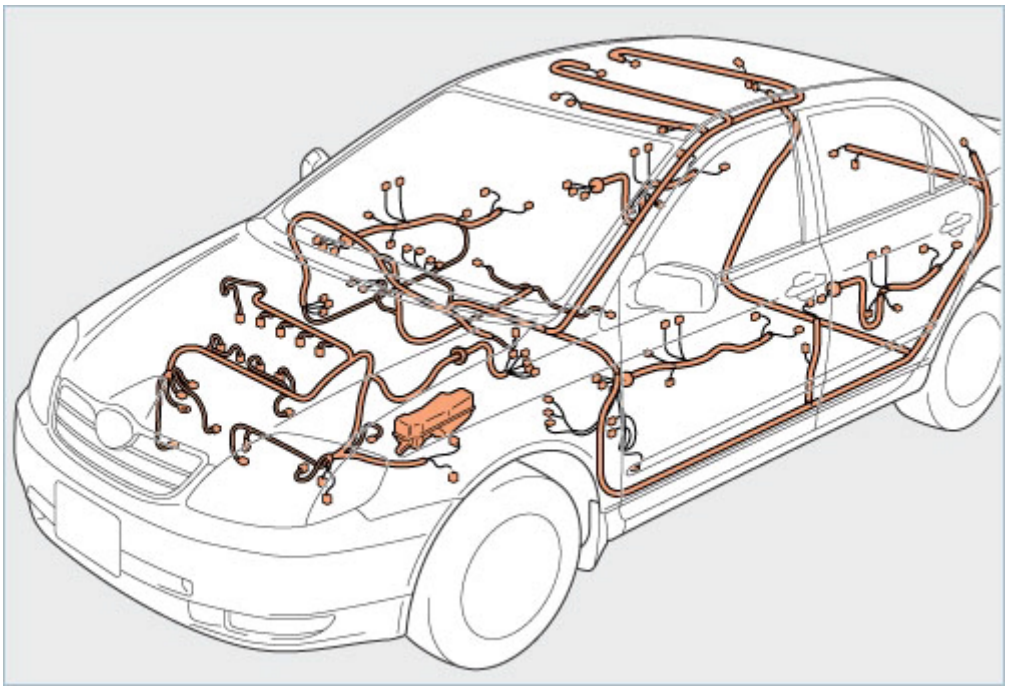
49.Body Electrical

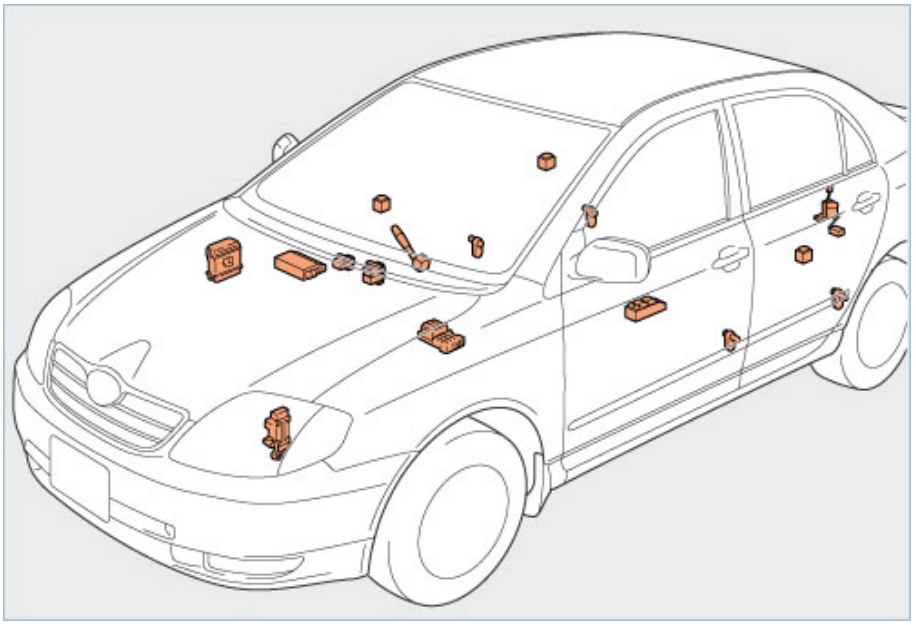
The body electrical components consist of electrical parts that are attached to the vehicle body.

