



2008 Buell XB Models Electrical Diagnostics Manual
99493-08Y

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IMPORTANT NOTICE

Buell motorcycles conform to all applicable U.S.A. Federal Motor Vehicle Safety Standards and U.S.A. Environmental Protection Agency regulations effective on the date of manufacture.

To maintain the safety, dependability, and emission and noise control performance, it is essential that the procedures, specifications and service instructions in this manual are followed.

Any substitution, alteration or adjustment of emission system and noise control components outside of factory specifications may be prohibited by law.

Buell Motorcycle Company



2008 Buell XB Models Electrical Diagnostics Manual

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99493-08Y

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2008 Buell XB Models Electrical Diagnostics Manual (99493-08Y)

Please clip out and mail to:
Service Communications Department
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P.O. Box 653
Milwaukee, WI USA 53201

NOTES



ABOUT THIS MANUAL

GENERAL

This electrical diagnostic service manual has been prepared with two purposes in mind. First, it will acquaint the user with the construction of the Buell product and assist in the performance of repair. Secondly, it will introduce to the professional Buell Technician the latest field-tested and factory-approved diagnostic methods. We sincerely believe that this manual will make your association with Buell products more pleasant and profitable.

HOW TO USE YOUR SERVICE MANUAL

Refer to the table below for the content layout of this manual.

NO.	CHAPTER
1	Starting / Charging
2	Engine Management
A	Appendix A Connector Repair
B	Appendix B Wiring Diagrams
C	Appendix C Conversions
D	Appendix D Glossary

Use the TABLE OF CONTENTS (which follows this FOREWORD) and the INDEX (at the back of this manual) to quickly locate subjects. Sections and topics in this manual are sequentially numbered for easy navigation.

For example, a cross-reference shown as **2.1 SPECIFICATIONS** refers to chapter 2 CHASSIS, heading 2.1 SPECIFICATIONS.

For quick and easy reference, all pages contain a section number followed by a page number. For example, **page 3-5** refers to page 5 in section 3.

A number of acronyms and abbreviations are used in this document. See the [D.1 GLOSSARY](#) for a list of acronyms, abbreviations and definitions.

PREPARATION FOR SERVICE

WARNING

Stop the engine when refueling or servicing the fuel system. Do not smoke or allow open flame or sparks near gasoline. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00002a)

Good preparation is very important for efficient service work. A clean work area at the start of each job will allow you to perform the repair as easily and quickly as possible, and will reduce the incidence of misplaced tools and parts. A motorcycle that is excessively dirty should be cleaned before work starts. Cleaning will occasionally uncover sources of trouble. Tools, instruments and any parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a distraction and causes needless delay.

NOTES

- To avoid unnecessary disassembly, carefully read all relative service information before repair work is started.*
- In figure legends, the number which follows the name of a part indicates the quantity necessary for one complete assembly.*

SERVICE BULLETINS

In addition to the information presented in this manual, Buell Motor Company will periodically issue Service Bulletins to Buell dealers. Service Bulletins cover interim engineering changes and supplementary information. Consult the Service Bulletins to keep your product knowledge current and complete.

USE GENUINE REPLACEMENT PARTS

WARNING

Do not use aftermarket parts and custom made front forks which can adversely affect performance and handling. Removing or altering factory installed parts can adversely affect performance and could result in death or serious injury. (00001a)

To ensure satisfactory and lasting repairs, carefully follow the manual instructions and use only genuine Buell replacement parts. This is your assurance that the parts you are using will fit right, operate properly and last longer.

WARNINGS AND CAUTIONS

Statements in this manual preceded by the following words are of special significance.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. (00119a)

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. (00139a)

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage. (00140a)

NOTE

Refers to important information, and is placed in italic type. It is recommended that you take special notice of these items.

Proper service and repair is important for the safe, reliable operation of all mechanical products. The service procedures recommended and described in this manual are effective methods for performing service operations.

WARNING

Always wear proper eye protection when using hammers, arbor or hydraulic presses, gear pullers, spring compressors, slide hammers and similar tools. Flying parts could result in death or serious injury. (00496b)

Some of these service operations require the use of tools specially designed for the purpose. These special tools should be used when and as recommended. It is important to note that some warnings against the use of specific service methods, which could damage the motorcycle or render it unsafe, are stated in this manual. However, please remember that these warnings are not all-inclusive. Inadequate safety precautions could result in death or serious injury.

Since Buell Motorcycle Company could not possibly know, evaluate or advise the service trade of all possible ways in which service might be performed, or of the possible hazardous consequences of each method, we have not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Buell Motorcycle Company must first thoroughly satisfy himself that neither his nor the operator's safety will be jeopardized as a result. Failure to do so could result in death or serious injury.

PRODUCT REFERENCES

WARNING

Read and follow warnings and directions on all products. Failure to follow warnings and directions can result in death or serious injury. (00470b)

When reference is made in this manual to a specific brand name product, tool or instrument, an equivalent product, tool or instrument may be substituted.

Kent-Moore Products

All tools mentioned in this manual with an "HD", "J" or "B" preface must be ordered through SPX Kent-Moore. For ordering

information or product returns, warranty or otherwise, visit www.spx.com.

Loctite Sealing and Threadlocking Products

Some procedures in this manual call for the use of Loctite products. If you have any questions regarding Loctite product usage or retailer/wholesaler locations, please contact Loctite Corp. at www.loctite.com.

PRODUCT REGISTERED MARKS

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All photographs, illustrations and procedures in this manual may not necessarily depict the most current model or component, but are based on the latest production information available at the time of publication.

Since product improvement is our continual goal, Buell Motorcycle Company reserves the right to change specifications, equipment or designs at any time without notice and without incurring obligation.

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NOTES



GENERAL

The specifications contained in the following tables are for the following Buell models: Ulysses, Lightning, and Firebolt.

Table 1-1. Starter Specifications

STARTER	
Free speed	3000 RPM (min) @ 11.5 V
Free current	90 Amp (max) @ 11.5 V
Stall current	400 Amp (max) @ 2.4 V
Stall torque	8.1 ft-lbs (11 Nm) (min) @ 2.4 V

Table 1-2. Service Wear Specifications

SERVICE WEAR LIMITS	IN.	MM
Brush length (minimum)	0.433	11.0
Commutator diameter (minimum)	1.141	28.981

Table 1-3. Torque Values

ITEM	TORQUE	
Battery terminal fasteners	72-96 in-lbs	8-11 Nm
Starter battery positive cable nut	60-85 in-lbs	7-10 Nm
Starter mounting bolts	13-20 ft-lbs	18-27 Nm



GENERAL

The starter is made up of an armature, field winding assembly, solenoid, drive assembly, idler gear and drive housing. The starter motor torque is increased through gear reduction. The gear reduction consists of the drive pinion on the armature, an idler gear and a clutch gear in the drive housing. The idler gear is supported by rollers. The clutch gear is part of the overrunning clutch/drive assembly. The overrunning clutch is the part which engages and drives the clutch ring gear. It also prevents the starter from overrunning. The field windings are connected in series with the armature through brushes and commutator segments.

Wiring Diagrams

For additional information concerning the starting system circuit, see the wiring diagrams in this section and Section 2, Engine Management.

Start Relay

The start relay is not repairable. Replace the unit if it fails.

Starter Interlock

See Section 2, Engine Management, for operation and troubleshooting information.

OPERATION

See [Figure 1-1](#). When the starter switch is pushed, the starter relay is activated and battery current flows into the pull-in winding (10) and the hold-in winding (11), to ground. The magnetic forces of the pull-in and hold-in windings in the solenoid push the plunger (7) causing it to shift to the left. This action engages the pinion gear (1) with the clutch ring gear (13). At the same time, the main solenoid contacts (8) are closed, so battery current flows directly through the field windings (3) to the armature (4) and to ground. Simultaneously, the pull-in winding (10) is shorted. The current continues flowing through the hold-in winding (11) keeping the main solenoid contacts (8) closed. At this point, the starter begins to crank the engine. After the engine has started, the pinion gear (1) turns freely on the pinion shaft through the action of the overrunning clutch (12). The overrunning clutch prevents the clutch ring gear (13) (which is now rotating under power from the engine) from turning the armature (4) too fast. When the starter switch is released, the current of the hold-in winding (11) is fed through the main solenoid contacts (8) and the direction of the current in the pull-in winding (10) is reversed. The solenoid plunger (7) is returned to its original position by the return spring, which causes the pinion gear (1) to disengage from the clutch ring gear (13).



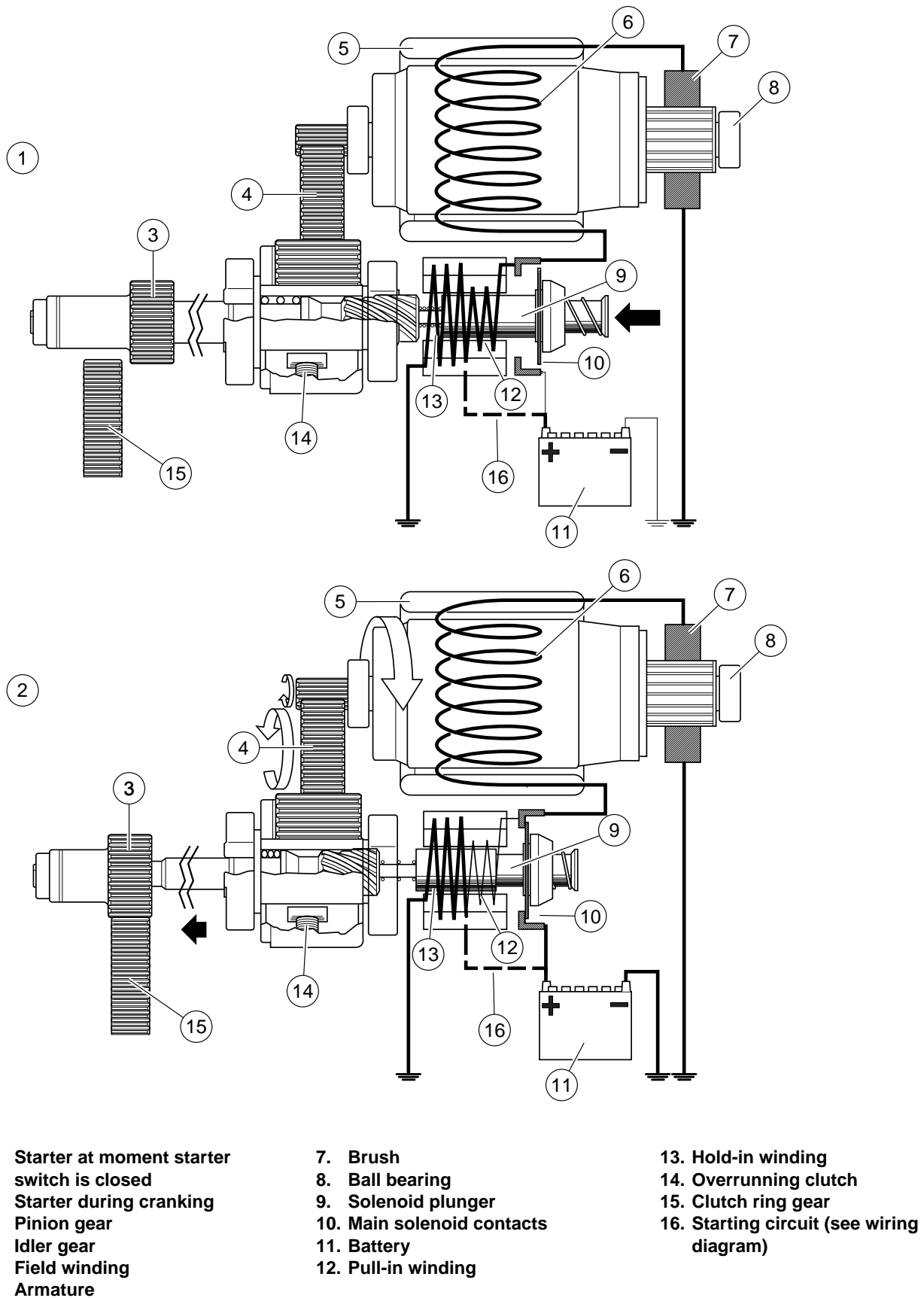


Figure 1-1. Starter Operation

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

- 1. See [Figure 1-2](#). Perform test for [1.5 DIAGNOSTICS/TROUBLESHOOTING, Voltage Drops](#).
- 2. Remove starter motor. Connect jumper wires as described in Free Running Current Draw Test under [1.8 TESTING STARTER ON BENCH](#).
- 3. Connect BREAKOUT BOX (Part No. B-48115) to Electronic Control Module (ECM).
- 4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) gray terminal socket probe and patch cord.
- 5. See Starter Current Draw Test under [1.7 TESTING STARTER ON MOTORCYCLE](#).
- 6. See Free Running Current Draw Test under [1.8 TESTING STARTER ON BENCH](#).

Job/Time Code Values

Dealership technicians filing warranty claims should use the job/time code values printed in **bold text** underneath the appropriate repair.

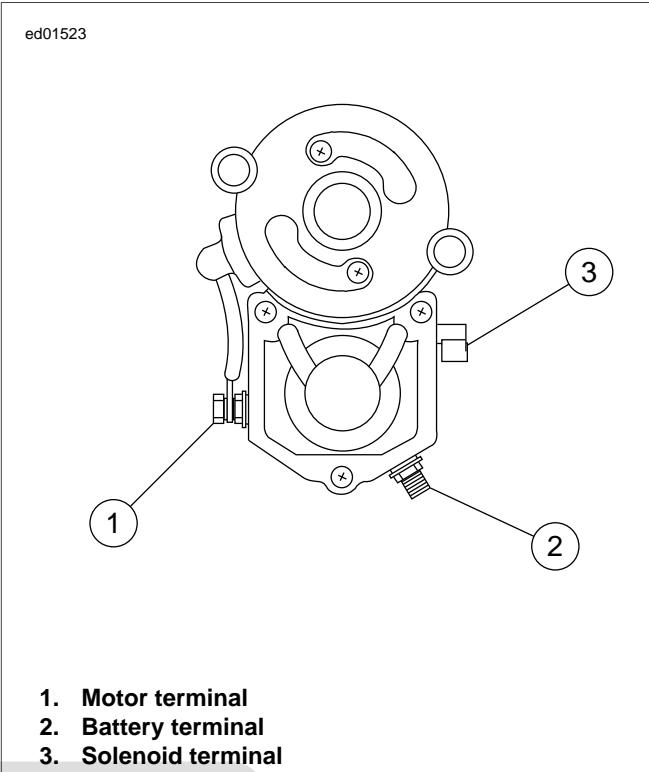


Figure 1-2. Starter Terminals

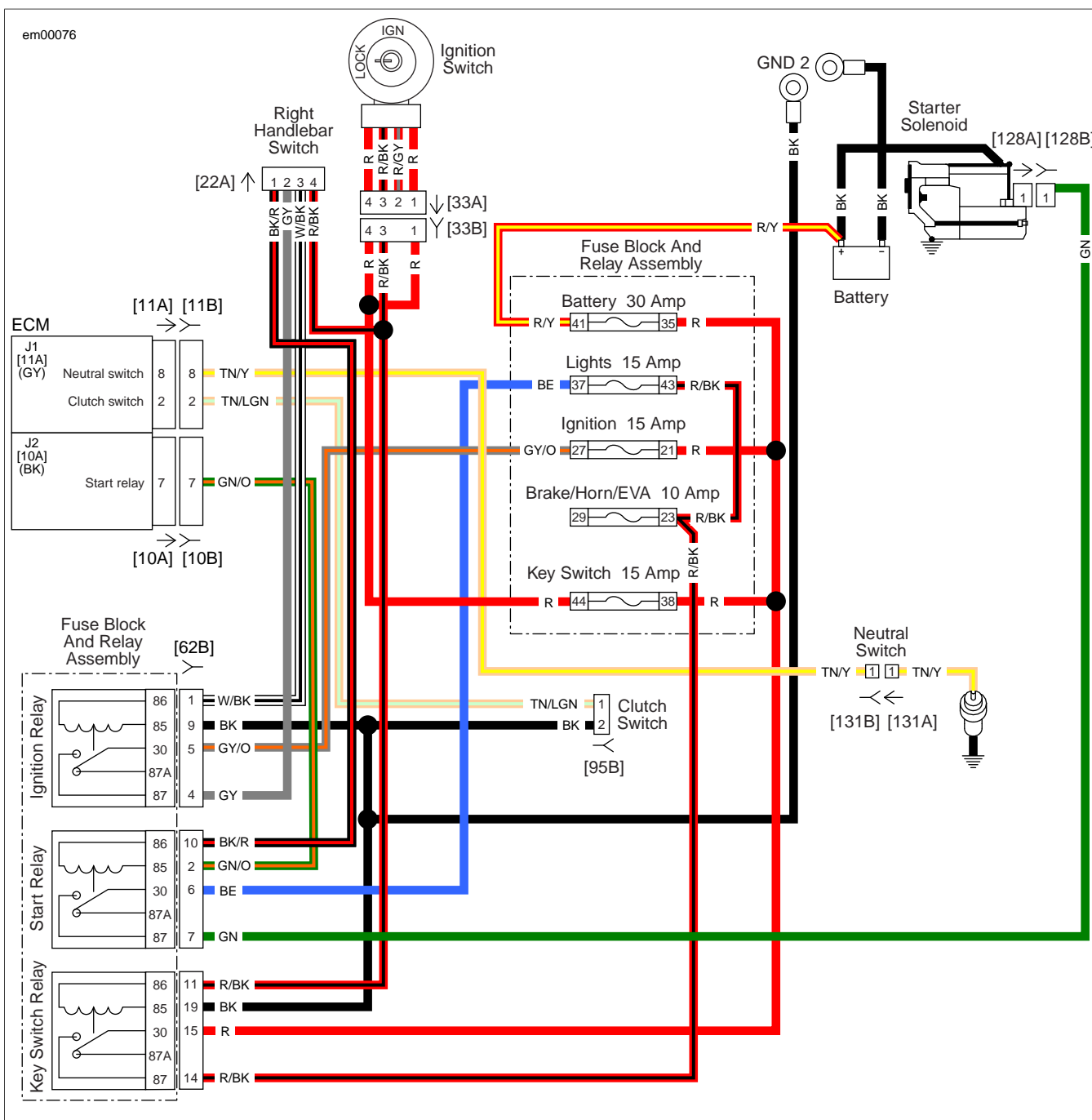


Figure 1-3. Starting Circuit (Ulysses, Lightning)

Table 1-4. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[22]	Right handlebar switch	4-place Multilock	Behind windscreen
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[128]	Starter solenoid	Spade terminal	Top of starter
[131]	Neutral switch	1-place bullet	Under sprocket cover

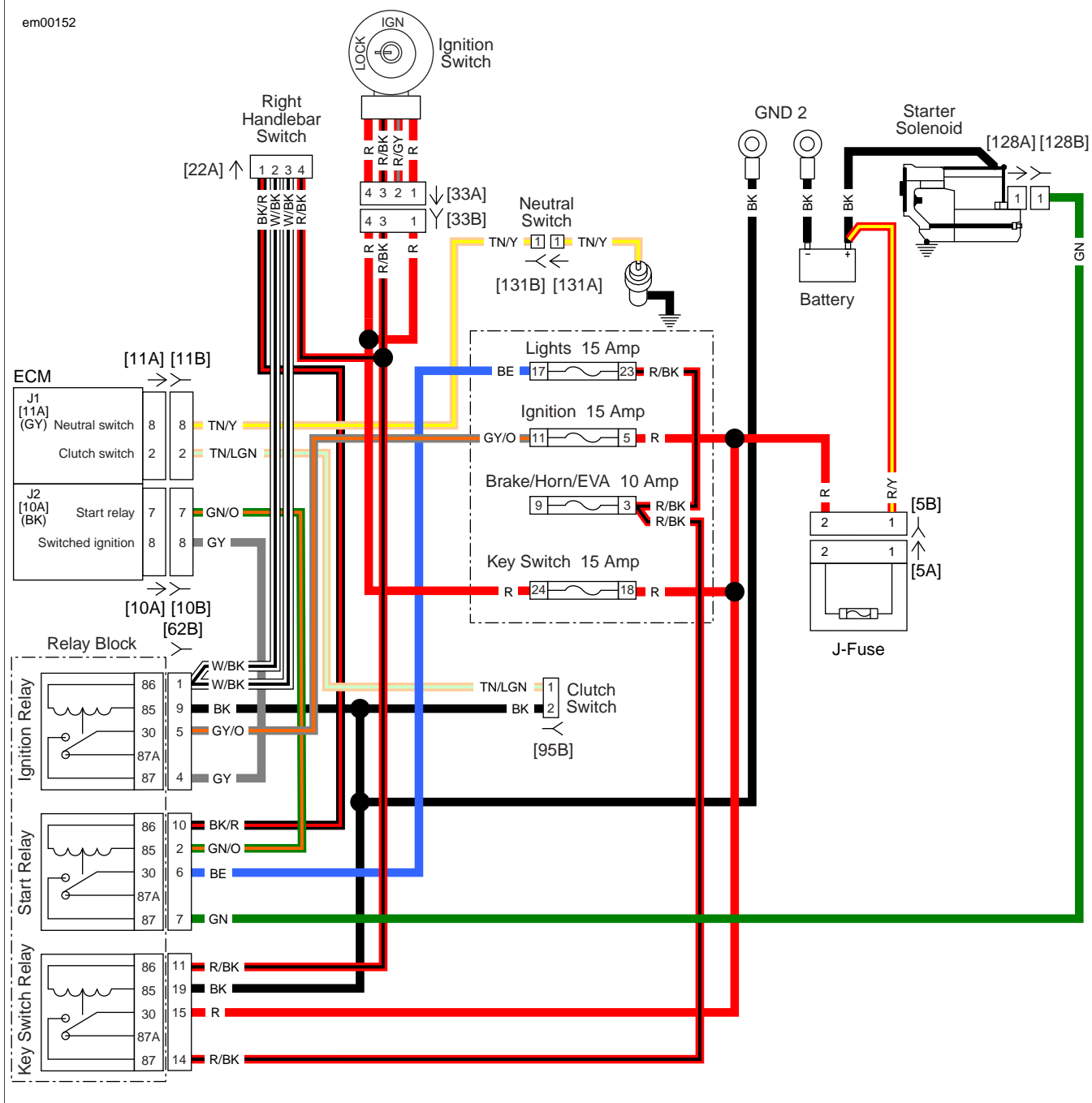
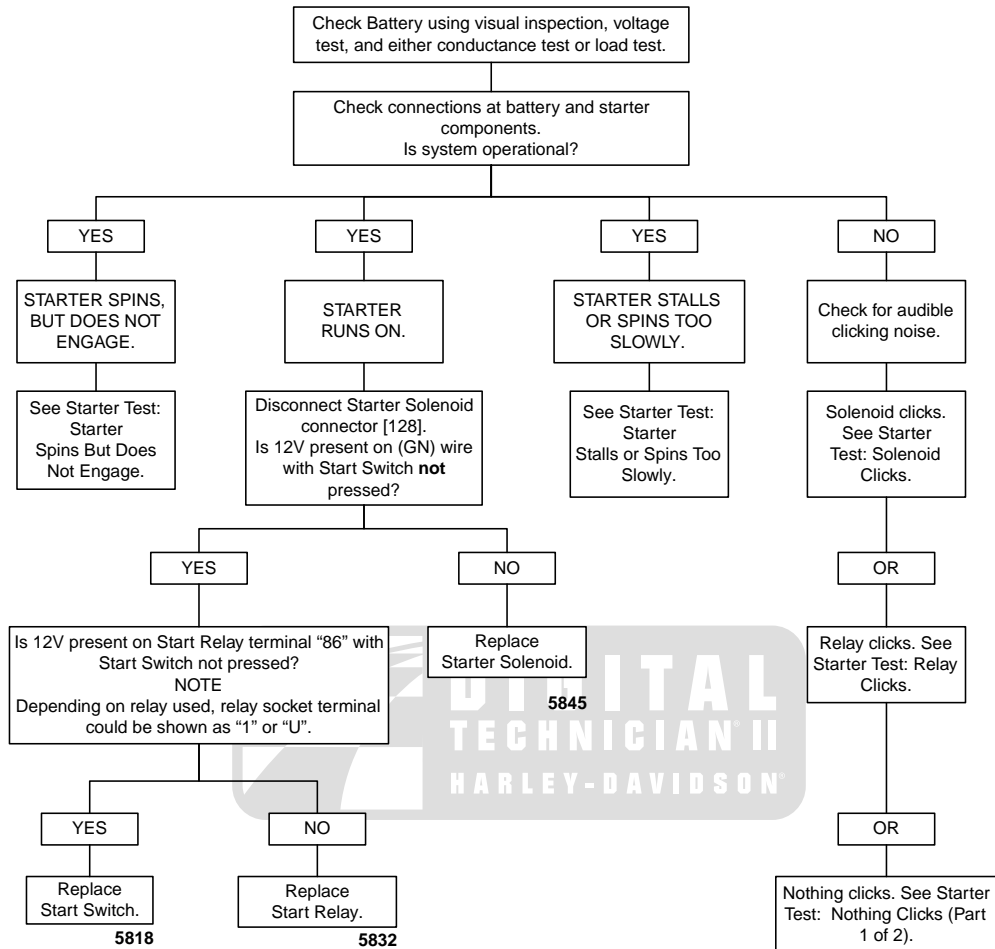


Figure 1-4. Starting Circuit (Firebolt)

Table 1-5. Wire Harness Connectors

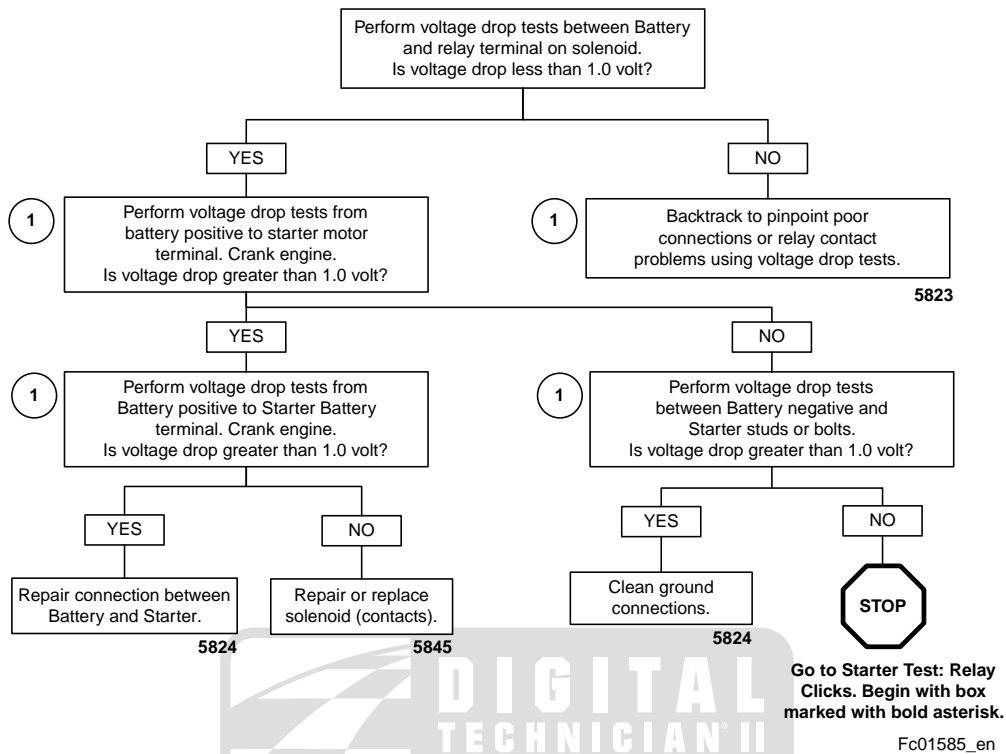
NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[22]	Right handlebar switch	4-place Multilock	Behind windscreen
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[128]	Starter solenoid	Spade terminal	Top of starter
[131]	Neutral switch	1-place bullet	Under sprocket cover

Starter Test 1

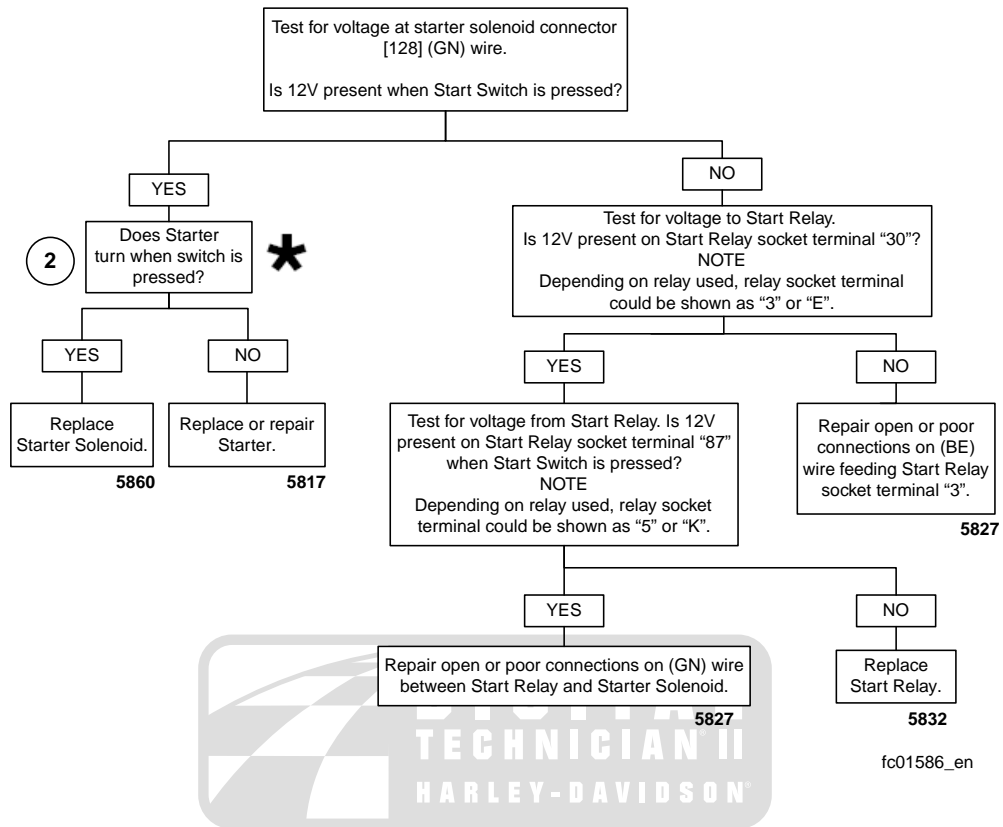


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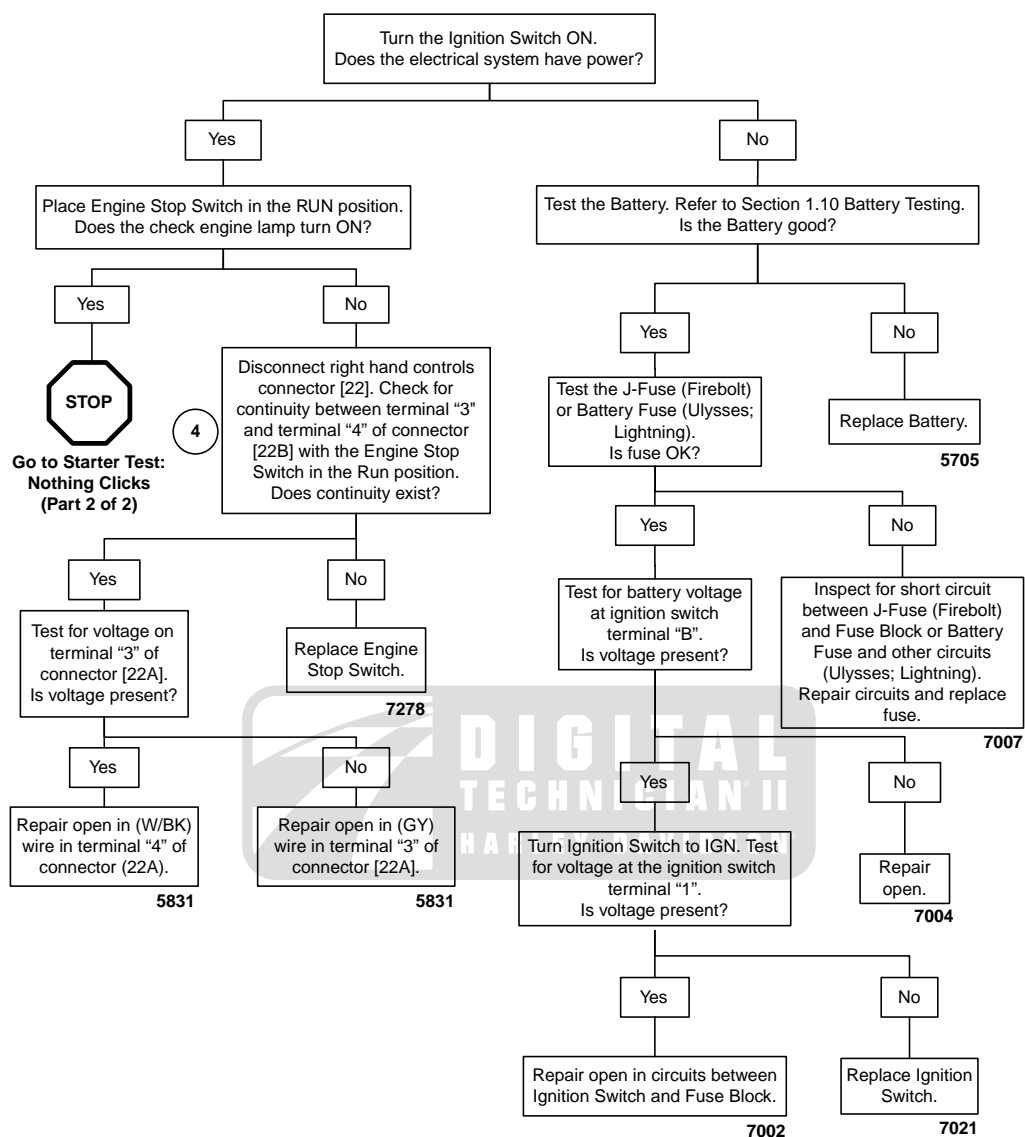
Solenoid Clicks: Starter Test 2



Relay Clicks: Starter Test 3

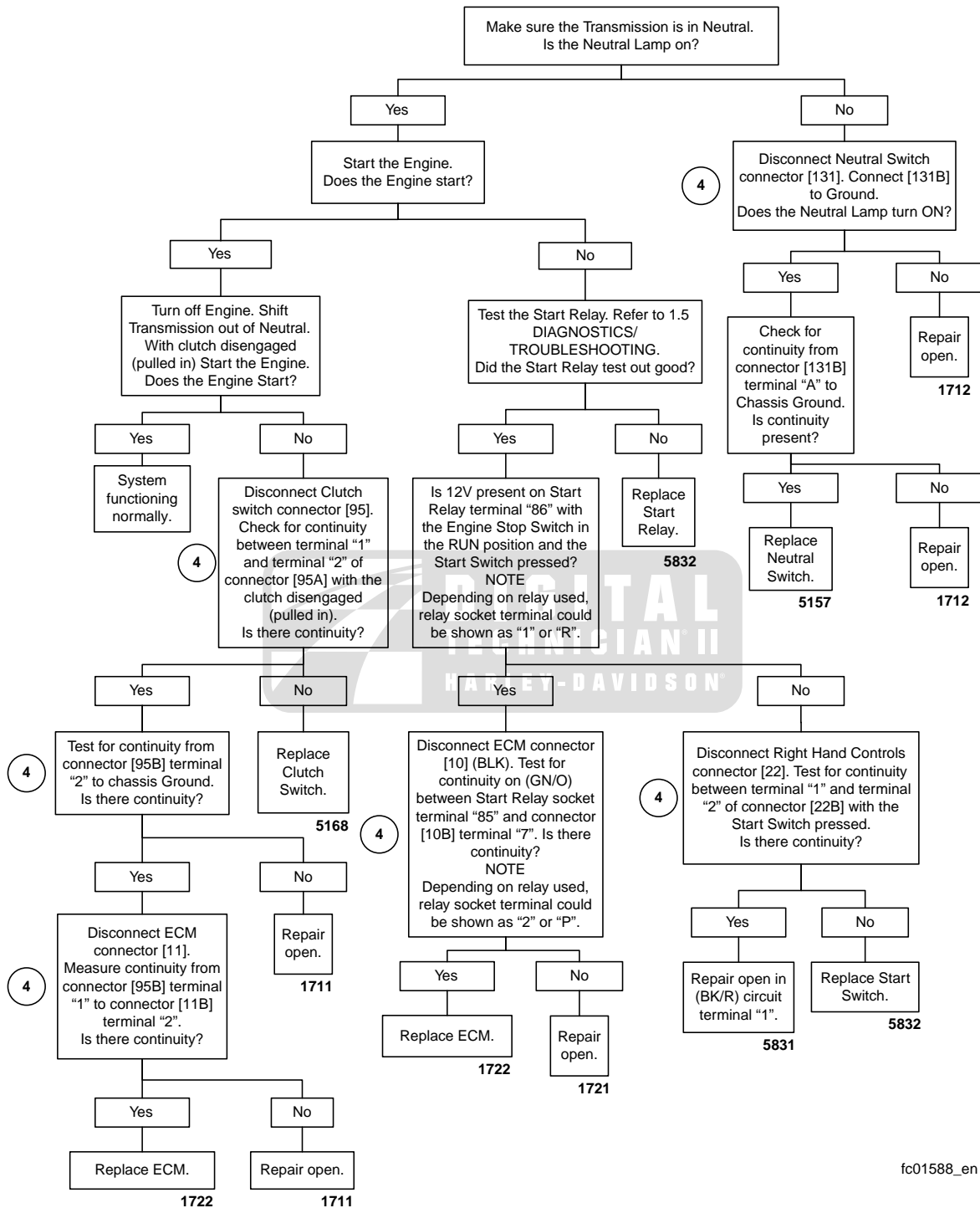


Nothing Clicks: Starter Test 4 (Part 1 of 2)

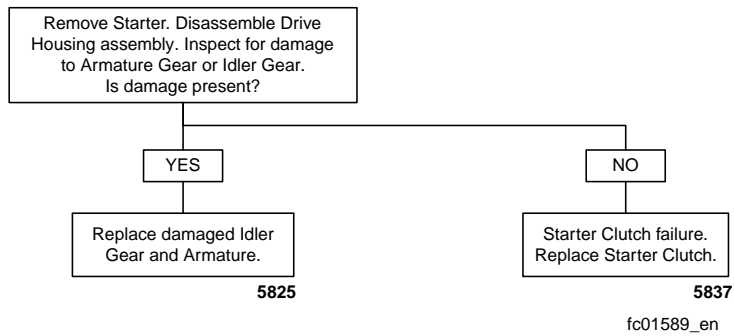


fc01587_en

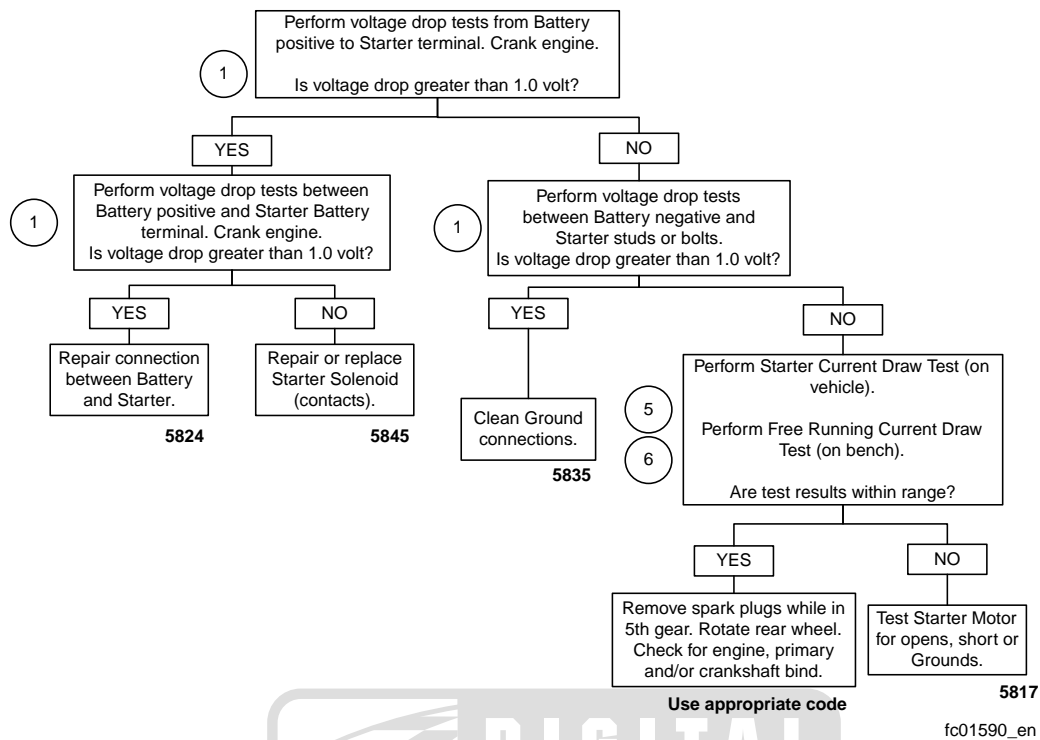
Nothing Clicks: Starter Test 4 (Part 2 of 2)



Starter Spins But Does Not Engage: Starter Test 5



Starter Stalls or Spins Too Slowly: Starter Test 6



STARTER ACTIVATION CIRCUITS

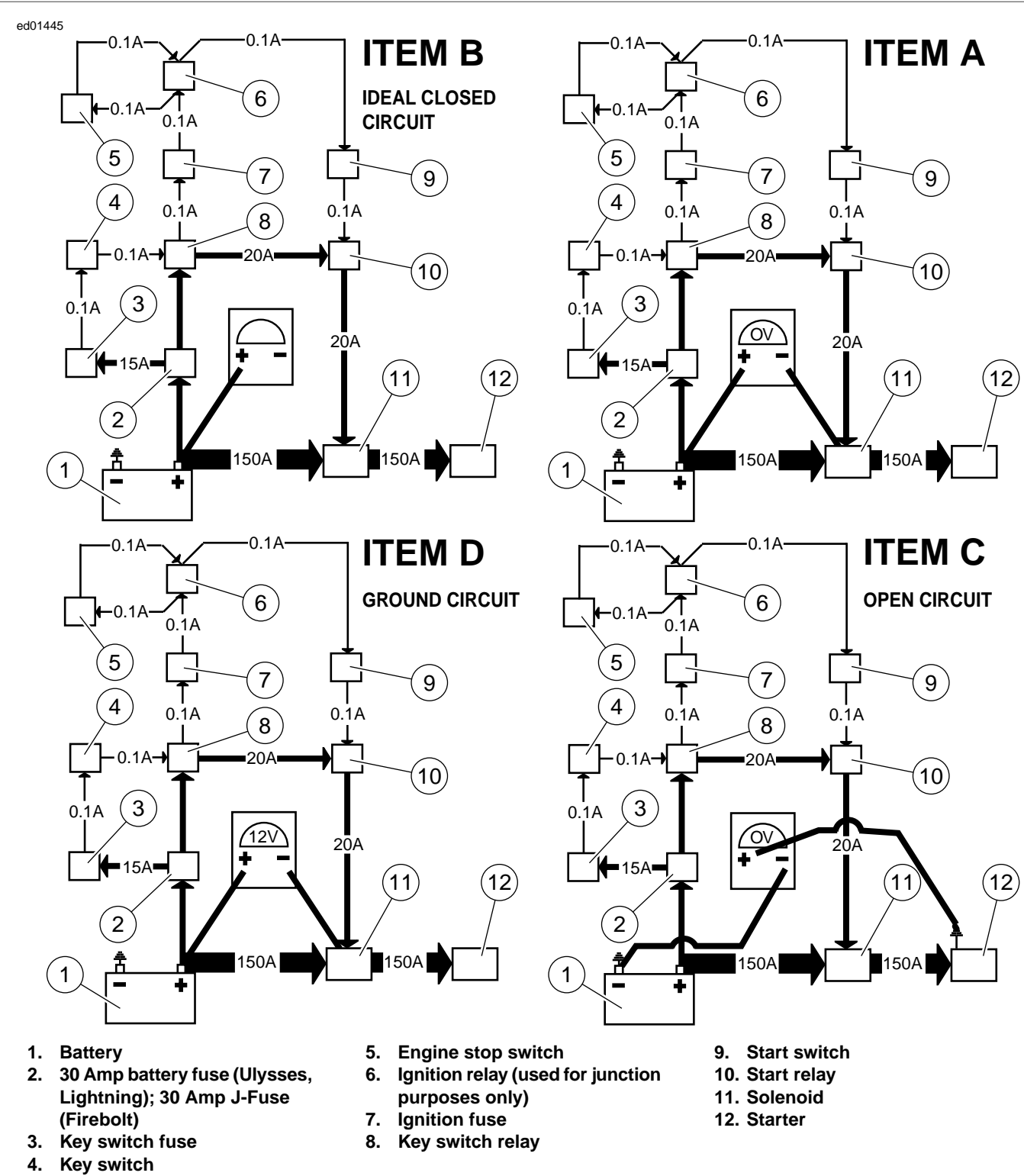


Figure 1-5. Typical Circuitry. Refer to wiring diagrams for more information.

GENERAL

The troubleshooting tables in [1.3 STARTING SYSTEM DIAGNOSIS](#) contain procedures to solve and correct most common problems. The [1.5 DIAGNOSTICS/TROUBLESHOOTING, Voltage Drops](#) procedure below will help you to locate poor connections or components with excessive voltage drops.

VOLTAGE DROPS

Check the integrity of all wiring, switches, fuses and connectors between the source and destination.

The voltage drop test measures the difference in potential or the actual voltage dropped between the source and destination.

1. See ITEM A in [Figure 1-5](#). Attach your red meter lead to the most positive part of the circuit, which in this case would be the positive post of the battery.
2. See ITEM B in [Figure 1-5](#). Attach the black meter lead to the final destination or component in the circuit (solenoid terminal from relay).
3. Activate the starter and observe the meter reading. The meter will read the voltage dropped or the difference in potential between the source and destination. An ideal circuit's voltage drop would be 0 volts or no voltage dropped, meaning no difference in potential.
4. See ITEM C in [Figure 1-5](#). An open circuit should read 12 volts, displaying all the voltage dropped, and the entire difference in potential displayed on the meter.

NOTE

Open circuits on the ground side will read zero.

5. Typically, a good circuit will drop less than 1.0 volt. If the voltage drop is greater, back track through the connections until the source of the potential difference is found. The benefits of doing it this way are speed and accuracy.
 - a. Readings aren't as sensitive to real battery voltage.
 - b. Readings show the actual voltage dropped, not just the presence of voltage.
 - c. This tests the system as it is actually being used. It is more accurate and will display hard to find poor connections.
 - d. This approach can be used on lighting circuits, ignition circuits, etc. Start from most positive and go to most negative (the destination or component).
6. See ITEM D in [Figure 1-5](#). The negative or ground circuit can be checked as well.
 - a. Place the negative lead on the most negative part of the circuit (or the negative battery post). Remember, there is nothing more negative than the negative post of the battery.
 - b. Place the positive lead to the ground you wish to check.
 - c. Activate the circuit. This will allow you to read the potential difference or voltage dropped on the negative or ground circuit. This technique is very effective for identifying poor grounds due to powdered paint. Even the slightest connection may cause an ohmmeter to give a good reading. However, when sufficient current is passed through, the resistance caused by the powdered paint will cause a voltage drop or potential difference in the ground circuit.

STARTER TROUBLESHOOTING

Table 1-6. Starter Does Not Run or Runs at Very Low Speeds

SOURCE OF PROBLEM	PROBABLE CAUSE	SOLUTION
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuited or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.
Wiring	Poor or no connection at either battery positive or negative cable, at either end.	Repair or replace cable(s).
	Cracked or corroded battery cable ends.	Clean, tighten or replace cable(s) as needed.
	Open wire(s) or poor connection at handlebar switch or start relay, especially relay ground wire.	Tighten connections or repair or replace wire(s).
Start switch, clutch switch or neutral switch	Poor switch contacts or open switch.	Replace switch.
Start relay	Open coil winding.	Replace relay.
	Poor or no continuity at relay points.	Replace relay.
Solenoid	Poor contact condition caused by burnt contact.	Polish contact surface or replace solenoid assembly.
	Pull-in winding open or short-circuited.	Repair or replace solenoid assembly.
	Hold-in winding open or short-circuited.	Repair or replace solenoid assembly.
Starting motor	Brushes worn below specification.	Check brush spring tension. Replace field frame and holder.
	Commutator burnt.	Re-face or replace.
	Commutator high mica.	Correct by undercutting.
	Field winding grounded.	Replace starter.
	Armature winding grounded or short-circuited.	Replace armature.
	Free running current draw out of range.	Replace starter.
	Reduction gears damaged.	Replace starter.
	Insufficient brush spring tension.	Replace starter.
	Disconnected lead wire between solenoid and field windings.	Repair or replace lead wire.
	Ball bearing sticks.	Replace bearing.
Temperature	Incorrect oil for low temperature.	Use recommended viscosity oil for temperature range. Consult Owner's Manual.

Table 1-7. Pinion Does Not Engage With Ring Gear While Starter is Cranked or Engine Cannot Be Cranked

SOURCE OF PROBLEM	PROBABLE CAUSE	SOLUTION
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuited or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.

Table 1-7. Pinion Does Not Engage With Ring Gear While Starter is Cranked or Engine Cannot Be Cranked

SOURCE OF PROBLEM	PROBABLE CAUSE	SOLUTION
Overrunning clutch	Overrunning clutch malfunction (rollers or compression spring).	Replace overrunning clutch.
	Pinion teeth worn out.	Replace overrunning clutch.
	Pinion does not run in overrunning direction.	Replace overrunning clutch.
	Poor sliding condition of spline teeth.	Remove foreign materials, dirt or replace overrunning clutch or pinion shaft.
	Reduction gears damaged.	Replace overrunning clutch and idler gear.
Gear teeth on clutch shell	Excessively worn teeth.	Replace clutch shell.

Table 1-8. Starter Does Not Stop Running

SOURCE OF PROBLEM	PROBABLE CAUSE	SOLUTION
Start switch or start relay	Unopened contacts.	Replace start switch or start relay.
	Poor return caused by sticky switch or relay contacts.	Replace start switch or start relay.
Gear teeth on clutch shell	Excessively worn teeth.	Replace clutch shell.
Solenoid	Return spring worn.	Replace spring.
	Coil layer shorted.	Replace solenoid.
	Contact plate melted and stuck.	Replace solenoid.



START RELAY TEST

1. See [Figure 1-6](#). The start relay can be tested using the motorcycle's 12-volt battery and a multimeter.
 - a. Unplug connector from relay.
 - b. To energize the relay connect relay terminal "85" to the negative battery terminal, and relay terminal "86" to the positive battery terminal. Some diodes contain internal diodes. If the applied voltage isn't the correct polarity, the diode could be damaged.
 - c. Check for continuity between the "30" and "87" terminals. A good relay shows continuity (continuity tester lamp "on" or a zero ohm reading on the ohmmeter). A malfunctioning relay will not show continuity and must be replaced.
2. If the start relay is functioning properly, proceed to [1.7 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test](#).
 - a. See [Figure 1-7](#) (Ulysses), [Figure 1-8](#) (Lightning) and [Figure 1-9](#) (Firebolt). Unplug start relay from relay/fuse block.
 - b. See [Figure 1-8](#) and [Figure 1-6](#). To energize the relay, connect relay terminal "85" to the negative battery terminal, and relay terminal "86" to the positive battery terminal.
 - c. Check for continuity between relay terminals "3" and "5". A good relay shows continuity (continuity tester lamp "on" or a zero ohm reading on the ohmmeter). A malfunctioning relay will not show continuity and must be replaced.

3. If start relay is functioning properly, proceed to [1.7 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test](#).

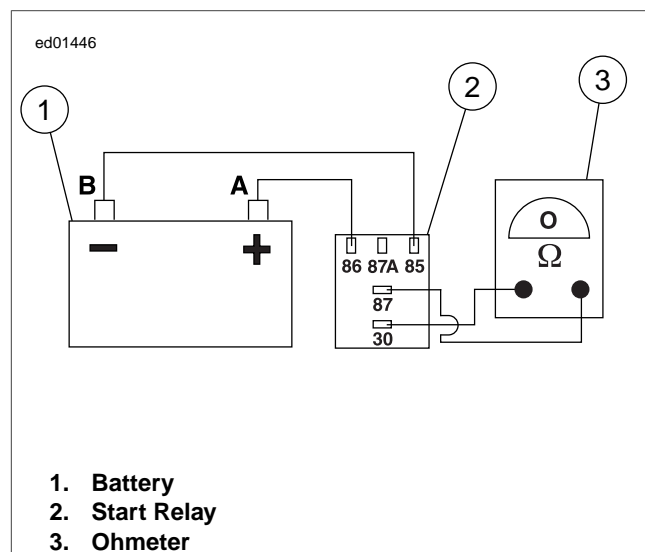


Figure 1-6. Start Relay Test

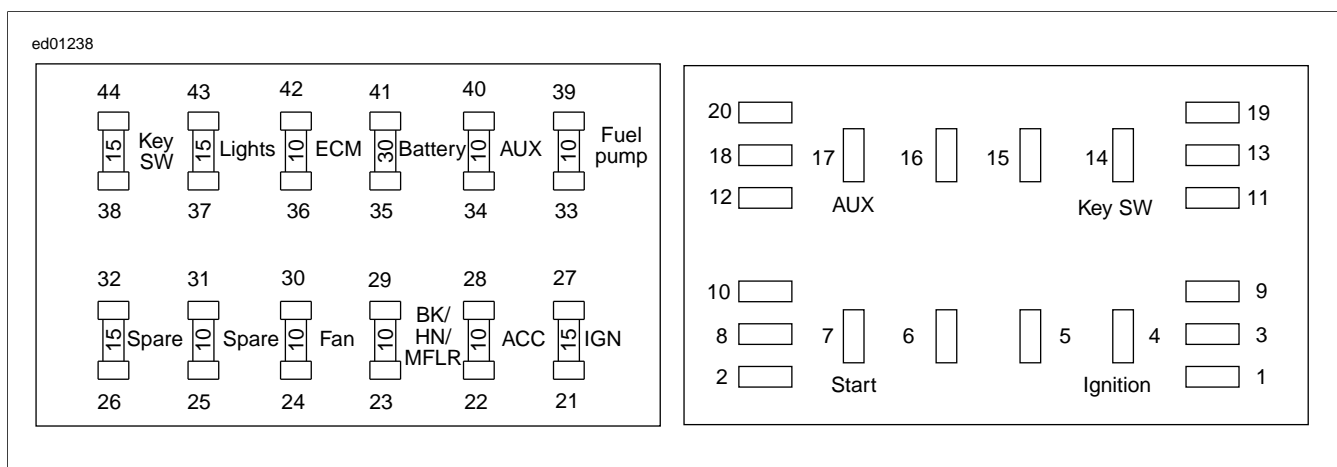


Figure 1-7. Fuses and Relays (Ulysses)

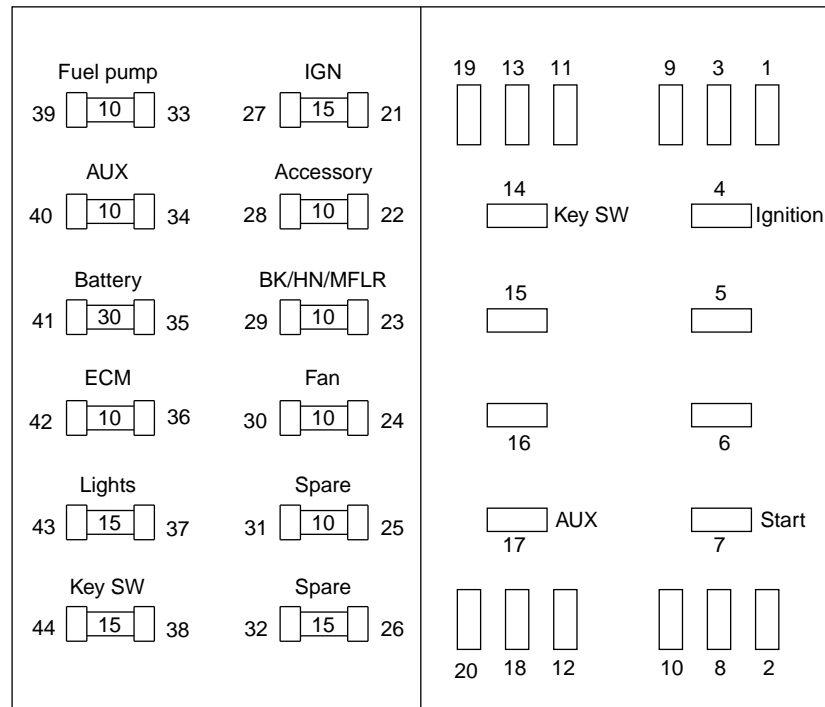


Figure 1-8. Fuses and Relays (Lightning)

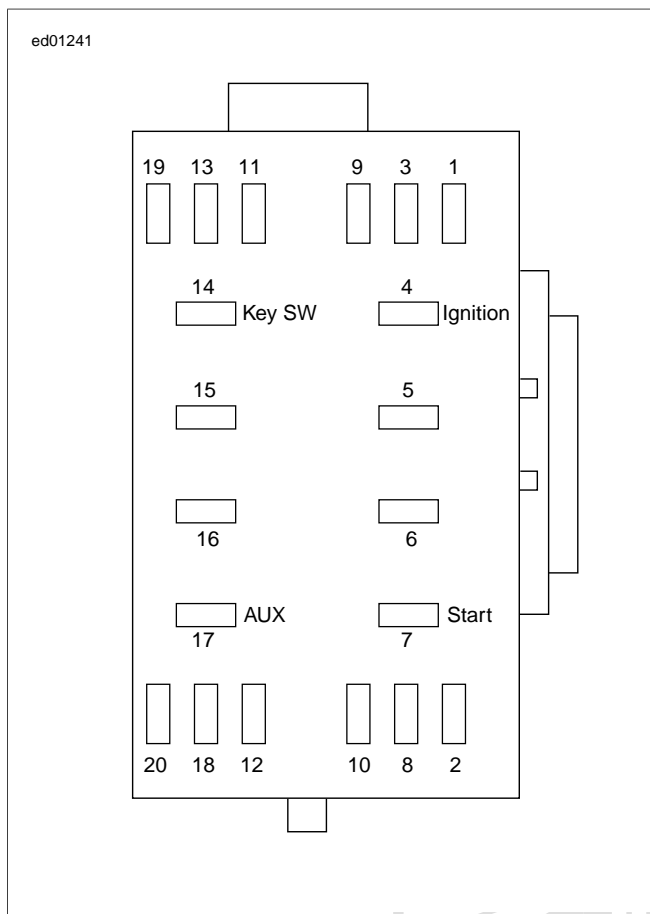


Figure 1-9. Relays (Firebolt)

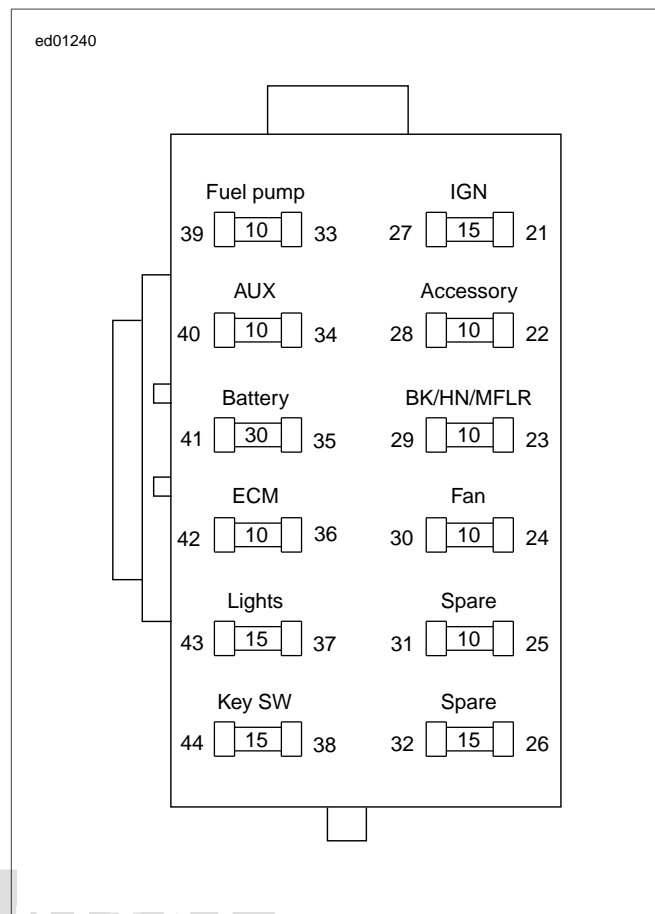


Figure 1-10. Fuses (Firebolt)

STARTER CURRENT DRAW TEST

NOTES

- Engine temperature should be stable and at room temperature.
- Battery should be fully charged.

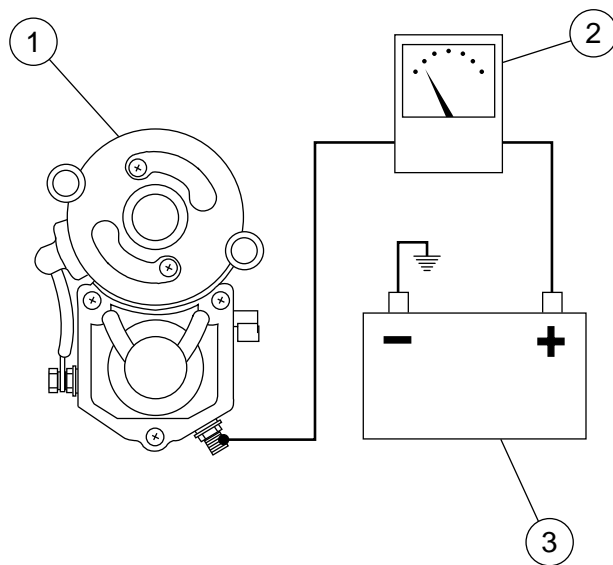
See [Figure 1-11](#). Check starter current draw with an induction ammeter before disconnecting battery. Proceed as follows:

1. Verify that transmission is in neutral. Disconnect spark plug wires from spark plug terminals.
2. Clamp induction ammeter over positive battery cable next to starter.
3. With ignition switch ON, turn engine over by pressing starter switch while reading the ammeter. Disregard initial high current reading which is normal when engine is first turned over.
 - a. Typical starter current draw will range from 140 to 180 amperes.
 - b. If starter current draw exceeds 180 amperes, the problem may be in the starter or starter drive. Remove starter for further tests. See the [1.8 TESTING STARTER ON BENCH, Free Running Current Draw Test](#).

NOTE

A DC current probe may be used if an induction ammeter is not available.

ed01525



- 1. Starter
- 2. Induction ammeter
- 3. Battery

Figure 1-11. Starter Current Draw Test



FREE RUNNING CURRENT DRAW TEST

1. Remove starter from motorcycle in accordance with the procedures in the Service Manual.
2. Place starter in vise, using a clean shop towel to prevent scratches or other damage.
3. See [Figure 1-12](#). Attach one heavy jumper cable (6 gauge minimum).
 - a. Connect one end to the starter mounting flange (1).
 - b. Connect the other end to the negative (-) terminal of a fully charged battery (2).
4. Connect a second heavy jumper cable (6 gauge minimum).
 - a. Connect one end to the positive (+) terminal of the battery (2).
 - b. Connect the other end to the battery terminal (4) on the starter solenoid. Place an inductive ammeter (3) over cable.
5. Connect a smaller jumper cable (14 gauge minimum).
 - a. Connect one end to the positive (+) terminal of the battery (2).
 - b. Connect the other end to the solenoid relay terminal (5).
6. Check ammeter reading.
 - a. Ammeter should show 90 amps maximum.
 - b. If reading is higher, disassemble starter for inspection. See the Service Manual.
 - c. If starter current draw on vehicle was over 200 amps and this test was within specification, there may be a problem with engine or primary drive.

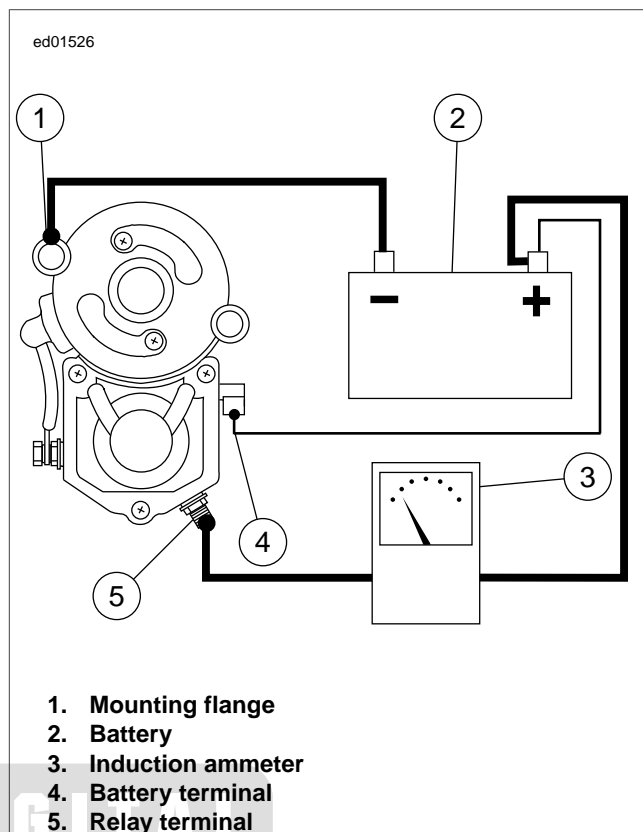


Figure 1-12. Free Running Current Draw Test

STARTER SOLENOID

Do not disassemble solenoid. Before testing, disconnect field wire from motor terminal as shown in [Figure 1-13](#).

Each test should be performed for only 3-5 seconds to prevent damage to solenoid.

The solenoid Pull-in, Hold-in, and Return tests must be performed together in one continuous operation. Conduct all three tests one after the other in the sequence given without interruption.

SOLENOID PULL-IN TEST

1. See [Figure 1-13](#). Using a 12-volt battery, connect three separate test leads as follows:
 - a. Solenoid housing to negative battery post.
 - b. Solenoid motor terminal to negative battery post.
 - c. Solenoid relay terminal to positive battery post.
2. Observe starter shaft.
 - a. If starter shaft extends strongly, solenoid is working properly.
 - b. If starter shaft does not extend strongly, replace the solenoid.

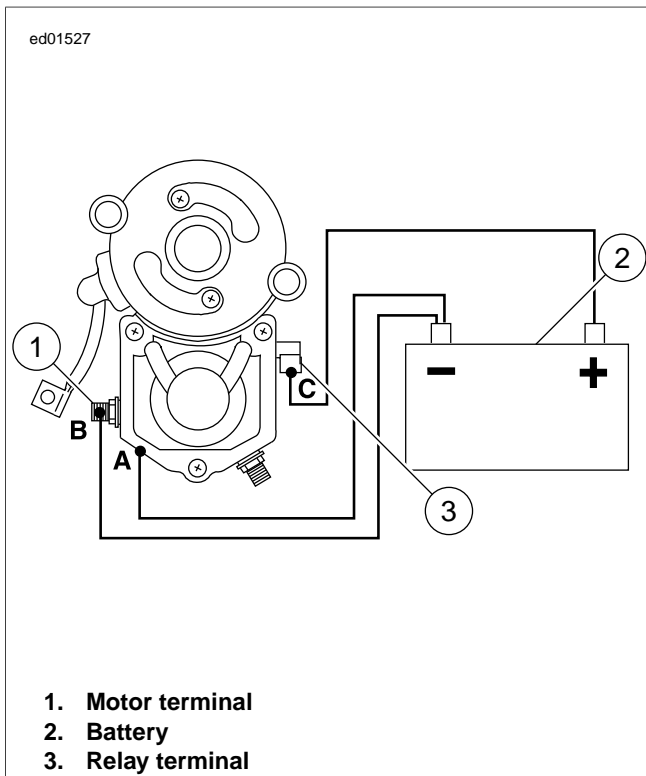


Figure 1-13. Test 1: Pull-in Test

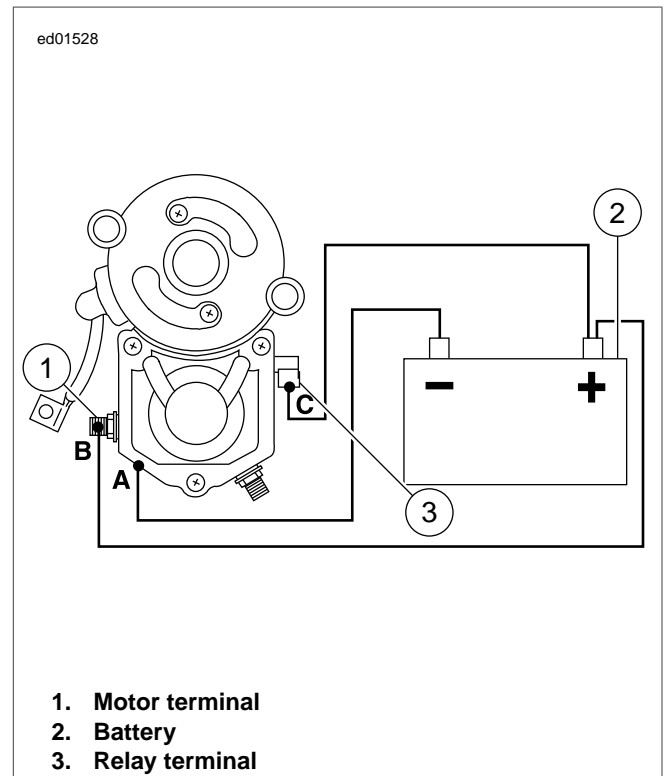


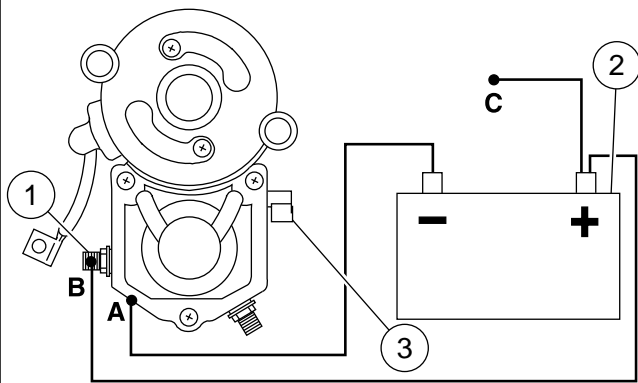
Figure 1-14. Test 2: Hold-in Test

SOLENOID HOLD-IN TEST

1. See [Figure 1-14](#). With test leads still connected in the manner specified in the previous [1.8 TESTING STARTER ON BENCH, Solenoid Hold-In Test](#), disconnect solenoid motor terminal/battery negative test lead (B) at negative battery post only; reconnect loose end of this test lead to positive battery post instead.
2. Observe starter shaft.
 - a. If starter shaft remains extended, solenoid is working properly.
 - b. If starter shaft retracts, replace the solenoid.

SOLENOID RETURN TEST

1. See [Figure 1-15](#). With test leads still connected in the manner specified at the end of the previous [1.8 TESTING STARTER ON BENCH, Solenoid Hold-In Test](#), disconnect solenoid relay terminal/ positive battery post test lead (C) at either end.
2. Observe starter pinion.
 - a. If starter shaft retracts, solenoid is working properly.
 - b. If starter shaft does not retract, replace the solenoid.



1. Motor terminal
2. Battery
3. Relay terminal

Figure 1-15. Test 3: Return Test

POST TEST

1. Carefully remove battery cables and jumpers.
2. Reattach starter cable to starter solenoid.
3. Reinstall starter assembly to motorcycle engine in accordance with the procedures in the Service Manual.



GENERAL

The charging system consists of the alternator and regulator. The charging system circuit is shown in [Figure 1-18](#) and [Figure 1-19](#).

Alternator

The alternator consists of two main components:

- The rotor which mounts to the engine sprocket shaft.
- The stator which bolts to the engine crankcase.

Voltage Regulator

See [Figure 1-16](#). The voltage regulator is a series regulator. The circuit combines the functions of rectifying and regulating. The system is a single phase 30 amp system capable of 405 watts at 3000 rpm.

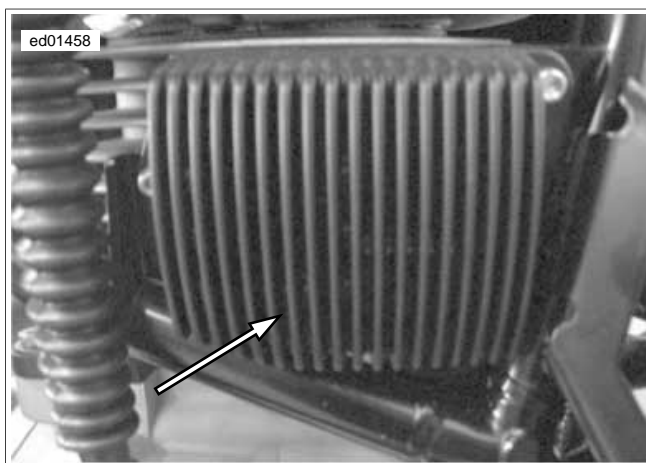


Figure 1-16. Voltage Regulator

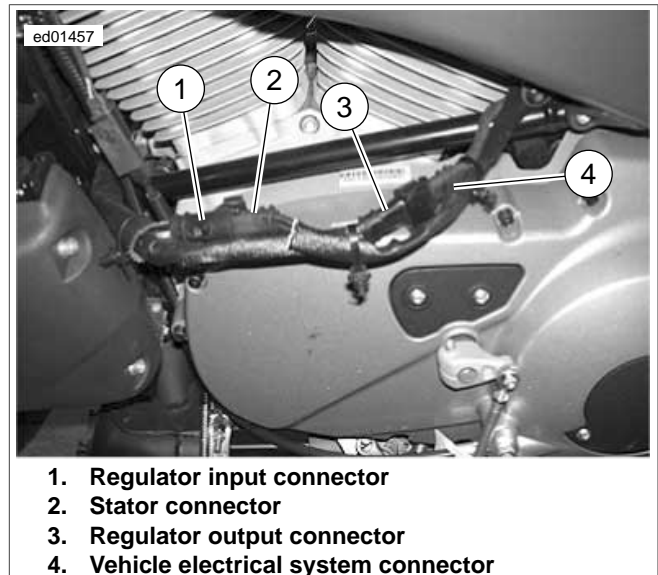


Figure 1-17. Voltage Regulator Connector [77]

TROUBLESHOOTING

PART NUMBER	TOOL NAME
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER

When the charging system fails to charge or does not charge at a satisfactory rate, make the following recommended checks.

Battery

Check for a weak or dead battery. See [1.10 BATTERY TESTING](#) for battery testing procedures. Battery must be fully charged in order to perform a load test, or starting or charging tests. However, a partially discharged battery may be tested using the BATTERY TEST function of the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-48053).

Wiring

Check for corroded or loose connections in the charging circuit. See [Figure 1-18](#).

Job/Time Code Values

Dealership technicians filing warranty claims should use the job/time code values printed in **bold text** underneath the appropriate repair.

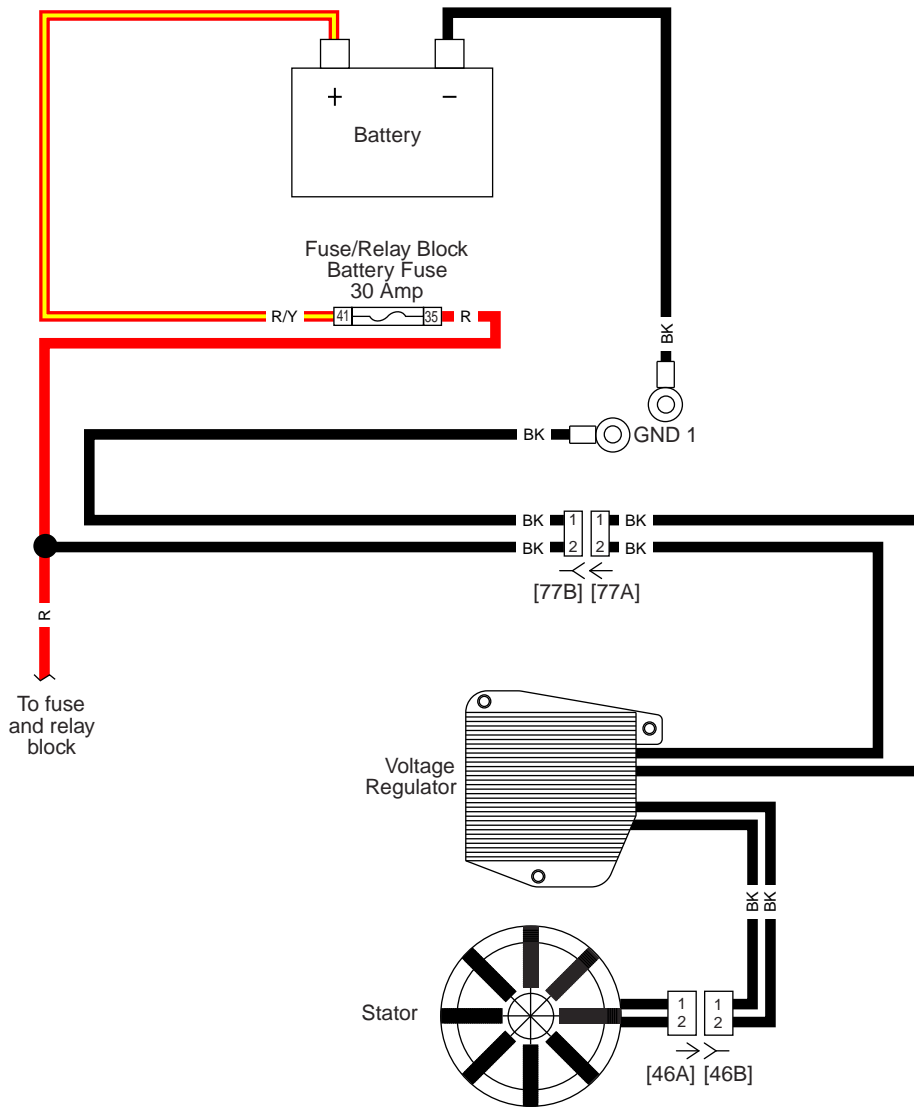
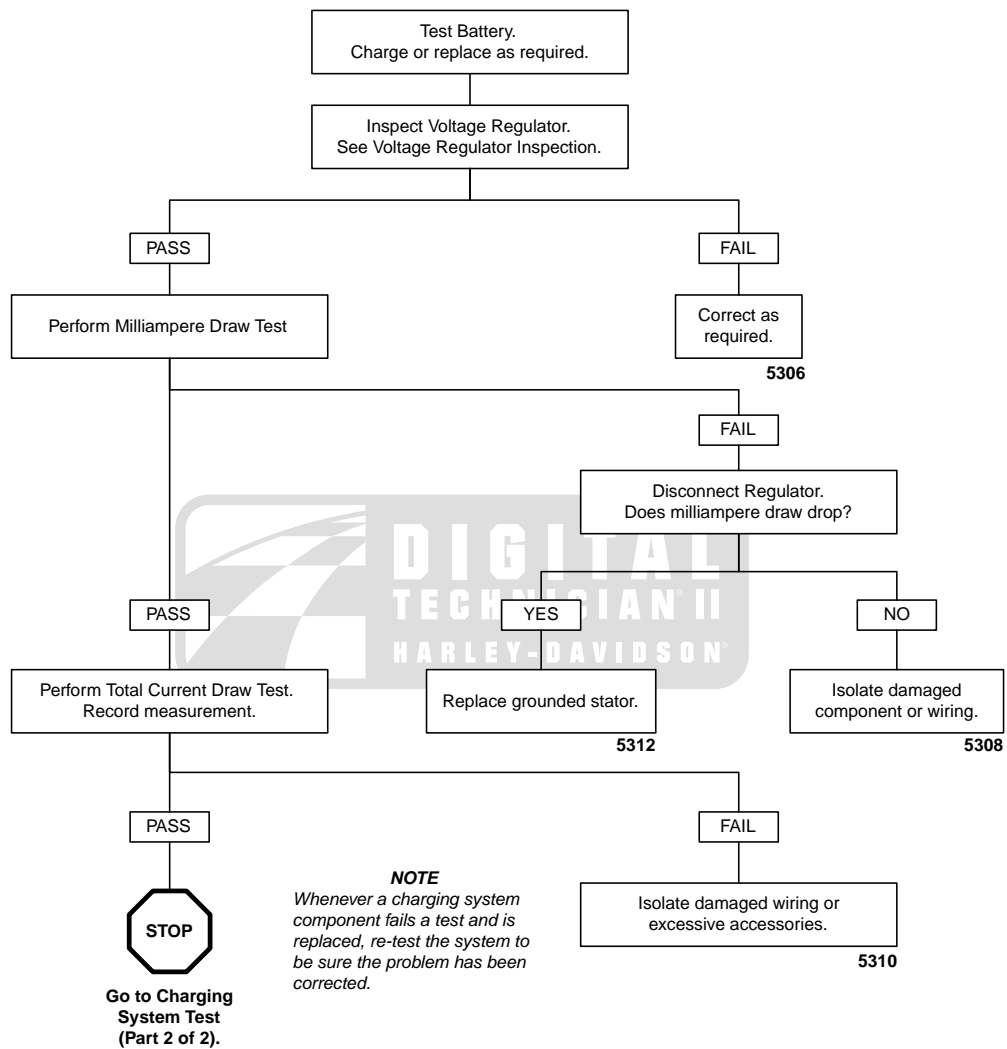


Figure 1-18. Charging System Circuit (Ulysses, Lightning)

Table 1-9. Wire Harness Connectors

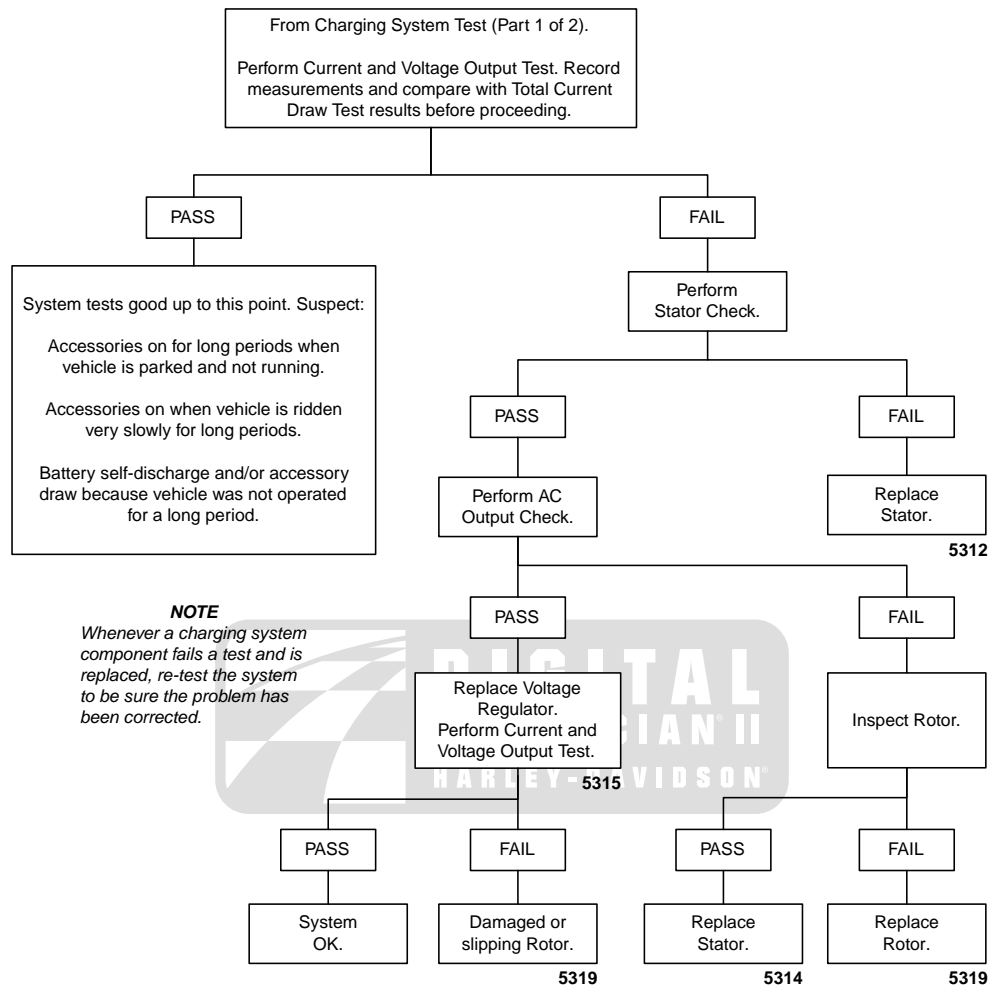
NO.	DESCRIPTION	TYPE	LOCATION
[46]	Stator	2-place Packard	Under ram air scoop
[77]	Voltage regulator	2-place Packard	Under ram air scoop

Charging System (Part 1 of 2)



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Charging System (Part 2 of 2)



fc01592_en

TESTING

PART NUMBER	TOOL NAME
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER

Milliampere Draw Test

NOTE

Be sure accessories are not wired so they stay on at all times. This condition could drain the battery completely if vehicle is parked for a long time. Check for this by connecting ammeter between negative battery cable and ground.

- 1. See Figure 1-20. Connect ammeter between negative battery terminal and battery. With this arrangement, you will also pick up any regulator drain.
- 2. With ignition switch turned to OFF and all lights and accessories off, observe current reading.
 - a. Maximum reading should be 2.0 miliampers,
 - b. A higher reading indicates excessive current draw. Any accessories must be considered and checked for excessive drain.

NOTE

A battery with a surface discharge condition could suffer a static drain. Correct by cleaning battery case.

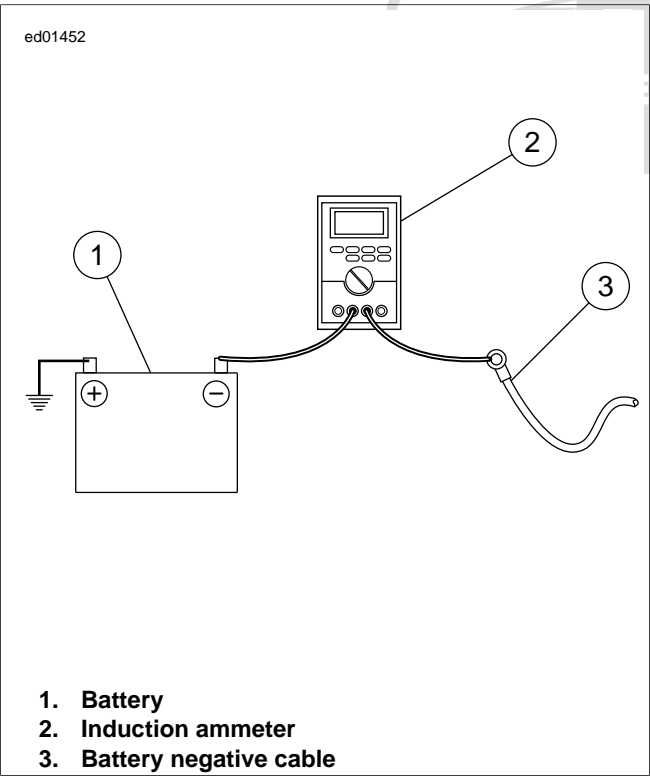


Figure 1-20. Milliampere Draw Test (Ignition turned to OFF)

Total Current Draw Test

If battery runs down during use, the current draw of the motorcycle components and accessories may exceed output of the charging system.

NOTE

If a load tester is unavailable, an ammeter with current probe may be used.

⚠ WARNING

Turn battery load tester OFF before connecting tester cables to battery terminals. Connecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00252a)

- 1. See Figure 1-21. To check for this condition, place load tester induction pickup or current probe pickup over battery negative cable.
- 2. Disconnect stator plug from voltage regulator. Start and run the engine at 2000 RPM.
- 3. With ignition and all continuously running lights and accessories turned on (headlamp on high beam), read the total current draw.
- 4. Compare this reading to the reading obtained after performing the Current and Voltage Output Test.
 - a. The current output should exceed current draw by 3.5 amps minimum.
 - b. If output does not meet specifications, there may be too many accessories for the charging system to handle.
- 5. Reconnect voltage regulator after testing.

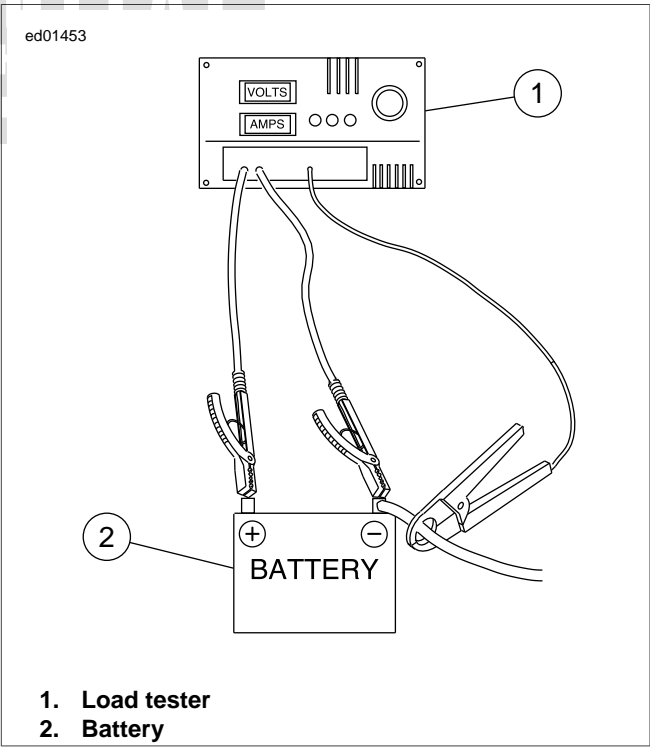


Figure 1-21. Check Current Draw (Ignition Switch On)

Current and Voltage Output Test: Using HD-48053

- 1. Connect the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-

48053) leads to the vehicle battery, analyzer instruction manual, system condition.

2. Follow the instructions in the analyzer instruction manual to perform a Charging System Test.

See [Figure 1-22](#). The test results will include a decision on the charging system condition and the measured output voltage at idle and at 3000 RPM. The analyzer printer will provide you with a printout including one of two possible test results:

1. CHARGING SYSTEM NORMAL - No problem found.
2. CHARGING SYSTEM PROBLEM - The analyzer detected a problem and will display one of the three following results:
 - a. LOW CHARGING VOLTS - The alternator is not supplying sufficient current for the system electrical loads.
 - b. HIGH CHARGING VOLTS - The voltage output from the alternator exceeds the normal regulator limits.
 - c. INVESTIGATE VOLT OUTPUT - The rev voltage is lower than the idle voltage.

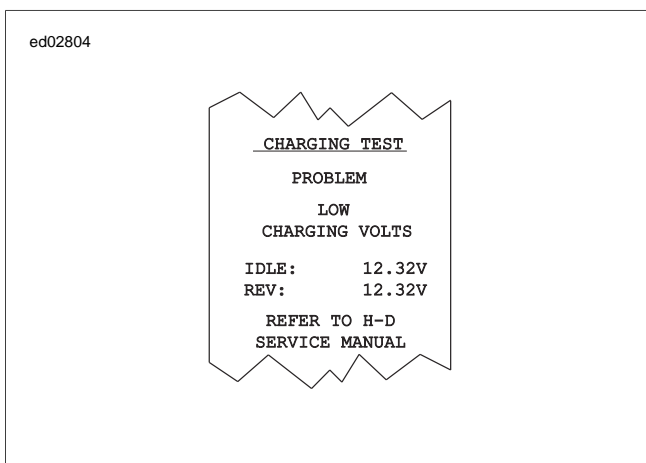


Figure 1-22. Charging System Test Results Printout

Current and Voltage Output Test: Using Load Tester

1. Connect load tester.
 - a. Connect negative and positive leads to battery terminals.
 - b. Place load tester induction pickup over positive regulator cable.
2. Run the engine at 3000 RPM. Do not leave any load switch turned on for more than 20 seconds or overheating and tester damage are possible. Increase the load as required to obtain a constant 13.0 VDC.
3. The current output should be 28-34 amps. Make note of measurement for use in [1.9 CHARGING SYSTEM Testing](#).

NOTE

Rider's habits may require output test at lower RPM.

4. After removing the load, read the load tester voltage meter.
 - a. If voltage to the battery is not more than 15 VDC, voltage output is within specifications. Investigate other possible problems. See Charging System Test flow charts.
 - b. If voltage is higher, voltage regulator is not functioning properly or connections are loose or dirty.

Stator Check

1. Turn ignition switch OFF.
2. See [Figure 1-23](#). Connect an ohmmeter.
 - a. Disconnect voltage regulator connector from alternator stator wiring.
 - b. Insert one ohmmeter lead into a stator connector socket.
 - c. Attach the other lead to a suitable ground.
3. Test for continuity with ohmmeter set to the ohms scale.
 - a. A good stator will show no continuity (ohms) between any stator socket and ground.
 - b. Any other reading indicates a grounded stator which must be replaced.
4. See [Figure 1-24](#). Remove ground lead. Check resistance across stator sockets 1 and 2.
5. Test for resistance with ohmmeter set on the ohms scale.
 - a. Resistance across the stator sockets should be 0.1-0.3 ohms.
 - b. If the resistance is higher, the stator is damaged and must be replaced.

NOTE

Verify that meter reads 0 ohms when probes are shorted together. If not, subtract lowest value from resistance value of stator.



Figure 1-23. Test for Grounded Stator (Typical)

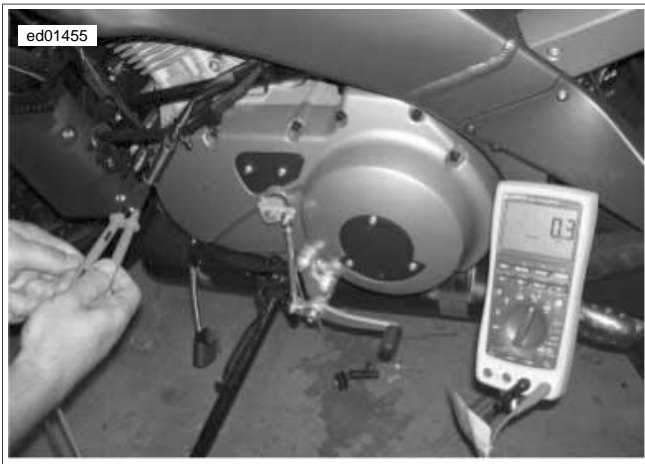


Figure 1-24. Check for Stator Resistance (Typical)

AC Output Check

1. See [Figure 1-25](#). Test AC output.
 - a. Disconnect voltage regulator connector from alternator stator wiring.
 - b. Connect an AC voltmeter across stator connector sockets 1 and 2.
 - c. Run the engine at 2000 RPM. The AC output should be 40-56 volts AC (approximately 20-28 volts per 1000 RPM).

2. Compare test results to specifications.
 - a. If the output is below specifications, charging problem could be a faulty rotor or stator.
 - b. If output is good, charging problem might be faulty voltage regulator. Replace as required.
3. Check the output again as previously described under [1.9 CHARGING SYSTEM, Testing](#).



Figure 1-25. Check Stator AC Voltage Output (Typical)



GENERAL

Three different procedures may be performed to provide a good indicator of battery condition: a voltage test, a conductance test, or a load test.

A battery may be tested, whether fully charged or not, via conductance test. In order to perform a load test, however, the battery must be fully charged.

VOLTMETER TEST

The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is fully charged. Refer to [Table 1-11](#).

If the open circuit (disconnected) voltage reading is below 12.6V, charge the battery and then recheck the voltage after the battery has set for one to two hours. If the voltage reading is 12.8V or above, perform the [1.10 BATTERY TESTING, Load Test](#) described in this section.

Table 1-11. Voltmeter Test For Battery Charge Conditions

VOLTAGE (OCV)	STATE OF CHARGE
12.7	100%
12.6	75%
12.3	50%
12.0	25%
11.8	0%

INSTALLATION

PART NUMBER	TOOL NAME
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER

Test the battery using the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-48053). Perform a battery test as follows:

1. Connect the HD-48053 analyzer leads to the vehicle's battery.
2. Follow the instructions in the analyzer's instruction manual to perform a battery test.

The test results will include a decision on the battery's condition, the measured state of charge and the measured CCA.

See [Figure 1-26](#). The analyzer's printer will provide you with a printout including one of five possible test results:

- GOOD BATTERY - Return the battery to service.
- GOOD-RECHARGE - Fully charge the battery and return to service.
- CHARGE & RETEST - Fully charge the battery and retest.
- REPLACE BATTERY - Replace the battery and retest.
- BAD CELL-REPLACE - Replace the battery and retest.

NOTE

A **REPLACE BATTERY** test result may also mean a poor connection between the battery cables and the vehicle. After disconnecting the battery cables from the battery, retest the battery using the out-of-vehicle test before replacing.

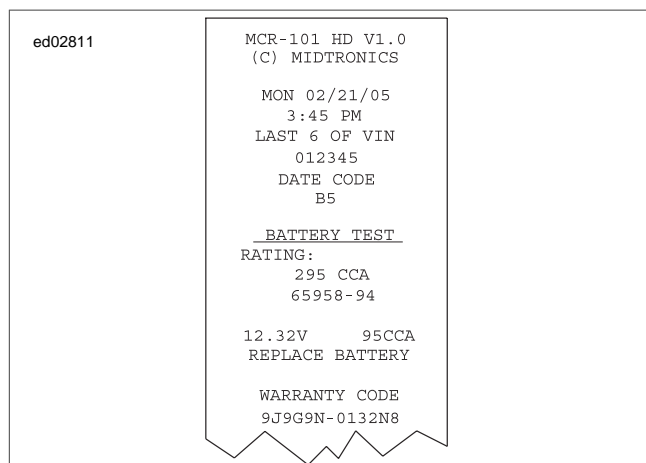


Figure 1-26. Battery Test Results Printout

LOAD TEST

To load test the battery, proceed as follows:

⚠ WARNING

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

1. Remove battery from motorcycle.
2. Always fully charge the battery before testing or test readings will be incorrect. Load testing a discharged battery can also result in permanent battery damage.
3. After charging, allow battery to stand for at least one hour before testing.

⚠ WARNING

Turn battery load tester OFF before connecting tester cables to battery terminals. Connecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00252a)

4. See [Figure 1-27](#). Connect tester leads to battery posts and place induction pickup over negative (black) cable.
5. Refer to [Table 1-12](#). To avoid load tester and/or battery damage, do not leave the load tester switch turned ON for more than 20 seconds. Load battery at 50% of CCA rating using the load tester. Voltage reading after 15 seconds should be 9.6V or more at 70°F (21°C).

⚠ WARNING

Turn battery load tester OFF before disconnecting tester cables to battery terminals. Disconnecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00253a)

⚠ WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

CAUTION

Do not over-tighten bolts on battery terminals. Use recommended torque values. Over-tightening battery terminal bolts could result in damage to battery terminals. (00216a)

6. Install the battery on the motorcycle.

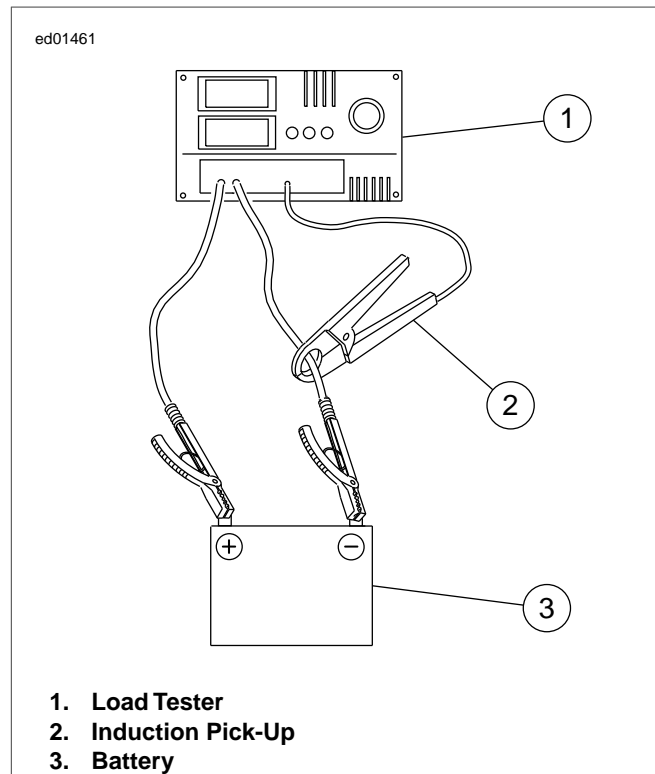


Figure 1-27. Load Test Battery

Table 1-12. Battery Load Test		
COLD CRANKING AMPERAGE (CCA)	100%	50%
All Buell models	200	100

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NOTES



SPECIFICATIONS

Table 2-1. Fuel System Specifications

FUEL SYSTEM	TYPE
Intake: • XB9	45 mm downdraft manifold, ram air
Intake: • XB12	49 mm downdraft manifold, ram air
Fuel delivery	DDFI Fuel Injection
Fuel pressure	49-51 PSI (338-352 kPa)
Recommended fuel	91 Octane

Table 2-2. Idle Speed Specifications

ADJUSTMENT	RPM
Normal idle speed	1050-1150 RPM, 1120 Nominal, hot

Table 2-3. Battery Specifications

BATTERY	
Size	12 VDC/12 AH/200CCA
Type	Sealed, AGM

Table 2-4. Spark Plug Specifications

SPARK PLUGS		
Size	12 mm	
Type	10R12X	
Gap	0.035 in.	0.9 mm
Torque	12-18 ft-lbs	16-24 Nm
Cable resistance (front and rear)	1,350-3,465 ohms	

Table 2-5. Alternator Specifications

ALTERNATOR	
AC voltage output	20-28 VAC per 1000 engine RPM
Stator coil resistance	0.1-0.3 ohms

Table 2-6. Regulator Specifications

REGULATOR	
Voltage output @ 3600 RPM	14.3-14.7 VDC @ 75° F (24° C)
Amperes @ 3600 RPM	32 Amps

Table 2-7. Electrical System Specifications

ELECTRICAL SYSTEM	AMPERES
Main fuse/battery fuse	30
Ignition fuse	15
Light fuse	15
Accessory fuse	10
Brake/horn/active muffler fuse	10
ECM fuse	10
Key switch fuse	15
Cooling fan fuse	10
Auxiliary fuse	10

Table 2-8. Ignition Coil Specifications

IGNITION COIL RESISTANCE	
Primary winding	0.5-0.7 ohms
Secondary winding	5500-7500 ohms

INTRODUCTION

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The Buell Dynamic Digital Fuel Injection (DDFI) System provides microprocessor-based electronic engine management for the 984cc and 1203cc high performance engines. The DDFI system has the following features:

- Independently mapped spark and fuel control.
- Engine and air temperature compensated fuel delivery.
- Engine load measurement through throttle position.
- Single point spark delivery (no waste spark).
- Sequential port indirect (manifold) fuel injection.
- Open/closed-loop air/fuel control.
- Automatic enrichment at start-up.
- Electric cooling fan for improved thermal management.
- Engine speed position determined using a single sensor Crankshaft Position (CKP) Sensor.
- Engine idle speed managed electronically with idle air control (IAC) motor.
- Full diagnostic capability compatible with the DIGITAL TECHNICIAN (Part No. HD-44750).
- Returnless fuel system (excess pressure relieved in tank by Fuel Pressure Regulator Valve).
- Interactive muffler control with muffler valve position feedback for 1203cc engines only.

The DDFI system uses ten sensors to monitor the operating conditions of the engine and make decisions as to ignition and starter enable, spark and fuel delivery. These sensors are:

- Throttle Position (TP) sensor.
- Crankshaft Position (CKP) sensor.
- Engine Temperature (ET) sensor.
- Intake Air Temperature (IAT) sensor.
- Oxygen (O₂) sensor.
- Bank Angle Sensor (BAS).
- Side stand sensor.
- Clutch switch.
- Neutral switch.
- Vehicle speed sensor.

The DDFI system also analyzes how the engine performs during a ride. It then stores his information internally so it will be available for the next ride

The 1200 models utilize an interactive exhaust system which has an electronically controlled actuator that activates a butterfly valve that controls exhaust flow in the dual-chamber muffler. The Electronic Control Module (ECM) monitors engine speed and throttle position while activating the valve. See [2.33 DTC P1470 \(21\), P1471 \(21\), P1477 \(21\), P1478 \(21\)](#).

GENERAL

The Buell DDFI operates both as an open and closed loop system which allows it to adjust for all possible operating conditions. During open loop operation, the system utilizes programmed fuel and spark maps in the ECM which provide ease of cold starting and maximum power at wide open throttle (WOT). The adaptive fuel value which is "learned" during closed loop operation is applied during open loop operation to adjust fuel and spark maps for optimum performance.

During closed loop operation, the system relies on input from the O₂ sensor to provide for the optimal air fuel mixture which results in reduced emissions, good fuel economy and power. In order for the system to enter closed loop operation, the following conditions must be met:

- O₂ Sensor at operating temperature (Engine at normal operating temperature).
- Operation below 4000 RPM with engine under steady or light load conditions.

By using both open and closed loop systems, engine performance is continuously tuned to compensate for changing conditions and provide maximum performance.

FOR MORE INFORMATION

To learn more about the Buell DDFI system, read the following topics in this section. A system diagram can be found in [Figure 2-1](#).

Troubleshooting

- [2.3 DIAGNOSTIC INTRODUCTION](#)
- [2.4 CHECKING FOR TROUBLE CODES](#)
- [2.5 CHECK ENGINE LAMP DIAGNOSTICS](#)
- [2.8 INITIAL DIAGNOSTIC CHECK](#)
- [Table 2-13](#)

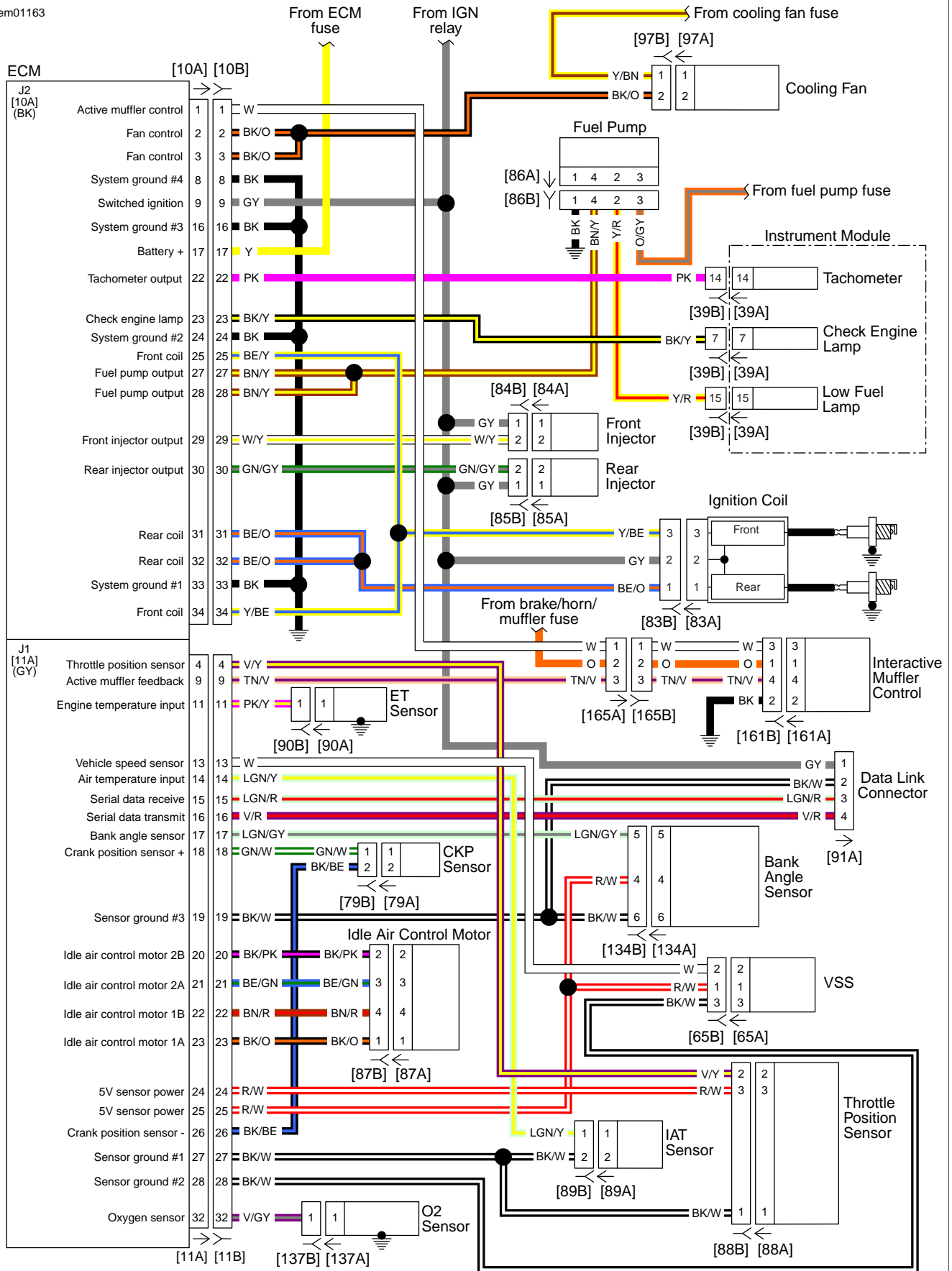


Figure 2-1. Dynamic Digital Fuel Injection (DDFI) System

Table 2-9. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat



SYSTEM PROBLEMS

All system problems fall into at least one of three general categories.

No Start

The engine cranks over freely, but will not start. This does not include situations where the engine will not crank, such as a security disabled starter, dead battery, etc. This condition assumes that all obvious checks (fuel in tank, etc.) have been made.

Poor Performance

The engine starts but there are performance problems. These problems may include poor fuel economy, rough idle, engine misfire, engine hesitation, severe spark knock, etc.

Check Engine Lamp

See [Figure 2-2](#). The check engine lamp indicates the Electronic Control Module (ECM) has determined a fault condition exists. There may also be starting or performance problems.

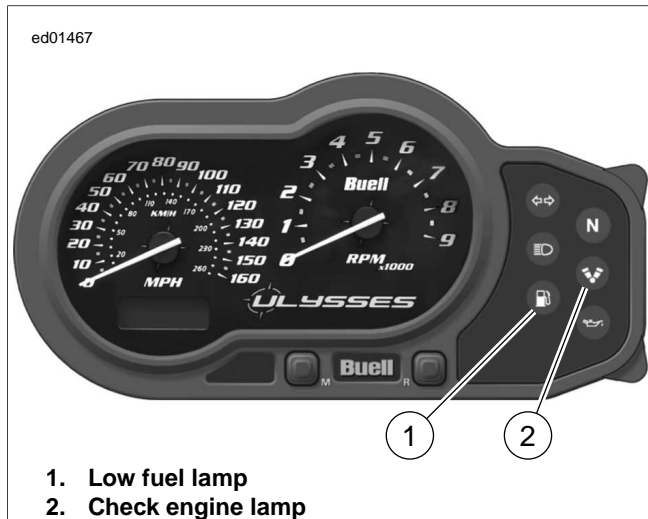


Figure 2-2. Check Engine Lamp (Typical)

RESOLVING PROBLEMS

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

NOTE

The most sophisticated method of resolving problems involves using a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).

To resolve system problems, five basic steps are involved. In order of occurrence, they are:

1. Check for diagnostic trouble codes (DTCs) by observing check engine lamp. See [2.4 CHECKING FOR TROUBLE CODES](#).
2. Retrieve trouble codes using check engine lamp diagnostics. See [2.5 CHECK ENGINE LAMP DIAGNOSTICS](#).
3. Diagnose system problems. This involves using special tools and the diagnostic flow charts in this section.
4. Correct problems through the replacement and/or repair of the affected components.
5. After repairs are performed, the work must be validated. This involves clearing the trouble codes and confirming proper vehicle operation as indicated by the behavior of the check engine lamp.

CHECK ENGINE LAMP

The diagnose problems, start by observing the behavior of the check engine lamp.

NOTES

- All references to "Key ON" or "Ignition Switch ON" require that the Ignition Switch be in the ON position and the engine stop switch be set to RUN.
 - If the check engine lamp is not illuminated at Key ON or if it fails to turn OFF after the initial four second period, then a problem exists in the check engine lamp circuit. See [2.10 CHECK ENGINE LAMP NOT ILLUMINATED AT KEY ON](#) or [2.11 CHECK ENGINE LAMP ON CONTINUOUSLY](#) for more information.
1. When the Ignition Switch is turned ON after being OFF for 2 seconds or more, the check engine lamp will illuminate for approximately four seconds and then turn off.
 2. See [Figure 2-5](#). After check engine lamp turns off after being illuminated for the first four second period, one of three situations may occur:
 - a. The check engine lamp remains off. This indicates there are no current fault conditions or stored functional trouble codes currently detected by the Electronic Control Module (ECM).
 - b. The check engine lamp stays off for only four seconds and then comes back on for an eight second period. This indicates a functional error code is stored, but no current trouble code exists.
 - c. If the check engine lamp remains on beyond the eight second period, then a current trouble code exists.
 3. See [2.4 CHECKING FOR TROUBLE CODES, Code Types](#) for a complete description of trouble code formats.

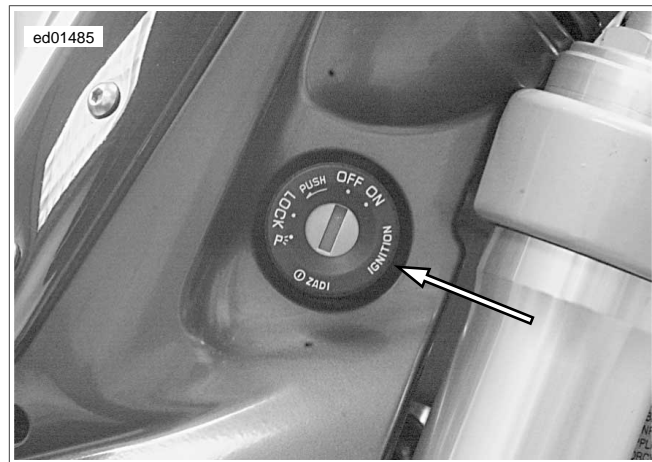


Figure 2-3. Ignition Switch

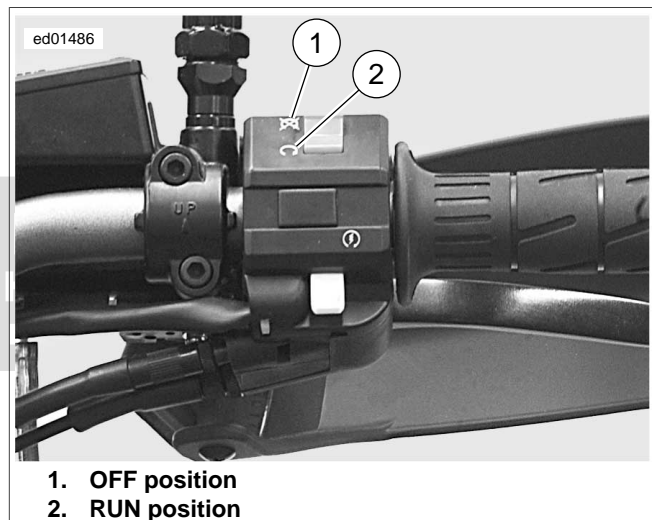


Figure 2-4. Engine Stop Switch

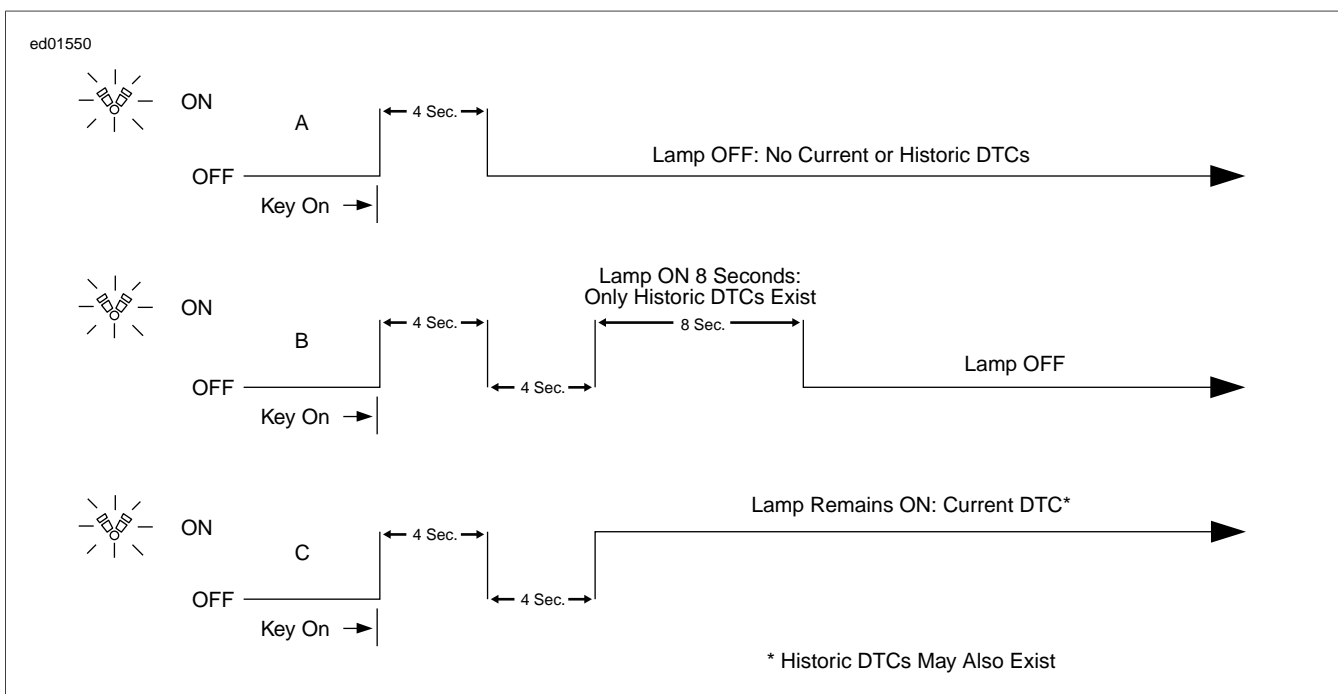


Figure 2-5. Check Engine Lamp Operation

CODE TYPES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

There are two types of trouble codes: current and historic. Certain codes are also called functional codes. Historic codes can be read using the check engine lamp diagnostics.

All trouble codes reside in the memory of the ECM unit the code is cleared by DIGITAL TECHNICIAN (Part No. HD-44750) or a total of 50 trips has elapsed. A trip consists of a start and run cycle lasting at least 30 seconds. After the 50 trip retention period, the trouble code is automatically erased from memory providing that no subsequent faults of the same type are detected in that period.

NOTE

Trouble codes relating to the fuel injectors or the ignition coils can only be fully diagnosed during actuation. For example, a problem with the ignition coils will be considered a current fault even after the problem is corrected, since the ECM will not know of its resolution until after the coils are activated by vehicle start sequence. In this manner, there may sometimes be a false indication of the current trouble code.

Current

Current trouble codes are those which are presently disrupt motorcycle operation. See the appropriate flow charts for solutions.

Historic

If a particular problem happens to resolve itself, the active status problem is dropped and it becomes a historic fault rather than a current fault.

Historic trouble codes are stored for a length of time to assist in the diagnosis of intermittent faults. The check engine lamp

will not turn on during normal operation if only historic codes are present.

It is important to note that historic trouble codes may also be present whenever the system indicates the existence of a current fault. See [2.4 CHECKING FOR TROUBLE CODES](#) if multiple trouble codes are found.

RETRIEVING TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The fuel injection system provides two levels of diagnostics.

- The most sophisticated mode employs using a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).
- The other mode requires using the check engine lamp. See [2.5 CHECK ENGINE LAMP DIAGNOSTICS](#) for more information.

MULTIPLE TROUBLE CODES

The throttle position and bank angle sensors are connected to separate lines (5V REF).

Also, the ECM, fuel pump, fuel injectors and ignition coils all receive +12 volts from the ignition relay. If this line should go to ground the ignition fuse will open.

Always start with the trouble code having the highest priority. Refer to [Table 2-13](#).

CHECK ENGINE LAMP FLASHES

In addition to alerting the rider to trouble codes, the check engine lamp will flash during operation to warn of potentially damaging temperature. While this condition is in effect, the ECM will reduce engine power to assist in cooling the engine

to a safe operating temperature. The check engine lamp will flash until the engine has cooled to a safe operating temper-

ature. This will not set a trouble code.



RETRIEVING TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

Trouble codes may be retrieved without the use of the DIGITAL TECHNICIAN (Part No. HD-44750).

1. Remove the protective cover from data link connector [91A]. The data link connector's location is different for each model. It is located under the fairing (Firebolt), under the seat (Lightning) or behind the left airflow guide (Ulysses).
2. To activate the diagnostic feature of the check engine lamp, proceed as follows:
 - a. See [Figure 2-6](#). Install diagnostic test wire from parts shown.
 - b. See [Figure 2-7](#). Install diagnostic test wire across terminal "1" and terminal "2" on the data link connector [91A].
 - c. Turn the Ignition Switch ON and wait approximately eight seconds for the check engine lamp to start flashing.
3. See [Figure 2-8](#). All trouble codes are sent out as a series of flashes. To retrieve the first digit of the trouble code simply observe the number of times the check engine lamp flashes.
 - a. The transmission of a trouble code is always preceded by six rapid flashes (about 3 per second).
 - b. This "intermission" is followed by a 2 second pause in which the check engine lamp is off.
 - c. The check engine lamp will then flash one or more times to indicate the first digit of the trouble code. The length of time the check engine lamp is illuminated and the length of time in which it is off are each about 1 second in duration.
4. The second digit follows:
 - a. Following transmission of the first digit, there is another 2 second pause in which the check engine lamp is off.
 - b. The check engine lamp will then flash one or more times to indicate the second digit of the trouble code. Count the number of times the check engine lamp flashes to retrieve the second digit.
5. If more than one trouble code is sent:
 - a. Following transmission of the second digit of the first code, there is a third 2 second pause in which the check engine lamp is off.
 - b. After the pause comes the intermission, which is followed by transmission of the next recorded trouble code.
 - c. All subsequent codes are sent in the same manner each separated from the next by the intermission.

6. Once all codes have been sent, the data string is repeated. When you have recorded the same trouble code twice, it is an indication that the transmission has been restarted and that all trouble codes have been retrieved.

NOTE

If the check engine lamp flashes at a rate faster than normal, then you are observing the "intermission" only, which means that no trouble codes are present.

7. When examining trouble codes, write down all codes on a piece of paper.
 - a. If trouble codes are present, refer to [Table 2-13](#). Follow the applicable flow charts for each code.
 - b. If trouble codes are NOT present, but starting or drive ability problems are evident, see charts under [2.8 INITIAL DIAGNOSTIC CHECK](#).
8. Turn the Ignition Switch OFF.
9. Remove diagnostic test wire and install protective cover over data link connector. Return data link connector to original position

NOTE

The engine may be started and run when the trouble codes are received using a jumper wire on terminals "1" and "2" of the data link connector. However, if the jumper wire is removed with the engine running, the check engine lamp will continue to flash trouble codes. To stop check engine lamp from flashing codes, turn engine stop switch OFF.

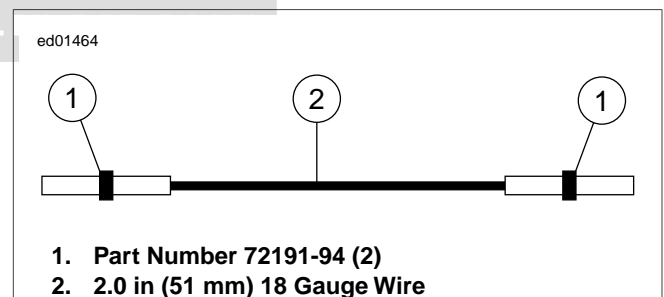


Figure 2-6. Diagnostic Test Wire

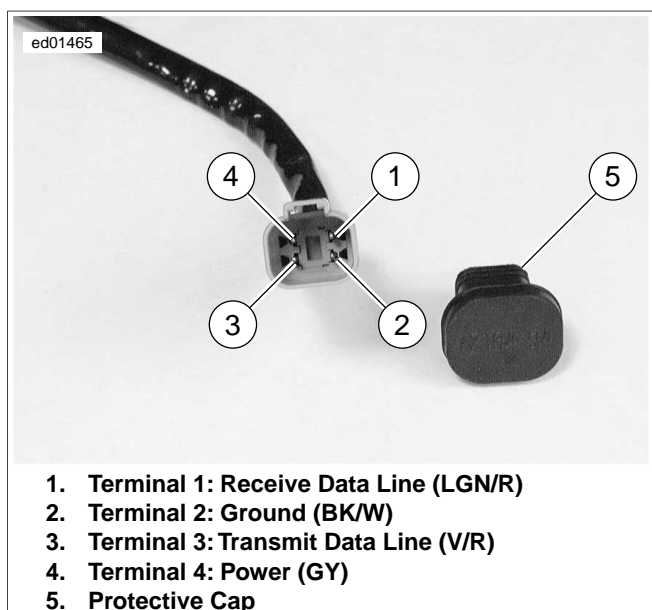


Figure 2-7. Data Link Connector Pin Identification

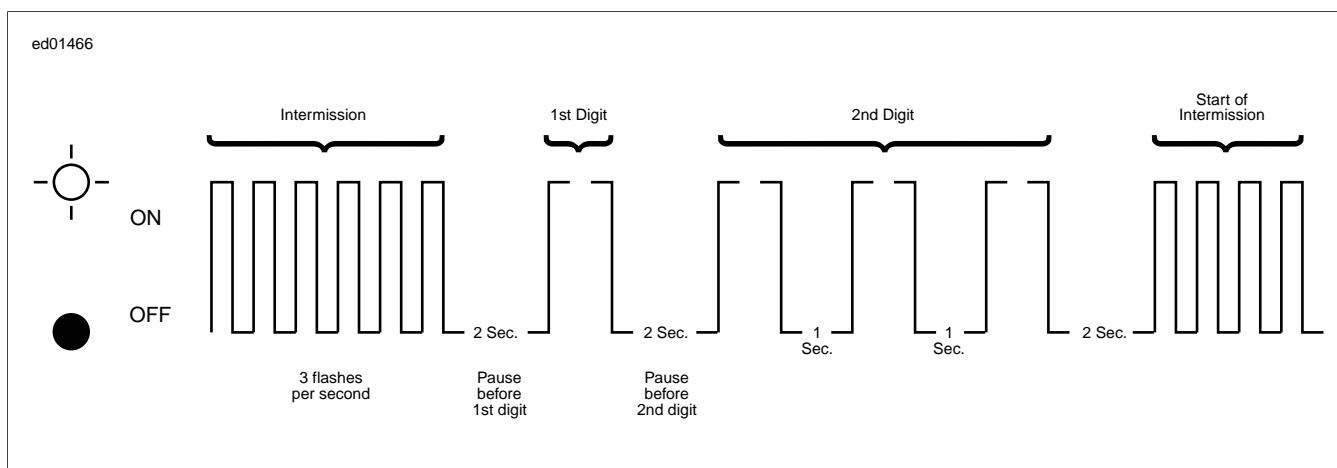


Figure 2-8. Check Engine Lamp Diagnostics

CLEARING CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

After correcting system problems, clear trouble codes. If the DIGITAL TECHNICIAN (Part No. HD-44750) is not available, perform 50 start and run cycles. To execute one run cycle:

1. Start the vehicle.
2. Let it run for at least 30 seconds.
3. Turn the engine off.

GENERAL

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-39978	DVOM

The BREAKOUT BOX (Part No. B-48115) splices into the main harness. Used in conjunction with a DVOM (Part No. HD-39978), it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects.

INSTALLATION

- Depress latches on each side of connectors [10] (black) and [11] (gray) and detach connectors from the Electronic Control Module (ECM).
- See [Figure 2-9](#), [Figure 2-10](#) and [Figure 2-11](#). Attach Breakout Box to black connector [10].
 - Attach black connector from Breakout Box to corresponding black ECM connector.
 - Attach black connector from the wiring harness to black connector on Breakout Box.
- Attach Breakout Box to gray connector [11].
 - Attach gray connector from Breakout Box to corresponding gray ECM connector.
 - Attach gray connector from the wiring harness to gray connector on Breakout Box.

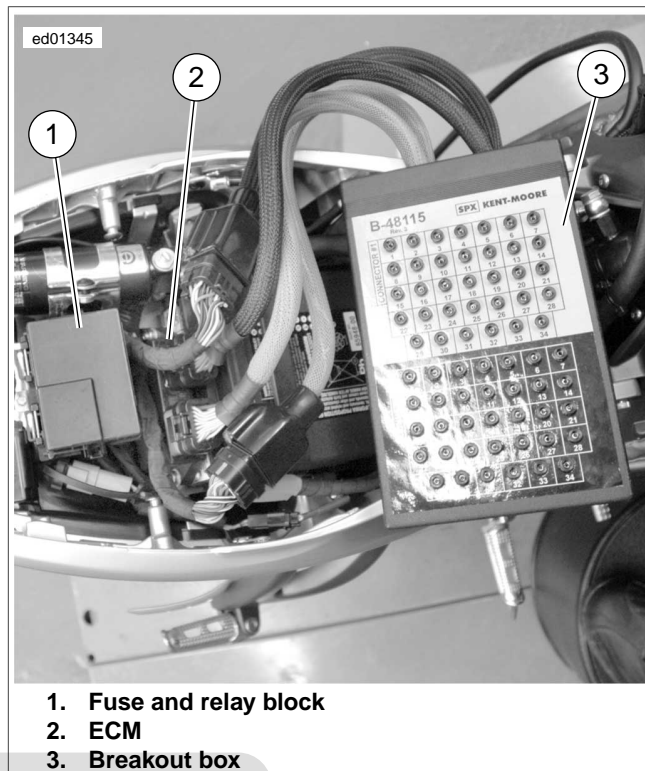


Figure 2-10. ECM and Breakout Box with Connections (Lightning)

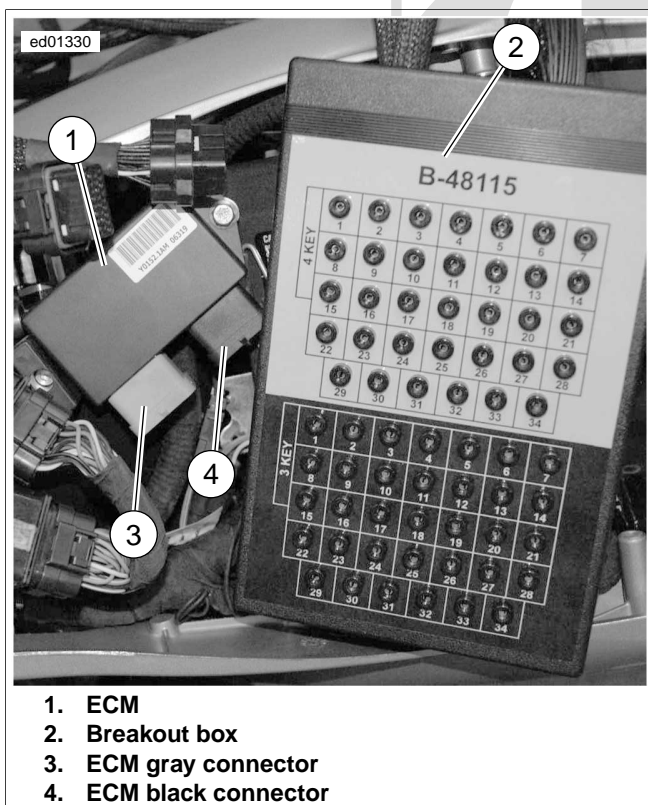


Figure 2-9. ECM and Breakout Box with Connections (Ulysses)

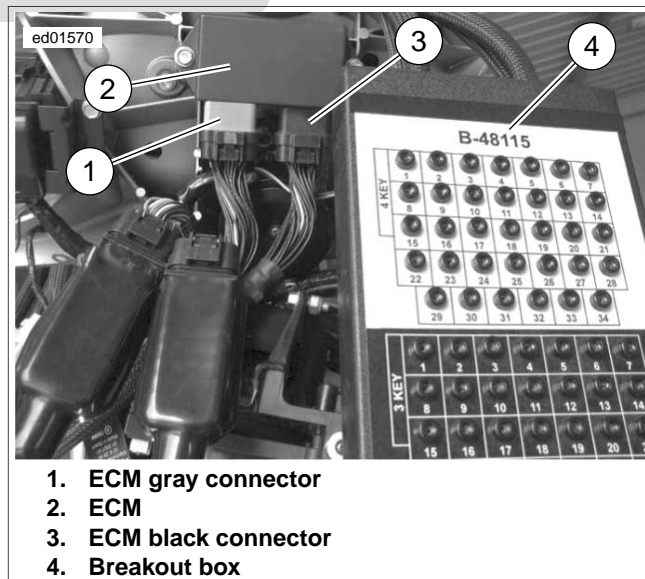


Figure 2-11. ECM and Breakout Box with Connections (Firebolt)

REMOVAL

- See [Figure 2-9](#), [Figure 2-10](#) and [Figure 2-11](#). Depress latches on each side of connectors [10] (black) and [11] (gray).

2. Detach Breakout Box connectors from ECM connectors.
3. Detach Breakout Box connectors from wiring harness.
4. Reconnect harness to ECM.



GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

NOTE

DIGITAL TECHNICIAN (Part No. HD-44750) can be used to perform wiggle test.

The wiggle test checks for the presence of intermittents in a wiring harness.

PROCEDURE

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-39978	DVOM

1. See [Figure 2-12](#). Connect DVOM (Part No. HD-39978) to wiring harness between the suspect connections. When diagnosing Electronic Control Module (ECM) connections, a BREAKOUT BOX (Part No. B-48115) may be used to simplify the procedure. See [2.6 BREAKOUT BOX](#).
2. Set DVOM to read voltage changes.

3. Start motorcycle engine and run at idle.
4. Shake or wiggle harness to detect intermittents. If intermittents are present, radical voltage changes will register on the DVOM.

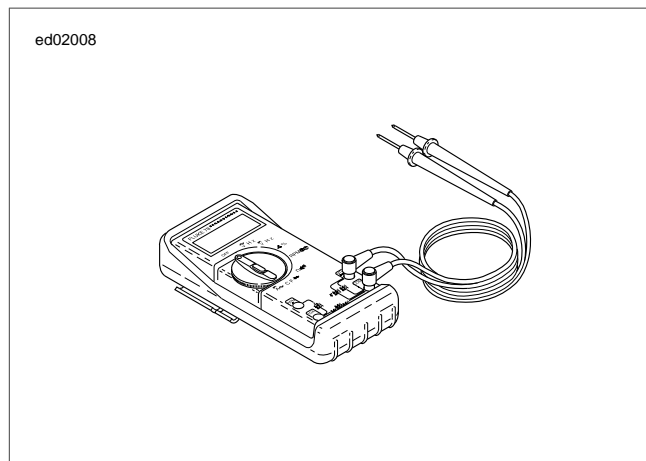


Figure 2-12. Fluke 78 Multimeter (DVOM) (Part No. HD-39978)



GENERAL

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-39978	DVOM

To locate faulty circuits or other system problems, follow the diagnostic flow charts in this section. For a systematic approach, always begin with [2.8 INITIAL DIAGNOSTIC CHECK, Initial Diagnostics](#). Read the general informational and then work your way through the flow chart box by box.

Diagnostic Notes

If a numbered circle appears adjacent to a flow chart box, then more information is offered in the diagnostic notes. Many diagnostic notes contain supplemental information, descriptions of various diagnostic tools or references to other parts of the manual where information on the location and removal of components may be obtained.

Circuit Diagram/Wire Harness Connector Cable

When working through a flow chart, refer to the illustrations, the associated circuit diagram and the wire harness connector table as necessary. The wire harness connector table for each circuit diagram identifies the connector number, description, type and general location.

In order to perform most diagnostic routines, a BREAKOUT BOX (Part No. B-48115) and a DVOM (Part No. HD-39978) are required. See [2.6 BREAKOUT BOX](#).

To perform the circuit checks with any degree of efficiency, a familiarity with the various wire connectors is also necessary.

Job/Time Code Values

Dealership technicians filing out warranty claims should use the job/time code values in Digital Technician.

INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

General Information

The diagnostic check is an organized approach to identifying a problem caused by an electronic control system malfunction.

NOTE

The engine may be started and run when the trouble codes are received using a jumper wire on terminals "1" and "2" of the data link connector. However, if the jumper wire is removed with the engine running, the check engine lamp will continue to flash trouble codes. To stop check engine lamp from flashing codes, turn engine stop switch OFF.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

- Compare engine behavior to tables.
 - Starts hard. Refer to [Table 2-10](#).
 - Hesitates, stumbles, surges, misfires and/or sluggish performance. Refer to [Table 2-11](#).
 - Engine exhaust emits black smoke or fouls plugs. Refer to [Table 2-12](#).
- Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black socket probes and patch cord.
- Connect BREAKOUT BOX (Part No. B-48115) to Electronic Control Module (ECM). See [2.6 BREAKOUT BOX](#).

All diagnostic codes are listed in [Table 2-13](#).

Table 2-10. Engine Starts Hard

CAUSE	SOLUTION
Engine temperature circuit	2.18 DTC P0117 (14), P0118 (14)
Improper fuel pressure	2.15 FUEL PRESSURE TEST
Spark plugs and/or wires	2.16 MISFIRE
Battery discharged	1.9 CHARGING SYSTEM, Troubleshooting
Crankshaft position sensor	2.22 DTC P0339 (56)
Manifold leak	2.9 INTAKE LEAK TEST
Ignition coil	2.16 MISFIRE
Leaky injectors	Test fuel injectors. 2.18 DTC P0117 (14), P0118 (14) .
Valve sticking	Perform compression test. See appropriate Buell Service Manual.

Table 2-11. Engine Performance Problems

CAUSE	SOLUTION
Engine temperature circuit	2.18 DTC P0117 (14), P0118 (14)
Crankshaft position sensor circuit	2.22 DTC P0339 (56)
Spark plugs and/or wires	2.16 MISFIRE
Improper fuel pressure	2.15 FUEL PRESSURE TEST
Manifold leak NOTE - When manifold leak is large enough, IAC will close to almost 0 and code P0506 will set.	2.9 INTAKE LEAK TEST A low IAC may also indicate an air intake leak.
Throttle plates not opening fully	Perform throttle cable adjustment. See appropriate Buell Service Manual
EVAP hose (California models only) disconnected from induction module	Connect.
Water or dirt in fuel system	Drain and refill with fresh fuel.
Cooling fan inoperative	2.29 DTC P0691 (36), P0692 (36).
Active muffler control inoperative	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21).

Table 2-12. Engine Exhaust Emits Black Smoke or Fouls Plugs

CAUSE	SOLUTION
Engine temperature circuit	2.18 DTC P0117 (14), P0118 (14)
Clogged air filter	2.17 DTC P0112 (15), P0113 (15)
Leaky injectors	Test fuel injectors. 2.23 DTC P0502 (43), P0503 (43), P0608 (37)
Improper fuel pressure	2.15 FUEL PRESSURE TEST

Table 2-13. Trouble Codes and Fault Conditions

RANKING	DTC	CHECK ENGINE LAMP CODE	FAULT CONDITION	SOLUTION
1	P0604	52	ECM RAM Failure	2.26 DTC P0603 (54), P0604 (52), P0605 (53), P0607 (55)
2	P0605	53	ECM ROM Failure	2.26 DTC P0603 (54), P0604 (52), P0605 (53), P0607 (55)
3	P0603	54	ECM EEPROM Failure	2.26 DTC P0603 (54), P0604 (52), P0605 (53), P0607 (55)
4	P0607	55	ECM Microprocessor Failure	2.26 DTC P0603 (54), P0604 (52), P0605 (53), P0607 (55)
5	P0339	56	Crankshaft Position Sensor Circuit Intermittent	2.22 DTC P0339 (56)
6	P0123	11	Throttle Position Sensor Circuit High	2.19 DTC P0122 (11), P0123 (11)
7	P0122	11	Throttle Position Sensor Circuit Low	2.19 DTC P0122 (11), P0123 (11)
8	P1502	45	Side Stand Sensor High/Open	2.34 DTC P1501 (45), P1502 (45), P1503 (45)
9	P1501	45	Side Stand Sensor Low	2.34 DTC P1501 (45), P1502 (45), P1503 (45)
10	P1503	45	Side Stand down at vehicle speed	2.34 DTC P1501 (45), P1502 (45), P1503 (45)
11	P1152	44	Bank Angle Sensor Shorted High	2.31 DTC P1151 (44), P1152 (44)

Table 2-13. Trouble Codes and Fault Conditions

RANKING	DTC	CHECK ENGINE LAMP CODE	FAULT CONDITION	SOLUTION
12	P1151	44	Bank Angle Sensor Shorted Low	2.31 DTC P1151 (44), P1152 (44)
13	P1154	26	Clutch Position Sensor Circuit Low	2.32 DTC P1154 (26), P1155 (27)
14	P1155	27	Neutral Switch Input Circuit Low	2.32 DTC P1154 (26), P1155 (27)
15	P0118	14	Engine Temperature Sensor High/Open	2.18 DTC P0117 (14), P0118 (14)
16	P0117	14	Engine Temperature Sensor Voltage Low	2.18 DTC P0117 (14), P0118 (14)
17	P0113	15	Intake Air Temperature Sensor High/Open	2.17 DTC P0112 (15), P0113 (15)
18	P0112	15	Intake Air Temperature Sensor Voltage Low	2.17 DTC P0112 (15), P0113 (15)
19	P0629	33	Fuel Pump Circuit High	2.28 DTC P0628 (33), P0629 (33)
20	P0628	33	Fuel Pump Circuit Low	2.28 DTC P0628 (33), P0629 (33)
21	P2301	24	Front Ignition Coil Control Circuit High	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25)
22	P2300	24	Front Ignition Coil Control Circuit Low	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25)
23	P2304	25	Rear Ignition Coil Control Circuit High	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25)
24	P2303	25	Rear Ignition Coil Control Circuit Low	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25)
25	P0262	23	Front Fuel Injector Circuit High	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32)
26	P0261	23	Front Fuel Injector Circuit Low	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32)
27	P0265	32	Rear Fuel Injector Circuit High	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32)
28	P0264	32	Rear Fuel Injector Circuit High	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32)
29	P0563	16	Battery Voltage High	2.25 DTC P0562 (16), P0563 (16)
30	P0562	16	Battery Voltage Low	2.25 DTC P0562 (16), P0563 (16)
31	P0502	43	Vehicle Speed Sensor High	2.23 DTC P0502 (43), P0503 (43), P0608 (37)
32	P0503	43	Vehicle Speed Sensor Intermittent/Erratic High	2.23 DTC P0502 (43), P0503 (43), P0608 (37)
33	P1470	21	Exhaust Valve Actuator Stuck Open	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21)
34	P1478	21	Exhaust Valve Actuator High	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21)
35	P1471	21	Exhaust Valve Actuator Stuck Closed	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21)
36	P1477	21	Exhaust Actuator Low/Open	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21)
37	P0152	13	Oxygen Sensor Circuit High/Engine Rich	2.20 DTC P0151 (13), P0152 (11), P0154 (13)
38	P0154	13	Oxygen Sensor Open/Inactive	2.20 DTC P0151 (13), P0152 (11), P0154 (13)
39	P0151	13	Oxygen Sensor Circuit Low/Engine Lean	2.20 DTC P0151 (13), P0152 (11), P0154 (13)
40	P0511	34	Idle Air Control Circuit	2.24 DTC P0506 (34), P0507 (34), P0511 (34)

Table 2-13. Trouble Codes and Fault Conditions

RANKING	DTC	CHECK ENGINE LAMP CODE	FAULT CONDITION	SOLUTION
41	P0506	34	Idle Air Control System - RPM Higher Than Expected	2.24 DTC P0506 (34), P0507 (34), P0511 (34)
42	P0507	34	Idle Air Control System - RPM Lower Than Expected	2.24 DTC P0506 (34), P0507 (34), P0511 (34)
43	P0692	36	Fan Control Circuit High	2.29 DTC P0691 (36), P0692 (36)
44	P0691	36	Fan Control Circuit Low	2.29 DTC P0691 (36), P0692 (36)
45	P0617	46	Starter Relay Circuit High	2.27 DTC P0617 (46)
46	P1112	22	Active Intake Control Throttle Position Sensor Feedback Failure	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY)
47	P1111	22	Active Intake Control Circuit Short High	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY)
48	P1110	22	Active Intake Control Circuit Short Low/Open	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY)
49	P1601	47	Auxiliary Relay Driver Circuit	2.35 DTC P1601 (47)
50	P0608	37	Vehicle Speed Sensor Control Module Fail	2.36 DTC P1653 (35), P1654 (35)
51	P1654	35	Tachometer Output High	2.36 DTC P1653 (35), P1654 (35)
52	P1653	35	Tachometer Output Low	2.36 DTC P1653 (35), P1654 (35)

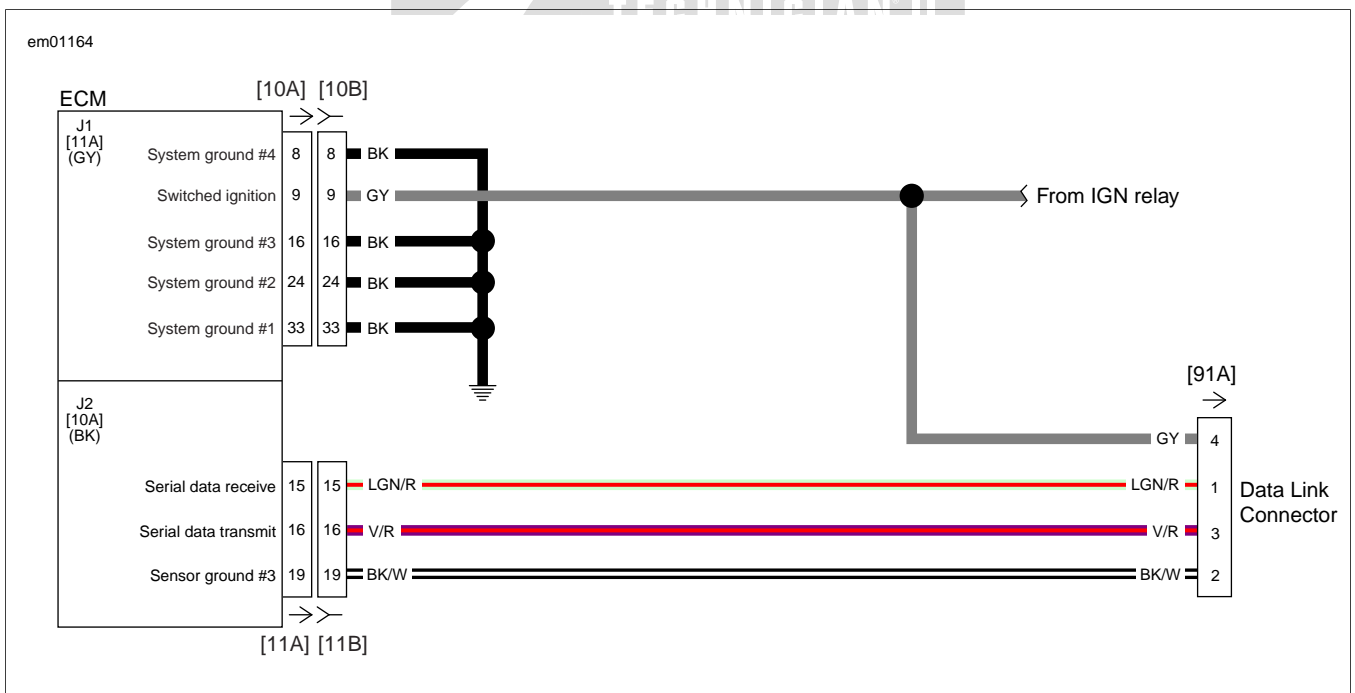


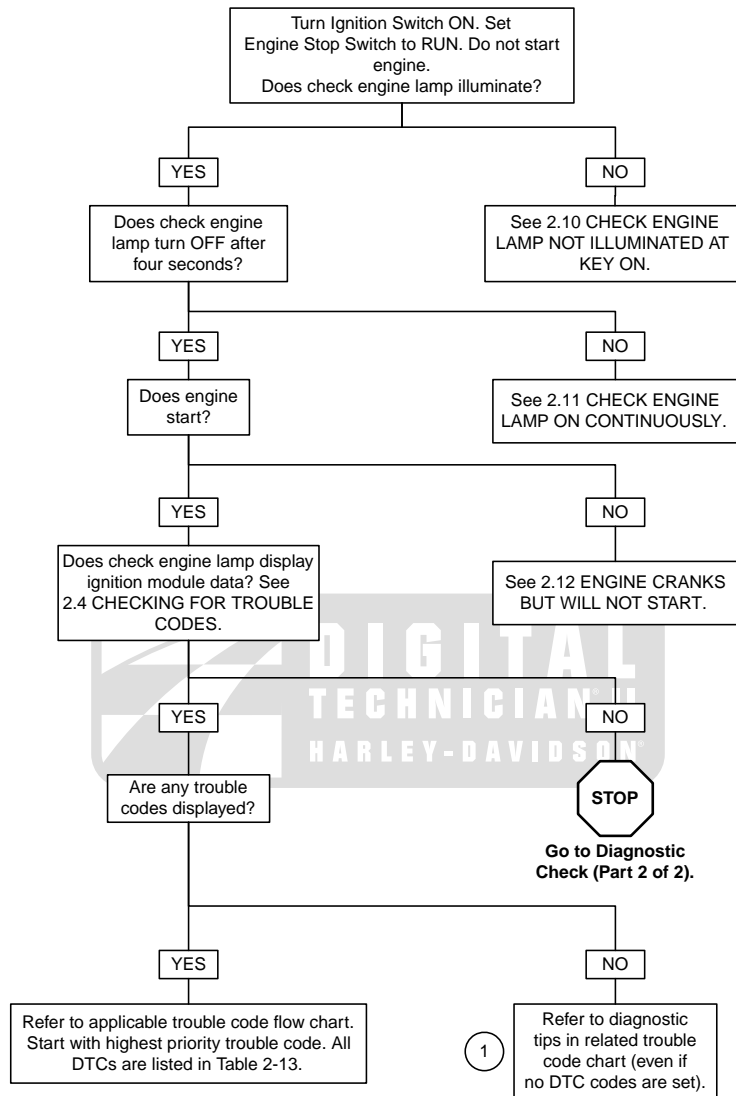
Figure 2-13. Diagnostic Check

Table 2-14. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[91A]	Data link connector	Firebolt	4-place Deutsch	Under fairing
		Ulysses		Behind left airflow guide
		Lightning		Under seat

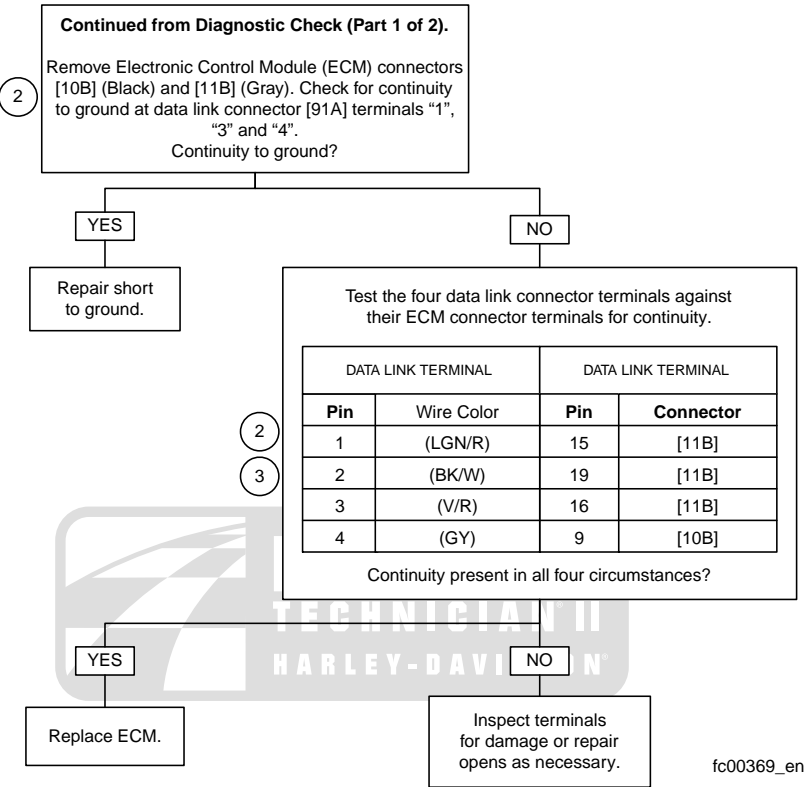


Diagnostic Check (Part 1 of 2)



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Diagnostic Check (Part 2 of 2)



NOTE: After replacing ECM or TPS, the TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate BUELL SERVICE MANUAL.

GENERAL

NOTES

- To prevent false readings, keep airbox cover installed when performing test.
- Do not direct propane into air scoop, false readings will result.

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

Parts List

- Standard 14 oz. propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).
- 12 in. (304 mm) long section of 1/4 in. (6 mm) diameter copper tubing.

Tester Assembly

- Cut rubber hose from kit to 18 in. (457 mm) in length.
- See [Figure 2-14](#). Flatten one end of copper tube to form a nozzle.
- Insert round side of copper tube into end of 18 in. (457 mm) tubing. See [Figure 2-15](#).

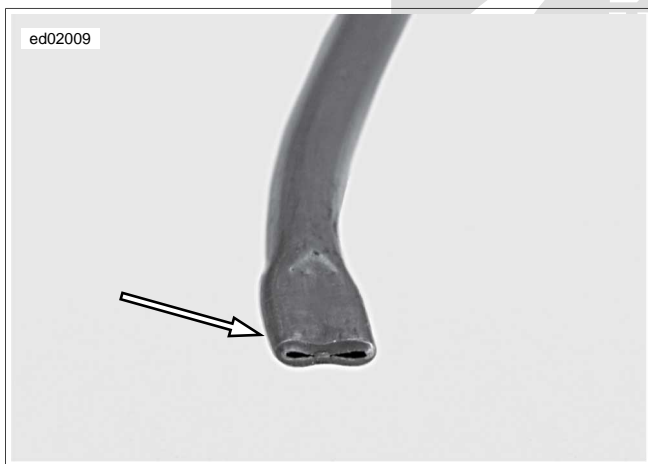
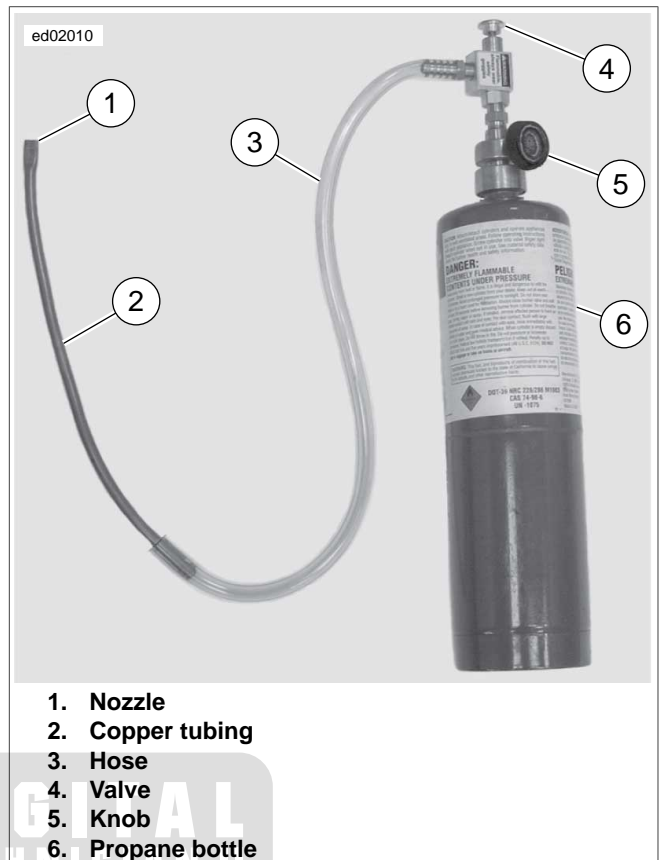


Figure 2-14. Nozzle



- Nozzle
- Copper tubing
- Hose
- Valve
- Knob
- Propane bottle

Figure 2-15. Leak Tester

INTAKE LEAK TESTING

WARNING

Do not allow open flame or sparks near propane. Propane is extremely flammable, which could cause death or serious injury. (00521b)

- Start engine.
- Warm engine to operating temperature.
- See [Figure 2-15](#). Turn knob (5) counterclockwise to open propane bottle.

NOTE

Do not direct propane stream toward front of engine. If propane enters Air Cleaner, a false reading will be obtained.

- See [Figure 2-16](#). Aim nozzle toward possible sources of leak such as Fuel Injectors and intake tract.
- See [Figure 2-15](#). Push valve (4) to release propane. Tone of engine will change when propane enters source of leak.
- Note which components fail the intake leak test, for further servicing.



Figure 2-16. Checking for Leaks



CHECK ENGINE LAMP NOT ILLUMINATED AT KEY ON

2.10

GENERAL

If the engine stop switch is set to RUN with the engine off, and the ignition switch is turned ON the check engine lamp should illuminate for four seconds.

Battery voltage is supplied to the check engine lamp bulb. The check engine lamp bulb is grounded by the Electronic Control Module (ECM) through the (BK/Y) wire. A lack of power to the ECM will cause the check engine lamp to be inoperative and also create a no start situation.



Figure 2-17. Check Engine Lamp (Typical)

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

Check for the following conditions:

- Check for open (BK/Y) wire.
- Check for open fuse.
- Check for failed bulb

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black pin probe and patch cord.
2. See [Figure 2-18](#), [Figure 2-19](#), [Figure 2-20](#). Inspect connector [10] (black) for contamination or corrosion. If connection is good, replace ECM. See [2.13 NO ECM POWER](#).
3. Check continuity between instrument module connector [39] terminal "7" and ECM connector [10] (black), terminal "23".



Figure 2-18. Electronic Control Module (Ulysses)

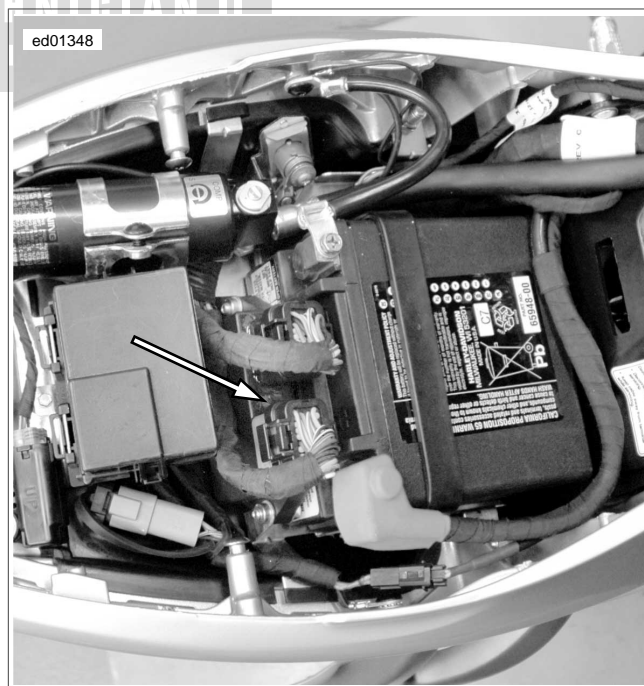


Figure 2-19. Electronic Control Module (Lightning)

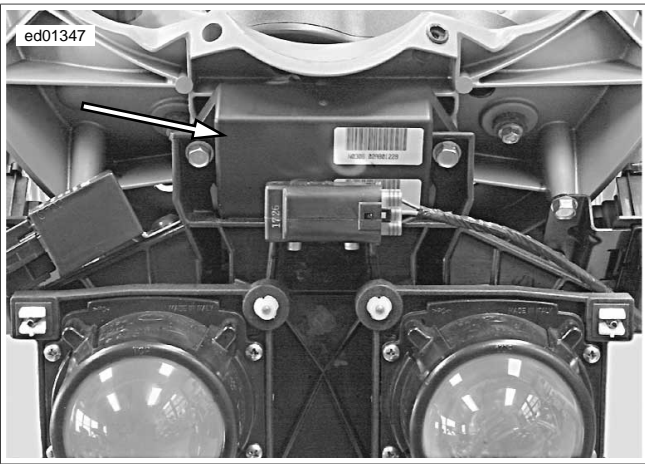


Figure 2-20. Electronic Control Module (Firebolt)

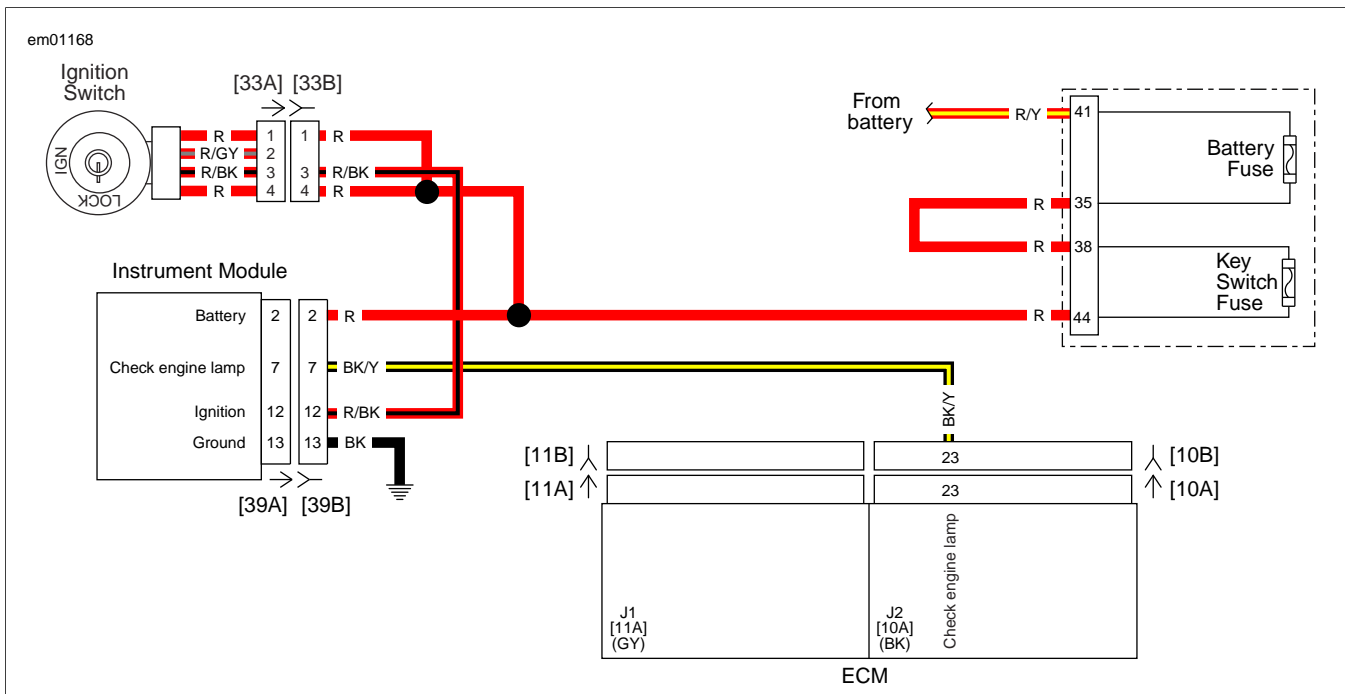


Figure 2-21. Check Engine Lamp Circuit (Ulysses, Lightning)

Table 2-15. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[39]	Instrument module	20-place Multilock	Behind windscreen

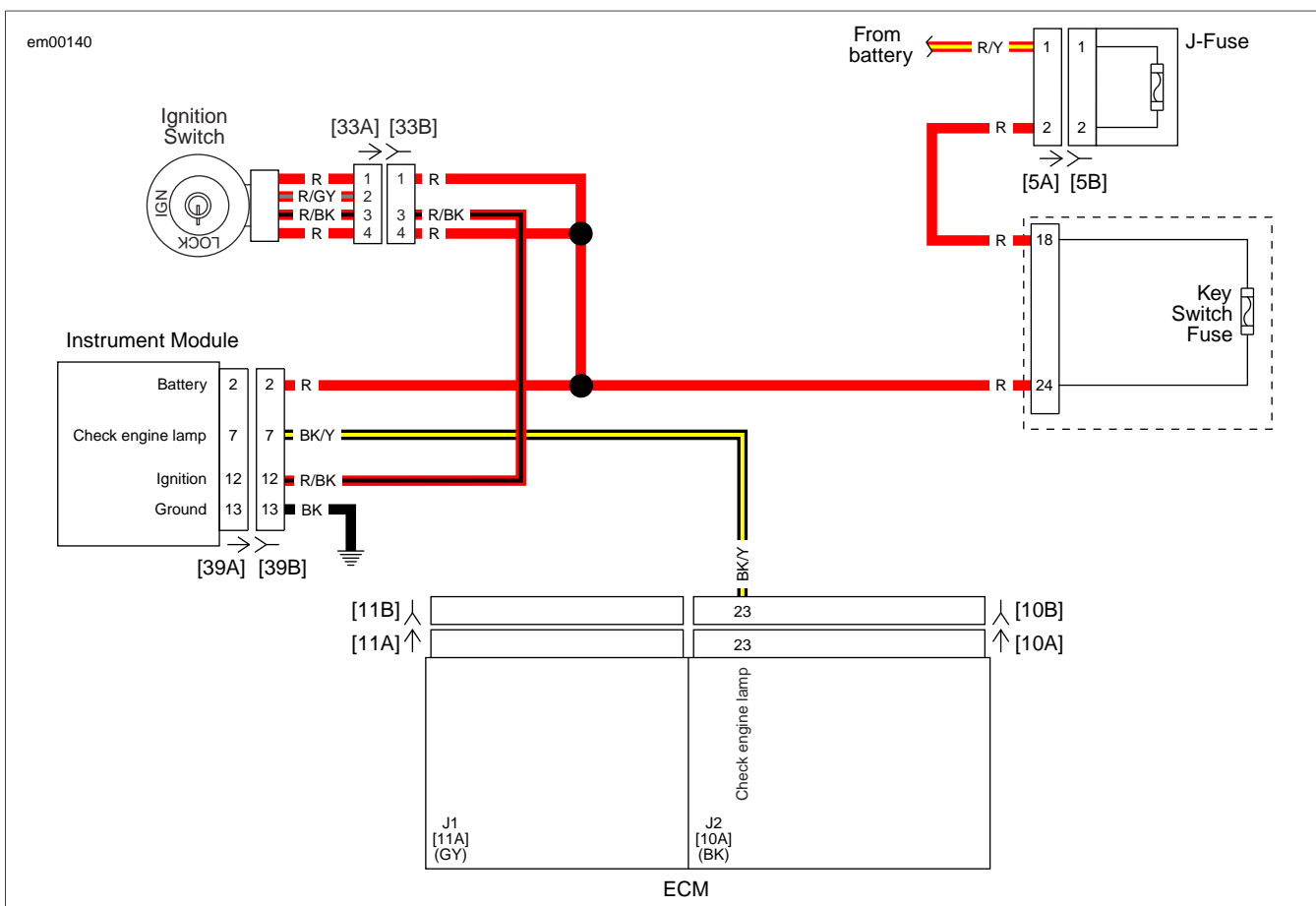
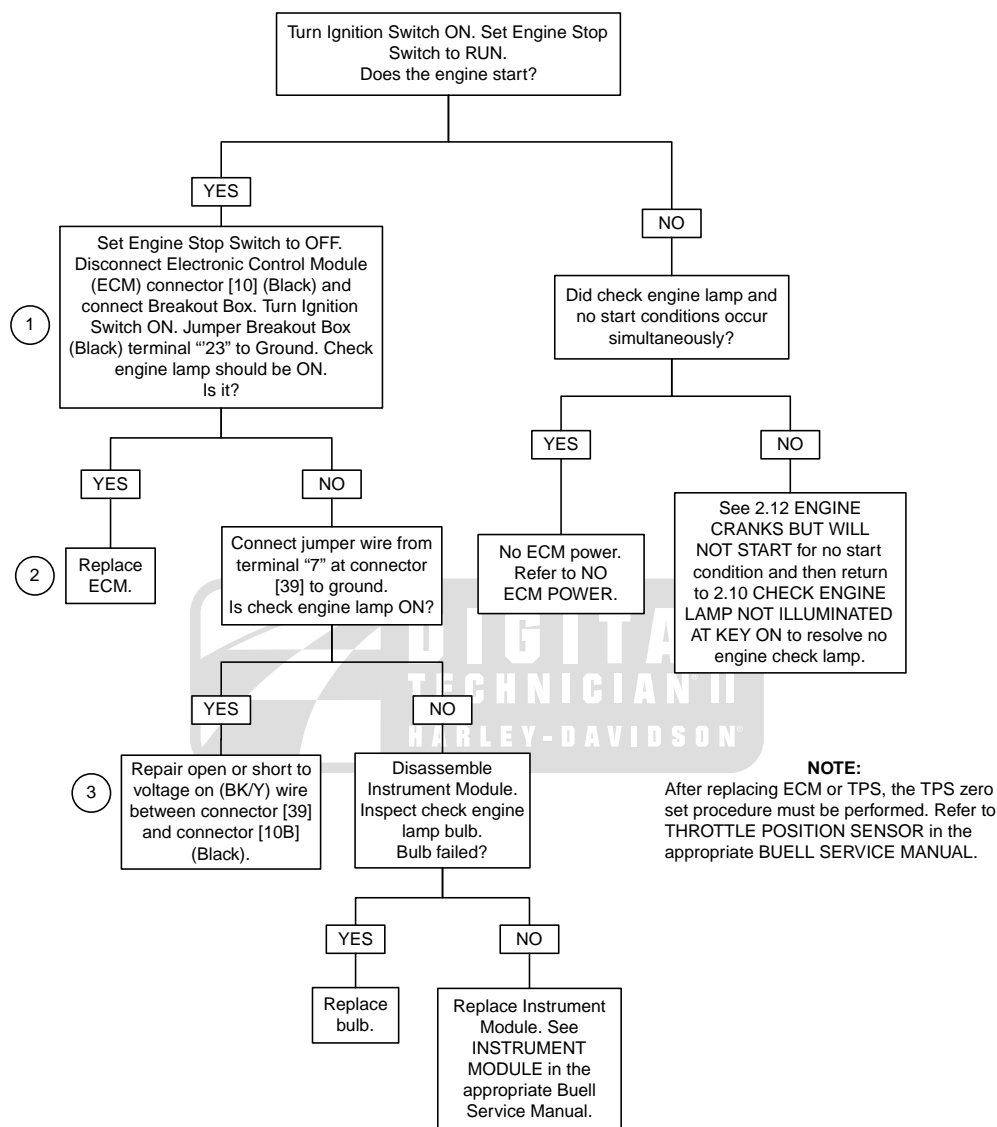


Figure 2-22. Check Engine Lamp Circuit (Firebolt)

Table 2-16. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[39]	Instrument module	20-place Multilock	In fairing

Check Engine Lamp Not Illuminated at Key On



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GENERAL

See [Figure 2-23](#). If the engine stop switch is set to RUN with the engine off, and the ignition switch is turned ON, the check engine lamp should illuminate for four seconds.

Following the initial period of illumination, the lamp should turn off for four seconds. It may then come back on for an eight second period (for a stored error) or remain on continuously (current error).



Figure 2-23. Check Engine Lamp

DIAGNOSTICS

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. See [Figure 2-25](#). If the check engine lamp turns off when the black Electronic Control Module (ECM) connector [10] is unplugged, the (BK/Y) wire is not shorted to ground.

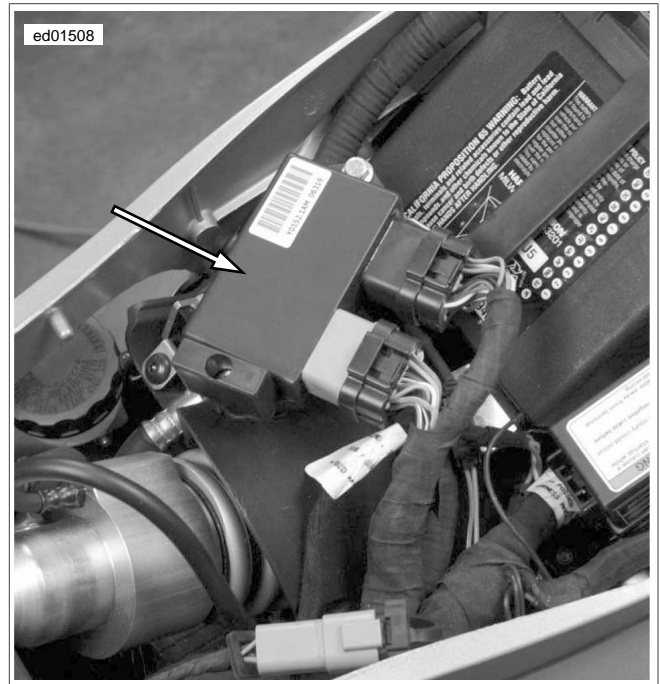


Figure 2-24. Electronic Control Module (Ulysses)

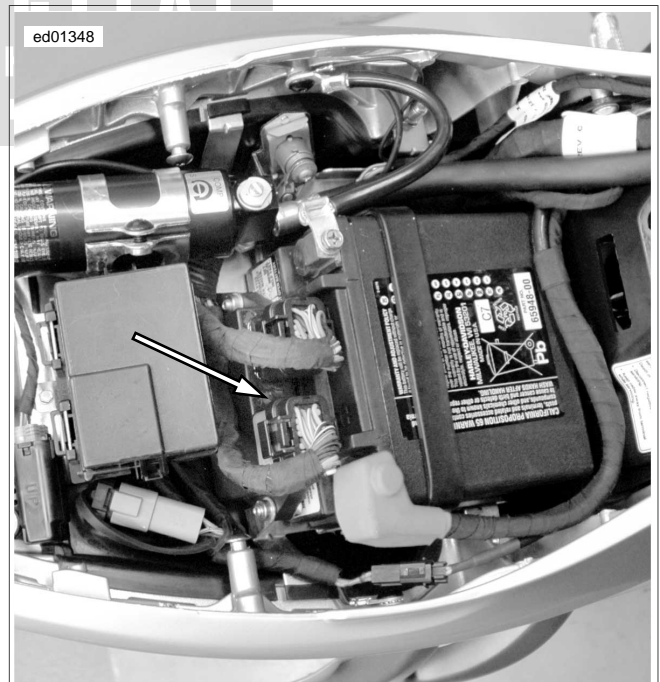


Figure 2-25. Electronic Control Module (Lightning)

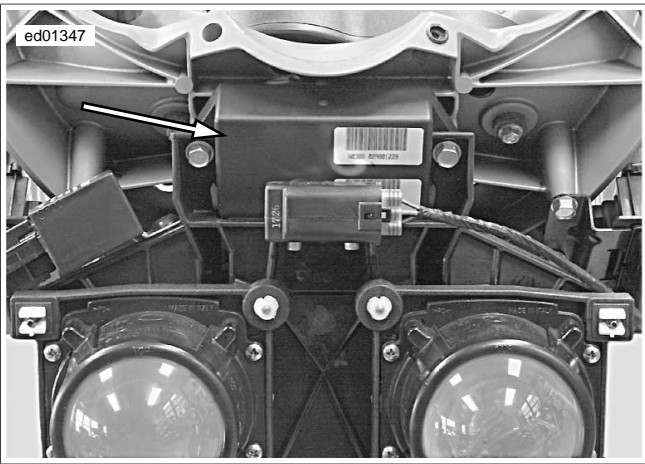


Figure 2-26. Electronic Control Module (Firebolt)

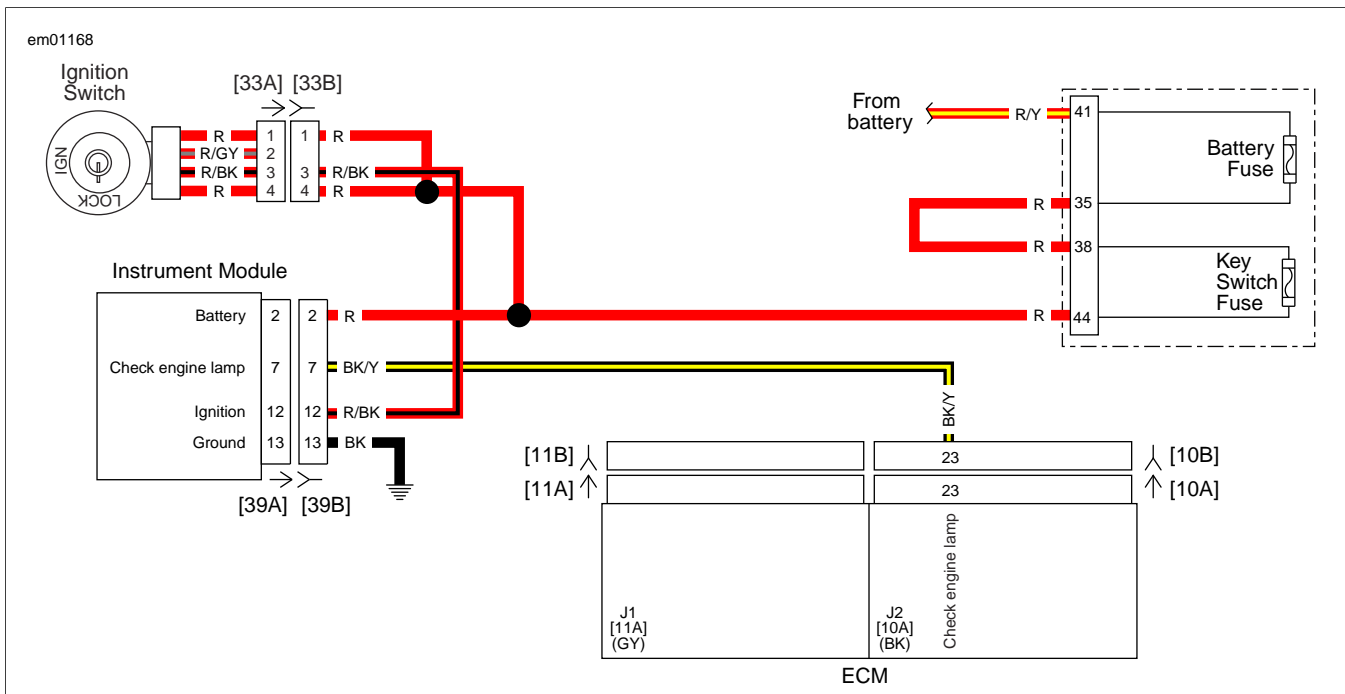


Figure 2-27. Check Engine Lamp Circuit (Ulysses, Lightning)

Table 2-17. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[39]	Instrument module	20-place Multilock	Behind windscreen

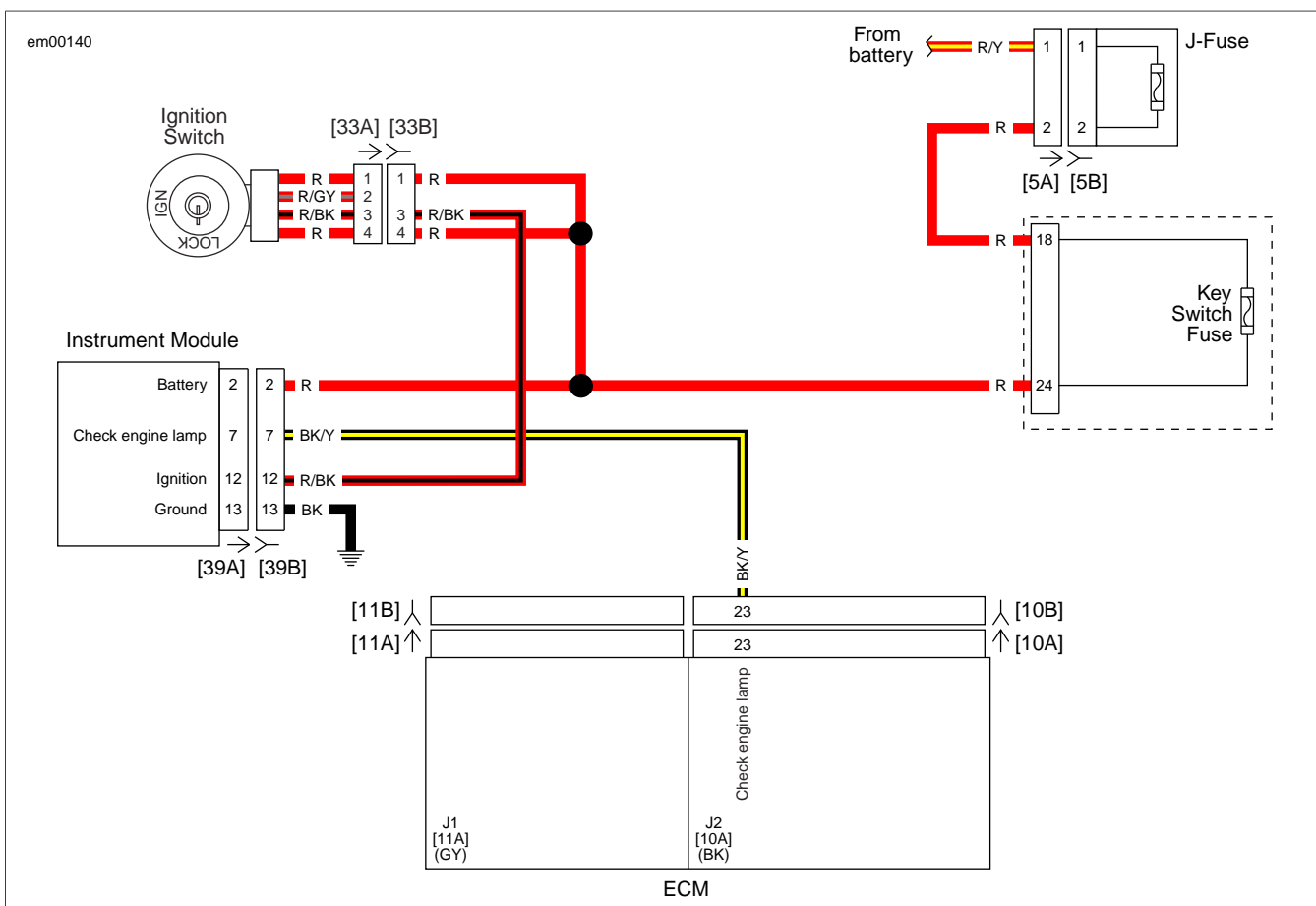
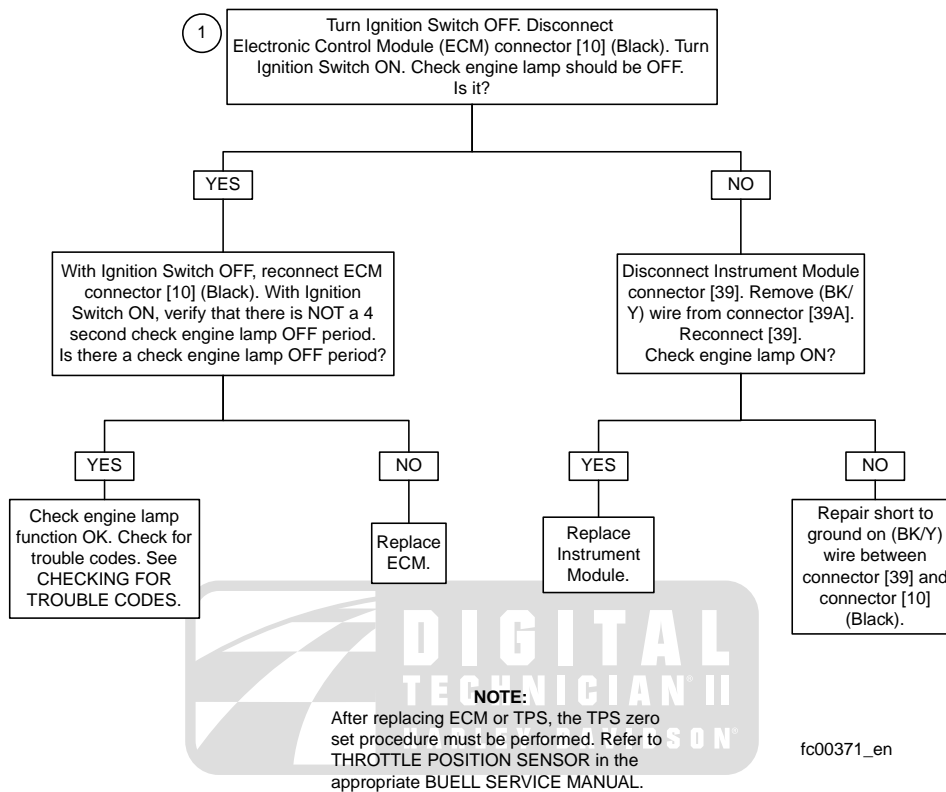


Figure 2-28. Check Engine Lamp Circuit (Firebolt)

Table 2-18. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[39]	Instrument module	20-place Multilock	In fairing

Check Engine Lamp On Continuously



GENERAL

If the starter will not crank engine, the problem is not ignition related. See [2.14 STARTS, THEN STALLS](#).

NOTE

The engine may be started and run when the trouble codes are received using a jumper wire on terminals "1" and "2" of the data link connector. However, if the jumper wire is removed with the engine running, the check engine lamp will continue to flash trouble codes. To stop check engine lamp from flashing codes, turn engine stop switch OFF.

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-26792	SPARK TESTER
HD-34730-2C	FUEL INJECTOR TEST LAMP

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

- Connect BREAKOUT BOX (Part No. B-48115) between harness and Electronic Control Module (ECM). See [2.6 BREAKOUT BOX](#).
- Check battery condition. Perform a voltage test and recharge if below 12.70 volts. Check battery connections and perform load test. Replace the battery if necessary.
- Remove spark plug cable from spark plug.
 - Visually check condition of plug.
 - See [Figure 2-29](#). Attach cable to SPARK TESTER (Part No. HD-26792). Clip tester to cylinder head bolt.
 - While cranking starter, look for spark. Repeat procedure on other spark plug cable.

WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

- Purge fuel line of high pressure gasoline. See appropriate Buell Service Manual.
- Access fuel injectors.
 - Remove right side air scoop. See appropriate Buell Service Manual.
 - Remove airbox to access fuel injectors. See appropriate Buell Service Manual.
- See [Figure 2-30](#). Plug FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) into Breakout Box. Note that cranking

the engine with test lamp in place of an ignition coil can sometimes cause code P2300 or P2304. This condition is normal and does not by itself indicate a malfunction. Codes must be cleared if this condition occurs.

- If resistance greater than 1 ohm is found between ECM connector [10] terminal "25" OR "34" and terminal "9", but not both, the open must be repaired but this repair will not correct the concern.

If resistance greater than 1 ohm is found between ECM connector [10] terminal "31" OR "32" and terminal "9", but not both, the open must be repaired but this repair will not correct the concern.

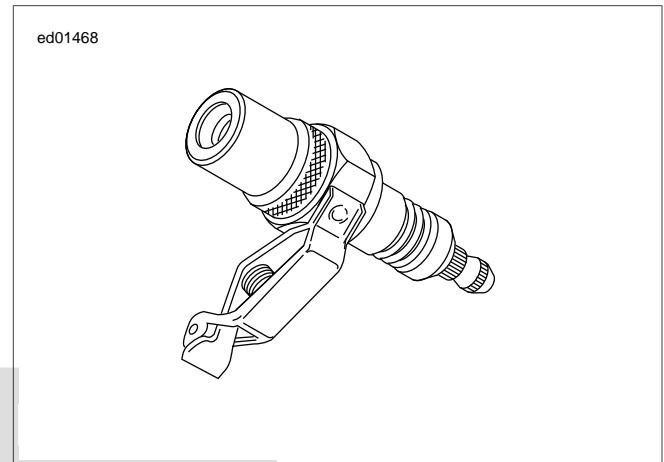


Figure 2-29. Spark Tester

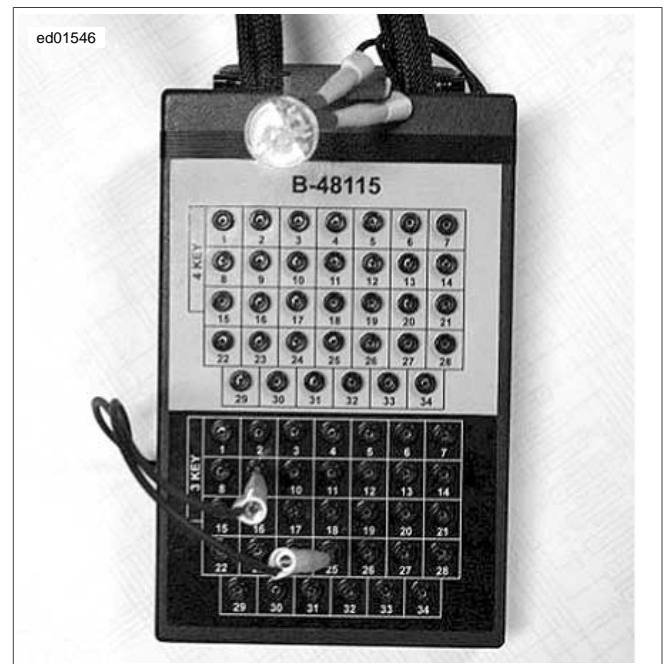


Figure 2-30. Ignition Coil Circuit Test

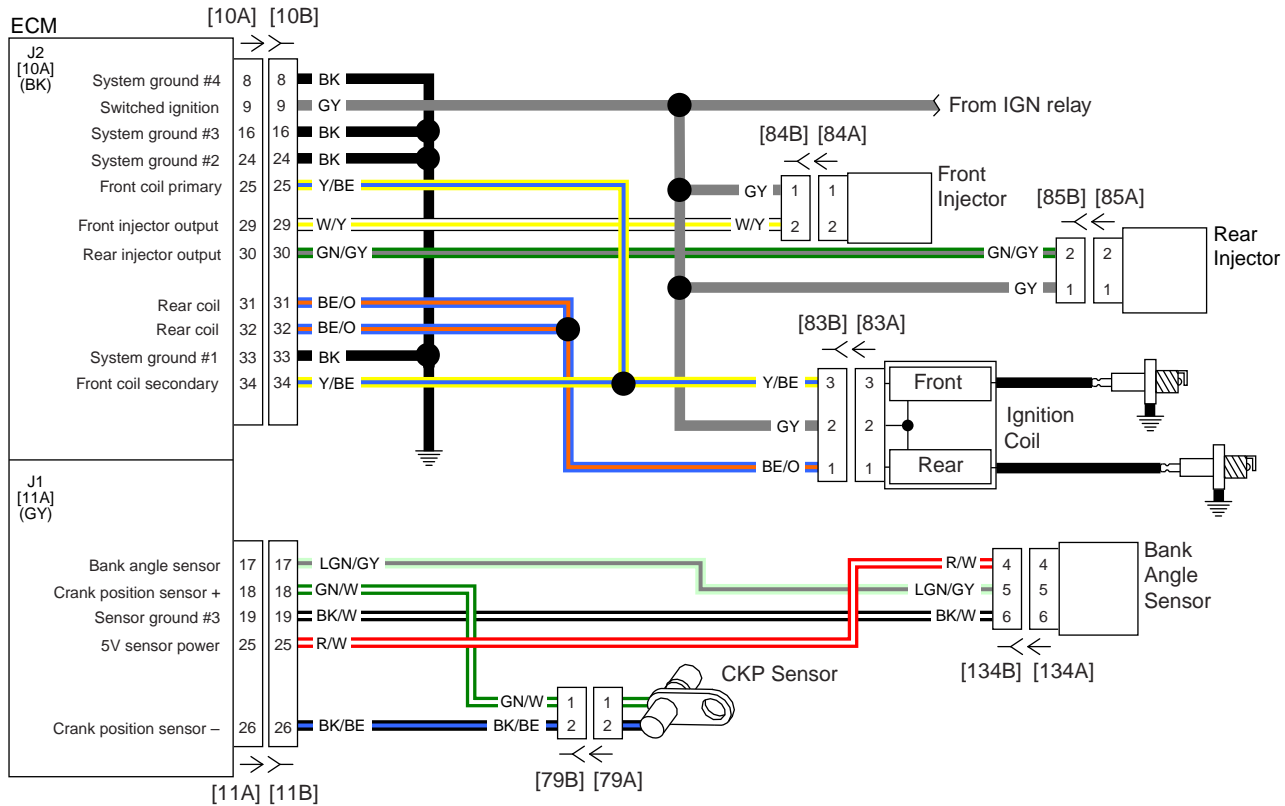
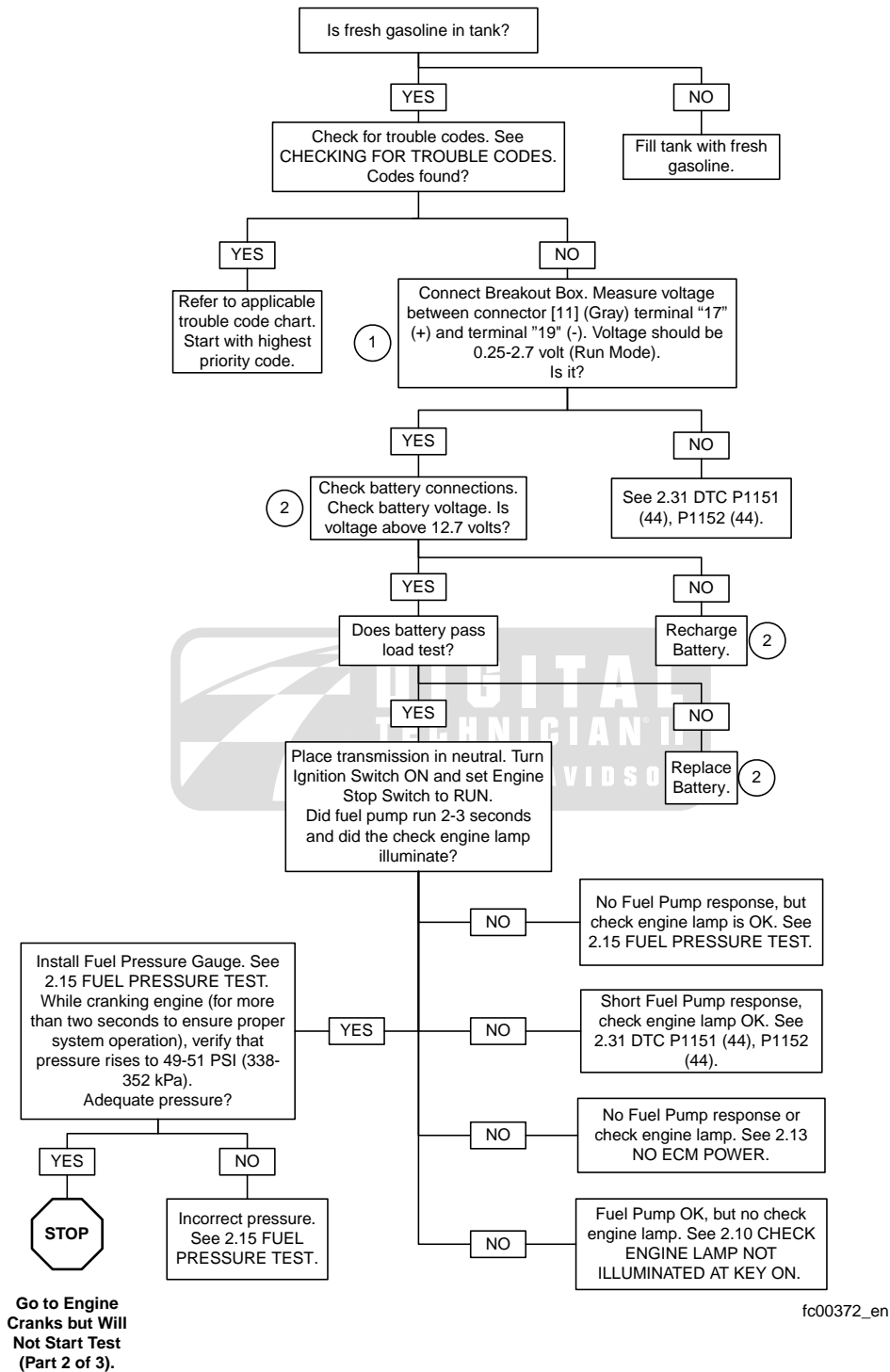


Figure 2-31. Ignition Circuit

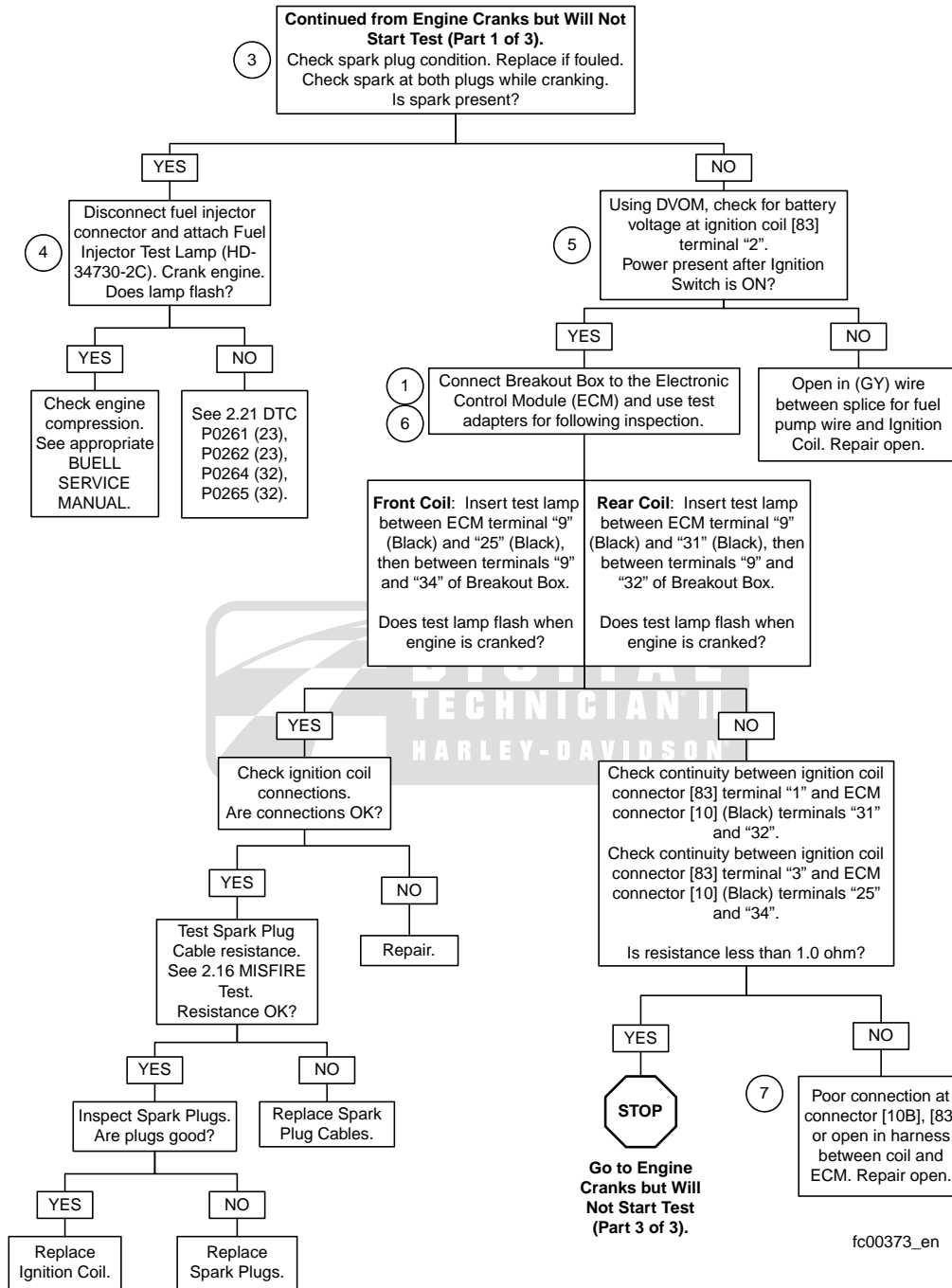
Table 2-19. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place mini-Deutsch	Below left ram air scoop
[83]	Ignition coil	All	3-place Delphi	Beneath airbox base
[84]	Front injector	All	2-place Packard	Beneath airbox base
[85]	Rear injector	All	2-place Packard	Beneath airbox base
[133]	Side stand sensor	All	3-place Amp	Below left ram air scoop
[134]	Bank angle sensor	Firebolt	6-place Sumitomo	In fairing
		Ulysses, Lightning		Under seat

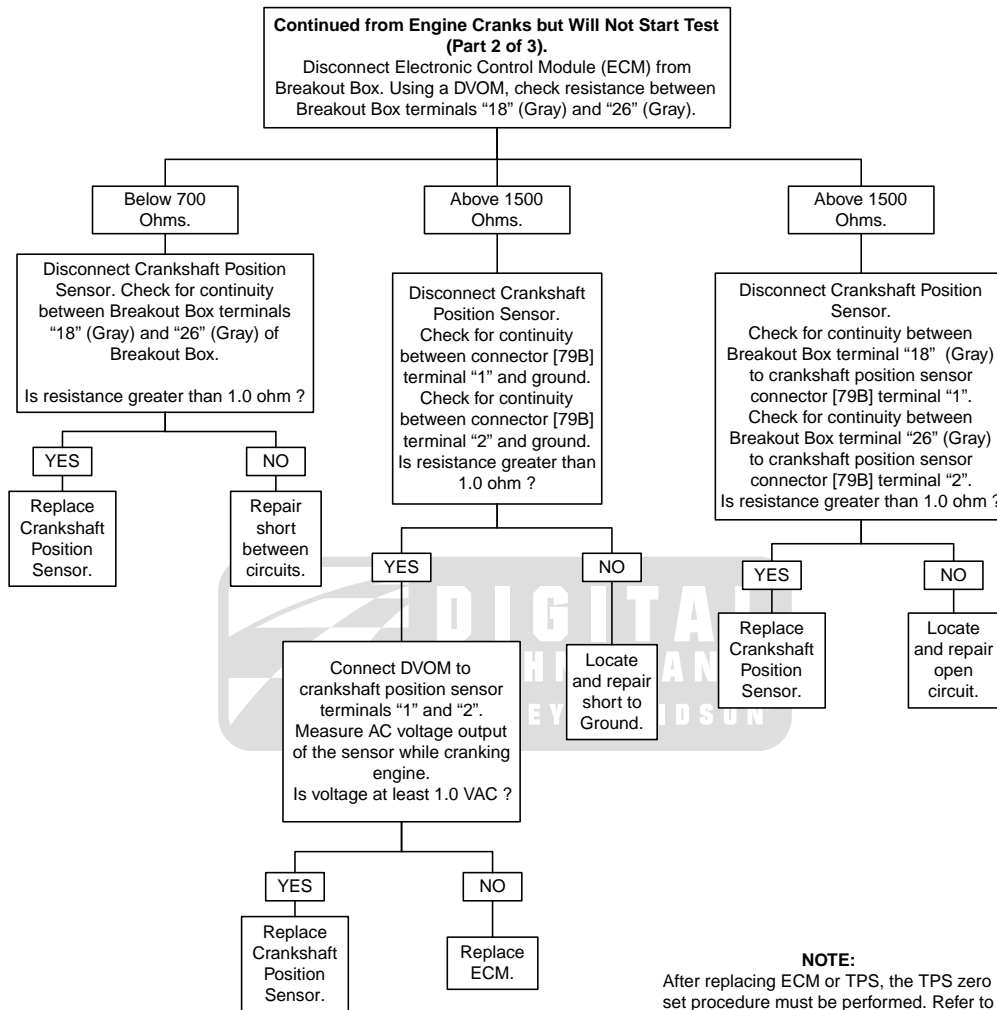
Engine Cranks But Will Not Start (Part 1 of 3)



Engine Cranks But Will Not Start (Part 2 of 3)



Engine Cranks But Will Not Start (Part 3 of 3)



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GENERAL

A relay controlled by the engine stop switch supplies power to the ECM. The relay requires a ground to operate. If the ground is not established, the ECM will not receive power. If the ECM does not appear to be receiving power, check the ground sources. An open ignition fuse or ECM fuse can also disable the ECM.

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

- 1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).

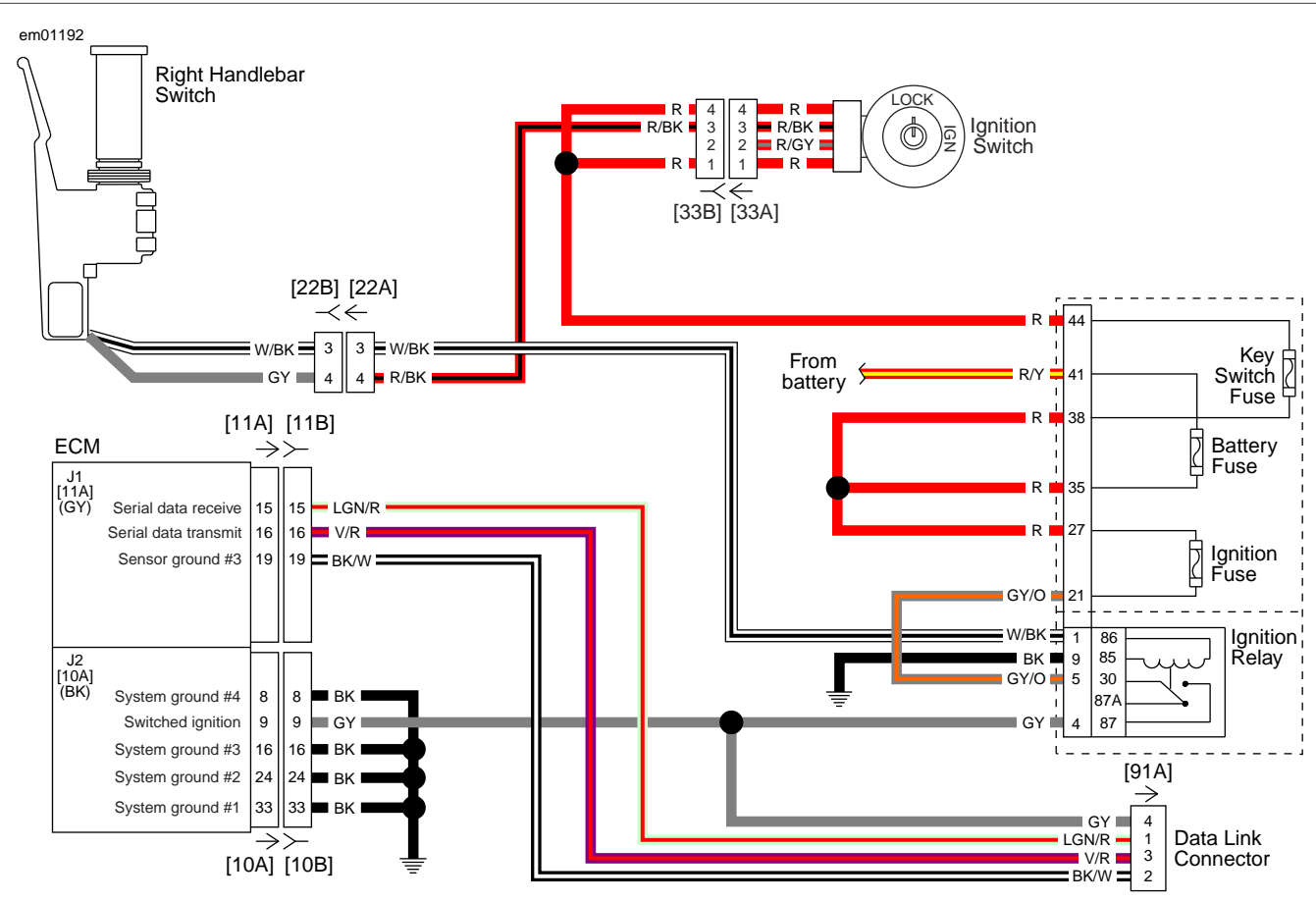


Figure 2-32. ECM Power Circuit (Ulysses, Lightning)

Table 2-20. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[22]	Right handlebar switch	4-place Multilock	To the right of windscreen

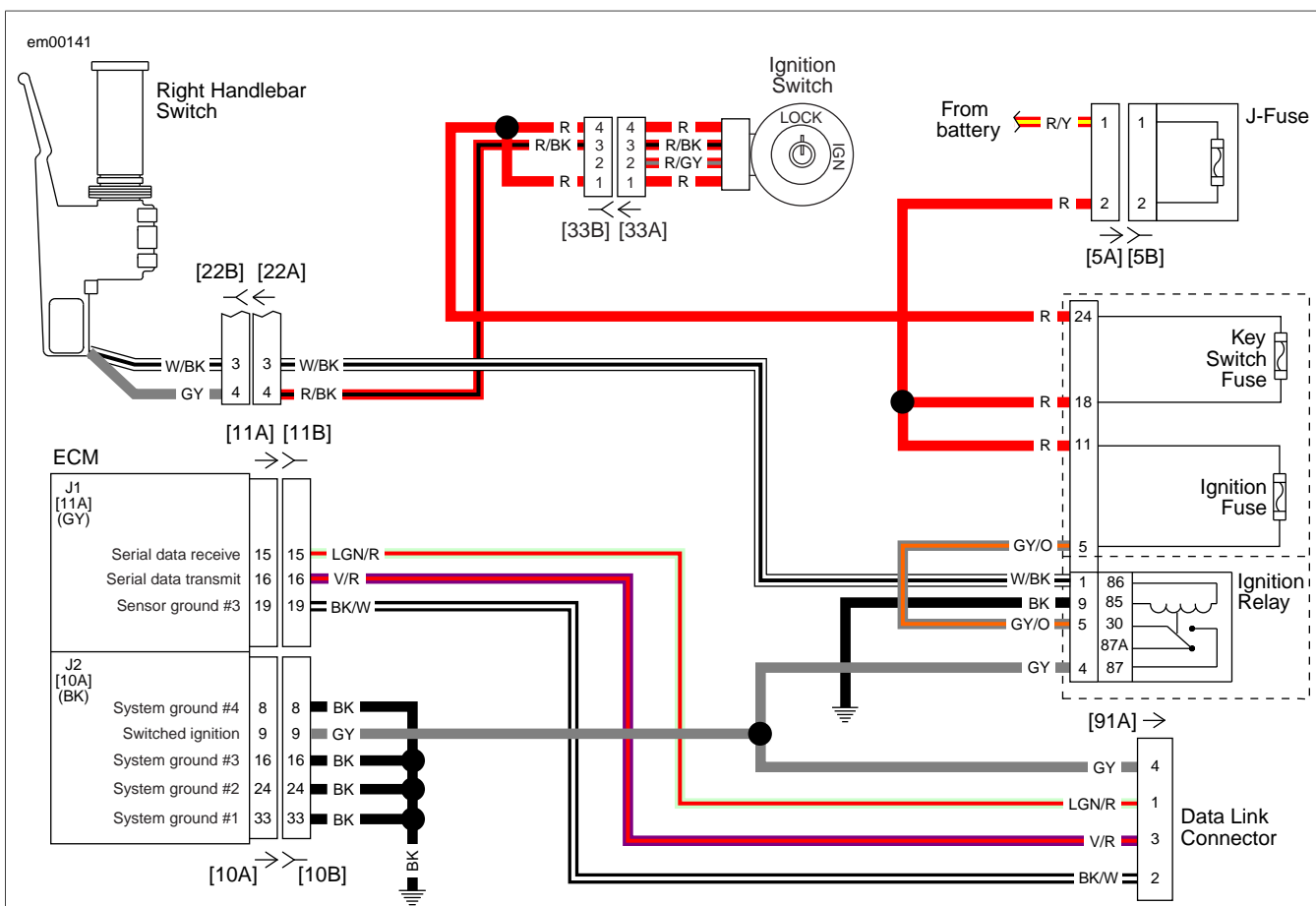
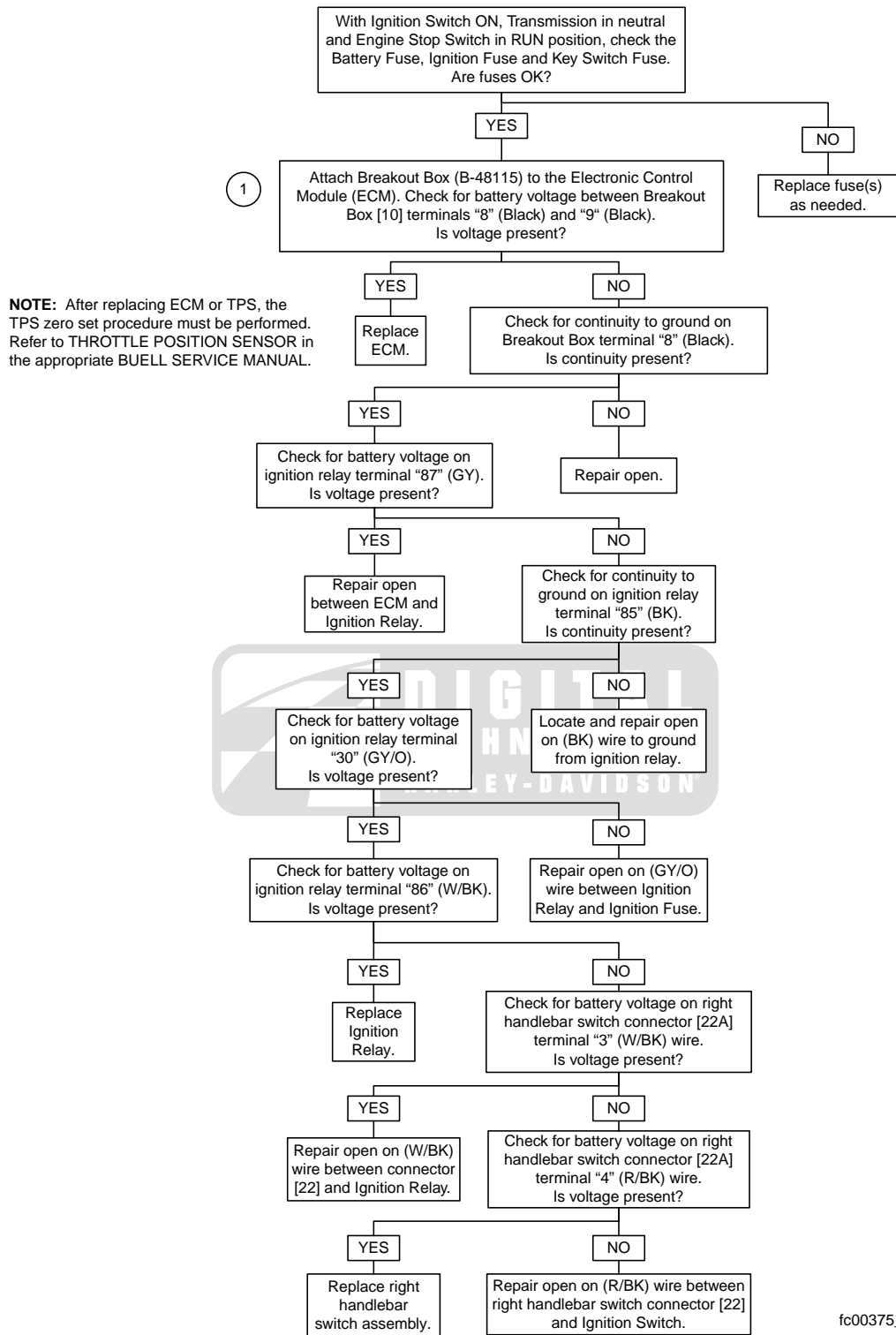


Figure 2-33. ECM Power Circuit (Firebolt)

Table 2-21. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[22]	Right handlebar switch	4-place Multilock	To the right of windscreen

No ECM Power



GENERAL

This symptom may be created by the following:

- fuel system.
- idle air control system.
- starting engine with side stand extended and transmission in gear.

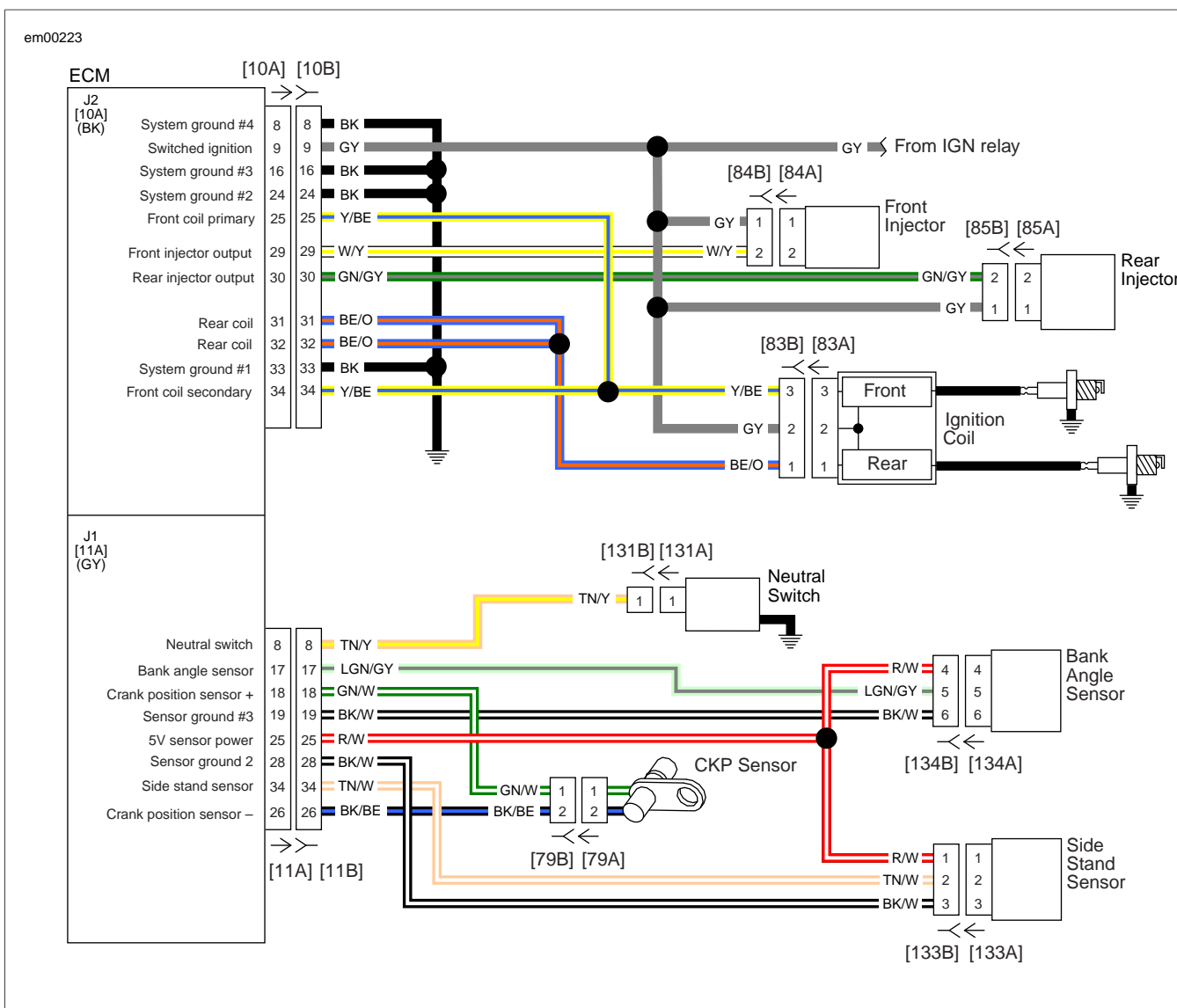


Figure 2-34. Ignition Circuit

Table 2-22. Wire Harness Connectors

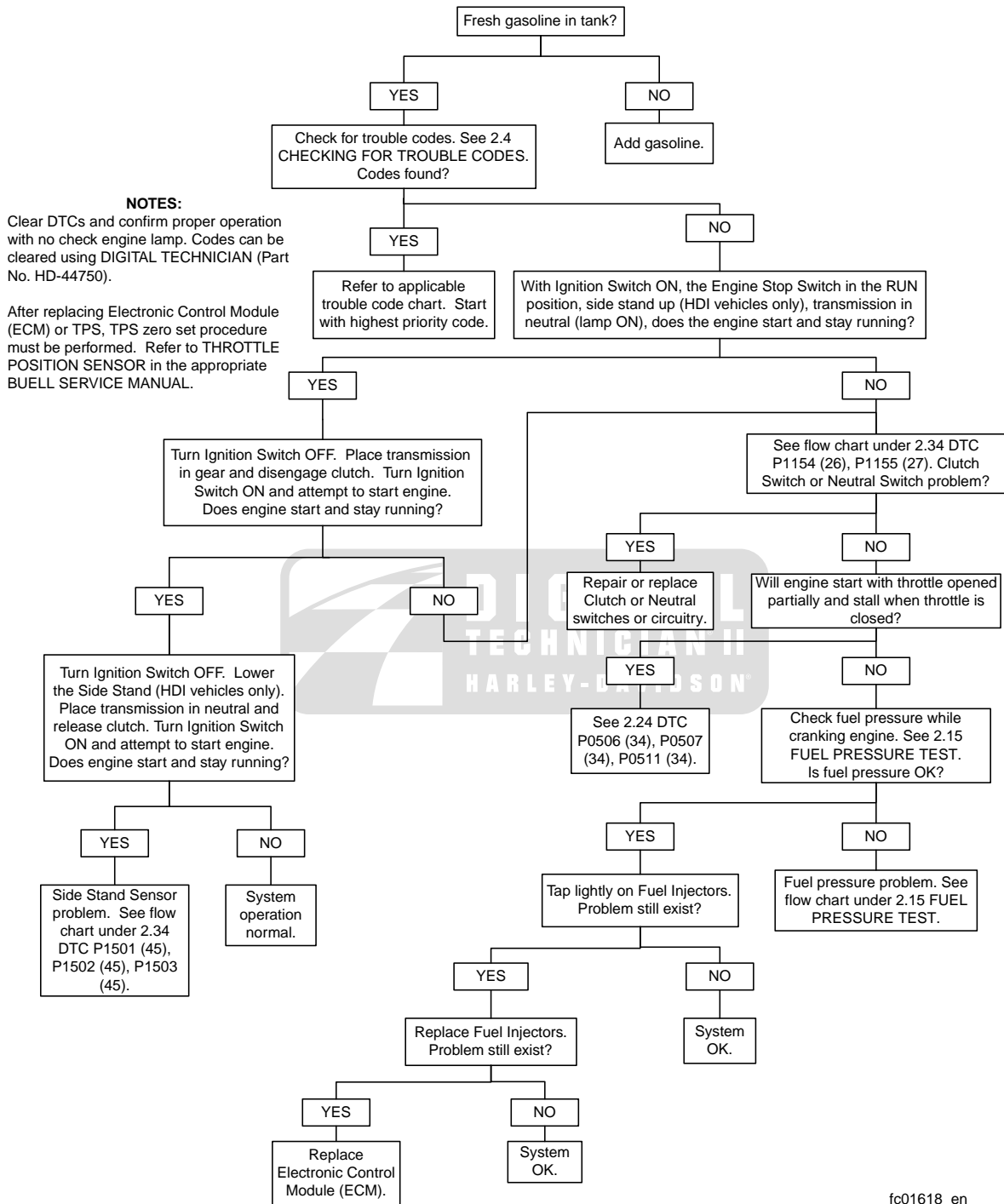
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat

Table 2-22. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[79]	Crankshaft Position (CKP) sensor	All	2-place mini-Deutsch	Below left ram air scoop
[83]	Ignition coil	All	3-place Delphi	Beneath airbox base
[84]	Front injector	All	2-place Packard	Beneath airbox base
[85]	Rear injector	All	2-place Packard	Beneath airbox base
[131]	Neutral switch	All	1-place	Under sprocket cover
[133]	Side stand sensor	All	3-place Amp	Below left ram air scoop
[134]	Bank angle sensor	Firebolt	6-place Sumitomo	In fairing
		Ulysses, Lightning		Under seat



Engine Starts Then Stalls



INSPECTION

PART NUMBER	TOOL NAME
B-45522	FUEL PRESSURE GAUGE ADAPTER
HD-41182	FUEL PRESSURE GAUGE

⚠ WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Remove airbox. See the appropriate Buell Service Manual.
2. Purge the fuel supply line of high pressure gasoline.
 - a. See [Figure 2-35](#). Disconnect the 4-place fuel pump connector [86]. The connector is located inside the left rear portion of the fuel tank/frame.
 - b. With the motorcycle in neutral, start the engine and allow vehicle to run.
 - c. When the engine stalls, press the starter button for 3 seconds to remove any remaining fuel from fuel line.

⚠ WARNING

Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)

3. [Figure 2-38](#) Depress button (2) of fuel line connector and disconnect the fuel line (3) from throttle body inlet (1).
4. See [Figure 2-39](#). Attach FUEL PRESSURE GAUGE ADAPTER (Part No. B-45522) (2) to throttle body inlet (1).
5. Connect the fuel line (3) to fuel pressure gauge adapter.

NOTE

See [Figure 2-40](#). Verify that fuel valve (2) and air bleed petcock (5) on the gauge are closed.

6. Attach FUEL PRESSURE GAUGE (Part No. HD-41182) (4) to fuel pressure gauge adapter (1).
7. See [Figure 2-35](#). Attach fuel pump connector [86] to main wiring harness.
8. See [Figure 2-40](#). Pressurize the fuel system.
 - a. Start and idle engine to pressurize the fuel system.
 - b. Open fuel valve (2) on fuel pressure gauge to allow fuel to flow down the gauge hose.
 - c. Position the air bleed tube (3) into proper container.
 - d. Open and close the air bleed petcock (5) to purge the fuel pressure gauge and hose of air. Repeat this step several times until only solid fuel (without bubbles) flows from the air bleed tube.
 - e. Close the air bleed petcock.

9. Open throttle and increase engine speed to 2500-3000 RPM. Note the reading on the pressure gauge.
 - a. If pressure is 49-51 PSI (338-352 kPa) then system is operating within limits.
 - b. If pressure is not within limits, see flow chart after disconnecting pressure gauge.

⚠ WARNING

Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)

10. See [Figure 2-40](#). Turn engine off. Detach pressure gauge (4) from adapter (1).
 - a. Open the air bleed petcock (5) to relieve fuel system pressure and purge the pressure gauge of gasoline.
 - b. Remove adapter from vehicle.
11. Detach adapter from vehicle.
12. Connect fuel line to throttle body inlet.

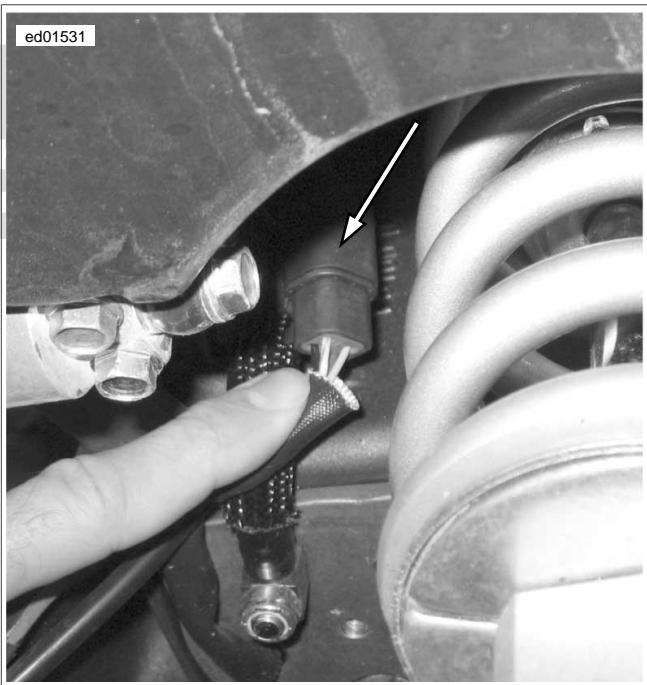


Figure 2-35. Fuel Pump Connector [86] (Ulysses - swingarm removed for illustration)



Figure 2-36. Fuel Pump Connector [86] (Lightning - swingarm removed for illustration)

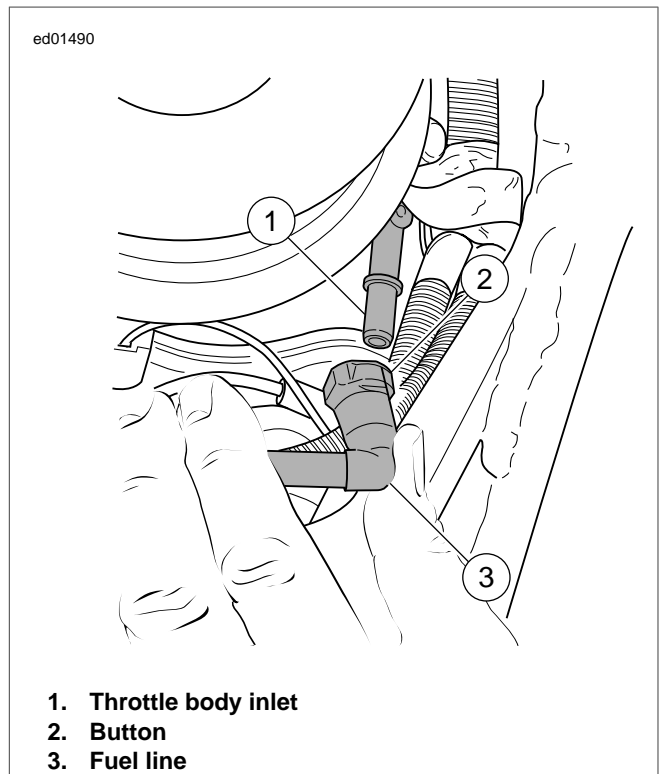


Figure 2-38. Fuel Line

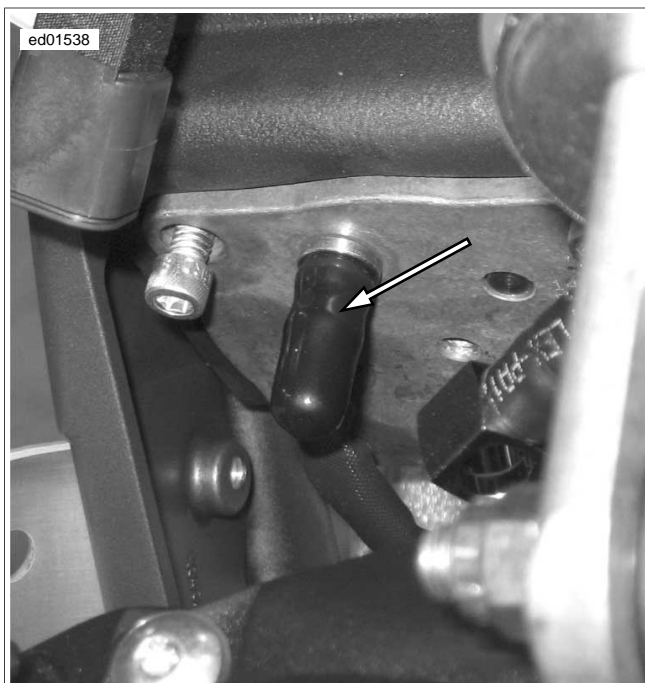


Figure 2-37. Fuel Pump Connector [86] (Firebolt - swingarm removed for illustration)

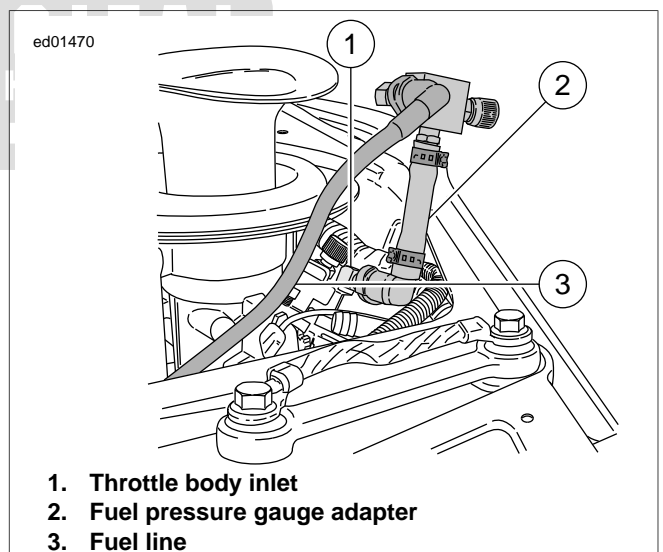
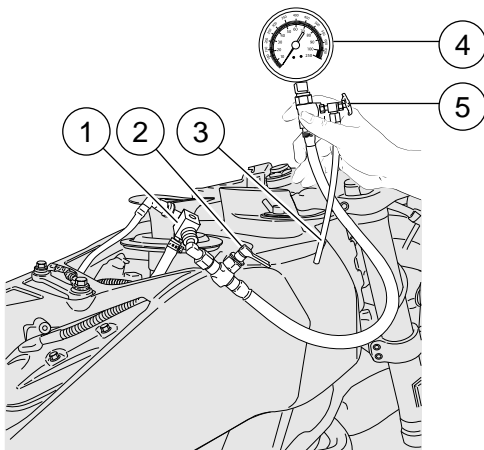


Figure 2-39. Fuel Pressure Gauge Adapter

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1. Fuel pressure gauge adapter (B-45522)
2. Fuel valve (closed position)
3. Air bleed tube
4. Fuel pressure gauge (HD-41182)
5. Air bleed petcock

Figure 2-40. Fuel Pressure Gauge (Part No. HD-41182)

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple socket probe and patch cord.
2. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#)
3. If resistance greater than 1 ohm is found between ECM connector [10] terminal "27" OR "28" and Fuel Pump connector [86A] terminal "4", but not both, the open must be repaired but this repair will not correct the concern.

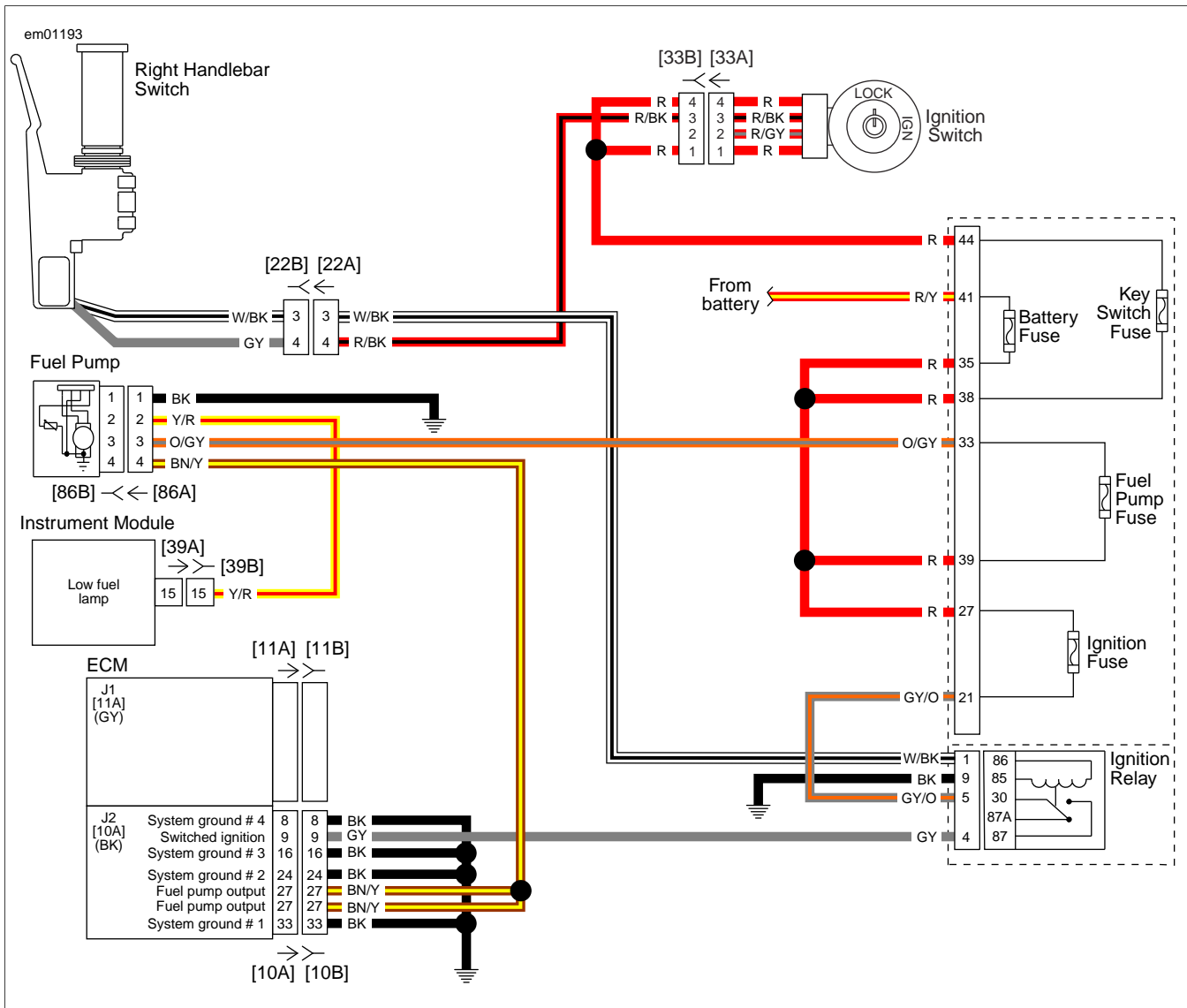


Figure 2-41. Fuel Pump Circuit (Ulysses, Lightning)

Table 2-23. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[39]	Instrument module	20-place Multilock	Behind windscreen
[86]	Fuel pump	4-place Multilock	Left side of frame



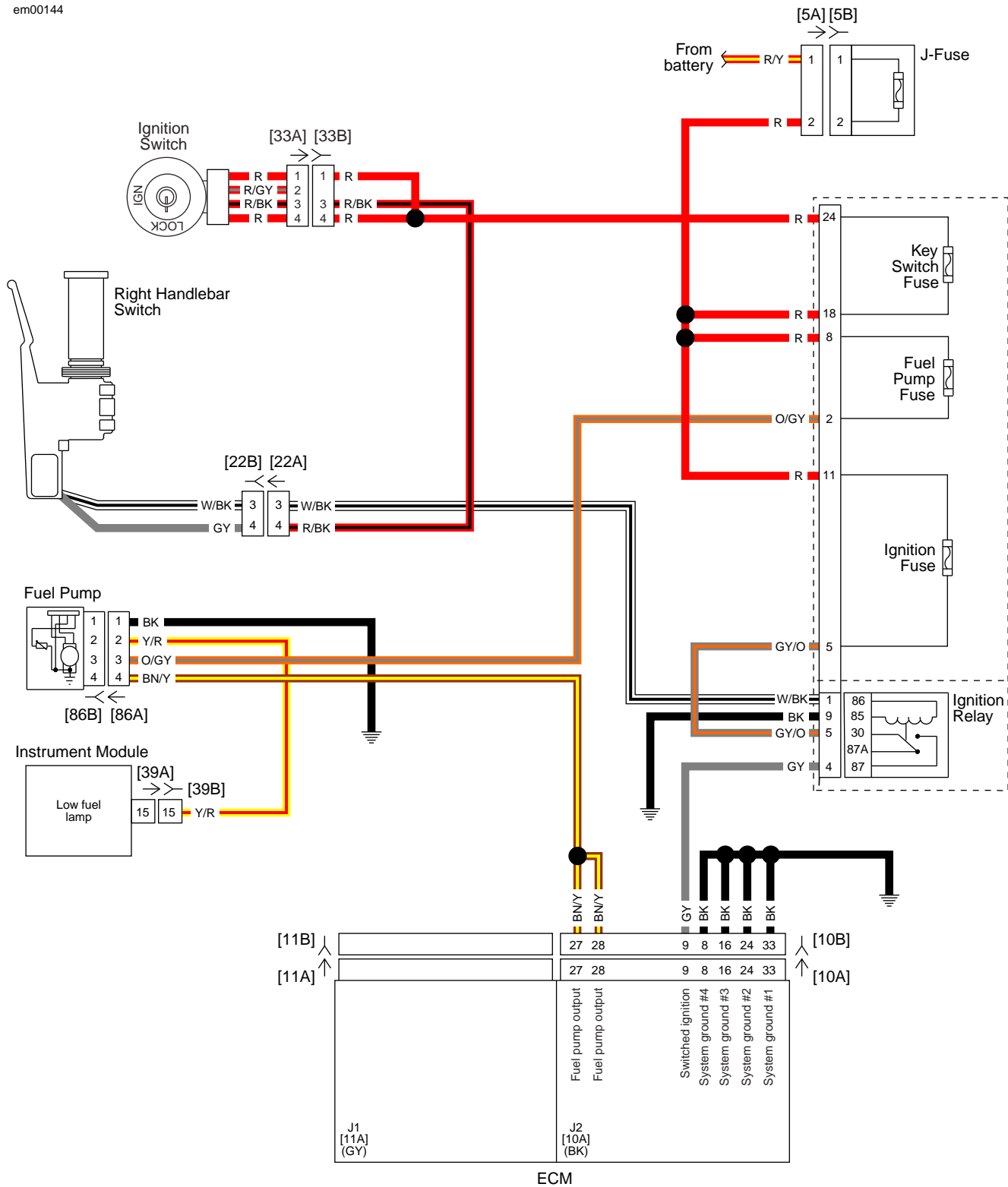


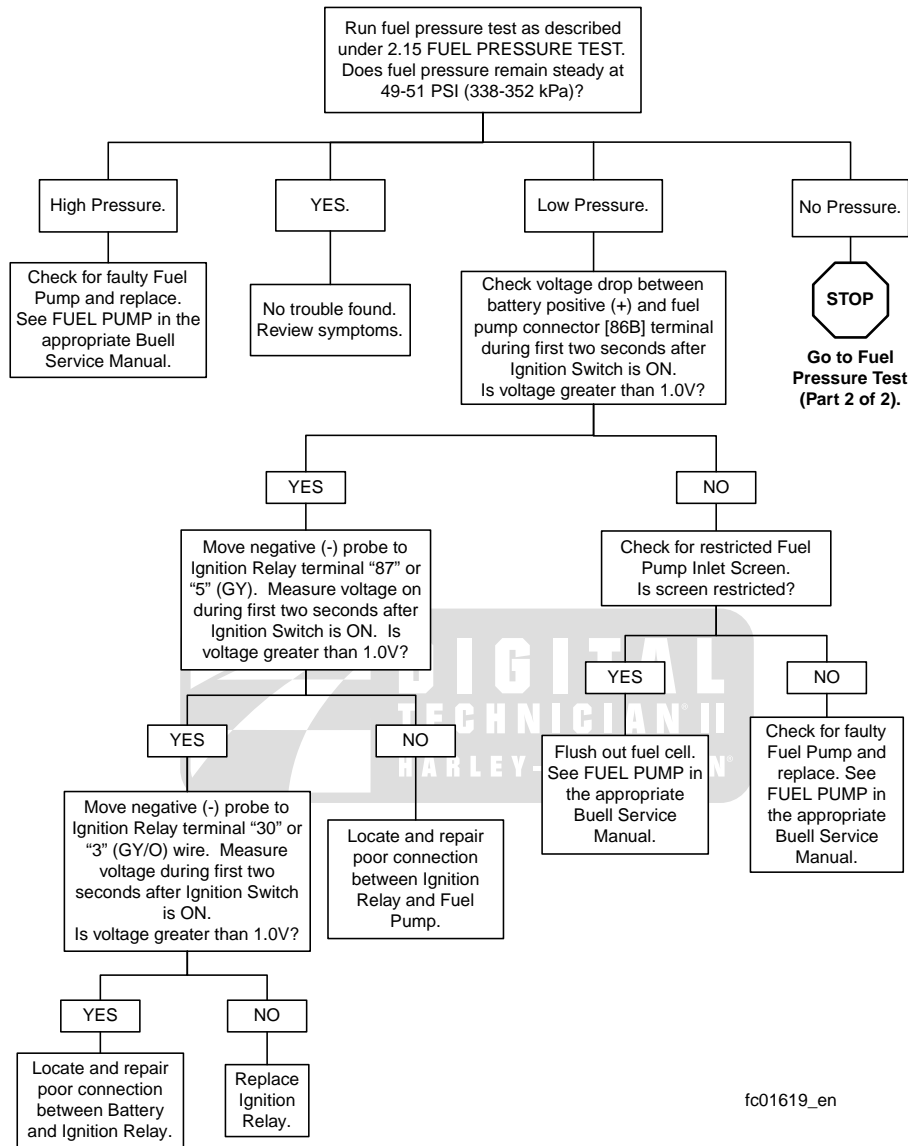
Figure 2-42. Fuel Pump Circuit (Firebolt)

Table 2-24. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[39]	Instrument module	20-place Multilock	In fairing
[86]	Fuel pump	4-place Multilock	Left side of frame

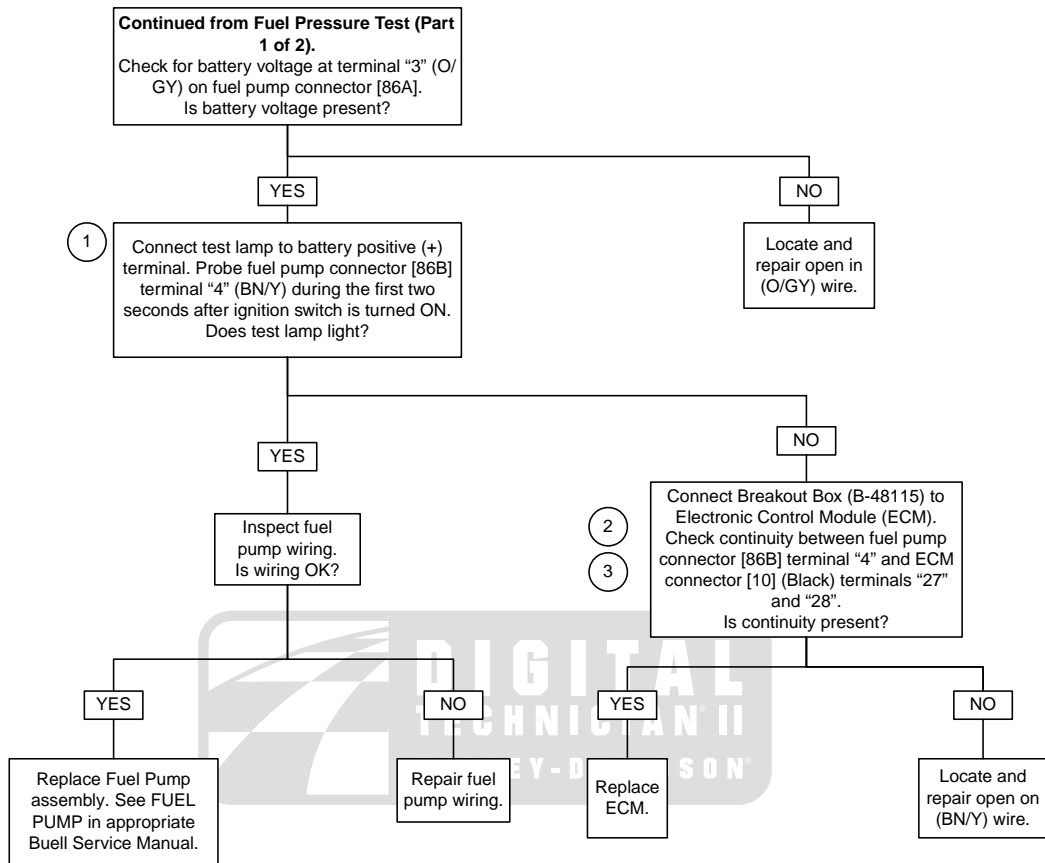


Fuel Pressure Test (Part 1 of 2)



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Fuel Pressure Test (Part 2 of 2)



NOTE:
After replacing ECM or TPS, the TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate BUELL SERVICE MANUAL.

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GENERAL

Misfire at Idle or Under Load

Misfire conditions may be caused by:

- Battery condition and connections.
- Fuel system problems. See tables under [2.8 INITIAL DIAGNOSTIC CHECK](#).

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-26792	SPARK TESTER
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

WARNING

Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)

1. See [Figure 2-43](#). A SPARK TESTER (Part No. HD-26792) must be used to verify adequate secondary voltage (25,000 volts) at the spark plug.
 - a. Turn ignition switch OFF.
 - b. Remove spark plug cable from spark plug. Visually check plug condition.
 - c. Attach cable to spark tester. Clip tester to cylinder head bolt.
 - d. While cranking engine, watch for spark to jump tester gap on leads.
 - e. Reinstall and repeat procedure on other spark to jump tester gap on leads.
2. Perform spark plug cable resistance test.
 - a. Remove spark plug cable from spark plug and ignition coil.
 - b. Using an ohmmeter, touch probes to terminals on each end of plug wire.
 - c. Compare resistance values to [Table 2-25](#). Replace cables not meeting specifications. Reinstall and repeat procedure on other spark plug cable.

3. If carbon tracking is evident, replace ignition coil and inspect spark plug wires. Wires must be clean and tight. Excessive wire resistance or faulty connections can cause ignition coil damage. See [2.37 DTC P2300 \(24\), P2301 \(24\), P2303 \(25\), P2304 \(25\)](#).
4. This test can also be performed by substituting a known good ignition coil for one causing the no spark condition. The ignition coil does not require full installation to be functional. Verify faulty ignition coil by performing resistance test. See [2.37 DTC P2300 \(24\), P2301 \(24\), P2303 \(25\), P2304 \(25\)](#).
5. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.

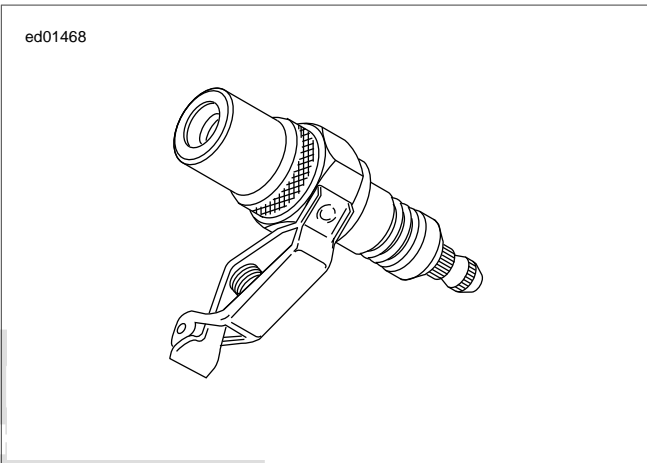


Figure 2-43. Spark Tester

Table 2-25. Spark Plug Cables

SPECIFICATION	FRONT & REAR
Length	5.75 in. (146 mm)
Resistance	1,430-3,360 ohms

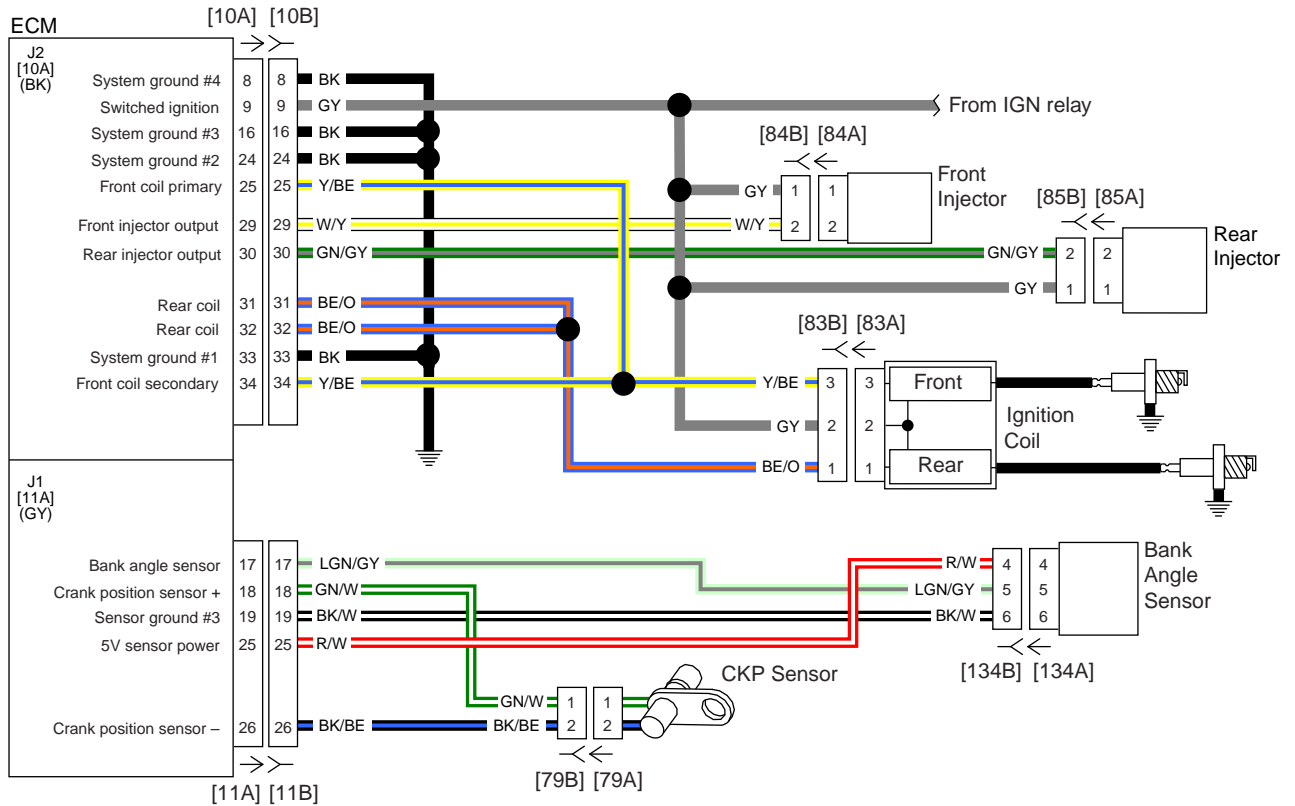
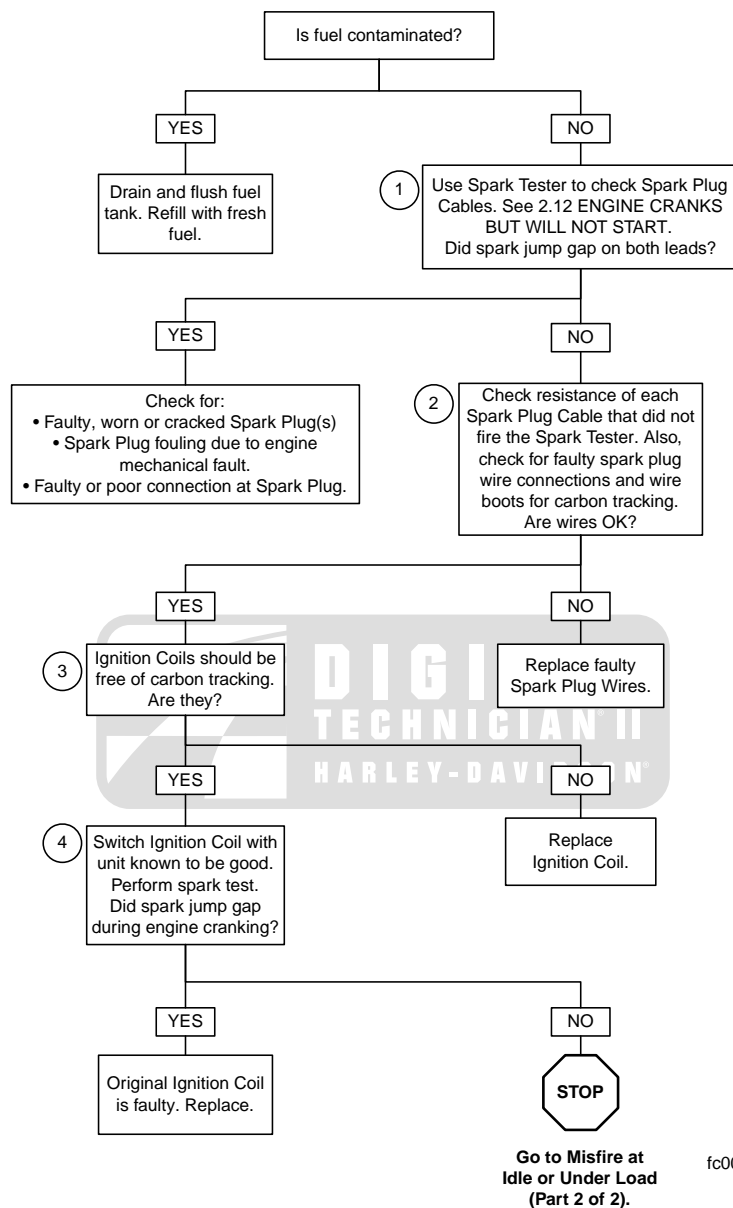


Figure 2-44. Ignition Circuit

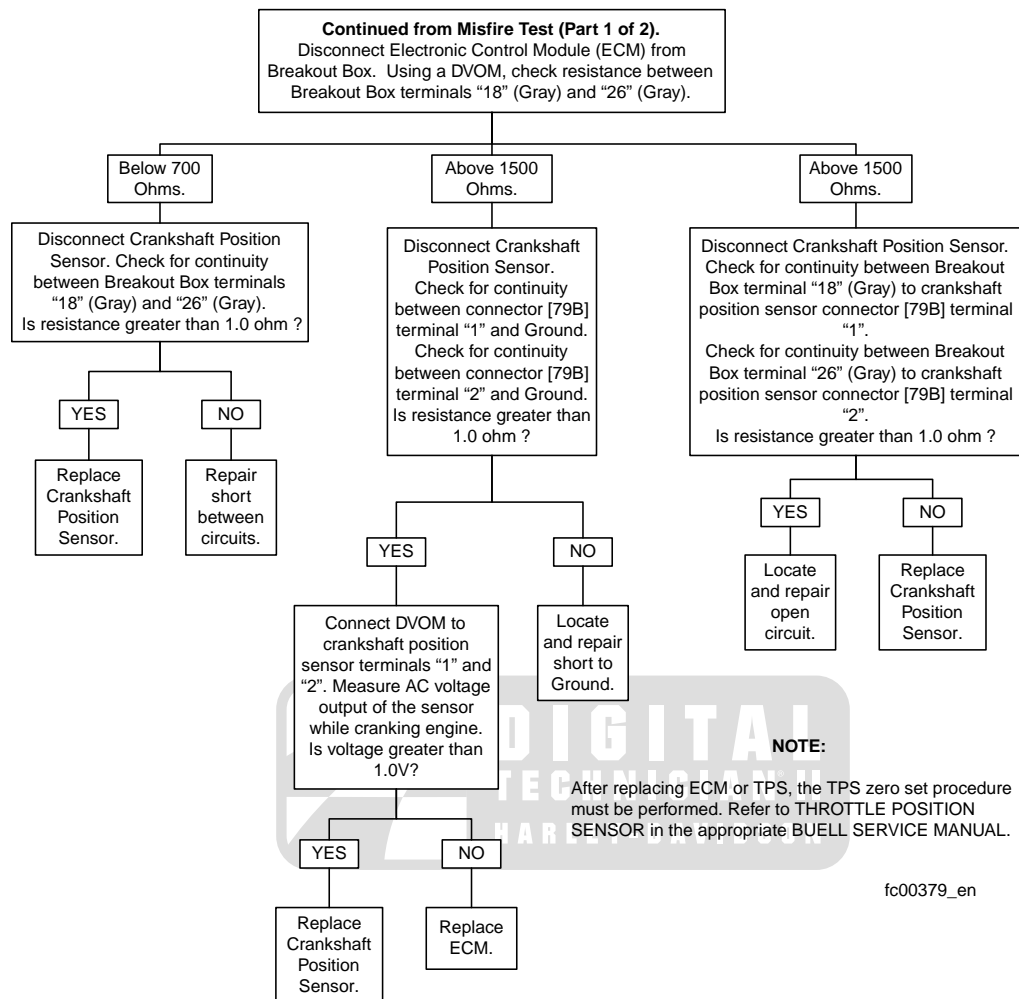
Table 2-26. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place mini-Deutsch	Below left ram air scoop
[83]	Ignition coil	All	3-place Delphi	Beneath airbox base
[84]	Front injector	All	2-place Packard	Beneath airbox base
[85]	Rear injector	All	2-place Packard	Beneath airbox base
[133]	Side stand sensor	All	3-place Amp	Below left ram air scoop
[134]	Bank angle sensor	Firebolt	6-place Sumitomo	In fairing
		Ulysses, Lightning		Under seat

Misfire at Idle or Under Load (Part 1 of 2)



Misfire at Idle or Under Load (Part 2 of 2)



GENERAL

Intake Air Temperature (IAT) Sensor

See [Figure 2-46](#). The Electronic Control Module (ECM) supplies and monitors a signal at terminal "14" of [11] to one side of the IAT sensor. The other side of the IAT sensor is connected to a common sensor ground, which is also connected to the ECM terminal "27" of [11].

Refer to [Table 2-28](#). The IAT sensor is a thermistor device, meaning that at a specific temperature, it will have a specific resistance across its terminals. As this resistance varies, so does the supplied voltage to terminal "14".

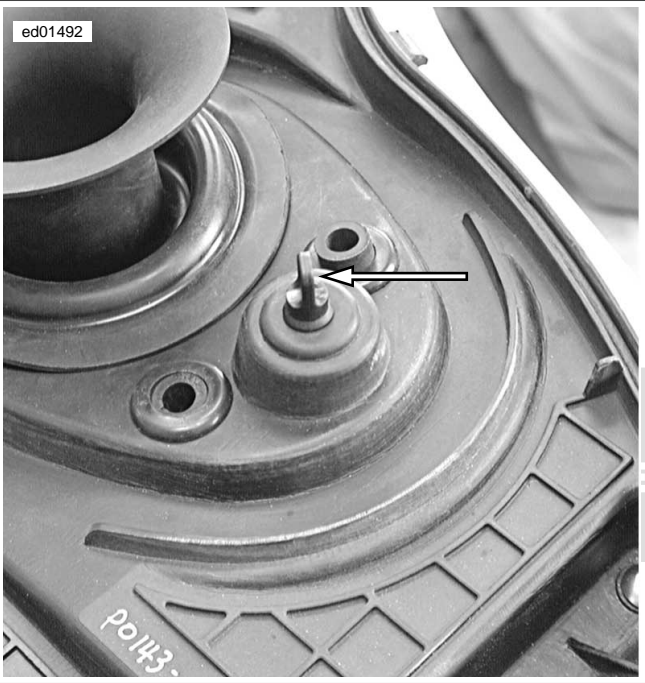


Figure 2-45. IAT Sensor

- At high temperatures, the resistance of the sensor is very low. This effectively lowers the signal voltage on terminal "14".
- At low temperatures, the resistance is very high, allowing the voltage to rise close to the supplied voltage of 5 volts.

The ECM monitors this voltage to compensate for various operating conditions.

Table 2-27. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0112	15	Intake air temperature sensor voltage low
P0113	15	Intake air temperature sensor voltage high/open

Table 2-28. Intake Air Temperature Sensor Specifications

VOLTS	RESISTANCE	TEMP °C	TEMP °F
0.49	1086	125	257
0.68	1561	113	235
0.86	2077	100	212
1.13	2920	90	194
1.40	3889	80	176
2.25	8149	60	140
3.09	16,178	40	104
3.52	23,670	30	86
3.94	31,170	20	68
4.24	55,359	10	50
4.53	96,383	0	32
4.68	146,250	-10	14
4.83	284,118	-20	-4

NOTE

All voltage and resistance values are approximate ($\pm 20\%$).

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

Check for the following conditions:

- Poor connection. Inspect ECM harness connector for backed out terminals, improper mating, broken locks improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- Perform [2.7 WIGGLE TEST](#) to locate intermittents. If connectors and harness check out OK, check intake air temperature reading while moving related connectors and wiring harness. If the failure is induced, the IAT sensor display will change.
- Shifted sensor. The temperature-to-resistance values table may be used to test the IAT sensor at various temperature levels in order to evaluate the possibility of a shifted (out-of-calibration) sensor which may result in driveability problems.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to EFI harness **only** (leave ECM disconnected). See [2.6 BREAKOUT BOX](#).

2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple socket probes and patch cord.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.

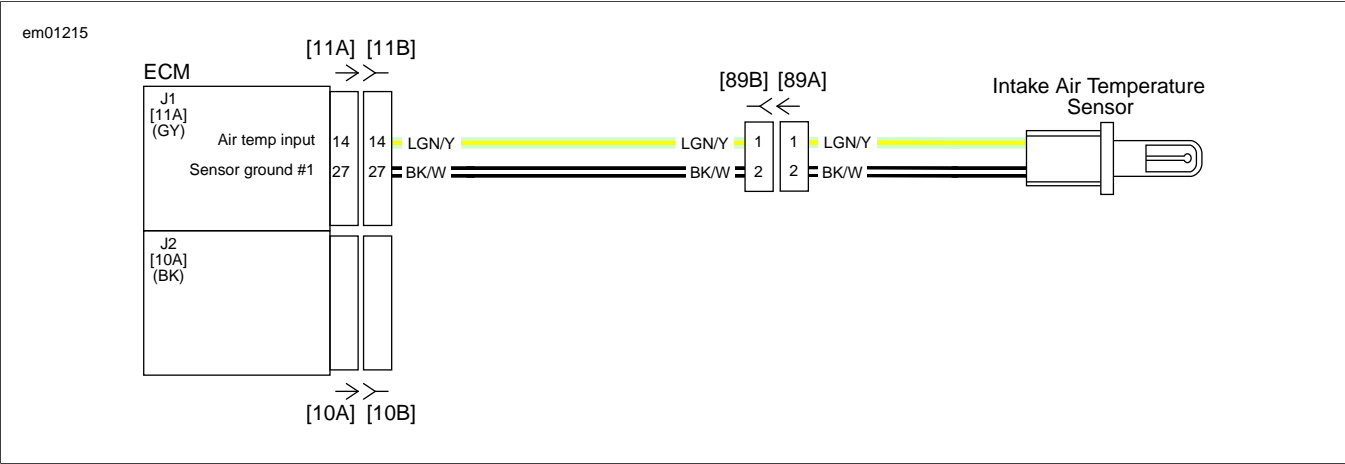
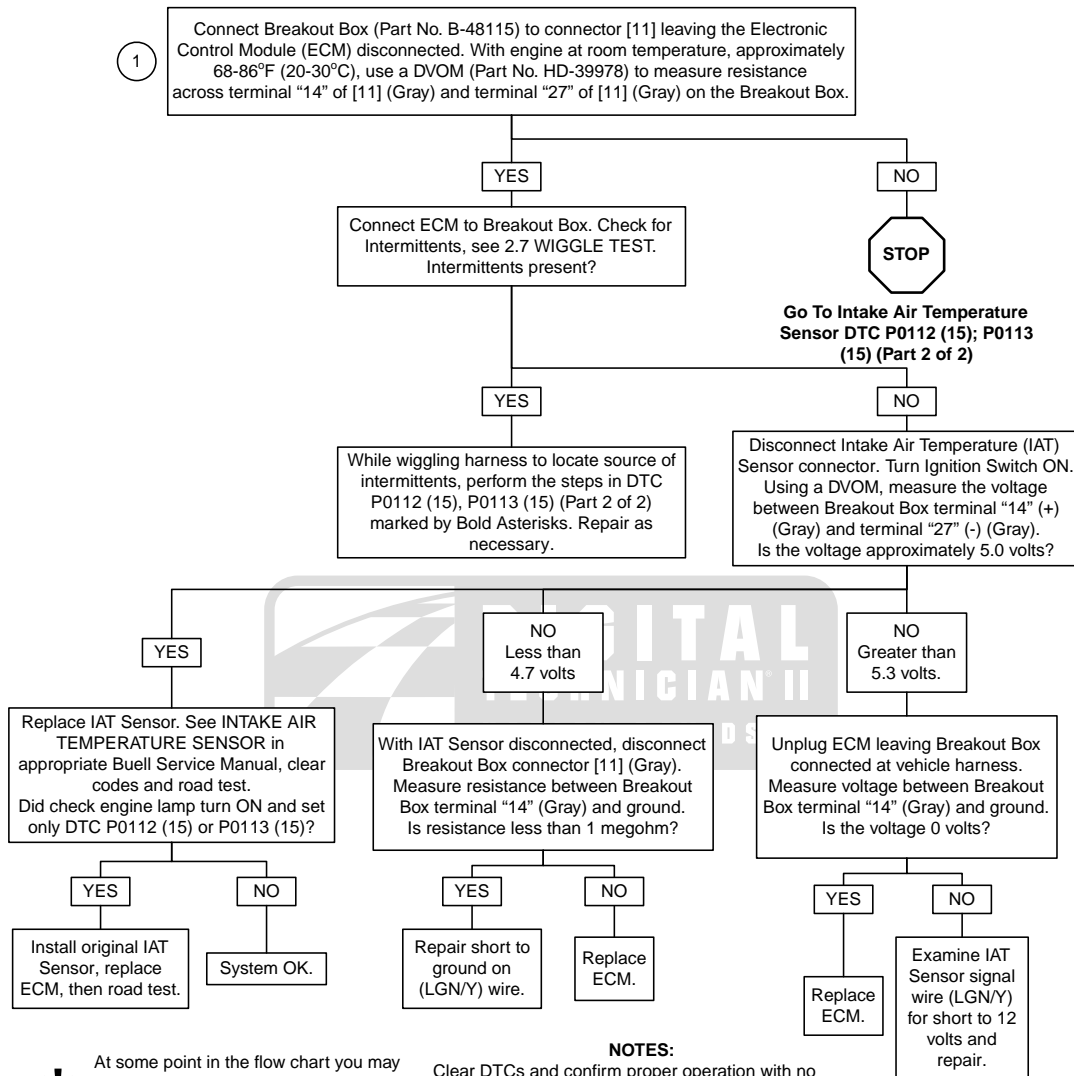


Figure 2-46. Intake Air Temperature Sensor Circuit

Table 2-29. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[89]	Intake Air Temperature (IAT) sensor	All	2-place Amp	In air cleaner baseplate

Intake Air Temperature: DTC P0112 (15); DTC P0113 (15) (Part 1 of 2)



At some point in the flow chart you may be instructed to jump directly to a the box with the bold asterisk. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

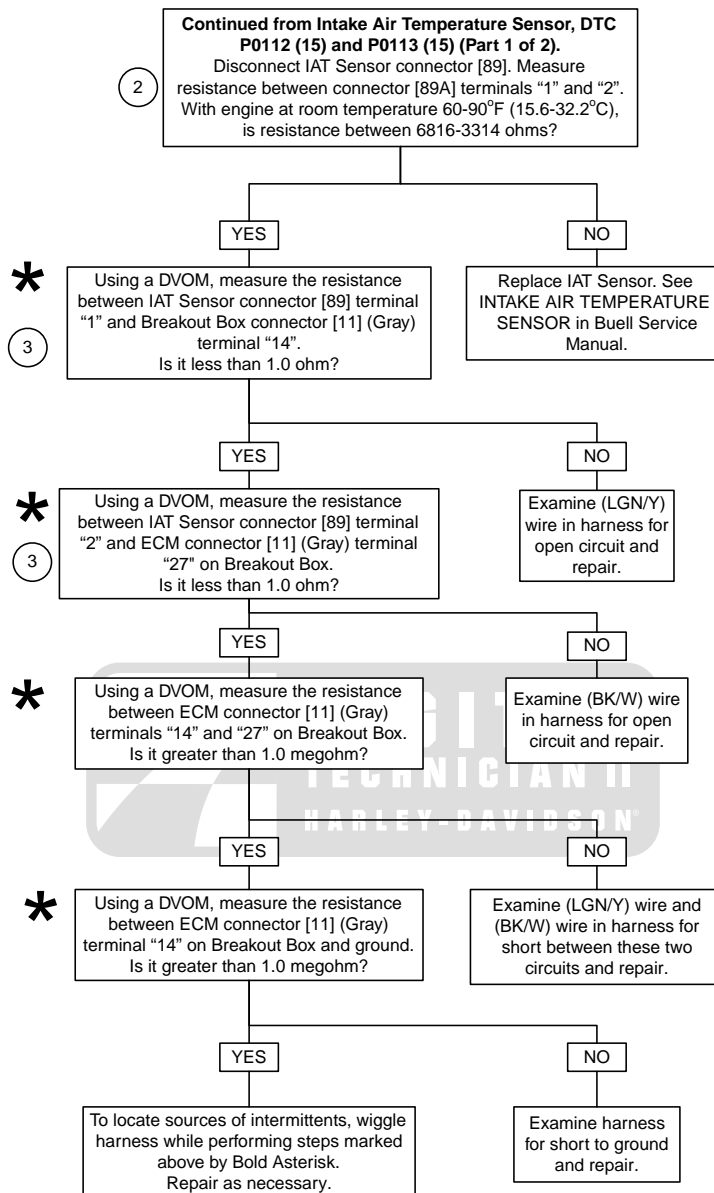
NOTES:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

After replacing Electronic Control Module (ECM) or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate Buell Service Manual.

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Intake Air Temperature: DTC P0112 (15); DTC P0113 (15) (Part 2 of 2)



At some point in the flow chart you may be instructed to jump directly to a the box with the bold asterisk. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

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GENERAL

Engine Temperature (ET) Sensor

NOTE

Do not pull on ET sensor wiring. Excess strain to sensor wiring will cause sensor damage.

See [Figure 2-47](#). The Electronic Control Module (ECM) supplies and monitors a 0-5 volt signal to one side of the ET sensor. The other side of the ET sensor is connected to ground through the engine.

Refer to [Table 2-31](#). The ET sensor is a thermistor device which means that at a specific temperature, it will have a specific resistance across its terminals. As this resistance varies, so does the voltage sent to the temperature sensor input on the ECM.

- At high temperatures, the resistance of the sensor is very low. This effectively lowers the signal voltage.
- At low temperatures, the resistance is very high, allowing the voltage to rise close to the supplied voltage of 5 volts.

The ECM monitors this voltage to compensate for various operating conditions.

Table 2-30. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0117	14	Engine sensor voltage low
P0118	14	Engine voltage high/open

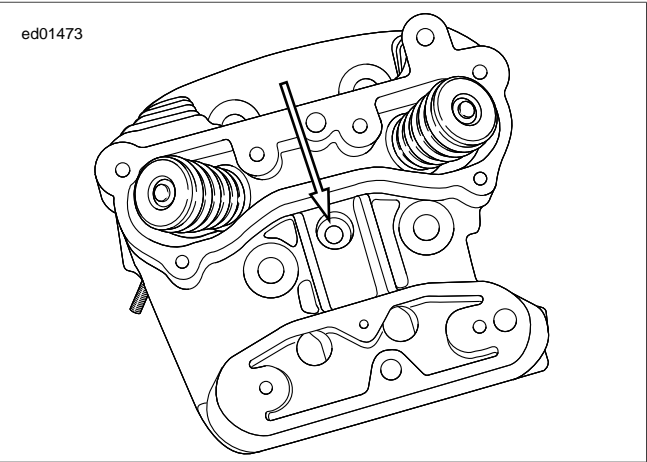


Figure 2-47. Location of Engine Temperature Sensor in Rear Cylinder Head

Table 2-31. Engine Temperature Sensor Specifications

VOLTS	RESISTANCE	TEMP °C	TEMP °F
0.00	0	300	572
0.21	145	255	491
0.42	303	210	410
0.62	463	190	374
0.81	638	170	338
1.20	1042	150	302
1.59	1539	130	266
3.01	4991	85	185
4.43	25,647	40	104
4.63	41,295	25	77
4.83	93,759	10	50
4.88	134,200	0	32
4.93	232,414	-10	14

NOTE

All voltage and resistance values are approximate ($\pm 20\%$).

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

Check for the following conditions:

- **Poor Connection:** Inspect ECM harness connector [11] for backed out terminals, improper mating, broken locks improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Shifted Sensor:** The temperature-to-resistance values table may be used to test the ET sensor at various temperature levels in order to evaluate the possibility of a shifted (out-of-calibration) sensor which may result in driveability problems.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple socket probes and patch cord.

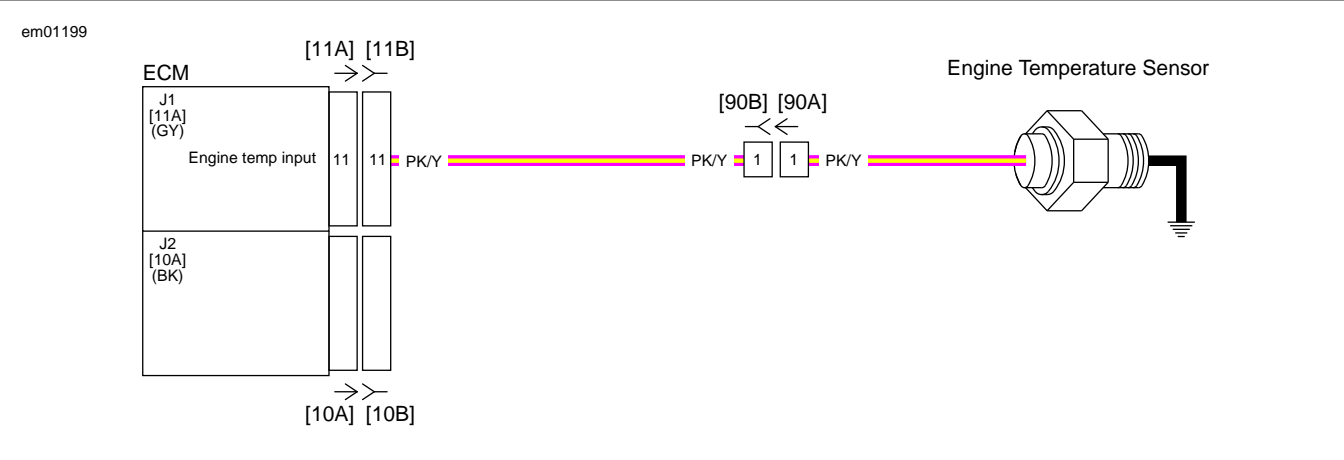


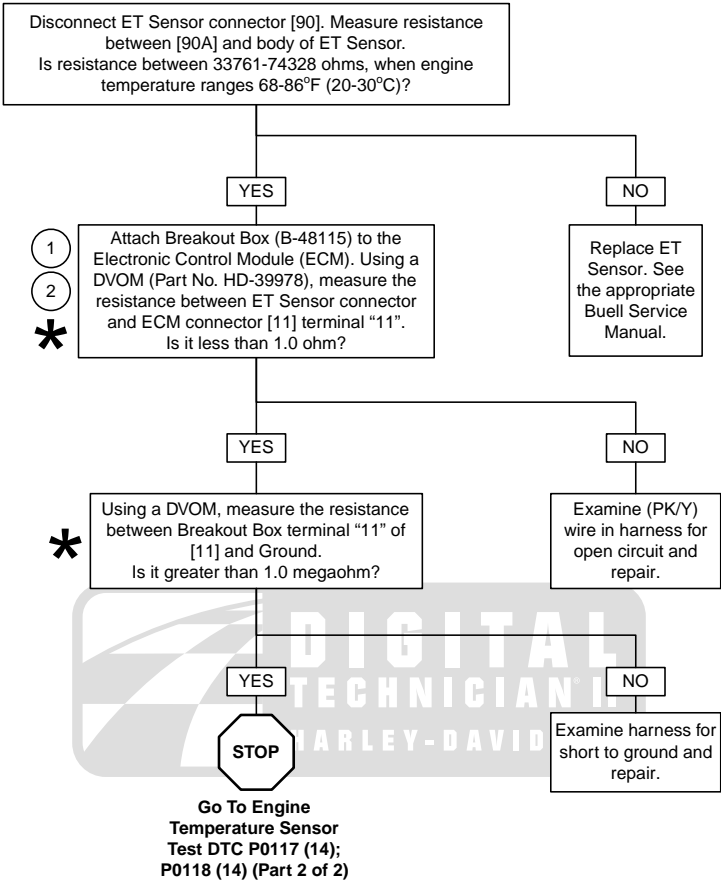
Figure 2-48. Engine Temperature Sensor Circuit

Table 2-32. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[90]	Engine Temperature (ET) sensor	All	1-place bullet	Beneath air cleaner base-plate



Engine Temperature Sensor: DTC P0117 (14); DTC P0118 (14) (Part 1 of 2)

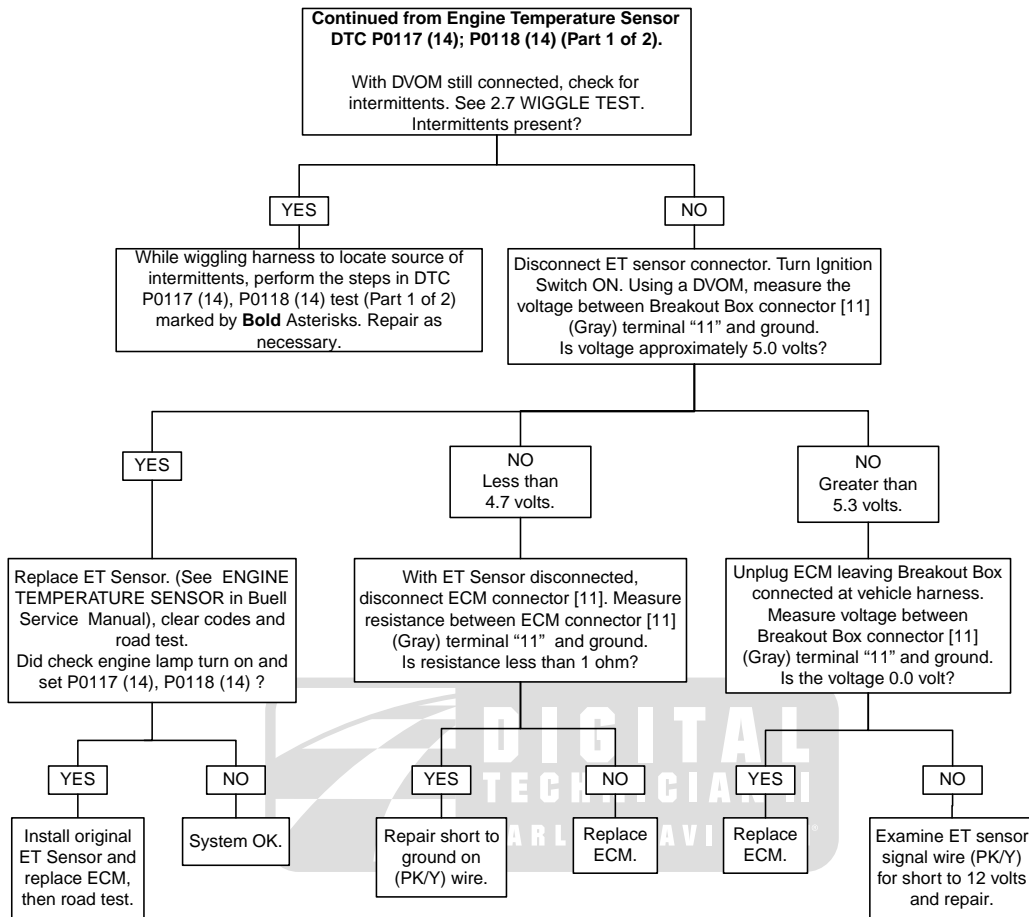


* At some point in the flow chart you may be instructed to jump directly to a the box with the bold asterisk. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

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Engine Temperature Sensor: DTC P0117 (14); DTC P0118 (14) (Part 2 of 2)



***** At some point in the flow chart you may be instructed to jump directly to a the box with the bold asterisk. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

NOTES:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

After replacing Electronic Control Module (ECM) or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate Buell Service Manual.

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GENERAL

Throttle Position Sensor (TPS)

See [Figure 2-49](#). The TPS is supplied 5.0 volts from the ECM (5v REF) and sends a signal back to the ECM (TPS) which varies according to throttle position. The output signal from the TPS varies from:

- Approximately 0.33 volts at idle (closed throttle).
- Approximately 3.86 volts at wide open throttle.

A Code 11 will set if the TPS signal voltage does not fall within the acceptable range.

NOTE

If the TPS is removed and/or replaced, the TPS zero set procedure must be performed. For replacement of TPS, refer to THROTTLE POSITION SENSOR in the Service Manual.

Table 2-33. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0122	11	Throttle position sensor circuit low
P0123	11	Throttle position sensor circuit high

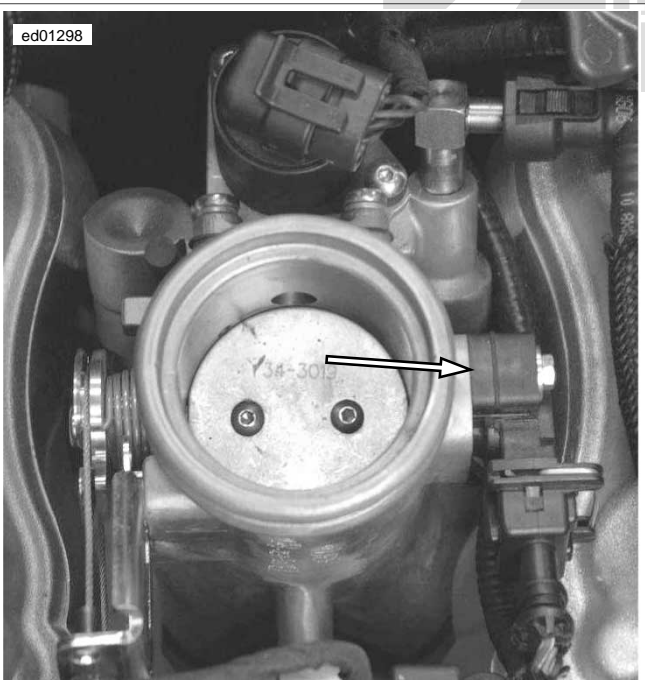


Figure 2-49. TPS Assembly

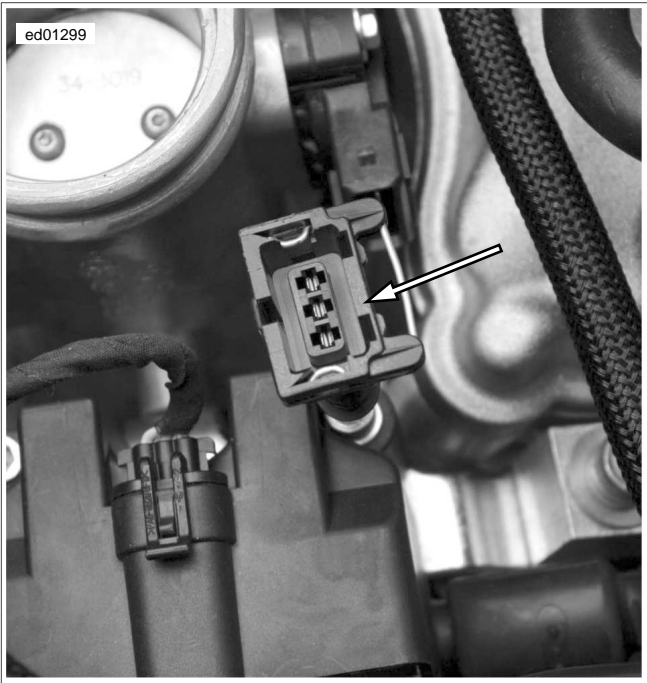


Figure 2-50. TPS Terminals [88A]

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

Check for the following conditions:

- **Poor Connection:** Inspect ECM harness connector for backed out terminals, improper mating, broken locks improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- Perform [2.6 BREAKOUT BOX](#) to locate intermittents. If connections and harness check out OK, monitor TPS voltage using DVOM while moving related connectors ad wiring harness. If the failure is induced, the DVOM display will change.
- **TPS scaling:** Observe the TPS voltage display while operating the throttle with engine stopped and ignition switch ON. Display should vary from closed throttle TPS voltage (when throttle is closed) to greater than 4.0 volts (when throttle is held wide open). As the throttle is **slowly** moved, the voltage should change gradually without spikes or low voltage being observed.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple socket probes and patch cord.

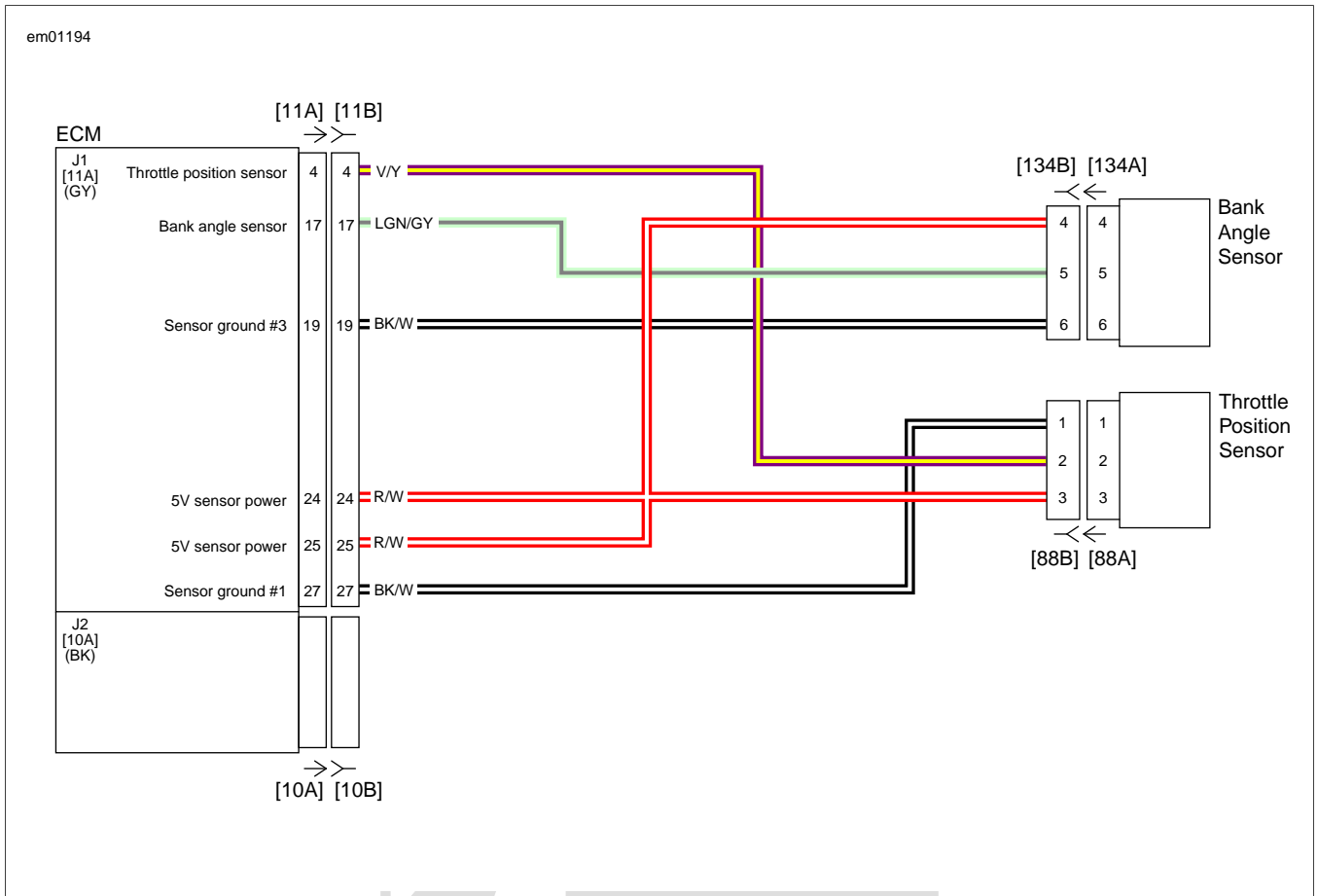
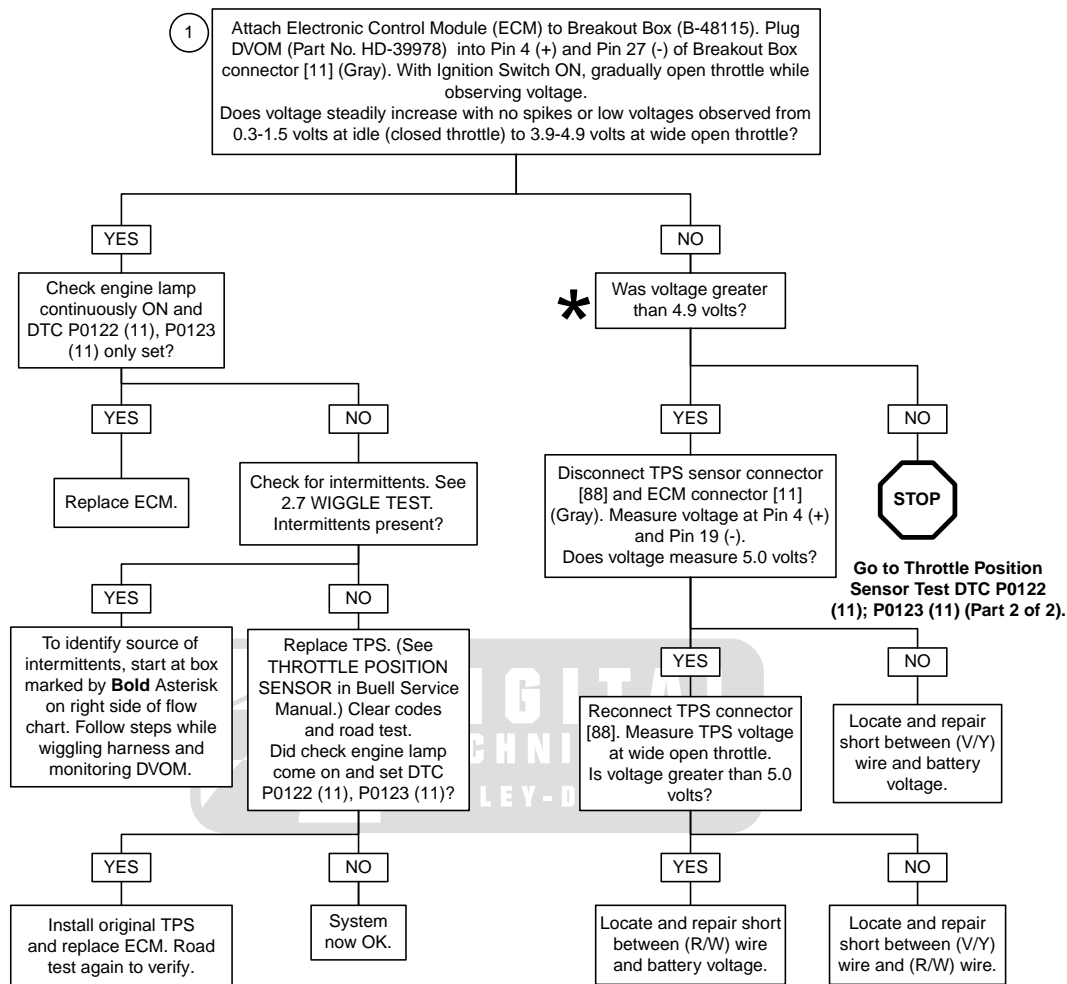


Figure 2-51. Throttle Position Sensor Circuit

Table 2-34. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Deutsch	Below left ram air scoop
[88]	Throttle Position Sensor (TPS)	All	3-place Amp	Beneath air cleaner base-plate
[134]	Bank angle sensor	Firebolt	6-place Sumitomo	In fairing
		Ulysses, Lightning		Under seat

Throttle Position Sensor: DTC P0122 (11); DTC P0123 (11) (Part 1 of 2)



***** At some point in the flow chart you may be instructed to jump directly to a box with the bold asterisk. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

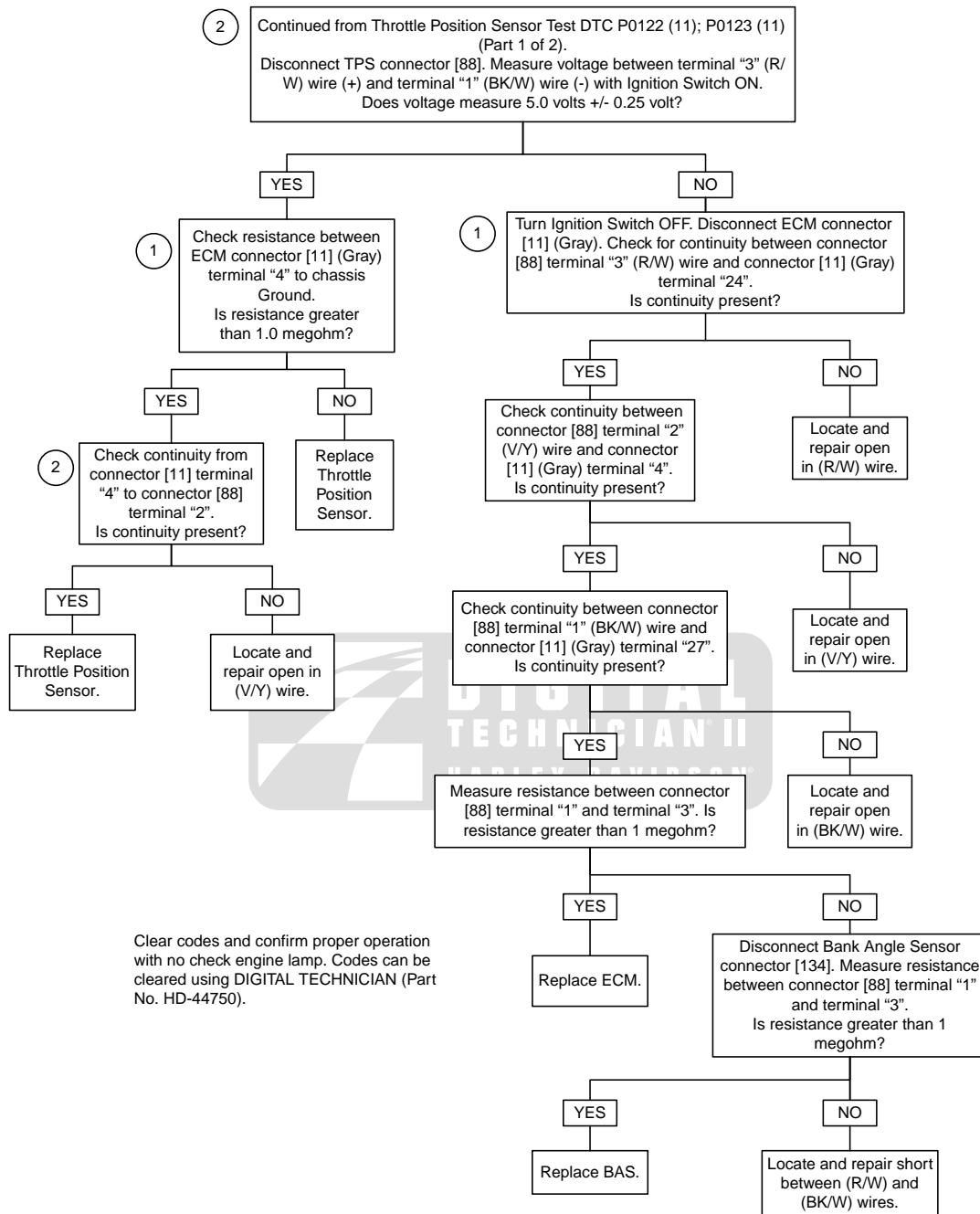
NOTES:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

After replacing ECM or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate Buell Service Manual.

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Throttle Position Sensor: DTC P0122 (11); DTC P0123 (11) (Part 2 of 2)



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GENERAL

Oxygen (O2) Sensor

See [Figure 2-52](#). The oxygen sensor provides a signal to the Electronic Control Module (ECM) which indicates whether the engine is running rich or lean.

- A low voltage signal (<0.41 V) indicates the engine is running lean.
- A high voltage signal (>0.56V) indicates the engine is running rich.

When the air/fuel mixture is ideal, approximately 14.7 parts air to 1 part fuel, the voltage will be approximately 0.48 V.

Table 2-35. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0151	13	Oxygen (O ₂) sensor circuit low/engine lean
P0152	13	Oxygen (O ₂) sensor circuit high/engine rich
P0154	13	Oxygen (O ₂) sensor open/inactive

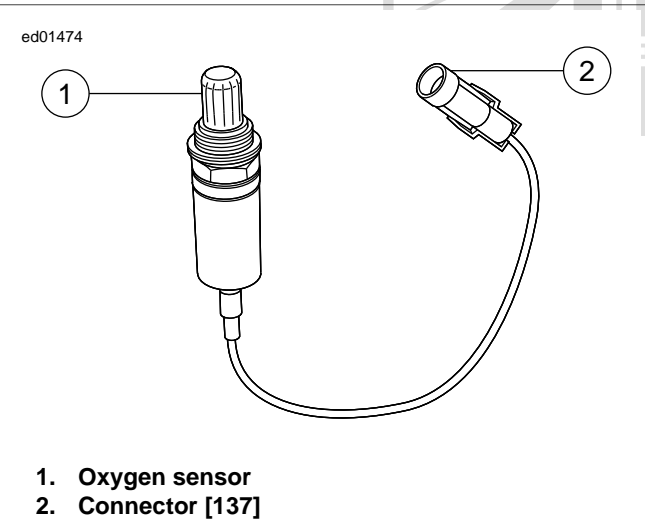


Figure 2-52. Oxygen Sensor

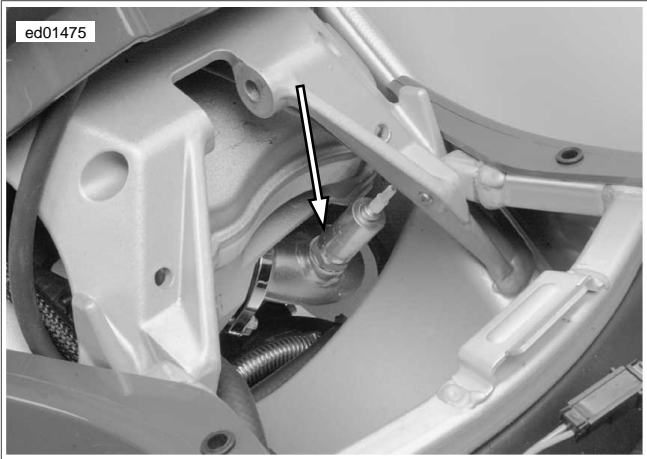


Figure 2-53. Oxygen Sensor (shock absorber removed)

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-39978	DVOM

Diagnostic Tips

The DVOM (Part No. HD-39978) displays the signal from the oxygen sensor in volts. This voltage will have an average value tending towards lean, rich or ideal value depending on operating temperature of the engine, engine speed and throttle position. An open/short to voltage or short to ground in the (V/GY) wire will cause the engine to run rich (short to ground) or lean (short to voltage) until fault is detected, vehicle will run in open loop. The engine must be running below 5000 RPM for the ECM to detect an oxygen failure.

Check for the following conditions:

- **Poor Connection:** Inspect ECM harness connector, fuel injector connectors and oxygen sensor connector [137] wiring for backed out terminals, improper mating, broken locks improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Dirty/Stuck Open Injectors:** The motorcycle may run lean (dirty/clogged injectors) or rich (stuck open injectors) if there is an injector problem. This could also cause poor fuel economy and performance.
- **Loose Oxygen Sensor:** See [Figure 2-53](#). If the oxygen sensor is loose engine performance may be affected. This could also show up as a slow changing oxygen sensor voltage.
- **Loose/Leaking Exhaust:** This can cause poor ground connection for sensor or allow fresh air into the exhaust system. If fresh air enters exhaust system, the oxygen sensor will read a lean condition, causing the system to go rich.

Diagnostic Notes

Each reference number below correlates to a circled number

on the flow chart(s).

- 1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).

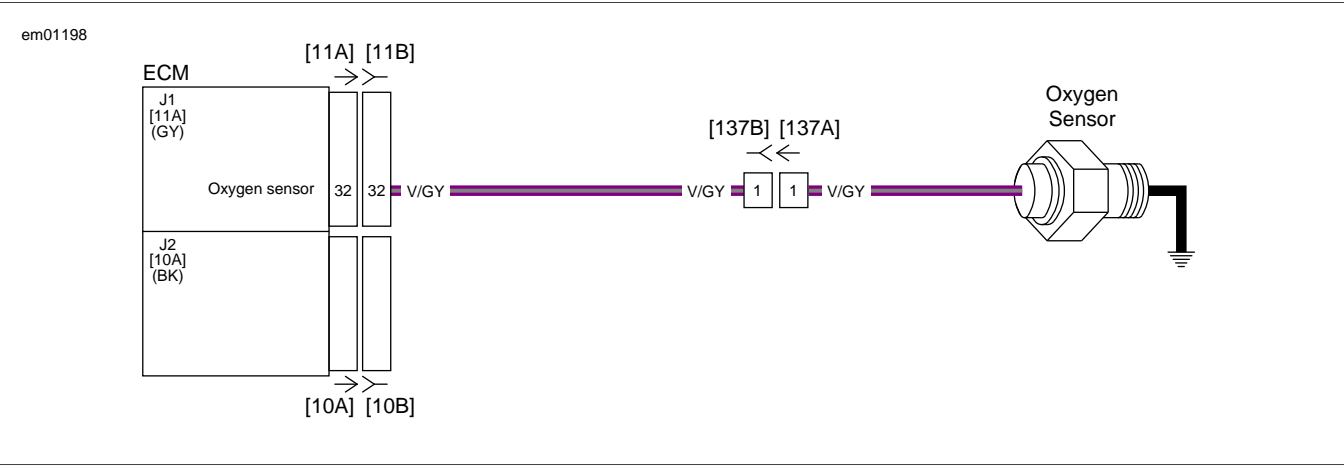
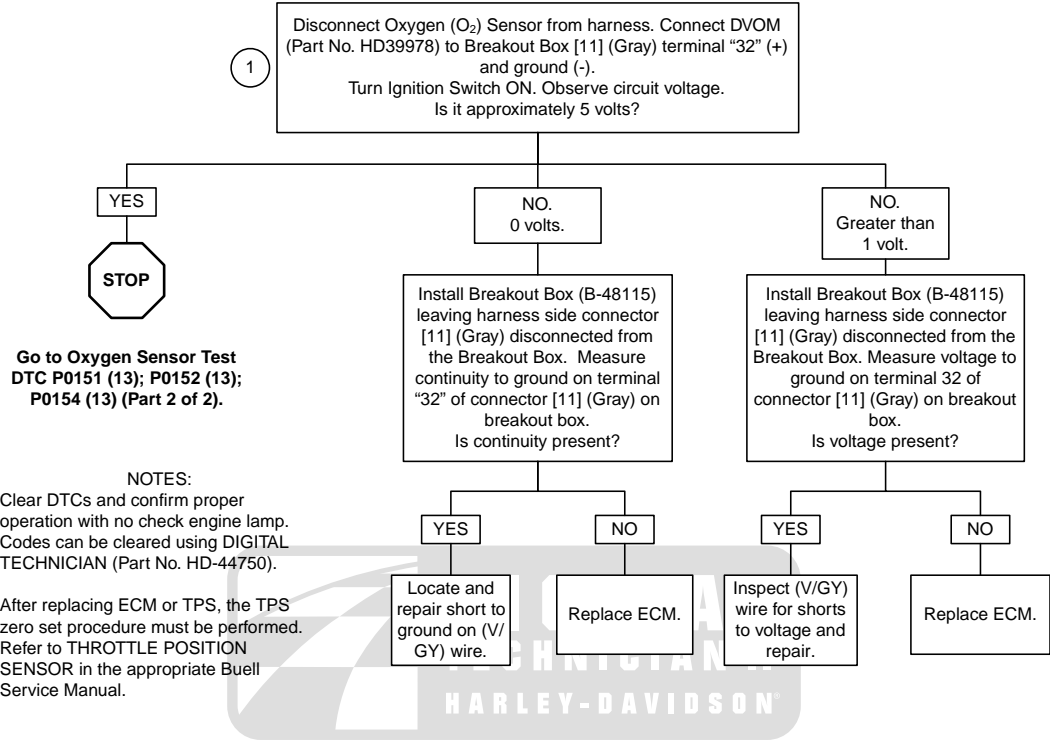


Figure 2-54. Oxygen Sensor Circuit

Table 2-36. Wire Harness Connectors

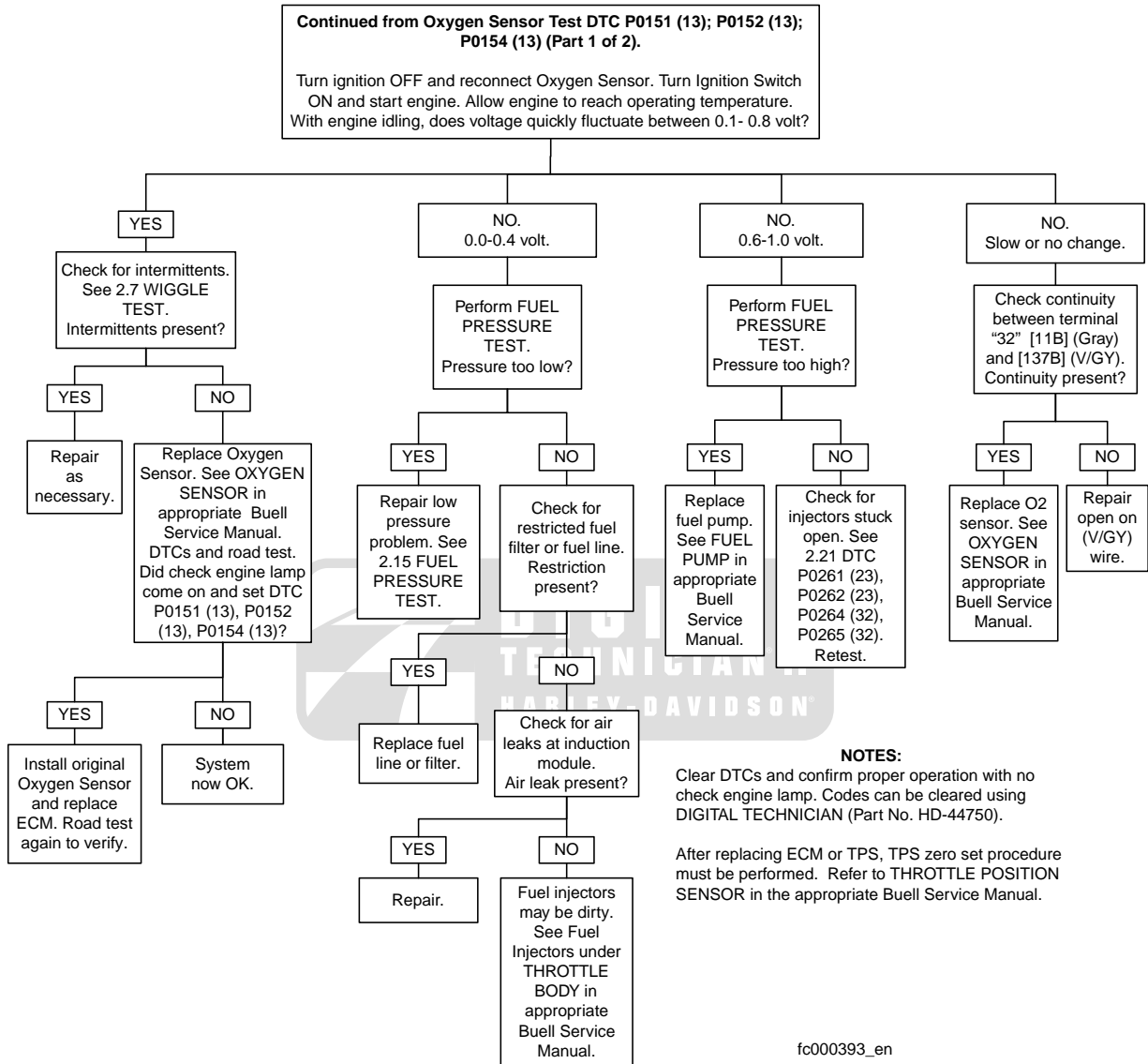
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[137]	Oxygen (O ₂) sensor	All	1-place Packard	Above rear cylinder head

Oxygen Sensor: DTC P0151 (13); DTC P0152 (13); DTC P0154 (13) (Part 1 of 2)



fc00392_en

Oxygen Sensor: DTC P0151 (13); DTC P0152 (13); DTC P0154 (13) (Part 2 of 2)



DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32)

2.21

GENERAL

Front and Rear Fuel Injectors

See [Figure 2-55](#). The fuel injectors are solenoids that allow pressurized fuel into the engine intake tract. The fuel injectors are timed to the engine cycle and are triggered sequentially.

NOTE

Front and rear fuel injectors are not interchangeable due to specific spray patterns designed for the engine.

The power for the fuel injectors comes from the ignition relay. The ignition relay also provides power for fuel pump, Electronic Control Module (ECM) and the ignition coil. The ECM provides the path to ground to trigger the fuel injectors.

NOTE

Ignition relay failure or wiring harness problems will cause 12 volt power to be lost to both fuel injectors, ignition coil, ECM and fuel pump.

Table 2-37. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0261	23	Front fuel injector circuit low
P0262	23	Front fuel injector circuit high
P0264	32	Rear fuel injector circuit low
P0265	32	Rear fuel injector circuit high

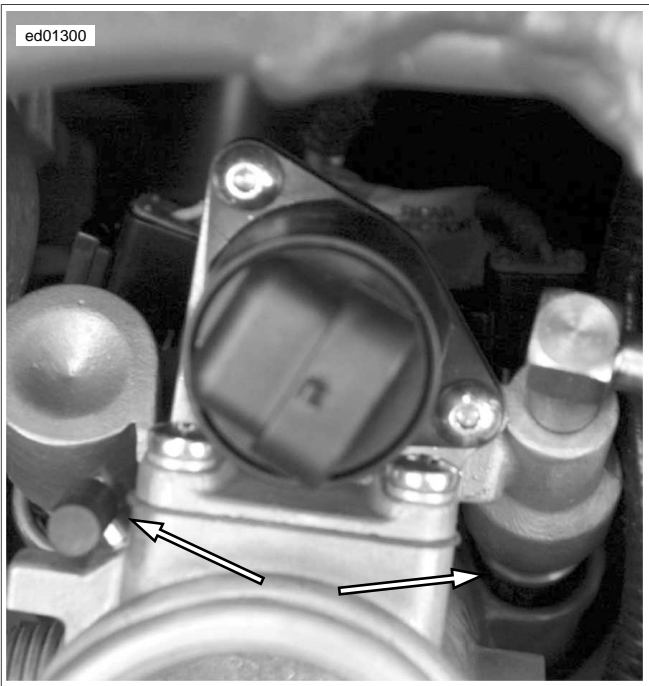


Figure 2-55. Fuel Injectors

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

⚠ WARNING

Gasoline can drain from the fuel line when disconnected from carburetor. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00257a)

1. Purge fuel line. See FUEL PUMP in the appropriate Buell Service Manual.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes and patch cord.
3. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
4. Use FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C).

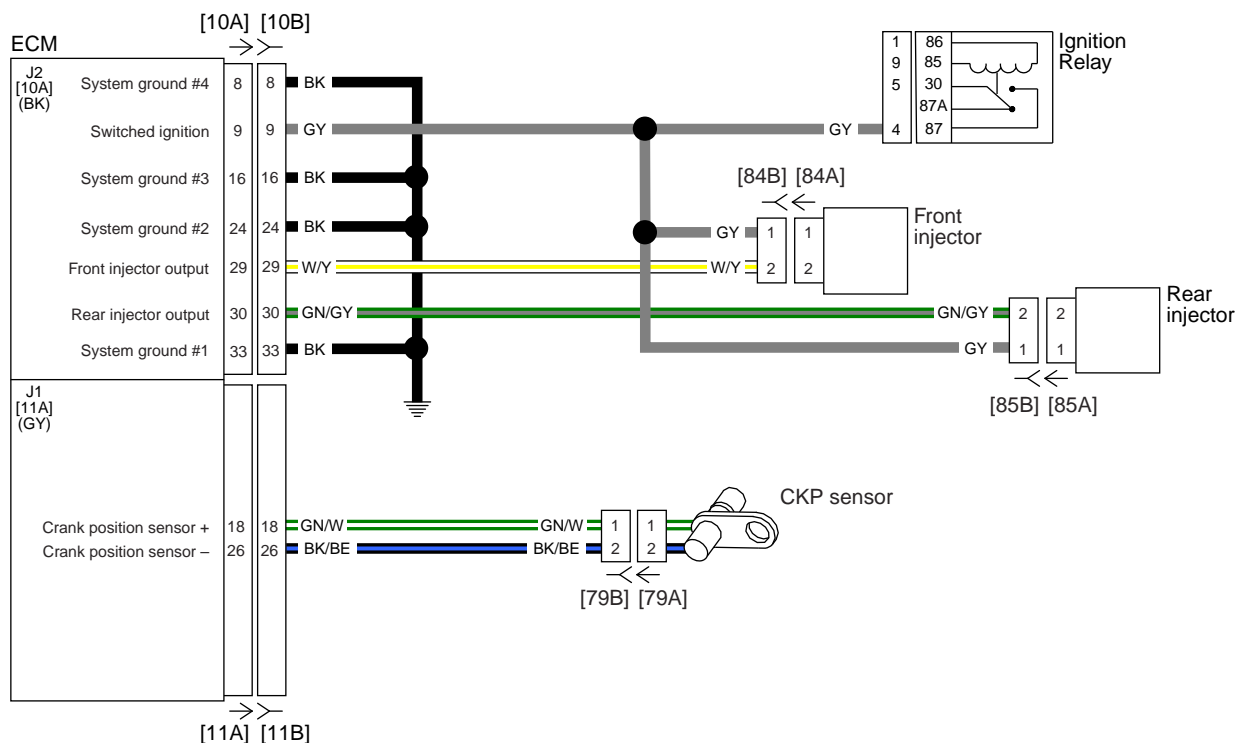
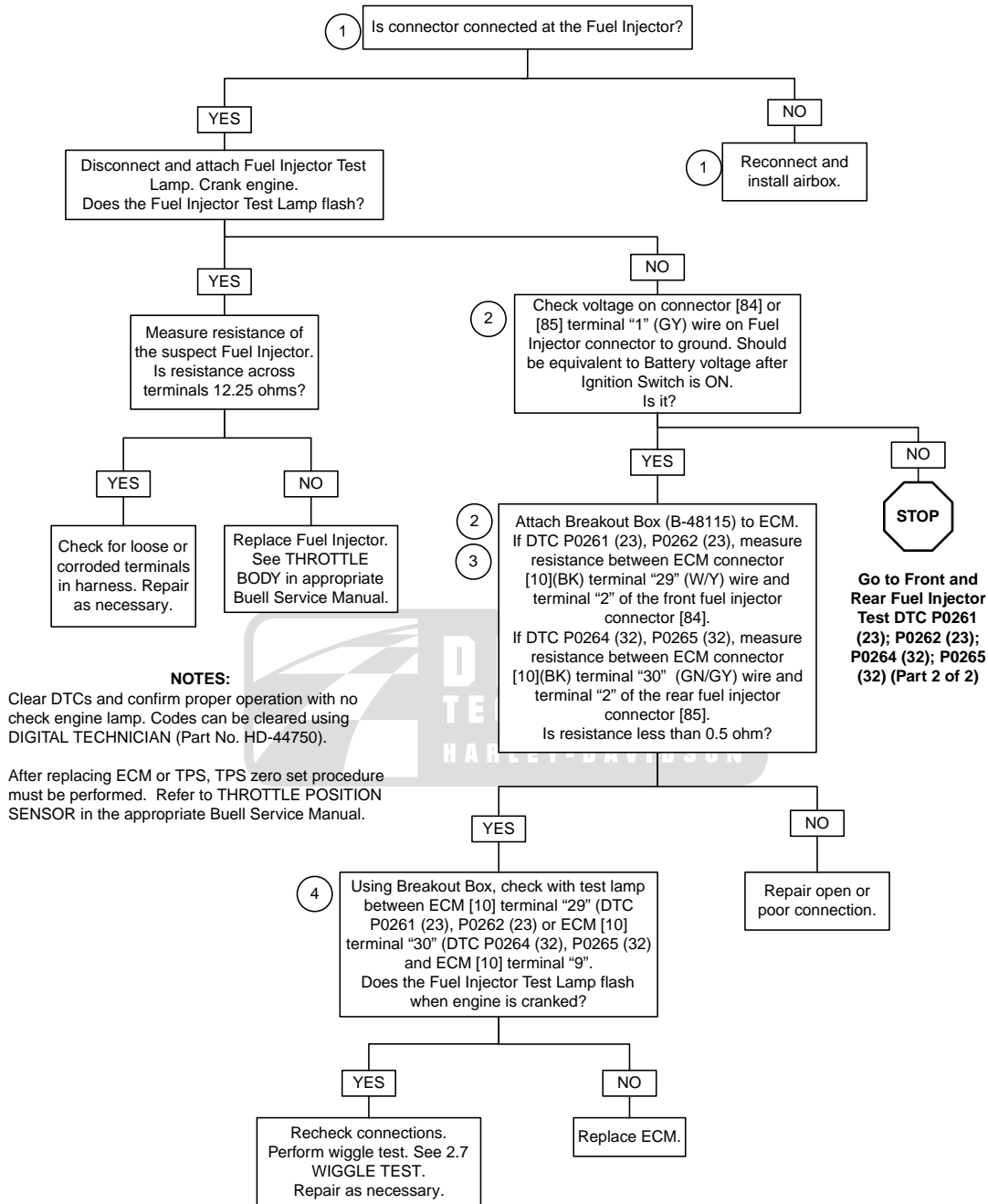


Figure 2-56. Fuel Injector Circuit

Table 2-38. Wire Harness Connectors

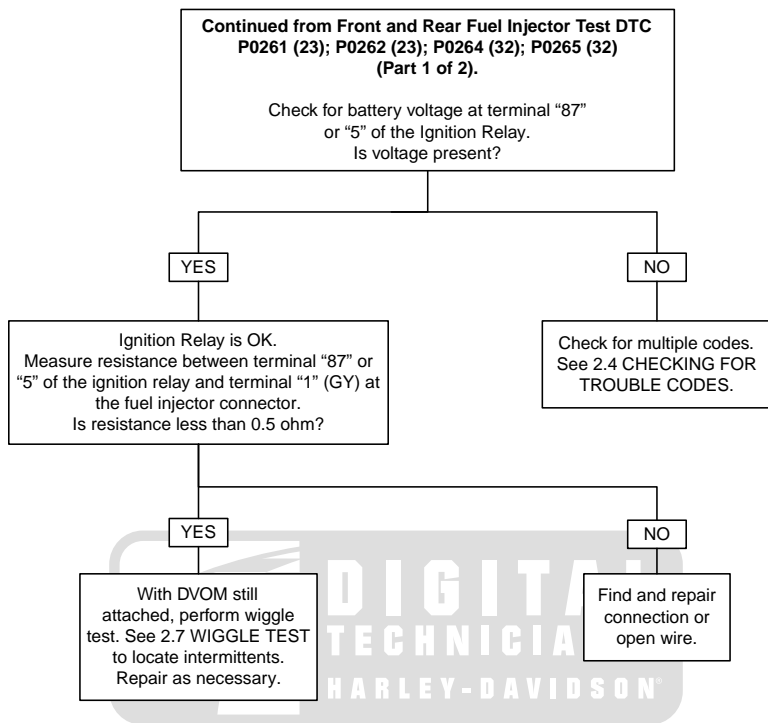
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Below left ram air scoop
[84]	Front injector	All	2-place Packard	Beneath air cleaner base plate
[85]	Rear injector	All	2-place Packard	Beneath air cleaner base plate

Front and Rear Fuel Injector: DTC P0261 (23); DTC P0262 (23); DTC P0264 (32); DTC P0265 (32) (Part 1 of 2)



fc00402_en

Front and Rear Fuel Injector: DTC P0261 (23); DTC P0262 (23); DTC P0264 (32); DTC P0265 (32) (Part 2 of 2)



NOTE:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

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GENERAL

Crankshaft Position (CKP) Sensor

See [Figure 2-57](#). The Crankshaft Position (CKP) sensor is located on the front of the engine crankcase. The sensor harness connector [79] is located under a protective boot below the left ram air scoop.

NOTE

If signal is not detected or cannot synchronize (DTC P0339), engine will not start.

Table 2-39. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0339	56	CKP sensor circuit intermittent

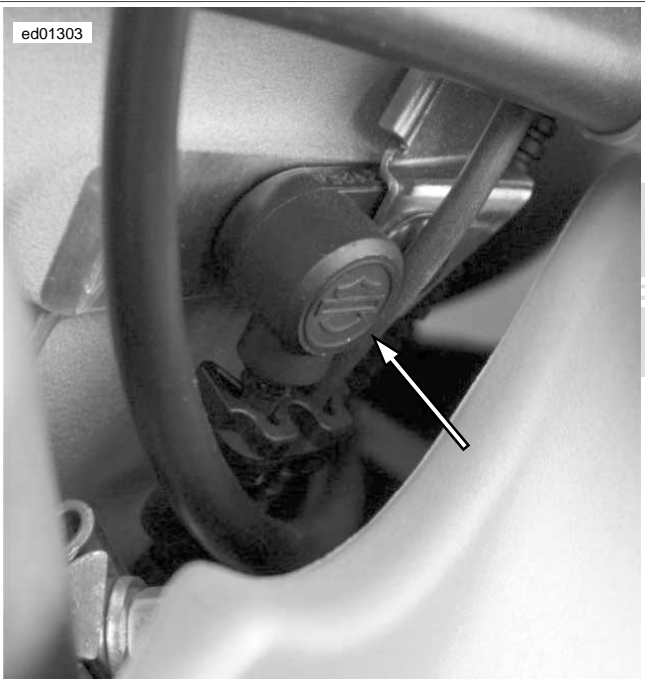


Figure 2-57. CKP Sensor Location

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

Engine must be cranked for more than five seconds without CKP signal to set code.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. One megohm is very high resistance. Some meters will read OL, etc.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown socket probes and patch cords.
4. For testing purposes, install sensor without running wiring along normal path. Disconnect and route wiring properly if system is now OK.



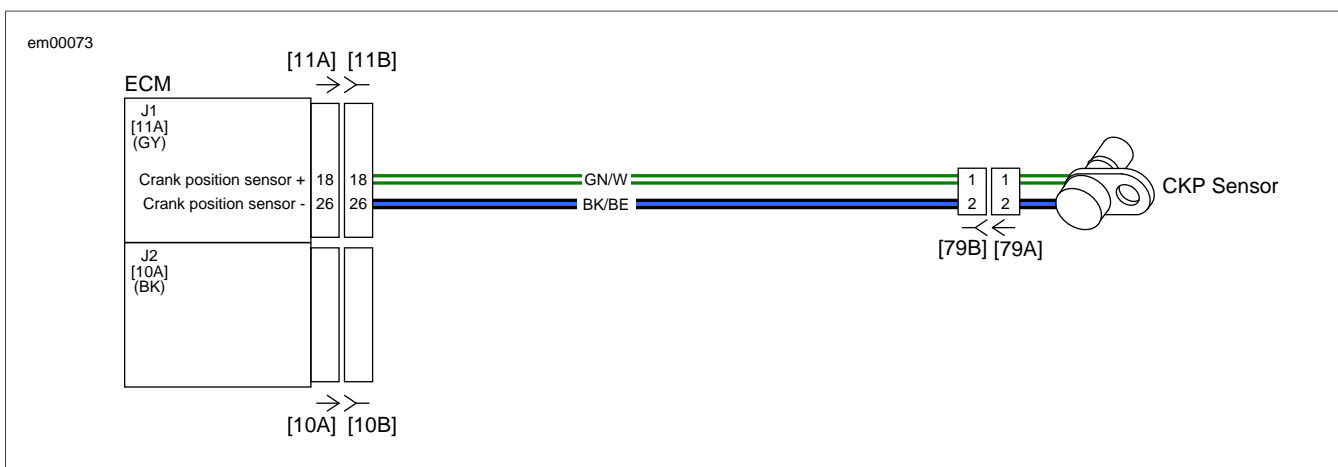


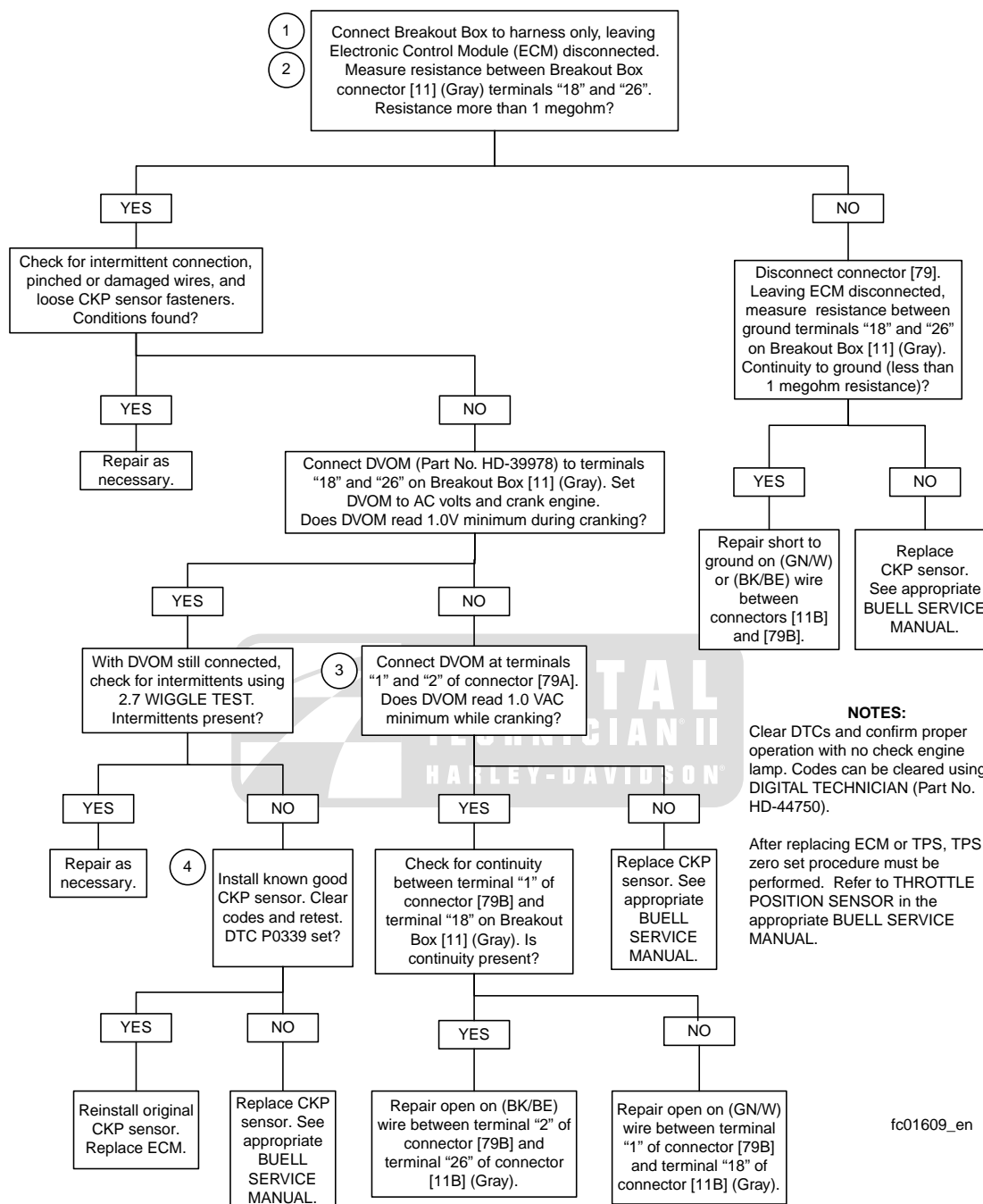
Figure 2-58. CKP Sensor Circuit

Table 2-40. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Below left ram air scoop



Crankshaft Position Sensor: DTC P0339 (56)



GENERAL

Vehicle Speed Sensor

See [Figure 2-59](#). The vehicle speed sensor is powered and monitored by the ECM. The ECM processes the vehicle speed signal and transmits this signal to the speedometer through serial data.

Table 2-41. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0502	43	Vehicle Speed Sensor (VSS) high
P0502	43	Vehicle Speed Sensor (VSS) intermittent or erratic
P0608	37	Vehicle Speed Sensor (VSS) control module fail

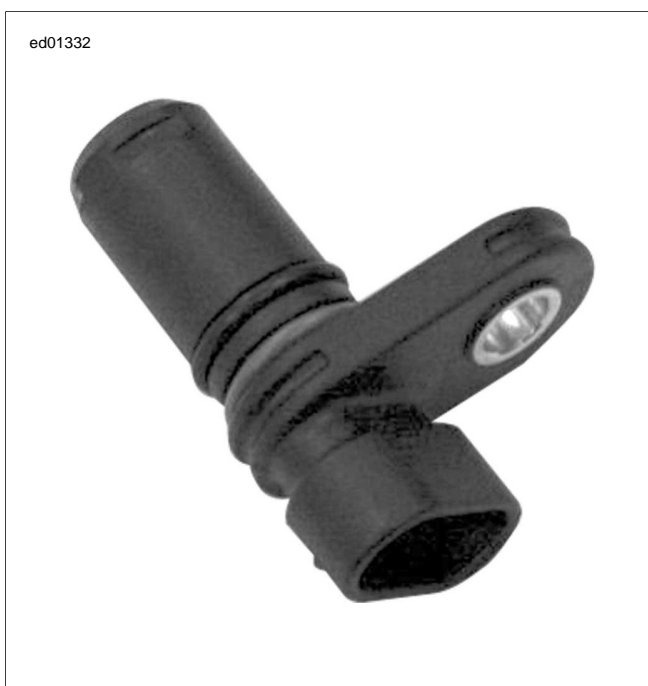


Figure 2-59. Vehicle Speed Sensor

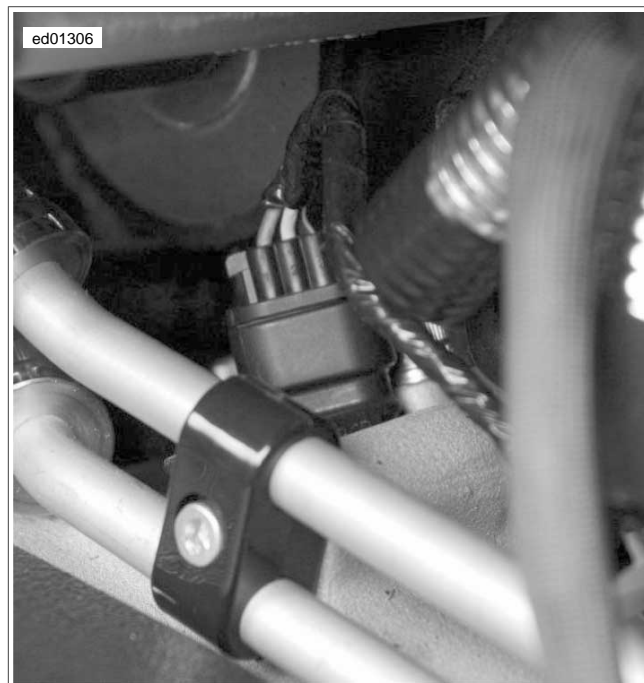


Figure 2-60. Vehicle Speed Sensor Location

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41354	SPEEDOMETER TESTER
HD-41354-1	INPUT/OUTPUT CABLE

Diagnostic Notes

If a short low/open or a short high condition, the P0608 code is set reflecting a problem in the Vehicle Speed Sensor (VSS), Electronic Control Module (ECM), Instrument Module (IM), or wiring harness.

Each reference number below correlates to a circled number on the flow chart(s).

1. Use SPEEDOMETER TESTER (Part No. HD-41354) and INPUT/OUTPUT CABLE (Part No. HD-41354-1) to provide a signal to the speed indication system.
2. Connect BREAKOUT BOX (Part No. B-48115) between wire harness and ECM.



Figure 2-61. Speedometer Tester (Part No. HD-41354)

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TECHNICIAN II
HARLEY-DAVIDSON®



NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[33]	Ignition switch	4-place Augat	Behind windscreen
[39]	Instrument module	20-place Multilock	Behind windscreen
[65]	Vehicle Speed Sensor (VSS)	3-place Deutsch	Right rear top of crankcase

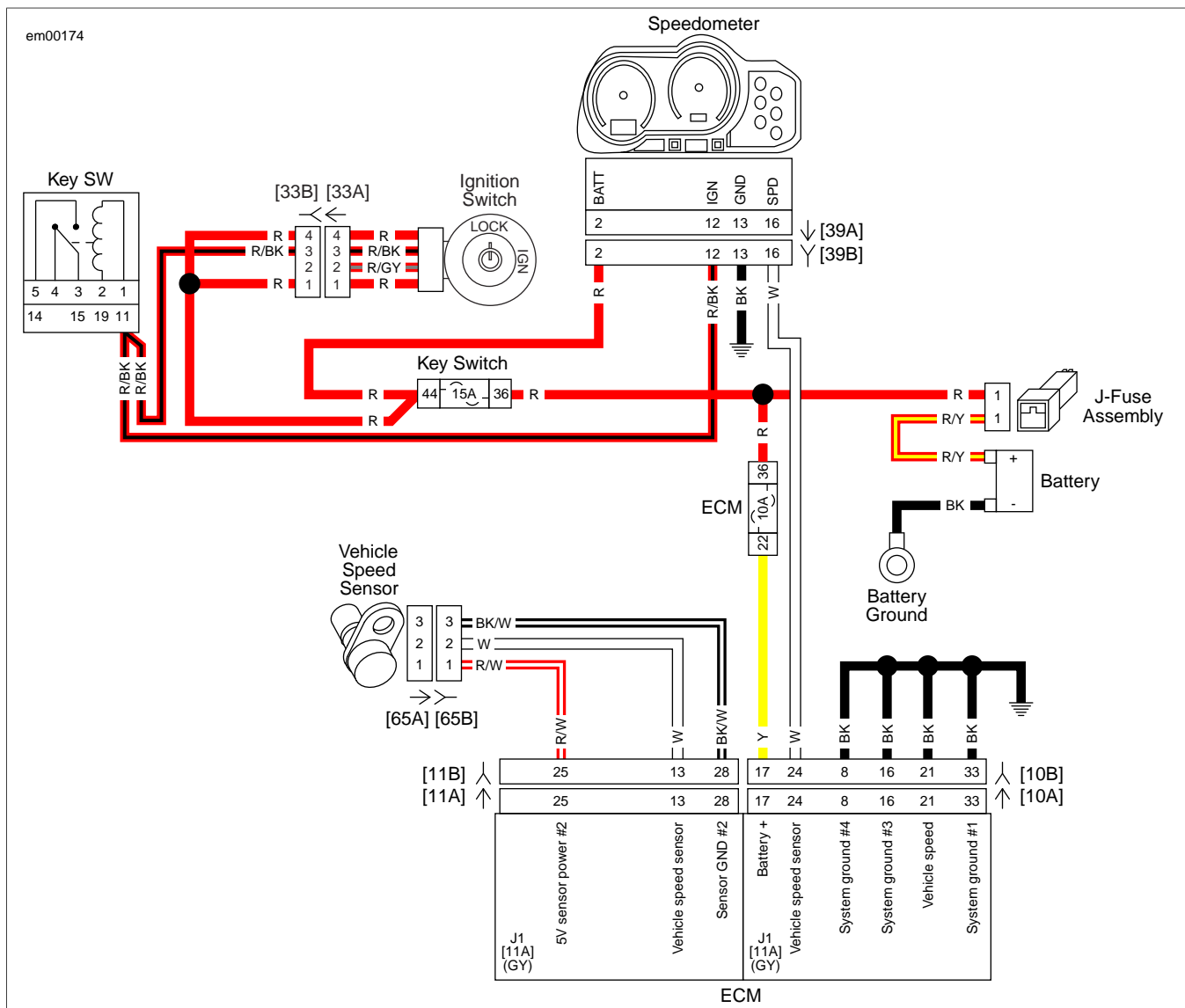
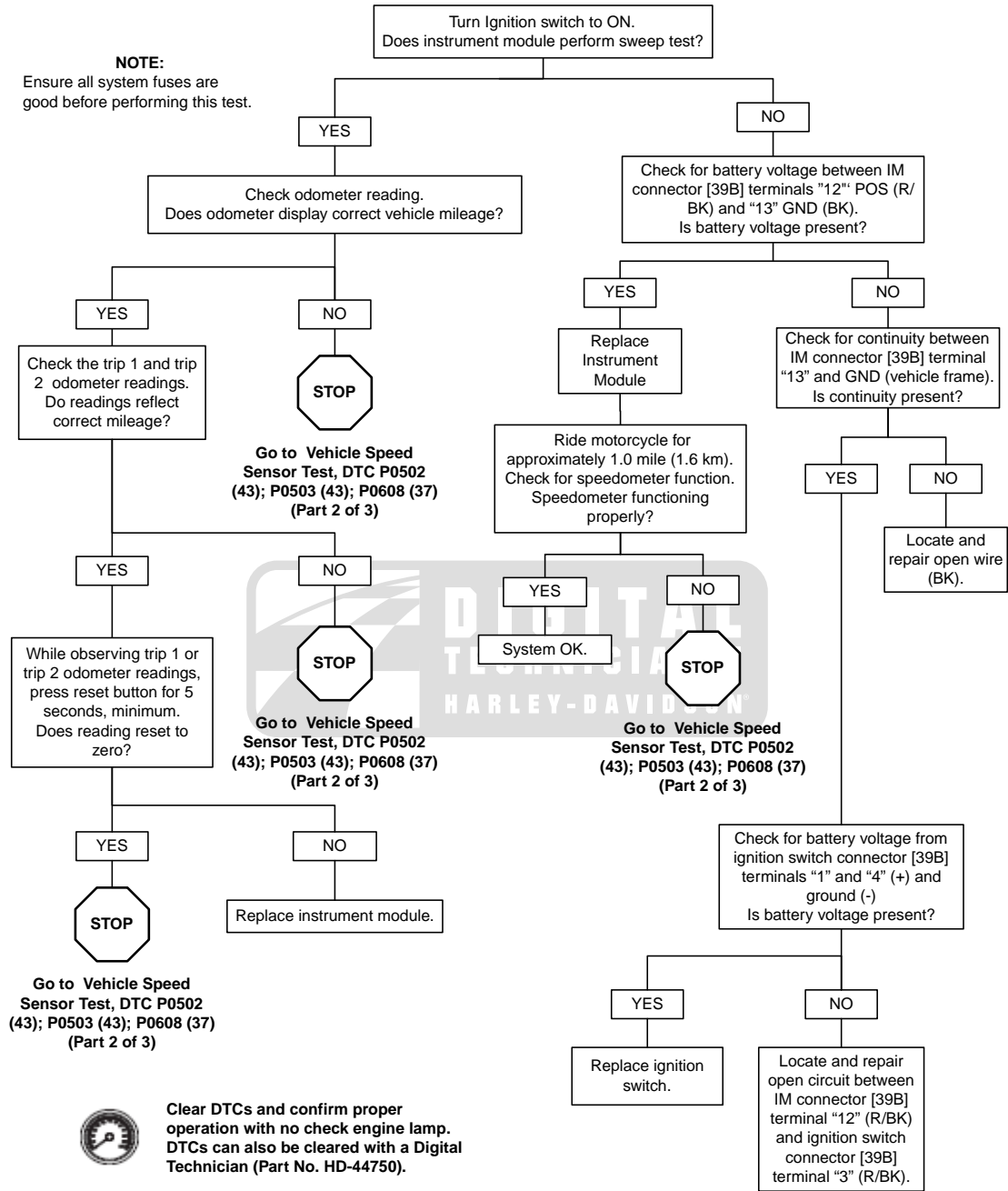


Figure 2-63. Vehicle Speed Sensor Circuit (Firebolt)

Table 2-43. Wire Harness Connectors

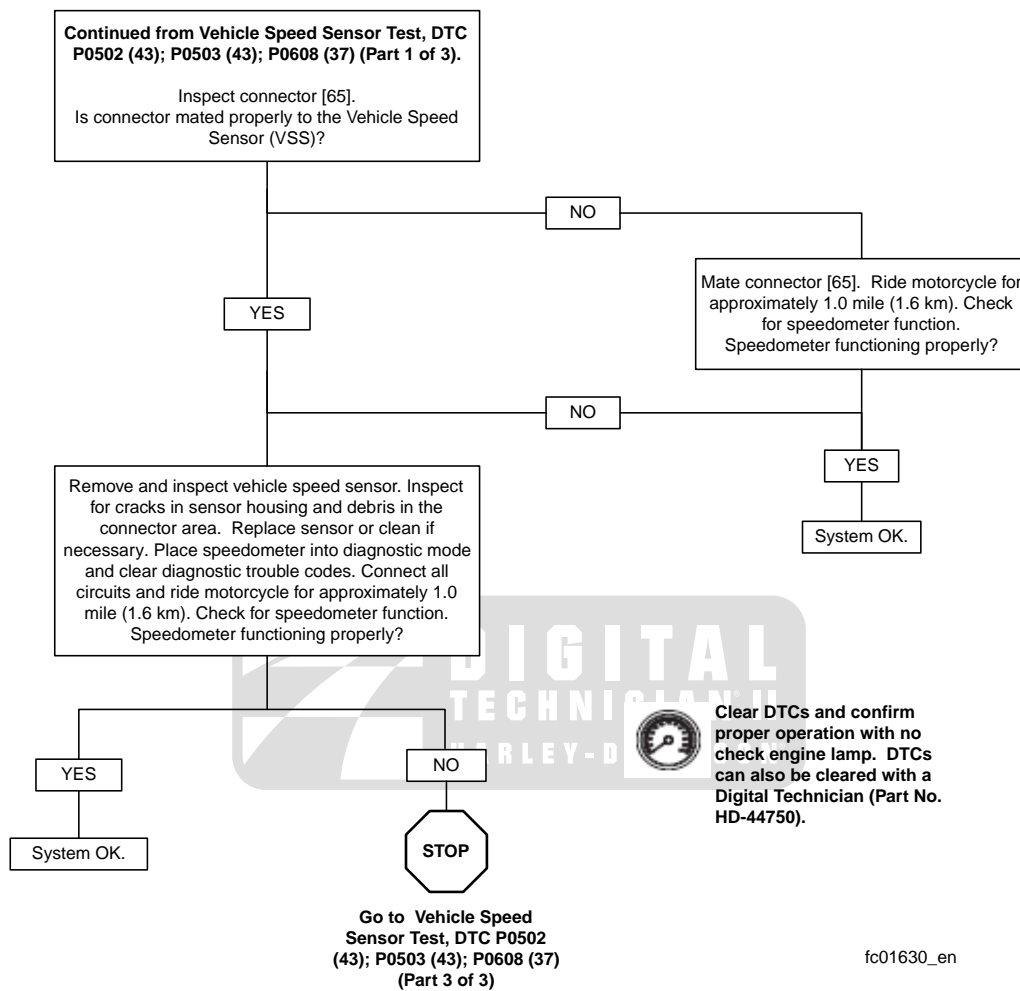
NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[33]	Ignition switch	4-place Augat	Beneath fairing
[39]	Instrument module	20-place Multilock	In fairing
[65]	Vehicle Speed Sensor (VSS)	3-place Deutsch	Right rear top of crankcase

Vehicle Speed Sensor: DTC P0502 (43); DTC P0503 (43); DTC P0608 (37) (Part 1 of 3)



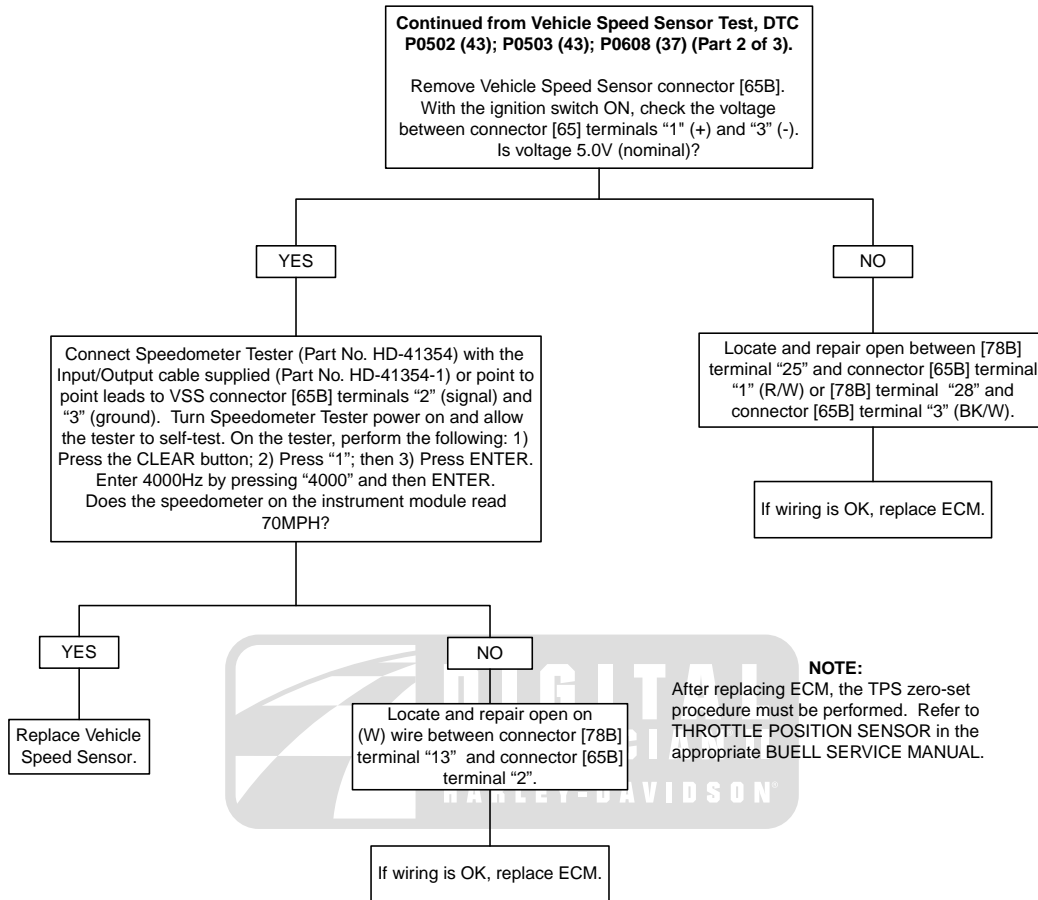
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Vehicle Speed Sensor: DTC P0502 (43); DTC P0503 (43); DTC P0608 (37) (Part 2 of 3)



fc01630_en

Vehicle Speed Sensor: DTC P0502 (43); DTC P0503 (43); DTC P0608 (37) (Part 3 of 3)



fc01631_en

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

IAC Operation

The ECM controls engine idle speed by moving the Idle Air Control (IAC) motor to open or close a passage around the throttle plate. It does this by sending voltage pulses to the proper motor winding of the IAC motor. This causes the pintle to move in or out of the IAC motor a given distance for each pulse received.

- To increase idle speed, the ECM retracts the pintle, allowing more air to flow through the throttle body.
- To decrease idle speed, the ECM extends the pintle, allowing less air to flow through the throttle body.

The IAC motor position is measured in steps. This can only be done by using a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).

- A high number of steps represents a retracted pintle and open passage around throttle plate. This correlates with an increase in the amount of air flowing through the throttle body.
- Five steps represents a fully extend pintle. A five reading indicates an abnormal condition in which the pintle has been fully extended and has consequently closed the passage around the throttle plate

Each time the ignition switch is turned ON, the ECM resets the IAC motor by sending enough pulses to extend the pintle and effectively close the throttle body. The fully extended value is the ECM reference point. A given number of steps are then calculated by the ECM for use in setting the proper idle speed and IAC position.

Table 2-44. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0506	34	Idle Air Control (IAC) system RPM higher than expected
P0507	34	Idle Air Control (IAC) system RPM lower than expected
P0511	34	Idle Air Control (IAC) circuit

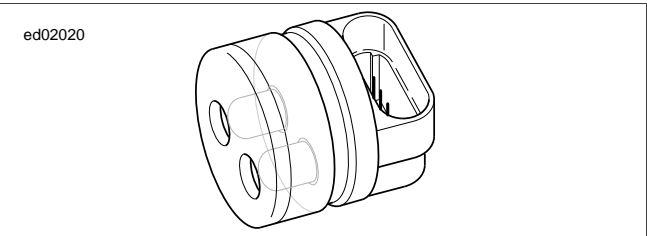


Figure 2-64. IAC Test Lamp (Part No. HD-41199-3)

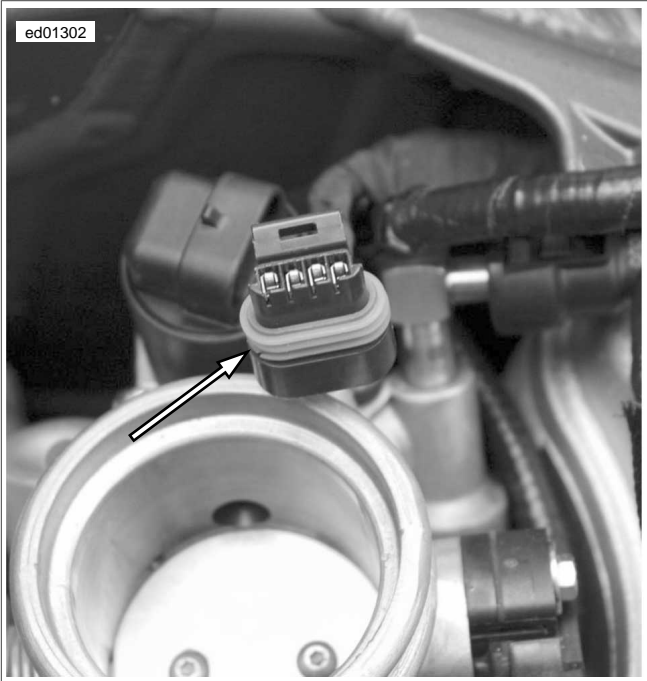


Figure 2-65. IAC Motor Connector

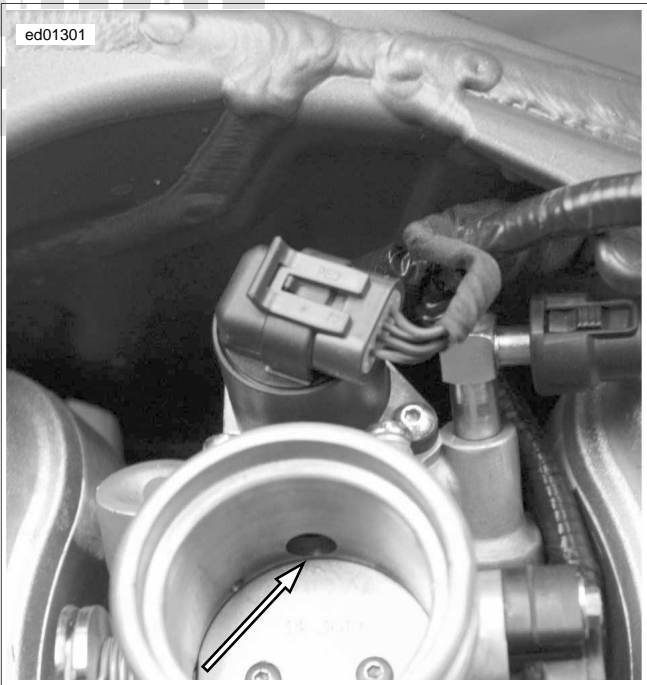


Figure 2-66. IAC Motor Pintle Air Inlet

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Tips

Engine idle speed can be adversely affected by the following:

- A loss of idle speed control does not necessarily imply the IAC motor or wiring has failed. It can be caused by a number of conditions such as an intake air leak, improperly adjusted throttle stop (factory set) or a misfiring cylinder.
- Leaking injectors will cause fuel imbalance and poor idle quality due to different air/fuel ratios in each cylinder. To check for leaky injectors, first remove the air cleaner. See Air Cleaner in the appropriate Buell Service Manual. Turn key ON for 2 seconds five consecutive times. Replace the fuel injector if there is any evidence of raw fuel in bores. See Fuel Injectors in the appropriate Buell Service Manual.
- To confirm IAC function, disconnect fuel pump. Turn engine stop and ignition switch on and listen for IAC movement (clicking or humming noise) for a few seconds after the ignition switch is turned on.
- Vacuum leaks. To check for vacuum, see Intake Leak Test in the appropriate Buell Service Manual.
- Contaminated fuel.
- Excessive oil in crankcase (oil sumping).
- Throttle Position (TP) sensor reading of greater than 5% (possible throttle cable misadjustment) or battery voltage reading of less than 9 volts will disable idle speed control.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. When the ignition is keyed ON, the IAC motor pintle extends and then retracts to a fixed position for increased airflow and idle speed during the engine start sequence. This ON reset procedure takes 2 seconds to perform.
2. Test lamp behavior may follow two patterns. The color of the lights is not relevant to IAC motor operation.
 - a. Normal behavior: At ignition switch ON, test lights will alternately flash to confirm Electronic Control Module (ECM) signals.
 - b. Problem indicated: One or more lights fail to illuminate during ignition switch ON/OFF cycle.

NOTE

There is a remote possibility that one of the circuits is shorted to voltage which could have been indicated by a steady light. Disconnect the ECM and turn the ignition switch ON. Probe terminals to check for this condition.

3. Connect BREAKOUT BOX (Part No. B-48115) to main wire harness only leaving ECM disconnected. See [2.6 BREAKOUT BOX](#).
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.
5. Repair faulty ECM connection or replace ECM. If ECM requires replacement, see ECM in the appropriate Buell Service Manual.

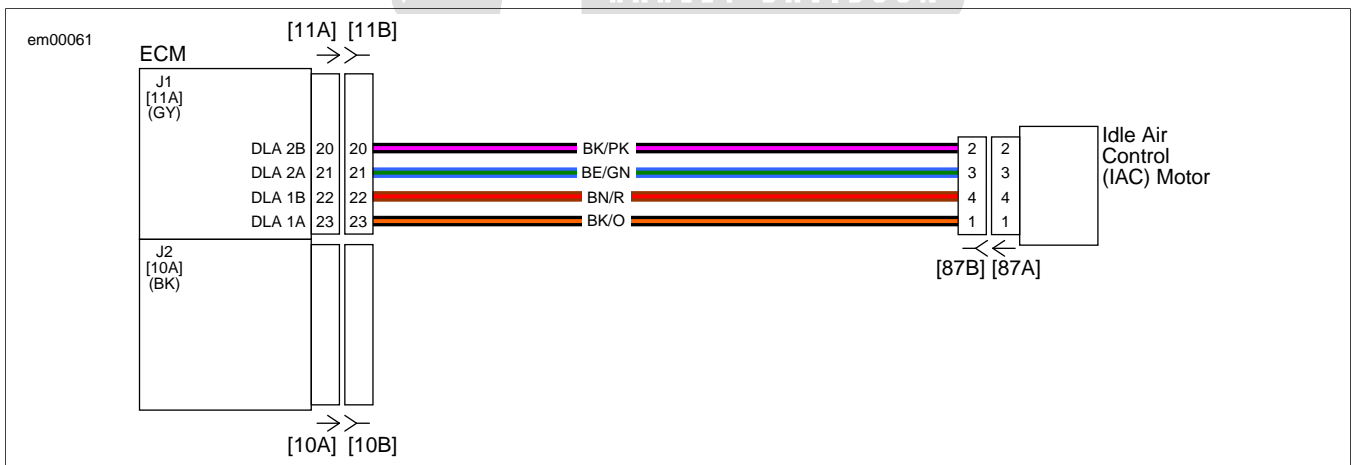
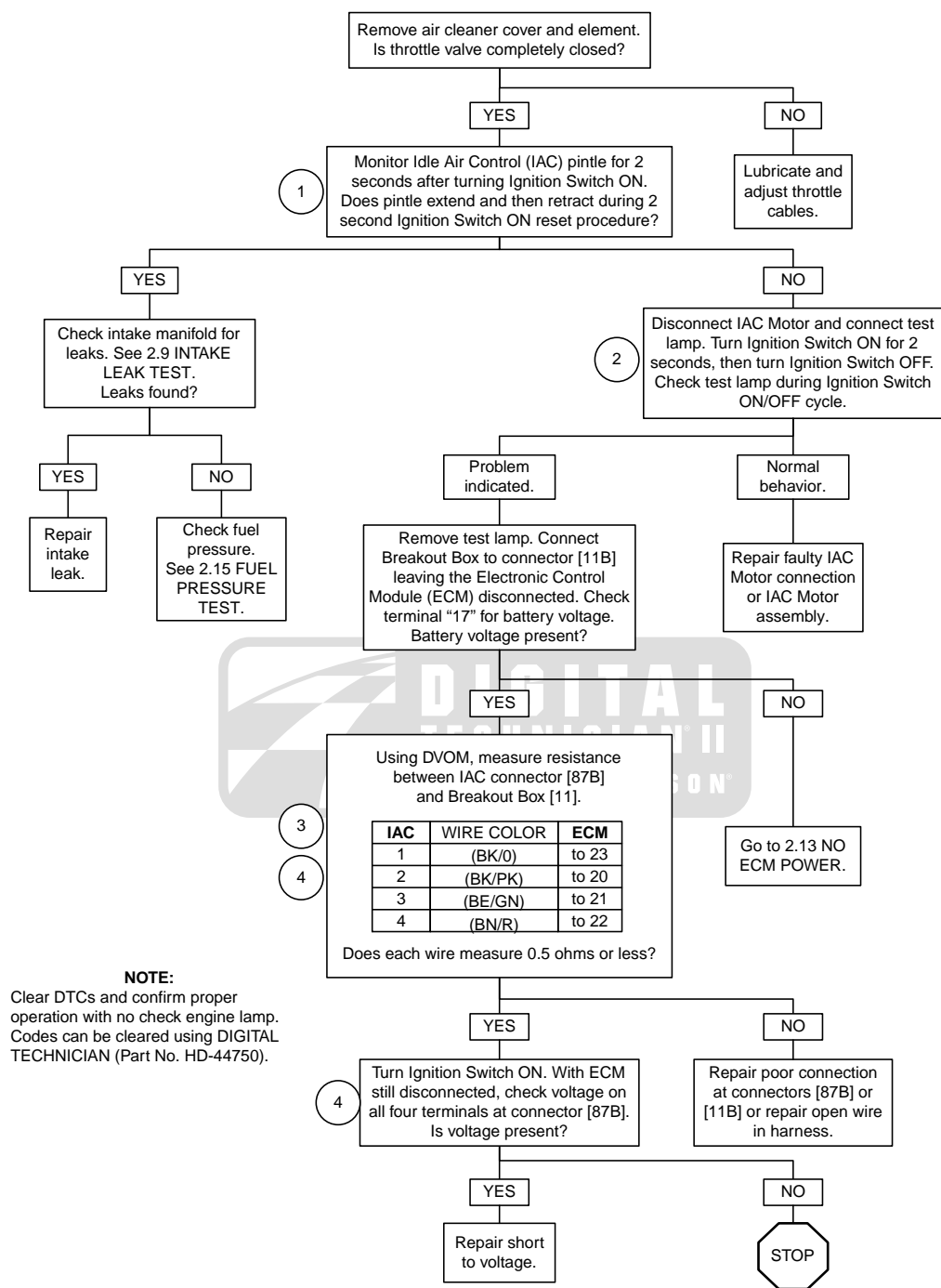


Figure 2-67. IAC Motor Circuit

Table 2-45. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[87]	Idle Air Control (IAC) motor	All	4-place Delphi	Beneath air cleaner base-plate

Idle Air Control: DTC P0506 (34); DTC P0507 (34); DTC P0511 (34) (Part 1 of 2)

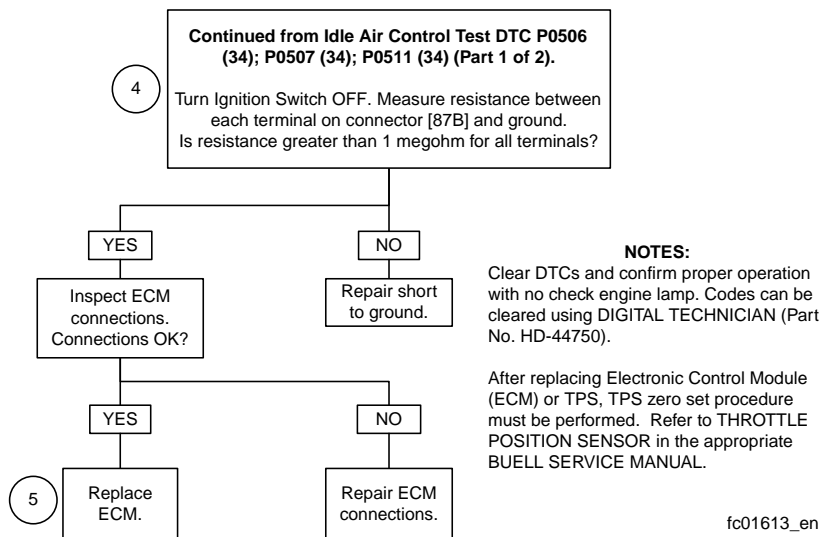


NOTE:
Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

Go to Idle Air Control Test
DTC P0506 (34); P0507 (34);
P0511 (34) (Part 2 of 2).

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Idle Air Control: DTC P0506 (34); DTC P0507 (34); DTC P0511 (34) (Part 2 of 2)



GENERAL

Battery Voltage

A Code 16 will set if the ECM detect battery positive voltage less than 6 volts or greater than 20 volts.

- A low voltage condition typically occurs during activation of the starter or generally indicates loose wire connections.
- A high voltage condition is usually caused by a faulty voltage regulator.

Table 2-46. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0562	16	Battery voltage low
P0563	16	Battery voltage high

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. The ECM is monitoring voltage at ECM connector [10] (black) terminal "9". Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. This checks for voltage drops in the ECM power circuit. If a significant voltage drop is not present, condition may be caused by excessive starter current draw.

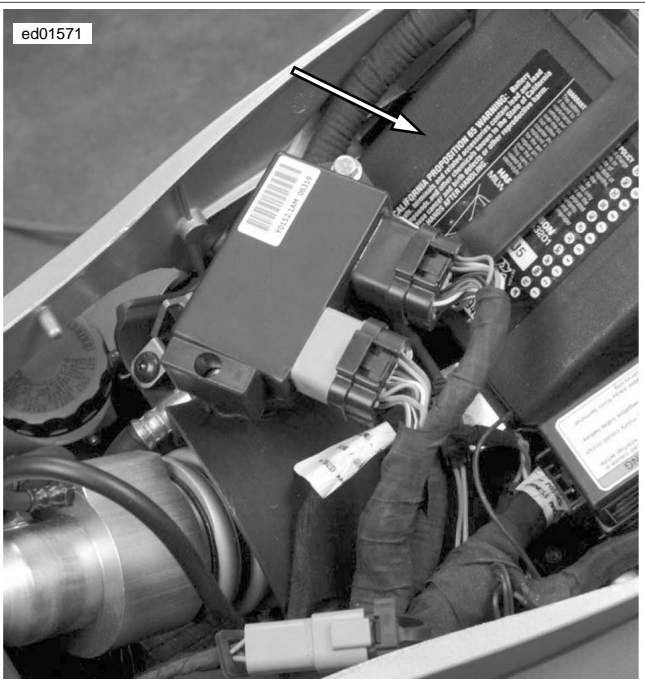


Figure 2-68. Battery Location (Ulysses)

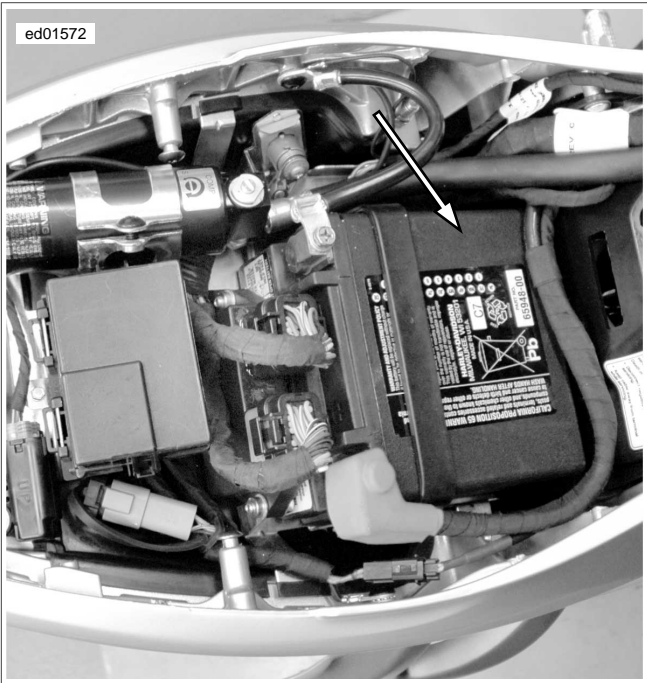


Figure 2-69. Battery Location (Lightning)

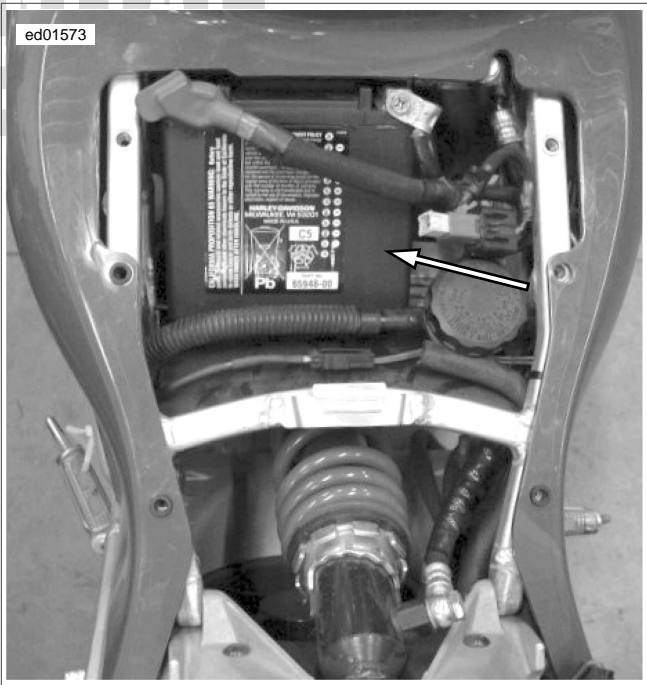


Figure 2-70. Battery Location (Firebolt)

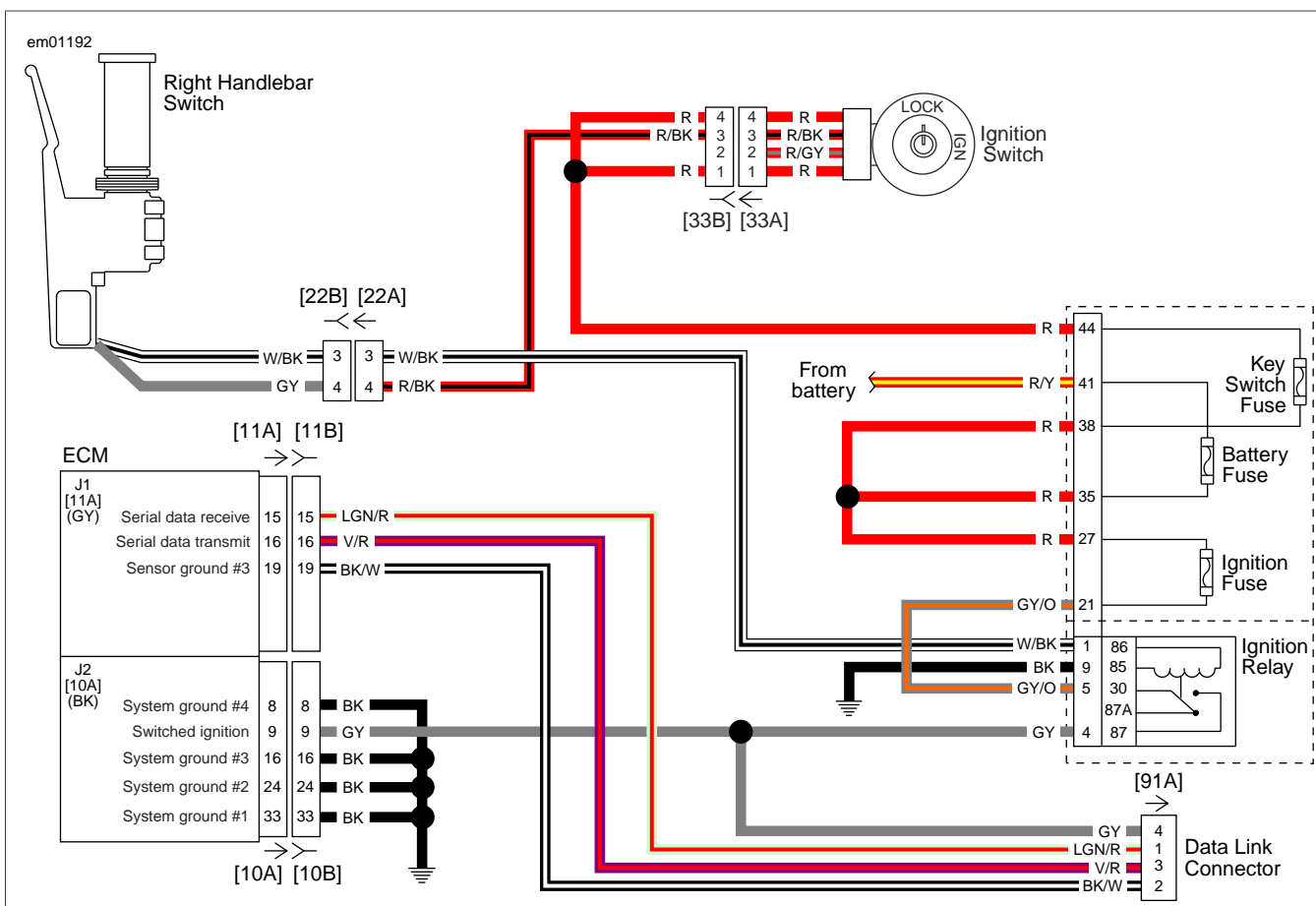
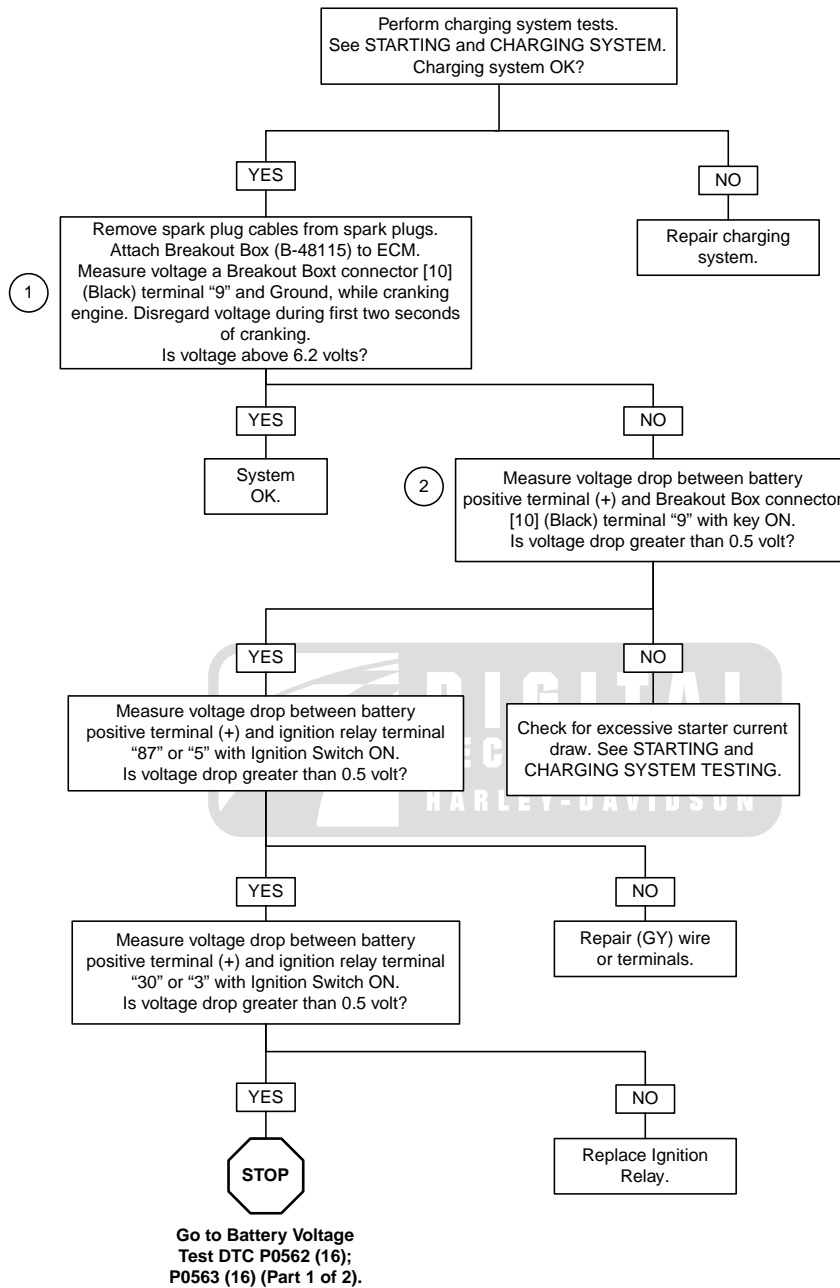


Figure 2-71. Battery Voltage Circuit (Ulysses, Lightning)

Table 2-47. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[22]	Right hand controls	4-place Multilock	Behind windscreen
[33]	Ignition switch	4-place Augat	Behind windscreen
[91]	Data link connector	4-place Deutsch	Behind left airflow guide

Battery Voltage: DTC P0562 (16); DTC P0563 (16) (Part 1 of 2)

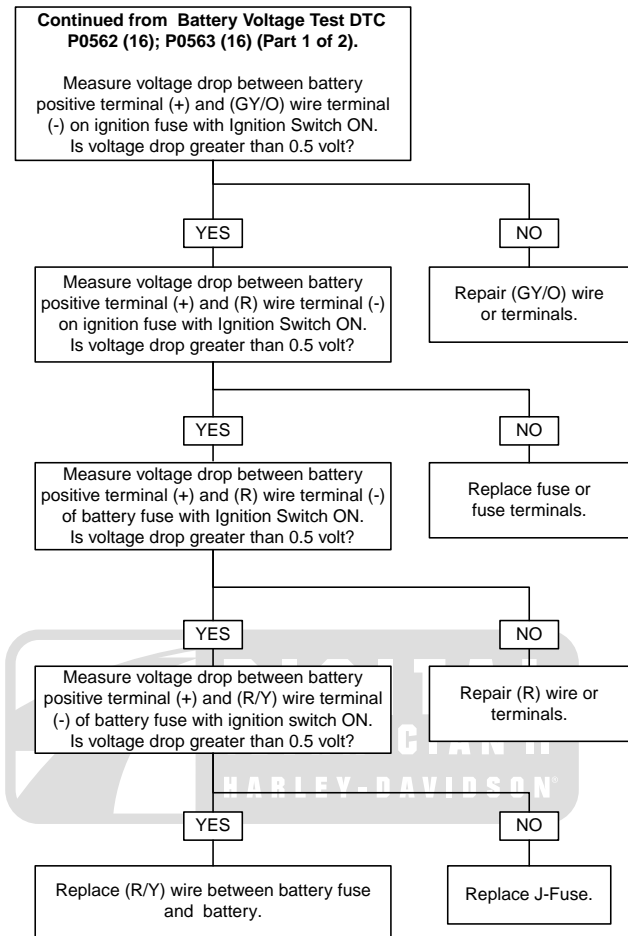


NOTE:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

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Battery Voltage: DTC P0562 (16); DTC P0563 (16) (Part 2 of 2)



NOTE:
Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

fc00400_en

DTC P0603 (54), P0604 (52), P0605 (53), P0607 (55)

2.26

GENERAL

ECM Failure

All of the following codes indicate a failure which requires replacement of the Electronic Control Module (ECM). Refer to ELECTRONIC CONTROL MODULE in the appropriate Buell Service Manual.

- Code 52 - RAM failure
- Code 53 - ROM failure
- Code 54 - EE PROM failure
- Code 55 - Microprocessor failure



Figure 2-73. Electronic Control Module (Ulysses)

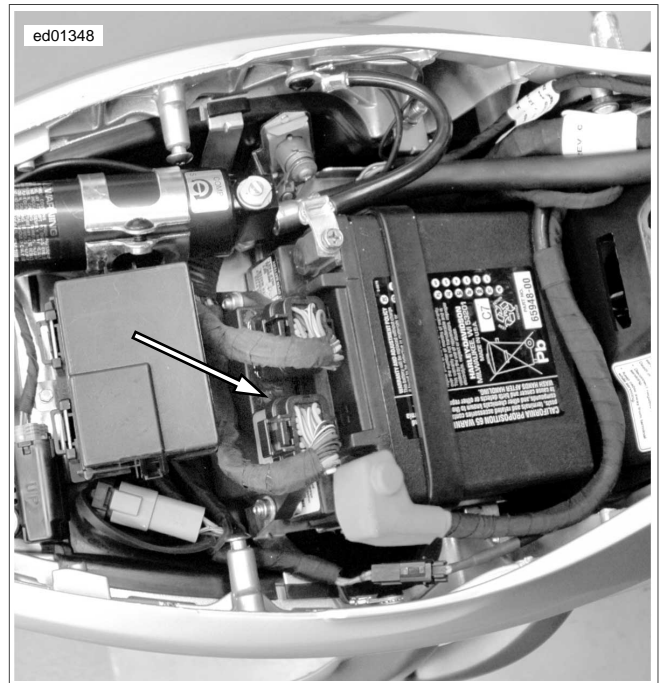


Figure 2-74. Electronic Control Module (Lightning)

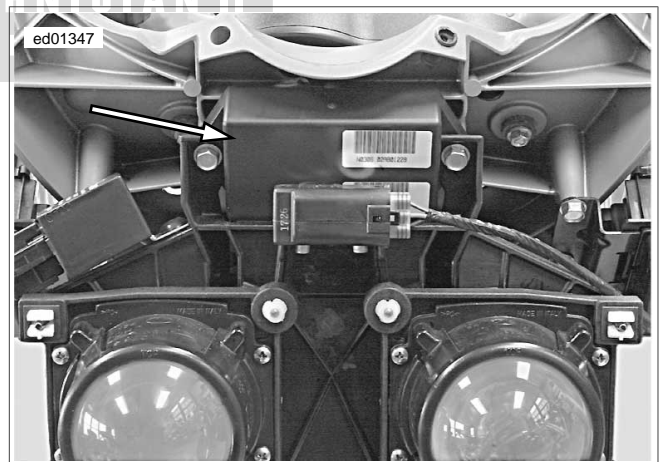


Figure 2-75. Electronic Control Module (Firebolt)

GENERAL

Start Relay

When the starter switch is pushed, the start relay is activated and battery current flows to the starter. When the starter switch is released, the start relay is deactivated and battery current stops flowing to the starter.

NOTE

The start relay is not repairable. Replace the unit if it fails.

Table 2-49. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0617	46	Start relay circuit high

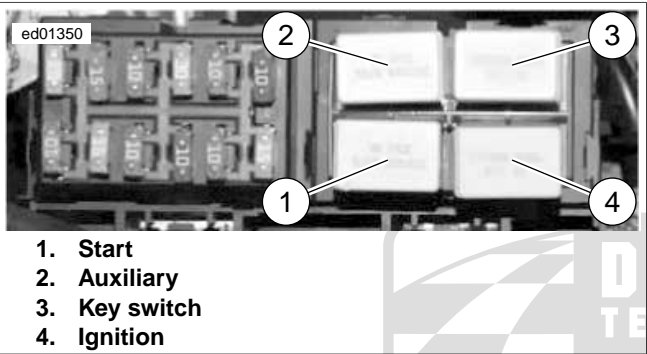


Figure 2-76. Start Relay (Ulysses)

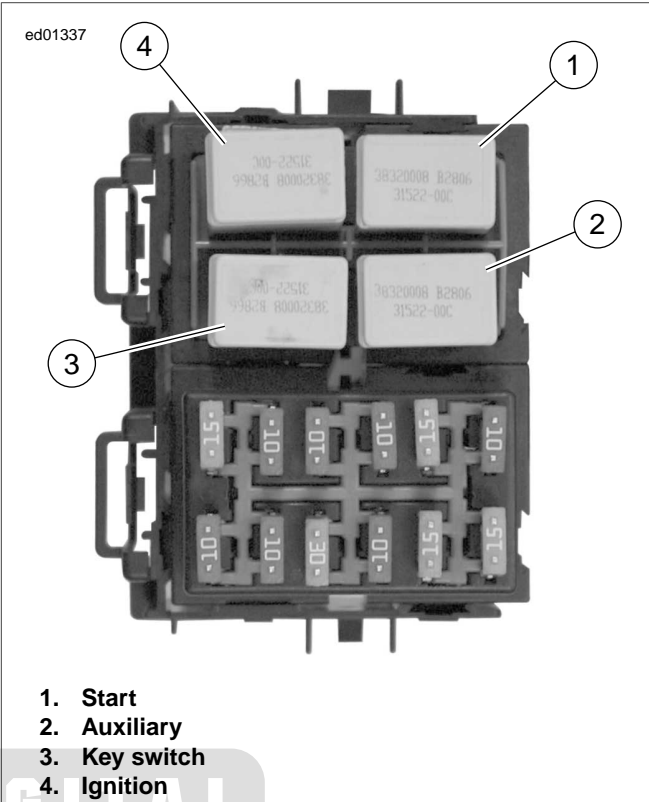


Figure 2-77. Start Relay (Lightning)

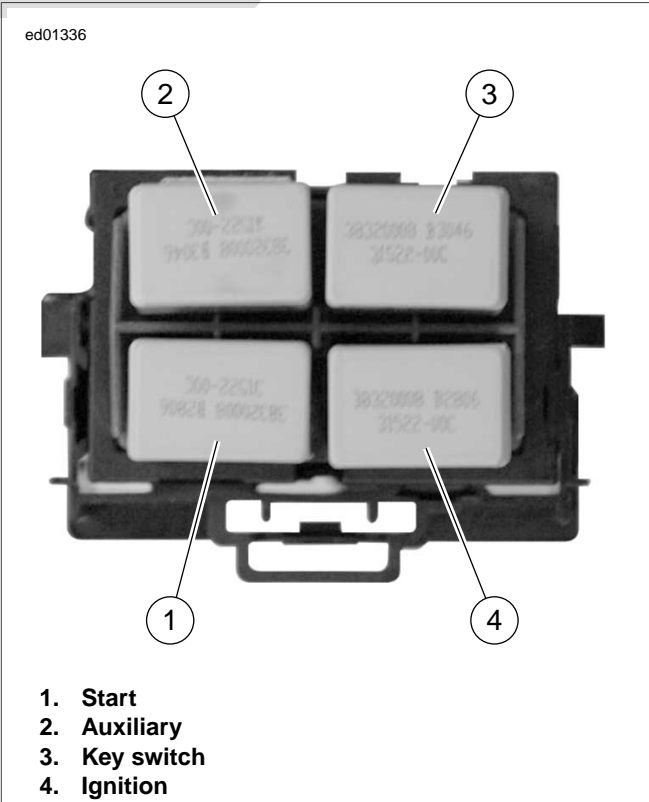


Figure 2-78. Start Relay (Firebolt)

em000076

Wiring diagram for a 2004 Honda CBR600F4i motorcycle, showing the electrical system layout. The diagram includes the ECM, Ignition Switch, Right Handlebar Switch, Fuse Block And Relay Assembly, Ignition Relay, Start Relay, Key Switch Relay, Battery, Starter Solenoid, and Neutral Switch. It details the wiring for various components like the Neutral switch, Clutch switch, Start relay, and fuses for Battery, Lights, Ignition, Brake/Horn/EVA, and Key Switch. The diagram also shows the connection to the battery and the starter solenoid.

N	TYPE
---	------

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[22]	Right handlebar switch	4-place Multilock	Behind windscreen
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[128]	Starter solenoid	Spade terminal	Top of starter
[131]	Neutral switch	1-place bullet	Under sprocket cover

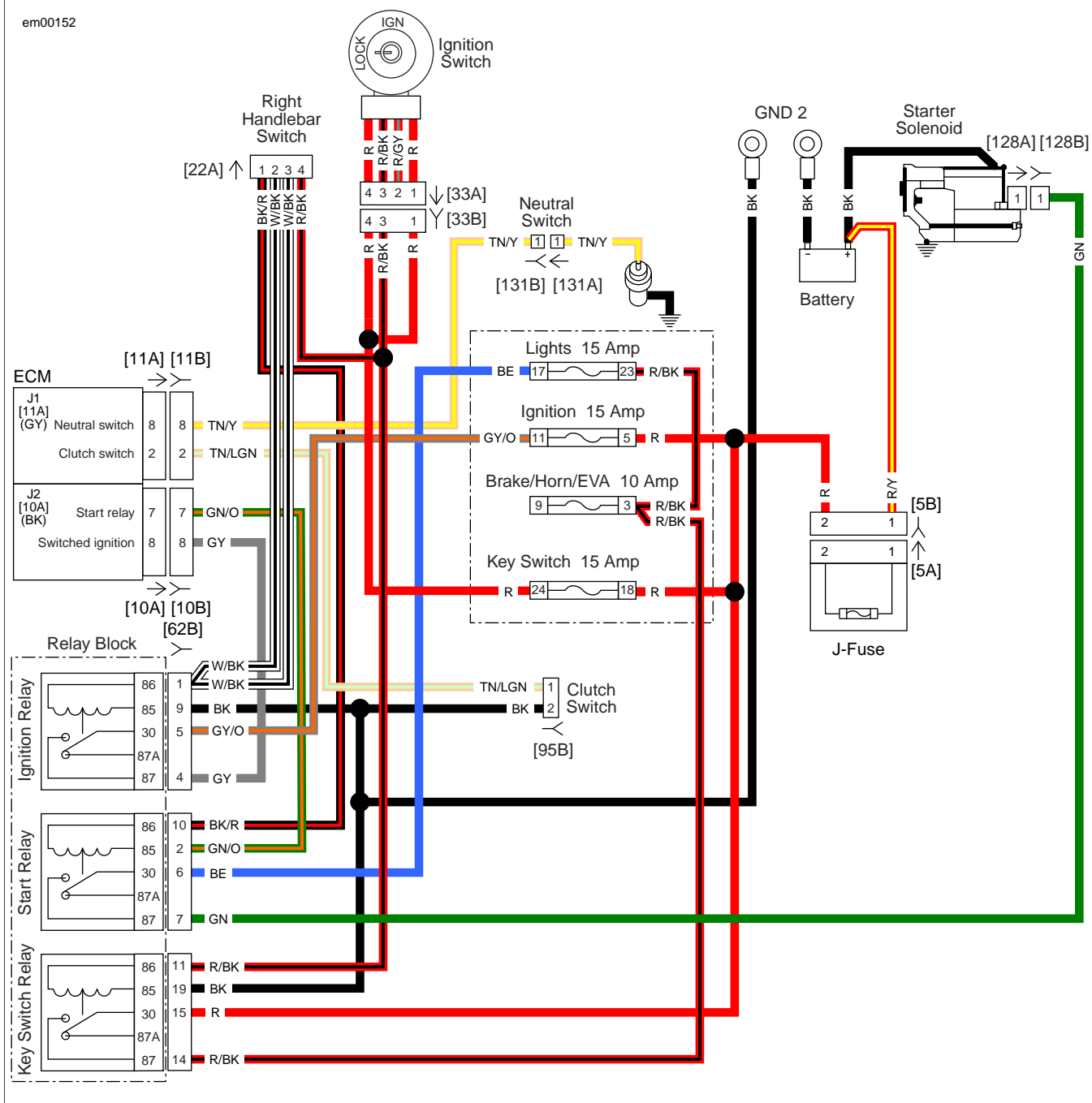
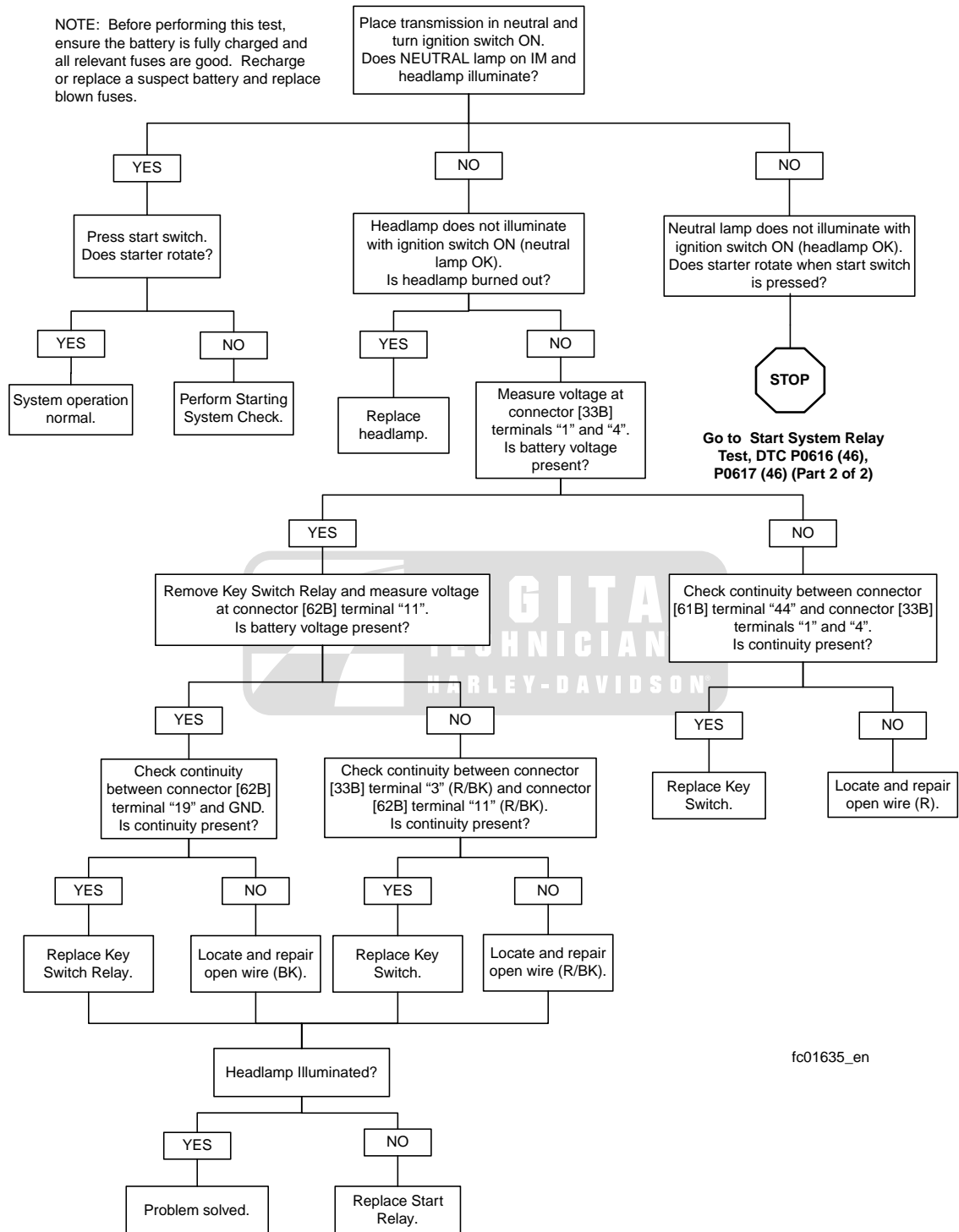


Figure 2-80. Electric Starting System Circuit (Firebolt)

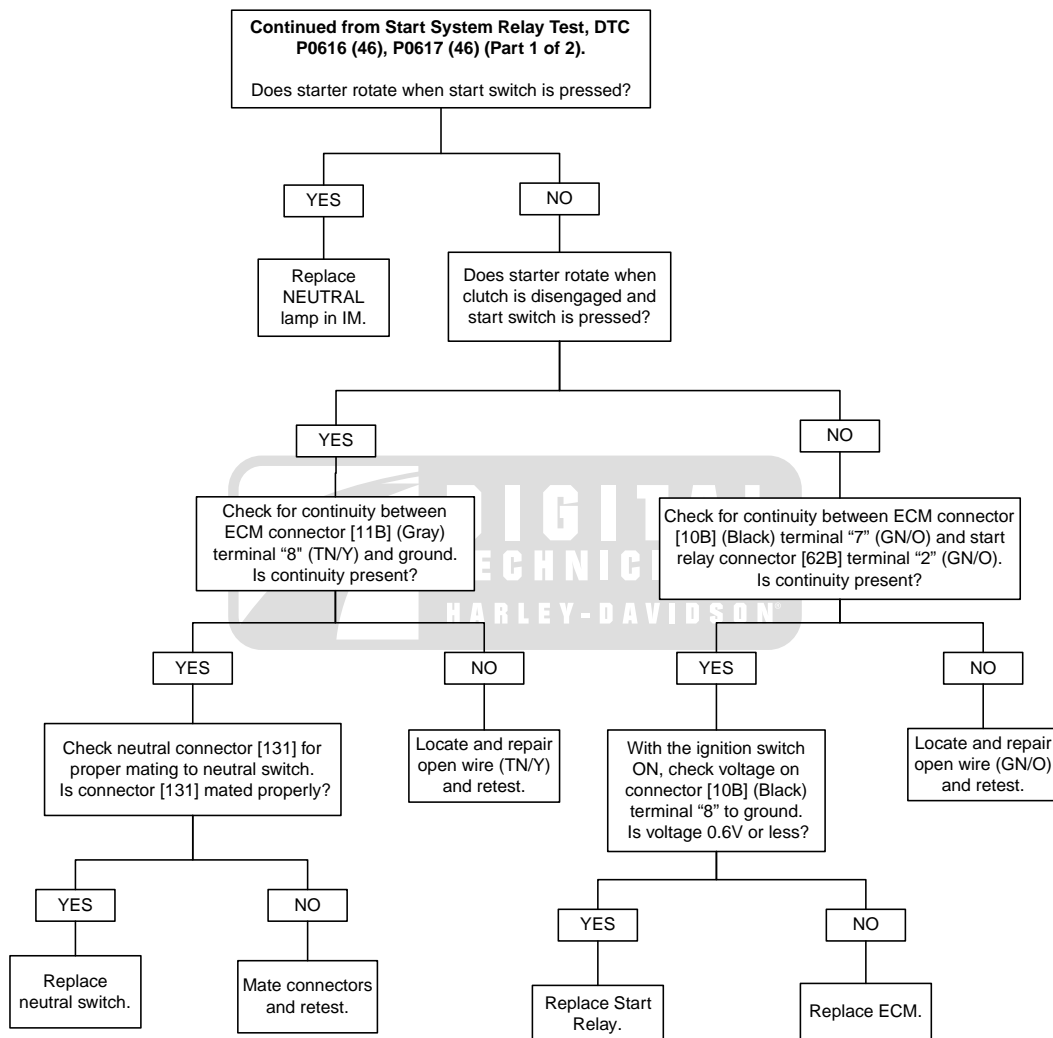
Table 2-51. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[22]	Right handlebar switch	4-place Multilock	Behind windscreen
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[128]	Starter solenoid	Spade terminal	Top of starter
[131]	Neutral switch	1-place bullet	Under sprocket cover

Start System Relay: DTC P0617 (46) (Part 1 of 2)



Start System Relay: DTC P0617 (46) (Part 2 of 2)



fc01636_en

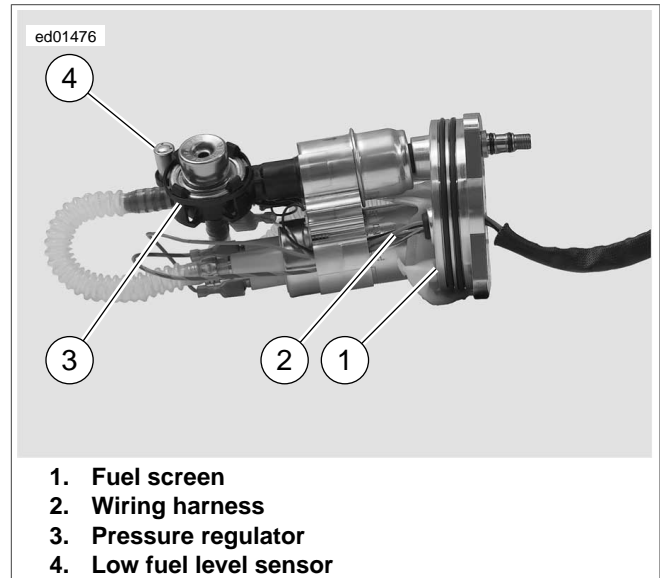
GENERAL**Fuel Pump**

The fuel pump assembly is shown in [Figure 2-81](#). ECM terminals "27" and "28" provide ground to the fuel pump. These codes will set if:

- (BN/Y) wire is shorted to 12 volts. This will also cause the ignition fuse to blow.
- (BN/Y) wire is shorted to ground. This will cause the fuel pump to run continuously even when the motor is not running.
- Fuel pump motor stalls.

Table 2-52. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0628	33	Fuel pump circuit low
P0629	33	Fuel pump circuit high

**Figure 2-81. Fuel Pump Assembly****DIAGNOSTICS**

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.
3. If resistance greater than 1 ohm is found between ECM connector [10] terminal "27" OR "28" and fuel pump connector [86A] terminal "4", but not both, the open must be repaired but this repair will not correct the concern.

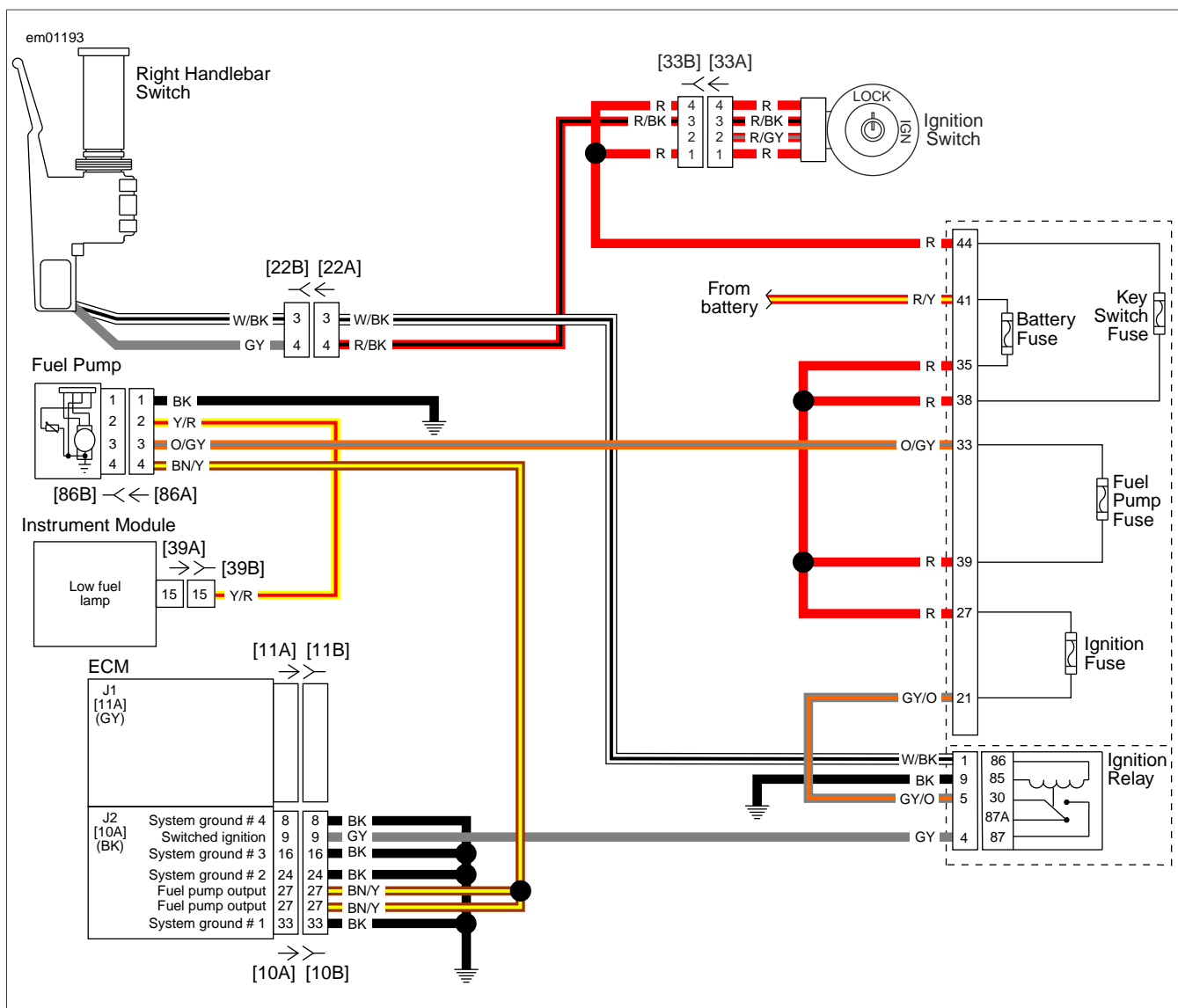


Figure 2-82. Fuel Pump Circuit (Ulysses, Lightning)

Table 2-53. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[22]	Right hand controls	4-place Multilock	Behind windscreen
[33]	Ignition switch	4-place Augat	Behind windscreen
[39]	Instrument module	20-place Multilock	Behind windscreen
[86]	Fuel pump	4-place Multilock	Left side of frame



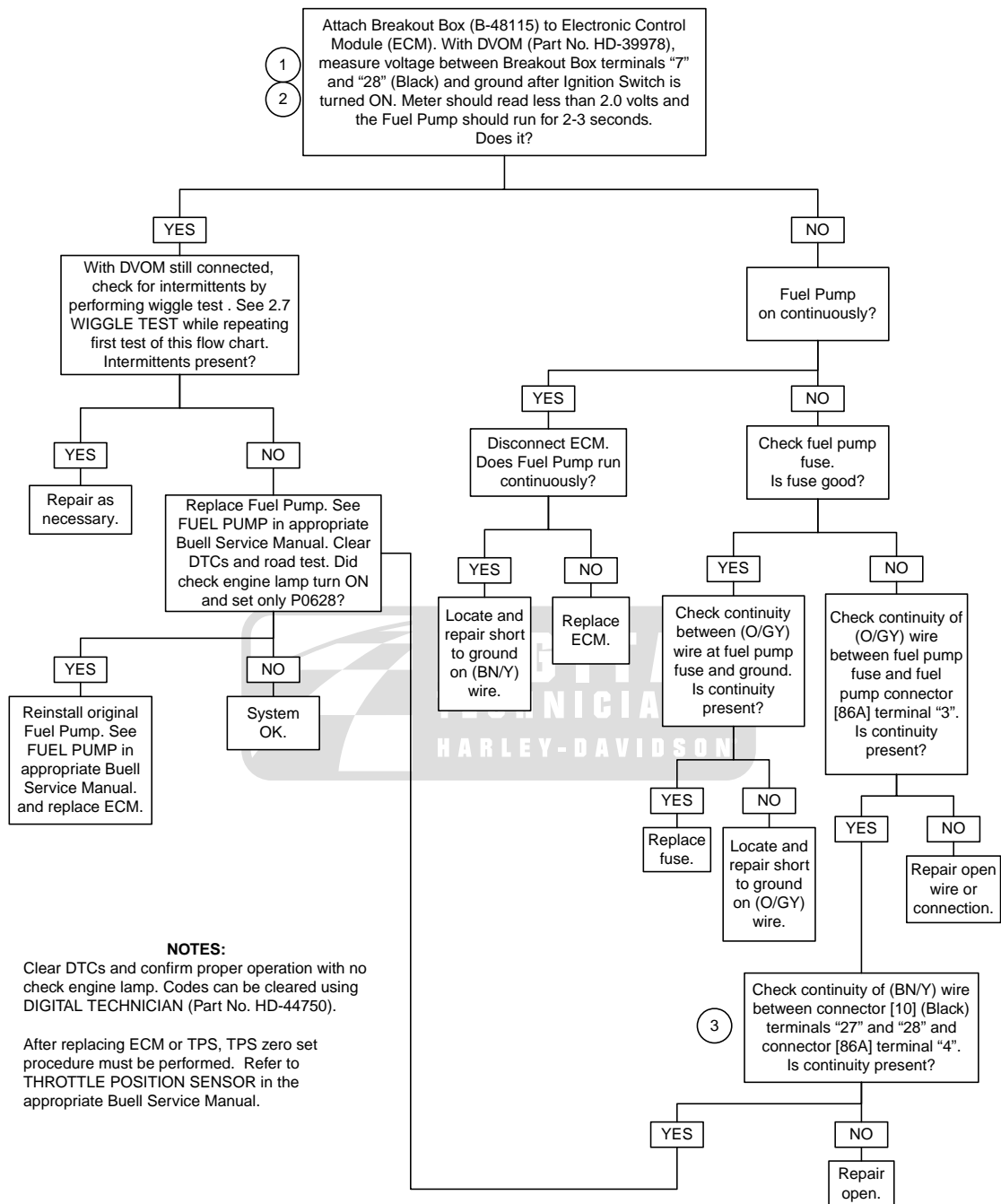
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Table 2-54. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[22]	Right hand controls	4-place Multilock	Beneath fairing
[33]	Ignition switch	4-place Augat	Beneath fairing
[39]	Instrument module	20-place Multilock	In fairing
[86]	Fuel pump	4-place Multilock	Left side of frame



Fuel Pump: DTC P0628 (33); DTC P0629 (33)



NOTES:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

After replacing ECM or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate Buell Service Manual.

fc00405_en

GENERAL

Cooling Fan High Voltage

This code occurs when the engine is running and the ECM has commanded the fan on, and the voltage remains high at terminals "2" and "3" of ECM [10] (BK) connector.

NOTE

An engine temperature (ET) sensor signal, indicating a cylinder head temperature above a preset temperature causes the ECM to command the fan on. When ignition is OFF, fan may run for approximately two and a half minutes depending on temperature of vehicle when ignition was turned off. See [Table 2-55](#).

Table 2-55. Cooling Fan Specifications

	FAN ON	FAN OFF
Key ON	455° F (235° C)	383° F (195° C)
Key ON (HDI)	437° F (225° C)	383° F (195° C)
Key OFF	266° F (130° C)	230° F (110° C)

This code can also set if fan blade does not spin (blocked fan blade) when fan is commanded on and battery voltage is applied to fan.

Cooling Fan Low Voltage

This code will set when the ignition key is ON and the ECM does not sense voltage at terminals "2" and "3" of ECM [10] (BK) connector.

Table 2-56. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P0691	36	Fan control circuit low
P0692	36	Fan control circuit high



Figure 2-84. Cooling Fan

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.
2. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
3. If voltage is present at Breakout Box connector [10] terminal "2" OR "3" but not both, the open must be repaired but this repair will not correct the concern
4. If cooling fan runs when jumper wire is connected to Electronic Control Module (ECM) connector [10B] terminal "2" OR "3" and ground, but not both, the open must be repaired but this repair will not correct the concern
5. If resistance greater than 1 ohm is found between Electronic Control Module (ECM) connector [10] terminal "27" OR "28" and fuel pump [86A] terminal "4", but not both, the open must be repaired but this repair will not correct the concern.

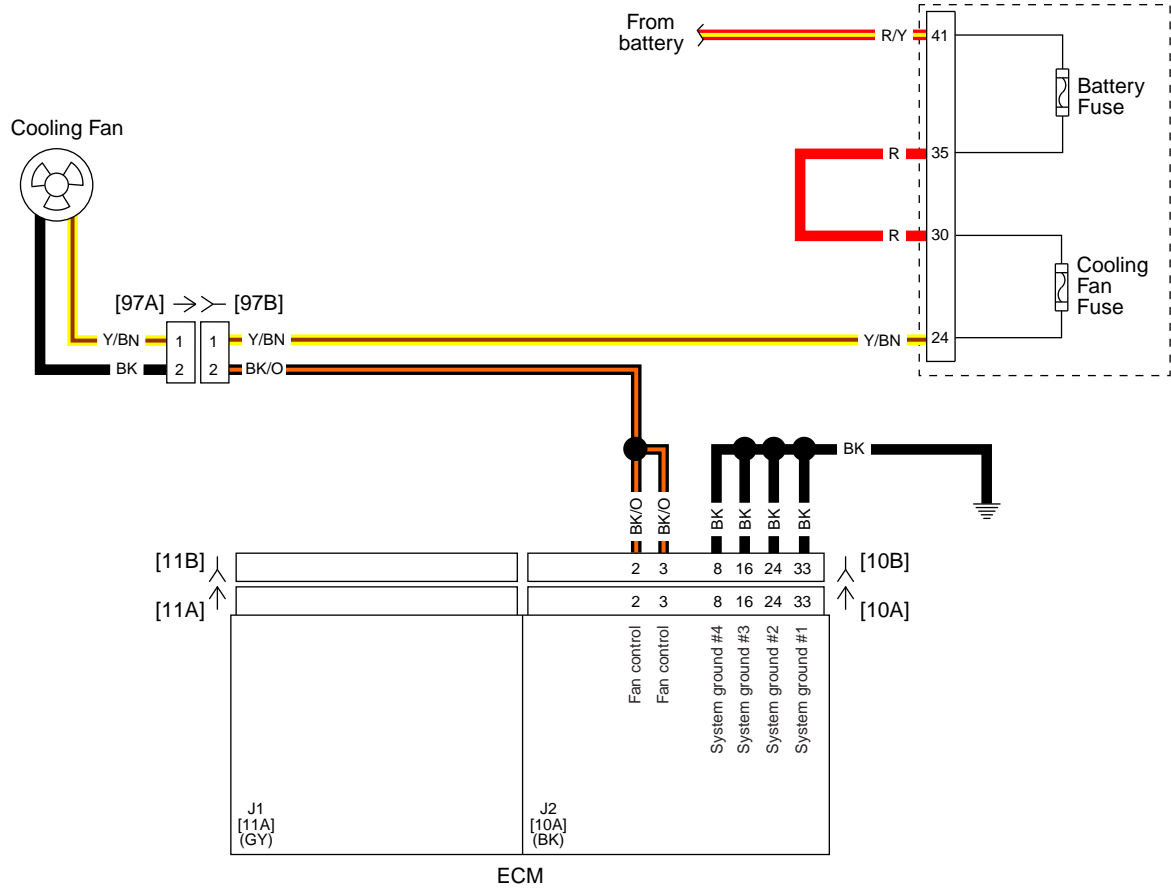


Figure 2-85. Cooling Fan Circuit (Ulysses, Lightning)

Table 2-57. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[97]	Cooling fan	2-place Multilock	Behind rear cylinder

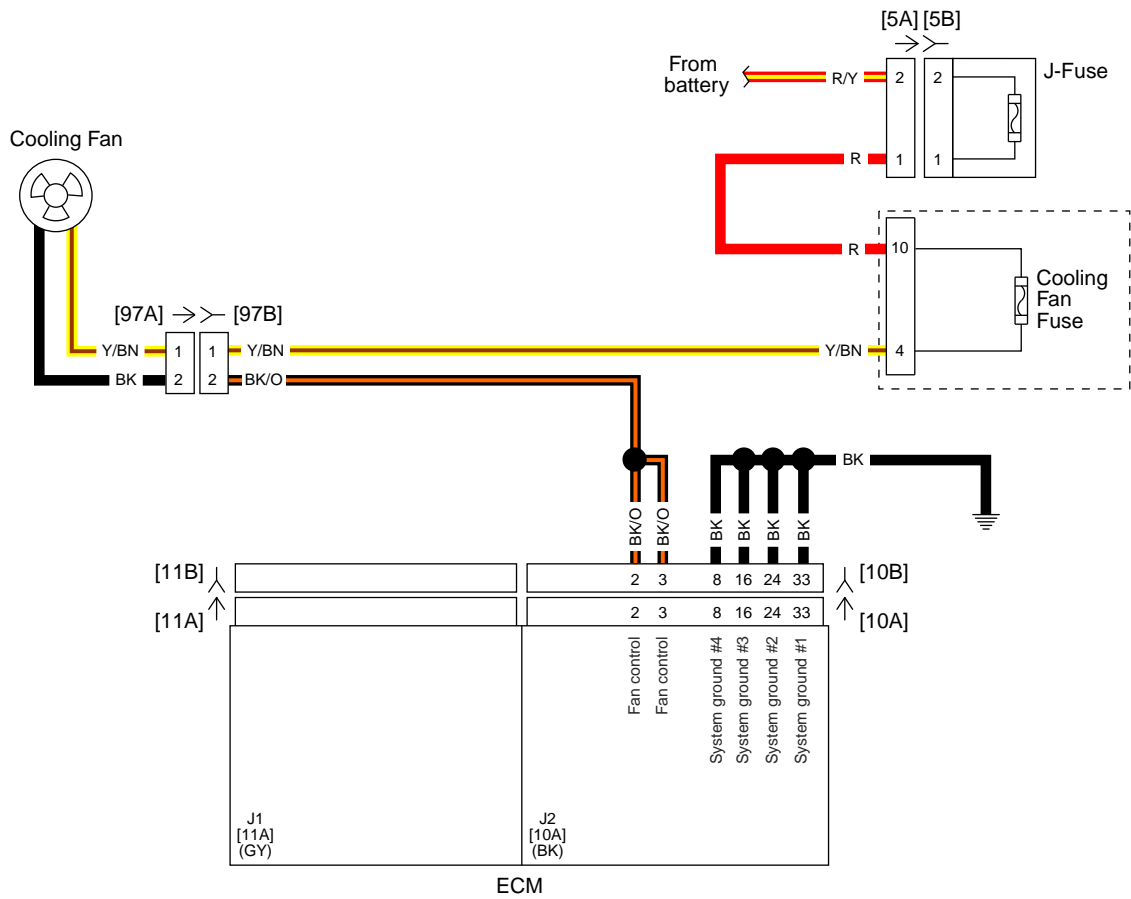
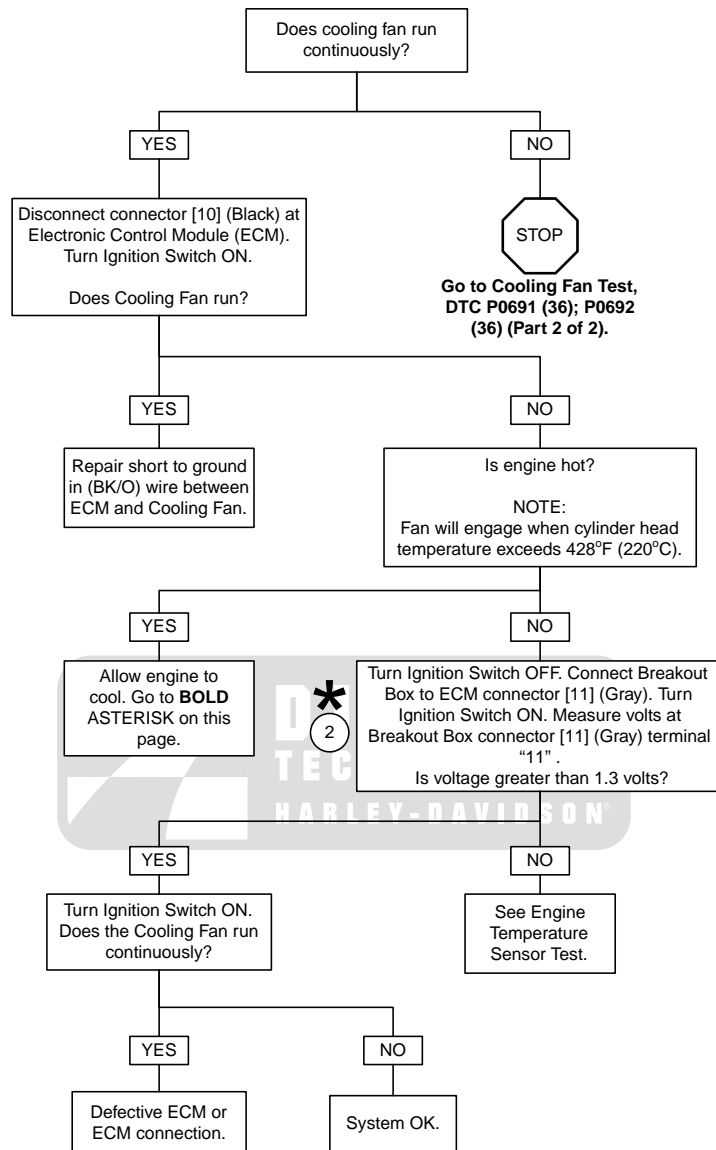


Figure 2-86. Cooling Fan Circuit (Firebolt)

Table 2-58. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[97]	Cooling fan	2-place Multilock	Behind rear cylinder

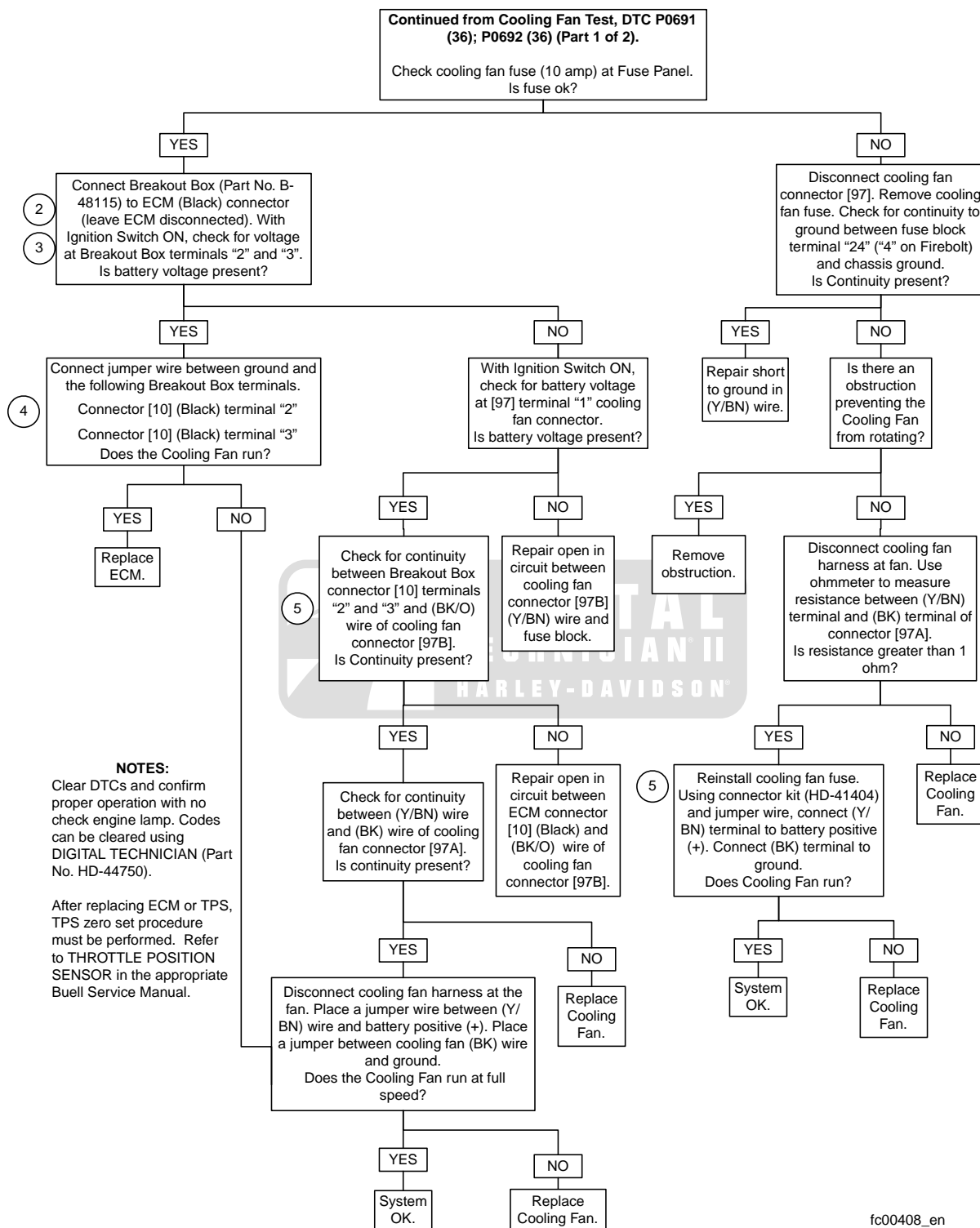
Cooling Fan: DTC P0691 (32); DTC P0692 (32) (Part 1 of 2)



***** At some point in the flow chart you may be instructed to jump directly to a box with the **bold asterisk**. Disregard the asterisk (but not the instruction box) if your normal progression through the chart brings you to this location.

fc00407_en

Cooling Fan: DTC P0691 (32); DTC P0692 (32) (Part 2 of 2)



DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY)

2.30

GENERAL

Active Intake System (Japanese Models Only)

The active intake system utilizes a solenoid in the airbox which is connected to the throttle valve via a cable. The throttle valve is automatically closed by the solenoid under certain conditions to reduce engine noise. See [Figure 2-87](#) for locations of system components.

A code 22 will set if the ECM detects that the output for the active intake control is not in agreement with the feedback circuit (minimum TP sensor voltage when actuated).

Likely causes for a code 22 are:

- Mechanical fault in the active intake solenoid (8) throttle valve, or cable (2).
- Electrical fault in the solenoid circuit.
- Electrical fault in the throttle position sensor circuit.
- TPS reading not between 10.4-10.9 when activated.

Table 2-59. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1110	22	Active intake control circuit low/open
P1111	22	Active intake control circuit high
P1112	22	Active intake control throttle position sensor feedback failure

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), attach brown pin probe and patch cord to [178] or [179].

VERIFY SETTINGS

1. Prior to verifying the active intake system, perform the throttle position sensor (TPS) zero set procedure. See Throttle Position Sensor (TPS) in the appropriate Buell Service Manual.
2. Leave Digital Technician attached to vehicle.
3. In Digital Technician, go to Active Intake test screen.
4. Rotate throttle grip to wide open throttle (WOT).
5. Check that when the throttle plate reaches WOT, TPS reads above 82 degrees. If not, proceed to the cable adjustment procedure in the appropriate Buell Service Manual.
6. While holding the throttle wide open, activate the active intake tab on Digital Technician.
7. Verify that the TPS setting is between 10.4-10.9 degrees. If settings are not correct, proceed to cable adjustment procedure in the appropriate Buell Service Manual.

REMOVAL

NOTE

If solenoid bracket needs to be replaced, remove the baseplate assembly, turn it over and remove the three fasteners securing the bracket to the baseplate.

1. Disconnect electrical connector [178] (1).
2. Hold solenoid shaft by flat spot provided and break cable connector (6) loose.
3. Unthread cable connector and disconnect cable from solenoid (8).
4. Loosen jam nut (5) and disconnect active cable (2) from cable bracket (4).

NOTE

Follow next step only if solenoid is to be replaced.

5. Loosen pinch fastener on solenoid bracket (9).
6. Remove the two fasteners at the front on the solenoid bracket (9) and slide solenoid (8) out of bracket.

NOTE

When removing baseplate it will be necessary to feed the electrical connector and active cable and grommets through the baseplate.

7. Remove baseplate (10).
8. If the active cable needs to be replaced disconnect the wheel (2).

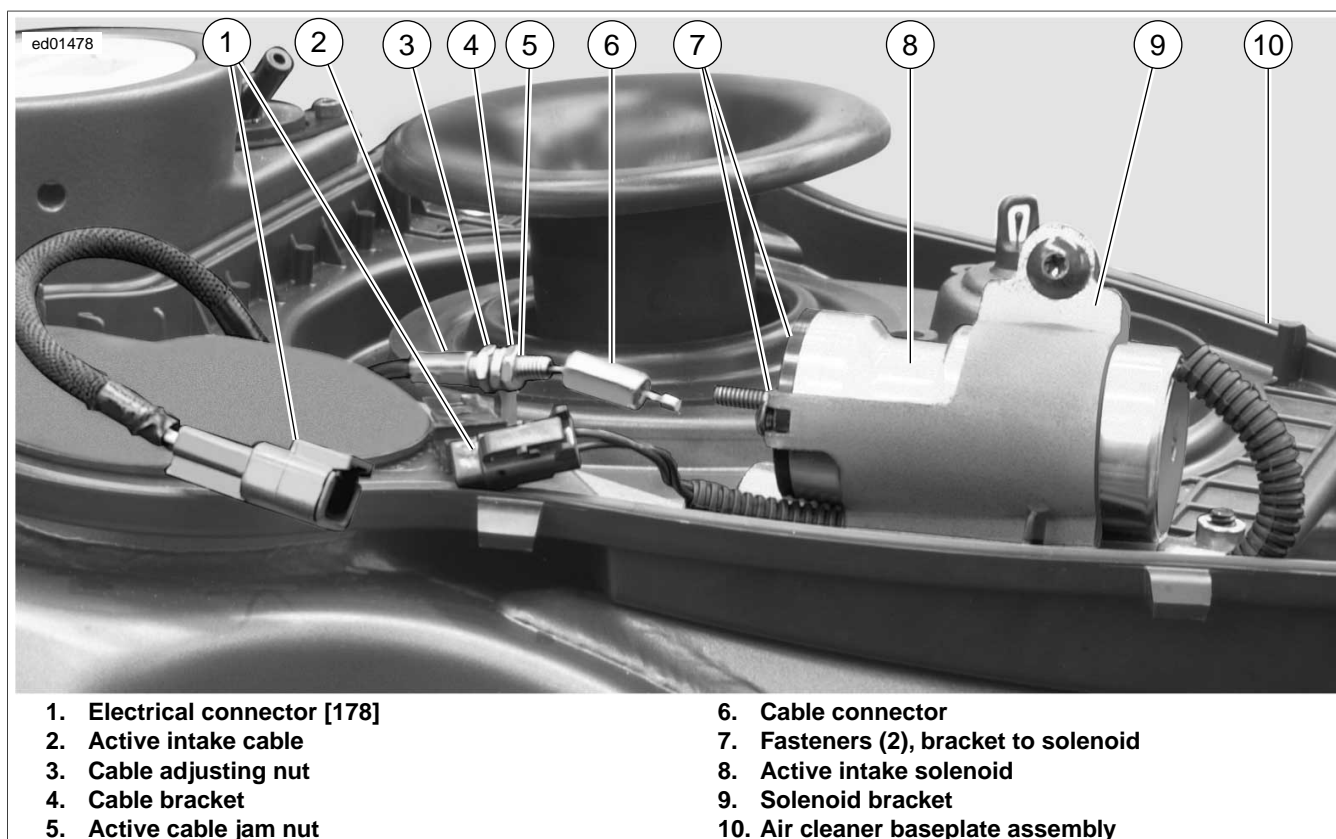


Figure 2-87. Disconnecting Active Intake System

INSTALLATION

NOTE

If solenoid bracket was removed, reinstall using the three fasteners and tighten to 48-60 **in-lbs** (5.4-6.7 Nm).

1. Install baseplate assembly.

NOTES

- When installing the backing plate it is important to ensure that the active cable remains in the tower on the cable wheel on the throttle body. If the cable comes out the cable will not work properly and will not be able to be adjusted.
- When installing baseplate be sure to feed the electrical connector (1) through hole in baseplate first and then insert active cable and then grommet.
- Follow next step only if solenoid was removed.

2. Install solenoid (8) into bracket (9) and tighten pinch fastener to 48-60 **in-lbs** (5.4-6.7 Nm) and bracket to solenoid fasteners to 20-24 **in-lbs** (2.3-2.7 Nm).
3. Install active cable (2) onto bracket (4) and leave jam nut (5) loose until the setting can be verified.
4. Connect active cable (2) to solenoid shaft and tighten cable connector (6) to 20-24 **in-lbs** (2.3-2.7 Nm).
5. Connect electrical connector [178].
6. See Cable Adjustment in the appropriate Buell Service Manual and verify active cable setting.
7. Tighten jam nuts to 48-60 **in-lbs** (5.4-6.7 Nm).

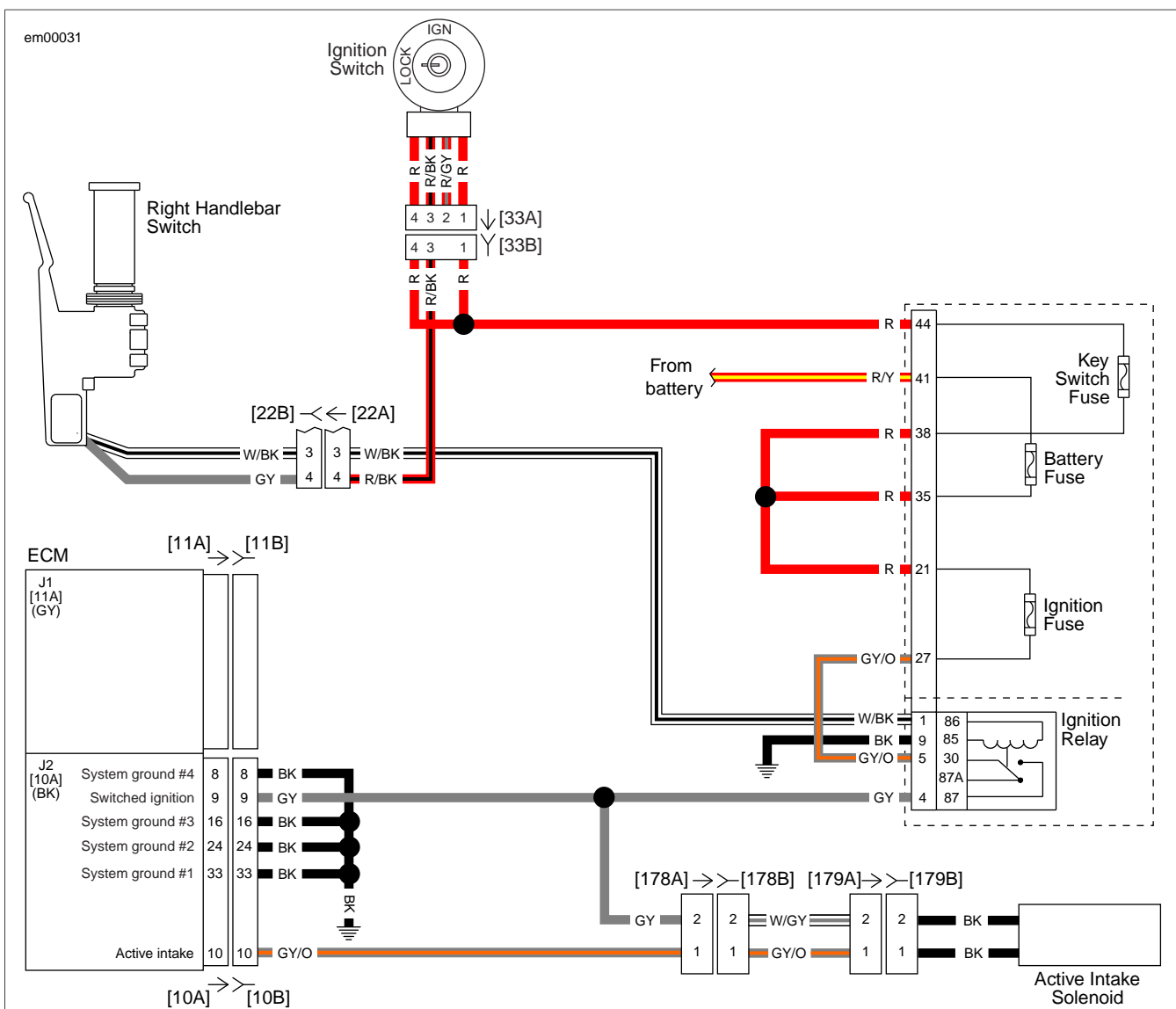


Figure 2-88. Active Intake System (Ulysses, Lightning)

Table 2-60. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[22]	Right hand controls	4-place Multilock	Behind windscreen
[33]	Ignition switch	4-place Augat	Behind windscreen
[178]	Active intake solenoid	2-place Deutsch	Under airbox cover
[179]	Active intake system sub-harness	2-place Deutsch	Under seat

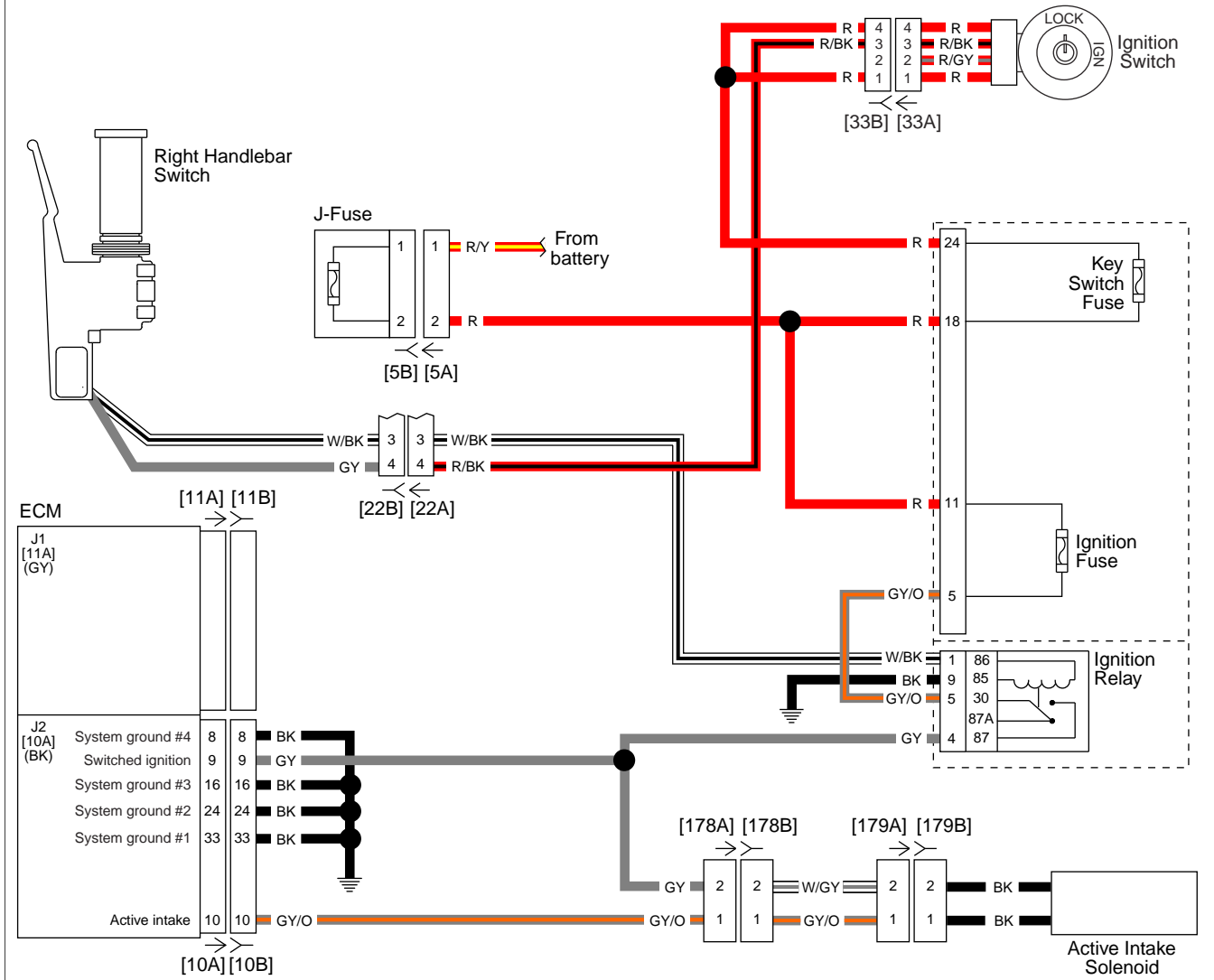
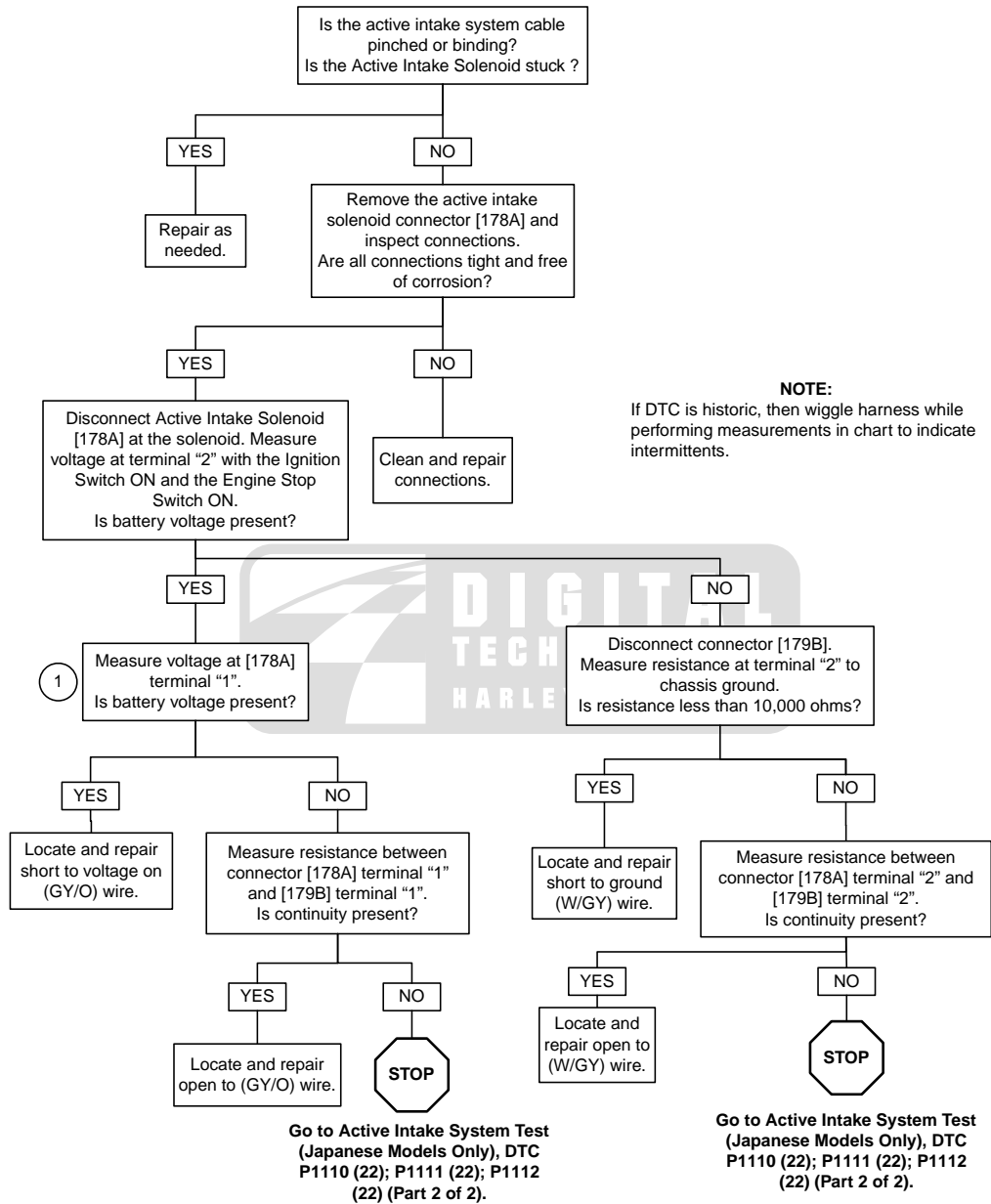


Figure 2-89. Active Intake System (Firebolt)

Table 2-61. Wire Harness Connectors

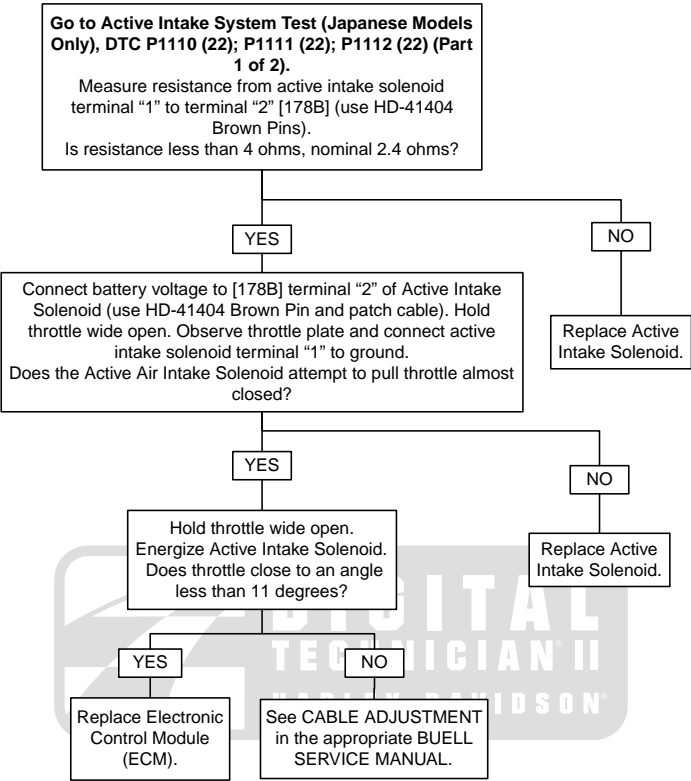
NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[22]	Right hand controls	4-place Multilock	In fairing
[33]	Ignition switch	4-place Augat	In fairing
[178]	Active intake solenoid	2-place Deutsch	Under airbox cover
[179]	Active intake system sub-harness	2-place Deutsch	Under seat

Active Intake System (Japan Models Only): DTC P1110 (22); DTC P1111 (22); P1112 (22) (Part 1 of 2)



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Active Intake System (Japan Models Only): DTC P1110 (22); DTC P1111 (22); P1112 (22)
(Part 2 of 2)



NOTE:
After replacing ECM or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate BUELL SERVICE MANUAL.

fc01608_en

GENERAL**Bank Angle Sensor**

The Bank Angle Sensor (BAS) operates from the ECM 5 volt sensor reference, and is grounded through the ECM on a common sensor ground circuit. Refer to [Table 2-63](#). The BAS sends a signal to the ECM ranging from 0.24 - 3.4V under normal operating conditions. A signal between 3.4 - 4.79V will cause the ECM to turn off the engine. Once activated, the BAS causes the ECM to turn off the engine. When the vehicle is righted, the ignition must be switched OFF and then ON in order to restart the engine.

If the signal from the BAS is below 0.24V or above 4.79V, the ECM sets a code. Refer to [Table 2-62](#). DTC P1151 is set when the BAS output is shorted low (to ground); and P1152 is set when the BAS output is shorted high (to voltage). An open circuit output will act like a shorted high, and set DTC P1152. If a code occurs, the engine will continue to run.

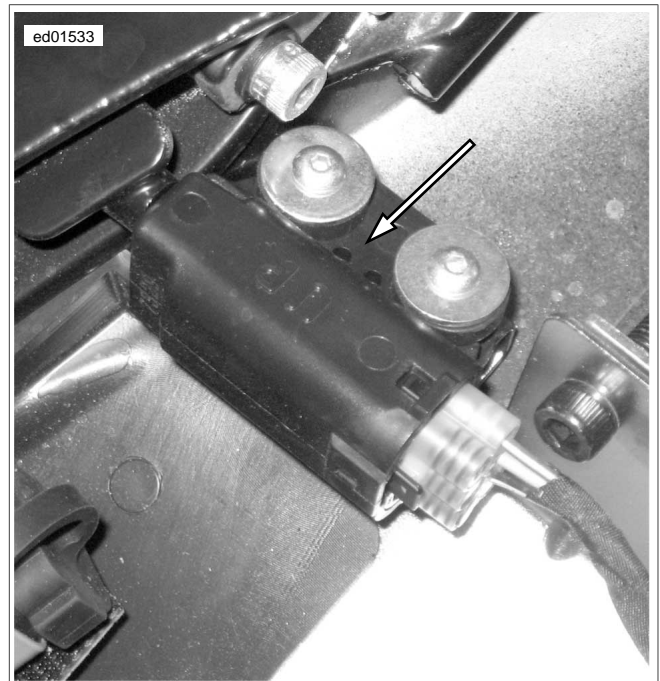
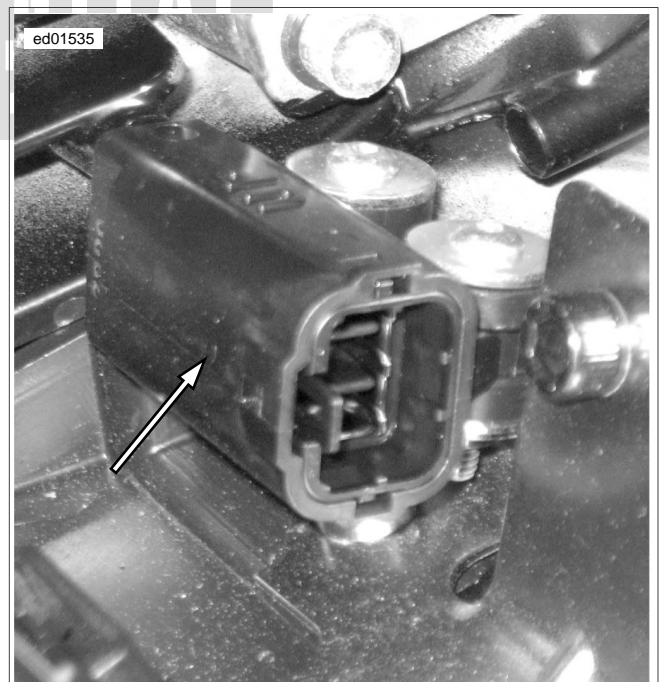
A tipped vehicle will not set a DTC.

Table 2-62. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1151	44	Bank angle sensor shorted low
P1152	44	Bank angle sensor shorted high or failed sensor

Table 2-63. Bank Angle Sensor Voltage

MODE	VOLTS
Run mode	0.24-3.4
Disable mode	3.5-4.79

**Figure 2-90. Bank Angle Sensor (Top View)****Figure 2-91. Bank Angle Sensor (Connector End)**

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

- 1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.
- 2. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).

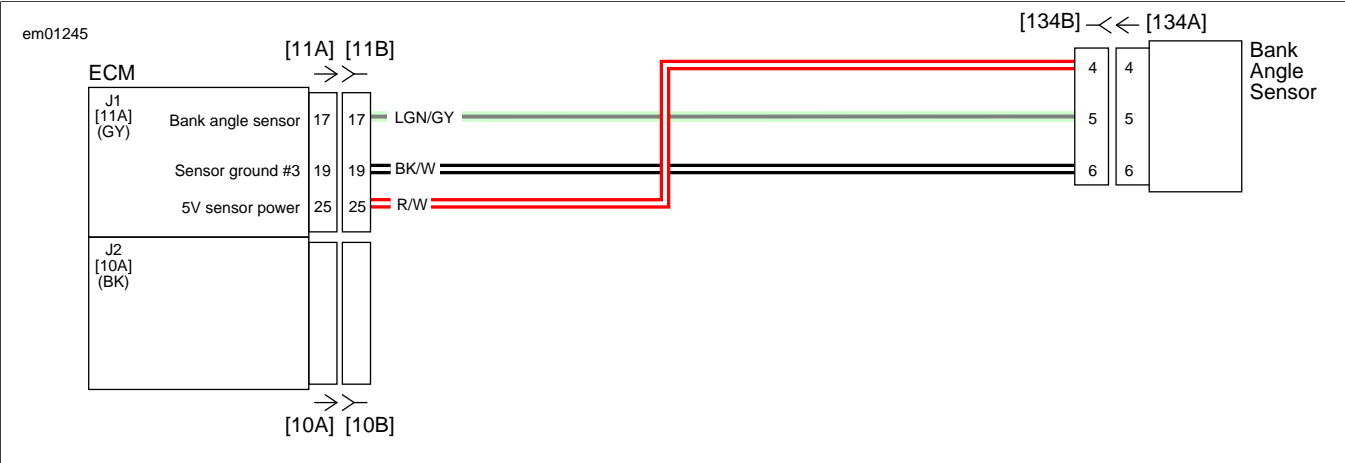
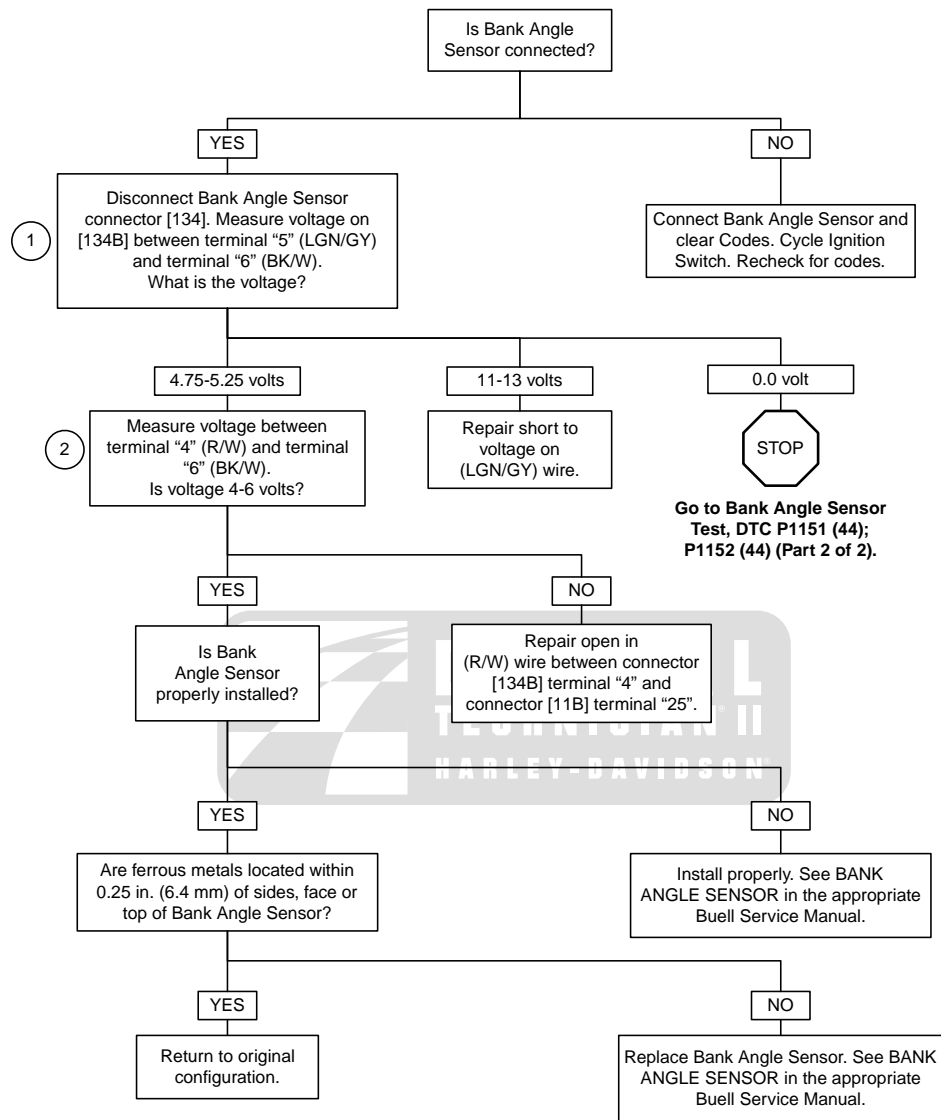


Figure 2-92. Bank Angle Sensor Circuit

Table 2-64. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[134]	Bank angle sensor	All	6-place Sumitomo	In fairing

Bank Angle Sensor: DTC P1151 (44); DTC P1152 (44) (Part 1 of 2)

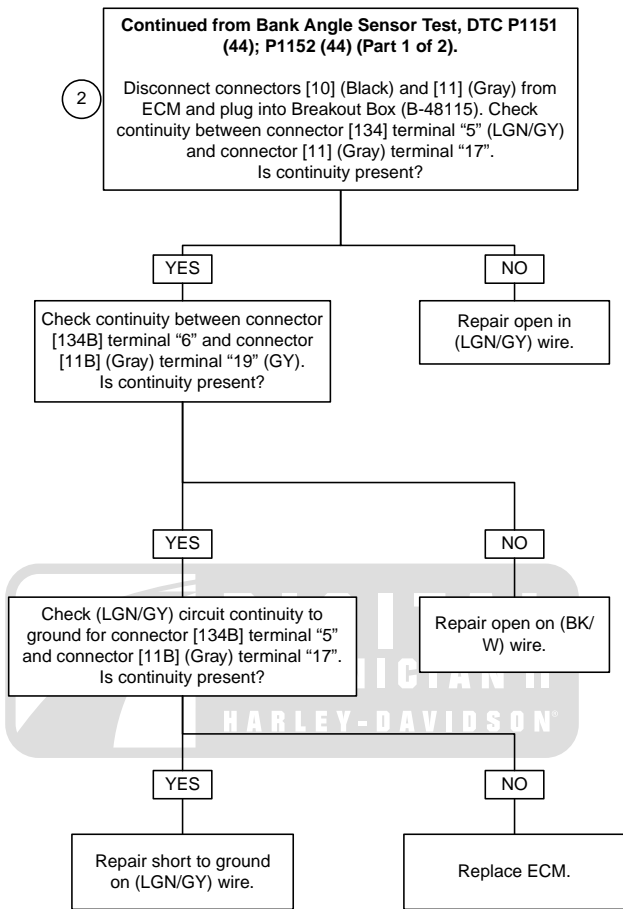


NOTE:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

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Bank Angle Sensor: DTC P1151 (44); DTC P1152 (44) (Part 2 of 2)



NOTES:

Clear DTCs and confirm proper operation with no check engine lamp. Codes can be cleared using DIGITAL TECHNICIAN (Part No. HD-44750).

After replacing ECM or TPS, TPS zero set procedure must be performed. Refer to THROTTLE POSITION SENSOR in the appropriate BUELL SERVICE MANUAL.

fc00410_en

GENERAL

Clutch Switch and Neutral Switch

Diagnostic trouble codes (DTCs) P1154 (26) and P1155 (27) will set when either the clutch switch circuit or neutral switch circuit is shorted to ground at speeds greater than 10 MPH (16 km/h) for more than 60 seconds. Refer to [Table 2-65](#).

Table 2-65. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1154	26	Clutch position sensor circuit low
P1155	27	Neutral switch input circuit low

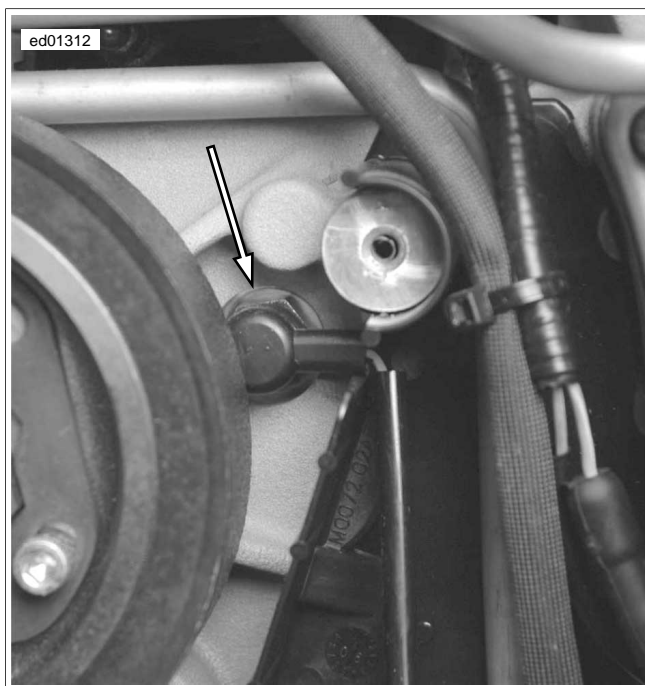


Figure 2-93. Neutral Switch

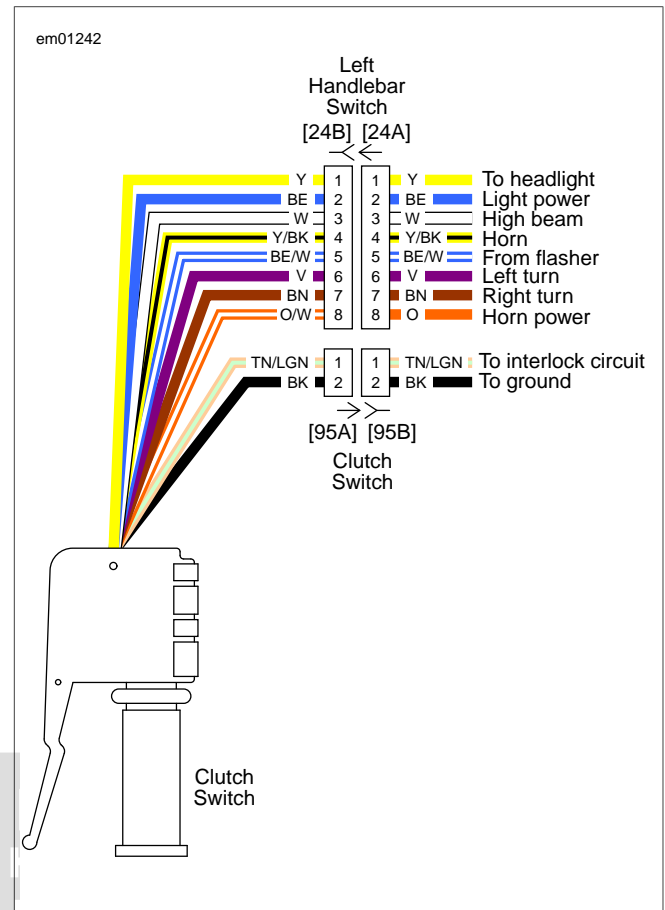


Figure 2-94. Left Handlebar Switch Connection (No pin 1 connection on Firebolt)

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. If DTC is current (lamp on continuously, clear codes return during operation), replace ECM. If DTC is historic, check for intermittents.

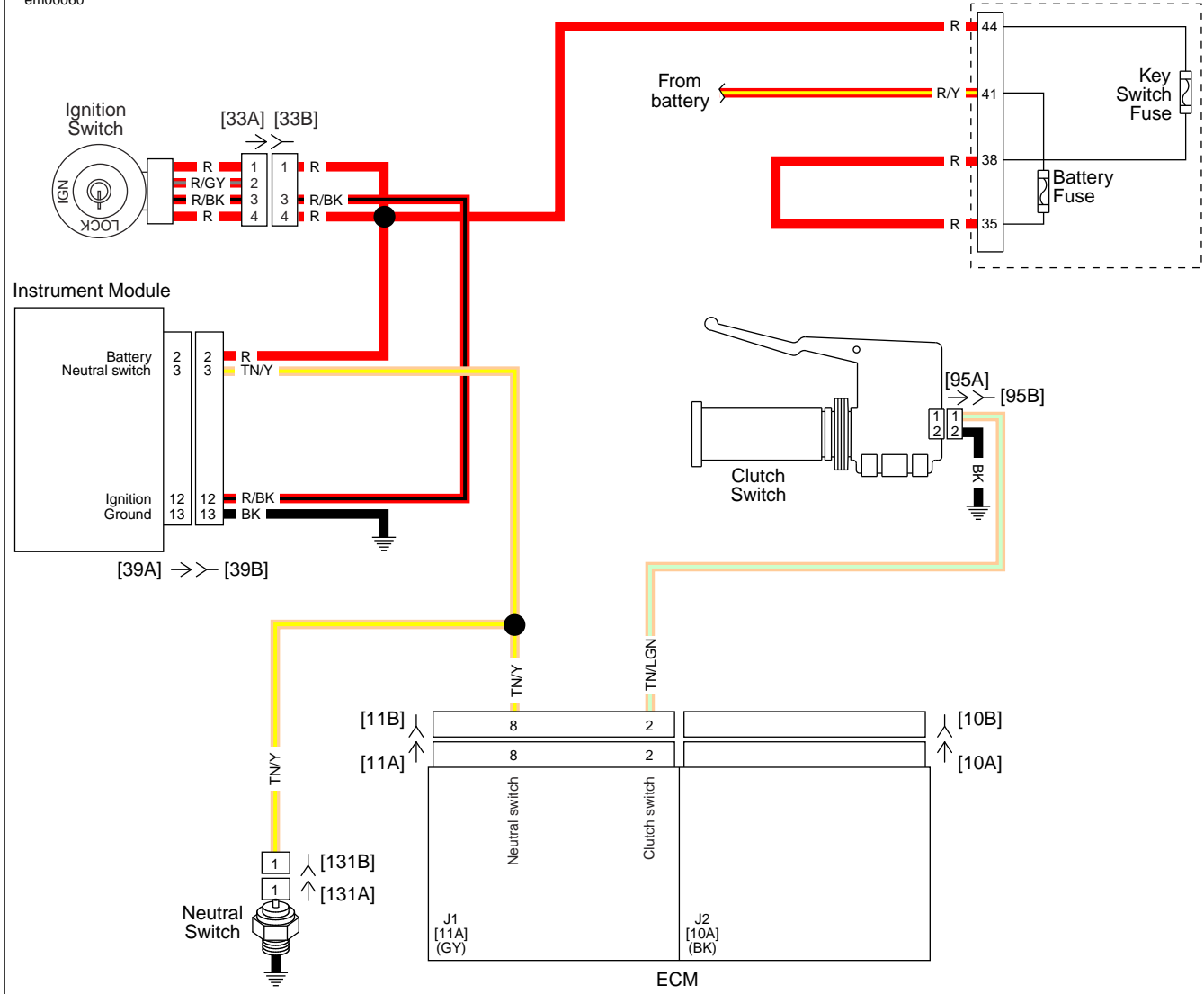


Figure 2-95. Clutch and Neutral Interlock Circuits (Ulysses, Lightning)

Table 2-66. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[33]	Ignition switch	4-place Augat	Behind windscreen
[39]	Instrument module	20-place Multilock	In front modules behind windscreen
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[131]	Neutral switch	1-place Bullet	Under sprocket cover

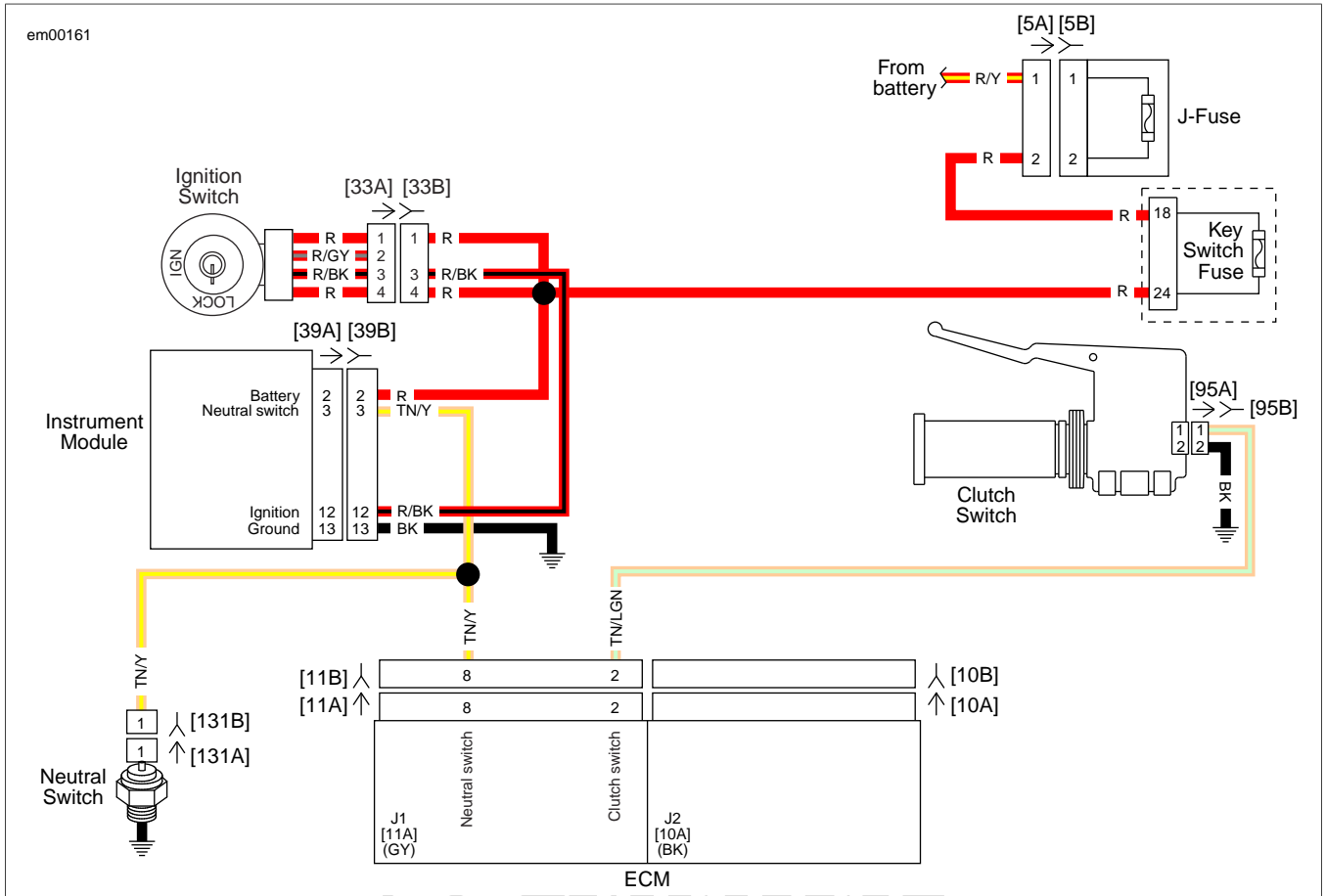
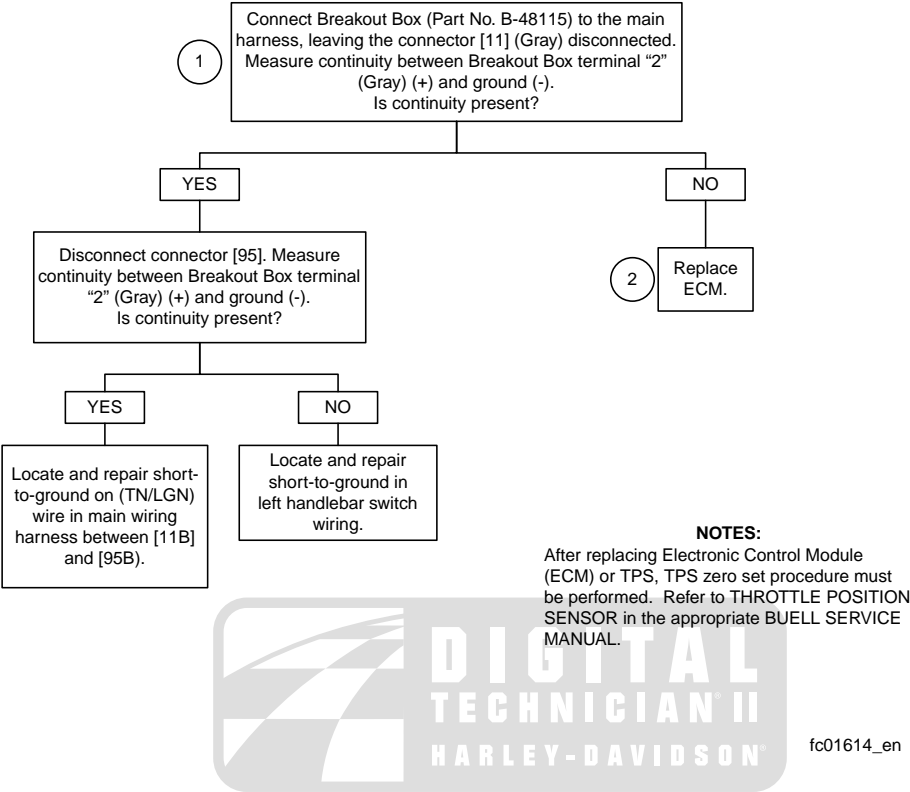


Figure 2-96. Clutch and Neutral Interlock Circuits (Firebolt)

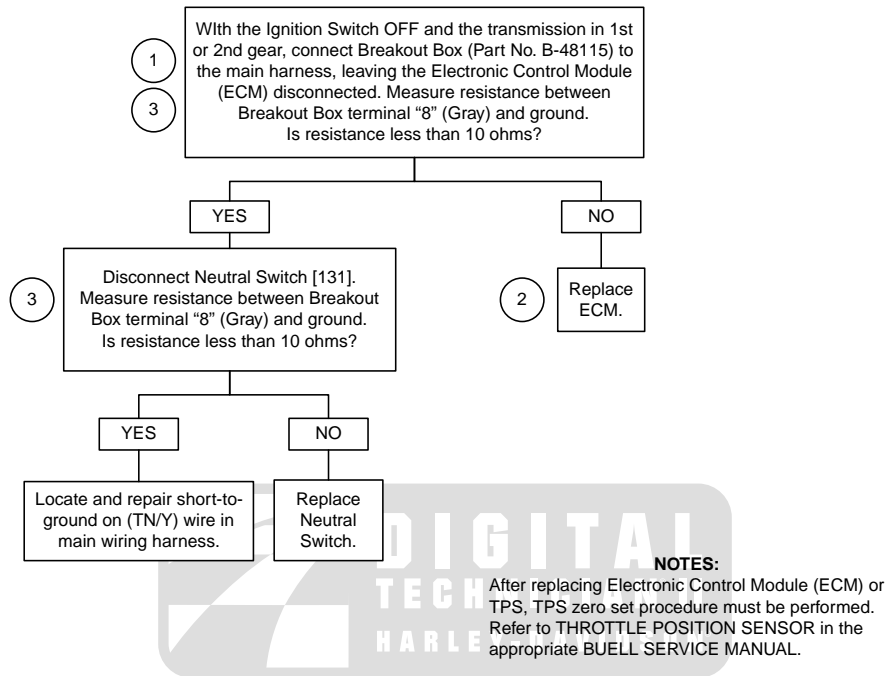
Table 2-67. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[33]	Ignition switch	4-place Augat	Beneath fairing
[39]	Instrument module	20-place Multilock	In fairing
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[131]	Neutral switch	1-place bullet	Under sprocket cover

Clutch Switch: DTC P1154 (26)



Neutral Switch: DTC P1155 (27)



fc01615_en

DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21)

2.33

INTERACTIVE MUFFLER CONTROL ACTUATOR

The interactive exhaust system utilizes an actuator valve in the muffler which is connected to a servo motor via a cable. The valve position automatically adjusts to enhance engine performance.

A Code 21 will set if the ECM detects that the output for the Interactive Muffler Control Actuator is not in agreement with the feedback circuit.

- Mechanical fault in the actuator, valve or cable.
- Electrical fault in the actuator circuit.
- Electrical fault in the actuator feedback circuit.
- Electrical fault in the brake light or horn circuits.

Table 2-68. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1470	21	Interactive muffler control actuator stuck open
P1471	21	Interactive muffler control actuator stuck closed
P1477	21	Interactive muffler control actuator low/open
P1478	21	Interactive muffler control actuator high

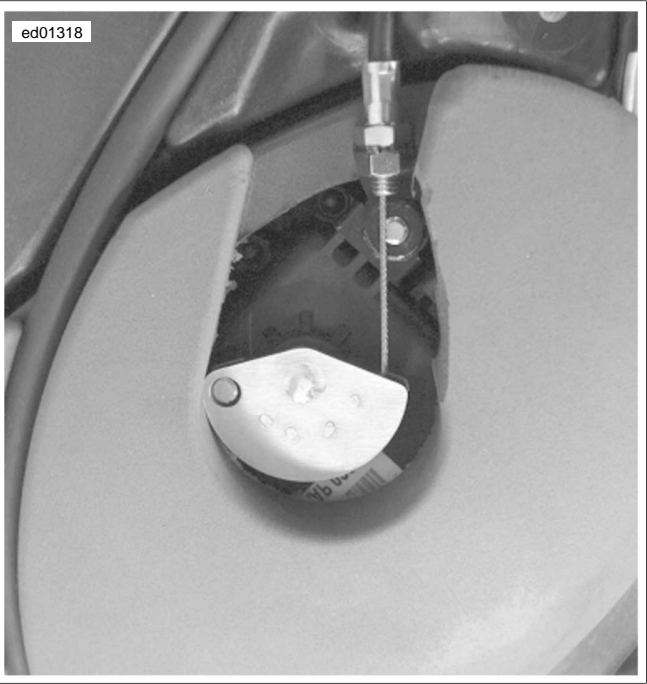


Figure 2-97. Active Muffler Control Actuator (Open)

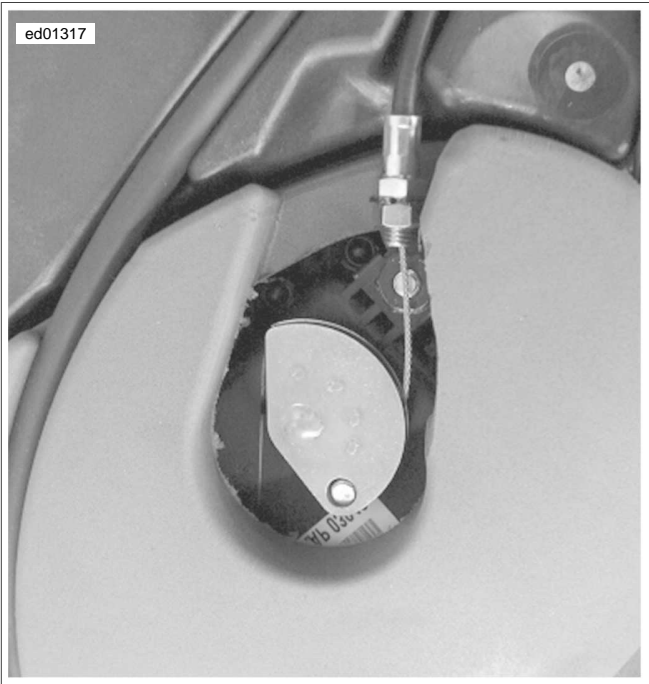


Figure 2-98. Active Muffler Control Actuator (Closed)

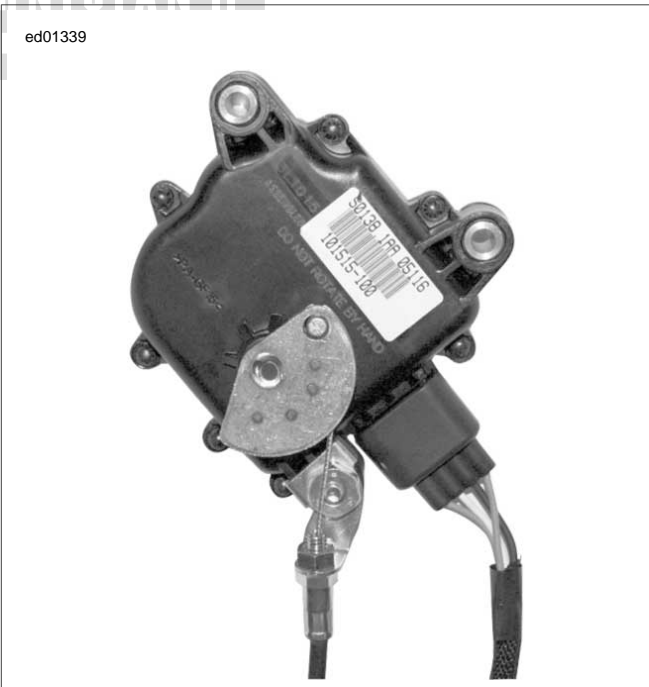


Figure 2-99. Active Muffler Control Actuator Motor

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), use purple male pin probe and patch cord.

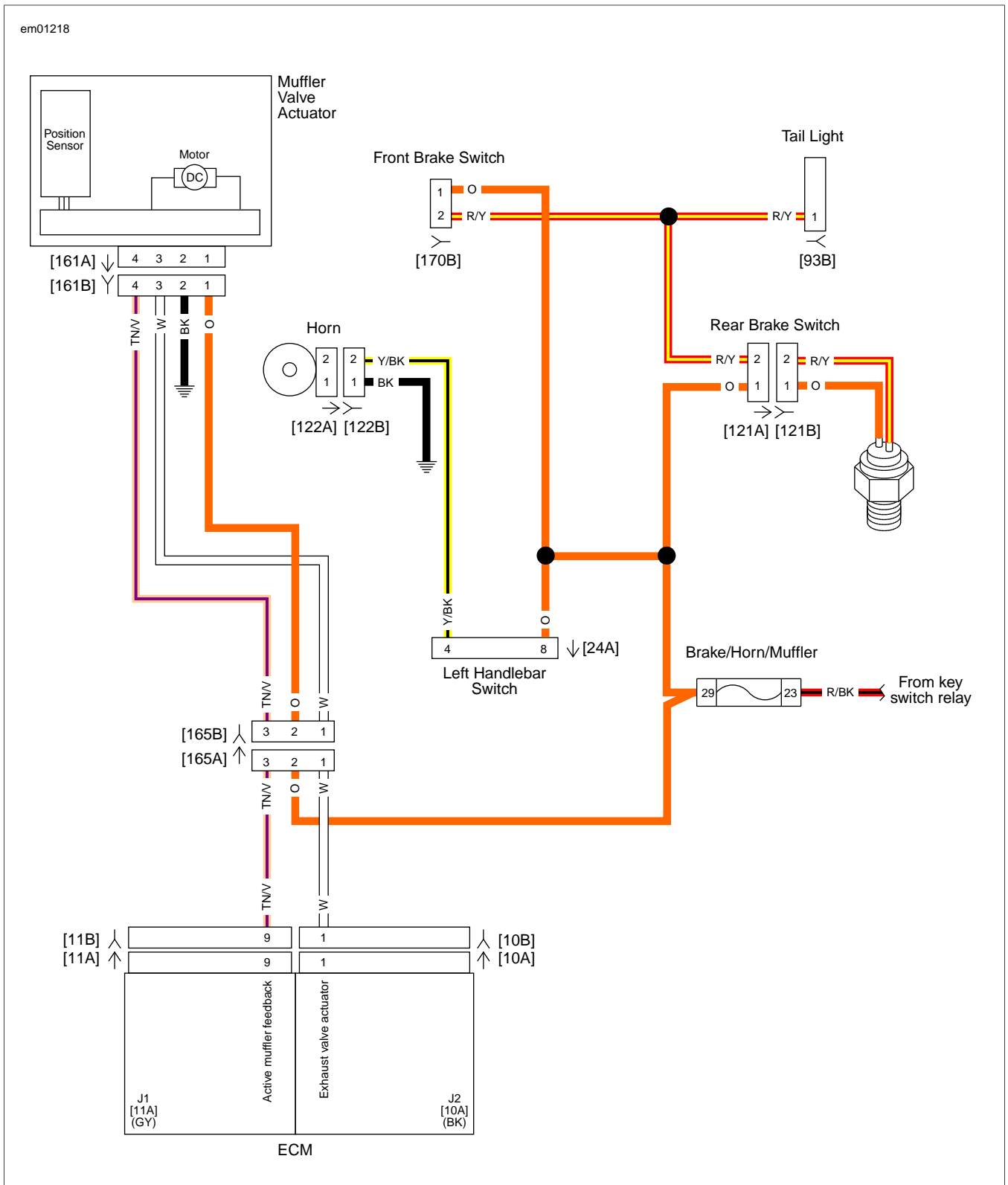


Figure 2-100. Interactive Exhaust Circuit (Ulysses, Lightning)

Table 2-69. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[11]	ECM (GY)	34-place Amp (Tyco)	Under seat
[24]	Left hand controls	4-place Multilock	Behind windscreen
[93]	Tail light	3-place Amp	Under seat
[121]	Front brake switch	2-place Multilock	Underside of front master cylinder assembly
[122]	Horn switch	Spade lugs	Behind windscreen
[161]	Muffler valve actuator	4-place Deutsch	Beneath intake cover assembly
[165]	Sub-harness	3-place Packard	Under seat



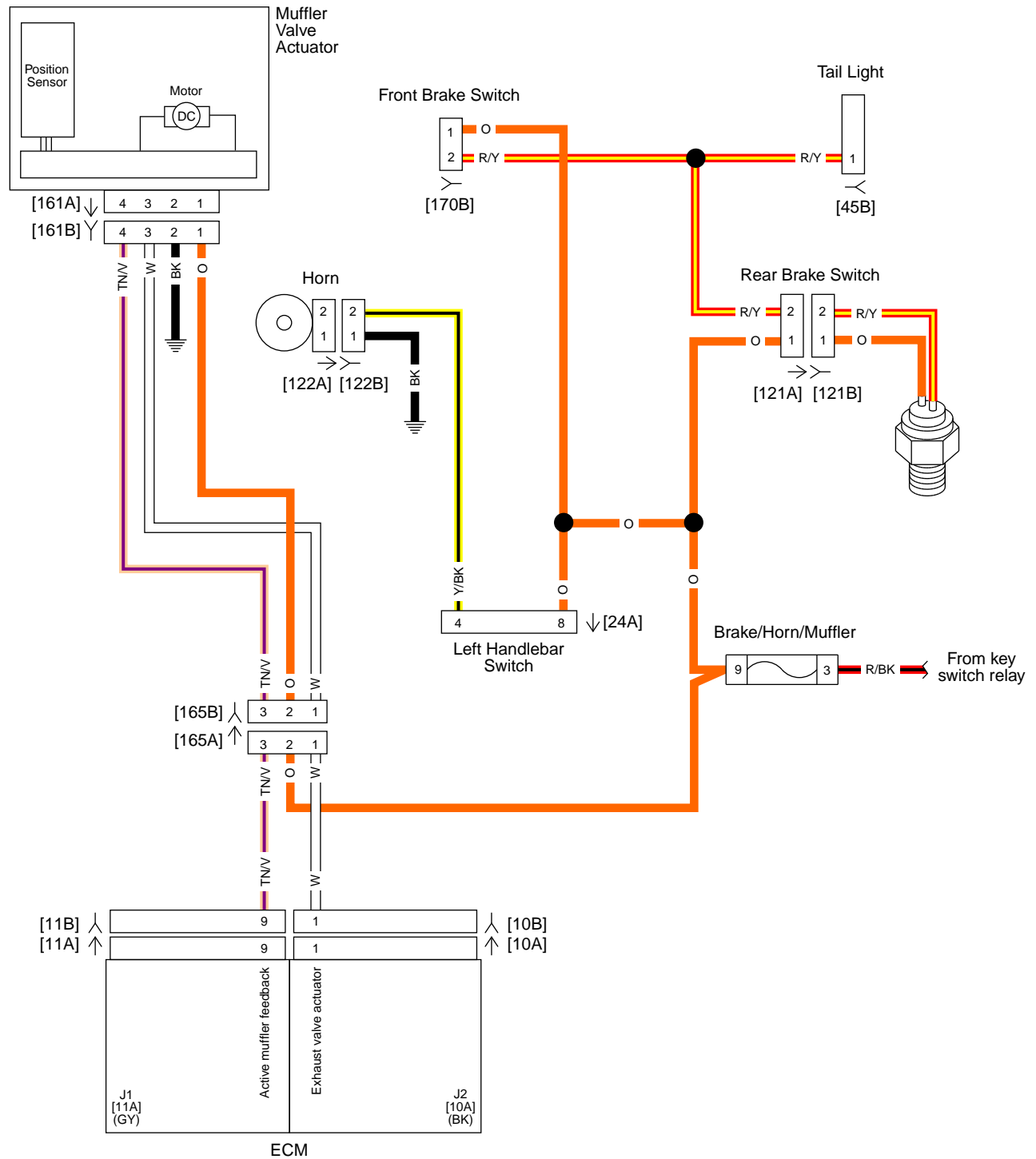


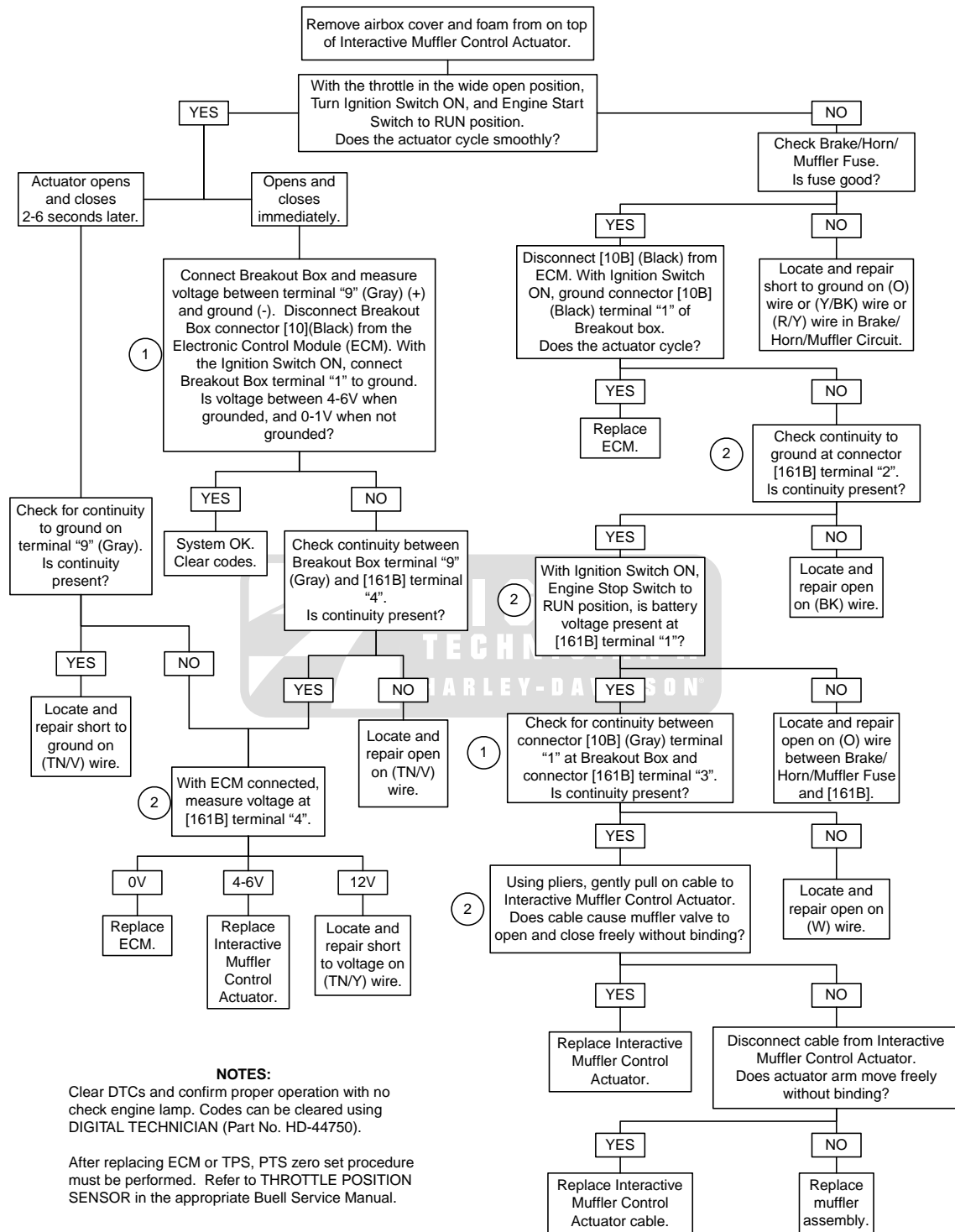
Figure 2-101. Interactive Exhaust Circuit (Firebolt)

Table 2-70. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[11]	ECM (GY)	34-place Amp (Tyco)	In fairing
[24]	Left hand controls	4-place Multilock	Beneath fairing
[45]	Tail light	3-place Amp	Under seat
[121]	Front brake switch	2-place Multilock	Underside of front master cylinder assembly
[122]	Horn switch	Spade lugs	In fairing
[161]	Muffler valve actuator	4-place Deutsch	Beneath intake cover assembly
[165]	Sub-harness	3-place Packard	Under seat



Interactive Muffler Control Actuator: DTC P1470 (21); DTC P1471 (22); DTC P1478 (22); DTC P1478 (22)



fc00401_en

GENERAL

Side Stand Sensor

The side stand sensor utilizes a Hall effect sensor to monitor side stand position. When the side stand is fully retracted, the sensor picks up the presence of the metal tab mounted on the side stand. When the side stand is extended, the engine will only start and run if the ECM receives a signal from the neutral switch indicating that the transmission is in neutral. Otherwise, the engine will start and stall.

The ECM provides 5V power feed and ground circuits to the side stand sensor. A signal is sent to the ECM based on side stand position. This signal allows the ECM to determine whether the side stand is retracted or extended.

The side stand sensor also has a fail enable mode. This mode allows the engine to start and run if the system recognizes a problem with the side stand sensor circuit.

Table 2-71. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1501	45	Side stand sensor low
P1502	45	Side stand sensor high
P1503	45	Side stand down at vehicle speed 9 MPH (15 km/h) or greater

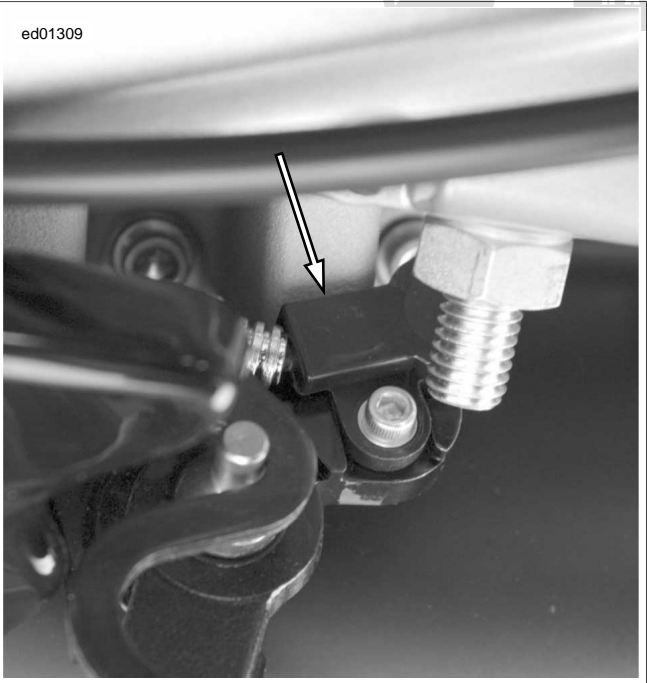


Figure 2-102. Side Stand Sensor



Figure 2-103. Side Stand Sensor Connector

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-39978	DVOM
HD-41404-B	HARNESS CONNECTOR TEST KIT

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. See the appropriate Buell Service Manual for ECM replacement.
2. Unplug the neutral switch connector [131]. Using a DVOM (Part No. HD-39978), test continuity to ground. When the transmission is in neutral, continuity should exist. When the transmission is in gear, there should not be continuity to ground through the neutral switch.
3. When the side stand is retracted, voltage on connector [11] terminal "34" (gray) should be approximately 1.5-2V. When the side stand is extended, the voltage on connector [11] terminal "34" (gray) should be approximately 4-4.5V.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown male probe and patch cord.

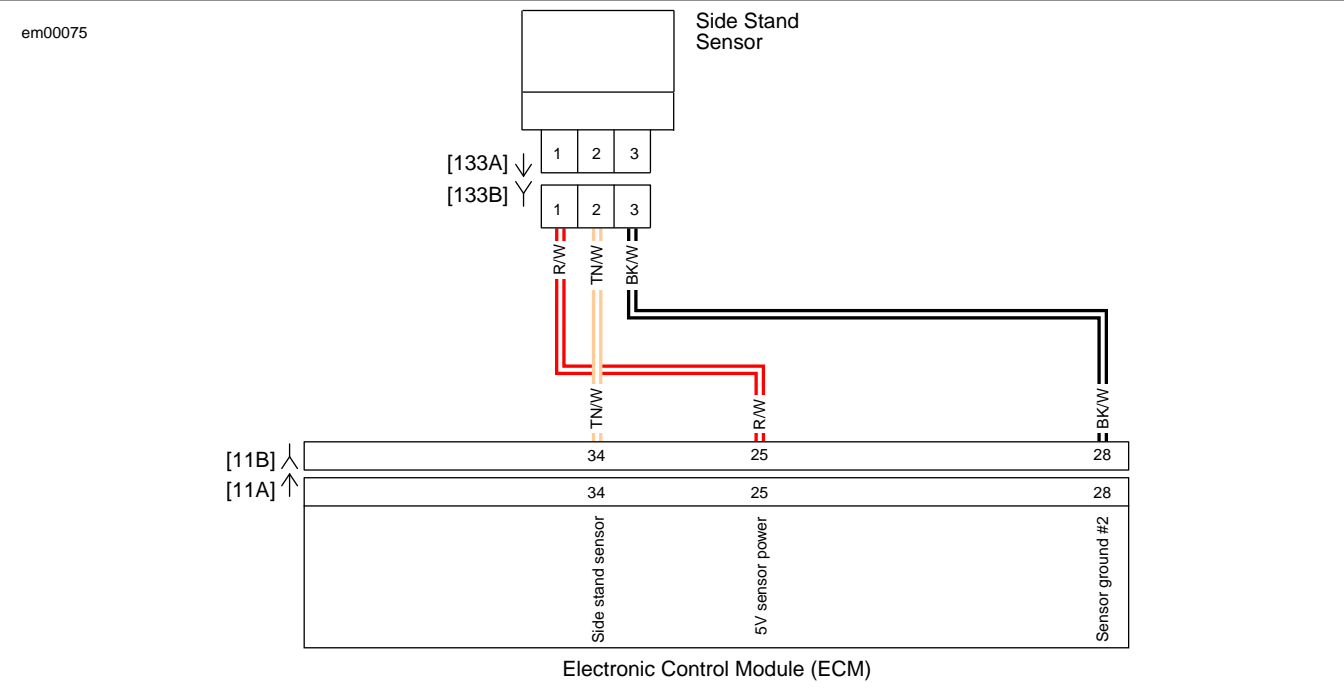
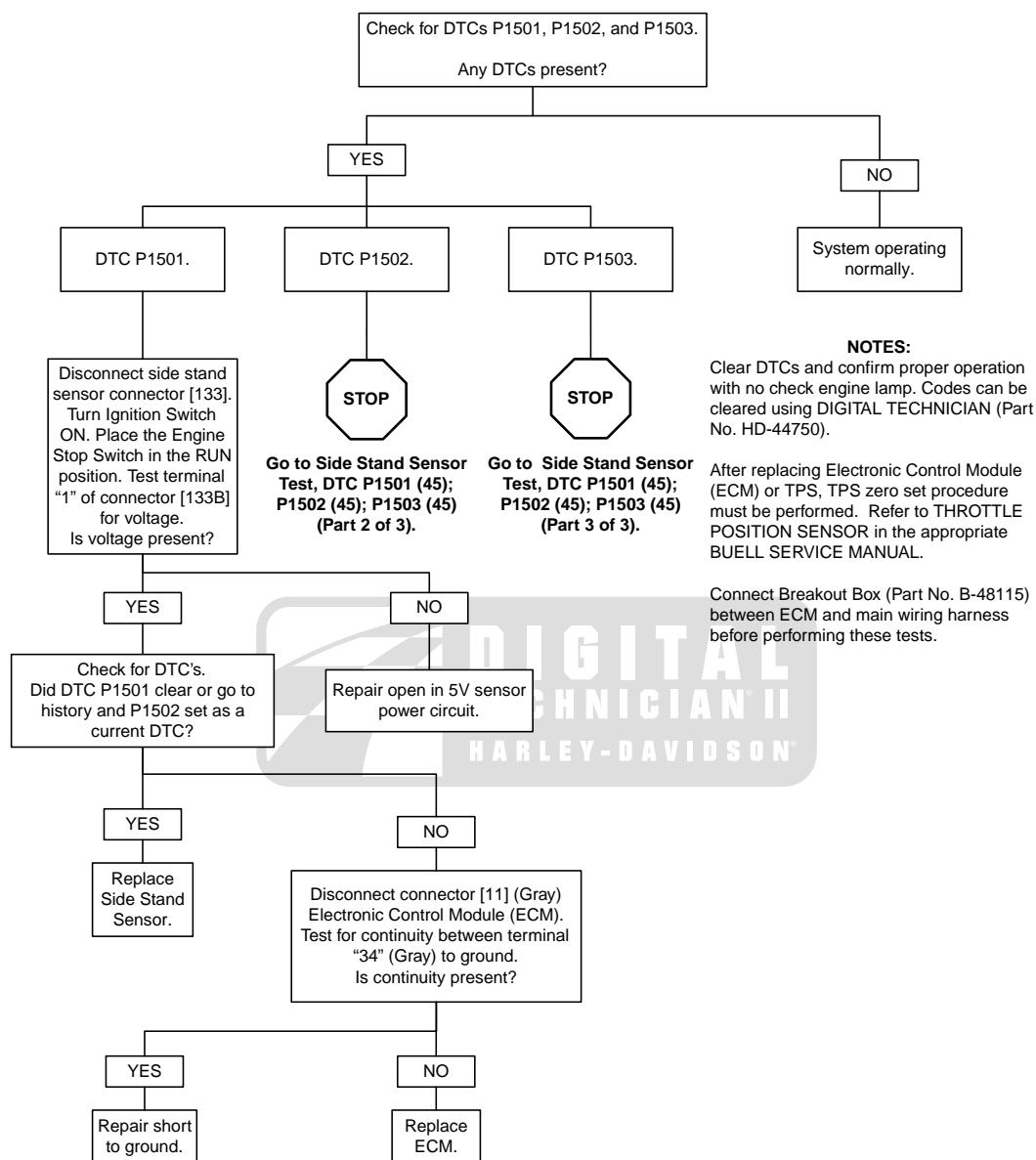


Figure 2-104. Side Stand Sensor Circuit (HDI only)

Table 2-72. Wire Harness Connectors

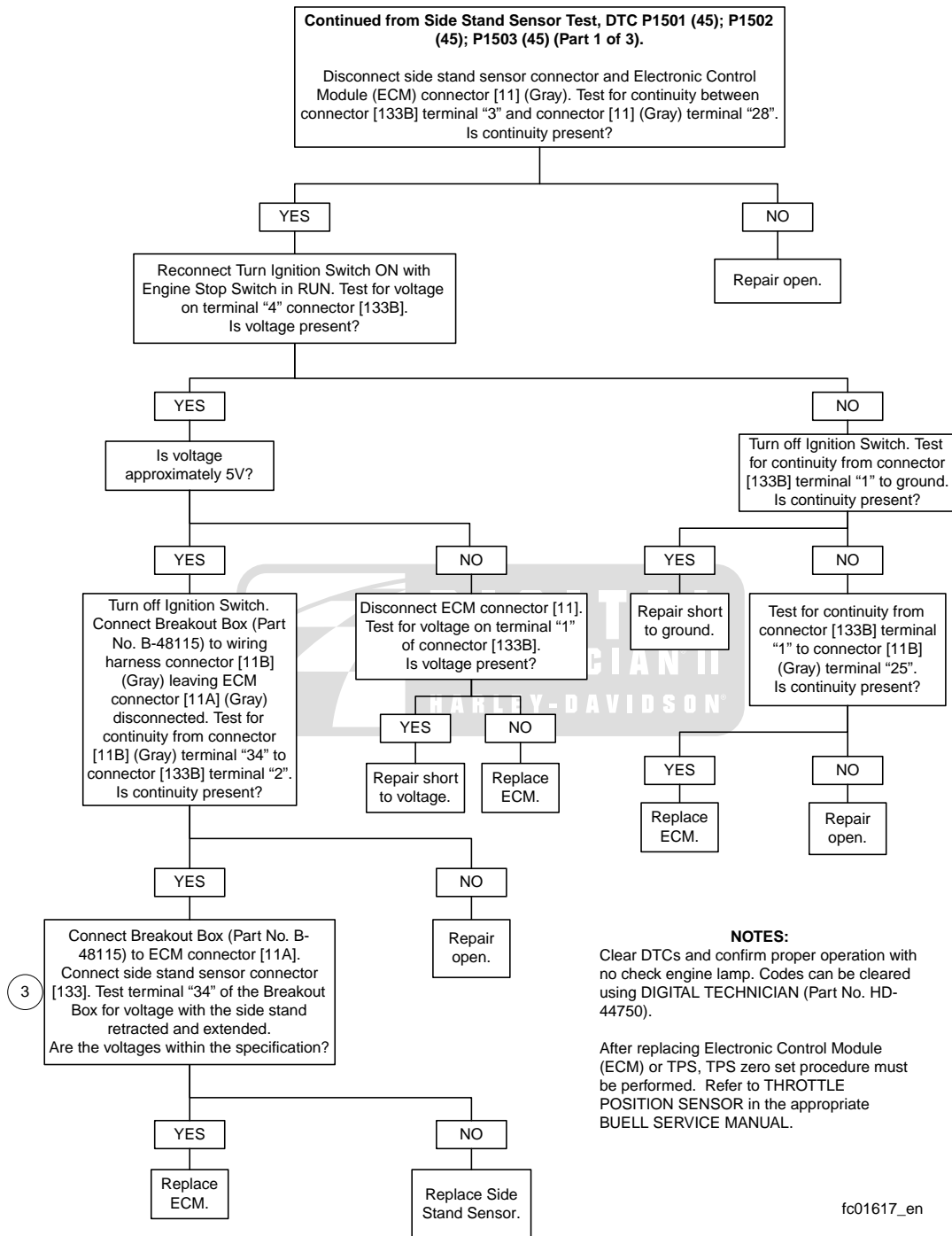
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[133]	Side stand sensor	All	3-place Amp	Behind left ram air scoop

Side Stand Sensor Low: DTC P1501 (45); Side Stand Sensor High: DTC P1502 (45); Side Stand Sensor Down at Vehicle Speed: DTC P1503 (45) (Part 1 of 3)

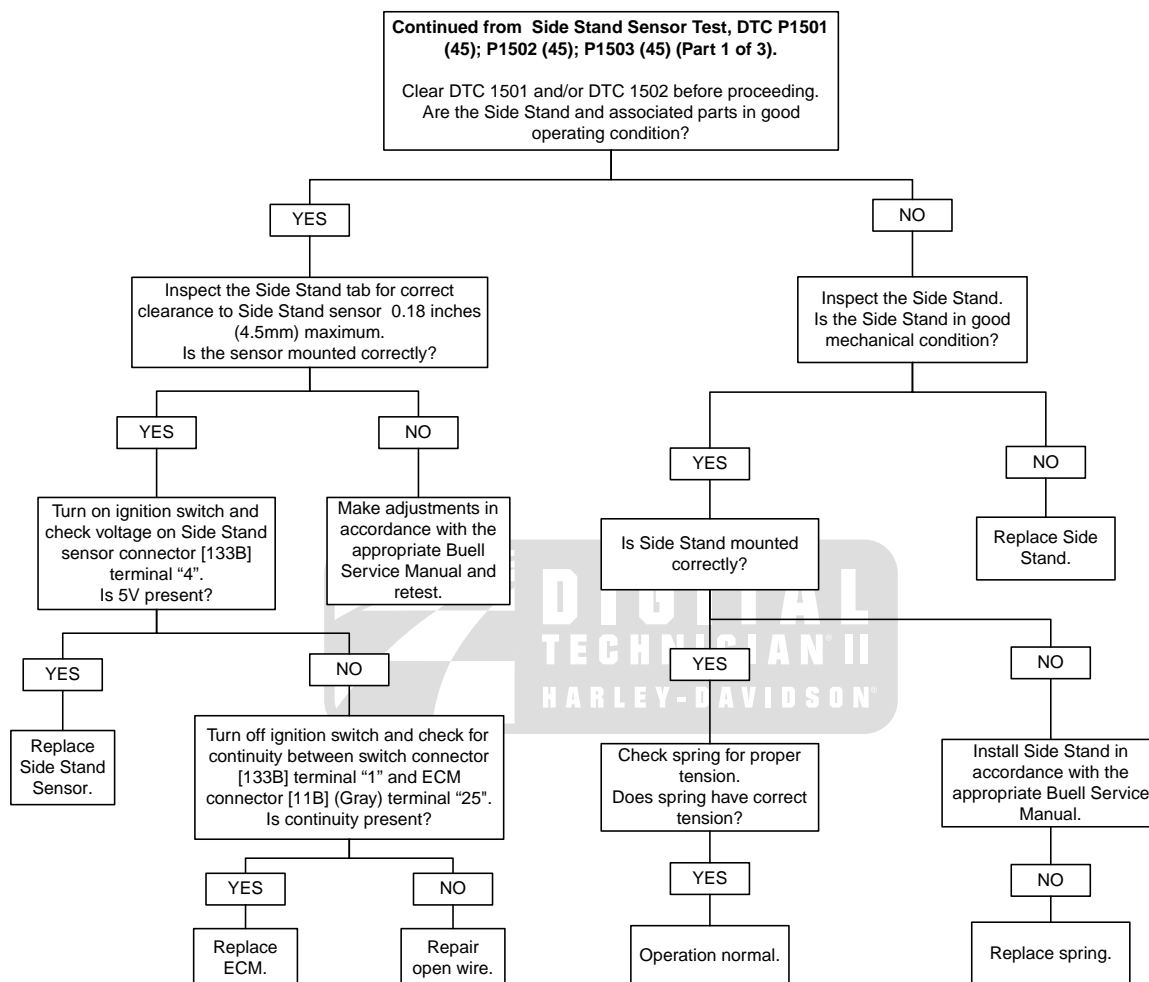


fc01616_en

Side Stand Sensor Low: DTC P1501 (45); Side Stand Sensor High: DTC P1502 (45); Side Stand Sensor Down at Vehicle Speed: DTC P1503 (45) (Part 2 of 3)



Side Stand Sensor Low: DTC P1501 (45); Side Stand Sensor High: DTC P1502 (45); Side Stand Sensor Down at Vehicle Speed: DTC P1503 (45) (Part 3 of 3)



fc01632_en

GENERAL**Auxiliary Power Outlets**

The 12-volt auxiliary power outlet circuit consists of two power outlets for the 12-volt electrical accessories. The front 12-volt auxiliary power outlet is located in the dash to the speedometer assembly. The rear 12-volt auxiliary power outlet is located in the tail section under the seat of the Ulysses only.

Table 2-73. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1601	47	Auxiliary relay driver circuit

**Figure 2-105. Front 12 Volt Auxiliary Power Outlet (Ulysses Shown)****Figure 2-106. Rear 12 Volt Auxiliary Power Outlet (Ulysses Only)****DIAGNOSTICS****Diagnostic Tips**

- The 12-volt auxiliary power outlets will function with the ignition switch key in the ON or PARK positions
- The 12-volt auxiliary power outlet circuit contains a 10-amp fuse to protect overloading of the circuit. Verify that the combined accessory load of the both power outlets does not exceed the amperage rating of the fuse.

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Remove the seat to access the rear 12-volt auxiliary power outlet electrical connector.
2. Remove the windscreen to access the front 12-volt auxiliary power outlet electrical connector.

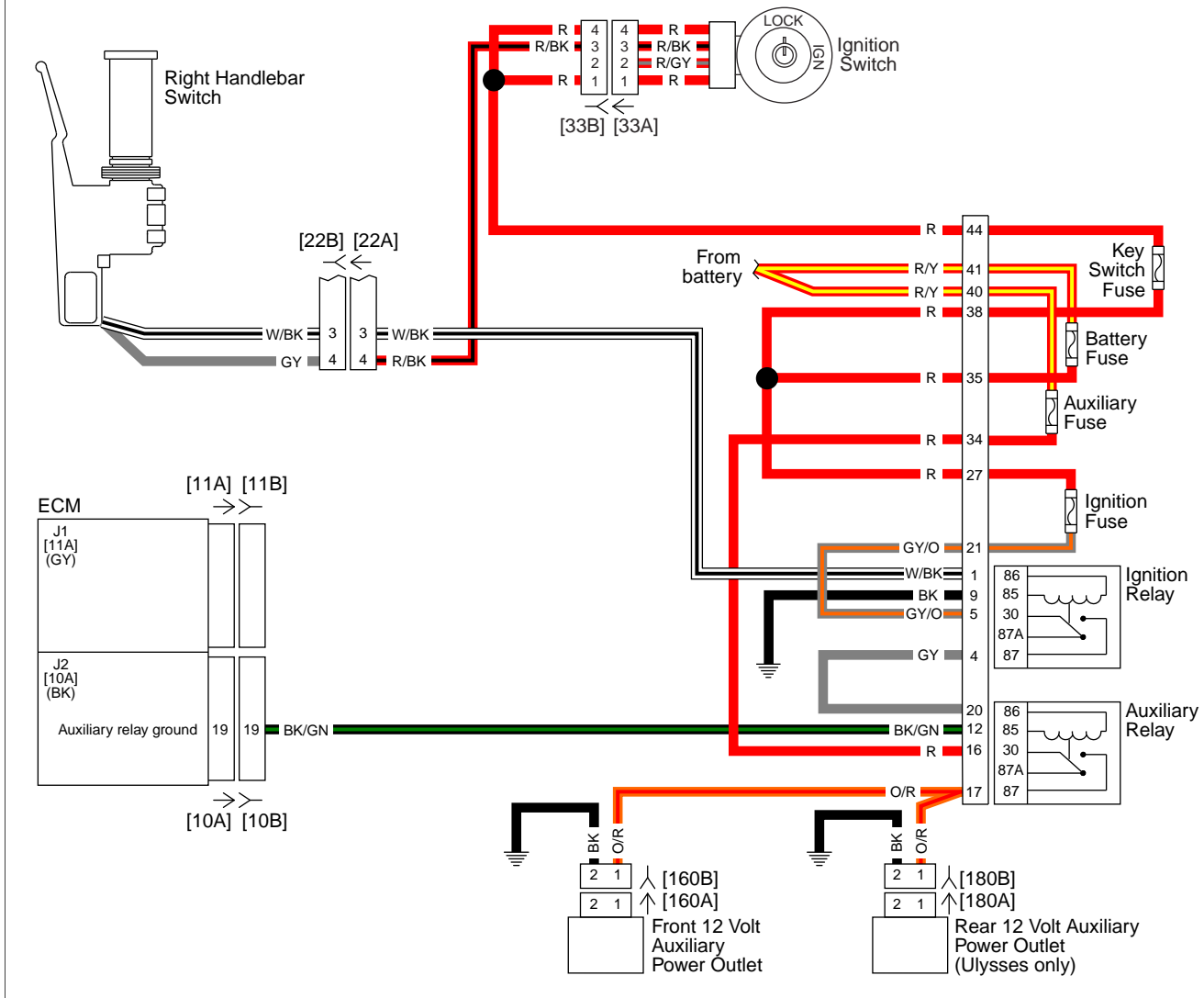


Figure 2-107. 12 Volt Auxiliary Power Outlet Circuit (Ulysses, Lightning)

Table 2-74. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	All	34-place Amp (Tyco)	Under seat
[22]	Right handlebar switch	All	4-place Multilock	Behind windscreen
[33]	Ignition switch	All	4-place Augat	Behind windscreen
[160]	Front 12-volt auxiliary power outlet	All	2-place Sumitomo	Behind windscreen
[180]	Rear 12-volt auxiliary power outlet	Ulysses only	2-place Sumitomo	Under seat

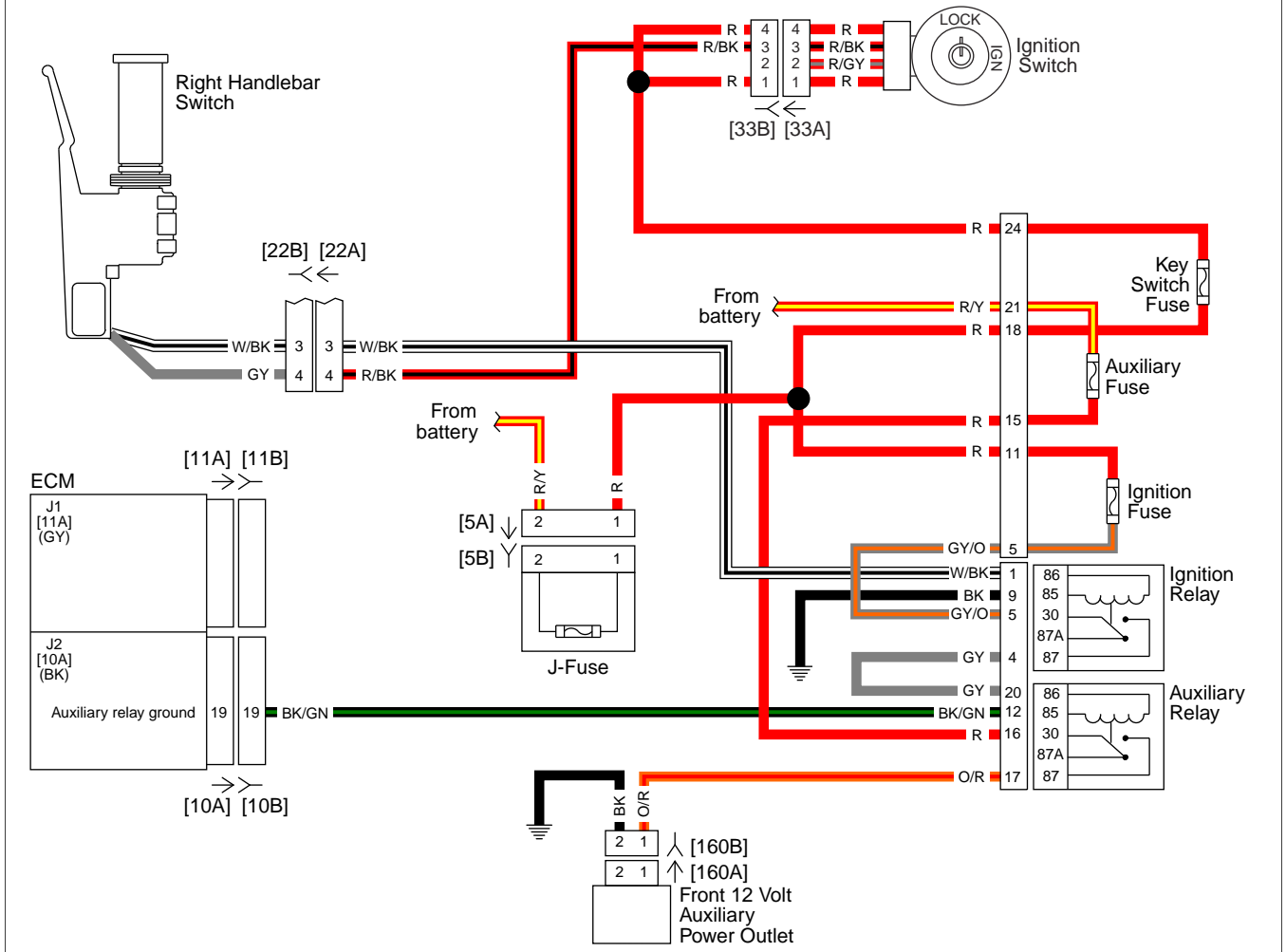
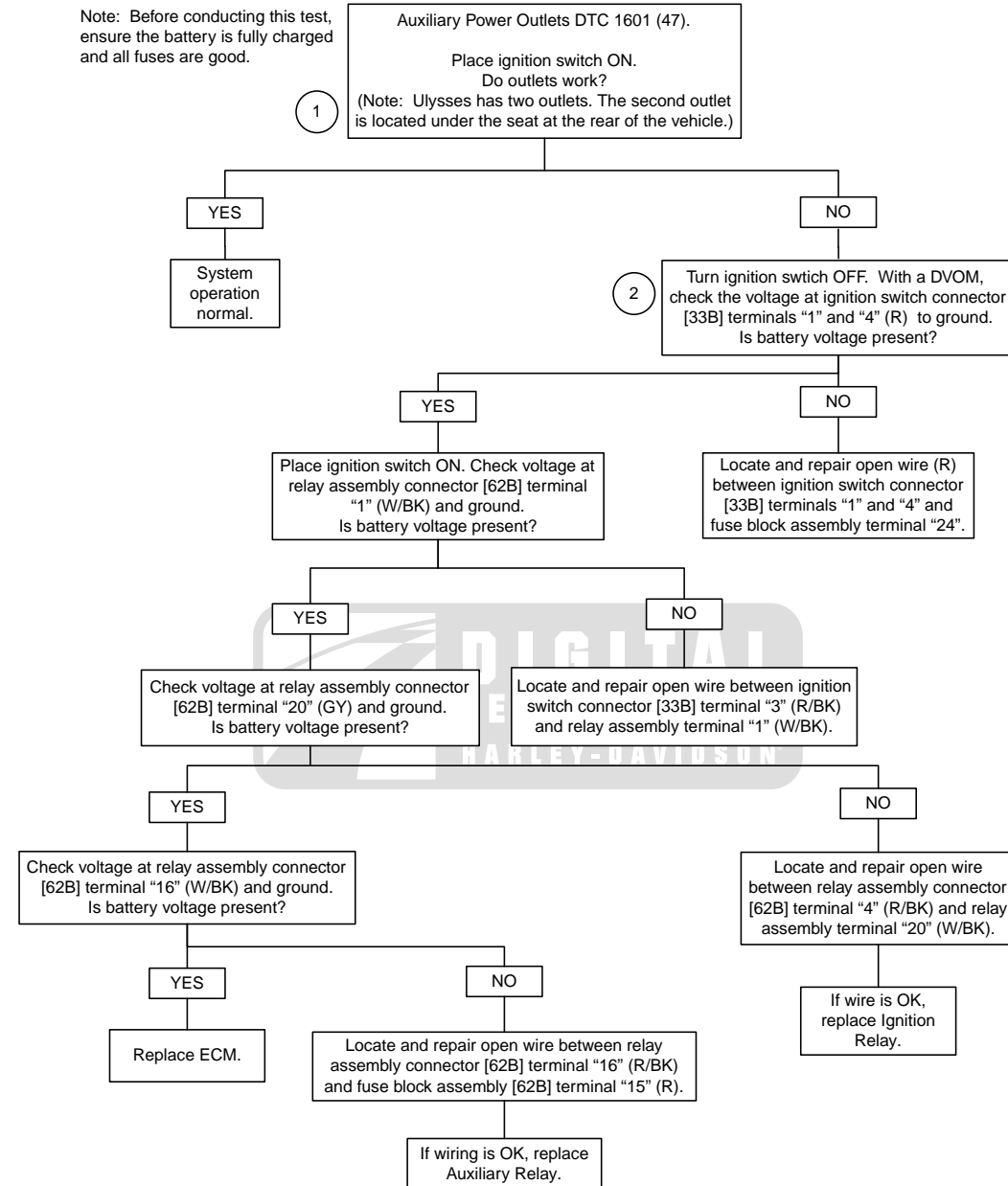


Figure 2-108. 12 Volt Auxiliary Power Outlet Circuit (Firebolt)

Table 2-75. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[22]	Right handlebar switch	4-place Multilock	Beneath fairing
[33]	Ignition switch	4-place Augat	Beneath fairing
[160]	Front 12-volt auxiliary power outlet	2-place Sumitomo	Beneath fairing

Auxiliary Power Outlet: DTC P1601 (47)



fc01639_en

GENERAL**Tachometer**

A DTC will set if the (PK) tachometer wire is shorted to power or ground.

Table 2-76. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P1653	35	Tachometer output low
P1654	35	Tachometer output high

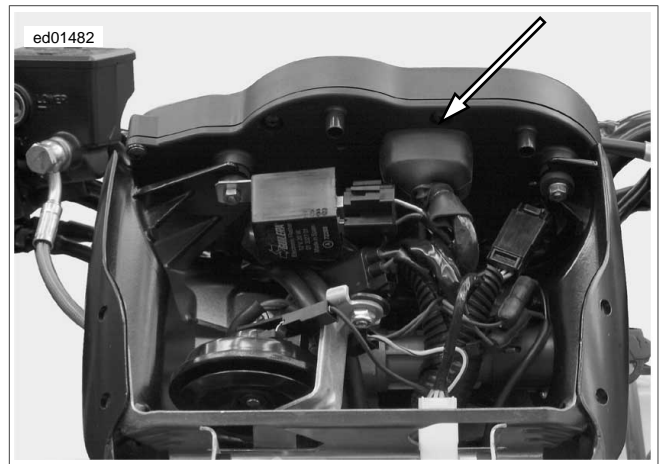
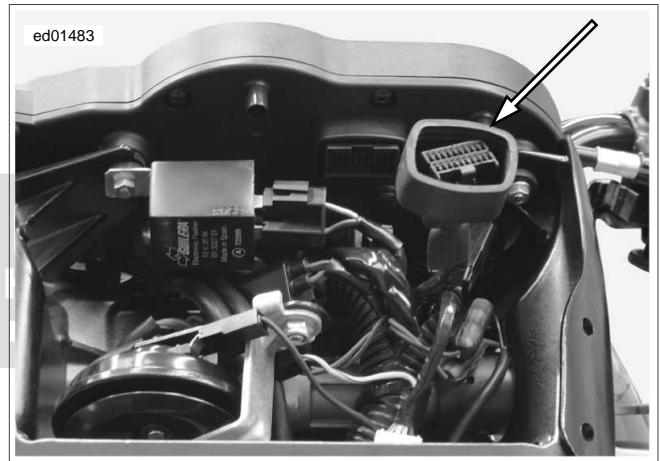
DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
2. Replace instrument module. See Instrument Module in the appropriate Buell Service Manual.

**Figure 2-109. Instrument Module Connector [39] (Typical)****Figure 2-110. Instrument Module Connector [39] (Disconnected)**

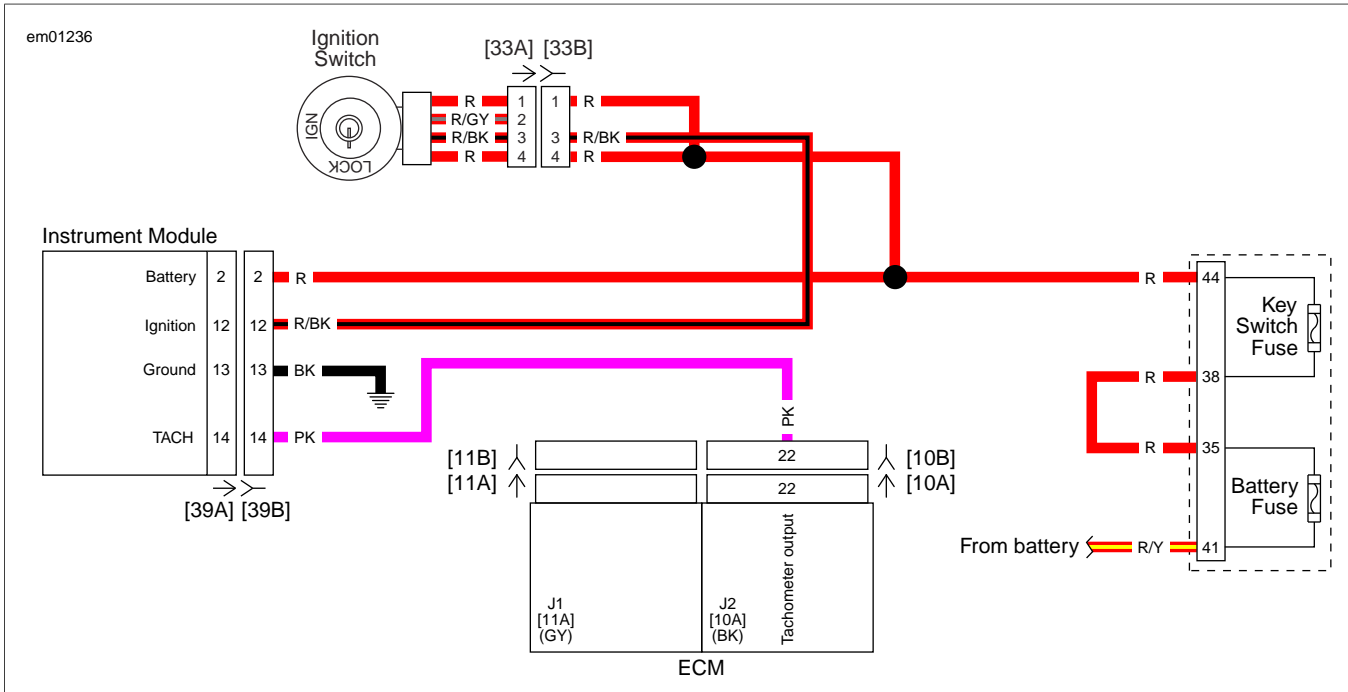


Figure 2-111. Tachometer Circuit (Ulysses, Lightning)

Table 2-77. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[10]	ECM (BK)	34-place Amp (Tyco)	Under seat
[33]	Ignition switch	4-place Augat	Behind windscreen
[39]	Instrument module	20-place Multilock	Behind windscreen

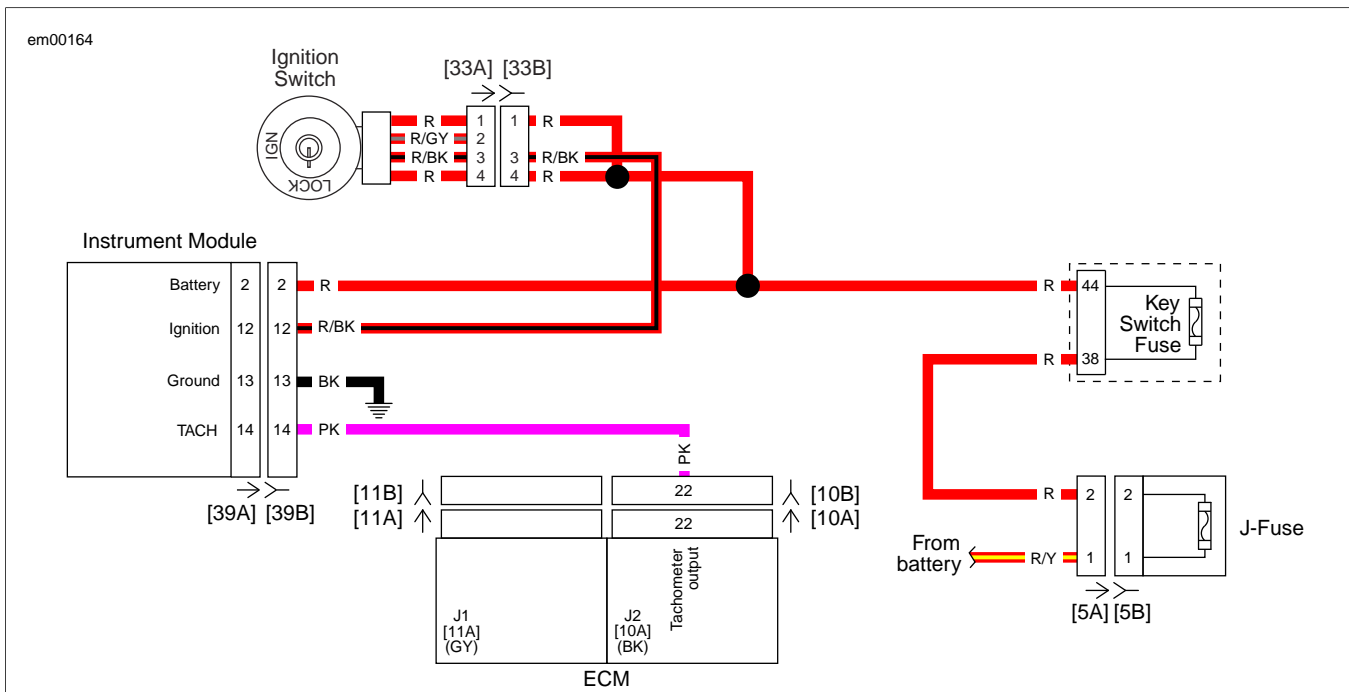


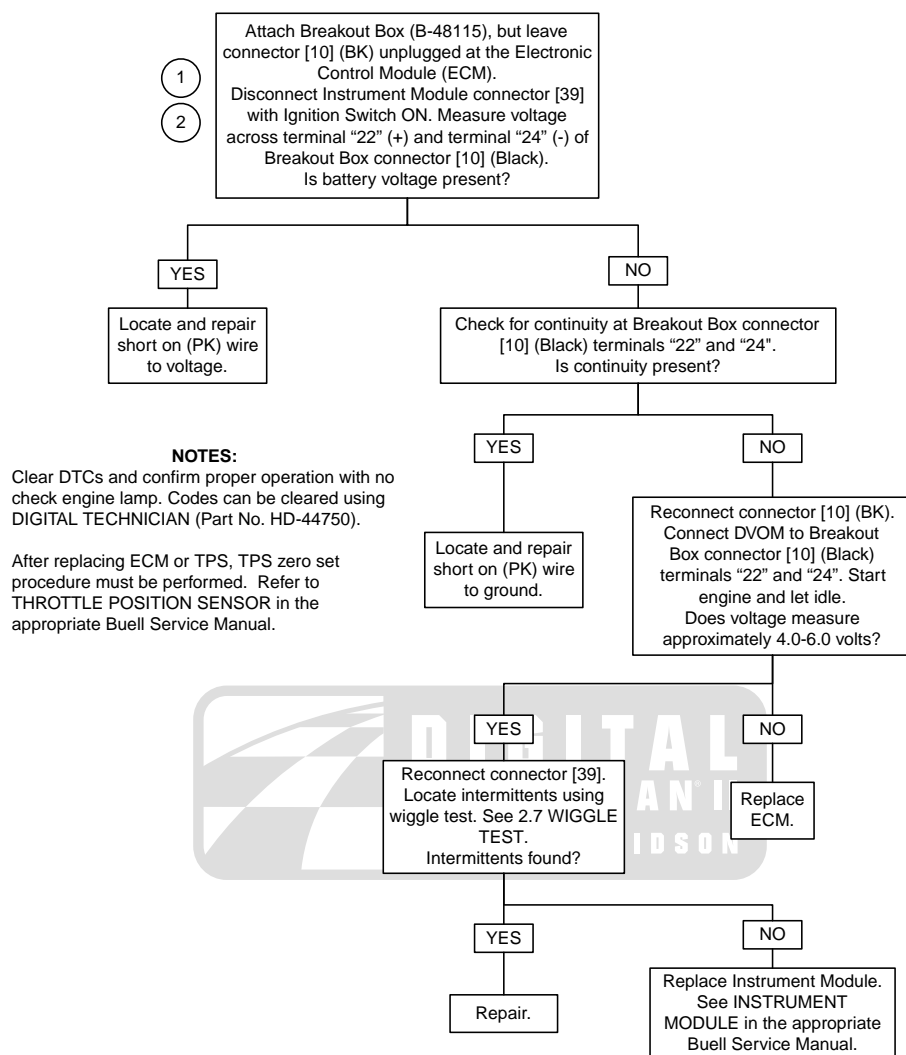
Figure 2-112. Tachometer Circuit (Firebolt)

Table 2-78. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	J-Fuse	Spade terminals	Under seat
[10]	ECM (BK)	34-place Amp (Tyco)	In fairing
[33]	Ignition switch	4-place Augat	Beneath fairing
[39]	Instrument module	20-place Multilock	In fairing



Tachometer: DTC P1653 (35); DTC P1634 (35)



fc00406_en

DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25)

2.37

GENERAL

Front (Code 24) and Rear (Code 25) Ignition Coils

A combination of these codes will set if the ignition coil rise time is out of range. This could occur if there is an open ignition coil or loss of power to the ignition coil. If multiple codes are set, P2303 (25), P2304 (25) the cause may be an ignition coil power failure.

See [Figure 2-113](#). The ignition coil receives power from the ignition relay at ignition coil pin B (3) at the same time that the fuel pump and fuel injectors are activated.

Table 2-79. Code Description

DTC	CHECK ENGINE LAMP CODE	DESCRIPTION
P2300	24	Front ignition coil control circuit low
P2301	24	Front ignition coil control circuit high
P2303	25	Rear ignition coil control circuit low
P2304	25	Rear ignition coil control circuit high

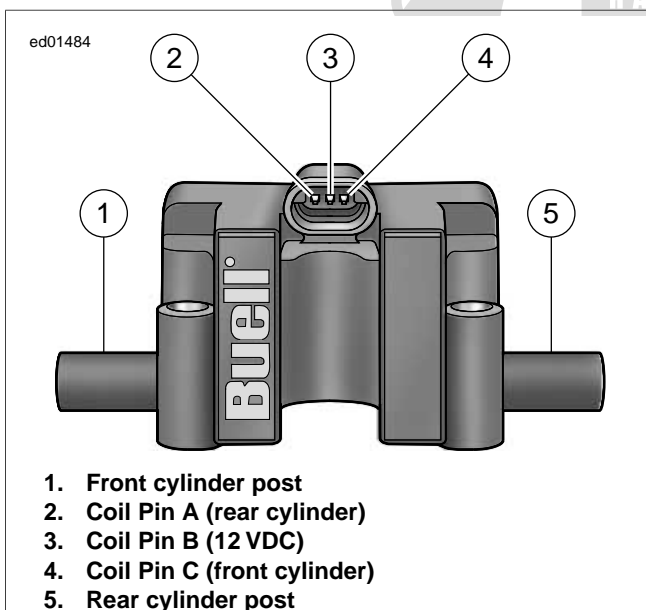


Figure 2-113. Ignition Coil

DIAGNOSTICS

PART NUMBER	TOOL NAME
B-48115	BREAKOUT BOX
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER

Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes and patch cord.
2. Connect BREAKOUT BOX (Part No. B-48115) to ECM. See [2.6 BREAKOUT BOX](#).
3. Plug IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) and FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) into Breakout Box. Note that cranking the engine with test lamp in place of the ignition coil can sometimes cause P2300 (24), P2301 (24), P2303 (25), P2304 (25). This condition is normal and does not by itself indicate a malfunction. Codes must be cleared if this condition occurs.
4. If resistance greater than 1 ohm is found between ECM connector [10] terminal "25" OR "34" and terminal "9", but not both, the open must be repaired but this repair will not correct the concern. If resistance greater than 1 ohm is found between ECM connector [10] terminal "31" OR "32" and terminal "9", but not both, the open must be repaired but this repair will not correct the concern.

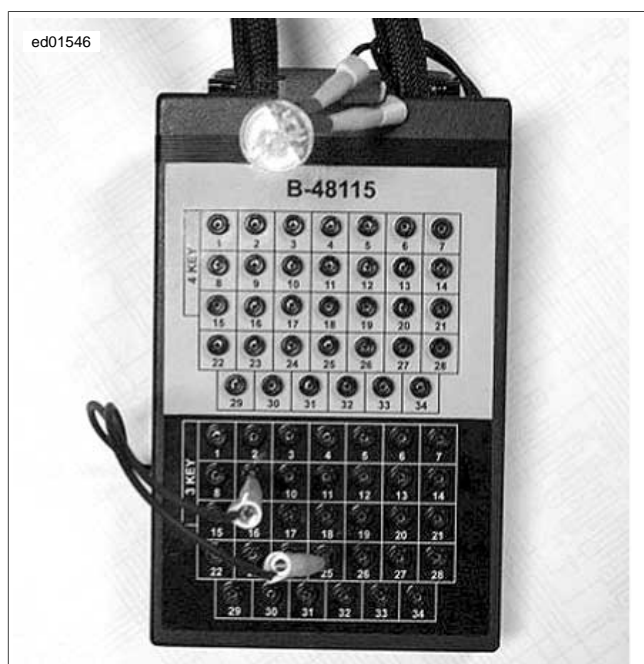


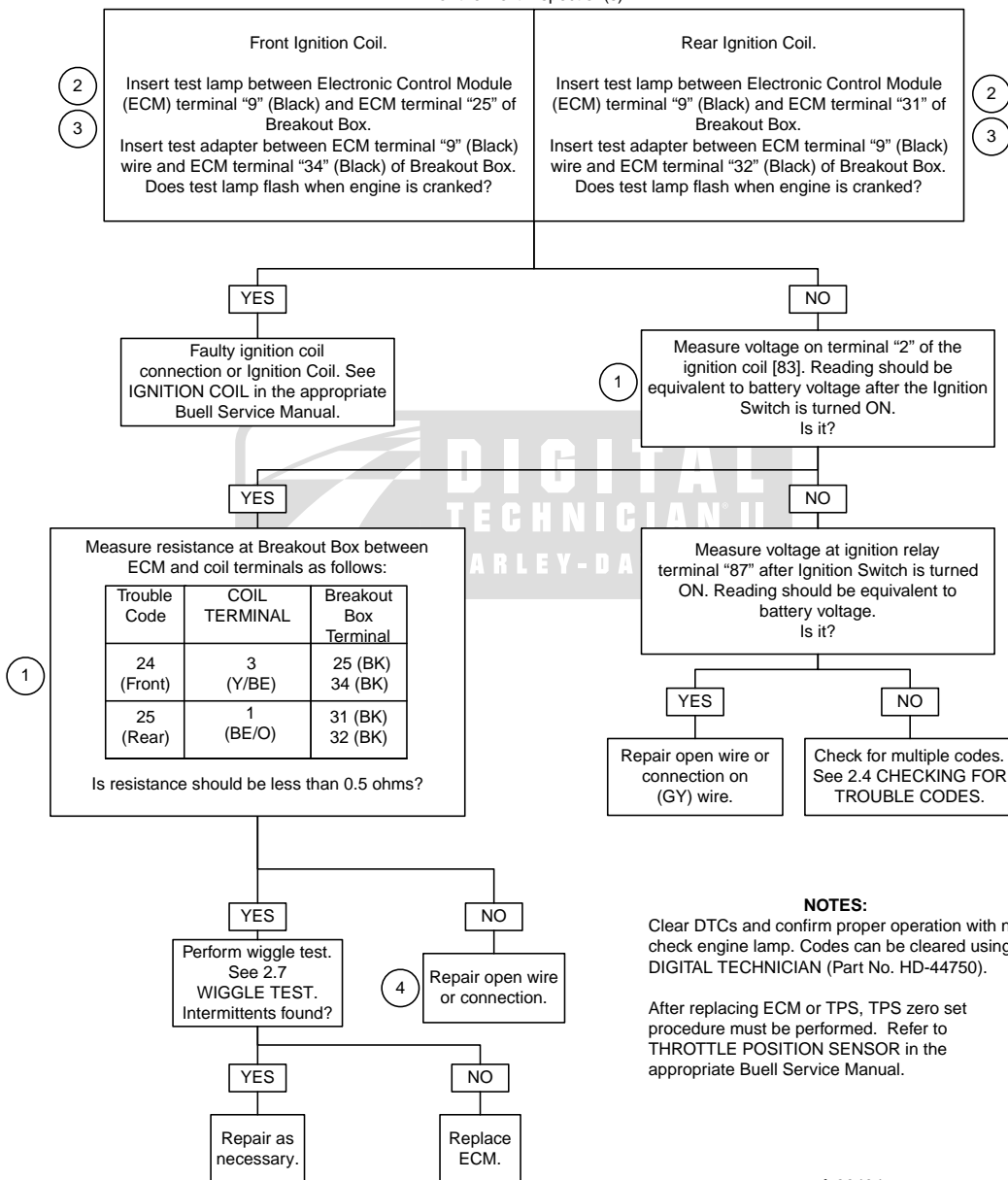
Figure 2-114. Ignition Coil Circuit Test



NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[10]	ECM (BK)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[11]	ECM (GY)	Firebolt	34-place Amp (Tyco)	In fairing
		Ulysses, Lightning		Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Below left ram air scoop
[83]	Ignition coil	All	3-place Delphi	Beneath air cleaner base plate

Ignition Coil: DTC P2300 (24); DTC P2301 (24); DTC P2303 (25); DTC P2304 (25)

NOTE:
Use Breakout Box and test adapter
for the Next Inspection(s).



fc00404_en

GENERAL

Heated Handlebar Grips are installed on the Ulysses model as standard equipment. High and low heat ranges are included consuming 18 and 11 watts, respectively. See [Figure 2-116](#) for heater controls. Power for operation is routed through a Heated Handlebar Grips subharness connected to the Auxiliary Power circuit.

There are no diagnostic trouble codes (DTCs) for this equipment. Refer to [Table 2-81](#) for Heated Handlebar Grips specifications.

DIAGNOSTICS

Diagnostic Tips

- The heated handlebar grips will function with the ignition switch in the ON position.
- The 12 Volt auxiliary circuit contains a 10 Amp fuse to protect overloading the circuit. Any auxiliary loads in addition to the heated handlebar grips should be reduced when the heated handlebar grips are used so as to not exceed the ampere rating of the fuse.

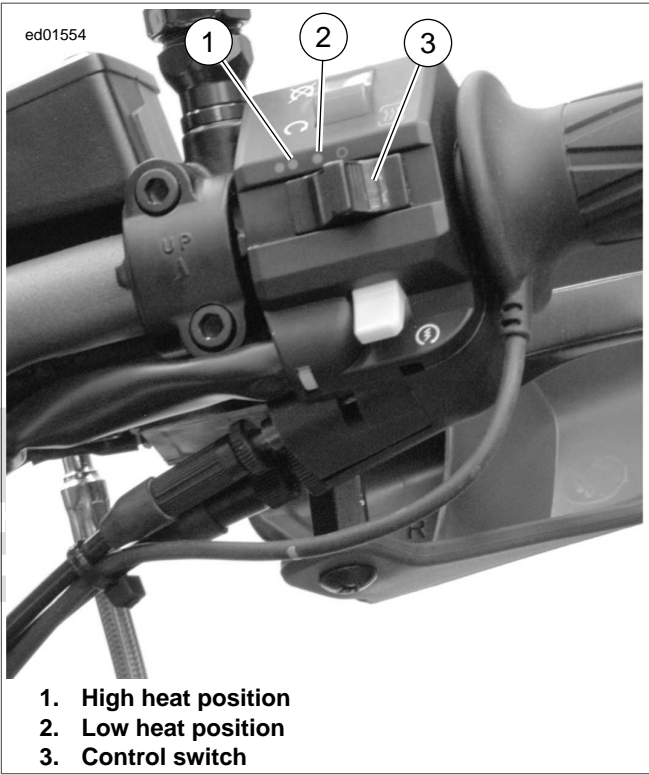
Diagnostic Notes

Each reference number below correlates to a circled number on the flow chart(s).

1. Remove windscreen to access the connectors for the Heated Handlebar Grips.

Table 2-81. Heated Handlebar Grips Specification

PARAMETER	TEMPERATURE RANGE 1 (HI)	TEMPERATURE RANGE 2 (LO)
Voltage	12V±0.26 VDC	12V
Current	1.5A	0.93A
Watts (@ 12V)	18W, ±15%	11W
Heating Element Resistance	8 Ohms	13 Ohms



1. High heat position
2. Low heat position
3. Control switch

Figure 2-116. Heated Handlebar Grips Control Switch

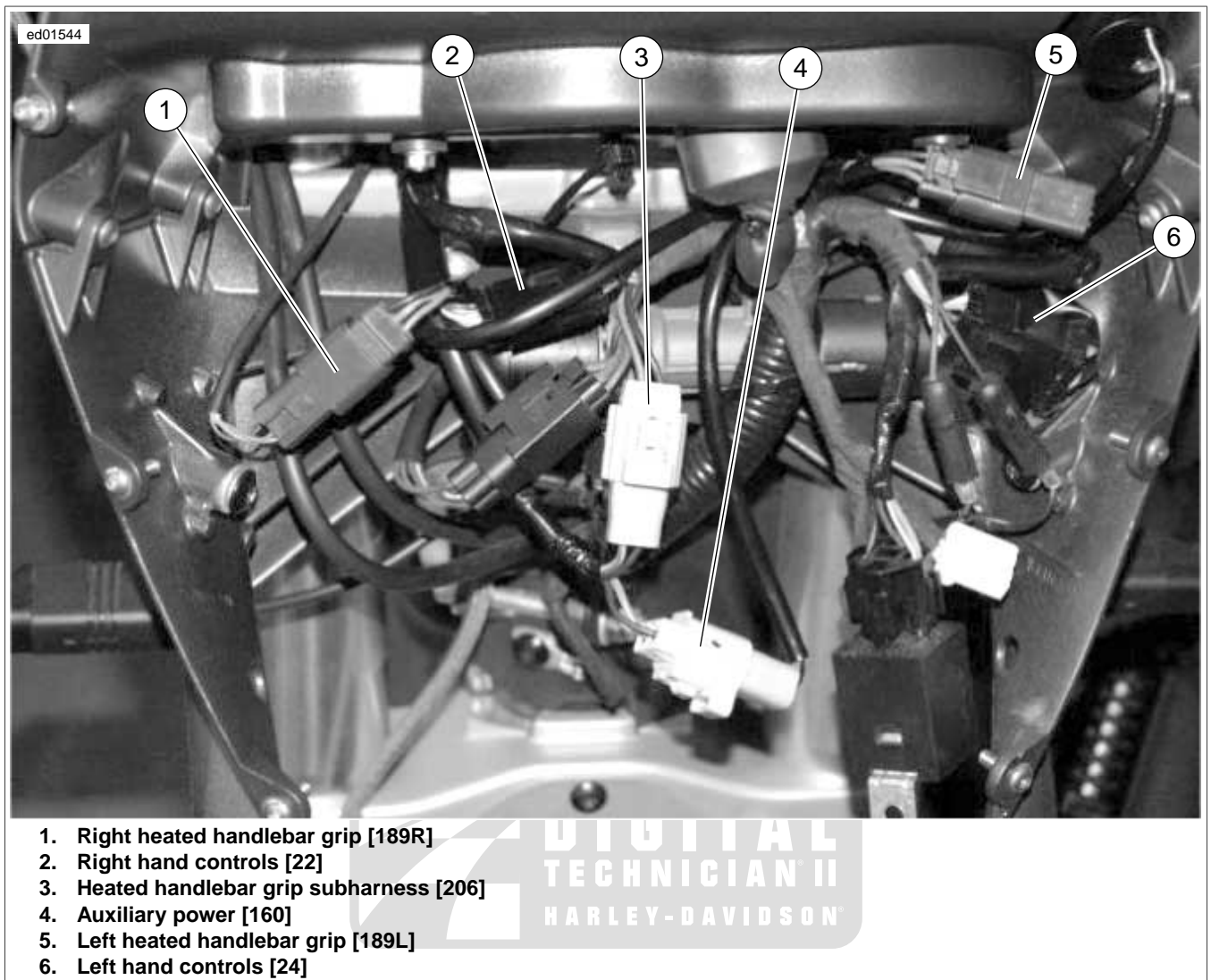


Figure 2-117. Heated Handlebar Grips Connector Locations

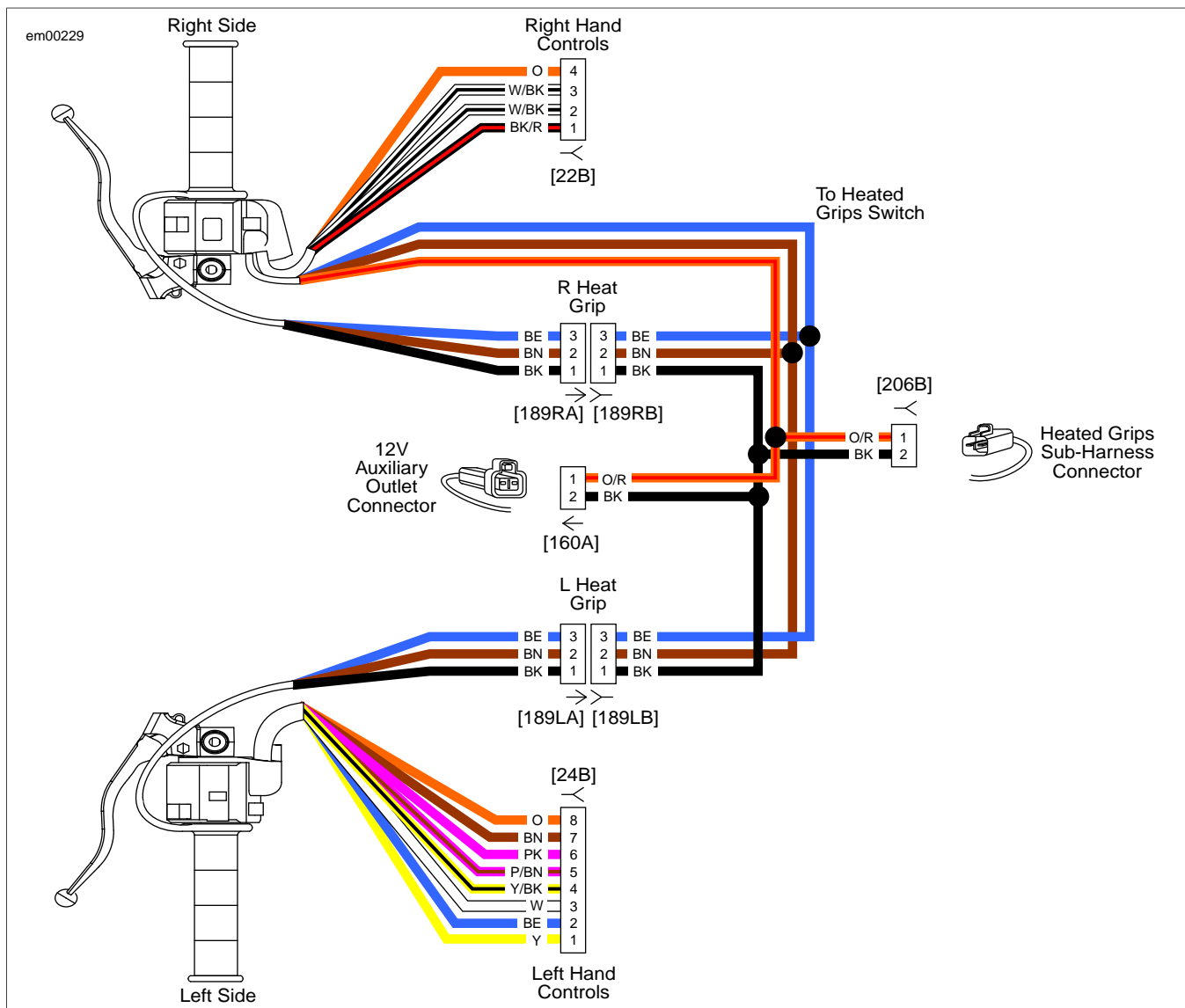
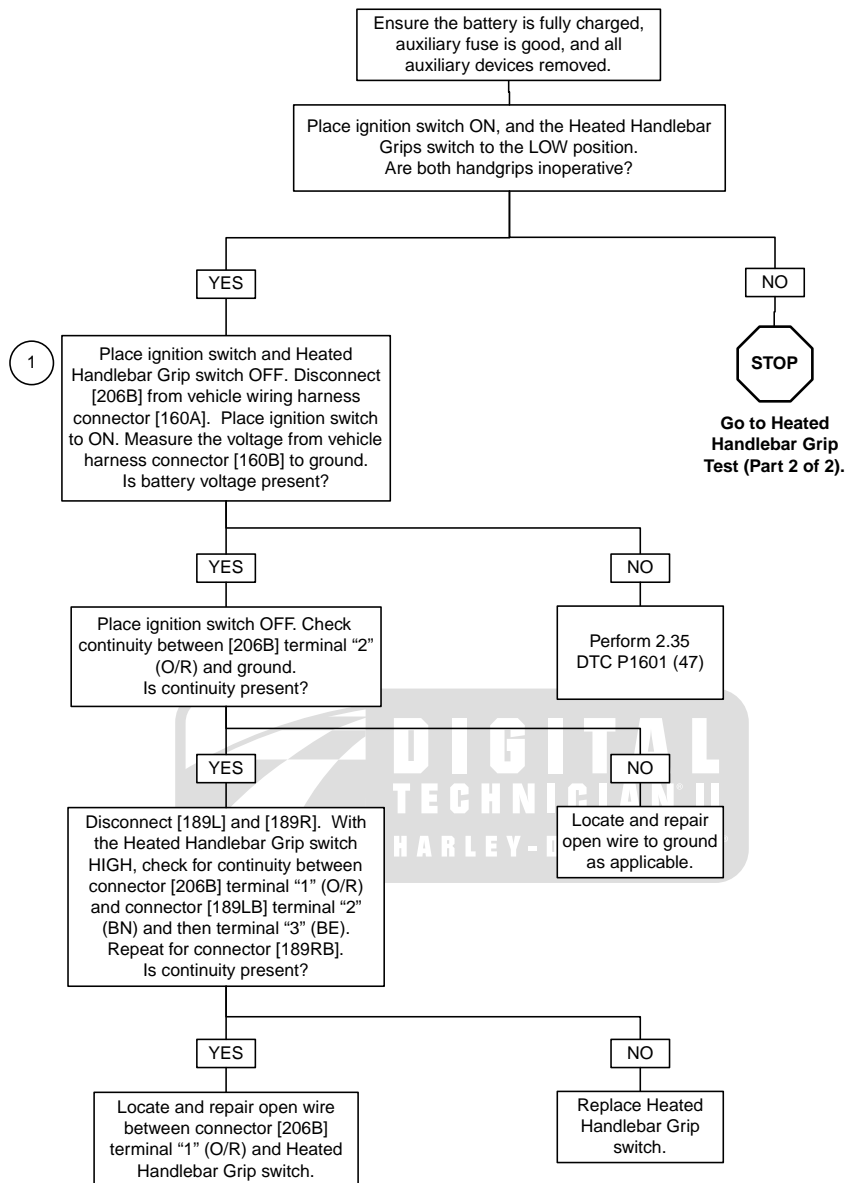


Figure 2-118. Heated Handlebar Grips Circuit

Table 2-82. Wire Harness Connectors

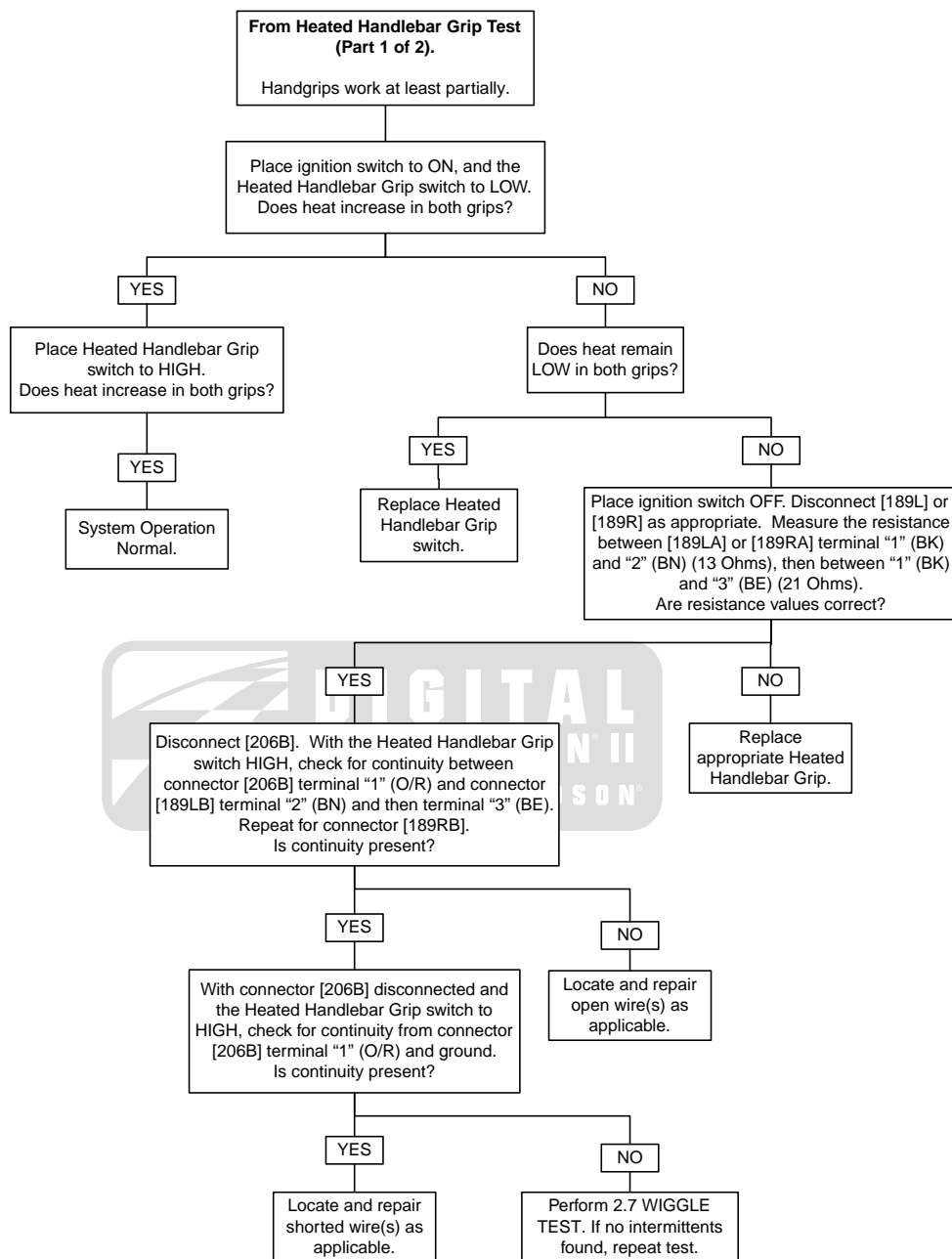
NO.	DESCRIPTION	TYPE	LOCATION
[22A]	Right handlebar grip controls	4-place Multilock	Inside windscreen
[24B]	Left handlebar grip controls	8-place Multilock	Inside windscreen
[160A]	Auxiliary power	2-place Sumitomo	Inside windscreen
[189L]	Left heated handlebar grip	3-place Deutsch	Inside windscreen
[189R]	Right heated handlebar grip	3-place Deutsch	Inside windscreen
[260B]	Heated handlebar grip subharness	2-place Sumitomo	Inside windscreen

Heated Handlebar Grips Test (Part 1 of 2)



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Heated Handlebar Grips Test (Part 2 of 2)



fc01656_en

SUBJECT	PAGE NO.
A.1 AMP MULTILOCK CONNECTORS.....	A-1
A.2 DELPHI CONNECTORS.....	A-5
A.3 DEUTSCH ELECTRICAL CONNECTORS.....	A-7
A.4 DEUTSCH STANDARD TERMINALS.....	A-11
A.5 METRI-PACK TERMINALS.....	A-12
A.6 150 METRI-PACK CONNECTORS.....	A-14
A.7 280 METRI-PACK CONNECTORS.....	A-16
A.8 480 METRI-PACK CONNECTORS.....	A-18
A.9 630 METRI-PACK CONNECTORS.....	A-19
A.10 SEALED SPLICE CONNECTORS.....	A-20



NOTES



AMP MULTILOCK CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41609	AMP MULTILOCK CRIMPER

General

AMP Multilock connectors are found between wire harnesses and component wiring and may be either floating or anchored to the frame with attachment clips.

See [Figure A-1](#). Attachment clips (1) on the pin housings are fitted to T-studs on the motorcycle frame. The T-studs identify OE connector locations. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

For terminal crimping use the AMP MULTILOCK CRIMPER (Part No. HD-41609).

Separating Pin and Socket Housings

1. If necessary, slide connector attachment clip T-stud to the large end of the opening.
2. See [Figure A-1](#). Depress the release button (2) on the socket terminal side of the connector and pull the socket housing (3) out of the pin housing (4).

Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it snaps in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud and slide connector to engage T-stud to small end of opening.

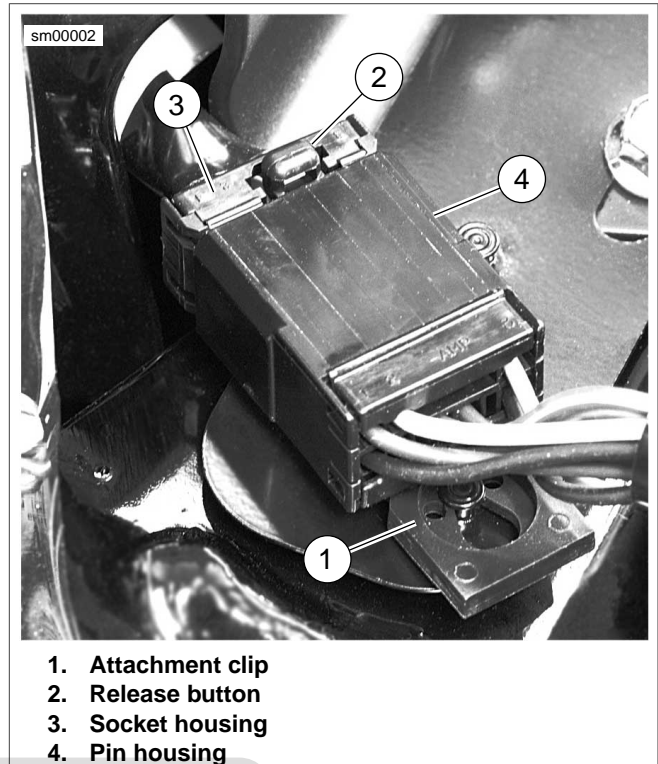


Figure A-1. AMP Multilock Connector

Removing Terminals from Housing

1. See [Figure A-2](#). Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Insert a pick or pin into the terminal cavity until it stops.

NOTE

If socket/pin terminal tool is not available, a push pin/safety pin or a Snap-on pick (Part No. TT600-3) may be used.

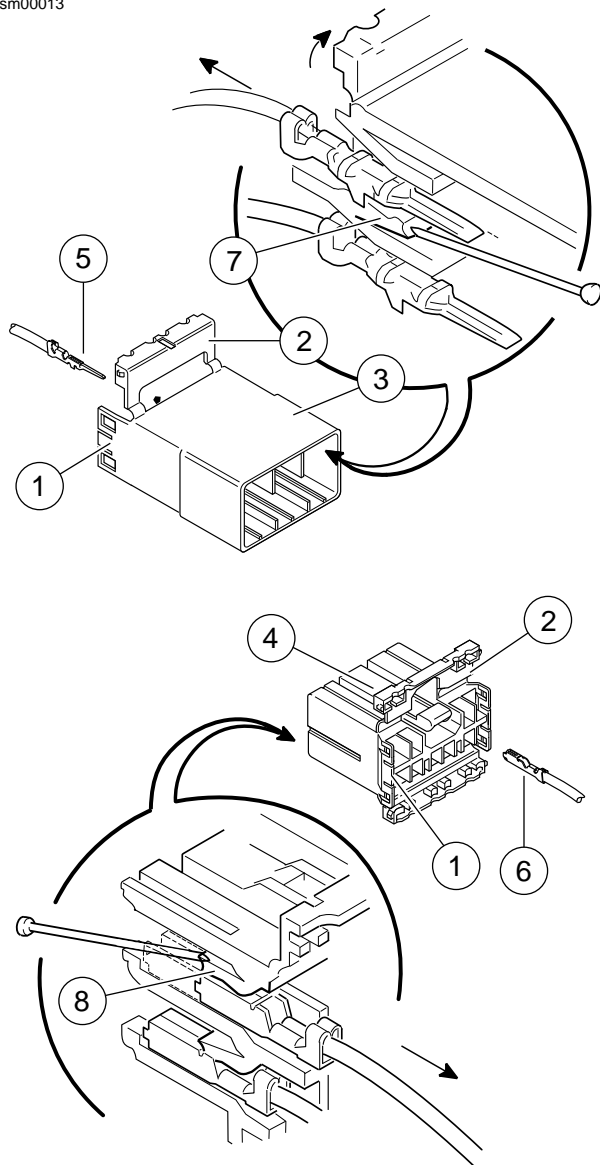
4. Press the tang in the housing to release the terminal.
 - a. **Socket:** Lift the socket tang (8) up.
 - b. **Pin:** Press the pin tang (7) down.

NOTE

A "click" is heard if the tang is released.

5. Gently tug on wire to pull wire and terminal from cavity.

sm00013



1. Latch
2. Secondary lock open
3. Pin housing
4. Socket housing
5. Pin terminal
6. Socket terminal
7. Tang (pin)
8. Tang (socket)

Figure A-2. AMP Multilock Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

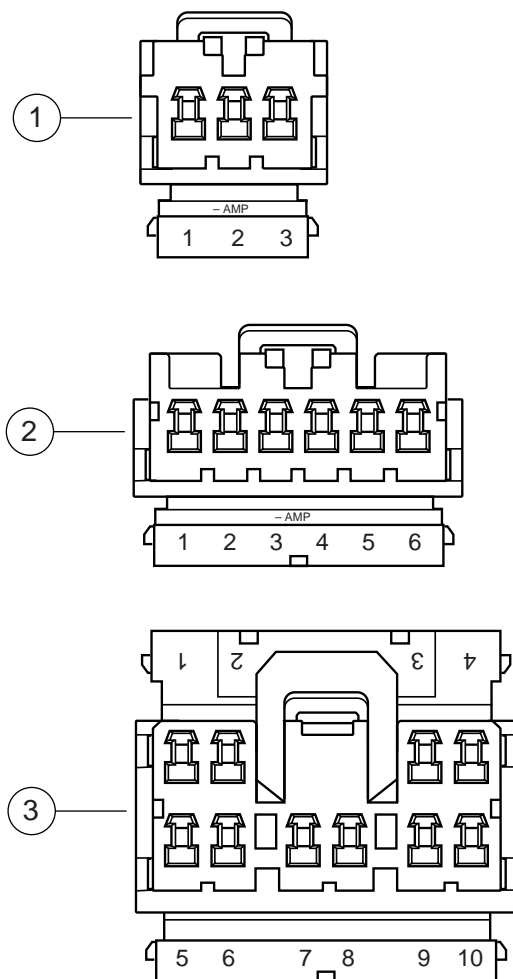
See [Figure A-3](#). Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

1. Hold the terminal so the catch faces the tang in the chamber. Insert the terminal into its numbered cavity until it snaps in place.

NOTES

- Up and down can be determined by the position of the release button, the button is the top of the connector.
 - On the pin side of the connector, tangs are positioned at the bottom of each cavity, so the slot in the pin terminal (on the side opposite the crimp tails) must face downward.
 - On the socket side, tangs are at the top of each cavity, so the socket terminal slot (on the same side as the crimp tails) must face upward.
2. Gently tug on wire end to verify that the terminal is locked in place.
 3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

sm00005



1. 3-place housing
2. 6-place housing
3. 10-place housing

Figure A-3. AMP Multilock Connector: Cavity Numbers on Secondary Locks (Socket Housings Shown)

Preparing Wire Leads for Crimping

1. Strip $\frac{5}{32}$ in. (4.0 mm) of insulation from the wire lead.

2. See [Figure A-2](#) and [Figure A-5](#). Select the pin/socket terminals from the parts catalog and identify the insulation crimp tails (1) and the wire crimp tails (2) and the groove for the crimp tool locking bar (3).
3. Identify the wire lead gauge and the corresponding crimper tool and nesting die. Refer to [Table A-1](#).

Table A-1. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest

WIRE GAUGE	NEST
20	Front
16	Middle
18	Rear

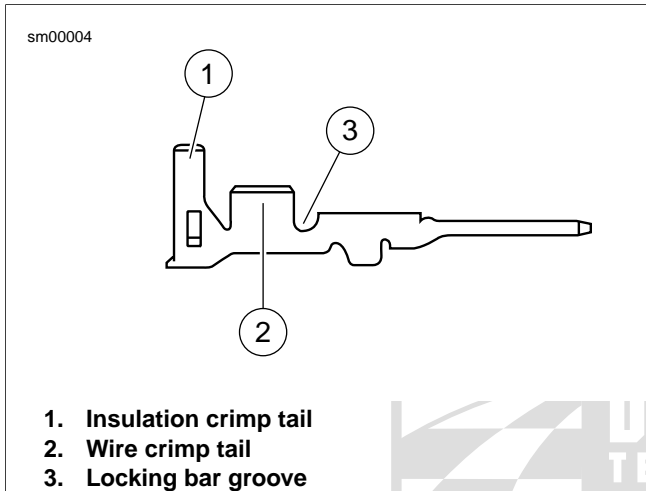


Figure A-4. AMP Multilock Connector: Pin Terminal

1. See [Figure A-6](#). Squeeze the handles to cycle the AMP MULTILOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

NOTE

See [Figure A-2](#) and [Figure A-5](#). Hold the terminal with the insulation crimp tail (1) facing up. The tool will hold the terminal by the locking bar groove (3) and crimp the wire crimp tail (2) around the bare wire of the stripped lead and the insulation crimp tail around the insulation.

3. See [Figure A-6](#). With the insulation crimp tail facing upward, insert terminal (pin or socket) (3) through the locking bar, so that the closed side of the terminal rests on the nest of the crimp tool.
4. Release locking bar to lock position of contact (4). When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails.
5. Insert stripped end of lead (5) until ends make contact with locking bar.
6. Verify that wire is positioned so that wire crimp tails squeeze bare wire strands, while insulation crimp tails fold over the wire lead insulation.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
8. Raise up locking bar (8) and remove crimped terminal.

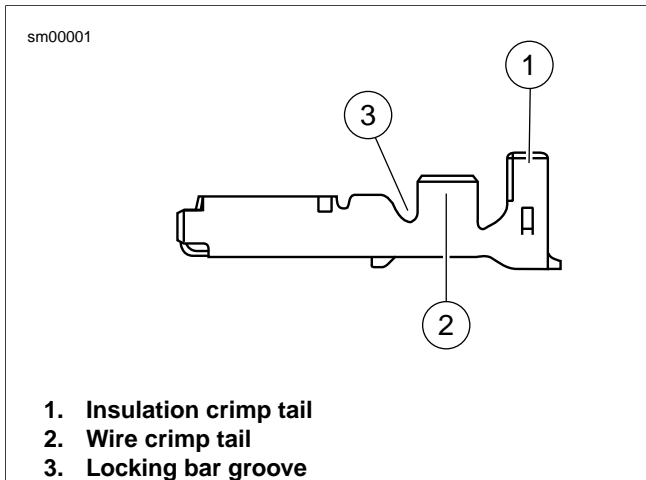


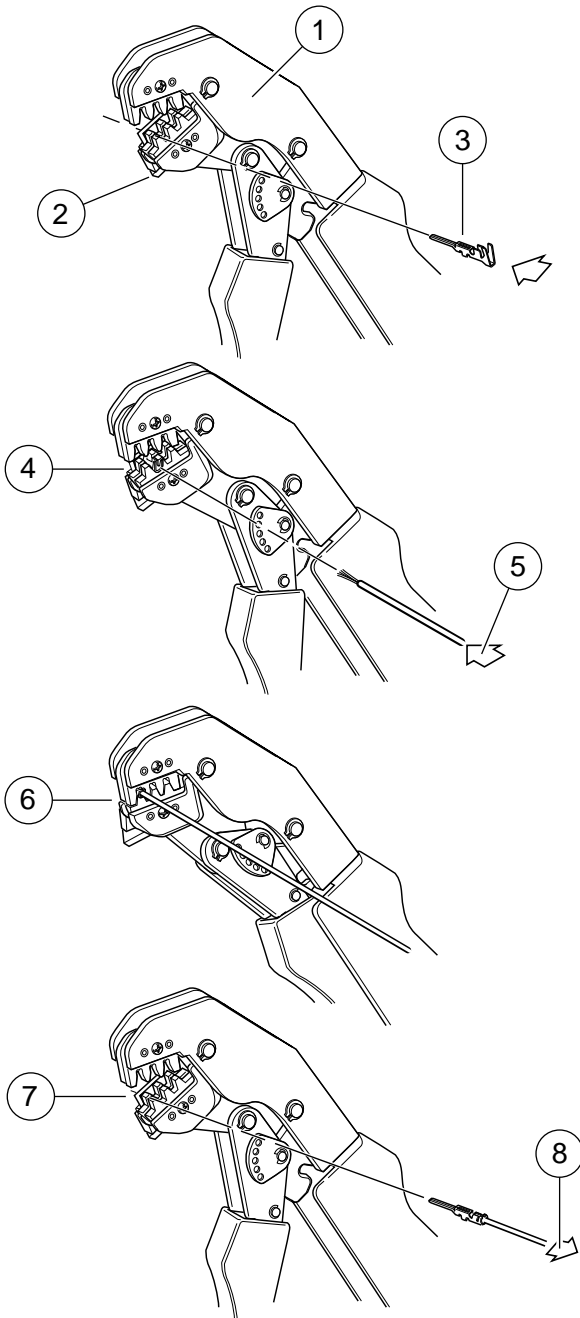
Figure A-5. AMP Multilock Connector: Socket Terminal

Crimping Terminals to Leads

NOTE

Crimping with an Amp Multilock tool is a one step operation. One squeeze crimps both the wire core and the insulation tails.

sm00007



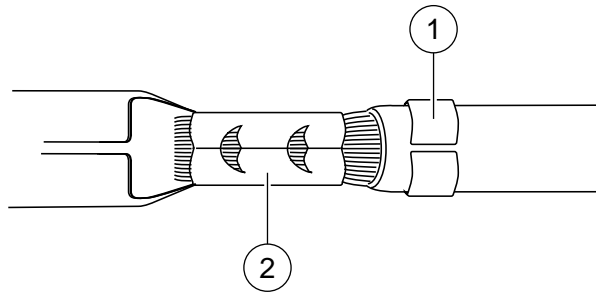
1. Open position
2. Locking bar flange
3. Insert contact
4. Release locking bar
5. Insert lead
6. Squeeze
7. Raise locking bar
8. Remove crimped terminal

Figure A-6. AMP Multilock Connector: Terminal Crimping Procedure

Inspecting Crimped Terminals

See [Figure A-7](#). Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.

sm00008



1. Insulation crimp
2. Wire core crimp

Figure A-7. AMP Multilock Connector: Terminal Crimp

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DELPHI CONNECTOR REPAIR

General

Delphi connectors are embossed with the brand name, Delphi, on the housing latch.

Separating Pin and Socket Housings

See [Figure A-8](#). Bend back the external latch(es) slightly and separate pin and socket halves of connector.

Mating Pin and Socket Housings

Push pin and socket halves of connector together until external latch(es) engage.

Removing Socket Terminals

NOTE

Although the parts of the different Delphi connectors vary in appearance, the instructions which follow will work for all. The only exception is the oil pressure sender connector [139B], the terminals of which are removed like the Packard push-to-seat connectors. Therefore, see [A.6 150 METRI-PACK CONNECTORS](#) to remove/install terminals in this connector.

1. See [Figure A-9](#). If present, free one side of wire lock (1) from ear on wire end of socket housing, then release the other side. Release wires from channels in wire lock and remove from socket housing.
2. Use a fingernail to pry colored terminal lock (2) loose and then remove from mating end of socket housing.
3. Using a thin flat blade, like the unsharpened edge of a hobby knife, gently pry tang (3) outward away from terminal, and then tug on wire to back terminal out wire end of chamber. Do not pull on wire until tang is released or terminal will be difficult to remove.

Installing Socket Terminals

NOTE

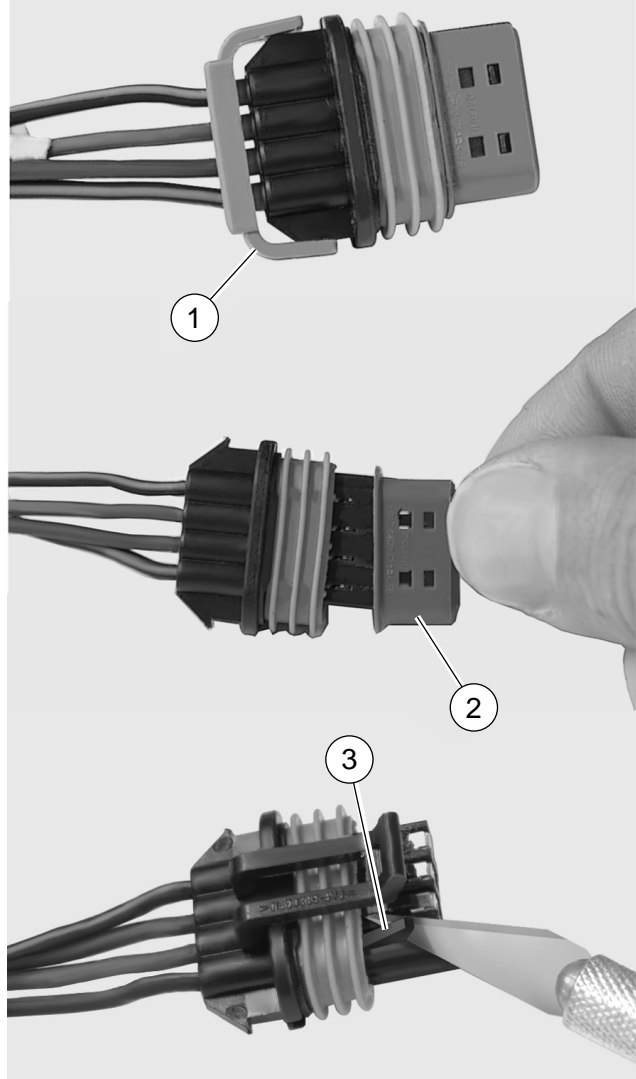
For wire location purposes, alpha or numeric characters are stamped into the wire end of each socket housing.

1. Gently push tang on socket housing inward toward chamber. With the open side of the terminal facing the tang, push terminal into chamber at wire end of socket housing.
2. Gently tug on wire to verify that terminal is locked and will not back out of chamber. If necessary, use fingernail to push tang into engagement with terminal.
3. Install colored terminal lock onto mating end of socket housing.
4. If present, seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.



Figure A-8. Delphi Connector: Socket Housing Latch

sm00015



1. Remove wire lock
2. Remove terminal lock
3. Pry tang outward

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Figure A-9. Delphi Connector: Removing Socket Terminals

DEUTSCH CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41475	DEUTSCH CONNECTOR SERVICE KIT
HD-41475-100	FLAT BLADE L-HOOK

General

Deutsch connectors are colored coded for location purposes. Those connectors associated with **left** side accessories, such as the front and rear **left** turn signals, are **gray**. All other connectors, including those associated with right side accessories, are **black**.

NOTE

A **DEUTSCH CONNECTOR SERVICE KIT** (Part No. HD-41475) contains a selection of wire seals, internal seals, seal plugs, secondary locking wedges, attachment clips and socket/pin terminals. Also included is a compartmented storage box, carrying case and a **FLAT BLADE L-HOOK** (Part No. HD-41475-100) is used for the removal of all types of locking wedges.

Separating Pin and Socket Housings

See [Figure A-10](#). To separate the connector halves, depress the external latch(es) (1) on the socket housing (2) while rocking the pin (3) and socket housings.

NOTES

- Generally, the socket housing is found on the accessory side, while the pin housing is plumbed to the wiring harness.
- Two-, three-, four- and six-place Deutsch connectors have one latch on the connector.
- Eight- and twelve-place connectors have a latch on each side. Simultaneously press both latches to separate the connector.

Mating Pin and Socket Housings

- Align the connectors to match the wire lead colors.
 - For One External Latch:** Two-, three-, four- and six-place Deutsch connectors have one external latch on the socket half of the connector. To fit the halves of the connector together, the latch on the socket side must be aligned with the latch cover on the pin side.
 - For Two External Latches:** (8-place and 12-place) Align the tabs on the socket housing with the grooves on the pin housing.
- Insert socket housing into pin housing until it snaps or clicks into place.

For Two External Latches: (8-place and 12-place) If latches do not click (latch), press on one side of the connector until that latch engages, then press on the opposite side to engage the other latch.
- If necessary, fit the attachment clip to the pin housing.

- Place large end of slot on attachment clip over T-stud on frame. Push assembly forward to engage small end of slot.

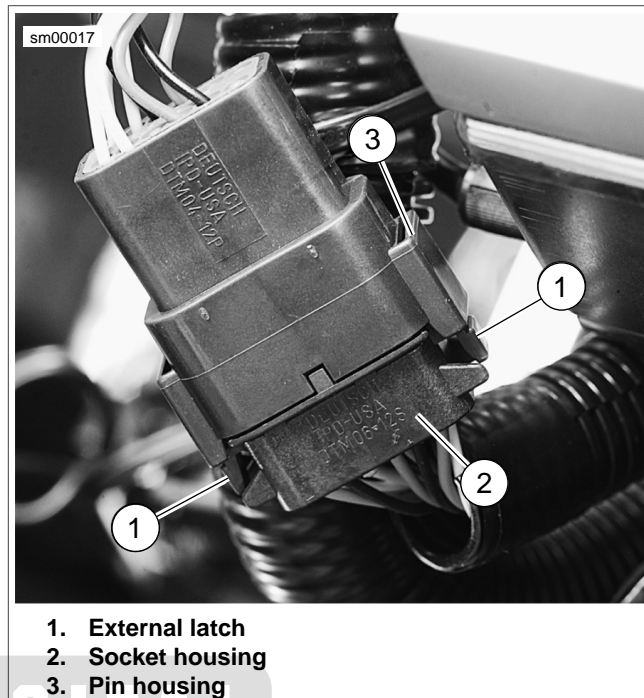


Figure A-10. Deutsch Connector

Removing Socket Terminals

- See [Figure A-11](#). Insert a small screwdriver between the socket housing and locking wedge in-line with the groove (in-line with the pin holes if the groove is absent). Turn the screwdriver 90 degrees to pop the wedge up and remove the secondary locking wedge.
- See [Figure A-14](#). Use a pick or small screwdriver to depress terminal latches inside socket housing and back out sockets through holes in rear wire seal.

NOTE

If wire leads require **new** terminals, see the instructions for crimping terminals.

Installing Socket Terminals

- Match wire lead color to connector cavity.
- See [Figure A-13](#). Fit rear wire seal (1) into back of socket housing (2), if removed.
- Grasp wire lead (3) approximately 1.0 in. (25.4 mm) behind the socket terminal. Gently push socket through hole in wire seal into its chambers until it "clicks" in place.
- A tug on the wire will confirm that it is properly locked in place.

NOTE

Seal plugs (6) are installed through the wire seals of unused chambers. If removed, seal plugs must be replaced to seal the connector.

5. Install internal seal (4) on lip of socket housing, if removed.
6. Insert tapered end of secondary locking wedge (5) into socket housing and press down until it snaps in place. The wedge fits into the center groove within the socket housing and holds the terminal latches tightly closed.

NOTES

- See [Figure A-12](#). While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (1) pointing toward the external latch.
- If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the socket housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.

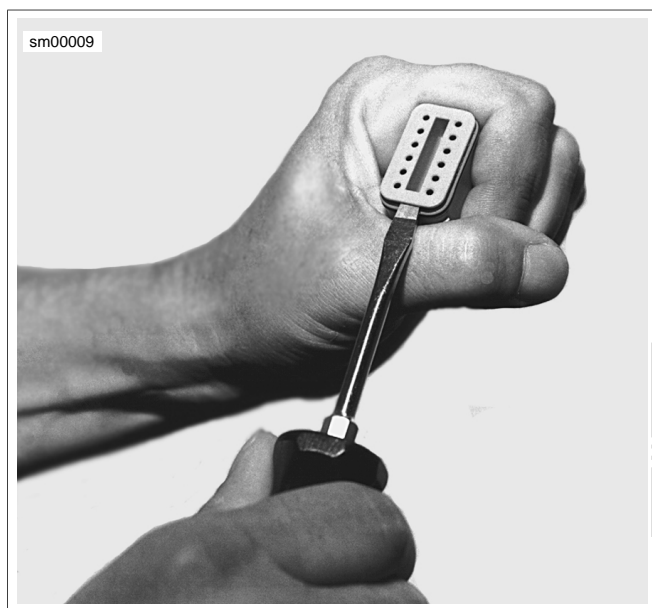


Figure A-11. Deutsch Connector: Remove Secondary Locking Wedge

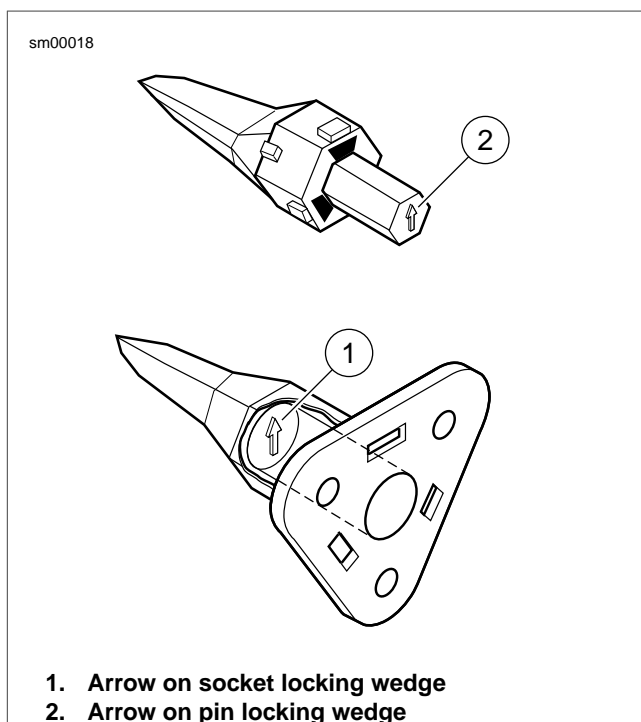


Figure A-12. Deutsch Connector: 3-Place Locking Wedges

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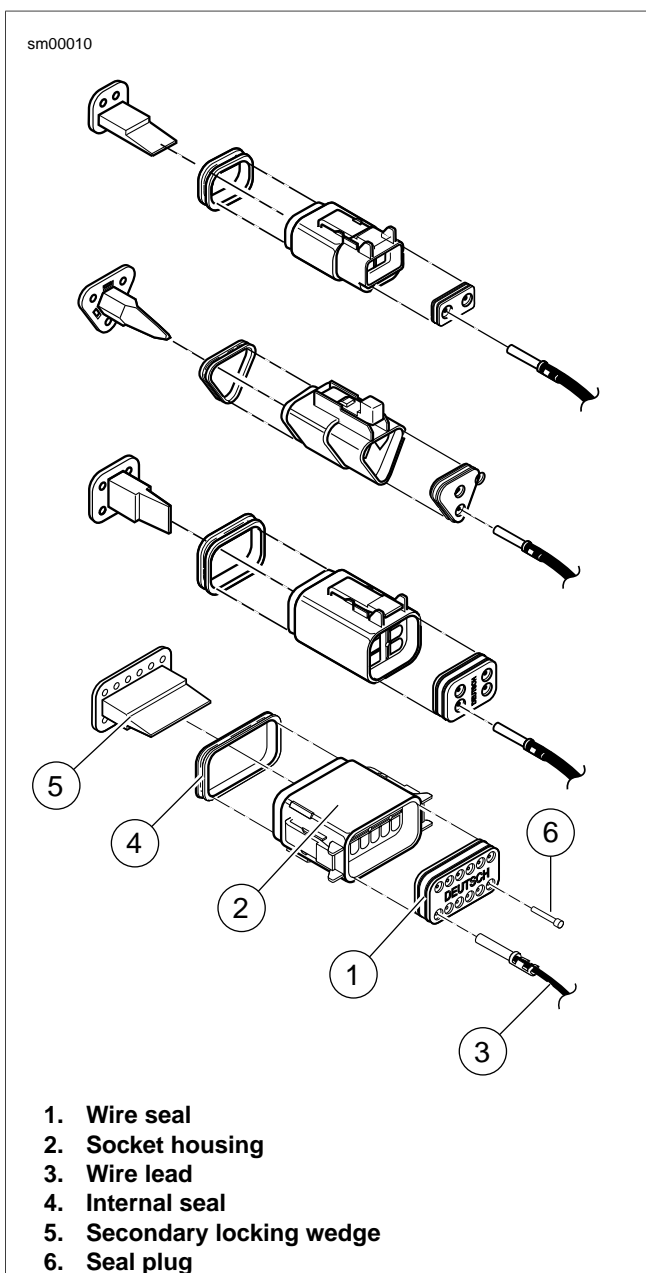


Figure A-13. Deutsch Connector: 2, 3, 4 and 12-Place Socket Housings

Removing Pin Terminals

1. Use the hooked end of a stiff piece of mechanics wire, a needle nose pliers or the FLAT BLADE L-HOOK (Part No. HD-41475-100) to remove the secondary locking wedge.
2. Gently depress terminal latches inside pin housing and back out pins through holes in wire seal.

NOTES

- If wire leads require **new** terminals, see the instructions for crimping terminals.
- If it should become necessary to replace a pin or socket housing, please note that the 8-place and 12-place gray and black connectors are not interchangeable. Since location of the alignment tabs differ between the black and

gray connectors, plugs or receptacles must be replaced by those of the same color.

- When replacing both socket and pin housings, then the black may be substituted for the gray, and vice versa. The socket and pin housings of all other connectors are interchangeable, that is, the black may be mated with the gray, since the alignment tabs are absent and the orientation of the external latch is the same.

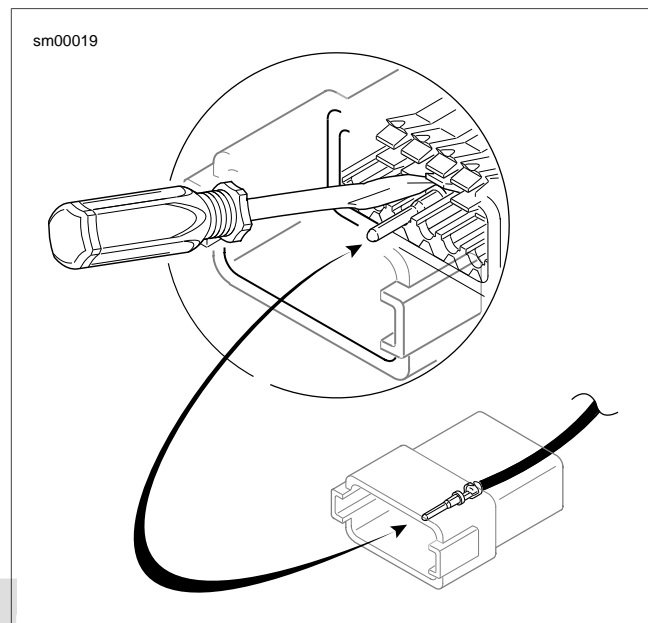


Figure A-14. Deutsch Connector: Depress Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See [Figure A-15](#). Fit wire seal (1) into back of pin housing (2).
2. Grasp wire lead approximately 1.0 in. (25.4 mm) behind the pin terminal (3). Gently push pin through holes in wire seal into its respective numbered chamber until it "clicks" in place.

NOTE

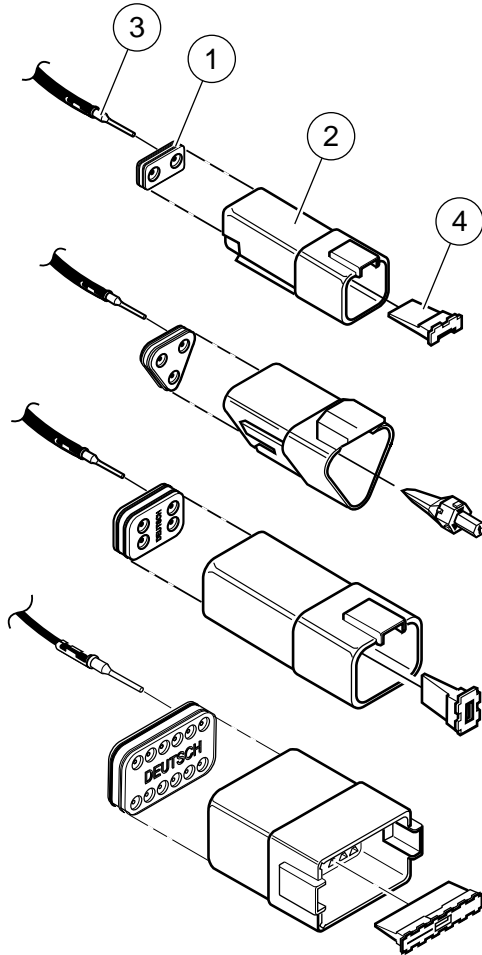
A tug on the wire lead will confirm that a pin is locked in place.

3. Insert tapered end of secondary locking wedge (4) into pin housing and press down until it snaps in place.

NOTES

- The wedge fits in the center groove of the pin housing and holds the terminal latches tightly closed.
- See [Figure A-12](#). While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (2) pointing toward the external latch.
- If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the pin housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.

sm00020



1. Wire seal
2. Pin housing
3. Pin terminal
4. Locking wedge

Crimping Terminals

Identify which of the types of Deutsch terminals are used with the connector and follow the corresponding crimping instructions. Refer to [Table A-2](#).

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Figure A-15. Deutsch Connector: 2, 3, 4 and 12-Place Pin Housings

Table A-2. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
Standard (with crimp tails)	A.4 DEUTSCH STANDARD TERMINALS

DEUTSCH STANDARD TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL

Preparing Wire Leads for Crimping

1. Use a shop gauge to determine gauge of wire lead.
2. Strip lead removing 5/32 in. (4.0 mm) of insulation.

Crimping Terminal to Lead

1. See [Figure A-16](#). Squeeze the handles of the DEUTSCH TERMINAL CRIMP TOOL (Part No. HD-39965-A) to open the jaws. Push the locking bar (1) up.
2. Insert (2) terminal (socket/pin) through hole of the locking bar, so that the rounded side of the contact barrel rests in the nest (concave split level area) with the crimp tails facing upward. To match the wire gauge to the crimp tool die, refer to [Table A-3](#).
3. Release locking bar to lock terminal in die.

NOTE

If the crimp tails are slightly out of vertical alignment, the crimp tool automatically rotates the terminal so that the tails face

straight upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

4. Insert stripped wire core between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that short pair of crimp tails squeeze bare wire strands, while long pair folds over the insulation.
5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens after the terminal is crimped.
6. Raise locking bar up and remove wire lead and terminal.

Inspecting Crimps

Inspect the wire core and insulation crimps. Distortion should be minimal.

Table A-3. Deutsch Standard Terminal Crimp: Wire Gauge To Die

WIRE GAUGE (AWG)	CRIMP TOOL DIE
20	Front
16-18	Middle

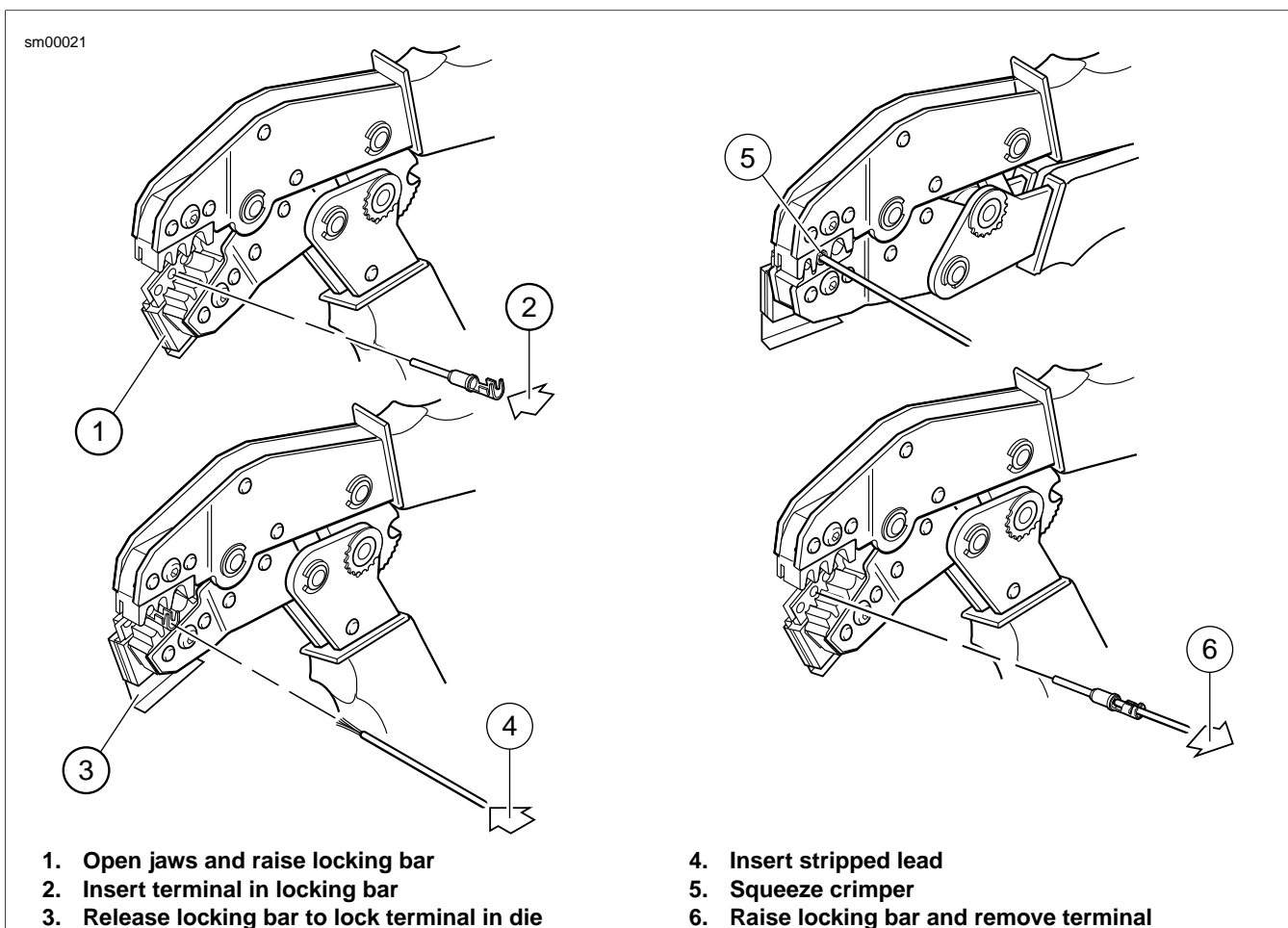


Figure A-16. Crimping a Deutsch Standard Terminal

METRI-PACK TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-6	PACKARD TERMINAL CRIMP TOOL
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-38125-8	PACKARD CRIMPING TOOL

Matching Terminal To Crimper

Metri-Pack connectors embossed with the initials P.E.D. require Packard crimp tools to crimp terminals to wire leads.

Terminals are crimped twice to a wire lead, once over the wire core and a second time over the insulation/seal.

See [Figure A-17](#). A completed crimp may require two different crimping dies found on PACKARD TERMINAL CRIMP TOOL (Part No. HD-38125-6) and/or PACKARD TERMINAL CRIMPER (Part No. HD-38125-7). The terminal (pin or socket) and the wire lead gauge will determine the core crimp die and the insulator/seal die.

NOTE

The PACKARD CRIMPING TOOL (Part No. HD-38125-8) will also crimp sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.

Preparing Wire Lead

Use a wire stripper to strip off the insulation and expose 5/32 in. (4.0 mm) of wire core.

Crimping Wire Core

NOTE

Metri-Pack terminal crimps require two steps. Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.

1. Squeeze and release handles until ratchet automatically opens.
2. Identify the corresponding sized nest for the core crimp.
3. Position the core crimp in the die. Be Sure the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles until crimpers just secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeeze core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool will automatically open.

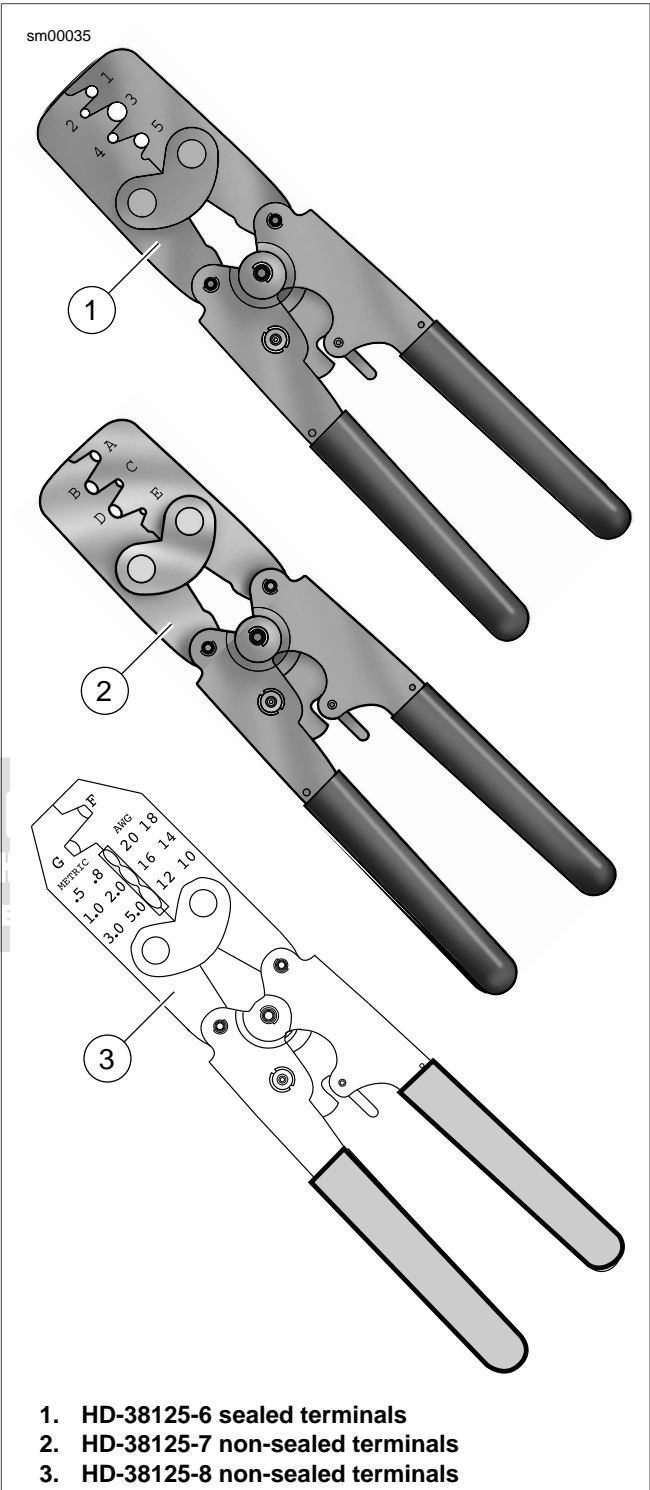


Figure A-17. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

NOTE

Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.

1. See [Figure A-18](#). Identify the correct die for the insulation/seal crimp (2).

2. Position the insulation/seal crimp in the nest. Be sure the insulation/seal crimp tails are facing the forming jaws.
3. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimp is complete.

Inspecting Crimps

1. See [Figure A-18](#). Inspect the wire core crimp (1). The tails should be folded in on the wire core without any distortion or excess wire strands.
2. Inspect the insulation (2) or seal (3) crimp. The tails of the terminal should be wrapped around the insulation without distortion.

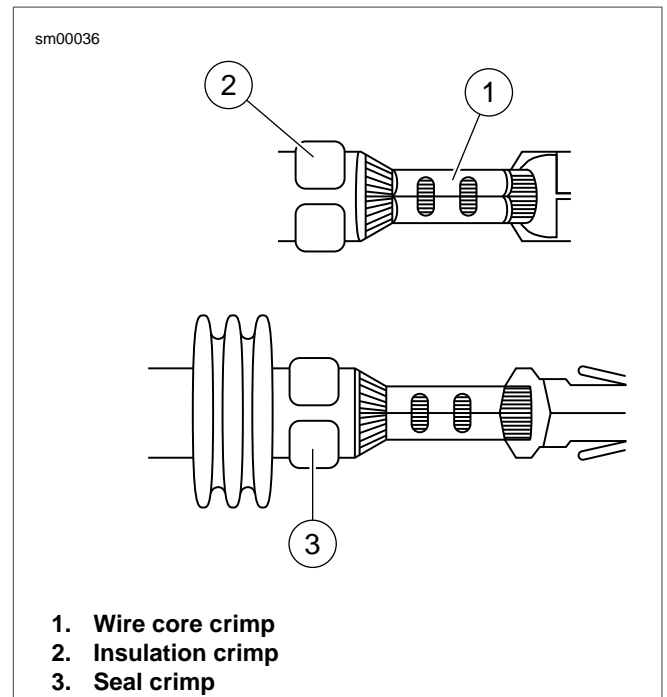


Figure A-18. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps



150 METRI-PACK CONNECTOR REPAIR

General

Metri-Pack connectors are embossed with the initials (P.E.D.).

There are two types of connectors in this series:

- Pull-to-Seat
- Push-to-Seat

Separating Pin and Socket Housings

Bend back the external latch slightly and separate the pin and socket halves of the connector.

Mating Pin and Socket Housings

Align the wire colors and push the pin and socket halves of the connector together.

Removing Socket Terminal

1. See [Figure A-19](#) for pull-to-seat connector or [Figure A-20](#) for push to seat connector. Remove wire lock (1) from wire end of socket housing on push-to-seat type connectors.

NOTE

For best results, free one side of wire lock first and then release the other side.

2. Find the locking tang in the mating end of the connector.

NOTE

The tangs are always positioned in the middle of the chamber and are on the same side as the external latch.

3. Gently insert a safety pin into the chamber about 1/8 in. (3.2 mm).
 - a. **For pull-to-seat:** Stay between the terminal and the chamber wall and pivot the end of the pin toward the terminal body.
 - b. **For push-to-seat:** There is a small opening for the pin.
4. When a click is heard, remove the pin and repeat the procedure.

NOTE

The click is the sound of the tang returning to the locked position as it slips from the point of the pin.

5. Pick at the tang until the clicking stops and the pin seems to slide in deeper than it had previously. This is an indication that the tang has been depressed.

NOTE

On those terminals that have been extracted on multiple occasions, the click may not be heard, but pivot the pin as if the click was heard at least 3 times.

6. Remove the pin.
 - a. **For pull-to-seat:** Push on the lead to extract the terminal from the mating end of the connector.
 - b. **For push-to-seat:** Pull on the lead to draw the terminal out the wire end.

Inserting Socket Terminal

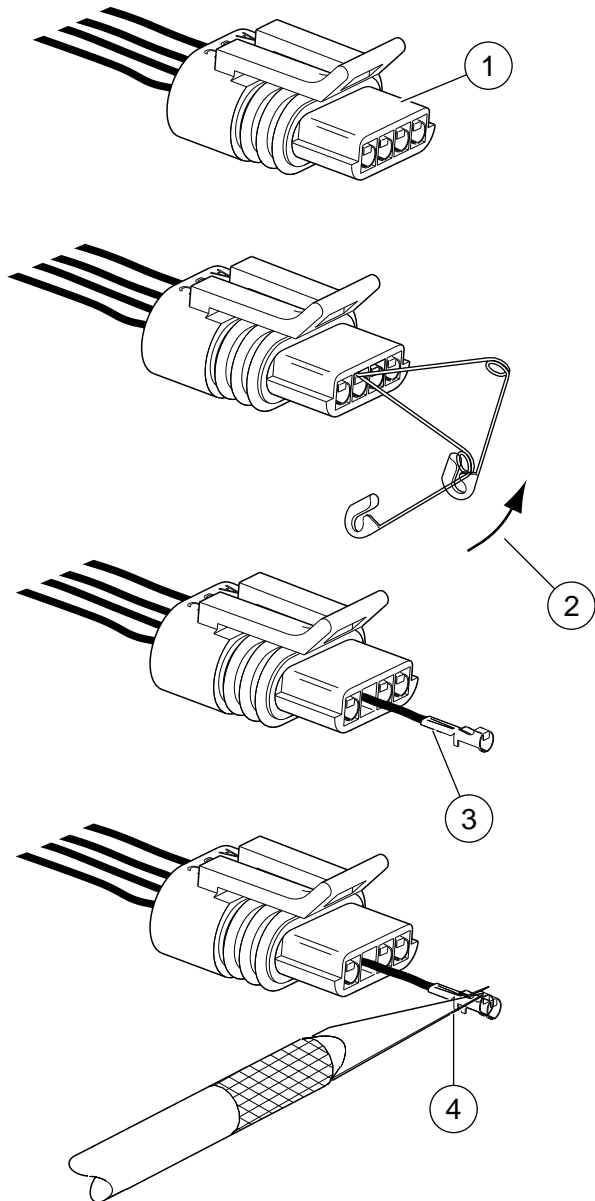
NOTE

For wire location purposes, alpha characters are stamped into the socket housings.

1. See [Figure A-19](#) for pull-to-seat connector or [Figure A-20](#) for push to seat connector. Using a thin flat blade, like that on a hobby knife, carefully bend the tang outward away from the terminal body.
2. Gently pull or push on the lead to install the terminal back into the chamber. A click is heard when the terminal is properly seated.
3. Gently pull or push on the lead to verify that the terminal is locked in place.

For push-to-seat: See [Figure A-20](#). Seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.

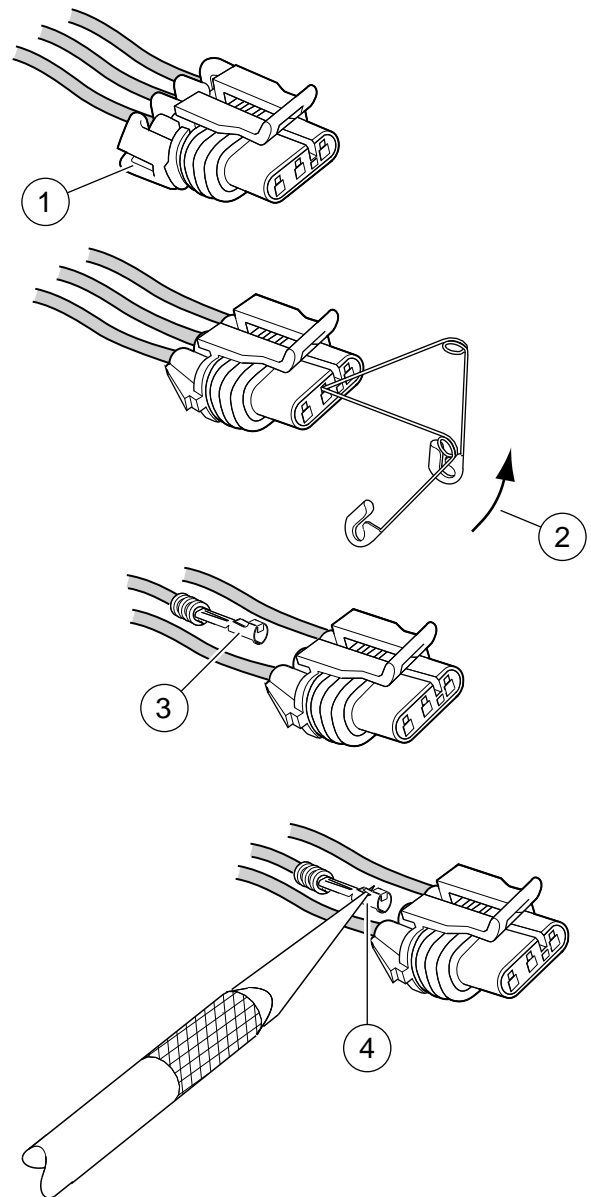
sm00027



1. Locate tang in chamber
2. Pivot pin to depress tang
3. Push to remove
4. Raise tang to install

Figure A-19. 150 Metri-Pack Connector: Pull-to-Seat

sm00028



1. Remove wire lock
2. Pivot pin to depress tang
3. Pull to remove
4. Raise tang to install

Figure A-20. 150 Metri-Pack Connector: Push-to-Seat

280 METRI-PACK CONNECTOR REPAIR

General

See [Figure A-21](#). Called Packard connectors, Metri-Pack series connectors are embossed with the initials (P.E.D.)

Separating Pin and Socket Housings

Depress the wireform and use a rocking motion to detach the socket connector half.

Mating Pin and Socket Housings

Align the groove in the socket housing with the tab in the pin housing. Push the pin and socket halves of the connector together until the latch clicks.

Removing Socket Terminals

1. See [Figure A-22](#). Pry rubber seal from wire end of connector and move seal down wires (1) toward conduit. Hold the connector so that the wireform is facing down.
2. Looking into the wire end of the connector, insert the point of a safety pin (2) between the top of the terminal and the inside chamber wall.
3. Push safety pin completely into chamber while watching terminal on mating end of connector. When terminal is observed moving forward slightly, tang is depressed. Remove safety pin.

NOTE

Repeat as necessary until the terminal can be pushed out of the connector.

4. Push on wire end of the lead to extract the terminal from the mating end of the connector.
5. If necessary, crimp new terminals on wires. See [A.5 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps](#).

Installing Socket Terminals

NOTE

Terminal cavities are lettered on the socket housing. To match the wire lead colors to the terminal cavity, refer to the wiring diagram.

1. See [Figure A-22](#). Using a thin flat blade, like an X-Acto knife (4), carefully bend the tang outward away from the terminal body.
2. Gently pull on the wire lead (5) to draw the terminal back into the chamber. The tang faces opposite the wireform as it enters the chamber.

NOTE

A "click" is heard when the terminal is properly seated.

3. Push on lead to verify that terminal is locked in place.
4. Fit rubber wire seal back into wire end of connector.

Crimping Terminals

If necessary, crimp new terminals on the wire leads. Refer to [A.5 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps](#).

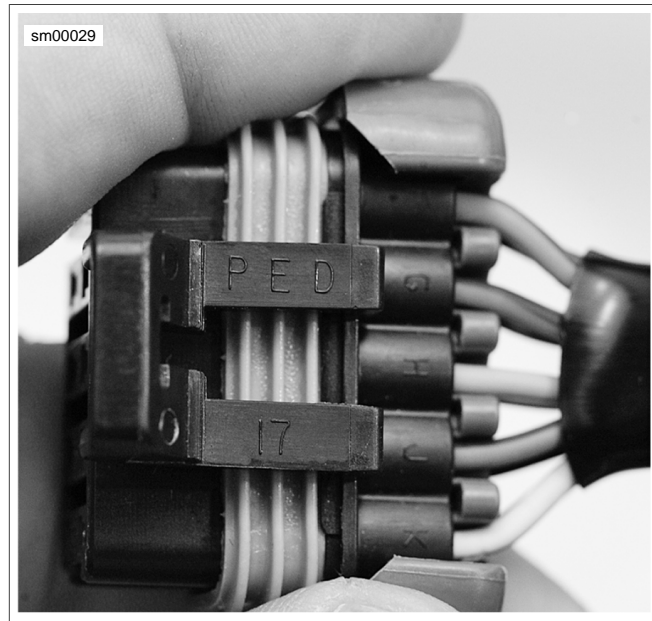
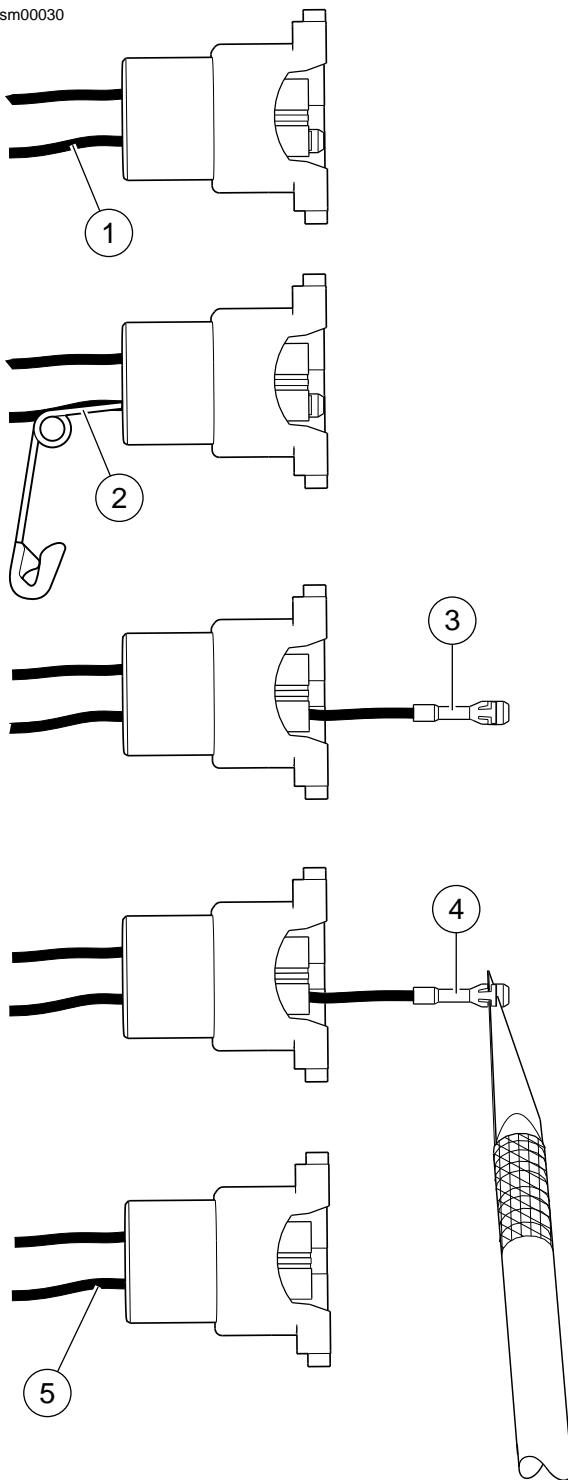


Figure A-21. 280 Metri-Pack Connector (P.E.D.)

sm00030



**Figure A-22. 280 Metri-Pack Connector: Remove/Install
Socket Terminal**

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480 METRI-PACK CONNECTOR REPAIR

General

A 480 Metri-Pack (P.E.D.) connector is frequently used for the B+ (battery voltage) connector to power P&A accessories.

Referred to as Packard connectors, Metri-Pack connectors are embossed with the initials P.E.D.

Separating Pin and Socket Housings

NOTE

Cut any cable strap anchoring the wire conduits of the pin (accessory connector housing) and the socket (B+) housing.

See [Figure A-23](#). Using small flat blade screwdriver, depress button (1) on pin housing (red wire) side of the connector and pull apart the pin and socket housings.

Mating Pin and Socket Housings

Orient the latch on the socket housing to the button catch on the pin housing and press the housings together.

Removing Socket Terminals

1. See [Figure A-23](#). Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped opening centered next to the terminal. Gently insert the point of a stick pin or large safety pin into the opening (3) between the tang and the chamber wall until it stops.
3. Pivot the end of the pin toward the terminal body to depress the tang.
4. Remove the pin and then pull terminal out of the wire end of connector housing.
5. If necessary, crimp **new** terminals on wires. See [A.5 METRI-PACK TERMINALS](#).

Installing Socket Terminals

1. Carefully bend the tang outward away from the terminal body.
2. With the tang on the same side as the square shaped opening in the mating end of the connector housing, feed terminal into wire end of connector housing until it "clicks" in place.
3. Verify that terminal will not back out of the chamber. A slight tug on the cable will confirm that it is locked.

4. Rotate the hinged secondary lock inward until latches fully engage tabs on both sides of connector housing.

NOTE

If removed, install **new** anchored cable strap in O.E. location. Tighten cable strap to capture conduit of both accessory connector and B+ connector approximately 1.0 in. (25.4 mm) from housings.

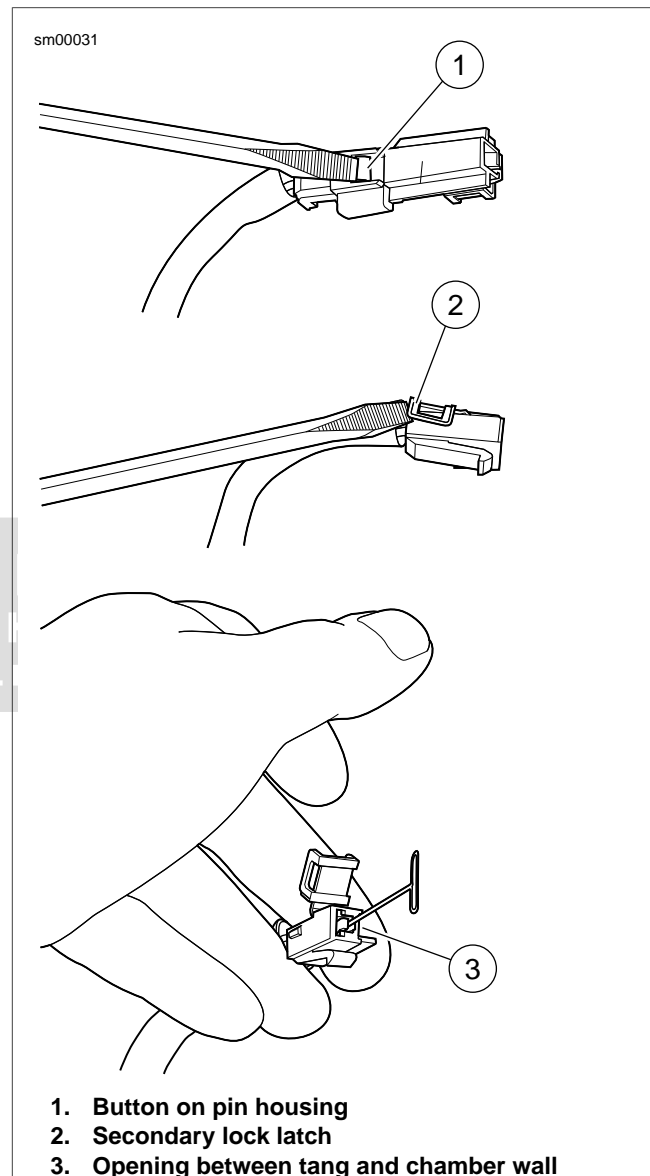


Figure A-23. 480 Metri-Pack Connector: Remove Socket Terminal

630 METRI-PACK CONNECTOR REPAIR

PART NUMBER	TOOL NAME
TT600-3	SNAP-ON PICK

General

Referred to as Packard connectors, Metri-Pack 630 series connectors are embossed with the initials P.E.D.

Separating Pin and Socket Housings*NOTE*

If necessary, remove connector from barbed anchor or other retaining device.

Bend back the external latch slightly and separate pin and socket halves of the connector.

Mating Pin and Socket Housings

Orient the latch to the catch and push the pin and socket halves of the connector together until the latch "clicks".

NOTE

If removed, install connector on barbed anchor or other OE retaining device.

Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails and

engages a rib in the chamber wall to lock the terminal in place.

3. Moving to the mating end of the connector, take note of the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to depress the locking tang.
5. Remove the pick and gently tug on the wire to pull the terminal from the wire end of the connector. Repeat steps if the terminal is still locked in place.
6. If necessary, crimp **new** terminals on wires. Refer to [A.5 METRI-PACK TERMINALS](#).

Installing Socket Terminal*NOTE*

Refer to the wiring diagrams to match wire lead colors to alpha characters molded into the secondary locks of each connector housing.

1. Using a thin flat blade, like that of a hobby knife, carefully bend the tang outward away from the terminal body.
2. With the tang facing the chamber wall, push the lead into the chamber at the wire end of the connector. A click is heard when the terminal is properly seated.
3. Gently tug on the wire end to verify that the terminal is locked in place and will not back out of the chamber.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-38125-8	PACKARD CRIMPING TOOL
HD-39969	ULTRA-TORCH UT-100
HD-41183	HEAT SHIELD ATTACHMENT

General

Splice connectors and several OE ring terminal connectors use heat shrink covering to seal the connection.

Preparing Wire Leads

NOTE

If adjacent wires are to be spliced, stagger the splices so that the sealed splice connectors will not touch each other but are located at different positions along the length of the wires.

1. Using a shop gauge, identify the gauge of the wire.
2. Match the wire gauge to a sealed splice connector by color and part number. Refer to [Table A-4](#).
3. Using a wire stripper, cut and strip a length of insulation off the wire ends. Refer to [Table A-4](#) for the strip length.

Table A-4. Sealed Splice Connectors

WIRE GAUGE	COLOR	PART NO.	STRIP LENGTH
18-20 (0.5-0.8 mm)	Red	70585-93	3/8 in. (9.5 mm)
14-16 (1.0-2.0 mm)	Blue	70586-93	3/8 in. (9.5 mm)
10-12 (3.0-5.0 mm)	Yellow	70587-93	3/8 in. (9.5 mm)

NOTE

If any copper wire strands are cut off of the wire core, trim the end and strip the wire again in a larger gauge stripper.

Splicing Wire Leads

NOTE

See [Figure A-25](#). The connector is crimped twice - one side and then the other.

1. See [Figure A-24](#). Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws and insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See [Figure A-25](#). Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).
5. Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.

6. Slide the connector to the other half of the metal insert. Insert the stripped wire lead (1) until it stops, and crimp the lead in the insert (2).

WARNING

Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

- Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.
 - Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.
 - Always keep hands away from tool tip area and heat shrink attachment.
7. Use an ULTRA-TORCH UT-100 (Part No. HD-39969), or a ROBINAIR HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

Inspecting Seals

See [Figure A-25](#). Allow the splice to cool and inspect the seal. The insulation should appear smooth and cylindrical. Melted sealant will have extruded out the ends (4) of the insulation.

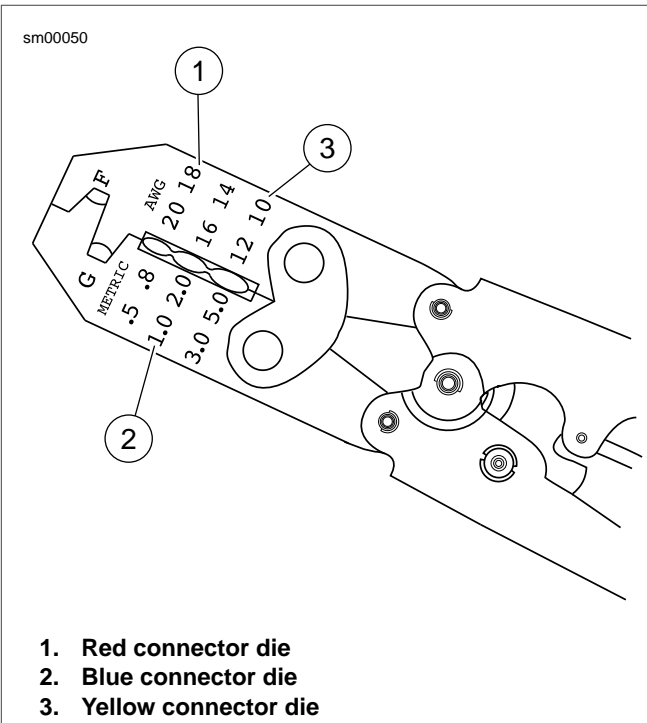
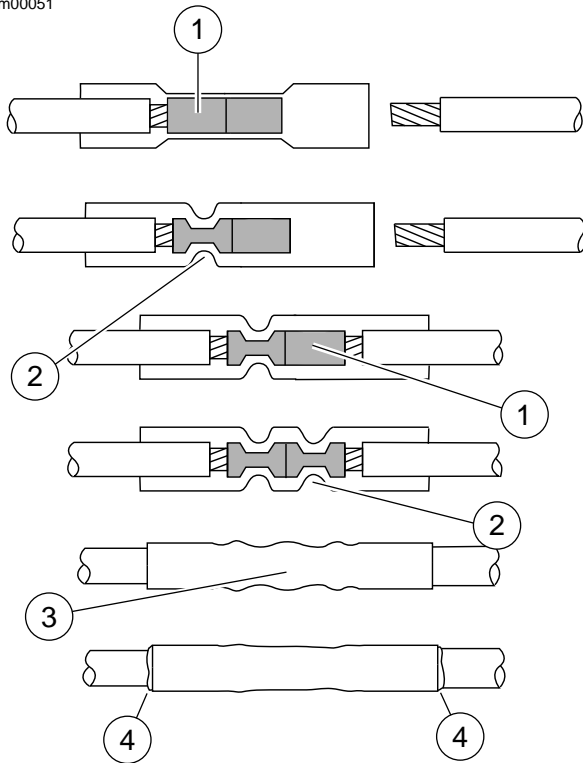


Figure A-24. Packard Crimping Tool (HD-38125-8)

sm00051



1. Wire lead in metal insert
2. Crimp metal insert
3. Center of crimp
4. Melted sealant

Figure A-25. Sealed Splice Connector



NOTES



SUBJECT	PAGE NO.
B.1 CONNECTORS.....	B-1
B.2 WIRING DIAGRAMS.....	B-3



NOTES



CONNECTOR LOCATIONS

Table B-1. Buell Connector Locations

No.	Description	Type	Location
[5]	J-Fuse	Spade terminals	Under seat (Firebolt only)
[7]	Tail harness	8-place Multilock	Left side under tail section (Firebolt only)
[10]	Electronic Control Module (ECM) (black)	34-place Amp (Tyco)	Under seat (Ulysses, Lightning)
			In fairing (Firebolt)
[11]	Electronic Control Module (ECM) (gray)	34-place Amp (Tyco)	Under seat (Ulysses, Lightning)
			In fairing (Firebolt)
[18]	Right rear turn signal	2 1-place bullet	Under rear wire cover (Ulysses)
			Under seat (Lightning)
			Under tail section (Firebolt)
[19]	Left rear turn signal	2 1-place bullet	Under rear wire cover (Ulysses)
			Under seat (Lightning)
			Under tail section (Firebolt)
[22]	Right hand controls	4-place Multilock	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[24]	Left hand controls	8-place Multilock	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[30]	Flasher	5-place Amp	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[31R]	Right front turn signal	2 1-place bullet	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[31L]	Left front turn signal	2 1-place bullet	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[33]	Ignition switch	4-place Augat	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[38]	Headlight connector	4-place Amp	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[39]	Instrument module	20-place Multilock	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[45]	License plate lamp	2 1-place bullet	Under rear wire cover (Ulysses, Lightning)
			Under seat (Firebolt)
[46]	Stator	2-place Packard	Below left ram air scoop
[61]	Fuse assembly	Socket terminals	Under seat (Ulysses, Lightning)
			Right side of fairing (Firebolt)
[62]	Relay assy	Spade terminals	Under seat (Ulysses, Lightning)
			Left side of fairing (Firebolt)
[65]	Vehicle Speed Sensor (VSS)	3-place Deutsch	Right rear top of crankcase
[77]	Voltage regulator	2-place Packard	Behind left ram air scoop
[79]	Crankcase Position (CKP) sensor	2-place Mini-Deutsch	Below left ram air scoop
[83]	Ignition coil	3-place Packard	Beneath aircleaner baseplate
[84]	Front fuel injector	2-place Packard	Beneath aircleaner baseplate
[85]	Rear fuel injector	2-place Packard	Beneath aircleaner baseplate

Table B-1. Buell Connector Locations

No.	Description	Type	Location
[86]	Fuel pump	4-place Multilock	Left side of frame
[87]	Idle air control	4-place Delphi	Beneath air cleaner baseplate
[88]	Throttle Position (TP) sensor	3-place Amp	Beneath air cleaner baseplate
[89]	Intake Air Temperature (IAT) sensor	2-place Amp	In air cleaner baseplate
[90]	Engine Temperature (ET) sensor	1-place bullet	Beneath air cleaner baseplate
[91A]	Data link connector	4-place Deutsch	Beneath left airflow guide (Ulysses)
			Under seat (Lightning)
			Under fairing (Firebolt)
[93]	Tail light	3-place Amp (Tyco) (Ulysses)	Back of tail light, under seat
		3 spade terminals (Lightning, Firebolt)	
[95]	Clutch switch	2-place Multilock	Underside of clutch lever assembly
[97]	Cooling fan	2-place Multilock	Behind rear cylinder under seat
[120]	Oil pressure switch	Post terminal	Bottom of oil pump
[121]	Rear brake switch	2-place Multilock	Under seat
[122]	Horn	Spade terminals	Behind windscreen (Ulysses, Lightning)
			In fairing (Firebolt)
[128]	Starter solenoid	Spade terminal	Top of starter
[131]	Neutral switch	1-place bullet	Under sprocket cover
[133]	Side stand sensor	3-place Deutsch	Behind left ram air scoop
[134]	Bank angle sensor	6-place Sumitomo	Under seat (Ulysses, Lightning)
			In fairing (Firebolt)
[137]	Oxygen sensor	1-place Packard	Above rear cylinder head
[160]	Front auxiliary power outlet	2-place Sumitomo	Behind windscreen (Ulysses, Lightning)
			Beneath fairing (Firebolt)
[161]	Interactive exhaust to actuator	4-place Amp (Tyco)	Under intake cover
[165]	Interactive exhaust subharness to main harness	3-place Deutsch	Under seat
[178]	Active intake system to solenoid	2-place Deutsch	Under air cleaner cover
[180]	Rear auxiliary power outlet	2-place Sumitomo	Under seat (Ulysses only)
[189L]	Left heated grip	3-place Deutsch	Behind windscreen (Ulysses only)
[189R]	Right heated grip	3-place Deutsch	Behind windscreen (Ulysses only)
[206]	Heated grip subharness connector	3-place Sumitomo	Behind windscreen (Ulysses only)

WIRING DIAGRAM INFORMATION

Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to [Table B-2](#).

For Solid Color Wires: See [Figure B-1](#). The alpha code identifies wire color (3).

For Striped Wires: The code is written with a slash (/) between the solid color code and the stripe code (4). For example, a trace labeled GN / Y is a green wire with a yellow stripe.

Wiring Diagram Symbols

See [Figure B-1](#). On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets (1). The letter (2) inside the brackets identifies whether the housing is a socket or pin housing.

A=Pin: The letter A after a connector number and the pin symbol (6) identifies a pin housing.

B=Socket: The letter B after a connector number and the socket symbol (5) identifies a socket housing.

Other symbols found on the wiring diagrams include the symbol for a diode (7), a symbol for a wire-to-wire connection (8), a symbol that verifies that no connection (9) between two wire traces exists and a symbol identifying two wires that are twisted together (10).

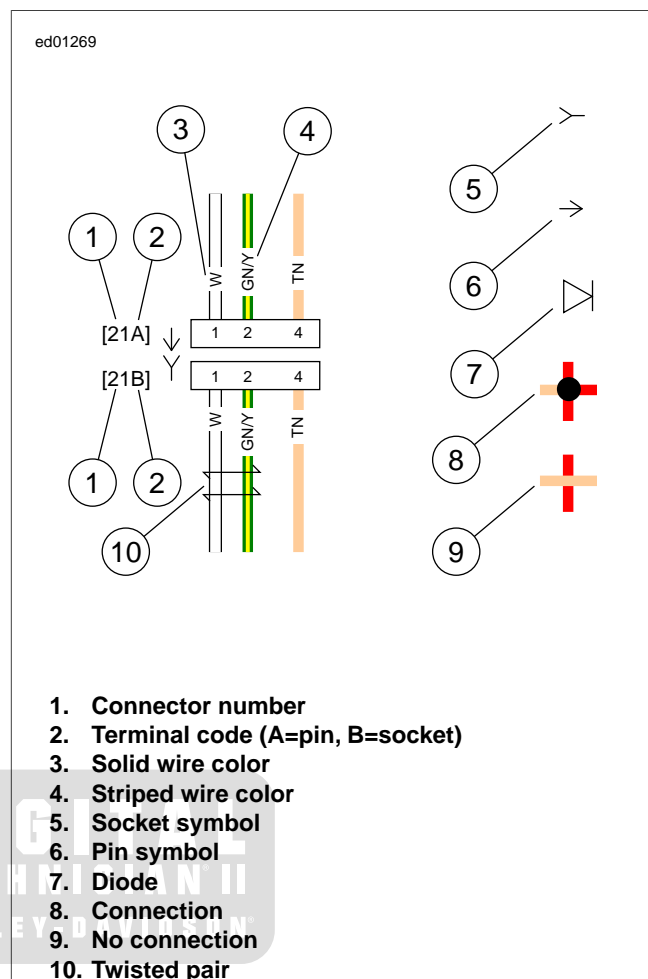


Figure B-1. Connector/Wiring Diagram Symbols (typical)

Table B-2. Wire Color Codes

ALPHA CODE	WIRE COLOR
BE	Blue
BK	Black
BN	Brown
GN	Green
GY	Grey
LGN	Light Green
O	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

Wiring Diagram List

DIAGRAM	LOCATION
Main Harness, Ulysses and Lightning	Figure B-2
Main Harness, Firebolt	Figure B-3
Engine Management Circuit, All Models	Figure B-4
Lighting Circuit, Ulysses and Lightning	Figure B-5
Lighting Circuit, Firebolt	Figure B-6
Component Circuits, All Models	Figure B-7
Horn and Instruments Circuit, All Models	Figure B-8
Starting Circuit, Ulysses and Lightning	Figure B-9
Starting Circuit, Firebolt	Figure B-10
Charging Circuits, All Models	Figure B-11
Heated Handlebar Grips (Ulysses only)	Figure B-12



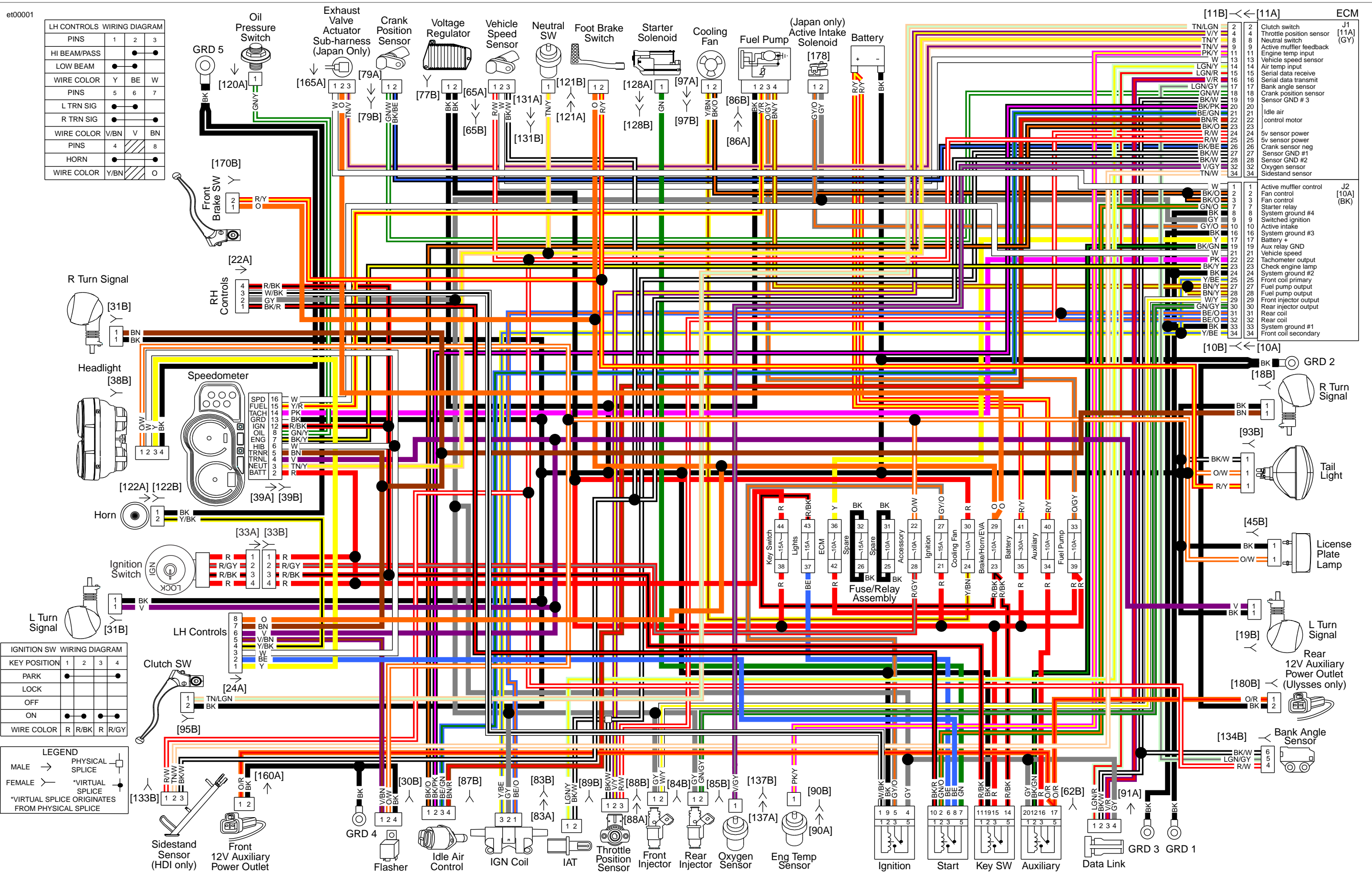


Figure B-2. Main Harness, Ulysses and Lightning

Figure B-2.
Main Harness, Ulysses and Lightning

Figure B-2.
Main Harness, Ulysses and Lightning



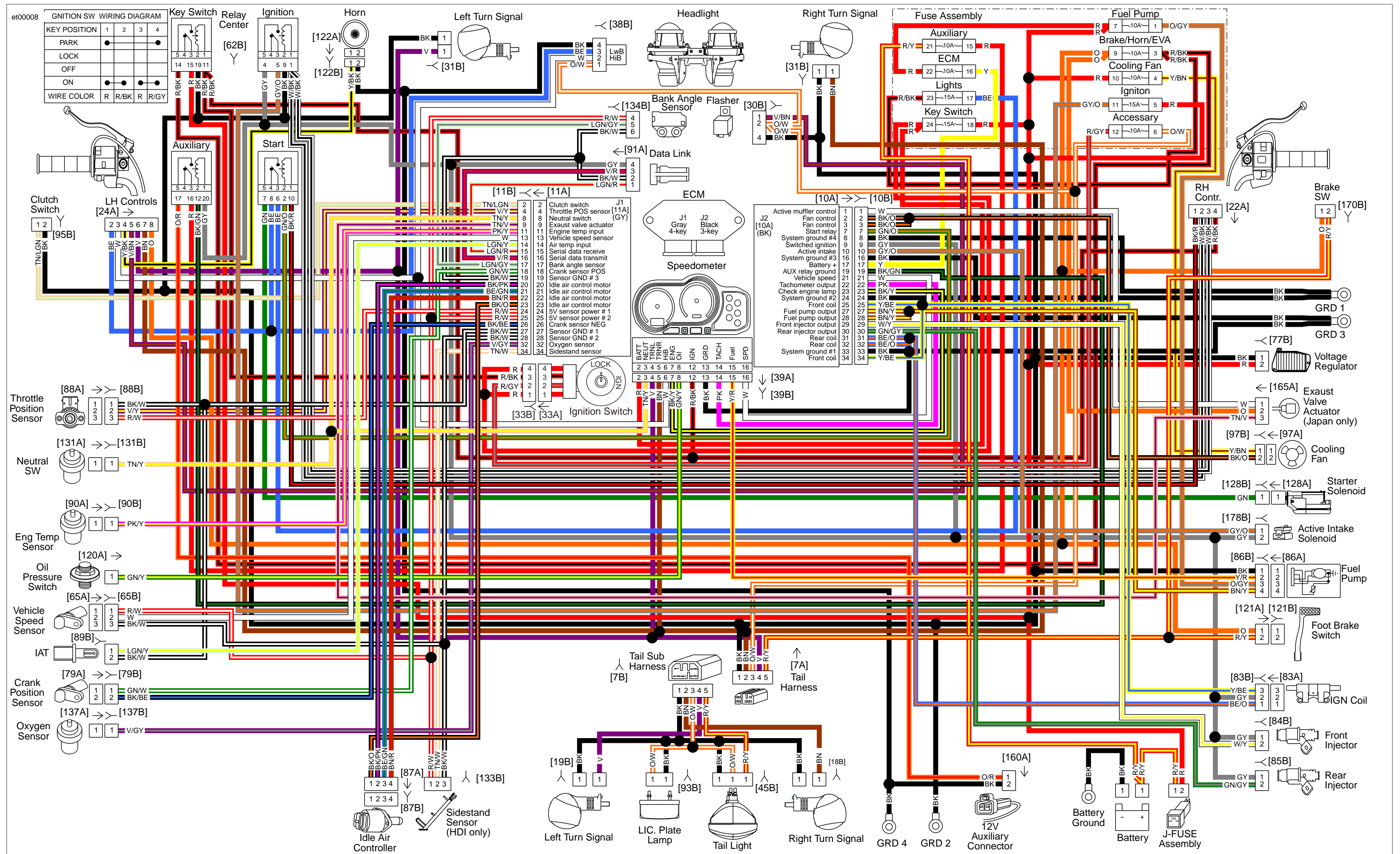


Figure B-3. Main Harness, Firebolt

Figure B-3.
Main Harness, Firebolt

Figure B-3.
Main Harness, Firebolt



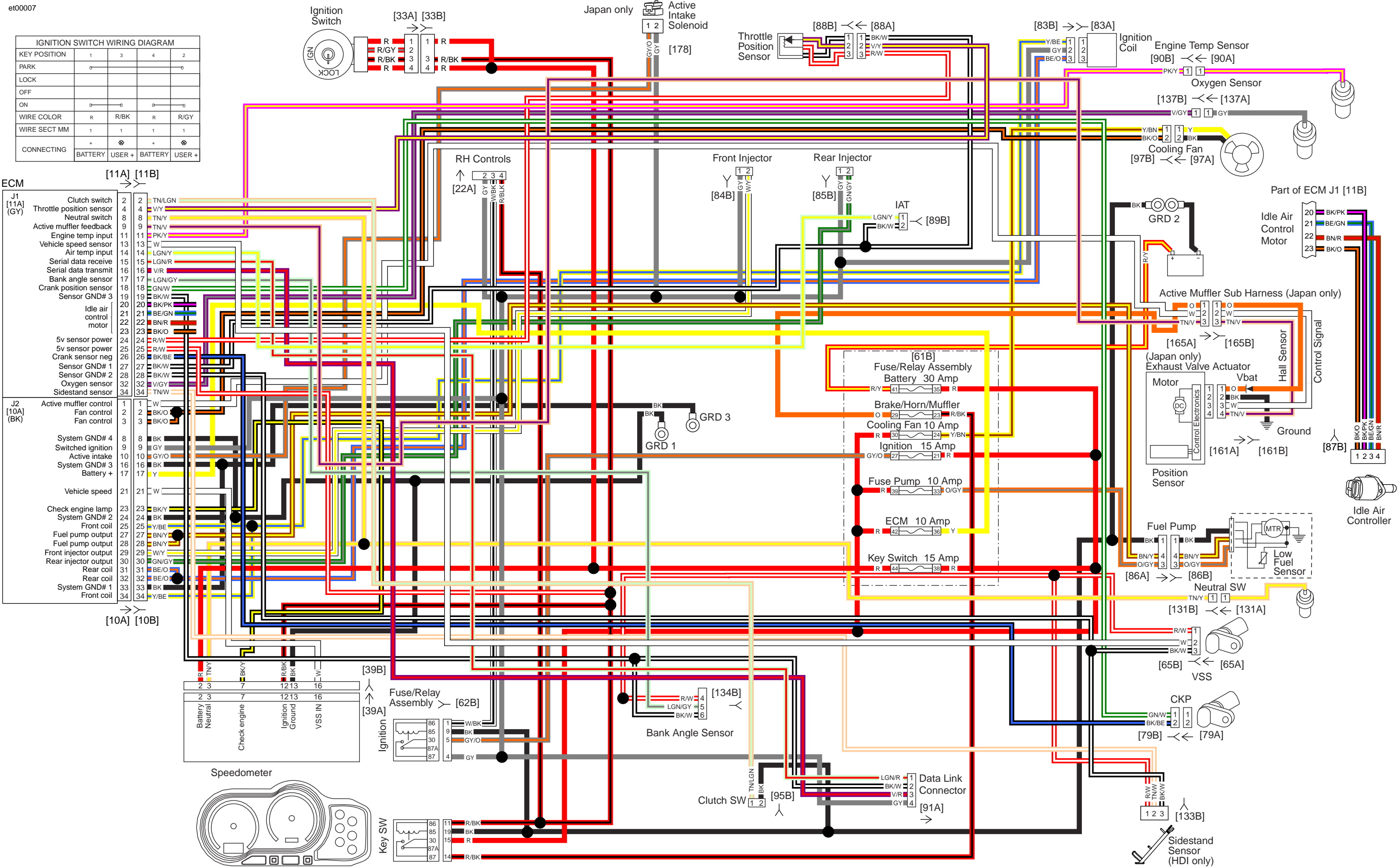


Figure B-4. Engine Management Circuit, All Models

Figure B-4.
Engine Management Circuit, All Models

Figure B-4.
Engine Management Circuit, All Models



IGNITION SWITCH WIRING DIAGRAM				
KEY POSITION	1	3	4	2
PARK	0			0
LOCK				
OFF				
ON	0	0	0	0
WIRE COLOR	R	R/BK	R	R/GY
WIRE SECT MM	1	1	1	1
CONNECTING	BATTERY	USER + BATTERY	BATTERY	USER +

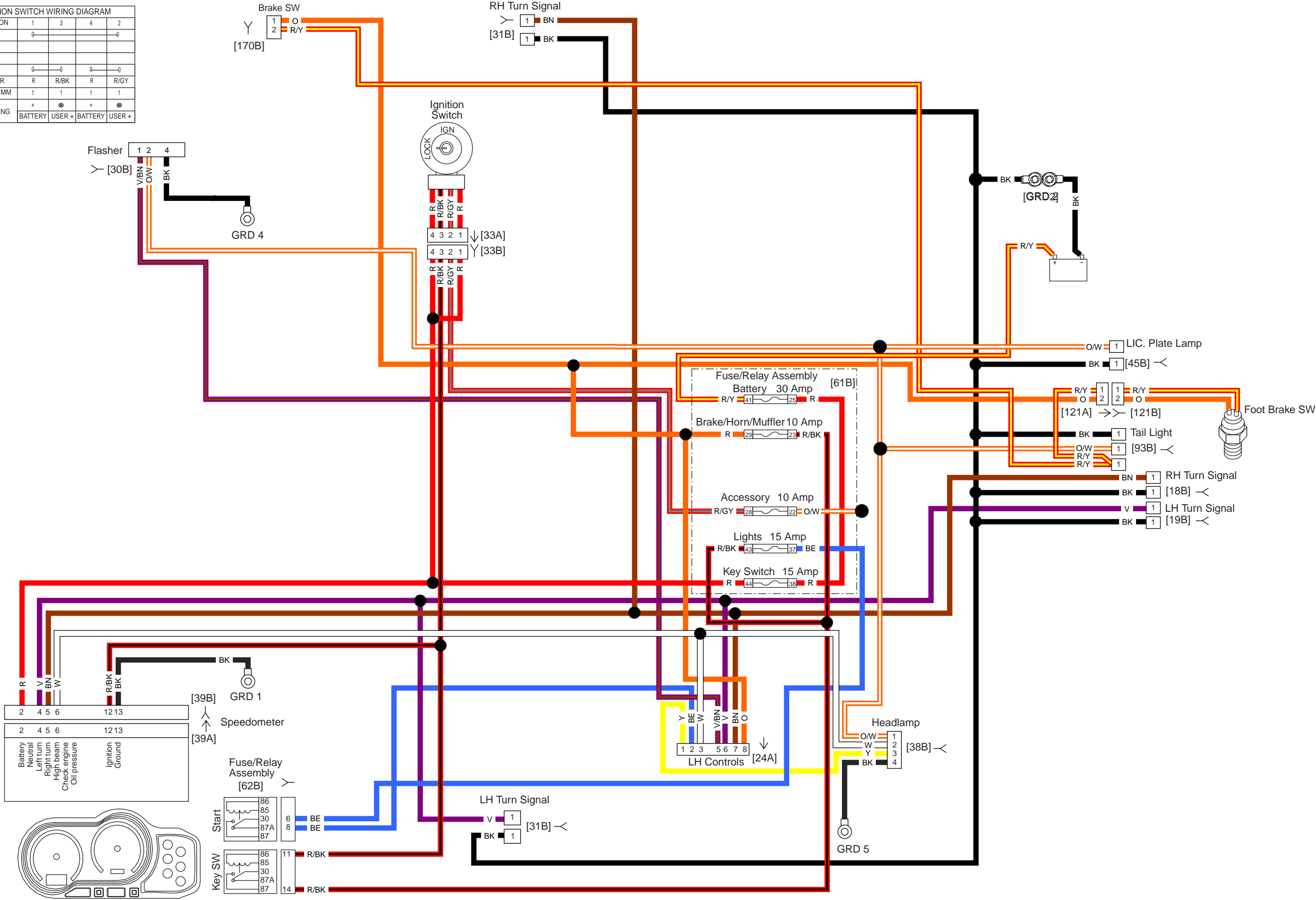


Figure B-5. Lighting Circuit, Ulysses and Lightning

Figure B-5.
Lighting Circuit, Ulysses and Lightning

Figure B-5.
Lighting Circuit, Ulysses and Lightning



IGNITION SWITCH WIRING DIAGRAM				
KEY POSITION	1	3	4	2
PARK	0			0
LOCK				
OFF				
ON	0	0	0	0
WIRE COLOR	R	R/BK	R	R/GY
WIRE SECT MM	1	1	1	1
CONNECTING	BATTERY	USER +	BATTERY	USER +

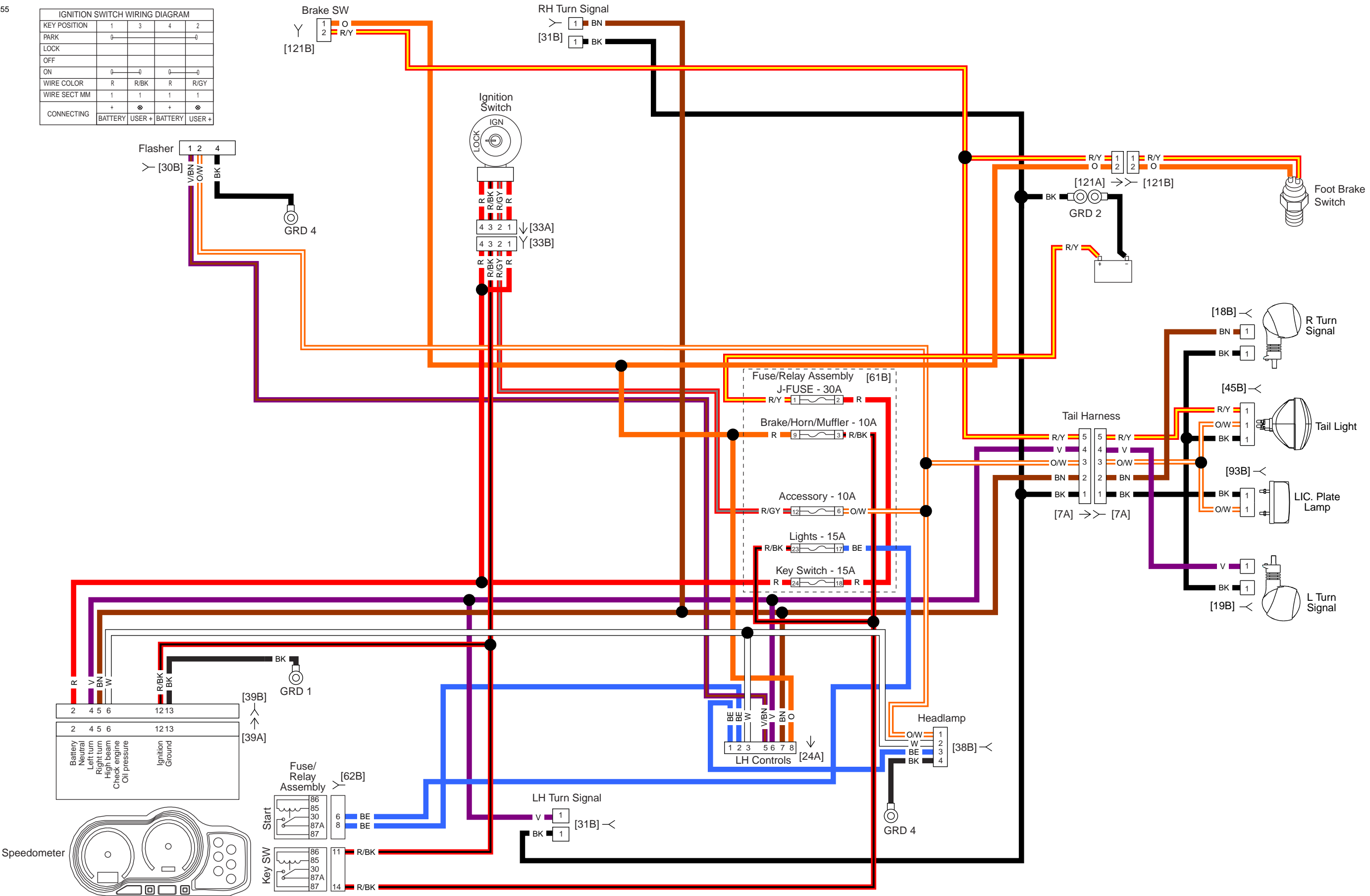


Figure B-6. Lighting Circuit, Firebolt

Figure B-6.
Lighting Circuit, Firebolt

Figure B-6.
Lighting Circuit, Firebolt



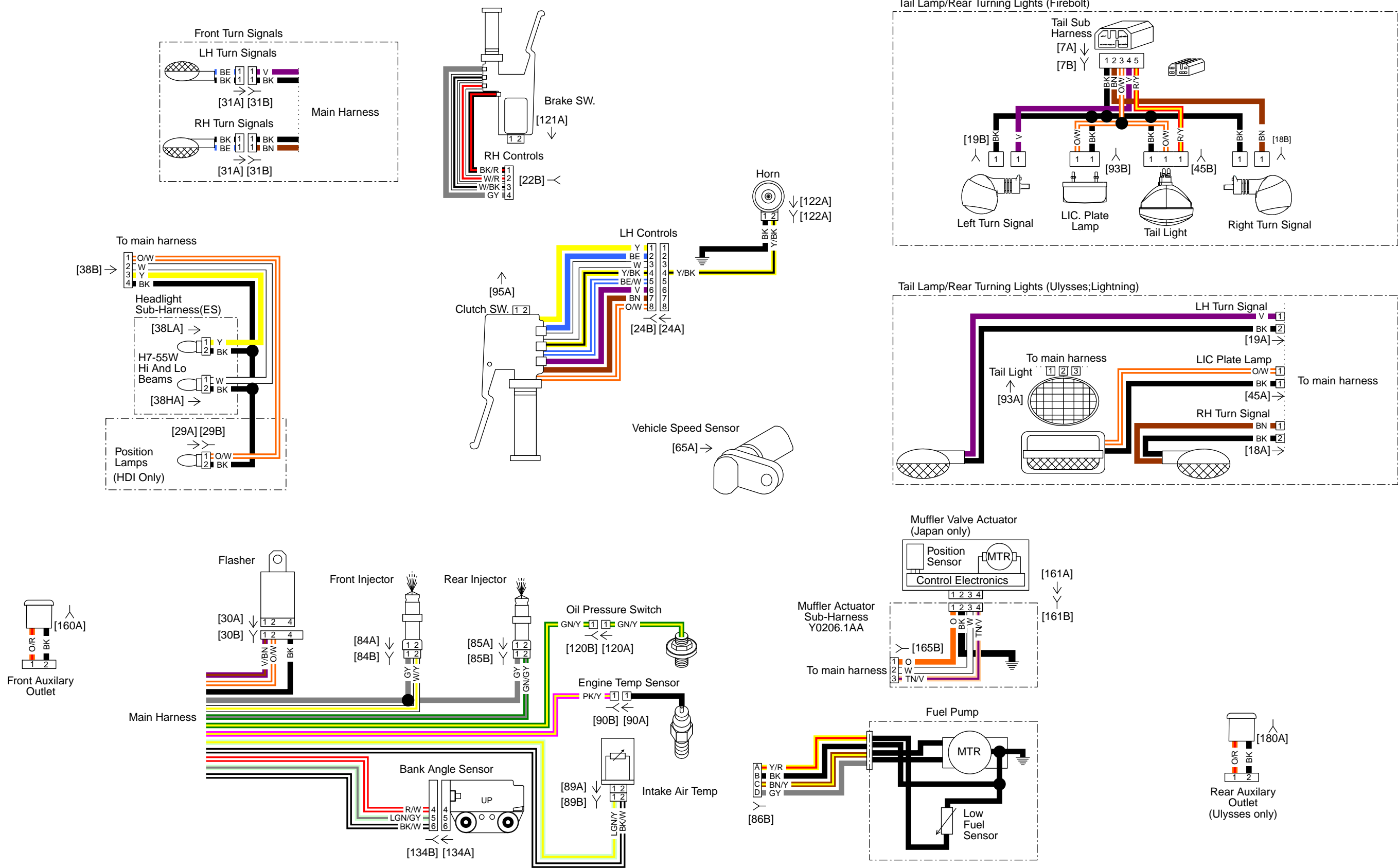


Figure B-7. Component Circuits, All Models

Figure B-7.
Component Circuits, All Models

Figure B-7.
Component Circuits, All Models



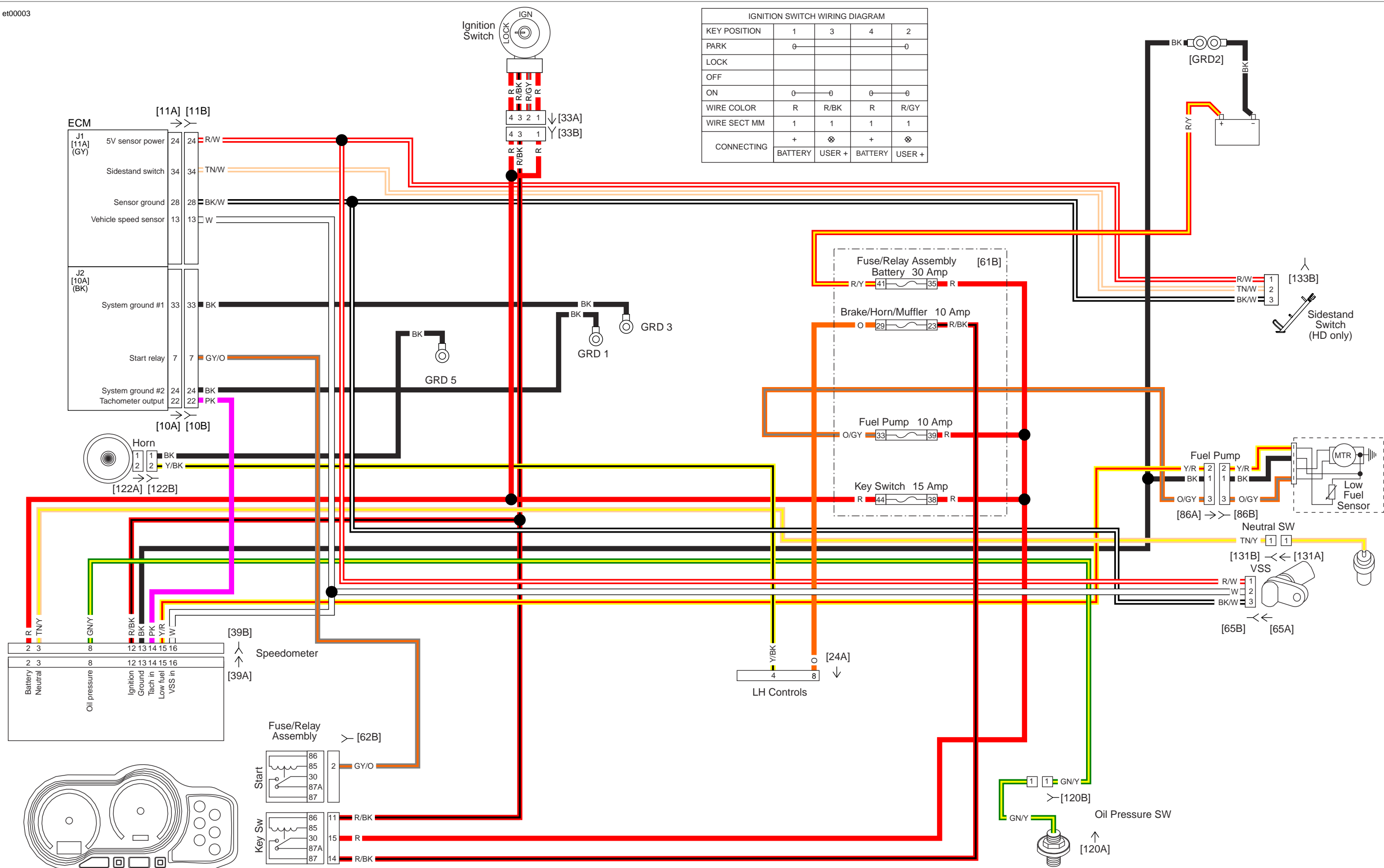


Figure B-8. Horn and Instruments Circuit, All Models

Figure B-8.
Horn and Instruments Circuit, All Models

Figure B-8.
Horn and Instruments Circuit, All Models



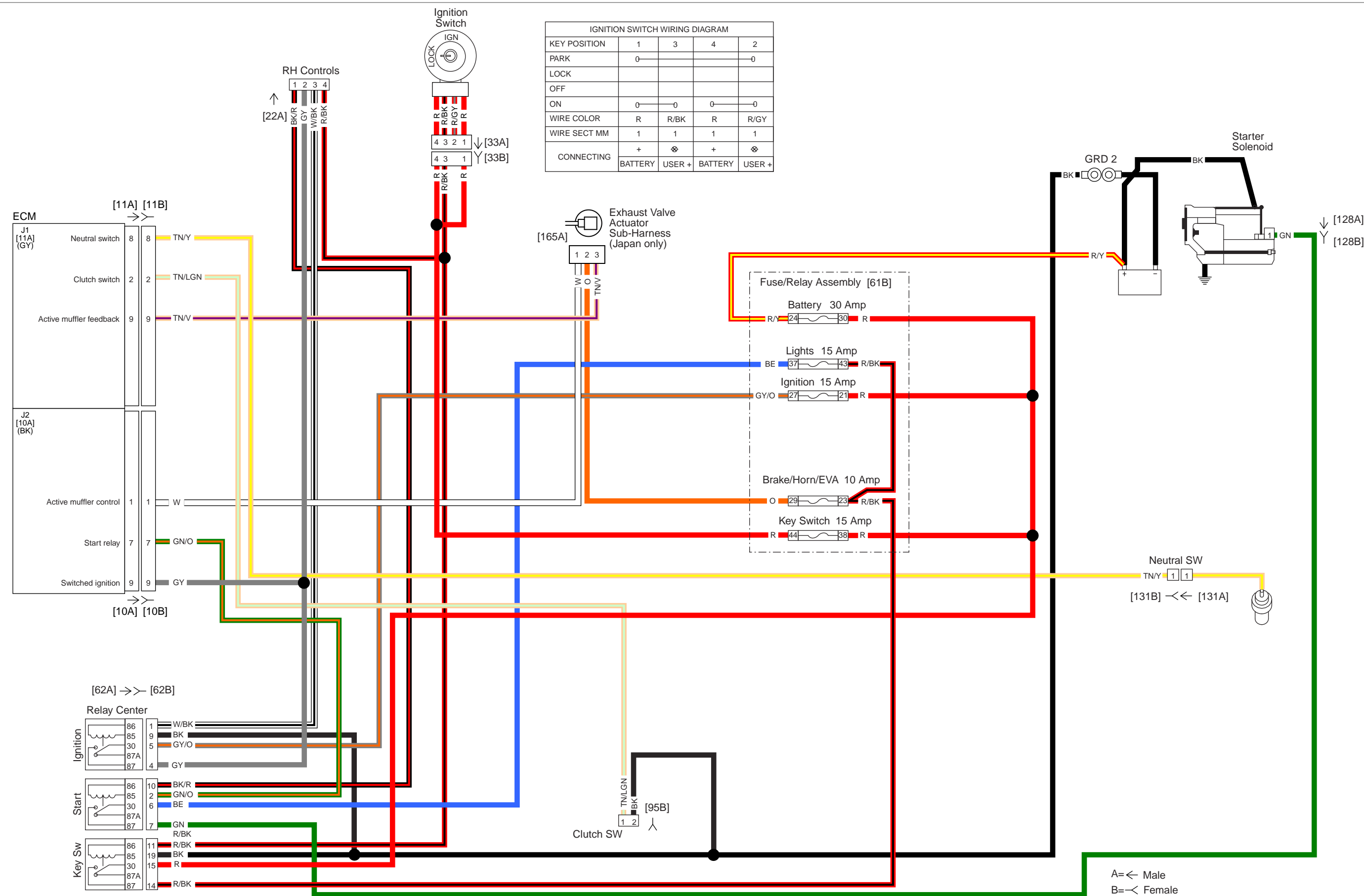


Figure B-9. Starting Circuit, Ulysses and Lightning

Figure B-9.
Starting Circuit, Ulysses and Lightning

Figure B-9.
Starting Circuit, Ulysses and Lightning



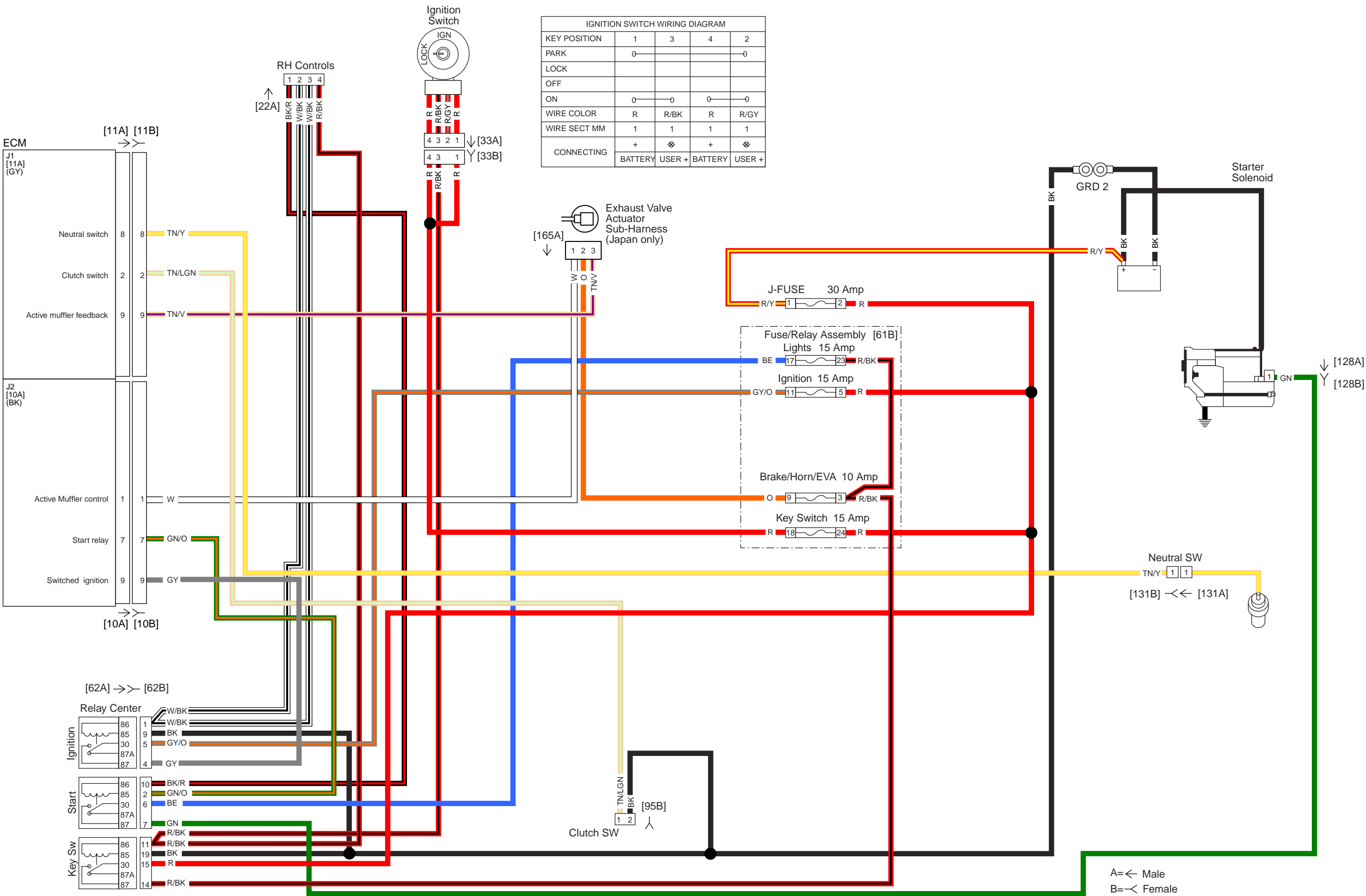


Figure B-10. Starting Circuit, Firebolt

Figure B-10.
Starting Circuit, Firebolt

Figure B-10.
Starting Circuit, Firebolt



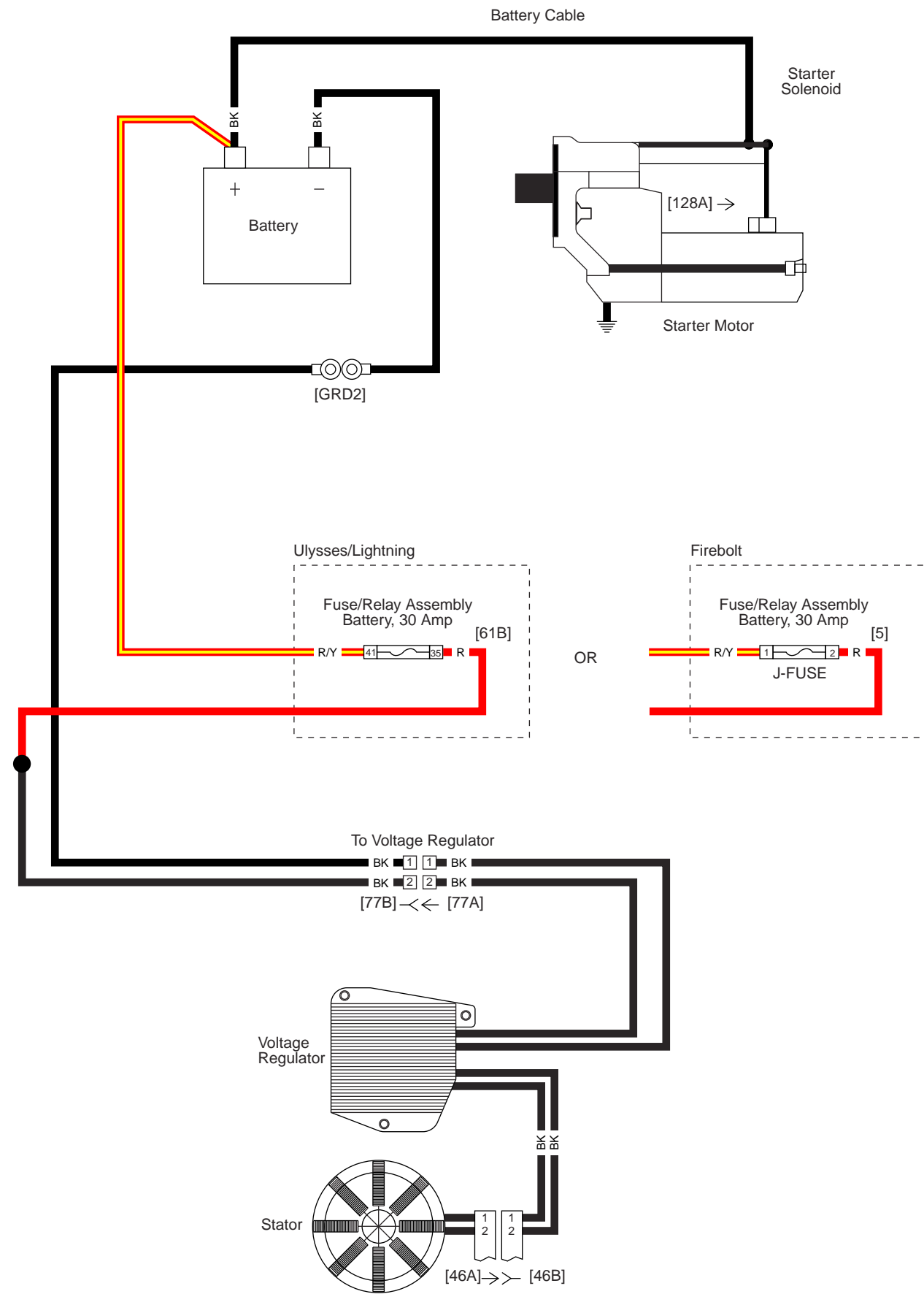


Figure B-11. Charging Circuits, All Models

Figure B-11.
Charging Circuits, All Models

Figure B-11.
Charging Circuits, All Models



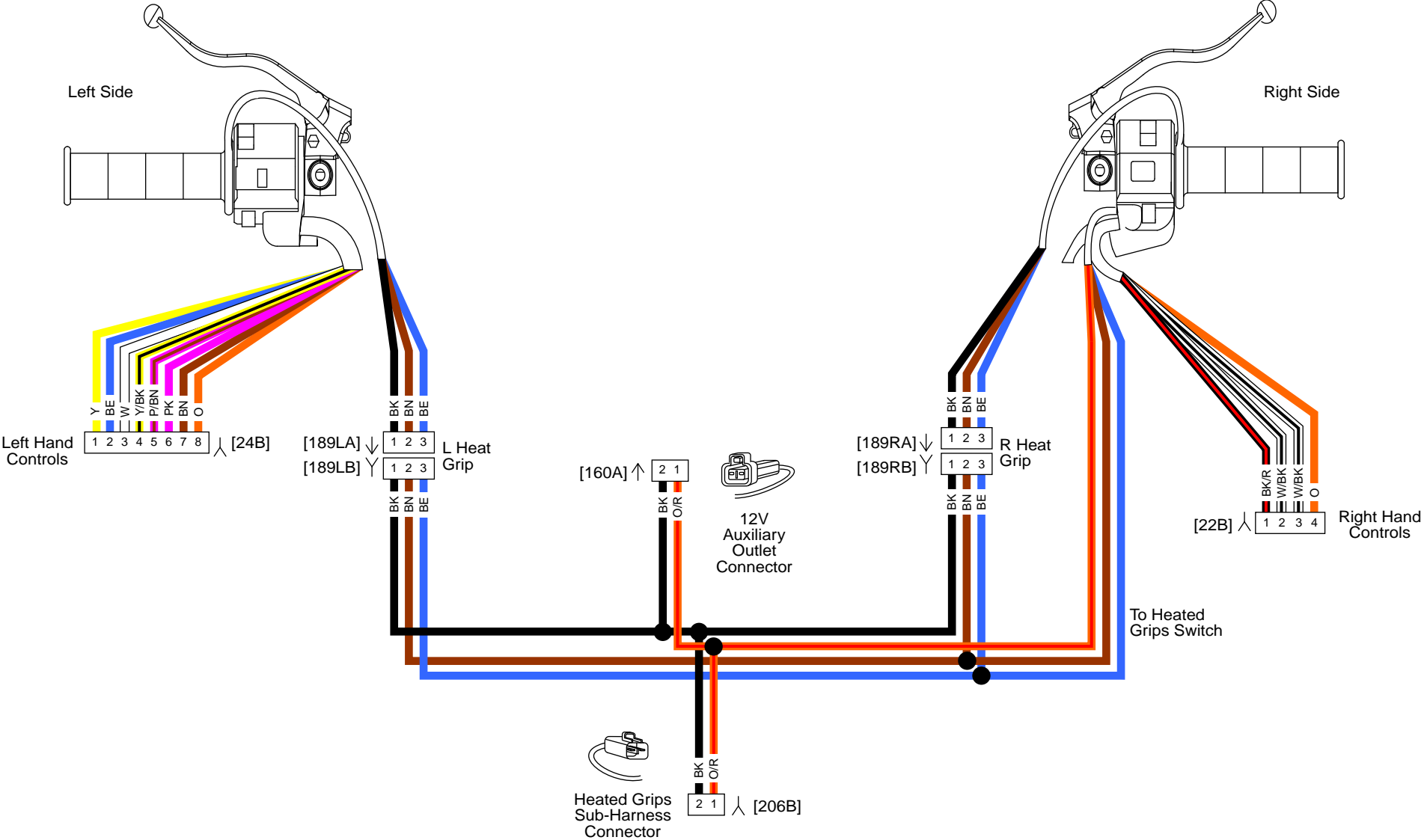


Figure B-12. Heated Handlebar Grips (Ulysses only)

Figure B-12.
Heated Handlebar Grips (Ulysses only)

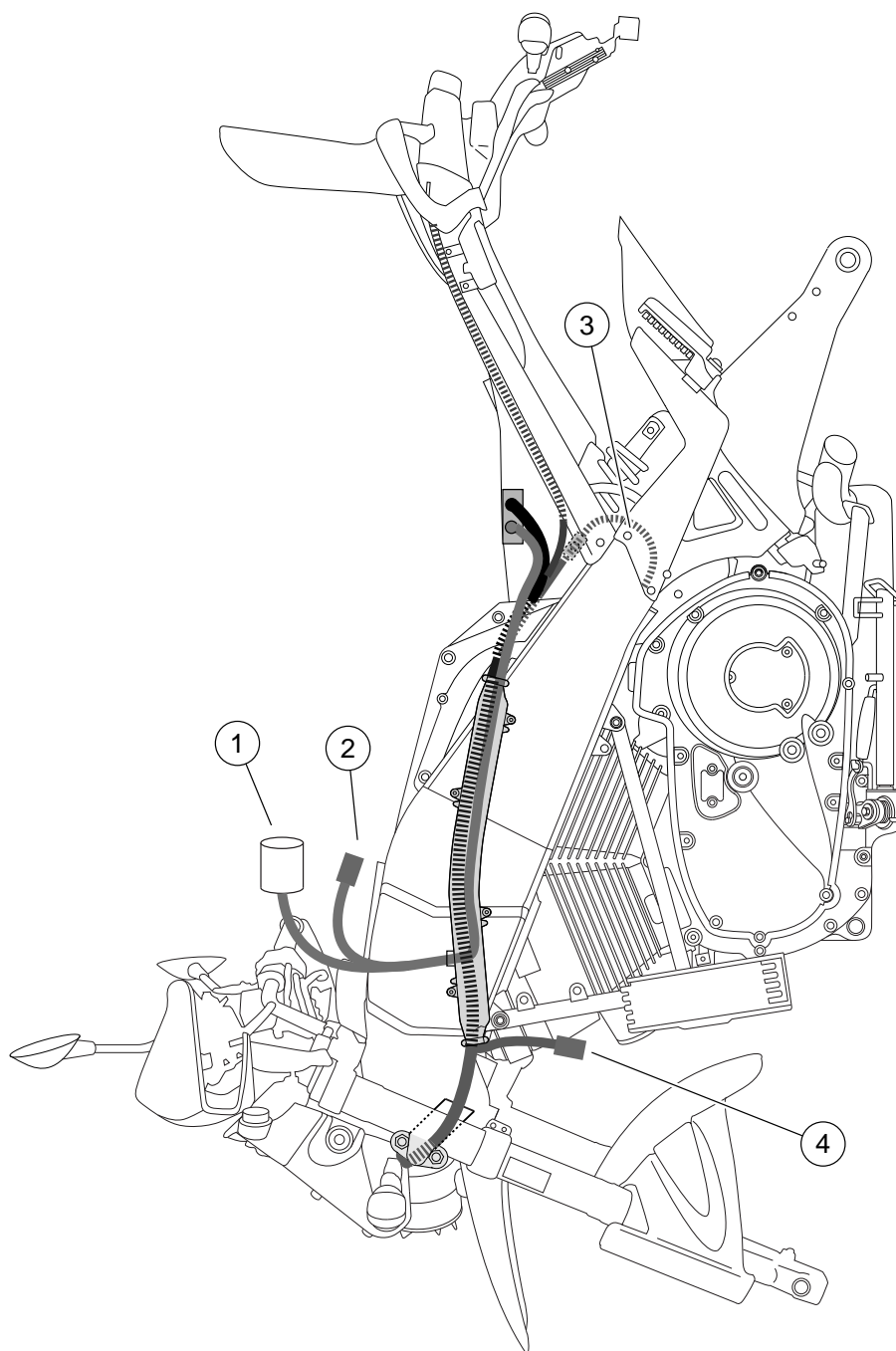
Figure B-12.
Heated Handlebar Grips (Ulysses only)



Wiring Diagram List

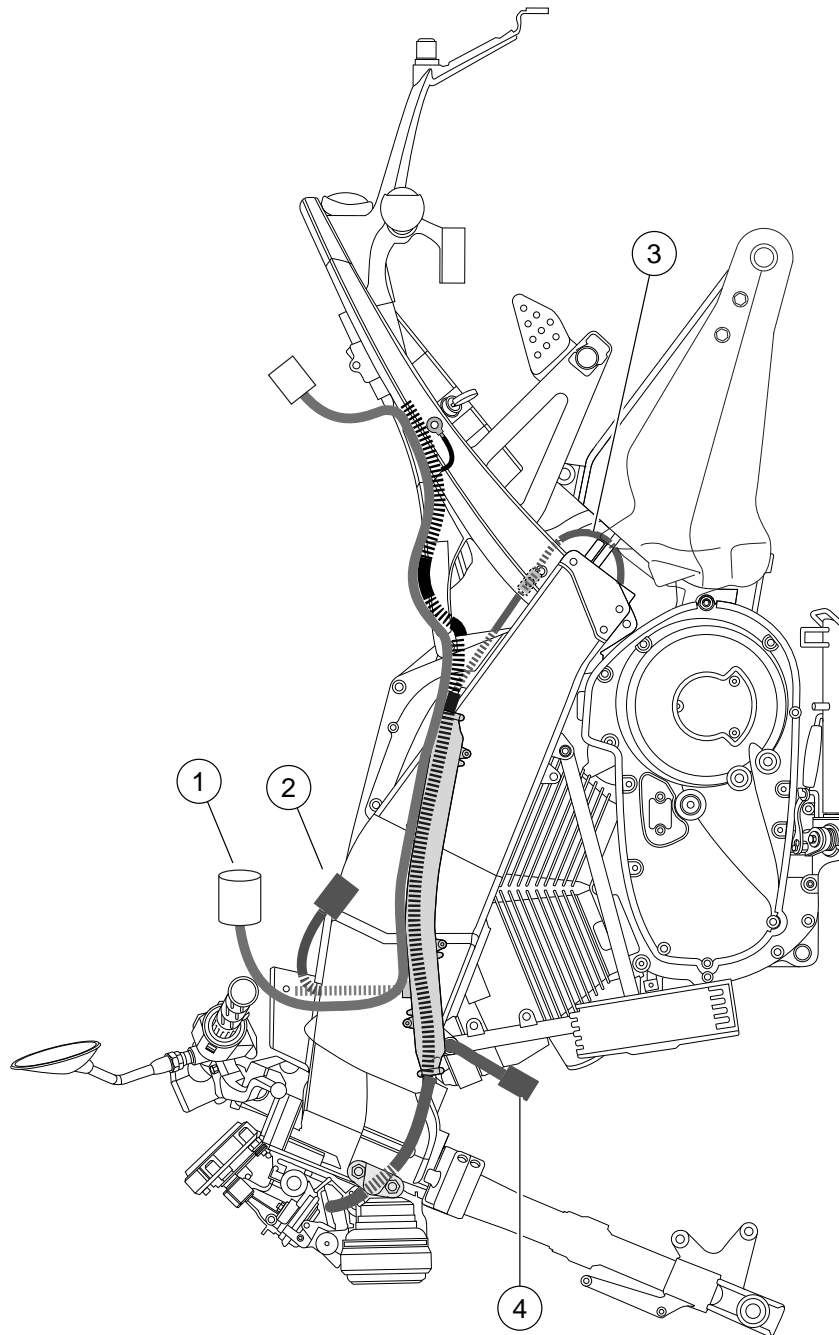
DIAGRAM	LOCATION
Wiring Harness, Left Side View (Ulysses)	Figure B-13
Wiring Harness, Left Side View (Lightning)	Figure B-14
Wiring Harness, Left Side View (Firebolt)	Figure B-15
Wiring Harness, Top View (Ulysses)	Figure B-16
Wiring Harness, Top View (Lightning)	Figure B-17
Wiring Harness, Top View (Firebolt)	Figure B-18
Wiring Harness, Right Side View (Ulysses)	Figure B-19
Wiring Harness, Right Side View (Lightning)	Figure B-20
Wiring Harness, Right Side View (Firebolt)	Figure B-21
Exhaust Valve Actuator, Right Side View (Ulysses)	Figure B-22
Exhaust Valve Actuator, Right Side View (Lightning)	Figure B-23
Exhaust Valve Actuator, Right Side View (Firebolt)	Figure B-24





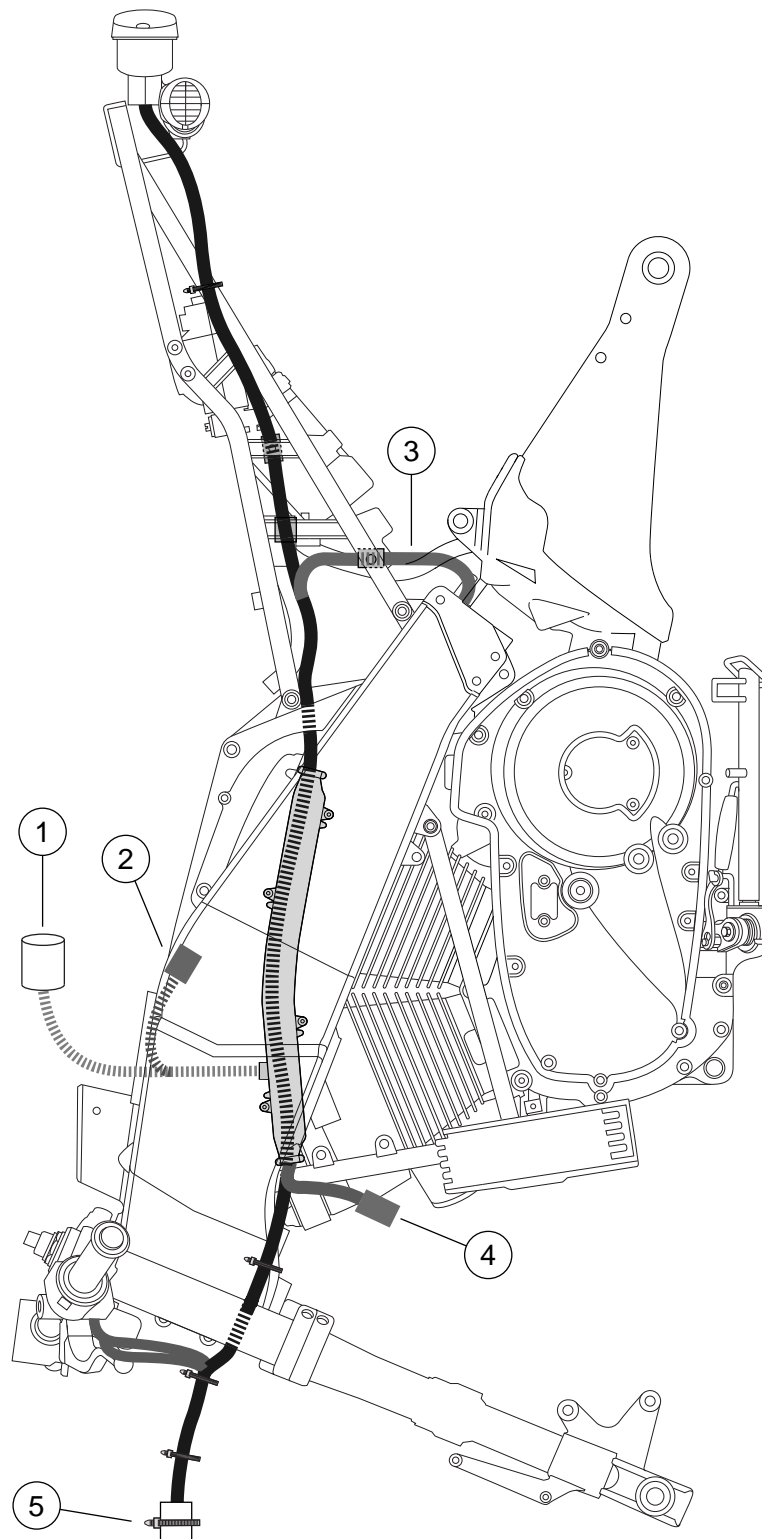
1. Active intake solenoid (Japan only)
2. Ignition coil
3. Fuel pump
4. Crank Position (CKP) sensor

Figure B-13. Wiring Harness, Left Side View (Ulysses)



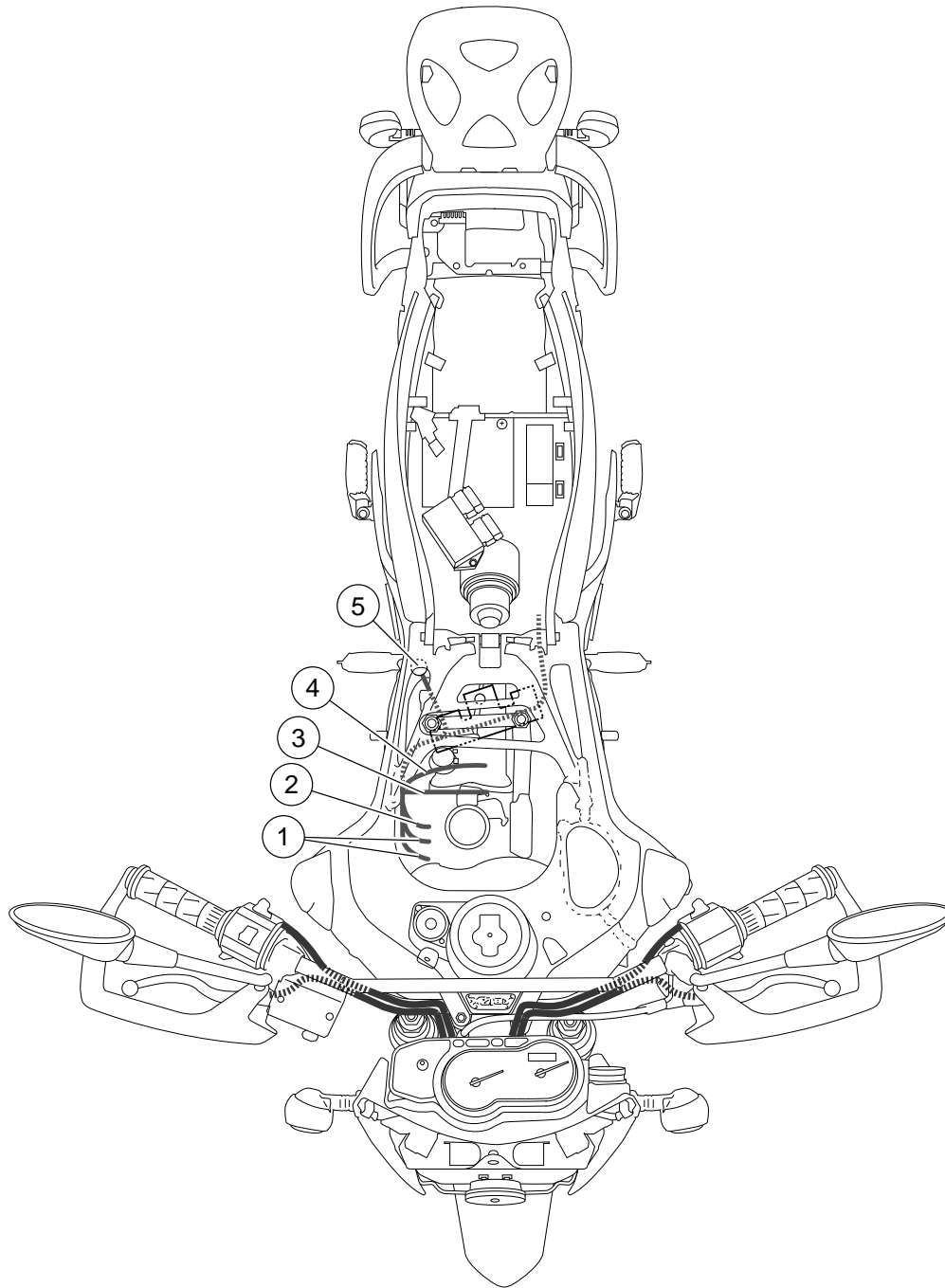
1. Active Intake Solenoid (Japan only)
2. Ignition coil
3. Fuel pump
4. Crank Position (CKP) sensor

Figure B-14. Wiring Harness, Left Side View (Lightning)



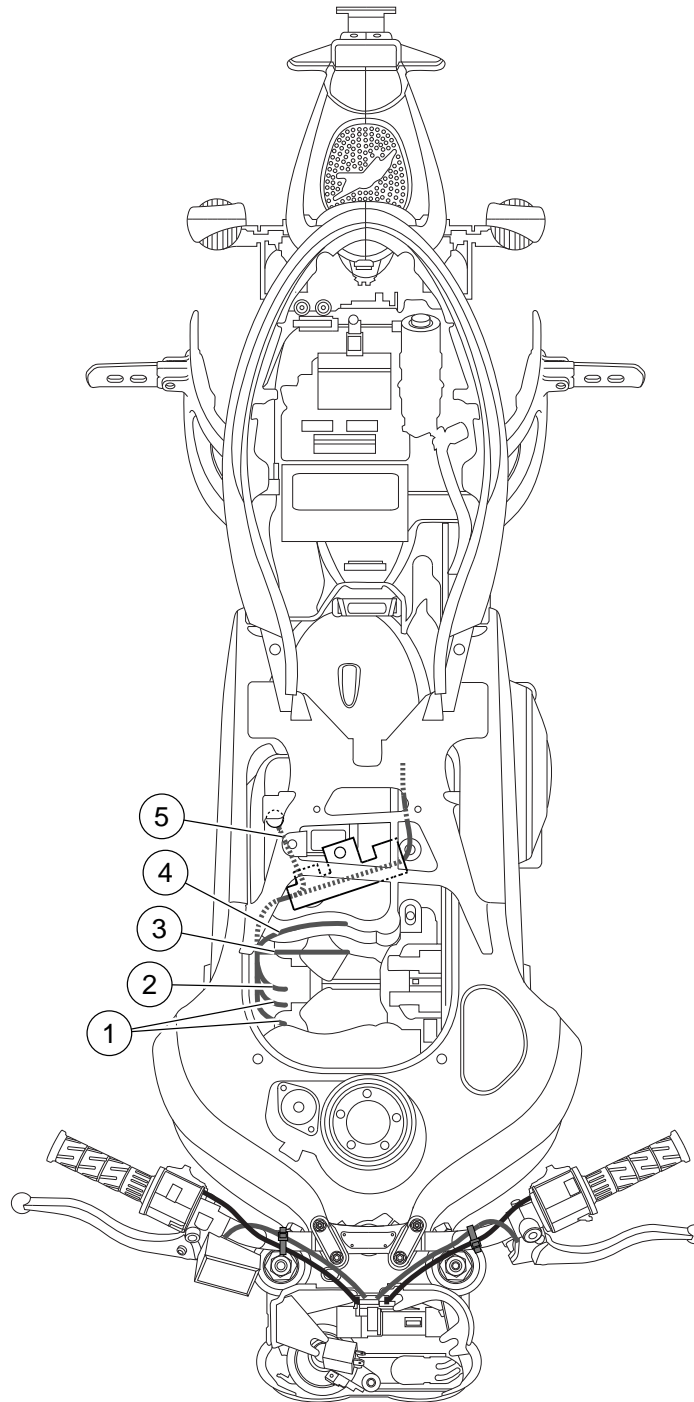
1. Active intake solenoid (Japan only)
2. Ignition coil
3. Fuel pump
4. Crankshaft Position (CKP) sensor
5. To ECM

Figure B-15. Wiring Harness, Left Side View (Firebolt)



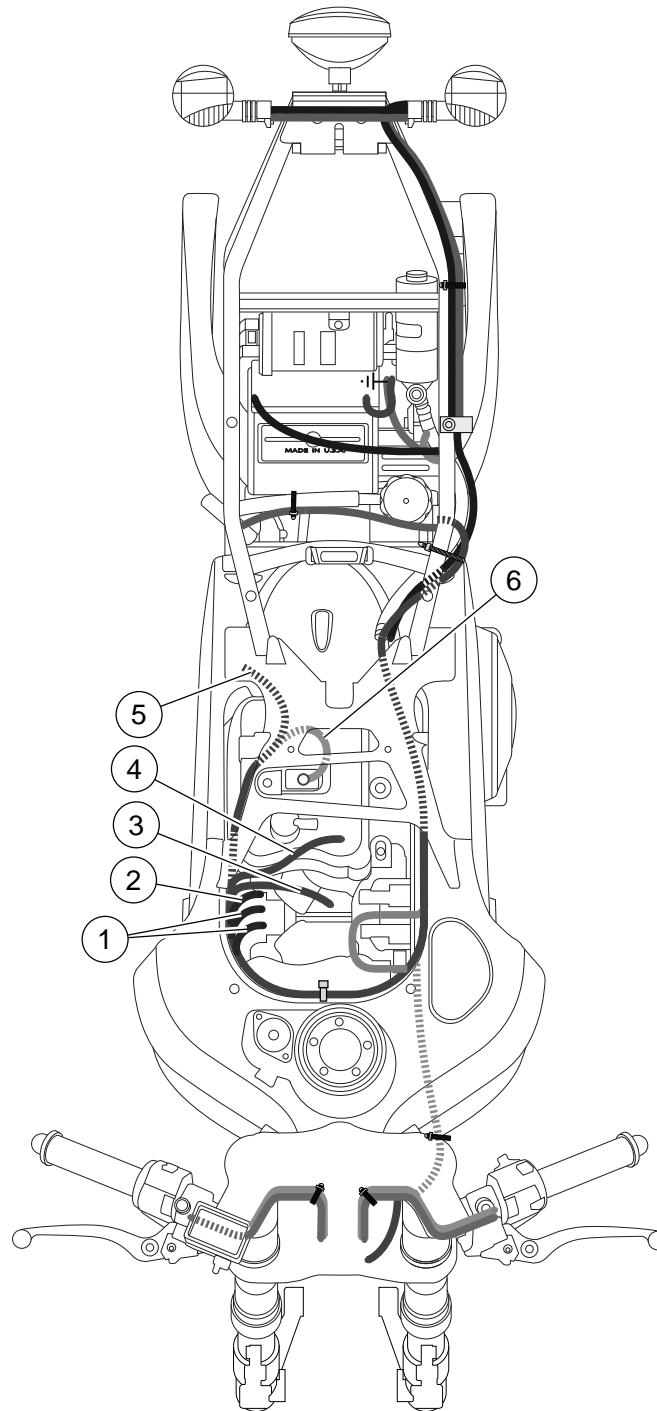
- 1. Fuel injector (2)
- 2. Idle Air Control (IAC)
- 3. Throttle Position Sensor (TPS)
- 4. Intake Air Temperature (IAT) sensor
- 5. Oxygen (O2) sensor

Figure B-16. Wiring Harness, Top View (Ulysses)



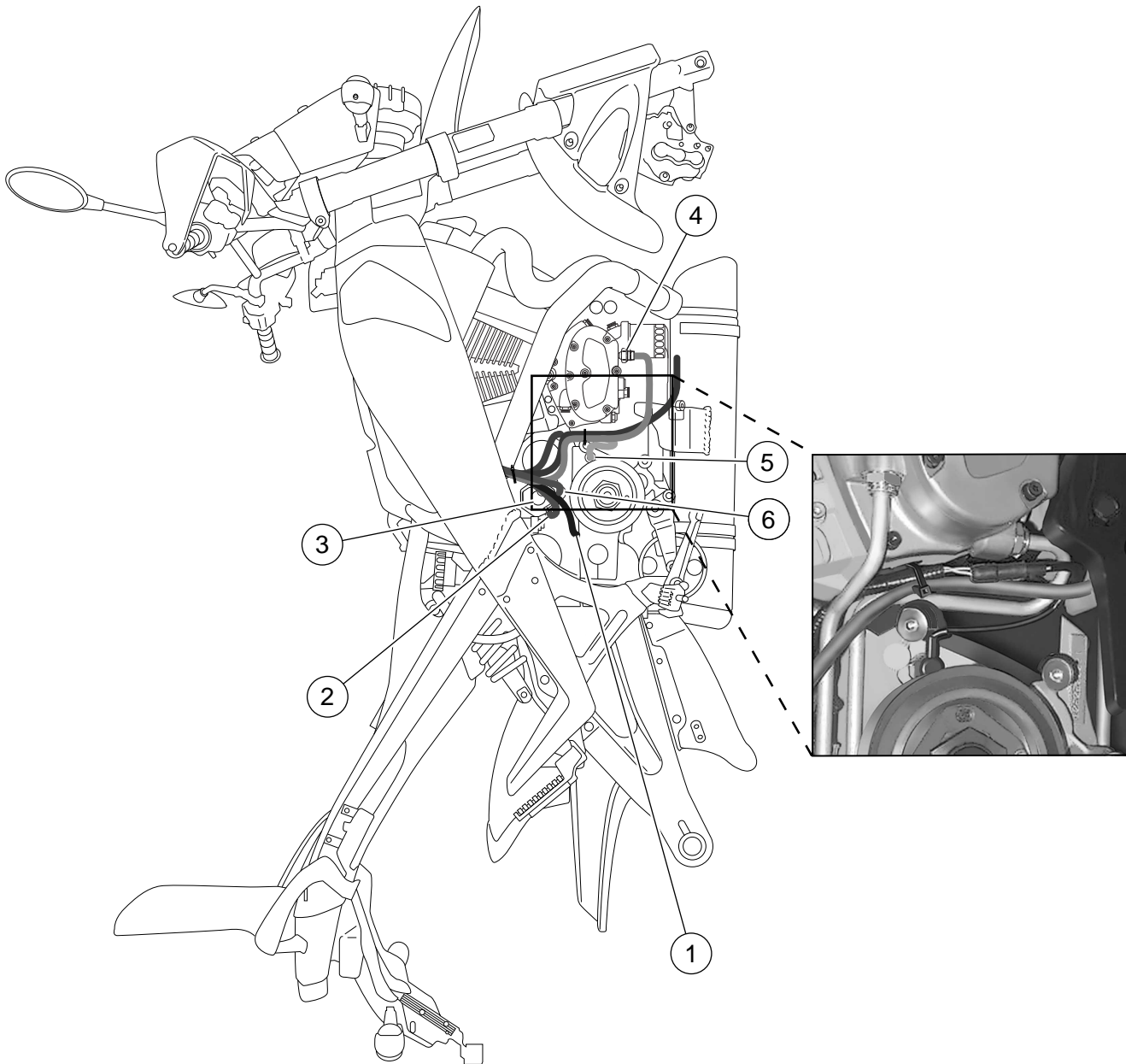
1. Fuel injector (2)
2. Idle Air Control (IAC)
3. Throttle Position Sensor (TPS)
4. Intake Air Temperature (IAT) sensor
5. Oxygen (O2) sensor

Figure B-17. Wiring Harness, Top View (Lightning)



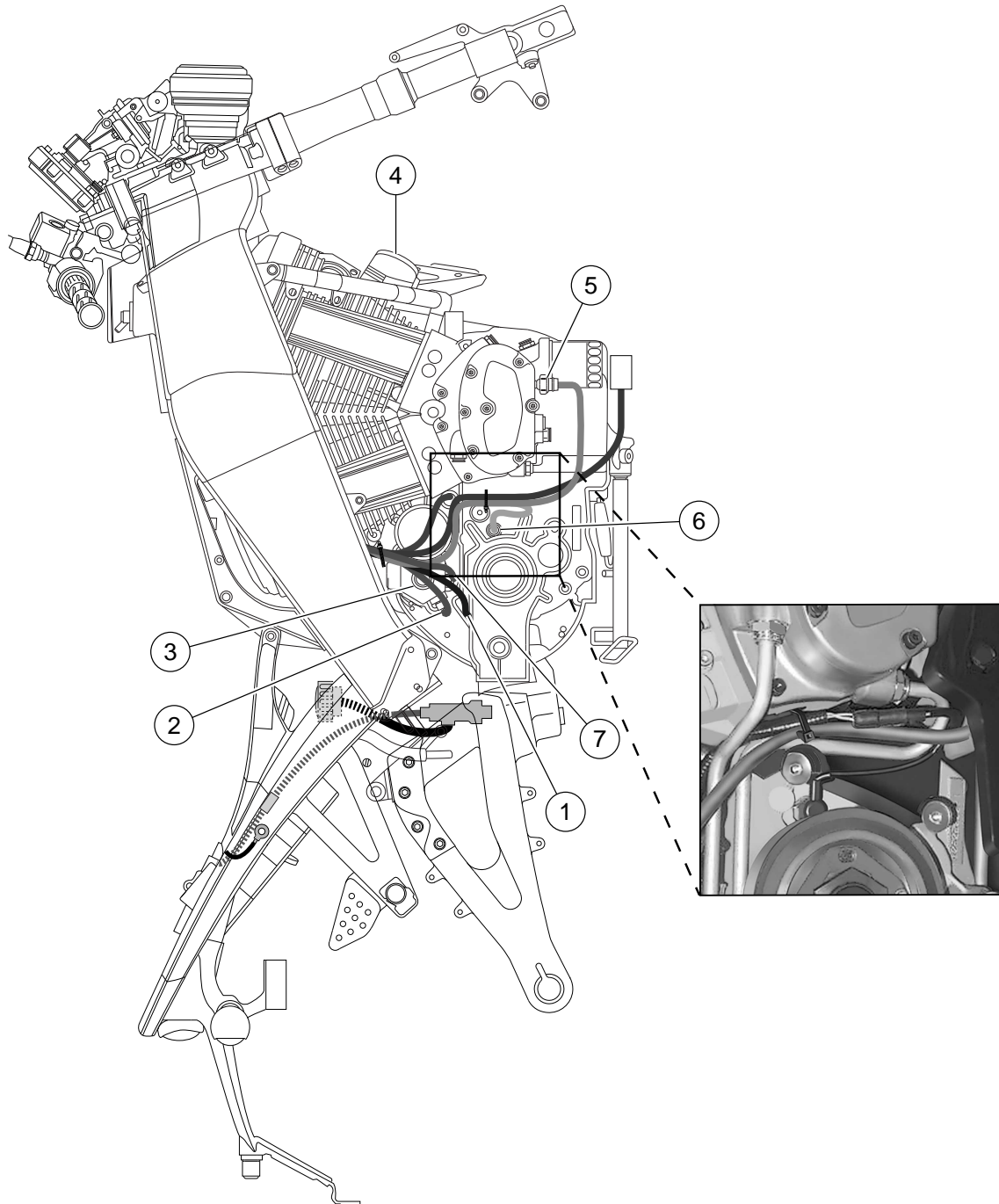
1. Fuel injector (2)
2. Idle Air Control (IAC)
3. Throttle Position Sensor (TPS)
4. Intake Air Temperature (IAT) sensor
5. Oxygen (O2) sensor
6. Engine Temperature (ET) sensor

Figure B-18. Wiring Harness, Top View (Firebolt)



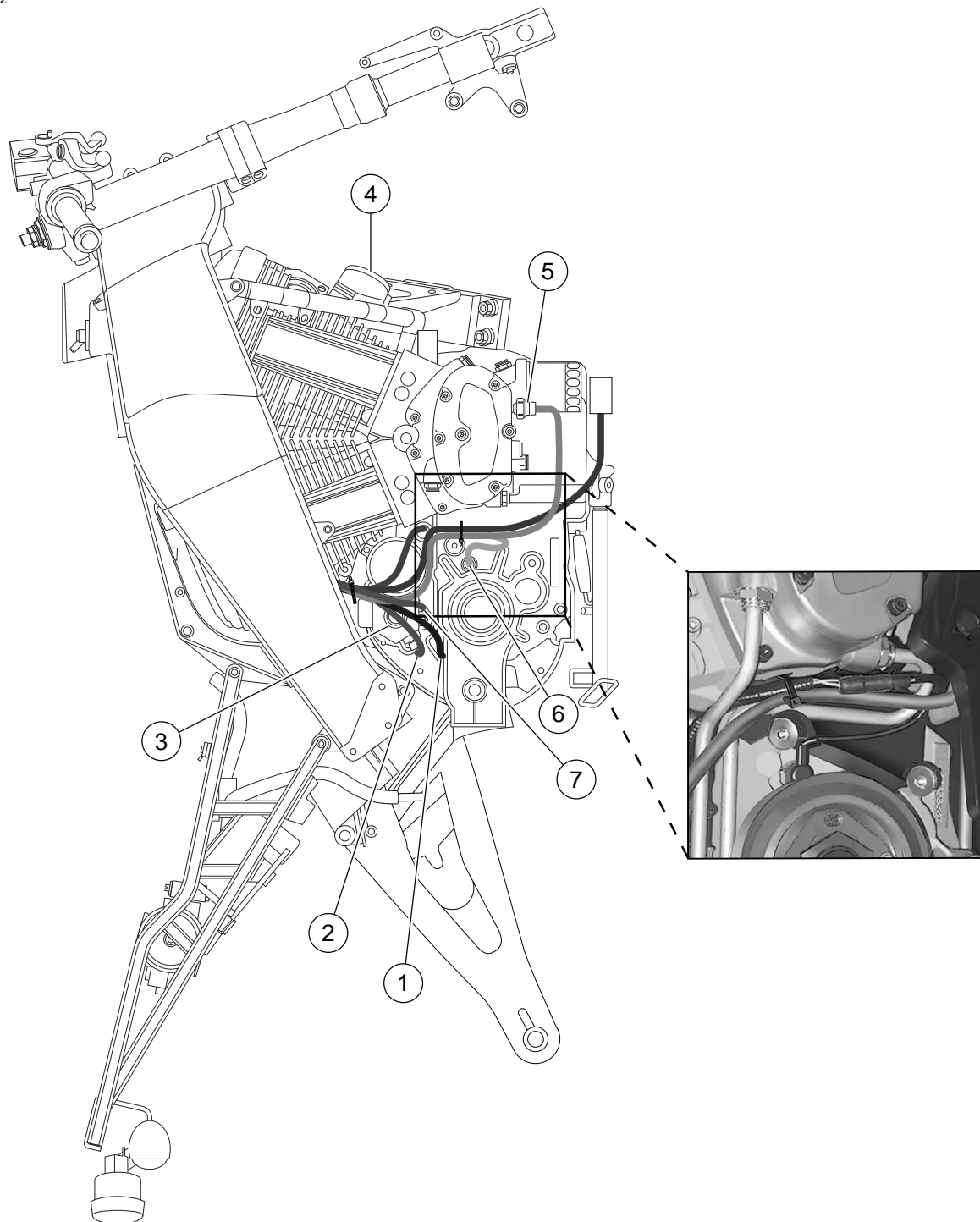
1. Vehicle Speed Sensor (VSS)
2. Cable, starter to battery positive
3. Solenoid
4. Oil pressure switch
5. Neutral switch
6. Relay terminal

Figure B-19. Wiring Harness, Right Side View (Ulysses)



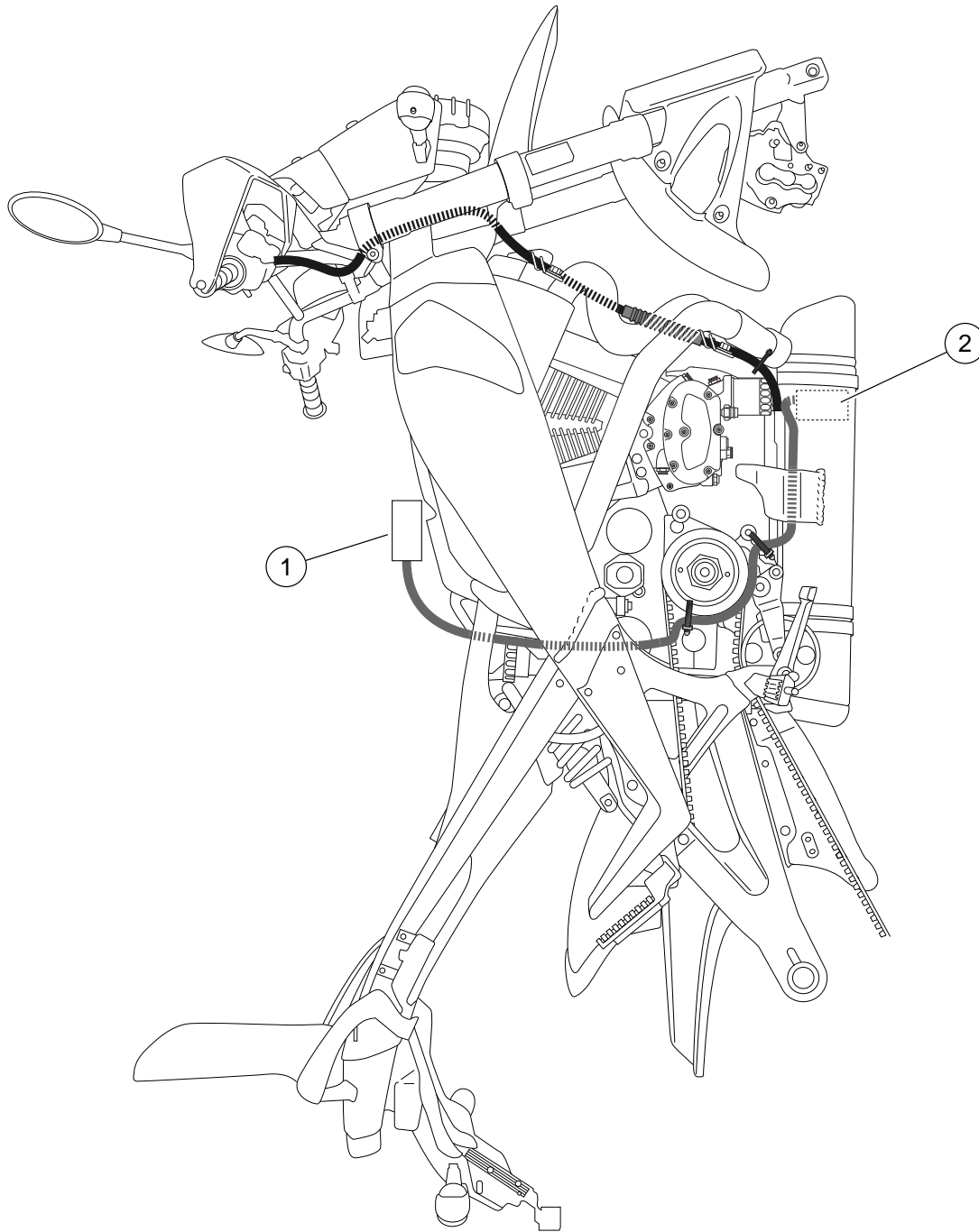
1. Vehicle Speed Sensor (VSS)
2. Cable, starter to battery positive
3. Solenoid
4. Voltage regulator
5. Oil pressure switch
6. Neutral switch
7. Relay terminal

Figure B-20. Wiring Harness, Right Side View (Lightning)



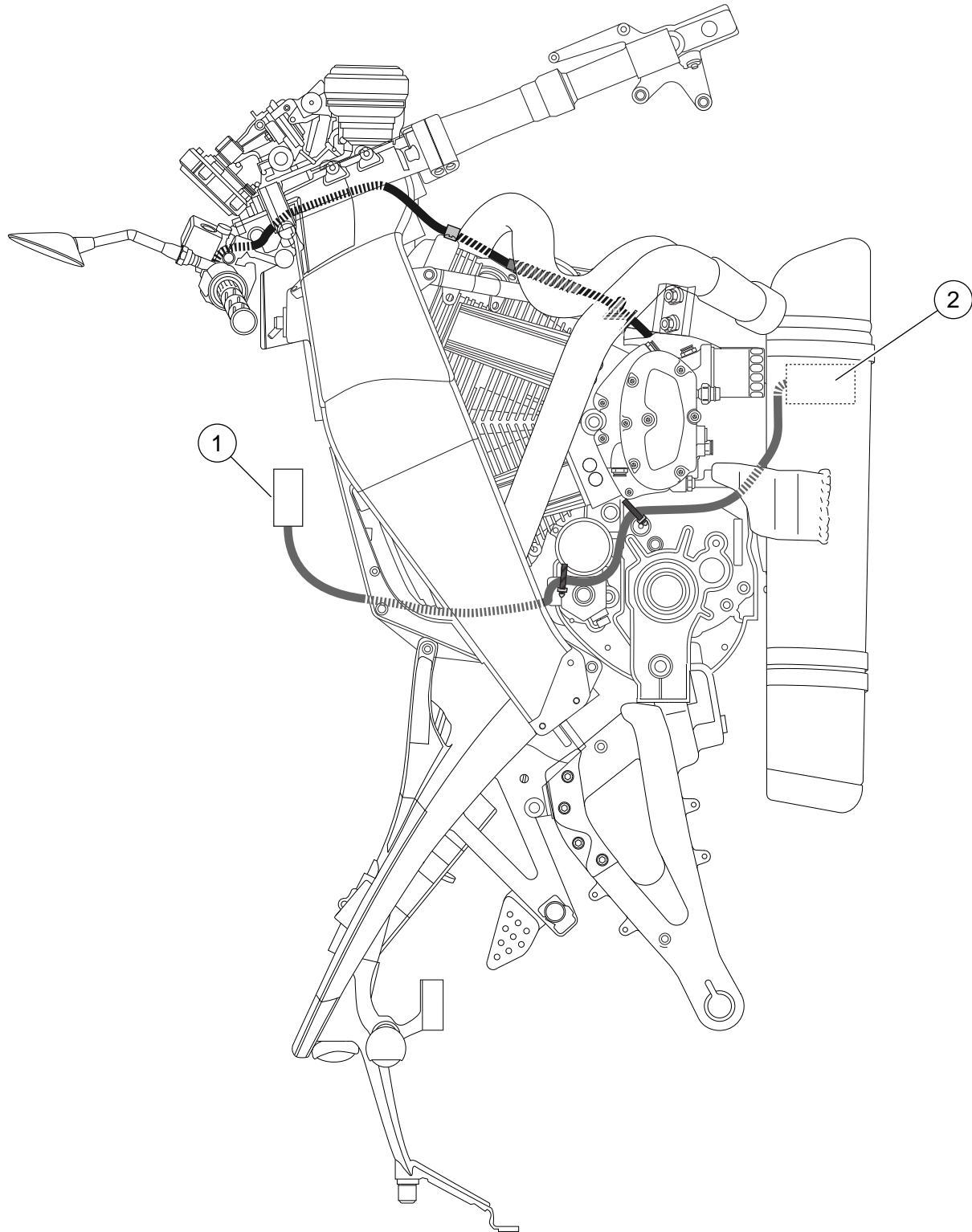
1. Vehicle Speed Sensor (VSS)
2. Cable, starter to battery positive
3. Solenoid
4. Voltage regulator
5. Oil pressure switch
6. Neutral switch
7. Relay terminal

Figure B-21. Wiring Harness, Right Side View (Firebolt)



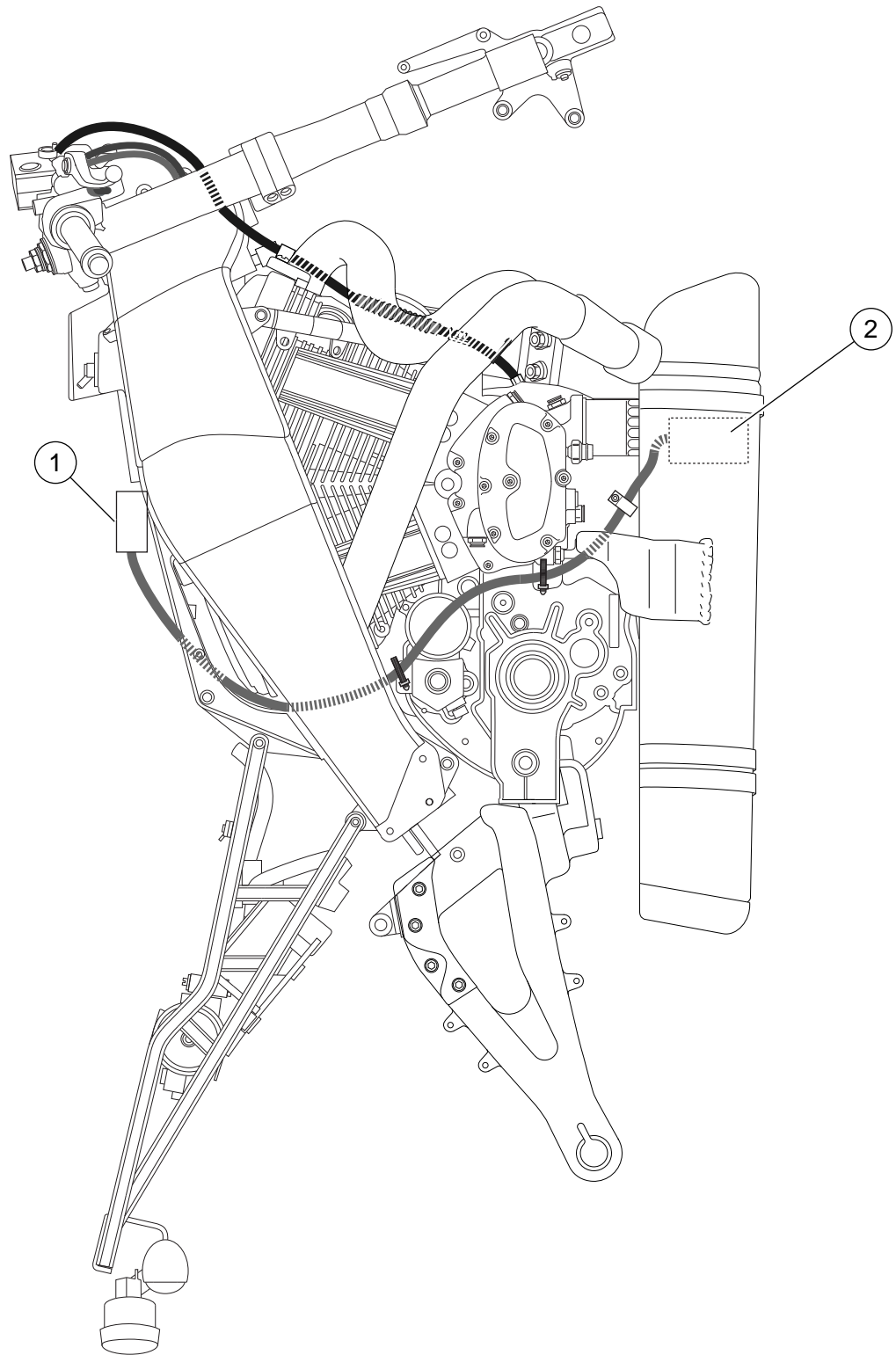
- 1. Exhaust valve actuator
- 2. Muffler valve

Figure B-22. Exhaust Valve Actuator, Right Side View (Ulysses)



1. Exhaust valve actuator
2. Muffler valve

Figure B-23. Exhaust Valve Actuator, Right Side View (Lightning)



- 1. Exhaust valve actuator
- 2. Muffler valve

Figure B-24. Exhaust Valve Actuator, Right Side View (Firebolt)

NOTES



SUBJECT	PAGE NO.
C.1 METRIC CONVERSION.....	C-1
C.2 FLUID CONVERSIONS.....	C-2
C.3 TORQUE CONVERSIONS.....	C-3



NOTES



METRIC CONVERSION

C.1

CONVERSION TABLE

Table C-1. Metric Conversions

MILLIMETERS to INCHES (MM x 0.03937 = IN.)								INCHES to MILLIMETERS (IN. x 25.40 = MM)							
MM	IN.	MM	IN.	MM	IN.	MM	IN.	IN.	MM	IN.	MM	IN.	MM	IN.	MM
.1	.0039	25	.9842	58	2.283	91	3.582	.001	.025	.6	15.240	1-15/16	49.21	3-5/16	84.14
.2	.0078	26	1.024	59	2.323	92	3.622	.002	.051	5/8	15.875	2	50.80	3-3/8	85.72
.3	.0118	27	1.063	60	2.362	93	3.661	.003	.076	11/16	17.462	2-1/16	52.39	3.4	86.36
.4	.0157	28	1.102	61	2.401	94	3.701	.004	.102	.7	17.780	2.1	53.34	3-7/16	87.31
.5	.0197	29	1.142	62	2.441	95	3.740	.005	.127	3/4	19.050	2-1/8	53.97	3-1/2	88.90
.6	.0236	30	1.181	63	2.480	96	3.779	.006	.152	.8	20.320	2-3/16	55.56	3-9/16	90.49
.7	.0275	31	1.220	64	2.519	97	3.819	.007	.178	13/16	20.638	2.2	55.88	3.6	91.44
.8	.0315	32	1.260	65	2.559	98	3.858	.008	.203	7/8	22.225	2-1/4	57.15	3-5/8	92.07
.9	.0354	33	1.299	66	2.598	99	3.897	.009	.229	.9	22.860	2.3	58.42	3-11/16	93.66
1	.0394	34	1.338	67	2.638	100	3.937	.010	.254	15/16	23.812	2-5/16	58.74	3.7	93.98
2	.0787	35	1.378	68	2.677	101	3.976	1/64	.397	1	25.40	2-3/8	60.32	3-3/4	95.25
3	.1181	36	1.417	69	2.716	102	4.016	.020	.508	1-1/16	26.99	2.4	60.96	3.8	96.52
4	.1575	37	1.456	70	2.756	103	4.055	.030	.762	1.1	27.94	2-7/16	61.91	3-13/16	96.84
5	.1968	38	1.496	71	2.795	104	4.094	1/32	.794	1-1/8	28.57	2-1/2	63.50	3-7/8	98.42
6	.2362	39	1.535	72	2.834	105	4.134	.040	1.016	1-3/16	30.16	2-9/16	65.09	3.9	99.06
7	.2756	40	1.575	73	2.874	106	4.173	.050	1.270	1.2	30.48	2.6	66.04	3-15/16	100.01
8	.3149	41	1.614	74	2.913	107	4.212	.060	1.524	1-1/4	31.75	2-5/8	66.67	4	101.6
9	.3543	42	1.653	75	2.953	108	4.252	1/16	1.588	1.3	33.02	2-11/16	68.26	4-1/16	102.19
10	.3937	43	1.693	76	2.992	109	4.291	.070	1.778	1-5/16	33.34	2.7	68.58	4.1	104.14
11	.4331	44	1.732	77	3.031	110	4.331	.080	2.032	1-3/8	34.92	2-3/4	69.85	4-1/8	104.77
12	.4724	45	1.772	78	3.071	111	4.370	.090	2.286	1.4	35.56	2.8	71.12	4-3/16	106.36
13	.5118	46	1.811	79	3.110	112	4.409	.1	2.540	1-7/16	36.51	2-13/16	71.44	4.2	106.68
14	.5512	47	1.850	80	3.149	113	4.449	1/8	3.175	1-1/2	38.10	2-7/8	73.02	4-1/4	107.95
15	.5905	48	1.890	81	3.189	114	4.488	3/16	4.762	1-9/16	39.69	2.9	73.66	4.3	109.22
16	.6299	49	1.929	82	3.228	115	4.527	.2	5.080	1.6	40.64	2-15/16	74.61	4-5/16	109.54
17	.6693	50	1.968	83	3.268	116	4.567	1/4	6.350	1-5/8	41.27	3	76.20	4-3/8	111.12
18	.7086	51	2.008	84	3.307	117	4.606	.3	7.620	1-11/16	42.86	3-1/16	77.79	4.4	111.76
19	.7480	52	2.047	85	3.346	118	4.645	5/16	7.938	1.7	43.18	3.1	78.74	4-7/16	112.71
20	.7874	53	2.086	86	3.386	119	4.685	3/8	9.525	1-3/4	44.45	3-1/8	79.37	4-1/2	114.30
21	.8268	54	2.126	87	3.425	120	4.724	.4	10.160	1.8	45.72	3-3/16	80.96	4-9/16	115.89
22	.8661	55	2.165	88	3.464	121	4.764	7/16	11.112	1-13/16	46.04	3.2	81.28	4.6	116.84
23	.9055	56	2.205	89	3.504	122	4.803	1/2	12.700	1-7/8	47.62	3-1/4	82.55	4-5/8	117.47
24	.9449	57	2.244	90	3.543	123	4.842	9/16	14.288	1.9	48.26	3.3	83.82	4-11/16	119.06

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this Service Manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

METRIC SYSTEM

Fluid volume measurements in this Service Manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). Should you need to convert from U.S. units-of-measure to metric units-of-measure (or vice versa), refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this Service Manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. Should you need to convert from U.S. units to British Imperial units (or vice versa), refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)



UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this service manual. To convert units, use the following equations:

- foot pounds (ft-lbs) X 12.00000 = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs).

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs).
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs**).
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm).
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm).



NOTES



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NOTES



ACRONYMS AND ABBREVIATIONS

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
AC	Alternating Current
ACC	Accessory
ACR	Automatic Compression Release
AGM	Absorbed Glass Mat (battery)
AMP	Ampere
AWG	American Wire Gauge
B+	Battery Voltage
BAS	Bank Angle Sensor
BTDC	Before Top Dead Center
C	Celsius (Centigrade)
CA	California
CAL	Calibration
CC	Cubic Centimeters
CCA	Cold Cranking Amps
CKP	Crankshaft Position
cm	Centimeter
DC	Direct Current
DLC	Data Link Connector
DOM	Domestic
DTC	Diagnostic Trouble Code
DVOM	Digital Volt Ohm Meter
ECM	Electronic Control Module
ECT	Engine Coolant Temperature
EEPROM	Electrically Erasable Programmable Read Only Memory
EFI	Electronic Fuel Injection
ET	Engine Temperature
EVAP	Evaporative Emissions Control System
F	Fahrenheit
ft-lbs	Foot-Pounds
fl oz.	Fluid Ounce
g	Gram
GAL	Gallon
GAWR	Gross Axle Weight Rating
GND	Ground (electrical)
GVWR	Gross Vehicle Weight Rating
HDI	Harley-Davidson International
H-DSSS	Harley-Davidson Smart Security System
HFSM	Hands Free Security Module
Hg	Mercury
IAC	Idle Air Control

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
IAT	Intake Air Temperature
ID	Inside Diameter
IGN	Ignition Light/Key Switch
IM	Instrument Module
In.	Inch
INJ PW	Injector Pulse Width
in-lbs	Inch-Pounds
Kg	Kilogram
Km	Kilometer
kPa	Kilopascal
km/hr	Kilometers Per Hour
L	Liter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
mA	Milliampere
MAP	Manifold Absolute Pressure
ml	milliliter
mm	millimeter
MPH	Miles Per Hour
ms	millisecond
Nm	Newton-Meter
N/A	Not Applicable
no.	Number
O ₂	Oxygen
OD	Outside Diameter
OEM	Original Equipment Manufacturer
oz	Ounce
P&A	Parts and Accessories
PN	Part Number
PSI	Pounds per Square Inch
RES	Reserve
RPM	Revolutions Per Minute
SCFH	Cubic Feet per Hour at Standard Conditions
TCA	Throttle Control Actuator
TDC	Top Dead Center
TGS	Twist Grip Sensor
TP	Throttle Position
TMAP	Intake Air Temperature/Manifold Absolute Pressure
TSM	Turn Signal Module
TSSM	Turn Signal/Security Module
V	Volt
VAC	Volts of Alternating Current
VDC	Volts of Direct Current

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
VIN	Vehicle Identification Number
VSS	Vehicle Speed Sensor



NOTES



Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
B-45522	FUEL PRESSURE GAUGE ADAPTER	2.15 FUEL PRESSURE TEST, Inspection
B-48115	BREAKOUT BOX	1.3 STARTING SYSTEM DIAGNOSIS, Diagnostics
B-48115	BREAKOUT BOX	2.6 BREAKOUT BOX, General
B-48115	BREAKOUT BOX	2.7 WIGGLE TEST, Procedure
B-48115	BREAKOUT BOX	2.8 INITIAL DIAGNOSTIC CHECK, Initial Diagnostics
B-48115	BREAKOUT BOX	2.12 ENGINE CRANKS BUT WILL NOT START, Diagnostics
B-48115	BREAKOUT BOX	2.13 NO ECM POWER, Diagnostics
B-48115	BREAKOUT BOX	2.15 FUEL PRESSURE TEST, Diagnostics
B-48115	BREAKOUT BOX	2.17 DTC P0112 (15), P0113 (15), Diagnostics
B-48115	BREAKOUT BOX	2.18 DTC P0117 (14), P0118 (14), Diagnostics
B-48115	BREAKOUT BOX	2.19 DTC P0122 (11), P0123 (11), Diagnostics
B-48115	BREAKOUT BOX	2.20 DTC P0151 (13), P0152 (11), P0154 (13), Diagnostics
B-48115	BREAKOUT BOX	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32), Diagnostics
B-48115	BREAKOUT BOX	2.22 DTC P0339 (56), Diagnostics
B-48115	BREAKOUT BOX	2.23 DTC P0502 (43), P0503 (43), P0608 (37), Diagnostics
B-48115	BREAKOUT BOX	2.24 DTC P0506 (34), P0507 (34), P0511 (34), Diagnostics
B-48115	BREAKOUT BOX	2.25 DTC P0562 (16), P0563 (16), Diagnostics
B-48115	BREAKOUT BOX	2.29 DTC P0691 (36), P0692 (36), Diagnostics
B-48115	BREAKOUT BOX	2.31 DTC P1151 (44), P1152 (44), Diagnostics
B-48115	BREAKOUT BOX	2.36 DTC P1653 (35), P1654 (35), Diagnostics
B-48115	BREAKOUT BOX	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25), Diagnostics
HD-25070	ROBINAIR HEAT GUN	A.10 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-26792	SPARK TESTER	2.12 ENGINE CRANKS BUT WILL NOT START, Diagnostics
HD-26792	SPARK TESTER	2.16 MISFIRE, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	2.12 ENGINE CRANKS BUT WILL NOT START, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32), Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25), Diagnostics
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.5 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.5 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.5 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.10 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.4 DEUTSCH STANDARD TERMINALS, Deutsch Standard Terminal Crimps
HD-39969	ULTRA-TORCH UT-100	A.10 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-39978	DVOM	2.6 BREAKOUT BOX, General
HD-39978	DVOM	2.7 WIGGLE TEST, Procedure
HD-39978	DVOM	2.8 INITIAL DIAGNOSTIC CHECK, General
HD-39978	DVOM	2.20 DTC P0151 (13), P0152 (11), P0154 (13), Diagnostics
HD-39978	DVOM	2.34 DTC P1501 (45), P1502 (45), P1503 (45), Diagnostics
HD-41182	FUEL PRESSURE GAUGE	2.15 FUEL PRESSURE TEST, Inspection
HD-41183	HEAT SHIELD ATTACHMENT	A.10 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41354	SPEEDOMETER TESTER	2.23 DTC P0502 (43), P0503 (43), P0608 (37), Diagnostics
HD-41354-1	INPUT/OUTPUT CABLE	2.23 DTC P0502 (43), P0503 (43), P0608 (37), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	1.3 STARTING SYSTEM DIAGNOSIS, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.8 INITIAL DIAGNOSTIC CHECK, Initial Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.10 CHECK ENGINE LAMP NOT ILLUMINATED AT KEY ON, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.16 MISFIRE, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.17 DTC P0112 (15), P0113 (15), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.18 DTC P0117 (14), P0118 (14), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.19 DTC P0122 (11), P0123 (11), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.21 DTC P0261 (23), P0262 (23), P0264 (32), P0265 (32), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.22 DTC P0339 (56), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.24 DTC P0506 (34), P0507 (34), P0511 (34), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.28 DTC P0628 (33), P0629 (33), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.33 DTC P1470 (21), P1471 (21), P1477 (21), P1478 (21), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.34 DTC P1501 (45), P1502 (45), P1503 (45), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.15 FUEL PRESSURE TEST, Diagnostics
HD-41417	PROPANE ENRICHMENT KIT	2.9 INTAKE LEAK TEST, Leak Tester
HD-41475	DEUTSCH CONNECTOR SERVICE KIT	A.3 DEUTSCH ELECTRICAL CONNECTORS, Deutsch Connector Repair
HD-41475-100	FLAT BLADE L-HOOK	A.3 DEUTSCH ELECTRICAL CONNECTORS, Deutsch Connector Repair
HD-41609	AMP MULTILOCK CRIMPER	A.1 AMP MULTILOCK CONNECTORS, AMP Multilock Connector Repair
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER	2.37 DTC P2300 (24), P2301 (24), P2303 (25), P2304 (25), Diagnostics

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-44750	DIGITAL TECHNICIAN	2.2 DYNAMIC DIGITAL FUEL INJECTION (DDFI), Introduction
HD-44750	DIGITAL TECHNICIAN	2.7 WIGGLE TEST, General
HD-44750	DIGITAL TECHNICIAN	2.24 DTC P0506 (34), P0507 (34), P0511 (34), General
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER	1.9 CHARGING SYSTEM, Troubleshooting
TT600-3	SNAP-ON PICK	A.9 630 METRI-PACK CONNECTORS, 630 Metri-Pack Connector Repair



NOTES



2008 Buell XB Models Electrical Diagnostics Manual

FASTENER	TORQUE VALUE		NOTES
Cable connector	20-24 in-lbs	2.3-2.7 Nm	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Installation
Jam nuts	48-60 in-lbs	5.4-6.7 Nm	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Installation
Pinch fastener	48-60 in-lbs	5.4-6.7 Nm	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Installation
Solenoid fastener	20-24 in-lbs	2.3-2.7 Nm	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Installation
Solenoid fasteners	48-60 in-lbs	5.4-6.7 Nm	2.30 DTC P1110 (22), P1111 (22), P1112 (22) (JAPANESE MODELS ONLY), Installation





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