

Section 5

Diagnosing Body Electrical Problems

Circuit	Junction Block Connectors				Junction Connectors	
					ID #	PIN
Automatic Light Control	12 (2J)	1 (1W)	8 (1G)	<input type="checkbox"/>	J5	A
Clock	12 (2J)	1 (1W)	8 (1G)	<input type="checkbox"/>	J5/J6	A/B
DRL Relay	12 (2J)	1 (1W)	7 (1V)	<input type="checkbox"/>		
Ignition Key Cyl	12 (2J)	1 (1W)	2 (1M)	<input type="checkbox"/>	J15	A
Luggage Comp. Light	12 (2J)	1 (1W)	9 (1S)	<input type="checkbox"/>		
Vanity Light RH	12 (2J)	1 (1W)	5 (1F)	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

- Learning Objectives:**
1. Examine the diagnostic strategies for:
 - Open Circuit Problems
 - High Resistance Problems
 - Unwanted Parasitic Load Problems
 - Short-to-ground Problems
 - Feedback Problems
 2. Look at the advantages and disadvantages each diagnostic tool has when isolating a particular circuit problem.
 3. Show how to apply the DVOM, jumper wire, and EWD in the diagnostic process for each circuit.
 4. Perform practice case studies and on-car diagnosis worksheets for each type of circuit problem.



Notes

Introduction In step #3 of the six-step troubleshooting plan, you analyzed all the symptoms that were confirmed through your preliminary checks. Based upon these symptoms, you could make a conclusion as to the *type* of electrical problem that the circuit has:

- An open circuit
- A high resistance problem
- An unwanted parasitic load or short-to-ground
- A feedback from another circuit

Diagnosing Open Circuit Problems In this section, we will concentrate on *diagnostic strategies and techniques* that should be used to isolate each of these problems. You'll find that using the "right" tool for each type of problem will save you a lot of time when working to pinpoint location of the circuit problem.

Of all the types of electrical problems, **open circuit** problems are the most common. Open circuits are typically caused by:

1. Disconnected connectors
2. Bad switches
3. Poor terminal contacts
4. Cut wires
5. Blown or defective fuses

You can assume that you have an **open circuit problem** whenever there is no visible sign of operation. You can use a number of tools to find the location of an open circuit. Each of the tools has its advantages and disadvantages, so it's probably best to use a combination of the three, depending on the situation.

Using a Voltmeter on Open Circuit Problems

An open circuit voltage test (positive probe at terminal, negative probe connected to a known good ground) will verify continuity in the circuit to the +B source. If the negative probe of the meter is grounded through the ground wire of the circuit (meter is connected in *series* to the circuit), it will verify continuity of the ground side as well.

1. Use the EWD to determine where to make the checks and if any switches/relays need to be closed.
2. Connect the **negative probe of the voltmeter to ground**, and use the **positive probe to check the various pin voltages** with the circuit ON. Remember that the EWD **will not** tell you how much voltage you should have at *every* pin in the circuit. You need to apply your knowledge about circuits to determine what the correct voltage should be.

NOTE

- Inspect the connectors/locations that are the easiest access, then check the harder ones, if necessary.
- Keep in mind that even if your voltmeter indicates near battery voltage at a terminal, it tells you only that **there is a connection between +B and the inspection point**, and **not how good the connection is**. With high circuit resistance, the open circuit voltage would stay about the same. The only way to detect this resistance would be to measure for a voltage drop around the load or the suspect area of the circuit or to check the resistance with an ohmmeter.

Voltmeter Advantages and Disadvantages

Advantage: Easy to use, cannot cause circuit/fuse damage

Disadvantage: Cannot detect a high resistance problem with open circuit voltage check; would have to disconnect the ground point to check the continuity of the ground side wiring. (It would probably be easier to use an ohmmeter to check the ground side.)

Using the Voltmeter for Open Circuits

If the Headlight Relay did not work, you could check Connector 2E/pin 1 and pin 3 of the Integration Relay for voltage. This would verify that there is continuity from +B through 2F/pin 2, and the relay coil. It would not detect a high resistance problem. By measuring from pin 13 and pin 11 of the Combination Switch, you can check the continuity of both the power and ground side of the switch in one measurement. The measurements shown would indicate a problem with the Combination Switch.

Voltmeter in parallel to the switch; Should be 0V when the switch is CLOSED. 12V reading indicates switch is OPEN. (+B continuity to pin 13, continuity to ground at pin 11)

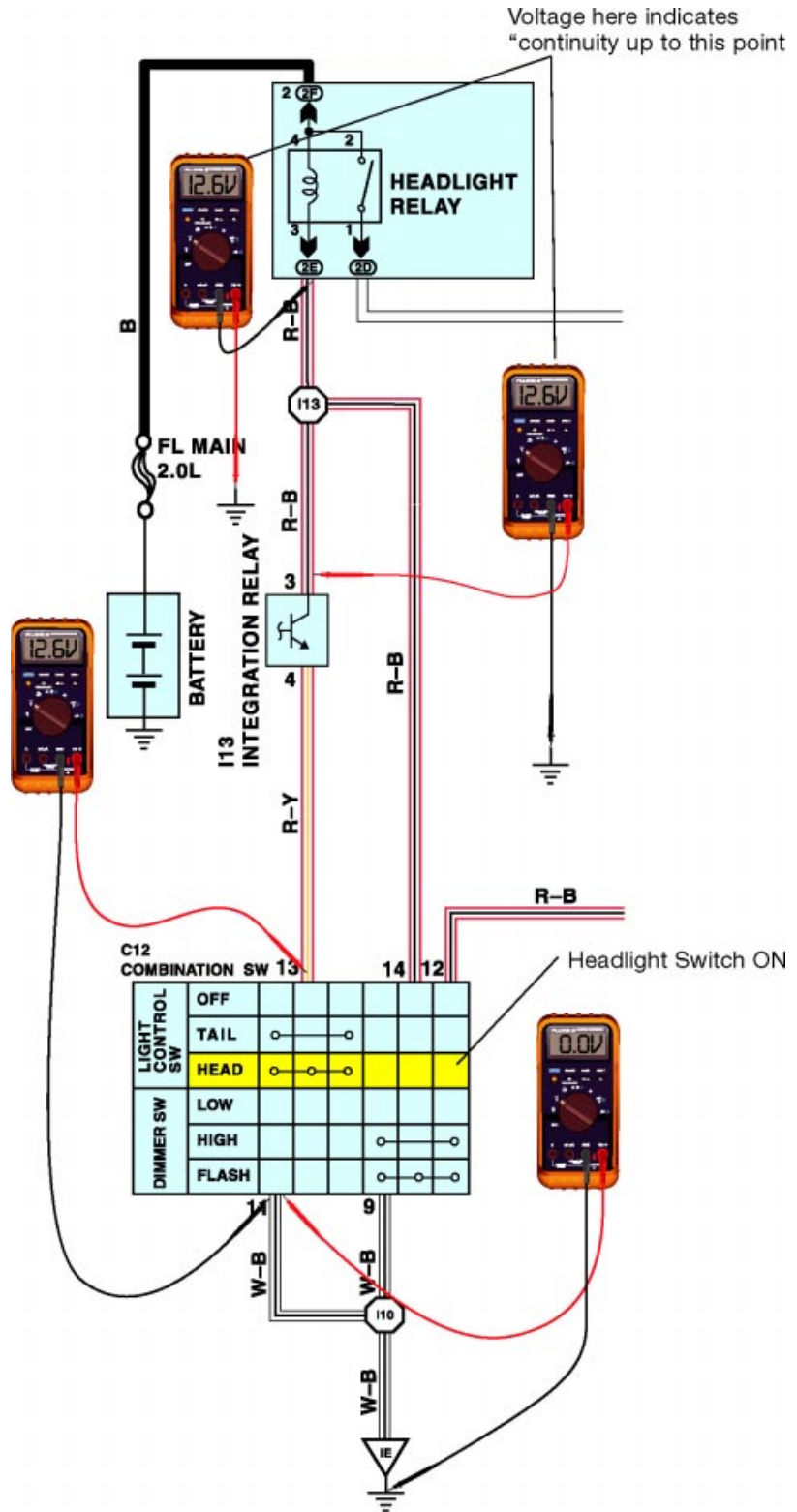


Fig. 5-1
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Using an Ohmmeter on Open Circuit Problems

An ohmmeter can also be used to check continuity in the wiring on both sides of the circuit.

1. Use the EWD to determine the appropriate test points. Be sure that the circuit is OFF while making the measurement, and that there are *no unwanted parallel connections* in the section of the circuit you are testing.
2. Connect the ohmmeter probes on each end of the section of the circuit you want to check.

Ohmmeter Advantages and Disadvantages

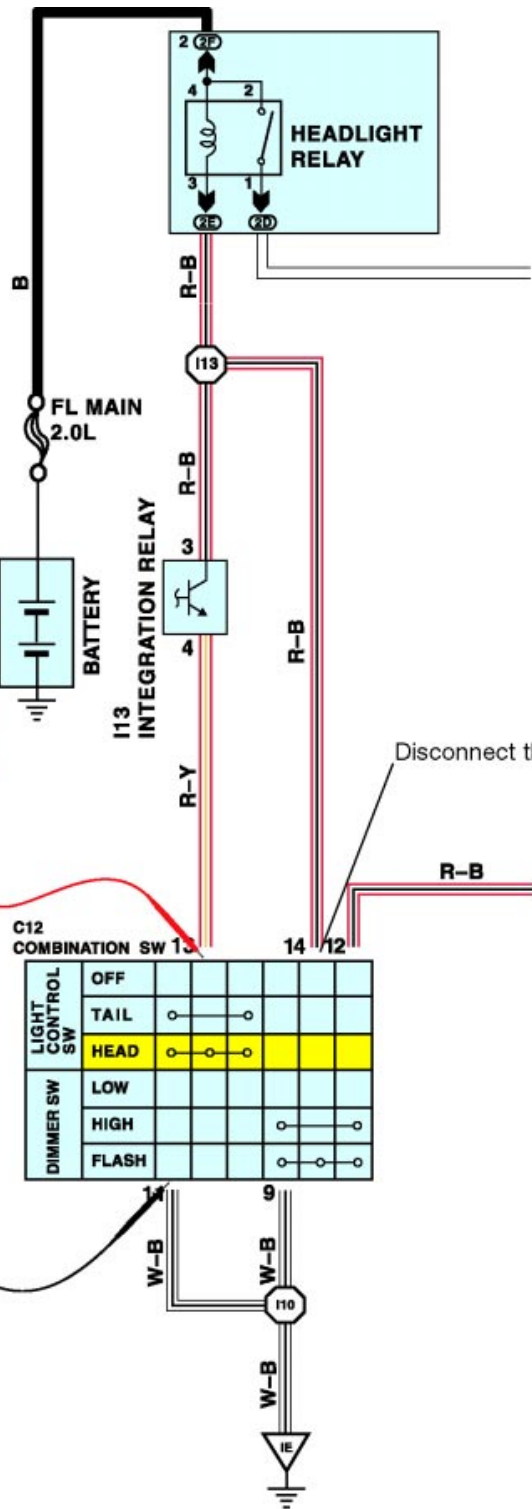
Advantage: Checks for resistance problems

Disadvantage: More difficult to connect to the circuit, requires power to be turned OFF. Usually need to disconnect more connectors to isolate the portion of the circuit being tested. On **high current flow circuits** (starter motor or load which draws above **4A**), the amount of resistance that can cause a problem (in the *tenths of an ohm*) is very small and difficult to detect. A **voltage drop check** is more useful in this case.

Using an Ohmmeter

The Ohmmeter can check for high resistance problems, and see if the relay coil resistance is within specification

Ohmmeter will confirm the bad switch



LIGHT CONTROL SW	OFF				
	TAIL	○	○		
	HEAD	○	○		
DIMMER SW	LOW				
	HIGH			○	○
	FLASH				○

Fig. 5-2
L6521502

Using a Jumper Wire

Use a **jumper wire** to by-pass sections of the circuit.

1. Use the EWD to determine sections circuit which can be by-passed with a jumper wire
2. Connect the jumper wire by backprobing connectors

Jumper Wire Advantages and Disadvantages

Advantages: A quick, simple means of eliminating parts of the circuit

Disadvantage: Could be difficult to use depending on connector/part location; How it is connected into the circuit is critical; has the potential of damaging the circuit.

CAUTION

- Because of the potential for accidental short-to-grounds when using a jumper wire, be sure to follow the EWD and plan the placement of the jumper carefully, **never by-passing a load!** If available, use a fused jumper wire.
- Never by-pass a resistor in a circuit. Components, such as fuel injectors, can have a *series resistor* which limits current flow through the injector solenoid coils. *Shunting* around that resistor could cause significant damage.

Using a Jumper Wire

A Jumper wire can be used to bypass the relay ground circuit to see if the headlight circuit is OK.

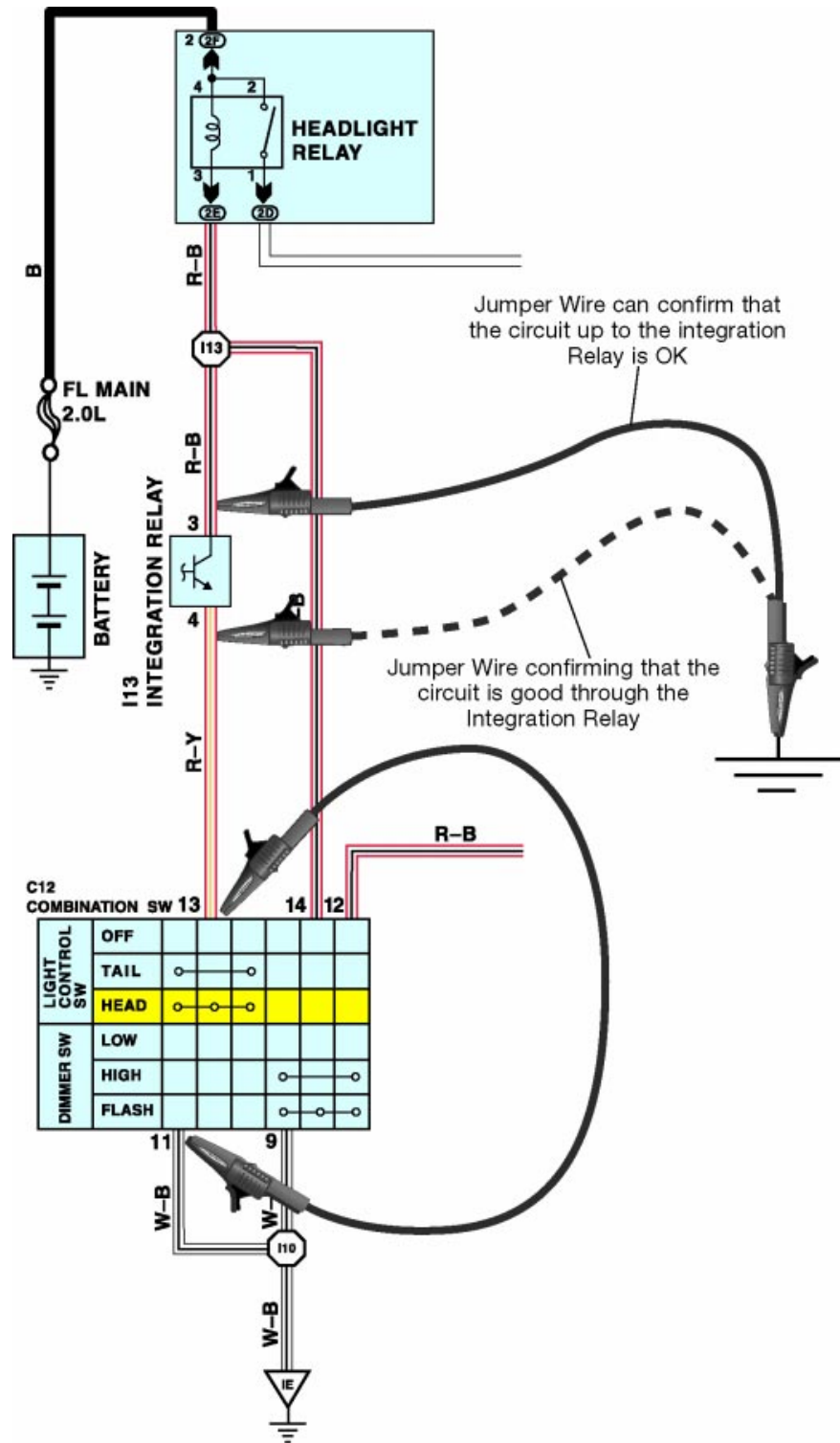


Fig. 5-3
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High Resistance Problems

High resistance circuit problems are very similar to open circuit problems. But instead of an *infinite* amount of resistance stopping current flow entirely, a high resistance problem *adds series resistance* into the circuit to **restrict** current flow. This restriction can cause the load in the circuit to:

- Operate erratically
- Operate *partially* (such as a dim bulb)
- Not work at all (insufficient current flow/voltage)

Causes of a High Resistance Problem

In the best of connections and conductors there will always be a certain amount of resistance. As you learned earlier, there are 5 factors which affect the resistance in any conductor. The condition of the conductor is the factor which is at the heart of all high resistance problems:

- **Corrosion at connections**

The effects of weather, road salt, and moisture can take its toll on a terminal and harness. Although weather sealing on most terminals has improved greatly, terminal corrosion remains a problem.

- **Cut/chafed wiring**

Any reduction in the *diameter* of a wire also adds resistance. When any of the strands in a wire are cut, series resistance is also added. Also, a hole in the wire's insulation allows moisture to corrode the wire adding resistance into the circuit.

Because of the *wicking* action of the wire, this corrosion will eventually affect a large area of the wire, not just the area where the insulation is damaged.

- **Poor grounding point**

Most circuits on the vehicle use a *chassis ground*, a ground which is fastened to any metal surface of the vehicle. These ground points tend to be more exposed to weathering than the +B side of the circuit, with a high potential for corrosion.

Many chassis grounding points are located on painted areas. A poor connection could result if the "cutting" action of the terminal or lock washer does not sufficiently clear the paint from the surface.

By taking this voltage drop, and comparing it to battery voltage, you will know how much voltage is being lost to resistance in the circuit. Remember that for most body electrical circuits, about 0.2V per connection or about 0.5V for the entire circuit is allowed. For low current flow sensor circuits, or any circuit related to an ECU, up to about 0.1V loss in a circuit's wiring and connections is acceptable.

Diagnosing High Resistance Problems

Because you are dealing with a **series resistance**, you can use the *series circuit voltage principles* to quickly determine if you have a high resistance problem and isolate its location.

Determine If There is Current Flow in the Circuit

You can usually determine if there is current flow by seeing if there are any visible signs of operation (dim light bulb, slow turning motor, relay contact “buzzing”, etc.). **However, there still can be some current flow in a circuit even if there is no external sign of operation.**

A voltage drop measurement can verify if there is current flow or not. Since voltage drops occur only if there is current flow in a circuit, a **voltage drop at the load**, *with confirmed continuity through the load*, means that there is current flow in the circuit.

Measure for the voltage drop by connecting the voltmeter in parallel directly at the +B and ground terminal of the load, with the circuit ON.

Isolate the Problem

The exact location of a high resistance problem can be easily found. Any resistance in a series circuit causes a voltage drop. To isolate the problem, you just need to look for the voltage drop to “flag” the exact location:

1. Connect the voltmeter in parallel: Place one probe at the ground terminal at the load, and the other probe to a known good ground.
2. With the circuit ON, measure the voltage drop. If the voltage drop **exceeds 0.5V (about 0.2V per connection) you have a problem on the ground side of the circuit.** If the voltage drop is OK, the problem **must be on the +B side of the load.**

If you want to measure in parallel to the +B side of the circuit, you can connect one probe to the +B terminal of the load, and the other probe to a fuse or other wiring that has a connection to the positive terminal of the battery.

3. When you know which side of the circuit has the problem, use the EWD to locate test points in the circuit (wire harness to wire harness connectors, junction or relay block connectors, etc.) that you can continue to make voltage drop measurements at.

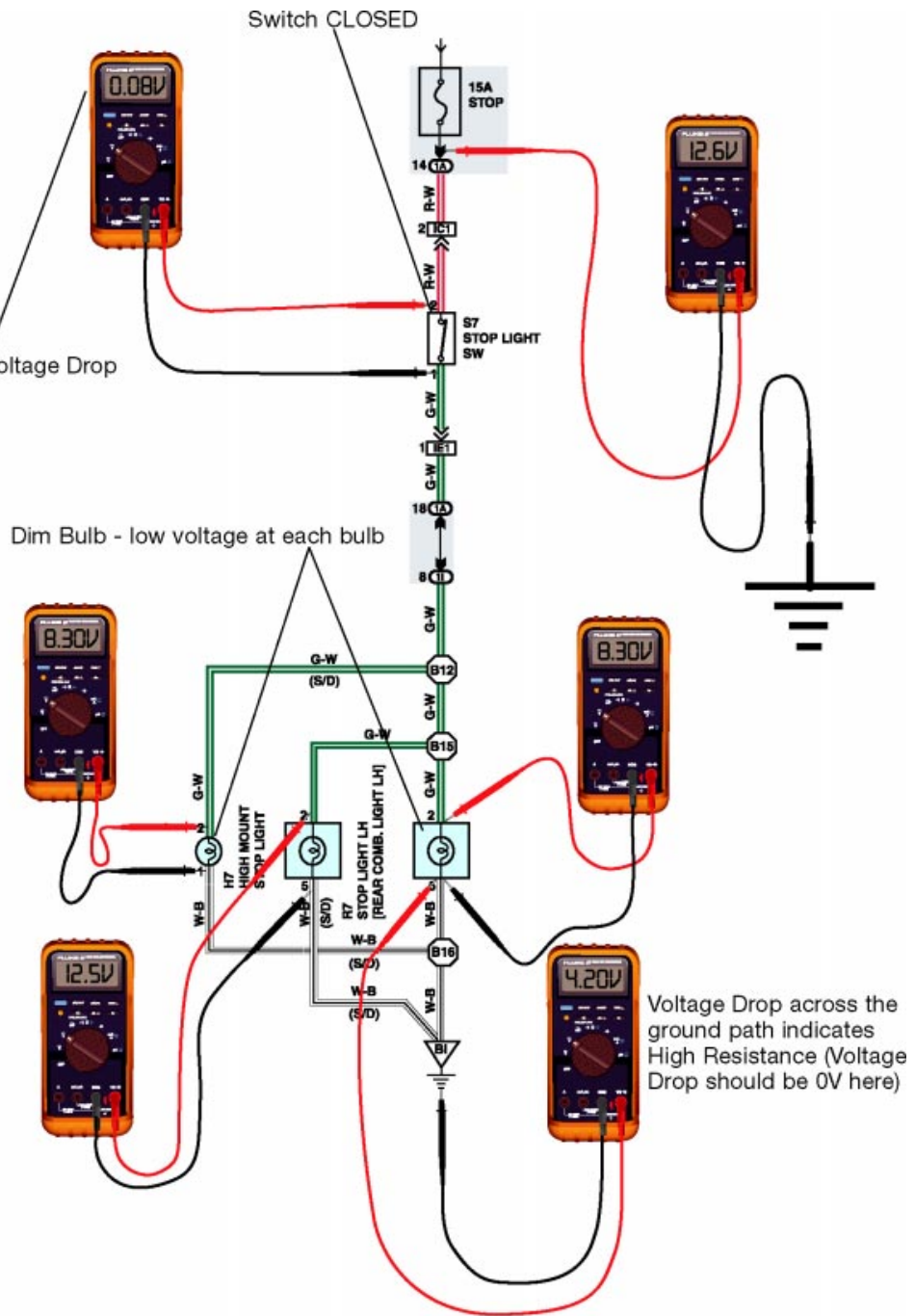
NOTE

Remember that a near 0V drop is normal if the wire/connection is OK. The voltage drop occurs only when there is resistance.

Isolating a High Resistance Problem

Use a voltage drop check to the ground side of the circuit to eliminate or confirm the ground side as the problem. From that point, continue to use a process of elimination.

No Resistance - 0V Voltage Drop



Voltage Drop across the ground path indicates High Resistance (Voltage Drop should be 0V here)

Fig. 5-4
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Diagnosing Parasitic Load Problems

A **parasitic load** continuously draws current from the battery, even when the key is OFF. With the introduction of ECUs that have a “memory”, a small parasitic load of **up to 50mA** is considered **acceptable**. You will find the average parasitic load to be around 20mA or less, depending on the vehicle.

If the customer complains of a dead battery after the car is parked for a day or two (and the charging system/battery are OK), an **unwanted parasitic load** could be the cause. These excessive parasitic loads are usually caused by a short circuit condition where the *control* of the circuit (such as a switch) is bypassed, causing the load to be ON all the time.

Parasitic Load Diagnostic Procedure

Isolating a parasitic load problem is a matter of disconnecting various fuses, junction blocks, wire harness-to-wire harness connectors, and individual connectors or pins (applying a strategic process of elimination). This process can be broken into two parts:

- **Isolate the fuse** which “feeds” the parasitic load
- Determine **which individual circuit has the problem** by disconnecting connectors fed by that fuse.

Verify the Problem and Isolate the Fuse

1. **Verify that all lights and accessories are OFF. (An important step!)**
2. Connect an ammeter to the battery negative terminal, and measure the current draw. **If above 50mA, a parasitic load problem exists.**
3. **Disconnect fuses one-by-one** until the parasitic load drops to a normal level.

CAUTION

Some **aftermarket alarm systems** operate the horn or a siren when the battery is reconnected. This high current flow could potentially blow the fuse in your ammeter. To avoid this problem:

1. **Connect a jumper wire between the battery post and battery cable** to let the initial surge of current pass.
2. **With the jumper wire still connected, connect the ammeter** to the battery post and cable.
3. **Disconnect the jumper wire** and measure the parasitic load. All that is left now is a process of elimination. Since you know which fuse is connected to the problem, you now need to find which circuits are connected to that fuse and disconnect the circuits one-by-one until parasitic load drops off. There are two different “strategies” that you can use to pinpoint the location of the parasitic load:

Measuring Parasitic Load

If an aftermarket alarm system is installed, connect a jumper wire between the battery negative terminal and the red meter lead, touch the black meter lead to the negative battery post, lift the terminal over the meter lead, and measure the parasitic load.

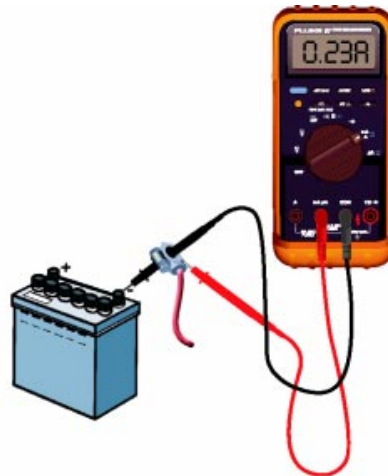


Fig. 5-5
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Determining the Location

- **Disconnect components that are fed by that fuse.** Look at **Section H Power Source (Current Flow)** to find the components which use that fuse, and one-by-one, disconnect these components until the parasitic load drops off. This simple, straightforward approach can have some time saving advantages *if there are not a lot of components that are connected to the fuse* (too many connectors to disconnect), and if most or all of the *connectors are easy to get to*.

NOTE

When disconnecting the components, choose each one **strategically**. Go first to the components that are the easiest to get to, or to components that have a history of causing these unwanted “draws”. Areas to check first include lighting circuits (trunk light, vanity light, interior light, etc.), and aftermarket accessory installations.

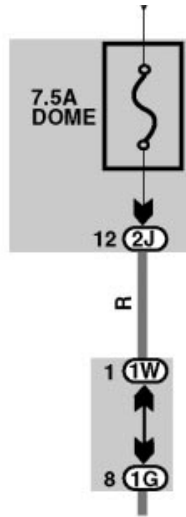
- **Follow the current flow through the Junction Blocks.** If there are a very large number of individual components which use the fuse, you may want to isolate the junction block used by the problem circuit. By finding the junction block, you will be able to narrow down the number of component connectors you will have to disconnect. The procedure to follow is listed below. **Note that this is a time consuming process, and should only be used if there are too many components that would have to be disconnected, or if the component connectors are not easy to get to.**

**Procedure for
Mapping Current
Flow Through the
J/Bs**

1. To determine which Junction Block connectors are fed by that fuse: Look at **each** *System Circuit Diagram* for that specific fuse at the top of the page. **Note any Junction Blocks or Junction Connectors that are used, and write down the connector and terminal numbers.** (This is a time consuming step, but it has to be done.)
2. **Disconnect each junction block connector individually** until the parasitic load drops to a normal level. By doing this, you are identifying which connector provides power to the problem circuit.
3. If a single J/B connector has two or more pins which branch into other circuits, you can isolate the individual circuits on the J/B connector by *carefully* removing the specific terminals, one at a time. If you have an inductive ammeter which is sensitive enough to measure the parasitic amperage, simply clamp around the specific wires to determine which one is connected to the problem.
4. Look at the list of J/B connectors and terminal numbers that you wrote down earlier. **See which circuits use that specific J/B connector and pin.**
5. **Isolate individual components** in each of those circuits. **Disconnect the connector** at any of the loads or at a wire harness-to-wire harness connector. Watch for the **parasitic load to drop to a normal level on the ammeter.** When this happens, you know that you have disconnected the problem from the circuit. Again, you can also use an inductive ammeter (if the amperage is high enough) to pinpoint the problem wire.
6. Reconnect the connector, and strategically disconnect other connectors until you isolate the problem.
7. Once the location of the short causing the parasitic load has been isolated, **make the repair.**

Mapping Current Flow Through the J/Bs

Looking at the system circuit diagrams of the circuits which use the fuse, you need to write down which J/B connectors and pins are used. This map of the current flow will help you track down the cause of the problem.



Circuit	Junction Block Connectors				Junction Connectors	
	12 (2J)	1 (1W)	8 (1G)		ID #	PIN
Automatic Light Control	12 (2J)	1 (1W)	8 (1G)	<input type="checkbox"/>	J5	A
Clock	12 (2J)	1 (1W)	8 (1G)	<input type="checkbox"/>	J5/J6	A/B
DRL Relay	12 (2J)	1 (1W)	7 (1V)	<input type="checkbox"/>		
Ignition Key Cyl	12 (2J)	1 (1W)	2 (1M)	<input type="checkbox"/>	J15	A
Luggage Comp. Light	12 (2J)	1 (1W)	9 (1S)	<input type="checkbox"/>		
Vanity Light RH	12 (2J)	1 (1W)	5 (1F)	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Fig. 5-6
L6521506

**Diagnosing
Shorts-to-
Ground**

A **short-to-ground** occurs whenever a circuit finds a path to ground *before going through the load*. Because current flow is no longer controlled by the resistance of the load, excessive current flow forces the fuse or circuit breaker to “blow”, avoiding damage to the wiring.

The process for diagnosing a short-to-ground has similarities to diagnosing a parasitic load. The major differences are:

**Short-to-Ground
Diagnostic
Strategy**

- You **know exactly which fuse** the problem is connected to.
- You **need to connect a load (such as a test light, short finder, or headlight) in place of the fuse** while isolating the location of the problem.
- You know that the short-to-ground will be **located in either the load itself or in the wiring before the load**. The problem can never be on the ground side of a load. Because the short-to-ground could potentially be located somewhere within the harness, the number of possible causes is multiplied.

Selecting a Load A load of some type must be used in place of the fuse in order to diagnose the circuit. It is a common practice to use an ordinary 12V test light. But be aware that **not just any test light will work**. In fact, if the fuse circuit you are testing is connected to a number of unswitched parallel branches (especially lighting circuits), **an average test light will be ON at all times, even if the short-to-ground is fixed!**

Power Source (Current Flow) Chart (Pre 1999 MY)

Use the Current Flow Chart to find all the loads powered by the blown fuse.

CB or Fuse	* Page Nos of Related Systems		Parts		Code or Location	
	D7	D8	D9	D10	D11	D12
① 50A HTR						
5A TEL						
7.5A DOME	•	•	•	•	•	•
10A ECU-B						
10A HAZARD						
10A HORN						
② 15A EFI						
15A HEAD(LH)						
15A HEAD(RH)						
20A RADIO NO.1						
30A CDS						
30A RDI						
③ 25A A/F HTR						
10A H-LP LH(LWR)						
10A H-LP RH(LWR)						
④ 60A ABS						
5A IGN						
5A STARTER						
7.5A OBD						

Fig. 5-7
L652f507

Power Source (Current Flow) Chart (Beginning 1999 MY)

Starting with the 1999 MY, the Power Source (Current Flow) Chart becomes a table format.

Fuse	System	Page	
10A GAUGE	Stop Light	122	
	Tail Light	105	
	VSC	216	
15A HEATER	Automatic Air Conditioning	272	
	Rear Window Defogger and Mirror Heater	246	
10A MIRROR-HEATER	Engine Control (Brazil)	74	
	Engine Control and Engine Immobilizer System (USA and Canada)	62	
	Rear Window Defogger and Mirror Heater	246	
10A TAIL	Engine Control (Brazil)	74	
	Engine Control and Engine Immobilizer System (USA and Canada)	62	
15A CIG	Cigarette Lighter and Clock	246	
	Remote Control Mirror (w/o Driving Position Memory)	190	
	Shift Lock	210	
	SRS	235	
	ABS	230	
	ABS and Traction Control	232	
	Automatic Glass-Resistant EC Mirror	250	
	Cellular Mobile Telephone	253	
	Cruise Control	192	
	Door Lock Control	160	
15A ECU-IG	Electric Modulated Suspension	212	
	Headlight Beam Level Control	98	
	Power Seat (Driver's Seat w/ Driving Position Memory)	146	
	Rocking Fan and Condenser Fan	269	
	Shift Lock	210	
	Theft Deterrent	168	
	VSC	216	
	Wireless Door Lock Control	174	
	15A FOG	Front Fog Light	118
	10A POWER-OUTLET	Power Outlet	134
15A STOP	ABS	230	
	ABS and Traction Control	232	
	Cruise Control	192	
	Electric Modulated Suspension	212	
	Electronically Controlled Transmission and A/T Indicator (Brazil)	204	
	Electronically Controlled Transmission and A/T Indicator (USA and Canada)	198	
	Engine Control (Brazil)	74	
	Engine Control and Engine Immobilizer System (USA and Canada)	62	
	Power Seat (Driver's Seat w/ Driving Position Memory)	146	
	Shift Lock	210	
Stop Light	122		
VSC	216		

- These are the page numbers of the first page on which the related system is shown.

Fig. 5-8
L652f508

In general, it is better to **use a load which requires a few amps to operate**, such as a sealed beam headlight. With a **sealed beam headlight**, you will see a “bright light” go “dim” when the short-to-ground is disconnected. But there are alternatives to this approach.

Some technicians use a *short finder* or circuit breaker in place of the fuse. A short finder kit consists of a circuit breaker and a low-quality inductive type ammeter or compass. While the circuit breaker “pulses” the circuit OFF and ON, you follow the wiring with the inductive ammeter. When you reach the location of the short-to-ground, the ammeter will no longer show any current flow in the wire.

The success rate using a short finder is mixed. Isolating and following a circuit’s wiring behind the instrument panel, or through harnesses which have additional wires that have *normal* current flow through them can be difficult. Keep in mind that depending on the gauge of wire and the type of insulation (vinyl or PVC), a circuit breaker (**even a short finder**) will allow momentary “bursts” of current flow that may exceed the capacity of wiring, possibly causing heat damage to the insulation or wire, and could also damage adjacent wires in the harness.

The Bottom Line The best tool to use for a finding a short-to-ground is a sealed beam headlight or a load which uses a few amps. A test light, short finder or circuit breaker can be used, but precautions must be taken to prevent damaging the harness, or mis-diagnosing the problem.

**Use a Headlamp
as a Load in Place
of the Fuse**

Using a circuit breaker or short finder could potentially damage some circuits. A load which draws around 3A to 8A will work best.



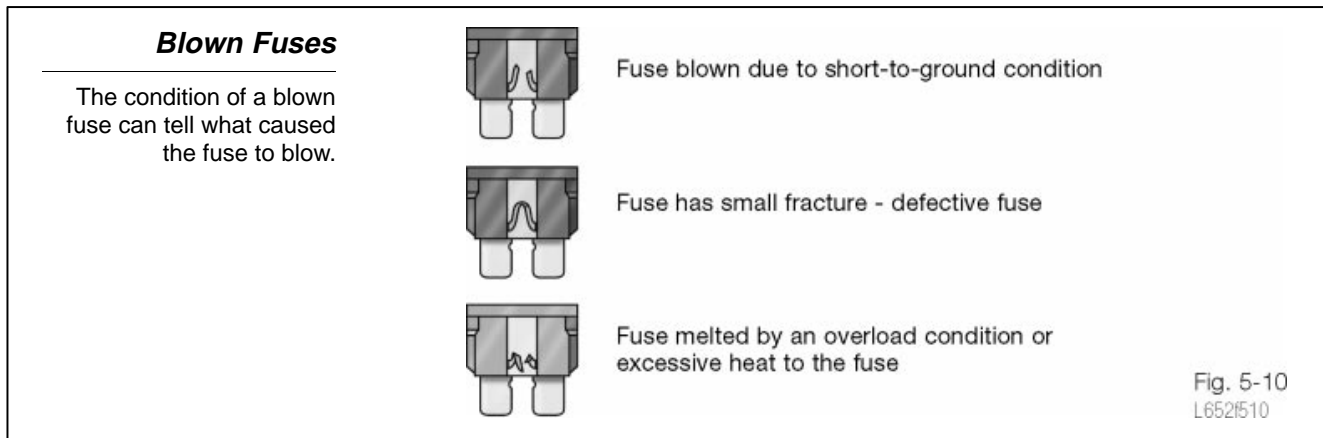
Fig. 5-9
L652f509

Short-to-Ground Diagnostic Procedure

To determine the location of a short-to-ground:

1. Locate the blown fuse, and **inspect its condition**:

- If **“blown cleanly”** or is **“charred”**—you know that you have a direct short-to-ground condition.
- If it looks **“melted”**— a large amount of current flow went through it for a period of time; check for an overload condition. This could be caused by aftermarket accessory installations. This condition can also be caused by a source of heat adjacent to the fuse. A poor connection near or at the fuse, while causing less current flow in the circuit, can also generate a significant amount of heat which can damage the fuse.
- If fuse looks **“fractured”**—probably a defective fuse; replace the fuse and recheck the system.



2. Determine if the short-to-ground is **intermittent or continuous**.

- If it's not clear whether the fuse is blowing intermittently or on a continuous basis, (and if a supply of replacement fuses is available), replace the blown fuse with a new one, and retest the circuit.
- **If the fuse is blowing intermittently**, find out the exact *conditions* which cause the fuse to blow. This may point you directly to the problem circuit.

3. **Connect an appropriate load in the place of the blown fuse.**

With the short-to-ground condition present, the load should be ON.

Connect an Appropriate Load

The lamp will go OFF when the short has been disconnected.

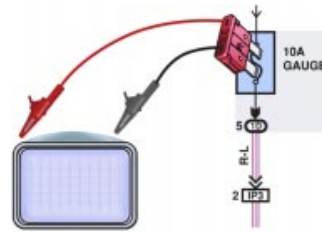


Fig. 5-11
L6521511

Disconnecting Component Connectors First

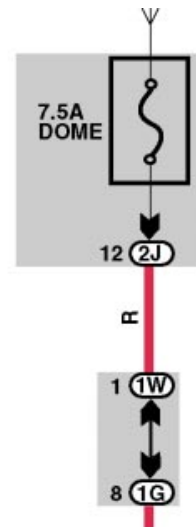
Your next step in this process of elimination is to disconnect individual connectors. Where to start is not as “clear cut” as it is with a parasitic load. Here are the advantages and disadvantages of two strategies:

Mapping Current Flow Through the J/Bs

Using **Section H, Power Source (Current Flow)**, determine which components are connected to that fuse. If the components connected to the blown fuse are accessible, and there are not too many, it can be a quick means of eliminating some of the possible causes. But if the problem is in the harness, you will have to use the “*mapping current flow through the Junction Blocks*” technique.

Mapping Current Flow Through the J/Bs

Your use of the Power Source Matrix and System Circuit Diagrams is the same as when diagnosing a parasitic load problem.



Circuit	Junction Block Connectors				Junction Connectors	
	12 (2J)	1 (1W)	8 (1G)		ID #	PIN
Automatic Light Control				<input type="checkbox"/>	J5	A
Clock				<input type="checkbox"/>	J5/J6	A/B
DRL Relay				<input type="checkbox"/>		
Ignition Key Cyl				<input type="checkbox"/>	J15	A
Luggage Comp. Light				<input type="checkbox"/>		
Vanity Light RH				<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Fig. 5-12
L6521512

This method is similar to the procedure used in the parasitic load diagnosis section, except that you are watching for the load to turn OFF, instead of watching the ammeter. Because the current flow in the circuit will be a **few amps instead of milliamps**, you can use an **inductive ammeter** to isolate which individual wire at the J/B connector feeds to the short-to-ground. This is much easier than removing the individual terminals from the J/B connector.

1. Determine which Junction Block Connectors are fed by that fuse. Look at **each System Circuit Diagram** for that specific fuse at the top of the page. Note any **Junction Blocks or Junction Connectors** that are used, and **write down the connector and terminal numbers**. Again, this is a time consuming step, but it must be done.
2. **Disconnect each junction block connector individually** until the load turns OFF. By doing this, you are identifying which J/B connector provides power to the problem circuit. Reconnect the connectors.
3. In some circuits, a single J/B connector can distribute power from a fuse into a number of different circuits. You can isolate which terminal/wire is connected to the short-to-ground by using an inductive ammeter or by individually removing each terminal until the load turns off.
4. Look at the list of J/B connectors and terminal numbers that you wrote down earlier. **See which circuits use that specific J/B connector and pin.**
5. Look at the System Circuit Diagrams of the circuits from your list in step 1. **Isolate circuits by disconnecting appropriate harness-to-harness connectors**, watching for the load to turn OFF. This will further pinpoint the problem circuit, but you may still need to isolate which terminal/wire is connected to the short-to-ground by using an inductive ammeter or by individually removing each terminal until the load turns off. Also, you may need to cross-reference the various splice points between the circuits by looking at the individual wiring diagrams.
6. Continue to strategically disconnect/reconnect connectors in the circuits until you isolate the problem.
7. Once the location of the short-to-ground has been isolated, **make the repair.**

Remember that with a short-to-ground, the problem must be on the +B side of the load, or in the load itself.

Isolate the Problem

Strategically disconnect connectors to isolate the location of the short. When the test light does not go off, you know that you are AFTER the short. When the light goes off, you know that you have opened the circuit BEFORE the short.

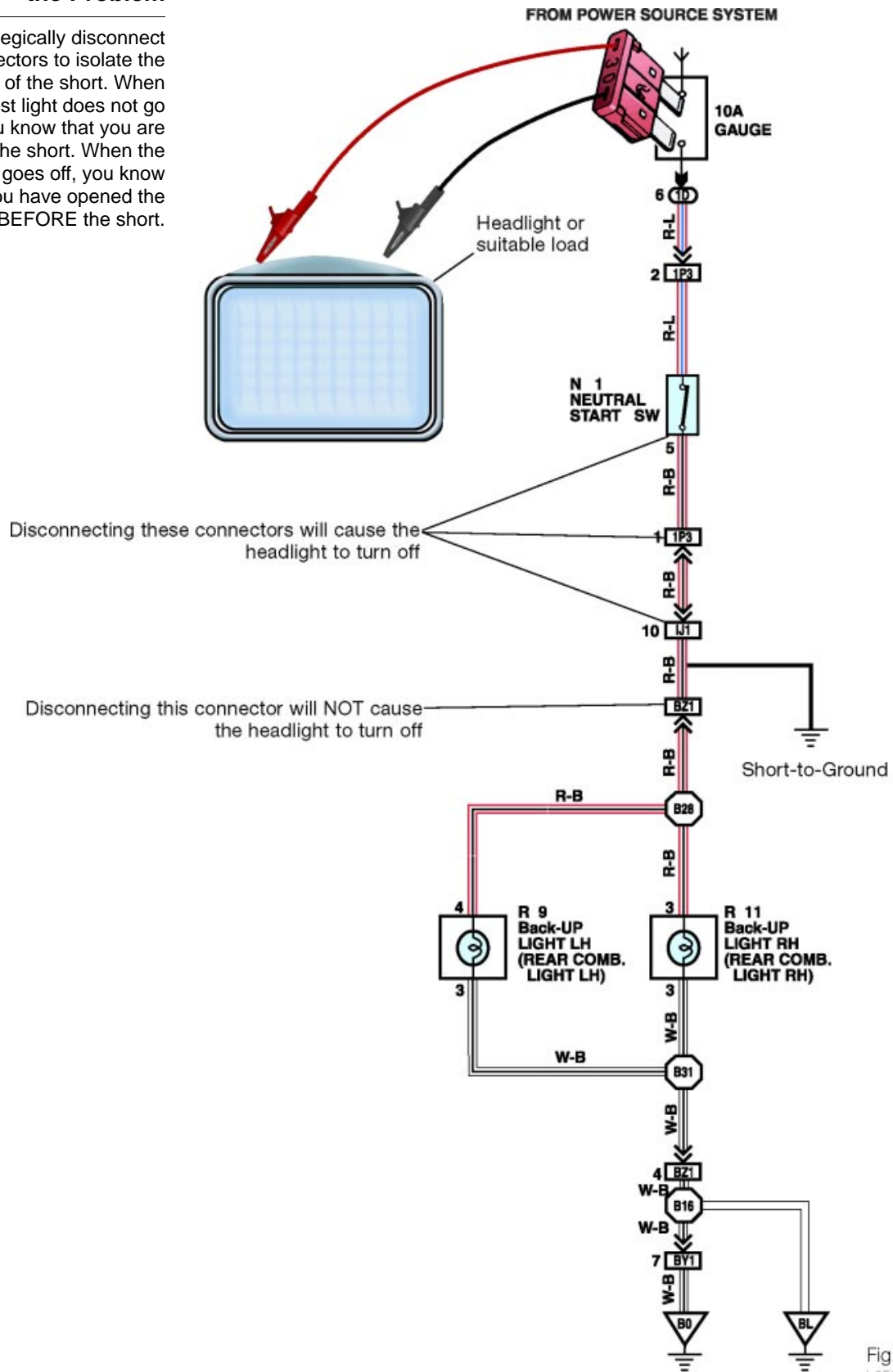


Fig. 5-13
L6521513

Feedback Problems

Feedback problems are probably the strangest electrical problems you can encounter on a vehicle. At one time or another, you have probably seen an electrical problem that just did not make sense, with seemingly unrelated circuits affecting each other like “magic”:

- Operating the right side turn signal causes the side markers to flash
- When the rear defogger is turned ON, the radio turns OFF
- When the horn is operated, the high beam indicator turns ON.

As you know, there is no “magic” in electricity. These circuits have to be related through parallel connections on either the +B or the ground circuit. For example, an open in the circuit to a ground point (in a circuit that has no redundant or alternate ground path) will force current flow to find another path to ground. This other path to ground can be through any load or resistance that has a parallel connection to the problem circuit.

Feedback Problem

Figuring out the cause of a feedback problem can be very difficult. You may need to look at separate EWD pages to find connector terminal relationships that cause feedback problems.

TURN SIGNAL AND HAZARD WARNING LIGHT

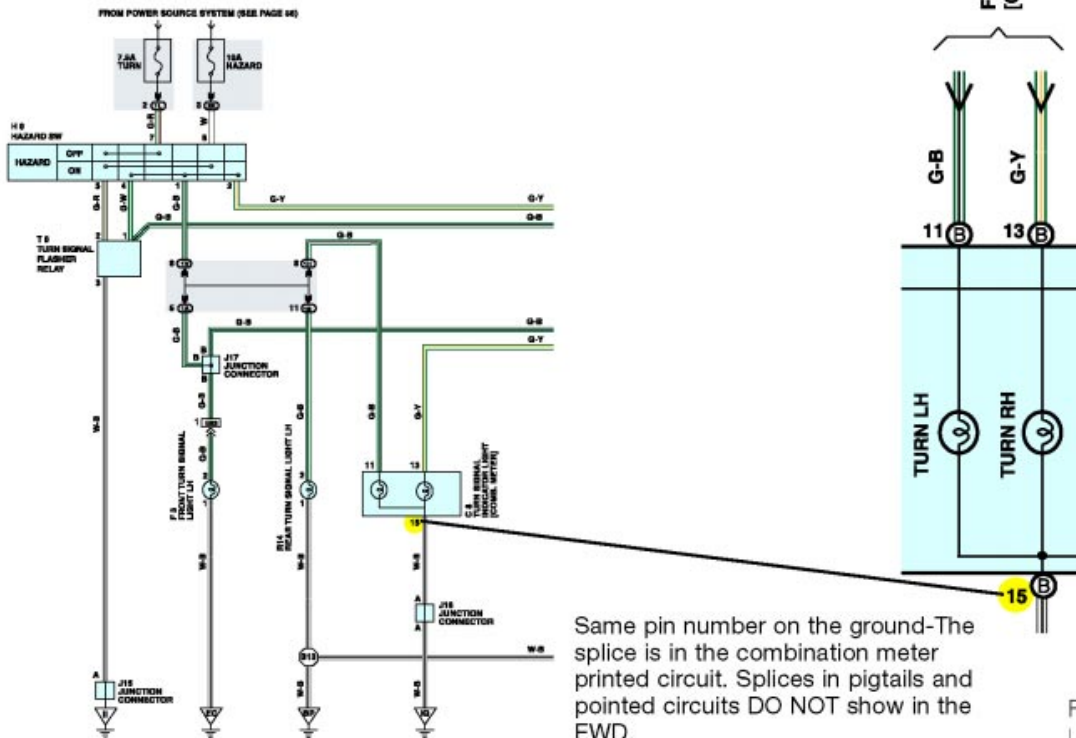


Fig. 5-14
L652F514

Diagnosing a Feedback Problem

With a feedback problem, tracing the path of current flow is extremely difficult. You have to think *backwards* as you try to guess where current flow is going. Since feedback problems don't happen very often, **figuring out** how everything is happening could be a very time consuming process.

Quick Checks for Lighting Circuits

Fortunately, there are some quick checks that you can make to catch just about any feedback problems you will run into.

One of the most common areas of feedback problems is in the car's exterior lighting circuits. When working on a **lighting circuit feedback problem** check the following:

- A shorted light bulb (by a blown filament).
- The customer installed light bulb of the incorrect type or wattage.
- There is an open in one of the light bulb grounds. Use an ohmmeter to check the ground (the socket of the bulb). To do this accurately, be sure to remove all the lights in that combination light. This way, the ohmmeter will not be measuring a parallel connection to ground through one of the other filaments.

Checking Lighting Circuits

Check for shorted light bulbs and open ground paths. Remove the light bulbs and individually inspect the ground paths.

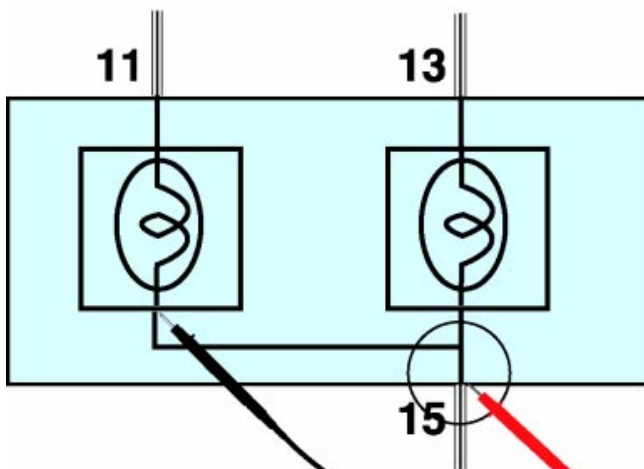


Fig. 5-15
L652#515

Quick Checks for General Feedback Problems

When diagnosing feedback in any body electrical circuit:

1. **Check the fuses**

Look for a blown fuse on any circuit. The lack of a voltage in a circuit can sometimes allow voltage from one circuit to feedback into another.

2. **Check for open ground wires**

A simple disconnected ground wire can cause the worst of feedback problems.

3. **Check for an open circuit isolation diode**

In many circuits, a diode is used in the circuit to prevent feedback problems from happening. If you are operating a circuit that has an isolation diode, and the feedback condition occurs, it's a good place to check.

If the Quick Checks Do Not Find the Cause

If these quick checks **do not find the cause** of the problem:

1. **Thoroughly check each circuit individually**

Make your inspections to *one circuit at a time*, and make sure current flow is going **exactly** where it's supposed to. Check each connection and section of wiring with an ohmmeter, making sure that there is continuity to the correct locations as *specified* in the EWD. Apply this check to both the +B and ground sides of the circuit.

2. **Technical Assistance**

With a database of **solved** problems from throughout the country, Lexus Technical Assistance can be of great help for this type of problem. When you reach the "wall" in diagnosing the problem, call your Region/PD's assigned TAS.