



2011 Touring Models Electrical Diagnostic Manual

99497-11

©2010 H-D.

IMPORTANT NOTICE

Harley-Davidson 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.

Harley-Davidson Motor Company



2011 Touring Models Electrical Diagnostic Manual

©2010 H-D.
ALL RIGHTS RESERVED
99497-11

Printed in the U.S.A.

VISIT THE HARLEY-DAVIDSON WEB SITE
<http://www.harley-davidson.com>

READER COMMENTS

The Harley-Davidson Service Communications Department maintains a continuous effort to improve the quality and usefulness of its publications. To do this effectively, we need user feedback - your critical evaluation of this manual.

Please comment on the completeness, accuracy, organization, usability, and readability of this manual.

Please list the page, item, and part number(s) of any errors you find in this manual.

Please tell us how we can improve this manual.

Occupation:

Name:

Dealership:

Street:

Department:

City:

State:

Zip:

2011 Touring Models Electrical Diagnostic Manual (99497-11)

Please clip out and mail to:

Service Communications Department

Harley-Davidson Motor Company

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 Harley-Davidson product and assist in the performance of repair. Secondly, it will introduce to the professional Harley-Davidson Technician the latest field-tested and factory-approved diagnostic methods. We sincerely believe that this manual will make your association with Harley-Davidson 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	General Information
2	Initial Diagnostics and Serial Data
3	Starting and Charging
4	Instruments
5	Accessories, Horn, Lighting and Security
6	Engine Management
7	ABS
8	Audio System
A	Appendix A Connector Repair
B	Appendix B Wiring
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. Chapters and topics in this manual are sequentially numbered for easy navigation.

For example, a cross-reference shown as **2.2 SPECIFICATIONS** refers to chapter 2 CHASSIS, heading 2.2 SPECIFICATIONS.

For quick and easy reference, all pages contain a chapter number followed by a page number. For example, **page 3-5** refers to page 5 in Chapter 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.*
- When servicing a vehicle equipped with the Harley-Davidson Smart Security System (H-DSSS), you must first disarm the security system. Either keep the fob in close proximity to the vehicle, or use Digital Technician II to disable the security system while the vehicle is being serviced and re-enable the system after service is completed.*

SERVICE BULLETINS

In addition to the information presented in this manual, Harley-Davidson Motor Company will periodically issue service bulletins to Harley-Davidson 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

Harley-Davidson parts and accessories are designed for Harley-Davidson motorcycles. Using non-Harley-Davidson parts or accessories can adversely affect performance, stability or handling, which could result in death or serious injury. (00001b)

To achieve satisfactory and lasting repairs, carefully follow the service manual instructions and use only genuine Harley-Davidson replacement parts. Behind the emblem bearing the words GENUINE HARLEY-DAVIDSON stand more than 100 years of design, research, manufacturing, testing and inspecting experience. 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)

NOTICE

NOTICE indicates a potentially hazardous situation which, if not avoided, may result in property damage. (00140b)

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, remember that these warnings are not all-inclusive. Inadequate safety precautions could result in death or serious injury.

Since Harley-Davidson 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 Harley-Davidson 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

Apple, Alcantara S.p.A., Allen, Amp Multilock, Bluetooth, Brembo, Delphi, Deutsch, Dunlop, Dynojet, Fluke, G.E. Versilube, Garmin, Gunk, Hydroseal, Hylomar, iPhone, iPod, Kevlar, Lexan, Loctite, Lubriplate, Keps, K&N, Magnaflux, Marson Thread-Setter Tool Kit, MAXI fuse, Molex, Michelin, MPZ, Multilock, nano, NGK, Novus, Packard, Pirelli, Permatex, Philips, PJ1, Pozidriv, Robinair, S100, Sems, Snap-on, Teflon, Threadlocker, Torca, Torco, TORX, Tufoil, Tyco, Ultratorch, Velcro, X-Acto, XM Satellite Radio, and zumo are among the trademarks of their respective owners.

H-D MICHIGAN, INC. TRADEMARK INFORMATION

Harley, Harley-Davidson, H-D, Bar & Shield, Cross Bones, Digital Tech, Digital Technician, Digital Technician II, Dyna, Electra Glide, Evolution, Fat Bob, Fat Boy, Glaze, Gloss, H-D, H-Dnet.com, HD, Harley, Harley-Davidson, Heritage Softail, Low Rider, Night Rod, Nightster, Night Train, Profile, Revolution, Road Glide, Road King, Road Tech, Rocker, Softail, Sportster, Street Glide, Street Rod, Sun Ray, Sunwash, Tech Link, Twin Cam 88, Twin Cam 88B, Twin Cam 96, Twin Cam 96B, Twin Cam 103, Twin Cam 103B, Twin Cam 110, Twin Cam 110B, Tour-Pak, Screamin' Eagle, Softail, Super Glide, SYN3, Ultra Classic, V-Rod, VRSC and Harley-Davidson Genuine Motor Parts and Genuine Motor Accessories are among the trademarks of H-D Michigan, Inc.

CONTENTS

All photographs, illustrations and procedures 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, Harley-Davidson reserves the right to change specifications, equipment or designs at any time without notice and without incurring obligation.

GENERAL INFORMATION

1.1 SPECIFICATIONS AND COMPONENT LOCATIONS

Specifications.....	1-1
Component Locations.....	1-2

1.2 DIAGNOSTIC TOOLS

How To Use Diagnostic Tools.....	1-13
HD-26792 Spark Tester.....	1-13
HD-34730-2D Fuel Injector Test Light.....	1-13
HD-39978 Digital Multimeter (Fluke 78).....	1-13
HD-41404-C Harness Connector Test Kit.....	1-14
HD-42682 Breakout Box (Instruments).....	1-14
HD-42682 Breakout Box (TSM/TSSM/HFSM).....	1-14
HD-48637 Breakout Box (ECM).....	1-15
HD-48642 Breakout Box (ABS).....	1-15
HD-47918 Advanced Audio System Breakout Box.....	1-16
HD-44687 Ignition Coil Circuit Test Adapter.....	1-16
HD-48053 Advanced Battery Conductance and Electrical System Analyzer.....	1-17
HD-48650 Digital Technician II.....	1-17

1.3 DIAGNOSTICS AND TROUBLESHOOTING

Voltage Drop.....	1-18
Voltage Drop Test.....	1-18
Wiggle Test.....	1-19
Relay Diagnostics.....	1-19
Relay Variation.....	1-19
Relay Test.....	1-19
Job/Time Codes Values.....	1-20

INITIAL DIAGNOSTICS AND SERIAL DATA

2.1 INITIAL DIAGNOSTICS

Description and Operation.....	2-1
Retrieving Trouble Codes.....	2-1
Odometer Self-Diagnostics.....	2-1
Diagnostic Mode.....	2-1
Diagnostics.....	2-1
Diagnostic Tips.....	2-1
Code Types.....	2-6
Current.....	2-6
Historic.....	2-6
Multiple Trouble Codes.....	2-6
Clearing DTCs.....	2-6
Security Lamp.....	2-6
Check Engine Lamp.....	2-6
Symptoms.....	2-7
Connector Information.....	2-8
Initial Diagnostics.....	2-21
1. Verifying Current DTC Test.....	2-21
2. Battery Power Test.....	2-21
3. Ignition Power Test.....	2-21
4. Engine Stop Switch Circuit Test.....	2-21
5. Security System Test.....	2-21
6. Starter System Test.....	2-21
7. Engine Running Test.....	2-21
8. Verification Test.....	2-21

2.2 SERIAL DATA COMMUNICATION

Description and Operation.....	2-22

Components.....	2-23
Electronic Control Module (ECM).....	2-23
Speedometer and Tachometer.....	2-23
TSM/TSSM/HFSM.....	2-23
Data Link Connector (DLC).....	2-23
Communication DTCs and "Bus Er".....	2-23
Diagnostic Tips.....	2-23

2.3 DTC U1016, U1040, U1064, U1097, U1255

Description and Operation.....	2-24
Diagnostic Tips.....	2-24
Connector Information.....	2-24
DTC U1016.....	2-25
1. Open Ground Test.....	2-25
2. Switched Power Circuit Open Test.....	2-25
3. TSM/TSSM/HFSM Serial Data Circuit Continuity Test.....	2-26
4. Speedometer Serial Data Circuit Continuity Test.....	2-26
5. Tachometer Serial Data Circuit Continuity Test.....	2-26
DTC U1040, U1255.....	2-26
1. ABS Fuse Visual Test.....	2-26
2. Loss of Power Test.....	2-26
3. Loss of Ground Test.....	2-26
4. Instrument Serial Data Circuit Continuity Test.....	2-26
5. Power Circuit Short to Ground Test.....	2-27
DTC U1064, U1255.....	2-27
1. Fuse Test.....	2-27
2. Loss of Battery Power Test.....	2-27
3. Loss of Ignition Power Test.....	2-27
4. Loss of Ground Test.....	2-27
5. Speedometer Serial Data Circuit Continuity Test.....	2-27
6. Power Circuit Short to Ground Test.....	2-27
7. ECM Serial Data Circuit Continuity Test.....	2-27
8. Tachometer Serial Data Circuit Continuity Test.....	2-28
DTC U1097, U1255.....	2-28
1. Fuse Test.....	2-28
2. Loss of Power Test.....	2-28
3. Loss of Ground Test.....	2-28
4. Speedometer Serial Data Circuit Continuity Test.....	2-28
5. Power Circuit Short to Ground Test.....	2-28
6. ECM Serial Data Circuit Continuity Test.....	2-28

2.4 DTC U1300, U1301 OR BUS ER

Description and Operation.....	2-29
Diagnostic Tips.....	2-29
Connector Information.....	2-29
DTC U1300.....	2-30
1. Serial Data Short to Ground Test.....	2-30
2. ECM Test.....	2-30
3. TSM/TSSM/HFSM Test.....	2-30
4. ABS Module Test (If Vehicle is not Equipped with ABS, Go to Test 5.).....	2-30
5. Tachometer Test (If Vehicle is not Equipped with Tachometer, Go to Test 6.).....	2-30
6. Radio Test (If Vehicle is not Equipped with Radio, Go to Test 7.).....	2-30
7. Serial Data Short to Ground Test.....	2-30
8. Serial Data Circuit Open Test.....	2-30
9. Intermittent Test.....	2-30
DTC U1301.....	2-31
1. Serial Data Short to Voltage Test.....	2-31
2. ECM Test.....	2-31
3. TSM/TSSM/HFSM Test.....	2-31
4. ABS Module Test (If Vehicle is not Equipped with ABS, Go to Test 5.).....	2-31
5. Tachometer Test (If Vehicle is not Equipped with Tachometer, Go to Test 6.).....	2-31

TABLE OF CONTENTS

6. Radio Test (If Vehicle is not Equipped with Radio, Go to Test 7.).....	2-31
7. Serial Data Short to Voltage Test.....	2-31
8. Serial Data Circuit Open Test.....	2-31
9. Intermittent Test.....	2-32

STARTING AND CHARGING

3.1 BATTERY TESTING

General.....	3-1
Voltmeter Test.....	3-1
Conductance Test.....	3-1
Load Test.....	3-1

3.2 STARTING SYSTEM

Description and Operation.....	3-3
Components.....	3-3
Starter.....	3-3
Starter Solenoid.....	3-3
Engine Stop Switch.....	3-3
Start Switch.....	3-3
Start Relay.....	3-3
Ignition Switch.....	3-3
Battery.....	3-4
Grinding Noise Or Erratic Starting.....	3-4
Job/Time Code Values.....	3-4
Connector Information.....	3-4
Starter Troubleshooting.....	3-6
Starter Testing.....	3-7
1. Starting System Operational Test.....	3-7
2. Audible Noise Test.....	3-7
3. Starter Solenoid Test.....	3-7
4. Start Switch Circuit Test.....	3-7
5. Start Switch Circuit Short to Voltage Test.....	3-7
6. Start Switch Circuit Short to Voltage [2B] Test.....	3-7
7. Start Switch Circuit Short to Voltage [2A] Test	3-7
8. Start Switch Test.....	3-7
9. Start Relay Test.....	3-8
Nothing Clicks.....	3-8
1. Battery Test.....	3-8
2. Fuse Test.....	3-8
3. Ignition Circuit Test.....	3-8
4. Ignition Switch Supply Voltage Test.....	3-8
5. Ignition Switch to [222] Test	3-8
6. Ignition Switch Test.....	3-8
7. Ignition Switch to [222] Continuity Test.....	3-9
8. Start Switch Circuit Voltage Test.....	3-9
9. Start Switch Test.....	3-9
10. Start Switch Circuit Continuity Test.....	3-9
11. Start Switch Circuit Continuity [2B] Test.....	3-9
12. Start Switch Circuit Continuity [2A] Test.....	3-9
13. Start Relay Control Circuit Test.....	3-9
14. Start Relay Control Circuit Open Test.....	3-9
15. TSM/TSSM/HFSM Ground Test.....	3-9
16. Continuity at Neutral Switch Test.....	3-9
17. Neutral Switch Ground Circuit Test.....	3-10
18. Start Relay Coil Control Circuit Short to Voltage Test.....	3-10
19. Engine Stop Switch Voltage Test.....	3-10
20. Relay Enable Circuit Continuity Test.....	3-10
21. Anti-Theft Tracking Module Test.....	3-10
Start Relay Clicks.....	3-10

1. Battery Test.....	3-10
2. Starter Solenoid Control Coil Voltage Test.....	3-10
3. Starter Solenoid Control Coil Continuity Test.....	3-10
4. Start Solenoid Wiring Inspection Test.....	3-10
5. Starter Solenoid Test.....	3-11
Starter Solenoid Clicks.....	3-11
1. Battery Test.....	3-11
2. Starter Voltage Drop Test.....	3-11
3. Starter Solenoid Voltage Drop Starter Side Test.....	3-11
4. Starter Solenoid Battery Side Voltage Drop Test.....	3-11
5. Starter Ground Circuit Voltage Drop Test.....	3-11
6. Starter Ground Test.....	3-11
7. Starter Draw Test.....	3-11
8. Mechanical Binding Test.....	3-11
Starter Spins But Does Not Engage.....	3-12
1. Pinion Gear and Clutch Shell Test.....	3-12
Starter Stalls or Spins Too Slowly.....	3-12
1. Battery Test.....	3-12
2. Starter Stud Voltage Drop Test.....	3-12
3. Starter Ground Circuit Voltage Drop Test.....	3-12
4. Starter Draw Test.....	3-12
5. Starter Solenoid Voltage Drop Starter Side Test.....	3-12
6. Starter Solenoid Battery Side Voltage Drop Test.....	3-12

3.3 TESTING STARTER ON MOTORCYCLE

Starter Current Draw Test.....	3-13

3.4 TESTING STARTER ON BENCH

Free Running Current Draw Test.....	3-14
Starter Solenoid.....	3-14
Solenoid Pull-In Test.....	3-14
Solenoid Hold-In Test.....	3-14
Solenoid Return Test.....	3-15

3.5 CHARGING SYSTEM

Description and Operation.....	3-16
Alternator.....	3-16
Voltage Regulator.....	3-16
Troubleshooting.....	3-16
Battery.....	3-16
Wiring.....	3-16
Voltage Regulator Inspection.....	3-16
Job/Time Code Values.....	3-16
Connector Information.....	3-16
Low or No Charging.....	3-17
1. Battery Test.....	3-17
2. Off Idle Voltage Test.....	3-17
3. AC Output Test.....	3-17
4. Stator Test.....	3-17
5. Rotor Inspection Test.....	3-17
6. Voltage Regulator Power Circuit Test.....	3-17
7. Voltage Regulator Ground Circuit Test.....	3-17
Overcharging.....	3-17
1. Battery Voltage Test.....	3-17
2. Voltage Regulator Ground Circuit Test.....	3-17
Low Battery After Extended IGN OFF.....	3-18
1. Battery Test.....	3-18
2. Amp Draw Test.....	3-18
Battery Runs Down During Use.....	3-18
1. Total Current Draw Test.....	3-18
2. Battery Test.....	3-18
Battery Charging Tests.....	3-18

TABLE OF CONTENTS

Milliampere Draw Test.....	3-18	2. Fuel Pump and Sender Test.....	4-5
Total Current Draw and Output Test.....	3-19	3. Fuel Gauge Voltage Test.....	4-5
Stator Test.....	3-20	4. Fuel Level Sender Circuit Continuity Test.....	4-5
AC Output Test.....	3-21	5. Fuel Level Sender Circuit Test.....	4-5
3.6 DTC B0563, P0562, P0563		DTC B1005.....	4-5
Description and Operation.....	3-22	1. Fuel Level Sender Voltage Test.....	4-5
DTC B0563.....	3-22	2. Fuel Pump and Sender Test.....	4-5
DTC P0562 and P0563.....	3-22	3. Fuel Level Sender Circuit Test.....	4-6
Diagnostics.....	3-22	4. Fuel Level Sender Circuit Continuity Test.....	4-6
Diagnostic Tips.....	3-22	5. Fuel Gauge Ground Circuit Test.....	4-6
Connector Information.....	3-22	6. Fuel Sender Resistance Test.....	4-6
DTC P0562.....	3-24	4.3 DTC B1008	
1. Battery Test.....	3-24	Description and Operation.....	4-7
2. Charging System Test.....	3-24	Trip Odometer Reset Switch Closed.....	4-7
3. ECM Switched Voltage Test.....	3-24	DTC B1008.....	4-7
4. ECM Switched Voltage Drop Test.....	3-24	1. Rubber Boot Test.....	4-7
5. ECM Ground Circuit Voltage Drop Test.....	3-24	2. Trip Odometer Reset Switch Test.....	4-7
6. ECM Switched Power Circuit Resistance Test.....	3-24	4.4 NO INSTRUMENT POWER	
7. Switched Power Circuit Resistance Test.....	3-24	Description and Operation.....	4-8
8. Switched Power Circuit Resistance [1A] Test.....	3-24	Connector Information.....	4-8
9. Switched Power Circuit Resistance [1B] Test.....	3-24	Speedometer Inoperative.....	4-10
10. Ignition Circuit Resistance Test.....	3-25	1. Battery and Ignition Function Test	4-10
11. Ignition Circuit Resistance [1A] Test.....	3-25	2. Accessory Function Test.....	4-10
12. Ignition Circuit Resistance [1B] Test.....	3-25	3. Accessory Fuse Test.....	4-10
13. Engine Stop Switch Test.....	3-25	4. Battery Fuse Test.....	4-10
14. Ignition Circuit Voltage Drop Test.....	3-25	5. Battery Circuit to Battery Fuse Test.....	4-10
15. Ignition Circuit Resistance Test.....	3-25	6. Battery Circuit to Speedometer Test.....	4-10
16. Ignition Switch To [222] Resistance Test.....	3-25	7. Battery Circuit Short to Ground Test.....	4-10
17. Ignition Switch Battery Circuit Voltage Drop Test.....	3-25	8. Ignition Circuit Test.....	4-10
18. Battery Voltage to Main Fuse Voltage Drop Test.....	3-25	9. Instrument Power Circuit Test.....	4-10
19. Main Fuse to Ignition Switch Resistance Test.....	3-25	10. Ignition Fuse Test.....	4-11
20. Main Fuse to [222] Resistance Test.....	3-25	11. Ignition Power to Instrument Fuse Test.....	4-11
21. Repair Validation Test	3-26	12. Ignition Power Short to Ground Test.....	4-11
DTC B0563, P0563.....	3-26	13. Ground Circuit Test.....	4-11
1. Charging System Test.....	3-26	4.5 INDICATOR LAMPS	
2. Repair Validation Test.....	3-26	Description and Operation.....	4-12
3.7 DTC B1006, B1007		Low Fuel Indicator.....	4-12
Description and Operation.....	3-27	Neutral Indicator.....	4-15
Diagnostic Tips.....	3-27	Oil Pressure Indicator.....	4-15
DTC B1006, B1007.....	3-27	Turn Signal Indicators.....	4-15
1. Charging System Test.....	3-27	High Beam Indicator.....	4-15
2. Repair Validation Test.....	3-27	Sixth Gear Indicator.....	4-15
INSTRUMENTS		Connector Information.....	4-15
4.1 INSTRUMENTS		Oil Pressure Lamp Always On.....	4-17
Description and Operation.....	4-1	1. Oil Pressure Lamp Function Test.....	4-17
Trip Odometer Reset Switch Operation.....	4-1	2. Engine Running Test.....	4-17
Speedometer Theory of Operation.....	4-1	3. Oil Pressure Sensor Test.....	4-17
Tachometer Theory of Operation.....	4-2	4. Oil Pressure Circuit Test.....	4-17
Instrument Diagnostics.....	4-2	5. Mechanical Test.....	4-17
4.2 DTC B1004, B1005		Oil Pressure Lamp Inoperative.....	4-17
Description and Operation.....	4-3	1. Oil Pressure Lamp Function Test.....	4-17
Connector Information.....	4-3	2. Oil Pressure Switch Test.....	4-17
DTC B1004.....	4-5	3. Oil Pressure Circuit Test.....	4-17
1. Fuel Level Sender Voltage Test.....	4-5	Neutral Lamp Always On.....	4-18
		1. Neutral Lamp Function Test.....	4-18
		2. Transmission Operation Test.....	4-18
		3. Neutral Switch Test	4-18
		4. TSM/TSSM/HFSM Test.....	4-18
		5. Neutral Switch Circuit Test.....	4-18

TABLE OF CONTENTS

Neutral Lamp Inoperative.....	4-18
1. Neutral Lamp Function Test.....	4-18
2. Neutral Switch Test.....	4-18
3. Neutral Switch Power Circuit Open Test.....	4-18
High Beam Indicator Lamp Inoperative.....	4-19
1. High Beam Indicator Function Test.....	4-19
2. High Beam Indicator Circuit Test	4-19
Turn Signal Indicator Inoperative.....	4-19
1. Turn Signal Function Test.....	4-19
2. Turn Signal Indicator Circuit Test	4-19

4.6 GAUGES

Theory of Operation.....	4-20
Fuel Gauge and Sender Test.....	4-20
Oil Pressure Gauge and Indicator Light.....	4-21
Problem.....	4-21
Ambient Air Temperature Gauge.....	4-21
Problem.....	4-21
Voltmeter Gauge.....	4-22
Problem.....	4-22

ACCESSORIES, HORN, LIGHTING AND SECURITY

5.1 ACCESSORIES

Description and Operation.....	5-1
Components.....	5-1
P&A Connectors.....	5-1
P&A Fuses.....	5-1
Connector Information.....	5-2
Rear Auxiliary Power Outlet Inoperative.....	5-3
1. Power Outlet Fuse Test.....	5-3
2. Power Outlet Test.....	5-3
3. Power Outlet Ground Circuit Test.....	5-3
4. Power Outlet Short to Ground Test.....	5-3
Cigar Lighter Inoperative.....	5-3
1. P&A Fuse Test.....	5-3
2. Cigar Lighter Test.....	5-3
3. Cigar Lighter Ground Circuit Test.....	5-3
4. Power Outlet Short to Ground Test.....	5-3

5.2 HEATED HAND GRIPS

Description and Operation.....	5-4
Diagnostic Tips.....	5-4
Connector Information.....	5-4
Heated Handgrips Inoperative.....	5-6
1. P&A Fuse Test.....	5-6
2. Current Draw Test.....	5-6
3. Power Supply Test.....	5-6
4. Heated Grips Ground Circuit Test.....	5-6
5. Heated Grips Test.....	5-6
6. Heated Grips Short to Ground Test.....	5-6
7. Heated Grip Power Circuit Short to Ground Test.....	5-6
8. Heated Grips Resistance Test.....	5-6

5.3 CRUISE CONTROL

Description and Operation.....	5-7
System Operation.....	5-7
Troubleshooting.....	5-8
Diagnostic Tips.....	5-8
Cruise Inoperative Diagnostics.....	5-8

Cruise Control Inoperative Conditions.....	5-10

5.4 DTC P0577

Cruise Control.....	5-11
Connector Information.....	5-11
DTC P0577.....	5-13
1. Cruise Set/Coast Circuit Voltage Test.....	5-13
2. Cruise Set/Coast Switch Test.....	5-13
3. Cruise Resume/Accelerate Circuit Voltage Test.....	5-13
4. Cruise Circuit Voltage Test.....	5-13

5.5 HORN

Description and Operation.....	5-14
Components.....	5-14
Horn Switch.....	5-14
Horn.....	5-14
Symptoms.....	5-14
Diagnostic Tips.....	5-14
Connector Information.....	5-14
Horn Always On.....	5-15
1. Horn Switch Test.....	5-15
Horn Inoperative.....	5-15
1. Accessory Circuit Open or Shorted Test.....	5-15
2. Horn Test.....	5-15
3. Ground Circuit Open Test.....	5-15
4. Horn Switch Malfunction Test.....	5-15
5. Horn Power Circuit Open Test.....	5-15

5.6 TURN SIGNALS

Description and Operation.....	5-16
BAS Operation.....	5-16
BAS Restart.....	5-16
Manual Cancellation.....	5-16
Automatic Cancellation.....	5-16
Four-Way Flashing.....	5-16
Will Not Cancel Upon Turn Completion, No DTCs.....	5-19
1. TSM/TSSM/HFSM Mounting Test.....	5-19
2. Correct Configuration Test.....	5-19
3. 4-Way Cancellation Test.....	5-19
4. Turn Signals Cancel Test.....	5-19
5. Speedometer Test.....	5-19
Flash at Double Normal Rate, All Bulbs Work, No DTCs.....	5-19
1. Lamp Load Calibration Test.....	5-19
2. Lamp Verification Test.....	5-19
3. Bulb Corrosion Test.....	5-19
4. Lamp Connection Terminal Corrosion Test.....	5-19
5. Verification Test.....	5-20
6. Lamp Operation Test.....	5-20
7. Lamp Assembly Test.....	5-20
Both Turn Signal Lamps on One Side Inoperative, No DTCs.....	5-20
1. Left or Right Turn Signal Malfunction Test.....	5-20
2. Right Turn Signal Circuit Test.....	5-20
3. Right Turn Signal Switch Test.....	5-20
4. Right Turn Signal Circuit Continuity Test.....	5-20
5. Left Turn Signal Circuit Test.....	5-20
6. Left Turn Signal Switch Test.....	5-20
7. Left Turn Signal Circuit Continuity Test.....	5-20
8. Right Turn Signal Short to Voltage Test.....	5-21
9. Left Turn Signal Short to Voltage Test.....	5-21
10. Anti-Theft Tracking Module Test.....	5-21
One Turn Signal Lamp Inoperative, No DTCs.....	5-21

1. Inoperative Signal Location Test.....	5-21	12. Rear Stop Lamp Switch Test.....	5-32
2. Right Front Turn Signal Bulb Test.....	5-21	13. Rear Stop Lamp Switch ACCY Circuit Test.....	5-32
3. Right Front Turn Signal Circuit Test.....	5-21	14. Front Stop Lamp Switch Test.....	5-32
4. Right Front Turn Signal Ground Circuit Test.....	5-21	15. Front Stop Lamp Switch ACCY Circuit Test.....	5-32
5. Left Front Turn Signal Bulb Test.....	5-21	16. Rear Stop Lamp to ABS Diode Pack Circuit Test.....	5-32
6. Left Front Turn Signal Circuit Test.....	5-21	17. ABS Diode Pack Rear Circuit Test.....	5-32
7. Left Front Turn Signal Ground Circuit Test.....	5-22	18. Front Stop Lamp to ABS Diode Pack Circuit Test.....	5-32
8. Right Rear Turn Signal Bulb Test.....	5-22	19. ABS Diode Pack Front Circuit Test.....	5-32
9. Right Rear Turn Signal Circuit Test: Except LED Lights.....	5-22	20. Relay Power Test.....	5-32
10. Right Rear Turn Signal Ground Circuit Component Test.....	5-22	21. Stop Lamp Test.....	5-32
11. Left Rear Turn Signal Bulb Test.....	5-22	22. Circuit Board Test.....	5-32
12. Left Rear Turn Signal Circuit Test: Except LED Lights.....	5-22	23. Stop Lamp Circuit Test.....	5-33
13. Left Rear Turn Signal Component Test.....	5-22	24. Lightbar Circuit Test.....	5-33
14. Right Rear Turn Signal Ground Circuit Test.....	5-22	25. Stop Lamp Circuit Test.....	5-33
15. Right Rear Turn Signal Circuit Test: LED Lights.....	5-22	26. Facia/Converter Module Test.....	5-33
16. Left Rear Turn Signal Ground Circuit Test.....	5-23		
17. Left Rear Turn Signal Circuit Test: LED Lights.....	5-23		
5.7 HEADLAMPS			
Description and Operation.....	5-24	Description and Operation.....	5-34
Diagnostic Tips.....	5-24	Connector Information.....	5-34
Connector Information.....	5-24	Position Lamp Inoperative: HDI.....	5-36
Headlamp Inoperative, No DTCs.....	5-26	1. Accessory Circuit Test.....	5-36
1. Operational Test.....	5-26	2. Position Lamp Test.....	5-36
2. High Beam Indicator Test.....	5-26	3. Ground Circuit Test.....	5-36
3. Headlamp High Beam Circuit Switch Test.....	5-26	Running Lamps Inoperative.....	5-36
4. High Beam Headlamp Test.....	5-26	1. Running Lamp Test.....	5-36
5. Headlamp Low Beam Switch Test.....	5-26	2. General Lamp Test.....	5-36
6. Low Beam Headlamp Test.....	5-26	3. Single Lamp Power Test.....	5-36
7. High Beam Indicator Test.....	5-26	4. Lights Fuse Test.....	5-36
8. Headlamp Power Circuit Open Test.....	5-26		
9. Headlamp Fuse Test.....	5-27	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126	
10. Power Circuit Test.....	5-27	Description and Operation.....	5-37
Auxiliary Lamps Inoperative.....	5-27	Connector Information.....	5-37
1. Auxiliary Lamps Operation Test.....	5-27	DTC B1121: HFSM.....	5-40
2. Auxiliary Bulb Test.....	5-27	1. Turn Signal Lamp Inspection Test.....	5-40
3. Auxiliary Lamp Circuit Test: FLHR/C.....	5-27	2. Turn Signal Circuit Open Test.....	5-40
4. Auxiliary Lamp Switch Test.....	5-27	DTC B1121: TSM/TSSM.....	5-40
5. Auxiliary Lamp Power Circuit Test: FLHR/C.....	5-27	1. Operational Test.....	5-40
6. Auxiliary Lamp Circuit Test: Except FLHR/C.....	5-27	2. Indicator Short to Voltage Test.....	5-40
7. Auxiliary Lamp Power Circuit Test: Except FLHR/C.....	5-27	3. TSM/TSSM Short to Voltage Test.....	5-40
		4. Indicator Shorted Test.....	5-40
		5. Shorted Turn Signal Circuit Test.....	5-40
		6. Turn Signal Circuit Open Test.....	5-40
		DTC B1122: HFSM.....	5-41
		1. Turn Signal Lamp Inspection Test.....	5-41
		2. Turn Signal Circuit Open Test.....	5-41
		DTC B1122: TSM/TSSM.....	5-41
		1. Operational Test.....	5-41
		2. Indicator Short to Voltage Test.....	5-41
		3. TSM/TSSM/HFSM Short to Voltage Test.....	5-41
		4. Indicator Shorted Test.....	5-41
		5. Turn Signal Circuit Shorted Test.....	5-41
		6. Turn Signal Circuit Open Test.....	5-41
		DTC B1123.....	5-42
		1. Turn Signal Lamp Inspection Test.....	5-42
		2. Turn Signal Circuit Short to Ground Test.....	5-42
		3. Indicator Test.....	5-42
		4. Facia/Converter Module Test.....	5-42
		DTC B1124.....	5-42
		1. Turn Signal Lamp Inspection Test.....	5-42
5.8 STOP LAMPS			
Description and Operation.....	5-28		
Diagnostic Tips.....	5-28		
Connector Information.....	5-28		
Stop Lamp Inoperative.....	5-31		
1. Accessory Circuit Test.....	5-31		
2. ACCY Fuse Test.....	5-31		
3. ACCY Circuit from Ignition Switch Test.....	5-31		
4. Ignition Switch Test.....	5-31		
5. Accessory Circuit Resistance Test.....	5-31		
6. Fuel Level Sensor Test.....	5-31		
7. Speedometer Test.....	5-31		
8. Stop Lamp Switch Test.....	5-31		
9. Brake Relay Test.....	5-31		
10. Relay Coil Circuit Test.....	5-31		
11. Stop Lamp Switch Power Circuit Test.....	5-32		

TABLE OF CONTENTS

2. Turn Signal Circuit Short to Ground Test.....	5-42	Initial Pin Entry: HFSM.....	5-53
3. Indicator Test.....	5-42	Initial Pin Entry: TSSM.....	5-54
4. Facia/Converter Module Test.....	5-42	Changing the Pin.....	5-56
DTC B1125.....	5-43	Transport Mode.....	5-57
1. Turn Signal Circuit Short to Ground Test.....	5-43	To Enter Transport Mode: HFSM.....	5-57
2. Rear Turn Signal Test.....	5-43	To Exit Transport Mode: HFSM.....	5-57
DTC B1126.....	5-43	To Enter Transport Mode: TSSM.....	5-57
1. Turn Signal Circuit Short to Ground Test.....	5-43	To Exit Transport Mode: TSSM.....	5-57
2. Rear Turn Signal Test.....	5-43	Service Mode.....	5-57
5.11 DTC B1135, B1136, B1141, B1142		Four-Way Flashing.....	5-57
Diagnostics.....	5-44	To Arm the HFSM with the Hazard Warning Flashers ON.....	5-57
DTC B1135 Accelerometer Fault.....	5-44	To Disarm the HFSM and Turn the Hazard Warning Flashers OFF.....	5-57
DTC B1136 Accelerometer Tip-Over Self-Test Fault.....	5-44	Storage Mode: TSSM.....	5-57
DTC B1141 Ignition Switch Open/Low.....	5-44	Power Disruption and Configuring: HFSM.....	5-58
DTC B1142 Internal Fault.....	5-44	Power Disruption and Configuring: TSSM.....	5-59
DTC B1141.....	5-44		
1. Ignition Circuit Open Test.....	5-44	5.16 FAILS TO DISARM	
5.12 SECURITY SYSTEM		Description and Operation.....	5-60
Security Lamp.....	5-45	HFSM.....	5-60
Security Immobilization.....	5-45	TSSM.....	5-60
TSSM/HFSM Features.....	5-46	Diagnostic Tips.....	5-60
Security System Options: TSSM.....	5-46	Connector Information.....	5-60
Warnings.....	5-46	Fails to Disarm: TSSM.....	5-62
Arming: HFSM.....	5-46	1. Key Fob Test.....	5-62
Arming: TSSM.....	5-46	2. Left Turn Signal Test.....	5-62
Auto-Arming Function: TSSM.....	5-47	3. Fob Battery Test.....	5-62
Disarming: HFSM.....	5-47	4. TSSM Test.....	5-62
Automatic Disarming.....	5-47	Fails to Disarm: HFSM.....	5-62
Disarming with a PIN.....	5-47	1. Fob Test.....	5-62
Disarming: TSSM.....	5-47	2. Antenna Circuit Short to Ground Test.....	5-62
Alarm.....	5-48	3. Antenna Circuit Open Test.....	5-62
Activation.....	5-48	4. Security System Antenna Test.....	5-62
Deactivation.....	5-48	5. Non-Functional Fob Test.....	5-62
Alarm Sensitivity: TSSM.....	5-48		
Sensitivity.....	5-48	5.17 DTC B1131, B1132	
5.13 KEY FOB		Description and Operation.....	5-63
HFSM Fob.....	5-50	Diagnostic Tips.....	5-63
TSSM Fob.....	5-50	Connector Information.....	5-63
Arming the System.....	5-50	DTC B1131.....	5-64
Disarming the System.....	5-50	1. Siren Verification Test.....	5-64
Troubleshooting.....	5-50	2. Alarm Signal Short to Ground Test.....	5-64
Fob Assignment: HFSM.....	5-50	3. Battery Circuit Test.....	5-64
Fob Assignment: TSSM.....	5-50	4. Power Supply and Ground Test.....	5-64
5.14 SIREN		5. Alarm Signal Circuit Open Test.....	5-64
Description and Operation.....	5-52	6. Alarm Signal Short to Ground Test.....	5-64
Siren Chirp Mode Confirmation: HFSM.....	5-52	7. Security Siren Resistance Test.....	5-65
Chirpless Mode.....	5-52	8. Security Siren Validation Test.....	5-65
Chirp Mode.....	5-52	DTC B1132.....	5-65
Switching Modes.....	5-52	1. Siren Verification Test.....	5-65
5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS		2. Alarm Signal Circuit Short to Voltage Test.....	5-65
General.....	5-53	3. Alarm Signal Short to Voltage Test.....	5-65
Actuation: HFSM.....	5-53	5.18 DTC B1134	
Configuring a TSSM.....	5-53	Description and Operation.....	5-66
Selecting a PIN.....	5-53	Connector Information.....	5-66
		DTC B1134.....	5-67
		1. Relay Control Circuit Short to Voltage Test.....	5-67
		2. Start Relay Test.....	5-67

5.19 DTC B1143, B1144, B1145

Description and Operation.....	5-68
Connector Information.....	5-68
DTC B1143.....	5-68
1. Security Antenna Visual Test.....	5-68
2. Security Antenna Short to Ground Test.....	5-68
DTC B1144.....	5-69
1. Security Antenna Visual Test.....	5-69
2. Security Antenna Short to Voltage Test.....	5-69
DTC B1145.....	5-69
1. Security Antenna Resistance Test.....	5-69
2. Antenna B Circuit Open Test.....	5-69
3. Antenna A Circuit Open Test.....	5-69

5.20 DTC B1154, B1155

Description and Operation.....	5-70
Diagnostic Tips.....	5-70
Connector Information.....	5-70
DTC B1154.....	5-72
1. Clutch Circuit Short to Ground Test.....	5-72
2. Clutch Switch Circuit Test.....	5-72
3. Clutch Switch Test.....	5-72
DTC B1155.....	5-72
1. Neutral Circuit Short to Ground Test.....	5-72
2. Neutral Switch Short to Ground Test.....	5-72

ENGINE MANAGEMENT

6.1 EFI SYSTEM

General.....	6-1
Heat Management System.....	6-2
Enable/Disable EITMS.....	6-2

6.2 ELECTRONIC CONTROL MODULE

General.....	6-4
ECM.....	6-4
32-2 Flywheel.....	6-4
Crank Position Signal Synchronization.....	6-5
Engine Phase.....	6-5
Engine Run Mode.....	6-5

6.3 SENSORS AND DRIVERS

Description and Operation.....	6-6
Sensors.....	6-6
Crank Position (CKP) Sensor.....	6-6
Twist Grip Sensor (TGS).....	6-6
Twist Control Actuator (TCA).....	6-6
Jiffy Stand Sensor (JSS): HDI.....	6-6
Bank Angle Sensor (BAS).....	6-6
Clutch Switch.....	6-6
Neutral Switch.....	6-6
Engine Temperature (ET) Sensor.....	6-6
Temperature Manifold Absolute Pressure (TMAP) Sensor.....	6-6
Manifold Absolute Pressure (MAP) Sensor.....	6-6
Intake Air Temperature (IAT) Sensor.....	6-6
Vehicle Speed Sensor (VSS).....	6-7
HO2S: Front and Rear.....	6-7
Drivers.....	6-7
Fuel Pump.....	6-7
Ignition Coil and Spark Plugs.....	6-7

Fuel Injectors.....	6-7
Start Relay.....	6-7
Purge Solenoid (If Equipped).....	6-7

6.4 DTC P0107, P0108, P0112, P0113

Description and Operation.....	6-9
TMAP: MAP Signal.....	6-9
TMAP: IAT Signal.....	6-9
Diagnostics.....	6-9
Diagnostic Tips: MAP Portion of TMAP Sensor.....	6-9
Diagnostic Tips: IAT Portion of TMAP Sensor.....	6-9
Connector Information.....	6-9
DTC P0107.....	6-10
1. MAP Sensor Test.....	6-10
2. MAP Sensor Signal Voltage Test.....	6-10
3. MAP Sensor Signal Wire Continuity Test.....	6-10
4. MAP Sensor Signal Wire Shorted to Ground Test.....	6-11
5. MAP Sensor Signal Wire Shorted to Sensor Ground Test.....	6-11
6. MAP Sensor 5V Reference Wire Open Test.....	6-11
7. MAP Sensor 5V Reference Shorted to Signal Ground Test.....	6-11
DTC P0108.....	6-11
1. MAP Sensor Test.....	6-11
2. MAP Sensor Signal Wire Short to 5V Test.....	6-11
3. MAP Sensor Signal Wire Short to Voltage Test.....	6-11
4. MAP Sensor 5V Reference Shorted to Battery Voltage Test.....	6-11
5. MAP Sensor Ground Wire Open Test.....	6-11
DTC P0112.....	6-12
1. IAT Sensor Test.....	6-12
2. IAT Sensor Signal Wire Shorted to Ground Test.....	6-12
3. IAT Sensor Signal Voltage High Test.....	6-12
4. IAT Sensor Signal Wire Shorted to Sensor Ground Test.....	6-12
DTC P0113.....	6-12
1. IAT Sensor Test.....	6-12
2. IAT Sensor Signal Wire Open Test.....	6-12
3. IAT Sensor Open Ground Wire Test.....	6-12
4. IAT Sensor Signal Wire Shorted to Sensor Power Test.....	6-12

6.5 DTC P0117, P0118

Description and Operation.....	6-13
Diagnostic Tips.....	6-13
Connector Information.....	6-13
DTC P0117.....	6-14
1. ET Sensor Test.....	6-14
2. ET Sensor Signal Wire Shorted to Ground Test.....	6-14
3. ET Sensor Signal Wire Shorted to Sensor Ground Test.....	6-14
DTC P0118.....	6-14
1. ET Sensor Test.....	6-15
2. ET Sensor Signal Wire Open Test.....	6-15
3. ET Sensor Open Ground Wire Test.....	6-15
4. ET Sensor Signal Wire Shorted to Power Test.....	6-15
5. ET Sensor Resistance Test.....	6-15

6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223

Description and Operation.....	6-16

TABLE OF CONTENTS

Connector Information.....	6-17	DTC P0032.....	6-26
DTC P0120.....	6-17	1. Rear HO2S Resistance Test.....	6-26
1. Sensor Power-1 Circuit Test.....	6-17	2. Front HO2S Resistance Test.....	6-26
2. TPS-1 Circuit Shorted Test.....	6-17	3. HO2S Short to Voltage Test.....	6-26
3. TPS-1 Circuit Continuity Test.....	6-17	DTC P0131.....	6-26
4. TPS-1 Circuit Short to Ground Test.....	6-18	1. Front HO2S Test.....	6-26
5. TPS-1 Circuit Short to Voltage Test.....	6-18	2. Front HO2S Signal Wire Shorted to Sensor Ground	
6. Sensor Ground Continuity Test.....	6-18	Test.....	6-26
7. TCA Test.....	6-18	3. Front HO2S Signal Wire Shorted to Ground Test...	6-27
DTC P0122.....	6-18	4. Front HO2S Operation Test.....	6-27
1. TCA Sensor-1 Circuit Test.....	6-18	DTC P0132.....	6-27
2. TCA Sensor-1 Circuit Short to Ground Test.....	6-18	1. Front HO2S Operation Test.....	6-27
3. TCA Power-1 Circuit Open Test.....	6-18	DTC P0134.....	6-27
4. TCA Sensor Test.....	6-18	1. Front HO2S Signal Wire Short Circuit Voltage	
5. ECM Test.....	6-18	Test.....	6-27
DTC P0123.....	6-19	2. Front HO2S Open Sensor Ground Test.....	6-27
1. TPS-1 Voltage Test.....	6-19	3. Front HO2S Signal Wire Open Test.....	6-27
2. TPS-1 Circuit Test.....	6-19	DTC P0151.....	6-28
3. Sensor Power Circuit Test.....	6-19	1. Rear HO2S Test.....	6-28
4. TCA Test.....	6-19	2. Rear HO2S Signal Wire Shorted to Sensor Ground	
5. Sensor Ground Test.....	6-19	Test.....	6-28
6. Sensor Ground Circuit Shorted Test.....	6-19	3. Rear HO2S Signal Wire Shorted to Ground Test...	6-28
7. Sensor Ground Circuit Test.....	6-19	4. Rear HO2S Operation Test.....	6-28
8. TPS-1 Circuit Function Test.....	6-19	DTC P0152.....	6-28
9. Sensor Ground Continuity Test.....	6-19	1. Rear HO2S Operation Test.....	6-28
10. Ground Circuit Open Test.....	6-19	DTC P0154.....	6-29
11. TPS-1 Continuity Test.....	6-20	1. Rear HO2S Signal Wire Short Circuit Voltage	
DTC P0220.....	6-20	Test.....	6-29
1. Sensor Power-2 Circuit Test.....	6-20	2. Rear HO2S Open Sensor Ground Test.....	6-29
2. Sensor Power-2 Short to Voltage Test.....	6-20	3. Rear HO2S Signal Wire Open Test.....	6-29
3. TPS-2 Circuit Shorted Test.....	6-20		
4. TPS-2 Circuit Continuity Test.....	6-20	6.8 DTC P0261, P0262, P0263, P0264	
5. TPS-1 Circuit Short to Ground Test.....	6-20	Description and Operation.....	6-30
6. TPS-1 Circuit Short to Voltage Test.....	6-20	Connector Information.....	6-30
7. Sensor Ground Continuity Test.....	6-20	DTC P0261.....	6-32
8. TCA Test.....	6-20	1. Front Fuel Injector Test.....	6-32
DTC P0222.....	6-21	2. Front Fuel Injector Power Wire Open Circuit Test...	6-32
1. TCA Sensor-2 Circuit Test.....	6-21	3. Front Fuel Injector Power Wire Shorted to Ground	
2. TCA Sensor-2 Circuit Short to Ground Test.....	6-21	Test.....	6-32
3. TCA Power-1 Circuit Open Test.....	6-21	4. Fuel Injector/System Relay Test.....	6-32
4. TCA 5V Ref Circuit Short to Ground Test.....	6-21	5. Injector Resistance Test.....	6-32
5. ECM Test.....	6-21	6. Driver Short to Ground Test.....	6-32
DTC P0223.....	6-21	DTC P0262.....	6-32
1. TPS-2 Voltage Test.....	6-21	1. Front Fuel Injector Control Wire Shorted to Voltage	
2. TPS-2 Circuit Test.....	6-21	Test.....	6-32
3. Sensor Power Circuit Test.....	6-22	2. Injector Resistance Test.....	6-32
4. Sensor Ground Test.....	6-22	DTC P0263.....	6-33
5. Shorted 5V Circuit Test.....	6-22	1. Rear Fuel Injector Test.....	6-33
6. Sensor Ground Circuit Test.....	6-22	2. Rear Fuel Injector Power Wire Open Circuit Test...	6-33
7. TPS-2 Circuit Test.....	6-22	3. Rear Fuel Injector Power Wire Shorted to Ground	
8. Sensor Ground Continuity Test.....	6-22	Test.....	6-33
9. Ground Circuit Open Test.....	6-22	4. Fuel Injector/System Relay Test.....	6-33
		5. Injector Resistance Test.....	6-33
		6. Driver Short to Ground Test.....	6-33
		DTC P0264.....	6-33
		1. Rear Fuel Injector Control Wire Shorted to Voltage	
		Test.....	6-33
		2. Injector Resistance Test.....	6-33
6.7 DTC P0031, P0032, P0131, P0132, P0134,		6.9 DTC P0373, P0374	
P0151, P0152, P0154		Description and Operation.....	6-34
Description and Operation.....	6-23	Diagnostic Tips.....	6-34
Diagnostic Tips.....	6-23		
Connector Information.....	6-24		
DTC P0031.....	6-26		
1. HO2S Voltage Test.....	6-26		
2. HO2S Ground Test.....	6-26		
3. HO2S Resistance Test.....	6-26		

TABLE OF CONTENTS

Connector Information.....	6-34
DTC P0373.....	6-35
1. CKP Sensor Test.....	6-35
DTC P0374.....	6-35
1. CKP Sensor Connections Test.....	6-35
2. CKP Sensor Signal Wire Continuity Test.....	6-35
3. CKP Sensor Ground Wire Continuity Test.....	6-35
4. CKP Sensor Signal Wire Shorted to CKP Ground Wire Test.....	6-35
5. CKP Sensor Low Shorted to Ground Test.....	6-35
6. CKP Sensor Output Test.....	6-35
7. CKP Sensor Signal Wire Shorted to Ground Test.....	6-35

6.10 DTC P0444, P0445

Description and Operation.....	6-36
Purge Solenoid (If Equipped).....	6-36
Connector Information.....	6-36
DTC P0444.....	6-38
1. Purge Solenoid Test.....	6-38
2. Purge Solenoid Voltage Test.....	6-38
3. Purge Solenoid Control Wire Shorted to Ground Test.....	6-38
4. Purge Solenoid Control Wire Open Test.....	6-38
DTC P0445.....	6-38
1. Purge Solenoid Test.....	6-38
2. Purge Solenoid Short to Voltage Test.....	6-38

6.11 DTC P0501, P0502

Description and Operation.....	6-39
Connector Information.....	6-39
DTC P0501.....	6-41
1. VSS Connections Test.....	6-41
2. VSS Sensor Power Short to Ground Test.....	6-41
3. VSS Signal Wire Short to Ground Test.....	6-41
4. VSS Signal Wire Open Test.....	6-41
5. VSS Dirty or Damaged Test.....	6-41
DTC P0502.....	6-41
1. VSS Sensor Power Shorted to Voltage Test.....	6-41
2. VSS Signal Wire Short to Voltage Test.....	6-41
3. VSS Ground Wire Open Test.....	6-41
4. VSS Signal Wire Shorted to Sensor Power Test.....	6-42
5. VSS Test.....	6-42

6.12 DTC P0505

Loss of Idle Speed Control.....	6-43
Connector Information.....	6-43
DTC P0505.....	6-44
1. Fuel Quality Test.....	6-44
2. Vacuum Leak Test.....	6-44

6.13 DTC P0572

Description and Operation.....	6-45
Brake Switch.....	6-45
Diagnostic Tips.....	6-45
DTC P0572.....	6-46
1. Stop Lamp Switch Validation Test.....	6-46
2. Brake Input Circuit Test.....	6-46
3. Accessory Circuit Test.....	6-47
4. Rear Stop Lamp Switch Circuit Test.....	6-47
5. Rear Stop Lamp Switch Test.....	6-47
6. ABS Diode Pack Test.....	6-47
7. ECM Circuit Test.....	6-47

8. Front Stop Lamp Switch Circuit Test.....	6-47
9. Front Stop Lamp Switch Test.....	6-47
10. ABS Diode Pack Test.....	6-47
11. ECM Circuit Test.....	6-47

6.14 DTC P0603, P0605

Description and Operation.....	6-48
DTC P0603 Test.....	6-48
DTC P0605 Test.....	6-48

6.15 DTC P0641, P0651

Description and Operation.....	6-49
DTC P0641.....	6-50
1. Sensor Power-1 Circuit Test.....	6-50
2. Sensor Power-1 Circuit Resistance Test.....	6-50
3. TCA Test.....	6-50
4. JSS Test.....	6-50
5. TGS Test.....	6-50
6. VSS Test.....	6-50
DTC P0651.....	6-50
1. Sensor Power-2 Circuit Test.....	6-50
2. Sensor Power-2 Circuit Resistance Test.....	6-50
3. TMAP Test.....	6-51
4. TGS Test.....	6-51

6.16 DTC P1001, P1002, P1003, P1004

Description and Operation.....	6-52
Connector Information.....	6-52
DTC P1001.....	6-54
1. System Relay Test.....	6-54
2. System Relay Coil Power Circuit Test.....	6-54
3. System Relay Coil Control Short to Ground Test.....	6-54
4. System Relay Coil Control Circuit Test.....	6-54
DTC P1002.....	6-54
1. System Relay Test.....	6-54
2. System Relay Coil Short to Voltage Test.....	6-54
DTC P1003.....	6-54
1. System Relay Test.....	6-54
2. System Relay Power Supply Test.....	6-54
3. System Relay Switch Side Circuit Test.....	6-55
4. System Relay Power Supply Circuit Test.....	6-55
DTC P1004.....	6-55
1. System Relay Test.....	6-55
2. System Relay Switch Side Short to Voltage Test.....	6-55
3. System Relay Coil Short to Ground Test.....	6-55
4. Rear Ignition Coil Short to Voltage Test.....	6-55
5. Front Ignition Coil Short to Voltage Test.....	6-55

6.17 DTC P1009, P1010

Description and Operation.....	6-56
Password Problem.....	6-56
Connector Information.....	6-56
DTC P1009, P1010.....	6-57
1. Incorrect Password Test.....	6-57
2. TSM/TSSM/HFSM Replacement Test.....	6-57

6.18 DTC P1270

Description and Operation.....	6-58
TGS2 Validation.....	6-58
Connector Information.....	6-58
DTC P1270.....	6-60
1. ECM Connector Test.....	6-60

TABLE OF CONTENTS

2. ECM Circuit Test.....	6-60	1. Exhaust Actuator Motor High Test.....	6-71
3. Relay Circuit Test.....	6-60	2. Exhaust Actuator Motor Shorted to Voltage Test....	6-71
6.19 DTC P1351, P1352, P1354, P1355		6.22 DTC P1501, P1502	
Description and Operation.....	6-61	Description and Operation.....	6-72
Connector Information.....	6-61	Connector Information.....	6-72
DTC P1351.....	6-63	DTC P1501.....	6-73
1. Ignition Coil Test.....	6-63	1. JSS 5V Reference Open Circuit Test.....	6-73
2. Ignition Coil Input Voltage Test.....	6-63	2. JSS 5V Reference Shorted to Ground Test.....	6-73
3. Ignition Coil Control Wire Continuity Test.....	6-63	3. JSS Signal Wire Shorted to Ground Test.....	6-73
4. Ignition Coil Control Wire Shorted to Ground Test.....	6-63	4. JSS Signal Wire Open Circuit Test.....	6-74
DTC P1352.....	6-63	DTC P1502.....	6-74
1. Ignition Coil Shorted to Voltage Test.....	6-63	1. JSS Ground Wire Test.....	6-74
2. Ignition Coil Open Test.....	6-63	2. JSS 5V Reference Wire Short to Voltage Test.....	6-74
DTC P1354.....	6-64	3. JSS Signal Wire Short to Voltage Test.....	6-74
1. Ignition Coil Test.....	6-64	4. JSS 5V Reference and Signal Shorted Together Test.....	6-74
2. Ignition Coil Input Continuity Test.....	6-64	Side Stand Displayed on Odometer.....	6-74
3. Ignition Coil Control Wire Continuity Test.....	6-64	1. Starts, Then Stalls Test.....	6-74
4. Ignition Coil Control Wire Shorted to Ground Test.....	6-64	2. Neutral Test	6-74
DTC P1355.....	6-64	3. JSS Clearance Test.....	6-74
1. Ignition Coil Shorted to Voltage Test.....	6-64	6.23 DTC P1510, P1511, P1512	
2. Ignition Coil Open Test.....	6-64	Description and Operation.....	6-75
6.20 DTC P1353, P1356, P1357, P1358		Throttle Actuation Control Management.....	6-75
Description and Operation.....	6-65	DTC P1510, P1511, P1512.....	6-75
Connector Information.....	6-65	1. DTC Verification Test.....	6-75
DTC P1353, P1356.....	6-67	6.24 DTC P1514	
1. Absence of Fuel Test.....	6-67	Description and Operation.....	6-76
2. Ignition Coil Primary Resistance Test.....	6-67	Air Flow Fault.....	6-76
3. Spark Plug Wire Test.....	6-67	DTC P1514.....	6-76
4. Ignition Coil Secondary Resistance Test	6-67	1. DTC Verification Test.....	6-76
DTC P1357, P1358.....	6-67	6.25 DTC P1600	
1. Ion Sense Continuity Test.....	6-67	Description and Operation.....	6-77
2. Ion Sense Resistance Test.....	6-67	DTC P1600.....	6-77
3. Ion Sense Short to Voltage Test.....	6-67	1. DTC Verification Test.....	6-77
6.21 DTC P1475, P1477, P1478		6.26 DTC P1655, P1656	
Description and Operation.....	6-68	Description and Operation.....	6-78
Connector Information.....	6-68	Connector Information.....	6-78
DTC P1475.....	6-70	DTC P1655.....	6-80
1. Exhaust Actuator Test.....	6-70	1. Front ACR Test.....	6-80
2. Exhaust Actuator Voltage Test.....	6-70	2. Rear ACR Test.....	6-80
3. Exhaust Actuator Motor Ground Wire Continuity Test.....	6-70	3. Rear ACR Control Circuit Test.....	6-80
4. Exhaust Actuator Motor Power Wire Continuity Test.....	6-70	4. Front ACR Control Circuit Short to Ground Test....	6-80
5. Exhaust Actuator Feedback Voltage Test.....	6-70	5. Rear ACR Control Circuit Short to Ground Test....	6-80
6. Exhaust Actuator Feedback Continuity Test.....	6-70	6. Shorted ACR Test.....	6-80
7. Exhaust Actuator Feedback Control Test.....	6-70	7. ACR Supply Circuit Open Test.....	6-80
8. Exhaust Actuator Feedback Run Test.....	6-70	8. ACR Control Circuit Continuity Test.....	6-80
9. Exhaust Actuator Feedback Short to Voltage Test.....	6-70	DTC P1656.....	6-81
10. Exhaust Actuator Feedback Short to Ground Test.....	6-71	1. Front ACR Test.....	6-81
DTC P1477.....	6-71	2. Rear ACR Control Circuit Test.....	6-81
1. Exhaust Actuator Motor Open Test.....	6-71	3. Rear ACR Test.....	6-81
2. Exhaust Actuator Motor Shorted to Ground Test....	6-71	4. Front ACR Control Circuit Test.....	6-81
3. Exhaust Actuator Feedback Shorted to Ground Test.....	6-71	6.27 DTC P2100, P2101, P2102, P2103	
DTC P1478.....	6-71	Description and Operation.....	6-82
		Connector Information.....	6-82
		DTC P2100.....	6-83

TABLE OF CONTENTS

1. TCA Test.....	6-83
2. TCA High Circuit Test.....	6-83
3. TCA Low Circuit Test.....	6-83
DTC P2101.....	6-84
1. TCA Circuit Resistance Test.....	6-84
2. TCA Test.....	6-84
3. TCA High Circuit Test.....	6-84
4. TCA Low Circuit Test.....	6-84
DTC P2102.....	6-84
1. TCA High Circuit Test.....	6-84
2. TCA Test.....	6-84
DTC P2103.....	6-84
1. TCA High Circuit Test.....	6-84
2. TCA Low Circuit Test.....	6-85

6.28 DTC P2105, P2107

Description and Operation.....	6-86
DTC P2105.....	6-88
1. DTC Verification Test.....	6-88
DTC P2107.....	6-88
1. ECM Connector Test.....	6-88
2. ECM Circuit Test.....	6-88
3. Relay Circuit Test.....	6-88

6.29 DTC P2119

Description and Operation.....	6-89
DTC P2119.....	6-89
1. Air Inlet Interference Test.....	6-89
2. Validation Test.....	6-89

6.30 DTC P2122, P2123, P2127, P2128

Description and Operation.....	6-90
DTC P2122.....	6-90
1. TGS-1 Voltage Test.....	6-90
2. TGS-1 Circuit Open Test.....	6-90
3. TGS-1 Short to Ground Test.....	6-90
4. Twist Grip Sensor Test.....	6-90
5. TGS-1 Test.....	6-90
6. TGS-1 Open Test.....	6-90
7. Sensor Power-1 Continuity Test.....	6-90
8. Sensor Power Resistance Test.....	6-91
9. TCA Test.....	6-91
10. JSS Test.....	6-91
11. VSS Test.....	6-91
DTC P2123.....	6-91
1. TGS-1 Voltage Test.....	6-91
2. TGS-1 Short to Voltage Test.....	6-91
3. TGS-1 Short to Ground Test.....	6-91
4. TGS Test.....	6-91
5. TGS-1 Test.....	6-92
6. TGS-1 Open Test.....	6-92
7. Sensor Power-1 Continuity Test.....	6-92
8. Sensor Power Resistance Test.....	6-92
9. TCA Test.....	6-92
DTC P2127.....	6-92
1. TGS-2 Voltage Test.....	6-92
2. TGS-2 Open Test.....	6-92
3. TGS-2 Short to Ground Test.....	6-92
4. TGS Test.....	6-92
5. TGS-2 Test.....	6-93
6. TGS-2 Open Test.....	6-93
7. Sensor Power-2 Continuity Test.....	6-93

8. Sensor Power Resistance Test.....	6-93
9. TMAP Test.....	6-93
DTC P2128.....	6-93
1. TGS-1 Voltage Test.....	6-93
2. TGS-1 Short to Voltage Test.....	6-93
3. TGS-1 Short to Ground Test.....	6-93
4. TGS Test.....	6-93
5. TGS-1 Test.....	6-94
6. TGS-1 Open Test.....	6-94
7. Sensor Power-1 Continuity Test.....	6-94
8. Sensor Power Resistance Test.....	6-94
9. TCA Test.....	6-94

6.31 DTC P2135, P2138

Description and Operation.....	6-95
DTC P2135.....	6-95
1. TPS-2 Voltage Test.....	6-95
2. TPS-2 Circuit Test.....	6-95
3. Sensor Power Circuit Test.....	6-95
4. Sensor Ground Test.....	6-95
5. Shorted 5V Circuit Test.....	6-95
6. Sensor Ground Circuit Test.....	6-95
7. TPS-2 Circuit Test.....	6-95
8. Sensor Ground Continuity Test.....	6-95
9. Ground Circuit Open Test.....	6-96
DTC P2138.....	6-96
1. TGS-2 Voltage Test.....	6-96
2. TGS-2 Circuit Test.....	6-96
3. Sensor Power Circuit Test.....	6-96
4. Sensor Ground Test.....	6-96
5. Shorted 5V Circuit Test.....	6-96
6. Sensor Ground Circuit Test.....	6-96
7. Sensor Ground-2 Open Circuit Test.....	6-96
8. TGS-2 Circuit Test.....	6-96
9. Sensor Ground Continuity Test.....	6-96
10. Ground Circuit Open Test.....	6-97

6.32 DTC P2176

Description and Operation.....	6-98
DTC P2176.....	6-98
1. Air Inlet Interference Test.....	6-98
2. Validation Test.....	6-98

6.33 ENGINE CRANKS, BUT WILL NOT START

Description and Operation.....	6-99
Connector Information.....	6-99
Engine Cranks But Will Not Start.....	6-101
1. Preliminary Engine Tests.....	6-101
2. Check Engine Lamp Test.....	6-101
3. Spark Present Test.....	6-101

6.34 NO ECM POWER

Description and Operation.....	6-102
Connector Information.....	6-102
No ECM Power.....	6-103
1. ECM Fuse Test.....	6-103
2. IGN Fuse Test.....	6-103
3. ECM Connector Test.....	6-103
4. ECM Battery Wire Test.....	6-103
5. ECM Switched Voltage Test.....	6-104

TABLE OF CONTENTS

6. ECM Ground Wires Test.....	6-104
7. Engine Stop Switch Battery Voltage Test.....	6-104
8. Engine Stop Switch Test.....	6-104

6.35 STARTS, THEN STALLS

Description and Operation.....	6-105
Diagnostic Tips.....	6-105
Connector Information.....	6-105
Starts, Then Stalls.....	6-105
1. Throttle Test.....	6-105
2. Jiffy Stand Test.....	6-105
3. Neutral Switch Test.....	6-105
4. Fuel System Test.....	6-105

6.36 FUEL SYSTEM ELECTRICAL TEST

Description and Operation.....	6-106
Connector Information.....	6-106
Fuel System Electrical Test.....	6-108
1. ECM Fuse Test.....	6-108
2. Fuel Pump Voltage Test.....	6-108
3. Fuel Pump Open Circuit Test.....	6-108

6.37 MISFIRE AT IDLE OR UNDER LOAD

Description and Operation.....	6-109
Diagnostic Tips.....	6-109
In-line Spark Tester.....	6-109
Connector Information.....	6-109
Misfire At Idle or Under Load.....	6-111
1. Power Ground Continuity Test.....	6-111
2. Spark Test.....	6-111
3. Spark Plug Wire Test.....	6-111
4. Carbon Tracking Inspection Test.....	6-111
5. Ignition Coil Primary Wire Continuity Test.....	6-111
6. Battery to System Relay Voltage Drop Test.....	6-111
7. System Relay Test.....	6-111
8. Battery to ECM Fuse Voltage Drop Test.....	6-111
9. Battery to Fuse Block Voltage Drop Test.....	6-111
10. Battery to Main Fuse Voltage Drop Test.....	6-112
11. Battery to Main Fuse Block Voltage Drop Test.....	6-112

ABS

7.1 ANTI-LOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION

Description and Operation.....	7-1
Pressure Hold.....	7-2
Pressure Decrease.....	7-2
Pressure Increase.....	7-2
Initialization Self-Test.....	7-2
ABS Indicator.....	7-3

7.2 DTC C1017, C1018

Description and Operation.....	7-4
Conditions for Setting the DTC.....	7-4
Action Taken When the DTC Sets.....	7-4
Conditions for Clearing the DTC.....	7-4
Diagnostic Tips.....	7-4
Connector Information.....	7-4
DTC C1017.....	7-5
1. ABS Fuse Test.....	7-5
2. Battery Circuit Short to Ground Test.....	7-5

3. Battery Voltage Circuit Test.....	7-5
4. Ground Circuit Open Test.....	7-6
DTC C1018.....	7-6
1. Ground Circuit Open Test.....	7-6

7.3 DTC C1021, C1023

Description and Operation.....	7-7
Conditions for Setting the DTC.....	7-7
Action Taken When the DTC Sets.....	7-7
Conditions for Clearing the DTC.....	7-7
Diagnostic Tips.....	7-7
Connector Information.....	7-7
DTC C1021, C1023.....	7-8
1. DTC Verification Test.....	7-8
2. Validation of Current DTC Test.....	7-8

7.4 DTC C1025, C1027, C1206, C1208

Description and Operation.....	7-9
Conditions for Setting the DTC.....	7-9
Action Taken When the DTC Sets.....	7-9
Conditions for Clearing the DTC.....	7-9
Diagnostic Tips.....	7-9
Connector Information.....	7-9
DTC C1025 (Front), C1027 (Rear), C1206, C1208.....	7-10
1. Electrical Interference Test.....	7-10
2. Loose or Damaged Connections Test.....	7-10
3. Validation of Current DTC Test.....	7-10
4. WSS Circuit Open Test.....	7-10
5. Worn or Damaged Components Test.....	7-10

7.5 DTC C1032, C1034

Description and Operation.....	7-11
Conditions for Setting the DTC.....	7-11
Action Taken When the DTC Sets.....	7-11
Conditions for Clearing the DTC.....	7-11
Diagnostic Tips.....	7-11
Connector Information.....	7-11
DTC C1032.....	7-12
1. Validation of Current DTC Test.....	7-12
2. Front WSS Low Circuit Test.....	7-12
3. Front WSS Circuits Short to Ground Test.....	7-12
4. Front WSS High Circuit Test.....	7-12
5. Front WSS Low Circuit Open Test.....	7-12
6. Front WSS Short to Ground Test.....	7-12
7. Front WSS Circuits Short to Voltage Test.....	7-12
8. Front WSS Circuits Shorted Together Test.....	7-12
9. Front WSS Continuity Test.....	7-12
10. Front WSS Short to Voltage Test.....	7-12
DTC C1034.....	7-13
1. Validation of Current DTC Test.....	7-13
2. Rear WSS Low Circuit Test.....	7-13
3. Rear WSS Circuits Short to Ground Test.....	7-13
4. Rear WSS High Circuit Test.....	7-13
5. Rear WSS Low Circuit Open Test.....	7-13
6. Rear WSS Circuits Short to Ground Test.....	7-13
7. Rear WSS Circuits Short to Voltage Test.....	7-13
8. Rear WSS Circuits Shorted Together Test.....	7-13
9. Rear WSS Continuity Test.....	7-13
10. Rear WSS Short to Voltage Test.....	7-13

7.6 DTC C1042, C1043

Description and Operation.....	7-14

TABLE OF CONTENTS

Conditions for Setting the DTC.....	7-14	3. ECU Test.....	7-25
Action Taken When the DTC Sets.....	7-14		
Conditions for Clearing the DTC.....	7-14	7.11 DTC C1158	
Diagnostic Tips.....	7-14	Description and Operation.....	7-26
DTC C1042.....	7-14	Conditions for Setting the DTC.....	7-26
1. Ground Circuit Open Test.....	7-14	Action Taken When the DTC Sets.....	7-26
2. Pump Motor Test.....	7-14	Conditions for Clearing the DTC.....	7-26
DTC C1043.....	7-15	DTC C1158.....	7-26
1. Ground Circuit Open Test.....	7-15	1. Validation of Current DTC Test.....	7-26
		2. Successful Calibration Test.....	7-26
7.7 DTC C1094		7.12 DTC C1212	
Description and Operation.....	7-16	Description and Operation.....	7-27
Conditions for Setting the DTC.....	7-16	Conditions for Setting the DTC.....	7-27
Action Taken When the DTC Sets.....	7-16	Action Taken When the DTC Sets.....	7-27
Conditions for Clearing the DTC.....	7-16	Conditions for Clearing the DTC.....	7-27
Diagnostic Tips.....	7-16	Diagnostic Tips.....	7-27
Connector Information.....	7-16	Connector Information.....	7-27
DTC C1094.....	7-17	DTC C1212.....	7-28
1. Validation of Current DTC Test.....	7-17	1. Validation of Current DTC Test.....	7-28
2. Front Brake Input Short to Voltage Test.....	7-17	2. Stop Lamp Switch Input Circuits Voltage Test.....	7-28
3. Front Stop Lamp Switch Test.....	7-18	3. Rear Stop Lamp Switch Input Test.....	7-29
		4. Rear Stop Lamp Circuit Test.....	7-29
7.8 DTC C1095		5. Rear Stop Lamp Switch Test.....	7-29
Description and Operation.....	7-19	6. Rear Stop Lamp Switch Accessory Circuit Open Test.....	7-29
Conditions for Setting the DTC.....	7-19	7. Front Stop Lamp Switch Accessory Circuit Open Test.....	7-29
Action Taken When the DTC Sets.....	7-19	8. Front Stop Lamp Switch Test.....	7-29
Conditions for Clearing the DTC.....	7-19		
Connector Information.....	7-19	7.13 DTC C1214	
DTC C1095.....	7-20	Description and Operation.....	7-30
1. Validation of Current DTC Test.....	7-20	Conditions for Setting the DTC.....	7-30
2. DTC Verification Test.....	7-20	Action Taken When the DTC Sets.....	7-30
3. Tail/Stop Lamp Test.....	7-21	Conditions for Clearing the DTC.....	7-30
4. Ground Circuit Open Test.....	7-21	Diagnostic Tips.....	7-30
5. Front Stop Lamp Switch Test.....	7-21	Connector Information.....	7-30
6. Front Stop Lamp Switch Input Circuit Open Test.....	7-21	DTC C1214.....	7-31
7. ABS Diode Pack Test.....	7-21	1. Validation of Current DTC Test.....	7-31
8. Tail/Stop Lamp Circuit Open Test.....	7-21	2. Rear Stop Lamp Switch Input Voltage Test.....	7-31
9. Front Stop Lamp Switch Test.....	7-21	3. Rear Stop Lamp Switch Test.....	7-32
10. Accessory Circuit Test.....	7-21		
		7.14 DTC C1216	
7.9 DTC C1151		Description and Operation.....	7-33
Description and Operation.....	7-22	Conditions for Setting the DTC.....	7-33
Conditions for Setting the DTC.....	7-22	Action Taken When the DTC Sets.....	7-33
Action Taken When the DTC Sets.....	7-22	Conditions for Clearing the DTC.....	7-33
Conditions for Clearing the DTC.....	7-22	Diagnostic Tips.....	7-33
Diagnostic Tips.....	7-22	Connector Information.....	7-33
Connector Information.....	7-22	DTC C1216.....	7-34
DTC C1151.....	7-23	1. Validation of Current DTC Test.....	7-34
1. Validation of Current DTC Test.....	7-23	2. DTC Verification Test.....	7-34
2. Brake Lines Installation Test.....	7-23	3. Tail/Stop Lamp Test.....	7-34
3. ECU Test.....	7-23	4. Rear Stop Lamp Switch Input Circuit Open Test.....	7-35
		5. ABS Diode Pack Test.....	7-35
7.10 DTC C1153		6. Tail/Stop Lamp Circuit Open Test.....	7-35
Description and Operation.....	7-24	7. Rear Stop Lamp Switch Test.....	7-35
Conditions for Setting the DTC.....	7-24	8. Accessory Circuit Test.....	7-35
Action Taken When the DTC Sets.....	7-24		
Conditions for Clearing the DTC.....	7-24		
Diagnostic Tips.....	7-24		
Connector Information.....	7-24		
DTC C1153.....	7-25		
1. Validation of Current DTC Test.....	7-25		
2. Brake Lines Installation Test.....	7-25		

TABLE OF CONTENTS

7.15 DTC C1014, C1055-C1066, C1118, C1121

Description and Operation.....	7-36
Circuit Description.....	7-36
Conditions for Setting the DTC.....	7-36
Action Taken When the DTC Sets.....	7-36
Conditions for Clearing the DTC.....	7-36
Connector Information.....	7-36
DTC C1014, C1055-C1066, C1118, C1121.....	7-38
1. Battery Circuit Voltage Test.....	7-38
2. Battery Power Circuit Resistance Test.....	7-38
3. Ignition Circuit Test.....	7-38
4. Ground Circuit Resistance Test.....	7-38

7.16 ABS INDICATOR ALWAYS ON OR INOPERATIVE

Description and Operation.....	7-39
Diagnostic Tips.....	7-39
Connector Information.....	7-39
ABS Indicator Always On or Inoperative.....	7-41
1. DTC Test.....	7-41
2. ABS Lamp Function Test.....	7-41
3. Serial Data Circuit Test.....	7-41
4. ABS Fuse Test.....	7-41
5. ABS Power Circuit Test.....	7-41
6. ABS Ground Circuit Test.....	7-41
7. ABS Power Circuit Short to Ground Test.....	7-41

AUDIO SYSTEM

8.1 RADIO DIAGNOSTICS

Description and Operation.....	8-1
Diagnostics.....	8-1
Diagnostic Tips.....	8-1
Radio Diagnostic Display.....	8-1

8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS

Description and Operation.....	8-6
Diagnostics.....	8-6
Diagnostic Tips.....	8-6
Radio Switch Diagnostics.....	8-8
1. Checking for Diagnostic Trouble Codes (DTCs) Test.....	8-8
2. Switch Function Test	8-9
3. DTC B2007, Handlebar Audio Switch Shorted High (Part A) Test.....	8-9
4. DTC B2007, Handlebar Audio Switch Shorted High (Part B) Test.....	8-9
5. DTC B2007, Handlebar Mode Switch Shorted High (Part A) Test.....	8-9
6. DTC B2007, Handlebar Mode Switch Shorted High (Part B) Test.....	8-9
7. DTC B2007, Handlebar PTT/Squelch Switch Shorted High (Part A) Test.....	8-9
8. DTC B2007, Handlebar PTT/Squelch Switch Shorted High (Part B) Test.....	8-10
9. DTC B2008, Handlebar Audio Switch Shorted Low (Part A) Test.....	8-10

10. DTC B2008, Handlebar Audio Switch Shorted Low (Part B) Test.....	8-10
11. DTC B2008, Handlebar Mode Switch Shorted Low (Part A) Test.....	8-10
12. DTC B2008, Handlebar Mode Switch Shorted Low (Part B) Test.....	8-10
13. DTC B2008, Handlebar PTT/Squelch Switch Shorted Low (Part A) Test.....	8-10
14. DTC B2008, Handlebar PTT/Squelch Switch Shorted Low (Part B) Test.....	8-10
15. DTC B2009, Handlebar Audio Switch Stuck or Open (Part A) Test.....	8-10
16. DTC B2009, Handlebar Audio Switch Stuck or Open (Part B) Test.....	8-11
17. DTC B2009, Handlebar Mode Switch Stuck or Open (Part A) Test.....	8-11
18. DTC B2009, Handlebar Mode Switch Stuck or Open (Part B) Test.....	8-11
19. DTC B2009, Handlebar PTT/Squelch Switch Stuck or Open (Part A) Test.....	8-11
20. DTC B2009, Handlebar PTT/Squelch Switch Stuck or Open (Part B) Test.....	8-11
21. DTC B2010, Passenger Audio/PTT Switch Shorted High (Part A) Test.....	8-12
22. DTC B2010, Passenger Audio/PTT Switch Shorted High (Part B) Test.....	8-12
23. DTC B2010, Passenger Mode Switch Shorted High (Part A) Test.....	8-12
24. DTC B2010, Passenger Mode Switch Shorted High (Part B) Test.....	8-12
25. DTC B2011, Passenger Audio/PTT Switch Shorted Low (Part A) Test.....	8-13
26. DTC B2011, Passenger Audio/PTT Switch Shorted Low (Part B) Test.....	8-13
27. DTC B2011, Passenger Mode Switch Shorted Low (Part A) Test.....	8-13
28. DTC B2011, Passenger Mode Switch Shorted Low (Part B) Test.....	8-13
29. DTC B2012, Passenger Audio/PTT Switch Stuck or Open (Part A) Test.....	8-13
30. DTC B2012, Passenger Audio/PTT Switch Stuck or Open (Part B) Test.....	8-13
31. DTC B2012, Passenger Mode Switch Stuck or Open (Part A) Test.....	8-14
32. DTC B2012, Passenger Mode Switch Stuck or Open (Part B) Test.....	8-14

8.3 DTC B2016-B2027, RADIO SPEAKER DIAGNOSTICS

Description and Operation.....	8-15
Diagnostic Tips.....	8-15
B2016 Front Speakers Shorted: Without Amplifier.....	8-15
1. Front Speakers Shorted (Part A) Test.....	8-15
2. Front Speakers Shorted (Part B) Test.....	8-15
B2016 Front Speakers Shorted: With Amplifier.....	8-15
1. Front Speakers Shorted (Part A) Test.....	8-15
2. Front Speakers Shorted (Part B) Test.....	8-15
B2017 Front Speakers Open: Without Amplifier.....	8-16
1. Front Speakers Open (Part A) Test.....	8-16
2. Front Speakers Open (Part B) Test.....	8-16
B2017 Front Speakers Open: With Amplifier.....	8-17
1. Front Speakers Open (Part A) Test.....	8-17

TABLE OF CONTENTS

2. Front Speakers Open (Part B) Test.....	8-17	2. CB Module CAN Test.....	8-27
B2018 Front Speakers Shorted to Ground: Without Amplifier.....	8-17	DTC U1308 Infotainment Bus Lost Communication with Future Accessory Module (4-Pin).....	8-27
1. Front Speakers Shorted to Ground Test.....	8-17	1. Future Accessory Voltage Test.....	8-27
B2018 Front Speakers Shorted to Ground: With Amplifier.....	8-17	2. Future Accessory CAN Test.....	8-27
1. Front Speakers Shorted to Ground.....	8-17	DTC U1310 Infotainment Bus Lost Communication with iPod.....	8-28
B2019 Front Speakers Shorted to Battery: Without Amplifier.....	8-18	1. iPod Voltage Test.....	8-28
1. Front Speakers Shorted to Battery Test.....	8-18	2. iPod CAN Test.....	8-28
B2019 Front Speakers Shorted to Battery: With Amplifier.....	8-18	DTC U1312 Infotainment Bus Lost Communication with Future Accessory Module (12-Pin).....	8-28
1. Front Speakers Shorted to Battery Test.....	8-18	1. Future Accessory Voltage Test.....	8-28
B2020 Rear Speakers Shorted: Without Amplifier.....	8-18	2. Future Accessory CAN Test.....	8-28
1. Rear Speakers Shorted (Part A) Test.....	8-19	DTC U1313 Infotainment Bus Lost Communication with XM Module.....	8-28
2. Rear Speakers Shorted (Part B) Test.....	8-19	1. XM Module Voltage Test.....	8-28
B2020 Rear Speakers Shorted: With Amplifier.....	8-20	2. XM Module CAN Test.....	8-28
1. Rear Speakers Shorted (Part A) Test.....	8-20	DTC U1314 Infotainment Bus Lost Communications with Navigation Module.....	8-28
2. Rear Speakers Shorted (Part B) Test.....	8-20	1. Navigation Module Test.....	8-28
B2021 Rear Speakers Open: Without Amplifier.....	8-20	DTC U1317 Infotainment Bus Lost Communication with High Output Amplifier.....	8-29
1. Rear Speakers Open (Part A) Test.....	8-20	1. Amplifier Module Voltage Test.....	8-29
2. Rear Speakers Open (Part B) Test.....	8-20	2. Amplifier Module CAN Test.....	8-29
B2021 Rear Speakers Open: With Amplifier.....	8-20	3. CAN Short to Voltage Test.....	8-29
1. Rear Speakers Open (Part A) Test.....	8-20	4. CAN Short to Ground Test.....	8-29
2. Rear Speakers Open (Part B) Test.....	8-20	5. CAN Open Test.....	8-29
B2022 Rear Speakers Shorted to Ground: Without Amplifier.....	8-21		
1. Rear Speakers Shorted to Ground Test.....	8-21		
B2022 Rear Speakers Shorted to Ground: With Amplifier.....	8-21		
1. Rear Speakers Shorted to Ground Test.....	8-21		
B2023 Rear Speakers Shorted to Battery: Without Amplifier.....	8-21		
1. Rear Speakers Shorted to Battery Test.....	8-21		
B2023 Rear Speakers Shorted to Battery: With Amplifier.....	8-21		
1. Rear Speakers Shorted to Battery Test.....	8-21		
		8.5 ADVANCED AUDIO SYSTEM SYMPTOMS	
8.4 SERIAL DATA BUS DIAGNOSTICS		General.....	8-30
Description and Operation.....	8-22	Factory Defaults.....	8-30
Loss of Serial Data: DTC U1016.....	8-22	Diagnostics.....	8-31
Starts then Stalls: DTC U1300, U1301.....	8-22	Diagnostic Tips.....	8-31
Diagnostic Tips.....	8-22	Symptom 1: Radio Inoperative.....	8-32
DTC U1016 J1850 Loss of Communication with ECM.....	8-22	1. Radio Power Test.....	8-32
1. Speed Pulse Availability Test.....	8-23	2. Radio Power Continuity Test.....	8-32
2. Serial Data Continuity Test.....	8-23	3. Radio Memory Continuity Test.....	8-33
DTC U1302 Infotainment Bus Off Error.....	8-24	Symptom 2: Poor or No Reception.....	8-33
1. Infotainment Bus Voltage Test.....	8-24	1. Low-Band Radio Operation Test.....	8-33
2. Infotainment Bus Shorted to Ground Test.....	8-24	2. FM-Band Radio Operation Test.....	8-33
3. Infotainment Bus Wires Shorted Together Test.....	8-24	3. Antenna Cable Test.....	8-34
4. Infotainment Bus Shorted to Voltage Test.....	8-25	4. Antenna Cable Open Circuit Test.....	8-34
DTC U1306 Infotainment Bus Lost Communication with Hands-Free Phone Module.....	8-25	5. Antenna Cable Short Circuit Test.....	8-34
1. Hands-Free Phone Module Voltage Test.....	8-27	6. Antenna Base Shorted to Ground Test.....	8-34
2. Hands-Free Phone Module Jumper Harness Voltage Test.....	8-27	7. Antenna Base Open to Ground Plate Test.....	8-34
3. Hands-Free Phone Module CAN Test.....	8-27	Symptom 3: Static Present with Engine Running.....	8-36
4. Hands-Free Phone Module Jumper Harness CAN Test.....	8-27	1. Static Observation Test.....	8-36
DTC U1307 Infotainment Bus Lost Communication with CB Module.....	8-27	2. Regulator Test.....	8-36
1. CB Module Voltage Test.....	8-27	3. Regulator Connectors Test.....	8-36
		4. Ignition System Test.....	8-36
		Symptom 4: CB Transmitter Inoperative.....	8-36
		1. Set-Up Test.....	8-36
		2. Push-to-Talk (PTT) Test.....	8-36
		3. CB Transmission Test.....	8-36
		4. CB Reception Test.....	8-36
		5. CB Modulation Test.....	8-36
		6. Microphone Test.....	8-36
		7. CB Antenna Cable Open Circuit Test.....	8-37
		8. CB Antenna Cable Shield Open Circuit Test.....	8-37
		9. CB Antenna Cable Shorted Test.....	8-37
		Symptom 5: CB Receiver Inoperative.....	8-37
		1. Set-Up Test.....	8-37

TABLE OF CONTENTS

2. Receiver Audio Test.....	8-37	Symptom 12: No or Low Audio from XM or XM Inoperative.....	8-46
3. Squelch Operation Test.....	8-37	1. XM Radio Operation Test.....	8-46
4. Receiver Operation Test.....	8-37	2. XM Audio Voltage Output Test.....	8-48
5. Receiver Audio Voltage Test.....	8-37	3. XM Audio Output Continuity Test.....	8-48
6. Receiver Audio Open Circuit Test.....	8-38	4. XM Audio Output Short to Ground Test.....	8-48
7. Receiver Audio Short to Ground Test.....	8-38	5. XM Audio Output Wires Shorted Together Test.....	8-48
8. Receiver Audio Shorted Together Test.....	8-38	6. XM Audio Output Shorted to Voltage Test.....	8-48
9. Receiver Audio Harness Shorted to Voltage Test.....	8-38	7. XM Module Power Test.....	8-48
Symptom 6: Intercom Inoperative.....	8-38	8. XM Module CAN Voltage Test.....	8-48
1. Set-Up Mode Test.....	8-38	9. XM Module CAN Continuity Test.....	8-48
2. Intercom Speech Test.....	8-38	10. XM Module Power/Ground Bus Continuity Test.....	8-49
3. VOX Maximum (Open) Test.....	8-38	Symptom 13: No or Intermittent Reception on XM Module.....	8-49
4. VOX Adjustment Test.....	8-38	1. XM Antenna Power Test	8-49
5. Headset Test.....	8-38	2. XM Antenna Resistance Test.....	8-49
Symptom 7: Handheld Microphone/PTT Inoperative.....	8-39	Symptom 14: Navigation Inoperative.....	8-49
1. Set-Up Test.....	8-39	1. Navigation Module Activation Test.....	8-49
2. Switch Diagnostic Test.....	8-39	2. GPS Antenna Error Test.....	8-49
3. PTT Open Circuit Test.....	8-39	3. GPS Antenna Resistance Test.....	8-49
4. PTT Short Circuit to Ground Test.....	8-40	4. GPS Module Error Test.....	8-50
Symptom 8: Fairing Mounted Speaker Switch Malfunction.....	8-40	5. Screen Speed Test.....	8-50
1. Speaker Switch Headset Mode Test.....	8-40	6. Navigation CD Operation Test.....	8-50
2. Speaker Switch Speaker and Headset Mode Test.....	8-40	Symptom 15: AVC Inoperative.....	8-50
3. Speaker Switch Mode Test.....	8-40	1. AVC Speed Test.....	8-50
4. Headset SpkA Voltage Test.....	8-41	2. Screen Speed Test.....	8-50
5. Headset SpkA Continuity Test.....	8-41	Symptom 16: Handlebar, Passenger or Sidecar Switches Inoperative.....	8-50
6. Headset SpkA Short to Ground Test.....	8-41	Symptom 17: CD Skipping.....	8-50
7. Headset SpkA Short to Voltage Test.....	8-41	1. CD Player to CB/Intercom Interactivity Test.....	8-50
8. Headset SpkB Voltage Test.....	8-41	2. Radio Input (Power) Positive Voltage Drop Test.....	8-50
9. Headset SpkB Continuity Test.....	8-41	3. Radio Input (Power) Negative Voltage Drop Test.....	8-51
10. Headset SpkB Short to Voltage Test.....	8-41	4. Front Motor Mount Inspection Test.....	8-51
11. Headset SpkB Short to Ground Test.....	8-41	5. Exhaust System Mounts Inspection Test.....	8-51
Symptom 9: Headset Speakers Inoperative.....	8-41	Symptom 18: Hands-Free Phone Module Initial Diagnostics.....	8-51
1. Headset Speaker Operational Test.....	8-42	1. Phone Mode Enable Test.....	8-51
2. Rider Headset Speaker Continuity Test.....	8-42	2. Phone Pairing Test.....	8-51
3. Rider Headset Speaker Shorted Wires Test.....	8-42	3. Phone Communication Test.....	8-51
4. Rider Headset Speaker Short to Voltage Test.....	8-42	4. Phonebook Download Test.....	8-51
5. Rider Headset Speaker Short to Ground Test.....	8-43	5. Signal Strength Test.....	8-51
6. Passenger Headset Speaker Continuity Test.....	8-43	6. Phone Module Power Test.....	8-53
7. Passenger Headset Speaker Shorted Wires Test.....	8-43	7. CAN Communication Test.....	8-53
8. Passenger Headset Speaker Short to Voltage Test.....	8-43	8. Phone Module Continuity Test.....	8-53
9. Passenger Headset Speaker Short to Ground Test.....	8-43	9. Phone Module Open Ground Test.....	8-53
Symptom 10: No or Low Audio from Microphones.....	8-43	10. Phone Mode Entry Test.....	8-53
1. Headset Microphone Set-Up Test.....	8-43	11. Phone Module Output Test.....	8-53
2. Headset Microphone Voltage Test.....	8-44	12. Phone Module Continuity Test.....	8-53
3. Microphone Sum Out Voltage Test.....	8-44	13. Phone Module Audio Short to Low Test.....	8-53
4. Headset Microphone Circuit Continuity Test.....	8-44	14. Phone Module Audio Short to Ground Test.....	8-53
5. Headset Microphone Circuit Short to Ground Test.....	8-45	15. Phone Module Audio Short to Voltage Test.....	8-53
6. Headset Microphone Circuit Wires Shorted Together Test.....	8-45	16. Phone Module Antenna Test.....	8-53
7. Headset Microphone Circuit Short to Voltage Test.....	8-45	APPENDIX A CONNECTOR REPAIR	
Symptom 11: No or Low Audio with High Output Amplifier.....	8-45	A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS	
1. Amplifier Power Voltage Test.....	8-45	Autofuse Unsealed Connector Repair.....	A-1
2. Amplifier CAN Test.....	8-45	General.....	A-1
3. Amplifier Power Open Ground Test.....	8-45	Disassembly.....	A-1
4. Amplifier Power Open to Battery Test.....	8-45	Assembly.....	A-1

A.2 DELPHI 100W MICRO-PACK SEALED CONNECTOR

Delphi 100W Micro-Pack Sealed Connector Repair.....	A-2
General.....	A-2
Separating Socket Housing From ECM.....	A-2
Mating Socket Housing To ECM.....	A-2
Removing Socket Terminal.....	A-2
Installing Socket Terminal.....	A-2
Crimping Terminals.....	A-2

A.3 DELPHI 150 METRI-PACK SEALED CONNECTORS

Delphi 150 Metri-Pack Sealed Connector Repair.....	A-4
General.....	A-4
Separating Pin and Socket Housings.....	A-4
Mating Pin and Socket Housings.....	A-4
Removing Socket Terminal.....	A-4
Inserting Socket Terminal.....	A-4

A.4 DELPHI 280 METRI-PACK UNSEALED CONNECTORS

Fuse Block Repair.....	A-6
Removing Socket Terminals.....	A-6
Installing Socket Terminals.....	A-6
Crimping Terminals.....	A-6

A.5 DELPHI 480 METRI-PACK UNSEALED CONNECTORS

Delphi 480 Metri-Pack Unsealed Connector Repair.....	A-7
General.....	A-7
Separating Pin and Socket Housings.....	A-7
Mating Pin and Socket Housings.....	A-7
Removing Socket Terminals.....	A-7
Installing Socket Terminals.....	A-7

A.6 DELPHI 630 METRI-PACK UNSEALED CONNECTORS

Delphi 630 Metri-Pack Unsealed Connector Repair.....	A-8
Separating Pin and Socket Housings.....	A-8
Mating Pin and Socket Housings.....	A-8
Removing Socket Terminal.....	A-8
Installing Socket Terminal.....	A-8

A.7 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING

Delphi 800 Metri-Pack Sealed Main Fuse Housing Repair.....	A-9
Removing Socket Terminals.....	A-9
Installing Socket Terminals.....	A-9

A.8 DELPHI METRI-PACK TERMINAL REPAIR

Metri-Pack Terminal Crimps.....	A-11
Matching Terminal To Crimper.....	A-11
Preparing Wire Lead.....	A-11
Crimping Wire Core.....	A-11
Crimping Insulation/Seal.....	A-11
Inspecting Crimps.....	A-12

A.9 DELPHI MICRO 64 SEALED CONNECTORS

Delphi Micro 64 Sealed Connector Repair.....	A-13
General.....	A-13
Separating Pin and Socket Housings.....	A-13
Mating Pin and Socket Housings.....	A-13
Removing Terminal.....	A-13
Installing Terminal.....	A-14
Preparing Wire Leads for Crimping.....	A-14
Crimping Terminals.....	A-14
Inspecting Crimps.....	A-14

A.10 DELPHI GT 150 SEALED CONNECTORS

Delphi GT 150 Sealed Connector Repair.....	A-16
General.....	A-16
Separating Pin and Socket Housings.....	A-16
Mating Pin and Socket Housings.....	A-16
Removing Socket Terminals.....	A-16
Installing Socket Terminals.....	A-16

A.11 DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR

Delphi GT 280 Sealed 73-Terminal ECM Connector.....	A-18
Separating Socket Housing From ECM.....	A-18
Mating Socket Housing To ECM.....	A-18
Socket Terminal.....	A-18
ECM Ground Terminal.....	A-18

A.12 DEUTSCH DT SEALED CONNECTORS

Deutsch DT Sealed Connector Repair.....	A-20
General.....	A-20
Separating Pin and Socket Housings.....	A-20
Mating Pin and Socket Housings.....	A-20
Removing Socket Terminals.....	A-20
Installing Socket Terminals.....	A-20
Removing Pin Terminals.....	A-22
Installing Pin Terminals.....	A-22
Crimping Terminals.....	A-23

A.13 DEUTSCH DT SEALED TERMINAL REPAIR

Deutsch DT Sealed Terminal Crimps.....	A-24
Preparing Wire Leads for Crimping.....	A-24
Crimping Terminal to Lead.....	A-24
Inspecting Crimps.....	A-24

A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

Deutsch DTM Sealed Mini Terminal Crimps.....	A-25
Preparing Wire Leads for Crimping.....	A-25
Crimping a Mini Terminal to Wire Lead.....	A-25
Inspecting Crimps.....	A-25

A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR

Deutsch DTM Sealed Solid Barrel Terminal Crimps.....	A-26
Preparing Wire Leads For Crimping.....	A-26
Adjusting Crimper Tool.....	A-26

TABLE OF CONTENTS

Crimping a Barrel Contact To Wire Lead.....	A-26
Inspecting Crimps.....	A-26
A.16 JAE MX19 SEALED CONNECTORS	
JAE MX19 Sealed Connectors.....	A-28
Connector Housings.....	A-28
Removing Terminals.....	A-28
Installing Terminals.....	A-28
A.17 MOLEX CMC SEALED CONNECTORS	
Molex CMC Sealed Connectors.....	A-29
Separating the Connector.....	A-29
Removing Terminals.....	A-29
Installing Terminals.....	A-29
A.18 MOLEX MX 150 SEALED CONNECTORS	
Molex MX 150 Sealed Connector Repair.....	A-31
Separating Pin and Socket Housings.....	A-31
Mating Pin and Socket Housings.....	A-31
Removing Terminals.....	A-31
Installing Terminals.....	A-31
Crimp Terminal to Lead.....	A-32
Prepare Lead.....	A-32
Prepare Tool.....	A-32
Position Terminal in the Punch/Die.....	A-33
Insert Stripped Lead.....	A-33
Crimp Terminal to Lead.....	A-34
Inspect Crimp.....	A-34
A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR	
Tyco 070 Multilock Unsealed Connector Repair.....	A-35
General.....	A-35
Separating Pin and Socket Housings.....	A-35
Mating Pin and Socket Housings.....	A-35
Removing Terminals from Housing.....	A-35
Inserting Terminals into Housing.....	A-36
Preparing Wire Leads for Crimping.....	A-36
Crimping Terminals to Leads.....	A-37
Inspecting Crimped Terminals.....	A-38
A.20 SEALED SPLICE CONNECTORS	
Sealed Splice Connector Repair.....	A-39
General.....	A-39
Preparing Wire Leads.....	A-39

Splicing Wire Leads.....	A-39
Inspecting Seals.....	A-39

APPENDIX B WIRING

B.1 CONNECTORS

Connector Locations.....	B-1
Function/Location.....	B-1
Place and Color.....	B-1
Connector Number.....	B-1
Repair Instructions.....	B-1

B.2 WIRING DIAGRAMS

Wiring Diagram Information.....	B-7
Wire Color Codes.....	B-7
Wiring Diagram Symbols.....	B-7
2011 Touring Wiring Diagrams.....	B-9

APPENDIX C CONVERSIONS

C.1 METRIC CONVERSION

Conversion Table.....	C-1

C.2 FLUID CONVERSIONS

United States System.....	C-2
Metric System.....	C-2
British Imperial System.....	C-2

C.3 TORQUE CONVERSIONS

United States System.....	C-3
Metric System.....	C-3

APPENDIX D GLOSSARY

D.1 GLOSSARY

Acronyms and Abbreviations.....	D-1

REFERENCE MATERIAL

TOOLS.....	I

TORQUE VALUES.....	XIII

INDEX.....	XV

TABLE OF CONTENTS

SUBJECT	PAGE NO.
1.1 SPECIFICATIONS AND COMPONENT LOCATIONS	1-1
1.2 DIAGNOSTIC TOOLS.....	1-13
1.3 DIAGNOSTICS AND TROUBLESHOOTING.....	1-18



NOTES



SPECIFICATIONS AND COMPONENT LOCATIONS

1.1

SPECIFICATIONS

Table 1-1. Fuel System Specifications

FUEL SYSTEM	TYPE
Intake	Side draft throttle body
Recommended fuel	91 Octane

Table 1-2. Idle Speed Specifications

ADJUSTMENT	RPM
Normal idle speed	950-1050 Nominal, non-adjustable

Table 1-3. Battery Specifications

BATTERY	SPECIFICATIONS
Size	12V/28 AH/405CCA
Type	Sealed, AGM

Table 1-4. Spark Plug Specifications

SPARK PLUG	SPECIFICATIONS	
Gap	0.038-0.043 in.	0.97-1.09 mm
Torque with anti-seize applied to threads	12-18 ft-lbs	16.3-24.4 Nm
Type	Harley-Davidson No. 6R12	

Table 1-5. Spark Plug Cables

SPECIFICATION	FRONT	REAR
Length in.	34.5-35	16.5-17
Length mm	876-889	419-431
Resistance-ohms	8625-23,334	4125-11,334

Table 1-6. Ignition Coil Specifications

WINDING	RESISTANCE
Ignition coil primary resistance at room temperature	0.5-0.7 Ohm
Ignition coil secondary resistance at room temperature	5500-7500 Ohms

Table 1-7. Starter Specifications

STARTER	SPECIFICATIONS
Cranking current	200A
Free speed	3000 rpm (min)
Free current	90A
Stall torque	8.0 ft-lbs (10.8 Nm)

Table 1-8. Fuel Pump Pressure Specifications

RANGE	VALUE
Normal	55-62 psi (380-425 kPa)

Table 1-9. Alternator Specifications

MEASUREMENT	VALUE
AC voltage output	16-23 VAC per 1000 rpm
Stator coil resistance	0.1-0.2 Ohm

Table 1-10. Regulator Specifications

MEASUREMENT	VALUE
Amperes @ 3000 rpm	35-50A
Voltage @ 3600 rpm	14.3-14.7V @ 75 °F (24 °C)

Table 1-11. Fuse Specifications

ITEM	RATING (AMPERES)
Instruments fuse	15
Accessory fuse	15
Battery fuse	15
ECM PWR fuse	15
Fuel pump fuse	15
Ignition fuse	15
Lights fuse	15
Main fuse	40
P&A IGN fuse	2
Exhaust control	15
Brake fuse	15
P&A fuse	15
Radio power/siren fuse	15
Headlamp fuse	15
ABS fuse	30
Radio memory fuse	15
Power outlet fuse	15

COMPONENT LOCATIONS

Some components and connectors are not easily located on

the motorcycle. The following graphics show locations for these components and connectors. The graphics are generally ordered from front to back around the motorcycle.

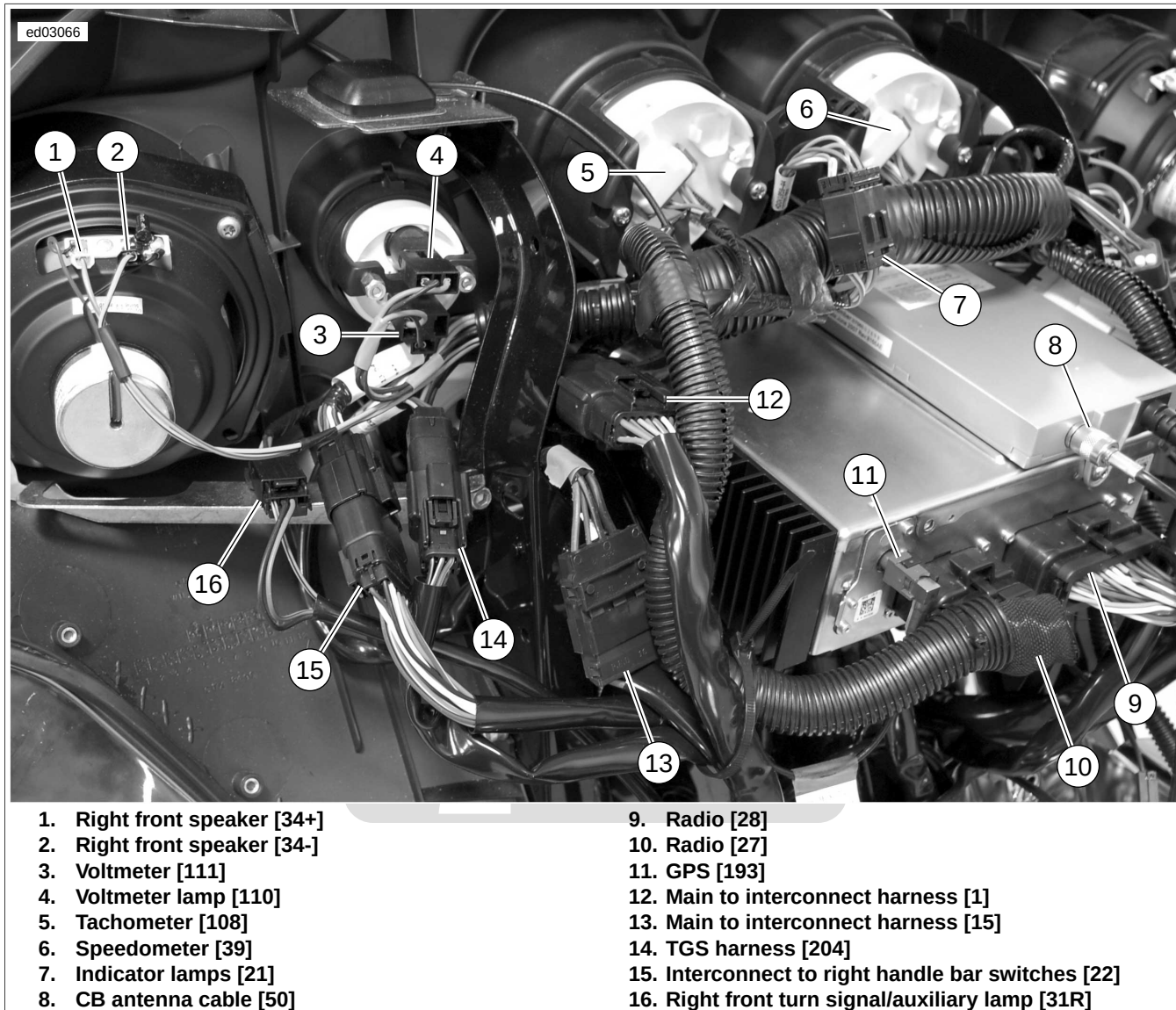


Figure 1-1. Right Side Behind Upper Fairing

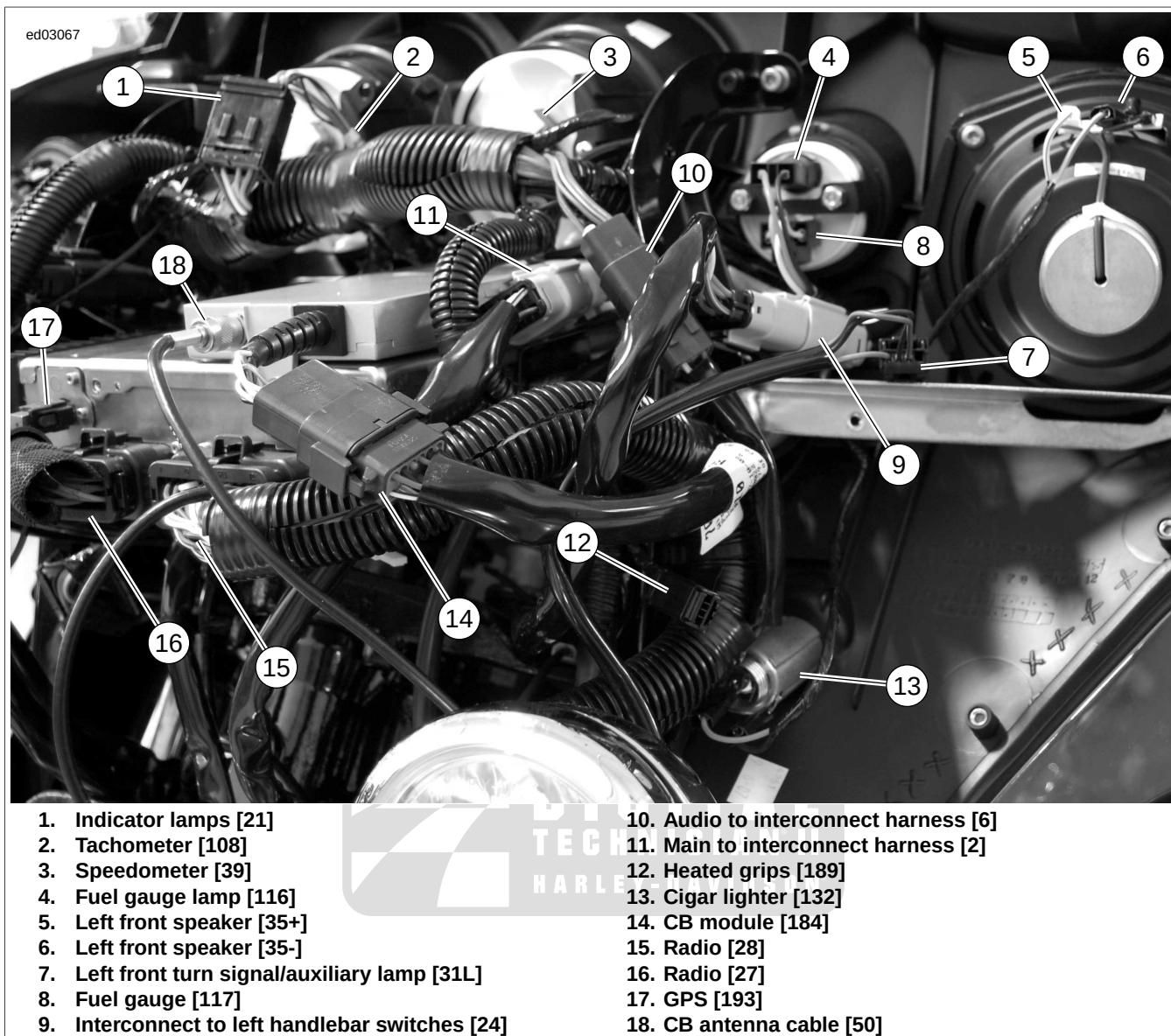


Figure 1-2. Left Side Inner Fairing: Except FLT models

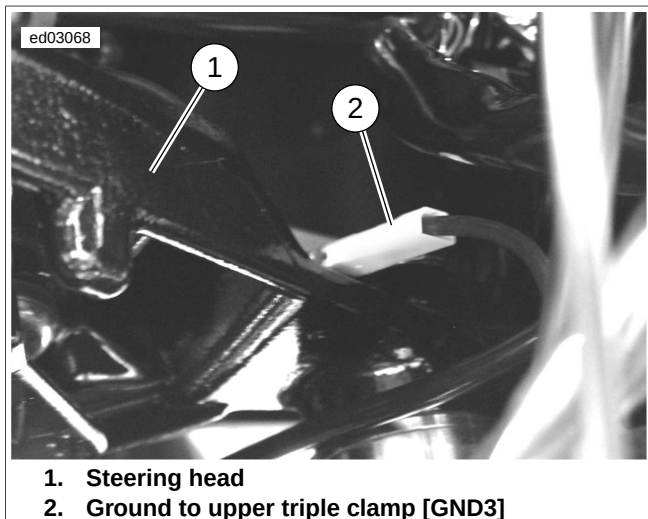


Figure 1-3. Steering Head Ground

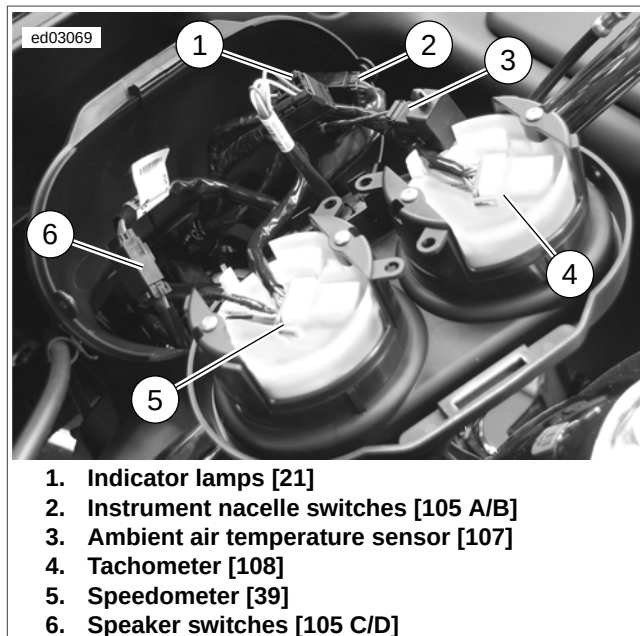


Figure 1-4. FLTR Instruments

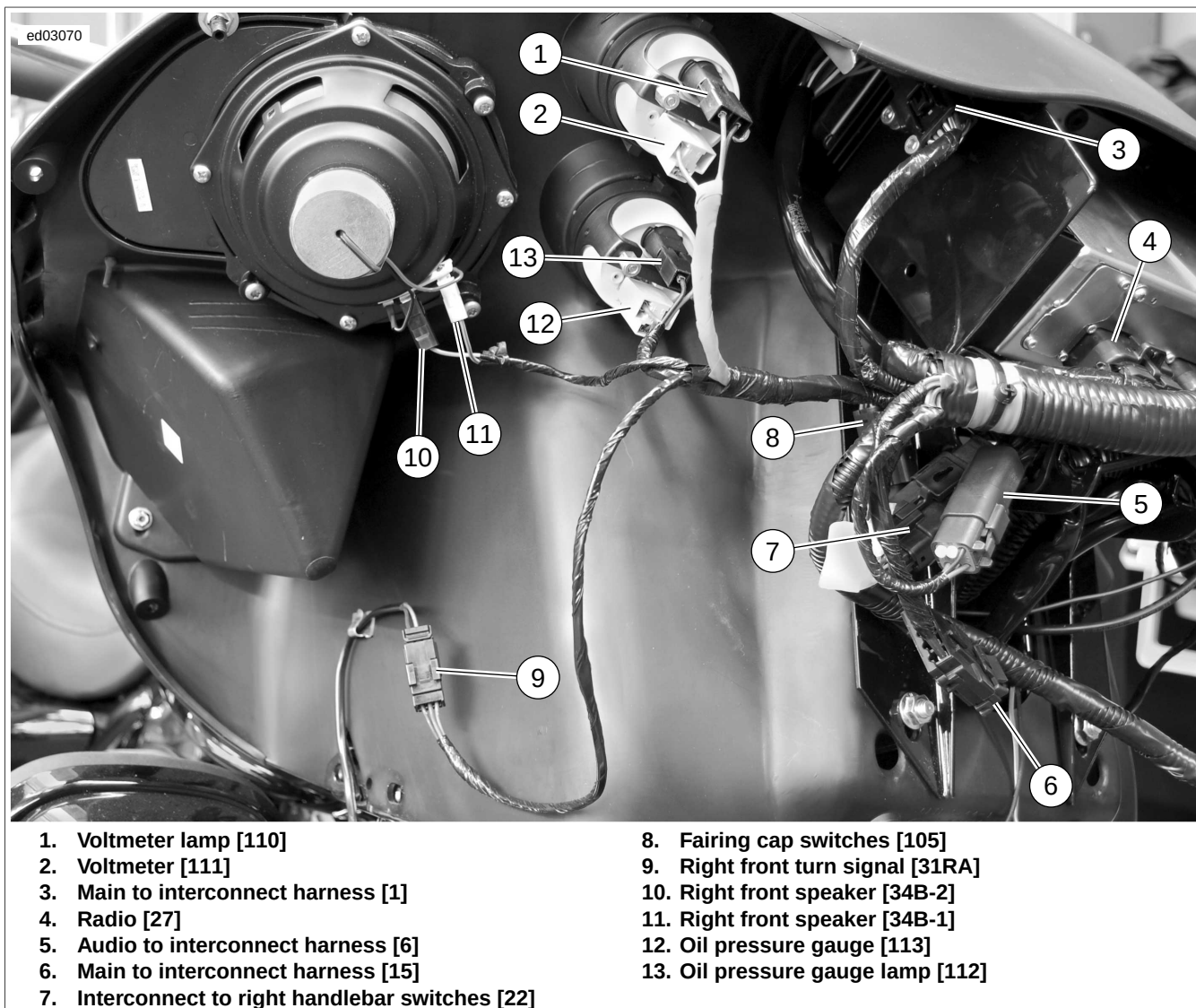


Figure 1-5. FLTR Right Side Behind Upper Fairing

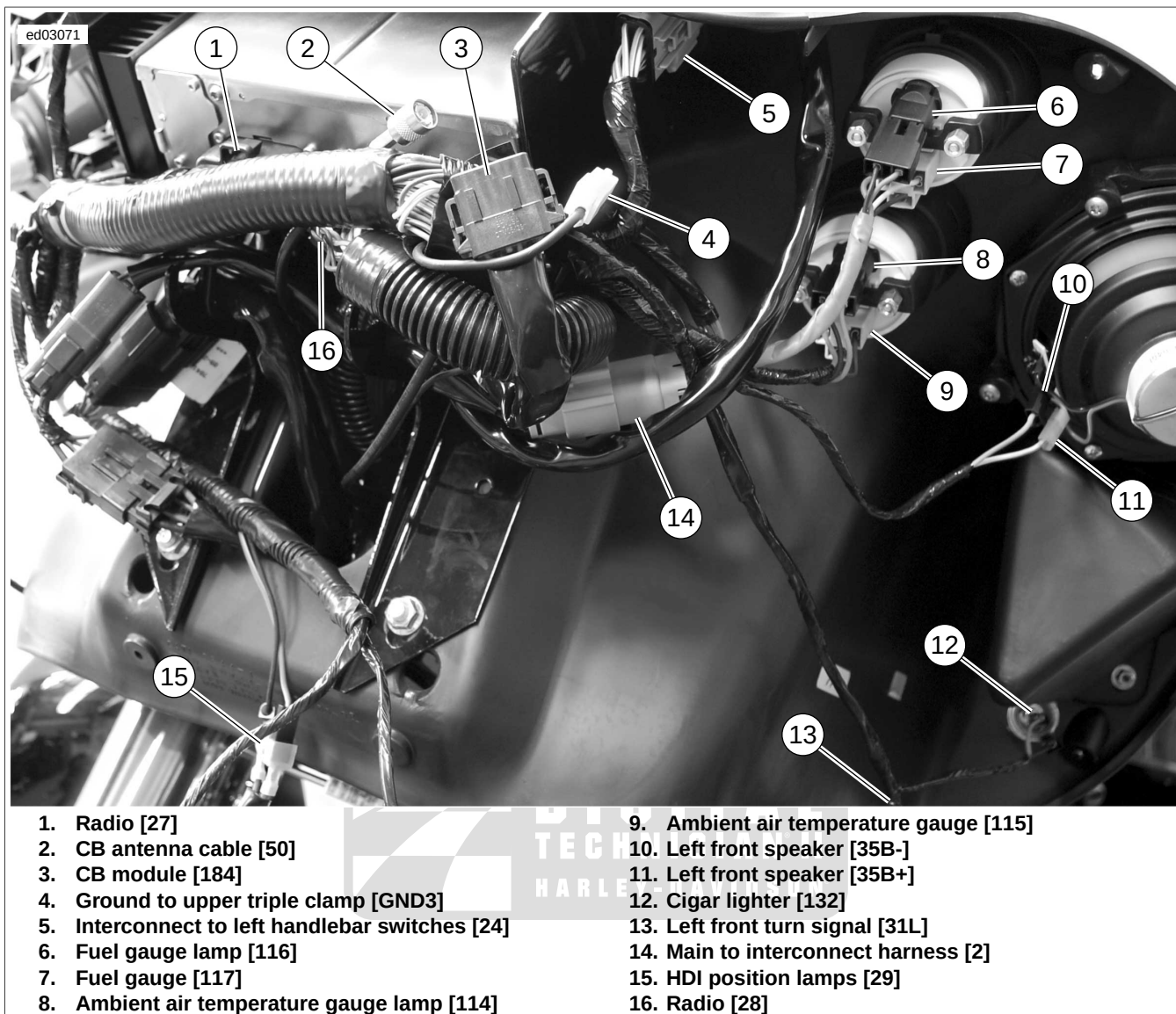


Figure 1-6. Left Side Inner Fairing: FLT models

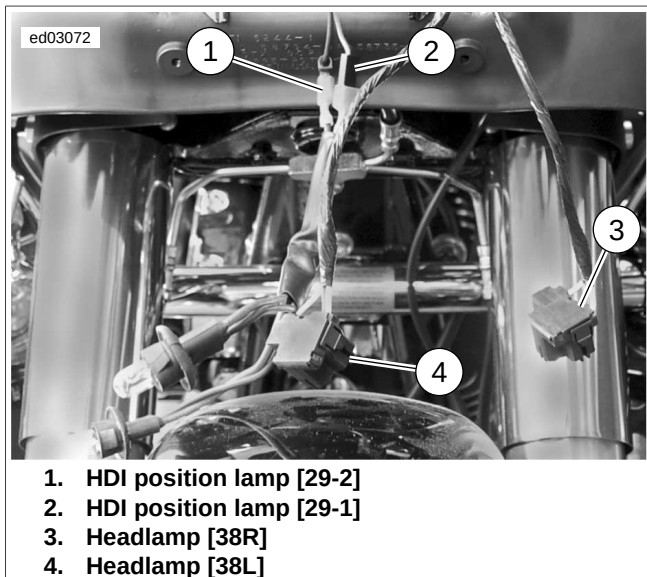


Figure 1-7. Headlamp: FLT Models

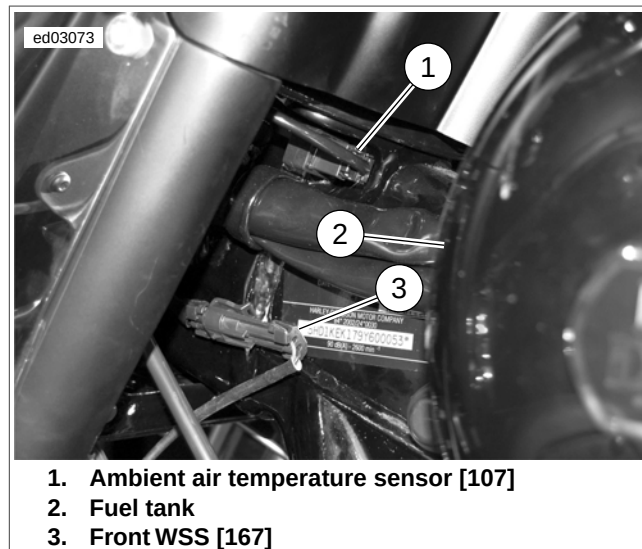


Figure 1-9. Front WSS and Ambient Air Temperature Sensor

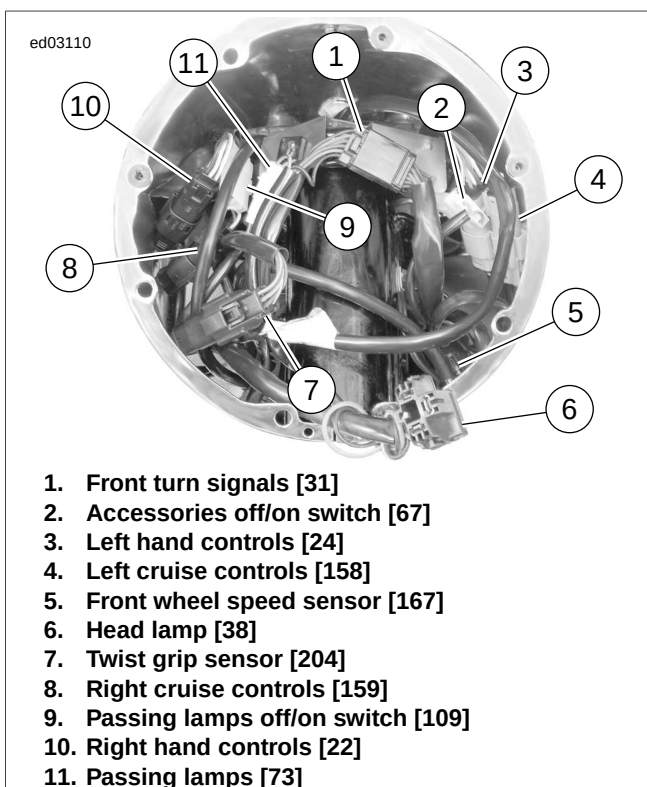


Figure 1-8. Head Lamp Nacelle: FLH Models

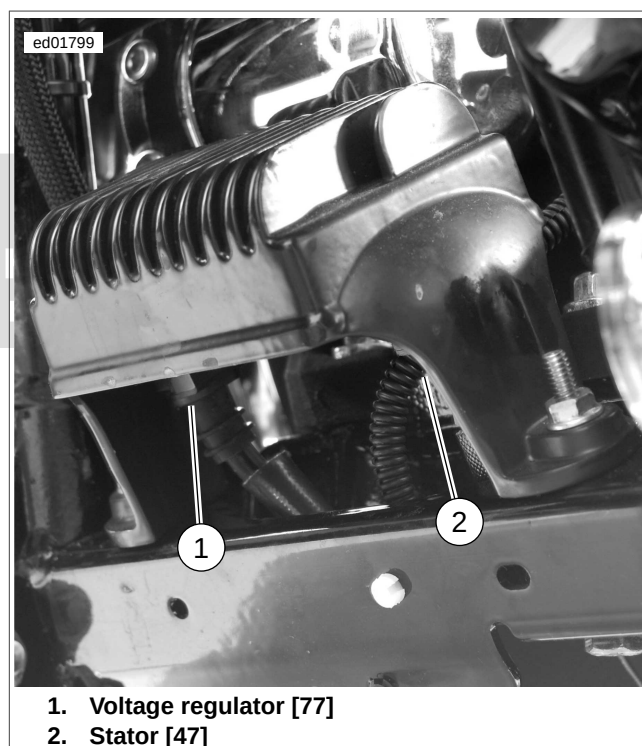


Figure 1-10. Voltage Regulator: Left Side View

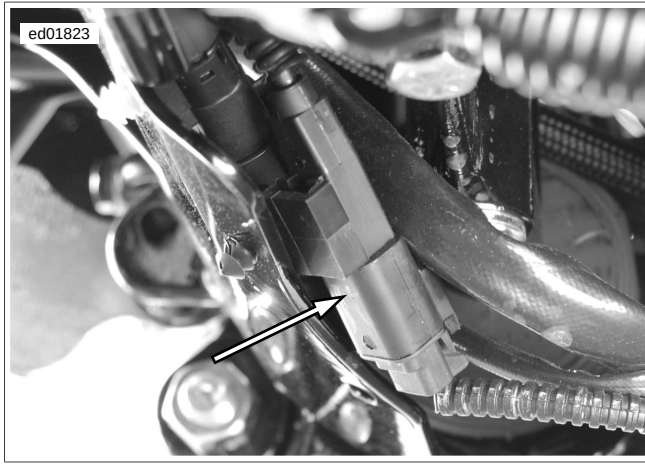


Figure 1-11. CKP Sensor [79] (from underneath)

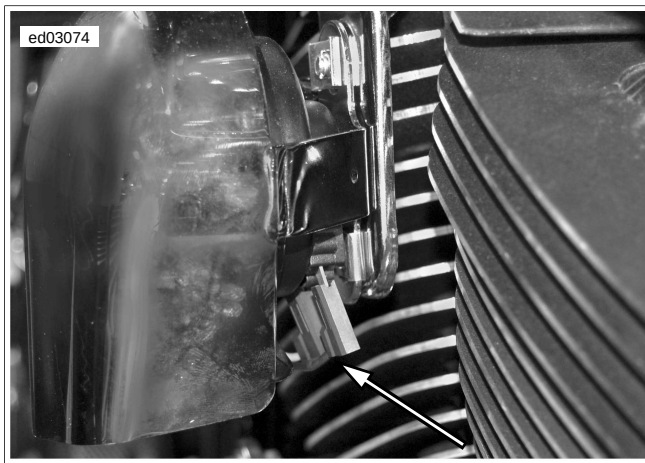


Figure 1-12. Horn [122]

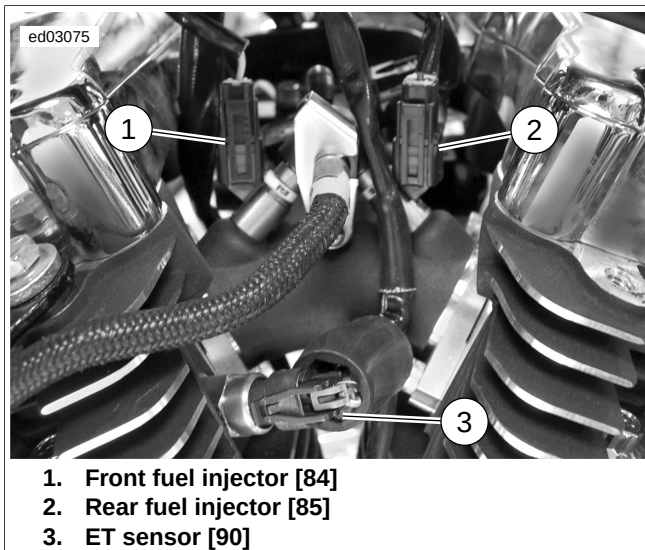
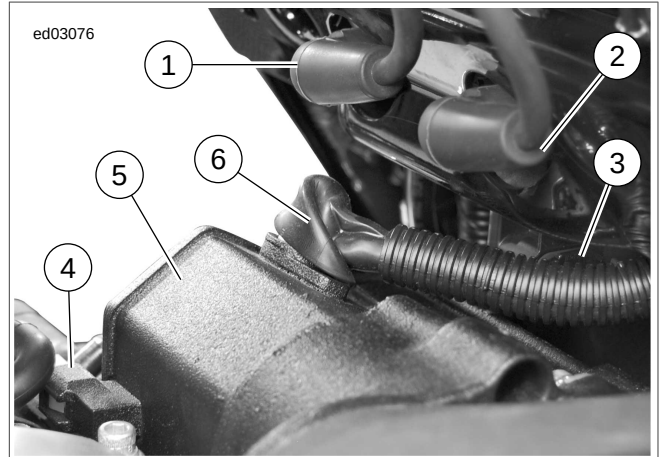
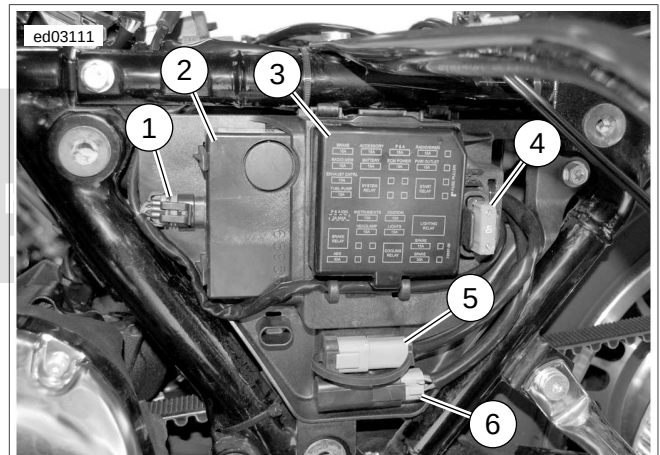


Figure 1-13. Between Cylinders Left Side



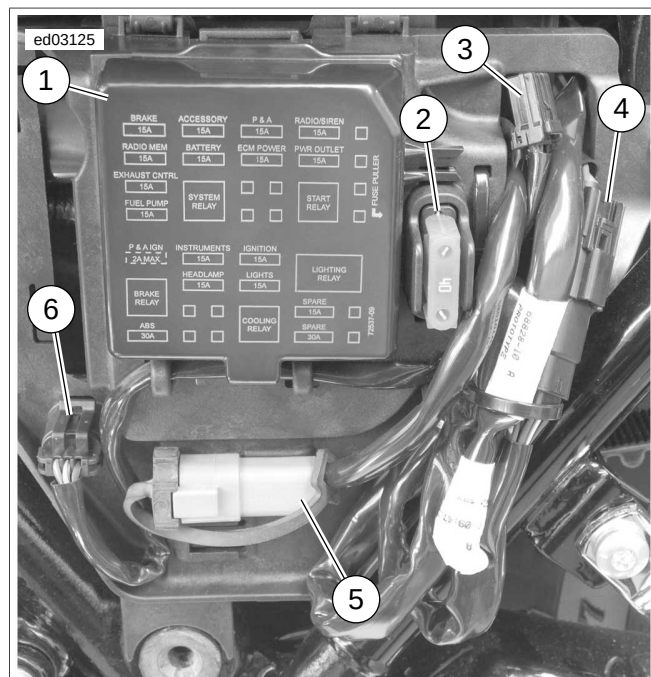
1. Rear spark plug wire
2. Front spark plug wire
3. Ignition coil [83]
4. Starter solenoid [128]
5. Starter
6. Battery to starter cable

Figure 1-14. Starter Area From Left Side



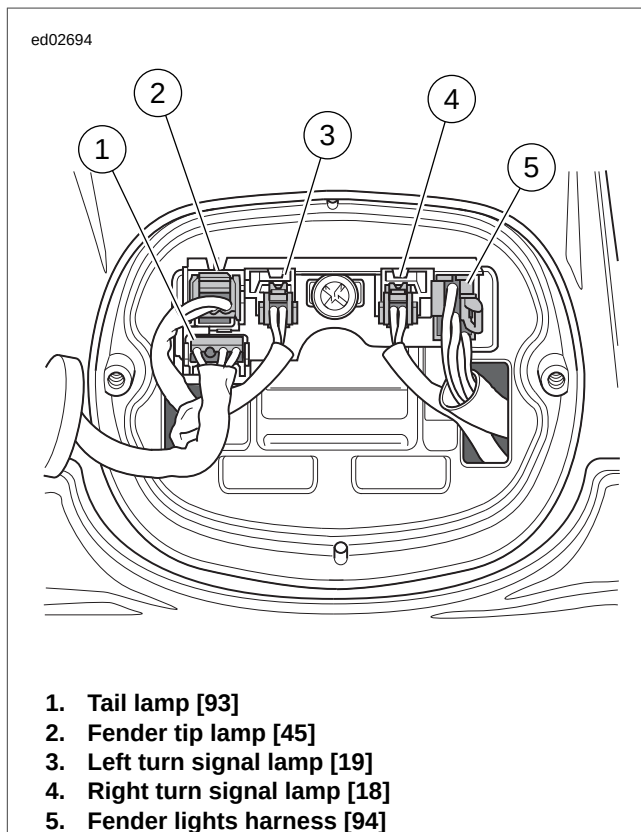
1. Security siren [142]
2. Security siren (if equipped)
3. Fuse block
4. Main fuse [5]
5. DLC [91]
6. ABS diode pack [201] (if equipped)

Figure 1-15. Under Left Side Cover: Except FLTRX, FLHX, FLHTC



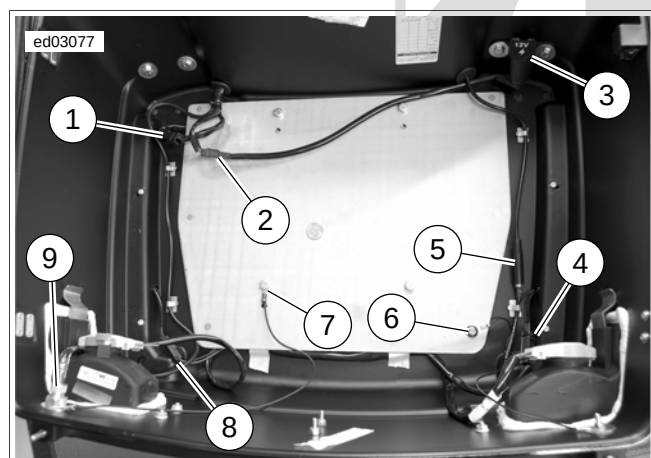
1. Fuse block
2. Main fuse [5]
3. Tour-Pak [12]
4. Main to rear lighting interconnect harness [257]
5. DLC [91]
6. Security siren [142]

Figure 1-16. Under Left Side Cover: FLTRX, FLHX, FLHTC



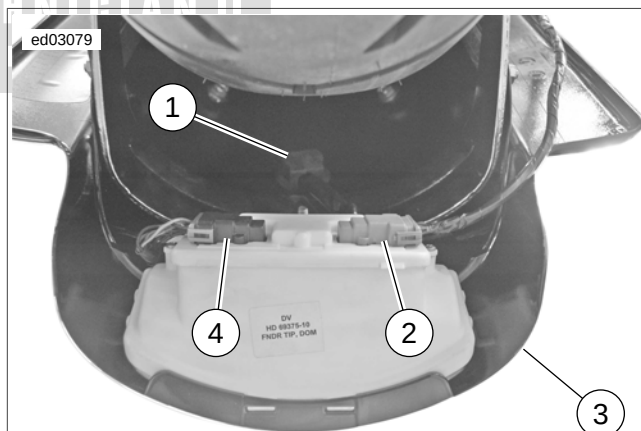
1. Tail lamp [93]
2. Fender tip lamp [45]
3. Left turn signal lamp [19]
4. Right turn signal lamp [18]
5. Fender lights harness [94]

Figure 1-18. Rear Fender Lights Assembly



1. Tour-Pak lights (rear lamp fascia on FLHX) [12]
2. Power outlet [258]
3. Power outlet
4. Right marker light [12-2]
5. CB antenna cable [104]
6. CB antenna ground
7. Radio antenna cable ground
8. Left marker light [12-3]
9. Radio antenna cable [52]

Figure 1-17. Tour-Pak Interior



1. Tail lamp
2. Fascia/converter module [262]
3. Rear fender
4. Fascia/converter module [226]

Figure 1-19. Fascia/Converter Module

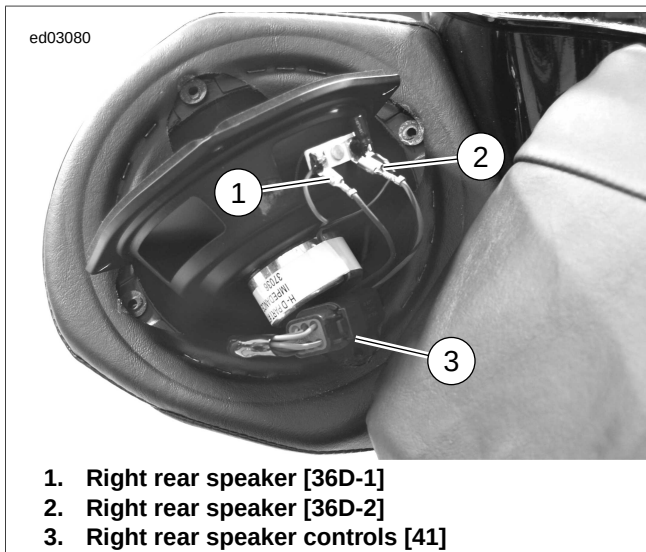


Figure 1-20. Rear Speaker

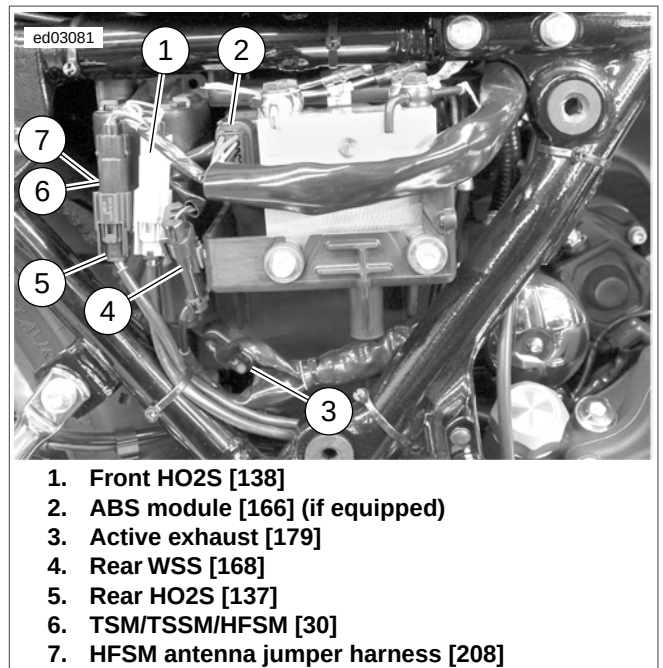


Figure 1-21. Under Right Side Cover



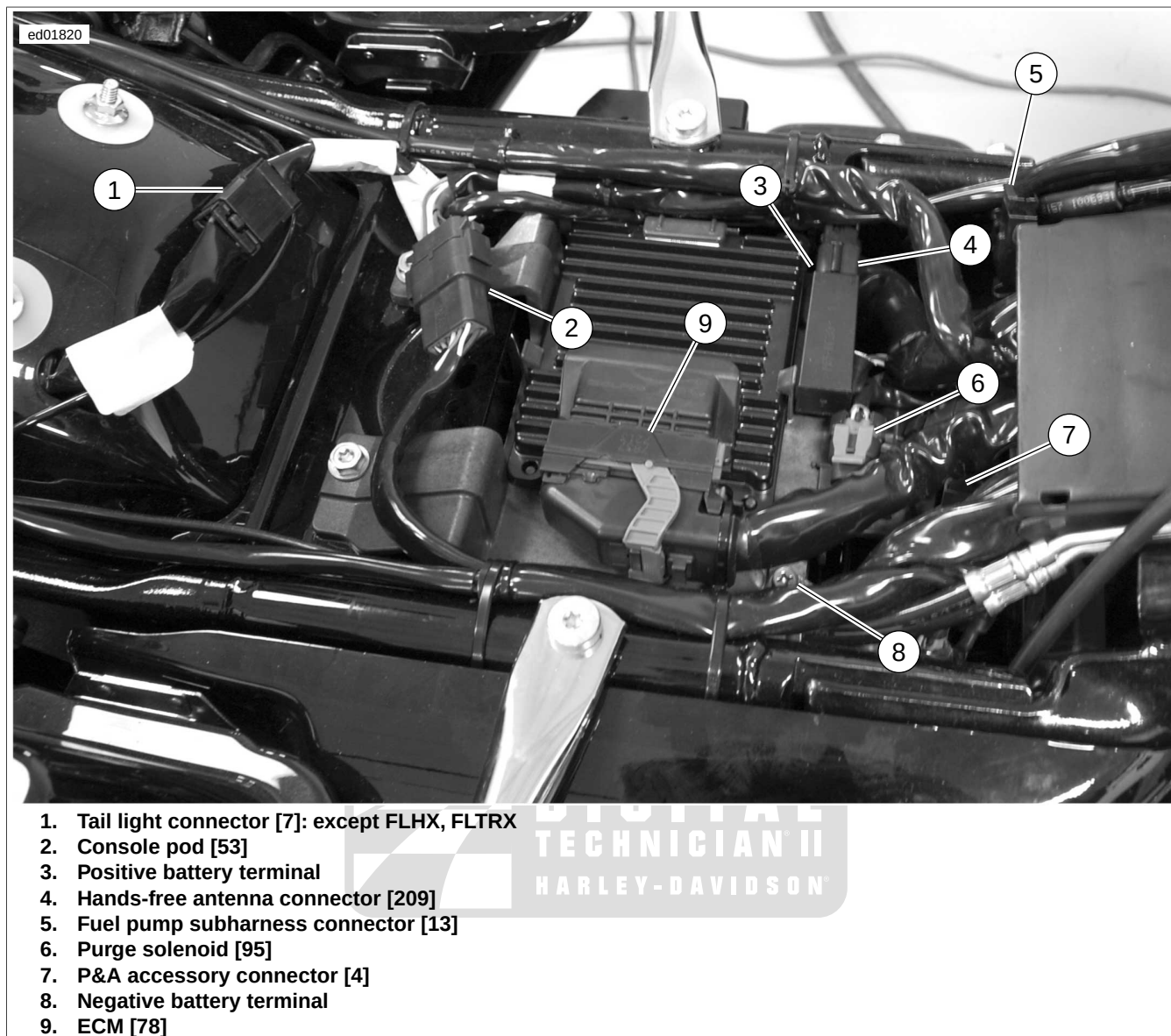


Figure 1-22. Electrical Connectors Under Seat



Figure 1-23. [95] Purge Solenoid (Under seat)

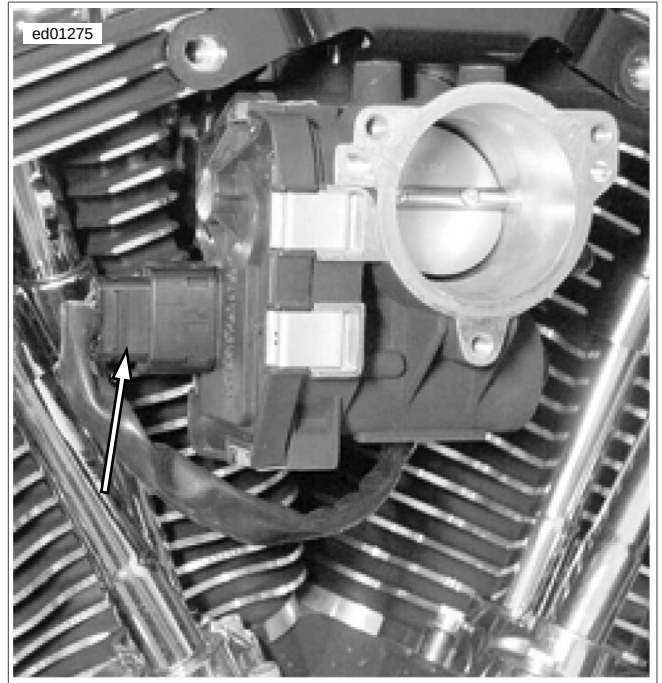
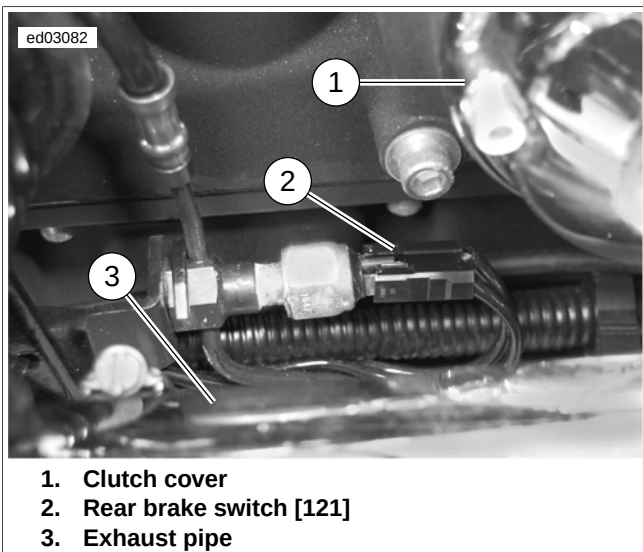
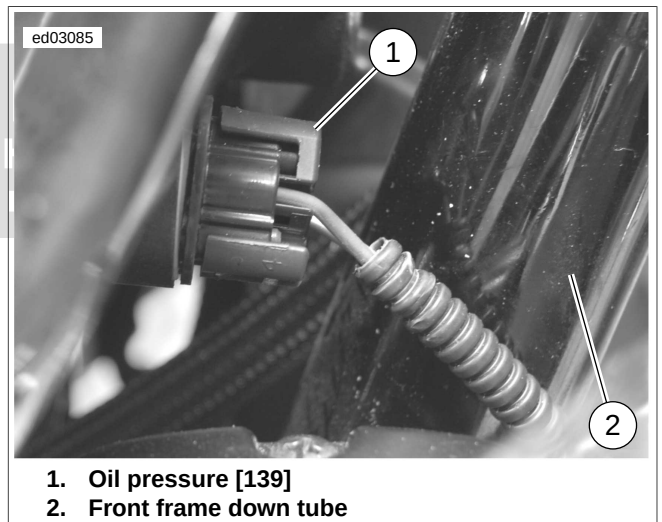


Figure 1-25. Throttle Control Connector [211]



1. Clutch cover
2. Rear brake switch [121]
3. Exhaust pipe

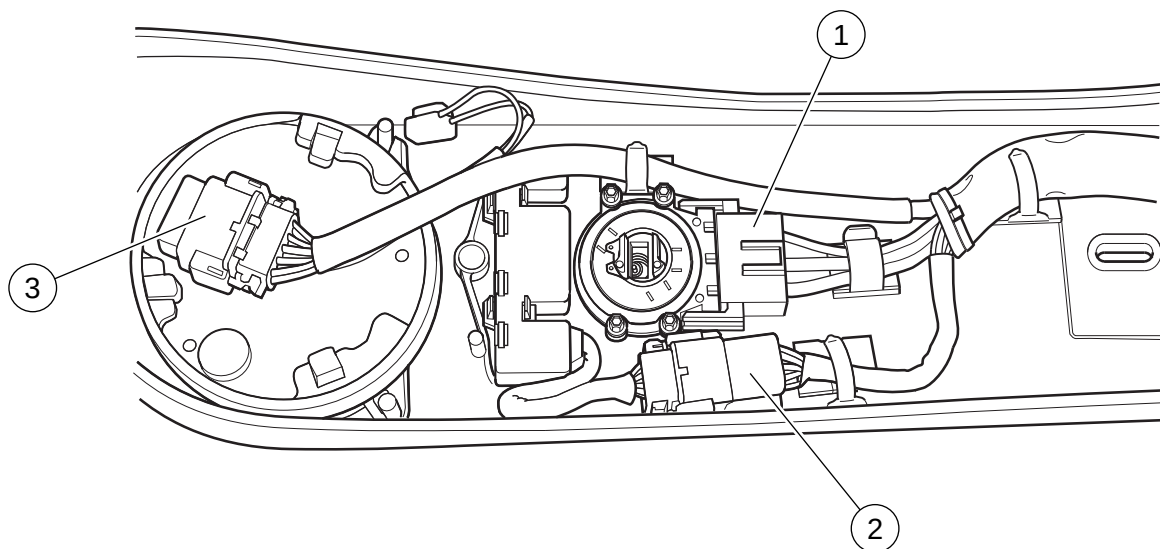
Figure 1-24. Rear Brake Switch



1. Oil pressure [139]
2. Front frame down tube

Figure 1-26. Oil Pressure Switch

ed02699



1. Ignition/light key switch [33]
2. Indicator lights [21]
3. Speedometer [39]

Figure 1-27. Instrument Console Connectors: FLHR, FLHRC

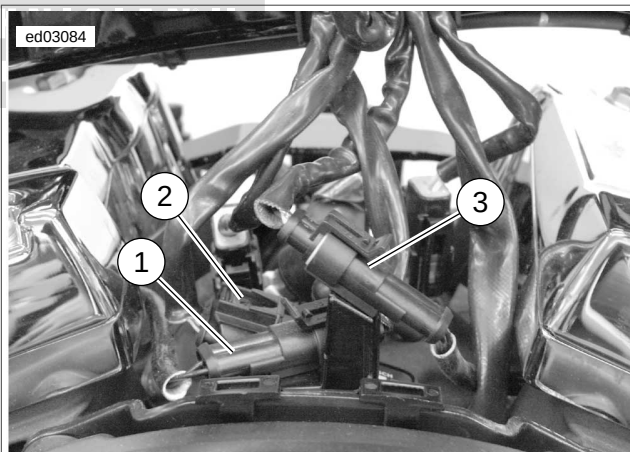
ed03083



1. Fuel pump [141]
2. Fuel tank

Figure 1-28. Under Console

ed03084



1. Rear ACR [203R]
2. TMAP [80]
3. Front ACR [203F]

Figure 1-29. Between Cylinders Right Side

DIAGNOSTIC TOOLS

1.2

HOW TO USE DIAGNOSTIC TOOLS

PART NUMBER	TOOL NAME
HD-26792	SPARK TESTER
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-39978	DIGITAL MULTIMETER (FLUKE 78)
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER
HD-46601	BREAKOUT BOX ADAPTERS
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER
HD-48637	BREAKOUT BOX
HD-48642	ABS BREAKOUT BOX
HD-48650	DIGITAL TECHNICIAN II

HD-26792 Spark Tester

See [Figure 1-30](#). The SPARK TESTER (Part No. HD-26792) is used to verify adequate spark at the spark plug. Attach the tester to the spark plug wire and to ground. While cranking the engine, a spark should jump across the gap on the tester leads.

NOTE

Engine will not spark with both spark plugs removed. When checking for spark, use SPARK TESTER (Part No. HD-26792) with both plugs installed.

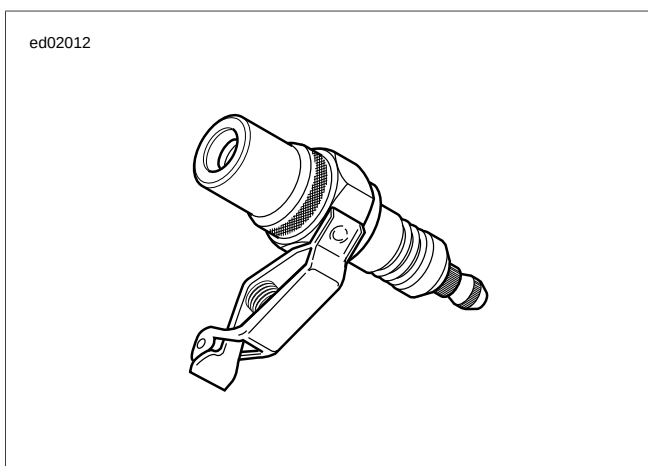
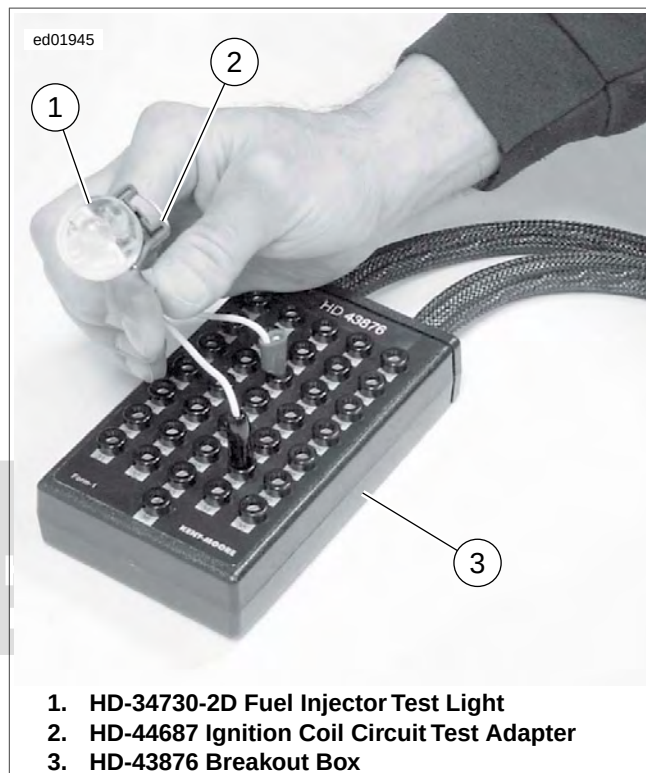


Figure 1-30. Spark Tester

HD-34730-2D Fuel Injector Test Light

The FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) and IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) are used to test the fuel injector drivers as well as the ignition coil drivers in the ECM.

1. Connect the BREAKOUT BOX (Part No. HD-48637).
2. Disconnect the fuel injector connectors.
3. See [Figure 1-31](#) for typical setup. Connect one side of the fuel injector test light to power and the other to the terminal on the ECM for the circuit you are testing.
4. Crank the engine.
5. If the test light flashes, the circuit is working properly.



1. HD-34730-2D Fuel Injector Test Light
2. HD-44687 Ignition Coil Circuit Test Adapter
3. HD-43876 Breakout Box

Figure 1-31. Fuel Injector Test Light

HD-39978 Digital Multimeter (Fluke 78)

The DIGITAL MULTIMETER (FLUKE 78) (Part No. HD-39978) is used for various tests throughout this manual.

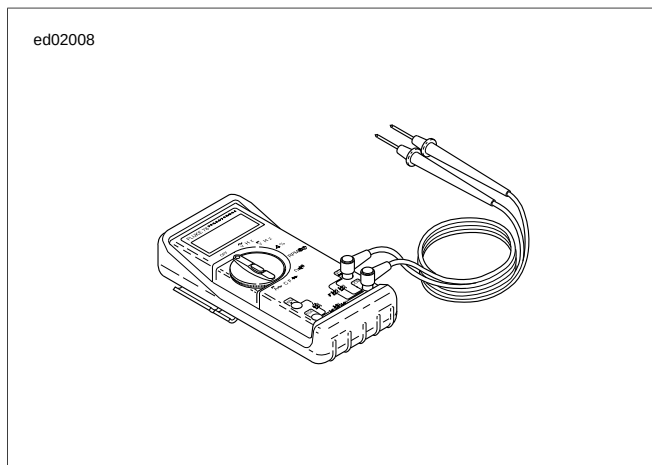


Figure 1-32. Digital Multimeter (Fluke 78) (Part No. HD-39978)

HD-41404-C Harness Connector Test Kit

The HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) contains pin and socket terminals and stackable banana jack patch cords used to test circuits. The pin and socket terminals are used to connect to various connectors used on the vehicle. See the tool instruction sheet for specific terminal usage.

NOTE

To prevent terminal damage while using the probe tips, insert the probe tip straight into the cavity and keep it stable during the test. Do not wiggle or move the probe tip once it has been inserted into the terminal. Do not use more than one probe per terminal or cavity at any one time.

HD-42682 Breakout Box (Instruments)

The BREAKOUT BOX (Part No. HD-42682) and BREAKOUT BOX ADAPTERS (Part No. HD-46601) connect to the speedometer [39]. Used in conjunction with a multimeter, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects. Install breakout box in series using the black connectors as follows:

1. Access the speedometer [39]. See the service manual.
2. See [Figure 1-33](#). Press latch and disconnect speedometer [39B].
3. Connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39A] and [39B] (speedometer) or [108A] and [108B] (tachometer).
4. Attach black connectors from BREAKOUT BOX (Part No. HD-42682) to BREAKOUT BOX ADAPTERS (Part No. HD-46601). All tests will be performed using the black side of the breakout box.
5. When testing is completed, remove the breakout box and jumper harness, and restore connections.

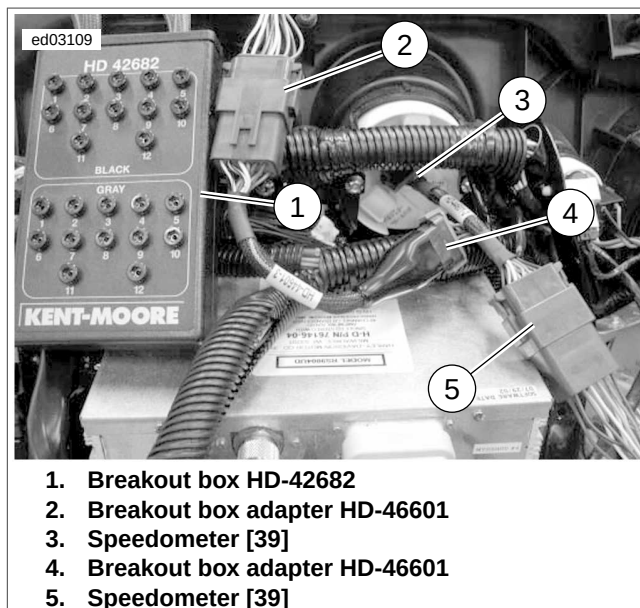


Figure 1-33. Breakout Box Connection

HD-42682 Breakout Box (TSM/TSSM/HFSM)

The BREAKOUT BOX (Part No. HD-42682) splices into the main harness. Used in conjunction with a multimeter, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects. Install breakout box in series as follows:

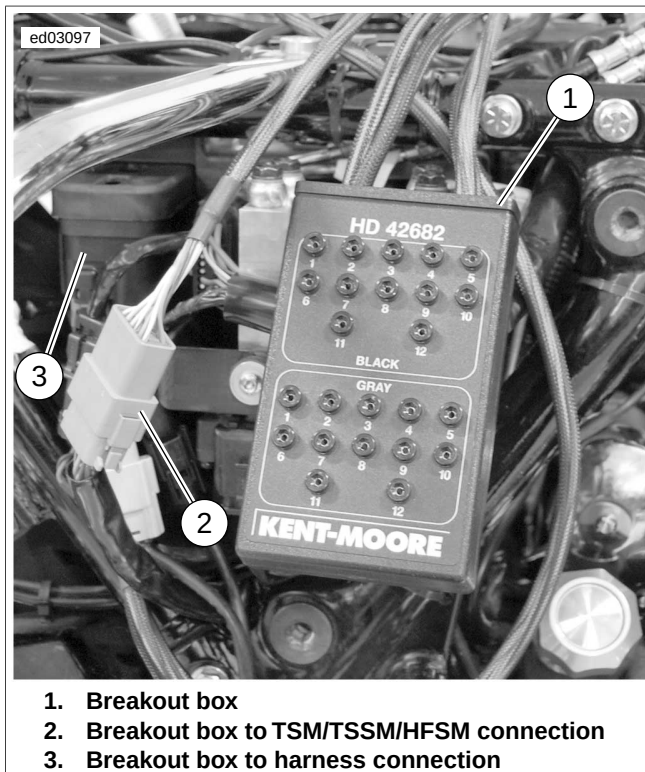
NOTE

For HFSM: Disarm security system, then remove main fuse while the system remains disarmed.

1. Access TSM/TSSM/HFSM. See the service manual.
2. Disconnect HFSM antenna jumper [208] and TSM/TSSM/HFSM [30].
 - a. **For HFSM:** Press latches and disconnect [208].
 - b. Press latches and disconnect [30].
3. See [Figure 1-34](#). Connect BREAKOUT BOX (Part No. HD-42682) to connectors.
4. **For HFSM:** Mate antenna [208B] to HFSM.
5. When testing is completed remove the breakout box and restore connections.

NOTE

Vehicle will not start with TSM/TSSM/HFSM disconnected or incorrectly mounted.



1. Breakout box
2. Breakout box to TSM/TSSM/HFSM connection
3. Breakout box to harness connection

Figure 1-34. Breakout Box Connection Point at TSM/TSSM/HFSM (Typical)

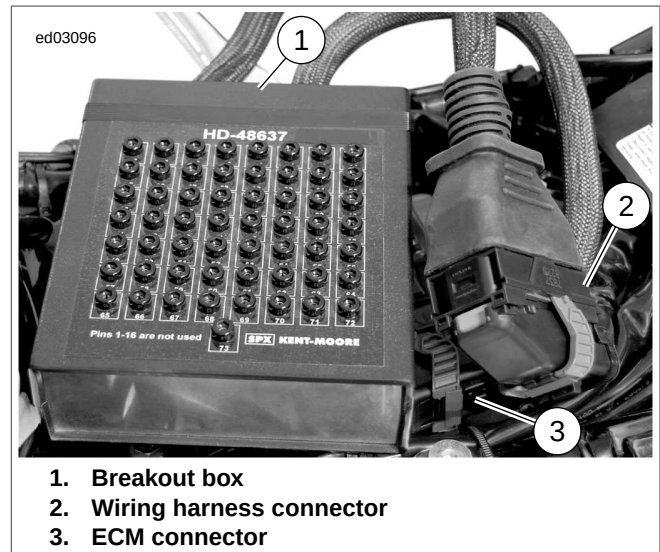
HD-48637 Breakout Box (ECM)

The BREAKOUT BOX (Part No. HD-48637) splices into the main harness. Used in conjunction with a multimeter, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects. Install breakout box in series as follows:

NOTE

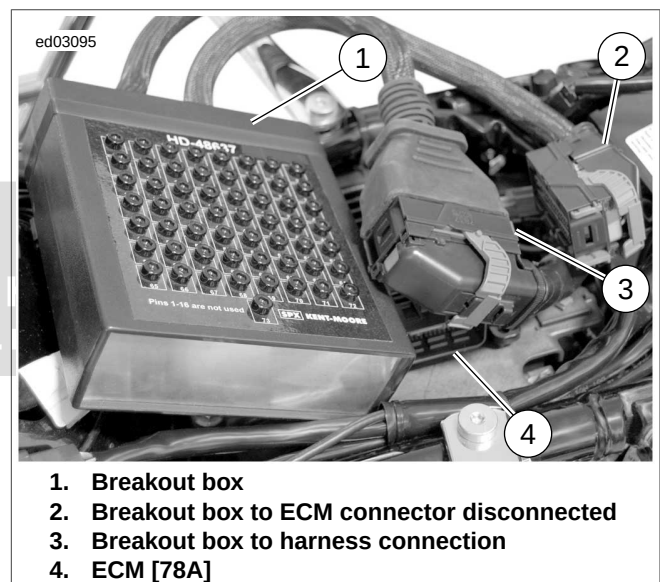
See wiring diagrams for ECM terminal functions. ECM is located under passenger seat.

1. Access the ECM. See the service manual.
2. Press latch and disconnect ECM [78].
3. See [Figure 1-35](#). Connect BREAKOUT BOX (Part No. HD-48637) to connectors.
4. When testing is completed, remove the breakout box and restore connections.



1. Breakout box
2. Wiring harness connector
3. ECM connector

Figure 1-35. Breakout Box



1. Breakout box
2. Breakout box to ECM connector disconnected
3. Breakout box to harness connection
4. ECM [78A]

Figure 1-36. ECM Breakout Box Disconnected

HD-48642 Breakout Box (ABS)

The ABS BREAKOUT BOX (Part No. HD-48642) connects to the ABS module [166]. Used in conjunction with a multimeter, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects. Install breakout box in series as follows:

1. Remove the right side cover. See the service manual.
2. Press latch and disconnect ABS module [166B].
3. See [Figure 1-37](#). Connect ABS BREAKOUT BOX (Part No. HD-48642) to connectors.

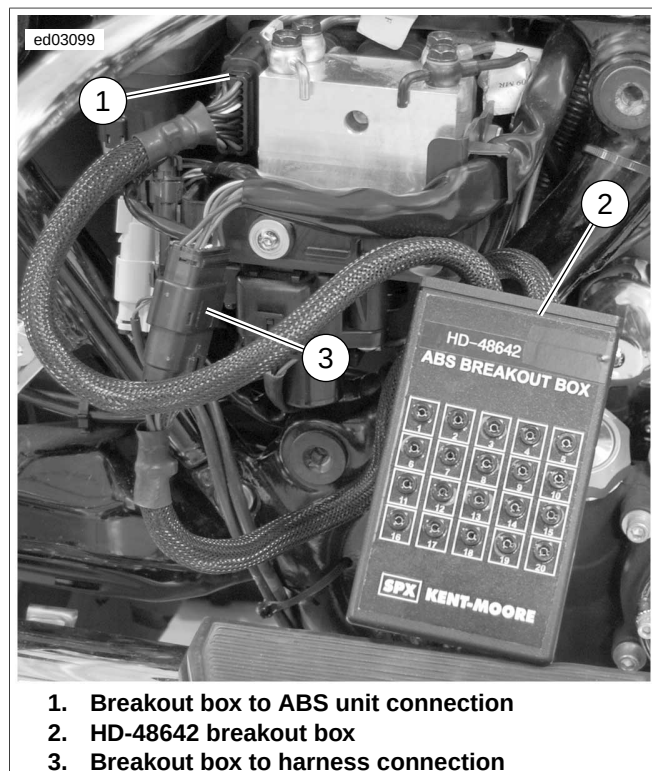


Figure 1-37. Typical HD-48642 Connection

4. See [Figure 1-38](#). In some cases it is necessary to leave the ABS module disconnected.

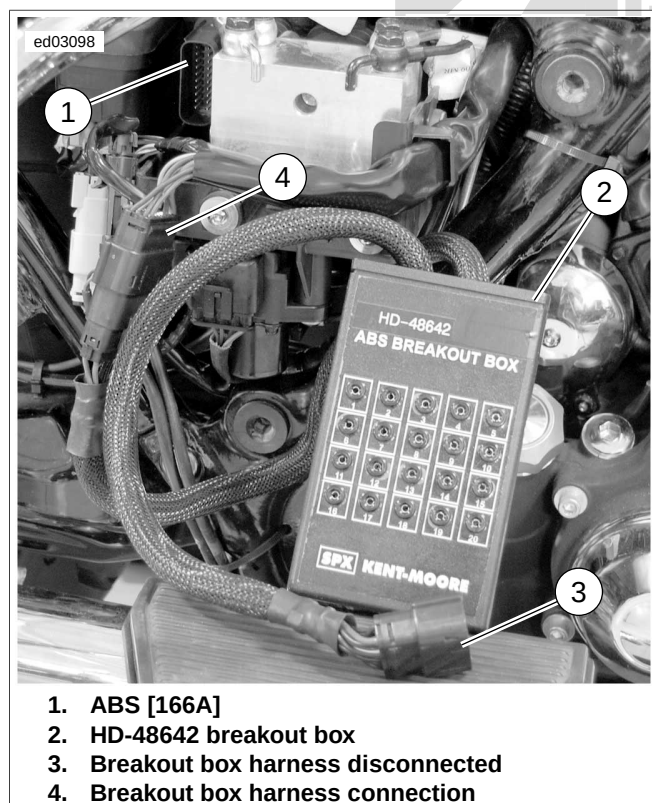


Figure 1-38. Typical HD-48642 With ABS Module Disconnected

5. When testing is completed remove the breakout box and restore connections.
6. Install the right side cover. See the service manual.

HD-47918 Advanced Audio System Breakout Box

The ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) connects to the radio at [27] and [28]. Used in conjunction with a multimeter, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects. Install breakout box in series as follows:

1. Remove the upper fairing and windshield. See the service manual.
2. Press the latch and disconnect radio [27] and radio [28].
3. See [Figure 1-39](#). Connect BREAKOUT BOX (Part No. HD-47918) to connectors.
4. When testing is completed remove the breakout box and restore connections.
5. Install the upper fairing and windshield. See the service manual.

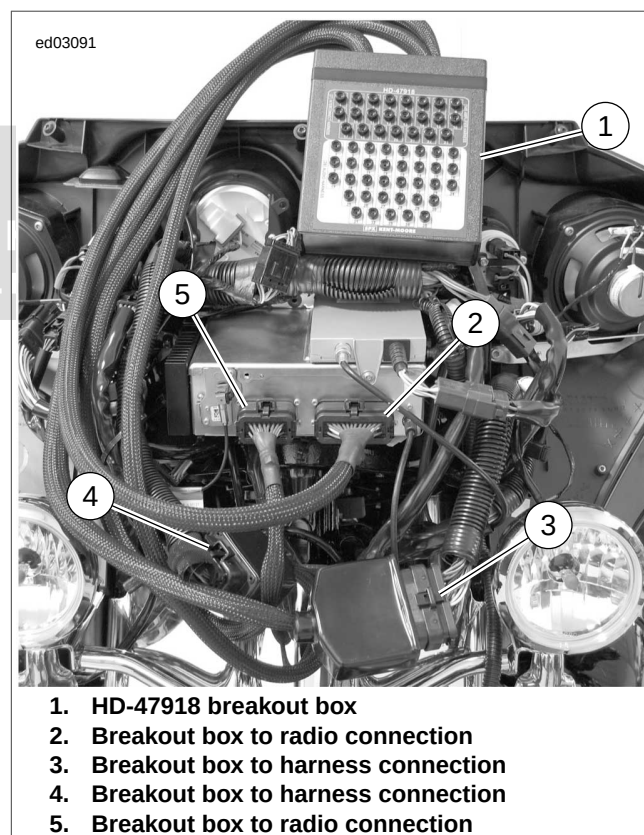


Figure 1-39. Typical HD-47918 Connection

HD-44687 Ignition Coil Circuit Test Adapter

The IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) and FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) are used to test the fuel injector drivers as well as the ignition coil drivers in the ECM.

1. Connect the BREAKOUT BOX (Part No. HD-48637).

2. Disconnect the fuel injector connectors.
3. See [Figure 1-31](#) for typical setup. Connect one side of the fuel injector test light to power and the other to the terminal on the ECM for the circuit you are testing.
4. Crank the engine.
5. If the test light flashes, the circuit is working properly.

HD-48053 Advanced Battery Conductance and Electrical System Analyzer

Follow the instructions in the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-48053) instruction manual to perform a battery test. The test results include a decision on the battery condition and the measured state of charge.



Figure 1-40. HD-48053 Advanced Battery Conductance and Electrical System Analyzer Kit

HD-48650 Digital Technician II

DIGITAL TECHNICIAN II (Part No. HD-48650) is a computer based diagnostic device used to communicate/diagnose and program systems/modules.

Diagnostics in this manual are developed under the assumption that DTII is not available.



DIAGNOSTICS AND TROUBLESHOOTING

1.3

VOLTAGE DROP

Voltage Drop Test

The voltage drop test:

- Helps locate poor connections or components with excessive voltage drops.
- Measures the difference in potential or the actual voltage dropped between the source and destination.
- Checks the integrity of the wiring, switches, fuses, connectors and contacts between the source and destination.
- Identifies poor grounds.

A voltage drop test measures the difference in voltage between two points in a circuit. The amount of voltage dropped over any part of a circuit is directly related to the amount of resistance in that part of the circuit.

Components such as wires, switches and connectors are designed to have very little resistance and therefore very little voltage drop. A voltage drop greater than 1.0V across these components indicates a high resistance and possible fault.

The benefits of doing it this way are:

- Readings are not as sensitive to real battery voltage.
- Readings show the actual voltage dropped not just the presence of voltage.
- The system is tested as it is actually being used.
- Testing is more accurate and displays hard-to-find poor connections.
- Starting circuits, lighting circuits or ignition circuits can be tested with this approach. (Start from the most positive and go to the most negative destination or component.)

When testing a typical power circuit, place the positive (red) meter lead on the most positive part of the circuit (or the positive battery post). Remember, there is nothing more positive than the positive post of the battery. Place the negative (black) meter lead at the positive side of the connector in question. Activate the circuit. Move the negative meter lead through the circuit until the high voltage drop is found.

When testing a typical ground circuit, 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. Place the positive meter lead at the negative side of the connector in question. Activate the circuit. Move the positive meter lead through the circuit until the high voltage drop is found.

The following steps demonstrate a typical starter circuit voltage drop test:

1. Disconnect the fuel pump connector [86] to prevent the engine from starting.
 - a. Connect the red meter lead to the positive battery post.
 - b. Connect the black meter lead to the battery power starter post on the starter and observe the meter reading.
 - c. Crank the starter and observe the meter reading. The difference in the voltage is the voltage drop.
2. See [Figure 1-41](#). Move the black meter lead to the starter side post of the starter solenoid. Crank the starter.

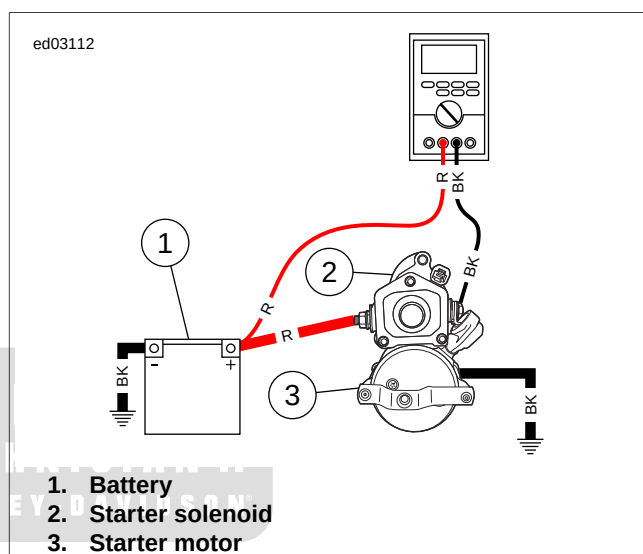


Figure 1-41. To Starter Solenoid Starter Terminal

3. See [Figure 1-42](#). Move the black meter lead to the battery side post on the starter solenoid. Crank the starter.

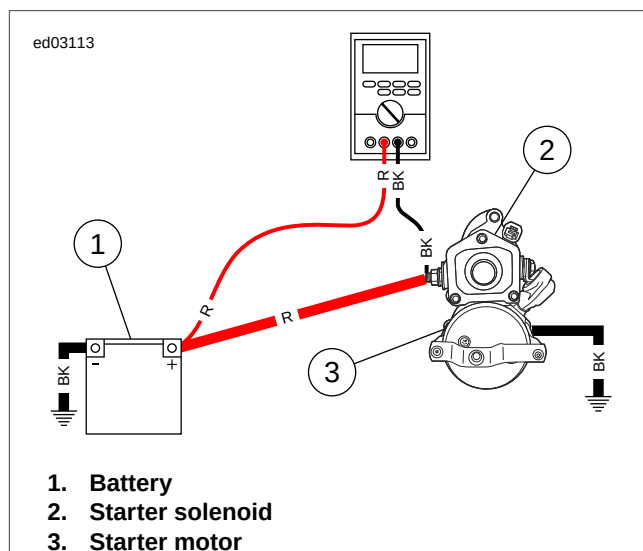


Figure 1-42. To Starter Solenoid Battery Terminal

4. See [Figure 1-43](#). Finally move the black meter lead to the negative battery post and the red meter lead to the starter case. Crank the starter.

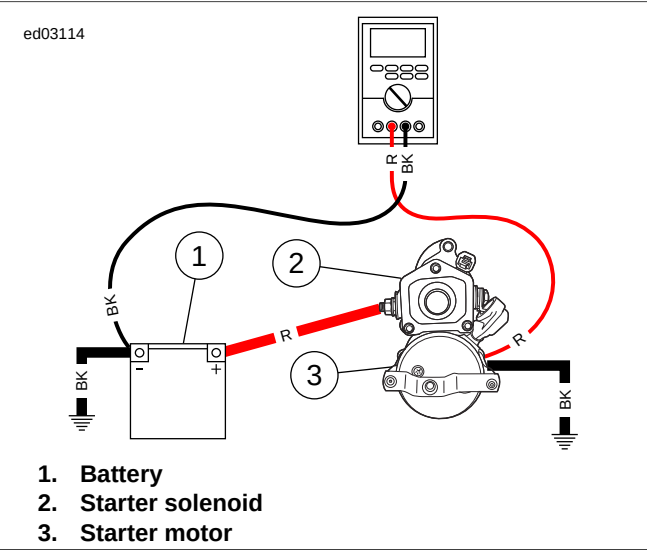


Figure 1-43. Starter Ground Circuit

WIGGLE TEST

PART NUMBER	TOOL NAME
HD-39978	DIGITAL MULTIMETER (FLUKE 78)
HD-48637	BREAKOUT BOX
HD-48650	DIGITAL TECHNICIAN II

The wiggle test checks for the presence of intermittents in a wiring harness. The DIGITAL TECHNICIAN II (Part No. HD-48650) can be used to perform the wiggle test.

- See [Figure 1-44](#). Connect DIGITAL MULTIMETER (FLUKE 78) (Part No. HD-39978) to wiring harness between the suspect connections. When diagnosing ECM connections, use BREAKOUT BOX (Part No. HD-48637) to simplify the procedure. See [1.2 DIAGNOSTIC TOOLS](#).
- Set the multimeter to read voltage changes.
- Start the motorcycle engine and run at idle.
- Shake or wiggle the harness to detect intermittents. If intermittents are present, radical voltage changes register on the multimeter.

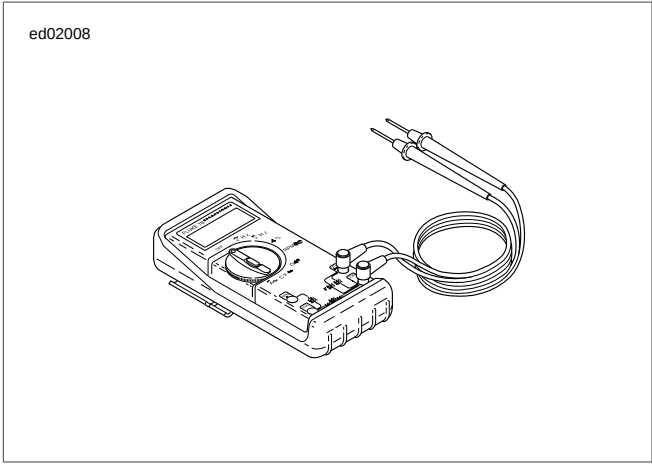


Figure 1-44. Digital Multimeter (Fluke 78) (Part No. HD-39978)

RELAY DIAGNOSTICS

Relay Variation

See [Figure 1-45](#). Relays normally have four or five terminals. The circuitry inside the relays are very similar with the exception of the normally closed contact being eliminated in the four terminal relay. Some relays have five terminals at the base, even though internally 4 or 87A are not connected. See this topic whenever a relay terminal is referenced in this manual to make sure the proper terminal is being accessed.

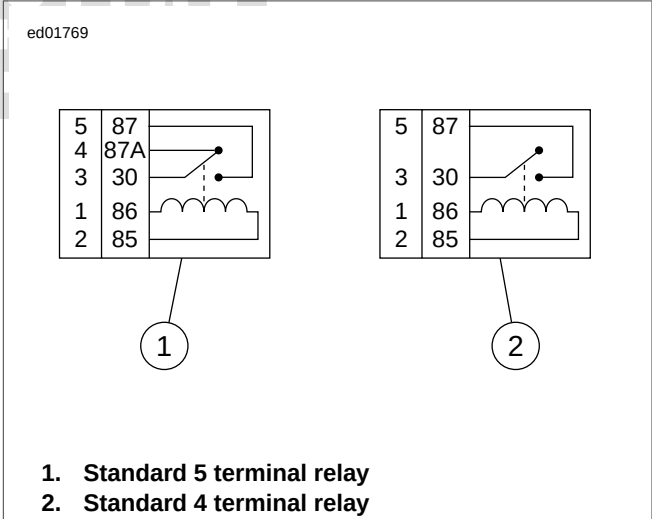


Figure 1-45. Standard Relays

Relay Test

A relay can be tested using the motorcycle's 12V battery and a multimeter.

- Unplug the relay from relay block.
- See [Figure 1-46](#) and [Figure 1-47](#) to energize the relay. Connect relay terminal 85 to the negative battery terminal and relay terminal 86 to the positive battery terminal.

NOTE

Some relays contain internal diodes. If the applied voltage is not the correct polarity, the diode could be damaged.

- 3. Test for continuity between terminals 30 and 87.
 - a. A good relay shows continuity (continuity tester lamp on or a zero Ohm reading on the ohmmeter).
 - b. A malfunctioning relay will not show continuity and must be replaced.

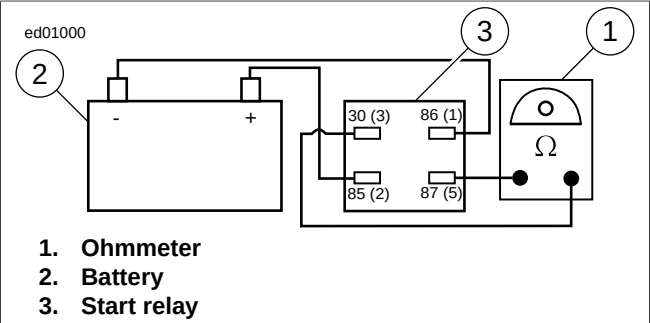


Figure 1-46. Four Terminal Relay Test

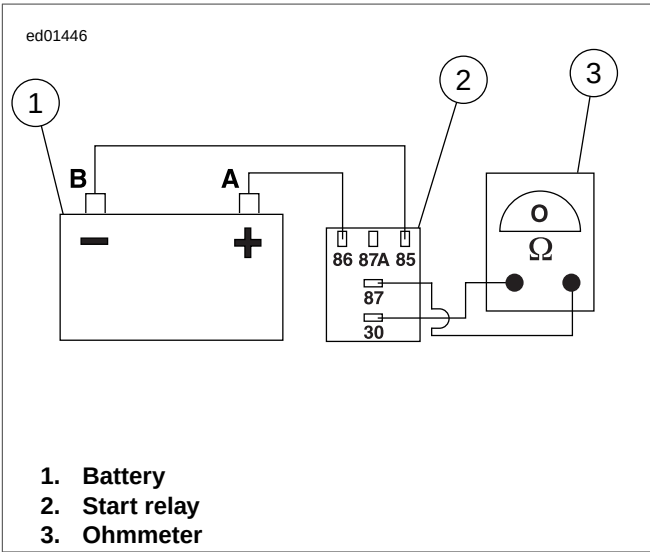


Figure 1-47. Five Terminal Relay Test

JOB/TIME CODES VALUES

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Dealership technicians filing warranty claims should use the job/time code values printed in bold text at the end of the appropriate repair. When using DIGITAL TECHNICIAN II (Part No. HD-48650), dealership technicians filling out warranty claims should use the job/time code given by the computer.



TABLE OF CONTENTS

SUBJECT	PAGE NO.
2.1 INITIAL DIAGNOSTICS.....	2-1
2.2 SERIAL DATA COMMUNICATION.....	2-22
2.3 DTC U1016, U1040, U1064, U1097, U1255.....	2-24
2.4 DTC U1300, U1301 OR BUS ER.....	2-29



NOTES



INITIAL DIAGNOSTICS

2.1

DESCRIPTION AND OPERATION

Use initial diagnostics as a starting point to efficiently troubleshoot concerns. A basic understanding of electronics and a general knowledge of the motorcycle are necessary to effectively use this manual.

Before diagnosing a concern, perform a general functional test of the motorcycle to verify the concern and to make sure there is nothing else that could cause problems with accurately diagnosing the motorcycle. Use the procedures in this chapter for initial diagnostics.

NOTE

When working through a diagnostic procedure follow the steps in the order instructed. Never jump to a test in another procedure. All "Go to test" statements refer to a test in that procedure.

RETRIEVING TROUBLE CODES

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

There are two levels of diagnostics.

- The most sophisticated mode uses a computer-based diagnostic package called DIGITAL TECHNICIAN II (Part No. HD-48650).
- The second mode requires using the odometer self-diagnostics. Speedometer, tachometer, TSM/TSSM/HFSM, ECM and ABS (if equipped) codes can be accessed and cleared.

On vehicles equipped with a radio, the radio DTCs are not read with either DTII or the odometer self-diagnostics. The radio DTCs are retrieved through the radio and shown on the radio display. See [8.1 RADIO DIAGNOSTICS](#) for the procedure to retrieve radio DTCs.

ODOMETER SELF-DIAGNOSTICS

Diagnostic Mode

- To enter diagnostic mode press and hold the trip odometer reset switch while turning the IGN ON.
- Release the trip odometer reset switch. "diag" will appear on the odometer display.
- Press and release the trip odometer reset switch. "PSSPt b" will appear on the odometer display.

- PSSPt b indicates the different modules that could display codes if equipped.
 - P - ECM codes
 - S - TSM/TSSM/HFSM codes
 - SP - Speedometer codes
 - t - Tachometer codes
 - b - ABS codes
- Quickly press and release the trip odometer reset switch to cycle through the letters. The letters will flash as they are selected.
- Once the corresponding letter is flashing to the desired module press and hold the trip odometer reset switch.
- If no DTCs are present, "none" will appear on display.
- If any DTCs are stored in the module, either current or historic, they will appear on the odometer. Quickly pressing and releasing the trip odometer reset switch will cycle through the stored DTCs.

NOTE

The ECM will show "no rsp" if the engine stop switch is not in the RUN position. Verify the engine stop switch is in the RUN position.

- If odometer displays "no rsp" then the motorcycle may not be equipped with the module. If the motorcycle is equipped with the selected module then go to other modules and look for applicable communication codes.
- When all the DTCs have been cycled the odometer will display "end".
- To clear all the DTCs in that module press and hold the trip odometer reset switch. If DTCs are not to be cleared quickly press and release the trip odometer reset switch. The part number of the module will be displayed.
- Press and release the trip odometer reset switch again to continue to the next module.
- Turn the IGN OFF to exit diagnostic mode.

