Mercedes-Benz

Service

Electrical Troubleshooting Manual USA

Model 201 Model Years 1984 - 1993

Mercedes-Benz of North America, Inc.

S-2372-092

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INTRODUCTION

This manual contains schematic diagrams and component locations for models 201.024/028 (190 E 2.3), 201.029 (190 E 2.6), 201.034 (190 E 2.3–16), 201.122 (190 D 2.2), 201 .126 (190 D 2.5) and 201 .128 (190 D 2.5 Turbo). Also included is information on: How To Use This Manual, Symbols, Troubleshooting Procedure and Automatic Climate Control.

Schematic diagrams should be referred to when diagnosing a problem (see Troubleshooting Procedure).

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

Mercedes-Benz of North America, Inc
Service and Parts Literature

HOW TO USE THIS MANUAL

How to Read Schematic Diagrams

Electrical components which work together are shown together. Schematic drawings are arranged so that current flows from positive at the top of the page, to negative at the bottom. Fuses are shown at the top of the page. All wires, connectors, switches, and motors are shown in the flow of current to ground at the bottom of the page. The "hot" labels appearing at the top of fuses or components show the Ignition Starter/Switch positions which supply power to the point. (See Circuit Identification, page 9.)

The terminal number "30" appearing on the Ignition/Starter Switch and Exterior Lamp Switch means that these terminals are always supplied with power. The terminal number "15" on the Ignition/Starter Switch means that this terminal is supplied with power only when the Ignition/Starter Switch is in the "Run" or "Start" positions.

Component and Wire Representation

All wiring between components is shown exactly as it exists on the vehicle. Wiring inside complicated components has been simplified to aid in understanding their electrical operation. Transistorized components are shown as plain boxes labeled with a solid state symbol. Switches and sensors are shown "at rest," as if the Ignition Starter/Switch were off. Notes are included which describe how switches and other components work.

Circuits Which Share Power and/or Grounds

Each circuit is shown completely on one schematic diagram. Wires common to different schematics are cross referenced and marked with arrows. To find other circuits which might share fuse terminals or screw terminal blocks, look on the Power Distribution or Fuse Block Details schematics. To find other circuits which might share connections to ground terminals, look on the Ground Distribution schematics.

Power Distribution and Ground Distribution Diagrams

The Power Distribution diagrams show connections from the Battery and Alternator to the fuses, and to the Ignition Starter/Switch and Exterior Lamp Switch. This will tell you how each circuit gets its power, and what circuits share common fuses. Ground Distribution diagrams show how several circuits are connected to common grounds.

Component Identification

Component names are found underlined next to or above each component. Above the component name, you will find a Component Identification Code Number.

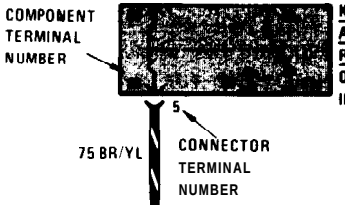
REVISIONS:

SYMBOLS

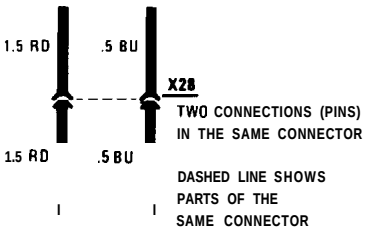
ONE POLE, TWO POSITION SWITCH

SWITCHES THAT MOVE TOGETHER

OASHEO LINE SHOWS A MECHANICAL CONNECTION BETWEEN SWITCHES



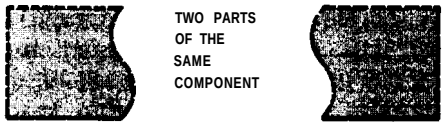
WIRE INSULATION	
COLOR	ABBREVIATIONS
BLACK	BK
BROWN	BR
RED	RD
YELLOW	YL
GREEN	GN
BLUE	BU
VIOLET	VI
GRAY	GY
WHITE	WT
PINK	PK



