CIRCUIT DIAGRAMS

- Circuit diagrams are arranged so that current flow is from the top of the diagram (current source) to the bottom of the diagram (ground).
- Only those components that work together in the circuit are shown. If only part of a component is used in the circuit, then only that part of the component is shown.
- Remember:

Entire component

Part of a component

TERMINAL NUMBER	DESIGNATION
50	Battery voltage: Ignition Switch in position III
30	Battery voltage: supplied constantly
15	Battery voltage: Ignition Switch in position II or III
R	Battery voltage: Ignition Switch in positions I, II
31	Ground

See Introduction (I) for additional circuit diagram symbols.

DIAGNOSIS

- If the diagram is accompanied by text:

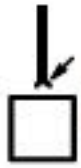
– Read the Circuit Operation before proceeding with the electrical diagnosis.

– Read the Troubleshooting Hints before performing the System Diagnosis.

– Tests follow the System Diagnosis

– When performing the System Diagnosis, be certain that all components disconnected in previous steps are reconnected unless otherwise directed.

Component is disconnected.
Backprobe harness connector



Component is connected.
Backprobe harness connector

Component is disconnected.
Probe component

Component is disconnected.
Probe harness connector

Probe in-line connector

INTRODUCTION

This manual is intended for use by trained Land Rover technicians as an aid to diagnosing electrical concerns.

This manual is organized into sections. Most sections contain circuit diagrams. Each section has a unique alpha–numeric code that will normally remain the same from year to year. For example, the Headlights circuit is in Section H1, with the first page of the section numbered H1–1. The following pages of this section will be numbered H1–2, H1–3, H1–4, etc. The manual does not contain any information concerning removal, refit or overhaul of electrical components or harnesses. These details are contained in the Workshop Manual. The following information forms the basis of the troubleshooting routines:

- Circuit Diagrams
- System Diagnosis Flow Charts
- Component Location Table
- Component Locations Views

Additional information, such as Circuit Operation, is also contained in the manual to aid in your understanding of how the different circuits operate.

DESCRIPTION OF MANUAL

Circuit Operation and Diagram

The Circuit Operation information at the beginning of the section will give you an overview of how the circuit works.

The Circuit Diagrams should always be your starting point in using this Electrical Troubleshooting Manual. The diagram shows the electrical current paths when a circuit is operating properly. It is essential to understand how a circuit should work before trying to figure out why it doesn't. Diagrams are shown with the Ignition Switch in the OFF position and other switches in the OFF or 'at rest' position.

Notes are provided after certain switches to clarify switch positions. Abbreviations found in the notes are explained in the Abbreviation Table found in the SYMBOLS section of this chapter.

Circuit Diagrams (schematics) break the entire electrical system into individual circuits. Electrical components that work together are shown together.

Each diagram is arranged so current flows from positive, at the top of the page, to ground, at the bottom of the page. The 'power' labels at the top of a fuse show when the Battery, Main Light Switch, or Ignition Switch supplies power to that fuse.

Wires that connect to another circuit are shown with an arrowhead pointing in the direction of current flow. The name of the circuit that shares the wiring is provided for reference.

Wire Colour charts are no longer provided on each circuit page. One chart is provided in the SYMBOLS section of this chapter.

'See Fuse Details' means there are more connections to other circuits that are not shown. All such shared circuits are shown on the Fuse Details diagrams. 'See Ground Distribution' means there are more shared ground circuits which are shown on the Ground Distribution diagrams.

No attempt is made on the diagrams to represent components and wiring as they physically appear on the car. For example, a long length of wire is treated no differently in a diagram from one which is only a few centimetres long. The number of cavities for each connector is listed in the Component Location Table rather than illustrated. Similarly, switches and other components are shown as simply as possible, showing function only.

Power Distribution

The Power Distribution diagrams are found in Section Y1. These diagrams show how voltage is supplied from the positive Battery terminal to the various circuits in the vehicle.

The individual Circuit Diagrams begin with a fuse or the Ignition Switch. Power Distribution shows the wiring from the Battery to the Fuse Boxes, the Ignition Switch, the Main Lighting Switch, and any circuit fuses not located in a Fuse Box.

