

1988
BMW 735i (E32)
Electrical
Troubleshooting
Manual
Vehicles Produced 1/87 - 8/87

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The purpose of this manual is to provide information to aid in electrical troubleshooting. It consists of schematics, component location information, harness routing views and connector views.

The manual is divided into sections called cells. In each cell electrical components that work together are shown together on one or more schematics. At the top of the page is the fuse (positive) that powers the circuit. The flow of current is shown through all wires, connectors, switches, and motors to ground (negative) at the bottom of the page.

Within the schematic all switches and sensors are shown "at rest," as though the Ignition Switch were off. For identification, component names are underlined and placed next to or above each component. Notes are included that describe how or when switches and other components work.

The Power Distribution schematics show the current feed through all the connections from the Battery and Alternator to each fuse and the Ignition and

Light Switches. If a Power Distribution schematic is combined with any other circuit schematic, a complete picture is made of how that circuit works. The Ground Distribution schematics show how several circuits are connected to common grounds. All wiring between components is shown exactly as it exists in the vehicles; however, the wiring is not drawn to scale. To aid in understanding electrical operation, wiring inside complicated components has been simplified. Further information regarding schematic symbols and references can be found in cell 0140 (Symbols).

With this car, BMW introduces the Central Body Electronics System. This system incorporates the use of a single module that controls many apparently unrelated functions. For instance, the Sunroof and Windshield Wipers are controlled by the same module. However, only the portion of the module that controls the Sunroof will appear in the Sunroof schematics.

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INTRODUCTION

Component Identification Information begins in cell 7000 and consists of the Component Location List, Component Location Photographs, and Harness Connector Faces. The Component Location List helps you find where the parts of the circuit are in the vehicle. A brief description of the location is given along with a reference to the photograph that shows the component and its connecting wires. The Harness Connector Faces show the cavity or terminal locations of all connectors having three or more pins. Harness Connector Faces help you locate test points. The drawings show the connector faces you see after the harness connector has been disconnected from a component.

TROUBLESHOOTING PROCEDURES

Diagnostic procedures for many of the circuits in this manual are included with the schematics. These procedures are based on a logical problem-solving procedure. The steps listed below are provided for those circuits that do not include diagnostic procedures. Following these steps will enable you to make a quick diagnosis of the problem.

1. Verify the Problem

Operate the problem circuit to check the accuracy of the complaint. Note the symptoms of the inoperative circuit.

2. Analyze the Problem

Refer to the schematic of the problem circuit in the ETM. Determine how the circuit is supposed to work by tracing the current path(s) from the power feed through the circuit components to ground. Then, based on the symptoms you noted in step 1 and your understanding of circuit operation, identify one or more possible causes of the problem.

3. Isolate the Problem

Make circuit tests to prove or disprove the preliminary diagnosis made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting. Test for the most likely cause of failure first. Try to make tests at points which are easily accessible.

4. Repair the Problem

Once the specific problem is identified, make the repair using the proper tools and safe procedures.

5. Check the Problem

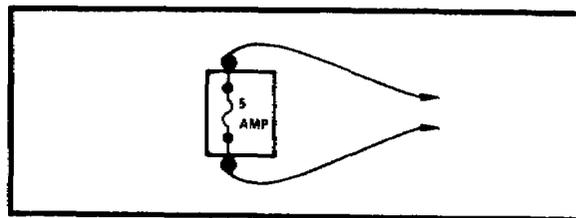
Operate the circuit to check for satisfactory circuit operation. Good repair practice calls for rechecking all circuits you have worked on.

TROUBLESHOOTING TOOLS

Isolating the problem (Step 3 of TROUBLESHOOTING PROCEDURES) requires the use of a voltmeter and/or ohmmeter. A voltmeter measures voltage at selected points in a circuit. An ohmmeter measures a circuit's resistance to current flow. It has an internal battery that provides current to the circuit under test. Disconnect the car battery when using an ohmmeter because the battery voltage will cause the ohmmeter to give false readings. Also, do not use an ohmmeter on solid state components. The voltage that the ohmmeter applies to the circuit could damage these components.

Fused Jumper Wire

A jumper wire is made up of an in-line fuse holder connected to a set of test leads. It should have a five ampere fuse. Use it for bypassing open circuits. Never use a jumper wire across any load (motors, etc.). This direct battery short will blow the fuse.