TWO CONNECTIONS (PINS) IN THE SAME CONNECTOR

DASHED LINE SHOWS PARTS OF THE SAME CONNECTOR

SCREW TERMINAL BLOCK



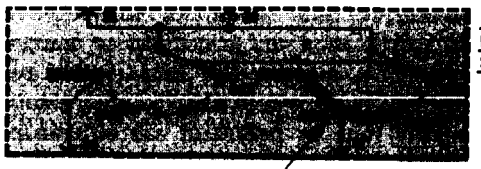
TWO PARTS OF THE SAME COMPONENT

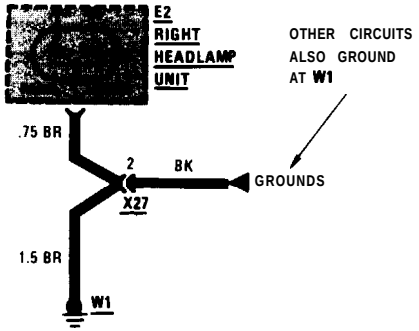
WIRE SIZE CONVERSION CHART	
METRIC (CROSS SECTIONAL AREA IN MM 2)	AWG (AMERICAN WIRE GAUGE)
.5	20
15	18
1	16
1.5	14
2	14
2.5	12
4	10
6	8
8	8
16	4
20	4
25	2
32	2

RELAY SHOWN WHEN COIL IS ENERGIZED, SWITCH WITH NO CURRENT IS PULLED CLOSED FLOWING THROUGH COIL

DIODE CURRENT CAN FLOW ONLY IN THE DIRECTION OF THE ARROW

TWO POLE, FOUR POSITION SWITCH

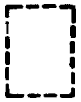


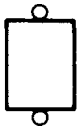


REVISIONS.

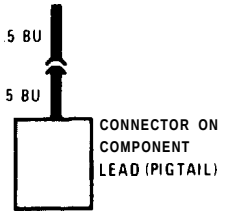
SYMBOLS


ENTIRE COMPONENT SHOWN

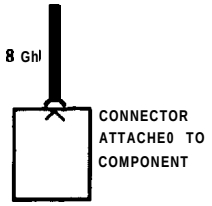

PART OF A COMPONENT SHOWN


COMPONENT WITH SCREW TERMINALS

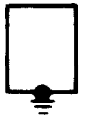

TRANSISTORIZED COMPONENT



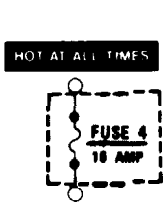
CONNECTOR ON COMPONENT LEAD (PIGTAIL)



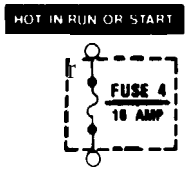
CONNECTOR ATTACHE0 TO COMPONENT


COMPONENT CASE IS DIRECTLY ATTACHED TO METAL PART OF CAR (GROUNDED)

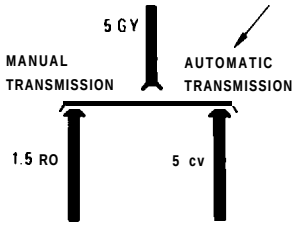

FUSE WITH SCREW TERMINALS



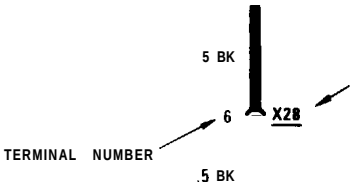
INDICATES THAT FUSE 4 IS ALWAYS SUPPLIED WITH POWER



INDICATES THAT FUSE 4 IS SUPPLIED WITH POWER WITH THE IGNITION SWITCH IN THE RUN OR START POSITIONS

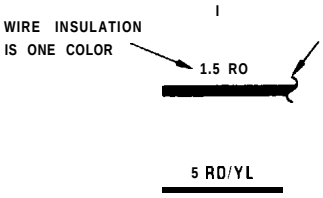


WIRE CHOICES FOR OPTIONS ARE SHOWN AN0 LABELEO



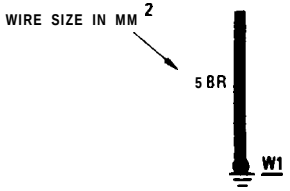
CONNECTOR REFERENCE NUMBER FOR COMPONENT LOCATION CHART

CHART ALSO SHOWS TOTAL NUMBER OF CONTACTS POSSIBLE: X28(6 PIN)



A WAVY LINE MEANS A WIRE IS TO BE CONTINUED

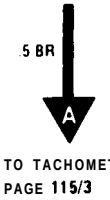
WIRE INSULATION IS ONE COLOR WITH ANOTHER COLOR STRIPE (RED WITH YELLOW1



WIRE IS ATTACHED TO METAL PART OF CAR (GROUNDED)

GROUND IS NUMBEREO FOR REFERENCE ON COMPONENT LOCATION CHART

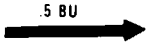
OTHER CIRCUITS THAT SHARE A GROUNO ARE SHOWN IN GROUNO DISTRIBUTION



TO TACHOMETER, PAGE 115/3

CURRENT PATH IS CONTINUED AS LABELEO THE ARROW SHOWS DIRECTION OF CURRENT FLOW AN0 IS REPEATED WHERE CURRENT PATH CONTINUES.