Basic composition

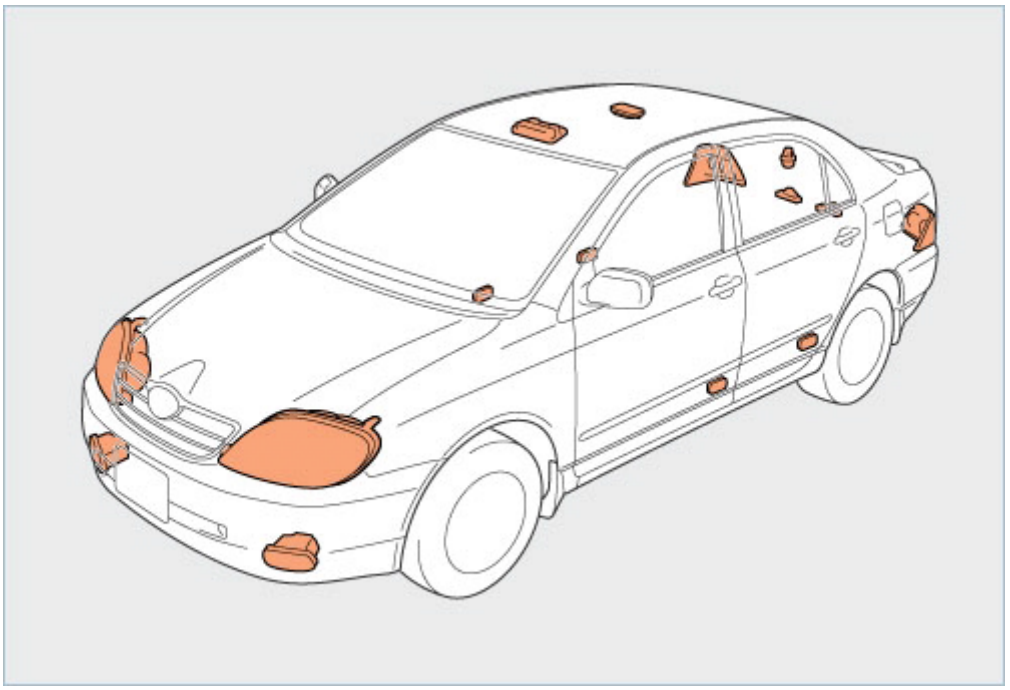
Wire harness



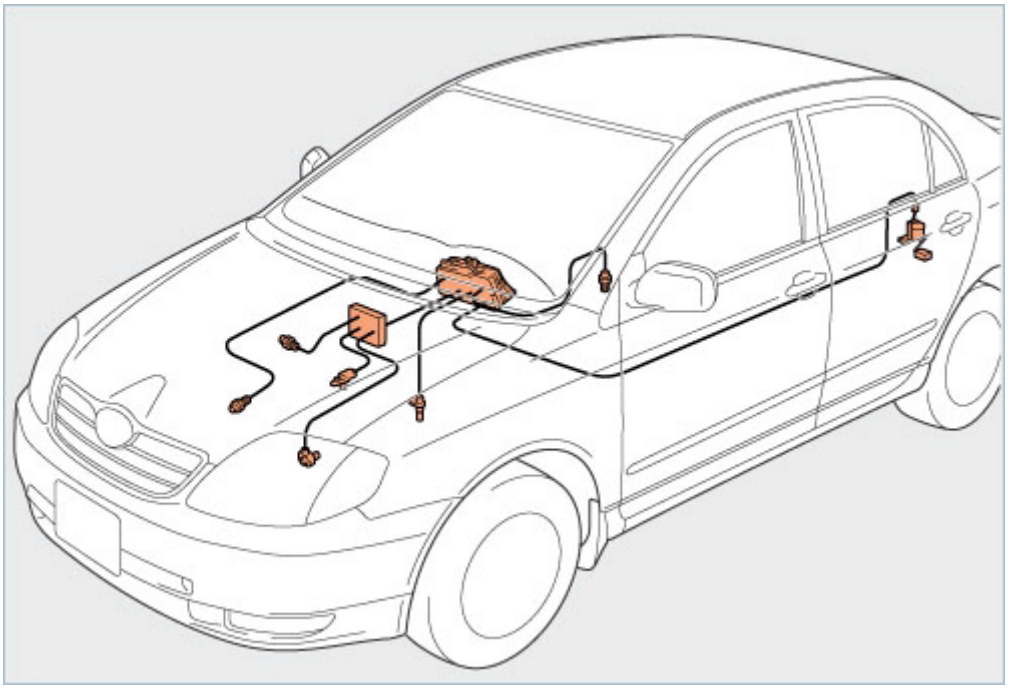
Switches and relays



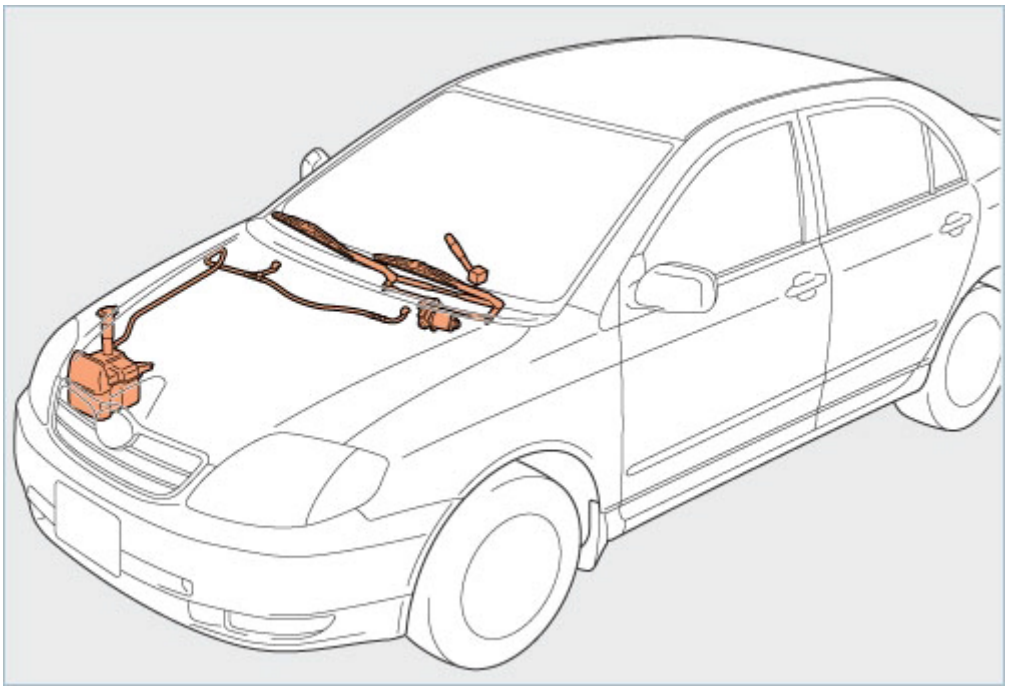
Lighting system



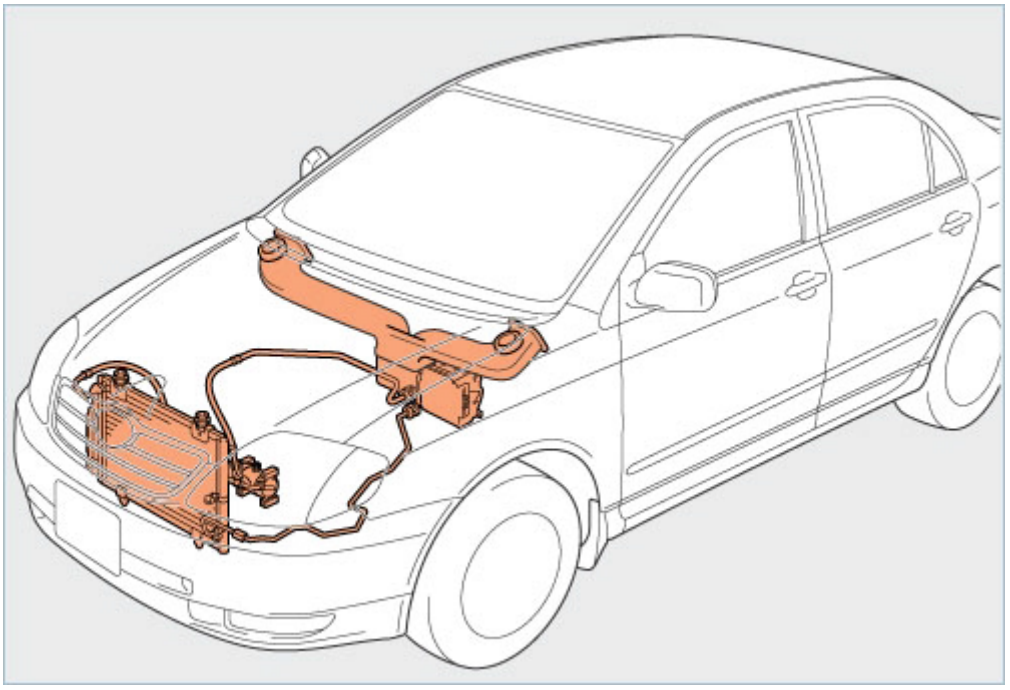
Combination meter and gauges



Wipers and washers



Air conditioning



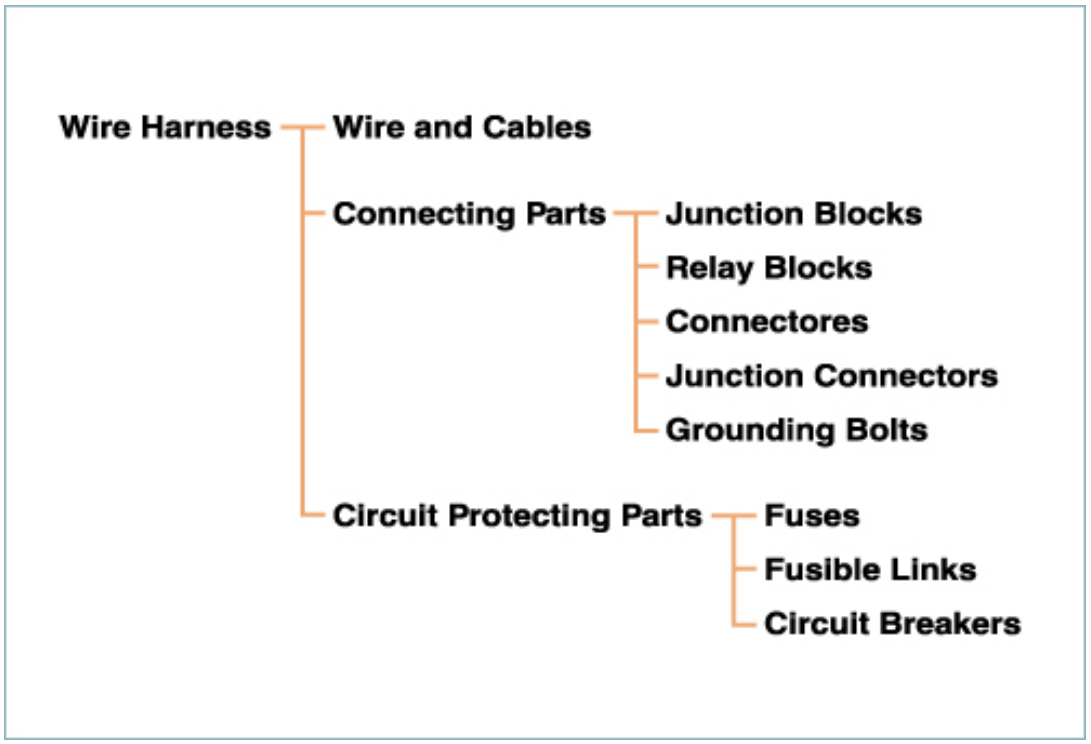
Wire Harness

The wire harnesses are divided into the following groups that facilitate the connections among the electrical components of a vehicle:

Wires and cables

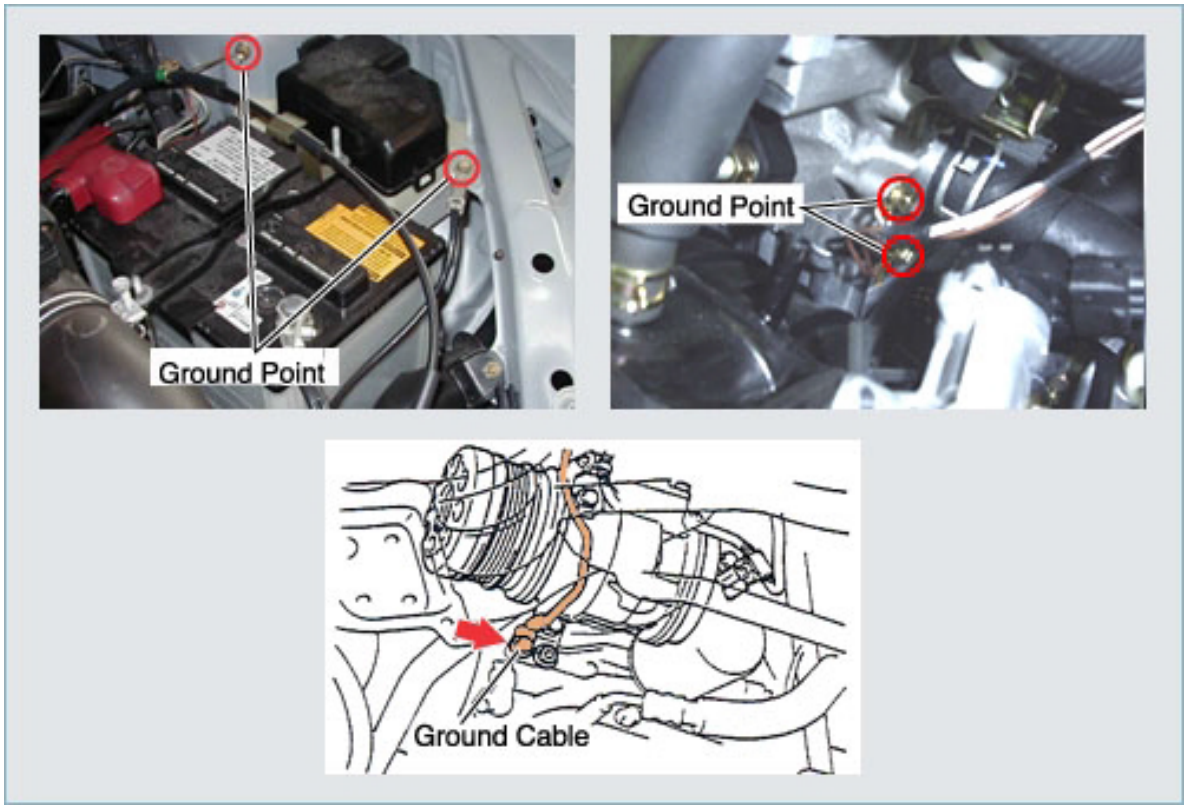
Connecting parts

