

2008 Touring Models Electrical Diagnostics Manual

99497-08

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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

2008 Touring Models Electrical Diagnostics Manual

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2008 Touring Models Electrical Diagnostics Manual (99497-08)

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	Starting / Charging
2	Instruments
3	TSM/HFSM
4	Engine Management
5	Audio System
6	ABS
A	Appendix A Connector Repair
B	Appendix B Wiring
C	Appendix C Conversions
D	Appendix D Glossary
E	Appendix E TSM/TSSM (Japan/Korea)

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

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

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

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

PREPARATION FOR SERVICE

⚠WARNING

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

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

NOTES

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

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

To ensure satisfactory and lasting repairs, carefully follow the 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 service manual preceded by the following words are of special significance.

⚠WARNING

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

⚠CAUTION

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

CAUTION

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

NOTE

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

Proper service and repair is important for the safe, reliable operation of all mechanical products. The service procedures recommended and described in this service 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 service manual. However, please 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

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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.

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NOTES

STARTER TROUBLESHOOTING 1.1

GENERAL

The troubleshooting tables contain detailed procedures to solve and correct problems. Follow 1.2 STARTING SYSTEM DIAGNOSIS to diagnose starting system problems. The 1.3 DIAGNOSTICS/TROUBLESHOOTING, Voltage Drop procedure will help you to locate poor connections or components with excessive voltage drops.

STARTER TROUBLESHOOTING

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

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

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Table 1-2. Pinion Does Not Engage With Ring Gear While Starter is Cranked or Engine Cannot Be Cranked

SOURCE OF PROBLEM	PROBABLE CAUSE	SOLUTION
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuited or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.
Overrunning clutch	Overrunning clutch malfunction (rollers or compression spring).	Replace overrunning clutch.
	Pinion teeth worn out.	Replace starter clutch sub-assembly.
	Pinion does not run in overrunning direction.	Replace overrunning clutch.
	Poor sliding condition of spline teeth.	Remove foreign materials, dirt or replace overrunning clutch or pinion shaft.
	Reduction gears damaged.	Replace overrunning clutch and idler gear.
Gear teeth on clutch shell	Excessively worn teeth.	Replace clutch shell.

Table 1-3. Starter Does Not Stop Running

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

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STARTING SYSTEM DIAGNOSIS 1.2

DIAGNOSTICS

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

Diagnostic Notes

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

1. See 1.3 DIAGNOSTICS/TROUBLESHOOTING, Voltage Drop.
2. Remove starter motor. Connect jumper wires as described in 1.6 TESTING STARTER ON BENCH, Free Running Current Draw Test.
3. Connect BREAKOUT BOX (Part No. HD-42682) to TSM/TSSM/HFSM as follows:
   a. On models with a TSM/HFSM, see 3.12 BREAKOUT BOX: TSM/HFSM.
   b. On models with a TSSM (Japan/Korea), E.11 BREAKOUT BOX: TSM/TSSM.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) purple terminal pin probe and patch cord.
5. See 1.5 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test.
6. See 1.6 TESTING STARTER ON BENCH, Free Running Current Draw Test.
7. Closely inspect handlebar controls for pinched wiring.

Job/Time Code Values

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

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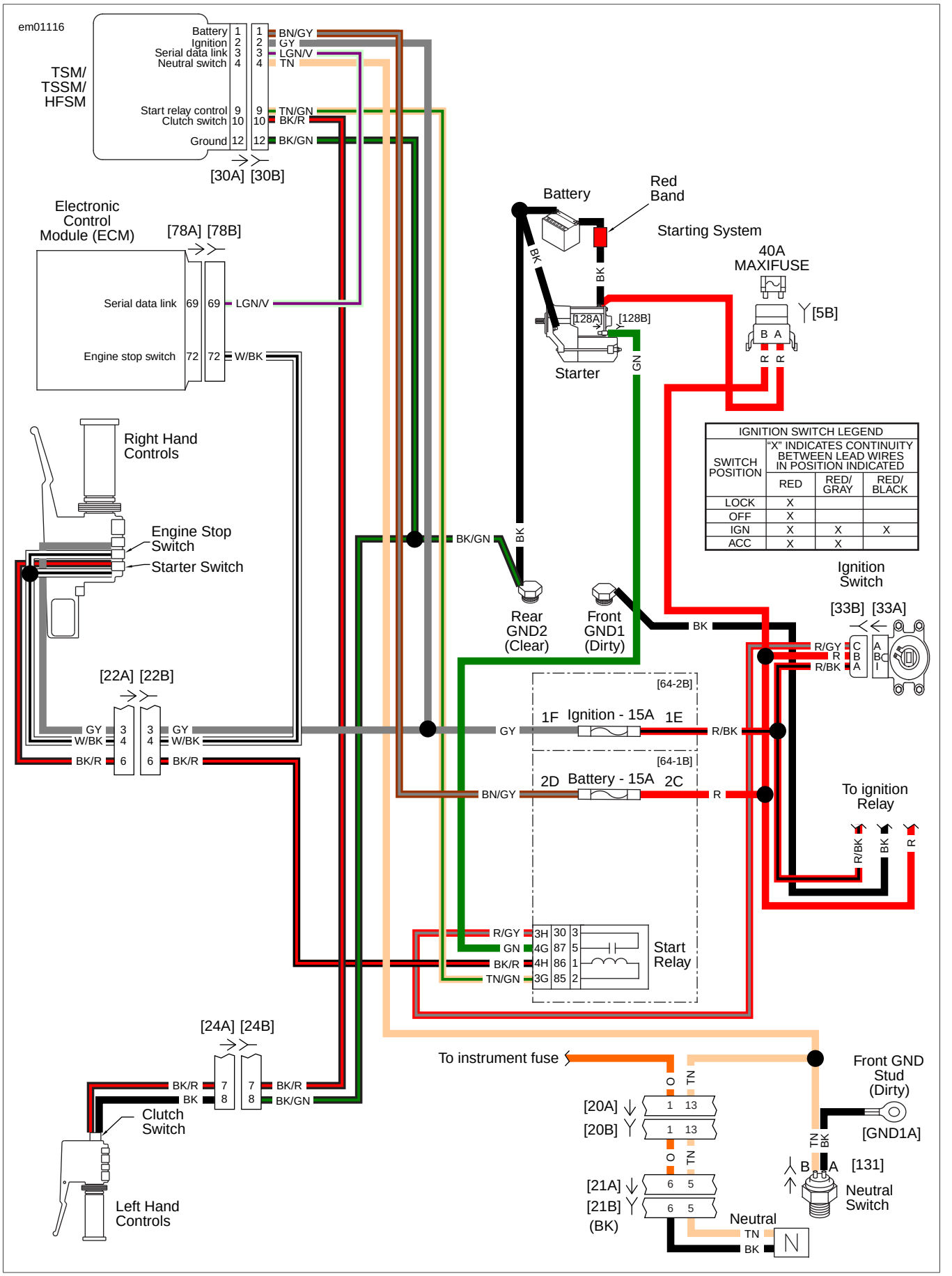


Figure 1-1. Starting Circuit (FLHR/C/S)

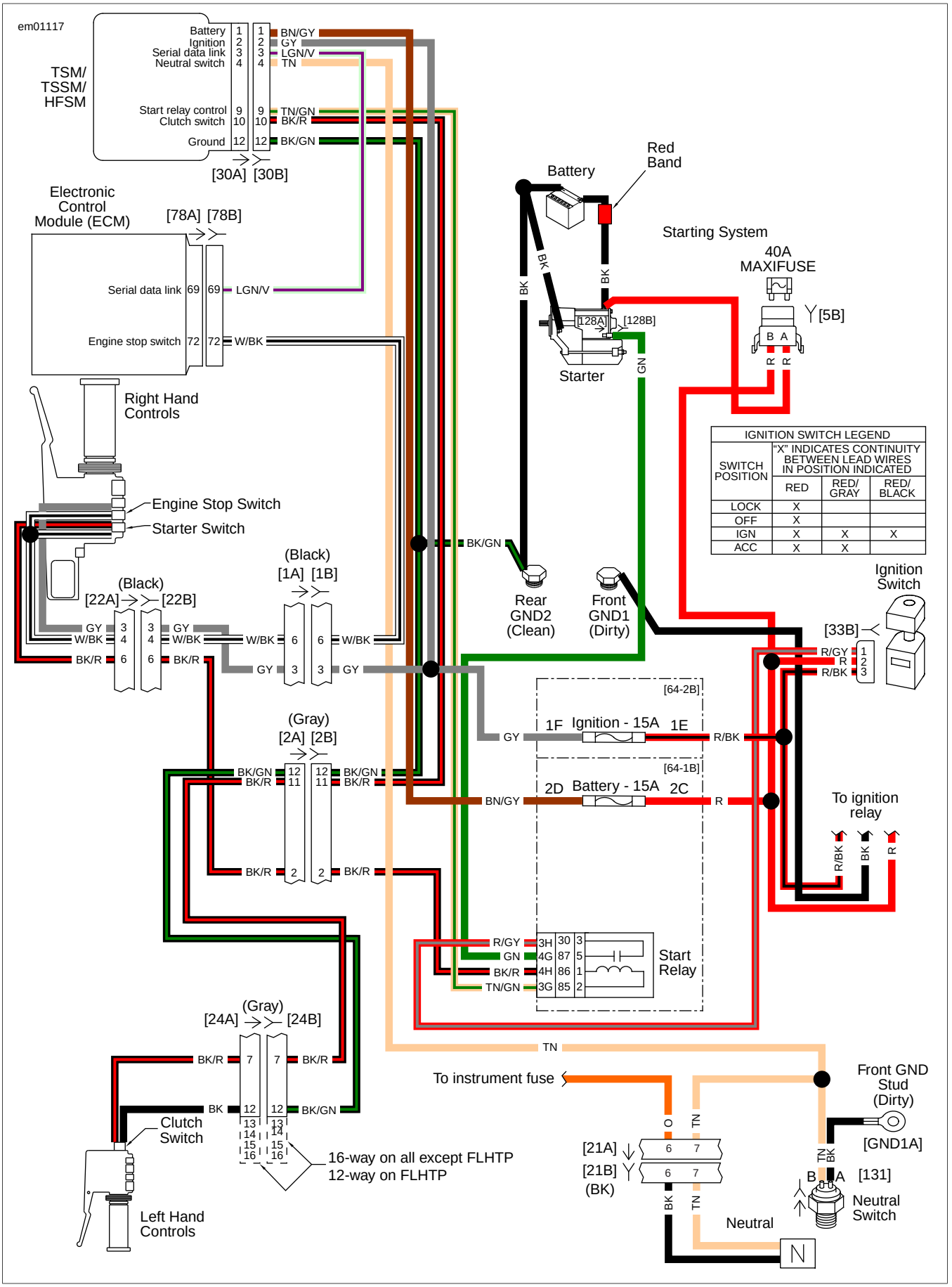
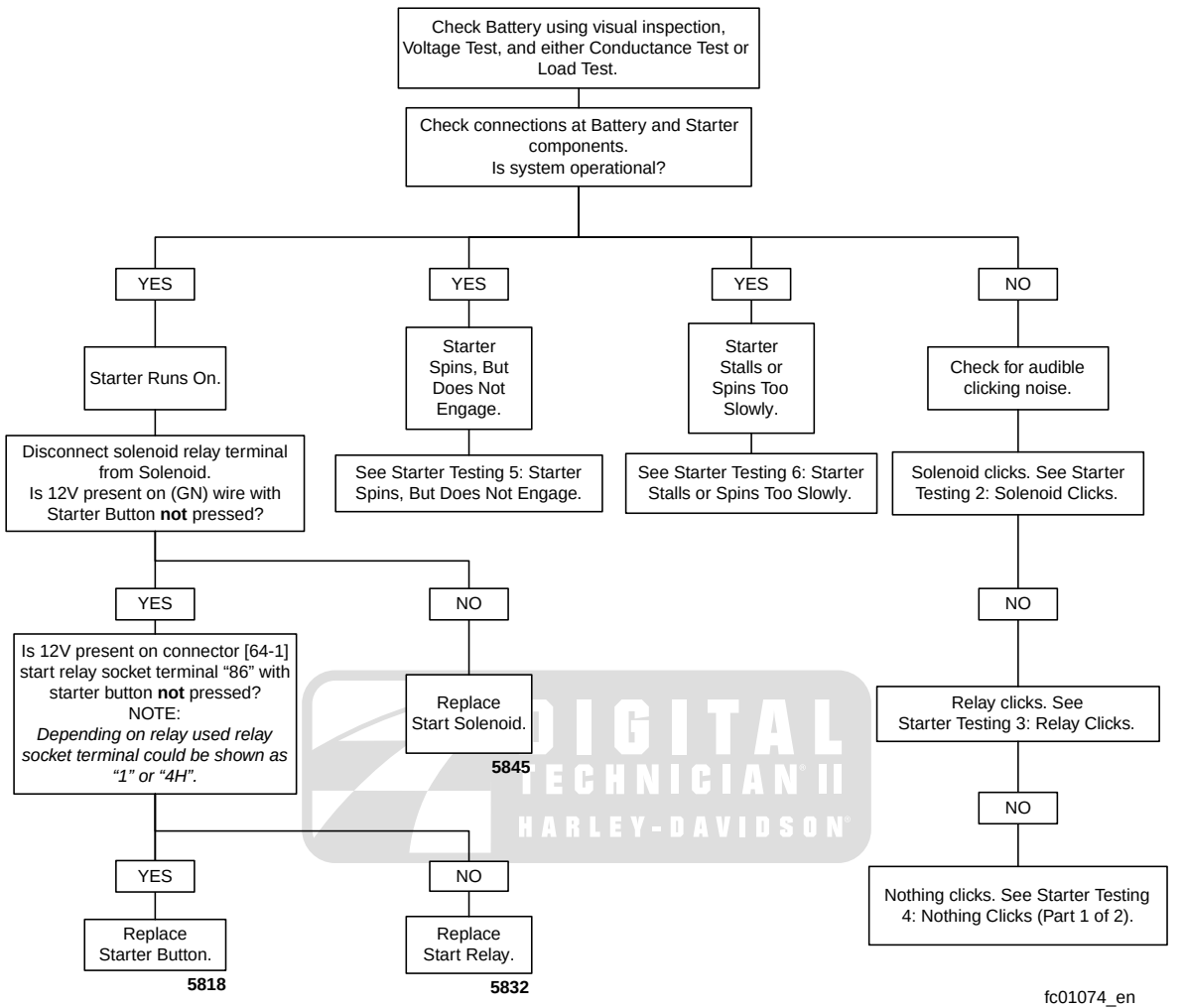


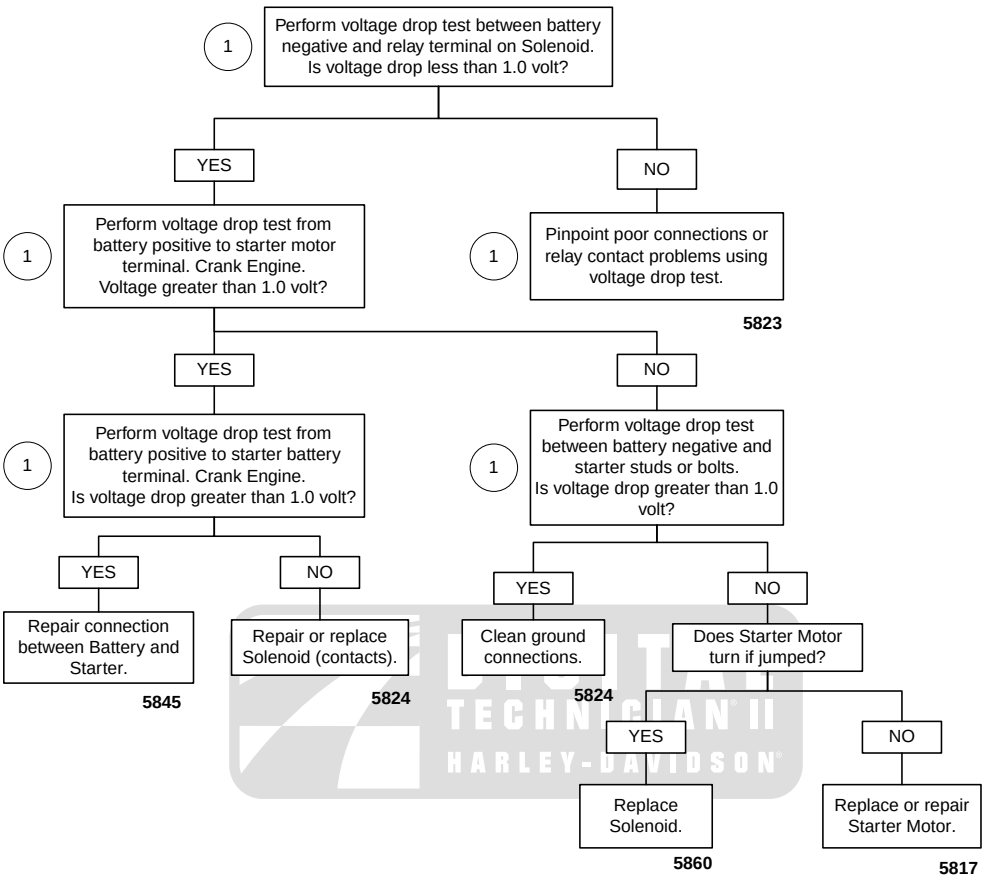
Figure 1-2. Starting Circuit (FLHX, FLHT/C/U, FLTR)

Starter Testing 1



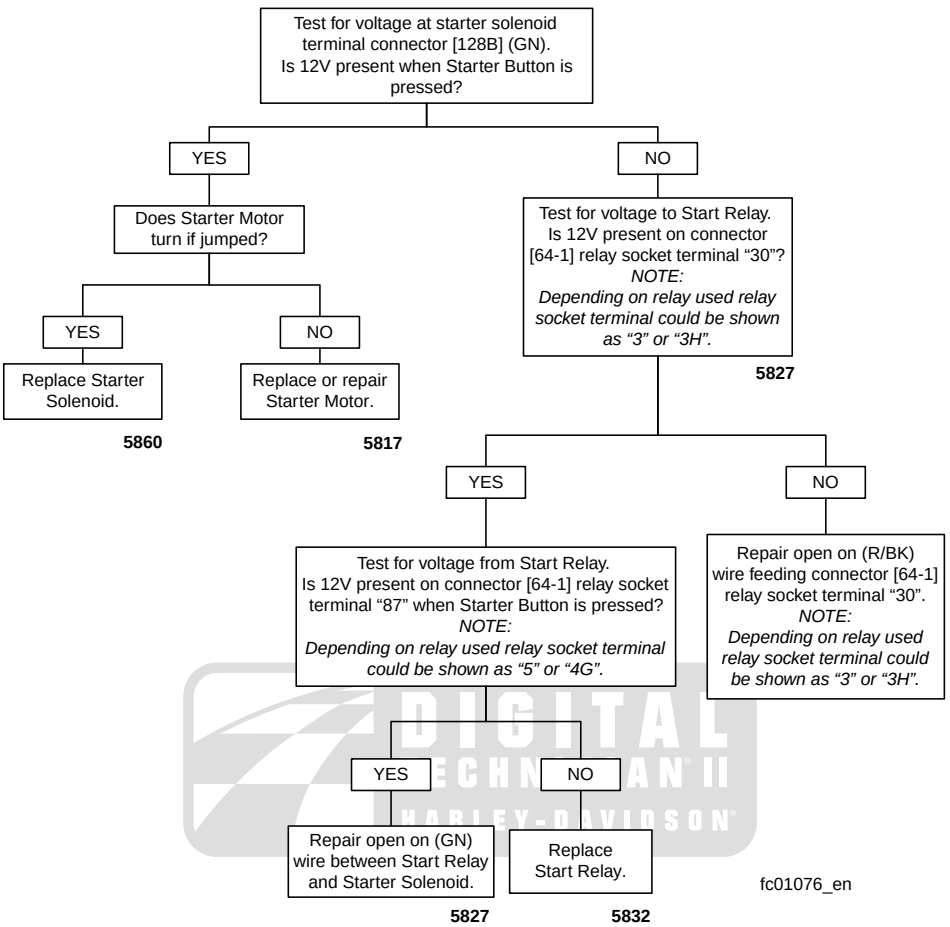
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starter Testing 2: Solenoid Clicks

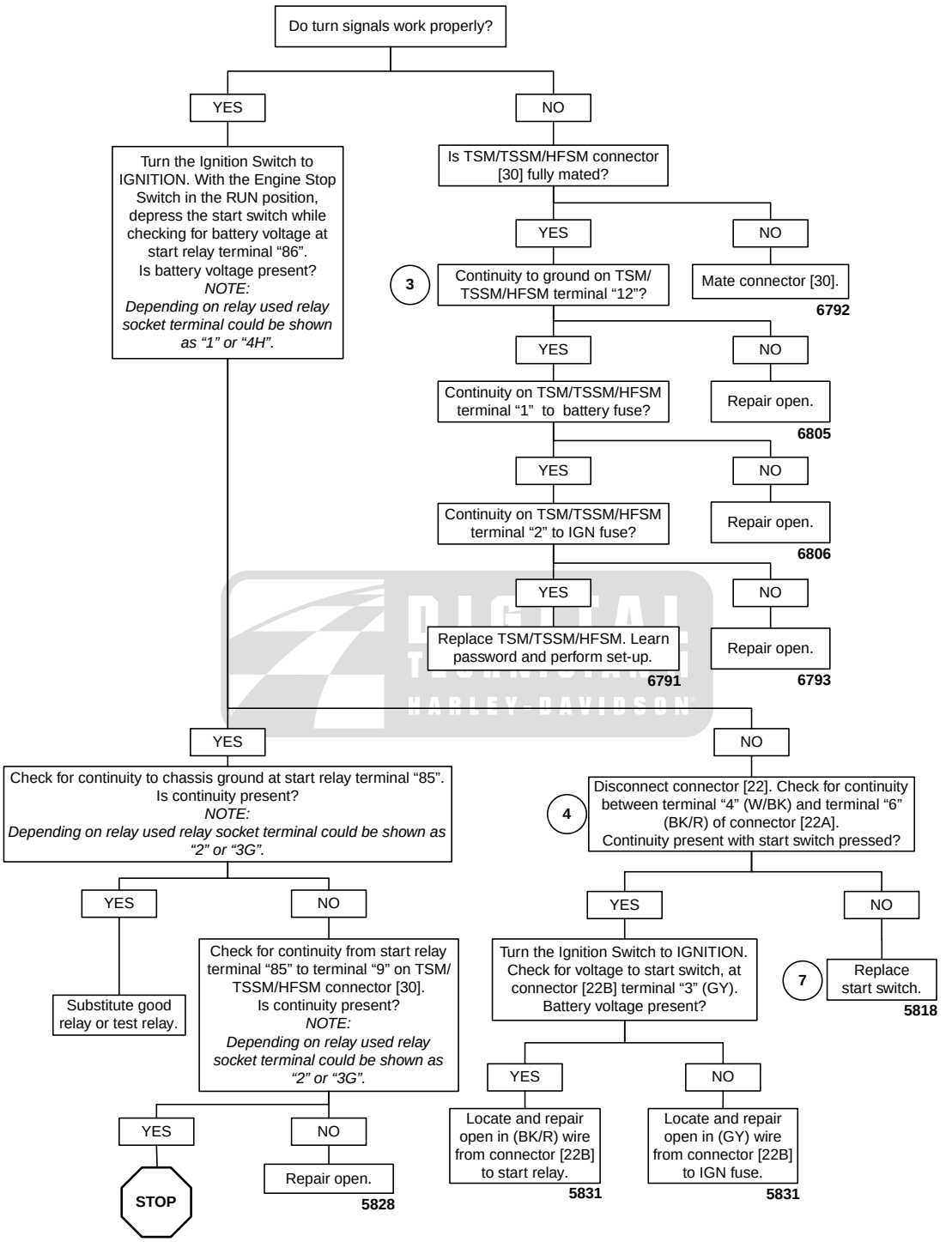


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Starter Testing 3: Relay Clicks



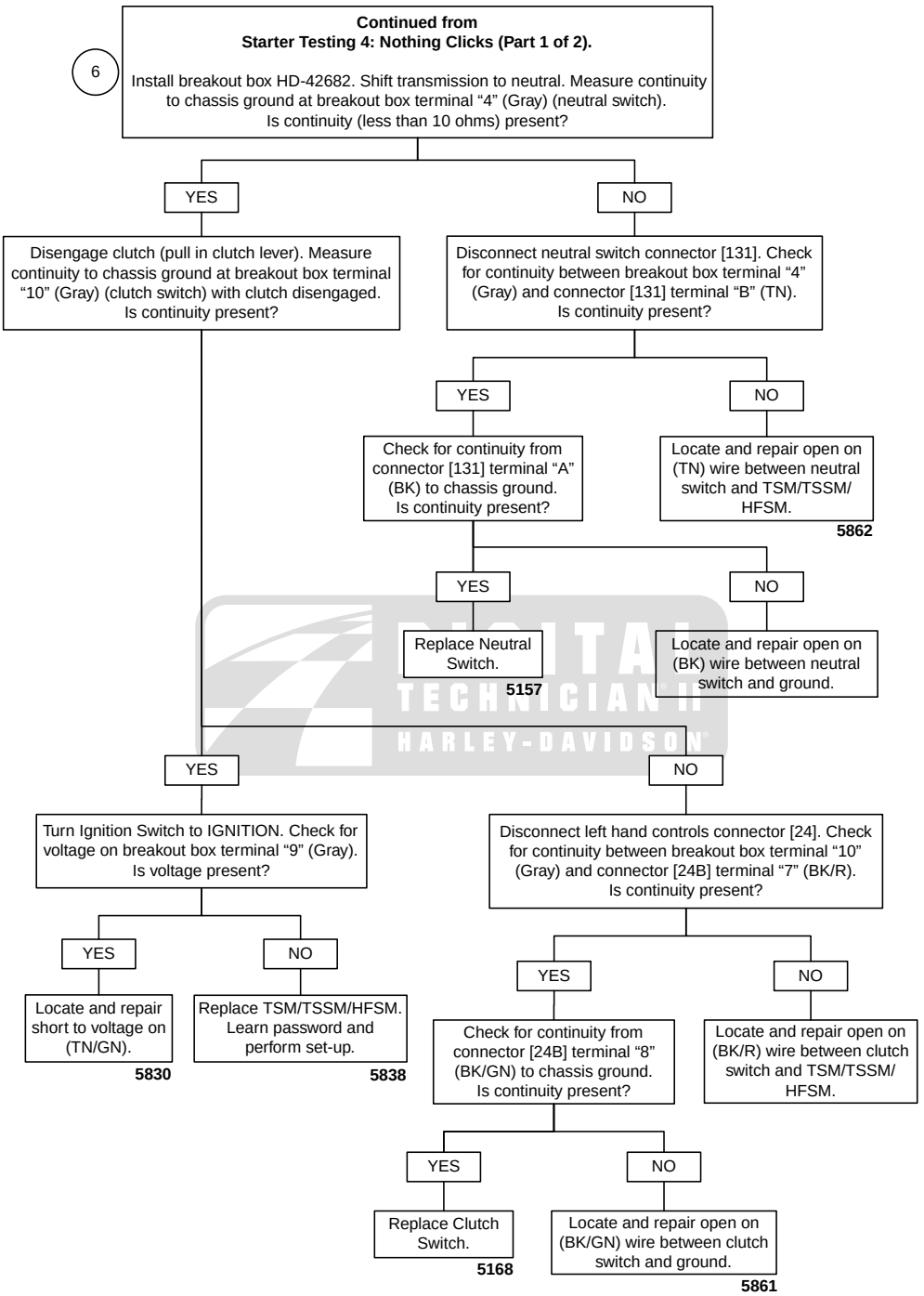
Starter Testing 4: Nothing Clicks (Part 1 of 2)



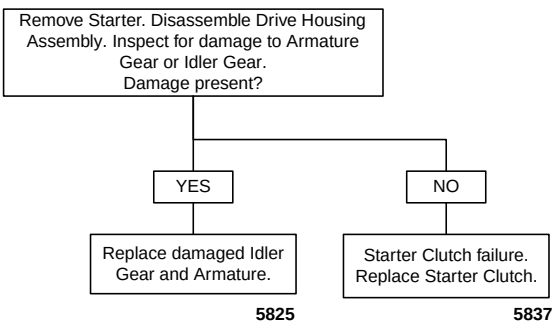
Go to Starter Testing 4: Nothing Clicks (Part 2 of 2).

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

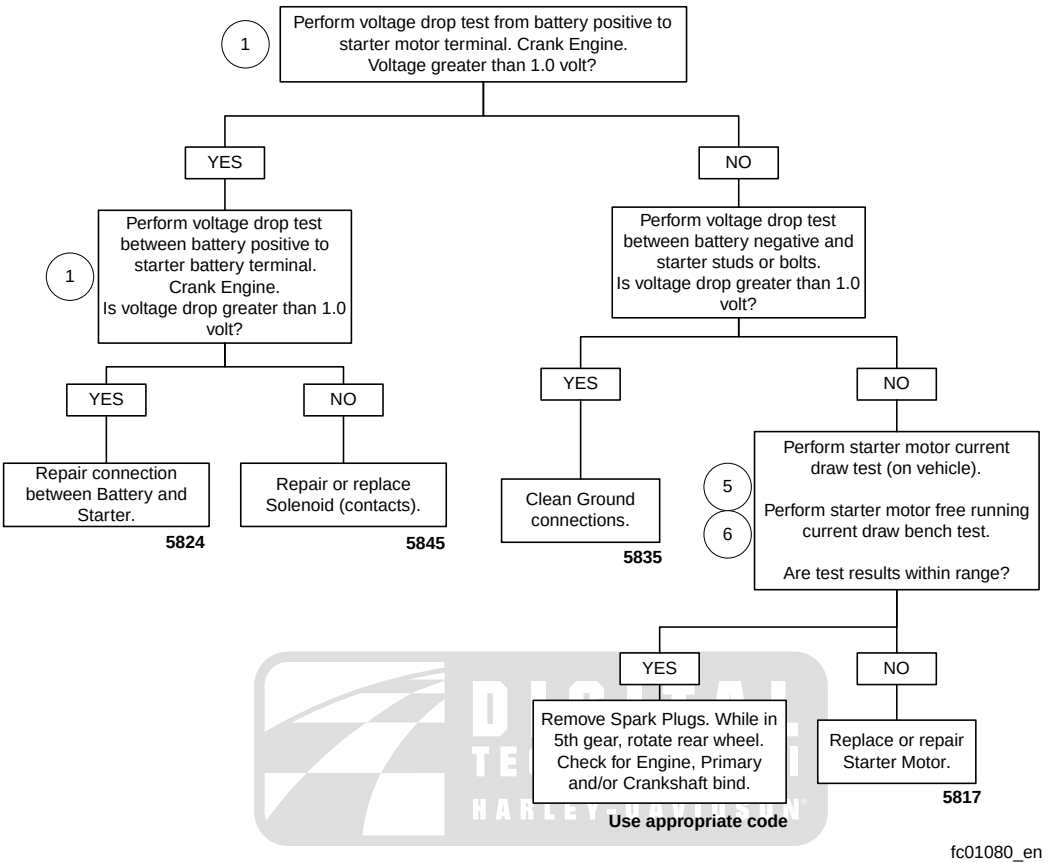


Starter Testing 5: Starter Spins, But Does Not Engage



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starter Testing 6: Starter Stalls or Spins Too Slowly



DIAGNOSTICS/TROUBLESHOOTING 1.3

VOLTAGE DROP

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

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

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

NOTE

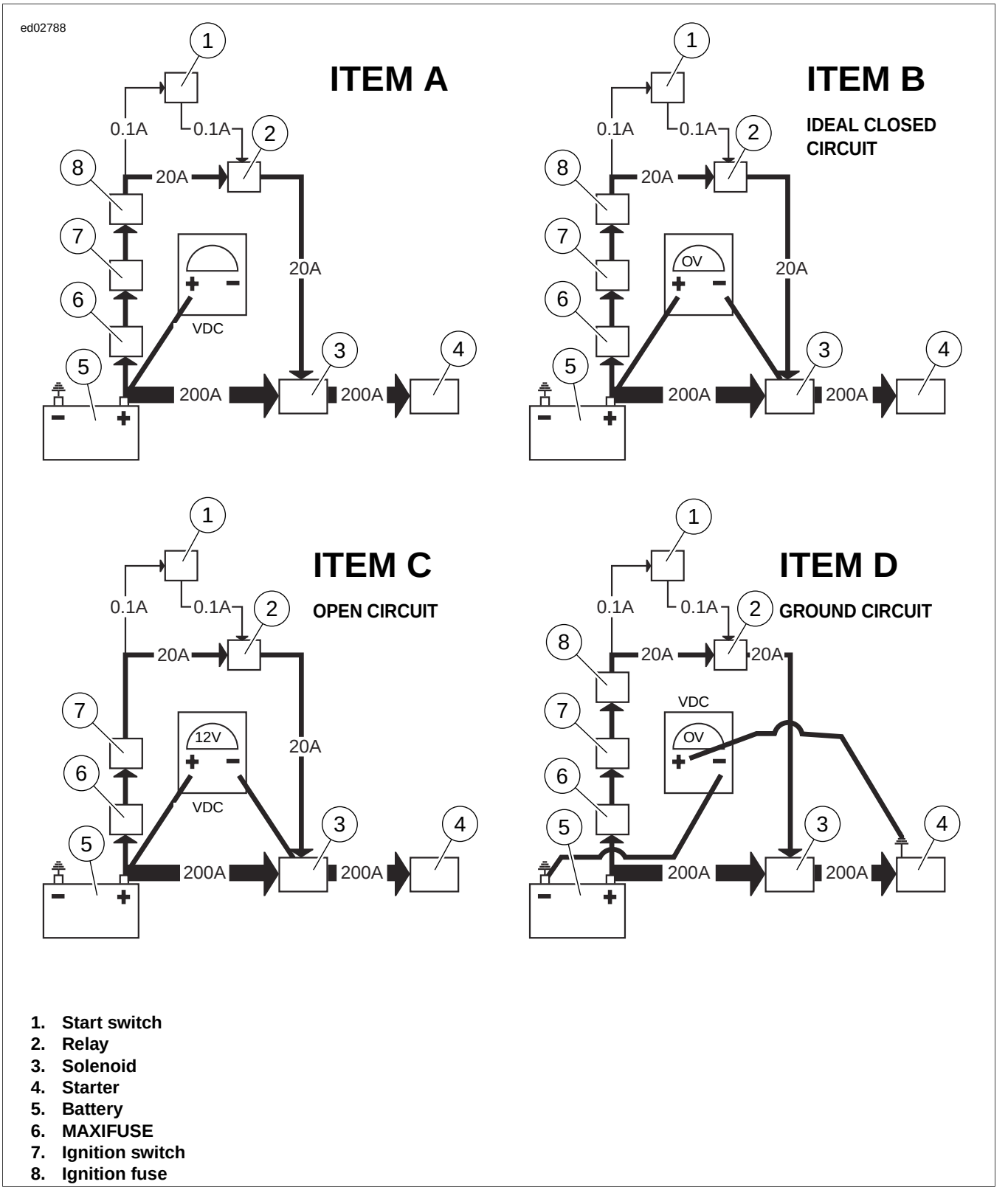
Open circuits on the ground side will read zero.

5. Typically, a good circuit will drop less than 1.0 volt. If the voltage drop is greater, back track through the connections until the source of the potential difference is found. The benefits of doing it this way are speed and accuracy.
   a. Readings are not as sensitive to real battery voltage.
   b. Readings show the actual voltage dropped, not just the presence of voltage.
   c. This tests the system as it is actually being used. It is more accurate and will display hard to find poor connections.
   d. This approach can be used on lighting circuits, ignition circuits, etc. Start from most positive and go to most negative (the destination or component).
6. See ITEM D in Figure 1-3. The negative or ground circuit can be checked as well.
   a. Place the negative lead on the most negative part of the circuit (or the negative battery post). Remember, there is nothing more negative than the negative post of the battery.
   b. Place the positive lead to the ground you wish to check.
   c. Activate the circuit. This will allow you to read the potential difference or voltage dropped on the negative or ground circuit. This technique is very effective for identifying poor grounds due to powdered paint. Even the slightest connection may cause an ohmmeter to give a good reading. However, when sufficient current is passed through, the resistance caused by the powdered paint will cause a voltage drop or potential difference in the ground circuit.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

STARTER ACTIVATION CIRCUITS 1.4

STARTER ACTIVATION CIRCUITS



1. Start switch
2. Relay
3. Solenoid
4. Starter
5. Battery
6. MAXIFUSE
7. Ignition switch
8. Ignition fuse

Figure 1-3. Typical Circuitry. Refer to wiring diagrams for more information.

TESTING STARTER ON MOTORCYCLE 1.5

START RELAY TEST

1. See Figure 1-4. Locate the start relay behind the left side cover.
2. See Figure 1-5. The start relay can be tested using the motorcycle's 12 volt battery and a multimeter.
   a. Unplug connector from relay.
   b. To energize relay, connect the "85"(2) and relay terminal "86"(1) to the positive battery terminal.
   c. Check for continuity between the 30 (3) and 87 (5) terminals. A good relay shows continuity (continuity tester lamp "on" or a zero ohm reading on the ohmmeter). A malfunctioning relay will not show continuity and must be replaced.
3. If start relay is functioning properly, proceed to 1.5 TESTING STARTER ON MOTORCYCLE, Starter Current Draw Test.

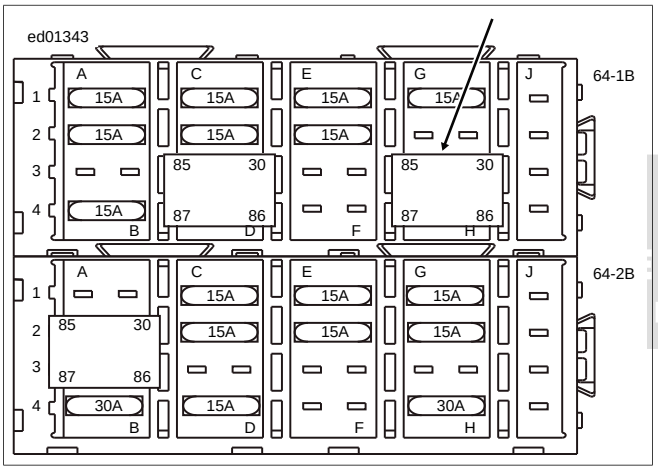
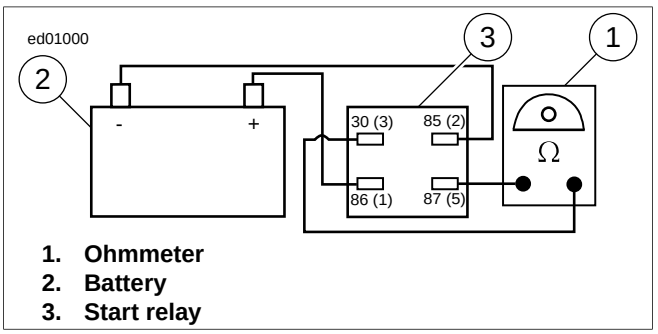


Figure 1-4. Start Relay



1. **Ohmmeter**
2. **Battery**
3. **Start relay**

Figure 1-5. Start Relay Test

STARTER CURRENT DRAW TEST

NOTES

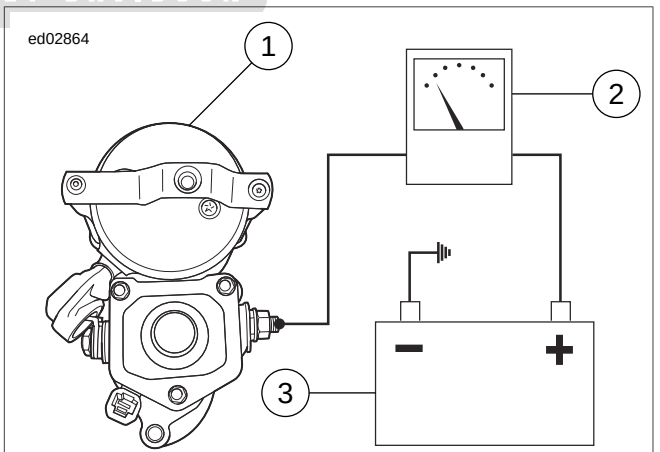
- *Engine temperature should be stable and at room temperature.*
- *Battery should be fully charged.*

See Figure 1-6. Check starter current draw with an induction ammeter before disconnecting battery. Proceed as follows:

1. Verify that transmission is in neutral. Disconnect spark plug wires from spark plug terminals.
2. Clamp induction ammeter over positive battery cable next to starter.
3. With ignition switch to IGNITION, turn engine over by pressing starter switch while reading the ammeter. Disregard initial high current reading which is normal when engine is first turned over.
   a. Typical starter current draw will range between 160 to 200 amperes.
   b. If starter current draw exceeds 250 amperes, then the problem may be in the starter or starter drive. Remove starter for further tests. See 1.6 TESTING STARTER ON BENCH, Free Running Current Draw Test.

NOTE

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



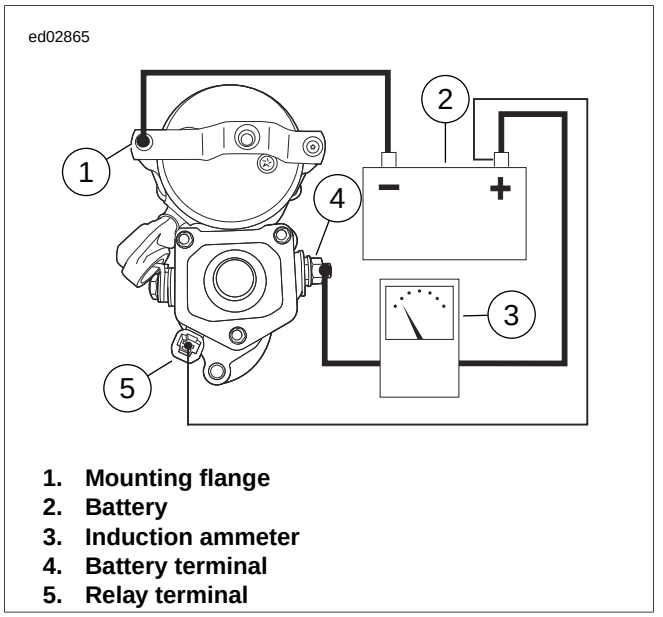
1. **Starter**
2. **Induction Ammeter**
3. **Battery**

Figure 1-6. Starter Current Draw Test

TESTING STARTER ON BENCH 1.6

FREE RUNNING CURRENT DRAW TEST

1. Place starter in vise, using a clean shop towel to prevent scratches or other damage.
2. See Figure 1-7. Attach one heavy jumper cable (6 gauge minimum).
   a. Connect one end to the starter mounting flange (1).
   b. Connect the other end to the negative (-) terminal of a fully charged battery (2).
3. Connect a second heavy jumper cable (6 gauge minimum).
   a. Connect one end to the positive (+) terminal of the battery (2).
   b. Connect the other end to the battery terminal (4) on the starter solenoid. Place an inductive ammeter (3) over cable.
4. Connect a smaller jumper cable (14 gauge minimum).
   a. Connect one end to the positive (+) terminal of the battery (2).
   b. Connect the other end to the solenoid relay terminal (5).
5. Check ammeter reading.
   a. Ammeter should show 90 amps maximum.
   b. If reading is higher, disassemble starter for inspection. See the Service Manual.
   c. If starter current draw on vehicle was over 200 amps and this test was within specification, there may be a problem with engine or primary drive.



1. **Mounting flange**
2. **Battery**
3. **Induction ammeter**
4. **Battery terminal**
5. **Relay terminal**

Figure 1-7. Free Running Current Draw Test

STARTER SOLENOID

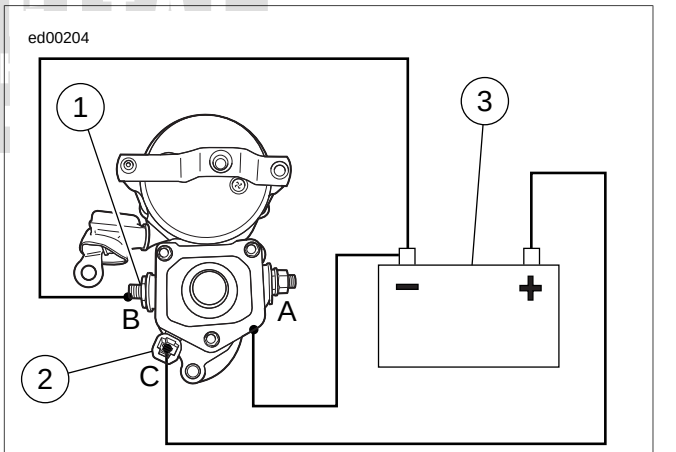
Do not disassemble solenoid. Before testing, disconnect field wire from motor terminal as shown in Figure 1-8.

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

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

SOLENOID PULL-IN TEST

1. See Figure 1-8. Using a 12 volt battery, connect three separate test leads as follows:
   a. Solenoid housing to negative battery post.
   b. Solenoid motor terminal to negative battery post.
   c. Solenoid relay terminal to positive battery post.
2. Observe starter shaft.
   a. If starter shaft extends strongly, solenoid is working properly.
   b. If starter shaft does not extend strongly, replace the solenoid.



1. **Motor terminal**
2. **Relay terminal**
3. **Battery**

Figure 1-8. Pull-In Test

SOLENOID HOLD-IN TEST

1. See Figure 1-9. With test leads still connected in the manner specified in the previous 1.6 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 the solenoid.

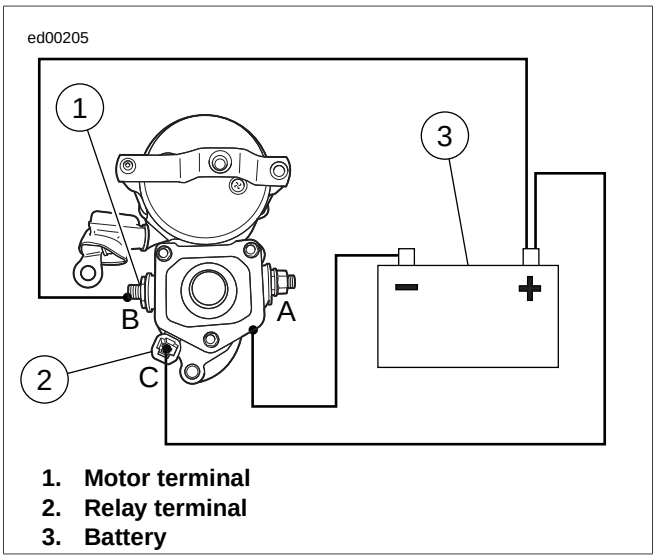


Figure 1-9. Hold-In Test

SOLENOID RETURN TEST

1. See Figure 1-10. With test leads still connected in the manner specified at the end of the previous 1.6 TESTING STARTER 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 the solenoid.

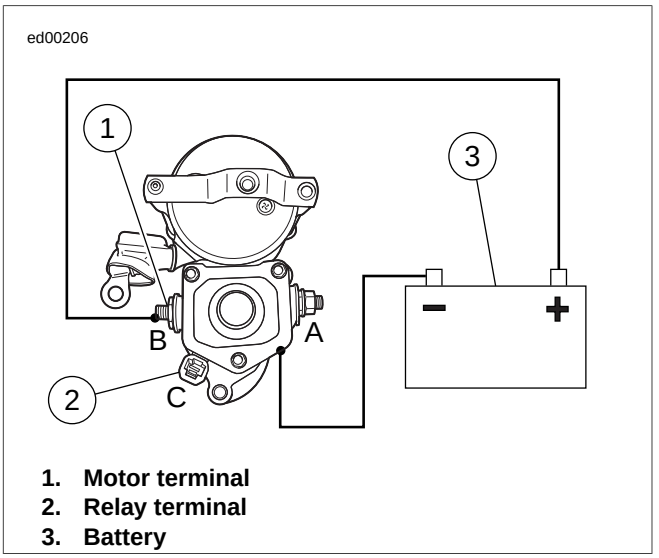


Figure 1-10. Return Test

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CHARGING SYSTEM 1.7

GENERAL

The charging system consists of the alternator and voltage regulator. Charging system circuits are shown in Figure 1-12.

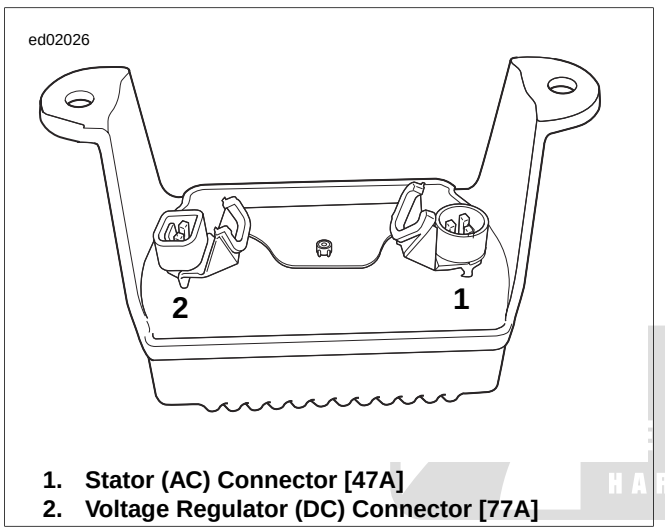
Alternator

The alternator consists of two main components:

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

Voltage Regulator

See Figure 1-11. The voltage regulator is a series regulator. The circuit combines the functions of rectifying and regulating.



1. **Stator (AC) Connector [47A]**
2. **Voltage Regulator (DC) Connector [77A]**

Figure 1-11. Voltage Regulator (Bottom View) AC and DC Connectors

TROUBLESHOOTING

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

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

Battery

Check for a weak or dead battery. See 1.8 BATTERY TESTING for battery testing procedures. Battery must be fully charged in order to perform a load test, or starting or charging tests. However, a partially discharged battery may be tested using the BATTERY TEST function of the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-48053).

Wiring

The stator and battery plug and socket connections must be clean and tight.

See Figure 1-12. Check for corroded or loose connections in the charging circuit.

Voltage Regulator Inspection

The voltage regulator must have a clean, tight connection for proper operation. Check by using an ohmmeter with one lead on chassis ground, such as battery ground cable, and the other on the voltage regulator ground lead.

Job/Time Code Values

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

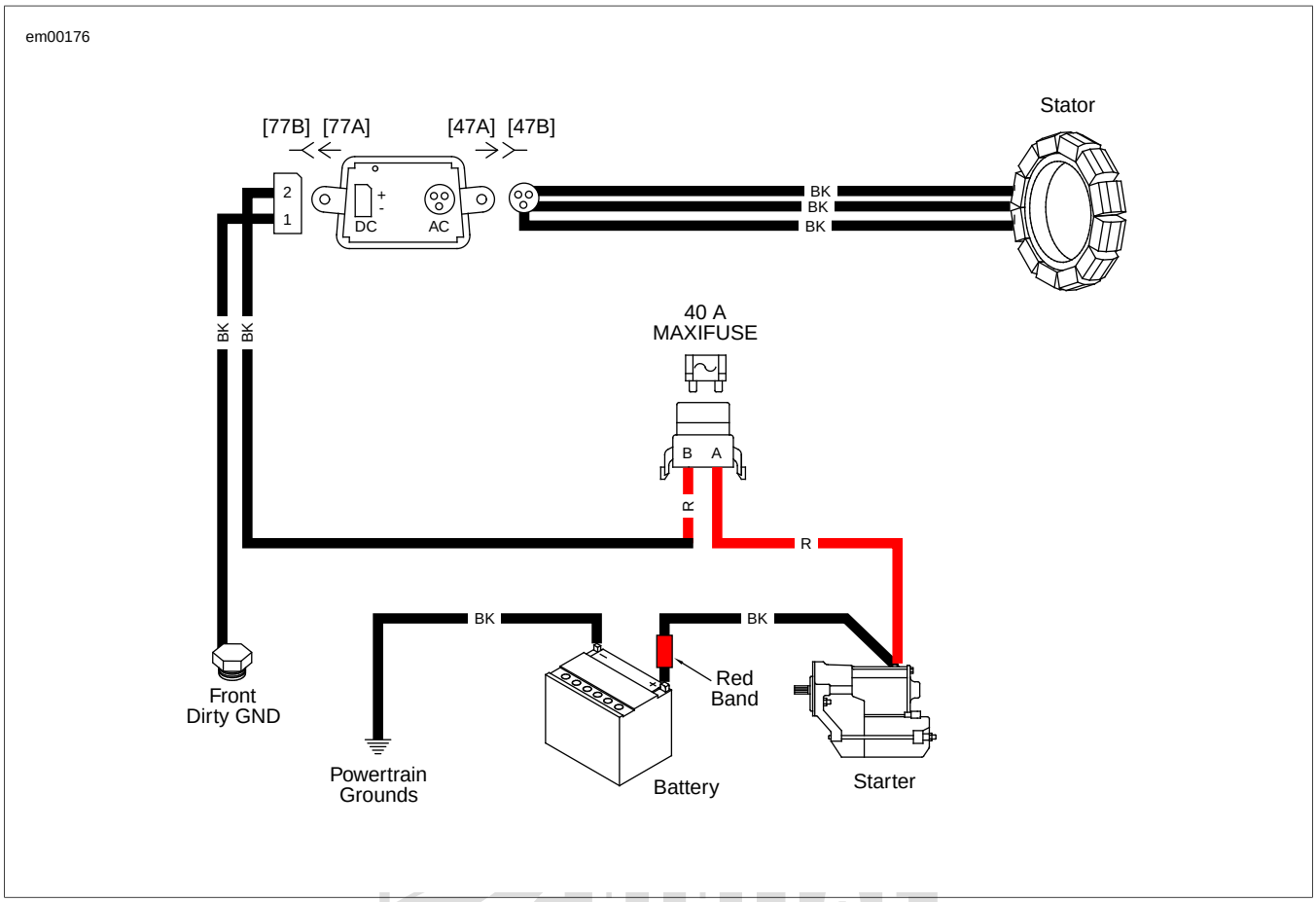
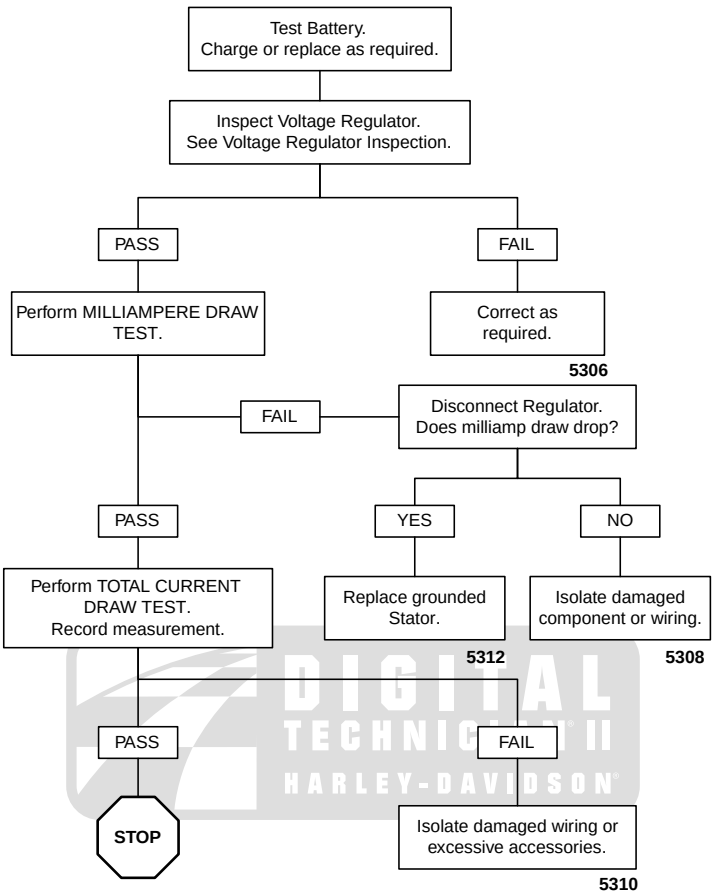
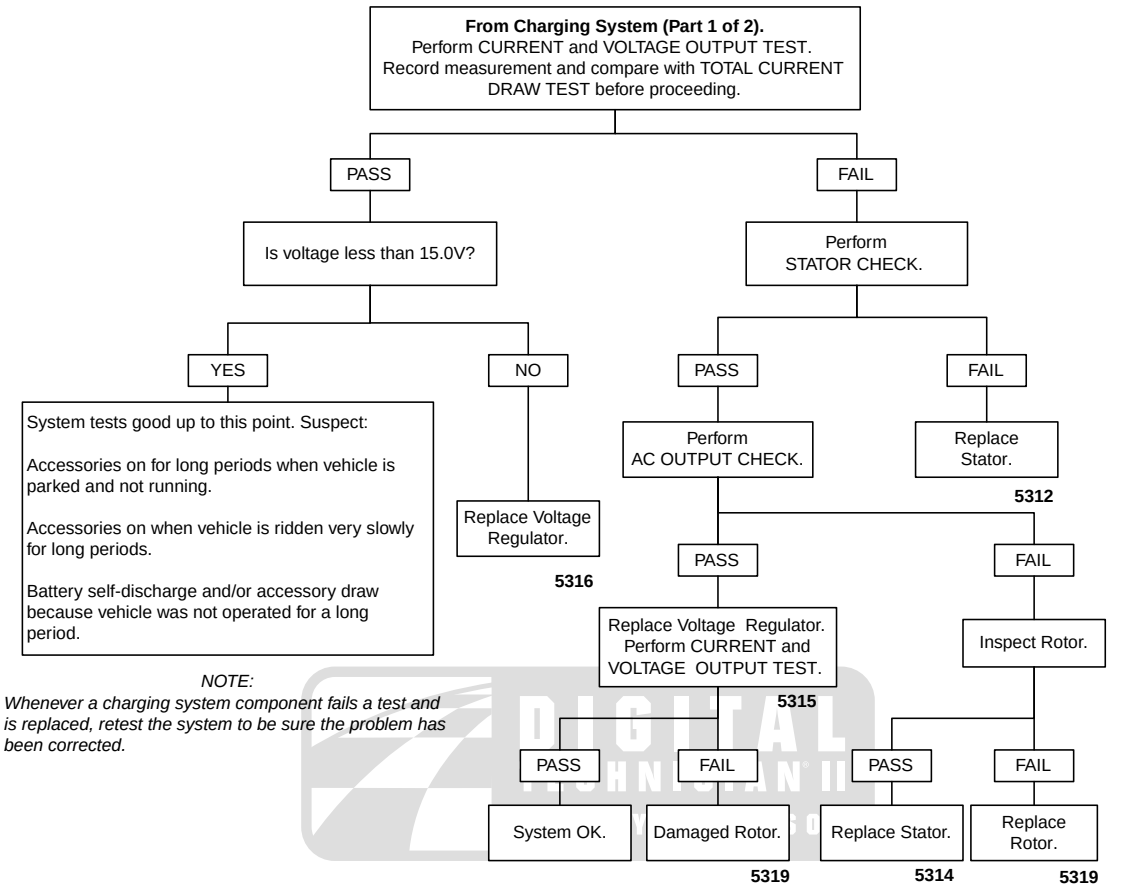


Figure 1-12. Charging System Circuit (Typical)

Charging System Test (Part 1 of 2)



Charging System Test (Part 2 of 2)



NOTE:
Whenever a charging system component fails a test and is replaced, retest the system to be sure the problem has been corrected.

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TESTING

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER

Milliampere Draw Test

NOTES

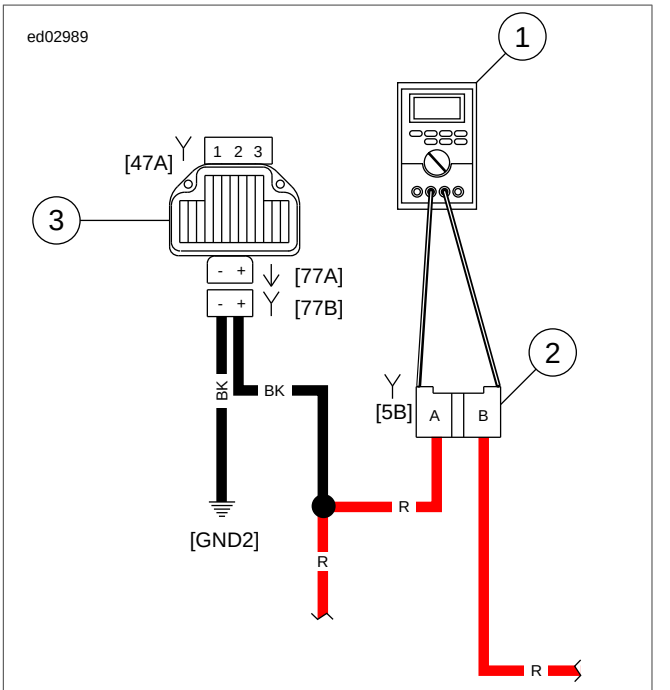
- *Be sure accessories are not wired so they stay on at all times. This condition could drain battery completely if vehicle is parked for a long time. Check for this by connecting ammeter between negative battery terminal and battery.*
- *TSM/TSSM/HFSM will continue to draw 16-25 mA for 30 seconds after ignition is turned OFF. Any disruption and reconnection of battery power, such as disconnecting the battery to place a meter in series, will cause TSM/TSSM/HFSM to draw 16-25 mA for 30 seconds.*

Disconnect siren during milliamperes draw test. (Siren may draw up to 20 mA.)

1. Remove left side cover. Remove MAXIFUSE.
2. See Figure 1-13. Using HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) red male socket probes and patch cords, connect ammeter to MAXIFUSE socket terminals. With this arrangement, you will also pick up any regulator drain.
3. With ignition switch turned to OFF and all lights and accessories off, observe current reading.
   a. Refer to Table 1-4. Add regulator draw ammeter reading to appropriate value for TSM/TSSM/HFSM/ECM. If observed ammeter reading is less than listed in table, draw is within limits.
   b. A higher reading indicates excessive current draw. Any accessories must be considered and checked for excessive drain.

NOTE

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



1. **Ammeter**
2. **MAXIFUSE socket**
3. **Voltage regulator**

Figure 1-13. Milliampere Draw Test (Ignition Turned to OFF)

Table 1-4. 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 will draw for 2-24 hours from time motorcycle battery is connected and 0.05 milliamperes once siren battery is charged. Disconnect siren during milliampere draw test.

Total Current Draw Test

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

NOTE

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

⚠WARNING

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

1. See Figure 1-14. To check for this condition, place load tester induction pickup or current probe pickup over battery negative cable.
2. Disconnect stator plug from voltage regulator. Start the motorcycle and run the engine at 2000 RPM.
3. With ignition and all continuously running lights and accessories turned on (headlamp on high beam), read the total current draw.
4. Compare this reading to the reading obtained after performing the CURRENT AND VOLTAGE OUTPUT TEST.
   a. The current output should exceed current draw by 3.5 amps minimum.
   b. If output does not meet specifications, there may be too many accessories for the charging system to handle.
5. Reconnect voltage regulator after testing.

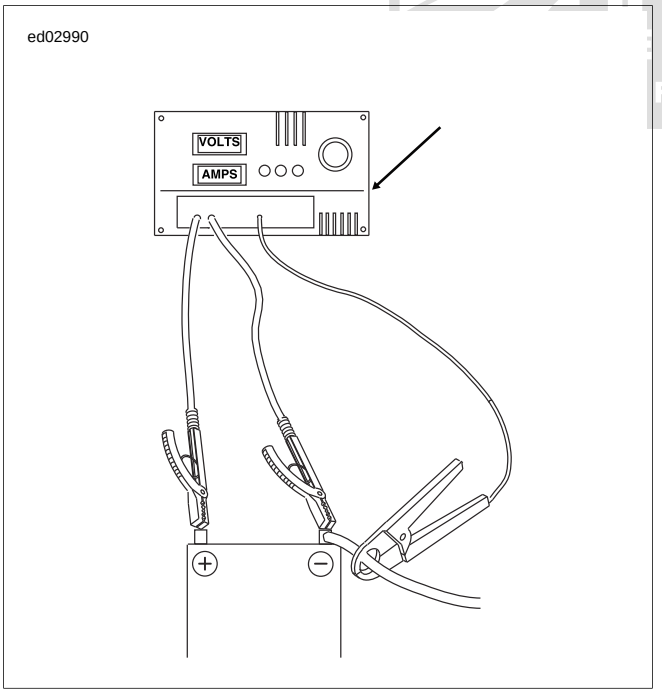


Figure 1-14. Check Durrent Draw (Ignition Switch On)

Current and Voltage Output Test: Using HD-48053

Connect ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (Part No. HD-48053) to the vehicle's battery.

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

See Figure 1-15. The test results will include a decision on the charging system's condition and the measured system voltage at idle and at 3000 RPM. The analyzer's printer will provide you with a printout including one of two possible test results:

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

Current and Voltage Output Test: Using Load Tester

1. See Figure 1-14. Connect load tester.
   a. Connect negative and positive leads to battery terminals.
   b. Place load tester induction pickup over positive regulator cable.
2. Run the engine at 3000 RPM. Increase the load as required to obtain a constant 13.0VDC. Do not leave any load switch turned on for more than 20 seconds or overheating and tester damage are possible.
3. The current output should be 35-50 amps. Make note of measurement for use in TOTAL CURRENT DRAW TEST.

NOTE

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

4. See Figure 1-14. After removing the load, read the load tester voltage meter.
   a. If voltage to the battery is not more than 15V, voltage output is within specifications. Investigate other possible problems. See Charging System Test.
   b. If voltage is higher, voltage regulator is not functioning properly.

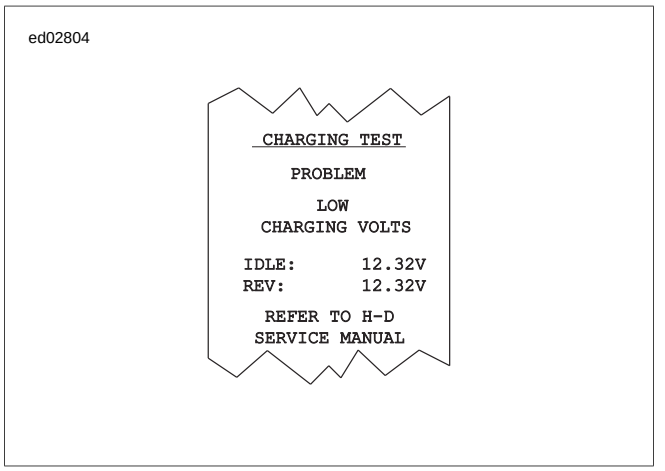


Figure 1-15. Charging System Test Results Printout

Stator Check

1. Turn ignition switch OFF.
2. See Figure 1-16. Connect an ohmmeter.
   a. Disconnect voltage regulator connector from alternator stator wiring.
   b. Insert one ohmmeter lead into a stator connector socket.
   c. Attach the other lead to a suitable ground.
3. Test for continuity with ohmmeter set to the ohms scale.
   a. A good stator will show no continuity (open circuit) between any stator sockets and ground.
   b. Any other reading indicates a grounded stator which must be replaced.
4. See Figure 1-17. Remove ground lead. Check resistance across stator sockets 1-2, 2-3 and 3-1.
5. Test for resistance with ohmmeter set on the ohms scale.
   a. Resistance across all the stator sockets should be 0.1-0.2 ohms.
   b. If the resistance is higher, the stator is damaged and must be replaced.
   c. If the resistance is lower, it could indicate turn to turn short.

NOTE

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

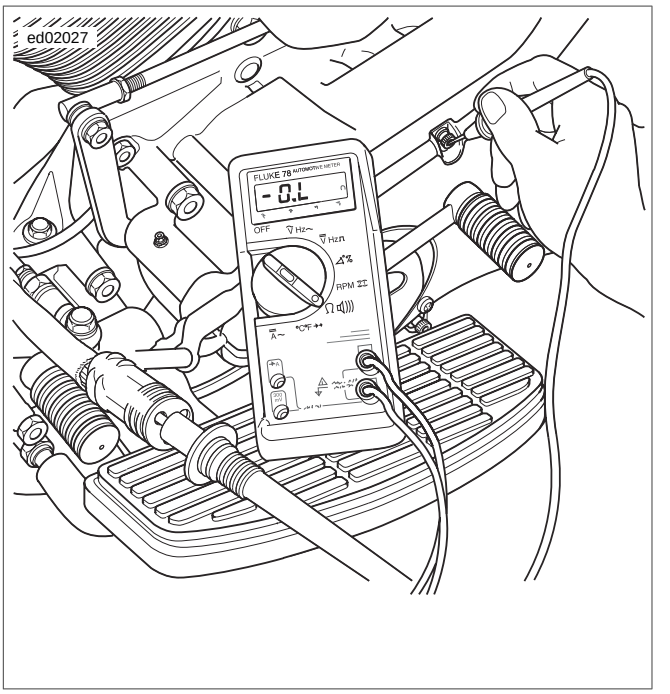


Figure 1-16. Test for Grounded Stator (Typical)

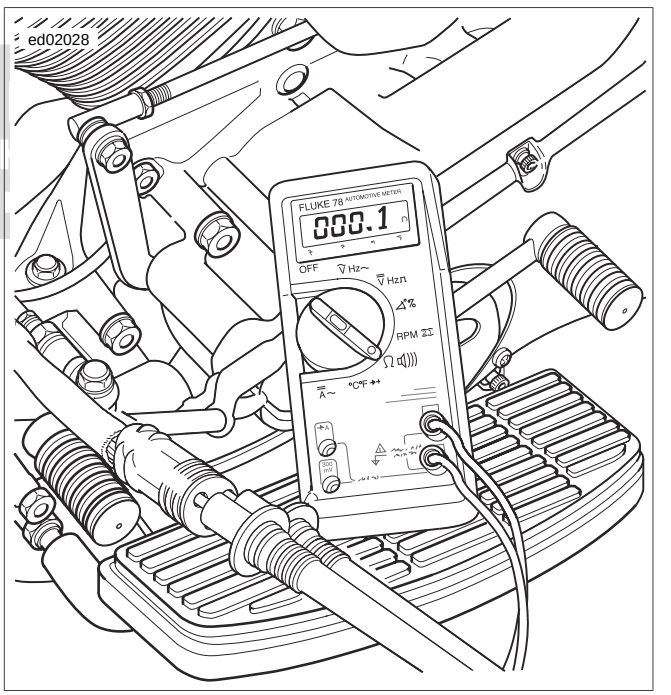


Figure 1-17. Check for Stator Resistance (Typical)

AC Output Check

1. See Figure 1-18. Test AC output.
   a. Disconnect voltage regulator connector from alternator stator wiring.
   b. Connect an AC voltmeter across stator connector sockets 1-2.
   c. Run the engine at 2000 RPM. The AC output should be 32-46 volts AC (approximately 16-23 per 1000 RPM).
   d. Repeat test across stator sockets 2-3 and 3-1.
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 spec, charging problem might be faulty regulator. Replace as required.
3. Check the output again as previously described under Current and Voltage Output Test.

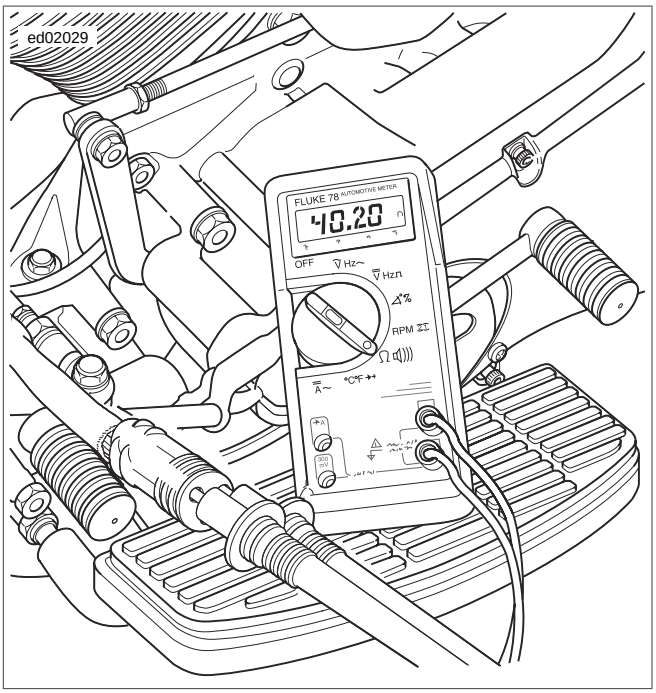


Figure 1-18. Check Stator AC Voltage Output (Typical)

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BATTERY TESTING 1.8

GENERAL

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

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

VOLTMETER TEST

The voltmeter test provides a general indicator of battery 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 1-5.

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 the LOAD TEST described in this section.

Table 1-5. Voltmeter Test For Battery Charge Conditions

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

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 HD-48053 analyzer leads to the vehicle battery lead terminal, not to bolt or wire terminal.

NOTE

Connect the tester directly to the lead terminals of the battery, and not the bolts.

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 1-19. The analyzer printer will provide you with a printout including one of six possible test results:

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

NOTES

- *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.*
- *Connect the tester directly to the lead terminals of the battery, and not the bolts.*

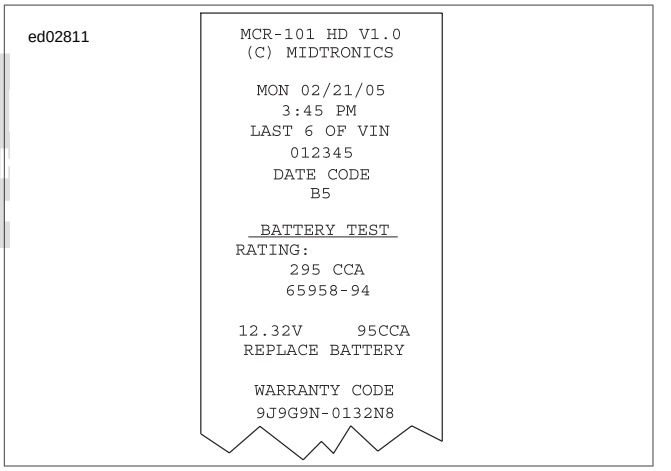


Figure 1-19. Battery Test Results Printout

LOAD TEST

To load test the battery, proceed as follows:

WARNING

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

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

⚠WARNING

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

4. See Figure 1-20. 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.

5. Refer to Table 1-6. Load battery at 50% of CCA rating using the load tester. Voltage reading after 15 seconds should be 9.6V or more at 70° F (21° C).

⚠WARNING

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

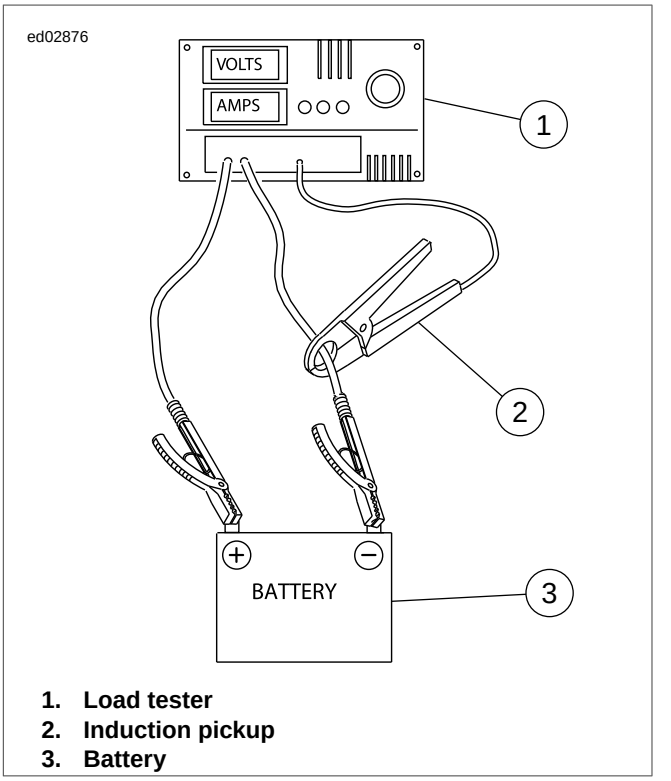
⚠WARNING

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

CAUTION

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

6. Install the battery in the motorcycle.



1. **Load tester**
2. **Induction pickup**
3. **Battery**

Figure 1-20. Load Test Battery

Table 1-6. Battery Load Test

COLD CRANKING AMPERAGE (CCA)	100%	50%
Touring models	300	150

NOTES

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SUBJECT	PAGE NO.
2.1 CHECKING FOR DIAGNOSTIC TROUBLE CODES	2-1
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2.3 SPEEDOMETER SELF DIAGNOSTICS	2-11
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NOTES

CHECKING FOR DIAGNOSTIC TROUBLE CODES 2.1

CHECK ENGINE LAMP

See Figure 2-1. To diagnose Electronic Control Module (ECM) system problems, begin by observing the behavior of the check engine lamp (1).

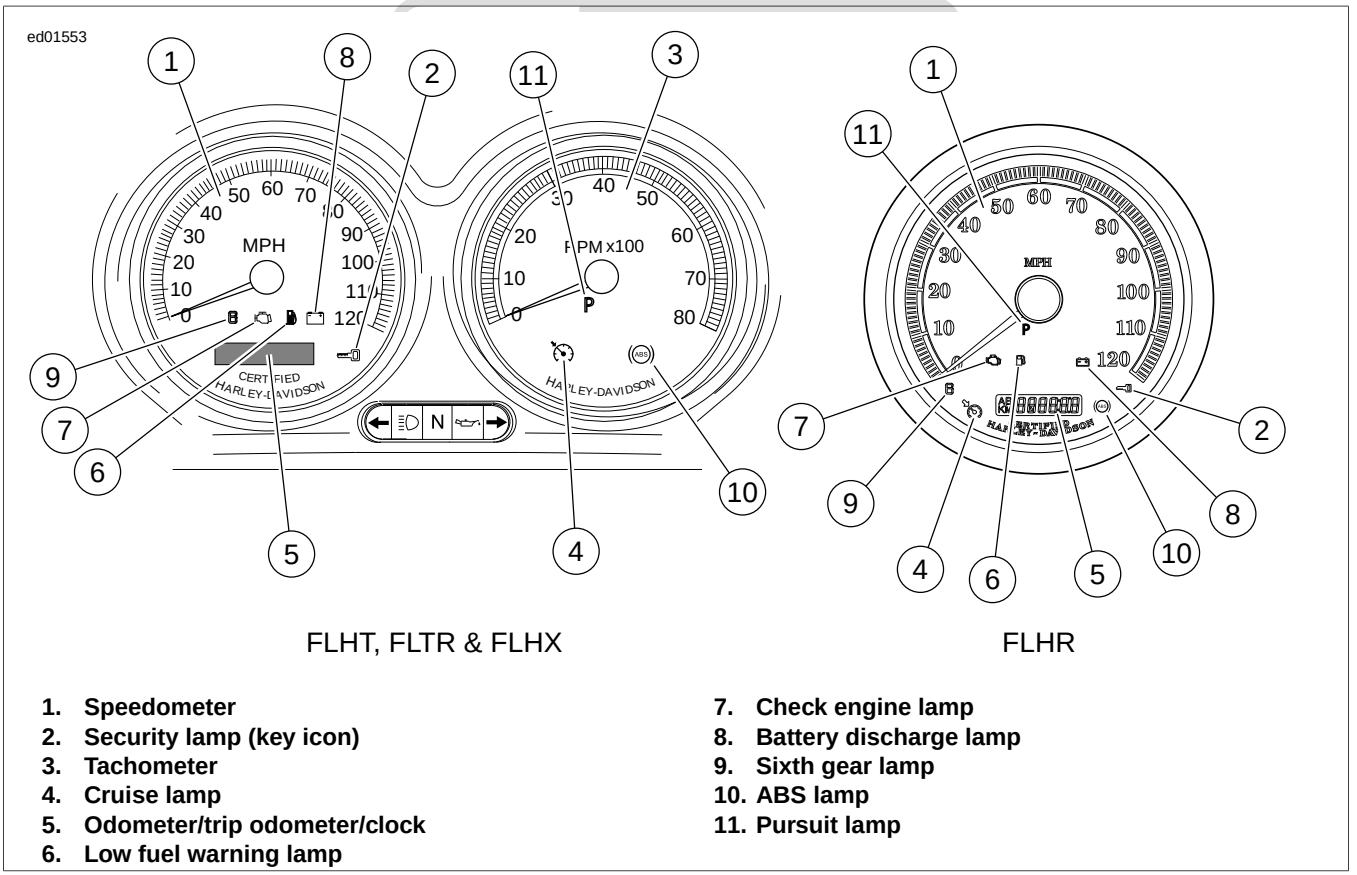
NOTES

- *See Figure 2-2. "Key ON" means that the Ignition Switch is turned to IGNITION and the Engine Stop Switch is set to RUN (although the engine is **not** running).*
- *When the Ignition Switch is turned to IGNITION, the check engine lamp will illuminate for approximately four seconds and then turn off.*
- *If the check engine lamp is not illuminated at Ignition ON, the problem is likely to be an instrument failure. See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*
- *If the check engine lamp illuminates late (after 20 seconds), the problem is most likely a serial data bus failure. Test for Diagnostic Trouble Codes (DTCs) using speedometer self diagnostics. See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*
- *If the check engine lamp fails to turn off after the initial four-second period, see 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*

1. See Figure 2-3. 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 remains off for only four seconds and then illuminates for an eight-second period. This indicates a DTC is stored, but no current DTC exists.
   c. The lamp remains on beyond the eight-second period. This indicates a current DTC exists.
2. See 2.1 CHECKING FOR DIAGNOSTIC TROUBLE CODES, Code Types which follows for a complete description of DTC formats.

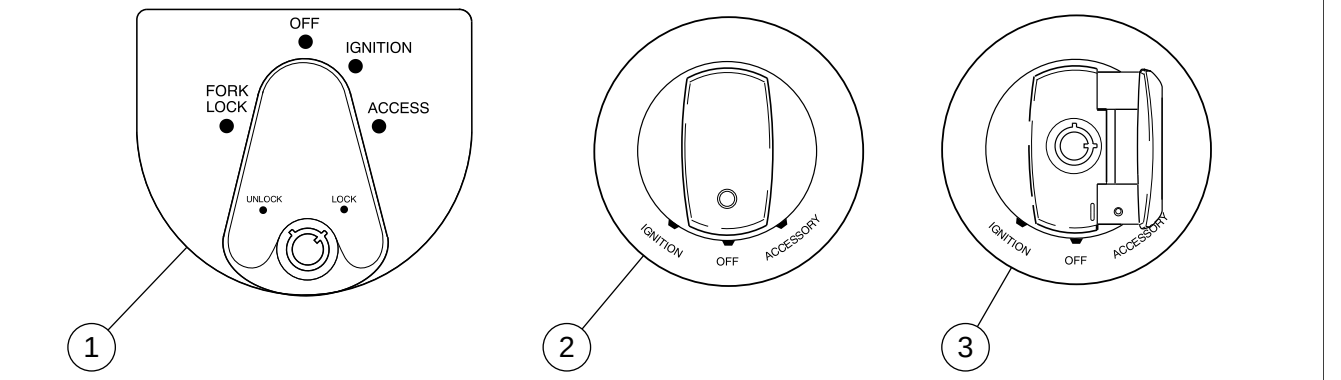
NOTE

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.



1. **Speedometer**
2. **Security lamp (key icon)**
3. **Tachometer**
4. **Cruise lamp**
5. **Odometer/trip odometer/clock**
6. **Low fuel warning lamp**
7. **Check engine lamp**
8. **Battery discharge lamp**
9. **Sixth gear lamp**
10. **ABS lamp**
11. **Pursuit lamp**

Figure 2-1. Speedometer



1. **All except FLHR models**
2. **All FLHR models (cover shown closed)**
3. **All FLHR models (cover shown open)**

Figure 2-2. Ignition Switch (FLHX, FLHT/C/U, FLTR)

SECURITY LAMP

To diagnose TSM/HFSM system problems, begin by observing the behavior of the security lamp.

NOTES

- *To provide an indication of HFSM DTCs, the security lamp is enabled on HFSM models.*
- *See Figure 2-2. "Key ON" means that the ignition switch is turned to IGNITION and the engine stop switch is set to RUN (although the engine is **not** running).*
- *When the ignition switch is turned to IGNITION, the check engine lamp will illuminate for approximately four seconds and then turn off.*
- *If the check engine lamp is not illuminated at IGNITION ON, the problem is likely to be an instrument failure. See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*
- *If the check engine lamp illuminates late (after 20 seconds), See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*
- *If the security lamp fails to turn OFF after the initial four-second period, a problem exists in the instrumentation. See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.*

1. See Figure 2-3. After the security 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 HFSM.
   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. The lamp remains on beyond the eight-second period. This indicates a current DTC exists.
2. See 2.1 CHECKING FOR DIAGNOSTIC TROUBLE CODES, Code Types which follows for a complete description of DTC formats.

NOTE

Some DTCs can only be fully diagnosed during actuation. For example, a problem with the turn signals will be considered a current fault even after the problem is corrected, since the TSM/HFSM will not know of its resolution until after the turn signals are activated. In this manner, there may sometimes be a false indication of the current DTC.

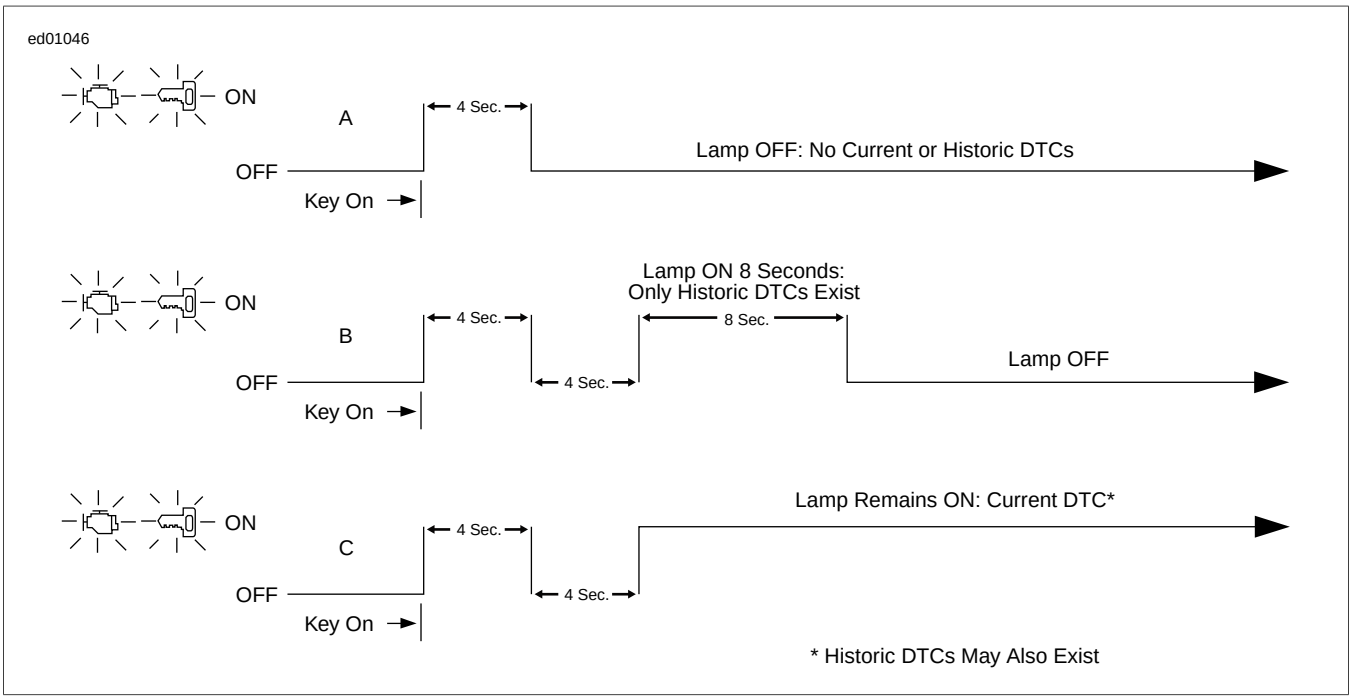


Figure 2-3. Check Engine and Security Lamp Operation

CODE TYPES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

There are two types of DTCs: current and historic. If a DTC is stored, it can be read using DIGITAL TECHNICIAN (Part No. HD-44750) or speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS.

All DTCs reside in the memory of the ECM, TSM/TSSM/HFSM, speedometer or tachometer until the code is cleared.

Current

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

Historic

If a particular problem happens to resolve itself, the active status problem is dropped and it becomes a historic fault rather than a current fault. Historic DTCs are stored for a length of time to assist in the diagnosis of intermittent faults.

Historic DTCs are cleared after a total of 50 trips has elapsed. A trip consists of a start and run cycle. After the 50 trip retention period, the historic DTC is automatically erased from memory providing no subsequent faults of the same type are detected in that period.

DTCs can only be identified as historic using DIGITAL TECHNICIAN (Part No. HD-44750), a computer-based diagnostic package.

It is important to note that historic DTCs may also be present whenever the system indicates the existence of a current fault. See 2.1 CHECKING FOR DIAGNOSTIC TROUBLE CODES, Multiple Diagnostic Trouble Codes if multiple DTCs are found.

Diagnostic charts are designed for use with current DTCs and as a result they frequently suggest wire repair or part replacement.

RETRIEVING DIAGNOSTIC TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The engine management system provides two levels of diagnostics.

- The most sophisticated mode employs DIGITAL TECHNICIAN (Part No. HD-44750), a computer-based diagnostic package.
- The second mode requires using the speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS.

MULTIPLE DIAGNOSTIC TROUBLE CODES

While it is possible for more than one fault to occur and set more than one DTC, there are several conditions which may result in **one** fault setting **multiple** DTCs. For example, serial data DTCs (DTC U1016, U1064, U1097, U1300 and U1301) may be accompanied by other DTCs. **Always** correct the serial data DTCs before resolving other DTCs.

For proper resolution of multiple DTCs, refer to Table 2-2.

INITIAL DIAGNOSTIC CHECK: SPEEDOMETER 2.2

GENERAL

- Constant power is supplied to the speedometer through terminal "5" of connector [39]. The speedometer turns on when power is applied to terminal "1". The speedometer proceeds through an initialization sequence every time power is removed and re-applied to terminal "6". The visible part of this sequence is the check engine lamp (in "run" mode), security lamp, backlighting, odometer and fuel level. Upon IGNITION ON, the check engine lamp and security lamp will illuminate for four seconds and then (if parameters are normal) will go out.
- To locate faulty circuits or other system problems, follow the diagnostic flow charts and tests in this section. For a systematic approach, always begin with 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER, Initial Diagnostics which follows. Read the general information and then work your way through the flow chart box by box.
- Loss of power on any of the four power inputs will change speedometer behavior. Refer to Table 2-1.

Table 2-1. Speedometer Function Chart - Loss of Input

Terminal 5 (Constant)	Terminal 1 (IGN)	Terminal 6 (ACC)	Terminal 7 (GRD)	Terminal 8 and 11 (Trip Odometer Reset Switch)
• Security lamp glows dimly during 4-second bulb check.	• Will not "WOW". • Turn signals still functional. • Speedometer will indicate vehicle speed (zero). • Security lamp still functions. • Check engine lamp and battery lamp non-functional. • Diagnostics absent.	• Display will be non-functional in accessory and ignition modes. • Security lamp still performs 4-second bulb check in ignition mode.	• Display completely non-functional. • Diagnostic absent.	• No trip odometer reset switch function. • Will not "WOW".

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Diagnostic Notes

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

Circuit Diagram/Wire Harness Connector Table

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

In order to perform most diagnostic routines, a Breakout Box and a DVOM are required. See 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER.

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

INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Tips

- If Speedometer reads "BUS Er" with the ignition switch turned to IGNITION (engine stop switch at RUN with the engine off), check data bus for an open or short to ground between data link connector [91A] terminal "3" and ECM connector [78B] terminal "69", TSM/TSSM/HFSM connector [30B] terminal "3", speedometer connector [39B] terminal "2" or tachometer (if equipped) connector [108B] terminal "2".
- Check for an open data test terminal between data link connector [91A] terminal "3" and TSM/TSSM/HFSM connector [30B] terminal "3". With ignition switch turned to IGNITION, serial data bus voltage should be typically 0.6-0.8 volts. The range of acceptable voltage is greater than 0 and less than 7.0 volts.
- To identify intermittents, wiggle instrument and/or vehicle harness while performing steps in the Diagnostic Check charts.

Diagnostic Notes

The reference number below correlates with the circled number on the initial diagnostic check flow charts.

1. Connect BREAKOUT BOX (Part No. HD-42682) and INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601) between wire harness and speedometer.

All Speedometer diagnostic trouble codes are listed in Table 2-2.

Table 2-2. Speedometer/Tachometer Diagnostic Trouble Codes (DTC) Priority Chart

DTC	PRI-ORITY	FAULT CONDITION	SOLUTION	MODULE
"BUS Er"	1	Serial data bus shorted low/open/high	2.14 DTC U1300, U1301 OR BUS ER	Speedometer/tacho-meter
U1300	2	Serial data low	2.14 DTC U1300, U1301 OR BUS ER	Speedometer/tacho-meter
U1301	3	Serial data high	2.14 DTC U1300, U1301 OR BUS ER	Speedometer/tacho-meter
U1016	4	Loss of ECM serial data	2.12 DTC U1016	Speedometer/tacho-meter
U1064	5	Loss of TSM/TSSM/HFSM serial data.	2.13 DTC U1064, U1255	Speedometer/tacho-meter
U1255	6	Missing response from other module (TSM/TSSM/HFSM and/or ECM) at startup	2.13 DTC U1064, U1255	Speedometer/tacho-meter
B1007	7	Ignition line overvoltage	2.10 DTC B1006, B1007	Speedometer/tacho-meter
B1006	8	Accessory line overvoltage	2.10 DTC B1006, B1007	Speedometer/tacho-meter
B1008	9	Reset switch closed	2.11 DTC B1008	Speedometer
B1004	10	Fuel level sending unit low	2.9 DTC B1004, B1005	Speedometer
B1005	11	Fuel level sending unit high/open	2.9 DTC B1004, B1005	Speedometer

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Other Diagnostic Trouble Codes

See 3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM for any diagnostic trouble codes related to the Turn Signal Module (TSM), Turn Signal Security Module (TSSM) or Hands-Free Security Module (HFSM).

See 4.5 INITIAL DIAGNOSTIC CHECK: EFI for any diagnostic trouble codes related to the Electronic Control Module (ECM).

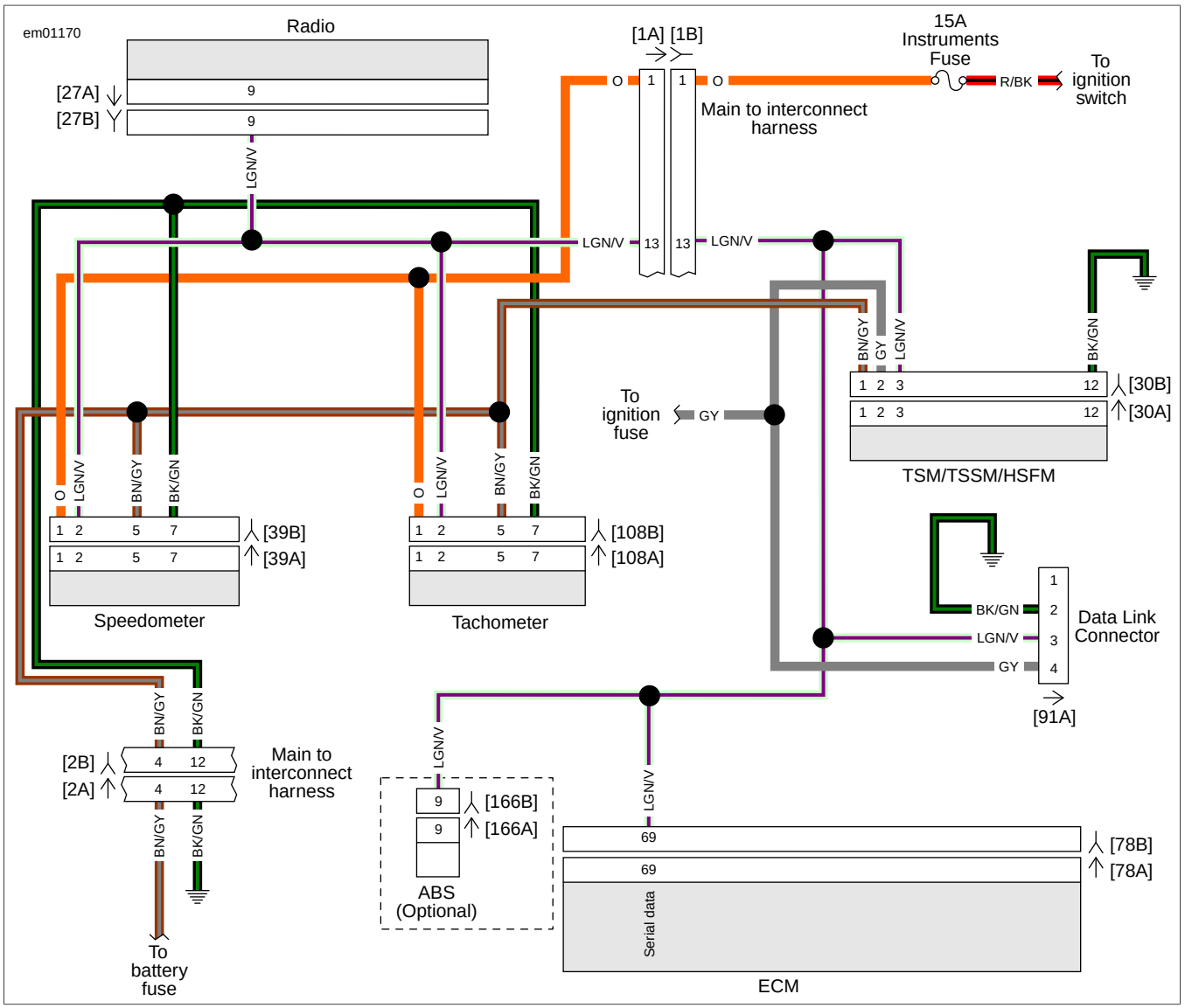


Figure 2-4. Diagnostic Check: FLHX, FLHT/C/U, FLTR

Table 2-3. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - left fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover

Table 2-3. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

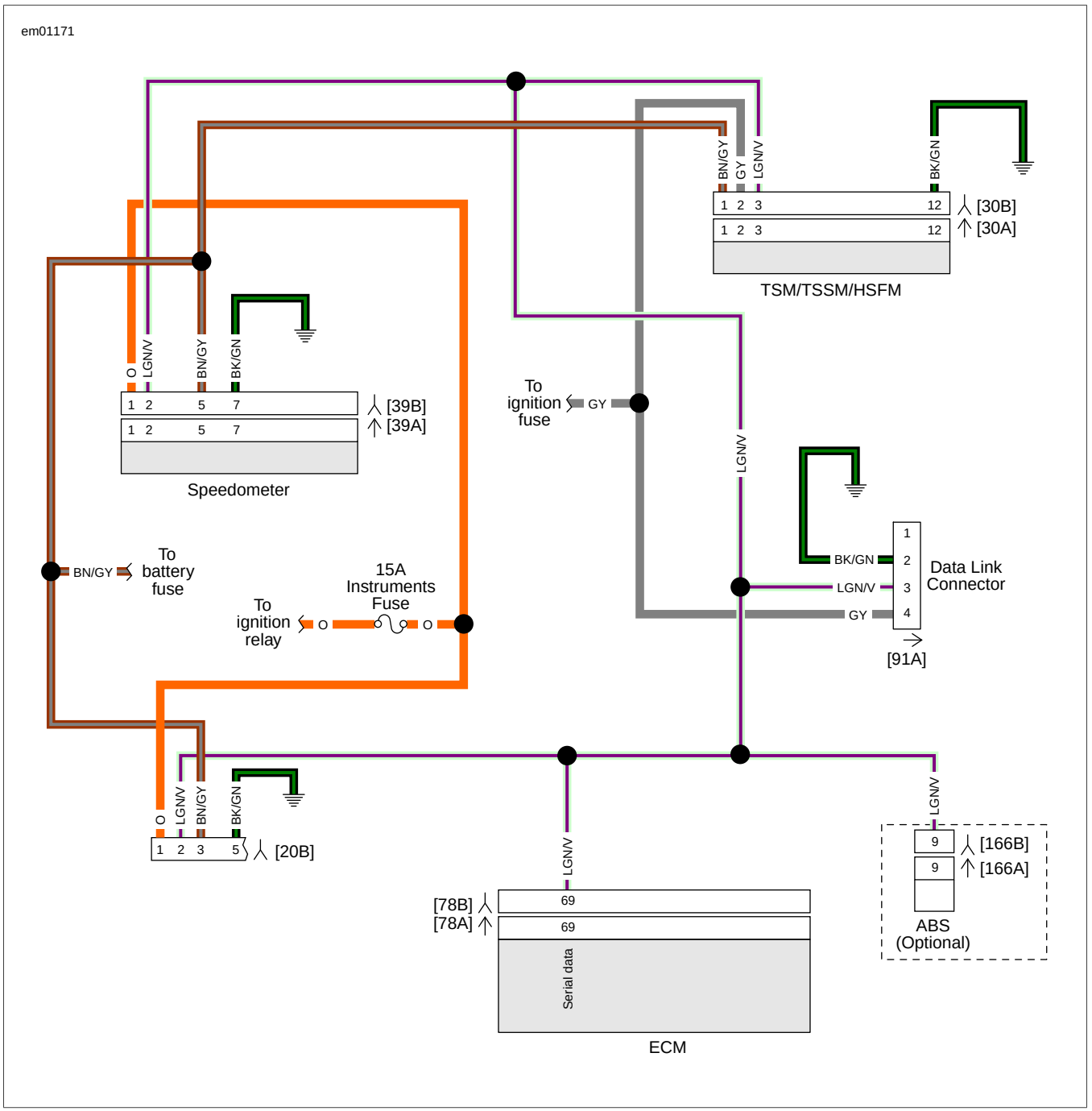


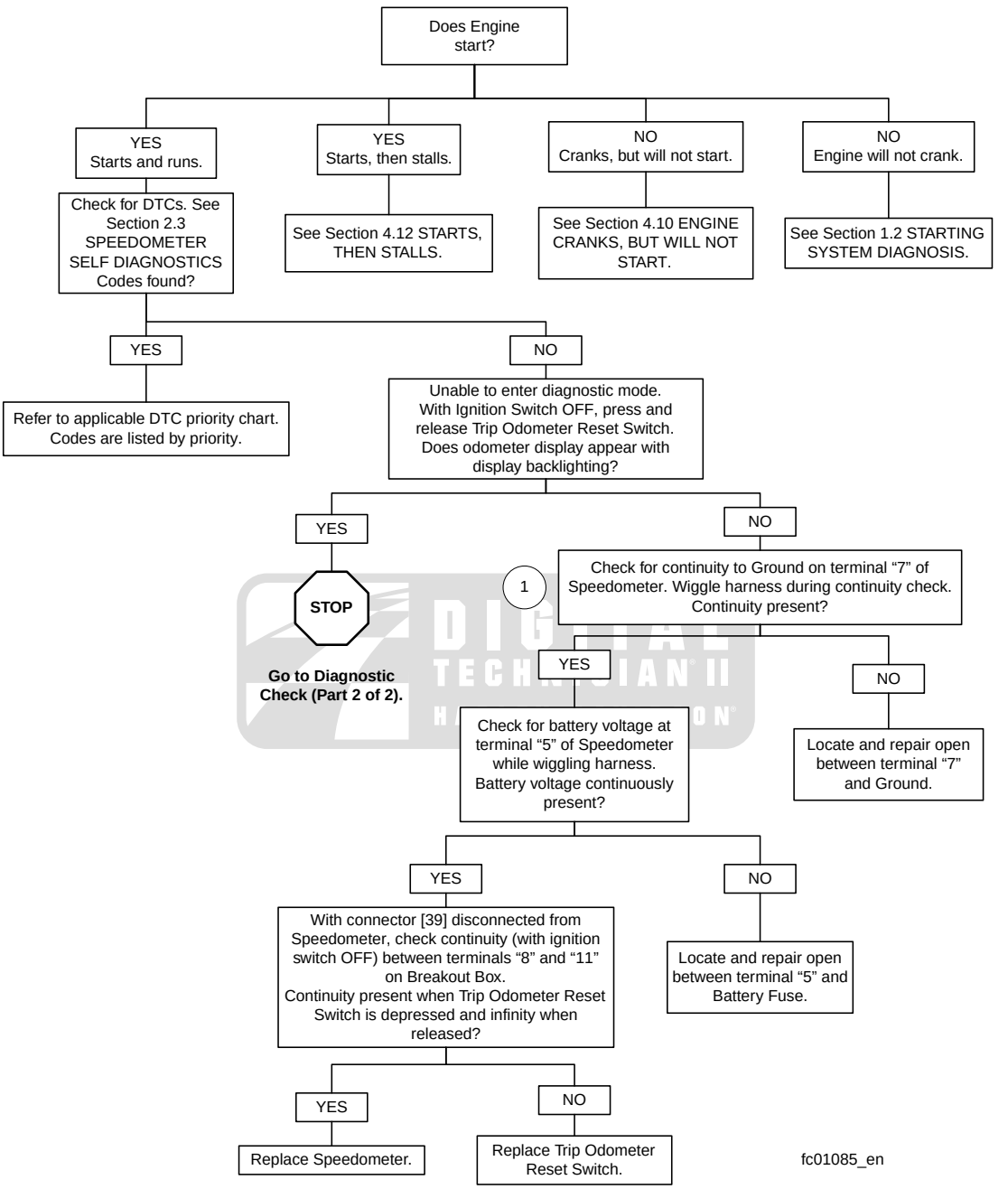
Figure 2-5. Diagnostic Check: FLHR/C/S

Table 2-4. Wire Harness Connectors

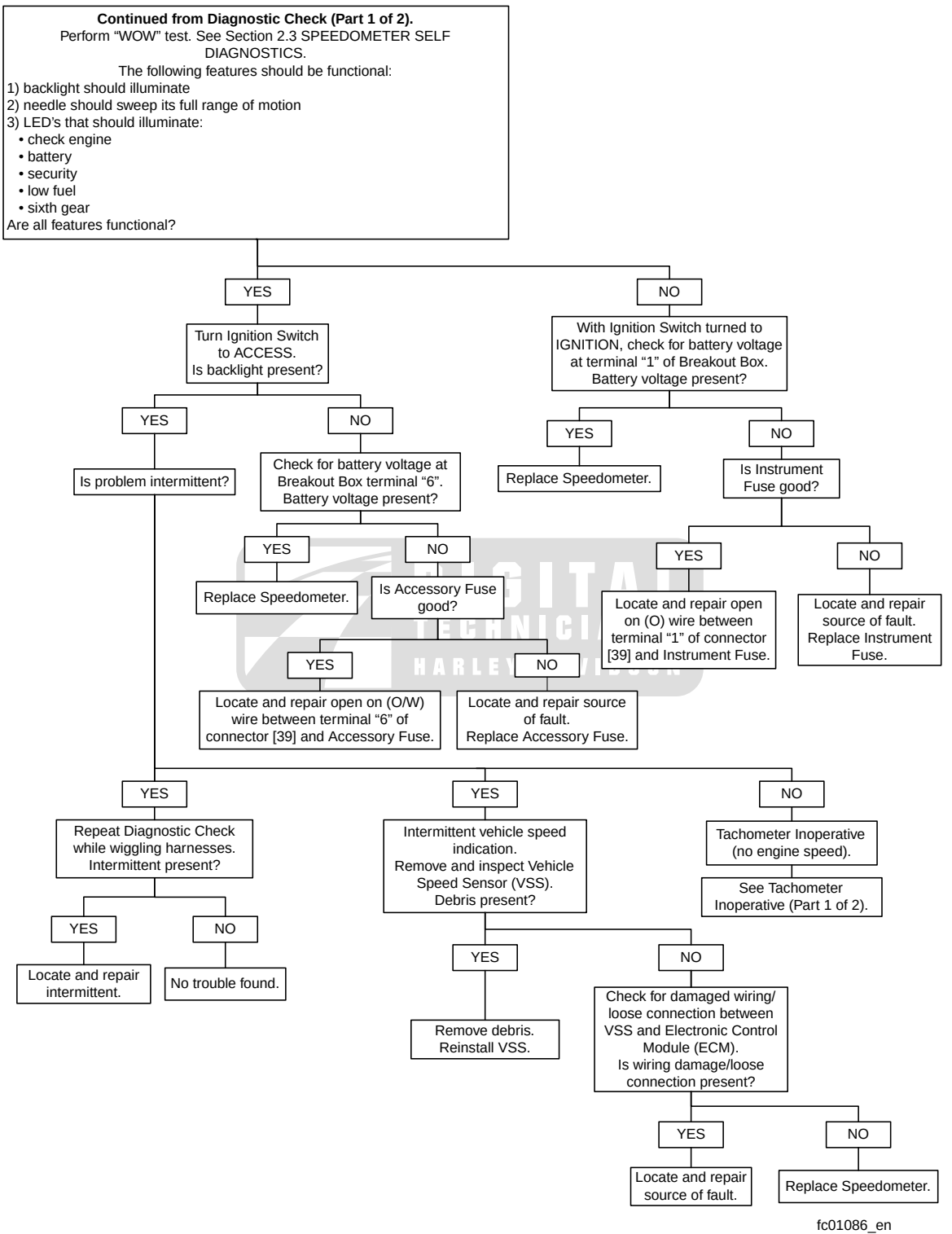
NO.	DESCRIPTION	TYPE	LOCATION
[20]	Console harness	16-place Molex	Under seat
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Mini-Deutsch	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Diagnostic Check (Part 1 of 2)



Diagnostic Check (Part 2 of 2)



SPEEDOMETER SELF DIAGNOSTICS 2.3

GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/TSSM/HFSM, and ECM Diagnostic Trouble Codes (DTCs) (diagnostic mode).