A WIRE WHICH CONNECTS TO ANOTHER CIRCUIT

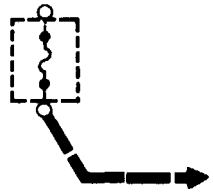


LAMPS: TURN/ HAZARD/STOP, PAGE 113

ALL MODELS

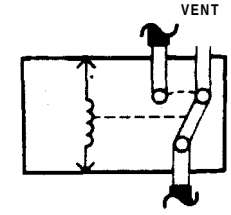
REVISIONS:

SYMBOLS

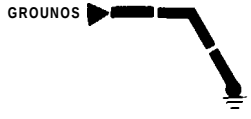


THIS FUSE FEEDS OTHER CIRCUITS WHICH ARE NOT SHOWN HERE THESE CIRCUITS ARE IDENTIFIED IN "POWER DISTRIBUTION"

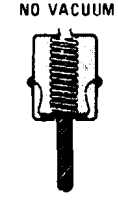
POWER DISTRIBUTION



A SWITCHOVER VALVE IS A SOLENOID OPERATED VACUUM VALVE THE VALVE IS VENTEO WHEN THE COIL OF THE SOLENOID IS OE ENERGIZED



CIRCUITS NOT SHOWN HERE SHARE THIS CROUNO THESE CIRCUITS ARE IDENTIFIED IN " CROUNO DISTRIBUTION "



VACUUM ELEMENTS PUSH OR PULL A SHAFT BETWEEN TWO FIXED POSITIONS WHEN VACUUM IS APPLIED. THE SHAFT IS PULLEO IN WHEN NO VACUUM IS PRESENT, THE SHAFT IS PUSHEO OUT BY A SPRING

VACUUM RESTRICTOR

VACUUM RESTRICTORS ARE POROUS BRASS PLUGS IN THE VACUUM HOSE. THE RESTRICTOR SLOWS THE VACUUM FLOW

INDUCTIVE SENSOR

TEMPERATURE SENSOR

CHECK VALVE

VACUUM CAN FLOW EASILV IN THE DIRECTION OF THE ARROW. VACUUM CANNOT FLOW AGAINST THE ARROW.

ALL MODELS

REVISIONS:

1/87

TROUBLESHOOTING PROCEDURE

1. VERIFY THE COMPLAINT
   Operate the problem circuit in all modes to check the accuracy of the complaint. This may give a clue as to the extent, nature, and location of the problem.
2. CHECK THE FUSE AND RELATED CIRCUITS
   Determine the extent of the problem by operating circuits which share the same fuse. If the other circuits work, the fuse is good. The cause must be within the wiring unique to the problem circuit.
3. REFER TO THE E.T.M. AND ANALYZE THE CIRCUIT
   Study the circuit schematic to learn how the circuit should operate. The schematic will tell you:
   - Where the circuit receives current.
   - What circuit protection is involved.
   - What switches control current flow.
   - How the loads operate.

   Understanding the total circuit is necessary if you are to troubleshoot efficiently. Determine possible problem areas and testing locations. The Component Location table tells where components and ground points are located.
4. SYSTEMATICALLY TEST THE CIRCUIT IN ORDER TO ISOLATE THE PROBLEM
   As a general guideline:
   - If the fault affects a single component of a circuit, start to test at that component.
   - If the fault affects a number of components of a circuit, start to test at the point where the circuit gets its power.
5. MAKE THE REPAIR
   After you have narrowed the problem down to a specific cause, repair as necessary.
6. VERIFY CIRCUITOPERATION
   First operate the repaired circuit in all modes to be sure you have fixed the entire problem. Next, operate all circuits which share the same fuse. Be sure that this does not cause the problem to reappear.

TESTING TOOLS

A VOLTMETER is used to measure voltage at various points within a circuit. If an analog VOLTMETER is used, it must have a resistance of at least 20,000 ohms per volt in the low range. Any digital VOLTMETER may be used.