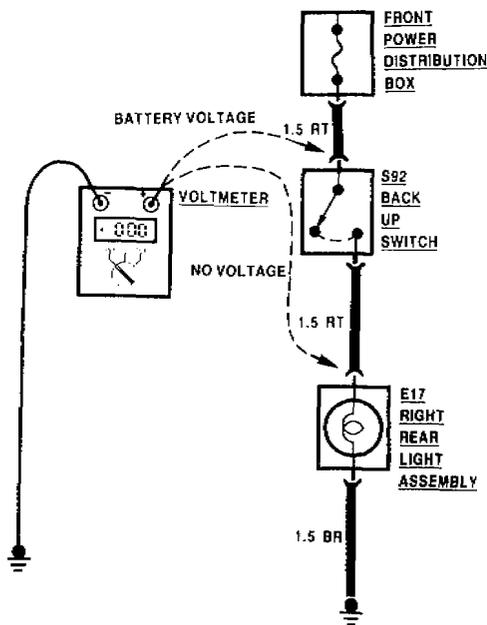
Fused Jumper Wire

TROUBLESHOOTING TESTS

Voltage Test

This test measures voltage in a circuit. By taking measurements at several points (terminals or connectors) along the circuit, you can isolate the problem.

To take a voltage measurement, connect the negative lead of the voltmeter to the battery's negative terminal or other known good ground. Then connect the positive lead of the voltmeter to the point you want to test. The voltmeter will measure the voltage present at that point in the circuit.

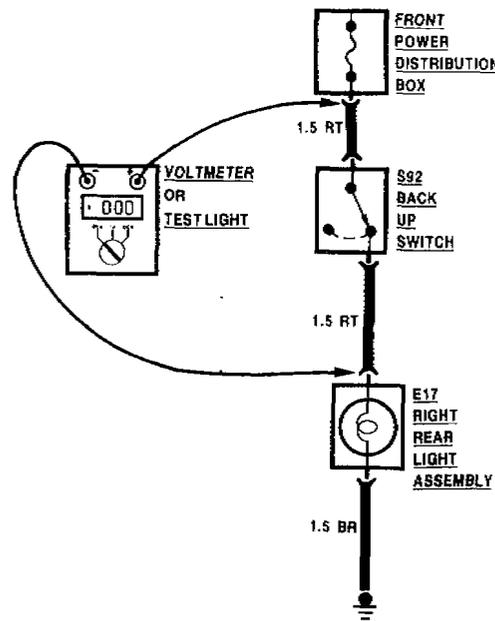


Voltage Test

Voltage Drop Test

Wires, connectors, and switches are designed to conduct current with a minimum loss of voltage. A voltage drop of more than one volt indicates a problem.

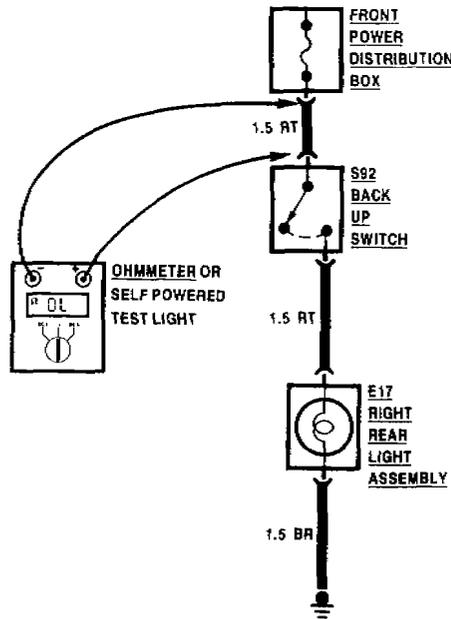
To test for voltage drop, connect the voltmeter leads to connectors at either end of the circuit's suspected problem area. The positive lead should be connected to the connector closest to the power source. The voltmeter will show the voltage drop between these two points. Any switches in the circuit should be on during this test.



Voltage Drop Test

Continuity Test

To perform a continuity test, first disconnect the car battery. Then, while holding the leads together, adjust the ohmmeter to read zero. Connect the ohmmeter leads to connector or terminals at either end of the circuit's suspected problem area. The ohmmeter will show the resistance across that part of the circuit. This test can also be performed with a self-powered test light.