DIAGNOSTICS

Diagnostic Tips

- For a quick check of speedometer function, a "WOW" test can be performed. Press and hold trip odometer reset switch (Figure 2-1), then turn Ignition Switch ON. Release trip odometer reset switch. Background lighting should illuminate, gauge needle should sweep its full range of motion, and indicator lamps (check engine, low fuel, battery and security) should illuminate.
- If instrument module fails "WOW" test, check for battery, ground, ignition, trip odometer reset switch and accessory wiring to speedometer. If any feature in the speedometer is non-functional, see 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.

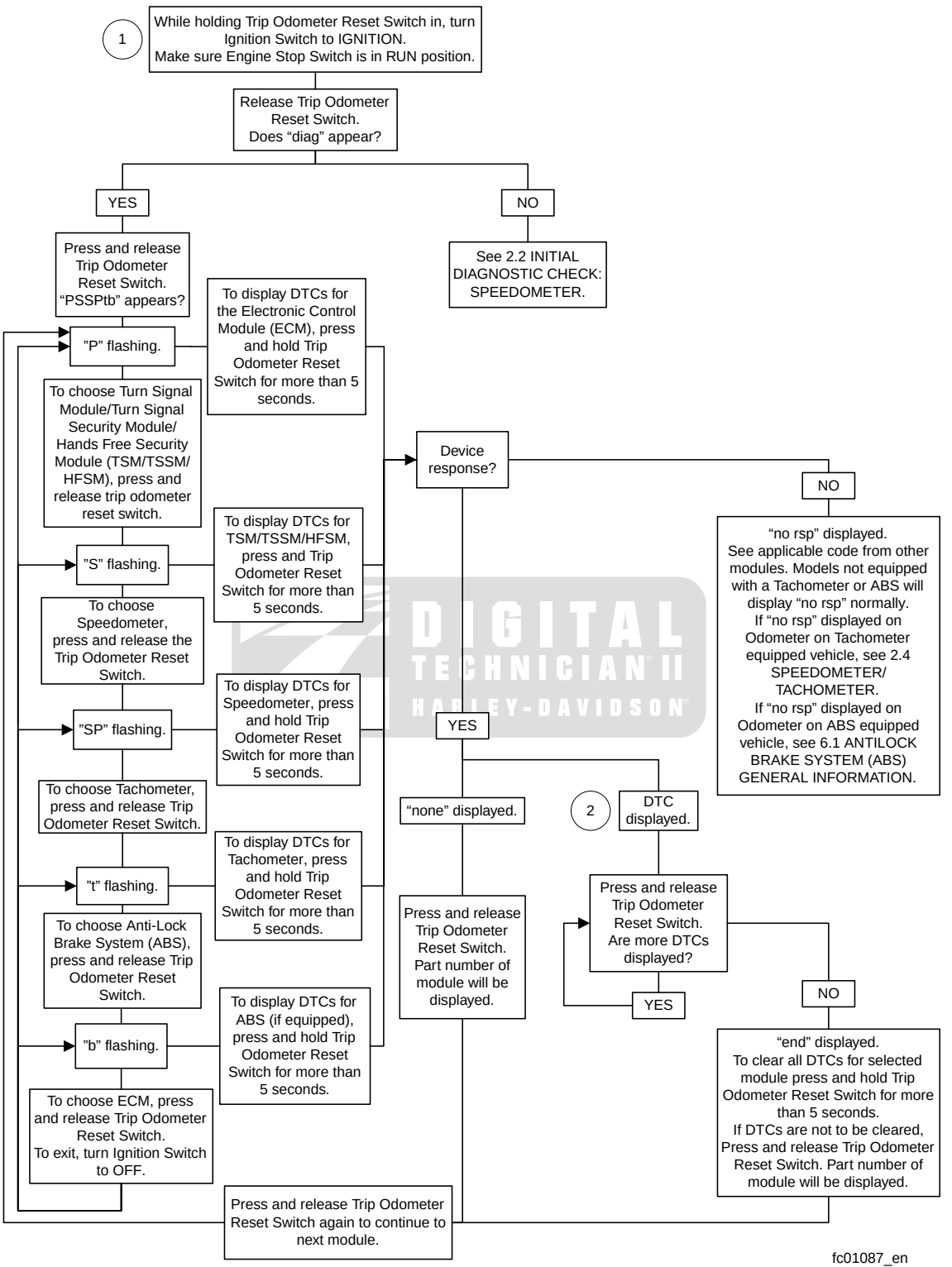
Diagnostic Notes

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

1. To exit diagnostic mode, turn ignition switch OFF.
2. To clear DTCs for the selected module:
   a. Press and hold the trip odometer reset switch for more than 5 seconds to display available modules, release.
   b. Press the trip odometer reset switch to choose the module.
   c. Press and hold the trip odometer reset switch for more than 5 seconds to display the DTC, release.
   d. Press and hold the trip odometer reset switch for more than 5 seconds to clear the DTCs for the selected module.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Speedometer Self Diagnostics



SPEEDOMETER/TACHOMETER 2.4

GENERAL

NOTE

Some icons may illuminate during "WOW" test though the icon has no functionality on that vehicle.

The speedometer consists of a speedometer display and several icons. The icons include the sixth gear indicator, check engine, low fuel, battery, security and cruise enabled lamps.

Trip Odometer Reset Switch

Pressing the trip odometer reset switch provides the following capabilities:

- Change the odometer display between mileage, trip A and trip B values (press and immediately release).
- Reset an individual trip odometer (press and hold 2-3 seconds).
- Gain access to the diagnostic mode, clear DTCs, and exit diagnostic mode. See 2.3 SPEEDOMETER SELF DIAGNOSTICS.
- Display odometer while ignition switch is OFF. Press and hold trip odometer reset switch while ignition switch is OFF and odometer mileage will be displayed.
- On models with dual scale speedometers, toggle between miles/kilometers on odometer and trip odometer display. To toggle display, turn ignition switch ON. Press and hold trip odometer reset switch while odometer is displayed. Release trip odometer reset switch when change is noted. (If trip odometer reset switch is held while trip odometer is displayed, trip odometer will reset.)
- The trip odometer reset switch is also used to set or select the clock located in the odometer. The clock function for the odometer is not present on vehicles equipped with the Advanced Audio System. Detailed instructions for setting the clock are located in the Owner's Manual.

SPEEDOMETER THEORY OF OPERATION

The speedometer circuit consists of a vehicle speed sensor, the ECM, trip odometer reset switch and the speedometer. The vehicle speed sensor is mounted on the rear of the transmission case below the starter motor assembly. The sensor circuitry is that of a Hall-effect sensor 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 the ECM circuitry, converted into serial data then sent to the speedometer to control the position of the speedometer needle and the odometer liquid crystal display (LCD). The vehicle speed serial data is also transmitted to the TSM/TSSM/HFSM for turn signal cancellation.

ODOMETER THEORY OF OPERATION

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 A and trip odometer B displays.

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

The odometer can display six numbers to indicate a maximum of 999999 miles/kilometers. The trip odometers can display six numbers with a tenth of a mile accuracy for a maximum of 99999.9 miles/kilometers.

The speedometer indicates when vehicle is in sixth gear. Selection of sixth gear is inferred as the system identifies when correct RPM and vehicle speed coincide.

Job/Time Code Values

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

TACHOMETER THEORY OF OPERATION

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

DIAGNOSTICS

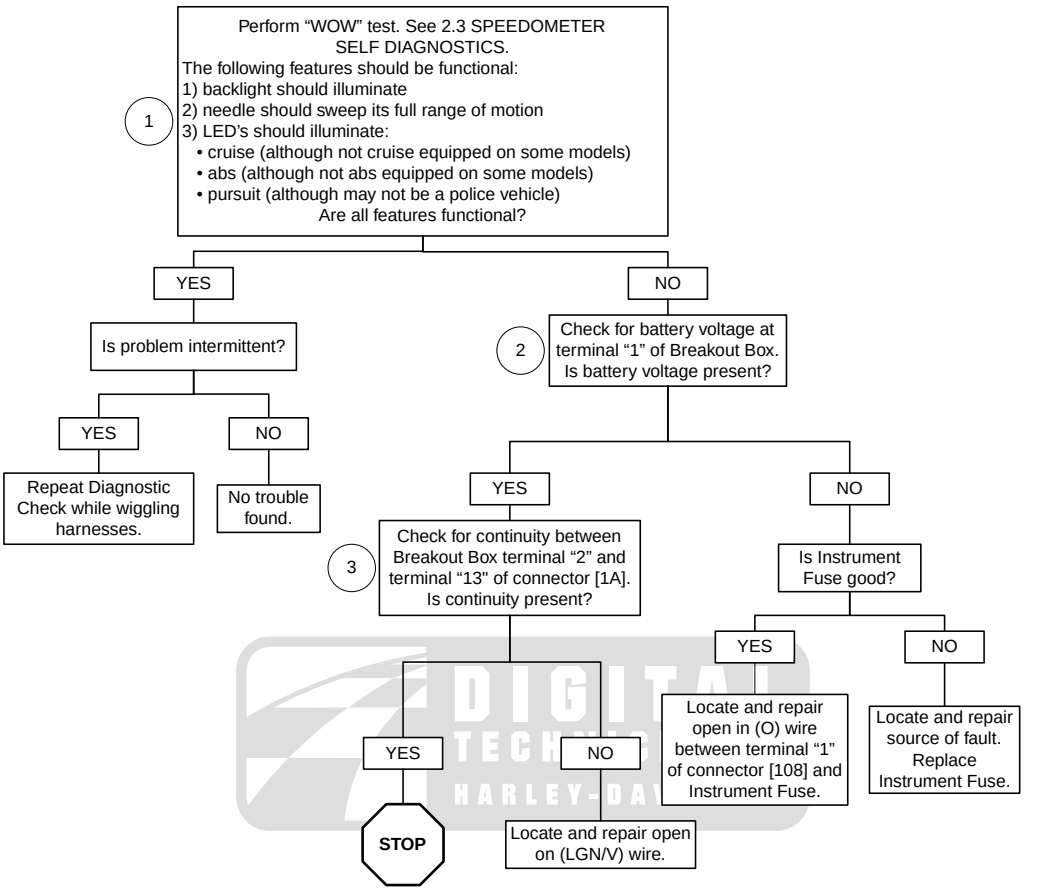
PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Notes

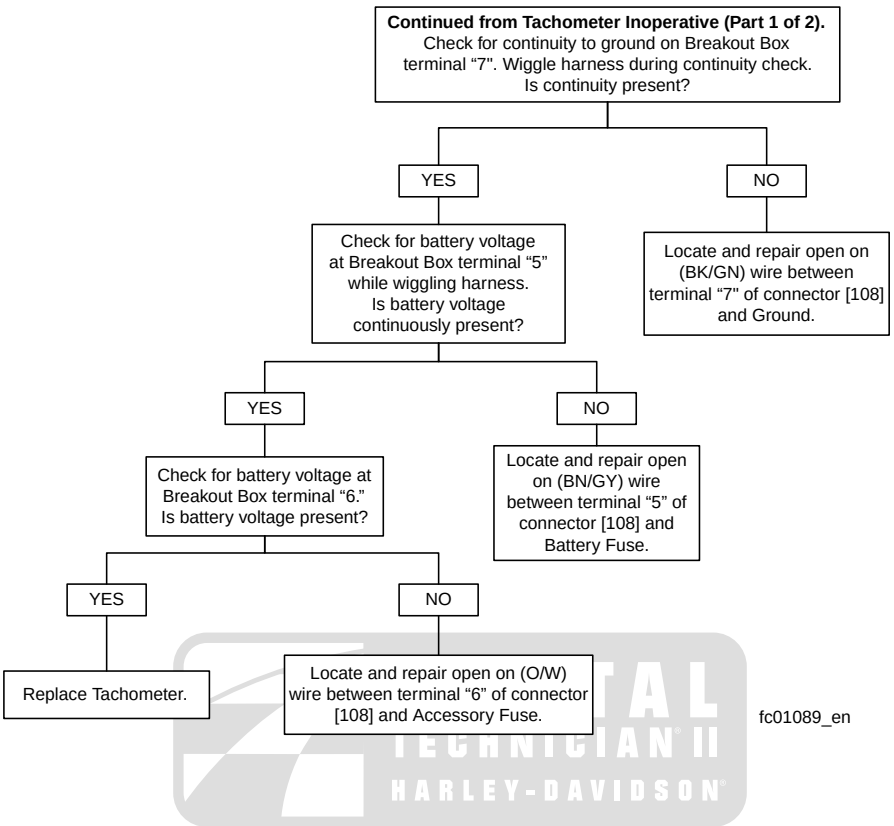
Each reference number below correlates to a circled number on the flow chart(s).

1. If problems are intermittent, wiggle harness while performing tests.
2. Connect BREAKOUT BOX (Part No. HD-42682) and INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601) between wire harness and tachometer.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black pin probe and patch cord.

Tachometer Inoperative (Part 1 of 2)



Tachometer Inoperative (Part 2 of 2)



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BREAKOUT BOX: SPEEDOMETER/TACHOMETER 2.5

GENERAL

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

The BREAKOUT BOX (Part No. HD-42682) and INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601) connect to speedometer connector [39]. Used in conjunction with a DVOM, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects.

NOTE

See wiring diagrams for speedometer terminal functions.

INSTALLATION

1. See Figure 2-6. Release the external latches and remove connector [39B].
2. See Figure 2-8. Connect instrument harness adapters to connectors [39A] and [39B].
3. See Figure 2-7. Attach connectors from Breakout Box to instrument harness adapters.

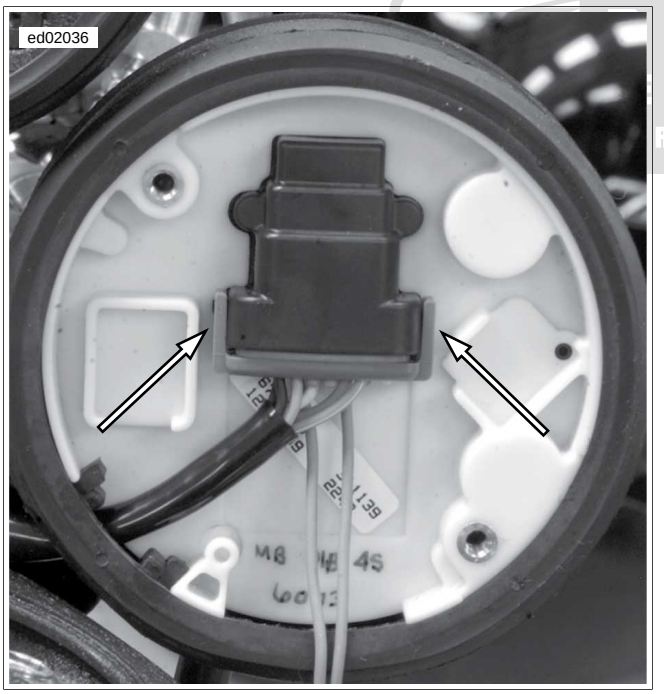


Figure 2-6. Speedometer Connector [39]

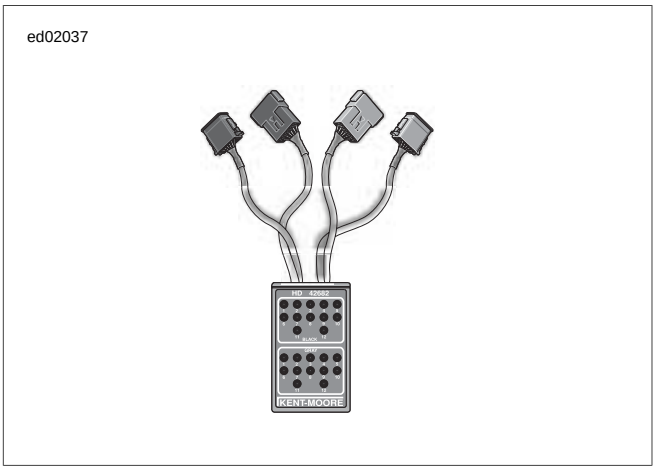


Figure 2-7. Breakout Box (Part No. HD-42682)

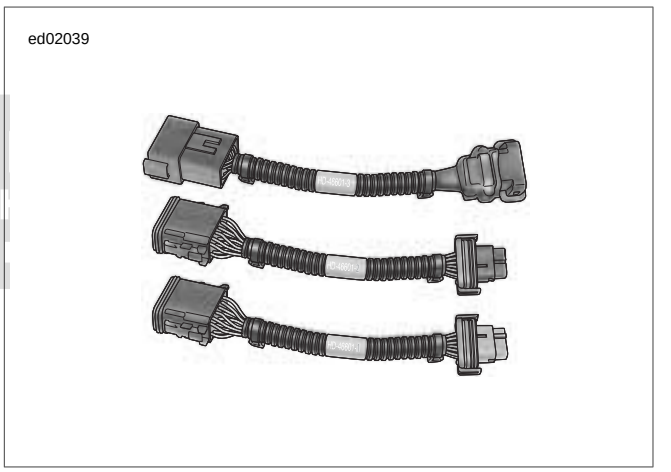


Figure 2-8. Instrument Harness Adapters (Part No. HD-46601)

REMOVAL

1. Detach connectors from Breakout Box to instrument harness adapters.
2. Detach instrument harness adapters from connectors [39A] and [39B].
3. Install connector [39B] to speedometer.

FUEL GAUGE 2.6

THEORY OF OPERATION

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 several circumstances.

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

Use the 2.6 FUEL GAUGE, 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 gauge sender located at bottom of gauge. Turn ignition switch to IGNITION.
   a. Fuel gauge must indicate FULL. If gauge indicated 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.
   If fuel tank is full, the reading should be 30-50 ohms. An empty tank should have a 240-260 ohm resistance. A half full tank will be approximately 125-165 ohms.
   If a very high resistance or infinity is indicated on the meter, the sender may be "open" or not grounded. Check that 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 broken or disconnected wire. Replace gauge if wiring problem is not found.

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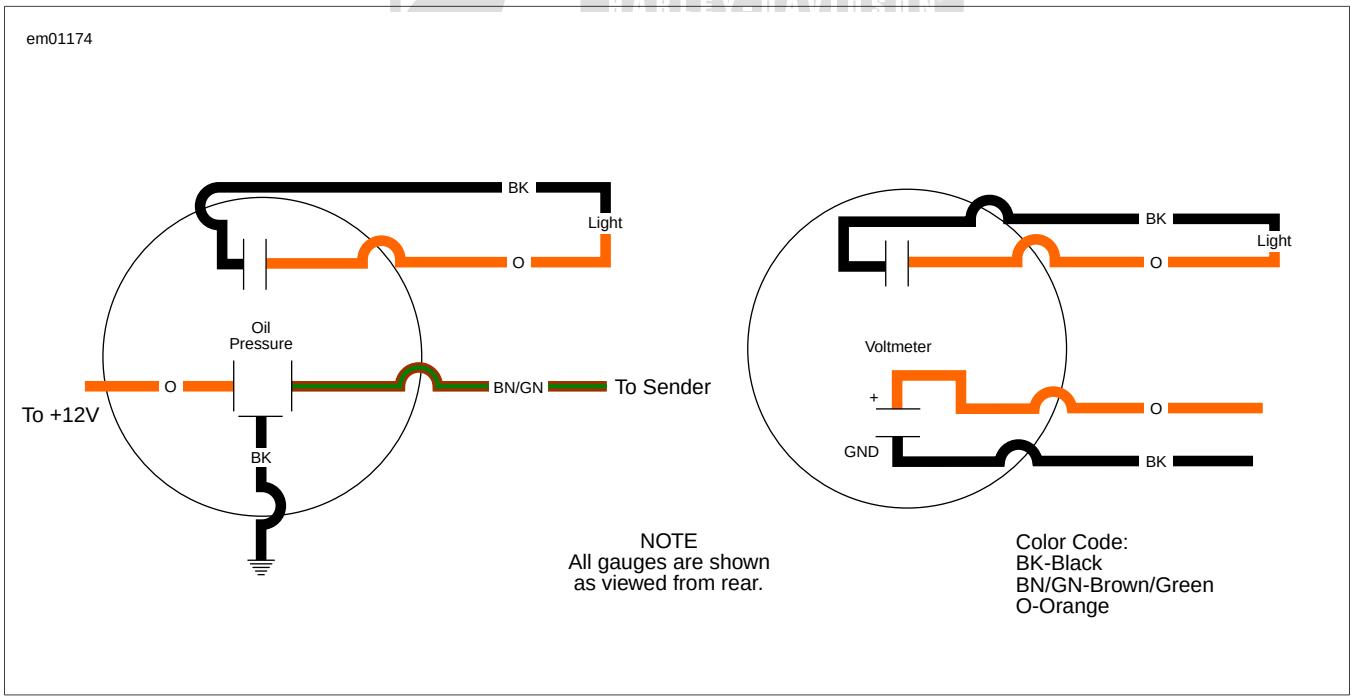


Figure 2-9. Connections for Gauges

OIL, AIR AND VOLTMETER GAUGES 2.7

OIL PRESSURE GAUGE AND INDICATOR LIGHT

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

Problem

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

CAUTION

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)

Cause 1

No oil pressure due to lack of oil or faulty oil pump.

Solution 1

1. Check oil level. Add oil if low.
2. Restart engine and verify that oil pressure light goes off and gauge indicates pressure. If problem still exists, refer to OIL PUMP in the Service Manual.

Cause 2

Contacts in pressure sending unit not opening to shut off light. Variable resistor in sender is shorted to ground.

Solution 2

1. Locate the oil pressure sending unit on the front right side of the crankcase.
2. Verify that the electrical connector is properly connected to the sending unit.
3. If the oil pressure gauge indicates pressure but the low oil pressure light remains on proceed as follows:
   a. Remove electrical connector from oil pressure sending unit. Using ohmmeter and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) 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.
   b. Start the engine and run at a fast idle. The ohmmeter must read infinity.
   c. Replace the sending unit if the above meter readings are not obtained.
4. If the low oil pressure light functions correctly, but the pressure gauge does not, Then proceed as follows:
   a. Remove electrical connector from oil pressure sending unit. Turn the ignition switch to IGNITION. The gauge must read zero.
   b. Ground (BN/GN) wire terminal to crankcase. The gauge must read full scale 60 PSI.
   c. Replace the sending unit if the above gauge readings are obtained. If the gauge readings are not obtained, then replace the pressure gauge.

Cause 3

No power to gauge.

Solution 3

See Voltmeter Gauge.

AMBIENT AIR TEMPERATURE GAUGE

Problem

Gauge inoperative.

Cause 1

Sensor not grounded or open between sensor and gauge.

Solution 1

Test for continuity between terminal "1" and ground and terminal "3" and gauge. Repair if open.

Cause 2

Broken or disconnected power or ground wire to gauge.

Solution 2

Check for 12V 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.

Cause 3

Malfunction in gauge or sensor.

Solution 3

Measure resistance between terminals "1" and "3" at 65-85°F (18.3-29.4°C). Resistance should be 43-31 ohms. Replace sensor if out of range, replace gauge if within range.

VOLTMETER GAUGE

Problem

Meter inoperative.

Cause

Broken or disconnected leads to meter or open meter winding.

Solution

1. With ignition switch turned to IGNITION, verify that 12V is present at "±" terminal on voltmeter. With ignition switch turned to OFF, check ground terminal for continuity to ground.

2. Replace the voltmeter if 12V is present and ground terminal is grounded.
3. If 12V is not present, trace wiring until disconnected or broken wire is found and repair as necessary. If ground terminal is not grounded, refer to wiring diagram and repeat procedure given for 12V lead.

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INDICATOR LIGHTS: ALL 2.8

GENERAL

See Figure 2-10. All models are equipped with Light Emitting Diode (LED) indicators. The indicator lights assembly is not serviceable. If one LED is bad, the entire assembly must be replaced.

See 2.8 INDICATOR LIGHTS: ALL, Diagnostics for troubleshooting procedures.

Table 2-5. Indicator Lamp Connector [21] (All But FLHR/C/S)

TERMINAL	WIRE COLOR	FUNCTION
1	Brown	Right Turn Power
2	Green/Yellow	Oil Pressure Lamp To Switch
3	White	High Beam Power
4	Violet	Left Turn Power
5	Black	Ground
6	Orange	Neutral/Oil Pressure Power
7	Tan	Neutral Lamp To Switch
8	Not Used	N/A
9	Not Used	N/A
10	Not Used	N/A

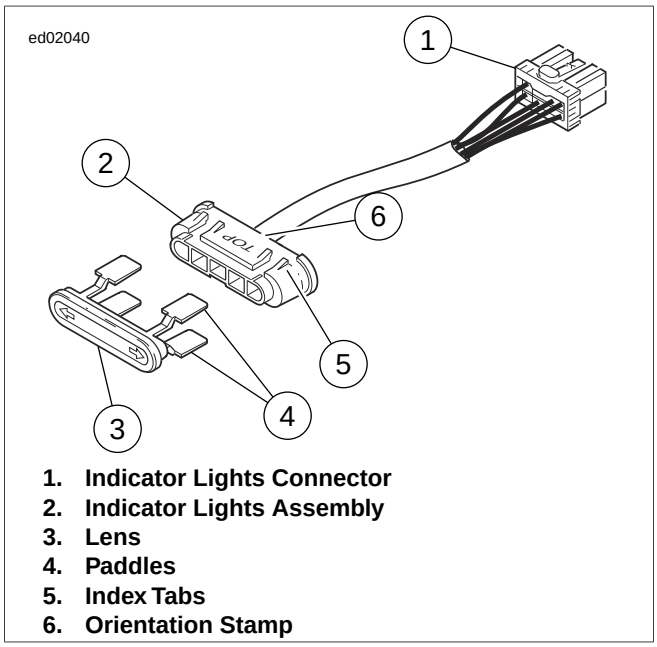
Table 2-6. Indicator Lamp Connector [21] (FLHR/C/S)

TERMINAL	WIRE COLOR	FUNCTION
1	Violet	Left Turn Power
2	White	High Beam Power
3	Green/Yellow	Oil Pressure Lamp To Switch
4	Brown	Right Turn Power
5	Tan	Neutral Lamp To Switch
6	Orange	Neutral/Oil Pressure Power
7	Black	Ground
8	Not Used	N/A

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Table 2-7. Indicator Lamp Wiring

INDICATOR LAMP	CONNECTION
Oil pressure	Ground through switch
Neutral	Ground through harness
High beam	12V when active
Right/left turn	12V when active



1. **Indicator Lights Connector**
2. **Indicator Lights Assembly**
3. **Lens**
4. **Paddles**
5. **Index Tabs**
6. **Orientation Stamp**

Figure 2-10. Indicator Lights Assembly (FLHS, FLHT/C/U, FLTR)

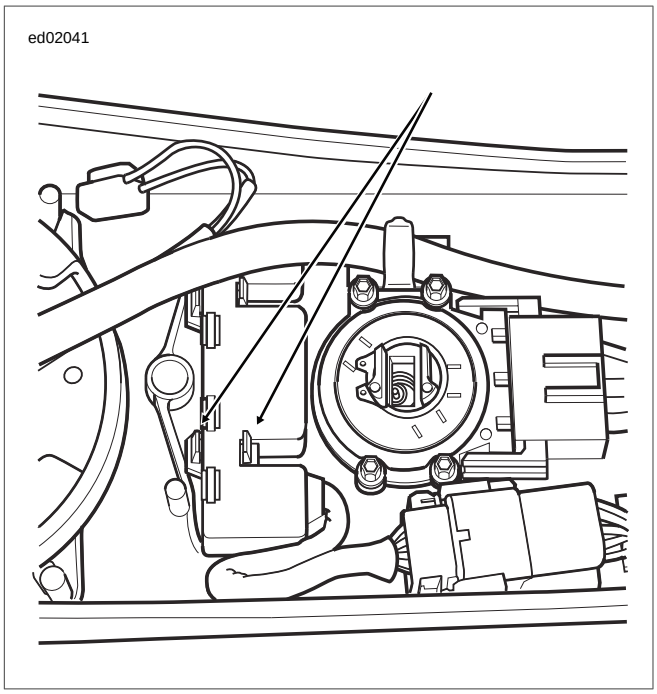


Figure 2-11. Release Paddles to Free Indicator Light Assembly (FLHR/C)

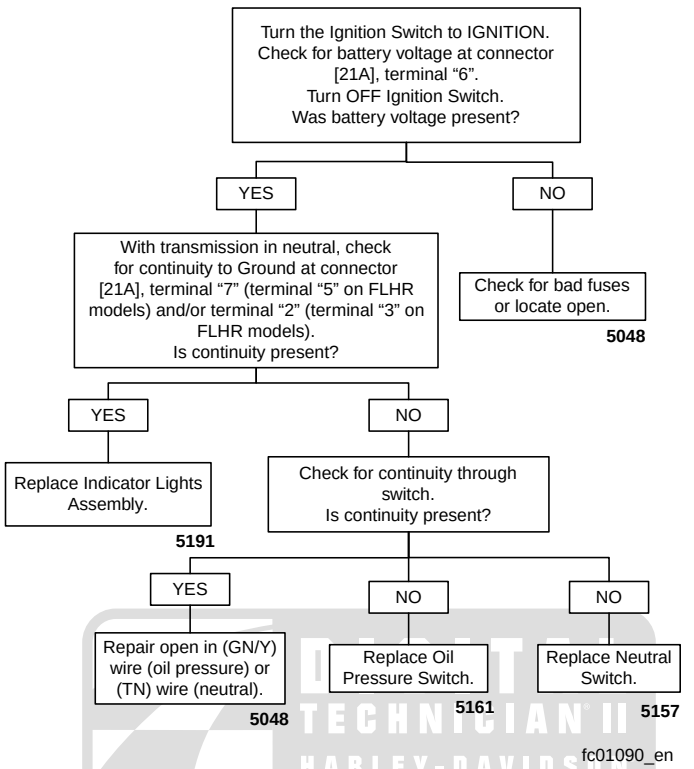
Job/Time Code Values

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

DIAGNOSTICS

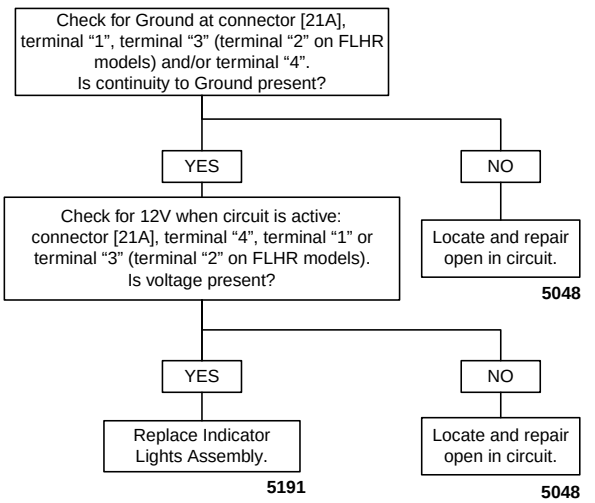
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Oil Pressure or Neutral Indicator Will Not Function



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High Beam or R/L Turn Signal Indicator Will Not Function



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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1004, B1005 2.9

GENERAL

See Figure 2-12. The fuel level is monitored by the speedometer terminal "9" of connector [39] (Y/W).

- If the voltage on terminal "9" of connector [39] exceeds the lower limit for greater than or equal to 15 seconds a DTC B1004 will set.
- If the voltage on terminal "9" of connector [39] exceeds the upper limit (or is open) for greater than or equal to 15 seconds a DTC B1005 will set.

Table 2-8. Code Description

DTC	DESCRIPTION
B1004	Fuel level sending unit low
B1005	Fuel level sending unit high/open

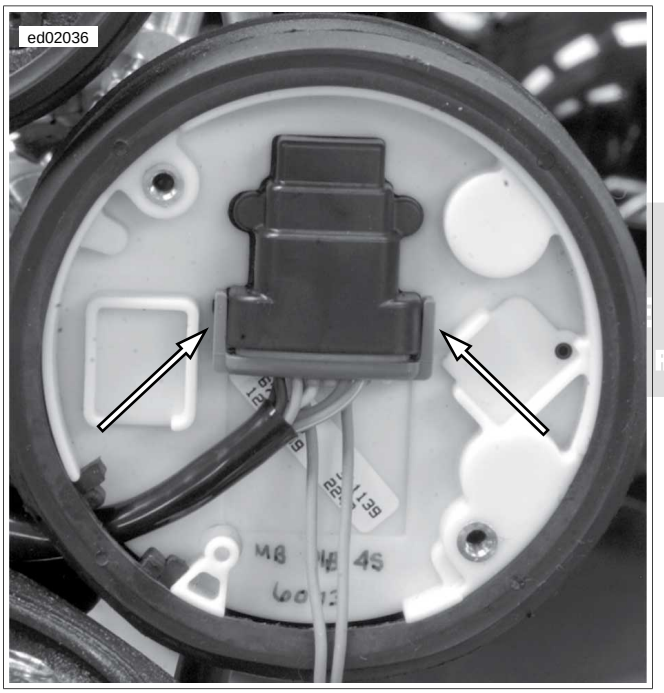


Figure 2-12. Speedometer Connector [39]

DIAGNOSTICS

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

Diagnostic Tips

If fuel gauge is performing erratically (possible false DTCs), inspect for unobstructed movement of sending unit arm. Repair or align as necessary.

Diagnostic Notes

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

1. See Figure 2-14. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown pin probe and patch cord.
2. See Figure 2-13. Connect BREAKOUT BOX (Part No. HD-42682) and INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601) between wire harness and speedometer.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.

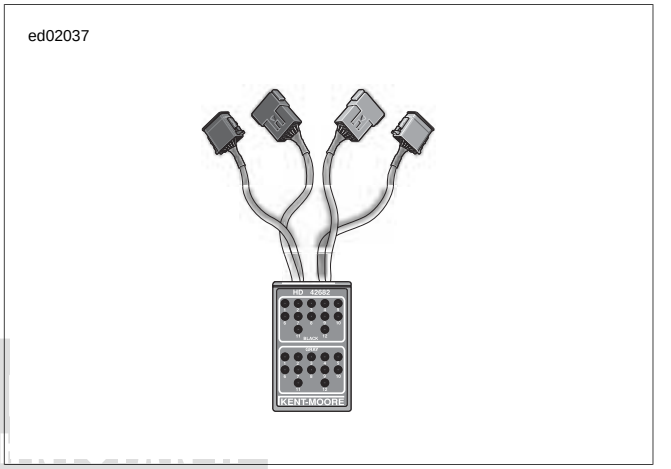


Figure 2-13. Breakout Box (Part No. HD-42682)

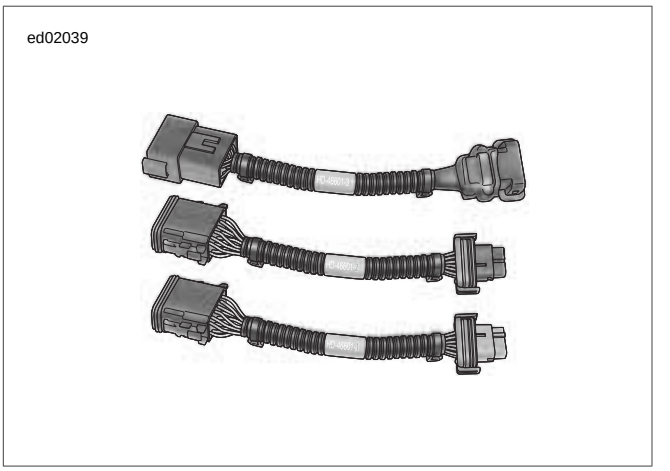


Figure 2-14. Instrument Harness Adapters (Part No. HD-46601)

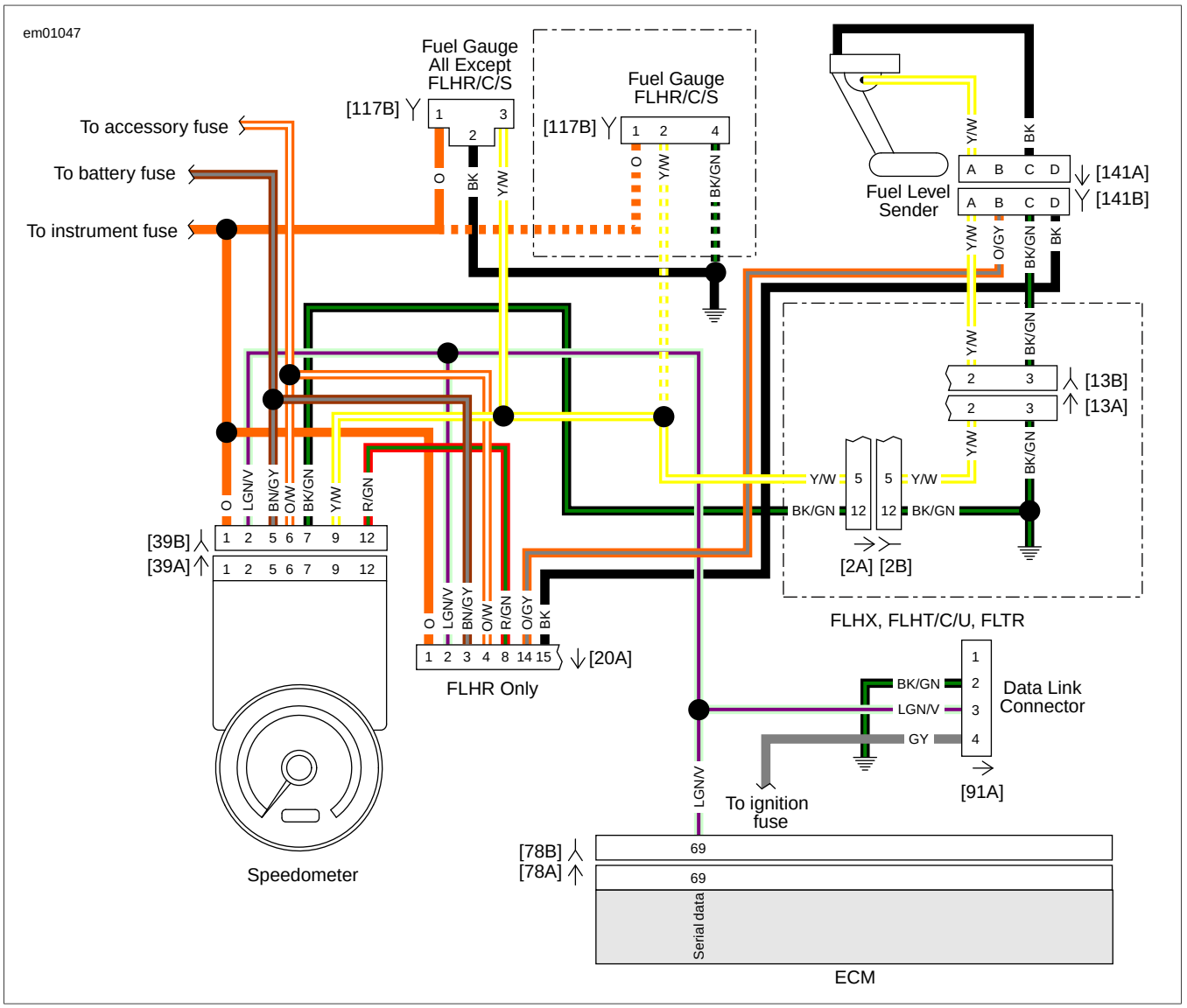
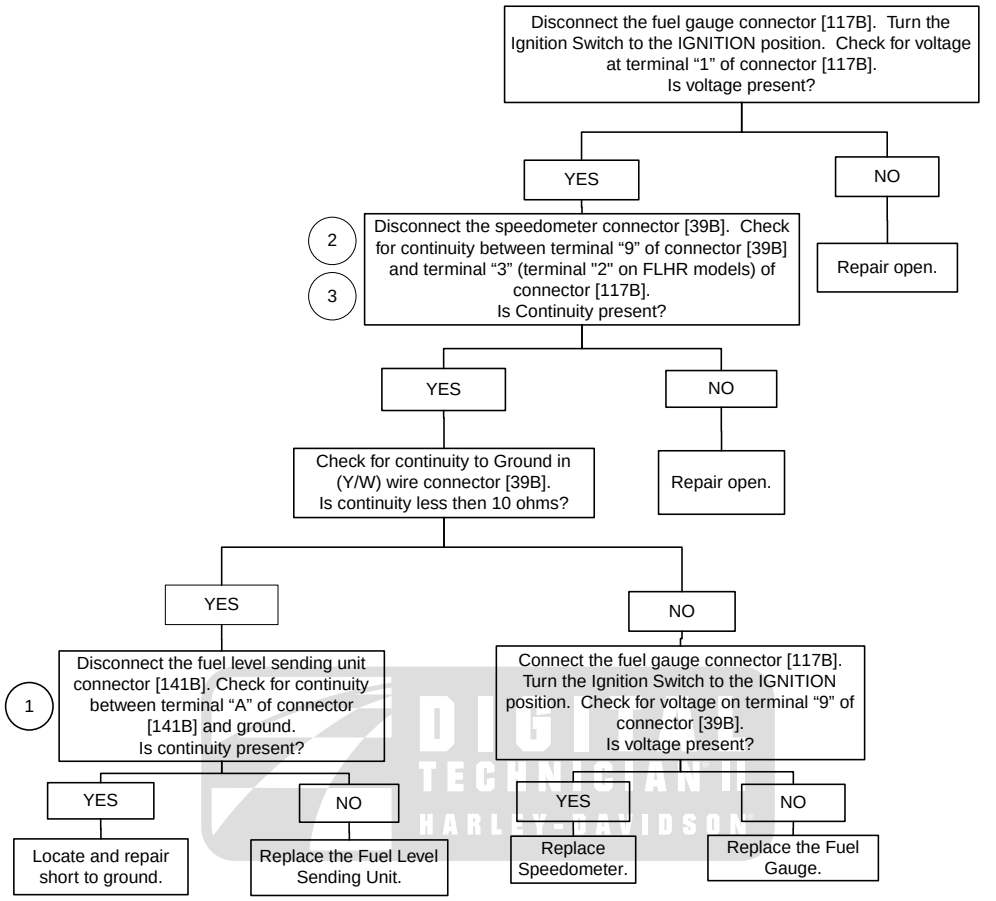


Figure 2-15. Fuel Sender Circuit

Table 2-9. Wire Harness Connectors

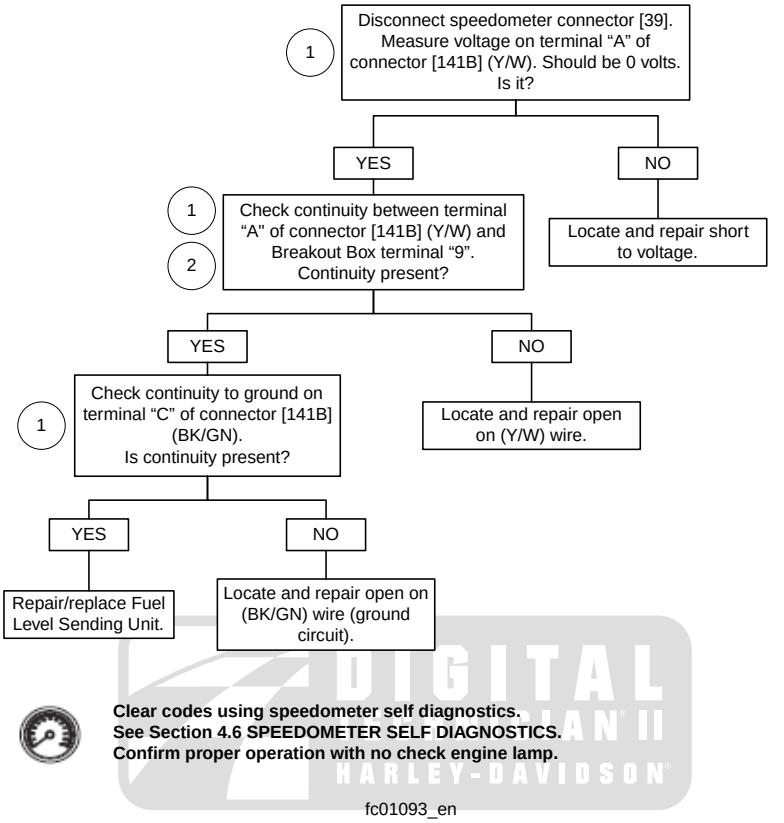
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - left fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[13]	Fuel tank harness	FLHT/C	4-place Multilock	Behind fuel tank (under seat)
		FLTR	4-place Multilock	Behind fuel tank (under seat)
[20]	Console harness	FLHR	16-place Molex	Under seat
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[117]	Fuel gauge	All	Spade terminals	Inner fairing - back of fuel gauge
[141]	Fuel level sender	All	4-place Packard	Top of canopy (under console)

Fuel Level Sending Unit: DTC B1004



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Fuel Level Sending Unit: DTC B1005



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DTC B1006, B1007 2.10

GENERAL

Accessory or Ignition Line Overvoltage

Ignition and accessory voltage is constantly monitored by the speedometer (terminal "1" ignition and terminal "6" accessory). If the battery voltage fails to meet normal operating parameters, a Diagnostic Trouble Code (DTC) is set.

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

NOTE

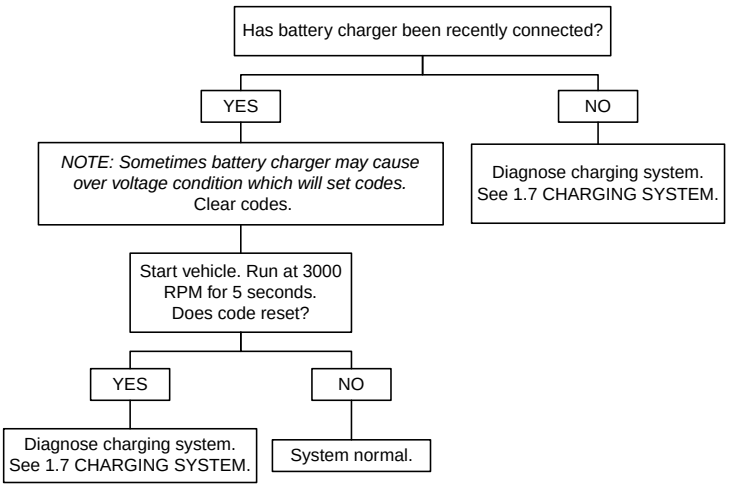
ECM or TSM/TSSM/HFSM may also set a battery voltage DTC.

Table 2-10. Code Description

DTC	DESCRIPTION
B1006	Accessory line overvoltage
B1007	Ignition line overvoltage

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Accessory or Ignition Line Overvoltage: DTC B1006, B1007



Clear codes using speedometer self diagnostics.
See Section 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no Check Engine Lamp.

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DTC B1008 2.11

GENERAL

Trip Odometer Reset Switch Closed

Diagnostic Trouble Code (DTC) B1008 will be set if trip odometer reset switch terminals are in a constant shorted state.

Table 2-11. Code Description

DTC	DESCRIPTION
B1008	Trip odometer reset switch closed

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Notes

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

1. Disconnect speedometer connector [39] (at the back of the speedometer). See 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER.
2. Connect BREAKOUT BOX (Part No. HD-42682) (black) to wire harness connector [39B] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601), **leaving speedometer disconnected**.

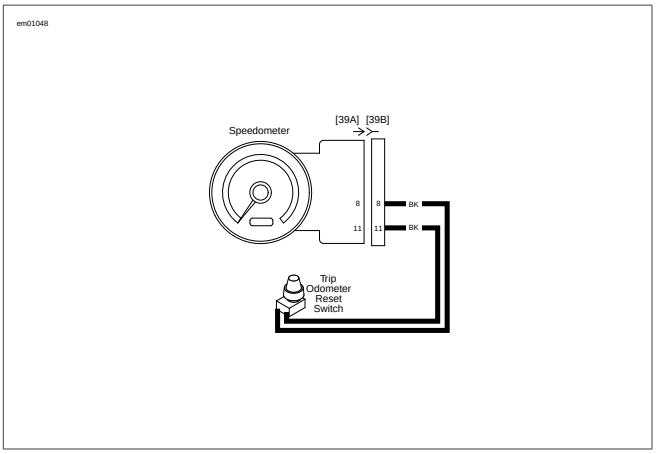
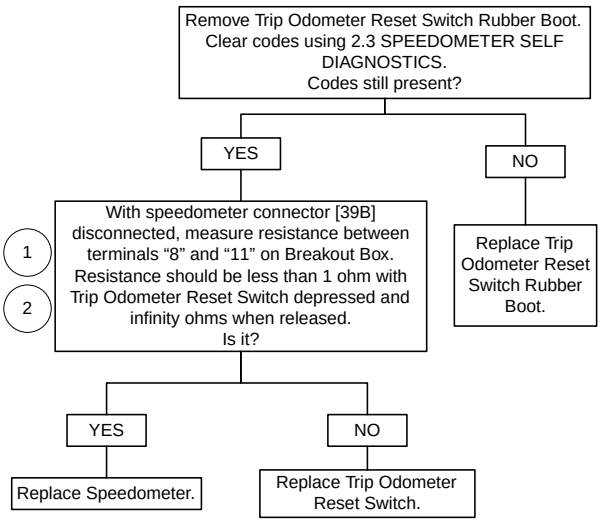


Figure 2-16. Trip Odometer Reset Switch Circuit

Table 2-12. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)

Trip Odometer Reset Switch Closed: DTC B1008



Clear codes using speedometer self diagnostics.
See Section 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

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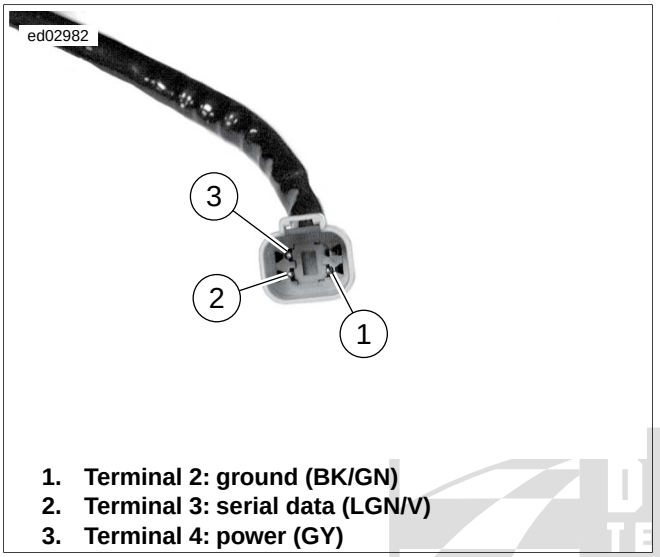
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DTC U1016 2.12

GENERAL

Loss of ECM Serial Data

See Figure 2-17. The data link connector provides a means for the ECM, TSM/TSSM/HFSM 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. A DTC U1016 indicates that the ECM is not capable of sending this state of health message.



1. **Terminal 2: ground (BK/GN)**
2. **Terminal 3: serial data (LGN/V)**
3. **Terminal 4: power (GY)**

Figure 2-17. Data Link Connector

Table 2-13. Code Description

DTC	DESCRIPTION
U1016	Loss of all ECM serial data (state of health)
	Loss of vehicle speed
	Loss of vehicle inhibit motion
	Loss of powertrain security status

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-43876	BREAKOUT BOX

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/TSSM/HFSM connector [30A] and wire harness connector [30B]. See 4.7 BREAKOUT BOX: EFI.
2. Connect BREAKOUT BOX (Part No. HD-43876) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

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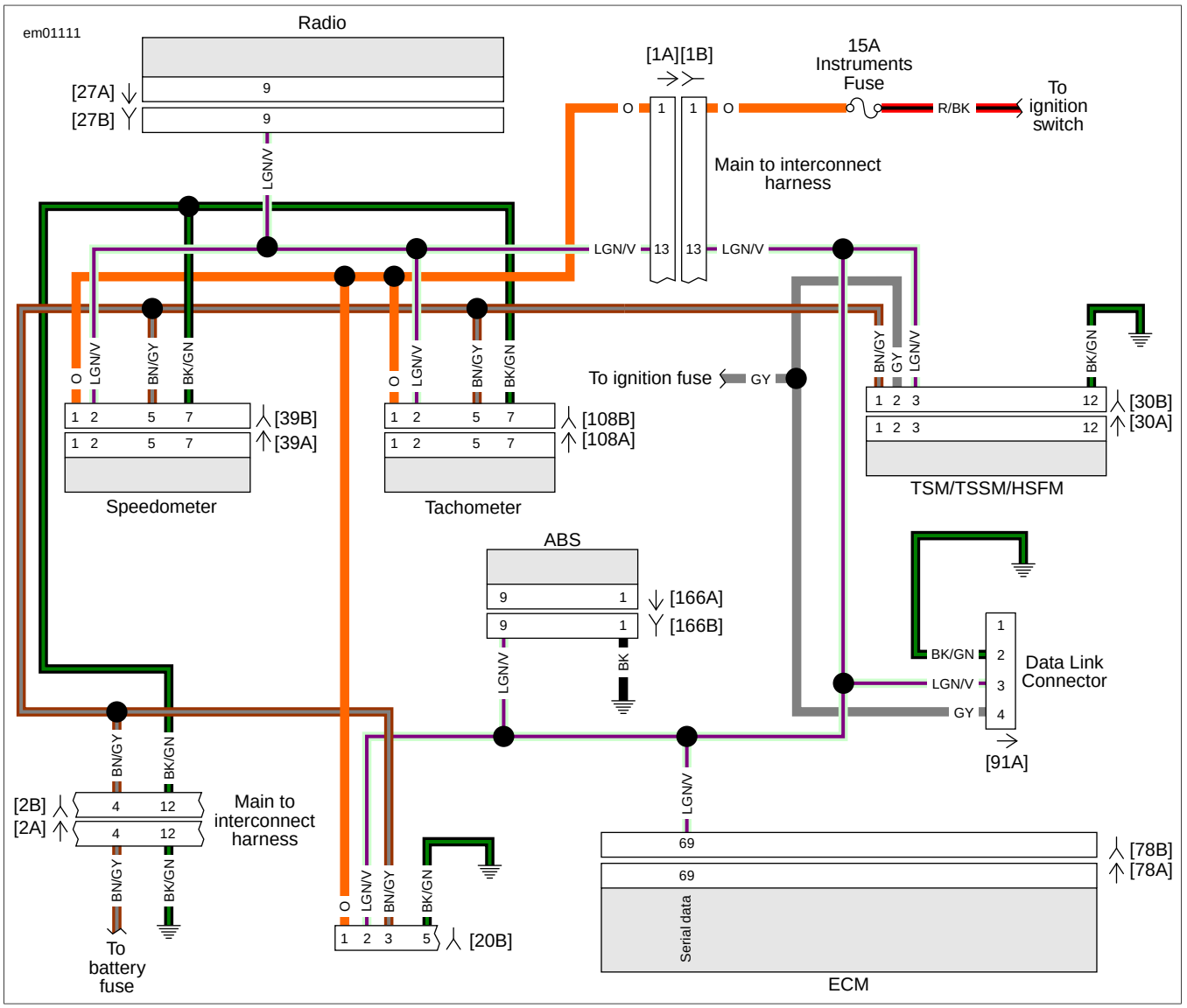


Figure 2-18. Serial Data Circuit: FLHX, FLHT/C/U, FLTR

Table 2-14. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - left fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[20]	Console harness	All	16-place Molex	Under seat
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat

Table 2-14. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

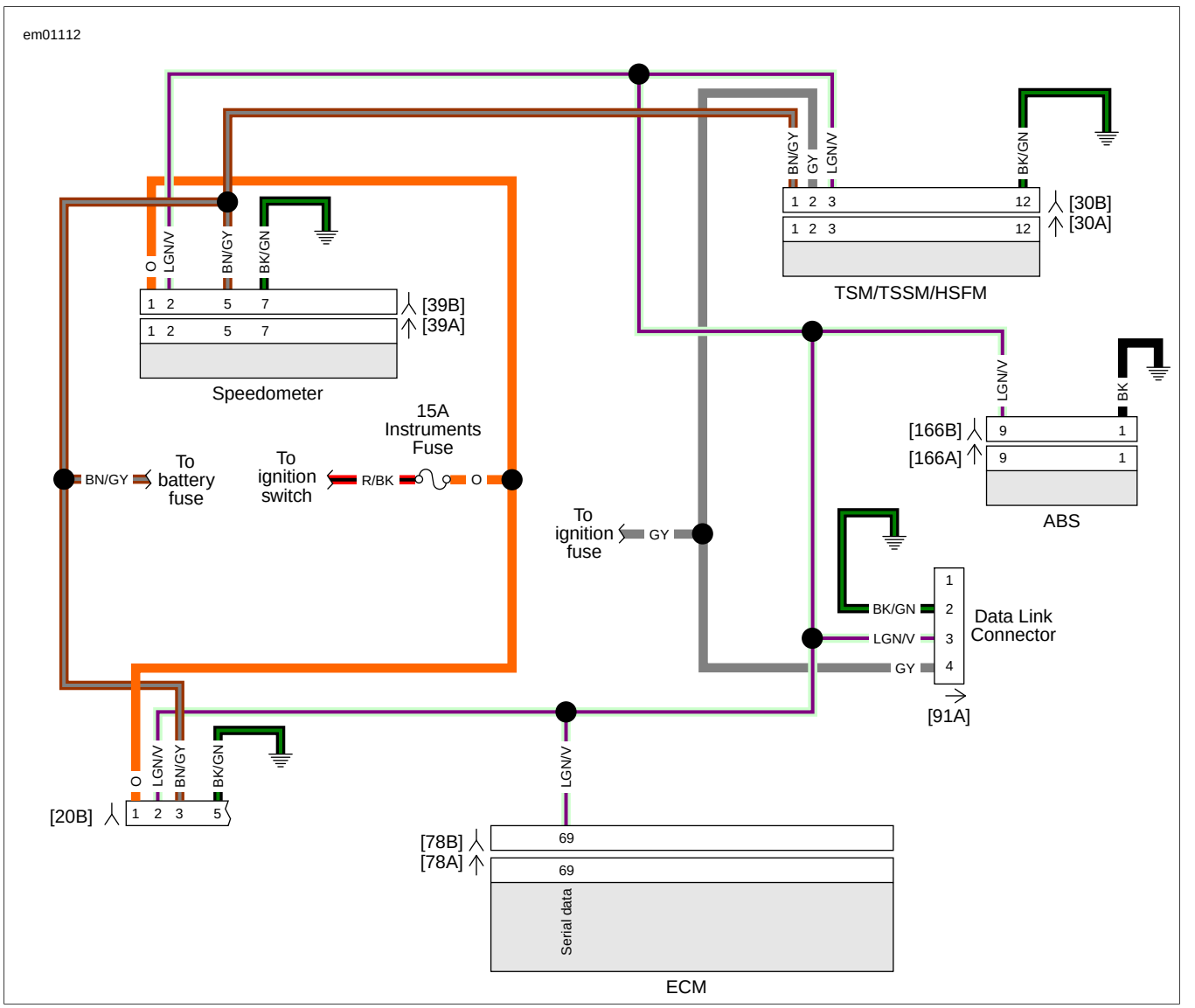


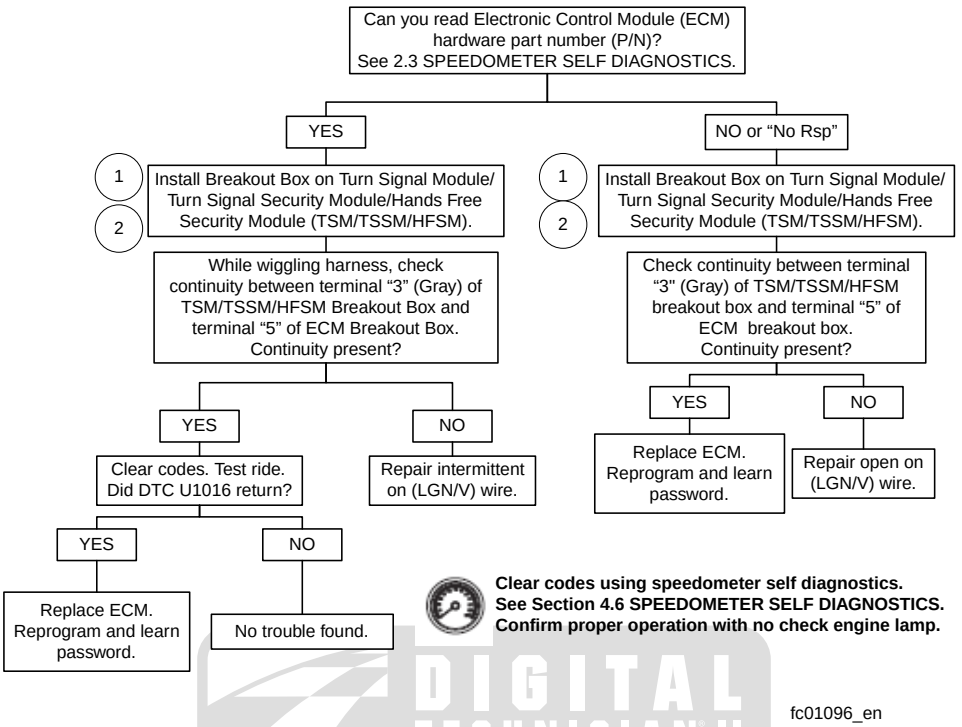
Figure 2-19. Serial Data Circuit: FLHR/C/S

Table 2-15. FLHR Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[20]	Console harness	16-place Molex	Under seat
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Mini-Deutsch	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

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Loss of ECM Serial Data: DTC U1016



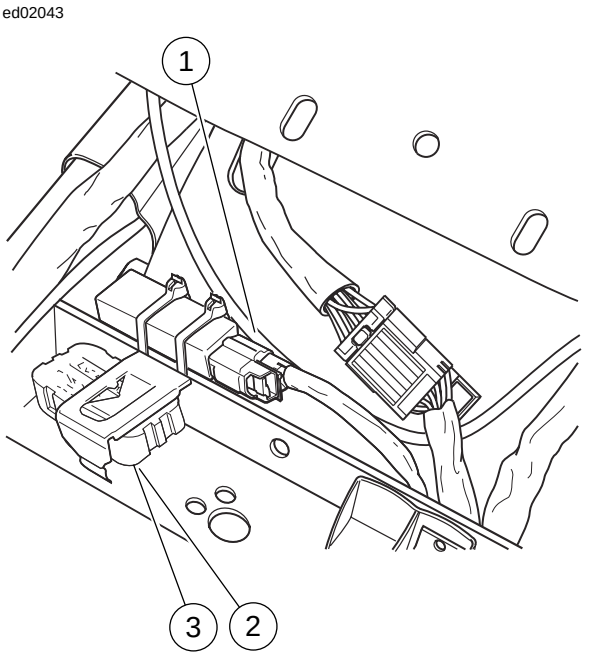
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1064, U1255 2.13

GENERAL

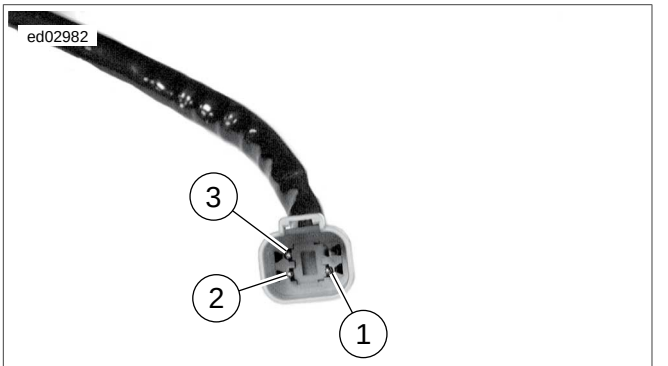
Loss of TSM/TSSM/HFSM Serial Data

See Figure 2-21. The data link connector provides a means for the ECM, TSM/TSSM/HFSM 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. A DTC U1255 (only reported by the TSM/TSSM/HFSM or speedometer) indicates that no messages were present during power up of the current key cycle. A DTC U1064 indicates that there was communication on the data bus since power up, but was lost or interrupted during that key cycle.



1. **HFSM Antenna connector [209]**
2. **HFSM Antenna Jumper Harness connector [208]**
3. **TSM/TSSM/HFSM connector [30]**

Figure 2-20. Frame Crossmember (Under Seat)



1. **Terminal 2: ground (BK/GN)**
2. **Terminal 3: serial data (LGN/V)**
3. **Terminal 4: power (GY)**

Figure 2-21. Data Link Connector

Table 2-16. Code Description

DTC	DESCRIPTION
U1064	Loss of TSM/TSSM/HFSM serial data
U1255	Serial data error/missing message

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) as follows:
   a. Mate black socket housing on Breakout Box with speedometer connector [39] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601).
   b. Mate black pin housing on Breakout Box with speedometer harness connector [39B] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601).
   c. Mate gray socket housing on Breakout Box with TSM/TSSM/HFSM connector [30A].
   d. Mate gray pin housing on Breakout Box with harness connector [30B].

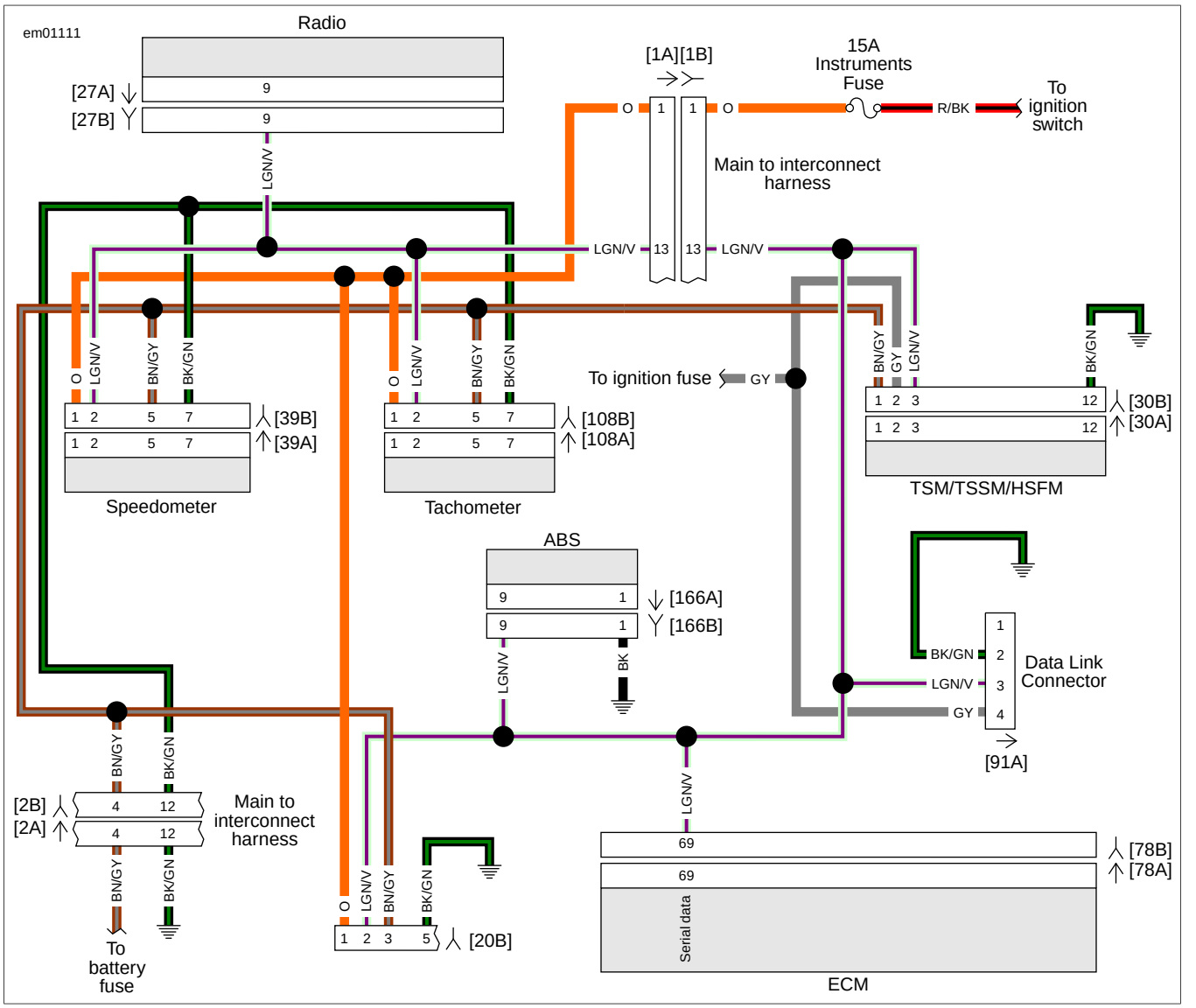


Figure 2-22. Serial Data Circuit: FLHX, FLHT/C/U, FLTR

Table 2-17. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - left fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[20]	Console harness	All	16-place Molex	Under seat
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat

Table 2-17. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

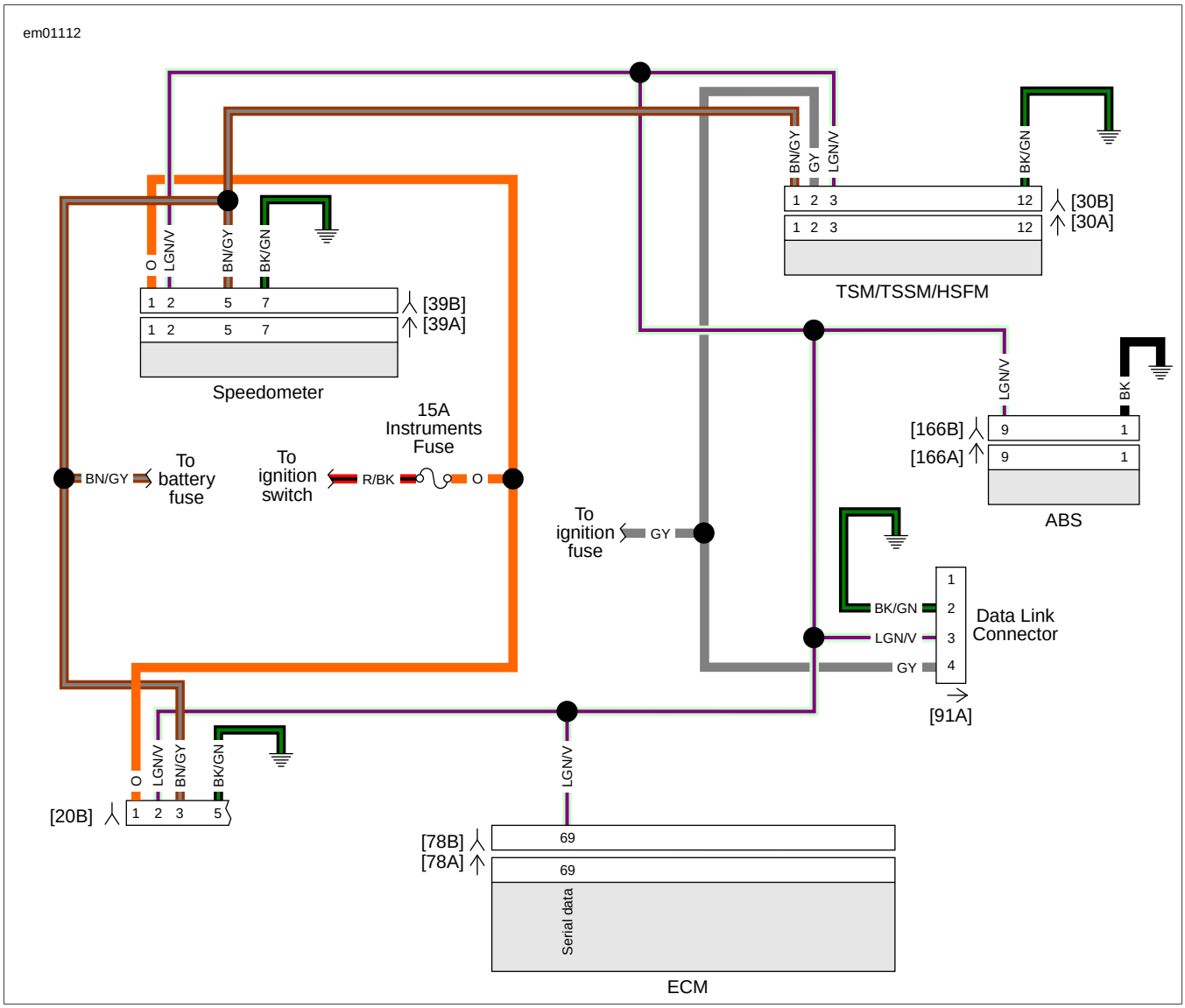


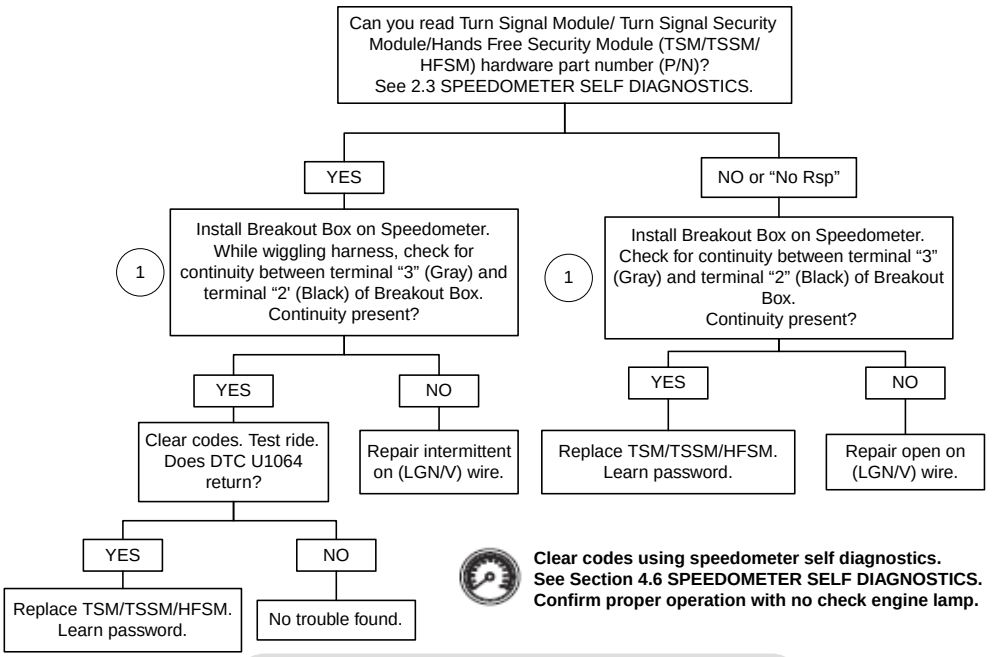
Figure 2-23. Serial Data Circuit: FLHR/C/S

Table 2-18. FLHR Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[20]	Console harness	16-place Molex	Under seat
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Mini-Deutsch	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Loss of TSM/TSSM/HFSM Serial Data: DTC U1064, U1255



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1300, U1301 OR BUS ER 2.14

GENERAL

Serial Data Low or Serial Data Open/High

See Figure 2-24. The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a DVOM. In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6-0.8 volts. The range for acceptable operations is 0-7.0 volts.

Table 2-19. Code Description

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



Figure 2-24. Electronic Control Module (ECM)

DIAGNOSTICS

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.
- If a U1300, U1301 or "BUS Er" is present, perform diagnostic procedures listed in 4.12 STARTS, THEN STALLS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

TURN SIGNAL OVERVIEW 3.1

GENERAL

The Turn Signal Module (TSM) has two major functions:

- Control turn signals.
- Serve as Bank Angle Sensor (BAS).

The optional, factory-installed, Harley-Davidson Smart Security System (**H-DSSS**) includes a Hands-Free Security Module (**HFSM**) which provides the same functions as the TSM, but also includes security and immobilization functions.

SECURITY SYSTEM: JAPAN/KOREA

The security system on motorcycles sold in Japan and Korea meet the regulatory requirements for those countries. The system incorporates a Turn Signal Security Module (**TSSM**). Complete details on operation, troubleshooting, and diagnostics are found in E.1 TSM/TSSM (JAPAN/KOREA) OVERVIEW.

TURN SIGNAL FUNCTIONS

- **Manual turn signal control:** Manual activation/deactivation of left and right turn signal flashing sequences.
- **Automatic turn signal cancellation:** Automatic cancellation of left and right turn signal flashing sequences based on either vehicle speed, vehicle acceleration or turn completion.
- **Hazard warning 4-way flashers:** Four-way left and right turn signal flashing capability.
- **Turn signal lamp diagnostics:** Self-diagnostics for short circuit and open lamp conditions on both left and right turn signal systems. See 3.9 CHECKING FOR DIAGNOSTIC TROUBLE CODES.

NOTE

The turn signals cannot be activated or deactivated when the Ignition Switch is in the ACC position. The turn signals can only be activated or deactivated with the Ignition Switch in the IGNITION position.

MANUAL CANCELLATION

To stop the turn signals from flashing, briefly depress the turn signal switch a second time.

To switch turn direction signals, depress 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/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 (11.3 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 (11.3 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.
- The turn signals will cancel within two seconds upon turn completion. A sensor inside the TSM/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 motorcycle for 0.25 miles (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.

BANK ANGLE FUNCTIONS

- **Emergency engine shutdown:** Will provide engine shutdown when vehicle is tipped over.
- **Emergency outputs disable:** Will disable turn signal lamps and starter motor when vehicle is tipped over.

BANK ANGLE RESTART

The engine will shut off automatically if the vehicle is tipped over. The turn signals, starter motor, Electronic Control Module (ECM), fuel pump and coil will be disabled.

The odometer displays "tIP" when a tip over condition is detected.

To restart the motorcycle after shutdown has occurred:

1. Return the motorcycle to an upright position.
2. Cycle the Ignition Switch OFF-**ON** before restarting the motorcycle.

CLUTCH/NEUTRAL INTERLOCK

- **Disables starter:** Disables starter until either the clutch lever is pulled in or transmission neutral is selected.
- **Diagnostics:** Provides diagnostics for clutch and neutral switch faults.

SECURITY SYSTEM H-DSSS

See 3.2 HARLEY-DAVIDSON SMART SECURITY SYSTEM.

HARLEY-DAVIDSON SMART SECURITY SYSTEM 3.2

COMPONENTS

The Harley-Davidson Smart Security System (H-DSSS) consists of three components:

- **Hands-Free Security Module:** See Figure 3-1. A electronic module that functions both as the Turn Signal Module (TSM) and as the Hands-Free Security Module (HFSM).
- **Hands-Free Antenna:** See Figure 3-1. Mounted under the seat of the motorcycle.
- **Hands-Free Fob:** See Figure 3-2. A remote control device, intended to be carried by the rider whenever the vehicle is being operated.

NOTE

Do not relocate any of the Security System components.



Figure 3-1. HFSM and Antenna



Figure 3-2. Hands-Free Fob w/Serial Number Label

SECURITY IMMOBILIZATION

The Hands-Free Security System (HFSM) provides security and immobilization functions not found on the Turn Signal Module (TSM). The 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 3.6 WARNINGS AND ALARMS, Siren Chirp Mode (Confirmation).

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:** Siren, if installed, activates its self-alarm mode. Turn signals will not flash.

See 3.5 ARMING/DISARMING SECURITY SYSTEM for more information.

NOTE

Disconnect the battery to prevent the siren (if installed) from activating within 5 seconds of turning the Ignition Switch to OFF/FORK LOCK. If the HFSM is armed, you must turn the Ignition Switch to IGNITION with a fob within range, again turn the Ignition Switch to OFF/FORK LOCK and remove the MAXIFUSE before the 5-second arming period expires. With the MAXIFUSE removed, the battery can be disconnected.

HFSM FEATURES

The following information applies only to motorcycles equipped with the Hands Free Security System (HFSM).

- **Security lamp:** See Figure 3-3. A lamp (key icon) within the speedometer face tells the rider if the system is armed or disarmed.
- **Personal code disarming:** If the fob is not available, the HFSM allows the rider to disable the security alarm and immobilization functions with a five-digit personal code.
- **Arming confirmation:** When the 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.
- **Disarming confirmation:** When the 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 Figure 3-4. 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:** This mode allows the dealer to disable security system via DIGITAL TECHNICIAN. Dealer service mode is exited when module detects an assigned fob in range.

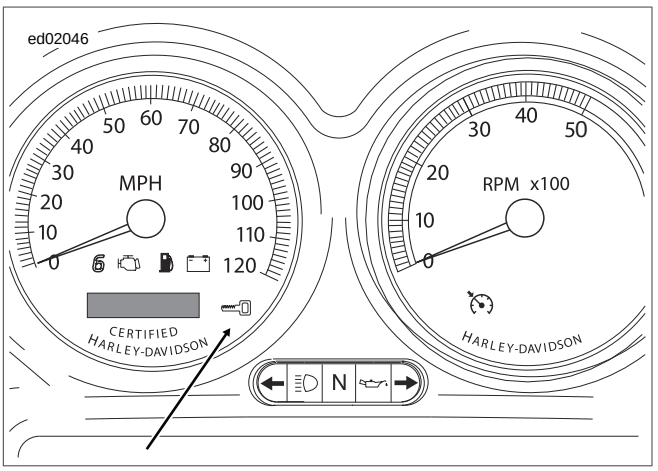


Figure 3-3. Security Lamp (Key Icon)

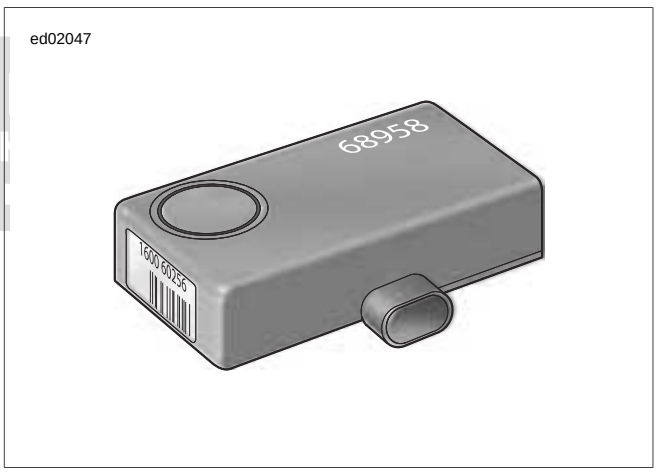


Figure 3-4. Security Siren

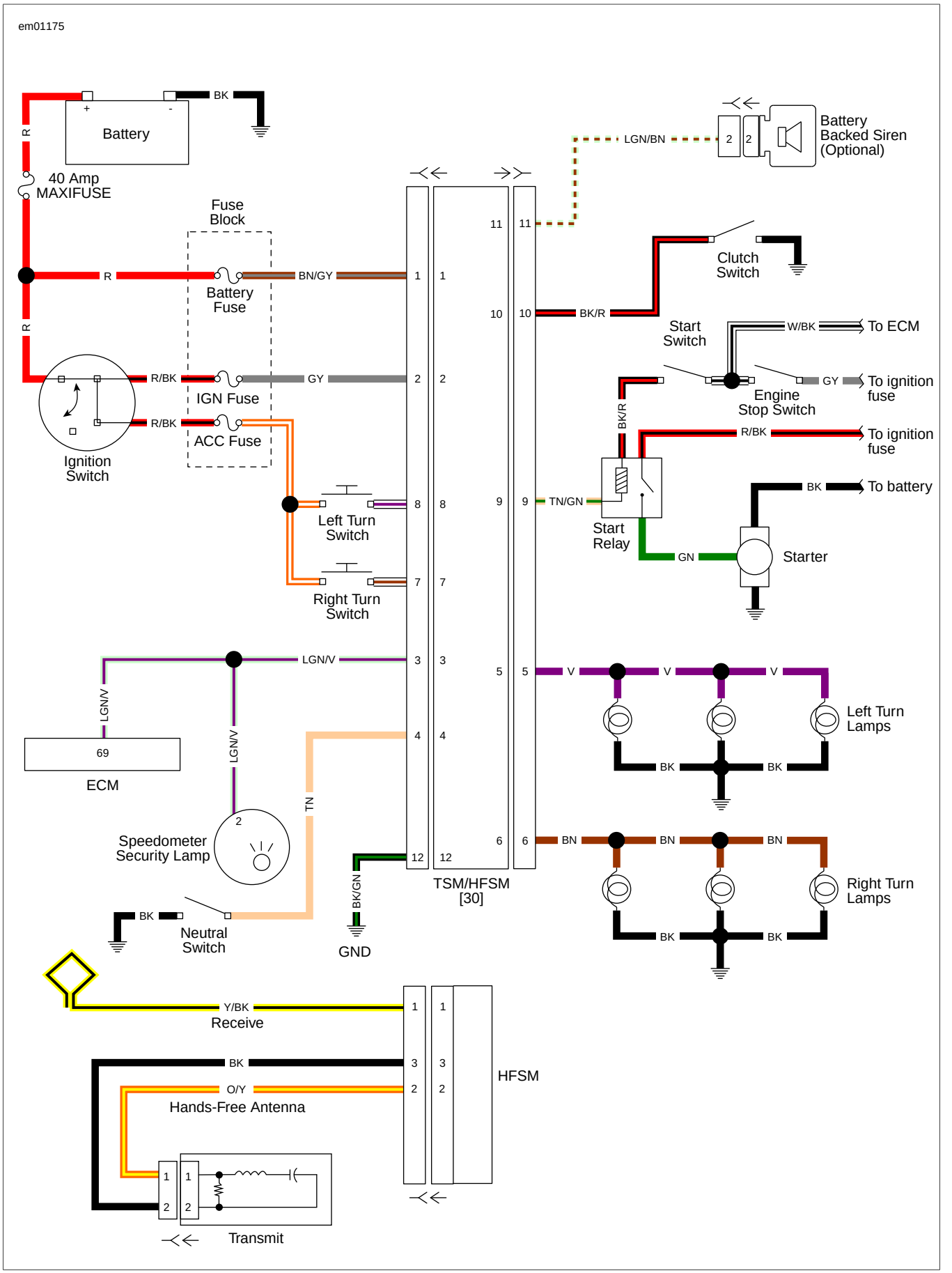


Figure 3-5. Simplified TSM/HFSM Wiring

H-DSSS ACTUATION 3.3

GENERAL

Setting up a vehicle TSM/HFSM depends on whether the vehicle has a Turn Signal Module (TSM) or the optional Hands-Free Security Module (HFSM) security system installed.

SIDECAR CONFIGURATION

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

All motorcycles ship with the H-DSSS set for use **without** a sidecar installed. If a motorcycle is equipped with a TSM, no further actuation is required. If motorcycle is to be used with a sidecar, a remote BAS will need to be installed and properly configured using DIGITAL TECHNICIAN (Part No. HD-44750).

ACTUATION

Actuation consists of assigning two fobs to the system, and entering an initial Personal Identification Number (PIN). The PIN can be changed by the rider at any time.

1. Configure HFSM motorcycles by assigning **both** fobs to the vehicle.
2. Configure HFSM motorcycles 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). See 3.4 PERSONAL IDENTIFICATION NUMBER (PIN).

Once the system has been activated, it will always "arm" within 5 seconds of turning the Ignition Switch to **OFF** and no motorcycle motion.

FOB ASSIGNMENT

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

Use DIGITAL TECHNICIAN (Part No. HD-44750) to assign both fobs to the H-DSSS. Follow the menu prompts in the Digital Technician 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.

POWER DISRUPTION AND CONFIGURING

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.
- Battery 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 **OFF**, cycle Ignition Switch **IGNITION-OFF-IGNITION-OFF-IGNITION** and press left turn signal switch **twice**.
2. Repeat steps listed above.
3. Continue with PIN entry sequence listed.

PERSONAL IDENTIFICATION NUMBER (PIN) 3.4

GENERAL

The Personal Identification Number (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

To enter a PIN on a motorcycle with no PIN previously installed during HFSM actuation, refer to Table 3-1.

Table 3-1. Entering an Initial PIN: HFSM

STEP	ACTION	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 Ignition Switch **IGNITION**-OFF-**IGNITION**-OFF-**IGNITION.**	
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 until desired digit is displayed in odometer.	
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 until desired digit is displayed in odometer.	
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 until desired digit is displayed in odometer.	
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 until desired digit is displayed in odometer.	
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 the Ignition Switch to **OFF.**	

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CHANGING THE PIN

To change a PIN, refer to Table 3-2. The rider can change the PIN at any time.

Modifying an Existing Pin

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 3-2. Changing the PIN: HFSM

STEP	ACTION	CONFIRMATION	NOTES
1	Select a 5-digit (1 thru 9) personal code and record in the Owner's Manual and on the wallet card.		
2	With fobs present, cycle Ignition Switch **IGNITION**-OFF-**IGNITION**-OFF-**IGNITION.**		
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 desired digit is displayed in 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 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 odometer.		
12	Press **right** turn signal button **1** time.	The new digit will replace the current in the odometer. The fifth digit will flash.	
13	Enter fifth digit (e) of new PIN by pressing **left** turn signal button until desired digit is displayed in 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 Ignition Switch to **OFF.**		Turning Ignition Switch to OFF stores PIN.

DIGITAL TECHNICIAN II

ARMING/DISARMING SECURITY SYSTEM 3.5

HANDS-FREE FOB

See Figure 3-6. The HFSM's reception range for the Hands-Free Fob signal depends on a specific receiver pattern. The range will be an arm's length.

NOTES

- *Environmental and geographic conditions may affect signal range.*
- *Always have the fob present whenever the motorcycle is operated.*
- *Do not place fob in metal enclosure, and do not place it closer than 3.0 in. (80.0 mm) to the hands-free antenna, cellular phones, PDAs, displays and other electronic devices while operating the motorcycle. That may prevent the fob from disarming the security system.*
- *Fob battery should be replaced every year. See 3.27 HFSM MAINTENANCE.*



Figure 3-6. Hands-Free Fob

SECURITY LAMP (KEY ICON)

Refer to Table 3-3. See Figure 3-7. The security lamp (key icon) in the speedometer face provides feedback to the rider confirming armed or disarmed status.

Table 3-3. Security Lamp Status

LAMP	MODE
Does not flash.	No security system (TSM only), security system not armed.
Flashes every second.	Two minute 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 Ignition Switch OFF.	Arming is starting up. You have 5 seconds before system is armed.
Stays on solid with Ignition Switch ON.	If solid for more than 4 seconds after Ignition Switch is turned to IGNITION, a current DTC is present.

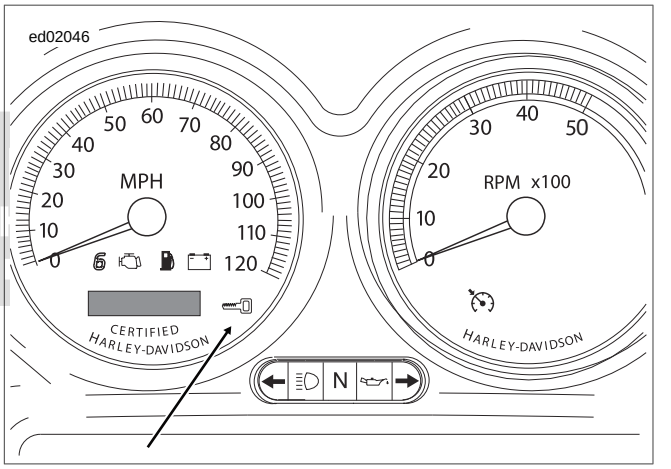


Figure 3-7. Security Lamp (Key Icon)

ARMING

The H-D Smart Security System automatically arms within five seconds when the motorcycle is parked and the Ignition Switch is turned to **OFF** and motion is not detected.

Confirmation: On arming, the turn signals flash twice and the Security Siren will "chirp" twice if chirp function is activated. While armed, the security lamp (key icon) will flash every 2.5 seconds. Refer to Table 3-3.

DISARMING

There are two ways to disarm the H-D Smart Security System:

- Automatic disarming.
- Disarming with a Personal Identification Number (PIN).

Automatic Disarming

Always have the fob present when riding, loading, fueling, moving, parking or servicing the motorcycle. Carry the fob in

a convenient pocket. The H-D Smart Security System disarms automatically when the Ignition Switch is turned to IGNITION. On disarming, the Security 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 3-3.

Disarming with a Personal Identification Number (PIN)

See 3.4 PERSONAL IDENTIFICATION NUMBER (PIN) to enter an initial PIN to actuate the system.

Refer to Table 3-3. 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. **During this time, the vehicle will not accept any attempt to enter a PIN.**

Table 3-4. Entering the PIN to Disarm HFSM (Example: 3-1-3-1-3)

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF.**		
2	Turn Ignition Switch to **IGNITION.**		
3	Hold **both** turn switches in until confirmation. *	Security lamp blinks at fast rate and "0- - - - " is displayed in the odometer. The first digit will flash.	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.	The first digit will be displayed and the next dash will flash in the odometer.	Serves as "enter" key.
6	Enter second digit of code (1) by pressing **left** turn switch **1** time.		
7	Press **right** turn switch 1 time.	The first two digits will be displayed and the next dash will flash in the odometer.	Serves as "enter" key.
8	Enter third digit of code (3) by pressing **left** turn switch **3** times.		
9	Press **right** turn switch 1 time.	The first three digits will be displayed and the next dash will flash in the odometer.	Serves as "enter" key.
10	Enter fourth digit of code (1) by pressing **left** turn switch **1** time.		
11	Press **right** turn switch **1** time.	The first four digits will be displayed and the next dash will flash in the odometer.	Serves as "enter" key.
12	Enter fifth digit of code (3) by pressing **left** turn switch **3** times.		
13	Press **right** turn switch **1** time.	Security lamp stops blinking and the odometer displays miles.	System is disarmed.
* This must be done within two seconds of turning the Ignition Switch to IGNITION. If system issues a warning before the security system flashes at a fast rate, then cycle Ignition Switch OFF until security key icon flashes at 2.5 second rate before re-attempting PIN entry.			

DIGITAL TECHNICIAN HARLEY-DAVIDSON

WARNINGS AND ALARMS 3.6

WARNINGS

A warning consists of three alternate flashes of the turn signals and chirp from the optional Security Siren. Warnings are issued from an armed HFSM in the following order:

1. **First Warning:** A warning is issued whenever a person without a fob present attempts to move the motorcycle or turns the Ignition Switch to **IGNITION.**
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.

ALARM

Activation

In the full alarm state, the turn signals flash alternately, and if equipped with the Security Siren, the siren will sound.

After 30 seconds of alarm, if no further motorcycle motion is detected, the alarm will stop.

NOTE

*Motorcycle must be returned to original parked position with Ignition Switch turned to **OFF**.*

If motorcycle motion continues, the alarm will start again continue for another 30 seconds.

The HFSM will repeat the alarm cycles 10 times for a total of five minutes, with a 10-second pause between alarm cycles.

NOTES

- *During warnings and alarms, the starter motor and the ignition remain disabled.*
- *The alarm will also activate the LED and vibration or audible modes of a Harley-Davidson Security Pager. A pager can operate either in silent or in combination with an optional Smart Siren. The range of the pager can be up to 0.50 mile (0.89 km).*

Deactivation

The alarm cycles can be discontinued at any time by moving an assigned fob to the motorcycle. The presence of the fob will terminate the alarm.

SIREN CHIRP MODE (CONFIRMATION)

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 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 two 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 Ignition Switch to ON and the system disarmed, turn the Ignition Switch OFF.
2. When the system arms (2 flashes of turn signals), immediately turn the Ignition Switch to ON.
3. Wait until the security lamp goes out, then immediately turn the Ignition Switch OFF.
4. When the system arms (2 flashes of turn signals), immediately turn the Ignition Switch to ON and wait for system to disarm.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

SERVICE/EMERGENCY FUNCTIONS 3.7

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 picked up and moved in an armed state, however, any attempt to start the engine will trigger the alarm.

To Enter Transport Mode:

1. Turn the Ignition Switch to IGNITION.
2. Set the Engine Stop Switch to OFF.
3. With an assigned fob within range, turn the Ignition Switch from IGNITION to ACCESS.
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 ACCESS.
5. After the turn signals flash once, turn the Ignition Switch to OFF and the module is armed.
6. Confirmation: Turn signal will blink three times when armed for one ignition cycle.

To Exit Transport Mode:

Return the system to normal operation:

1. With the fob present, turn the Ignition Switch to IGNITION to disarm the HFSM. To cancel the transport mode, set the Engine Stop Switch to RUN.

SERVICE MODE

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

With a fob present, the HFSM can be configured for service by disabling the security system with DIGITAL TECHNICIAN (Part No. HD-44750).

Once disabled, the motorcycle 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

If it is necessary to leave a motorcycle parked along side the road, the hazard warning four-way flashers can be turned ON with the Smart Security System armed.

To Arm the HFSM with the Hazard Warning Flashers ON

1. Turn the Ignition Switch to IGNITION.
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 the Ignition Switch to 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 IGNITION.
2. Simultaneously press the left and right turn signal switches.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

TROUBLESHOOTING 3.8

TURN SIGNALS (TSM/HFSM)

Verify the operation of the turn signals and the integrity of the fuse protecting the turn signals before further troubleshooting.

SECURITY SYSTEM (HFSM)

If the fob is present, and the security system is issuing "warnings" or "Alarm" when the motorcycle is moved, the reason may be one of the following:

1. Strong electromagnetic interference in the area you have parked.
   a. Verify you have not placed your fob in metal enclosure, or within 3.0 in. (80.0 mm) of other electronic devices.
   b. Place fob next to motorcycle and turn the Ignition Switch to IGNITION. After the system disarms, the fob can be placed back in its carrying location.
   c. Try moving the motorcycle approximately 15 feet (4.57 m) away from the current parking spot.
2. The fob battery is dead. Use PIN to disarm the vehicle. Replace fob battery.
3. Fob is damaged. Use PIN to disarm the vehicle. Replace the fob.

NOTES

- *If your Security Icon is staying solid ON while you are riding the vehicle, take your vehicle to your dealer as soon as practical.*
- *Always lock the fork and take the ignition key with you for added protection.*

DIAGNOSTICS MODE

The TSM/HFSM measures the current when the turn signals are used. If there is a burned out light bulb on one side, the remaining light and the corresponding turn signal indicator flash at double the normal rate starting with the fifth flash.

Other diagnostic conditions monitored include:

- Short circuit in the turn signal wiring.
- Open circuit in the turn signal wiring.
- Stuck turn signal switch.

NOTES

- *A stuck turn signal switch will disable the automatic turn signal cancellation feature.*
- *If a stuck switch is detected, you must hold the left and right turn signal switches in for more than one second to activate the four-way flashers.*

See 3.9 CHECKING FOR DIAGNOSTIC TROUBLE CODES for more information.

TROUBLESHOOTING

To resolve TSM/HFSM faults, follow three basic steps:

1. Retrieve Diagnostic Trouble Codes (DTCs) using speedometer self diagnostics. See 3.11 SPEEDOMETER SELF-DIAGNOSTICS.
2. Diagnose system problems. This involves using special tools and the diagnostic flow charts in this section.
3. Correct problems through the replacement and/or repair of the affected components.

After repairs are performed, the work must be validated. This involves clearing the DTCs and confirming proper vehicle operation as indicated by the behavior of the turn signals.

CHECKING FOR DIAGNOSTIC TROUBLE CODES 3.9

GENERAL

Problems fall into at least one of five categories:

- Turn signal malfunction.
- Bank angle (engine disable).
- Clutch/neutral interlock (starter enable).
- Security lamp problem.
- Security system malfunction.

SECURITY LAMP DIAGNOSTICS

To diagnose system problems, start by observing the behavior of the security lamp.

NOTE

- *See Figure 3-8. "Key ON" means that the Ignition Switch is turned to IGNITION and the Engine Stop Switch is set to RUN (although the engine is **not** running).*
- *See Figure 3-9. When the Ignition Switch is turned to ON, the security lamp will illuminate for approximately four seconds and then turn off.*
- *If the security lamp is not illuminated at Key ON or if it fails to turn OFF after the initial four-second period, the speedometer may need to be replaced. See 3.11 SPEEDOMETER SELF-DIAGNOSTICS. If "BUS Er" is displayed on the odometer, it may take up to twenty seconds for the security lamp to illuminate.*
- *The security lamp will also light for eight seconds after the bulb check if historic diagnostic trouble codes (DTCs) are present. The security lamp will stay on if current DTCs are set. If a historic DTC is present, the security lamp will light for 2 ignition cycles or until the DTC is cleared manually.*

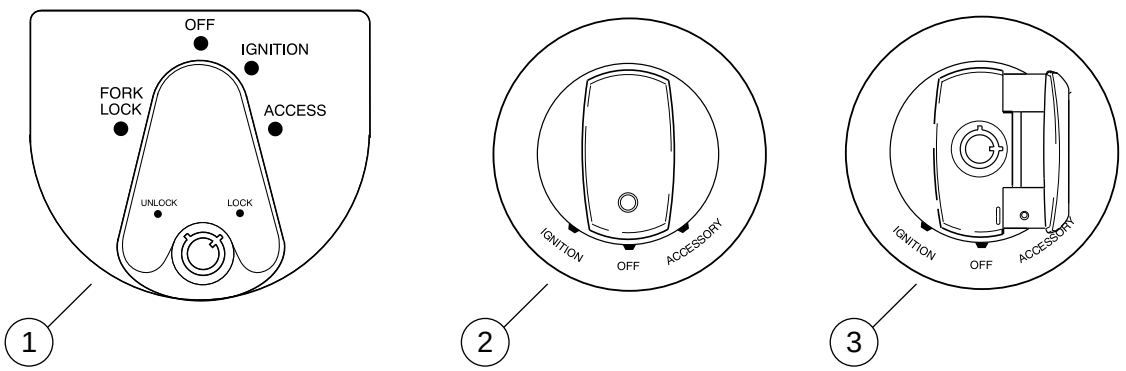
See Figure 3-10. After the lamp turns off after being illuminated for the first four-second period, one of three events may occur:

- The lamp remains off. This indicates there are no current fault conditions or stored historic DTCs currently detected by the HFSM.
- The lamp stays off for only four seconds and then comes back on for an eight-second period. This indicates a historic DTC is stored, but no current DTC exists.
- The lamp remains on beyond the eight-second period. This indicates a current DTC exists.

NOTE

See 3.9 CHECKING FOR DIAGNOSTIC TROUBLE CODES, Code Types for a complete description of DTC formats.

om00705a



1. **All except FLHR models**
2. **All FLHR models (cover shown closed)**
3. **All FLHR models (cover shown open)**

Figure 3-8. Ignition Switch: Touring Models

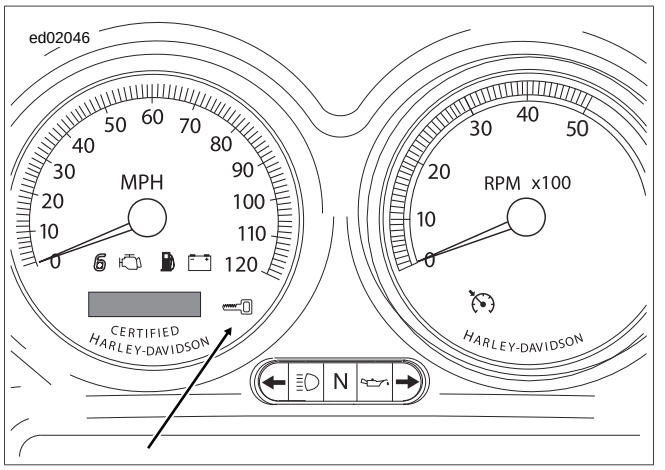


Figure 3-9. Security Lamp (Key Icon)

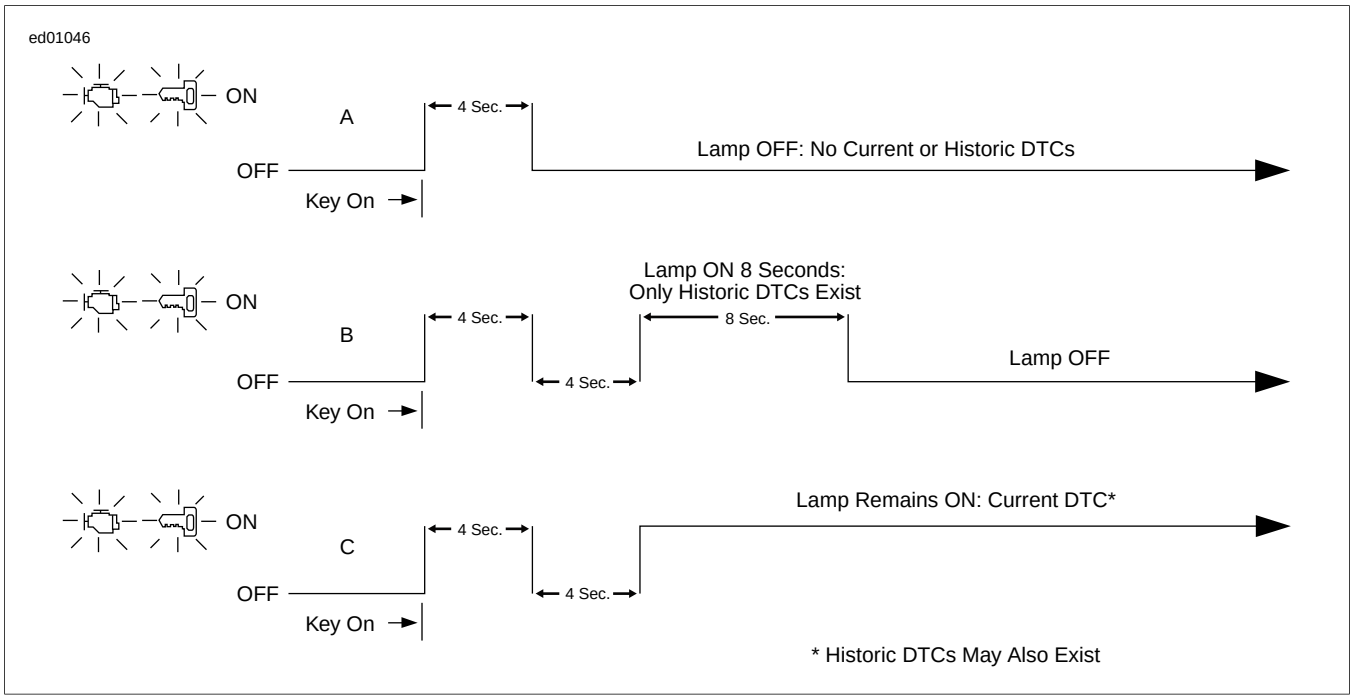


Figure 3-10. Security Lamp Operation

CODE TYPES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

There are two types of diagnostic trouble codes (DTCs):

- **Current**
- **Historic**

If a DTC is stored, it can be read using either a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750) or speedometer self diagnostics. See 3.11 SPEEDOMETER SELF-DIAGNOSTICS.

NOTES

- *Speedometer self diagnostics will display both current and historic DTCs. To differentiate between current and historic DTCs, a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750) must be employed.*
- *All DTCs reside in the memory of the ECM, TSM/HFSM, speedometer, or tachometer until the DTC is cleared by use of the speedometer self diagnostics. See 3.11 SPEEDOMETER SELF-DIAGNOSTICS.*
- *A historic DTC is also cleared after a total of 50 ignition cycles has 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 are present during the current ignition cycle. See the appropriate flow charts for solutions.

Historic

If a particular problem happens to resolve itself, the active status problem is dropped and it becomes a historic DTC rather than a current DTC. For example, intermittent output shorts can become typical historic DTCs.

Historic DTCs can only be retrieved using a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).

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 MULTIPLE DTCs/PRIORITY RANKING if multiple DTCs are found.

Diagnostic charts are designed for use with current DTCs and as a result they frequently suggest part replacement. When diagnosing a historic DTC, the charts can be helpful, but should not lead to part replacement without verification the part is faulty.

RETRIEVING DTCS

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The TSM/HFSM supports two levels of diagnostics.

- The most sophisticated mode employs a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).
- The second mode requires using the speedometer self diagnostics. Speedometer, tachometer (if equipped), TSM/HFSM and ECM DTCs can be accessed and cleared. See 3.11 SPEEDOMETER SELF-DIAGNOSTICS.

MULTIPLE DTCS/PRIORITY ORDER

While it is possible for more than one fault to occur and set more than one DTC, there are several conditions which may result in **one** fault setting **multiple** DTCs:

Serial data DTCs (U1016, U1255, U1300 and U1301) may be accompanied by other DTCs. **Always** correct the serial data DTCs before resolving the other DTCs.

Refer to Table 3-5. This table lists the DTCs in priority order. Correct DTCs in priority order.