Use of an OHMMETER should be limited to harness wiring, connections and switches. It should not be used on solid state components or relays. An OHMMETER measures a circuit for its resistance to current flow. Since an OHMMETER has an internal battery that provides current to the circuit under test, it is first necessary to disconnect the car battery. This will ensure that there is no voltage already present in the circuit.

An AMMETER measures the current flowing within a circuit. There are two types of AMMETERS: the SERIES AMMETER and the INDUCTIVE (clamp-on) AMMETER (e.g. Sun DMM-5). The INDUCTIVE AMMETER is clamped around a wire in the circuit under test. The SERIES AMMETER must be connected into the circuit.

A SERIES AMMETER must never be connected in parallel with a component. This can cause a short circuit and damage the meter.

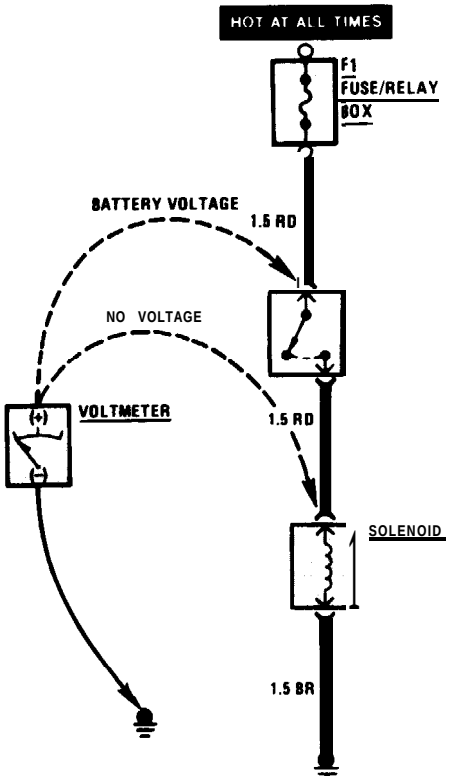
REVISIONS:

EXIT

TESTS

Voltage Test

1. Connect the negative lead of the VOLTMETER to a known good ground or negative (-) battery terminal.
2. Connect the positive lead of the VOLTMETER to a point (connector or terminal) you wish to test.
3. If the meter registers, there is voltage pre sent. This voltage should be within one volt of measured battery voltage. A loss of more than one volt indicates a problem. A loose connection is a likely cause. Take readings at several points along the circuit to isolate the problem.

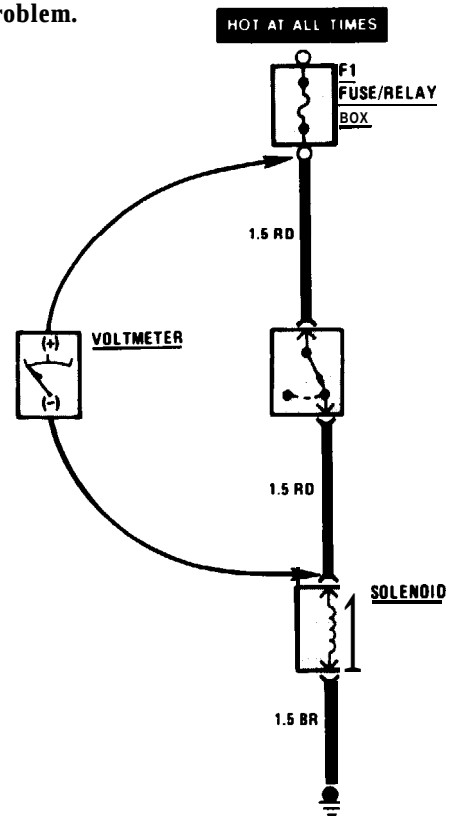


Voltage Test

Voltage Drop Test

This test checks for voltage being lost along a wire, or through a connection or switch.

