1992-93 System Wiring Diagrams

Audi - S4

HOW TO USE WIRING DIAGRAMS

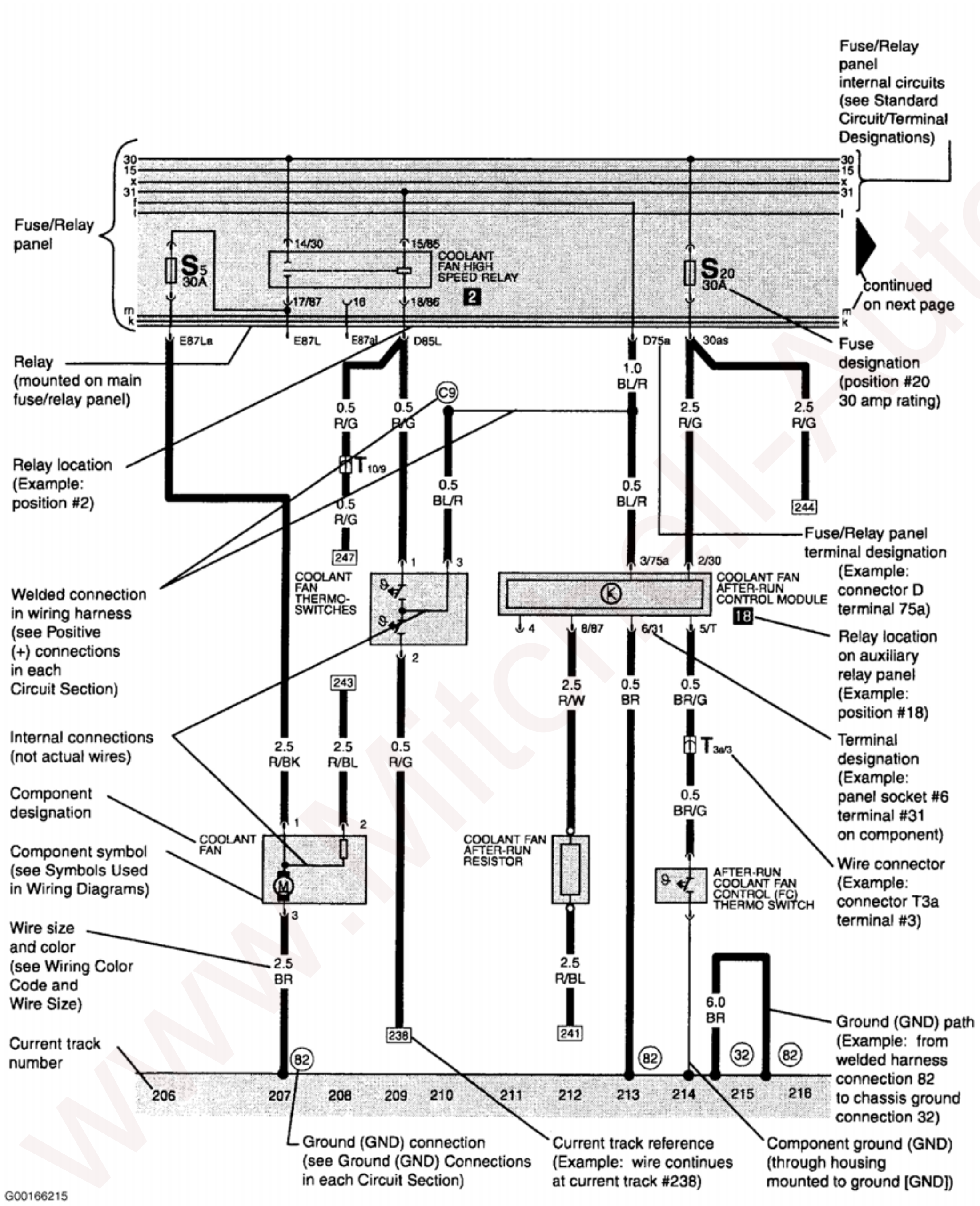