Circuit protecting parts, etc.



Body ground

In a vehicle, the negative terminal of every electrical device and the negative terminal of the battery are connected to the sheet metal of the vehicle body in order to form an electric circuit. The connection of the negative terminals to the body is called a "body ground". The body ground minimizes the number of wire harnesses that are used.



Wires and Cables

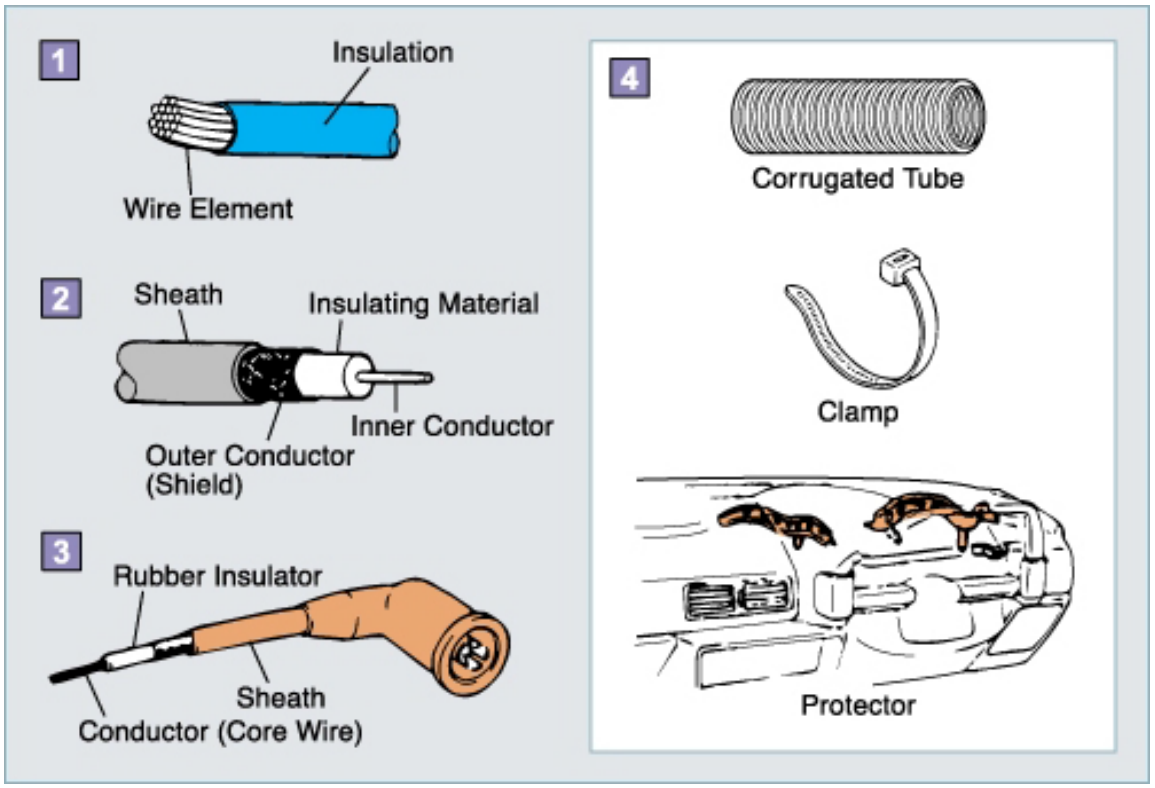
Three main types of wires and cables are used on a vehicle. To protect them, wiring protective parts are used:

Low-voltage wires

Shielded cables

High-tension cords

Wiring protective parts



Connecting Parts

To facilitate their connection, the wire harnesses are concentrated in a few sections of the vehicle:

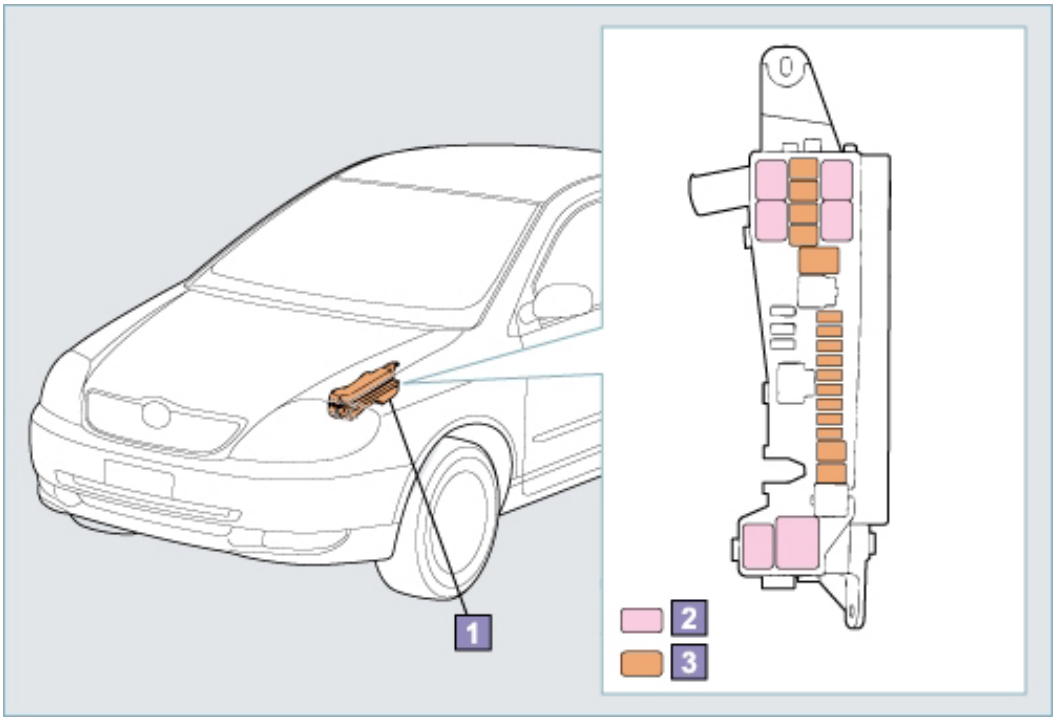
1.Junction blocks (J/B)

A junction block is a part in which the connectors for an electric circuit are grouped together.

Generally, it consists of the following: Printed circuit boards, fuses, relays, circuit breakers, and other devices.

2. Relay block (R/B)

Although very similar to a junction block, a relay block does not have printed circuit boards or other centralized connecting functions.



3.Connectors

The function of the connectors, which are used between wire harnesses or between a wire harness and an electric component, is to provide electrical connections.

There are two types of connectors:

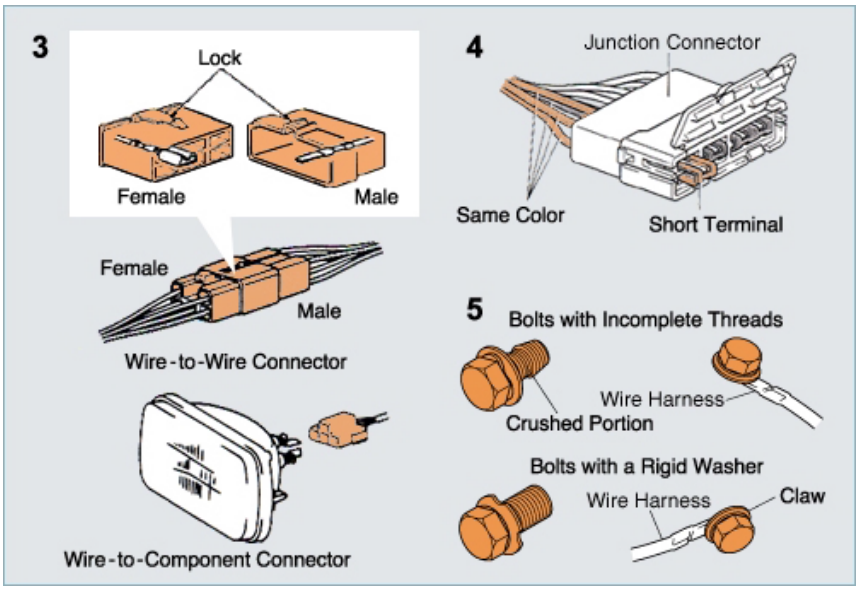
Wire-to-wire connector,Wire-to-component connector.Connectors are divided into male and female types,depending on the shape of their terminals.Connectors also come in various colors.

4.Junction connector

The function of a junction connector is to connect terminals of the same group.

5.Grounding bolts

The grounding bolts are used for grounding the wire harnesses and electric components to the vehicle body. Unlike ordinary bolts, the surfaces of these bolts are painted green to prevent oxidation.