Table 3-5. TSM/HFSM DTCs and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	DIAGNOSTICS
1	U1300	Serial Data Low	3.25 DTC U1300, U1301 OR BUS ER
2	U1301	Serial Data High	3.25 DTC U1300, U1301 OR BUS ER
3	U1016	Loss of ECM Serial Data	3.24 DTC U1016, U1255
4	U1255	Serial Data Error	3.24 DTC U1016, U1255
5	B1142	Smart Security System Internal fault	3.19 DTC B1136, B1142 (HFSM ONLY)
6	B1135	Accelerometer Failed	3.18 DTC B1135
7	B1136 (HFSM)	Accelerometer Tip Test Error	3.19 DTC B1136, B1142 (HFSM ONLY)
8	B1151	Back Angle Sensor (BAS) Short to Ground	3.22 DTC B1151, B1152, B1153
9	B1152	Back Angle Sensor (BAS) Short to Battery	3.22 DTC B1151, B1152, B1153
10	B1153	Back Angle Sensor (BAS) High	3.22 DTC B1151, B1152, B1153
NOTE: Sidecar DTCs apply only to Touring models equipped with sidecars. If DTCs B1151, B1152 and/or B1153 are present on non-sidecar-equipped motorcycles, the TSM/TSSM/HFSM is not properly configured.			
11	B1154	Clutch Switch Input Short to Ground	3.23 DTC B1154, B1155
12	B1155	Neutral Switch Input Short to Battery	3.23 DTC B1154, B1155
13	B1134	Starter Output High	3.17 DTC B1134
14	B1121 (TSM)	Left Turn Output Fault	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
	B1121 (HFSM)	Left Turn Output Open	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
15	B1122 (TSM)	Right Turn Output Fault	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
	B1122 (HFSM)	Right Turn Output Open	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
16	B1123 (HFSM)	Left Turn Output Short to Ground	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS

Table 3-5. TSM/HFSM DTCs and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	DIAGNOSTICS
17	B1124 (HFSM)	Right Turn Output Short to Ground	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
18	B1125 (HFSM)	Left Turn Output Short to Battery	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
19	B1126 (HFSM)	Right Turn Output Short to Battery	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS
20	B1143 (HFSM)	Security Antenna Short to Ground	3.21 DTC B1143, B1144, B1145 (HFSM ONLY)
21	B1144 (HFSM)	Security Antenna Short to Battery	3.21 DTC B1143, B1144, B1145 (HFSM ONLY)
22	B1145 (HFSM)	Security Antenna Open	3.21 DTC B1143, B1144, B1145 (HFSM ONLY)
23	B0563	Battery Voltage High	3.14 DTC B0563
24	B1131 (HFSM)	Alarm Output Low	3.16 DTC B1131, B1132 (HFSM ONLY)
25	B1132 (HFSM)	Alarm Output High	3.16 DTC B1131, B1132 (HFSM ONLY)
26	B1141 (TSM)	Ignition Switch Low/Open	3.21 DTC B1143, B1144, B1145 (HFSM ONLY)
	B1141 (HFSM)	Ignition Switch Low/Open	3.20 DTC B1141 (HFSM ONLY)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INITIAL DIAGNOSTIC CHECK: TSM/HFSM 3.10

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

To locate faulty circuits or other system problems, follow the diagnostic flow charts. For a systematic approach, always begin with INITIAL DIAGNOSTICS. Read the general information and then work your way through the flow chart box by box.

Diagnostic Notes

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

Circuit Diagram/Wire Harness Connector Table

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

In order to perform most diagnostic routines, a Breakout Box and a digital volt/ohmmeter (DVOM) are required. See 3.12 BREAKOUT BOX: TSM/HFSM.

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

Job/Time Codes

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

Reprogramming ECM

Diagnostic charts frequently suggest Electronic Control Module (ECM) replacement. In the event an ECM needs to be replaced, it must be reprogrammed using a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750). See your dealer. Password learn procedure must also be performed. See 3.26 TSM/HFSM: PASSWORD LEARN.

INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Tips

- If odometer reads "BUS Er" with the Ignition Switch turned ON (Engine Stop Switch at RUN with the engine off), check data bus for an open or short to ground between data link connector [91A] terminal "3" and ECM connector [78B] terminal "69", HFSM connector [30B] terminal "3", speedometer connector [39B] terminal "2" or tachometer (if equipped) connector [108B] terminal "2".
- Check for an open diagnostic test terminal between data link connector [91A] terminal "3" and TSM/HFSM connector [30B] terminal "3". With Ignition Switch turned ON, serial data bus voltage should be typically 0.6-0.8 volts. The range of acceptable voltage is 0-7.0 volts.
- To identify intermittents, wiggle wire harness while performing steps in the diagnostic check charts.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness connector [39B] and speedometer connector [39A] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601). See 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER.
2. Compare TSM/HFSM system behavior to symptoms in Table 3-6.

Table 3-6. Symptoms That May Not Set Diagnostic Trouble Codes

SYMPTOM	START WITH FLOW CHART
HFSM: Fails to disarm	HFSM: Fails to Disarm
TSM/HFSM: Turn signal will not cancel	TSM/HFSM Turn Signal Error 1A (Part 1 of 2): Will Not Cancel On Turn Completion
TSM/HFSM: Turn signal cancels erratically	TSM/HFSM Turn Signal Error 1A (Part 2 of 2): Cancels Erratically
TSM/HFSM: Turn signal flashes double normal rate, all bulbs good	TSM/HFSM Turn Signal Error 3A: Turn Signals Flash at Double Normal Rate, All Bulbs Work
TSM: Turn signals will not flash	TSM Turn Signal Error 2A Will Not Flash, 4-Way Flashers Inoperable (Part 1 of 4): DTC B1121, B1122, B1141
HFSM: Symptom - Will not flash. No DTCs or DTC B1141	Will Not Flash, No Codes (Part 1 of 2): DTC B1141

Other Diagnostic Trouble Codes (DTCs)

See 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER for any DTCs related to the speedometer.

See 4.5 INITIAL DIAGNOSTIC CHECK: EFI for any DTCs related to the Electronic Control Module (ECM).

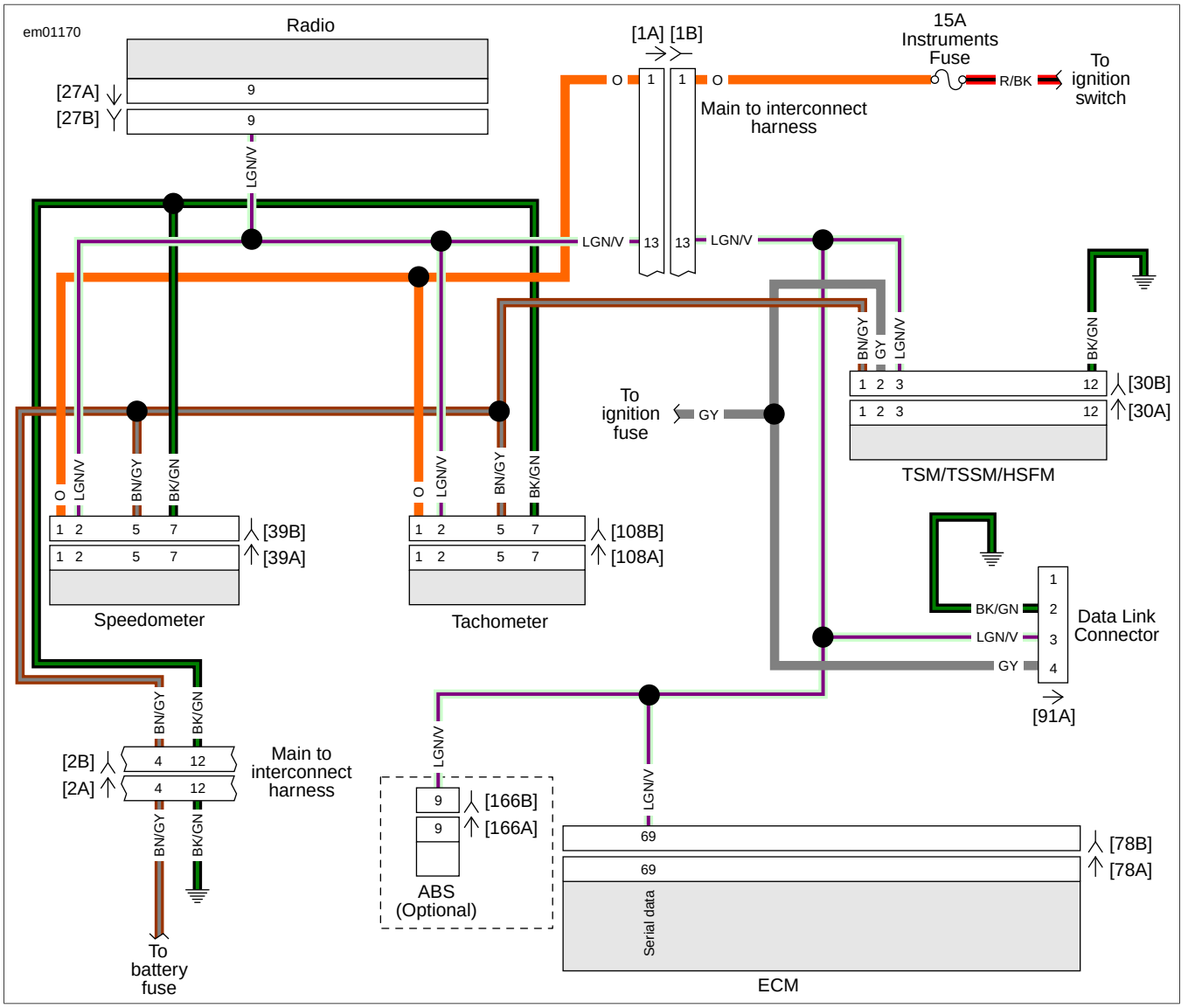


Figure 3-11. Initial Diagnostic Check (FLHX, FLHT/C/U, FLTR)

Table 3-7. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - right fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under Bezel (back of speedometer)

Table 3-7. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

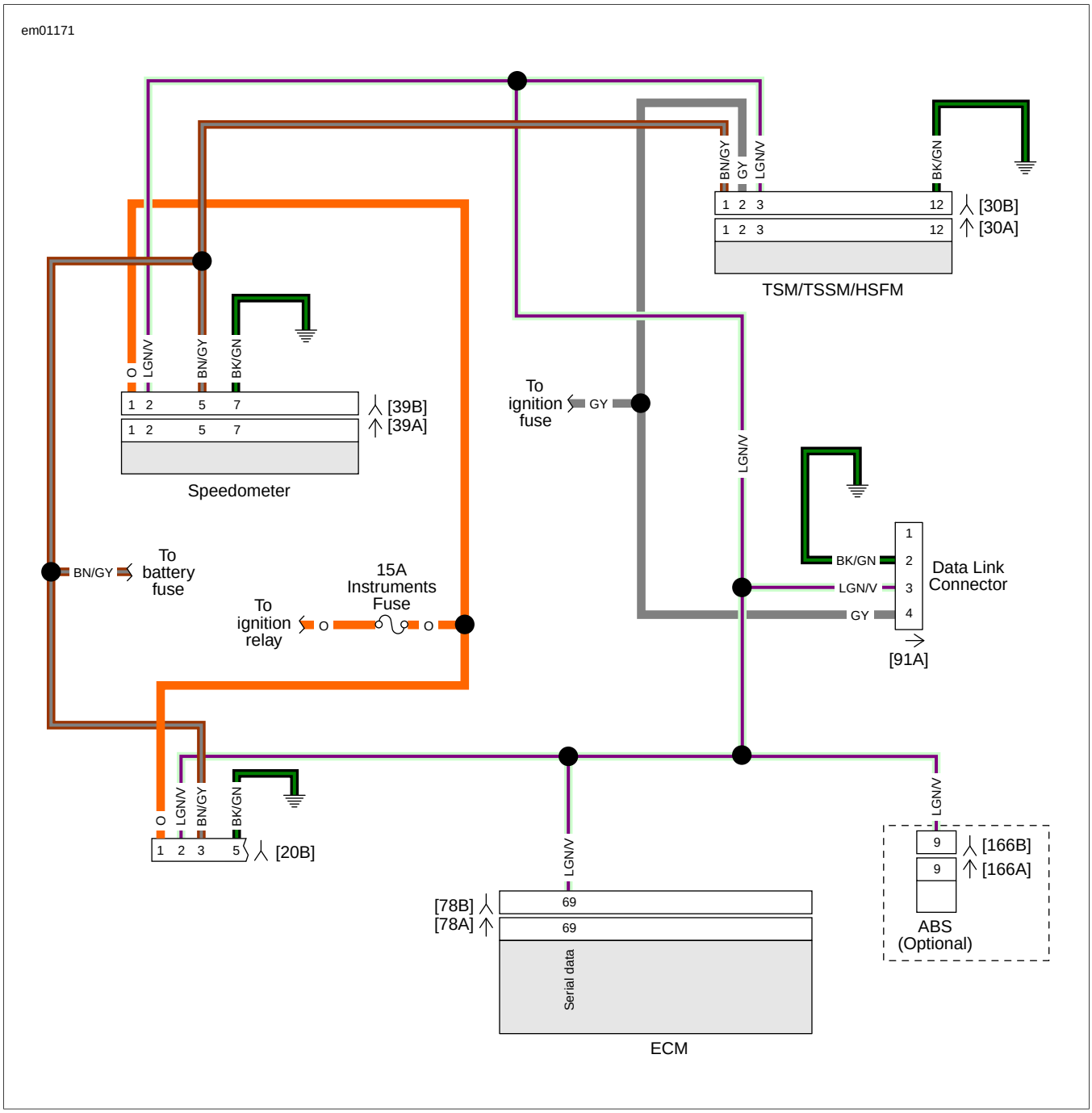


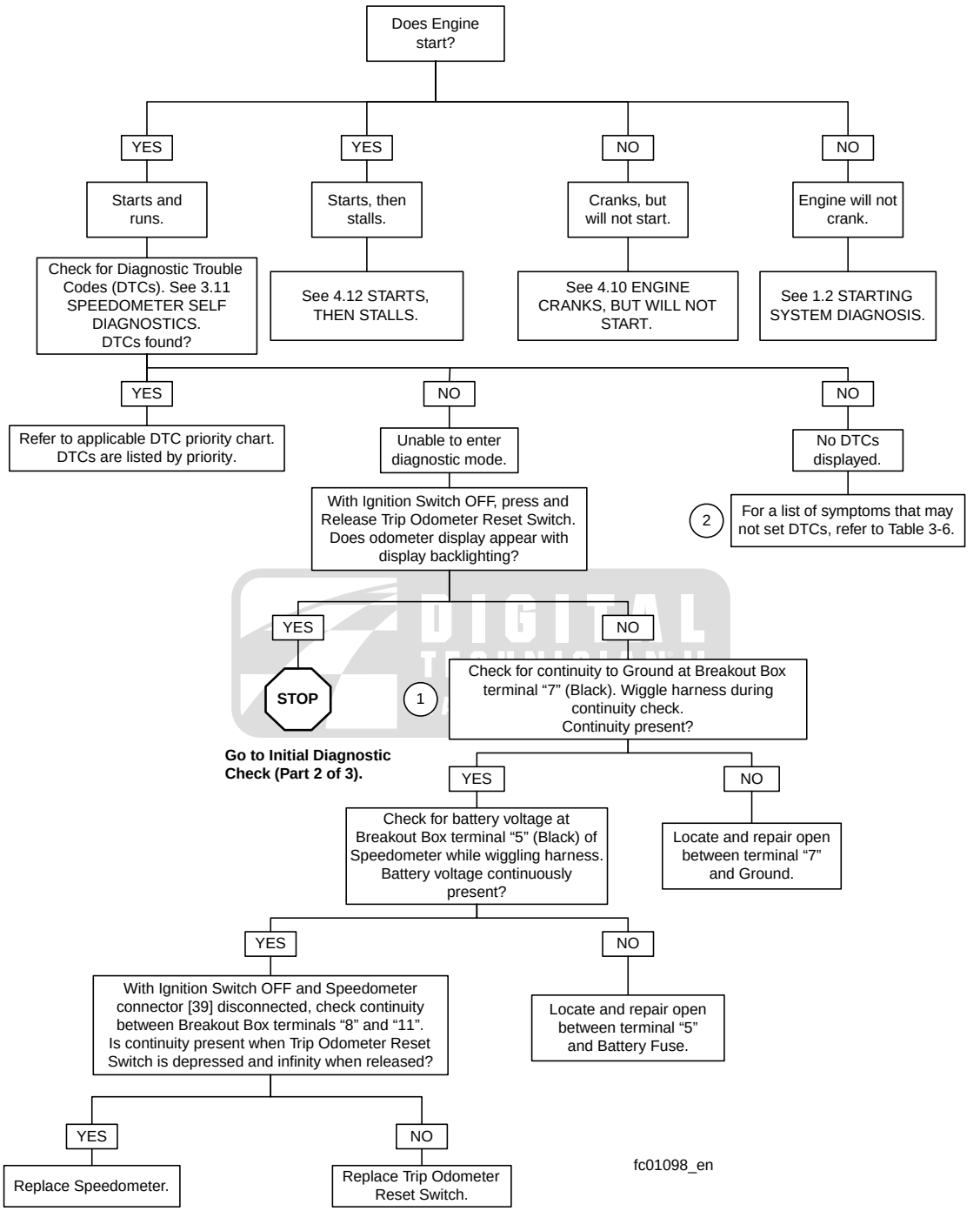
Figure 3-12. Initial Diagnostic Check (FLHR/C/S)

Table 3-8. Wire Harness Connectors

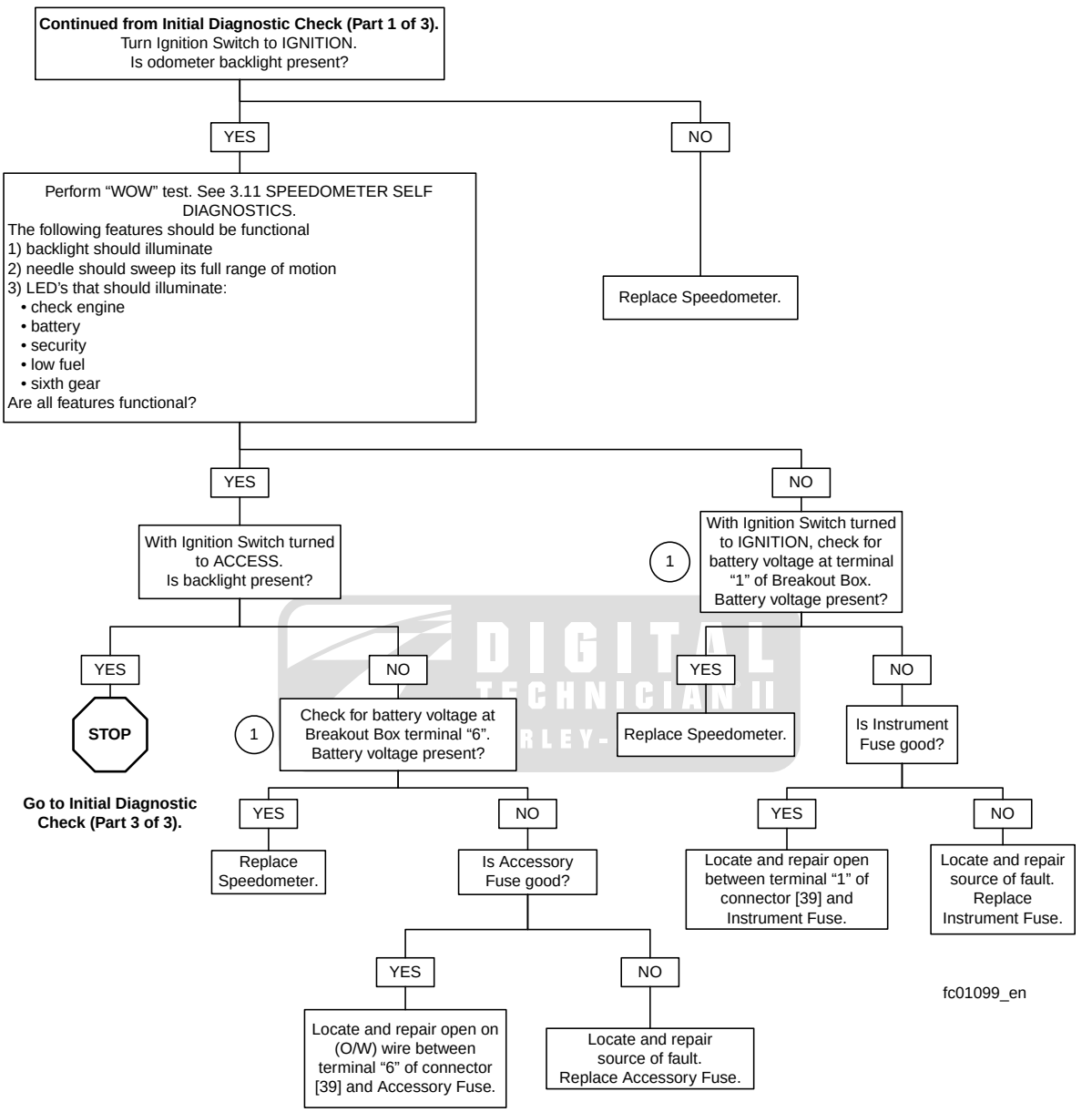
NO.	DESCRIPTION	TYPE	LOCATION
[20]	Console harness	16-place Molex	Under seat
[30]	TSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

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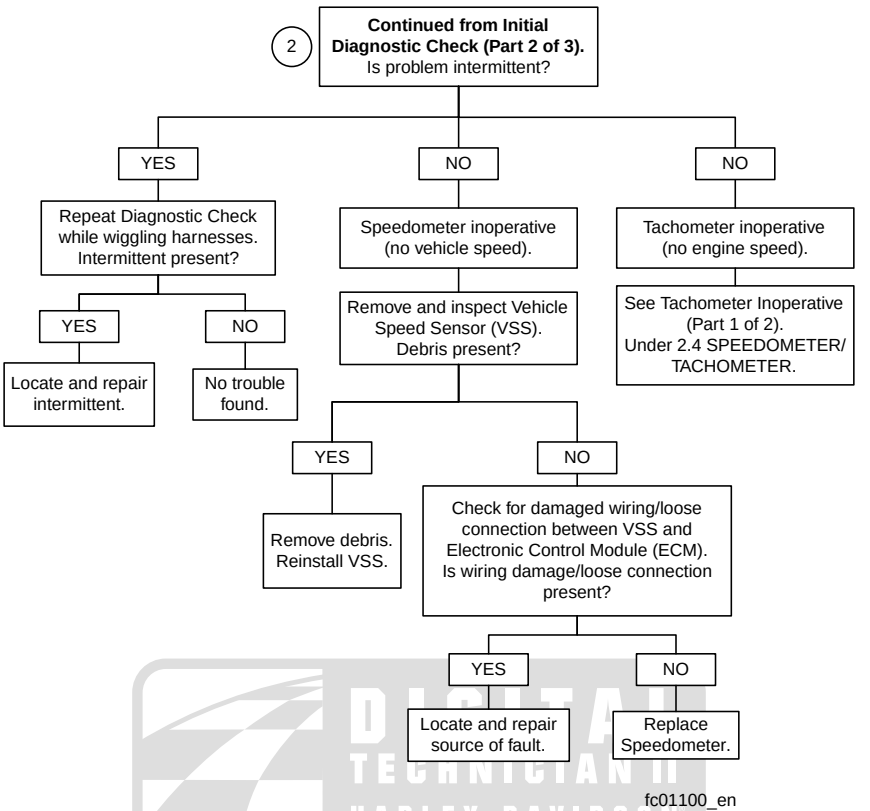
Initial Diagnostic Check (Part 1 of 3)



Initial Diagnostic Check (Part 2 of 3)



Initial Diagnostic Check (Part 3 of 3)



SPEEDOMETER SELF-DIAGNOSTICS 3.11

GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/HFSM, and Electronic Control Module (ECM) Diagnostic Trouble Codes (DTCs) (diagnostic mode).

DIAGNOSTICS

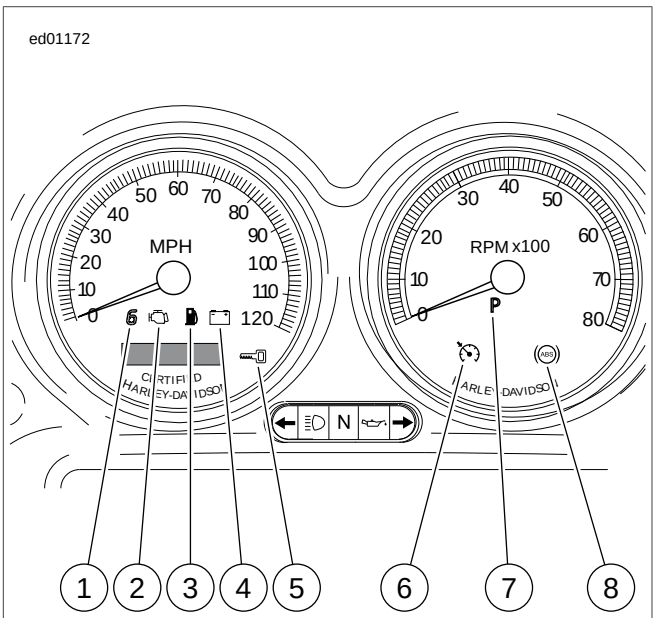
Diagnostic Tips

- For a quick check of speedometer function, a "WOW" test can be performed. Press and hold trip odometer reset switch then turn Ignition Switch ON (see Figure 3-14). Release trip odometer reset switch. See Figure 3-13. Background lighting should illuminate, gauge needles should sweep their full range of motion, and indicator lamps (battery, security, low fuel, check engine, ABS, cruise, pursuit, and sixth gear indicator) should illuminate. All lamps should illuminate, even those not used in normal vehicle operation.
- If speedometer fails "WOW" test, check for battery, ground, ignition, trip odometer reset switch, and accessory wiring to speedometer. If any feature in the speedometer is non-functional, see 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.

Diagnostic Notes

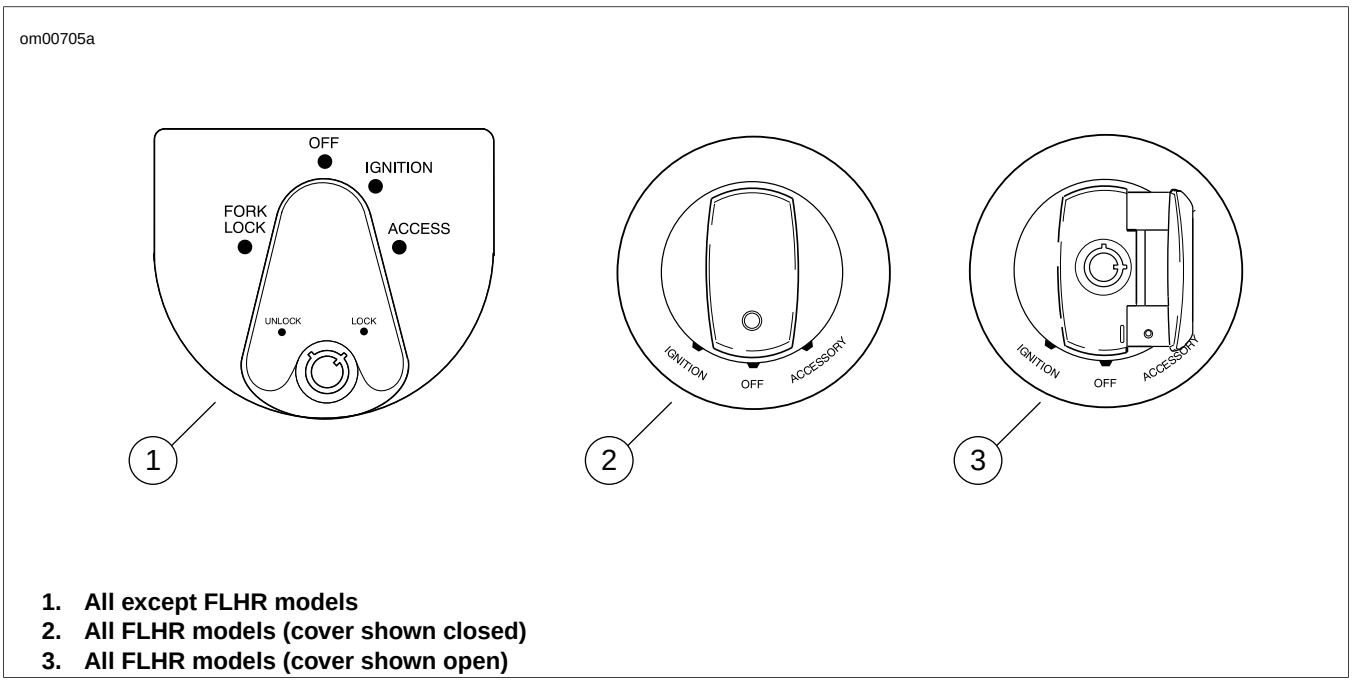
Each reference number below correlates to a circled number on the flow chart(s).

1. To exit diagnostic mode, turn Ignition Switch OFF.
2. To clear DTCs for the selected module, press the trip odometer reset switch for more than 5 seconds when a DTC is displayed. This procedure will clear all DTCs for the selected module.



1. **Sixth gear indicator**
2. **Check engine lamp**
3. **Low fuel lamp**
4. **Battery lamp**
5. **Security lamp (key icon)**
6. **Cruise enabled lamp**
7. **Pursuit lamp**
8. **ABS lamp**

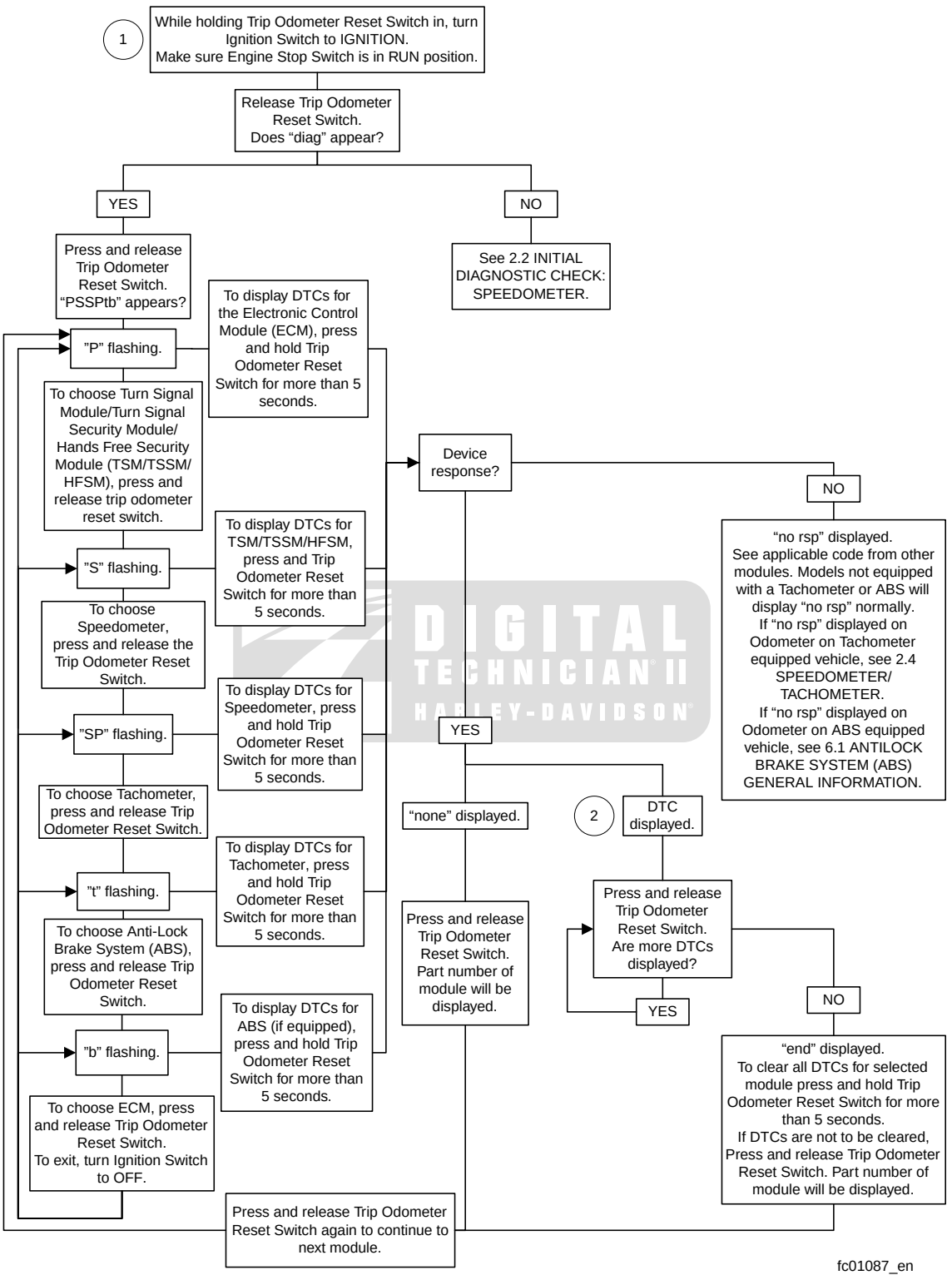
Figure 3-13. Icons



1. **All except FLHR models**
2. **All FLHR models (cover shown closed)**
3. **All FLHR models (cover shown open)**

Figure 3-14. Ignition Switch: Touring Models

Speedometer Self Diagnostics



BREAKOUT BOX: TSM/HFSM 3.12

GENERAL

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

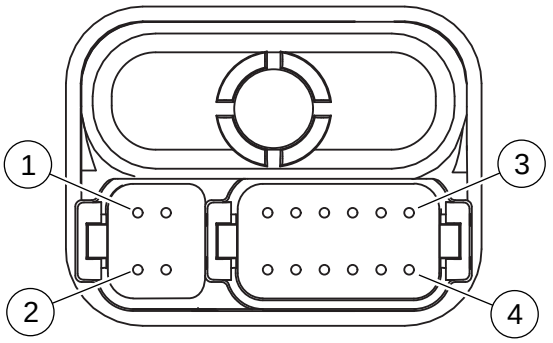
The BREAKOUT BOX (Part No. HD-42682) splices into the main harness. Used in conjunction with a digital volt/ohmmeter (DVOM), it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects.

INSTALLATION

NOTE

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

1. Access TSM/HFSM.
2. See Figure 3-15. Disconnect harness connector(s) from TSM/HFSM:
   a. **For HFSM:** Depress latches on antenna connector [208] and remove from antenna connector [208A].
   b. Depress latches on main harness connector [30B] and remove from main connector [30A].
3. Attach Breakout Box to connector(s).
   a. Mate gray socket housing on Breakout Box with TSM/HFSM connector [30A].
   b. Mate gray pin housing on Breakout Box with vehicle harness connector [30B].
4. **For HFSM:** Mate antenna connector [208] to HFSM.



1. **Connector [208A] terminal 1**
2. **Connector [208A] terminal 4**
3. **Connector [30A] terminal 12**
4. **Connector [30A] terminal 1**

Figure 3-15. TSM/HFSM Terminal Cavity Numbers

REMOVAL

1. See Figure 3-15. **For HFSM:** Depress latches on antenna connector [208B] and disconnect from HFSM antenna connector [208A] (4).
2. Disconnect Breakout Box from vehicle:
   a. Depress latches and detach gray Breakout Box socket connector from TSM/HFSM main harness connector [30A] (1).
   b. Detach gray Breakout Box connector from TSM/HFSM main harness connector [30B] (3).
3. **For HFSM:** Mate the antenna connector [208B].
4. Mate main harness connector [30B] to TSM/HFSM.
5. Reinstall TSM/HFSM.
6. Install parts removed for access.

NOTE

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

Table 3-9. TSM/HFSM Connector [30B]

TERMINAL	FUNCTION	TERMINAL	FUNCTION
1	Battery 12V	7	Right turn switch input
2	Battery 12V switched	8	Left turn switch input
3	Serial data	9	Start relay ground
4	Neutral switch input	10	Clutch switch input
5	Left turn feed output	11	Alarm signal output
6	Right turn feed output	12	Chassis ground

FAILS TO DISARM (HFSM ONLY) 3.13

GENERAL

If the HFSM does not respond or responds weakly (limited range - will not consistently disarm with fob within normal range), follow the flow chart.

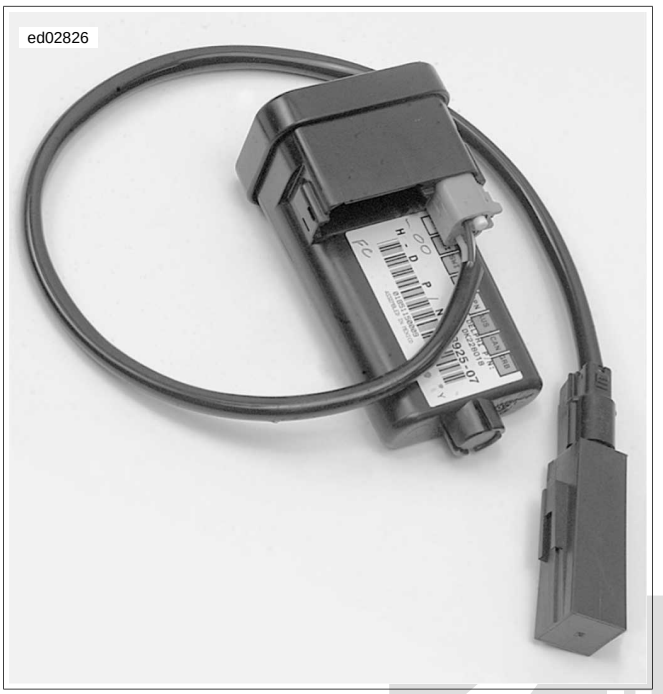


Figure 3-16. HFSM and Antenna

JOB/TIME CODES

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

DIAGNOSTICS

Diagnostic Tips

- Verify that the hands-free antenna or a cell phone is not within 3.0 in. (80 mm) of key fob.
- Interference from physical surroundings may affect RF transmission. Place fob next to motorcycle or move motorcycle to a new location and retest.
- See Figure 3-16. 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 3-17. Verify fob battery (1) voltage is at least 2.9 volts. See 3.27 HFSM MAINTENANCE.
- Fob serial number (2) 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 3-17. Open Fob: HFSM

Diagnostic Notes

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

1. After a battery disconnect, the HFSM will not enter the configuration mode on the first attempt. All attempts to assign a fob or enter the configuration mode will require at least two attempts.

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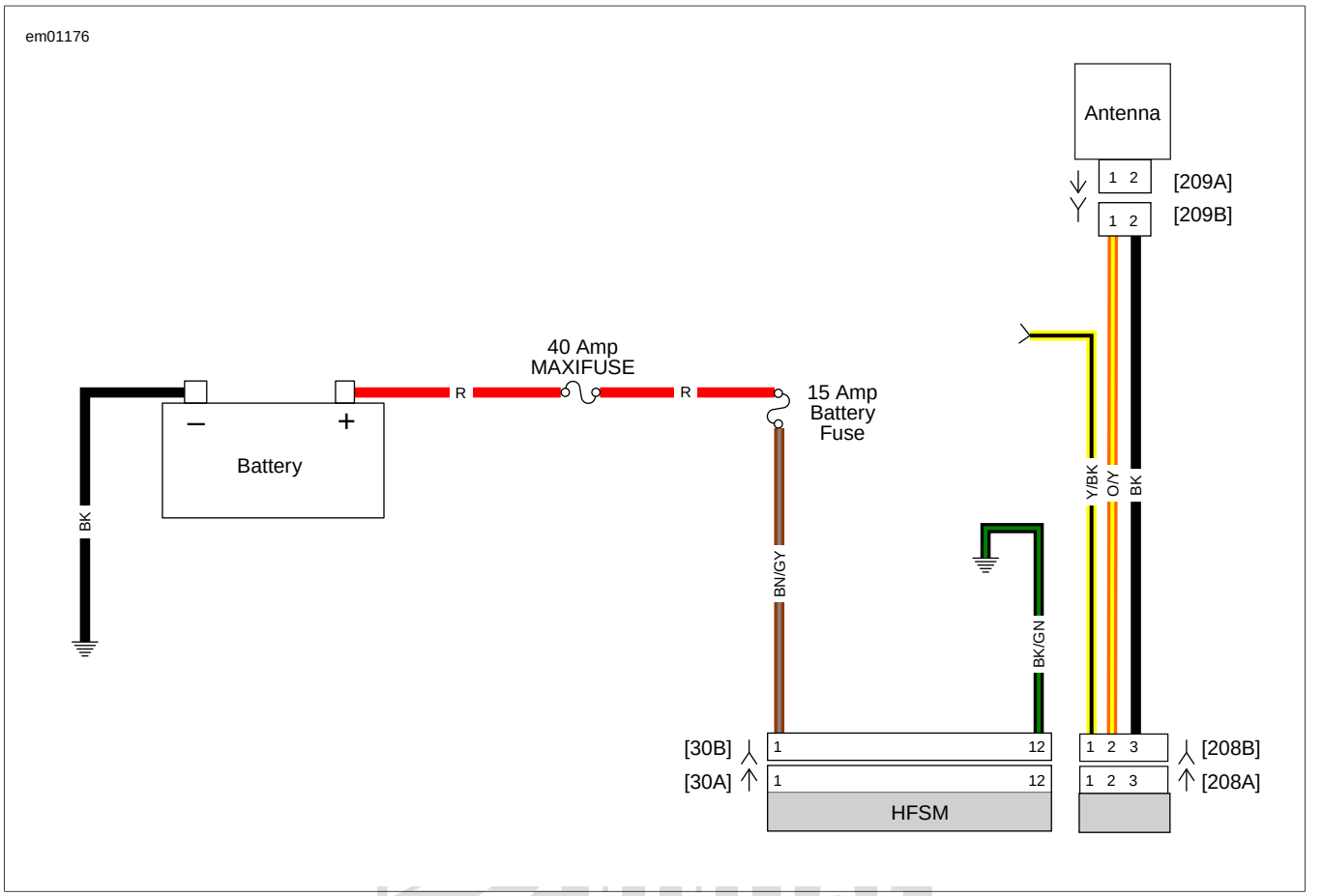


Figure 3-18. Antenna Circuit: HFSM

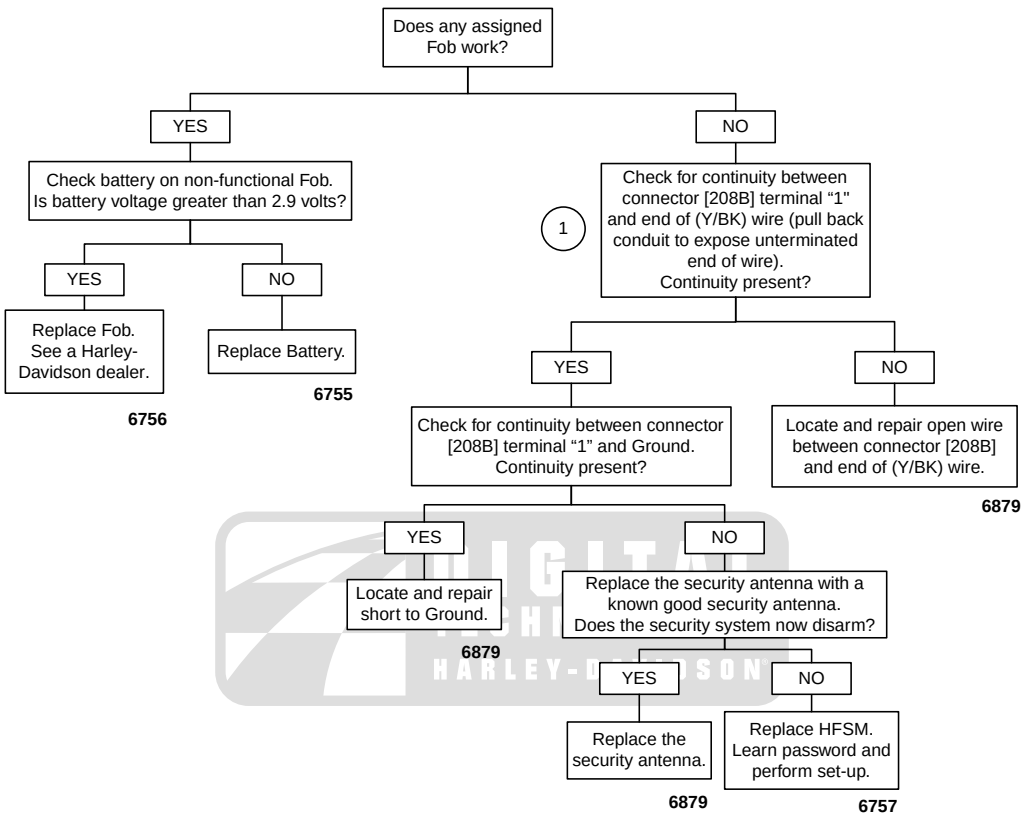
Table 3-10. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)
[208]	HFSM	4-place Deutsch	HFSM in crossmember at rear of battery box (under seat)
[209]	Security antenna	2-place Molex	Top of rear fender (under seat)

HFSM: Fails to Disarm

NOTE

The fob for the HFSM must be assigned using DIGITAL TECHNICIAN (Part No. HD-44750). DIGITAL TECHNICIAN can also validate fob operation when connected to the motorcycle.



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DTC B0563 3.14

GENERAL

The TSM/HFSM continually checks the battery voltage during IGN/OFF and IGN/RUN power modes. If the voltage exceeds 16.0 volts for more than 5.0 ±0.5 seconds, the TSM/HFSM sets Diagnostic Trouble Code (DTC) B0563.

DIAGNOSTICS

Diagnostic Tips

- This DTC may set when the vehicle is placed on a battery charger, on fast charge, for a long period of time.
- The HFSM does not illuminate the security lamp when this DTC is set.

Diagnostic Notes

See 1.7 CHARGING SYSTEM tests to correct. Problem may be faulty voltage regulator.

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TSM/HFSM: TURN SIGNAL ERRORS AND DTCS 3.15

GENERAL

The turn signals will automatically cancel based on either the speed/acceleration of the vehicle or upon turn completion. See 3.1 TURN SIGNAL OVERVIEW.

TSM/HFSM: For turn signal diagnostics based on symptoms, refer to Table 3-11.

TSM DTCs Only: Refer to Table 3-12.

HFSM DTCs Only: Refer to Table 3-13.

Table 3-11. Turn Signal Symptoms: TSM/HFSM

DTC	SYMPTOM	START WITH FLOW CHART
N/A	Turn signal will not cancel on turn completion	TSM/HFSM Turn Signal Error 1A (Part 1 of 2): Will Not Cancel on Turn Completion
N/A	Turn signal cancels erratically	TSM/HFSM Turn Signal Error 1A (Part 2 of 2): Cancels Erratically
N/A	Turn signals flash at double normal rate, all bulbs work	TSM/HFSM Turn Signal Error 3A: Turn Signals Flash at Double Normal Rate, All Bulbs Work

Table 3-12. Turn Signal DTCs: TSM Only

DTC	SYMPTOM	START WITH FLOW CHART
B1121	Turn signals will not flash, 4-way flashers inoperable	TSM Turn Signal Error 2A: Will Not Flash, 4-Way Flashers Inoperable (Part 1 of 4): DTC B1121, B1122, B1141
B1122		
B1141		

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Table 3-13. Turn Signal DTCs: HFSM Only

DTC	SYMPTOM	START WITH FLOW CHART
B1121	Left turn signal inoperable	HFSM Turn Signal Error 4A Left Turn Signal Lamp Open Circuit: DTC B1121; Right Turn Signal Lamp Open Circuit: DTC B1122
B1122	Right turn signal inoperable	HFSM Turn Signal Error 4A Left Turn Signal Lamp Open Circuit: DTC B1121; Right Turn Signal Lamp Open Circuit: DTC B1122
B1123	Left turn signal inoperable	HFSM Turn Signal Error 5A Left Turn Signal Lamp Short-to-Ground: DTC B1123; Right Turn Signal Lamp Short-to-Ground: DTC B1124
B1124	Right turn signal inoperable	HFSM Turn Signal Error 5A Left Turn Signal Lamp Short-to-Ground: DTC B1123; Right Turn Signal Lamp Short-to-Ground: DTC B1124
B1125	Left turn signal inoperable	HFSM Turn Signal Error 6A Left Turn Signal Lamp Short-to-Voltage: DTC B1125; Right Turn Signal Lamp Short-to-Voltage: DTC B1126
B1126	Right turn signal inoperable	HFSM Turn Signal Error 6A Left Turn Signal Lamp Short-to-Voltage: DTC B1125; Right Turn Signal Lamp Short-to-Voltage: DTC B1126

DIAGNOSTICS

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

Job/Time Codes

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

Diagnostic Tips

- **TSM Only:** Diagnostic Trouble Codes B1121 and B1122 will illuminate the security lamp. DTC B1141 will **not** illuminate the security lamp.
- **HFSM Only:** Diagnostic Trouble Codes B1121, B1122, B1123, B1124, B1125, and B1126 will illuminate the security lamp.
- **TSM/HFSM:** When an over current or short-to-ground condition is detected, it will turn off the turn lamp outputs.

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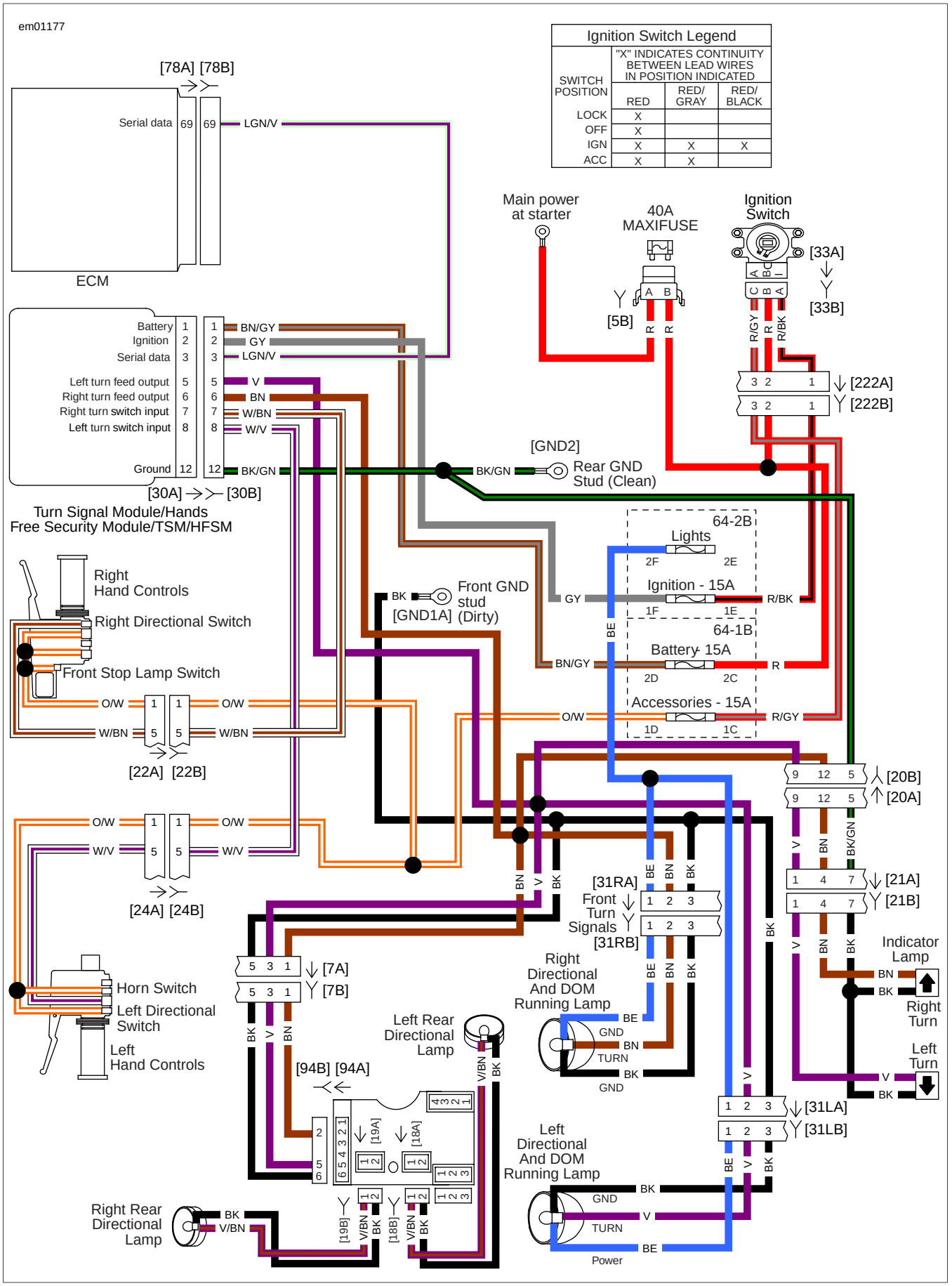


Figure 3-19. Turn Signal Circuit (FLHR/C/S)

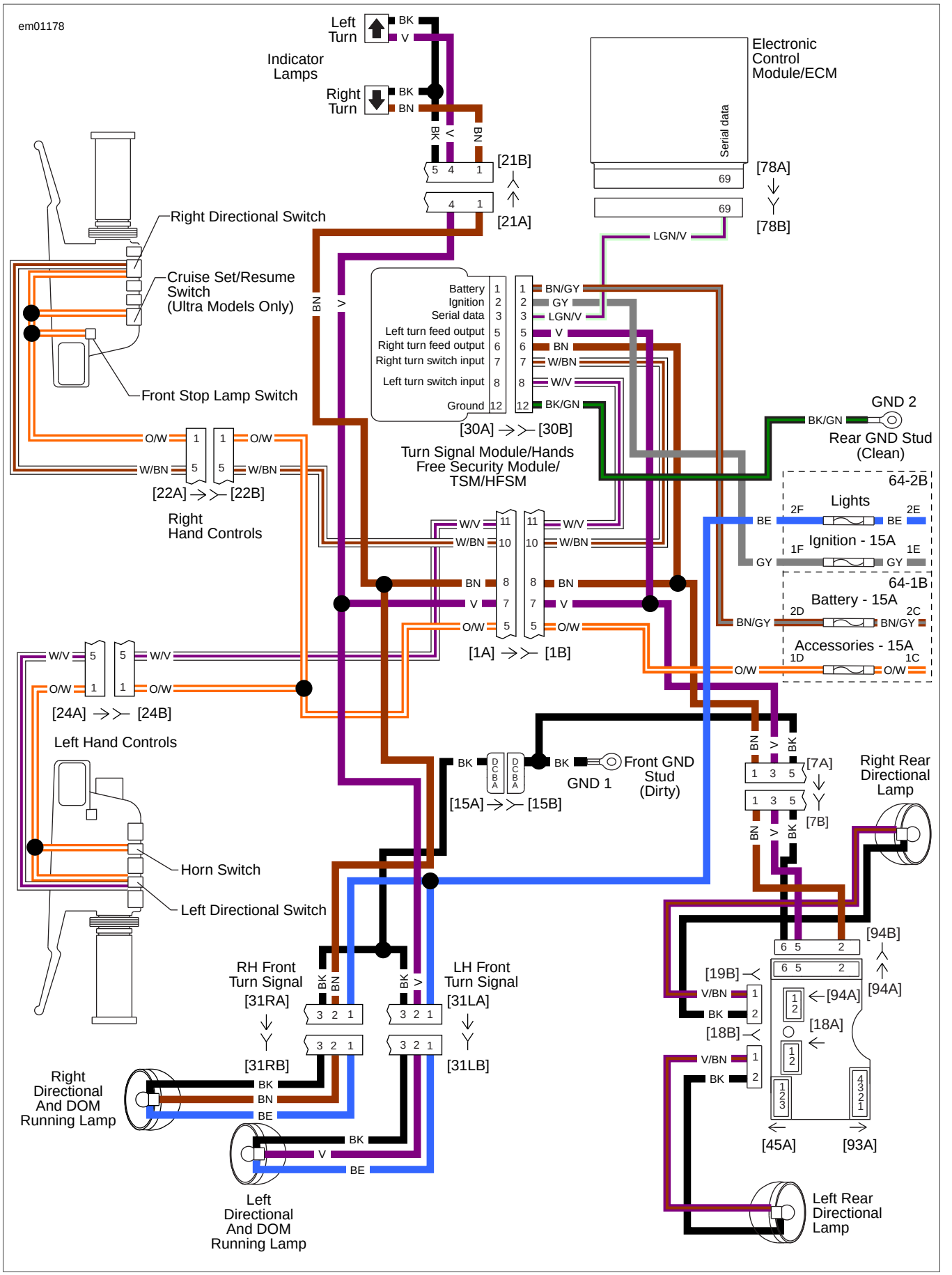


Figure 3-20. Turn Signal Circuit (FLHX, FLHT/C/U, FLTR)

Table 3-14. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C/U	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[7]	Rear fender lights harness	All	8-place Multilock	Top of rear fender (under seat)
[15]	Main to interconnect harness	FLHT/C/U	4-place Packard	Inner fairing - right fairing bracket
		FLTR	4-place Packard	Inner fairing - below radio (right ride)
[18]	Left rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[20]	Console harness	All	16-place Molex	Under seat
[21]	Indicator lamps	FLHR/C/S	8-place Deutsch	Under console
		FLHT/C/U	10-place Multilock	Inner fairing (above radio)
[22]	Right handlebar switches	FLHR/C/S	6-place Molex (Black)	Inside headlamp nacelle
		FLHT/C/U	12-place Molex (Black)	Inner fairing - right fairing support bracket
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (Gray)	Inside headlamp nacelle
		FLHT/C/U	16-place Molex (Gray)	Inner fairing - left fairing support bracket
[30]	TSM/HFSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31]	Left/right front turn signal/auxiliary lamp	FLHR/C/S	6-place Multilock	Inside headlamp nacelle
		FLHT/C/U	4-place Multilock	Inner fairing - left/right fairing support bracket
[33]	Ignition/light key switch	FLHR/C/S	3-place Packard	Under console
		FLHT/C/U	3-place Packard	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[222]	Main to ignition harness	All	4-place Packard	Rear of fuel tank

Diagnostic Notes: All Turn Signal Flow Charts

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

1. Gain access to vehicle's TSM/HFSM.
2. Perform the following procedure:
   a. See Figure 3-21. Position TSM/HFSM in same orientation it is mounted on vehicle. Turn Ignition Switch on. Turn 4-way flashers on by depressing both left and right turn signal switches simultaneously. Turn Ignition Switch off; 4-way flashers should continue to flash.
   b. Tilt TSM/HFSM greater than 45 degrees to the left.
   c. Repeat step a.
   d. Tilt TSM/HFSM greater than 45 degrees to the right.
3. To enable diagnostic mode, see 3.9 CHECKING FOR DIAGNOSTIC TROUBLE CODES.
4. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/HFSM connector [30A] and wiring harness connector [30B]. See 3.12 BREAKOUT BOX: TSM/HFSM.
5. Closely inspect handlebar controls for pinched wiring.
6. Connect purpleHARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) adapters and patch cords to connector [22] (right) or connector [24] (left).
7. Replace HFSM if DTC is current (lamp ON continuously, cleared codes return during operation). If DTC is historic, check for intermittents.

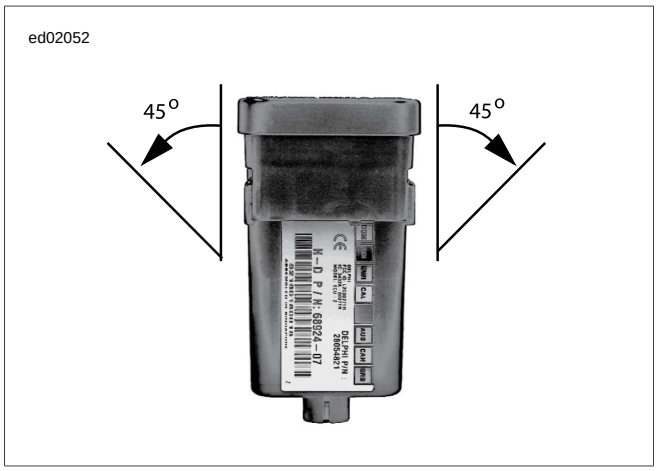
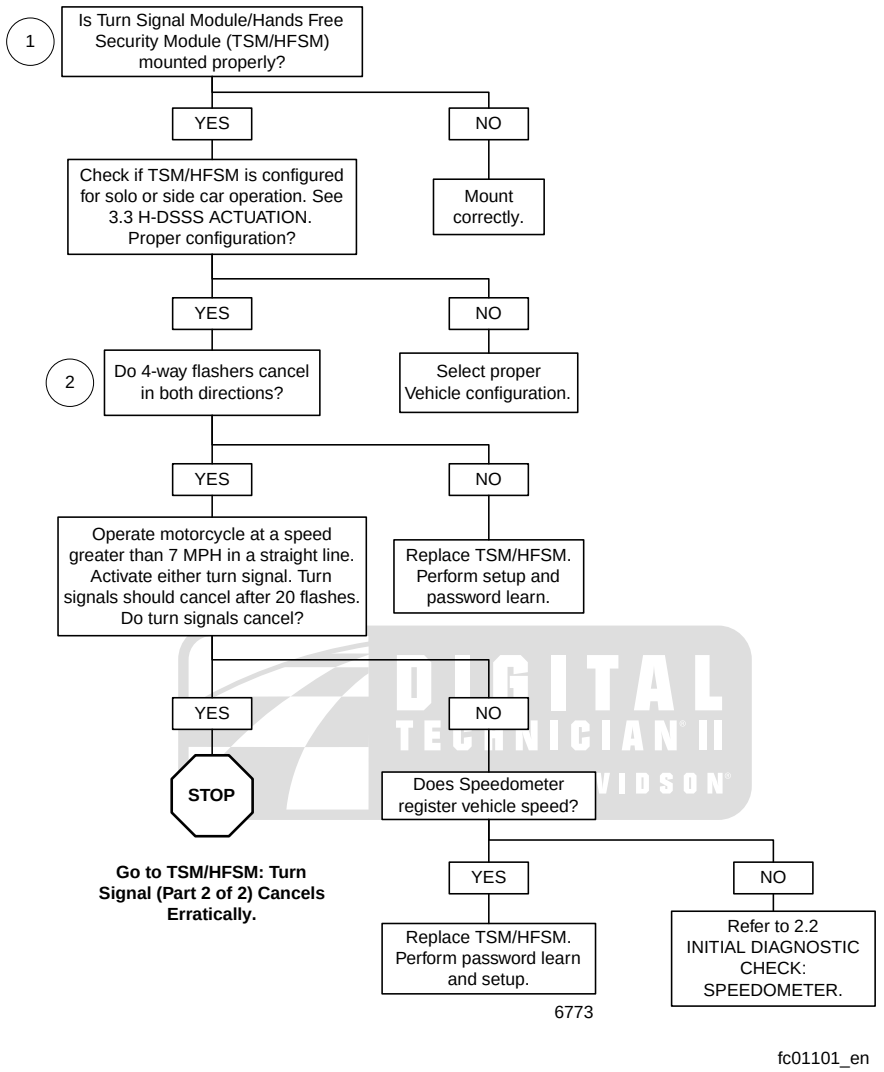


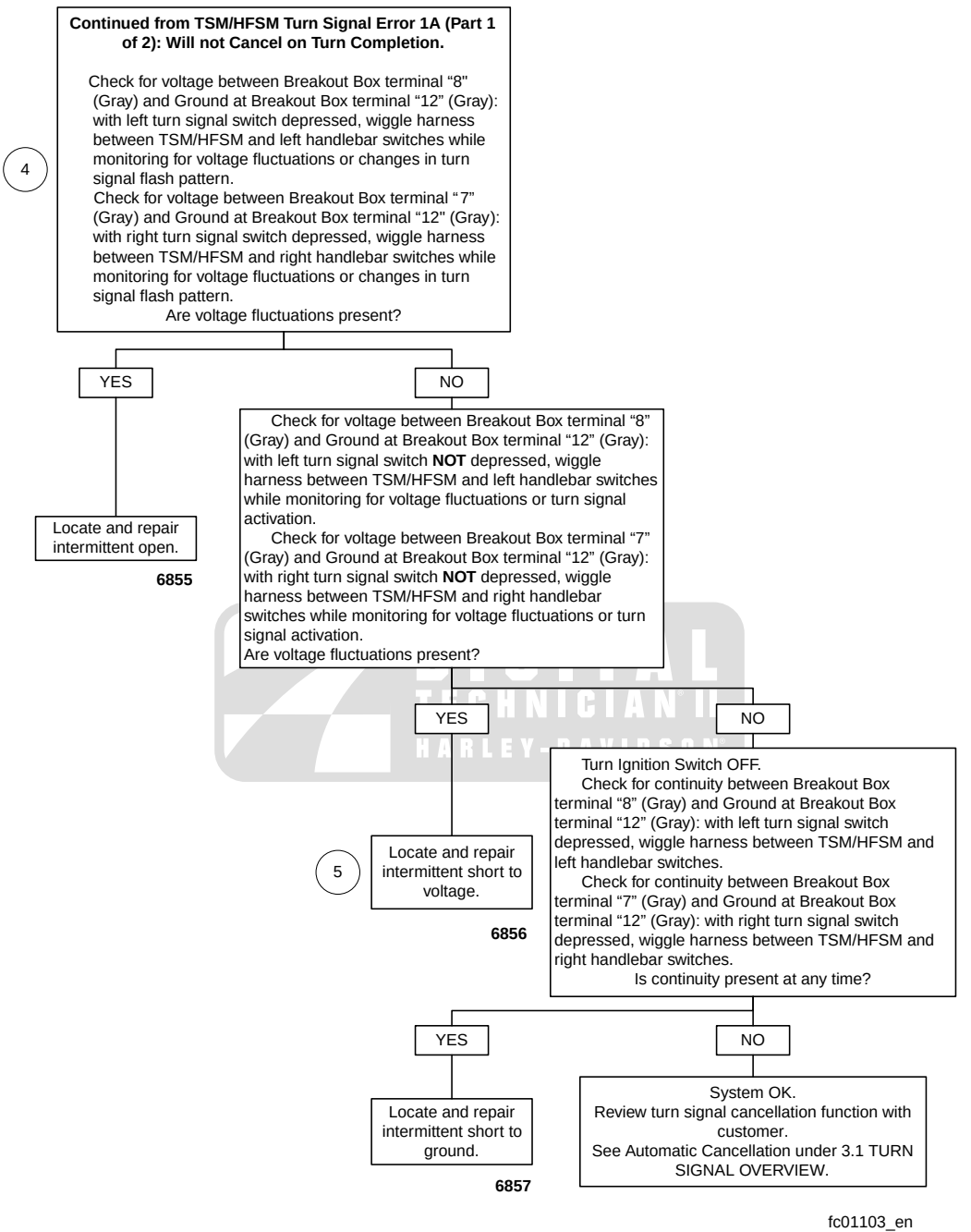
Figure 3-21. Tilting TSM/HFSM

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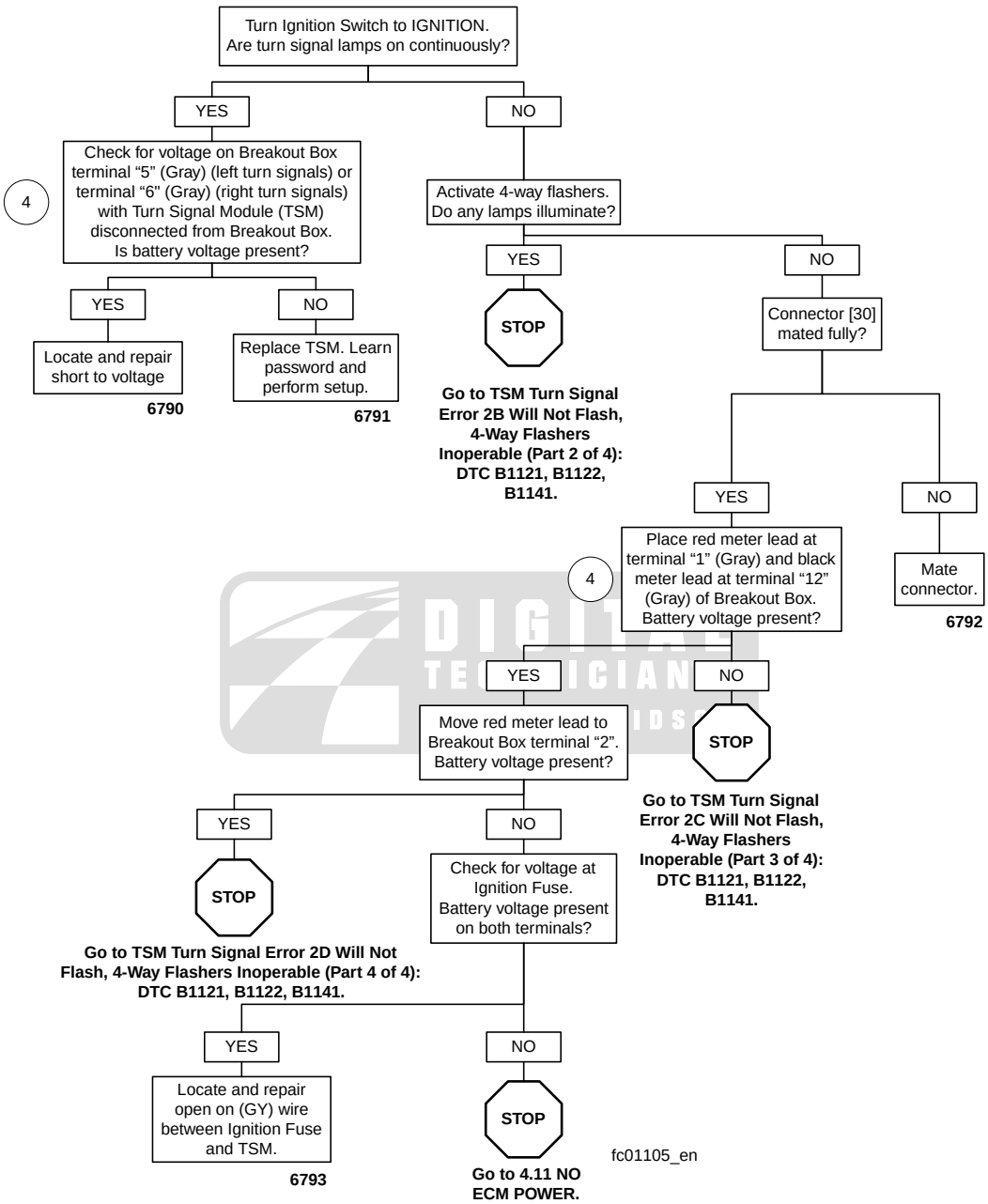
TSM/HFSM Turn Signal Error 1A (Part 1 of 2): Will Not Cancel on Turn Completion



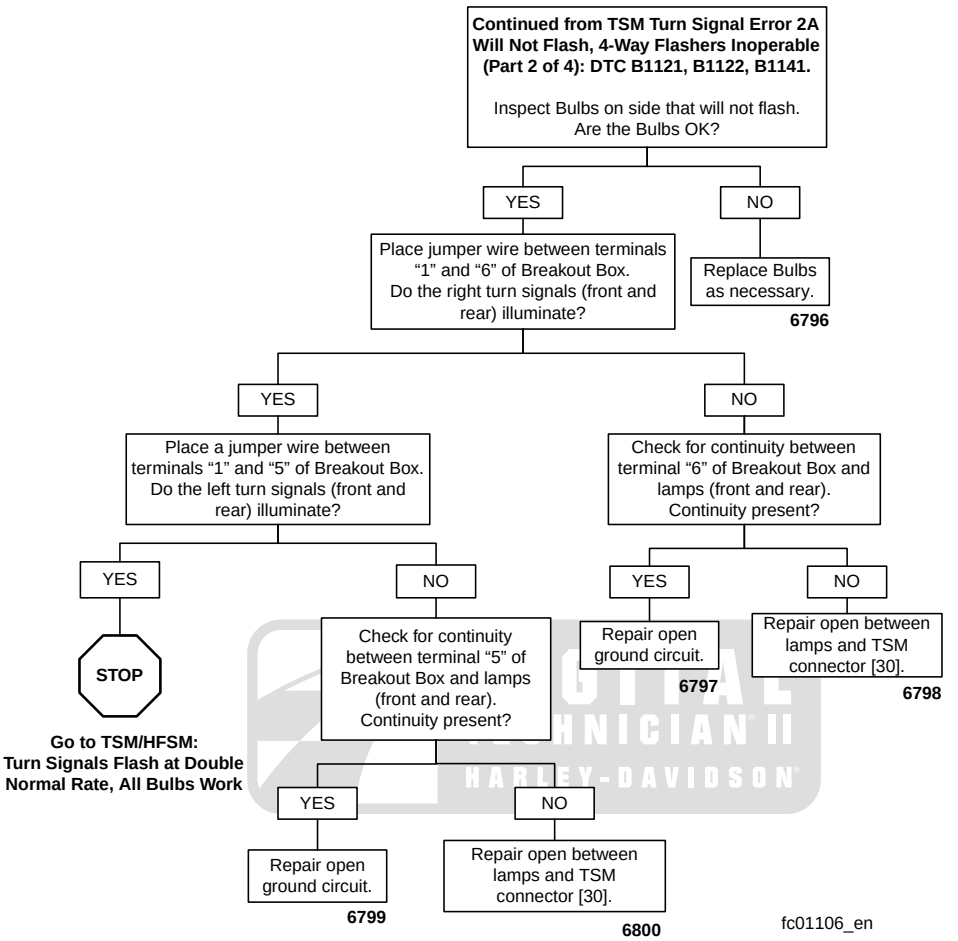
TSM/HFSM Turn Signal Error 1A (Part 2 of 2): Cancels Erratically



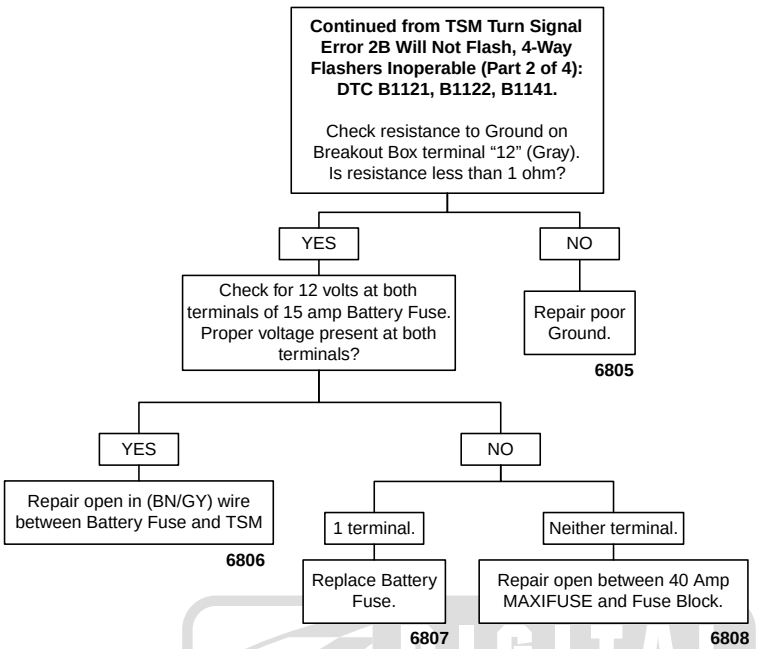
TSM Turn Signal Error 2A: Will Not Flash, 4-Way Flashers Inoperable (Part 1 of 4): DTC B1121, B1122, B1141



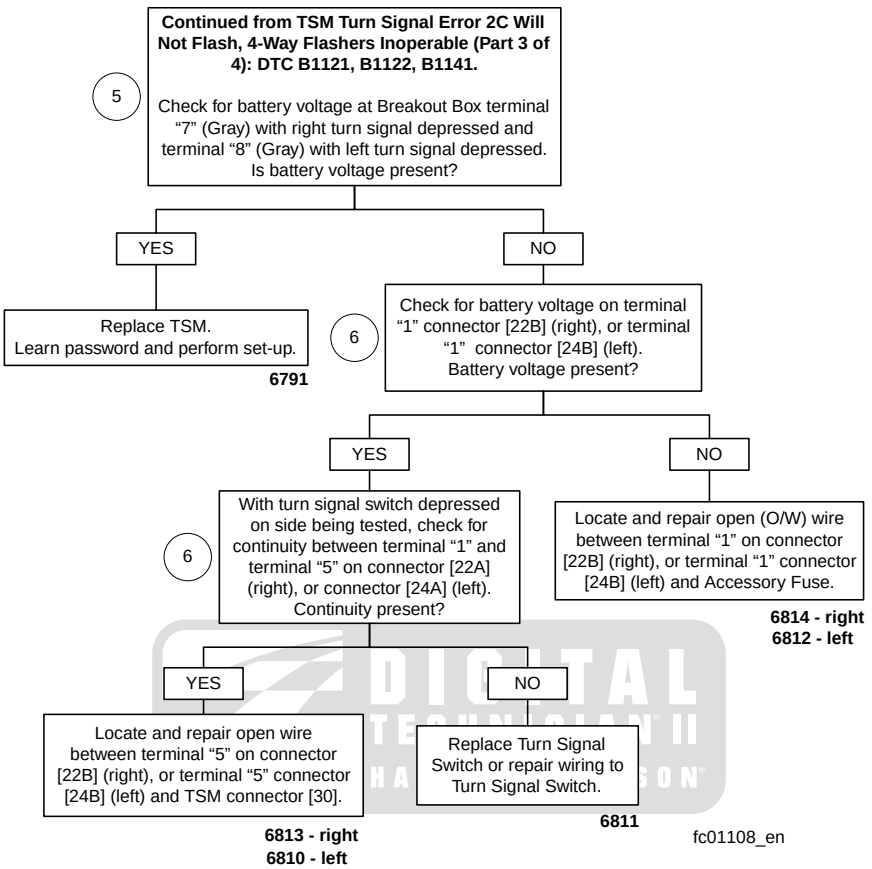
TSM Turn Signal Error 2B: Will Not Flash, 4-Way Flashers Inoperable (Part 2 of 4): DTC B1121, B1122, B1141



TSM Turn Signal Error 2C: Will Not Flash, 4-Way Flashers Inoperable (Part 3 of 4): DTC B1121, B1122, B1141



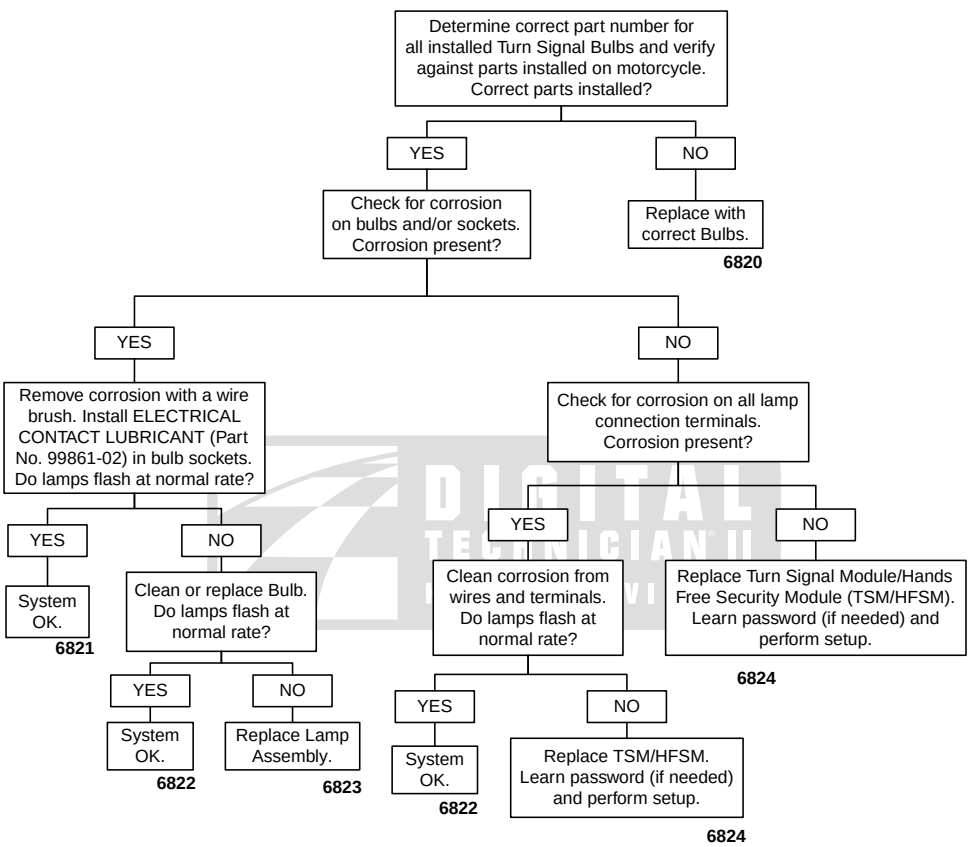
TSM Turn Signal Error 2D: Will Not Flash, 4-Way Flashers Inoperable (Part 4 of 4): DTC B1121, B1122, B1141



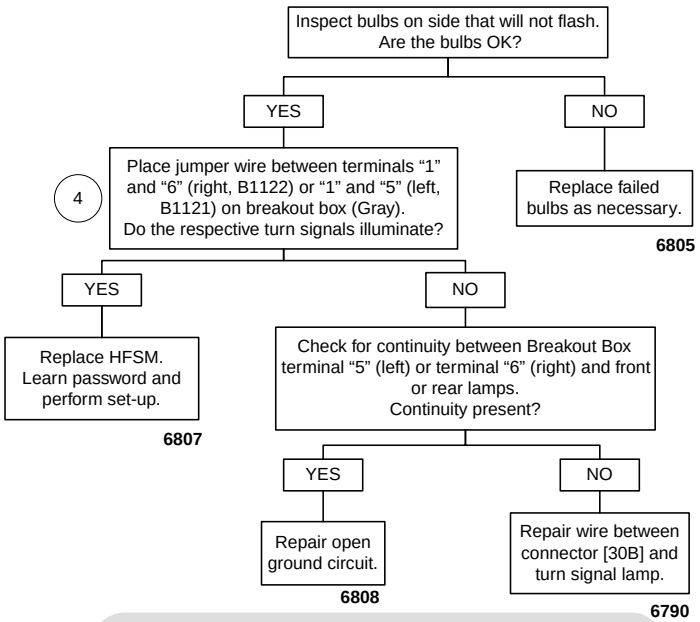
TSM/HFSM Turn Signal Error 3A: Turn Signals Flash at Double Normal Rate, All Bulbs Work

NOTE:
Before troubleshooting this issue you should verify that the lamp loads have been learned by:

1) Turn ignition switch Off-On.
2) Activate left turn lamps for 4 or more flashes.
3) Activate right turn lamps for 4 or more flashes.

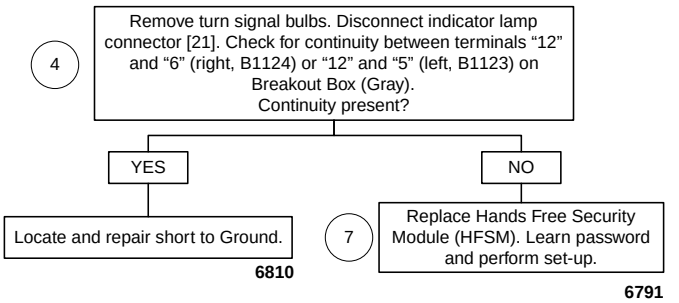


HFSM Turn Signal Error 4A: Left Turn Signal Lamp Open Circuit: DTC B1121; Right Turn Signal Lamp Open Circuit: DTC B1122



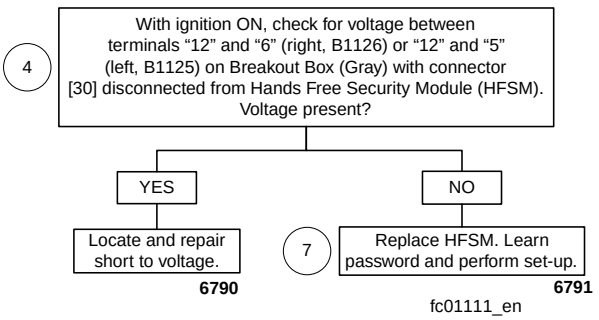
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HFSM Turn Signal Error 5A: Left Turn Signal Lamp Short-to-Ground: DTC B1123; Right Turn Signal Lamp Short-to-Ground: DTC B1124



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HFSM Turn Signal Error 6A: Left Turn Signal Lamp Short-to-Voltage: DTC B1125; Right Turn Signal Lamp Short-to-Voltage: DTC B1126



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DTC B1131, B1132 (HFSM ONLY) 3.16

GENERAL

NOTE

This section applies only to those vehicles equipped with the optional security system.

See Figure 3-22. An alarm cycle is activated when the HFSM is connected, the siren has been armed by the HFSM and a security event occurs. See 3.6 WARNINGS AND ALARMS. 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.

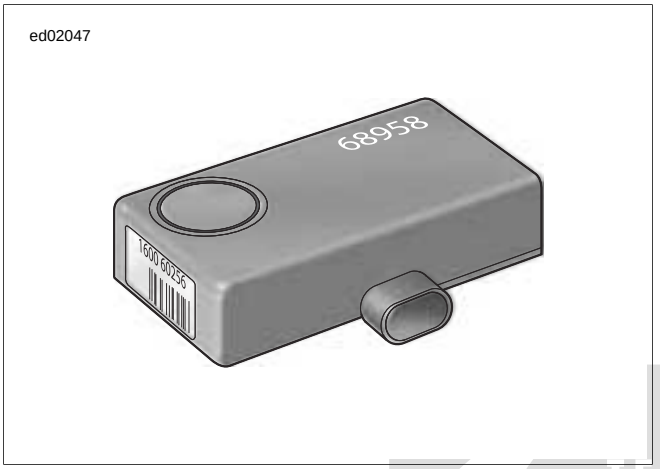


Figure 3-22. Security Siren

DIAGNOSTICS

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

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 12.5 volts.
- 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 nine-volt 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 to 30 seconds and then turn off for 5 to 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, or the siren vehicle battery connection is open or shorted to ground, or the siren vehicle ground connection is open, or a security event has occurred. See 3.6 WARNINGS AND ALARMS for a description of alarm functions.

Diagnostic Notes

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

1. Use BREAKOUT BOX (Part No. HD-42682) and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord. See 3.12 BREAKOUT BOX: TSM/HFSM.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray socket probe and patch cord.
3. Having the correct multimeter ohm scale is important for this test. Some meters may read infinity for high ohm values. If this is the case, check your ohm scale and retest.

Table 3-15. Siren Alarm Output DTCs

DTC	SYMPTOM	START WITH FLOW CHART
B1131	Alarm output low	Alarm Output Low: DTC B1131; Alarm Output High: DTC B1132
B1132	Alarm output high	

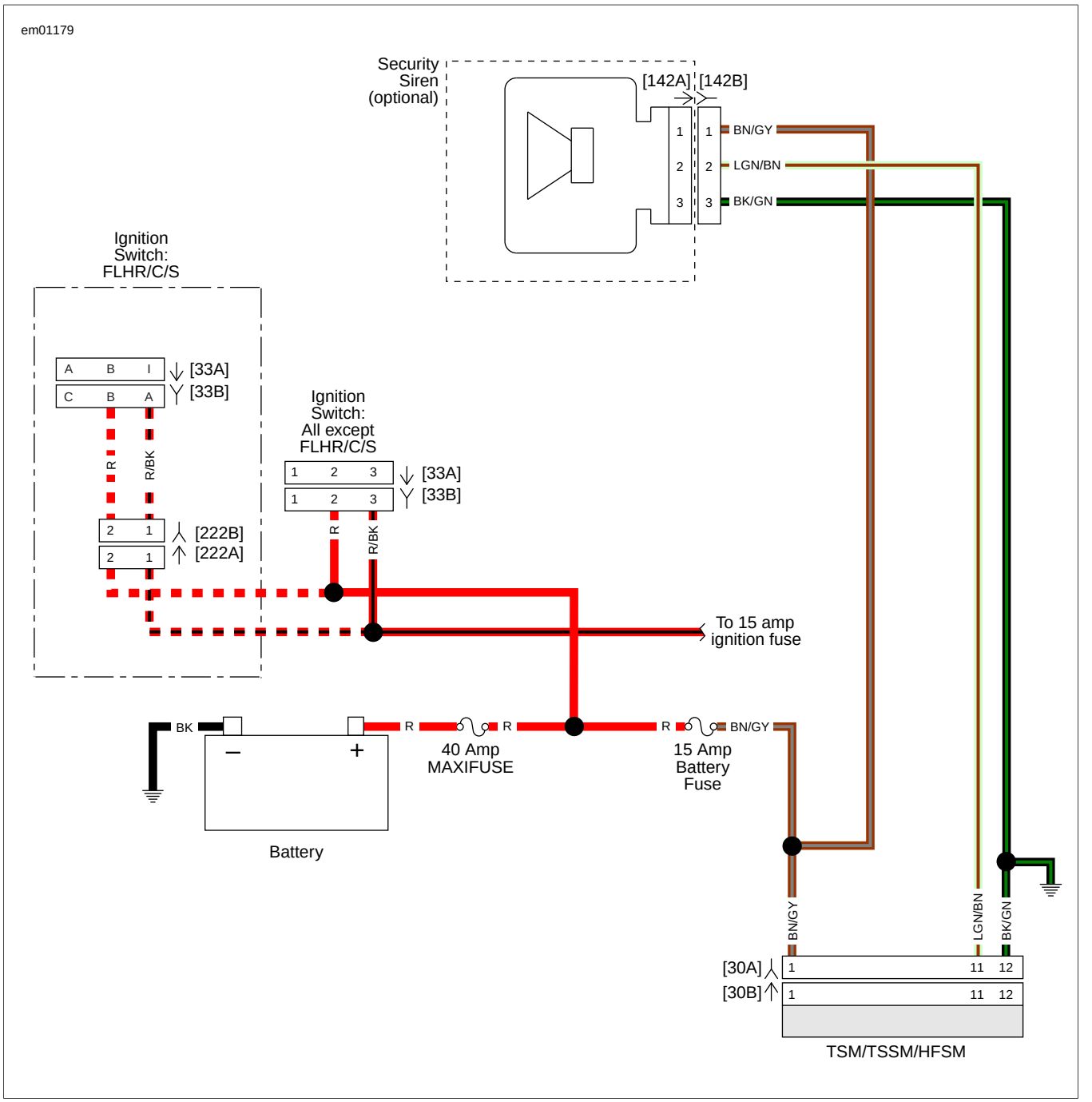
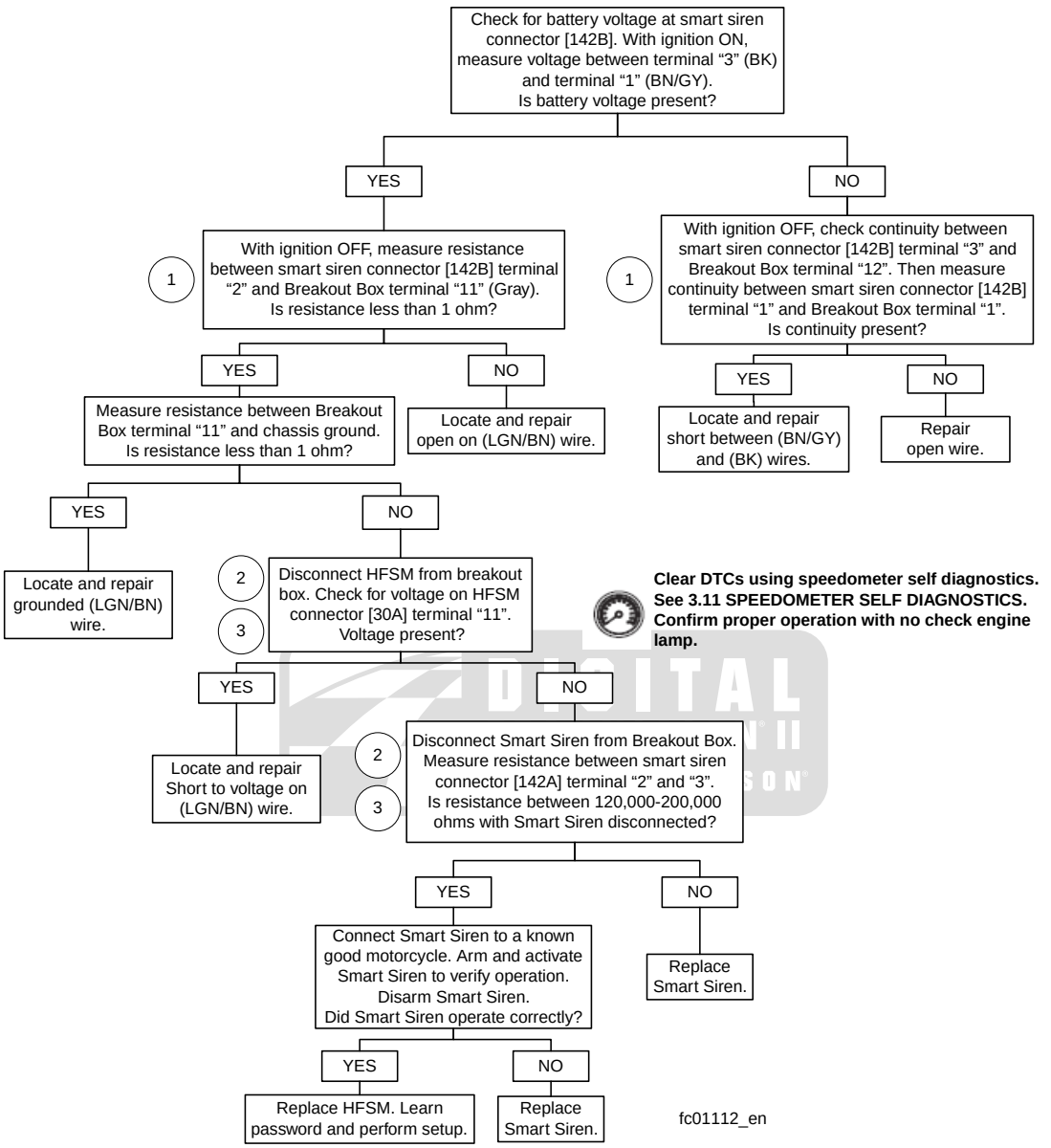


Figure 3-23. Smart Siren Circuit

Table 3-16. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[33]	Ignition switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[142]	Security siren	3-place Packard	Under left side cover
[222]	Main to ignition harness	4-place Packard	Rear of fuel tank

Alarm Output Low: DTC B1131; Alarm Output High: DTC B1132



DTC B1134 3.17

GENERAL

DTC B1134 Starter Output High

With the HFSM (if equipped) disarmed, the Ignition Switch set to IGNITION, the transmission in neutral or the clutch pulled in, and the Engine Stop Switch set to RUN, the start relay is grounded. Battery voltage is applied to the start relay and coil which are grounded through the TSM/HFSM.

DTC B1134 is set when that ground is not established through the TSM/HFSM. Refer to flow chart.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) to wire harness connector [30] leaving TSM/HFSM disconnected. 3.12 BREAKOUT BOX: TSM/HFSM.

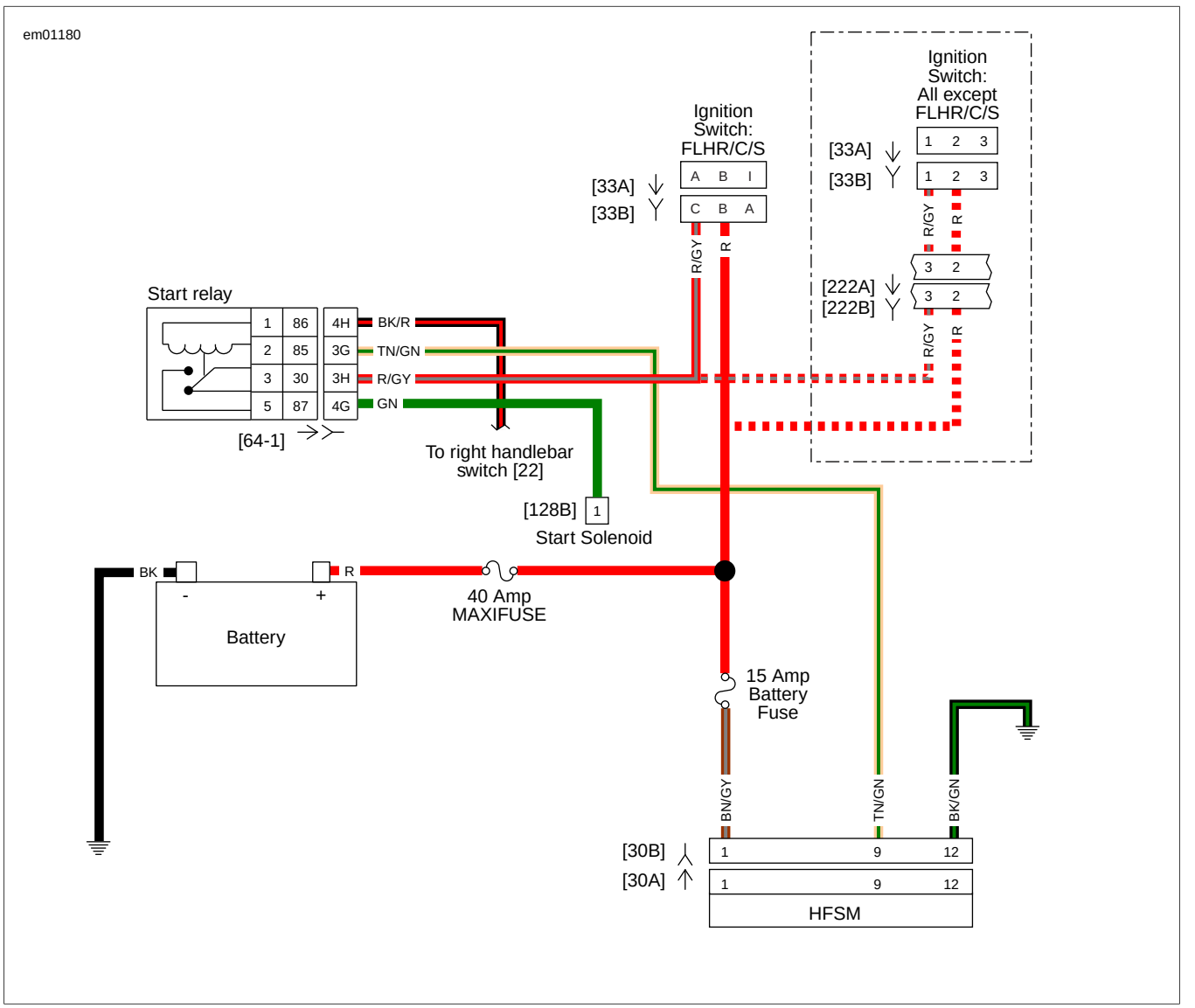


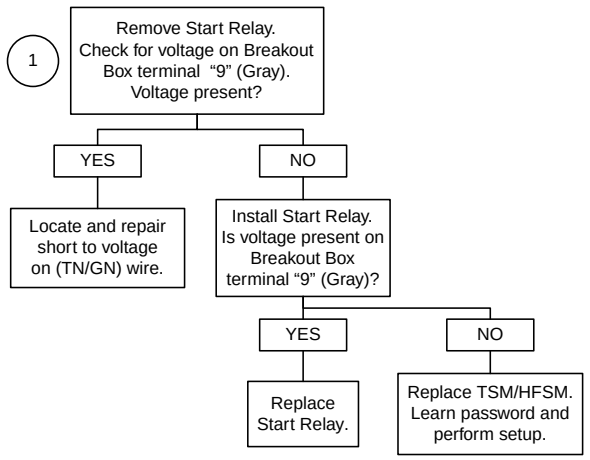
Figure 3-24. Starter/HFSM Circuit

Table 3-17. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Interconnect to right handlebar switches	12-place Molex (Black)	Inner fairing - right fairing support brace
[30]	TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[33]	Ignition switch	34-place Packard	Inner fairing - under radio (front of ignition switch housing)
[62]	Start relay	Fuse Block	Fuse block (under left side cover)
[128]	Starter solenoid	Spade terminals	Top of starter
[134]	Sidecar Bank Angle Sensor (BAS)	4-place Deutsch	Under seat
[222]	Main to ignition switch	4-place Packard	Rear of fuel tank

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starter Output High: DTC B1134



Clear DTCs using speedometer self diagnostics. See 3.11 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1135 3.18

DIAGNOSTICS

DTC B1135 Accelerometer Fault

DTC B1135 indicates a failure which requires replacement of the TSM/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.

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DTC B1136, B1142 (HFSM ONLY) 3.19

DIAGNOSTICS

DTC B1136 Accelerometer Tip-Over Self-Test Fault

DTC B1136 indicates a failure which requires replacement of the HFSM.

DTC B1142 Internal Fault

DTC B1142 indicates a failure which requires replacement of the HFSM.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1141 (HFSM ONLY) 3.20

DIAGNOSTICS

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

DTC B1141 Ignition Switch Open/Low

DTC B1141 or a symptom of Will Not Flash can be diagnosed using the flow charts.

Diagnostic Notes

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/HFSM connector [30A] and wiring harness connector [30B]. See 3.12 BREAKOUT BOX: TSM/HFSM.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple terminal probe and patch cord.

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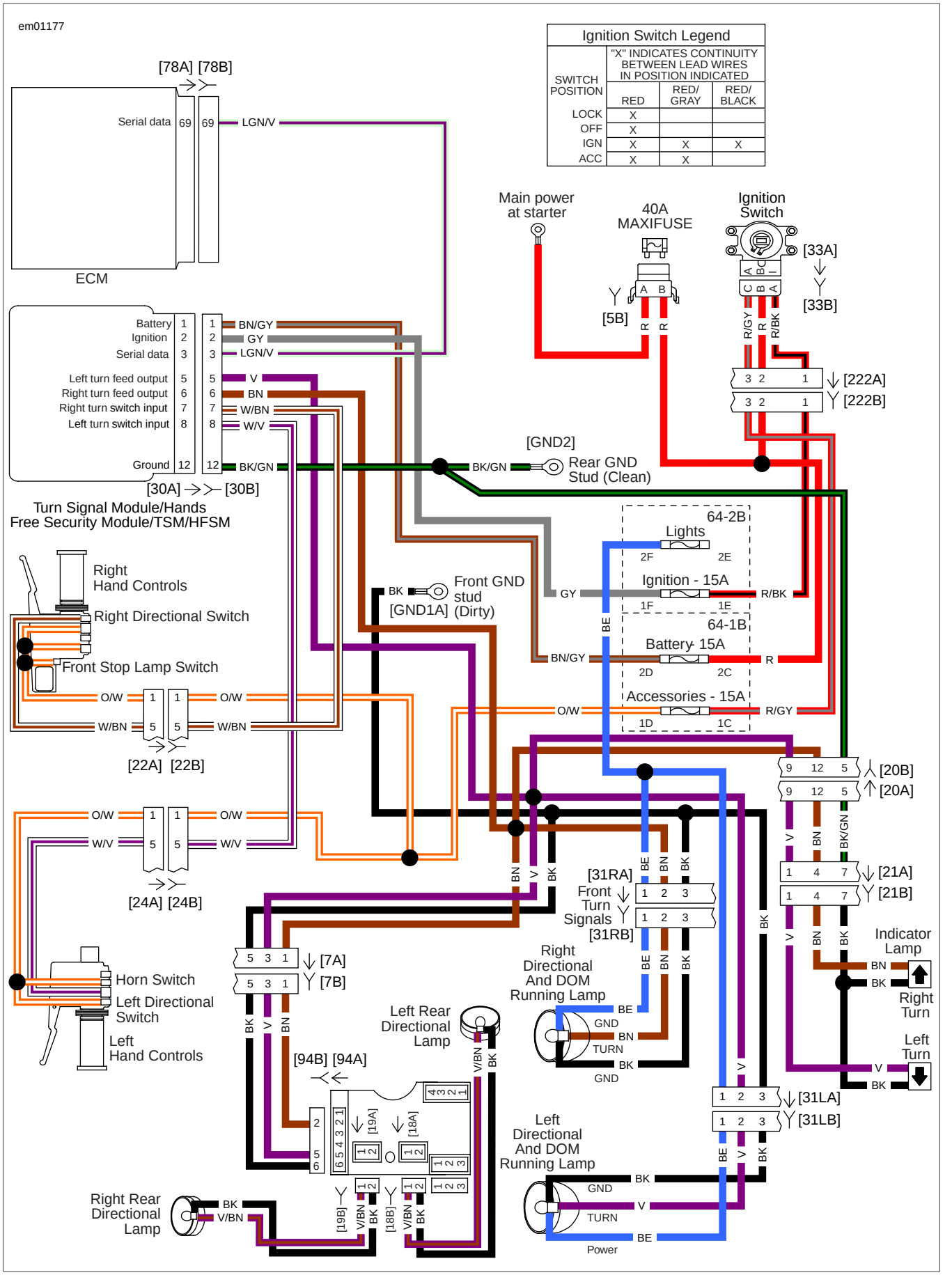


Figure 3-25. Turn Signal Circuit (FLHR/C/S)

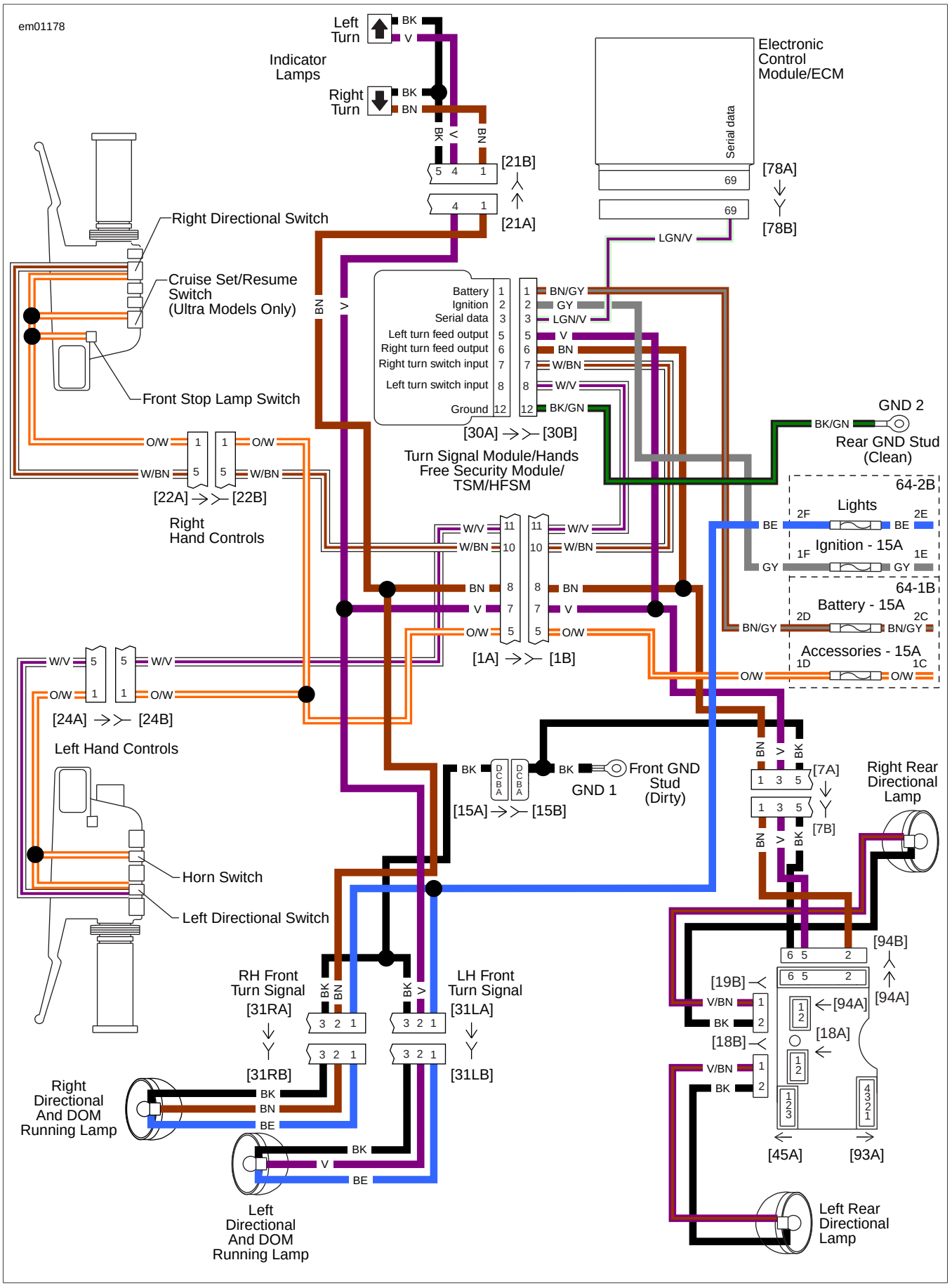


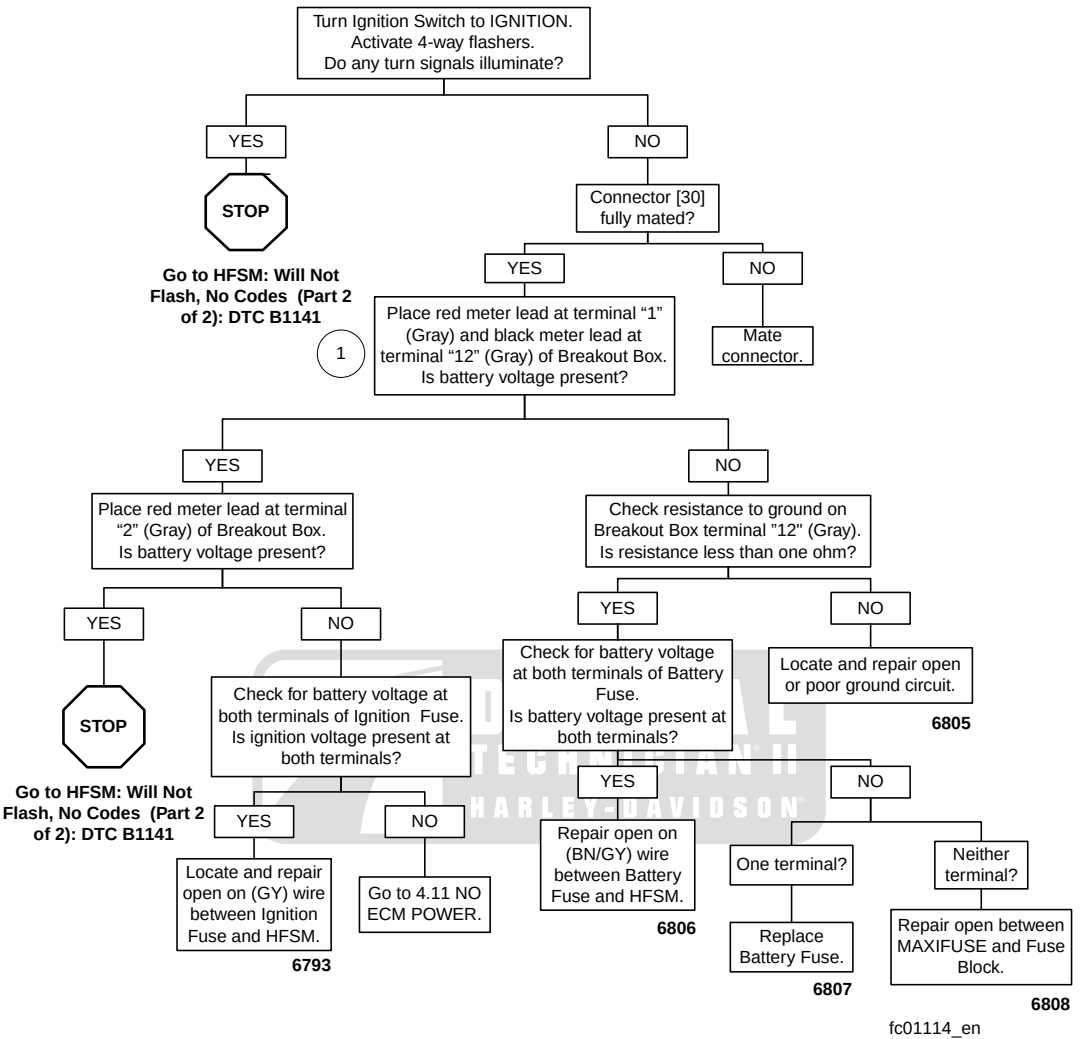
Figure 3-26. Turn Signal Circuit (FLHX, FLHT/C/U, FLTR)

Table 3-18. Wire Harness Connectors

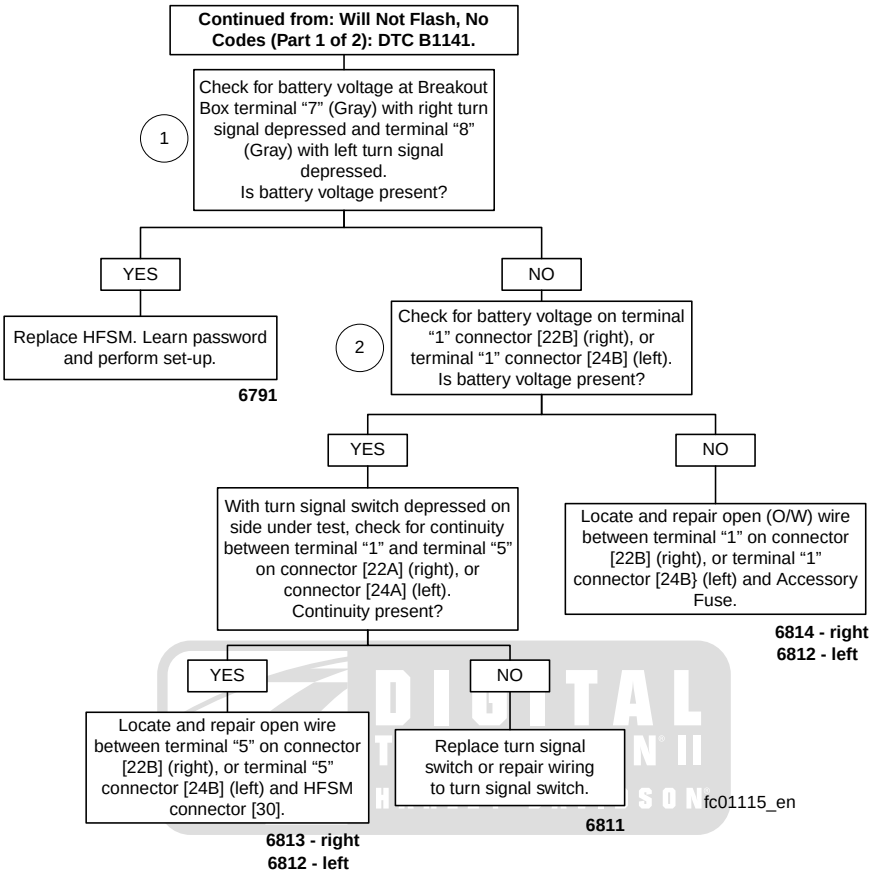
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C/U	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[7]	Rear fender lights harness	All	8-place Multilock	Top of rear fender (under seat)
[15]	Main to interconnect harness	FLHT/C/U	4-place Packard	Inner fairing - right fairing bracket
		FLTR	4-place Packard	Inner fairing - below radio (right ride)
[18]	Left rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[20]	Console harness	All	16-place Molex	Under seat
[21]	Indicator lamps	FLHR/C/S	8-place Deutsch	Under console
		FLHT/C/U	10-place Multilock	Inner fairing (above radio)
[22]	Right handlebar switches	FLHR/C/S	6-place Molex (Black)	Inside headlamp nacelle
		FLHT/C/U	12-place Molex (Black)	Inner fairing - right fairing support bracket
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (Gray)	Inside headlamp nacelle
		FLHT/C/U	16-place Molex (Gray)	Inner fairing - left fairing support bracket
[30]	TSM/HFSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31]	Left/right front turn signal/auxiliary lamp	FLHR/C/S	6-place Multilock	Inside headlamp nacelle
		FLHT/C/U	4-place Multilock	Inner fairing - left/right fairing support bracket
[33]	Ignition/light key switch	FLHR/C/S	3-place Packard	Under console
		FLHT/C/U	3-place Packard	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[222]	Main to ignition harness	All	4-place Packard	Rear of fuel tank

DIGITAL TECHNICIAN HARLEY-DAVIDSON

Will Not Flash, No Codes (Part 1 of 2): DTC B1141



Will Not Flash, No Codes (Part 2 of 2): DTC B1141



DTC B1143, B1144, B1145 (HFSM ONLY) 3.21

GENERAL

Diagnostic Trouble Codes (DTCs) B1143, B1144 and B1145 will set when faults occur to the security antenna circuit used to transmit to the fob. Refer to Table 3-19.