Fuse Details

The Fuse Details diagrams are found in Section Y2. These diagrams show all the wiring between each fuse in the Fuse Boxes and the components connected to the output of the fuse. The Fuse Details diagrams are extremely helpful in locating a short circuit that causes a fuse to blow. These diagrams also aid in troubleshooting an inoperative circuit by showing a second circuit using the same fuse. If the second circuit works, then the fuse and certain wires of the inoperative circuit are good.

Ground Distribution

The Ground Distribution diagrams are found in Section Y5. These diagrams show which components share each ground point. This information can often be a timesaver when troubleshooting a poor ground.

For example, if the Fuel Pump does not run, you may suspect an open in its circuit to ground. However, if the Number Plate Lamps work, and they share the same ground point as the Fuel Pump, you know that the ground and the wire up to the common splice are good. You have learned this just by inspecting the diagram and knowing the vehicle's symptoms.

Connector Views

Connector Views are provided in section Z6. All connectors with 2 terminals or more will be shown. Pin-out tables with the approriate wire colours will also be shown.

Component Location Table

A Component Location Table can be found in Section Z4. Except for the location of obvious components like the Left Headlight, the table lists the location of every component, connector and ground point depicted in the Circuit Diagrams. The table also gives references to Component Location Views located in Section Z5 and cross references to Workshop Manual remove and refit procedure sections. The number of cavities in each connector and the connector colour are also listed. Wires may not be used in all connector cavities.

TROUBLESHOOTING TECHNIQUE

The following five–step troubleshooting procedure is recommended.

1. Verify the Problem

Check the operation of the circuit to be sure you understand the problem. Do not begin disassembly or testing until you have narrowed down the possible causes.

2. Analyze the Circuit Diagram (schematic)

Analyze the diagram. Check circuits that share the wiring with the problem circuit. The names of shared circuits are often given on each Circuit Diagram to aid troubleshooting. Shared power and ground circuits can be found in the Power and Ground Distribution sections. Try to operate the shared circuits. If these circuits work, then the shared wiring is OK. The cause must be within the wiring used only by the problem circuit. If several circuits fail at the same time, chances are the power (fuse) or ground circuit is faulty.

3. Find the Cause

- Narrow down the possible causes.
- Before you replace a component, check power, signal, and ground wires at the component harness connector.

4. Repair the Problem

Once the specific problem is identified, make the repair. Be sure to use the correct tools and safe procedures.

5. Check the Repair

Check the operation of the repaired circuit in all modes to make sure you fixed the entire problem. If the problem was a blown fuse, be sure to test all of the circuits on that fuse. Make sure no new problems are present.

TEST EQUIPMENT

Where applicable, Land Rover– recommended testers should be used.

Voltmeter and Test Light

Use a voltmeter or test light to check for voltage. While a test light shows whether or not voltage is present, a voltmeter indicates how much voltage there is.

CAUTION: A number of circuits include solid state devices. Voltages in these circuits should be tested only with a 10 megohm or higher impedance digital multimeter. Never use a test light on circuits that contain solid state devices. Damage to the device may result.

On circuits without solid state devices, a test light may be used to check for voltage. A test light is made up of a 12 volt bulb with a pair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. The bulb will come on if the voltage at the point being tested is greater than 5 volts.

Self–powered Test Light and Ohmmeter

Use a self–powered test light or ohmmeter to check for continuity. The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

CAUTION: Never use a self–powered test light on circuits that contain solid state devices. Damage to these devices may result.

Diodes and solid state devices in a circuit can make an ohmmeter give a false reading. To find out if a component is affecting a measurement, take one reading, reverse the leads, and take a second reading. If the readings differ, the component is affecting the measurement.

Circuits that contain solid state devices should only be tested with a 10 megohm or higher impedance digital multimeter.

A self–powered test light consists of a light bulb, battery and two leads. If the leads are touched together, the bulb will go on.

A self–powered test light is only used on an unpowered circuit. First, disconnect the battery or remove the fuse that feeds the circuit you are working on. Select two points along the circuit through which there should be continuity. Connect one lead of the self–powered test light to each point. If there is continuity, the test light's circuit will be completed and the bulb will go on.