Circuit Protecting Parts

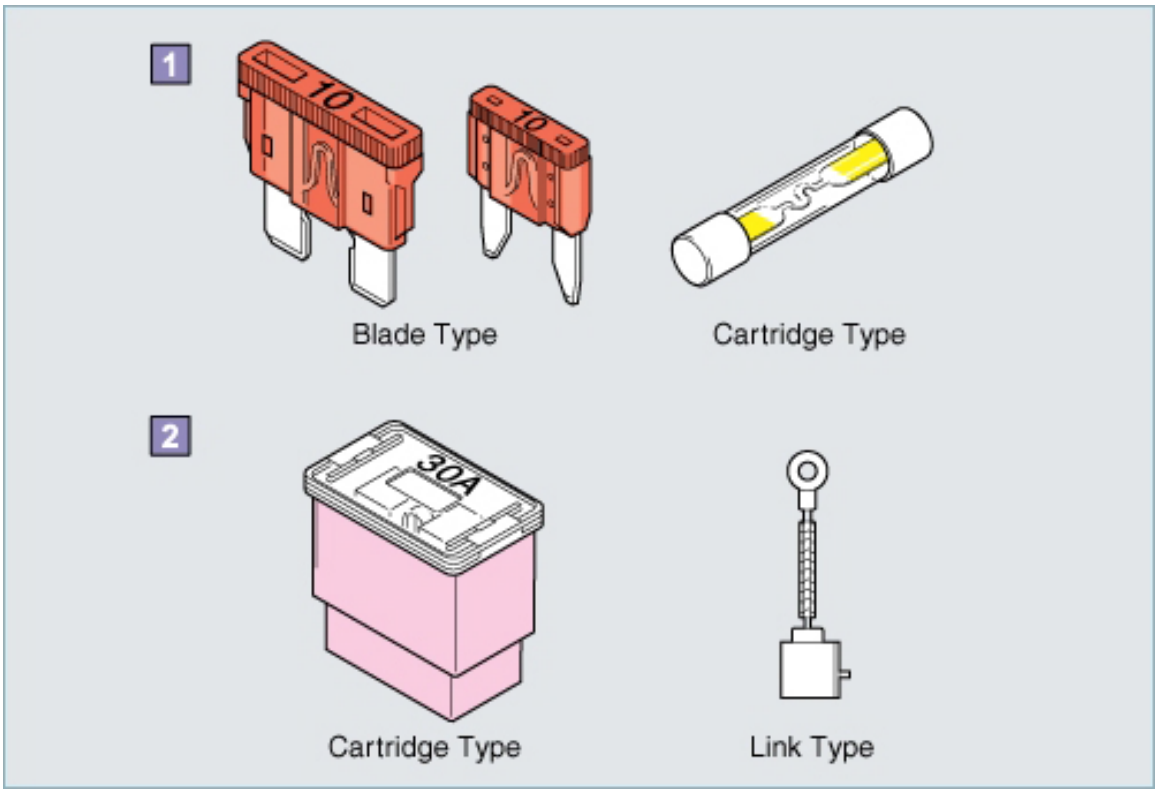
Circuit protecting parts protect circuits from the excessive current that flows when a wire or an electronic/electric component is shorted.

Fuses

A fuse is installed between a fusible link and an electrical device. When a current that exceeds a prescribed amperage flows through the circuit of an individual electrical device, the fuse melts to protect the circuit.Two types of fuses are used: a blade type, and a cartridge type.

Fusible links

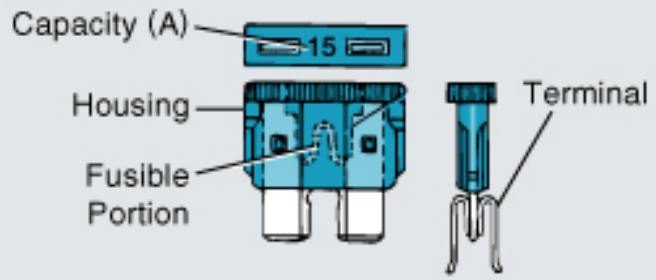
A fusible link is installed inline between the power source and an electrical device through which a current with a large amperage flows. If an excessive current flows as a result of the wire harness shorting with the body, the fusible link melts to protect the wire harness. Two types of fusible links are used: a cartridge type and a link type.



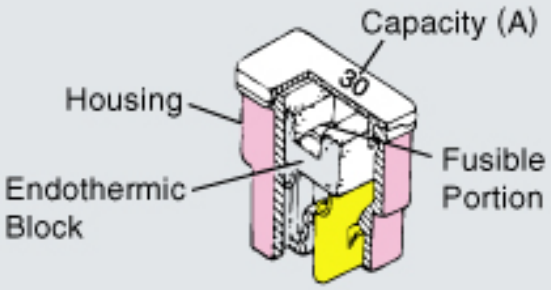
Types of fuses and fusible links

The blade type fuses and the cartridge type fusible links are color-coded in accordance with their capacity.

Blade Type Fuse



Cartridge Type Fuseble Link



Fuse identification

Fuse Capacity (A)	Color
5	Yellowish Brown
7.5	Brown
10	Red
15	Blue
20	Yellow
25	Clear
30	Green

Fusible Link Identification

Capacity (A)	Color
30	Pink
40	Green
50	Red
60	Yellow
80	Black
100	Blue

Circuit breakers

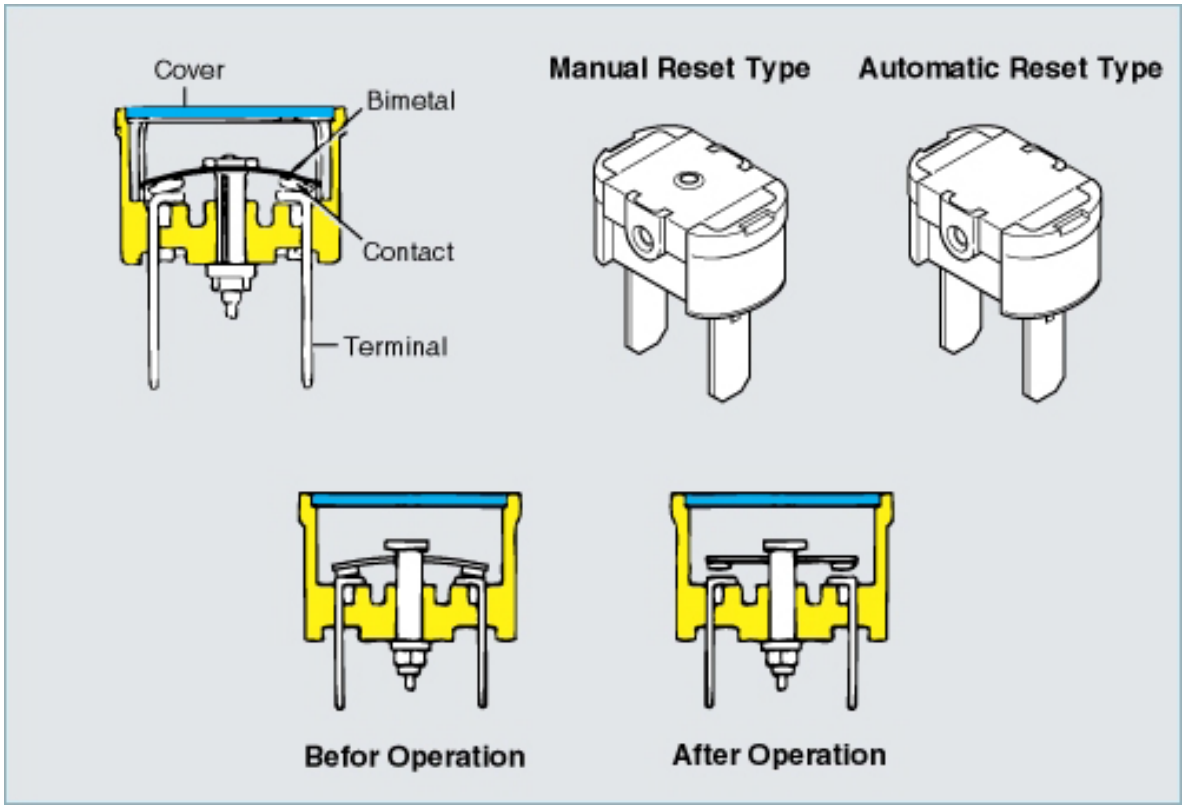
A circuit breaker is used for protecting a circuit with a large amperage load that cannot be protected by a fuse, such as power windows, a defogger, blower motor, etc.