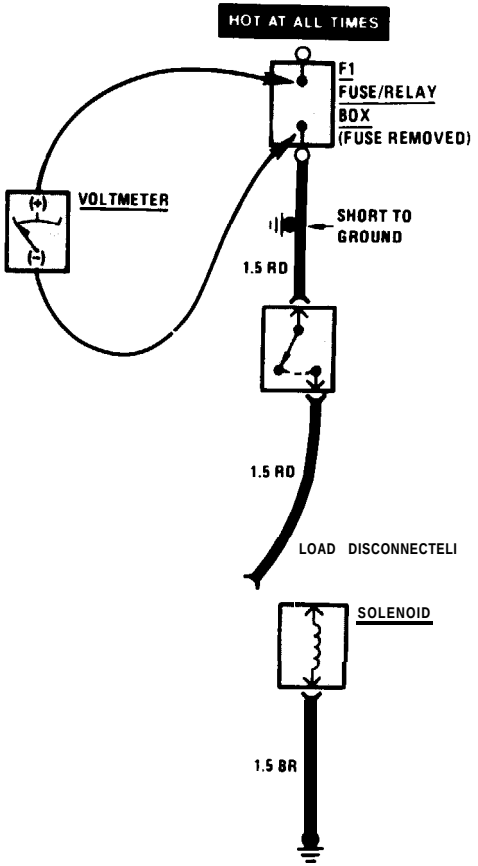
1. Connect the positive lead of the VOLTMETER to the end of the wire, or to the side of the connection which is closest to the battery.
2. Connect the negative lead to the other end of the wire, or the other side of the connection.
3. When the circuit is operated, the VOLTMETER will show the difference in voltage between the two points. A difference (or drop) of more than one volt indicates a problem.



Voltage Drop Test

Testing For Short to Ground With a Voltmeter

1. Remove the blown fuse and disconnect the load.
2. Connect the VOLTMETER across the fuse terminals.
3. Beginning near the fuse box, move the harness from side to side while watching the VOLTMETER.
4. If the meter registers, there is a short to ground in the wiring.



Testing for Short with Voltmeter

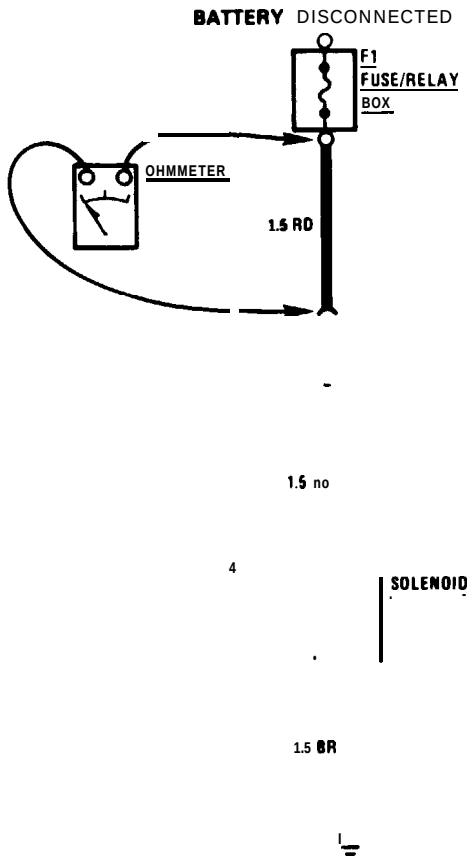
ALL MODELS

REVISIONS:

TROUBLESHOOTING

Continuity Test

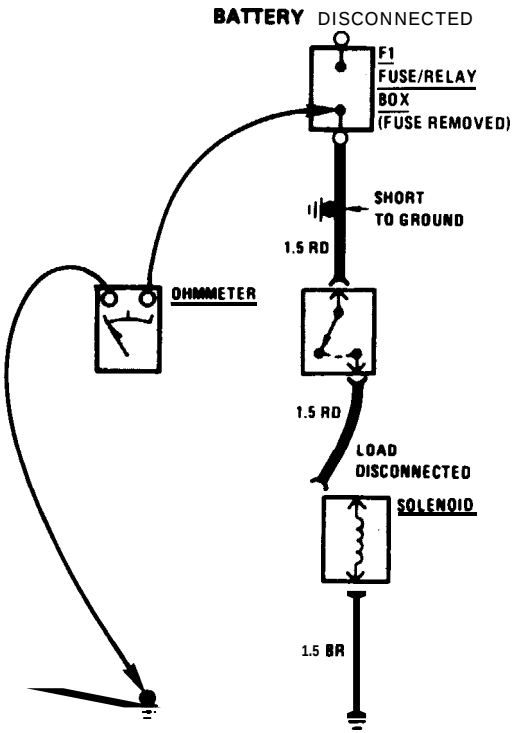
1. Check OHMMETER by adjusting the needle to zero while holding the leads together.
2. Disconnect the car battery.
3. Connect one lead of the OHMMETER to one end of the part of the circuit you wish to test.
4. Connect the other lead to the other end.
5. If the meter shows low or no resistance, there is continuity.