Fig. 1: How To Read Wiring Diagrams
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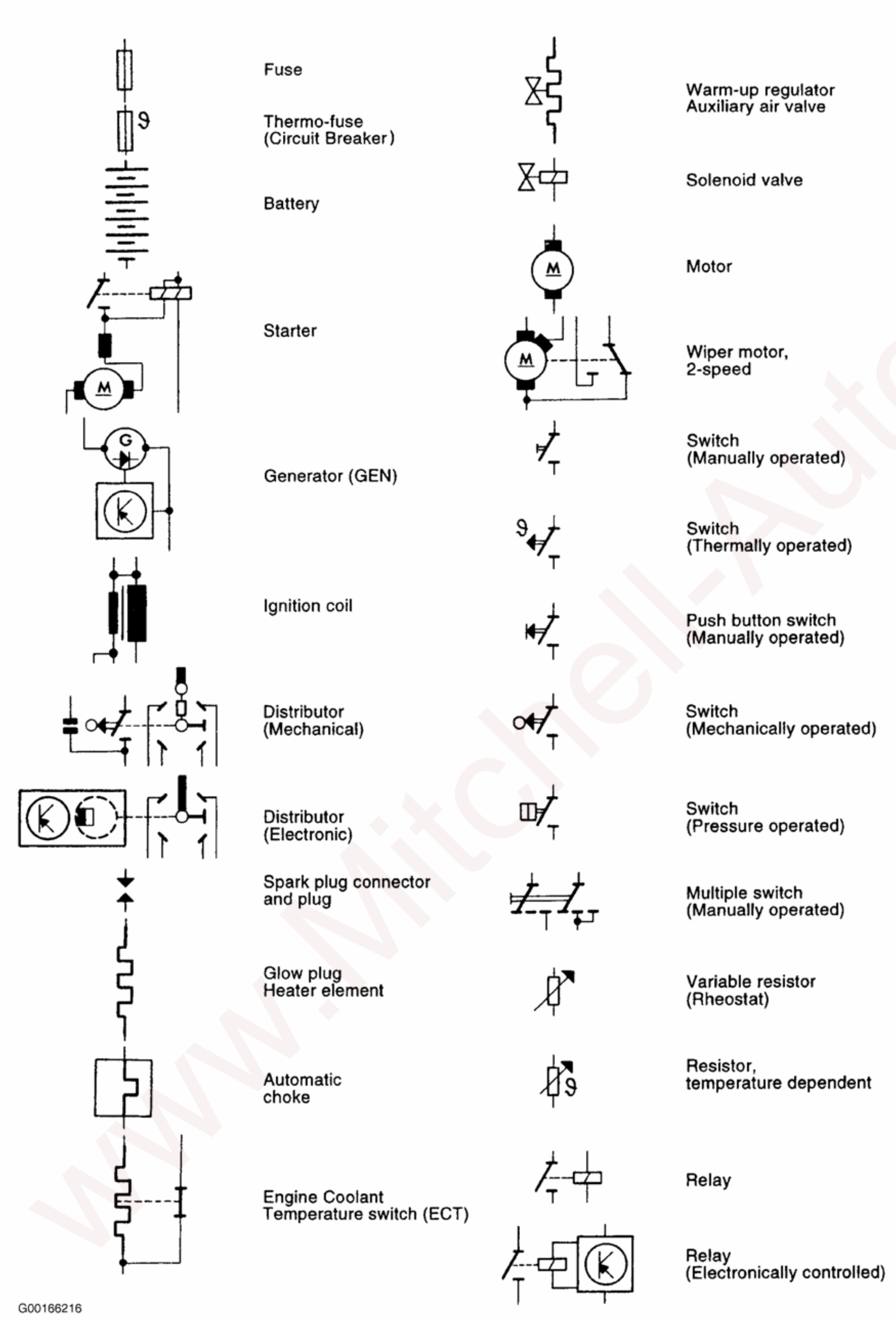