Table 3-19. Security Antenna DTCs

DTC	CONDITION	START WITH FLOWCHART
B1143	Security antenna short-to-ground	Security Antenna Short-to-Ground: DTC B1143
B1144	Security antenna short-to-battery	Security Antenna Short-to-Battery: DTC B1144
B1145	Security antenna open	Security Antenna Open: DTC B1145

DIAGNOSTICS

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

Diagnostic Notes

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

1. Use black male HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) adapters and patch cords to connector [208B].
2. If DTC is current (lamp on continuously, cleared codes return during operation), replace HFSM. If DTC is historic, check for intermittents.
3. Connect light blue male HARNESS CONNECTOR TEST KIT adapters and patch cords to connector [209B], and black male HARNESS CONNECTOR TEST KIT adapters and patch cords to connector [208B].

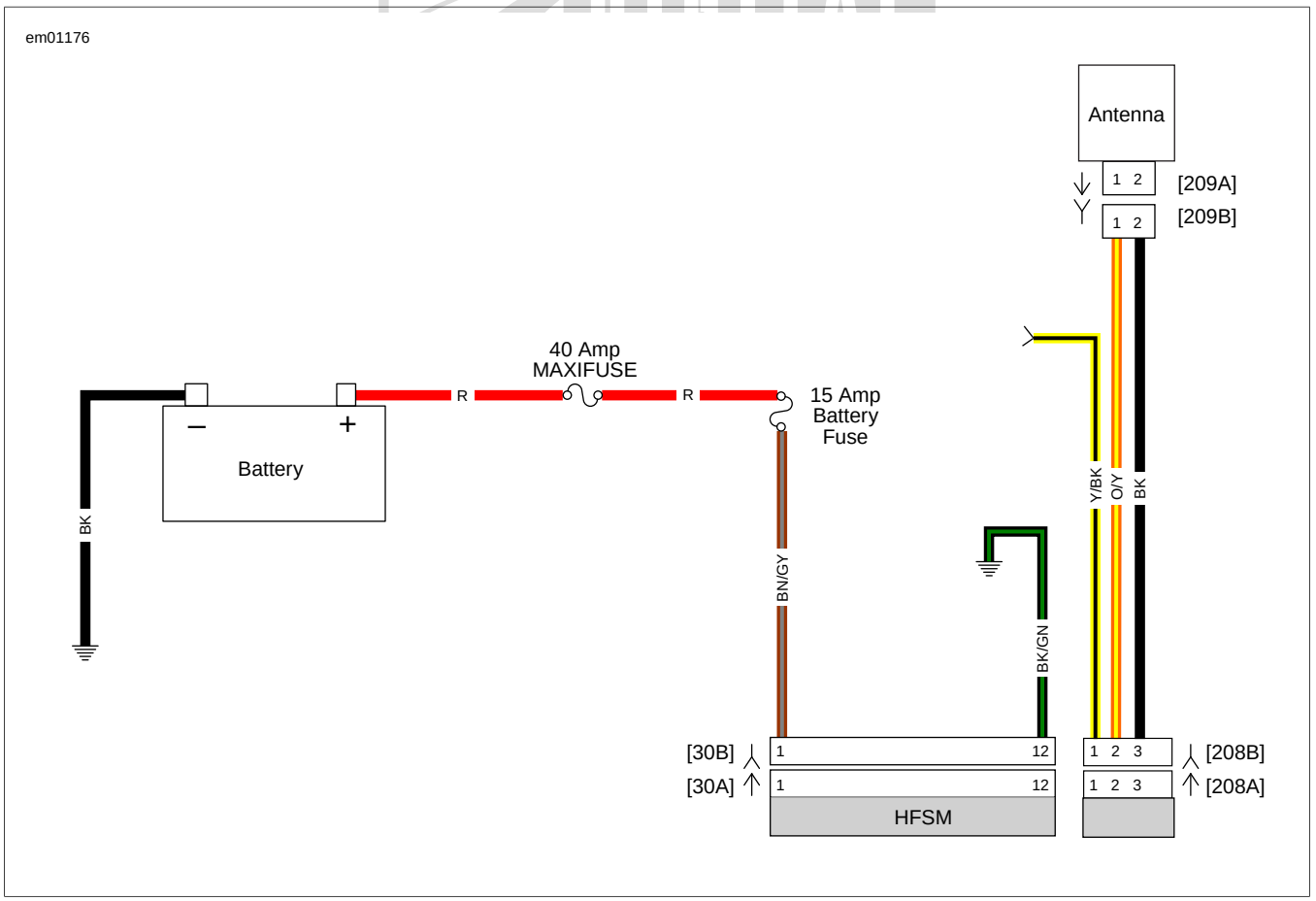


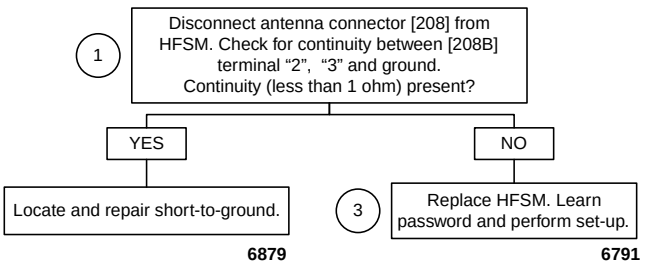
Figure 3-27. Security Antenna Circuit

Table 3-20. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)
[208]	HFSM	4-place Deutsch	HFSM in crossmember at rear of battery box (under seat)
[209]	Security antenna	2-place Molex	Top of rear fender (under seat)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

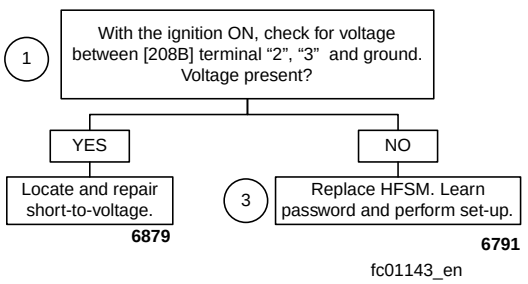
Security Antenna Short-to-Ground: DTC B1143



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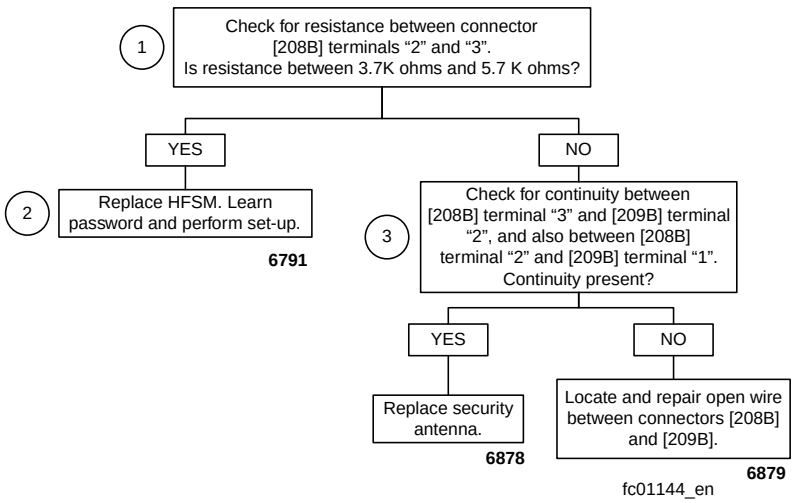
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Security Antenna Short-to-Voltage: DTC B1144



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Security Antenna Open: DTC B1145



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1151, B1152, B1153 3.22

GENERAL

Sidecar Bank Angle Sensor (BAS)

These Diagnostic Trouble Codes (DTCs) are set when a TSM/HFSM is configured for sidecar use and a fault is detected with the sidecar BAS.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-44750	DIGITAL TECHNICIAN

Diagnostic Tips

- The smart siren cannot be disarmed when the ignition switch is turned to IGNITION and a bank angle sensor is installed. If the ignition switch triggers the security alarm, then the switch must be turned off to disarm the siren.
- Use DIGITAL TECHNICIAN (Part No. HD-44750) to ensure sidecar learn.
- Ensure that no other circuits are tied to terminal "11" of the TSM/HFSM.
- If a sidecar is installed without the bank angle sensor kit then the TSM/HFSM will continue to operate in Solo mode on a sidecar bike.
- If the bank angle sensor is removed without disabling sidecar learning then the TSM/HFSM will set a DTC until sidecar learning is disabled using DIGITAL TECHNICIAN, or the bank angle sensor is reinstalled.
- The software is designed to prevent the TSM/HFSM from switching to sidecar mode unless the entire system is operating properly (no DTCs set).
- The bank angle sensor cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A sidecar tip-over event cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A short to ground fault cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A short to battery fault cannot be detected **unless** the security function is in the alarm mode (that is, lights flashing, siren sounding).
- An out-of-range fault cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).

Diagnostic Notes

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

1. Use BREAKOUT BOX (Part No. HD-42682) and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord. 3.12 BREAKOUT BOX: TSM/HFSM
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.

Table 3-21. Sidecar Bank Angle Sensor (BAS) DTCs

DTC	DESCRIPTION	START WITH FLOW CHART
B1151	Bank Angle Sensor Short to Ground	Sidecar BAS Short-to-Ground: DTC B1151; Sidecar BAS Short-to-Battery: DTC B1152; Sidecar BAS High: DTC B1153
B1152	Bank Angle Sensor Short to Battery	Sidecar BAS Short-to-Ground: DTC B1151; Sidecar BAS Short-to-Battery: DTC B1152; Sidecar BAS High: DTC B1153
B1153	Bank Angle Sensor Open	Sidecar BAS Short-to-Ground: DTC B1151; Sidecar BAS Short-to-Battery: DTC B1152; Sidecar BAS High: DTC B1153

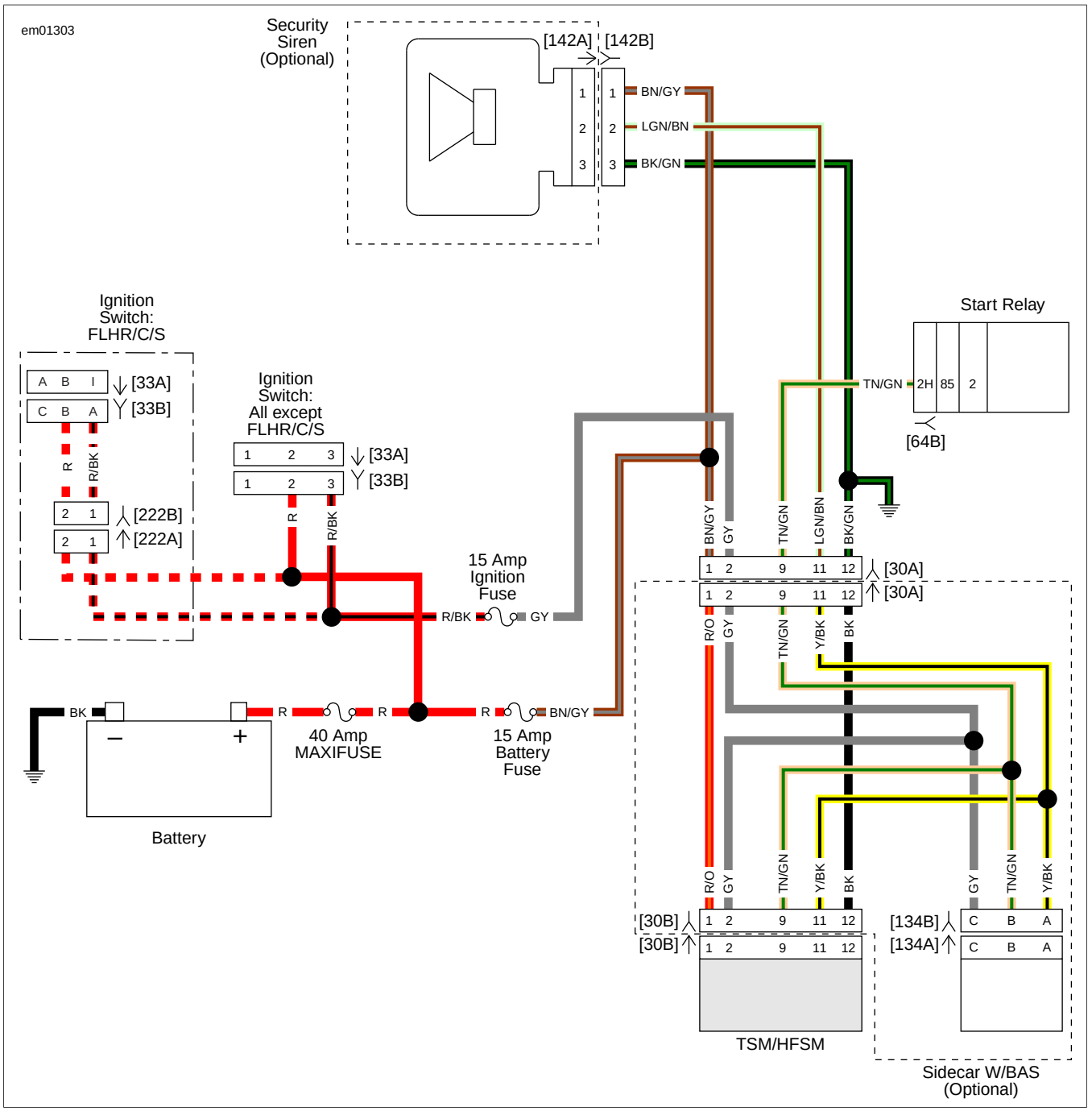


Figure 3-28. Siren Circuit

Table 3-22. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[33]	Ignition switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[64]	Fuse block	Packard	Under left side cover
[134]	Sidecar Bank Angle Sensor (BAS)	4-place Deutsch	Under seat

Table 3-22. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[142]	Security siren	3-place Packard	Under left side cover
[222]	Main to ignition harness	4-place Packard	Rear of fuel tank

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DTC B1154, B1155 3.23

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Diagnostic Tips

Diagnostic Trouble Codes (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 3-23.

Table 3-23. Clutch/Neutral Switch DTCs

DTC	SYMPTOM	START WITH FLOW CHART
B1154	Clutch switch short-to-ground	Clutch Switch Short-to-Ground: DTC B1154
B1155	Neutral switch short-to-ground	Neutral Switch Short-to-Ground: DTC B1155

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) to HFSM. 3.12 BREAKOUT BOX: TSM/HFSM
2. If DTC is current (lamp on continuously, clear codes return during operation), replace HFSM. If DTC is historic, check for intermittents.
3. A reading of several hundred ohms is normal due to the neutral indicator lamp (LED).

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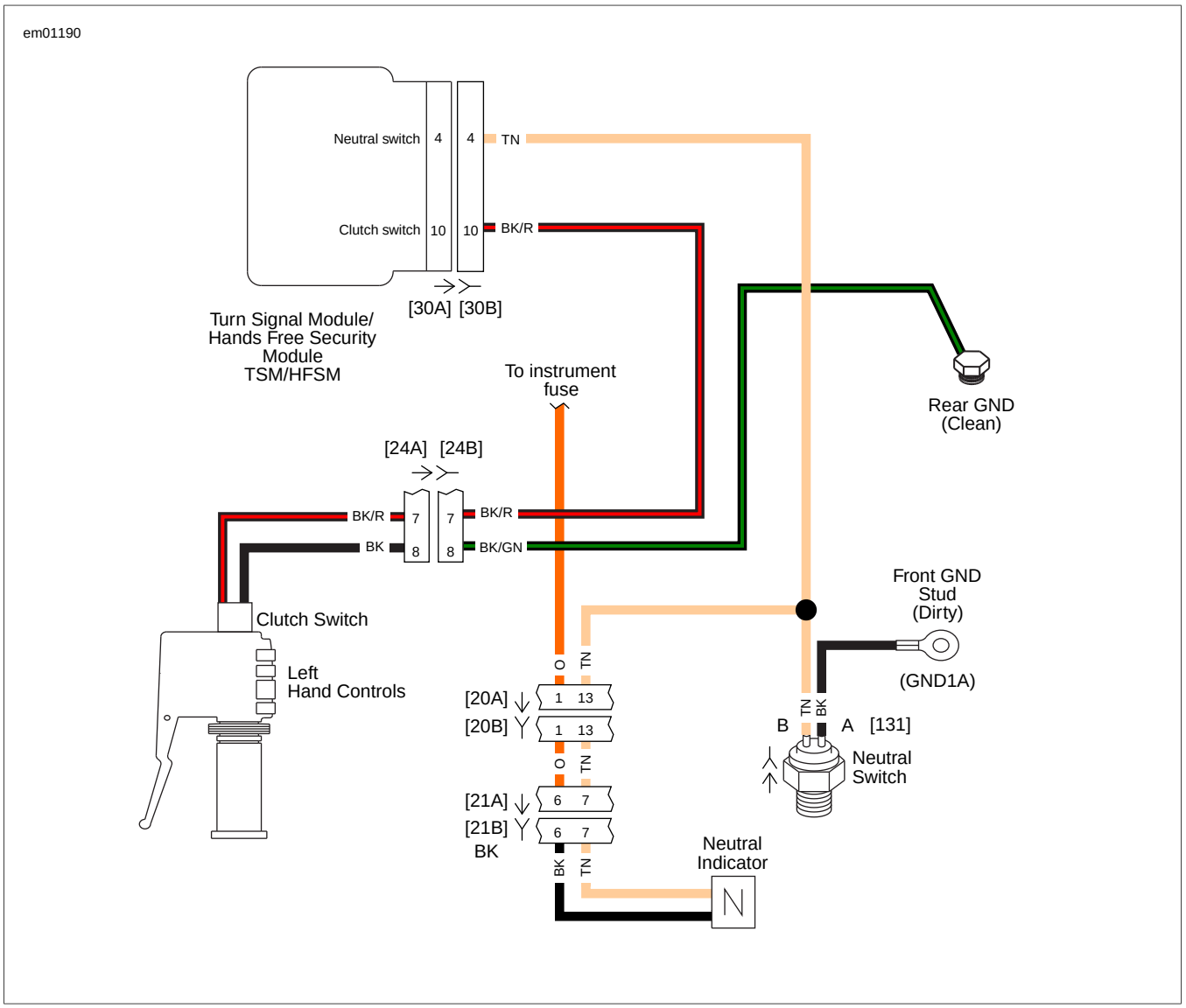


Figure 3-29. Clutch and Neutral Interlock Circuits (FLHR/C/S)

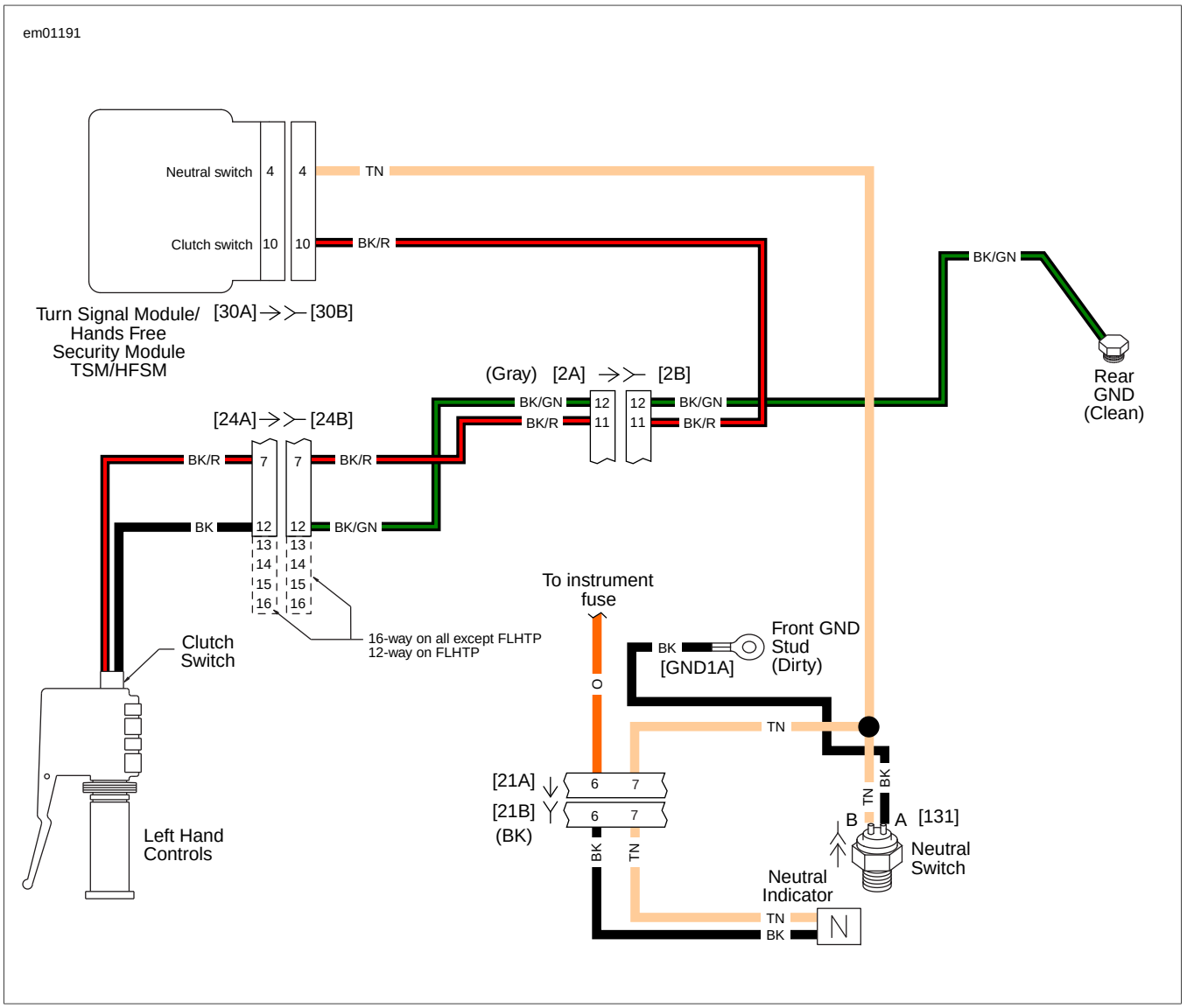


Figure 3-30. Clutch and Neutral Interlock Circuits (FLHX, FLHT/C/U, FLTR)

Table 3-24. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[2]	Main to interconnect harness	FLHR/C/S	12-place Molex (Gray)	Inner fairing - left radio support bracket
[21]	Indicator lamps	FLHR/C/S	8-place Deutsch	Under console
		FLHT/C/U	10-place Multilock	Inner fairing (above radio)
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (Gray)	Inside headlamp nacelle - fork stem nut lock plate
		FLHT/C/U	16-place Molex (Gray)	Inner fairing - left fairing support bracket
[30]	TSM/HFSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[131]	Neutral switch	All	Post Terminals	Top of transmission (right side)

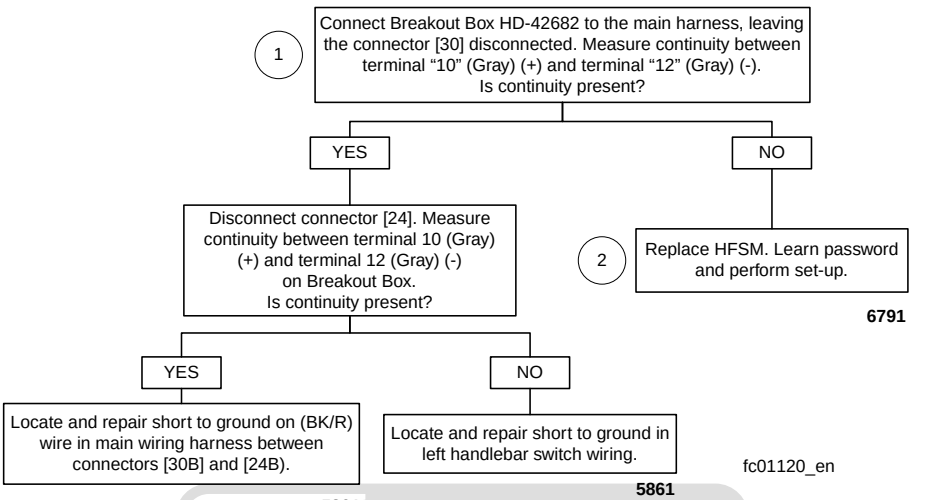
NOTE

DTCs B1154, B1155 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).

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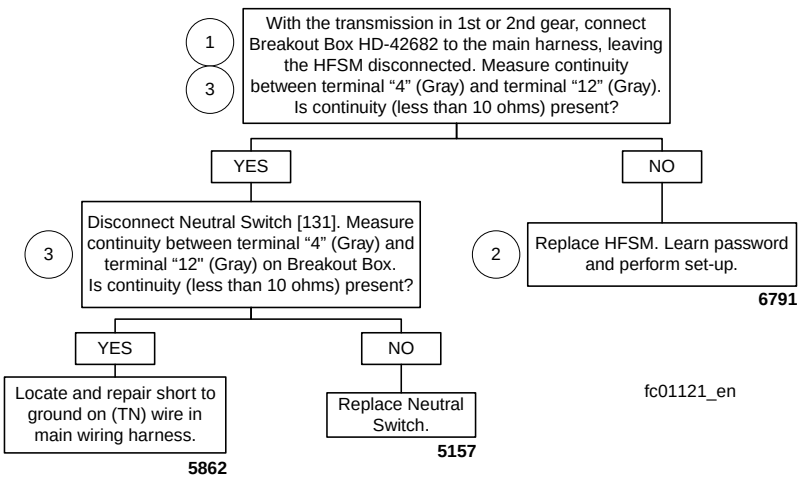
Clutch Switch Short-to-Ground: DTC B1154

NOTE
DTCs B1145, B1155 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).



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Neutral Switch Short-to-Ground: DTC B1155



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1016, U1255 3.24

GENERAL

The serial data connector provides a means for the Electronic Control Module (ECM), TSM/HFSM, 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. A Diagnostic Trouble Code (DTC) U1016 indicates that the ECM is not capable of sending this state of health message. A DTC U1255 indicates that no messages were present during power up of the current key cycle. A DTC U1016 indicates that there was communication on the data bus since power up, but communication was lost or interrupted during that key cycle.

Table 3-25. Code Description

DTC	CONDITION	START WITH FLOW CHART
U1016	Loss of all ECM serial data	Loss of ECM Serial Data: DTC U1016; Serial Data Error/Missing Message: DTC U1255
U1255	Serial data error	Loss of ECM Serial Data: DTC U1016; Serial Data Error/Missing Message: DTC U1255

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-43876	BREAKOUT BOX

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/HFSM connector [30A] and wire harness connector [30B]. See 3.12 BREAKOUT BOX: TSM/HFSM.
2. Connect BREAKOUT BOX (Part No. HD-43876) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

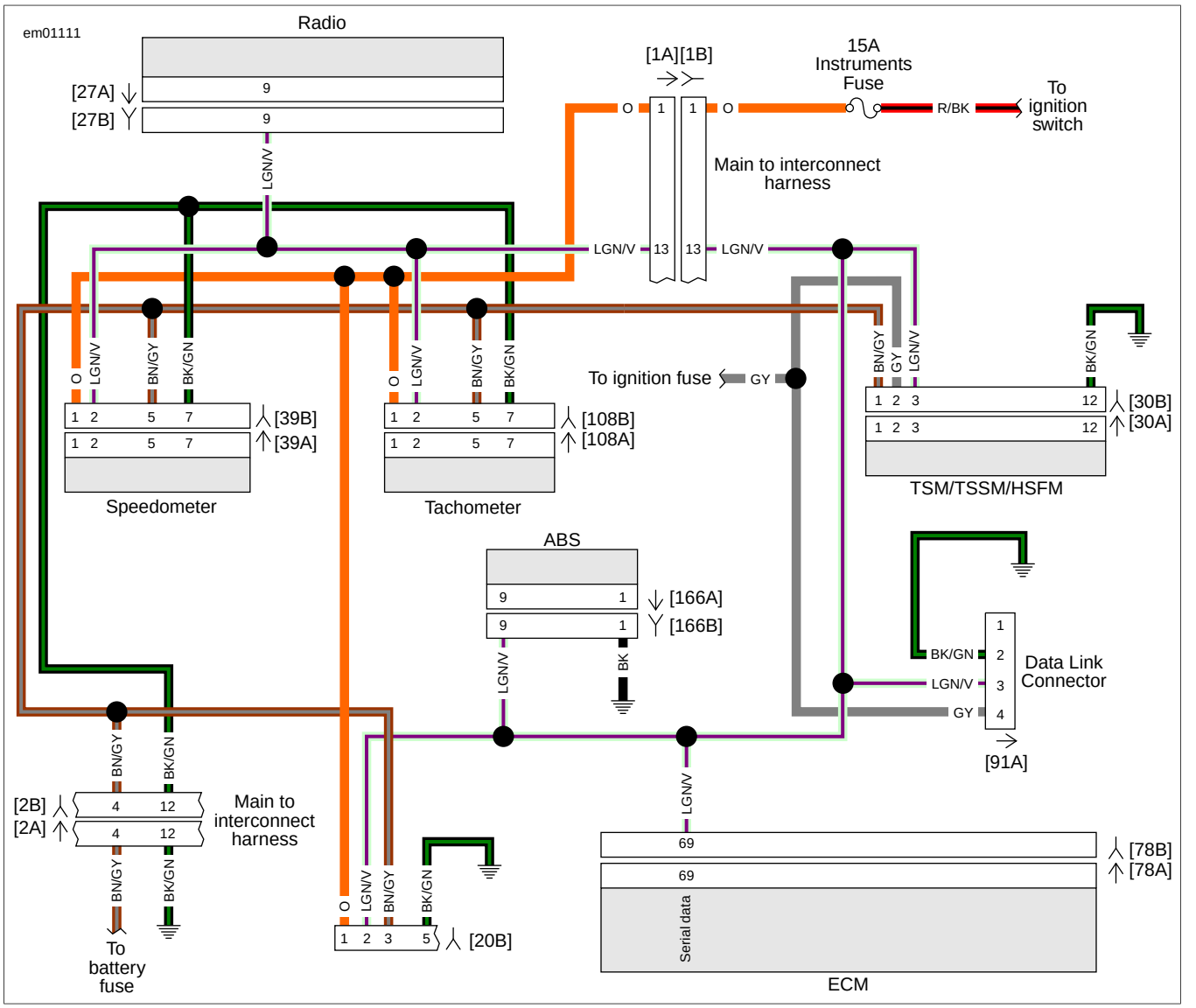


Figure 3-31. Serial Data Circuit: FLHX, FLHT/C/U, FLTR

Table 3-26. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C/U	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C/U	12-place Molex (Gray)	Inner fairing - right fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[20]	Console harness	All	16-place Molex	Under seat
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C/U	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under left side cover

Table 3-26. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C/U	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	12-place Molex	Under right side cover

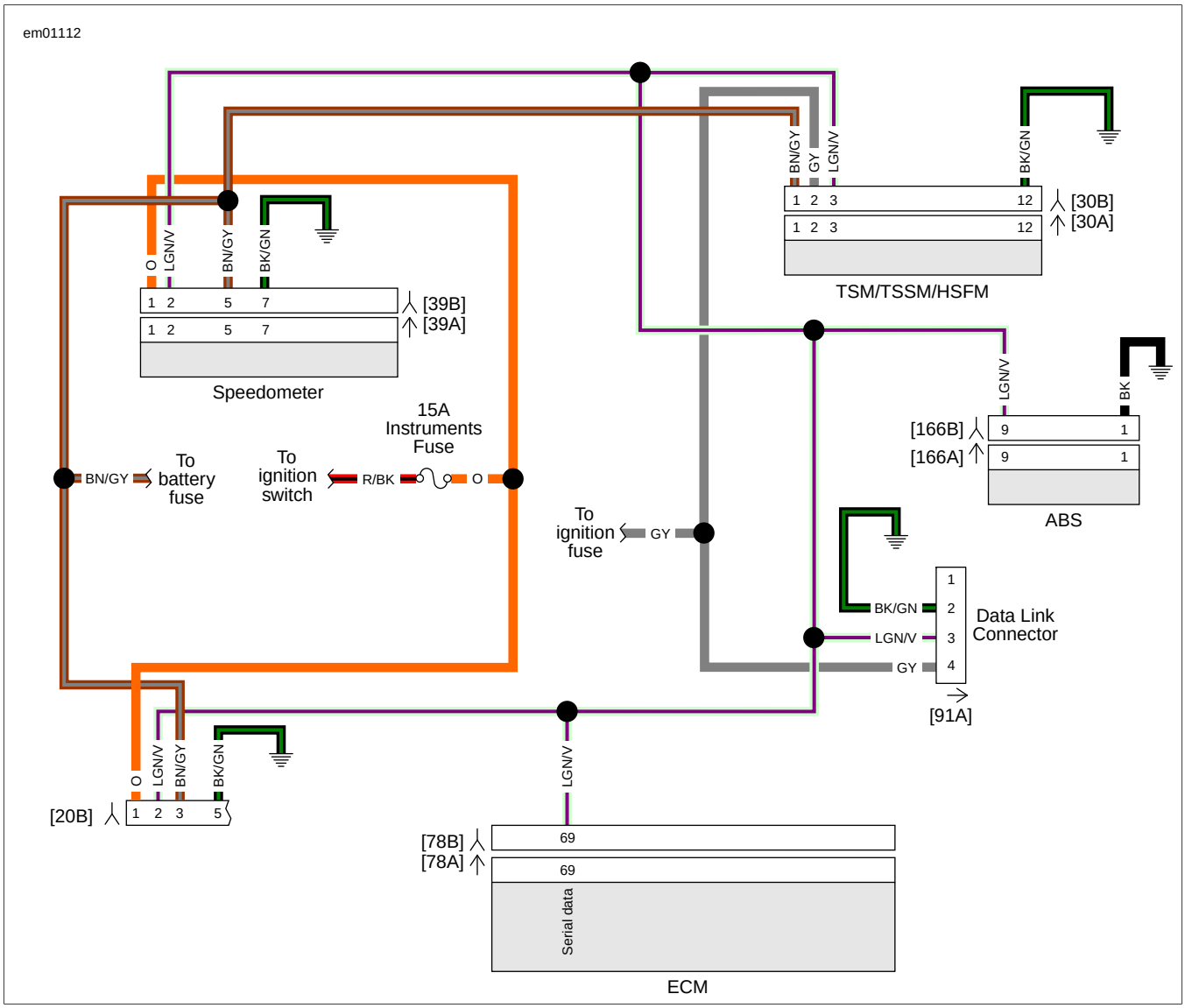


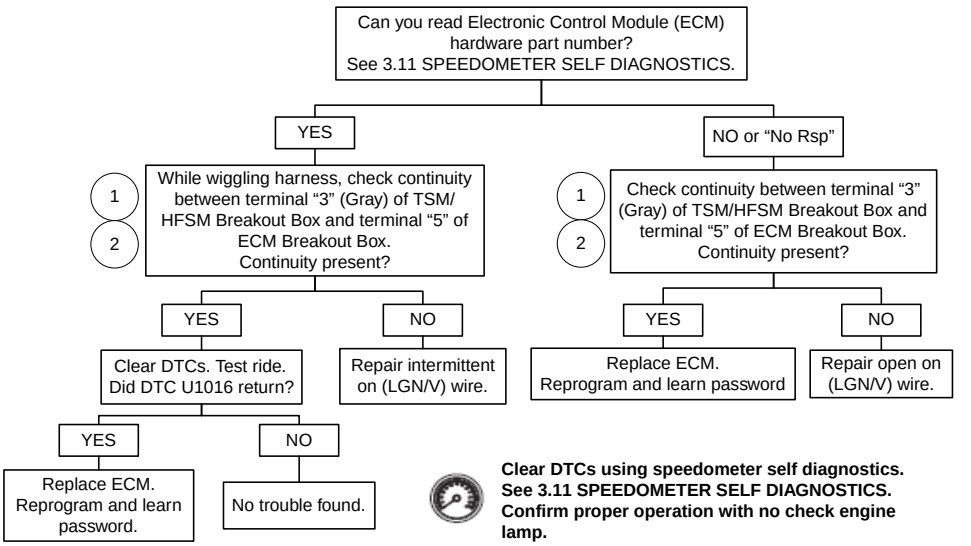
Figure 3-32. Serial Data Circuit: FLHR/C/S

Table 3-27. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[20]	Console harness	16-place Molex	Under seat
[30]	TSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Loss of ECM Serial Data: DTC U1016; Serial Data Error/Missing Message: DTC U1255



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1300, U1301 OR BUS ER 3.25

DIAGNOSTICS

The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a DVOM. In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6-0.8 volts. The range for acceptable operations is 0-7.0 volts.

Diagnostic Tips

- If serial data is shorted, these Diagnostic Trouble Codes (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.

Diagnostic Notes

If a U1300, U1301 or "BUS Er" is present, perform diagnostic procedures listed in 4.12 STARTS, THEN STALLS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TSM/HFSM: PASSWORD LEARN 3.26

GENERAL

If the ECM or TSM/HFSM is faulty, follow the instructions in the Service Manual for ECM or TSM/HFSM replacement. Then, to determine if password learn is necessary, refer to Table 3-28.

Table 3-28. Password Learn

DEVICE REPLACED	IS PASSWORD LEARN NECESSARY?
ECM	Yes
TSM	No *
TSM/HFSM	Yes
* If a TSM has been replaced by a HFSM, or a HFSM has been replaced by a TSM, password learn is necessary.	

PASSWORD LEARNING

To perform password learning procedure, refer to Table 3-29. When finished, continue with all instructions under 3.3 H-DSSS ACTUATION.

Always perform all appropriate instructions under 3.3 H-DSSS ACTUATION after TSM/HFSM replacement or removal.

NOTE

Fob assignment must be performed at an authorized Harley-Davidson dealer using Digital Technician.

Table 3-29. Setting TSM/HFSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
	Ignition must be turned off for at least 15 seconds.	With Ignition Switch turned off, Check Engine Lamp and Security Lamp will be off.	
1	Install **new** TSM/HFSM or ECM. Perform all steps under 3.3 H-DSSS ACTUATION.		
2	Set Engine Stop Switch to **RUN.**		
3	Turn Ignition Switch **ON.**	Verify Check Engine Lamp and Security Lamp illuminate and then turn off.	TSM/HFSM enables start relay.
4	Attempt normal start one time.	Engine starts and stalls. Check Engine Lamp illuminates and stays on.	Password has not been learned. ECM sets DTC P1009.
5	Wait ten seconds. Security Lamp will illuminate and stay on.	Security Lamp illuminates.	ECM enters Password Learning mode for ten minutes. Do not cycle Ignition Switch or interrupt vehicle power or Password Learn will be unsuccessful.
6	Wait until Security Lamp turns off.		This takes ten minutes.
7	Quickly (within one second) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
8	Wait until Security Lamp turns off.		This takes ten minutes.
9	Quickly (within one second) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
10	Wait until Security Lamp turns off.		This takes ten minutes.
11	Quickly (within one second) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
12	Turn Ignition Switch **OFF**. Wait 15 seconds before turning Ignition Switch on. Turn Ignition Switch **ON** and start engine to confirm successful Password Learn procedure. Clear DTCs.		
13	Perform all steps under 3.3 H-DSSS ACTUATION.		

HFSM MAINTENANCE 3.27

GENERAL

The HFSM uses a battery in the fob and siren. These are the only parts requiring periodic maintenance.

HANDS-FREE FOB

Schedule

Replace the fob battery every year.

Battery Replacement

1. See Figure 3-33. Open the fob case.
   a. Place a thin blade in the thumbnail slot (1) between the 2 halves of the case.
   b. Slowly twist the blade.
2. Replace battery (2).
   a. Remove the original battery.
   b. Install a **new** battery with the positive (+) side down. Use a Panasonic® 2032 or equivalent.
3. With O-ring (3) in place, align case halves and snap case halves together.



1. Thumbnail slot
2. Battery (Panasonic 2032)
3. O-ring

Figure 3-33. Open Fob: HFSM

SMART SIREN (IF INSTALLED)

Schedule

The siren's internal 9 volt battery is rechargeable and does not need to be replaced on a regular basis. Battery life under normal conditions is approximately three to six years.

NOTES

- *See Figure 3-34 and Figure 3-35. Early style siren will work with both TSSM and HFSM. Late style siren will only work with HFSM.*
- *The internal siren battery may not charge if the vehicle's battery is less than 12.5 volts.*

Battery Replacement: Early Style Siren

1. Disarm system and remove siren.
2. See Figure 3-34. Remove battery cover.
   a. Place the siren module on a flat and sturdy table with the potted section (area with epoxy covering circuit board) facing up and towards you.
   b. Position a knife blade at a 45 degree angle to the long side of the siren case. Insert the knife blade between the siren case and battery cover at one of the two accessible corners of the battery cover. Keep the blade slightly higher towards the battery cover as this helps keep the blade away from the battery seal.
   c. Slowly twist the blade towards the battery cover and the cover will pop off.

NOTES

- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on new battery.*
- *Only a 9 volt nickel metal hydride battery should be used in the siren.*

3. Replace battery by removing old battery from polarized battery clip. Install a **new** 9 volt nickel metal hydride battery.
4. Reinstall battery cover.
   a. Carefully replace the rubber seal.
   b. Align battery cover with case placing round corners on cover away from connector [142A]. Snap cover into place.
5. Install siren and check operation. If siren is working properly, it will respond with two chirps after receiving the arm command.

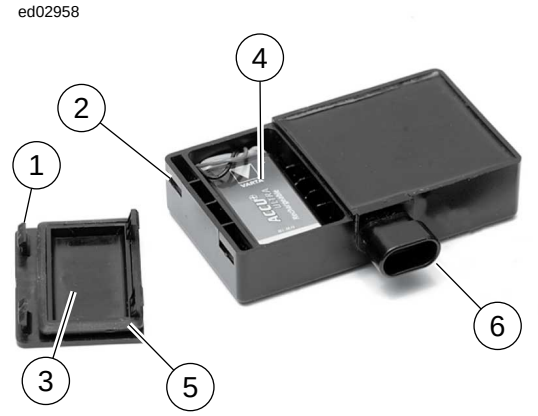
Battery Replacement: Late Style Siren

1. Disarm system and remove siren.
2. See Figure 3-35. With a small screwdriver or pick, push the catches (1) in through the two slots (2) in the end of the siren to release the battery cover (3).

NOTES

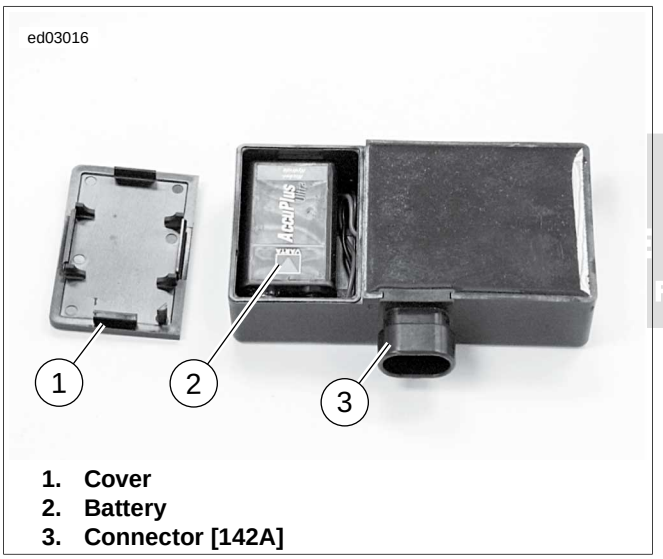
- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on new battery.*
- *Only a 9 volt nickel metal hydride battery should be used in the siren.*

3. Replace battery (4) by removing old battery from polarized battery clip.
4. Recharge and re-install or install a **new** 9 volt nickel metal hydride battery.
5. Reinstall battery cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.
6. Install siren and check operation. If siren is working properly, it will respond with two chirps after receiving the arm command.



1. Catch
2. Slot
3. Cover
4. 9 volt battery
5. Rubber seal
6. Connector [142A]

Figure 3-35. Siren Battery Compartment (Late Style Siren)



1. Cover
2. Battery
3. Connector [142A]

Figure 3-34. Battery Compartment (Early Style Siren)

IGITAL
CHNICIAN II
RLEY-DAVIDSON

NOTES

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON®

NOTES

SPECIFICATIONS 4.1

SPECIFICATIONS

General

The following specifications are provided as general electrical information for ignition components, and fuse/relay information. See Figure 4-1 for location of fuses and relays.

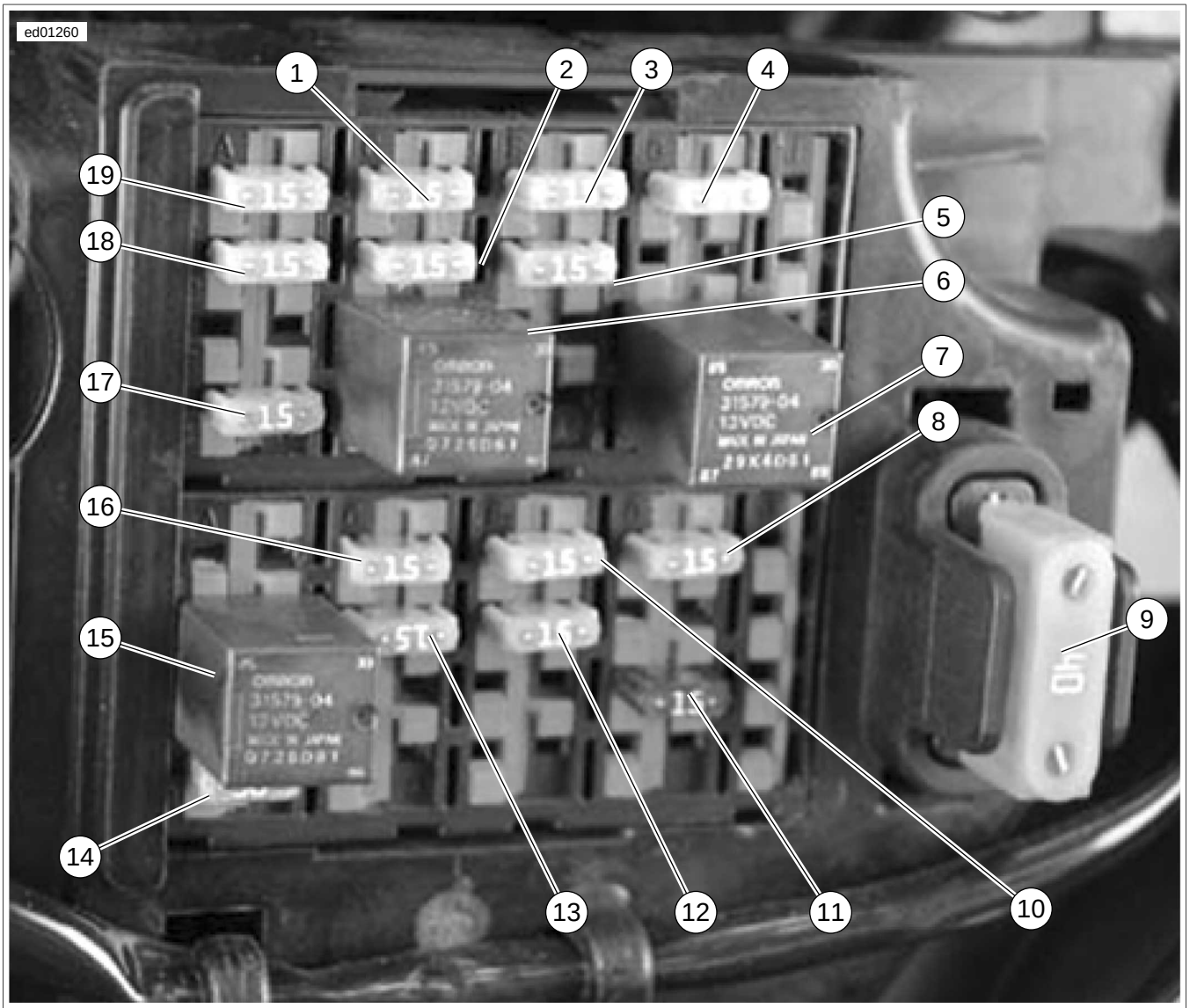
Table 4-1. General Specifications

IGNITION	DATA
Spark timing advance	-4° - 45° BTDC (range) 12° - 24° BTDC @1000 RPM
Idle speed	1000 ± 50 RPM
Spark plug size	12 mm
Spark plug gap	0.038-0.043 in 0.97-1.09 mm
Spark plug type	Harley-Davidson No. 6R12 (no substitute)
Ignition coil primary resistance	0.3-0.5 ohms
Ignition coil secondary resistance	2500-3500 ohms

Table 4-2. Fuse Ratings

ITEM NO.	PROTECTED (SYSTEM) CIRCUIT RELAY	RATING (AMPS)	COLOR
1	Accessory	15A	Blue
2	Battery	15A	Blue
3	P&A	15A	Blue
4	Radio Power/Siren	15A	Blue
5	ECM Power	15A	Blue
6	System Relay	--	--
7	Start Relay	--	--
8	Engine Control	15A	Blue
9	MAXIFUSE	40A	Orange
10	Ignition	15A	Blue
11	Spare	15A	Blue
12	Lights	15A	Blue
13	Headlamp	15A	Blue
14	ABS	30A	Green
15	Brake Relay	--	--
16	Instruments	15A	Blue
17	Fuel Pump	15A	Blue
18	Radio Memory	15A	Blue
19	Brake/Cruise	15A	Blue

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure 4-1. Fuse and Relay Locations

EFI SYSTEM 4.2

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

See Figure 4-2. The engine management system consists of the following components:

- Electronic Control Module (ECM)
- Crankshaft Position (CKP) Sensor
- Temperature/Manifold Absolute Pressure (TMAP) Sensor
- Engine Temperature (ET) Sensor
- Twist Grip Sensor (TGS)
- Throttle Control Actuator (TCA)
- Vehicle Speed Sensor (VSS)
- Oxygen (O_2) Sensors
- Active Exhaust Actuator (HDI only)
- Turn Signal Module (TSM) or optional module with integrated Security System
- Ignition Coil
- Fuel Pump
- Fuel Injector
- Purge Solenoid

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 primarily from the ET, CKP, TMAP, TGS, O_2 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° to 50° 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 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 that 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 throttle engine. Two corresponding Throttle Position (TP) sensors receive input from the ECM, corresponding to the position of the TGS, to adjust the throttle plates position, 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 5.0 volt 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 O_2 Sensor 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 (Part No. HD-44750) 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 O_2 Sensors, one mounted in each of the two exhaust pipes, to monitor the exhaust gas air/fuel mixture ratio. Each O_2 Sensor samples the exhaust oxygen content and provides specific resistance (across the sensor terminals) to the ECM. The ECM continuously adjusts the air/fuel mixture to maintain an optimal air/fuel mixture. When properly mixed, the O_2Sensor voltage(s) will measure approximately 0.45 volt, each.

The Active Exhaust System (HDI only) utilizes an actuator valve located in the rear exhaust pipe that is connected via a cable. The valve position automatically adjusts to enhance engine performance.

The TSM/TSSM/HFSM contain a Bank Angle Sensor (BAS), a safety device which shuts off the fuel injection if the vehicle is leaned more than 45° (either direction) from the upright position. If the BAS is actuated, the vehicle must be repositioned upright (vertical) and the Ignition Switch must be turned off and turned back to the IGNITION position before the engine is capable of being restarted.

The ignition coils, mounted forward 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 - no waste spark system). 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 will shut off the system relay within 2.0 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 2008 stock Touring model motorcycles, an optional heat management system may be enabled through DIGITAL TECHNICIAN (Part No. HD-44750). After being enabled, the heat management system improves rider comfort by turning off the rear cylinder fuel injector whenever the following conditions exist:

- High engine temperature.
- Engine at idle speed.
- Low 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.

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.

TROUBLESHOOTING

See the diagnostic charts for troubleshooting information.

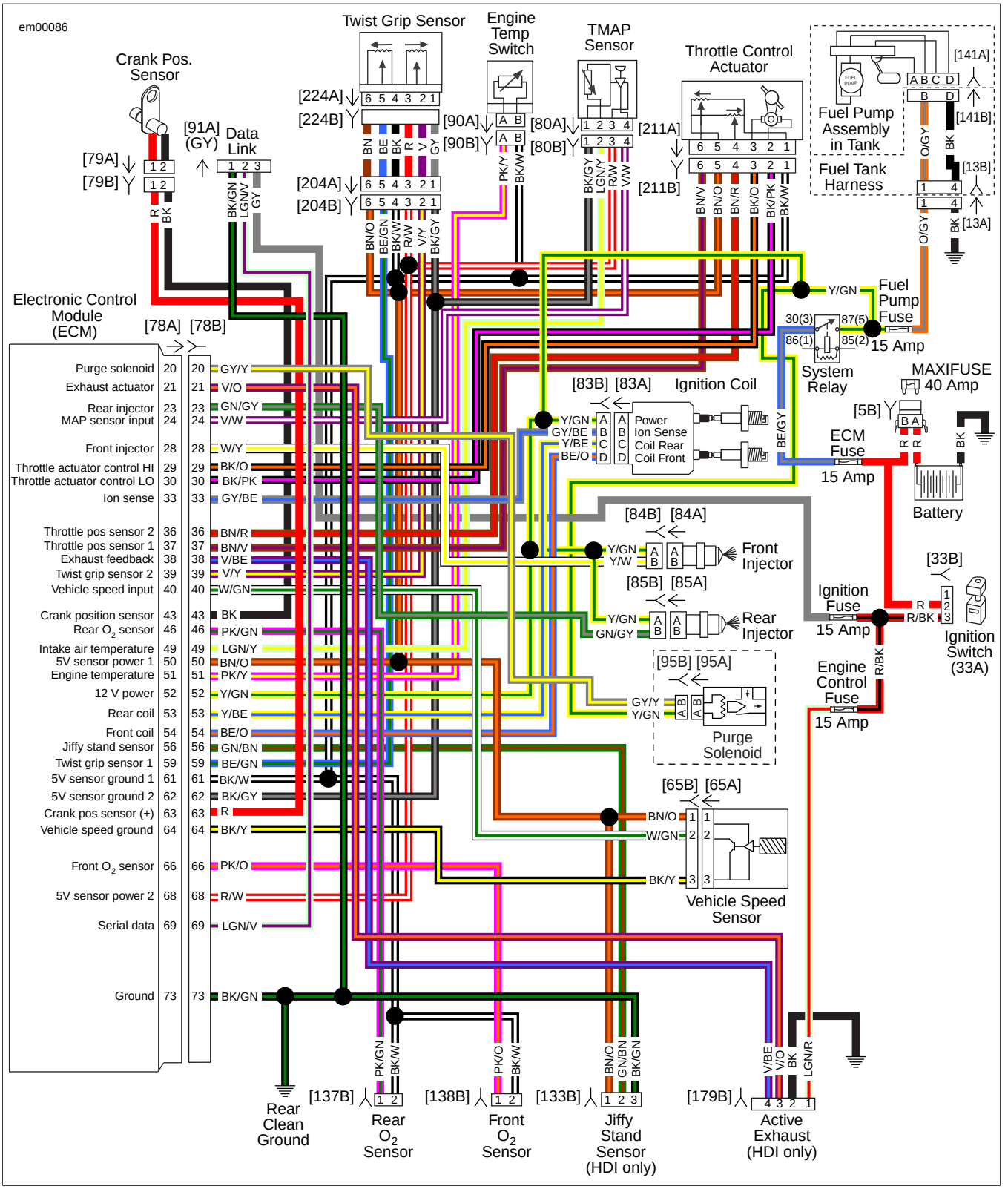


Figure 4-2. EFI Circuit

Table 4-3. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[13]	Fuel tank harness	All	4-place Multilock	Behind fuel tank (under seat)
[33]	Ignition switch	FLHT/C/U/ FLHTR	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
		FLHR/C	3-place Packard	Under console
[65]	Vehicle Speed Sensor (VSS)	All	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	All	4-place Delphi	Top of induction module
[83]	Ignition coil	All	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	All	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	All	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	All	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[95]	Purge solenoid	All	2-place Delphi	Below fuel tank (left side)
[133]	Jiffy Stand Sensor	All	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	All	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	All	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	All	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	All	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	All	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	All	6-place Molex	Right side of engine (Induction Module)

DIGITAL TECHNICIAN HARLEY-DAVIDSON

EFI DIAGNOSTIC INTRODUCTION 4.3

SYSTEM PROBLEMS

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

No Start

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

Poor Performance

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

Check Engine Lamp

See Figure 4-3. The check engine lamp indicates the Electronic Control Module (ECM) has determined a fault condition exists. There may also be starting or performance problems.

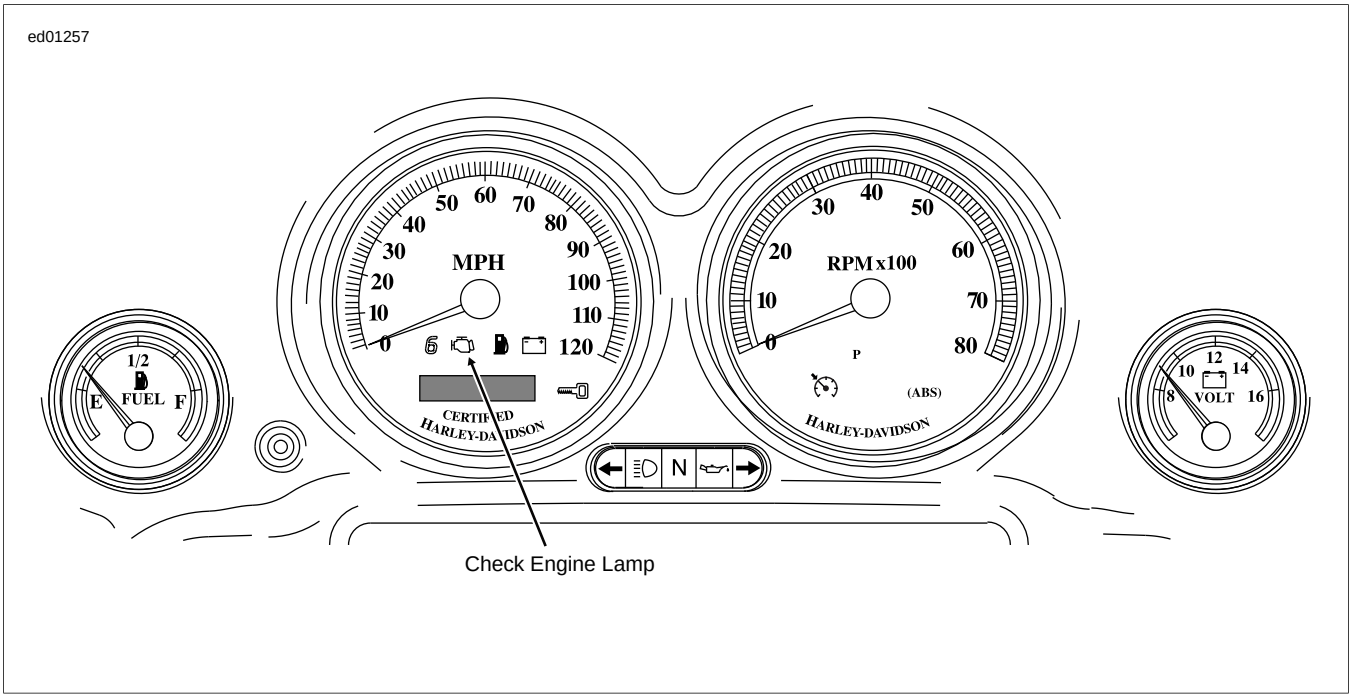


Figure 4-3. Speedometer

RESOLVING PROBLEMS

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

1. Check for Diagnostic Trouble Codes (DTCs) by using speedometer self diagnostics. See 4.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI.
2. Retrieve Diagnostic Trouble Codes (DTCs) by using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF-DIAGNOSTICS.
3. Diagnose system problems. This involves using special tools and the diagnostic flow charts in this section.
4. Correct problems through the replacement and/or repair of the affected components.
5. After repairs are performed, the work must be validated. This involves clearing the DTCs and confirming proper vehicle operation as indicated by the lack of DTCs.

CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI 4.4

CHECK ENGINE LAMP

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

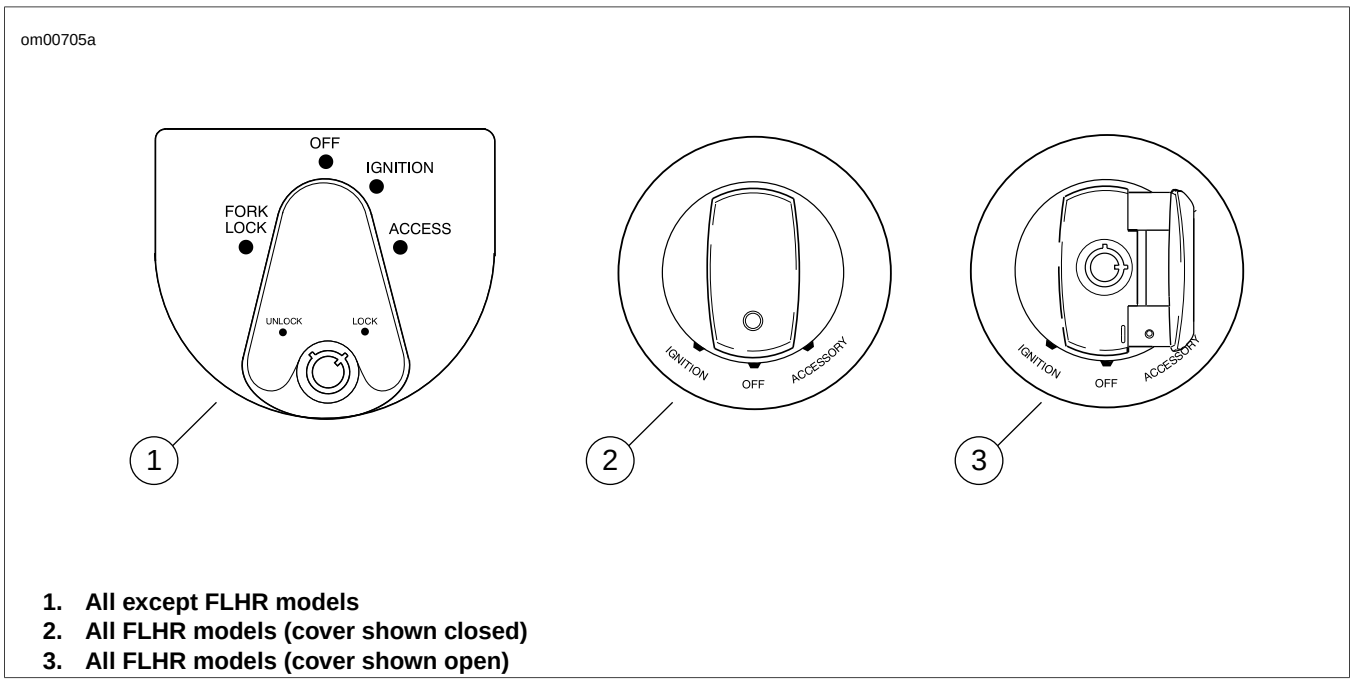
NOTES

- *See Figure 4-4. The Ignition Switch is turned to IGNITION and the Engine Stop Switch is set to RUN (although the engine is **not** running).*
- *When the Ignition Switch is turned to IGNITION, the check engine lamp will illuminate for approximately four seconds and then turn off.*
- *If the check engine lamp is not illuminated while in IGNITION position, or if it fails to turn OFF after the initial four-second period, then the speedometer may need to be replaced. See 4.5 INITIAL DIAGNOSTIC CHECK: EFI.*

1. See Figure 4-5. When the lamp turns off after being illuminated for the first four-second period, it will:
   a. remain off if there are no fault conditions or trouble codes currently detected by the Ignition Control Module.
   b. come back on for an 8-second period if only historic codes exist.
   c. come back on, and remain on, if a current trouble code exists.
2. See 4.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI, Code Types for a complete description of Diagnostic Trouble Code (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 vehicle start sequence. In this manner, there may sometimes be a false indication of the current trouble code.



1. All except FLHR models
2. All FLHR models (cover shown closed)
3. All FLHR models (cover shown open)

Figure 4-4. Ignition Switch: Touring Models

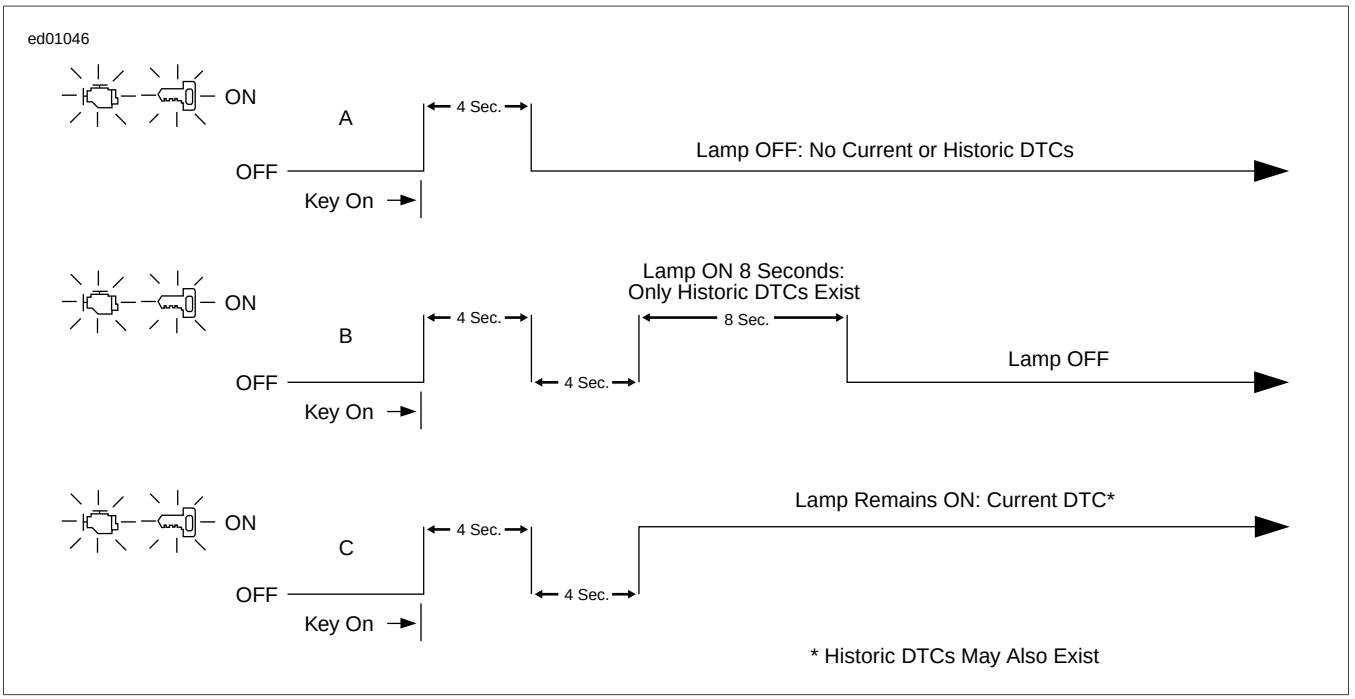


Figure 4-5. Check Engine Lamp Operation

CODE TYPES

There are two types of Diagnostic Trouble Codes (DTCs): current and historic. If a DTC is stored, it can be read using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF-DIAGNOSTICS.

All DTCs reside in the memory of the ECM, TSM/TSSM/ HFSM, speedometer, ABS or tachometer until the DTC is cleared by use of the speedometer self diagnostics. See 4.6 SPEEDOMETER SELF-DIAGNOSTICS.

A historic DTC is also cleared after a total of 50 trips has elapsed. A trip consists of a start and run cycle. After the 50 trip 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 are present during the current ignition cycle. See the appropriate flow charts for solutions.

Historic

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

Historic codes are stored for a length of time to assist in the diagnosis of intermittent faults. See Figure 4-5. The check engine lamp will come back on for 8 seconds to indicate the existence of only historic codes.

It is important to note that historic codes may also be present whenever the system indicates the existence of a current code. See 4.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI, Multiple Diagnostic Trouble Codes if multiple trouble codes are found.

Diagnostic charts are designed for use with current DTCs and as a result they frequently suggest part replacement. When diagnosing a historic code the charts can be helpful, but should not lead to part replacement without verification that a suspected component/part is faulty.

RETRIEVING DIAGNOSTIC TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The engine management system provides two levels of diagnostics.

- The most sophisticated mode employs a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).
- The second mode requires using the speedometer self diagnostics. Speedometer, ABS, tachometer (if equipped), TSM/TSSM/HFSM and ECM DTCs can be accessed and cleared. See 4.6 SPEEDOMETER SELF-DIAGNOSTICS.

MULTIPLE DIAGNOSTIC TROUBLE CODES

While it is possible for more than one fault to occur and set more than one trouble code, there are several conditions which may result in one fault setting multiple trouble codes:

- The TMAP sensor, TGS, Jiffy Stand Sensor and VSS are connected to the same reference line (+5 V Vref). If the reference line goes to ground or open, multiple codes can be set.
- Serial data codes (DTC U1300, U1301, U1016, U1064, and U1097) may be accompanied by other codes. **Always** correct the serial data codes before resolving the other codes.

Refer to Table 4-8. This table gives most ECM DTCs a priority ranking.

INITIAL DIAGNOSTIC CHECK: EFI 4.5

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

To locate faulty circuits or other system problems, follow the diagnostic flow charts in this section. For a systematic approach, always begin with 4.5 INITIAL DIAGNOSTIC CHECK: EFI, Initial Diagnostics. Read the general information and then work your way through the flow chart box by box.

Diagnostic Notes

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

Circuit Diagram/Wire Harness Connector Table

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

In order to perform most diagnostic routines, a Breakout Box and a digital volt/ohmmeter (DVOM) are required. See 4.7 BREAKOUT BOX: EFI.

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

Reprogramming ECM

Diagnostic charts frequently suggest ECM replacement. In the event an ECM needs to be replaced, it must be reprogrammed using a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750). See your dealer. Password learn procedure must also be performed. See 3.26 TSM/HFSM: PASSWORD LEARN.

INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-46601	INSTRUMENT HARNESS ADAPTERS
HD-48637	BREAKOUT BOX

General Information

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

Diagnostic Tips

- If speedometer reads "No Rsp" (no response) while in diagnostic mode, check data bus for an open or short to ground between data connector [91A] terminal "3" and ECM, TSM/TSSM/HFSM, speedometer or tachometer, and ABS (if equipped). For more information on speedometer diagnostic mode, see 4.6 SPEEDOMETER SELF-DIAGNOSTICS.
- Check for an open diagnostic test terminal between data terminal "3" and ECM terminal "5". With Ignition Switch at IGNITION, transmit data should be typically 0.6-0.8 volt. The range of acceptable voltage is greater than 0.0 and less than 7.0 volts.
- If speedometer reads "BUS Er" (serial data bus error), refer to flow charts in 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER.

Diagnostic Notes

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

1. Compare engine behavior to symptoms tables.
   a. Engine starts hard. Refer to Table 4-5.
   b. Hesitates, stumbles, surges, misfires and/or sluggish performance. Refer to Table 4-6.
   c. Engine exhaust emits black smoke or fouls plugs. Refer to Table 4-7.
2. Connect BREAKOUT BOX (Part No. HD-48637) and INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601) between wire harness and speedometer. See 2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER

All EFI DTCs are listed in Table 4-8.

Other Diagnostic Trouble Codes (DTCs)

See 3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM for any codes related to the Turn Signal Module (TSM), Turn Signal Security Module (TSSM) or Hands-Free Security Module (HFSM).

See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER for any codes related to the speedometer or tachometer.

See 6.4 INITIAL DIAGNOSTIC CHECK: ABS for any codes related to the Antilock Brake System (ABS).

Table 4-4. Typical Scan Values for Engine Data

ITEM	MIN. VALUE	MAX. VALUE	HOT IDLE
TMAP sensor	10.3 kPa	104 kPa	10.3-13.3 in. Hg (35-45 kPa)
	0 volts	5.1 volts	
RPM	975	5,000 limited	1000

Table 4-4. Typical Scan Values for Engine Data

ITEM	MIN. VALUE	MAX. VALUE	HOT IDLE
ET sensor	3° F (-16° C)	464° F (240° C)	230-300° F (110-150° C)
	0.0 volts	5.0 volts	0.5-3.23 volts
INJ PW front	0	50 mS	2-4 mSec
INJ PW rear	0	50 mS	2-4 mSec
Advance front	-4	45°	12-24°
Advance rear	-4	45°	12-24°
VSS	0	120	0 MPH
Battery voltage	10	15	14.5 volts
ENG RUN	OFF	RUN	RUN
Idle RPM	975	1450	975-1025

NOTE

Hot idle specifications are with stock exhaust, the engine operating at 1000 RPM and an engine temperature of approximately 260° F (127° C). Idle settings may be changed with the idle set procedure. See the Service Manual.

Table 4-5. Engine Starts Hard

SYMPTOM	SOLUTION
Battery discharged	See 1.7 CHARGING SYSTEM, Troubleshooting.
Spark Plugs	4.16 MISFIRE AT IDLE OR UNDER LOAD.
Spark Plug wires	4.16 MISFIRE AT IDLE OR UNDER LOAD.
Ignition Coil	4.16 MISFIRE AT IDLE OR UNDER LOAD.
Valve sticking	See the Service Manual.
Contamination in fuel system	Drain and refill with fresh fuel.
Loss of battery power to ECM terminal "71"*	4.11 NO ECM POWER.
* DTCs will not clear (although they appear to).	

Table 4-6. Engine Performance Problems

CAUSE	SOLUTION
Manifold leak	4.9 INTAKE LEAK TEST.
TMAP sensor plugged or not operating properly	4.18 DTC P0107, P0108, P0112, P0113.
Contamination in fuel system	Drain and refill with fresh fuel.
Spark plugs	4.16 MISFIRE AT IDLE OR UNDER LOAD.
Low fuel pressure	4.15 FUEL PRESSURE TEST.

Table 4-7. Engine Exhaust Emits Black Smoke or Fouls Plugs

CAUSE	SOLUTION
Clogged air filter.	See Air Cleaner Filter in the Service Manual.
TMAP sensor plugged or not operating properly.	4.18 DTC P0107, P0108, P0112, P0113.
Purge solenoid or vent to evaporative canister not routed or operating properly.	4.24 DTC P0444, P0445.

Table 4-8. EFI Diagnostic Trouble Codes (DTCs) and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	SOLUTION
1	P0605	ECM FLASH Memory Error	4.29 DTC P0603, P0605
2	P0603	ECM EEPROM Memory Error	4.29 DTC P0603, P0605
3	U1300	ECM Serial Data Low	4.12 STARTS, THEN STALLS
4	U1301	ECM Serial Data High	4.12 STARTS, THEN STALLS
5	U1097	Loss of Speedometer Serial Data To ECM	4.47 DTC U1097
6	U1064	Loss of TSM/FSFM Serial Data To ECM	4.46 DTC U1064
7	P1003	System Relay Contacts Open	4.14 SYSTEM RELAY FAULT
8	P1002	System Relay Coil High/Shorted	4.14 SYSTEM RELAY FAULT
9	P1001	System Relay Coil Open/Low	4.14 SYSTEM RELAY FAULT
10	P1004	System Relay Contacts Closed	4.14 SYSTEM RELAY FAULT
11	P1009	Incorrect Password	4.31 DTC P1009, P1010
12	P1010	Missing Password	4.31 DTC P1009, P1010
13	P0641	5V +VRef 1 Out Of Range	4.30 DTC P0641, P0651
14	P0651	5V +VRef 2 Out Of Range	4.30 DTC P0641, P0651
15	P0373	CKP Sensor Intermittent	4.23 DTC P0373, P0374
16	P0107	MAP Sensor Open/Low	4.18 DTC P0107, P0108, P0112, P0113
17	P0108	MAP Sensor High	4.18 DTC P0107, P0108, P0112, P0113
18	P0374	CKP Sensor Synch Error	4.23 DTC P0373, P0374
19	P1600	EFI Module Processor - Internal Fault	4.38 DTC P1600
20	P1270	TGS Validation Error	4.32 DTC P1270
21	P2107	EFI Module Processor Internal Error	4.41 DTC P2107
22	P2122	TGS1 Low/Open	4.43 DTC P2122, P2123, P2127, P2128
23	P2123	TGS1 High	4.43 DTC P2122, P2123, P2127, P2128
24	P2127	TGS2 Low/Open	4.43 DTC P2122, P2123, P2127, P2128
25	P2128	TGS2 High	4.43 DTC P2122, P2123, P2127, P2128
26	P2138	TGS Correlation Error	4.44 DTC P2135, P2138
27	P0120	TPS1 Range Error	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
28	P0220	TPS2 Range Error	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
29	P0122	TPS1 Low	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
30	P0123	TPS2 High/Open	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
31	P0222	TPS2 Low	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
32	P0223	TPS2 High/Open	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223
33	P2135	TPS Correlation Error	4.44 DTC P2135, P2138
34	P2119	EFI Motor Throttle Body Range Performance	4.42 DTC P2119

DIGITAL TECHNICIAN HARLEY-DAVIDSON

Table 4-8. EFI Diagnostic Trouble Codes (DTCs) and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	SOLUTION
35	P2100	EFI Motor Circuit Open	4.39 DTC P2100, P2101, P2102, P2103
36	P2101	EFI Motor Circuit Range Performance (Actuation Error)	4.39 DTC P2100, P2101, P2102, P2103
37	P2102	EFI Motor Circuit Low	4.39 DTC P2100, P2101, P2102, P2103
38	P2103	EFI Motor Circuit High	4.39 DTC P2100, P2101, P2102, P2103
39	P2176	EFI Closed Position Not Learned	4.45 DTC P2176
40	P1514	Air Flow Fault	4.37 DTC P1514
41	P2105	EFI Forced Engine Shutdown	4.40 DTC P2105
42	P1501	Jiffy Stand Sensor Low	4.35 DTC P1501, P1502
43	P1502	Jiffy Stand Sensor High	4.35 DTC P1501, P1502
44	P0572	Brake Switch Low	4.27 DTC P0572
45	P0117	ET Sensor Low	4.19 DTC P0117, P0118
46	P0118	ET Sensor High	4.19 DTC P0117, P0118
47	P0112	IAT Voltage Low	4.18 DTC P0107, P0108, P0112, P0113
48	P0113	IAT Voltage Open/High	4.18 DTC P0107, P0108, P0112, P0113
49	P1351	Front Ignition Coil Driver Open/Low	4.33 DTC P1351, P1352, P1354, P1355
50	P1354	Rear Ignition Coil Driver Open/Low	4.33 DTC P1351, P1352, P1354, P1355
51	P1352	Front Ignition Coil Driver High/Shorted	4.33 DTC P1351, P1352, P1354, P1355
52	P1355	Rear Ignition Coil Driver High/Shorted	4.33 DTC P1351, P1352, P1354, P1355
53	P1357	Front Cylinder Combustion Intermittent	4.17 COMBUSTION ABSENT/INTERMITTENT
54	P1358	Rear Cylinder Combustion Intermittent	4.17 COMBUSTION ABSENT/INTERMITTENT
55	P0261	Front Injector Open/Low	4.22 DTC P0261, P0262, P0263, P0264
56	P0263	Rear Injector Open/Low	4.22 DTC P0261, P0262, P0263, P0264
57	P0262	Front Injector High	4.26 DTC P0562, P0563
58	P0264	Rear Injector High	4.26 DTC P0562, P0563
59	P0562	Battery Voltage Low	4.26 DTC P0562, P0563
60	P0563	Battery Voltage High	4.26 DTC P0562, P0563
61	P0501	VSS Sensor Low	4.25 DTC P0501, P0502
62	P0502	VSS Sensor High/Open	4.25 DTC P0501, P0502
63	P1356	Rear Cylinder No Combustion	4.17 COMBUSTION ABSENT/INTERMITTENT
64	P1353	Front Cylinder No Combustion	4.17 COMBUSTION ABSENT/INTERMITTENT
65	P0444	Purge Solenoid Open/Low	4.24 DTC P0444, P0445
66	P0445	Purge Solenoid High	4.24 DTC P0444, P0445
67	P1475	Exhaust Actuation Position Error	4.34 DTC P1475, P1477, P1478
68	P1477	Exhaust Actuator Open/Low	4.34 DTC P1475, P1477, P1478
69	P1478	Exhaust Actuator Shorted/High	4.34 DTC P1475, P1477, P1478
70	P0131	Front Oxygen Sensor Low	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
71	P0151	Rear Oxygen Sensor Low	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
72	P0132	Front Oxygen Sensor High	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
73	P0152	Rear Oxygen Sensor High	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
74	P0134	Front Oxygen Sensor Inactive	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
75	P0154	Rear Oxygen Sensor Inactive	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154
76	P1510	EFI Limited Performance Mode	4.36 DTC P1510, P1511, P1512
77	P1511	EFI Power Management Mode	4.36 DTC P1510, P1511, P1512

Table 4-8. EFI Diagnostic Trouble Codes (DTCs) and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	SOLUTION
78	P1512	EFI Forced Idle Mode	4.36 DTC P1510, P1511, P1512
79	P0577	Cruise Control Input High	4.28 DTC P0577

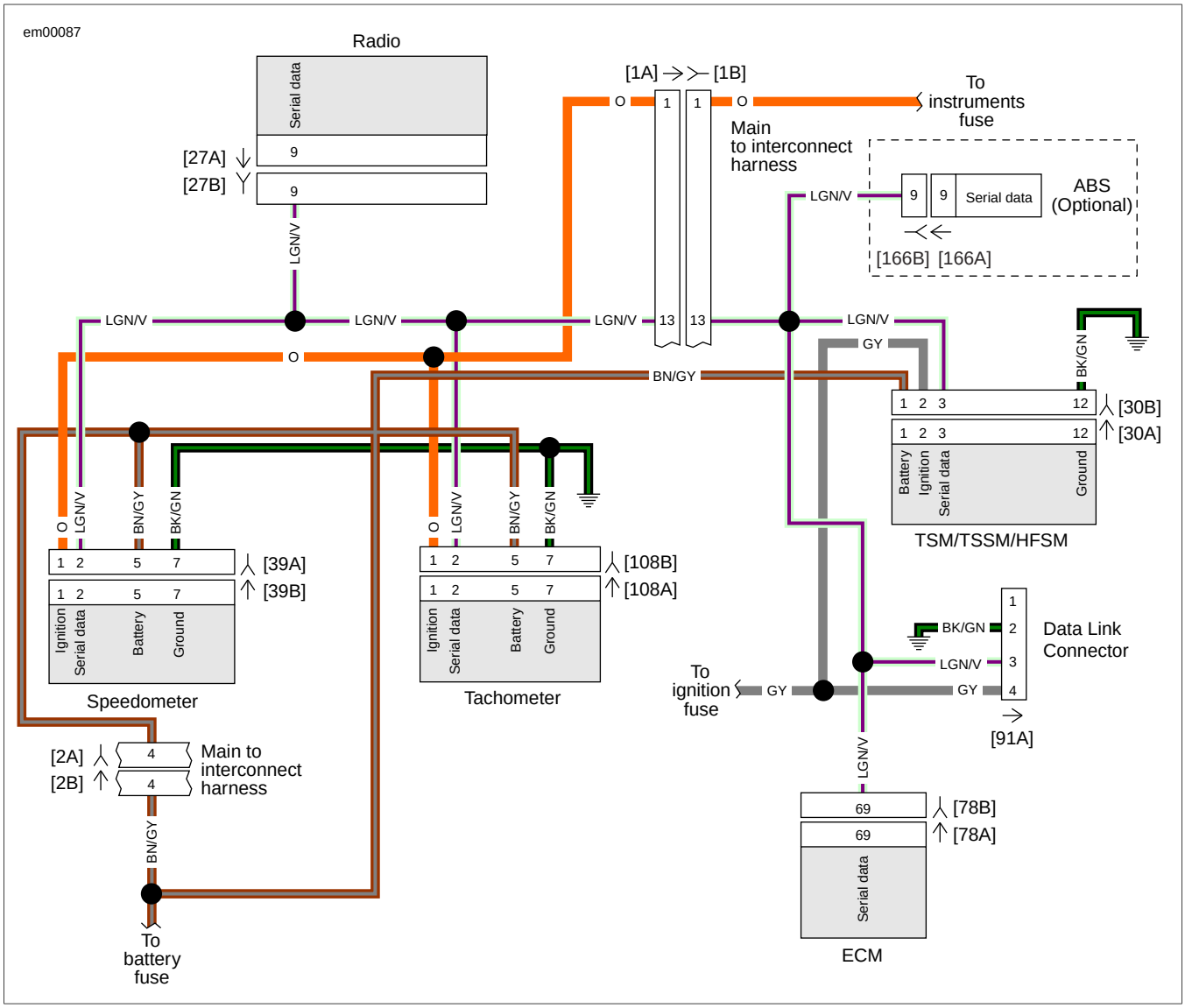


Figure 4-6. Diagnostic Check (FLHX, FLHT/C/U, FLTR)

Table 4-9. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - left fairing support bracket
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)

Table 4-9. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS Module	All	20-place Molex	Under right side cover

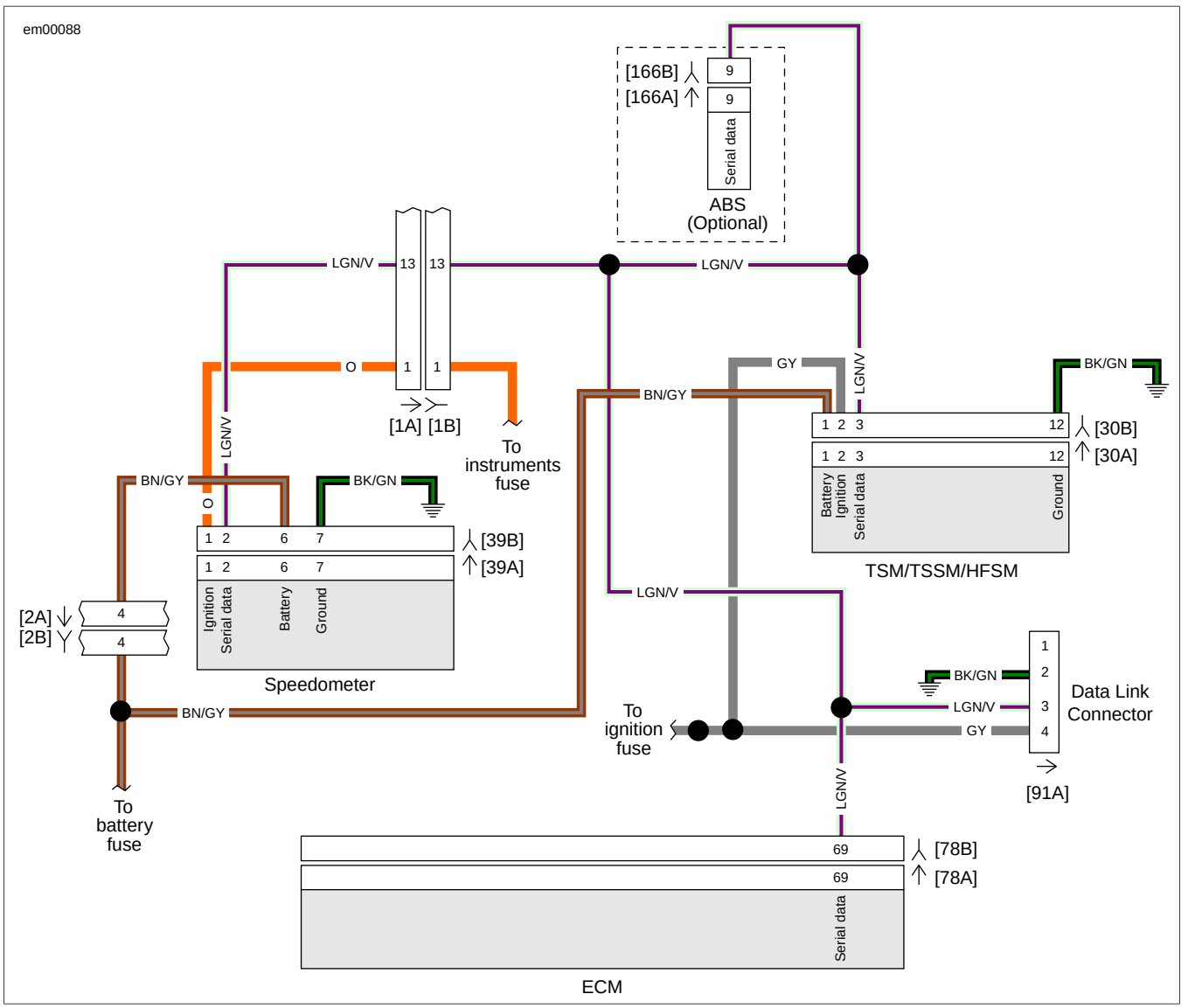


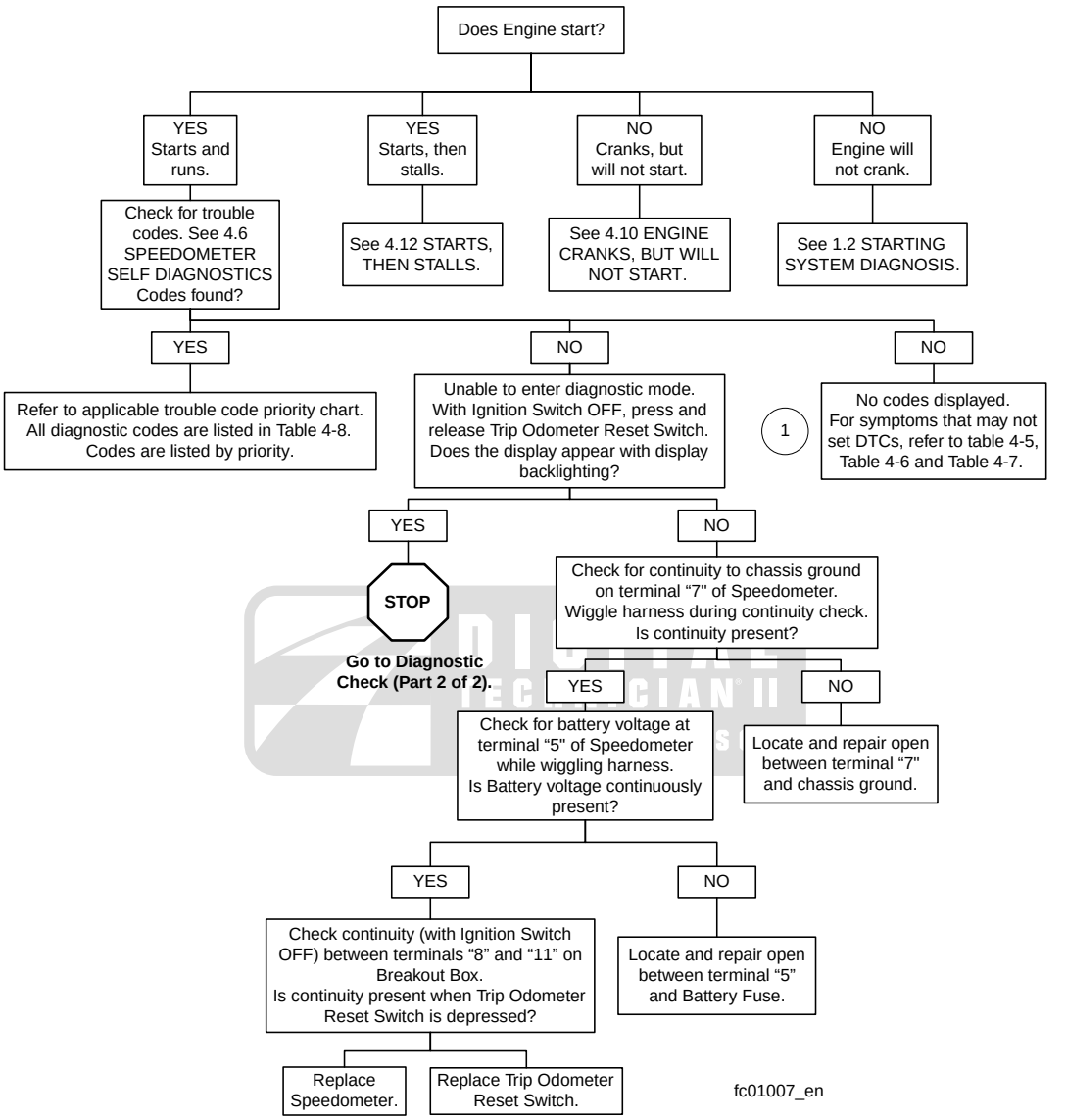
Figure 4-7. Diagnostic Check (FLHR/C/S)

Table 4-10. Wire Harness Connectors

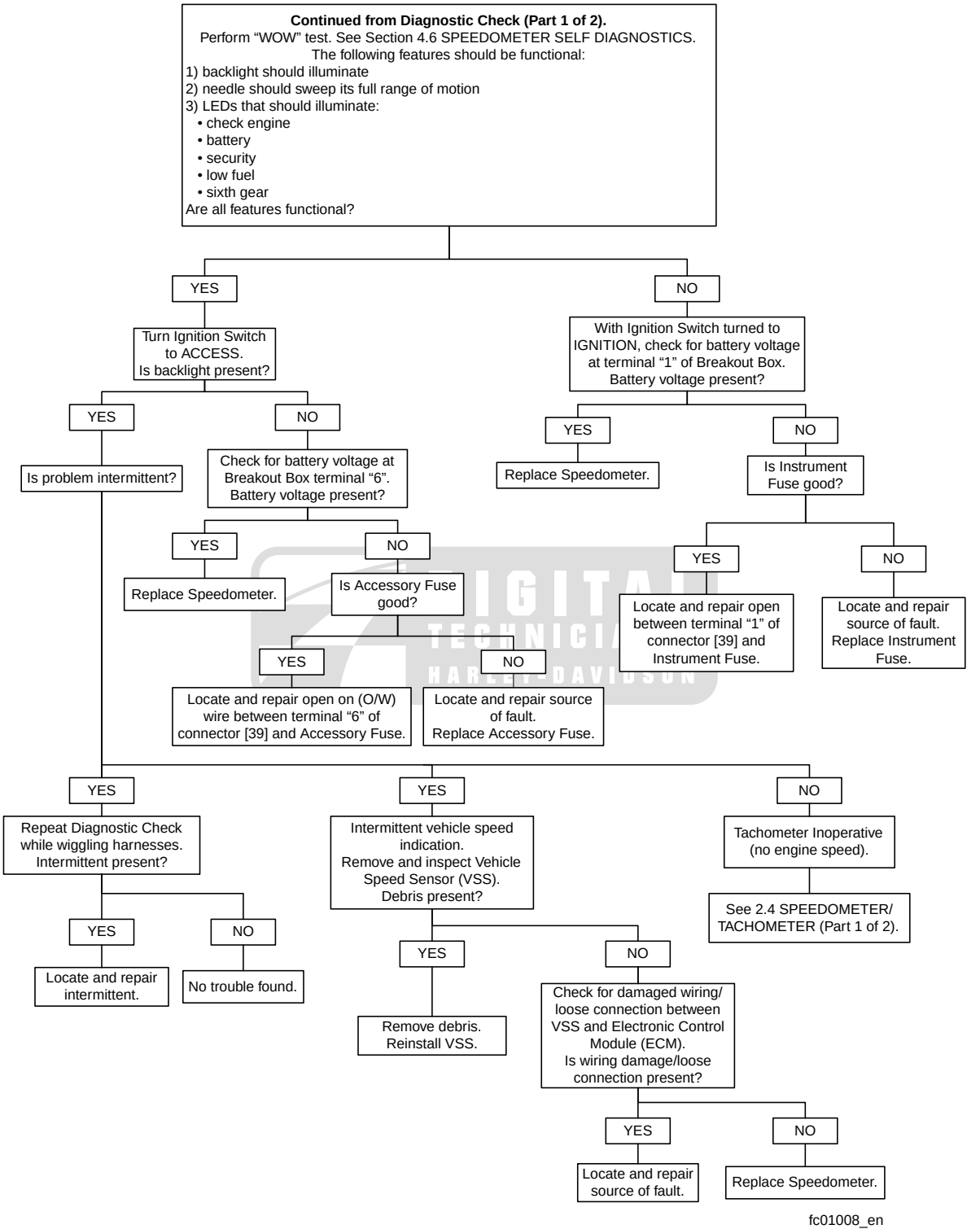
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (Black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (Gray)	Inner fairing - left radio support bracket
[30]	TSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Mini-Deutsch	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

Diagnostic Check (Part 1 of 2)



Diagnostic Check (Part 2 of 2)



SPEEDOMETER SELF-DIAGNOSTICS 4.6

GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/TSSM/HFSM, ABS and ECM Diagnostic Trouble Codes (DTCs) (diagnostic mode).

DIAGNOSTICS

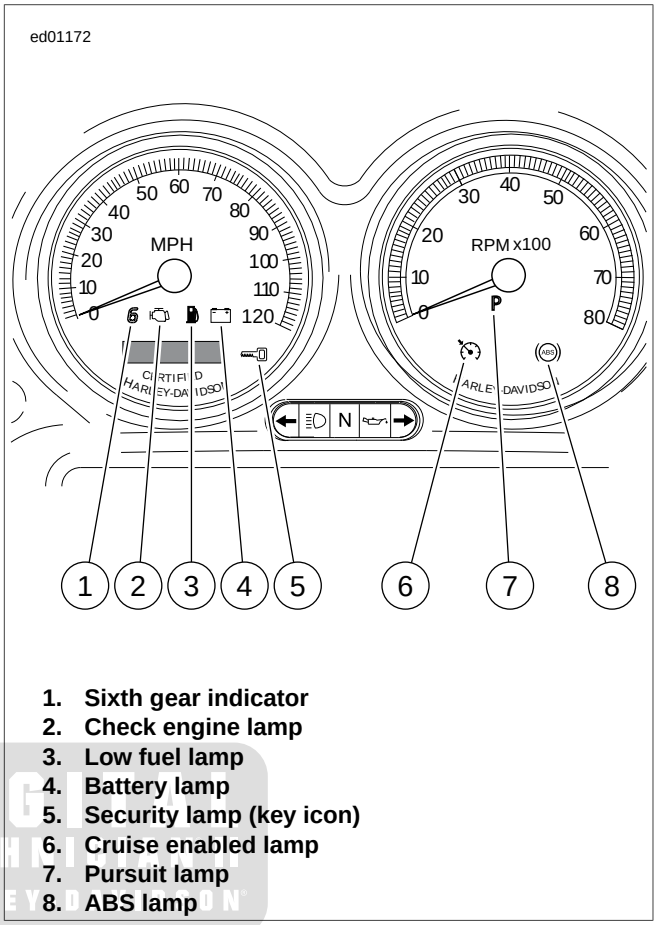
Diagnostic Tips

- For a quick check of speedometer function, a "WOW" test can be performed. Press and hold trip odometer reset switch then turn Ignition Switch to IGNITION. Background lighting should illuminate, speedometer needle should sweep its full range of motion, and indicator lamps (sixth gear, check engine, low fuel, battery, security, cruise enabled, pursuit, and ABS) should illuminate. Some lamps, like the cruise enabled lamp, may illuminate even if the vehicle is not equipped with cruise control. See Figure 4-8.
- If speedometer fails "WOW" test, check for battery, ground, ignition, trip odometer reset switch and accessory wiring to speedometer. If any feature in the speedometer is non-functional, see 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.

Diagnostic Notes

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

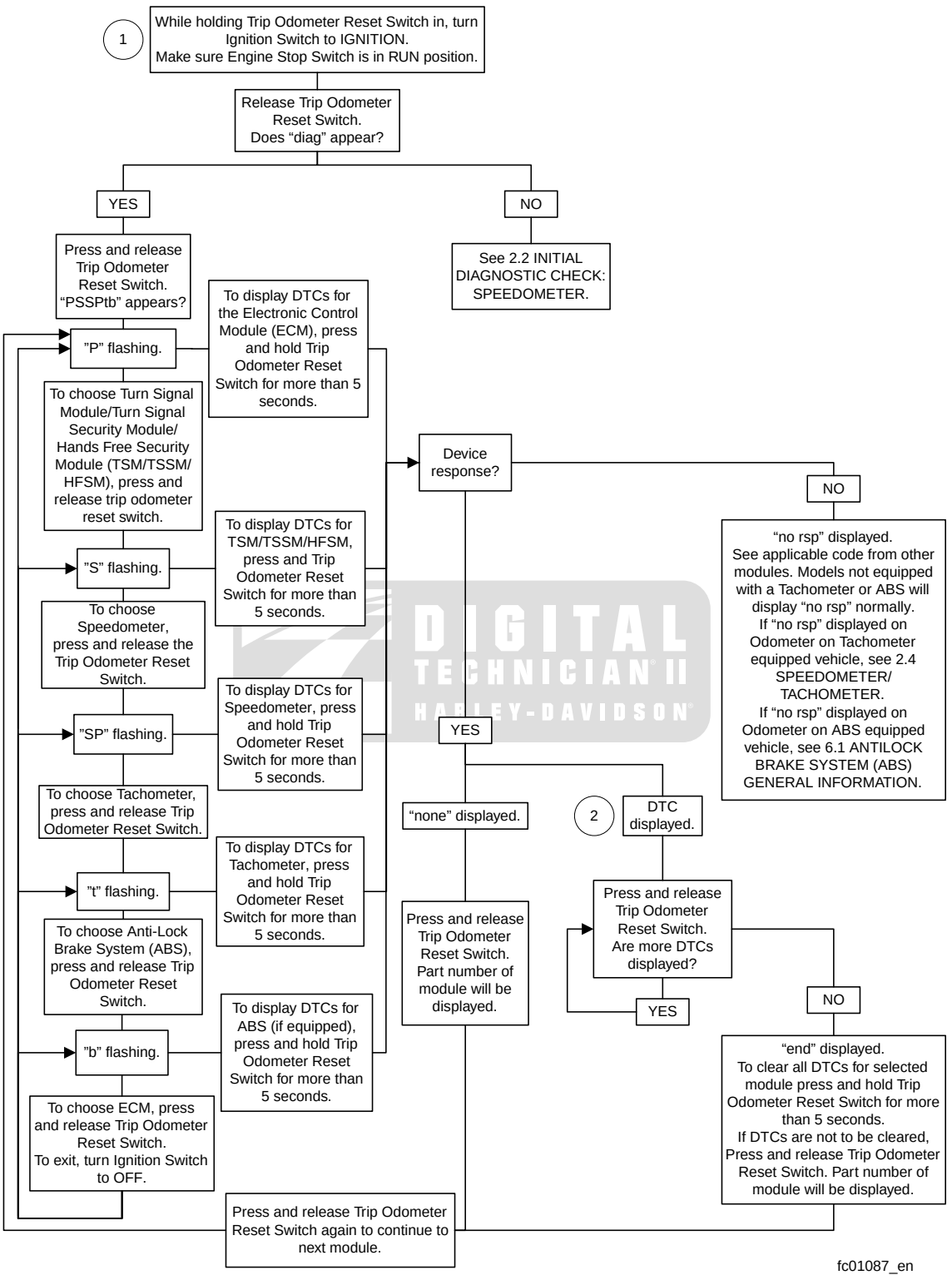
1. To exit diagnostic mode, turn Ignition Switch OFF.
2. To clear DTCs for the selected module:
   a. Press and hold the trip odometer reset switch for more than 5 seconds to display available modules, release.
   b. Press the trip odometer reset switch to choose module.
   c. Press and hold the trip odometer reset switch for more than 5 seconds to display the DTC, release.
   d. Press and hold the trip odometer reset switch for more than 5 seconds to clear DTC(s) for the module selected.



1. **Sixth gear indicator**
2. **Check engine lamp**
3. **Low fuel lamp**
4. **Battery lamp**
5. **Security lamp (key icon)**
6. **Cruise enabled lamp**
7. **Pursuit lamp**
8. **ABS lamp**

Figure 4-8. Icons

Speedometer Self Diagnostics



BREAKOUT BOX: EFI 4.7

GENERAL

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

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

NOTE

See wiring diagrams for ECM terminal functions.

INSTALLATION

1. Remove the seat.
2. See Figure 4-9. Release the lock and disconnect the ECM connector [78B].
3. See Figure 4-10. Install connectors from the Breakout Box to the harness connectors.



Figure 4-9. Electronic Control Module (ECM)



Figure 4-10. Breakout Box

REMOVAL

1. Separate connectors to remove Breakout Box between ECM and harness.
2. Install connector [78B] to connect harness to ECM.
3. Install the seat.