Continuity Test

Testing For Short to Ground With an Ohmmeter

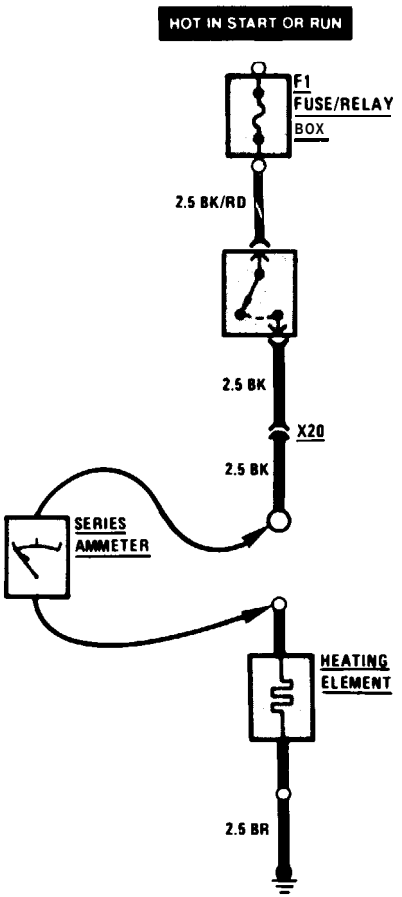
1. Calibrate OHMMETER by adjusting the needle to zero while holding the leads together.
2. Remove the blown fuse and disconnect the battery and load.
3. Connect one lead of the OHMMETER to the fuse terminal on the load side.
4. Connect the other lead to a known good ground.
5. Beginning near the fuse box, move the harness from side to side, while watching the OHMMETER.
6. If there is no short, the meter will show infinitely high resistance. If the meter registers low or no resistance, there is a short to ground in the wiring.



Tenting **for Short with Ohmmeter**

Current Test With a Series Ammeter

1. Disconnect the circuit at a convenient point such as a connector.
2. Connect a lead of the AMMETER to one side of the open circuit.
3. Connect the second lead of the AMMETER to the other side of the open circuit. The AMMETER completes the circuit.
4. With the circuit operating, the AMMETER will show how much current is flowing in the circuit.

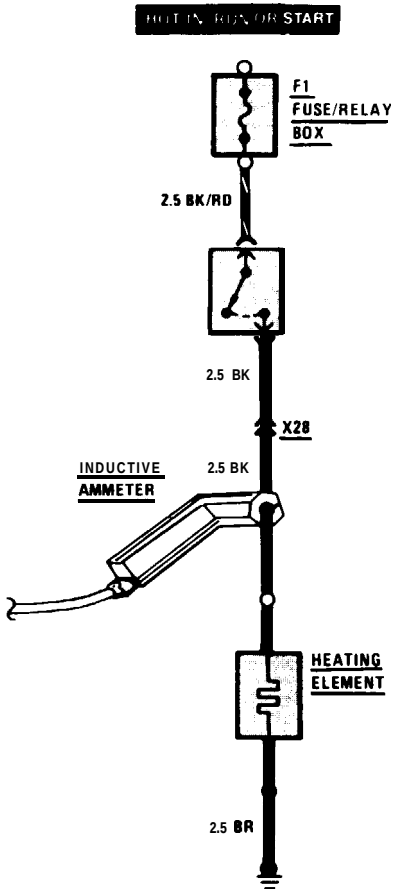


Current Test (Series Ammeter)

REVISIONS:

Current Test **With** an Inductive Ammeter

1. Clamp the AMMETER pliers around the **wire under test in the circuit.**
2. With the circuit operating, the AMMETER will show how much current is flowing in the circuit.