Fused Jumper Wire

Use a fused jumper wire to bypass an open circuit. A fuse jumper wire is made up of an in–line fuse holder connected to a set of test leads. Never use a jumper wire across any load. This direct battery short will blow the fuse.

The following symbol represents a fused jumper:

SYMBOLS

The abbreviations and symbols explained here are used throughout the manual; it is necessary to know what they mean in order to use the diagrams effectively.

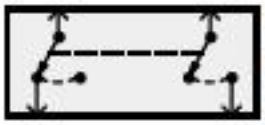

Battery


F1 Fuse


MF2 Maxi-Fuse®


Circuit Breaker

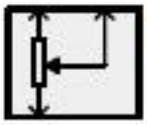

One-pole on/off switch


Two-pole switch

Dashed line indicates mechanical connection between switches


Multiple Position Switch


Variable resistor. Wiper moves by external force


Potentiometer. Wiper moves by external force


Steering Column Rotary Coupler


Diode. Current flows in direction of arrow only


LED


Bulb


Electronic or Solid State device

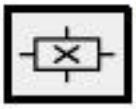
Permanent magnet motor (one speed)

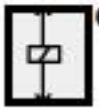
Permanent magnet motor (two speed)


Heating Element


Antenna


Loudspeaker or horn


Hall Effect Sensor

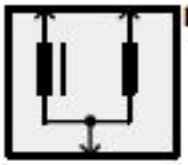

Coil

Hall Effect Sensor

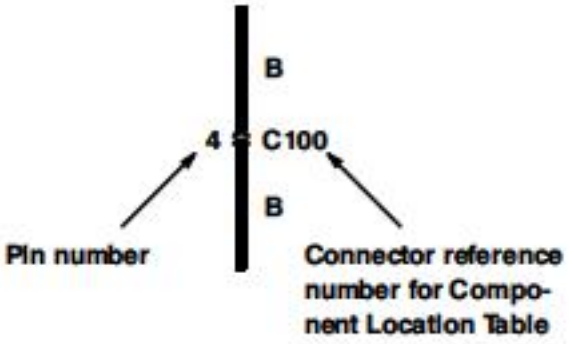

Solenoid

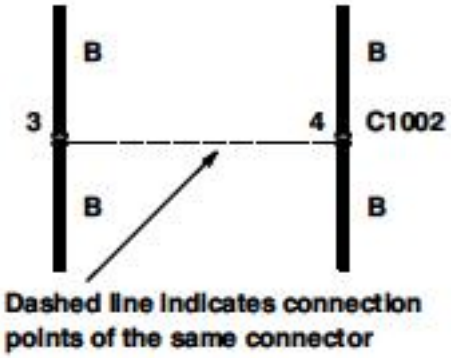
Relay

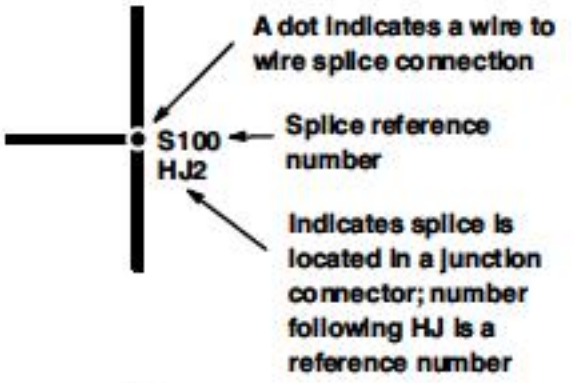
Switch is drawn into the closed position when current flows through coil

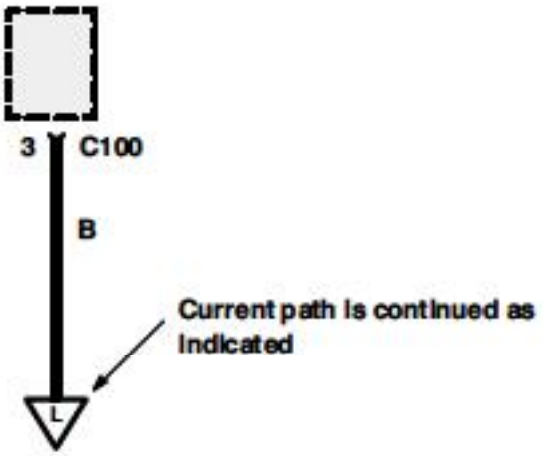

Ignition Coil

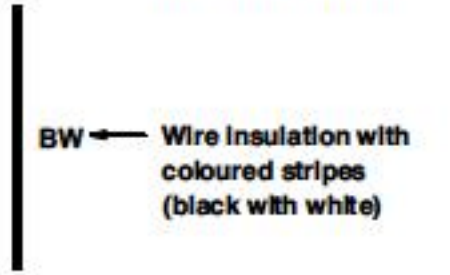

Steering Column Horn Brush/ Slip Ring

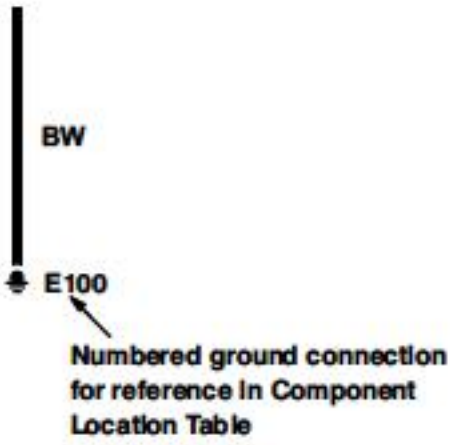


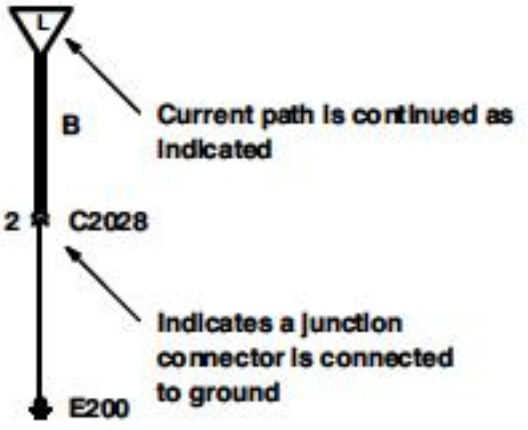


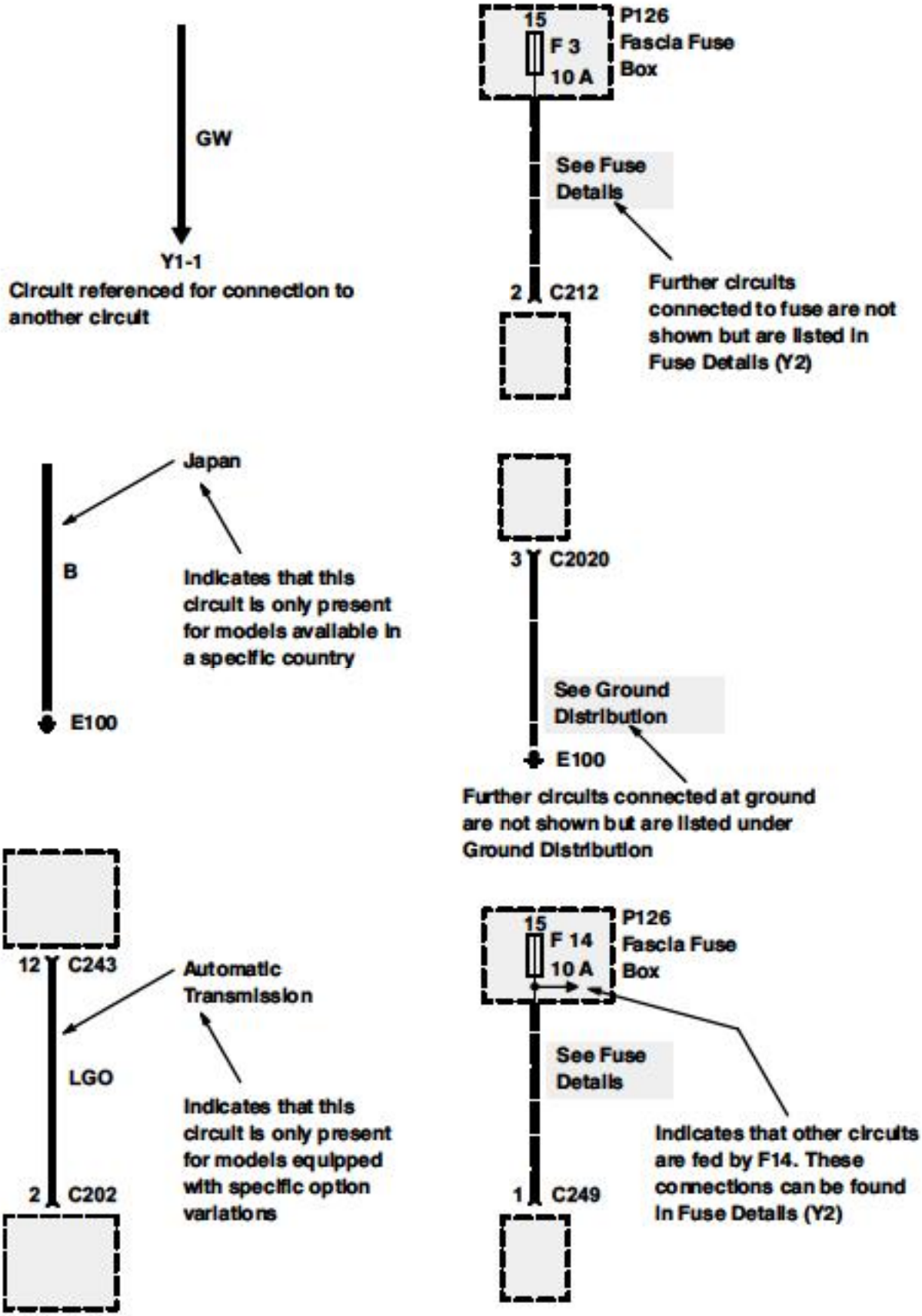













Entire component


Part of a component


Component with screw terminals

Plug connected at component

Plug connected to connection wire of component


Component housing connected directly to vehicle ground

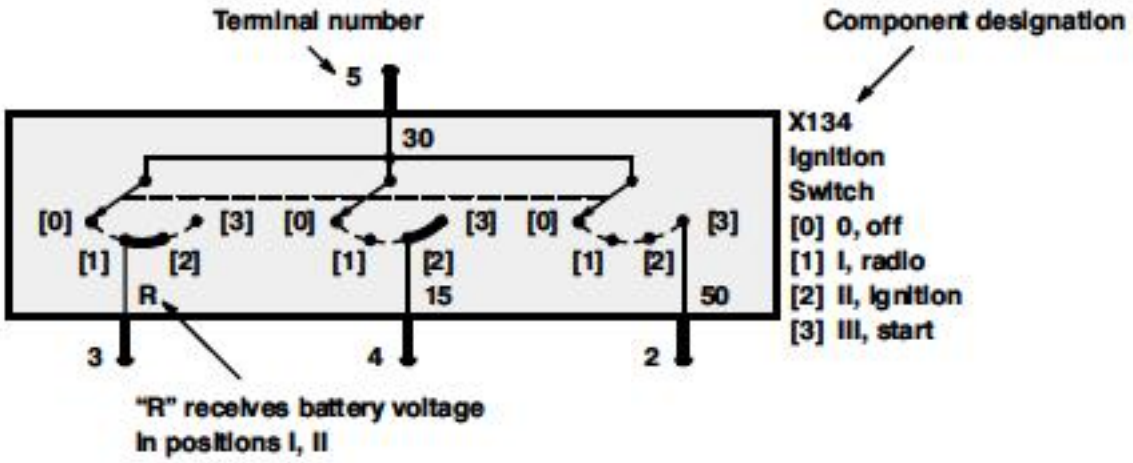

Component is disconnected. Backprobe harness connector


Component is connected. Backprobe harness connector


Component is disconnected. Probe component


Component is disconnected. Probe harness connector


Probe in-line connector



Terminal number	Designation
50	Battery voltage: Ignition Switch in position III
30	Battery voltage: supplied constantly
15	Battery voltage: Ignition Switch in position II or III
R	Battery voltage: Ignition Switch in positions I, II
31	Ground

Terminal number	Designation
X	Switched battery voltage through the ignition load relay or accessory relay; ignition switch is in position I or II.
49	Flasher unit input
49a	Flasher unit output
50	Start
56	Headlamp
56a	High beam
56b	Low beam
56d	Headlamp flash
58	Side lamps
85	End of relay coil
86	Start of relay coil
87	Relay contact
87a	Relay contact

Definition of Vehicle Component Codes

All components are identified by a letter followed by an arbitrary number assigned to the component. The letter assigned to the component indicates the type of component.

B	Bulbs, Heated Screens, Mirror Demisters, Cigar Lighters, and Heated Washer Jets
K	Relays, Solenoids, Speakers, and Resistors
M	Motors
P	Fuse Boxes and Fusible Links
X	Switches and Sensors
Z	Electronic Control Units, Modules, Shields, Diodes, and Capacitors

Wire Colours

All wires are identified by letters which indicate a certain colour. Wire colour and size will only be shown once if it does not change throughout the circuit. The following chart explains the wire colour abbreviations.

Wire Colour Chart

B - Black	P - Purple
G - Green	R - Red
K - Pink	S - Grey
L - Light	U - Blue
N - Brown	W - White
O - Orange	Y - Yellow

Previous and Next Arrows

A schematic page which follows another schematic page of the same chapter will have an arrow in the upper left hand corner. There is no arrow on the first schematic page of a chapter. Schematic pages which are followed by another schematic page will have an arrow in the lower right hand corner. If the page is the last page of the chapter, there will be a square instead of an arrow.

Page Qualifiers

Schematic pages which are specific to certain model, option or country variations will have a small "Qualifier" after the Previous Arrow in the upper left–hand corner. For example, a section might contain pages specific to petrol engines and some pages specific to diesel engines. "Petrol" will be shown in the upper left hand corner of petrol specific pages, and "Diesel" will be shown in the upper left hand corner of diesel specific pages.

Circuit Qualifiers

Certain abbreviations are used throughout the Electrical Troubleshooting Manual as circuit qualifiers. The following list explains all abbreviations used as qualifiers in the Circuit Diagrams.

ABS	Anti-Lock Braking System
LHD	Lefthand Drive
RHD	Righthand Drive
LWB	Long Wheel Base
SWB	Short Wheel Base
NAS	North American Countries
MFI–V8	Multiport Fuel Injection (MFI–V8)
MFI–T16	Multiport Fuel Injection (MFI–T16)
300 Tdi	Tdi Diesel
300 Tdi with EGR	Tdi Diesel with Exhaust Gas Recirculation (EGR)
300 Tdi without EGR	Tdi Diesel without Exhaust Gas Recirculation (EGR)
300 Tdi with EDC	Tdi Diesel with Electronic Diesel Control (EDC)
300 Tdi without EDC	Tdi Diesel without Electronic Diesel Control (EDC) (applies to Tdi Diesels with and without EGR)
SFI–V8	Sequential Multiport Fuel Injection (SFI–V8)
A/C	Air Conditioning
BBUS	Battery Backed Up Alarm Sounder (Z272)

Switch Positions

Certain abbreviations are used throughout the Electrical Troubleshooting Manual as Switch Position notes. The following list explains all abbreviations used as Switch Position notes in the Circuit Diagrams.

< 100°	Less than 100°
> 100°	More than 100°

Connectors, Grounds, and Splices are identified by a letter followed by a number. Connectors are identified by C, grounds by E, and splices by S. Some splices are contained in junction connectors. These splices are identified by the prefix "HJ" below the splice's reference number. The number assigned to the connector, ground, or splice corresponds to its location in the vehicle.

Connector, Ground, and Splice Identification by Location