Fig. 2: Wiring Diagram Symbols (1 Of 2)
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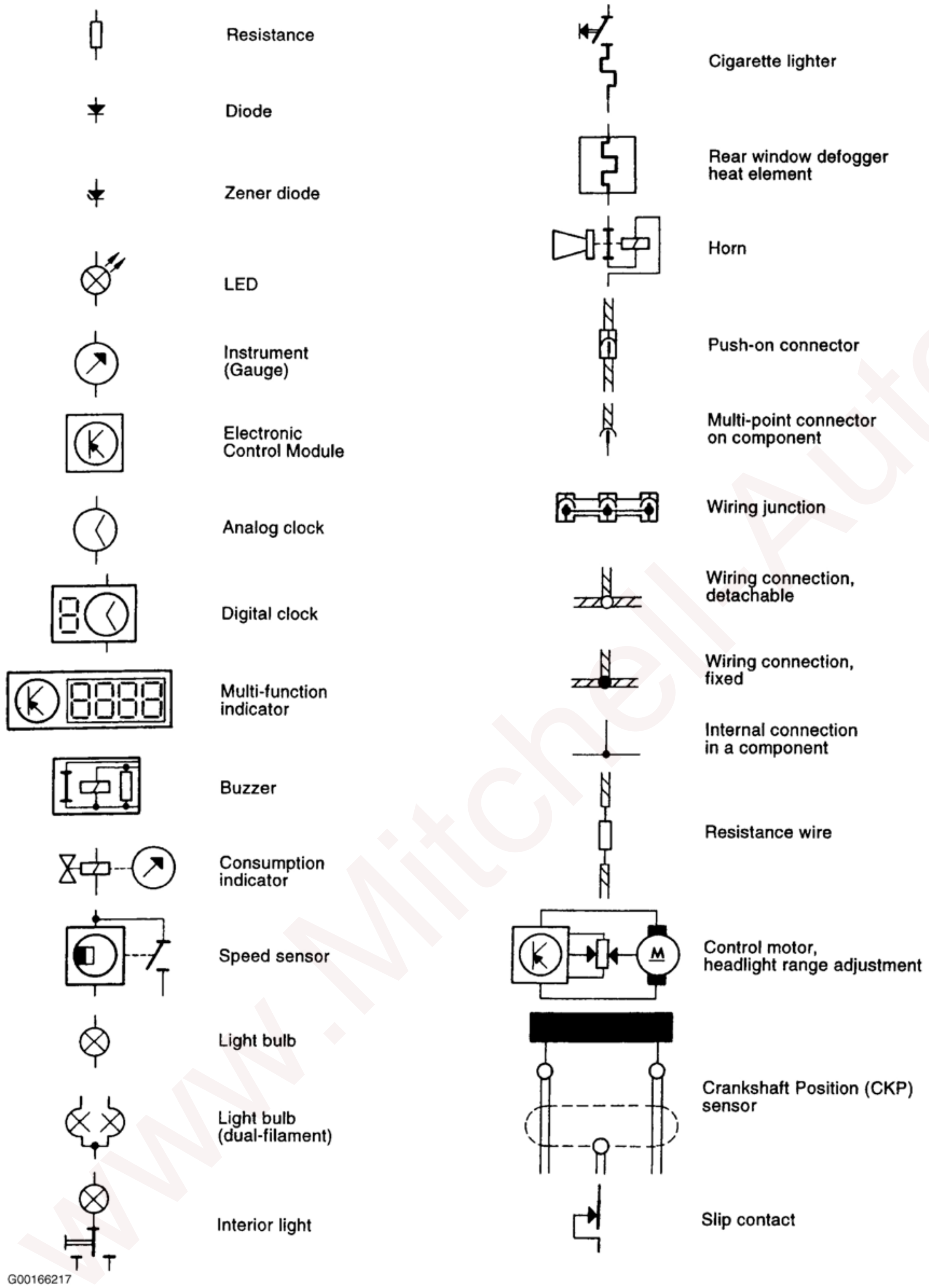

Fig. 3: Wiring Diagram Symbols (2 Of 2)
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Circuit Number	Circuit Description	Most Common Wire Color
15	Powered when ignition switch is in "On" or "Start" positions	Black (BK)
x	Load-reduction circuit Powered by load-reduction relay when ignition switch is in "On" position (Not powered in "Start" position)	Black/Yellow (BK/Y)
30	Battery positive (+) Voltage Powered whenever battery is connected	Red (R)
31	Ground (GND) or battery negative (–)	Brown (BR)
50	Powered only when ignition switch is in "Start" position	Red/Black (R/BK)
B+	From generator (GEN) Charging Voltage to battery	Red (R)
D+	Generator (GEN) warning light and field energizing circuit	—
85	Ground (GND) (–) side of switching relay	Brown (BR)
86	Power-input (+) side of switching relay	—
87	Relay change-over contact	—

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Fig. 4: Standard Circuit & Terminal Designations
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TROUBLE SHOOTING

Troubleshooting

Basic Electricity

Electricity is defined by three basic elements: Voltage, Current and Resistance.

Voltage

Voltage is a measure of electromotive force, sometimes referred to as electrical "pressure". It can be described as the difference in potential (potential for the flow of electricity) between any two points in a circuit.

A typical automobile battery, for example, has a difference in potential of about 12 Volts between the positive (+) terminal and the negative (–) terminal.