When a current that exceeds the rated amperage flows, a bimetal element in the breaker generates heat and expands to break the circuit.

Even if the current is below the rated amperage, if current flows repeatedly within a short or long period, the temperature of the bimetal rises to break the circuit.

Unlike a fuse, a circuit breaker can be reused when its bimetal is reset.

Circuit breaker has two types as shown in the left illustration: the automatic reset type which is reset automatically, and the manual reset type which is reset manually.



Switches and Relays

Switches and relays open and close electric circuits in order to turn the lights ON/OFF, as well as to operate the control systems.

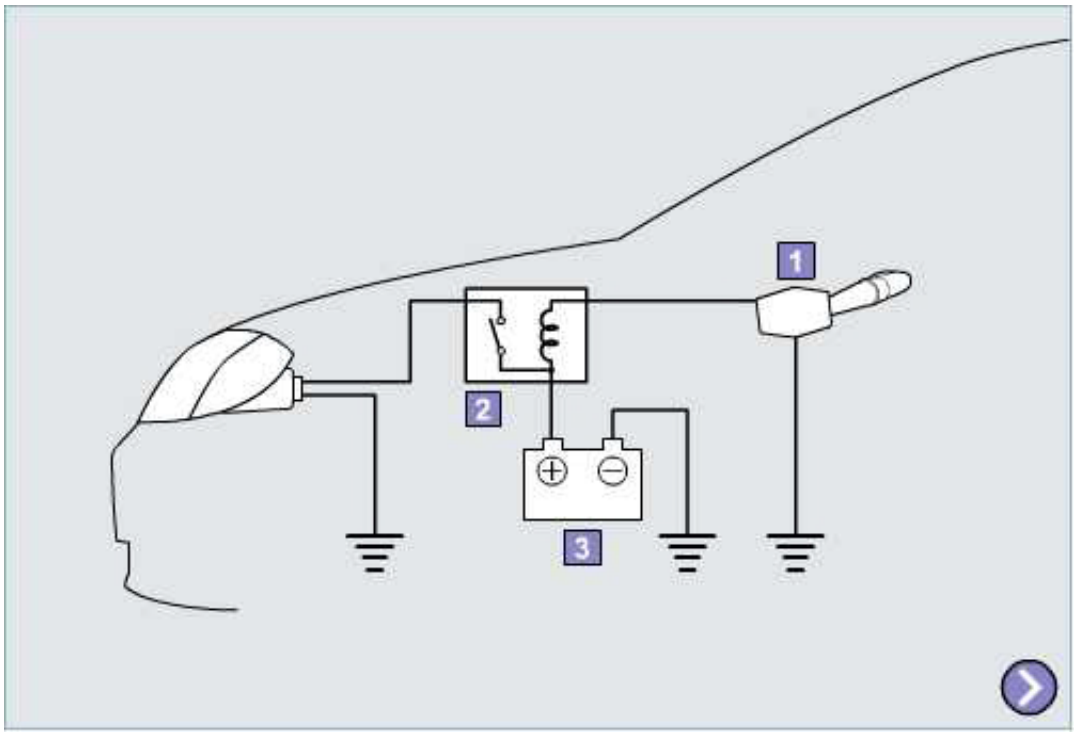
1.Switches

Some switches are operated manually, while others operate automatically by sensing a pressure, oil pressure, or temperature.

2.Relays

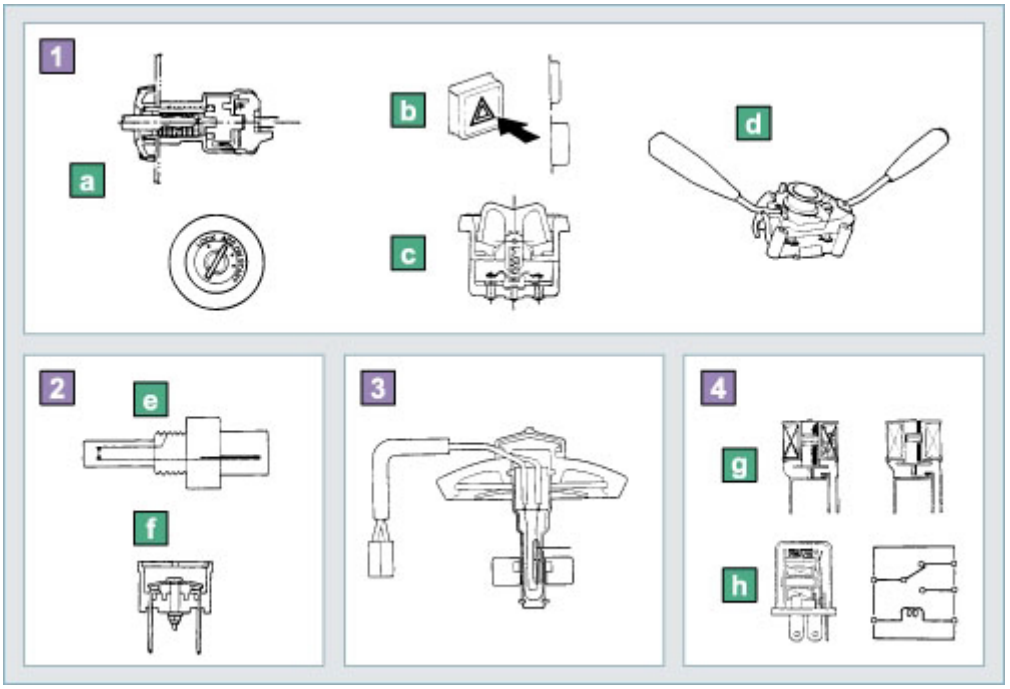
Relays enable ON/OFF with a small current of electric circuits which need a large current. When relays are used, the circuits which needs a large current can be simplified.