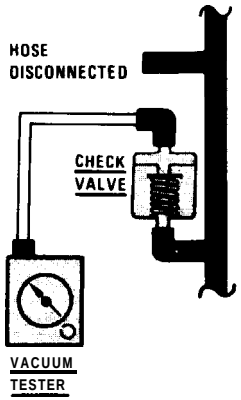


Current Test (**Inductive** Ammeter)

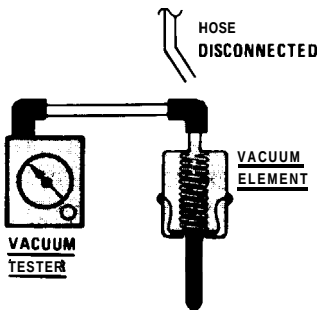
Troubleshooting Vacuum Components

A VACUUM TESTER is used to apply vacuum to vacuum components. The tester (M-B part no. 589 25 2100) registers in mbar of vacuum. Two typical applications of this **tester** are shown below.

PERMISSIBLE LEAKS	
Check Valves	50 mbar in 10 min. et 300 mbar vacuum
Other Vacuum Components	20 mbar/min. at 300 mbar vacuum



ONCE VACUUM IS APPLIEO, THE READING SHOULO REMAIN STABLE WITHIN THE LIMITSSHOWN ABOVE.

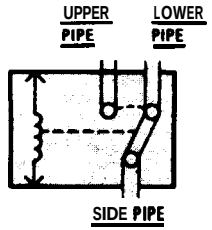


ELEMENT SHAFT SHOULD RETRACT AS VACUUM IS APPLIED BY TESTER. ONCE VACUUM **IS APPLIED,** THE READING SHOULD REMAIN **STABLE** WITHIN THE LIMITSSHOWN ABOVE.

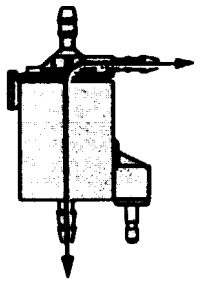
Switchover Valves (as of MY 1984)

The former switchover valves on all models are replaced by a standard switchover valve.

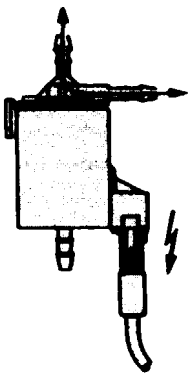
When de-energized (no current), the side and the lower pipes are connected to each other. When energized, the upper pipe connects to the side pipe. If only two pipes are used, a standard protective cap with vent is plugged onto the third pipe.



SCHEMATIC SYMBOL FOR **SWITCHOVER** VALVE



SWITCHOVER VALVE DE-ENERGIZE0



SWITCHOVER VALVE ENERGIZED

ALL MODELS

REVISIONS:

CIRCUIT IDENTIFICATION

Circuit	Description
1	Negative side of ignition coil (low voltage).
4	Output of ignition coil (high voltage).
15	Battery voltage; ignition/starter switch in "Run" (pos. 2) of "Start".
15R	Battery voltage; ignition/starter switch in ''Accy'' (pos. 1), "Run" (pos. 2) or "Start".
15R/30	Power feed for Power Seat Motors and Telescopic Steering Wheel.
15x	Battery voltage; ignition/starter switch in "Run" (Pos. 2).
16	Ignition switching unit connection from negative side of coil.
30	Battery voltage; "hot" at all times.
31	Ground.
31b	Switched ground.
49	Turn signal/hazard flasher input.
49a	Turn signal/hazard flasher output.
50	Starter motor control.
56	Power feed for headlamps.
56a	Headlamps; high beam and indicator lamp.
56b	Headlamps; low beam.
56d	Headlamp flasher.
58D	Instrument lamp output; from Electronic Control Unit.
58d	Instrument lamp output; from Rheostat.
58L	Parking, tail, side marker lamps; left side.
58R	Parking, tail, side marker lamps; right side.
58N	Fog lamps.
61	Charge indicator.
85	Relay winding; ground side.
86	Relay winding; positive side.
87	Relay output; normally open.
87a	Relay output; normally closed.
K, K30	Battery voltage; exterior lamp switch in "Parking" or "Headlamp" position.
L	Turn signal lamps; left side.
LA	Preglow indicator.'
N	Fog lamp switch; output.
NSE	Fog lamp switch; input.
	Battery voltage with exterior lamp switch in "Parking" or "Headlamp" position.
P30	Power feed for R and L standing lamps; battery voltage with ignition/starter switch in "Off" or "Accessory" position.
R	Turn signal lamps; right side.
TD	Engine speed signal.
	NOTE: Circuit identification numbers will appear on schematics inside component boxes. Connector terminal numbers will appear on schematics outside component boxes.

REVISIONS: