Fuel pump Fuel pump relay (key 1) Fuse 4 Fuse 6 Hot start relay Impulse trigger Intake manifold pressure sensor Thermal time switch	fuse panel air cleaner inlet engine, top fuse box right kick panel under dash, passenger side engine, top behind right rear axle fuse box fuse box fuse box under dash pass. side, against console distributor left cowl (engine comp.) engine, top center	4 19 7-1 4 24-1 3-1 23-2 4 4 7-5	8 8 8 8 8 8 7

COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	LOC. PHOTO SEC. 4
FUEL INJECTION SYSTEM (continued)			
Throttle valve switch	rt. side throttle housing	22-2	
Water temperature sensor	engine, top	7-4	
C102 (6 terminal)	engine, top front	17-1	2
C103 (6 terminal)	under dash, passenger's side		2
C104 (12 terminal)	under dash, driver's side	1-7	4
C 111 (2 terminal)			
GLOVE BOX LIGHT (2, D1)			
Fuse 4	fuse box		7
Glove box light	glove box		
Glove box light switch	glove box		
HEATED REAR WINDOW (5, D19)			
Delay relay	under dash, driver's side	1-2	
Fuse 10	fuse box		7
Heater element	rear window		
Switch	center console		
HORNS (3, D24)			
Fuse 2	fuse box		7
Horns			
Horn switch			
C106 (14 terminal)	under dash, driver's side		5
IGNITION CIRCUIT (1, D25)			
Diagnostic test plug	left of distributor	16-1	
Distributor	engine, top front		
Ignition coil	engine, front left	6-2	
Ignition switching unit	left fender	6-1	
Spark plugs			



COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	TERM. PHOTO SEC. 4
KICKDOWN CIRCUIT (3, D10)			
Fuse 4 Solenoid valve Switch	transmission, right side under accelerator pedal	12-1	7
LIGHT SWITCH CIRCUIT (2, D15)			
Fuse 1	fuse box		7
Fuse 5	fuse box		7
Fuse 7	fuse box		7
Fuse 8	fuse box		7
Fuse 11	fuse box		7
Fuse 12	fuse box		7
Fuse 13	fuse box		7
Fuse 14	fuse box		7
Fog light switch	light switch, pull handle		
High beam indicator	instrument cluster		
High/low/pass switch	combination switch		
Ignition switch			12
Left fog light			
Left front marker			
Left head lights			
Left rear marker			
Light switch			
Left tail light			
License plate			
Right fog light			
Right front marker			
Right head lights			
Right rear marker			
Right tail lights			
C104 (12 terminal)	under dash, driver's side	1-7	4
C105 (3 terminal)	under battery plate		5
C106 (14 terminal)	under dash, driver's side		

COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	TERM. PHOTO SEC. 4
RADIO (1, D11)			
Antenna Fuse Radio	right front fender fuse box (in line)	4-5	
SAFETY INTERLOCK CIRCUIT (1, D6)			
AC/Starter relay (key 4) Buzzer, warning Door switch Driver's buckle switch Driver's seat switch Fasten seat belt light Ignition lock warning sw. Passenger's buckle switch Passenger's seat switch Seat belt/starter logic relay Starter lockout switch	fuse box under dash, driver's side upper switch  ignition switch  under dash, driver's side transmission, left side	4 13-2  15 14  13-4 11-1	8 16   13
SLIDING ROOF CIRCUIT (2, C25)			
Fuse 10 Motor Switch	fuse box near left trunk hinge		7
TURN SIGNALS (2, C5)			
Flasher relay Flasher switch Fuse 1 Fuse 4 Left front turn light Left rear turn light	under dash, driver's side console fuse box fuse box	1-1	21 7 7



COMPONENT	VEHICLE LOCATION	LOC. PHOTO SEC. 3	TERM. PHOTO SEC. 4
TURN SIGNALS (Continued)			
Left turn signal Right front turn light Right rear turn light Right turn signal Turn signal switch C104 (12 terminal) C106 (14 terminal)	combination switch under dash, driver's side under dash, driver's side	1-7	4 5
WINDOW CIRCUITS (3, D6)			
Fuse 4 Fuse 15 Fuse 16 Left front motor Left rear motor Left rear switch Left side switch group Right front motor Right rear motor Right rear switch Right side switch group Relay (key 10) Safety switch C107 (6 terminal) C108 (2 terminal)	fuse box fuse box fuse box door door door console door door door console left kick panel console console console	2	7 7 7        8  2
WINDSHIELD WIPER/WASHER (4, D5)			
Fuse 8 Interval wipe relay Washer-pump motor Washer switch Wiper motor Wiper switch C106 (14 terminal)	fuse box under dash, driver's side below battery floorboard under dash, behind console combination switch under dash, driver's side	1-5	7 11    5

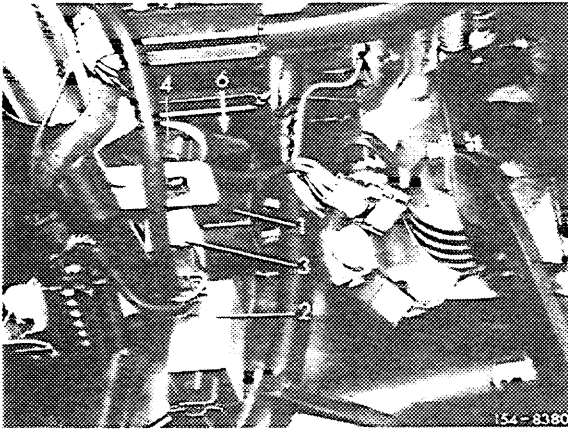


Fig. 3-1  
 1—Turn signal flasher relay  
 2—Heated rear window delay relay  
 4—Reading light delay relay  
 5—Interval wipe relay  
 7—C104