3.Battery

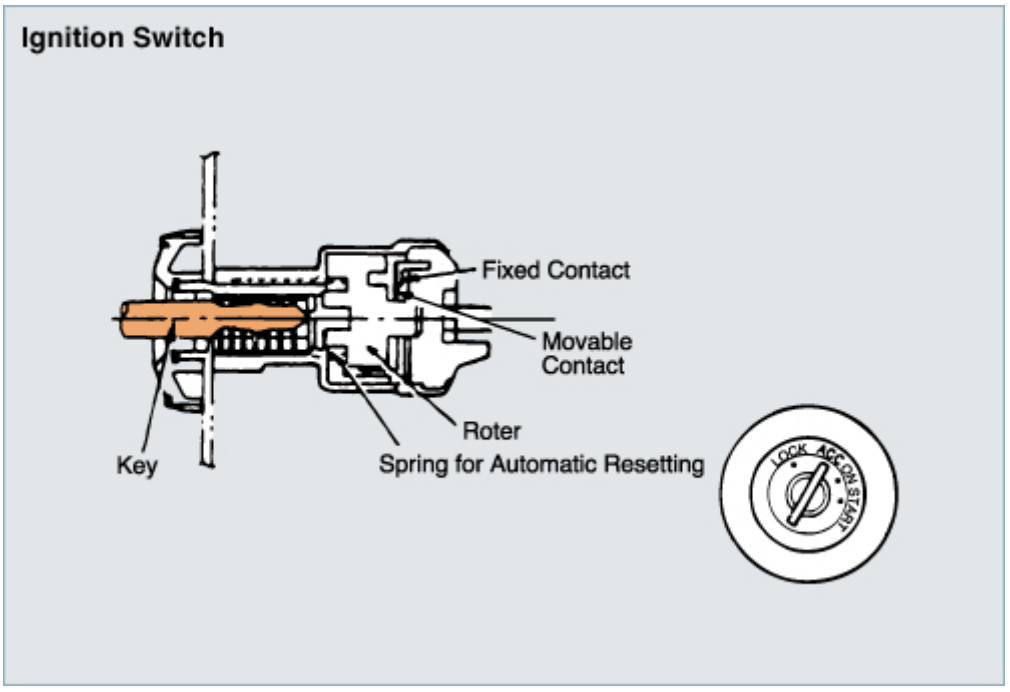


The types of switches and relays

1.Switches directly operated by hand

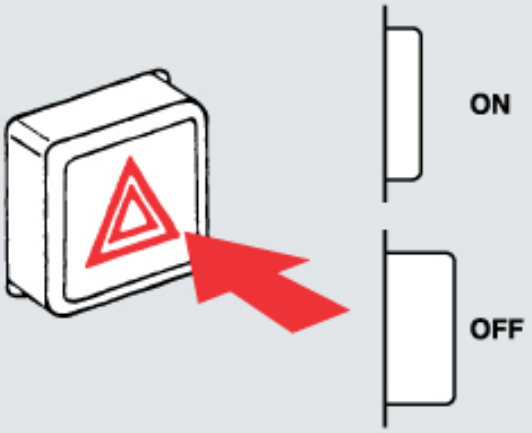


2. Rotary switches



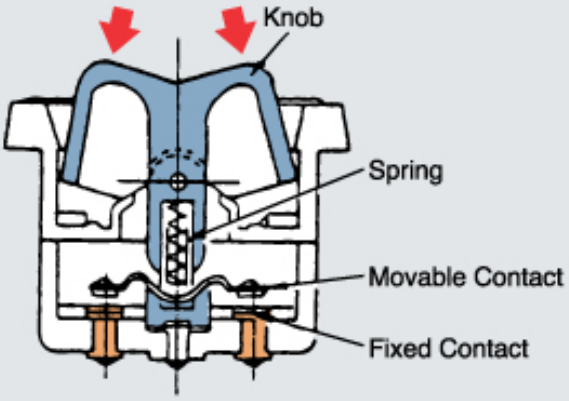
3. Push switches

Hazard Warning Switch

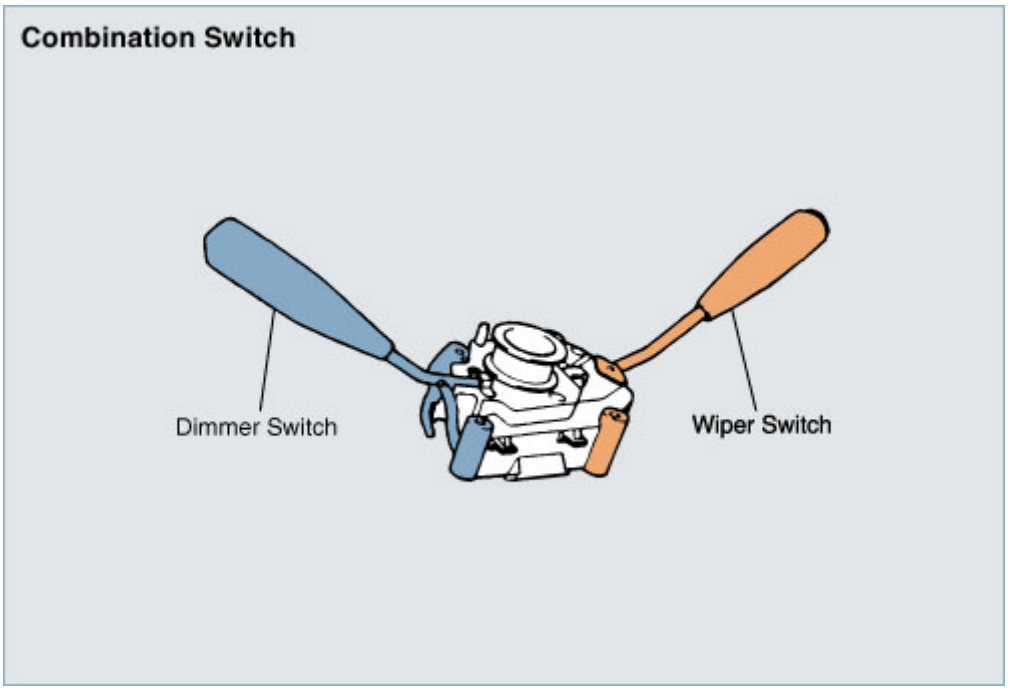


4. Seesaw switches

Door Lock Switch

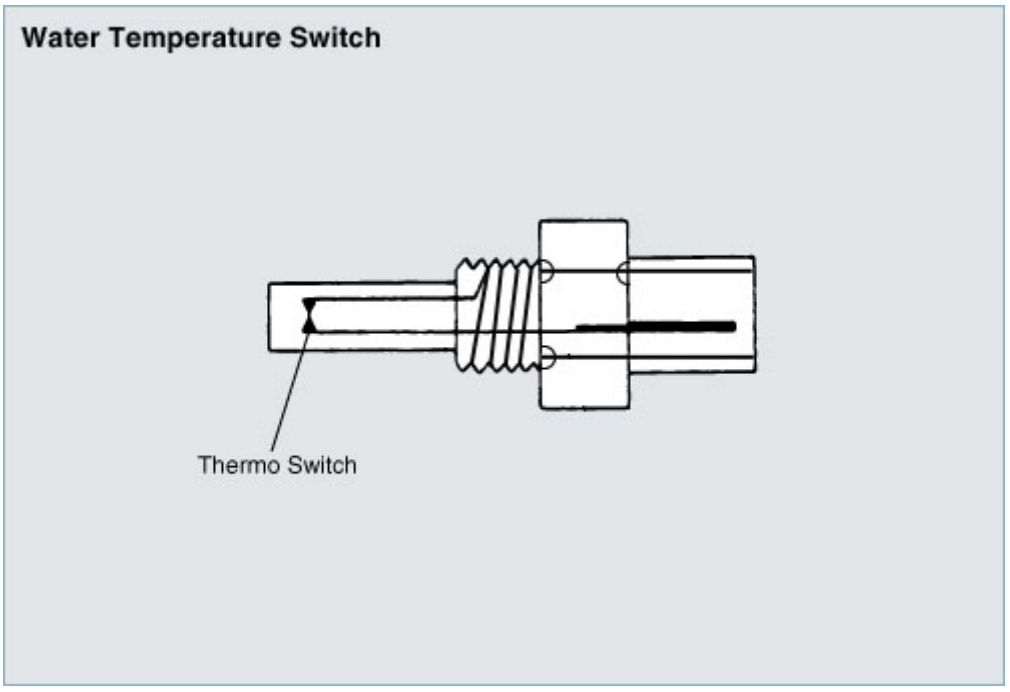


5. Lever switches

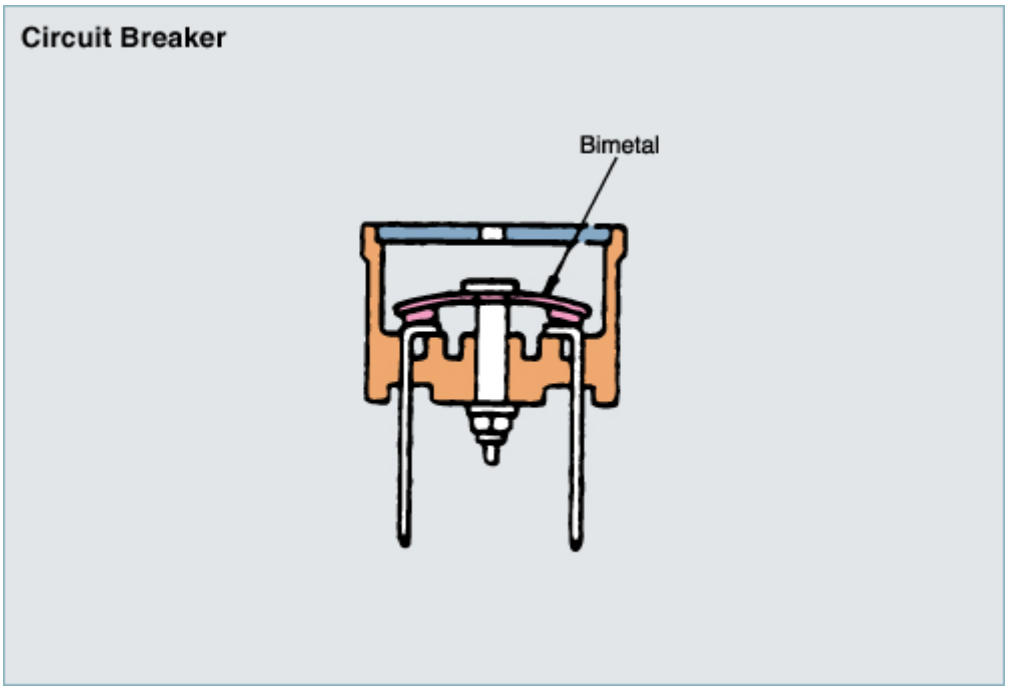


2. Switches operated by changes in temperature or electrical current.

Temperature detection switches

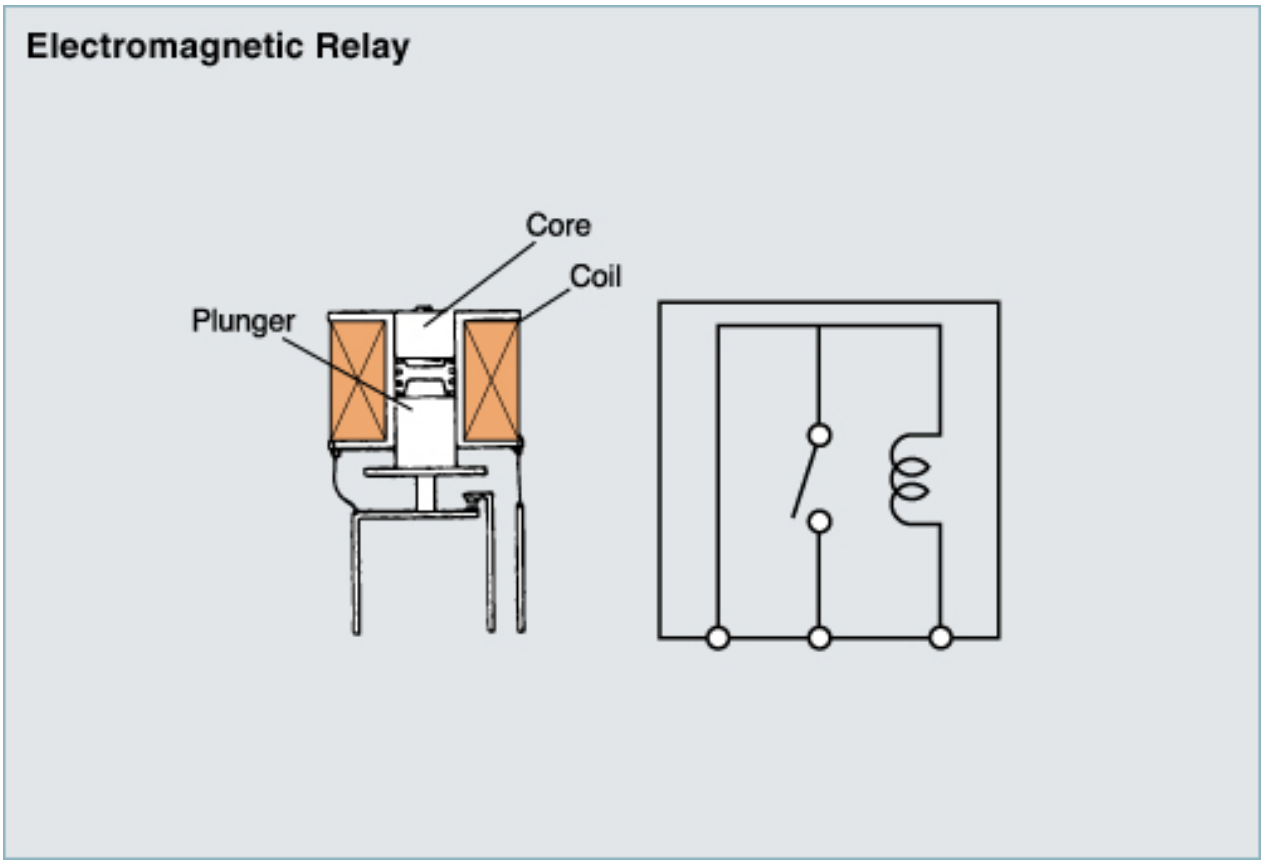


Current detection switches, etc.



Relays

Electromagnetic relay



Hinge type switching relay