DIAGNOSTICS

Diagnostic Tips

- For a quick check of instrument function, a "WOW" test can be performed by entering odometer self-diagnostics. Background lighting should illuminate, gauge needles should sweep their full range of motion, and indicator lamps controlled by the serial data circuit (battery, security and check engine) should illuminate.
- If the instrument fails "WOW" test, check for battery, ground and ignition voltage to the instrument. If any feature in the speedometer or tachometer is non-functional, see [4.1 INSTRUMENTS](#).

Table 2-1. Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	PRIORITY ORDER	FAULT CONDITION	SOLUTION
B0563	138	Battery voltage high	3.6 DTC B0563, P0562, P0563
B1004	145	Fuel sender low	4.2 DTC B1004, B1005
B1005	146	Fuel sender open/high	4.2 DTC B1004, B1005
B1006	143	Accessory line overvoltage	3.7 DTC B1006, B1007
B1007	142	Ignition line overvoltage	3.7 DTC B1006, B1007
B1008	144	Trip odometer rest switch closed	4.3 DTC B1008
B1121	129	Left turn output fault	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1122	130	Right turn output fault	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1123	131	Left turn signal short-to-ground	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1124	132	Right turn signal short-to-ground	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1125	133	Left turn signal short-to-voltage	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1126	134	Right turn signal short-to-voltage	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126
B1131	139	Alarm output low	5.17 DTC B1131, B1132
B1132	140	Alarm output high	5.17 DTC B1131, B1132
B1134	128	Start relay output high	5.18 DTC B1134
B1135	23	Accelerometer fault	5.11 DTC B1135, B1136, B1141, B1142
B1136	24	Accelerometer tip-over self-test fault	5.11 DTC B1135, B1136, B1141, B1142
B1141	141	Ignition switch open/low	5.11 DTC B1135, B1136, B1141, B1142
B1142	22	Internal fault	5.11 DTC B1135, B1136, B1141, B1142
B1143	135	Security antenna short-to-ground	5.19 DTC B1143, B1144, B1145
B1144	136	Security antenna short-to-battery	5.19 DTC B1143, B1144, B1145
B1145	137	Security antenna open	5.19 DTC B1143, B1144, B1145
B1151	25	BAS short to ground	See the Trike or Sidecar supplement manual.
B1152	26	BAS short to battery	See the Trike or Sidecar supplement manual.
B1153	27	Bank angle switch high	See the Trike or Sidecar supplement manual.
B1154	28	Clutch switch short-to-ground	5.20 DTC B1154, B1155
B1155	29	Neutral switch short-to-ground	5.20 DTC B1154, B1155
C0562	111	System voltage low	3.6 DTC B0563, P0562, P0563
C0563	112	System voltage high	3.6 DTC B0563, P0562, P0563
C1014	105	ECU internal solid state relay fault	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1017	110	Pump motor power circuit open fault	7.2 DTC C1017, C1018
C1018	109	Pump motor ground high resistance fault	7.2 DTC C1017, C1018
C1021	115	Front wheel speed sensor always equals zero kph	7.3 DTC C1021, C1023
C1023	116	Rear wheel speed sensor always equals zero kph	7.3 DTC C1021, C1023
C1025	117	Front wheel speed sensor signal intermittent	7.4 DTC C1025, C1027, C1206, C1208
C1027	118	Rear wheel speed sensor signal intermittent	7.4 DTC C1025, C1027, C1206, C1208
C1032	113	Front wheel speed sensor circuit open or shorted	7.5 DTC C1032, C1034
C1034	114	Rear wheel speed sensor circuit open or shorted	7.5 DTC C1032, C1034

Table 2-1. Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	PRIORITY ORDER	FAULT CONDITION	SOLUTION
C1042	107	Pump motor open	7.6 DTC C1042, C1043
C1043	108	Pump motor stalled	7.6 DTC C1042, C1043
C1055	96	ECU internal fault	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1056	97	ECU internal fault - solid state relay shorted ON	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1057	98	ECU internal fault - solid state relay shorted to ground	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1061	99	ECU internal fault - front apply solenoid	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1062	100	ECU internal fault - front release solenoid	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1065	101	ECU internal fault - rear apply solenoid	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1066	102	ECU internal fault - rear release solenoid	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1094	121	Front brake switch always on	7.7 DTC C1094
C1095	122	Front brake switch open	7.8 DTC C1095
C1118	103	ECU internal fault - front apply solenoid correlation	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1121	104	ECU internal fault - rear apply solenoid correlation	7.15 DTC C1014, C1055-C1066, C1118, C1121
C1151	126	Front wheel ABS release too long	7.9 DTC C1151
C1153	127	Rear wheel ABS release too long	7.10 DTC C1153
C1158	106	Calibration programming required	7.11 DTC C1158
C1206	119	Front wheel speed sensor frequency out of range	7.4 DTC C1025, C1027, C1206, C1208
C1208	120	Rear wheel speed sensor frequency out of range	7.4 DTC C1025, C1027, C1206, C1208
C1212	125	Front or rear brake not applied with decel	7.12 DTC C1212
C1214	123	Rear brake switch always on	7.13 DTC C1214
C1216	124	Rear brake switch open	7.14 DTC C1216
P0031	82	O2 heater low/open	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0032	82	O2 heater shorted/high	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0107	19	MAP sensor open/low	6.4 DTC P0107, P0108, P0112, P0113
P0108	20	MAP sensor high	6.4 DTC P0107, P0108, P0112, P0113
P0112	58	IAT sensor voltage low	6.4 DTC P0107, P0108, P0112, P0113
P0113	59	IAT sensor open/high	6.4 DTC P0107, P0108, P0112, P0113
P0117	56	ET sensor voltage low	6.5 DTC P0117, P0118
P0118	57	ET sensor open/high	6.5 DTC P0117, P0118
P0120	38	Throttle position sensor 1 range error	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0122	40	TP sensor open/low	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0123	41	TP sensor high	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0131	84	Front O2 sensor low (lean)	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0132	86	Front O2 sensor high (rich)	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0134	88	Front O2 sensor open/not responding	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154

Table 2-1. Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	PRIORITY ORDER	FAULT CONDITION	SOLUTION
P0151	85	Rear O2 sensor low (lean)	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0152	87	Rear O2 sensor high (rich)	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0154	89	Rear O2 sensor open/not responding	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154
P0220	39	Throttle position sensor 2 range error	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0222	42	Throttle position sensor 2 low/open	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0223	43	Throttle position sensor 2 high	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223
P0261	66	Front injector open/low	6.8 DTC P0261, P0262, P0263, P0264
P0262	68	Front injector high	6.8 DTC P0261, P0262, P0263, P0264
P0263	67	Rear injector open/low	6.8 DTC P0261, P0262, P0263, P0264
P0264	69	Rear injector high	6.8 DTC P0261, P0262, P0263, P0264
P0373	18	CKP sensor intermittent	6.9 DTC P0373, P0374
P0374	21	CKP sensor synch error	6.9 DTC P0373, P0374
P0444	77	Purge control open/low	6.10 DTC P0444, P0445
P0445	78	Purge control high	6.10 DTC P0444, P0445
P0501	72	VSS low	6.11 DTC P0501, P0502
P0502	73	VSS high	6.11 DTC P0501, P0502
P0505	76	Loss of idle speed control	6.12 DTC P0505
P0562	70	Battery voltage low	3.6 DTC B0563, P0562, P0563
P0563	71	Battery voltage high	3.6 DTC B0563, P0562, P0563
P0572	55	Brake switch low	6.13 DTC P0572
P0577	93	Cruise control input high	5.4 DTC P0577
P0603	2	ECM EEPROM error	6.14 DTC P0603, P0605
P0605	1	ECM flash error	6.14 DTC P0603, P0605
P0641	16	5V ref 1 out of range	6.15 DTC P0641, P0651
P0651	17	5V ref 2 out of range	6.15 DTC P0641, P0651
P0661	48	Intake solenoid low/open	6.15 DTC P0641, P0651
P0662	49	Intake solenoid high/shorted	6.15 DTC P0641, P0651
P1001	12	System relay coil open/low	6.16 DTC P1001, P1002, P1003, P1004
P1002	11	System relay coil high/shorted	6.16 DTC P1001, P1002, P1003, P1004
P1003	10	System relay contacts open	6.16 DTC P1001, P1002, P1003, P1004
P1004	13	System relay contacts closed	6.16 DTC P1001, P1002, P1003, P1004
P1009	14	Incorrect password	6.17 DTC P1009, P1010
P1010	15	Missing password	6.17 DTC P1009, P1010
P1270	31	Twistgrip position sensor 2 A/D validation error	6.18 DTC P1270
P1351	60	Front ignition coil open/low	6.19 DTC P1351, P1352, P1354, P1355
P1352	62	Front ignition coil high/shorted	6.19 DTC P1351, P1352, P1354, P1355
P1353	75	Front cylinder no combustion detected	6.20 DTC P1353, P1356, P1357, P1358
P1354	61	Rear ignition coil open/low	6.19 DTC P1351, P1352, P1354, P1355
P1355	63	Rear ignition coil high/shorted	6.19 DTC P1351, P1352, P1354, P1355
P1356	74	Rear cylinder no combustion detected	6.20 DTC P1353, P1356, P1357, P1358

Table 2-1. Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	PRIORITY ORDER	FAULT CONDITION	SOLUTION
P1357	64	Front ignition coil intermittent secondary detected	6.20 DTC P1353, P1356, P1357, P1358
P1358	65	Rear ignition coil intermittent secondary detected	6.20 DTC P1353, P1356, P1357, P1358
P1475	79	Exhaust position actuation error	6.21 DTC P1475, P1477, P1478
P1477	80	Exhaust actuator low/open	6.21 DTC P1475, P1477, P1478
P1478	81	Exhaust actuator high/shorted	6.21 DTC P1475, P1477, P1478
P1501	53	JSS low	6.22 DTC P1501, P1502
P1502	54	JSS high	6.22 DTC P1501, P1502
P1510	90	Throttle actuator control limited performance	6.23 DTC P1510, P1511, P1512
P1511	91	Throttle actuator limited power management mode	6.23 DTC P1510, P1511, P1512
P1512	92	Throttle actuator control forced idle mode	6.23 DTC P1510, P1511, P1512
P1514	51	Throttle actuator control system airflow fault	6.24 DTC P1514
P1600	30	TAC module - internal fault	6.25 DTC P1600
P1653		Tachometer low	
P1654		Tachometer high	
P1655	94	ACR solenoid low	6.26 DTC P1655, P1656
P1656	95	ACR solenoid high	6.26 DTC P1655, P1656
P2100	46	Throttle actuator control motor circuit/open	6.27 DTC P2100, P2101, P2102, P2103
P2101	47	Throttle actuator control motor circuit range error	6.27 DTC P2100, P2101, P2102, P2103
P2102	48	Throttle actuator control motor circuit low	6.27 DTC P2100, P2101, P2102, P2103
P2103	49	Throttle actuator control motor circuit high	6.27 DTC P2100, P2101, P2102, P2103
P2105	52	Throttle actuator control system - forced engine shutdown	6.28 DTC P2105, P2107
P2107	32	Throttle actuator control module processor	6.28 DTC P2105, P2107
P2119	45	Throttle actuator control system throttle return error	6.29 DTC P2119
P2122	33	Twistgrip position sensor 1 low/open	6.30 DTC P2122, P2123, P2127, P2128
P2123	34	Twistgrip position sensor 1 high	6.30 DTC P2122, P2123, P2127, P2128
P2127	35	Twistgrip position sensor 2 low/open	6.30 DTC P2122, P2123, P2127, P2128
P2128	36	Twistgrip position sensor 2 high	6.30 DTC P2122, P2123, P2127, P2128
P2135	44	Throttle position sensor correlation error	6.31 DTC P2135, P2138
P2138	37	Twistgrip position sensor correlation error	6.31 DTC P2135, P2138
P2176	50	Throttle actuator control system - closed position not learned	6.32 DTC P2176
U1016	7	Loss of ECM serial data	2.3 DTC U1016, U1040, U1064, U1097, U1255
U1040	8	Loss of ABS serial data	2.3 DTC U1016, U1040, U1064, U1097, U1255
U1064	6	Loss of TSM/TSSM/HFSM serial data	2.3 DTC U1016, U1040, U1064, U1097, U1255
U1097	5	Loss of speedometer serial data	2.3 DTC U1016, U1040, U1064, U1097, U1255
U1255	9	Missing response at module	2.3 DTC U1016, U1040, U1064, U1097, U1255

Table 2-1. Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	PRIORITY ORDER	FAULT CONDITION	SOLUTION
U1300	3	Serial data low	2.4 DTC U1300, U1301 OR BUS ER
U1301	4	Serial data open/high	2.4 DTC U1300, U1301 OR BUS ER

CODE TYPES

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

There are two types of DTCs: current and historic. If a DTC is stored, it can be read using either a computer-based diagnostic package called DIGITAL TECHNICIAN II (Part No. HD-48650) or odometer self-diagnostics.

NOTES

- *Odometer self-diagnostics will display both current and historic DTCs. To differentiate between current and historic DTCs, a computer-based diagnostic package called DIGITAL TECHNICIAN II (Part No. HD-48650) must be employed.*
- *Current DTCs reside in the memory of the ECM, TSM/TSSM/HFSM, speedometer, tachometer or ABS (if equipped) until the DTC is resolved.*
- *A historic DTC can be cleared by use of the odometer self-diagnostics or after a total of 50 ignition cycles (start and run cycle) have elapsed. After the 50 ignition cycle retention period, the DTC is automatically erased from memory providing that no subsequent faults of the same type are detected in that period.*

Current

Current DTCs are those which presently disrupt motorcycle operation and are set during the current ignition cycle. See the appropriate diagnostic procedures for solutions.

Historic

If a particular problem happens to resolve itself, the active status problem is dropped and it becomes a historic DTC rather than a current DTC. DTCs will also lose their current status when the ignition is turned off. If the problem still exists when the ignition is turned on the code will show as current.

Historic DTCs are stored for 50 ignition cycles after any DTC was last set as current to assist in the diagnosis of intermittent faults. On the 50th cycle, the DTC will clear itself. The security lamp will only indicate the existence of historic DTCs for two ignition cycles.

It is important to note that historic DTCs will exist whenever the system indicates the existence of a current fault. See [2.1 INITIAL DIAGNOSTICS, Multiple Trouble Codes](#) if multiple DTCs are found.

Diagnostic procedures are designed for use with current DTCs. As a result, they frequently suggest part replacement. When diagnosing a historic DTC, the procedures can be helpful but

should not lead to part replacement without verification that the part is faulty.

MULTIPLE TROUBLE CODES

All DTCs are assigned a priority number to determine the order in which they should be diagnosed. In the event there are multiple DTCs present always diagnose the highest priority first. Refer to [Table 2-1](#).

After each DTC is repaired, restore connections, clear DTCs and start vehicle. Perform self-diagnostics test and verify repair, verify if DTCs are present, and if DTCs are still present. Refer to [Table 2-1](#).

CLEARING DTCs

DTCs should be cleared after any diagnostic or repair procedure is performed. The odometer is capable of displaying and clearing ECM, TSM/TSSM/HFSM, speedometer, tachometer and ABS DTCs. Once the DTCs are cleared perform a road test to verify DTCs do not return. It is important to perform a road test and not simply start the motorcycle since some DTCs may require vehicle speed or other inputs in order to validate repair.

SECURITY LAMP

The security lamp functions in the same manner as the check engine lamp, except that it is controlled by the TSSM/HFSM. The security lamp will be turned on when codes are present in the TSSM/HFSM. When B1004 or B1005 codes are present in the TSSM/HFSM, the low fuel lamp on the speedometer or tachometer will also be illuminated.

CHECK ENGINE LAMP

To diagnose ECM system problems, start by observing the behavior of the check engine lamp.

NOTES

- *"IGN ON" means that the ignition switch is turned to IGN and the engine stop switch is set to RUN (although the engine is **not** running).*
- *When the IGN is turned ON, the check engine lamp will illuminate for approximately four seconds and then turn off.*
- *If the check engine lamp is not illuminated at IGN ON or if it fails to turn off after the initial four-second period, then see [6.34 NO ECM POWER](#).*

1. See [Figure 2-1](#). After the check engine lamp turns off following the first four second illumination period, one of three events may occur.
 - a. The lamp remains off. This indicates there are no current fault conditions or stored DTCs currently detected by the ECM.
 - b. The lamp stays off for only four seconds and then comes back on for an eight second period. This indicates a DTC is stored, but no current DTC exists.
 - c. If the lamp remains on beyond the eight-second

period, a current DTC exists.

2. See [2.1 INITIAL DIAGNOSTICS, Code Types](#) for a complete description of DTC formats.

NOTE

Some DTCs can only be fully diagnosed during actuation. For example, a problem with the ignition coil will be considered a current fault even after the problem is corrected, since the ECM will not know of its resolution until after the coil is exercised by the vehicle start sequence. In this manner, there may sometimes be a false indication of the current DTC.

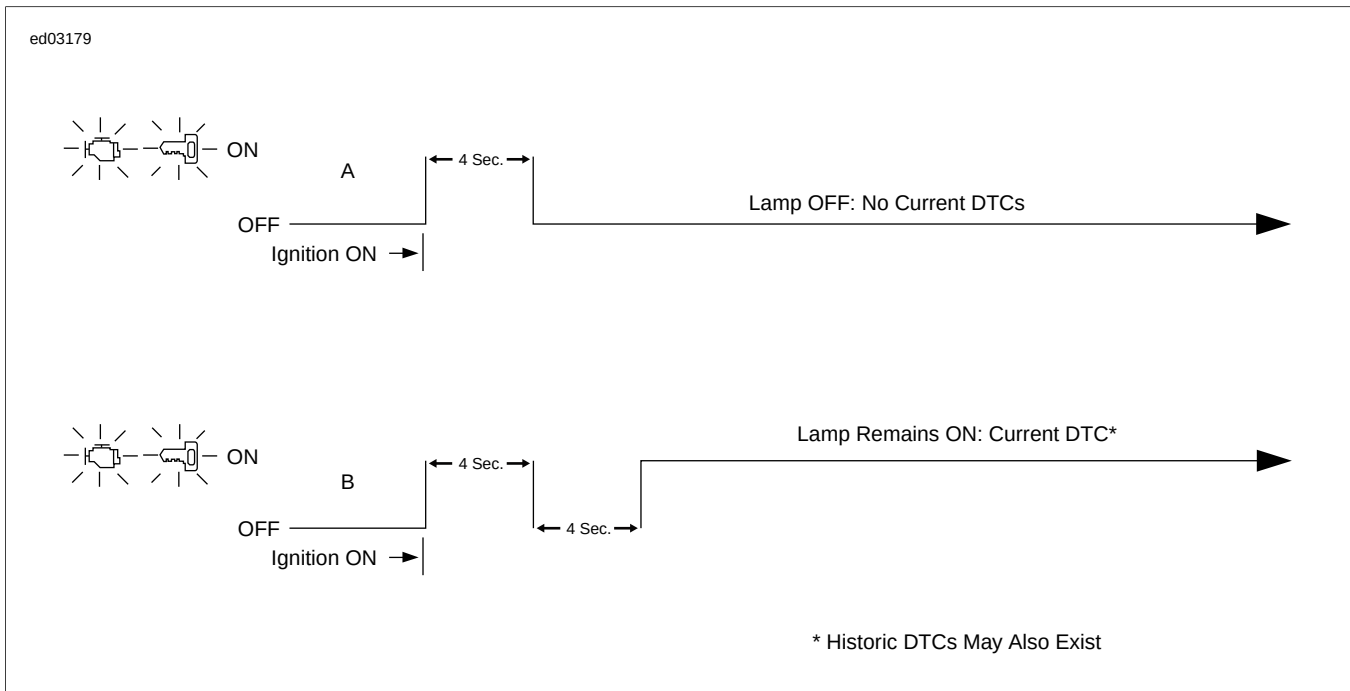


Figure 2-1. Check Engine Lamp and Security Lamp Operation

SYMPTOMS

If no DTCs are present but there is a symptom or concern indicating a malfunction, address and repair the symptom if it

is not a normal characteristic of the system. Refer to [Table 2-2](#) for a list of symptoms.

Table 2-2. Symptom Table

SYMPTOM	DIAGNOSTIC PROCEDURE
Ambient temperature gauge inoperative	4.6 GAUGES
Auxiliary lamps inoperative	5.7 HEADLAMPS
Battery runs down during use	3.5 CHARGING SYSTEM
Both turn signals on one side inoperative, no DTCs	5.6 TURN SIGNALS
"Bus Er" displayed	2.2 SERIAL DATA COMMUNICATION
Charging system inoperative	3.5 CHARGING SYSTEM
Check engine lamp inoperative	6.34 NO ECM POWER
Engine cranks, but will not start	6.33 ENGINE CRANKS, BUT WILL NOT START
Fuel gauge inoperative	4.6 GAUGES
Headlamp inoperative	5.7 HEADLAMPS
High beam indicator inoperative	4.5 INDICATOR LAMPS

Table 2-2. Symptom Table

SYMPTOM	DIAGNOSTIC PROCEDURE
Horn always on	5.5 HORN
Horn inoperative	5.5 HORN
Low battery after extended IGN OFF	3.5 CHARGING SYSTEM
Low fuel lamp always on	4.5 INDICATOR LAMPS
Low fuel lamp inoperative	4.5 INDICATOR LAMPS
Low or no charging	3.5 CHARGING SYSTEM
Neutral lamp always on	4.5 INDICATOR LAMPS
Neutral lamp inoperative	4.5 INDICATOR LAMPS
No ECM power	6.34 NO ECM POWER
Misfire at idle or under load	6.37 MISFIRE AT IDLE OR UNDER LOAD
Oil pressure gauge inoperative	4.6 GAUGES
Oil pressure lamp always on	4.5 INDICATOR LAMPS
Oil pressure lamp inoperative	4.5 INDICATOR LAMPS
One turn signal lamp inoperative, no DTCs	5.6 TURN SIGNALS
Overcharging	3.5 CHARGING SYSTEM
P&A battery power inoperative	5.1 ACCESSORIES
Position lamp inoperative (HDI)	5.9 RUNNING LAMPS
Running lamps inoperative	5.9 RUNNING LAMPS
Security lamp inoperative	5.12 SECURITY SYSTEM
Speedometer inoperative	4.1 INSTRUMENTS
Starter does not spin	3.2 STARTING SYSTEM
Starter inoperative	3.2 STARTING SYSTEM
Starter solenoid clicks	3.2 STARTING SYSTEM
Starter spins, but does not engage	3.2 STARTING SYSTEM
Starter stalls or spins too slowly	3.2 STARTING SYSTEM
Starts, then stalls	6.35 STARTS, THEN STALLS
Stop lamp inoperative	5.8 STOP LAMPS
Tachometer inoperative	4.1 INSTRUMENTS
Tail lamp inoperative	5.9 RUNNING LAMPS
Turn signal indicator inoperative	4.5 INDICATOR LAMPS
Turn signal inoperative	5.6 TURN SIGNALS
Turn signals flash at double normal rate	5.6 TURN SIGNALS
Turn signals will not cancel on turn completion	5.6 TURN SIGNALS
Voltmeter gauge inoperative	4.6 GAUGES

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

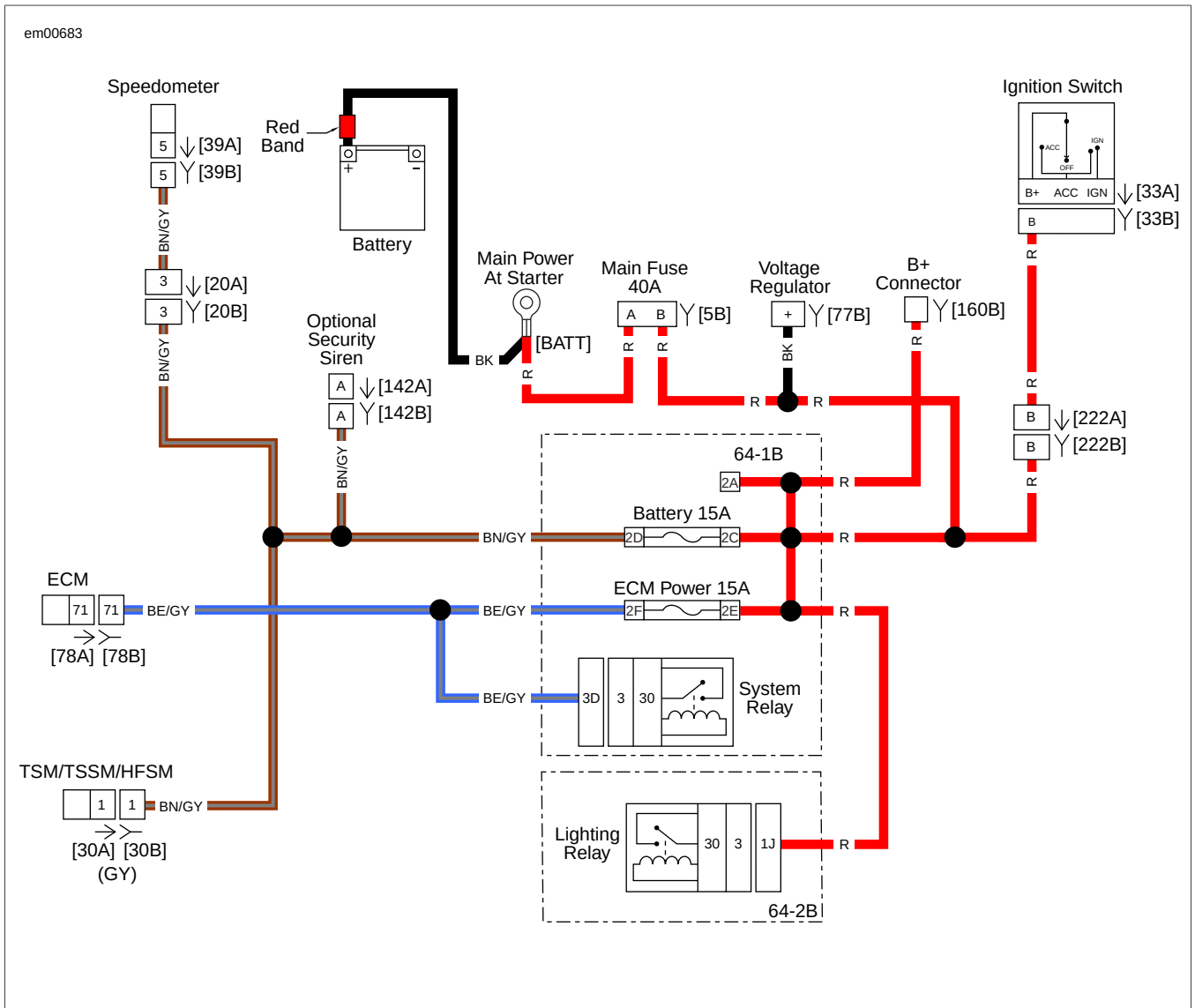


Figure 2-2. Battery Power: FLHR/C

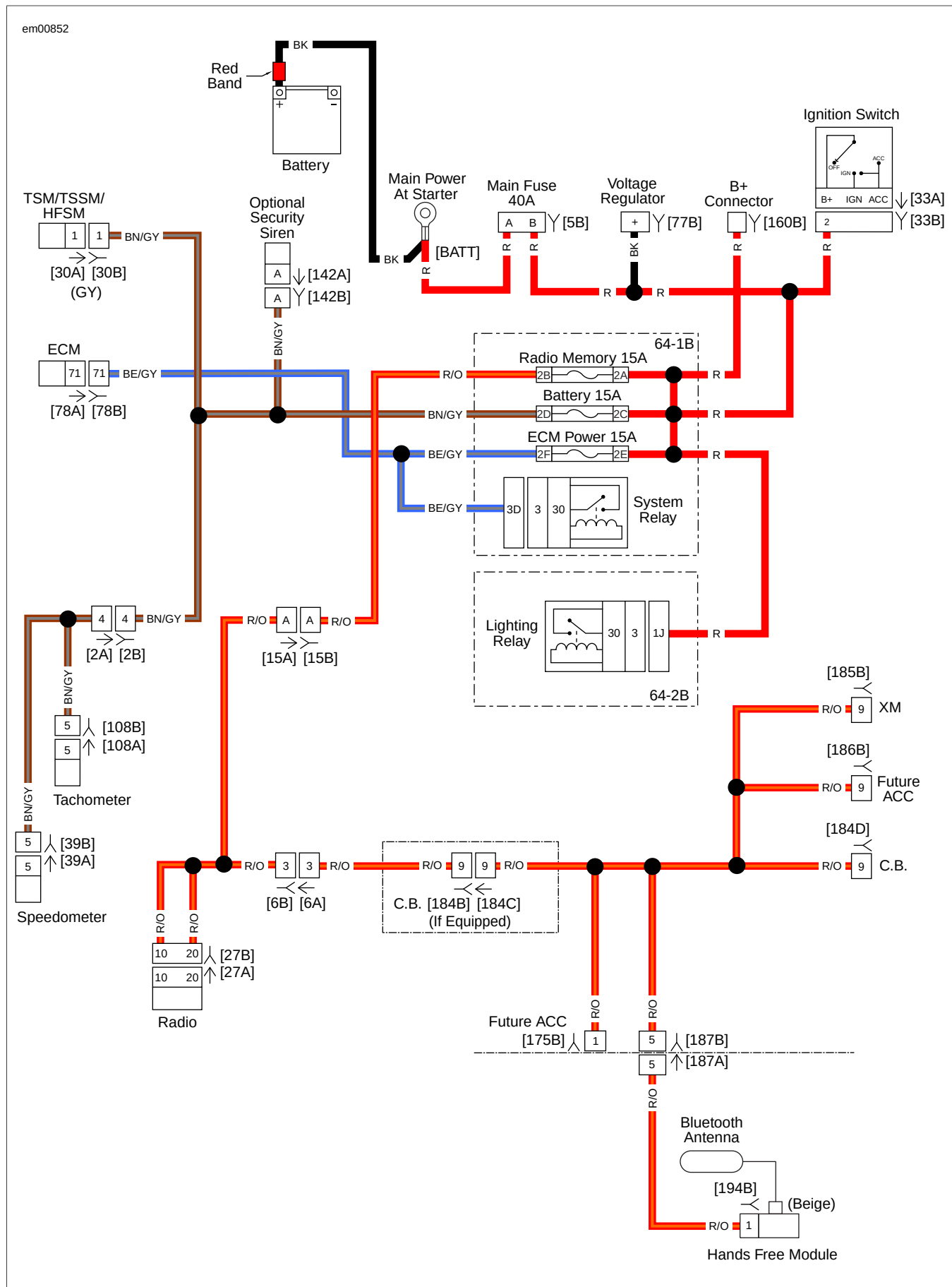


Figure 2-3. Battery Power: Except FLHR/C

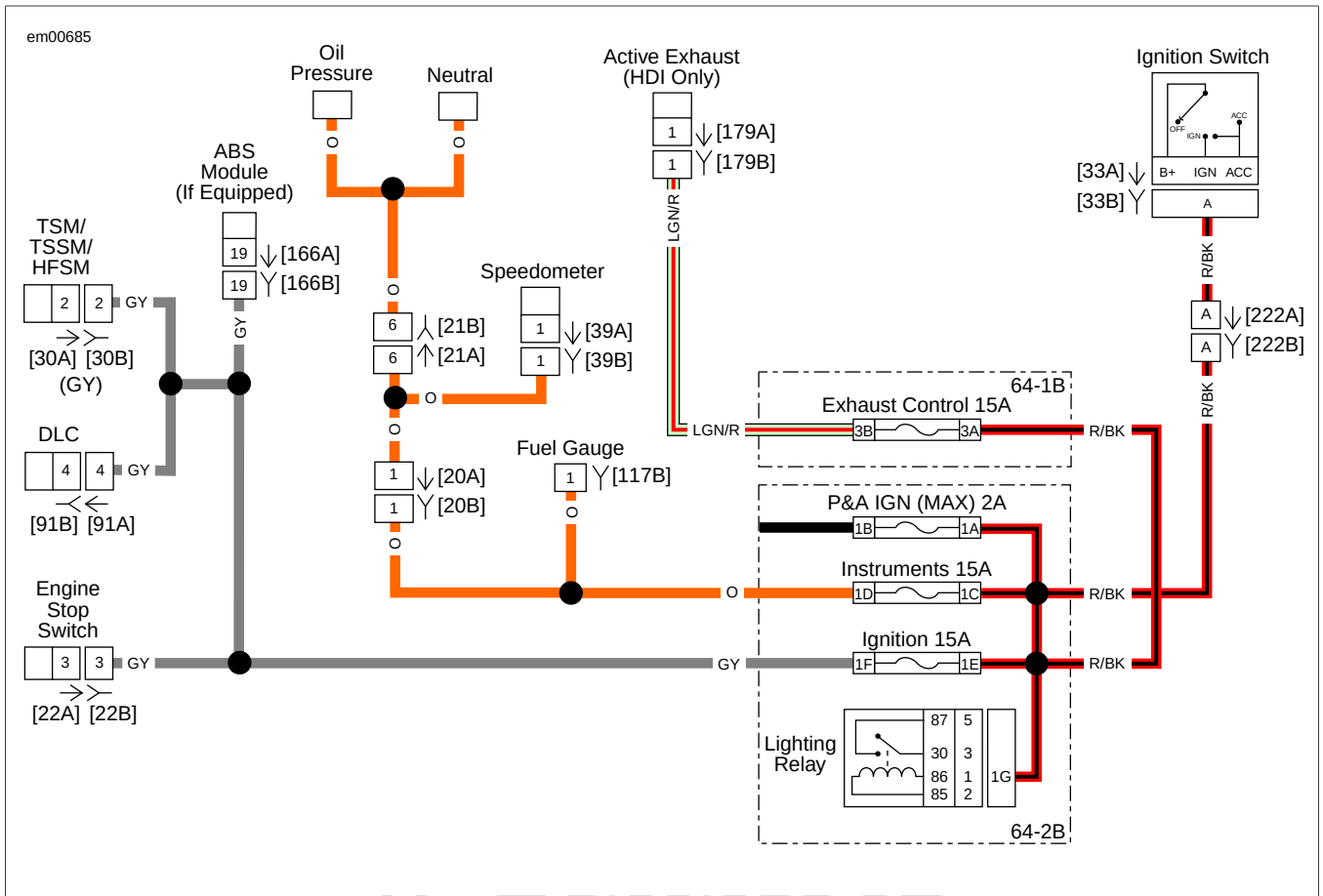


Figure 2-4. Ignition Power: FLHR/C

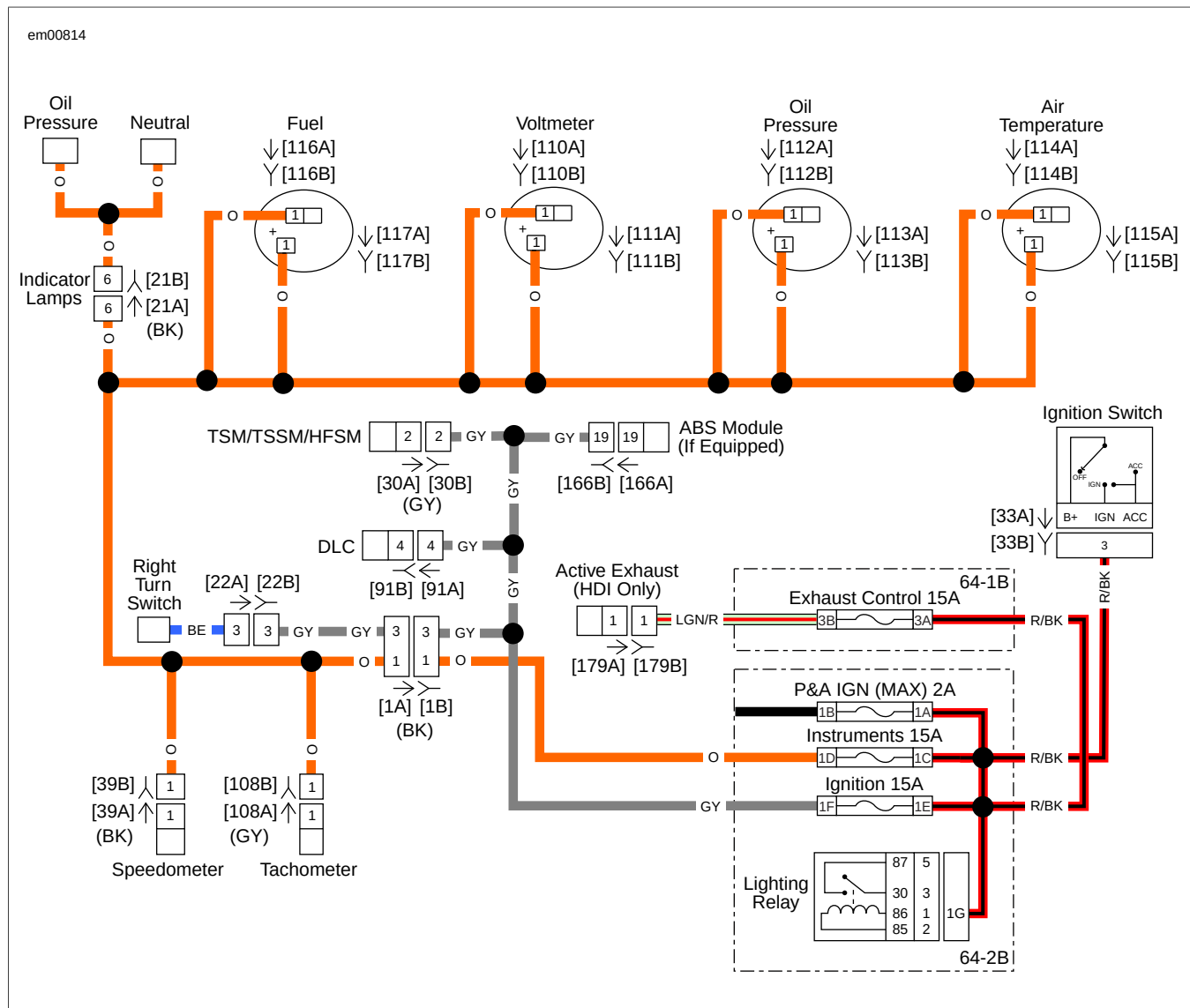


Figure 2-5. Ignition Power: Except FLHR/C

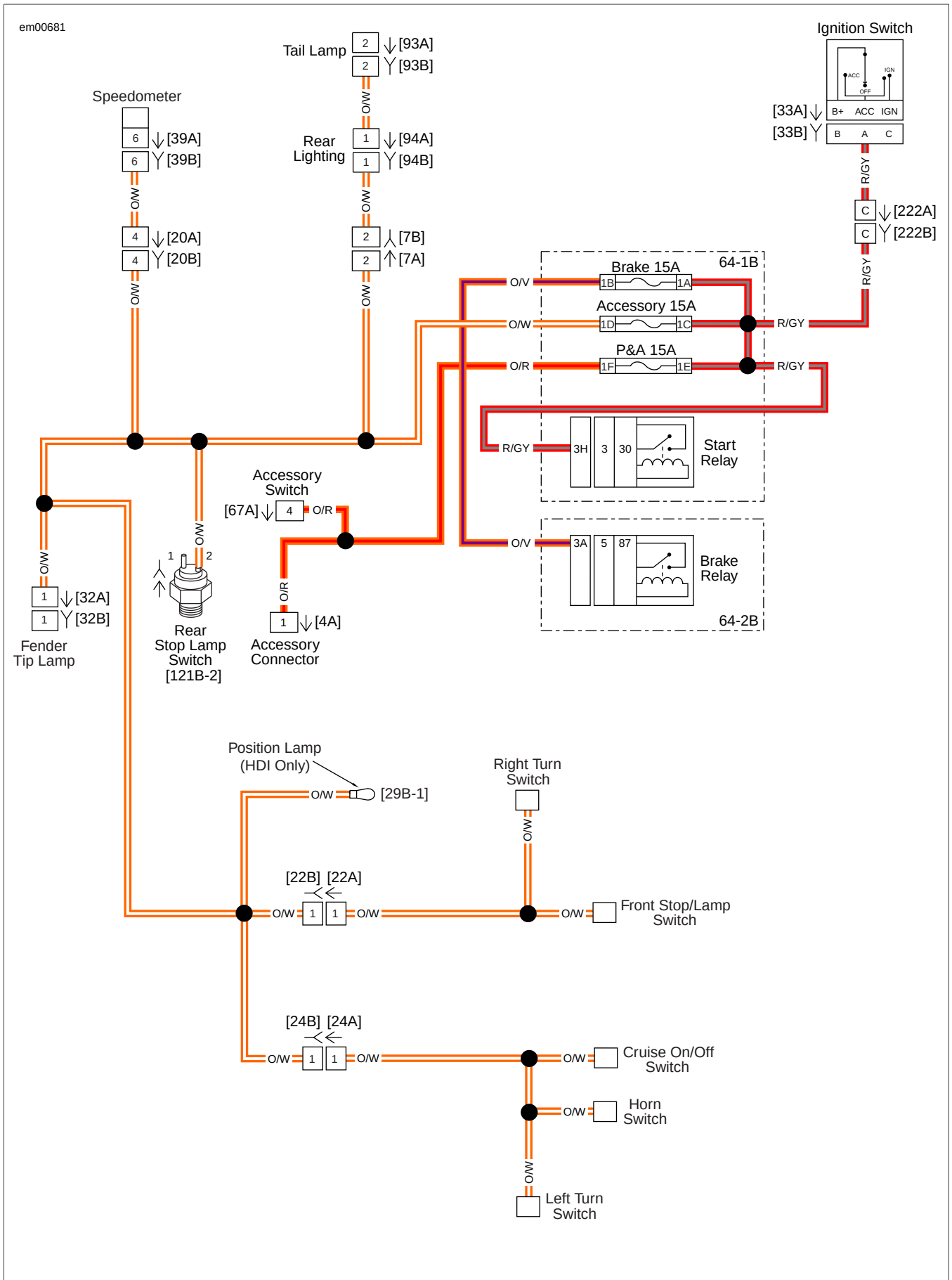


Figure 2-6. Accessory Power: FLHR/C

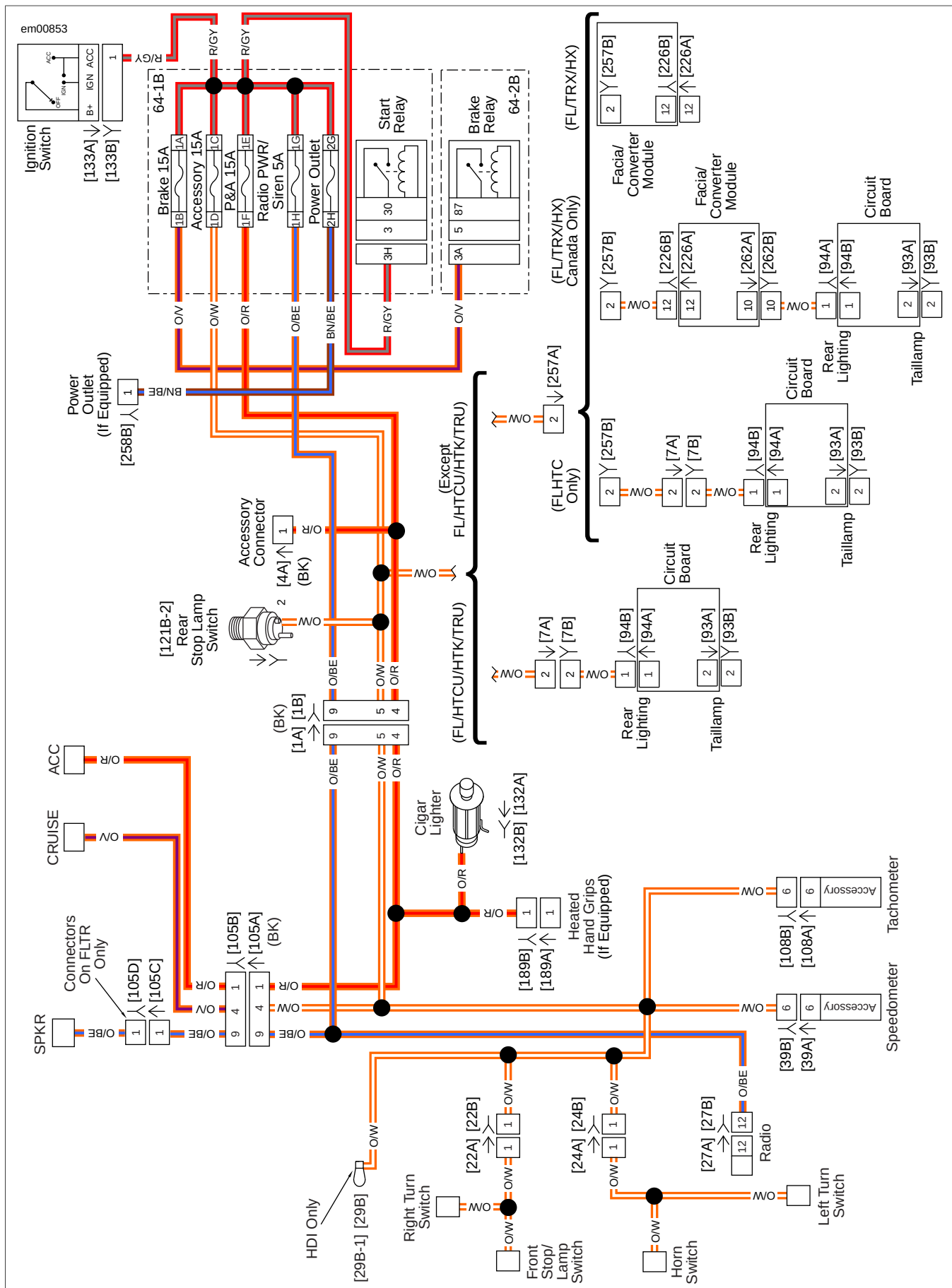


Figure 2-7. Accessory Power: Except FLHR/C

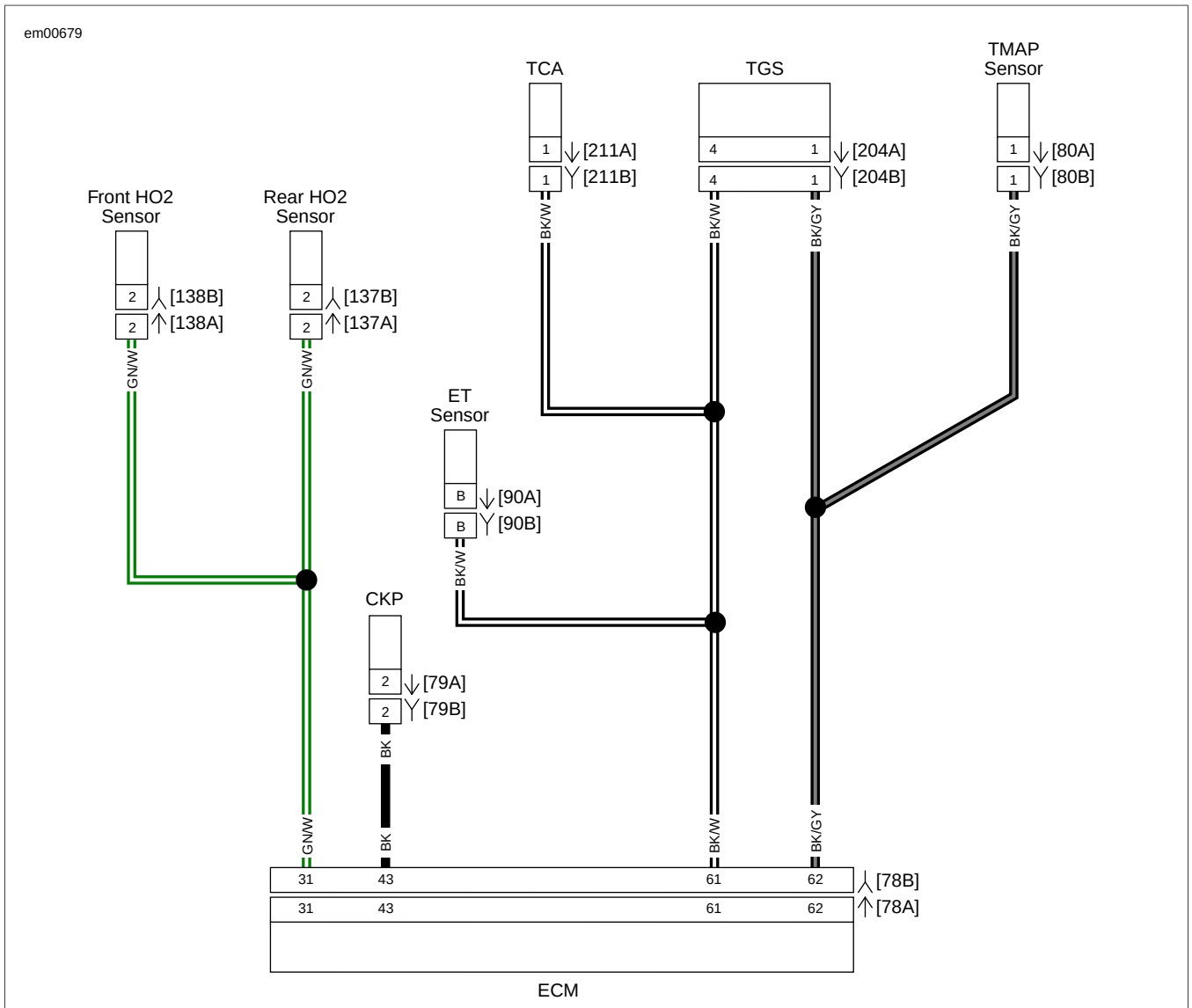


Figure 2-8. Sensor Grounds

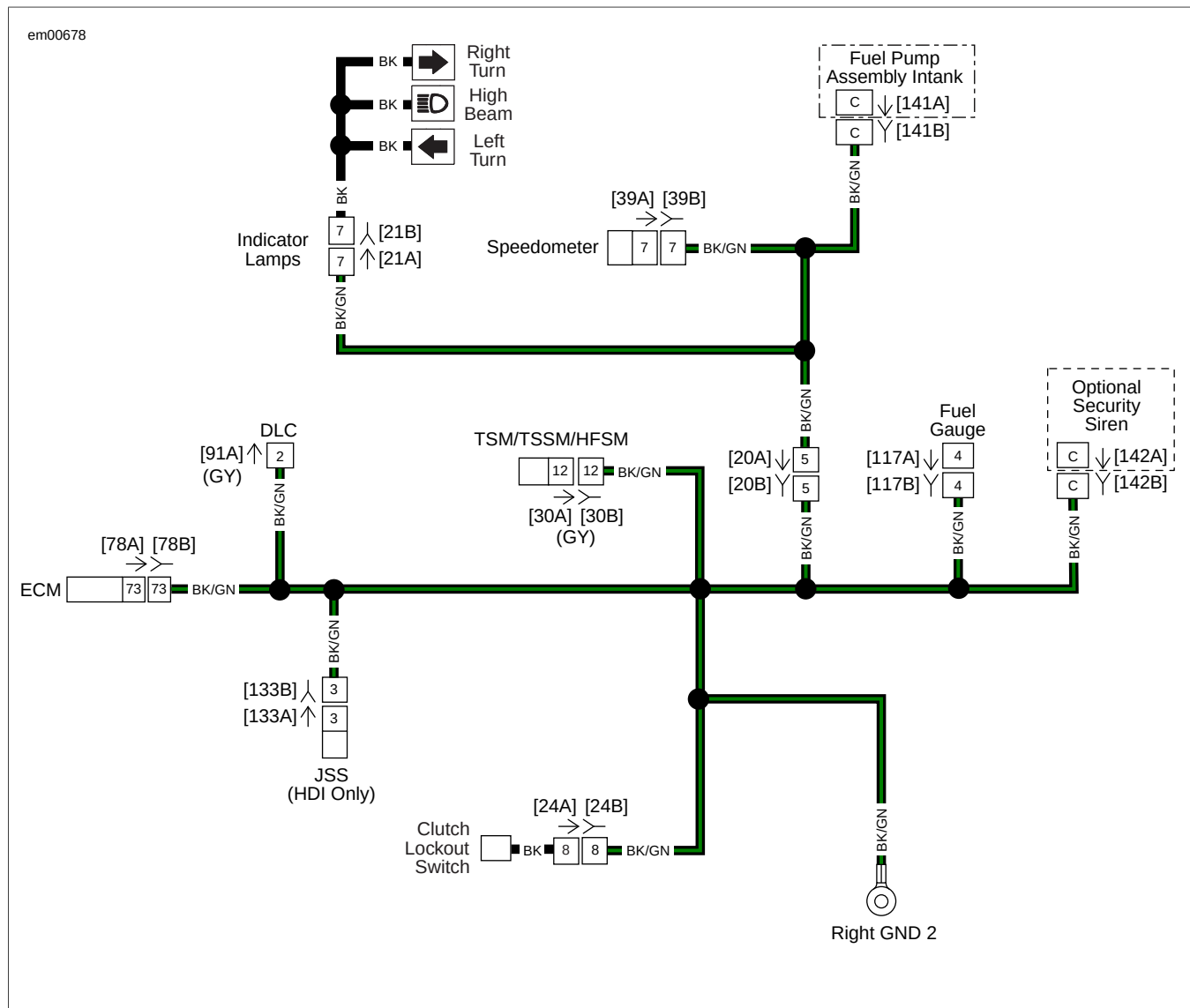


Figure 2-9. Right GND2: FLHR/C

em00854

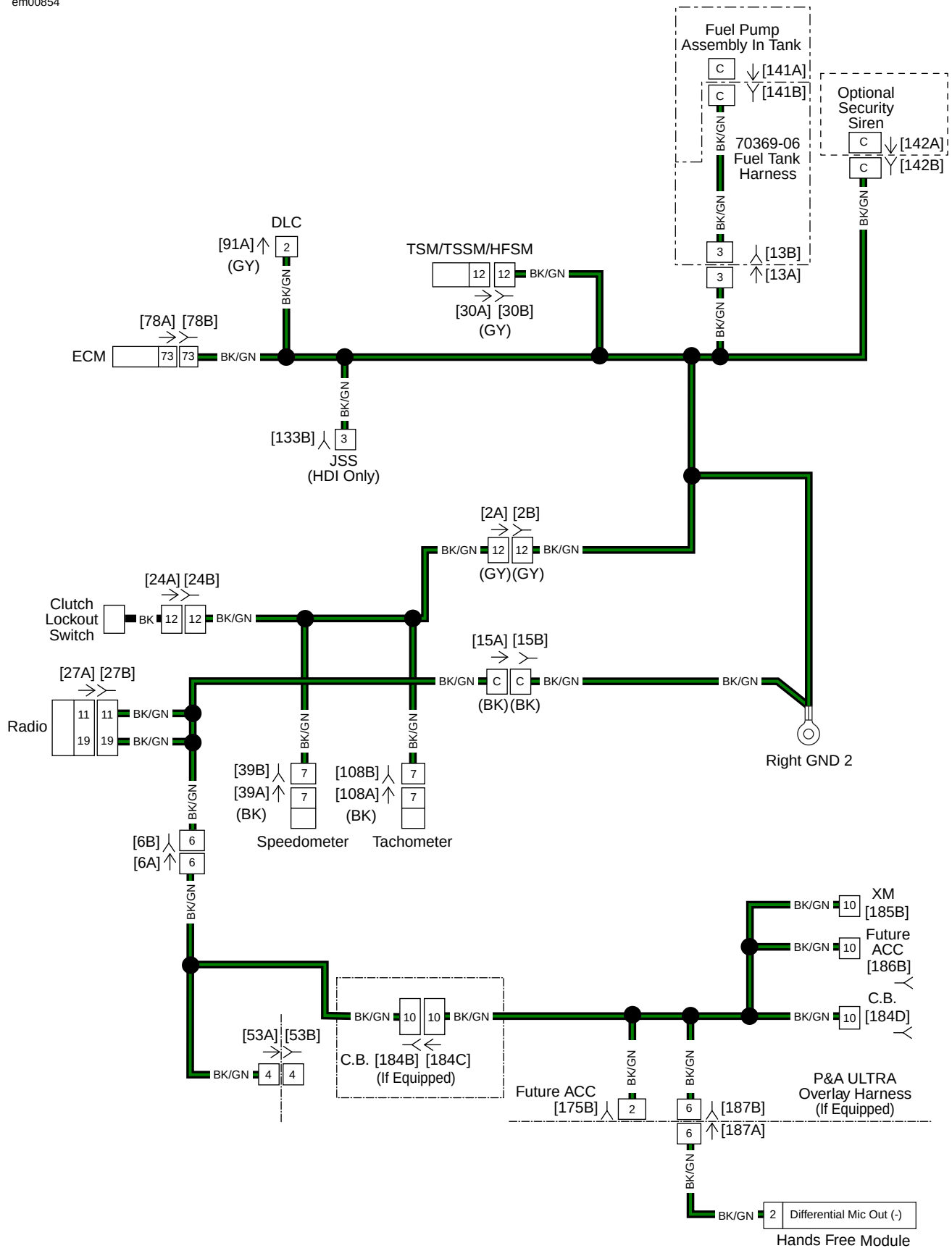


Figure 2-10. Right GND2: Except FLHR/C

em00855

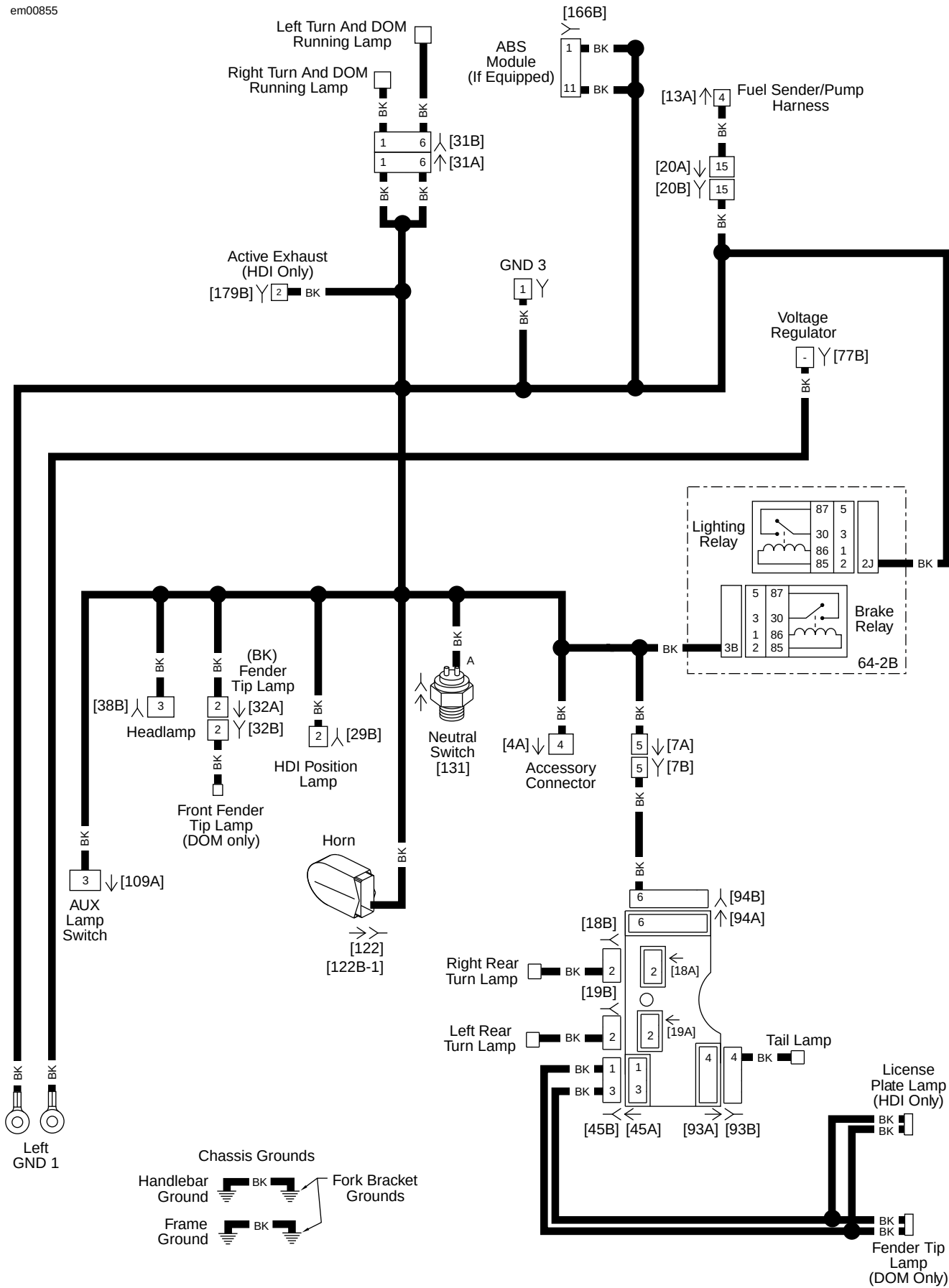


Figure 2-11. Left GND1: FLHR/C

em00827

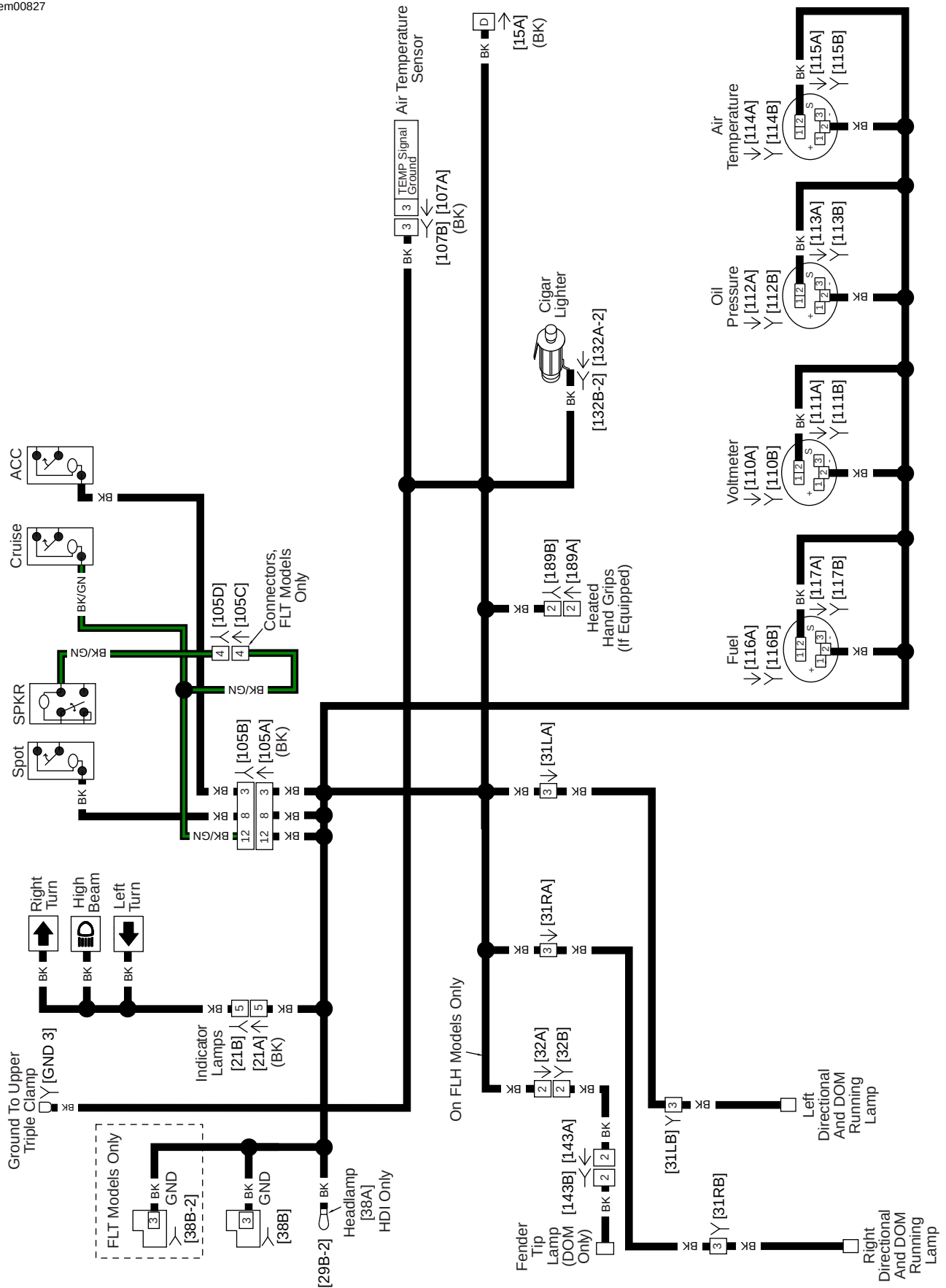


Figure 2-12. Left GND1: Except FLHR/C (Part 1 of 2)

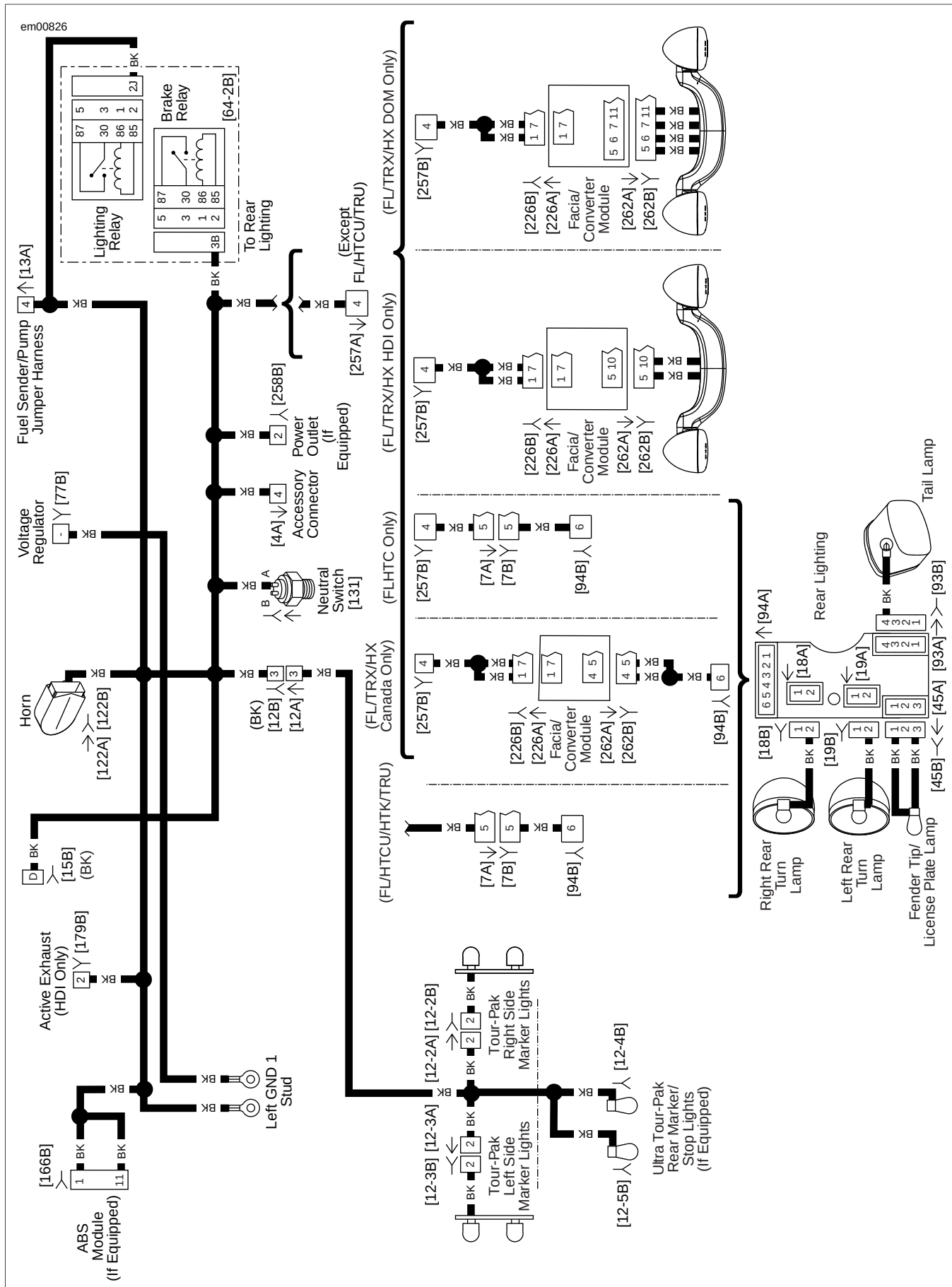


Figure 2-13. Left GND1: Except FLHR/C (Part 2 of 2)

INITIAL DIAGNOSTICS

1. Verifying Current DTC Test

1. Check for DTCs. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Are any DTCs present?
 - a. **Yes.** Refer to [Table 2-1](#).
 - b. **No.** [Go to Test 2](#).

2. Battery Power Test

1. Verify battery is charged. See [3.1 BATTERY TESTING](#).
2. Does vehicle have battery power?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** [Go to Test 3](#).

3. Ignition Power Test

1. With the engine stop switch in the off position, turn IGN ON.
2. Do the headlamps and instruments illuminate?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** Refer to [Table 2-2](#).

4. Engine Stop Switch Circuit Test

1. Turn the engine stop switch to the RUN position.
2. Does the check engine lamp illuminate for a few seconds, then turn off?
 - a. **Yes.** [Go to Test 5](#).
 - b. **No.** See [6.34 NO ECM POWER](#).

5. Security System Test

1. Turn the IGN OFF-ON.
2. Observe the security lamp.
3. Does the security lamp illuminate for a few seconds and then turn off?
 - a. **Yes.** [Go to Test 6](#).
 - b. **No.** See [5.12 SECURITY SYSTEM](#).

6. Starter System Test

1. Press the start button.
2. Does the starter spin and crank the engine?
 - a. **Yes.** [Go to Test 7](#).
 - b. **No.** See [3.2 STARTING SYSTEM](#).

7. Engine Running Test

1. Start the engine.
2. Does the engine start and run correctly?
 - a. **Yes.** [Go to Test 8](#).
 - b. **No.** See [6.1 EFI SYSTEM](#).

8. Verification Test

1. Operate the systems of the vehicle to verify the concern.
2. Was the concern duplicated?
 - a. **Yes.** See appropriate diagnostic. Refer to [Table 2-2](#).
 - b. **No.** Concern is intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).

SERIAL DATA COMMUNICATION

2.2

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Serial data communication circuits are used by modules and diagnostic tools to share information.

The speedometer, ECM, TSM/TSSM/HFSM, radio, ABS and tachometer (if equipped) all communicate on the serial data circuit. The serial data circuit is a (LGN/V) wire that runs to all the modules and is used to transfer data from one module to the other. This line also runs to the DLC [91] and is used to communicate with the modules using DIGITAL TECHNICIAN II (Part No. HD-48650).

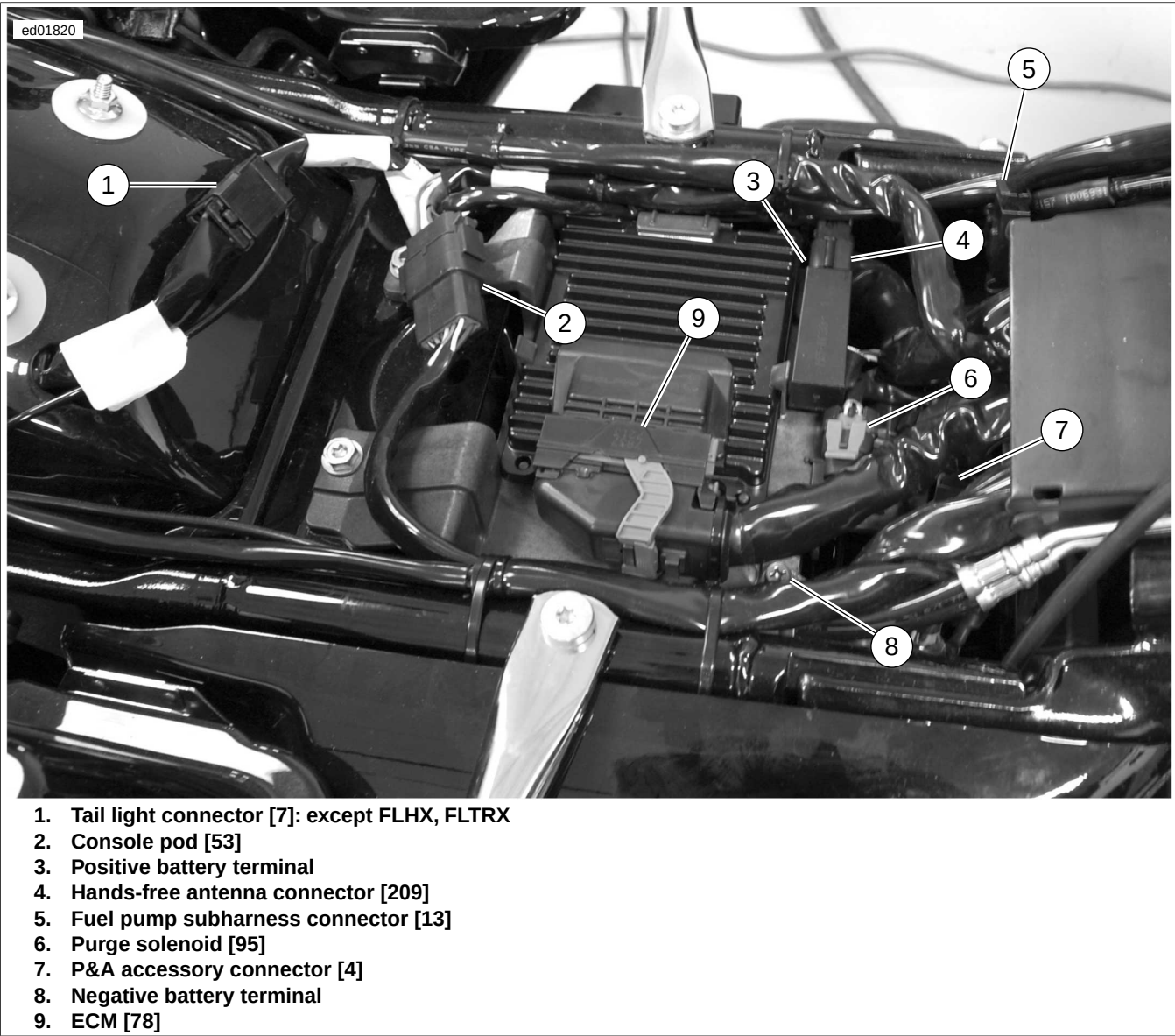


Figure 2-14. Electrical Connectors Under Seat

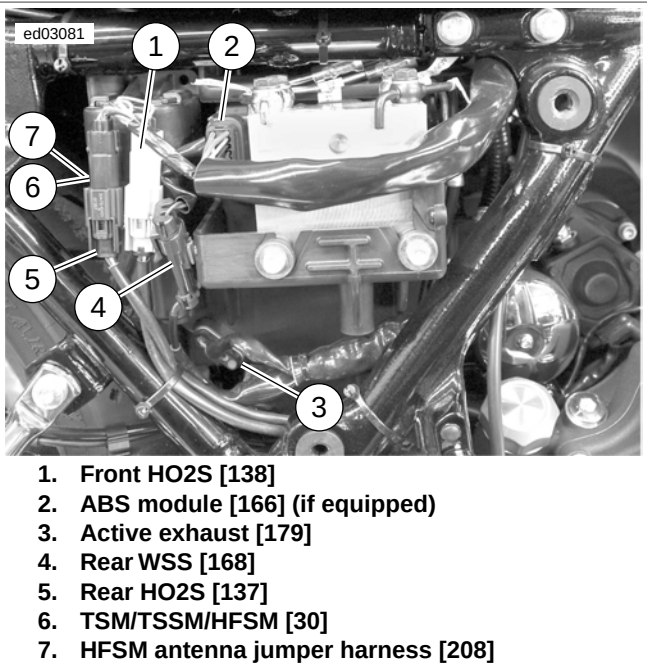


Figure 2-15. Under Right Side Cover

COMPONENTS

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Electronic Control Module (ECM)

See [Figure 2-14](#). The ECM is located under the seat. The ECM monitors the sensors from the engine and fuel systems in order to manage the fuel and spark delivery to the motorcycle which enhances performance and driveability.

Speedometer and Tachometer

The speedometer and tachometer contain part of the indicator and warning lamps for the motorcycle. They use the serial data circuit to receive information from the other modules to know which lamps to illuminate at any given time.

TSM/TSSM/HFSM

See [Figure 2-15](#). The TSM/TSSM/HFSM is located under the right side cover. It monitors the turn signals switches and controls the turn signals. The clutch and neutral switches are also inputs to the TSM/TSSM/HFSM. It uses these inputs to determine when it is safe to allow the motorcycle to start. It allows starter engagement and sends the information to the

ECM over the serial data circuit letting the ECM know to activate the fuel injectors. The TSSM/HFSM also controls the security functions on the motorcycle if equipped with the factory security system.

Data Link Connector (DLC)

See [Figure 2-16](#). The DLC is located under the left side cover. The DLC is used to connect the DIGITAL TECHNICIAN II (Part No. HD-48650) to the motorcycle.

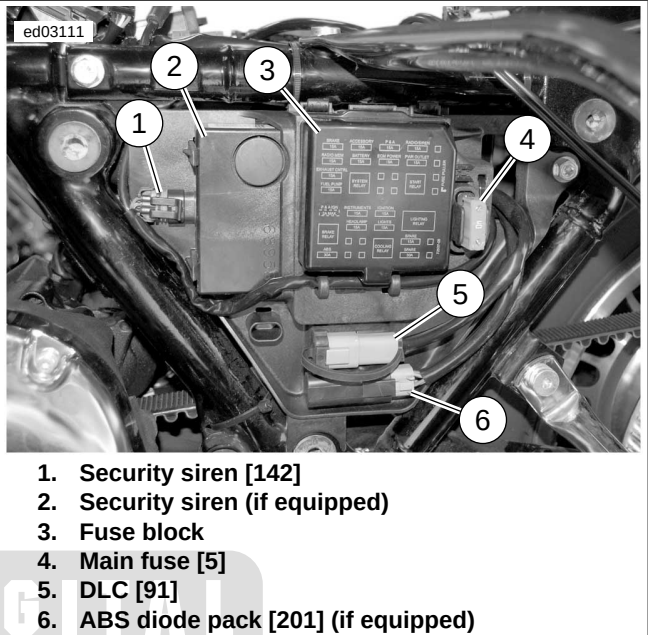


Figure 2-16. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

COMMUNICATION DTCS AND "BUS ER"

There are several DTCs that may set due to an issue with the serial data circuit. Different DTCs are set by different modules. If a module loses communication it is not able to generate a DTC. Therefore, the other modules will set DTCs for that module indicating they are not able to communicate with it.

Diagnostic Tips

Modules must have power and be grounded in order to communicate. Therefore, when checking any communication DTC be sure to check the power and ground connections on the suspected module. In some cases "Bus Er" will show on the odometer.

DTC U1016, U1040, U1064, U1097, U1255

2.3

DESCRIPTION AND OPERATION

The serial data circuit provides a means for the ECM, speedometer, tachometer, TSM/TSSM/HFSM, radio and ABS (if equipped) to communicate their current status. When all operating parameters on the serial data link are within specifications, a state of health message is sent between the components.

- DTC U1016 indicates that the ECM is not capable of sending this state of health message. It also indicates that there was communication on the data bus since power up, but communication was lost or interrupted during that key cycle.
- DTC U1040 indicates that the ABS module is not capable of sending its state of health message.
- DTC U1064 indicates that the TSM/TSSM/HFSM is not capable of sending this state of health message. It also indicates that there was communication on the data bus since power up, but was lost or interrupted during that key cycle.
- DTC U1097 indicates the speedometer is not capable of sending its state of health message.
- DTC U1255 indicates that no messages were present during power up of the current key cycle.

NOTE

Always start with [2.1 INITIAL DIAGNOSTICS](#) before proceeding with this test.

Table 2-3. Code Description

DTC	DESCRIPTION
U1016	Loss of all ECM serial data (state of health)
U1040	Loss of ABS serial data (state of health)
U1064	Loss of TSM/TSSM/HFSM serial data (state of health)
U1097	Loss of speedometer serial data (state of health)
U1255	Serial data error/missing message

Diagnostic Tips

The TSM/TSSM/HFSM controls the turn signals and supplies voltage for the turn signals to operate. A short on the turn signal circuits can cause the battery fuse to open. If no short to ground is found in the battery fuse circuit check the turn signal circuits between the TSM/TSSM/HFSM and the turn signals for a short to ground.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

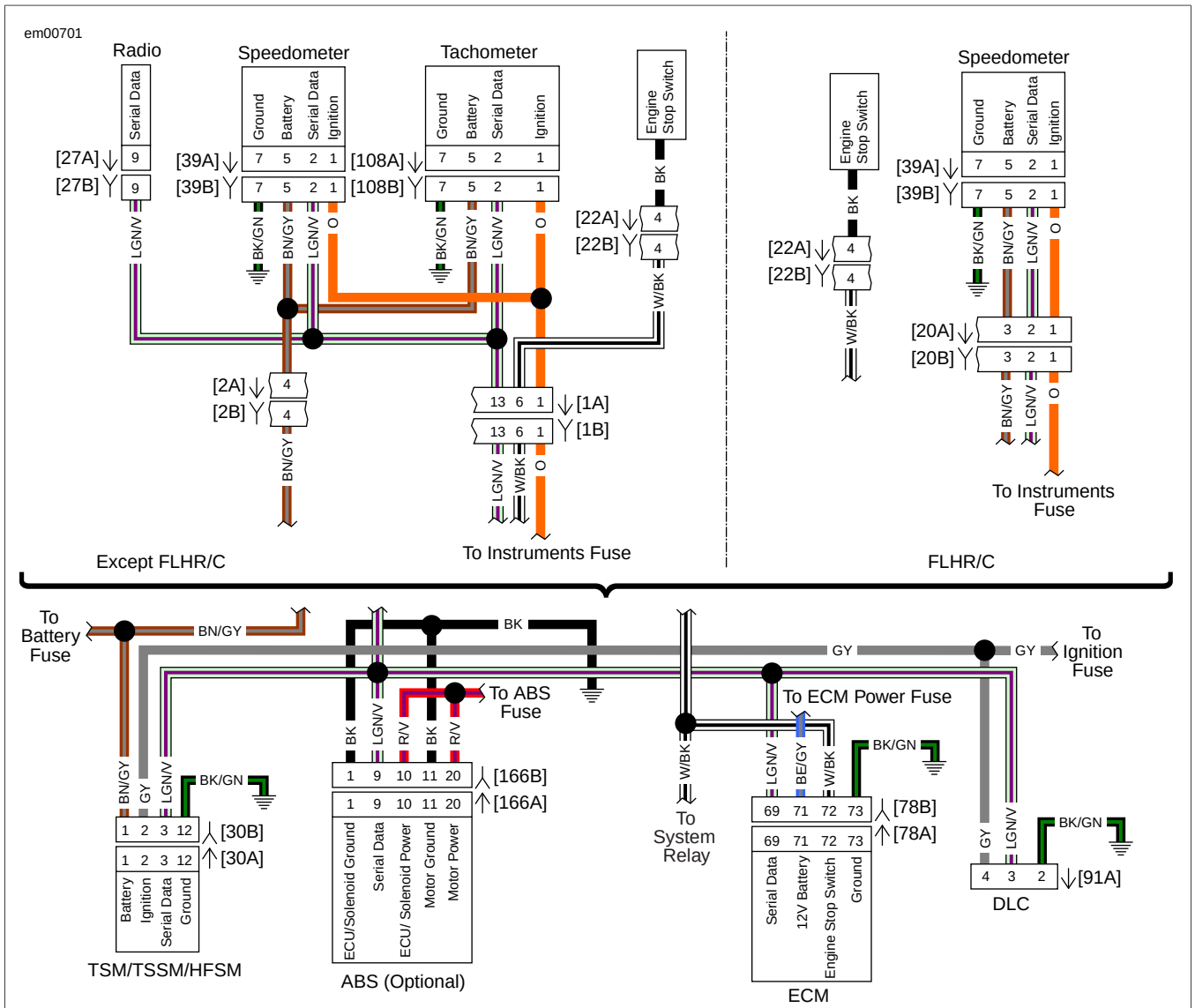


Figure 2-17. Serial Data Circuit

DTC U1016

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS
HD-48637	BREAKOUT BOX

Table 2-4. DTC U1016 Diagnostic Faults

POSSIBLE CAUSES
Open ground
Open switched power
ECM malfunction
Open serial data circuit

1. Open Ground Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity from breakout box terminal 73 to ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in ground circuit.

2. Switched Power Circuit Open Test

1. With IGN ON and engine stop switch in the RUN position, test for voltage at breakout box terminal 72.

2. Is battery voltage present?
 - a. **Yes. The TSM/TSSM/HFSM is reporting the DTC. [Go to Test 3.](#)**
 - b. **Yes. The speedometer is reporting the DTC. [Go to Test 4.](#)**
 - c. **Yes. The tachometer is reporting the DTC. [Go to Test 5.](#)**
 - d. **No.** Repair open in (W/BK) wire.

3. TSM/TSSM/HFSM Serial Data Circuit Continuity Test

1. With the IGN OFF, install BREAKOUT BOX (Part No. HD-42682) at the TSM/TSSM/HFSM. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between TSM/TSSM/HFSM breakout box terminal 3 and ECM breakout box terminal 69.
3. Is continuity present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

4. Speedometer Serial Data Circuit Continuity Test

1. Connect harness BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39A] and [39B]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters, leaving [39A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between speedometer breakout box terminal 2 and ECM breakout box terminal 69.
3. Is continuity present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

5. Tachometer Serial Data Circuit Continuity Test

1. Connect harness BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [108A] and [108B]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters, leaving [108A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between tachometer breakout box terminal 2 and ECM breakout box terminal 69.
3. Is continuity present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

DTC U1040, U1255

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS
HD-48642	ABS BREAKOUT BOX

Table 2-5. DTC U1040, U1255 Diagnostic Faults

POSSIBLE CAUSES
Open ABS fuse
Open battery circuit
Open ground circuit
Open serial data circuit
Short to ground in power circuit
ECU malfunction

1. ABS Fuse Visual Test

1. Inspect the ABS fuse.
2. Is the ABS fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. Loss of Power Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) leaving [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for voltage at breakout box terminals 10 and 20 to ground.
3. Is battery voltage present on both terminals?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (R/V) wire.

3. Loss of Ground Test

1. Test for continuity from breakout box terminals 1 and 11 to ground.
2. Is continuity present on both terminals?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in ground circuit.

4. Instrument Serial Data Circuit Continuity Test

1. Connect harness BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39] (FLHR/C) or [108] (except FLHR/C). Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters, leaving [39A] or [108A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between the instrument breakout box terminal 2 and ABS breakout box terminal 9.
3. Is continuity present?
 - a. **Yes.** Replace the ECU. See the service manual.
 - b. **No.** Repair open in (LGN/V) wire.

5. Power Circuit Short to Ground Test

1. Remove the ABS fuse.
2. Connect ABS BREAKOUT BOX (Part No. HD-48642) leaving [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between terminal 10 and battery negative.
4. Is continuity present?
 - a. **Yes.** Repair short to ground in (R/V) wire.
 - b. **No.** Replace the ABS fuse and test for intermittent short to ground. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).

DTC U1064, U1255

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS
HD-48637	BREAKOUT BOX

Table 2-6. DTC U1064, U1255 Diagnostic Faults

POSSIBLE CAUSES
Open battery fuse
Open battery circuit
Open ground circuit
Open serial data circuit
TSM/TSSM/HFSM malfunction
Short to ground in power circuit

1. Fuse Test

1. Inspect battery fuse.
2. Is battery fuse good?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** [Go to Test 6](#).

2. Loss of Battery Power Test

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness [30B] and TSM/TSSM/HFSM [30A].
2. Connect BREAKOUT BOX (Part No. HD-42682) using BREAKOUT BOX ADAPTERS (Part No. HD-46601) to the speedometer [39]. See [1.2 DIAGNOSTIC TOOLS](#).
3. With IGN ON and engine stop switch in the RUN position, use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter to test for voltage at TSM/TSSM/HFSM breakout box terminal 1.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 3](#).
 - b. **No.** Repair open in (BN/GY) wire.

3. Loss of Ignition Power Test

1. Test for voltage at terminal 2 of the TSM/TSSM/HFSM breakout box.
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** Repair open in (GY) wire.

4. Loss of Ground Test

1. Turn IGN OFF.
2. Test for continuity to ground from TSM/TSSM/HFSM breakout box terminal 12.
3. Is continuity present?
 - a. **Yes.** The speedometer is reporting the DTC. [Go to Test 5](#).
 - b. **Yes.** The ECM is reporting the DTC. [Go to Test 7](#).
 - c. **Yes.** The tachometer is reporting the DTC. [Go to Test 8](#).
 - d. **No.** Repair open in ground circuit.

5. Speedometer Serial Data Circuit Continuity Test

1. Test for continuity between speedometer breakout box terminal 2 and TSM/TSSM/HFSM breakout box terminal 3.
2. Is continuity present?
 - a. **Yes.** Replace the TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

6. Power Circuit Short to Ground Test

1. Disconnect the siren (if equipped).
2. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness [30B] and TSM/TSSM/HFSM [30A].
3. Connect BREAKOUT BOX (Part No. HD-42682) using BREAKOUT BOX ADAPTERS (Part No. HD-46601) to the speedometer [39]. See [1.2 DIAGNOSTIC TOOLS](#).
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between speedometer breakout box terminal 5 to ground.
5. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/GY) wire and replace battery fuse.
 - b. **No.** See diagnostic tips. Replace battery fuse and test for intermittent short to ground. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).

7. ECM Serial Data Circuit Continuity Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], at the ECM. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between TSM/TSSM/HFSM breakout box terminal 3 and ECM breakout box terminal 69.

3. Is continuity present?
 - a. **Yes.** Replace TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

8. Tachometer Serial Data Circuit Continuity Test

1. Test for continuity between tachometer breakout box terminal 2 and TSM/TSSM/HFSM breakout box terminal 3.
2. Is continuity present?
 - a. **Yes.** Replace the TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

DTC U1097, U1255

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS
HD-48637	BREAKOUT BOX

Table 2-7. DTC U1097, U1255 Diagnostic Faults

POSSIBLE CAUSES
Open battery fuse
Open ignition circuit
Open ground circuit
Speedometer malfunction
Open serial data circuit
Short to ground in power circuit

1. Fuse Test

1. Inspect battery fuse.
2. Is battery fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. Loss of Power Test

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness [30B] and TSM/TSSM/HFSM [30A].
2. Connect BREAKOUT BOX (Part No. HD-42682) using BREAKOUT BOX ADAPTERS (Part No. HD-46601) to the speedometer [39]. See [1.2 DIAGNOSTIC TOOLS](#).
3. With IGN ON and engine stop switch in the RUN position, use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter to test for voltage at speedometer breakout box terminal 5.

4. Is battery voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (BN/GY) wire.

3. Loss of Ground Test

1. Turn IGN OFF.
2. Test for continuity to ground from speedometer breakout box terminal 7.
3. Is continuity present?
 - a. **Yes.** The TSM/TSSM/HFSM is reporting the DTC. [Go to Test 4.](#)
 - b. **Yes.** The ECM is reporting the DTC. [Go to Test 6.](#)
 - c. **No.** Repair open in ground circuit.

4. Speedometer Serial Data Circuit Continuity Test

1. Test for continuity between speedometer breakout box terminal 2 and TSM/TSSM/HFSM breakout box terminal 3.
2. Is continuity present?
 - a. **Yes.** Replace the speedometer. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

5. Power Circuit Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-42682), using BREAKOUT BOX ADAPTERS (Part No. HD-46601) between wire harness [39B] and speedometer [39A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for short to ground breakout box terminal 5.
3. Is a short to ground present?
 - a. **Yes.** Repair short to ground in (BN/GY) wire and replace battery fuse.
 - b. **No.** Replace battery fuse and test for intermittent short to ground. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING](#), [Wiggle Test](#).

6. ECM Serial Data Circuit Continuity Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter test for continuity between speedometer breakout box terminal 2 and ECM breakout box terminal 69.
3. Is continuity present?
 - a. **Yes.** Replace speedometer. See the service manual.
 - b. **No.** Repair open on (LGN/V) wire.

DTC U1300, U1301 OR BUS ER

2.4

DESCRIPTION AND OPERATION

The typical serial data voltage range is 0V (inactive) to 7V (active). Due to the high speed voltage fluctuations of the signal, voltages will be much lower on a multimeter. In analog mode, a multimeter reading serial data will show continuous voltage when active, typically 0.6-0.8V. The range for acceptable operations is 0-7.0V.

Table 2-8. Code Description

DTC	DESCRIPTION
U1300	Serial data open/low
U1301	Serial data high

Diagnostic Tips

- If serial data is shorted, these DTCs will automatically cause the check engine lamp to illuminate. The odometer will read "BUS Er" in this condition.
- DTCs P1009 and P1010 may accompany DTCs U1300 and U1301.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

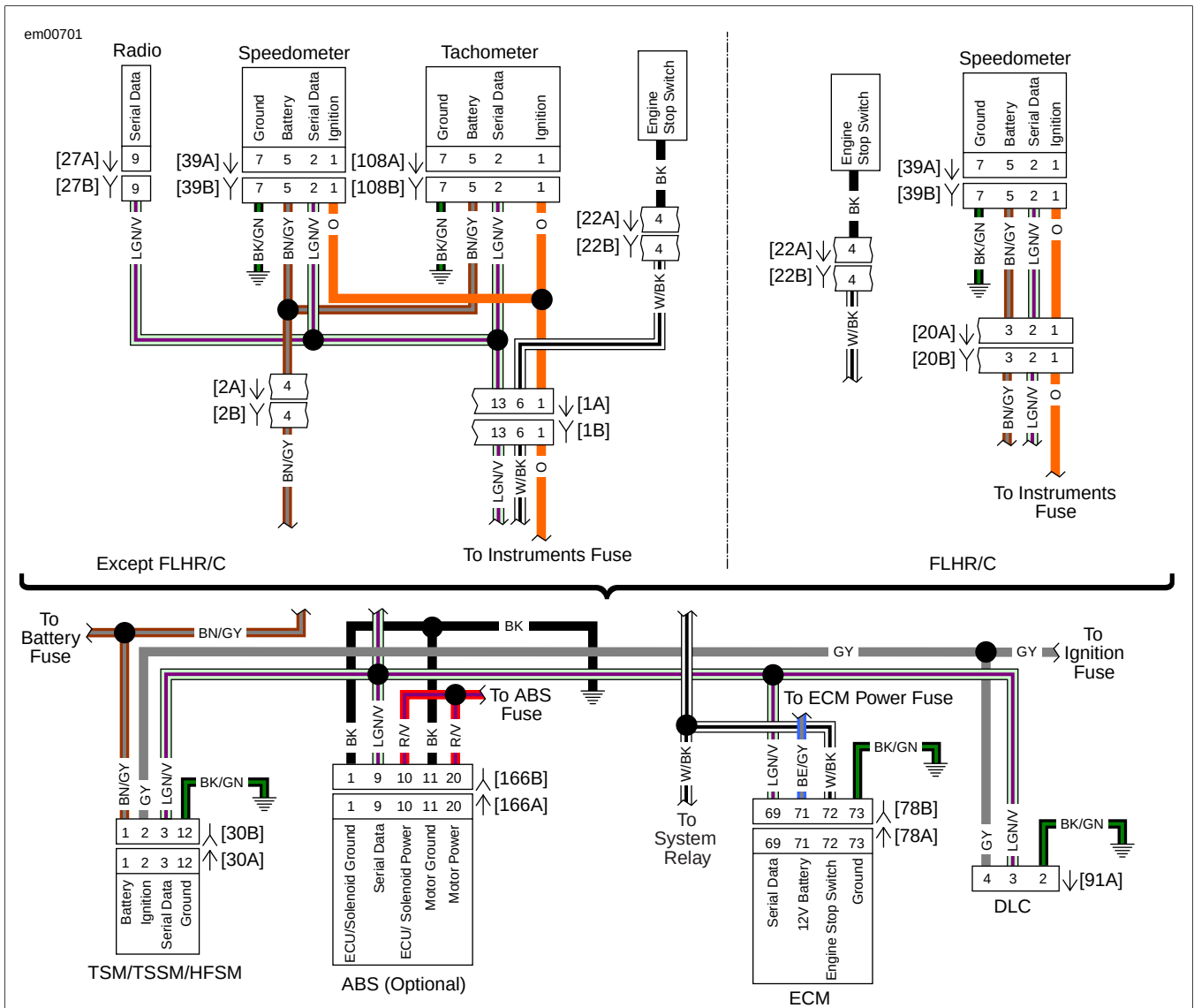


Figure 2-18. Serial Data Circuit

DTC U1300

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-45325	JUMPER HARNESS

Table 2-9. DTC U1300 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
TSM/TSSM/HFSM malfunction
ECU malfunction
Short to ground in serial data wire
Radio malfunction
Open in serial data circuit
Speedometer malfunction
Tachometer malfunction

1. Serial Data Short to Ground Test

1. Turn IGN ON.
2. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 9.](#)

2. ECM Test

1. Turn IGN OFF.
2. Disconnect the ECM [78B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace ECM. See the service manual.

3. TSM/TSSM/HFSM Test

1. Turn IGN OFF.
2. Disconnect the TSM/TSSM/HFSM [30A].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual.

4. ABS Module Test (If Vehicle is not Equipped with ABS, Go to Test 5.)

1. Turn IGN OFF.
2. Disconnect ABS module [166B].
3. Turn IGN ON.

4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace ECU of ABS module. See the service manual.

5. Tachometer Test (If Vehicle is not Equipped with Tachometer, Go to Test 6.)

1. Turn IGN OFF.
2. Disconnect tachometer [108B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Replace the tachometer. See the service manual.

6. Radio Test (If Vehicle is not Equipped with Radio, Go to Test 7.)

1. Turn IGN OFF.
2. Disconnect the radio [27B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Replace the radio. See the service manual.

7. Serial Data Short to Ground Test

1. Turn IGN OFF.
2. Disconnect speedometer [39B].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for continuity from DLC [91A] terminal 3 to ground.
4. Is continuity present?
 - a. **Yes.** Repair short to ground in (LGN/V) wire.
 - b. **No.** [Go to Test 8.](#)

8. Serial Data Circuit Open Test

1. Connect BREAKOUT BOX (Part No. HD-42682) and JUMPER HARNESS (Part No. HD-45325) to the wiring harness [39B] leaving the speedometer disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity from terminal 7 of breakout box to DLC [91A] terminal 3.
3. Is continuity present?
 - a. **Yes.** Replace speedometer. See the service manual.
 - b. **No.** Repair open in (LGN/V) wire.

9. Intermittent Test

1. Turn IGN OFF.
2. Disconnect the ECM [78B], speedometer [39B], TSM/TSSM/HFSM [30B], tachometer [108], radio [27] and ABS module [166B] (if equipped).

3. Test for continuity between DLC [91A] terminal 3 and ground while performing a wiggle test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).
4. Is continuity present?
 - a. **Yes.** Repair short to ground in (LGN/V) wire.
 - b. **No.** Verify that current DTC U1301 is set.

DTC U1301

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-45325	JUMPER HARNESS

Table 2-10. DTC U1301 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
TSM/TSSM/HFSM malfunction
ECU malfunction
Short to voltage in serial data circuit
Radio malfunction
Speedometer malfunction
Tachometer malfunction

1. Serial Data Short to Voltage Test

1. Turn IGN ON.
2. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** [Go to Test 9](#).

2. ECM Test

1. Turn IGN OFF.
2. Disconnect the ECM [78B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 3](#).
 - b. **No.** Replace ECM. See the service manual.

3. TSM/TSSM/HFSM Test

1. Turn IGN OFF.
2. Disconnect the TSM/TSSM/HFSM [30B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual.

4. ABS Module Test (If Vehicle is not Equipped with ABS, Go to Test 5.)

1. Turn IGN OFF.
2. Disconnect the ABS module [166B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 5](#).
 - b. **No.** Replace ECU of ABS module. See the service manual.

5. Tachometer Test (If Vehicle is not Equipped with Tachometer, Go to Test 6.)

1. Turn IGN OFF.
2. Disconnect tachometer [108B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 6](#).
 - b. **No.** Replace the tachometer. See the service manual.

6. Radio Test (If Vehicle is not Equipped with Radio, Go to Test 7.)

1. Turn IGN OFF.
2. Disconnect the radio [27B].
3. Turn IGN ON.
4. Does "BUS Er" appear on odometer display?
 - a. **Yes.** [Go to Test 7](#).
 - b. **No.** Replace the radio. See the service manual.

7. Serial Data Short to Voltage Test

1. Turn the IGN OFF.
2. Disconnect speedometer [39B].
3. Turn IGN ON.
4. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for voltage from DLC [91A] terminal 3 to ground.
5. Is battery voltage present?
 - a. **Yes.** Repair short to voltage in (LGN/V) wire.
 - b. **No.** [Go to Test 8](#).

8. Serial Data Circuit Open Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-42682) and JUMPER HARNESS (Part No. HD-45325) to the wiring harness [39B] leaving the speedometer disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity from breakout box terminal 7 to DLC [91A] terminal 3.

4. Is continuity present?
 - a. **Yes.** Replace speedometer. See the service manual.
 - b. **No.** Repair open in (LGN/V) wire.
3. Turn IGN ON.
4. Test for voltage between DLC [91A] terminal 3 and ground while performing a wiggle test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).

9. Intermittent Test

1. Turn IGN OFF.
2. Disconnect the ECM [78B], speedometer [39B], TSM/TSSM/HFSM [30B], tachometer [108], radio [27] and ABS module [166B] (if equipped).
5. Is voltage present?
 - a. **Yes.** Repair short to voltage in (LGN/V) wire.
 - b. **No.** Verify that current DTC U1301 is set.



TABLE OF CONTENTS

SUBJECT	PAGE NO.
3.1 BATTERY TESTING.....	3-1
3.2 STARTING SYSTEM.....	3-3
3.3 TESTING STARTER ON MOTORCYCLE.....	3-13
3.4 TESTING STARTER ON BENCH.....	3-14
3.5 CHARGING SYSTEM.....	3-16
3.6 DTC B0563, P0562, P0563.....	3-22
3.7 DTC B1006, B1007.....	3-27



NOTES



BATTERY TESTING

3.1

GENERAL

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

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

VOLTMETER TEST

The voltmeter test provides a general indication of battery state of charge or condition. Check the voltage of the battery to verify that it is in a 100% fully charged condition. Refer to [Table 3-1](#).

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 12.7V or above, perform a load test. See [3.1 BATTERY TESTING, Load Test](#).

Table 3-1. Voltmeter Test For Battery Charge Conditions

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

CONDUCTANCE TEST

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 analyzer leads to the vehicle battery terminal, not to the bolt or wire terminal.

NOTE

Connecting the analyzer to the bolt or wire terminal may not give an accurate reading of battery condition.

2. Follow the instructions in the analyzer instruction manual to perform a battery test.

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

See [Figure 3-1](#). The analyzer printer will provide a printout including the possible test results:

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.

- GOOD BATTERY - Return the battery to service.
- GOOD-RECHARGE - Fully charge the battery and return to service.
- CHARGE & RETEST - Fully charge the battery and then check the voltage after the battery has set for one to two hours, and retest. If battery fails retest, replace battery.
- REPLACE BATTERY - Replace the battery.
- BAD CELL-REPLACE - Replace the battery.
- BATTERY NOISE - Remove surface charge from battery and retest.

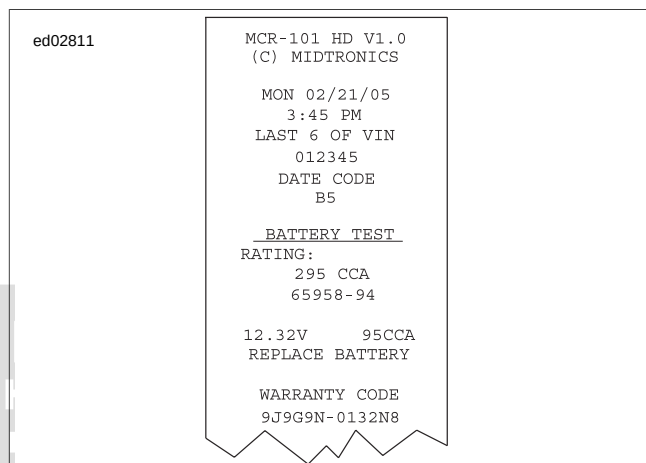


Figure 3-1. Battery Test Results Printout

LOAD TEST

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. With vehicle battery on a bench, charge the battery.

NOTE

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.

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)

2. See [Figure 3-2](#). Connect tester leads to battery posts and place induction pickup over negative (black) cable.

NOTE

To avoid load tester and/or battery damage, do not leave the load tester switch turned ON for more than 20 seconds.

- 3. 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). Refer to [Table 3-2](#).

⚠ 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)

NOTICE

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)

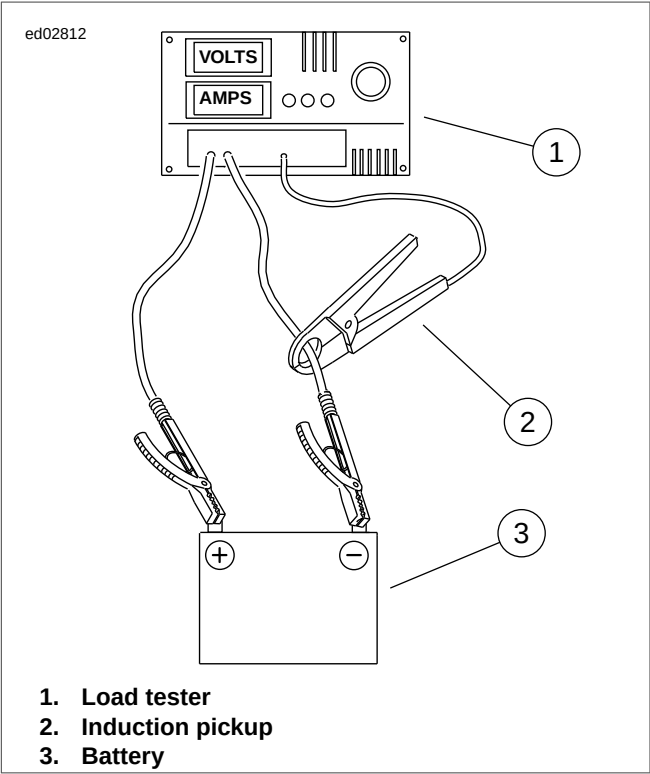


Figure 3-2. Load Test Battery

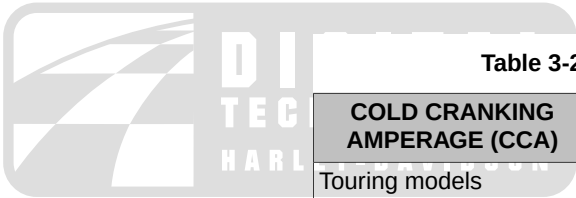


Table 3-2. Battery Load Test

COLD CRANKING AMPERAGE (CCA)	100%	50%
Touring models	405	200

STARTING SYSTEM

3.2

DESCRIPTION AND OPERATION

With IGN ON, battery voltage is supplied to the start relay and ignition fuse. The ignition fuse supplies battery voltage to the engine stop switch and TSM/TSSM/HFSM.

With engine stop switch to RUN, battery voltage is supplied to the start switch and the ECM. The TSM/TSSM/HFSM monitors the clutch switch, neutral switch and the state of the security system. If the security system is not armed and either the clutch lever is pulled in or the motorcycle is in neutral, the TSM/TSSM/HFSM provides ground to the start relay coil.

When the start switch is pressed, power flows to the coil side of the start relay. The TSM/TSSM/HFSM supplies the ground to the start relay, energizing the start relay. This allows battery voltage from the ignition switch to flow through the start relay to the starter solenoid. This energizes the solenoid and full battery power is sent to the starter.

COMPONENTS

Starter

The starter receives power from the battery through the starter solenoid and is grounded through the starter case. When the starter solenoid is energized, two actions happen:

- The plunger pulls inward which allows current to flow to the starter motor.
- The pinion gear engages with the ring gear on the clutch shell.

With the starter motor turning, the rotation is transferred to the following:

- The starter armature gear transfers rotation to the idler gear.
- The idler gear transfers rotation to the starter clutch.
- The starter clutch transfers rotation through a spline gear to the starter drive shaft which also drives the pinion gear.
- The pinion gear transfers its rotation to the ring gear on the clutch shell.
- The primary chain drives the alternator rotor sprocket on the end of the crankshaft.

The starter clutch is equipped with one way clutch so when the engine starts, it allows the clutch shell and sprocket to spin freely without causing any damage to the starter motor. After the engine starts and the start switch is released, the plunger returns to its normal position, disengaging the pinion gear from the clutch shell and sprocket.

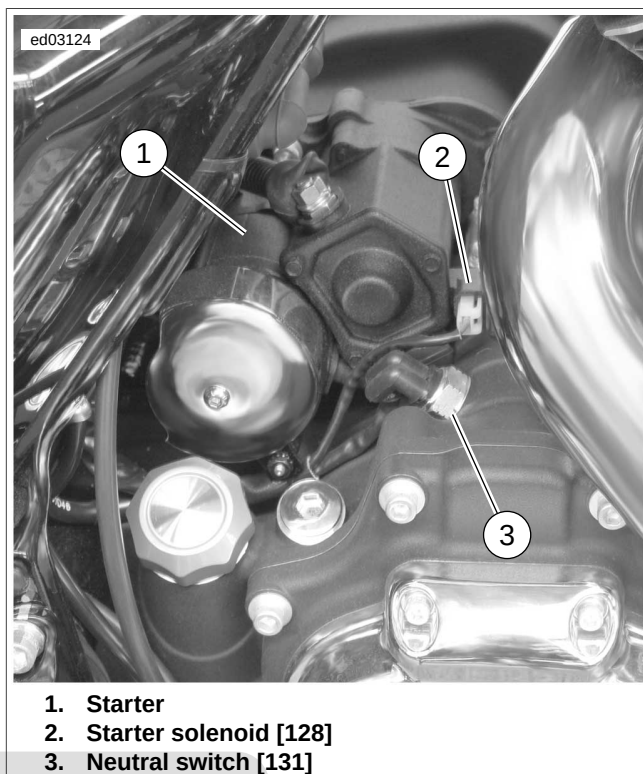


Figure 3-3. Starter Solenoid [128]

Starter Solenoid

See [Figure 3-3](#). The starter solenoid provides power to the starter. The solenoid is a means of controlling a high amperage device with a low amperage switch. The low amperage switch in this circuit is the start relay. When the start relay is activated it sends voltage to the starter solenoid making a magnetic field that pulls a larger circuit closed, allowing voltage to the starter.

Engine Stop Switch

The engine stop switch is located on the right hand controls. With the engine stop switch in the RUN position, battery voltage is supplied to the start switch and the ECM.

Start Switch

The start switch is a push button switch located in the right hand controls. When the start switch is pressed, power flows to the coil side of the start relay.

Start Relay

The start relay is located in the fuse block under the left side cover. Power is supplied to the coil side of the start relay when the start switch is pressed. The TSM/TSSM/HFSM controls the ground to the coil side of the relay. When the relay is energized, it supplies power from the ignition switch to the starter solenoid.

Ignition Switch

The ignition switch turns the electrical power to the vehicle on and/or off. The ignition switch has three positions. In the OFF

position, the ignition switch turns off all power to the vehicle except for the components powered directly by the battery. When the ignition switch is in the ACC position it allows power to flow through the ACCY fuse and supplies power to only certain parts of the vehicle such as the lights. In the ON or IGN position the ignition switch supplies power for all the systems on the vehicle.

Battery

WARNING

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

WARNING

Never remove warning label attached to top of battery. Failure to read and understand all precautions contained in warning, could result in death or serious injury. (00064a)

WARNING

Explosive hydrogen gas, which escapes during charging, could cause death or serious injury. Charge battery in a well-ventilated area. Keep open flames, electrical sparks and smoking materials away from battery at all times. KEEP BATTERIES AWAY FROM CHILDREN. (00065a)

WARNING

If battery becomes hot, gassing or spewing of electrolyte can occur, which could cause death or serious injury. Unplug or turn OFF the charger until battery cools. (00412b)

WARNING

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer, and birth defects or other reproductive harm. Wash hands after handling. (00019e)

NOTICE

If battery releases an excessive amount of gas during charging, decrease the charging rate. Overheating can result in plate distortion, internal shorting, drying out or damage. (00413b)

The AGM batteries are permanently sealed, maintenance-free, valve-regulated, lead/calcium and sulfuric acid batteries.

The battery is recharged by the alternator and kept from overcharging by the regulator during use.

Battery condition can be determined by a voltage test, a conductance test or a load test. See [3.1 BATTERY TESTING](#).

A battery may be tested, whether fully charged or not, using the conductance test. However, the battery must be fully charged to perform a load test.

Grinding Noise Or Erratic Starting

1. Remove starter. See the service manual.
2. Inspect the starter mounting surface and mating area on inner primary for arcing and pitting. This condition is caused by insufficient ground and or clamp load.
3. Clean mating surfaces.
4. Inspect starter pinion gear. Replace starter clutch assembly if damaged (cracked or missing teeth). Rounding of pinion gear teeth is considered normal. If pinion gear needs to be replaced, inspect ring gear on clutch. Replace clutch ring gear if damaged. See the service manual.
5. Install starter. See the service manual.

Job/Time Code Values

Dealership Technicians filing warranty claims should use the job/time code values printed in (bold text) beside the appropriate repair.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



STARTER TROUBLESHOOTING

The troubleshooting tables contain detailed procedures to solve and correct problems. Follow [3.2 STARTING SYSTEM](#) to dia-

gnose starting system problems. The [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#) procedure will help you to locate poor connections or components with excessive voltage drops.

Table 3-3. Starter Does Not Run or Runs at Very Low Speeds

SOURCE OF PROBLEM	POSSIBLE CAUSE	SOLUTION
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuit or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.
Wiring	Poor or no connection at either end of the battery positive or negative cable.	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 (grounds through TSM/TSSM/HFSM).	Tighten connections or repair or replace wire(s).
Start switch, clutch switch, engine stop 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.
	TSM/TSSM/HFSM has disabled start relay.	Disarm security system inspect for neutral or clutch circuit issue.
Starter solenoid	Poor contact condition caused by burned contacts.	Replace solenoid assembly.
	Windings open or short-circuited.	Replace solenoid assembly.
Starter motor	Brushes worn below specification.	Replace starter.
	Commutator burnt.	Replace starter.
	Commutator high mica.	Replace starter.
	Field winding grounded.	Replace starter.
	Armature winding grounded or short-circuited.	Replace starter.
	Free running current draw out of range.	Replace starter.
	Insufficient brush spring tension.	Replace starter.
Starter clutch	Starter clutch failure.	Replace starter clutch assembly.

Table 3-4. Starter Spins But Does Not Engage

SOURCE OF PROBLEM	POSSIBLE CAUSE	SOLUTION
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuit or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.
Starter motor	Pinion gear teeth worn out.	Replace starter clutch assembly.
Gear teeth on clutch shell and sprocket.	Excessively worn teeth.	Replace clutch shell and sprocket.
Starter clutch	Starter clutch failure.	Replace starter clutch assembly.

Table 3-5. Starter Does Not Stop Running

SOURCE OF PROBLEM	POSSIBLE 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.
Starter solenoid	Coil shorted.	Replace starter solenoid assembly.
	Contact plate melted and stuck.	Replace starter solenoid assembly.

STARTER TESTING

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

Table 3-6. Starter Testing Diagnostic Faults

POSSIBLE CAUSES
Short to voltage at starter solenoid
Start switch malfunction
Short to voltage on start relay supply circuit
Start relay malfunction

1. Starting System Operational Test

- With IGN ON, transmission in neutral and the engine stop switch in the RUN position, press the start switch.
- Does the starter spin?
 - Yes. Starter spins, but does not engage.** See [3.2 STARTING SYSTEM, Starter Spins But Does Not Engage](#).
 - Yes. Starter stalls or spins too slowly.** See [3.2 STARTING SYSTEM, Starter Stalls or Spins Too Slowly](#).
 - Yes. Starter runs on.** [Go to Test 3](#).
 - No.** [Go to Test 2](#).

2. Audible Noise Test

- While listening for audible clicking noises from the start relay and starter solenoid, press the start switch.
- Is there a click?
 - Yes. Start solenoid clicks.** See [3.2 STARTING SYSTEM, Starter Solenoid Clicks](#).
 - Yes. Start relay clicks.** See [3.2 STARTING SYSTEM, Start Relay Clicks](#).
 - No.** See [3.2 STARTING SYSTEM, Nothing Clicks](#).

3. Starter Solenoid Test

- Disconnect starter solenoid [128].
- Does starter stop?
 - Yes.** [Go to Test 4](#).
 - No.** Replace starter solenoid assembly. (5845)

4. Start Switch Circuit Test

- Turn IGN OFF, remove start relay.
- Turn IGN ON. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) test for voltage at fuse block [64-1B] socket terminal 4H (BK/R) wire.
- Is battery voltage present?
 - Yes.** [Go to Test 5](#).
 - No.** [Go to Test 7](#).

5. Start Switch Circuit Short to Voltage Test

- Turn IGN OFF, disconnect right hand controls [22].
- Turn IGN ON, test for voltage at [22B] terminal 6.
- Is voltage present?
 - Yes. Except FLHR/C.** [Go to Test 6](#).
 - Yes. FLHR/C.** Repair short to voltage between [22B] terminal 6 and [64-1B] socket terminal 4H (BK/R) wire.
 - No.** [Go to Test 8](#).

6. Start Switch Circuit Short to Voltage [2B] Test

- Turn IGN OFF, disconnect interconnect harness [2].
- Turn IGN ON, test for voltage at [2B] terminal 2.
- Is voltage present?
 - Yes.** Repair short to voltage between [2B] terminal 2 and [22B] terminal 6 (BK/R) wire. (5041)
 - No.** [Go to Test 7](#).

7. Start Switch Circuit Short to Voltage [2A] Test

- Test for voltage at [2A] terminal 2.
- Is voltage present?
 - Yes.** Repair short to voltage between [2A] terminal 2 and [64-1B] socket terminal 4H (BK/R) wire. (5041)
 - No.** [Go to Test 8](#).

8. Start Switch Test

- Test for continuity between [22A] terminal 4 (W/BK) wire and terminal 6 (BK/R) wire.

2. Is continuity present?
 - a. **Yes.** Replace start switch. See the service manual. **(5818)**
 - b. **No.** Repair short to voltage on [22A] terminal 6 (BK/R) wire. **(5041)**

9. Start Relay Test

1. Perform relay test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
2. Is the start relay good?
 - a. **Yes.** Perform wiggle test to locate short to voltage between [64-1B] socket terminals 4G (GN) wire or 3H (R/GY) wire. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#). **(5041)**
 - b. **No.** Replace start relay. **(5832)**

NOTHING CLICKS

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX

Table 3-7. Nothing Clicks Diagnostic Faults

POSSIBLE CAUSES
Low battery
Open fuse
Open ignition switch feed circuit
Start switch malfunction
Start relay malfunction
TSM/TSSM/HFSM malfunction
Ignition switch malfunction
Open ignition circuit
Open start switch circuit
Neutral switch malfunction
Open neutral circuit
Clutch switch malfunction
Open clutch switch circuit
Engine stop switch malfunction
Open ignition circuit
Open security circuit

NOTE

Verify that vehicle is in neutral and that the key fob is present and in working order (if security equipped) and that the engine stop switch is in RUN position.

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).

2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed, attempt to start engine, if nothing clicks continue with tests. [Go to Test 2.](#)

2. Fuse Test

1. Verify that all fuses including main fuse are good.
2. Are all fuses good?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace fuse and repair circuit accordingly. If problem is still present, continue with tests. [Go to Test 3.](#)

3. Ignition Circuit Test

1. With IGN ON, verify that ignition circuit is working properly.
2. Do lights illuminate?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 4.](#)

4. Ignition Switch Supply Voltage Test

1. With IGN OFF, disconnect ignition switch [33].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter, test for battery voltage at ignition switch [33B] terminal 2 on all vehicles except for FLHR/C and terminal B on FLHR/C (R) wire.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No. Except FLHR/C.** Repair open between ignition switch [33B] terminal 2 and main fuse [5B] terminal B (R) wire. **(5041)**
 - c. **No. FLHR/C.** [Go to Test 5.](#)

5. Ignition Switch to [222] Test

1. Disconnect console ignition switch [222].
2. Test for continuity between ignition switch [33B] terminal B and [222A] terminal B.
3. Is continuity present?
 - a. **Yes.** Repair open in (R) wire from [222B] terminal B and [64-1B] socket terminal 2C.
 - b. **No.** Repair open in (R) wire from [222A] terminal B and ignition switch [33B] terminals B.

6. Ignition Switch Test

1. With IGN ON, test for continuity between ignition switch [33A] terminals B+ and IGN.

2. Is continuity present?
 - a. **Yes.** On all vehicles except for FLHR/C, repair open in (R/BK) wire from [33B] terminal 3. **(5041)**
 - b. **No. Except FLHR/C.** Replace ignition switch. See the service manual. **(7287)**
 - c. **No. FLHR/C.** [Go to Test 7.](#)

7. Ignition Switch to [222] Continuity Test

1. Test for continuity between ignition switch [33B] terminal A and [222A] terminal A.
2. Is continuity present?
 - a. **Yes.** Repair open in (R/BK) wire from [222B] terminal B and [64-2B] socket terminal 1E.
 - b. **No.** Repair open in (R/BK) wire from [222A] terminal B and ignition switch [33B] terminals B.

8. Start Switch Circuit Voltage Test

1. With IGN OFF, remove start relay.
2. Turn IGN ON.
3. While pressing the start switch, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multi-meter, test for battery voltage at [64-1B] socket terminal 4H (BK/R) wire.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 11.](#)
 - b. **No.** [Go to Test 9.](#)

9. Start Switch Test

1. Turn IGN OFF and disconnect right hand controls [22].
2. With the start switch pressed, test for continuity between [22A] terminals 6 (BK/R) wire and 4 (W/B) wire.
3. Is continuity present?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** Replace the start switch. See the service manual. **(5818)**

10. Start Switch Circuit Continuity Test

1. Test for continuity between [22B] terminal 6 and [64-1B] socket terminal 4H (BK/R) wire.
2. Is continuity present?
 - a. **Yes.** [Go to Test 19.](#)
 - b. **No. Except FLHR/C.** [Go to Test 11.](#)
 - c. **No. FLHR/C.** Repair (BK/R) wire between [22B] terminal 6 and [64-1B] socket terminal 4H.

11. Start Switch Circuit Continuity [2B] Test

1. Disconnect interconnect harness [2].
2. Test for continuity between [2B] terminal 2 and [22B] terminal 6.

3. Is continuity present?
 - a. **Yes.** Repair open between [2B] terminal 2 and [22B] terminal 6 (BK/R) wire. **(5041)**
 - b. **No.** [Go to Test 13.](#)

12. Start Switch Circuit Continuity [2A] Test

1. Test for continuity between [2A] terminal 2 and [64-1B] socket terminal 4H (BK/R) wire.
2. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open between [2A] terminal 2 and [64-1B] socket terminal 4H (BK/R) wire. **(5041)**

13. Start Relay Control Circuit Test

1. Test for continuity between [64-1B] socket terminal 3G (TN/GN) wire and ground.
2. Is continuity present?
 - a. **Yes.** Replace start relay. See the service manual. If problem is still present, see [3.2 STARTING SYSTEM, Start Relay Clicks.](#) **(5832)**
 - b. **No.** [Go to Test 14.](#)

14. Start Relay Control Circuit Open Test

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness [30B] and TSM/TSSM/HFSM [30A]. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Test for continuity between [64-1B] socket terminal 3G and breakout box terminal 9 (TN/GN) wire.
3. Is continuity present?
 - a. **Yes.** [Go to Test 15.](#)
 - b. **No, without anti-theft tracking module.** Repair open between [64-1B] socket terminal 3G and TSM/TSSM/HFSM [30B] terminal 9 (TN/GN) wire. **(5041)**
 - c. **No, with anti-theft tracking module.** [Go to Test 20.](#)

15. TSM/TSSM/HFSM Ground Test

1. Test for continuity between breakout box terminal 12 (BK) wire and ground.
2. Is continuity present?
 - a. **Yes.** [Go to Test 16.](#)
 - b. **No.** Repair open between TSM/TSSM/HFSM [30B] terminal 12 and right GND 2 (BK/GN) wire. **(5041)**

16. Continuity at Neutral Switch Test

1. Verify that transmission is in neutral.
2. Measure for resistance between breakout box terminal 4 (TN) wire and ground.
3. Is resistance less than 10 Ohms?
 - a. **Yes.** [Go to Test 18.](#)
 - b. **No.** [Go to Test 17.](#)

17. Neutral Switch Ground Circuit Test

1. Test for continuity between neutral switch [131] (BK) wire and ground.
2. Is continuity present?
 - a. **Yes.** Replace neutral switch. See the service manual. **(5157)**
 - b. **No.** Repair open between neutral switch [131] and GND 1 (BK) wire. **(5041)**

18. Start Relay Coil Control Circuit Short to Voltage Test

1. Turn IGN ON.
2. Test for battery voltage on breakout box terminal 9.
3. Is battery voltage present?
 - a. **Yes.** Repair short to voltage between TSM/TSSM/HFSM [30B] terminal 9 and [64-1B] socket terminal 3G on (TN/GN) wire. **(5041)**
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual. **(5838)**

19. Engine Stop Switch Voltage Test

1. Test for voltage between [22B] terminal 3 and ground.
2. Is battery voltage present?
 - a. **Yes.** Replace engine stop switch. See the service manual.
 - b. **No.** Repair open between ignition fuse and [22B] (GY) wire.

20. Relay Enable Circuit Continuity Test

1. Disconnect the anti-theft tracking module.
2. Test for continuity between [64-1B] socket terminal 3G and anti-theft tracking module [266B] terminal C (TN/GN) wire.
3. Is continuity present?
 - a. **Yes.** [Go to Test 21.](#)
 - b. **No.** Repair open in (TN/GN) wire. **(5041)**

21. Anti-Theft Tracking Module Test

1. Test for continuity between breakout box terminal 9 and anti-theft tracking module [266B] terminal D (TN/GN) wire.
2. Is continuity present?
 - a. **Yes.** Replace the anti-theft tracking module. See the service manual. **(6756)**
 - b. **No.** Repair open in (GN) wire. **(5041)**

START RELAY CLICKS

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

Table 3-8. Start Relay Clicks Diagnostic Faults

POSSIBLE CAUSES
Low battery
Starter solenoid malfunction
Open starter solenoid control circuit
Open starter solenoid ground circuit

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed, attempt to start engine, if start relay continues to click and starter does not engage. [Go to Test 2.](#)

2. Starter Solenoid Control Coil Voltage Test

1. With IGN OFF, disconnect starter solenoid [128].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for battery voltage on [128B] terminal 1 (GN) wire.
4. Is battery voltage present when start switch is pressed?
 - a. **Yes.** Replace starter solenoid assembly. See the service manual. **(5845)**
 - b. **No.** [Go to Test 3.](#)

3. Starter Solenoid Control Coil Continuity Test

1. Turn IGN OFF and remove start relay.
2. Test for continuity between [128B] terminal 1 and fuse block [64-1B] socket terminal 4G (GN) wire.
3. Is continuity present?
 - a. **Yes.** See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#). If relay tests good, continue with tests. [Go to Test 4.](#)
 - b. **No.** Repair open between [128B] terminal 1 and [64-1B] socket terminal 4G (GN) wire. **(5041)**

4. Start Solenoid Wiring Inspection Test

1. Inspect for corrosion or damage to the wiring from [128A] to starter solenoid.
2. Are there any problems?
 - a. **Yes.** Repair damage or replace starter solenoid assembly. See the service manual. If problem is still present, then continue with tests. [Go to Test 5.](#) **(5845)**
 - b. **No.** [Go to Test 5.](#)

5. Starter Solenoid Test

1. With IGN ON, press the start switch.
2. Does starter solenoid click?
 - a. **Yes.** See [3.2 STARTING SYSTEM, Starter Solenoid Clicks](#).
 - b. **No.** Repair open in [64-1B] socket terminal 3H (R/BK) wire.

STARTER SOLENOID CLICKS

Table 3-9. Starter Solenoid Clicks Diagnostic Faults

POSSIBLE CAUSES
Low battery
Starter malfunction
Starter solenoid malfunction
Open battery cable
Open starter cable
Mechanical binding

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** Charge or replace battery as needed. Attempt to start engine. If starter solenoid continues to click and starter does not engage, then continue with tests. [Go to Test 2](#).

2. Starter Voltage Drop Test

1. Perform voltage drop tests from battery (+) to starter stud on starter (BK) wire. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#).
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** [Go to Test 3](#).
 - b. **No.** [Go to Test 5](#).

3. Starter Solenoid Voltage Drop Starter Side Test

1. Perform voltage drop test from battery (+) terminal to starter solenoid terminal 2 (BK) wire.
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** Replace starter solenoid assembly. See the service manual. **(5845)**

4. Starter Solenoid Battery Side Voltage Drop Test

1. Perform voltage drop test from battery (+) terminal to starter solenoid terminal 1 (BK) wire.

2. Is voltage drop greater than 1.0V?
 - a. **Yes.** Repair or replace (BK) wire from starter solenoid terminal 1 to battery (+) terminal. **(5041)**
 - b. **No.** Replace starter solenoid assembly. See the service manual. **(5845)**

5. Starter Ground Circuit Voltage Drop Test

1. Perform voltage drop test from battery (-) terminal to ground.
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** Inspect (BK) wire for damage from battery (-) terminal to chassis ground, repair or replace if necessary. [Go to Test 6](#).
 - b. **No.** [Go to Test 7](#).

6. Starter Ground Test

1. Remove starter attaching bolts. See the service manual.
2. Clean bolts and starter base, install starter bolts.
3. Does engine crank?
 - a. **Yes. Engine cranks at normal speed.** Repair complete.
 - b. **Yes. Engine cranks, but at a slower speed.** See [3.3 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test](#).
 - c. **No.** Replace starter. See the service manual. **(5817)**

7. Starter Draw Test

1. Perform Starter Current Draw Test on motorcycle. See [3.3 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test](#).
2. Perform Starter Motor Free Running Current Draw Test (on bench). See [3.4 TESTING STARTER ON BENCH, Free Running Current Draw Test](#).
3. Are test results within range?
 - a. **Yes.** [Go to Test 8](#).
 - b. **No.** Replace starter. See the service manual. **(5817)**

8. Mechanical Binding Test

1. Remove spark plugs and place transmission in 5th gear.
2. Raise vehicle.
3. Rotate rear wheel.
4. Check for engine binding in the primary and/or crankshaft or starter clutch.
5. Is engine binding? See the service manual.
 - a. **Yes.** Repair as needed. (Use appropriate code).
 - b. **No.** Replace starter solenoid assembly. **(5845)**

STARTER SPINS BUT DOES NOT ENGAGE

Table 3-10. Starter Spins But Does Not Engage Diagnostic Faults

POSSIBLE CAUSES
Clutch assembly
Clutch shell and sprocket

1. Pinion Gear and Clutch Shell Test

1. Remove primary cover.
2. Inspect for damage to starter pinion gear and clutch shell and sprocket.
3. Is damage present?
 - a. **Yes.** Replace the clutch assembly or clutch shell and sprocket. See the service manual. **(5825)**
 - b. **No.** Replace the clutch assembly. See the service manual. **(5837)**

STARTER STALLS OR SPINS TOO SLOWLY

Table 3-11. Starter Stalls or Spins Too Slowly Diagnostic Faults

POSSIBLE CAUSES
Low battery
Starter malfunction
Starter solenoid malfunction
Poor connections at starter ground
Open battery cable
Open starter cable

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed. If symptom is still present, then continue with tests. [Go to Test 2.](#)

2. Starter Stud Voltage Drop Test

1. Perform voltage drop test from battery (+) terminal to starter stud on starter (BK) wire. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#).

2. Is voltage drop greater than 1.0V?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 3.](#)

3. Starter Ground Circuit Voltage Drop Test

1. Perform voltage drop test between battery (-) terminal and starter attaching bolts.
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** Clean ground connections. **(5041)**
 - b. **No.** [Go to Test 4.](#)

4. Starter Draw Test

1. Perform Starter Current Draw Test on motorcycle. See [3.3 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test](#).
2. Perform Starter Motor Free Running Current Draw Test (on bench). See [3.4 TESTING STARTER ON BENCH, Free Running Current Draw Test](#).
3. Are test results within range?
 - a. **Yes.** With the spark plugs removed and the transmission in 5th gear, rotate rear wheel. Check for engine, primary and/or crankshaft bind. (Use appropriate code)
 - b. **No.** Replace starter. See the service manual. **(5817)**

5. Starter Solenoid Voltage Drop Starter Side Test

1. Perform voltage drop test between battery (+) terminal to starter solenoid terminal 2.
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair connection or (BK) wire between starter solenoid and starter. **(5041)**

6. Starter Solenoid Battery Side Voltage Drop Test

1. Perform voltage drop test between battery (+) terminal and starter solenoid terminal 1 (R) wire.
2. Is voltage drop greater than 1.0V?
 - a. **Yes.** Repair or replace connection between battery (+) terminal and starter solenoid terminal 1 (R) wire. **(5041)**
 - b. **No.** Repair or replace starter solenoid assembly. See the service manual. **(5845)**

TESTING STARTER ON MOTORCYCLE

3.3

STARTER CURRENT DRAW TEST

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

NOTES

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

Check starter current draw with an induction ammeter before disconnecting battery. Proceed as follows:

1. Verify that transmission is in neutral and engine stop switch is in OFF position.
2. Remove start relay.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect patch cord to fuse block [64-1B] socket terminals 4G and 3H.

4. Clamp induction ammeter over positive starter cable to starter solenoid.

NOTE

In next step with engine stop switch in OFF position and purple male probes connected to the [64-1B] terminals 4G and 3H in place of the start relay, starter will turn but engine will not start. This configuration also prevents diagnostic trouble codes from being set.

5. With IGN ON, read the ammeter. Disregard initial high current reading which is normal when engine is first turned over.
 - a. Typical starter current draw will range between 160-200A.
 - b. If starter current draw exceeds 250A, then the problem may be in the starter or starter drive. See [3.4 TESTING STARTER ON BENCH, Free Running Current Draw Test](#).



TESTING STARTER ON BENCH

3.4

FREE RUNNING CURRENT DRAW TEST

1. Place starter in vise, using a clean shop towel to prevent scratches or other damage.
2. See [Figure 3-5](#). Attach one heavy jumper cable (6 gauge minimum).
 - a. Connect one end to the starter mounting flange.
 - b. Connect the other end to the battery (-) terminal of a fully charged battery.
3. Connect a second heavy jumper cable (6 gauge minimum).
 - a. Connect one end to the battery (+) terminal of the battery.
 - b. Connect the other end to the battery terminal on the starter. Place an induction ammeter over cable.

CAUTION

Keep fingers and clothing away from starter gear to prevent personal injury. (00613b)

4. Connect a smaller jumper cable (14 gauge minimum).
 - a. Connect one end to the positive (+) terminal of the battery.
 - b. Connect the other end to the solenoid relay terminal.
5. Check ammeter reading.
 - a. Ammeter should show 90A max.
 - b. If reading is higher, replace starter. See the service manual.
 - c. If starter current draw on vehicle was over 120A and this test was within specification, there may be a problem with engine or primary drive.

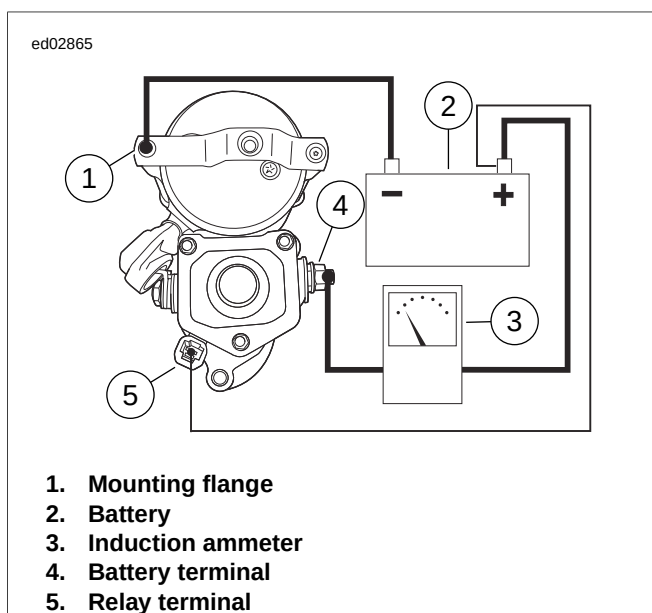


Figure 3-5. Free Running Current Draw Test

STARTER SOLENOID

Do not disassemble solenoid. Before testing, disconnect field wire from solenoid motor terminal as shown in [Figure 3-6](#).

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 3-6](#). Using a 12V 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 solenoid assembly.

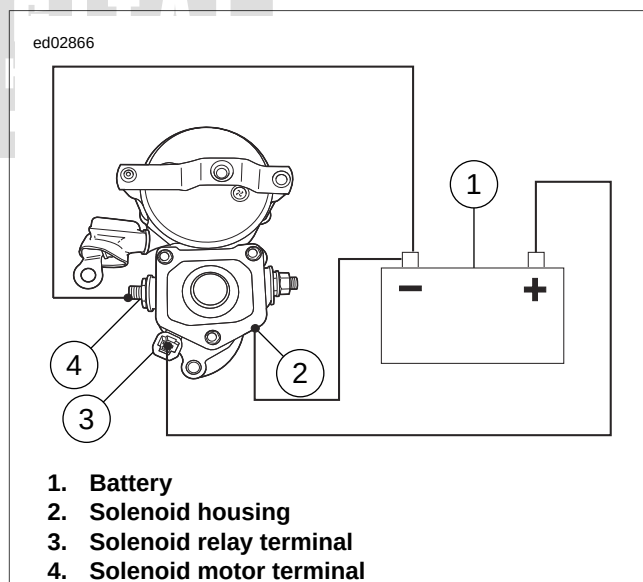


Figure 3-6. Pull-In Test

SOLENOID HOLD-IN TEST

1. See [Figure 3-7](#). With test leads still connected in the manner specified in the previous [3.4 TESTING STARTER ON BENCH, Solenoid Pull-In Test](#), disconnect solenoid motor terminal/battery negative test lead 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 solenoid assembly.

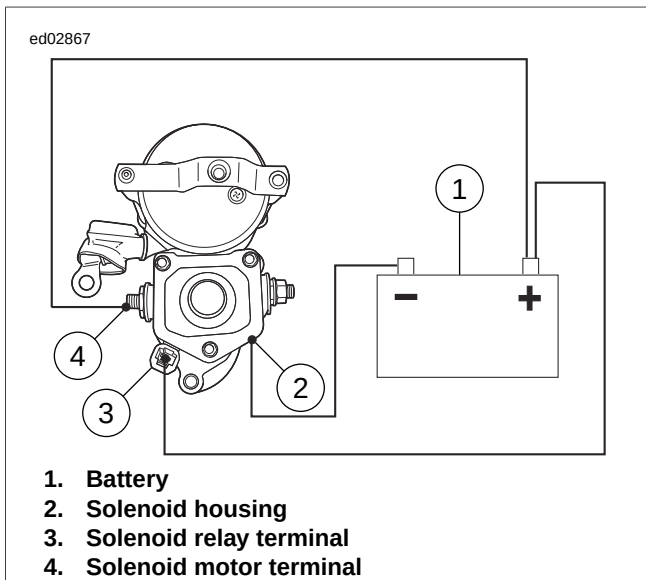


Figure 3-7. Hold-In Test

- [ON BENCH, Solenoid Hold-In Test](#), disconnect solenoid relay terminal/positive battery post test lead at either end.
2. Observe starter pinion.
 - a. If starter shaft retracts, solenoid is working properly.
 - b. If starter shaft does not retract, replace solenoid assembly.

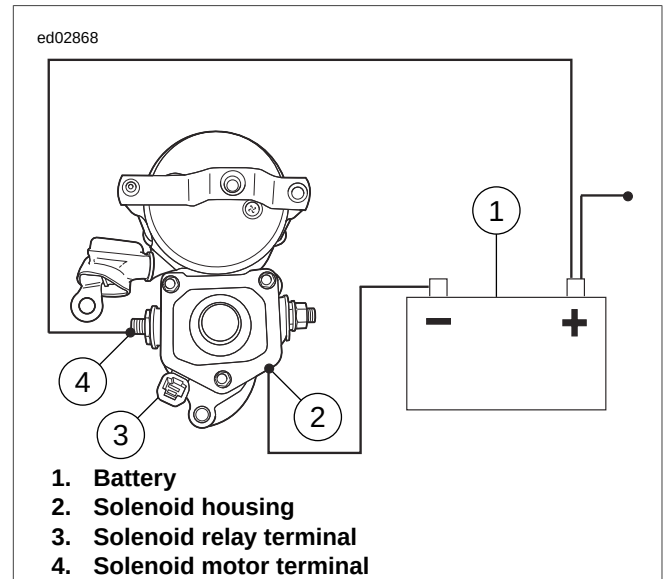


Figure 3-8. Return Test

SOLENOID RETURN TEST

1. See [Figure 3-8](#). With test leads still connected in the manner specified at the end of [3.4 TESTING STARTER](#)

CHARGING SYSTEM

3.5

DESCRIPTION AND OPERATION

The charging system is the source of electric current that supplies power to run the ignition, lights, accessories and charge the battery. AC voltage is generated by an alternator assembly driven by the crankshaft. A rotor supplied with a magnetic field spins around a stator. A rectifier (located in the regulator) converts the voltage from AC to DC. A regulator ensures that the output voltage is properly matched to the battery voltage as engine speed varies. Even though the alternator provides additional voltage at all engine speeds, it is not recommended to idle the vehicle for long periods of time.

Alternator

The alternator consists of two main components:

- The rotor which mounts to the primary side of the crankshaft.
- The stator which is attached to the crankcase half.

Voltage Regulator

See [Figure 3-9](#). The voltage regulator is a series regulator. The circuit combines the functions of rectifying and regulating.

TROUBLESHOOTING

When the charging system fails to charge or does not charge at a satisfactory rate, check the following items.

Battery

Test for a weak or dead battery. Battery must be fully charged in order to perform a load test or starting or charging tests. See [3.1 BATTERY TESTING](#).

Wiring

The stator connections must be clean and tight.

Check for corroded or loose connections in the charging system circuit.

Voltage Regulator Inspection

The voltage regulator must have clean, tight connections for proper operation. Verify both AC and DC connectors are fully inserted and locked with the regulator latch.

Job/Time Code Values

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

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

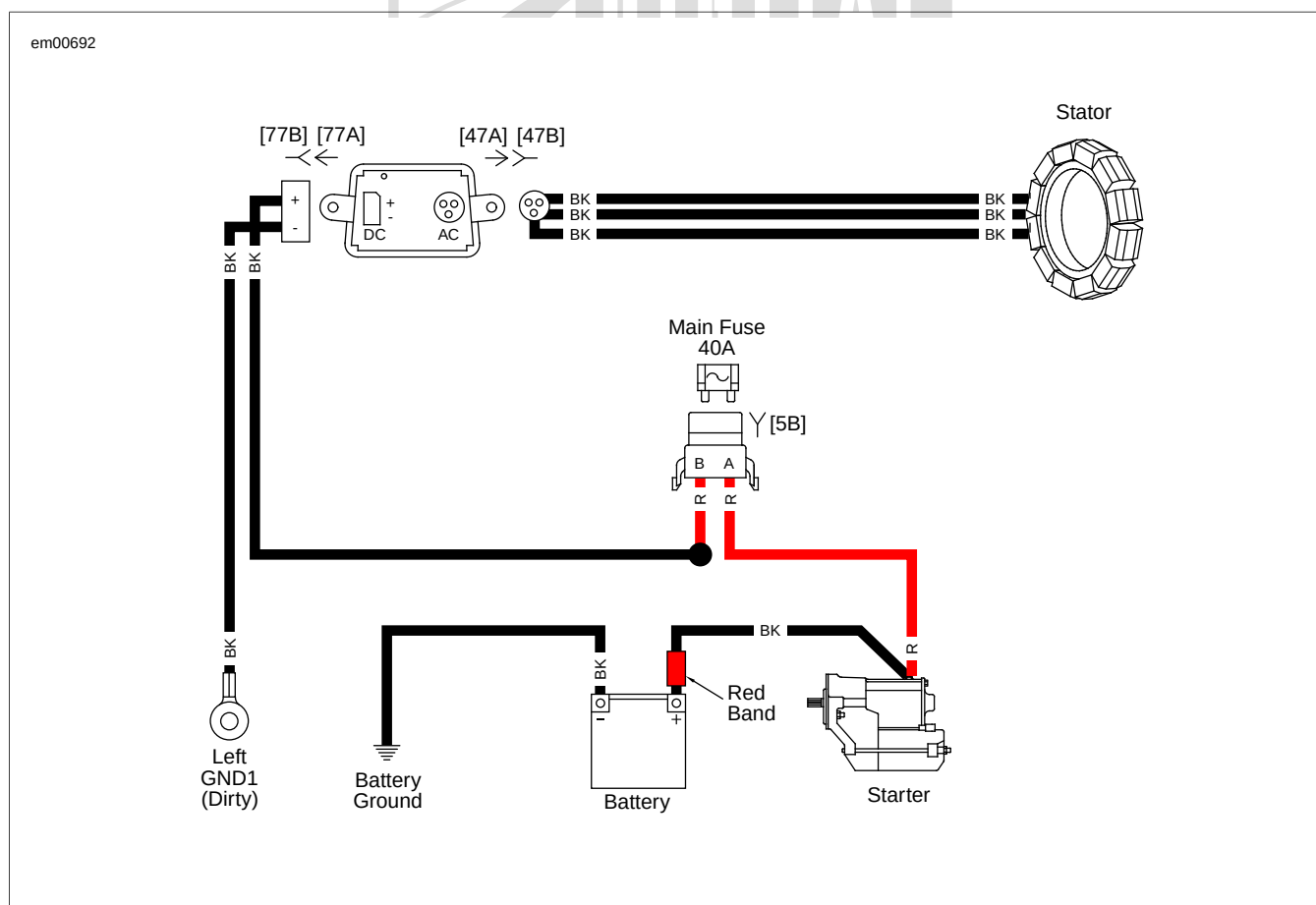


Figure 3-9. Charging System Circuit

LOW OR NO CHARGING

Table 3-12. Low or No Charging Diagnostic Faults

POSSIBLE CAUSES
Low battery
Stator malfunction
Rotor malfunction
Voltage regulator malfunction
Open voltage regulator circuit
Stator shorted to ground
AC wire shorted to ground

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed. Verify repair.

NOTE

A discharged battery may show a reading under 13V even though the charging system is working properly.

2. Off Idle Voltage Test

1. With the vehicle is neutral, start engine and run at 3000 rpm.
2. Test battery voltage.
3. Is voltage above 13V?
 - a. **Yes.** Charging system working properly.
 - b. **No.** [Go to Test 3.](#)

3. AC Output Test

1. Perform an AC output test. See [3.5 CHARGING SYSTEM, Battery Charging Tests](#).
2. Did the output test pass?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 4.](#)

4. Stator Test

1. Perform a stator test. See [3.5 CHARGING SYSTEM, Battery Charging Tests](#).
2. Is the stator good?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace stator. See the service manual. **(5309)**

5. Rotor Inspection Test

1. Inspect the rotor for damage.
2. Remove center bolt and inspect for signs of the center hole becoming oval. See the service manual.

3. Verify that stator bolts have not backed out and contacted the rotor.
4. Is rotor in good condition?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Replace rotor. See the service manual. **(5319)**

6. Voltage Regulator Power Circuit Test

1. With IGN OFF, disconnect voltage regulator [77].
2. Test for continuity between voltage regulator [77B] terminal + and main fuse [5B].
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open wire between voltage regulator [77B] terminal + and [5B]. **(5041)**

7. Voltage Regulator Ground Circuit Test

NOTE

The voltage regulator ground must have a clean, tight connection for proper grounding.

1. Test for continuity between voltage regulator [77B] terminal - and ground.
2. Is continuity present?
 - a. **Yes.** Replace voltage regulator. See the service manual. **(5316)**
 - b. **No.** Repair open wire between voltage regulator [77B] terminal - and GND 1 (BK) wire. **(5041)**

OVERCHARGING

Table 3-13. Overcharging Diagnostic Faults

POSSIBLE CAUSES
Voltage regulator malfunction

1. Battery Voltage Test

1. With the vehicle in neutral, start engine and run at 3000 rpm, test battery voltage.
2. Is voltage above 15.5V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charging system working properly.

2. Voltage Regulator Ground Circuit Test

NOTE

The voltage regulator ground must have a clean, tight connection for proper grounding.

1. With IGN OFF, disconnect voltage regulator [77].
2. Test for continuity between voltage regulator [77B] terminal - and ground.

3. Is continuity present?
 - a. **Yes.** Replace voltage regulator. See the service manual. (5316)
 - b. **No.** Repair open wire between voltage regulator [77B] terminal - and GND 1 (BK) wire. (5041)

LOW BATTERY AFTER EXTENDED IGN OFF

Table 3-14. Low Battery After Extended IGN OFF Diagnostic Faults

POSSIBLE CAUSES
Battery
Accessories improperly wired to stay on at all times
Excessive draw from electrical component with IGN OFF
Battery self-discharge and/or component draw because motorcycle was not operated for a long period

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed. Verify repair.

2. Amp Draw Test

1. Perform a milliampere draw test. See [3.5 CHARGING SYSTEM, Battery Charging Tests](#).
2. Did the test exceed maximum draw?
 - a. **Yes.** Repair excessive draw and run test again. (5308)
 - b. **No.** System is working properly.

BATTERY RUNS DOWN DURING USE

Table 3-15. Battery Runs Down During Use Diagnostic Faults

POSSIBLE CAUSES
Low battery
Excessive accessory draw
Accessories on when idling or low rpm riding for extended period

1. Total Current Draw Test

1. Perform a Total Current Draw and Output Test. See [3.5 CHARGING SYSTEM, Battery Charging Tests](#).
2. Does charging system exceed current draw by 3.5A?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** System accessory power requirements exceed charging system capability.

2. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).

2. Is battery condition good?
 - a. **Yes.** System is working properly.
 - b. **No.** Charge or replace battery as needed.

BATTERY CHARGING TESTS

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

Milliampere Draw Test

NOTE

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

1. If vehicle is equipped with HFSM, enable service mode before performing test.
2. Disconnect the security siren (if equipped).
3. Remove main fuse.

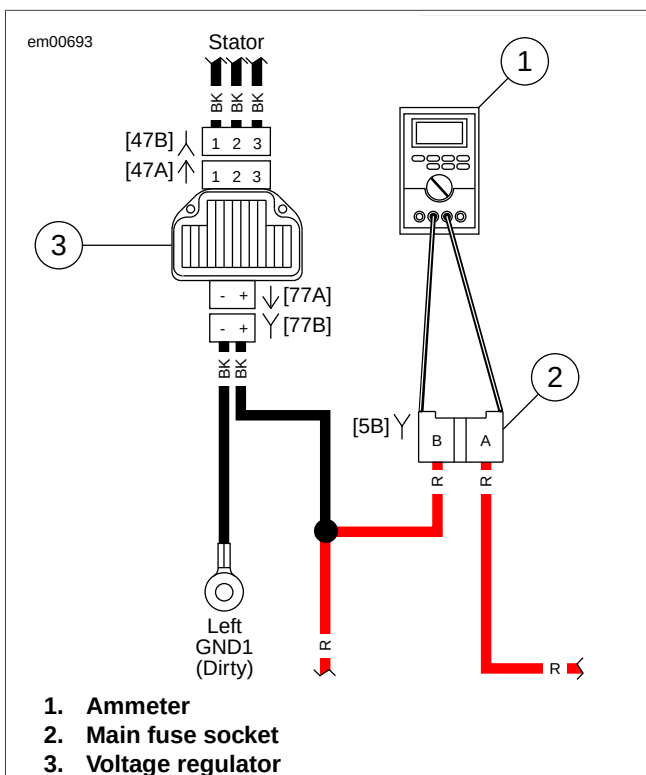
NOTE

With IGN OFF, an initial current draw of up to 200 mA will occur directly after connecting meter. This should drop to the values shown in [Table 3-16](#) in less than one minute.

4. See [Figure 3-10](#). Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect ammeter to main fuse socket terminals. With this arrangement, you will pick up any drain.
5. With IGN OFF and all lights and accessories off, observe current reading.
 - a. Add voltage regulator draw to appropriate value for TSM/TSSM/HFSM and ECM. If observed ammeter reading is less than listed in table, draw is within limits. Refer to [Table 3-16](#).
 - b. A higher reading indicates excessive current draw. Any accessories must be considered and checked for excessive drain.

Table 3-16. Milliampere Draw Test

ITEM	MAXIMUM DRAW IN MILLIAMPERES
ECM	1.0
Speedometer	1.0
Tachometer	1.0
TSM (no security)	1.0
TSSM (armed)	3.0
TSSM (disarmed)	3.0
TSSM (storage mode)	1.0
HFSM	1.0
Security siren (optional)	20.0*
Voltage regulator	2.0
Radio	2.0
High output amplifier	1.0
CB module	1.0
XM module	1.0
* Siren draws for 2-24 hours from the time the motorcycle battery is connected and 0.05 milliamperes once siren battery is charged. Disconnect siren during milliampere draw test.	

**Figure 3-10. Milliampere Draw Test (Ignition Turned to OFF)**

Total Current Draw and Output 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)

- See [Figure 3-11](#). Connect load tester.
 - Connect negative and positive leads to battery terminals.
 - Place load tester induction pickup over battery negative cable.
- With IGN OFF, disconnect voltage regulator [77].
- Start engine.
- Turn all continuously running lights and accessories turned ON (headlamp on high beam).
- Run engine at 3000 rpm, and make note of the current draw.
- Turn engine OFF.
- With IGN OFF, connect voltage regulator [77].
- Remove the induction pickup from the battery negative cable.
- Place induction pickup over positive regulator cable.
- Start engine and run at 3000 rpm.

NOTE

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 13.0V.
- Current output should be 35-50A. Make note of current output.

NOTE

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

- Compare both of these readings.
 - The current output should exceed current draw by 3.5A minimum.
 - If output does not meet specifications, there may be too many accessories for the charging system to handle.

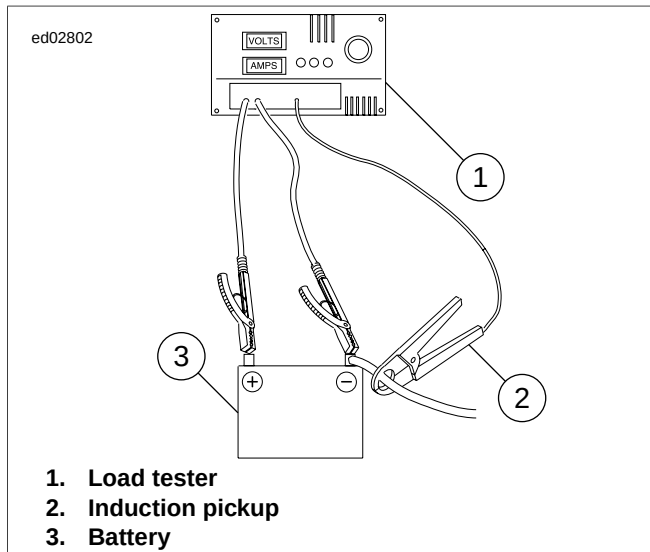


Figure 3-11. Check Current Draw (Ignition Switch On)

Stator Test

1. Turn IGN OFF.
2. See [Figure 3-12](#). Connect an ohmmeter.
 - a. Disconnect voltage regulator [47] from 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.
 - a. A good stator will show no continuity (open circuit) between all stator sockets and ground.
 - b. Any other reading indicates a grounded stator which must be replaced.
4. See [Figure 3-13](#). Remove ground lead. Measure resistance across stator [47B] terminals 1-2, 2-3 and 3-1.
 - a. Resistance across all the stator terminals should be 0.1-0.3 Ohm.
 - b. If the resistance is higher, the stator is damaged and must be replaced.
 - c. If resistance is lower, the stator may have a turn-to-turn short and should be replaced.

NOTE

When measuring resistance (Ohms), compensate for test lead resistance before performing the measurement. Select the Ohms position and touch the test leads together. Refer to the multimeter user's manual to either zero the display or manually subtract the test lead resistance from the measured circuit's value.

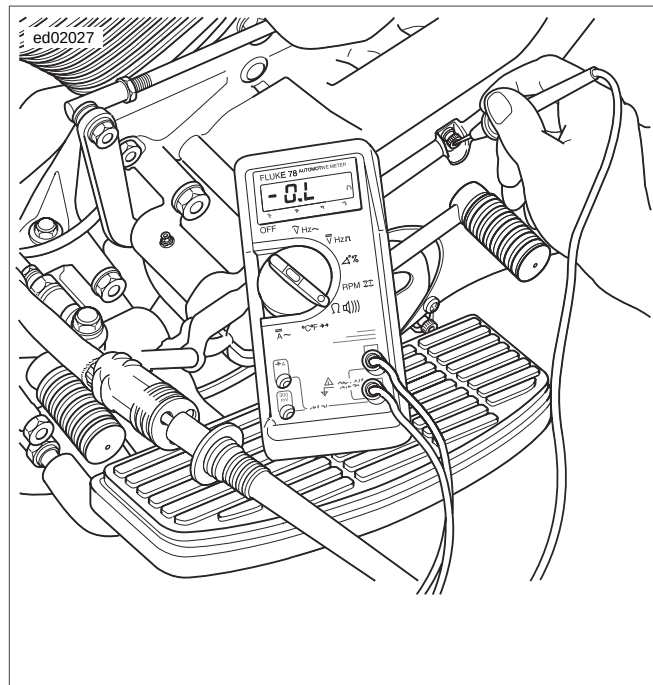


Figure 3-12. Test for Grounded Stator (Typical)

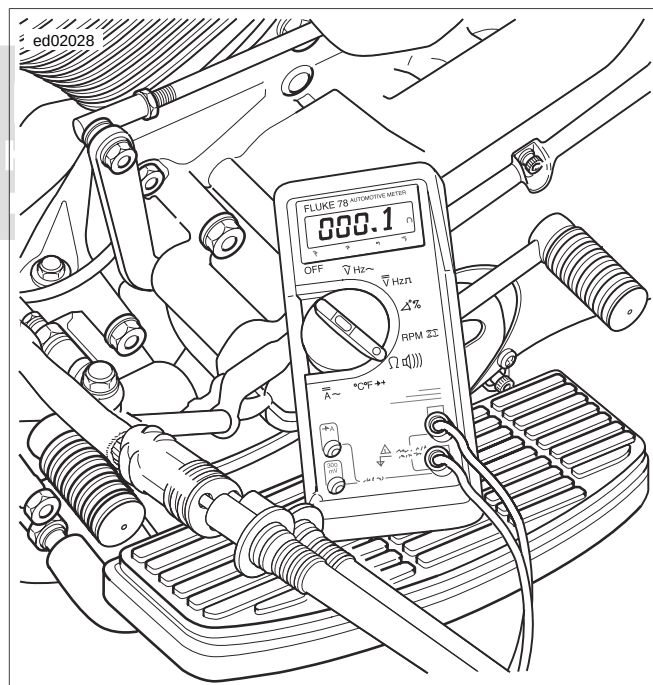


Figure 3-13. Check for Stator Resistance (Typical)

AC Output Test

1. See [Figure 3-14](#). Test AC output.
 - a. Disconnect voltage regulator [47] from alternator stator wiring.
 - b. Test for VAC across stator [47B] terminals 1 to 2.
 - c. Run the engine at 2000 rpm. The VAC output should be 32-46 VAC (approximately 16-22 per 1000 rpm).
 - d. Repeat test using terminals 2 to 3 and 1 to 3.
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 within specifications, charging problem might be faulty voltage regulator. Replace as required. See the service manual.
3. Check the output again as previously described under Total Current Draw and Output Test.

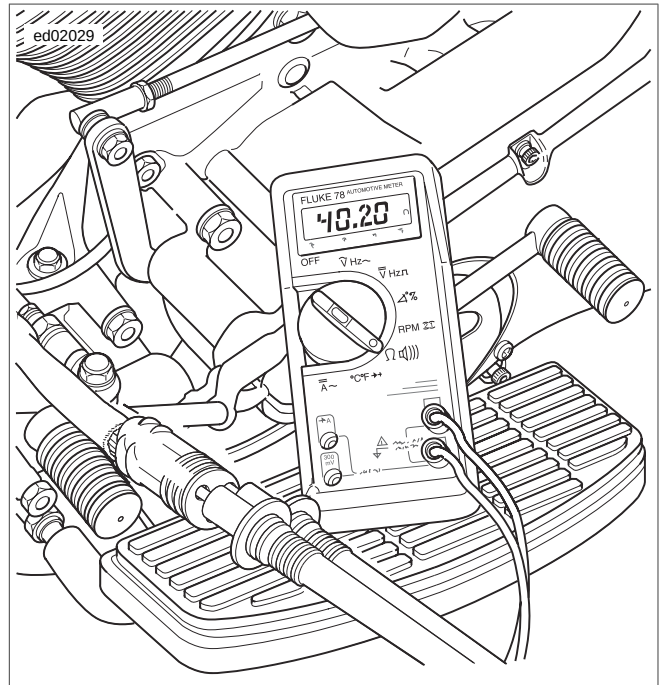


Figure 3-14. Check Stator AC Voltage Output (Typical)



DTC B0563, P0562, P0563

3.6

DESCRIPTION AND OPERATION

Battery voltage is monitored by several modules. If the battery voltage fails to meet normal operating parameters, a DTC is set.

DTC B0563

Battery voltage is monitored by the TSM/TSSM/HFSM on terminal 1. DTC B0563 is displayed when the TSM/TSSM/HFSM exceeds 16.0V for more than 5.0 ±0.5 seconds.

DTC P0562 and P0563

Battery voltage is monitored by the ECM on terminal 13.

- DTC P0562 is displayed when battery voltage is less than 12.2V at idle and voltage does not increase when engine speed is greater than 2000 rpm.
- DTC P0563 is displayed when battery voltage is greater than 15.0V for more than 4 seconds.

Table 3-17. Code Description

DTC	DESCRIPTION
B0563	TSM/TSSM/HFSM voltage high
P0562	ECM voltage low
P0563	ECM voltage high

DIAGNOSTICS

Diagnostic Tips

Any of the following conditions could cause these DTCs to set:

- The vehicle is placed on a battery charger, on fast charge, for a long period of time.
- The charging system is malfunctioning
- There is excessive battery draw and/or extended idling in heavy traffic.
- A faulty system ground is present.

Low voltage generally indicates a loose wire, corroded connections, battery and/or a charging system problem.

High voltage DTC may set when the vehicle is placed on a battery charger, for a long period of time.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).





DTC P0562

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 3-18. DTC P0562 Diagnostic Faults

POSSIBLE CAUSES
Low battery
Ignition switch malfunction
Engine stop switch malfunction
ECM malfunction
Open ECM ground circuit
Open ECM switched power circuit
Open ignition circuit

1. Battery Test

1. Verify battery condition. See [3.1 BATTERY TESTING](#).
2. Is battery condition good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery as needed. Verify repair.

2. Charging System Test

1. Perform charging system test. See [3.5 CHARGING SYSTEM, Low or No Charging](#).
2. Is charging system working properly?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair charging system. [Go to Test 15.](#)

3. ECM Switched Voltage Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78A] and ECM [78B]. See [1.2 DIAGNOSTIC TOOLS](#).
2. With the engine stop switch in the RUN position and the transmission in neutral, turn the IGN ON.
3. Test for voltage on breakout box between terminals 72 and 73.
4. Is battery voltage present?
 - a. **Yes.** System is working properly. [Go to Test 15.](#)
 - b. **No.** [Go to Test 4.](#)

4. ECM Switched Voltage Drop Test

1. Perform a voltage drop test between battery (+) terminal and breakout box terminal 72. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#).
2. Is voltage drop greater than 0.5V?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 5.](#)

5. ECM Ground Circuit Voltage Drop Test

1. Test for voltage drop test between breakout box terminal 73 and battery (-) terminal.
2. Is voltage drop greater than 0.5V?
 - a. **Yes.** Repair wiring between ECM [78B] terminal 73 and battery negative.
 - b. **No.** Problem may be intermittent. Locate and repair bad connection. Perform [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#). If no problem is found, continue with tests. [Go to Test 15.](#)

6. ECM Switched Power Circuit Resistance Test

1. With IGN OFF, remove system relay.
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between breakout box terminal 72 and fuse block [64-2B] socket terminal 4D (W/BK) wire.
3. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair (W/BK) wire between ECM [78B] terminal 72 and [64-1B] socket terminal 4D.
 - b. **No.** [Go to Test 7.](#)

7. Switched Power Circuit Resistance Test

1. Disconnect right hand controls [22].
2. Measure resistance between [22B] terminal 4 and [64-1B] socket terminal 4D (W/BK) wire.
3. Is resistance greater than 1 Ohm?
 - a. **Yes. Except FLHR/C.** [Go to Test 8.](#)
 - b. **Yes. FLHR/C.** Repair (W/BK) wire between [22B] terminal 4 and [64-2B] socket terminal 4D.
 - c. **No.** [Go to Test 10.](#)

8. Switched Power Circuit Resistance [1A] Test

1. Disconnect interconnect harness [1].
2. Measure resistance between [22B] terminal 4 and [1A] terminal 6 (W/BK) wire.
3. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair (W/BK) wire between [22B] terminal 4 and [1A] terminal 6.
 - b. **No.** [Go to Test 9.](#)

9. Switched Power Circuit Resistance [1B] Test

1. Measure resistance between [64-2B] socket terminal 4D and [1B] terminal 6 (W/BK) wire.
2. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair (W/BK) wire between [64-2B] socket terminal 4D and [1B] terminal 6.
 - b. **No.** [Go to Test 10.](#)

10. Ignition Circuit Resistance Test

1. Measure resistance between ignition fuse [64-2B] socket terminal 1F and [22B] terminal 3 (GY) wire.
2. Is resistance greater than 1 Ohm?
 - a. **Yes. Except FLHR/C.** [Go to Test 11.](#)
 - b. **Yes. FLHR/C.** Repair (GY) wire between [22B] terminal 3 and [64-2B] socket terminal 1F.
 - c. **No.** [Go to Test 13.](#)

11. Ignition Circuit Resistance [1A] Test

1. Disconnect interconnect harness [1].
2. Measure resistance between [22B] terminal 3 and [1A] terminal 3 (GY) wire.
3. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair (GY) wire between [22B] terminal 3 and [1A] terminal 3.
 - b. **No.** [Go to Test 12.](#)

12. Ignition Circuit Resistance [1B] Test

1. Measure resistance between [64-1B] socket terminal 4D and [1B] terminal 3 (GY) wire.
2. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair (W/BK) wire between [64-1B] socket terminal 4D and [1B] terminal 3.
 - b. **No.** [Go to Test 10.](#)

13. Engine Stop Switch Test

1. Measure resistance between [22A] terminals 4 (GY) wire and 3 (W/BK) wire.
2. Is resistance greater than 1 Ohm?
 - a. **Yes.** Replace the engine stop switch assembly. See the service manual.
 - b. **No.** [Go to Test 14.](#)

14. Ignition Circuit Voltage Drop Test

1. With IGN ON, perform a voltage drop test between battery (+) terminal and [64-2B] socket terminal 1E. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#).
2. Is voltage drop greater than 0.5V?
 - a. **Yes.** [Go to Test 15.](#)
 - b. **No.** [Go to Test 17.](#)

15. Ignition Circuit Resistance Test

1. With IGN OFF, disconnect ignition switch [33].
2. Measure resistance between ignition switch [33B] terminal 3 on all vehicles except for FLHR/C, terminal A on FLHR/C (R/BK) wire and [64-2B] socket terminal 1E.

3. Is resistance greater than 1 Ohm?
 - a. **Yes. Except FLHR/C.** Repair wire between ignition switch [33B] terminal A (R/BK) wire and [64-1B] socket terminal 1E.
 - b. **Yes. FLHR/C.** [Go to Test 16.](#)
 - c. **No.** [Go to Test 17.](#)

16. Ignition Switch To [222] Resistance Test

1. Disconnect console ignition switch [222].
2. Measure resistance between ignition switch [33B] terminal A and [222A] terminal A.
3. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair wire between [222A] terminal A and [33B] terminal A (R/BK) wire.
 - b. **No.** Repair wire between [222B] terminal A and [64-2B] socket terminals 1E (R/BK) wire.

17. Ignition Switch Battery Circuit Voltage Drop Test

1. Perform a voltage drop test between battery (+) terminal and ignition switch [33B] terminal 2 on all vehicles except for FLHR/C and terminal B on FLHR/C (R) wire.
2. Is voltage drop greater than 0.5V?
 - a. **Yes.** [Go to Test 18.](#)
 - b. **No.** Replace ignition switch. See the service manual.

18. Battery Voltage to Main Fuse Voltage Drop Test

1. With IGN OFF, remove main fuse.
2. Perform a voltage drop test between battery (+) terminal and main fuse [5B] terminal A (R) wire.
3. Is voltage drop greater than 0.5V?
 - a. **Yes.** Repair wire between battery (+) terminal and main fuse [5B] terminal B (R) wire.
 - b. **No.** [Go to Test 19.](#)

19. Main Fuse to Ignition Switch Resistance Test

1. Measure resistance between main fuse [5B] terminal 2 and ignition switch [33B] terminal B on all vehicles except for FLHR/C and terminal B on FLHR/C (R) wire.
2. Is resistance greater than 1 Ohm?
 - a. **Yes. Except FLHR/C.** Inspect main fuse for corrosion. If main fuse is good, repair wire between main fuse [5B] terminal B and ignition switch [33B] terminal 2 (R) wire.
 - b. **Yes. FLHR/C.** [Go to Test 20.](#)
 - c. **No.** [Go to Test 21.](#)

20. Main Fuse to [222] Resistance Test

1. Disconnect console ignition switch [222].

2. Measure resistance between ignition switch [33B] terminal B and [222A] terminal B.
3. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair wire between [222A] terminal B and [33B] terminal B (R) wire.
 - b. **No.** Repair wire between [222B] terminal B and main fuse [5B] terminal B (R) wire.

21. Repair Validation Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start vehicle.
3. Run at 3000 rpm for 5 seconds.
4. Does code set?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** System working properly.

DTC B0563, P0563

Table 3-19. DTC B0563, P0563 Diagnostic Faults

POSSIBLE CAUSES
Charging system malfunction
TSM/TSSM/HFSM malfunction
ECM malfunction



1. Charging System Test

1. Perform charging system tests. See [3.5 CHARGING SYSTEM](#).
2. Is charging system good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair charging system. [Go to Test 2.](#)

2. Repair Validation Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start vehicle.
3. Run at 3000 rpm for 5 seconds.
4. Does code set?
 - a. **Yes, DTC B0563.** Replace TSM/TSSM/HFSM. See the service manual.
 - b. **Yes, DTC P0563.** Replace ECM. See the service manual.
 - c. **No.** System working properly.

DTC B1006, B1007

DESCRIPTION AND OPERATION

Battery voltage is constantly monitored by the speedometer. If the battery voltage fails to meet normal operating parameters, a DTC is set.

The speedometer monitors terminal 1 for ignition power and terminal 6 for accessory power.

- DTC B1006 is displayed when accessory line voltage is greater than 16.0V for longer than 5 seconds.
- DTC B1007 is displayed when ignition line voltage is greater than 16.0V for longer than 5 seconds.

NOTE

ECM, ECU and/or TSM/TSSM/HFSM may also set a battery voltage DTC.

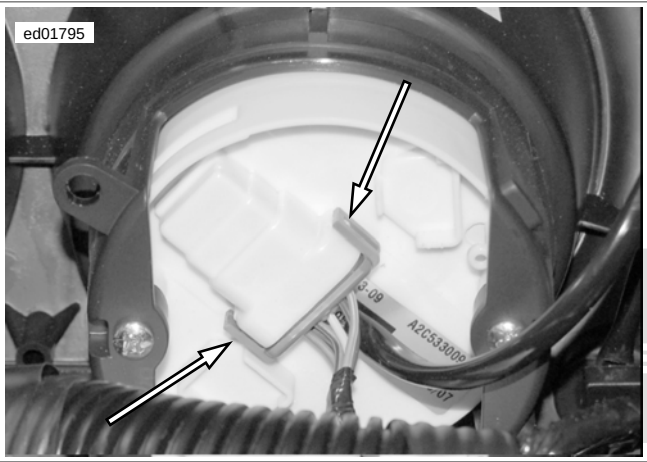


Figure 3-16. Speedometer Connector [39]

Table 3-20. Code Description

DTC	DESCRIPTION
B1006	Accessory line overvoltage
B1007	Ignition line overvoltage

Diagnostic Tips

Voltage high DTC may set when the vehicle is placed on a battery charger, on fast charge, for a long period of time.

DTC B1006, B1007

Table 3-21. DTC B1006, B1007 Diagnostic Faults

POSSIBLE CAUSES
Charging system malfunction
Speedometer malfunction

1. Charging System Test

1. Perform charging system tests. See [3.5 CHARGING SYSTEM](#).
2. Is charging system good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair charging system.

2. Repair Validation Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start vehicle.
3. Run at 3000 rpm for 5 seconds.
4. Does code reset?
 - a. **Yes.** Replace speedometer. See the service manual.
 - b. **No.** System working properly.

NOTES



TABLE OF CONTENTS

SUBJECT	PAGE NO.
4.1 INSTRUMENTS.....	4-1
4.2 DTC B1004, B1005.....	4-3
4.3 DTC B1008.....	4-7
4.4 NO INSTRUMENT POWER.....	4-8
4.5 INDICATOR LAMPS.....	4-12
4.6 GAUGES.....	4-20



NOTES



INSTRUMENTS

4.1

DESCRIPTION AND OPERATION

See [Figure 4-1](#). The speedometer and tachometer (if equipped) contain several indicators. These indicators include the check engine, security, low battery and low fuel lamps. The sixth gear and cruise control indicators may also be shown depending on the model of vehicle.

Trip Odometer Reset Switch Operation

Pressing the trip odometer reset switch provides the following capabilities:

- Change the odometer display between mileage, trip and fuel range values (press and immediately release).
- Reset the trip odometer (press and hold 2-3 seconds).
- Gain access to self-diagnostic mode and clear diagnostic codes. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).

The odometer mileage is permanently stored and will not be lost when electrical power is turned off or disconnected. The trip odometer reset switch allows switching between the odometer, trip odometer and fuel range displays.

To zero the trip odometer, have the odometer display visible, press and keep the trip odometer reset switch depressed. The trip odometer mileage will be displayed for 2-3 seconds and then the trip mileage will return to zero.

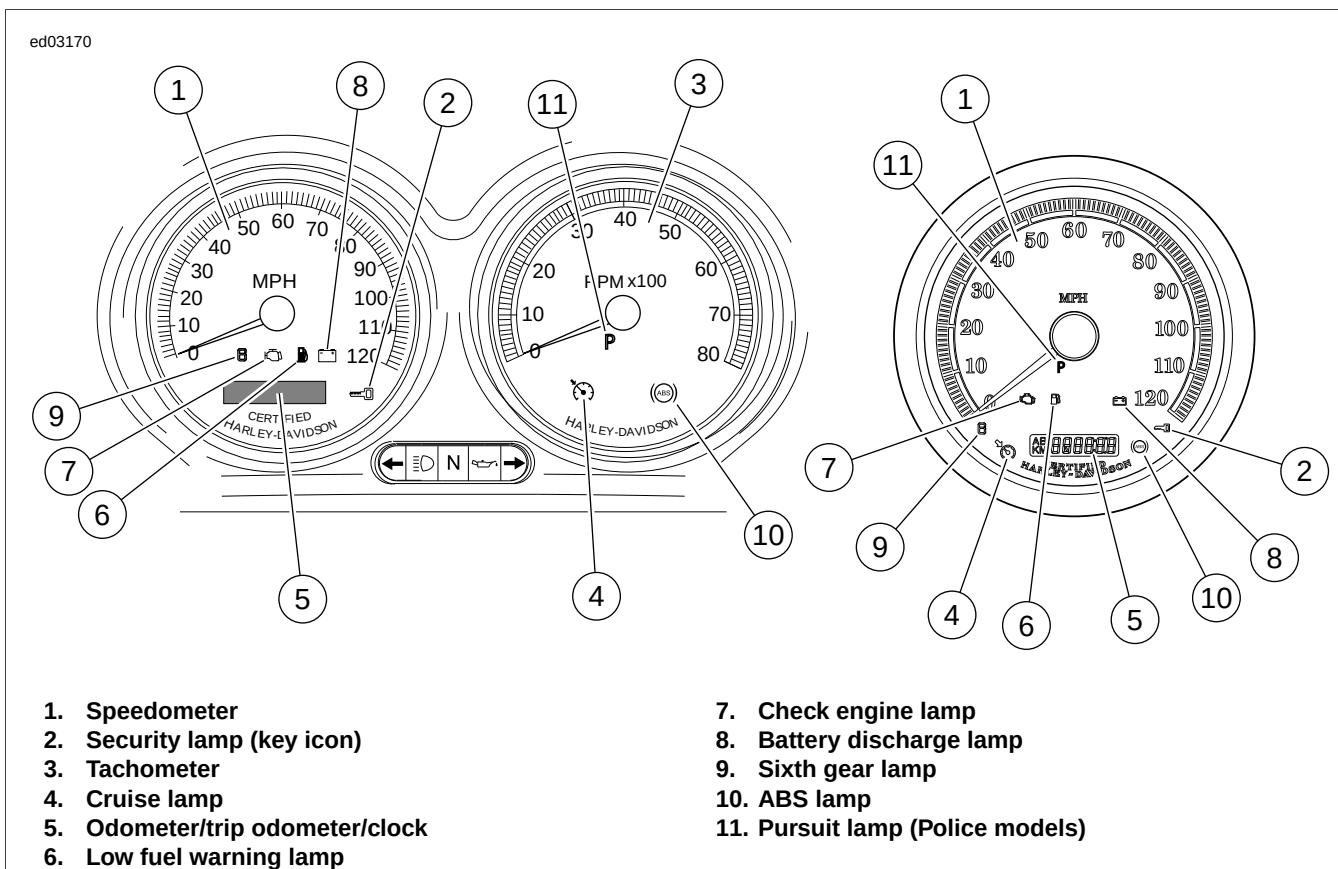


Figure 4-1. Speedometer

SPEEDOMETER THEORY OF OPERATION

The speed sensor is mounted at the back of the transmission case. The sensor circuitry is a Hall-Effect sensor that is triggered by the gear teeth of 5th gear on the transmission mainshaft.

The output from the sensor is a series of pulses that are interpreted by ECM circuitry, converted into serial data then sent to the speedometer. The speedometer converts the data to control the position of the speedometer needle. It also provides input to the TSM/TSSM/HFSM for turn signal cancellation.

TACHOMETER THEORY OF OPERATION

The tachometer receives serial data from the ECM. The ECM converts the signal from the CKP to serial data and sends it to the tachometer. The tachometer interprets the serial data and converts it into tachometer needle movement.

INSTRUMENT DIAGNOSTICS

The speedometer and tachometer monitor direct inputs from sensors and switches, along with receiving information from the ECM over the serial data circuit. They set codes when the parameters for the inputs are out of range. These codes begin with a B prefix to separate them from other types of codes.

Table 4-1. Code Description

DTC	DESCRIPTION
B1004	Fuel level sensor low
B1005	Fuel level sensor high/open
B1006	Speedometer accessory voltage high
B1007	Speedometer ignition voltage high
B1008	Trip switch closed

Some sensors and switches send direct inputs to the instruments and do not have DTCs associated with them. Therefore, symptoms may occur indicating a fault without any DTCs present.



DTC B1004, B1005

4.2

DESCRIPTION AND OPERATION

The fuel level is monitored by the speedometer [39] at terminal 9 (Y/W) wire.

- If the voltage on terminal 9 exceeds the lower limit for greater than or equal to 15 seconds a DTC B1004 will be set and the low fuel warning lamp will illuminate.
- If the voltage on terminal 9 exceeds the upper limit (or is open) for greater than or equal to 15 seconds a DTC B1005 will set and the low fuel warning lamp will illuminate.

Table 4-2. Code Description

DTC	DESCRIPTION
B1004	Fuel level sensor or wiring shorted low
B1005	Fuel level sensor or wiring high/open

Voltage is supplied to the fuel pump and sender from the fuel pump fuse through the (O/GY) wire. Voltage is also supplied to the fuel level sender on the (Y/W) wire from the fuel gauge. As the fuel level changes the resistance of the sender changes. The fuel gauge and the low fuel lamp are controlled through the (Y/W) wire based off the change in the resistance of the fuel level sender.

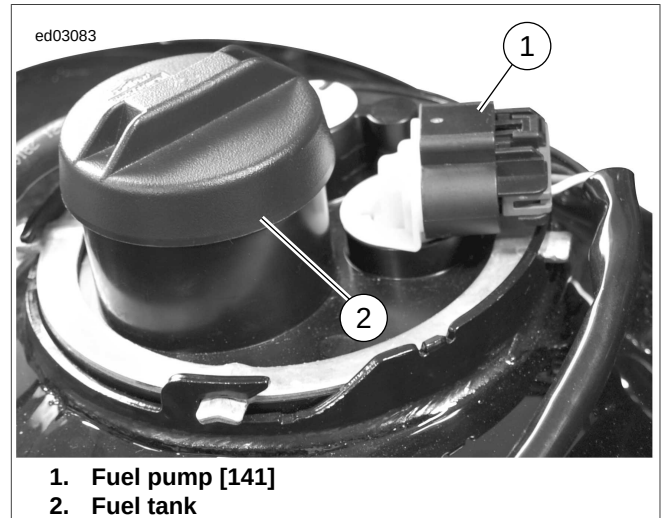


Figure 4-2. Under Console

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



em01047

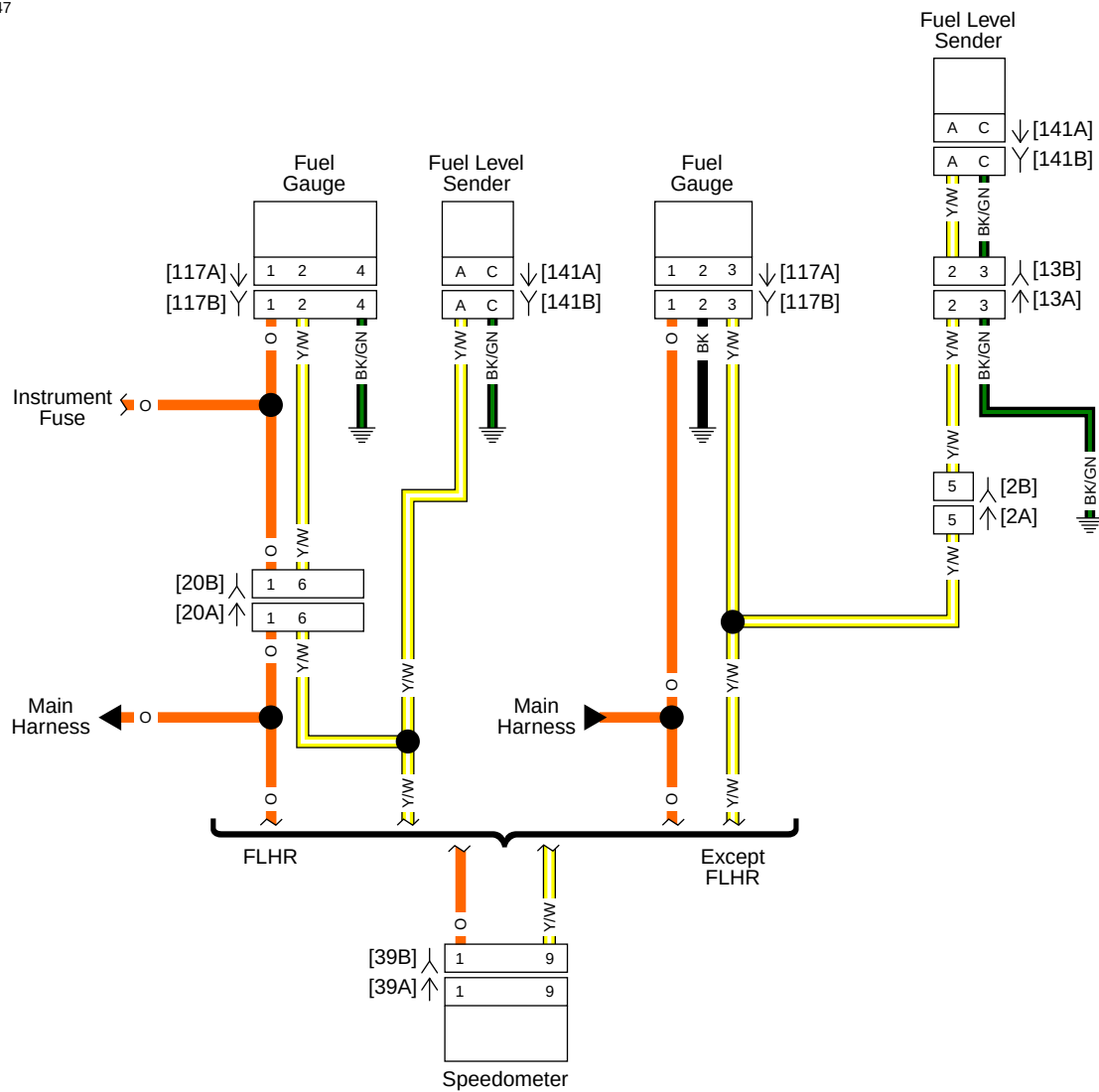


Figure 4-3. Fuel Sensor Circuit

DTC B1004

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS

Table 4-3. DTC B1004 Diagnostic Faults

POSSIBLE CAUSES
Instrument malfunction
Short to ground in fuel level sender circuit
Fuel pump and sender assembly malfunction
Open fuel level sender circuit
Short to ground in accessory power circuit
Ignition switch malfunction
Open ignition accessory circuit

1. Fuel Level Sender Voltage Test

1. Disconnect the speedometer [39].
2. Connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected.
3. Turn IGN ON.
4. Measure voltage between terminal 9 and ground of breakout box.
5. Is voltage greater than 5.0V?
 - a. **Yes.** Replace the speedometer. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Fuel Pump and Sender Test

1. Disconnect the fuel pump and sender assembly.
2. Measure voltage between breakout box terminal 9 and ground.
3. Is voltage greater than 5.0V?
 - a. **Yes.** Replace the fuel pump and sender assembly. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Fuel Gauge Voltage Test

1. Disconnect the fuel gauge.
2. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between fuel gauge [117B] terminal 1 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair Open in (O) wire between fuel gauge terminal 1 and instrument fuse.