The basic units of electrical potential are **Volts** (V). Very low Voltages are expressed as **millivolts** (mV).
1 V = 1000 mV; 1 mV = .001 V

Current

Current is the term describing the flow of electricity through a conductor. In a complete circuit, potential (Voltage) will cause current to flow from positive (+) to negative (–).

The basic units of current flow are amperes or **amps** (A). Small amounts of current flow are often measured in **millamps** (mA).
1 A = 1000 mA; 1 mA = .001 A

Resistance

Resistance resists or opposes the flow of electricity. Conductors are made from materials of low resistance that allow electricity to flow easily. Insulators are materials of very high resistance that inhibit the flow of electricity.

The basic unit of resistance is the **Ohm** Ω. High resistance values are often expressed as Kilohms (KΩ).
1 KΩ = 1000Ω

Resistance vs. Current Flow

The basic rule of electricity (Ohm's Law) states that one unit of force (1 Volt) is required for one unit of current (1 am) to flow against one unit of resistance (1 Ohm). From Ohm's Law, we also know that:

Voltage = Current x Resistance

When Voltage is approximately constant, as in an automobile electrical system, current and resistance affect each other. As resistance increases, there will be less current flow. And lower resistance will permit higher current flow.

Higher resistance = lower current flow
Example: Corrosion on a headlight connector (higher resistance) causes the light to be dim (lower current flow).

Lower resistance = higher current flow
Example: A damaged wire shorted to ground (GND) (lower resistance) overloads circuit capacity (higher current flow) and blows a fuse.

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Fig. 5: Trouble Shooting Basic Electricity
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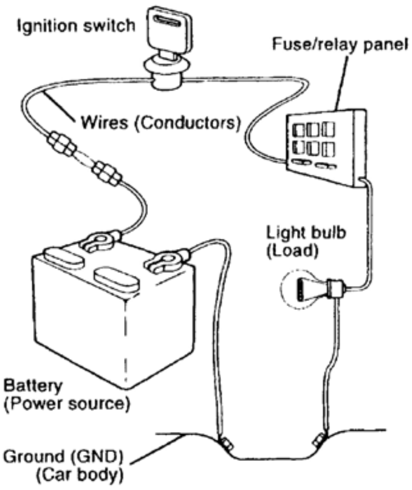
Definition of a Circuit

Four things are required for current to flow in any electrical circuit, and for that circuit, and for that circuit to function as intended:

- **Power Source** (Voltage)
- **Conductors** (wires, printed circuits, etc.)
- **Load or Consumer** (a user of electrical power)
- **Complete Circuit** (a connection to ground (GND))



A complete circuit

Open Circuits

An open circuit is an incomplete circuit. An open circuit occurs when some kind of malfunction interrupts the circuit path and prevents current flow. Some common causes of open circuits are:

- broken wire
- loose or disconnected connector
- loose or damaged connector terminal
- corrosion
- malfunctioning fuse or component

Test for an open circuit by checking continuity using an Ohmmeter (multimeter), or by checking for Voltage at various points of the circuit using a test light or Voltmeter (multimeter). See **Checking Wiring and Components.**

Short Circuits

A short circuit is an unintended complete circuit. A short circuit occurs when some kind of malfunction causes current flow to follow the wrong path.

A short circuit to ground (GND) (grounded circuit) may prevent Voltage from reaching a component. If Voltage is shorted directly to ground (GND), bypassing any load, the unrestricted current flow will damage fuses, wires or components. Some common causes of short circuits are:

- damaged wire or wiring harness
- malfunctioning insulation
- internally damaged component
- incorrect connection

Test for a short circuit to ground (GND) using a multimeter or a test light to indicate circuit malfunctions and abnormal current flow paths. See **Checking for Short Circuit to Ground (GND).**

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Fig. 6: Definition Of A Circuit
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Troubleshooting Procedure

Verify the complaint – Check the complaint. Try to understand the problem. If possible, let the driver show you what happens. Check all functions of the system and note the symptoms before starting any testing or disassembly.

Analyze the problem – Identify the part of the electrical system that is most likely to be causing the problem. Find the Circuit Section in the manual that applies to that part of the system. Find the wiring diagram that applies to the vehicle. By following the circuit from a ground (GND) back to the power source, get an understanding of how the circuit works.

Find the problem – You will find the problem if you follow a simple and logical step-by-step procedure. Test portions of the circuit one at a time, starting with the area or component most likely to be malfunctioning. Test first at points that you can reach most easily.

Repair the problem – When you find the cause of the problem, make the repair. Use appropriate tools and procedures.

Check the results – Be sure it works. Check the functions of all parts of the circuit that you worked on.

Working on the Electrical System

A test light or a multimeter can be very helpful for testing circuits.

Current flow is logical, always moving from the highest potential at the Voltage source (+) toward the lowest potential at ground (–). Using a wiring diagram to trace a circuit, you should start with the ground (GND) and then follow the wires back to the source of power.

To troubleshoot a circuit:

1. Inspect all connections, especially grounds (GND). Make sure they are clean, tight and corrosion-free.
2. Check the fuses.

> ***Note***
>
> *Repeated fuse failures are the sign of a malfunctioning wire, a failed component, or a short to ground (GND) somewhere in the circuit.*

3. Check for Voltage reaching particular components or points in the circuit.
4. Check continuity between points to look for breaks in the circuit (open circuit).
5. Check Voltage drop at connections, especially ground (GND) connections.

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Fig. 7: Trouble Shooting Procedure
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Checking for voltage

Checking for Voltage confirms that the circuit is uninterrupted between the Voltage source and the test point. The example illustrates troubleshooting the high-speed circuit for the radiator cooling fan.

Voltage: If the test light or multimeter indicates Voltage potential, then the circuit between the Voltage source and terminal 1 of the fan connector is OK.

NO Voltage: Power is not reaching the fan connector. The fan is probably OK. Look for a malfunction somewhere between the Voltage source and the fan connector. (Example: Check for Voltage reaching terminal E87La of the fuse/relay panel)

> ***CAUTION***
>
> *Direct contact with meter probes at the connector terminals can easily damage the small contacts, causing poor connections and risking future intermittent malfunctions.*

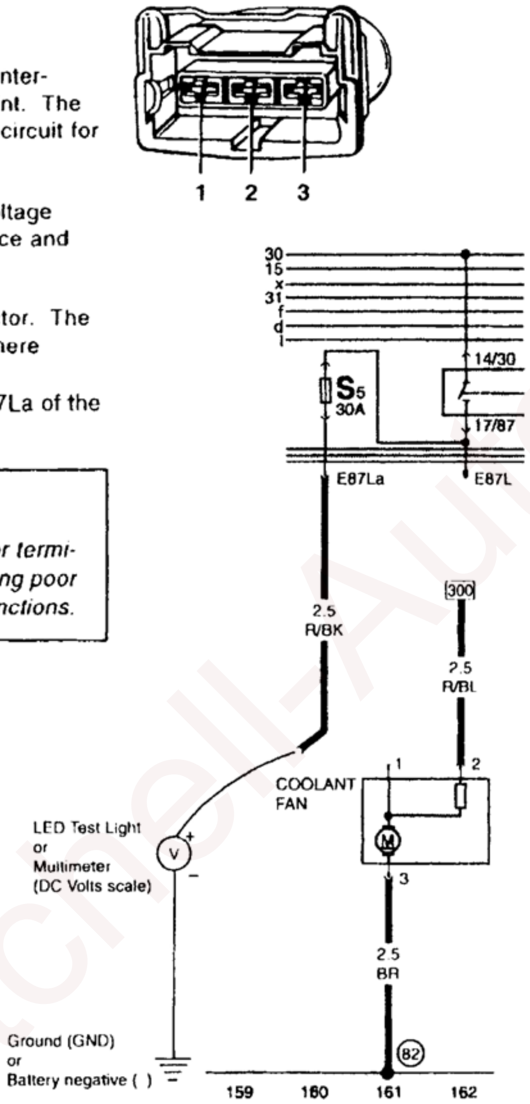

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Fig. 8: Checking For Voltage
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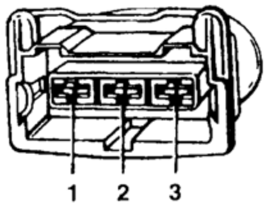
Checking Ground (GND) Connections

Checking ground (GND) connections as shown confirms that the circuit is complete - that the necessary path to ground (GND) is uninterrupted and current can flow in the circuit. The example illustrates troubleshooting the high-speed circuit for the radiator cooling fan.

Voltage: If the test light or multimeter indicates Voltage, then there is potential for current flow between the known Voltage source and ground (GND) at the test point. The ground (GND) side of the circuit, between terminal 3 of the fan connector and battery negative (–), is OK.

NO Voltage: The test point is not providing a path that completes the circuit to ground (GND). The fan is probably OK. Look for a malfunction somewhere in the wiring between the fan connector and chassis ground (GND). Also check the mechanical ground connection at the chassis (body).



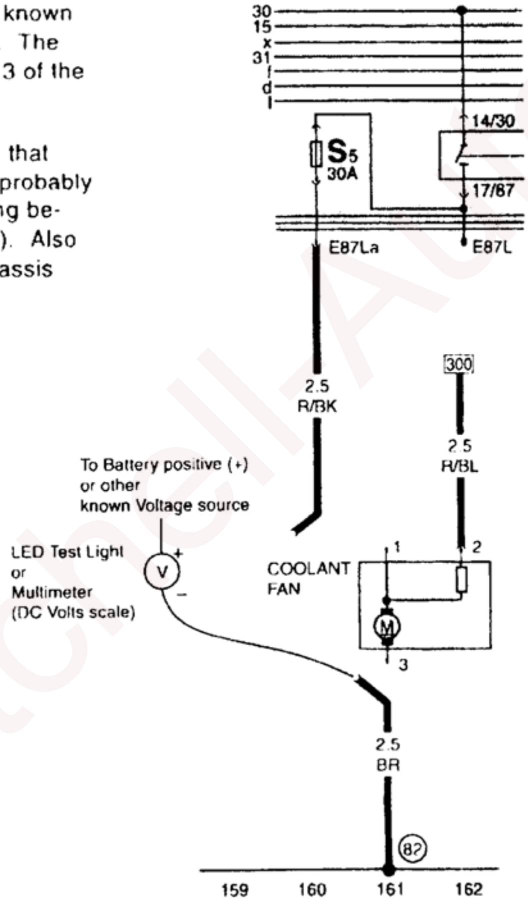


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Fig. 9: Checking Ground Connections (1 Of 2)
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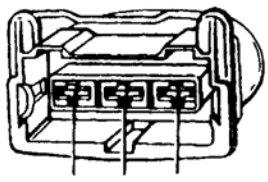
Continuity (approximately 0 Ω): Little or no resistance indicates that there is a continuous conductive path between the two test points - the circuit's ground (GND) path between terminal 3 and battery negative (–) is OK.

No Continuity: There is resistance to current flow in the ground (GND) side of the circuit. The fan is probably OK. Look for a malfunction somewhere in the wiring between the fan connector and chassis ground (GND). Also check the mechanical ground (GND) connection at the chassis (body).

> ***CAUTION***
>
> *Direct contact with meter probes at the connector terminals can easily damage the small contacts, causing poor connections and risking future intermittent malfunctions.*



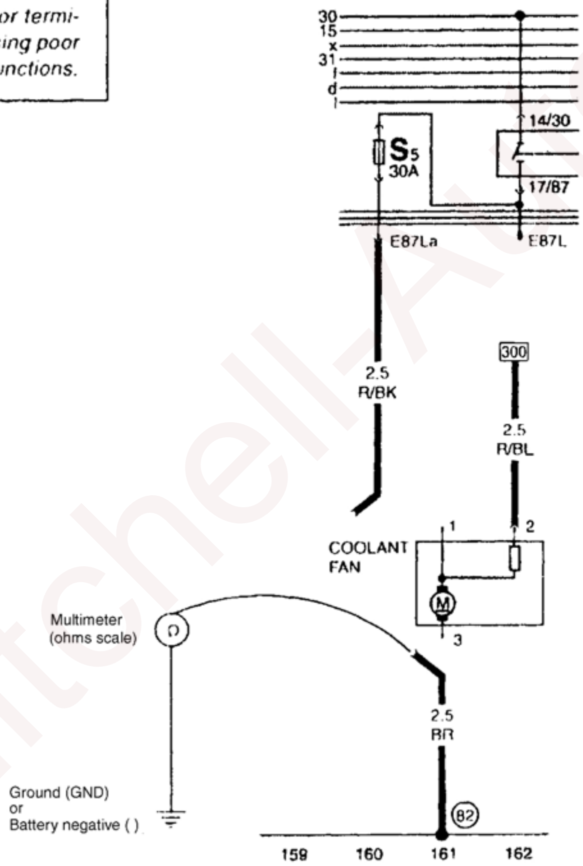


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Fig. 10: Checking Ground Connections (2 Of 2)
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