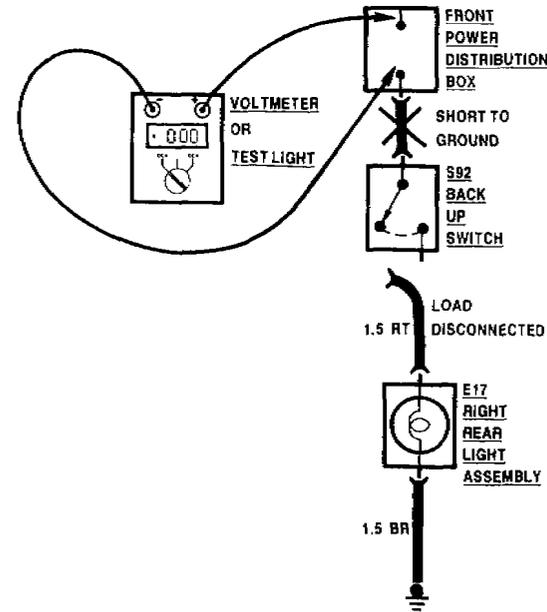


Continuity Test

Short Test Using voltmeter

To locate a wiring short to ground, remove the blown fuse and disconnect the load. Connect the voltmeter leads to the fuse terminals. The positive lead should be connected to the terminal closest to the power source.

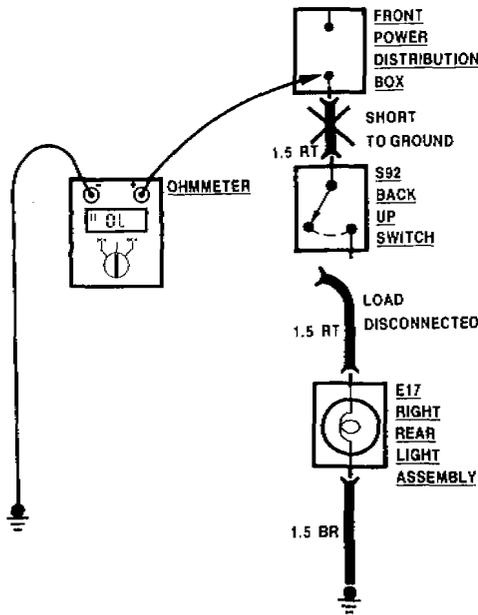
Starting near the FRONT POWER DISTRIBUTION BOX, move the wire harness back and forth and watch the voltmeter reading. If the voltmeter registers a reading, there is a short to ground in the wiring. Somewhere in the area of the harness being moved, the wire insulation is worn away and the circuit is grounding.



Short Test Using Voltmeter

Short Test Using Ohmmeter

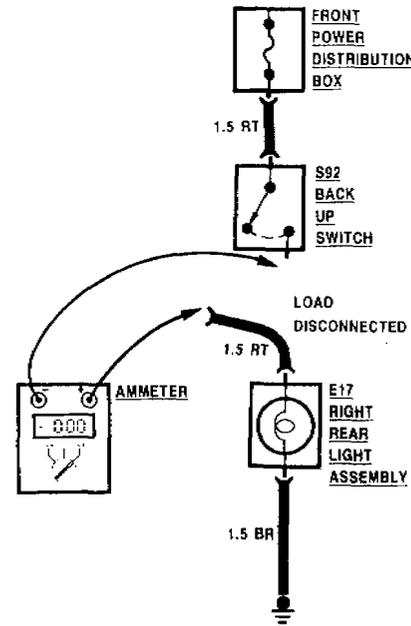
Disconnect the battery. While holding the leads together, adjust the ohmmeter to read zero. Remove the blown fuse and disconnect the load. Connect one lead of the ohmmeter to the fuse terminal that is closest to the load. Connect the other lead to a known good ground. Starting near the FRONT POWER DISTRIBUTION BOX, move the wire harness back and forth and watch the ohmmeter reading. Low or no resistance indicates a short to ground in the wiring. Infinitely high resistance indicates no short.



Short Test Using Ohmmeter

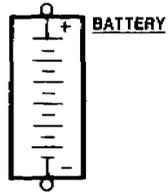
Current Test Using Ammeter

To measure the current, connect the ammeter leads to the connector or terminals in series with the circuit. The ammeter will show the current through the circuit.