4. Fuel Level Sender Circuit Continuity Test

1. Test for continuity between [117B] terminal 3 and breakout box terminal 9.
2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (Y/W) wire between fuel gauge and speedometer.

5. Fuel Level Sender Circuit Test

1. Test for continuity between [117B] terminal 3 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (Y/W) wire.
 - b. **No.** Replace the fuel gauge. See the service manual.

DTC B1005

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS

Table 4-4. DTC B1005 Diagnostic Faults

POSSIBLE CAUSES
Open ground circuit
Short to voltage in fuel level sensor circuit
Fuel gauge malfunction
Instrument malfunction
Fuel pump and sender malfunction
Open fuel level sensor circuit

1. Fuel Level Sender Voltage Test

1. Disconnect the speedometer [39].
2. Connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected.
3. Turn IGN ON.
4. Measure voltage between breakout box terminal 9 and ground.
5. Is voltage greater than 7.0V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the speedometer. See the service manual.

2. Fuel Pump and Sender Test

1. Disconnect the fuel gauge [117].
2. Measure voltage between breakout box terminal 9 and ground.

3. Is voltage greater than 7.0V?

- a. **Yes.** [Go to Test 3.](#)
- b. **No.** [Go to Test 4.](#)

3. Fuel Level Sender Circuit Test

1. Disconnect fuel level sender [141].
2. Measure voltage between breakout box terminal 9 and ground.
3. Is voltage greater than 7.0V?
 - a. **Yes.** Repair short to voltage on (Y/W) wire.
 - b. **No.** Replace the fuel pump and sender assembly. See the service manual.

4. Fuel Level Sender Circuit Continuity Test

1. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [117B] terminal 3 and breakout box terminal 9.

2. Is continuity present?

- a. **Yes.** [Go to Test 5.](#)
- b. **No.** Repair open in (Y/W) wire between fuel gauge and speedometer.

5. Fuel Gauge Ground Circuit Test

1. Test for continuity between [117B] terminal 2 and ground.
2. Is continuity present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair open between [117] terminal 2 (BK) wire and ground.

6. Fuel Sender Resistance Test

1. Disconnect fuel level sender [141].
2. Measure resistance between [141A] terminal A and ground.
3. Is resistance greater than 350 Ohms?
 - a. **Yes.** Replace the fuel level sender. See the service manual.
 - b. **No.** Replace the fuel gauge. See the service manual.



DTC B1008

4.3

DESCRIPTION AND OPERATION

Trip Odometer Reset Switch Closed

Code B1008 will be set if trip odometer reset switch terminals are closed for more than 2 minutes.

Table 4-5. Code Description

DTC	DESCRIPTION
B1008	Trip odometer reset switch closed

DTC B1008

Table 4-6. DTC B1008 Diagnostic Faults

POSSIBLE CAUSES
Trip odometer reset switch boot malfunction
Instrument malfunction
Trip odometer reset switch malfunction

1. Rubber Boot Test

1. Access the trip odometer reset switch.

2. Remove rubber boot.
3. With the speedometer connected, clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
4. Did DTC B1008 set? This code may take up to 2 minutes to set.
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace boot. See the service manual.

2. Trip Odometer Reset Switch Test

1. Disconnect speedometer [39]. Using terminal remover HD-45928, remove terminal 11 from [39B]. Connect [39].
2. Turn IGN ON and observe the check engine lamp.
3. Is the DTC current? See [2.1 INITIAL DIAGNOSTICS, Check Engine Lamp](#).
 - a. **Yes.** Replace speedometer. See the service manual.
 - b. **No.** Replace the trip odometer reset switch. See the service manual.



NO INSTRUMENT POWER

DESCRIPTION AND OPERATION

See [Figure 4-4](#). The speedometer and tachometer (if equipped) receive battery power at terminal 5 and ignition power at terminal 1. This is supplied through the battery fuse and the instrument fuse located in fuse block [64]. Accessory power is supplied through the ACCY fuse at terminal 6. The speedometer and tachometer (if equipped) go through an initialization sequence every time power is removed and re-applied to terminal 1. The visible part of this sequence is the illumination of check engine lamp, security lamp, backlighting, odometer and fuel level. With IGN ON, the check engine lamp and security lamp will illuminate for 4 seconds and then (if parameters are normal) go out.

Loss of power on any of the inputs will change the instruments behavior. Refer to [Table 4-7](#).

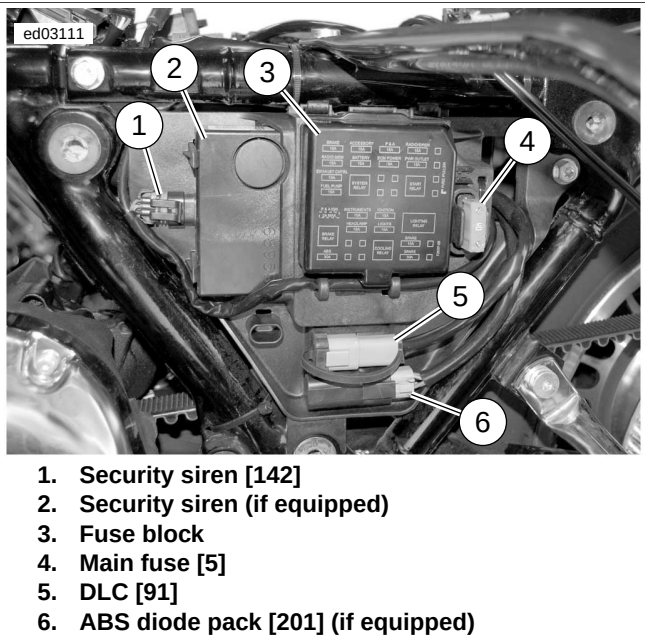


Figure 4-4. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

Table 4-7. Function Chart - Loss of Input

TERMINAL 5 (BATTERY)	TERMINAL 1 (IGN)	TERMINAL 6 (ACC)	TERMINAL 7 (GND)
Speedometer is non-functional	Will not "WOW". See 2.1 INITIAL DIAGNOSTICS, Diagnostics .	Speedometer non-functional in ACC position.	Instrument completely non-functional
	Needles freeze, backlighting is functional	Check engine, low fuel, battery, cruise and ABS lamps non-functional	Diagnostics absent
	Check engine lamp, low fuel and battery lamp are non-functional. Diagnostics absent.		

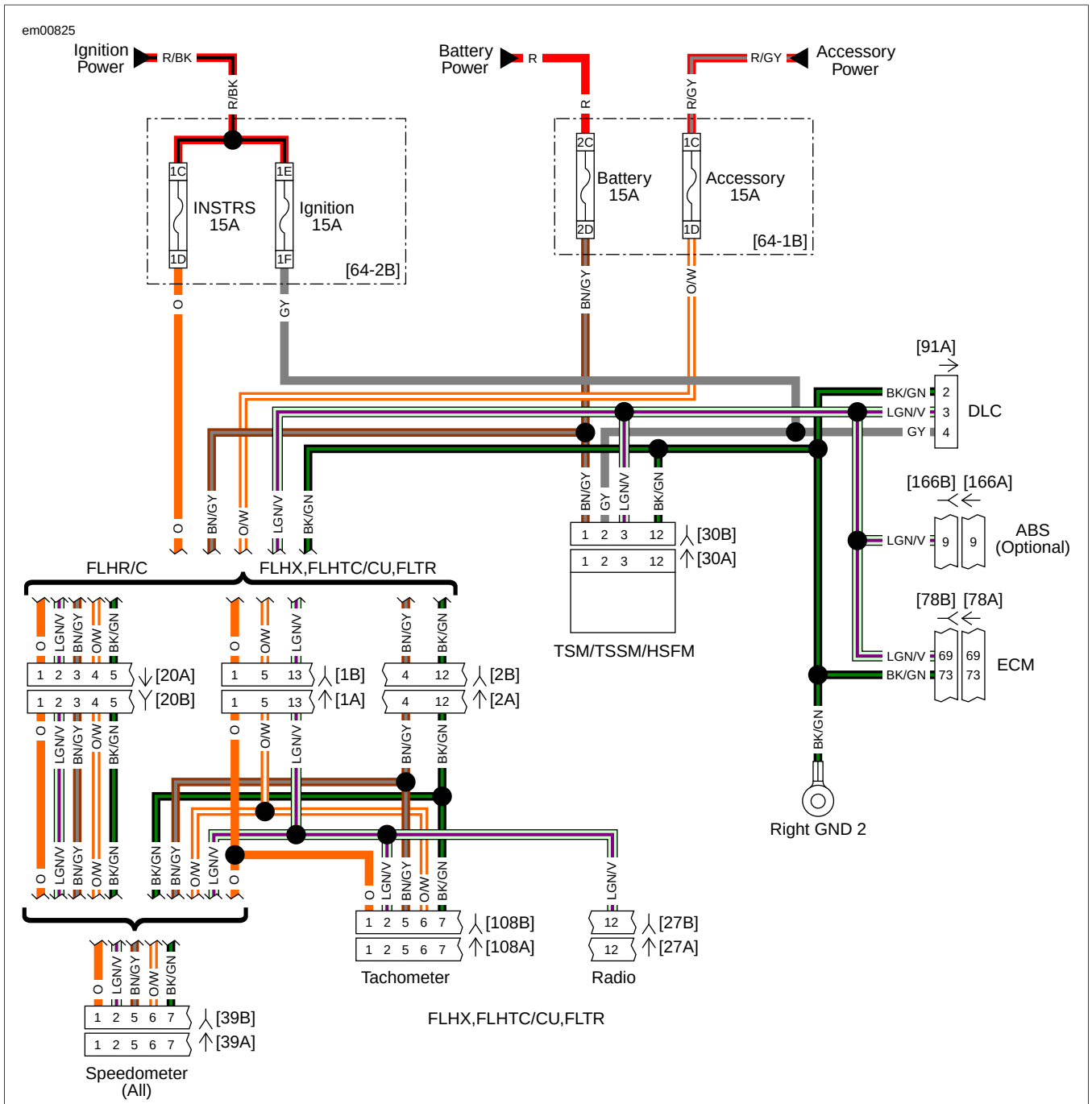


Figure 4-5. Instruments Power Circuit Diagram

SPEEDOMETER INOPERATIVE

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	BREAKOUT BOX ADAPTERS

Table 4-8. Speedometer Inoperative Diagnostic Faults

POSSIBLE CAUSES
Instrument malfunction
Open accessory circuit
Open battery circuit
Open ignition circuit
Short to ground in cooling fan circuit
Ignition switch malfunction
Short to ground in ignition circuit
Open ground circuit
Short in accessory circuit

1. Battery and Ignition Function Test

- Turn IGN ON.
- Does the speedometer have full function?
 - Yes.** [Go to Test 2.](#)
 - No, check engine lamp, battery lamp and security lamp are inoperative but backlighting is functional.** [Go to Test 8.](#)
 - No, speedometer does not operate at all.** [Go to Test 4.](#)

2. Accessory Function Test

- Turn IGN to ACC.
- Does the instrument have full ACC function?
 - Yes.** Concern is intermittent, perform a wiggle test to test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - No.** [Go to Test 3.](#)

3. Accessory Fuse Test

- With IGN OFF, connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
- Turn IGN ON.
- Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage at breakout box terminal 6.
- Is battery voltage present?
 - Yes.** Replace the speedometer. See the service manual. **(7311)**
 - No.** Repair open in (O/W) wire. **(5043)**

4. Battery Fuse Test

- Inspect the battery fuse.
- Is the fuse good?
 - Yes.** [Go to Test 5.](#)
 - No.** [Go to Test 7.](#)

5. Battery Circuit to Battery Fuse Test

- Test for voltage at [64-1B] socket terminal 2C.
- Is battery voltage present?
 - Yes.** [Go to Test 6.](#)
 - No.** Repair open between battery fuse and main fuse (R) wire. **(5041)**

6. Battery Circuit to Speedometer Test

- With IGN OFF, connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
- Install battery fuse in fuse block.
- Test for voltage at breakout box terminal 5.
- Is battery voltage present?
 - Yes.** [Go to Test 13.](#)
 - No.** Repair open between [39B] terminal 5 and [64-1B] socket terminal 2D (BN/GY) wire. **(5041)**

7. Battery Circuit Short to Ground Test

- With IGN OFF, connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
- Test for continuity between breakout box terminal 5 and ground.
- Is continuity present?
 - Yes.** Repair short to ground in (BN/GY) wire. **(5041)**
 - No.** Concern is intermittent, perform a wiggle test to test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#) Replace the battery fuse.

8. Ignition Circuit Test

- Turn IGN OFF for at least 15 seconds.
- Turn IGN ON and the engine stop switch to RUN.
- Does the fuel pump run and then shut off?
 - Yes.** [Go to Test 9.](#)
 - No.** [Go to Test 10.](#)

9. Instrument Power Circuit Test

- With IGN OFF, disconnect speedometer [39].

2. Connect BREAKOUT BOX ADAPTERS (Part No. HD-46601) to [39]. Attach connectors from BREAKOUT BOX (Part No. HD-42682) to harness adapters leaving [39A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. With IGN ON, test for voltage between breakout box terminal 1 and ground.
4. Is battery voltage present?
 - a. **Yes.** Replace speedometer. See the service manual. **(7311)**
 - b. **No.** Repair open in (O) ignition wire. **(5041)**

10. Ignition Fuse Test

1. Inspect the ignition fuse.
2. Is the fuse good?
 - a. **Yes.** [Go to Test 11.](#)
 - b. **No.** [Go to Test 12.](#)

11. Ignition Power to Instrument Fuse Test

1. With IGN ON, test for battery voltage between [64-2B] socket terminal 1D and ground.

2. Is battery voltage present?
 - a. **Yes.** Repair open in (O) wire. **(5041)**
 - b. **No.** Inspect wiring from instrument fuse to ignition switch for an open or damaged condition. If the wiring is good replace the ignition switch. See the service manual. **(7287)**

12. Ignition Power Short to Ground Test

1. Test for continuity between [64-2B] socket terminal 1D and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (O) wire. Replace instrument fuse. **(5041)**
 - b. **No.** Replace the ignition fuse and verify operation. **(6729)**

13. Ground Circuit Test

1. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 7 and ground.
2. Is continuity present?
 - a. **Yes.** Replace the speedometer. See the service manual. **(7311)**
 - b. **No.** Repair open in (BK/GN) wire. **(5041)**



INDICATOR LAMPS

DESCRIPTION AND OPERATION

See [Figure 4-6](#). The battery, check engine, security and low fuel indicators are located in the speedometer. The other indicators are located separately from the speedometer.

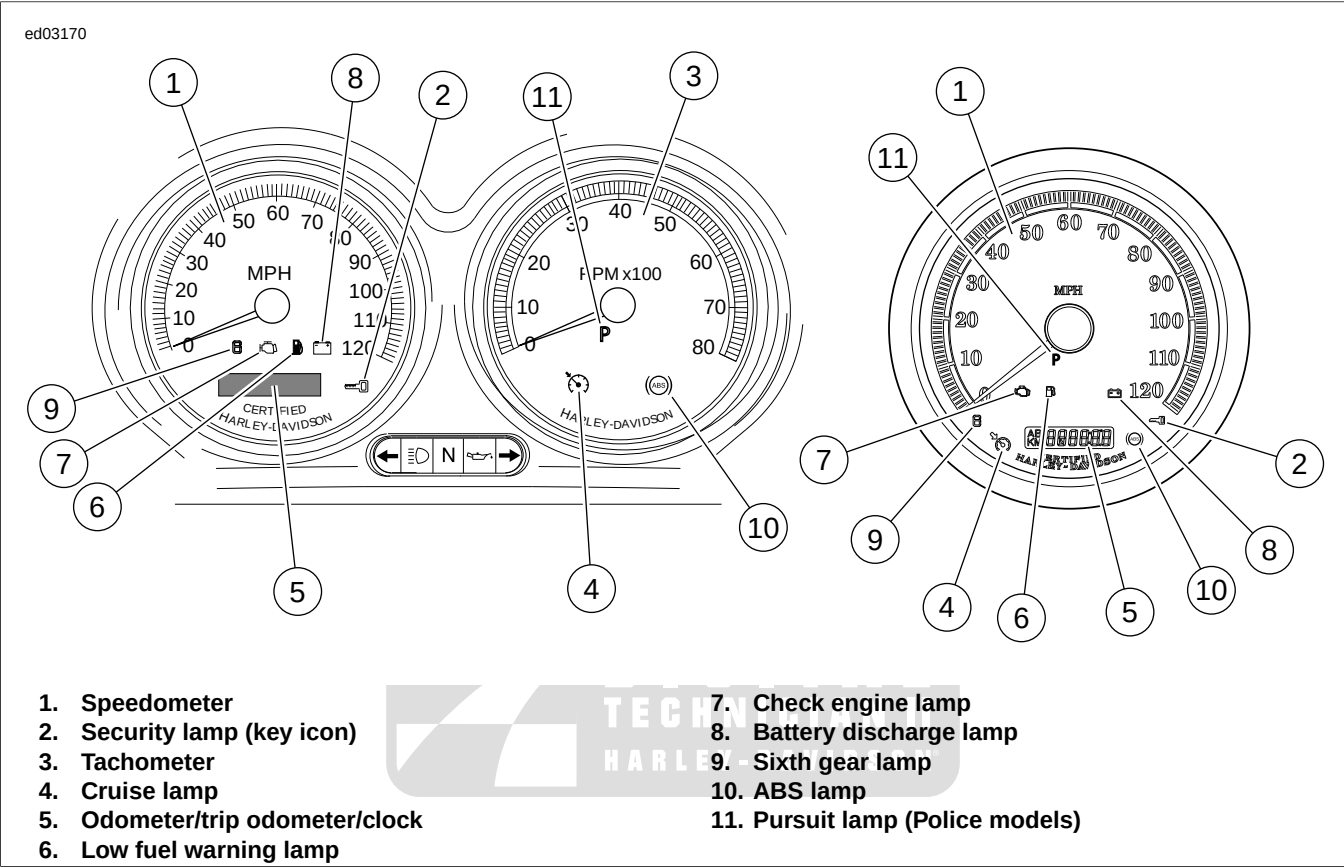


Figure 4-6. Speedometer

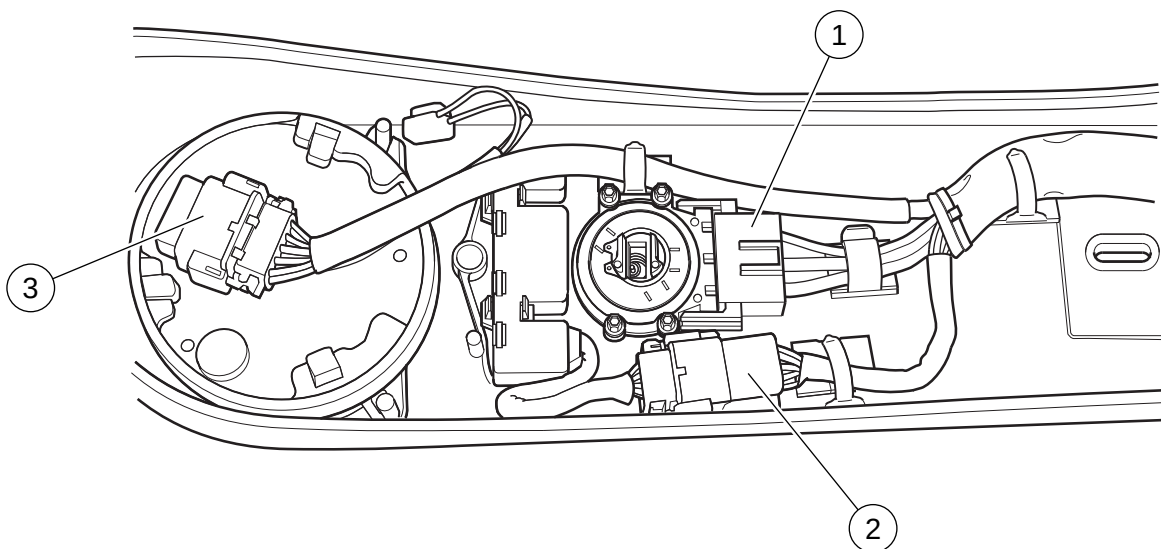
Table 4-9. Indicator Lamp Wiring

INDICATOR LAMP	CONNECTION
Check engine	Serial data
Security	Serial data
Battery	Serial data
Sixth gear indicator	Serial data
Oil pressure	Ground through switch
Neutral	Ground through switch
High beam	12V when active
Right/left turn	12V when active
Low fuel	1.0 gal (3.8 L)

Low Fuel Indicator

See [Figure 4-7](#). The low fuel indicator is controlled at terminal 9 (Y/W) of the speedometer. The fuel gauge sends voltage on the (Y/W) wire to the low fuel lamp and fuel level sender. When the fuel drops below 1.0 gal (3.8L), the resistance in the fuel level sender reaches a point that causes enough of a change in the voltage on the (Y/W) wire it signals the speedometer to activate the low fuel lamp.

ed02699



- 1. Ignition/light key switch [33]
- 2. Indicator lights [21]
- 3. Speedometer [39]

Figure 4-7. Instrument Console Connectors: FLHR, FLHRC



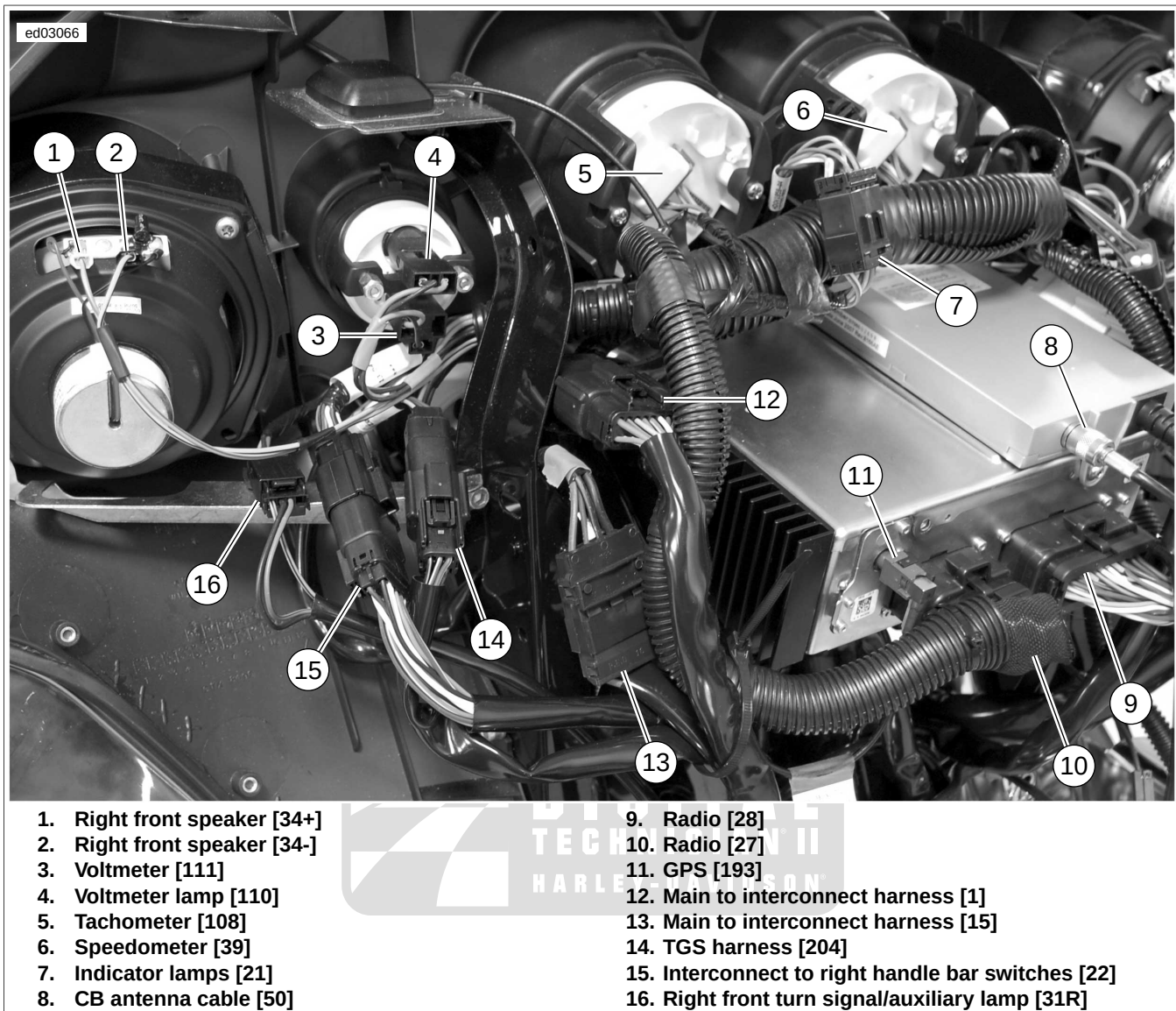


Figure 4-8. Right Side Behind Upper Fairing

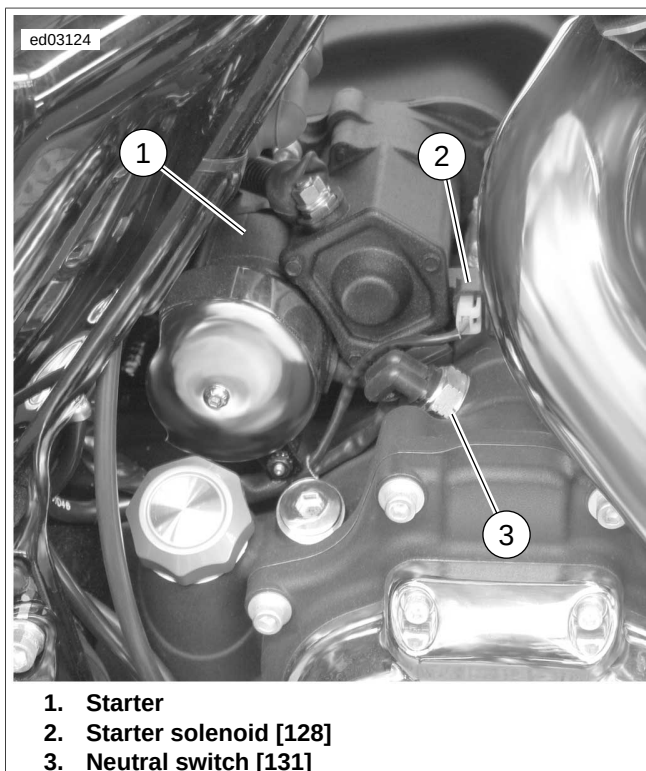


Figure 4-9. Starter Solenoid [128]

Neutral Indicator

See [Figure 4-9](#). The neutral indicator is controlled through the (TN) wire connected to the TSM/TSSM/HFSM and the neutral switch. When the transmission is in neutral, the neutral switch closes and illuminates the neutral indicator.

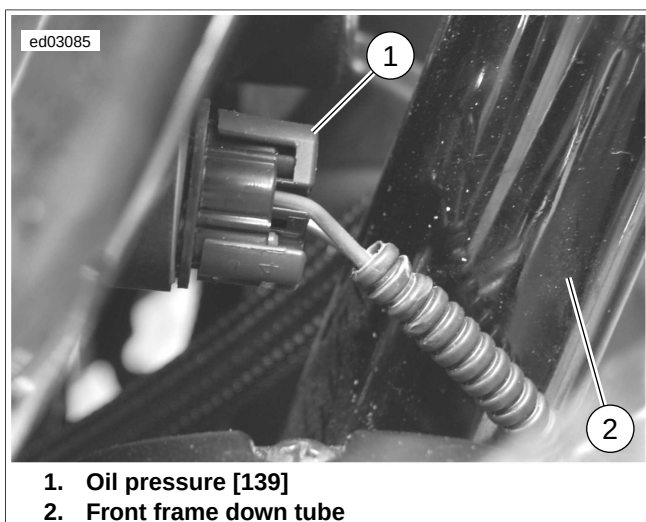


Figure 4-10. Oil Pressure Switch

Oil Pressure Indicator

See [Figure 4-10](#). The oil pressure indicator is connected to the oil pressure switch. The switch closes when oil pressure is low and illuminates the oil pressure indicator. This is why the oil pressure indicator is illuminated with the IGN ON and the engine OFF.

Turn Signal Indicators

The turn signal indicators are controlled by the TSM/TSSM/HFSM. When the TSM/TSSM/HFSM receives an input from the left or right turn signal switch it flashes the correct turn signals including the turn signal indicators. When the left turn signal switch is pressed voltage is supplied on the (V) wire to the left turn signals including the turn signal indicator. When the right turn signal switch is pressed, voltage is supplied on the (BN) wire to the right turn signals including the indicator.

High Beam Indicator

This circuit is powered when the headlamp switch is placed in the high beam position. In the high position, voltage is supplied to the (W) wire and the high beam headlamps. This wire also supplies power to the high beam indicator, causing it to illuminate.

Sixth Gear Indicator

The sixth gear indicator illuminates indicating the vehicle is in sixth gear. This is done by the ECM. The ECM monitors the vehicle speed and engine rpm with the clutch engaged. It then sends a signal over the serial data circuit to illuminate the indicator when the parameters are correct for sixth gear operation. Therefore, there may be a delay in the indicator illuminating when shifting to sixth gear. The ECM receives clutch switch status from the TSM/TSSM/HFSM. Pulling in the clutch lever will cause the sixth gear indicator to turn off.

If the sixth gear indicator is inoperative or always on check for any DTCs. If no DTCs are present, verify the clutch switch is operating properly. If the clutch is disengaged without moving the clutch switch, the sixth gear indicator may come on briefly due to reduced engine rpm during shifting. If none of these conditions exist and the sixth gear indicator is malfunctioning replace the speedometer.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

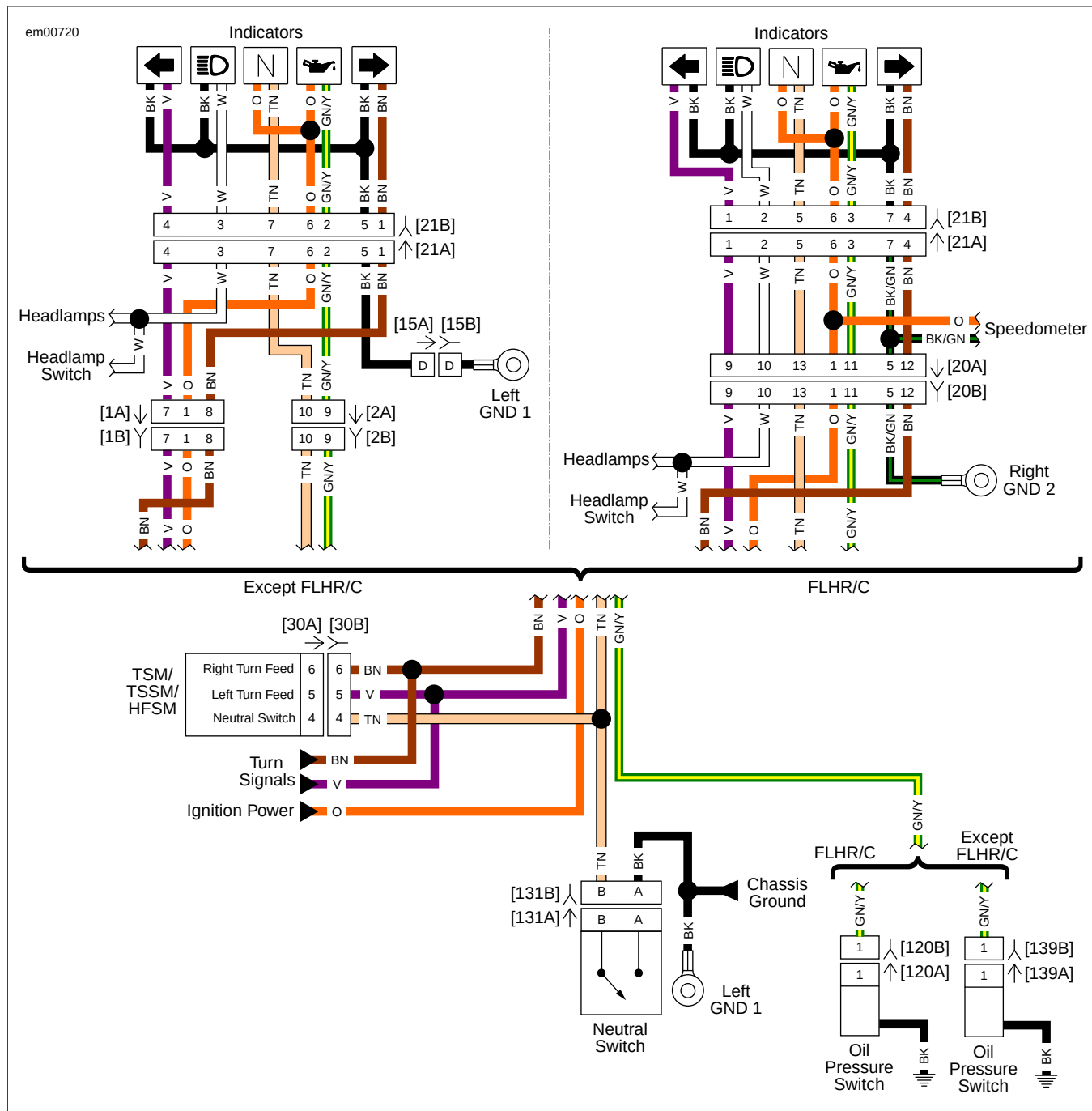


Figure 4-11. Indicator Lamps

OIL PRESSURE LAMP ALWAYS ON

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

Table 4-10. Oil Pressure Lamp Always On Diagnostic Faults

POSSIBLE CAUSES
Short to ground in oil pressure circuit
Indicator malfunction
Mechanical issue
Oil pressure switch malfunction

1. Oil Pressure Lamp Function Test

1. Turn IGN ON with the engine OFF.
2. Does the oil pressure lamp illuminate?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See [4.5 INDICATOR LAMPS, Oil Pressure Lamp Inoperative.](#)

2. Engine Running Test

1. Start the engine.
2. Does the oil pressure lamp turn OFF and stay off?
 - a. **Yes.** Oil pressure lamp is operating properly. Test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - b. **No.** [Go to Test 3.](#)

3. Oil Pressure Sensor Test

1. Disconnect the oil pressure sensor [120] or [139].
2. Does the oil pressure lamp turn OFF?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 4.](#)

4. Oil Pressure Circuit Test

1. With IGN OFF, disconnect indicator lamps [21].
2. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [21A] terminal 3 (FLHR/C) or terminal 2 (except FLHR/C) and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground between [21A] terminal 3 (FLHR/C) or terminal 2 (except FLHR/C) and [120B] terminal 1 (GN/Y) wire. **(5041)**
 - b. **No.** Repair or replace the indicator harness. See the service manual. **(5191)**

5. Mechanical Test

1. Inspect the engine for any issues that may affect oil pressure. See the service manual.

2. Was the problem found?
 - a. **Yes.** Repair as needed.
 - b. **No.** Replace the oil pressure switch. See the service manual. **(5161)**

OIL PRESSURE LAMP INOPERATIVE

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

Table 4-11. Oil Pressure Lamp Inoperative Diagnostic Faults

POSSIBLE CAUSES
Oil pressure switch malfunction
Open oil pressure circuit
Indicator malfunction

1. Oil Pressure Lamp Function Test

1. Turn IGN ON with the engine OFF.
2. Does the oil pressure lamp illuminate?
 - a. **Yes.** Test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - b. **No.** [Go to Test 2.](#)

2. Oil Pressure Switch Test

1. Disconnect the oil pressure sensor [120] or [139].
2. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect [120B] terminal 1 to ground.
3. Does the oil pressure lamp turn ON?
 - a. **Yes.** Replace oil pressure switch. See the service manual. **(5161)**
 - b. **No.** [Go to Test 3.](#)

3. Oil Pressure Circuit Test

1. With IGN OFF, disconnect console harness [20].
2. Test for continuity between indicator lamps [21A] terminal 3 (FLHR/C) or terminal 2 (except FLHR/C) and [120B] terminal 1 or [139B] terminal A.
3. Is continuity present?
 - a. **Yes.** Repair or replace the indicator harness. See the service manual. **(5191)**
 - b. **No.** Repair open between [21] and [120] (GN/Y) wire. **(5041)**

NEUTRAL LAMP ALWAYS ON

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

Table 4-12. Neutral Lamp Always On Diagnostic Faults

POSSIBLE CAUSES
Neutral switch malfunction
Short to ground in neutral circuit
Indicator malfunction
TSM/TSSM/HFSM malfunction

1. Neutral Lamp Function Test

- With the vehicle in neutral, turn IGN ON with the engine OFF.
- Does the neutral lamp illuminate?
 - Yes.** [Go to Test 2.](#)
 - No.** See [4.5 INDICATOR LAMPS, Neutral Lamp Inoperative.](#)

2. Transmission Operation Test

- Shift the transmission out of neutral.
- Does the neutral lamp turn OFF and stay off?
 - Yes.** Neutral lamp is operating properly. Test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - No.** [Go to Test 3.](#)

3. Neutral Switch Test

- Disconnect the neutral switch [131].
- Does the neutral lamp turn OFF?
 - Yes.** Replace the neutral switch. See the service manual. **(5157)**
 - No.** [Go to Test 4.](#)

4. TSM/TSSM/HFSM Test

- Disconnect the TSM/TSSM/HFSM [30].
- Does the neutral lamp turn OFF?
 - Yes.** Replace the TSM/TSSM/HFSM. See the service manual. **(6845)**
 - No.** [Go to Test 5.](#)

5. Neutral Switch Circuit Test

- Disconnect indicator lamps [21].
- Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [21A] terminal 5 (FLHR/C) or terminal 7 (except FLHR/C) and ground.

- Is continuity present?
 - Yes.** Repair short to ground in (TN) wire. **(5041)**
 - No.** Repair or replace the indicator harness. See the service manual. **(5191)**

NEUTRAL LAMP INOPERATIVE

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

Table 4-13. Neutral Lamp Inoperative Diagnostic Faults

POSSIBLE CAUSES
Neutral switch malfunction
Open ground circuit
Open neutral switch circuit
Indicator malfunction

1. Neutral Lamp Function Test

- With the vehicle in neutral, turn IGN ON with the engine OFF.
- Does the neutral lamp illuminate?
 - Yes.** Test for intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - No.** [Go to Test 2.](#)

2. Neutral Switch Test

- Disconnect the neutral switch [131].
- Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jump the (TN) wire to ground.
- Does the neutral lamp turn ON?
 - Yes.** Replace the neutral switch. See the service manual. **(5157)**
 - No.** [Go to Test 3.](#)

3. Neutral Switch Power Circuit Open Test

- With IGN OFF, disconnect indicator lamps [21].
- Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [21A] terminal 5 (FLHR/C) or terminal 7 (except FLHR/C) and [131B] (TN) wire.
- Is continuity present?
 - Yes.** Repair or replace the indicator harness. See the service manual. **(5191)**
 - No.** Repair open in (TN) wire between [21] and neutral switch. **(5041)**

HIGH BEAM INDICATOR LAMP INOPERATIVE

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

Table 4-14. High Beam Indicator Lamp Inoperative Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
Open High beam indicator circuit

1. High Beam Indicator Function Test

1. With IGN ON, operate the headlamp switch.
2. Do the high and low beam headlamps function correctly?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See [5.7 HEADLAMPS](#).

2. High Beam Indicator Circuit Test

1. With the IGN OFF, disconnect indicator lamps [21].
2. With the IGN ON and the headlamp switch in the high position and using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage at [21A] terminal 2 (FLHR/C) or terminal 3 (except FLHR/C).
3. Is voltage present?
 - a. **Yes.** Repair or replace the indicator harness. See the service manual. **(5191)**
 - b. **No.** Repair open in (W) wire between headlamp switch and [21A]. **(5041)**

TURN SIGNAL INDICATOR INOPERATIVE

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

Table 4-15. Turn Signal Indicator Inoperative Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
Open turn signal circuit

1. Turn Signal Function Test

1. With ignition ON, operate the turn signals.
2. Do the turn signals operate?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See [5.6 TURN SIGNALS](#).

2. Turn Signal Indicator Circuit Test

1. With IGN OFF, disconnect indicator lamps [21].
2. With the IGN ON and the turn signals activated and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage at [21A] (V) and (BN) wires.
3. Is voltage cycling on and off?
 - a. **Yes.** Repair or replace the indicator harness. See the service manual. **(5191)**
 - b. **No.** Repair open between [21A] and [30B] (V) or (BN) wire. **(5041)**

THEORY OF OPERATION

See [Figure 4-12](#). With ignition switch turned to IGNITION, the fuel gauge is connected to +12 Volts. Current flows through the gauge and variable resistor in the fuel gauge sending unit to ground. The sending unit float controls the amount of resistance in the variable resistor.

Inoperative gauges may be caused by any of the following:

- Sender or fuel gauge not grounded.
- Malfunction in sender or fuel gauge.
- Inoperative or disconnected wire from ignition switch to fuel gauge.
- Corroded connections at fuel gauge.

Use the [4.6 GAUGES, Fuel Gauge and Sender Test](#) to test suspect components.

FUEL GAUGE AND SENDER TEST

PART NUMBER	TOOL NAME
HD-35500	MULTI-METER

NOTE

Always refer to the applicable wiring diagram when troubleshooting instruments or gauges.

1. Remove gauge. Ground (Y/W) wire of fuel level sender located at bottom of gauge. Turn ignition switch to IGNITION.
 - a. Fuel gauge must indicate FULL. If gauge indicates FULL, gauge is functioning correctly. Proceed to step 2.
 - b. If gauge did not indicate FULL, proceed to step 3.
2. Set MULTI-METER (Part No. HD-35500) to RXI scale to measure the resistance of the sending unit. Place one probe on (Y/W) and the other probe on chassis ground.
 - a. If fuel tank is full, the reading should be 30-50 Ohms. An empty tank should have a 240-260 Ohms resistance. A half full tank is approximately 125-165 Ohms.
 - b. If a very high resistance or infinity is indicated on the meter, the sender may be open or not grounded. Check that the sender and fuel tank are grounded by placing one probe of Multi-Meter on sender flange and the other probe on crankcase. Meter must indicate one Ohm or less. Replace sender if one Ohm or less was present. If a higher resistance is present, check for poor connection on ground wire.
3. Check voltage to (O/W) (+) and (BK) (-) wire of fuel gauge connector [117] if gauge did not indicate FULL.
 - a. Correct reading is equivalent to battery voltage.
 - b. If battery voltage is not present, check for inoperative or disconnected wire. Replace gauge if wiring problem is not found.

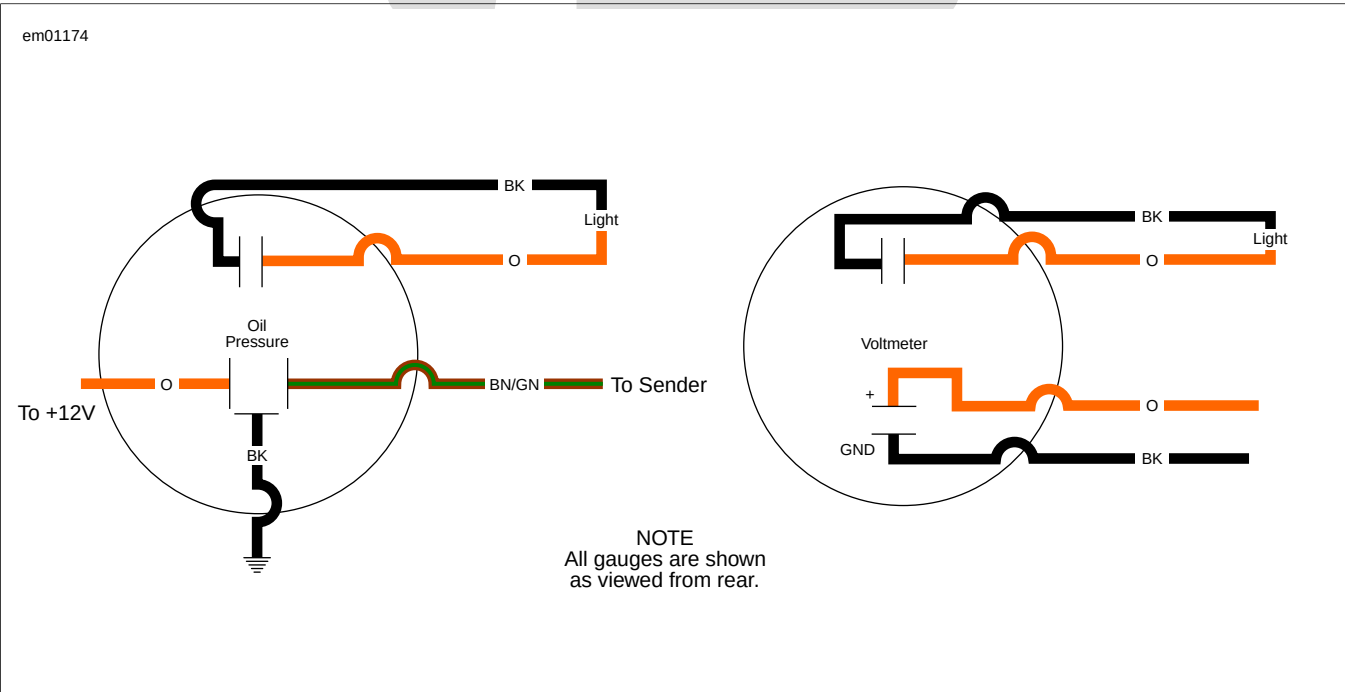


Figure 4-12. Connections for Gauges

OIL PRESSURE GAUGE AND INDICATOR LIGHT

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

Problem

Low oil pressure light remains on with engine running above idle and/or oil pressure gauge does not work.

NOTICE

Do not operate the engine when the oil level is below the add mark on the dipstick at operating temperature. Engine damage will result. (00187b)

Table 4-16. Oil Pressure Gauge and Indicator Light

CAUSE	SOLUTION
No oil pressure due to lack of oil or faulty oil pump.	Check oil level. Add oil if low. Restart engine and verify oil pressure light goes off and gauge indicates pressure. If problem still exists, refer to oil pump in the service manual.
Contacts in pressure sending unit not opening to shut off light. Variable resistor in sender is shorted to ground.	Locate the oil pressure sending unit on the front right side of the crankcase. Verify the electrical connector is properly connected to the sending unit. If the oil pressure gauge indicates pressure but the low oil pressure light remains on proceed as follows: - Remove electrical connector from oil pressure sending unit. Using ohmmeter and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) gray socket probe and patch cord, place one probe on indicator lamp terminal (closest to latch on sending unit), place the other probe on the crankcase. Ohmmeter must read less than one Ohm. - Start the engine and run at a fast idle. The ohmmeter must read infinity. - Replace the sending unit if the above meter readings are not obtained. If the low oil pressure light functions correctly, but the pressure gauge does not, then proceed as follows: - Remove electrical connector from oil pressure sending unit. Turn the ignition switch to IGNITION. The gauge must read zero. - Ground (BN/GN) wire terminal to crankcase. The gauge must read full scale 60 PSI (414 kPa). - Replace the sending unit if the above gauge readings are obtained. If the gauge readings are not obtained, then replace the pressure gauge.
No power to gauge.	See Voltmeter Gauge. See 4.6 GAUGES, Voltmeter Gauge .

AMBIENT AIR TEMPERATURE GAUGE

Problem

Gauge inoperative.

Table 4-17. Ambient Air Temperature Gauge

CAUSE	SOLUTION
Sensor not grounded or open between sensor and gauge.	Test for continuity between terminal 1 and ground and terminal 3 and gauge. Repair if open.
Broken or disconnected power or ground wire to gauge.	Check for battery voltage between terminals 1 and 3 at connector [115A]. Replace gauge if voltage is present. Use voltage drop tests and continuity checks to isolate if voltage is not present.
Malfunction in gauge or sensor.	Measure resistance between terminals 1 and 3 at 65-85 °F (18.3-29.4 °C). Resistance should be 31-43 Ohms. Replace sensor if out of range, replace gauge if within range.

VOLTMETER GAUGE

Problem

Meter inoperative.

Table 4-18. Voltmeter Gauge

CAUSE	SOLUTION
Inoperative or disconnected leads to meter or open meter winding.	With ignition switch turned to IGNITION, verify battery voltage is present at both positive and negative terminals on the voltmeter terminal on voltmeter. With ignition switch turned to OFF, check ground terminal for continuity to ground.
	Replace the voltmeter if battery voltage is present and ground terminal is grounded.
	If battery voltage is not present, trace wiring until disconnected or inoperative wire is found and repair as necessary. If ground terminal is not grounded, refer to wiring diagram and repeat procedure given for 12V lead.



TABLE OF CONTENTS

SUBJECT	PAGE NO.
5.1 ACCESSORIES.....	5-1
5.2 HEATED HAND GRIPS.....	5-4
5.3 CRUISE CONTROL.....	5-7
5.4 DTC P0577.....	5-11
5.5 HORN.....	5-14
5.6 TURN SIGNALS.....	5-16
5.7 HEADLAMPS.....	5-24
5.8 STOP LAMPS.....	5-28
5.9 RUNNING LAMPS.....	5-34
5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126.....	5-37
5.11 DTC B1135, B1136, B1141, B1142.....	5-44
5.12 SECURITY SYSTEM.....	5-45
5.13 KEY FOB.....	5-50
5.14 SIREN.....	5-52
5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS.....	5-53
5.16 FAILS TO DISARM.....	5-60
5.17 DTC B1131, B1132.....	5-63
5.18 DTC B1134.....	5-66
5.19 DTC B1143, B1144, B1145.....	5-68
5.20 DTC B1154, B1155.....	5-70



NOTES



ACCESSORIES

5.1

DESCRIPTION AND OPERATION

The battery circuit is connected to battery power after the 40 Amp main fuse and supplies constant power. The P&A 15 Amp circuit is connected to the ACCY circuit of the ignition switch and supplies power in the ignition switch ACCY and IGN positions.

The P&A IGN 2 Amp (maximum) circuit is connected to the IGN circuit of the ignition switch and supplies power only when the ignition switch is in the IGN position. These circuits can be used to supply power to additional systems on the motorcycle.

NOTE

The FLHTCU/K also are equipped with an additional 15 Amp circuit to supply power to an accessory power outlet in the Tour-Pak.

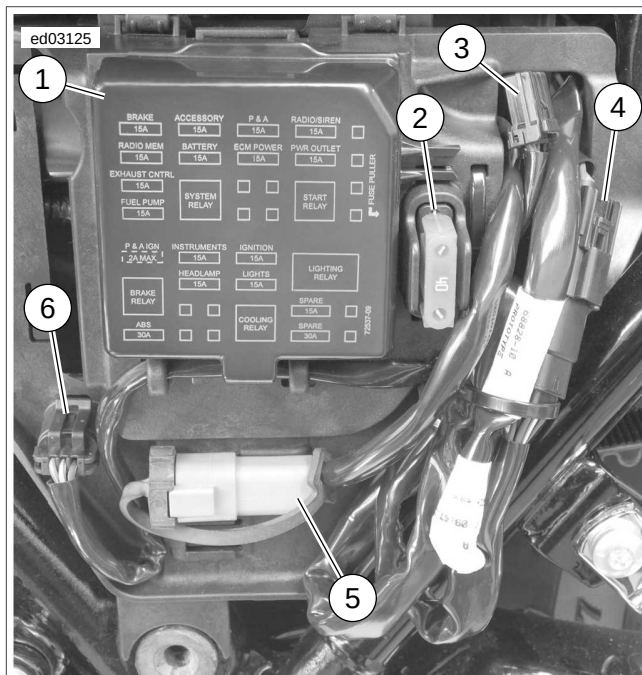
COMPONENTS

P&A Connectors

See [Figure 5-1](#). The P&A battery circuit [160] and the P&A accessory circuit [4] are located under the seat. A cover is plugged into them to keep them from being accidentally grounded. The P&A ignition 2A circuit is wired directly into the fuse block [64-2B]. See [Figure 5-3](#). The power outlet is powered through [258] and mounted in the Tour-Pak. The ACCY circuit also supplies power to the cigar lighter [132] mounted in the fairing and optional heated hand grips [189].

P&A Fuses

See [Figure 5-2](#). All the fuses are located under the left side cover.



1. Fuse block
2. Main fuse [5]
3. Tour-Pak [12]
4. Main to rear lighting interconnect harness [257]
5. DLC [91]
6. Security siren [142]

Figure 5-2. Under Left Side Cover: FLTRX, FLHX, FLHTC

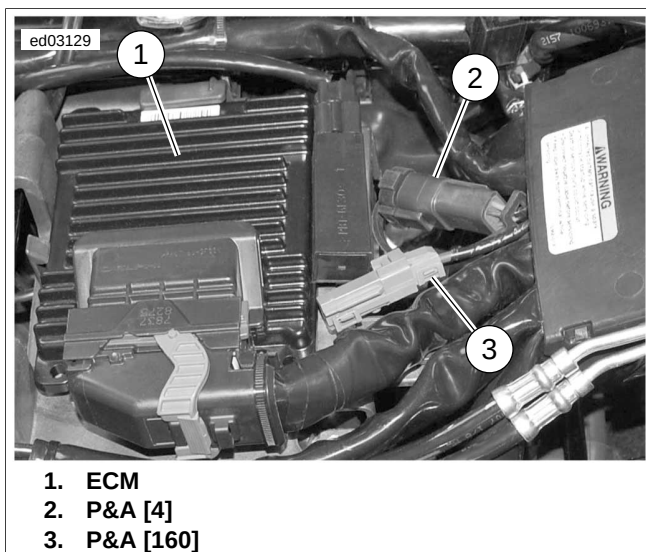


Figure 5-1. Under Seat (Rear)

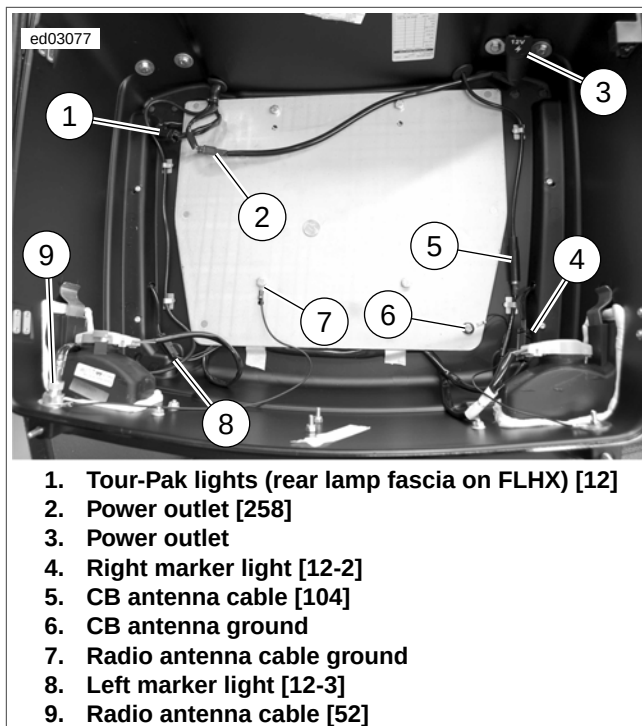


Figure 5-3. Tour-Pak Interior

Connector Information

For additional information about the connectors in the following

diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

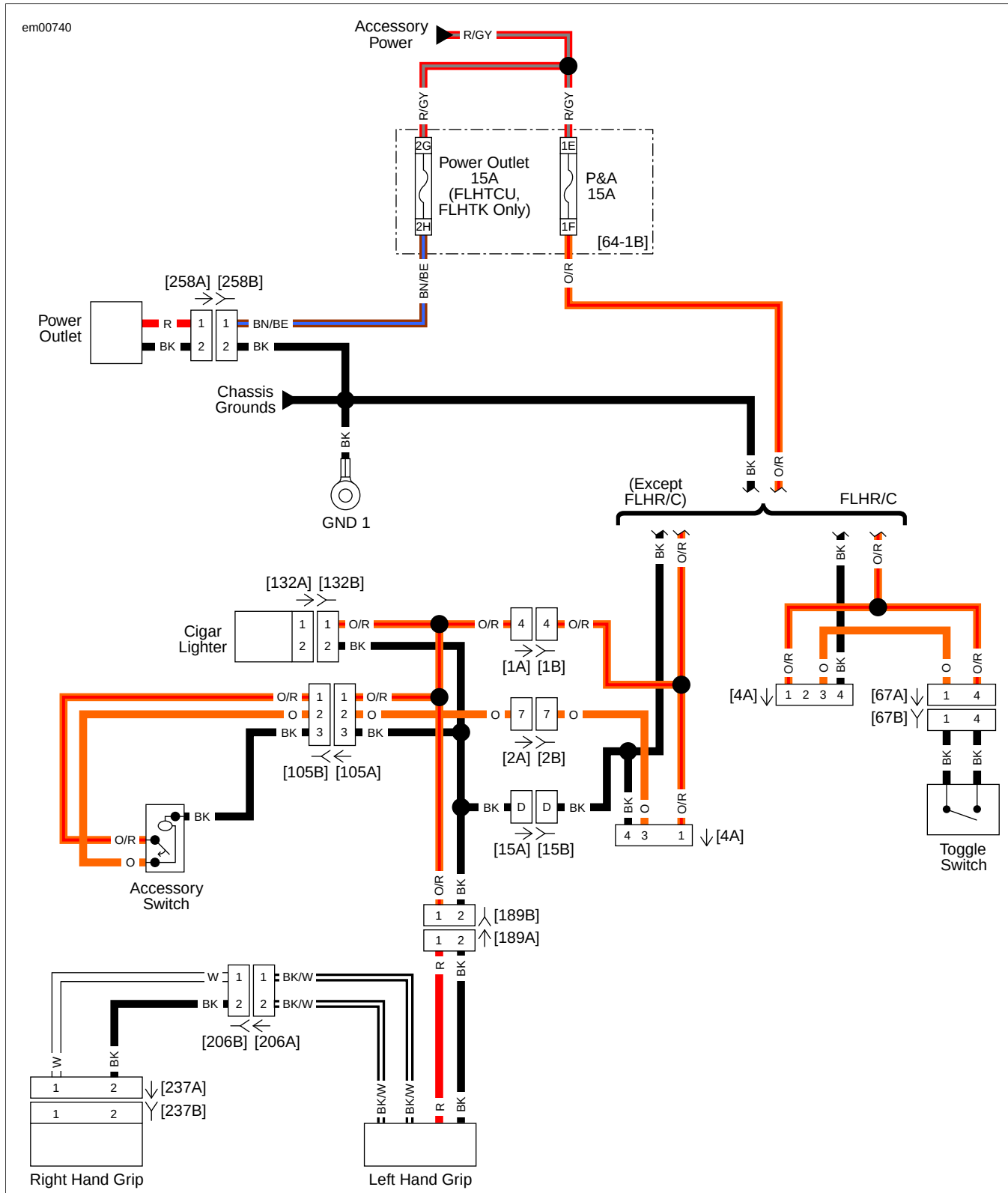


Figure 5-4. Auxiliary Power Outlets

REAR AUXILIARY POWER OUTLET INOPERATIVE

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

Table 5-1. Rear Auxiliary Power Outlet Inoperative Diagnostic Faults

POSSIBLE CAUSES
Power outlet malfunction
Open in the ground circuit
Open in the power circuit
Short to ground in the power circuit
Malfunction in the device attached to the power outlet

1. Power Outlet Fuse Test

1. Inspect the power outlet fuse.
2. Is the fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. Power Outlet Test

1. Disconnect power outlet [258].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [258B] terminal 1 and terminal 2.
4. Is battery voltage present?
 - a. **Yes.** Replace auxiliary power outlet. See the service manual. **(5116)**
 - b. **No.** [Go to Test 3.](#)

3. Power Outlet Ground Circuit Test

1. Test for voltage between [258B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (BN/BE) wire. **(5041)**

4. Power Outlet Short to Ground Test

1. Disconnect power outlet [258].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [258B] terminal 1 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/BE) wire. **(5041)**
 - b. **No.** Verify the component connected to the power outlet did not cause the overload. If no issue with the component was verified, then replace the power outlet fuse. If the fuse opens again, replace the auxiliary power outlet. See the service manual. **(5116)**

CIGAR LIGHTER INOPERATIVE

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

Table 5-2. Cigar Lighter Inoperative Diagnostic Faults

POSSIBLE CAUSES
Cigar lighter malfunction
Open in the ground circuit
Open in the power circuit
Short to ground in the power circuit

1. P&A Fuse Test

1. Inspect the P&A fuse.
2. Is the fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. Cigar Lighter Test

1. Disconnect cigar lighter [132].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [132B] terminal 1 and terminal 2.
4. Is battery voltage present?
 - a. **Yes.** Replace defective part of cigar lighter. See the service manual. **(6077)**
 - b. **No.** [Go to Test 3.](#)

3. Cigar Lighter Ground Circuit Test

1. Test for voltage between [132B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (O/R) wire. **(5041)**

4. Power Outlet Short to Ground Test

1. Disconnect cigar lighter [132].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [258B] terminal 1 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (O/R) wire. **(5041)**
 - b. **No.** Replace the P&A fuse. If the fuse opens again, replace the cigar lighter. See the service manual. **(6077)**

HEATED HAND GRIPS

5.2

DESCRIPTION AND OPERATION

See [Figure 5-5](#). The heated handgrips are controlled by the rotating switch located at the end of the left handgrip. The switch can be turned from an OFF position through 6 increasingly warm settings.

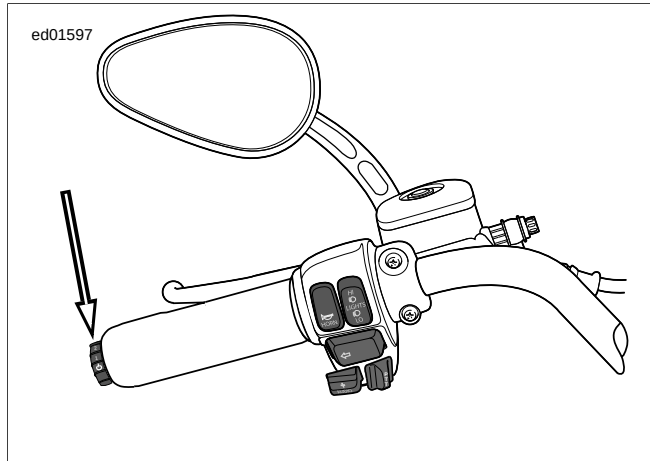


Figure 5-5. Heated Handgrip Control Switch

Diagnostic Tips

If the heating element controller, located in the left grip, detects an open or short between the left and right grip circuit, the system is disabled. To enable the heating element control circuit, the ignition switch must be re-cycled after the problem is resolved.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



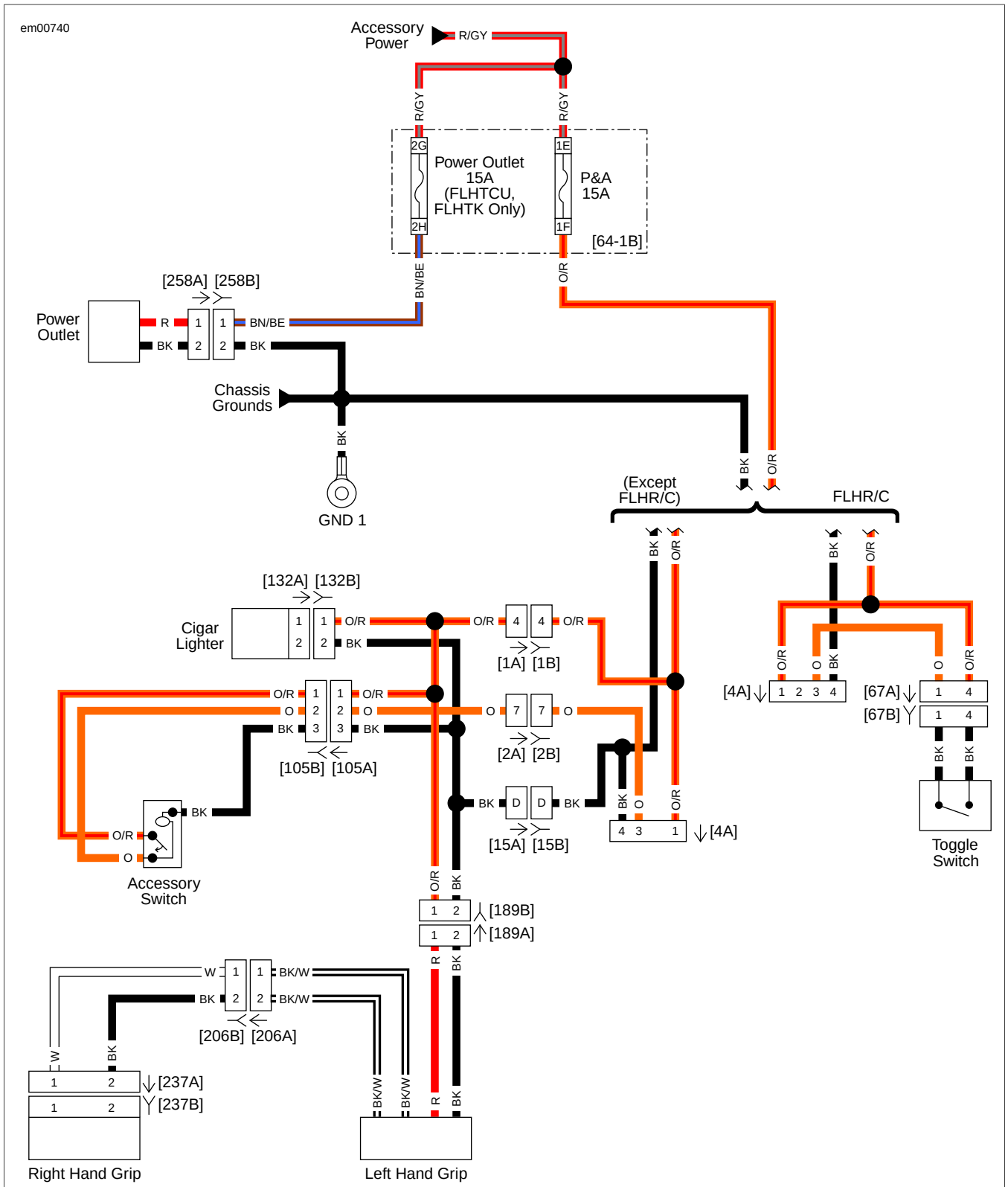


Figure 5-6. Heated Handgrip Circuit

HEATED HANDGRIPS INOPERATIVE

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

Table 5-3. Heated Handgrips Inoperative Diagnostic Faults

POSSIBLE CAUSES
Open in the ground circuit
Open in the power circuit
Short to ground in the power circuit
Right heated grip malfunction
Left heated grip malfunction

1. P&A Fuse Test

1. Inspect the P&A fuse.
2. Is the fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. Current Draw Test

1. Turn the IGN ON.
2. With the heated handgrips off, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure the current draw across the fuse block [64-1B] socket terminal 1E and terminal 1F.
3. Turn the heated handgrips control to the maximum setting while watching the current draw.
4. Does the current draw increase to approximately 3.5 Amps above the original reading?
 - a. **Yes.** System functioning normally.
 - b. **No.** [Go to Test 3.](#)

3. Power Supply Test

1. Install the P&A fuse.
2. Disconnect heated grips [189].
3. Turn IGN ON.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [189B] terminal 1 and terminal 2.
5. Is battery voltage present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** [Go to Test 4.](#)

4. Heated Grips Ground Circuit Test

1. Test for voltage between [189B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (O/R) wire. **(5041)**

5. Heated Grips Test

1. Disconnect right heated handgrip [237].
2. Test for continuity between [237A] terminal 1 and ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Replace the right heated grip. See the service manual. **(6553)**

6. Heated Grips Short to Ground Test

1. Disconnect heated handgrip interconnect [206].
2. Test for continuity between [206A] terminal 1 and ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair short to ground between [237A] terminal 1 and [206B] terminal 1. **(5041)**

7. Heated Grip Power Circuit Short to Ground Test

1. Disconnect heated handgrip to main harness [189].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [189B] terminal 1 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (O/R) wire. **(5041)**
 - b. **No.** Replace left hand grip. See the service manual.

8. Heated Grips Resistance Test

1. Disconnect right heated handgrip [237].
2. Measure resistance between [237B] terminal 1 and terminal 2.
3. Is resistance 7-12 Ohms?
 - a. **Yes.** Replace the left heated grip. See the service manual. **(6553)**
 - b. **No.** Replace the right heated grip. See the service manual. **(6554)**

CRUISE CONTROL

5.3

DESCRIPTION AND OPERATION

The ECM controls and monitors the operation of the vehicle cruise control. The cruise switch allows the control circuit to be enabled or disabled and, when enabled, the lamp in the switch illuminates.

Actual engagement of the vehicle cruise control is provided by the cruise SET/RESUME switch, located on the operator right hand controls. This switch is a three position momentary switch, spring loaded to the center position.

Switch-Right Position (SET/COAST)

- When the switch is toggled to the right position and released, the cruise control is engaged and set to current vehicle speed.
- If the switch is toggled right and held momentarily, then the cruise control enters the COAST mode.

Switch-Left Position (RESUME/ACCELERATE)

- After brakes are applied or throttle is forced towards the stop or the clutch is disengaged, the cruise control is disengaged. When the switch is toggled to the left position then released, the cruise control is engaged and will resume the previously set speed/condition.
- If the switch is toggled left and held momentarily while the cruise control is engaged, acceleration is provided, increasing the vehicle rpm/speed. If the switch is toggled left and held, it continues to increase the vehicle speed until the switch is released and allowed to return to the neutral position.

(speedometer on FLHRC models) turns from orange to green to indicate the cruising speed is locked in.

4. The ECM monitors both the engine rpm and the VSS output speed signal. The ECM signals the throttle control actuator to open or close the throttle to keep the speedometer output speed signal constant. The engine rpm is monitored to detect engine overspeed, a condition which automatically causes cruise disengagement.
5. The ECM automatically disengages cruise mode whenever the ECM receives one of the following inputs:
 - a. Front or rear brake is applied.
 - b. Throttle is "rolled forward" past closed, thereby actuating throttle roll off (disengage) command.
 - c. Motorcycle clutch is engaged or wheel slip detected. (ECM senses too great an increase in rpm).
 - d. Cruise on/off switch placed in the off position.
 - e. Handlebar-mounted engine stop switch placed in the off position.
 - f. Handlebar-mounted cruise SET/RESUME switch is pushed to SET and held in that position until vehicle speed drops below 30 mph (48 km/h) or pushed to RES until vehicle speed exceeds 93 mph (150 km/h).

NOTE

If the vehicle speed is above 30 mph (48 km/h) when the cruise SET/RESUME switch is released, then the cruise system automatically re-engages.

Table 5-4. Code Description

DTC	DESCRIPTION
P0577	Cruise Control Input Error

SYSTEM OPERATION

To engage and disengage the cruise control system, proceed as follows:

1. While riding in fourth, fifth or sixth gear, turn the cruise on/off switch to the ON (lamp illuminated) position. See [Figure 5-7](#). The switch is located on the fairing cap of FLHTCU models, the instrument nacelle of FLTR models and the left handlebar lower switch housing on FLHRC models. The cruise enabled/engaged lamp in the tachometer face (speedometer on FLHRC models) turns orange to indicate the system is activated. See [Figure 5-9](#). An orange lamp in the switch on both FLHTCU and FLTR models also indicates this condition to the rider.
2. See [Figure 5-8](#). With the motorcycle traveling at the desired cruise speed, 30-90 mph (48-145 km/h), momentarily push the cruise SET/RESUME switch to SET.
3. See [Figure 5-9](#). The ECM monitors the VSS to establish the desired vehicle speed. The ECM then modulates the throttle control actuator to maintain vehicle speed. The cruise enabled/engaged lamp in the tachometer face

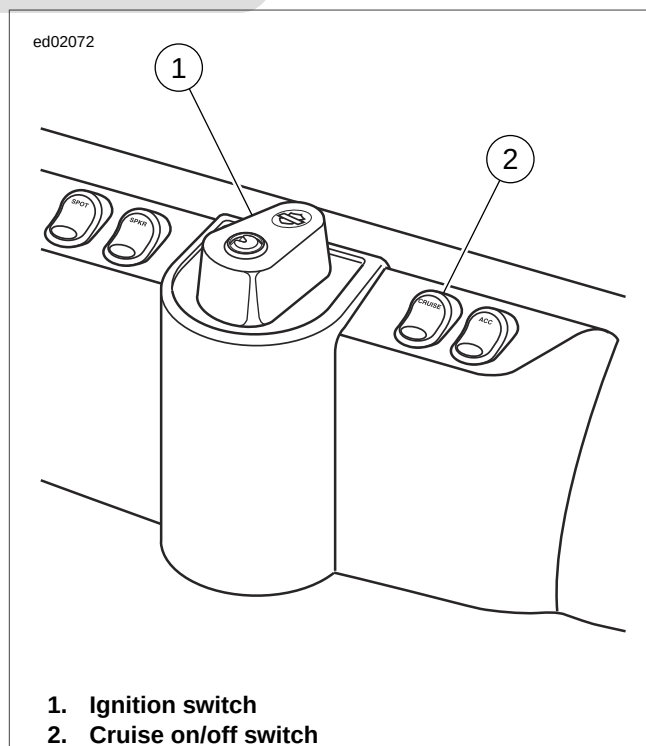


Figure 5-7. Fairing Cap (FLHTCU)

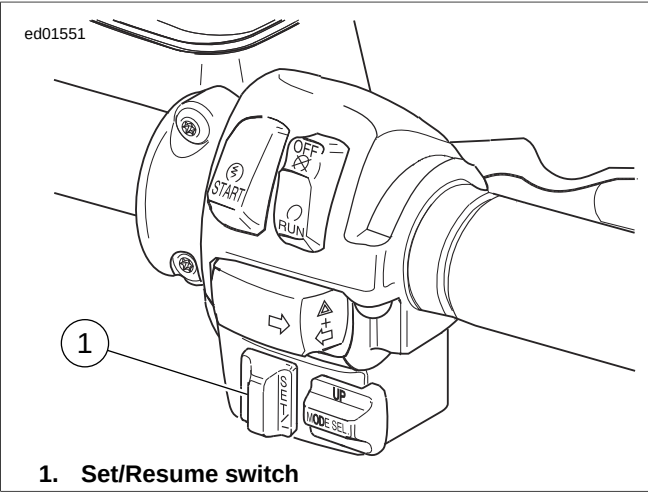


Figure 5-8. Right Handlebar Switch Assembly: FLHTCU, FLTRX, FLTRU

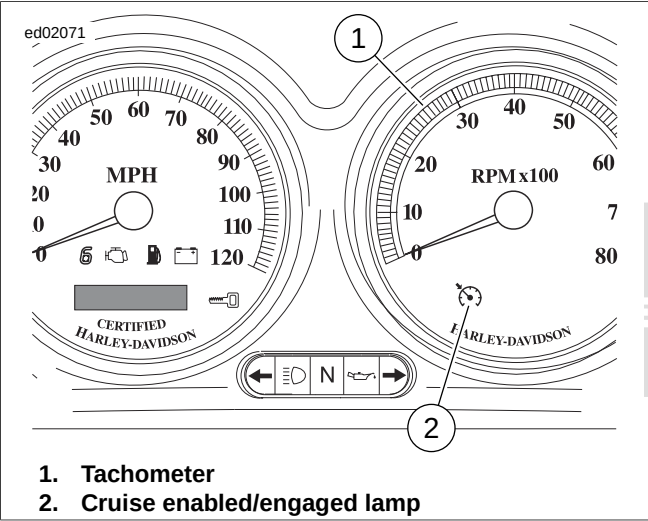


Figure 5-9. Instrument Panel (FLHTCU - typical)

TROUBLESHOOTING

The ECM provides on-board diagnostics to help isolate any problems that occur with the cruise system.

If the cruise is inoperative or fails to set, begin troubleshooting. Refer to [Table 5-5](#). If the cruise seems to disengage or drop out for no apparent reason, see [5.4 DTC P0577](#).

See [Figure 5-9](#). In the diagnostic mode, the cruise enabled/engaged lamp is employed as a test indicator. The lamp is in the tachometer face (speedometer on FLHR/C models).

Diagnostic Tips

- An intermittent may be caused by poor connection, rubbed through wire insulation or an inoperative wire inside the insulation.
- **Poor connection:** Inspect component and harness connectors for backed out terminals, improper mating, inoperative locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harnesses.

CRUISE INOPERATIVE DIAGNOSTICS

All diagnostics steps are listed in table format. Follow the numbered steps to test the system. Compare the system behavior CORRECT FUNCTION to INCORRECT FUNCTION columns and advance to the next step listed. Refer to [Table 5-5](#).



Table 5-5. Cruise Inoperative Diagnostics

NO.	ACTION	CORRECT FUNCTION	INCORRECT FUNCTION
1	Enter the diagnostic mode: RUN switch off, ignition switch at IGNITION. Hold the SET/RESUME switch at SET while turning the RUN switch on.	The green cruise lamp illuminates and remains on as long as the cruise SET/RESUME switch is held in the SET position. Continue to next step.	If the green cruise lamp remains illuminated after the switch is released then one of the switches or related wiring is open or shorted.
2	Push the SET/RESUME switch to RES(UME) and hold in this position.	The green cruise lamp illuminates and remains on as long as the SET/RESUME switch is held in the RES(UME) position. Continue to next step.	If the green cruise lamp does not illuminate at all, check for one or more of the following conditions: • RES(UME) switch not wired correctly. • Open or shorted wire to RES(UME) switch.
3	Turn the throttle grip tightly closed to check the throttle roll-off command.	The green cruise lamp illuminates when the grip is closed (roll-off position), and extinguishes when the throttle grip returns to its free position. Continue to next step.	If the green cruise lamp does not illuminate, see 6.31 DTC P2135, P2138 .

Table 5-5. Cruise Inoperative Diagnostics

NO.	ACTION	CORRECT FUNCTION	INCORRECT FUNCTION
4	Apply the front brake lever.	The green cruise lamp will illuminate and remain on until the brake lever is released. Continue to next step.	If the green cruise lamp does not illuminate, check for one or more of the following conditions: • Front brake switch not wired correctly. • Open or shorted wire to front brake switch. • Front brake switch not working properly. See 6.13 DTC P0572 .
5	Apply the rear brake pedal.	The green cruise lamp illuminates and remains on until the brake pedal is released. Continue to next step.	If the green cruise lamp does not illuminate, check for one or more of the following conditions: • Rear brake switch not wired correctly. • Inoperative or pinched wire to rear brake switch. • Rear brake switch not working properly. See 6.13 DTC P0572 .
6	To restart or repeat the diagnostic sequence, return to Step 1.		



CRUISE CONTROL INOPERATIVE CONDITIONS

The cruise control will become inoperative under the following conditions:

- Ignition is off
- Cruise control switch is off (open)
- Ignition voltage
- Throttle position faults P0120 and P0220
- VSS faults P0501 and P0502
- Cruise control switch or brake switch failure P0577
- TPS correlation error P2135
- Flash checksum error P0605
- Brake switch fault P0572
- TBW limited performance mode P1510
- Cruise control set speed is too low
- Cruise control set speed is too high
- Vehicle cannot increase to cruise control set speed (up hill)
- Vehicle cannot decrease to cruise control set speed (down hill)
- Brake is applied
- Twist grip roll-off
- ECM seeing both the SET/RESUME switches pressed at the same time
- Engine has not been running enough
- Clutch lever is pulled in (declutched)
- Vehicle acceleration rate is too high
- Vehicle deceleration rate is too high
- Vehicle speed is too high
- Vehicle speed is too low
- Engine rpm is too high
- Engine rpm is too low
- Engine rpm acceleration is too high
- Transmission is in too low of a gear or in neutral



DTC P0577

5.4

CRUISE CONTROL

The cruise control system is monitored and controlled through the ECM. The set/coast and resume/accelerate switches are inputs to the ECM. If the circuits between either one of the

switches and the ECM become shorted to voltage the ECM will set DTC P0577 and disable the cruise control system.

Table 5-6. Code Description

DTC	DESCRIPTION
P0577	Cruise Control Input High

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



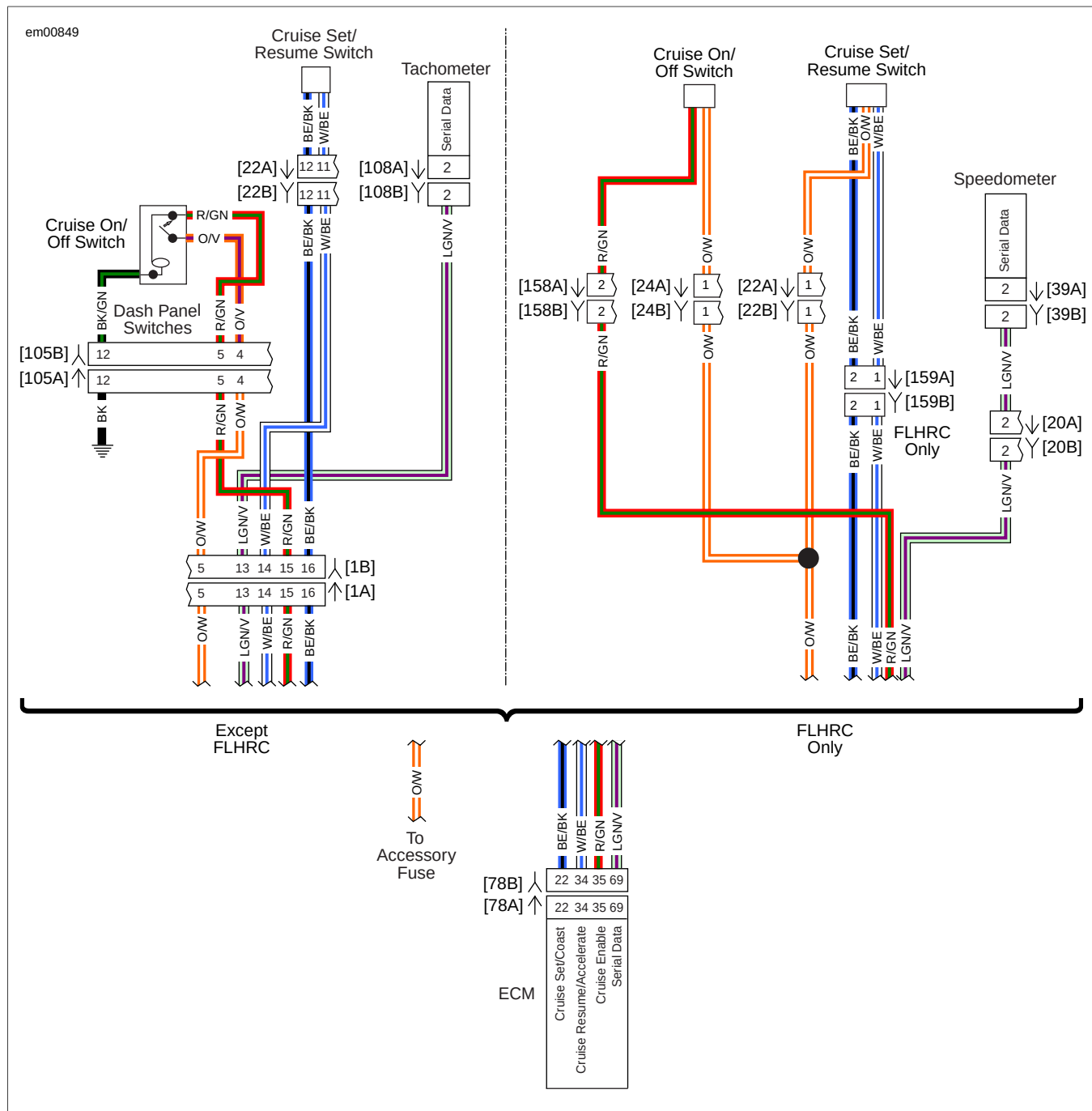


Figure 5-10. Cruise Control Circuit

DTC P0577

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 5-7. DTC P0577 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in cruise set/coast circuit
Cruise resume/accelerate switch malfunction
Cruise set/coast switch malfunction
Short to voltage in cruise resume/accelerate circuit

1. Cruise Set/Coast Circuit Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminal 22 and ground.
4. Is voltage greater than 1.0V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 3.](#)

2. Cruise Set/Coast Switch Test

1. Disconnect right hand controls [22].

2. Measure voltage between breakout box terminal 22 and ground.
3. Is voltage greater than 1.0V?
 - a. **Yes.** Repair short to voltage on (BE/BK) wire. **(5041)**
 - b. **No.** Replace Cruise Set/Coast Switch. See the service manual.

3. Cruise Resume/Accelerate Circuit Voltage Test

1. Measure voltage between breakout box terminal 34 and ground.
2. Is voltage greater than 1.0V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** See diagnostic tips.

4. Cruise Circuit Voltage Test

1. Disconnect right hand controls [22].
2. Measure voltage between breakout box terminal 34 and ground.
3. Is voltage greater than 1.0V?
 - a. **Yes.** Repair short to voltage on (W/BE) wire. **(5041)**
 - b. **No.** Replace Cruise Resume/Accelerate Switch. See the service manual.



HORN

DESCRIPTION AND OPERATION

The horn is powered through the horn switch from the accessory fuse. The horn is grounded through GND 1. When the horn switch is pressed, battery voltage is applied to the horn [122] terminal 1, causing the horn to sound.

COMPONENTS

Horn Switch

The horn switch is a push button switch on the left handlebar controls.

Horn

See [Figure 5-11](#). The horn is located on the left side of the vehicle between the cylinders.



Figure 5-11. Horn [122]

SYMPTOMS

The horn circuit does not set DTCs when there is a malfunction. Instead, one of the symptoms shown in [Table 5-8](#) exists to indicate a concern with the system.

Table 5-8. Horn Symptoms

SYMPTOM	COMMON CAUSE
Horn always on	Short to voltage or a stuck switch
Horn inoperative	Open circuit, faulty horn or horn switch

Diagnostic Tips

If the fuse is open, check the circuit between the horn switch and the horn for a short to ground. This would cause the fuse to open only when the horn switch is pressed. A short between the brake lamp switches and the tail/stop lamp causes this fuse to open when the brakes are applied.

The (O/W) wire from the fuse supplies battery voltage to several components. A short anywhere in the (O/W) wire causes the fuse to open immediately.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

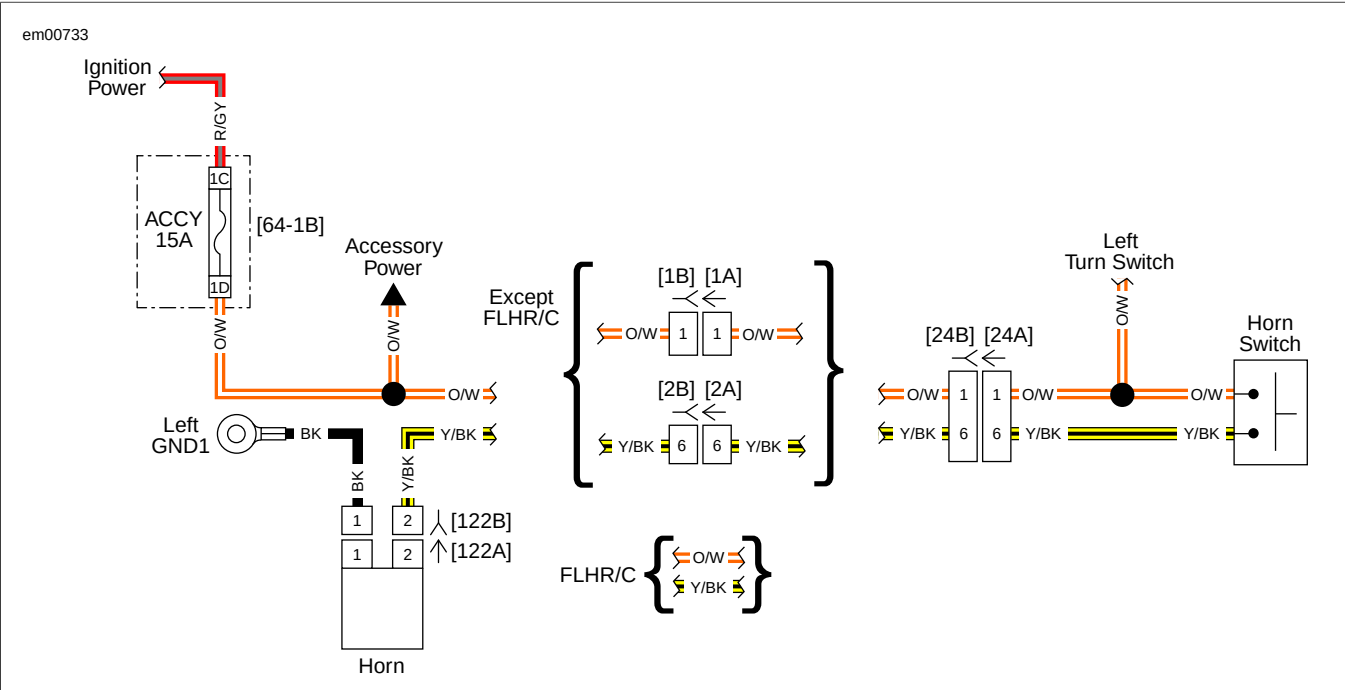


Figure 5-12. Horn

HORN ALWAYS ON

Table 5-9. Horn Always On Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in horn power circuit
Horn switch malfunction

1. Horn Switch Test

1. Disconnect left hand controls [24].
2. Does the horn turn off?
 - a. **Yes.** Replace the horn switch. See the service manual. **(5171)**
 - b. **No.** Repair short to voltage in the (Y/BK) wire between horn and left hand controls. **(5041)**

HORN INOPERATIVE

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

Table 5-10. Horn Inoperative Diagnostic Faults

POSSIBLE CAUSES
Open accessory circuit
Shorted accessory circuit
Horn malfunction
Open ground circuit
Horn switch malfunction
Open horn power circuit

1. Accessory Circuit Open or Shorted Test

1. With the IGN ON, activate the front and rear brakes.
2. Does the tail/stop lamp illuminate?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Inspect the fuse. If fuse is good locate and repair open in (O/W) wire. If fuse is open repair short to ground in circuits that may affect the fuse. See diagnostic tips. **(5043)**

2. Horn Test

1. Disconnect the horn [122].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for voltage at horn [122B] between terminal 1 and terminal 2.
3. Press the horn switch.
4. Is battery voltage present?
 - a. **Yes.** Replace the horn. See the service manual. **(5765)**
 - b. **No.** [Go to Test 3.](#)

3. Ground Circuit Open Test

1. Test for continuity between horn [122B] terminal 1 and ground.
2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in the ground circuit. **(5041)**

4. Horn Switch Malfunction Test

1. Connect the horn [122].
2. Disconnect left hand controls [24].
3. With IGN ON, using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) jumper [24B] terminal 1 and terminal 6.
4. Does the horn sound?
 - a. **Yes.** Replace the horn switch. See the service manual. **(5171)**
 - b. **No.** [Go to Test 5.](#)

5. Horn Power Circuit Open Test

1. Test for voltage from [24B] terminal 1 (O/W) to ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (Y/BK) wire between [24B] and horn. **(5041)**
 - b. **No.** Repair open (O/W) wire between [24A] and fuse block. **(5043)**

TURN SIGNALS

5.6

DESCRIPTION AND OPERATION

TSM/TSSM/HFSM receives battery power through the ignition. The operation functions the same way whether you have a TSM, a TSSM or a HFSM. The TSM communicates with the other modules on the vehicle through the serial data circuit. The turn signal switches are inputs to the TSM. When the turn signal switch is pressed the switch closes and power flows to TSM. This signals the TSM to supply voltage and control the flash rate to the turn signals and the turn signal indicator. If the turn signal switches are pressed at the same time and held down the TSM initiates the four-way flashers.

The TSM also monitors the position of the clutch and neutral switches to determine if it is safe to start the vehicle. The BAS is internal to the TSM and allows the TSM to determine if the vehicle is tipped over. If a tip over event occurs, the TSM sends a signal to the ECM to turn off the engine.

The TSM has three major functions:

- Controls the turn signals.
- Serves as the BAS.
- Monitors the clutch and neutral switches to prevent starter engagement.

BAS Operation

The TSM/TSSM/HFSM uses an internal BAS to monitor vehicle position. Under normal driving conditions the TSM/TSSM/HFSM uses the BAS along with speed input provided from the ECM to know when to automatically cancel the turn signals after a turn. The TSM/TSSM/HFSM will disable turn signal lamps and starter activation and will send a message to the ECM to shut down the ignition and the fuel pump if the vehicle is tipped over. The odometer will display "tIP" when a tip-over condition is present.

BAS Restart

To restart the vehicle after shutdown has occurred:

1. Return the vehicle to an upright position.
2. Cycle the IGN OFF-ON before restarting the vehicle.

Manual Cancellation

If you want to stop the turn signals from flashing, briefly press the turn signal switch a second time.

If you are signalling to turn in one direction and you press the switch for the opposite turn signal, the first signal is cancelled and the opposite side begins flashing.

Automatic Cancellation

Press the left or right turn switch to activate automatic turn signal cancellation. There is no need to hold the turn switch in when approaching the turn. The TSM/TSSM/HFSM will not cancel the signal before the turn is actually completed.

- When the directional switch is released, the system starts a 20 count. As long as the vehicle is traveling above 7

mph (11 km/h), the directional will always cancel after 20 flashes if the system does not recognize any other input.

- If the vehicle speed drops to 7 mph (11 km/h) or less, including stopped, the directionals will continue to flash. Counting will resume when vehicle speed reaches 8 mph (12.9 km/h) and will automatically cancel when the count total equals 20 as stated above.
- See [Figure 5-13](#). The turn signals will cancel within two seconds upon turn completion. A sensor inside the TSM/TSSM/HFSM cancels the signal after the vehicle has been returned to an upright position.

NOTE

The bank angle cancellation function has an automatic calibration feature. Ride the vehicle for 0.25 mile (0.4 km) at steady speeds (upright) to calibrate the system. Performance of bank angle function may not be optimal until this calibration is performed. This self-calibration is performed automatically every time the vehicle is started and ridden.



Figure 5-13. Tilting TSM/HFSM

Four-Way Flashing

Use the following method to activate the four-way flashers:

1. With the ignition switch ON and the security system disarmed (models with security only), press the left and right turn signal switches at the same time.
2. Turn the ignition switch OFF and arm the security system if present and desired. The four-way flashers will continue for two hours.
3. To cancel four-way flashing, disarm the security system if necessary, turn the ignition switch ON and press the left and right turn signal switches at the same time.

This system allows a stranded vehicle to be left in the four-way flashing mode and secured until help is found.

If the security system is disarmed while the four-way flashers are active, the lights will flash as follows:

1. TSSM/HFSM stops four-way flashing mode. Vehicle sits for 1 second with turn signals off.
2. TSSM/HFSM performs disarming confirmation (1 flash).
3. Vehicle sits for 1 second with turn signals off.
4. Vehicle restarts four-way flashing mode.

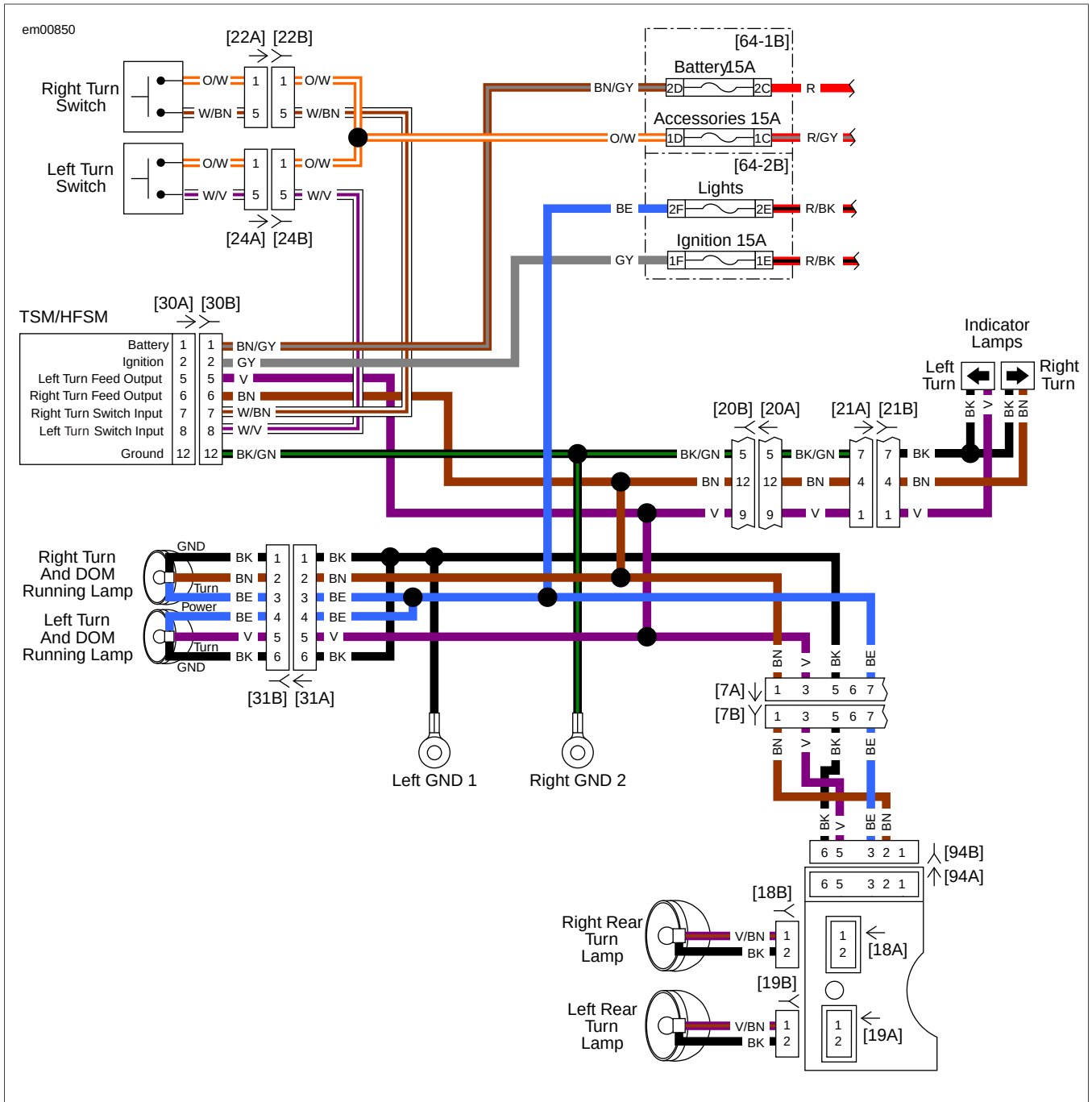


Figure 5-14. Turn Signal Circuit: FLHR/C

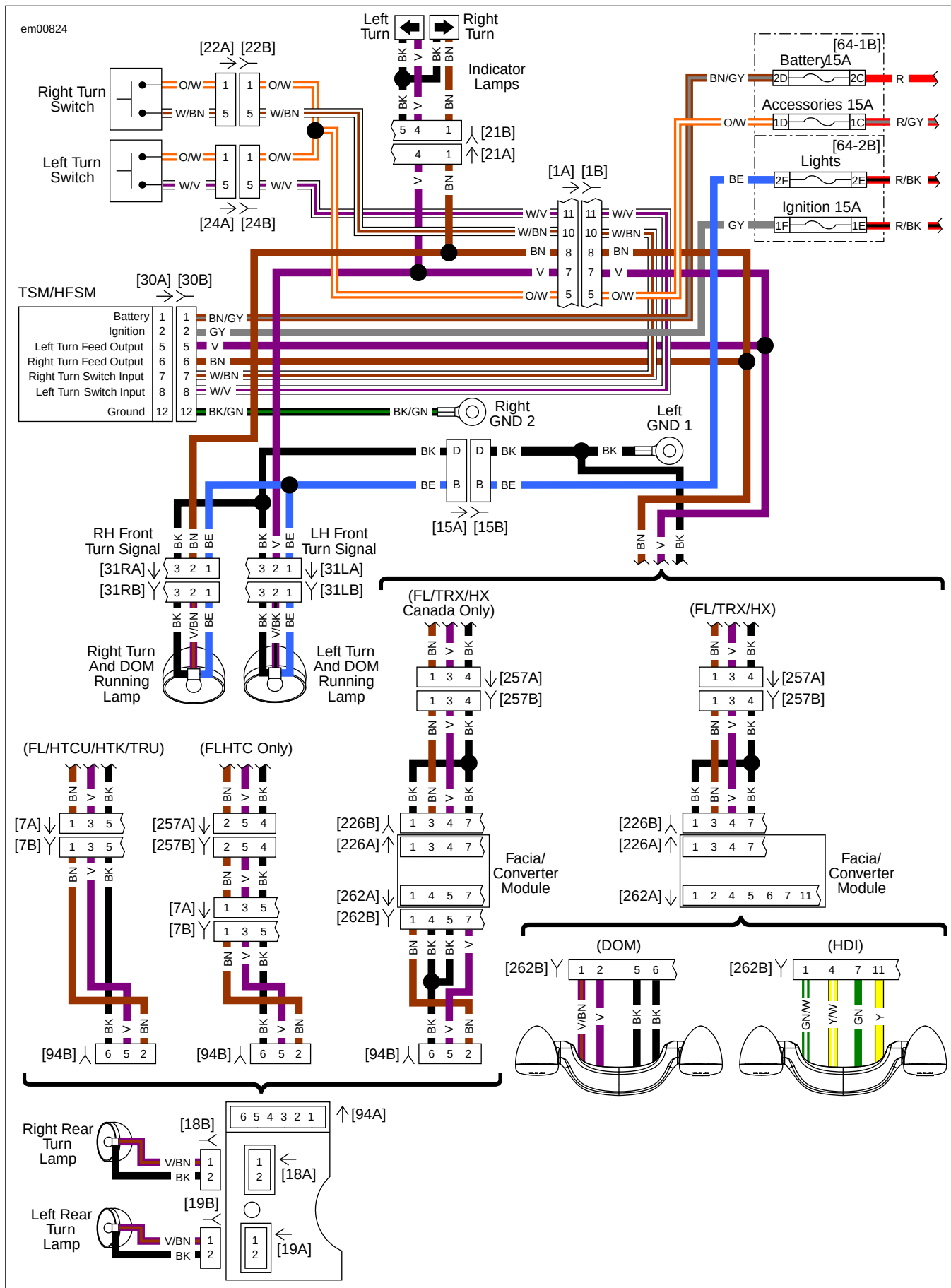


Figure 5-15. Turn Signal Circuit: Except FLHR/C

WILL NOT CANCEL UPON TURN COMPLETION, NO DTCS

Table 5-11. Will Not Cancel Upon Turn Completion, No DTCS Diagnostic Faults

POSSIBLE CAUSES
Improper configuration
TSM/TSSM/HFSM malfunction

1. TSM/TSSM/HFSM Mounting Test

1. Verify TSM/TSSM/HFSM is mounted correctly.
2. Is TSM/TSSM/HFSM mounted correctly?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Mount correctly.

2. Correct Configuration Test

1. Check if TSM/TSSM/HFSM is configured correctly. See [5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS](#).
2. Proper configuration?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Select proper vehicle configuration.

3. 4-Way Cancellation Test

1. Gain access to the vehicle's TSM/TSSM/HFSM.
2. See [Figure 5-13](#). Position TSM/TSSM/HFSM in the same orientation it is mounted on the vehicle.
3. With IGN ON, turn on 4-way flashers by depressing both left and right turn signal switches at the same time.
4. Turn IGN OFF. The 4-way flashers should continue to flash.
5. Tilt the module greater than 45 degrees to the left.
6. Repeat steps 2-4 then tilt the module greater than 45 degrees to the right.
7. Do 4-way flashers cancel in both directions?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual. **(6773)**

4. Turn Signals Cancel Test

1. Operate vehicle at a speed greater than 7 mph (11.2 km/h) in a straight line.
2. Activate either turn signal.
3. Turn signals should cancel after 20 flashes.
4. Do turn signals cancel?
 - a. **Yes.** System operating properly.
 - b. **No.** [Go to Test 5.](#)

5. Speedometer Test

1. Does speedometer register vehicle speed?
 - a. **Yes.** Replace TSM/TSSM/HFSM. See the service manual. **(6773)**
 - b. **No.** See [2.1 INITIAL DIAGNOSTICS](#).

FLASH AT DOUBLE NORMAL RATE, ALL BULBS WORK, NO DTCS

PART NUMBER	TOOL NAME
99861-02	ELECTRICAL CONTACT LUBRICANT

Table 5-12. Flash at Double Normal Rate, All Bulbs Work, No DTCS Diagnostic Faults

POSSIBLE CAUSES
Incorrect lamps
TSM/TSSM/HFSM malfunction
Lamp malfunction

1. Lamp Load Calibration Test

1. Disconnect the negative battery cable for at least one minute.
2. Connect the negative battery cable.
3. Turn IGN ON.
4. Activate the left turn signals for more than four flashes.
5. Activate the right turn signals for more than four flashes.
6. Did the turn signals calibrate?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Correct issue and recalibrate.

2. Lamp Verification Test

1. Determine correct part number for all installed turn signal bulbs.
2. Verify correct parts are installed on vehicle.
3. Are the correct parts installed?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace with correct bulbs. See the service manual. **(6820)**

3. Bulb Corrosion Test

1. Check for corrosion on bulbs and/or sockets.
2. Is corrosion present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 4.](#)

4. Lamp Connection Terminal Corrosion Test

1. Check for corrosion on all lamp connection terminals.

2. Is corrosion present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual. **(6791)**

5. Verification Test

1. Clean corrosion from wires and terminals.
2. Do lamps flash at normal rate?
 - a. **Yes.** System OK. **(6822)**
 - b. **No.** Replace TSM/TSSM/HFSM. See the service manual. **(6791)**

6. Lamp Operation Test

1. Remove corrosion with a wire brush.
2. Install ELECTRICAL CONTACT LUBRICANT (Part No. 99861-02) in bulb sockets.
3. Do lamps flash at normal rate?
 - a. **Yes.** System OK. **(6822)**
 - b. **No.** [Go to Test 7.](#)

7. Lamp Assembly Test

1. Clean or replace bulb.
2. Do lamps flash at normal rate?
 - a. **Yes.** System OK. **(6822)**
 - b. **No.** Replace lamp assembly. See the service manual. **(6823)**

BOTH TURN SIGNAL LAMPS ON ONE SIDE INOPERATIVE, NO DTCS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-13. Both Turn Signal Lamps on One Side Inoperative, No DTCs Diagnostic Faults

POSSIBLE CAUSES
Open on turn signal inputs
Open accessory circuit
Left turn signal switch malfunction
Right turn signal switch malfunction
TSM/TSSM/HFSM malfunction

1. Left or Right Turn Signal Malfunction Test

1. With IGN ON, operate the left and right turn signals.
2. Are the right turn signals inoperative?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. Right Turn Signal Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) between wire harness connector [30B] and TSM/TSSM/HFSM [30A]. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Turn IGN ON.
3. While pressing the right turn signal switch, using a multi-meter, test for voltage on breakout box (gray) terminal 7.
4. Is battery voltage present when switch is pressed?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** [Go to Test 3.](#)

3. Right Turn Signal Switch Test

1. Disconnect right hand controls [22].
2. Test for voltage between [22B] terminal 1 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (O/W) wire. **(5041)**

4. Right Turn Signal Circuit Continuity Test

1. Turn IGN OFF.
2. Test for continuity between [22B] terminal 5 and breakout box (gray) terminal 7.
3. Is continuity present?
 - a. **Yes.** Replace the right turn signal switch. See the service manual. **(6811)**
 - b. **No.** Repair open in (W/BN) wire. **(5041)**

5. Left Turn Signal Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) between wire harness connector [30B] and TSM/TSSM/HFSM [30A]. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Turn IGN ON.
3. While pressing the left turn signal switch, using a multi-meter, test for voltage on breakout box (gray) terminal 8.
4. Is battery voltage present when switch is pressed?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No.** [Go to Test 6.](#)

6. Left Turn Signal Switch Test

1. Disconnect left hand controls [24].
2. Test for voltage between [24B] terminal 1 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (O/W) wire. **(5043)**

7. Left Turn Signal Circuit Continuity Test

1. Turn IGN OFF.
2. Test for continuity between [24B] terminal 5 and breakout box (gray) terminal 8.

3. Is continuity present?
 - a. **Yes.** Replace the left turn signal switch. See the service manual. **(6811)**
 - b. **No.** Repair open in (W/V) wire. **(5041)**

8. Right Turn Signal Short to Voltage Test

1. Release the right turn signal switch.
2. Test for voltage on breakout box (gray) terminal 7.
3. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (W/BN) wire.
 - b. **No, without anti-theft tracking module.** Replace the TSM/TSSM/HFSM. See the service manual.
 - c. **No, with anti-theft tracking module.** [Go to Test 10.](#)

9. Left Turn Signal Short to Voltage Test

1. Release the left turn signal switch.
2. Test for voltage on breakout box (gray) terminal 8.
3. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (W/V) wire.
 - b. **No, without anti-theft tracking module.** Replace the TSM/TSSM/HFSM. See the service manual.
 - c. **No, with anti-theft tracking module.** [Go to Test 10.](#)

10. Anti-Theft Tracking Module Test

1. Disconnect anti-theft tracking module.
2. Press the inoperative turn signal switch.
3. Do the turn signals function properly?
 - a. **Yes.** Replace the anti-theft tracking module. See the service manual.
 - b. **No.** Replace the TSM/TSSM/HFSM. See the service manual.

ONE TURN SIGNAL LAMP INOPERATIVE, NO DTCS

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

Table 5-14. One Turn Signal Lamp Inoperative, No DTCs Diagnostic Faults

POSSIBLE CAUSES
Open turn signal circuit
Open turn signal ground circuit
Inoperative turn signal
TSM/TSSM/HFSM malfunction

1. Inoperative Signal Location Test

1. With IGN ON, operate the left and right turn signals.

2. Do all the turn signals operate on both sides?
 - a. **Yes.** System operating properly.
 - b. **No, right front turn signal inoperative.** [Go to Test 2.](#)
 - c. **No, left front turn signal inoperative.** [Go to Test 5.](#)
 - d. **No, right rear turn signal inoperative.** [Go to Test 8.](#)
 - e. **No, left rear turn signal inoperative.** [Go to Test 11.](#)

2. Right Front Turn Signal Bulb Test

1. Remove the right front turn signal bulb.
2. Inspect the bulb.
3. Is the bulb good?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace the bulb. See the service manual. **(6820)**

3. Right Front Turn Signal Circuit Test

1. Disconnect front turn signal [31] (FLHR/C) or [31R] (except FLHR/C).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect a test light to [31A] (FLHR/C) or [31RA] (except FLHR/C) between terminals 1 and 2.
3. Press the right turn signal switch.
4. Does the test light flash?
 - a. **Yes.** Replace the right front turn signal. See the service manual. **(6823)**
 - b. **No.** [Go to Test 4.](#)

4. Right Front Turn Signal Ground Circuit Test

1. Test for voltage between [31A] (FLHR/C) or [31RA] (except FLHR/C) terminal 2 and ground.
2. Does the voltage cycle on and off?
 - a. **Yes.** Repair open in (BK) wire between [31A] (FLHR/C) or [31RA] (except FLHR/C) terminal 1 and ground. **(5041)**
 - b. **No.** Repair open in (BN) wire between [31A] (FLHR/C) or [31RA] (except FLHR/C) terminal 2 and TSM/TSSM/HFSM. **(5041)**

5. Left Front Turn Signal Bulb Test

1. Remove the left front turn signal bulb.
2. Inspect the bulb.
3. Is the bulb good?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Replace the bulb. See the service manual. **(6820)**

6. Left Front Turn Signal Circuit Test

1. Disconnect front turn signal [31] (FLHR/C) or [31L] (except FLHR/C).

2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect a test light to [31A] between terminal 5 and terminal 6 (FLHR/C) or [31LA] between terminal 2 and terminal 3 (except FLHR/C).
3. Press the left turn signal switch.
4. Does the test light flash?
 - a. **Yes.** Replace the left front turn signal. See the service manual. **(6823)**
 - b. **No.** [Go to Test 7.](#)

7. Left Front Turn Signal Ground Circuit Test

1. Test for voltage between [31A] (FLHR/C) terminal 5 and ground or [31LA] (except FLHR/C) terminal 2 and ground.
2. Does the voltage cycle on and off?
 - a. **Yes.** Repair open in (BK) wire between [31A] terminal 6 and ground (FLHR/C) or [31LA] terminal 3 and ground (except FLHR/C). **(5041)**
 - b. **No.** Repair open in (V) wire between [31A] terminal 5 and TSM/TSSM/HFSM (FLHR/C) or [31LA] terminal 2 and TSM/TSSM/HFSM (except FLHR/C). **(5041)**

8. Right Rear Turn Signal Bulb Test

1. Remove the right rear turn signal bulb.
2. Inspect the bulb.
3. Is the bulb good?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No. Lamp is LED.** [Go to Test 15.](#)
 - c. **No. Bulb does not work.** Replace the bulb. See the service manual. **(6820)**

9. Right Rear Turn Signal Circuit Test: Except LED Lights

1. Disconnect right rear turn signal [18] (except FLTRX/FLHX) or [262] (FLTRX/FLHX).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect a test light to [18A] terminal 1 and terminal 2 or [262A] terminal 1 and terminal 6.
3. Press the right turn signal switch.
4. Does the test light flash?
 - a. **Yes.** Replace the right rear turn signal. See the service manual. **(6823)**
 - b. **No.** [Go to Test 10.](#)

10. Right Rear Turn Signal Ground Circuit Component Test

1. Disconnect rear fender lights [94] (except FLTRX/FLHX) or [226] (FLTRX/FLHX).
2. Test for voltage between [94B] terminal 2 and terminal 6 or [226B] terminal 3 and terminal 7.

3. Does the voltage cycle off and on?
 - a. **Yes. Except FLTRX/FLHX.** Replace the circuit board. See the service manual. **(5215)**
 - b. **Yes. FLTRX/FLHX.** Replace the facia/converter module. See the service manual. **(6809)**
 - c. **No.** [Go to Test 14.](#)

11. Left Rear Turn Signal Bulb Test

1. Remove the left rear turn signal bulb.
2. Inspect the bulb.
3. Is the bulb good?
 - a. **Yes.** [Go to Test 12.](#)
 - b. **No. Lamp is LED.** [Go to Test 17.](#)
 - c. **No. Bulb does not work.** Replace the bulb. See the service manual. **(6820)**

12. Left Rear Turn Signal Circuit Test: Except LED Lights

1. Disconnect left rear turn signal [19] (except FLTRX/FLHX) or rear lighting jumper harness [262] (FLTRX/FLHX).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect a test light to [19A] terminal 1 and terminal 2 or [262A] terminal 2 and terminal 5.
3. Press the left turn signal switch.
4. Does the test light flash?
 - a. **Yes.** Replace the left rear turn signal. See the service manual. **(6823)**
 - b. **No.** [Go to Test 13.](#)

13. Left Rear Turn Signal Component Test

1. Test for voltage between [94B] terminal 5 and terminal 6 or [226B] terminal 1 and terminal 4.
2. Does the voltage cycle off and on?
 - a. **Yes. Except FLTRX/FLHX.** Replace the circuit board. See the service manual. **(5215)**
 - b. **Yes. FLTRX/FLHX.** Replace the facia/converter module. See the service manual. **(6809)**
 - c. **No.** [Go to Test 16.](#)

14. Right Rear Turn Signal Ground Circuit Test

1. Test for voltage between [94] terminal 2 or [226] terminal 3 and ground.
2. Does the voltage cycle on and off?
 - a. **Yes.** Repair open in the (BK) wire. **(5041)**
 - b. **No.** Repair open in the (BN) wire. **(5041)**

15. Right Rear Turn Signal Circuit Test: LED Lights

1. Disconnect rear lighting jumper harness [262].

2. Test for voltage at [262A] between terminal 1 and terminal 5.
3. Does the voltage cycle on and off?
 - a. **Yes.** Replace the lightbar. See the service manual. **(6823)**
 - b. **No.** [Go to Test 10.](#)

16. Left Rear Turn Signal Ground Circuit Test

1. Test for voltage between [94] terminal 5 or [226] terminal 4 and ground.

2. Does the voltage cycle on and off?
 - a. **Yes.** Repair open in the (BK) wire. **(5041)**
 - b. **No.** Repair open in the (V) wire. **(5041)**

17. Left Rear Turn Signal Circuit Test: LED Lights

1. Disconnect rear lighting jumper harness [262].
2. Test for voltage at [262A] between terminal 2 and terminal 5.
3. Does the voltage cycle on and off?
 - a. **Yes.** Replace the lightbar. See the service manual. **(6823)**
 - b. **No.** [Go to Test 12.](#)



HEADLAMPS

5.7

DESCRIPTION AND OPERATION

When the ignition is turned ON the headlamp switch receives power through the lights fuse.

- In the low position the headlamp switch directs voltage through the (Y) wire to illuminate the low beam headlamp.
- In the high position voltage is directed through the (W) wire to the high beam headlamp and the high beam indicator.

See [Figure 5-16](#) and [Figure 5-17](#). The headlamp could have one (FLH models) or two (FLT models) connectors depending on the model. Most models have a single connector for the low and high beam headlamp. However, the FLT model has a left assembly connector and a right assembly connector.

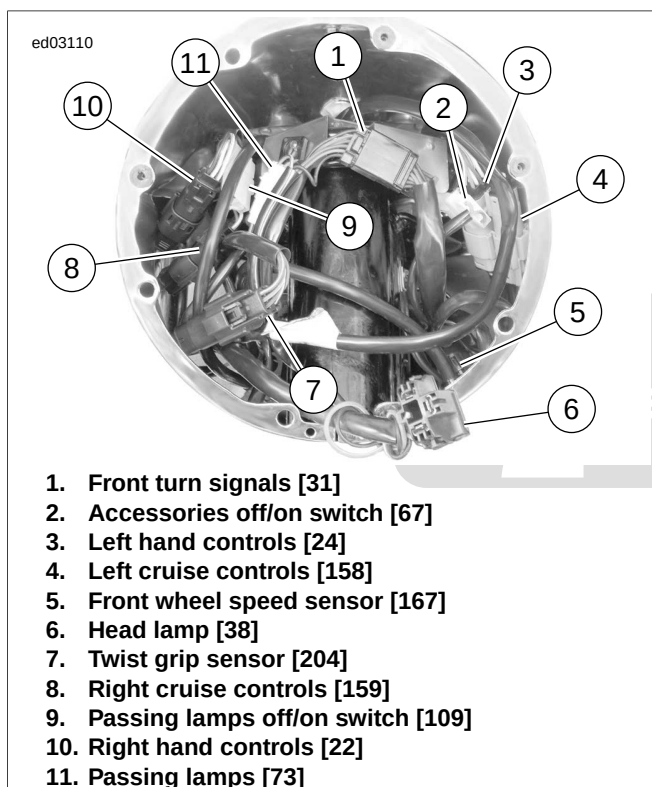


Figure 5-16. Head Lamp Nacelle: FLH Models

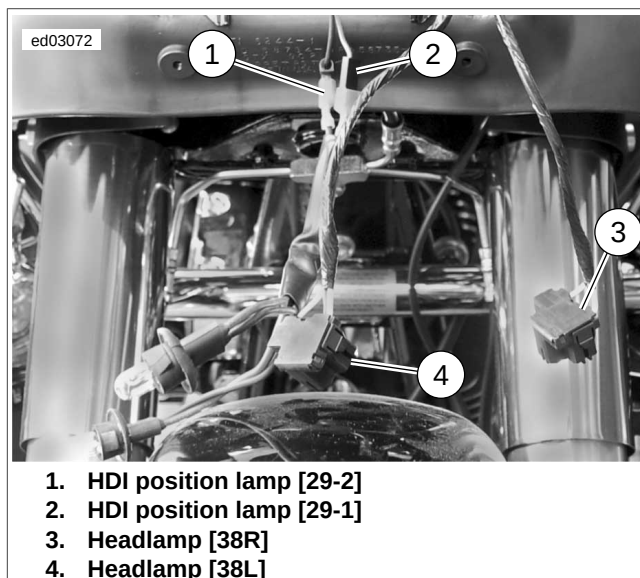


Figure 5-17. Headlamp: FLT Models

Diagnostic Tips

If the headlight fuse is open, test for short to ground on (BE) wire from the fuse to the headlamp switch. Also, check for a short to ground on the (W) wire from the headlamp switch. If this circuit is grounded, it will open the fuse when the headlamp switch is in the high position.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

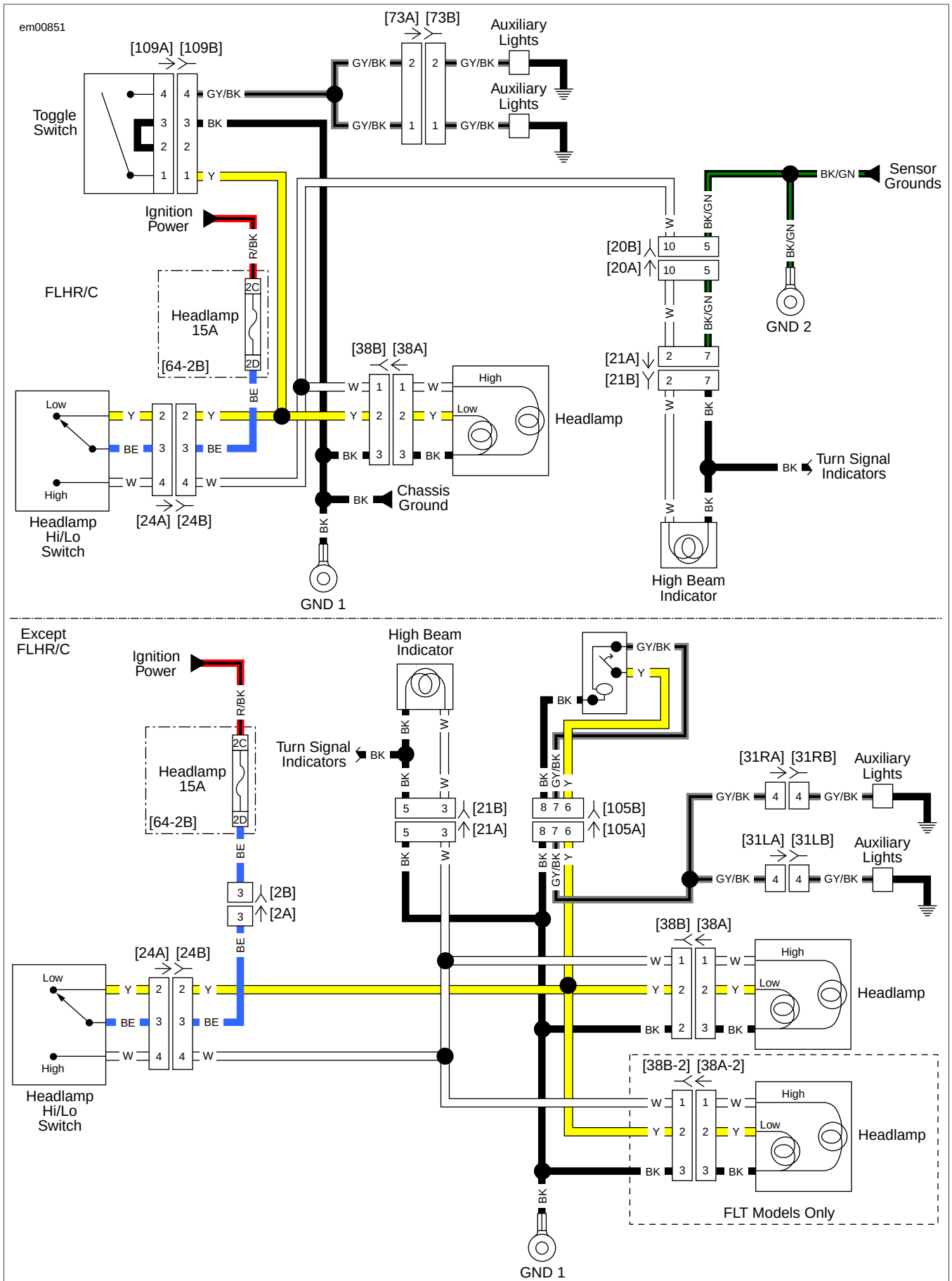


Figure 5-18. Headlamp

HEADLAMP INOPERATIVE, NO DTCS

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

Table 5-15. Headlamp Inoperative, No DTCs Diagnostic Faults

POSSIBLE CAUSES
Open fuse
Open power to switch circuit
Headlamp Hi/Lo switch malfunction
Open ground circuit
Open high beam power circuit
Open low beam power circuit
Headlamp malfunction

1. Operational Test

1. Turn IGN ON.
2. Move the headlamp switch to the high and low positions.
3. Do the headlamps work in both positions?
 - a. **Yes.** Concern is intermittent perform wiggle test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#).
 - b. **No. High beam headlamp inoperative.** [Go to Test 2.](#)
 - c. **No. Low beam headlamp inoperative.** [Go to Test 5.](#)
 - d. **No. Both headlamps inoperative.** [Go to Test 7.](#)

2. High Beam Indicator Test

1. With the headlamp Hi/Lo switch in the high position, observe the high beam indicator lamp.
2. Does the high beam indicator illuminate?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 3.](#)

3. Headlamp High Beam Circuit Switch Test

1. With IGN OFF, disconnect left hand controls [24].
2. Place the headlamp Hi/Lo switch in the high position.
3. Using a HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jumper [24B] terminals 3 and 4 together.
4. Turn IGN ON.
5. Does the high beam headlamp operate?
 - a. **Yes.** Replace the left switch assembly. See the service manual. **(5171)**
 - b. **No.** Repair open in (W) wire between [24B] and the indicators. **(5041)**

4. High Beam Headlamp Test

1. Disconnect the high beam headlamp.

2. With the IGN ON and the headlamp Hi/Lo switch in the high position, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [38A] (FLH models) or [38A-2] (FLT models) terminals 1 and 3.
3. Is battery voltage present?
 - a. **Yes.** Replace the headlamp. See the service manual. **(5185)**
 - b. **No.** Repair open in (W) wire to headlamp. **(5041)**

5. Headlamp Low Beam Switch Test

1. With the IGN OFF, disconnect left hand controls [24].
2. Using a HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jumper [24B] terminals 2 and 3 together.
3. Turn IGN ON.
4. Does the low beam headlamp operate?
 - a. **Yes.** Replace the left switch assembly. See the service manual. **(5171)**
 - b. **No.** [Go to Test 6.](#)

6. Low Beam Headlamp Test

1. Connect [24].
2. Disconnect the low beam headlamp.
3. With the headlamp Hi/Lo switch in the low position using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [38A] (FLH models) or [38A-2] (FLT models) terminals 2 and 3.
4. Is battery voltage present?
 - a. **Yes.** Replace the headlamp. See the service manual. **(5185)**
 - b. **No.** Repair open in (Y) wire to headlamp. **(5041)**

7. High Beam Indicator Test

1. With the headlamp Hi/Lo switch in the high position, observe the high beam indicator lamp.
2. Does the high beam indicator illuminate?
 - a. **Yes.** Repair open in (BK) ground circuit from headlamp. **(5041)**
 - b. **No.** [Go to Test 8.](#)

8. Headlamp Power Circuit Open Test

1. With the IGN OFF, disconnect left hand controls [24].
2. Using a HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jumper [24B] terminals 2 and 3 together.
3. Turn IGN ON.
4. Does the low beam headlamp operate?
 - a. **Yes.** Replace the left switch assembly. See the service manual. **(5171)**
 - b. **No.** Repair open in (BE) wire to [24B]. **(5039)**

9. Headlamp Fuse Test

1. Inspect the headlamp fuse.
2. Is the fuse good?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No.** [Go to Test 10.](#)

10. Power Circuit Test

1. Test for voltage on [64-2B] socket terminal 2D of the headlamp fuse.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BE) wire between fuse block and headlamp Hi/Lo switch. **(5039)**
 - b. **No.** Repair open in (R/BK) wire. **(5041)**

AUXILIARY LAMPS INOPERATIVE

Table 5-16. Auxiliary Lamps Inoperative Diagnostic Faults

POSSIBLE CAUSES
Auxiliary lamp malfunction
Toggle switch malfunction
Open in auxiliary power circuit
Open in auxiliary ground circuit

1. Auxiliary Lamps Operation Test

1. Place the headlamp switch in the low position.
2. Turn on the auxiliary lamps.
3. Do the auxiliary lamps illuminate?
 - a. **Yes.** System operating properly. Intermittent perform wiggle test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test.](#)
 - b. **No. Auxiliary lamps and headlamps are inoperative.** See [5.7 HEADLAMPS, Headlamp Inoperative, No DTCs.](#)
 - c. **No. Only one auxiliary lamp is operative.** [Go to Test 2.](#)
 - d. **No. Both auxiliary lamps are inoperative.** [Go to Test 4.](#)

2. Auxiliary Bulb Test

1. Inspect the bulb.
2. Is the bulb good?
 - a. **Yes.** FLHR/C. [Go to Test 3.](#)
 - b. **Yes.** Except FLHR/C. [Go to Test 6.](#)
 - c. **No.** Replace the bulb. See the service manual. **(5227)**

3. Auxiliary Lamp Circuit Test: FLHR/C

1. Disconnect auxiliary lamps [73].

2. Test for battery voltage between inoperative circuit at [73B] terminal 1 or 2 and ground.
3. Is battery voltage present?
 - a. **Yes.** Replace the inoperative auxiliary lamp. **(5227)**
 - b. **No.** Repair open in the (GY/BK) wire between the toggle switch and [73]. **(5041)**

4. Auxiliary Lamp Switch Test

1. Disconnect auxiliary lamp switch [109] (FLHR/C) models, [105] on FLHT models.
2. Jumper [109B] terminals 1 and 3 (FLHR/C) or [105A] terminals 6 and 7 (FLHT) together.
3. With the headlamp switch in the low position, turn IGN ON.
4. Do the auxiliary lamps illuminate?
 - a. **Yes.** Replace the auxiliary lamp toggle switch. **(5167)**
 - b. **No.** FLHR/C. [Go to Test 5.](#)
 - c. **No.** Except FLHR/C. [Go to Test 7.](#)

5. Auxiliary Lamp Power Circuit Test: FLHR/C

1. Test for battery voltage from auxiliary lamp switch [109B] terminal 1 (Y) to ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (GY/BK) wire between [109B] and [73B]. **(5041)**
 - b. **No.** Repair open in (Y) wire between [109B] and headlamp switch. **(5041)**

6. Auxiliary Lamp Circuit Test: Except FLHR/C

1. Disconnect left front turn signal [31L] or right front turn signal [31R].
2. Test for battery voltage between inoperative circuit at [31] terminal 4 and ground.
3. Is battery voltage present?
 - a. **Yes.** Replace the inoperative auxiliary lamp. **(5227)**
 - b. **No.** Repair open in the (GY/BK) wire between the toggle switch and [31]. **(5041)**

7. Auxiliary Lamp Power Circuit Test: Except FLHR/C

1. Test for battery voltage from [105A] terminal 1 (Y) to ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (GY/BK) wire between [105A] and [31]. **(5041)**
 - b. **No.** Repair open in (Y) wire between [105A] and headlamp switch. **(5041)**

STOP LAMPS

5.8

DESCRIPTION AND OPERATION

The front stop lamp switch is a mechanical switch located in the right handlebar switch assembly. See [Figure 5-19](#). The rear stop lamp switch is a pressure switch located on the right side at the rear of the crankcase.

The brake switches receive power through the ACCY fuse. On vehicles without ABS, When the front or rear stop lamp switch is applied, voltage travels through the switch to the coil side of the brake relay.

On vehicles with ABS the voltage from the stop lamp switch is sent to the ABS module and also through an ABS diode pack to the coil side of the brake relay.

The diode pack isolates the front and rear stop lamp voltages so the ABS module can determine which stop lamp switch is applied.

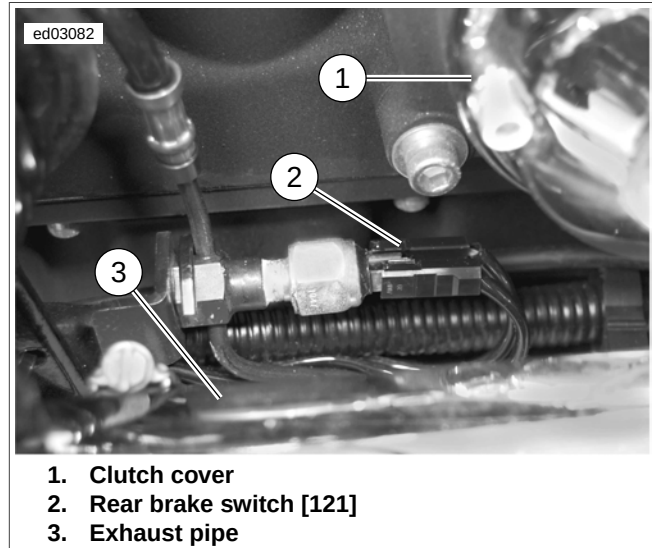


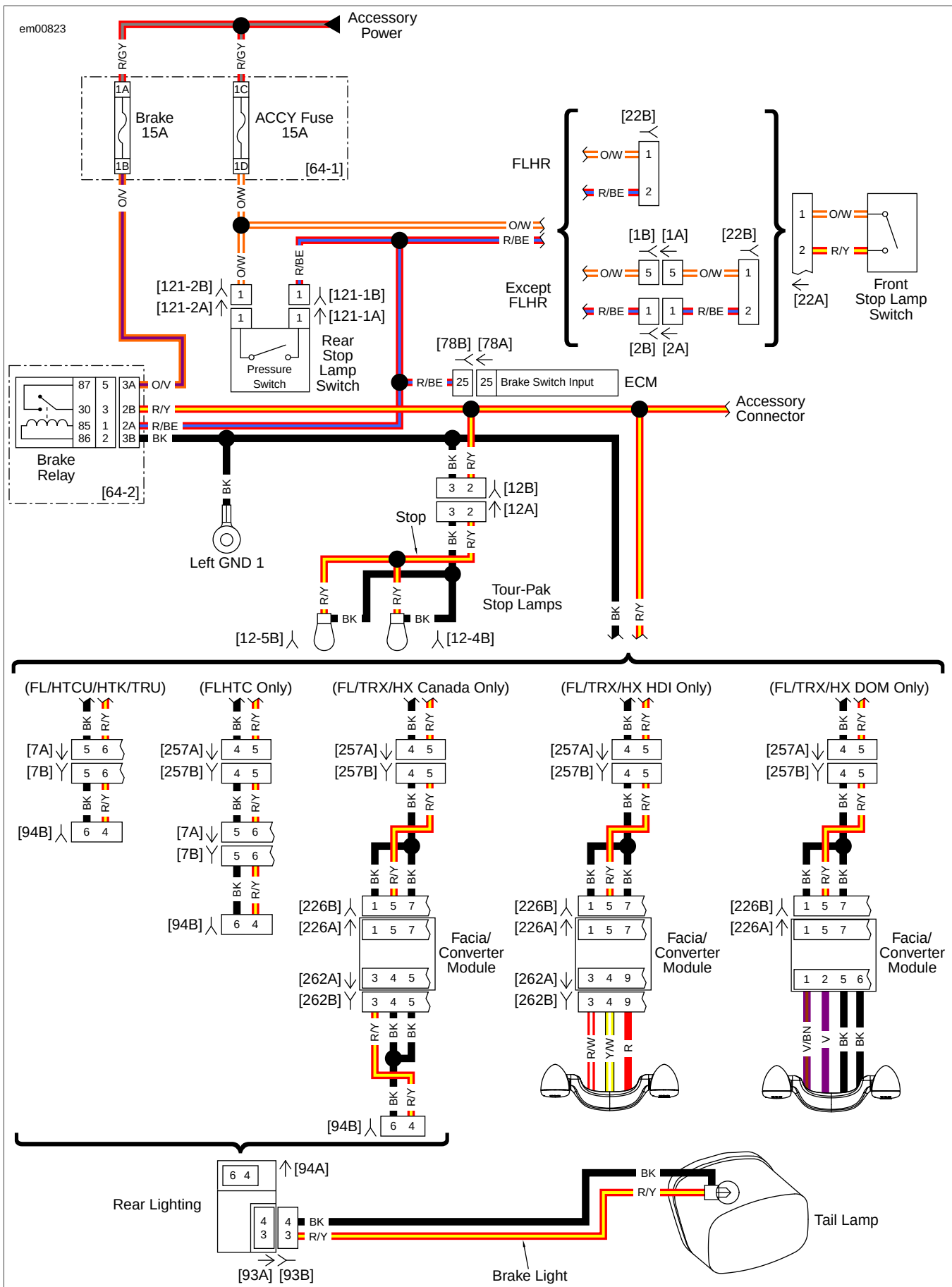
Figure 5-19. Rear Brake Switch

Diagnostic Tips

When testing for a short to ground due to an open fuse, check the (R/Y) wire between the brake relay and the stop lamp. A short to ground on these wires causes the brake fuse to open only when the brake switches are closed. A short to ground in the (Y/BK) wire between the horn switch and the horn causes the ACCY fuse to open when the horn switch is pressed and needs to be checked for a short to ground as well.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



5-30 2011 Touring Diagnostics: Accessories, Horn, Lighting and Security

STOP LAMP INOPERATIVE

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

Table 5-17. Stop Lamp Inoperative Diagnostic Faults

POSSIBLE CAUSES
Open fuse
Short in stop lamp circuit
Open power to switch circuit
Open ground circuit
Open stop lamp circuit
Stop lamp malfunction
Rear stop lamp switch malfunction
Front stop lamp switch malfunction

1. Accessory Circuit Test

- Turn IGN to ACC.
- Does the speedometer illuminate?
 - Yes.** [Go to Test 8.](#)
 - No.** [Go to Test 2.](#)

2. ACCY Fuse Test

- Inspect the ACCY fuse.
- Is the fuse good?
 - Yes.** [Go to Test 3.](#)
 - No.** [Go to Test 5.](#)

3. ACCY Circuit from Ignition Switch Test

- With IGN in ACC, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between [64-1B] socket terminal 1C and ground.
- Is battery voltage present?
 - Yes.** Repair open in (O/W) wire from ACCY fuse. **(5043)**
 - No.** [Go to Test 4.](#)

4. Ignition Switch Test

- With IGN OFF, disconnect the ignition switch [33].
- Test for continuity between ignition switch [33B] terminal 1 and [64-1B] socket terminal 1C.
- Is continuity present?
 - Yes.** Replace the ignition switch. See the service manual. **(7287)**
 - No.** Repair open between [64-1B] socket terminal 1C and ignition switch [33B] terminal 1 (R/GY) wire. **(5041)**

5. Accessory Circuit Resistance Test

- With the ACCY fuse removed, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multi-

meter, measure resistance between [64-1B] socket terminal 1D and ground.

- Is resistance less than 10 Ohms?
 - Yes.** [Go to Test 6.](#)
 - No.** See diagnostic tips. Replace ACCY fuse and verify repair. **(6822)**

6. Fuel Level Sensor Test

- Disconnect fuel tank harness [13].
- Measure resistance between [64-1B] socket terminal 1D and ground.
- Is resistance less than 10 Ohms?
 - Yes.** [Go to Test 7.](#)
 - No.** Replace fuel level sensor. See the service manual. **(6035)**

7. Speedometer Test

- Disconnect the speedometer [39B].
- Measure resistance between [64-1B] socket terminal 1D and ground.
- Is resistance less than 10 Ohms?
 - Yes.** Repair short to ground in accessory circuit (O/W) wire. **(5043)**
 - No.** Replace the speedometer. See the service manual. **(6826)**

8. Stop Lamp Switch Test

- Apply the front brake while observing the stop lamp.
- Apply the rear brake while observing the stop lamp.
- Does the stop lamp illuminate?
 - Yes. Stop lamp illuminates only with front brake applied.** [Go to Test 12.](#)
 - Yes. Stop lamp illuminates only with rear brake applied.** [Go to Test 14.](#)
 - No.** [Go to Test 9.](#)

9. Brake Relay Test

- Test brake relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics.](#)
- Does relay pass test?
 - Yes.** [Go to Test 10.](#)
 - No.** Replace brake relay. See the service manual. **(1407)**

10. Relay Coil Circuit Test

- Test for voltage between [64-2B] terminal 2A and terminal 3B.
- With the brake applied, is voltage present?
 - Yes.** [Go to Test 20.](#)
 - No.** [Go to Test 11.](#)

11. Stop Lamp Switch Power Circuit Test

1. Test for voltage between [64-2B] terminal 2A and ground.
2. With the brake applied, is voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (R/BE) wire. **(5041)**

12. Rear Stop Lamp Switch Test

1. Disconnect rear stop lamp switch [121].
2. Jumper rear stop lamp switch [121B] terminal 1B and terminal 2B together.
3. Turn IGN ON.
4. Does the brake lamp illuminate?
 - a. **Yes.** Replace the rear stop lamp switch. See the service manual. **(5141)**
 - b. **No.** [Go to Test 13.](#)

13. Rear Stop Lamp Switch ACCY Circuit Test

1. Test for voltage between rear stop lamp switch [121B] terminal 2B and ground.
2. Is battery voltage present?
 - a. **Yes. Without ABS.** Repair open in (R/BE) wire between rear stop lamp switch and brake relay. **(5041)**
 - b. **Yes. With ABS.** [Go to Test 16.](#)
 - c. **No.** Repair open in (O/W) wire. **(5043)**

14. Front Stop Lamp Switch Test

1. With IGN OFF, disconnect right hand controls [22].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) jumper [22B] terminals 1 and 2 together.
3. Turn IGN ON.
4. Does the brake lamp illuminate?
 - a. **Yes.** Replace front stop lamp switch. See the service manual. **(5176)**
 - b. **No.** [Go to Test 15.](#)

15. Front Stop Lamp Switch ACCY Circuit Test

1. Test for voltage between [22B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes. Without ABS.** Repair open in (R/BE) wire between front stop lamp switch and stop lamp. **(5041)**
 - b. **Yes. With ABS.** [Go to Test 18.](#)
 - c. **No.** Repair open in (O/W) wire. **(5043)**

16. Rear Stop Lamp to ABS Diode Pack Circuit Test

1. Connect rear stop lamp switch [121].
2. Disconnect ABS diode pack [201].

3. With rear brake applied, test for voltage between ABS diode pack [201B] terminal 1 and ground 2.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 17.](#)
 - b. **No.** Repair open in (PK/BN) wire. **(5041)**

17. ABS Diode Pack Rear Circuit Test

1. Test for continuity between ABS diode pack [201B] terminal 4 and [64-2B] terminal 2A.
2. Is continuity present?
 - a. **Yes.** Replace ABS diode pack. See the service manual. **(1404)**
 - b. **No.** Repair open in (R/BE) wire. **(5041)**

18. Front Stop Lamp to ABS Diode Pack Circuit Test

1. Connect [22].
2. Disconnect ABS diode pack [201].
3. With front brake applied, test for voltage between terminal 2 of ABS diode pack [201B] and ground.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 19.](#)
 - b. **No.** Repair open in (R/BN) wire. **(5041)**

19. ABS Diode Pack Front Circuit Test

1. Test for continuity between ABS diode pack [201B] terminal 3 and [64-2B] terminal 2A.
2. Is continuity present?
 - a. **Yes.** Replace ABS diode pack. See the service manual. **(1404)**
 - b. **No.** Repair open in (R/BE) wire. **(5041)**

20. Relay Power Test

1. Test for voltage between [64-2B] terminal 3A and ground.
2. Is battery voltage present?
 - a. **Yes. Except FLTRX, FLHX, FLHTC.** [Go to Test 21.](#)
 - b. **Yes. FLTRX, FLHX, FLHTC.** [Go to Test 24.](#)
 - c. **No.** Repair open in (O/V) wire. **(5041)**

21. Stop Lamp Test

1. Install brake relay.
2. Disconnect tail lamp [93].
3. With brake applied, test for voltage between [93A] terminals 3 and 4.
4. Is battery voltage present?
 - a. **Yes.** Replace stop lamp assembly. **(5215)**
 - b. **No.** [Go to Test 22.](#)

22. Circuit Board Test

1. Disconnect rear fender lights [94].

2. With brake applied, test for voltage between [94B] terminals 4 and 6.
3. Is battery voltage present?
 - a. **Yes.** Replace the circuit board. See the service manual. **(5215)**
 - b. **No.** [Go to Test 23.](#)

23. Stop Lamp Circuit Test

1. With brake applied, test for voltage between [94B] terminals 4 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (R/Y) wire. **(5041)**

24. Lightbar Circuit Test

NOTE

Only follow this test if the turn signals in the light bar also function as the stop lamps.

1. Disconnect rear lighting jumper harness [226].
2. With brake applied, test for voltage between [226B] terminals 5 and 7.

3. Is battery voltage present?
 - a. **Yes.** [Go to Test 26.](#)
 - b. **No.** [Go to Test 25.](#)

25. Stop Lamp Circuit Test

1. With brake applied, test for voltage between [226B] terminal 5 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire. **(5041)**
 - b. **No.** Repair open in (R/Y) wire. **(5041)**

26. Facia/Converter Module Test

1. Connect rear lighting jumper harness [226].
2. Disconnect rear lighting jumper harness [262].
3. With brake applied, test for voltage between [262A] terminal 3 and terminal 4 (right) or terminal 9 and terminal 7 (left).
4. Is battery voltage present?
 - a. **Yes.** Replace the lightbar. See the service manual. **(6823)**
 - b. **No.** Replace the facia/converter module. See the service manual. **(6809)**



RUNNING LAMPS

5.9

DESCRIPTION AND OPERATION

The running lamps consist of the front position lamp (HDI), the license plate lamp, the tail lamp, the Tour-Pak lamps (FLHTCU, FLHTK), the front and rear fender tip lamps, and on domestic models the turn signals are used as well. The running lamps

are powered through the accessory fuse when the ignition switch is in the IGN or ACCY position.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

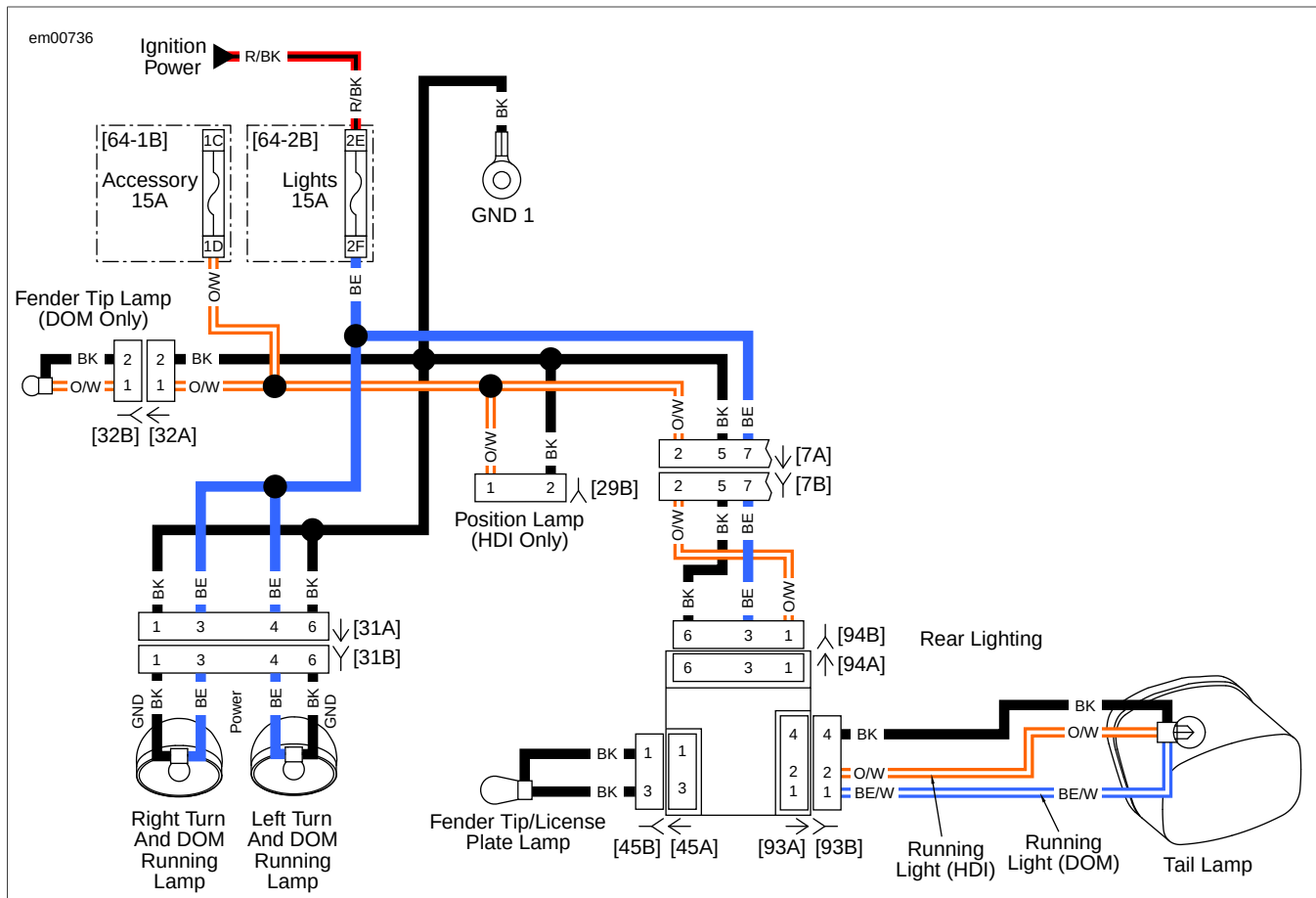


Figure 5-22. Running Lamps: FLHR/C

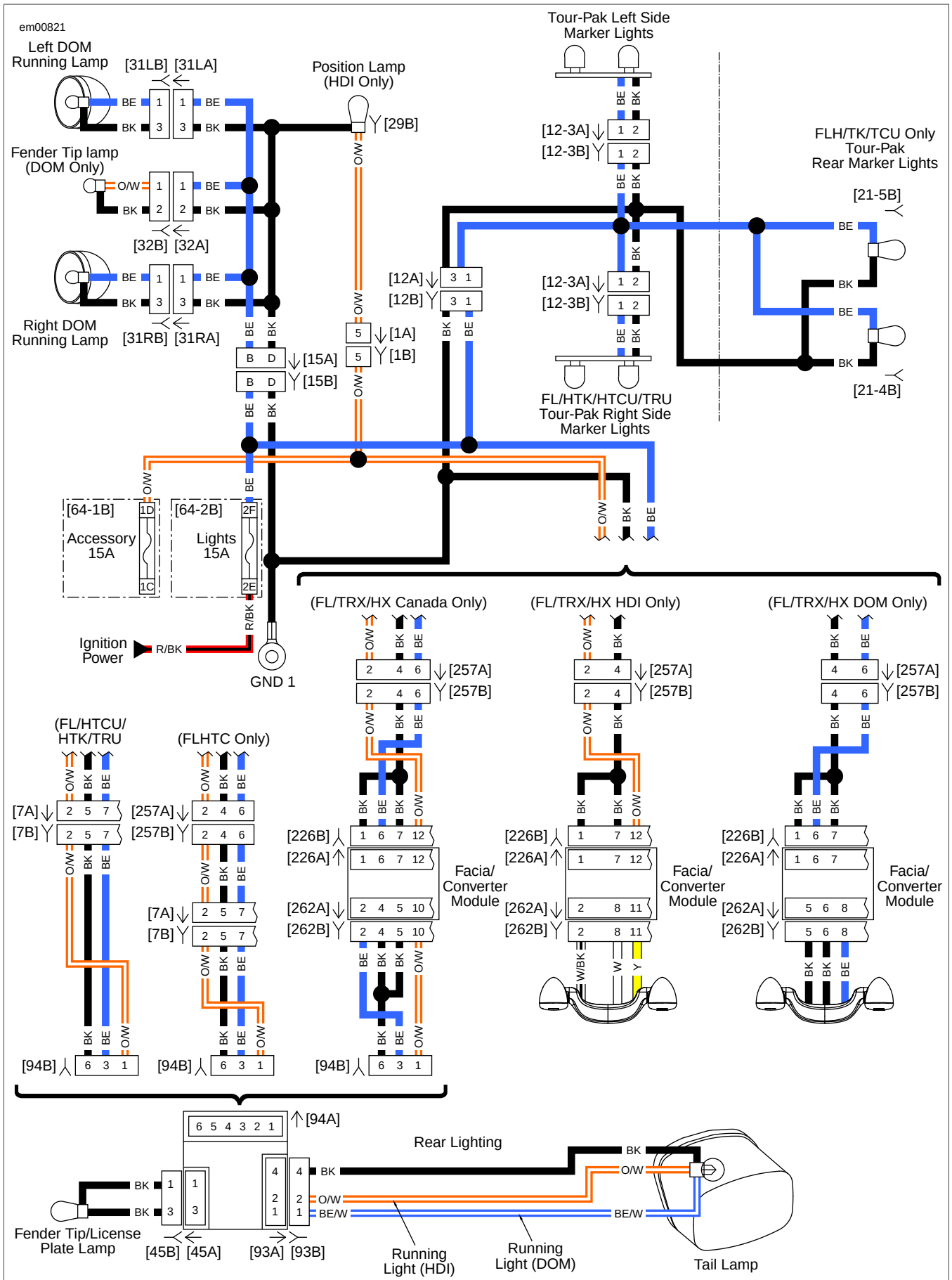


Figure 5-23. Running Lamps: Except FLHR/C

POSITION LAMP INOPERATIVE: HDI

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

Table 5-18. Position Lamp Inoperative Diagnostic Faults: HDI

POSSIBLE CAUSES
Open accessory circuit
Lamp malfunction
Open ground

1. Accessory Circuit Test

1. Turn the IGN to ACC.
2. Apply either the front or rear brake.
3. Does the stop lamp illuminate?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See [5.8 STOP LAMPS, Stop Lamp Inoperative.](#)

2. Position Lamp Test

1. Disconnect position lamp [29].
2. With the IGN ON, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between position lamp [29B] terminal A and terminal B.
3. Is battery voltage present?
 - a. **Yes.** Replace position lamp. See the service manual. **(5143)**
 - b. **No.** [Go to Test 3.](#)

3. Ground Circuit Test

1. Test for voltage between position lamp [29B] terminal B and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) ground wire. **(5041)**
 - b. **No.** Repair open in (O/W) wire. **(5043)**

RUNNING LAMPS INOPERATIVE

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

Table 5-19. Running Lamps Inoperative Diagnostic Faults

POSSIBLE CAUSES
Open lights circuit
Lamp malfunction
Open ground

1. Running Lamp Test

1. Turn IGN ON.
2. Do any of the running lamps work?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. General Lamp Test

1. Inspect the inoperative lamp and repair any issues.
2. Disconnect inoperative lamp connector.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between inoperative lamp power and ground terminals.
4. Is battery voltage present?
 - a. **Yes.** Replace the inoperative lamp.
 - b. **No.** [Go to Test 3.](#)

3. Single Lamp Power Test

1. Test for voltage between inoperative lamp power terminal and a good ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in ground circuit. **(5041)**
 - b. **No.** Repair open in power circuit. **(5041)**

4. Lights Fuse Test

1. Inspect the lights fuse.
2. Is the fuse good?
 - a. **Yes.** Repair open in (BE) wire. **(5039)**
 - b. **No.** Repair short to ground in (BE) wire and replace lights fuse. **(5039)**

DESCRIPTION AND OPERATION

See [Figure 5-24](#). The TSM/TSSM/HFSM is located under the right side cover.

- Terminal 1 receives battery power.
- Terminal 2 receives ignition power.
- Terminal 3 communicates with other modules on the vehicle through the serial data circuit.
- Terminal 12 is ground through the TSM/TSSM/HFSM.

The turn signal switches are inputs to the TSM/TSSM/HFSM. When the TSM/TSSM/HFSM receives voltage from either of the turn signal switches it supplies voltage to the corresponding turn signal lamps and sends a message to the indicator lamps to flash the correct turn signal indicator.

The TSM/TSSM/HFSM also monitors the position of the clutch and neutral switches to determine if it is safe to start the vehicle. The BAS is internal to the TSM/TSSM/HFSM and allows the TSM/TSSM/HFSM to determine if the vehicle is tipped over. If a tip over event occurs, the TSM/TSSM/HFSM shuts off the engine.

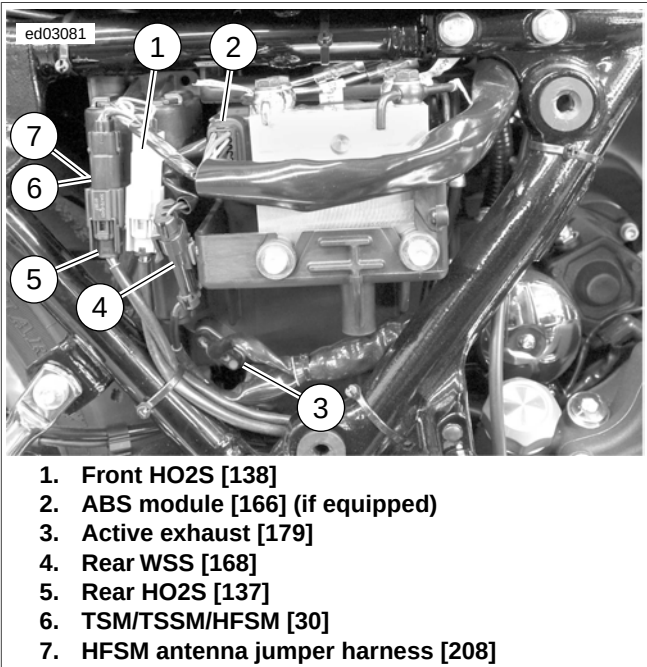


Figure 5-24. Under Right Side Cover



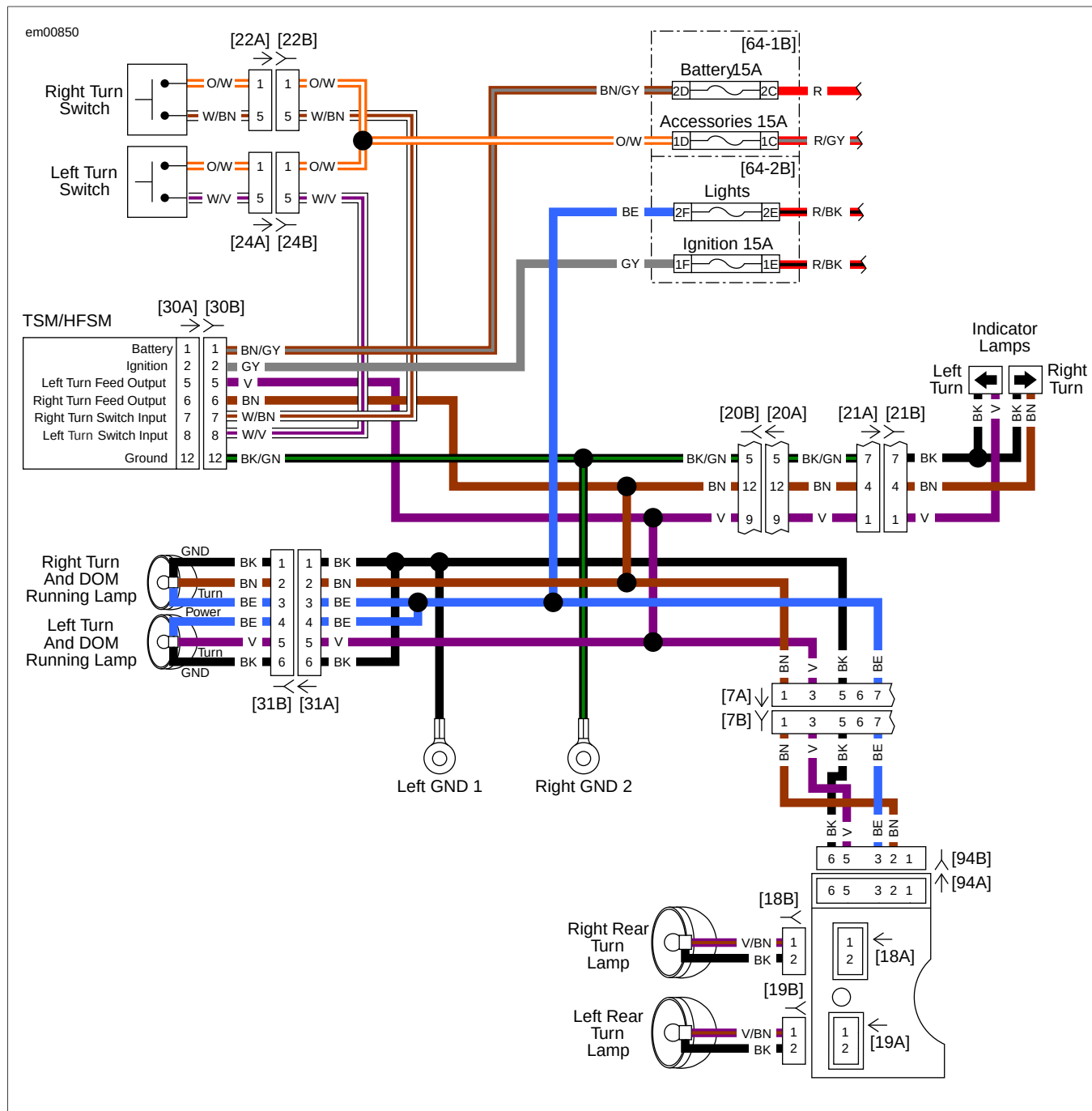
The TSM/TSSM/HFSM monitors the output circuits and sets DTCs if faults are detected.

Table 5-20. Code Description

DTC	DESCRIPTION
B1121	Left turn output fault
B1122	Right turn output fault
B1123	Left turn signal short-to-ground: HFSM
B1124	Right turn signal short-to-ground: HFSM
B1125	Left turn signal short-to-voltage: HFSM
B1126	Right turn signal short-to-voltage: HFSM

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



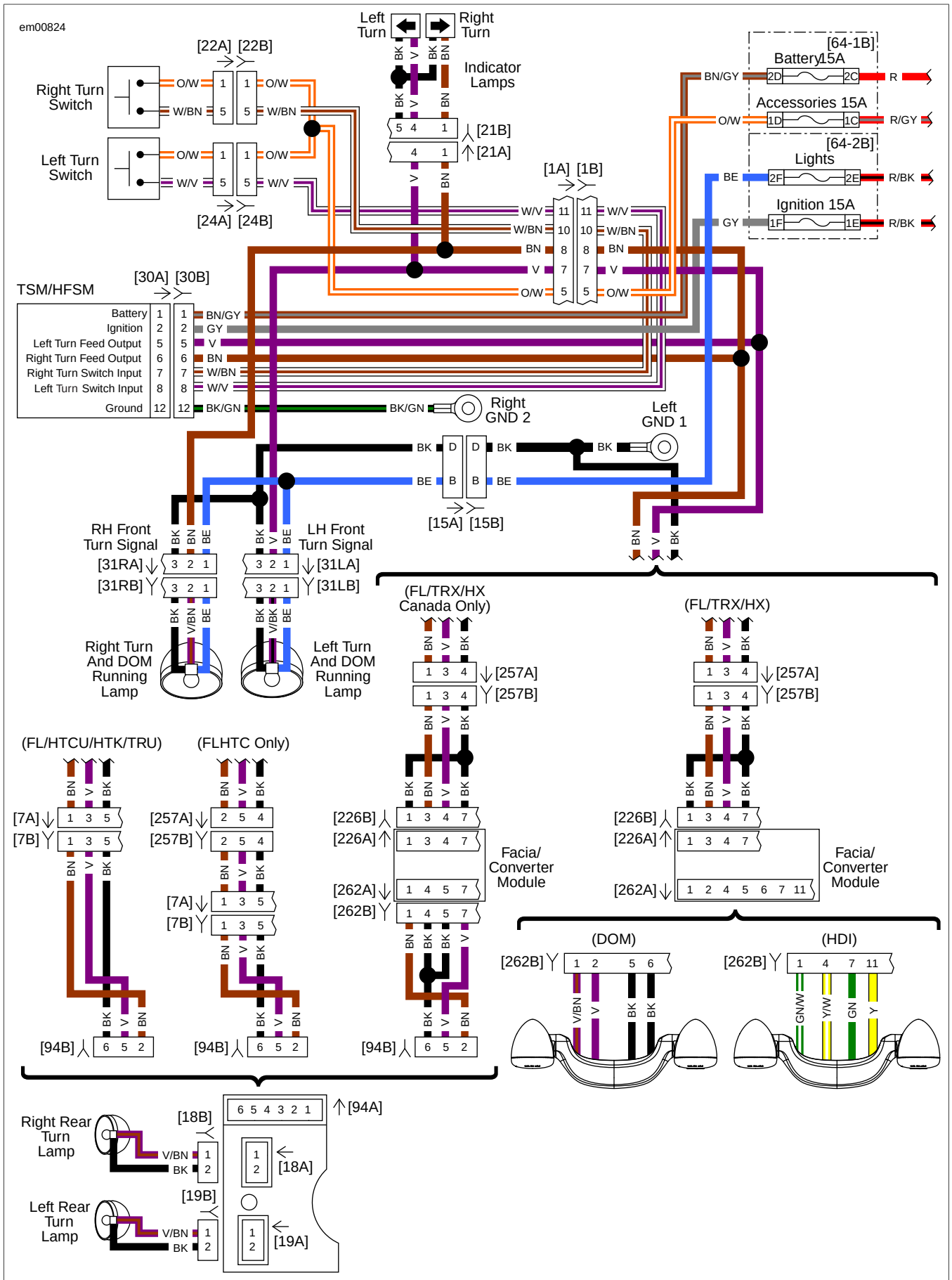


Figure 5-26. Turn Signal Circuit: Except FLHR/C

DTC B1121: HFSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-21. DTC B1121 Diagnostic Faults: HFSM

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Open left turn signal circuit

1. Turn Signal Lamp Inspection Test

1. Remove and inspect left side turn signal bulbs.
2. Confirm the turn signal bulbs are the correct part numbers and the sockets are not corroded or damaged.
3. Were any issues found with the lamps?
 - a. **Yes.** Repair as needed.
 - b. **No.** [Go to Test 2.](#)

2. Turn Signal Circuit Open Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect front turn signal [31] or [31L].
3. Test for continuity between breakout box terminal 5 and [31A] terminal 5 or [31LA] terminal 2.
4. Is continuity present?
 - a. **Yes.** Replace the HFSM. See the service manual.
 - b. **No.** Repair open in (V) wire.

DTC B1121: TSM/TSSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-22. DTC B1121 Diagnostic Faults: TSM/TSSM

POSSIBLE CAUSES
Indicator malfunction
Short to voltage on left turn signal circuit
TSM/TSSM malfunction
Short to ground on left turn signal circuit
Open left turn signal circuit

1. Operational Test

1. Turn IGN ON.
2. Are the turn signal lamps on continuously?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. Indicator Short to Voltage Test

1. Turn IGN OFF.
2. Disconnect indicator lamps [21].
3. Turn IGN ON.
4. Are the turn signal lamps on continuously?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace the indicator lamp assembly. See the service manual.

3. TSM/TSSM Short to Voltage Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM wire harness [30B], leaving the TSM/TSSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, using a multimeter, test for voltage between breakout box terminal 5 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on the (V) wire.
 - b. **No.** Replace the TSM/TSSM. See the service manual.

4. Indicator Shorted Test

1. With IGN OFF, disconnect indicator lamps [21].
2. Turn IGN ON.
3. Operate the left turn signals.
4. Do the turn signals flash?
 - a. **Yes.** Replace the indicator lamp assembly. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. Shorted Turn Signal Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM wire harness [30B] leaving TSM/TSSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminal 5 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (V) wire from terminal 5.
 - b. **No.** [Go to Test 6.](#)

6. Turn Signal Circuit Open Test

1. Disconnect rear fender lights [94] (except FLTRX/FLHX) or rear lighting jumper harness [226] (FLTRX/FLHX).
2. Test for continuity between breakout box terminal 5 and [94A] (except FLTRX/FLHX) terminal 5 or [226B] (FLTRX/FLHX) terminal 4.

3. Is continuity present?
 - a. **Yes.** Replace the TSM/TSSM. See the service manual.
 - b. **No.** Repair open in (V) wire.

DTC B1122: HFSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-23. DTC B1122 Diagnostic Faults: HFSM

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Open right turn signal circuit

1. Turn Signal Lamp Inspection Test

1. Remove and inspect the right side turn signal bulbs.
2. Confirm the turn signal bulbs are the correct part numbers and the sockets are not corroded or damaged.
3. Were any issues found with the lamps?
 - a. **Yes.** Repair as needed.
 - b. **No.** [Go to Test 2.](#)

2. Turn Signal Circuit Open Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect front turn signal [31] or [31R].
3. Test for continuity between breakout box terminal 6 and [31A] terminal 2 or [31RA] terminal 2.
4. Is continuity present?
 - a. **Yes.** Replace the HFSM. See the service manual.
 - b. **No.** Repair open in (BN) wire.

DTC B1122: TSM/TSSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-24. DTC B1122 Diagnostic Faults: TSM/TSSM

POSSIBLE CAUSES
Indicator malfunction
Short to voltage on right turn signal circuit
TSM/TSSM malfunction
Short to ground on right turn signal circuit
Open right turn signal circuit

1. Operational Test

1. Turn IGN ON.

2. Are the turn signal lamps on continuously?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. Indicator Short to Voltage Test

1. With IGN OFF, disconnect indicator lamp [21].
2. Turn IGN ON.
3. Are the turn signal lamps on continuously?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace the indicator lamp assembly. See the service manual.

3. TSM/TSSM/HFSM Short to Voltage Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM wire harness [30B], leaving TSM/TSSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, using a multimeter, test for voltage between breakout box terminal 6 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on the (BN) wire.
 - b. **No.** Replace the TSM/TSSM. See the service manual.

4. Indicator Shorted Test

1. With IGN OFF, disconnect indicator lamp[21].
2. Turn IGN ON.
3. Operate the left turn signals.
4. Do the turn signals flash?
 - a. **Yes.** Replace the indicator lamp assembly. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. Turn Signal Circuit Shorted Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM wire harness [30B] leaving TSM/TSSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminal 6 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN) wire.
 - b. **No.** [Go to Test 6.](#)

6. Turn Signal Circuit Open Test

1. Disconnect rear fender lights [94] (except FLTRX/FLHX) or [226] (FLTRX/FLHX).
2. Test for continuity between breakout box terminal 6 and [94A] (except FLTRX/FLHX) terminal 2 or [226B] (FLTRX/FLHX) terminal 3.

3. Is continuity present?
 - a. **Yes.** Replace the TSM/TSSM. See the service manual.
 - b. **No.** Repair open in (BN) wire.

DTC B1123

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-25. DTC B1123 Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Short to ground on left turn signal circuit

1. Turn Signal Lamp Inspection Test

1. Remove and inspect left side turn signal bulbs.
2. Confirm the turn signal bulbs are the correct part numbers and the sockets are not corroded or damaged.
3. Were any issues found with the lamps?
 - a. **Yes.** Repair as needed.
 - b. **No.** [Go to Test 2.](#)

2. Turn Signal Circuit Short to Ground Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving the HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect indicator lamps [21].
3. Using a multimeter, test for continuity between breakout box terminal 5 and terminal 12.
4. Is continuity present?
 - a. **Yes. Except FLTRX/FLHX.** Repair short to ground in left turn signal circuit (V) wire.
 - b. **Yes. FLTRX/FLHX.** [Go to Test 4.](#)
 - c. **No.** [Go to Test 3.](#)

3. Indicator Test

1. Install turn signal bulbs.
2. Remove breakout box and connect HFSM [30].
3. With the indicator lamps disconnected, operate the left turn signals.
4. Do the turn signals function and flash correctly?
 - a. **Yes.** Replace the indicator lamp assembly. See the service manual.
 - b. **No.** Replace the HFSM. See the service manual.

4. Facia/Converter Module Test

1. Disconnect rear lighting jumper harness [226].
2. Test for continuity between breakout box terminal 5 and terminal 12.

3. Is continuity present?
 - a. **Yes.** Repair short to ground in left turn signal circuit (V) wire.
 - b. **No.** Replace the facia/converter module. See the service manual.

DTC B1124

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-26. DTC B1124 Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Short to ground on right turn signal circuit

1. Turn Signal Lamp Inspection Test

1. Remove and inspect right side turn signal lamps.
2. Confirm the turn signal bulbs are the correct part numbers and the sockets are not corroded or damaged.
3. Were any issues found with the lamps?
 - a. **Yes.** Repair as needed.
 - b. **No.** [Go to Test 2.](#)

2. Turn Signal Circuit Short to Ground Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect indicator lamps [21].
3. Using a multimeter, test for continuity between breakout box terminal 6 and terminal 12.
4. Is continuity present?
 - a. **Yes. Except FLTRX/FLHX.** Repair short to ground in right turn signal circuit (BN) wire.
 - b. **Yes. FLTRX/FLHX.** [Go to Test 4.](#)
 - c. **No.** [Go to Test 3.](#)

3. Indicator Test

1. Install turn signal bulbs.
2. Remove breakout box and connect HFSM [30].
3. With the indicator lamps disconnected, operate the right turn signals.
4. Do the turn signals function and flash correctly?
 - a. **Yes.** Replace the indicator lamp assembly. See the service manual.
 - b. **No.** Replace the HFSM. See the service manual.

4. Facia/Converter Module Test

1. Disconnect rear lighting jumper harness [226].

2. Test for continuity between breakout box terminal 5 and terminal 12.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in left turn signal circuit (V) wire.
 - b. **No.** Replace the facia/converter module. See the service manual.

DTC B1125

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-27. DTC B1125 Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Short to voltage on left turn signal circuit

1. Turn Signal Circuit Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving the HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, using a multimeter, test for voltage between breakout box terminal 5 and terminal 12.
3. Is voltage present?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** Replace HFSM. See the service manual.

2. Rear Turn Signal Test

1. With IGN OFF, disconnect rear fender lights [94] (except FLTRX/FLHX) or [226] (FLTRX/FLHX).
2. Turn IGN ON.
3. Test for voltage between breakout box terminal 5 and terminal 12.
4. Is voltage present?
 - a. **Yes.** Repair short to voltage in left turn signal circuit (V) wire.
 - b. **No. Except FLTRX/FLHX.** Replace the circuit board. See the service manual.
 - c. **No. FLTRX/FLHX.** Replace the facia/converter module. See the service manual.

DTC B1126

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-28. DTC B1126 Diagnostic Faults

POSSIBLE CAUSES
Indicator malfunction
HFSM malfunction
Short to voltage on right turn signal circuit

1. Turn Signal Circuit Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to HFSM wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, using a multimeter, test for voltage between breakout box terminal 6 and terminal 12.
3. Is voltage present?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** Replace HFSM. See the service manual.

2. Rear Turn Signal Test

1. With IGN OFF, disconnect rear fender lights [94] (except FLTRX/FLHX) or [226] (FLTRX/FLHX).
2. Turn IGN ON.
3. Test for voltage between breakout box terminal 6 and terminal 12.
4. Is voltage present?
 - a. **Yes.** Repair short to voltage in right turn signal circuit (V) wire.
 - b. **No. Except FLTRX/FLHX.** Replace the circuit board. See the service manual.
 - c. **No. FLTRX/FLHX.** Replace the facia/converter module. See the service manual.

DTC B1135, B1136, B1141, B1142

5.11

DIAGNOSTICS

DTC B1135 Accelerometer Fault

DTC B1135 indicates a failure which requires replacement of the TSM/TSSM/HFSM.

NOTE

When DTC B1135 is set, the tip-over engine shutdown, HFSM tamper alarm and bank angle sensors are disabled. The security lamp will also illuminate when this code is set.

DTC B1136 Accelerometer Tip-Over Self-Test Fault

DTC B1136 indicates a failure which requires replacement of the HFSM.

DTC B1141 Ignition Switch Open/Low

DTC B1141 indicates the TSM/TSSM/HFSM is recognizing an open or low condition on the ignition circuit.

DTC B1142 Internal Fault

DTC B1142 indicates a failure which requires replacement of the HFSM.

DTC B1141

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-29. DTC B1141 Diagnostic Faults

POSSIBLE CAUSES
TSM/TSSM/HFSM malfunction
Open ignition circuit

1. Ignition Circuit Open Test

1. Connect TSM/TSSM/HFSM BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM/HFSM wire harness [30B], leaving TSM/TSSM/HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With the IGN ON, using a multimeter, test for voltage between breakout box terminal 2 and ground.
3. Is voltage present?
 - a. **Yes.** Replace the TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Repair open in (GY) ignition wire.



SECURITY SYSTEM

5.12

SECURITY LAMP

The security lamp (key icon) in the instrument face provides feedback to the rider confirming armed or disarmed status. Refer to [Table 5-30](#).

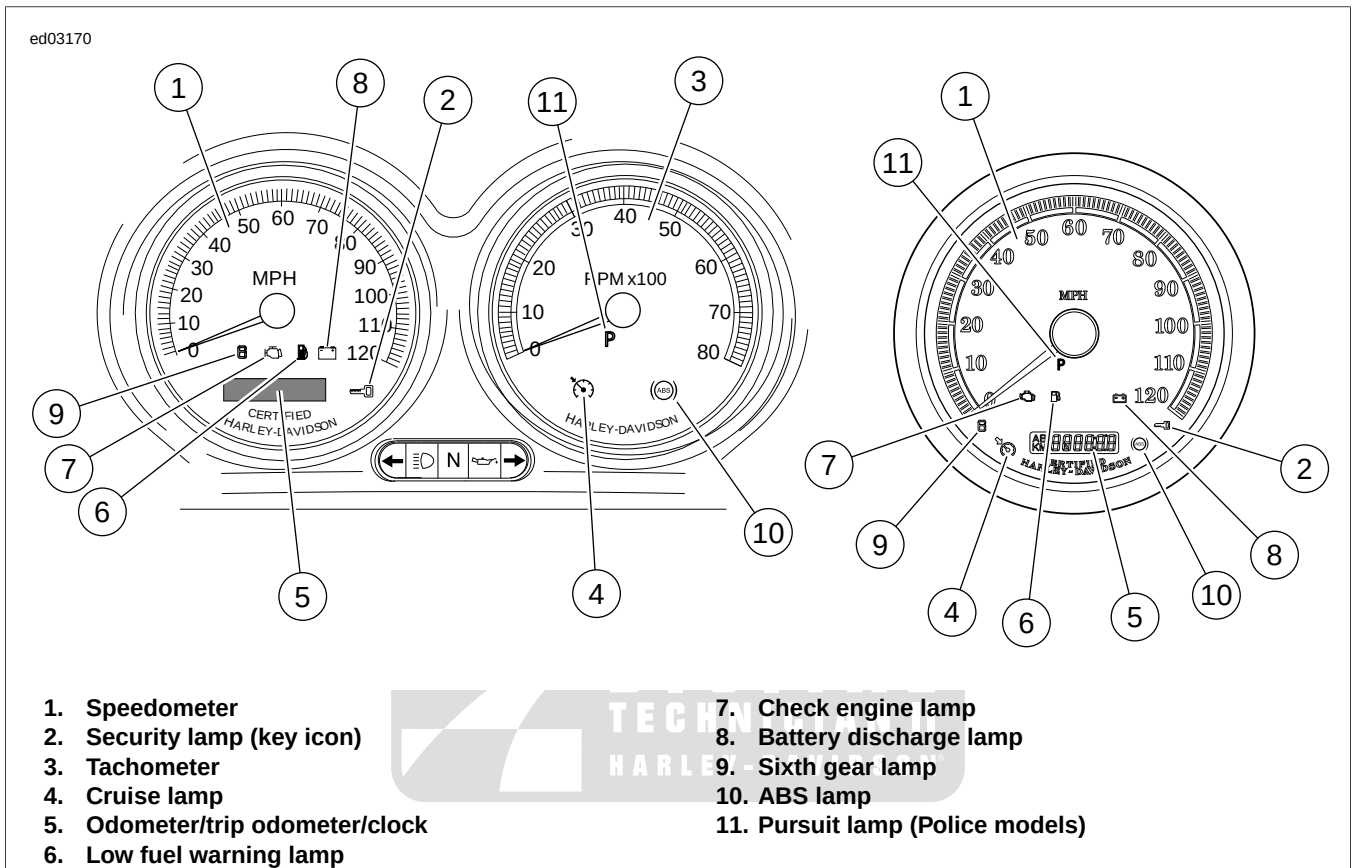


Figure 5-27. Speedometer

Table 5-30. Security Lamp Status

LAMP	MODE
Does not flash.	No security system (TSM only), security system not armed.
Flashes every second.	2 minute (HFSM) or ten minute (TSSM) timeout after failed PIN entry attempt or a battery reconnect has occurred while armed.
Flashes every 2.5 seconds.	Security system armed.
Flashes 4 times a second.	PIN entry mode.
Stays on solid with IGN OFF.	Arming is starting up. You have 5 seconds (HFSM) or 30 seconds (TSSM) before system is armed.
Stays on solid with IGN ON.	If solid for more than 4 seconds after IGN ON, a current DTC is present.

SECURITY IMMOBILIZATION

The TSSM/HFSM provides security and immobilization functions not found on the TSM. The TSSM/HFSM will disable the starter and ignition system. Additional functions include the ability to alternately flash the left and right turn signals and sound a siren (if equipped) if a theft attempt is detected.

NOTE

The siren must be in the chirp mode for the siren to chirp on arming or disarming. See [5.14 SIREN, Siren Chirp Mode Confirmation: HFSM](#).

Conditions that activate the security system when system is armed include:

- **Detecting tampering of the ignition circuit:** Turn signals flash three times, optional siren chirps once and then turns off. If the tampering continues, a second warning will activate after four seconds. Continued tampering will cause the alarm to activate for 30 seconds and then turn off. The

two warnings/alarm cycle is repeated for each tampering incident.

- **Detecting vehicle movement:** Turn signals flash three times, optional siren chirps once and then turns off. If the vehicle is not returned to its original position, a second warning will activate after four seconds. If the vehicle is not returned to its original position, the alarm activates for 30 seconds then turns off. The two warnings/alarm cycle may repeat a maximum of 10 times with a 10 second pause between cycles.
- **Detecting that a battery or ground disconnect has occurred while armed:** The optional siren activates its self-alarm mode. Turn signals will not flash.

NOTE

Always disarm the TSSM/HFSM before removing or disconnecting the battery to prevent the siren (if installed) from activating. If the TSSM is in auto-arming mode, you must disarm the system and disconnect the battery or remove the battery fuse before the 30 second arming period expires.

TSSM/HFSM FEATURES

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The following information applies only to vehicles equipped with the TSSM/HFSM.

- **Security lamp:** See [Figure 5-27](#). The security lamp (key icon) tells the rider if the system is armed or disarmed.
- **Personal code disarming:** If the fob is not available, the TSSM/HFSM allows the rider to disable the security alarm and immobilization functions with a five-digit personal code.
- **Arming confirmation:** When the TSSM/HFSM is armed, the system provides visual feedback (confirmation) to the rider by flashing the turn signals and an audible "chirp" if equipped with the optional smart siren and chirp mode is enabled.
- **Remote arming/disarming (TSSM only):** See [5.13 KEY FOB](#). Owners may enable and disable security alarm and immobilization functions with a personally carried transmitter. This transmitter is referred to as a **key fob**. Remote arming/disarming is a function of the TSSM (Japan/Korea) only.
- **Auto-arming (TSSM only):** Automatically enables the security alarm and immobilization functions within 30 seconds after the ignition switch is switched OFF.
- **Disarming confirmation:** When the TSSM/HFSM is disarmed, the system provides an audible "chirp" (confirmation) if equipped with the optional smart siren and chirp mode is enabled.
- **Transport mode:** It is possible to arm the security system without enabling the motion detector for one ignition cycle.

This allows the vehicle to be moved in an immobilized state.

- **Starter/ignition disable:** When armed the starter and ignition system are disabled.
- **Security system alarm:** See [5.14 SIREN](#). The system will alternately flash the left and right turn signals and sound an optional Smart Siren if a vehicle security condition is detected while the system is armed.
- **Dealer service mode (HFSM only):** This mode allows the dealer to disable security system via DIGITAL TECHNICIAN II (Part No. HD-48650). Dealer service mode is exited when module detects an assigned fob in range.

Security System Options: TSSM

The following options are only available on the TSSM unit: alarm sensitivity, auto-arming feature and storage mode.

Default settings for the TSSM include:

- Solo vehicle configuration.
- Medium motion sensitivity on alarm sensitivity.
- All vehicles are shipped with auto-arming disabled.
- Storage mode set to 10 days.

WARNINGS

A warning consists of three alternate flashes of the turn signals and chirp from the optional smart siren. Warnings are issued from an armed TSSM/HFSM in the following order:

1. **First Warning:** A warning is issued whenever a person without a fob present or with the system armed attempts to move the vehicle or turns the ignition switch to **IGN**.
2. **Second Warning:** If the motion continues or the ignition switch is not turned back to **OFF**, a second warning is issued within four seconds of the first.
3. **Alarm:** If the motion continues or the ignition switch is not turned to **OFF** past the second warning, the smart security system will go into full alarm.

ARMING: HFSM

The H-DSSS automatically arms within five seconds when the vehicle is parked and the ignition switch is turned to **OFF** and motion is not detected.

On arming, the turn signals flash twice and the smart siren will "chirp" twice if chirp function is activated. While armed, the security lamp (key icon) will flash once every 2.5 seconds. Refer to [Table 5-30](#).

ARMING: TSSM

There are two methods to arm the security system:

- Using the key fob.
- Using auto-arming.

NOTE

The vehicle cannot be armed with the IGN ON.

Auto-Arming Function: TSSM

Auto-arming causes the system to automatically arm itself (no key fob needed) within 30 seconds after the ignition switch is turned OFF. During this period, the security lamp stays illuminated to indicate auto-arming is starting up.

The vehicle may be moved during these 30 seconds without triggering the alarm. However, any motion after that period will trigger the security alarm. Upon expiration of the auto-arming period, the turn signals flash twice, the security lamp begins to flash and the siren (if equipped) chirps twice.

The TSSM allows remote arming via the key fob at any time. However, if the system is remotely disarmed (with the key fob) but the ignition switch is not turned ON within 30 seconds, the system will re-arm itself when auto-arming is enabled.

Japan and Korea vehicles have auto-arming disabled by default. However, the feature may be enabled if the customer desires.

When auto-arming is disabled, the key fob must be used to arm the security system. To set the auto-arming function, refer to [Table 5-31](#).

Table 5-31. Selecting TSSM Auto-Arming Function

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop switch to OFF		Verify the security lamp is not flashing (vehicle is disarmed)
2	Turn IGN ON-OFF-ON-OFF-ON		
3	Press left turn switch 2 times and release	Two flashes turn signals and indicators (See 5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS , Power Disruption and Configuring: TSSM regarding battery disconnects.)	Two flashes - Japan/Korea configuration TSSM
4	Press and hold key fob button until confirmation is received	One flash turn signals and indicators	
5	Press and hold key fob button until confirmation is received	Two flashes turn signals and indicators	
6	Press left turn switch 1 time and release	Turn signals and indicators flash to indicate option selected	One flash - auto-arming disabled Two flashes - auto-arming enabled
7	Press and release left turn switch to advance through options	Turn signals and indicators flash to indicate option selected	
8	Turn IGN OFF		

DISARMING: HFSM

There are two ways to disarm the H-DSSS:

- Automatic Disarming.
- Using the PIN.

Automatic Disarming

Always have the fob present when riding, loading, fueling, moving, parking or servicing the vehicle. Carry the fob in a convenient pocket. The H-DSSS disarms automatically when the ignition switch is turned to ON.

On disarming, the smart siren will chirp once (if chirp function is activated) and the security lamp (key icon) will turn ON solid for four seconds then go out. Refer to [Table 5-30](#).

Disarming with a PIN

See [5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS](#) to enter an initial PIN to enable the system.

If you make an error while disarming the HFSM using the PIN, the alarm will activate for 30 seconds after the last digit is entered. After a failed attempt, the security lamp will flash once every second for 2 minutes (HFSM) or ten minutes (TSSM). **During this time, the vehicle will not accept any attempt to enter a PIN.** Refer to [Table 5-30](#).

DISARMING: TSSM

There are two ways to disarm the system:

- Using the key fob. This method works in all situations **except** before turning ignition switch ON when TSSM storage mode is activated.
- Using a PIN.

If you make an error while disarming the TSSM using a PIN, the alarm will activate for 30 seconds after the last digit is entered. After a failed attempt, the security lamp will flash once every second for 10 minutes. **During this time, the vehicle will not accept any attempt to enter a PIN.** Refer to [Table 5-32](#).

Table 5-32. Disarming TSSM/HFSM with the PIN (Example: 3-1-3-1-3)

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop switch to OFF		
2	Turn IGN to the IGN position (HFSM) Turn IGN to the ACC position (TSSM)		
3	Hold both turn switches in until confirmation	Security lamp flashes at fast rate	System is ready for PIN entry
4	Enter first digit of code (3) by pressing left turn switch 3 times		
5	Press right turn switch 1 time		Serves as "enter" key for first digit
6	Enter second digit of code (1) by pressing left turn switch 1 time		
7	Press right turn switch 1 time		Serves as "enter" key for second digit
8	Enter third digit of code (3) by pressing left turn switch 3 times		
9	Press right turn switch 1 time		Serves as "enter" key for third digit
10	Enter fourth digit of code (1) by pressing left turn switch 1 time		Serves as "enter" key for fourth digit
11	Press right turn switch 1 time		
12	Enter fifth digit of code (3) by pressing left turn switch 3 times		System is disarmed. You may use the vehicle or program another key fob
13	Press right turn switch 1 time	Security lamps stop flashing	

ALARM

Activation

In the full alarm state, the turn signals flash alternately, and if equipped with the smart siren, the siren will sound.

After 30 seconds of alarm, if no further vehicle motion is detected, the alarm will stop.

NOTE

*Vehicle must be returned to original parked position with ignition switch turned to **OFF**.*

If vehicle motion continues, the alarm will start again continue for another 30 seconds.

The TSSM/HFSM will repeat the alarm cycles 10 times for a total of five minutes, with a 10-second pause between alarm cycles.

During warnings and alarms, the starter motor and the ignition remain disabled.

Deactivation

The alarm cycles can be discontinued at any time by moving an assigned fob to the vehicle. The presence of the fob will terminate the alarm.

ALARM SENSITIVITY: TSSM

Sensitivity

The TSSM has four sensitivity settings: extremely low, low, medium or high. The selection chosen controls the sensitivity of the security system regarding motion detection.

To set alarm sensitivity, refer to [Table 5-33](#).

Table 5-33. TSSM Alarm Sensitivity

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop switch to OFF		Verify the security lamp is not flashing (vehicle is disarmed)
2	Turn IGN ON-OFF-ON-OFF-ON		

Table 5-33. TSSM Alarm Sensitivity

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
3	Press left turn switch 2 times and release	Two flashes turn signals and indicators depending on vehicle configuration. (See 5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS, Power Disruption and Configuring: TSSM regarding battery disconnects.)	Two flashes - Japan/Korea configuration TSSM
4	Press and hold key fob button until confirmation is received	One flash turn signals and indicators	
5	Press left turn switch 1 time and release	Turn signals and indicators flash to indicate option selected	One flash - extremely low Two flashes - low sensitivity Three flashes - medium sensitivity Four flashes - high sensitivity
6	Press and release left turn switch to advance through options	Turn signals and indicators flash to indicate option selected	One flash - extremely low Two flashes - low sensitivity Three flashes - medium sensitivity Four flashes - high sensitivity
7	Turn IGN OFF		



HFSM FOB

See [Figure 5-28](#). The HFSM's reception range for the hands-free fob signal depends on a specific receiver pattern. The typical range will be an arm's length.

NOTES

- *Environmental and geographic conditions may affect signal range.*
- *Always have the fob present whenever the vehicle is operated.*
- *Do not place fob in metal enclosure, and do not place it closer than 3.0 in. (80.0 mm) to cellular phones, the handsfree antenna, PDAs, displays and other electronic devices while operating the vehicle. That may prevent the fob from disarming the security system.*
- *Fob battery should be replaced every year. See the service manual.*



Figure 5-28. Hands-Free Fob

TSSM FOB

The TSSM reception range for the key fob signal depends on a specific receiver pattern.

NOTE

Environmental and geographic conditions may affect signal range.

Arming the System

1. Hold key fob horizontal at waist level.
2. Point key fob at the front of the vehicle.

3. Hold down the key fob button until the system responds with two turn signal flashes.

Disarming the System

1. Hold key fob horizontal at waist level.
2. Point key fob at the front of the vehicle.
3. Quickly press the key fob button twice. The system will respond with one turn signal flash.

NOTE

*Disarming function may require practice. The key fob button **must** be pressed twice within 1.5 seconds to send the disarm command. The action is very similar to double-clicking a computer mouse. Light quick taps work best; very hard or very slow taps are less likely to work.*

Troubleshooting

If the key fob button has been pressed numerous times while away from the vehicle, the fob may fall out of synchronization with the TSSM. If this happens, the TSSM might fail to recognize the key fob's commands.

To solve this problem, press and hold the key fob button for 10-15 seconds until the security system responds with two turn signal flashes. After confirmation, you may resume normal fob operation.

FOB ASSIGNMENT: HFSM

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Use DIGITAL TECHNICIAN II (Part No. HD-48650) to assign both fobs to the H-DSSS. Follow the menu prompts in the DIGITAL TECHNICIAN II (Part No. HD-48650) display and scan the fob serial number with the bar code reader, or key-in the number from the keyboard. See a Harley-Davidson dealer.

NOTE

Each fob has a unique serial number. The label should be removed from the fob and attached to a blank NOTES page in the Owner's Manual for reference.

FOB ASSIGNMENT: TSSM

Refer to [Table 5-34](#) to assign a key fob to a vehicle equipped with a TSSM.

The key fob on TSSM vehicles must be set so it will operate the alarm system on the vehicle. This assignment **must** be completed with no pauses between steps greater than 10 seconds. Turn the ignition OFF after all key fobs have been assigned. The programming mode will also exit after 60 seconds has elapsed without detecting any fob sign-up messages or turn signal switch activity.

Two key fobs may be assigned to the TSSM. The first successful attempt to program a fob will disable all previously assigned fobs. If a second fob is to be programmed, it must be done in the same programming sequence as the initial fob.

Table 5-34. Key FOB Assignment: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop to OFF		Verify the security lamp is not flashing (vehicle is disarmed) This assignment procedure must be completed with no pauses between steps greater than 10 seconds
2	Turn ignition/headlamp switch ON-OFF-ON-OFF-ON		
3	Press left turn switch 2 times and release	One to four flashes turn signals and indicators depending on vehicle configuration (See 5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS, Power Disruption and Configuring: TSSM regarding battery disconnects.)	One flash - Worldwide TSM, no security Two flashes - Japan/Korea configuration TSSM
4	Press right turn switch 1 time and release	One flash turn signals and indicators	
5	Press left turn switch 1 time and release	Two flashes turn signals and indicators	
6	Press and hold key fob button until confirmation is received	Two flashes turn signals and indicators	This may take 10-25 seconds.
7	If you have two key fobs, press and hold button on second key fob until confirmation is received	Two flashes turn signals and indicators	Optional step
8	Turn ignition/headlamp switch OFF		

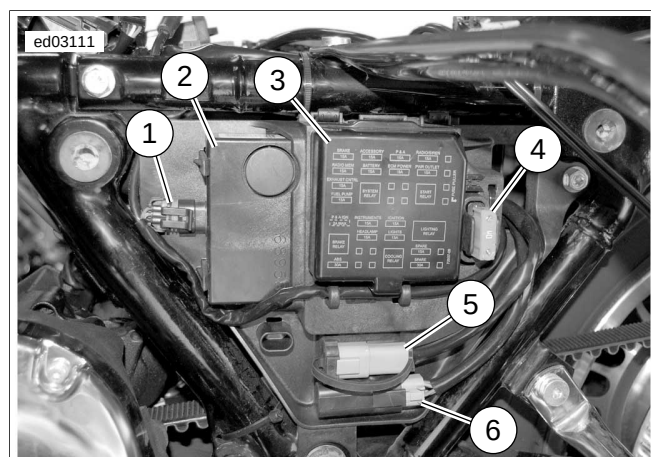


DESCRIPTION AND OPERATION

See [Figure 5-29](#). The Smart Siren is not a standard part of the security system but can be added to the system. The siren is attached at [142] off the TSSM/HFSM. Through this connector, it shares the battery circuit, the ground circuit and the alarm signal circuit with the TSSM/HFSM. The siren is used to add an audible warning to the visual warnings that are a standard function of the security system.

NOTE

Vehicles equipped with a siren and an external BAS, including Trikes or vehicles with an optional sidecar, will react differently when starting than other vehicles. These vehicles should be placed in gear when the ignition is turned OFF. If the ignition is turned ON with the vehicle in neutral the siren will sound even if the security system is disabled. Therefore, the ignition switch should be turned ON with the vehicle in gear and then shifted to neutral. Once in neutral the vehicle can be started normally.



1. Security siren [142]
2. Security siren (if equipped)
3. Fuse block
4. Main fuse [5]
5. DLC [91]
6. ABS diode pack [201] (if equipped)

Figure 5-29. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

SIREN CHIRP MODE CONFIRMATION: HFSM

Chirpless Mode

In the chirpless mode, the siren does not chirp on arming or disarming.

NOTE

Even when armed in the chirpless mode, the siren still chirps warnings on movement and will activate the alarm through the normal cycles.

Chirp Mode

On arming in the chirp mode, the siren responds with two chirps. When disarming, the siren responds with a single chirp.

Switching Modes

Cycling quickly through three armings and disarmings will switch the system from either the chirpless mode or the chirp mode to its opposite.

1. With the fob present, the IGN ON and the system disarmed, turn the IGN OFF.
2. When the security lamp turns off, immediately turn the IGN ON. If the turn signals flash twice before the IGN is turned ON, the system will drop out of the switching mode sequence and will have to be started over from the beginning.
3. Wait until the security lamp goes out, then immediately turn the IGN OFF.
4. When the security lamp turns off, immediately turn the IGN ON. If the turn signals flash twice before the IGN is turned ON, the system will drop out of the switching mode sequence and will have to be started over from the beginning.
5. Wait until the security lamp goes out, then immediately turn the IGN OFF.
6. When the security lamp turns off, immediately turn the IGN ON. If the turn signals flash twice before the IGN is turned ON, the system will drop out of the switching mode sequence and will have to be started over from the beginning.

SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS

5.15

GENERAL

Setting up a vehicle's TSM/TSSM/HFSM depends on whether the vehicle has a TSM or the optional TSSM or HFSM security system installed.

ACTUATION: HFSM

Actuation consists of assigning two fobs to the system, and entering an initial PIN. The PIN can be changed by the rider at any time.

1. Configure HFSM vehicles by assigning **both** fobs to the vehicle.
2. Configure HFSM vehicles by entering a PIN picked by the owner. The personal code allows the owner to operate the system if the fob is lost or inoperable. Record the PIN in the owner's manual and instruct the customer to carry a copy (use the wallet card found in the owner's manual).

Once the system has been activated, it will always "arm" within 5 seconds of turning the ignition switch to **OFF** and no vehicle motion.

CONFIGURING A TSSM

NOTE

Do not forget to enter a PIN for TSSM vehicles. If a PIN is not assigned and both key fobs are lost or damaged while the vehicle is armed, the TSSM must be replaced.

Changes to TSSM settings are made by a series of programming operations involving the ignition key, left/right turn signal switches and key fob (security systems).

At certain steps in the programming sequence, the vehicle may provide confirmation of settings by flashing the turn signals, turn signal indicators and/or security lamp. In addition, when programming a PIN into a TSSM system, the odometer displays the PIN to the user and dynamically updates it as the code is entered or changed.

All programming operations are listed in table format. Follow the numbered steps to configure the system. If a confirmation response is listed, wait for the confirmation before continuing to the next step. Important information pertaining to certain actions will be found in the NOTES column.

SELECTING A PIN

The PIN consists of five digits. Each digit can be any number from 1-9. There can be no zeros (0) in the PIN. The PIN **must** be used to disarm the security system in case the fob becomes unavailable.

INITIAL PIN ENTRY: HFSM

To enter a PIN on a vehicle with no PIN previously installed during HFSM actuation, refer to [Table 5-35](#).

Table 5-35. Entering an Initial PIN: HFSM

NO.	ACTION	WAIT FOR CONFIRMATION
1	Select a 5-digit (1 through 9) initial PIN and record in the owner's manual and on the wallet card.	
2	With an assigned fob present, set engine stop switch to OFF .	
3	Cycle IGN ON-OFF-ON-OFF-ON	
4	Press left turn signal button 2 times.	Turn signals will flash 3 times.
5	Press right turn signal button 1 time.	Five dashes will appear in the odometer window. The first dash will flash.
6	Enter first digit (a) of initial PIN by pressing left turn signal button a times.	
7	Press right turn signal button 1 time.	The digit (a) will replace the dash in the odometer. The second dash will flash.
8	Enter second digit (b) of initial PIN by pressing left turn signal button until desired digit is displayed in odometer.	
9	Press right turn signal button 1 time.	The digit (b) will replace the dash in the odometer. The third dash will flash.
10	Enter third digit (c) of initial PIN by pressing left turn signal button c times.	
11	Press right turn signal button 1 time.	The digit (c) will replace the dash in the odometer. The fourth dash will flash.
12	Enter fourth digit (d) of initial PIN by pressing left turn signal button d times.	

Table 5-35. Entering an Initial PIN: HFSM

NO.	ACTION	WAIT FOR CONFIRMATION
13	Press right turn signal button 1 time.	The digit (d) will replace the dash in the odometer. The fifth dash will flash.
14	Enter fifth digit (e) of initial PIN by pressing left turn signal button e times.	
15	Press right turn signal button 1 time.	The digit (e) will replace the dash in the odometer. The first digit will flash.
16	Turn IGN OFF .	

INITIAL PIN ENTRY: TSSM

NOTE

Do not forget to enter a PIN for TSSM vehicles. If a PIN is not assigned and the key fob is lost or damaged while the vehicle is armed, the TSSM must be replaced.

The TSSM PIN consists of five digits. Each digit can be any number from 1-9. There can be no zeros (0) in the PIN. The PIN **must** be used to disarm the security system in case the key fob becomes unavailable.

Refer to [Table 5-36](#) to enter an initial PIN with no PIN previously installed. The procedure listed uses 3-1-3-1-3 as the desired PIN.

NOTE

For better security, do not use 3-1-3-1-3 as a PIN. It is shown as an example only.

Decide what five-digit PIN the owner would like to use. The code will be programmed using the turn signal switches and

key fob. Keep a record of the PIN in a secure place such as your wallet or the Owner's Manual.

- When programming the PIN, the security lamp flashes to provide feedback when entering each digit. The odometer also displays the PIN and the change dynamically.
- The number of security lamp flashes corresponds to the number currently selected for a given digit. Therefore, the lamp may flash 1-9 times depending on the number entered. The five-digit PIN will change in the odometer window and the active digit will blink.
- Press the left turn switch one time to increment each digit.
- Quickly press the key fob button twice to advance to the next digit.

NOTE

The programming mode exits upon turning the ignition switch to OFF, or if no turn signal switch/key fob button activity occurs for 60 seconds. No data is saved for partial configuration attempts if entering a PIN for the first time. If a PIN has previously been entered, the user can change any digit or group of digits.

Table 5-36. Entering an Initial TSSM PIN (Example: 3-1-3-1-3) with No PIN Previously Entered

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop switch to OFF		Verify the security lamp is not flashing (vehicle is disarmed) This assignment procedure must be completed with no pauses between steps greater than 10 seconds
2	Turn IGN ON-OFF-ON-OFF-ON		
3	Press left turn switch 2 times and release	One to four flashes turn signals and indicators depending on vehicle configuration (See 5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS, Power Disruption and Configuring: TSSM regarding battery disconnects)	One flash - Worldwide TSM, no security Two flashes - Japan/Korea configuration TSSM
4	Quickly press key fob button 2 times and release	One flash turn signals and indicators Odometer displays current five-digit PIN (five dashes if no code entered), first digit flashes	Vehicle is in PIN entry mode ready to enter or modify first digit

Table 5-36. Entering an Initial TSSM PIN (Example: 3-1-3-1-3) with No PIN Previously Entered

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
5	Press left turn switch 1 time and release	Security lamp flashes 1-9 times if code was previously entered	A lack of confirmation flashes indicates no digit entered
6	Press and release left turn switch to advance through the digits In this example, you will press and release three times	Blinking digit in odometer display increments, security lamp flashes to indicate each digit selected In this example, the blinking digit displayed is 3 and the security lamp will flash three times	You have selected 3 as a number for the first digit
7	Quickly press key fob button 2 times and release	Two flashes turn signals and indicators second digit in odometer display blinks	You have confirmed 3 as a number for the first digit and have advanced to entering the second digit
8	Press left turn switch 1 time and release	None	A lack of confirmation flashes indicates no digit entered
9	Press and release left turn switch to advance through the digits In this example, you will perform this step one time	Blinking digit in odometer display increments, security lamp flashes to indicate each digit selected In this example, the blinking digit displayed is 1 and the security lamp will flash one time	You have selected 1 as a number for the second digit
10	Quickly press key fob button 2 times and release	Three flashes turn signals and indicators third digit in odometer display blinks	You have confirmed 1 as a number for the second digit and have advanced to entering the third digit
11	Press left turn switch 1 time and release	None	A lack of confirmation flashes indicates no digit entered
12	Press and release left turn switch to advance through the digits In this example, you will repeat this step three times	Blinking digit in odometer display increments, security lamp flashes to indicate each digit selected In this example, the blinking digit displayed is 3 and the security lamp will flash three times	You have selected 3 as a number for the third digit
13	Quickly press key fob button 2 times and release	Four flashes turn signals and indicators fourth digit in odometer display blinks	You have confirmed 3 as a number for the third digit and have advanced to entering the fourth digit
14	Press left turn switch 1 time and release	None	A lack of confirmation flashes indicates no digit entered
15	Press and release left turn switch to advance through the digits In this example, you will perform this step one time	Blinking digit in odometer display increments, security lamp flashes to indicate each digit selected In this example, the blinking digit displayed is 1 and the security lamp will flash one time	You have selected 1 as a number for the fourth digit
16	Quickly press key fob button 2 times and release	Five flashes turn signals and indicators fifth digit in odometer display blinks	You have confirmed 1 as a number for the fourth digit and have advanced to entering the fifth digit
17	Press left turn switch 1 time and release	None	A lack of confirmation flashes indicates no digit entered
18	Press and release left turn switch to advance through the digits In this example, you will repeat this step three times	Blinking digit in odometer display increments, security lamp flashes to indicate each digit selected In this example, the blinking digit displayed is 3 and the security lamp will flash three times	You have selected 3 as a number for the fifth digit
19	Quickly press key fob button 2 times and release	One flash turn signals and indicators first digit in odometer display blinks	You have confirmed 3 as a number for the fifth digit and have gone back to the first digit

Table 5-36. Entering an Initial TSSM PIN (Example: 3-1-3-1-3) with No PIN Previously Entered

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
20	Turn IGN OFF		
21	Write down code in Owner's Manual		
22	Arm the security system and attempt to disarm using PIN entry. Refer to Table 5-32 .		

CHANGING THE PIN

To change a PIN, refer to [Table 5-37](#).

If a PIN was previously entered, the odometer will display the equivalent digit. Each additional press of the left turn switch will increment the digit.

Examples:

- To advance from 5 to 6, press and release the left turn switch 1 time.
- To advance from 8 to 2, press and release the left turn switch 3 times (9-1-2).

Table 5-37. Changing the PIN: HFSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Select a 5-digit (1 through 9) personal code and record in the owner's manual and on the wallet card.		
2	With fobs present, cycle IGN ON-OFF-ON-OFF-ON		
3	Press left turn signal button 2 times.	Turn signals will flash 3 times.	
4	Press right turn signal button 1 time.	Current PIN will appear in odometer. The first digit will flash.	
5	Enter first digit (a) of new PIN by pressing left turn signal button until desired digit is displayed in odometer.		
6	Press right turn signal button 1 time.	The new digit will replace the current in the odometer. The second digit will flash.	
7	Enter second digit (b) of new PIN by pressing left turn signal button until the desired digit is displayed in the odometer.		
8	Press right turn signal button 1 time.	The new digit will replace the current in the odometer. The third digit will flash.	
9	Enter third digit (c) of new PIN by pressing left turn signal button until desired digit is displayed in the odometer.		
10	Press right turn signal button 1 time.	The new digit will replace the dash in the odometer. The fourth digit will flash.	
11	Enter fourth digit (d) of new PIN by pressing left turn signal button until desired digit is displayed in the odometer.		
12	Press right turn signal button 1 time.	The new digit will replace the current in the odometer. The fifth digit will flash.	

Table 5-37. Changing the PIN: HFSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
13	Enter fifth digit (e) of new PIN by pressing left turn signal button until desired digit is displayed in the odometer.		
14	Press right turn signal button 1 time.	The new digit will replace the current in the odometer. The first digit will flash.	
15	Turn the IGN OFF.		Turning the ignition switch to OFF stores the PIN.

TRANSPORT MODE

Transport mode is especially useful when working on the vehicle. If it is not used, the alarm will activate under many typical service activities.

To Enter Transport Mode: HFSM

It is possible to arm the security system without enabling the motion detector for one ignition cycle. This allows the vehicle to be picked up and moved in an armed state, however, any attempt to start the engine will trigger the alarm.

1. Turn the ignition switch to IGN.
2. Set the engine stop switch to the OFF position.
3. With an assigned fob within range, turn the ignition switch from OFF to ACC.
4. Simultaneously, press both the left and the right turn signal switches. This must be done within five seconds of turning the ignition switch to ACC.
5. After the turn signals flash once, turn the ignition switch to OFF and the module is armed.
6. The turn signals flash three times to confirm module arming in transfer mode for one ignition cycle.

To Exit Transport Mode: HFSM

Return the system to normal operation:

1. With the fob present, turn the ignition switch to IGN to disarm the HFSM.
2. To cancel the transport mode, set the engine stop switch to RUN.

To Enter Transport Mode: TSSM

It is possible to arm the security system without enabling the motion detector for one ignition cycle. This allows the vehicle to be picked up and moved in an armed state. In this mode, any attempt to bypass the ignition system will trigger the security system.

1. Turn the engine stop switch to the OFF position. Verify the security lamp is not flashing.
2. Turn IGN ON.
3. Press and hold key fob button until the turn signals and indicators flash three times.

4. Turn IGN OFF.

5. Press and hold key fob button until the turn signals and indicators flash three times.

To Exit Transport Mode: TSSM

To exit from transport mode and return the system to normal operation/functions, disarm the system using either the key fob or PIN.

SERVICE MODE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

With a fob present, the HFSM can be configured for service by disabling the security system with DIGITAL TECHNICIAN II (Part No. HD-48650).

Once disabled, the vehicle can be operated without an assigned fob present. To maintain the Service Mode, the assigned fobs must be kept out of range. If the fob appears in range, the Service Mode will be exited.

FOUR-WAY FLASHING

To Arm the HFSM with the Hazard Warning Flashers ON

If it is necessary to leave a vehicle parked along side the road, the hazard warning four-way flashers can be turned ON with the smart security system armed.

1. Turn IGN ON.
2. Simultaneously press both left and right turn signal switches to turn the four-way flashers ON. The four-way flashers will continue for two hours.
3. Turn IGN OFF to arm the smart security system.

To Disarm the HFSM and Turn the Hazard Warning Flashers OFF

1. With a fob present, turn the ignition switch to IGN.
2. Simultaneously press the left and right turn signal switches.

STORAGE MODE: TSSM

The TSSM has a special mode for long term storage. This mode prevents the security system from draining the battery

after a period of days (10, 20, 60 or infinite) without any ignition switch activity.

- If the TSSM is set to infinite, the system will not go into storage mode.
- Vehicles will enter storage mode whether the security system is armed or disarmed.
- If set to 20 days or greater, the customer must use an approved trickle charger to keep the battery from discharging.

In storage mode, all alarm functions remain active but the receiver is shut down and will not respond to the key fob. The vehicle is immobilized because the starter motor and ECM are disabled. When the storage mode is entered, the security lamp stops flashing to conserve power.

To wake up the TSSM from storage mode, the ignition switch must be turned ON. This will trigger a warning/alarm if the system was previously armed. You must use the key fob or PIN to disarm the system and stop the alarm.

To set the storage mode preferences, refer to [Table 5-38](#).

Table 5-38. Storage Mode Preferences: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set engine stop switch to OFF		Verify the security lamp is not flashing (vehicle is disarmed)
2	Turn IGN ON-OFF-ON-OFF-ON		
3	Press left turn switch 2 times and release	Two flashes turn signals and indicators depending on vehicle configuration (See 5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS, Power Disruption and Configuring: TSSM regarding battery disconnects.)	Two flashes - Japan/Korea configuration TSSM
4	Press and hold key fob button until confirmation is received	One flash turn signals and indicators	
5	Release and then hold key fob button until confirmation is received	Two flashes turn signals and indicators	
6	Release and then hold key fob button until confirmation is received	Three flashes turn signals and indicators	
7	Press left turn switch 1 time and release	Turn signals and indicators flash to indicate option selected	One flash - 10 days Two flashes - 20 days Three flashes - 60 days Four flashes - Infinite
8	Press left turn switch to advance through options	Turn signals and indicators flash to indicate option selected	One flash - 10 days Two flashes - 20 days Three flashes - 60 days Four flashes - Infinite
9	Turn IGN OFF.		

POWER DISRUPTION AND CONFIGURING: HFSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

The HFSM will not enter PIN entry mode on the first attempt after battery voltage has been removed from terminal 1. This will occur after any of the following:

- Battery disconnect or power drain.
- Main fuse removal.
- Connecting BREAKOUT BOX (Part No. HD-42682) to HFSM connector.

Therefore, after all battery reconnects, the configuration sequence must be modified as follows:

1. Set engine stop switch to the OFF position, cycle ignition switch IGN to **ON-OFF-ON-OFF-ON** and press left turn signal switch twice.
2. Repeat steps listed above.
3. Continue with PIN entry sequence listed.

POWER DISRUPTION AND CONFIGURING: TSSM

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

The TSSM will not enter configuration mode on the first attempt after battery voltage has been removed from terminal 1. This will occur after any of the following:

- Battery disconnect or power drain.
- Main fuse removal.

- Connecting BREAKOUT BOX (Part No. HD-42682) to TSSM connector.

Therefore, after all battery reconnects, the configuration sequence must be modified as follows.

1. Set engine stop switch to OFF, cycle ignition/headlamp switch **ON-OFF-ON-OFF-ON** and press left turn signal switch twice.
2. Repeat step listed above.
3. Continue with configuration sequence listed.



FAILS TO DISARM

5.16

DESCRIPTION AND OPERATION

HFSM

If the HFSM does not respond, responds with limited range or will not consistently disarm with fob within normal range, follow the diagnostic procedure.

TSSM

This section applies only to those vehicles equipped with the optional security system (TSSM).

NOTE

*Disarming function may require practice. The key fob button **must** be pressed twice within 1.5 seconds to send the disarm command. The action is very similar to double-clicking a computer mouse. Light quick taps work best; very hard or very slow taps are less likely to work.*

The key fob sends a RF signal to activate all remote TSSM functions. The left front turn signal switch wire serves as the vehicle's antenna. If the TSSM does not respond (no confirmation at arming/disarming system) or responds weakly (limited range, won't consistently arm/disarm or synchronize), follow the diagnostic procedure.

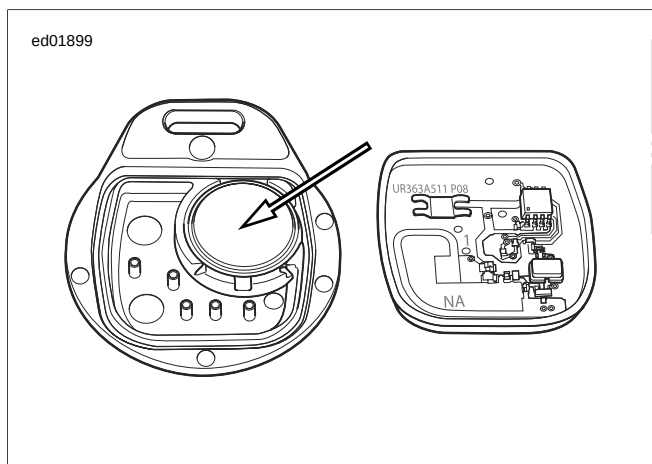


Figure 5-30. Key Fob Battery: TSSM

Diagnostic Tips

- Verify that cell phone is not within 3.0 in. (80.0 mm) of key fob.
- Interference from physical surroundings may affect RF transmission. Place fob next to vehicle or move vehicle to a new location and retest.
- See [Figure 5-30](#). Verify that antenna is in OE location and that seat has not been replaced with a metal base seat.
- Check for damage to antenna wire.
- See [Figure 5-31](#). Verify fob battery voltage is at least 2.9V.
- Fob serial number is located inside fob. Open fob by twisting a thin blade in the thumbnail slot between fob halves.



1. Battery
2. Fob serial number

Figure 5-31. Open Fob: HFSM

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

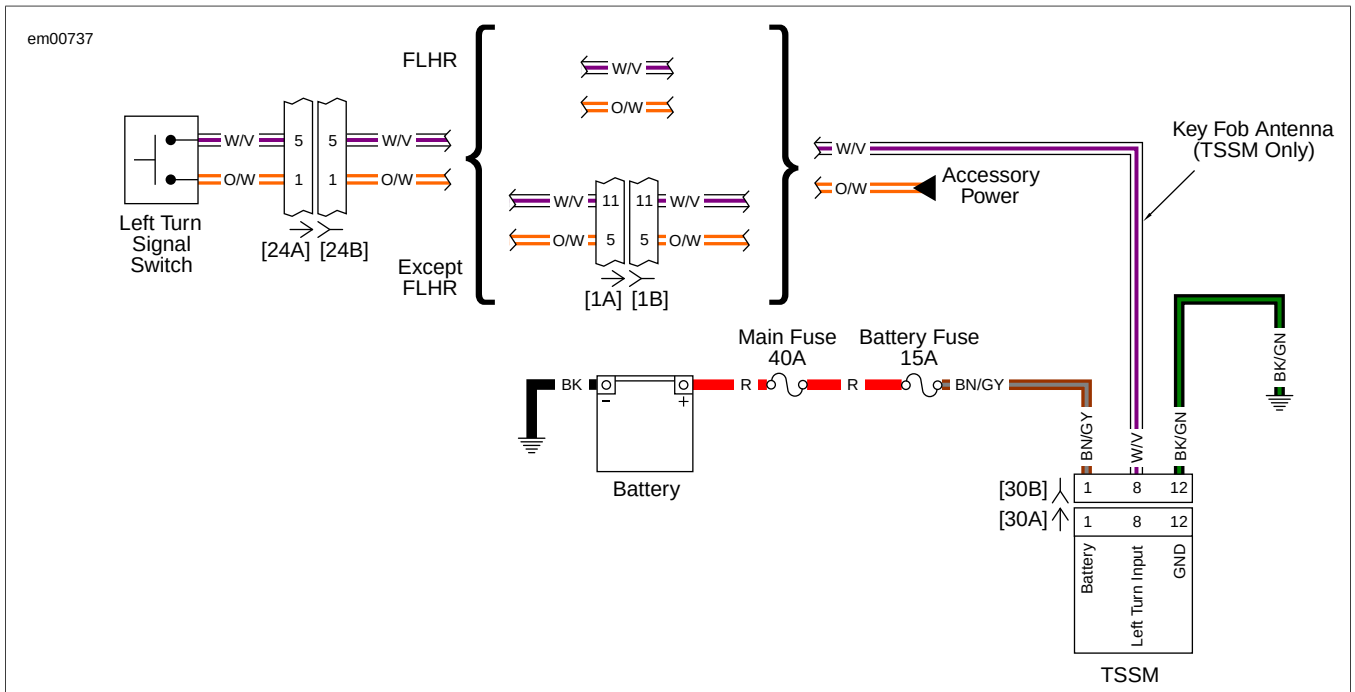


Figure 5-32. Antenna Circuit: TSSM

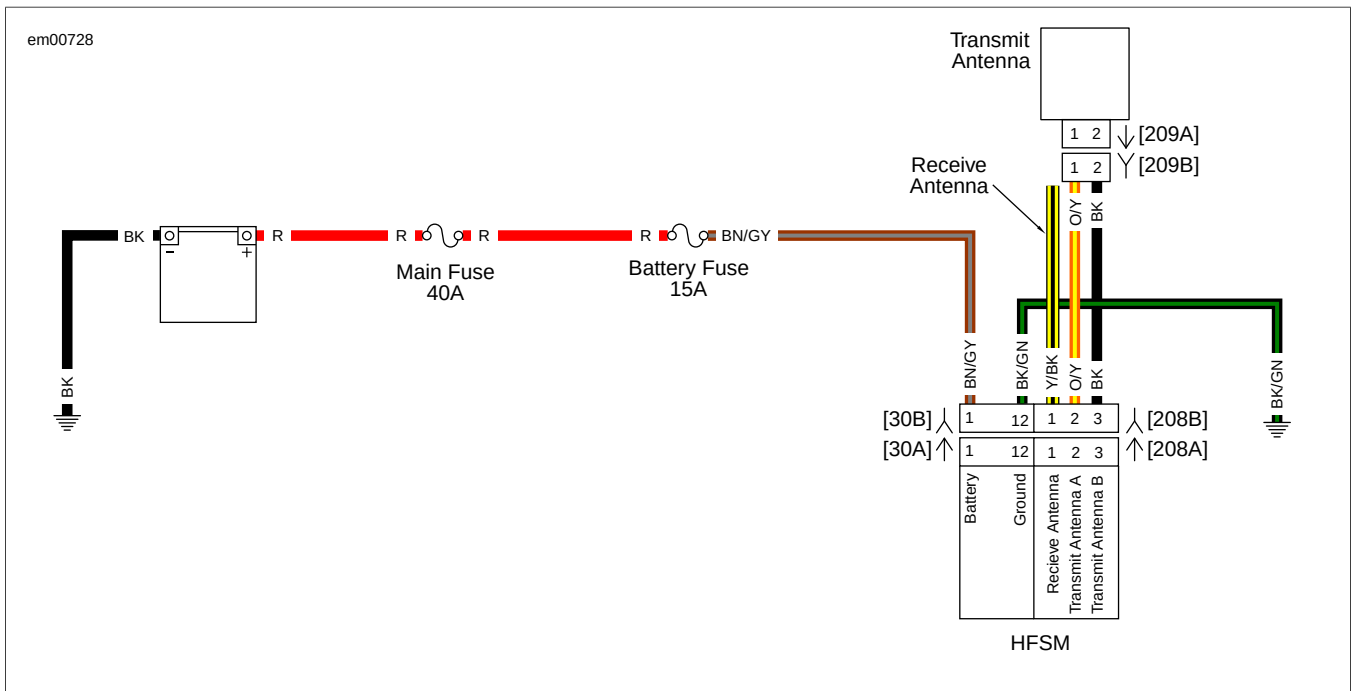


Figure 5-33. Antenna Circuit: HFSM

FAILS TO DISARM: TSSM

Table 5-39. Fails to Disarm Diagnostic Faults: TSSM

POSSIBLE CAUSES
Fob malfunction
Fob battery discharged
TSSM malfunction

1. Key Fob Test

1. Verify the key fob is correct for the vehicle.
2. Is the key fob correct for the vehicle?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Obtain correct fob or replace fob. See the service manual. Verify fob is synchronized to vehicle's TSSM.

2. Left Turn Signal Test

1. Operate the left turn signal.
2. Does left turn signal function?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** See [5.6 TURN SIGNALS](#).

3. Fob Battery Test

1. Replace fob battery and retest. See the service manual.
2. Does fob work?
 - a. **Yes.** System OK. **(6755)**
 - b. **No.** [Go to Test 4.](#)

4. TSSM Test

1. Attempt to assign **new** fob to TSSM and retest.
2. Does fob work?
 - a. **Yes.** System OK. **(6756)**
 - b. **No.** Replace TSSM. See the service manual. **(6757)**

FAILS TO DISARM: HFSM

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

Table 5-40. Fails to Disarm Diagnostic Faults: HFSM

POSSIBLE CAUSES
Open antenna circuit
Short to ground in antenna circuit
Antenna malfunction
Fob malfunction
HFSM malfunction

1. Fob Test

1. Test all assigned fobs.
2. Does any assigned fob work?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 2.](#)

2. Antenna Circuit Short to Ground Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between HFSM antenna jumper harness [208B] terminal 1 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground. **(5041)**
 - b. **No.** [Go to Test 3.](#)

3. Antenna Circuit Open Test

1. Check for continuity between HFSM antenna jumper harness [208B] terminal 1 and end of (Y/BK) wire (pull back conduit to expose unterminated end of wire).
2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open on (Y/BK) wire. **(5041)**

4. Security System Antenna Test

1. Replace the security antenna with a known good security antenna. See the service manual.
2. Does the security system now disarm?
 - a. **Yes.** Replace the security antenna. See the service manual. **(6878)**
 - b. **No.** Replace HFSM. See the service manual. **(6757)**

5. Non-Functional Fob Test

1. Check battery on non-functional fob.
2. Is battery voltage greater than 2.9V?
 - a. **Yes.** Replace fob. See the service manual. **(6756)**
 - b. **No.** Replace battery. See the service manual. **(6755)**

DTC B1131, B1132

DESCRIPTION AND OPERATION

NOTE

This section applies only to those vehicles equipped with the optional security system.

See [Figure 5-34](#). An alarm cycle is activated when the HFSM is connected, the siren has been armed by the HFSM and a security event occurs. See [5.12 SECURITY SYSTEM](#). Under normal armed operation, the siren input (terminal B) is driven low by the HFSM to trigger the audible alarm. When the siren input is driven high by the HFSM the audible alarm stops.

Table 5-41. Code Description

DTC	DESCRIPTION
B1131	Alarm output low
B1132	Alarm output high

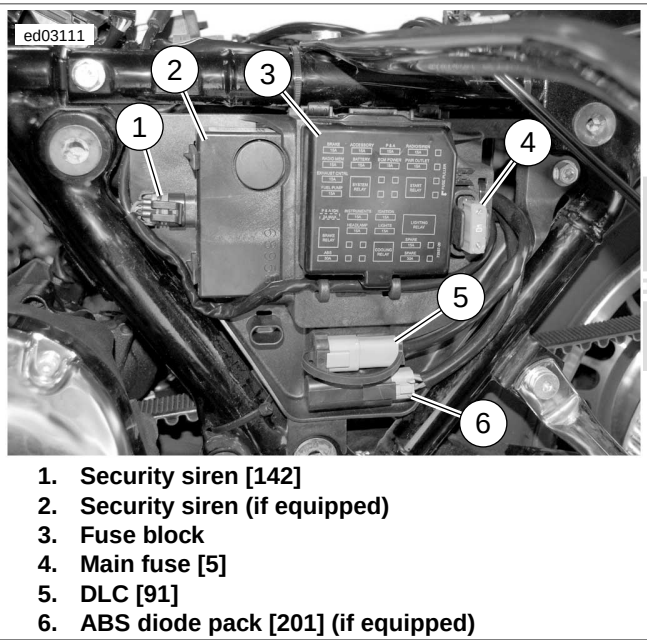


Figure 5-34. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

Diagnostic Tips

- If the siren is armed and the internal siren battery is dead, shorted, disconnected or has been charging for a period longer than 24 hours, the siren will respond with three chirps on arming instead of two.
- The internal siren battery may not charge if the vehicle's battery is less than 12.5V.
- If the siren does not chirp two or three times on a valid arming command from the HFSM, the chirp function has been disabled, the siren is either not connected, not working or the siren wiring was opened or shorted while the siren was disarmed.
- If the siren enters the self-driven mode where it is powered from the siren internal 9V battery, the turn-signal lamps will not alternately flash. If the HFSM activates the siren, the turn-signal lamps will flash. If the siren has been armed and a security event occurs, and the siren is in self-driven mode, the siren will alarm for 20-30 seconds and then turn off for 5-10 seconds. This alarm cycle will be repeated ten times if the siren is in the self-driven mode.
- If the siren does not stop alarming after it has been armed, then either the HFSM output or siren input may be shorted to ground, the siren vehicle battery connection is open or shorted to ground, the siren vehicle ground connection is open or a security event has occurred. See [5.12 SECURITY SYSTEM](#) for a description of alarm functions.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

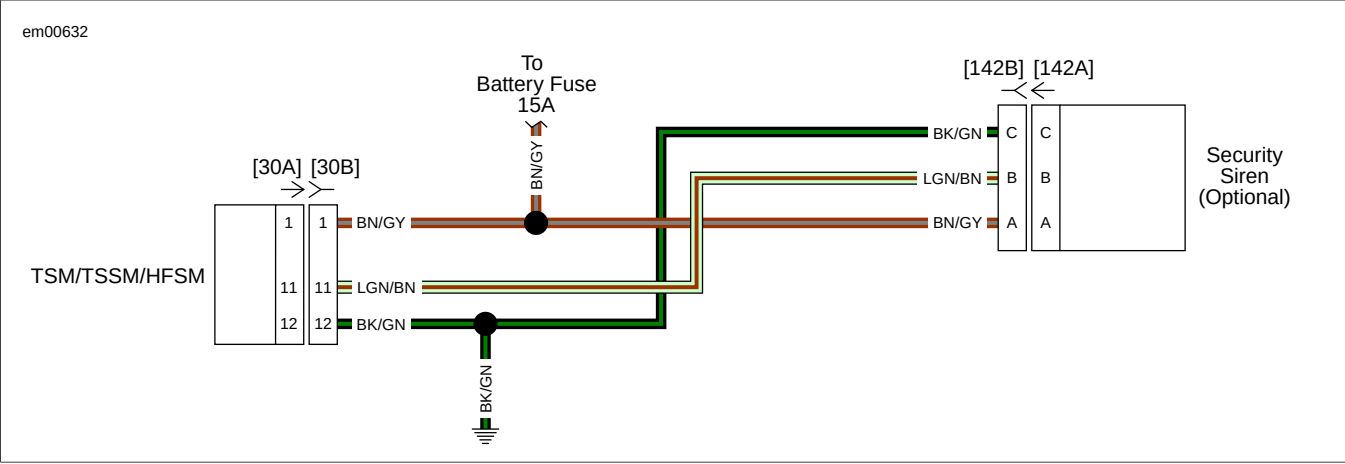


Figure 5-35. Smart Siren Circuit

DTC B1131

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX

Table 5-42. DTC B1131 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in alarm signal
Open ground circuit
Open power circuit
TSSM/HFSM malfunction
Open alarm signal
Siren malfunction

1. Siren Verification Test

1. Disarm the security system.
2. Inspect the vehicle for a security siren.
3. Is a security siren present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 2.](#)

2. Alarm Signal Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving TSSM/HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using a multimeter, test for continuity between breakout box terminals 11 and 12.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (LGN/BN) wire between [142B] terminal B and [30B] terminal 11.
 - b. **No.** Replace the TSSM/HFSM. See the service manual.

3. Battery Circuit Test

1. Remove the security siren.
2. With IGN ON, and the engine stop switch in the RUN position, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for battery voltage at [142B] between terminals A and C.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 4.](#)

4. Power Supply and Ground Test

1. Test for battery voltage between [142B] terminal A and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK/GN) ground wire between [142B] terminal C and ground.
 - b. **No.** Repair open in (BN/GY) wire.

5. Alarm Signal Circuit Open Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving TSSM/HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using a multimeter, test for continuity between [142B] terminal B and breakout box terminal 11.
3. Is continuity present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair open in (LGN/BN) wire between [142B] and [30B].

6. Alarm Signal Short to Ground Test

1. Test for continuity between breakout box terminals 11 and 12.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (LGN/BN) wire.
 - b. **No.** [Go to Test 7.](#)

7. Security Siren Resistance Test

1. Measure resistance at [142A] between terminals B and C.
2. Is the security siren resistance between 40,000-160,000 Ohms?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Replace the security siren. See the service manual.

8. Security Siren Validation Test

1. Connect and operate the security siren on a known good vehicle.
2. Does the siren function properly with no DTCs set?
 - a. **Yes.** Replace the TSSM/HFSM. See the service manual.
 - b. **No.** Replace the security siren. See the service manual.

DTC B1132

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-43. DTC B1132 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in alarm signal
Open ground circuit
Open power circuit
TSM/TSSM/HFSM malfunction
Open alarm signal
Siren malfunction

1. Siren Verification Test

1. Disarm the security system.
2. Inspect the vehicle for a security siren.
3. Is a security siren present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 2.](#)

2. Alarm Signal Circuit Short to Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, using a multimeter, test for voltage between breakout box terminal 11 and ground.
3. Is battery voltage present?
 - a. **Yes.** Repair short to voltage in (LGN/BN) wire.
 - b. **No.** Replace the TSSM/HFSM. See the service manual.

3. Alarm Signal Short to Voltage Test

1. Disconnect the security siren.
2. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving TSSM/HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. With IGN ON, test for voltage between breakout box terminal 11 and ground.
4. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (LGN/BN) wire.
 - b. **No.** Replace the TSSM/HFSM. See the service manual.

DTC B1134

5.18

DESCRIPTION AND OPERATION

See [Figure 5-36](#). With the TSM/TSSM/HFSM (if equipped) disarmed, IGN ON, engine stop switch in the RUN position, and the transmission in neutral or clutch lever pulled in, the start relay is grounded. Battery voltage is applied to the start relay coil which is grounded through the TSM/TSSM/HFSM. DTC B1134 is set when that ground is not established through the TSM/TSSM/HFSM.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

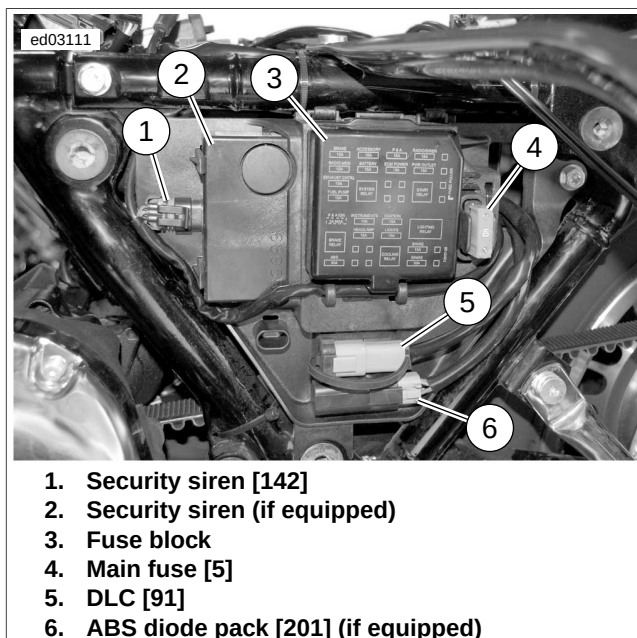


Figure 5-36. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

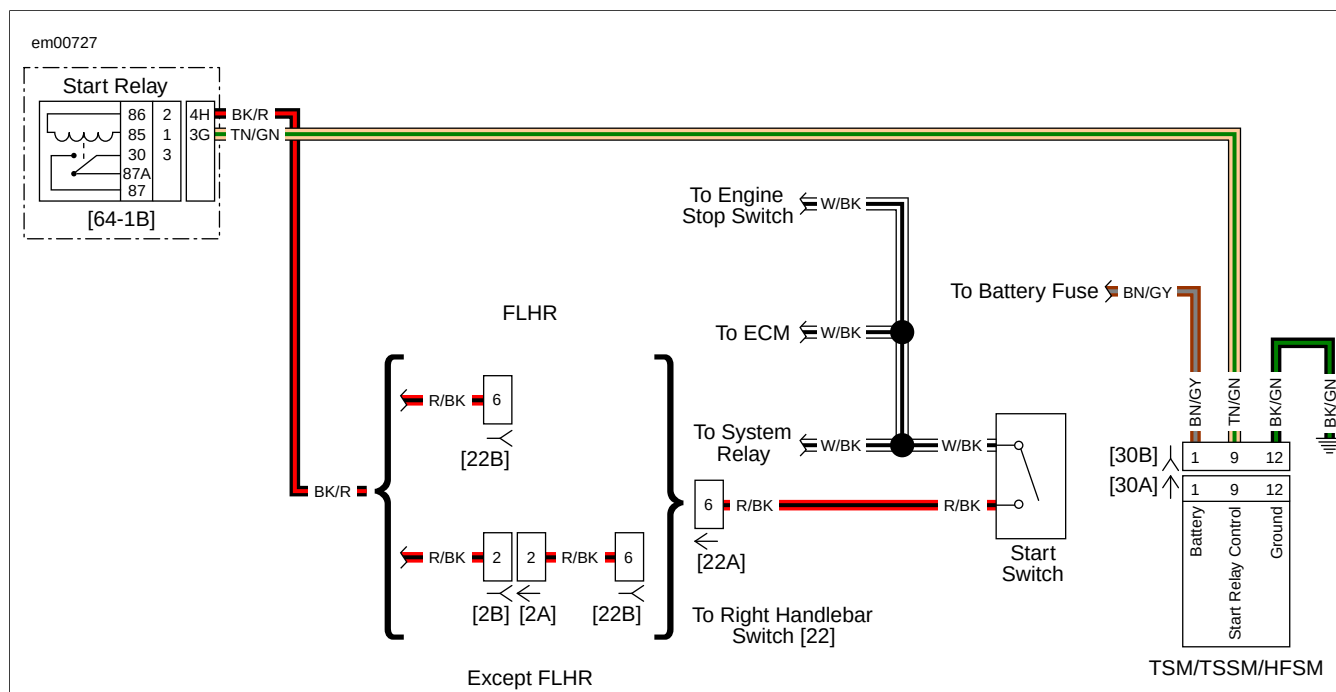


Figure 5-37. Starter TSM/TSSM/HFSM Circuit

DTC B1134

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-44. DTC B1134 Diagnostic Faults

POSSIBLE CAUSES
TSM/TSSM/HFSM malfunction
Start relay malfunction
Short to voltage in start relay control circuit

1. Relay Control Circuit Short to Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness [30B] and TSM/TSSM/HFSM [30A]. See [1.2 DIAGNOSTIC TOOLS](#).

2. Remove start relay.
3. With IGN ON, using a multimeter, test for voltage on breakout box (Gray) terminal 9.
4. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (TN/GN) wire.
 - b. **No.** [Go to Test 2.](#)

2. Start Relay Test

1. Test start relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
2. Does relay pass test?
 - a. **Yes.** Replace TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Replace start relay. See the service manual.



DTC B1143, B1144, B1145

5.19

DESCRIPTION AND OPERATION

DTC B1143, B1144 or B1145 will set when a fault occurs to the security antenna circuit used to transmit to the fob. Refer to [Table 5-45](#).

Table 5-45. Code Description

DTC	DESCRIPTION
B1143	Security antenna short-to-ground
B1144	Security antenna short-to-voltage
B1145	Security antenna open

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

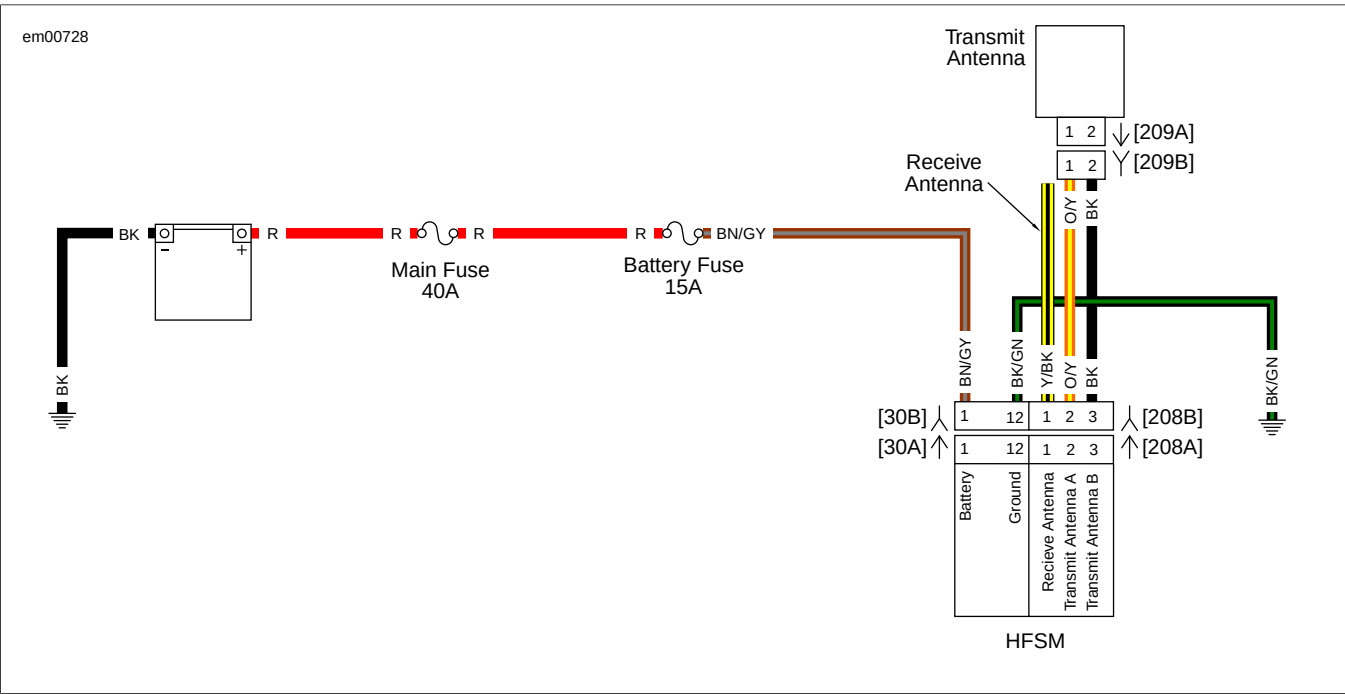


Figure 5-38. Antenna Circuit: HFSM

DTC B1143

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

Table 5-46. DTC B1143 Diagnostic Faults

POSSIBLE CAUSES
Security antenna malfunction
HFSM malfunction
Open antenna circuit

1. Security Antenna Visual Test

1. Inspect the security antenna for damage.

2. Is the security antenna damaged?
 - a. **Yes.** Repair or replace security antenna as needed. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Security Antenna Short to Ground Test

1. Disconnect HFSM antenna jumper [208].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between terminal 2 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (O/Y) wire.
 - b. **No.** Replace the HFSM. See the service manual.

DTC B1144

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

Table 5-47. DTC B1144 Diagnostic Faults

POSSIBLE CAUSES
Security antenna malfunction
HFSM malfunction
Short to voltage in antenna circuit

1. Security Antenna Visual Test

1. Inspect the security antenna for damage.
2. Is the security antenna damaged?
 - a. **Yes.** Repair or replace security antenna as needed. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Security Antenna Short to Voltage Test

1. Disconnect HFSM antenna jumper [208].
2. With IGN ON, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between terminal 2 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage in (O/Y) wire.
 - b. **No.** Replace the HFSM. See the service manual.

DTC B1145

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

Table 5-48. DTC B1145 Diagnostic Faults

POSSIBLE CAUSES
Security antenna malfunction
HFSM malfunction
Open antenna circuit

1. Security Antenna Resistance Test

1. Disconnect HFSM antenna [209].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance at [209A] between terminals 1 and 2.
3. Is resistance greater than 5700 Ohms?
 - a. **Yes.** Replace the security antenna. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Antenna B Circuit Open Test

1. Disconnect HFSM antenna jumper [208].
2. Test for continuity between [208B] terminal 3 and [209B] terminal 2.
3. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (BK) wire.

3. Antenna A Circuit Open Test

1. Test for continuity between [208B] terminal 2 and [209B] terminal 1.
2. Is continuity present?
 - a. **Yes.** Replace the HFSM. See the service manual.
 - b. **No.** Repair open in (O/Y) wire.

DTC B1154, B1155

5.20

DESCRIPTION AND OPERATION

The TSM/TSSM/HFSM monitors the clutch and neutral switch circuits to determine whether or not to let the vehicle start. If the TSM/TSSM/HFSM does not see that the clutch switch is closed (lever pulled in) or the neutral switch is closed (transmission in neutral) it will not activate the start relay. The TSM/TSSM/HFSM controls the start relay by supplying the ground circuit to the coil of the start relay.

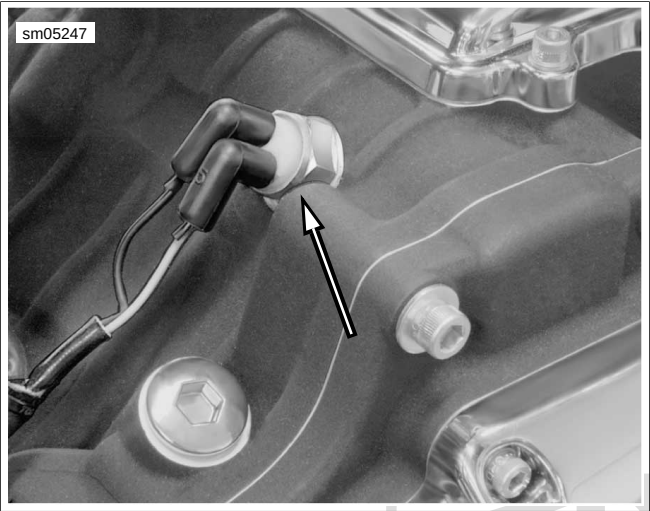


Figure 5-39. Neutral Switch [131]

Diagnostic Tips

DTCs B1154 and B1155 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 5-49](#).

Table 5-49. Code Description

DTC	DESCRIPTION
B1154	Clutch switch short-to-ground
B1155	Neutral switch short-to-ground

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



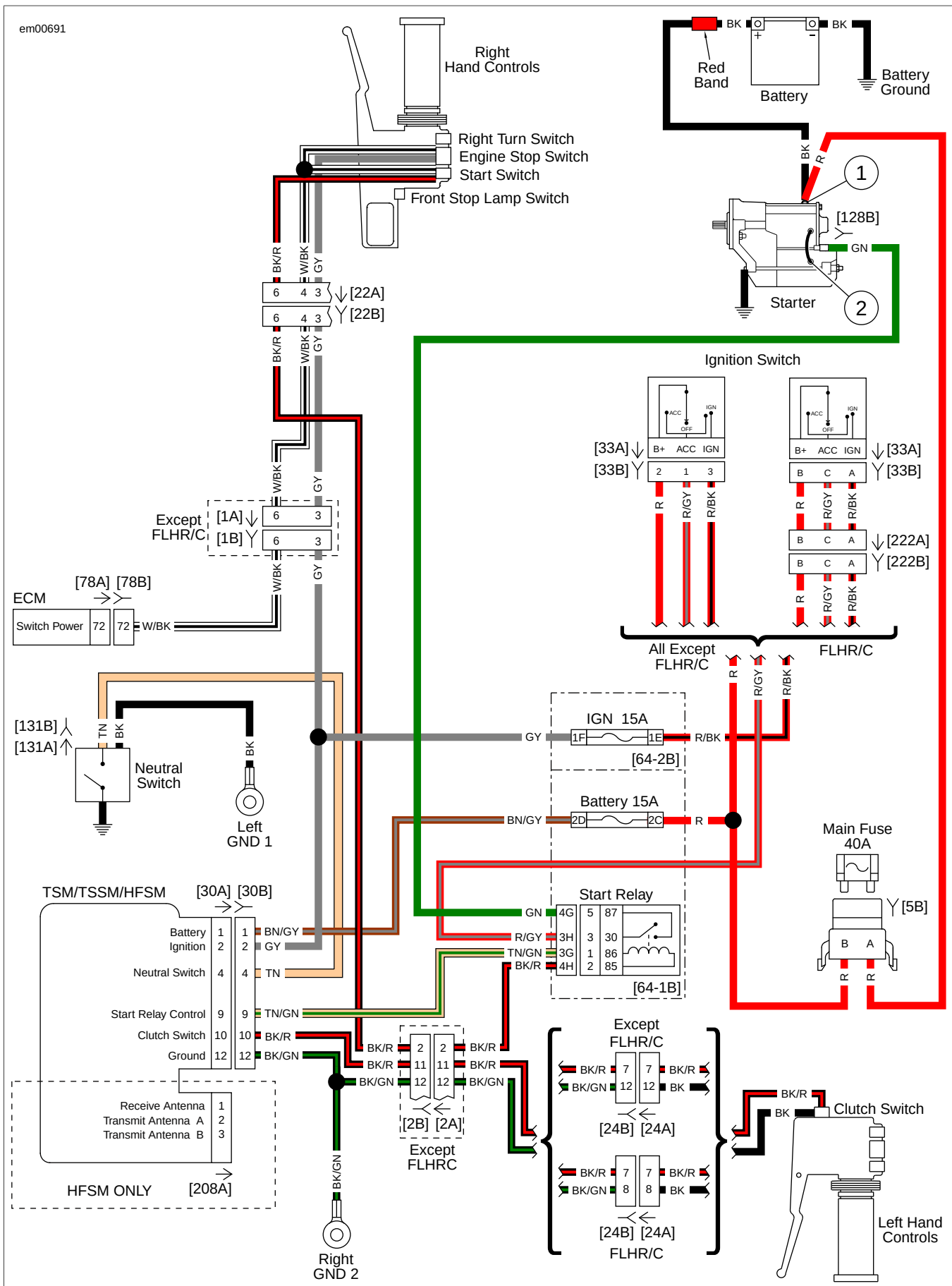


Figure 5-40. Starting Circuit

DTC B1154

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-50. DTC B1154 Diagnostic Faults

POSSIBLE CAUSES
TSM/TSSM/HFSM malfunction
Switch malfunction
Short to ground in clutch switch circuit

NOTE

This DTC may occur if the vehicle is ridden with clutch disengaged (pulled in) at speeds greater than 10 mph (16 km/h) for more than 60 seconds (coasting down a long mountain road).

1. Clutch Circuit Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using a multimeter, test for continuity between breakout box (Gray) terminal 10 and terminal 12.
3. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace HFSM. See the service manual.

2. Clutch Switch Circuit Test

1. Disconnect left hand controls [24].
2. Test for continuity between breakout box (Gray) terminal 10 and terminal 12.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (BK/R) wire in main wiring harness between [30B] and [24B].
 - b. **No.** [Go to Test 3.](#)

3. Clutch Switch Test

1. Inspect left handlebar switch wiring for a short to ground.

2. Was a short to ground present?
 - a. **Yes.** Repair short to ground in left handlebar switch wiring.
 - b. **No.** Replace clutch switch. See the service manual.

DTC B1155

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Table 5-51. DTC B1155 Diagnostic Faults

POSSIBLE CAUSES
TSM/TSSM/HFSM malfunction
Short to ground in neutral circuit
Neutral switch malfunction

NOTE

This DTC may occur if the vehicle is ridden in neutral at speeds greater than 10 mph (16 km/h) for more than 60 seconds (coasting down a long mountain road).

1. Neutral Circuit Short to Ground Test

1. Shift the transmission into 1st or 2nd gear.
2. Connect BREAKOUT BOX (Part No. HD-42682) to wire harness [30B], leaving HFSM [30A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Using a multimeter, measure resistance between breakout box (Gray) terminal 4 and terminal 12.
4. Is resistance less than 10 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace HFSM. See the service manual.

2. Neutral Switch Short to Ground Test

1. Disconnect neutral switch [131].
2. Measure resistance between breakout box (Gray) terminal 4 and terminal 12.
3. Is resistance less than 10 Ohms?
 - a. **Yes.** Repair short to ground on (TN) wire.
 - b. **No.** Replace neutral switch. See the service manual.

TABLE OF CONTENTS

SUBJECT	PAGE NO.
6.1 EFI SYSTEM.....	6-1
6.2 ELECTRONIC CONTROL MODULE.....	6-4
6.3 SENSORS AND DRIVERS.....	6-6
6.4 DTC P0107, P0108, P0112, P0113.....	6-9
6.5 DTC P0117, P0118.....	6-13
6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223.....	6-16
6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154.....	6-23
6.8 DTC P0261, P0262, P0263, P0264.....	6-30
6.9 DTC P0373, P0374.....	6-34
6.10 DTC P0444, P0445.....	6-36
6.11 DTC P0501, P0502.....	6-39
6.12 DTC P0505.....	6-43
6.13 DTC P0572.....	6-45
6.14 DTC P0603, P0605.....	6-48
6.15 DTC P0641, P0651.....	6-49
6.16 DTC P1001, P1002, P1003, P1004.....	6-52
6.17 DTC P1009, P1010.....	6-56
6.18 DTC P1270.....	6-58
6.19 DTC P1351, P1352, P1354, P1355.....	6-61
6.20 DTC P1353, P1356, P1357, P1358.....	6-65
6.21 DTC P1475, P1477, P1478.....	6-68
6.22 DTC P1501, P1502.....	6-72
6.23 DTC P1510, P1511, P1512.....	6-75
6.24 DTC P1514.....	6-76
6.25 DTC P1600.....	6-77
6.26 DTC P1655, P1656.....	6-78
6.27 DTC P2100, P2101, P2102, P2103.....	6-82
6.28 DTC P2105, P2107.....	6-86
6.29 DTC P2119.....	6-89
6.30 DTC P2122, P2123, P2127, P2128.....	6-90
6.31 DTC P2135, P2138.....	6-95
6.32 DTC P2176.....	6-98
6.33 ENGINE CRANKS, BUT WILL NOT START.....	6-99
6.34 NO ECM POWER.....	6-102
6.35 STARTS, THEN STALLS.....	6-105
6.36 FUEL SYSTEM ELECTRICAL TEST.....	6-106
6.37 MISFIRE AT IDLE OR UNDER LOAD.....	6-109

NOTES



EFI SYSTEM

6.1

GENERAL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

See [Figure 6-1](#). The engine management system consists of the following components:

- ECM
- CKP sensor
- TMAP sensor
- ET sensor
- TGS
- TCA
- VSS
- HO2S
- Active exhaust actuator (HDI)
- Ignition coil
- Fuel pump
- Fuel injector
- Purge solenoid (if equipped)

The ECM is a solid state device mounted under the seat and sealed to prevent contamination from dust/dirt, water and oil. The ECM controls engine performance based upon input supplied to the ECM from the ET, CKP, TMAP, TGS, HO2S and the VSS sensors and other additional low-voltage circuits and components between the battery and ignition coil.

- The ECM controls the dwell time for the ignition coil, providing optimum ignition circuit performance for all engine speeds/load conditions. Optimizing the ignition system allows the ECM to control/vary engine timing (as needed) from 0-50 degrees BTDC.
- The ECM also has built-in protection against transient voltages, continuous reverse voltages and inadvertent damage resulting from jump starts. The ECM is a non-repairable item and must be replaced when it fails.

The CKP sensor is located in the front left side of the crankcase. The CKP generates an AC signal that is sent to the ECM where it is used to reference engine position (TDC) and speed. It functions by taking readings off the 30 teeth on the left side flywheel (two teeth are missing to establish a reference point).

The TMAP sensor is a dual-purpose sensor, mounted in the top of the intake manifold. One portion is used to measure temperature and the other portion is used to measure the air pressure inside the intake manifold. The temperature part of the TMAP contains a thermistor element, used to measure the temperature of the air entering the intake manifold. The MAP portion of this sensor is used to measure the difference between atmospheric pressure and vacuum pressure, within the intake manifold. The ECM processes information from the TMAP (and other sensors) to adjust ignition timing and fuel to achieve optimum engine performance.

The ET sensor contains a thermistor element that varies the sensor's internal electrical resistance. As the engine temperature changes the resistance in the ET sensor changes. The ECM monitors this resistance to compensate for various operating conditions.

The TGS, mounted on the right hand side of the handlebar, houses two internal (opposing) Hall-effect sensors for operator control of the engine's throttle. The opposing operation of the sensors ensures that repositioning of the throttle twist grip, forward and/or back, is accurately reported to the ECM. As the throttle is operated, position changes are reported to the ECM which controls the corresponding movement of the throttle plate by the TCA.

The TCA, mounted to the intake manifold, operates the throttle plate internal to the induction module on the engine. Two corresponding TP sensors receive input from the ECM, corresponding to the position of the TGS, to adjust the position of the throttle plates, accordingly. The ECM incorporates an H-Bridge and WatchDog microprocessor, used as safety devices, to control inadvertent or unexpected operations/conditions of the TCA and TGS.

The VSS is mounted in the transmission, beneath the starter motor. The VSS is a Hall-effect sensor, used to monitor and report vehicle speed based upon a reference point on the 5th gear of the transmission. A 5V reference signal and common ground circuitry are provided to the VSS, from the ECM. The VSS communicates electrical pulses to the ECM, where vehicle speed is calculated and sent to the speedometer as a serial data message.

The HO2S diagnostic codes may be seen during the vehicle break-in period. The sensor diagnostic codes will not illuminate the check engine lamp for current or historic codes and will only be indicated by DIGITAL TECHNICIAN II (Part No. HD-48650) or speedometer self-diagnostics. If the diagnostic codes are reported during the break-in period, clear or ignore the code(s) until the break-in period is complete.

There are two HO2S, one mounted in each of the two exhaust pipes, to monitor the exhaust gas air/fuel mixture ratio. Each HO2S samples the exhaust oxygen content and provides specific voltage to the ECM. The ECM continuously adjusts the air/fuel mixture to maintain an optimal air/fuel mixture. When properly mixed, the HO2S voltage(s) will measure approximately 0.45V, each when measuring across the sensor.

The active exhaust system (HDI only) uses an actuator valve located in the rear of the exhaust pipe that is connected via a cable. The valve position automatically adjusts to enhance engine performance.

The ignition coils, mounted rearward on the chassis beneath the fuel tank, provide high voltage output to the spark plugs. Each ignition coil is made up of a primary winding where low voltage input creates a high voltage spike in the collapsible field of the secondary winding. The front and rear coils are fired independently (one cylinder at a time). The ignition coil contains an extra terminal where the ECM monitors the current of the secondary winding for knock detection and combustion diagnostics.

The fuel pump, mounted inside the fuel tank on the vehicle, is a submersible pump used to provide fuel to the fuel injectors. The fuel pump is protected by an in-line 15 amp replaceable fuse.

- When the ignition switch is in the IGNITION position and the engine stop switch is in the RUN position, the ECM grounds the system relay supplying voltage to the fuel pump.
- The fuel pump continues running during cranking and normal running operation, as long as the ECM is receiving input from the CKP sensor. If no CKP pulses are received, the ECM shuts off the system relay within 2 seconds after the ignition is turned on, the engine has stalled or immediately after the engine is shut off.
- The fuel pump contains a pressure regulator which maintains consistent fuel pressure to each of the fuel injectors. Excess fuel flow is bypassed into the fuel tank by the pressure regulator.

There are two fuel injectors mounted to the intake manifold. The ECM controls the injectors by actuating the injector solenoid enabling fuel to be metered through the injector and atomized into the intake manifold.

- The injectors are timed to the combustion cycle and are triggered sequentially. When the ECM determines that fuel is required, the ECM supplies a short duration ground to the fuel injector, which opens and releases fuel into the air intake manifold.
- The ECM grounds the system relay, which supplies voltage to the fuel injectors. Each injector is protected and grounded by the ECM, through a common point ground within the ECM.

The purge solenoid (working with the charcoal canister) allows the vapors to escape back into the throttle body. The purge solenoid is timed to the throttle position but is disabled at startup, low engine temperature, low engine speed or low

vehicle speed. The power for the purge solenoid comes from the system relay. The ECM provides the path to ground to trigger the purge solenoid.

Heat Management System

To improve rider comfort on all stock Touring model motorcycles, an optional heat management system may be enabled. After being enabled, the heat management system improves rider comfort by turning off the rear cylinder fuel injector when all of the following conditions exist:

- High engine temperature
- Engine at idle speed
- Low or no vehicle speed
- Clutch lever pulled in or transmission in neutral

As the engine maintains idle speed, the rear cylinder functions as an "air pump," helping to cool the engine. This continues until one of the above listed conditions is no longer met, then the rear cylinder fires normally again.

NOTE

When the engine is in heat management mode, a noticeable difference in idle may be accompanied by a unique exhaust odor. While these conditions are normal, a rider or technician unaware of the heat management system may incorrectly assume an idle problem is present.

Enable/Disable EITMS

1. Turn the ignition ON with the motorcycle at idle and not moving (the motorcycle may be running or not running).
2. Push the throttle to roll-off position and hold.
3. After approximately 3 seconds, the cruise indicator will flash either red (disabled) or green (enabled).
4. Repeat step two to change.

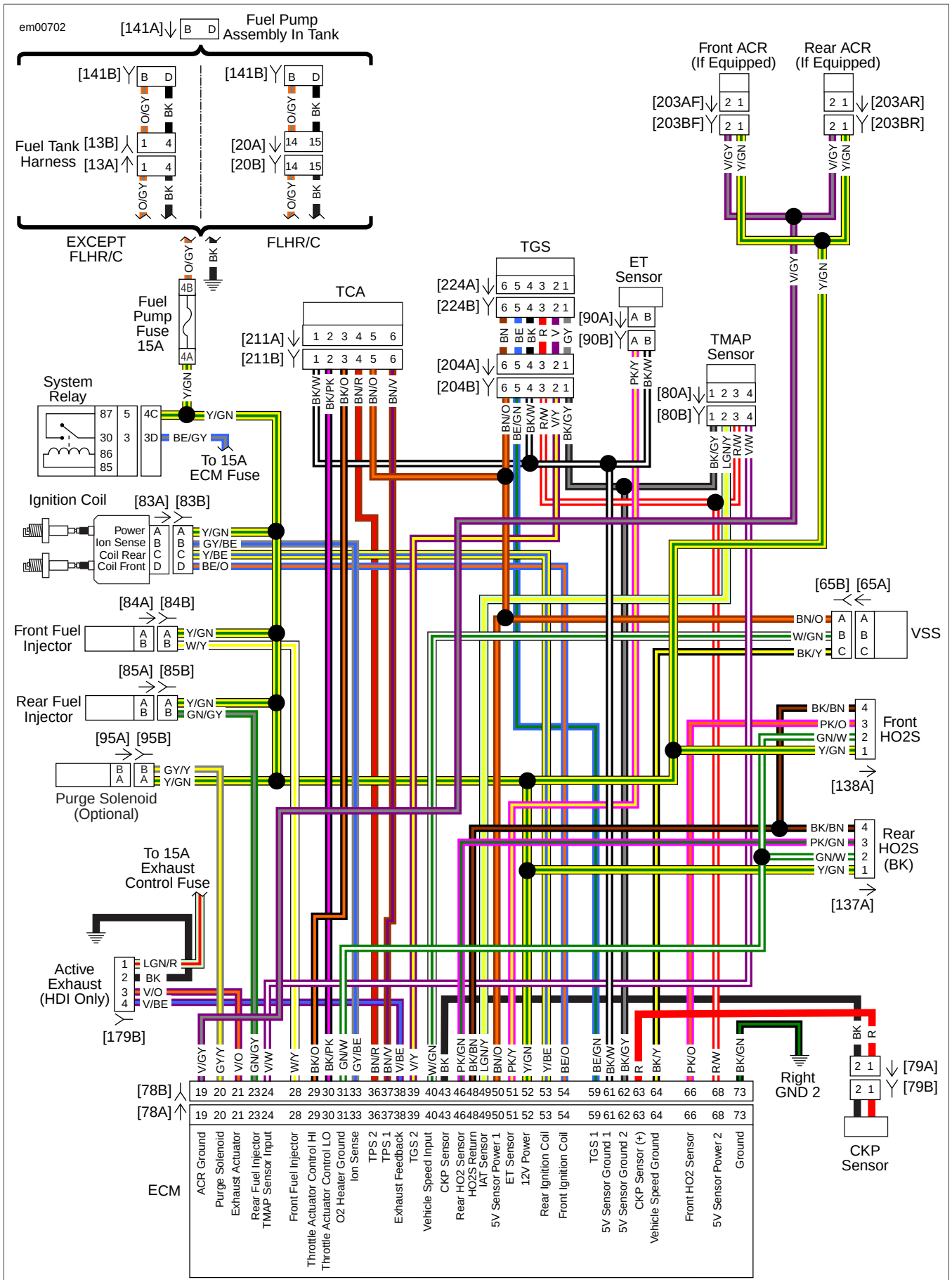


Figure 6-1. EFI Simplified Schematic

ELECTRONIC CONTROL MODULE

6.2

GENERAL

See [Figure 6-2](#). The ECM receives and processes signals from the sensors and applies output signals to the drivers to start,

idle and run the engine. This section describes the configuration of the ECM for this vehicle.

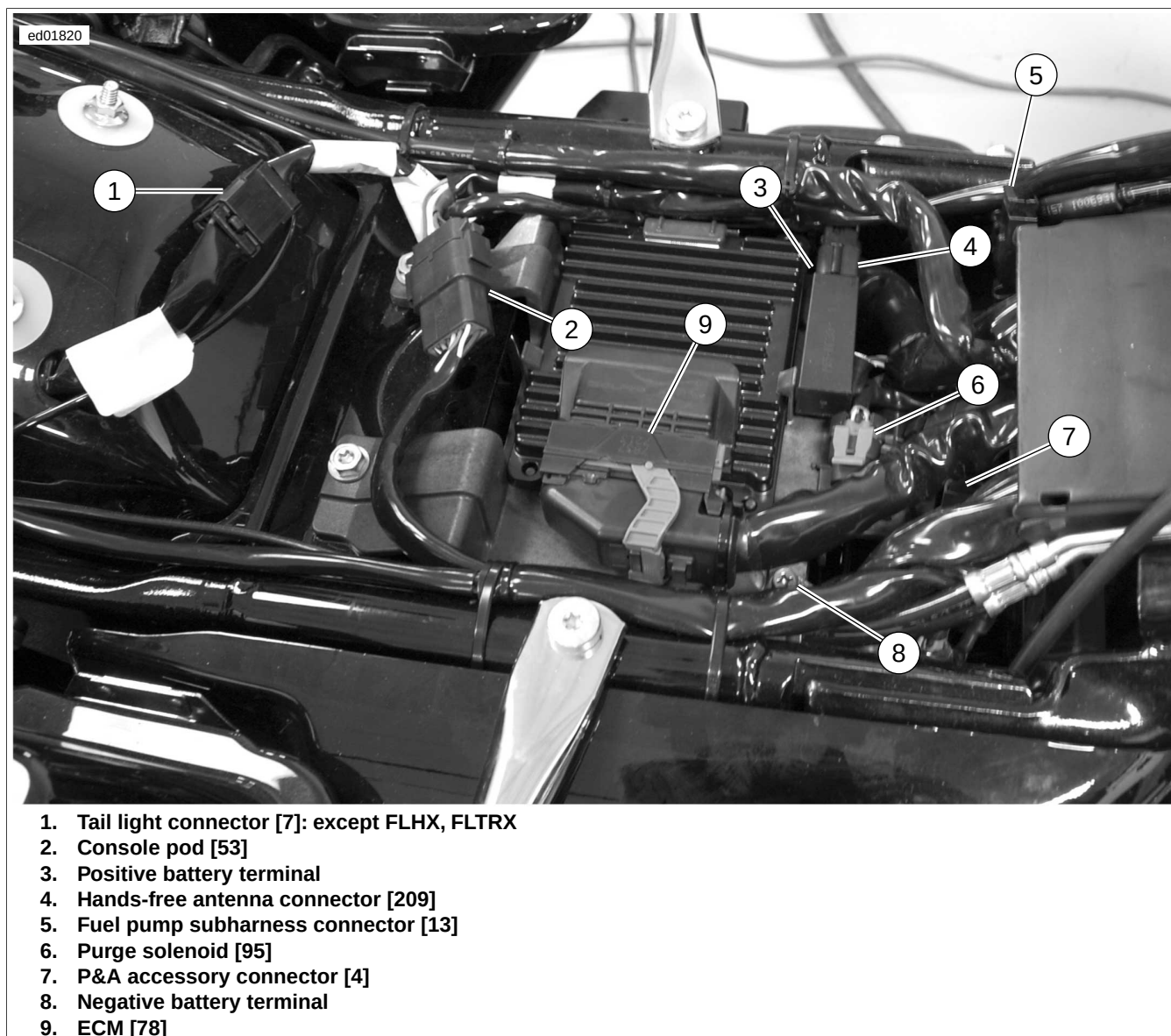


Figure 6-2. Electrical Connectors Under Seat

ECM

The ECM is mounted under the seat. It computes the spark advance for proper ignition timing and fuel control based on sensor inputs (from ET, CKP, TMAP, TGS, HO2S and VSS sensors) and controls the low-voltage circuits for the ignition coils and injectors.

The ECM contains all of the components used in the ignition system. The dwell time for the ignition coil is also calculated in the microprocessor and is dependent upon battery voltage. The programmed dwell is an added feature to give adequate spark at all speeds. (The ECM has added protection against

transient voltages, continuous reverse voltage protection and damage due to jump starts.) The ECM is fully enclosed to protect it from vibration, dust, water or oil. This unit is a non-repairable item. If it fails, it must be replaced. When the ECM is replaced, see the service manual.

32-2 Flywheel

The left flywheel has 32 teeth evenly spaced around its circumference with two consecutive teeth missing (sync gap). In this configuration, the ECM determines engine position, engine phase and engine speed from the CKP sensor input. Phase (TDC compression) is determined by the ECM during startup

and, when necessary, while running. No engine ignition events can occur until the ECM determines the relationship of piston position to crankshaft position. The following paragraphs in this section describe synchronization and phasing by the ECM to provide smooth operation of the engine at all speeds.

Crank Position Signal Synchronization

In the 32-2 crank configuration, crankshaft position is determined by the ECM finding the two-tooth (sync gap) in the CKP sensor signal. This is usually accomplished the first time the sync gap is encountered. The ECM monitors the CKP signal status every engine revolution. If the ECM determines synchronization is lost, it immediately terminates ignition events and synchronizes on the next occurrence of the sync gap.

Engine Phase

Phasing is accomplished by the ECM identifying a widening in the CKP signal caused by the deceleration of the crankshaft, as a piston approaches TDC on its compression stroke. Since the rear cylinder approaches TDC earlier than the front cylinder, engine phase can be readily discriminated. Phasing is normally accomplished on the first TDC cycle after engine synchroniza-

tion. Once phased, the ECM can begin normal ignition events. If the ECM experiences a system reset or loss of synchronization while the engine is running it also loses phase.

When phase is lost one of the following occurs:

- If an engine-not-running (Crank Mode) rpm is detected, the ECM executes the normal start-up phasing process.
- If Engine Run Mode is detected, the ECM executes a running re-phase sequence.

The front cylinder is fired every engine revolution. The ECM monitors the power stroke after the fire event to determine if sufficient acceleration occurred to indicate the ECM fired on the compression stroke. When two valid power strokes are detected, the ECM locks phase and resumes normal ignition events.

Engine Run Mode

Many functions of the EFI system require an engine run mode determination. Engine run is determined by the level of engine rpm. Generally, the engine is considered to be running when engine rpm exceeds a minimum of 750 rpm.



SENSORS AND DRIVERS

6.3

DESCRIPTION AND OPERATION

Sensors and drivers play an important part in the ECM's ability to provide the proper operational parameters for engine efficiency, emissions control and fuel economy. When a failure occurs, a DTC is generated by, and stored in, the ECM. These codes help the technician diagnose engine trouble to the proper sensor or driver. See [2.1 INITIAL DIAGNOSTICS](#).

SENSORS

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Not all sensor problems cause an engine shutdown, but sensor failure can seriously degrade overall engine performance. A notable exception is the CKP sensor, which if faulty, completely disables engine operation. The following are brief explanations of sensor types and their functions within the EFI system.

Crank Position (CKP) Sensor

The CKP sensor, located on the left front of the lower crankcase half, is a variable reluctance sensor that generates AC voltage as the teeth on the flywheel pass by the sensor. The signal is routed to the ECM where it is used to determine crankshaft position, engine speed (rpm) and engine phase (TDC compression). Without the presence of the CKP signal, the ECM will not allow the ignition and fuel injection drivers to operate, and thus the engine will not run. The ECM uses crankshaft compression slow down events to determine engine phase. Therefore, the spark plugs must be installed when checking for spark.

Twist Grip Sensor (TGS)

The TGS, mounted on the right hand side of the handlebar, houses two internal (opposing) Hall-effect sensors for operator control of the engine's throttle. The opposing operation of the sensors ensures that repositioning of the throttle twist grip, forward and/or back, is accurately reported to the ECM. As the throttle is operated, position changes are reported to the ECM that controls the corresponding movement of the throttle plate by the TCA.

Twist Control Actuator (TCA)

The TCA, mounted to the intake manifold, operates the throttle plate internal to the induction module on the engine. Two corresponding TP sensors provide input to the ECM, so the ECM may verify that plate position corresponds to TGS input (rider desired position of the plate) and to adjust the position of the throttle plate, accordingly.

Jiffy Stand Sensor (JSS): HDI

The JSS uses a Hall-effect device to monitor jiffy stand position. When the jiffy stand is fully retracted, the sensor picks up the presence of a metal tab mounted to the jiffy stand. When extended, the engine only starts and runs if the ECM receives a signal from the neutral switch indicating the transmission is in neutral, or a signal from the clutch switch indicating the clutch is engaged. Otherwise, the engine stalls as the clutch is released with the transmission in gear.

Bank Angle Sensor (BAS)

The BAS is within the TSM/TSSM/HFSM. The TSM/TSSM/HFSM will shut the engine down if the vehicle is tipped over. Once the sensor is tripped, the motorcycle must be righted, the ignition turned off and then on again before the engine can be restarted. This is communicated across the serial data circuit.

Clutch Switch

The TSM/TSSM/HFSM provides voltage to the clutch switch, which is open when the clutch is disengaged (released). With the clutch engaged (pulled in), the switch closes, allowing current flow to ground. The ECM will not allow the engine to start unless the transmission is in neutral or the clutch is engaged.

Neutral Switch

The instrument fuse provides voltage to the neutral switch, which is open when the transmission is in gear. With the transmission in neutral, the switch is closed, allowing current flow to ground. The TSM/TSSM/HFSM will not allow the engine to start unless the transmission is in neutral or the clutch is engaged.

Engine Temperature (ET) Sensor

The ET sensor is a thermistor device, which means that at a specific temperature it has a specific resistance across its terminals. As this resistance varies, so does the voltage.

- At high temperatures, the resistance of the sensor is very low, which effectively lowers the signal voltage on ECM [78] terminal 51.
- At low temperatures, the resistance is very high, allowing the voltage to rise close to 5V. The ECM monitors this voltage to compensate for various operating conditions.

Temperature Manifold Absolute Pressure (TMAP) Sensor

The TMAP sensor combines the MAP and IAT in a single component. Each functions as described in the paragraphs following, and are tested as separate units.

Manifold Absolute Pressure (MAP) Sensor

The MAP sensor is supplied 5V from the ECM and sends a signal back to ECM. This signal varies in accordance with engine vacuum, intake air temperature and atmospheric barometric pressure. The MAP sensor monitors the intake manifold pressure (vacuum) and sends the information to the ECM. The ECM then adjusts the spark and fuel timing advance curves for optimum performance. The output of the sensor can also be used to determine if the engine is rotating when a fault with the CKP sensor is present.

Intake Air Temperature (IAT) Sensor

The IAT sensor is a thermistor device. As such, it will have a specific resistance across its terminals at a specific temper-

ature. As the temperature varies, the thermistor resistance varies, and so does the voltage on ECM [78] terminal 49.

- At high temperatures, the resistance of the sensor is very low, which effectively lowers the signal voltage on ECM [78] terminal 49.
- At low temperatures, the resistance is very high, allowing the voltage to rise close to 5V. The ECM monitors this voltage to compensate for various operating conditions.

Vehicle Speed Sensor (VSS)

The VSS is a Hall-effect device mounted close to the teeth of the 5th gear in the transmission. The output signal frequency varies with vehicle speed. The ECM processes the vehicle speed signal and transmits it via the serial data circuit to the speedometer to indicate vehicle speed.

HO2S: Front and Rear

The HO2S sensor detects unburned oxygen in the engine exhaust. The output of the sensor is a voltage having a range of about 0-1.0V. The normal output is 0.5V which represents a balance between a lean (not enough fuel) and rich (too much fuel) air/fuel mixture. An output less than 0.5V represents a lean mixture; greater than 0.5V represents a rich mixture. The change in output level signals the ECM to modify the air/fuel ratio. This voltage is what is seen across the sensor. If the voltage is measured from the sensor to ground or is displayed on DIGITAL TECHNICIAN II (Part No. HD-48650) it will range from 0.7-1.7V. This will cause the midpoint between rich and lean to be 1.2V.

It is important to note the HO2S do not operate efficiently until it is at operating temperature. Therefore, before any troubleshooting takes place, bring the sensor to operating temperature. Leaks in the exhaust system, leaky exhaust valves, misfires or any engine problem allowing unburned oxygen into the exhaust stream could create a DTC indicating a bad sensor. Look for problems related to an improper air/fuel mixture before replacing the sensor.

DRIVERS

The ECM drivers are the output devices or system outputs of the EFI system. Drivers are provided ground by the ECM to pump, inject and ignite the air/fuel mixture in the engine, and to activate relays.

Fuel Pump

The fuel pump, located inside the fuel tank, is provided battery voltage when the system relay is activated.

Ignition Coil and Spark Plugs

The ignition coil creates the energy to fire the spark plugs and ignite the air/fuel mixture in the cylinders. Advancing or retarding the spark is controlled by the ECM to suit load and speed conditions of the engine.

See [Figure 1-14](#). The ignition coil is provided power by the system relay.

Fuel Injectors

The system relay provides battery power to the fuel injectors. The ECM provides the path to ground to trigger the injectors. The fuel injectors are pulse-width modulated solenoids for metering fuel into the intake tract. The pulse-width of the ground path to the injectors is varied by the ECM in response to inputs from the various sensors, thus varying the length of time the injector is open.

Start Relay

Pressing the start switch activates the start relay, sending battery voltage to the starter solenoid. The TSM/TSSM/HFSM controls the ground to the start relay, disabling it during security and tip over conditions.

Purge Solenoid (If Equipped)

The purge solenoid allows vapors from the charcoal canister to flow to the throttle body. The timing and amount of solenoid opening depends on engine speed, vehicle speed, engine temperature and throttle position.

Table 6-1. Engine Starts Hard

CAUSE	SOLUTION
Engine temperature circuit	Repair the circuit. If DTC P0117 or P0118 is present, diagnose and correct DTCs.
Fuel or Ignition system fault	Perform misfire diagnostics.
Battery discharged	Charge and test the battery. Perform charging system diagnosis if problem continues.
Crank position sensor circuit	Repair the circuit. If DTC P0373 or P0374 is present, diagnose and correct DTC.
Manifold leak	Perform intake leak test. See the service manual.
Ignition coil circuit/spark plugs	Repair the circuit. If DTC P1351, P1352, P1354 or P1355 is present, diagnose and correct DTCs.
Leaky injectors	Check for mechanical failures of the fuel injectors. If DTC P0261, P0262, P0263 or P0264 is present, diagnose and correct them.
Clogged fuel injectors	Clean or replace fuel injectors. See the service manual.
Valve sticking	Perform compression test. See the service manual.

Table 6-2. Engine Performance Problems

CAUSE	SOLUTION
Engine temperature circuit	Repair the circuit. If DTC P0117 or P0118 are present, diagnose and correct DTCs.
Crank position sensor circuit	Repair the circuit. If DTC P0373 and P0374 are present, diagnose and correct DTC.
Fuel or Ignition system fault	Perform misfire diagnostics.
EVAP hose disconnected from induction module (if equipped)	Connect.
Fuel system contaminated	Drain and refill with fresh fuel.

Table 6-3. Engine Emits Black Exhaust or Fouls Plugs

CAUSE	SOLUTION
Engine temperature circuit	Repair the circuit. If DTC P0117 or P0118 are present, diagnose and correct DTCs.
Clogged air filter	Replace air filter.
Leaky injectors	Repair the circuit. If DTC P0261, P0262, P0263 or P0264 are present, diagnose and correct DTCs.



DTC P0107, P0108, P0112, P0113

6.4

DESCRIPTION AND OPERATION

See [Figure 6-3](#). The TMAP sensor provides the functions of both an IAT sensor and a MAP sensor in one unit. The TMAP sensor is supplied 5V from ECM terminal 68 and sends MAP and IAT signals back to ECM terminals 24 and 49 respectively. Refer to [Table 6-4](#).

Table 6-4. Code Description

DTC	DESCRIPTION
P0107	MAP sensor open/low
P0108	MAP sensor high
P0112	IAT sensor voltage low
P0113	IAT sensor open/high

TMAP: MAP Signal

The MAP signal varies in accordance with engine vacuum and atmospheric pressure. Changes in atmospheric pressure are influenced by weather and altitude.

TMAP: IAT Signal

The IAT portion of the TMAP 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 voltage on terminal 49 of the ECM.

- At high temperatures, the resistance of the IAT sensor is very low, which effectively lowers the signal voltage on terminal 49.
- At low temperatures, the resistance is very high, allowing the voltage to rise close to 5V. The ECM monitors this voltage to compensate for various operating conditions.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-23738	VACUUM PUMP

Diagnostic Tips: MAP Portion of TMAP Sensor

- DTCs P0107 or P0108 will set if the MAP sensor signal is out of range. DTC P0108 can only be detected with the engine running.
- MAP sensor output check. Using the VACUUM PUMP (Part No. HD-23738), apply a vacuum to the pressure port of the TMAP sensor. The MAP signal voltage should lower as the vacuum is applied.
- The TMAP and TGS are connected to the same reference line (+5V Vref). If the reference line goes to ground or open, multiple codes will be set (DTCs P0107, P0108, P0122, P0123, P1501 and P1502).

Diagnostic Tips: IAT Portion of TMAP Sensor

Check the following conditions:

- Poor connection:** Inspect ECM and harness connector [78] for backed out terminals, improper mating, inoperative locks, improperly formed or damaged terminals, poor terminal- to-wire connection and damaged harness.
- Perform [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#) to locate intermittents:** If connections and harness check out OK, use a multimeter to check the IAT sensor voltage reading while moving related connectors and wiring harnesses. If the failure is induced, then the IAT sensor voltage reading will change.
- Shifted sensor resistance value:** Compare the temperatures of the ET and IAT sensors with the engine at ambient temperature in order to evaluate the possibility of a shifted (out of calibration) sensor which may result in driveability problems. The sensor temperatures should be within 10 degrees of each other.
- An intermittent may be caused by poor connection, rubbed through wire insulation or an inoperative wire within the wire's insulation.
- A faulty sensor can negatively affect the signal voltage of the other sensors sharing the same 5V reference. If the wiring passes the following tests, disconnect one sensor at a time on the 5V reference and verify the DTC is still present. Additional DTCs will be set as each sensor is disconnected, clear DTCs after this test. Be sure to perform this test before replacing a component.

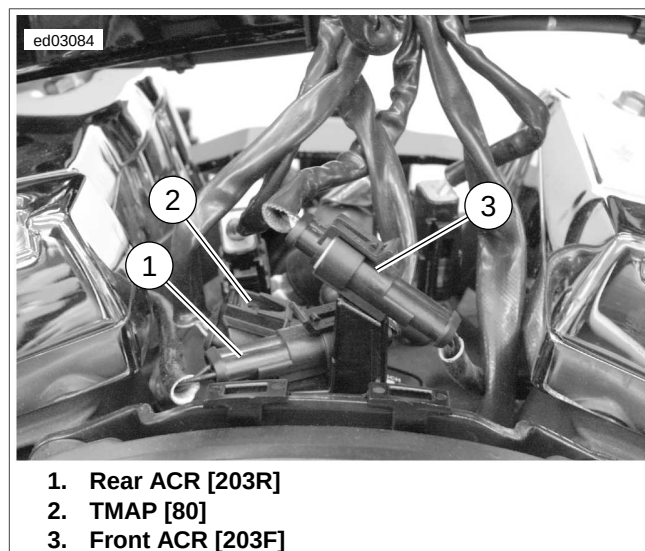


Figure 6-3. Between Cylinders Right Side

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

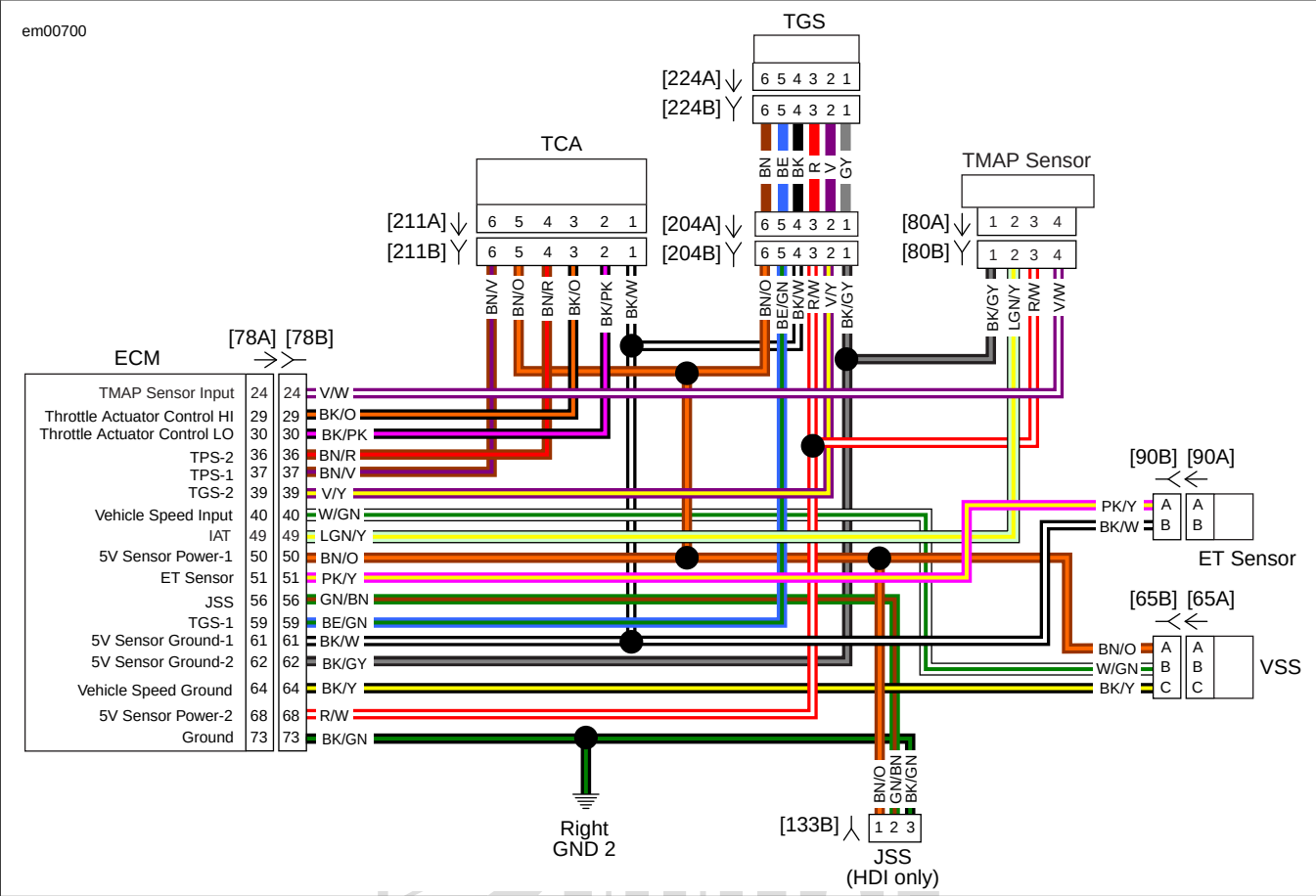


Figure 6-4. Throttle Control Actuator Circuit

DTC P0107

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-5. DTC P0107 Diagnostic Faults

POSSIBLE CAUSES
TMAP sensor malfunction
ECM malfunction
Open or shorted to ground signal wire
Open or shorted to ground 5V reference circuit

1. MAP Sensor Test

1. Disconnect the TMAP sensor [80].
2. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), connect a test wire between [80B] terminals 3 and 4.
3. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
4. Turn IGN OFF and ON.

5. Does the DTC P0107 reset?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the TMAP sensor. See the service manual.

2. MAP Sensor Signal Voltage Test

1. Remove the test wire.
2. With IGN ON, test for voltage from [80B] terminal 3 to ground.
3. Is voltage approximately 5V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 6.](#)

3. MAP Sensor Signal Wire Continuity Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between [80B] terminal 4 and breakout box terminal 24.
3. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (V/W) wire.

4. MAP Sensor Signal Wire Shorted to Ground Test

1. Test for continuity between breakout box terminal 24 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (V/W) wire.
 - b. **No.** [Go to Test 5.](#)

5. MAP Sensor Signal Wire Shorted to Sensor Ground Test

1. Turn IGN OFF.
2. Test for continuity between breakout box terminals 24 and 62.
3. Is continuity present?
 - a. **Yes.** Repair short between (V/W) and (BK/GY) wires.
 - b. **No.** See diagnostic tips before replacement. Replace the ECM. See the service manual.

6. MAP Sensor 5V Reference Wire Open Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between [80B] terminal 3 and breakout box terminal 68.
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (R/W) wire.

7. MAP Sensor 5V Reference Shorted to Signal Ground Test

1. Test for continuity between breakout box terminals 68 and 62.
2. Is continuity present?
 - a. **Yes.** Repair short between the (R/W) and (BK/GY) wires.
 - b. **No.** See diagnostic tips before replacement. Replace the ECM. See the service manual.

DTC P0108

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-6. DTC P0108 Diagnostic Faults

POSSIBLE CAUSES
MAP sensor malfunction
ECM malfunction
Short to voltage

1. MAP Sensor Test

1. Disconnect the TMAP sensor [80].

2. Clear DTCs using odometer self-diagnostics. [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
3. Start engine.
4. Does the DTC P0108 reset?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. MAP Sensor Signal Wire Short to 5V Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminals 24 and 68.
3. Is continuity present?
 - a. **Yes.** Repair short between (R/W) and (V/W) wires.
 - b. **No.** [Go to Test 3.](#)

3. MAP Sensor Signal Wire Short to Voltage Test

1. With IGN ON, test for voltage on breakout box terminal 24.
2. Is voltage present?
 - a. **Yes.** Repair short to voltage in (V/W) wire.
 - b. **No.** [Go to Test 4.](#)

4. MAP Sensor 5V Reference Shorted to Battery Voltage Test

1. With IGN ON, test for voltage between breakout box terminal 68 and ground.
2. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage in (R/W) wire.
 - b. **No.** [Go to Test 5.](#)

5. MAP Sensor Ground Wire Open Test

1. Test for continuity between [80B] terminal 1 and breakout box terminal 62.
2. Is continuity present?
 - a. **Yes.** Replace the TMAP sensor. See the service manual.
 - b. **No.** Repair open in (BK/GY) wire.

DTC P0112

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-7. DTC P0112 Diagnostic Faults

POSSIBLE CAUSES
IAT sensor malfunction
ECM malfunction
Short to ground in 5V reference circuit

1. IAT Sensor Test

1. Disconnect TMAP sensor [80].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between terminals 1 and 2 of [80A].
3. Is the resistance reading between 500-5000 Ohms with the vehicle and sensor at ambient room temperature?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace TMAP sensor. See the service manual.

2. IAT Sensor Signal Wire Shorted to Ground Test

1. Measure resistance between [80B] terminal 2 (LGN/Y) and ground.
2. Is resistance reading less than 1 Ohm?
 - a. **Yes.** Repair short to ground on (LGN/Y) wire.
 - b. **No.** [Go to Test 3.](#)

3. IAT Sensor Signal Voltage High Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Test continuity between breakout box terminals 49 and 73.
3. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair short to ground on (LGN/Y) wire.

4. IAT Sensor Signal Wire Shorted to Sensor Ground Test

1. Test continuity between breakout box terminals 49 and 62.
2. Is continuity present?
 - a. **Yes.** Repair short between terminals 1 and 2 of [80B] (LGN/Y and BK/GY) wires.
 - b. **No.** Replace ECM. See the service manual.

DTC P0113

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-8. DTC P0113 Diagnostic Faults

POSSIBLE CAUSES
IAT sensor malfunction
ECM malfunction
Open or short to voltage in 5V reference circuit

1. IAT Sensor Test

1. Disconnect TMAP sensor [80].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between [80B] terminal 2 (LGN/Y) and ground.
3. Is the voltage reading greater than 6V?
 - a. **Yes.** Repair short to voltage on (LGN/Y) wire.
 - b. **No.** Voltage is less than 4V. [Go to Test 2.](#)

2. IAT Sensor Signal Wire Open Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) to wiring harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
3. Test for continuity between [80B] terminal 2 (LGN/Y) and breakout box terminal 49.
4. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open circuit in (LGN/Y) wire.

3. IAT Sensor Open Ground Wire Test

1. Test for continuity between breakout box terminal 62 and [80B] terminal 1 (BK/GY).
2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (BK/GY) wire.

4. IAT Sensor Signal Wire Shorted to Sensor Power Test

1. Test for continuity between breakout box terminals 49 and 68.
2. Is continuity present?
 - a. **Yes.** Repair short between (LGN/Y) and (R/W) wires. Verify IAT sensor resistance value and if incorrect replace TMAP sensor. See the service manual.
 - b. **No.** Replace ECM. See the service manual.

DTC P0117, P0118

6.5

DESCRIPTION AND OPERATION

The ECM supplies and monitors a voltage signal terminal 51 to one side of the ET sensor. The other side of the ET sensor is connected to a common sensor ground, which is also connected to the ECM terminal 61.

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 on terminal 51.

- At high temperatures, the resistance of the sensor is very low, which effectively lowers the signal voltage on terminal 51.
- At low temperatures, the resistance is very high, allowing the voltage to rise close to 5V.

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

Table 6-9. Code Description

DTC	DESCRIPTION
P0117	ET sensor voltage low
P0118	ET sensor open/high

Diagnostic Tips

Once the engine is started, the temperature should rise steadily.

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

Check the following conditions:

- **Poor connection:** Inspect ECM harness connector [78] for backed out terminals, improper mating, inoperative locks, improperly formed or damaged terminals, poor terminal-to-wire connection, loose sensor and damaged harness.
- **Perform [1.3 DIAGNOSTICS AND TROUBLESHOOTING](#), [Wiggle Test](#) to locate intermittents:** If connections and

harness check out OK, use a multimeter to check the engine temperature reading while moving related connectors and wiring harness. If the failure is induced, the engine temperature display will change.

- **Shifted sensor resistance value:** Compare the temperatures of the ET and IAT sensors with the engine at ambient temperature in order to evaluate the possibility of a shifted (out of calibration) sensor which may result in driveability problems. The sensor temperatures should be within 10 °F (10 °C) of each other.

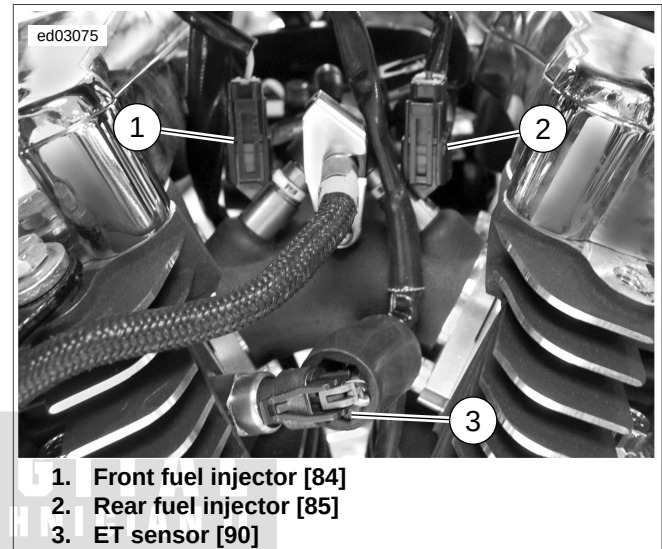


Figure 6-5. Between Cylinders Left Side

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

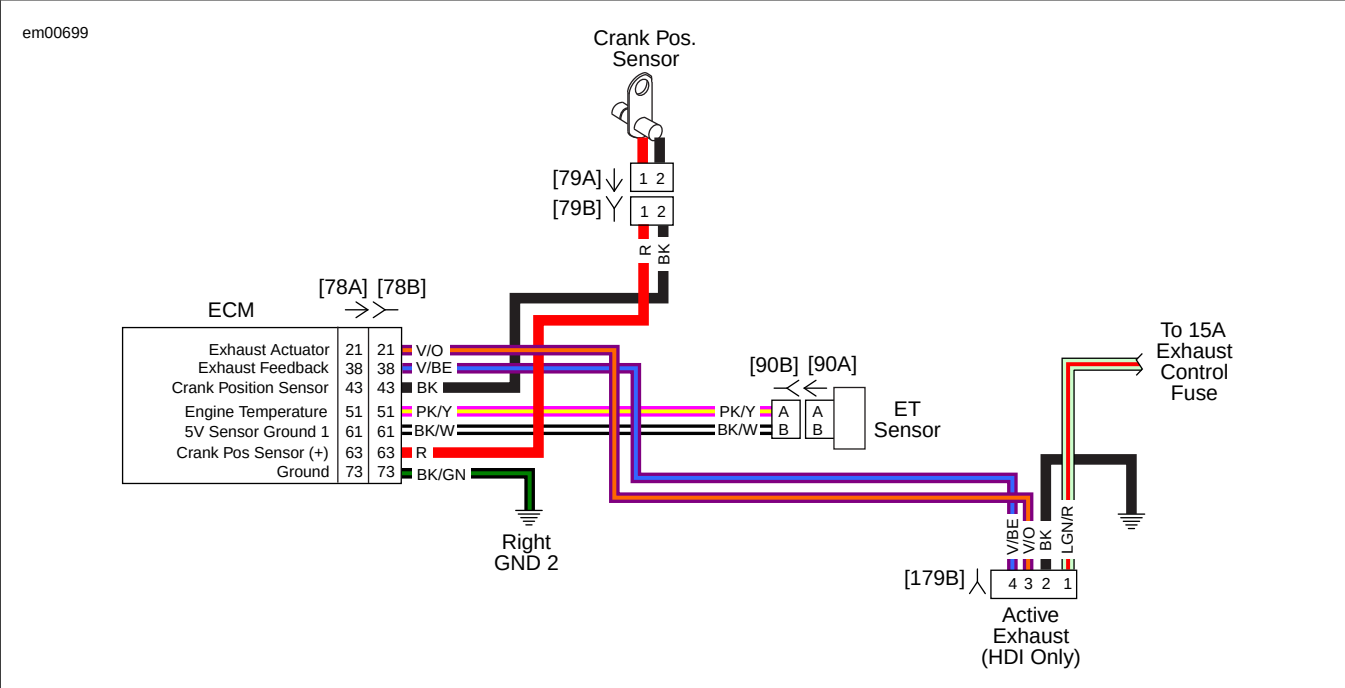


Figure 6-6. ET Sensor, CKP Sensor and Active Exhaust Circuit

DTC P0117

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-10. DTC P0117 Diagnostic Faults

POSSIBLE CAUSES
ET sensor malfunction
ECM malfunction
Short to ground in 5V reference circuit

1. ET Sensor Test

1. Disconnect ET sensor [90].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure the resistance between [90A] terminals A and B.
3. Is the resistance reading between 900-10,000 Ohms with the vehicle and sensor at ambient room temperature?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace ET sensor. See the service manual.

2. ET Sensor Signal Wire Shorted to Ground Test

1. Measure resistance between ET sensor [90B] terminal A (PK/Y) and ground.

2. Is resistance reading less than 1 Ohm?
 - a. **Yes.** Repair short to ground in (PK/Y) wire.
 - b. **No.** [Go to Test 3.](#)

3. ET Sensor Signal Wire Shorted to Sensor Ground Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Test continuity between to breakout box terminals 51 and 61.
3. Is continuity present?
 - a. **Yes.** Repair short between terminal A (PK/Y) and B (BK/W) of [90B] wires.
 - b. **No.** Replace ECM. See the service manual.

DTC P0118

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-11. DTC P0118 Diagnostic Faults

POSSIBLE CAUSES
ET sensor malfunction
ECM malfunction
Open or short to voltage

1. ET Sensor Test

1. Disconnect ET sensor [90].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure the voltage between ET sensor [90B] terminal A (PK/Y) and ground.
3. Is the voltage reading greater than 6V?
 - a. **Yes.** Repair short to voltage on (PK/Y) wire.
 - b. **No.** Voltage is less than 4V. [Go to Test 2.](#)

2. ET Sensor Signal Wire Open Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) to wiring harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between ET sensor [90B] terminal A (PK/Y) and breakout box terminal 51.
4. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open circuit in the (PK/Y) wire.

3. ET Sensor Open Ground Wire Test

1. Test for continuity between ET sensor [90B] terminal B (BK/W) and breakout box terminal 61.
2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (BK/W) wire.

4. ET Sensor Signal Wire Shorted to Power Test

1. Test for continuity voltage between breakout box terminals 51 and 73.
2. Is voltage present?
 - a. **Yes.** Repair short to voltage in the (PK/Y) wire. Verify ET sensor resistance value and if incorrect replace ET sensor. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. ET Sensor Resistance Test

1. Measure the resistance of the ET sensor at ambient room temperature.
2. Is resistance reading between 900-10,000 Ohms?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Replace the ET sensor. See the service manual.



DTC P0120, P0122, P0123, P0220, P0222, P0223

6.6

DESCRIPTION AND OPERATION

See [Figure 6-7](#). A dual TPS is integrated into the TCA, mounted to the induction module.

Within the TCA, a set of potentiometers are designated as TPS (TPS1 and TPS2). The ECM drives the motor in the TCA to open and close the throttle plate based on the signals from the twist grip sensor. The TPS (TPS1 and TPS2) send signals back to the ECM based on throttle plate position to verify the throttle plate movement.

The ECM supplies a 5.0V signal from terminal 50 of [78] to TPS1 and TPS2. The signals from TPS1 and TPS2 are sent back to the ECM [78] terminals 37 and 36 and vary in voltage according to actual throttle plate position.

The two TP sensors work opposite each other. When one sensor reads high, the other reads low. The sum of TPS1 and TPS2 signals should measure around 5.0V.

See [Figure 6-1](#) for TCA (TPS1 and TPS2) circuitry diagram. Refer to [Table 6-12](#) for DTCs associated with TPS1 and TPS2 of the TCA.

Table 6-12. Code Description

DTC	DESCRIPTION
P0120	TPS1 range error
P0122	TPS1 low/open
P0123	TPS1 high
P0220	TPS2 range error
P0222	TPS2 low/open
P0223	TPS2 high

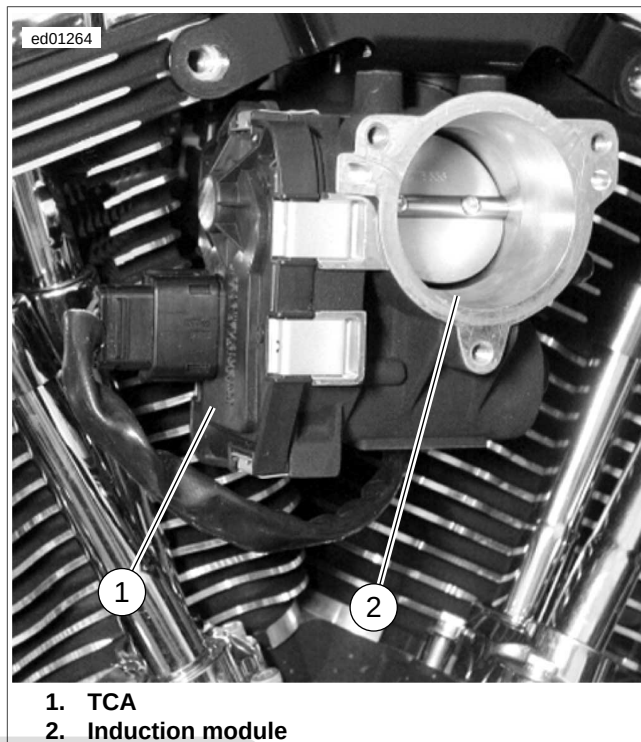


Figure 6-7. Throttle Control Actuator (TCA) Location

NOTE

The TMAP and TGS are both connected to the same reference line (+5V REF). If the line goes to ground or open, multiple trouble codes will be set (DTCs P0107, P0108 and P0122, P0123, P1501 or P1502). Start with the highest priority DTC. Refer to [Table 2-1](#).

Check for the following conditions:

- **Poor connection:** Inspect ECM harness connector [78B] for backed out terminals, improper mating, inoperative locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Perform [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#) to locate intermittents:** If connections and harness check out OK, monitor TPS voltage using a multimeter while moving related connectors and wiring harness. If the failure is induced, the TPS voltage will change.
- An intermittent may be caused by poor connection, rubbed through wire insulation or an inoperative wire within the wire insulation.
- A faulty sensor can negatively affect the signal voltage of the other sensors sharing the same 5V reference. If the wiring passes the following tests, disconnect one sensor at a time on the 5V reference and verify the DTC is still present. Additional DTCs will be set as each sensor is disconnected, clear DTCs after this test. Be sure to perform this test before replacing a component.

Connector Information

For additional information about the connectors in the following

diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

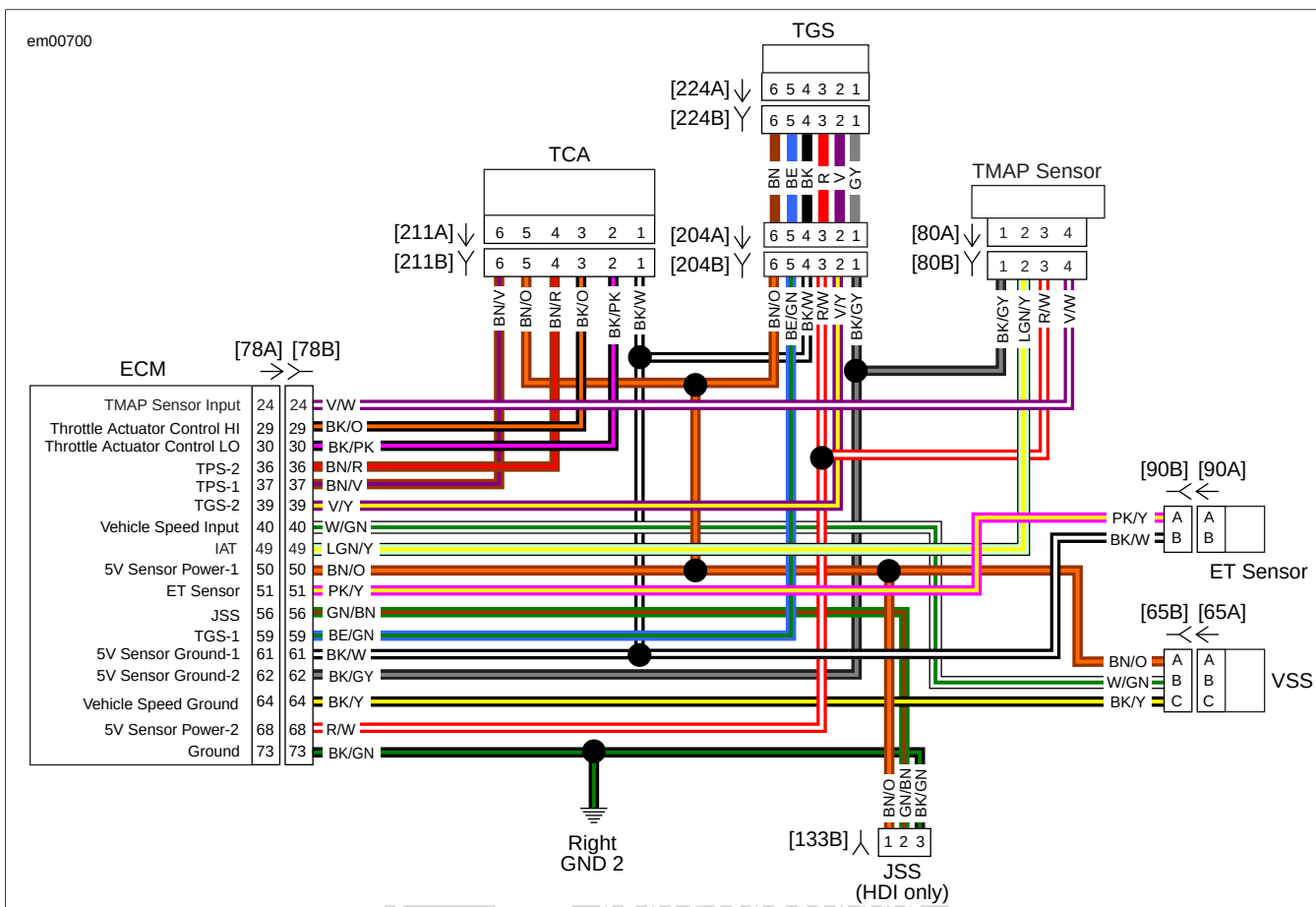


Figure 6-8. Throttle Control Actuator Circuit

DTC P0120

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-13. DTC P0120 Diagnostic Faults

POSSIBLE CAUSES
Open in sensor power circuit
Short to voltage in TPS-1 circuit
Open in TPS-1 circuit
Short to ground in TPS-1 circuit
Open n sensor ground circuit
ECM malfunction
TCA malfunction

1. Sensor Power-1 Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).

2. Disconnect TCA [211].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 50 and TCA [211] terminal 5.
4. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (BN/O) wire.

2. TPS-1 Circuit Shorted Test

1. Test continuity between breakout box terminal 50 and terminal 37.
2. Is continuity present?
 - a. **Yes.** Repair short between (BN/V) and (BN/O) wires.
 - b. **No.** [Go to Test 3.](#)

3. TPS-1 Circuit Continuity Test

1. Test continuity between breakout box terminal 37 and TCA [211B] terminal 6.

2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (BN/V) wire.

4. TPS-1 Circuit Short to Ground Test

1. Test continuity between breakout box terminal 37 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (BN/V) wire.
 - b. **No.** [Go to Test 5.](#)

5. TPS-1 Circuit Short to Voltage Test

1. Turn IGN ON.
2. Test for voltage between breakout box terminal 37 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on (BN/V) wire.
 - b. **No.** [Go to Test 6.](#)

6. Sensor Ground Continuity Test

1. Test continuity between breakout box terminal 61 and TCA [211B] terminal 1.
2. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (BK/W) wire.

7. TCA Test

1. Turn IGN OFF.
2. Connect ECM [78A] to breakout box.
3. Connect TCA [211].
4. Turn IGN ON.
5. Measure voltage between breakout box terminals 37 and 61.
6. Is voltage between 0.4-4.8V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Replace the TCA. See the service manual.

DTC P0122

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-14. DTC P0122 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in TPS-1 Circuit
TCA malfunction
Open in sensor power circuit
ECM malfunction

1. TCA Sensor-1 Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS.](#)
2. Turn IGN ON and engine stop switch to run.
3. Test for voltage at breakout box between terminal 37 and terminal 61.
4. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. TCA Sensor-1 Circuit Short to Ground Test

1. Turn IGN OFF.
2. Disconnect ECM [78A] from breakout box.
3. Disconnect TCA [211].
4. Test for continuity between breakout box terminal 37 and ground.
5. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/V) wire.
 - b. **No.** [Go to Test 3.](#)

3. TCA Power-1 Circuit Open Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 50 and TCA [211] terminal 5.
2. Is continuity present?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Repair open in (BN/O) wire.

4. TCA Sensor Test

1. Turn IGN OFF.
2. Disconnect TCA [211].
3. Test for voltage between breakout box terminal 50 and ground.
4. Is voltage greater than 4V?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. ECM Test

1. Disconnect ECM [78A] from breakout box.
2. Test for continuity at breakout box between terminals 37 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/V) wire.
 - b. **No.** Replace the ECM. See the service manual.

DTC P0123

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-15. DTC P0123 Diagnostic Faults

POSSIBLE CAUSES
Open in TPS-1 circuit
Short to voltage in TPS-1 circuit
Short to voltage in sensor power circuit
TCA malfunction
ECM malfunction
Open in sensor ground circuit

1. TPS-1 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminals 37 and 61.
4. Is voltage less than 4.8V?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** [Go to Test 2.](#)

2. TPS-1 Circuit Test

1. Disconnect TCA [211].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between TCA [211B] terminal 6 and ground.
3. Is voltage between 4-5.25V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No. Less than 4V.** Repair open in (BN/V) wire.
 - c. **No. Greater than 5.25V.** Repair short to voltage in (BN/V) wire.

3. Sensor Power Circuit Test

1. Measure voltage between TCA [211B] terminal 5 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair short to voltage in (BN/O) wire.

4. TCA Test

1. Jumper TCA [211B] terminals 6 and 1.
2. Measure voltage between breakout box terminals 37 and 61.

3. Is voltage greater than 1.0V?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace the TCA. See the service manual.

5. Sensor Ground Test

1. Turn IGN OFF.
2. Measure resistance between TCA [211B] terminal 1 and ground.
3. Is resistance less than 2 Ohms?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 7.](#)

6. Sensor Ground Circuit Shorted Test

1. Test for continuity between TCA [211B] terminals 5 and 6.
2. Is continuity present?
 - a. **Yes.** Repair short between (BN/V) and (BN/O) wires.
 - b. **No.** Replace the ECM. See the service manual.

7. Sensor Ground Circuit Test

1. Disconnect the ECM [78A].
2. Test for continuity between TCA [211B] terminal 1 and breakout box terminal 61.
3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (BK/W) wire.

8. TPS-1 Circuit Function Test

1. Disconnect TCA [211].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between [211B] terminal 6 and ground.
3. Is voltage between 2-5.25V?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No. Less than 2V.** Repair open in (BN/V) wire.
 - c. **No. Greater than 5.25V.** Repair short to voltage on (BN/V) wire.

9. Sensor Ground Continuity Test

1. Measure voltage between TCA [211B] terminal 5 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** Repair short to voltage on (BN/O) wire.

10. Ground Circuit Open Test

1. Turn IGN OFF.
2. Disconnect the ECM [78A].
3. Test for continuity between TCA [211B] terminal 1 and breakout box terminal 61.

4. Is continuity present?
 - a. **Yes.** [Go to Test 11.](#)
 - b. **No.** Repair open in (BK/W) wire.

11. TPS-1 Continuity Test

1. Test for continuity between TCA [211B] terminal 6 and breakout box terminal 37.
2. Is continuity present?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Repair open in (BN/V) wire.

DTC P0220

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-16. DTC P0220 Diagnostic Faults

POSSIBLE CAUSES
Open in sensor power circuit
Short to voltage in sensor power circuit
Open in TPS-2 circuit
Short to voltage in TPS-2 circuit
Short to ground in TPS-2 circuit
Open in sensor ground circuit
ECM malfunction
TCA malfunction

1. Sensor Power-2 Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect TCA [211].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 50 and TCA [211] terminal 5.
4. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (BN/O) wire.

2. Sensor Power-2 Short to Voltage Test

1. Test for voltage between breakout box terminal 50 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair short to voltage (BN/O) wire.
 - b. **No.** [Go to Test 3.](#)

3. TPS-2 Circuit Shorted Test

1. Test continuity between breakout box terminals 50 and 36.

2. Is continuity present?
 - a. **Yes.** Repair short between (BN/R) and (BN/O) wires.
 - b. **No.** [Go to Test 4.](#)

4. TPS-2 Circuit Continuity Test

1. Test continuity between breakout box terminals 36 and TCA [211B] terminal 4.
2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (BN/R) wire.

5. TPS-1 Circuit Short to Ground Test

1. Test continuity between breakout box terminal 36 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (BN/R) wire.
 - b. **No.** [Go to Test 6.](#)

6. TPS-1 Circuit Short to Voltage Test

1. Turn IGN ON.
2. Test for voltage between breakout box terminal 36 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to voltage on (BN/R) wire.
 - b. **No.** [Go to Test 7.](#)

7. Sensor Ground Continuity Test

1. Test continuity between breakout box terminal 61 and TCA [211B] terminal 1.
2. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in (BK/W) wire.

8. TCA Test

1. Connect ECM [78A] to breakout box.
2. Connect TCA [211].
3. Measure voltage between breakout box terminals 36 and 61.
4. Is voltage between 0.4-4.8V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Replace the TCA. See the service manual.

DTC P0222

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-17. DTC P0222 Diagnostic Faults

POSSIBLE CAUSES
Open in sensor power circuit
Short to ground in TPS-2 circuit
TCA malfunction
ECM malfunction

1. TCA Sensor-2 Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON and engine stop switch to run.
3. Test for voltage at breakout box between terminal 36 and terminal 61.
4. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. TCA Sensor-2 Circuit Short to Ground Test

1. Turn IGN OFF.
2. Disconnect ECM [78A] from breakout box.
3. Disconnect TCA [211].
4. Test for continuity between breakout box terminal 36 and ground.
5. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/R) wire.
 - b. **No.** [Go to Test 3.](#)

3. TCA Power-1 Circuit Open Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 50 and TCA [211] terminal 5.
2. Is continuity present?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Repair open in (BN/O) wire.

4. TCA 5V Ref Circuit Short to Ground Test

1. Turn IGN OFF.
2. Disconnect TCA [211].
3. Test for voltage between breakout box terminal 50 and ground.

4. Is voltage greater than 4V?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. ECM Test

1. Disconnect ECM [78A] from breakout box.
2. Test for continuity at breakout box between terminal 36 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/R) wire.
 - b. **No.** Replace the ECM. See the service manual.

DTC P0223

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-18. DTC P0223 Diagnostic Faults

POSSIBLE CAUSES
Open in sensor power circuit
Short to voltage in sensor power circuit
Open in TPS-2 circuit
Short to voltage in TPS-2 circuit
Short to ground in TPS-2 circuit
Open in sensor ground circuit
ECM malfunction
TCA malfunction

1. TPS-2 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Measure voltage between breakout box terminals 36 and 61.
4. Is voltage less than 4.8V?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** [Go to Test 2.](#)

2. TPS-2 Circuit Test

1. Disconnect TCA [211].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between TCA [211B] terminal 4 and ground.
3. Is voltage less than 0.2V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 5.](#)

3. Sensor Power Circuit Test

1. Measure voltage between TCA [211B] terminal 5 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair short to voltage in (BN/O) wire.

4. Sensor Ground Test

1. Turn IGN OFF.
2. Measure resistance between TCA [211B] terminal 1 and ground.
3. Is resistance less than 2 Ohms?
 - a. **Yes.** Replace TCA. See the service manual.
 - b. **No.** [Go to Test 6.](#)

5. Shorted 5V Circuit Test

1. Test for continuity between TCA [211B] terminals 4 and 5.
2. Is continuity present?
 - a. **Yes.** Repair short between (BN/R) and (BN/O) wires.
 - b. **No.** Repair short to voltage on (BN/R) wire.

6. Sensor Ground Circuit Test

1. Disconnect the ECM [78A].
2. Test for continuity between [211B] terminal 1 and breakout box terminal 61.

3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (BK/W) wire.

7. TPS-2 Circuit Test

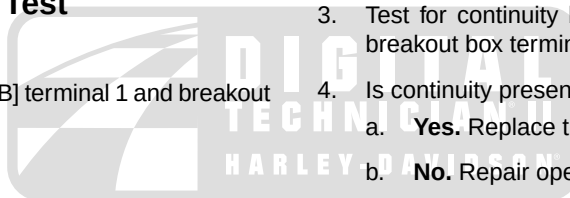
1. Disconnect TCA [211].
2. Measure voltage between TCA [211B] terminal 4 and ground.
3. Is voltage less than 1.0V?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair short to voltage on (BN/R) wire.

8. Sensor Ground Continuity Test

1. Measure voltage between TCA [211B] terminal 5 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No.** Repair short to voltage on (BN/O) wire.

9. Ground Circuit Open Test

1. Turn IGN OFF.
2. Disconnect the ECM [78A].
3. Test for continuity between TCA [211B] terminal 1 and breakout box terminal 61.
4. Is continuity present?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Repair open in (BK/W) wire.



DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154

6.7

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

See [Figure 6-9](#). The HO2S provides a signal to the ECM which indicates whether the engine is running rich or lean.

- A P0131 (front) or P0151 (rear) is set when the ECM detects an excessively lean condition for a specified length of time. This can be caused by mechanical issues such as exhaust leaks. DTCs may also set if HO2S sensor fails.
- A P0132 (front) or P0152 (rear) is set when the ECM detects an excessively rich condition for a specified length of time. This can be caused by oil contamination or fuel injector malfunctions. DTCs may also set if HO2S sensor fails.
- A P0134 is set when the front O2 sensor circuit is open or sensor is too cold to respond. A P0154 is set when the rear O2 sensor circuit is open or sensor is too cold to respond. Excessive oil usage may also cause these codes to set.

When the air/fuel mixture is ideal, approximately 14.6 parts air to 1 part fuel, the voltage will be approximately 0.45V when measuring across the sensor. If the voltage is measured from the sensor (terminals 46 or 66) to ground, the voltage will read approximately 1.2V. This difference is due to an internal bias in the ECM. When using DIGITAL TECHNICIAN II (Part No. HD-48650), the O2 voltage reading is displayed in the higher range 0.7-1.7V.

Table 6-19. Code Description

DTC	DESCRIPTION
P0031	Heater open/low
P0032	Heater shorted/high
P0131	Front O2 sensor low or engine running lean
P0132	Engine front O2 running rich
P0134	Front O2 sensor open/not responding/high
P0151	Rear O2 sensor low or engine running lean
P0152	Engine rear O2 running rich
P0154	Rear O2 sensor open/not responding/high

The heater portion of the HO2S is powered through the system relay. The front and rear HO2S heaters share a common ground through terminal 31 of the ECM. If the ECM recognizes an open or short in the heater circuit it will set either DTC P0031 or P0032.

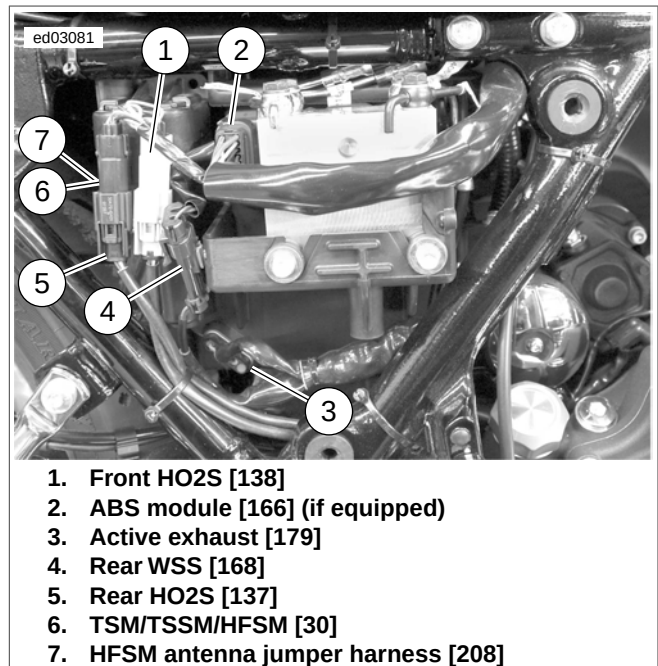


Figure 6-9. Under Right Side Cover

Diagnostic Tips

HO2S diagnostic codes may be seen during the vehicle break-in period. The HO2S DTCs will not illuminate the check engine lamp for current or historic codes and will only be indicated by DIGITAL TECHNICIAN II (Part No. HD-48650) or odometer self-diagnostics. If the DTCs are reported during the break-in period, clear or ignore the codes until the break-in period is completed. All historic HO2S DTCs are to be ignored and cleared.

The multimeter displays the signal from the HO2S 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 (PK/O) wire (front) and (PK/GN) wire (rear) will cause the engine to run rich (short to ground) or lean (short to voltage) until fault is detected. Once fault is detected, vehicle will run in open loop.

Check for the following conditions:

- **Poor connection:** Inspect the ECM [78], fuel injector [84, 85] and HO2S [137, 138] connectors for backed out terminals, improper mating, inoperative locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harnesses.
- **Dirty/stuck open injectors:** The vehicle may run lean (dirty/clogged injectors) or rich (stuck open injectors) if

there are injector problems. This could also cause poor fuel economy and performance.

- **Loose HO2S:** If an HO2S is loose, engine performance may be affected. This could also show up as a slow changing HO2S voltage.
- **Loose/leaking exhaust:** This can cause a poor ground connection for the sensor or allow fresh air into the exhaust system. If fresh air enters exhaust system, the HO2S will read a lean condition, causing the system to go rich.
- **Engine misfire:** See [6.37 MISFIRE AT IDLE OR UNDER LOAD](#).
- **Leaking injectors:** 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 box and air filter. See the service manual. Then, with the throttle wide open, turn IGN ON for 2 seconds and then OFF for 2 seconds five consecutive times. Replace the fuel injector if there is any evidence of raw fuel in the bores. See Fuel Injectors in the service manual.

- **Intake leaks:** See the service manual.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



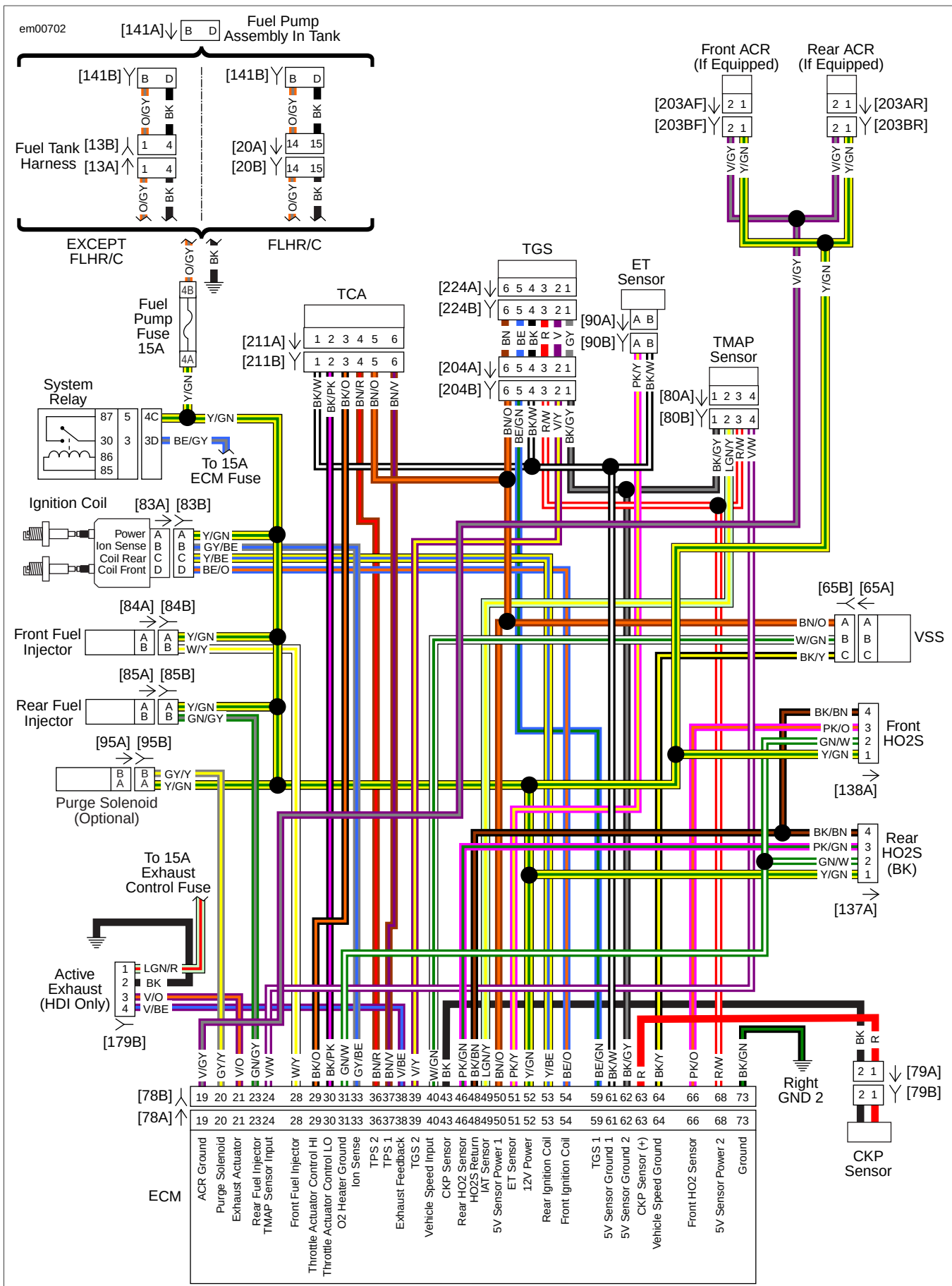


Figure 6-10. EFI Simplified Schematic

DTC P0031

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-20. DTC P0031 Diagnostic Faults

POSSIBLE CAUSES
Open in sensor ground circuit
ECM malfunction
HO2 malfunction
Open in sensor power circuit

1. HO2S Voltage Test

1. Disconnect front HO2S [138].
2. Turn IGN ON using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for battery voltage between front HO2S [138A] terminal 1 and ground.
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (Y/GN).

2. HO2S Ground Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between ECM [78A] terminal 31 and front HO2S [138A] terminal 2.
3. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (GN/W).

3. HO2S Resistance Test

1. Measure resistance between front HO2S [138B] terminal 1 and terminal 2.
2. Is resistance between 13.5-23.5 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Replace both HO2S. See the service manual.

DTC P0032

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

Table 6-21. DTC P0032 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
HO2 malfunction
Short to voltage in sensor ground circuit

1. Rear HO2S Resistance Test

1. Disconnect rear HO2S [137].
2. Turn IGN ON, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between rear HO2S [137B] terminal 1 and terminal 2.
3. Is resistance between 13.5-23.5 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace rear HO2S. See the service manual.

2. Front HO2S Resistance Test

1. With IGN OFF, disconnect front HO2S [138].
2. Measure resistance between front HO2S [138B] terminal 1 and terminal 2.
3. Is resistance between 13.5-23.5 Ohms?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace front HO2S. See the service manual.

3. HO2S Short to Voltage Test

1. With IGN ON, test for voltage between front HO2S [138A] terminal 2 and ground.
2. Is voltage present?
 - a. **Yes.** Repair short to voltage in (GN/W) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P0131

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-22. DTC P0131 Diagnostic Faults

POSSIBLE CAUSES
Front HO2S malfunction
ECM malfunction
Short to ground in signal circuit
Fuel system malfunction
Leak in exhaust system

1. Front HO2S Test

1. Disconnect front HO2S [138].
2. Turn IGN ON.
3. Measure voltage between front HO2S [138A] terminal 3 (PK/O), to chassis ground.
4. Is voltage approximately 5V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 2.](#)

2. Front HO2S Signal Wire Shorted to Sensor Ground Test

1. Turn IGN OFF.

2. Disconnect ECM [78].
3. Test for continuity between front HO2S [138A] terminals 3 (PK/O) and 4 (BK/BN).
4. Is continuity present?
 - a. **Yes.** Repair short between (PK/O) and (BK/BN) wires.
 - b. **No.** [Go to Test 3.](#)

3. Front HO2S Signal Wire Shorted to Ground Test

1. Test for continuity between front HO2S [138A] terminal 3 (PK/O) and vehicle ground.
2. Is continuity present?
 - a. **Yes.** Repair short between (PK/O) wire and ground.
 - b. **No.** If ECM [78] connections are good, replace ECM. See the service manual.

4. Front HO2S Operation Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Place transmission in neutral, engine stop switch to RUN and IGN ON. Start engine and allow to reach operating temperature.
3. With engine speed at a steady rpm, measure voltage between breakout box terminals 66 and 73.
4. Is voltage approximately 1.2V?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No, constant 0.7-1.1V.** Perform fuel pressure test. See the service manual. Look for incorrect ECM calibration, low fuel pressure, air leaks and dirty injectors. If no issues are found, replace HO2S.

DTC P0132

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-23. DTC P0132 Diagnostic Faults

POSSIBLE CAUSES
Front HO2S malfunction
ECM malfunction
Fuel system malfunction
Oil contamination on sensor

1. Front HO2S Operation Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
3. Start the engine and allow it to reach operating temperature.

4. With engine speed at a steady rpm, measure voltage between breakout box terminals 66 and 73.
5. Is voltage approximately 1.2V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No, constant 1.3-1.7V.** Perform fuel pressure test. See the service manual. Look for incorrect ECM calibration, high fuel pressure, stuck open or leaking injectors. If no issues are found, replace the HO2S.

DTC P0134

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-24. DTC P0134 Diagnostic Faults

POSSIBLE CAUSES
Front HO2S malfunction
ECM malfunction
Open or short to voltage in signal circuit
Open sensor ground
Heavy oil contamination

1. Front HO2S Signal Wire Short Circuit Voltage Test

1. Disconnect front O2 sensor [138].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between front HO2S [138A] terminal 3 to chassis ground.
4. Is voltage greater than 5V?
 - a. **Yes.** Repair short to voltage on (PK/O) wire.
 - b. **No, voltage greater than 4V.** [Go to Test 2.](#)
 - c. **No, voltage less than 4V.** [Go to Test 3.](#)

2. Front HO2S Open Sensor Ground Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between front HO2S [138A] terminal 4 (BK/BN) and breakout box terminal 48.
4. Is continuity present?
 - a. **Yes.** Replace the front HO2S. See the service manual.
 - b. **No.** Repair open on (BK/BN) wire.

3. Front HO2S Signal Wire Open Test

1. Test for continuity between front HO2S [138A] terminal 3 (PK/O) and breakout box terminal 66.

2. Is continuity present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open (PK/O) wire.

DTC P0151

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-25. DTC P0151 Diagnostic Faults

POSSIBLE CAUSES
Rear HO2S malfunction
ECM malfunction
Short to ground in signal circuit
Fuel system malfunction
Leak in exhaust system

1. Rear HO2S Test

1. Disconnect rear HO2S [137].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between rear HO2S [137A] terminal 3 (PK/GN) to ground.
4. Is voltage approximately 5V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 2.](#)

2. Rear HO2S Signal Wire Shorted to Sensor Ground Test

1. Turn IGN OFF.
2. Disconnect ECM [78].
3. Test for continuity between rear HO2S [137A] terminals 3 (PK/GN) and 4 (BK/BN).
4. Is continuity present?
 - a. **Yes.** Repair short between (PK/GN) and (BK/BN) wires.
 - b. **No.** [Go to Test 3.](#)

3. Rear HO2S Signal Wire Shorted to Ground Test

1. Test for continuity between rear HO2S [137A] terminal 3 (PK/GN) and ground.
2. Is continuity present?
 - a. **Yes.** Repair short between (PK/GN) wire and ground.
 - b. **No.** If ECM [78] connections are good, replace ECM. See the service manual.

4. Rear HO2S Operation Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Place transmission in neutral, engine stop switch to RUN and IGN ON. Start engine and allow to reach operating temperature.
3. With engine speed at a steady rpm, measure voltage between ECM breakout box terminals 46 and 73.
4. Is voltage approximately 1.2V?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No, constant 0.7-1.1V.** Perform fuel pressure test. See the service manual. Look for incorrect ECM calibration, low fuel pressure, air leaks and dirty injectors. If no issues are found, replace HO2S.

DTC P0152

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-26. DTC P0152 Diagnostic Faults

POSSIBLE CAUSES
Rear HO2S malfunction
ECM malfunction
Fuel system malfunction
Oil contamination on sensor

1. Rear HO2S Operation Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
3. Start the engine and allow it to reach operating temperature.
4. With engine speed at a steady rpm, measure voltage between breakout box terminals 46 and 73.
5. Is voltage approximately 1.2V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No, constant 1.3-1.7V.** Perform fuel pressure test. See the service manual. Look for incorrect ECM calibration, high fuel pressure, stuck open or leaking injectors. If no issues are found, replace the HO2S.

DTC P0154

PART NUMBER	TOOL NAME
HD-48637	HARNESS CONNECTOR TEST KIT

Table 6-27. DTC P0154 Diagnostic Faults

POSSIBLE CAUSES
Rear HO2S malfunction
ECM malfunction
Open or short voltage in signal circuit
Open sensor ground
Heavy oil contamination

1. Rear HO2S Signal Wire Short Circuit Voltage Test

1. Disconnect rear HO2S [137].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-48637) and a multimeter, measure voltage between rear HO2S [137A] terminal 3 to chassis ground.

4. Is voltage greater than 5.5V?
 - a. **Yes.** Repair short to voltage on (PK/GN) wire.
 - b. **No, voltage greater than 4V.** [Go to Test 2.](#)
 - c. **No, voltage less than 4V.** [Go to Test 3.](#)

2. Rear HO2S Open Sensor Ground Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between rear HO2S [137A] terminal 4 (BK/BN) and breakout box terminal 48.
4. Is continuity present?
 - a. **Yes.** Replace the rear HO2S. See the service manual.
 - b. **No.** Repair open on (BK/BN) wire.

3. Rear HO2S Signal Wire Open Test

1. Test for continuity between rear HO2S [137A] terminal 3 (PK/GN) and breakout box terminal 46.
2. Is continuity present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open in (PK/GN) wire.



DTC P0261, P0262, P0263, P0264

6.8

DESCRIPTION AND OPERATION

The fuel injectors are solenoids that allow pressurized fuel into the intake tract. The injectors are timed to the engine cycle and triggered sequentially. The power for the injectors comes from the system relay. The system relay also provides power for the fuel pump and the ignition coil. The ECM provides the path to ground to trigger the injectors.

NOTE

ECM fuse and system relay failures or wiring harness problems will cause 12V power to be lost to both injectors, ignition coils and fuel pump.

Table 6-28. Code Description

DTC	DESCRIPTION
P0261	Front injector open/low
P0262	Front injector high
P0263	Rear injector open/low
P0264	Rear injector high

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

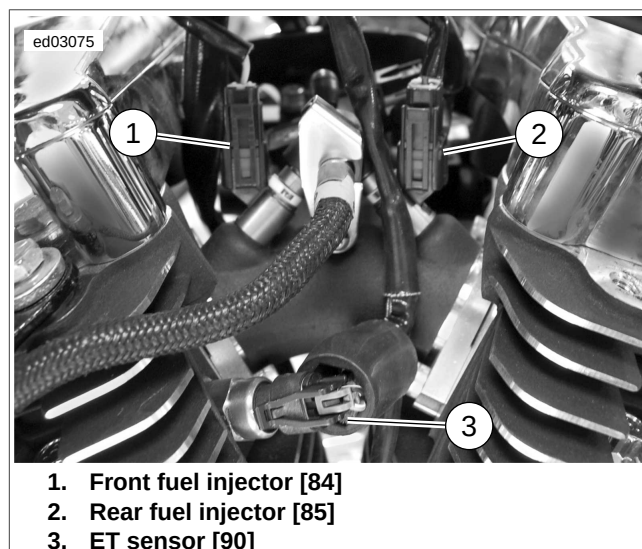


Figure 6-11. Between Cylinders Left Side



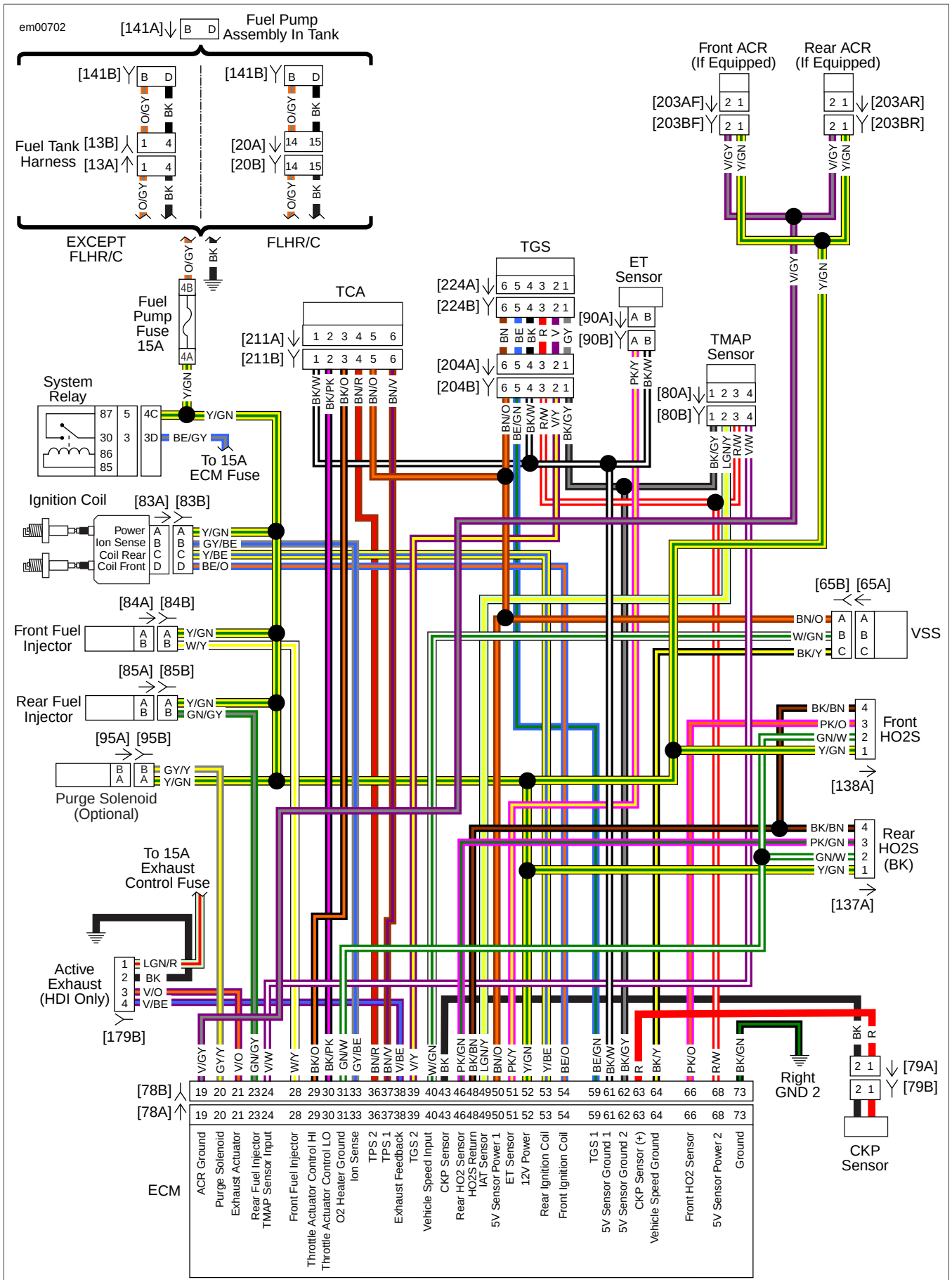


Figure 6-12. EFI Simplified Schematic

DTC P0261

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-48637	BREAKOUT BOX

Table 6-29. DTC P0261 Diagnostic Faults

POSSIBLE CAUSES
Front fuel injector malfunction
ECM malfunction
Open signal circuit
Open power circuit

1. Front Fuel Injector Test

1. Disconnect front fuel injector [84].
2. Connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) to front fuel injector [84B].
3. Crank engine.
4. Does light flash when engine is cranking (or running)?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No. Lamp does not illuminate.** [Go to Test 2.](#)
 - c. **No. Lamp is on steady.** [Go to Test 6.](#)

2. Front Fuel Injector Power Wire Open Circuit Test

1. Turn IGN OFF and engine stop switch to RUN.
2. Remove fuel injector test light.
3. Connect BREAKOUT BOX (Part No. HD-48637) to ECM harness [78B] leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
4. Test for continuity between breakout box terminal 28 and front fuel injector [84B] terminal B (W/Y).
5. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open on (W/Y) wire.

3. Front Fuel Injector Power Wire Shorted to Ground Test

1. Test for continuity between breakout box terminal 28 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short in (W/Y) to ground.
 - b. **No.** [Go to Test 4.](#)

4. Fuel Injector/System Relay Test

1. Remove system relay.
2. Test for continuity between system relay socket terminal 4C (Y/GN) wire and front fuel injector [84B] terminal A (Y/GN).

3. Is continuity present?
 - a. **Yes.** If connections are good, replace ECM. See the service manual.
 - b. **No.** Repair open (Y/GN) wire.

5. Injector Resistance Test

1. Test resistance between terminal A and B of front fuel injector [84A].
2. Is resistance value between 10-20 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Replace front fuel injector. See the service manual.

6. Driver Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminal 28 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (W/Y) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P0262

Table 6-30. DTC P0262 Diagnostic Faults

POSSIBLE CAUSES
Front fuel injector malfunction
ECM malfunction
Short to ground in signal circuit

1. Front Fuel Injector Control Wire Shorted to Voltage Test

1. Disconnect front fuel injector [84].
2. Measure the voltage between front fuel injector [84B] terminal B (W/Y) and ground.
3. Is voltage less than 1.0V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair short to voltage on (W/Y) wire.

2. Injector Resistance Test

1. Test resistance between terminal A and B of front fuel injector [84A].
2. Is resistance value between 10-20 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Replace front fuel injector. See the service manual.

DTC P0263

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-48637	BREAKOUT BOX

Table 6-31. DTC P0263 Diagnostic Faults

POSSIBLE CAUSES
Rear fuel injector malfunction
ECM malfunction
Open signal circuit
Open power circuit

1. Rear Fuel Injector Test

1. Disconnect rear fuel injector [85].
2. Connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) to rear fuel injector [85B].
3. Crank engine.
4. Does lamp flash when engine is cranking (or running)?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No. Lamp does not illuminate.** [Go to Test 2.](#)
 - c. **No. Lamp is on steady.** [Go to Test 6.](#)

2. Rear Fuel Injector Power Wire Open Circuit Test

1. Turn IGN OFF and engine stop switch to RUN.
2. Remove fuel injector test light.
3. Connect BREAKOUT BOX (Part No. HD-48637) to ECM harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
4. Test for continuity between breakout box terminal 23 and rear fuel injector [85B] terminal B (GN/GY).
5. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open on (GN/GY) wire.

3. Rear Fuel Injector Power Wire Shorted to Ground Test

1. Test for continuity between breakout box terminal 23 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short in (GN/GY) to ground.
 - b. **No.** [Go to Test 4.](#)

4. Fuel Injector/System Relay Test

1. Remove system relay.

2. Test for continuity between system relay socket terminal 4C (Y/GN) wire and rear fuel injector [85B] terminal A (Y/GN).
3. Is continuity present?
 - a. **Yes.** If connections are good, replace ECM. See the service manual.
 - b. **No.** Repair open (Y/GN) wire.

5. Injector Resistance Test

1. Test resistance between terminal A and B of rear fuel injector [85A].
2. Is resistance value between 10-20 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Replace rear fuel injector. See the service manual.

6. Driver Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminal 23 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (GN/GY) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P0264

Table 6-32. DTC P0264 Diagnostic Faults

POSSIBLE CAUSES
Rear fuel injector malfunction
ECM malfunction
Short to ground in signal circuit

1. Rear Fuel Injector Control Wire Shorted to Voltage Test

1. Disconnect rear fuel injector [85].
2. Measure the voltage between rear fuel injector [85B] terminal B (GN/GY) and ground.
3. Is voltage less than 1.0V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair short to voltage on (GN/GY) wire.

2. Injector Resistance Test

1. Test resistance between terminal A and B of rear fuel injector [85A].
2. Is resistance value between 10-20 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Replace rear fuel injector. See the service manual.

DTC P0373, P0374

DESCRIPTION AND OPERATION

If the CKP sensor signal is weak or absent, DTCs P0373 or P0374 will be set. DTC P0373 is usually set when several attempts to crank the engine have failed.

NOTE

If signal is not detected or cannot synchronize (DTC P0374), engine will not start.

Table 6-33. Code Description

DTC	DESCRIPTION
P0373	CKP sensor intermittent
P0374	CKP not detected/cannot synchronize

Diagnostic Tips

Engine must be cranked for more than five seconds without CKP signal to set P0374 code. Intermittent TMAP wiring or sensor issues may cause these codes to set prior to setting TMAP codes. Verify TMAP wiring and sensor prior to replacing the ECM.

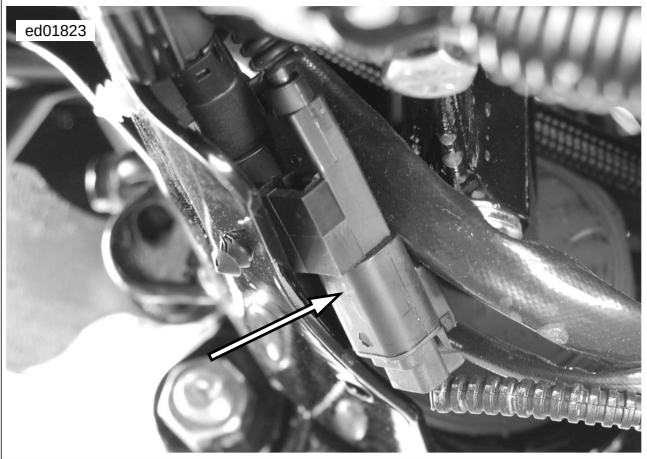


Figure 6-13. CKP Sensor [79] (from underneath)

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

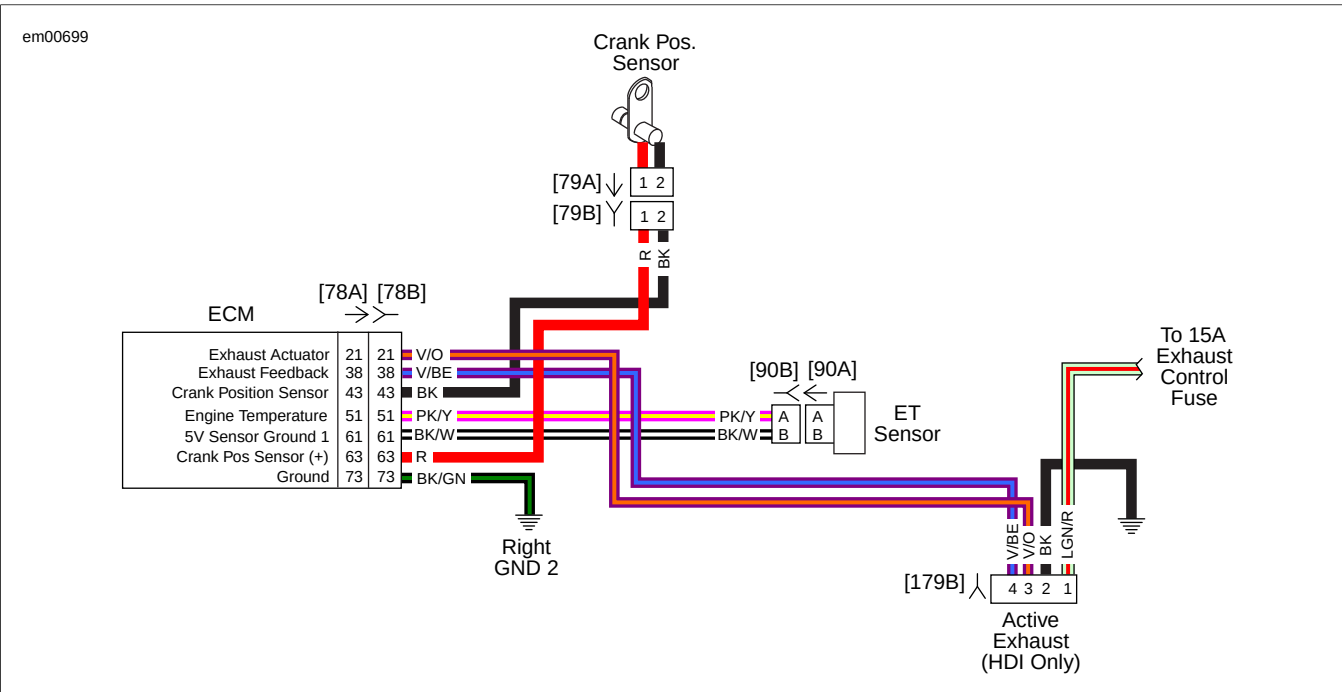


Figure 6-14. ET Sensor, CKP Sensor and Active Exhaust Circuit

DTC P0373

Table 6-34. DTC P0373 Diagnostic Faults

POSSIBLE CAUSES
CKP sensor malfunction
ECM malfunction
Open or short to ground in signal circuit

1. CKP Sensor Test

1. Clear the DTC. [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start the vehicle.
3. Did DTC P0373 reset?
 - a. **Yes.** Inspect and verify battery and starting system. See [3.2 STARTING SYSTEM](#).
 - b. **No.** System functioning properly.

DTC P0374

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-35. DTC P0374 Diagnostic Faults

POSSIBLE CAUSES
CKP sensor malfunction
ECM malfunction
Open or short to ground in signal circuit

1. CKP Sensor Connections Test

1. With IGN OFF, disconnect ECM [78] and inspect for damaged, corroded or pushed out terminals.
2. Are terminal problems present?
 - a. **Yes.** Repair terminals as required.
 - b. **No.** [Go to Test 2](#).

2. CKP Sensor Signal Wire Continuity Test

1. Disconnect CKP sensor [79].
2. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 63 to CKP sensor [79B] terminal 1 (R).

4. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 3](#).
 - b. **No.** Repair open wire (R).

3. CKP Sensor Ground Wire Continuity Test

1. Test continuity from breakout box terminal 43 to CKP sensor [79B] terminal 2 (BK).
2. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 4](#).
 - b. **No.** Repair open on (BK) wire.

4. CKP Sensor Signal Wire Shorted to CKP Ground Wire Test

1. Test for continuity between breakout box terminals 63 and 43.
2. Is continuity present?
 - a. **Yes.** Repair short between CKP [79B] terminals 1 (R) and 2 (BK).
 - b. **No.** [Go to Test 5](#).

5. CKP Sensor Low Shorted to Ground Test

1. Test for continuity between breakout box terminals 43 and 73.
2. Is continuity present?
 - a. **Yes.** Repair short to sensor ground on (BK) wire.
 - b. **No.** [Go to Test 6](#).

6. CKP Sensor Output Test

1. Connect CKP sensor [79].
2. Test for AC voltage at breakout box terminals 63 and 43.
3. Place transmission in neutral, turn IGN ON and engine stop switch to RUN.
4. Crank engine for 5 seconds while observing multimeter.
5. Is AC voltage present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** [Go to Test 7](#).

7. CKP Sensor Signal Wire Shorted to Ground Test

1. Disconnect CKP sensor [79].
2. Test for continuity between breakout box terminals 63 and 73.
3. Is continuity present?
 - a. **Yes.** Repair shorted (R) wire to ground.
 - b. **No.** Replace the CKP sensor. See the service manual.

DESCRIPTION AND OPERATION

Purge Solenoid (If Equipped)

See [Figure 6-15](#). To comply with emission standards in some areas, a purge solenoid is required. The purge solenoid is located under the seat. Two vent lines run from the purge solenoid. One line connects to the top of the fuel tank and the other connects to a vent canister mounted to the vehicle chassis in front of the purge solenoid. A second return line from the vent canister connects to the air intake manifold allowing vented fumes to be recirculated into the engine.

The purge solenoid is timed to the throttle position and is disabled during startup, low engine temperature, low engine speed or low vehicle speed. Power for the purge solenoid is supplied by the system relay. The system relay also provides power for the VSS, fuel pump and the ignition coil. The ECM provides a path to ground to trigger the purge solenoid.

NOTES

- *System fuse and system relay failures or wiring harness problems will cause 12V power to be lost to the VSS, ignition coils, fuel pump and purge solenoid.*
- *Purge solenoid is not installed on non-California vehicles and DTCs P0444 and P0445 are not available. If these DTCs appear, the ECM is improperly programmed and should be reprogrammed.*

Table 6-36. Code Description

DTC	DESCRIPTION
P0444	Purge solenoid open/low
P0445	Purge solenoid high

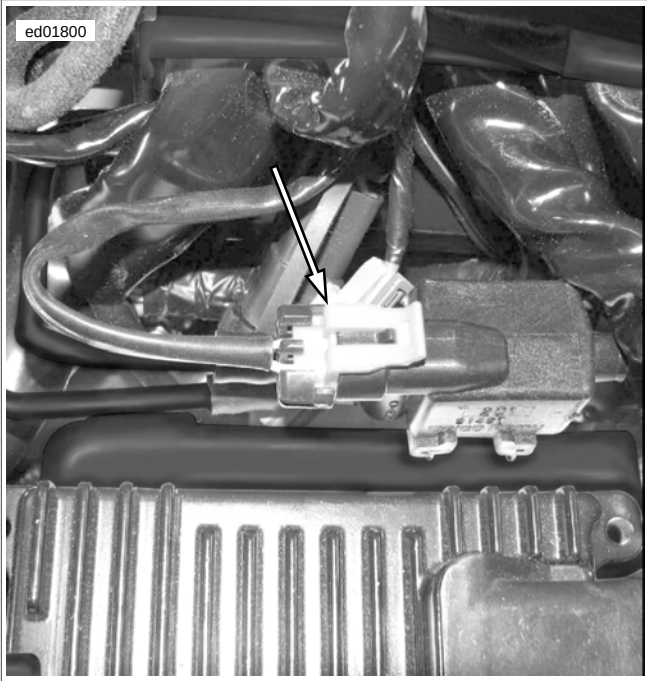


Figure 6-15. [95] Purge Solenoid (Under seat)

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

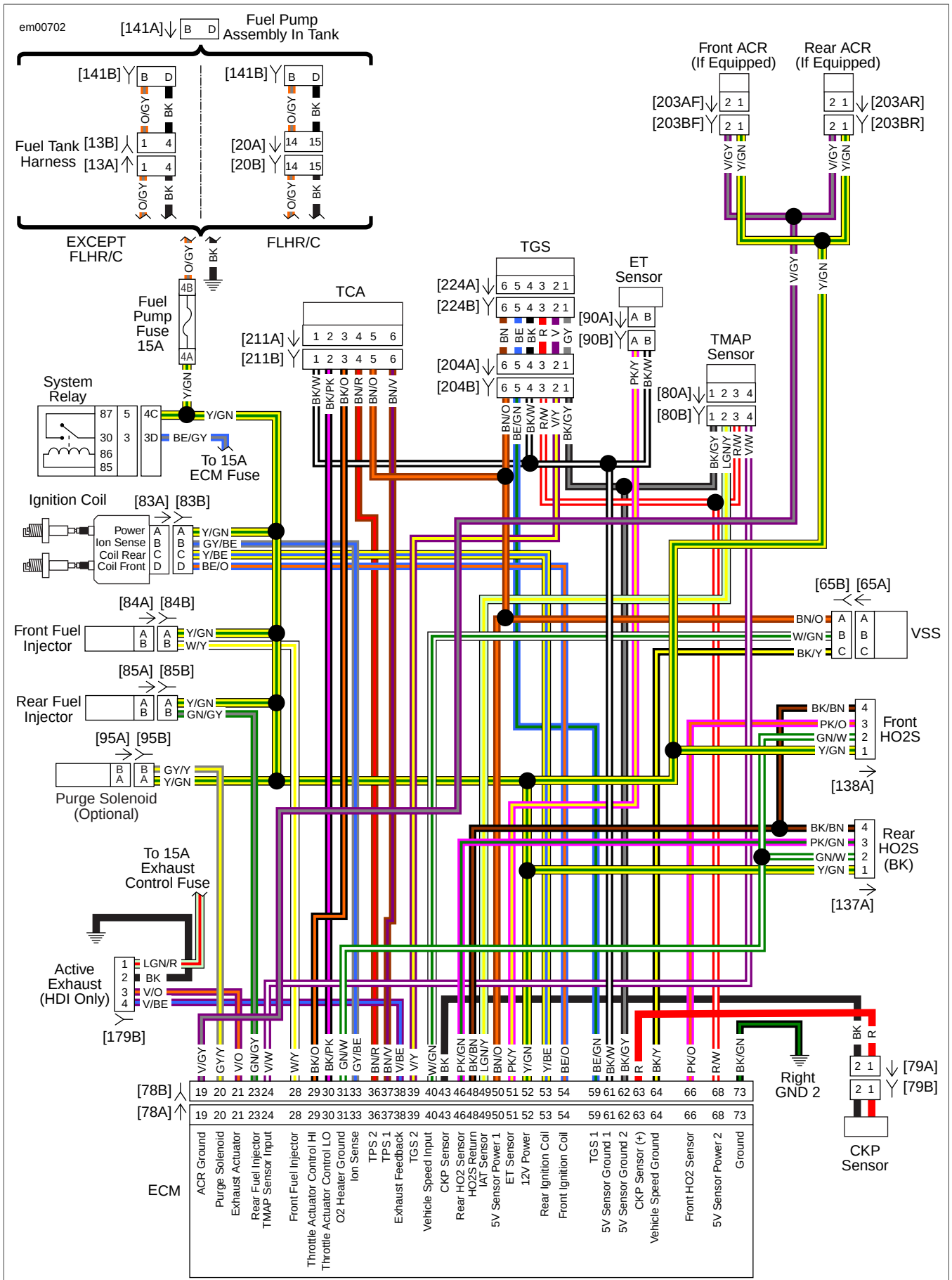


Figure 6-16. EFI Simplified Schematic

DTC P0444

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-37. DTC P0444 Diagnostic Faults

POSSIBLE CAUSES
Purge solenoid malfunction
ECM malfunction
Short to ground in signal circuit

1. Purge Solenoid Test

1. With IGN OFF, disconnect purge solenoid [95].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between purge solenoid [95A] terminals A and B.
3. Is resistance between 4-21 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace purge solenoid. See the service manual.

2. Purge Solenoid Voltage Test

1. Connect a multimeter to purge solenoid [95B] terminal A and ground.
2. With the engine stop switch in RUN and while observing the multimeter, turn the IGN ON.
3. Is battery voltage present on multimeter for approximately two seconds after IGN ON?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open (Y/GN) wire.

3. Purge Solenoid Control Wire Shorted to Ground Test

1. Turn IGN OFF and leave engine stop switch in RUN.
2. Disconnect ECM [78].
3. Test for continuity between purge solenoid [95B] terminal B (GY/Y) and ground.
4. Is continuity present?
 - a. **Yes.** Repair short to ground on (GY/Y) wire.
 - b. **No.** [Go to Test 4.](#)

4. Purge Solenoid Control Wire Open Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test continuity between purge solenoid [95B] terminal B (GY/Y) and breakout box terminal 20.
3. Is continuity present?
 - a. **Yes.** If ECM connections are good, replace ECM. See the service manual.
 - b. **No.** Repair open in (GY/Y) wire.

DTC P0445

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

Table 6-38. DTC P0445 Diagnostic Faults

POSSIBLE CAUSES
Purge solenoid malfunction
ECM malfunction
Short to voltage in signal circuit

1. Purge Solenoid Test

1. Disconnect purge solenoid [95].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between purge solenoid [95A] terminals A and B.
3. Is resistance between 4-21 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace purge solenoid. See the service manual.

2. Purge Solenoid Short to Voltage Test

1. Place transmission in neutral, IGN ON and set engine stop switch to RUN.
2. Measure voltage between purge solenoid [95B] terminal B (GY/Y) and ground.
3. Is battery voltage present on multimeter?
 - a. **Yes.** Repair short to voltage on (GY/Y) wire.
 - b. **No.** If ECM connections are good, replace ECM. See the service manual.

DTC P0501, P0502

6.11

DESCRIPTION AND OPERATION

See [Figure 6-17](#). The VSS is powered and monitored by the ECM. The ECM processes the vehicle speed signal and transmits this signal to the TSM/TSSM/HFSM and speedometer through serial data circuit.

NOTE

When the vehicle speed is greater than 0, the closed loop idle speed control is inhibited.

Table 6-39. Code Description

DTC	DESCRIPTION
P0501	VSS low
P0502	VSS high



Figure 6-17. VSS Location (Under Starter)



Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

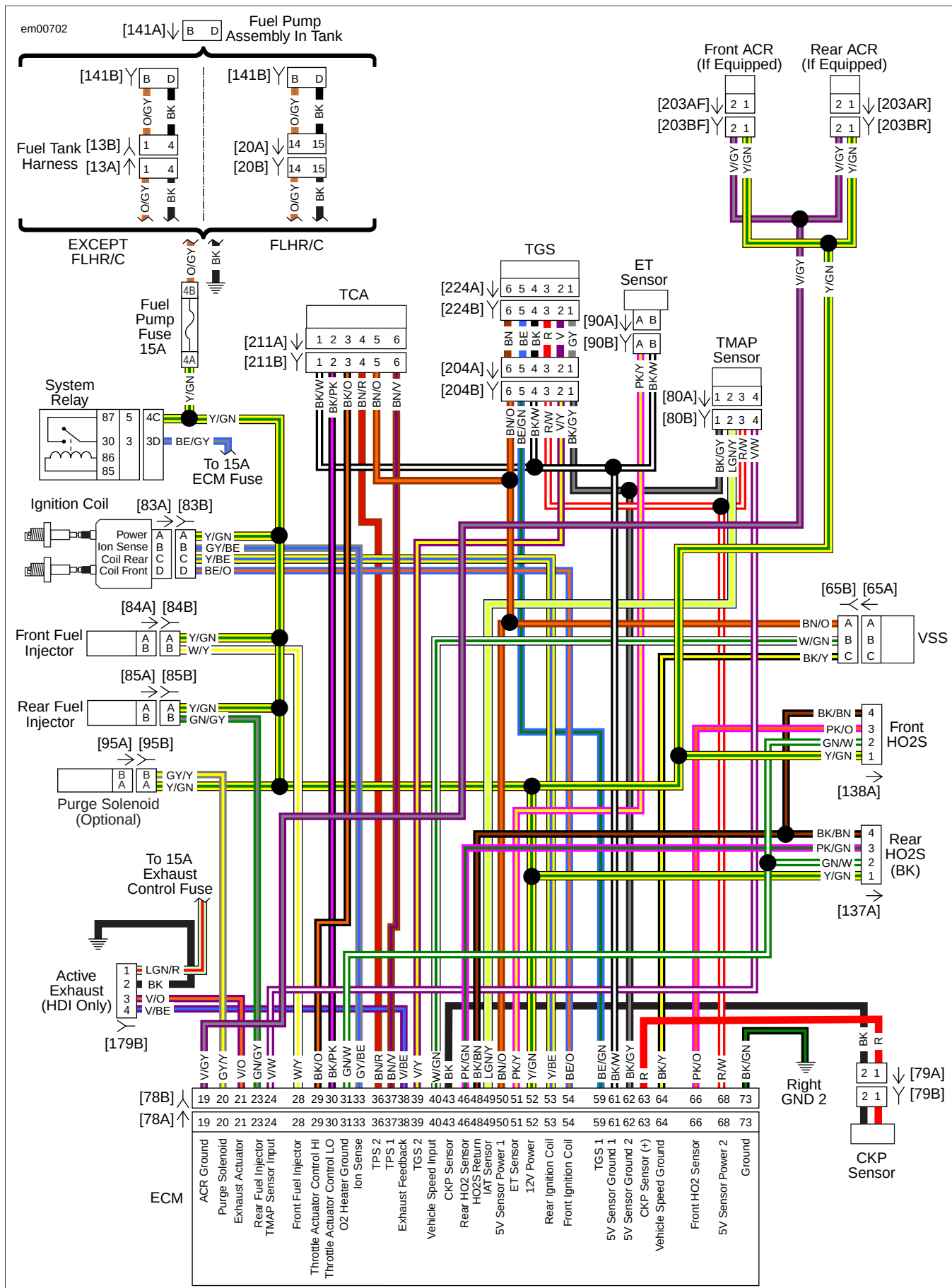


Figure 6-18. EFI Simplified Schematic

DTC P0501

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-40. DTC P0501 Diagnostic Faults

POSSIBLE CAUSES
VSS malfunction
ECM malfunction
Open or short to ground in signal circuit
Open or short to ground in 5V reference circuit

1. VSS Connections Test

1. With IGN OFF, disconnect VSS [65].
2. Inspect VSS [65] for damaged terminals, backed out or bent terminals. Repair as necessary.
3. Place transmission in neutral, turn IGN ON and engine stop switch to RUN.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between VSS [65B] terminal 1 and ground.
5. Is voltage reading approximately 5.0V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 2.](#)

2. VSS Sensor Power Short to Ground Test

1. Turn IGN OFF.
2. Disconnect ECM [78].
3. Test continuity between VSS [65B] terminal 1 and ground.
4. Is continuity present?
 - a. **Yes.** Repair short to ground on (BN/O) wire.
 - b. **No.** Repair open on (BN/O) wire.

3. VSS Signal Wire Short to Ground Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between breakout box terminals 40 and 73.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (W/GN) wire.
 - b. **No.** [Go to Test 4.](#)

4. VSS Signal Wire Open Test

1. Test for continuity between breakout box terminals 40 and VSS [65B] terminal 2.
2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open on (W/GN) wire.

5. VSS Dirty or Damaged Test

1. Remove VSS.
2. Check for debris on the sensor tip.
3. Is debris present?
 - a. **Yes.** Clean debris from VSS and install.
 - b. **No.** If VSS connections are good, replace VSS. See the service manual.

DTC P0502

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-41. DTC P0502 Diagnostic Faults

POSSIBLE CAUSES
VSS malfunction
ECM malfunction
Short to voltage in signal circuit
Open ground
5V reference shorted to battery voltage

1. VSS Sensor Power Shorted to Voltage Test

1. With IGN OFF, disconnect VSS [65].
2. Inspect VSS [65] for damaged terminals, backed out or bent terminals. Repair as necessary.
3. Place transmission in neutral, turn IGN ON and engine stop switch to RUN.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between VSS [65B] terminals 1 (BN/O) and 3 (BK/Y).
5. Is voltage greater than 6.0V?
 - a. **Yes.** Repair short to voltage on (BN/O) wire.
 - b. **No.** [Go to Test 2.](#)

2. VSS Signal Wire Short to Voltage Test

1. Measure voltage between VSS [65B] terminal 2 (W/GN) and ground.
2. Is voltage above 6.0V?
 - a. **Yes.** Repair short to voltage on (W/GN) wire.
 - b. **No.** [Go to Test 3.](#)

3. VSS Ground Wire Open Test

1. Test continuity between breakout box terminal 64 and VSS [65B] terminal 3 (BK/Y).
2. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open on (BK/Y) wire.

4. VSS Signal Wire Shorted to Sensor Power Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test continuity between breakout box terminals 40 and 50.
3. Is continuity present?
 - a. **Yes.** Repair short between (W/GN) and (BN/O) wires.
 - b. **No.** [Go to Test 5.](#)

5. VSS Test

1. Connect ECM [78A] to breakout box.
2. Verify the VSS [65] is disconnected.
3. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
4. Did the DTC P0502 return?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Replace the VSS. See the service manual.



DTC P0505

6.12

LOSS OF IDLE SPEED CONTROL

The throttle control actuator uses a two wire DC motor to move the throttle plate from the spring loaded off-idle detent. The ECM supplies a pulse width modulated voltage signal through [78B] terminals 29 and 30. The ECM monitors throttle position through the dual position sensors (TPS1 and TPS2). This code will set if the throttle actuation faults cause the idle to become unstable. This can be caused by a loose TPS, throttle actuator friction or an intermittent air leak.

NOTE

Although the ECM monitors terminals 29 and 30, faults on these terminals will not cause this DTC. Faults on these terminals will be higher priority DTCs, address them first.

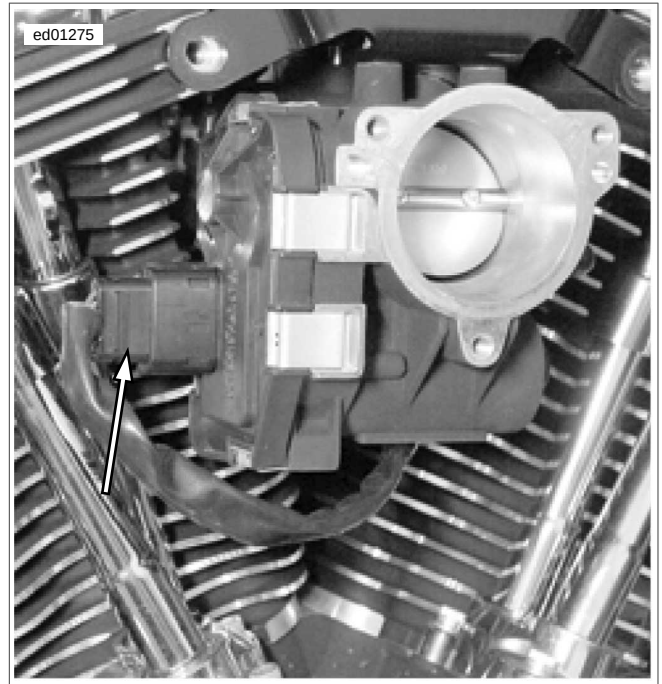
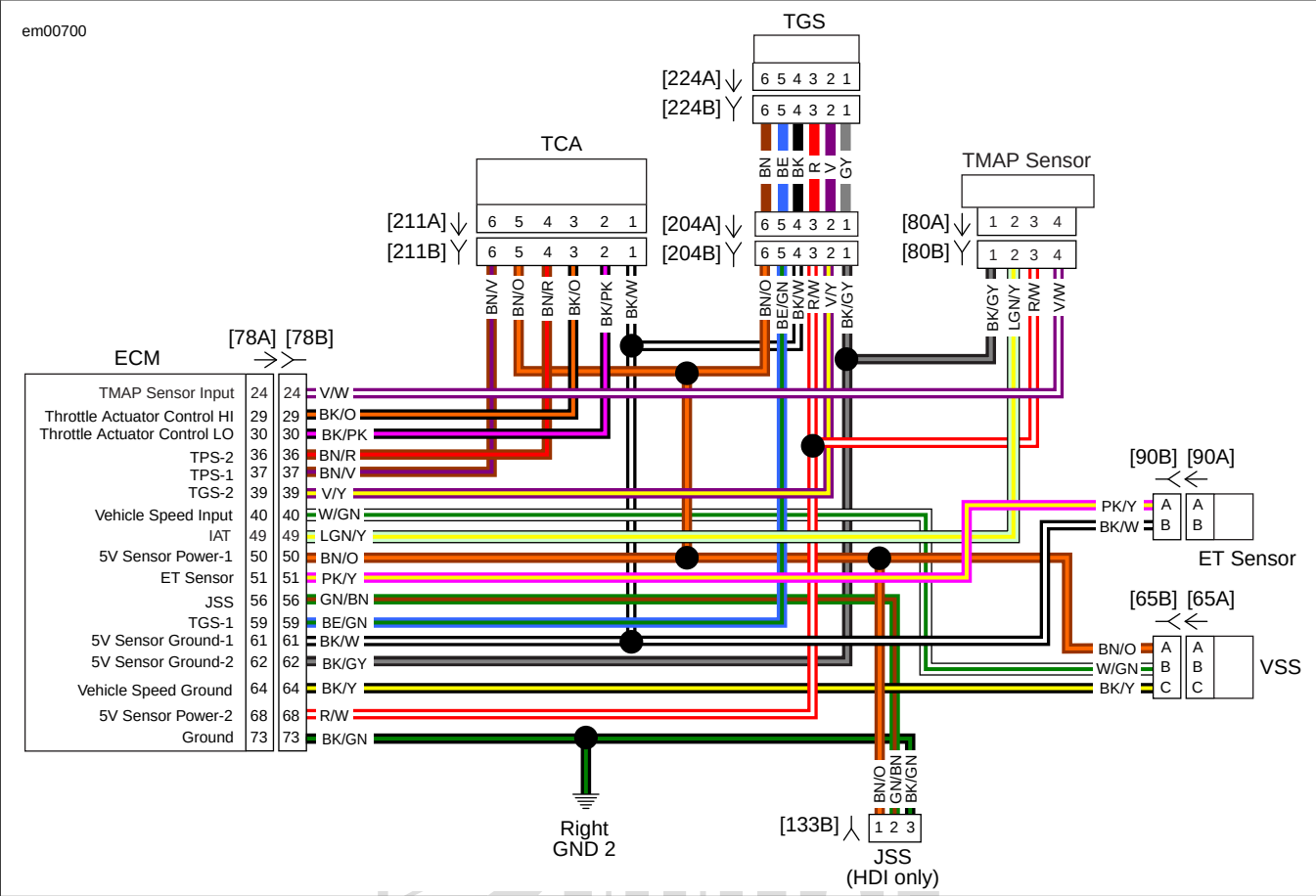


Figure 6-19. Throttle Control Connector [211]



Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



DTC P0505

Table 6-42. DTC P0505 Diagnostic Faults

POSSIBLE CAUSES
TCA malfunction
Vacuum/air leaks
Fuel system problems

1. Fuel Quality Test

1. Verify there is sufficient supply of fresh fuel in the fuel tank.

2. Is fuel quality and level acceptable?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Flush the fuel system and fill fuel tank.

2. Vacuum Leak Test

1. Start the motorcycle and check for vacuum leaks.
2. Were any leaks found?
 - a. **Yes.** Repair the vacuum leak.
 - b. **No.** Replace the TCA. See the service manual.

DTC P0572

6.13

DESCRIPTION AND OPERATION

Brake Switch

There are two stop lamp switches. The front stop lamp switch is a mechanical switch located on the right hand controls. The rear stop lamp switch is a pressure switch located in the brake line under the exhaust pipes.

On vehicles not equipped with ABS, when the stop lamp switches are closed they supply power to the coil side of the brake relay. This energizes the brake relay and supplies power to the stop lamp. The stop lamp switches also supply an input to the ECM.

On vehicles equipped with ABS, when the stop lamp switches are closed each switch supplies a separate input to the ABS module. Power is also supplied through the ABS diode pack to the ECM (as a brake input) and to the brake relay. The brake relay energizes and supplies power to the stop lamps.

During an ignition cycle, the ECM must receive a valid brake switch input. During the same ignition cycle the vehicle has to reach 31 mph (50 km/h) in third gear or higher and return to a stop three times without any brake switch signals in order to set DTC P0572.

Table 6-43. Code Description

DTC	DESCRIPTION
P0572	Brake switch input error

Diagnostic Tips

The accessory circuit supplies power to the stop lamp switches and horn switch. A short to ground on the switch circuits will cause the accessory fuse to open only when the switch is applied. This includes a short in the ABS diode pack on ABS equipped vehicles.

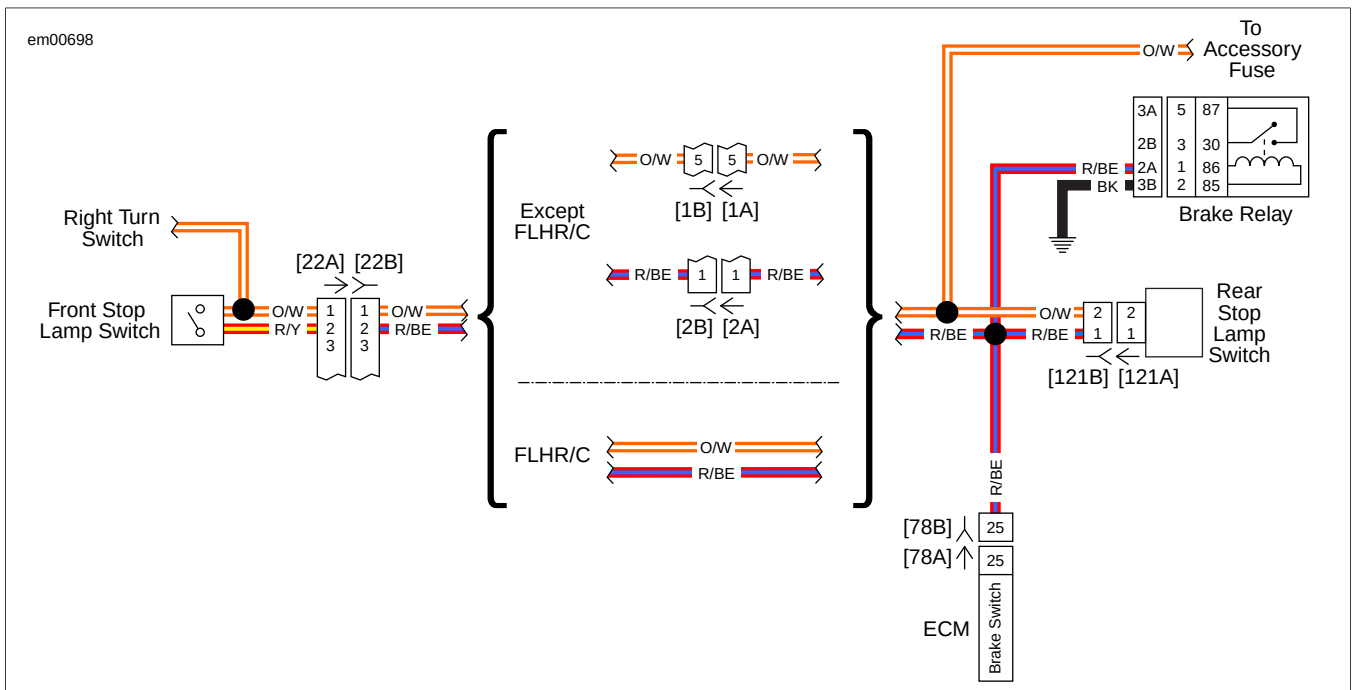


Figure 6-21. Brake Switches Schematic without ABS

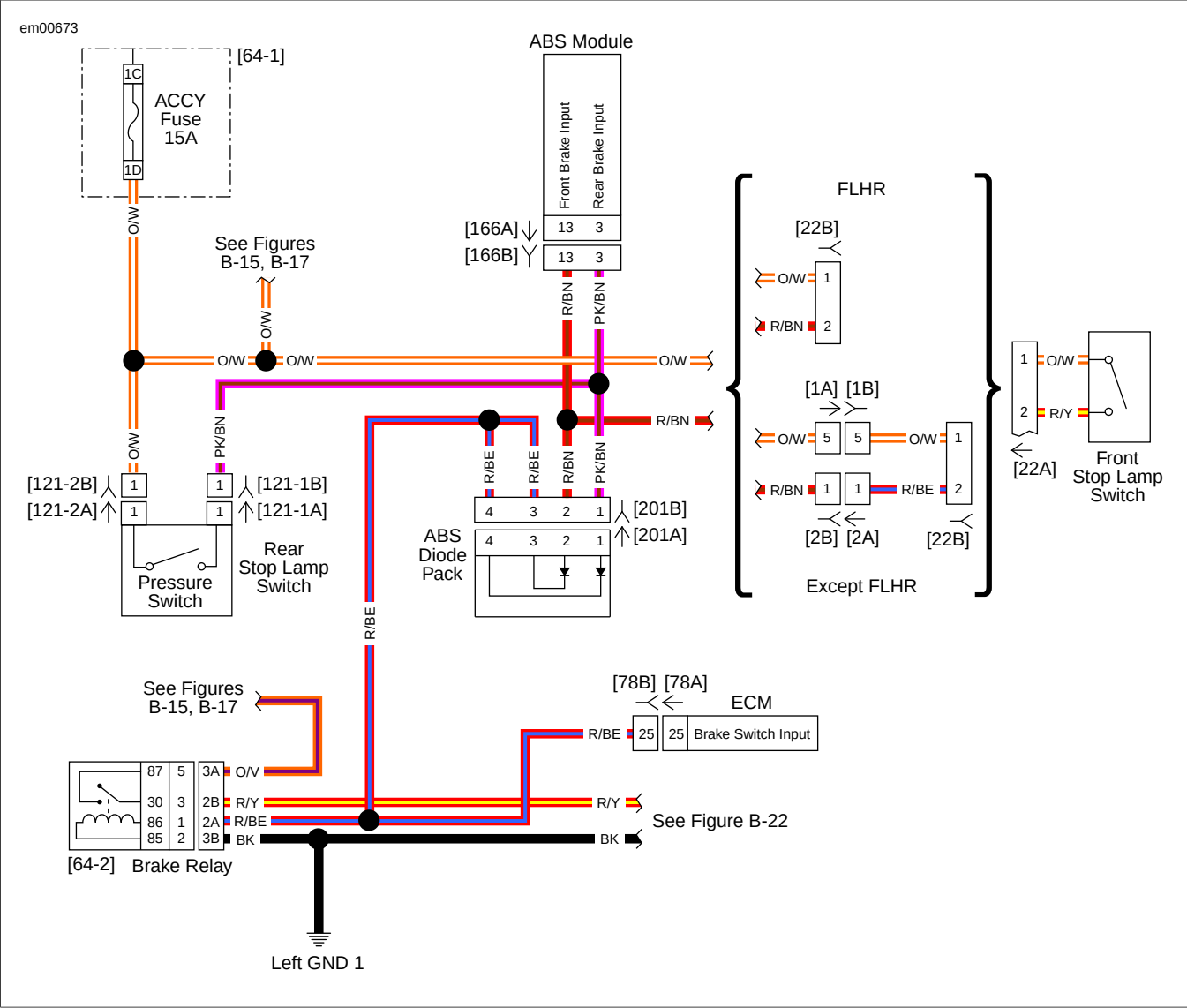


Figure 6-22. Brake Switches Schematic

DTC P0572

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-44. DTC P0572 Diagnostic Faults

POSSIBLE CAUSES
Open in accessory circuit
Stop lamp switch malfunction
Open in stop lamp switch circuit
ABS diode pack malfunction
Open in brake switch input circuit

1. Stop Lamp Switch Validation Test

1. Apply the front and rear brakes independently of each other.
2. Does the stop lamp illuminate with either brake applied?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No, it only illuminates when the front brake is applied.** [Go to Test 4.](#)
 - c. **No, it only illuminates when the rear brake is applied.** [Go to Test 8.](#)
 - d. **No, it does not illuminate at all.** [Go to Test 3.](#)

2. Brake Input Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS.](#)

2. With IGN ON and the brake applied, using a multimeter, test for voltage between breakout box terminal 25 and ground.
3. Is battery voltage present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (R/BE) wire.

3. Accessory Circuit Test

1. Inspect the accessory fuse.
2. Is the fuse good?
 - a. **Yes.** Repair open in (O/W) wire.
 - b. **No.** Repair short to ground in accessory circuit. See diagnostic tips. Replace the accessory fuse.

4. Rear Stop Lamp Switch Circuit Test

1. Disconnect rear stop lamp switch [121].
2. With IGN ON, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage between rear stop lamp switch [121-2B] and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (O/W) wire.

5. Rear Stop Lamp Switch Test

1. Jumper rear stop lamp switch [121-1B] to [121-2B].
2. Turn IGN ON.
3. Does the stop lamp illuminate?
 - a. **Yes.** Replace the rear stop lamp switch. See the service manual.
 - b. **No. Without ABS.** Repair open in (R/BE) wire.
 - c. **No. With ABS.** [Go to Test 6.](#)

6. ABS Diode Pack Test

1. Disconnect ABS diode [201].
2. Test for voltage at ABS diode [201B] terminal 1.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (PK/BN) wire.

7. ECM Circuit Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).

3. Test for continuity between breakout box terminal 25 and ABS diode [201B] terminal 4.
4. Is continuity present?
 - a. **Yes.** Replace ABS diode pack. See the service manual.
 - b. **No.** Repair open in (R/BE) wire.

8. Front Stop Lamp Switch Circuit Test

1. Disconnect right hand controls [22].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, with IGN ON, test for voltage between [22B] terminal 1 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No.** Repair open in (O/W) wire.

9. Front Stop Lamp Switch Test

1. Jumper [22B] terminal 1 to terminal 2.
2. Turn IGN ON.
3. Does the stop lamp illuminate?
 - a. **Yes.** Replace the front stop lamp switch. See the service manual.
 - b. **No. Without ABS.** Repair open in (R/BE) wire.
 - c. **No. With ABS.** [Go to Test 10.](#)

10. ABS Diode Pack Test

1. Disconnect ABS diode [201].
2. Test for voltage at ABS diode [201B] terminal 2.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 11.](#)
 - b. **No.** Repair open in (PK/BN) wire.

11. ECM Circuit Test

1. Turn IGN OFF.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between breakout box terminal 25 and ABS diode [201B] terminal 3.
4. Is continuity present?
 - a. **Yes.** Replace ABS diode pack. See the service manual.
 - b. **No.** Repair open in (R/BE) wire.

DTC P0603, P0605

6.14

DESCRIPTION AND OPERATION

See [Figure 6-23](#). The DTCs listed indicate a failure which requires replacement of the ECM. See the service manual for replacement information. Refer to [Table 6-45](#).

NOTE

After replacing ECM, perform password learning procedure and clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).

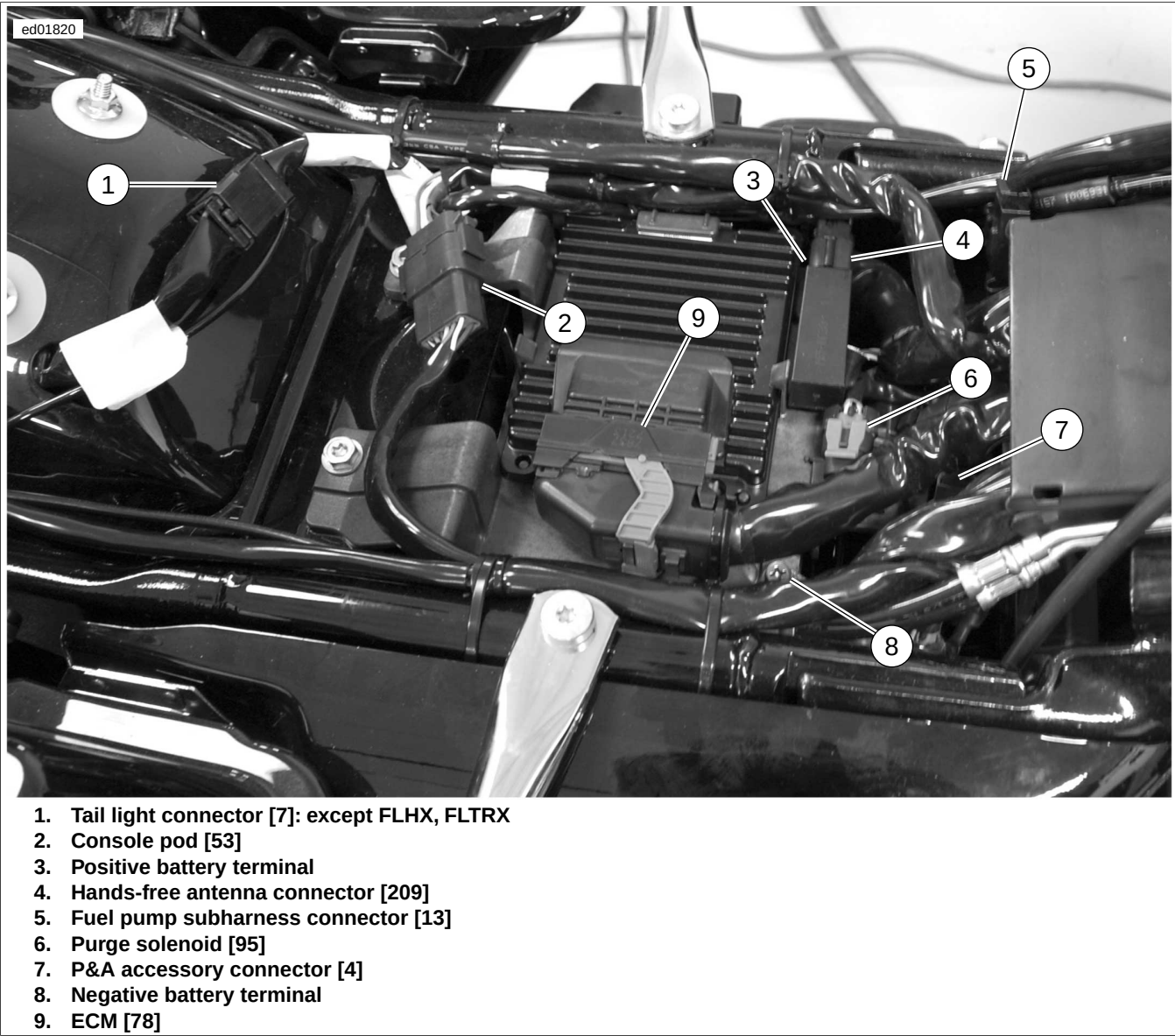


Figure 6-23. Electrical Connectors Under Seat

Table 6-45. Code Description

DTC	DESCRIPTION
P0603	ECM EEPROM error
P0605	ECM flash error

DTC P0603 Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).

2. Replace ECM if DTCs reappear. See the service manual.

DTC P0605 Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Attempt to program ECM using correct calibration.
3. Restart vehicle. If DTC reappears, replace ECM. See the service manual.

DTC P0641, P0651

6.15

DESCRIPTION AND OPERATION

See [Figure 6-24](#). The ECM controls 5V power from terminal 50 for sensor power-1 and terminal 68 for sensor power-2. The ECM provides a common ground point for components through terminal 61 for sensor power-1 and terminal 62 for sensor power-2. The ECM monitors voltage on the 5V reference circuits and sets the DTCs below if the voltage goes out of range. Refer to [Table 6-46](#).

- DTC P0641 is displayed when sensor voltage 1 is out of range. The 5V sensor power-1 circuit supplies the TCA,

VSS, jiffy stand sensor and sensor 2 of the TGS with a 5V reference signal.

- DTC P0651 is displayed when sensor power-2 is out of range. The 5V sensor power-2 circuit supplies the TMAP sensor and sensor 1 of the TGS with a 5V reference signal.

Table 6-46. Code Description

DTC	DESCRIPTION
P0641	5V reference-1 out of range
P0651	5V reference-2 out of range

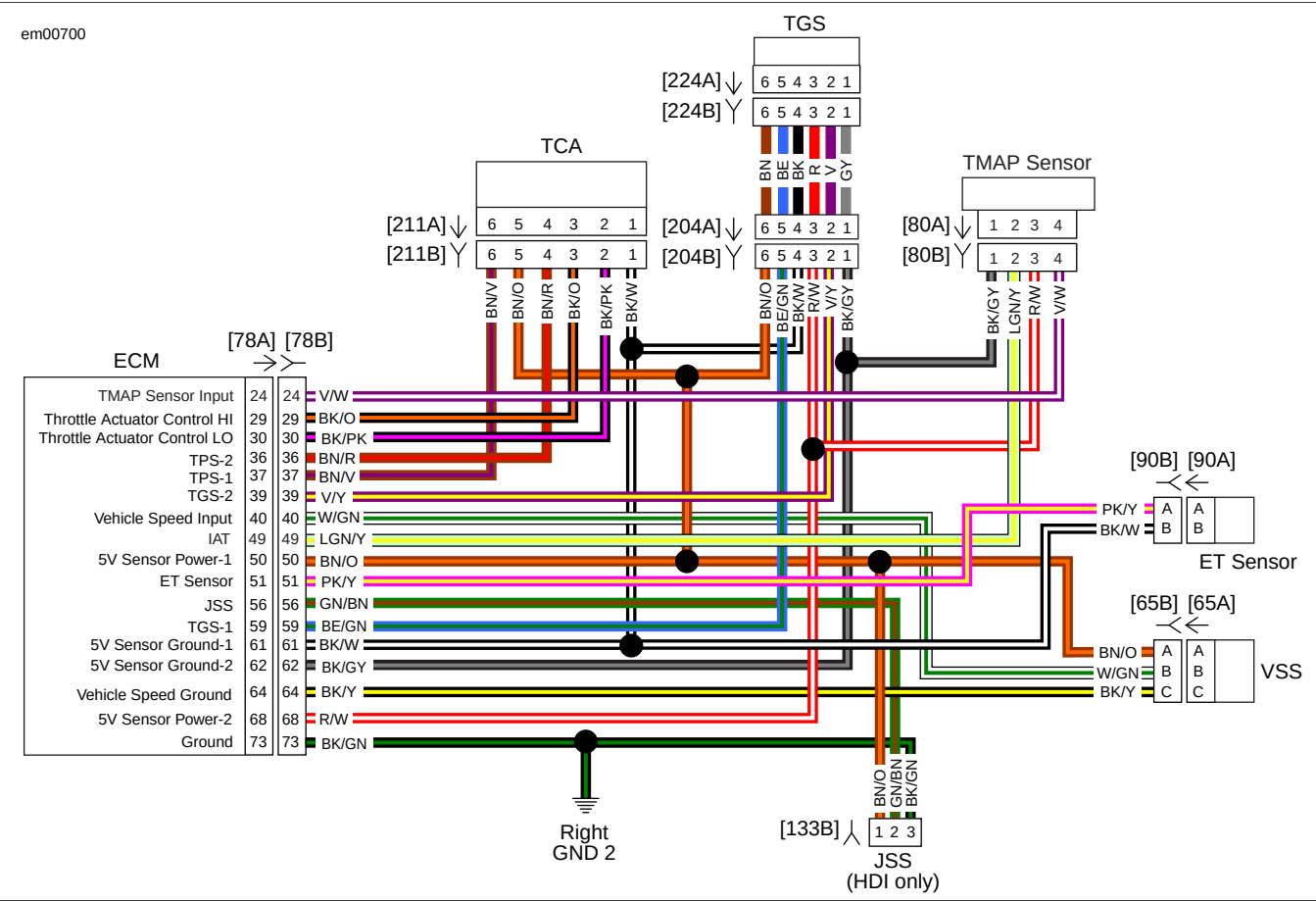


Figure 6-24. Throttle Control Actuator Circuit

DTC P0641

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-47. DTC P0641 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in sensor power-1 circuit
Short to ground in sensor power-1 circuit
ECM malfunction
TCA malfunction
JSS malfunction
TGS malfunction
VSS malfunction

1. Sensor Power-1 Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, test for voltage between breakout box terminal 50 and terminal 61.
4. Is voltage between 4-6V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No. Greater than 6V.** Repair short to voltage in (BN/O) wire.
 - c. **No. Less than 4V.** Repair short to ground in (BN/O) wire.

2. Sensor Power-1 Circuit Resistance Test

1. Measure resistance between breakout box terminal 50 and terminal 61.
2. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. TCA Test

1. Disconnect the TCA [211].
2. Measure resistance between breakout box terminal 50 and terminal 61.
3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** [Go to Test 4.](#)

4. JSS Test

1. Disconnect the JSS [133].
2. Measure resistance between breakout box terminal 50 and terminal 61.

3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the JSS. See the service manual.
 - b. **No.** [Go to Test 5.](#)

5. TGS Test

1. Disconnect the TGS [224].
2. Measure resistance between breakout box terminal 50 and terminal 61.
3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** [Go to Test 6.](#)

6. VSS Test

1. Disconnect the VSS [65].
2. Measure resistance between breakout box terminal 50 and terminal 61.
3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the VSS. See the service manual.
 - b. **No.** Repair short to ground in (BN/O) wire.

DTC P0651

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-48. DTC P0651 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in sensor power-2
Short to ground in sensor power-2
ECM malfunction
TMAP malfunction
TGS malfunction

1. Sensor Power-2 Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, test for voltage between breakout box terminal 68 and terminal 62.
4. Is voltage between 4-6V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No. Greater than 6V.** Repair short to voltage in (R/W) wire.
 - c. **No. Less than 4V.** Repair short to ground in (R/W) wire.

2. Sensor Power-2 Circuit Resistance Test

1. Measure resistance between breakout box terminal 68 and terminal 62.

2. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. TMAP Test

1. Disconnect the TMAP [80].
2. Measure resistance between breakout box terminal 68 and terminal 62.
3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TMAP. See the service manual.
 - b. **No.** [Go to Test 4.](#)

4. TGS Test

1. Disconnect the TGS [224].
2. Measure resistance between breakout box terminal 68 and terminal 62.
3. Is resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** Repair short to ground in (R/W) wire.



DTC P1001, P1002, P1003, P1004

6.16

DESCRIPTION AND OPERATION

With IGN ON and the engine stop switch at RUN, the ECM will energize the system relay to complete the circuit to the in-tank fuel pump, ignition coils and fuel injectors. They will remain powered as long as the engine is cranking or running, and the ECM is receiving ignition reference pulses from the CKP sensor. If there are no reference pulses, the ECM will de-energize the system relay within 2 seconds after ignition is ON or engine has stalled, or immediately after the ignition is shut OFF.

Table 6-49. Code Description

DTC	DESCRIPTION
P1001	System relay coil open/low
P1002	System relay coil high/shorted
P1003	System relay contacts open
P1004	System relay contacts closed

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



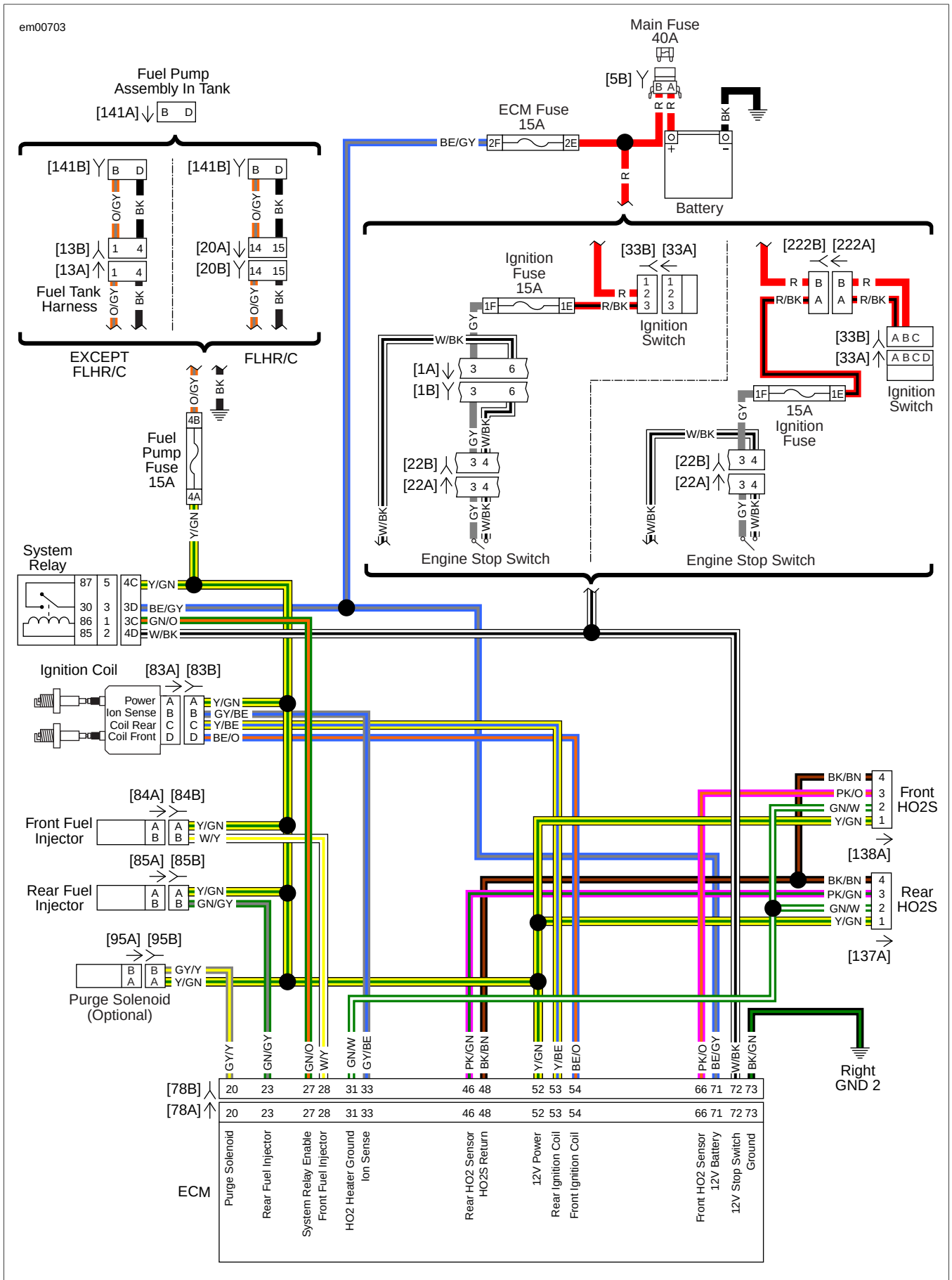


Figure 6-25. System Relay Circuit

DTC P1001

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-50. DTC P1001 Diagnostic Faults

POSSIBLE CAUSES
Relay malfunction
Open in coil supply circuit
Short to ground in coil control circuit
ECM malfunction
Open in coil control circuit

1. System Relay Test

1. Remove the system relay.
2. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
3. Is the system relay OK?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the system relay. See the service manual.

2. System Relay Coil Power Circuit Test

1. With IGN ON and the engine stop switch in RUN, using a multimeter, test for voltage at [64-1B] socket terminal 4D.
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (W/BK) wire.

3. System Relay Coil Control Short to Ground Test

1. With IGN OFF, disconnect the ECM [78].
2. Test for continuity from [64-1B] socket terminal 3C to ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (GN/O) wire.
 - b. **No.** [Go to Test 4.](#)

4. System Relay Coil Control Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Test for continuity between [64-1B] socket terminal 3C and breakout box terminal 27.
3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (GN/O) wire.

DTC P1002

Table 6-51. DTC P1002 Diagnostic Faults

POSSIBLE CAUSES
Relay malfunction
Short to voltage in coil control circuit
ECM malfunction

1. System Relay Test

1. Remove the system relay.
2. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
3. Is the system relay OK?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the system relay. See the service manual.

2. System Relay Coil Short to Voltage Test

1. Test for voltage between [64-1B] socket terminal 3C and ground.
2. Is voltage present?
 - a. **Yes.** Repair short to voltage in (GN/O) wire.
 - b. **No.** Replace the ECM. See the service manual.

DTC P1003

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

Table 6-52. DTC P1003 Diagnostic Faults

POSSIBLE CAUSES
Relay malfunction
ECM malfunction
Open in switch output circuit
Short to ground in the switch supply circuit
Open in switch supply circuit

1. System Relay Test

1. Remove the system relay.
2. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
3. Is the system relay OK?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the system relay. See the service manual.

2. System Relay Power Supply Test

1. Test for voltage between [64-1B] socket terminal 3D and ground.

2. Is battery voltage present?

a. **Yes.** [Go to Test 3.](#)

b. **No.** [Go to Test 4.](#)

3. System Relay Switch Side Circuit Test

1. Disconnect the rear fuel injector [85].

2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [64-1B] socket terminal 4C and [85B] terminal A.

3. Is continuity present?

a. **Yes.** Replace the ECM. See the service manual.

b. **No.** Repair open in (Y/GN) wire.

4. System Relay Power Supply Circuit Test

1. Test for continuity between [64-1B] socket terminal 3D and ground.

2. Is continuity present?

a. **Yes.** Repair short to ground in (BE/GY) wire and replace ECM fuse.

b. **No.** Repair open in power supply to system relay. This includes the (BE/GY) wire, ECM fuse and the (R) wire between the ECM and 40A main fuse.

DTC P1004

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-53. DTC P1004 Diagnostic Faults

POSSIBLE CAUSES
Relay malfunction
Short to voltage in the switch circuit
Short to ground in coil control circuit
Short to voltage rear coil control circuit
Short to voltage front coil control circuit

1. System Relay Test

1. Remove the system relay.

2. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).

3. Is the system relay OK?

a. **Yes.** [Go to Test 2.](#)

b. **No.** Replace the system relay. See the service manual.

2. System Relay Switch Side Short to Voltage Test

1. Using a multimeter, test for voltage on [64-1B] socket terminal 4C.

2. Is voltage present?

a. **Yes.** Repair short to voltage in (Y/GN) wire.

b. **No.** [Go to Test 3.](#)

3. System Relay Coil Short to Ground Test

1. Disconnect the ECM [78].

2. Test for continuity between [64-1B] socket terminal 3C and ground.

3. Is continuity present?

a. **Yes.** Repair short to ground on (GN/O) wire.

b. **No.** [Go to Test 4.](#)

4. Rear Ignition Coil Short to Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).

2. With IGN ON, test for voltage on breakout box terminal 53 to ground.

3. Is voltage present?

a. **Yes.** Repair short to voltage on (Y/BE) wire.

b. **No.** [Go to Test 5.](#)

5. Front Ignition Coil Short to Voltage Test

1. With IGN ON, test for voltage on breakout box terminal 54 to ground.

2. Is voltage present?

a. **Yes.** Repair short to voltage on (BE/O) wire.

b. **No.** Replace the ECM. See the service manual.

DTC P1009, P1010

6.17

DESCRIPTION AND OPERATION

Password Problem

The ECM, TSM/TSSM/HFSM, ABS and speedometer exchange passwords during operation. An incorrect password or missing password will set a diagnostic code. Refer to [Table 2-1](#).

NOTE

If the TSM/TSSM/HFSM is not connected to the wiring harness, the vehicle will not start.

Table 6-54. Code Description

DTC	DESCRIPTION
P1009	Incorrect password
P1010	Missing password

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

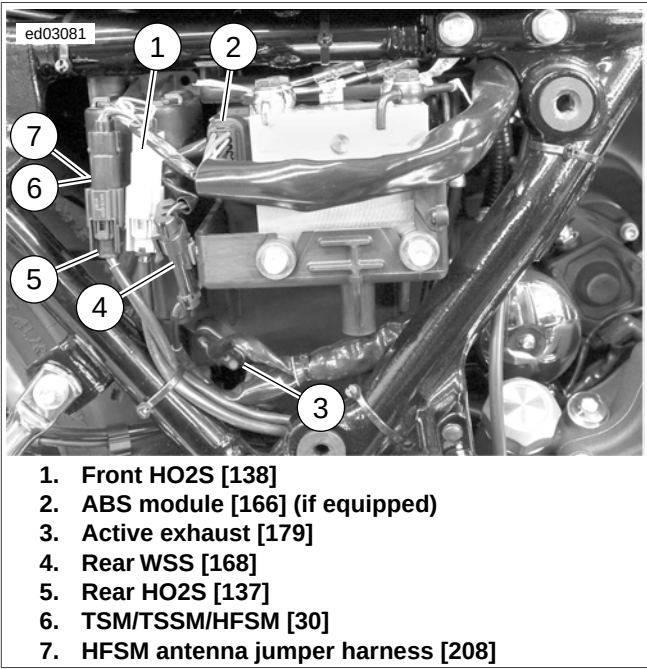


Figure 6-26. Under Right Side Cover



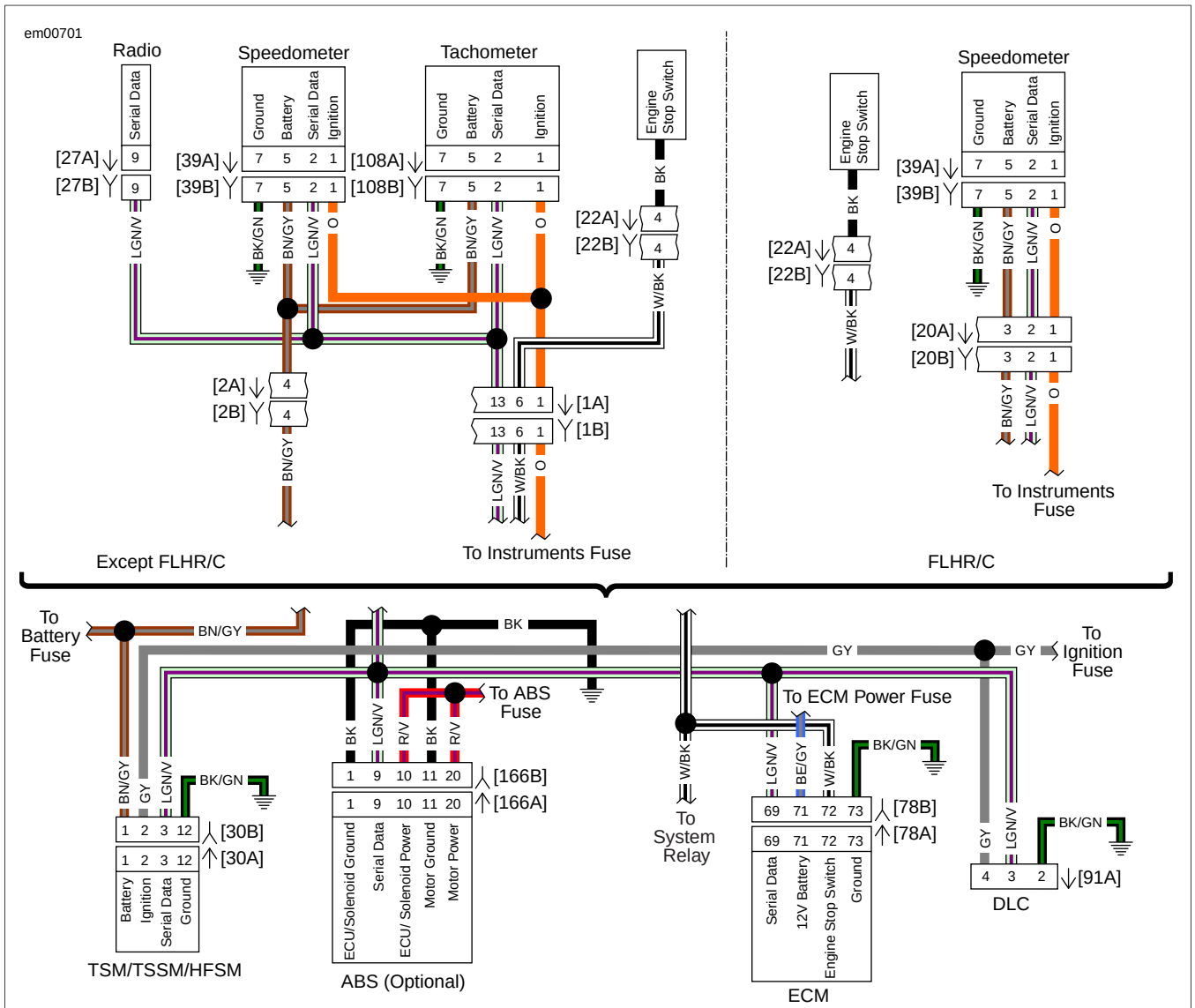


Figure 6-27. Serial Data Circuit

DTC P1009, P1010

Table 6-55. DTC P1009, P1010 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
TSM/TSSM/HFSM malfunction

1. Incorrect Password Test

1. Program password. See the service manual.

2. Does DTC P1009 or P1010 set?

- a. **Yes.** [Go to Test 2.](#)
- b. **No.** System okay.

2. TSM/TSSM/HFSM Replacement Test

1. Replace TSM/TSSM/HFSM. See the service manual.
2. Program password. See the service manual.
3. Does DTC P1009 or P1010 set?
 - a. **Yes.** Install original TSM/TSSM/HFSM and replace ECM. See the service manual.
 - b. **No.** System okay.

DTC P1270

6.18

DESCRIPTION AND OPERATION

TGS2 Validation

Within the ECM, there are two independent Analog/Digital (A/D) converter modules used to validate the input of Twist Grip Sensor 2 (TGS2). TGS2 inputs are sent into both converter modules and if the output of the two readings are not within the designated value of each other, for a specified time, then DTC P1270 fault is initiated.

Unless the ECM has a poor or intermittent connection, DTC P1270 indicates the ECM is defective and requires replacement. See the service manual for replacement information.

NOTE

After replacing the ECM, perform password learning procedure and clear codes.

Table 6-56. Code Description

DTC	DESCRIPTION
P1270	TGS2 validation error

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



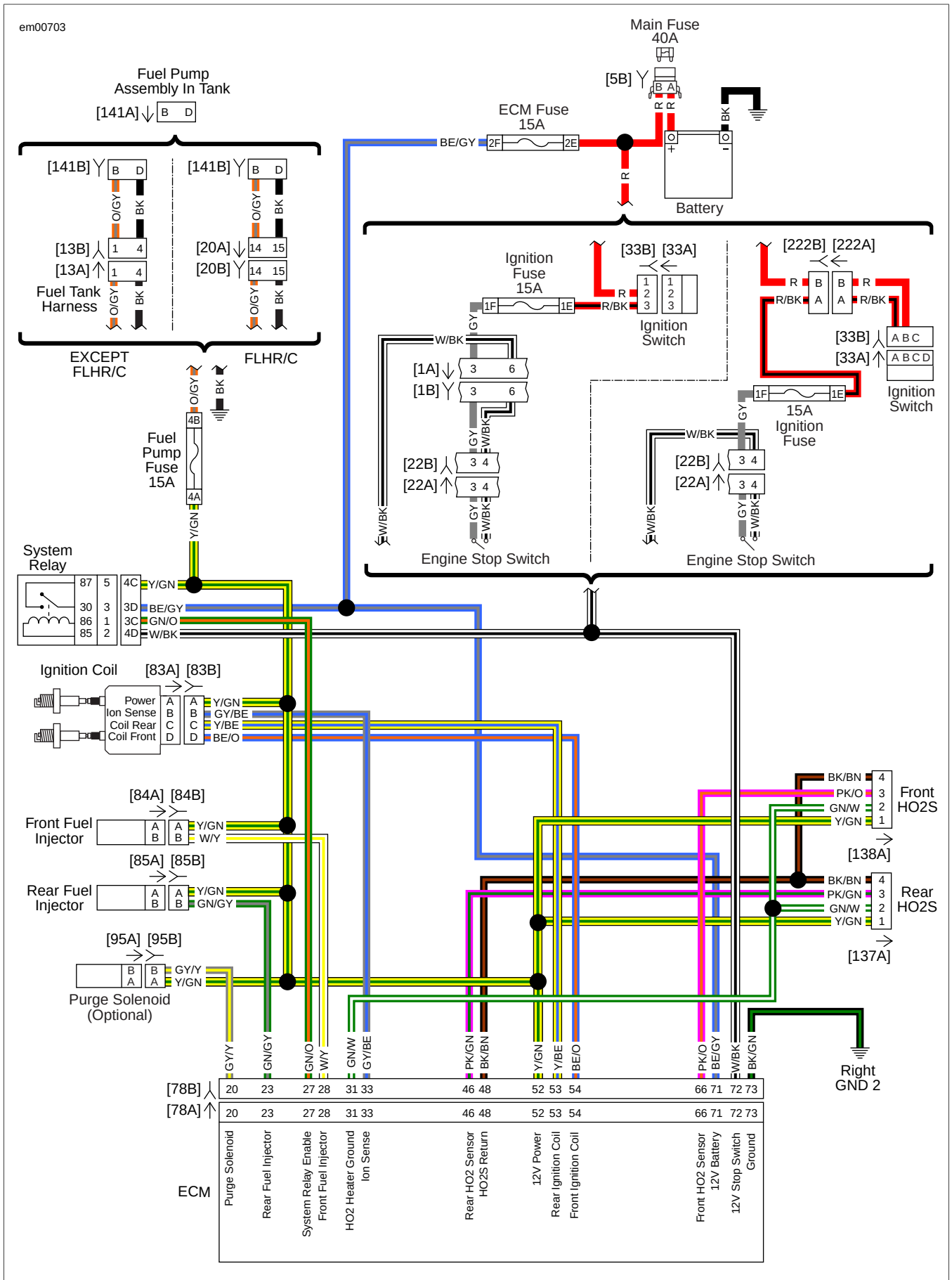


Figure 6-28. System Relay Circuit

DTC P1270

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-57. DTC P1270 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Open system relay supply circuit
System relay malfunction

1. ECM Connector Test

1. With IGN OFF, disconnect ECM [78] and inspect for damaged, corroded or pushed out terminals.
2. Are terminal problems present?
 - a. **Yes.** Repair terminals as required.
 - b. **No.** [Go to Test 2.](#)

2. ECM Circuit Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Start the engine.
3. Test for voltage between breakout box terminal 52 and ground. Voltage is not present unless motorcycle is running or at IGN ON for 2 seconds.
4. Is battery voltage present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Relay Circuit Test

1. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
2. Is the relay good?
 - a. **Yes.** Repair open or high resistance in (Y/GN) wire.
 - b. **No.** Replace the system relay.



DTC P1351, P1352, P1354, P1355

6.19

DESCRIPTION AND OPERATION

Ignition coil DTCs will set if the ignition coil primary voltage is out of range. This could occur if there is an open coil or loss of power to the coil. If front and rear DTCs are set simultaneously, it is likely a coil power failure or a coil failure.

The coil receives power from the system relay at the same time that the fuel pump and injectors are activated. The system relay is active for the first 2 seconds after the ignition switch is turned ON and then shuts off until rpm is detected from the CKP sensor, at which time system relay is reactivated. The ECM is responsible for turning on the system relay by providing the ground to activate the relay, which in turn powers the coil.

Table 6-58. Code Description

DTC	DESCRIPTION
P1351	Front ignition coil open/low
P1352	Front ignition coil high/shorted
P1354	Rear ignition coil open/low
P1355	Rear ignition coil high/shorted

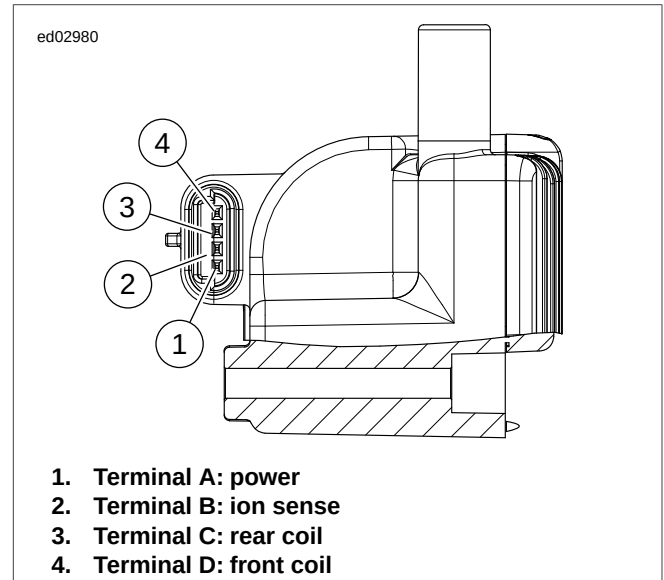


Figure 6-29. Ignition Coil

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



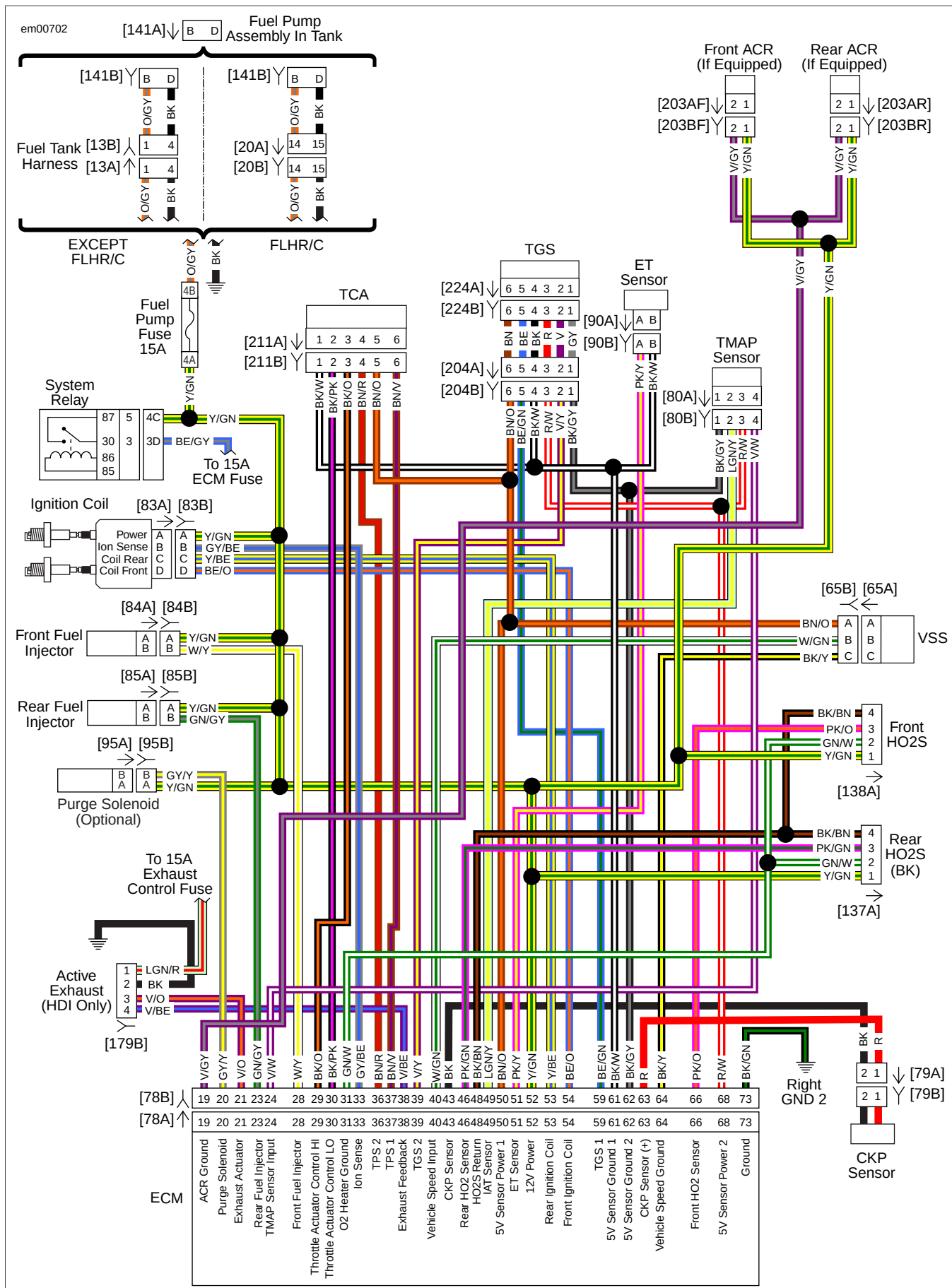


Figure 6-30. EFI Simplified Schematic

DTC P1351

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-59. DTC P1351 Diagnostic Faults

POSSIBLE CAUSES
Ignition coil malfunction
ECM malfunction
Open or short to ground in signal circuit
Open power circuit

1. Ignition Coil Test

1. Disconnect ignition coil [83]. Inspect for damaged or backed out terminals and corrosion. Repair as required.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) to connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) into ignition coil harness [83B] terminals A and D.
3. Turn IGN ON and engine stop switch to RUN.
4. Does lamp flash when engine is cranked?
 - a. **Yes.** Replace ignition coil. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Ignition Coil Input Voltage Test

1. Disconnect the system relay.
2. Turn IGN ON. Voltage will only be present for 2 seconds after ignition is turned on.
3. Test for battery voltage at ignition coil [83B] terminal A to ground.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open (Y/GN) wire between [83B] and system relay [64-1B] terminal 4C.

3. Ignition Coil Control Wire Continuity Test

1. Turn IGN OFF and engine stop switch to RUN.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between breakout box terminal 54 and ignition coil [83B] terminal D (BE/O).
4. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open (BE/O) wire.

4. Ignition Coil Control Wire Shorted to Ground Test

1. Disconnect ECM [78A] from breakout box.
2. Test for continuity between breakout box terminals 54 and 73.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (BE/O) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P1352

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

Table 6-60. DTC P1352 Diagnostic Faults

POSSIBLE CAUSES
Front ignition coil malfunction
ECM malfunction
Short to voltage in signal circuit

1. Ignition Coil Shorted to Voltage Test

1. Disconnect ignition coil [83].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between ignition coil [83B] terminal D and ground.
4. Is voltage more than 1.0V?
 - a. **Yes.** Repair short to voltage on (BE/O) wire.
 - b. **No.** [Go to Test 2.](#)

2. Ignition Coil Open Test

1. Test resistance between front ignition coil [83A] terminals A and D.
2. Is resistance greater than 4.0 Ohms?
 - a. **Yes.** If ECM connections are good, replace ECM. See the service manual.
 - b. **No.** Replace ignition coil. See the service manual.

DTC P1354

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-61. DTC P1354 Diagnostic Faults

POSSIBLE CAUSES
Rear ignition coil malfunction
ECM malfunction
Open or short to ground in signal circuit
Open power circuit

1. Ignition Coil Test

1. Disconnect ignition coil [83]. Inspect for damaged or backed out terminals and corrosion. Repair as required.
2. Turn IGN OFF.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) to connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D) into ignition coil harness [83B] terminals A and C.
4. Turn IGN ON and engine stop switch to RUN.
5. Does lamp flash when engine is cranked?
 - a. **Yes.** Replace ignition coil. See the service manual.
 - b. **No.** [Go to Test 2.](#)

2. Ignition Coil Input Continuity Test

1. Disconnect the system relay.
2. Test for continuity between system relay [64-1B] socket terminal 4C and [83B] terminal A.
3. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open (Y/GN) wire between [83B] and system relay [64-1B] terminal 4C.

3. Ignition Coil Control Wire Continuity Test

1. Turn IGN OFF and engine stop switch to RUN.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
3. Test for continuity between breakout box terminal 53 and ignition coil [83B] terminal C (Y/BE).

4. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open (Y/BE) wire.

4. Ignition Coil Control Wire Shorted to Ground Test

1. Disconnect ECM [78A] from breakout box.
2. Test for continuity between breakout box terminals 53 and 73.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (Y/BE) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P1355

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

Table 6-62. DTC P1355 Diagnostic Faults

POSSIBLE CAUSES
Rear ignition coil malfunction
ECM malfunction
Short to voltage in signal circuit

1. Ignition Coil Shorted to Voltage Test

1. Disconnect ignition coil [83B].
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), using a multimeter, measure voltage between ignition coil [83B] terminal C and ground.
4. Is voltage more than 1.0V?
 - a. **Yes.** Repair short to voltage on (Y/BE) wire.
 - b. **No.** [Go to Test 2.](#)

2. Ignition Coil Open Test

1. Measure resistance between rear ignition coil [83A] terminals A and C.
2. Is resistance greater than 4.0 Ohms?
 - a. **Yes.** If ECM connections are good, replace ECM. See the service manual.
 - b. **No.** Replace ignition coil. See the service manual.

DTC P1353, P1356, P1357, P1358

6.20

DESCRIPTION AND OPERATION

See [Figure 6-31](#). A feedback voltage signal in the secondary ignition circuit (terminal B) detects the presence of combustion each time a cylinder fires on ECM terminal 33. For diagnostic purposes, this signal is only analyzed at high speed and load conditions where it may be easily measured. Failure to detect combustion at high speed and load means one of following conditions is true:

- Cylinder is truly misfiring.
- There is a lack of continuity in the ignition coil secondary circuit.

NOTE

Make sure vehicle is running properly before performing the tests in this section. Perform fuel pressure tests if required. See the service manual. If fuel pressure is not within the proper range, see [6.36 FUEL SYSTEM ELECTRICAL TEST](#).

Table 6-63. Code Description

DTC	DESCRIPTION
P1353	Front cylinder no combustion
P1356	Rear cylinder no combustion
P1357	Front cylinder combustion intermittent
P1358	Rear cylinder combustion intermittent

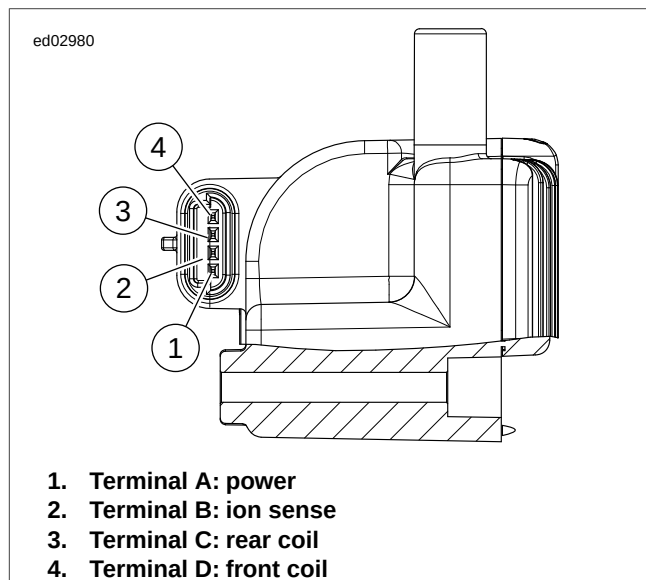


Figure 6-31. Ignition Coil

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

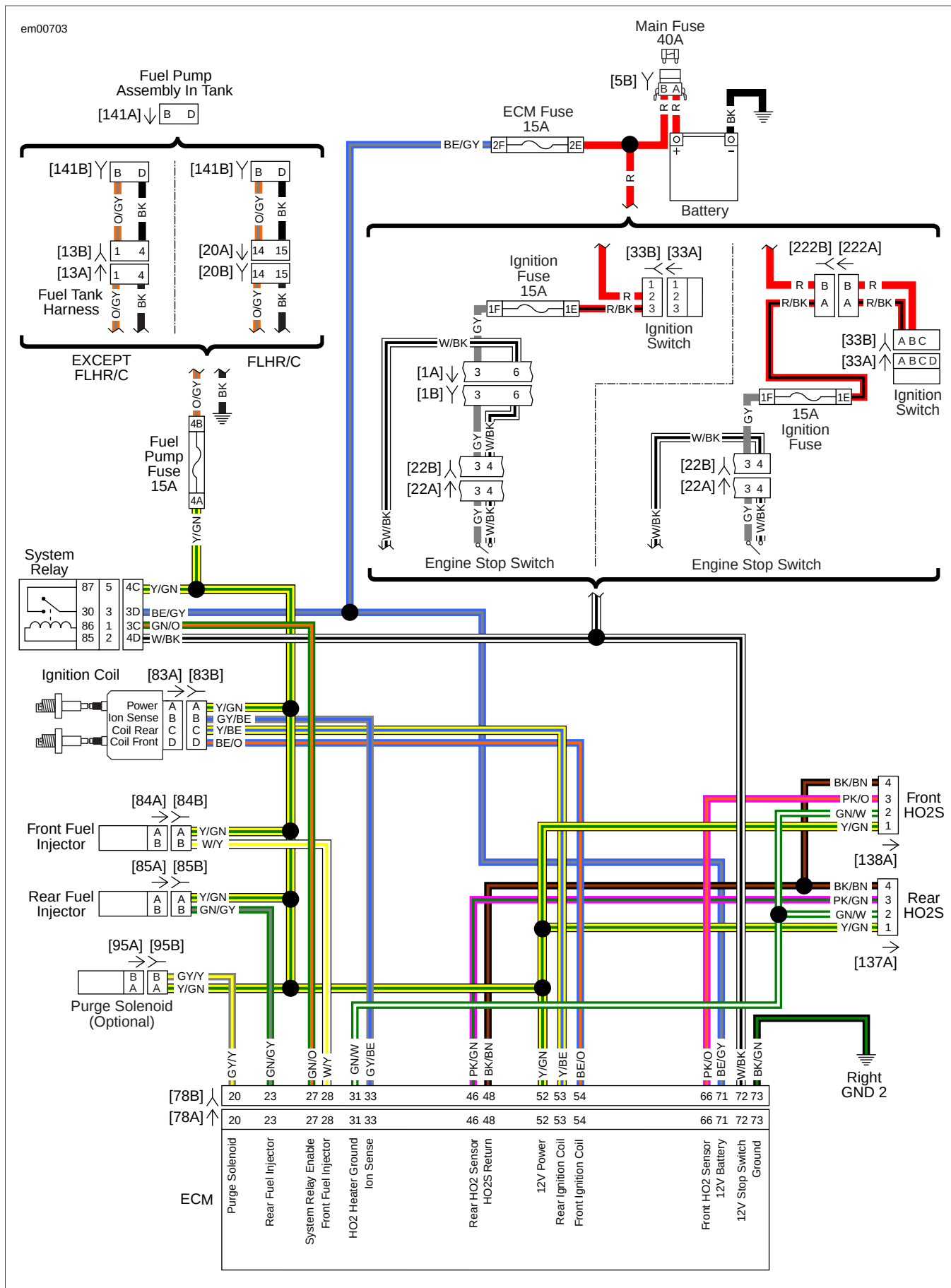


Figure 6-32. System Relay Circuit

DTC P1353, P1356

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

Table 6-64. DTC P1353, P1356 Diagnostic Faults

POSSIBLE CAUSES
Ignition coil malfunction
ECM malfunction
Fuel system problems
Open or short to voltage in signal circuit
Spark plug wire connections faulty

1. Absence of Fuel Test

1. Verify vehicle has fuel.
2. Has vehicle run out of fuel recently?
 - a. **Yes.** Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#). Fill with fresh fuel and restart. If code returns, then continue with tests. [Go to Test 2.](#)
 - b. **No.** [Go to Test 2.](#)

2. Ignition Coil Primary Resistance Test

1. Disconnect ignition coil [83].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure resistance between ignition coil [83A] terminals A and C, and then from terminals A and D.
3. Is resistance 0.3-0.5 Ohms?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace the ignition coil. See the service manual.

3. Spark Plug Wire Test

1. Disconnect the spark plug wires.
2. Measure the resistance of the spark plug wires.
3. Is the front and rear spark plug wire resistance within the specified range? Refer to [Table 1-6](#).
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Replace the out of range spark plug wire. See the service manual.

4. Ignition Coil Secondary Resistance Test

1. Measure resistance between ignition coil [83A] terminal A to the front coil secondary. Repeat measurement for the rear coil secondary.

2. Is resistance 3500-4500 Ohms?
 - a. **Yes.** Replace spark plug. See the service manual.
 - b. **No.** Replace the ignition coil. See the service manual.

DTC P1357, P1358

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-65. DTC P1357, P1358 Diagnostic Faults

POSSIBLE CAUSES
Ignition coil malfunction
ECM malfunction
Fuel system problems
Open or short to voltage in signal circuit
Spark plug wire connections faulty

1. Ion Sense Continuity Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between the ignition coil [83B] terminal B and breakout box terminal 33.
3. Is continuity present?
 - a. **Yes.** Replace spark plug. See the service manual. If condition persists, then continue with tests. [Go to Test 2.](#)
 - b. **No.** Repair open in (GY/BE) wire.

2. Ion Sense Resistance Test

1. Measure resistance between ignition coil [83A] terminals A and B.
2. Is resistance greater than 100,000 Ohms?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Ion Sense Short to Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. With IGN ON, test for voltage between ignition coil [83B] terminal B and breakout box terminal 73.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on (GY/BE) wire.
 - b. **No.** Replace ignition coil. See the service manual.

DTC P1475, P1477, P1478

6.21

DESCRIPTION AND OPERATION

Active exhaust actuator is included on HDI vehicles only.

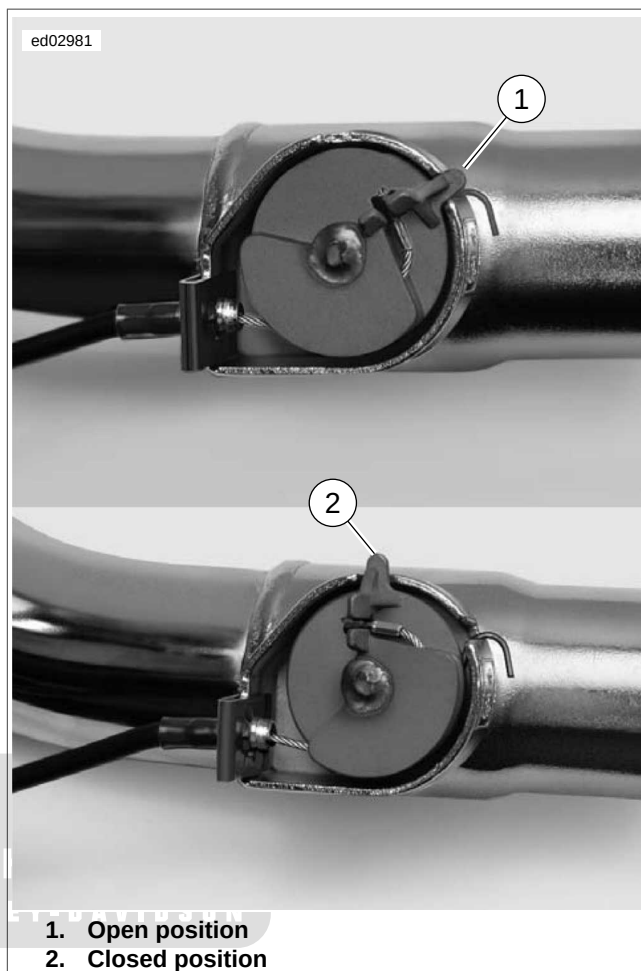
The active exhaust actuator system utilizes an actuator valve located in the rear exhaust pipe which is connected to a servo motor via a cable. The valve position automatically adjusts to enhance engine performance.

Table 6-66. Code Description

DTC	DESCRIPTION
P1475	Exhaust actuator position failure
P1477	Exhaust actuator open/low
P1478	Exhaust actuator high

NOTE

The AIS and active exhaust actuator share the same power source and function simultaneously.



1. Open position
2. Closed position

Figure 6-33. Bellcrank

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

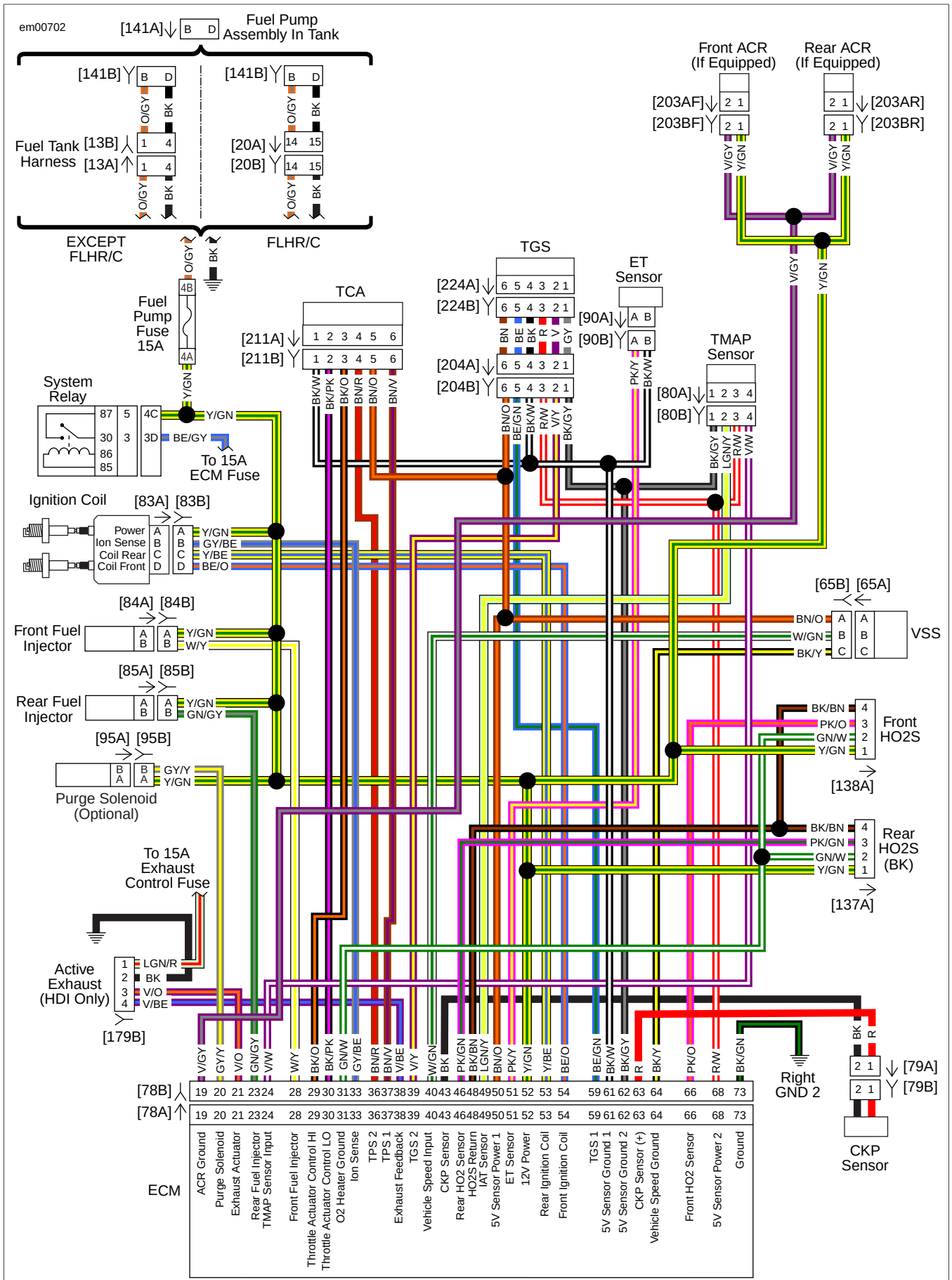


Figure 6-34. EFI Simplified Schematic

DTC P1475

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-67. DTC P1475 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Exhaust actuator malfunction
Open in ground circuit
Open in power circuit
Open in exhaust feedback circuit
Short to voltage in exhaust feedback circuit
Short to ground in exhaust feedback circuit

1. Exhaust Actuator Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jump breakout box terminal 21 to terminal 73.
3. Turn IGN ON.
4. Does actuator activate immediately?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Check exhaust control fuse. If fuse is okay, then continue with tests. [Go to Test 2.](#)

2. Exhaust Actuator Voltage Test

1. Disconnect exhaust actuator [179].
2. With IGN ON, measure the voltage between [179B] terminals 1 and 2.
3. Is battery voltage present?
 - a. **Yes.** Check the cable and bellcrank assembly from exhaust actuator to exhaust valve for proper operation. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Exhaust Actuator Motor Ground Wire Continuity Test

1. Turn IGN OFF.
2. Test for continuity between active exhaust actuator [179B] terminal 2 and ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open on (BK) wire.

4. Exhaust Actuator Motor Power Wire Continuity Test

1. With IGN OFF, test for continuity between active exhaust actuator [179B] terminal 1 and [64-1B] socket terminal 3B.

2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open on (LGN/R) wire.

5. Exhaust Actuator Feedback Voltage Test

1. Turn IGN ON.
2. Measure the voltage between breakout box terminal 38 and terminal 73.
3. Is voltage 4.5-5.5V?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No. Battery voltage.** [Go to Test 9.](#)
 - c. **No. 0V.** [Go to Test 10.](#)

6. Exhaust Actuator Feedback Continuity Test

1. Turn IGN OFF, disconnect exhaust actuator [179].
2. Using a multimeter, test for continuity between [179B] terminal 4 and breakout box terminal 38.
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open wire (V/BE).

7. Exhaust Actuator Feedback Control Test

1. Connect the exhaust actuator [179].
2. Turn IGN ON and engine stop switch to RUN.
3. Measure the voltage between breakout box terminal 38 and terminal 73.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), jump between breakout box terminals 21 and 73 several times.
5. Does the voltage change to less than 1.0V and the exhaust actuator valve open each time?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Replace active exhaust actuator. See the service manual.

8. Exhaust Actuator Feedback Run Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#). Start the engine.
2. Run the engine in neutral between 1500-2500 rpm.
3. Does the exhaust valve open at 1600 rpm or less and close at 1800 or more?
 - a. **Yes.** System okay.
 - b. **No.** Check connectors for damaged, pushed out or corroded pins. If no problems are found, replace ECM. See the service manual.

9. Exhaust Actuator Feedback Short to Voltage Test

1. With IGN OFF, disconnect ECM [78A] from breakout box.

2. With IGN ON and engine not running, test for voltage between breakout box terminal 38 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on (V/BE) wire.
 - b. **No.** Replace ECM. See the service manual.

10. Exhaust Actuator Feedback Short to Ground Test

1. Disconnect ECM [78A] from breakout box.
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter, test for continuity between active exhaust actuator [179B] terminal 4 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (V/BE) wire.
 - b. **No.** Replace ECM. See the service manual.

DTC P1477

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-68. DTC P1477 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Exhaust actuator malfunction
Open in exhaust actuator circuit
Short to ground in exhaust actuator circuit

1. Exhaust Actuator Motor Open Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect exhaust actuator [179].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for continuity between breakout box terminal 21 to [179B] terminal 3.
4. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open (V/O) wire.

2. Exhaust Actuator Motor Shorted to Ground Test

1. Connect ECM [78A] to breakout box.
2. Test for continuity between breakout box terminal 21 and ground.

3. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace ECM. See the service manual.

3. Exhaust Actuator Feedback Shorted to Ground Test

1. Disconnect exhaust actuator [179] and disconnect ECM [78A] from breakout box.
2. Test for continuity between breakout box terminal 21 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground on (V/O) wire.
 - b. **No.** Replace active exhaust actuator. See the service manual.

DTC P1478

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-69. DTC P1478 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Exhaust actuator malfunction
Short to voltage in exhaust actuator circuit

1. Exhaust Actuator Motor High Test

1. Connect BREAKOUT BOX (Part No. HD-48637) to harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON and engine stop switch to RUN.
3. Using a multimeter, test for voltage between breakout box terminal 21 and ground.
4. Is voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace ECM. See the service manual.

2. Exhaust Actuator Motor Shorted to Voltage Test

1. Disconnect exhaust actuator [179].
2. Using a multimeter, test for voltage between breakout box terminal 20 and ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on (V/O) wire.
 - b. **No.** Replace active exhaust control actuator. See the service manual.

DESCRIPTION AND OPERATION

See [Figure 6-36](#). The Jiffy Stand Sensor (JSS) uses a Hall-effect sensor to monitor jiffy stand position. When the jiffy stand is fully retracted the sensor picks up the presence of the metal tab mounted to the jiffy stand. The metal tab is moved away from the sensor as the jiffy stand is extended. When the jiffy stand is extended the engine will only start and run if the TSM/TSSM/HFSM determines the transmission is in neutral. Otherwise the engine will stall as the clutch is released. This is done by monitoring the neutral switch input to the TSM/TSSM/HFSM and communicating that input over the serial data circuit to the ECM.

The JSS is powered and monitored by the ECM. The ECM supplies the 5V reference to the JSS. The JSS sends a signal back to the ECM. This signal is used by the ECM to determine when the jiffy stand is retracted or extended. The JSS is grounded through the ECM.

The JSS also has a Fail Enable Mode. This mode allows the engine to start and run if the system recognizes a problem with the JSS circuit. When a problem exists or if the transmission is put in gear with the jiffy stand extended, the odometer will display "Slde Stand". DTC P1501 or P1502 will set if the JSS circuits are out of range.

NOTE

The ECM supplies 5V reference voltage to the VSS, TPS and MAP sensors, in addition to the JSS. Problems on the 5V reference will cause other DTCs.

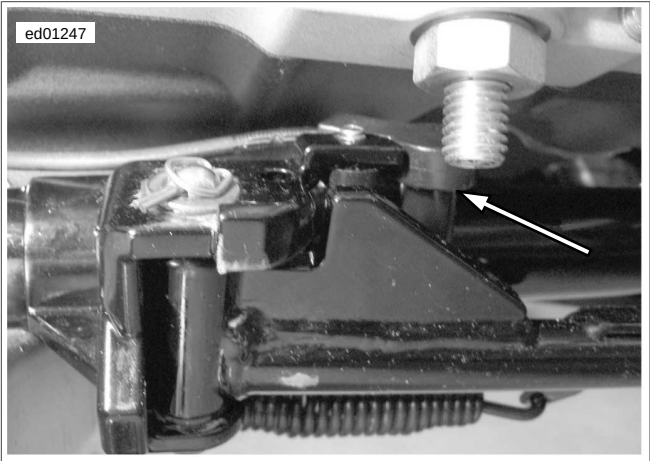


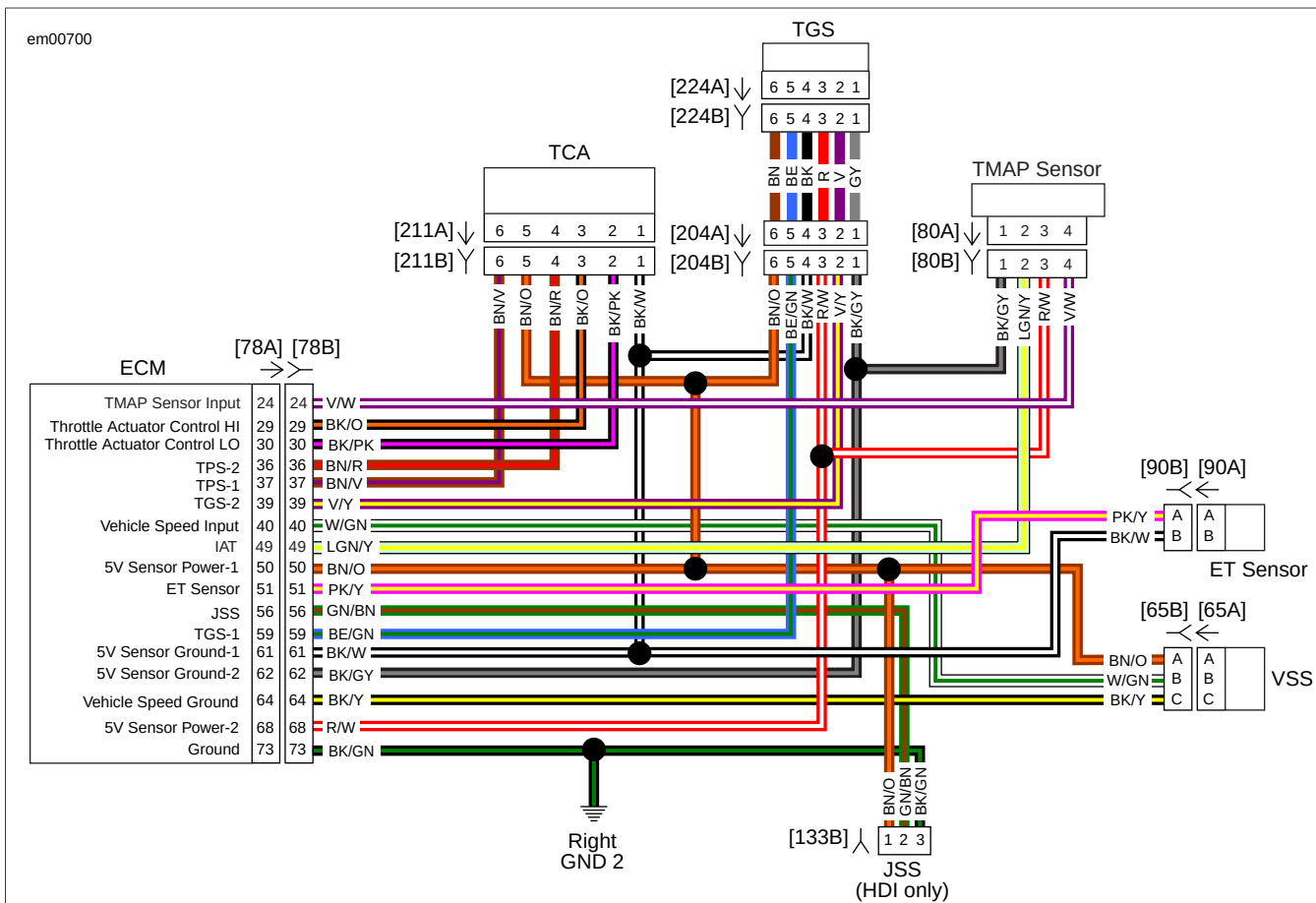
Figure 6-35. JSS

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

Table 6-70. Code Description

DTC	DESCRIPTION
P1501	JSS low
P1502	JSS high



DTC P1501

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-71. DTC P1501 Diagnostic Faults

POSSIBLE CAUSES
JSS malfunction
ECM malfunction
Open or short to ground in 5V reference circuit
Open or short to ground in signal circuit

1. JSS 5V Reference Open Circuit Test

1. Disconnect the JSS [133].
2. Inspect the connection for corrosion or backed out terminals. Repair as required.
3. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness [78B], leaving ECM [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
4. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity

between breakout box terminal 50 and JSS [133B] terminal 1 (BN/O).

5. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open on (BN/O) wire.

2. JSS 5V Reference Shorted to Ground Test

1. Test for continuity between JSS [133B] terminal 1 (BN/O) to ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (BN/O) wire.
 - b. **No.** [Go to Test 3.](#)

3. JSS Signal Wire Shorted to Ground Test

1. Test for continuity between breakout box terminal 56 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (GN/BN) wire.
 - b. **No.** [Go to Test 4.](#)

4. JSS Signal Wire Open Circuit Test

1. Test for continuity between breakout box terminal 56 and JSS [133B] terminal 2 (GN/BN).
2. Is continuity present?
 - a. **Yes.** Replace JSS. See the service manual.
 - b. **No.** Repair open on (GN/BN) wire.

DTC P1502

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

Table 6-72. DTC P1502 Diagnostic Faults

POSSIBLE CAUSES
JSS malfunction
ECM malfunction
Short to voltage in signal circuit
Open ground
Short to voltage in 5V reference circuit

1. JSS Ground Wire Test

1. Disconnect the JSS [133].
2. Using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between terminal 3 of [133B] and ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (BK/GN) wire.

2. JSS 5V Reference Wire Short to Voltage Test

1. Test for voltage at jiffy stand sensor [133B] terminal 1 (BN/O) wire.
2. Is voltage greater than 6V?
 - a. **Yes.** Repair short to battery voltage on (BN/O).
 - b. **No.** [Go to Test 3.](#)

3. JSS Signal Wire Short to Voltage Test

1. Test for voltage on [133B] terminal 2.

2. Is voltage greater than 5V?
 - a. **Yes.** Repair short to battery voltage in (GN/BN) wire.
 - b. **No.** [Go to Test 4.](#)

4. JSS 5V Reference and Signal Shorted Together Test

1. With IGN OFF, disconnect the ECM [78].
2. Test for continuity between terminals 1 and 2 of [133B].
3. Is continuity present?
 - a. **Yes.** Repair short between (BN/O) and (GN/BN) wires.
 - b. **No.** Replace JSS. See the service manual.

SIDE STAND DISPLAYED ON ODOMETER

Table 6-73. Side Stand Displayed on Odometer Diagnostic Faults

POSSIBLE CAUSES
Jiffy stand is down
Jiffy stand out of adjustment

1. Starts, Then Stalls Test

1. Check for DTCs and diagnose them first.
2. Does the engine start and stall?
 - a. **Yes.** See [6.35 STARTS, THEN STALLS.](#)
 - b. **No.** [Go to Test 2.](#)

2. Neutral Test

1. Verify the transmission is in neutral.
2. Is the neutral indicator on?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** See [4.5 INDICATOR LAMPS.](#)

3. JSS Clearance Test

1. Inspect the JSS and the jiffy stand for correct mounting and clearance to the jiffy stand tab.
2. Is the clearance less than 0.18 in (4.5 mm)?
 - a. **Yes.** Replace the JSS. See the service manual.
 - b. **No.** Install the JSS and jiffy stand correctly. See the service manual.

DTC P1510, P1511, P1512

6.23

DESCRIPTION AND OPERATION

Throttle Actuation Control Management

The ECM constantly monitors throttle actuation and throttle component positioning. Several safety features are programmed into the ECM to limit performance when an error or fault in throttle actuation is detected. These DTCs always accompany another code. Refer to [Table 6-74](#).

Table 6-74. Code Description

DTC	DESCRIPTION
P1510	Throttle actuator control limited performance mode
P1511	Throttle actuator control power management mode
P1512	Throttle actuator control forced idle mode

Performance limitations are identified by code, as follows:

- **P1510 Limited Performance:** Enables near normal operation of the vehicle, guarding against inadvertent wide open throttle conditions. Typically this code is the result if one of the TGS or TP sensors, or one of each, has failed.
- **P1511 Power Management:** Provides more limitation on driveability, due to failure of the TCA, without a TGS, MAP or airflow faults. The TCA is de-energized and the throttle plate returns to its idle detent position. The ECM monitors the operation of the TGS and adjusts the spark advance

and cylinder shutoff/rev limiting, allowing the vehicle to reach traffic speeds (limp-home).

- **P1512 Forced Idle Mode:** Provides extreme limitation of driveability, due to a failure of both TGS, TGS validation error or failure of one TGS and the brake switch. The TCA is de-energized and the throttle plate is forced to a fast idle position providing enough torque to operate at a high idle speed.

DTC P1510, P1511, P1512

Table 6-75. DTC P1510, P1511, P1512 Diagnostic Faults

POSSIBLE CAUSES
Other DTCs set
ECM malfunction

1. DTC Verification Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start and run the engine for a few seconds.
3. Cycle the engine on and off, for a few seconds each time a total of three times.
4. Did DTC P1510, P1511 or P1512 set with no other DTCs?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No. Other DTCs set.** Refer to [Table 2-1](#).
 - c. **No. No DTCs set.** DTC was properly cleared.

DTC P1514

6.24

DESCRIPTION AND OPERATION

Air Flow Fault

The ECM uses the TMAP sensor to monitor air flow past the throttle plate. This ensures proper throttle plate positioning, when the throttle is released and allowed to return to the unpowered position. The unpowered position is typically 7% of throttle plate range.

In order to avoid inconsistent readings at low rpm (or at idle), testing air flow is only performed at engine speeds above normal idle (10% of throttle plate range or approximately 1300 rpm).

The ECM compares the intake manifold pressure value from the TMAP to the throttle plate position value from the TPS. DTC 1514 sets if the manifold pressure is higher than it should be for that given throttle plate position for three consecutive ignition cycles. If a TMAP sensor error is present, then the ECM does not check P1514 parameters and instead P2105 (forced shutdown mode) is initiated, shutting down the fuel pump and fuel injectors. See [6.28 DTC P2105, P2107](#). The

ECM only checks for DTC P1514 if power management mode (DTC P1511) is present.

Table 6-76. Code Description

DTC	DESCRIPTION
P1514	Air flow fault

DTC P1514

Table 6-77. DTC P1514 Diagnostic Faults

POSSIBLE CAUSES
Other DTCs set
ECM malfunction

1. DTC Verification Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start and run the engine for a few seconds.
3. Cycle the engine on and off, for a few seconds each time a total of three times.
4. Did DTC P1514 set with no other DTCs?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No. Other DTCs set.** Refer to [Table 2-1](#).
 - c. **No. No DTCs set.** DTC was properly cleared.



DTC P1600

6.25

DESCRIPTION AND OPERATION

The ECM uses a main microprocessor and a monitoring microcontroller, to communicate with the throttle actuation control system.

The microcontroller monitors the main microprocessor of the ECM, and when a communication failure is identified, the microcontroller shuts down the TCA and fuel injectors.

An internal ignition delay timer monitors when the ignition circuit is energized. The microcontroller issues DTC P1600 if no communication is established between the main microprocessor or if a monitoring failure occurs within three consecutive ignition cycles.

Table 6-78. Code Description

DTC	DESCRIPTION
P1600	TCA module processor - internal fault

DTC P1600

Table 6-79. DTC P1600 Diagnostic Faults

POSSIBLE CAUSES
Other DTCs set
ECM malfunction

1. DTC Verification Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start and run the engine for a few seconds.
3. Cycle the engine on and off, for a few seconds each time a total of three times.
4. Did DTC P1600 set with no other DTCs?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No. Other DTCs set.** Refer to [Table 2-1](#).
 - c. **No. No DTCs set.** DTC was properly cleared.



DTC P1655, P1656

6.26

DESCRIPTION AND OPERATION

See [Figure 6-37](#). The Automatic Compression Release (ACR) is opened and closed by the ECM to assist starting.

See [Figure 6-38](#). When open, compressed gases are released through the exhaust port.

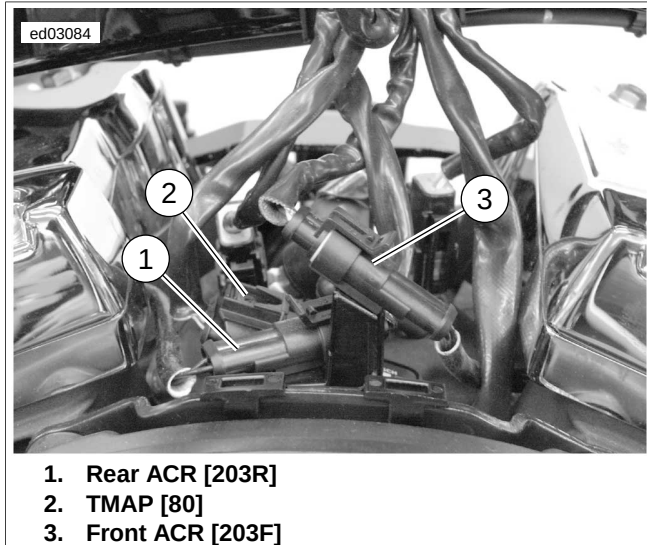


Figure 6-37. Between Cylinders Right Side

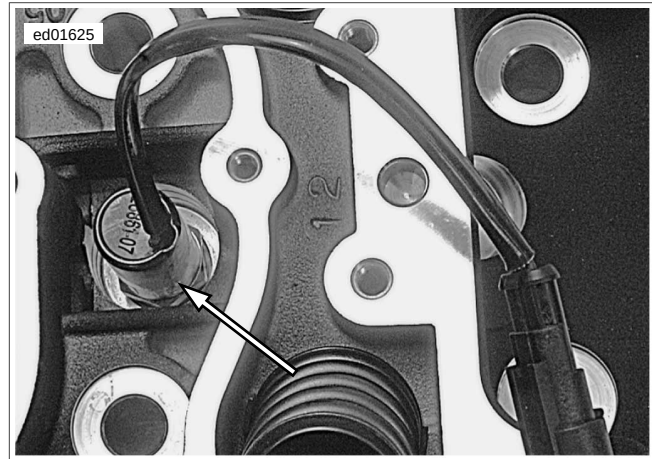


Figure 6-38. ACR in Head

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



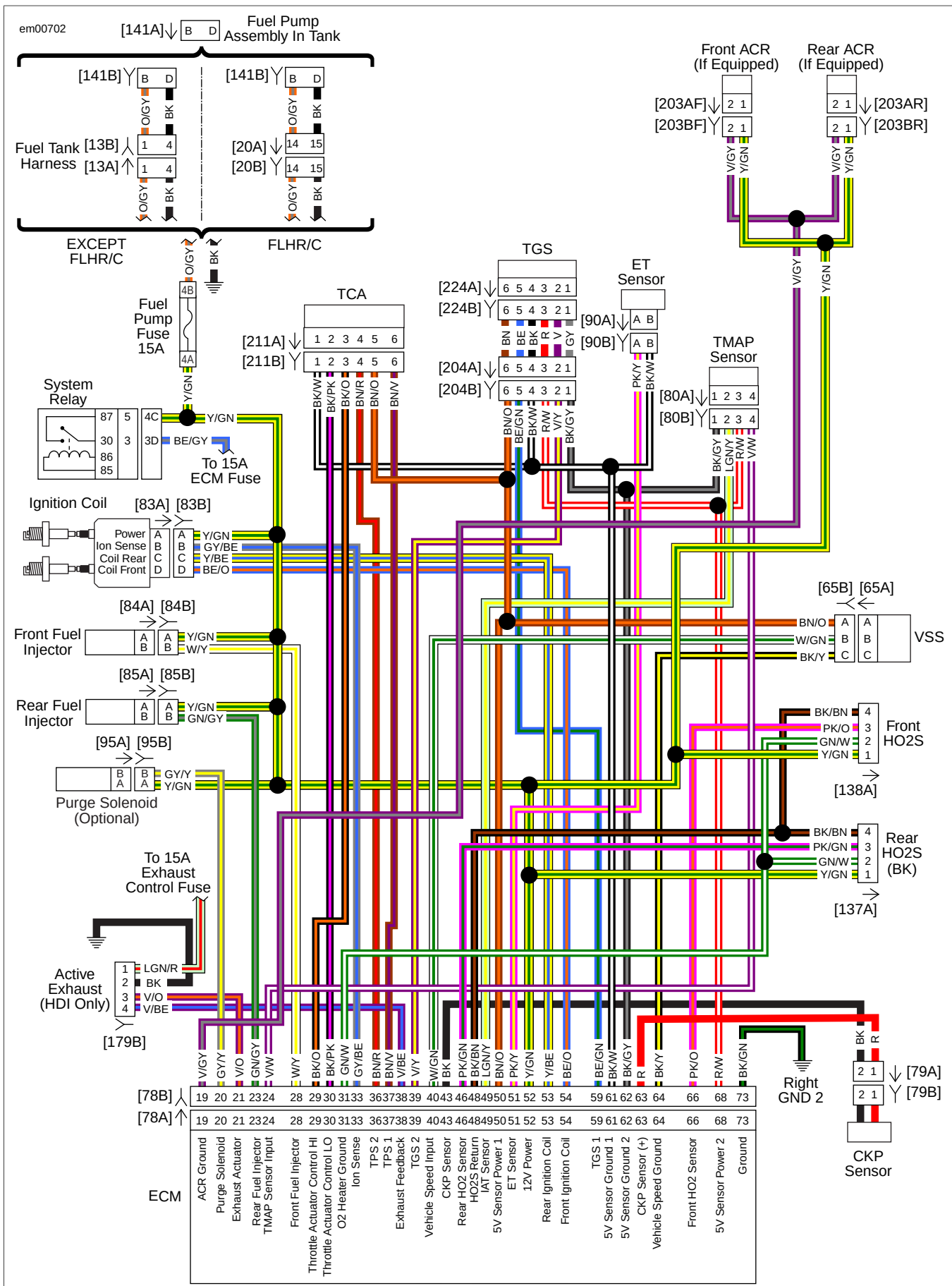


Figure 6-39. EFI Simplified Schematic

DTC P1655

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-80. DTC P1655 Diagnostic Faults

POSSIBLE CAUSES
ACR solenoid malfunction
Open in ACR control circuit
Open in system relay circuit
ECM malfunction
Short to ground in ACR control circuit

1. Front ACR Test

1. Disconnect front ACR [203F].
2. Connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D).
3. Crank engine for 5 seconds.
4. Does the test light flash on and off?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No, test light stays on steady.** [Go to Test 4.](#)
 - c. **No, did not stay on steady.** [Go to Test 6.](#)

2. Rear ACR Test

1. Disconnect rear ACR [203R].
2. Connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D).
3. Crank engine for 5 seconds.
4. Does the test light flash on and off?
 - a. **Yes.** Replace front and rear ACR solenoids. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Rear ACR Control Circuit Test

1. While cranking the engine, test for voltage between [203RB] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open between [203RB] and [78] (V/GY) wire.
 - b. **No.** Repair open in (Y/GN) wire.

4. Front ACR Control Circuit Short to Ground Test

1. Turn IGN OFF.
2. Disconnect ECM [78].
3. Test for continuity between [203FB] terminal 2 and ground.

4. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace the ECM. See the service manual.

5. Rear ACR Control Circuit Short to Ground Test

1. Disconnect rear ACR [203RB].
2. Test for continuity between [203FB] terminal 2 and ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground in (V/GY) wire.
 - b. **No.** Replace front and rear ACR solenoids. See the service manual.

6. Shorted ACR Test

1. Disconnect rear ACR [203RB].
2. Crank engine for 5 seconds.
3. Does the test light flash on and off?
 - a. **Yes.** Replace front and rear ACR solenoids. See the service manual.
 - b. **No.** [Go to Test 7.](#)

7. ACR Supply Circuit Open Test

1. Disconnect the test light.
2. While cranking the engine, test for voltage between [203FB] terminal 1 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in (Y/GN) wire.

8. ACR Control Circuit Continuity Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A] leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 19 and [203FB] terminal 2.
3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (V/GY) wire.

DTC P1656

PART NUMBER	TOOL NAME
HD-34730-2D	FUEL INJECTOR TEST LIGHT
HD-41404-C	HARNESS CONNECTOR TEST KIT

Table 6-81. DTC P1656 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in ACR control circuit
ACR solenoid malfunction
ECM malfunction

1. Front ACR Test

1. Disconnect front ACR [203F].
2. Connect FUEL INJECTOR TEST LIGHT (Part No. HD-34730-2D).
3. Crank engine for 5 seconds.
4. Does the test light flash on and off?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 3.](#)

2. Rear ACR Control Circuit Test

1. Disconnect rear ACR [203R].
2. While cranking the engine, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multi-

meter, test for measure voltage between [203FB] terminal 2 and ground.

3. Is voltage greater than 1.0V?
 - a. **Yes.** Repair short to voltage between [203FB] terminal 2 and [78B] terminal 19.
 - b. **No.** Replace front and rear ACR solenoids. See the service manual.

3. Rear ACR Test

1. Disconnect rear ACR [203R].
2. Crank engine for 5 seconds.
3. Does the test light flash on and off?
 - a. **Yes.** Replace front and rear ACR solenoids. See the service manual.
 - b. **No.** [Go to Test 4.](#)

4. Front ACR Control Circuit Test

1. Disconnect fuel injector test light.
2. While cranking the engine, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multi-meter, test for voltage between [203FB] terminal 2 and ground.
3. Is voltage greater than 1.0V?
 - a. **Yes.** Repair short to voltage between [203FB] terminal 2 and ECM [78B] terminal 19.
 - b. **No.** Replace the ECM. See the service manual.



DTC P2100, P2101, P2102, P2103

6.27

DESCRIPTION AND OPERATION

The TCA contains two potentiometers (designated as TPS1 and TPS2) and an electric DC motor for controlling the actuation of the throttle. TPS1 and TPS2 are mounted in the TCA. They are connected to the keyed shaft for the throttle plate and used to communicate the position of the throttle plate.

Each TPS supplies input to the ECM in response to the positioning of the throttle plate. The ECM activates the motor in the TCA to move the throttle plate, based on signals from the TGS.

See [Figure 6-40](#). The TCA motor receives input (position data) from the ECM connector [78] terminal 29 for electronic throttle control - HI and terminal 30 for electronic throttle control - LOW. The TCA motor drives a series of gears to rotate the position of the throttle plate. Refer to [Table 6-82](#) for defect codes associated with TCA drive motor.

Table 6-82. Code Description

DTC	DESCRIPTION
P2100	TAC motor open
P2101	TAC motor circuit range/performance (actuation error)
P2102	TAC motor control circuit shorted low
P2103	TAC motor control circuit shorted high

- **P2100 TAC Motor Circuit Open:** Indicates the ECM identified an open load fault for the TCA motor driver.
- **P2101 TAC Motor Circuit Range/Performance:** Indicates the actual position of the throttle plate is out of range from the commanded throttle plate position.
- **P2102 TAC Motor Control Circuit Shorted Low:** Indicates the ECM identified that the drive motor is shorted to ground within the TAC drive motor circuit.
- **P2103 TAC Motor Control Circuit Shorted High:** Indicates the drive motor is shorted high within the TAC drive motor circuit.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



Figure 6-40. Throttle Control Actuator Circuit

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

POSSIBLE CAUSES
ECM malfunction
Open in throttle actuator control circuit high
TCA malfunction
Open in throttle actuator control circuit low

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using a multimeter, measure resistance between breakout box terminal 29 and terminal 30.

3. Is resistance greater than 10 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Perform wiggle test. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#). If resistance below 10 Ohms, replace the ECM. See the service manual.

1. Disconnect TCA [211].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 29 and TCA [211B] terminal 3.
3. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (BK/O) wire.

1. Test for continuity between breakout box terminal 30 and TCA [211B] terminal 2.
2. Is continuity present?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Repair open in (BK/PK) wire.

DTC P2101

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-84. DTC P2101 Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Short between throttle actuator control circuits
Open in throttle actuator control circuit high
TCA malfunction
Open in throttle actuator control circuit low

1. TCA Circuit Resistance Test

- With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
- Using a multimeter, measure resistance between breakout box terminal 29 and terminal 30.
- Is resistance less than 2 Ohms?
 - Yes.** [Go to Test 2.](#)
 - No.** [Go to Test 3.](#)

2. TCA Test

- Disconnect TCA [211].
- Measure resistance between breakout box terminal 29 and terminal 30.
- Is resistance less than 2 Ohms?
 - Yes.** Repair short between the (BK/O) and (BK/PK) wires.
 - No.** Replace the TCA. See the service manual.

3. TCA High Circuit Test

- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 29 and TCA [211B] terminal 3.
- Is continuity present?
 - Yes.** [Go to Test 4.](#)
 - No.** Repair open in (BK/O) wire.

4. TCA Low Circuit Test

- Test for continuity between breakout box terminal 30 and TCA [211B] terminal 2.
- Is continuity present?
 - Yes.** Replace the ECM. See the service manual.
 - No.** Repair open in (BK/PK) wire.

DTC P2102

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

Table 6-85. DTC P2102 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in throttle actuator control circuit low
Short to ground in throttle actuator control circuit high
TCA malfunction

1. TCA High Circuit Test

- Disconnect TCA [211].
- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter test for measure resistance between [211B] terminal 3 and ground.
- Is resistance greater than 1000 Ohms?
 - Yes.** [Go to Test 2.](#)
 - No.** Repair short to ground in (BK/O) wire.

2. TCA Test

- Measure resistance between TCA [211B] terminal 2 and ground.
- Is resistance less than 2 Ohms?
 - Yes.** Repair short to ground in (BK/PK) wire.
 - No.** Replace the TCA. See the service manual.

DTC P2103

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-86. DTC P2103 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in throttle actuator control circuit low
Short to ground in throttle actuator control circuit high
ECM malfunction

1. TCA High Circuit Test

- With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
- Disconnect TCA [211].
- Using a multimeter, test for continuity between breakout box terminal 52 and terminal 29.
- Is continuity present?
 - Yes.** Repair short between (BK/O) and (Y/GN) wires.
 - No.** [Go to Test 2.](#)

2. TCA Low Circuit Test

1. Test for continuity between breakout box terminal 52 and terminal 30.
2. Is continuity present?
 - a. **Yes.** Repair short between (BK/PK) and (Y/GN) wires.
 - b. **No.** Replace the ECM. See the service manual.



DTC P2105, P2107

DESCRIPTION AND OPERATION

The TAC system uses DTC P2105 as a vehicle safety device. It provides a forced shut down of the engine when the performance of the TCA cannot be verified. Refer to [Table 6-87](#).

Initially, the ECM commands the fuel pump and fuel injectors to be disabled until the actual fault is cleared.

The TAC system sets DTC P2107 to identify faults with the ECM due to an internal over-temperature shutdown or a power supply failure. Refer to [Table 6-87](#).

Table 6-87. Code Description

DTC	DESCRIPTION
P2105	TAC system forced engine shutdown
P2107	TAC system module processor - internal fault



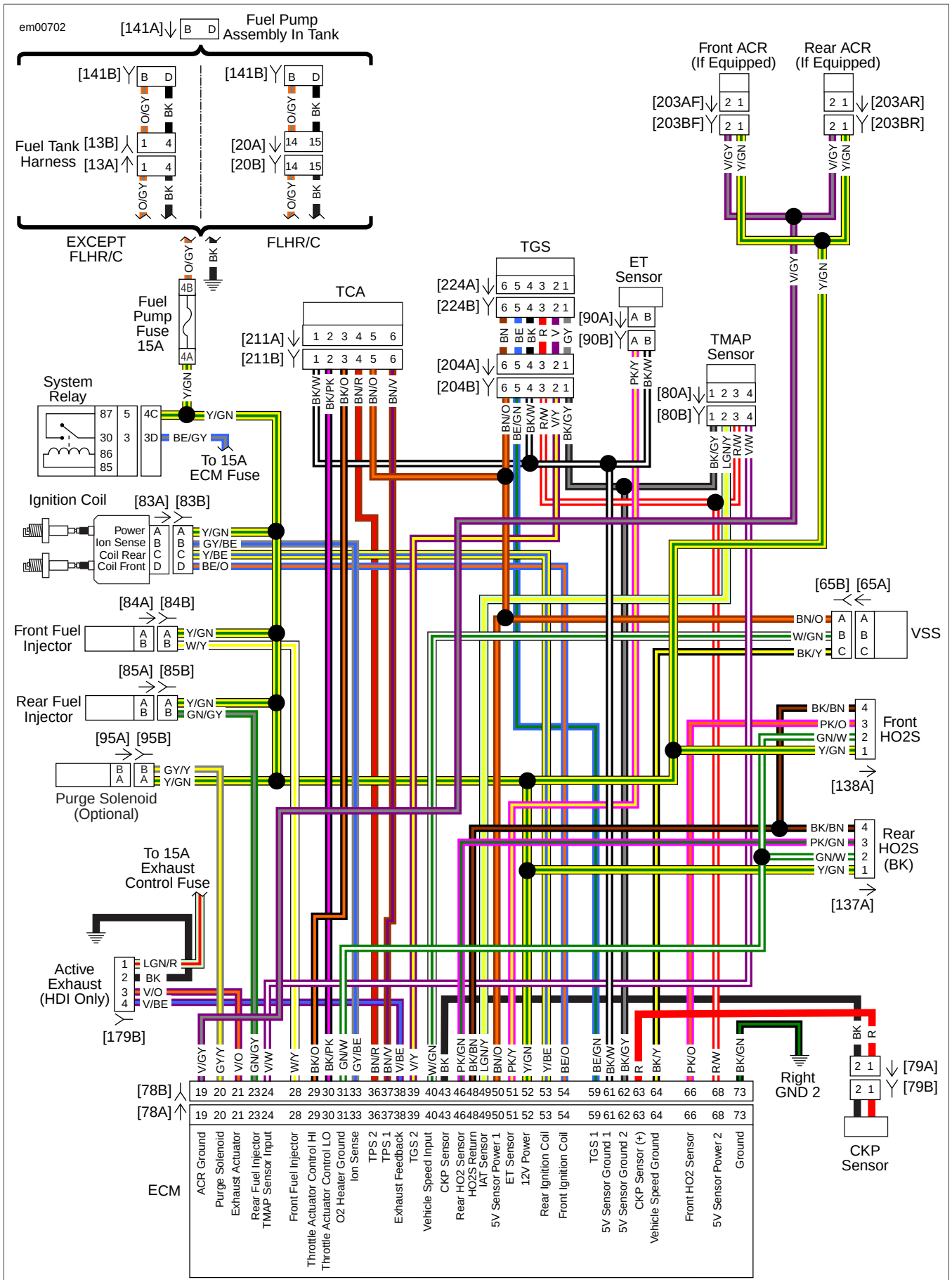


Figure 6-41. EFI Simplified Schematic

DTC P2105

Table 6-88. DTC P2105 Diagnostic Faults

POSSIBLE CAUSES
Other DTCs set
ECM malfunction

1. DTC Verification Test

1. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
2. Start and run the engine for a few seconds.
3. Check for DTCs. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
4. Did DTC P2105 set with no other DTCs?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No. Other DTCs set.** Refer to [Table 2-1](#).
 - c. **No. No DTCs set.** DTC was properly cleared.

DTC P2107

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Table 6-89. DTC P2107 Diagnostic Faults

POSSIBLE CAUSES
Open in system relay supply circuit
System relay malfunction
ECM malfunction

1. ECM Connector Test

1. IGN OFF, disconnect ECM [78] and inspect for damaged, corroded or pushed out terminals.
2. Are terminal problems present?
 - a. **Yes.** Repair terminals as required.
 - b. **No.** [Go to Test 2.](#)

2. ECM Circuit Test

1. With IGN OFF, connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Start the engine.
3. Using a multimeter, test for voltage between breakout box terminal 52 and ground.
4. Is battery voltage present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Relay Circuit Test

1. Test the system relay. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Relay Diagnostics](#).
2. Is the system relay good?
 - a. **Yes.** Repair open or high resistance in (Y/GN) wire.
 - b. **No.** Replace the system relay.

DTC P2119

6.29

DESCRIPTION AND OPERATION

The TAC system sets DTC P2119 when the ECM determines the throttle plate does not return to the correct de-energized position. This error primarily indicates there may be non-electrical conditions which affect the throttle body range/performance. Refer to [Table 6-90](#).

Table 6-90. Code Description

DTC	DESCRIPTION
P2119	TAC system throttle body range/performance

This DTC, if initiated, may have the following probable conditions:

- Something may be physically interfering with the throttle plate operation (such as foreign material, debris, physical obstruction or loosely/improperly mounted throttle plate).
- Damaged or inoperative throttle plate return spring.
- Defective mechanical component(s) internal to the TCA.

DTC P2119

Table 6-91. DTC P2119 Diagnostic Faults

POSSIBLE CAUSES
Induction module malfunction
Mechanical interference

1. Air Inlet Interference Test

1. Inspect the air inlet and check for foreign debris and/or mechanical interference to the throttle plate.
2. Were any issues found?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the induction module. See the service manual.

2. Validation Test

1. Remove obstructions and foreign debris from inlet and check throttle plate movement.
2. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
3. Start the engine and operate the throttle.
4. Check for DTCs. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
5. Did DTC P2119 set?
 - a. **Yes.** Replace the induction module. See the service manual.
 - b. **No.** Repair complete.

DTC P2122, P2123, P2127, P2128

6.30

DESCRIPTION AND OPERATION

The TGS is an electronic assembly that replaces the conventional throttle cable. Two opposing Hall-effect sensors transmit signals to the ECM. The ECM uses these signals to determine the desired throttle plate position. The ECM controls the motor in the TCA to move the throttle plate to the desired position.

The TGS receives a 5V reference signal from the ECM. As the throttle plate is opened the TGS1 signal voltage increases and TGS2 signal voltage decreases. By design, the sum of the voltages when measured for both TGS1 and TGS2 should equal approximately 5.0V. If the sum of these voltages is not 5.0V, then DTCs are initiated for TGS1 and/or TGS2.

The ECM monitors and controls the TAC system and generates DTCs when errors are reported by the ECM. Refer to [Table 6-92](#).

Table 6-92. Code Description

DTC	DESCRIPTION
P2122	TGS1 low/open
P2123	TGS1 high
P2127	TGS2 low/open
P2128	TGS2 high

DTC P2122

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-93. DTC P2122 Diagnostic Faults

POSSIBLE CAUSES
Open in TGS-1 circuit
Short to ground in TGS-1 circuit
TGS malfunction
Open in sensor power circuit
ECM malfunction
TCA malfunction
JSS malfunction
VSS malfunction

1. TGS-1 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminals 59 and 61.

4. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. TGS-1 Circuit Open Test

1. Disconnect TGS [204].
2. Disconnect ECM [78].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [204B] terminal 5 and breakout box terminal 59.
4. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (BE/GN) wire.

3. TGS-1 Short to Ground Test

1. Test for continuity between breakout box terminal 59 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (BE/GN) wire.
 - b. **No.** [Go to Test 4.](#)

4. Twist Grip Sensor Test

1. Test for continuity between breakout box terminal 50 and [204B] terminal 6.
2. Is continuity present?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** Repair open in (BN/O) wire.

5. TGS-1 Test

1. Measure voltage between breakout box terminal 59 and 61.
2. While watching the voltage slowly turn the throttle to the wide open position.
3. Does the voltage steadily increase to greater than 4.6V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 6.](#)

6. TGS-1 Open Test

1. Test for continuity between breakout box terminal 59 and [204B] terminal 5.
2. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (BE/GN) wire.

7. Sensor Power-1 Continuity Test

1. Disconnect TGS [204].
2. Disconnect ECM [78A] from breakout box.

3. Test continuity between breakout box terminal 50 and [204B] terminal 6.
4. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in (BN/O) wire.

8. Sensor Power Resistance Test

1. Measure resistance between breakout box terminal 50 and 61.
2. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** [Go to Test 9.](#)

9. TCA Test

1. Disconnect the TCA [211].
2. Measure resistance between breakout box terminal 50 and 61.
3. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** [Go to Test 10.](#)

10. JSS Test

1. Disconnect the JSS [131].
2. Measure resistance between breakout box terminal 50 and 61.
3. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the JSS. See the service manual.
 - b. **No.** [Go to Test 11.](#)

11. VSS Test

1. Disconnect the VSS [65].
2. Measure resistance between breakout box terminal 50 and 61.
3. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the VSS. See the service manual.
 - b. **No.** Repair short to ground in (BN/O) wire.

DTC P2123

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-94. DTC P2123 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in TGS-1 circuit
Short to voltage in sensor power circuit
TGS malfunction
Open in sensor ground circuit
ECM malfunction

1. TGS-1 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminals 59 and 61.
4. Is voltage greater than 4.8V?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 2.](#)

2. TGS-1 Short to Voltage Test

1. Disconnect TGS [204].
2. Disconnect ECM [78].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between [204B] terminal 5 and ground.
4. Is voltage less than 1.0V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair short to voltage in (BE/GN) wire.

3. TGS-1 Short to Ground Test

1. Measure voltage between [204B] terminal 6 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair short to voltage on (BN/O) wire.

4. TGS Test

1. Turn IGN OFF.
2. Test continuity between breakout box terminal 61 and [204B] terminal 4.
3. Is continuity present?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** Repair open in (BK/W) wire.

5. TGS-1 Test

1. Measure voltage between breakout box terminal 59 and 61.
2. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 7.](#)

6. TGS-1 Open Test

1. Turn IGN OFF.
2. Disconnect ECM [78A].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [204B] terminals 5 and [204B] terminal 6.
4. Is continuity present?
 - a. **Yes.** Repair short between (BN/O) and (BE/GN) wires.
 - b. **No.** Repair short to voltage in (BE/GN) wire.

7. Sensor Power-1 Continuity Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage [204B] terminal 6 and ground.
2. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (BN/O) wire.
 - b. **No.** [Go to Test 8.](#)

8. Sensor Power Resistance Test

1. Turn IGN OFF.
2. Measure resistance between [204B] terminal 4 and ground.
3. Is the resistance less than 2 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** [Go to Test 9.](#)

9. TCA Test

1. Disconnect the ECM [78A].
2. Test continuity between [204B] terminal 4 and breakout box terminal 61.
3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (BK/W) wire.

DTC P2127

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-95. DTC P2127 Diagnostic Faults

POSSIBLE CAUSES
Open in TGS-2 circuit
Short to ground in TGS-2 circuit
TGS malfunction
Open in sensor power circuit
ECM malfunction
TMAP malfunction
Short to ground in sensor power circuit

1. TGS-2 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminals 39 and 62.
4. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 5.](#)

2. TGS-2 Open Test

1. Disconnect TGS [204].
2. Disconnect ECM [78].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [204B] terminal 2 and breakout box terminal 39.
4. Is continuity present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair open in (V/Y) wire.

3. TGS-2 Short to Ground Test

1. Test for continuity between breakout box terminal 39 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (V/Y) wire.
 - b. **No.** [Go to Test 4.](#)

4. TGS Test

1. Test for continuity between breakout box terminal 68 and [204B] terminal 3.
2. Is continuity present?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** Repair open in (R/W) wire.

5. TGS-2 Test

1. Measure voltage between breakout box terminal 59 and 61.
2. While watching the voltage slowly turn the throttle to the wide open position.
3. Does the voltage steadily increase to greater than 4.6V?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** [Go to Test 6.](#)

6. TGS-2 Open Test

1. Test continuity between breakout box terminal 39 and [204B] terminal 2.
2. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open in (V/Y) wire.

7. Sensor Power-2 Continuity Test

1. Disconnect TGS [204].
2. Disconnect ECM [78A] from breakout box.
3. Test continuity between breakout box terminal 68 and [204B] terminal 3.
4. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in (R/W) wire.

8. Sensor Power Resistance Test

1. Measure resistance between breakout box terminal 68 and 62.
2. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** [Go to Test 9.](#)

9. TMAP Test

1. Disconnect the TMAP [80].
2. Measure resistance between breakout box terminal 50 and 61.
3. Is the resistance greater than 100 Ohms?
 - a. **Yes.** Replace the TMAP. See the service manual.
 - b. **No.** Repair short to ground in (R/W) wire.

DTC P2128

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-96. DTC P2128 Diagnostic Faults

POSSIBLE CAUSES
Short to voltage in TGS-2 circuit
Short to voltage in sensor power circuit
TGS malfunction
Open in sensor ground circuit
ECM malfunction

1. TGS-1 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using a multimeter, measure voltage between breakout box terminals 39 and 62.
4. Is voltage greater than 4.8V?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 2.](#)

2. TGS-1 Short to Voltage Test

1. Disconnect TGS [204].
2. Disconnect ECM [78A].
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between [204B] terminal 2 and ground.
4. Is voltage less than 1.0V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair short to voltage in (V/Y) wire.

3. TGS-1 Short to Ground Test

1. Measure voltage between [204B] terminal 3 and ground.
2. Is voltage less than 5.25V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair short to voltage on (R/W) wire.

4. TGS Test

1. Turn IGN OFF.
2. Test continuity between breakout box terminal 62 and [204B] terminal 1.
3. Is continuity present?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** Repair open in (BK/GY) wire.

5. TGS-1 Test

1. Measure voltage between breakout box terminal 39 and 62.
2. Is voltage greater than 0.2V?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 7.](#)

6. TGS-1 Open Test

1. Turn IGN OFF.
2. Disconnect ECM [78A].
3. Test continuity between TGS [204B] terminals 2 and 3.
4. Is continuity present?
 - a. **Yes.** Repair short between (R/W) and (V/Y) wires.
 - b. **No.** Repair short to voltage in (V/Y) wire.

7. Sensor Power-1 Continuity Test

1. Measure voltage TGS [204B] terminal 3 and ground.

2. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (R/W) wire.
 - b. **No.** [Go to Test 8.](#)

8. Sensor Power Resistance Test

1. Turn IGN OFF
2. Measure resistance between [204B] terminal 1 and ground.
3. Is the resistance less than 2 Ohms?
 - a. **Yes.** Replace the TGS. See the service manual.
 - b. **No.** [Go to Test 9.](#)

9. TCA Test

1. Disconnect the ECM [78A].
2. Test continuity between [204B] terminal 1 and breakout box terminal 62.
3. Is continuity present?
 - a. **Yes.** Replace the ECM. See the service manual.
 - b. **No.** Repair open in (BK/GY) wire.



DTC P2135, P2138

6.31

DESCRIPTION AND OPERATION

The TAC system uses DTCs when the ECM determines that a correlation error exists for either the TP sensor or the TGS.

The two TP sensors work opposite of each other. As the throttle plate opens, TPS1 voltage ranges from 0.0-5.0V, while TPS2 voltage ranges from 5.0-0.0V. The sum of the two TPS voltages should always measure approximately 5.0V.

The two TGSs work the same way. As the throttle plate is opened, TGS1 voltage increases and TGS2 voltage decreases. The sum of these two voltages should always measure approximately 5.0V. If either component fails to correlate the proper voltage or has out-of-range voltage conditions, then the ECM will initiate a DTC. Refer to [Table 6-97](#).

Table 6-97. Code Description

DTC	DESCRIPTION
P2135	TPS correlation error
P2138	TGS correlation error

DTC P2135

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-98. DTC P2135 Diagnostic Faults

POSSIBLE CAUSES
Open in TPS-1 circuit
Short to ground in TPS-1 circuit
Short to voltage in TPS-1 circuit
Open in TPS-2 circuit
Short to ground in TPS-2 circuit
Short to voltage in TPS-2 circuit
Short to voltage in sensor power circuit
TCA malfunction

1. TPS-2 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A], leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Disconnect TCA [211].
3. Turn IGN ON.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 37 and TCA [211B] terminals 6.
5. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (BN/V) wire.

2. TPS-2 Circuit Test

1. Test for continuity between breakout box terminal 37 and 61.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/V) wire.
 - b. **No.** [Go to Test 3.](#)

3. Sensor Power Circuit Test

1. Test for continuity between breakout box terminal 37 and 50.
2. Is continuity present?
 - a. **Yes.** Repair short between (BN/V) and (BN/O) wires.
 - b. **No.** [Go to Test 4.](#)

4. Sensor Ground Test

1. Test for continuity between breakout box terminal 36 and TCA [211B] terminal 4.
2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (BN/R) wire.

5. Shorted 5V Circuit Test

1. Test for continuity between breakout box terminals 36 and 61.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (BN/R) wire.
 - b. **No.** [Go to Test 6.](#)

6. Sensor Ground Circuit Test

1. Test for continuity between breakout box terminals 36 and 50.
2. Is continuity present?
 - a. **Yes.** Repair short between (BN/R) and (BN/O) wires.
 - b. **No.** [Go to Test 7.](#)

7. TPS-2 Circuit Test

1. Turn IGN OFF.
2. Measure voltage between breakout box terminals 36 and 61.
3. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (BN/R) wire.
 - b. **No.** [Go to Test 8.](#)

8. Sensor Ground Continuity Test

1. Measure voltage between breakout box terminals 37 and 61.

2. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (BN/O) wire.
 - b. **No.** [Go to Test 9.](#)

9. Ground Circuit Open Test

1. Connect TCA [211].
2. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics.](#)
3. Start the vehicle and operate the throttle.
4. Did the DTC return?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Operation normal.

DTC P2138

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Table 6-99. DTC P2138 Diagnostic Faults

POSSIBLE CAUSES
Open in TGS-1 circuit
Short to ground in TGS-1 circuit
Short to voltage in TGS-1 circuit
Open in TGS-2 circuit
Short to ground in TGS-1 circuit
Short to voltage in TGS-1 circuit
TCA malfunction

1. TGS-2 Voltage Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A] leaving [78A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#)
2. Disconnect TCA [211].
3. Disconnect TGS [204].
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 59 and [204B] terminal 5.
5. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open in (BE/GN) wire.

2. TGS-2 Circuit Test

1. Test for continuity between breakout box terminal 59 and 61.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (BE/GN) wire.
 - b. **No.** [Go to Test 3.](#)

3. Sensor Power Circuit Test

1. Test for continuity between breakout box terminal 59 and 50.
2. Is continuity present?
 - a. **Yes.** Repair short between (BE/GN) and (BN/O) wires.
 - b. **No.** [Go to Test 4.](#)

4. Sensor Ground Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 39 and TGS [204B] terminal 4.
2. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (V/Y) wire.

5. Shorted 5V Circuit Test

1. Test for continuity between breakout box terminals 39 and 61.
2. Is continuity present?
 - a. **Yes.** Repair short to ground in (V/Y) wire.
 - b. **No.** [Go to Test 6.](#)

6. Sensor Ground Circuit Test

1. Test for continuity between breakout box terminals 39 and 50.
2. Is continuity present?
 - a. **Yes.** Repair short between (V/Y) and (BN/O) wires.
 - b. **No.** [Go to Test 7.](#)

7. Sensor Ground-2 Open Circuit Test

1. Test for continuity between breakout box terminal 62 and [204B] terminal 1.
2. Is continuity present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in (BK/GY) wire.

8. TGS-2 Circuit Test

1. Turn IGN ON.
2. Measure voltage between breakout box terminals 39 and 61.
3. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (V/Y) wire.
 - b. **No.** [Go to Test 9.](#)

9. Sensor Ground Continuity Test

1. Measure voltage between breakout box terminals 59 and 61.
2. Is voltage greater than 5.25V?
 - a. **Yes.** Repair short to voltage on (BE/GN) wire.
 - b. **No.** [Go to Test 10.](#)

10. Ground Circuit Open Test

1. Connect [204].
2. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
3. Start the vehicle and operate the throttle.
4. Did the DTC return?
 - a. **Yes.** Replace the TCA. See the service manual.
 - b. **No.** Operation normal.



DTC P2176

6.32

DESCRIPTION AND OPERATION

The TAC system sets DTC P2176 when the ECM determines the zero position of the throttle plate has not been successfully learned.

At power up, the ECM adjusts the throttle plate to the limp-home position, then begins to move the throttle plate closed. The ECM monitors and verifies the amount of movement that occurred. The throttle plate minimum position is held briefly then verified against the expected minimum and maximum range of throttle. If the zero position is found within range, then the position is stored.

If the ECM is not able to learn the minimum position or if the learning fails four consecutive ignition cycles, the ECM initiates DTC P2176. Refer to [Table 6-100](#).

Table 6-100. Code Description

DTC	DESCRIPTION
P2176	TCA close position not learned

DTC P2176

Table 6-101. DTC P2176 Diagnostic Faults

POSSIBLE CAUSES
Induction module malfunction
Mechanical interference

1. Air Inlet Interference Test

1. Inspect the air inlet and check for foreign debris and/or mechanical interference to the throttle plate.
2. Were any issues found?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace the induction module. See the service manual.

2. Validation Test

1. Remove obstructions and foreign debris from inlet and check throttle plate movement.
2. Clear DTCs using odometer self-diagnostics. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
3. Start the engine and operate the throttle.
4. Check for DTCs. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#).
5. Did DTC P2176 set?
 - a. **Yes.** Replace the induction module. See the service manual.
 - b. **No.** Repair complete.

ENGINE CRANKS, BUT WILL NOT START

6.33

DESCRIPTION AND OPERATION

If the starter will not crank the engine, the problem is not EFI related. See [3.2 STARTING SYSTEM](#) or [5.12 SECURITY SYSTEM](#).

There may be DTCs associated with this problem. Check for DTCs and clear them before proceeding with this test.

NOTE

To set a CKP DTC, a start attempt must last at least 5 seconds.

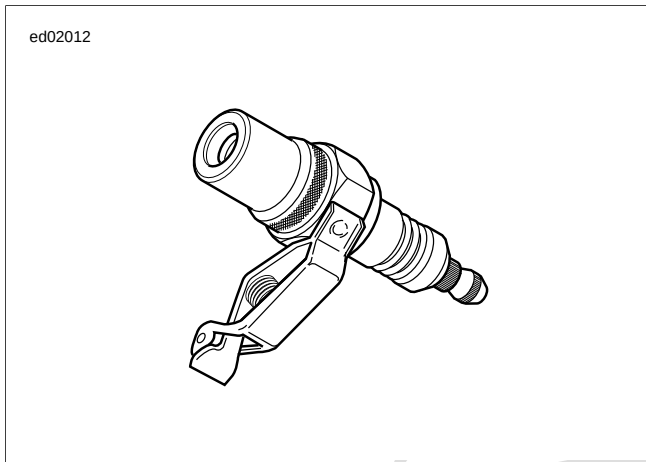


Figure 6-42. Spark Tester

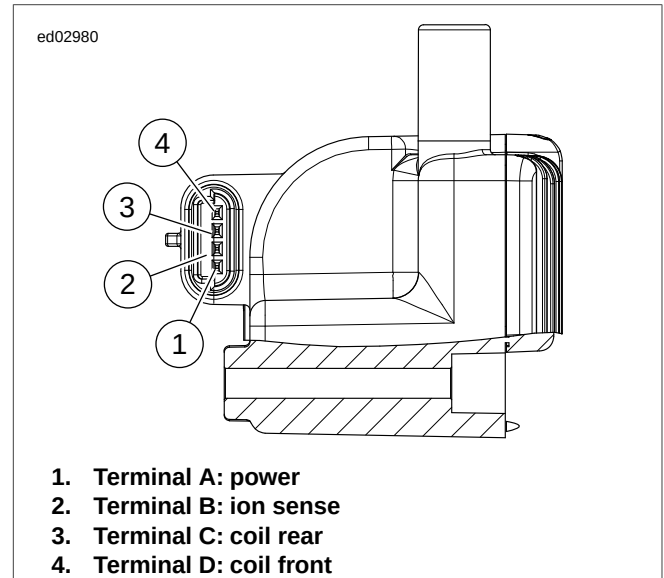


Figure 6-44. Ignition Coil Connector Terminals

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



Figure 6-43. Ignition Coil Circuit Test

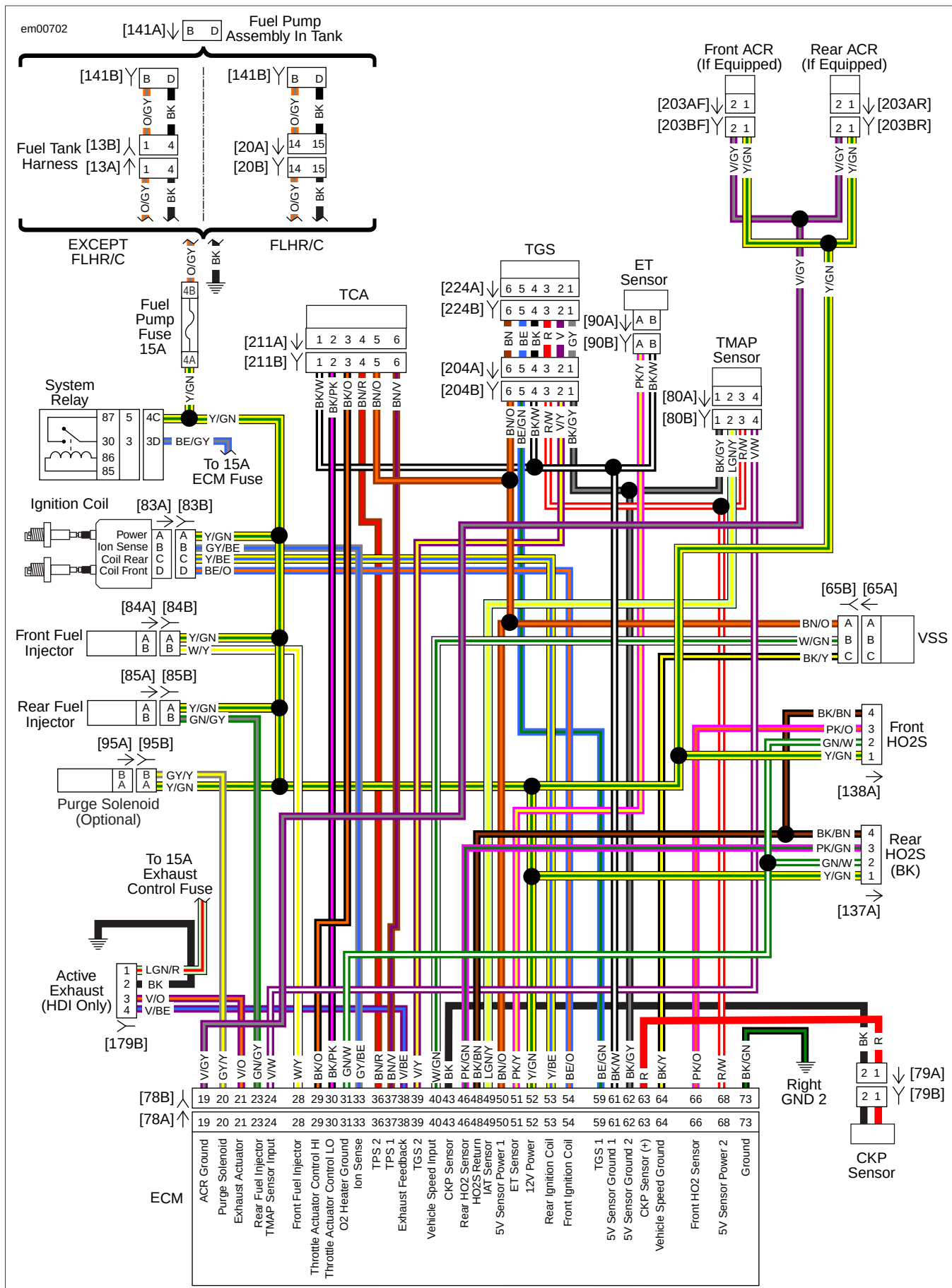


Figure 6-45. EFI Simplified Schematic

ENGINE CRANKS BUT WILL NOT START

PART NUMBER	TOOL NAME
HD-26792	SPARK TESTER

Table 6-102. Engine Cranks But Will Not Start Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Battery voltage too low
Ignition system malfunction
Fuel system malfunction
No or low compression

1. Preliminary Engine Tests

1. Make sure there is fresh fuel in tank, spark plug wires firmly connected to coil terminals, fuel injectors are not clogged and battery connections are in good condition.
2. Check for DTCs. See [2.1 INITIAL DIAGNOSTICS, Odometer Self-Diagnostics](#). If DTCs are present, see the appropriate DTC procedure.
3. Verify battery condition. See [3.1 BATTERY TESTING](#).

4. Does battery pass tests?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Charge or replace battery.

2. Check Engine Lamp Test

1. Turn IGN ON and engine stop switch to RUN.
2. Does check engine lamp illuminate for 4 seconds immediately after key ON?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** See [6.34 NO ECM POWER](#).

3. Spark Present Test

1. Check spark plug condition and replace if fouled.
2. Using SPARK TESTER (Part No. HD-26792), check spark at both plugs while cranking engine.
3. Is spark present?
 - a. **Yes.** Perform compression test, check fuel system and perform fuel pressure test. See the service manual.
 - b. **No.** The spark plugs will not spark if there is low or no compression. If spark is not present, test compression before troubleshooting ignition circuit. Once good compression is confirmed, check condition of ignition coils, coil primary wiring and spark plug boots. See [6.9 DTC P0373, P0374](#) or [6.19 DTC P1351, P1352, P1354, P1355](#).



NO ECM POWER

6.34

DESCRIPTION AND OPERATION

Constant power is supplied to the ECM through terminal 71. The ECM turns on when power is applied to terminal 72 of connector [78]. The ECM goes through an initialization sequence every time power is removed and re-applied to terminal 72. The only visible part of this sequence is the check engine lamp. Upon starting, the check engine lamp will illu-

minate for 4 seconds and then (if parameters are normal) go out.

If battery power is absent at ECM terminal 71:

- DTCs cannot be cleared. Tool will show them as cleared but will be present next time ignition key is cycled.
- ECM cannot be re-flashed.

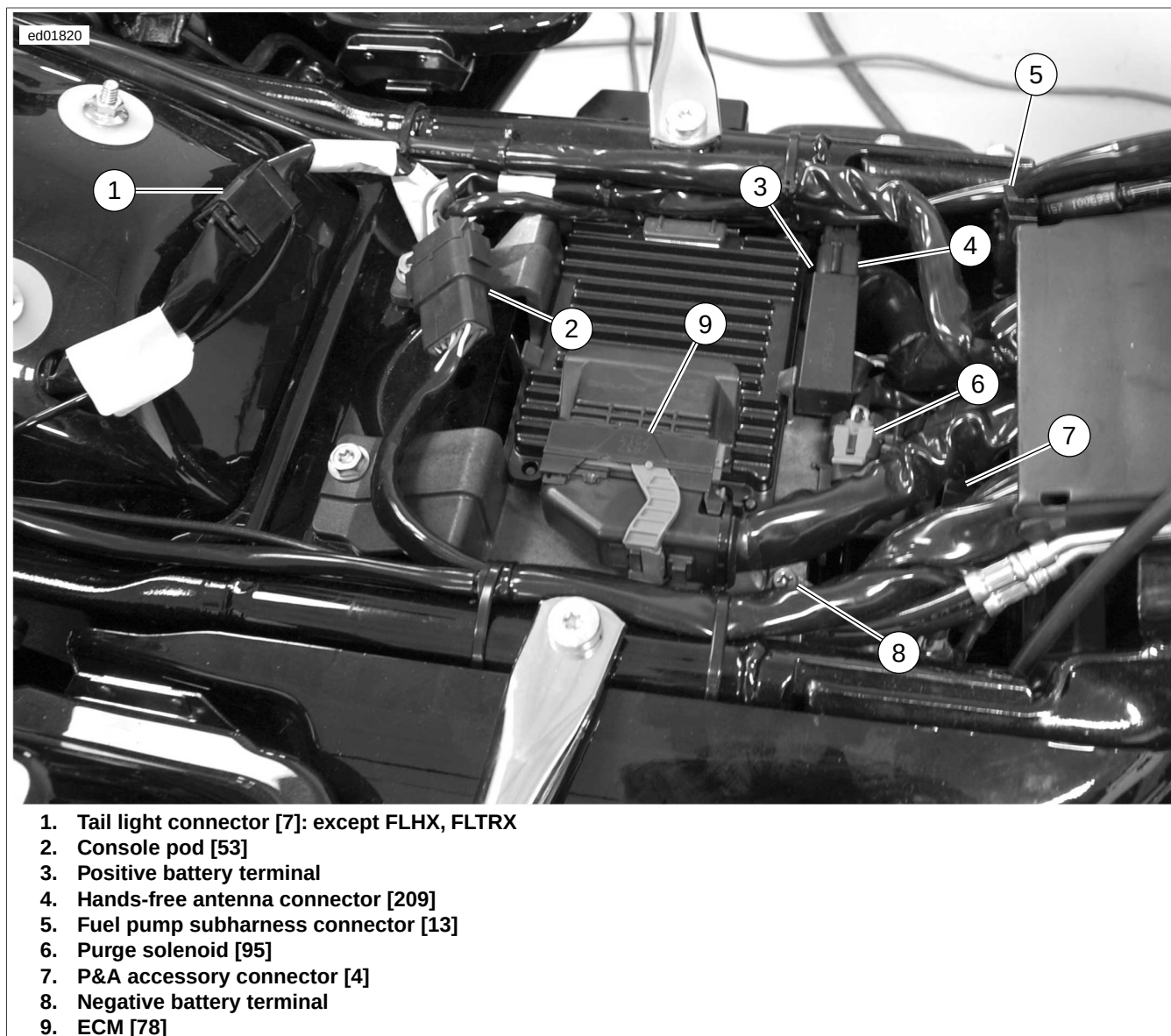


Figure 6-46. Electrical Connectors Under Seat

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

Figure 6-47. ECM Power Circuit

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

POSSIBLE CAUSES
ECM malfunction
Electrical system malfunction
Open or short to ground in ECM battery circuit
Open in ignition circuit
Engine stop switch malfunction

1. Check ECM fuse.
2. Is fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair short to ground on (BE/GY) wire and replace fuse.

2. Is fuse good?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Repair short to ground on (GY) or (W/BK) wire and replace IGN fuse.

1. With IGN OFF, disconnect ECM [78].
2. Check for backed out, damaged and corroded terminals. Repair terminal damage as required.
3. Connect ECM [78].
4. Turn IGN ON.
5. Does ECM have power?
 - a. **Yes.** Problem solved.
 - b. **No.** [Go to Test 4.](#)

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using a multimeter, test for battery voltage between breakout box terminal 71 (+) and ground.

3. Is battery voltage present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in (BE/GY) wire.

5. ECM Switched Voltage Test

1. Turn IGN ON and engine stop switch to RUN.
2. Measure voltage between breakout box terminal 72 and ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair open (W/BK) wire. If wire is okay, then continue with tests. [Go to Test 7.](#)

6. ECM Ground Wires Test

1. Measure voltage between positive battery terminal and breakout box terminal 73.
2. Is battery voltage present?
 - a. **Yes.** Replace ECM. See the service manual.
 - b. **No.** Repair open in (BK/GN) wire.

7. Engine Stop Switch Battery Voltage Test

1. Disconnect right hand controls [22].
2. Turn IGN ON.
3. Measure voltage on [22B] terminal 3 (GY) and ground.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open wire (GY).

8. Engine Stop Switch Test

1. Turn IGN OFF and engine stop switch to RUN.
2. Measure the resistance between [22A] terminals 3 and 4.
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** Repair open in (W/BK) wire from terminal 4 of [22B] and ECM (78B).
 - b. **No.** Repair or replace engine stop switch. See the service manual.



STARTS, THEN STALLS

6.35

DESCRIPTION AND OPERATION

The starts, then stalls condition may be created by the fuel system, the idle air control system or an ECM failure. When this condition exists, see [2.4 DTC U1300, U1301 OR BUS ER](#).

There may be DTCs set causing this condition. Solve the problems with the DTCs before performing the tests in this section. The DTCs that may be involved with starts, then stalls are:

- Fuel injectors: DTCs P0261, P0262, P0263 and P0264
- Ignition coils: DTCs P1351, P1352, P1354 and P1355
- Lost idle: DTC P0505
- TPS: DTCs P0122 and P0123
- Password Problem: DTCs P1009 and P1010
- JSS: DTCs P1501, P1502 and P1503
- Neutral switch: DTC P1155
- All modes: DTCs P0603 and P0605

Diagnostic Tips

- The vehicle will stall on HDI models if the jiffy stand is extended when the transmission is in gear and the clutch is released.
- If serial data is shorted, U1300 and U1301 will automatically set the check engine light.
- DTCs P1009 and P1010 may accompany DTCs U1300 and U1301.
- If this condition is fuel related, perform Fuel Pressure Test. See the service manual.
- If the fuel system passes the pressure test, perform the Fuel System Electrical Test. See [6.36 FUEL SYSTEM ELECTRICAL TEST](#).

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

STARTS, THEN STALLS

Table 6-104. Starts, Then Stalls Diagnostic Faults

POSSIBLE CAUSES
Fuel system malfunction
Idle air control system malfunction
Open serial data circuit
Neutral switch malfunction
TSM/TSSM/HFSM malfunction

1. Throttle Test

1. Start the engine.
2. Will engine start with the throttle partially opened and then stall when closed?
 - a. **Yes.** See [6.12 DTC P0505](#).
 - b. **No. Side StAnd displayed on odometer.** [Go to Test 2.](#)
 - c. **No. Odometer display normal.** [Go to Test 4.](#)

2. Jiffy Stand Test

1. Turn IGN OFF.
2. Raise jiffy stand.
3. Turn IGN ON and engine stop switch to RUN.
4. Does odometer display Side StAnd?
 - a. **Yes.** Inspect JSS for correct mounting and clearance to jiffy stand tab (0.18 in (4.5 mm)). If sensor is mounted correctly, replace JSS. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Neutral Switch Test

1. Is neutral switch circuit operating normally?
 - a. **Yes.** Replace TSM/TSSM/HFSM. See the service manual.
 - b. **No.** Replace neutral switch. See the service manual.

4. Fuel System Test

1. Perform Fuel Pressure test. See the service manual.
2. Is fuel pressure normal?
 - a. **Yes.** If fuel injectors are okay, replace ECM. See the service manual.
 - b. **No.** Repair fuel pressure problem. See the service manual.

FUEL SYSTEM ELECTRICAL TEST

6.36

DESCRIPTION AND OPERATION

With the IGN ON and the engine stop switch at RUN, the ECM will energize the system relay to complete the circuit to the in-tank fuel pump. It will remain on as long as the engine is cranking or running and the ECM is receiving ignition reference pulses from the CKP sensor. If there are no reference pulses, the ECM will de-energize the system relay within 2 seconds after ignition is turned on or the engine has stalled, or immediately after the ignition is shut off.

The fuel pump delivers fuel to the injectors. The pressure regulator controls system pressure.

See [Figure 6-48](#). When the engine is stopped, the pump can be turned on by applying battery voltage to the (O/GY) wire and ground to the (BK) wire of the fuel pump connector [141B].

Improper fuel system pressure may contribute to the following symptoms:

- Engine cranks, but will not run.
- Engine cuts out (may feel like ignition problems).
- Hesitation, loss of power and poor fuel economy.

NOTE

After turning ignition off, wait 10 seconds before turning the ignition back on to get the fuel pump to reprime. This time-out period is necessary for the fuel pump and IAC to reset.

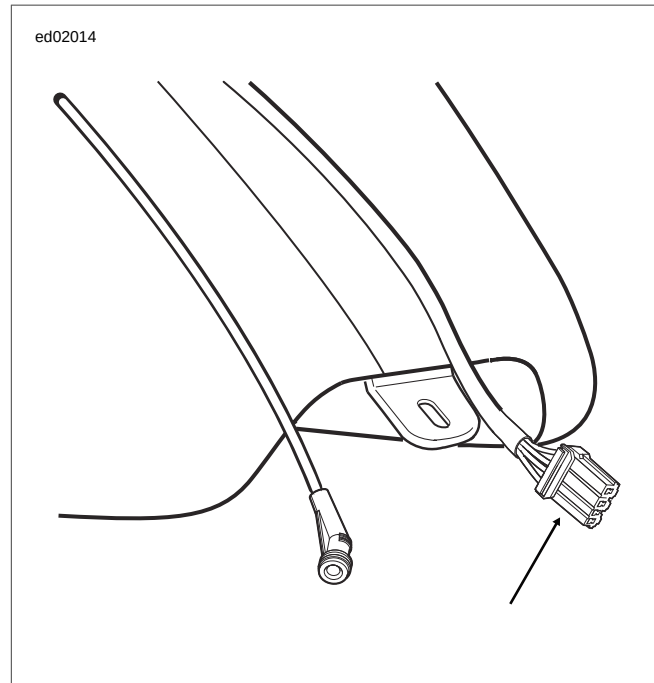


Figure 6-48. Fuel Pump/Fuel Level Sender Connector:
FLHX, FLHTC, FLHTCU, FLTRX

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

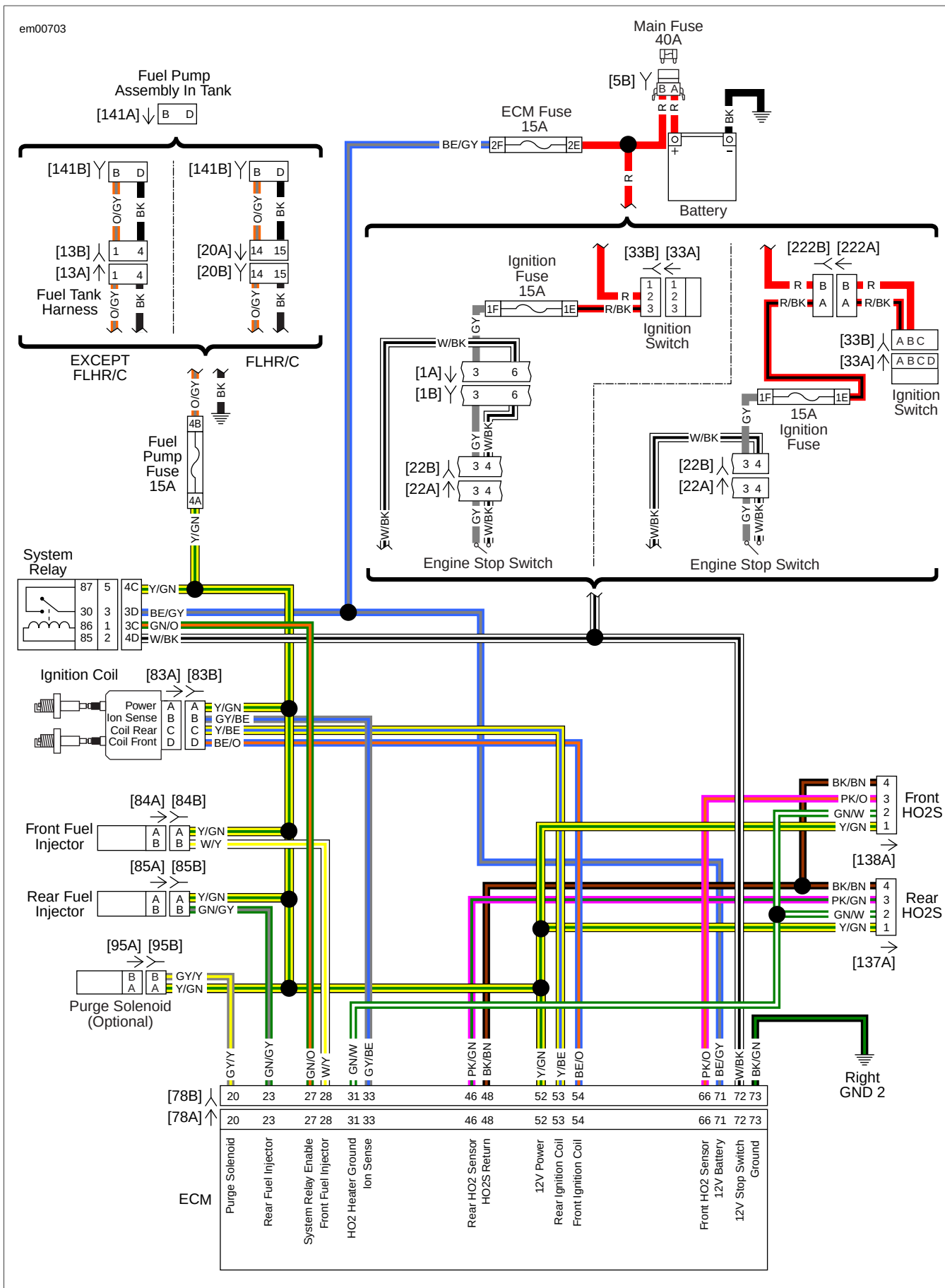


Figure 6-49. System Relay Circuit

FUEL SYSTEM ELECTRICAL TEST

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

Table 6-105. Fuel System Electrical Test Diagnostic Faults

POSSIBLE CAUSES
Fuel pump malfunction
Fuel pump electrical system
ECM malfunction
Electrical system malfunction
System relay malfunction
Open ground circuit

1. ECM Fuse Test

1. Check ECM fuse.
2. Is fuse good?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See [6.34 NO ECM POWER.](#)

2. Fuel Pump Voltage Test

1. Disconnect fuel pump connector [141].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between fuel pump [141A] terminals B and D during the first 2-3 seconds after IGN ON.
3. Is battery voltage present?
 - a. **Yes.** Replace fuel pump. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Fuel Pump Open Circuit Test

1. Turn IGN OFF.
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between [141A] terminal B and system relay [64-1B] terminal 4C.
3. Is continuity present?
 - a. **Yes.** Repair open on (BK) wire to ground.
 - b. **No.** Repair open (Y/GN) wire.



MISFIRE AT IDLE OR UNDER LOAD

6.37

DESCRIPTION AND OPERATION

Misfire conditions may be caused by:

- Battery condition and connections.
- Fuel system problems. Refer to [Table 6-1](#), [Table 6-2](#) and [Table 6-3](#).
- Ignition system faults.

Diagnostic Tips

⚠ 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)

When performing the steps in the diagnostic tests, a known good part can be used to verify whether a suspected part is faulty. The ignition coil does not require full installation to be functional. Verify faulty ignition coil by performing resistance test. See [6.19 DTC P1351, P1352, P1354, P1355](#).

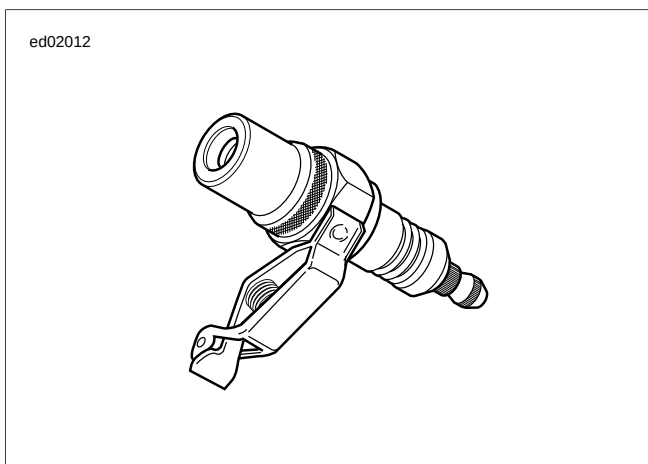


Figure 6-50. Spark Tester

IN-LINE SPARK TESTER

PART NUMBER	TOOL NAME
YA840	SNAP-ON IN-LINE SPARK TESTER

See [Figure 6-51](#). The use of a SNAP-ON IN-LINE SPARK TESTER (Part No. YA840) or equivalent can help determine

whether a problem exists in the ignition or fuel systems. If the test light flashes without interruption on both cylinders during the misfire event, verify spark plug condition and gap and inspect the fuel system for proper operation. If the test light does not flash, or the flash is interrupted during the misfire event, the problem is ignition related.

1. Turn IGN OFF.
2. Remove front spark plug wire and install SNAP-ON IN-LINE SPARK TESTER (Part No. YA840) between spark plug wire and spark plug.
3. Start engine and inspect tester light. The light will flash on each spark event if power is transmitted to the plug.
4. Install and repeat procedure on rear cylinder.

NOTE

A SNAP-ON IN-LINE SPARK TESTER (Part No. YA840) can also be used in conjunction with a load applying dynamometer to diagnose misfire under load.



Figure 6-51. In-line Spark Tester

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

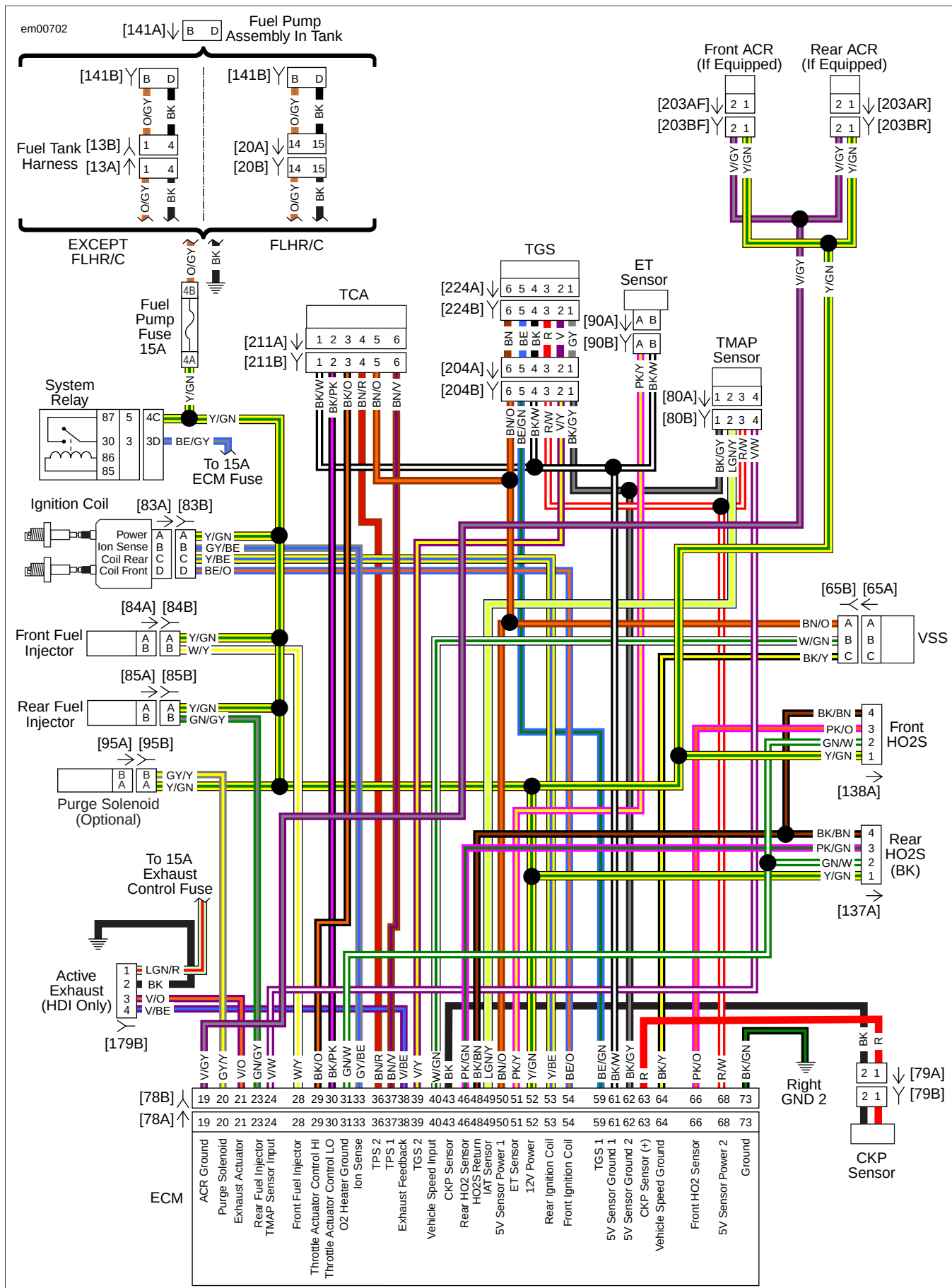


Figure 6-52. EFI Simplified Schematic

MISFIRE AT IDLE OR UNDER LOAD

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX
YA840	SNAP-ON IN-LINE SPARK TESTER

Table 6-106. Misfire At Idle or Under Load Diagnostic Faults

POSSIBLE CAUSES
ECM malfunction
Ignition system malfunction
Fuel system malfunction
Electrical system malfunction

1. Power Ground Continuity Test

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness [78B] and ECM [78A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, check for continuity between breakout box terminal 73 to ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair poor ground on (BK) wire.

2. Spark Test

1. Connect SNAP-ON IN-LINE SPARK TESTER (Part No. YA840) between front spark plug cable and ground. See [1.2 DIAGNOSTIC TOOLS](#).
2. Crank engine for a few seconds.
3. Remove tester from front spark plug cable and connect rear spark plug cable and ground.
4. Did spark jump gap on both cables?
 - a. **Yes.** Check for faulty, worn or cracked spark plugs, plug fouling due to mechanical problems or faulty connection at plug or coils. See the service manual and repair as required.
 - b. **No.** [Go to Test 3.](#)

3. Spark Plug Wire Test

1. Disconnect the spark plug wires.
2. Measure the resistance of the spark plug wires.
3. Is the front and rear spark plug wire resistance within the specified range? Refer to [Table 1-5](#).
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Replace the out of range spark plug wire. See the service manual.

4. Carbon Tracking Inspection Test

1. Inspect top of ignition coils for carbon tracking.

2. Is carbon tracking present?
 - a. **Yes.** Switch ignition coil with known good unit and perform Test 2. If spark jumps gap, replace ignition coil. See the service manual. If not, then continue with tests. [Go to Test 5.](#)
 - b. **No.** Replace ignition coil. See the service manual.

5. Ignition Coil Primary Wire Continuity Test

1. Turn IGN OFF.
2. Remove system relay and disconnect ignition coil [83].
3. Measure resistance between [64-1B] socket terminal 4C and [83B] terminal A. Wiggle connectors while measuring.
4. Is resistance continuously less than 0.5 Ohms?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair intermittent on (Y/GN) wire.

6. Battery to System Relay Voltage Drop Test

1. Reconnect ignition coil and install system relay.
2. Turn IGN ON, start engine.
3. With engine running, measure voltage drop between battery and system relay [64-1B] socket terminal 4C (under-side of fuse/relay block). See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Voltage Drop](#).
4. Is voltage drop less than 1.0V?
 - a. **Yes.** Problem is fuel related. Recheck symptoms.
 - b. **No.** [Go to Test 7.](#)

7. System Relay Test

1. With engine running, measure voltage drop between battery and system relay [64-1B] socket terminal 3D (under-side of fuse/relay block).
2. Is voltage drop less than 1.0V?
 - a. **Yes.** Replace system relay. See the service manual.
 - b. **No.** [Go to Test 8.](#)

8. Battery to ECM Fuse Voltage Drop Test

1. With engine running, measure voltage drop between battery and [64-1B] socket terminal 2F.
2. Is voltage drop less than 1.0V?
 - a. **Yes.** Repair (BE/GY) wire or connections.
 - b. **No.** [Go to Test 9.](#)

9. Battery to Fuse Block Voltage Drop Test

1. With engine running, measure voltage drop between battery and [64-1B] socket terminal 2E.
2. Is voltage drop less than 1.0V?
 - a. **Yes.** Repair ECM fuse connections or replace ECM fuse.
 - b. **No.** [Go to Test 10.](#)

10. Battery to Main Fuse Voltage Drop Test

1. With engine running, measure voltage drop between battery (+) and main fuse [5B] terminal A.
2. Is voltage drop less than 1.0V?
 - a. **Yes.** Repair (R) wire.
 - b. **No.** [Go to Test 11.](#)

11. Battery to Main Fuse Block Voltage Drop Test

1. With engine running, measure voltage drop between battery (+) and main fuse [5B] terminal B.
2. Is voltage drop less than 1.0V?
 - a. **Yes.** Repair main fuse connections or replace main fuse.
 - b. **No.** Repair (R) wire between battery and main fuse [5B] terminal B, including connections at starter.



TABLE OF CONTENTS

SUBJECT	PAGE NO.
7.1 ANTI-LOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION.....	7-1
7.2 DTC C1017, C1018.....	7-4
7.3 DTC C1021, C1023.....	7-7
7.4 DTC C1025, C1027, C1206, C1208.....	7-9
7.5 DTC C1032, C1034.....	7-11
7.6 DTC C1042, C1043.....	7-14
7.7 DTC C1094.....	7-16
7.8 DTC C1095.....	7-19
7.9 DTC C1151.....	7-22
7.10 DTC C1153.....	7-24
7.11 DTC C1158.....	7-26
7.12 DTC C1212.....	7-27
7.13 DTC C1214.....	7-30
7.14 DTC C1216.....	7-33
7.15 DTC C1014, C1055-C1066, C1118, C1121.....	7-36
7.16 ABS INDICATOR ALWAYS ON OR INOPERATIVE.....	7-39



NOTES



ANTI-LOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module controls brake application under extreme stopping conditions in order to keep the wheels from slipping. When wheel slip is detected during a brake application, an ABS event occurs. The hydraulic pressure to the individual wheel is controlled to prevent slipping on that wheel. Specific valves and individual hydraulic lines are provided for each wheel. The ABS can decrease, hold or increase fluid pressure to each brake. However, the ABS cannot increase hydraulic pressure above the pressure being transmitted by the master cylinder.

During an ABS event, a series of rapid pulsations may be felt in either the front brake lever or rear brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the ABS responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pulsations are present only during initialization and anti-lock braking. The pulsations stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During anti-lock braking on dry pavement intermittent chirping noises may be heard as the tires approach slipping. These noises and pulsations are considered normal during anti-lock operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal or lever. Brake operation during normal braking is no different then that of previous non-ABS systems. Maintaining a constant force on the brake pedal or lever provides the shortest stopping distance while maintaining vehicle stability.

In addition to the normal brake system, the ABS consists of the following components.

- See [Figure 7-1](#). The ECU contains the motor relay, valve relay, system enable relay and the solenoids.
- See [Figure 7-1](#). The HCU contains the four valves (an apply valve and release valve for each wheel), two pumps, pump motor and accumulators.
- See [Figure 7-2](#). Front WSS.
- See [Figure 7-3](#). Rear WSS.
- See [Figure 7-4](#). ABS Diode Pack.
- See [Figure 7-2](#). Front WSS connector.
- See [Figure 7-1](#). Rear WSS connector.

When referencing the ECU and the HCU as a unit they are referred to as the ABS module. When the ECU is replaced, use DIGITAL TECHNICIAN II (Part No. HD-48650) to program the ECU.

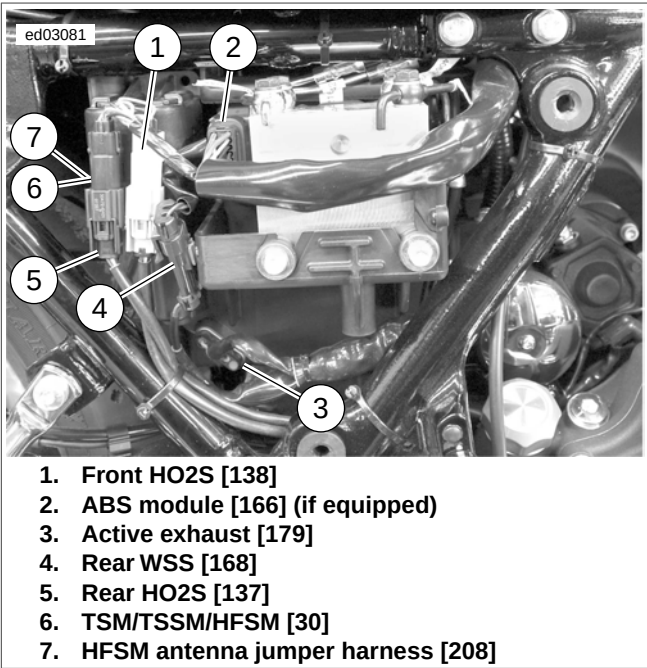


Figure 7-1. Under Right Side Cover



Figure 7-2. Front WSS (ABS Only)

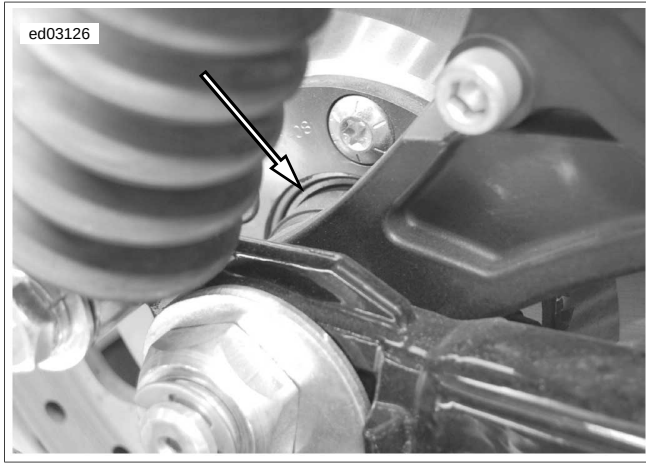
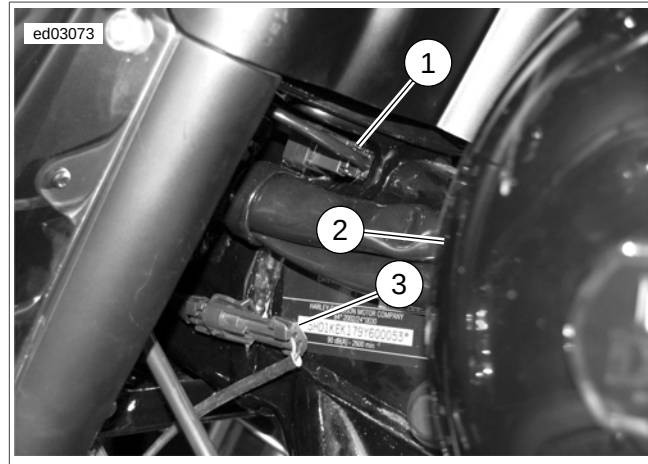
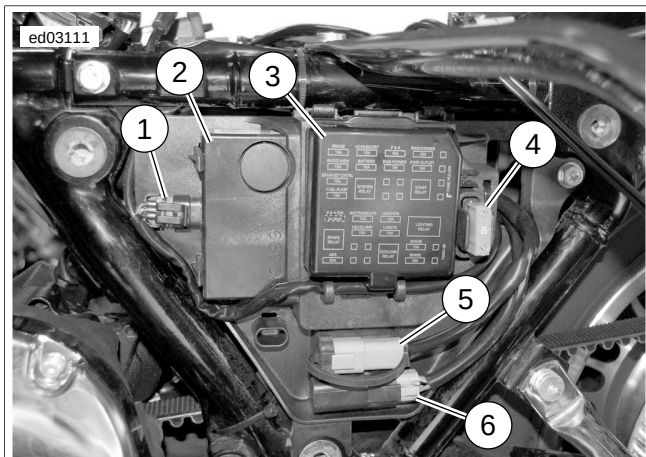


Figure 7-3. Rear WSS (ABS Only)



1. Ambient air temperature sensor [107]
2. Fuel tank
3. Front WSS [167]

Figure 7-5. Front WSS and Ambient Air Temperature Sensor



1. Security siren [142]
2. Security siren (if equipped)
3. Fuse block
4. Main fuse [5]
5. DLC [91]
6. ABS diode pack [201] (if equipped)

Figure 7-4. Under Left Side Cover: Except FLTRX, FLHX, FLHTC

Pressure Hold

The ECU closes the apply valve and keeps the release valve closed in order to isolate the slipping wheel when wheel slip occurs. This holds the pressure steady on the brake so that the hydraulic pressure does not increase or decrease.

Pressure Decrease

If a pressure hold does not correct the wheel slip condition, a pressure decrease occurs. The apply valve is closed and the release valve is opened. The excess fluid is stored in the accumulator until the pump can return the fluid to the master cylinder or fluid reservoir.

Pressure Increase

After the wheel slip is corrected, a pressure increase occurs. The ECU increases the pressure to individual wheels during deceleration in order to reduce the speed of the wheel. The apply valve is opened and the release valve is closed. The increased pressure is delivered from the master cylinder and will not exceed the pressure from the master cylinder.

Initialization Self-Test

The ABS module performs one initialization test each ignition cycle. The ABS module verifies internal circuitry and the wheel speed sensor circuits.

As part of the initialization self-test the ABS module also does a modulator test. This test consists of energizing the actuators and commanding the motor and solenoids on and off. The ABS module will run this test the first time the vehicle speed exceeds 10 mph (16 km/h) in an ignition cycle or when all the following conditions are met for the first time in an ignition cycle:

- Brake is not applied.
- Engine is above 500 rpm.
- No ABS event present.
- The system ECU is enabled.
- The ABS system is not communicating with DIGITAL TECHNICIAN II (Part No. HD-48650).

ABS Indicator

See [Figure 7-6](#). The speedometer illuminates the ABS indicator when the following occurs.

- The ECU detects an ABS disabling malfunction. The ECU sends a serial data message to the instrument requesting illumination.
- The speedometer performs a bulb check.
- The speedometer detects a loss of communication with

the ECU.

The ECU sends a message to the instrument when a malfunction that disables ABS operation is detected. Depending on the fault the ABS Indicator may stay on even after the malfunction is corrected. The indicator will not go off until the vehicle is operated at speeds greater than 10 mph (16 km/h). It is important to verify that this is not the cause of an ABS indicator which is illuminated when no DTCs are set, before attempting to diagnose other possible causes.

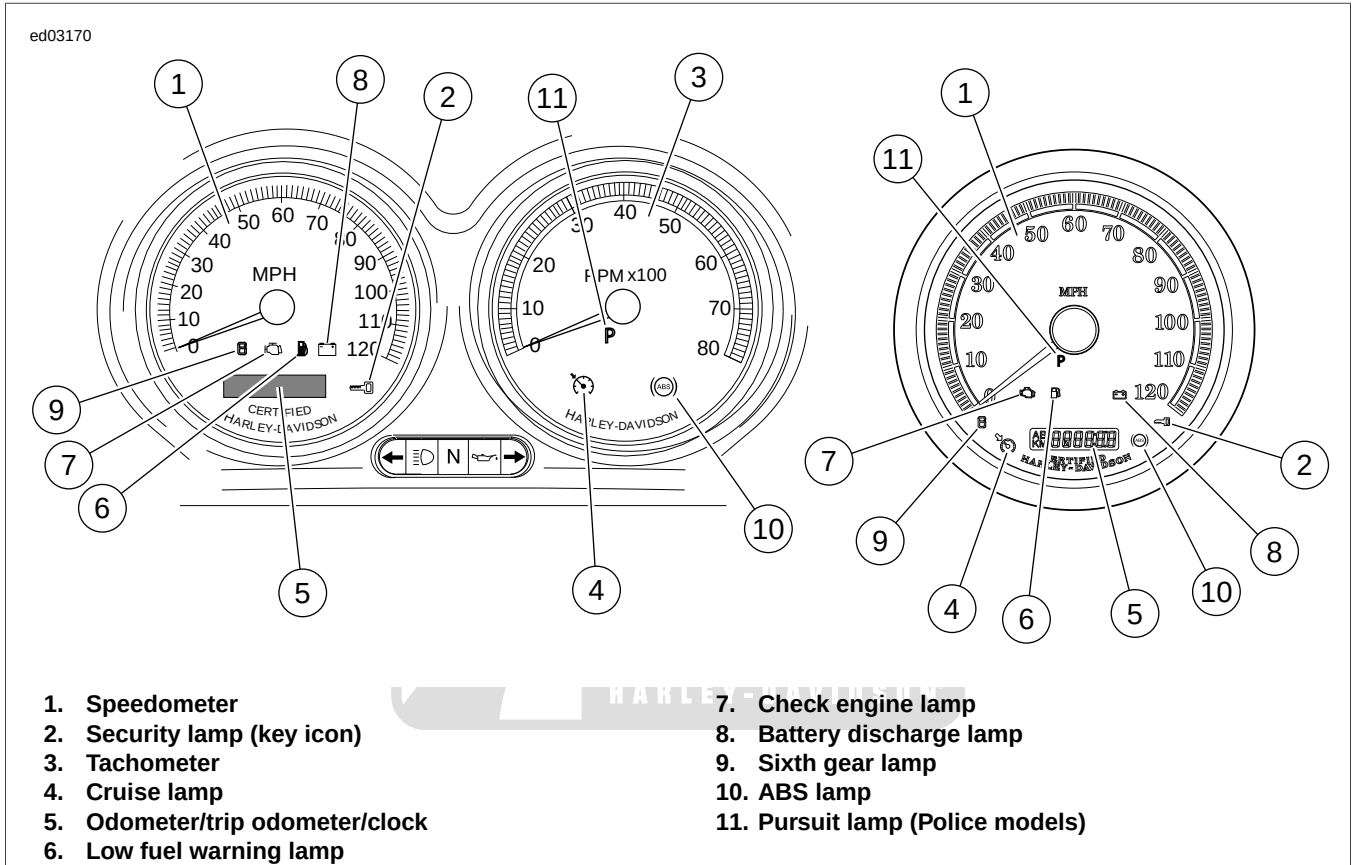


Figure 7-6. Speedometer

DTC C1017, C1018

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

See [Figure 7-7](#).

- **DTC C1017:** The ABS module monitors the internal relay for the pump motor along with the power circuit going to it.
- **DTC C1018:** The ABS module monitors the internal pump motor and the circuit supplying ground to the pump motor.

Table 7-1. Code Description

DTC	DESCRIPTION
C1017	Pump motor power circuit open fault
C1018	Pump motor ground high resistance fault

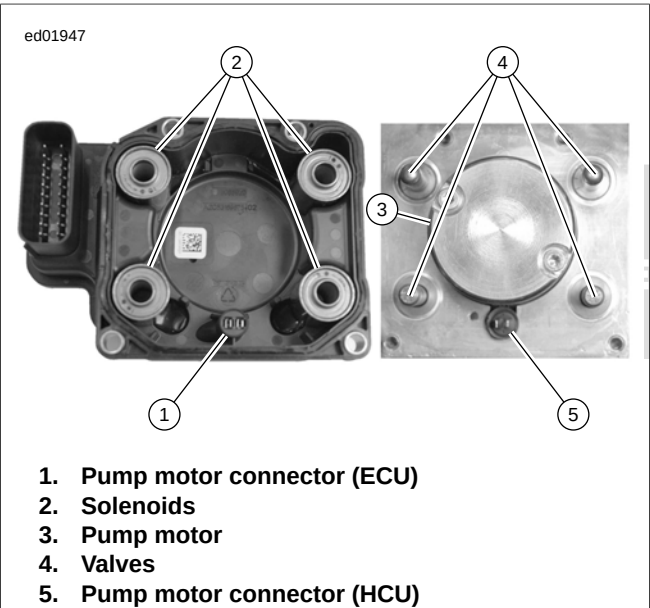


Figure 7-7. ECU and HCU Pump Motor Connectors

Conditions for Setting the DTC

DTC C1017 will set if any of the following conditions exist:

- The voltage across the pump is below 8.0V for 0.2 seconds.
- The battery voltage to the pump is less than 8.84V.
- The pump relay coil is NOT shorted to battery or open.

DTC C1018 will set if the following conditions exist when the pump motor is commanded off:

- The system voltage is between 8.0-18.0V.
- The voltage at the low side of the pump is greater than 1.7V.

DTC C1018 will set if the following conditions exist when the pump is commanded on:

- The system voltage is between 10.0-18.0V.
- The voltage across the pump motor is less than 8.4V.
- The voltage at the high side of the pump motor is greater than 8.84V.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for DTC C1017:

- High resistance or open pump motor battery circuit.
- Internal ECU pump relay fault.
- Battery or charging malfunction.

The following conditions are possible causes for DTC C1018:

- Pump motor ground circuit has high resistance or open.
- Battery or charging malfunction.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

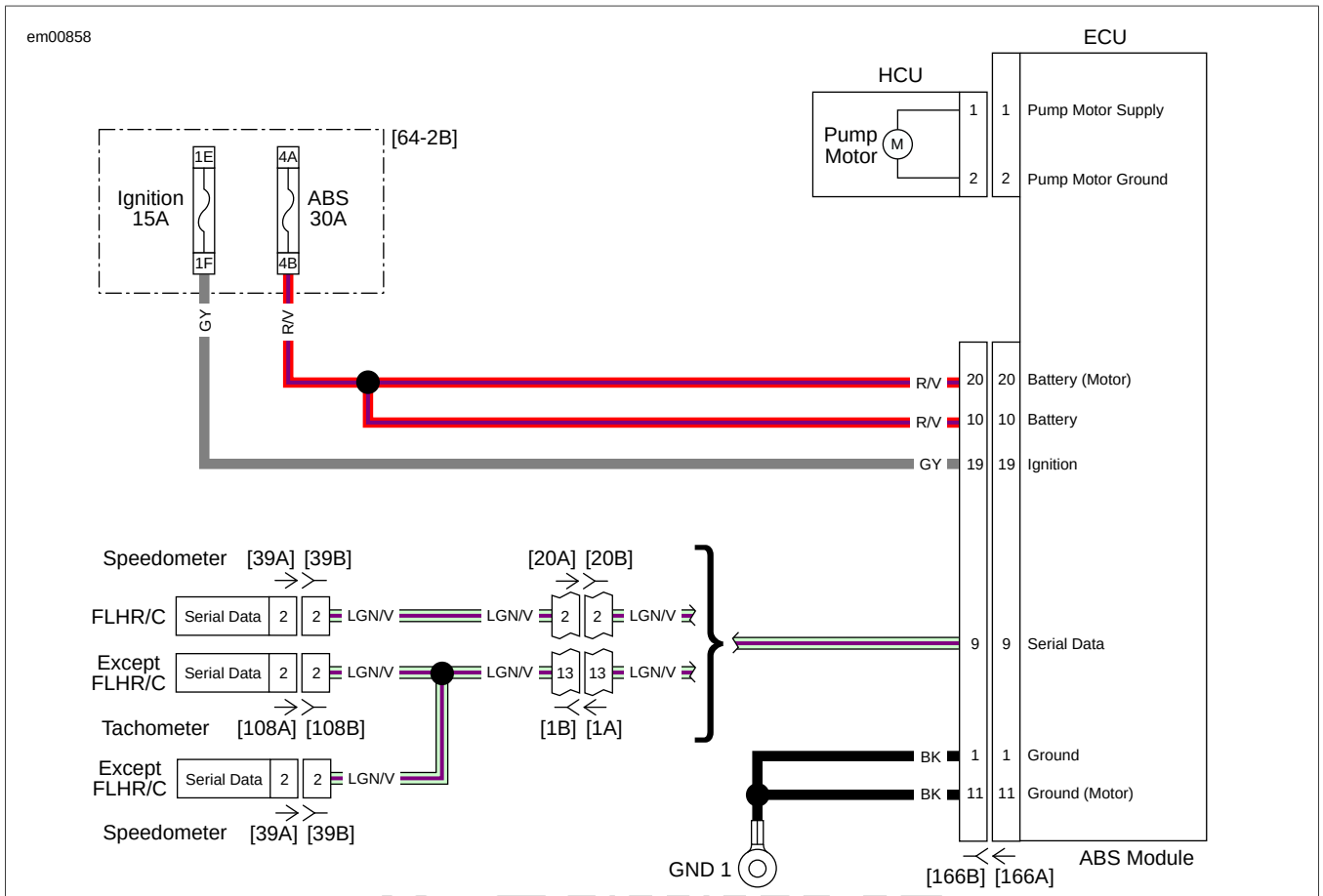


Figure 7-8. ABS Power and Ground Schematic

DTC C1017

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-2. DTC C1017 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Open ABS fuse
Short to ground in battery circuit
Open battery circuit
Open ground circuit

1. ABS Fuse Test

- Test the charging system for proper operation before proceeding. See [3.5 CHARGING SYSTEM](#).
- Inspect the 30A ABS fuse.
- Is the fuse good?
 - Yes.** [Go to Test 3.](#)
 - No.** [Go to Test 2.](#)

2. Battery Circuit Short to Ground Test

- Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between ABS [166B] terminals 1 and 20 at breakout box.
- Is continuity present?
 - Yes.** Repair short to ground ABS module [166B] terminal 20 (R/V) wire and replace the 30A ABS fuse.
 - No.** Replace ECU and 30A ABS fuse. See the service manual.

3. Battery Voltage Circuit Test

- Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for battery voltage between breakout box terminals 1 and 20.

3. Is battery voltage present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in ABS module [166B] terminal 20 (R/V) wire.

4. Ground Circuit Open Test

1. Test for continuity between breakout box terminal 11 and ground.
2. Is continuity present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Repair open in ground circuit ABS module [166B] terminal 11 (BK) wire.

DTC C1018

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-3. DTC C1018 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Open ground circuit

1. Ground Circuit Open Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 11 and ground.
3. Is continuity present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Repair open in ground circuit ABS module [166B] terminal 11 (BK) wire.



DTC C1021, C1023

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The active WSS is supplied system voltage from the ABS module. The sensor then returns a 7 mA or 14 mA signal back to the ABS module.

Table 7-4. Code Description

DTC	DESCRIPTION
C1021	WSS equals 0 (Front)
C1023	WSS equals 0 (Rear)

Conditions for Setting the DTC

- Ignition voltage is greater than 6.5V.
- The ABS is inactive.
- The brake is not depressed.
- There are no WSS circuit malfunctions.
- Vehicle must be driven above 10 mph (16 km/h) for 20 seconds without a brake input.

DTC C1021 will set if the following conditions exist for over 20 seconds:

- The front wheel speed equals 0 mph (0 km/h).
- The rear wheel speed is greater than 10 mph (16 km/h).
- The difference between the two wheel speeds is greater than 11 mph (18 km/h).

DTC C1023 will set if the following conditions exist for over 20 seconds.

- The rear wheel speed equals 0 mph (0 km/h).
- The front wheel speed is greater than 10 mph (16 km/h).
- The difference between the two wheel speeds is greater than 11 mph (18 km/h).

Action Taken When the DTC Sets

- The ABS module disables the ABS.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- Internal sensor fault.
- Spinning up the rear wheel over 10 mph (16 km/h) with the vehicle in a stationary position for an extended period of time (dynamometer).

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

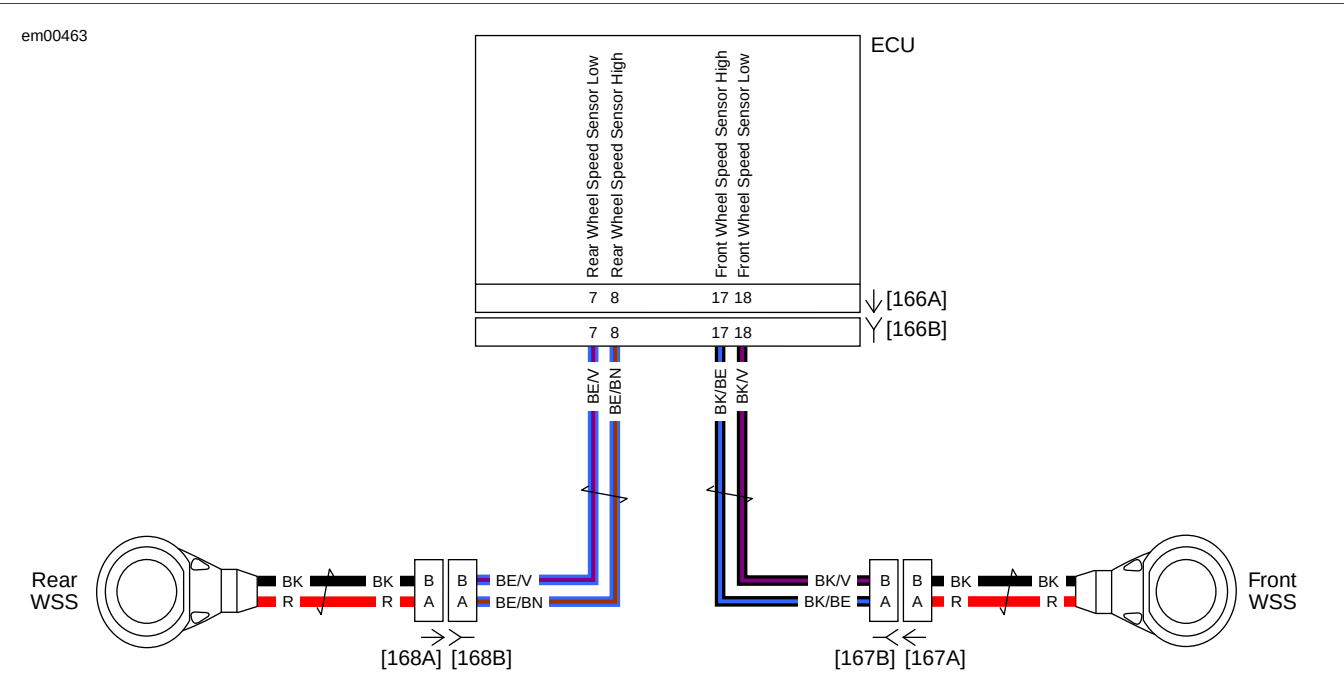


Figure 7-9. WSS

DTC C1021, C1023

Table 7-5. DTC C1021, C1023 Diagnostic Faults

POSSIBLE CAUSES
Faulty WSS
Worn bearing assembly
Dynamometer test

1. DTC Verification Test

1. Check for DTCs.
2. Are any other wheel speed DTCs present?
 - a. **Yes.** See [2.1 INITIAL DIAGNOSTICS](#).
 - b. **No.** [Go to Test 2.](#)

2. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** Replace appropriate bearing assembly and WSS. See the service manual.
 - b. **No.** This code may occur if the vehicle experiences an abnormal amount of wheel slippage due to slippery conditions under launch or intentional front or rear wheel spin (dynamometer testing).



DTC C1025, C1027, C1206, C1208

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The active WSS is supplied system voltage from the ABS module. The sensor then returns a 7 mA or 14 mA signal back to the ABS module.

Table 7-6. Code Description

DTC	DESCRIPTION
C1025	Wheel speed signal intermittent (Front)
C1027	Wheel speed signal intermittent (Rear)
C1206	Wheel speed signal frequency out of range (Front)
C1208	Wheel speed signal frequency out of range (Rear)

Conditions for Setting the DTC

The DTC will set if the following conditions exist.

- The ABS module detects a rapid variation in the wheel speed. The wheel speed changes by 12 mph (20 km/h) or more in 0.01 second. The change must occur 3 times with no more than 0.2 seconds between occurrences.
- The frequency of the wheel speed input goes above 2.5kHz for 20 milliseconds.

Action Taken When the DTC Sets

- The ABS module disables the ABS.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- External or internal wheel speed circuit intermittent open.
- Mismatched or improperly sized tires.
- Electrical noise on the WSS wires.
- Worn suspension components.
- Rough terrain.

If the fault only occurs in moist conditions (rain, snow, vehicle wash, etc.) inspect the wheel speed sensor and wiring for signs of water intrusion.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

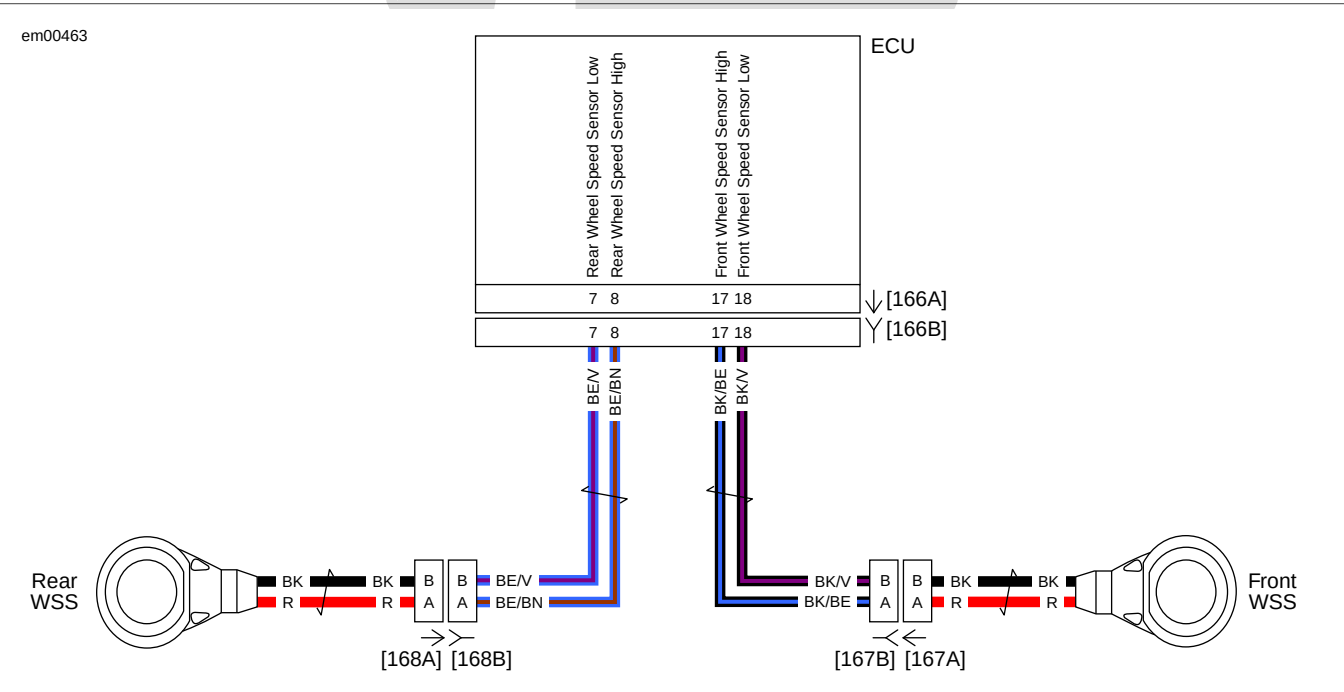


Figure 7-10. WSS

DTC C1025 (FRONT), C1027 (REAR), C1206, C1208

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-7. DTC C1025 (Front), C1027 (Rear), C1206, C1208 Diagnostic Faults

POSSIBLE CAUSES
Electrical interference
Poor connections
Intermittent open in WSS circuits
Faulty WSS
Worn bearing assembly

1. Electrical Interference Test

1. Inspect vehicle for accessories that may cause electrical interference with the wheel speed sensors.
2. Electrical interference present?
 - a. **Yes.** Remove or relocate interference.
 - b. **No.** [Go to Test 2.](#)

2. Loose or Damaged Connections Test

1. See [Figure 7-2](#) and [Figure 7-3](#). Inspect for loose or damaged connections on WSS circuits.
2. Were poor connections found?
 - a. **Yes.** Repair connections and circuits.
 - b. **No.** [Go to Test 3.](#)

3. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Operate vehicle under condition for running DTC.
3. Does DTC set?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** See diagnostic tips.

4. WSS Circuit Open Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Start engine and wait 10 seconds for ABS to complete initialization test.
4. While wiggling harness, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, check for voltage at breakout box terminal 18 to ground (front wheel) or terminal 7 to ground (rear wheel).
5. Does voltage drop out intermittently?
 - a. **Yes.** Repair open in circuits.
 - b. **No.** [Go to Test 5.](#)

5. Worn or Damaged Components Test

1. Inspect for worn or damaged suspension components.
2. Were worn or damaged components found?
 - a. **Yes.** Replace worn or damaged components as necessary.
 - b. **No.** Replace the appropriate bearing assembly and WSS. See the service manual.

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The active WSS is supplied system voltage from the ABS module. The sensor then returns a 7 mA or 14 mA signal back to the ABS module.

Table 7-8. Code Description

DTC	DESCRIPTION
C1032	Wheel speed sensor circuit open or shorted (Front)
C1034	Wheel speed sensor circuit open or shorted (Rear)

Conditions for Setting the DTC

The DTC will set if there are no front or rear WSS circuit malfunctions and the following conditions exist:

- Short to ground on either the high or low side circuits of the front WSS.
- Open on either the high or low side circuits of the front WSS.
- Short to voltage on the low side causing the voltage to go above 0.79V.
- WSS open.

Action Taken When the DTC Sets

- The ABS module disables the ABS.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared with in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- Open in any of the WSS circuits.
- Short to ground in any of the WSS wires.
- Front WSS open.
- Front wheel speed circuit low shorted to battery.

If the fault only occurs in moist conditions (rain, snow, vehicle wash, etc.) inspect the WSS and wiring for signs of water intrusion.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

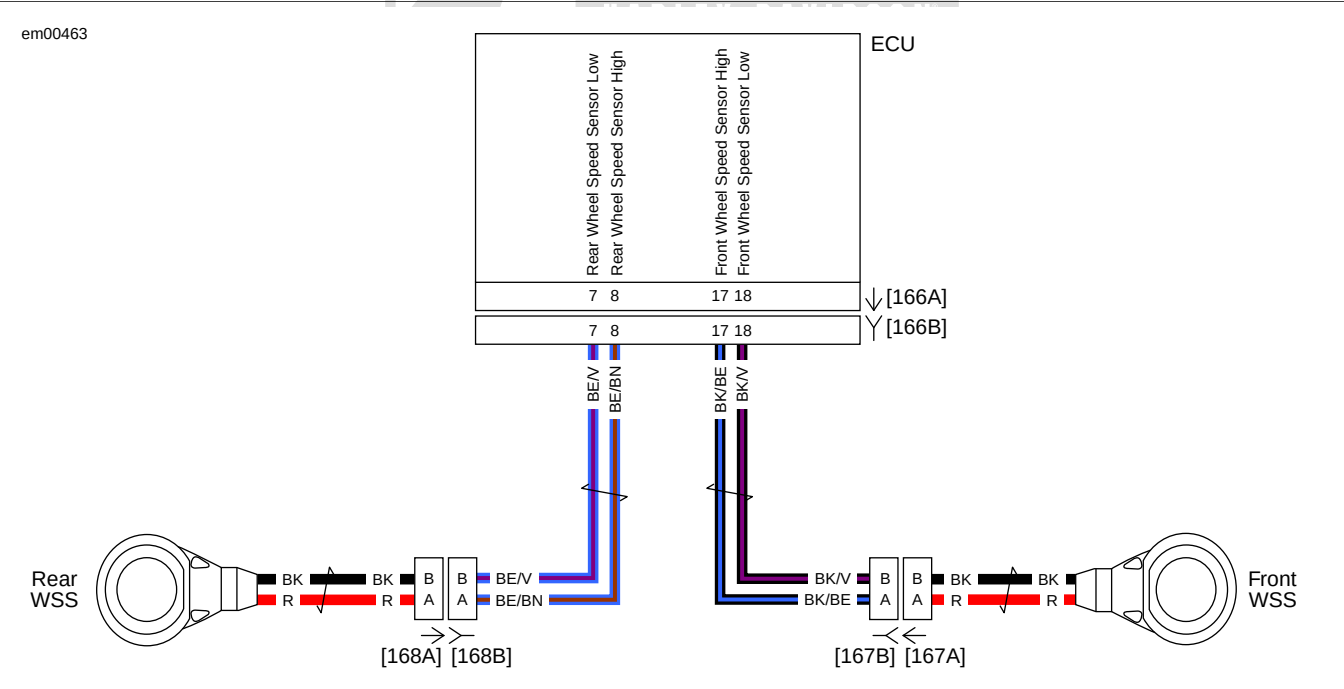


Figure 7-11. WSS

DTC C1032

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-9. DTC C1032 Diagnostic Faults

POSSIBLE CAUSES
Open front WSS circuit
Short to ground in front WSS circuit
Front WSS open
Front wheel speed signal wire shorted to voltage

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Front WSS Low Circuit Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Wait 10 seconds for ABS module to complete initialization test.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage between breakout box terminal 18 and ground.
5. Is voltage below 0.5V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 7.](#)

3. Front WSS Circuits Short to Ground Test

1. Disconnect ABS module [166A] from the breakout box.
2. Test breakout box terminal 17 for short to ground, and terminal 18 for short to ground.
3. Is short to ground present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 4.](#)

4. Front WSS High Circuit Test

1. Disconnect front WSS [167].
2. Test for continuity between breakout box terminal 17 and [167B] terminal A.

3. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open between ABS module [166B] terminal 17 and front WSS [167B] terminal A (BK/BE) wire.

5. Front WSS Low Circuit Open Test

1. Test for continuity between breakout box terminal 18 and front WSS [167B] terminal B.
2. Is continuity present?
 - a. **Yes.** Replace front WSS. See the service manual.
 - b. **No.** Repair open between ABS module [166B] terminal 18 and front WSS [167B] terminal B (BK/V) wire.

6. Front WSS Short to Ground Test

1. Disconnect front WSS [167].
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test breakout box terminals 17 and 18 for short to ground.
3. Is a short to ground present?
 - a. **Yes.** Repair short to ground in appropriate circuit.
 - b. **No.** Replace front WSS. See the service manual.

7. Front WSS Circuits Short to Voltage Test

1. Disconnect ABS module [166A] from breakout box.
2. Test breakout box terminals 17 and 18 for short to voltage.
3. Is a short to voltage present?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** [Go to Test 8.](#)

8. Front WSS Circuits Shorted Together Test

1. Disconnect front WSS [167].
2. Test breakout box terminals 17 and 18 for continuity.
3. Is continuity present?
 - a. **Yes.** Repair short in appropriate circuit.
 - b. **No.** [Go to Test 9.](#)

9. Front WSS Continuity Test

1. Test for continuity across terminals A and B at front WSS [167A].
2. Is continuity present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Replace front WSS. See the service manual.

10. Front WSS Short to Voltage Test

1. Disconnect front WSS [167].
2. Test breakout box terminals 17 and 18 for short to voltage.

3. Is short to voltage present?
 - a. **Yes.** Repair short to voltage in appropriate circuit.
 - b. **No.** Replace front WSS. See the service manual.

DTC C1034

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-10. DTC C1034 Diagnostic Faults

POSSIBLE CAUSES
Open rear WSS circuit
Short to ground in rear WSS circuit
Rear WSS open
Rear wheel speed signal wire shorted to voltage

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Rear WSS Low Circuit Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Wait 10 seconds for ABS module to complete initialization test.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage at breakout box between terminal 7 and ground.
5. Is voltage below 0.5V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 7.](#)

3. Rear WSS Circuits Short to Ground Test

1. Disconnect ABS module [166A] from the breakout box.
2. Test breakout box [166B] terminals 7 and 8 for continuity to ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 6.](#)

4. Rear WSS High Circuit Test

1. Disconnect rear WSS [168].

2. Test for continuity between breakout box terminal 8 and [168B] terminal A.
3. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open in rear WSS high circuit.

5. Rear WSS Low Circuit Open Test

1. Test for continuity between breakout box terminal 7 and [168B] terminal B.
2. Is continuity present?
 - a. **Yes.** Replace rear WSS. See the service manual.
 - b. **No.** Repair open between ABS module [166B] terminal 17 and [168B] terminal A (BE/BN) wire.

6. Rear WSS Circuits Short to Ground Test

1. Disconnect rear WSS [168].
2. Test breakout box terminals 7 and 8 for continuity to ground.
3. Is continuity present?
 - a. **Yes.** Replace rear WSS. See the service manual.
 - b. **No.** Repair short to ground in appropriate circuit.

7. Rear WSS Circuits Short to Voltage Test

1. Disconnect ABS module [166A] from the breakout box.
2. Test breakout box terminals 7 and 8 for short to voltage.
3. Is a short to voltage present?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** [Go to Test 8.](#)

8. Rear WSS Circuits Shorted Together Test

1. Disconnect rear WSS [168].
2. Test breakout box terminals 7 and 8 for continuity.
3. Is continuity present?
 - a. **Yes.** Repair short in appropriate circuit.
 - b. **No.** [Go to Test 9.](#)

9. Rear WSS Continuity Test

1. Test for continuity across terminals A and B at rear WSS [168A].
2. Is continuity present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Replace rear WSS. See the service manual.

10. Rear WSS Short to Voltage Test

1. Disconnect rear WSS [168].
2. Test breakout box terminals 7 and 8 for short to voltage.
3. Is a short to voltage present?
 - a. **Yes.** Repair short to voltage in appropriate circuit.
 - b. **No.** Replace rear WSS. See the service manual.

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

See [Figure 7-12](#). The pump motor is located in the HCU portion of the ABS module. Power is supplied through an internal pump motor relay when the ignition is turned on. The ECU monitors pump motor feedback voltage after activation to detect a stalled or binding pump motor.

Table 7-11. Code Description

DTC	DESCRIPTION
C1042	Pump motor open
C1043	Pump motor stalled

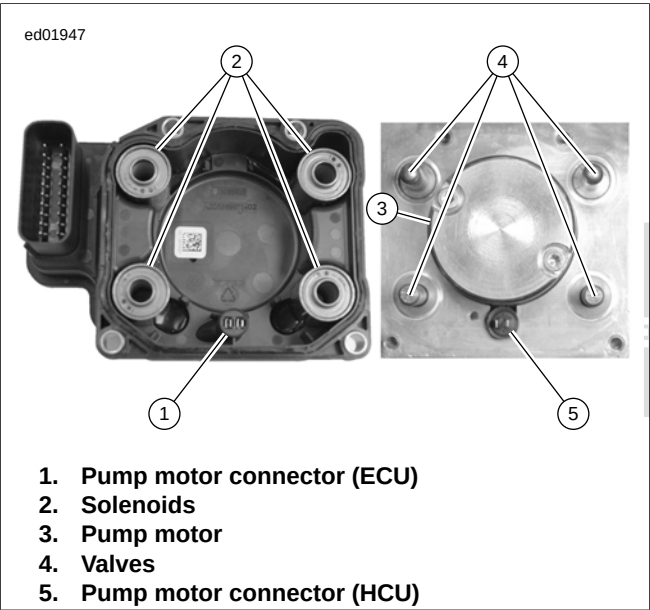


Figure 7-12. ECU and HCU Pump Motor Connectors

Conditions for Setting the DTC

DTC C1042 will set if current did not exceed 15.6A within 0.1 seconds of switching the pump motor on.

DTC C1043 will set if the following conditions exist:

- The pump takes less than 0.03 seconds to spin down.
- The current exceeds 15.6A within 0.33 millisecond of switching the pump motor on.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ECU automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for DTC C1042:

- Open or high resistance at the pump motor connector.
- Open or high resistance in the pump motor windings.

The following conditions are possible causes for DTC C1043:

- High side of the pump motor is shorted to ground.
- High or low resistance in the pump motor windings.
- The pump motor is seized or requires excessive torque to spin.

DTC C1042

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-12. DTC C1042 Diagnostic Faults

POSSIBLE CAUSES
Open or high resistance at the pump motor connector.
Open or high resistance in the pump motor windings.

1. Ground Circuit Open Test

- Connect ABS BREAKOUT BOX (Part No. HD-48642) to wire harness [166B] leaving ABS module [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 11 and ground.
- Is continuity present?
 - Yes.** [Go to Test 2.](#)
 - No.** Repair open ABS module [166B] terminal 11 (BK) wire.

2. Pump Motor Test

- Remove the ABS module and separate the ABS ECU from the ABS HCU. See the service manual.
- Measure the resistance between HCU terminals 1 and 2.
- Is resistance less than 2 Ohms?
 - Yes.** Replace the ECU. See the service manual.
 - No.** Replace the HCU. See the service manual.

DTC C1043

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-13. DTC C1043 Diagnostic Faults

POSSIBLE CAUSES
Short to ground in high side pump motor circuit
High or low resistance in the pump motor windings
The pump motor is seized or requires excessive torque to spin

1. Ground Circuit Open Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) to wire harness [166B] leaving ABS module [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for continuity between breakout box terminal 11 and ground.
3. Is continuity present?
 - a. **Yes.** Replace the HCU. See the service manual.
 - b. **No.** Repair open ABS module [166B] terminal 11 (BK) wire.



DTC C1094

7.7

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module monitors the front brake switch input. When the brake lever is applied the ABS module receives voltage on the front brake switch circuit. The ABS module uses this signal to enhance ABS operation.

Table 7-14. Code Description

DTC	DESCRIPTION
C1094	Front brake switch always on

Conditions for Setting the DTC

The DTC will set if all of the following conditions exist for 2 seconds:

- The ECU sees a front brake input.
- The vehicle speed exceeds 25 mph (40 km/h).
- The vehicle acceleration exceeds 5 mph (8 km/h) per second.

Action Taken When the DTC Sets

No action is taken when this code is set. The ABS indicator does not illuminate and the ABS is still active.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ECU automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- Short to voltage between the front brake switch and the ECU.
- Front brake switch stuck closed or applied during acceleration.
- Internal front brake sensing malfunction.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



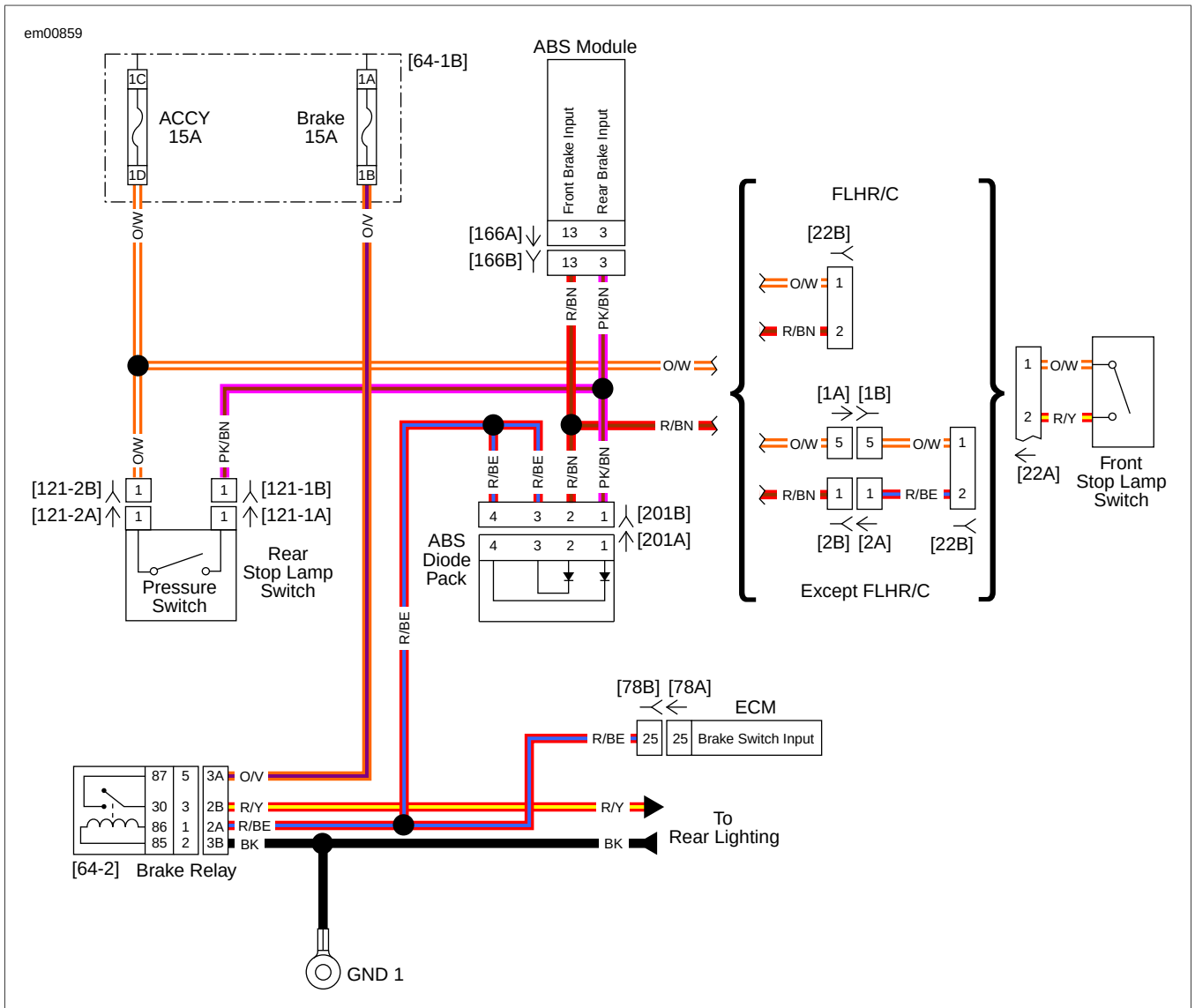


Figure 7-13. Brake Switches Schematic

DTC C1094

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-15. DTC C1094 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Front brake switch malfunction
Short to voltage in front brake switch circuit

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.

3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Front Brake Input Short to Voltage Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Wait 10 seconds for ABS module to complete initialization test.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, measure voltage at between breakout box terminal 13 and ground.

5. Is voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace ECU module. See the service manual.

3. Front Stop Lamp Switch Test

1. Disconnect right hand controls [22].

2. Test for voltage on [22B] terminal 2.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage on front stop lamp switch [22B] (R/BN) wire (FLHR/C) or (R/BE) wire (except FLHR/C).
 - b. **No.** Replace front brake switch. See the service manual.



DTC C1095

7.8

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module monitors the front brake switch input. When the brake lever is applied the ABS module receives voltage on the front brake switch circuit. The ABS module uses this signal to enhance ABS operation.

Table 7-16. Code Description

DTC	DESCRIPTION
C1095	Front brake switch open

Conditions for Setting the DTC

The DTC will set if the rear brake switch is not closed (brake applied) and all of the following conditions exist for 2 seconds:

- The ABS module detects an open in the front brake input circuit.
- The ABS module detects an open in the ground circuit to the front brake switch.

Action Taken When the DTC Sets

No action is taken when this code is set. The ABS indicator DOES NOT illuminate and the ABS is still active.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ECU automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



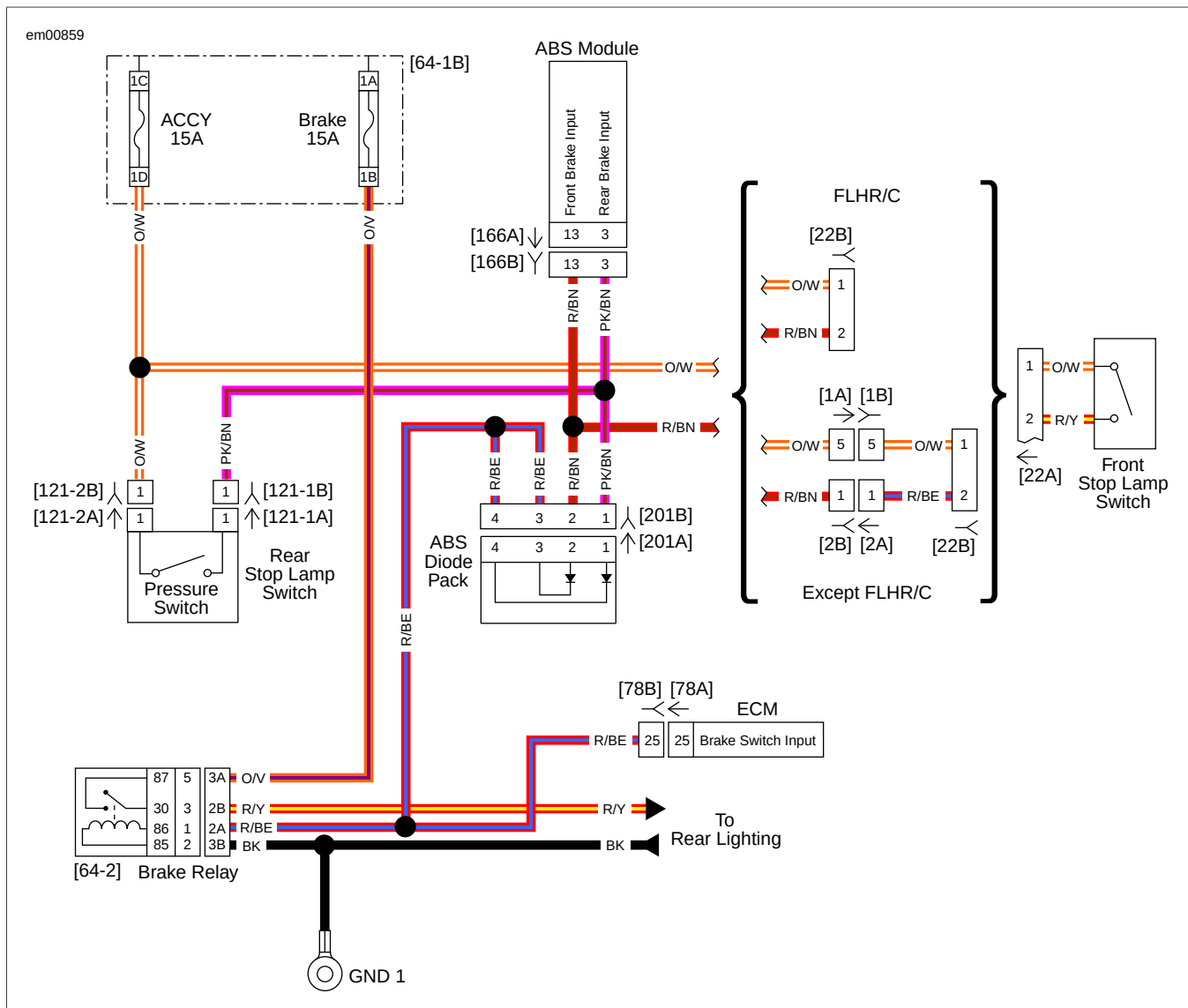


Figure 7-14. Brake Switches Schematic

DTC C1095

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-17. DTC C1095 Diagnostic Faults

POSSIBLE CAUSES
Open front brake input circuit
Open tail/stop lamp ground circuit
Internal ABS module problem in the front brake circuitry
Tail/stop lamp malfunction
ECU malfunction
ABS Diode pack malfunction
Front stop lamp switch malfunction

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** See diagnostic tips.

2. DTC Verification Test

1. Check for additional DTCs.
2. Is DTC C1216 set?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 5.](#)

3. Tail/Stop Lamp Test

1. Disconnect tail lamp [93].
2. Turn IGN ON.
3. While applying the brakes, use a multimeter to test for voltage between [93A] terminal 3 and terminal 4.
4. Is battery voltage present?
 - a. **Yes.** Replace tail/stop lamp. See the service manual.
 - b. **No.** [Go to Test 4.](#)

4. Ground Circuit Open Test

1. While applying the brakes, use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter to test for voltage between tail lamp [93A] terminal 3 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (BK) wire between tail/stop lamp [93A] terminal 4 and battery negative.
 - b. **No.** Repair open in (R/Y) wire between tail/stop lamp [93A] terminal 3 and ABS diode pack [201B].

5. Front Stop Lamp Switch Test

1. Apply the front brake.
2. Does the tail/stop lamp illuminate?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** [Go to Test 7.](#)

6. Front Stop Lamp Switch Input Circuit Open Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) to wiring harness [166B] leaving ABS module [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), with the front brake applied, use a multimeter test for voltage at breakout box terminal 13 to ground.
4. Is battery voltage present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Repair open in ABS module [166B] terminal 13 (R/BN) wire.

7. ABS Diode Pack Test

1. Disconnect ABS diode [201].
2. Jumper [201B] terminal 1 and terminal 4.
3. Apply front brake.
4. Does tail/stop lamp illuminate?
 - a. **Yes.** Replace ABS diode pack. See the service manual.
 - b. **No.** [Go to Test 8.](#)

8. Tail/Stop Lamp Circuit Open Test

1. While applying the front brake, use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and test for voltage between [201B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in (R/Y) wire between ABS diode pack [201B] and tail/stop lamp [93A].
 - b. **No.** [Go to Test 9.](#)

9. Front Stop Lamp Switch Test

1. Disconnect right hand controls [22].
2. Jumper [22B] terminal 1 and terminal 2.
3. Test for voltage between [201B] terminal 1 and ground.
4. Is battery voltage present?
 - a. **Yes.** Replace front stop lamp switch. See the service manual.
 - b. **No.** [Go to Test 10.](#)

10. Accessory Circuit Test

1. Test for voltage between front stop lamp switch [22B] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open on front stop lamp switch [22B] terminal 2 (R/BN) FLHR/C, (R/BE) except FLHR/C wire.
 - b. **No.** Repair open on front stop lamp switch [22B] terminal 1 (O/W) wire.

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module activates the valve relay to supply voltage to the valve solenoids. This voltage is referred to as the system voltage. The ABS module microprocessor activates individual valve solenoids by grounding the valve solenoid control circuits.

Table 7-18. Code Description

DTC	DESCRIPTION
C1151	Front wheel release too long

Conditions for Setting the DTC

The DTC will set if all of the following conditions exist.

- The ABS is commanding a pressure release from the front wheel release valve.
- The front wheel speed is below 3 mph (5 km/h) for more than 1 second.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- An intermittent WSS.
- A stuck or seized caliper or bald tires could contribute to this code setting.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

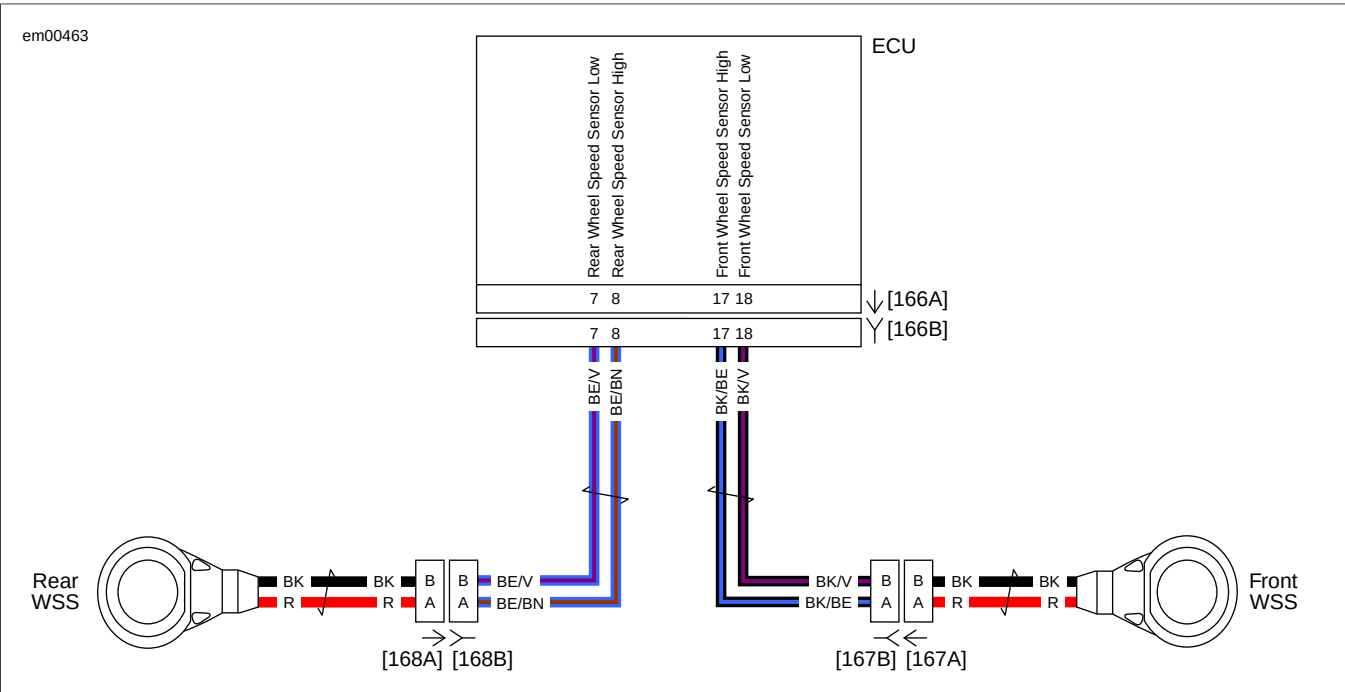


Figure 7-15. WSS

DTC C1151

Table 7-19. DTC C1151 Diagnostic Faults

POSSIBLE CAUSES
WSS equals 0 mph (0 km/h)
Internal ECU problem in the release solenoid
Internal problem in the HCU
Brake lines reversed on the HCU inlet and outlet ports

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Are any front WSS DTCs currently set?
 - a. **Yes.** See appropriate diagnostic procedure.
 - b. **No.** [Go to Test 2.](#)

2. Brake Lines Installation Test

1. Inspect brake lines at the ABS module for proper installation.
2. Are the lines installed properly?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Correctly install brake lines.

3. ECU Test

1. Remove the ABS module and separate the ABS ECU from the ABS HCU. See the service manual.
2. With the ECU connected to the harness, clear the DTCs.
3. Start the engine and wait 10 seconds for the ECU to perform an initialization test.
4. Did DTC C1151 set?
 - a. **Yes.** Replace ECU module. See the service manual.
 - b. **No.** Replace HCU module. See the service manual.



DTC C1153

7.10

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module activates the valve relay to supply voltage to the valve solenoids. This voltage is referred to as the system voltage. The ABS module microprocessor activates individual valve solenoids by grounding the valve solenoid control circuits.

Table 7-20. Code Description

DTC	DESCRIPTION
C1153	Rear wheel release too long

Conditions for Setting the DTC

The DTC will set if all of the following conditions exist:

- The ABS is commanding a pressure release from the rear wheel release valve.
- The rear wheel speed is below 3 mph (5 km/h) for more than 1 second.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- An intermittent WSS.
- A stuck or seized caliper or bald tires.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

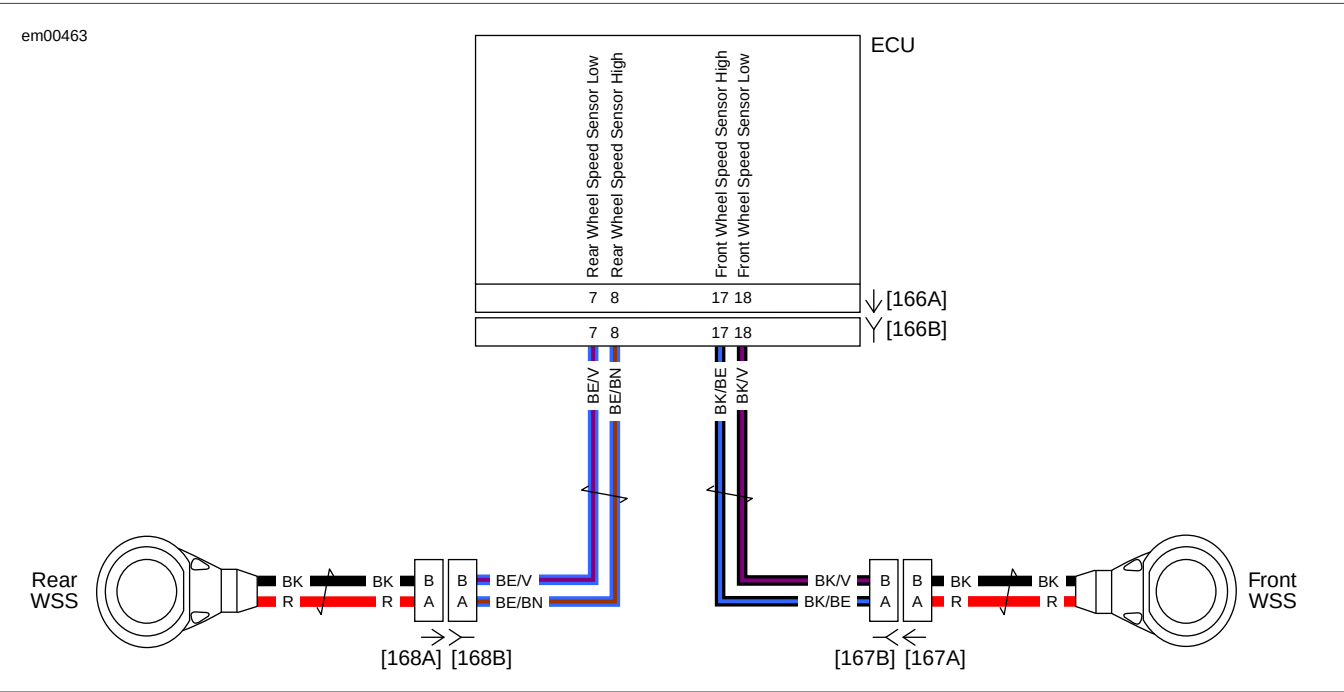


Figure 7-16. WSS

DTC C1153

Table 7-21. DTC C1153 Diagnostic Faults

POSSIBLE CAUSES
WSS equals 0 mph (0 km/h)
Internal ECU problem in the release solenoid
Internal problem in the HCU
Brake lines reversed on the HCU inlet and outlet ports

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Are any rear WSS DTCs currently set?
 - a. **Yes.** See appropriate diagnostic procedure.
 - b. **No.** [Go to Test 2.](#)

2. Brake Lines Installation Test

1. Inspect brake lines at the ABS module for correct installation.
2. Are the lines installed correctly?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Install brake lines correctly.

3. ECU Test

1. Remove the ABS module and separate the ABS ECU from the ABS HCU. See the service manual.
2. With the ECU connected to the harness, clear the DTCs.
3. Start the engine and wait 10 seconds for the ECU to perform an initialization test.
4. Did DTC C1153 set?
 - a. **Yes.** Replace ECU module. See the service manual.
 - b. **No.** Replace HCU module. See the service manual.



DTC C1158

7.11

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ECU is calibrated to maximize ABS performance. If the correct calibration is not in the module the ABS may not perform correctly.

Table 7-22. Code Description

DTC	DESCRIPTION
C1158	Calibration programming required

Conditions for Setting the DTC

The ABS module determines final calibration is not completed.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared with DIGITAL TECHNICIAN II (Part No. HD-48650). This code may be set whenever an ABS module is replaced or calibrated. The code on the **new** module will have to be cleared using DIGITAL TECHNICIAN II (Part No. HD-48650).

DTC C1158

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Table 7-23. DTC C1158 Diagnostic Faults

POSSIBLE CAUSES
An ECU that is not calibrated correctly or has an internal fault
All replacement ABS modules will have this DTC set
Any ECU calibration or update will cause code to set

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Does the DTC reset?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Successful Calibration Test

NOTE

Front and rear brake light circuits must be operational to successfully complete Digital Technician ABS service.

1. Using DIGITAL TECHNICIAN II (Part No. HD-48650) (see your dealer), attempt to calibrate the ECU using the ABS service feature found in Vehicle Set Up.
2. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).
3. Does the DTC set?
 - a. **Yes.** Replace ECU module. See the service manual.
 - b. **No.** Calibration complete.

DTC C1212

7.12

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module monitors the front and rear brake switch inputs through terminal 13 and terminal 3. This allows the ABS to determine if the brake is being applied or not when a wheel is decelerating.

Table 7-24. Code Description

DTC	DESCRIPTION
C1212	Front or rear brake not applied with decel

Conditions for Setting the DTC

The DTC will set if the following conditions exist. The first four conditions have to occur twice.

- The front or rear brake is not applied.
- There is no current ABS event in progress.
- Vehicle speed exceeds 15 mph (24 km/h).
- Vehicle decelerates at a rate greater than 5 mph (8 km/h) per second for more than two seconds.
- Vehicle speed drops below 15 mph (24 km/h).

Action Taken When the DTC Sets

No action is taken when this code is set. The ABS indicator DOES NOT illuminate and the ABS is still active.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ECU automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- A short or open on the brake switch input circuits to the ABS module.
- Downshifting up a steep hill without using the brakes two consecutive times could cause this code.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



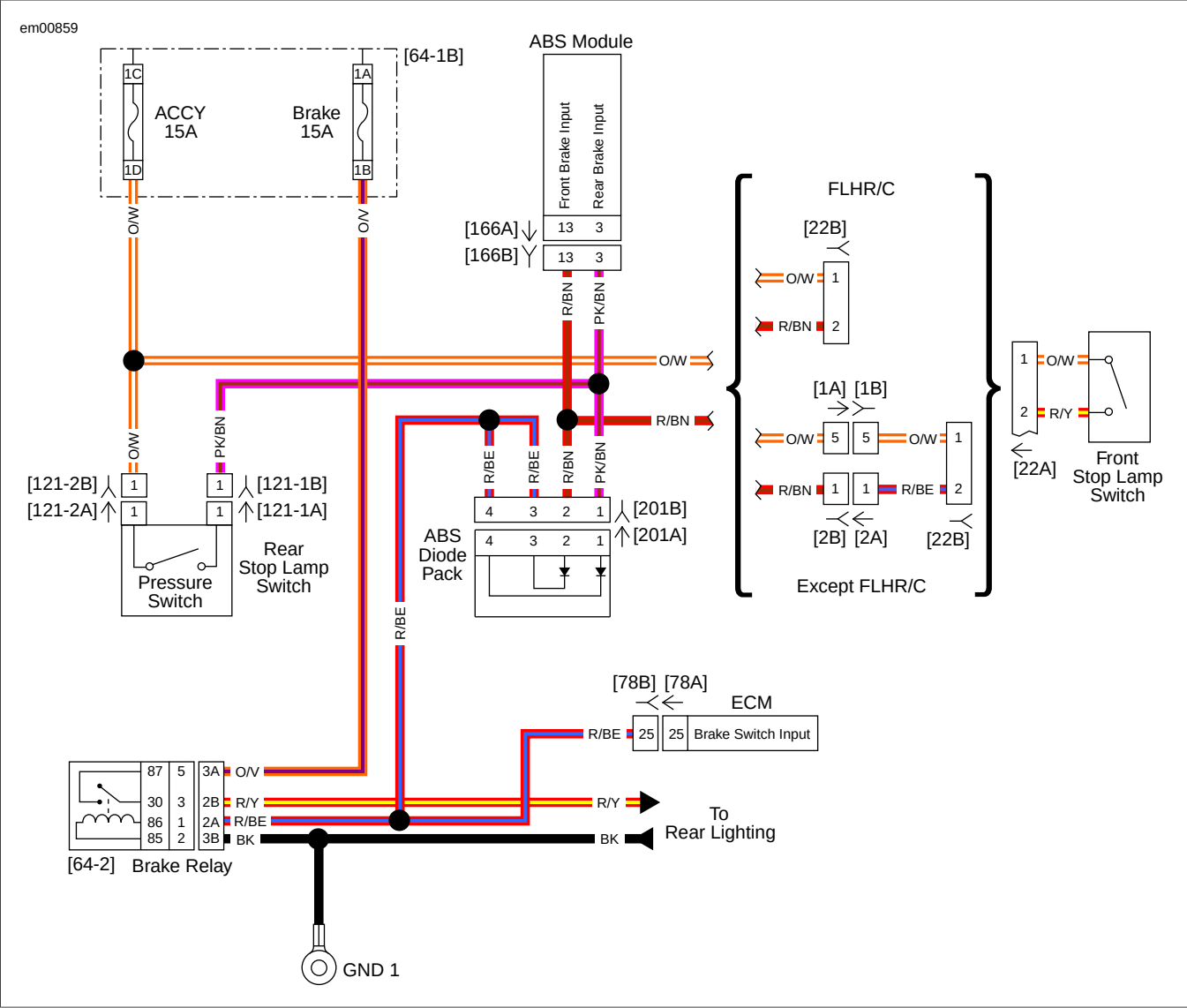


Figure 7-17. Brake Switches Schematic

DTC C1212

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-25. DTC C1212 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Open rear brake input circuit
Open front brake input circuit
Rear stop lamp switch malfunction
Front stop lamp switch malfunction

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).

2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Stop Lamp Switch Input Circuits Voltage Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Wait 10 seconds for ABS module to complete initialization test.
4. Apply front and rear stop lamp switches.

5. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage on breakout box terminal 13 to ground and terminal 3 to ground.
6. Is voltage present at both terminals?
 - a. **Yes.** Replace ECU module. See the service manual.
 - b. **No.** [Go to Test 3.](#)

3. Rear Stop Lamp Switch Input Test

1. Test for voltage on breakout box terminal 3 to ground.
2. Is voltage present at ABS module [166B] terminal 3?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** [Go to Test 4.](#)

4. Rear Stop Lamp Circuit Test

1. Apply the rear brake pedal.
2. Does the stop lamp illuminate?
 - a. **Yes.** Repair open in rear brake input circuit ABS module [166B] terminal 3.
 - b. **No.** [Go to Test 5.](#)

5. Rear Stop Lamp Switch Test

1. Disconnect rear stop lamp switch.
2. Apply rear brake pedal and test for continuity between rear stop lamp switch [121A] terminals 1 and 2.
3. Is continuity present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Replace rear stop lamp switch. See the service manual.

6. Rear Stop Lamp Switch Accessory Circuit Open Test

1. Turn the IGN ON.
2. Test for voltage on rear stop lamp switch [121B] terminal B to ground.
3. Is voltage present?
 - a. **Yes.** Repair open in rear stop lamp switch [121AB] (PK/BN) wire.
 - b. **No.** Repair open in rear stop lamp switch [121BB] (O/W) wire.

7. Front Stop Lamp Switch Accessory Circuit Open Test

1. Disconnect right hand controls [22B].
2. Test for voltage on [22B] terminal 1 to ground.
3. Is voltage present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Repair open in front stop lamp switch [22B] terminal 1 (O/W) wire.

8. Front Stop Lamp Switch Test

1. Connect jumper wire from [22B] terminal 1 to terminal 2.
2. Does the stop lamp illuminate?
 - a. **Yes.** Replace front stop lamp switch. See the service manual.
 - b. **No.** Repair open in front stop lamp switch [22B] terminal 2 (R/BN) FLHR/C, (R/BE) except FLHR/C wire.

DTC C1214

7.13

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module monitors the rear brake switch input. When the brake pedal is applied the ABS module receives voltage on the rear brake switch circuit. The ABS module uses this signal to enhance ABS operation.

Table 7-26. Code Description

DTC	DESCRIPTION
C1214	Rear brake switch always on

Conditions for Setting the DTC

The DTC will set if all of the following conditions exist for 2 seconds:

- The ABS module sees a rear brake input.
- The vehicle speed exceeds 25 mph (40 km/h).
- The vehicle acceleration exceeds 5 mph (8 km/h) per second.

Action Taken When the DTC Sets

No action is taken when this code is set. The ABS indicator does not illuminate and the ABS is still active.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- Rear brake switch stuck closed or applied during acceleration.
- Internal rear brake sensing malfunction.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



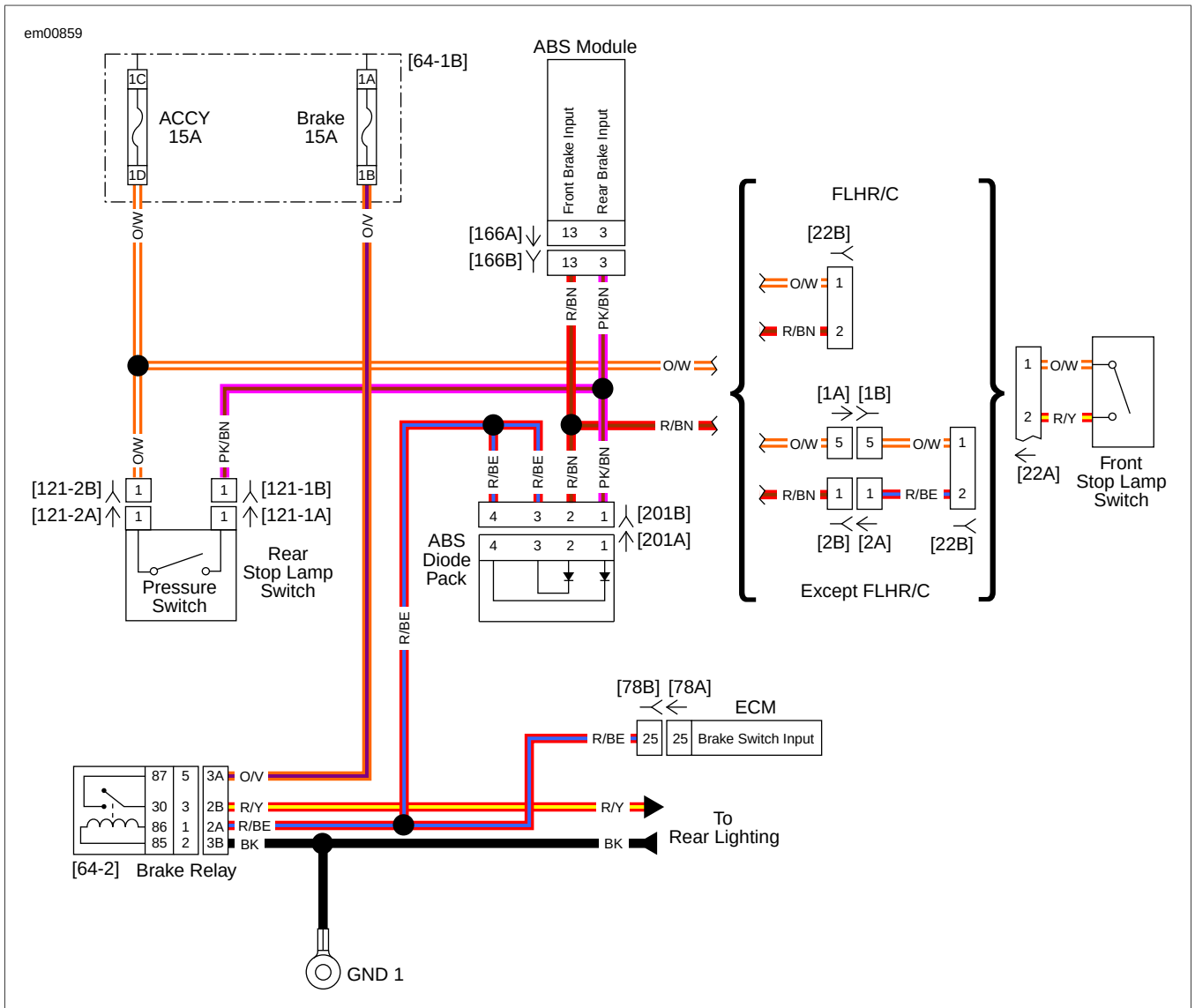


Figure 7-18. Brake Switches Schematic

DTC C1214

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-27. DTC C1214 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Rear brake switch malfunction
Short to voltage between the rear brake switch and the ABS module

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).

2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. Rear Stop Lamp Switch Input Voltage Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) to wire harness [166B] leaving ABS module [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage on breakout box terminal 3 to ground.

4. Is voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace ECU module. See the service manual.
2. Is voltage present?
 - a. **Yes.** Repair short to voltage on (PK/BN) wire.
 - b. **No.** Replace rear stop lamp switch. See the service manual.

3. Rear Stop Lamp Switch Test

1. Test for voltage on [121AB] terminal 1 (PK/BN) wire to ground.



DTC C1216

7.14

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

The ABS module monitors the rear brake switch input. When the brake pedal is applied the ABS module receives voltage on the rear brake switch circuit. The ABS module uses this signal to enhance ABS operation.

Table 7-28. Code Description

DTC	DESCRIPTION
C1216	Rear brake switch open

Conditions for Setting the DTC

The DTC will set if the front brake switch is not closed (brake applied) and all of the following conditions exist for 2 seconds:

- The ABS module detects an open in the rear brake input circuit.
- The ABS module detects an open in the ground circuit to the rear brake switch.

Action Taken When the DTC Sets

No action is taken when this code is set. The ABS indicator DOES NOT illuminate and the ABS is still active.

Conditions for Clearing the DTC

The condition for the DTC is no longer present and the DTC has been cleared in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

The ECU automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

The following conditions are possible causes for this fault:

- An open or loose connection in the rear brake input circuit.
- All brake lamps are open or burned out.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



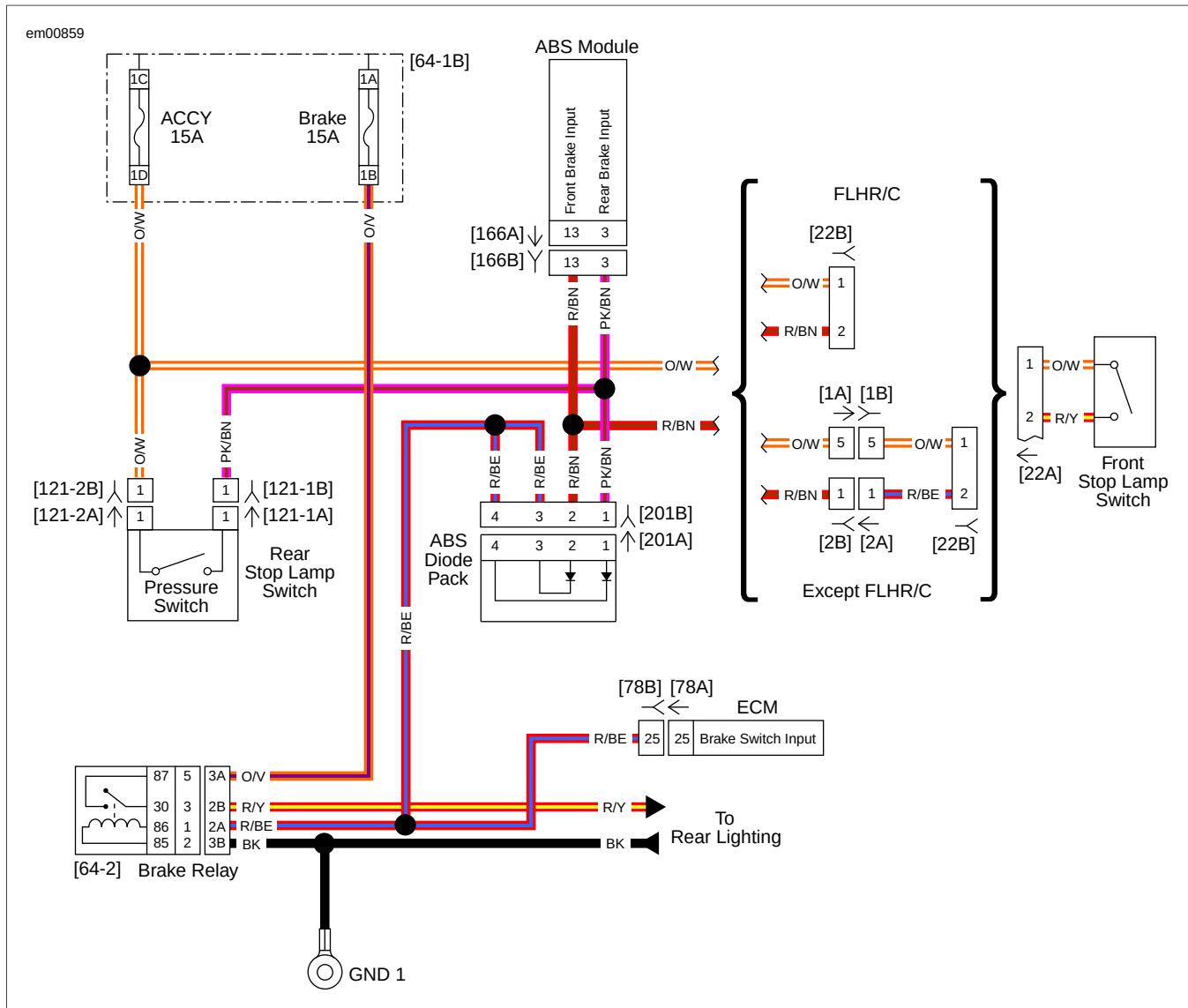


Figure 7-19. Brake Switches Schematic

DTC C1216

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

Table 7-29. DTC C1216 Diagnostic Faults

POSSIBLE CAUSES
ECU malfunction
Open rear brake input circuit
ABS Diode Pack malfunction
Open tail/stop lamp circuit
Rear stop lamp switch

1. Validation of Current DTC Test

1. Clear the DTC. See [2.1 INITIAL DIAGNOSTICS](#).

2. Start engine and wait 10 seconds for ABS to complete initialization test.
3. Did the DTC set?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** See diagnostic tips.

2. DTC Verification Test

1. Check for additional DTCs.
2. Is DTC C1095 set?
 - a. **Yes.** See [7.8 DTC C1095](#).
 - b. **No.** [Go to Test 3](#).

3. Tail/Stop Lamp Test

1. Apply the rear brake.

2. Does the tail/stop lamp illuminate?

- a. **Yes.** [Go to Test 4.](#)
- b. **No.** [Go to Test 5.](#)

4. Rear Stop Lamp Switch Input Circuit Open Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) to wiring harness connector [166B] leaving ABS module [166A] disconnected. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON with the engine stop switch in the RUN position.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, with the rear brake applied, measure voltage at breakout box terminal 3 to ground.
4. Is battery voltage present?
 - a. **Yes.** Replace ECU module. See the service manual.
 - b. **No.** Repair open in (PK/BN) wire.

5. ABS Diode Pack Test

1. Disconnect ABS diode pack [201].
2. Jumper [201B] terminal 2 and terminal 3.
3. Apply rear brake.
4. Does tail/stop lamp illuminate?
 - a. **Yes.** Replace ABS diode pack. See the service manual.
 - b. **No.** [Go to Test 6.](#)

6. Tail/Stop Lamp Circuit Open Test

1. While applying the rear brake, test for voltage between ABS diode [201B] terminal 2 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open in between ABS diode pack [201B] terminals 3 and 4 (R/Y) wire and tail/stop lamp [93A] terminal 3.
 - b. **No.** [Go to Test 7.](#)

7. Rear Stop Lamp Switch Test

1. Disconnect rear stop lamp switch [121].
2. Jumper terminal 1 of [121BB] and terminal 1 of [121AB].
3. Test for voltage between [201B] terminal 2 and ground.
4. Is battery voltage present?
 - a. **Yes.** Replace rear stop lamp switch. See the service manual.
 - b. **No.** [Go to Test 8.](#)

8. Accessory Circuit Test

1. Test for voltage between [121BB] terminal 1 and ground.
2. Is battery voltage present?
 - a. **Yes.** Repair open on rear stop lamp switch [121AB] (PK/BN) wire.
 - b. **No.** Repair open on rear stop lamp switch [121BB] (O/W) wire.



DTC C1014, C1055-C1066, C1118, C1121

7.15

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Circuit Description

The ABS module monitors the voltage level available for system operation. A low voltage condition prevents the system from operating properly. The ABS module also performs several self-tests for internal problems which may affect proper operation.

Table 7-30. Code Description

DTC	DESCRIPTION
C1014	ECU internal fault
C1055-C1066	ECU internal fault
C1118	ECU internal fault
C1121	ECU internal fault

Conditions for Setting the DTC

The ABS module detects an internal malfunction.

Action Taken When the DTC Sets

- ABS is disabled.
- The ABS indicator is illuminated.

Conditions for Clearing the DTC

Certain conditions that may cause this DTC to set cannot be cleared. Other conditions that may cause this DTC to set may be cleared, at least temporarily, in self-diagnostic mode or DIGITAL TECHNICIAN II (Part No. HD-48650).

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).



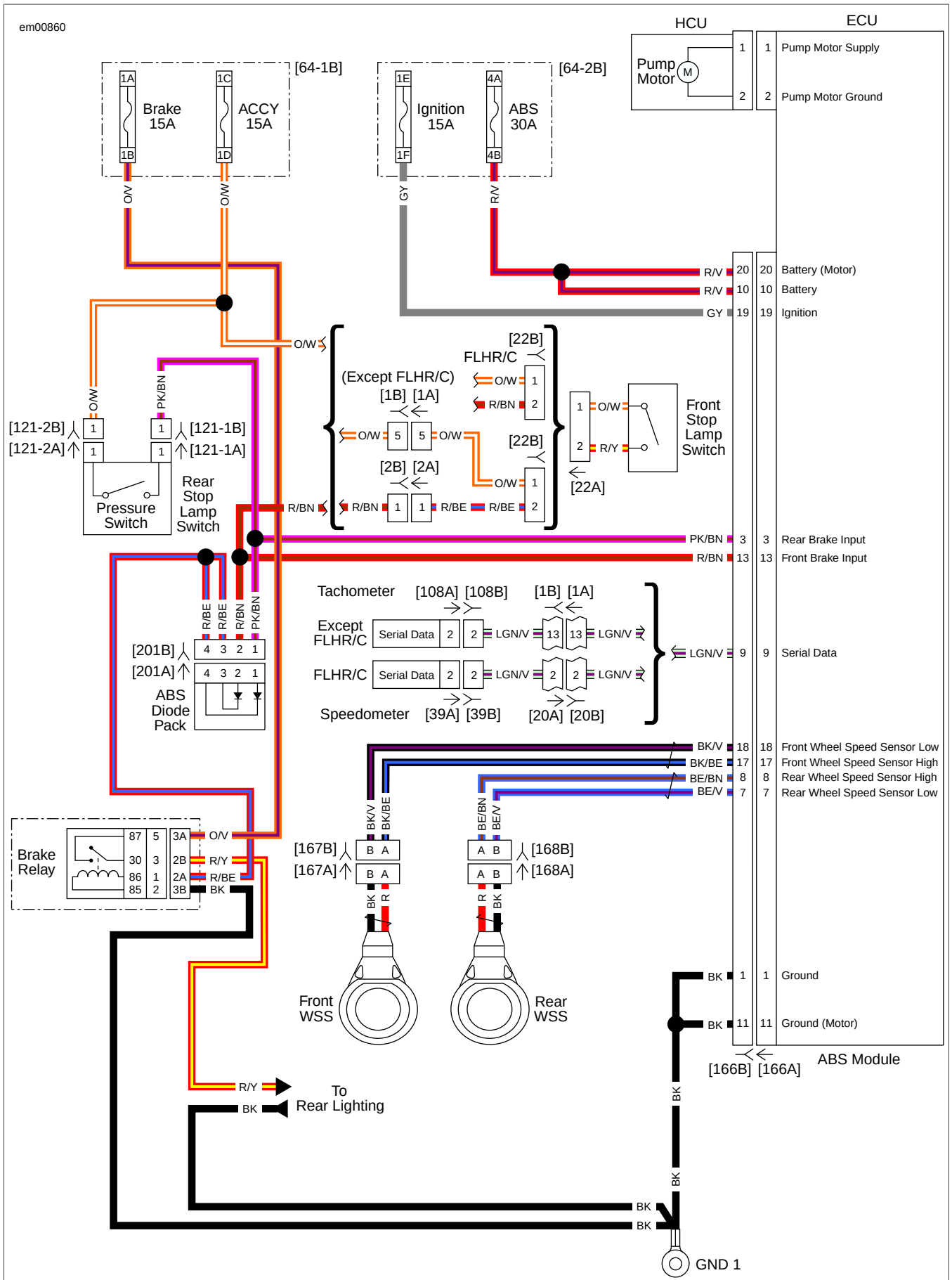


Figure 7-20. ABS Schematic

DTC C1014, C1055-C1066, C1118, C1121

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-48642	ABS BREAKOUT BOX

**Table 7-31. DTC C1014, C1055-C1066, C1118, C1121
Diagnostic Faults**

POSSIBLE CAUSES
Internal system malfunction
A faulty system voltage supply to the module
A faulty system ground

1. Battery Circuit Voltage Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Turn IGN ON.
3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test for voltage breakout box terminals 20 and 10 at battery negative.
4. Is the voltage above 10.5V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 2.](#)

2. Battery Power Circuit Resistance Test

1. Test resistance between breakout box terminals 10 and 20, and [64-2B] terminal 4B.
2. Is resistance greater than 1 Ohm?
 - a. **Yes.** Repair circuit.
 - b. **No.** Inspect battery and charging system. See [3.5 CHARGING SYSTEM](#).

3. Ignition Circuit Test

1. Test for voltage between breakout box terminal 19 and ground.
2. Is voltage above 10.5V?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair high resistance in ABS module [166B] terminal 19 (GY) wire.

4. Ground Circuit Resistance Test

1. Test the ground circuits at ABS module [166B] terminals 1 and 11 for high resistance or an open.
2. Is high resistance or open present?
 - a. **Yes.** Repair high resistance or open condition on ground circuits.
 - b. **No.** Replace ECU module. See the service manual.



ABS INDICATOR ALWAYS ON OR INOPERATIVE

7.16

DESCRIPTION AND OPERATION

See [Figure 7-21](#). The speedometer (FLHR/C) tachometer (except FLHR/C) illuminates the ABS indicator by supplying ground to the lamp. The ABS module sends a serial data message to the speedometer (FLHR/C) tachometer (except FLHR/C) in order to command the indicator ON or OFF.

Diagnostic Tips

The malfunction must be present during diagnosis in order to prevent unnecessary parts replacement.

Connector Information

For additional information about the connectors in the following diagram(s) and diagnostic procedure(s), including the color of the harness test kit terminal probes, see [B.1 CONNECTORS](#).

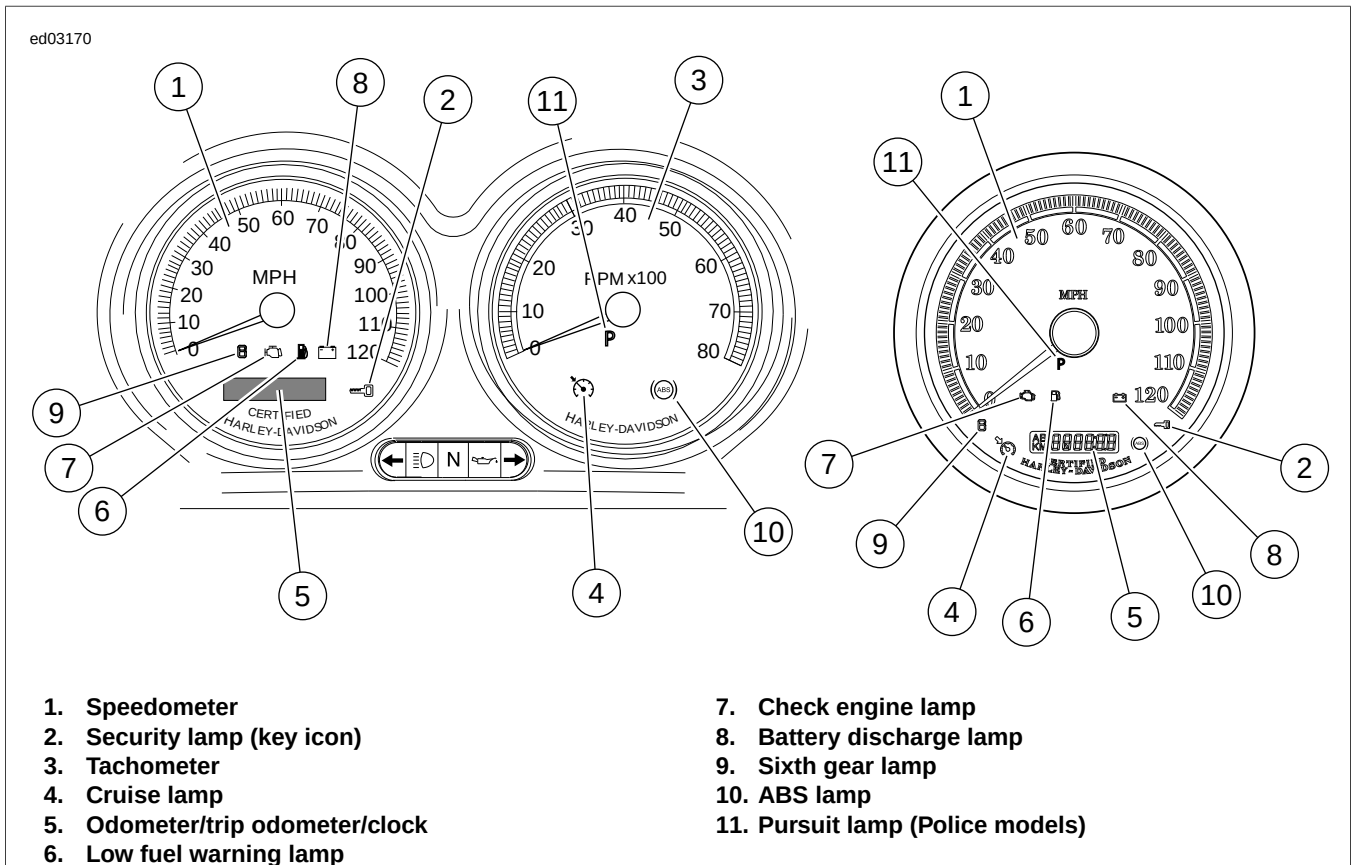


Figure 7-21. Speedometer

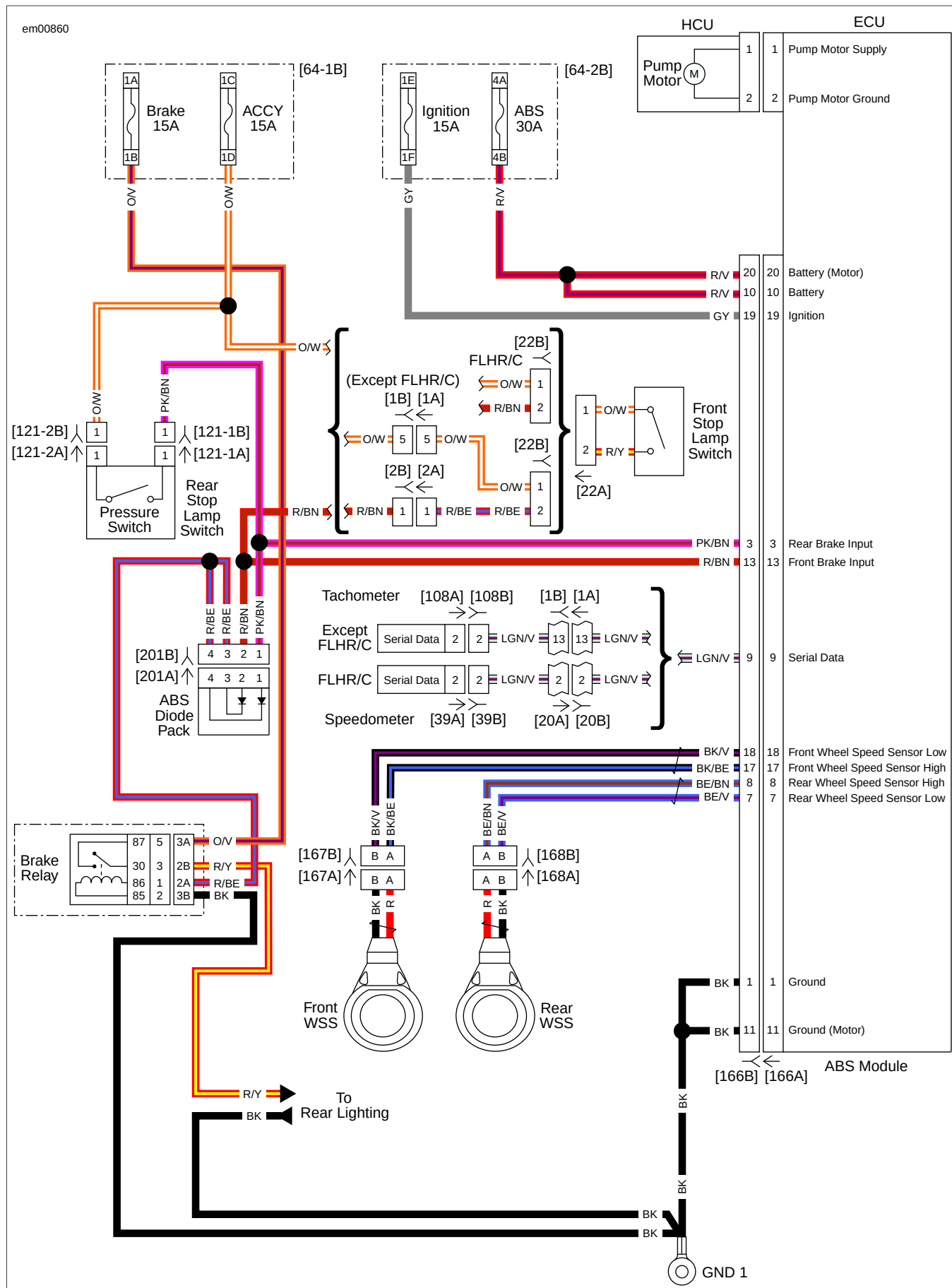


Figure 7-22. ABS Schematic

ABS INDICATOR ALWAYS ON OR INOPERATIVE

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-45325	JUMPER HARNESS
HD-48642	ABS BREAKOUT BOX

Table 7-32. ABS Indicator Always On or Inoperative Diagnostic Faults

POSSIBLE CAUSES
Speedometer (FLHR/C) or tachometer (except FLHR/C) malfunction
Open serial data circuit
Open battery circuit
ECU malfunction
Open ground circuit
Short to ground in battery circuit

1. DTC Test

1. Verify that the vehicle is equipped with ABS and has the appropriate speedometer (FLHR/C) or tachometer (except FLHR/C).
2. Clear the DTCs. See [2.1 INITIAL DIAGNOSTICS](#).
3. Are any ABS DTCs present?
 - a. **Yes.** See appropriate diagnostic procedure.
 - b. **No.** [Go to Test 2.](#)

2. ABS Lamp Function Test

1. Perform a "WOW" test. See [2.1 INITIAL DIAGNOSTICS](#).
2. Does the ABS lamp function properly during the "WOW" test?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace the speedometer (FLHR/C) or tachometer (except FLHR/C). See the service manual.

3. Serial Data Circuit Test

1. Connect ABS BREAKOUT BOX (Part No. HD-48642) between wire harness [166B] and ABS module [166A]. See [1.2 DIAGNOSTIC TOOLS](#).
2. Connect BREAKOUT BOX (Part No. HD-42682) and JUMPER HARNESS (Part No. HD-45325) between wire harness [39B] and speedometer [39A] (FLHR/C) or

between wire harness [108B] and tachometer [108A] (except FLHR/C). See [1.2 DIAGNOSTIC TOOLS](#).

3. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and a multimeter, test the (LGN/V) wire between ABS module [166B] terminal 9 and speedometer [39B] (FLHR/C) tachometer (except FLHR/C) terminal 7 for continuity.
4. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open in (LGN/V) between [166B] terminal 9 and [39B] terminal 7.

4. ABS Fuse Test

1. Inspect the ABS fuse.
2. Is fuse good?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 7.](#)

5. ABS Power Circuit Test

1. Install ABS fuse and disconnect ABS module [166A] from the breakout box.
2. Test for voltage at breakout box terminal 10 and 20 to ground.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** Repair open in ABS module battery circuit.

6. ABS Ground Circuit Test

1. Test for continuity at breakout box terminals 1 and 11 to ground.
2. Is continuity present?
 - a. **Yes.** Replace ECU. See the service manual.
 - b. **No.** Repair open in ABS module ground circuit.

7. ABS Power Circuit Short to Ground Test

1. Disconnect ABS module [166A] from the breakout box.
2. Test for short to ground between breakout box terminal 10 and 20.
3. Is continuity to ground present?
 - a. **Yes.** Repair short to ground between [166B] terminals 10 and 20 (R/V) wire and ABS fuse. Replace ABS fuse.
 - b. **No.** Condition is intermittent. See [1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test](#). Replace ABS fuse.

NOTES



TABLE OF CONTENTS

SUBJECT	PAGE NO.
8.1 RADIO DIAGNOSTICS.....	8-1
8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS.....	8-6
8.3 DTC B2016-B2027, RADIO SPEAKER DIAGNOSTICS.....	8-15
8.4 SERIAL DATA BUS DIAGNOSTICS.....	8-22
8.5 ADVANCED AUDIO SYSTEM SYMPTOMS.....	8-30



NOTES



RADIO DIAGNOSTICS

8.1

DESCRIPTION AND OPERATION

Harley-Davidson's Advanced Audio System, developed in partnership with Harman/Kardon, offers improved function and sound quality with an all new integrated design. The base radio features six AM and ten FM radio presets, integrated weather band and a single disc CD player compatible with CD/CDR/CDRW and MP3 format discs. The system also allows for seamless hook up of optional accessories (both current and future) to the base radio display and hand controls.

The Advanced Audio System consists of the following components:

- Radio
- CB module
- Antennas (radio and CB)
- Fairing, rear and sidecar speakers, depending upon model
- Handlebar, rear and sidecar switches, depending upon model
- High Output Amplifier. Standard on sidecar equipped Ultra Classic, CVO Ultra Classic and also as an optional accessory; located under the luggage rack
- Optional accessory XM satellite radio module and antenna; located in fairing above radio
- Optional accessory navigation module and external antenna; module plugs into radio chassis in fairing

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Diagnostic Tips

The system has onboard diagnostics to detect most fault conditions. Many faults are stored as diagnostic trouble codes (DTCs). Fault conditions that do not generate DTCs, or those for which DTCs cannot be read, can be identified by their symptoms. For troubleshooting and resolving switch inoperative without DTC conditions, as well as other symptoms, see [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS](#).

Radio Diagnostic Display

See A of [Figure 8-1](#). Press the eject button to remove any CD in the unit. Press and hold any two softkeys (buttons 1-6), turn the ignition switch ON. Once the H-D logo is displayed, the system automatically performs a complete switch check, scans for current DTCs and then displays the radio diagnostic display.

Release the softkeys only after the radio diagnostic display appears.

See B of [Figure 8-1](#). If, after the initial diagnostic check, any switches are found to be shorted to B+ or ground, the radio diagnostic display reports the applicable DTC and an abbreviated description. Refer to the appropriate diagnostic procedure for resolution of the problem.

If no switches are found to be shorted to B+ or ground, the technician may press selected switches to verify functionality. If a switch is functioning properly, the display shows the switch name and the word "OK."

NOTE

Verify the proper switch function is displayed when the radio display says "OK". Switch wiring shorted together could cause the radio to display "OK" for the wrong function.

See C of [Figure 8-1](#). If the switch is not working correctly, then the display does not change. All switches, handlebar, passenger and sidecar may be tested in this manner.

See D of [Figure 8-1](#). Pressing softkey 1 while in the radio diagnostic display sets the system back to the factory defaults. If a symptom is present without a DTC, restoring the factory default settings may sometimes resolve the issue. For more information, see [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS](#).

Pressing softkey 2 displays "Speed Pulses" followed by a speed pulse value. This feature may be employed to quickly verify whether the radio is configured correctly or whether the AVC or J1850 is working properly.

See E of [Figure 8-1](#). To use this feature, turn the IGN ON, with the engine stop switch RUN, access the radio diagnostic display, press softkey 2 to select AVC, and then walk or push the motorcycle while viewing the speed pulse value. If a value other than zero appears, it is an indication that J1850 and AVC are working properly. If speed pulses are not present, either the AVC needs to be reconfigured or another problem exists. See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1016 J1850 Loss of Communication with ECM](#) for resolution of the problem if the system is configured correctly.

See F and G of [Figure 8-1](#). Pressing softkey 3 displays the region and other configuration data, while softkey 4 shows the software version code.

Softkey 5 is reserved for software upgrades and prompts the technician to install the appropriate CD, while softkey 6 causes the system to exit the radio diagnostic mode and revert to the normal radio display.

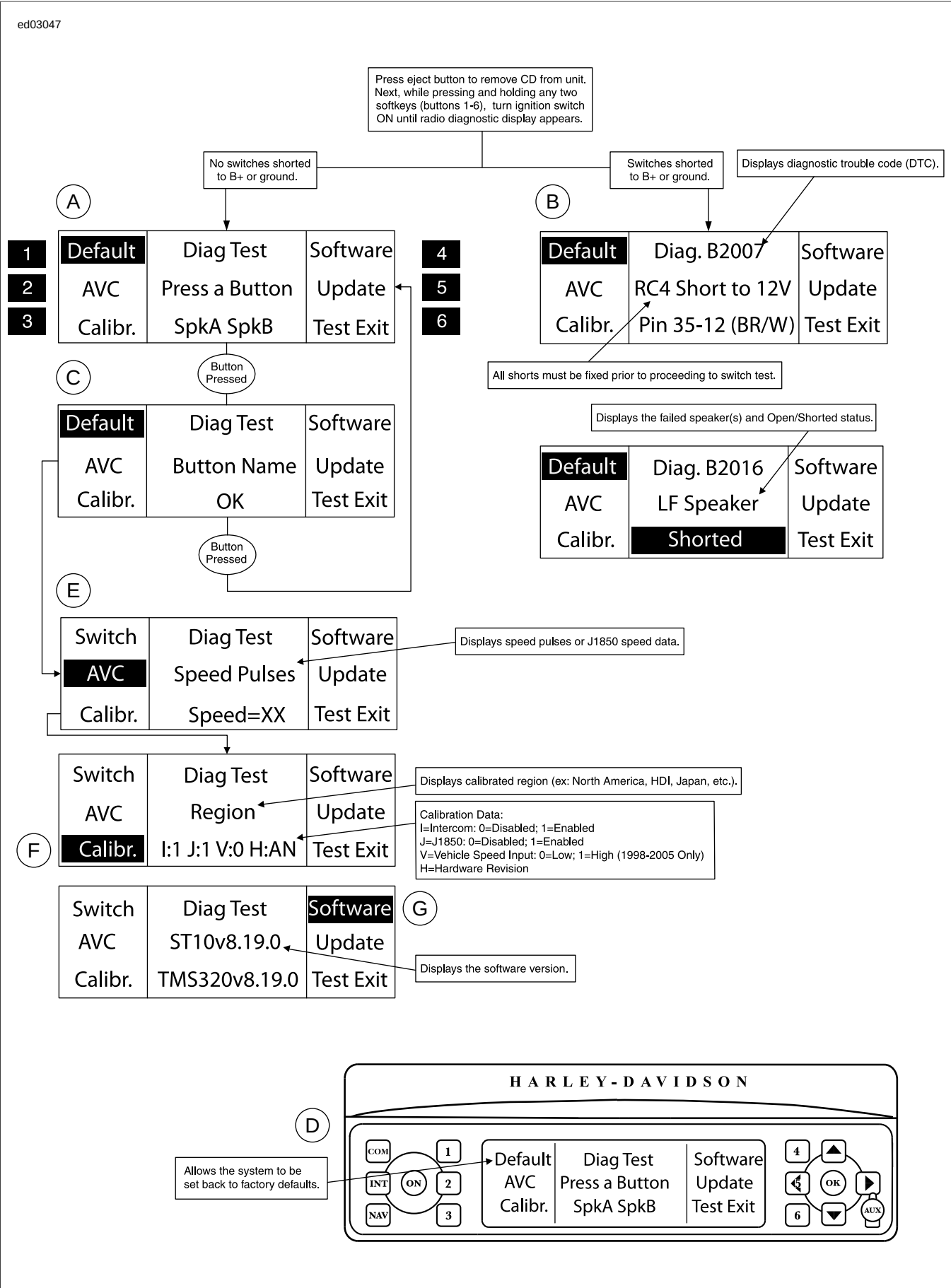


Figure 8-1. Initial Diagnostics - Radio Diagnostic Display

Table 8-1. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC	DESCRIPTION	FAULT-SET CONDITION	FAULT-CLEAR CONDITION T=TIME; R=RESISTANCE
B0563	Battery voltage high	t>=15 sec. V>= 16V	Normal range for t>=15 seconds
B2006	Radio switch stuck or open	t>=15 sec.	Normal range for t>=15 seconds
B2007	Handlebar switch shorted high	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds*
B2008	Handlebar switch shorted low	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds*
B2009	Handlebar switch stuck or open	t>=15 sec.	Normal range for t>=15 seconds
B2010	Passenger switch shorted high	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds*
B2011	Passenger switch shorted low	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds*
B2012	Passenger switch stuck or open	t>=15 sec.	Normal range for t>=15 seconds
B2016	Front speakers shorted	R<1.5 Ohms tested once per ignition cycle R>1.0 Ohm when setup as line out ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R>1.5 Ohms tested once per ignition cycle
B2017	Front speakers open	R>100 Ohms tested once per ignition cycle ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R<100 Ohms tested once per ignition cycle
B2018	Front speakers shorted to ground	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	
B2019	Front speakers shorted to battery	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	
B2020	Rear speakers shorted	R<1.5 Ohms tested once per ignition cycle R>1.0 Ohm when setup as line out ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R>1.5 Ohms tested once per ignition cycle
B2021	Rear speakers open	R>100 Ohms tested once per ignition cycle ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R<100 Ohms tested once per ignition cycle
B2022	Rear Speakers shorted to ground	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	
B2023	Rear speakers shorted to battery	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	
* Ignition ON after Ignition OFF for at least 10 seconds.			

Table 8-2. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC/SYMPTOM	DESCRIPTION	GO TO
U1016	J1850 lost communications with ECM	DTC U1304 through DTC U1317 can only be viewed as historic codes using DIGITAL TECHNICIAN II (Part No. HD-48650). The faults are detectable as current codes only if they happen to occur while in the diagnostic mode. To diagnose these conditions without the use of DIGITAL TECHNICIAN II (Part No. HD-48650), see 8.5 ADVANCED AUDIO SYSTEM SYMPTOMS .
U1300	J1850 bus shorted low	
U1301	J1850 bus shorted high	
U1302	Infotainment bus off error	
U1304	Infotainment bus lost communications with future	
U1305	Infotainment bus lost communications with future	
U1306	Infotainment bus lost communications with hands-free phone module	
U1307	Infotainment bus lost communications with CB	
U1308	Infotainment bus lost communications with future	
U1309	Infotainment bus lost communications with future	
U1310	Infotainment bus lost communications with future	
U1311	Infotainment bus lost communications with future	
U1312	Infotainment bus lost communications with future	
U1313	Infotainment bus lost communications with XM	
U1314	Infotainment bus lost communications with navigation	
U1315	Infotainment bus lost communications with future	
U1316	Infotainment bus lost communications with future	
U1317	Infotainment bus lost communications with high output amplifier	
1	Radio Inoperative	Symptom 1: Radio Inoperative
2	Poor or No Reception	Symptom 2: Poor or No Reception
3	Static Present With Engine Running	Symptom 3: Static Present with Engine Running
4	CB Transmitter Inoperative	Symptom 4: CB Transmitter Inoperative
5	CB Receiver Inoperative	Symptom 5: CB Receiver Inoperative
6	Intercom Inoperative	Symptom 6: Intercom Inoperative
7	Handheld Microphone/PTT Inoperative	Symptom 7: Handheld Microphone/PTT Inoperative
8	Speaker Switch Malfunction	Symptom 8: Fairing Mounted Speaker Switch Malfunction
9	Headset Speakers Inoperative	Symptom 9: Headset Speakers Inoperative
10	No or Low Audio From Microphones	Symptom 10: No or Low Audio from Microphones
11	No or Low Audio With High Output Amplifier	Symptom 11: No or Low Audio with High Output Amplifier
12	No or Low Audio From XM or XM Inoperative	Symptom 12: No or Low Audio from XM or XM Inoperative
13	XM - No or Intermittent Reception	Symptom 13: No or Intermittent Reception on XM Module
14	Navigation Inoperative	Symptom 14: Navigation Inoperative

Table 8-2. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC/SYMPTOM	DESCRIPTION	GO TO
15	AVC Inoperative	Symptom 15: AVC Inoperative
16	Handlebar, Passenger or Sidecar Switches Inoperative	Symptom 16: Handlebar, Passenger or Sidecar Switches Inoperative
17	CD Skipping	Symptom 17: CD Skipping
18	Hands-Free Phone Module Inoperative No or Low Audio To Hands-Free Phone Module No or Low Audio From Hands-Free Phone Module Hands-Free Phone Module - Phone Not Pairing	Symptom 18: Hands-Free Phone Module Initial Diagnostics



DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS

8.2

DESCRIPTION AND OPERATION

The sound system is designed to capture faults for each of the radio switch inputs. When a fault is detected, a DTC is generated. The DTC and related data appears on the radio display when the system is in the diagnostic mode. Refer to [Table 8-3](#).

Table 8-3. Code Description

DTC	DESCRIPTION
B2006	Radio switch stuck or open
B2007	Handlebar switch shorted high
B2008	Handlebar switch shorted low
B2009	Handlebar switch stuck or open
B2010	Passenger switch shorted high
B2011	Passenger switch shorted low
B2012	Passenger switch stuck or open

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Diagnostic Tips

Unless specified otherwise, install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) when called for in the following diagnostic procedures.

The diagnostic tests in this section have been developed to take into consideration the technician understands there are connectors and jumper harness adapters in the audio system that are not specifically called out in the tests. See [B.1 CONNECTORS](#) for connector locations when necessary.

If two functional wires are crossed in the wiring harness, a code may not set. The symptom experienced is that separate switches may operate the same function and the other function will not operate at all. Another indication of this is if the radio face plate displays a different function than requested. For example: when pressing the passenger PTT, the radio face plate display says "Audio Up OK". If any conditions similar to this exist, test the wiring of the desired and displayed functions for continuity and repair any wires shorted together.

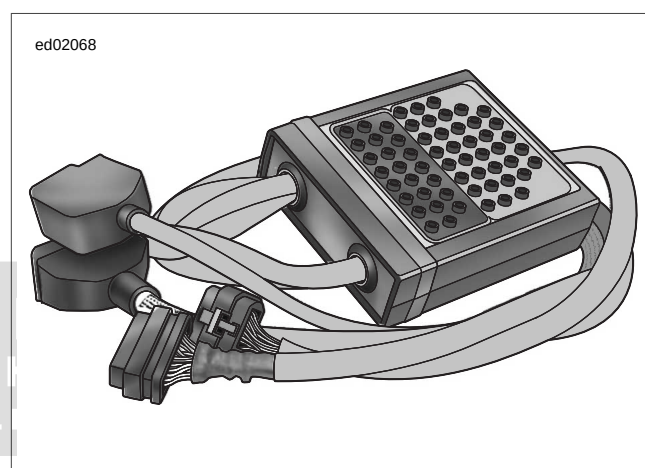


Figure 8-2. Radio Breakout Box (Part No. HD-47918)

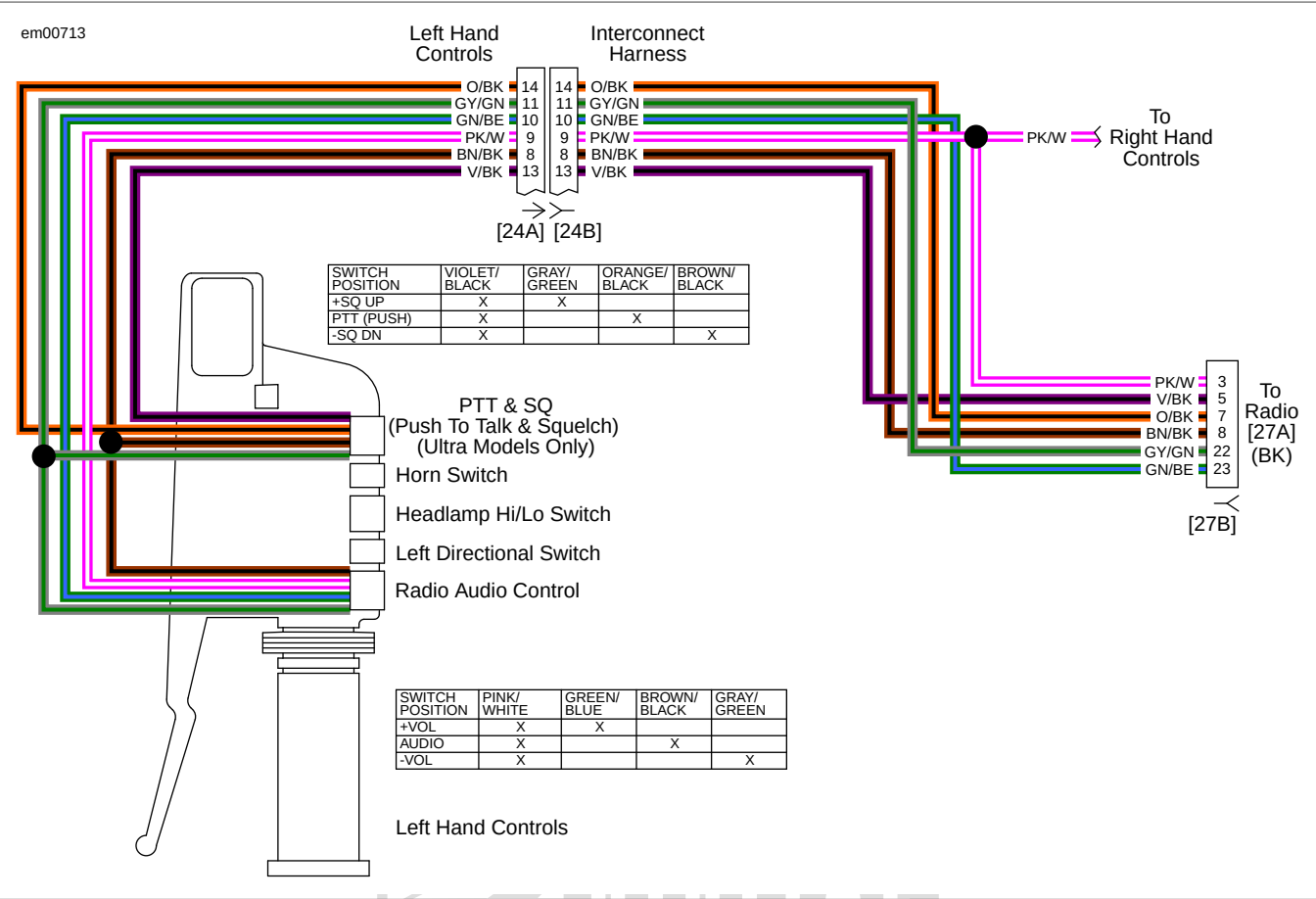


Figure 8-3. Handlebar Audio, PTT and Squelch Switch Circuit

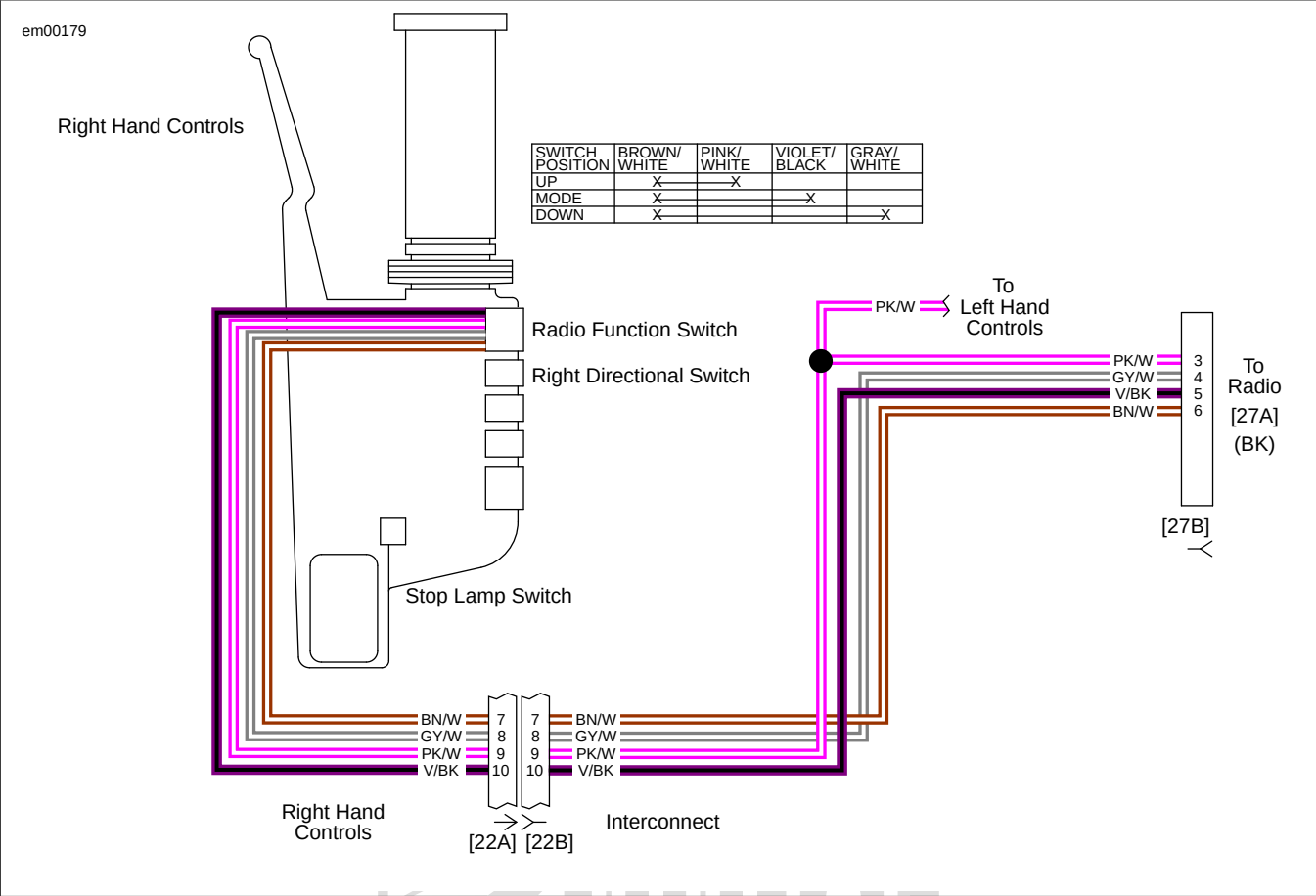


Figure 8-4. Handlebar Mode Switch Circuit

RADIO SWITCH DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-4. Radio Switch Diagnostic Faults

POSSIBLE CAUSES
Mechanical switch malfunction
Electrical switch malfunction
Radio malfunction

1. Checking for Diagnostic Trouble Codes (DTCs) Test

- While pressing any two softkeys (presets), turn IGN ON to enter diagnostic mode.

- Does radio power up and enter diagnostic mode?
 - Yes.** Tests should run automatically. If DTC B2007, B2008, B2010, B2011, B2013 or B2014 is present, refer to [Table 8-5](#).
 - No, only radio powers up.** [Go to Test 2.](#)
 - No, the radio does not power up.** See [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 1: Radio Inoperative](#).

Table 8-5. Shorted Switch Problems

DTC	DESCRIPTION OF FAULT	GO TO
B2007	Handlebar audio switch shorted high	Test 3
	Handlebar mode switch shorted high	Test 5
	Handlebar PTT/squelch switch shorted high	Test 7
B2008	Handlebar audio switch shorted low	Test 9
	Handlebar mode switch shorted low	Test 11
	Handlebar PTT/squelch switch shorted low	Test 13
B2010	Passenger audio/PTT switch shorted high	Test 21
	Passenger mode switch shorted high	Test 23
B2011	Passenger audio/PTT switch shorted low	Test 25
	Passenger mode switch shorted low	Test 27

2. Switch Function Test

- While watching the radio display, press each switch; audio up/down, audio, mode up/down, mode, PTT, squelch +/-.

NOTE

Verify the operated switch function is the same function being displayed on the radio face plate. A different function displayed on the face plate could indicate two function wires are shorted. See diagnostic tips.

- Does the display show the selected function when the switch is pressed?
 - Yes.** No fault found.
 - No.** Refer to [Table 8-6](#).

Table 8-6. Switch Mechanical Problems

DTC	DESCRIPTION OF FAULT	GO TO
B2006	Radio faceplate switches stuck or open	Replace radio. (6101)
B2009	Handlebar audio switch stuck or open	Test 15
	Handlebar mode switch stuck or open	Test 17
	Handlebar PTT/squelch switch stuck or open	Test 19
B2012	Passenger audio/PTT switch stuck or open	Test 29
	Passenger mode switch stuck or open	Test 31

3. DTC B2007, Handlebar Audio Switch Shorted High (Part A) Test

- Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) leaving radio [27A] disconnected.

- With IGN ON, measure voltage at breakout box terminals 3 (PK/W), 8 (BN/BK), 22 (GY/GN) or 23 (GN/BE) to ground as indicated on the radio display.
- Is voltage greater than 7V?
 - Yes.** [Go to Test 4](#).
 - No.** Replace radio. See the service manual. (6101)

4. DTC B2007, Handlebar Audio Switch Shorted High (Part B) Test

- Disconnect left hand controls [24].
- With IGN ON, measure voltage using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [24A] terminals 8 (BN/BK), 9 (PK/W), 10 (GN/BE) or 11 (GY/GN) to ground as indicated on the radio display.
- Is voltage greater than 7V?
 - Yes.** Repair short in handlebar harness on wire indicated on radio display. (5041)
 - No.** Repair short in interconnect harness on wire indicated on radio display. (5041)

5. DTC B2007, Handlebar Mode Switch Shorted High (Part A) Test

- Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) leaving radio [27A] disconnected.
- With IGN ON, measure voltage at breakout box terminals 3 (PK/W), 4 (GY/W), 5 (V/BK) or 6 (BN/W) to ground as indicated on the radio display.
- Is voltage greater than 7V?
 - Yes.** [Go to Test 6](#).
 - No.** Replace radio. See the service manual. (6101)

6. DTC B2007, Handlebar Mode Switch Shorted High (Part B) Test

- Disconnect right hand controls [22].
- With IGN ON, measure voltage using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [22A] terminals 7 (BN/W), 8 (GY/W), 9 (PK/W) or 10 (V/BK) to ground as indicated on the radio display.
- Is voltage greater than 7V?
 - Yes.** Repair short in handlebar harness on wire indicated on radio display. (5041)
 - No.** Repair short in interconnect harness on wire indicated on radio display. (5041)

7. DTC B2007, Handlebar PTT/Squelch Switch Shorted High (Part A) Test

- Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.

2. With IGN ON, measure voltage at breakout box terminals 5 (V/BK), 7 (O/BK), 8 (BN/BK) or 22 (GY/GN) to ground as indicated on the radio display.
3. Is voltage greater than 7V?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

8. DTC B2007, Handlebar PTT/Squelch Switch Shorted High (Part B) Test

1. Disconnect left hand controls [24].
2. With IGN ON, measure voltage using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [24A] terminals 8 (BN/BK), 11 (GY/GN), 13 (V/BK) or 14 (O/BK) to ground as indicated on the radio display.
3. Is voltage greater than 7V?
 - a. **Yes.** Repair short in handlebar harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in interconnect harness on wire indicated on radio display. **(5041)**

9. DTC B2008, Handlebar Audio Switch Shorted Low (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.
2. With IGN OFF, measure resistance using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [27B] terminals 3 (PK/W), 8 (BN/BK), 22 (GY/GN) or 23 (GN/BE) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

10. DTC B2008, Handlebar Audio Switch Shorted Low (Part B) Test

1. Disconnect left hand controls [24].
2. With IGN OFF, measure resistance at breakout box terminals 8 (BN/BK), 9 (PK/W), 10 (GN/BE) or 11 (GY/GN) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** Repair short in handlebar harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in interconnect harness on wire indicated on radio display. **(5041)**

11. DTC B2008, Handlebar Mode Switch Shorted Low (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.

2. With IGN OFF, measure resistance at breakout box terminals 3 (PK/W), 4 (GY/W), 5 (V/BK) or 6 (BN/W) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** [Go to Test 12.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

12. DTC B2008, Handlebar Mode Switch Shorted Low (Part B) Test

1. Disconnect right hand controls [22].
2. With IGN OFF, measure resistance using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [22A] terminals 7 (BN/W), 8 (GY/W), 9 (PK/W) or 10 (V/BK) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** Repair short in handlebar harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in interconnect harness on wire indicated on radio display. **(5041)**

13. DTC B2008, Handlebar PTT/Squelch Switch Shorted Low (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.
2. With IGN OFF, measure resistance at breakout box terminals 5 (V/BK), 7 (O/BK), 8 (BN/BK) or 22 (GY/GN) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** [Go to Test 14.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

14. DTC B2008, Handlebar PTT/Squelch Switch Shorted Low (Part B) Test

1. Disconnect left hand controls [24].
2. With IGN OFF, measure resistance using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multimeter from [24A] terminals 8 (BN/BK), 11 (GY/GN), 13 (V/BK) or 14 (O/BK) to ground as indicated on the radio display.
3. Is resistance less than 5000 Ohms?
 - a. **Yes.** Repair short in handlebar harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in interconnect harness on wire indicated on radio display. **(5041)**

15. DTC B2009, Handlebar Audio Switch Stuck or Open (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.

2. Test for continuity at the appropriate breakout box terminals with the audio switch pressed as indicated in [Table 8-7](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 16](#).

Table 8-7. Audio Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Audio +	3 (PK/W)	23 (GN/BE)
Audio -	3 (PK/W)	22 (GY/GN)
Audio (centered)	3 (PK/W)	8 (BN/BK)

16. DTC B2009, Handlebar Audio Switch Stuck or Open (Part B) Test

1. Disconnect left hand controls [24].
2. Test for continuity at [24A], using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) with the audio switch pressed as indicated in [Table 8-8](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Repair open in interconnect harness. **(5041)**
 - b. **No.** Replace switch or repair switch wiring. See the service manual. **(5186)**

Table 8-8. Audio Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Audio +	9 (PK/W)	10 (GN/BE)
Audio -	9 (PK/W)	11 (GY/GN)
Audio (centered)	9 (PK/W)	8 (BN/BK)

17. DTC B2009, Handlebar Mode Switch Stuck or Open (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.
2. Test for continuity at the appropriate breakout box terminals with the mode switch pressed as indicated in [Table 8-9](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 18](#).

Table 8-9. Mode Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Mode Up	6 (BN/W)	3 (PK/W)
Mode Dn	6 (BN/W)	4 (GY/W)
Mode In	6 (BN/W)	5 (V/BK)

18. DTC B2009, Handlebar Mode Switch Stuck or Open (Part B) Test

1. Disconnect right hand controls [22].
2. Test for continuity at [22A], using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) with the mode switch pressed as indicated in [Table 8-10](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Repair open in interconnect harness. **(5041)**
 - b. **No.** Replace switch or repair switch wiring. See the service manual. **(5183)**

Table 8-10. Mode Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Mode Up	7 (BN/W)	9 (PK/W)
Mode Dn	7 (BN/W)	8 (GY/W)
Mode In	7 (BN/W)	10 (V/BK)

19. DTC B2009, Handlebar PTT/Squelch Switch Stuck or Open (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.
2. Test for continuity at appropriate breakout box terminals with the PTT/squelch switch pressed as indicated in [Table 8-11](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 20](#).

Table 8-11. PTT/Squelch Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Squelch +	5 (V/BK)	22 (GY/GN)
Squelch -	5 (V/BK)	8 (BN/BK)
PTT	5 (V/BK)	7 (O/BK)

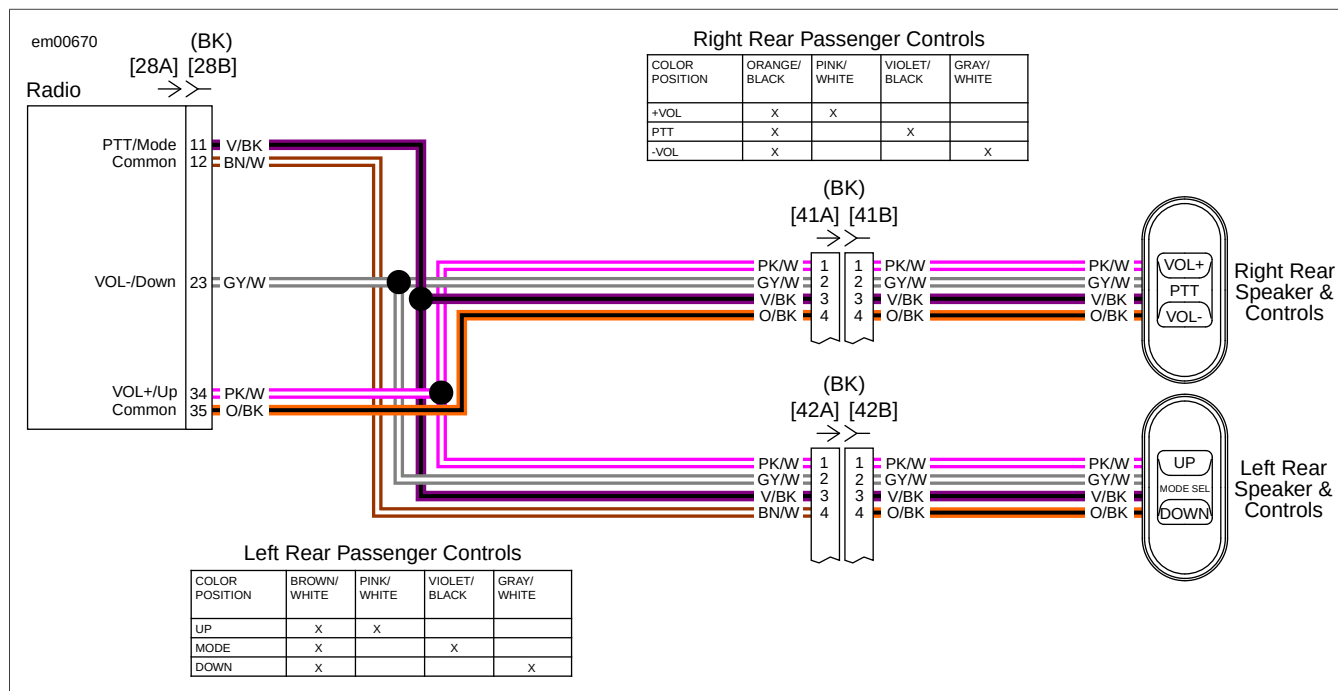
20. DTC B2009, Handlebar PTT/Squelch Switch Stuck or Open (Part B) Test

1. Disconnect left hand controls [24].

2. Test for continuity at [24A] using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) with the PTT/squelch switch pressed as indicated in [Table 8-12](#).
3. Does continuity exist as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Repair open in interconnect harness. **(5041)**
 - b. **No.** Replace switch or repair switch wiring. See the service manual. **(5184)**

Table 8-12. PTT/Squelch Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Squelch +	13 (V/BK)	11 (GY/GN)
Squelch -	13 (V/BK)	8 (BN/BK)
PTT	13 (V/BK)	14 (O/BK)

**Figure 8-5. Passenger Audio/PTT and Mode Switch Circuit**

21. DTC B2010, Passenger Audio/PTT Switch Shorted High (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. With IGN ON, measure voltage at breakout box terminals 34 (PK/W), 23 (GY/W), 11 (V/BK) or 35 (O/BK) to ground as indicated on the radio display.
3. Is voltage greater than 7V?
 - a. **Yes.** [Go to Test 22.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

22. DTC B2010, Passenger Audio/PTT Switch Shorted High (Part B) Test

1. Disconnect right rear speaker controls [41].
2. With IGN ON, measure voltage using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multi-meter from [41A] terminals 1 (PK/W), 2 (GY/W), 3 (V/BK) or 4 (O/BK) to ground as indicated on the radio display.

3. Is voltage greater than 7V?
 - a. **Yes.** Repair short in audio harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in passenger rear control switch harness on wire indicated on radio display. **(5041)**

23. DTC B2010, Passenger Mode Switch Shorted High (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. With IGN ON, measure voltage at breakout box terminals 34 (PK/W), 23 (GY/W), 11 (V/BK) or 12 (BN/W) to ground as indicated on the radio display.
3. Is voltage greater than 7V?
 - a. **Yes.** [Go to Test 24.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

24. DTC B2010, Passenger Mode Switch Shorted High (Part B) Test

1. Disconnect left rear speaker controls [42].

2. With IGN ON, measure voltage using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multi-meter from [42A] terminals 1 (PK/W), 2 (GY/W), 3 (V/BK) or 4 (BN/W) to ground as indicated on the radio display.
3. Is voltage greater than 7V?
 - a. **Yes.** Repair short in audio harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in passenger rear control switch harness on wire indicated on radio display. **(5041)**

25. DTC B2011, Passenger Audio/PTT Switch Shorted Low (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. With IGN OFF, test for continuity at breakout box terminals 34 (PK/W), 23 (GY/W), 11 (V/BK) or 35 (O/BK) to ground as indicated on the radio display.
3. Is continuity present?
 - a. **Yes.** [Go to Test 26.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

26. DTC B2011, Passenger Audio/PTT Switch Shorted Low (Part B) Test

1. Disconnect right rear speaker controls [41].
2. With IGN OFF, test for continuity using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multi-meter from [41A] terminals 1 (PK/W), 2 (GY/W), 3 (V/BK) or 4 (O/BK) to ground as indicated on the radio display.
3. Is continuity present?
 - a. **Yes.** Repair short in audio harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in passenger rear control switch harness on wire indicated on radio display. **(5041)**

27. DTC B2011, Passenger Mode Switch Shorted Low (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. With IGN OFF, test for continuity at breakout box terminals 34 (PK/W), 23 (GY/W), 11 (V/BK) or 12 (BN/W) to ground as indicated on the radio display.
3. Is continuity present?
 - a. **Yes.** [Go to Test 28.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

28. DTC B2011, Passenger Mode Switch Shorted Low (Part B) Test

1. Disconnect left rear speaker controls [42].
2. With IGN OFF, test for continuity using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) and multi-

meter from [42A] terminals 1 (PK/W), 2 (GY/W), 3 (V/BK) or 4 (BN/W) to ground as indicated on the radio display.

3. Is continuity present?
 - a. **Yes.** Repair short in audio harness on wire indicated on radio display. **(5041)**
 - b. **No.** Repair short in passenger rear control switch harness on wire indicated on radio display. [(BN/W) becomes (O/BK) in speaker box]. **(5041)**

29. DTC B2012, Passenger Audio/PTT Switch Stuck or Open (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. Test for continuity at the appropriate breakout box terminals with the audio switch pressed as indicated in [Table 8-13](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Switch operation normal. Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 30.](#)

Table 8-13. Audio/PTT Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Vol. Up	35 (O/BK)	34 (PK/W)
Vol. Down	35 (O/BK)	23 (GY/W)
PTT	35 (O/BK)	11 (V/BK)

30. DTC B2012, Passenger Audio/PTT Switch Stuck or Open (Part B) Test

1. Disconnect left rear speaker controls [41].
2. Test for continuity using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) at [41B] with the audio switch pressed as indicated in [Table 8-14](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Repair open or replace audio harness. **(5041)**
 - b. **No.** Replace rear volume/PTT switch or repair switch wiring. See the service manual. **(6627)**

Table 8-14. Audio/PTT Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Vol. Up	4 (O/BK)	1 (PK/W)
Vol. Dn	4 (O/BK)	2 (GY/W)
PTT	4 (O/BK)	3 (V/BK)

31. DTC B2012, Passenger Mode Switch Stuck or Open (Part A) Test

1. Remove outer fairing and connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [28A] disconnected.
2. Test for continuity at the appropriate breakout box terminals with the mode switch pressed as indicated in [Table 8-15](#).
3. Is each wire pair less than 0.5 Ohms as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Switch operation normal. Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 32](#).

Table 8-15. Mode Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Mode Up	12 (BN/W)	34 (PK/W)
Mode Dn	12 (BN/W)	23 (GY/W)
Mode In	12 (BN/W)	11 (V/BK)

32. DTC B2012, Passenger Mode Switch Stuck or Open (Part B) Test

1. Disconnect left rear speaker controls [42].
2. Test for continuity on [42B] terminals using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C) with the mode switch pressed as indicated in [Table 8-16](#).
3. Does continuity exist as each switch is pressed, and not when the switch is released?
 - a. **Yes.** Repair open in audio harness. **(5041)**
 - b. **No.** Replace switch or repair switch wiring. See the service manual. **(6627)**

Table 8-16. Mode Switch Stuck or Open Test

SWITCH POSITION	FROM TERMINAL	TO TERMINAL
Mode Up	4 (O/BK)	1 (PK/W)
Mode Dn	4 (O/BK)	2 (GY/W)
Mode In	4 (O/BK)	3 (V/BK)



DTC B2016-B2027, RADIO SPEAKER DIAGNOSTICS

8.3

DESCRIPTION AND OPERATION

PART NUMBER	TOOL NAME
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

The sound system is designed to capture faults for each of the radio speaker outputs. When a fault is detected, a DTC is generated. The DTC and related data appears on the radio display when the system is in the diagnostic mode. Refer to [Table 8-17](#).

Table 8-17. Code Description

DTC	DESCRIPTION
B2016	Front speakers shorted
B2017	Front speakers open
B2018	Front speakers shorted to ground
B2019	Front speakers shorted to battery
B2020	Rear speakers shorted
B2021	Rear speakers open
B2022	Rear speakers shorted to ground
B2023	Rear speakers shorted to battery

Diagnostic Tips

Unless specified otherwise, install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) when called for in the following diagnostic procedures.

The diagnostic tests in this section have been developed to take into consideration the technician understands there are connectors and jumper harness adapters in the audio system that are not specifically called out in the tests. See [B.1 CONNECTORS](#) for connector locations when necessary.

B2016 FRONT SPEAKERS SHORTED: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-18. B2016 Front Speakers Shorted: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires shorted together
Radio malfunction

1. Front Speakers Shorted (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [27] leaving radio disconnected.

2. Measure the resistance between breakout box terminals 16 and 17 (left speaker) or terminals 1 and 18 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

2. Front Speakers Shorted (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 16 and 17 (left speaker) or terminals 1 and 18 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** Repair short between radio [27B] terminals 16 (W/O) and 17 (LGN/W) (left speaker) or between terminals 1 (LGN/BK) and 18 (GY/R) (right speaker). **(5041)**
 - b. **No.** Replace speaker. See the service manual. **(6605)**

B2016 FRONT SPEAKERS SHORTED: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-19. B2016 Front Speakers Shorted: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires shorted together
Amplifier malfunction

1. Front Speakers Shorted (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149], leaving amplifier disconnected.
2. Measure the resistance between breakout box terminals 7 and 14 (left speaker) or terminals 6 and 13 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace amplifier. **(6107)**

2. Front Speakers Shorted (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 7 and 14 (left speaker) or terminals 6 and 13 (right speaker).

3. Is resistance less than 1.0 Ohm?
- a. **Yes.** Repair short between amplifier [149B] terminals 7 (W/O) and 14 (LGN/W) (left speaker) or between terminals 6 (GY/R) and 13 (LGN/BK) (right speaker). **(5041)**
 - b. **No.** Replace speaker. See the service manual. **(6605)**

B2017 FRONT SPEAKERS OPEN: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-20. B2017 Front Speakers Open: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires open
Radio malfunction

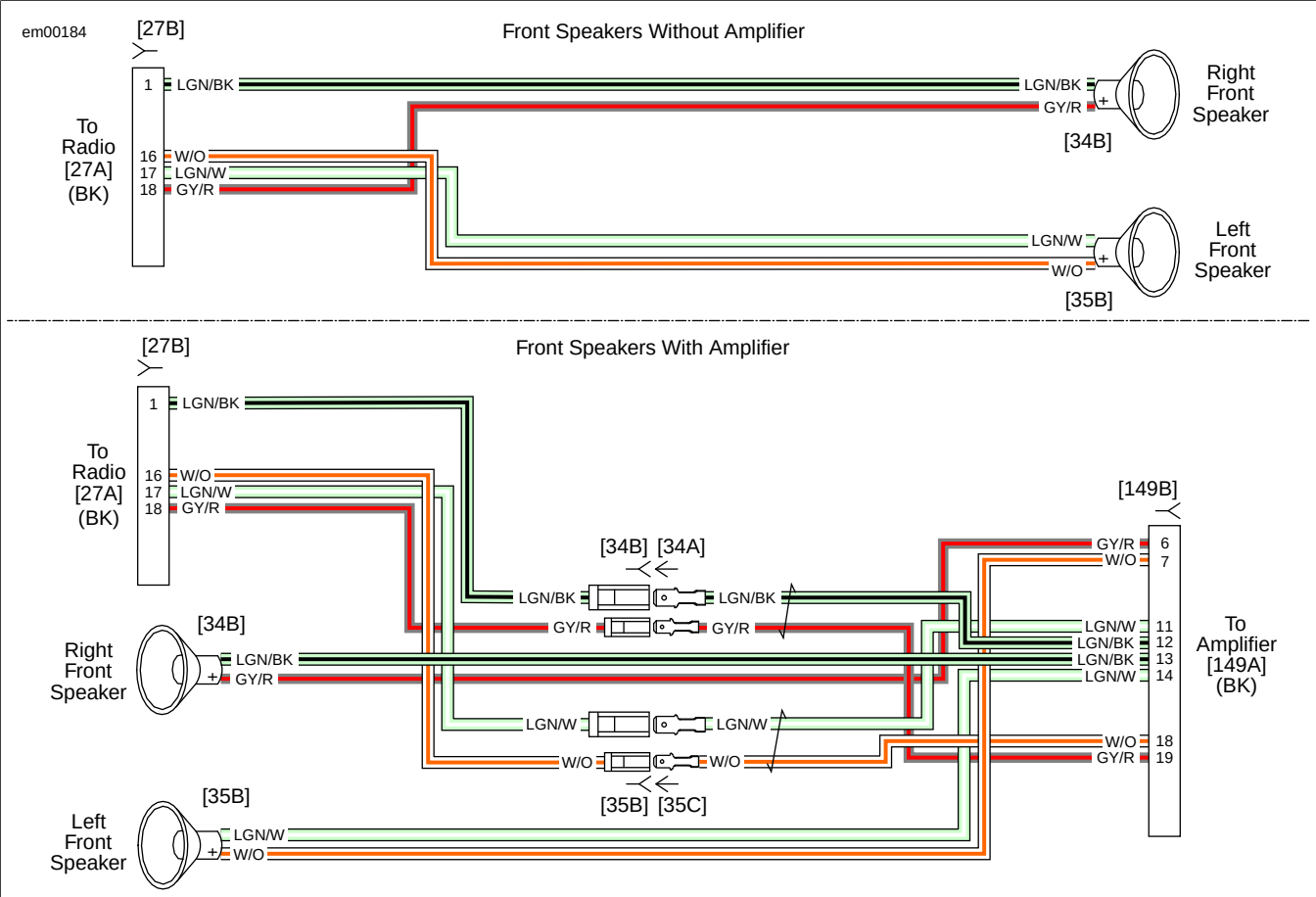


Figure 8-6. Front Speaker Circuit

1. Front Speakers Open (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [27] leaving radio disconnected.
2. Measure the resistance between breakout box terminals 16 and 17 (left speaker) or terminals 1 and 18 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

2. Front Speakers Open (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between speaker terminals at [34A] or [35A].

3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** Replace speaker. See the service manual. **(6605)**
 - b. **No.** Repair open wire(s) between radio [27B] terminals 16 (W/O) and 17 (LGN/W) (left speaker) or between terminals 1 (LGN/BK) and 18 (GY/R) (right speaker). **(5041)**

B2017 FRONT SPEAKERS OPEN: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-21. B2017 Front Speakers Open: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires shorted to ground
Amplifier malfunction

1. Front Speakers Open (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Measure the resistance between breakout box terminals 7 and 14 (left speaker) or terminals 6 and 13 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace amplifier. **(6107)**

2. Front Speakers Open (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between speaker terminals at [34A] or [35A].
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** Replace speaker. See the service manual. **(6605)**
 - b. **No.** Repair short between amplifier [149B] terminals 7 (W/O) and 14 (LGN/W) (left speaker) or between terminals 6 (GY/R) and 13 (LGN/BK) (right speaker). **(5041)**

B2018 FRONT SPEAKERS SHORTED TO GROUND: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-22. B2018 Front Speakers Shorted to Ground: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to ground
Radio malfunction

1. Front Speakers Shorted to Ground Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [27] leaving radio disconnected.
2. Test for continuity from breakout box terminals 16 and 17 (left speaker) or terminals 1 and 18 (right speaker) to ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground from radio [27B] terminals 16 (W/O) or 17 (LGN/W) (left speaker) or between terminals 1 (LGN/BK) and 18 (GY/R) (right speaker). **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

B2018 FRONT SPEAKERS SHORTED TO GROUND: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-23. B2018 Front Speakers Shorted to Ground: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to ground
Amplifier malfunction

1. Front Speakers Shorted to Ground

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Test for continuity from breakout box terminals 7 and 14 (left speaker) or terminals 6 and 13 (right speaker) to ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground from amplifier [149B] terminals 7 (W/O) or 14 (LGN/W) (left speaker) or between terminals 6 (GY/R) or 13 (LGN/BK) (right speaker). **(5041)**
 - b. **No.** Replace amplifier. **(6107)**

B2019 FRONT SPEAKERS SHORTED TO BATTERY: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-24. B2019 Front Speakers Shorted to Battery: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to battery
Radio malfunction

1. Front Speakers Shorted to Battery Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [27] leaving radio disconnected.
2. Turn IGN ON.
3. Test for voltage between breakout box terminals 16 and 17 (left speaker) to ground, or terminals 1 and 18 (right speaker) to ground.
4. Is voltage present?
 - a. **Yes.** Repair short to voltage from radio [27B] terminals 16 (W/O) and 17 (LGN/W) (left speaker) or terminals 1 (LGN/BK) and 18 (GY/R) (right speaker). **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

B2019 FRONT SPEAKERS SHORTED TO BATTERY: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-25. B2019 Front Speakers Shorted to Battery: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to battery
Radio malfunction

1. Front Speakers Shorted to Battery Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Turn IGN ON.
3. Test for voltage between breakout box terminals 7 and 14 (left speaker) to ground, or terminals 6 and 13 (right speaker) to ground.
4. Is voltage present?
 - a. **Yes.** Repair short to voltage from amplifier [149B] terminals 7 (W/O) and 14 (LGN/W) (left speaker) or terminals 6 (GY/R) and 13 (LGN/BK) (right speaker). **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6107)**

B2020 REAR SPEAKERS SHORTED: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-26. B2020 Rear Speakers Shorted: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires shorted together
Radio malfunction

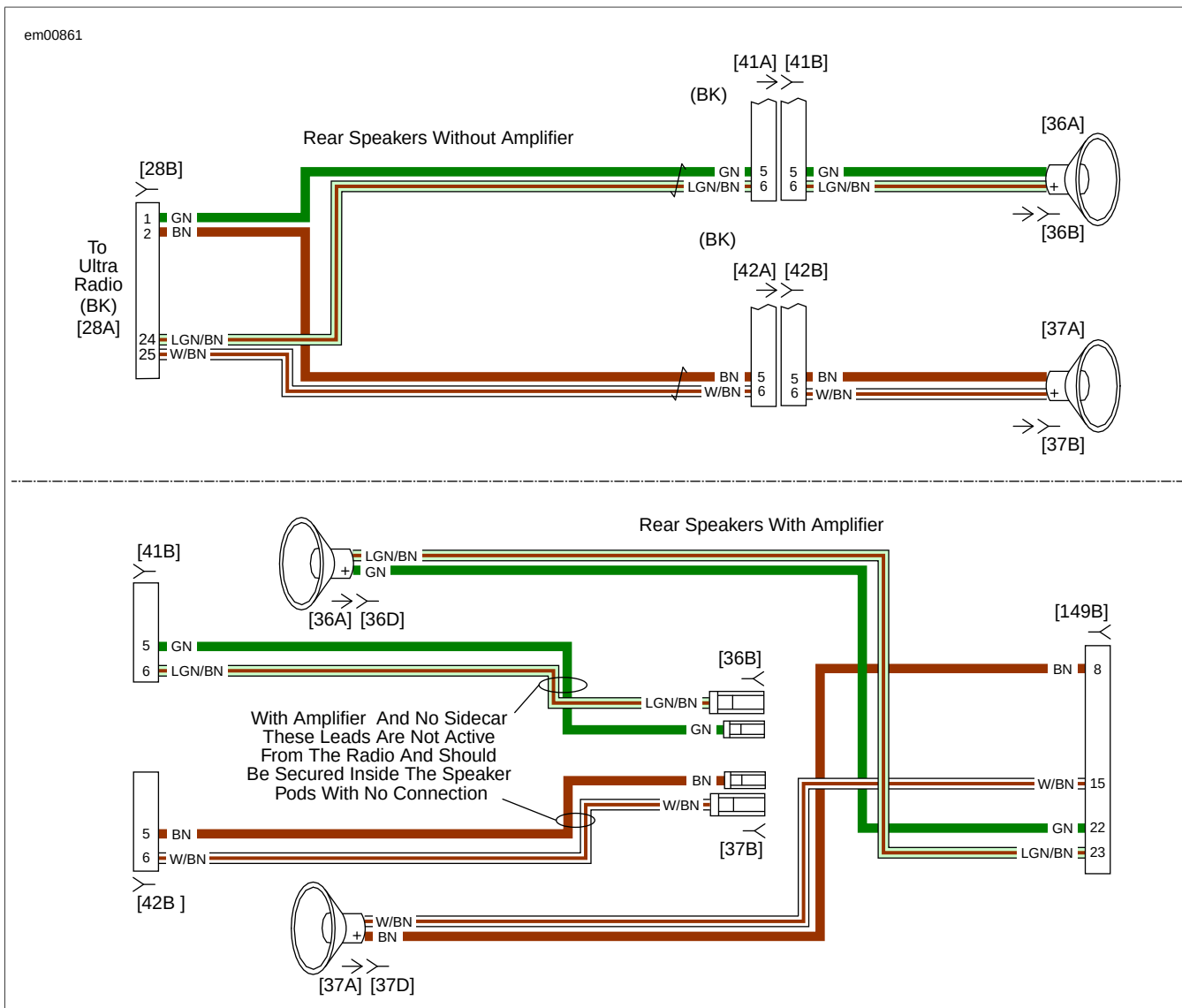


Figure 8-7. Rear Speaker Circuit

1. Rear Speakers Shorted (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [28] leaving radio disconnected.
2. Measure the resistance between breakout box terminals 2 and 25 (left speaker) or terminals 1 and 24 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

3. Is resistance less than 1.0 Ohm?

- a. **Yes.** Repair short between radio [28B] terminals 2 (BN) and 25 (W/BN) (left speaker) or between terminals 1 (GN) and 24 (LGN/BN) (right speaker). **(5041)**
- b. **No.** Replace speaker. See the service manual. **(6606)**

2. Rear Speakers Shorted (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 2 and 25 (left speaker) or terminals 1 and 24 (right speaker).

B2020 REAR SPEAKERS SHORTED: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-27. B2020 Rear Speakers Shorted: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires shorted together
Amplifier malfunction

1. Rear Speakers Shorted (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Measure the resistance between breakout box terminals 8 and 15 (left speaker) or terminals 22 and 23 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace amplifier. **(6107)**

2. Rear Speakers Shorted (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 8 and 15 (left speaker) or terminals 22 and 23 (right speaker).
3. Is resistance less than 1.0 Ohm?
 - a. **Yes.** Repair short between radio [28B] terminals 8 (BN) and 15 (W/BN) (left speaker) or between terminals 22 (GN) and 23 (LGN/BN) (right speaker). **(5041)**
 - b. **No.** Replace speaker. See the service manual. **(6606)**

B2021 REAR SPEAKERS OPEN: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-28. B2021 Rear Speakers Open: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires open
Radio malfunction

1. Rear Speakers Open (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [28] leaving radio disconnected.

2. Measure the resistance between breakout box terminals 2 and 25 (left speaker) or terminals 1 and 24 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace radio. See the service manual. **(6101)**

2. Rear Speakers Open (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 2 and 25 (left speaker) or terminals 1 and 24 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** Repair open between radio [28B] terminals 2 (BN) and 25 (W/BN) (left speaker) or between terminals 1 (GN) and 24 (LGN/BN) (right speaker). **(5041)**
 - b. **No.** Replace speaker. See the service manual. **(6606)**

B2021 REAR SPEAKERS OPEN: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-29. B2021 Rear Speakers Open: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker malfunction
Speaker wires open
Amplifier malfunction

1. Rear Speakers Open (Part A) Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Measure the resistance between breakout box terminals 8 and 15 (left speaker) or terminals 22 and 23 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace amplifier. **(6107)**

2. Rear Speakers Open (Part B) Test

1. Disconnect the affected speaker(s).
2. Measure the resistance between breakout box terminals 8 and 15 (left speaker) or terminals 22 and 23 (right speaker).
3. Is resistance greater than 3.0 Ohms?
 - a. **Yes.** Repair open between radio [28B] terminals 8 (BN) and 15 (W/BN) (left speaker) or between terminals 22 (GN) and 23 (LGN/BN) (right speaker). **(6117)**
 - b. **No.** Replace speaker. See the service manual. **(5041)**

B2022 REAR SPEAKERS SHORTED TO GROUND: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-30. B2022 Rear Speakers Shorted to Ground: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to ground
Radio malfunction

1. Rear Speakers Shorted to Ground Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [28] leaving radio disconnected.
2. Test for continuity from breakout box terminals 2 or 25 (left speaker) or terminals 1 or 24 (right speaker) to ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground from radio [28B] terminals 2 (BN) or 25 (W/BN) (left speaker) or between terminals 1 (GN) or 24 (LGN/BN) (right speaker) and ground. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

B2022 REAR SPEAKERS SHORTED TO GROUND: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-31. B2022 Rear Speakers Shorted to Ground: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to ground
Amplifier malfunction

1. Rear Speakers Shorted to Ground Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. Test for continuity from breakout box terminals 8 or 15 (left speaker) or terminals 22 or 23 (right speaker) to ground.
3. Is continuity present?
 - a. **Yes.** Repair short to ground from amplifier [149B] terminals 8 (BN) or 15 (W/BN) (left speaker) or between terminals 22 (GN) or 23 (LGN/BN) (right speaker). **(5041)**
 - b. **No.** Replace amplifier. **(6107)**

B2023 REAR SPEAKERS SHORTED TO BATTERY: WITHOUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-32. B2023 Rear Speakers Shorted to Battery: Without Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to battery
Radio malfunction

1. Rear Speakers Shorted to Battery Test

1. Install BREAKOUT BOX (Part No. HD-47918) to radio harness [28] leaving radio disconnected.
2. With IGN ON, test for voltage from breakout box terminals 2 or 25 (left speaker) or terminals 1 or 24 (right speaker) to ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage from radio [28B] terminals 2 (BN) or 25 (W/BN) (left speaker) or between terminals 1 (GN) or 24 (LGN/BN) (right speaker) and ground. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

B2023 REAR SPEAKERS SHORTED TO BATTERY: WITH AMPLIFIER

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX

Table 8-33. B2023 Rear Speakers Shorted to Battery: With Amplifier Diagnostic Faults

POSSIBLE CAUSES
Speaker wires shorted to battery
Amplifier malfunction

1. Rear Speakers Shorted to Battery Test

1. Install BREAKOUT BOX (Part No. HD-47918) to amplifier harness [149] leaving amplifier disconnected.
2. With IGN ON, test for voltage from breakout box terminals 8 or 15 (left speaker) or terminals 22 or 23 (right speaker) to ground.
3. Is voltage present?
 - a. **Yes.** Repair short to voltage from amplifier [149B] terminals 8 (BN) or 15 (W/BN) (left speaker) or between terminals 22 (GN) or 23 (LGN/BN) (right speaker). **(5041)**
 - b. **No.** Replace amplifier. **(6107)**

SERIAL DATA BUS DIAGNOSTICS

8.4

DESCRIPTION AND OPERATION

There are two serial data busses. The first is the J1850 serial data bus which communicates between the radio and the ECM, TSSM and instruments. Refer to [Table 8-34](#). The second serial data bus is the Infotainment bus, which uses a CAN protocol to communicate between the radio and the other radio accessories. Refer to [Table 8-35](#). The radio captures any errors found on both serial data busses and stores them as DTCs.

Table 8-34. Code Description

DTC	DESCRIPTION
U1016	J1850 lost communications with ECM
U1300	J1850 bus shorted low
U1301	J1850 bus shorted high

Table 8-35. Code Description

DTC	DESCRIPTION
U1302	Infotainment bus off error
U1306	Infotainment bus lost communications with hands-free phone module
U1307	Infotainment bus lost communications with CB
U1308	Infotainment bus lost communications with future
U1310	Infotainment bus lost communications with iPod
U1312	Infotainment bus lost communications with future
U1313	Infotainment bus lost communications with XM
U1314	Infotainment bus lost communications with navigation
U1317	Infotainment bus lost communications with high output amplifier

Loss of Serial Data: DTC U1016

The serial data connector provides a means for the ECM, TSM/TSSM and speedometer to communicate their current status. When all operating parameters on the serial data bus are within specifications, a state of health message is sent between the components. DTC U1016 indicates that the ECM is incapable of sending this state of health message.

Starts then Stalls: DTC U1300, U1301

The typical serial data voltage range is 0 (inactive) to 7V (active). Due to the short pulse, voltages will be much lower on a multimeter. In analog mode, a multimeter reading serial data will show continuous voltage when active, typically 0.6-0.8V. The range for acceptable operations is greater than 0 and less than 7V.

NOTE

Problems in the fuel system or idle air control system may also create this symptom. If this symptom is present, see [6.35 STARTS, THEN STALLS](#) before proceeding.

Diagnostic Tips

- If serial data is shorted, these codes will automatically trip the check engine light.
- DTCs P1009 and P1010 may accompany DTCs U1300 and U1301.
- If radio ground and antenna ground are open, a serial data BUS fault may occur causing a start and stall condition.
- The amplifier fuse is an inline fuse for all accessory installations and is mounted in the fuse block.

DTC U1016 J1850 LOSS OF COMMUNICATION WITH ECM

PART NUMBER	TOOL NAME
HD-47918	BREAKOUT BOX
HD-48637	BREAKOUT BOX

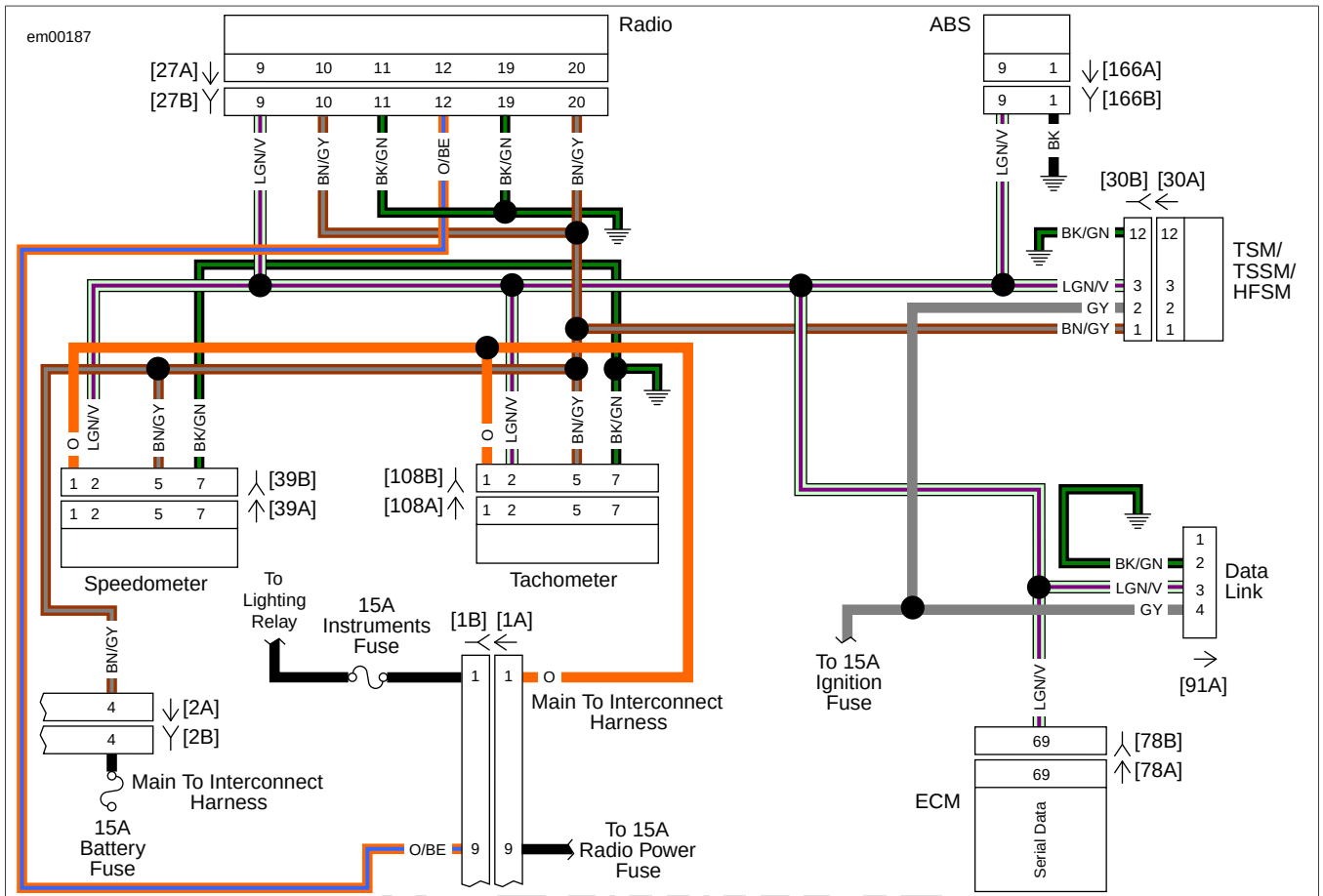


Figure 8-8. J1950 Serial Data Circuit

Table 8-36. DTC U1016 J1850 Loss of Communication with ECM Diagnostic Faults

POSSIBLE CAUSES
VSS malfunction
Serial bus shorted to ground
ECM malfunction
Radio malfunction
Speedometer malfunction

1. Speed Pulse Availability Test

1. Turn IGN ON and engine stop switch to RUN.
2. Enter radio diagnostics.
3. Rotate rear wheel.

4. Are speed pulses on radio display greater than 0?
 - a. **Yes.** Install BREAKOUT BOX (Part No. HD-47918) to radio harness [27] and perform wiggle test. Repair intermittent on (LGN/V) wire if necessary. **(6130)**
 - b. **No.** [Go to Test 2.](#)

2. Serial Data Continuity Test

1. Install radio BREAKOUT BOX (Part No. HD-47918) to radio harness [27], leaving radio [27A] disconnected, and ECM BREAKOUT BOX (Part No. HD-48637) to ECM harness [78], leaving ECM [78A] disconnected.
2. Test for continuity between radio breakout box terminal 9 and ECM breakout box terminal 69.
3. Does continuity exist?
 - a. **Yes.** Perform [2.1 INITIAL DIAGNOSTICS](#) if DTC U1016 has been set. If DTC U1016 is not present, replace ECM. See the service manual. **(6123)**
 - b. **No.** Repair open on (LGN/V) wire. **(5041)**

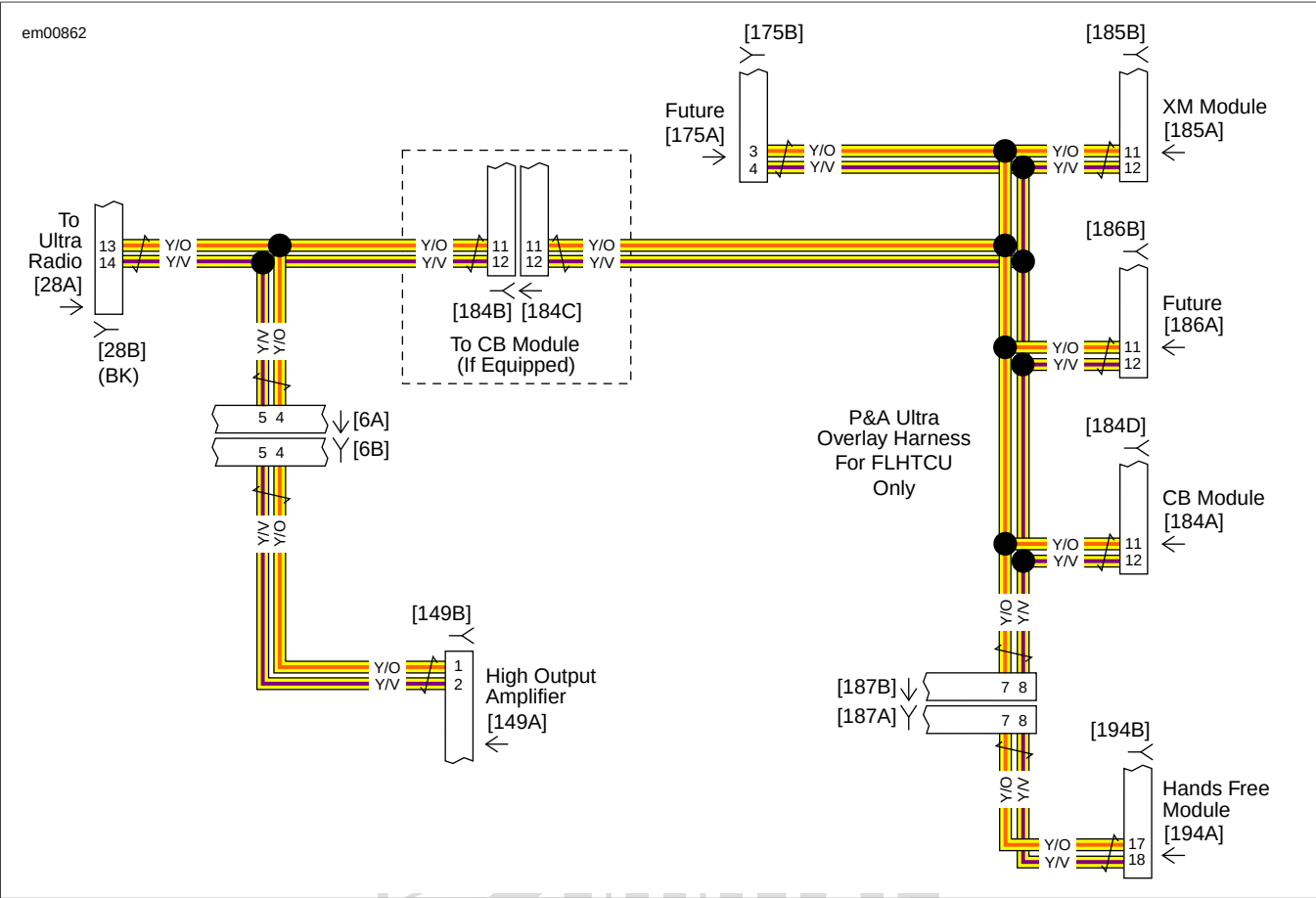


Figure 8-9. Infotainment CAN Bus Circuit

DTC U1302 INFOTAINMENT BUS OFF ERROR

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-37. DTC U1302, Infotainment Bus Off Error Diagnostic Faults

POSSIBLE CAUSES
Radio malfunction
Module shorted to ground or voltage

1. Infotainment Bus Voltage Test

1. Install radio ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) to radio [28A], leaving harness [28B] disconnected.
2. With IGN ON, measure voltage between breakout box terminals 13 and 14 using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).

3. Is voltage between 3.85-5.0V?
 - a. **Yes.** Bus voltage within range. System normal.
 - b. **No. 0V.** [Go to Test 2.](#)
 - c. **No. Greater than 0V.** [Go to Test 4.](#)

2. Infotainment Bus Shorted to Ground Test

1. Test for continuity from breakout box terminals 13 and 14 to ground.
2. Is continuity present?
 - a. **Yes.** Disconnect each installed module, including audio harness [6], CB [184] and hands free module [187], and check future ACCY [175] and [186], while observing multimeter. Replace module or repair (Y/O) or (Y/V) wiring causing short to ground. **(5041)**
 - b. **No.** [Go to Test 3.](#)

3. Infotainment Bus Wires Shorted Together Test

1. Connect [6], [184] and [187], leaving installed modules disconnected.
2. Test for continuity between [28B] terminals 13 and 14.

3. Is continuity present?
 - a. **Yes.** Repair shorted (Y/O) or (Y/V) wires. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

4. Infotainment Bus Shorted to Voltage Test

1. Connect breakout box to radio [28A].
2. With IGN ON, test for voltage between breakout box terminals 13 and 14.

3. Is battery voltage present?
 - a. **Yes.** Disconnect each installed module, including audio harness [6], CB [184] and hands free module [187], and check future ACCY [175] and [186], while observing multimeter. Replace module or repair (Y/O) or (Y/V) wiring causing short to voltage. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6101)**

DTC U1306 INFOTAINMENT BUS LOST COMMUNICATION WITH HANDS-FREE PHONE MODULE

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



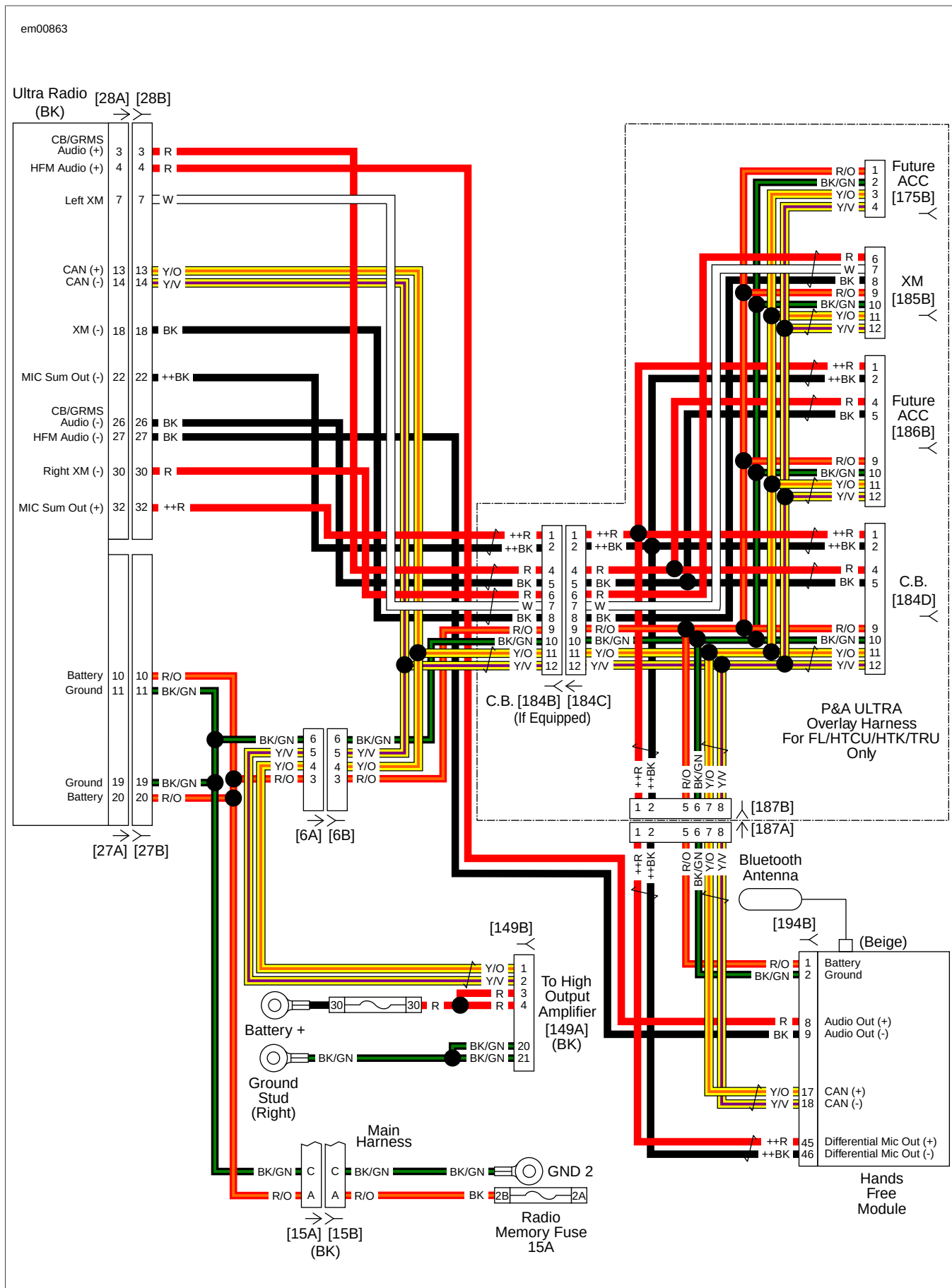


Figure 8-10. Audio, Microphone, Power and CAN Circuits

1. Hands-Free Phone Module Voltage Test

1. Disconnect hands-free phone module [194].
2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [194B] terminals 1 and 2.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 2.](#)

2. Hands-Free Phone Module Jumper Harness Voltage Test

1. Disconnect hands-free phone module jumper harness [187].
2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [187B] terminals 5 and 6.
3. Is battery voltage present?
 - a. **Yes.** Replace hands-free phone module jumper harness or repair open (R/O) or (BK/GN) wire. **(5041)**
 - b. **No.** Repair open wire between [187B] terminal 5 (R/O) and radio memory fuse, or terminal 6 (BK/GN) and ground. **(5041)**

3. Hands-Free Phone Module CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [194B] terminals 17 and 18.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace hands-free phone module. **(6102)**
 - b. **No.** [Go to Test 4.](#)

4. Hands-Free Phone Module Jumper Harness CAN Test

1. Disconnect hands-free phone module jumper harness [187].
2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [187B] terminals 7 and 8.
3. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace hands-free phone module jumper harness or repair open (Y/O) or (Y/V) wire. **(5041)**
 - b. **No.** Repair open wire between [187B] terminal 7 (Y/O) and radio [28B] terminal 13, or terminal 8 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1307 INFOTAINMENT BUS LOST COMMUNICATION WITH CB MODULE

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

1. CB Module Voltage Test

1. Disconnect CB module [184].

2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [184B] terminals 9 and 10.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between [184B] terminal 9 (R/O) and radio memory fuse, or terminal 10 (BK/GN) and ground. **(5041)**

2. CB Module CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between CB [184B] terminals 11 and 12.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace CB module. **(6625)**
 - b. **No.** Repair open wire between [184B] terminal 11 (Y/O) and radio [28B] terminal 13, or terminal 12 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1308 INFOTAINMENT BUS LOST COMMUNICATION WITH FUTURE ACCESSORY MODULE (4-PIN)

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

1. Future Accessory Voltage Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between future acc [175B] terminals 1 and 2.
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between [175B] terminal 1 (R/O) and radio memory fuse, or terminal 2 (BK/GN) and ground. **(5041)**

2. Future Accessory CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [175B] terminals 3 and 4.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** System normal.
 - b. **No.** Repair open wire between [175B] terminal 3 (Y/O) and radio [28B] terminal 13, or terminal 4 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1310 INFOTAINMENT BUS LOST COMMUNICATION WITH IPOD

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

1. iPod Voltage Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between future acc [186B] terminals 9 and 10.
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between [186B] terminal 9 (R/O) and radio memory fuse, or terminal 10 (BK/GN) and ground. **(5041)**

2. iPod CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [186B] terminals 11 and 12.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace iPod.
 - b. **No.** Repair open wire between [186B] terminal 11 (Y/O) and radio [28B] terminal 13, or terminal 12 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1312 INFOTAINMENT BUS LOST COMMUNICATION WITH FUTURE ACCESSORY MODULE (12-PIN)

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

1. Future Accessory Voltage Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between future acc [186B] terminals 9 and 10.
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between [186B] terminal 9 (R/O) and radio memory fuse, or terminal 10 (BK/GN) and ground. **(5041)**

2. Future Accessory CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [186B] terminals 11 and 12.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** System normal.
 - b. **No.** Repair open wire between [186B] terminal 11 (Y/O) and radio [28B] terminal 13, or terminal 12 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1313 INFOTAINMENT BUS LOST COMMUNICATION WITH XM MODULE

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

1. XM Module Voltage Test

1. Disconnect XM module [185].
2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between [185B] terminals 9 and 10.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between [185B] terminal 9 (R/O) and radio memory fuse, or terminal 10 (BK/GN) and ground. **(5041)**

2. XM Module CAN Test

1. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between XM [185B] terminals 11 and 12.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace XM module. **(6626)**
 - b. **No.** Repair open wire between [185B] terminal 11 (Y/O) and radio [28B] terminal 13, or terminal 12 (Y/V) and radio [28B] terminal 14. **(5041)**

DTC U1314 INFOTAINMENT BUS LOST COMMUNICATIONS WITH NAVIGATION MODULE

NOTE

This test assumes the navigation module is installed. There are no external connections to the navigation module except for the GPS antenna located under the fairing above the right front speaker.

1. Navigation Module Test

1. Turn IGN and radio ON.
2. Press NAV button on radio.
3. Does the radio show the navigation screen?
 - a. **Yes.** System ok. Clear codes.
 - b. **No.** Remove and install module and retest. If results are the same, swap navigation module with a known good module and retest. If results are the same, replace radio.

DTC U1317 INFOTAINMENT BUS LOST COMMUNICATION WITH HIGH OUTPUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-44608	RADIO BREAKOUT BOX
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

1. Amplifier Module Voltage Test

1. Disconnect amplifier [149] and connect amplifier RADIO BREAKOUT BOX (Part No. HD-44608) leaving amplifier disconnected.
2. With IGN ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between amplifier [149B] terminals 3 or 4 and 20 or 21.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Repair open wire between amplifier [149B] terminals 3 and 4 (R) and 30A amplifier fuse, or amplifier [149B] terminals 20 or 21 (BK/GN) and ground. **(6131)**

2. Amplifier Module CAN Test

1. With IGN and radio ON, and using the HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between breakout box terminals 1 and 2.
2. Is voltage between 3.85-5.0V?
 - a. **Yes.** Replace amplifier. **(6109)**
 - b. **No, voltage is greater than 5V.** [Go to Test 3.](#)
 - c. **No, voltage is less than 5V.** [Go to Test 4.](#)

3. CAN Short to Voltage Test

1. Turn IGN OFF.

2. Disconnect the radio.
3. Turn IGN ON.
4. Test for voltage between breakout box terminal 1 and ground or terminal 2 and ground.
5. Is voltage present on either circuit?
 - a. **Yes.** Repair short to voltage on the (Y/O) or (Y/V) wire. **(5041)**
 - b. **No.** Replace the radio. See the service manual. **(6101)**

4. CAN Short to Ground Test

1. Turn IGN OFF.
2. Disconnect the radio.
3. Test for continuity between breakout box terminal 1 and ground or terminal 2 and ground.
4. Is continuity present on either circuit?
 - a. **Yes.** Repair short to ground on the (Y/O) or (Y/V) wire. **(5041)**
 - b. **No.** [Go to Test 5.](#)

5. CAN Open Test

1. Connect the radio ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) to wire harness [28B], leaving the radio [28A] disconnected.
2. Test for continuity between breakout box [149B] terminal 1 and breakout box [28B] 13 or terminals 2 and 14.
3. Is continuity present on both circuits?
 - a. **Yes.** Replace the radio. See the service manual. **(6101)**
 - b. **No.** Repair open on the (Y/O) or (Y/V) wire. **(5041)**

ADVANCED AUDIO SYSTEM SYMPTOMS

8.5

GENERAL

Many faults may occur that will not set a DTC. These faults are listed in [Table 8-38](#).

Table 8-38. Advanced Audio System Symptoms

NO.	SYMPTOM	TEST
1	Radio Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 1: Radio Inoperative
2	Poor or No Reception	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 2: Poor or No Reception
3	Static Present with Engine Running	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 3: Static Present with Engine Running
4	CB Transmitter Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 4: CB Transmitter Inoperative
5	CB Receiver Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 5: CB Receiver Inoperative
6	Intercom Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 6: Intercom Inoperative
7	Handheld Microphone/PTT Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 7: Handheld Microphone/PTT Inoperative
8	Speaker Switch Malfunction	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 8: Fairing Mounted Speaker Switch Malfunction
9	Headset Speakers Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 9: Headset Speakers Inoperative
10	No or Low Audio From Microphones	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 10: No or Low Audio from Microphones
11	No or Low Audio With High Output Amplifier	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 11: No or Low Audio with High Output Amplifier
12	No or Low Audio From XM or XM Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
13	XM - No or Intermittent Reception	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 13: No or Intermittent Reception on XM Module
14	Navigation Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 14: Navigation Inoperative
15	AVC Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 15: AVC Inoperative
16	Handlebar, Passenger or Sidecar Switches Inoperative	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 16: Handlebar, Passenger or Sidecar Switches Inoperative
17	CD Skipping	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 17: CD Skipping
18	Hands-Free Phone Module Inoperative No or Low Audio To Hands-Free Phone Module No or Low Audio From Hands-Free Phone Module Hands-Free Phone Module - Phone Not Pairing	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 18: Hands-Free Phone Module Initial Diagnostics

FACTORY DEFAULTS

If a symptom is present without a DTC, restoring ROM defaults to the factory settings may resolve the issue, which can sometimes be caused by a unique sequence of rider interactions with the system.

NOTE

On FLHTCU, FLHTK, FLTRU models, set Intercom, VOX and CB squelch to midpoint and turn Weather Alert to OFF.

Access the radio diagnostic display and press softkey 1 (DEFAULT), or proceed as follows:

1. Turn IGN ON with the radio OFF.
2. Push and hold softkeys 1 and 3 and OK simultaneously for 2 seconds.
3. Push the arrow up 2 times.
4. Push softkey 2.
5. Turn IGN OFF for more than 20 seconds.
6. Turn ignition on and verify all defaults have reset.

The following are reset to the factory ROM defaults:

- Radio presets.
- Volume levels, bass, treble, AVC, fader and VOX.
- Display contrast.
- External amplifier present is reset to no amplifier (if an external amplifier is present, it will take two long ignition cycles before the radio is set up to enable the external amplifier).
- CB or PHONE present is reset to no phone (this is used by the radio to enable the intercom setting if a CB or phone are present, and like the amplifier, it will take two long ignition cycles before the radio completely enables the intercom).
- All DTCs are reset.
- Navigation saved data. This data is immediately updated upon navigation startup, so the user should be unaffected.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-48037	SWR METER ADAPTERS

Before proceeding with the diagnostics, make sure the radio is calibrated, any CD has been removed from the CD player and reset factory defaults. Doing so can reduce or eliminate needless troubleshooting of these symptoms.

If a CD is stuck in the player, the player must be reset. Remove the main fuse and wait 5 minutes and then install fuse. Turn

radio power ON and press the EJECT button. If the CD does not eject after performing the reset procedure, the radio is faulty and must be replaced.

Diagnostic Tips

Reading and understanding these diagnostic tips will help make troubleshooting symptomatic problems easier.

1. If radio is uncalibrated, CB is not functional. If the CB is not allowed in a region (Japan, for example), then the unit will not operate.
2. To use the dummy load, screw the lamp onto the antenna jack of the CB using the appropriate SWR METER ADAPTERS (Part No. HD-48037). Press the PTT switch. If the CB is transmitting a carrier wave, the lamp should illuminate. Speaking into the microphone should cause the lamp to flicker. It should get brighter and dimmer depending on how loud your voice is. A change in lamp brilliance means the CB is modulating.
3. The amplifier fuse is an inline fuse for all accessory installations and is mounted in the fuse block.
4. It is possible to have a fault on more than one handlebar control as a result of the following configuration:
 - Terminal 5 (V/BK) wire is common to both the PTT/Squelch and Mode handlebar controls.
 - Terminal 8 (BN/BK) wire is common to both the PTT/Squelch and Audio handlebar controls.
 - Terminal 22 (GY/GN) wire is common to both the PTT/Squelch and Audio handlebar controls.
5. Terminal 3 (PK/W) wire is common to both the Mode and Audio handlebar controls. Therefore, it is possible to have a fault on more than one handlebar control as a result of this configuration.
6. Some aftermarket exhaust systems may cause excessive pressure on the rear mounts causing the exhaust system to be put into a bind creating excessive vibration the CD player may not be able to isolate.

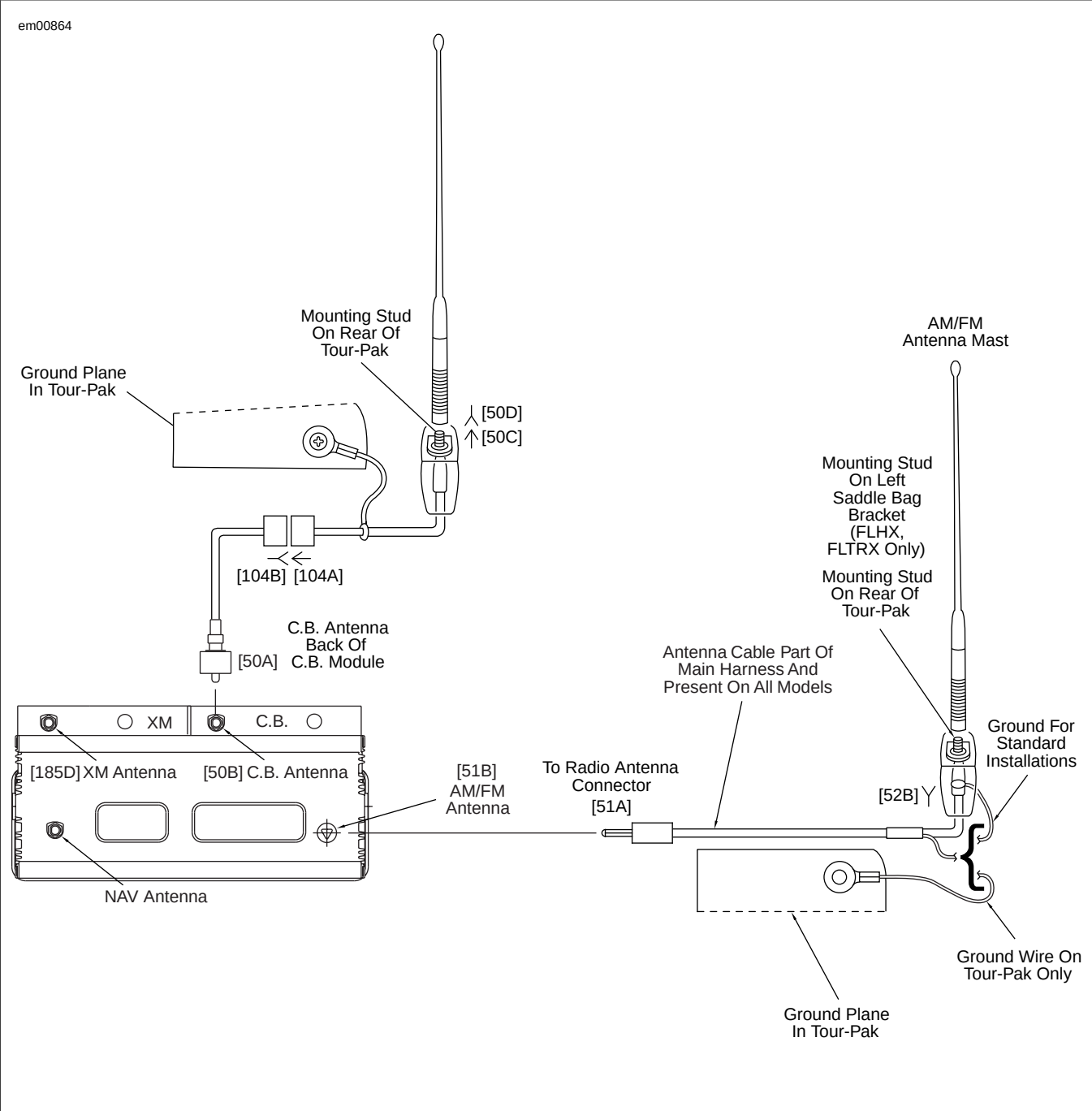


Figure 8-11. AM/FM and CB Antenna System Circuit

SYMPTOM 1: RADIO INOPERATIVE

PART NUMBER	TOOL NAME
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

1. Radio Power Test

1. Remove outer fairing.
2. Connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918), leaving radio [27A] disconnected.

3. With IGN ON, measure voltage at breakout box terminals 10 or 20, to 11 or 19.
4. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 3.](#)

2. Radio Power Continuity Test

1. Measure voltage from breakout box terminal 12 to ground.

2. Is battery voltage present?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** Repair open (O/BE) wire between radio [27B] terminal 12 and radio fuse.
2. Is continuity present?
 - a. **Yes.** Repair open (R/O) wire between radio [27B] and radio memory fuse terminal 2B.
 - b. **No.** Repair open (BK/GN) wire between radio [27B] and ground.

3. Radio Memory Continuity Test

1. Test for continuity from breakout box terminals 11 and 19 to ground.

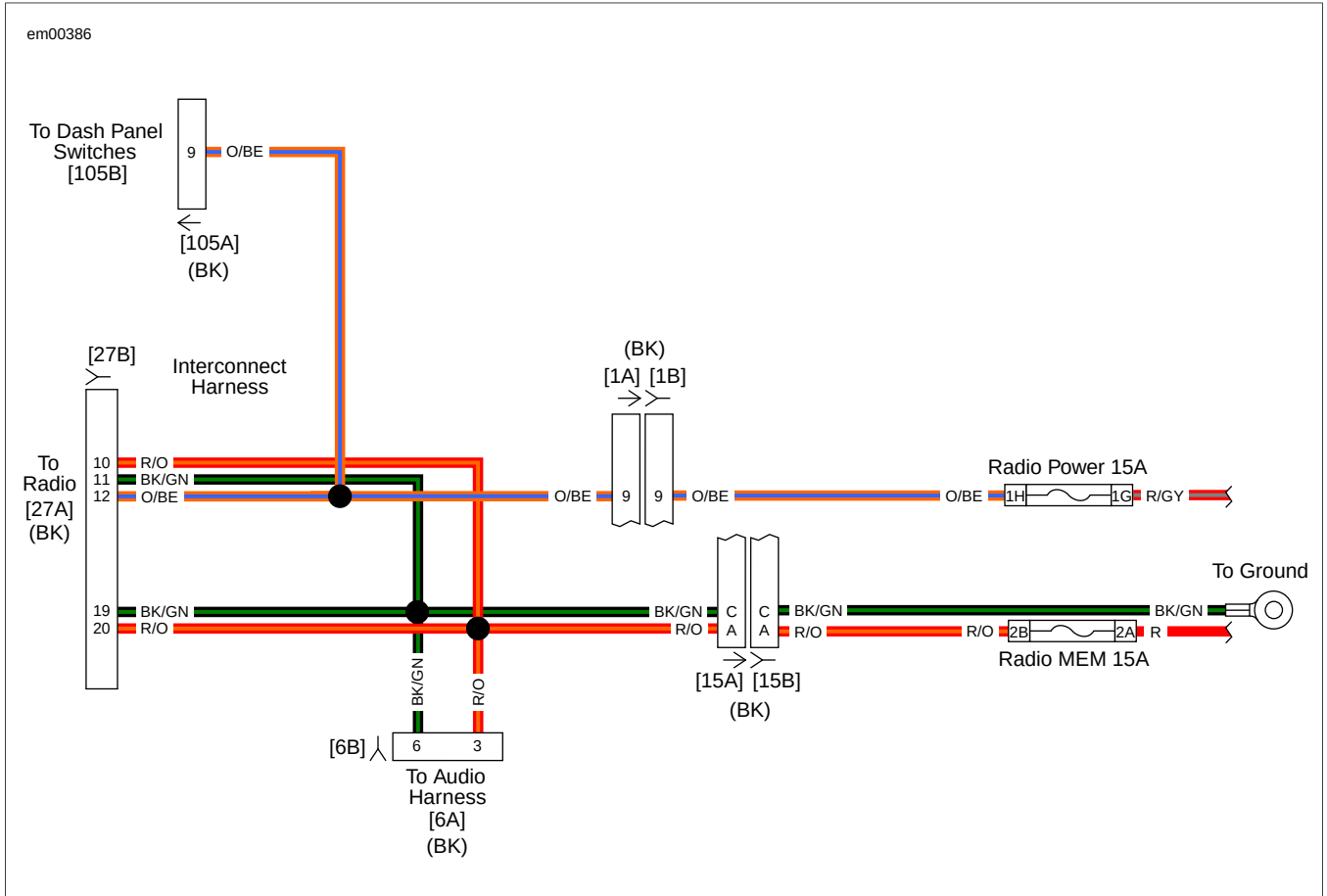


Figure 8-12. Radio Power

SYMPTOM 2: POOR OR NO RECEPTION

Table 8-39. Symptom 2: Poor or No Reception Diagnostic Faults

POSSIBLE CAUSES
Antenna and cable malfunctions
Radio malfunction
Stations out of range

1. Low-Band Radio Operation Test

1. Switch to AM (or LW/MW/W for HDI) band.
2. Locate a strong station using the seek button.

3. Does radio stop seeking on the strong station?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 3.](#)

2. FM-Band Radio Operation Test

1. Switch to FM band.
2. Locate a strong station using the seek button.
3. Does radio stop seeking on the strong station?
 - a. **Yes.** Operation normal. Review symptoms.
 - b. **No.** [Go to Test 3.](#)

3. Antenna Cable Test

1. Is antenna cable connected to mast and radio?
 - a. **Yes.** Disconnect antenna cable [51] and [52] and check connectors for damaged, pushed out or corroded terminals. Repair as required. If connectors are okay, then continue with tests. [Go to Test 4.](#)
 - b. **No.** Connect antenna cable. **(6609)**

4. Antenna Cable Open Circuit Test

1. Disconnect antenna from radio [51] and antenna base [52].
2. Test for continuity between center conductor of antenna cable from radio to antenna base.
3. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Replace antenna cable. See the service manual. **(6609)**

5. Antenna Cable Short Circuit Test

1. With antenna cable disconnected from radio [51] and antenna base [52], test for continuity between the antenna center conductor to antenna cable shield.

2. Is continuity present?
 - a. **Yes.** Replace antenna cable. See the service manual. **(6609)**
 - b. **No.** [Go to Test 6.](#)

6. Antenna Base Shorted to Ground Test

1. With antenna cable disconnected from radio [51] and antenna base [52], test for continuity between the antenna center conductor and the connector shell.
2. Is continuity present?
 - a. **Yes.** Replace antenna base assembly. See the service manual.
 - b. **No.** [Go to Test 7.](#)

7. Antenna Base Open to Ground Plate Test

1. With antenna cable disconnected from antenna base [52], test for continuity between the antenna shield (outer conductor) and ground plate inside Tour-Pak.
2. Is continuity present?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** Repair ground connection or replace antenna base assembly.



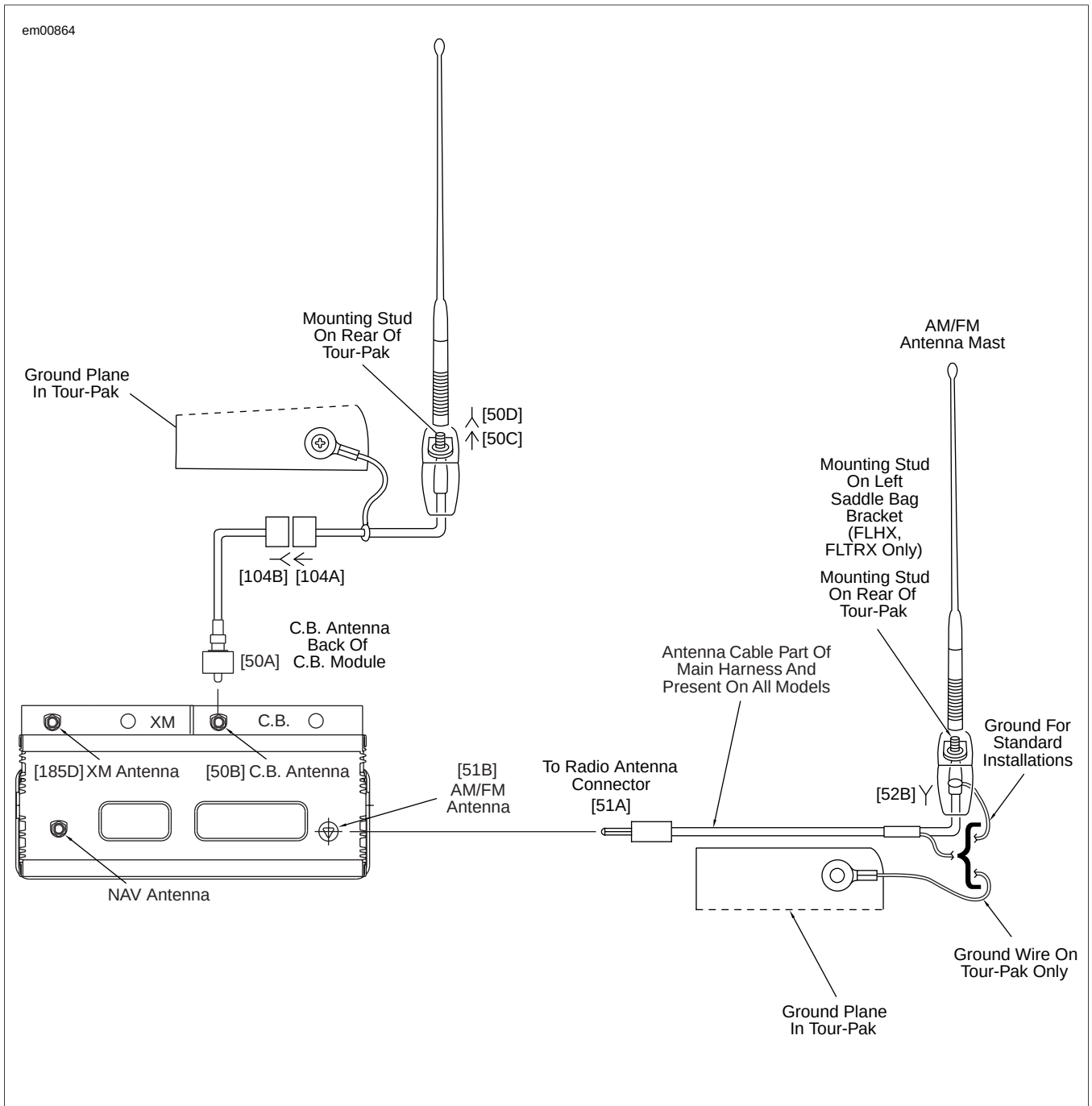


Figure 8-13. AM/FM and CB Antenna System Circuit

SYMPTOM 3: STATIC PRESENT WITH ENGINE RUNNING

Table 8-40. Symptom 3: Static Present with Engine Running Diagnostic Faults

POSSIBLE CAUSES
Alternator malfunction
Regulator malfunction
Loose power connections
Loose antenna connections

1. Static Observation Test

- Is static present only when the engine is operating?
 - Yes.** [Go to Test 2.](#)
 - No.** See [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 2: Poor or No Reception.](#)

2. Regulator Test

- Disconnect alternator [47] and start engine.
- Is static still present?
 - Yes.** [Go to Test 4.](#)
 - No.** [Go to Test 3.](#)

3. Regulator Connectors Test

- Inspect regulator connectors for damaged, pushed out or corroded terminals.
- Are connector terminations okay and the connectors tight?
 - Yes.** Replace voltage regulator. See the service manual. **(6134)**
 - No.** Clean and tighten connections. **(5041)**

4. Ignition System Test

- Test for proper spark plug wire resistance of 4975-11,950 Ohms.
- Is resistance within the specified range?
 - Yes.** If spark plug wires are in good condition, replace spark plugs. **(6132)**
 - No.** Replace spark plug wires. See the service manual. **(6133)**

SYMPTOM 4: CB TRANSMITTER INOPERATIVE

PART NUMBER	TOOL NAME
HD-39448	CB MICROPHONE LOAD DEVICE

Table 8-41. Symptom 4: CB Transmitter Inoperative Diagnostic Faults

POSSIBLE CAUSES
CB module malfunction
Radio malfunction

1. Set-Up Test

- Perform the following:
 - Press POWER button to turn radio ON.
 - Set Headset/Speaker switch on fairing to SPEAKER.
 - Press COM button.
 - Press softkey 1 to turn CB radio ON.
 - Set volume control to middle position on horizontal bar graph display.
- Does CB radio power up?
 - Yes.** [Go to Test 2.](#)
 - No.** See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1307 Infotainment Bus Lost Communication with CB Module.](#)

2. Push-to-Talk (PTT) Test

- Press any PTT switch.
- Does the channel number on the display invert?
 - Yes.** System okay.
 - No.** [Go to Test 3.](#)

3. CB Transmission Test

- Tune a known good receiver to the same channel as the transmitter under test.
- Press any PTT switch.
- Does transmitter transmit?
 - Yes.** [Go to Test 4.](#)
 - No.** See appropriate PTT switch inoperative test. If switches are okay, perform CB antenna test.

4. CB Reception Test

- Tune to different CB channels while listening.
- Are any signals being received?
 - Yes.** [Go to Test 5.](#)
 - No.** Replace CB Module. **(6625)**

5. CB Modulation Test

- Disconnect antenna [50] and connect CB MICROPHONE LOAD DEVICE (Part No. HD-39448) or equivalent to antenna jack [50B].
- With CB ON, press any PTT button, and speak into the microphone.
- Does dummy load change in brilliance when transmitting while speaking?
 - Yes.** [Go to Test 7.](#)
 - No.** [Go to Test 6.](#)

6. Microphone Test

- Repeat Test 5 with a known good microphone.

2. Does dummy load change in brilliance when transmitting while speaking?
 - a. **Yes.** Replace microphone.
 - b. **No.** See [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 10: No or Low Audio from Microphones](#).

7. CB Antenna Cable Open Circuit Test

1. Remove antenna mast from mounting stud.
2. Test for continuity between the center conductor of [50A] to mounting stud.
3. Is continuity present?
 - a. **Yes.** [Go to Test 8](#).
 - b. **No.** Replace antenna cable assembly. **(6609)**

8. CB Antenna Cable Shield Open Circuit Test

1. Check for continuity between outer connector shell [50A] and ground plate inside Tour-Pak.
2. Is continuity present?
 - a. **Yes.** [Go to Test 9](#).
 - b. **No.** Replace antenna cable assembly. **(6609)**

9. CB Antenna Cable Shorted Test

1. Check for continuity between the center conductor [50A] and ground plate inside Tour-Pak.
2. Is continuity present?
 - a. **Yes.** Replace antenna cable assembly. **(6609)**
 - b. **No.** Replace antenna mast. **(6613)**

SYMPTOM 5: CB RECEIVER INOPERATIVE

PART NUMBER	TOOL NAME
HD-42662	BREAKOUT BOX
HD-45325	JUMPER HARNESS
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-42. Symptom 5: CB Receiver Inoperative Diagnostic Faults

POSSIBLE CAUSES
CB module malfunction
Antenna malfunction
Radio malfunction

1. Set-Up Test

1. Perform the following:
 - a. Press POWER button to turn radio ON.
 - b. Set Headset/Speaker switch on fairing to SPEAKER.
 - c. Press COM button.
 - d. Press softkey 1 to turn CB radio ON.
 - e. Set volume control to middle position on horizontal bar graph display.
2. Does CB radio power up?
 - a. **Yes.** [Go to Test 2](#).
 - b. **No.** See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1307 Infotainment Bus Lost Communication with CB Module](#).

2. Receiver Audio Test

1. Press squelch switch down until bar graph on display moves to the left most position (open). Doing so keeps the squelch open and independent of received signal strength.
2. Is CB audio present? Unless a signal is actually present, audio will be in the form of static hissing.
 - a. **Yes.** [Go to Test 3](#).
 - b. **No.** [Go to Test 4](#).

3. Squelch Operation Test

1. Press squelch switch up until CB audio cuts out.
2. Transmit a signal from a nearby known good transmitter tuned to the same channel as the receiver under test.
3. Does the squelch open and is audio present?
 - a. **Yes.** Receiver okay.
 - b. **No.** Perform Symptom 4: CB Transmitter Inoperative, tests 7 through 9.

4. Receiver Operation Test

1. Transmit a signal from a nearby known good transmitter tuned to the same channel as the receiver under test.
2. Is CB receiver audio present?
 - a. **Yes.** Receiver okay.
 - b. **No.** [Go to Test 5](#).

5. Receiver Audio Voltage Test

1. Inspect for pushed out, damaged or corroded terminals on radio [28] and harness [184]. Repair as required.
2. Install BREAKOUT BOX (Part No. HD-42662) and JUMPER HARNESS (Part No. HD-45325) between harness [184D] and CB radio [184A], and Radio ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [28A] and harness [28B].
3. Using an external transmitter (tuned to the same channel as the receiver) for a test signal, measure the VAC between radio breakout box terminals 3 and 26.

4. Is voltage between 0-1 VAC?
 - a. **Yes.** Replace radio. See the service manual. **(6103)**
 - b. **No, battery voltage present.** [Go to Test 9.](#)
 - c. **No, 0V present.** [Go to Test 7.](#)
 - d. **No, less than battery voltage present.** [Go to Test 6.](#)

6. Receiver Audio Open Circuit Test

1. Disconnect radio [28A] leaving breakout box connected to harness [28B].
2. Test for continuity between radio breakout box terminal 3 and terminal 4 of [184D], and then from radio breakout box terminal 26 and terminal 5 of [184D].
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open wire(s) (R) or (BK) between harness [184D] and radio [28B]. **(5041)**

7. Receiver Audio Short to Ground Test

1. Test for continuity between radio breakout box terminal 3 and ground. Repeat for terminal 26 and ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (R) or (BK) wire(s). **(5041)**
 - b. **No.** [Go to Test 8.](#)

8. Receiver Audio Shorted Together Test

1. Test for continuity between radio breakout box terminals 3 and 26.
2. Is continuity present?
 - a. **Yes.** Repair short circuit between (R) and (BK) wire(s). **(5041)**
 - b. **No.** [Go to Test 9.](#)

9. Receiver Audio Harness Shorted to Voltage Test

1. With IGN ON, test for voltage between radio breakout box terminal 3 to ground, and repeat for terminal 26 to ground.
2. Is battery voltage present on either terminal to ground?
 - a. **Yes.** Repair short to voltage on (R) or (BK) wire(s). **(5041)**
 - b. **No.** Replace the CB Module. See the service manual. **(6625)**

SYMPTOM 6: INTERCOM INOPERATIVE

Table 8-43. Symptom 6: Intercom Inoperative Diagnostic Faults

POSSIBLE CAUSES
Intercom not installed
Radio malfunction

1. Set-Up Mode Test

1. Perform the following:
 - a. Press POWER button to turn radio ON.
 - b. Set Headset/Speaker switch on fairing to HEADSET.
 - c. Press COM button. Press softkey 1 to turn CB radio OFF.
 - d. Press INT button. Press softkey 1 to turn intercom ON (Setup Mode).
2. Does intercom enter setup mode?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** If intercom will not enter setup mode, the intercom is not installed. See your dealer for assistance.

2. Intercom Speech Test

1. Speak into any microphone.
2. Is voice heard in all headsets?
 - a. **Yes.** Intercom okay.
 - b. **No.** [Go to Test 3.](#)

3. VOX Maximum (Open) Test

1. Press softkey 4 to adjust VOX sensitivity to greater than 10 bars. Set front intercom volume control to middle position on horizontal bar graph display. Set rear volume to middle position.
2. Is intercom audio present both ways when speaking?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 5.](#)

4. VOX Adjustment Test

1. Adjust VOX level down one step at a time using softkey 6 until VOX is no longer open.
2. Speak loudly into any microphone.
3. Is audio present?
 - a. **Yes.** Intercom okay.
 - b. **No.** Replace radio. See the service manual. **(6103)**

5. Headset Test

1. Determine which headset is faulty by swapping headset positions, or by substituting a known good headset for one of the suspect units.
2. Does the problem follow the suspect unit or does the known good headset solve the problem?
 - a. **Yes.** Replace suspect headset.
 - b. **No.** Replace radio. See the service manual. **(6101)**

SYMPTOM 7: HANDHELD MICROPHONE/PTT INOPERATIVE

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	RADIO BREAKOUT BOX

Table 8-44. Symptom 7: Handheld Microphone/PTT Inoperative Diagnostic Faults

POSSIBLE CAUSES
PTT switch malfunction
Radio malfunction

1. Set-Up Test

- Perform the following:
 - Press POWER button to turn radio ON.
 - Press INT button. Press softkey 1 to turn intercom OFF.
 - Press COM button. Press softkey 1 to turn CB radio ON.
 - Set Headset/Speaker switch on fairing to SPEAKER.

- Press the handheld PTT switch. The following should occur:
 - Radio display shows CB mode.
 - CB transmitter operates.
 - CB channel number inverts.
- Do these changes take place?
 - Yes.** System okay.
 - No.** [Go to Test 2.](#)

2. Switch Diagnostic Test

- Enter switch diagnostics mode.
- With handheld microphone disconnected, does display show "Handheld PTT"?
 - Yes.** [Go to Test 3.](#)
 - No.** Substitute microphone with a known good unit. If display continues to show "Handheld PTT", then continue with tests. [Go to Test 4.](#)

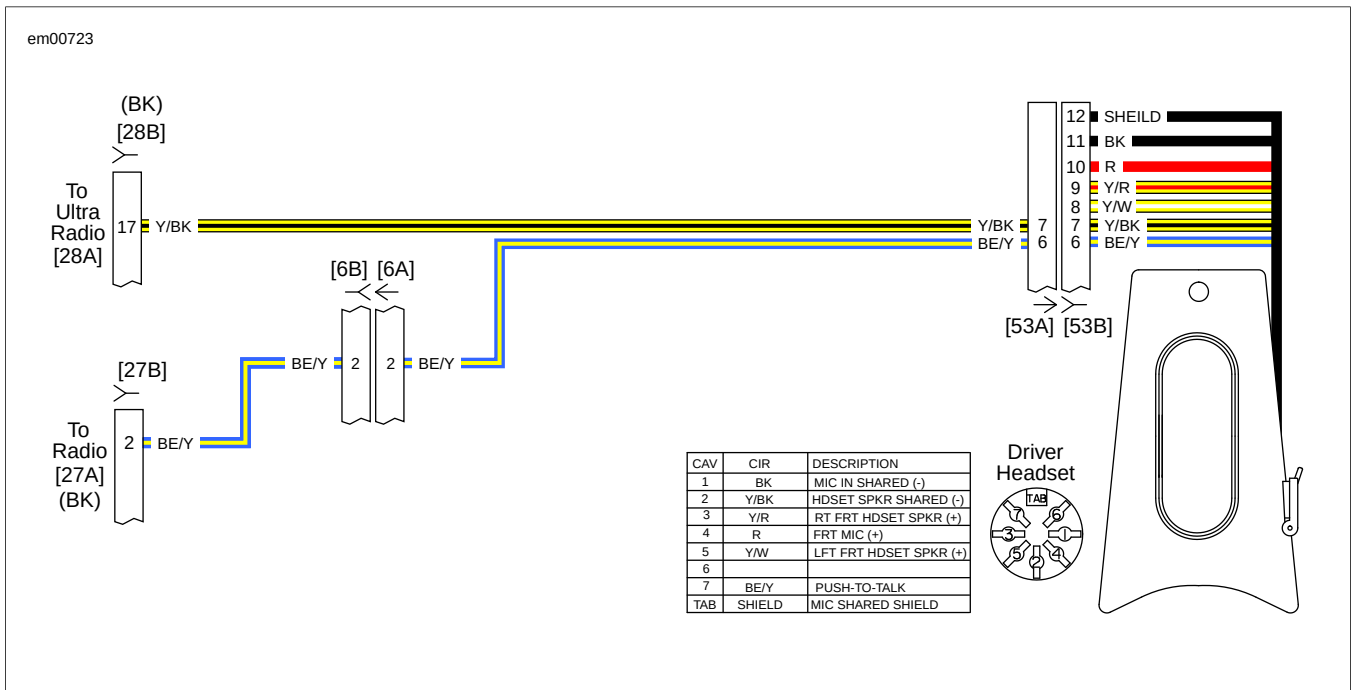


Figure 8-14. Handheld Microphone PTT Circuit

3. PTT Open Circuit Test

- Install RADIO BREAKOUT BOX (Part No. HD-47918) to radio harness [27B] and [28B], leaving radio disconnected.
- Test for continuity between breakout box [27] terminal 2 to breakout box [28] terminal 17 using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), and press handheld PTT switch.

- Is continuity present?
 - Yes.** Replace radio. See the service manual. **(6103)**
 - No.** Substitute microphone with a known good unit and perform step 2 again. If open still exists, repair open wire between [27B] terminal 2 (BE/Y), or between [28B] terminal 17 (Y/BK). **(5041)**

4. PTT Short Circuit to Ground Test

1. Test for continuity between breakout box [27] terminal 2 and from breakout box [28] terminal 17 to ground, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
2. Is continuity present?
 - a. **Yes.** Substitute microphone with known good unit and perform step 1 again. If short still exists, repair short to ground on [27B] terminal 2 (BE/Y) wire; or on [28B] terminal 17 (Y/BK). **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6103)**

SYMPTOM 8: FAIRING MOUNTED SPEAKER SWITCH MALFUNCTION

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-45. Speaker Switch Function

MODE	SPEAKER INPUT A (TERMINAL 21)	SPEAKER INPUT B (TERMINAL 13)	DIAGNOSTIC DISPLAY
Headset	Battery Voltage	0-1.0V	SpkA
Speaker/Headset	0-1.0V	4.5-5.5V	SpkB
Speaker	Battery Voltage	4.5-5.5V	SpkA SpkB

Table 8-46. Symptom 8: Fairing Mounted Speaker Switch Malfunction Diagnostic Faults

POSSIBLE CAUSES
Speaker switch malfunction
Radio malfunction

1. Speaker Switch Headset Mode Test

1. Put radio into diagnostic mode.
2. Place speaker switch in HEADSET (up position).
3. Does radio display show SpkA only (not SpkB)?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 4.](#)

2. Speaker Switch Speaker and Headset Mode Test

1. Place speaker switch to SPEAKER and HEADSET mode (middle position).
2. Does display show SpkB only (not SpkA)?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** [Go to Test 8.](#)

3. Speaker Switch Mode Test

1. Place speaker switch to SPEAKER mode (down position).
2. Does display show SpkA and SpkB?
 - a. **Yes.** Speaker switch okay. Review symptoms list.
 - b. **No.** Replace speaker switch. See the service manual. **(6143)**

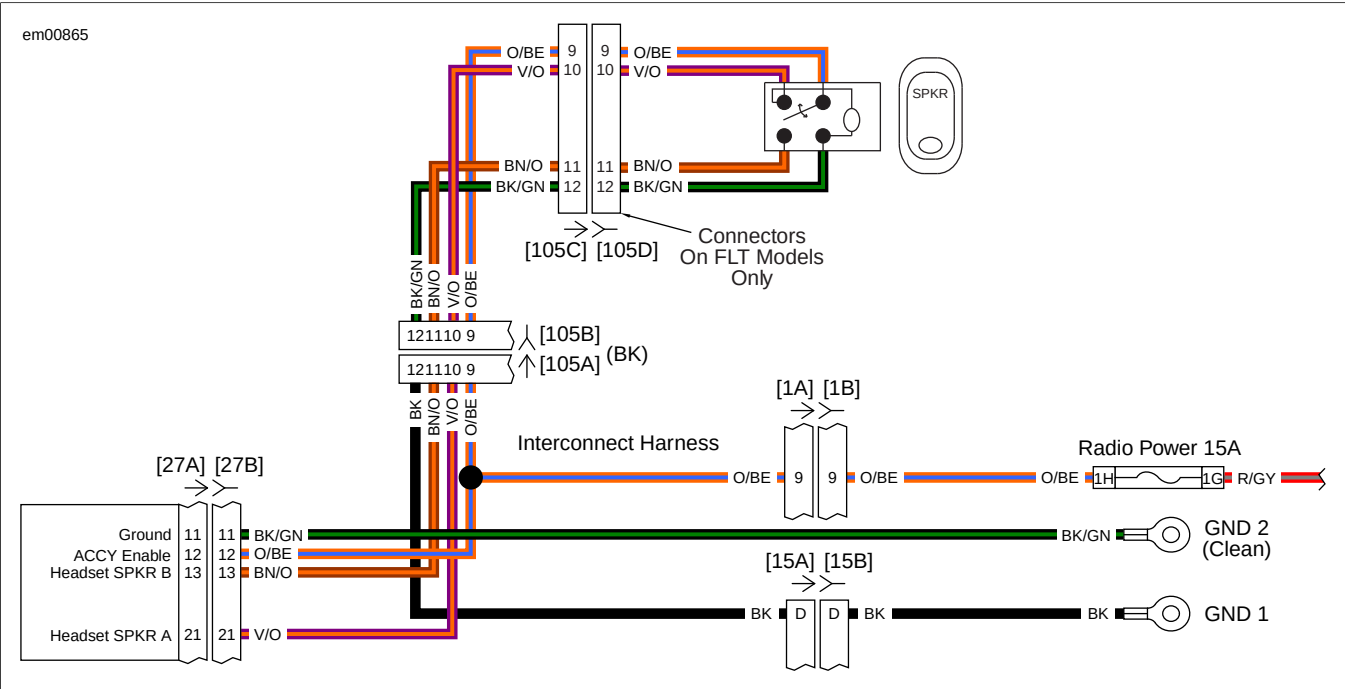


Figure 8-15. Speaker Switch Circuit

4. Headset SpkA Voltage Test

1. Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [27A] and harness [27B].
2. Measure voltage from breakout box [27] terminal 21 to ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
3. Is voltage less than 4.5V?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** [Go to Test 6.](#)

5. Headset SpkA Continuity Test

1. Disconnect radio breakout box from radio [27A], leaving harness [27B] connected.
2. Test for continuity between breakout box [27] terminal 21 and switch harness [105A] terminal 10 using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
3. Is continuity present?
 - a. **Yes.** Replace speaker switch. See the service manual. **(6143)**
 - b. **No.** Repair open (V/O) wire between [27B] terminal 21 and [105A] terminal 10. **(5041)**

6. Headset SpkA Short to Ground Test

1. Test for continuity from breakout box [27] terminal 21 to ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
2. Is continuity present?
 - a. **Yes.** Repair short to ground. **(5041)**
 - b. **No.** [Go to Test 7.](#)

7. Headset SpkA Short to Voltage Test

1. Test for voltage from breakout box [27] terminal 21 and ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
2. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (V/O) wire. If wire is okay, replace radio. **(6103)**
 - b. **No.** Replace speaker switch. See the service manual. **(6143)**

8. Headset SpkB Voltage Test

1. Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [27A] and harness [27B].

2. Measure voltage from breakout box [27] terminal 13 to ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
3. Is voltage less than 2.5V?
 - a. **Yes.** [Go to Test 9.](#)
 - b. **No.** [Go to Test 10.](#)

9. Headset SpkB Continuity Test

1. Disconnect radio breakout box from radio [27A], leaving harness [27B] connected.
2. Test for continuity between breakout box [27] terminal 13 and switch harness [105A] terminal 11 using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
3. Is continuity present?
 - a. **Yes.** Replace speaker switch. See the service manual. **(6143)**
 - b. **No.** Repair open (BN/O) wire between [27B] terminal 13 and [105A] terminal 11. **(5041)**

10. Headset SpkB Short to Voltage Test

1. Test for voltage from breakout box [27] terminal 13 and ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
2. Is battery voltage present?
 - a. **Yes.** Repair short to voltage on (BN/O) wire. **(5041)**
 - b. **No.** [Go to Test 11.](#)

11. Headset SpkB Short to Ground Test

1. Test for continuity from breakout box [27] terminal 13 to ground using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (BN/O) wire. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6103)**

SYMPTOM 9: HEADSET SPEAKERS INOPERATIVE

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Headset speakers rarely fail at the same time. Troubleshooting time can be significantly reduced by substituting known good units for the suspect units. Alternatively substituting parts of the suspect units (headsets and coil cords) can quickly determine whether the headsets or coil cords are faulty, or whether the fault lies elsewhere in the system.

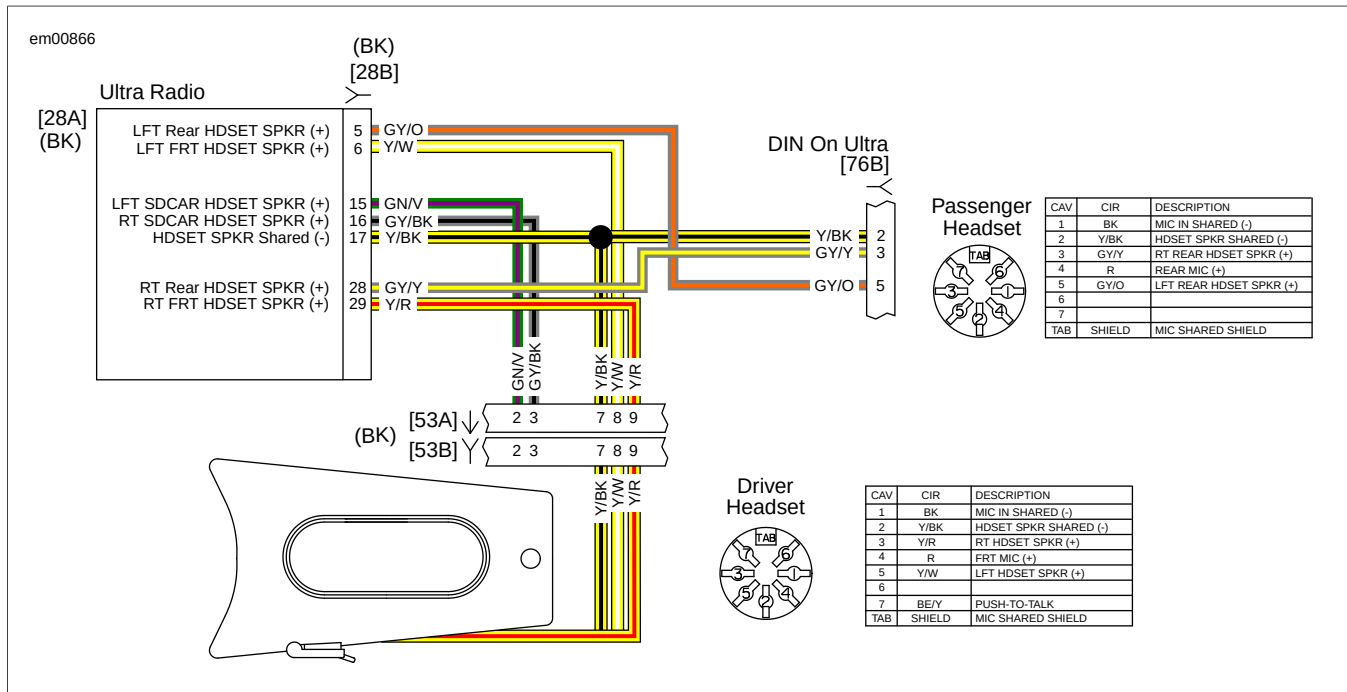


Figure 8-16. Headset Speaker Circuit

Table 8-47. Symptom 9: Headset Speakers Inoperative
Diagnostic Faults

POSSIBLE CAUSES	
Headset speaker malfunction	
Radio malfunction	

1. Headset Speaker Operational Test

1. Connect headsets to the appropriate DIN connectors.
2. Turn radio ON, tune to a station and place speaker switch to HEADSET.
3. Do both helmet speakers work?
 - a. **Yes.** System okay.
 - b. **No. Both helmet speakers inoperative.** Substitute or swap headsets and coil cords. If the problem clears in the suspect unit, replace that component.
 - c. **No. Rider headset.** [Go to Test 2.](#)
 - d. **No. Passenger headset.** [Go to Test 6.](#)

2. Rider Headset Speaker Continuity Test

1. Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) harness [27B] and harness [28B], leaving radio disconnected. Refer to [Table 8-48](#).
2. Test for continuity between breakout box [28] and rider DIN, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C).

3. Is continuity present?
- a. **Yes.** [Go to Test 3.](#)
- b. **No.** Repair open wire between radio harness [28B] and [53A], or [53B] and rider DIN. **(5041)**

Table 8-48. Rider Headset Speaker Terminations and Wire Colors

RADIO HARNESS [28B] TERMINAL	DIN CONNECTOR TERMINAL	WIRE COLOR
6	5	(Y/W)
17	2	(Y/BK)
29	3	(Y/R)

3. Rider Headset Speaker Shorted Wires Test

1. Test for continuity between breakout box [28] terminals 6, 17 and 29.
2. Is continuity present between any two terminals?
 - a. **Yes.** Repair shorted wires between radio harness [28B] and [53A], or [53B] and rider DIN. **(5041)**
 - b. **No.** [Go to Test 4.](#)

4. Rider Headset Speaker Short to Voltage Test

1. Connect radio breakout box to radio [28A], and turn radio ON.
2. Measure voltage between breakout box [28] terminals 6 (left) or 29 (right), to ground.

3. Is voltage greater than 9V?
 - a. **Yes.** Repair short to voltage between radio harness [28B] and [53A], or [53B] and rider DIN. **(5041)**
 - b. **No.** [Go to Test 5.](#)

5. Rider Headset Speaker Short to Ground Test

1. Turn radio off and disconnect radio breakout box from radio [28A].
2. Test for continuity between breakout box [28] terminals 6 (left), 17 or 29 (right) to ground.
3. Is continuity present on any terminals?
 - a. **Yes.** Repair short to ground between radio harness [28B] and [53A], or [53B] and rider DIN. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6103)**

6. Passenger Headset Speaker Continuity Test

1. Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) harness [27B] and harness [28B] leaving radio disconnected.
2. Test for continuity between breakout box [28] and rider DIN, using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C). Refer to [Table 8-49](#).
3. Is continuity present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** Repair open wire between radio harness [28B] and [76A], or [76B] and passenger DIN. **(5041)**

Table 8-49. Passenger Headset Speaker Terminations and Wire Colors

RADIO HARNESS [28B] TERMINAL	DIN CONNECTOR TERMINAL	WIRE COLOR
5	5	(GY/O)
17	2	(Y/BK)
28	3	(GY/Y)

7. Passenger Headset Speaker Shorted Wires Test

1. Test for continuity between breakout box [28] terminals 5, 17 and 28.
2. Is continuity present between any two terminals?
 - a. **Yes.** Repair shorted wires between radio harness [28B] and [76A], or [76B] and passenger DIN. **(5041)**
 - b. **No.** [Go to Test 8.](#)

8. Passenger Headset Speaker Short to Voltage Test

1. Connect radio breakout box to radio [28A], and turn radio ON.

2. Measure voltage between breakout box [28] terminals 5 (left) or 28 (right), to ground.
3. Is voltage greater than 9V?
 - a. **Yes.** Repair short to voltage between radio harness [28B] and [76A], or [76B] and passenger DIN. **(5041)**
 - b. **No.** [Go to Test 9.](#)

9. Passenger Headset Speaker Short to Ground Test

1. Turn radio off and disconnect radio breakout box from radio [28A].
2. Test for continuity between breakout box [28] terminals 5 (left), 17 or 28 (right) to ground.
3. Is continuity present on any terminals?
 - a. **Yes.** Repair short to ground between radio harness [28B] and [76A], or [76B] and passenger DIN. **(5041)**
 - b. **No.** Replace radio. See the service manual. **(6103)**

SYMPTOM 10: NO OR LOW AUDIO FROM MICROPHONES

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-50. Symptom 10: No or Low Audio from Microphones Diagnostic Faults

POSSIBLE CAUSES
Headset malfunction
Microphone malfunction

NOTE

Use PTT switch if intercom is not installed.

1. Headset Microphone Set-Up Test

1. Plug a known good headset in rider DIN connector.
2. Turn intercom ON, set VOX threshold to OPEN, intercom volume to mid-level.
3. Speak into the microphone.
4. Can the audio be heard in the headset?
 - a. **Yes.** Replace coil cord on faulty headset and retest. If fault persists, then continue with tests. [Go to Test 2.](#)
 - b. **No.** Perform test for each microphone driven source installed. If no issues are found then continue with testing. [Go to Test 2.](#)

em00867

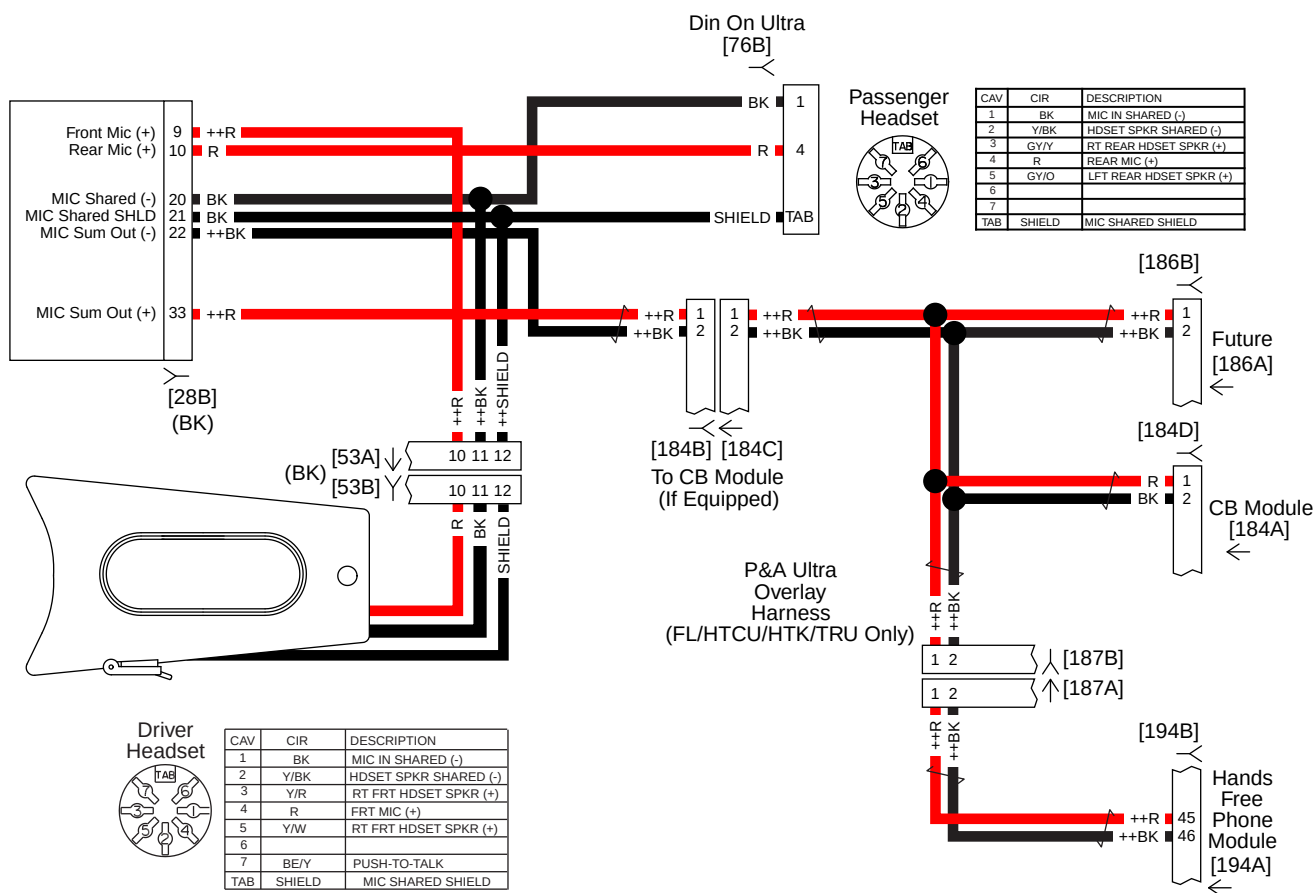


Figure 8-17. Headset Microphone Circuit

2. Headset Microphone Voltage Test

- Remove all microphones from DIN connectors.
- With radio/intercom ON, measure the voltage between terminals 4 and 1 of each DIN connector.
- Is the voltage between 7.5-8.5V?
 - Yes.** Replace microphone in faulty headset and retest. If fault persists, then continue with tests. [Go to Test 3.](#)
 - No.** [Go to Test 3.](#)

3. Microphone Sum Out Voltage Test

- Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [28A] and harness [28B].
- With radio ON, measure the voltage from breakout box [28] terminals 33 to 22.

- Is voltage between 7.5-8.5V?
 - Yes.** Replace radio. See the service manual. **(6103)**
 - No.** [Go to Test 4.](#)

4. Headset Microphone Circuit Continuity Test

- Disconnect breakout box from radio [28A].
- Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for continuity from breakout box [28] terminal:
 - 33 to CB module [184A] terminal 1.
 - 22 to CB module [184A] terminal 2.
 - 33 to Hands-Free module [194A] terminal 45 if equipped.
 - 22 to Hands-Free module [194A] terminal 46 if equipped.

3. Is continuity present?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Repair open (R) or (BK) wires between radio harness [28B] terminals 33 or 22 and CB module [184B] terminals 1 or 2 and Hands-Free module [194B] terminals 45 and 46. **(5041)**

5. Headset Microphone Circuit Short to Ground Test

1. Connect installed modules.
2. Test for continuity from breakout box terminals 33 and 22 to ground.
3. Is continuity present on either terminal?
 - a. **Yes.** Repair short to ground on (R) or (BK) wires. Installed modules may also be shorted to ground internally. Disconnect each module while observing multimeter. If disconnecting any module causes multimeter to indicate infinity, replace that module. **(5041)**
 - b. **No.** [Go to Test 6.](#)

6. Headset Microphone Circuit Wires Shorted Together Test

1. Test for continuity between breakout box terminals 33 and 22.
2. Is continuity present?
 - a. **Yes.** Repair short between (R) and (BK) wires. Installed modules may also be shorted internally. Disconnect each module while observing multimeter. If disconnecting any module causes multimeter to indicate infinity, replace that module. **(5041)**
 - b. **No.** [Go to Test 7.](#)

7. Headset Microphone Circuit Short to Voltage Test

1. Connect breakout box to radio [28A].
2. With radio ON, test for voltage between breakout box terminals 33 and 22 to ground.
3. Is voltage greater than 9V?
 - a. **Yes.** Repair short to voltage on (R) or (BK) wire. Installed modules may also be shorted to voltage internally. Disconnect each module while observing multimeter. If disconnecting any module causes multimeter to indicate normal voltage (7.5-8.5V), replace that module. **(6155)**
 - b. **No.** Replace radio. See the service manual. **(5041)**

SYMPTOM 11: NO OR LOW AUDIO WITH HIGH OUTPUT AMPLIFIER

PART NUMBER	TOOL NAME
HD-44608	RADIO BREAKOUT BOX

The high output amplifier is an option for some CVO models. Before proceeding with tests, make sure the amplifier 30A fuse is good.

1. Amplifier Power Voltage Test

1. Install RADIO BREAKOUT BOX (Part No. HD-44608) between amplifier and harness [149].
2. With IGN and radio ON, measure voltage between breakout box terminals 3 or 4 and 20 or 21.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** [Go to Test 3.](#)

2. Amplifier CAN Test

1. Measure voltage between breakout box terminals 1 and 2.
2. Is voltage between 3.85-5V?
 - a. **Yes.** See [8.3 DTC B2016-B2027, RADIO SPEAKER DIAGNOSTICS.](#)
 - b. **No.** See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1317 Infotainment Bus Lost Communication with High Output Amplifier.](#)

3. Amplifier Power Open Ground Test

1. Turn IGN OFF.
2. Test for continuity between breakout box terminals 20 and 21 to ground.
3. Is continuity present?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** Repair open to ground on (BK) wires between [149B] terminals 20 and 21. **(5041)**

4. Amplifier Power Open to Battery Test

1. Measure voltage between breakout box terminals 3 and 4 to ground.
2. Is battery voltage present?
 - a. **Yes.** Replace amplifier.
 - b. **No.** Repair open to battery on (R) wires between [149B] terminals 3 and 4. **(5041)**

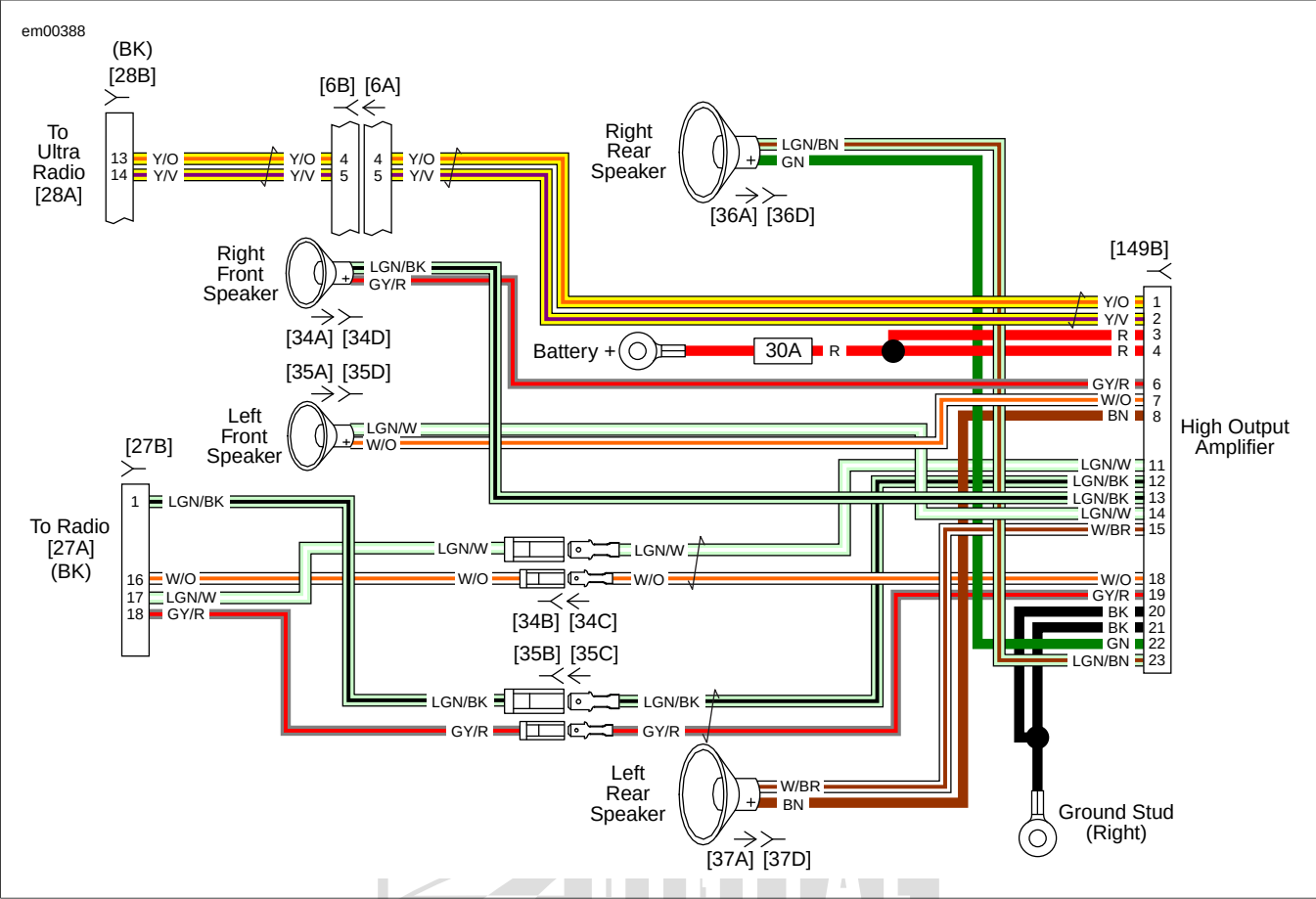


Figure 8-18. Front/Rear Speaker Circuits with Amplifier

SYMPTOM 12: NO OR LOW AUDIO FROM XM OR XM INOPERATIVE

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-45325	JUMPER HARNESS
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-51. Symptom 12: No or Low Audio from XM or XM Inoperative Diagnostic Faults

POSSIBLE CAUSES
XM module malfunction
Antenna malfunction
Satellite unavailable

1. XM Radio Operation Test

NOTE

XM radio is not available in all areas. Verify region supports XM radio.

1. Locate vehicle in an open area with line of site to southern sky.
2. Turn radio ON.
3. Does XM icon appear on radio display when moving through the bands with two or more signal bars present?
 - a. Yes. "Check Antenna" or "No Signal" appears on radio display. See [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 13: No or Intermittent Reception on XM Module](#).
 - b. Yes. Icon appears with no error message. [Go to Test 2](#).
 - c. No. [Go to Test 7](#).

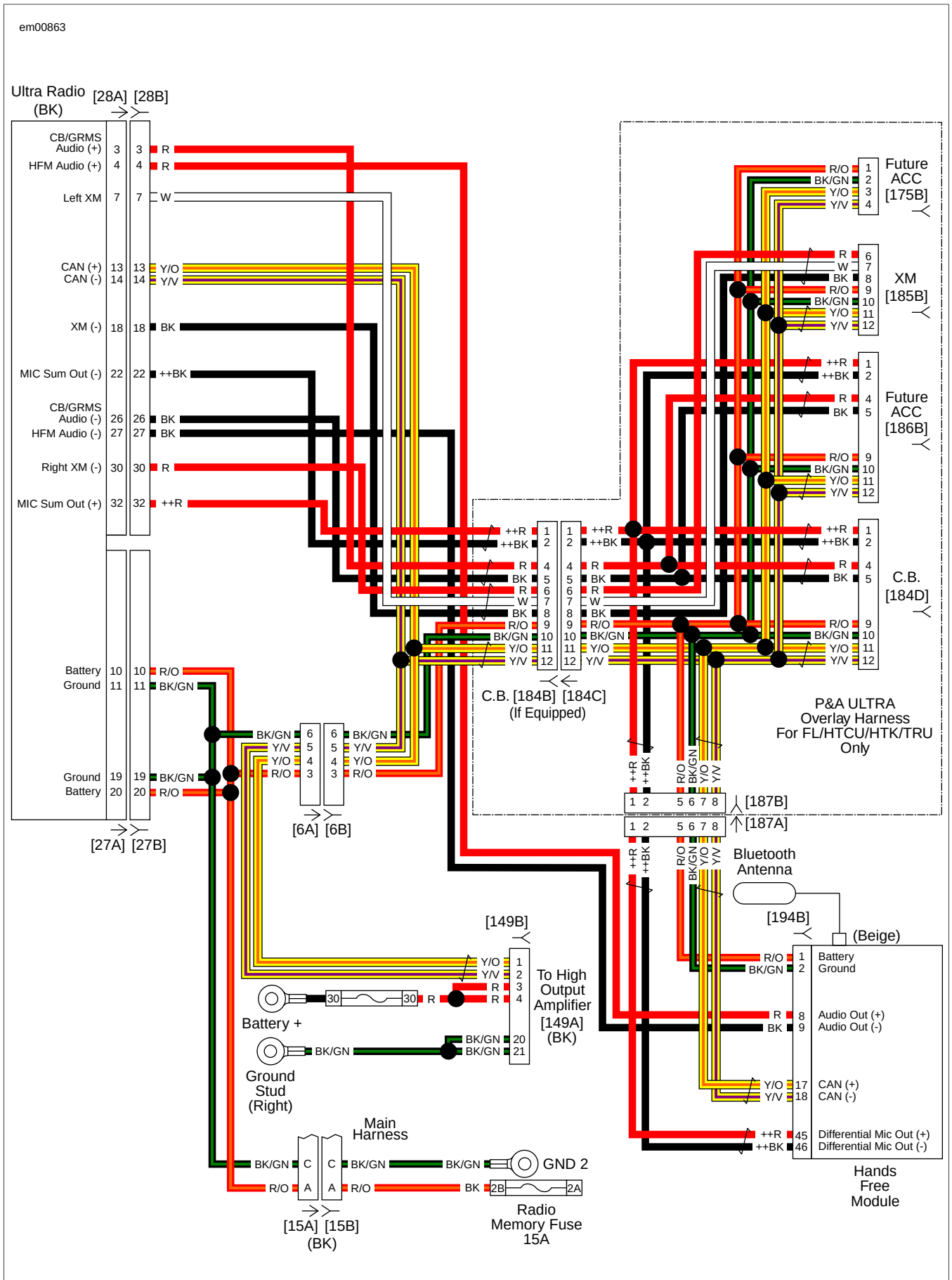


Figure 8-19. Audio, Microphone, Power and CAN Circuits

2. XM Audio Voltage Output Test

1. Connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [28A] and radio harness [28B].
2. With radio ON and XM active, measure voltage on breakout box [28] terminals 30 and 18 (right channel) and between terminals 7 and 18 (left channel).
3. Is varying AC voltage (0-1.5V) present when XM is active?
 - a. **Yes.** Replace radio. See the service manual. **(6103)**
 - b. **No.** [Go to Test 3.](#)

3. XM Audio Output Continuity Test

1. Turn radio off.
2. Disconnect XM radio [185].
3. Disconnect radio [28A] from breakout box.
4. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), test for continuity between the following:
 - a. Breakout box [28B] terminal 18 and XM [185B] terminal 8
 - b. Breakout box [28B] terminal 7 and XM [185B] terminal 7
 - c. Breakout box [28B] terminal 30 and XM [185B] terminal 6
5. Is continuity present?
 - a. **Yes.** Connect XM module. [Go to Test 4.](#)
 - b. **No.** Repair open on (R), (BK) or (W) wire between radio harness [28B] and XM [185B]. **(5041)**

4. XM Audio Output Short to Ground Test

1. Test for continuity between the following:
 - a. Breakout box [28B] terminal 18 and XM [185B] terminal 8
 - b. Breakout box [28B] terminal 7 and XM [185B] terminal 7
 - c. Breakout box [28B] terminal 30 and XM [185B] terminal 6
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (R), (BK) or (W) wire in radio harness to XM [185B]. Installed modules may also be shorted to ground internally. Disconnect XM module while observing multimeter. If disconnecting any module causes multimeter to indicate infinity, replace XM module. **(6157)**
 - b. **No.** [Go to Test 5.](#)

5. XM Audio Output Wires Shorted Together Test

1. Disconnect breakout box from radio [28A].

2. Test for continuity between the following:
 - a. Breakout box [28] terminals 18 and 7
 - b. Breakout box [28] terminal 7 and 30
 - c. Breakout box [28] terminal 30 and 18
3. Is continuity present?
 - a. **Yes.** Repair short between (R), (BK) or (W) wires in radio harness. Installed modules may also be shorted internally. Disconnect XM module while observing multimeter. If disconnecting any module causes multimeter to indicate infinity, replace XM module. **(5041)**
 - b. **No.** [Go to Test 6.](#)

6. XM Audio Output Shorted to Voltage Test

1. Connect breakout box to radio [28A].
2. Test for voltage between the following:
 - a. Breakout box [28] terminal 18 and ground.
 - b. Breakout box [28] terminal 7 and ground.
 - c. Breakout box [28] terminal 30 and ground.
3. Is voltage greater than 8V?
 - a. **Yes.** Repair short to voltage on (R), (BK) or (W) wires. Installed modules may also be shorted internally. Disconnect XM module while observing multimeter. If disconnecting any module causes multimeter to indicate normal voltage, replace XM module. **(5041)**
 - b. **No.** Replace XM module. **(6128)**

7. XM Module Power Test

1. Install BREAKOUT BOX (Part No. HD-42682) and JUMPER HARNESS (Part No. HD-45325) to XM [185B].
2. With IGN ON, measure voltage between XM breakout box (black) terminals 9 and 10.
3. Is battery voltage present?
 - a. **Yes.** [Go to Test 8.](#)
 - b. **No.** Inspect [185] for damaged, pushed back or corroded terminals. Repair as required, then continue testing. [Go to Test 10.](#)

8. XM Module CAN Voltage Test

1. Measure voltage between XM breakout box (black) terminals 11 and 12.
2. Is voltage between 4-6V?
 - a. **Yes.** Inspect [185] for damaged, pushed back or corroded terminals. Repair as required. If connections are okay, replace XM module. **(6126)**
 - b. **No.** [Go to Test 9.](#)

9. XM Module CAN Continuity Test

1. Connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [28A] and radio harness [28B].

2. Test for continuity between the following:
 - a. Radio breakout box [28] terminal 13 and XM breakout box (black) terminal 11.
 - b. Radio breakout box [28] terminal 14 and XM breakout box (black) terminal 12.
3. Is continuity present?
 - a. **Yes.** Replace radio. See the service manual. **(6103)**
 - b. **No.** Repair open on (Y/O) or (Y/V) wires. **(6128)**

10. XM Module Power/Ground Bus Continuity Test

1. Connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [27A] and harness [27B].
2. With radio on, test for voltage between breakout box terminal 10 and ground.
3. Is battery voltage present?
 - a. **Yes.** Repair open (R/O) wire between XM [185B] and radio memory fuse. **(6129)**
 - b. **No.** Repair open (BK/GN) wire between XM [185B] and ground. **(6129)**

SYMPTOM 13: NO OR INTERMITTENT RECEPTION ON XM MODULE

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

Before proceeding with this test, verify the vehicle is located in an open area with line of sight to the southern sky and all metal objects obstructing a properly installed antenna are removed.

Table 8-52. Symptom 13: No or Intermittent Reception on XM Module Diagnostic Faults

POSSIBLE CAUSES
XM module malfunction
Antenna malfunction
Satellite unavailable

1. XM Antenna Power Test

1. Disconnect XM antenna from XM module and turn IGN ON.
2. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure the voltage at XM antenna connector on back of XM module between center conductor and radio case.
3. Is voltage 4.25-4.75V?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Replace XM module. **(6126)**

2. XM Antenna Resistance Test

1. Turn IGN OFF.

2. Measure the resistance between XM antenna cable connector center conductor and antenna cable shield.
3. Is resistance between 35-55 Ohms?
 - a. **Yes.** Replace XM module. **(6126)**
 - b. **No.** Replace antenna. **(6146)**

SYMPTOM 14: NAVIGATION INOPERATIVE

Table 8-53. Symptom 14: Navigation Inoperative Diagnostic Faults

POSSIBLE CAUSES
Nav module malfunction
Antenna malfunction
Satellite unavailable

Before performing these tests, verify the following:

- Navigation CD is in good condition.
- Navigation module is properly installed in radio including screws.
- Vehicle is located in an open area with line of sight to the southern sky.
- Navigation antenna is properly installed and connected to navigation module.
- Any metal objects obstructing a properly installed antenna are removed.

1. Navigation Module Activation Test

1. Turn radio ON and press the NAV button.
2. Is the navigation screen displayed on the radio?
 - a. **Yes. "GPS Antenna Error" is displayed.** [Go to Test 2.](#)
 - b. **Yes. "GPS Module Error" is displayed.** Substitute module with known good unit. If problem persists, continue testing. [Go to Test 4.](#)
 - c. **No.** If "Navigation is Not Installed" is displayed, swap module with known good unit and retest. If problem persists replace radio. **(6103)**

2. GPS Antenna Error Test

1. Disconnect GPS antenna from navigation module.
2. Measure the voltage at the module from the center conductor to radio case.
3. Is voltage between 4.5-5.3V?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Replace navigation module. **(6182)**

3. GPS Antenna Resistance Test

1. Measure resistance at the GPS antenna connector between the center conductor and cable shield.
2. Is resistance between 105,000-122,000 Ohms?
 - a. **Yes.** Replace navigation module. **(6182)**
 - b. **No.** Replace antenna. **(6183)**

4. GPS Module Error Test

1. Activate the FM radio band and enter radio test menu (softkey 1, softkey 3 and OK pressed simultaneously).
2. Press down arrow to select diagnostic speed type (J1850 for model years 2006 and later).
3. Is speed type correct?
 - a. **Yes.** [Go to Test 5.](#)
 - b. **No.** Press CHANGE at softkey 4 until the correct speed type is displayed. Press EXIT at softkey 6 to store setting. Cycle ignition switch and repeat symptom tests.

5. Screen Speed Test

1. Press down arrow until diagnostic speed input appears. Should read "O" if the vehicle is stationary.
2. Ride motorcycle with the speed screen displayed while monitoring both the screen and the speedometer.
3. Does the number on the screen increment?
 - a. **Yes.** [Go to Test 6.](#)
 - b. **No.** If the speedometer showed a speed value, repair the speed input to the radio. See [8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 15: AVC Inoperative](#), and repeat Test 4.

6. Navigation CD Operation Test

1. Insert navigation CD and allow it to load.
2. Press OKAY when prompted and press softkey 5 to save the data.
3. Press softkey 4 (GPS).
4. Observe the number of satellites and latitude/longitude information.
5. Are there any satellites available (may take 5-10 minutes to acquire)?
 - a. **Yes.** Replace navigation module. **(6182)**
 - b. **No.** Replace navigation antenna. **(6183)**

SYMPTOM 15: AVC INOPERATIVE

Table 8-54. Symptom 15: AVC Inoperative Diagnostic Faults

POSSIBLE CAUSES
VSS malfunction
Loss of communication with ECM

1. AVC Speed Test

1. Activate the FM radio band and enter radio test menu (softkey 1, softkey 3 and OK pressed simultaneously).
2. Press down arrow to select diagnostic speed type (J1850 for model years 2006 and later).

3. Is speed type correct?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Press CHANGE at softkey 4 until the correct speed type is displayed. Press EXIT at softkey 6 to store setting. Cycle ignition switch and repeat symptom test.

2. Screen Speed Test

1. Press down arrow until diagnostic speed input appears. Should read "O" if the vehicle is stationary.
2. Ride motorcycle with the speed screen displayed while monitoring both the screen and the speedometer.
3. Does the number on the screen increment?
 - a. **Yes.** Adjust AVC by pressing AUDIO + until one or more bars are present.
 - b. **No.** See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1016 J1850 Loss of Communication with ECM.](#)

SYMPTOM 16: HANDLEBAR, PASSENGER OR SIDECAR SWITCHES INOPERATIVE

See [8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS.](#)

SYMPTOM 17: CD SKIPPING

PART NUMBER	TOOL NAME
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Before proceeding with the following tests, verify the following:

- CD is in good condition and properly formatted.
- Radio is installed properly. **(6171)**
- Handlebar risers do not contact bottom of radio chassis.

Table 8-55. Symptom 17: CD Skipping Diagnostic Faults

POSSIBLE CAUSES
CD not formatted properly
Exhaust system not mounted correctly
Radio malfunction

1. CD Player to CB/Intercom Interactivity Test

1. If the vehicle is equipped with a CB/Intercom, turn it OFF.
2. Does the CD still skip?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No.** Possible audio interruptions caused by incoming CB or intercom signals.

2. Radio Input (Power) Positive Voltage Drop Test

1. Install ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) to radio [27A] and radio harness [27B].

2. With IGN and radio ON, measure voltage drop between battery positive (+) and breakout box terminals 10 and 20.
3. Is voltage drop greater than 0.5V?
 - a. **Yes.** Repair source of voltage drop between battery positive and breakout box [27] terminals 10 and 20. **(6172)**
 - b. **No.** [Go to Test 3.](#)

3. Radio Input (Power) Negative Voltage Drop Test

1. With IGN and radio ON, measure voltage drop between battery negative (-) and breakout box terminals 11 and 19.
2. Is voltage drop greater than 0.5V?
 - a. **Yes.** Repair source of voltage drop between battery negative and breakout box [27] terminals 11 and 19. **(6172)**
 - b. **No.** [Go to Test 4.](#)

4. Front Motor Mount Inspection Test

1. Inspect front motor mount.
2. Is front motor mount damaged, loose or misaligned?
 - a. **Yes.** Align or replace front motor mount. See the service manual. **(6173)**
 - b. **No.** [Go to Test 5.](#)

5. Exhaust System Mounts Inspection Test

1. Inspect exhaust system mounts.
2. Do mounts allow muffler isolation so that vibration cannot reverberate through frame?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** Correct exhaust mount alignment. See the service manual.

SYMPTOM 18: HANDS-FREE PHONE MODULE INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-C	HARNESS CONNECTOR TEST KIT
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX

Table 8-56. Symptom 18: Hands-free Phone Module Initial Diagnostics Diagnostic Faults

POSSIBLE CAUSES
Phone incompatible with system
Phone won't pair
Phone malfunction

1. Phone Mode Enable Test

1. Can phone mode be enabled?
 - a. **Yes.** [Go to Test 2.](#)
 - b. **No. Phone icon appears on radio display.** [Go to Test 6.](#)
 - c. **No. Phone mode inoperative with no phone icon on display.** See [8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1306 Infotainment Bus Lost Communication with Hands-Free Phone Module.](#)

2. Phone Pairing Test

1. Is phone able to pair with module?
 - a. **Yes.** [Go to Test 3.](#)
 - b. **No.** Phone may not be compatible. See phone compatibility list on H-D Net or contact cellular provider for technical service and source compatible phone.

3. Phone Communication Test

1. Can caller be heard by rider and the rider be heard by caller?
 - a. **Yes.** [Go to Test 4.](#)
 - b. **No.** [Go to Test 6.](#)

4. Phonebook Download Test

1. Does phonebook download completely?
 - a. **Yes.** If the name of the phone service provider is displayed, then continue with tests. [Go to Test 5.](#)
 - b. **No.** Some phones or sim cards do not support all features. Contact cellular provider technical service or obtain compatible phone.

5. Signal Strength Test

1. Observe signal strength on display.
2. Is signal strength displayed in upper right hand corner of display?
 - a. **Yes.** System okay.
 - b. **No.** [Go to Test 16.](#)

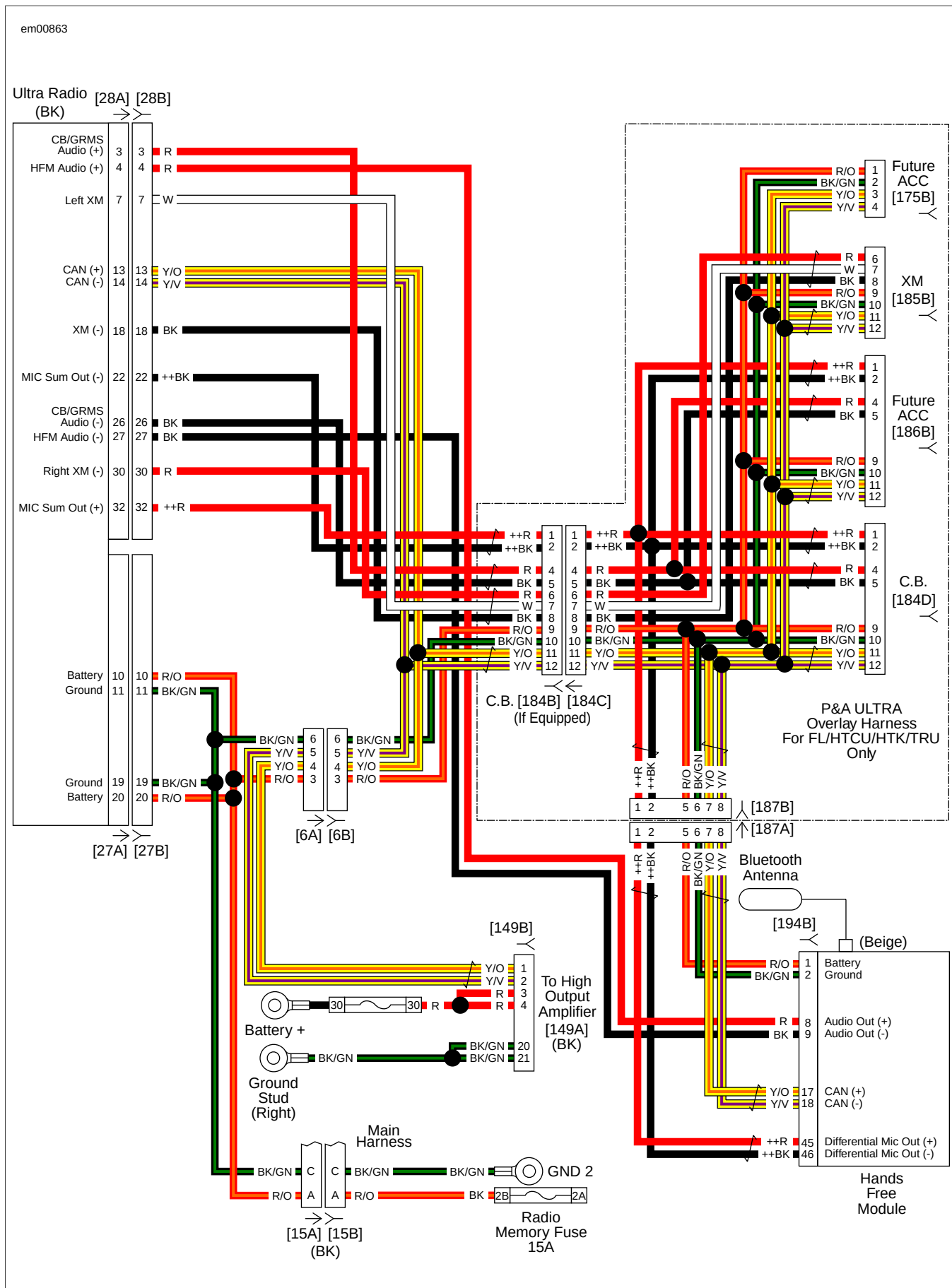


Figure 8-20. Audio, Microphone, Power and CAN Circuits

6. Phone Module Power Test

1. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-C), measure voltage between hands-free module [194B] terminals 1 and 2 (ground).
2. Is battery voltage present?
 - a. **Yes.** [Go to Test 7.](#)
 - b. **No.** [Go to Test 9.](#)

7. CAN Communication Test

1. Measure voltage between [194B] terminals 17 and 18.
2. Is measured voltage between 4.0-6.0V?
 - a. **Yes.** [Go to Test 10.](#)
 - b. **No.** [Go to Test 8.](#)

8. Phone Module Continuity Test

1. Connect ADVANCED AUDIO SYSTEM BREAKOUT BOX (Part No. HD-47918) between radio [28A] and radio harness [28B], leaving radio [28A] disconnected.
2. Test for continuity between [194B] terminal 17 and breakout box [28] terminal 13 and then between [194B] terminal 18 and breakout box [28] terminal 14.
3. Is continuity present?
 - a. **Yes.** Inspect [194] for damaged, pushed back or corroded terminals. Repair as required. If connector terminals are okay, replace radio.
 - b. **No.** Repair open on (Y/O) or (Y/V) wires. **(5041)**

9. Phone Module Open Ground Test

1. Test for continuity between [194B] terminal 2 to ground.
2. Is continuity present?
 - a. **Yes.** Repair open on (R/O) wire between [194B] and radio memory fuse. **(5041)**
 - b. **No.** Repair open on (BK/GN) wire between [194B] and ground. **(5041)**

10. Phone Mode Entry Test

1. Does radio enter phone mode when mode switch is pressed?
 - a. **Yes.** [Go to Test 11.](#)
 - b. **No.** Replace hands-free phone module.

11. Phone Module Output Test

1. Measure voltage between breakout box [28] terminals 4 and 27.

2. Is voltage between 0-5VAC while voice prompt is responding?
 - a. **Yes.** Replace radio. See the service manual. **(6101)**
 - b. **No.** [Go to Test 15.](#)

12. Phone Module Continuity Test

1. Test for continuity between breakout box [28] terminal 4 and [194B] terminal 8 and then between breakout box [28] terminal 27 and [194B] terminal 9.
2. Is continuity present?
 - a. **Yes.** [Go to Test 13.](#)
 - b. **No.** Repair open (R) or (BK) wire between [194B] and [28B]. **(5041)**

13. Phone Module Audio Short to Low Test

1. Test for continuity between breakout box [28] terminals 4 and 27.
2. Is continuity present?
 - a. **Yes.** [Go to Test 14.](#)
 - b. **No.** Repair short to low on (R) and (BK) wires. **(5041)**

14. Phone Module Audio Short to Ground Test

1. Test for continuity between breakout box [28] 4 and 27 to ground.
2. Is continuity present?
 - a. **Yes.** Repair short to ground on (R) or (BK) wire. **(5041)**
 - b. **No.** [Go to Test 15.](#)

15. Phone Module Audio Short to Voltage Test

1. With IGN and radio ON, measure voltage between breakout box [28] 4 and 27 to ground.
2. Is voltage greater than 9V?
 - a. **Yes.** Repair short to voltage on (R) or (BK) wire. **(5041)**
 - b. **No.** Replace hands-free module.

16. Phone Module Antenna Test

1. Inspect the hands-free module antenna.
2. Is the hands-free module antenna good?
 - a. **Yes.** Contact cellular provider technical service and verify phone is compatible. If phone is correct replace the hands-free phone module.
 - b. **No.** Replace the hands-free module antenna.

NOTES



TABLE OF CONTENTS

SUBJECT	PAGE NO.
A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS.....	A-1
A.2 DELPHI 100W MICRO-PACK SEALED CONNECTOR.....	A-2
A.3 DELPHI 150 METRI-PACK SEALED CONNECTORS.....	A-4
A.4 DELPHI 280 METRI-PACK UNSEALED CONNECTORS.....	A-6
A.5 DELPHI 480 METRI-PACK UNSEALED CONNECTORS.....	A-7
A.6 DELPHI 630 METRI-PACK UNSEALED CONNECTORS.....	A-8
A.7 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING.....	A-9
A.8 DELPHI METRI-PACK TERMINAL REPAIR.....	A-11
A.9 DELPHI MICRO 64 SEALED CONNECTORS.....	A-13
A.10 DELPHI GT 150 SEALED CONNECTORS.....	A-16
A.11 DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR.....	A-18
A.12 DEUTSCH DT SEALED CONNECTORS.....	A-20
A.13 DEUTSCH DT SEALED TERMINAL REPAIR.....	A-24
A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR.....	A-25
A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR.....	A-26
A.16 JAE MX19 SEALED CONNECTORS.....	A-28
A.17 MOLEX CMC SEALED CONNECTORS.....	A-29
A.18 MOLEX MX 150 SEALED CONNECTORS.....	A-31
A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.....	A-35
A.20 SEALED SPLICE CONNECTORS.....	A-39



NOTES



AUTOFUSE UNSEALED ELECTRICAL CONNECTORS

A.1

AUTOFUSE UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
GA500A	SNAP-ON TERMINAL PICK

General

Autofuse Unsealed connector terminals are found in ignition switches and some fuse blocks.

Disassembly

1. Obtain SNAP-ON TERMINAL PICK (Part No. GA500A).
2. See [Figure A-1](#) or [Figure A-2](#). Insert smallest pair of pins into chamber on mating end of socket housing to press tangs on each side of terminal simultaneously.
3. Gently pull on wire to remove terminal from wire end of socket housing.
4. If necessary, crimp **new** terminals on wires.

Assembly

1. Using a thin flat blade, like that on a hobby knife, carefully bend tang on each side of terminal outward away from terminal body.
2. With the open side of the terminal facing rib on wire end of socket housing, insert terminal into chamber until it locks in place.

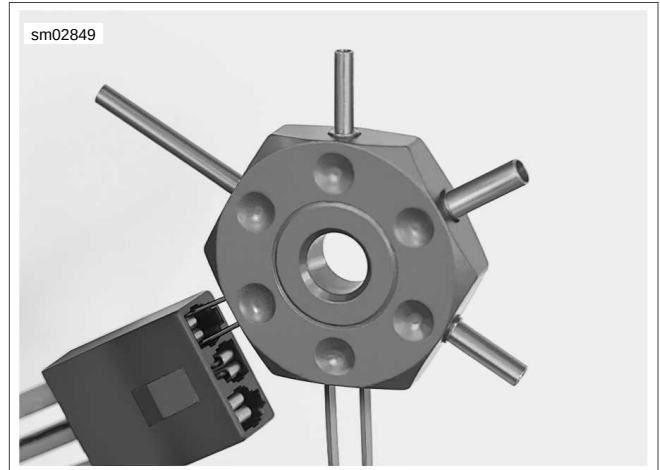


Figure A-1. Removing Autofuse Unsealed Terminal from Ignition Switch

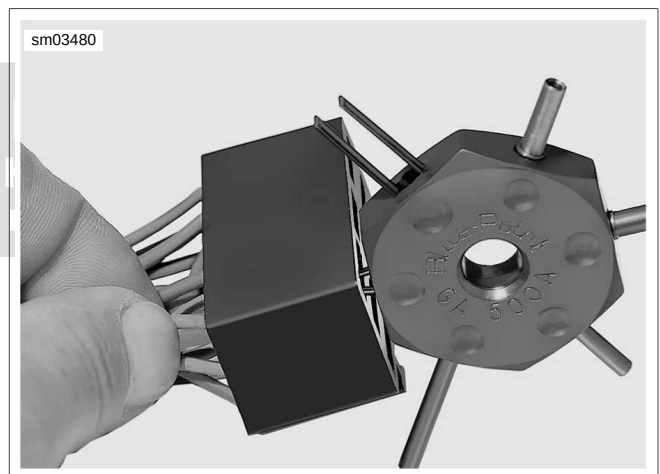


Figure A-2. Removing Autofuse Unsealed Terminal from Fuse Block

DELPHI 100W MICRO-PACK SEALED CONNECTOR

A.2

DELPHI 100W MICRO-PACK SEALED CONNECTOR REPAIR

General

A Delphi 100W Micro-Pack Sealed connector connects the electronic control module (ECM) to the main harness.

NOTE

For vehicles with 73-pin connectors, see [A.9 DELPHI MICRO 64 SEALED CONNECTORS](#) and [A.8 DELPHI METRI-PACK TERMINAL REPAIR](#).

Separating Socket Housing From ECM

See [Figure A-3](#). While pressing the connector into the ECM, press the thumb lever (1) against the connector until the latch (2) pops out of the catch (3) on the ECM.

Mating Socket Housing To ECM

Push the connector into the ECM until the latch is captured by the catch on the ECM.

Removing Socket Terminal

1. See [Figure A-4](#). Gently press latch (1) on each side of the clear plastic secondary lock (2) and remove. For best results, release one side at a time.
2. Carefully cut cable strap (3) to free strain relief collar (4) from conduit (5).
3. See [Figure A-5](#). Using a thin blade, gently pry at seam at back of socket housing to release three plastic pins (1) from slots in housing. Separate and spread halves of socket housing.
4. Push on wire lead to free terminal from chamber.

Installing Socket Terminal

1. From inside socket housing, gently pull on wire to draw terminal into chamber.
2. Exercising caution to avoid pinching wires, press halves of socket housing together until three plastic pins fully engage slots in housing.
3. Install **new** cable strap in groove of strain relief collar capturing cable conduit.
4. With the two ribs on the secondary lock on the same side as the external latch, install over terminals until latches lock in place.

Crimping Terminals

If necessary, crimp **new** terminals on wire leads. See [A.8 DELPHI METRI-PACK TERMINAL REPAIR](#).

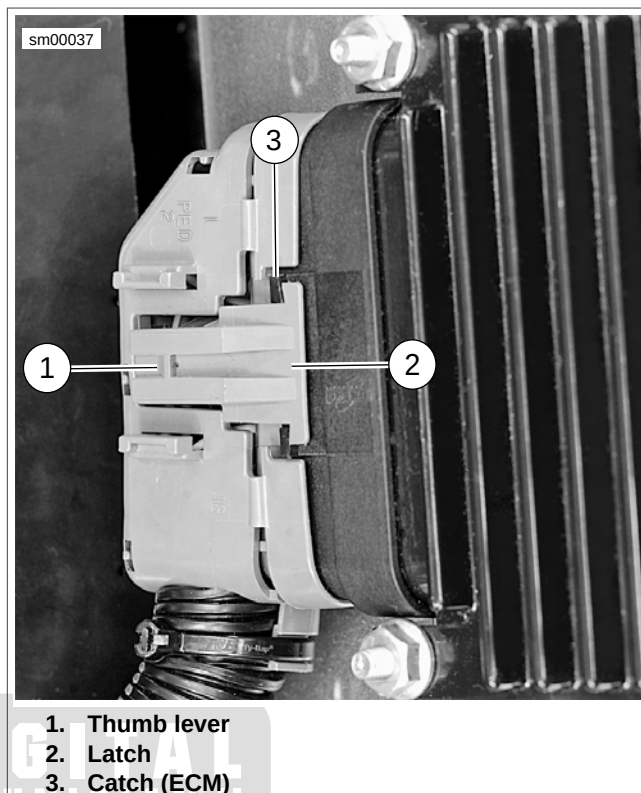


Figure A-3. Delphi 100W Micro-Pack Sealed Connector to ECM (typical)

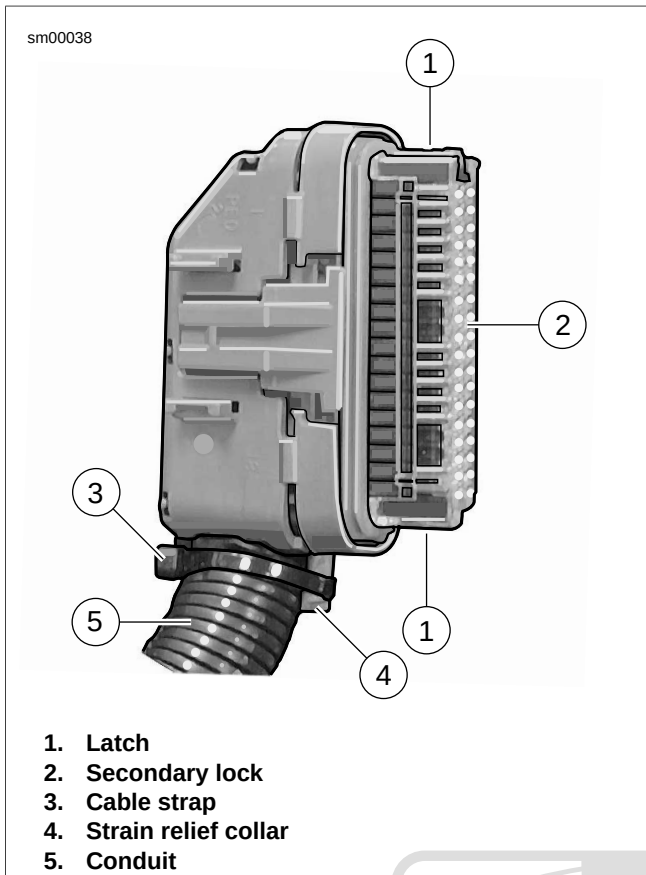


Figure A-4. Delphi 100W Micro-Pack Sealed Connector

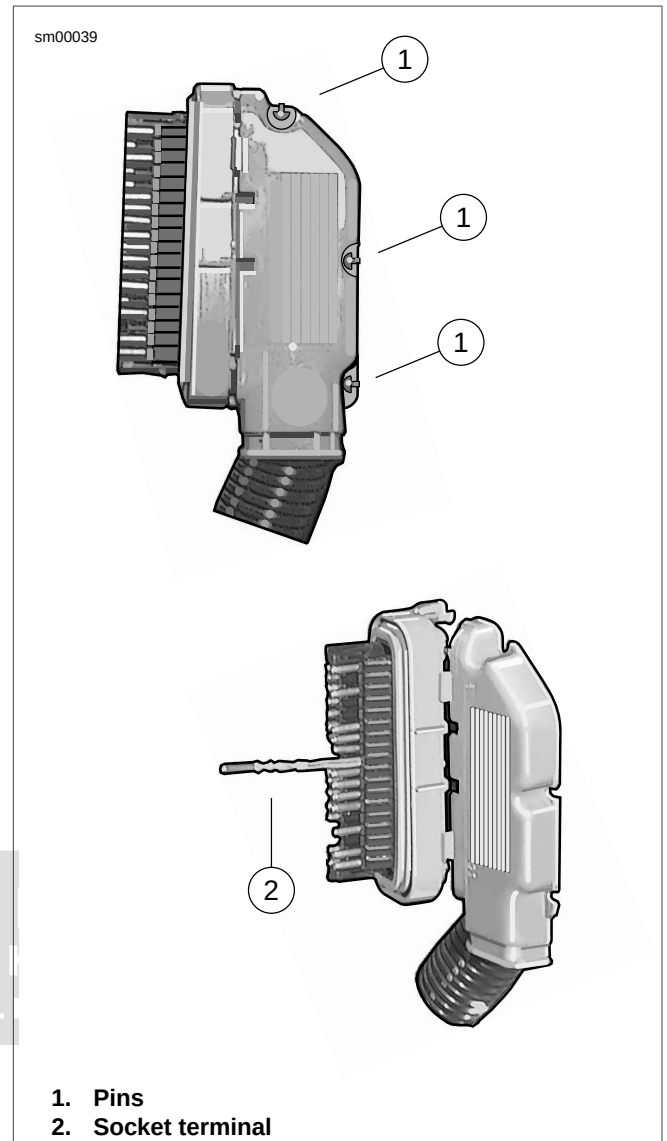


Figure A-5. Delphi 100W Micro-Pack Sealed Connector:
Separate Halves of Socket Housing

DELPHI 150 METRI-PACK SEALED CONNECTORS

A.3

DELPHI 150 METRI-PACK SEALED CONNECTOR REPAIR

General

Delphi 150 Metri-Pack Sealed 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-6](#) for pull-to-seat connector or [Figure A-7](#) 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-6](#) for pull-to-seat connector or [Figure A-7](#) 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-7](#). 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.

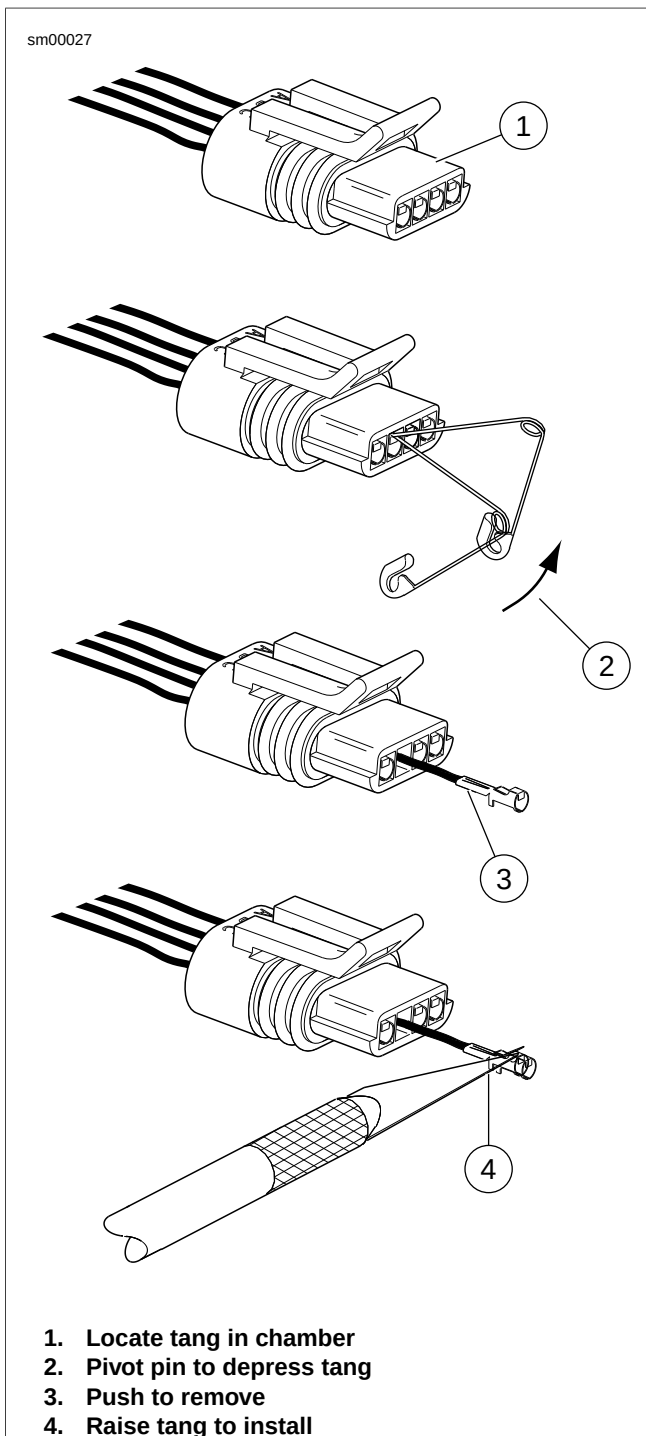


**Figure A-6. Delphi 150 Metri-Pack Sealed Connector:
Pull-to-Seat**

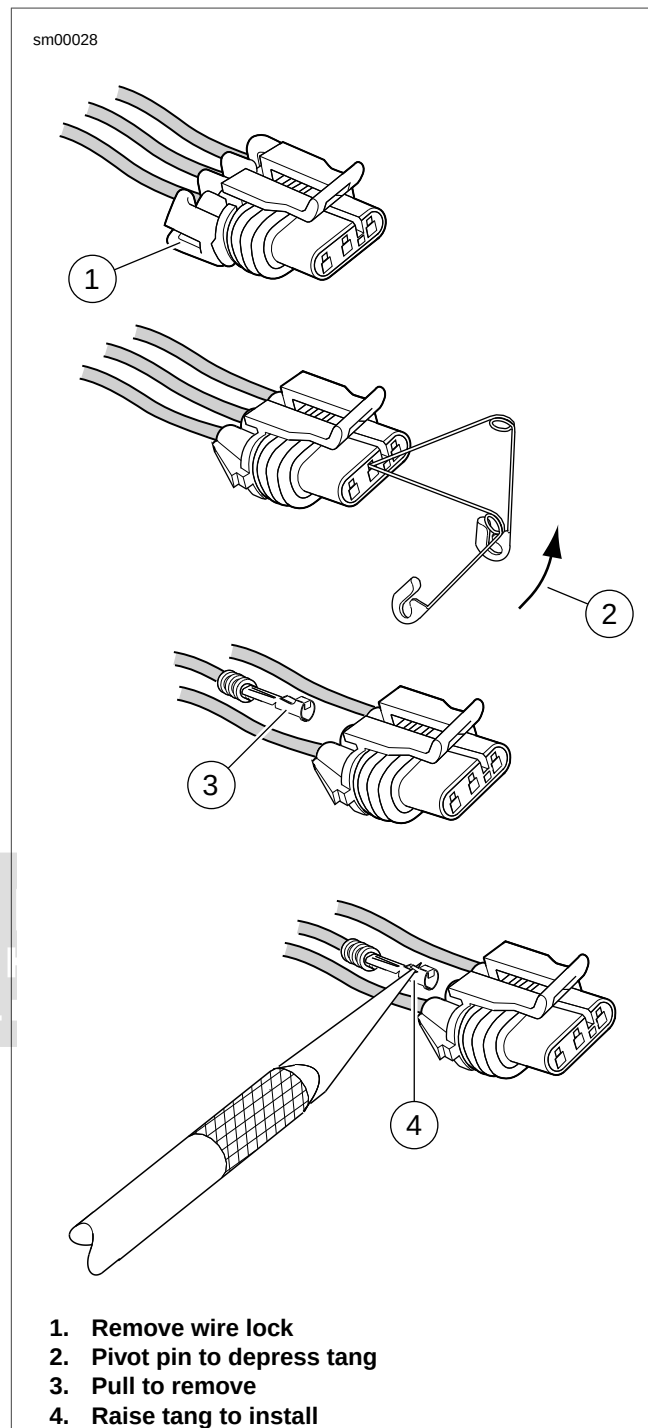


**Figure A-7. Delphi 150 Metri-Pack Sealed Connector:
Push-to-Seat**

DELPHI 280 METRI-PACK UNSEALED CONNECTORS

A.4

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See [Figure A-8](#). To remove secondary locks, insert end of small flat blade screwdriver (1) under lip of locking wedge (2) and gently pry up secondary lock.

NOTE

For best results, start with locking wedge on outboard side of secondary lock.

2. Looking into chamber at top of fuse block, note the tang next to each socket terminal.
3. Using a thin flat blade, like that on a hobby knife, gently push tang away from terminal, and then tug on wire to back terminal out.

Installing Socket Terminals

1. Match the wire lead color to the fuse block terminal cavity.

NOTES

- Refer to the main harness wiring diagram for wire lead color codes.
 - See [Figure A-9](#). The main fuse block terminal cavity is identified as alpha (1) and numeric (2) coordinates. Refer to the main harness wiring diagram for fuse block terminal cavity coordinates.
2. With the open side of the socket terminal facing the tang, push lead into chamber at the wire end of the fuse block. A click is heard when the terminal is properly engaged.
 3. Gently tug on the wire to verify that the terminal is locked in place and will not back out of the chamber.
 4. Install the secondary locks. With the locking wedges positioned above the tangs in each chamber, slide flat side of secondary lock into slot (between rows), and push down until it bottoms.

Crimping Terminals

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

A correctly crimped terminal may require different crimping dies found on separate crimpers.

NOTE

The wiring diagram indicates when one socket terminal is be crimped to two wire leads.

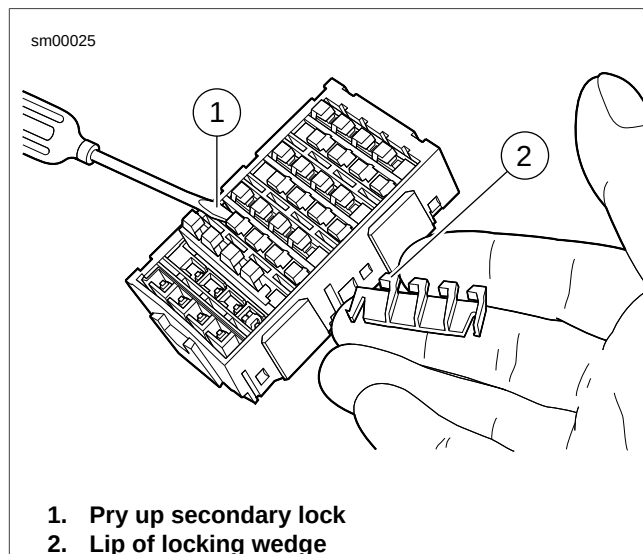


Figure A-8. Fuse Block: Remove Secondary Locks

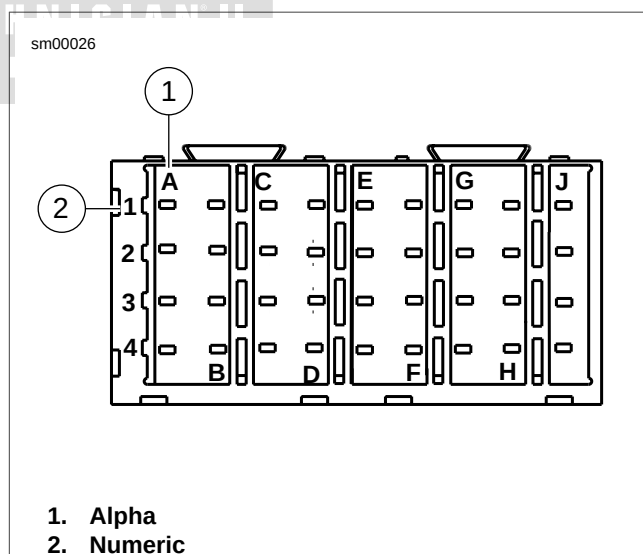


Figure A-9. Fuse Block: Coordinates (typical)

DELPHI 480 METRI-PACK UNSEALED CONNECTORS

A.5

DELPHI 480 METRI-PACK UNSEALED CONNECTOR REPAIR

General

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

See [Figure A-10](#). An AFL housing (5) is used on many ignition/light switches. The secondary lock (4) must be opened before removing the terminal from the housing.

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-10](#). Using small flat blade screwdriver, press 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-10](#). 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 press 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.8 DELPHI METRI-PACK TERMINAL REPAIR](#).

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.

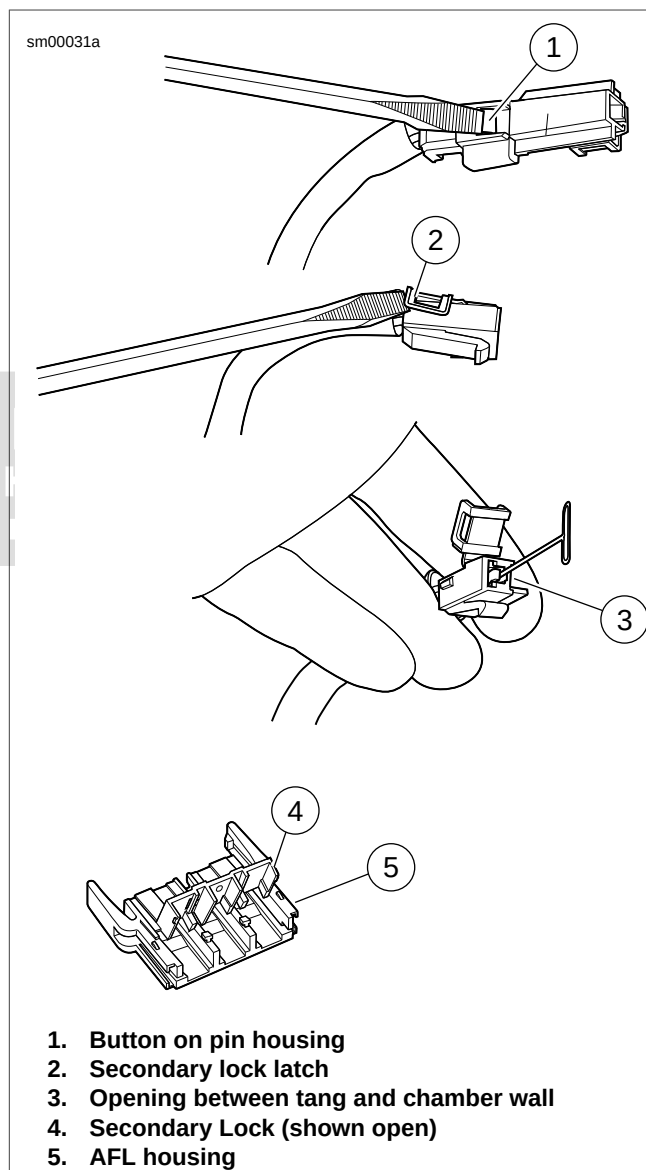


Figure A-10. Delphi 480 Metri-Pack Unsealed Connector: Remove Socket Terminal

DELPHI 630 METRI-PACK UNSEALED CONNECTORS

A.6

DELPHI 630 METRI-PACK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
SNAP-ON TT600-3	SNAP-ON PICK

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. SNAP-ON TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to press 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.8 DELPHI METRI-PACK TERMINAL REPAIR](#).

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.

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING

A.7

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING REPAIR

Removing Socket Terminals

1. Disconnect battery.
2. See [Figure A-11](#). Disengage slots (1) on secondary lock (2) from tabs (3) and remove secondary lock.
3. Insert flat blade of pick or small screwdriver into opening (4) until it stops.
4. Tug on cable to pull socket from connector housing. Pivot the pick toward the terminal body to release the latch if necessary.
5. Repeat to remove remaining socket terminal.

NOTE

The battery positive cable and power wire for the main fuse are crimped together at the starter ring terminal. Both must be replaced as an assembly if either requires replacement.

Installing Socket Terminals

1. See [Figure A-12](#). Carefully bend tang outward away from the terminal body.
2. Properly orient terminal to the cavity in the housing and push terminal into connector housing until it clicks in place. Verify that socket will not back out of chamber.
3. Push rubber seal into connector housing.
4. Repeat to install remaining socket terminal.
5. Install secondary lock onto connector housing. be sure slots engage tabs on sides of connector housing.
6. Connect battery cables.

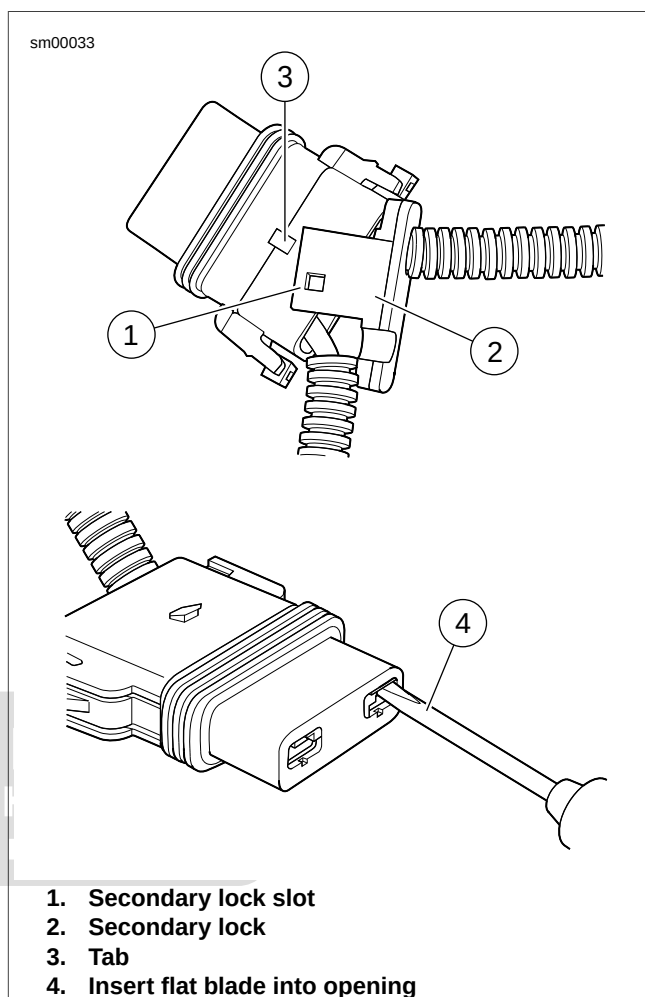


Figure A-11. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Remove Socket Terminals

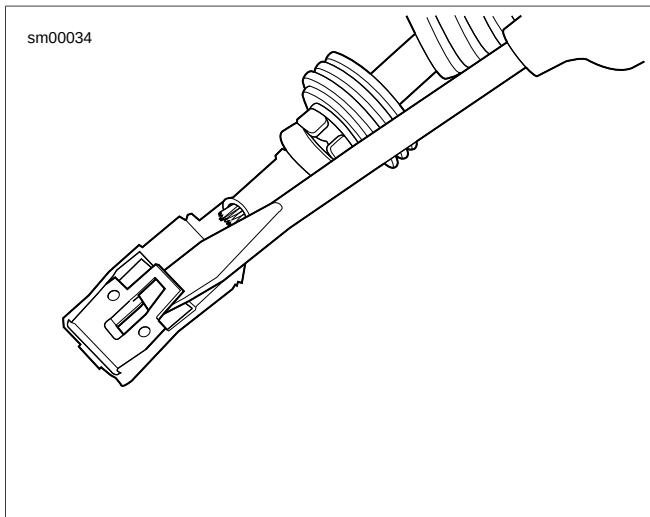


**Figure A-12. Delphi 800 Metri-Pack Sealed Main Fuse
Housing: Bend Tang**



DELPHI METRI-PACK TERMINAL REPAIR

A.8

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-13](#). 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.

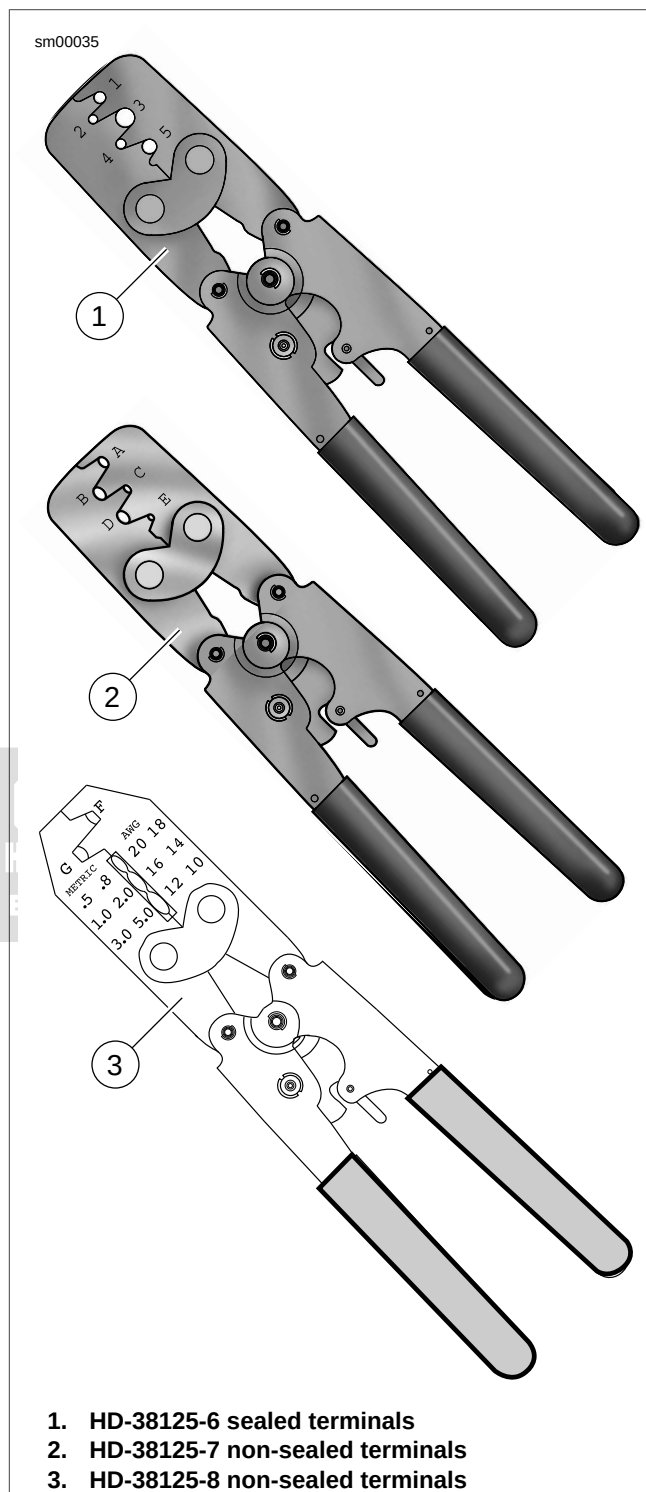


Figure A-13. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

NOTE

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

1. See [Figure A-14](#). 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-14](#). 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.

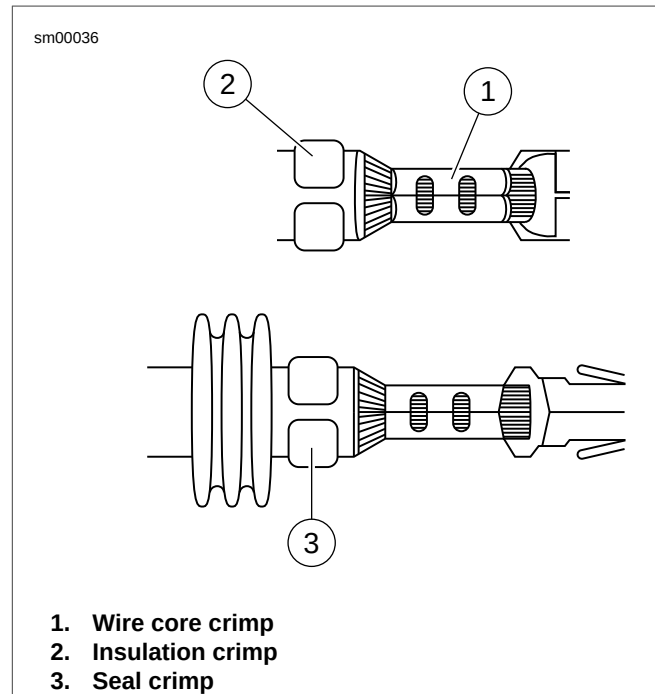


Figure A-14. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps



DELPHI MICRO 64 SEALED CONNECTORS

A.9

DELPHI MICRO 64 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-45928	TERMINAL REMOVER
HD-45929	TERMINAL CRIMPER

General

Delphi Micro 64 Sealed connectors are frequently found on speedometers, tachometers and the ECM of Touring Models.

Separating Pin and Socket Housings

Bend back the external latches slightly and separate the pin and socket housings.

Mating Pin and Socket Housings

Orient the wire lead colors and push the pin and socket housings of the connector together until the latches click.

Removing Terminal

1. See [Figure A-15](#). Locate the head of the secondary lock (1) on one side of the connector housing.
2. Insert the blade of a small screwdriver between the center ear of the lock and the connector housing and gently pry out lock. When partially removed, pull lock from connector housing.
3. Locate pin hole (2) between terminals on mating end of connector.

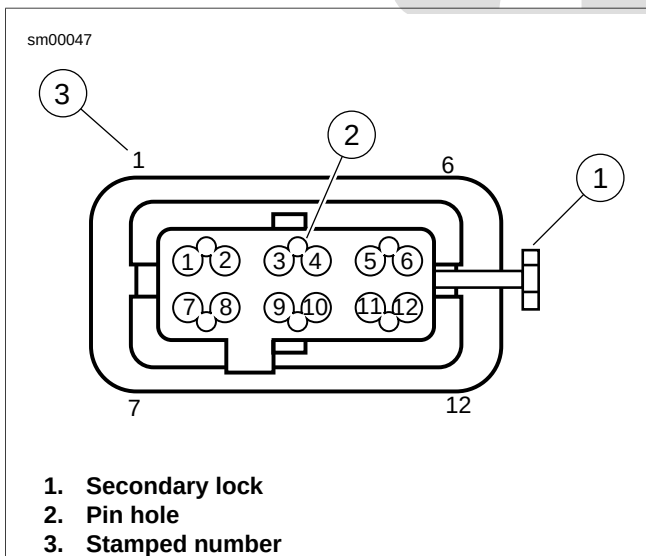


Figure A-15. Delphi Micro-64 Sealed Connector: Housing

4. See [Figure A-16](#). Obtain the TERMINAL REMOVER (Part No. HD-45928).
5. See [Figure A-17](#). Push the adjacent terminals all the way into the connector housing and then insert tool into hole until it bottoms.

6. Leaving the tool installed, gently tug on wires to pull either one or both terminals from wire end of connector. Remove tool.



Figure A-16. Terminal Remover (HD-45928)

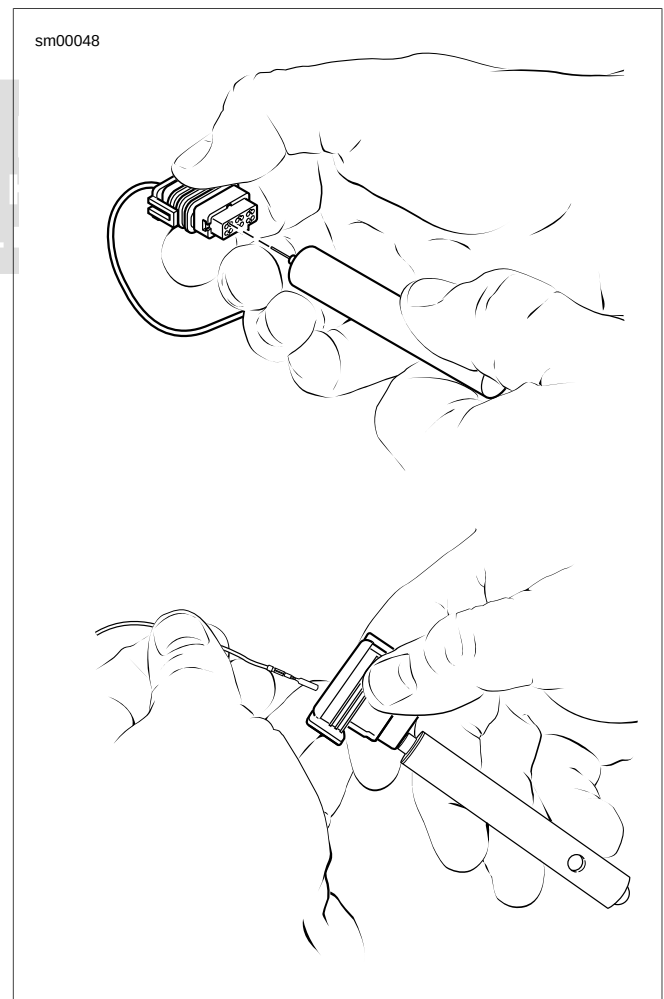


Figure A-17. Delphi Micro-64 Sealed Connector: Insert Tool and Remove Terminal

Installing Terminal

1. Insert terminal into its respective numbered chamber on wire end of connector. No special orientation of the terminal is necessary.

NOTE

See [Figure A-15](#). For wire location purposes, the corners of the socket housing are stamped (3) with the numbers 1, 6, 7 and 12, representing terminals 1-6 on one side, and 7-12 on the other.

2. Bottom the terminal in the chamber and then gently tug on the wire to verify that it is locked in place.

NOTE

Once the terminal is removed it may not lock in place when first installed. Until the lock engages, move the terminal back and forth slightly while wiggling the lead.

3. Since the terminal remover tool releases two terminals simultaneously, repeat step 2 on the adjacent terminal even if it was not pulled from the connector housing.
4. With the center ear on the head of the secondary lockpin facing the mating end of the connector, push secondary lock in until head is flush with the connector housing.

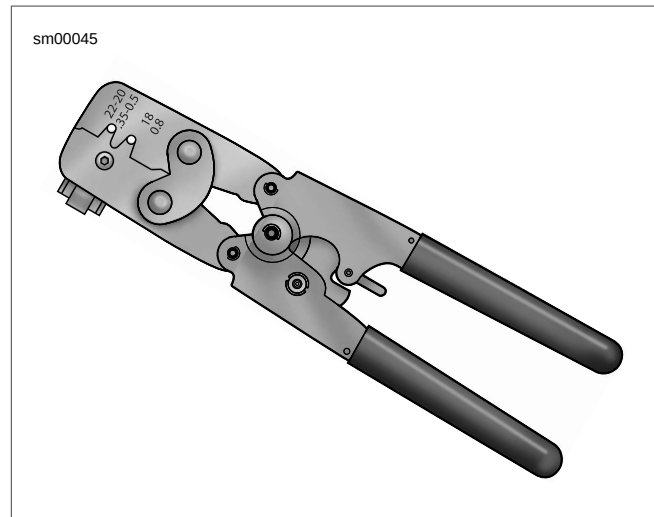


Figure A-18. Terminal Crimper (HD-45929)

Preparing Wire Leads for Crimping

Strip lead removing 1/8 in. (3.0 mm) of insulation.

Crimping Terminals

1. Inspect **new** socket terminal for bent or deformed contact and crimp tails. Replace as necessary.
2. See [Figure A-19](#). Squeeze the handles of the TERMINAL CRIMPER (Part No. HD-45929) to cycle the tool to the fully open position (1).
3. Raise locking bar and barrel holder by pushing up on bottom tab with index finger (2).
4. With the crimp tails facing upward, insert terminal through locking bar into front hole in barrel holder (20-22 gauge wire) (3).
5. Release locking bar to lock position of contact. When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails and the closed side of the terminal rests on the outer nest of the crimp tool.
6. Insert wires between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.
7. Squeeze handle of crimp tool until tightly closed (4). Tool automatically opens when the crimping sequence is complete.
8. Raise locking bar and barrel holder to remove contact.

Inspecting Crimps

Inspect the quality of the core and insulation crimps. Distortion should be minimal.



Figure A-19. Delphi Micro-64 Sealed Connector: Terminal in Crimper

DELPHI GT 150 SEALED CONNECTOR REPAIR

General

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

Separating Pin and Socket Housings

See [Figure A-20](#). 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.

1. See [Figure A-21](#). 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.



Figure A-20. Delphi GT 150 Sealed Connector: Socket Housing Latch

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.

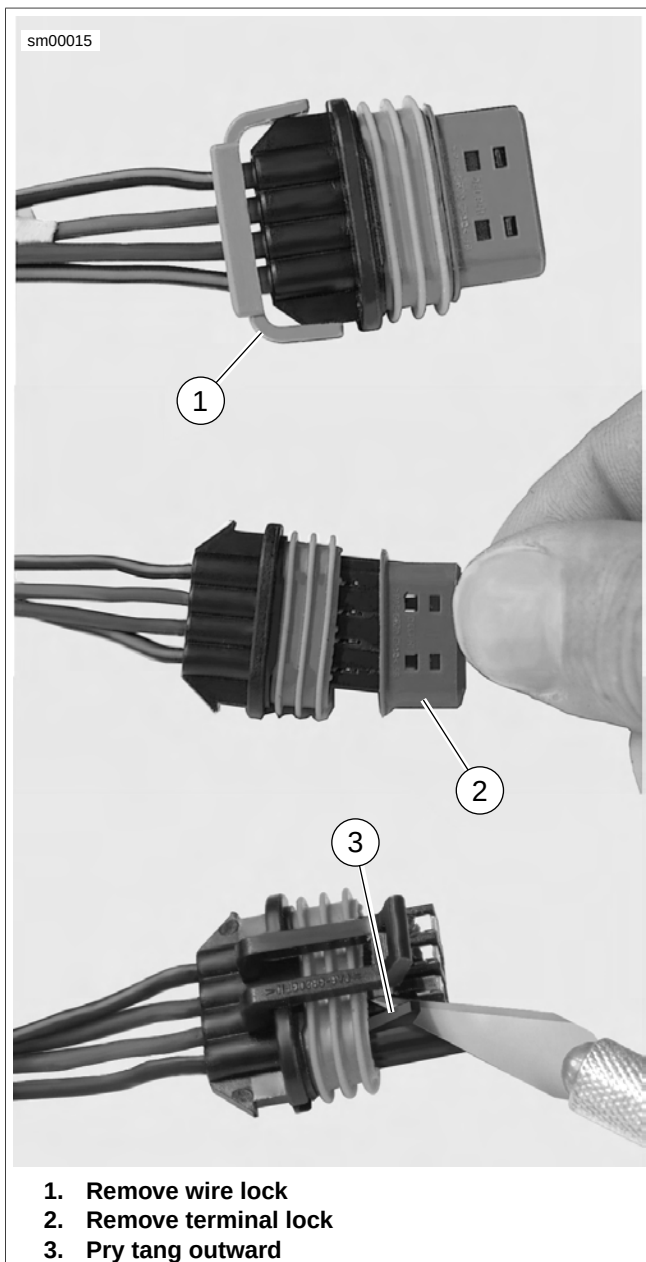


Figure A-21. Delphi GT 150 Sealed Connector: Removing Socket Terminals

DIGITAL
TECHNICIAN II
HARLEY-DAVIDSON®

DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR

A.11

DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR

NOTE

Do not operate latch lever when connector is not mated to ECU. Damage will occur.

Separating Socket Housing From ECM

NOTE

Although this procedure shows the ECM removed, the ECM connector can be removed and installed with the ECM removed or in place.

See [Figure A-22](#). Remove strap. While pressing latch (1), rotate lock lever to the released position (2).

Mating Socket Housing To ECM

Push the connector into the ECM and rotate lock lever to the locked position.

Socket Terminal

1. Cut cable strap to release harness from strain relief collar of connector housing.
2. See [Figure A-23](#). Release latches (4) that retain cover (3) to housing (2) and remove cover.
3. Follow instructions in [A.9 DELPHI MICRO 64 SEALED CONNECTORS](#) to remove and service the Micro-64 terminals.
4. Install connector housing cover. Verify all wires are within the confines of the cover and that the cover latches are engaged.
5. Install **new** cable strap cable to the strain relief of the connector.

ECM Ground Terminal

1. See [Figure A-23](#). Remove secondary lock (1).
2. See [Figure A-24](#). Using a thin blade screwdriver, gently pry ground terminal retainer from connector housing.
3. See [Figure A-25](#). Using a thin blade screwdriver, release latch and pull ground wire, wire seal and terminal from cover side of housing.
4. Follow instructions in [A.8 DELPHI METRI-PACK TERMINAL REPAIR](#) to replace the terminal or wire seal.
5. Push the terminal into place from the cover side of the connector housing until the latch engages. Pull on wire to verify terminal is secure.

NOTE

Secondary lock has one short leg and one long leg. Be sure to install correctly as shown in [Figure A-23](#).

6. See [Figure A-23](#). Install ground secondary lock (5) and install secondary lock (1) as shown.

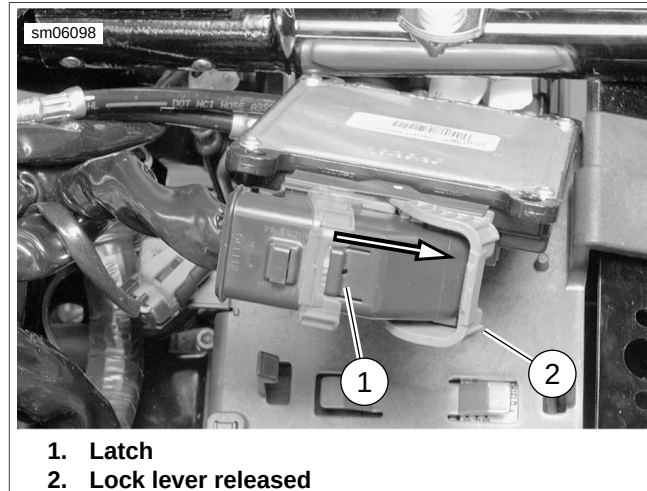


Figure A-22. Unlatch ECM Connector

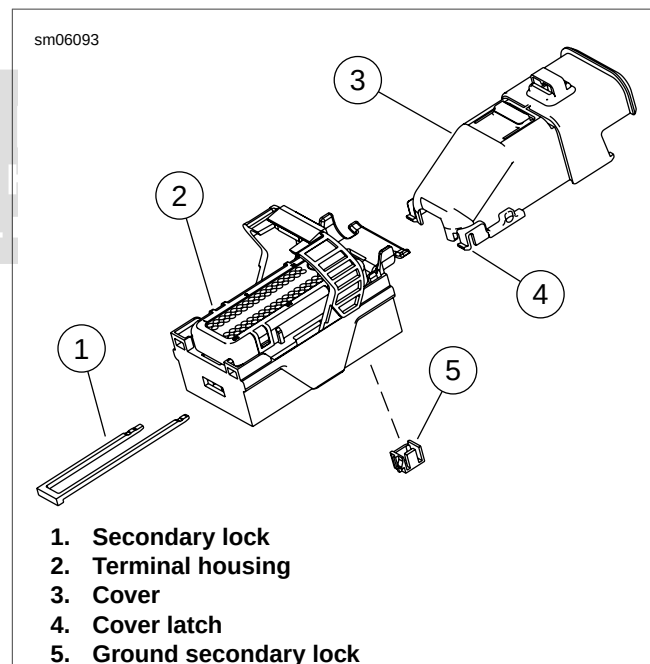


Figure A-23. Delphi 73-Terminal ECM Connector

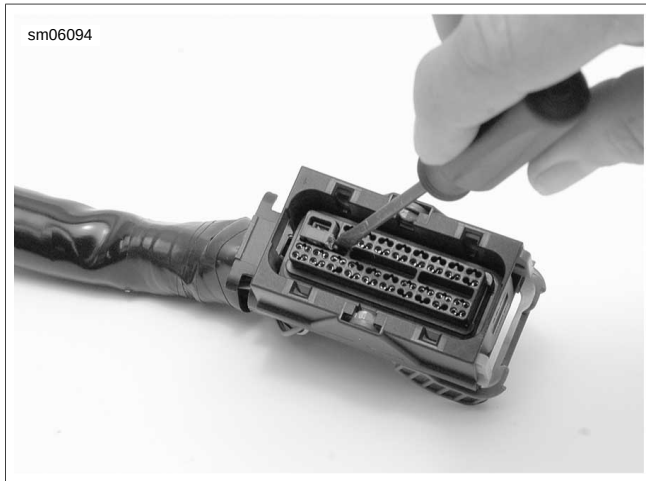


Figure A-24. Remove Ground Secondary Lock

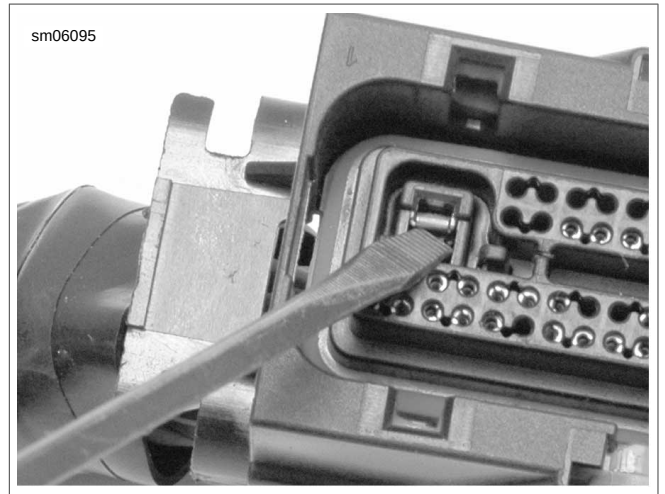


Figure A-25. Remove ECM Ground Terminal



DEUTSCH DT SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41475	DEUTSCH TERMINAL REPAIR KIT
HD-41475-100	FLAT BLADE L-HOOK

General

Deutsch DT Sealed 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 TERMINAL REPAIR 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-26](#). To separate the connector halves, Press 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

1. Align the connectors to match the wire lead colors.
 - a. **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.
 - b. **For Two External Latches:** (8-place and 12-place) Align the tabs on the socket housing with the grooves on the pin housing.
2. 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.
3. If necessary, fit the attachment clip to the pin housing.

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

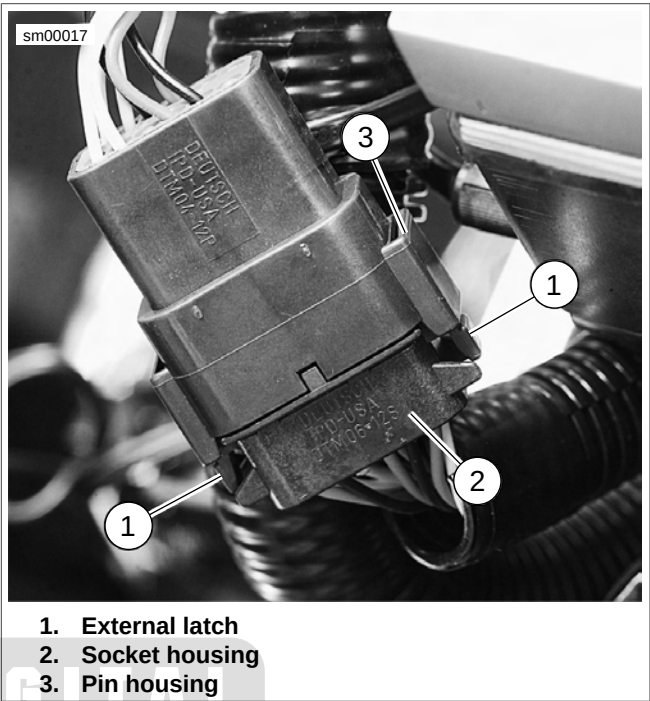


Figure A-26. Deutsch DT Sealed Connector

Removing Socket Terminals

1. See [Figure A-27](#). 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.
2. See [Figure A-30](#). Use a pick or small screwdriver to Press 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

1. Match wire lead color to connector cavity.
2. See [Figure A-29](#). Fit rear wire seal (1) into back of socket housing (2), if removed.
3. 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.
4. 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-28](#). 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.

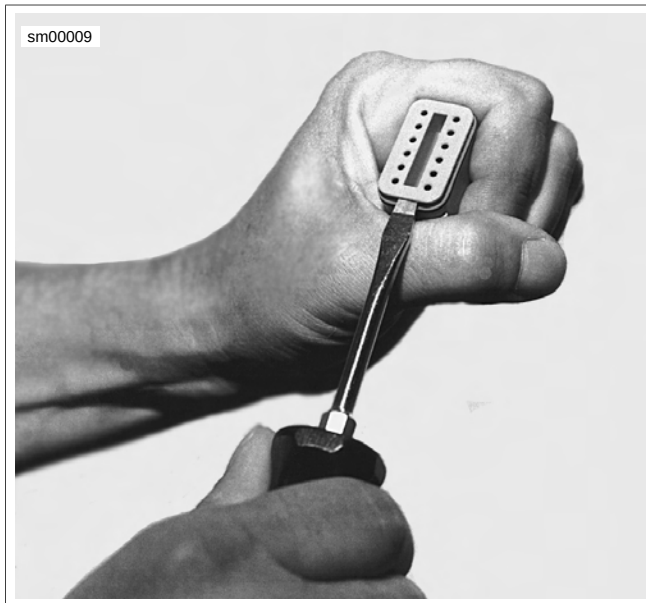


Figure A-27. Deutsch DT Sealed Connector: Remove Secondary Locking Wedge

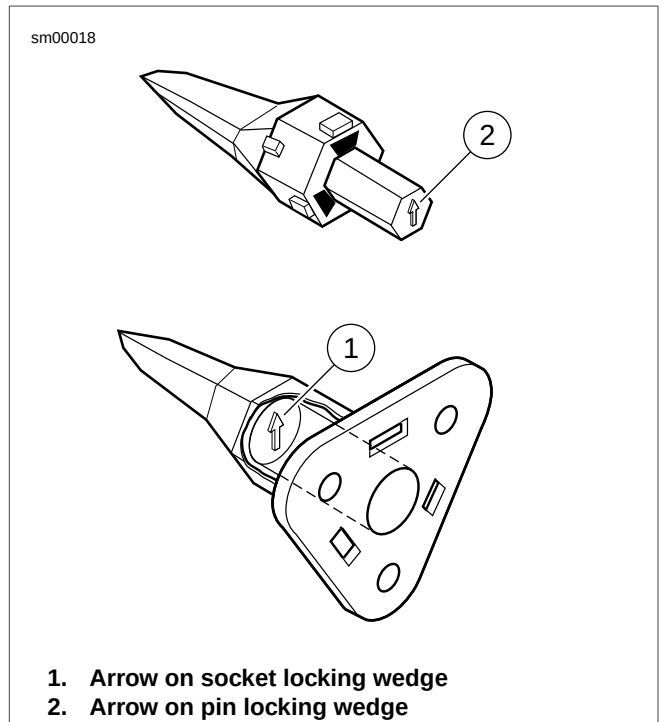


Figure A-28. Deutsch DT Sealed Connector: 3-Place Locking Wedges

DIGITAL
TECHNICIAN II
HARLEY-DAVIDSON®

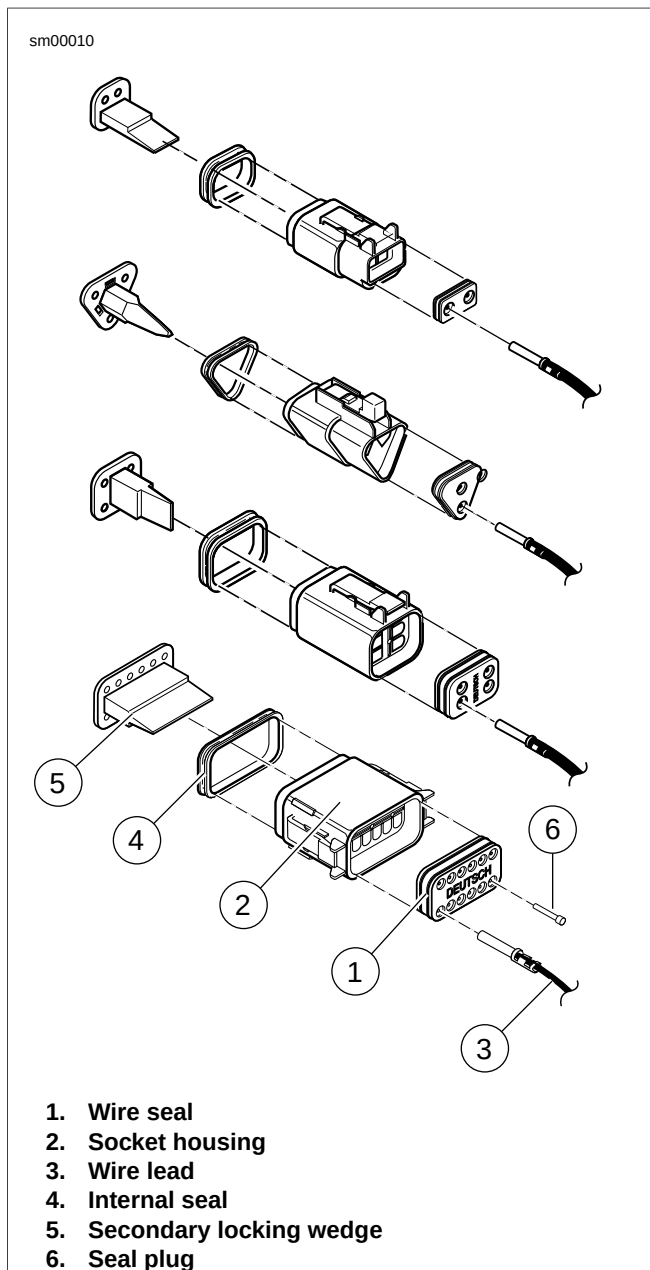


Figure A-29. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Socket Housings

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 Press 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, 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. 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.

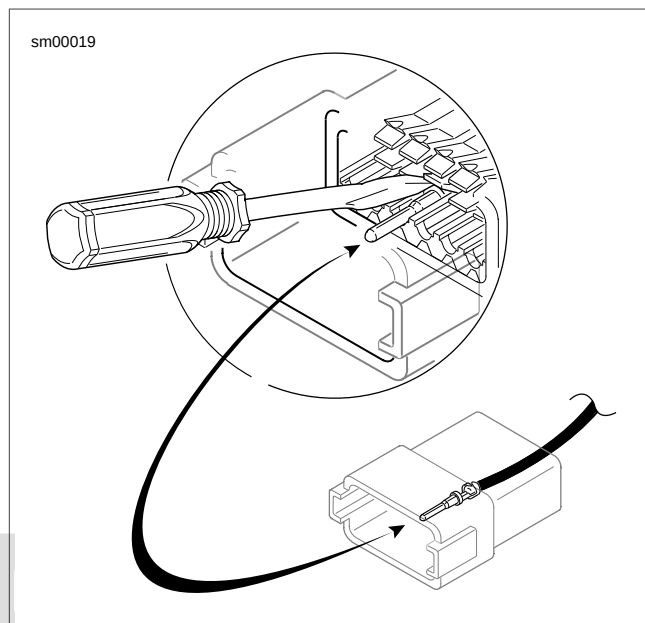


Figure A-30. Deutsch DT Sealed Connector: Depress Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See [Figure A-31](#). 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-28](#). 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.

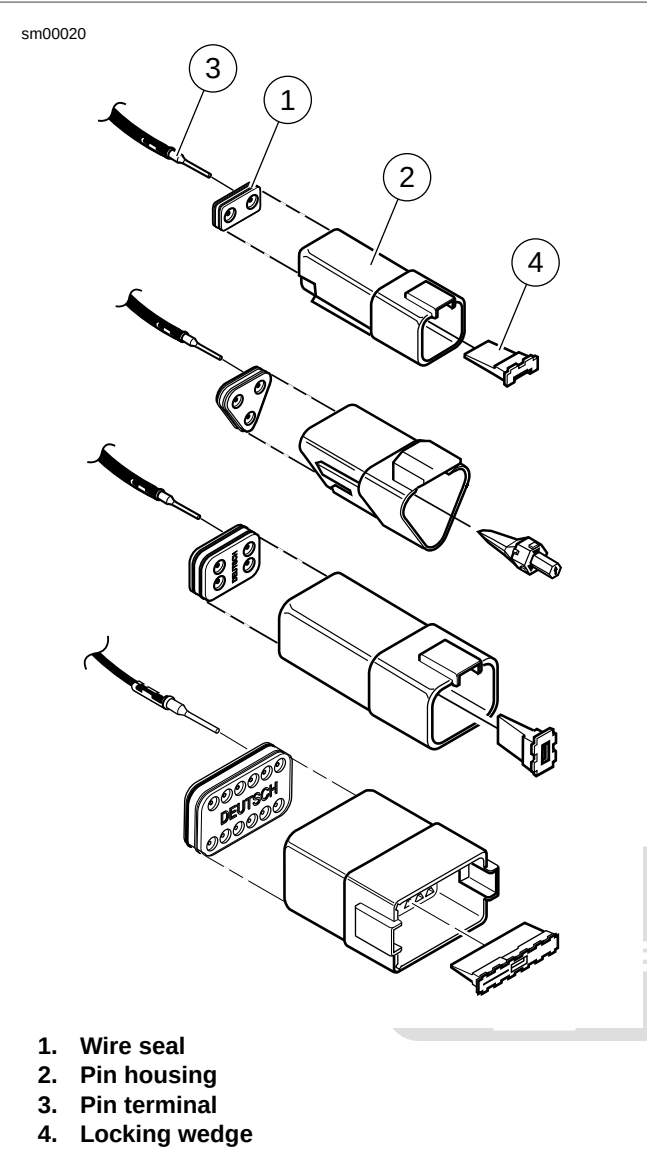


Figure A-31. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Pin Housings

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-1](#).



Table A-1. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
DT Sealed (with crimp tails)	A.13 DEUTSCH DT SEALED TERMINAL REPAIR
DTM Mini Sealed Terminal (solid barrel)	A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR
DTM Mini Sealed Terminal (with crimp tails)	A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

DEUTSCH DT SEALED TERMINAL REPAIR

A.13

DEUTSCH DT SEALED 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-32](#). 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-2](#).
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-2. Deutsch DT Sealed Terminal Crimp: Wire Gauge To Die

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

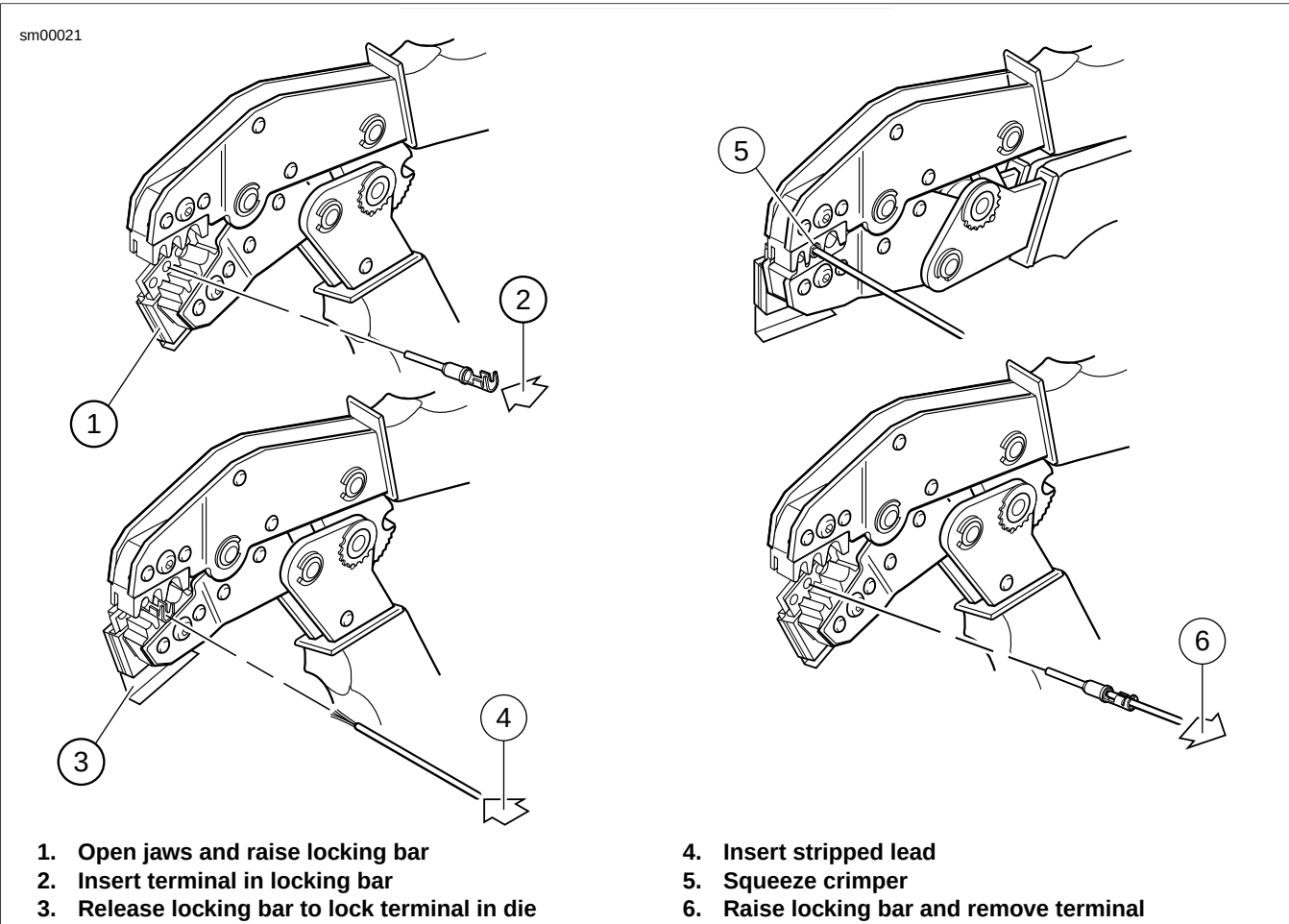


Figure A-32. Crimping a Deutsch DT Sealed Terminal

DEUTSCH DTM SEALED MINI TERMINAL REPAIR

A.14

DEUTSCH DTM SEALED MINI TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-7	PACKARD TERMINAL CRIMPER

Preparing Wire Leads for Crimping

Strip wire lead removing 5/32 in. (4.0 mm) of insulation.

Crimping a Mini Terminal to Wire Lead

1. See [Figure A-33](#). Compress the handles of PACKARD TERMINAL CRIMPER (Part No. HD-38125-7) until the ratchet (2) automatically opens.

NOTE

Always perform core crimp before insulation crimp.

2. Position the core crimp on die E (1) of the crimper. Be sure the core crimp tails are facing the forming jaws.
3. Gently apply pressure to handles of tool until crimpers just secure the core crimp tails.
4. Insert stripped wire core stands between crimp tails. Position wire so that short pair of crimp tails squeeze bare wire strands, while long pair squeeze over the insulation.
5. Squeeze handle of crimper until tightly closed. Tool automatically opens when the crimping sequence is complete.

NOTE

If the crimper does not open, it can be opened by squeezing the ratchet trigger (2).

6. Position the insulation crimp on nest C of the crimper. Be sure the insulation crimp tails are facing the forming jaws.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.

Inspecting Crimps

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

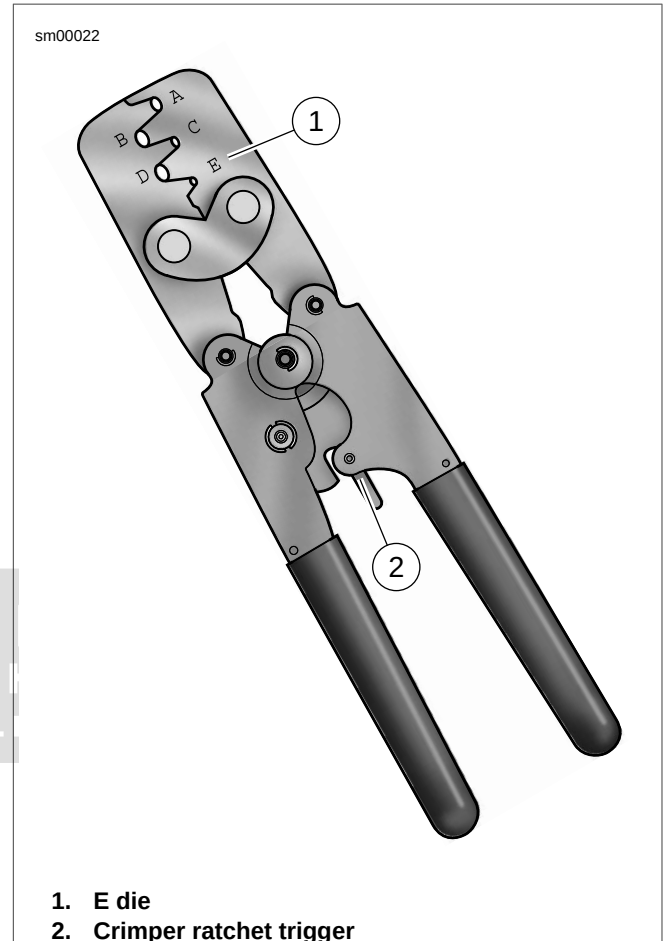


Figure A-33. Packard Terminal Crimper (HD-38125-7)

DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR

A.15

DEUTSCH DTM SEALED SOLID BARREL TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-42879	ELECTRICAL CRIMPER TOOL

Preparing Wire Leads For Crimping

For size 20, 16 and 12 contacts, wire ranges 26-12 AWG.

Strip wire lead removing 1/4 in. (6.4 mm) of insulation.

Adjusting Crimper Tool

1. See [Figure A-34](#). Squeeze the ELECTRICAL CRIMPER TOOL (Part No. HD-42879) handles to cycle the crimp tool to open.
2. Remove locking pin (1) from selector knob (2).
3. Raise selector knob and rotate until selected wire size stamped on wheel is aligned with "SEL. NO." arrow (3).
4. Loosen knurled locknut (4) and turn adjusting screw (5) clockwise (in) until it stops.

Crimping a Barrel Contact To Wire Lead

1. See [Figure A-35](#). Turn tool over and drop contact barrel (1) into indenter cover (2) hole with the wire end out.
2. Turn adjusting screw counterclockwise (out) until contact is flush with bottom of depression in indenter cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact is centered between the four indenter points (3).
4. Insert bare wire core strands of stripped wire lead (4) into contact barrel. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
5. Remove wire lead with crimped contact from indenter.

NOTE

Tool must be readjusted when changing contact size/type.

6. Install pin to lock selector knob.

Inspecting Crimps

Inspect the crimp. All core wire strands are to be crimped in the barrel.

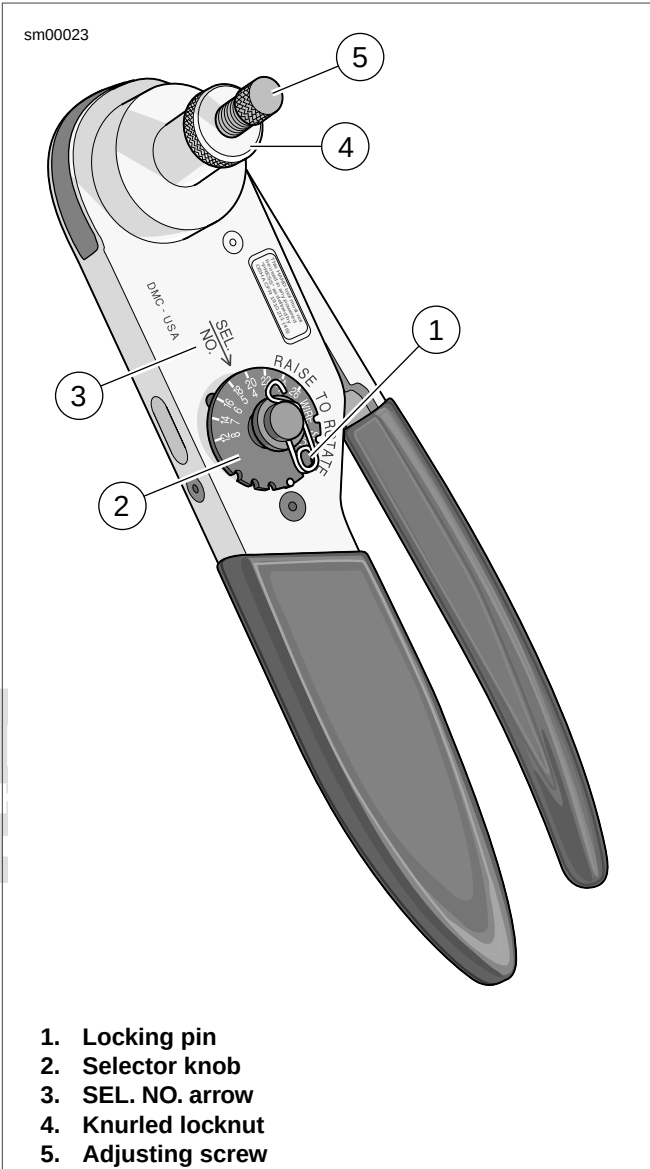


Figure A-34. Electrical Crimper Tool (HD-42879)

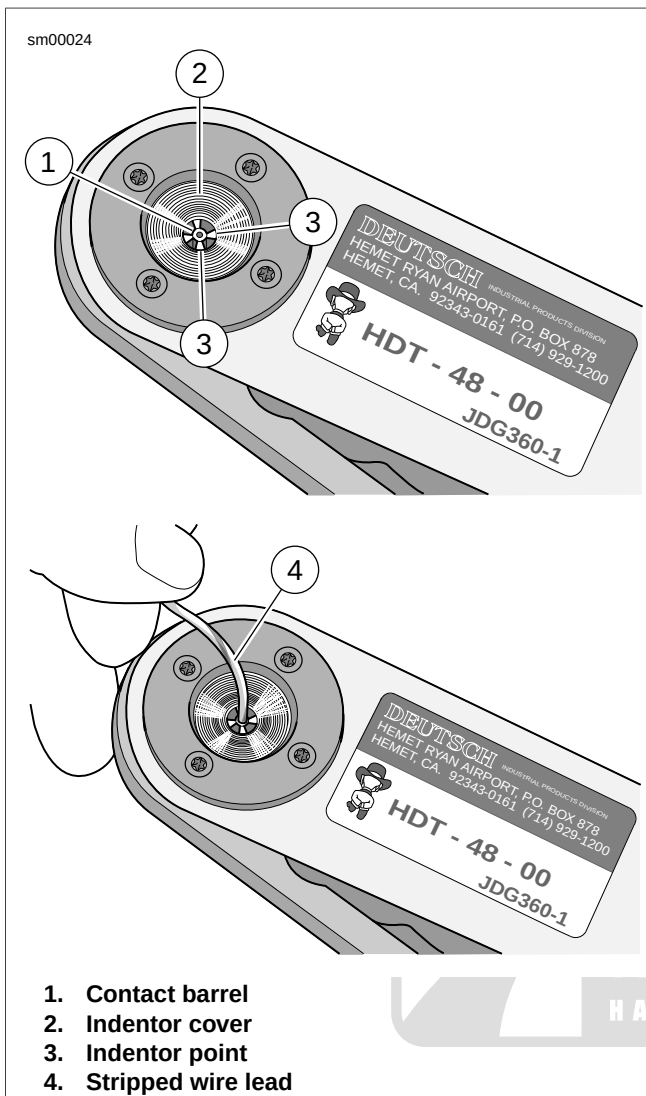


Figure A-35. Deutsch Solid Barrel

JAE MX19 SEALED CONNECTORS

A.16

JAE MX19 SEALED CONNECTORS

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

Connector Housings

Separate Housings: See [Figure A-36](#). Press the two release buttons on each side of the housing to separate the connector.

Connect Housings: Align and press the housings together until the locking tabs click.

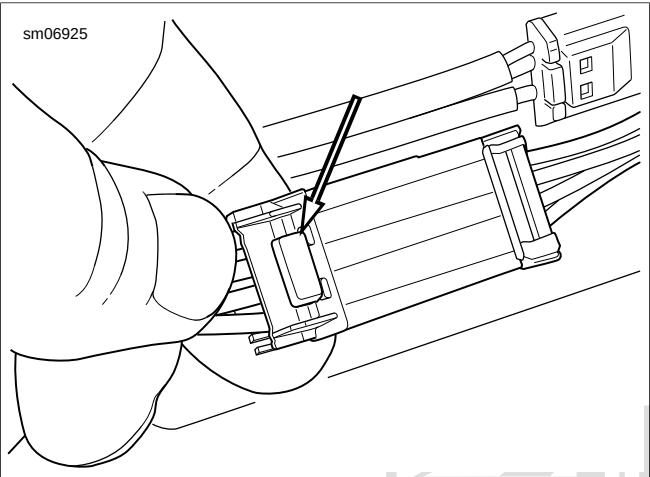


Figure A-36. Release Buttons: JAE MX19 Sealed Connector

Removing Terminals

1. Modify a TERMINAL EXTRACTOR (Part No. B-50085) by filing the front edge to 45 degrees.

2. See [Figure A-37](#). Insert the extractor (1) into the opening above the terminal and press the plastic molding (2) up and out of the way.
3. Pull the wire lead and terminal out of the back of the housing.

Installing Terminals

1. Inspect the plastic molding and replace the connector housing if necessary.
2. Orient the terminal to the housing and push terminal into the housing until it snaps into place.

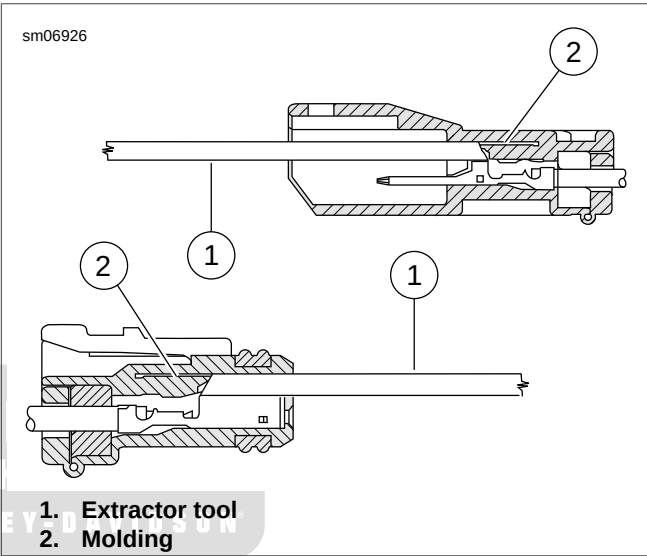


Figure A-37. JAE MX19 Terminal Removal

MOLEX CMC SEALED CONNECTORS

Separating the Connector

Release: See [Figure A-38](#). Press the catch and rotate the lever arm down.

Connect: Press on the front guard to release the latch and rotate the lever arm up until the catch clicks in place.

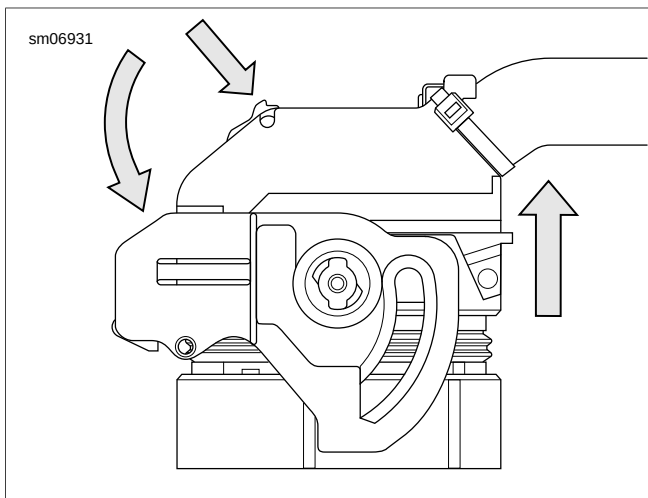


Figure A-38. Release

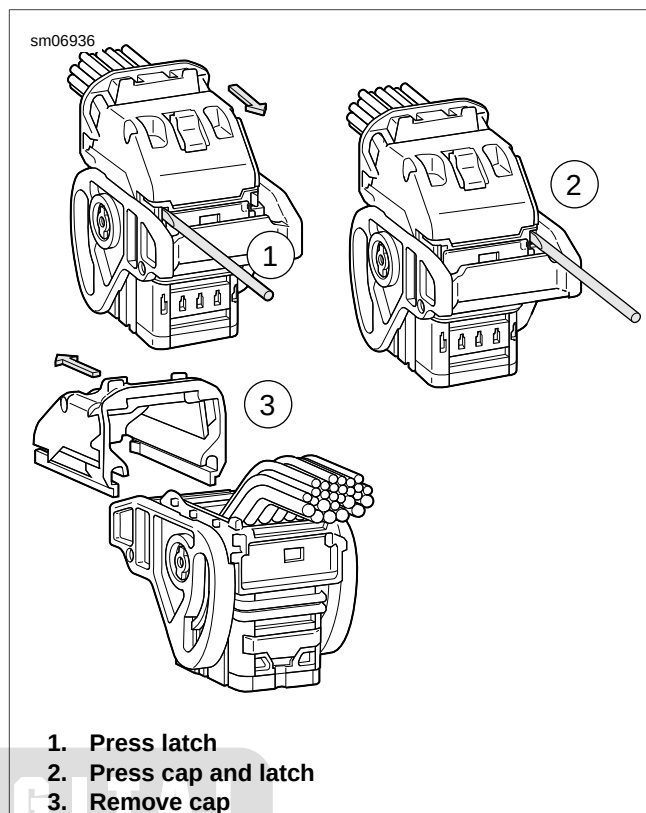


Figure A-39. Remove the Wire Lead Cap

Removing Terminals

1. With the lever arm open, cut the cable strap around the wire bundle.
2. See [Figure A-39](#). Open a wire cap latch with a small screwdriver (1).
3. Maintain pressure on the cap and open the opposite latch with the screw driver (2).
4. Slide the cap off (3).
5. See [Figure A-40](#). Use the screwdriver to open the secondary lock. Pull the locking bar all the way out.
6. See [Figure A-41](#). Locate the wire lead cavity by the alphanumeric coordinates.
7. See [Figure A-42](#). Insert the pins of the CMC extractor tool (1) into the access slots (2) of the terminal cavity and retract the lead and terminal.

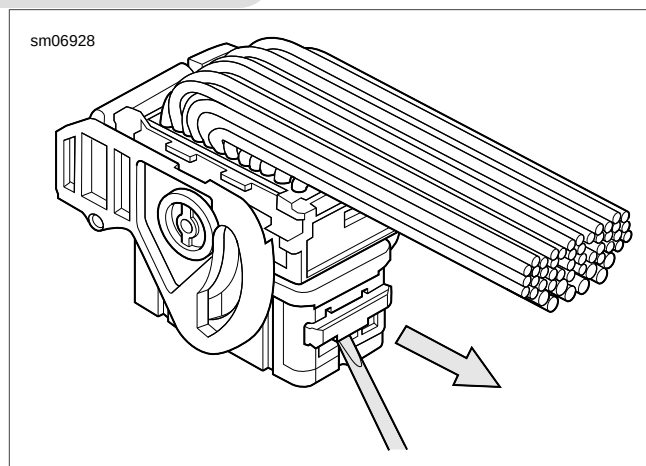


Figure A-40. Molex CMC Sealed Connector Secondary Lock

Installing Terminals

1. Orient the terminal to the housing cavity and snap the terminal in place.
2. Slide the cap over the lead bundle and snap the cap in place.
3. Install a cable strap through the guide and around the lead bundle.

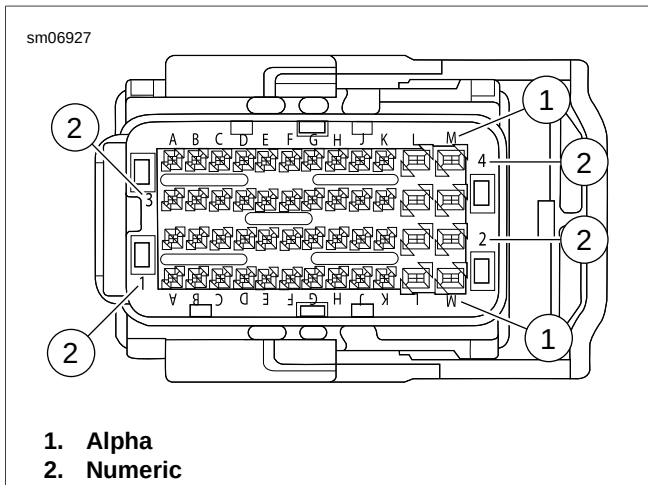


Figure A-41. Alpha - Numeric Coordinates

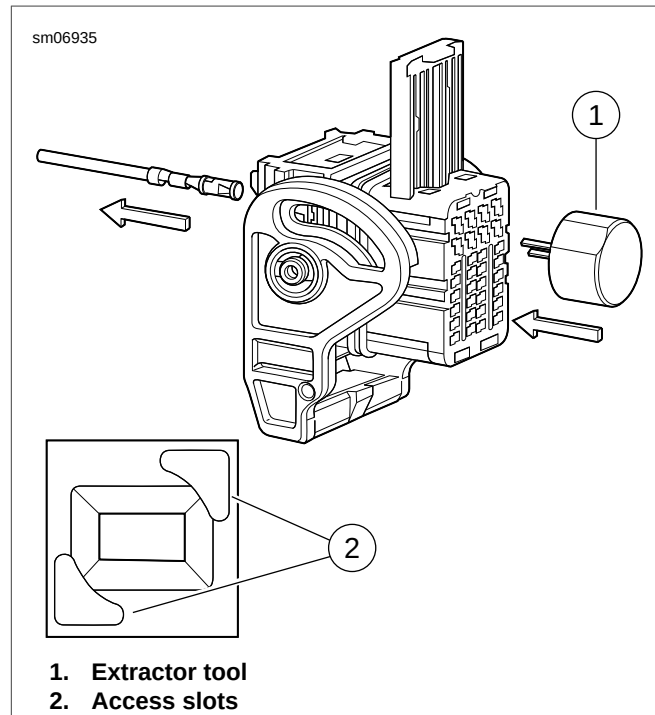


Figure A-42. Terminal Removal



MOLEX MX 150 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-48114	TERMINAL REMOVER

Separating Pin and Socket Housings

See [Figure A-43](#). Press the latch while pulling the pin and socket housings apart.

Mating Pin and Socket Housings

1. Orient the latch on the pin housing to the latch pocket on the socket housing so the rails on the outside of the pin housings lines up with the tunnels on the socket housing.
2. Press the housings together until the latch clicks.

Removing Terminals

1. Pull the secondary lock up, approximately 3/16 in. (4.8 mm), until it stops.
 - a. **Socket Housing:** See [Figure A-44](#). Use a small screwdriver in the pry slot. The slot next to the external latch provides a pivot point.
 - b. **Pin Housing:** See [Figure A-45](#). Use needle nose pliers to engage the D-holes in the center of the secondary lock.

NOTE

Do not remove the secondary lock from the connector housing.

2. See [Figure A-46](#). Insert TERMINAL REMOVER (Part No. HD-48114) into the pin hole next to the terminal until the tool bottoms.
 - a. **Socket Housing:** The pin holes are inside the terminal openings.
 - b. **Pin Housing:** The pin holes are outside the pins.
3. Pressing the terminal remover to the bottom of the pin hole, gently pull on the wire to remove wire terminal from its cavity.

Installing Terminals

1. See [Figure A-47](#). From the wiring diagram, match the wire color to its numbered terminal cavity.

NOTE

Cavity numbers (1) are stamped on the housing at the ends of the cavity rows. The cavity number can be determined by counting the cavities up or down along the row from each stamped number.

2. Orient the terminal so that the tang (2) opposite the open crimp engages the slot (3) in the cavity.
3. Push the terminal into the cavity.
4. Gently tug on wire to verify that the terminal is captured by the secondary lock.

5. With all terminals installed, push the secondary lock into the socket housing to lock the wire terminals into the housing.

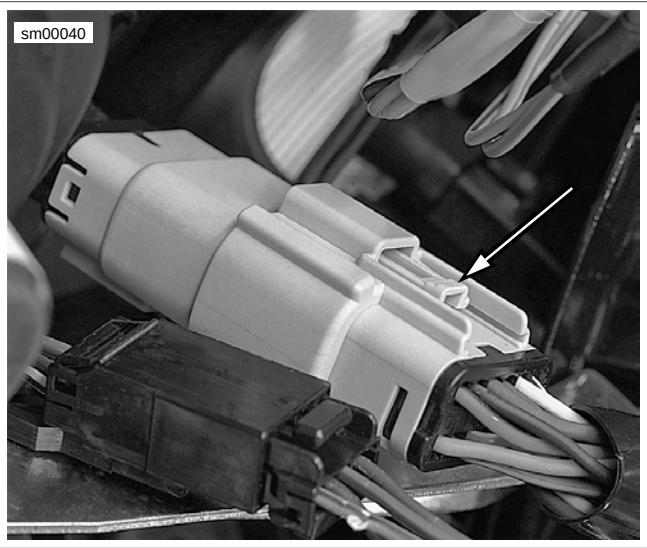


Figure A-43. Molex MX 150 Sealed Connector: Latch

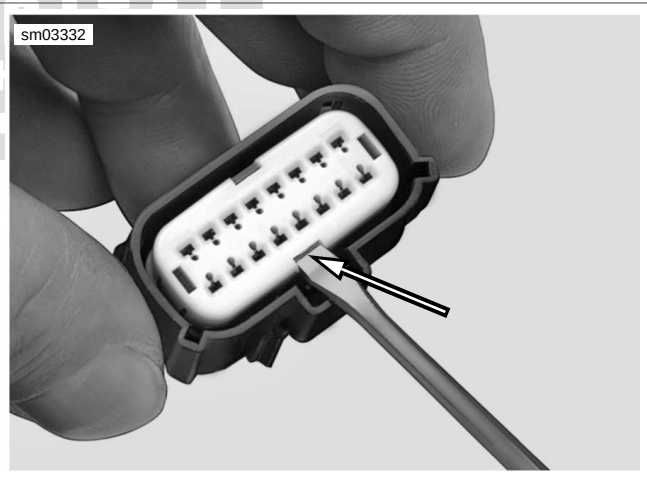


Figure A-44. Secondary Lock Pry Slot (Socket Housing)

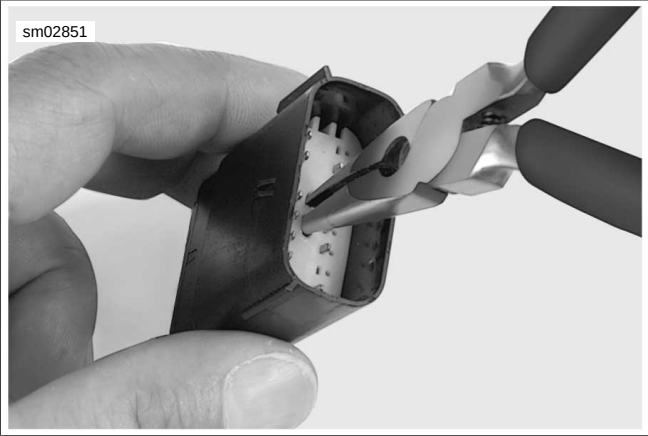


Figure A-45. Pull Up Secondary Lock (Pin Housing)

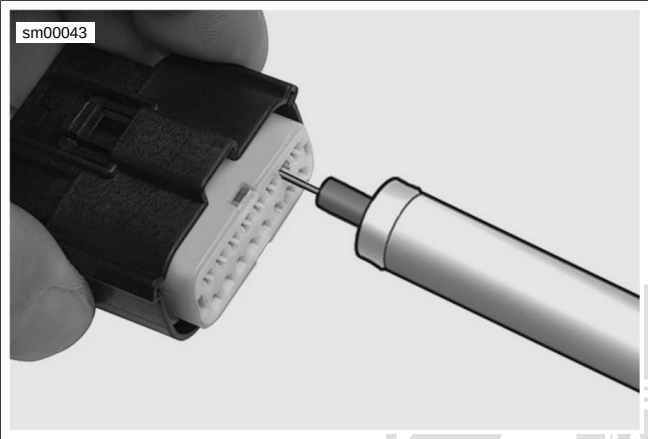


Figure A-46. Molex MX 150 Sealed Connector: Terminal Remover (HD-48114)

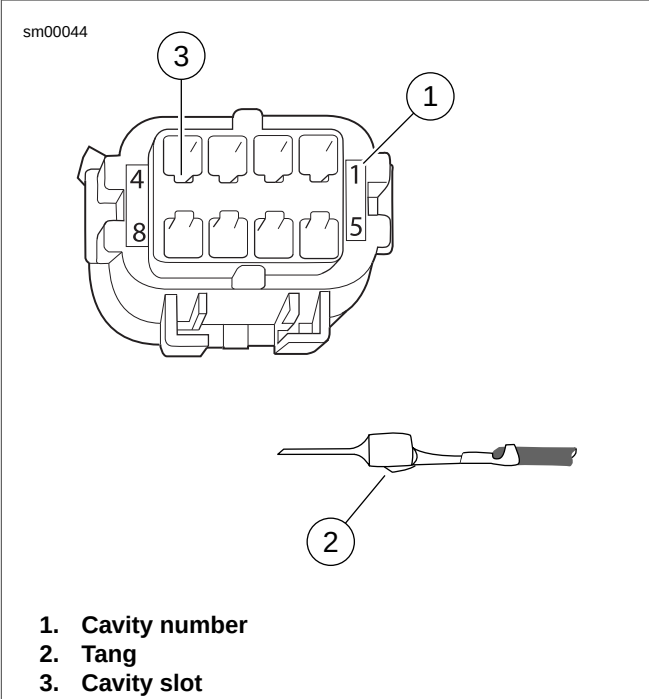


Figure A-47. Molex MX 150 Sealed Connector: Pin Cavities and Wire Terminal

CRIMP TERMINAL TO LEAD

PART NUMBER	TOOL NAME
HD-48119	TERMINAL CRIMPER

Prepare Lead

1. Cut the damaged terminal close to the back of the terminal to leave as much wire length as possible.
2. Strip approximately 3/16 in. (4.70-5.60 mm) of insulation from the end of the wire lead.

NOTE

The strip length is the same for both pin and socket terminals and for wire gauges from 22 to 14.

Prepare Tool

1. Identify the punch/die in the jaws of the TERMINAL CRIMPER (Part No. HD-48119) for the wire gauge. Refer to [Table A-3](#).
2. Squeeze and release the handles to open the tool.

NOTE

The crimp tool automatically opens when the handles are released.

3. See [Figure A-48](#). Hold fully open tool at approximately 45 degrees.

NOTE

Do NOT tighten the locknut holding the locator bars. The bars must float to accommodate the different terminal gauges.

Table A-3. Crimp Tool Wire Gauge Punch/Die

AWG (WIRE GAUGE)	PUNCH/DIE
22	Left
18-20	Middle
14-16*	Right
* Crimp 16 AWG pin terminals in the 18-20 middle die.	

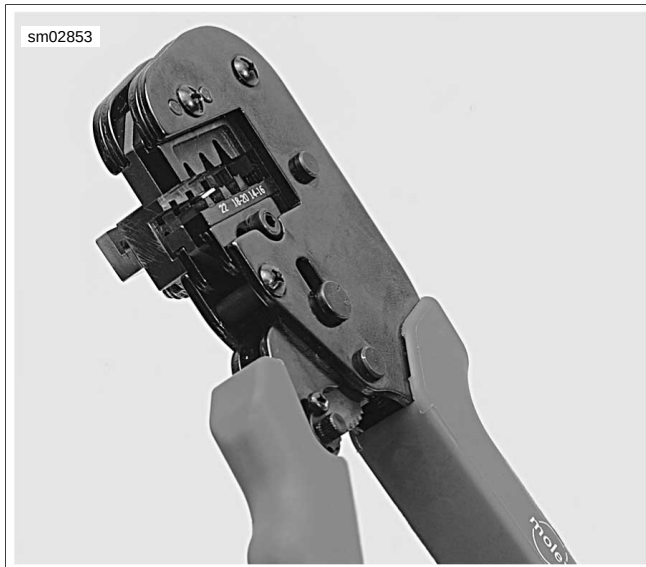


Figure A-48. Open Terminal Crimper (HD-48119) at 45 Degrees

Position Terminal in the Punch/Die

- See [Figure A-50](#). With the crimp tails up, place the terminal through the punch/die into the square opening in the socket locator bar.
 - Socket Terminal:** See [Figure A-49](#). A socket terminal stops against the back face of the socket locator bar (1).
 - Pin Terminal:** See [Figure A-51](#). The tip of a pin terminal passes through the socket locator bar and stops in the notch in the face of the pin locator bar.
- See [Figure A-52](#). Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

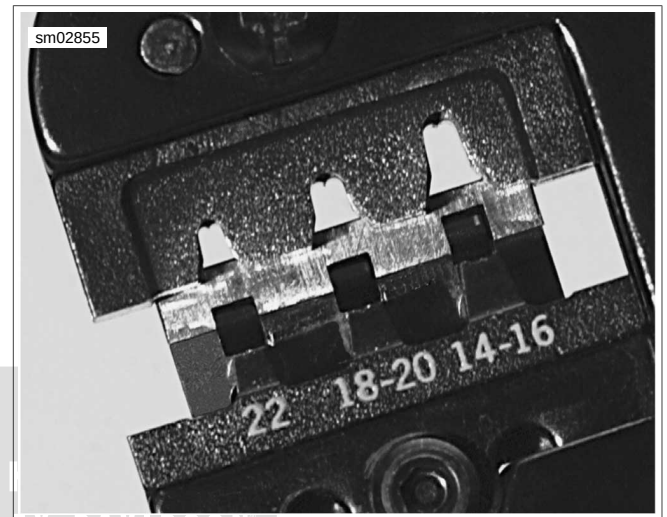
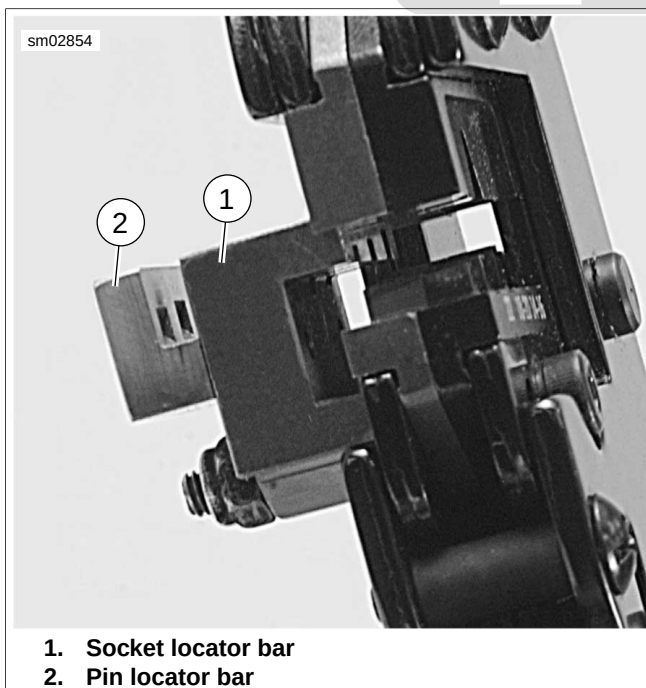


Figure A-50. Square Openings in Socket Locator Bar



1. Socket locator bar
2. Pin locator bar

Figure A-49. Terminal Locator Bars

Insert Stripped Lead

See [Figure A-53](#). Insert the stripped end (wire core) between the crimp tails at an up angle until the wire core touches the face of the socket locator bar above the square opening.

NOTES

- The insulation must extend through the insulation crimp tails.
- Insert the wire with little or no pressure. Pressing on the lead will bend the wire core.

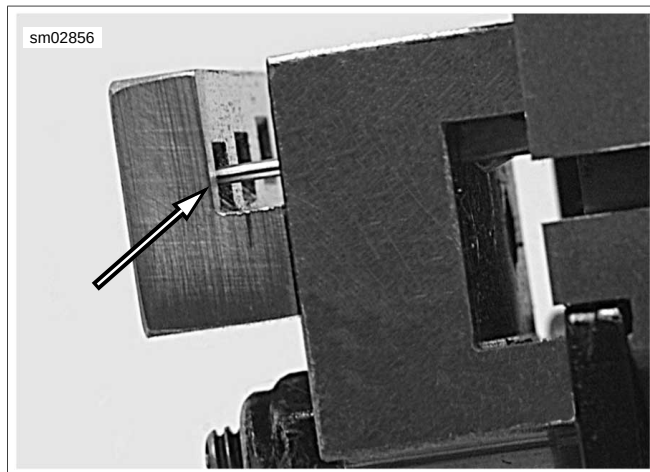


Figure A-51. Pin Terminal against Pin Locator Bar

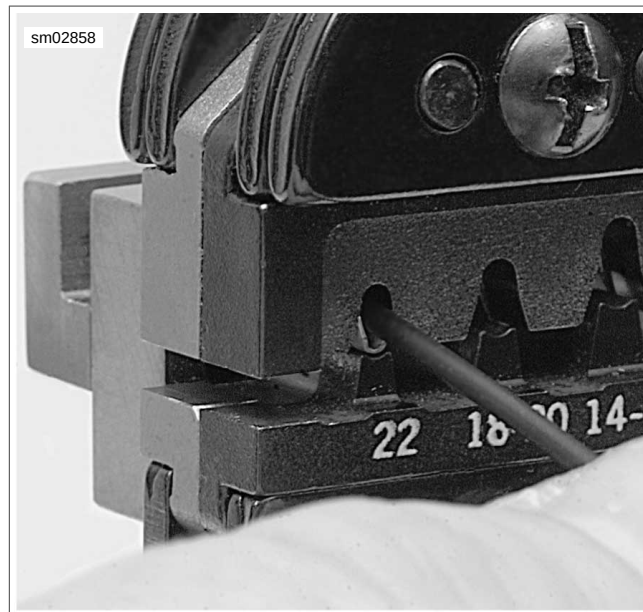


Figure A-53. Stripped Lead at Up Angle

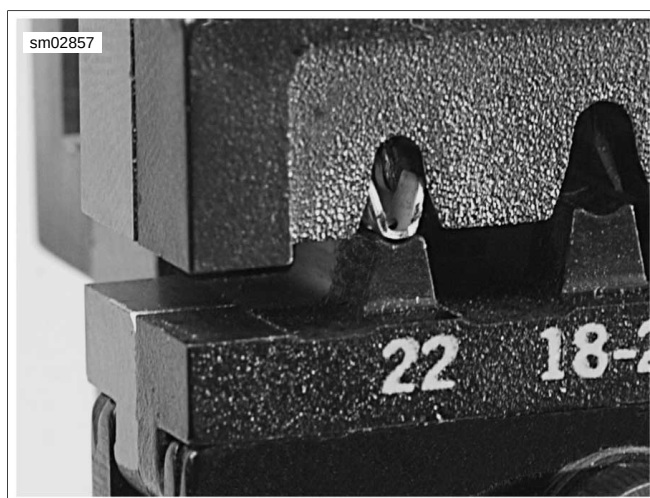


Figure A-52. Crimp Tails in Vertical Alignment between Punch and Die

Crimp Terminal to Lead

1. Holding the wire lead in position touching the locator face at an angle, quickly and smoothly squeeze the crimp tool closed.
2. Final squeeze the handles to open the tool and release the terminal.

NOTE

A stuck or jammed tool can be opened by pressing the ratchet release lever found between the handles. Do **not** force the handles open or closed.

Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
 - a. See [Figure A-54](#). The core tails should be creased into the wire strands at the core crimp (1).
 - b. Strands (2) of wire should be visible beyond the core crimp but not forward into the terminal shell.
 - c. The insulation tails should be folded into the insulation (3) without piercing or cutting the insulation.
 - d. Distortion should be minimal.
2. **Test Crimp:** Hold the terminal and pull the lead.

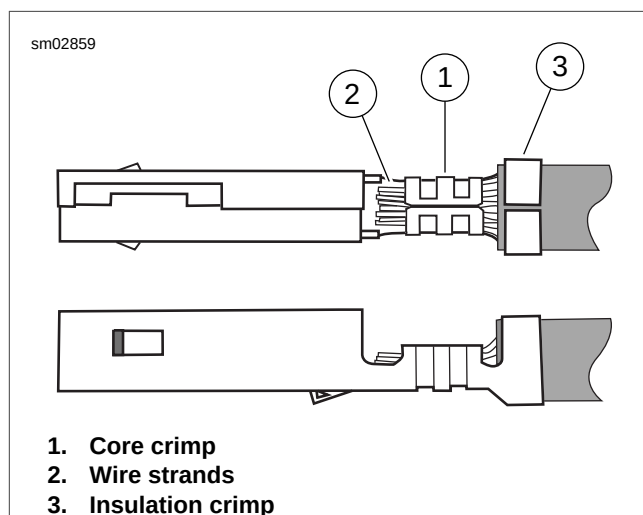


Figure A-54. Terminal Crimp

TYCO 070 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41609	AMP MULTI-LOCK CRIMPER
SNAP-ON TT600-3	SNAP-ON PICK

General

Tyco 070 Multilock Unsealed 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-55](#). 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 MULTI-LOCK 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-55](#). Press 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.

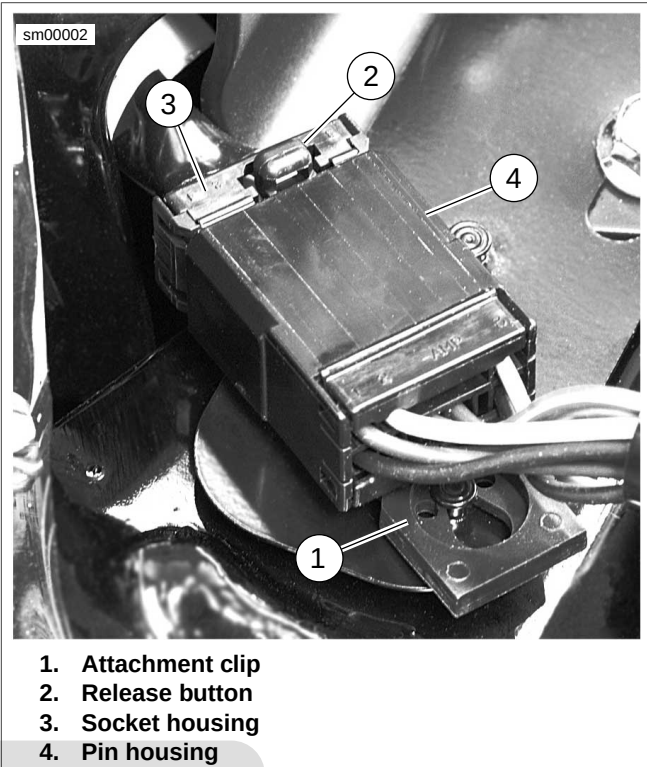


Figure A-55. Tyco 070 Multilock Unsealed Connector

Removing Terminals from Housing

1. See [Figure A-56](#). 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. SNAP-ON 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.

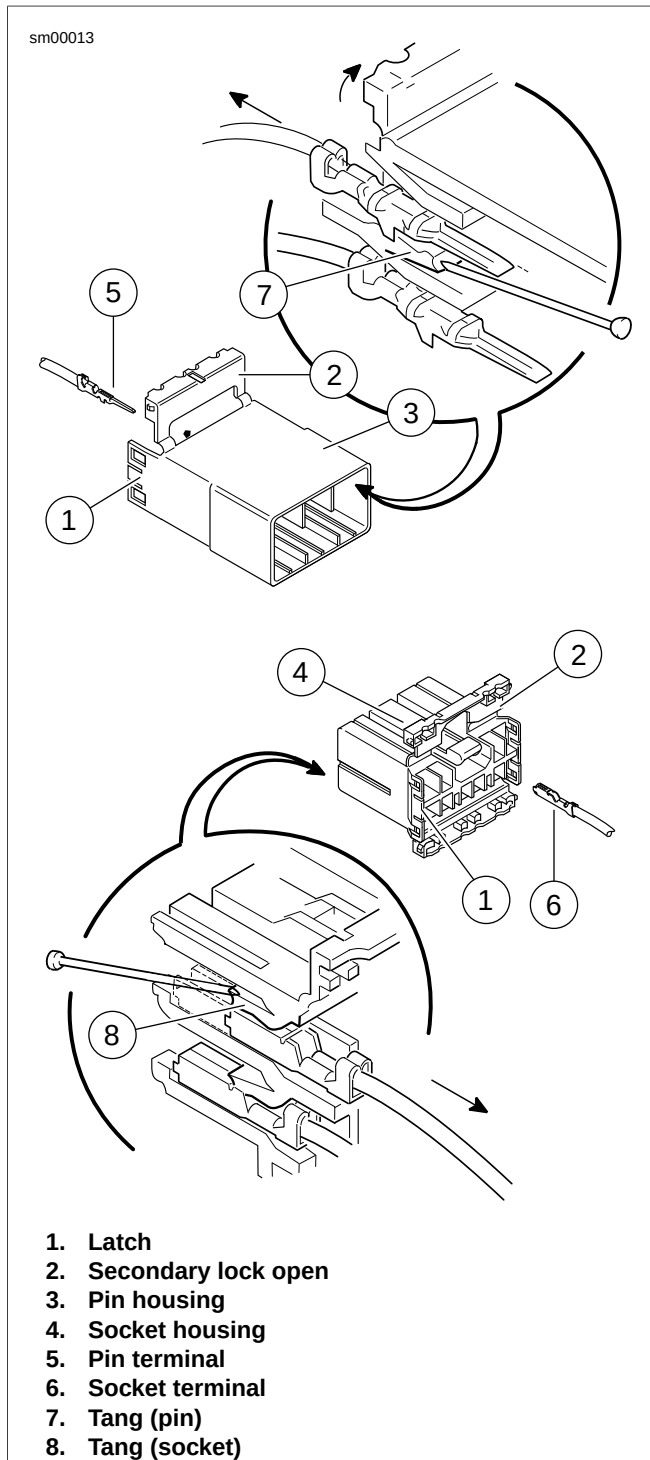


Figure A-56. Tyco 070 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

See [Figure A-57](#). 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.

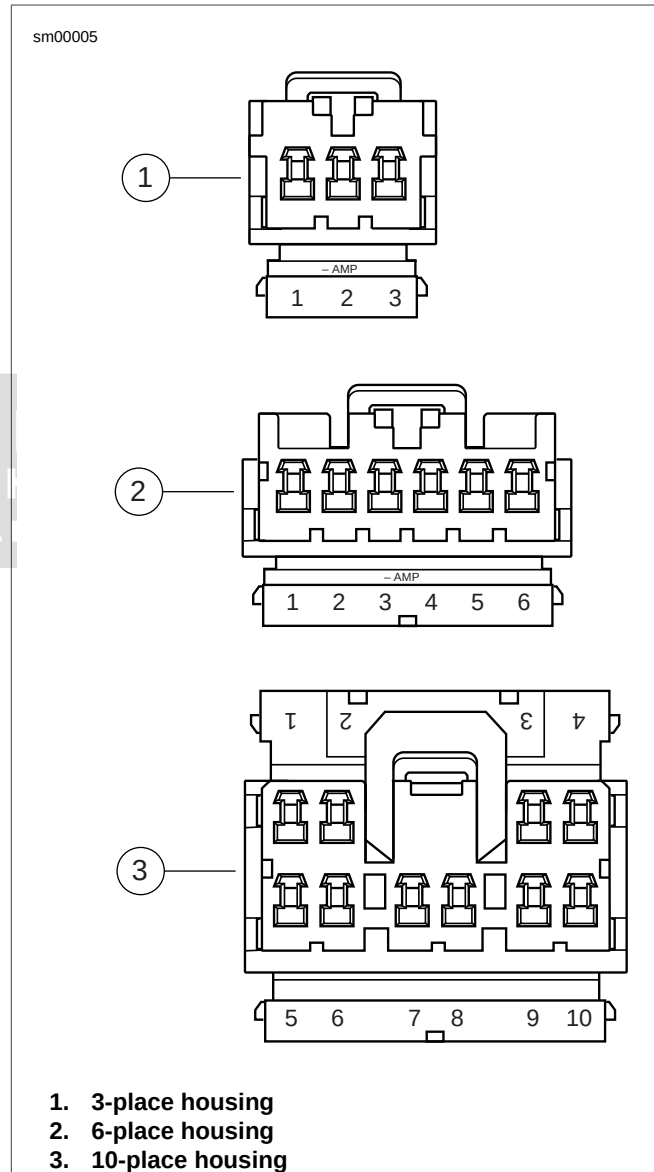


Figure A-57. Tyco 070 Multilock Unsealed Connector: Cavity Numbers on Secondary Locks (socket housings shown)

Preparing Wire Leads for Crimping

1. Strip 5/32 in. (4.0 mm) of insulation from the wire lead.

- 2. See [Figure A-58](#) and [Figure A-59](#). 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-4](#).

Table A-4. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest

WIRE GAUGE	NEST
20	Front
16	Middle
18	Rear

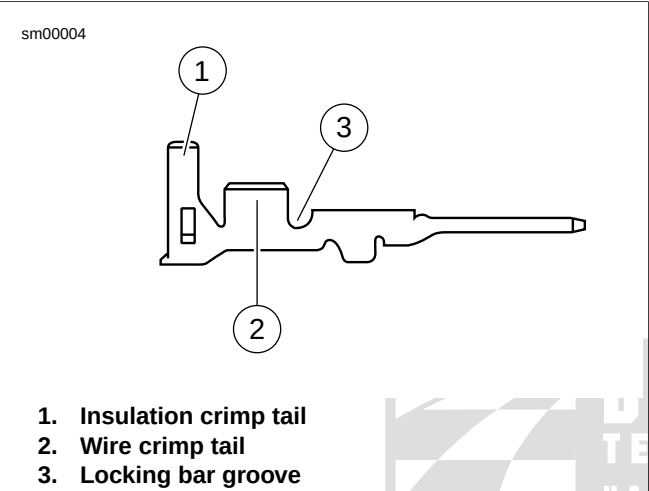


Figure A-58. Tyco 070 Multilock Unsealed Connector: Pin Terminal

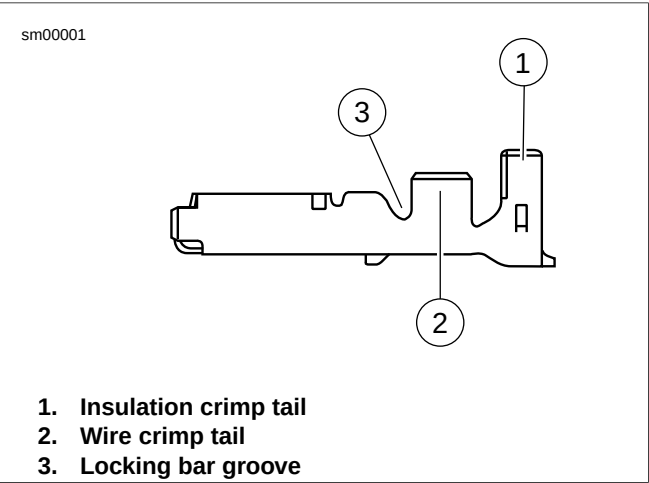


Figure A-59. Tyco 070 Multilock Unsealed Connector: Socket Terminal

Crimping Terminals to Leads

NOTE

Crimping with the AMP Multi-lock Crimper is a one step operation. One squeeze crimps both the wire core and the insulation tails.

- 1. See [Figure A-60](#). Squeeze the handles to cycle the AMP MULTI-LOCK 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-58](#) and [Figure A-59](#). 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-60](#). 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 (7) and remove crimped terminal.

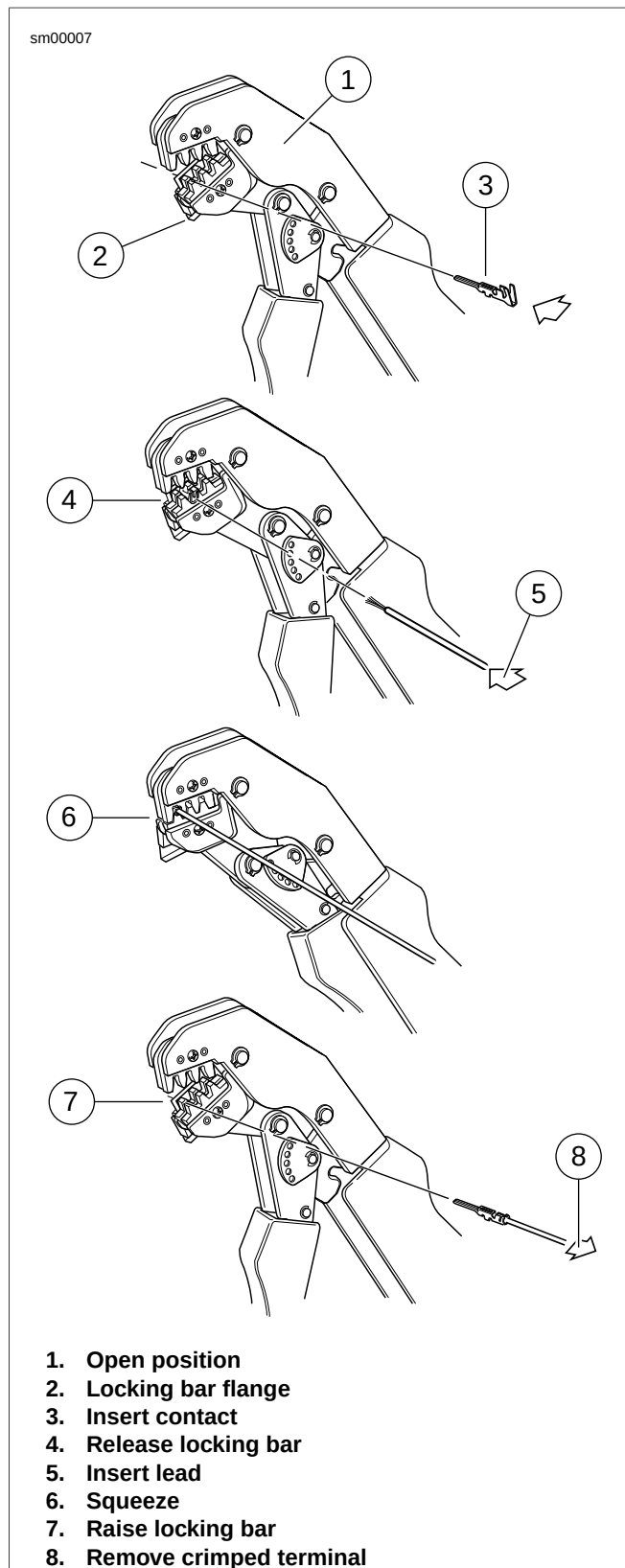


**Figure A-60. Tyco 070 Multilock Unsealed Connector:
Terminal Crimping Procedure**

Inspecting Crimped Terminals

See [Figure A-61](#). Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.

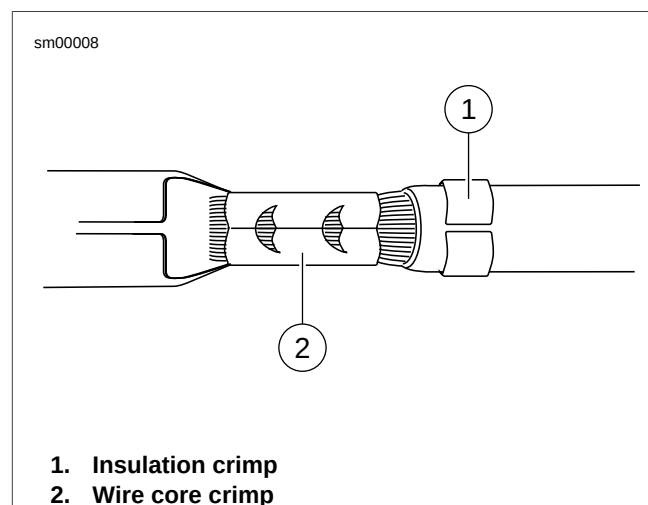


**Figure A-61. Tydo 070 Multilock Unsealed Connector:
Terminal Crimp**

DIGITAL
TECHNICIAN II
HARLEY-DAVIDSON®

SEALED SPLICE CONNECTORS

A.20

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN
HD-38125-8	PACKARD CRIMPING TOOL
HD-39969	ULTRA TORCH
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.

- Using a shop gauge, identify the gauge of the wire.
- Match the wire gauge to a sealed splice connector by color and part number. Refer to [Table A-5](#).
- Using a wire stripper, cut and strip a length of insulation off the wire ends. Refer to [Table A-5](#) for the strip length.

Table A-5. 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-63](#). The connector is crimped twice - one side and then the other.

- See [Figure A-62](#). Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
- Match the connector color to the wire gauge crimp die in the jaws and insert one end of the sealed connector.
- Gently squeeze the handles until the connector is held in the jaws.
- See [Figure A-63](#). Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).

- Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.
- 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.
- Use an ULTRA TORCH (Part No. HD-39969), or a 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-63](#). 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.

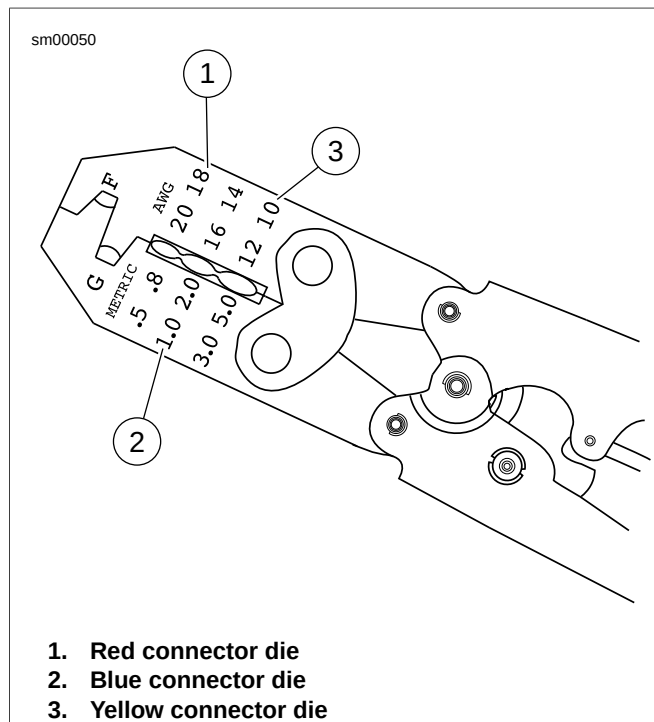


Figure A-62. Packard Crimping Tool (HD-38125-8)

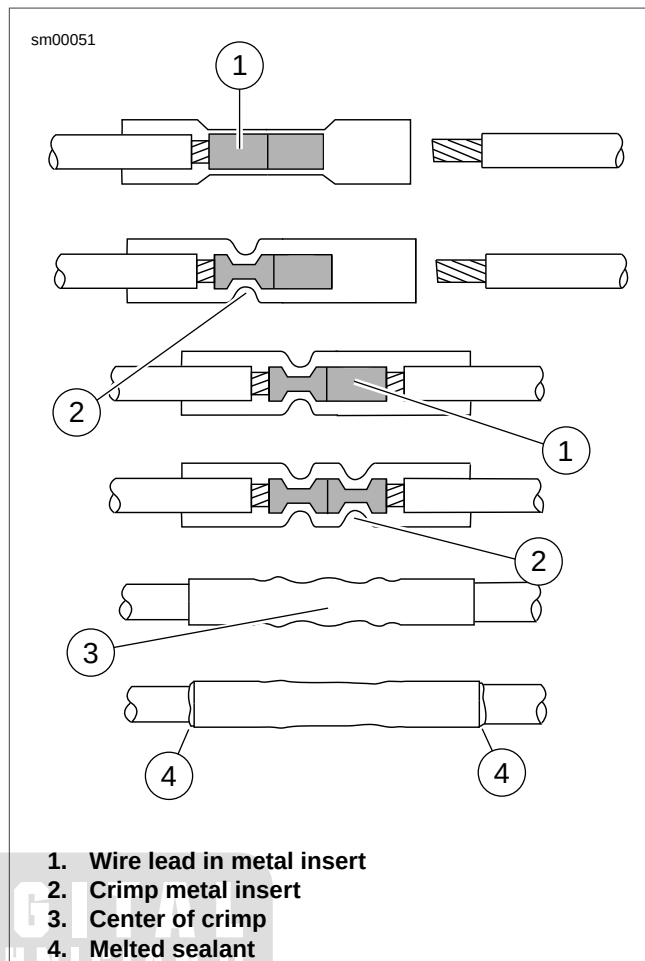


Figure A-63. Sealed Splice Connector

TABLE OF CONTENTS

SUBJECT	PAGE NO.
B.1 CONNECTORS.....	B-1
B.2 WIRING DIAGRAMS.....	B-7



NOTES



CONNECTORS

B.1

CONNECTOR LOCATIONS

Function/Location

On the motorcycle, a connector can be identified by its function and location. Refer to [Table B-1](#).

Place and Color

The place (number of wire cavities of a connector housing) and color of the connector can also aid identification.

Connector Number

On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets.

Repair Instructions

The repair instructions in this service manual are by connector type. Refer to [Table B-1](#).

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[1]	Main to interconnect harness	16-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right radio support bracket (FLH models) Inner fairing - right side below radio (FLT models)
[2]	Main to interconnect harness	12-place MX 150 Sealed (GY)	Gray	Inner fairing - left radio support bracket
[4]	P&A Accessory	4-place Deutsch DT Sealed (BK)	Black	Under seat
[5]	Main fuse	2-place Delphi 800 Metripack Sealed (BK)	Red	Under left side cover
[6]	Audio to interconnect harness	6-place Deutsch DT Sealed (BK)	Black	Inner fairing - left side of radio (FLH models) Inner fairing - right fairing support brace (FLT models)
[7]	Rear fender lights harness	8-place Tyco 070 Multilock Unsealed (BK)	Gray	Top of rear fender (under seat)
[12]	Tour-Pak lights (rear facia lamp on FLHX)	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak (inboard of upper frame tube on FLHX)
[13]	Fuel tank harness	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Behind fuel tank (under seat)
[15]	Main to interconnect harness	4-place Delphi 630 Sealed (BK)	Gray	Inner fairing - right fairing bracket (FLH models) Inner fairing - below radio (right side FLT models)
[18]	Right rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[19]	Left rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[20]	Console harness	16-place Molex MX 150 Sealed (BK)	Gray	Under seat
[21]	Indicator lamps	10-place Tyco 070 Multilock Unsealed (BK) (All except FLHR/C) 8-place Deutsch DTM Sealed (BK) (FLHR/C)	Gray Black	Inner fairing - above radio (All except FLHR/C) Under console (FLHR/C)
[22]	Interconnect to right handlebar switches	12-place Molex MX 150 Sealed (BK) (All except FLHR/C) 6-place Molex MX 150 Sealed (BK) (FLHR/C)	Gray	Inner fairing - right fairing support bracket (All except FLHR/C) Inside headlamp nacelle - fork stem nut lock plate (right side) (FLHR/C)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[24]	Interconnect to left handlebar switches	16-place Molex MX 150 Sealed (GY) (All except FLHR/C) 8-place Molex MX 150 Sealed (GY) (FLHR/C)	Gray	Inner fairing - left fairing support brace (All except FLHR/C) Inside headlamp nacelle - fork stem nut (left side) (FLHR/C)
[27]	Radio	23-place Tyco Superseal Sealed (BK)	Breakout Box	Inner fairing - back of radio (right side)
[28]	Radio	35-place Tyco Superseal Sealed (BK)	Breakout Box	Inner fairing - back of radio (left side)
[29]	HDI position lamp	Flag terminals	Gray	Back of headlamp
[30]	TSM/TSSM/HFSM	12-place Deutsch DT Sealed (GY)	Breakout Box	Under right side cover
[31]	Front turn signals	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside headlamp nacelle - fork stem nut lock plate (left side) (FLHR/C)
[31L]	Left front turn signal/auxiliary lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - left fairing support brace (outboard side) (FLH models) Inner fairing - left (outboard side) (FLT models)
[31R]	Right front turn signal/auxiliary lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - right fairing support brace (outboard side) (FLH models) Inner fairing - right (outboard side) (FLT models)
[32]	Front fender tip lamp jumper harness (DOM)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - below upper for bracket (left side) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[33]	Ignition Switch	3-place AutoFuse Unsealed (FLHR/C) Faston 250 Spade terminals (FLHX, FLHTK, FLHTC/U, FLTRX/U) (BK)	Red	Bottom of ignition switch (All except FLHR/C) Under console (FLHR/C)
[34]	Right front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of speaker)
[35]	Left front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of speaker)
[38]	Headlamp	Tyco Unsealed Spade (BK)	Gray	Inner fairing (back of headlamp) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[39]	Speedometer	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Inner fairing (back of speedometer) (FLHTC/U, FLHTK, FLHX) Instrument nacelle (back of speedometer) (FLT models) Back of speedometer (back of console) (FLHR/C)
[41]	Rear right speaker/passenger controls	6-place Molex MX 150 Sealed (BK)	Black	Inside rear right speaker box
[42]	Rear left speaker/passenger controls	6-place Molex MX 150 Sealed (BK)	Black	Inside rear left speaker box
[45]	Rear fender tip lamp (DOM)	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[47]	Stator	3-place Dekko (BK)	Green	Bottom of voltage regulator (left side)
[50]	CB antenna cable			Inner fairing - back of CB module
[51]	Radio antenna cable			Inner fairing - back of radio (left side)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[52]	Radio antenna cable to mast			Inside of Tour-Pak
[53]	Console pod	12-place Deutsch DTM Sealed (BK)	Black	Rear of battery box (under seat)
[64]	Fuse block/relays	Delphi PED 280 Unsealed	Gray	Under left side cover
[65]	VSS	3-place Delphi GT 150 Sealed (BK)	Gray	Top of transmission case (under starter)
[67]	Accessory switch	4-place Tyco Mate-N-lok Unsealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)
[73]	Auxiliary lamps	2-place Tyco 070 Multilock Unsealed (W)	Gray	Inside headlamp nacelle (FLHR/C)
[76]	Passenger headset	7-place DIN (BK)		Below rear left speaker box
[77]	Voltage regulator	2-place Dekko (BK)	Green	Bottom of voltage regulator (right side)
[78]	ECM	73-place Delphi Micro 64 Sealed (BK)	Breakout Box	Under seat
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Rear of lower front frame cross-member
[80]	TMAP sensor	4-place Bosch Compact 1.1M Sealed (BK)	Gray	Top of induction module
[83]	Ignition coil	4-place Delphi GT 150 Sealed (BK)	Gray	Bottom front of battery tray
[84]	Front fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[85]	Rear fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[90]	ET sensor	2-place Delphi GT 150 Sealed (BK)	Gray	Back of front cylinder (left side)
[91]	DLC	4-place Deutsch DT Sealed (GY)	Black	Under left side cover
[93]	Tail lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi 150 Metripack Sealed (BK)	Purple	Under seat
[105]	Fairing cap switches	12-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - above upper fork bracket (right side)
[105A, 105B]	Interconnect to nacelle switch harness	12-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside instrument nacelle (under bezel) (FLT models)
[105C, 105D]	Nacelle switch harness to speaker switch	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside instrument nacelle (under bezel) (FLT models)
[107]	Ambient Air Temperature (AAT) sensor	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Steering head, left side (FLHTC/U, FLHTK) Inside instrument nacelle (under bezel) (FLT models)
[108]	Tachometer	12-place Delphi Micro 64 Sealed (GY)	Breakout Box Red	Inner fairing (back of tachometer) (FLH models) Instrument nacelle (back of tachometer) (FLT models)
[109]	Auxiliary lamps switch	4-place Tyco Mate-N-Lok Unsealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[110]	Voltmeter lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of voltmeter)
[111]	Voltmeter	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of voltmeter)
[112]	Oil pressure gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of oil pressure gauge)
[113]	Oil pressure gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of oil pressure gauge)
[114]	Air temperature gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of air temperature gauge)
[115]	Air temperature gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of air temperature gauge)
[116]	Fuel gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of fuel gauge)
[117]	Fuel gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of fuel gauge) (All except FLHR/C) Bottom fuel tank left side (FLHR/C)
[120]	Oil pressure switch	Push On Right Angle Molded terminal (BK)	Black	Front right crankcase (FLHR/C)
[121]	Rear stop lamp switch	Tyco Insulated Spade terminals (BK)	Red	Mid-chassis, lower right side between frame and exhaust pipe)
[122]	Horn	Flag terminals (BK)	Red	Between cylinders (left side)
[128]	Starter solenoid	Delphi 56 Spade terminal (W)	Red	Top of starter
[131]	Neutral switch	Push On Right Angle Molded terminals (BK)		Top of transmission (right side)
[132]	Cigar lighter	Tyco Insulated Spade terminals	Red	Inner fairing
[133]	Jiffy stand sensor (if equipped)	3-place Molex MX 150 Sealed (BK)		Rear of lower front frame cross-member.
			Gray	HDI: Rear of lower front frame crossmember.
[134]	Sidecar BAS	3-place Delphi GT 150 Sealed	Gray	Under seat
[137]	HO2 sensor rear exhaust header	4-place Molex MX 150 Sealed (BK)	Gray	Under right side cover
[138]	HO2 sensor front exhaust header	4-place Molex MX 150 Sealed (GY)	Gray	Under right side cover
[139]	Oil pressure sender	4-place Delphi 150 Metripack Sealed (BK)	Gray	Front right crankcase (FLHX, FLHTK, FLHTC/U, FLTR/U/X)
[141]	Fuel pump and fuel level sender	4-place Delphi GT 280 Sealed (BK)	Gray	Under console on top of fuel tank canopy
[142]	Security siren (optional)	3-place Delphi GT 150 Sealed (BK)	Gray	Under left side cover
[143]	Front fender tip lamp (if equipped)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Under front fender tip lamp bracket
[149]	Audio amplifier	24-place Tyco Ampseal Sealed (BK)		Under Tour-Pak
[158]	Left handlebar switches (cruise control)	3-place Molex MX 150 Sealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)
[159]	Right handlebar switches (cruise control)	3-place Molex MX 150 Sealed (GY)	Gray	Inside headlamp nacelle (FLHR/C)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[160]	B+	1-place Delphi 480 Metripack Unsealed (GY)	Red	Under seat
[166]	ABS module	20-place Molex MX 150 Sealed (BK)	Breakout Box	Under right side cover
[167]	Front WSS	2-place Delphi 150 Metripack Sealed (BK)	Gray	Inner fairing - below upper fork bracket (left side) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[168]	Rear WSS	2-place Delphi 150 Metripack Sealed (BK)	Gray	Under right side cover
[179]	Active exhaust actuator (if equipped)	5-place Tyco Superseal 1.5 Sealed (BK)	Gray	HDI: Under right side cover
[184]	CB module	12-place Deutsch (BK)	Black	Inner fairing - left side of radio (FLHTC/U, FLHTK, FLHX)
[185]	XM module, antenna	12-place Deutsch DTM Sealed (BK)	Black	Inner fairing - back of radio
[187]	Hands-free module	8-place Deutsch DTM Sealed (BK)	Black	Inner fairing
[189]	Heated handgrip to main harness	3-place Tyco 040 Unsealed		Inside outer fairing, left side (FLHTK)
[201]	ABS diode	4-place Deutsch DT Sealed (BK)	Black	Under left side cover (below fuse box)
[203F]	ACR (front)	2-place Tyco Superseal 1.5 Sealed		Bracket attached to the throttle body
[203R]	ACR (rear)	2-place Tyco Superseal 1.5 Sealed		Bracket attached to the throttle body
[204]	TGS harness	6-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right fairing support bracket (FLHT/C/K, FLHX) Inner fairing - right side below radio (FLT models) Inside headlamp nacelle - fork stem nut lock plate (FLHR/C)
[206]	Heated handgrip interconnect	2-place Tyco 040 Unsealed		Inside outer fairing, right side (FLHTK)
[208]	HFSM antenna jumper harness	4-place Deutsch DT Sealed (GY)	Black	Under right side cover
[209]	HFSM antenna	2-place Molex MX 64 Unsealed (BK)	Gray	Under seat
[211]	TCA	6-place Molex MX 150 Sealed (BK)	Gray	Right side of engine (induction module)
[222]	Console ignition switch interconnect	4-place Delphi 630 Sealed (BK)	Gray	Under seat (FLHR/C)
[224]	TGS	7-place Tyco Mini Multilock (BK)		Handlebar throttle (inside right side handlebar)
[226]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module (FLHX, FLTRX)
[237]	Right heated grip	2-place Tyco 040 Unsealed		Inside handlebars, right side
[257]	Rear lighting jumper harness	6-place Molex MX 150 Sealed (BK)	Gray	Under left side cover

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[258]	Power outlet	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak (FLHTK)
[262]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module (FLHX, FLTRX)
[GND1] [GND1A] [GND2]	Harness grounds	Ring terminals		Under seat



WIRING DIAGRAMS

B.2

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.

For Striped Wires: The code is written with a slash (/) between the solid color code and the stripe code. 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 []. The letter inside the brackets identifies whether the housing is a socket or pin housing.

A=Pin: The letter A and the pin symbol after a connector number identifies the pin side of the terminal connectors.

B=Socket: The letter B and the socket symbol after a connector number identifies the socket side of the terminal connectors. Other symbols found on the wiring diagrams include the following:

Diode: The diode allows current flow in one direction only in a circuit.

Wire break: The wire breaks are used to show option variances or page breaks.

No Connection: Two wires crossing over each other in a wiring diagram that are shown with no splice indicating they are not connected together.

Circuit to/from: This symbol is used to identify there is a more complete circuit diagram on another page. The symbol is also identifying the direction of current flow.

Splice: Splices are where two or more wires are connected together along a wiring diagram. The location of the splice indicated in the wiring diagram is not the true location of the splice in the actual harness but to identify that the wires are spliced to that circuit.

Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules. These grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit. The dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

Twisted pair: This symbol indicates the two wires are twisted together in the harness. This minimizes the circuit's electromagnetic interference from external sources. If repairs are necessary to these wires they should remain as twisted wires.

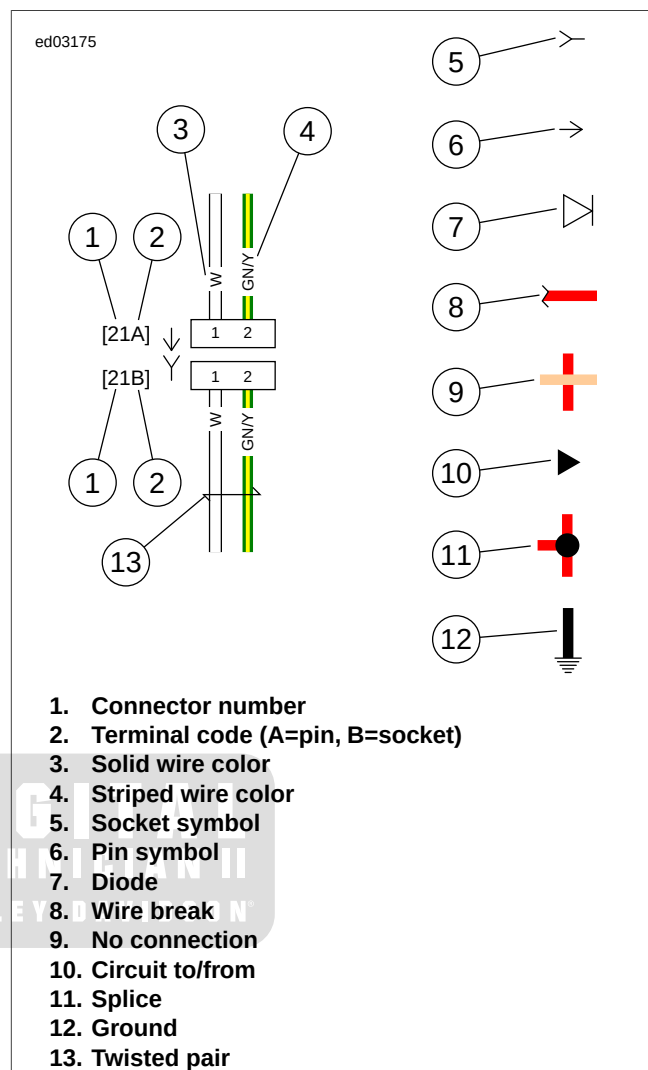


Figure B-1. Connector/Wiring Diagram Symbols

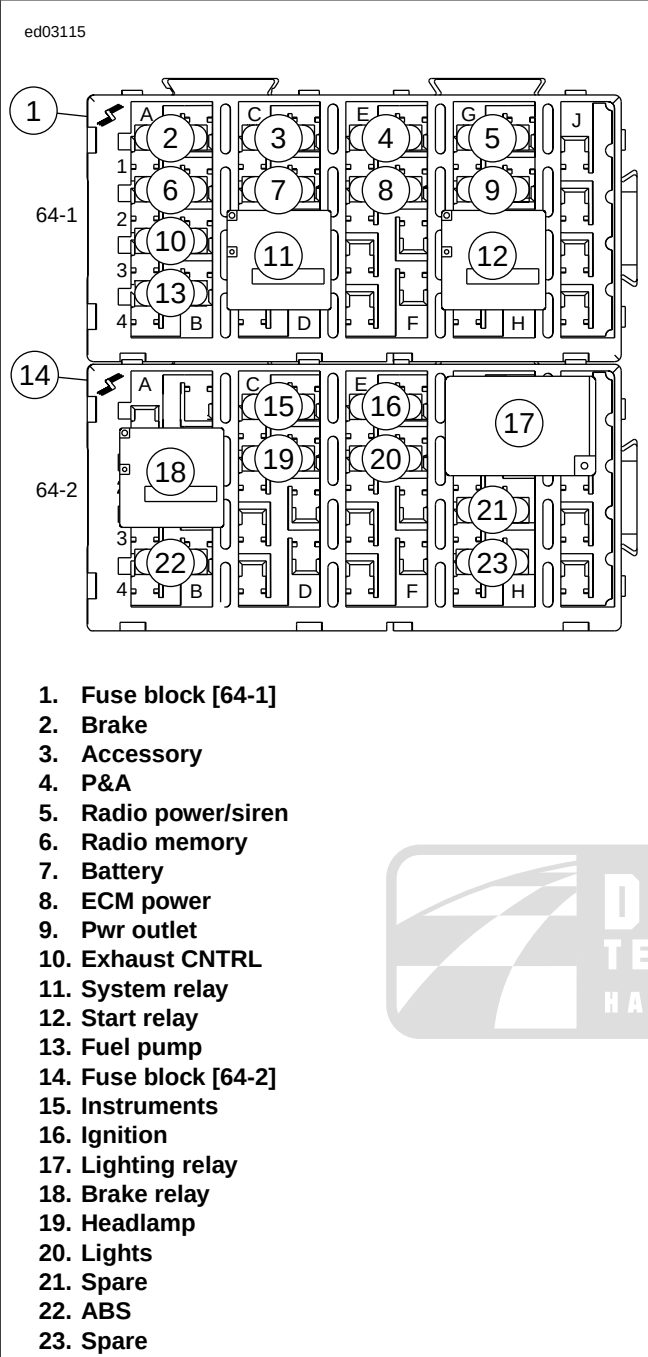


Figure B-2. Fuse Block and Socket Terminals

Table B-2. Wire Color Codes

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

2011 TOURING WIRING DIAGRAMS

Wiring Diagram List

DIAGRAM	LOCATION
Battery Power: FLHR/C	Figure B-3
Battery Power: Except FLHR/C	Figure B-4
Ignition Power: FLHR/C	Figure B-5
Ignition Power: Except FLHR/C	Figure B-6
Accessory Power: FLHR/C	Figure B-7
Accessory Power: Except FLHR/C	Figure B-8
Sensor Grounds	Figure B-9
Right GND2: FLHR/C	Figure B-10
Right GND2: Except FLHR/C	Figure B-11
Left GND1: FLHR/C	Figure B-12
Left GND1: 2011 Touring (Except FLHR/C)	Figure B-13
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS	Figure B-14
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS	Figure B-15
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS	Figure B-16
MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS	Figure B-17
MAIN HARNESS (5 OF 5): 2011 Touring	Figure B-18
Fairing Harness: 2011 Touring	Figure B-19
Indicators, Fairing Switches, Handlebar Switches: 2011 Touring	Figure B-20
Starting Circuit: 2011 Touring	Figure B-21
Rear Lighting, Charging System: 2011 Touring	Figure B-22
Front Lighting, Console Harness, ABS: 2011 Touring	Figure B-23
Security Circuit: 2011 Touring	Figure B-24
Security Circuit: 2011 Touring With Anti-Theft Tracking Module	Figure B-25
Ultra Radio RF Interconnect Circuit: 2011 Touring	Figure B-26
Classic Radio Circuit: 2011 Touring	Figure B-27
Ultra Radio Circuit: 2011 Touring	Figure B-28
2-Place Intercom and Headset Audio: 2011 Touring	Figure B-29
CAN and Module Audio Inputs to Ultra Radio: 2011 Touring	Figure B-30



em00852

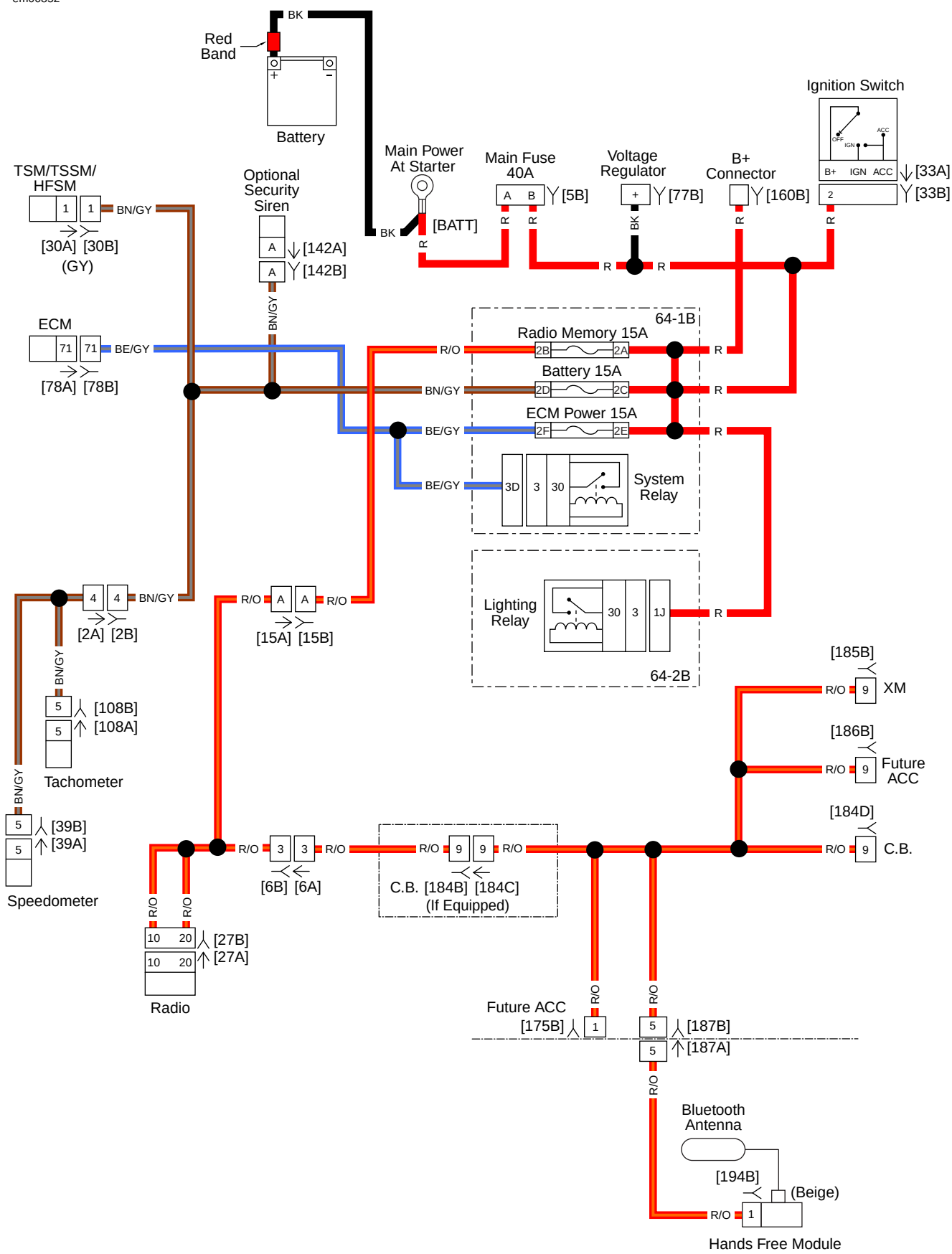


Figure B-4. Battery Power: Except FLHR/C

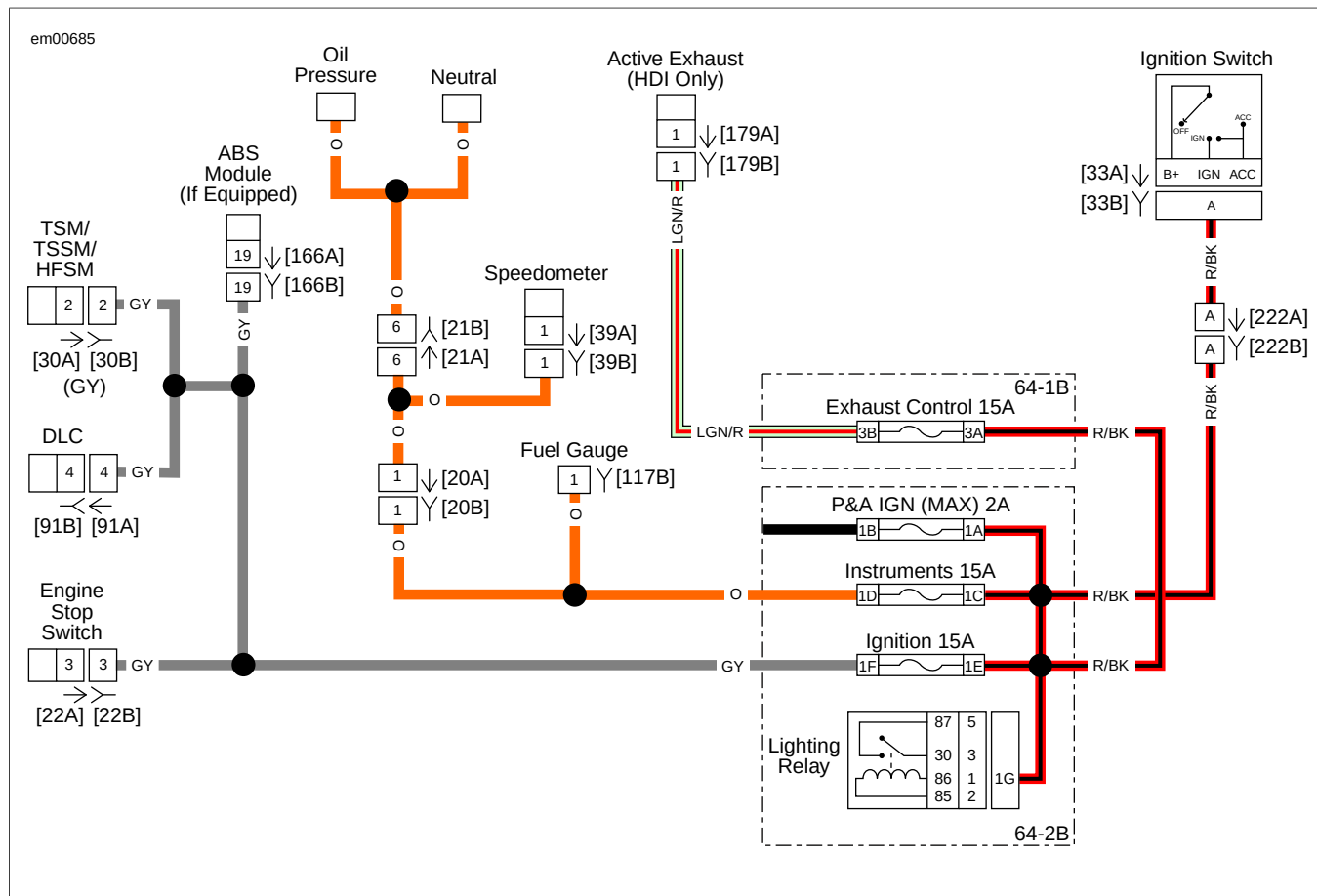


Figure B-5. Ignition Power: FLHR/C

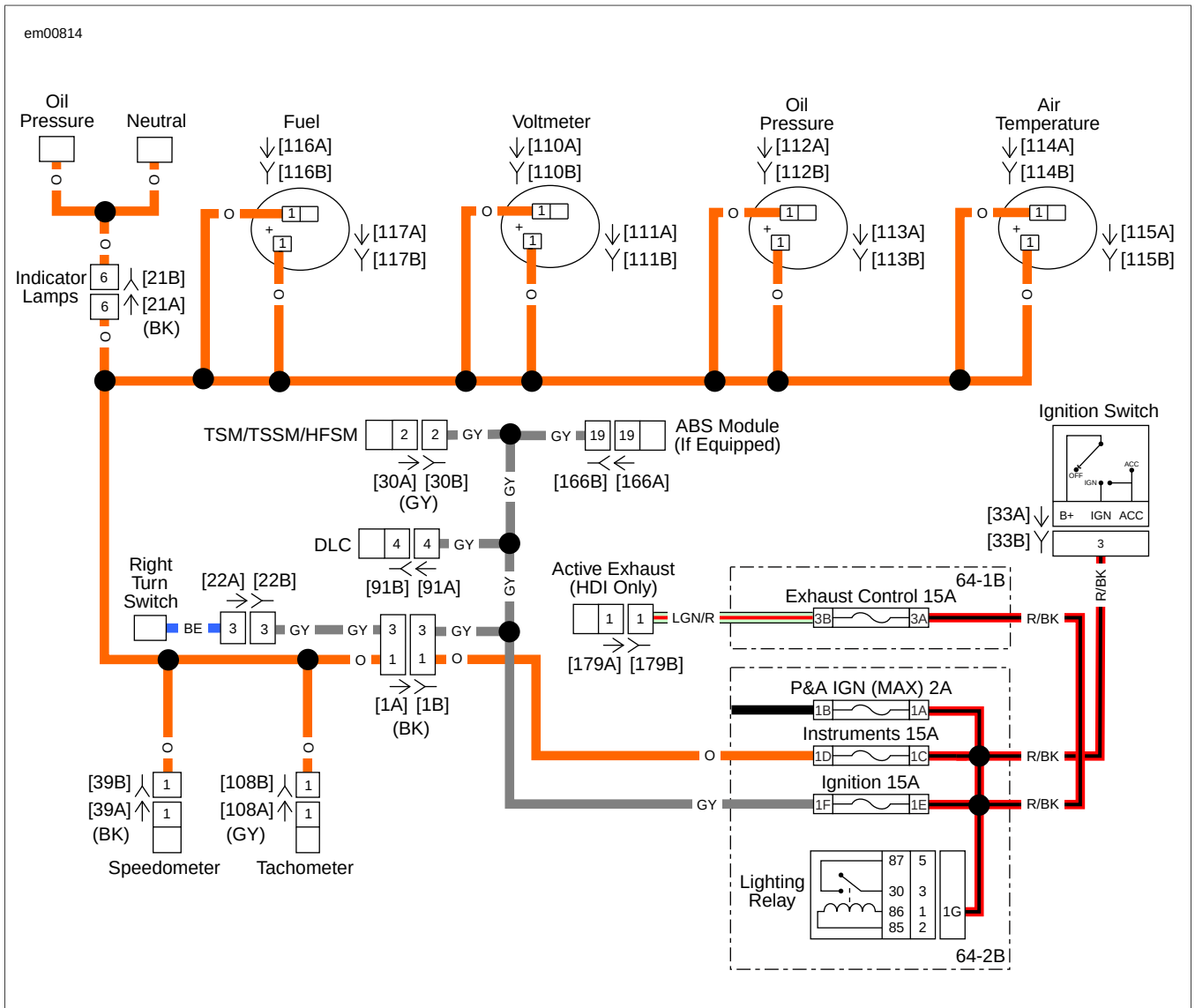


Figure B-6. Ignition Power: Except FLHR/C

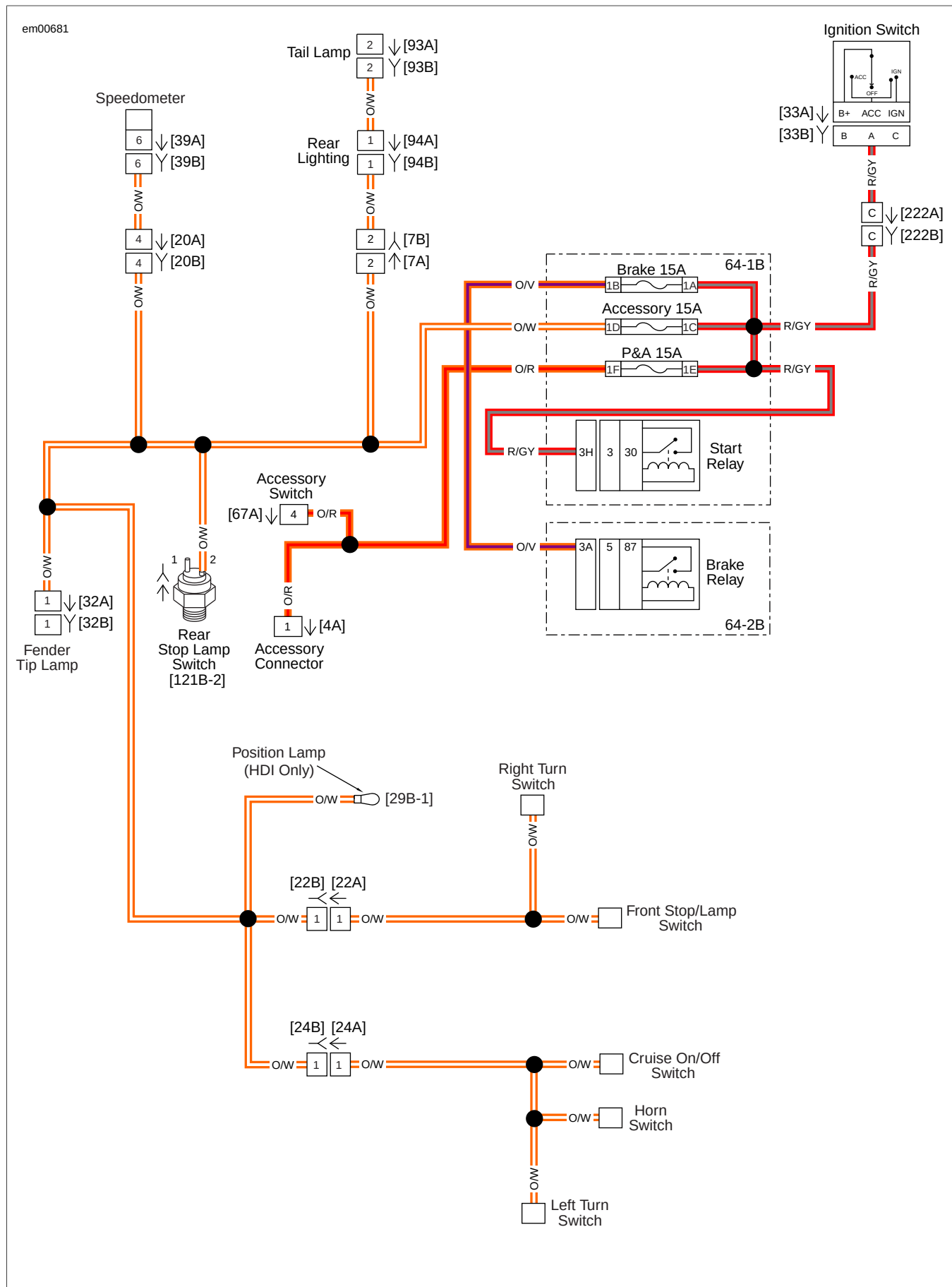


Figure B-7. Accessory Power: FLHR/C

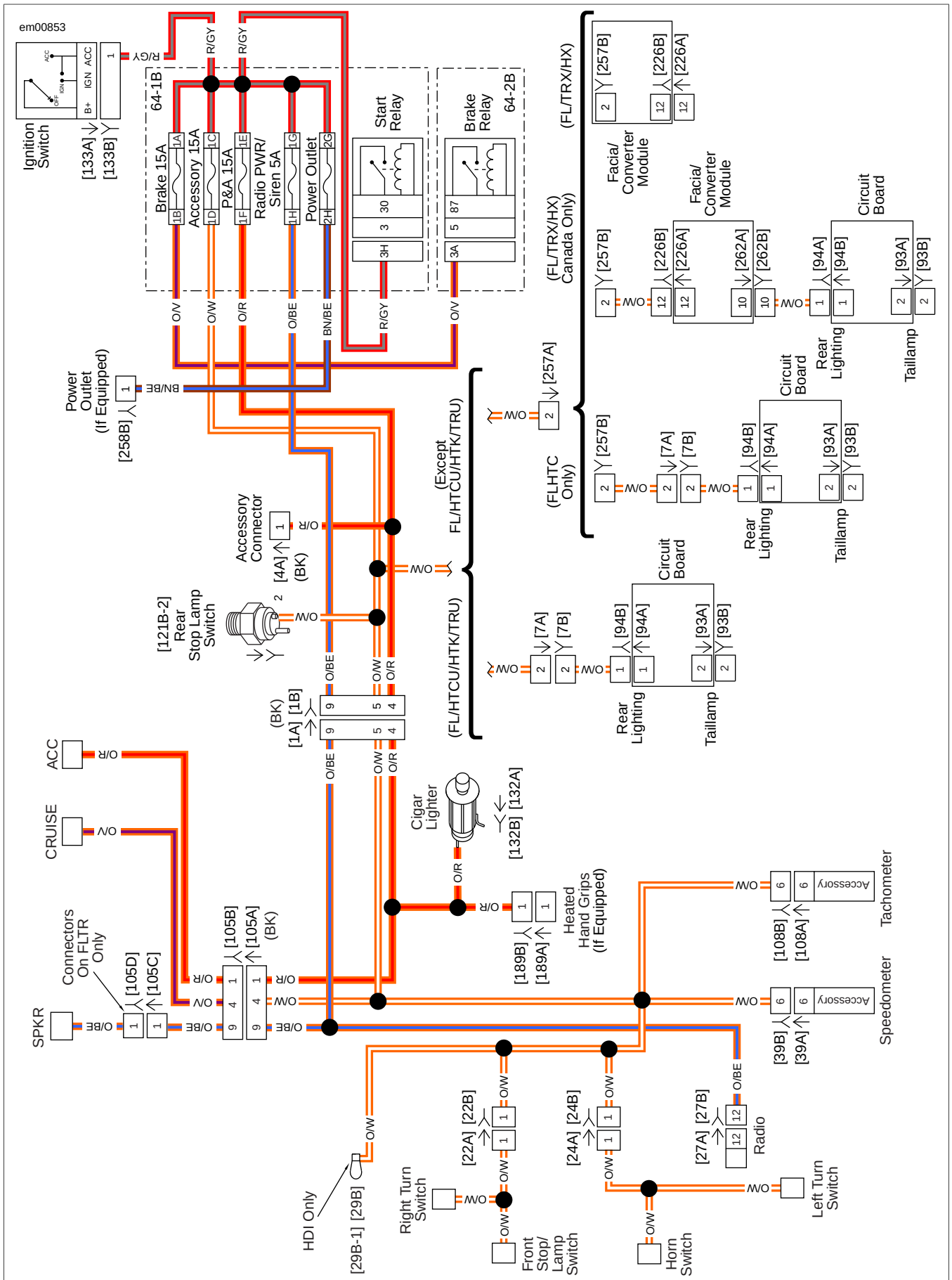


Figure B-8. Accessory Power: Except FLHR/C

em00679

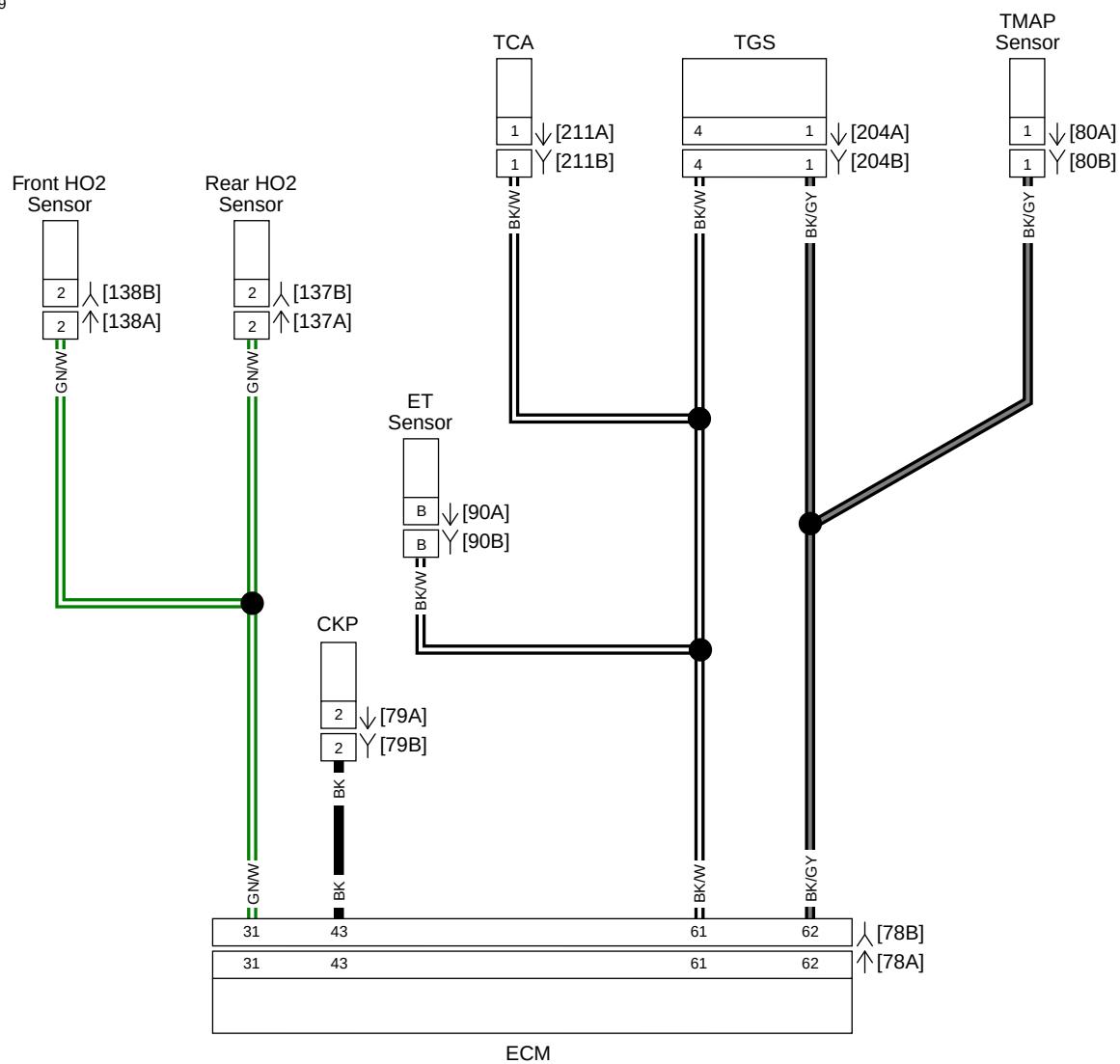


Figure B-9. Sensor Grounds

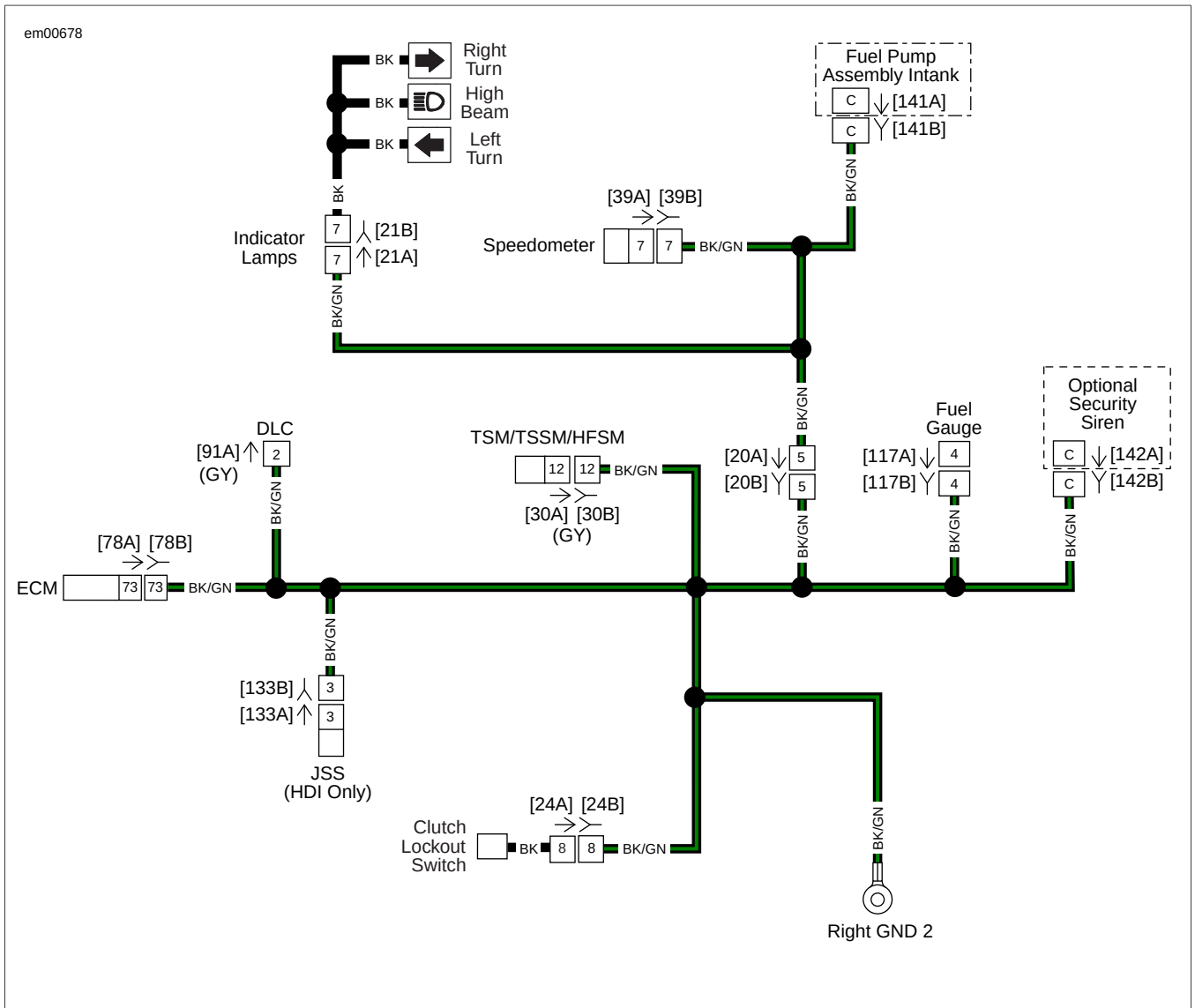


Figure B-10. Right GND2: FLHR/C

em00854

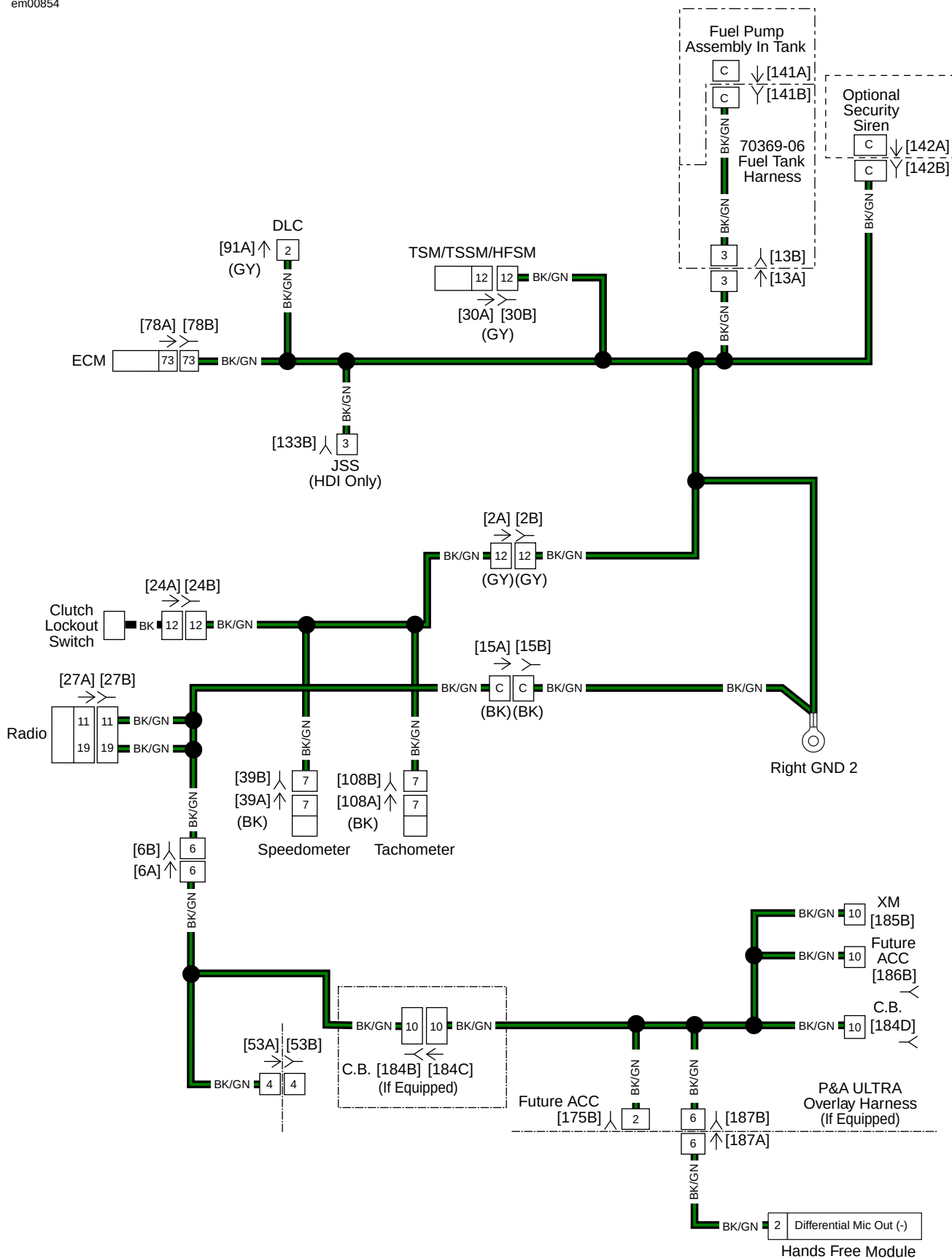


Figure B-11. Right GND2: Except FLHR/C

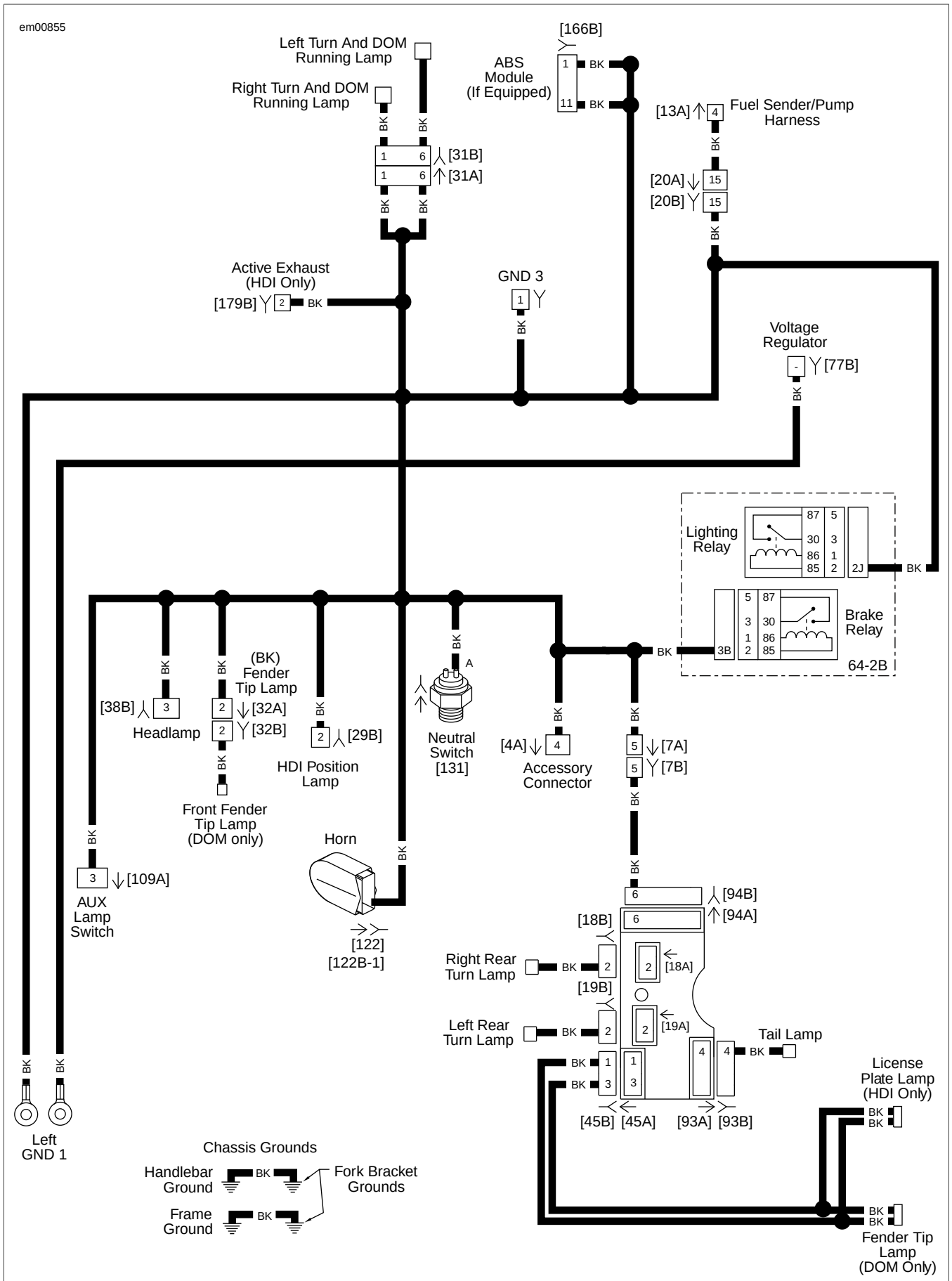


Figure B-12. Left GND1: FLHR/C

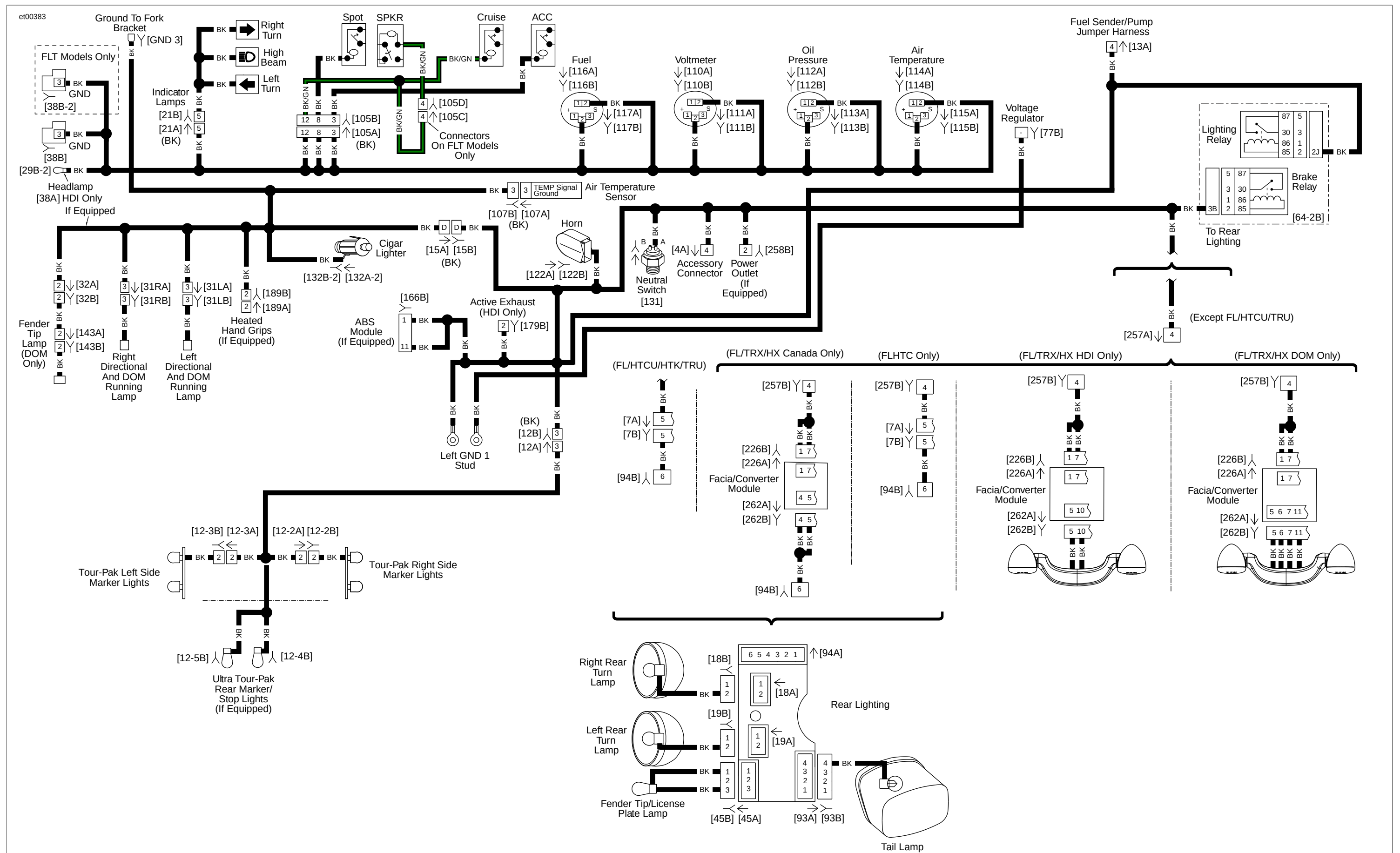


Figure B-13. Left GND1: 2011 Touring (Except FLHR/C)

Figure B-13.
Left GND1: 2011 Touring (Except FLHR/C)

Figure B-13.
Left GND1: 2011 Touring (Except FLHR/C)

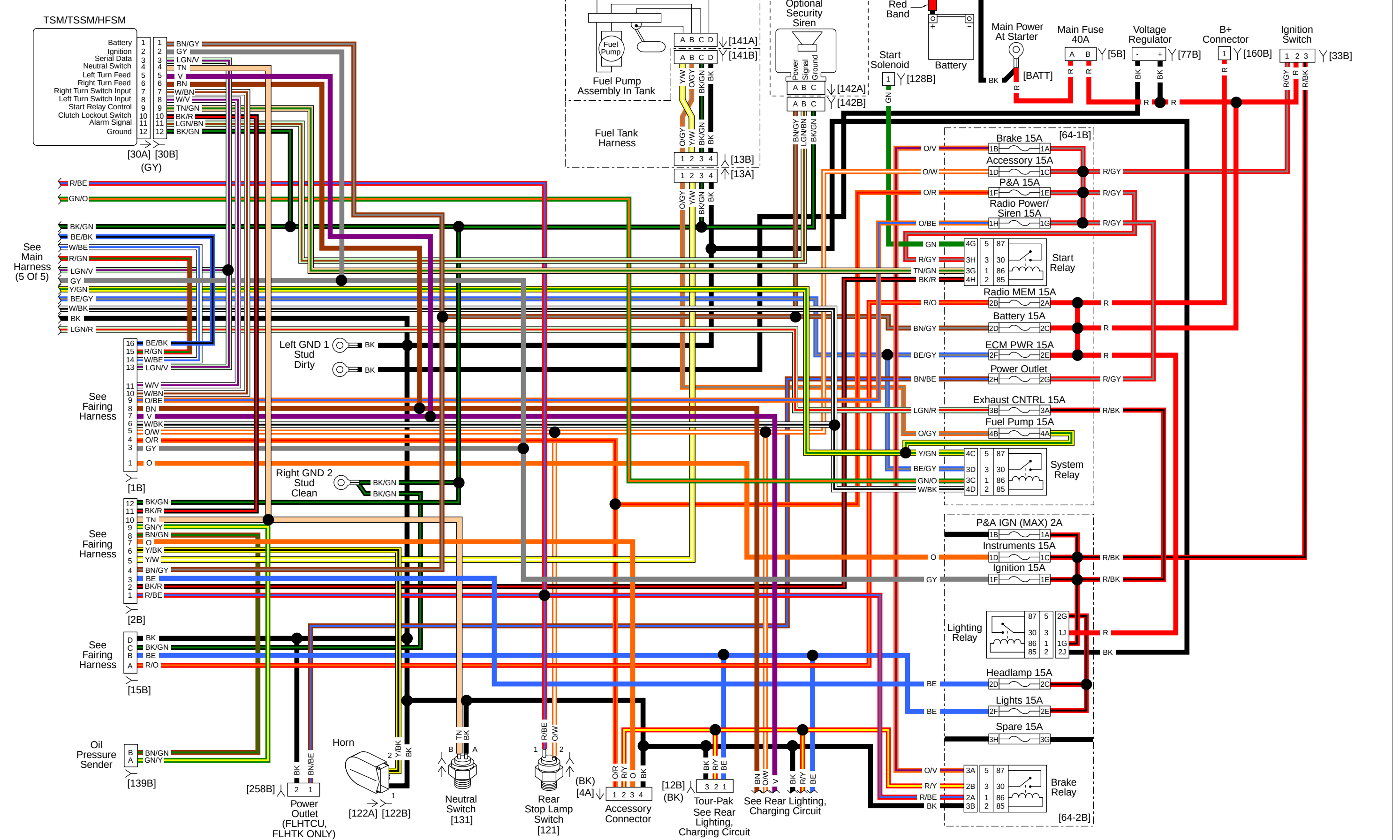


Figure B-14. MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS

Figure B-14.
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C)
without ABS

Figure B-14.
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C)
without ABS

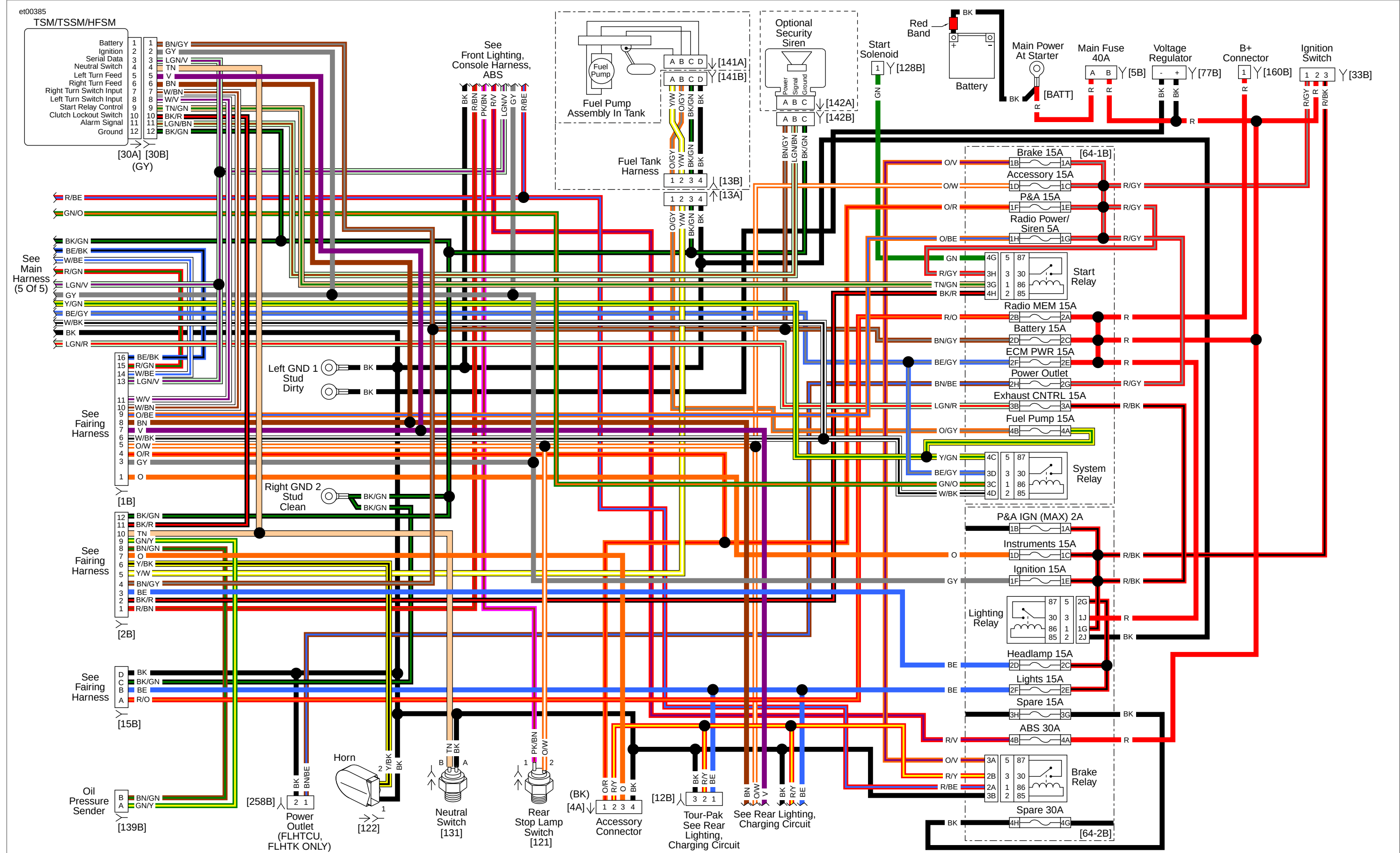


Figure B-15. MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS

Figure B-15.
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C)
with ABS

Figure B-15.
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C)
with ABS

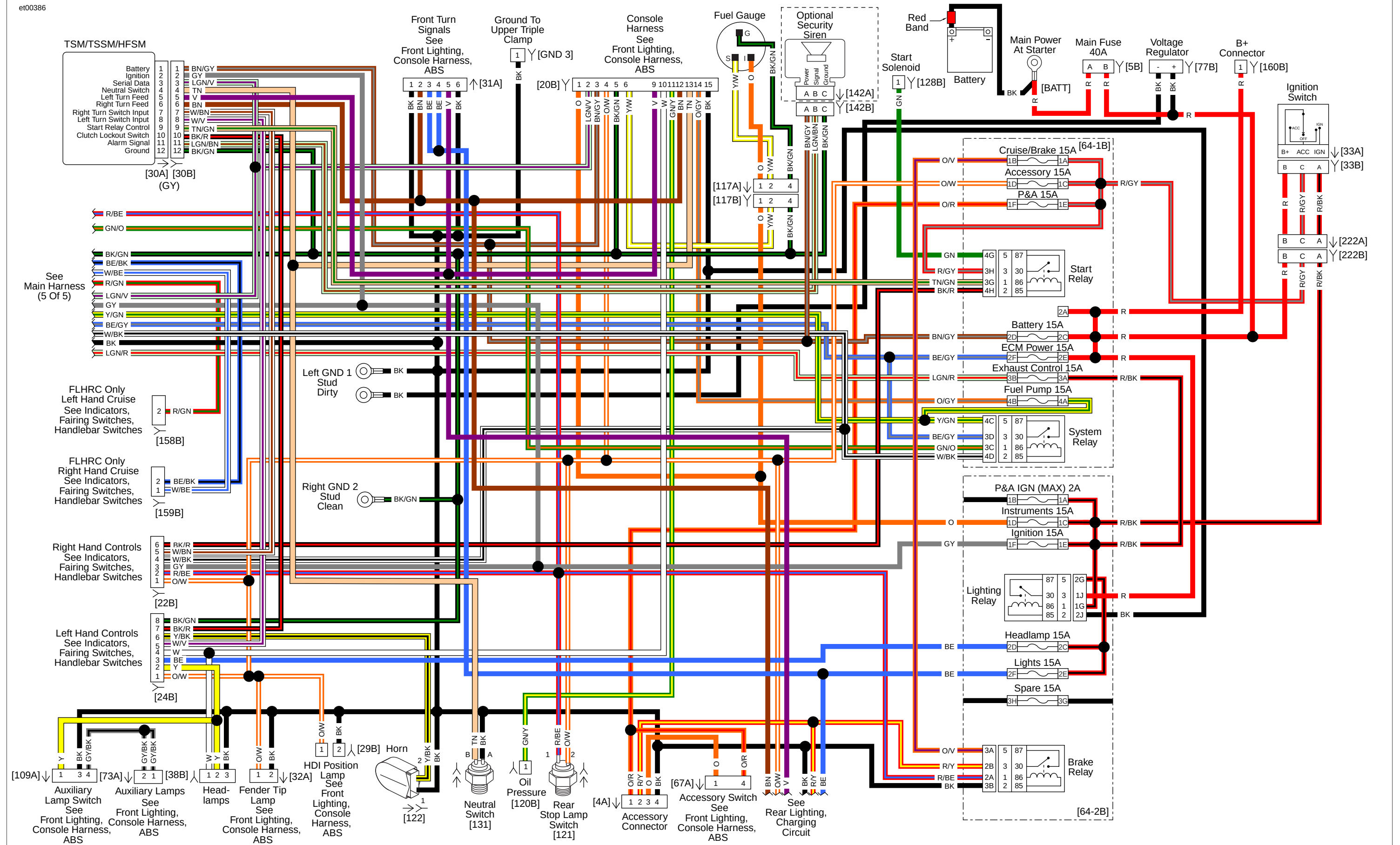


Figure B-16. MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS

Figure B-16.
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without
ABS

Figure B-16.
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without
ABS

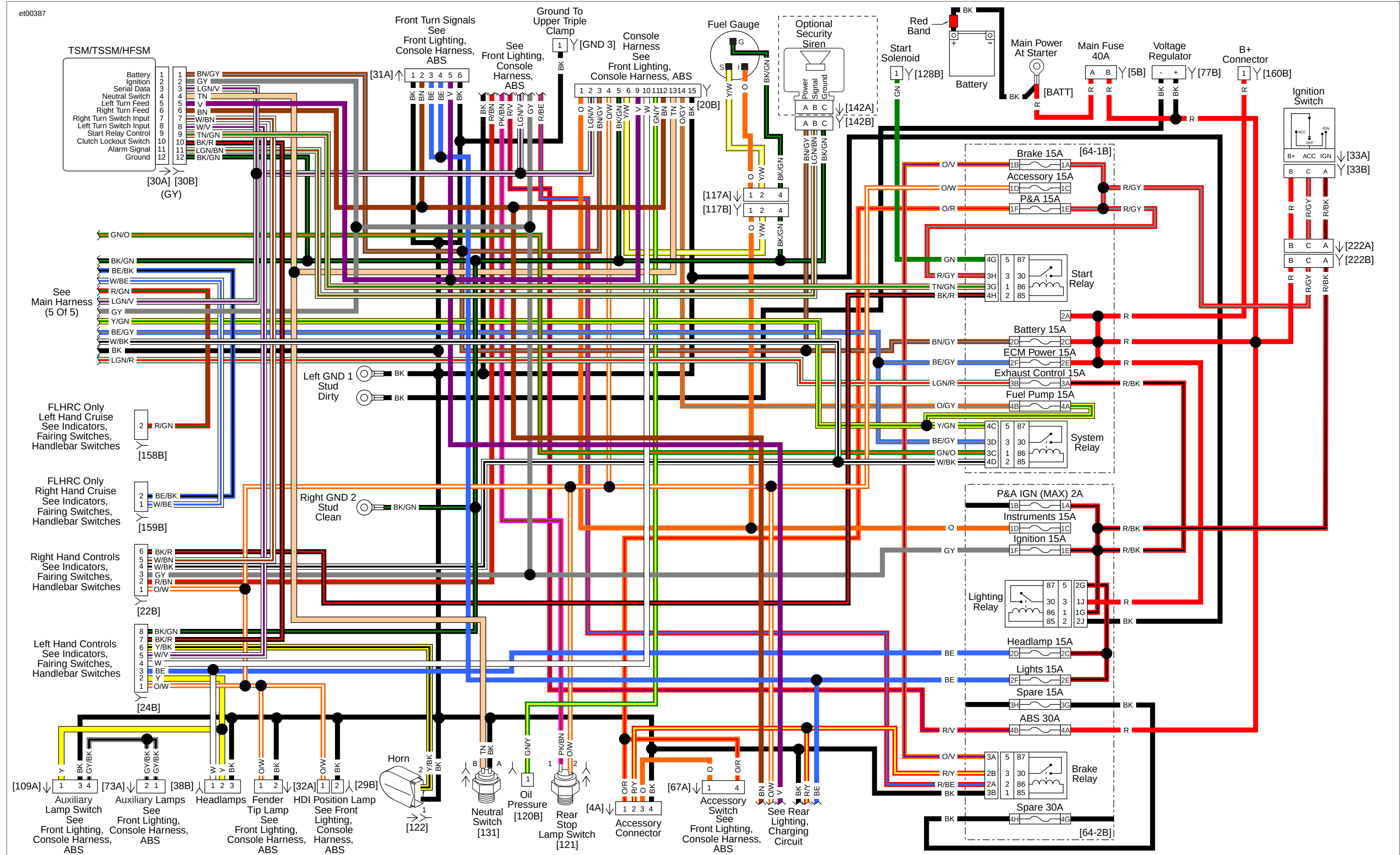


Figure B-17. MAIN HARNESS (4 OF 5): 2011 Touring (FLHRC) with ABS

Figure B-17.

MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS

Figure B-17.

MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS

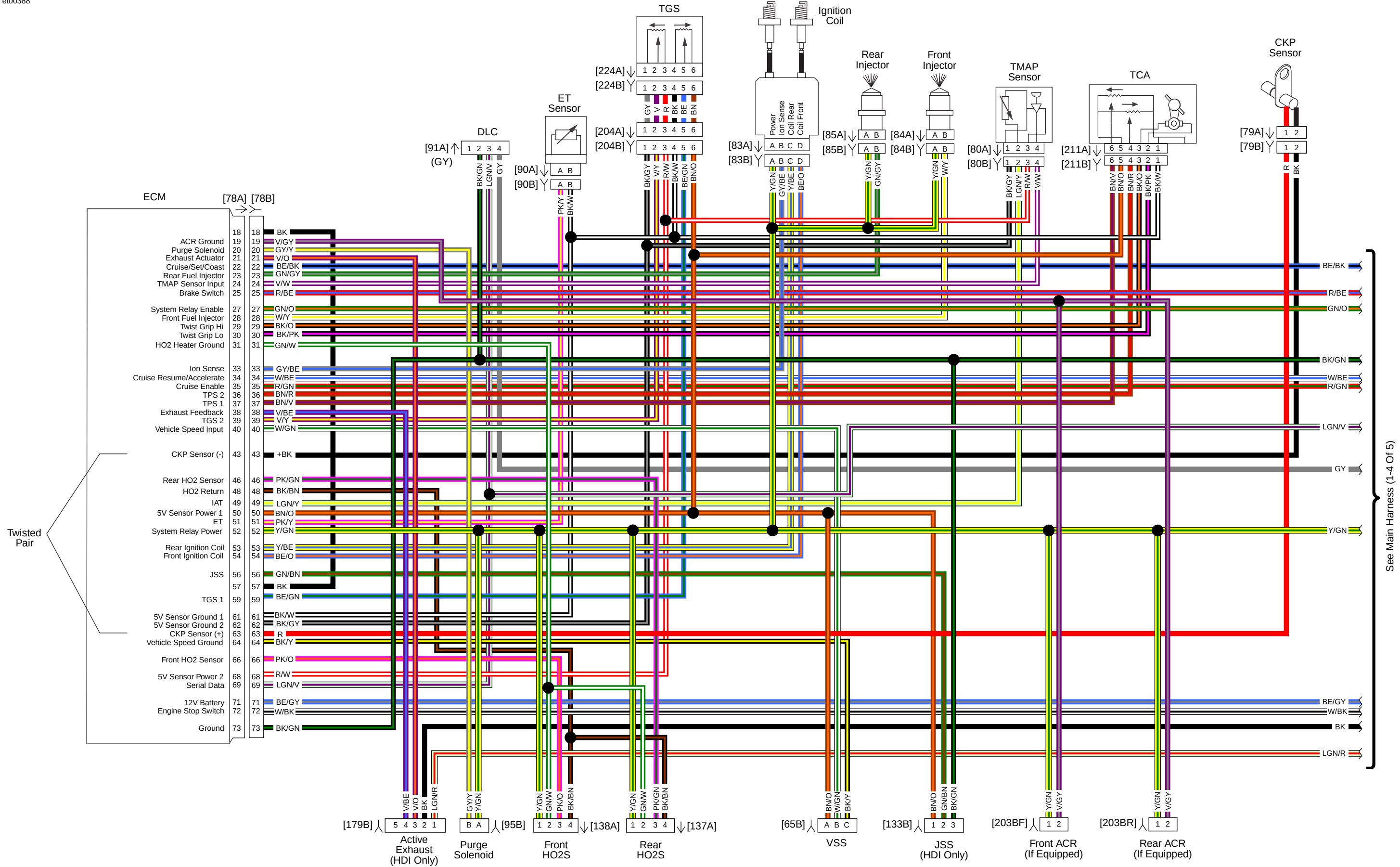


Figure B-18. MAIN HARNESS (5 OF 5): 2011 Touring

Figure B-18.
MAIN HARNESS (5 OF 5): 2011 Touring

Figure B-18.
MAIN HARNESS (5 OF 5): 2011 Touring

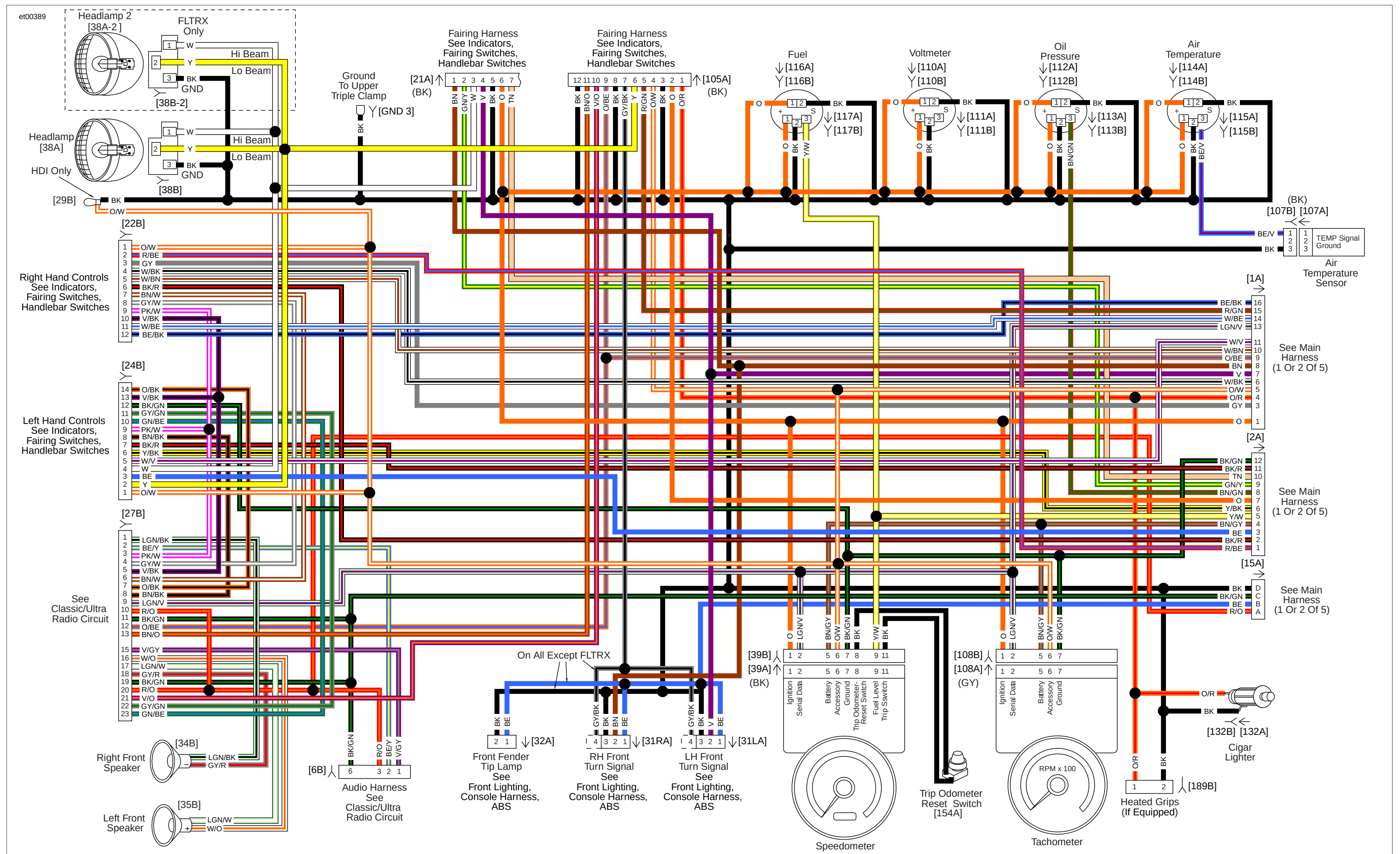


Figure B-19. Fairing Harness: 2011 Touring

Figure B-19.
Fairing Harness: 2011 Touring

Figure B-19.
Fairing Harness: 2011 Touring

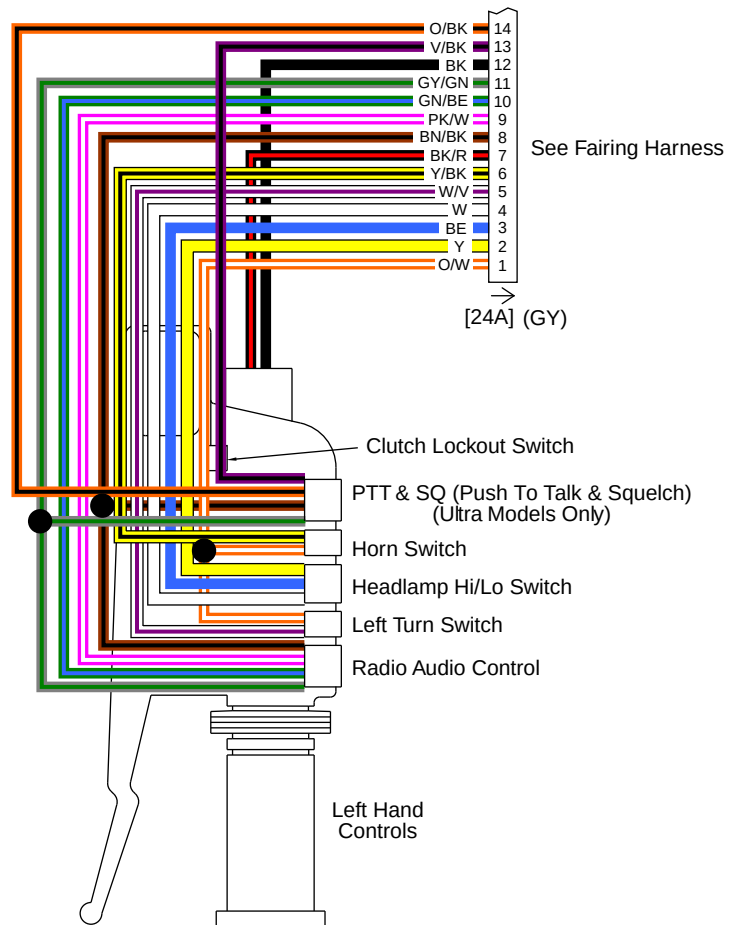
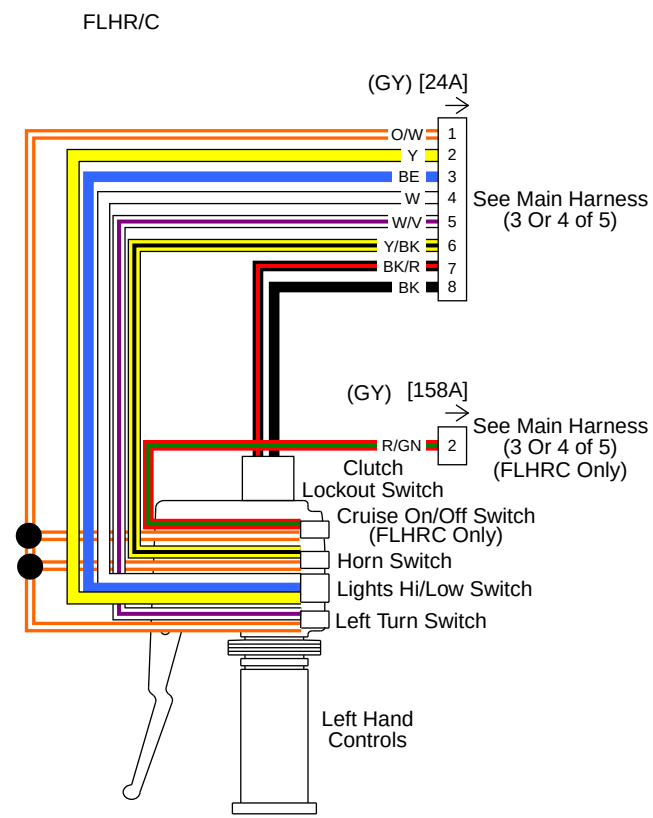
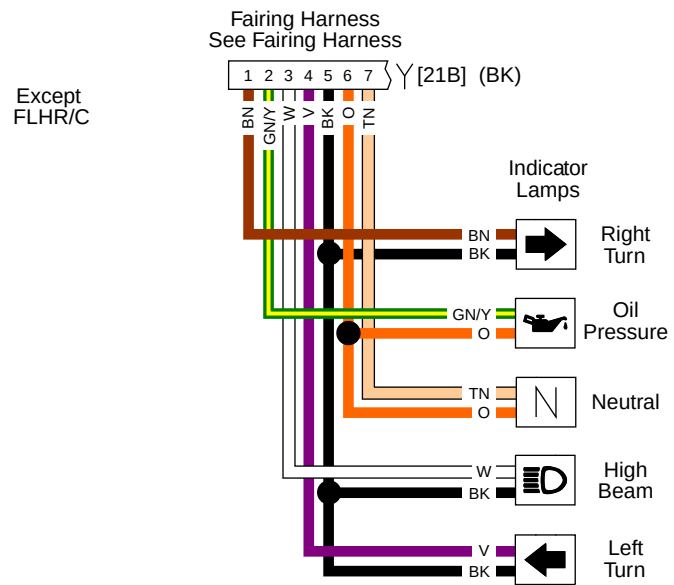
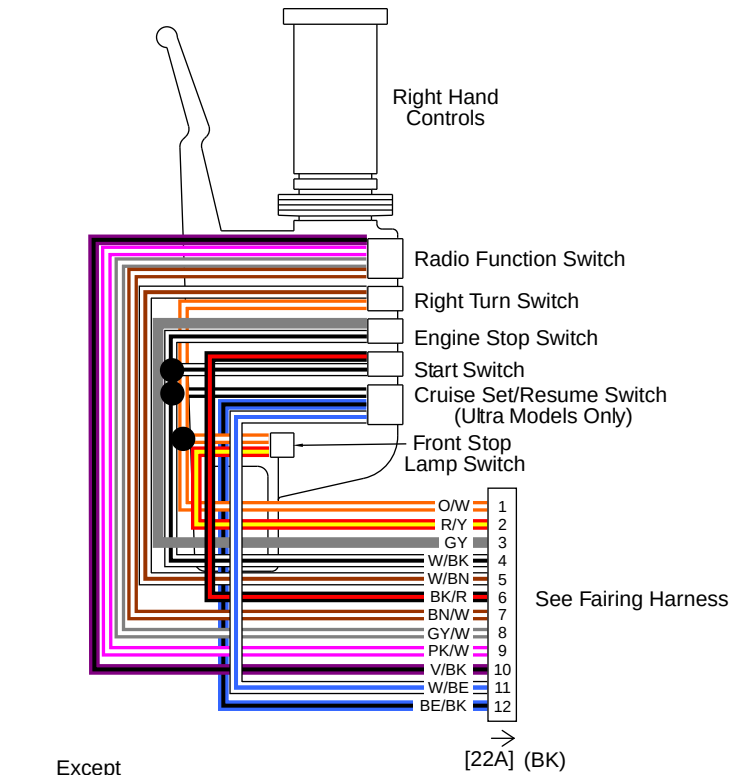
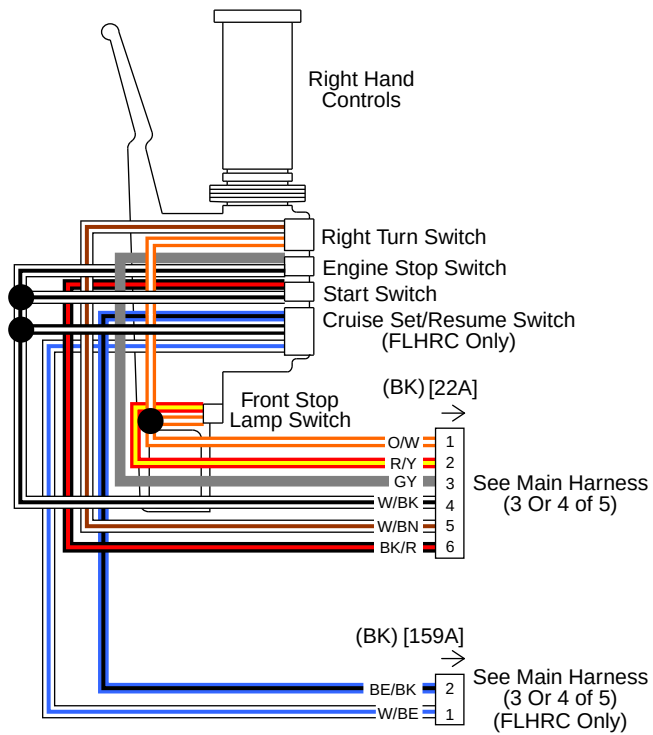
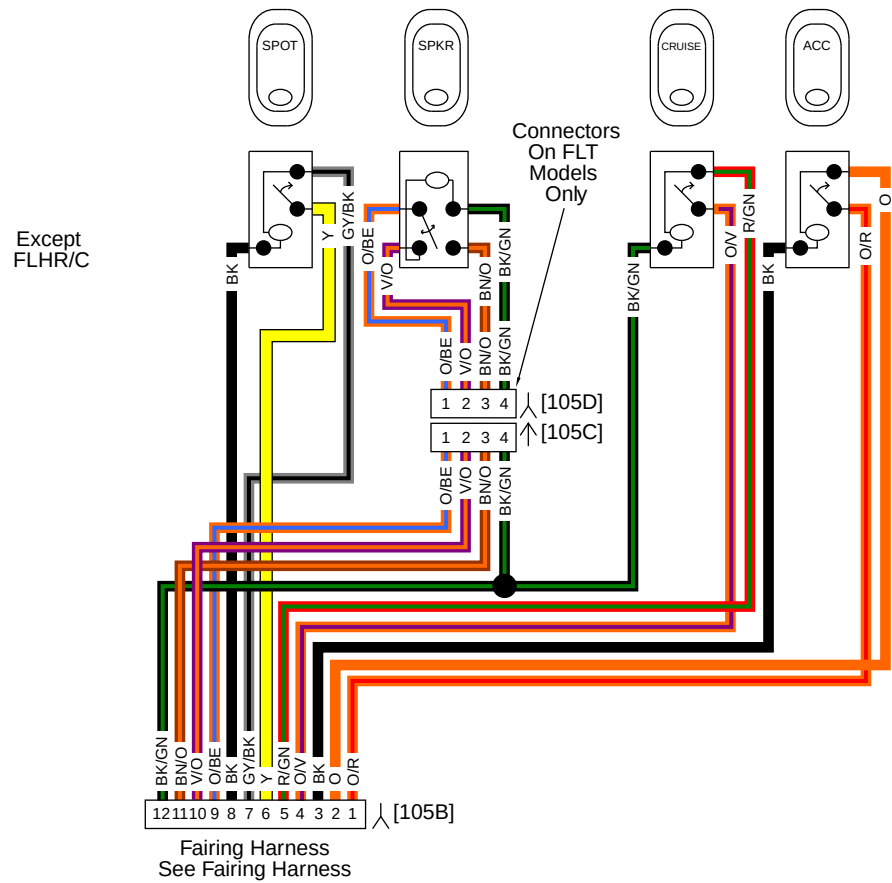


Figure B-20. Indicators, Fairing Switches, Handlebar Switches: 2011 Touring

Figure B-20.
Indicators, Fairing Switches, Handlebar Switches: 2011
Touring

Figure B-20.
Indicators, Fairing Switches, Handlebar Switches: 2011
Touring

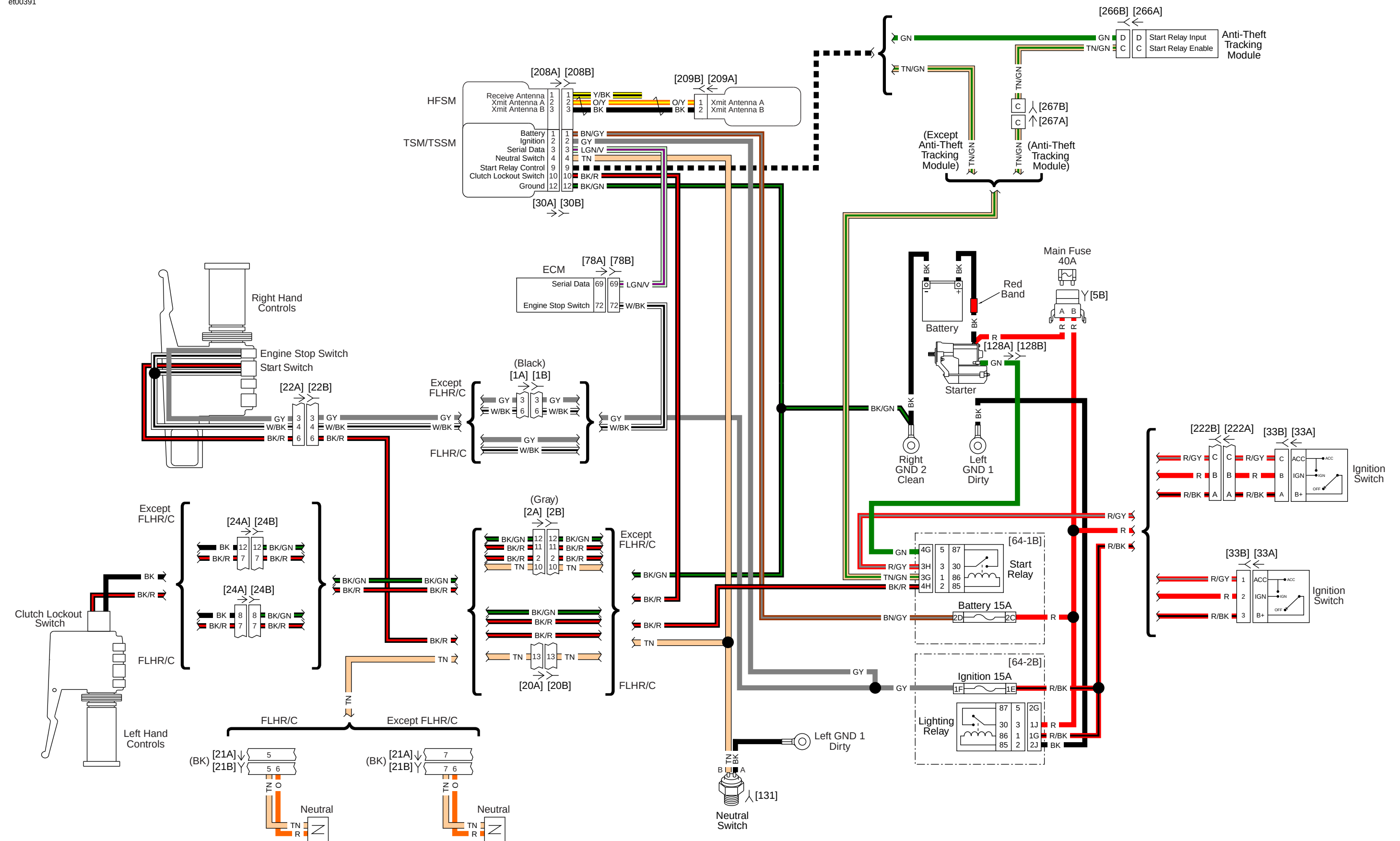


Figure B-21. Starting Circuit: 2011 Touring

Figure B-21.
Starting Circuit: 2011 Touring

Figure B-21.
Starting Circuit: 2011 Touring

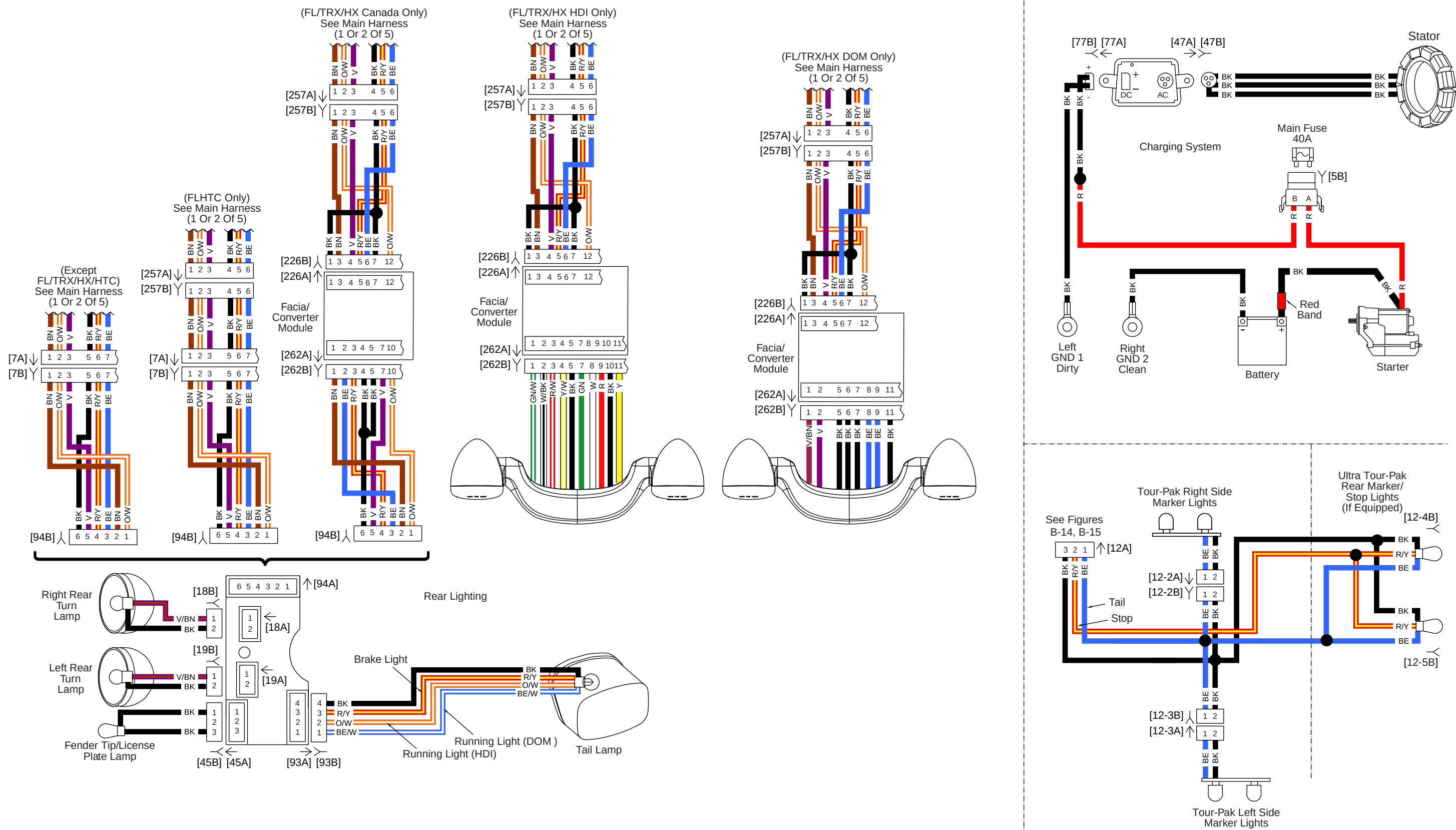


Figure B-22. Rear Lighting, Charging System: 2011 Touring

Figure B-22.
Rear Lighting, Charging System: 2011 Touring

Figure B-22.
Rear Lighting, Charging System: 2011 Touring

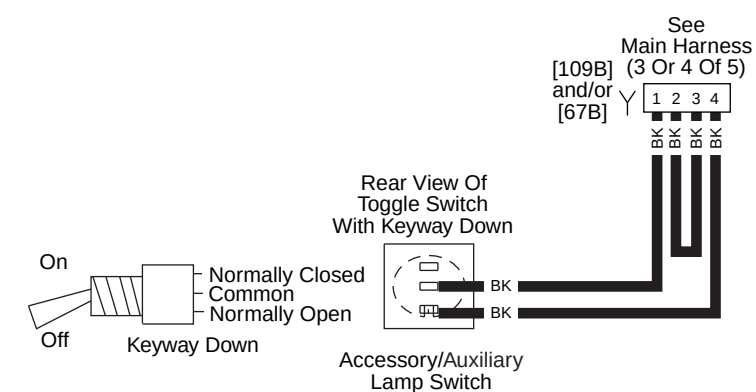
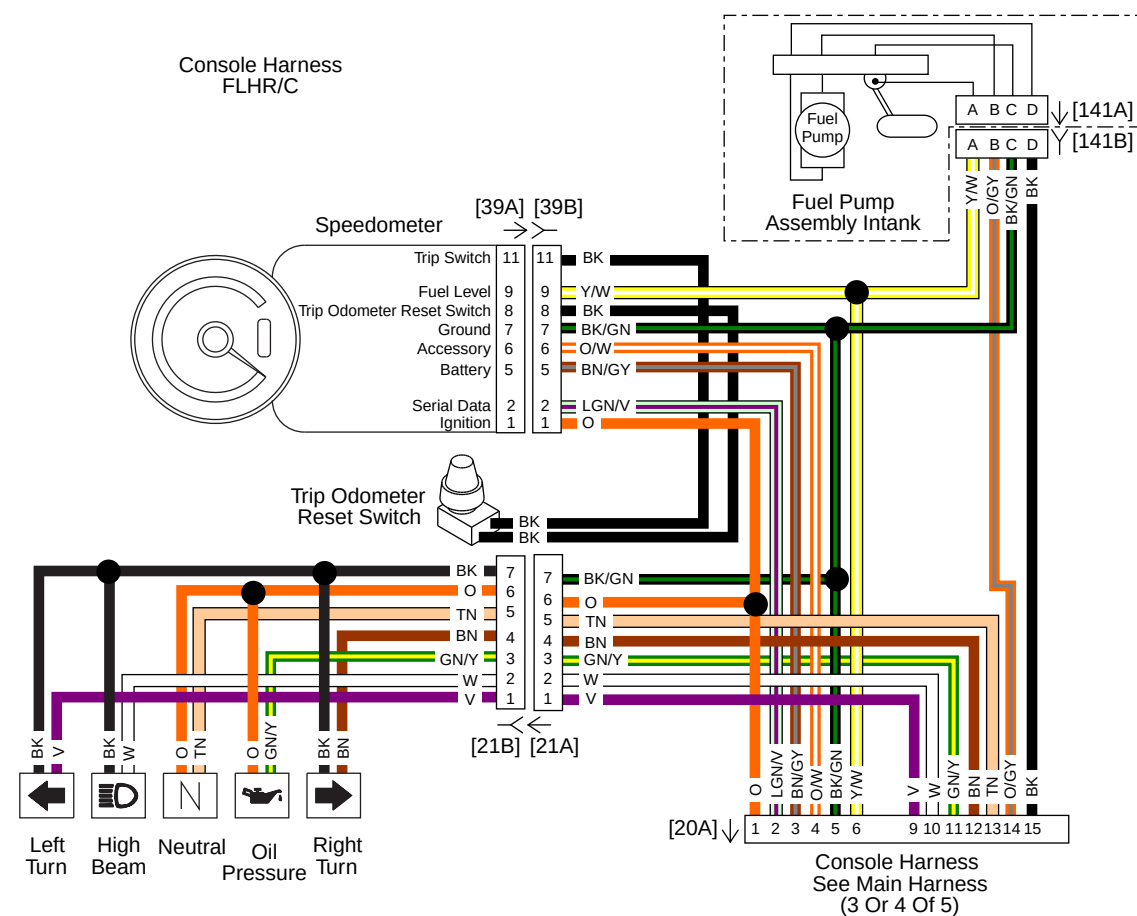
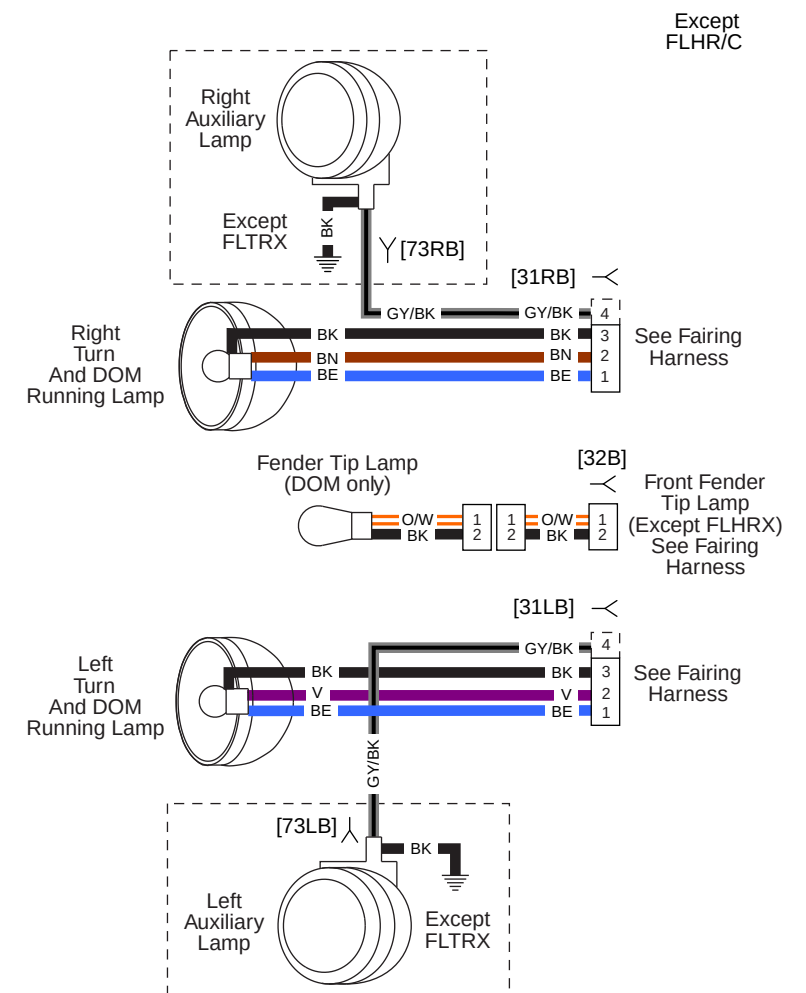
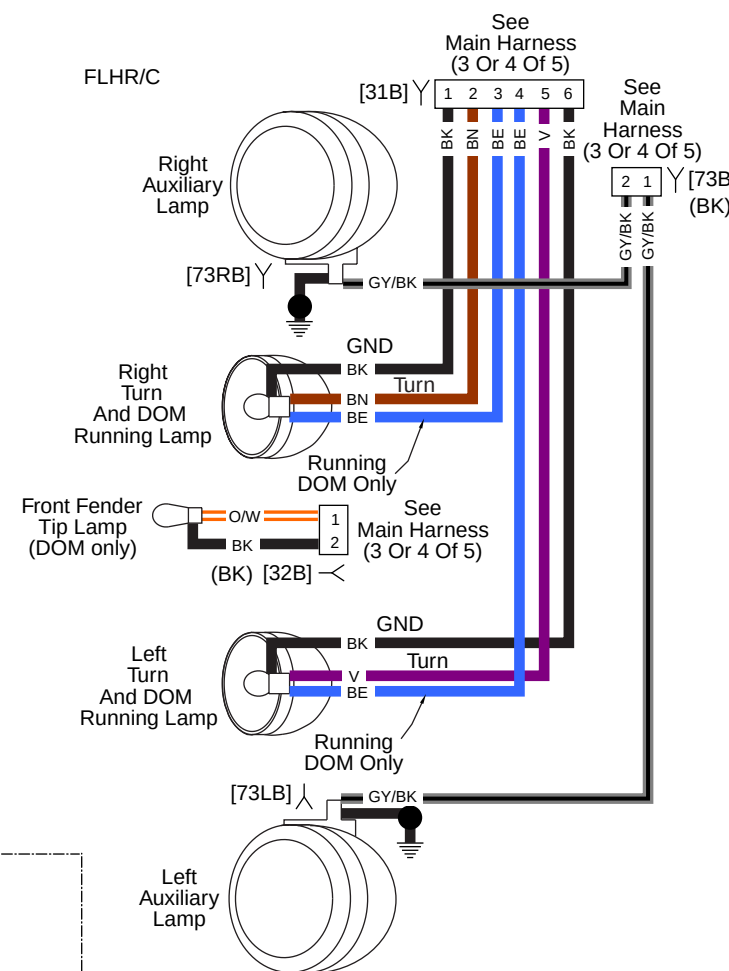
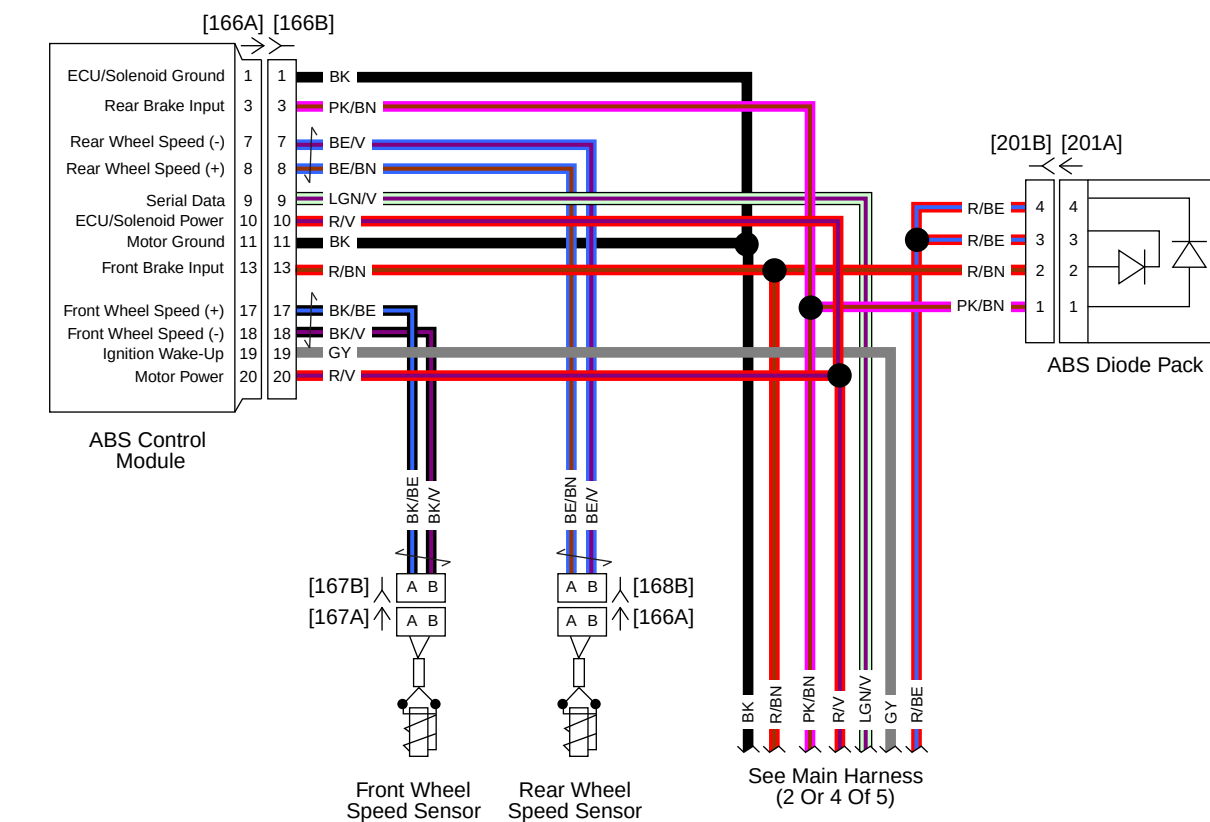


Figure B-23. Front Lighting, Console Harness, ABS: 2011 Touring

Figure B-23.

Front Lighting, Console Harness, ABS: 2011 Touring

Figure B-23.

Front Lighting, Console Harness, ABS: 2011 Touring

Figure B-24. Security Circuit: 2011 Touring

Figure B-24.
Security Circuit: 2011 Touring

Figure B-24.
Security Circuit: 2011 Touring

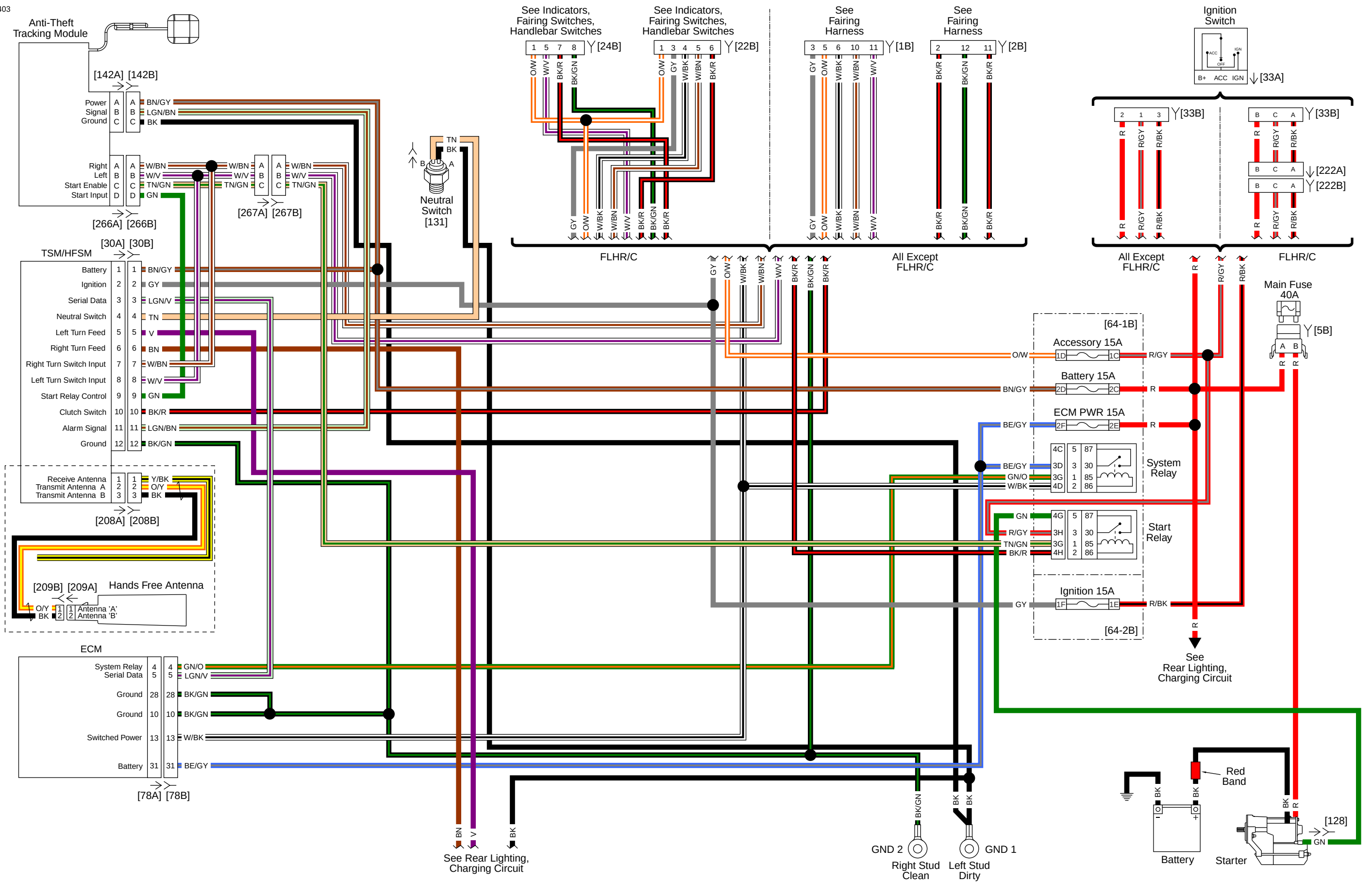


Figure B-25. Security Circuit: 2011 Touring With Anti-Theft Tracking Module

Figure B-25.

**Security Circuit: 2011 Touring With Anti-Theft Tracking
Module**

Figure B-25.

**Security Circuit: 2011 Touring With Anti-Theft Tracking
Module**

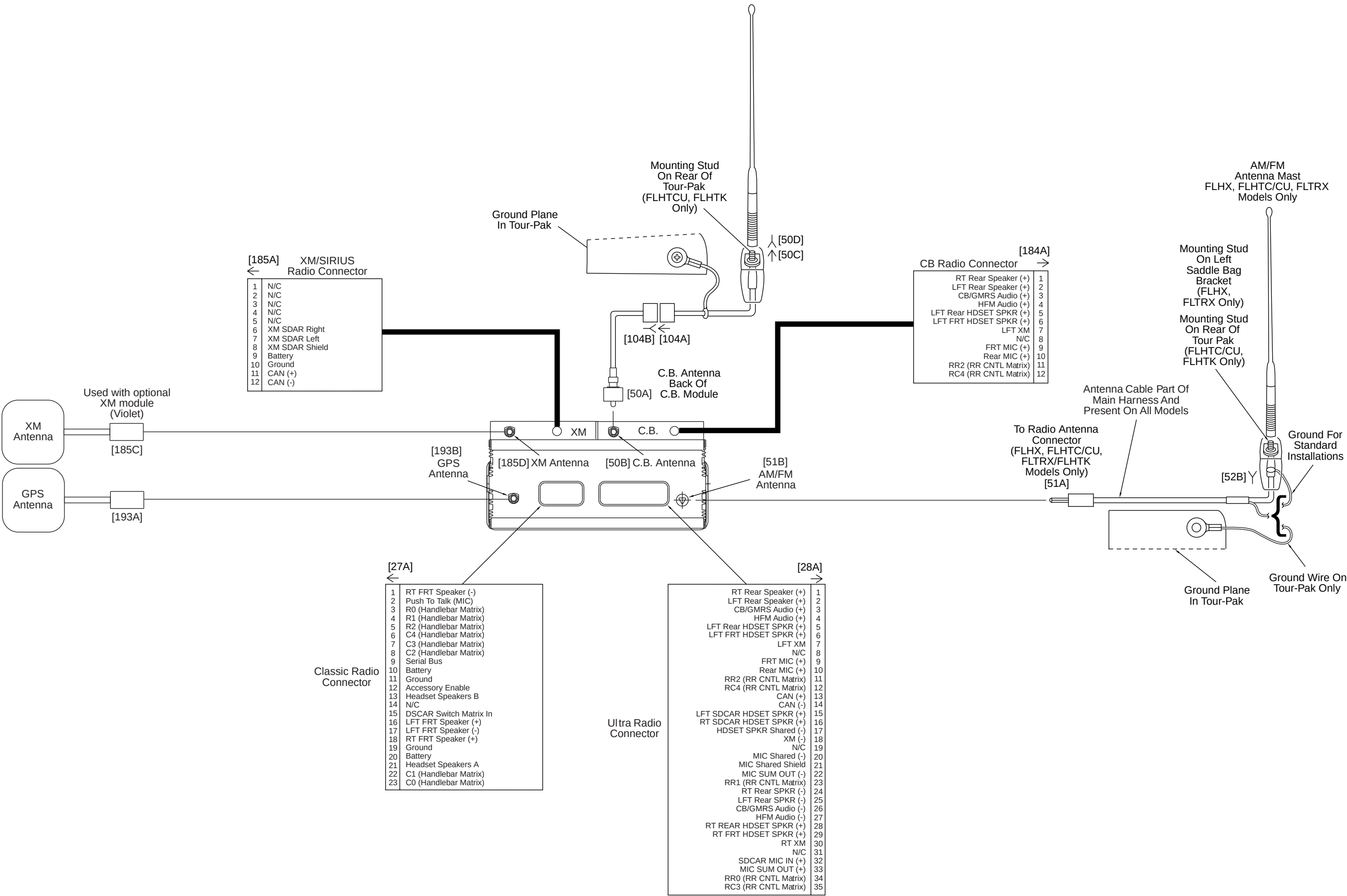


Figure B-26. Ultra Radio RF Interconnect Circuit: 2011 Touring

Figure B-26.
Ultra Radio RF Interconnect Circuit: 2011 Touring

Figure B-26.
Ultra Radio RF Interconnect Circuit: 2011 Touring

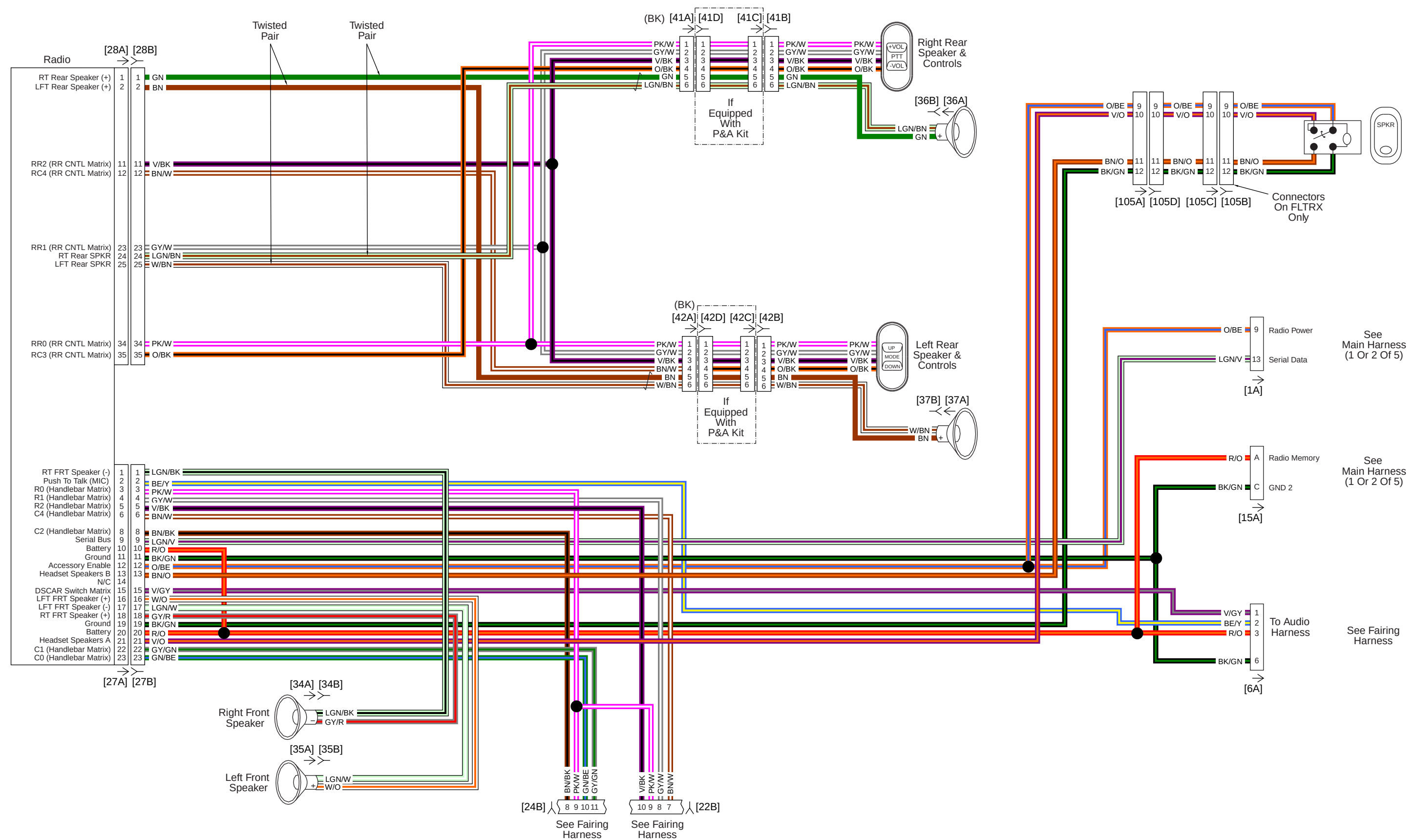


Figure B-27. Classic Radio Circuit: 2011 Touring

Figure B-27.
Classic Radio Circuit: 2011 Touring

Figure B-27.
Classic Radio Circuit: 2011 Touring

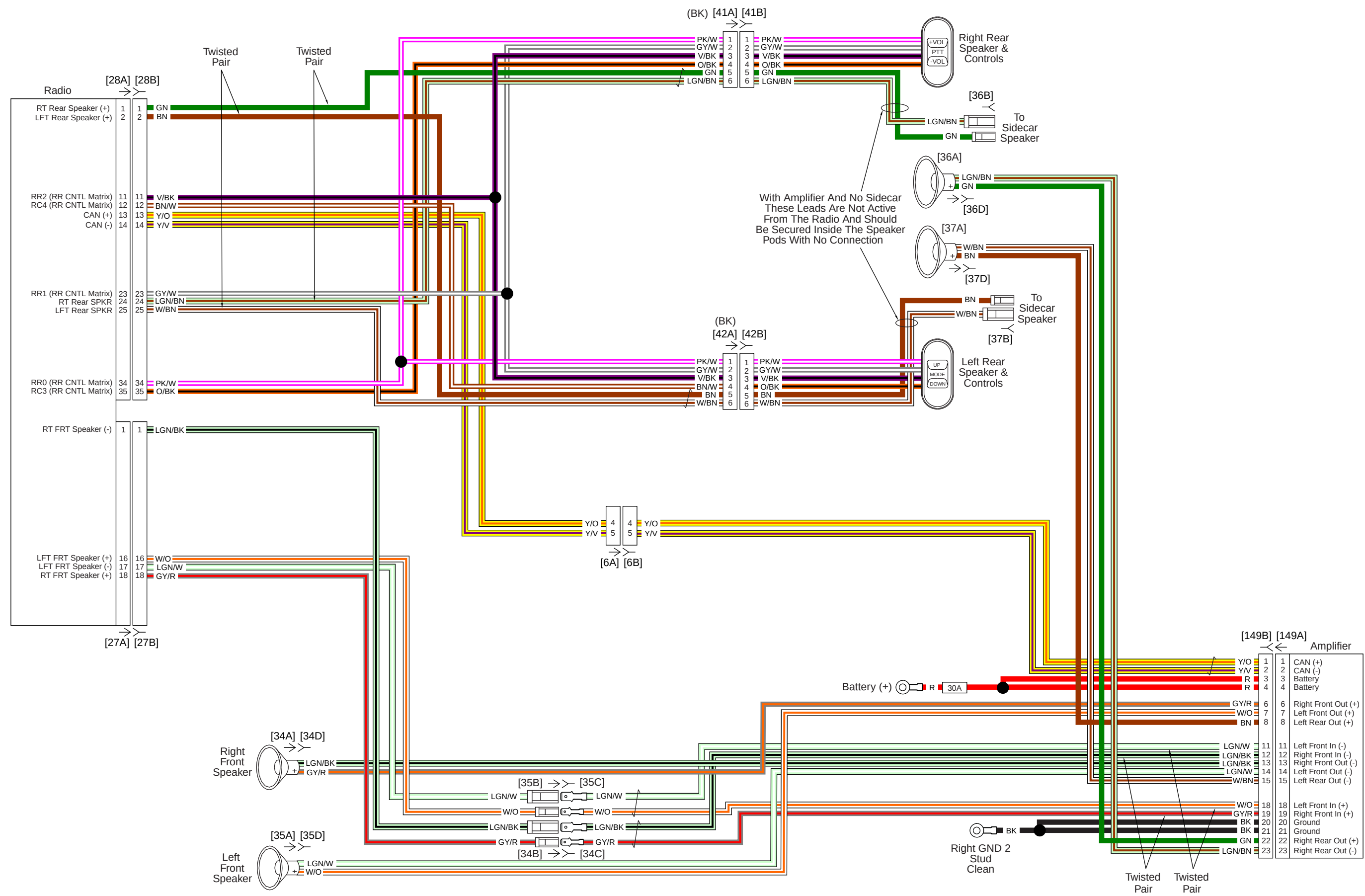


Figure B-28. Ultra Radio Circuit: 2011 Touring

Figure B-28.
Ultra Radio Circuit: 2011 Touring

Figure B-28.
Ultra Radio Circuit: 2011 Touring

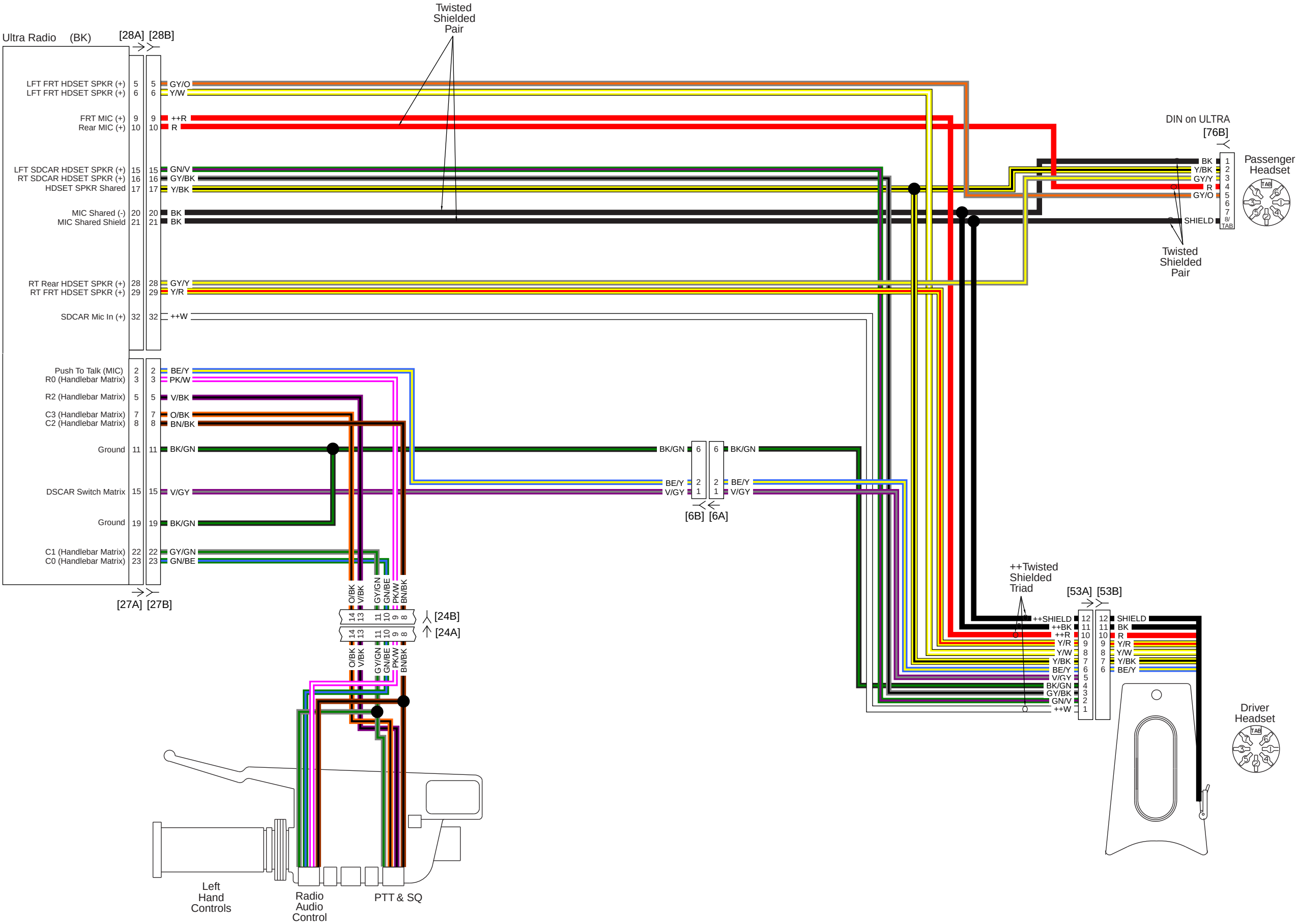


Figure B-29. 2-Place Intercom and Headset Audio: 2011 Touring

Figure B-29.
2-Place Intercom and Headset Audio: 2011 Touring

Figure B-29.
2-Place Intercom and Headset Audio: 2011 Touring

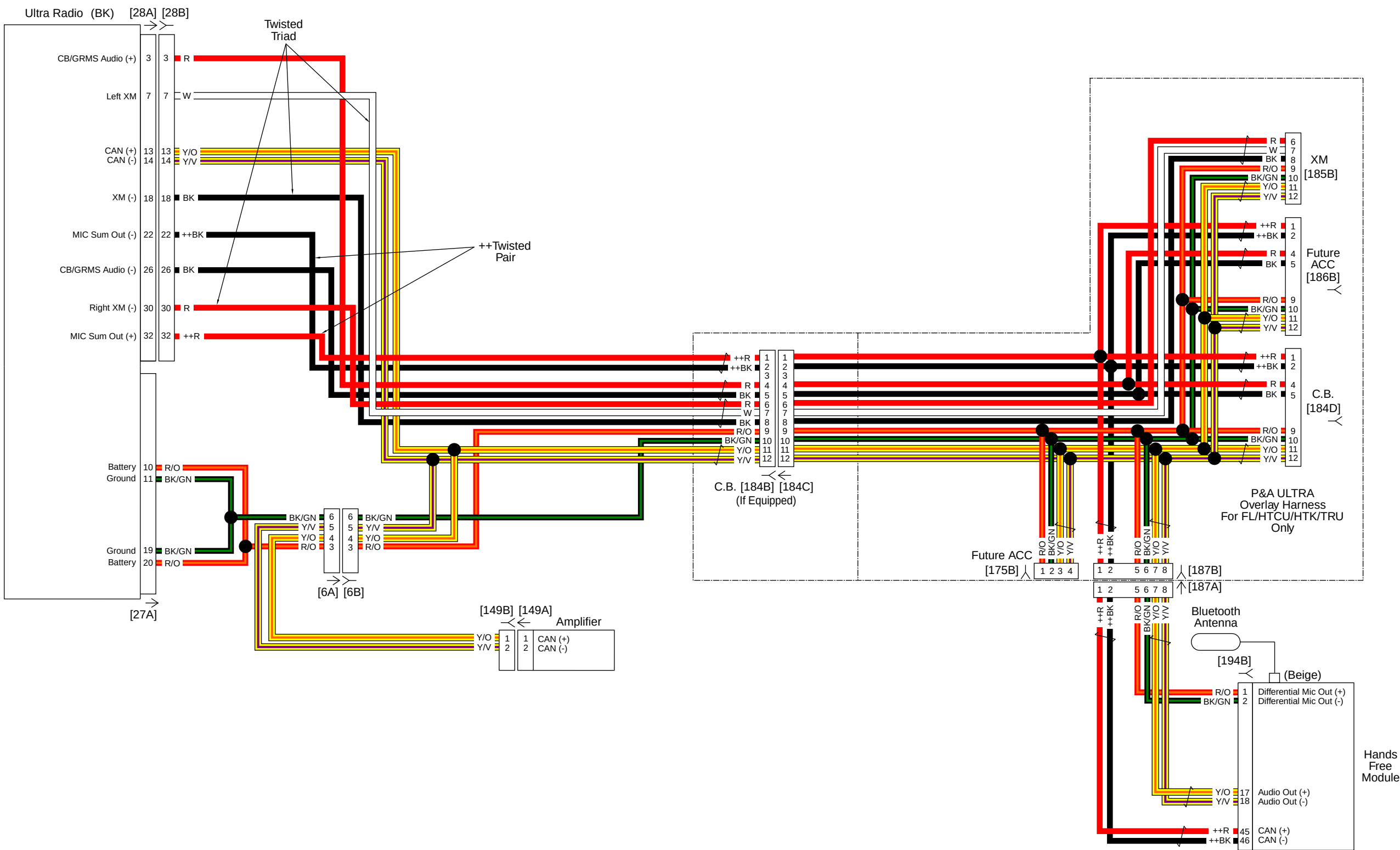


Figure B-30. CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

Figure B-30.

CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

Figure B-30.

CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

TABLE OF CONTENTS

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

FLUID CONVERSIONS

C.2

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 between U.S. units-of-measure and metric units-of-measure, 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 between U.S. units and British Imperial units, 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.)



TORQUE CONVERSIONS

C.3

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) $\times 12.00000$ = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) $\times 0.08333$ = 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) $\times 0.737563$ = foot pounds (ft-lbs).
- Newton meters (Nm) $\times 8.85085$ = inch pounds (**in-lbs**).
- foot pounds (ft-lbs) $\times 1.35582$ = Newton meters (Nm).
- inch pounds (**in-lbs**) $\times 0.112985$ = Newton meters (Nm).



NOTES



[TABLE OF CONTENTS](#)

SUBJECT	PAGE NO.
D.1 GLOSSARY.....	D-1



NOTES



ACRONYMS AND ABBREVIATIONS

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
ABS	Anti-lock braking system
Ah	Ampere-hour
AC	Alternating current
ACC	Accessory position on ignition switch
ACR	Automatic compression release
AIS	Active Intake Solenoid
AGM	Absorbed glass mat (battery)
AWG	American wire gauge
B+	Battery voltage
bar	Bar
BAS	Bank angle sensor
BTDC	Before top dead center
°C	Celsius (Centigrade)
CA	California
CAL	Calibration
CAN	Controller area network
cc	Cubic centimeters
cm	Centimeters
cm ³	Cubic centimeters
CCA	Cold cranking amps
CKP	Crankshaft position
cm	Centimeter
CCW	Counterclockwise
CW	Clockwise
DC	Direct current
DLC	Data link connector
DOM	Domestic
DTC	Diagnostic trouble code
DOT	Department of Transportation
DVOM	Digital volt ohm meter
ECM	Electronic control module
ECT	Engine coolant temperature
ECU	Electronic Control Unit
EEPROM	Electrically erasable programmable read only memory
EFI	Electronic fuel injection
ET	Engine temperature
EVAP	Evaporative emissions control system
°F	Fahrenheit
FPS	Fuel pressure sensor

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
ft	Foot
ft-lbs	Foot pounds
fl oz	Fluid ounce
g	Gram
gal	Gallon
GAWR	Gross axle weight rating
GPS	Global positioning system
GND	Ground (electrical)
GVWR	Gross vehicle weight rating
HCU	Hydraulic control unit
HDI	Harley-Davidson International
H-DSSS	Harley-Davidson smart security system
HFSM	Hands-free security module
Hg	Mercury
H02S	Heated oxygen sensor
hp	Horsepower
hr	Hour
IAC	Idle air control
IAT	Intake air temperature
IC	Instrument cluster
ID	Inside diameter
IGN	Ignition light/key switch position
in	Inch
in ³	Cubic inch
INJ PW	Injector pulse width
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
kPa	Kilopascal
km/h	Kilometers per hour
kW	Kilowatt
L	Liter
lb	Pounds
LCD	Liquid crystal display
LED	Light emitting diode
mA	Milliampere
MAP	Manifold absolute pressure
max	Maximum
mi	Mile
min	Minimum
mL	Milliliter
mm	Millimeter

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
mph	Miles per hour
ms	millisecond
Nm	Newton-meter
NiMH	Nickel metal hydride
N/A	Not applicable
O ₂	Oxygen
OD	Outside diameter
OEM	Original equipment manufacturer
oz	Ounce
P&A	Parts and Accessories
Part No.	Part number
PIN	Personal identification number
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RCM	Reverse control module
RES	Reserve mark on fuel supply valve
rpm	Revolutions per minute
s	seconds
SCFH	Cubic feet per hour at standard conditions
TCA	Throttle control actuator
TDC	Top dead center
TGS	Twist grip sensor
TMAP	Intake air temperature/manifold absolute pressure
TPS	Throttle position sensor
TSM	Turn signal module
TSSM	Turn signal/security module
V	Volt
VAC	Volts of alternating current
VDC	Volts of direct current
VIN	Vehicle identification number
VSS	Vehicle speed sensor
W	Watt
WSS	Wheel speed sensor

NOTES



Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
99861-02	ELECTRICAL CONTACT LUBRICANT	5.6 TURN SIGNALS, Flash at Double Normal Rate, All Bulbs Work, No DTCs
B-50085	TERMINAL EXTRACTOR	A.16 JAE MX19 SEALED CONNECTORS, JAE MX19 Sealed Connectors
GA500A	SNAP-ON TERMINAL PICK	A.1 AUTOFUSE UNSEALED ELECTRICAL CON-NECTORS, Autofuse Unsealed Connector Repair
HD-23738	VACUUM PUMP	6.4 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-25070	HEAT GUN	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-26792	SPARK TESTER	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-26792	SPARK TESTER	6.33 ENGINE CRANKS, BUT WILL NOT START, Engine Cranks But Will Not Start
HD-34730-2D	FUEL INJECTOR TEST LIGHT	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-34730-2D	FUEL INJECTOR TEST LIGHT	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.8 DTC P0261, P0262, P0263, P0264, DTC P0261
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.8 DTC P0261, P0262, P0263, P0264, DTC P0263
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.19 DTC P1351, P1352, P1354, P1355, DTC P1351
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.19 DTC P1351, P1352, P1354, P1355, DTC P1354
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.26 DTC P1655, P1656, DTC P1655
HD-34730-2D	FUEL INJECTOR TEST LIGHT	6.26 DTC P1655, P1656, DTC P1656
HD-35500	MULTI-METER	4.6 GAUGES, Fuel Gauge and Sender Test
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR, Deutsch DTM Sealed Mini Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39448	CB MICROPHONE LOAD DEVICE	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 4: CB Transmitter Inoperative
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.13 DEUTSCH DT SEALED TERMINAL REPAIR, Deutsch DT Sealed Terminal Crimps
HD-39969	ULTRA TORCH	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39978	DIGITAL MULTIMETER (FLUKE 78)	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-39978	DIGITAL MULTIMETER (FLUKE 78)	1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test
HD-41183	HEAT SHIELD ATTACHMENT	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41404-C	HARNESS CONNECTOR TEST KIT	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-41404-C	HARNESS CONNECTOR TEST KIT	2.4 DTC U1300, U1301 OR BUS ER, DTC U1301
HD-41404-C	HARNESS CONNECTOR TEST KIT	3.2 STARTING SYSTEM, Starter Testing
HD-41404-C	HARNESS CONNECTOR TEST KIT	3.2 STARTING SYSTEM, Start Relay Clicks
HD-41404-C	HARNESS CONNECTOR TEST KIT	3.6 DTC B0563, P0562, P0563, DTC P0562
HD-41404-C	HARNESS CONNECTOR TEST KIT	4.2 DTC B1004, B1005, DTC B1004
HD-41404-C	HARNESS CONNECTOR TEST KIT	4.2 DTC B1004, B1005, DTC B1005
HD-41404-C	HARNESS CONNECTOR TEST KIT	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	4.6 GAUGES, Oil Pressure Gauge and Indicator Light
HD-41404-C	HARNESS CONNECTOR TEST KIT	5.5 HORN, Horn Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	5.6 TURN SIGNALS, One Turn Signal Lamp Inoperative, No DTCs
HD-41404-C	HARNESS CONNECTOR TEST KIT	5.16 FAILS TO DISARM, Fails to Disarm: HFSM
HD-41404-C	HARNESS CONNECTOR TEST KIT	5.17 DTC B1131, B1132, DTC B1131
HD-41404-C	HARNESS CONNECTOR TEST KIT	5.19 DTC B1143, B1144, B1145, DTC B1143
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.4 DTC P0107, P0108, P0112, P0113, DTC P0107
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.4 DTC P0107, P0108, P0112, P0113, DTC P0112
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.4 DTC P0107, P0108, P0112, P0113, DTC P0113
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.5 DTC P0117, P0118, DTC P0117
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.5 DTC P0117, P0118, DTC P0118
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.5 DTC P0117, P0118, DTC P0118
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0120
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0122
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0123
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0220
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0222
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0223
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0031
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0031

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0134
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0151
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.9 DTC P0373, P0374, DTC P0374
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.10 DTC P0444, P0445, DTC P0445
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.11 DTC P0501, P0502, DTC P0502
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.13 DTC P0572, DTC P0572
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.13 DTC P0572, DTC P0572
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.16 DTC P1001, P1002, P1003, P1004, DTC P1003
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.19 DTC P1351, P1352, P1354, P1355, DTC P1351
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.19 DTC P1351, P1352, P1354, P1355, DTC P1352
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.19 DTC P1351, P1352, P1354, P1355, DTC P1355
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.20 DTC P1353, P1356, P1357, P1358, DTC P1357, P1358
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.21 DTC P1475, P1477, P1478, DTC P1475
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.21 DTC P1475, P1477, P1478, DTC P1477
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.22 DTC P1501, P1502, DTC P1501
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.26 DTC P1655, P1656, DTC P1655
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.26 DTC P1655, P1656, DTC P1656
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.27 DTC P2100, P2101, P2102, P2103, DTC P2100
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.27 DTC P2100, P2101, P2102, P2103, DTC P2101
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.30 DTC P2122, P2123, P2127, P2128, DTC P2122
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.30 DTC P2122, P2123, P2127, P2128, DTC P2123
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.30 DTC P2122, P2123, P2127, P2128, DTC P2127
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.30 DTC P2122, P2123, P2127, P2128, DTC P2128
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.31 DTC P2135, P2138, DTC P2135
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.31 DTC P2135, P2138, DTC P2138
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.36 FUEL SYSTEM ELECTRICAL TEST, Fuel System Electrical Test
HD-41404-C	HARNESS CONNECTOR TEST KIT	6.37 MISFIRE AT IDLE OR UNDER LOAD, Misfire At Idle or Under Load
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.2 DTC C1017, C1018, DTC C1017
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.2 DTC C1017, C1018, DTC C1017
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.2 DTC C1017, C1018, DTC C1018
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.4 DTC C1025, C1027, C1206, C1208, DTC C1025 (Front), C1027 (Rear), C1206, C1208
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.5 DTC C1032, C1034, DTC C1032
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.5 DTC C1032, C1034, DTC C1034
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.6 DTC C1042, C1043, DTC C1042
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.6 DTC C1042, C1043, DTC C1043
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.7 DTC C1094, DTC C1094
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.8 DTC C1095, DTC C1095
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.8 DTC C1095, DTC C1095

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.12 DTC C1212, DTC C1212
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.13 DTC C1214, DTC C1214
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.14 DTC C1216, DTC C1216
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.15 DTC C1014, C1055-C1066, C1118, C1121, DTC C1014, C1055-C1066, C1118, C1121
HD-41404-C	HARNESS CONNECTOR TEST KIT	7.16 ABS INDICATOR ALWAYS ON OR INOPERATIVE, ABS Indicator Always On or Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1302 Infotainment Bus Off Error
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1317 Infotainment Bus Lost Communication with High Output Amplifier
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 7: Handheld Microphone/PTT Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 8: Fairing Mounted Speaker Switch Malfunction
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 8: Fairing Mounted Speaker Switch Malfunction

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 9: Headset Speakers Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 9: Headset Speakers Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 10: No or Low Audio from Microphones
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 13: No or Intermittent Reception on XM Module
HD-41404-C	HARNESS CONNECTOR TEST KIT	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 18: Hands-Free Phone Module Initial Diagnostics
HD-41475	DEUTSCH TERMINAL REPAIR KIT	A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41475-100	FLAT BLADE L-HOOK	A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-42662	BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 5: CB Receiver Inoperative
HD-42682	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-42682	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-42682	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1040, U1255
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-42682	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-42682	BREAKOUT BOX	2.4 DTC U1300, U1301 OR BUS ER, DTC U1300
HD-42682	BREAKOUT BOX	2.4 DTC U1300, U1301 OR BUS ER, DTC U1301
HD-42682	BREAKOUT BOX	3.2 STARTING SYSTEM, Nothing Clicks
HD-42682	BREAKOUT BOX	4.2 DTC B1004, B1005, DTC B1004
HD-42682	BREAKOUT BOX	4.2 DTC B1004, B1005, DTC B1005
HD-42682	BREAKOUT BOX	4.4 NO INSTRUMENT POWER, Speedometer Inoperative

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-42682	BREAKOUT BOX	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-42682	BREAKOUT BOX	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-42682	BREAKOUT BOX	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-42682	BREAKOUT BOX	5.6 TURN SIGNALS, Both Turn Signal Lamps on One Side Inoperative, No DTCs
HD-42682	BREAKOUT BOX	5.10 DTC B1121, B1122, B1123, B1124, B1125, B1126, DTC B1121: HFSM
HD-42682	BREAKOUT BOX	5.15 SERVICE AND EMERGENCY FUNCTIONS AND CONFIGURATIONS, Power Disruption and Configuring: HFSM
HD-42682	BREAKOUT BOX	5.17 DTC B1131, B1132, DTC B1131
HD-42682	BREAKOUT BOX	5.17 DTC B1131, B1132, DTC B1131
HD-42682	BREAKOUT BOX	5.20 DTC B1154, B1155, DTC B1154
HD-42682	BREAKOUT BOX	7.16 ABS INDICATOR ALWAYS ON OR INOPERATIVE, ABS Indicator Always On or Inoperative
HD-42682	BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
HD-42879	ELECTRICAL CRIMPER TOOL	A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR, Deutsch DTM Sealed Solid Barrel Terminal Crimps
HD-44608	RADIO BREAKOUT BOX	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1317 Infotainment Bus Lost Communication with High Output Amplifier
HD-44608	RADIO BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 11: No or Low Audio with High Output Amplifier
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-45325	JUMPER HARNESS	2.4 DTC U1300, U1301 OR BUS ER, DTC U1300
HD-45325	JUMPER HARNESS	2.4 DTC U1300, U1301 OR BUS ER, DTC U1301
HD-45325	JUMPER HARNESS	7.16 ABS INDICATOR ALWAYS ON OR INOPERATIVE, ABS Indicator Always On or Inoperative
HD-45325	JUMPER HARNESS	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 5: CB Receiver Inoperative
HD-45325	JUMPER HARNESS	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
HD-45928	TERMINAL REMOVER	A.9 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-45929	TERMINAL CRIMPER	A.9 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-46601	BREAKOUT BOX ADAPTERS	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-46601	BREAKOUT BOX ADAPTERS	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1040, U1255
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-46601	BREAKOUT BOX ADAPTERS	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-46601	BREAKOUT BOX ADAPTERS	4.2 DTC B1004, B1005, DTC B1004
HD-46601	BREAKOUT BOX ADAPTERS	4.2 DTC B1004, B1005, DTC B1005
HD-46601	BREAKOUT BOX ADAPTERS	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-46601	BREAKOUT BOX ADAPTERS	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-46601	BREAKOUT BOX ADAPTERS	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-46601	BREAKOUT BOX ADAPTERS	4.4 NO INSTRUMENT POWER, Speedometer Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.2 DTC B2006-B2015, RADIO SWITCH DIAGNOSTICS, Radio Switch Diagnostics
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.3 DTC B2016-B2027, RADIO SPEAKER DIAGNOSTICS, Description and Operation
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1302 Infotainment Bus Off Error
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1317 Infotainment Bus Lost Communication with High Output Amplifier
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 1: Radio Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 5: CB Receiver Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 8: Fairing Mounted Speaker Switch Malfunction
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 8: Fairing Mounted Speaker Switch Malfunction
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 9: Headset Speakers Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 9: Headset Speakers Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 10: No or Low Audio from Microphones
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 12: No or Low Audio from XM or XM Inoperative
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 17: CD Skipping
HD-47918	ADVANCED AUDIO SYSTEM BREAKOUT BOX	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Symptom 18: Hands-Free Phone Module Initial Diagnostics
HD-48037	SWR METER ADAPTERS	8.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Diagnostics
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER	3.1 BATTERY TESTING, Conductance Test
HD-48114	TERMINAL REMOVER	A.18 MOLEX MX 150 SEALED CONNECTORS, Molex MX 150 Sealed Connector Repair
HD-48119	TERMINAL CRIMPER	A.18 MOLEX MX 150 SEALED CONNECTORS, Crimp Terminal to Lead
HD-48637	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48637	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48637	BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48637	BREAKOUT BOX	1.3 DIAGNOSTICS AND TROUBLESHOOTING, Wiggle Test

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-48637	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1016
HD-48637	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1064, U1255
HD-48637	BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1097, U1255
HD-48637	BREAKOUT BOX	3.6 DTC B0563, P0562, P0563, DTC P0562
HD-48637	BREAKOUT BOX	5.4 DTC P0577, DTC P0577
HD-48637	BREAKOUT BOX	6.4 DTC P0107, P0108, P0112, P0113, DTC P0107
HD-48637	BREAKOUT BOX	6.4 DTC P0107, P0108, P0112, P0113, DTC P0112
HD-48637	BREAKOUT BOX	6.4 DTC P0107, P0108, P0112, P0113, DTC P0113
HD-48637	BREAKOUT BOX	6.5 DTC P0117, P0118, DTC P0117
HD-48637	BREAKOUT BOX	6.5 DTC P0117, P0118, DTC P0118
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0120
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0122
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0123
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0220
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0222
HD-48637	BREAKOUT BOX	6.6 DTC P0120, P0122, P0123, P0220, P0222, P0223, DTC P0223
HD-48637	BREAKOUT BOX	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0031
HD-48637	BREAKOUT BOX	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0131
HD-48637	BREAKOUT BOX	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0134
HD-48637	BREAKOUT BOX	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, DTC P0151
HD-48637	BREAKOUT BOX	6.8 DTC P0261, P0262, P0263, P0264, DTC P0261
HD-48637	BREAKOUT BOX	6.8 DTC P0261, P0262, P0263, P0264, DTC P0263
HD-48637	BREAKOUT BOX	6.10 DTC P0444, P0445, DTC P0444
HD-48637	BREAKOUT BOX	6.11 DTC P0501, P0502, DTC P0501
HD-48637	BREAKOUT BOX	6.11 DTC P0501, P0502, DTC P0502
HD-48637	BREAKOUT BOX	6.13 DTC P0572, DTC P0572
HD-48637	BREAKOUT BOX	6.13 DTC P0572, DTC P0572
HD-48637	BREAKOUT BOX	6.16 DTC P1001, P1002, P1003, P1004, DTC P1004
HD-48637	BREAKOUT BOX	6.19 DTC P1351, P1352, P1354, P1355, DTC P1351
HD-48637	BREAKOUT BOX	6.19 DTC P1351, P1352, P1354, P1355, DTC P1354
HD-48637	BREAKOUT BOX	6.20 DTC P1353, P1356, P1357, P1358, DTC P1357, P1358

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-48637	BREAKOUT BOX	6.20 DTC P1353, P1356, P1357, P1358, DTC P1357, P1358
HD-48637	BREAKOUT BOX	6.21 DTC P1475, P1477, P1478, DTC P1477
HD-48637	BREAKOUT BOX	6.21 DTC P1475, P1477, P1478, DTC P1478
HD-48637	BREAKOUT BOX	6.26 DTC P1655, P1656, DTC P1655
HD-48637	BREAKOUT BOX	6.27 DTC P2100, P2101, P2102, P2103, DTC P2100
HD-48637	BREAKOUT BOX	6.27 DTC P2100, P2101, P2102, P2103, DTC P2101
HD-48637	BREAKOUT BOX	6.27 DTC P2100, P2101, P2102, P2103, DTC P2103
HD-48637	BREAKOUT BOX	6.30 DTC P2122, P2123, P2127, P2128, DTC P2123
HD-48637	BREAKOUT BOX	6.30 DTC P2122, P2123, P2127, P2128, DTC P2127
HD-48637	BREAKOUT BOX	6.30 DTC P2122, P2123, P2127, P2128, DTC P2128
HD-48637	BREAKOUT BOX	6.31 DTC P2135, P2138, DTC P2135
HD-48637	BREAKOUT BOX	6.31 DTC P2135, P2138, DTC P2138
HD-48637	BREAKOUT BOX	6.34 NO ECM POWER, No ECM Power
HD-48637	BREAKOUT BOX	6.37 MISFIRE AT IDLE OR UNDER LOAD, Misfire At Idle or Under Load
HD-48637	BREAKOUT BOX	8.4 SERIAL DATA BUS DIAGNOSTICS, DTC U1016 J1850 Loss of Communication with ECM
HD-48642	ABS BREAKOUT BOX	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48642	ABS BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1040, U1255
HD-48642	ABS BREAKOUT BOX	2.3 DTC U1016, U1040, U1064, U1097, U1255, DTC U1040, U1255
HD-48642	ABS BREAKOUT BOX	7.2 DTC C1017, C1018, DTC C1017
HD-48642	ABS BREAKOUT BOX	7.2 DTC C1017, C1018, DTC C1017
HD-48642	ABS BREAKOUT BOX	7.2 DTC C1017, C1018, DTC C1018
HD-48642	ABS BREAKOUT BOX	7.4 DTC C1025, C1027, C1206, C1208, DTC C1025 (Front), C1027 (Rear), C1206, C1208
HD-48642	ABS BREAKOUT BOX	7.5 DTC C1032, C1034, DTC C1032
HD-48642	ABS BREAKOUT BOX	7.5 DTC C1032, C1034, DTC C1034
HD-48642	ABS BREAKOUT BOX	7.6 DTC C1042, C1043, DTC C1042
HD-48642	ABS BREAKOUT BOX	7.6 DTC C1042, C1043, DTC C1043
HD-48642	ABS BREAKOUT BOX	7.7 DTC C1094, DTC C1094
HD-48642	ABS BREAKOUT BOX	7.8 DTC C1095, DTC C1095
HD-48642	ABS BREAKOUT BOX	7.12 DTC C1212, DTC C1212
HD-48642	ABS BREAKOUT BOX	7.13 DTC C1214, DTC C1214
HD-48642	ABS BREAKOUT BOX	7.14 DTC C1216, DTC C1216
HD-48642	ABS BREAKOUT BOX	7.15 DTC C1014, C1055-C1066, C1118, C1121, DTC C1014, C1055-C1066, C1118, C1121
HD-48642	ABS BREAKOUT BOX	7.16 ABS INDICATOR ALWAYS ON OR INOPER- ATIVE, ABS Indicator Always On or Inoperative
HD-48650	DIGITAL TECHNICIAN II	1.2 DIAGNOSTIC TOOLS, How To Use Diagnostic Tools
HD-48650	DIGITAL TECHNICIAN II	1.3 DIAGNOSTICS AND TROUBLESHOOTING, Job/Time Codes Values
HD-48650	DIGITAL TECHNICIAN II	5.12 SECURITY SYSTEM, TSSM/HFSM Features

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-48650	DIGITAL TECHNICIAN II	6.1 EFI SYSTEM, General
HD-48650	DIGITAL TECHNICIAN II	6.7 DTC P0031, P0032, P0131, P0132, P0134, P0151, P0152, P0154, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.1 ANTI-LOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.3 DTC C1021, C1023, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.5 DTC C1032, C1034, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.6 DTC C1042, C1043, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.7 DTC C1094, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.8 DTC C1095, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.9 DTC C1151, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.13 DTC C1214, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.14 DTC C1216, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	7.15 DTC C1014, C1055-C1066, C1118, C1121, Description and Operation
HD-48650	DIGITAL TECHNICIAN II	8.1 RADIO DIAGNOSTICS, Diagnostics
SNAP-ON TT600-3	SNAP-ON PICK	A.6 DELPHI 630 METRI-PACK UNSEALED CONNECTORS, Delphi 630 Metri-Pack Unsealed Connector Repair
SNAP-ON TT600-3	SNAP-ON PICK	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
YA840	SNAP-ON IN-LINE SPARK TESTER	6.37 MISFIRE AT IDLE OR UNDER LOAD, In-line Spark Tester
YA840	SNAP-ON IN-LINE SPARK TESTER	6.37 MISFIRE AT IDLE OR UNDER LOAD, Misfire At Idle or Under Load

NOTES



2011 Touring Models Electrical Diagnostic Manual

FASTENER	TORQUE VALUE	NOTES
No torque values were found in this manual.		





A

ABS Diode Pack Location.....	1-7
ABS Indicator Diagnostics.....	7-39
ABS Indicator Operation.....	7-3
ABS Module Location.....	1-9
AC Output Test.....	3-21
Active Exhaust.....	6-1
Active Exhaust Location.....	1-9
Alarm	
Activation.....	5-48
Deactivation.....	5-48
Alarm Sensitivity (TSSM).....	5-48
Alternator Description.....	3-16
Alternator Rotor.....	6-4
Ambient Air Temperature Gauge	
Problem.....	4-21
Ambient Air Temperature Sensor Location.....	1-4
Antenna Cable Location.....	1-8
Anti-lock Brake System (ABS) Description.....	7-1
Initialization Self-Test.....	7-2
Pressure Decrease.....	7-2
Pressure Hold.....	7-2
Pressure Increase.....	7-2
Autofuse Electrical Connector.....	A-1
Assembly.....	A-1
Disassembly.....	A-1
Automatic Compression Release (ACR)	
General.....	6-78
Auxiliary Lamps Diagnostics.....	5-27

B

BAS Description.....	6-6
Battery Description.....	3-4
Battery Testing.....	3-1
Bus ER.....	2-29

C

CB Antenna Cable Location.....	1-2
Changing the Pin	
Modifying an Existing Pin.....	5-56
Charging System Description.....	3-16
Charging System Diagnostics.....	3-17
Charging System Output Test.....	3-19
Check Engine Lamp.....	2-6
Cigar Lighter Location.....	1-2
CKP Sensor.....	6-1
CKP Sensor Description.....	6-6
CKP Sensor Location.....	1-7
CKP Synchronization.....	6-5
Clearing DTCs.....	2-6
Clutch Switch Description.....	6-6
Conductance Test.....	3-1
Connector Locations.....	B-1
Connectors	
Autofuse Unsealed.....	A-1
Delphi 100W Micro-Pack Sealed.....	A-2
Delphi 150 Metri-Pack Sealed.....	A-4
Delphi 280 Metri-Pack Unsealed.....	A-6
Delphi 480 Metri-Pack Unsealed.....	A-7
Delphi 630 Metri-Pack Unsealed.....	A-8
Delphi 800 Metri-Pack Sealed.....	A-9
Delphi GT 280 Sealed.....	A-18
Delphi Micro 64 Sealed.....	A-13
Deutsch DTM Sealed Mini.....	A-25
Deutsch DTM Sealed Solid Barrel.....	A-26
Deutsch DT Sealed.....	A-20
JAE MX19 Sealed.....	A-28

Metri-Pack Terminal Crimps.....	A-11
Molex CMC Sealed.....	A-29
Molex MX 150 Sealed.....	A-31
Sealed Splice.....	A-39
Tyco 070 Multilock Unsealed.....	A-35
Conversions	
Fluid.....	C-2
Length.....	C-1
Torque.....	C-3
Cruise Control	
Description and Operation.....	5-7
Cruise Control Diagnostics.....	5-8
Current Draw Values.....	3-19
Current DTCs.....	2-6

D

Data Link Connector.....	2-23
Delphi 100W Sealed Connector	
Repair.....	A-2
Delphi 150 Metri-Pack Connector	
Repair.....	A-4
Delphi 280 Metri-Pack Unsealed Connectors.....	A-6
Delphi 480 Metri-Pack Unsealed Connector	
Repair.....	A-7
Delphi 630 Metri-Pack Unsealed Connector.....	A-8
Delphi 800 Metri-Pack Sealed Connectors	
Repair.....	A-9
Delphi Connector	
Repair.....	A-16
Delphi GT 280 Sealed Connector.....	A-18
Delphi Micro-64 Sealed Connector	
Repair.....	A-13
Deutsch Connector	
Crimping Standard Terminals.....	A-24
Deutsch DTM Sealed Mini Connector	
Crimping Terminals.....	A-25
Deutsch DTM Sealed Solid Barrel Connector	
Crimping Terminals.....	A-26
Deutsch DT Sealed Connector	
Repair.....	A-20
Diagnostic Mode.....	2-1
DLC Location.....	1-7
DTC Priority Table.....	2-1
DTC B0563.....	3-22
DTC B1004.....	4-3
DTC B1005.....	4-3
DTC B1006.....	3-27
DTC B1007.....	3-27
DTC B1008.....	4-7
DTC B1121.....	5-37
DTC B1122.....	5-37
DTC B1123.....	5-37
DTC B1124.....	5-37
DTC B1125.....	5-37
DTC B1126.....	5-37
DTC B1131.....	5-63
DTC B1132.....	5-63
DTC B1134.....	5-66
DTC B1135.....	5-44
DTC B1136.....	5-44
DTC B1141.....	5-44
DTC B1142.....	5-44
DTC B1143.....	5-68
DTC B1144.....	5-68
DTC B1145.....	5-68
DTC B1154.....	5-70
DTC B1155.....	5-70
DTC B2006.....	8-6

DTC B2007.....	8-6	DTC P0132.....	6-23
DTC B2008.....	8-6	DTC P0134.....	6-23
DTC B2009.....	8-6	DTC P0151.....	6-23
DTC B2010.....	8-6	DTC P0152.....	6-23
DTC B2011.....	8-6	DTC P0154.....	6-23
DTC B2012.....	8-6	DTC P0220.....	6-16
DTC B2013.....	8-6	DTC P0222.....	6-16
DTC B2014.....	8-6	DTC P0223.....	6-16
DTC B2015.....	8-6	DTC P0261.....	6-30
DTC B2016.....	8-15	DTC P0262.....	6-30
DTC B2017.....	8-15	DTC P0263.....	6-30
DTC B2018.....	8-15	DTC P0264.....	6-30
DTC B2019.....	8-15	DTC P0373.....	6-34
DTC B2020.....	8-15	DTC P0374.....	6-34
DTC B2021.....	8-15	DTC P0444.....	6-36
DTC B2022.....	8-15	DTC P0445.....	6-36
DTC B2023.....	8-15	DTC P0501.....	6-39
DTC B2024.....	8-15	DTC P0502.....	6-39
DTC B2025.....	8-15	DTC P0505.....	6-43
DTC B2026.....	8-15	DTC P0562.....	3-22
DTC B2027.....	8-15	DTC P0563.....	3-22
DTC C1014.....	7-36	DTC P0572.....	6-45
DTC C1017.....	7-4	DTC P0577.....	5-11
DTC C1018.....	7-4	DTC P0603.....	6-48
DTC C1021.....	7-7	DTC P0605.....	6-48
DTC C1023.....	7-7	DTC P0641.....	6-49
DTC C1025.....	7-9	DTC P0651.....	6-49
DTC C1027.....	7-9	DTC P1001.....	6-52
DTC C1032.....	7-11	DTC P1002.....	6-52
DTC C1034.....	7-11	DTC P1003.....	6-52
DTC C1042.....	7-14	DTC P1004.....	6-52
DTC C1043.....	7-14	DTC P1009.....	6-56
DTC C1055.....	7-36	DTC P1010.....	6-56
DTC C1056.....	7-36	DTC P1270.....	6-58
DTC C1057.....	7-36	DTC P1351.....	6-61
DTC C1061.....	7-36	DTC P1352.....	6-61
DTC C1062.....	7-36	DTC P1353.....	6-65
DTC C1065.....	7-36	DTC P1354.....	6-61
DTC C1066.....	7-36	DTC P1355.....	6-61
DTC C1094.....	7-16	DTC P1356.....	6-65
DTC C1095.....	7-19	DTC P1357.....	6-65
DTC C1118.....	7-36	DTC P1358.....	6-65
DTC C1121.....	7-36	DTC P1475.....	6-68
DTC C1151.....	7-22	DTC P1477.....	6-68
DTC C1153.....	7-24	DTC P1478.....	6-68
DTC C1158.....	7-26	DTC P1501.....	6-72
DTC C1206.....	7-9	DTC P1502.....	6-72
DTC C1208.....	7-9	DTC P1510.....	6-75
DTC C1212.....	7-27	DTC P1511.....	6-75
DTC C1214.....	7-30	DTC P1512.....	6-75
DTC C1216.....	7-33	DTC P1514.....	6-76
DTC P0031.....	6-23	DTC P1600.....	6-77
DTC P0032.....	6-23	DTC P1655.....	6-78
DTC P0107.....	6-9	DTC P1656.....	6-78
DTC P0108.....	6-9	DTC P2100.....	6-82
DTC P0112.....	6-9	DTC P2101.....	6-82
DTC P0113.....	6-9	DTC P2102.....	6-82
DTC P0117.....	6-13	DTC P2103.....	6-82
DTC P0118.....	6-13	DTC P2105.....	6-86
DTC P0120.....	6-16	DTC P2107.....	6-86
DTC P0122.....	6-16	DTC P2119.....	6-89
DTC P0123.....	6-16	DTC P2122.....	6-90
DTC P0131.....	6-23	DTC P2123.....	6-90

DTC P2127.	6-90
DTC P2128.	6-90
DTC P2135.	6-95
DTC P2138.	6-95
DTC P2176.	6-98
DTC U1016.	2-24
DTC U1040.	2-24
DTC U1064.	2-24
DTC U1097.	2-24
DTC U1255.	2-24
DTC U1300.	2-29
DTC U1301.	2-29

E

ECM.	6-1
ECM Description.	6-4
ECM Drivers.	6-7
Fuel Injectors.	6-7
Fuel Pump.	6-7
Ignition Coils.	6-7
Purge Solenoid.	6-7
Start Relay.	6-7
ECM Location.	1-9
EFI System Overview.	6-1
Engine Phase.	6-5
Engine Run Mode.	6-5
Engine Stop Switch Description.	3-3
Engine Symptoms.	6-7
ET Sensor.	6-1
ET Sensor Description.	6-6
ET Sensor Location.	1-7

F

Fails to Disarm: HFSM Diagnostic.	5-62
Fails to Disarm: TSSM Diagnostic.	5-62
Fairing Cap Switches Location Oil Pressure Gauge Location.	1-4
Fluid Conversions.	C-2
Free Running Current Draw Test.	3-14
Front ACR Location.	1-12
Front Fuel Injector Location.	1-7
Front HO2S Location.	1-9
Front WSS Location.	1-6
Fuel Gauge	
Fuel Gauge and Sender Test.	4-20
Fuel Gauge Location.	1-2
Fuel Gauge Location Position Lamp Location: HDI.	1-4
Fuel Gauge Operation.	4-20
Fuel Injectors.	6-2
Fuel Injectors Description.	6-7
Fuel Pump.	6-2
Fuel Pump Description.	6-7
Fuel Pump Location.	1-9
Fuel System Electrical Test.	6-106
Fuse Block Location.	1-7
Fuse Block Repair.	A-6

G

Glossary	
Acronyms and Abbreviations.	D-1
GND3 Location.	1-4
GPS Location.	1-2

H

HD-26792 Spark Tester.	1-13
HD-34730-2D Fuel Injector Test Light.	1-13
HD-39978 Digital Multimeter (Fluke 78).	1-13
HD-41404-C Harness Connector Test Kit.	1-14
HD-42682 Breakout Box.	1-14
HD-42682 Breakout Box (TSM/TSSM/HFSM).	1-14
HD-44687 Ignition Coil Circuit Test Adapter.	1-16
HD-47918 Advanced Audio System Breakout Box.	1-16
HD-48053 Advanced Battery Conductance and Electrical System Analyzer.	1-17
HD-48637 Breakout Box (ECM).	1-15
HD-48650 Digital Technician II.	1-17
Headlamp Diagnostics.	5-26
Headlamp Operation.	5-24
Heated Grips Location.	1-2
Heated Handgrips	
Description.	5-4
Heat Management System.	6-2
HFSM Antenna Location.	1-9
HFSM Fails to Disarm.	5-60
High Beam.	4-15
High Beam Indicator Lamp Diagnostics.	4-19
History DTCs.	2-6
HO2S Description.	6-7
Horn Description.	5-14
Horn Diagnostics.	5-15
Horn Location.	1-7
Horn Switch Description.	5-14

I

Ignition Coil Location.	1-7
Ignition Coils.	6-1
Ignition Switch Description.	3-3
IM Operation.	4-8
Indicator Lamps.	4-12
Indicator Lamps Location.	1-2
Initial Diagnostics.	2-1
Diagnostic Procedure.	2-21

J

JAE MX19 Sealed Connector	
Connector Housings.	A-28
JAE MX19 Sealed Connectors	
Installing Terminals.	A-28
Removing Terminals.	A-28
Job/Time Codes.	1-20
JSS Description.	6-6

K

Key Fob	
Fob Assignment (HFSM).	5-50
Fob Assignment (TSSM).	5-50
HFSM Fob.	5-50
TSSM Fob.	5-50

L

Left Front Speaker Location.	1-2
Load Test.	3-1
Loctite.	I-II
Low Fuel Indicator.	4-12

M

Main Fuse Location.	1-7
Metric System.	C-2
Metri-Pack Terminal Crimps.	A-11
Milliampere Draw Test.	3-18
Molex CMC Sealed Connectors	
Housings.	A-29
Installing Terminals.	A-29
Removing Terminals.	A-29
Molex MX 150 Sealed Connector	
Repair.	A-31
Terminal Crimps.	A-32
Multiple DTCs.	2-6

N

Nacelle Wiring.	1-6
Neutral Indicator.	4-15
Neutral Lamp Diagnostics.	4-18
Neutral Switch Description.	6-6

O

O2 Sensor.	6-1
Odometer Self-Diagnostics.	2-1
Oil Pressure Gauge and Indicator	
Problem.	4-21
Oil Pressure Indicator.	4-15
Oil Pressure Lamp Diagnostics.	4-17
Oil Pressure Sensor Location.	1-11

P

P&A Accessory Connector Location.	1-9
PIN Description.	5-53
Changing the PIN.	5-56
Initial PIN Entry (HFSM).	5-53
Initial PIN Entry (TSSM).	5-54
Position Lamp Diagnostics (HDI).	5-36
Position Lamp Location: HDI Headlamp Location.	1-6
Position Lamp Location (HDI).	1-2
Power Outlet Location.	1-8
Purge Solenoid.	6-2
Purge Solenoid Description.	6-7
Purge Solenoid Location.	1-9

R

Radio	
Audio Diagnostics.	8-30
Factory Defaults.	8-30
Serial Data Errors.	8-22
Radio Description and Operation.	8-1
Radio Display.	8-1
Radio DTCs and Symptoms.	8-2
Radio Location.	1-2
Radio Symptom Diagnostics.	8-30
Rear ACR Location.	1-12
Rear Brake Switch Location.	1-11
Rear Fuel Injector Location.	1-7
Rear HO2S Location.	1-9
Rear WSS Location.	1-9
Relay Diagnostics.	1-19
Retrieving Trouble Codes.	2-1
Right Front Speaker Location.	1-2
Right Rear Speaker Location.	1-9
Running Lamps Description.	5-34

Running Lamps Diagnostics.	5-36

S

Sealed Splice Connectors.	A-39
Security Immobilization.	5-45
Security Lamp.	2-6
Security Lamp Description.	5-45
Security Siren Location.	1-7
Security System.	5-45
Arming (HFSM).	5-46
Arming (TSSM).	5-46
Auto-arming (TSSM).	5-46
Disarming (HFSM).	5-47
Disarming (TSSM).	5-47
Power Disruption and Configuration: HFSM.	5-58
Power Disruption and Configuration: TSSM.	5-59
Security System Options (TSSM).	5-46
Security System Warnings.	5-46
Sensors and Drivers.	6-6
BAS.	6-6
CKP.	6-6
Clutch Switch.	6-6
ET.	6-6
IAT.	6-6
JSS.	6-6
MAP.	6-6
Neutral Switch.	6-6
O2 Sensor.	6-7
VSS.	6-7
Serial Data	
Components.	2-23
Serial Data Communication.	2-22
Service and Emergency Functions.	5-53
Actuation (HFSM).	5-53
Configuring TSSM.	5-53
Service Bulletins.	I-I
Service Mode.	5-57
Service Preparation.	I-I
Siren Chirp Mode (HFSM).	5-52
Siren Description.	5-52
Sixth Gear.	4-15
Smart Security System	
Transport Mode.	5-57
Specifications	
Alternator.	1-1
Battery.	1-1
Fuel Pump.	1-1
Fuel System.	1-1
Fuse Rating.	1-1
Idle Speed.	1-1
Ignition Coil.	1-1
Regulator.	1-1
Spark Plug.	1-1
Starter.	1-1
Speedometer Location.	1-2
Speedometer Operation.	4-1
SPX Kent-Moore.	I-II
Starter Current Draw Test.	3-13
Starter Description.	3-3
Starter Solenoid	
Solenoid Hold-In Test.	3-14
Solenoid Pull-In Test.	3-14
Solenoid Return Test.	3-15

Starter Solenoid Description.	3-3
Starter Solenoid Location.	1-7
Starter Symptoms.	3-6
Starter Testing Diagnostics.	3-7
Starter Troubleshooting.	3-6
Starting System.	3-3
Start Relay Description.	3-3
Start Switch Description.	3-3
Stator Test.	3-20
Stop Lamp Diagnostics.	5-31
Stop Lamps Operation.	5-28
Storage Mode (TSSM).	5-57
Symptoms	
Symptom Table.	2-7

T

Tachometer Location.	1-2
Tachometer Operation.	4-2
Tail Lamp Wiring.	1-8
TCA.	6-1
TCA Location.	1-11
TGS.	6-1
TMAP Location.	1-12
TMAP Sensor.	6-1
TMAP Sensor Description.	6-6
Torque Conversion.	C-3
Trademarks	
Harley-Davidson.	I-II
Referenced Products.	I-II
Transport Mode.	5-57
Trip Odometer Reset Switch Operation.	4-1
TSM/TSSM/HFSM Location.	1-9
TSSM/HFSM Features	
Arming Confirmation.	5-46
Auto-arming (TSSM Only).	5-46
Dealer Service Mode (HFSM Only).	5-46
Disarming Confirmation.	5-46
Personal Code Disarming.	5-46
Remote Arming/Disarming (TSSM Only).	5-46
Security Lamp.	5-46
Security System Alarm.	5-46
Starter/Ignition Disable.	5-46
Transport Mode.	5-46
TSSM Fails to Disarm.	5-60
Turn Signal	
Diagnostics.	5-19
Turn Signal Indicators.	4-15
Turn Signal Indicators Diagnostics.	4-19
Tyco 070 Multilock Unsealed Connector	
Repair.	A-35

V

Voltage Drop Test.	1-18
Voltage Regulator Description.	3-16
Voltage Regulator Inspection.	3-16
Voltage Regulator Stator.	1-6
Voltmeter Gauge	
Problem.	4-22
Voltmeter Location.	1-2
Voltmeter Test.	3-1
VSS.	6-1
VSS Description.	6-7

W

Wiggle Test.	1-19
Wiring Diagram Symbols.	B-7
WOW Test.	2-1