WIGGLE TEST 4.8

GENERAL

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

PROCEDURE

PART NUMBER	TOOL NAME
HD-39978	DVOM
HD-48637	BREAKOUT BOX

1. See Figure 4-11. Connect DVOM (Part No. HD-39978) to wiring harness between the suspect connections. When diagnosing ECM connections, use a BREAKOUT BOX (Part No. HD-48637) to simplify the procedure. See 4.7 BREAKOUT BOX: EFI.
2. Set DVOM to read voltage changes.
3. Start motorcycle engine and run at idle.
4. Shake or wiggle harness to detect intermittents. If intermittents are present, radical voltage changes will register on the DVOM.

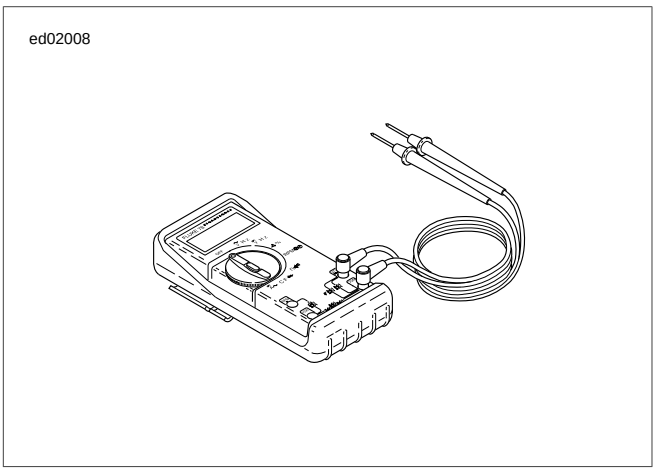


Figure 4-11. Fluke 78 Multimeter (DVOM) (Part No. HD-39978)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INTAKE LEAK TEST 4.9

GENERAL

⚠WARNING

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

To prevent false readings, keep airbox cover installed when performing test.

Do not direct propane into air cleaner, false readings will result.

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

Parts List

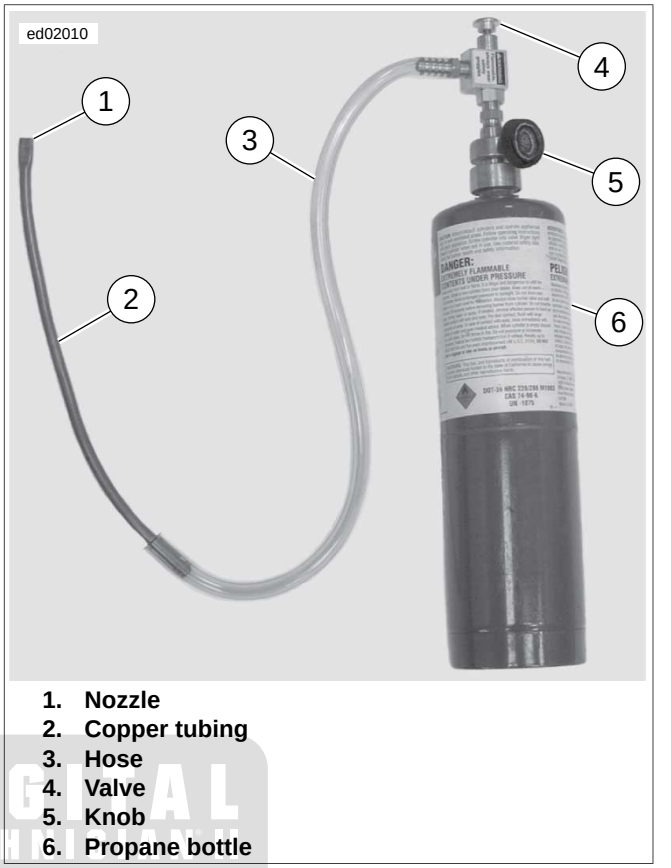
- Standard 14 oz. propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).
- 12 in. (304 mm) long section of 1/4 in. (6 mm) diameter copper tubing.

Tester Assembly

1. Cut rubber hose from kit to 18 in. (457 mm) in length.
2. See Figure 4-12. Flatten one end of copper tube to form a nozzle.
3. Insert round side of copper tube into end of 18 in. (457 mm) tubing. See Figure 4-13.



Figure 4-12. Nozzle



1. **Nozzle**
2. **Copper tubing**
3. **Hose**
4. **Valve**
5. **Knob**
6. **Propane bottle**

Figure 4-13. Leak Tester

INTAKE LEAK TESTING

1. Start engine.
2. Warm engine to operating temperature.
3. See Figure 4-13. Turn knob (5) counterclockwise to open propane bottle.

NOTE

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

4. See Figure 4-14. Aim nozzle toward possible sources of leak such as Fuel Injectors and intake tract.
5. See Figure 4-13. Push valve (4) to release propane. Tone of engine will change when propane enters source of leak.
6. Note which components fail the intake leak test, for further servicing.

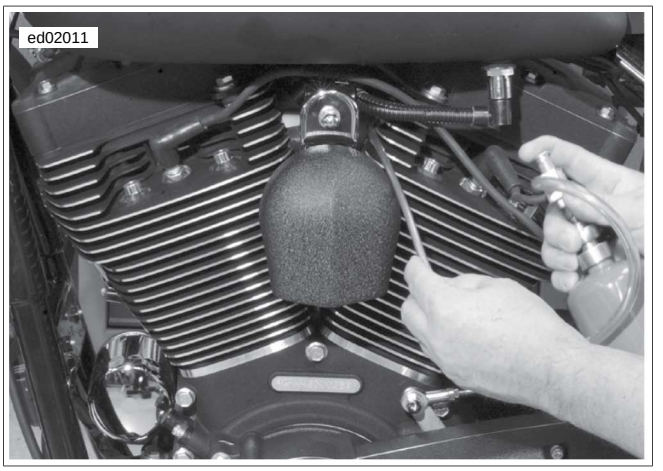


Figure 4-14. Checking for Leaks

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE CRANKS, BUT WILL NOT START 4.10

GENERAL

If the starter will not crank the engine, the problem is not EFI related. Refer to CHAPTER 1 - STARTING / CHARGING, CHAPTER 3 - TSM/HFSM or Appendix E - TSM/TSSM (Japan/Korea).

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-26792	SPARK TESTER
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER
HD-48637	BREAKOUT BOX

Diagnostic Notes

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

1. Check for Diagnostic Trouble Codes (DTCs). See 4.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI, Retrieving Diagnostic Trouble Codes.
2. Check the condition of the battery. Perform a voltage test and recharge if below 12.6V. Check battery connections and perform load test. Replace the battery if necessary. See Battery in the Service Manual.
3. Connect BREAKOUT BOX (Part No. HD-48637). See 4.7 BREAKOUT BOX: EFI.
4. Remove spark plug cable from spark plug.
   a. Visually check condition of plug.
   b. See Figure 4-15. Attach cable to SPARK TESTER (Part No. HD-26792). Clip tester to cylinder head bolt.
   c. While cranking engine, look for spark. Repeat procedure on other spark plug cables.

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.

5. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.
6. See Figure 4-16. Plug IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) and FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) into Breakout Box terminals "72" and "53". Start engine. If lamp flashes, no problem is found. Repeat for Breakout Box terminals "72" and "54".
7. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown socket probe and patch cord.

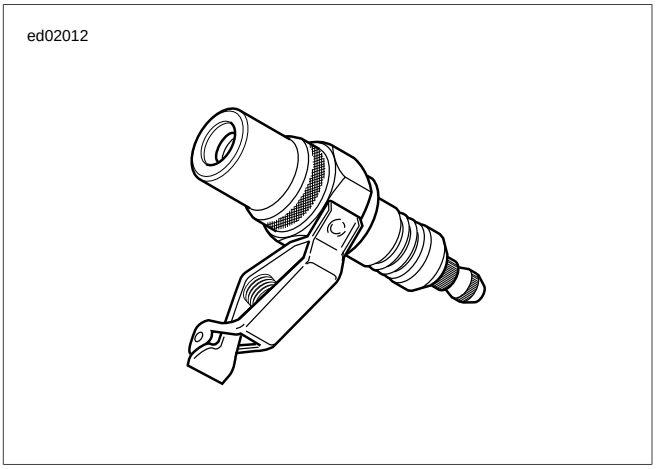


Figure 4-15. Spark Tester

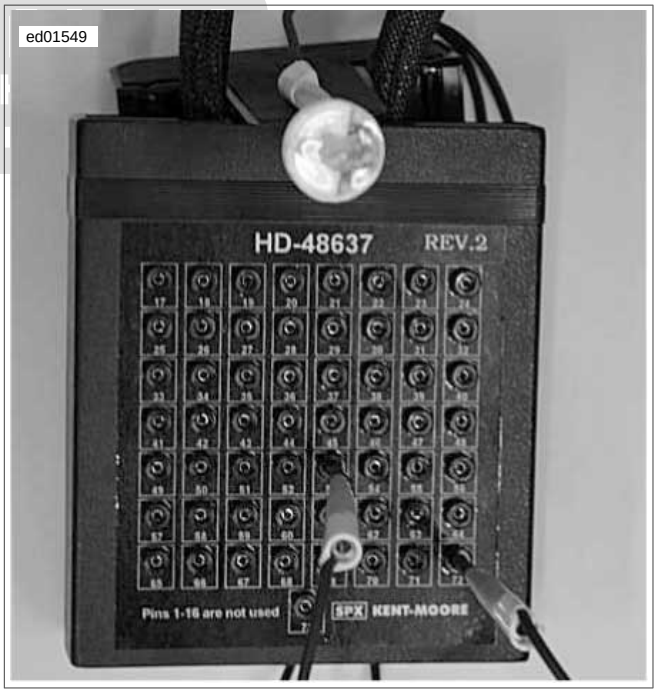


Figure 4-16. Ignition Coil Circuit Test

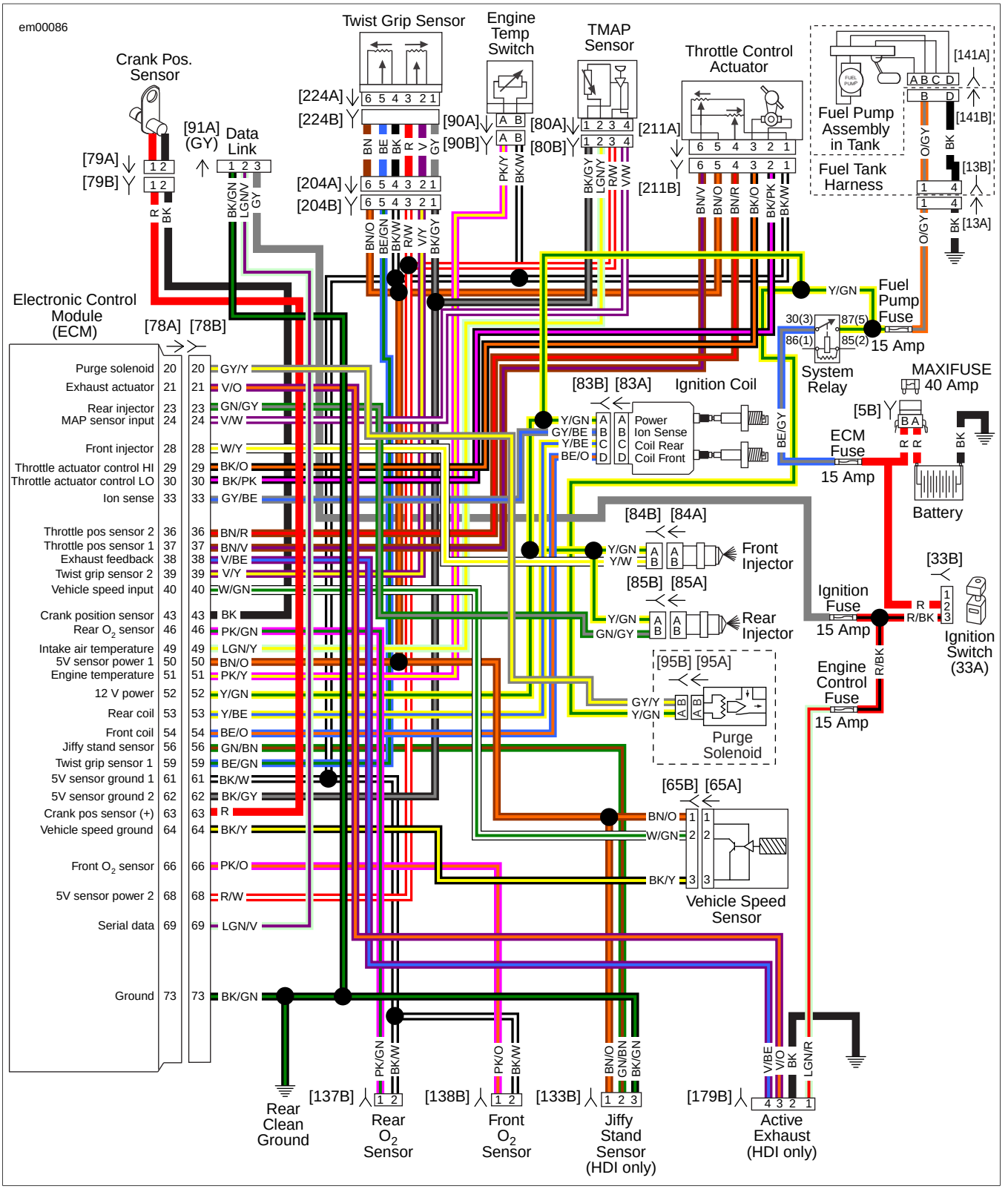


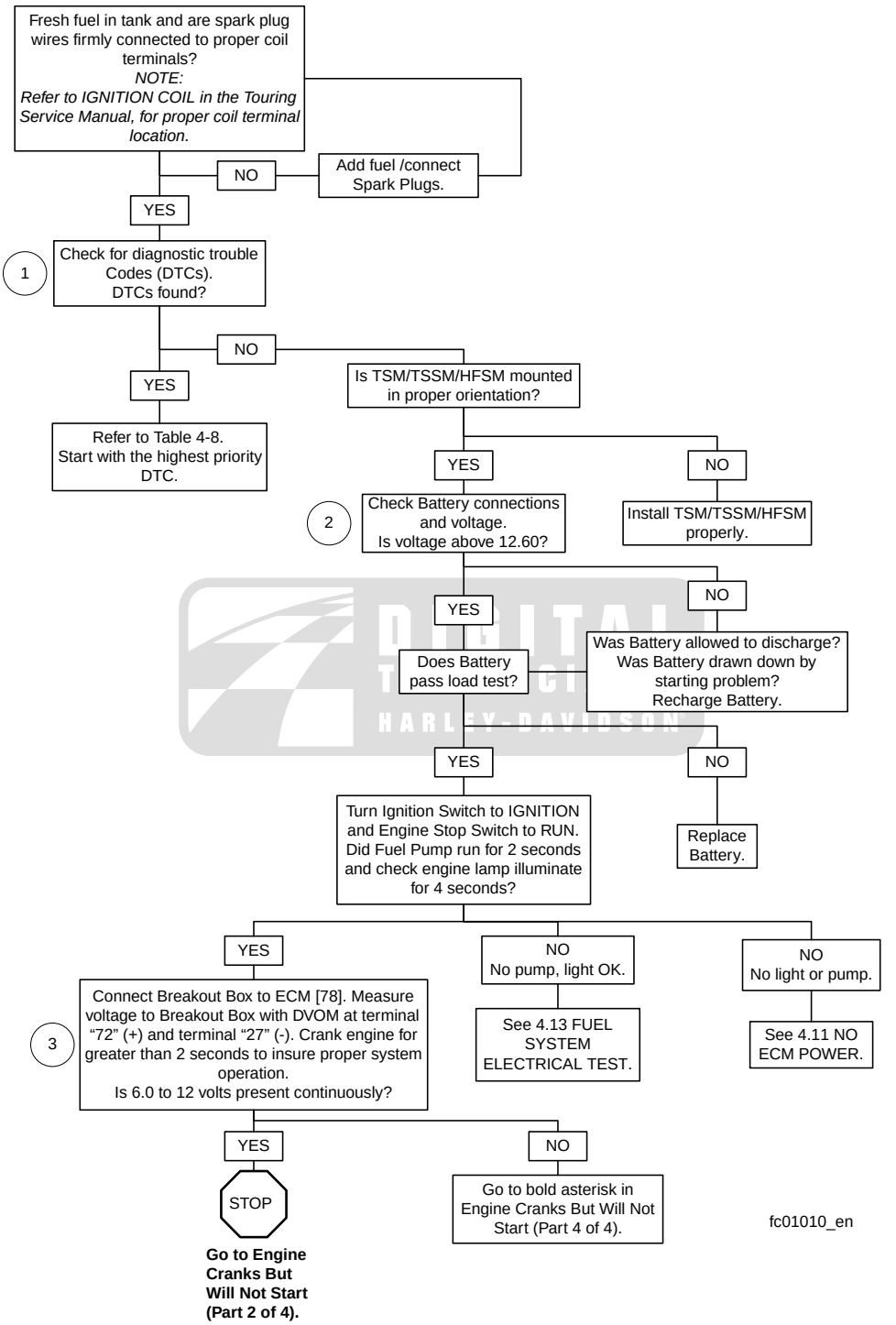
Figure 4-17. EFI Circuit

Table 4-11. Wire Harness Connectors

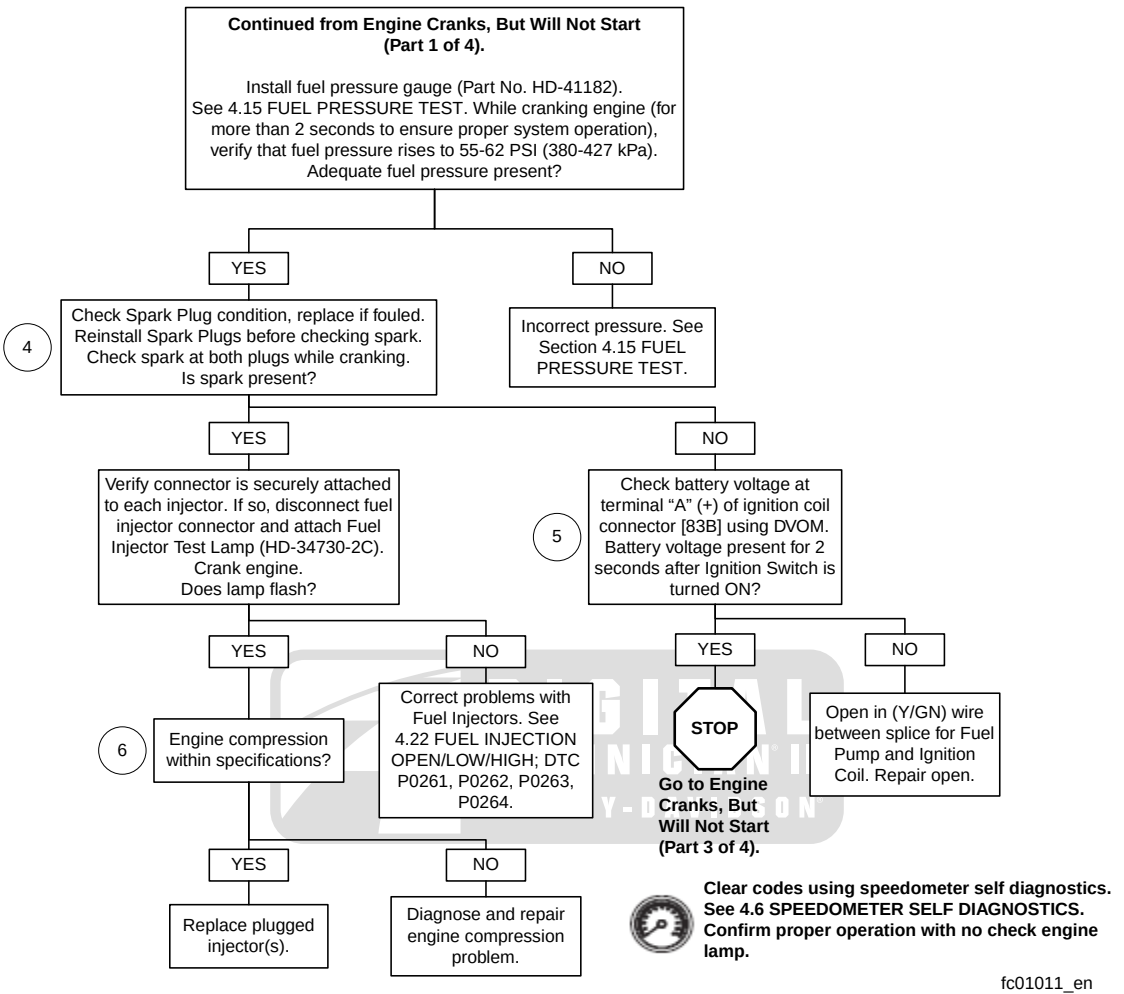
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[13]	Fuel tank harness	All	4-place Multilock	Behind fuel tank (under seat)
[33]	Ignition switch	FLHT/C/U/ FLHTR	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
		FLHR/C	3-place Packard	Under console
[65]	Vehicle Speed Sensor (VSS)	All	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	All	4-place Delphi	Top of induction module
[83]	Ignition coil	All	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	All	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	All	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	All	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[95]	Purge solenoid	All	2-place Delphi	Below fuel tank (left side)
[133]	Jiffy Stand Sensor	All	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	All	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	All	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	All	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	All	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	All	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	All	6-place Molex	Right side of engine (Induction Module)

DIGITAL TECHNICIAN HARLEY-DAVIDSON

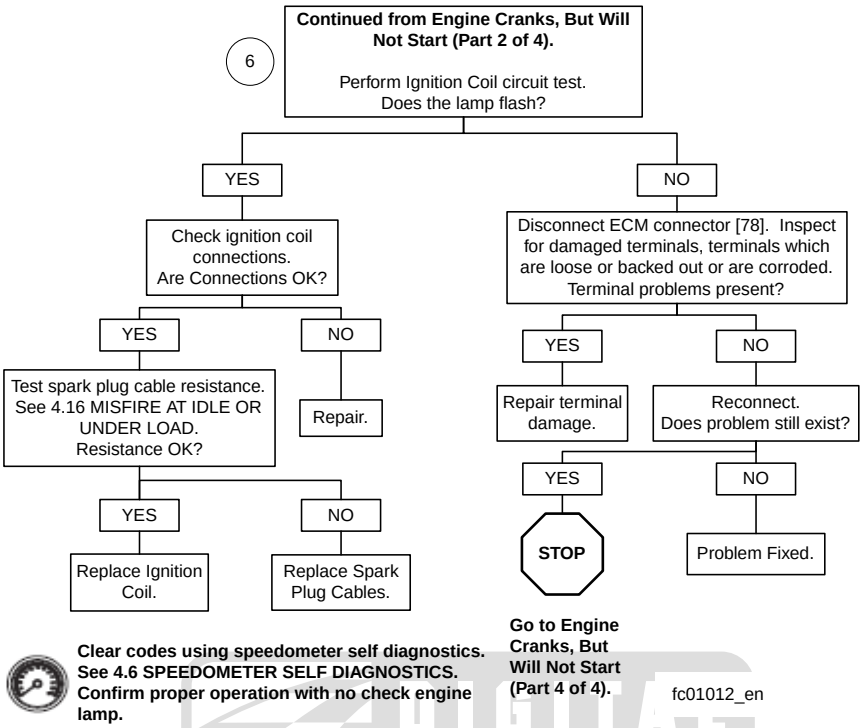
Engine Cranks, But Will Not Start (Part 1 of 4)



Engine Cranks, But Will Not Start (Part 2 of 4)

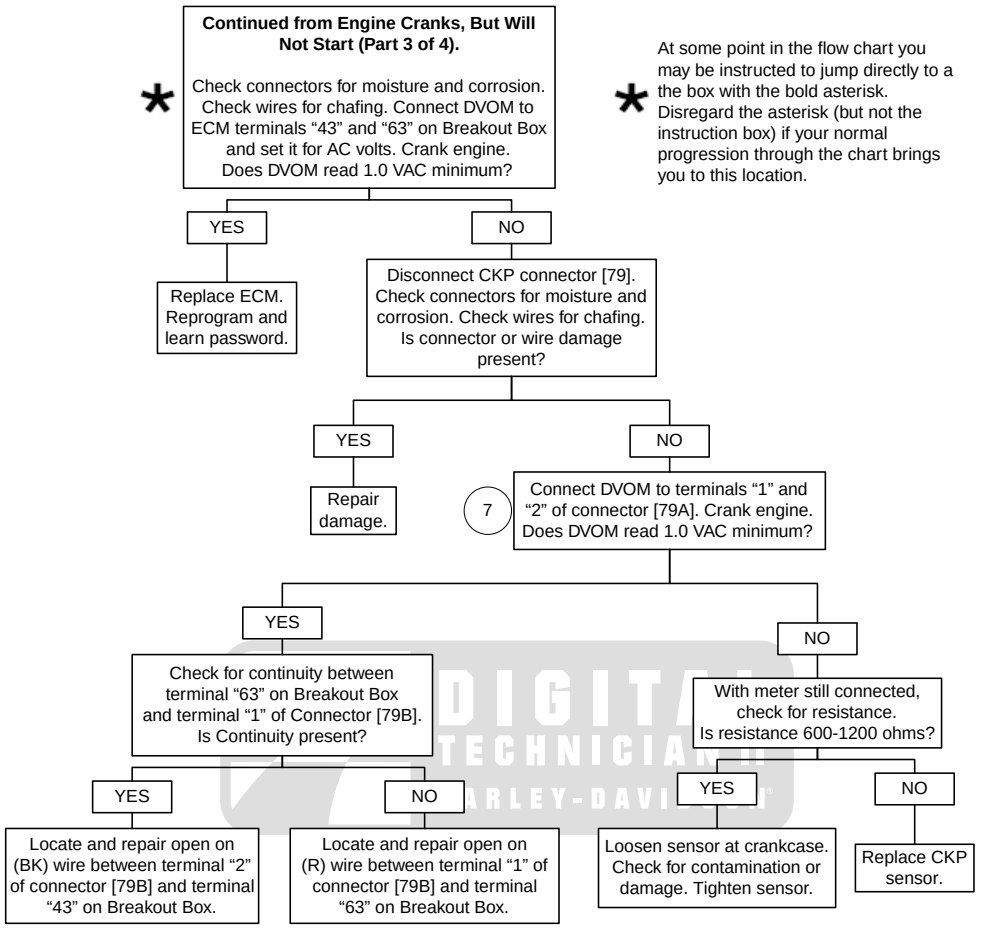


Engine Cranks, But Will Not Start (Part 3 of 4)



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Engine Cranks, But Will Not Start (Part 4 of 4)



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

Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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NO ECM POWER 4.11

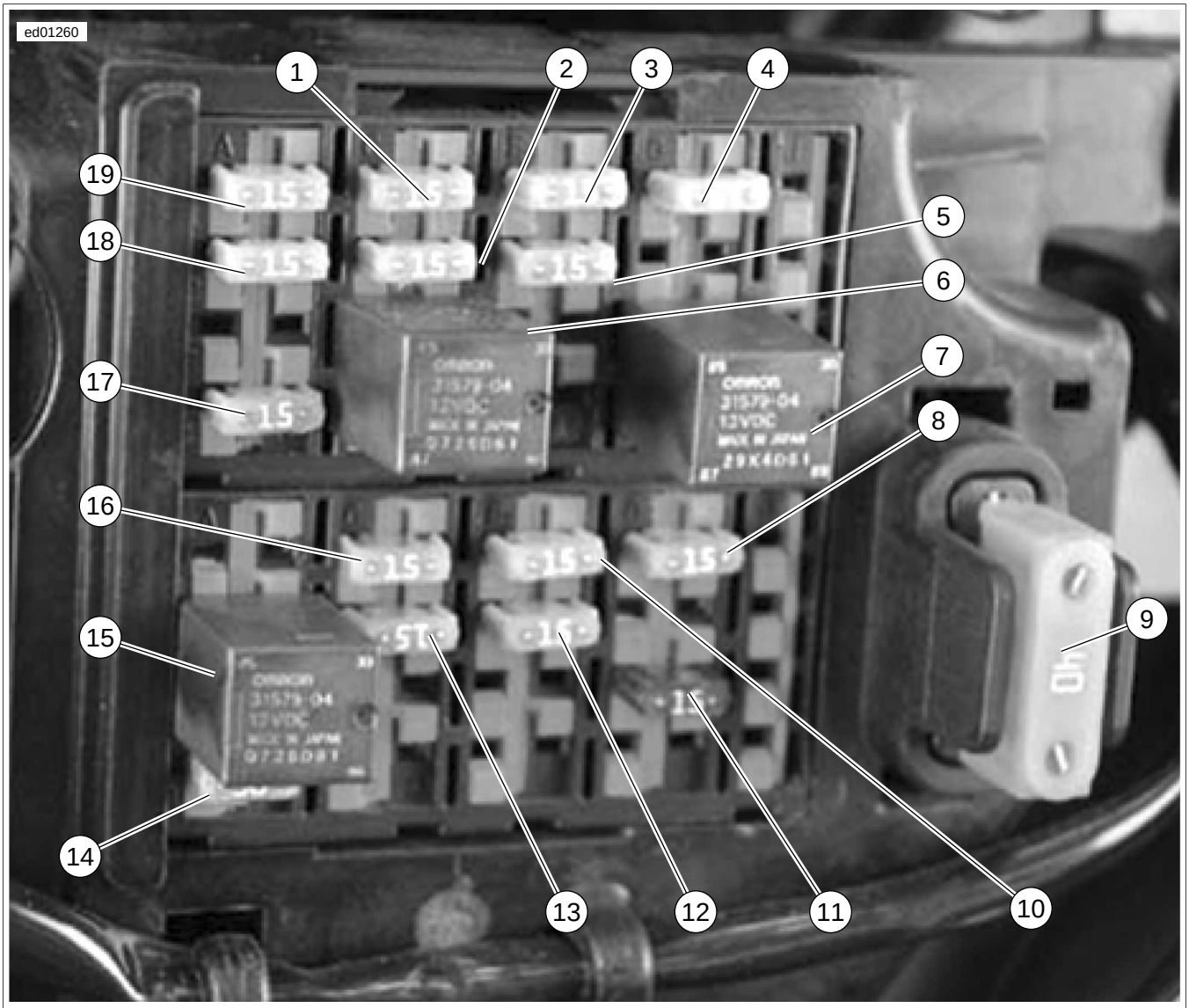
GENERAL

No Spark/No Check Engine Lamp at IGNITION

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 illuminate for 4 seconds and then (if parameters are normal) go out. See Figure 4-18, Figure 4-19, and Figure 4-20.

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.



1. **Accessory**
2. **Battery**
3. **P&A**
4. **Radio power/Siren (if equipped)**
5. **ECM power**
6. **System relay**
7. **Start relay**
8. **Engine control**
9. **MAXIFUSE**
10. **Ignition**
11. **Spare**
12. **Lights**
13. **Headlamp**
14. **ABS (if equipped)**
15. **Brake relay**
16. **Instruments**
17. **Fuel pump**
18. **Radio memory (if equipped)**
19. **Brake/Cruise**

Figure 4-18. Fuse and Relay Locations

DIAGNOSTICS

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637). See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B); purple probes and patch cords.

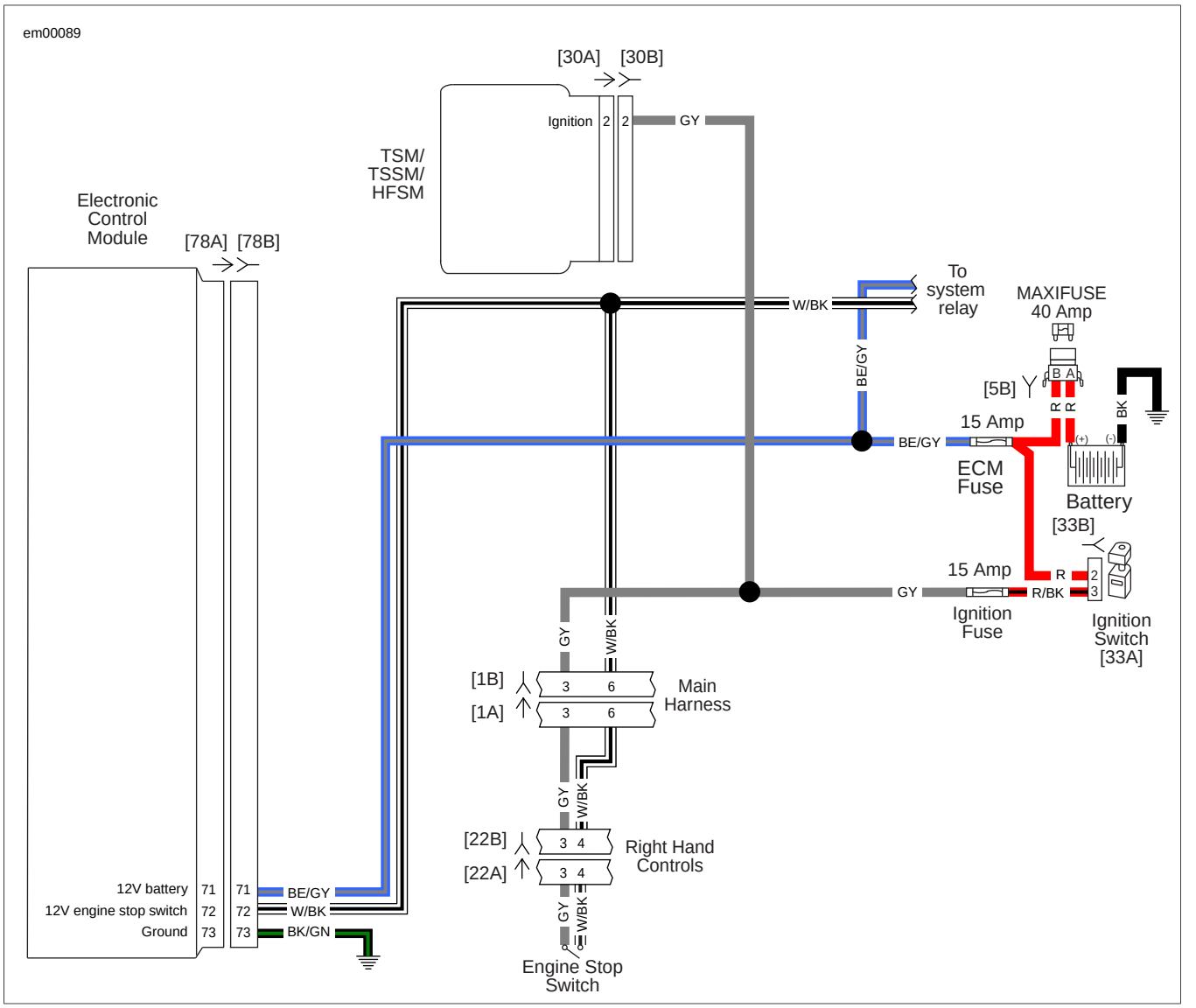


Figure 4-19. ECM Power Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-12. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (Black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[22]	Right handlebar switches	12-place Molex (Black)	Inner fairing (fork stem nut lock plate)
[30]	TSM/TSSM/HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)

Table 4-12. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[33]	Ignition switch	3-place Packard	Inner fairing - under radio
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat

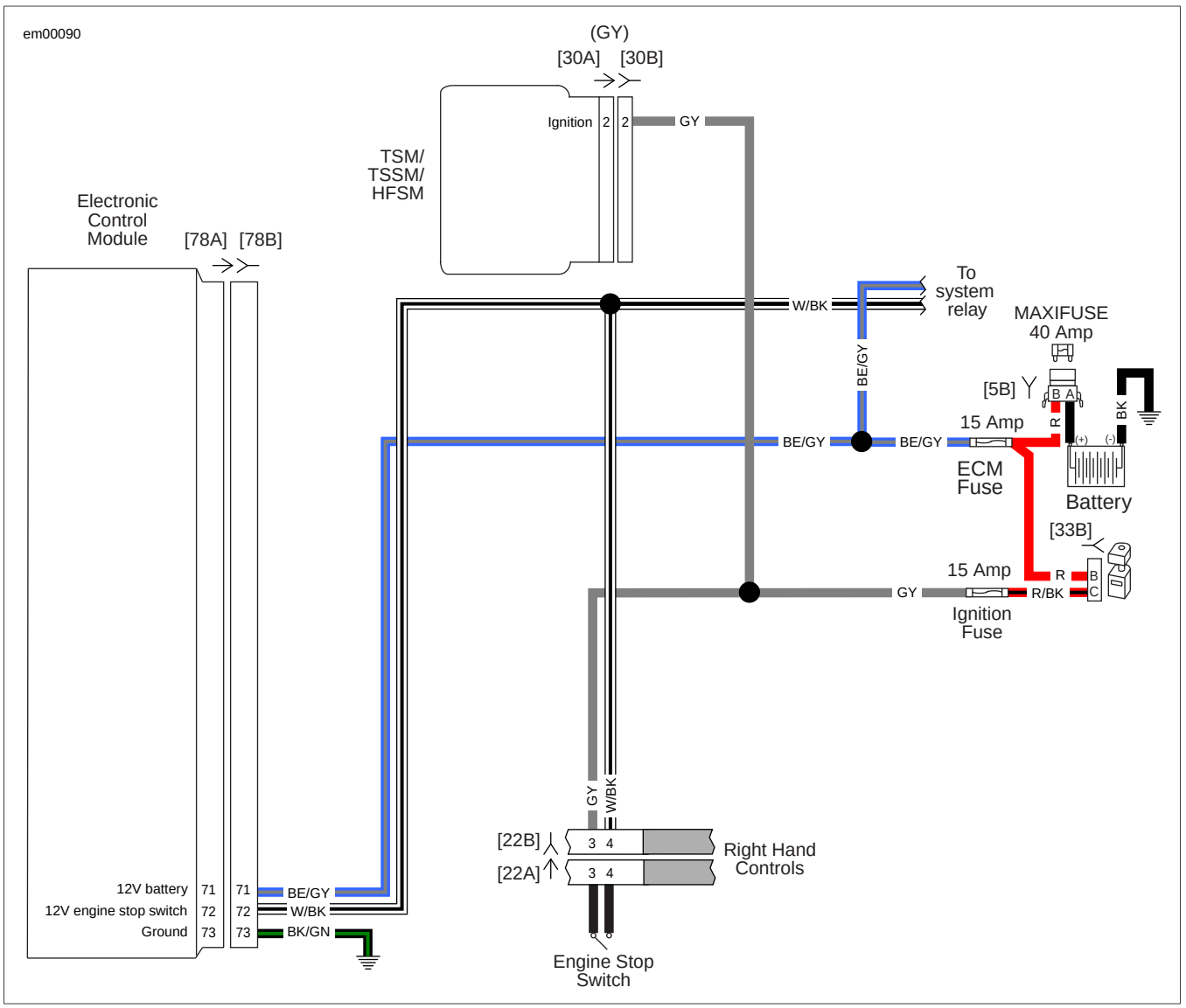
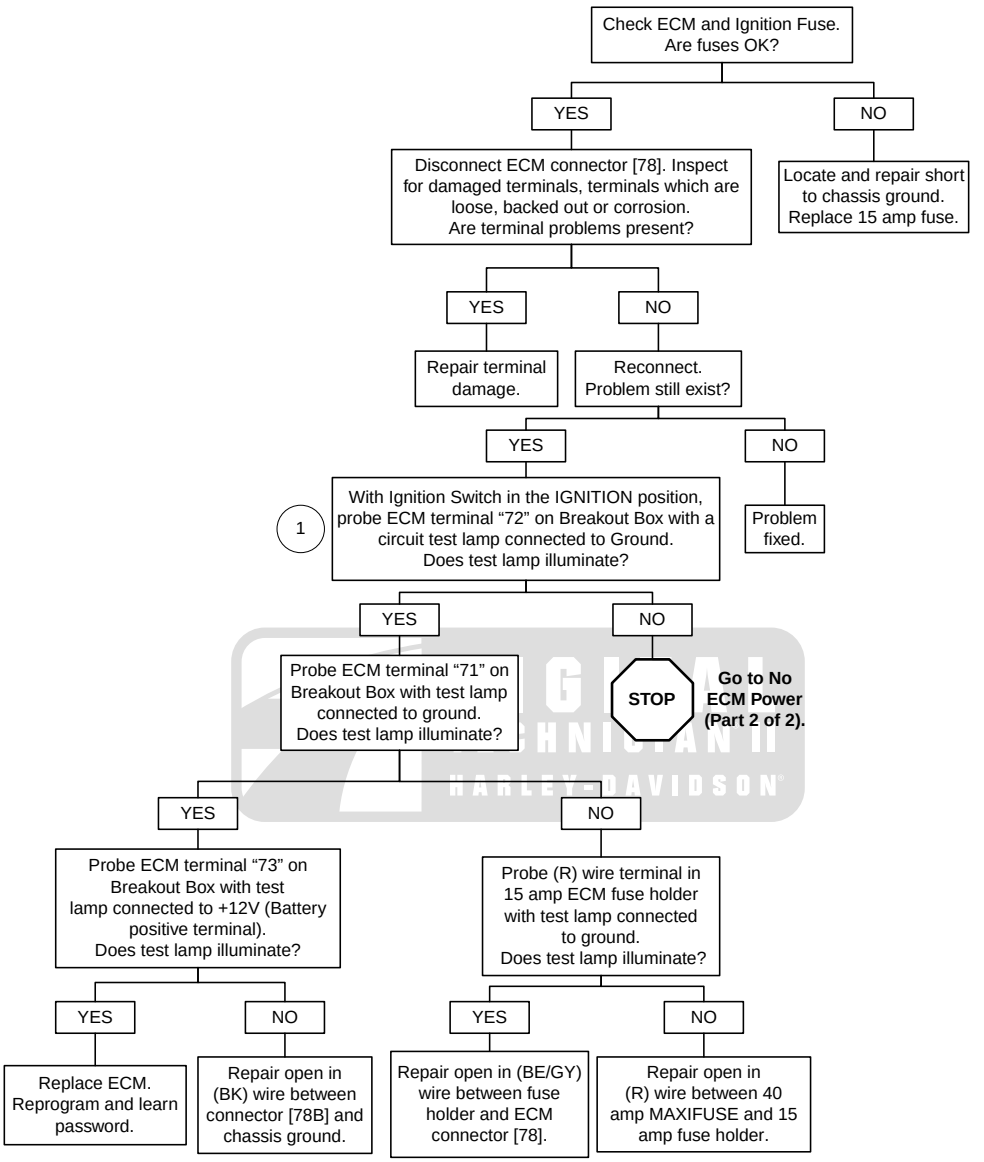


Figure 4-20. ECM Power Circuit (FLHR/C/S)

Table 4-13. Wire Harness Connectors

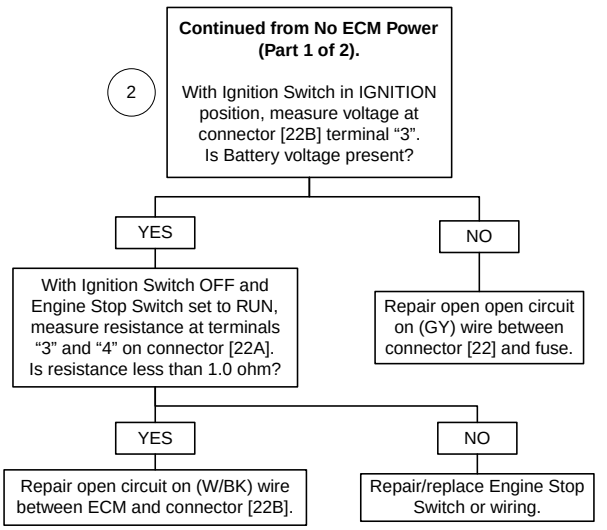
NO.	DESCRIPTION	TYPE	LOCATION
[22]	Right handlebar switches	6-place Molex (Black)	Inside headlamp nacelle
[33]	Ignition switch	3-place Packard	Under console
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat

No ECM Power (Part 1 of 2)



fc01014_en

No ECM Power (Part 2 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01015_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

STARTS, THEN STALLS 4.12

GENERAL

Diagnostic Trouble Codes U1300, U1301, or BUS ER

The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a digital volt/ohmmeter (DVOM). In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6-0.8 volt. The range for acceptable operations is greater than 0 and less than 7.0 volts.

NOTE

Problems in the fuel system may also create this symptom.

Table 4-14. Code Description

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



Figure 4-21. ECM Data Link Connector

DIAGNOSTICS

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

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 the vehicle is equipped with the Advanced Audio System and the radio ground and antenna ground are open, a serial data BUS fault may occur causing a start and stall condition.

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black socket probes and patch cord.
2. Unplug the neutral switch connector [131]. Using a DVOM, test for continuity between terminals "A" and "B" of the Neutral Switch. When the transmission is in NEUTRAL, continuity should exist. When the transmission is in gear, there should not be continuity through the Neutral Switch.

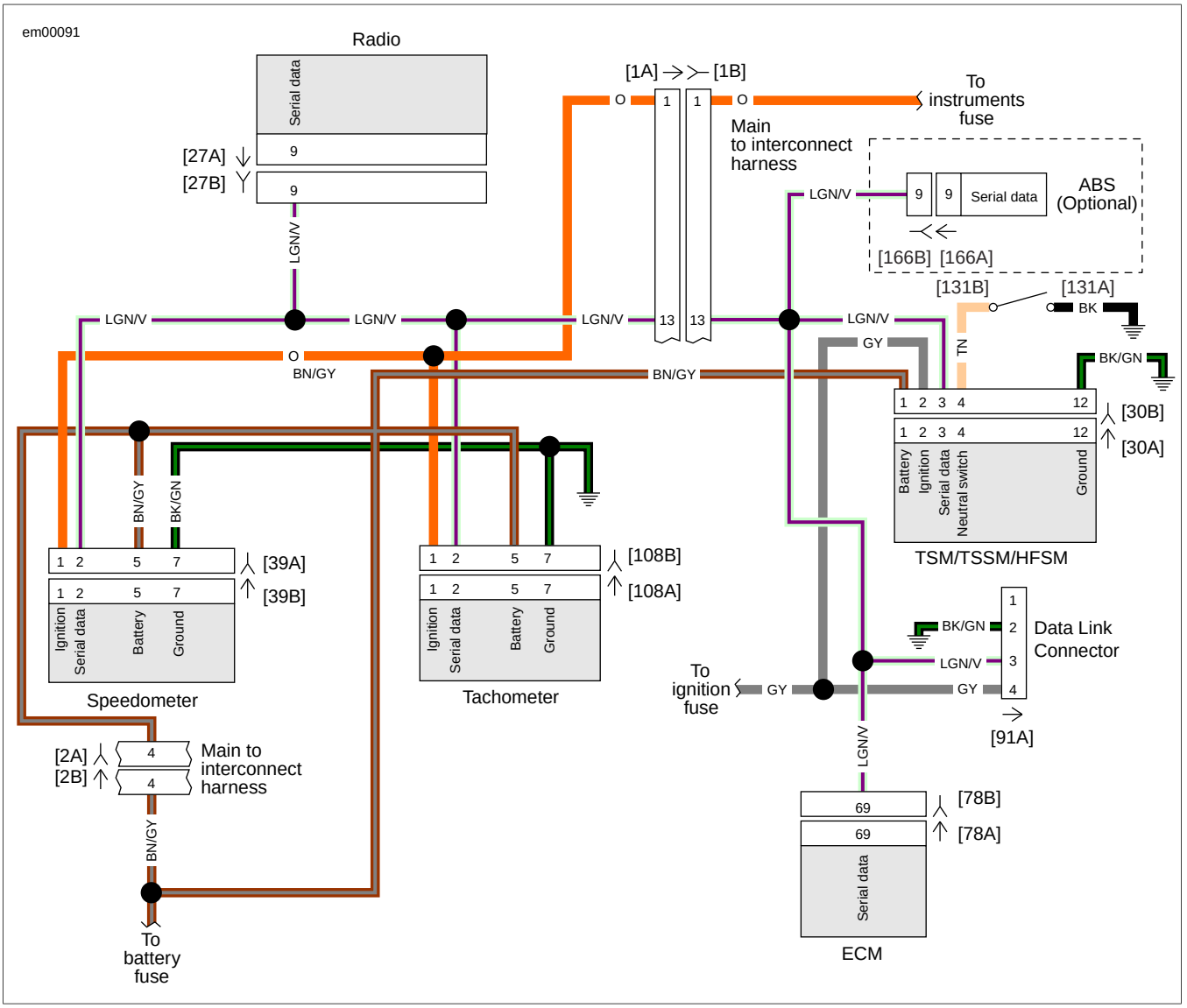


Figure 4-22. Serial Data Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-15. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (gray)	Inner fairing - right fairing support brace
		FLTR	12-place Molex (gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover

Table 4-15. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[131]	Neutral switch	All	Post terminal	Top of transmission (right side)
[166]	ABS module	All	20-place Molex	Under right side cover

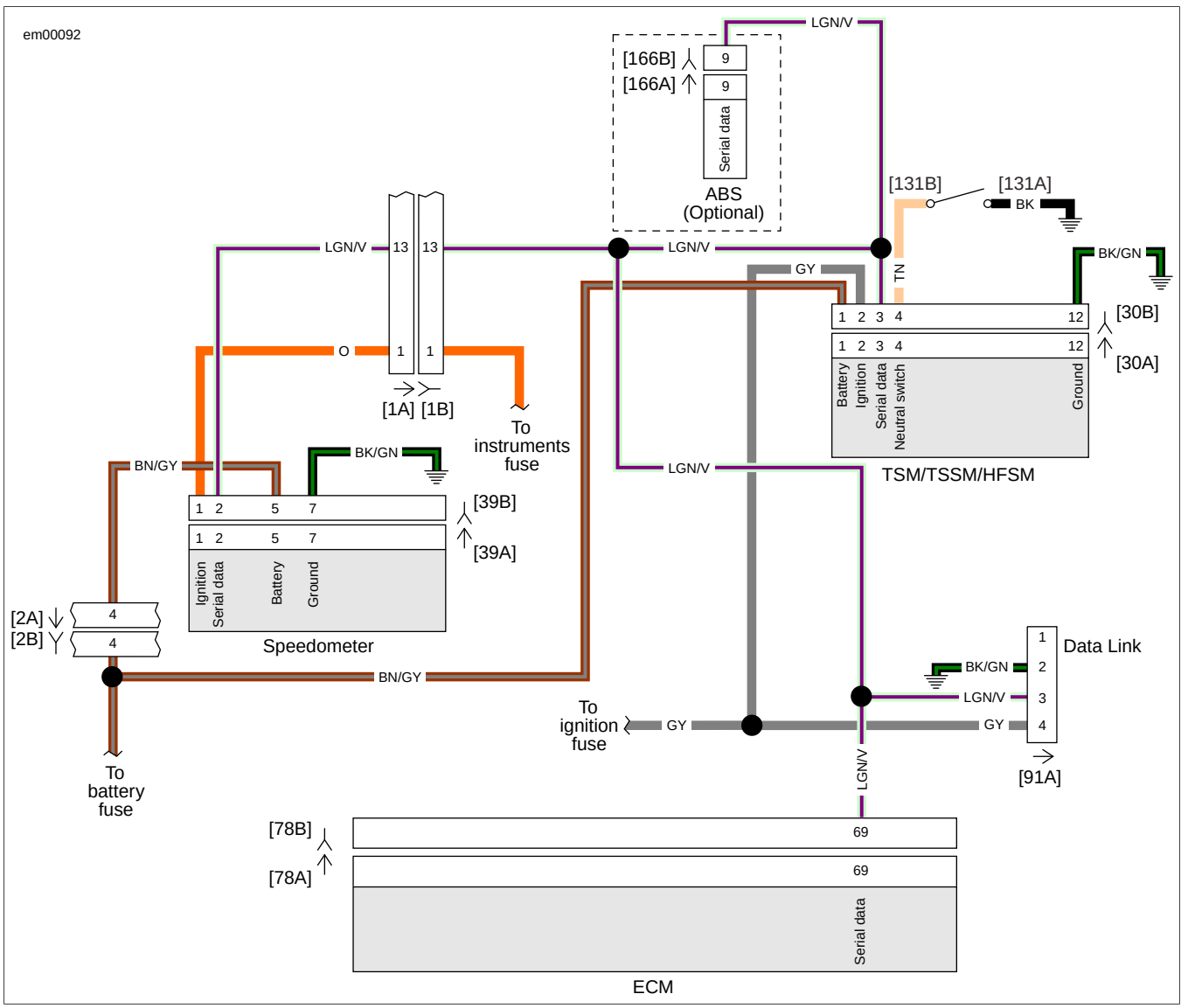


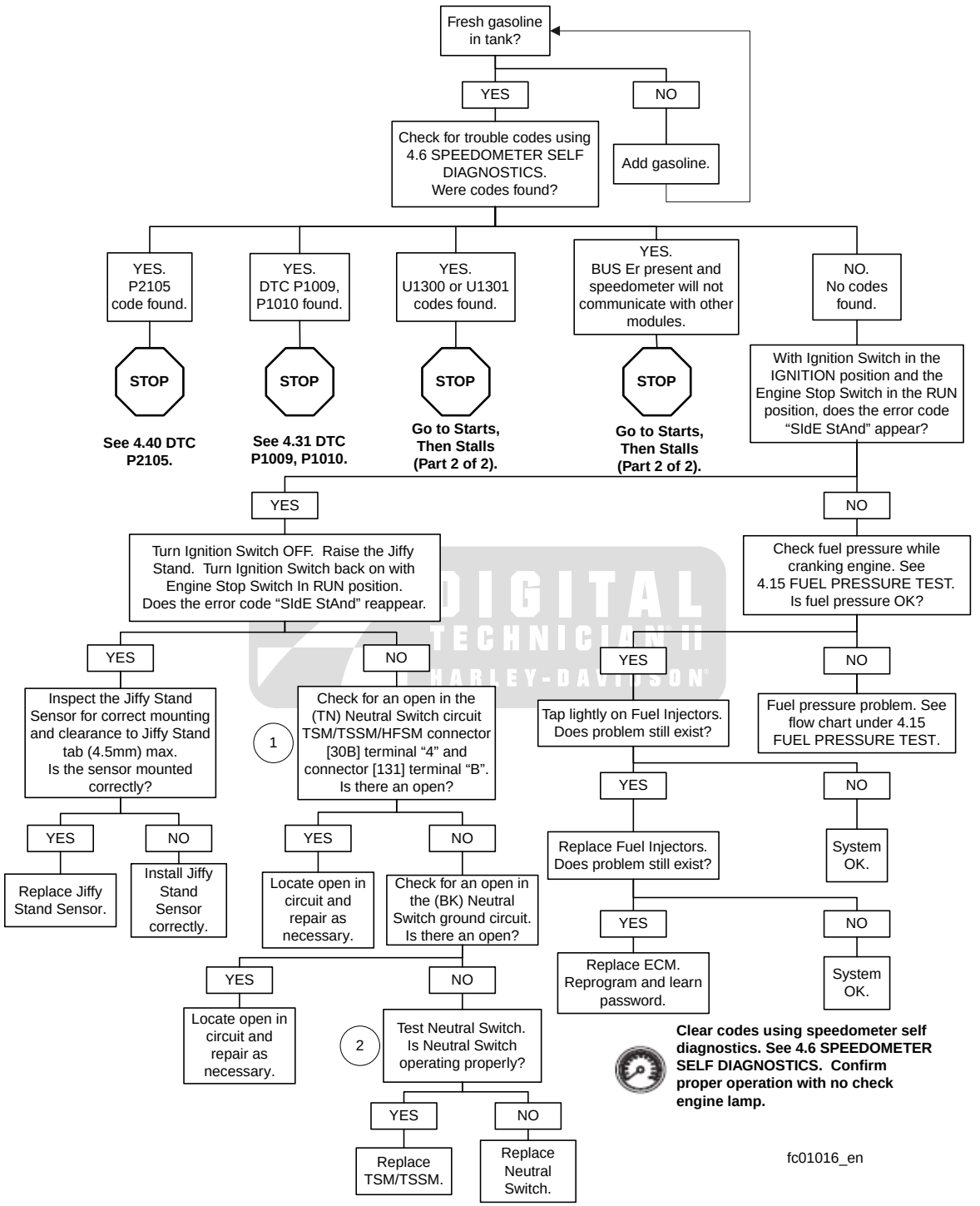
Figure 4-23. Serial Data Circuit (FLHR/C/S)

Table 4-16. Wire Harness Connectors

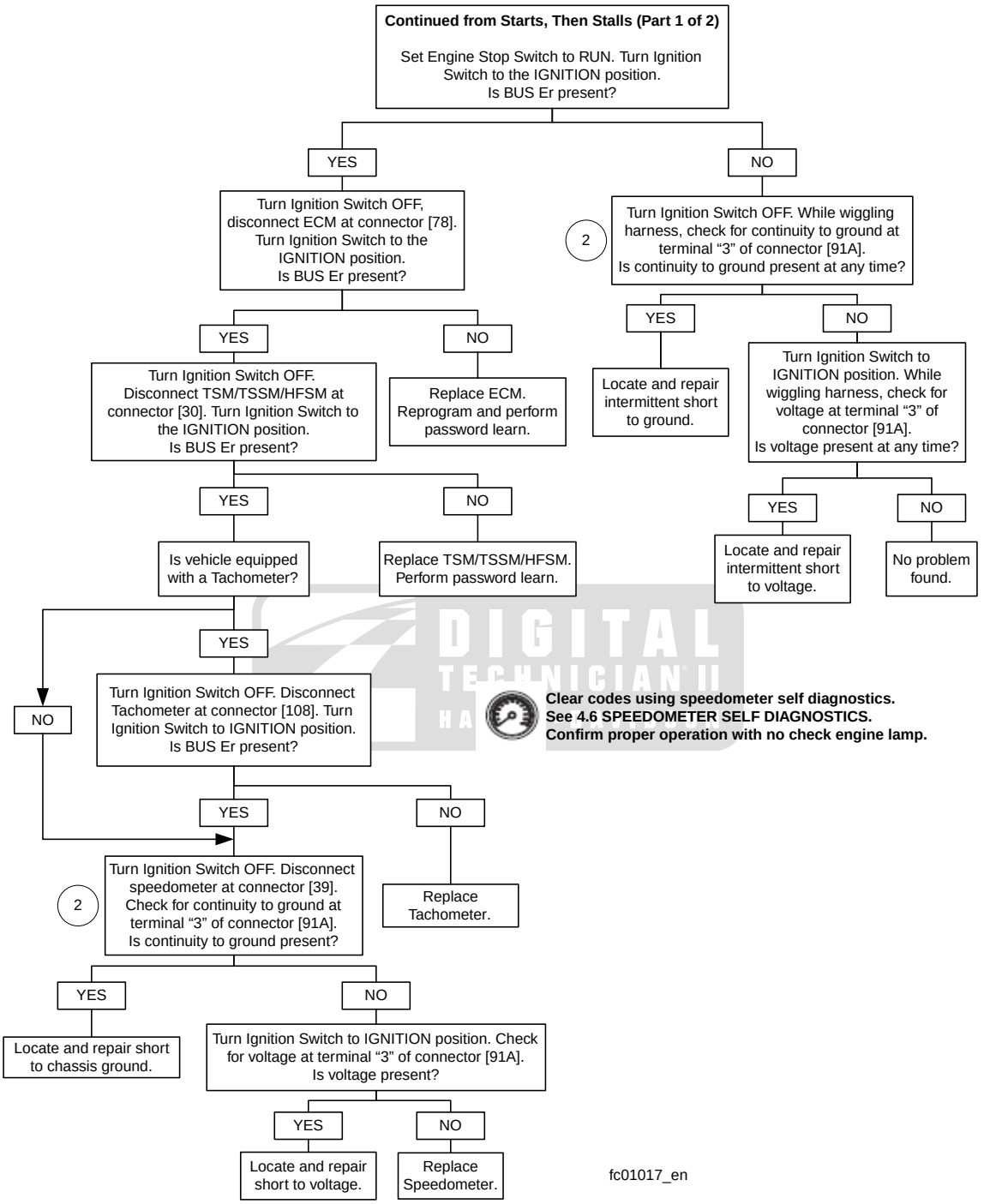
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (Black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (Gray)	Inner fairing - left radio support bracket
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of Speedometer)
[78]	Electronic Control Module (ECM)	76-place Delphi	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[131]	Neutral switch	Post terminal	Top of transmission (right side)
[166]	ABS module	20-place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starts, Then Stalls (Part 1 of 2)



Starts, Then Stalls (Part 2 of 2)



FUEL SYSTEM ELECTRICAL TEST 4.13

GENERAL

With the Ignition Switch on and the Engine Stop Switch at RUN, the Electronic Control Module (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 on or engine has stalled, or immediately after the ignition is shut off.

The fuel pump delivers fuel to the injectors. The pressure regulator is where the system pressure is controlled. Excess fuel flow is bypassed into the fuel tank through the pressure regulator. When the engine is stopped, the pump can be turned on by applying battery voltage and ground to the fuel pump connector [141A].

See Figure 4-24. The fuel pump connector is located forward of the fuse blocks. Improper fuel system pressure may contribute to one or all of the following symptoms.

- Engine cranks, but won't run.
- Engine cuts out (may feel like ignition problems).
- Hesitation, loss of power and poor fuel economy.

NOTE

After turning the ignition off, you must wait 10 seconds before turning the ignition back on to get the fuel pump to reprime. This time out period is necessary for the ECM to reset.

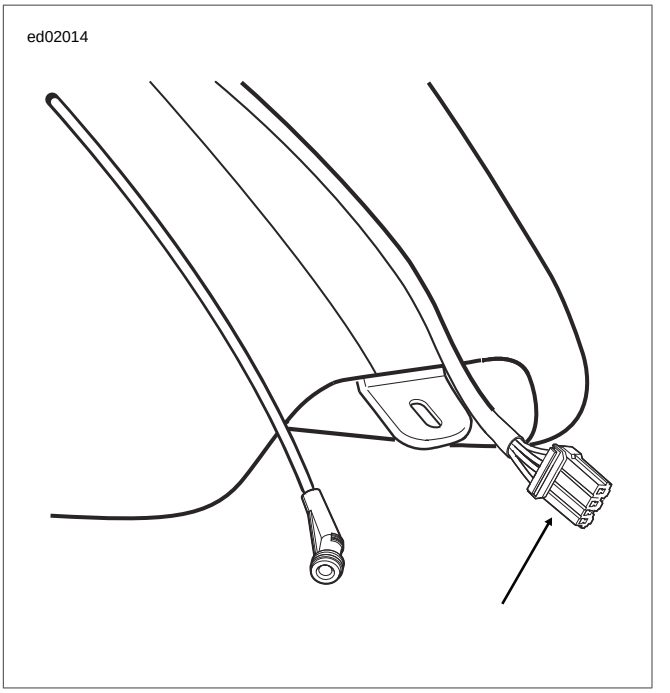


Figure 4-24. Fuel Pump/Fuel Level Sender Connector (FLHX, FLHT/C/U, FLTR)

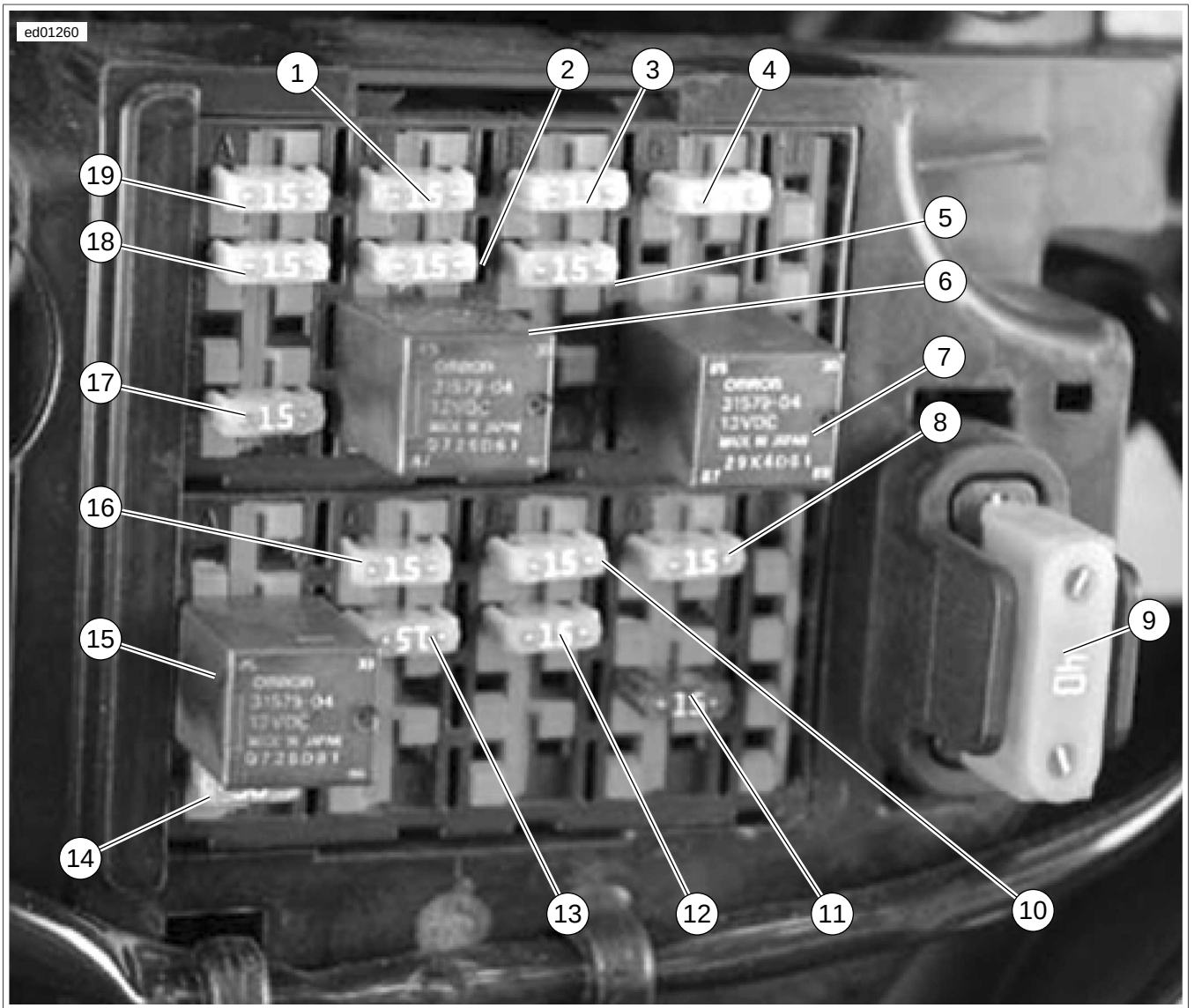
DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-43876	BREAKOUT BOX

Diagnostic Notes

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

1. Turns on fuel pump if wiring is OK. If pump runs, problem is in basic fuel delivery.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray probe and patch cord.
3. Connect BREAKOUT BOX (Part No. HD-43876). See 4.7 BREAKOUT BOX: EFI.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.



1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure 4-25. Fuse and Relay Locations

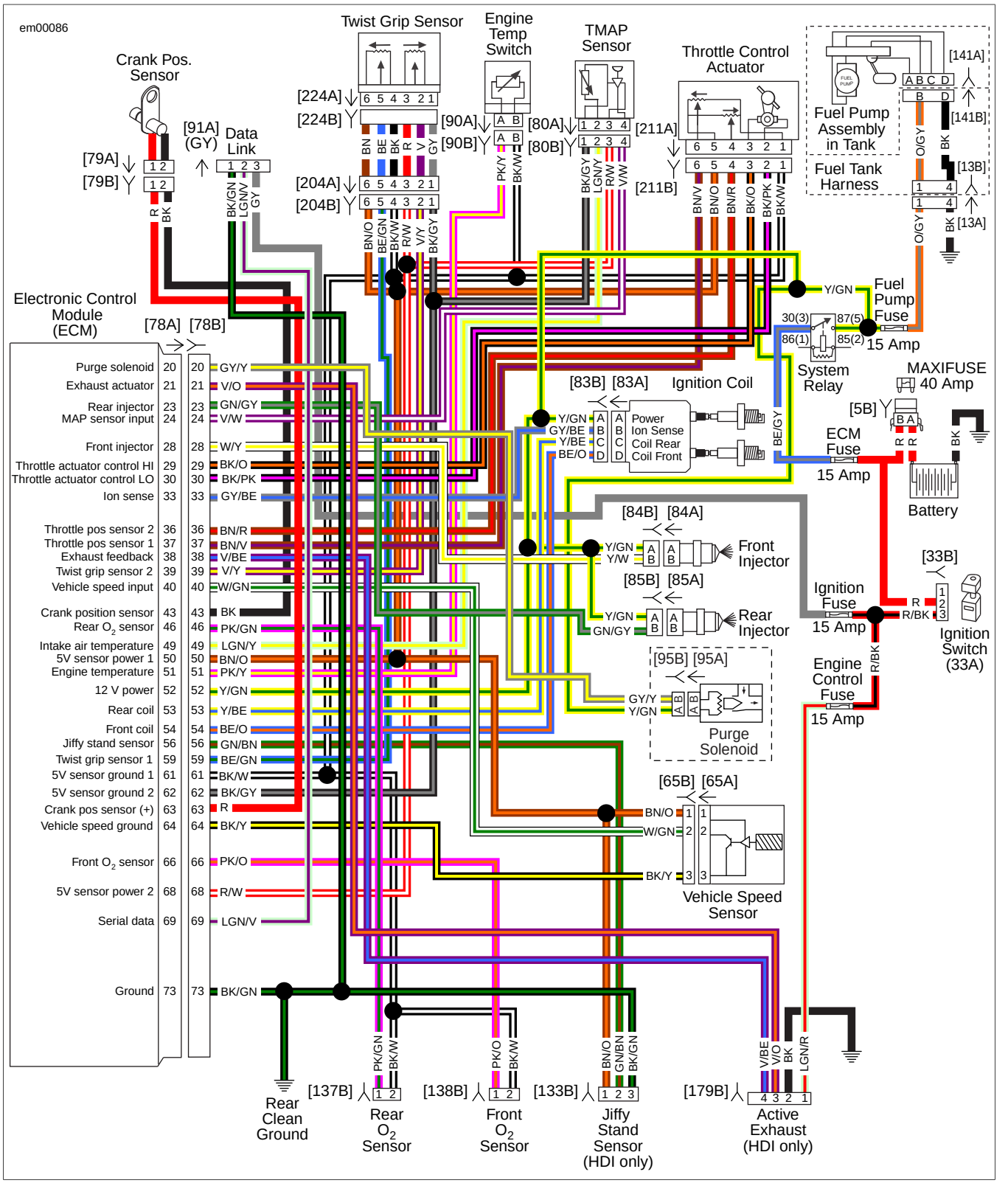


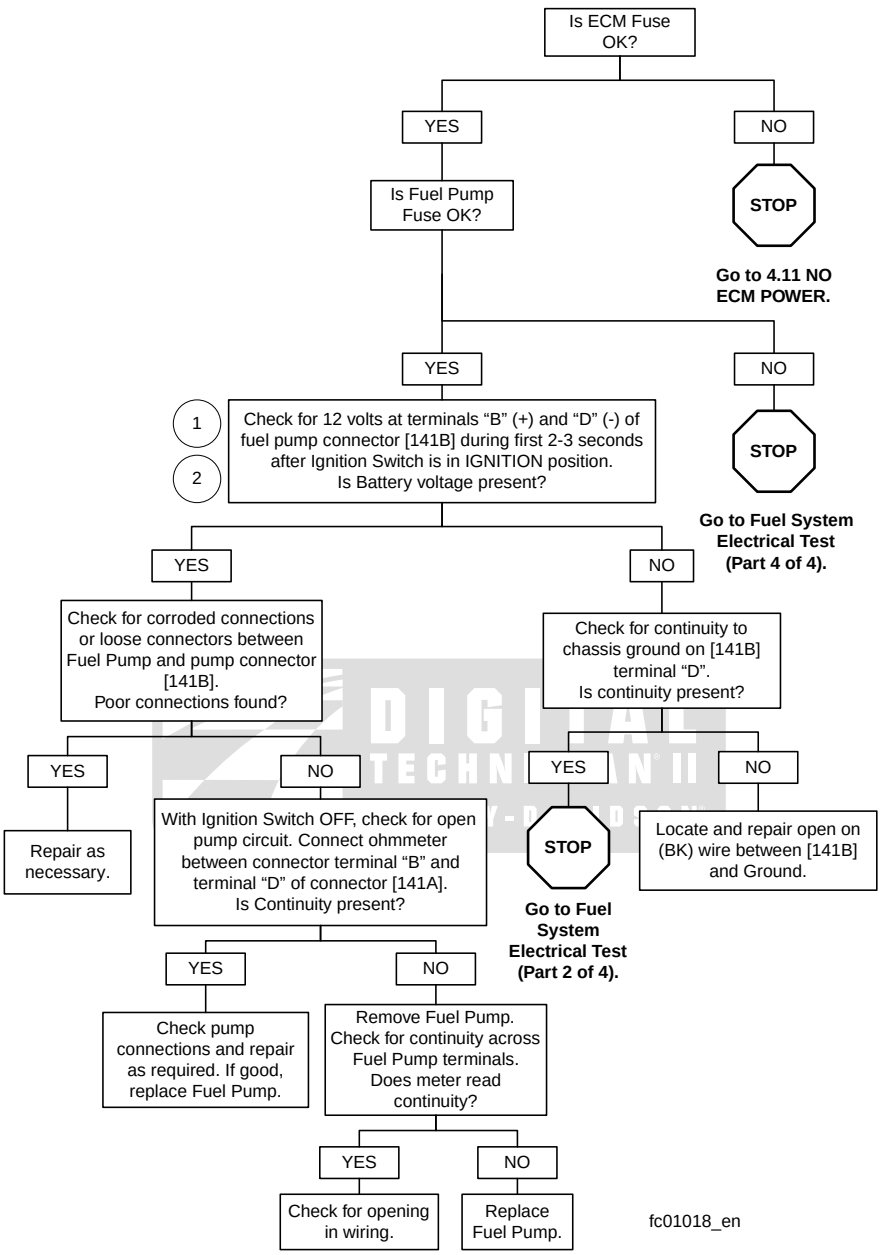
Figure 4-26. EFI Circuit

Table 4-17. Wire Harness Connectors

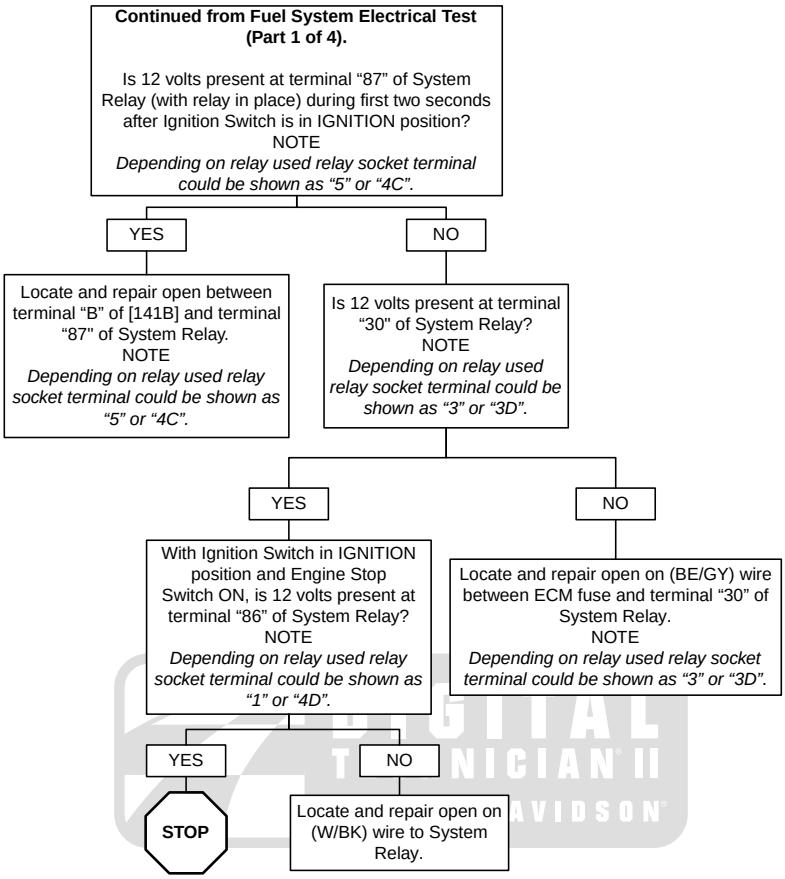
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[13]	Fuel tank harness	All	4-place Multilock	Behind fuel tank (under seat)
[33]	Ignition switch	FLHT/C/U/ FLHTR	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
		FLHR/C	3-place Packard	Under console
[65]	Vehicle Speed Sensor (VSS)	All	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	All	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	All	4-place Delphi	Top of induction module
[83]	Ignition coil	All	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	All	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	All	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	All	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[95]	Purge solenoid	All	2-place Delphi	Below fuel tank (left side)
[133]	Jiffy Stand Sensor	All	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	All	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	All	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	All	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	All	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	All	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	All	6-place Molex	Right side of engine (Induction Module)

DIGITAL TECHNICIAN HARLEY-DAVIDSON

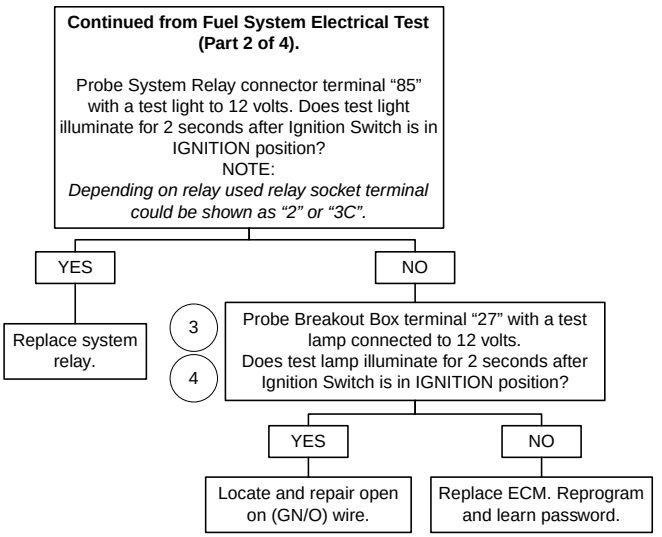
Fuel System Electrical Test (Part 1 of 4)



Fuel System Electrical Test (Part 2 of 4)

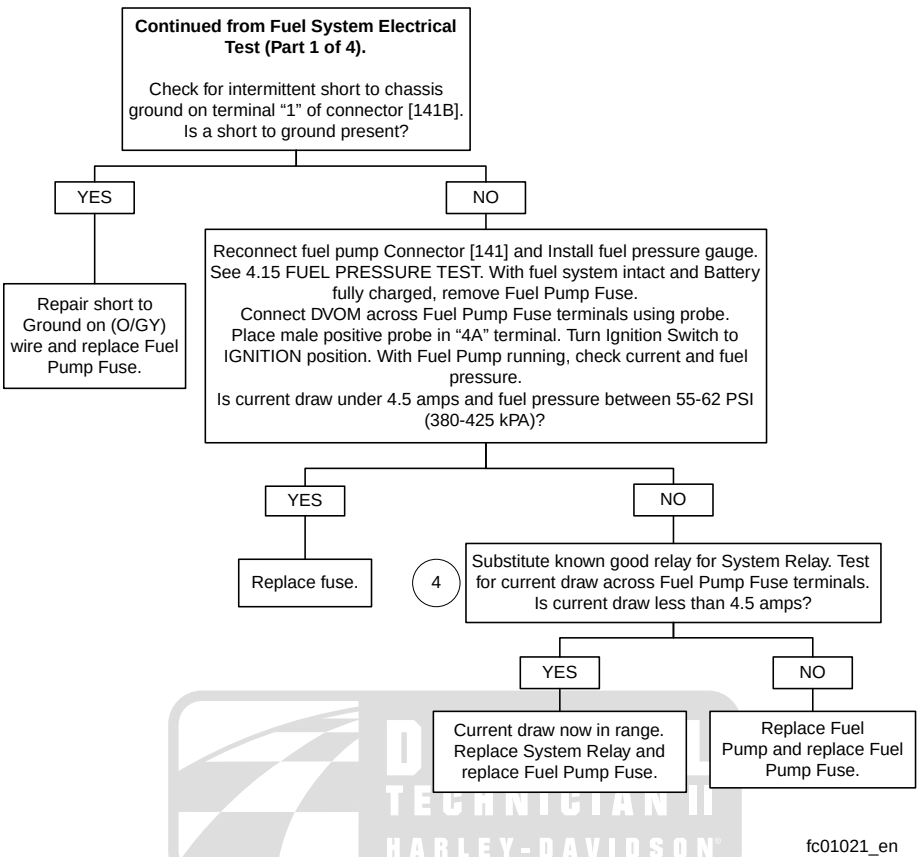


Fuel System Electrical Test (Part 3 of 4)



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Fuel System Electrical Test (Part 4 of 4)



TECHNICIAN II
HARLEY-DAVIDSON

SYSTEM RELAY FAULT 4.14

GENERAL

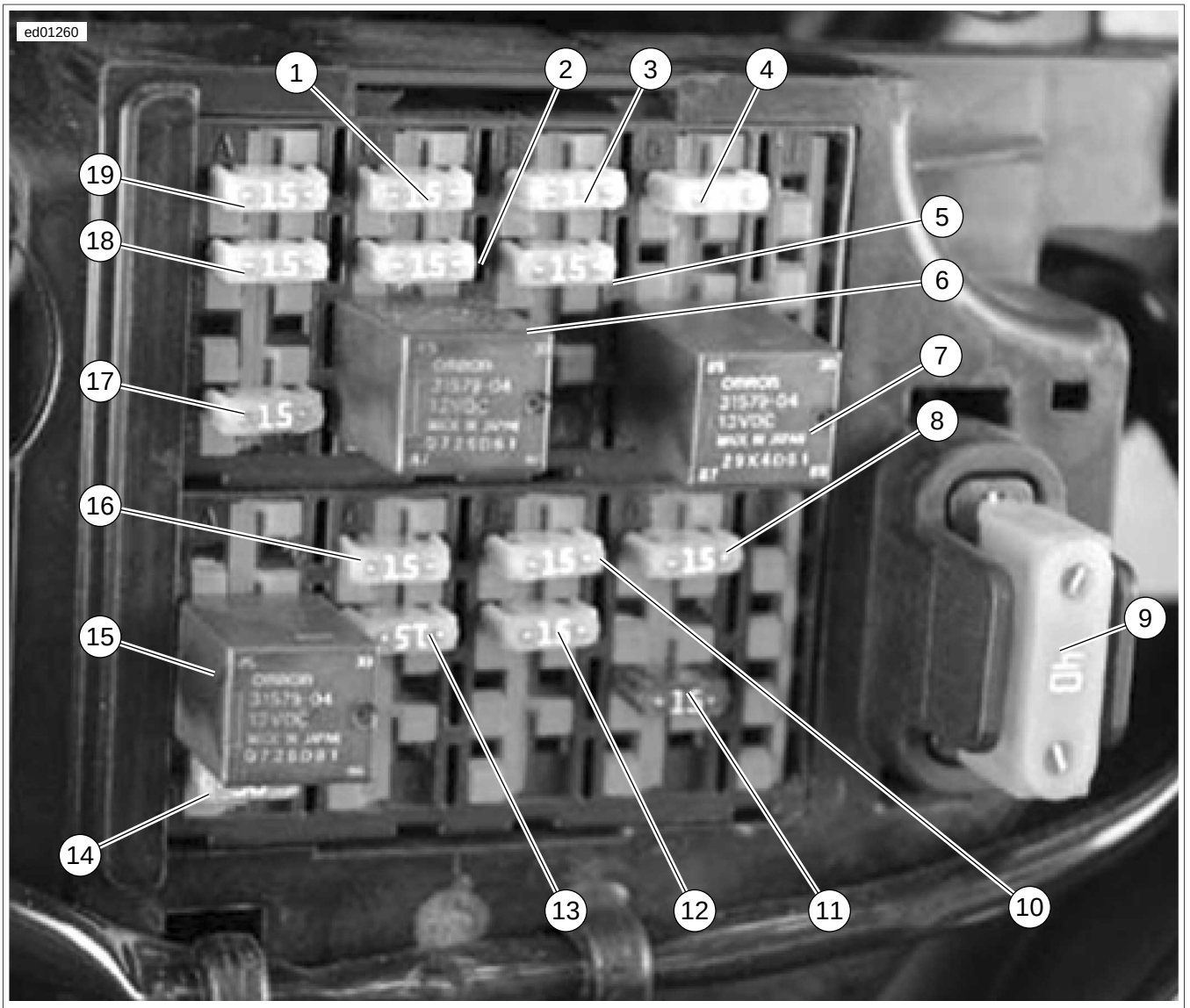
System Relay

See Figure 4-27. With the Ignition Switch 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 coil, 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 the ignition is ON or the engine has stalled, or immediately after the ignition is shut off.

Table 4-18. 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

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Accessory**
2. **Battery**
3. **P&A**
4. **Radio power/Siren (if equipped)**
5. **ECM power**
6. **System relay**
7. **Start relay**
8. **Engine control**
9. **MAXIFUSE**
10. **Ignition**
11. **Spare**
12. **Lights**
13. **Headlamp**
14. **ABS (if equipped)**
15. **Brake relay**
16. **Instruments**
17. **Fuel pump**
18. **Radio memory (if equipped)**
19. **Brake/Cruise**

Figure 4-27. Fuse and Relay Locations

DIAGNOSTICS

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

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.
2. Connect BREAKOUT BOX (Part No. HD-48637) to ECM. See 4.7 BREAKOUT BOX: EFI.

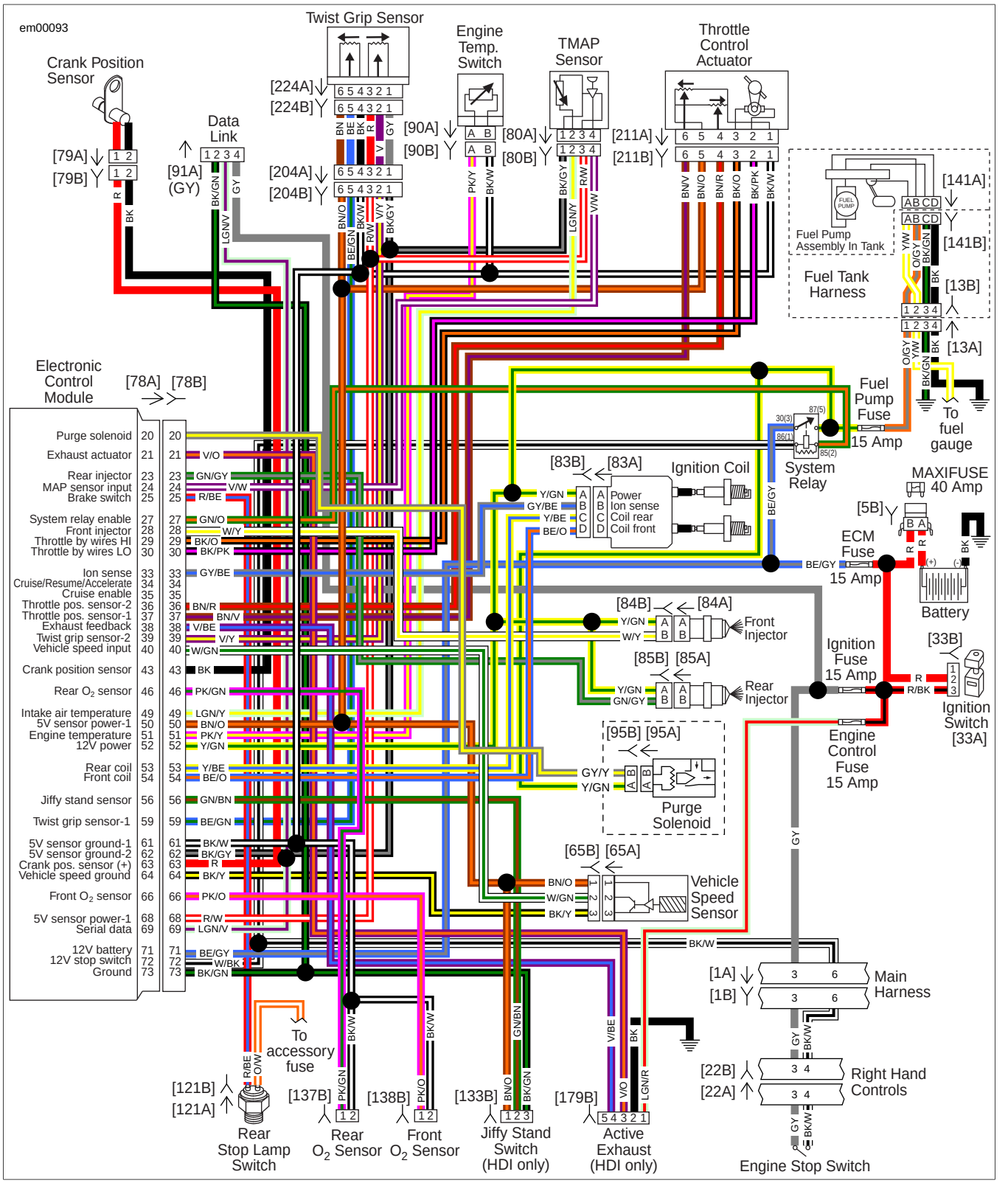


Figure 4-28. System Relay Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-19. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Delphi	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[121]	Rear brake light switch	Spade terminal	Bottom of rear frame downtub (right side)
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	6-place Molex	Right side of engine (induction module)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

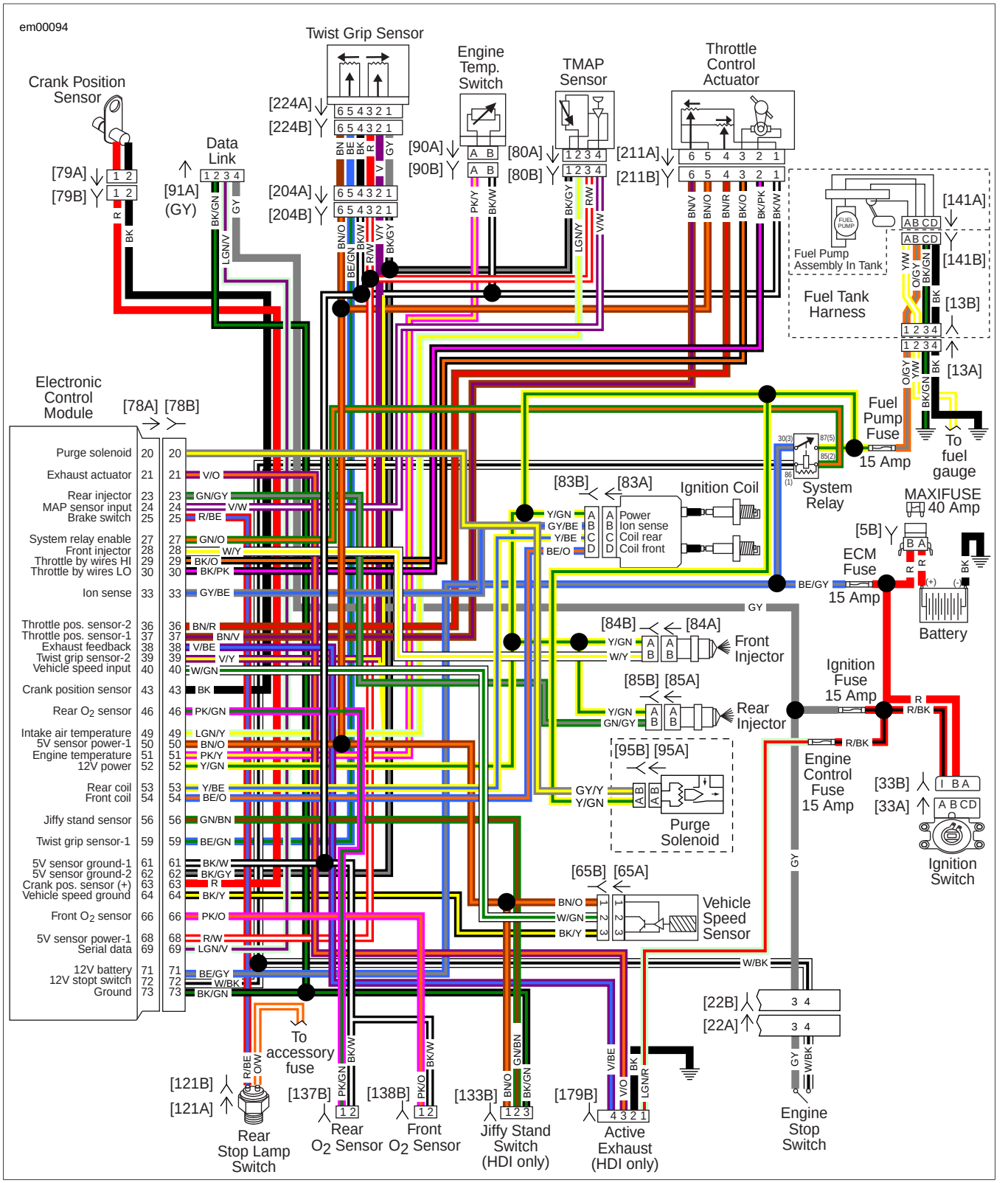


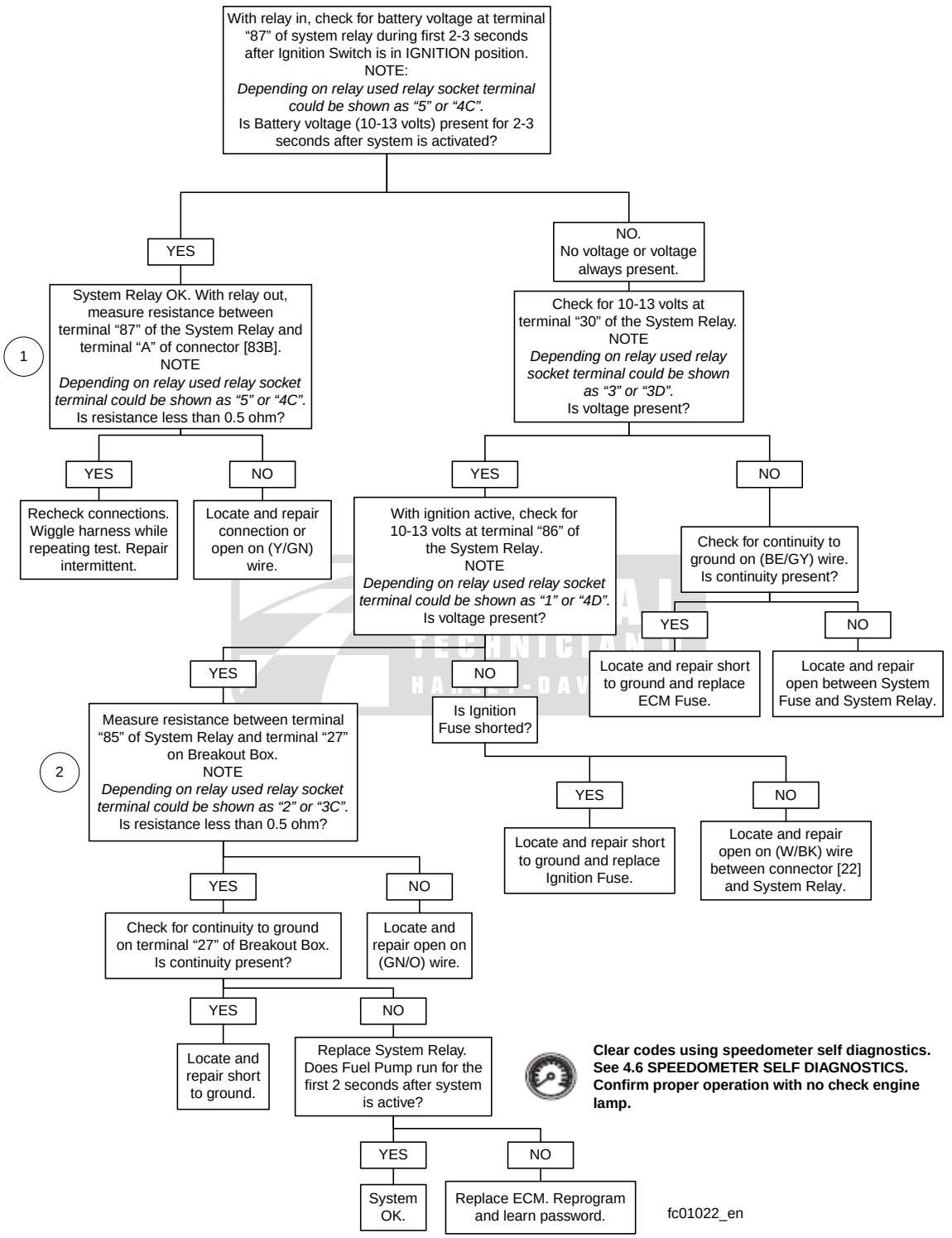
Figure 4-29. System Relay Circuit (FLHR/C/S)

Table 4-20. Wire Harness Connectors

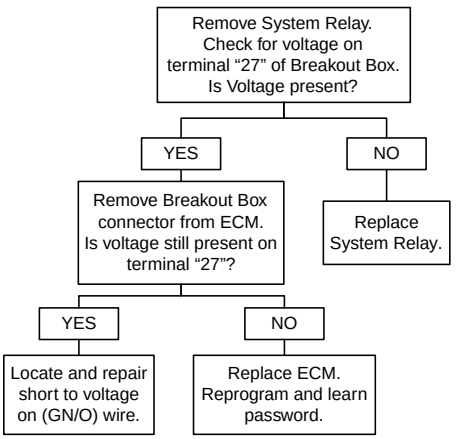
NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	6-place Molex (black)	Inside headlamp nacelle
[33]	Ignition switch	3-place Packard	Under console
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Delphi	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[121]	Rear brake light switch	Spade terminal	Bottom of rear frame downtub (right side)
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	6-place Molex	Right side of engine (induction module)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

System Relay Fault (Part 1 of 3)



System Relay Fault (Part 2 of 3)

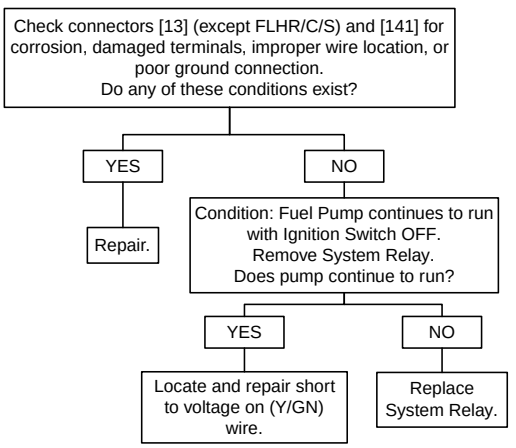


Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01023_en

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System Relay Fault (Part 3 of 3)



fc01024_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL PRESSURE TEST 4.15

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

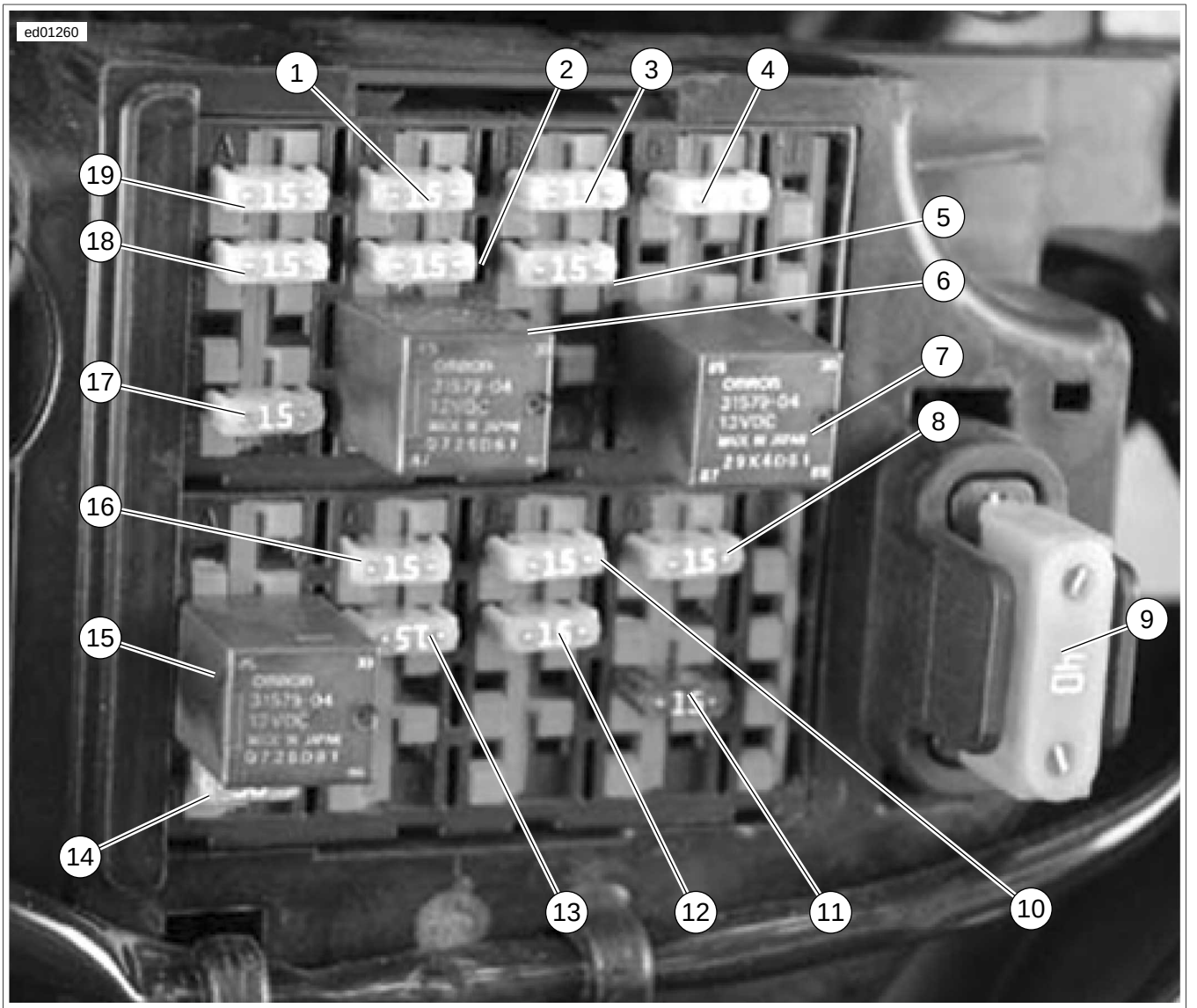
The fuel pump delivers fuel to the fuel line, to a cavity in the induction module that supplies the fuel injectors and to the pressure regulator, where the system pressure is controlled. Excess fuel pressure is bypassed to the fuel tank through the pressure regulator.

See Figure 4-30. The fuel pump fuse is located on the fuse block behind the left side cover. The fuel pump can be turned on with the DIGITAL TECHNICIAN (Part No. HD-44750) or by applying battery voltage to the fuel pump fuse.

Improper fuel system pressure may contribute to one of the following conditions:

- Cranks, but won't run.
- Cuts out (may feel like ignition problem).
- Hesitation, loss of power or poor fuel economy.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Accessory**
2. **Battery**
3. **P&A**
4. **Radio power/Siren (if equipped)**
5. **ECM power**
6. **System relay**
7. **Start relay**
8. **Engine control**
9. **MAXIFUSE**
10. **Ignition**
11. **Spare**
12. **Lights**
13. **Headlamp**
14. **ABS (if equipped)**
15. **Brake relay**
16. **Instruments**
17. **Fuel pump**
18. **Radio memory (if equipped)**
19. **Brake/Cruise**

Figure 4-30. Fuse and Relay Locations

TESTING

PART NUMBER	TOOL NAME
HD-41182	FUEL PRESSURE GAUGE
HD-44061	FUEL PRESSURE GAUGE ADAPTER

The fuel pressure gauge allows for fuel injector and fuel system pressure diagnosis. A special adapter allows the gauge to be attached to the external fuel supply line.

1. Remove left side cover.

⚠WARNING

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

2. Purge fuel supply line of high pressure fuel.
   a. See Figure 4-30. Unplug fuel pump fuse from fuse block.
   b. Start engine and allow vehicle to run.
   c. When engine stalls, operate starter for three seconds to remove any remaining fuel from fuel line.

⚠WARNING

Gasoline can drain from quick-connect fitting when removing fuel line. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00267a)

3. Pull up on chrome sleeve of quick-connect fitting (fitting on left side of fuel tank) and pull down on fuel supply line to disconnect.

NOTE

The next step requires two fuel pressure gauge adapters. Failure to use two adapters may cause the fuel line to twist, resulting in a broken fuel line or fuel line fitting.

4. Attach fuel line to gauge assembly.
   a. See Figure 4-32. Install a second adapter in series with the first.
   b. See Figure 4-32. Pull up on chrome sleeve of fuel tank quick-connect fitting and insert neck of FUEL PRESSURE GAUGE ADAPTER (Part No. HD-44061) into fuel supply line.
   c. While pushing up on bottom of adapter, pull down on chrome sleeve until it "clicks" into the locked position. Tug on adapter to be sure it is secure.
   d. See Figure 4-33. In the same manner, install fuel supply line fitting into adapter quick-connect fitting (4). Tug on fuel supply line to be sure that it is secure.

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

5. Verify that fuel valve and air bleed petcock on FUEL PRESSURE GAUGE (Part No. HD-41182) are closed.
6. See Figure 4-32. Remove protective cap from free end of fuel pressure gauge adapter. Connect fuel pressure gauge to Schroeder valve. Tighten fitting securely.
7. See Figure 4-30. Install fuel pump fuse.
8. Start and idle engine to pressurize fuel system. Open fuel valve to allow fuel to flow down hose of pressure gauge.
9. Position clear air bleed tube in a suitable container. Open and close air bleed petcock to purge gauge and hose of air. Repeat this step several times until only solid fuel (without bubbles) flows from air bleed tube. Close petcock.
10. Open and close throttle to change engine speed. Note pressure gauge reading. Fuel pressure should remain steady at 55-62 psi (380-425 kPa).
11. Turn engine off. Position air bleed tube in a suitable container. Open air bleed petcock to relieve fuel system pressure and purge pressure gauge of gasoline.

⚠WARNING

Gasoline can drain from the adapter when gauge is removed. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00254a)

12. Remove fuel pressure gauge from the adapter. Install protective cap over Schroeder valve.

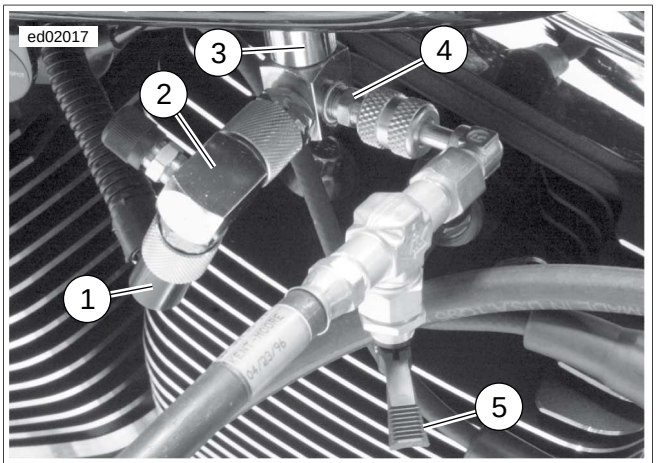
⚠WARNING

Gasoline can drain from the fuel line and adapter when removed. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00255a)

13. Pull up on sleeve of quick-connect fitting and remove fuel supply line from fuel pressure gauge adapter. Release adapter from fuel tank in the same manner.
14. Pull up on chrome sleeve of fuel tank quick-connect fitting and insert neck of fuel supply line fitting. While pushing up on bottom of fuel supply line fitting, pull down on chrome sleeve until it "clicks" into the locked position. Tug on fuel supply line to be sure that it is secure.
15. Install right side cover and saddlebag.



Figure 4-31. Fuel Pressure Gauge Adapters



1. **Fuel supply line**
2. **Adapter to fuel line**
3. **Adapter to fuel tank**
4. **Pressure adapter/Schroeder valve union**
5. **Fuel valve (closed position)**

Figure 4-32. Fuel Line (Typical)

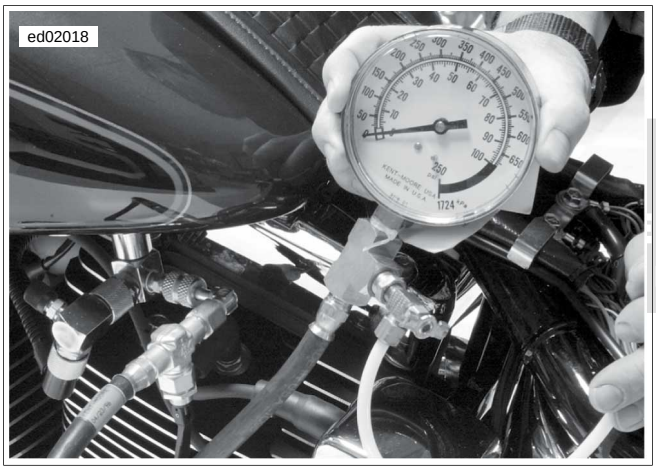


Figure 4-33. Fuel Pressure Gauge Installed (Typical)

DIAGNOSTICS

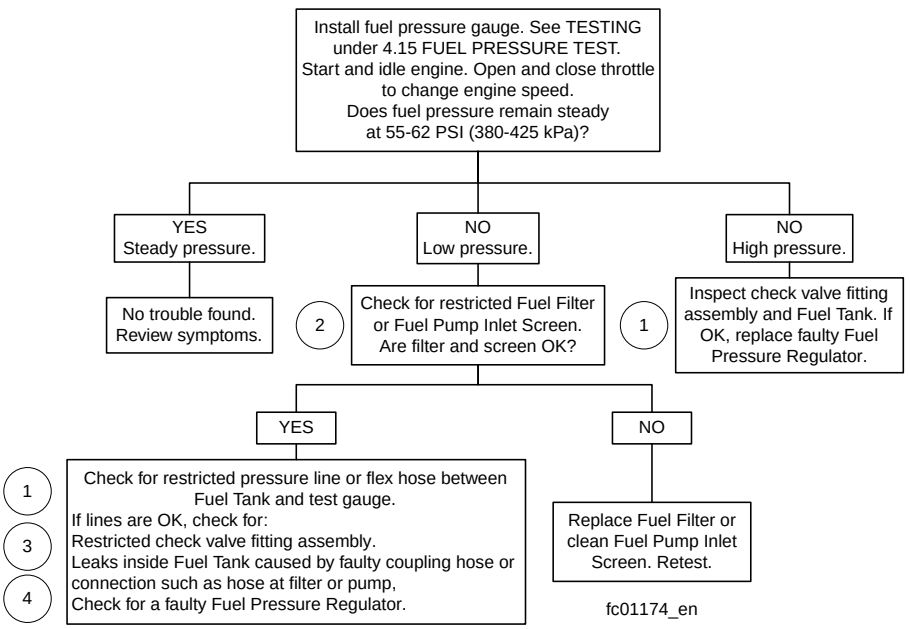
Diagnostic Notes

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

1. See Fuel Pressure Regulator, Removal/Installation in the Service Manual.
2. If fuel system has pressure, but it is less than specification, check for the following conditions.
   a. The amount of fuel to the injectors is within limits, but pressure is too low. Also, hard starting and overall poor performance condition may exist.
   b. Restricted fuel flow causing pressure drop. However, if pressure drop occurs only when driving, engine may surge then lose power as pressure begins to drop rapidly.
3. This condition may be identified when the fuel level is low and the fuel pump is turned on for the first 2 seconds after Ignition Switch is turned to IGNITION. A metallic ringing sound can be heard as the high pressure fuel is sprayed against the inside wall of the fuel tank.

IGITAL
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Fuel Pressure Test



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MISFIRE AT IDLE OR UNDER LOAD 4.16

GENERAL

Misfire at Idle or Under Load

- Battery condition and connections may also cause misfires. See Battery in the Service Manual for more information.
- Fuel system problems may also cause misfires. Consult 4.15 FUEL PRESSURE TEST and then see symptom tables under 4.5 INITIAL DIAGNOSTIC CHECK: EFI.
- Mechanical problems with the engine may cause misfires. See Section 3 of the Service Manual for more information.
- Vehicle modifications including intake and exhaust may cause misfires.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-26792	SPARK TESTER
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Diagnostic Notes

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

⚠WARNING

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

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

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.

2. See Figure 4-34. A SPARK TESTER (Part No. HD-26792) must be used to verify adequate secondary voltage (25,000 volts) at the spark plug.
   a. Turn Ignition Switch OFF.
   b. Remove spark plug cable from spark plug. Visually check plug condition.
   c. Attach cable to SPARK TESTER. Clip tester to cylinder head bolt.
   d. While cranking engine, watch for spark to jump tester gap on leads.
   e. Reinstall and repeat procedure on other spark plug cable.

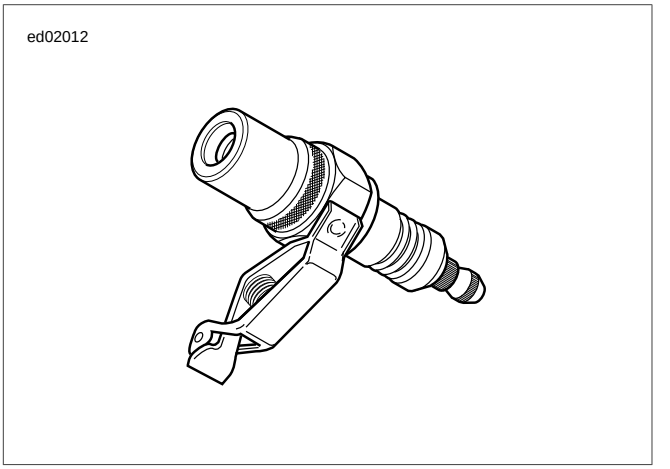


Figure 4-34. Spark Tester

Table 4-21. Spark Plug Cables

LOCATION	LENGTH	RESISTANCE
Front/Rear	20.2 in. (513 mm)	4975-11960

3. Perform spark plug cable resistance test.
   a. Remove spark plug cable from Spark Plug and Ignition Coil. For best results, use a needle nose pliers for removal/installation on coil. Gently grasp cable as close to terminals as possible.
   b. Using an ohmmeter, touch probes to terminals on each end of the spark plug cable.
   c. Compare resistance values to Table 4-21. Replace cables not meeting specifications. Reinstall and repeat procedure on other spark plug cable.
4. If carbon tracking is evident on outside of coil towers, replace ignition coil and inspect spark plug cables. Cables must be clean and tight. Excessive cable resistance or faulty connections can cause coil damage.
5. This test can also be performed by substituting a known good coil for one causing the no spark condition. The coil does not require full installation to be functional. Verify faulty coil by performing resistance test. See Ignition Coil in the Service Manual.
6. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) , red pin probe and patch cord to relay and gray pin probe and patch cord to the coil connector [83B].

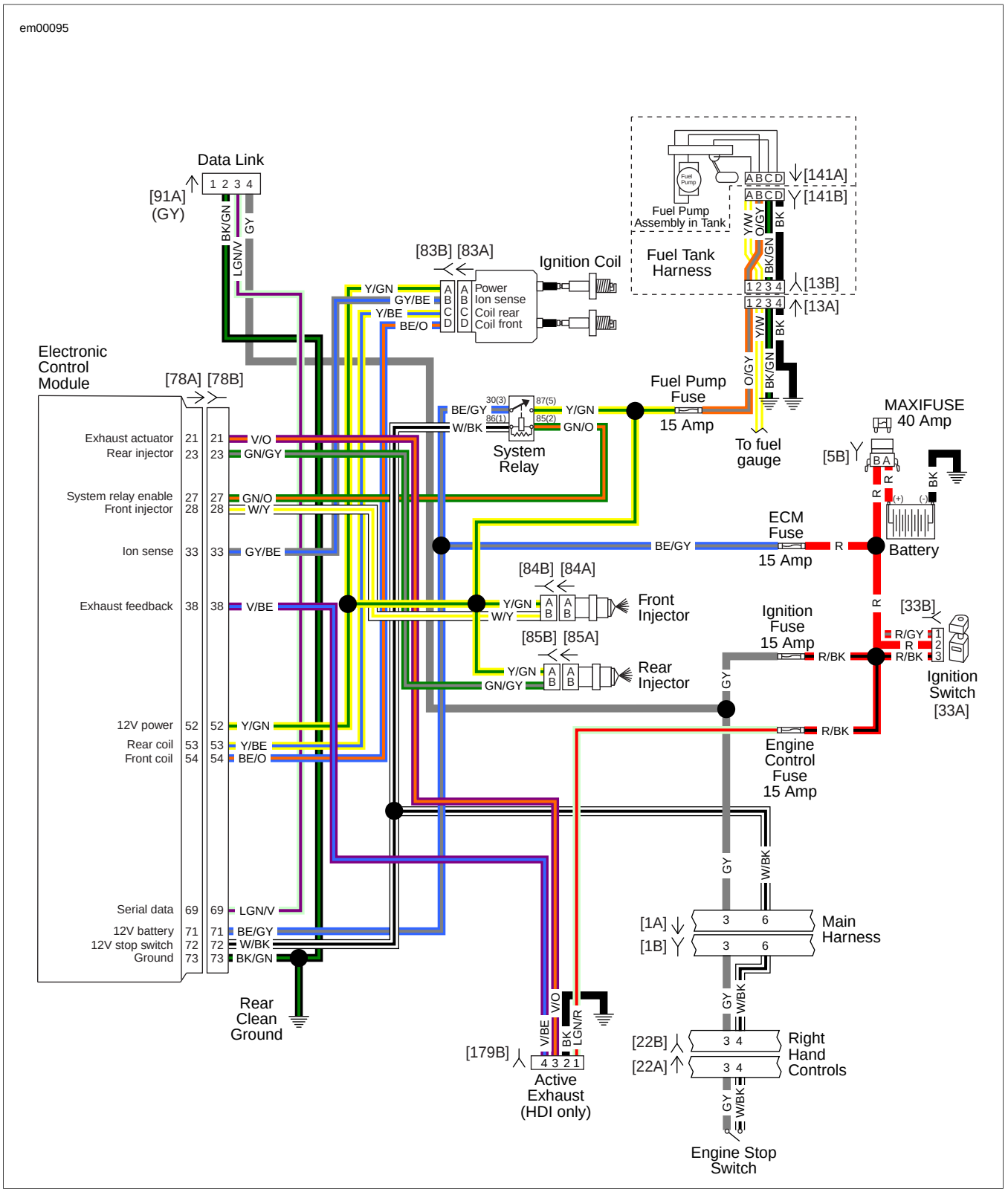


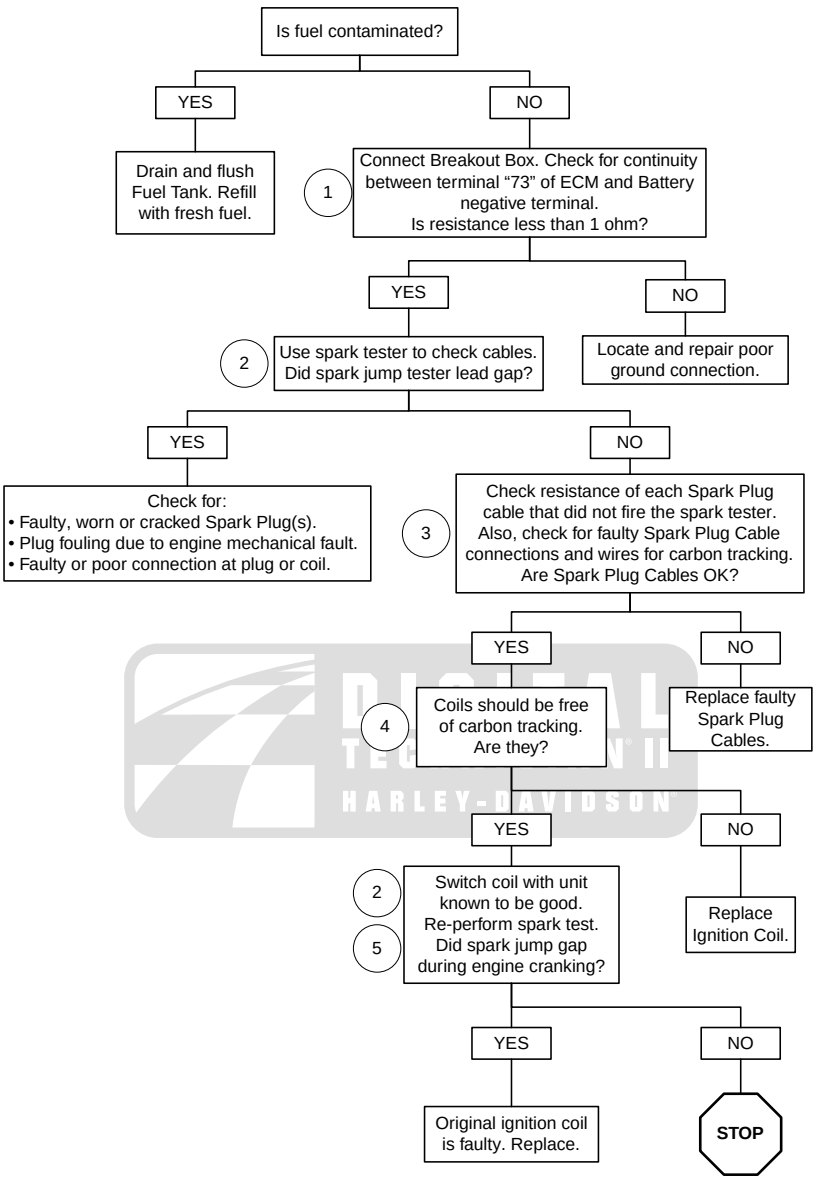
Figure 4-35. Ignition Coil Circuit Diagram

Table 4-22. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)

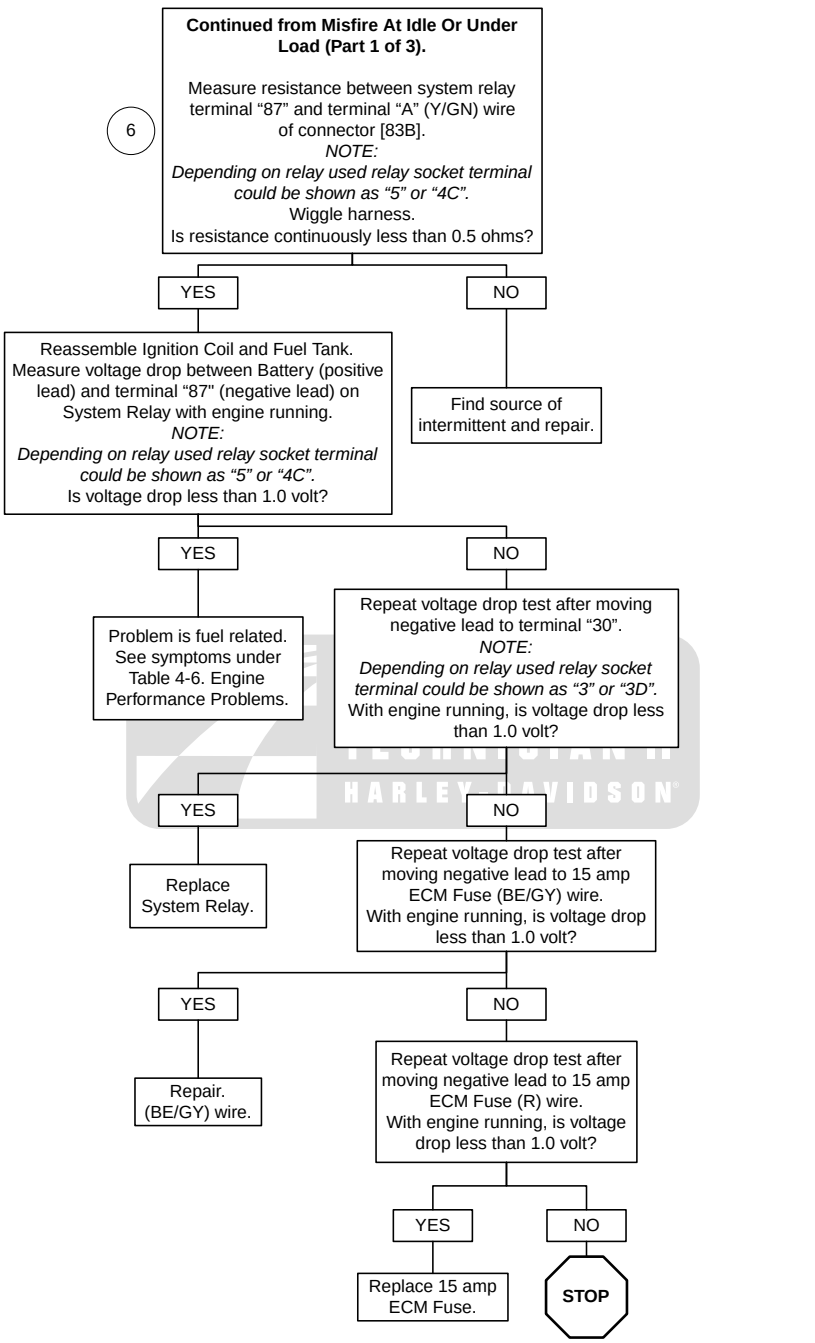
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Misfire at Idle or Under Load (Part 1 of 3)



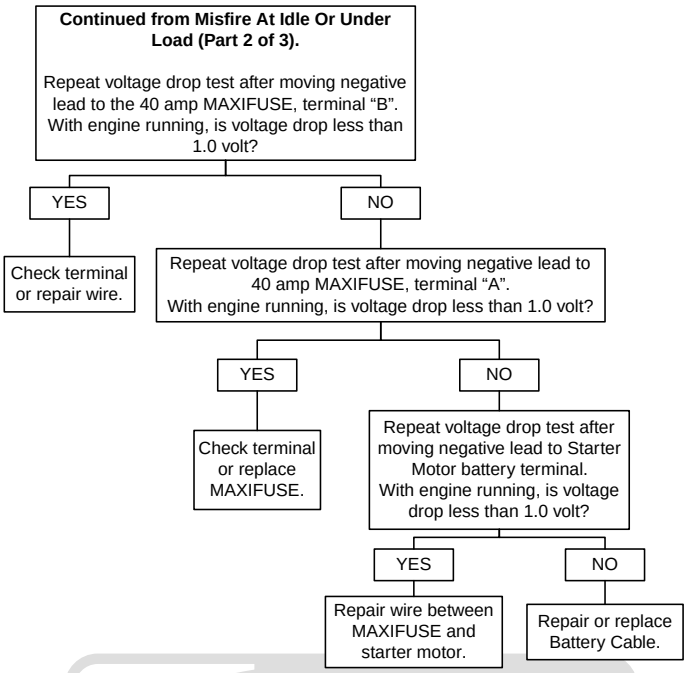
fc01026_en

Misfire at Idle or Under Load (Part 2 of 3)



fc01027_en

Misfire at Idle or Under Load (Part 3 of 3)



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COMBUSTION ABSENT/INTERMITTENT 4.17

GENERAL

Diagnostic Trouble Codes P1353, P1356, P1357, P1358: No Combustion

See Figure 4-36. A feedback voltage signal in the secondary ignition circuit detects the presence of combustion each time a cylinder fires on ECM terminal "33". For diagnostic purposes, this signal is only analyzed under load above 2000 RPM where it may be easily measured. Failure to detect combustion at high speed and load means one of following conditions exist.

- Cylinder is truly misfiring.
- There is a lack of continuity in the ignition coil secondary circuit.

Table 4-23. Code Description

DTC	DESCRIPTION
P1353	Front cylinder no combustion
P1356	Rear cylinder no combustion
P1357	Intermittent secondary front
P1358	Intermittent secondary rear

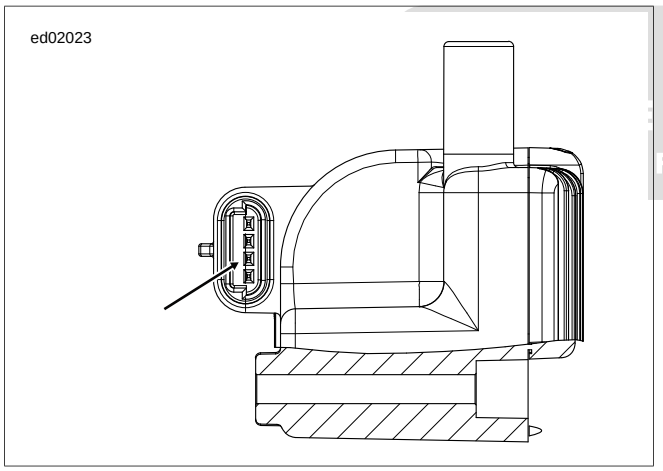


Figure 4-36. Ignition Coil

DIAGNOSTICS

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
2. Spark plugs must be correct Harley-Davidson resistor type specified for this model.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes and patch cords.
4. Perform spark plug cable resistance test.
   a. Remove spark plug cable from spark plug and ignition coil. For best results, use a needle nose pliers for removal/installation on coil. Gently grasp cable as close to terminals as possible.
   b. Using an ohmmeter, touch probes to terminals on each end plug wire.
   c. Compare resistance values to Table 4-24. Replace cables not meeting specifications. Reinstall and repeat procedure on other spark plug cable.

Table 4-24. Spark Plug Cables

LOCATION	LENGTH	RESISTANCE
Front/Rear	20.2 in. (513 mm)	4975-11960

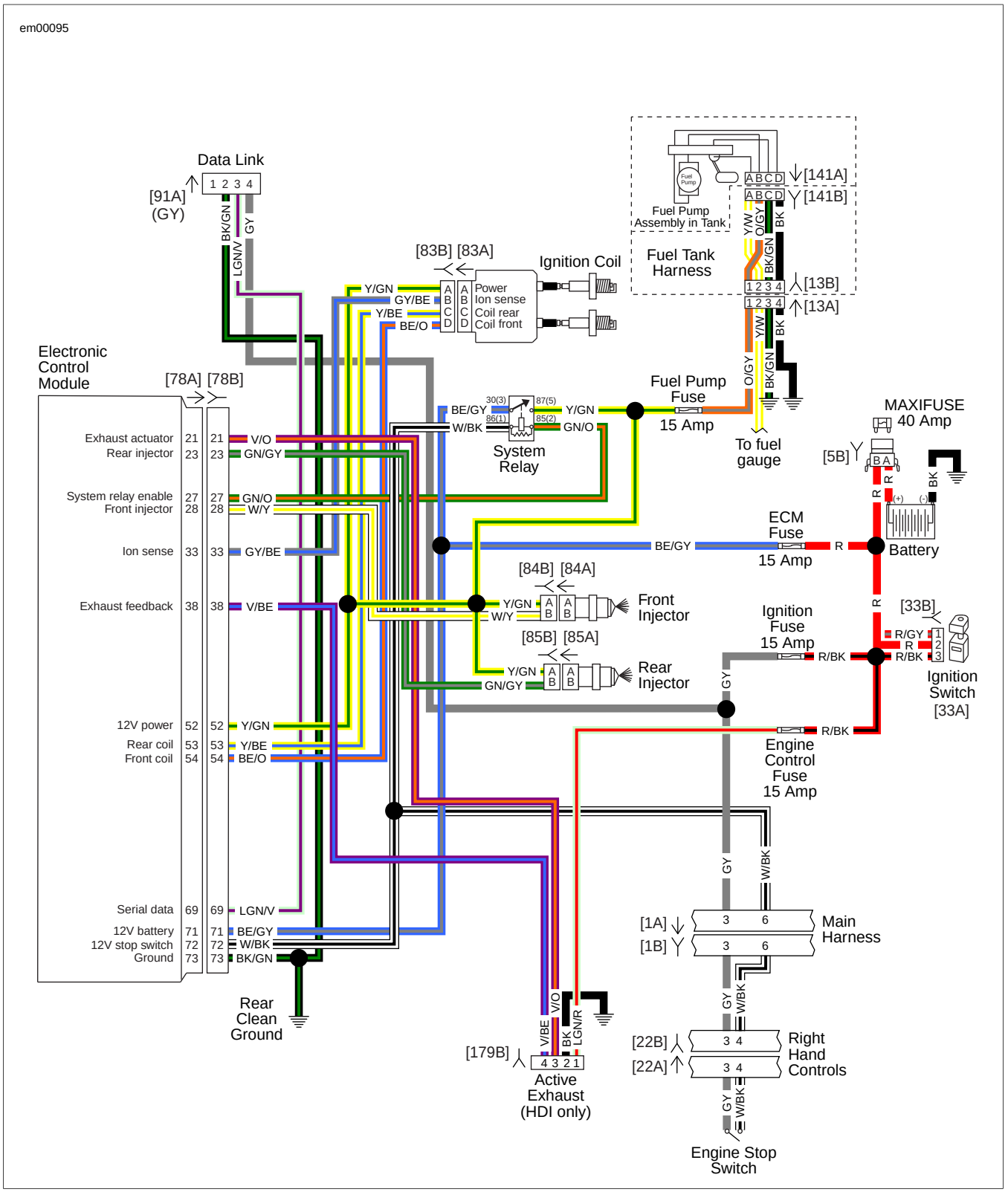


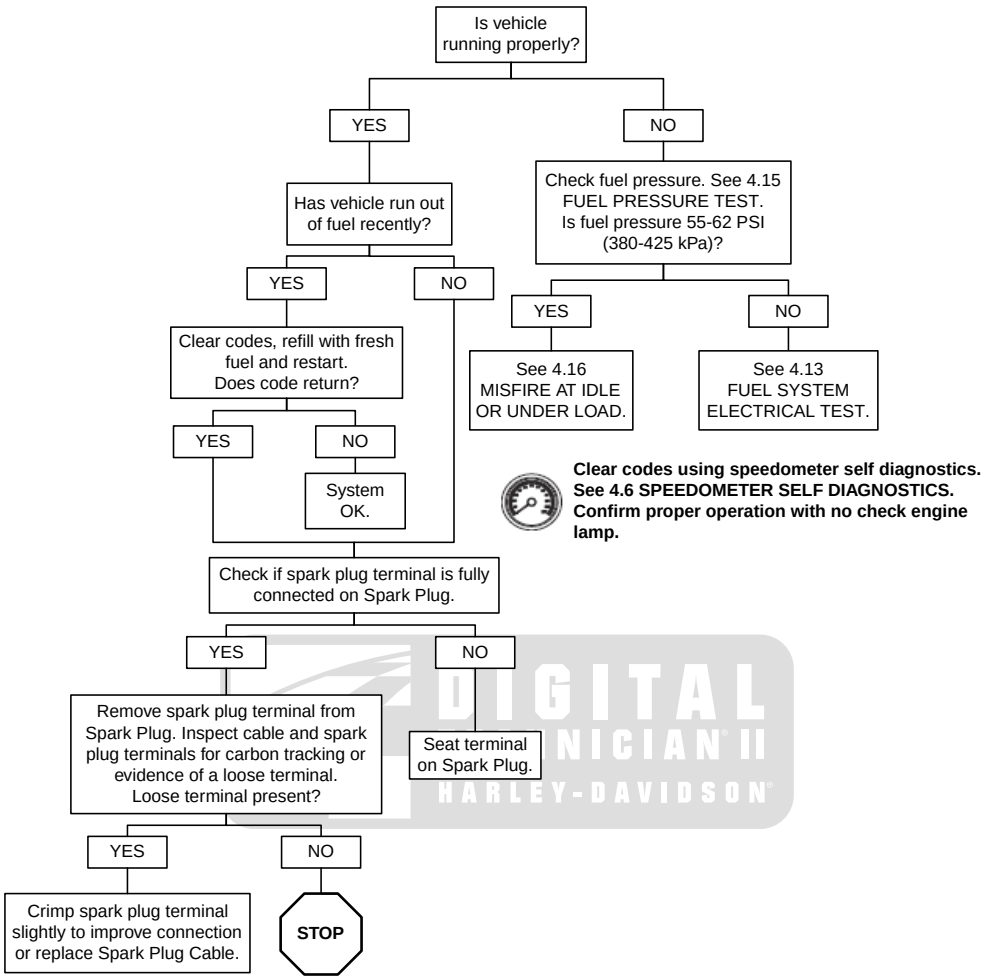
Figure 4-37. EFI Circuit

Table 4-25. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[5]	MAXIFUSE	ALL	2-place Packard	Under left side cover
[13]	Fuel tank harness	All	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	FLHR/C/U	6-place Molex (Black	Inside headlamp nacelle
		FLTR/C/X	12-place Molex (Black)	Inner fairing - right fairing support bracket
[33]	Ignition switch	FLHT/C/U FLHTR	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
		FLHR/C	3-place Packard	Under console
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[83]	Ignition coil	All	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	All	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	All	2-place Delphi	Below fuel tank (left side)
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[141]	Fuel pump and fuel level sender	FLHX, FLHT/C/U	4-place Packard	Front right crankcase
		FLHR/C/S, FLTR	4-place Packard	Top of canopy (under console)
[179]	Active	All	5-place Amp (Tyco)	Domestic (not used): Under right side cover
				HDI: Under right side cover (behind electrical bracket)

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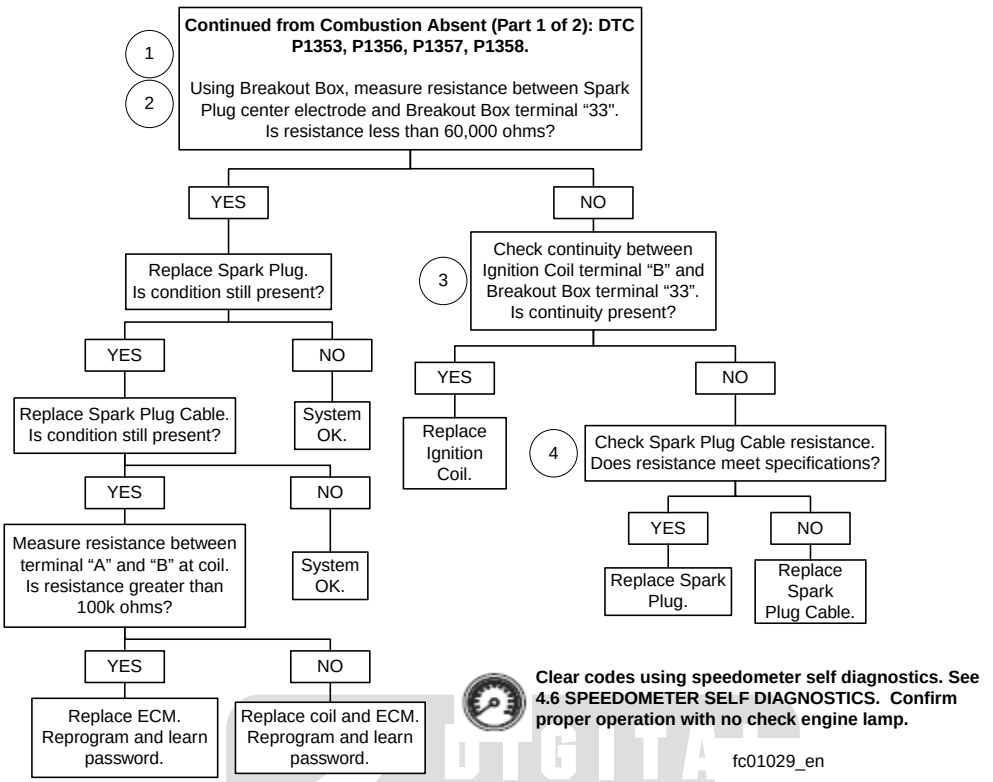
Combustion Absent (Part 1 of 2): DTC P1353, P1356, P1357, P1358



Go to Combustion Absent (Part 2 of 2): DTC P1353, P1356, P1357, P1358.

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Combustion Absent (Part 2 of 2): DTC P1353, P1356, P1357, P1358



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DTC P0107, P0108, P0112, P0113 4.18

GENERAL

See Figure 4-38. The Temperature Manifold Absolute Pressure (TMAP) sensor provides the functions of both an Intake Air Temperature (IAT) sensor and a Manifold Absolute Pressure (MAP) sensor in one unit.

The TMAP sensor is supplied 5 volts from ECM terminal "68" and sends MAP and IAT signals back to ECM terminals "24" and "49" respectively. Refer to Table 4-26.

Table 4-26. 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

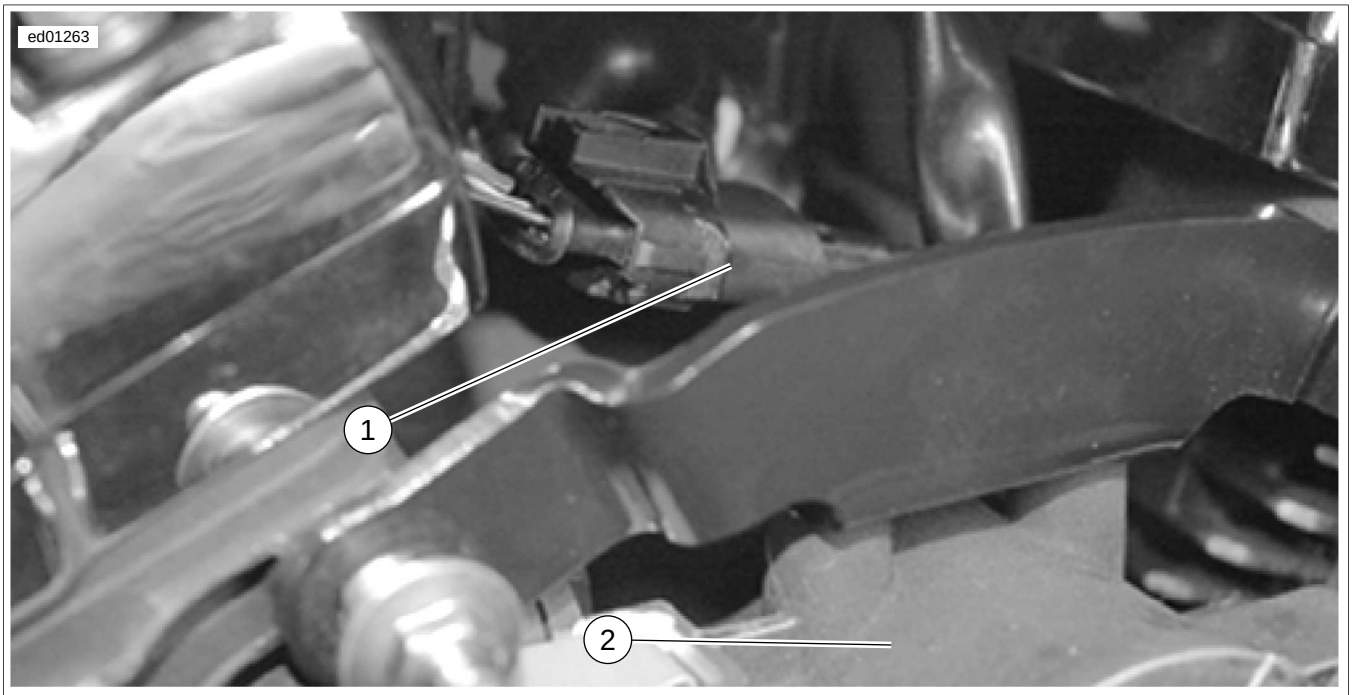
The MAP signal varies in accordance with engine vacuum and atmospheric pressure. Changes in atmospheric pressure are influenced by weather and altitude.

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 5 volts.

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



1. **TMAP**
2. **Induction Module**

Figure 4-38. TMAP Sensor Location

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-23738	VACUUM PUMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX
HD-48637	BREAKOUT BOX

Diagnostic Tips: MAP Portion of TMAP Sensor

- P0107 or P0108 codes will set if the MAP Sensor signal is out of range. Code 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 TP sensors are connected to the same reference line (+5V Vref). If the reference line goes to ground or open, multiple codes will be set (DTC P0107, P0108, P0122, P0123, P1501, 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, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Perform** 4.8 WIGGLE TEST **to locate intermittents**: If connections and harness check out OK, use a DVOM to check the Intake Air Temperature 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**: Refer to Table 4-27. This table may be used to test the IAT sensor at various temperature levels in order to evaluate the possibility of a shifted (out-of-calibration) sensor which may result in driveability problems.
- An intermittent may be caused by poor connection, rubbed through wire insulation or a wire broken within the wire?s insulation.

Diagnostic Notes: TMAP Sensor

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

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes and patch cords.
3. Connect BREAKOUT BOX (Part No. HD-48637) to main wire harness only (leave ECM disconnected). See 4.7 BREAKOUT BOX: EFI.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin socket probes and patch cords.
5. Replace TMAP sensor. See Service Manual.

Table 4-27. TMAP: IAT Sensor Table

TEMP °C	RESISTANCE	VOLTAGE	TEMP °F
-20	29121	4.9	-4
-10	16599	4.8	14
0	9750	4.6	32
10	5970	4.3	50
20	3747	4.0	68
25	3000	3.8	77
30	2417	3.6	86
40	1598	3.1	104
50	1080	2.6	122
60	746	2.2	140
70	526	1.7	158
80	377	1.4	176
90	275	1.1	194
100	204	0.9	212

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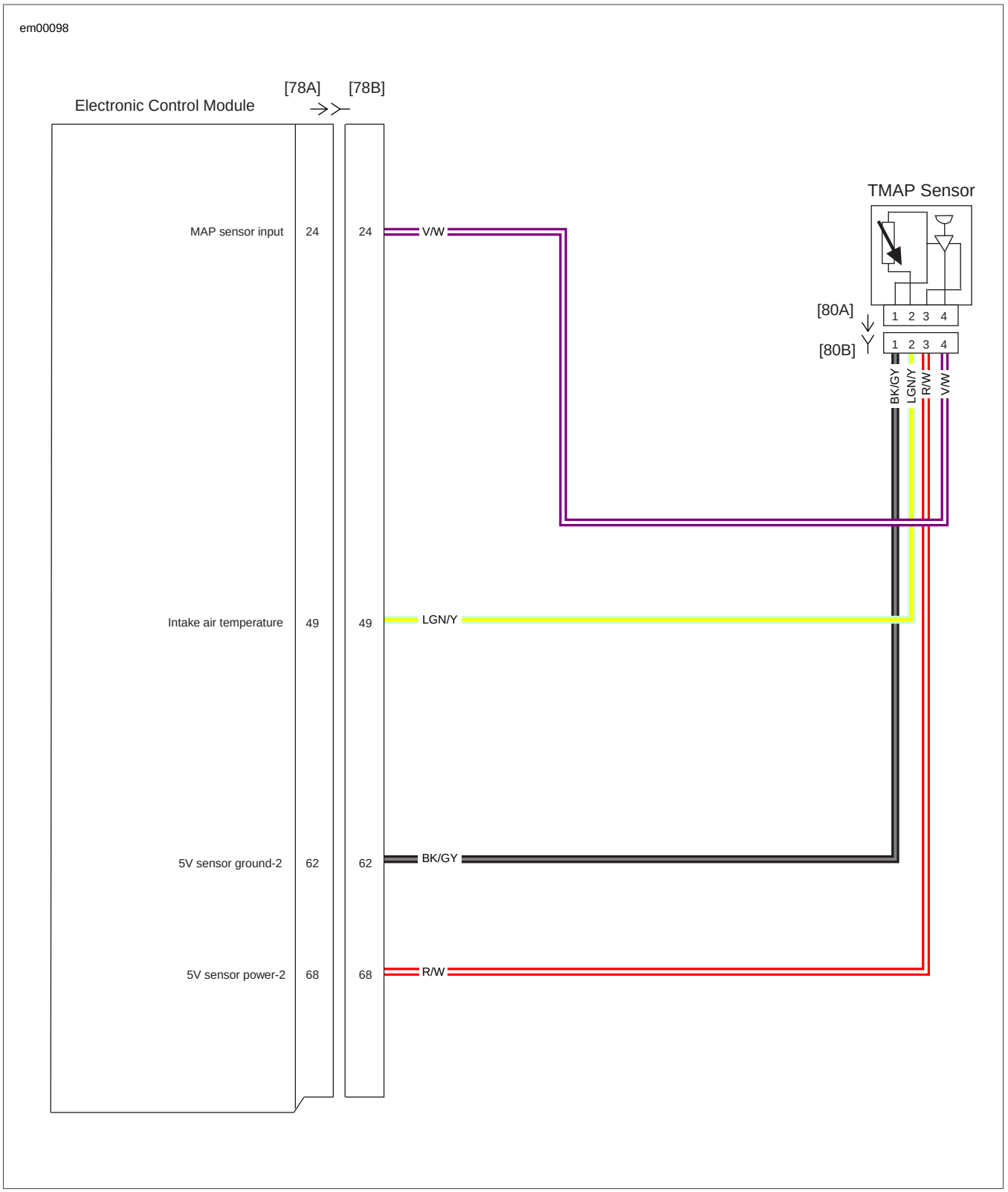


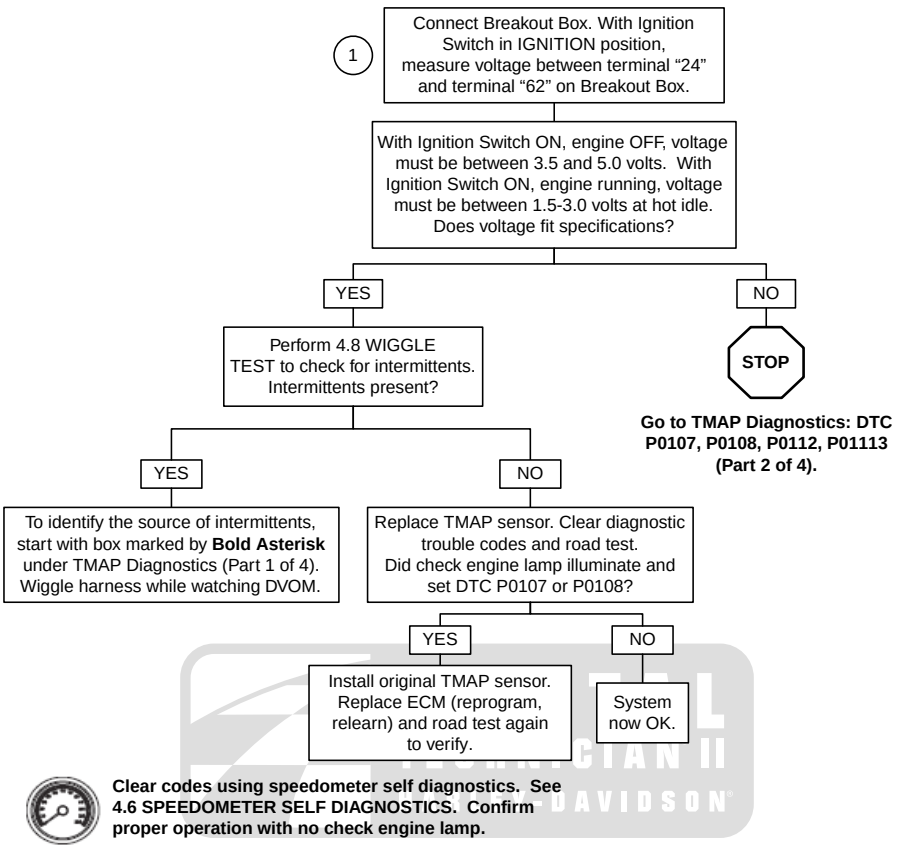
Figure 4-39. TMAP Sensor Circuit

Table 4-28. Wire Harness Connectors

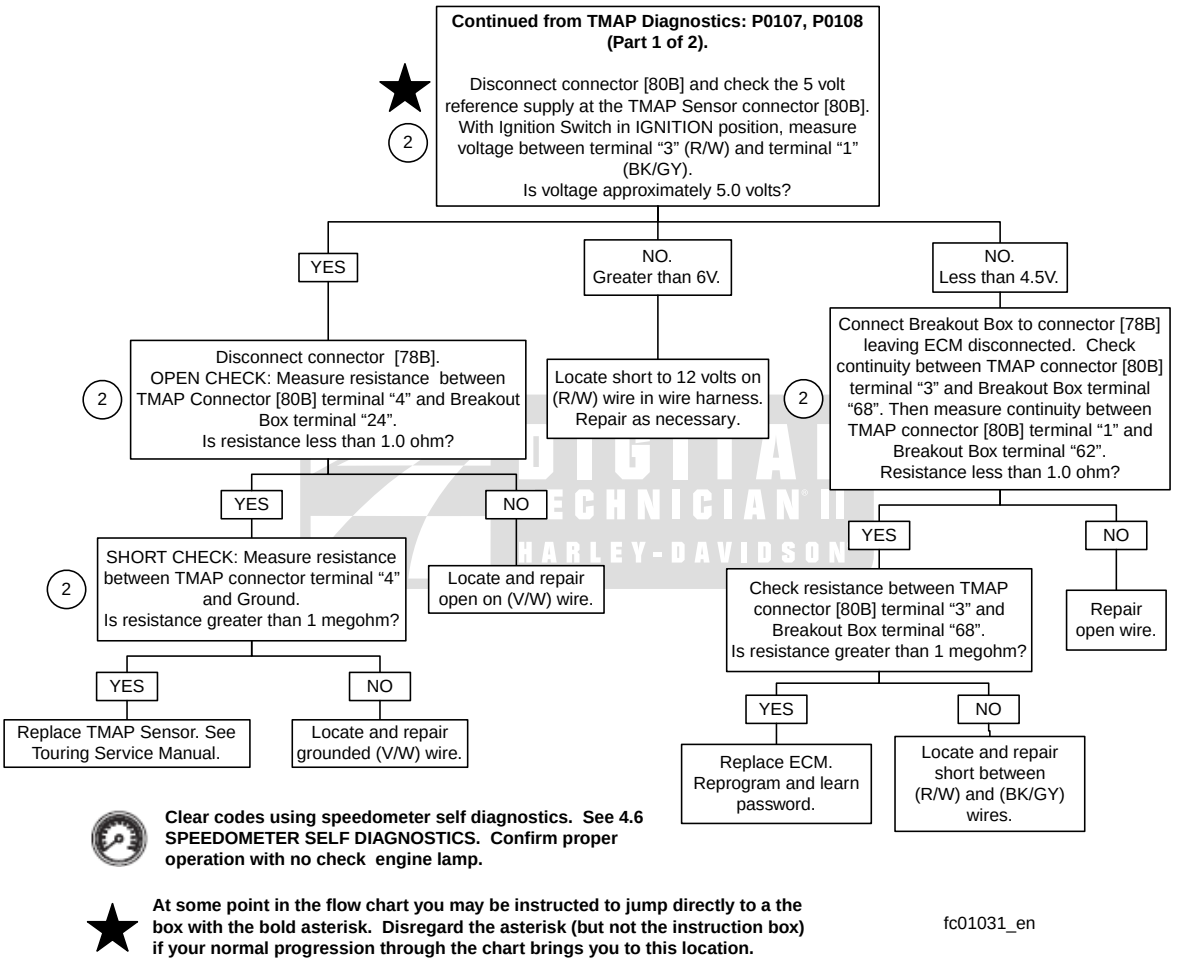
NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Packard	Top of induction module

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TMAP Diagnostics: DTC P0107, P0108, P0112, P0113 (Part 1 of 4)



TMAP Diagnostics: DTC P0107, P0108, P0112, P0113 (Part 2 of 4)

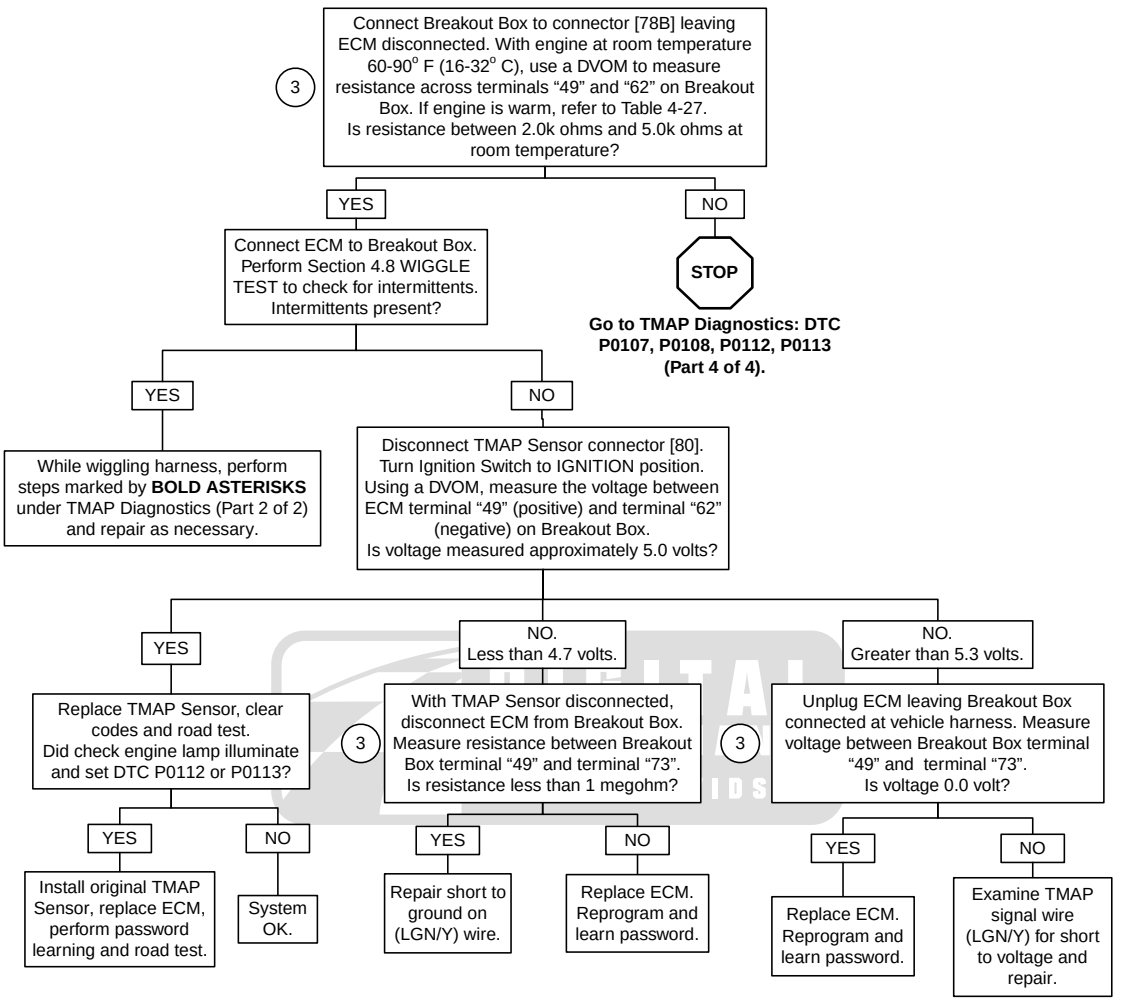


Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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

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TMAP Diagnostics: DTC P0107, P0108, P0112, P0113 (Part 3 of 4)

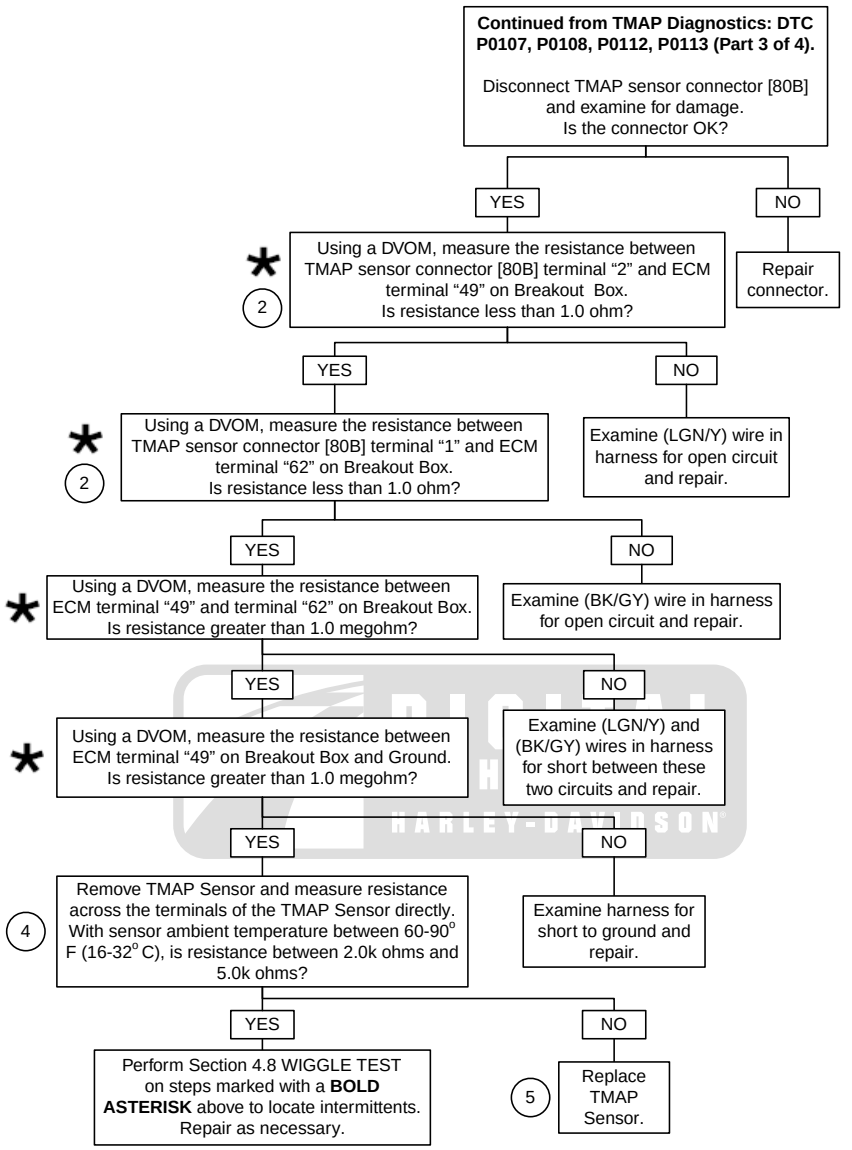


Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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

fc01032_en

TMAP Diagnostics: DTC P0107, P0108, P0112, P0113 (Part 4 of 4)



Clear codes using speedometer self diagnostics.
See 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

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

fc01033_en

DTC P0117, P0118 4.19

GENERAL

ET Sensor

The ECM supplies and monitors a voltage signal terminal "51" to one side of the Engine Temperature (ET) sensor. The other side of the ET sensor is connected to a common sensor ground terminal "61" of the ECM.

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 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 5.0 volts.

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

Table 4-29. Code Description

DTC	DESCRIPTION
P0117	ET sensor voltage low
P0118	ET sensor open/high

Table 4-30. ET Sensor Table

TEMP °C	RESISTANCE	VOLTAGE	TEMP °F
-20	28144	4.4	-4
-10	15873	4.0	14
0	9255	3.5	32
10	5571	3.0	50
20	3457	2.4	68
25	2750	2.1	77
30	2205	1.8	86
40	1442	1.3 or 4.1*	104
50	965	1.0 or 3.7*	122
60	661	3.3	140
70	462	2.9	158
80	329	2.5	176
90	238	2.1	194
100	175	1.7	212
* Between 40-50°C the ECM changes scaling. Voltages for ET sensor will shift scales in that range. This provides proper sensor resolution for all temperatures.			

DIAGNOSTICS

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

Diagnostic Tips

- Once the engine is started, the ET voltage should rise steadily.
- An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

Check the following conditions:

- **Poor connection**: Inspect ECM and harness connector [78] for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Perform** 4.8 WIGGLE TEST **to locate intermittents**: If connections and harness check out OK, use a DVOM to check the ET sensor voltage reading while moving related connectors and wiring harness. If the failure is induced, the ET sensor voltage reading will change.
- **Shifted sensor**: Refer to Table 4-30. This table may be used to test the ET sensor at various temperature levels in order to evaluate the possibility of a shifted (out-of-calibration) sensor which may result in driveability problems.

NOTE

All voltage and resistance values are approximate (± 20%). Measure ET sensor resistance between ECM terminal "51" and system ground ECM terminal "61".

Diagnostic Notes: ET Sensor

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to EFI wire harness only (leave ECM disconnected). See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes and patch cords.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray socket probes and patch cords.
4. Replace ET sensor. See Service Manual.

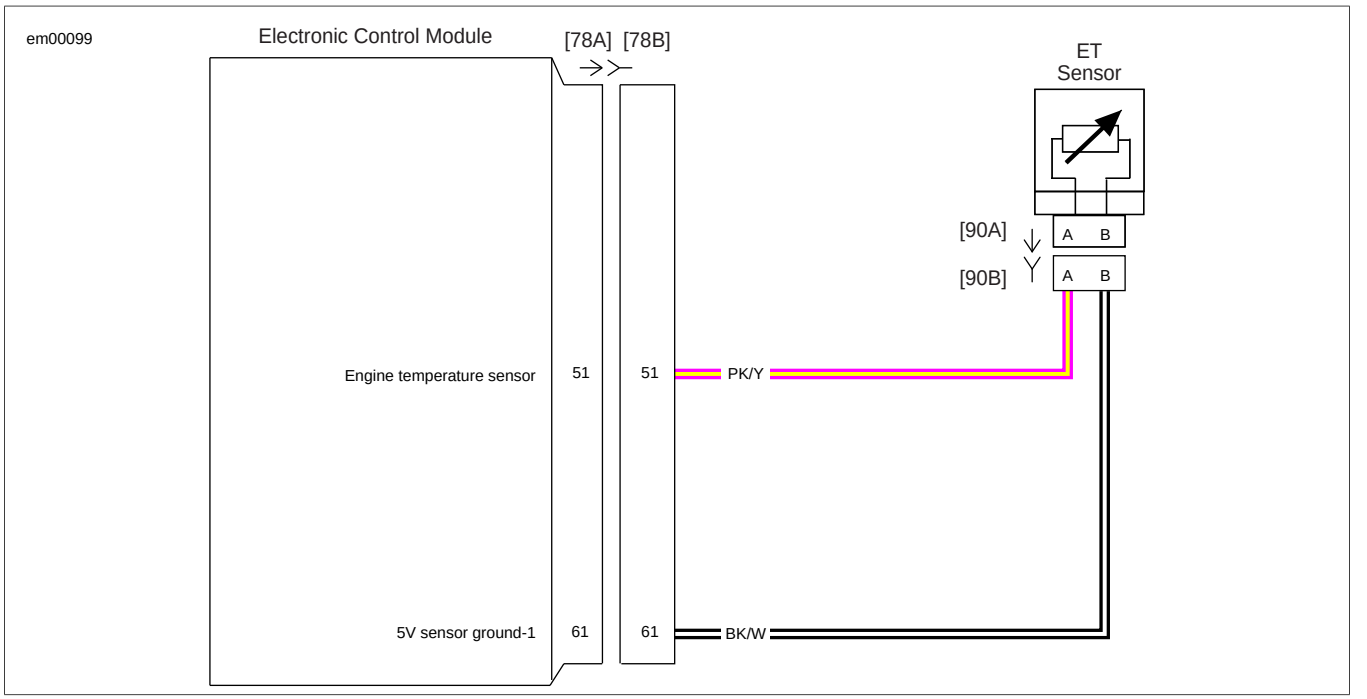
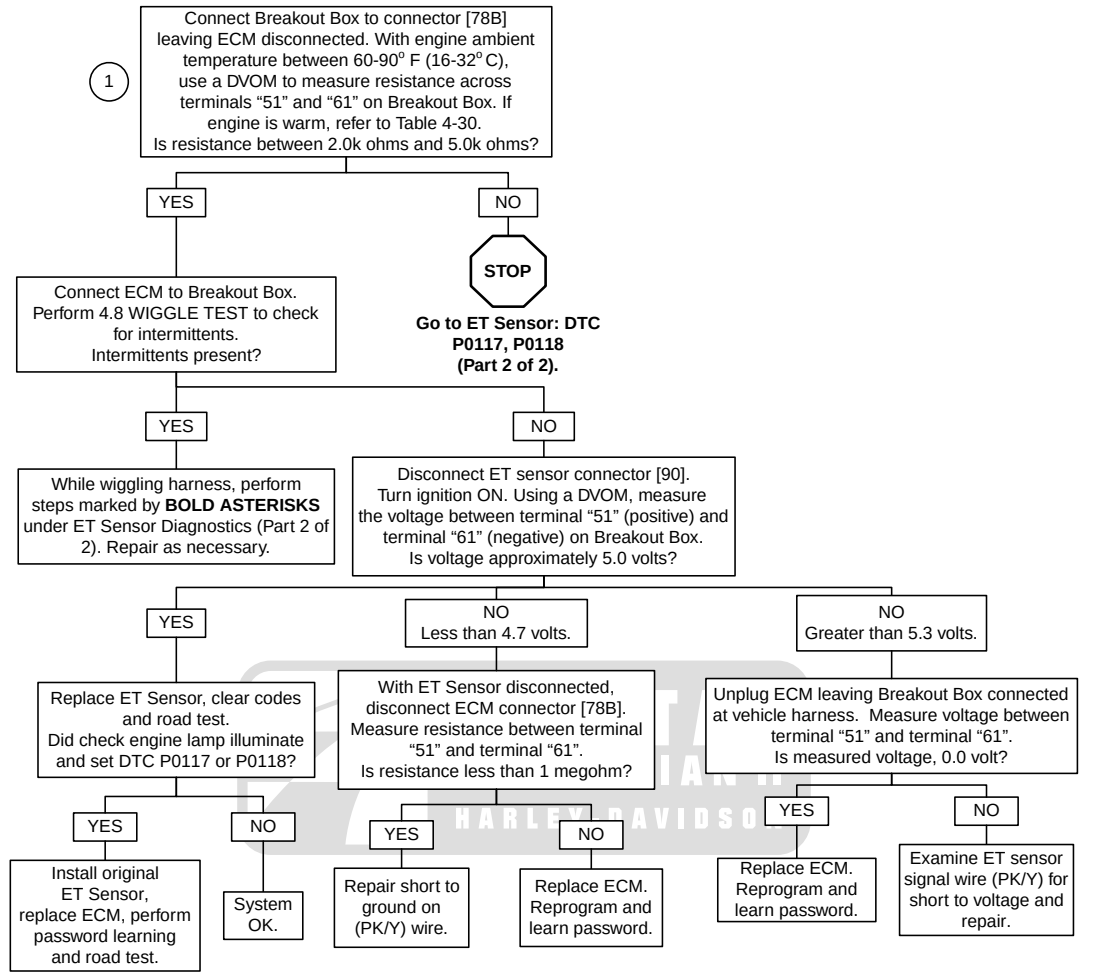


Figure 4-40. ET Sensor Circuit

Table 4-31. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)

ET Sensor: DTC P0117, P0118 (Part 1 of 2)

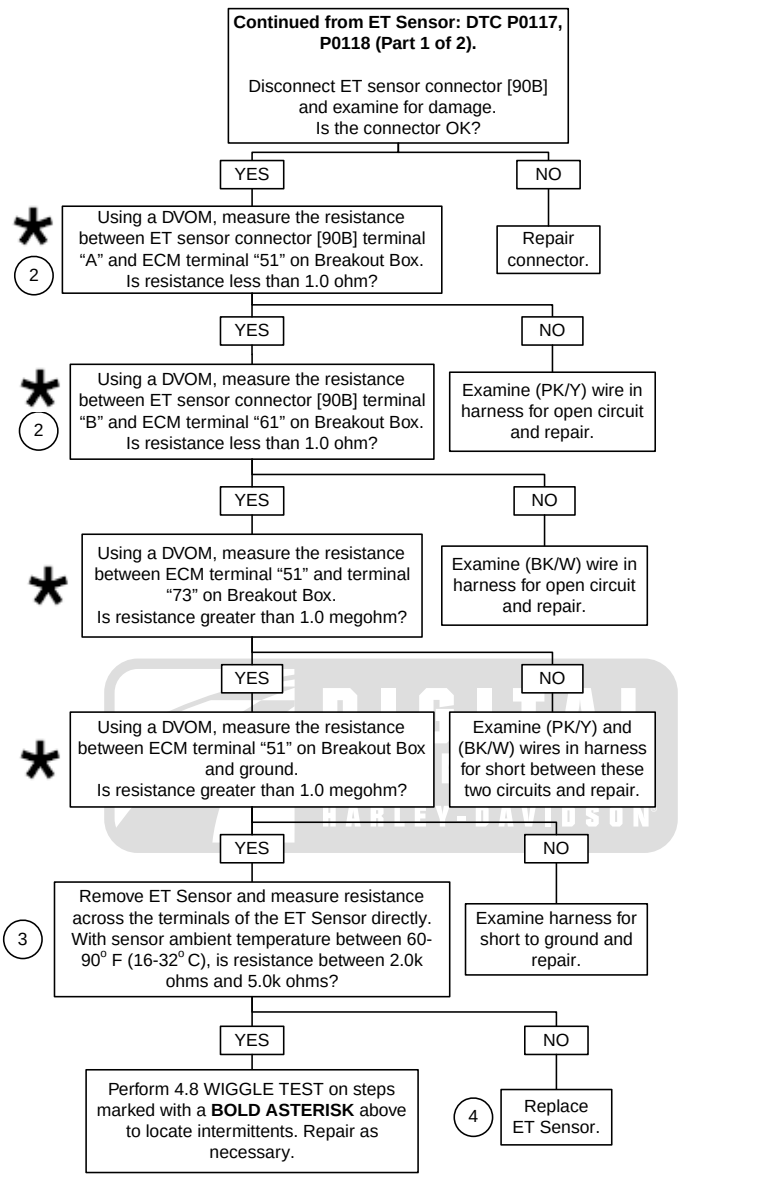


Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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

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ET Sensor: DTC P0117, P0118 (Part 2 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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

fc01035_en

DTC P0120, P0122, P0123, P0220, P0222, P0223 4.20

GENERAL

See Figure 4-41. A dual Throttle Position Sensor (TPS) is integrated into the Throttle Control Actuator (TCA), mounted to the Induction Module.

Within the TCA, a set of potentiometers are designated as Throttle Position Sensors (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 Throttle Position Sensors (TPS1 and TPS2) send signals back to the ECM based on throttle plate position to verify the throttle plate movement.

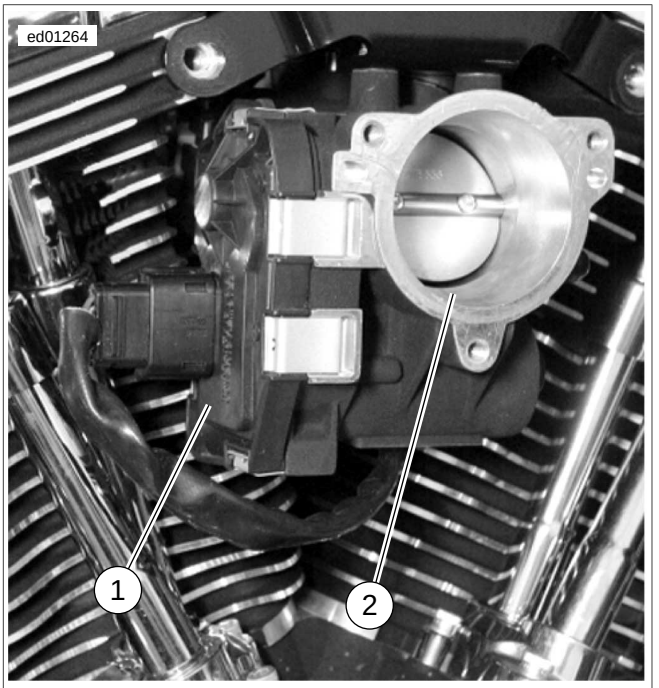
The ECM supplies a 5.0 volt signal from terminal "50" of connector [78] to TPS1 and TPS2. The signals from TPS1 and TPS2 are sent back to the ECM connector [78] terminal "37" and terminal "36" vary in voltage according to actual throttle plate position.

The two throttle position sensors work opposite each other. When one sensor reads high, the other reads low. The sum of TPS1 and TPS2 signals should measure around 5.0 volts.

Refer to Table 4-32 for defect codes associated with TPS1 and TPS2 of the TCA. See Figure 4-42 for TCA (TPS1 & TPS2) circuitry diagram.

Table 4-32. 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



1. **TCA**
2. **Induction Module**

Figure 4-41. Throttle Control Actuator (TCA) Location

DIAGNOSTICS

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

Diagnostic Tips

Check the following conditions:

- **Poor connection**: Inspect ECM and harness connector [78] for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harness.
- **Perform** 4.8 WIGGLE TEST **to locate intermittents**: If connections and harness check out OK, use a DVOM to check the TPS voltage reading while moving related connectors and wiring harnesses. If the failure is induced, then TPS voltage will change.
- An intermittent may be caused by poor connection, rubbed through wire insulation or a wire broken within the wire insulation.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

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

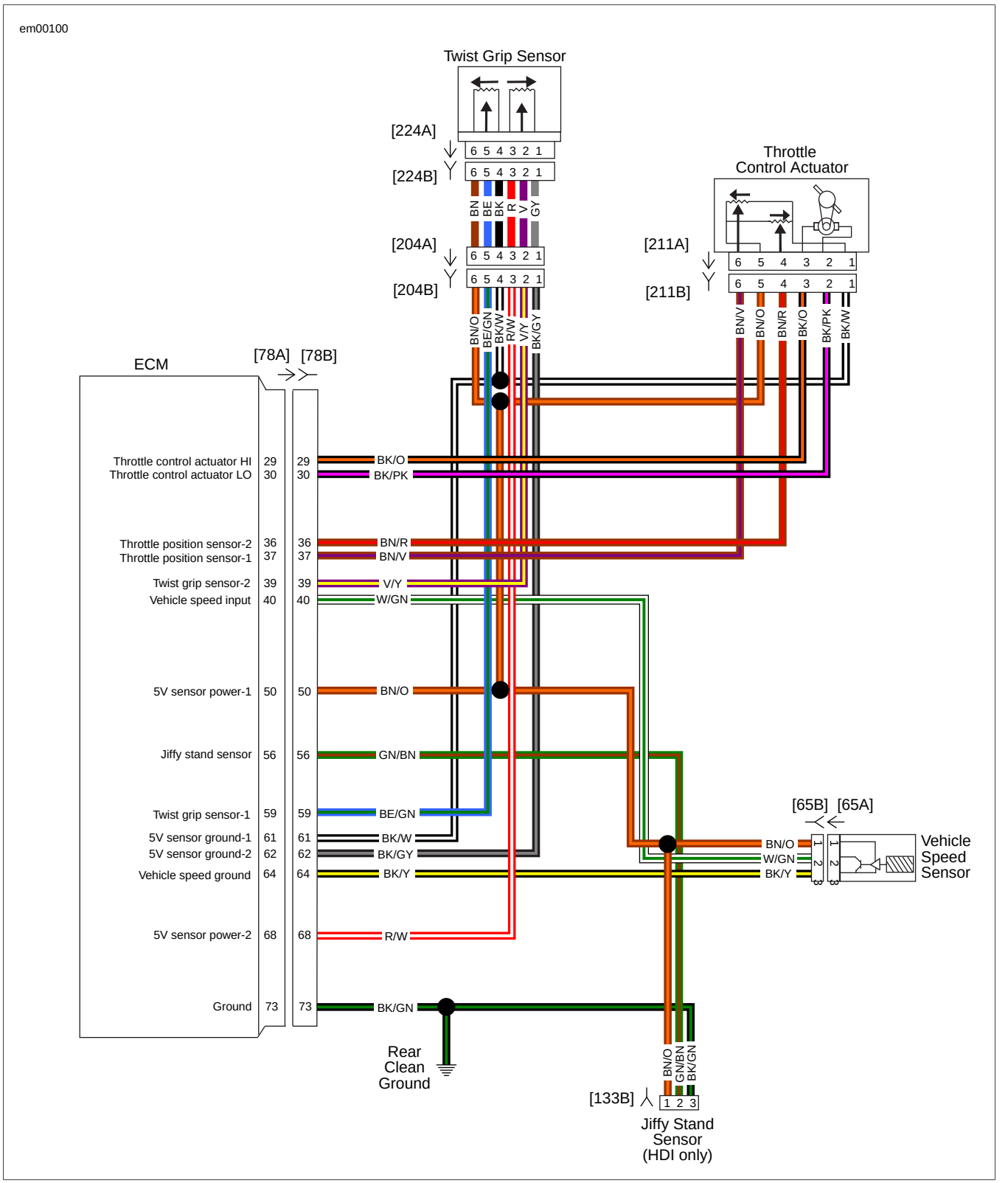


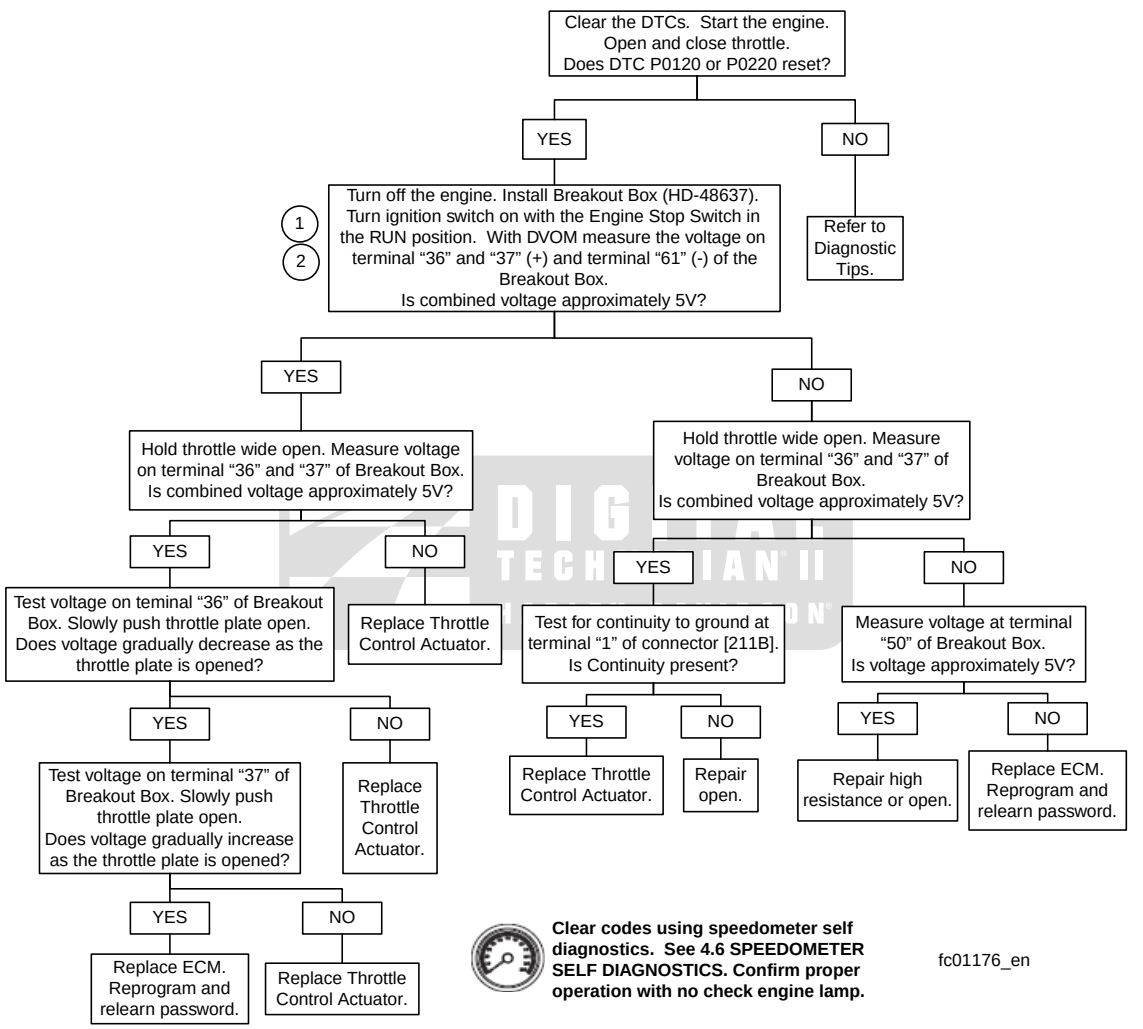
Figure 4-42. TCA Circuit

Table 4-33. Wire Harness Connectors

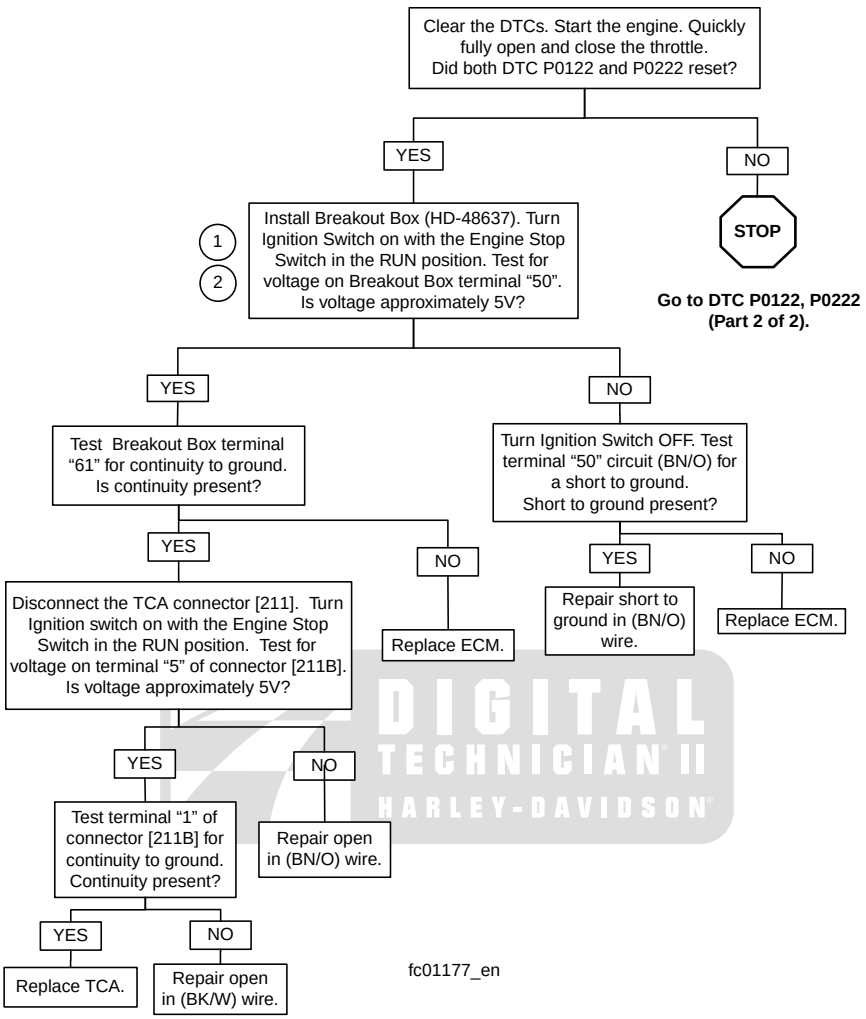
NO.	DESCRIPTION	TYPE	LOCATION
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower frame crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[204]	Twist Grip Sensor (TGS)	6-place Molex (black)	Inner fairing - right radio support bracket
[211]	Throttle Control Actuator (TCA)	6-place Molex	Throttle body

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DTC P0120, P0220

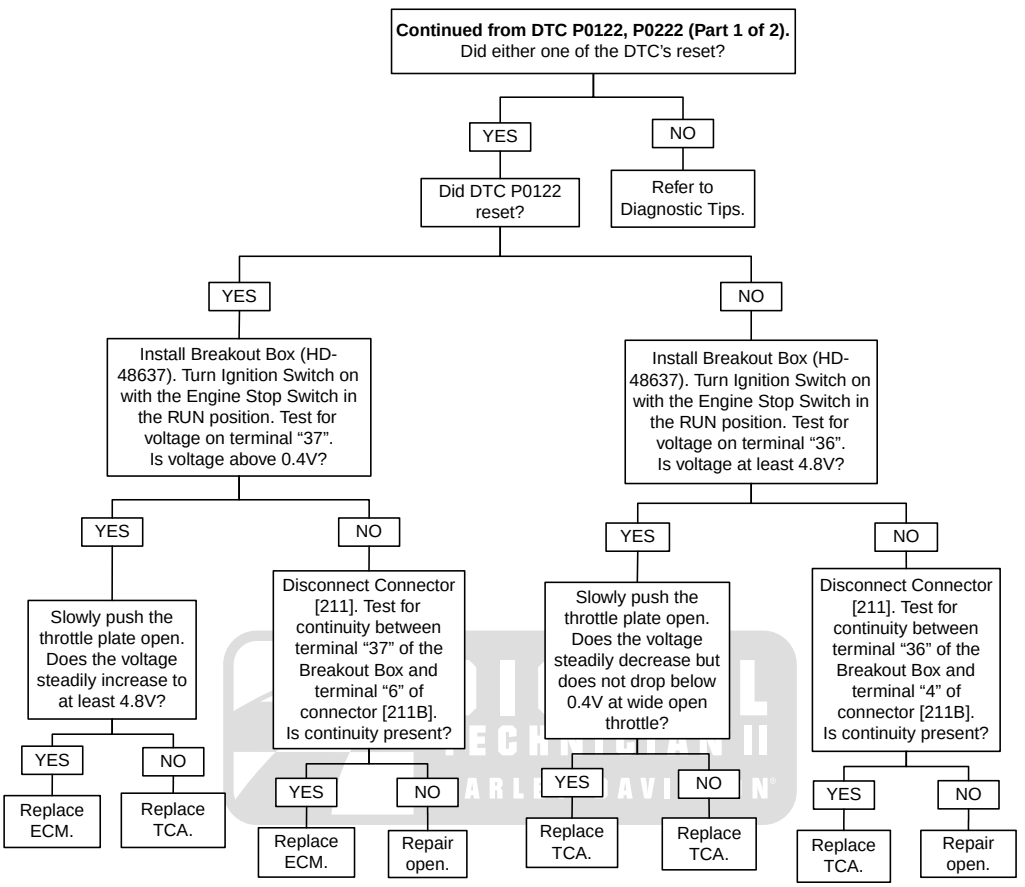


DTC P0120, P0122, P0220, P0222 (Part 1 of 2)



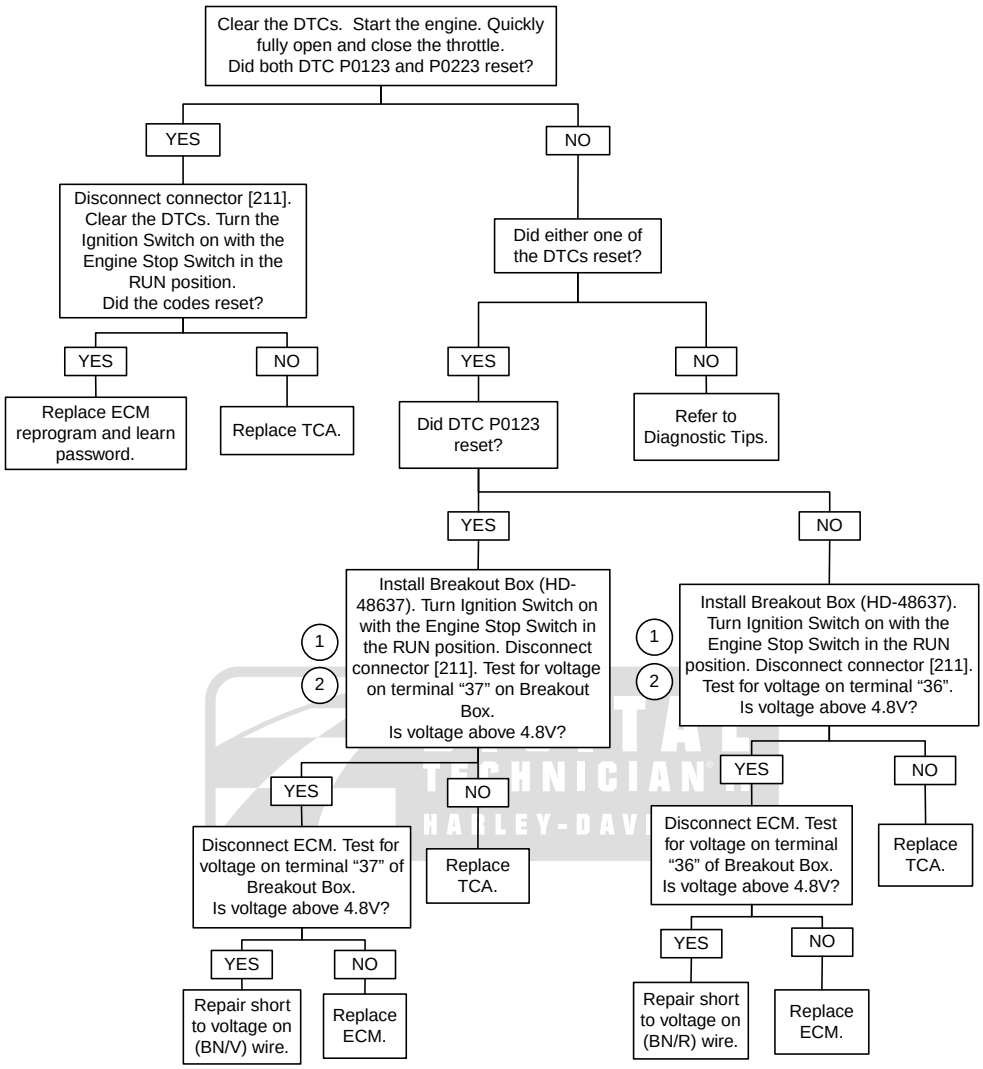
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P0120, P0122, P0220, P0222 (Part 2 of 2)



fc01036_en

DTC P0123, P0223



fc01037_en

DTC P0131, P0132, P0134, P0151, P0152, P0154 4.21

GENERAL

Oxygen Sensor

See Figure 4-43. The Oxygen (O_2) Sensor provides a signal to the ECM which indicates whether the engine is running rich or lean.

- DTC P0131 (front) or P0151 (rear) is set when the ECM detects an excessively lean condition for a specified length of time. DTCs may also set if O_2 sensor fails.
- DTC P0132 (front) or P0152 (rear) is set when the ECM detects an excessively rich condition for a specified length of time. DTCs may also set if O_2 sensor fails.
- DTC P0134 is set when the front O_2 sensor circuit is open or sensor is too cold to respond. A DTC P0154 is set when the rear O_2 sensor circuit is open or sensor is too cold to respond.

When the air/fuel mixture is ideal, approximately 14.6 parts air to 1 part fuel, the voltage will be approximately 0.45V.

Table 4-34. Code Description

DTC	DESCRIPTION
P0131	Front O_2 sensor low or engine running lean
P0132	Engine running rich
P0134	Front O_2 sensor open/not responding/high
P0151	Rear O_2 sensor low or engine running lean
P0152	Engine running rich
P0154	Rear O_2 sensor open/not responding/high

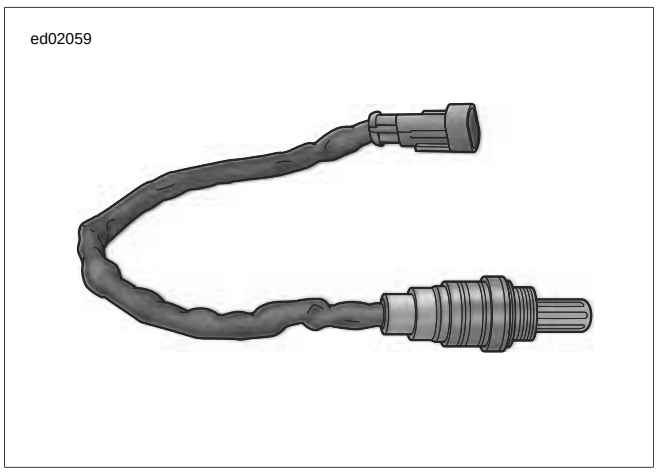


Figure 4-43. Oxygen Sensor

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Diagnostic Tips

DTCs for the O_2 sensor may be seen during the vehicle break-in period. The O_2 sensor diagnostic codes will not illuminate the check engine lamp for current or historic codes and will only be indicated by Digital Technician or speedometer self diagnostics. If the diagnostic codes are reported during the break-in period, clear or ignore the codes until the break-in period is completed. All historic O_2 sensor diagnostic codes are to be ignored and cleared.

The DVOM displays the signal from the O_2 sensor in volts. This voltage will have an average value tending towards lean, rich or ideal value depending on operating temperature of the engine, engine speed and throttle position. An open/short to voltage or short to ground in the (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 harness connector [78], fuel injector connectors [84, 85] and O_2 sensor connector wiring for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harnesses.
- **Dirty/stuck open injectors**: The motorcycle 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 oxygen sensor**: If the O_2 sensor is loose, engine performance may be affected. This could also show up as a slow changing O_2 sensor 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 O_2 sensor will read a lean condition, causing the system to go rich.
- **Engine misfire**: See 4.16 MISFIRE AT IDLE OR UNDER LOAD.

Diagnostic Notes

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

1. Connect a BREAKOUT BOX (Part No. HD-48637) between EFI wire harness and ECM before measuring voltage. See 4.7 BREAKOUT BOX: EFI.
2. 5 volts is typical for a cold engine. Once the O_2 sensors are up to operating temperature, typical voltage is 0.45 volt.
3. See Intake Leak Test in the Service Manual.

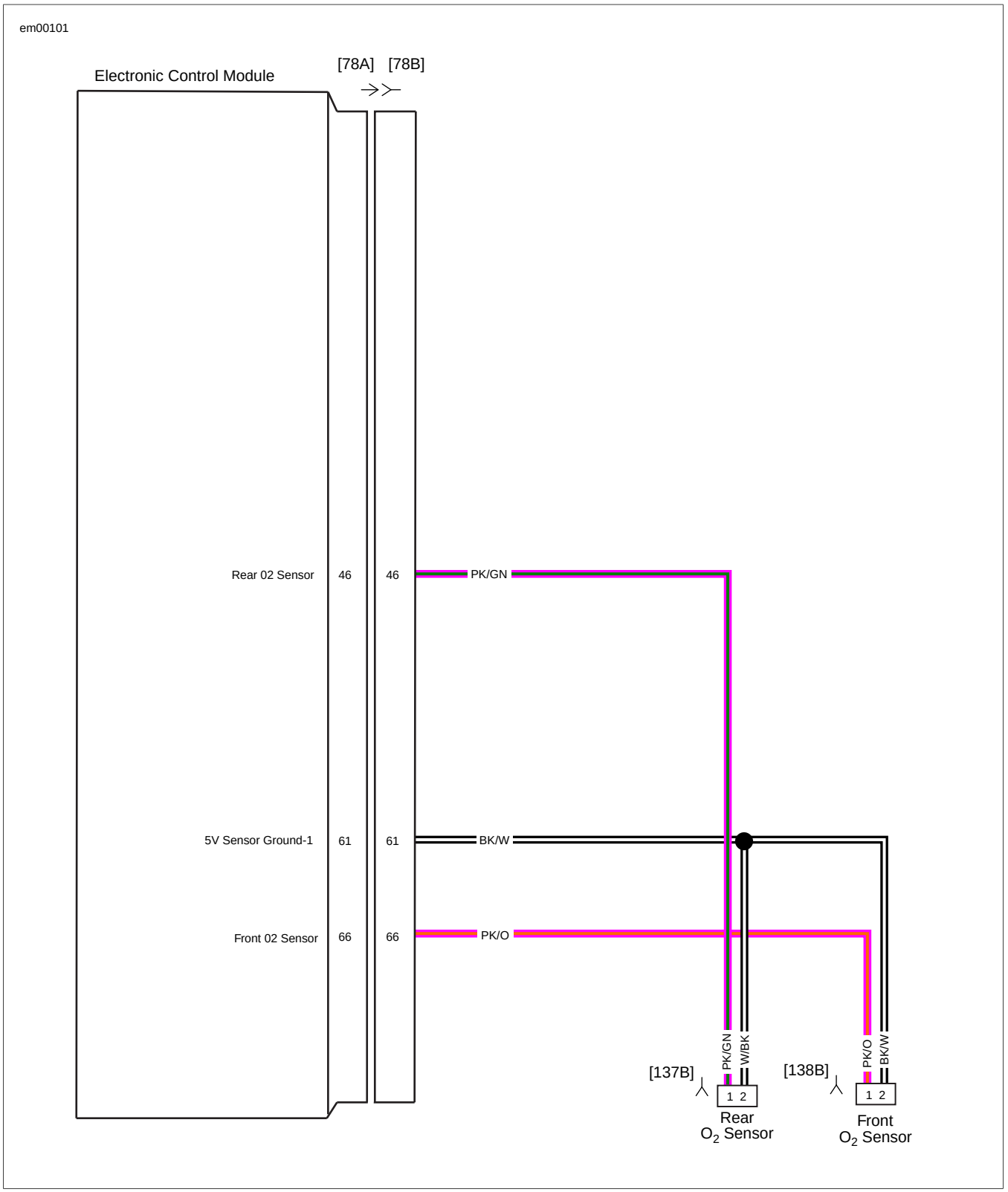


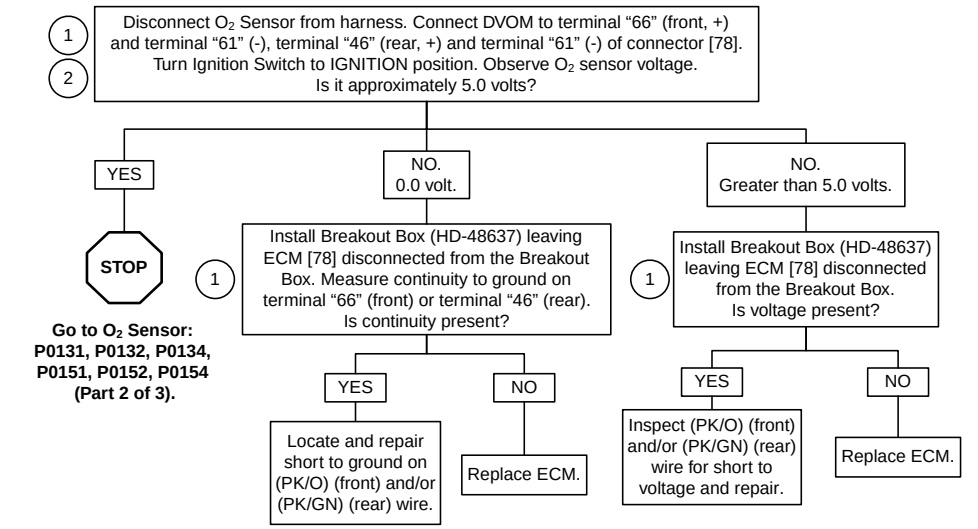
Figure 4-44. Oxygen Sensor Circuit Diagram

Table 4-35. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace between front frame downtubes (left side)

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O2 Sensor: DTC P0131, P0132, P0134, P0151, P0152, P0154 (Part 1 of 3)

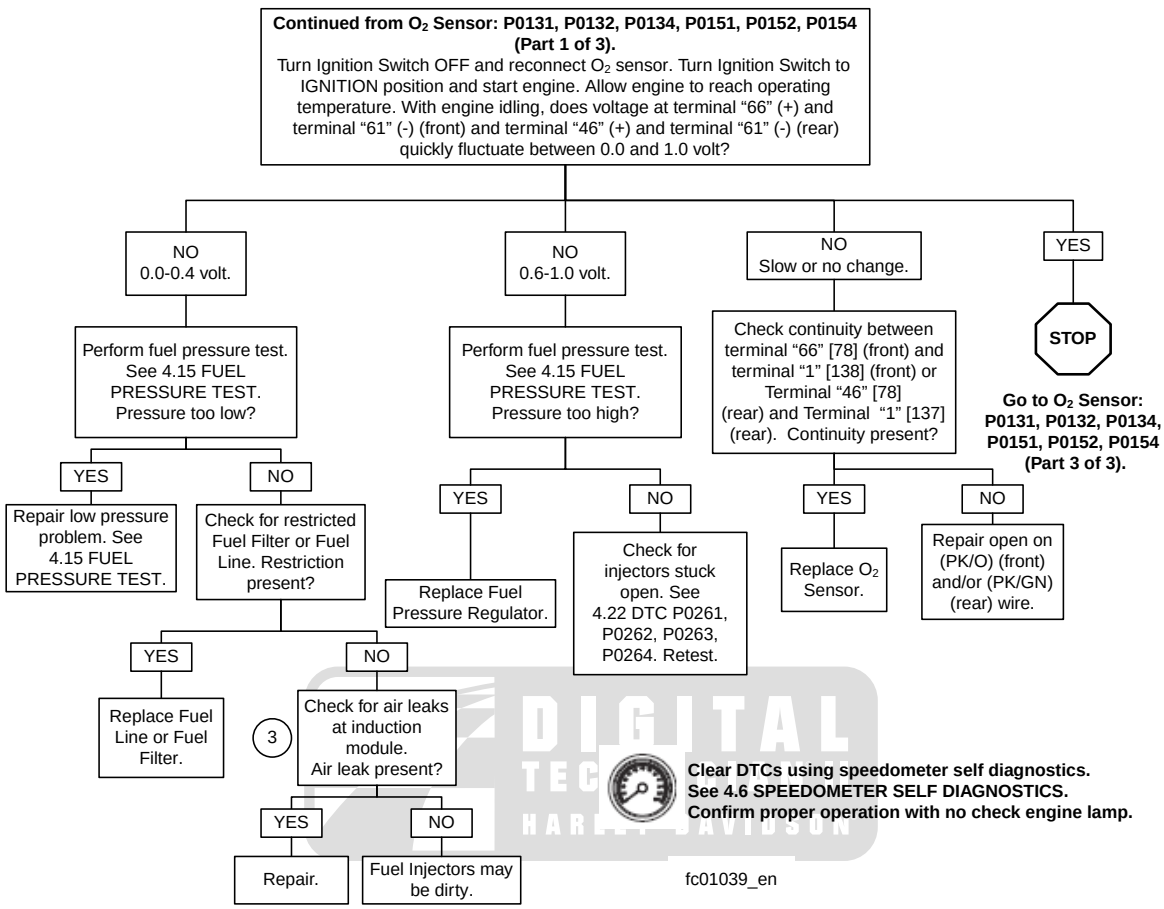


Clear DTCs using speedometer self diagnostics.
See 4.6 SPEEDOMETER SELF DIAGNOSTICS
Confirm proper operation with no check engine lamp.

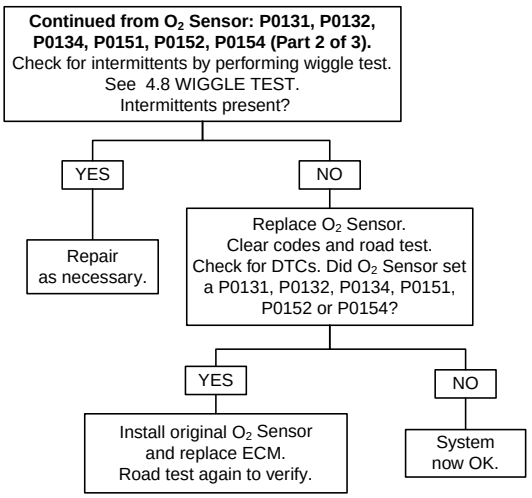
fc01038_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

O2 Sensor: DTC P0131, P0132, P0134, P0151, P0152, P0154 (Part 2 of 3)



O2 Sensor: DTC P0131, P0132, P0134, P0151, P0152, P0154 (Part 3 of 3)



Clear DTCs using speedometer self diagnostics.
See 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

fc01040_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P0261, P0262, P0263, P0264 4.22

GENERAL

Fuel Injectors

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 fuel injectors.

NOTE

ECM fuse and system relay failures or wiring harness problems will cause 12 volt power to be lost to both fuel injectors, ignition coils and fuel pump.

Table 4-36. Code Description

DTC	DESCRIPTION
P0261	Front injector open/low
P0262	Front injector high
P0263	Rear injector open/low
P0264	Rear injector high

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

Diagnostic Notes

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

1. See Service Manual for all service information.
2. Use FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C). See Figure 4-45.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.
4. Connect a BREAKOUT BOX (Part No. HD-48637) between EFI wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

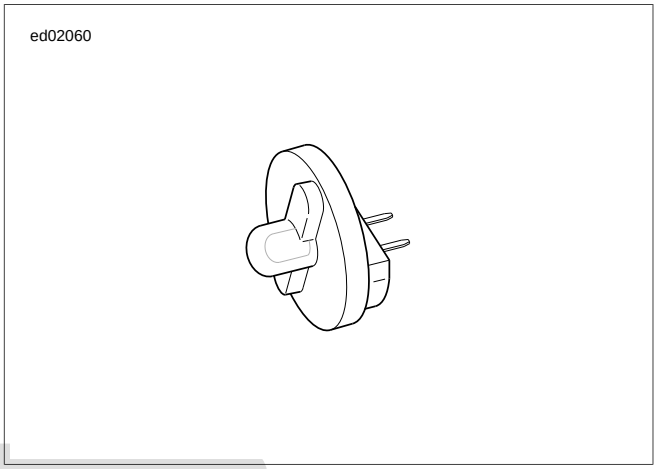


Figure 4-45. Fuel Injector Test Lamp (Part No. HD-34730-2C)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

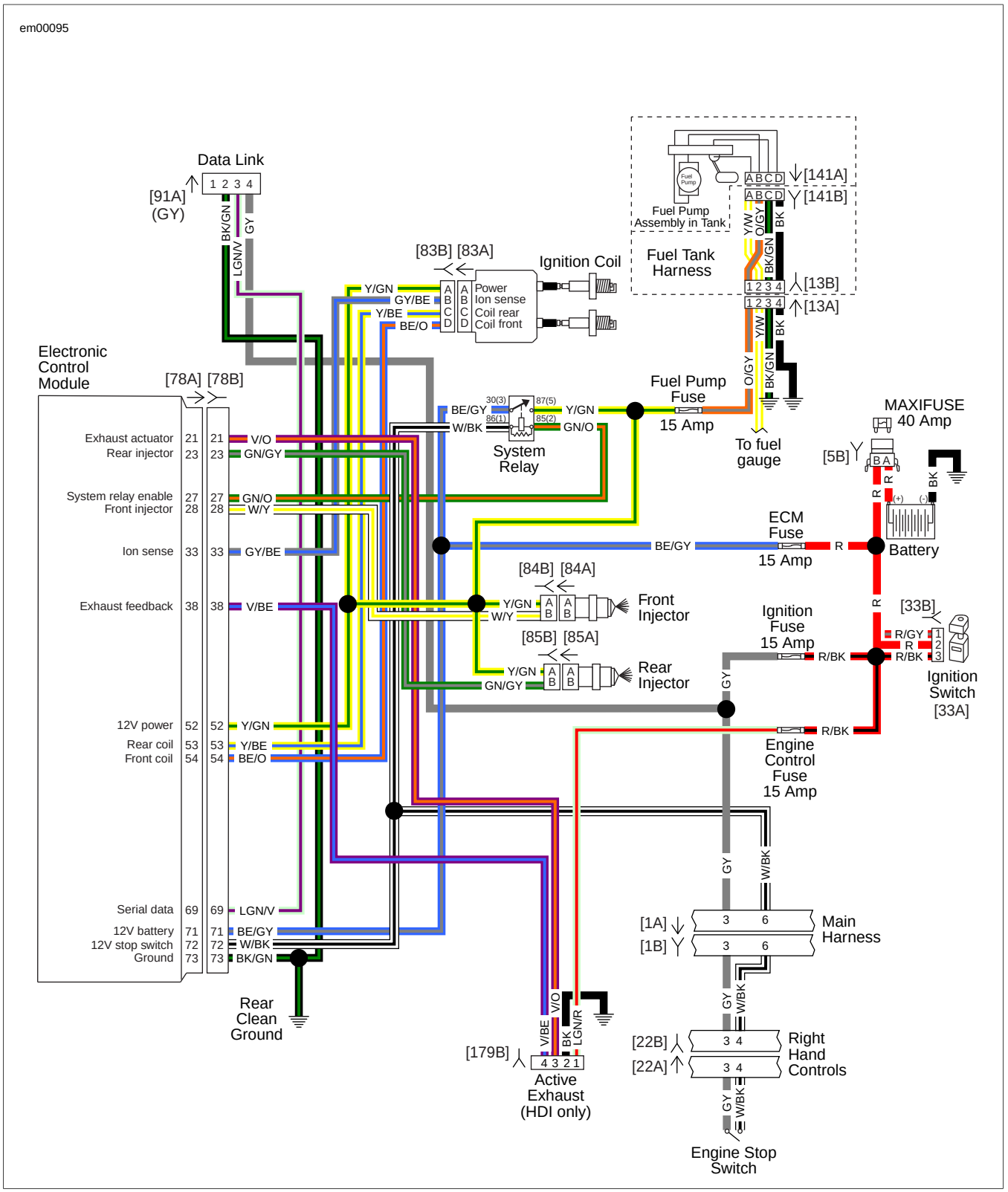


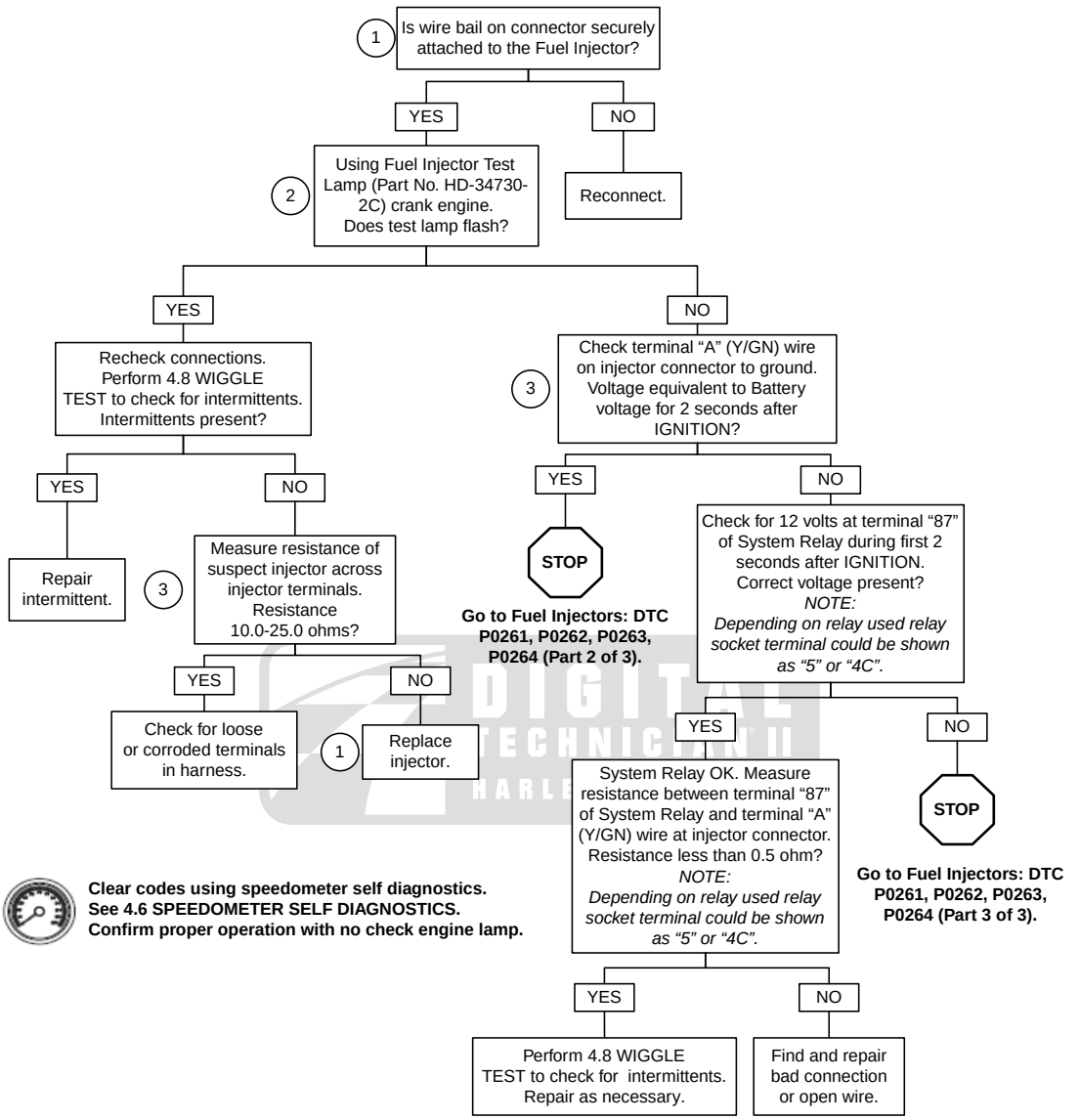
Figure 4-46. Fuel Injector Circuit

Table 4-37. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Delphi	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[121]	Rear brake light switch	Spade terminal	Bottom of rear frame downtub (right side)
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	6-place Molex	Right side of engine (induction module)

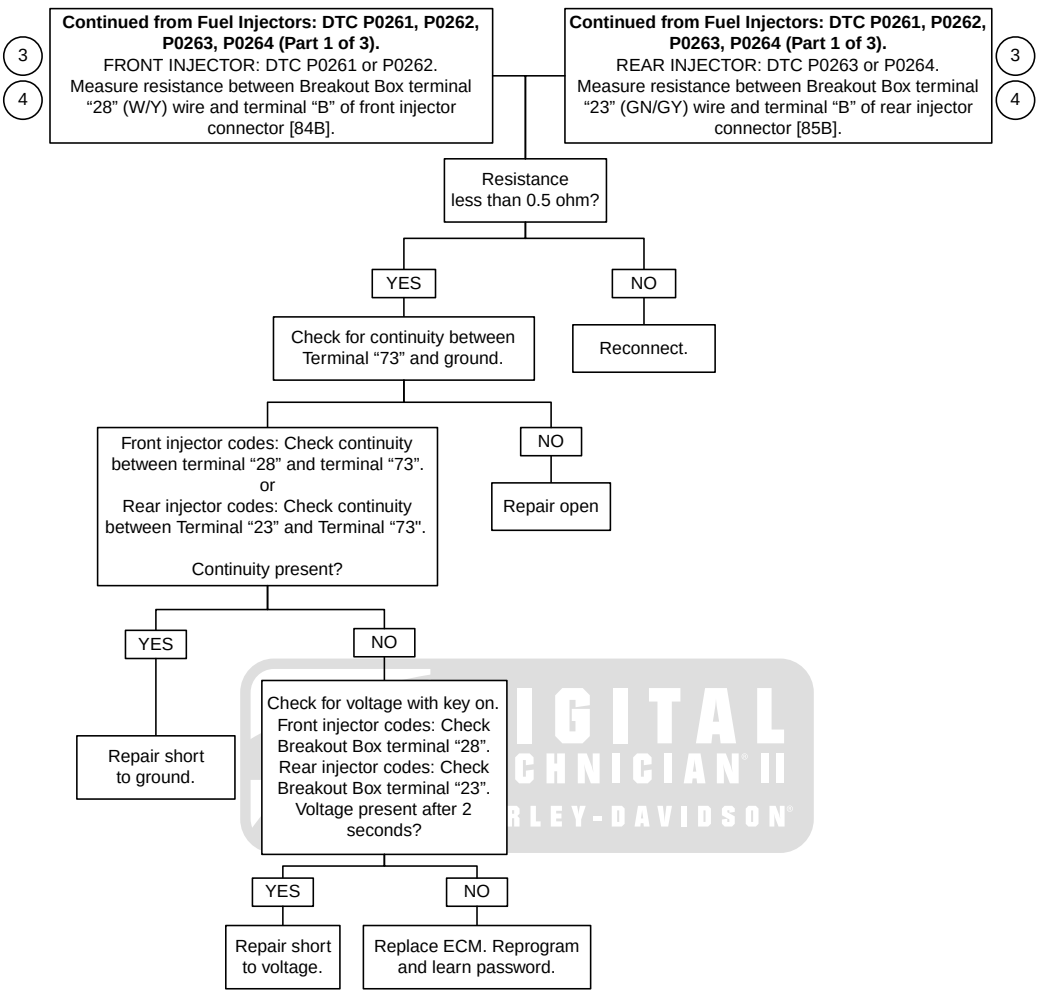
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Fuel Injectors: DTC P0261, P0262, P0263, P0264 (Part 1 of 3)



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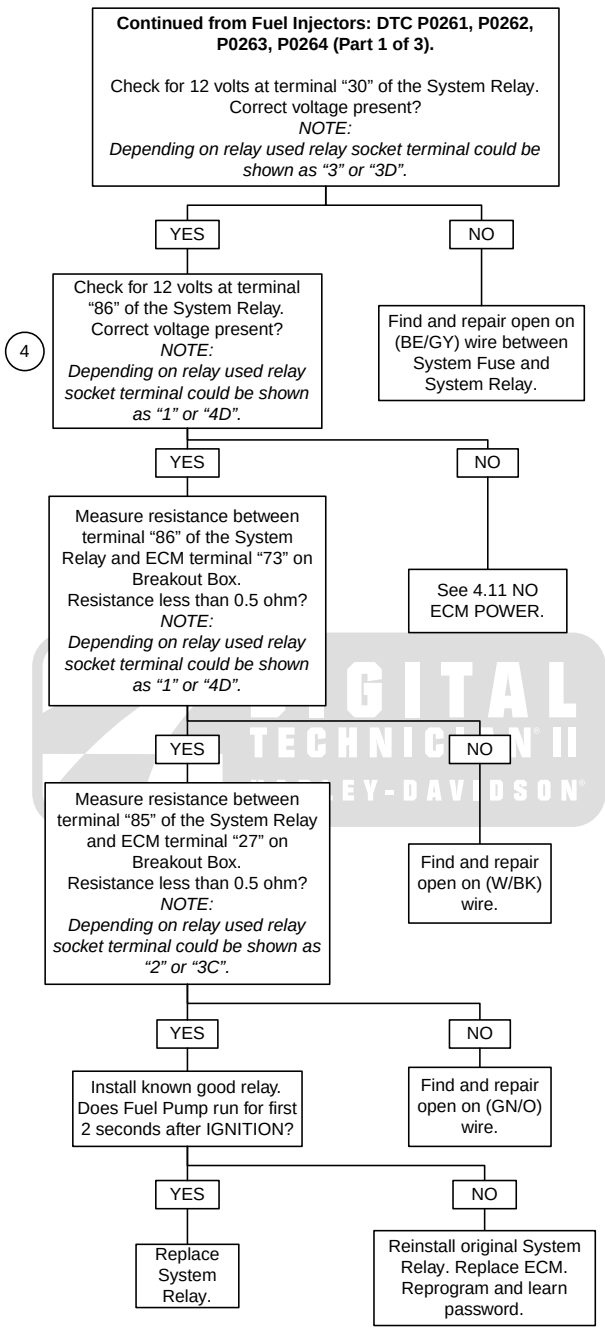
Fuel Injectors: DTC P0261, P0262, P0263, P0264 (Part 2 of 3)



fc01042_en

Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

Fuel Injectors: DTC P0261, P0262, P0263, P0264 (Part 3 of 3)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01043_en

DTC P0373, P0374 4.23

GENERAL

CKP Sensor

If the CKP sensor signal is weak or absent, Diagnostic Trouble Code (DTC) P0373 or P0374 will be set.

NOTE

If signal is not detected or cannot synchronize (DTC P0374), engine will not start.

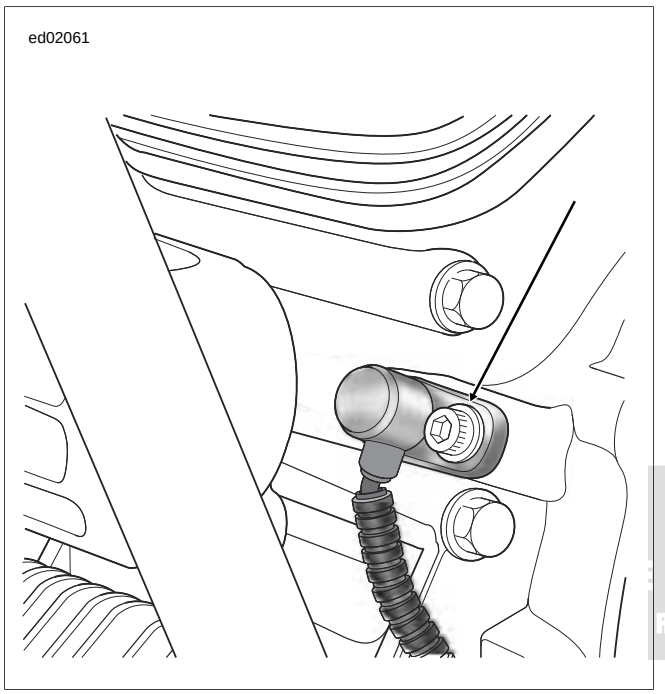
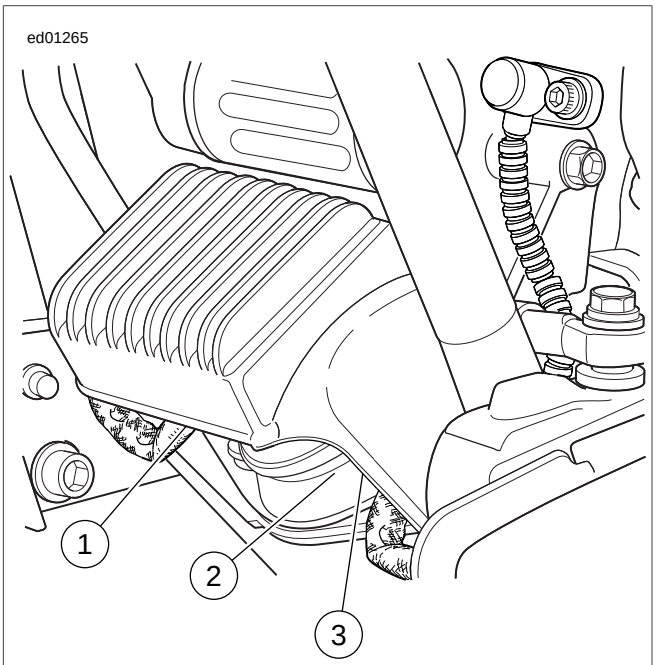


Figure 4-47. CKP Sensor



1. **Voltage Regulator [77]**
2. **CKP Sensor [79]**
3. **Stator [47]**

Figure 4-48. Voltage Regulator (Left Side View)

Table 4-38. Code Description

DTC	DESCRIPTION
P0373	CKP sensor intermittent
P0374	CKP sensor synch error

DIAGNOSTICS

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

Diagnostic Tips

- Engine must be cranked for more than five seconds without CKP sensor signal to set a DTC.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to ECM wire harness only (leave ECM disconnected). See 4.7 BREAKOUT BOX: EFI.
2. One megohm is very high resistance. Some meters will read OL, etc.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown socket probes and patch cords.

4. For testing purposes, install sensor without running wiring along normal path. Disconnect and route wiring properly if system is now OK.

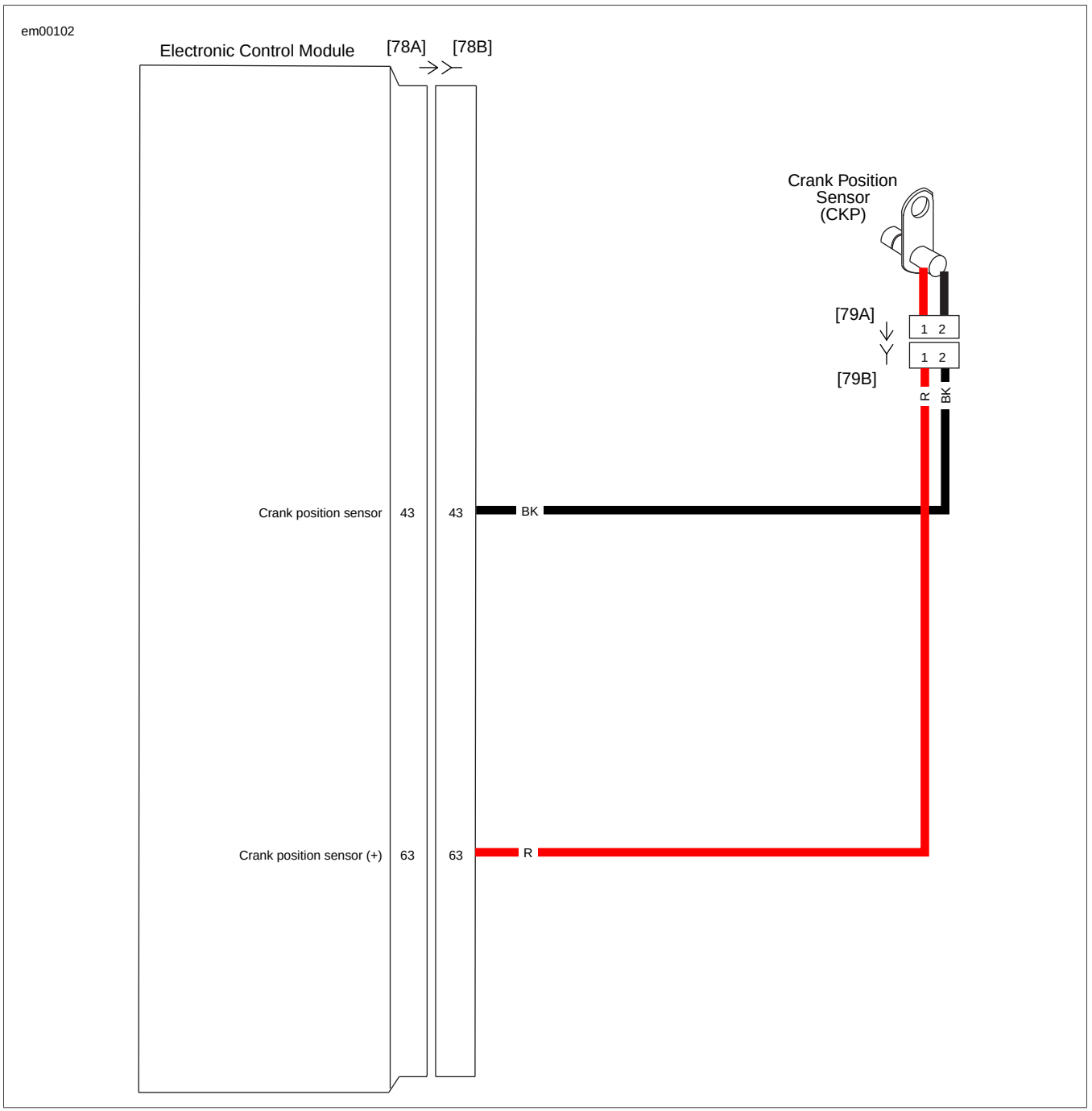
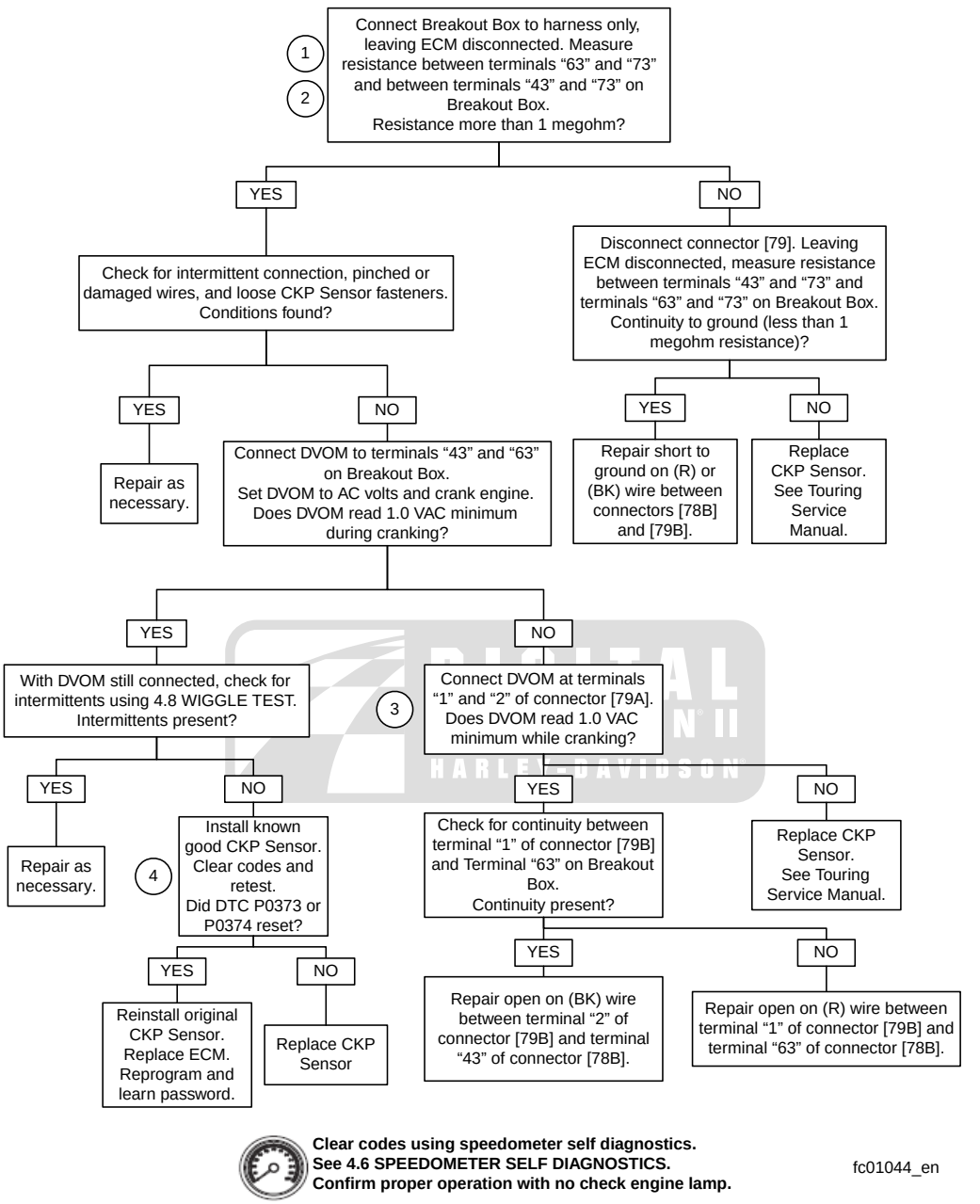


Figure 4-49. CKP Sensor Circuit

Table 4-39. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) Sensor	2-place Mini-Deutsch	Bottom of voltage regulator

CKP Sensor: DTC P0373, P0374



Clear codes using speedometer self diagnostics.
See 4.6 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

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DTC P0444, P0445 4.24

GENERAL

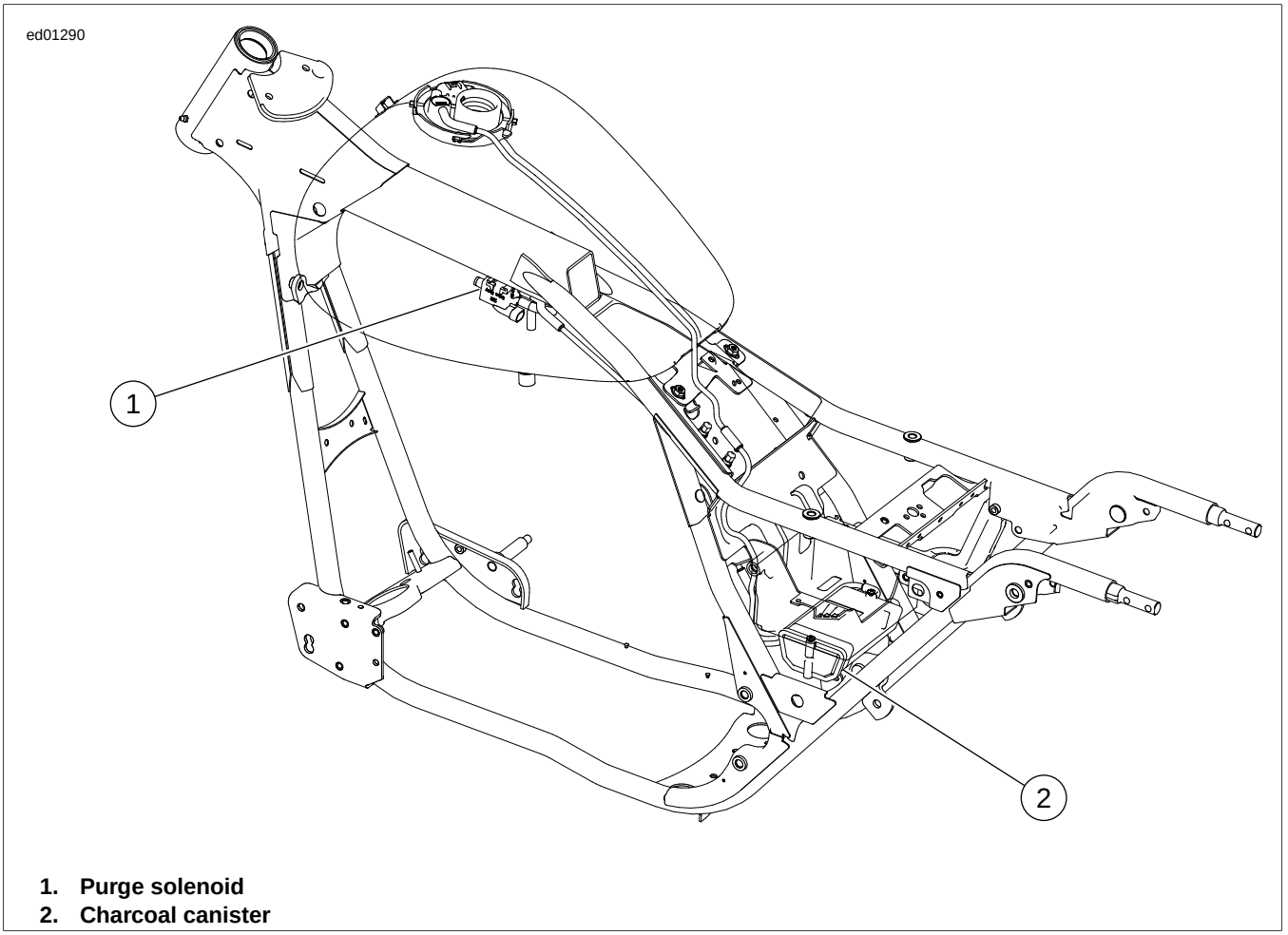
Purge Solenoid (CA and Select Foreign Market Models Only)

See Figure 4-50. To comply with California Emissions, a purge solenoid is mounted beneath the fuel tank of the vehicle, connecting to the vent line in the top of the fuel tank and to a vent canister mounted on the vehicle chassis under the battery holding tray. A return line from the canister reconnects to the air intake manifold allowing vented fumes to be recirculated, for emission efficiency.

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.*



1. **Purge solenoid**
2. **Charcoal canister**

Figure 4-50. Purge Solenoid Mounting Location

Table 4-40. Code Description

DTC	DESCRIPTION
P0444	Purge solenoid open/low
P0445	Purge solenoid high

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48637	BREAKOUT BOX

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

Diagnostic Notes

1. See Service Manual for all service information.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple terminal probes and patch cord to and gray socket probes and patch cord to FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C). See Figure 4-51.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple terminal probe and patch cord.
4. Connect a BREAKOUT BOX (Part No. HD-48637) to the ECM and mating connector. See 4.7 BREAKOUT BOX: EFI.
5. Use FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) to test the purge solenoid circuit by plugging the test lamp into connector [95B]. See Figure 4-51.

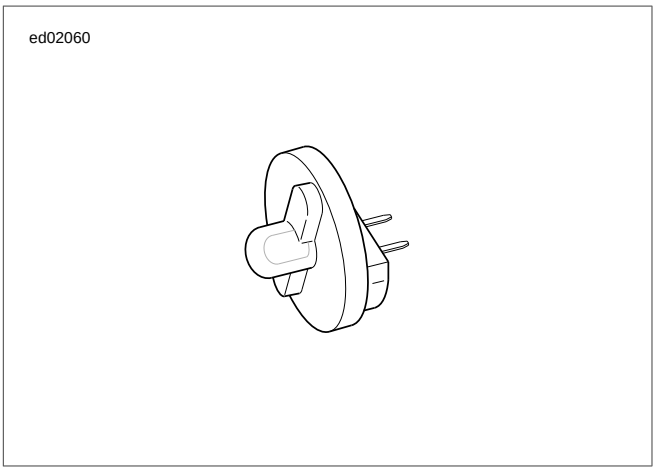


Figure 4-51. Fuel Injector Test Lamp (Part No. HD-34730-2C)

Diagnostic Procedure

NOTE

To access the purge solenoid and canister, the fuel tank must be removed from the vehicle.

See Figure 4-52 and Figure 4-53 for purge solenoid circuitry diagrams.

1. See Service Manual and properly remove the fuel tank from the vehicle.
2. If the charcoal canister requires removal, refer to Service Manual and remove/replace as required.
3. Check all of the formed plastic hoses and rubber hoses for air leaks, cracks, breaks, chafing and/or physical deterioration/wear. See Service Manual and replace any hoses found defective.
4. Proceed with flow charts.

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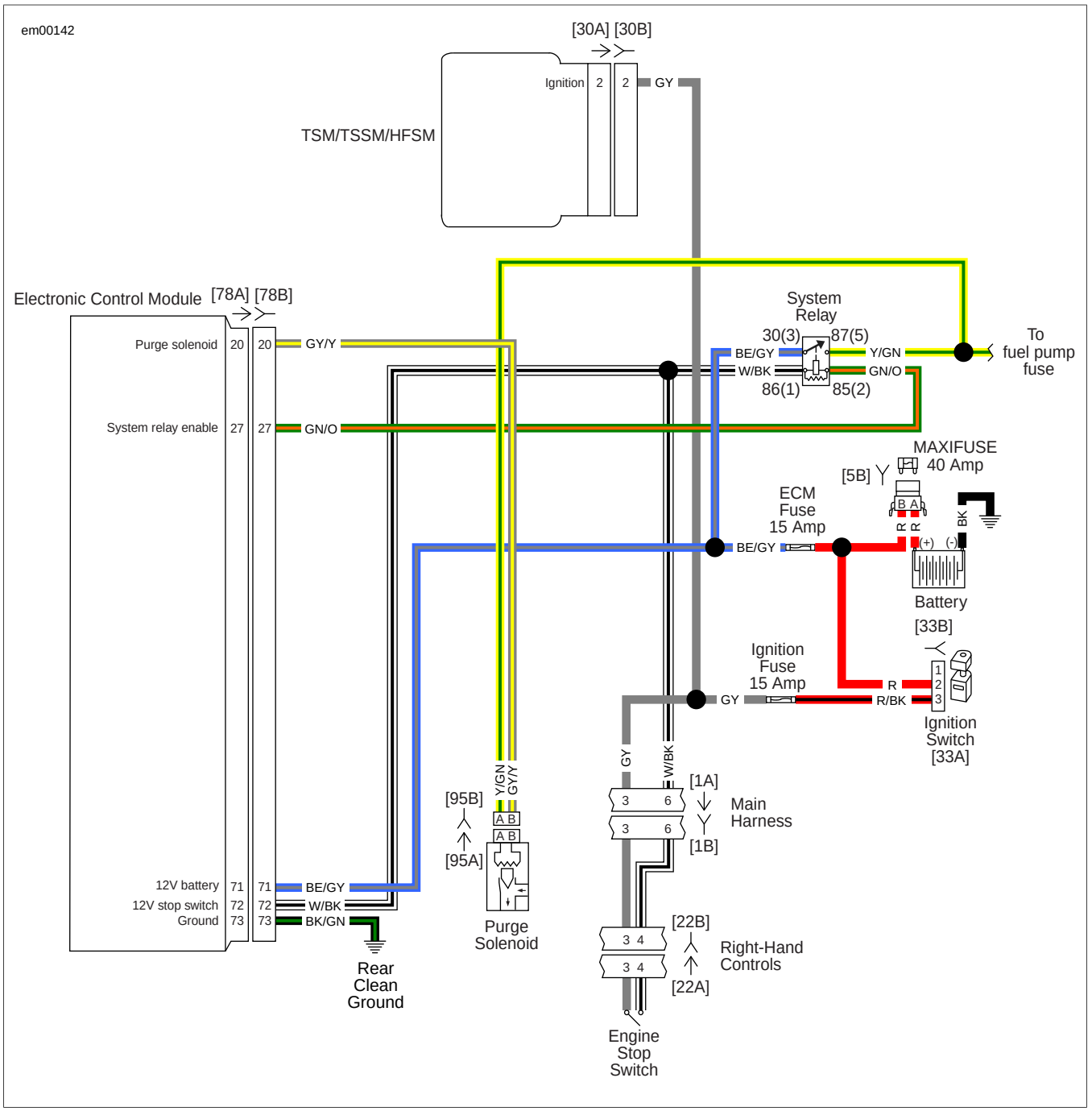


Figure 4-52. Purge Solenoid Circuit Diagram (FLHTP, FLHX, FLHT/C/CU, FLTR, FLTRU)

Table 4-41. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main harness	16-place Molex	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[22]	Right hand controls	6-place Molex (black)	Inside headlamp nacelle (FLHR/C/S)
[22]	Right hand controls	12-place Molex (Black)	Inner fairing right fairing support brace (FLHT/C/U)

Table 4-41. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box
[33]	Ignition switch	3-place Molex	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[95]	Purge solenoid	2-place Packard	Under fuel tank

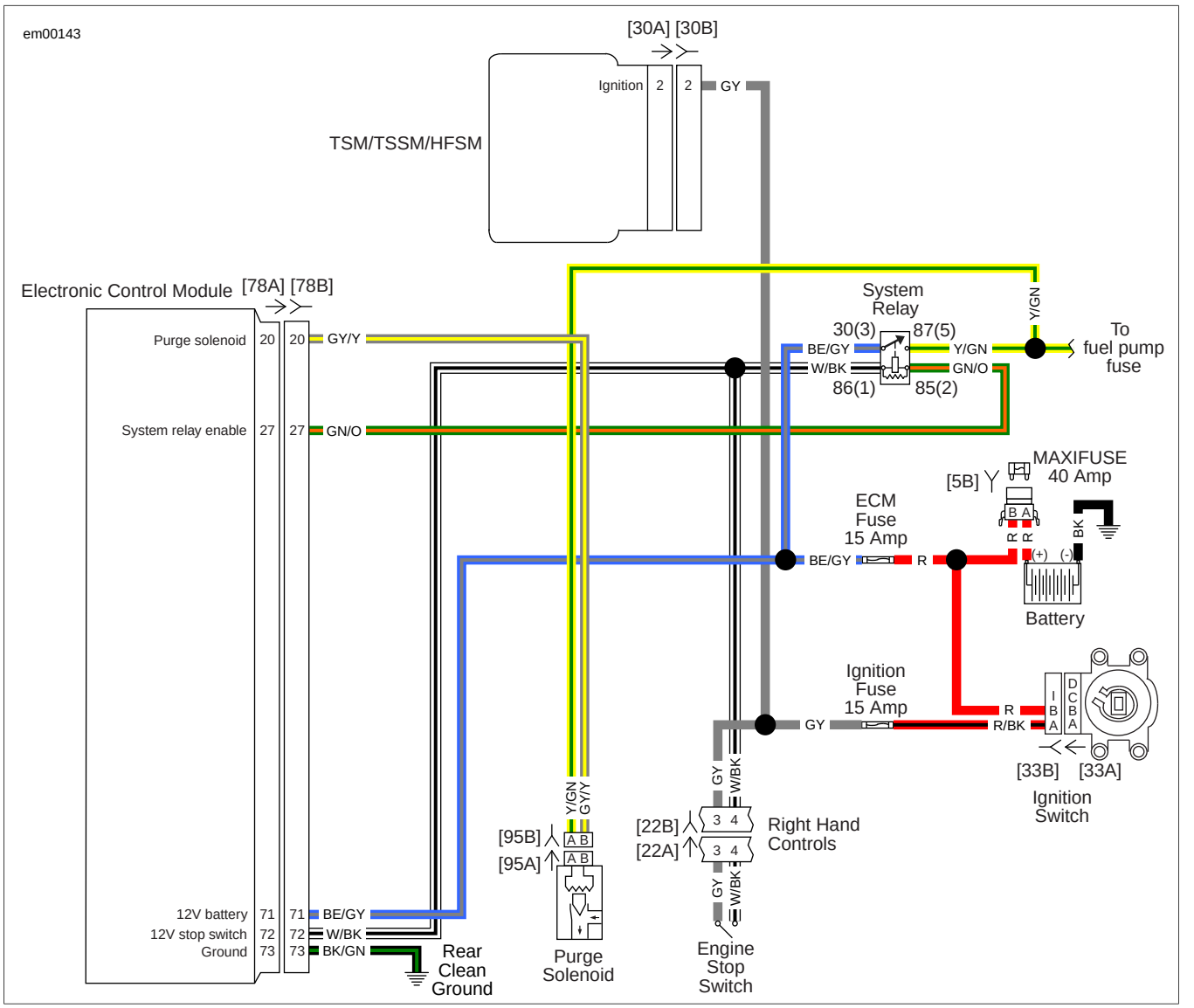


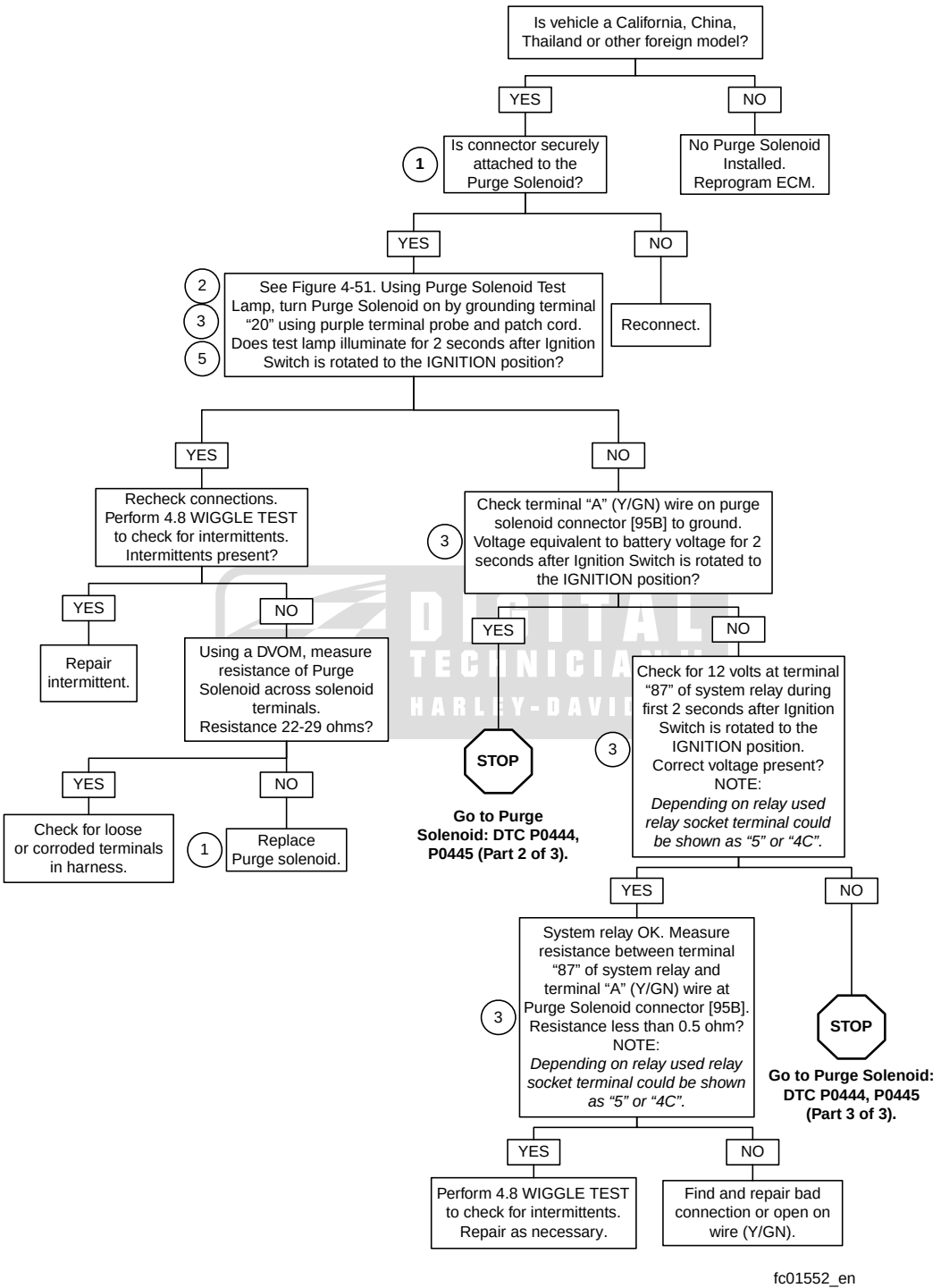
Figure 4-53. Purge Solenoid Circuit Diagram (FLHR, FLHRC)

Table 4-42. Wire Harness Connectors

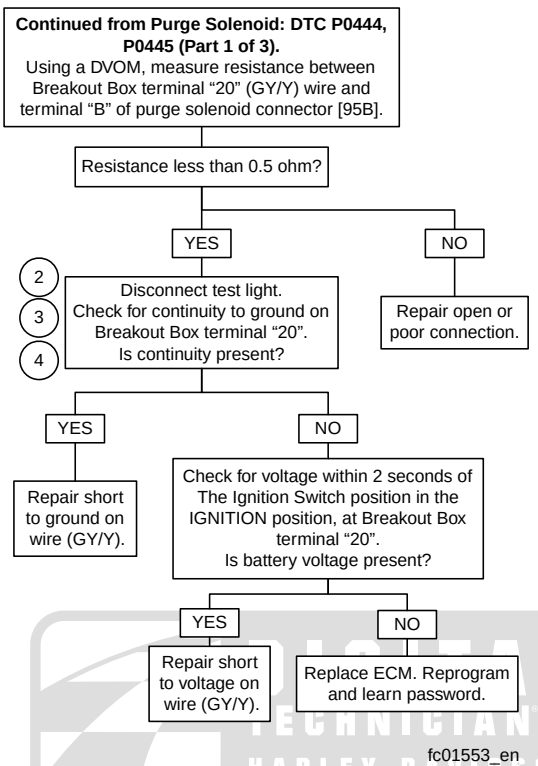
NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[22]	Right hand controls	6-place Molex (Black)	Inside headlamp nacelle
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box
[33	Ignition switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[95]	Purge solenoid	2-place Packard	Under fuel tank

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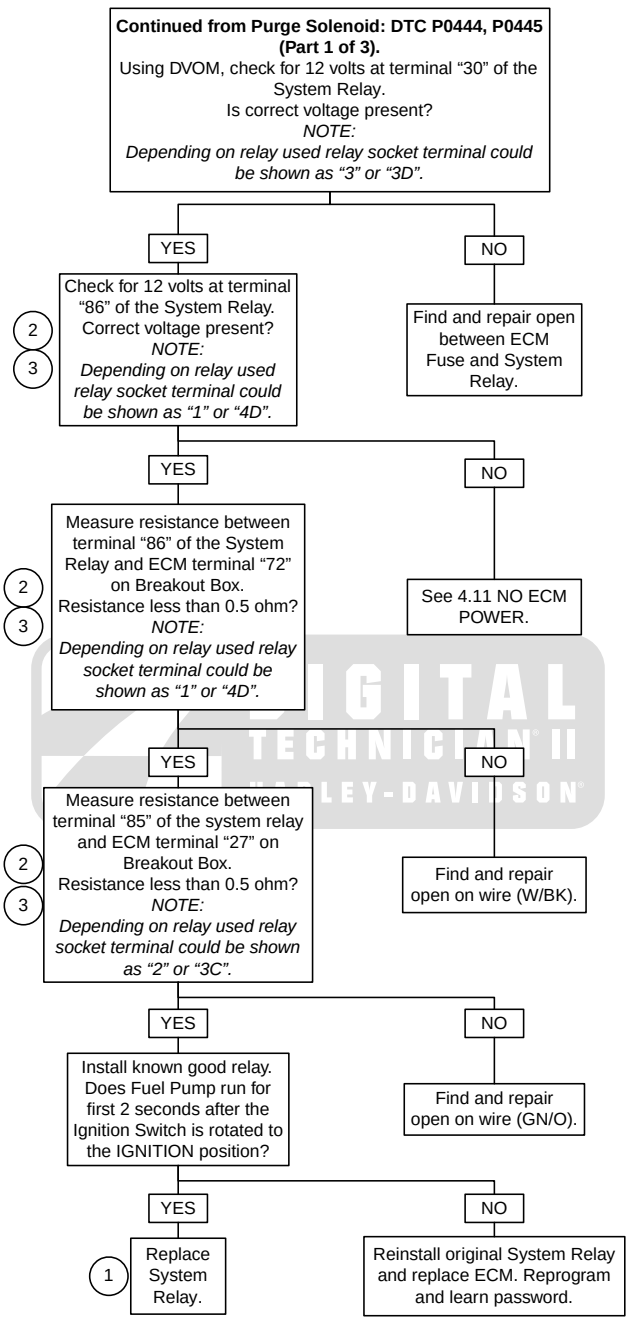
Purge Solenoid: DTC P0444, P0445 (Part 1 of 3)



Purge Solenoid: DTC P0444, P0445 (Part 2 of 3)



Purge Solenoid: DTC P0444, P0445 (Part 3 of 3)



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DTC P0501, P0502 4.25

GENERAL

Vehicle Speed Sensor (VSS)

See Figure 4-54. 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.

NOTE

When the vehicle speed is greater than 0, the closed loop idle speed control is inhibited.

Table 4-43. Code Description

DTC	DESCRIPTION
P0501	VSS low
P0502	VSS high/open

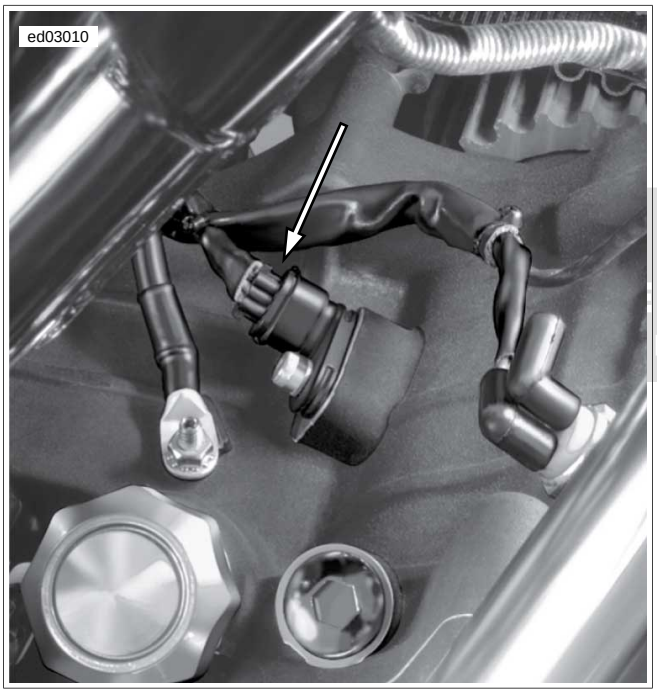


Figure 4-54. VSS Location (Under Starter)

DIAGNOSTICS

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

Diagnostic Notes

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

1. The speedometer has a built-in diagnostic mode. See 4.6 SPEEDOMETER SELF-DIAGNOSTICS.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.
3. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

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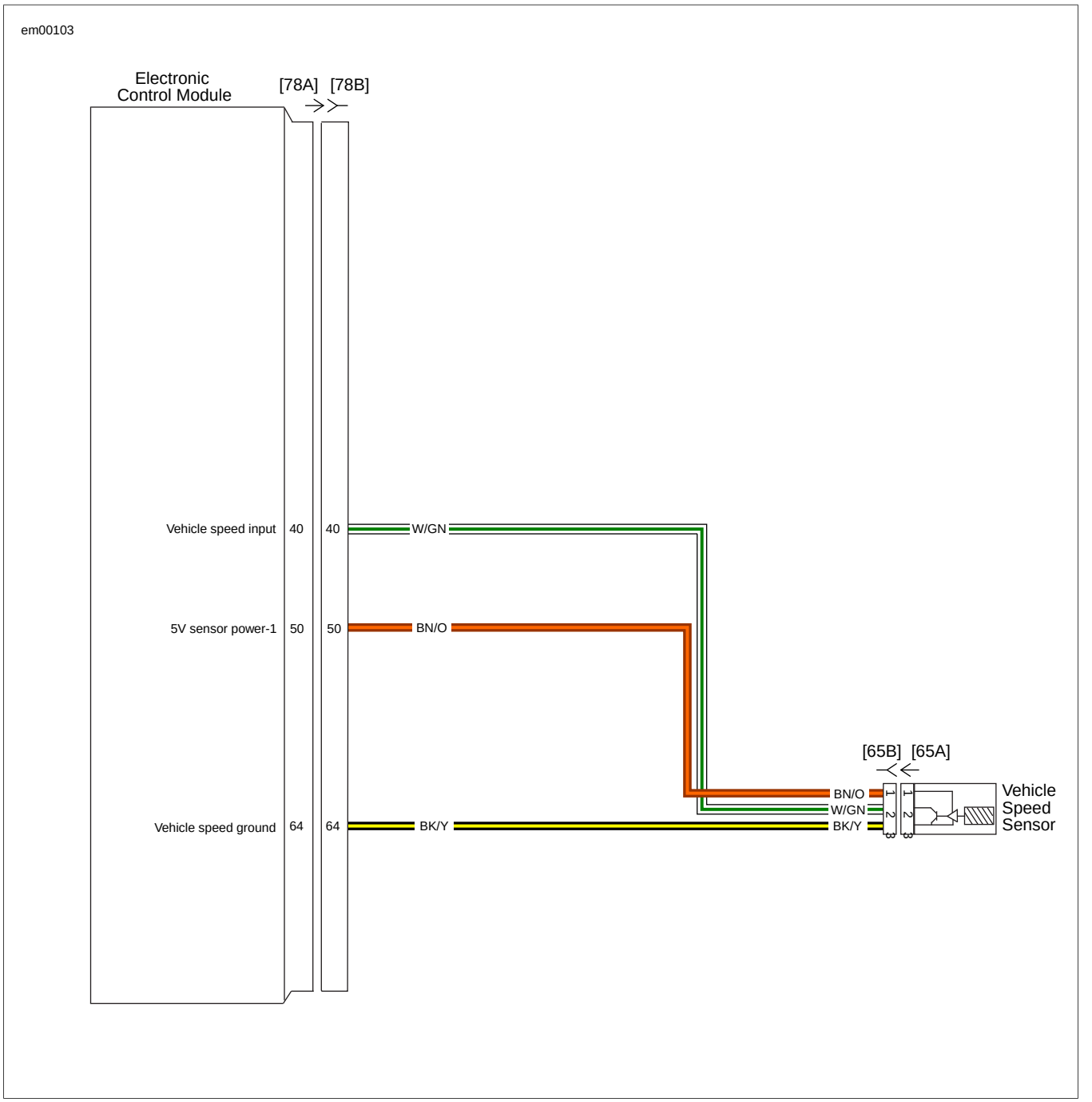
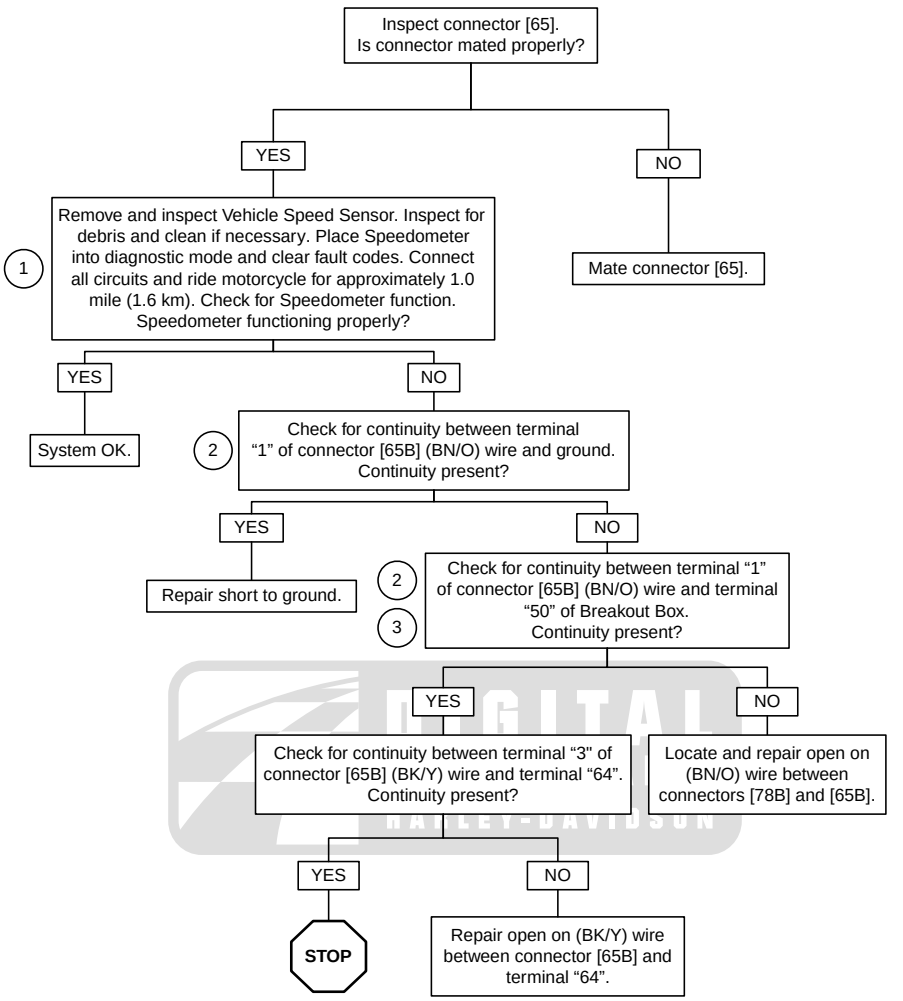


Figure 4-55. VSS Circuit Diagram

Table 4-44. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat

Vehicle Speed Sensor: DTC P0501, P0502 (Part 1 of 2)

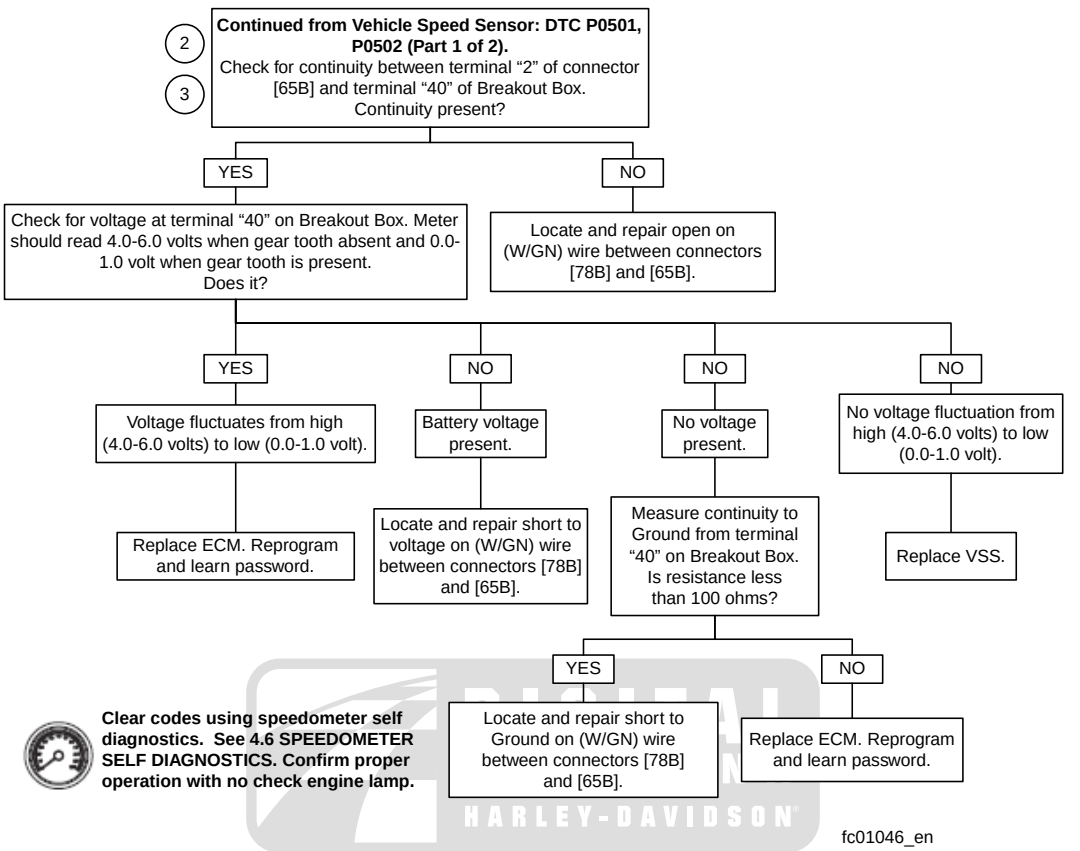


Go to Vehicle Speed Sensor: DTC P0501, P0502 (Part 2 of 2).

Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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Vehicle Speed Sensor: DTC P0501, P0502 (Part 2 of 2)



DTC P0562, P0563 4.26

GENERAL

Battery Voltage

Battery voltage is monitored by the ECM (terminal "72"). If the battery voltage fails to meet normal operating parameters, a code is set.

- When battery voltage at low RPM (<1300 RPM) is less than 12.5 volts and battery voltage at high RPM (>2000 RPM) minus battery voltage at low RPM is less than 0.25 volts, then DTC P0562 is set after 100 counts (up to 15 seconds).
- DTC P0563 is displayed when battery positive voltage is greater than 15.0 volts for more than 4 seconds.

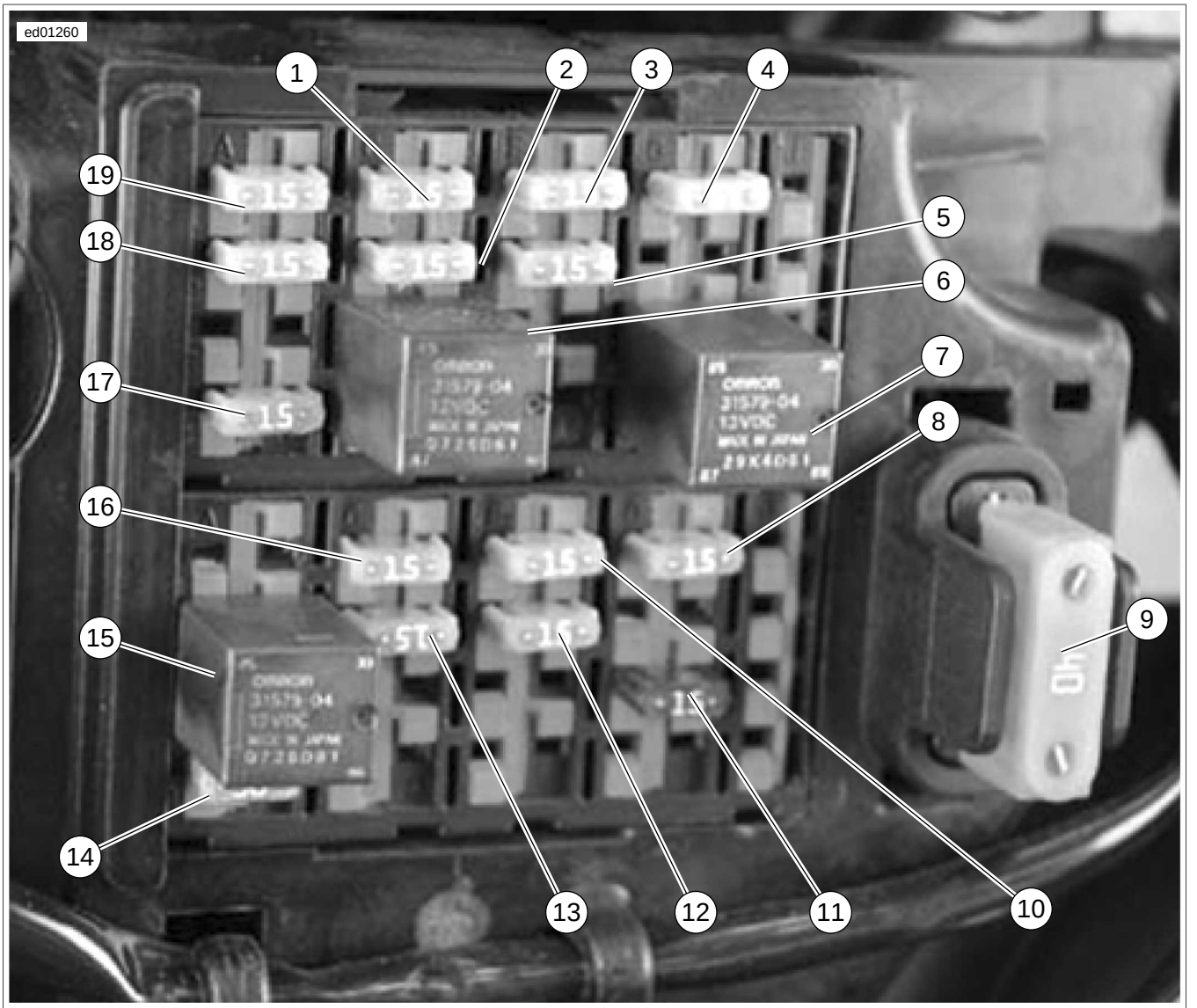
NOTES

- *Warm idle speed will be automatically increased if battery voltage is low at idle.*
- *TSM/TSSM/HFSM problems may also set DTC P0562 or P0563.*

Table 4-45. Code Description

DTC	DESCRIPTION
P0562	Battery voltage low
P0563	Battery voltage high

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1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure 4-56. Fuse and Relay Locations

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-48637	BREAKOUT BOX

Diagnostic Tips

- Low voltage generally indicates a loose wire, corroded connections, battery and/or a charging system problem.
- A high voltage condition may be caused by a faulty voltage regulator.

Diagnostic Notes

Each referenced number below correlates with a circled number on the flow chart(s).

1. Was battery allowed to discharge? Was battery drawn down by a starting problem?
   a. Yes. Charge battery.
   b. No. See 1.7 CHARGING SYSTEM, Troubleshooting.
2. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
3. Use DVOM with RPM Pick-up to check RPM on vehicles without tachometers.
4. This checks for voltage drops in the ECM circuit.
   a. Place (+) probe to battery positive terminal.
   b. Place (-) probe to (W/BK) terminal on BREAKOUT BOX (Part No. HD-48637).
5. Problem is most likely the ground connection at the frame.
6. Connect BREAKOUT BOX (Part No. HD-48637) to connector [22]. FLHR/C models will also need HD-42962 adapters.

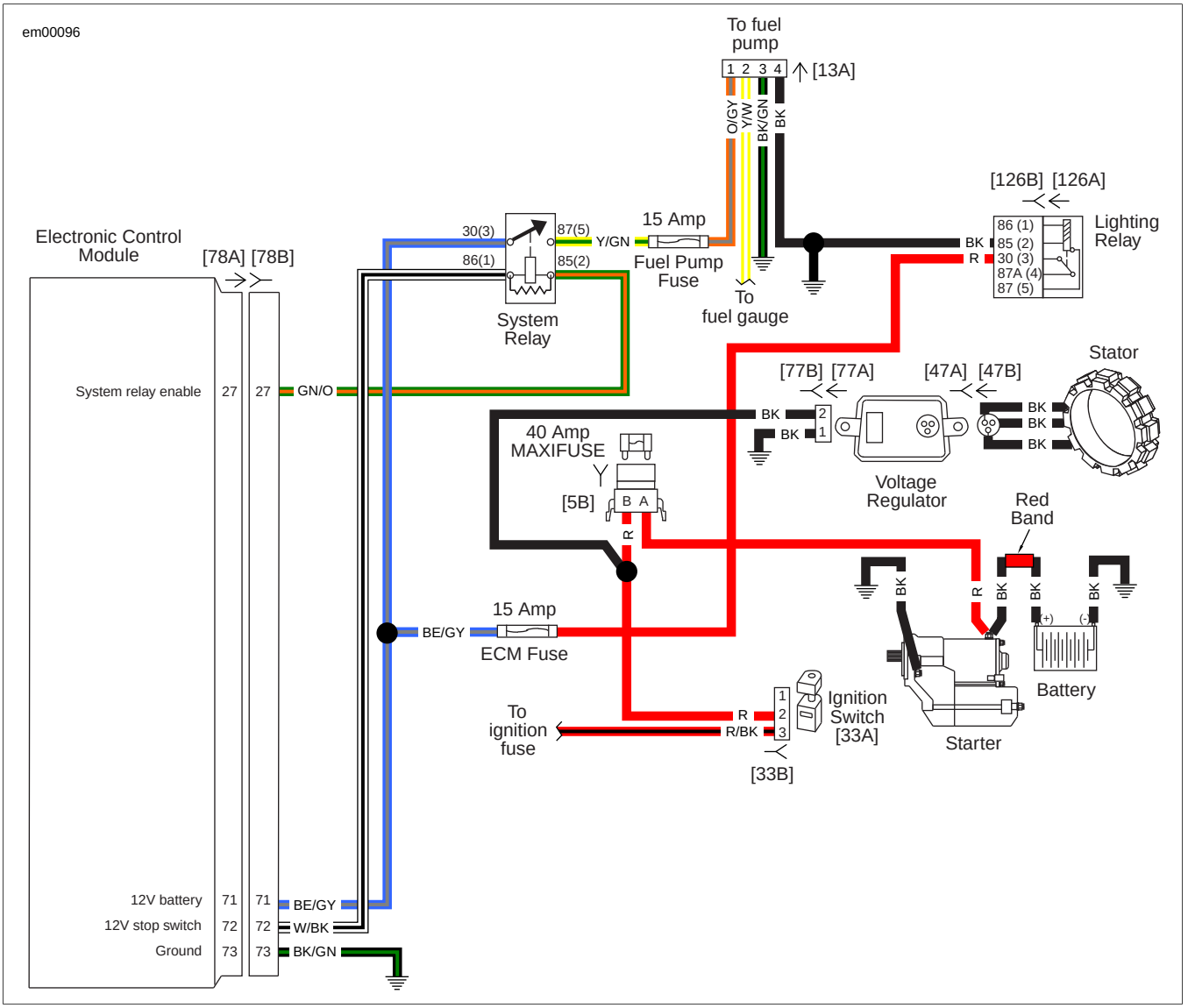


Figure 4-57. Battery Voltage Circuit Diagram (FLHX, FLHT/C/U, FLTR)

Table 4-46. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat

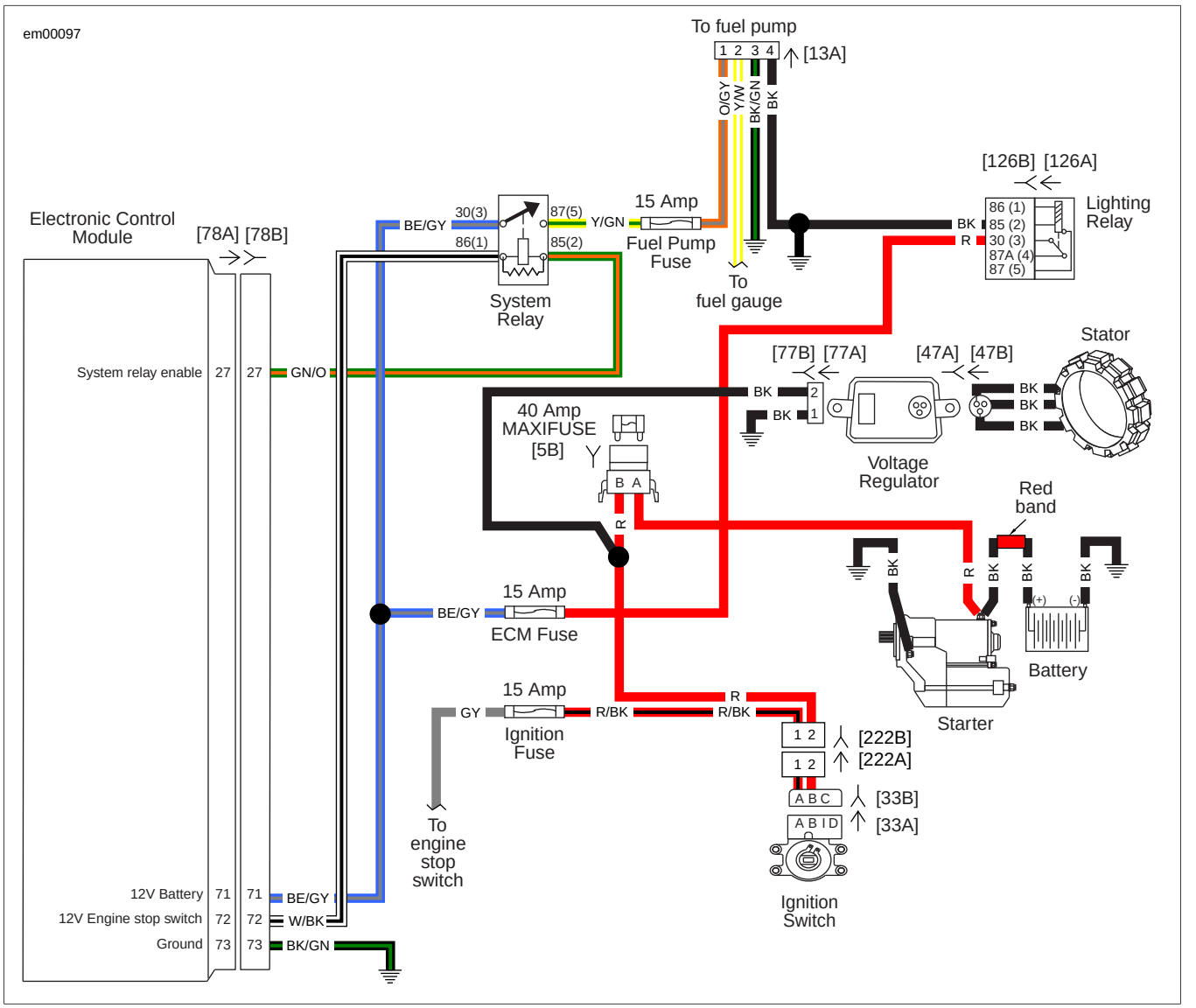


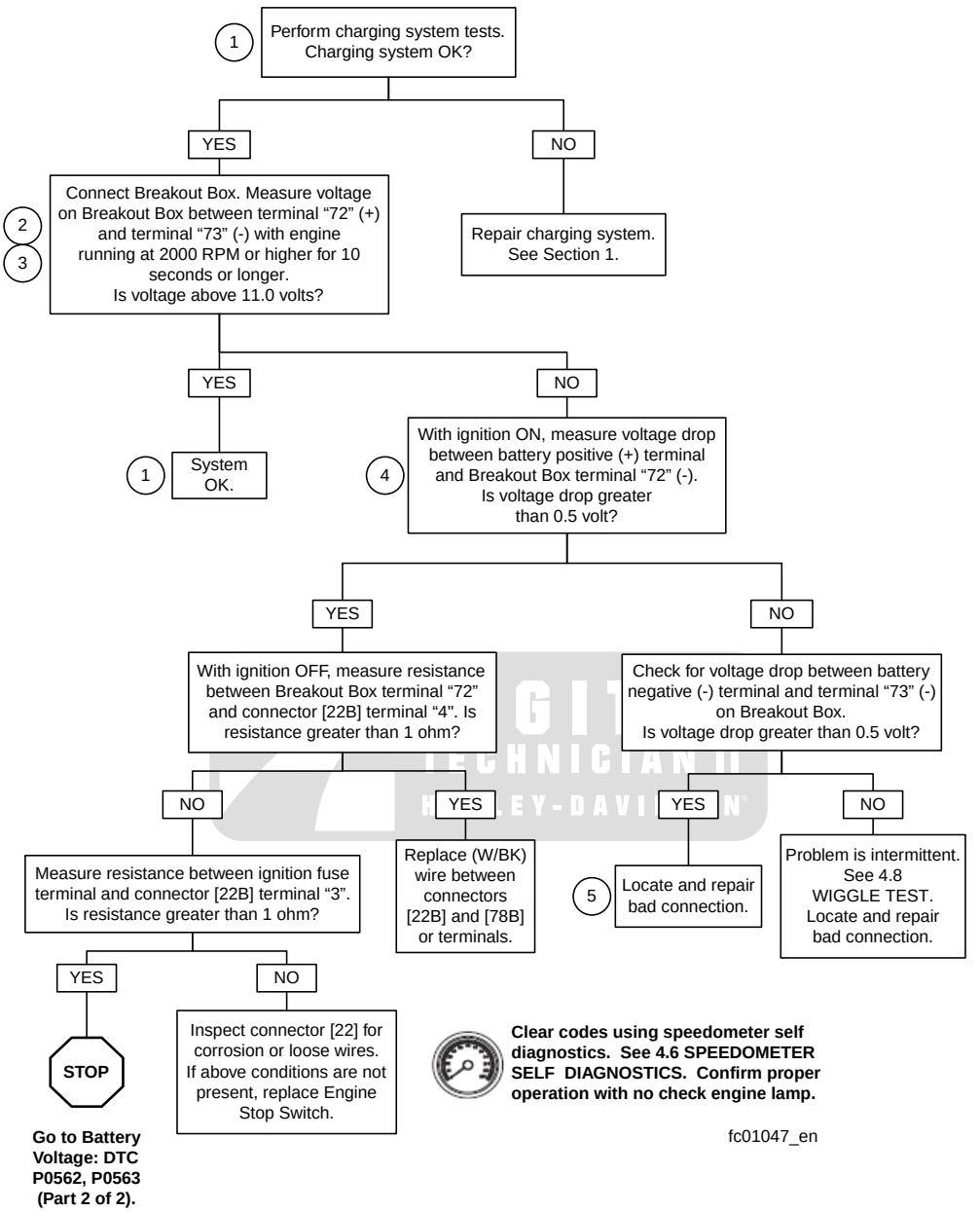
Figure 4-58. Battery Voltage Circuit Diagram (FLHR/C/S)

Table 4-47. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Right handlebar switches	6-place Molex (black)	Inside headlamp nacelle
[33]	Ignition switch	3-place Packard	Under console
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[222]	Main to ignition harness	4-place Packard	Rear of fuel tank (under seat)

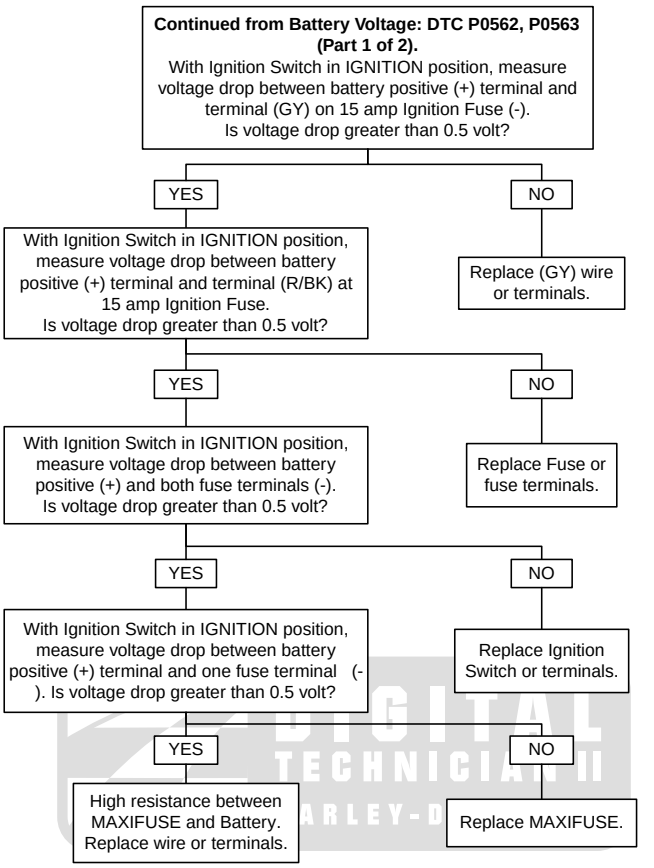
DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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



Go to Battery Voltage: DTC P0562, P0563 (Part 2 of 2).

Battery Voltage: DTC P0562, P0563 (Part 2 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC P0572 4.27

GENERAL

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 brake switch is a pressure switch located in the brake line under the exhaust pipes.

On vehicles not equipped with Antilock Brake System (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. Then 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 with out any brake switch signals in order to set DTC P0572.

Table 4-48. Code Description

DTC	DESCRIPTION
P0572	Brake switch input error

DIAGNOSTICS

Diagnostic Tips

- Check that the rear brake reservoir has the proper amount of brake fluid, and there are no apparent leaks. If fluid is low, the rear brake switch may not receive sufficient pressure to actuate the switch. Replenish brake fluid in the brake reservoir(s), as necessary.
- An intermittent may be caused by poor connection, rubbed through wire insulation or a wire broken inside the insulation.

Check for the following conditions:

- **Poor connection**: Inspect component and harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection and damaged harnesses.
- **Fluid leaks**: Check the rear brake switch for fluid leaks around the seal of the switch. Refer to Service Manual to repair a fluid leak.

Diagnostic Notes

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

1. When checking the (O/W) wire, from the accessory fuse for a short to ground, remember to check the wires on the other side of the switches for shorts to ground as well. These circuits could cause a short to the accessory fuse but ONLY when the switch is closed. The accessory fuse circuit supplies power to the cigar lighter, horn, left and right turn signal switches, front and rear brake switches and the cruise control switch.

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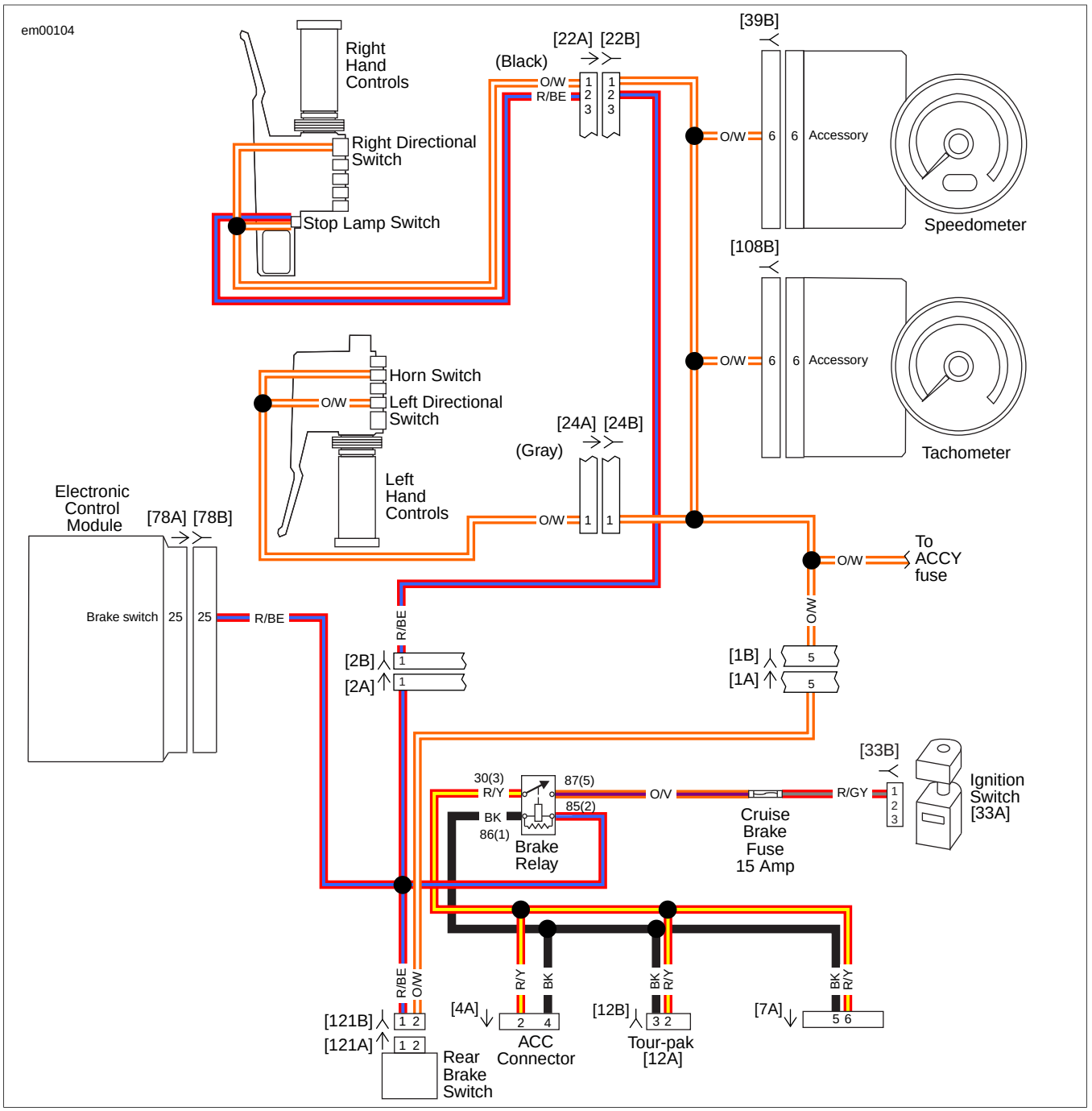


Figure 4-59. Brake Control Circuit Without ABS

Table 4-49. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - right faring support brace
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[4]	Accessory connector	All	4-place Deutsch (Black)	Under seat - left side of chassis
[7]	Rear fender lights harness	All	8-place Multilock	Top of rear fender (under seat)

Table 4-49. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[12]	Tour-Pak lights (rear fascia lamp on FLHX)	All	3-place Multilock	Inside Tour-Pak (inboard of upper frame tube on FLHX)
[22]	Right handlebar switches	FLHT/C	12-place Molex (Black)	Inner fairing (fork stem nut lock plate)
		FLTR	12-place Molex (Black)	Inside headlamp nacelle
[24]	Left handlebar switches	FLHT/C	12-place Molex (Gray)	Inner fairing (fork stem nut lock plate)
		FLTR	12-place Molex (Gray)	Inside headlamp nacelle
[33]	Ignition switch	All	3-place Packard	Inner fairing - under radio
[39]	Speedometer	All	12-place Packard	Inner fairing - back of speedometer
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[121]	Rear brake switch	All	2-place Delphi	Mid chassis, lower right side (between frame and exhaust pipe)

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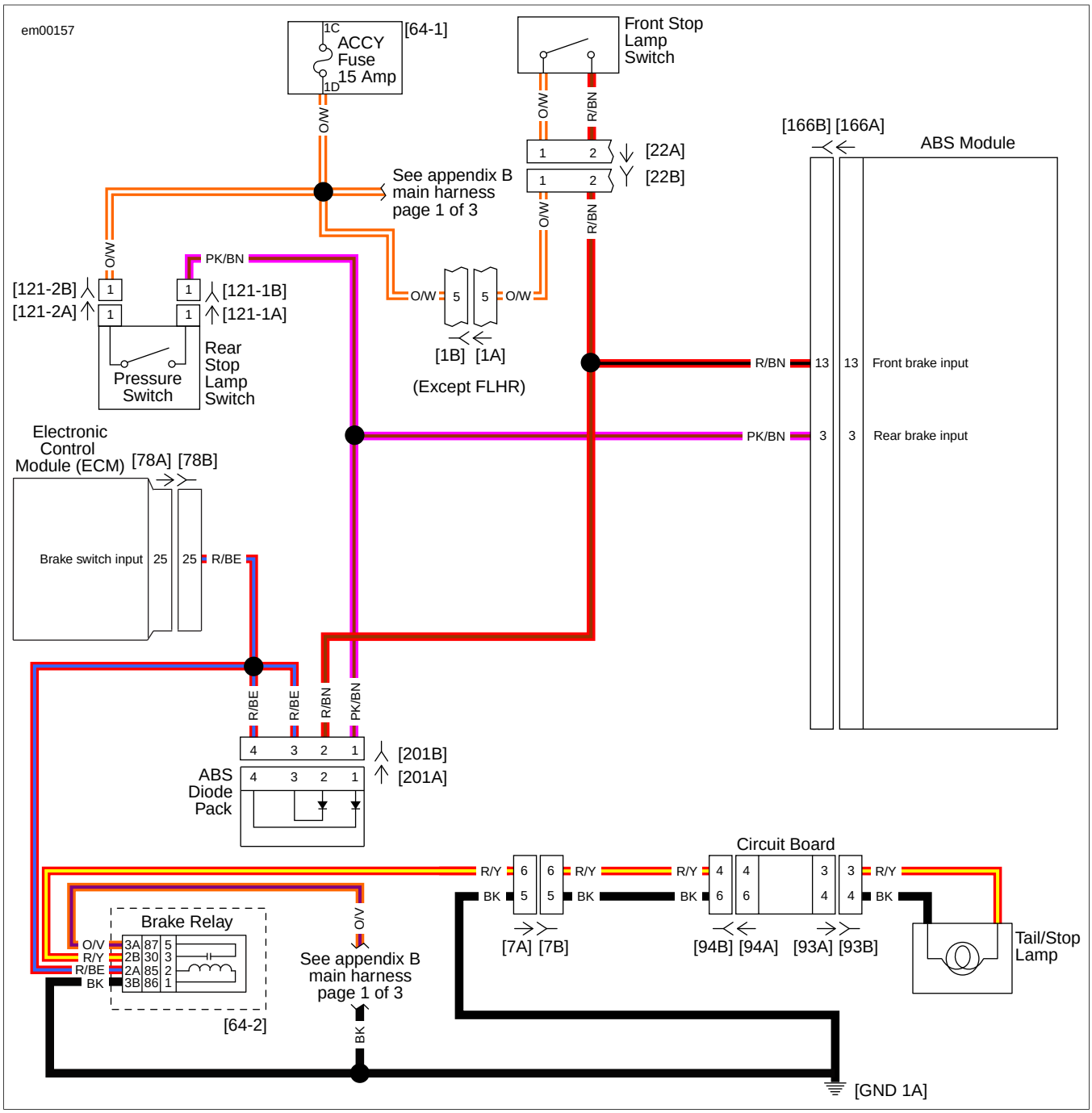


Figure 4-60. Brake Control Circuit With ABS

Table 4-50. Wire Harness Connectors

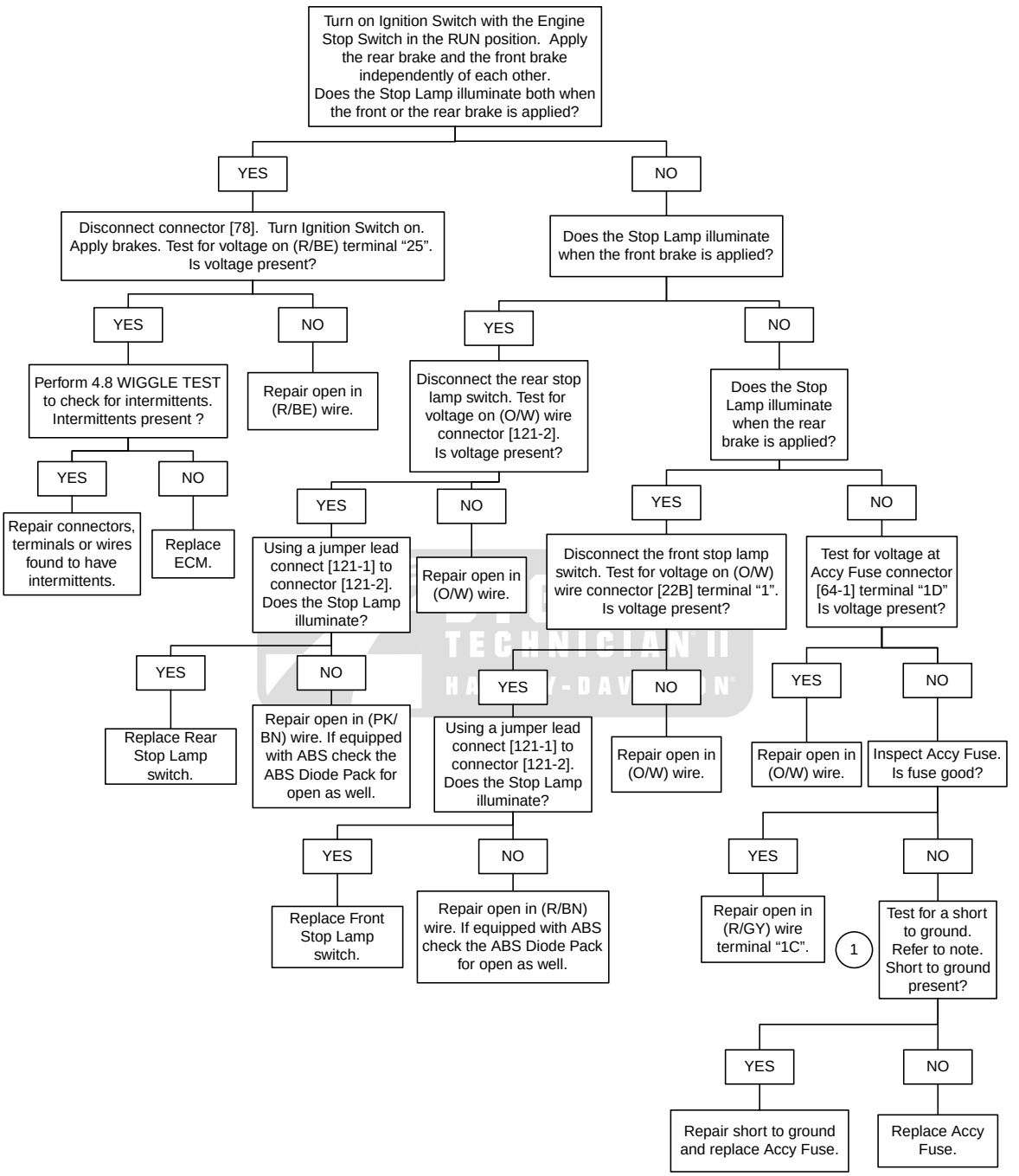
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[7]	Rear fender lights harness	All	8-place Multilock	Top of rear fender (under seat)
[22]	Right handlebar switches	FLHT/C	12-place Molex (Black)	Inner fairing (fork stem nut lock plate)
		FLTR	12-place Molex (Black)	Inside headlamp nacelle
[64]	Fuse block	All	Packard	Under left side cover

Table 4-50. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[93]	Tail lamp	All	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	All	6-place Multilock	Circuit board under tail lamp assembly
[121]	Rear brake light switch	All	Spade terminals	Bottom of rear frame downtube (right side)
[166]	ABS module	All	20-place Molex	Under right side cover
[201]	ABS diode	All	4-place Deutsch	Under left side cover (below fuse box)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Brake Switch: DTC P0572



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DTC P0577 4.28

GENERAL

The ECM controls and monitors the operation of the vehicle cruise control. The Cruise Control ON/OFF 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 3 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, the clutch is disengaged, then 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, then the ACCELERATE 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.

Table 4-51. Code Description

DTC	DESCRIPTION
P0577	Cruise Control Input Error

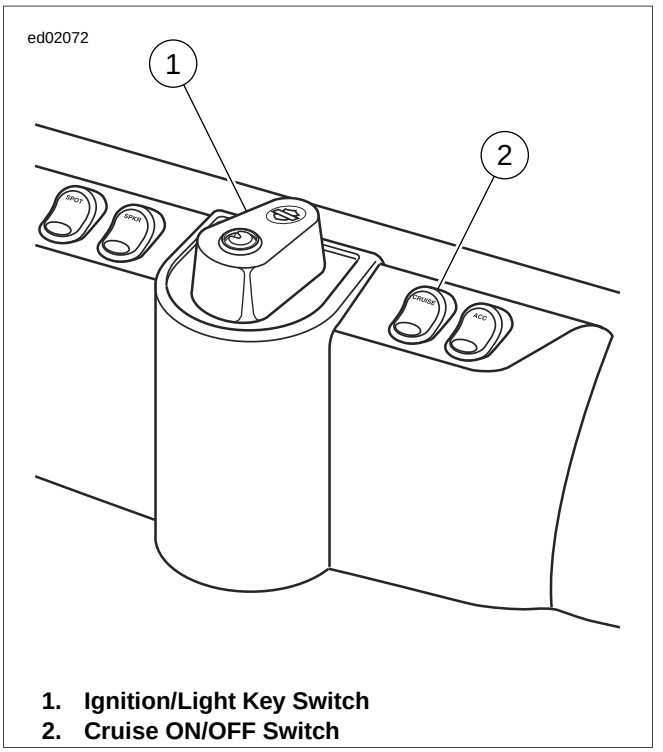
SYSTEM OPERATION

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 position. See Figure 4-61. 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 that the system is activated. See Figure 4-63. An orange lamp in the switch on both FLHTCU and FLTR models also indicates this condition to the rider.
2. With the motorcycle traveling at the desired "cruise" speed, 30-85 MPH (48-137 km/h), momentarily push the Cruise SET/RESUME switch to SET. See Figure 4-62.
3. The ECM "reads" the Vehicle Speed Sensor (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 (speedometer on FLHRC models) turns from orange to green to indicate that the cruising speed is locked in. See Figure 4-63.
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 back" or closed, thereby actuating throttle roll-off (disengage) command.
   c. Motorcycle clutch is disengaged (ECM senses too great an increase in RPM).
   d. Cruise ON/OFF Switch placed in the OFF position. The switch is located on the fairing cap of FLHTCU models, the instrument nacelle of FLTR models, and the left handelbar lower switch housing on FLHRC models. The green Cruise Enabled/Engaged lamp in the tachometer face (speedometer on FLHRC models) is extinguished to indicate that the system is deactivated. The orange lamp in the fairing cap switch of FLTR models is also extinguished.
   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 85 MPH (137 km/h).

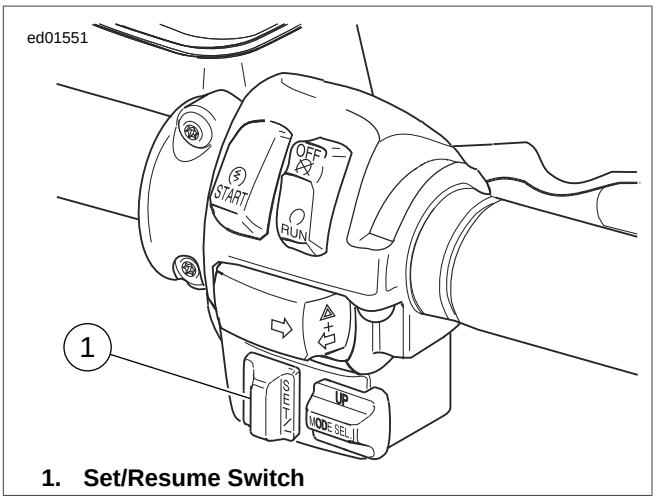
NOTE

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.



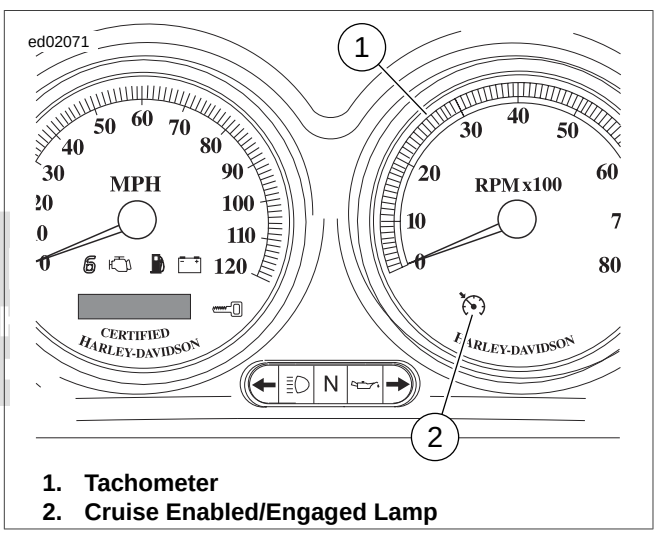
1. Ignition/Light Key Switch
2. Cruise ON/OFF Switch

Figure 4-61. Fairing Cap (FLHTCU)



1. Set/Resume Switch

Figure 4-62. Right Handlebar Switch Assembly (FLTR, FLHTCU)



1. Tachometer
2. Cruise Enabled/Engaged Lamp

Figure 4-63. Instrument Panel (FLHTCU)

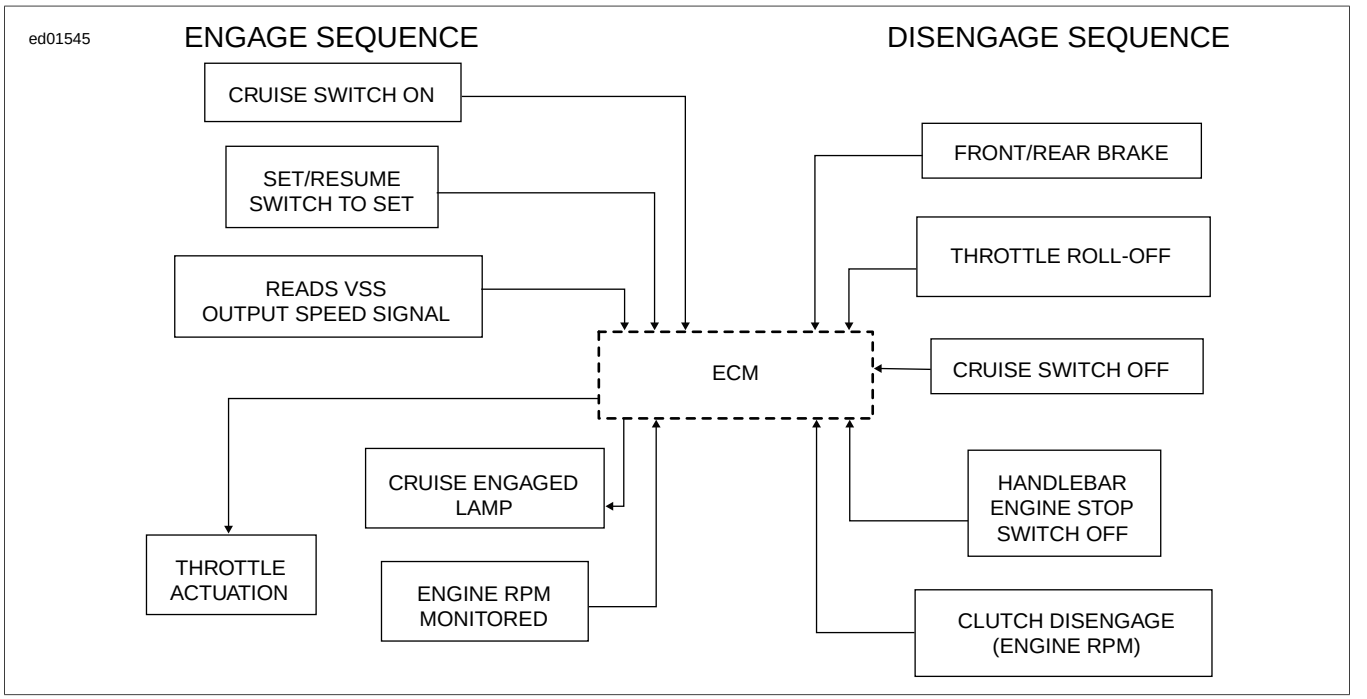


Figure 4-64. Cruise System Diagram

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 with Table 4-53. If the cruise seems to disengage or drop out for no apparent reason, see Cruise Control Inoperative: DTC P0577 (Part 1 of 2).

In the diagnostic mode, the Cruise Enabled/Engaged lamp is employed as a test indicator. The lamp is in the tachometer face (speedometer on FLHRC models). See Figure 4-63.

DIAGNOSTICS

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

Diagnostic Tips

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.
3. Replace defective mechanical components in accordance with the Service Manual. Follow the flow chart steps provided until component replacement directs you to the Service Manual.
4. If the cruise engaged lamp (green) does not illuminate at all, check for one or more of the following conditions:
   a. SET/RESUME switch faulty or not wired correctly.
   b. Broken or pinched wire to SET switch.
   c. Cruise engaged lamp burned out or miswired.
   d. Faulty cruise main switch and associated wiring.
   e. Brake light on constantly.
5. Repeat Step 1. If the cruise engaged lamp still does not illuminate, see Cruise Control: Initial Diagnostics. Repair any problems then recheck by repeating Step 1.
6. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray female probe and patch cord.

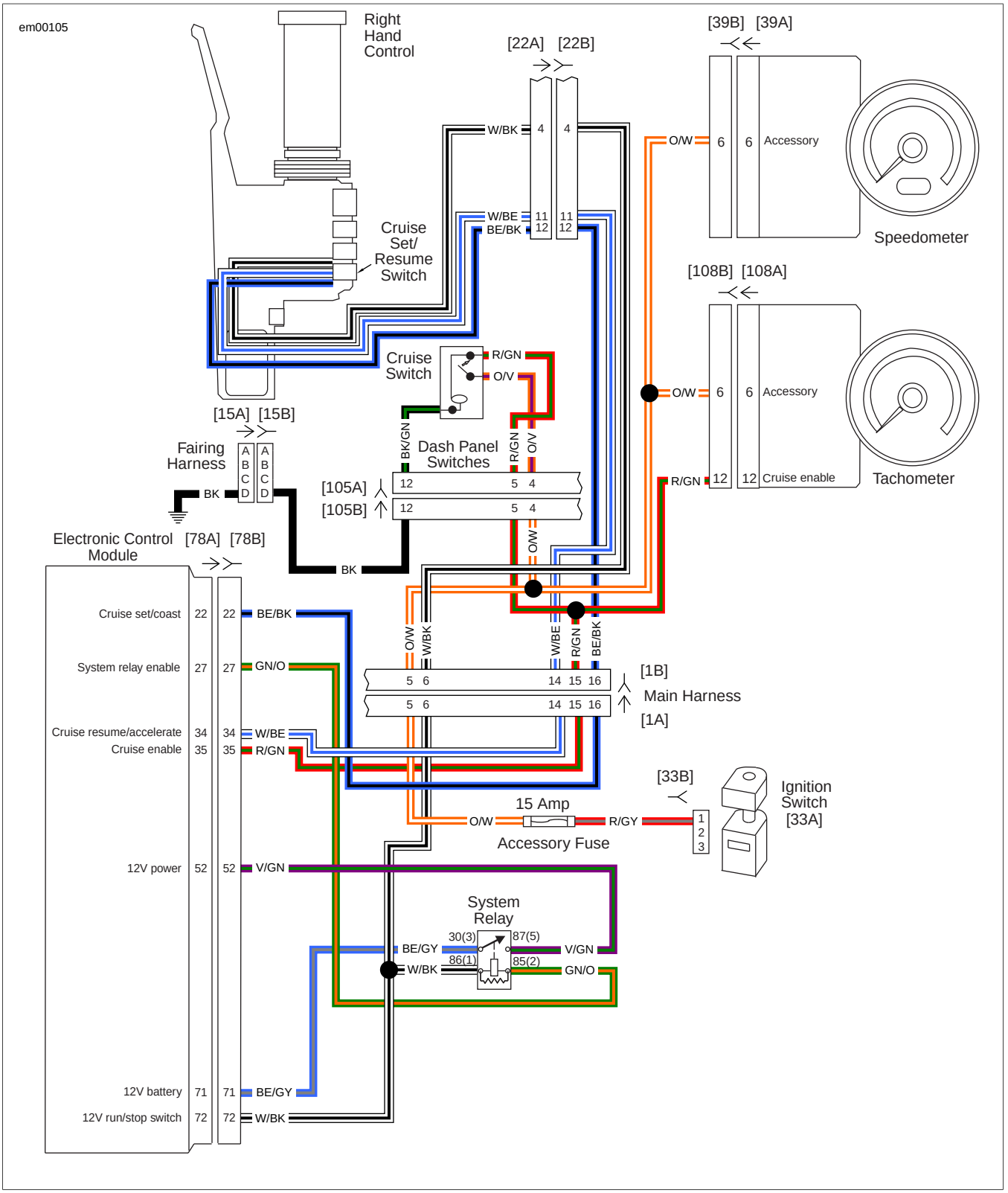


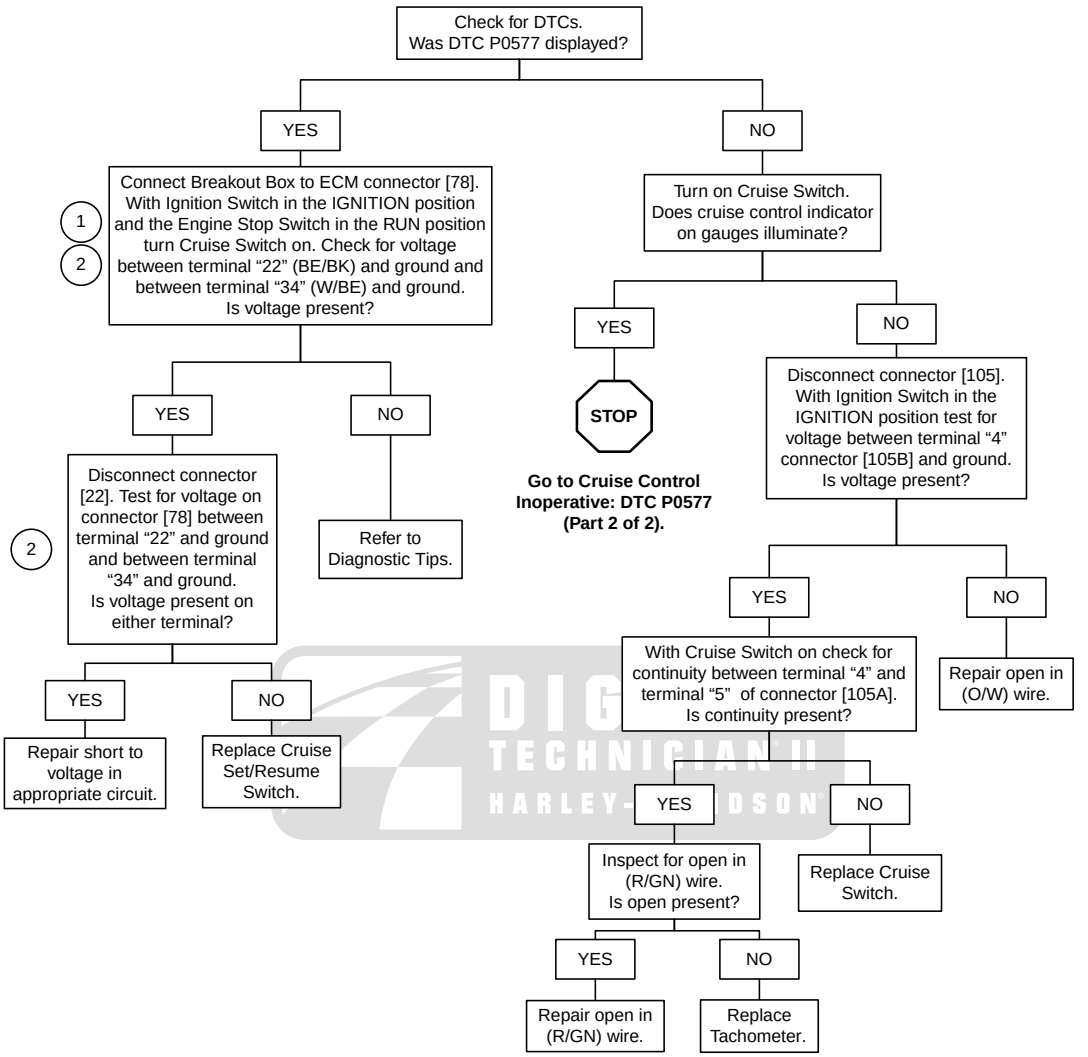
Figure 4-65. Cruise Control Circuit Diagram

Table 4-52. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[15]	Faring harness	All	4-place Molex	Inner fairing - below radio
[22]	Right handlebar switches	FLHT/C	12-place Molex (Black)	Inner fairing (fork stem nut lock plate)
		FLTR	12-place Molex (Black)	Inside headlamp nacelle
[33]	Ignition switch	All	3-place Packard	Inner fairing - under radio
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[105]	Dash panel switches	All	12-place Delphi	Inner fairing - beneath dash panel
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)

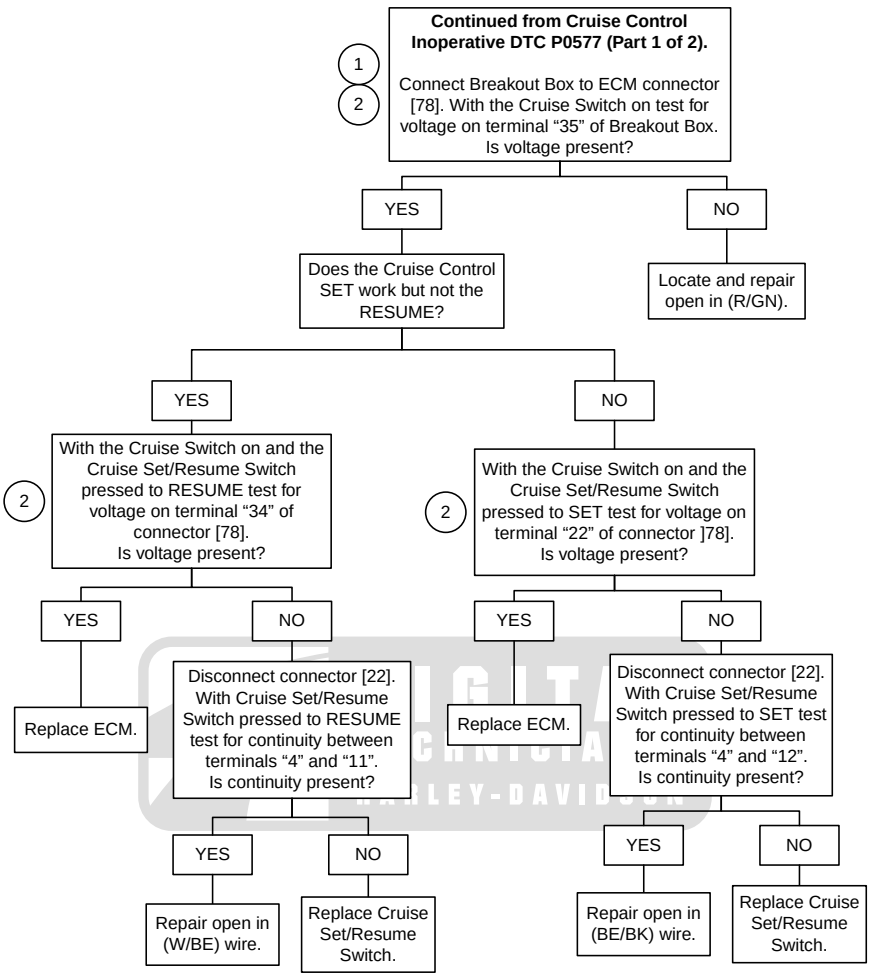
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Cruise Control Inoperative: DTC P0577 (Part 1 of 2)



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Cruise Control Inoperative: DTC P0577 (Part 2 of 2)



fc01250_en

CRUISE INOPERATIVE DIAGNOSTICS

Refer to Table 4-53. 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.

Table 4-53. Cruise Inoperative Diagnostics

NO.	ACTION	CORRECT FUNCTION	INCORRECT FUNCTION
1	Enter the diagnostic mode: with fairing cap cruise ON/OFF switch at ON, and the handlebar-mounted cruise set to SET/RESUME Switch held at SET, turn the Ignition Switch to IGNITION.	The cruise engaged lamp will illuminate and will remain on as long as the cruise SET/RESUME Switch is held in the SET position. Continue with Step 2.	If the cruise engaged lamp remains illuminated after the switch is released then either the switch or related wiring is shorted.
2	Push the handlebar-mounted cruise SET/RESUME switch to RES(UME) and hold in this position.	The cruise engaged lamp will illuminate and remain on as long as the SET/RESUME Switch is held in the RES(UME) position. Continue with Step 3.	If the cruise engaged lamp does not illuminate at all, check for one or more of the following conditions: • RES(UME) switch not wired correctly. • Broken or pinched wire to RES(UME) switch or cruise control module. Continue with Cruise Control: Resume Switch.
3	Next, turn the throttle grip tightly closed to check the throttle roll-off command.	The cruise engaged lamp will illuminate when the grip is closed (roll-off position), and then be extinguished when the throttle grip returns to its free position. Continue with Step 4.	If the cruise engaged lamp does not illuminate at all, go to 4.44 DTC P2135, P2138.
4	Apply the front brake lever.	The cruise engaged lamp will illuminate and remain on until the brake lever is released. Continue with Step 5.	If the cruise engaged lamp does not illuminate at all, check for one or more of the following conditions: • Front brake switch not wired correctly. • Broken or pinched wire to front brake switch or cruise control module. • Front brake switch not working properly. See Cruise Control: Brake Lights Always On or 4.27 DTC P0572.
5	Apply the rear brake pedal.	The cruise engaged lamp will illuminate and remain on until the brake pedal is released. Continue to Step 6.	If the cruise engaged lamp does not illuminate at all, check for one or more of the following conditions: • Rear brake switch not wired correctly. • Broken or pinched wire to front brake switch or cruise control module. • Rear brake switch not working properly. See Cruise Control: Brake Lights Always On or 4.27 DTC P0572.
6	To restart or repeat the diagnostic sequence, return to Step 1.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CRUISE DISENGAGE CAUSES

OFF Request

- Ignition is off
- Cruise ON/OFF switch is off (open)
- Excessive battery voltage
- Throttle position fault P0120, P0220
- Vehicle speed sensor fault P0501, P0502
- Cruise switch failure P0577
- TP sensor correlation error P2135
- Flash checksum error P0605
- Brake switch fault P0572
- TBW limited performance mode P1510

DISENGAGE Request

- Cruise control is under speed, under target speed
- Cruise control is over speed, over target speed
- Cruise control is under speed, under target speed for excessive time
- Cruise control is over speed, over target speed for excessive time
- Brake is applied for debounce time
- Twist grip roll-off
- Both the SET/COAST and the RESUME/ACCELERATE switches are pressed at the same time
- Engine run time minimum not met
- Clutch lever is pulled in (declutched)
- Excessive vehicle acceleration rate
- Vehicle speed exceeds maximum cruise speed limit
- Vehicle speed below minimum cruise speed limit
- Engine speed exceeds maximum engine speed limit
- Engine speed below minimum engine speed limit
- Excessive engine speed acceleration
- Vehicle speed governing active
- Transmission is in too low of a gear or in Neutral

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P0603, P0605 4.29

GENERAL

ECM Failure

Refer to Table 4-54. The DTCs listed indicate a failure which requires replacement of the ECM. See the Service Manual for replacement information.

NOTE

After replacing ECM perform password learning procedure and clear codes.

Table 4-54. Code Description

DTC	DESCRIPTION
P0603	ECM EEPROM error
P0605	ECM flash error

DIAGNOSTICS

These codes are set under two conditions.

- If DTC P0603 or P0605 occur during normal operation, replace ECM. Reprogram and learn password.
- If DTC P0603 or P0605 occur during or after reprogramming, perform the following:

DTC P0603

1. Clear DTCs.
2. Power down the vehicle. Wait 10 seconds.
3. Turn Ignition Switch to IGNITION.
4. Replace ECM if codes reappear.

DTC P0605

1. Clear DTCs.
2. Power down the vehicle.
3. Attempt to reprogram ECM using correct calibration.
4. Restart vehicle. If code reappears, replace ECM.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P0641, P0651 4.30

GENERAL

See Figure 4-66. The ECM controls 5 volt power from terminal "50" for Vref-1 and terminal "68" for Vref-2. The ECM provides common point ground for components through terminal "61" for Vref-1 and terminal "62" for Vref-2. The ECM monitors voltage on the 5V reference circuits and sets the DTC codes below if the voltage goes out of range. See Table 4-55.

- DTC P0641 code will be displayed when Vref-1 voltage is out of range. The 5V sensor power-1 (Vref-1) circuit supplies the Throttle Control Actuator (TCA), Vehicle Speed Sensor (VSS), Jiffy Stand Sensor, and Sensor 2 of the Twist Grip Sensor (TGS) with a 5V reference signal.
- DTC P0651 code will be displayed when Vref-2 is out of range. The 5V sensor power-2 (Vref-2) circuit supplies the TMAP Sensor, and Sensor 1 of the TGS with a 5V reference signal.