Current Test Using Ammeter

SYMBOLS



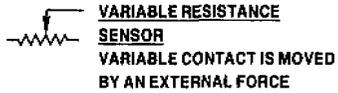
BATTERY



FUSE



CIRCUIT
BREAKER



VARIABLE RESISTANCE
SENSOR
VARIABLE CONTACT IS MOVED
BY AN EXTERNAL FORCE



VARIABLE RESISTOR
RESISTANCE IS CHANGED
BY TEMPERATURE OR
PRESSURE



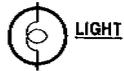
DIODE
CURRENT CAN FLOW ONLY
IN DIRECTION OF ARROW



ZENER DIODE
TO REGULATE VOLTAGE



LIGHT
EMITTING
DIODE



LIGHT



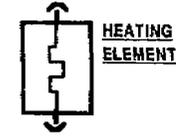
BIFILAMENT
LIGHT



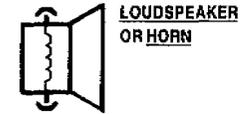
PERMANENT
MAGNET
MOTOR
ONE SPEED



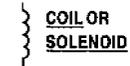
PERMANENT
MAGNET
MOTOR
TWO SPEEDS



HEATING
ELEMENT



LOUDSPEAKER
OR HORN



COIL OR
SOLENOID



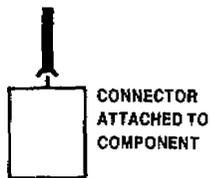
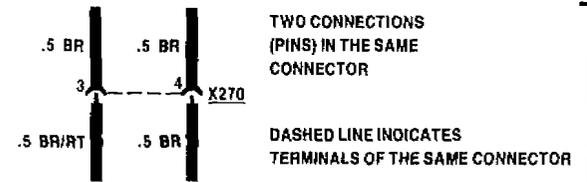
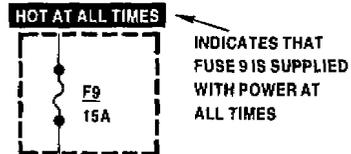
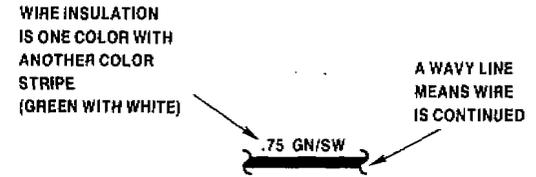
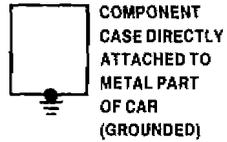
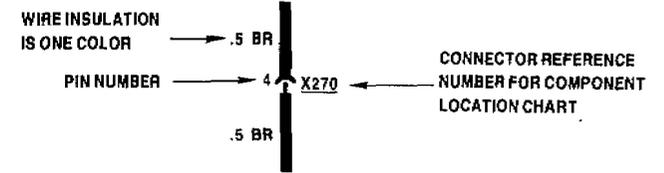
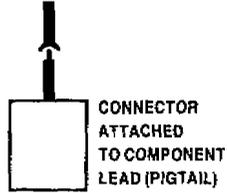
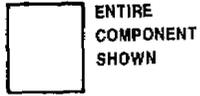
SOLENOID
CONTROLLED
VALVE OR
CLUTCH
SOLENOID



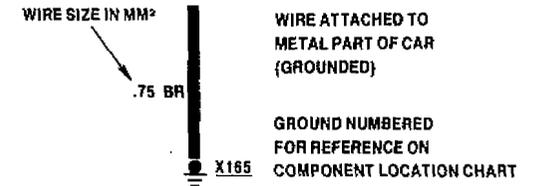
TRANSISTORIZED
SWITCH



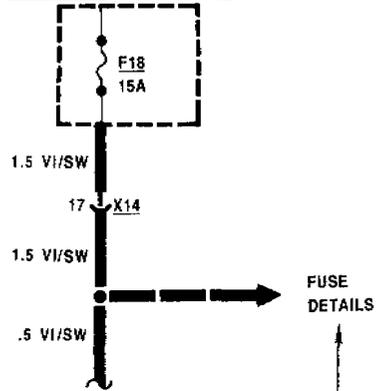
SYMBOLS



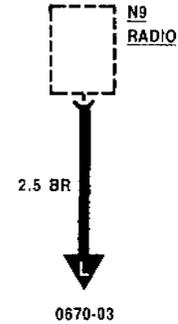
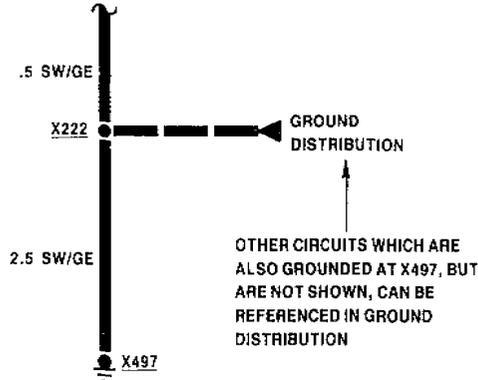
TERMINAL NUMBER	DESCRIPTION
50	VOLTAGE: IGNITION SWITCH IN START
30	VOLTAGE: SUPPLIED AT ALL TIMES
15	VOLTAGE: IGNITION SWITCH IN RUN OR START
15E	VOLTAGE: IGNITION SWITCH IN RUN
R	VOLTAGE: IGNITION SWITCH IN ACCESSORY, RUN, OR START



HOT IN ACC, RUN OR START



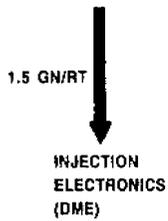
OTHER CIRCUITS WHICH SHARE FUSE 18, BUT ARE NOT SHOWN, CAN BE REFERENCED IN FUSE DETAILS



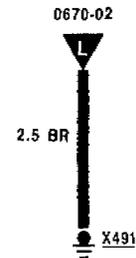
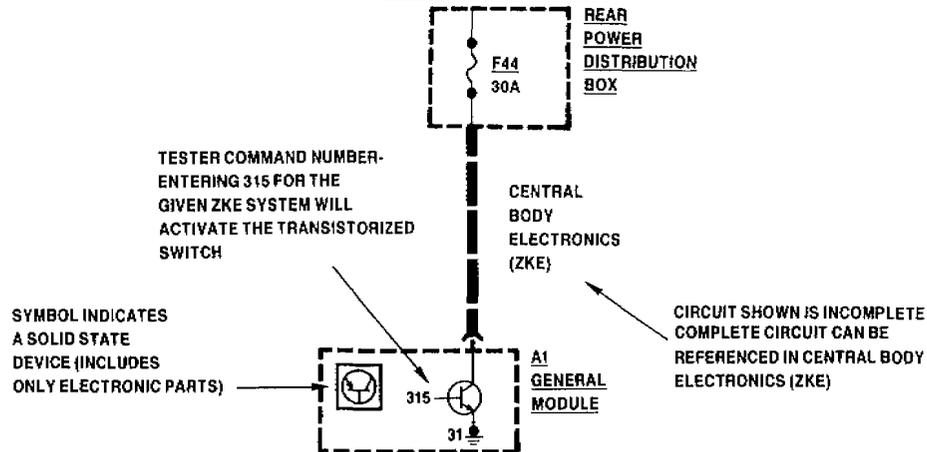
CURRENT PATH IS CONTINUED AS LABELED

ARROW SHOWS DIRECTION OF CURRENT FLOW AND IS REPEATED WHERE CURRENT PATH CONTINUES

CIRCUIT REFERENCE — A WIRE WHICH CONNECTS TO ANOTHER CIRCUIT



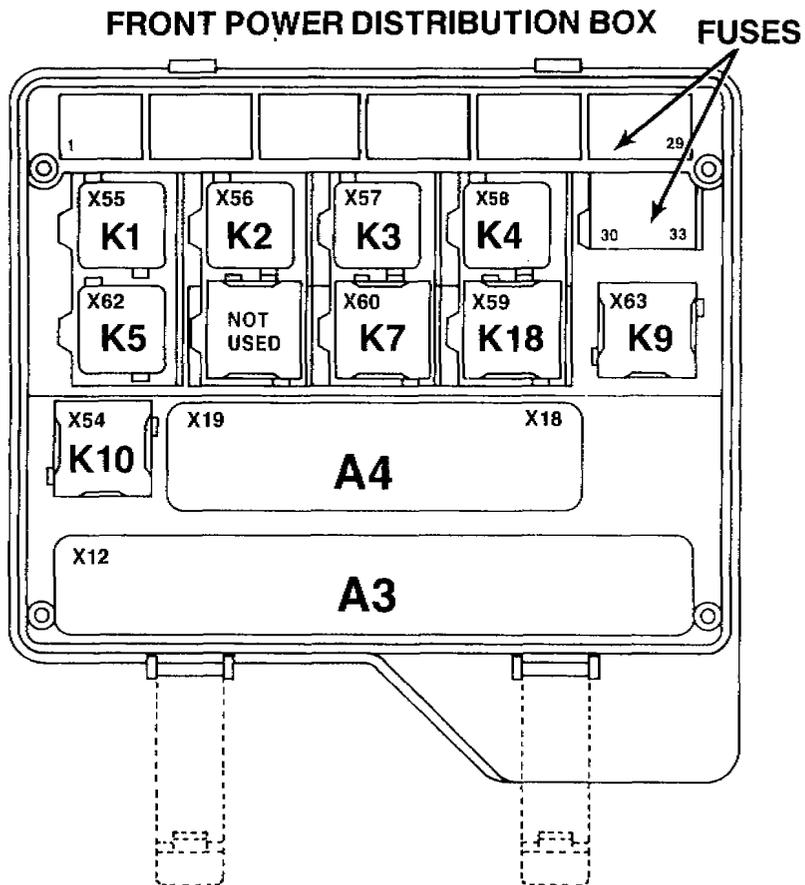
HOT IN ACC, RUN OR START





POWER DISTRIBUTION CHARTS

FRONT POWER DISTRIBUTION BOX

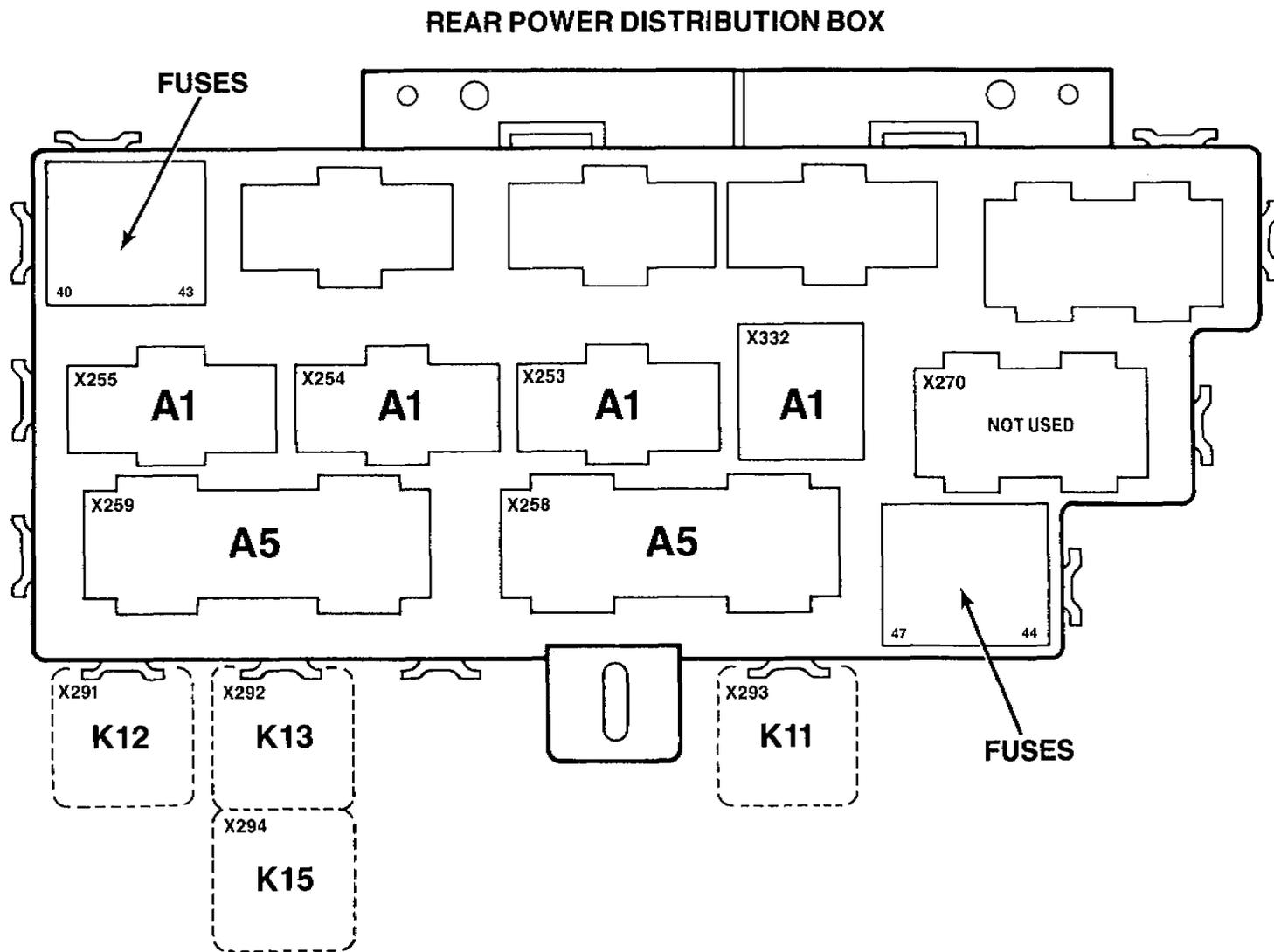


COMPONENTS IN FRONT POWER DISTRIBUTION BOX		
NUMBER	CONNECTOR	DESCRIPTION
A3	X12	LAMP CONTROL MODULE
A4	X18, X19	CHECK CONTROL MODULE
K1	X55	STARTER RELAY
K2	X56	HORN RELAY
K3	X57	UNLOADER RELAY, KLR
K5	X62	INTENSIVE WASH PUMP RELAY
K7	X60	PARKING LIGHT MONITOR RELAY
K9	X63	UNLOADER RELAY, KL15
K10	X54	ABS RELAY
K18	X64	FRONT DEFOGGER/WATER PUMP RELAY
K4	X58	BLOWER RELAY



POWER DISTRIBUTION CHARTS

REAR POWER DISTRIBUTION BOX



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POWER DISTRIBUTION CHARTS

REAR POWER DISTRIBUTION BOX

COMPONENTS IN REAR POWER DISTRIBUTION BOX		
NUMBER	CONNECTOR	DESCRIPTION
A1	X253, X254, X255 AND X332	GENERAL MODULE
A5	X258, X259	RELAY MODULE
K11	X293	WIPER RELAY
K12	X291	WIPER PRESSURE CONTROL RELAY (ADV)
K13	X292	REAR DEFOGGER RELAY
K15	X294	ELECTRIC POWER PROTECTION RELAY



FUSE CHARTS

Fuse No.	Size/ Color	Circuit Protected
1	7.5A(BR)	Brake Lining Warning (Also Fuses 17 and 20) Instrument Cluster/Check Control (Also Fuses 12, 17, 20 and 21) On-Board Computer (Also Fuses 17 and 20) Windshield Washer (ZKE) Windshield Wiper (ZKE)
2	7.5A(BR)	Headlights/Fog Lights (Also Fuses 3, 5, 7, 10, 11, 13 and 14) Lamp Monitor (Also Fuses 3, 4, 5, 7 and 15)
3	7.5A(BR)	Headlights/Fog Lights (Also Fuses 2, 5, 7, 10, 11, 13 and 14) Lamp Monitor (Also Fuses 2, 4, 5, 7 and 15) Turn/Hazard Lights (Also Fuse 6)
4	7.5A(BR)	Lamp Monitor (Also Fuses 2, 3, 5, 7 and 15) Park/Tail/Marker/Underhood Lights (Also Fuses 5, 15 and 20)
5	10A(RT)	Glove Box Light/Cigar Lighter/Ashtray Light/Charging Plug (Also Fuses 21 and 26) Headlights/Fog Lights (Also Fuses 2, 3, 7, 10, 11, 13 and 14) Lamp Monitor (Also Fuses 2, 3, 4, 7 and 15) License/Trunk Lights (Also Fuse 21) Park/Tail/Marker/Underhood Lights (Also Fuses 4, 15 and 20)
6	7.5A(BR)	Turn/Hazard Lights (Also Fuse 3)
7	15A(LT BL)	Headlights/Fog Lights (Also Fuses 2, 3, 5, 10, 11, 13 and 14) Lamp Monitor (Also Fuses 2, 3, 4, 5 and 15)
8	7.5A(BR)	(Not Used)
9	15A(LT BL)	Automatic Climate Control (IHKA) (Also Fuses 19, 20, 21, 29 and 33) Horn
10	7.5A(BR)	Headlights/Fog Lights (Also Fuses 2, 3, 5, 7, 11, 13 and 14)
11	7.5A(BR)	Headlights/Fog Lights (Also Fuses 2, 3, 5, 7, 10, 13 and 14)

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Fuse No.	Size/ Color	Circuit Protected
12	15A(LT BL)	Back Up Lights Instrument Cluster/Check Control (Also Fuses 1, 17, 20, and 21) Memory Mirrors (Also Fuses 16, 17, 18, 30, 42, and 44) Windshield Washer Jet Heaters
13	7.5A(BR)	Headlights/Fog Lights (Also Fuses 2, 3, 5, 7, 10, 11 and 14)
14	7.5A(BR)	Headlights/Fog Lights (Also Fuses 2, 3, 5, 7, 10, 11 and 13)
15	7.5A(BR)	Antilock Brake System (ABS) (Also Fuses 17 and 29) Brake Lights Cruise Control (Tempomat) (Also Fuse 17) Lamp Monitor (Also Fuses 2, 3, 4, 5, 7 and 8) Park/Tail/Marker/Underhood Lights (Also Fuses 4, 5 and 20)
16	30A(LT GN)	Memory Mirrors (Also Fuses 12, 17, 18, 30, 42 and 44) Memory Seat (Also Fuses 17, 18, 30, 42 and 44)



FUSE CHARTS

Fuse No.	Size/Color	Circuit Protected
17	7.5A(BR)	Antilock Brake System (ABS) (Also Fuses 15 and 29) Antitheft System (DWA) (Also Fuses 18, 20 and 31) Brake Lining Warning (Also Fuses 1 and 20) Central Body Electronics (ZKE) (Also Fuses 30, 44 and 47) Cruise Control (Tempomat) (Also Fuse 15) Door Lock Heating (ZKE) (Also Fuse 30) Electronic Transmission Control (AEGS) Injection Electronics (DME) (Also Fuse 23) Instrument Cluster/Check Control (Also Fuses 1, 12, 20 and 21) Interior Lights (ZKE) (Also Fuses 21, 30 and 44) On-Board Computer (Also Fuses 1 and 20) Memory Mirrors (Also Fuses 12, 16, 18, 30 42 and 44) Memory Seat (Also Fuses 16, 18, 30, 42 and 44) Power Windows (ZKE) (Also Fuses 20, 30, 31 and 44) Start Sunroof (ZKE) (Also Fuses 20, 30, 31 and 44)
18	15A(LT BL)	Antitheft System (DWA) (Also Fuses 17, 20 and 31) Memory Mirrors (Also Fuses 12, 16, 17, 30, 42 and 44) Memory Seat (Also Fuses 16, 17, 30, 42 and 44) Radio (Also Fuses 21 and 41)
19	30A (LT GN)	Automatic Climate Control (IHKA) (Also Fuses 9, 20, 21, 29 and 33)

BMW
7 **FUSE CHARTS**

Fuse No.	Size/ Color	Circuit Protected
20	7.5A(BR)	Antitheft System (DWA) (Also Fuses 17, 18 and 31) Automatic Climate Control (IHKA) (Also Fuses 9, 19, 21, 29 and 33) Brake Lining Warning (Also Fuses 1 and 17) Central Locking System (ZKE) (Also Fuses 30 and 31) Instrument Cluster/Check Control (Also Fuses 1, 12, 17 and 21) On-Board Computer (Also Fuses 1 and 17) Park/Tail/Marker/Underhood Lights (Also Fuses 4, 5 and 15) Power Windows (ZKE) (Also Fuses 17, 30, 31 and 44) Sunroof (ZKE) (Also Fuses 17, 30, 31 and 44)
21	7.5A(LT BL)	Automatic Climate Control (IHKA) (Also Fuses 9, 19, 20, 29 and 33) Glove Box Light/Cigar Lighter/Ashtray Light/Charging Plug (Also Fuses 5 and 26) Instrument Cluster/Checker Control (Also Fuses 1, 12, 17 and 20) Interior Lights (ZKE) (Also Fuses 17, 30 and 44) License/Trunk Lights (Also Fuse 5) Radio (Also Fuses 18 and 41)
22	30A(LT GN)	Windshield Wiper Pressure Control (ZKE) (Also Fuse 44)
23	7.5A(BR)	Injection Electronics (DME) (Also Fuse 17)
24	7.5A(BR)	(Not Used)
25	30A(LT GN)	Auxiliary Fan (Also Fuse 29)
26	30A(LT GN)	Glove Box Light/Cigar Lighter/Ashtray Light/Charging Plug (Also Fuses 5 and 21)
27	30A(LT GN)	(Not Used)
28	15A(LT BL)	Power Assist Steering (Servotronic)
29	7.5A(BR)	Antilock Brake System (ABS) (Also Fuses 15 and 17) Automatic Climate Control (IHKA) (Also Fuses 9, 19, 20, 21 and 33) Auxiliary Fan (Also Fuse 25) Rear Window Defogger (Also Fuses 33 and 46)

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