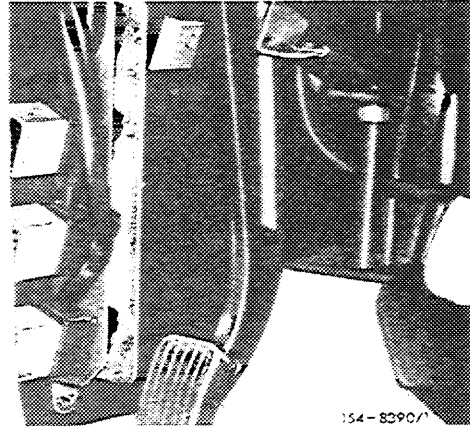


Fig. 3-2  
 Key 8—Auxiliary fan separation relay  
 Key 5—Change-over valve relay  
 Key 6—Auxiliary fan relay  
 Key 10—Window relay

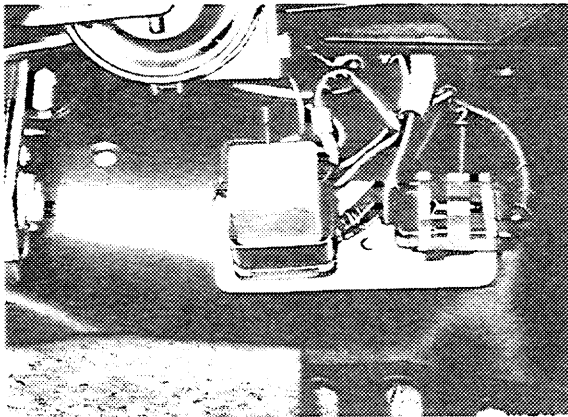


Fig. 3-3  
 1—Fuel injection relay (Key 3)  
 2—Antenna power connector

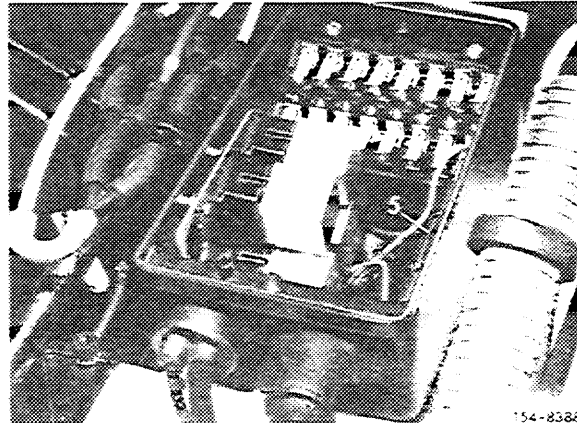


Fig. 3-4  
 Key 1—Fuel pump relay  
 Key 2—Cold start valve relay  
 Key 4—AC/Starter relay  
 Key 5—Radio fuse

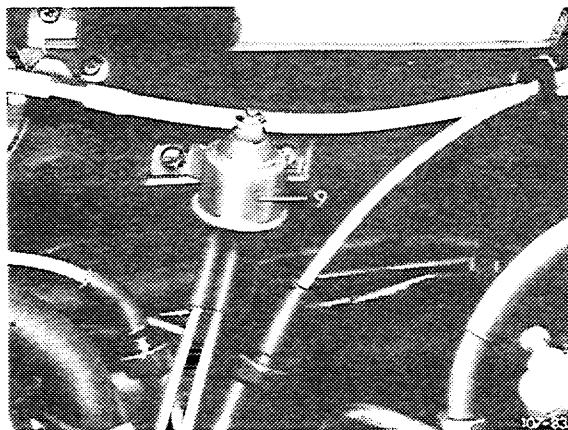


Fig. 3-5  
 9—Change-over valve

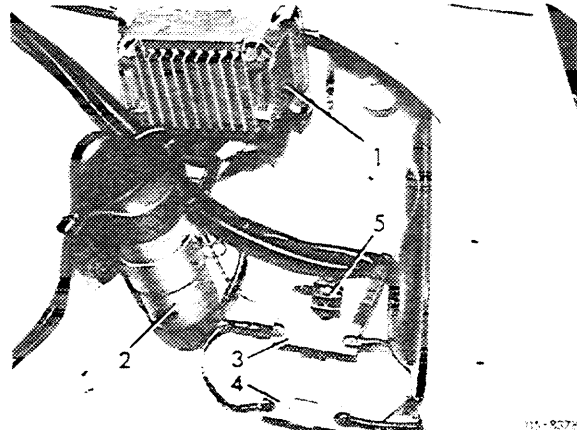
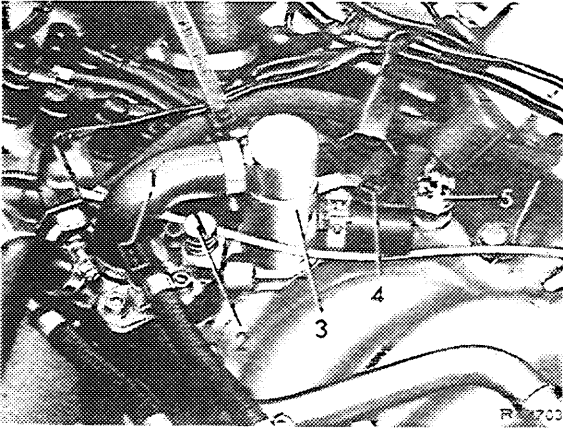
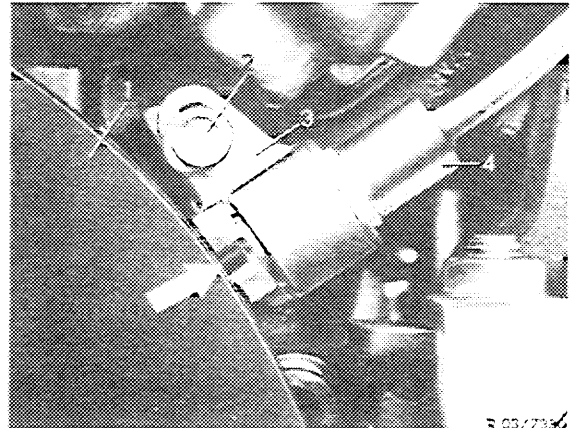


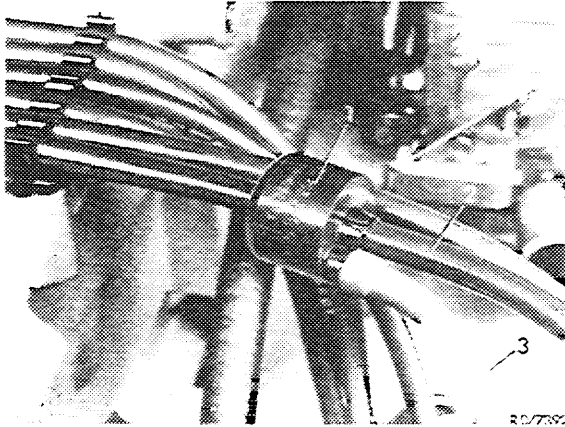
Fig. 3-6  
 1—Ignition switching unit  
 2—Ignition coil  
 3—0.4 Ohm pre-resistance  
 4—0.6 Ohm pre-resistance



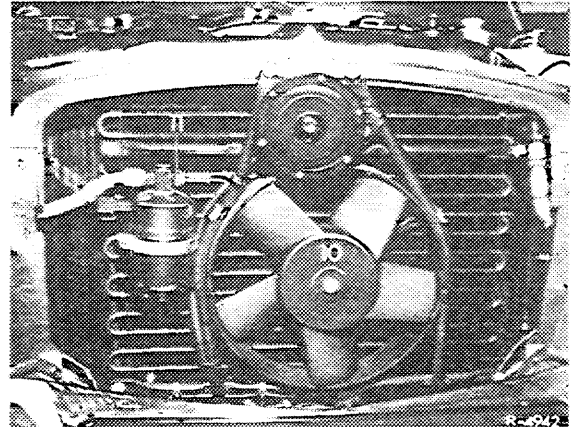
**Fig. 3-7**  
 1—Start valve (plug disconnected)  
 2—Idle speed adjusting screw  
 3—Additional air valve  
 4—Water temperature sensor  
 5—Thermal time switch



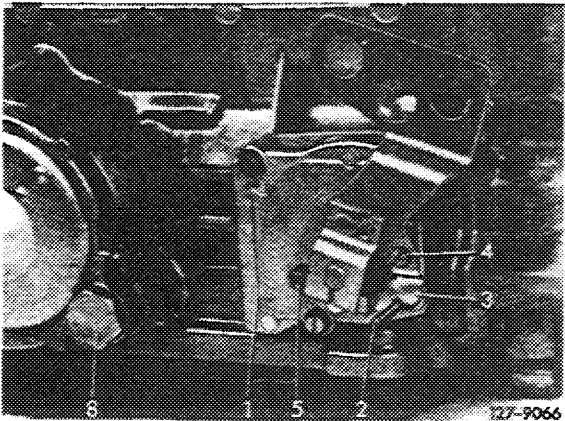
**Fig. 3-8**  
 1—Vibration damper  
 2—Fastening screw  
 3—Top holding bracket  
 4—TDC transmitter



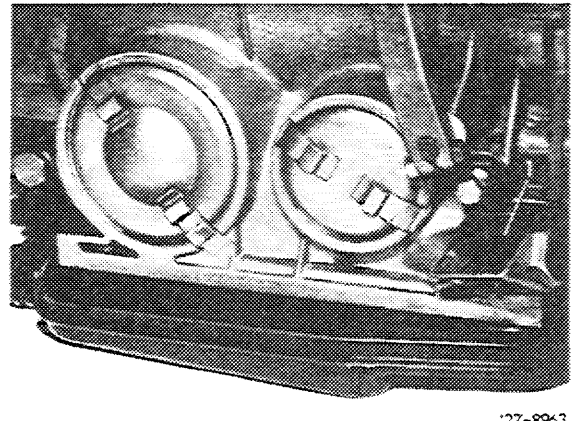
**Fig. 3-9**  
 1—Cylinder No.1 firing impulse transmitter  
 2—Cylinder No.1 ignition cable  
 3—Cable to Diagnostic plug



**Fig 3-10**  
 10—Auxiliary fan  
 11—Refrigerant temperature switch  
 62C/144F



**Fig. 3-11**  
 1—Starter lockout switch/backup  
 light switch



**Fig. 3-12**  
 1—Kickdown solenoid valve

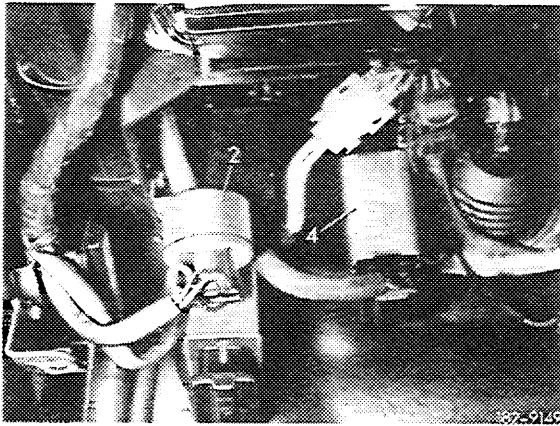


Fig. 3-13  
 2—Buzzer, warning  
 4—Seat belt starter logic relay

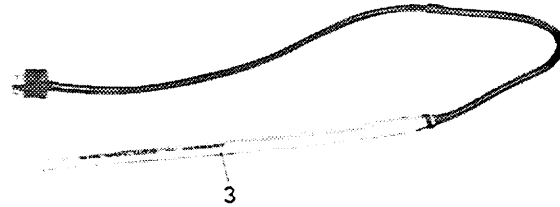


Fig. 3-14  
 Seat contact switches

R 54/720:

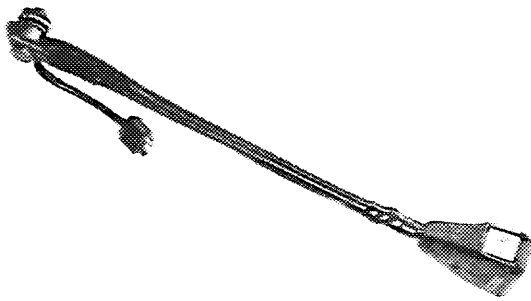


Fig. 3-15  
 Belt buckle switch

182-9'5C

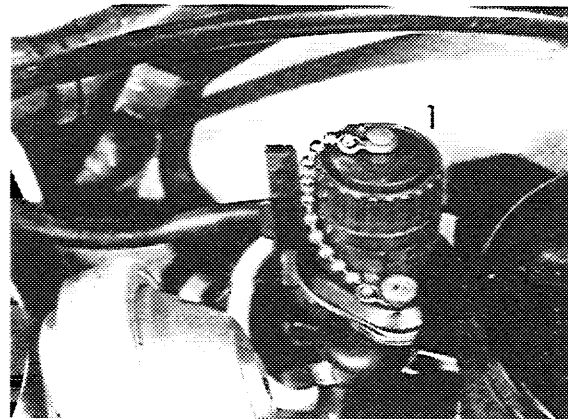


Fig. 3-16  
 1—Diagnostic plug

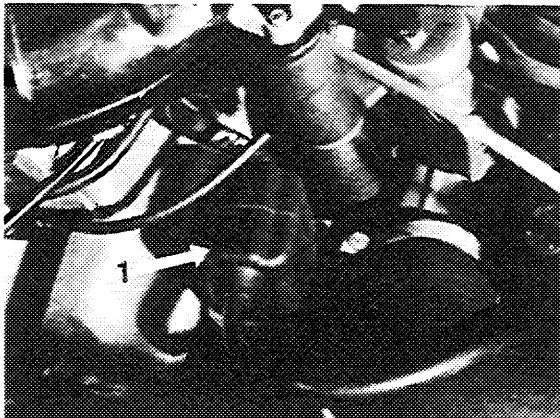


Fig. 3-17  
 1—C106 Impulse trigger connector

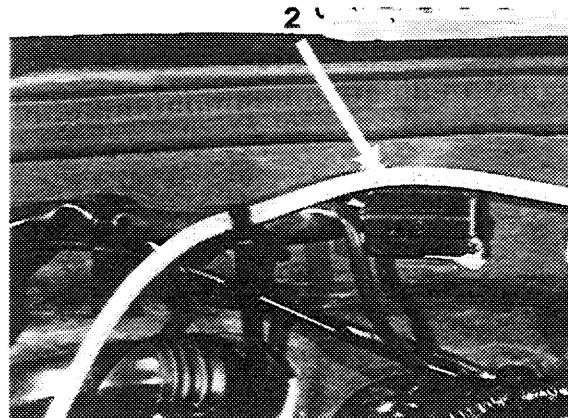


Fig. 3-18  
 2—Blower motor pre-resistor  
 connector

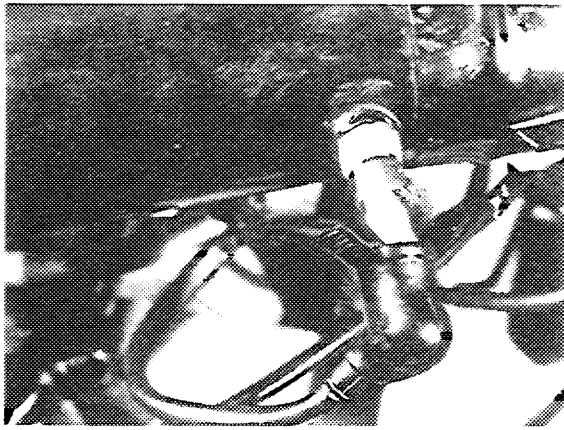


Fig. 3-19  
Air temperature sensor

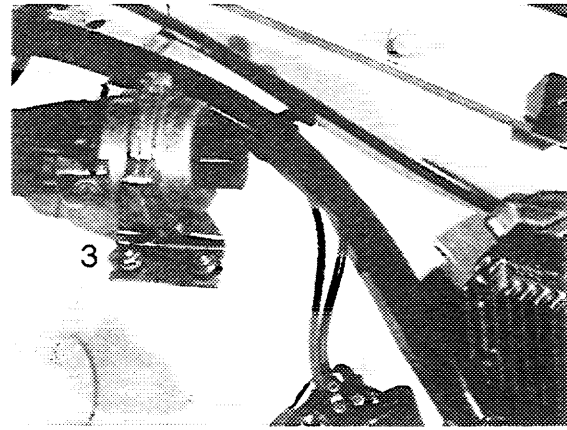


Fig. 3-20  
3—Intake manifold sensor

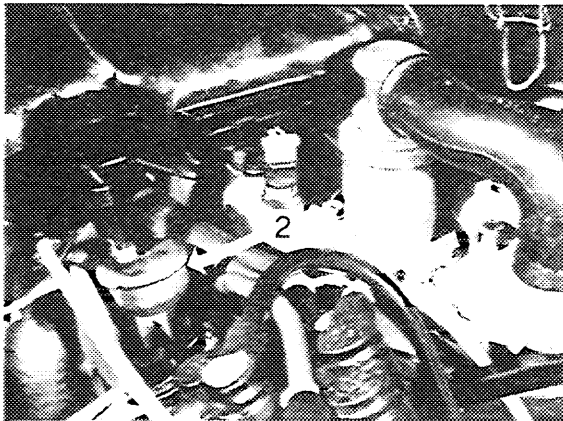


Fig. 3-21  
2—Engine temperature switch, 100C/212F

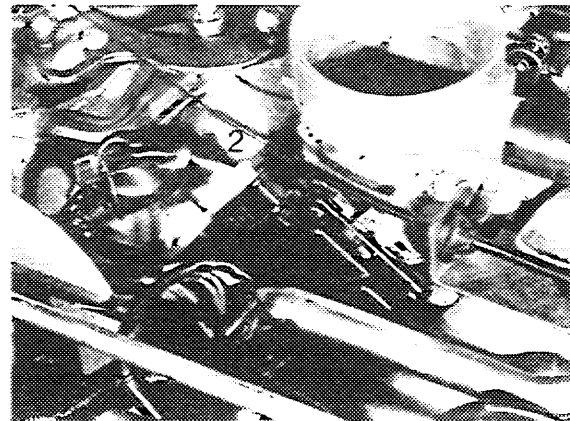


Fig. 3-22  
2—Throttle valve switch

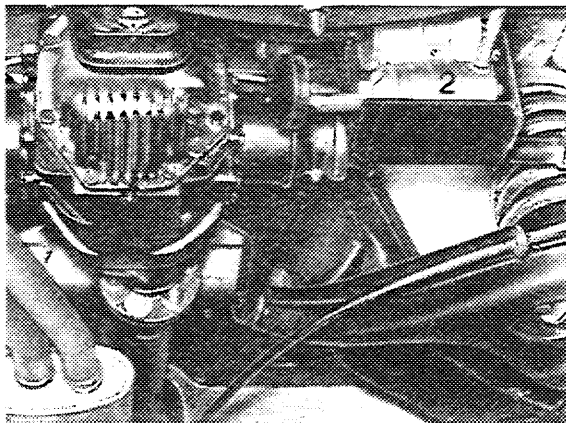


Fig. 3-23  
2—Fuel pump

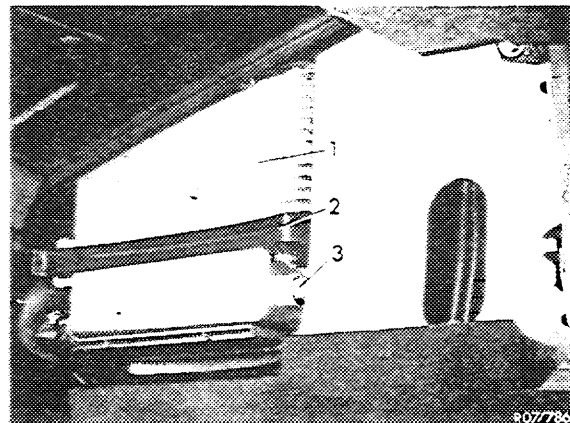


Fig. 3-24  
1—Electronic control unit  
2—Spring clip  
3—Idle speed adjust screw

## SECTION IV - COMPONENT TERMINAL IDENTIFIER

	Figure Number
Blower motor pre-resistors	4-19
Blower motor switch	4-18
Buzzer, warning	4-16
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Relay	4-8
Seat belt/starter logic relay	4-10
Window switch group	4-9
Windshield washer switch	4-20
Windshield wiper interval relay	4-11



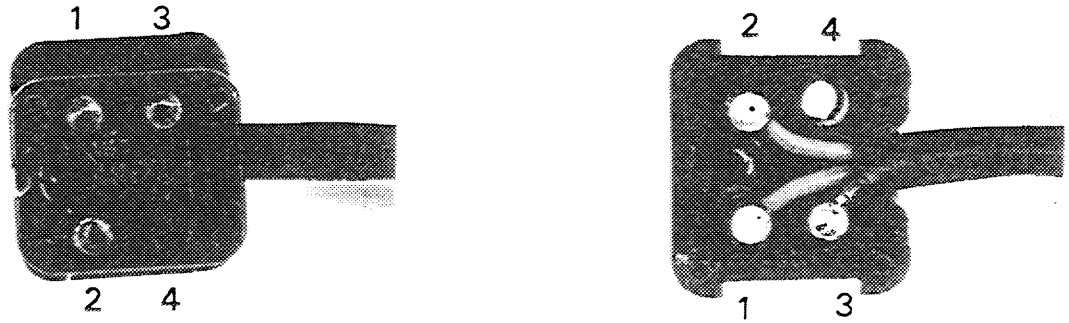


Fig. 4-1  
Connector, 4 terminal

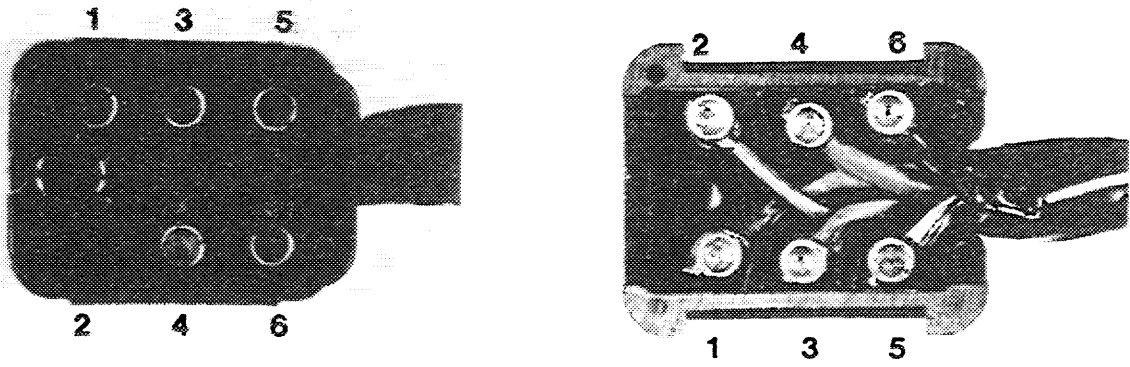


Fig. 4-2  
Connector, 6 terminal

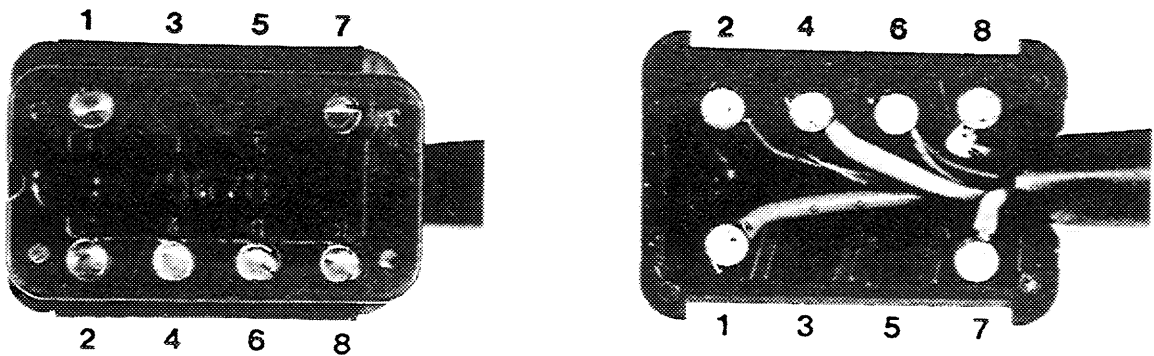


Fig. 4-3  
Connector 8 terminal

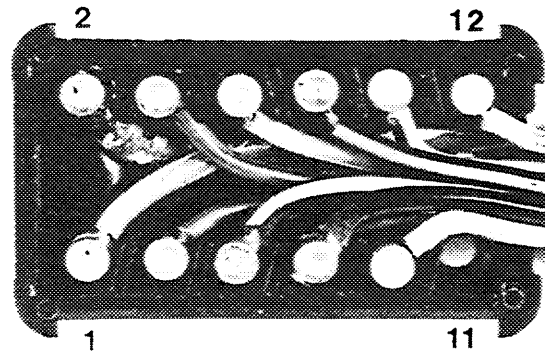
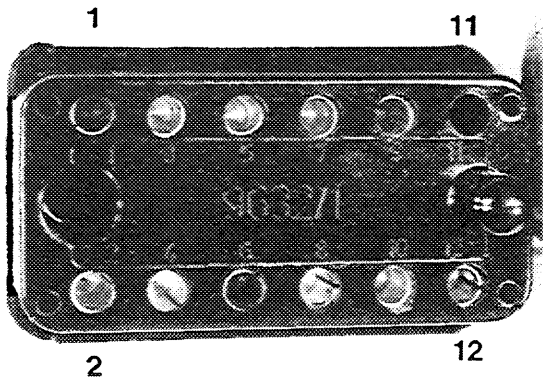


Fig. 4-4  
Connector, 12 terminal

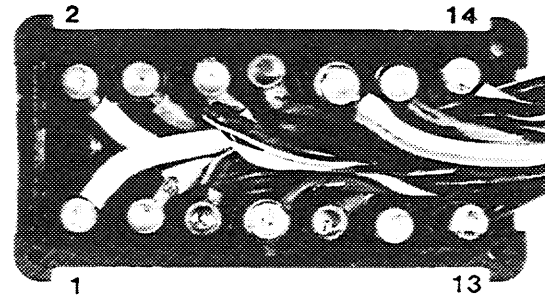
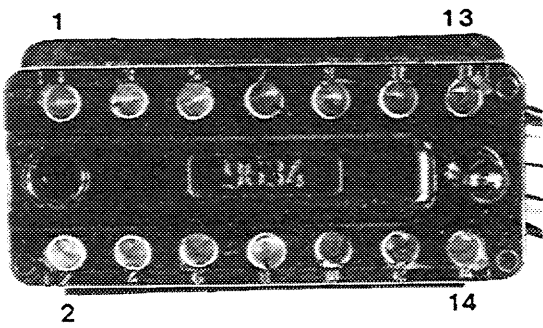


Fig. 4-5  
Connector, 14 terminal

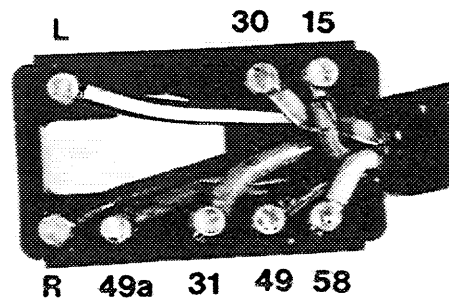
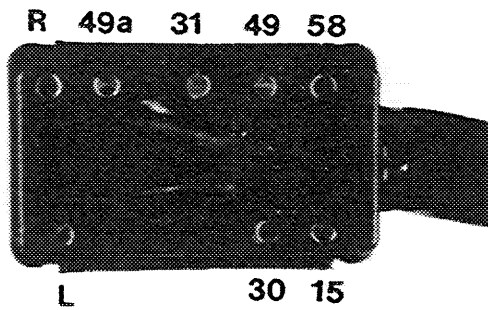


Fig. 4-6  
Connector, flasher switch



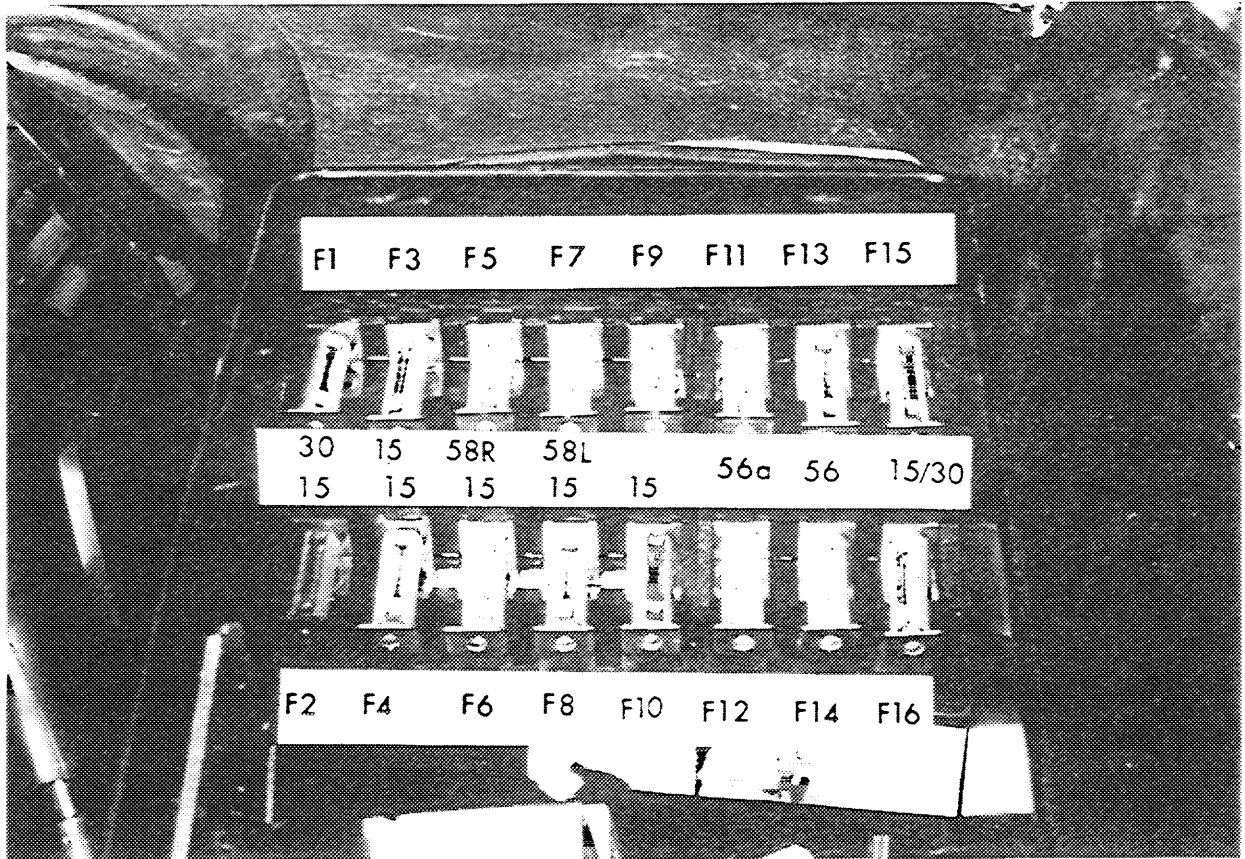


Fig. 4-7  
Fuse box

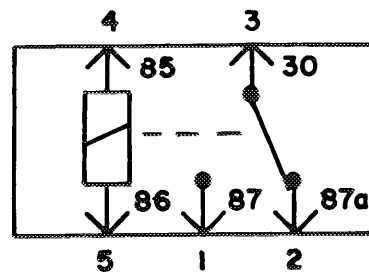
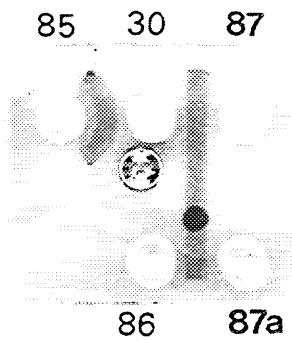


Fig. 4-8  
Relay

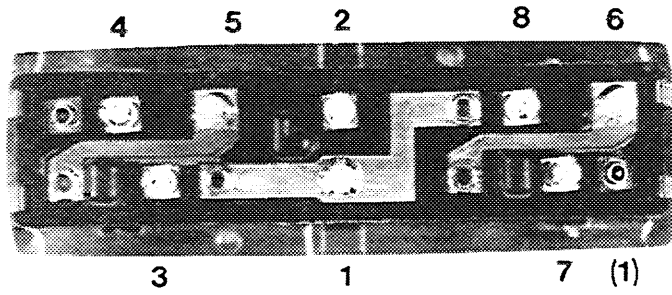


Fig. 4-9  
Window switch group  
(the 1 terminal has two alternate positions)

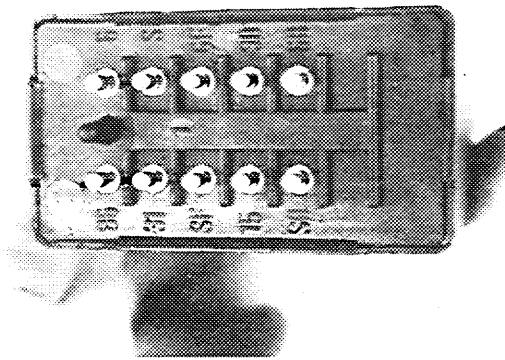


Fig. 4-10  
Seat belt starter logic relay

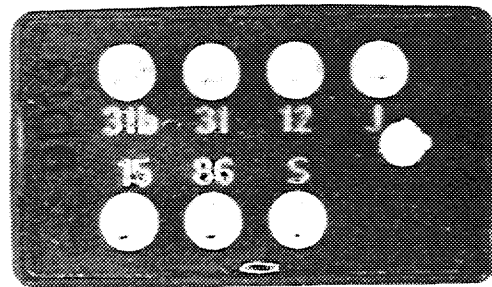


Fig. 4-11  
Windshield wiper interval relay

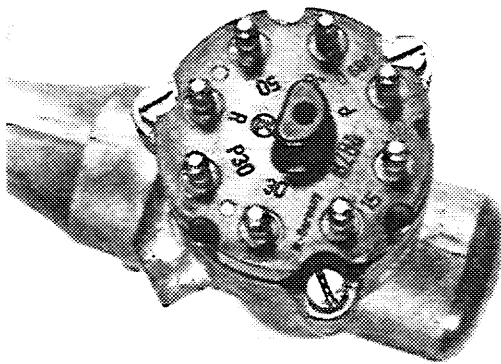


Fig. 4-12  
Ignition switch



Fig. 4-13  
Ignition lock warning switch

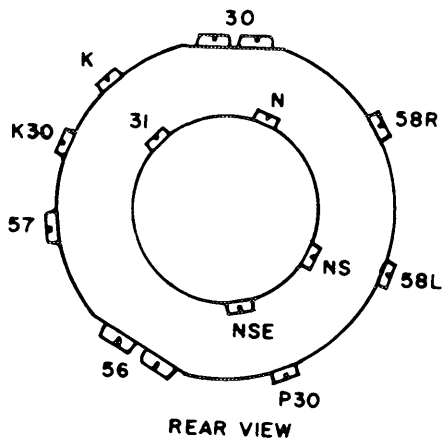


Fig. 4-14  
Light switch

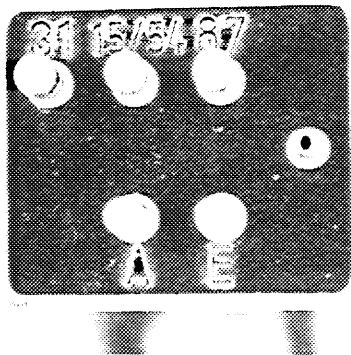


Fig. 4-15  
Heated rear window delay relay

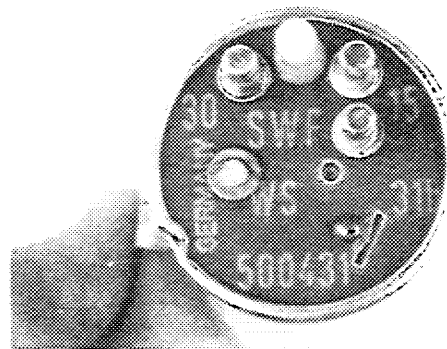


Fig. 4-16  
Buzzer, warning

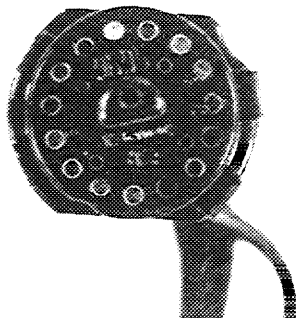


Fig. 4-17  
Connector, 15 terminal (instrument cluster)

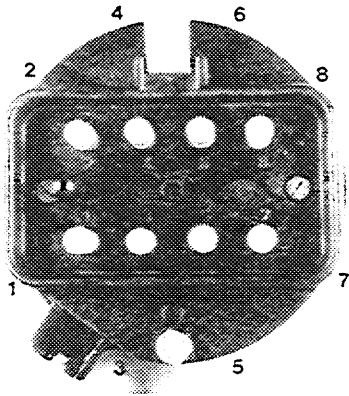


Fig. 4-18  
Blower motor switch

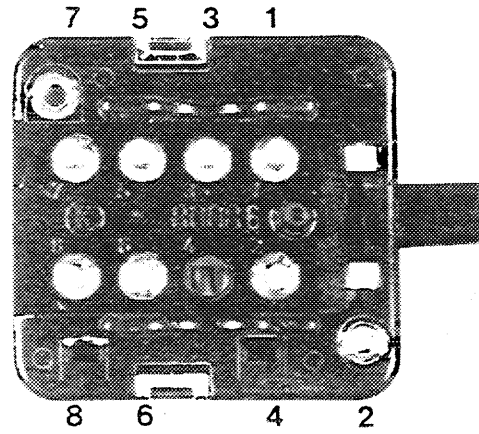


Fig. 4-19  
Blower motor pre-resistors

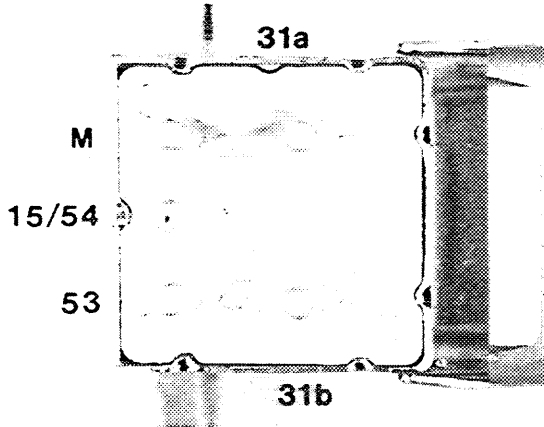


Fig. 4-20  
Windshield washer switch

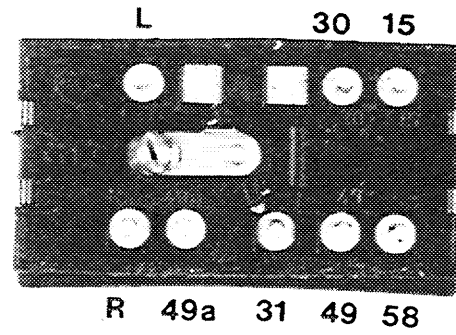


Fig. 4-21  
Flasher switch