Table 4-55. Code Description

DTC	DESCRIPTION
P0641	5V Vref-1 out of range
P0651	5V Vref-2 out of range

DIAGNOSTICS

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

Diagnostic Tips

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

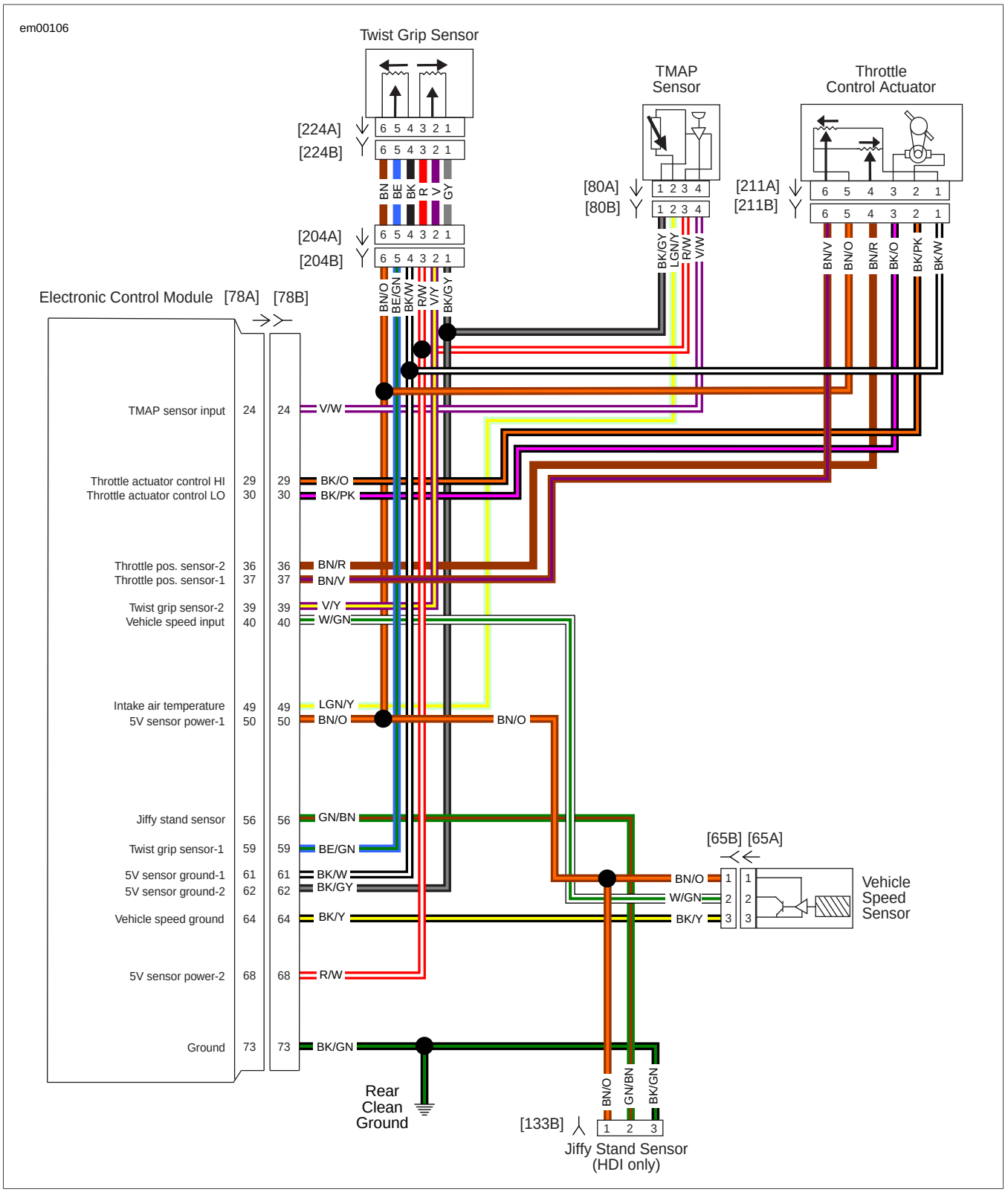


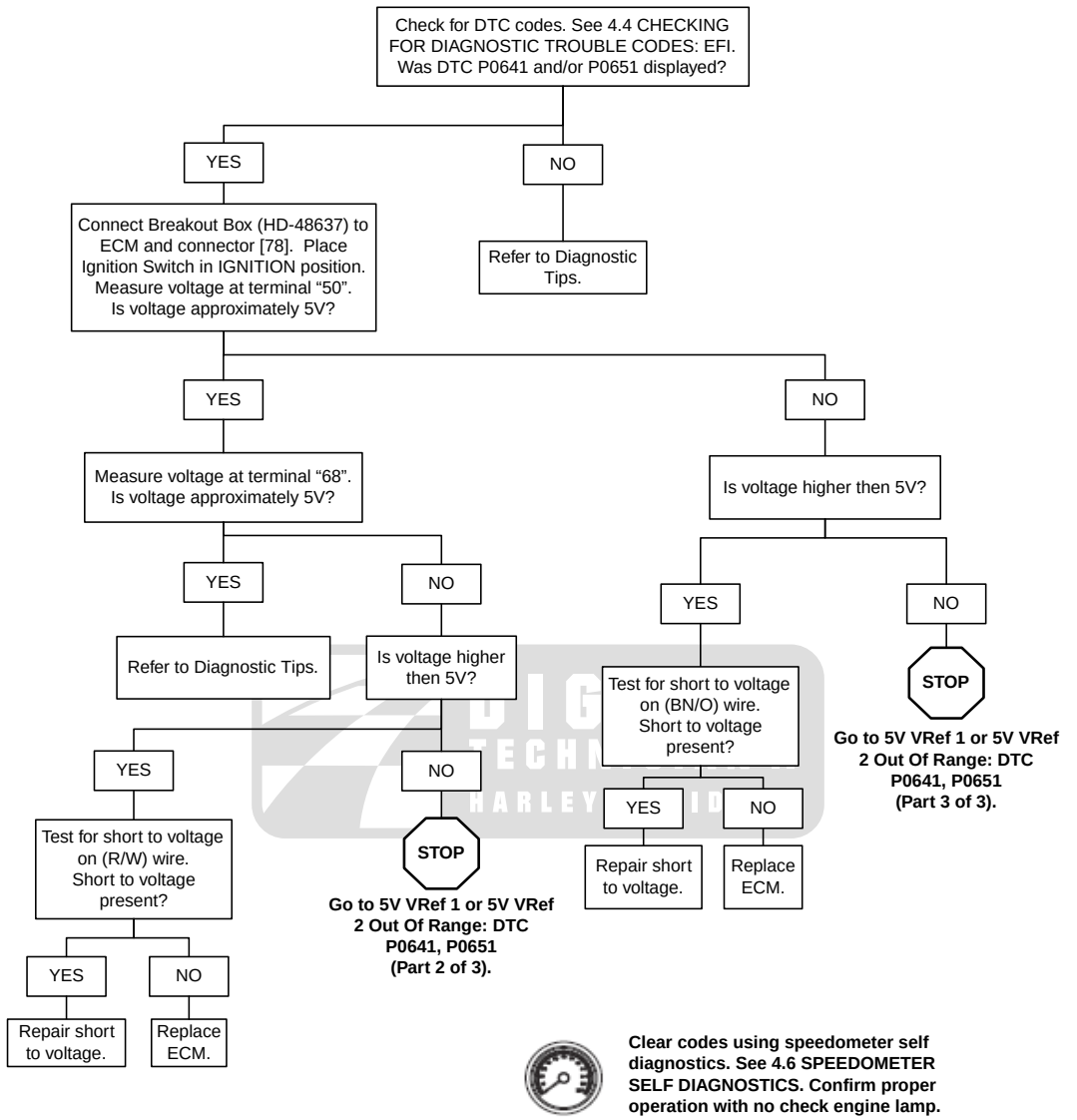
Figure 4-66. 5-Volt Vref-1 and Vref-2 Circuit

Table 4-56. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[65B]	Vehicle Speed Sensor (VSS)	All	3-place Delphi	Top of transmission case (beneath starter)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	All	4-place Delphi	Top of air intake manifold (vehicle right side)
[133B]	Jiffy Stand Sensor	All	3-place Packard	Front of engine on left frame rail
[204]	Twist Grip Sensor (TGS)	All	6-place Molex	Inner fairing (right of tachometer)
[211]	Throttle Control Actuator (TCA)	All	6-place Delphi	Side of air intake manifold (vehicle right side)

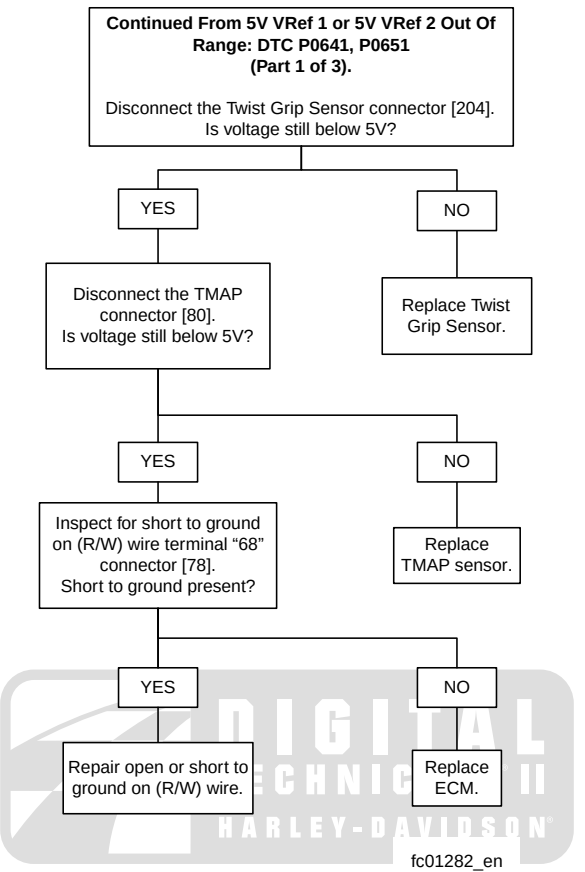
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

5 Volt VRef 1 or VRef 2 Out of Range: DTC P0641, P0651 (Part 1 of 3)

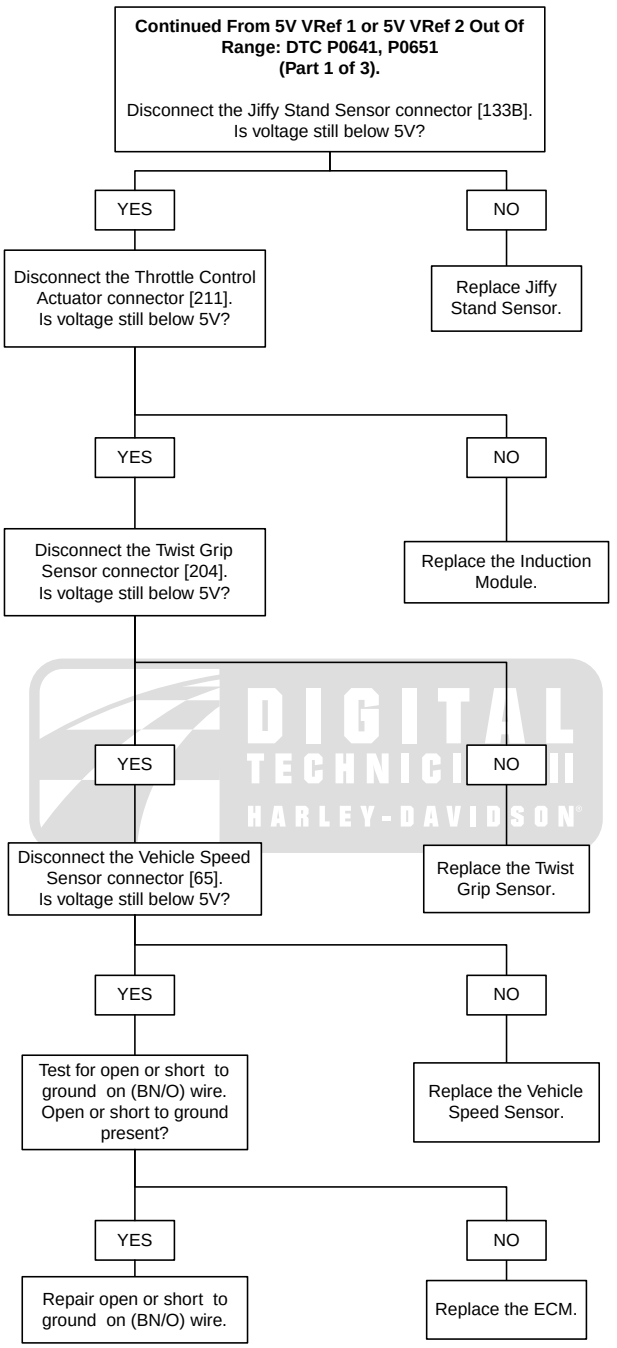


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5 Volt VRef 1 or VRef 2 Out of Range: DTC P0641, P0651 (Part 2 of 3)



5 Volt VRef 1 or VRef 2 Out of Range: DTC P0641, P0651 (Part 3 of 3)



fc01283_en

DTC P1009, P1010 4.31

GENERAL

Password Problem

The ECM, TSM/TSSM/HFSM and speedometer exchange passwords during operation. An incorrect password or missing password will set a diagnostic code.

NOTE

If the TSM/TSSM/HFSM is not connected to the wiring harness, the vehicle will not start.

Table 4-57. Code Description

DTC	DESCRIPTION
P1009	Incorrect password
P1010	Missing password

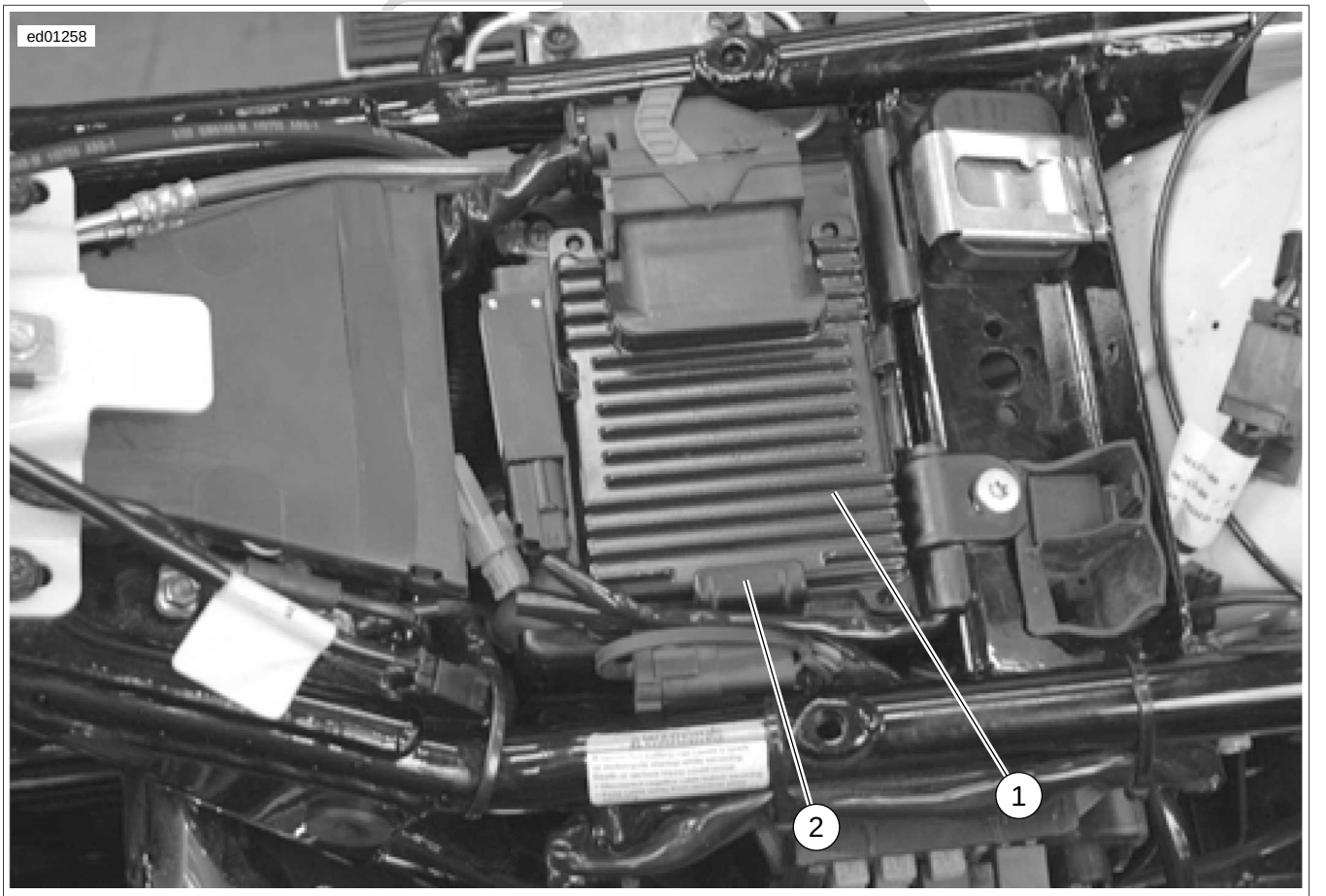
DIAGNOSTICS

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

Diagnostic Notes

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

1. DTC P1009 may be set if a recent ECM or TSM/TSSM/HFSM replacement did not follow the correct password assignment procedure. See 3.26 TSM/HFSM: PASSWORD LEARN for details.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black socket probes and patch cord.
3. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
4. Historic codes DTC U1300 or DTC U1301 would also have been set. Clear codes.
5. See the Service Manual for TSM/TSSM/HFSM replacement. See 3.26 TSM/HFSM: PASSWORD LEARN, Password Learning for the password learning procedure.



1. **ECM**
2. **ECM mounting bracket**

Figure 4-67. ECM Mounting Bracket (Under Seat)

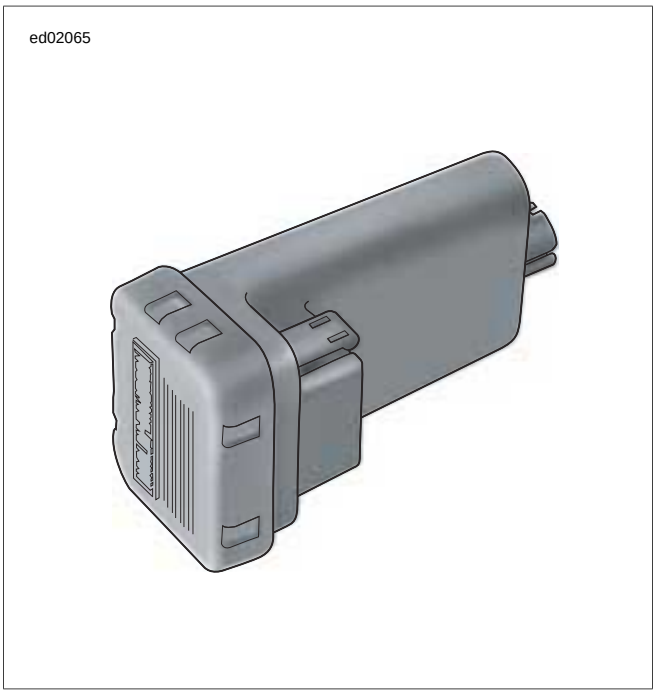


Figure 4-68. TSM/TSSM/HFSM

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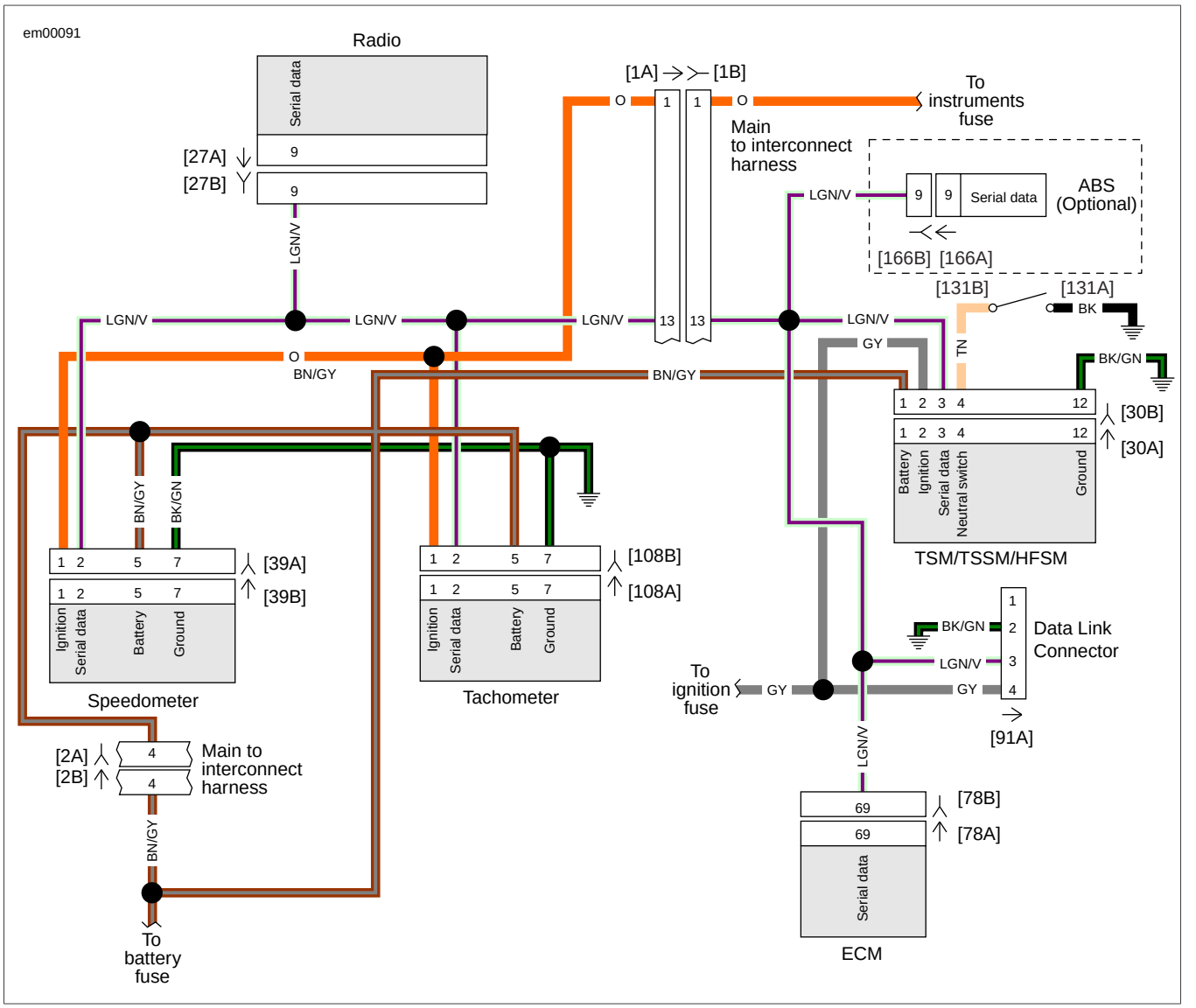


Figure 4-69. Serial Data Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-58. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (gray)	Inner fairing - right fairing support bracket
		FLTR	12-place Molex (gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[91]	Data link connector	All	4-place Deutsch	Under right side cover

Table 4-58. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

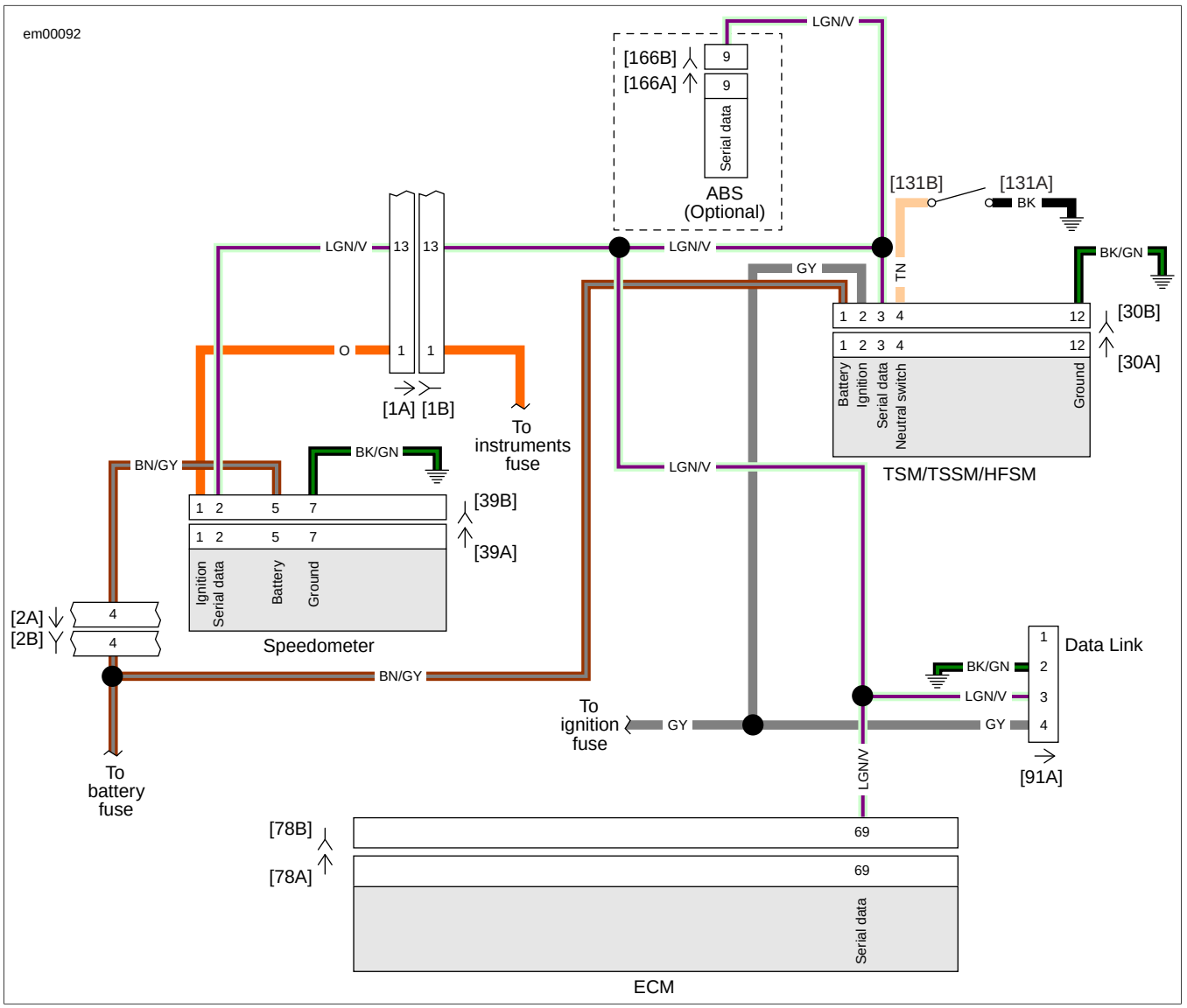


Figure 4-70. Serial Data Circuit (FLHR/C/S)

Table 4-59. Wire Harness Connectors

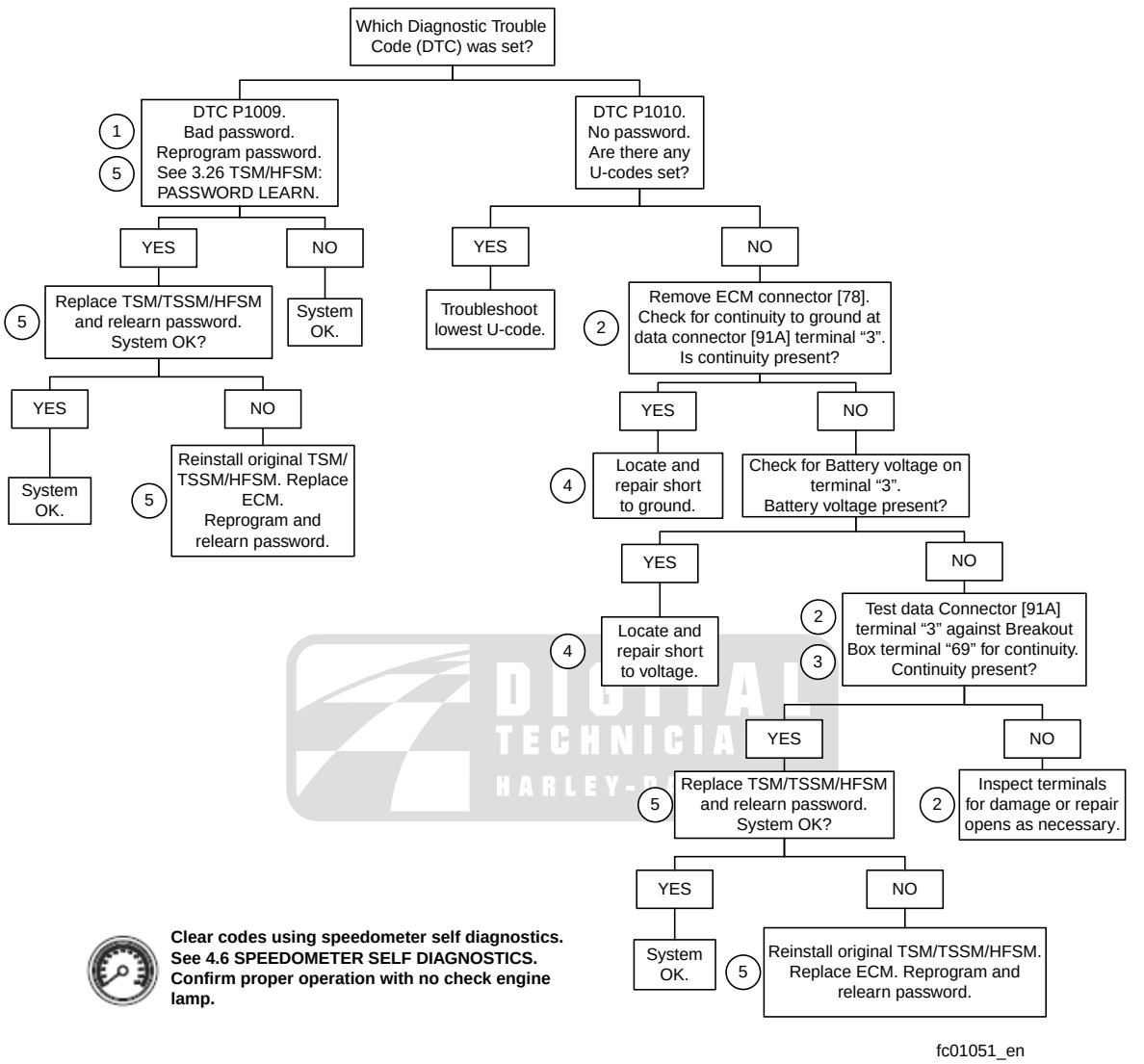
NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Inner fairing (back of speedometer)

Table 4-59. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[91]	Data link connector	4-place Deutsch	Under right side cover
[166]	ABS module	20-place Molex	Under right side cover

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Password Problem: DTC P1009, P1010



DTC P1270 4.32

GENERAL

TGS 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 comes 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 that the ECM is defective and requires replacement. See Service Manual for replacement information.

NOTE

After replacing the ECM, perform password learning procedure and clear codes.

Table 4-60. Code Description

DTC	DESCRIPTION
P1270	TGS2 validation error

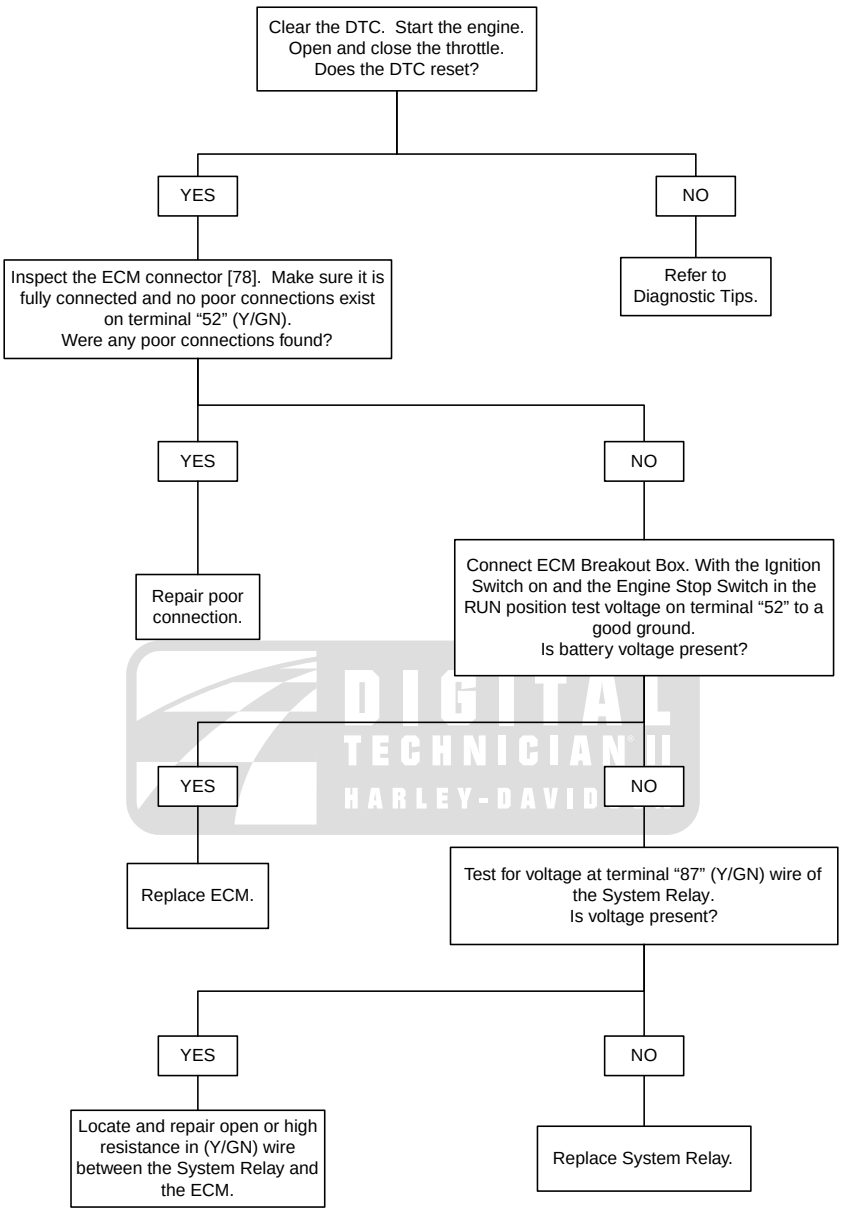
DIAGNOSTICS

Diagnostic Tips

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

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TGS Validation Error: DTC P1270



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC P1351, P1352, P1354, P1355 4.33

GENERAL

Ignition Coil

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.

See Figure 4-72. 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 it 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 4-61. 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

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-34730-2C	FUEL INJECTOR TEST LAMP
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER
HD-48637	BREAKOUT BOX

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probes and patch cord.

NOTE

Gently connect test lamp to connector [83B]. Forcefully inserting test lamp will result in ignition connector terminal damage.

2. See Figure 4-71. Plug IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) and FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) into Breakout Box. Note that cranking the engine with test lamp in place of the ignition coil can sometimes cause a DTC P1351, P1352, P1354 or P1355. This condition is normal and does not by itself indicate a malfunction. DTCs must be cleared if this condition occurs.
3. Connect BREAKOUT BOX (Part No. HD-48637) between EFI wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple socket probes and patch cord.

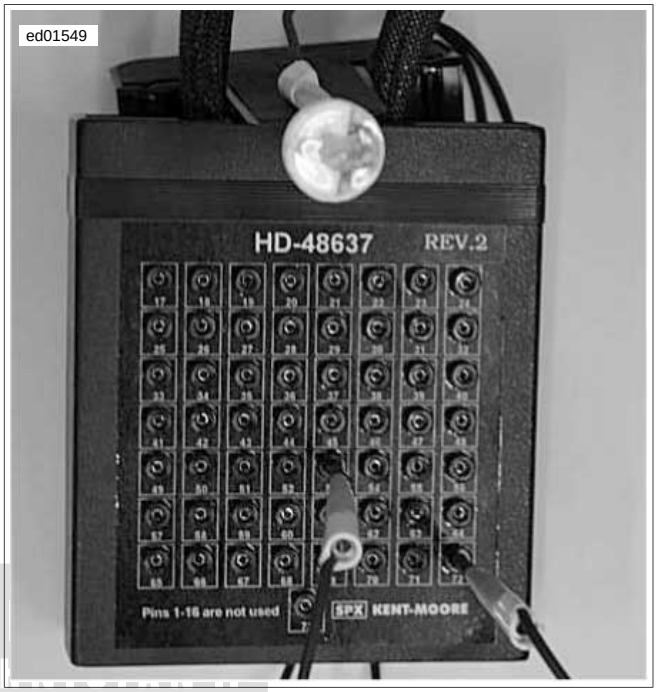
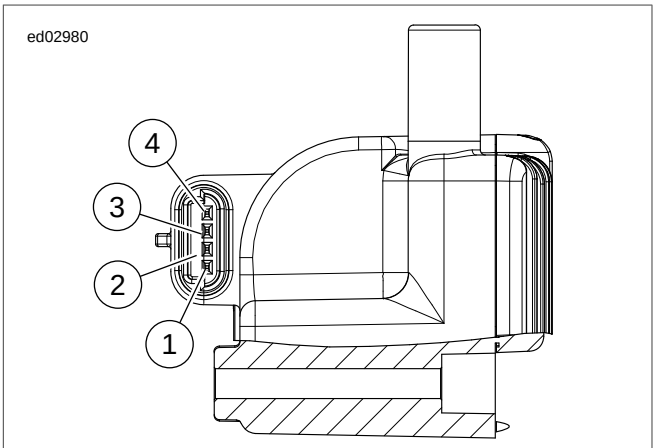


Figure 4-71. Ignition Coil Circuit Test



1. **Power**
2. **Feedback signal pin**
3. **Rear coil**
4. **Front coil**

Figure 4-72. Ignition Coil Connector Terminals

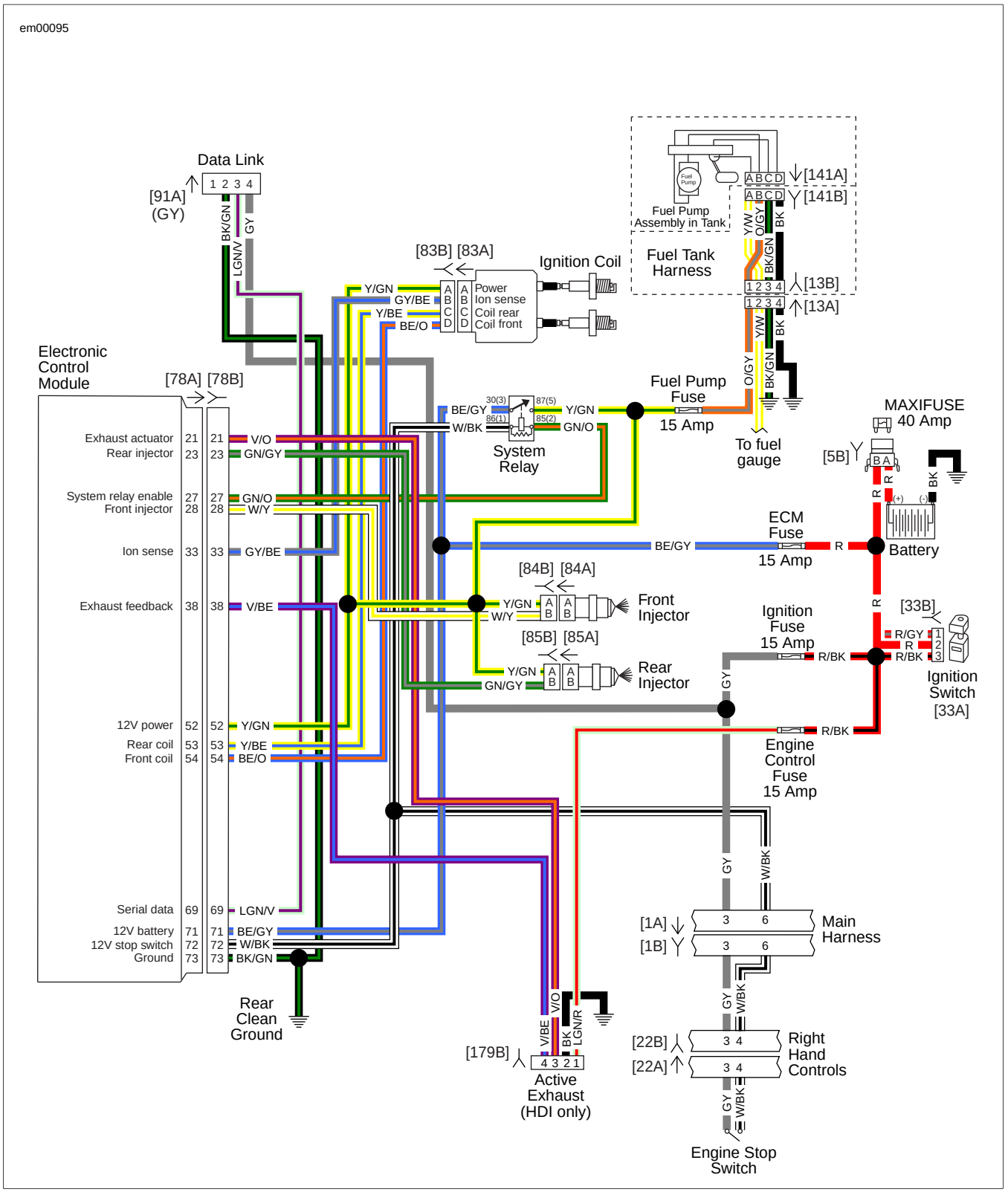


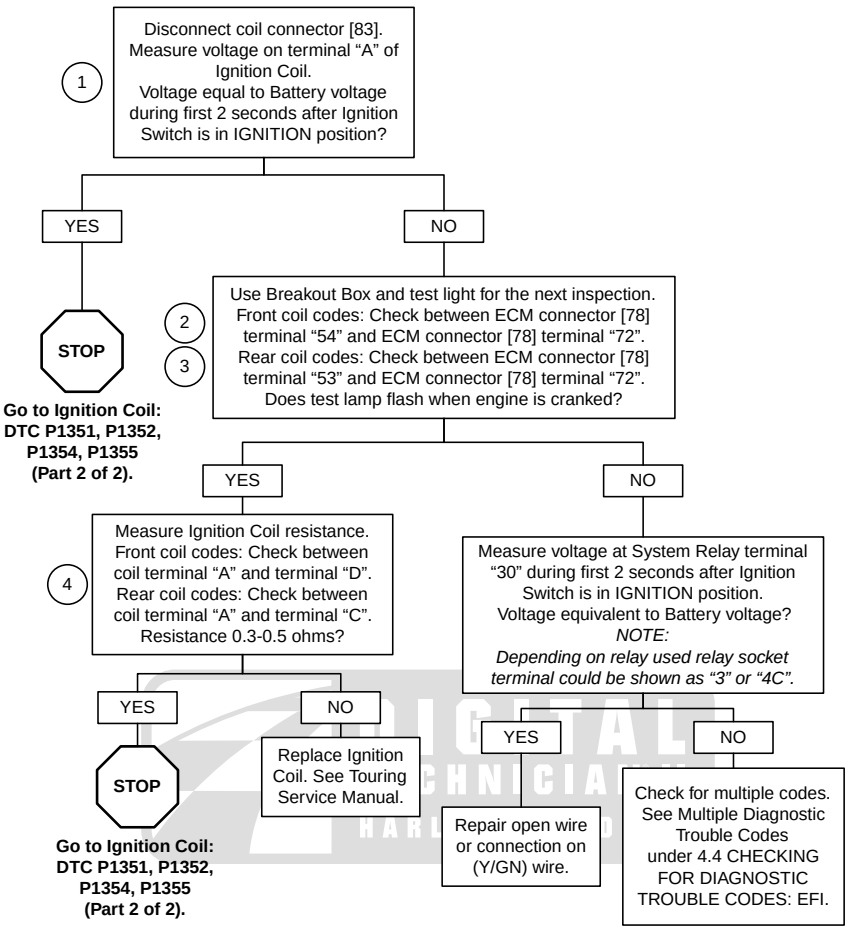
Figure 4-73. Ignition Coil Circuit Diagram

Table 4-62. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)

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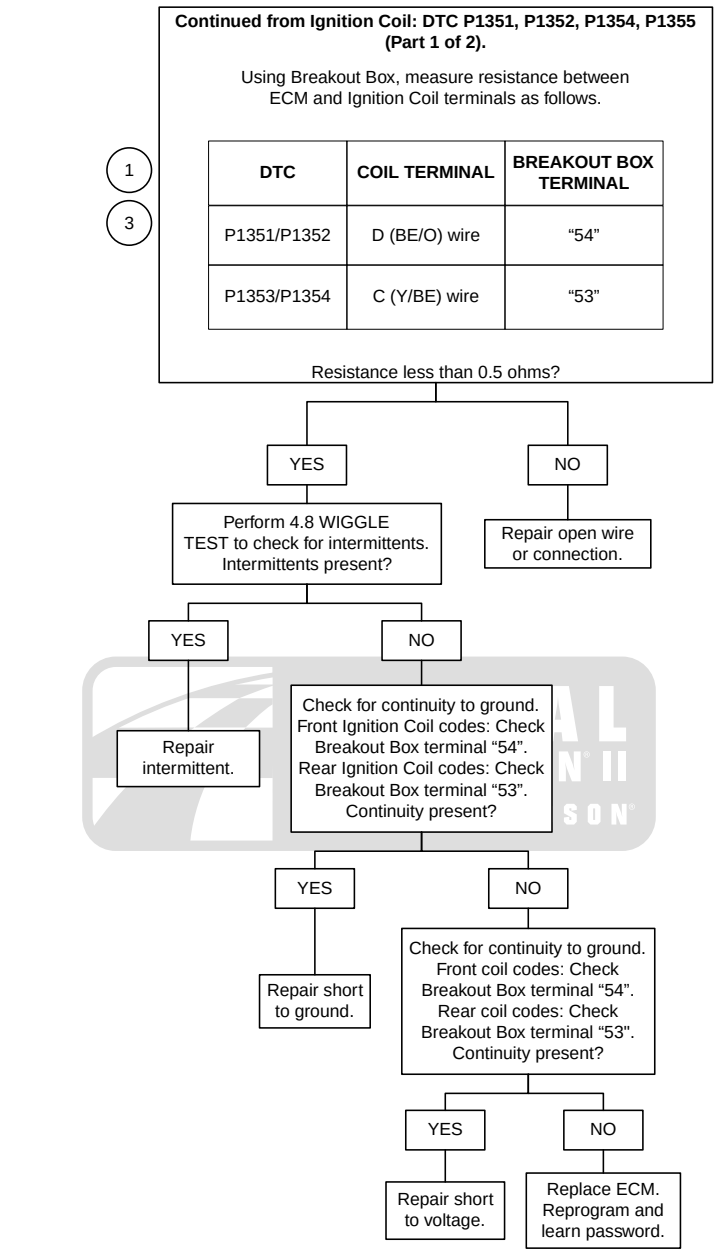
Ignition Coil: DTC P1351, P1352, P1354, P1355 (Part 1 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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Ignition Coil: DTC P1351, P1352, P1354, P1355 (Part 2 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC P1475, P1477, P1478 4.34

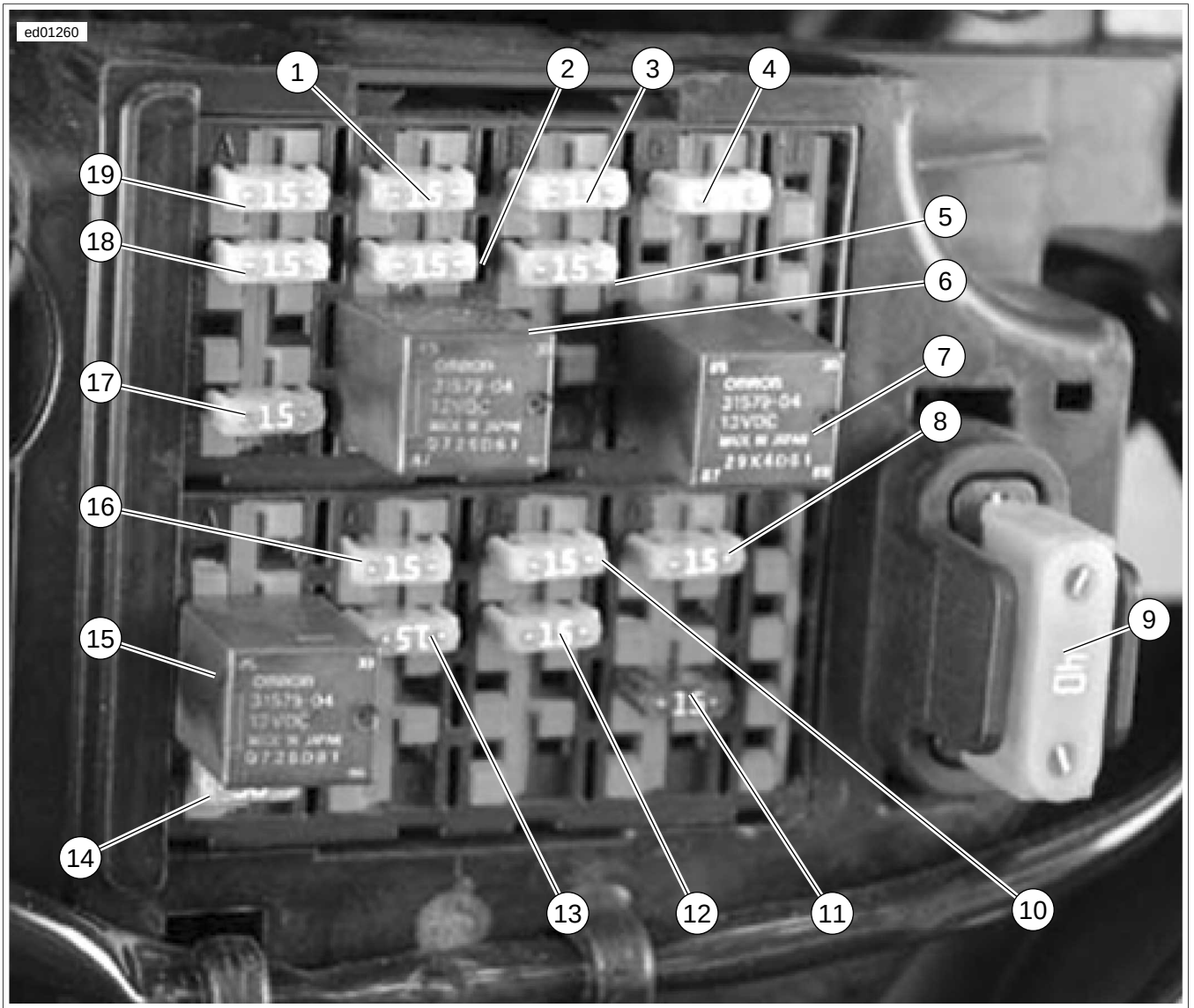
GENERAL

Active Exhaust Actuator (HDI Models)

The Active Exhaust 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. The Active Exhaust is protected by a 15 amp fuse.

Table 4-63. Code Description

DTC	DESCRIPTION
P1475	Exhaust actuation position error
P1477	Exhaust actuator open/low
P1478	Exhaust actuator shorted



1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure 4-74. Fuse and Relay Locations

DIAGNOSTICS

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probe and patch cord.

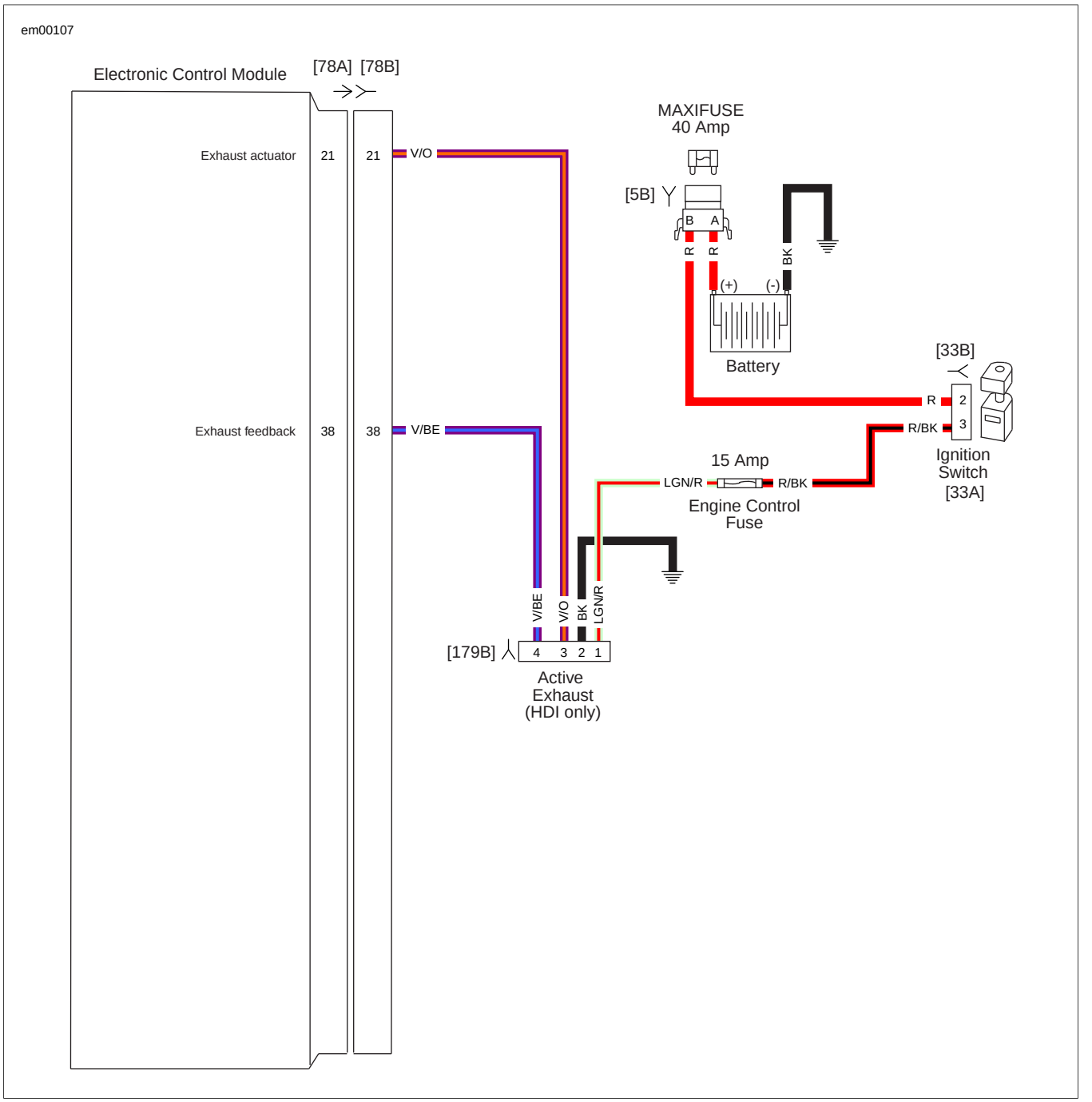


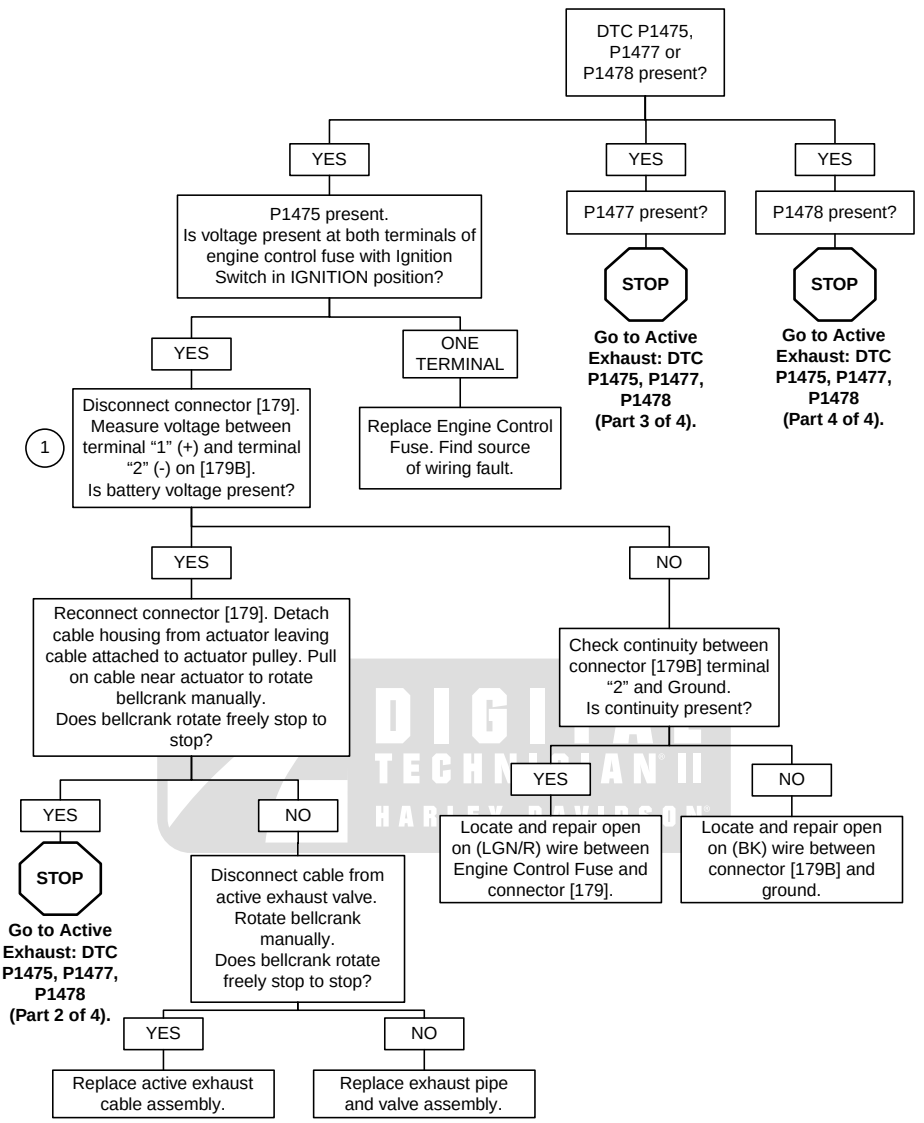
Figure 4-75. Active Exhaust Actuator Circuit

Table 4-64. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[33]	Ignition switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[179]	Active Exhaust Actuator	5-place Amp (Tyco)	Under right side cover (behind electrical bracket)

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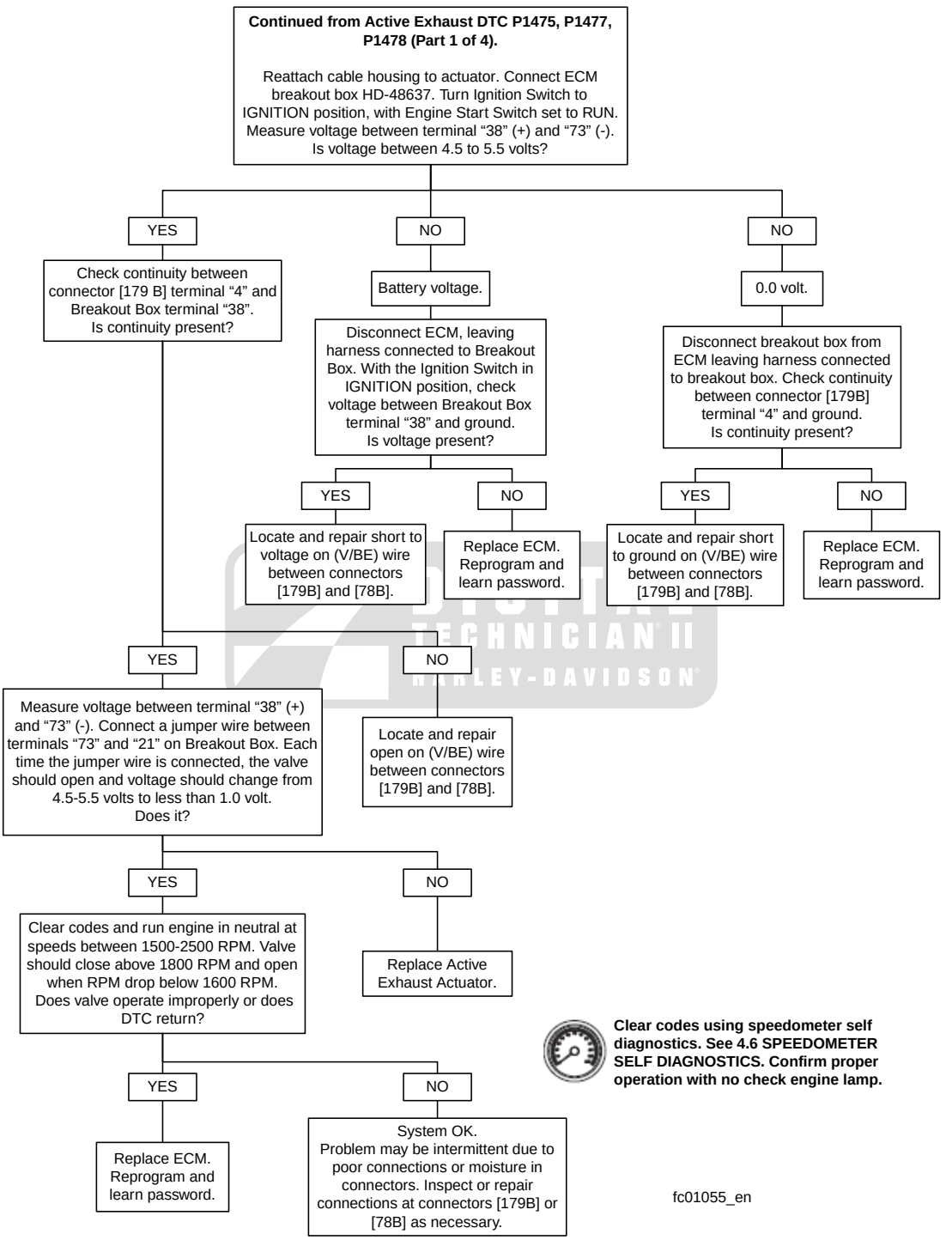
Active Exhaust: DTC P1475, P1477, P1478 (Part 1 of 4)



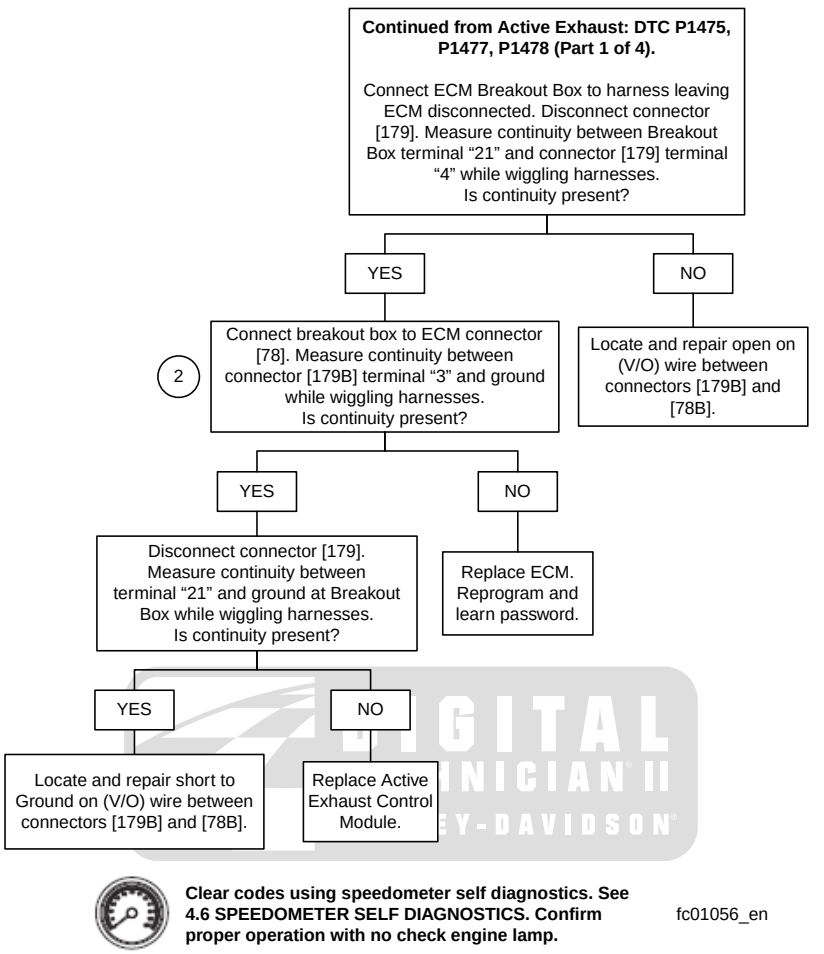
Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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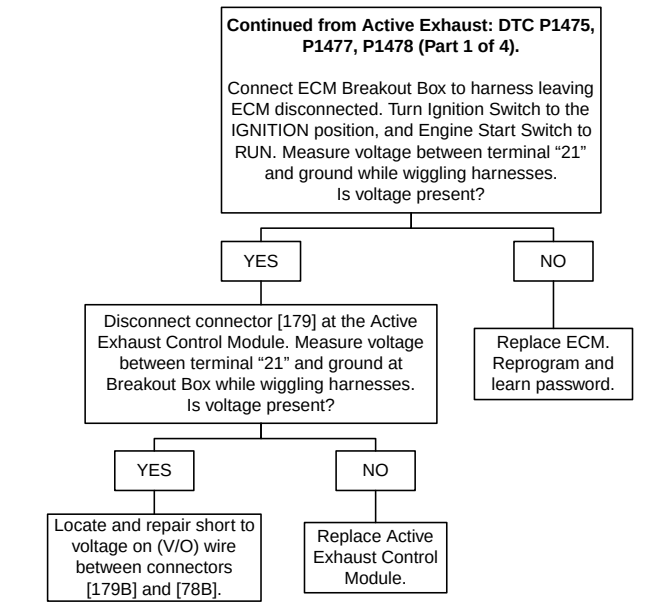
Active Exhaust: DTC P1475, P1477, P1478 (Part 2 of 4)



Active Exhaust: DTC P1475, P1477, P1478 (Part 3 of 4)



Active Exhaust: DTC P1475, P1477, P1478 (Part 4 of 4)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01057_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P1501, P1502 4.35

GENERAL

Jiffy Stand Sensor (HDI and FLHTP)

The Jiffy Stand Sensor utilizes 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 start and run only if the TSM/TSSM/HFSM determines the transmission is in neutral, otherwise the engine will start and stall. 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 Electronic Control Module (ECM).

The Jiffy Stand Sensor also has a Fail Enable Mode. This mode allows the engine to start and run if the system recognizes a problem with the Jiffy Stand Sensor circuit. If a problem exists or if the transmission is put in gear with the Jiffy Stand extended the odometer will display "SIdE Stand". Code P1501 or P1502 will set if the Jiffy Stand Sensor circuits are out of range.

The Jiffy Stand Sensor is powered and monitored by the ECM. The ECM terminal "50" supplies the 5V reference to the Jiffy Stand Sensor connector [133] terminal "1". See Figure 4-76. The Jiffy Stand Sensor terminal "2" sends a signal back to the ECM terminal "56". This signal is how the ECM determines if the Jiffy Stand is retracted or extended. The Jiffy Stand Sensor terminal "3" is grounded through the ECM terminal "73".

NOTE

The ECM supplies not only the Jiffy Stand Sensor but also the Vehicle Speed Sensor (VSS) and the Throttle Control Actuator (TCA) with a 5V reference signal from terminal "50".

Table 4-65. Code Description

DTC	DESCRIPTION
P1501	Jiffy Stand Sensor low
P1502	Jiffy Stand Sensor high

DIAGNOSTICS

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

Diagnostic Notes

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

1. See the Service Manual for TSM/TSSM/HFSM replacement. See 4.7 BREAKOUT BOX: EFI for the password learning procedure.
2. Unplug the Neutral Switch connector [131]. Using a DVOM test for continuity between terminals "A" and "B" of the Neutral Switch. When the transmission is in neutral, continuity should exist. When the transmission is in gear, there should not be continuity through the Neutral Switch.
3. When the Jiffy Stand is retracted, voltage on terminal "56" should be approximately 1.65 to 2.47 volts. When the Jiffy Stand is extended, the voltage on terminal "56" should be approximately 2.94 to 4.41 volts.
4. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
5. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.
6. Replace defective mechanical components in accordance with the Service Manual. Follow the flow chart steps provided until component replacement directs you to the Service Manual.

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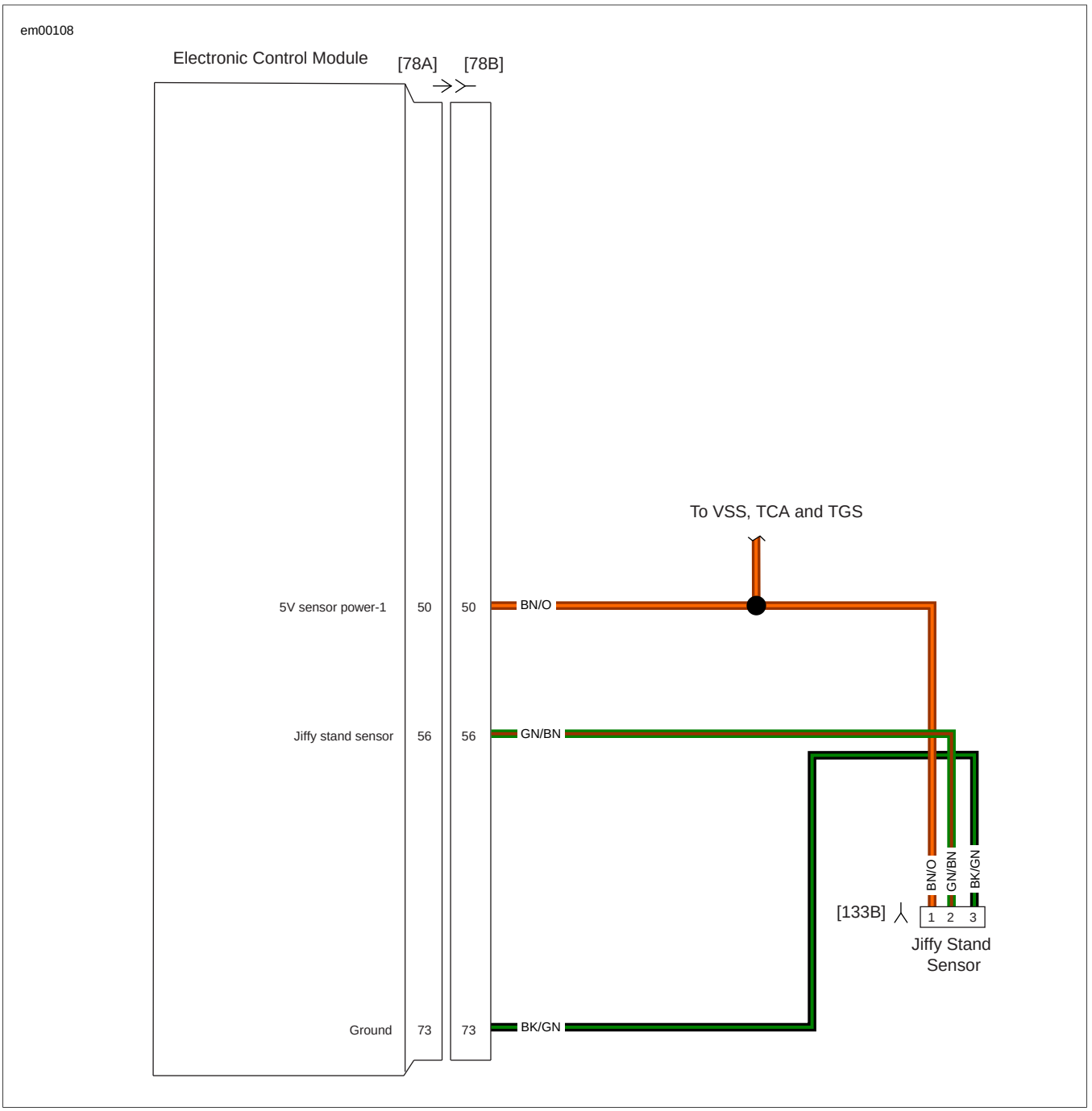
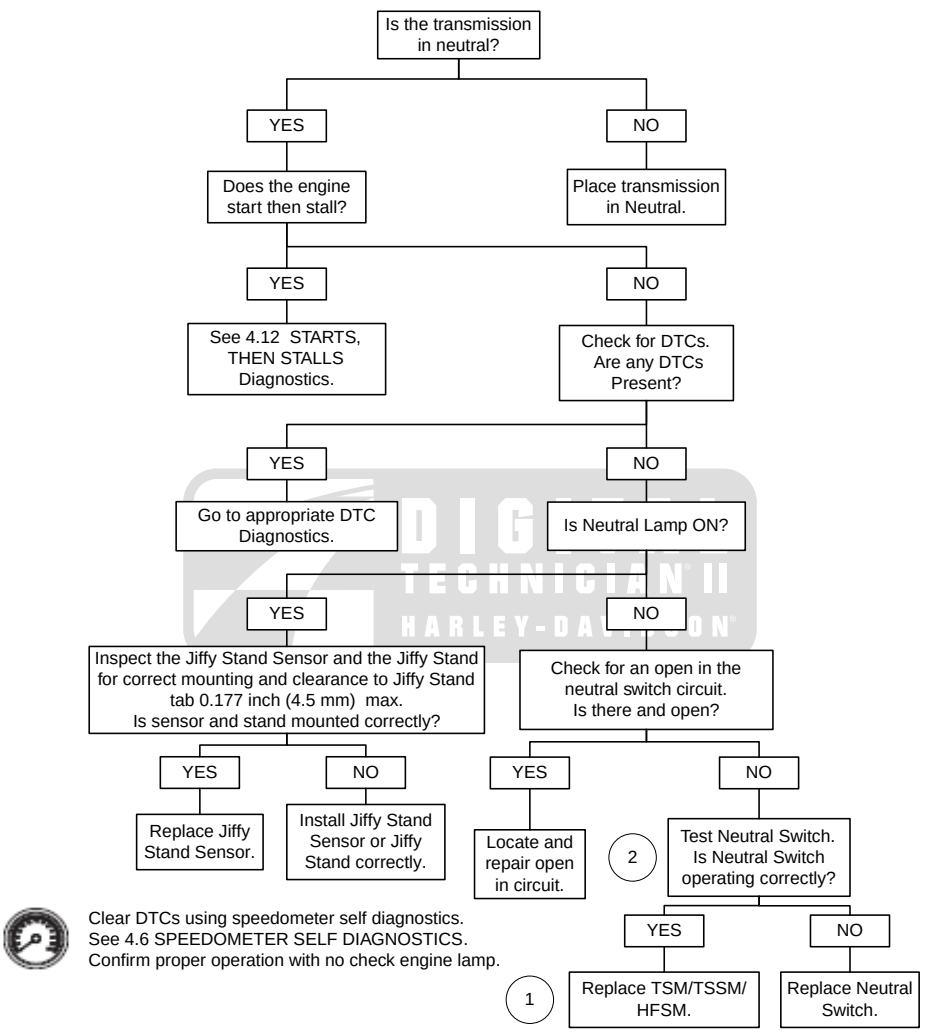


Figure 4-76. Jiffy Stand Sensor Circuit

Table 4-66. Wire Harness Connectors

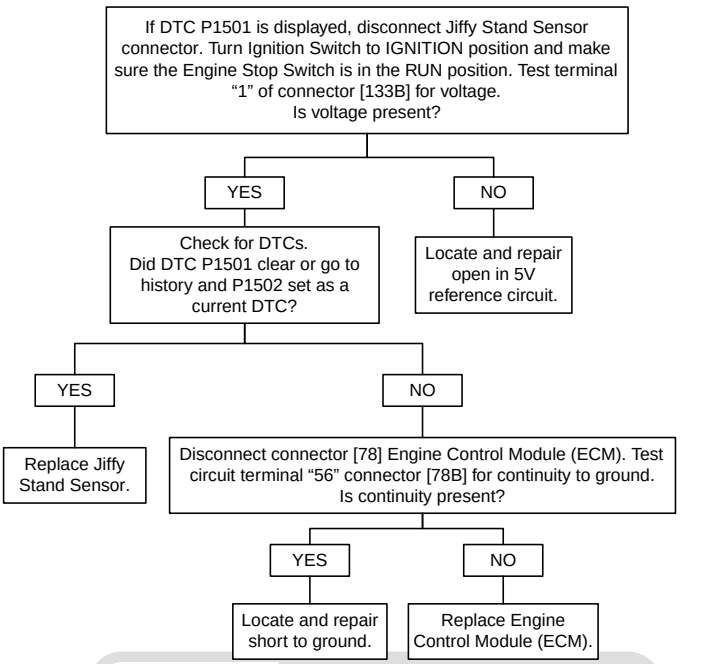
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[133]	Jiffy Stand Sensor	HDI and FLHTP	3-place Molex	Under voltage regulator

Side Stand Displayed on Odometer



fc01286_en

Jiffy Stand Sensor: DTC P1501

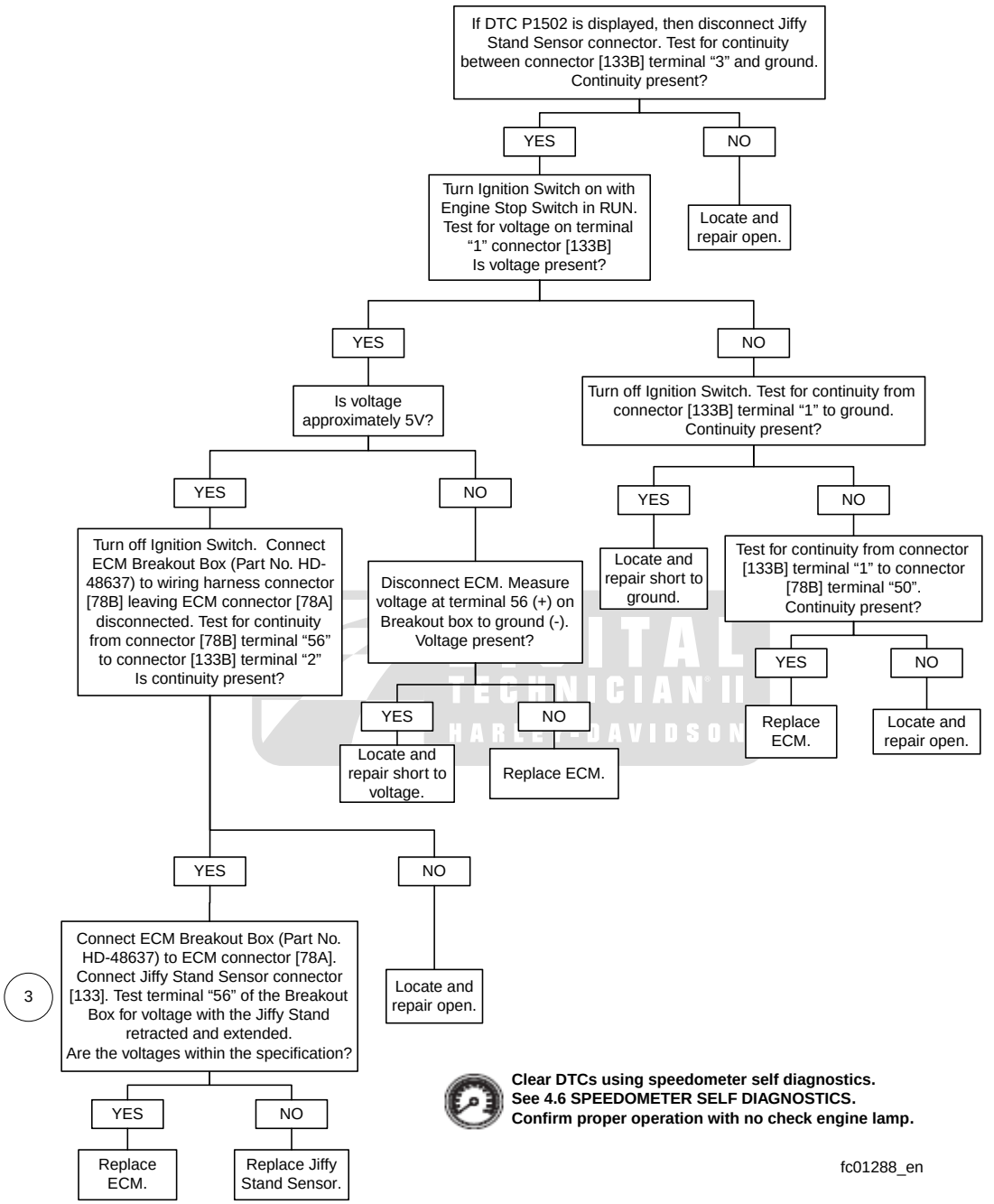


Clear DTCs using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01287_en

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Jiffy Stand Sensor: DTC P1502



DTC P1510, P1511, P1512 4.36

GENERAL

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 (Refer to Table 4-67), when an error or fault in throttle actuation is detected. These DTCs will always accompany another code.

Table 4-67. 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:** This DTC enables near normal operation of the vehicle, guarding against inadvertent "wide open throttle" conditions. Typically this code will be the result if one of the Twist Grip Sensors (TGS) or Throttle Position (TP) Sensors, or one of each, has failed.
- **P1511 Power Management:** This DTC provides more limitation on driveability, due to failure of the Throttle Control Actuator (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 will monitor 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:** This DTC 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.

DIAGNOSTICS

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

Diagnostic Notes

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

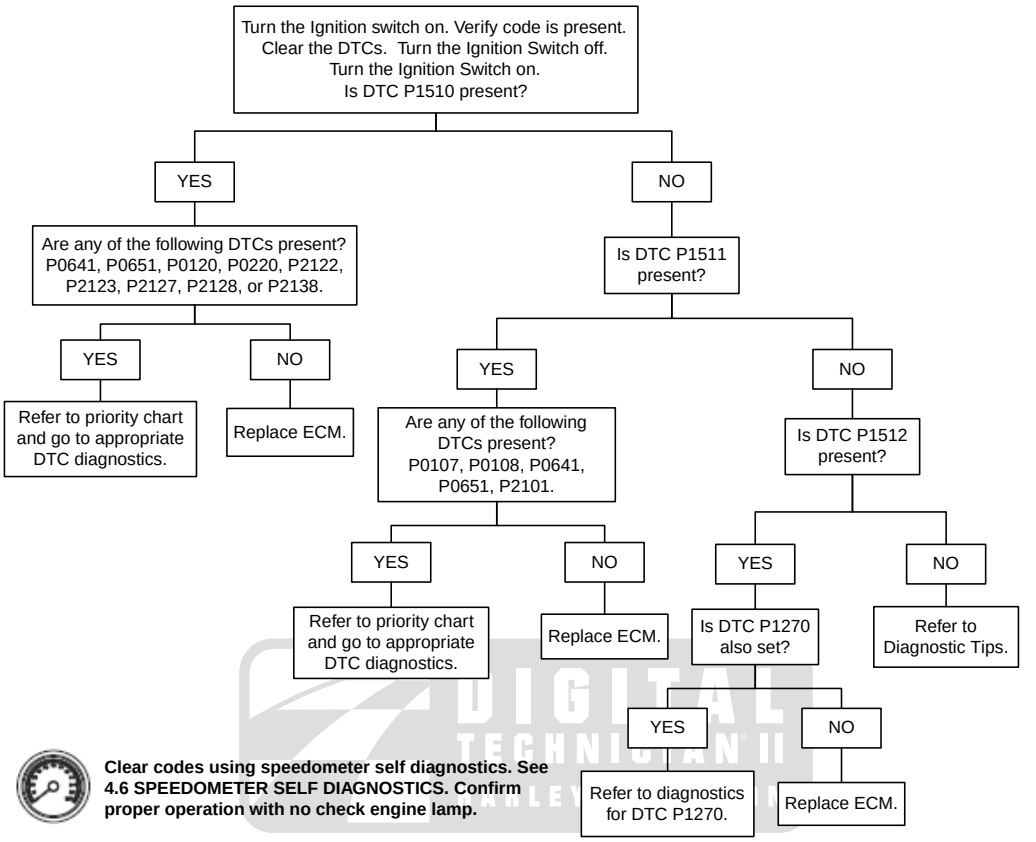
1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.

Diagnostic Tips

DTCs P1510, P1511 and P1512 may remain for one extra ignition cycle after other codes are cleared.

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Throttle Actuation Control Management: DTC P1510, P1511, P1512



fc01289_en

DTC P1514 4.37

GENERAL

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 1,300 RPM).

The ECM compares the intake manifold pressure value from the TMAP to the throttle plate position value from the TPS. If the manifold pressure is higher then it should be for that given throttle plate position for three consecutive ignition cycles DTC P1514 is set. 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 4.40 DTC P2105. The ECM only checks for DTC P1514 if Power Management mode (DTC P1511) is present.

Table 4-68. Code Description

DTC	DESCRIPTION
P1514	Air flow fault

DIAGNOSTICS

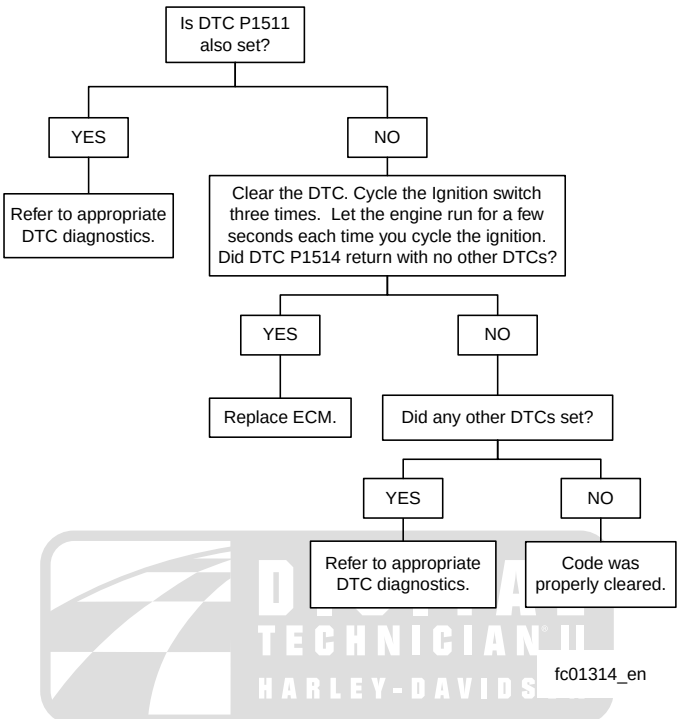
Diagnostic Notes

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

1. Replace defective mechanical components in accordance with the Service Manual. Follow the flow chart steps provided until component replacement directs you to the Service Manual.

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Air Flow Fault: DTC P1514



DTC P1600 4.38

GENERAL

The ECM integrates a main microprocessor and a watchdog microcontroller, used to communicate with the throttle actuation control system.

The watchdog microcontroller communicates with the main microprocessor of the ECM, and when a communication failure is identified, the watchdog shuts down the TCA and Fuel Injectors.

An internal ignition delay timer monitors when the ignition circuit is energized. The watchdog will issue a DTC P1600 if no communication is established between the main microprocessor and the watchdog microcontroller or if a watchdog failure occurs within 3 consecutive ignition cycles.

Table 4-69. Code Description

DTC	DESCRIPTION
P1600	TCA module processor - internal fault

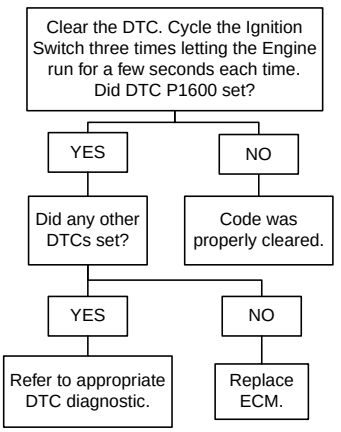
DIAGNOSTICS

Diagnostic Tips

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

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TAC Module Processor – Internal Fault: DTC P1600



fc01315_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC P2100, P2101, P2102, P2103 4.39

GENERAL

The ECM incorporates an H-Bridge driver chip which provides diagnostics for the Throttle Actuation Control (TAC) system.

The Throttle Control Actuator (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 Twist Grip Sensors (TGS).

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 4-70 for defect codes associated with TCA drive motor and see Figure 4-77 for TCA circuitry diagram.

Table 4-70. 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:** This DTC indicates that the ECM identified an open load fault for the TCA motor driver.
- **P2101 TAC Motor Circuit Range/Performance:** This DTC indicates that the actual position of the throttle plate is out of range from the commanded throttle plate position.
- **P2102 TAC Motor Control Circuit Shorted Low:** This DTC indicates that the ECM identified that the drive motor is shorted to ground within the TAC drive motor circuit.
- **P2103 TAC Motor Control Circuit Shorted High:** This DTC indicates that the drive motor is shorted high within the TAC drive motor circuit.

DIAGNOSTICS

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

Diagnostic Tips

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.

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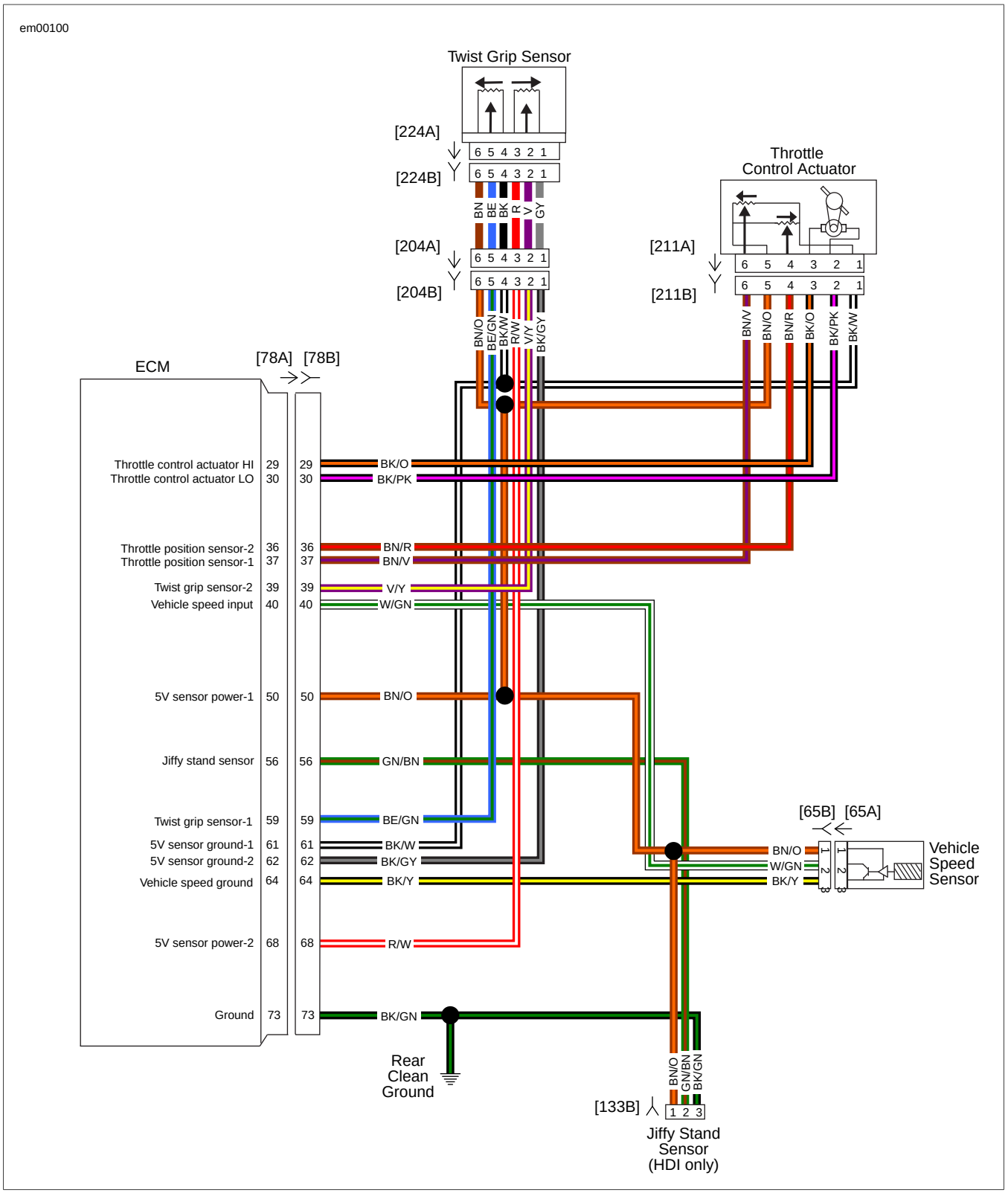


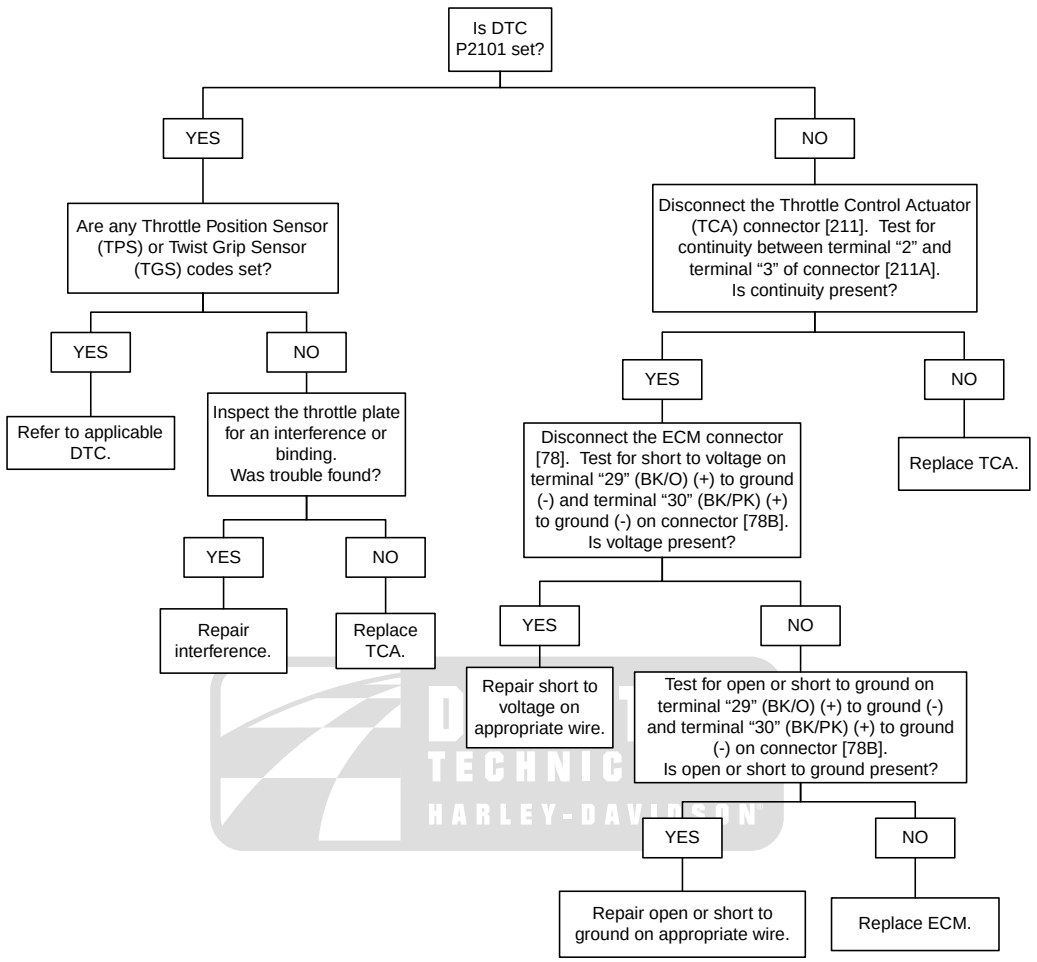
Figure 4-77. TCA Circuit

Table 4-71. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[133]	Jiffy Stand Sensor	3-place Molex (Black)	Domestic (not used): Electrical caddy at bottom of lower frame crossmember HDI: Electrical caddy at bottom of lower frame crossmember
[204]	Twist Grip Sensor	6-place Molex (Black)	Inner fairing - right radio support bracket
[211]	Throttle Control Actuator (TCA)	6-place Delphi	Behind air cleaner

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Throttle Control Actuator: DTC P2100, P2101, P2102, P2103



fc01316_en

DTC P2105 4.40

GENERAL

The Throttle Actuation Control (TAC) System uses DTC P2105 as a vehicle safety device. It provides a forced shut down of the engine when the performance of the Throttle Control Actuator (TCA) cannot be verified. Refer to Table 4-72.

Initially, the ECM commands the fuel pump and fuel injectors to be disabled until the actual fault is cleared.

Table 4-72. Code Description

DTC	DESCRIPTION
P2105	TAC system forced engine shutdown

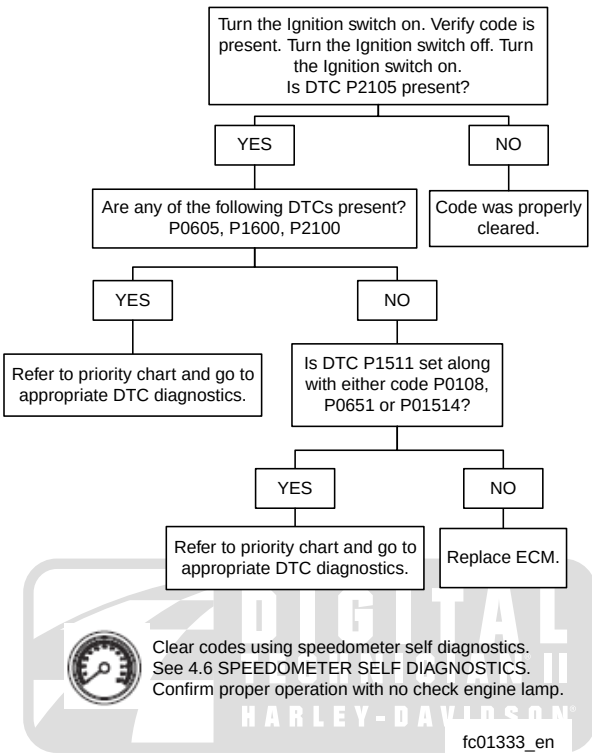
DIAGNOSTICS

Diagnostic Notes

Refer to and conduct diagnostics as identified on the flow chart.

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TAC System Forced Engine Shutdown: DTC P2105



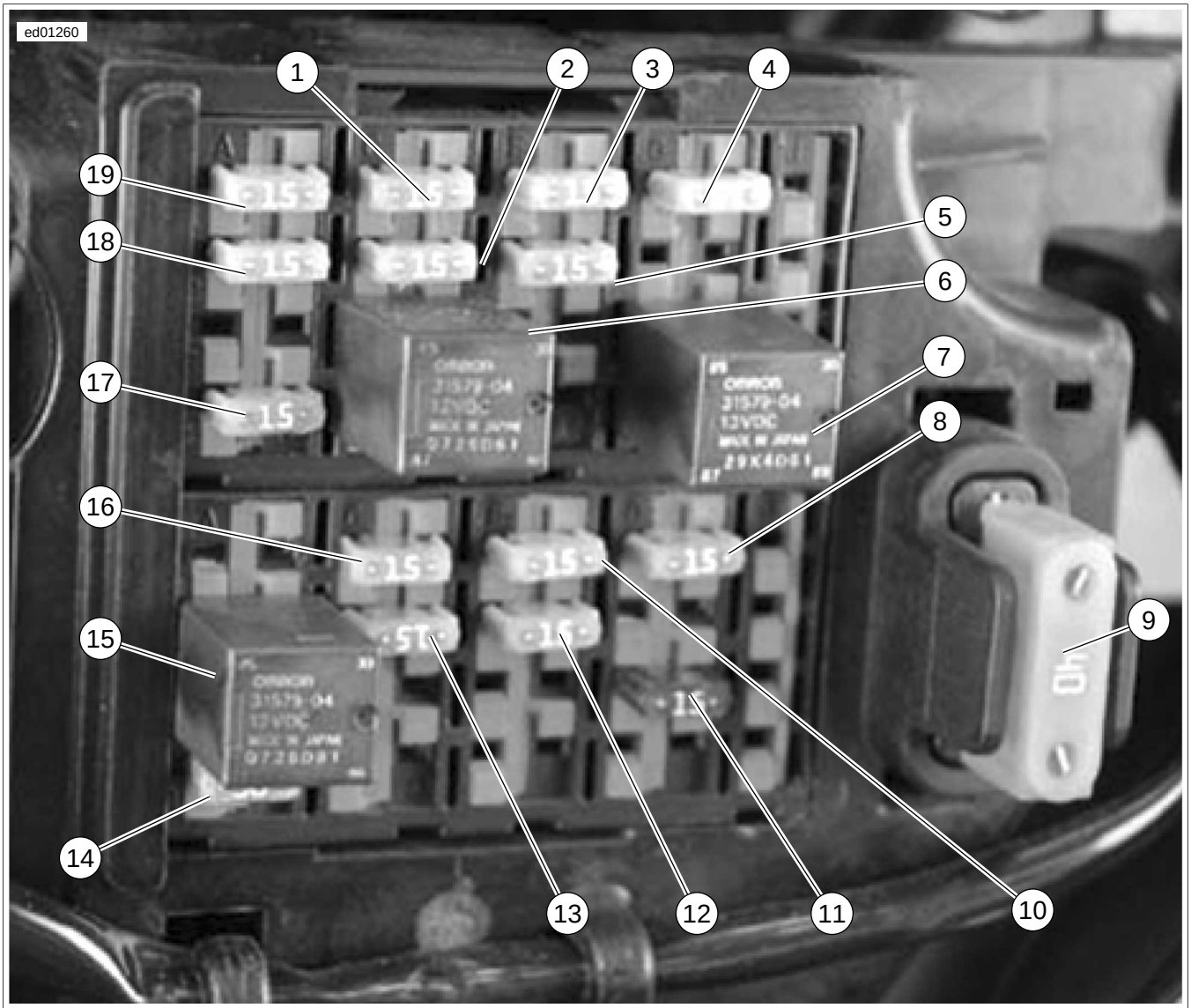
DTC P2107 4.41

GENERAL

Refer to Table 4-73. The Throttle Actuation Control (TAC) System sets DTC P2107 to identify faults with the ECM due to an internal over-temperature shutdown or a power supply failure.

Table 4-73. Code Description

DTC	DESCRIPTION
P2107	TAC system module processor - internal fault



1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure 4-78. Fuse and Relay Locations

DIAGNOSTICS

Diagnostic Tips

This code is usually set due to an internal problem with the ECM. However, poor connections and high resistance on (Y/GN) 12V power wire can also cause this code to set. If the code does not reset after it is cleared, check for an intermittent poor connection on this wire.

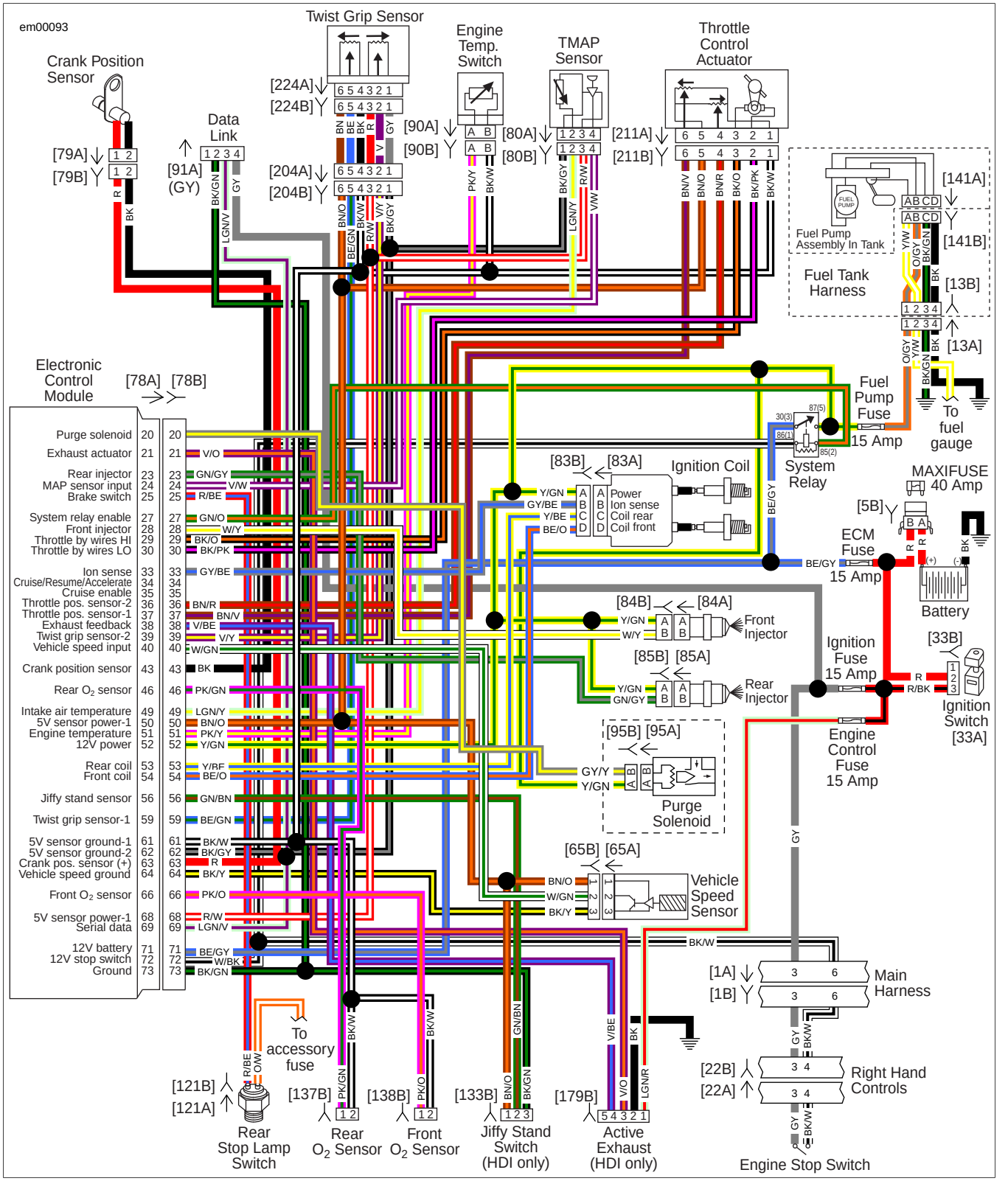


Figure 4-79. System Relay Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-74. Wire Harness Connectors

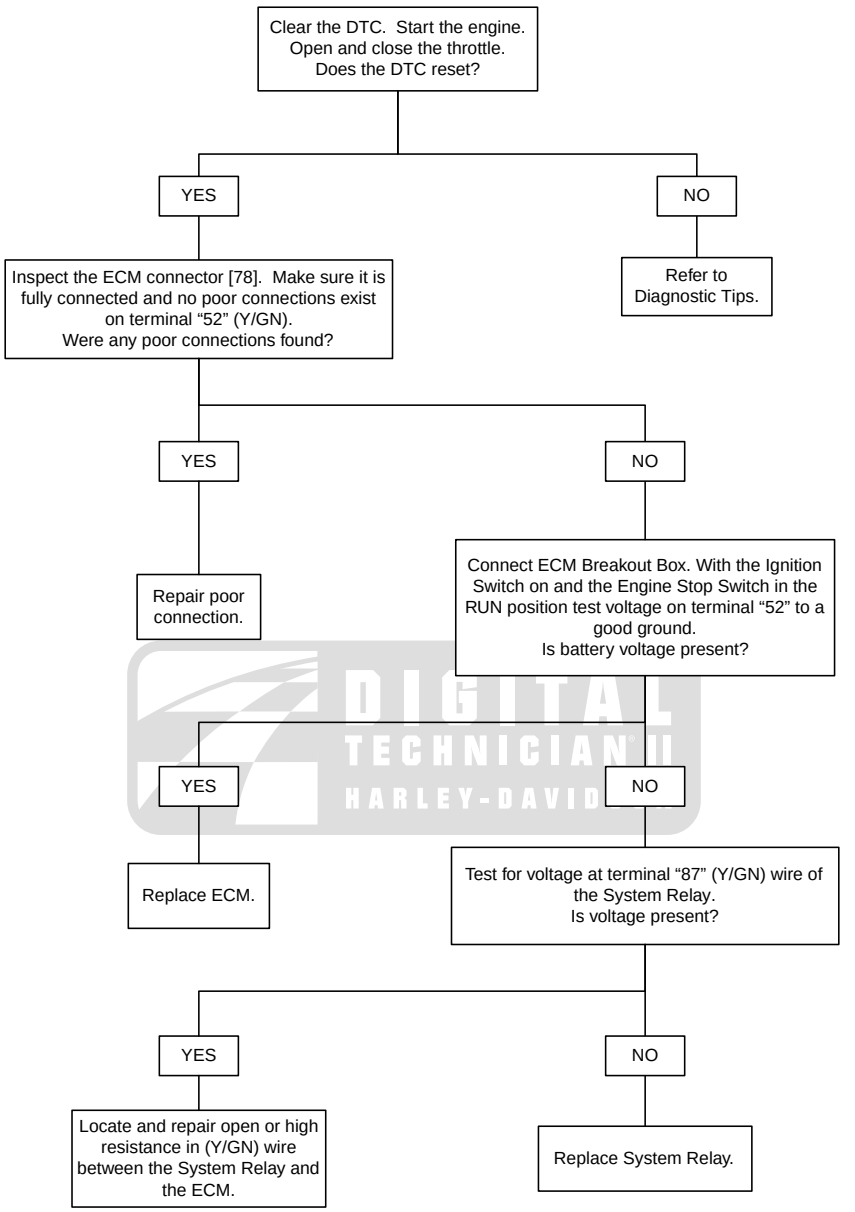
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing (right radio support bracket)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[22]	Right handlebar switches	12-place Molex (black)	Inner fairing (fork stem nut lock plate)
[33]	Ignition switch	3-place Packard	Inner fairing (under radio)
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Mini-Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Delphi	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[121]	Rear brake light switch	Spade terminal	Bottom of rear frame downtub (right side)
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie bottom of lower crossmember HDI: Electrical caddie at bottom of lower frame crossmember
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Front right crankcase
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover HDI: Under right side cover (behind electrical bracket)
[204]	Twist Grip Sensor (TGS)	6-place Amp (Tyco)	Throttle control-handle bar (right side)
[211]	Throttle Control Actuator (TCA) and Throttle Position (TP) sensor	6-place Molex	Right side of engine (induction module)

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Diagnostic Notes

Refer to and conduct diagnostics as identified on the flow chart.

DTC 2107



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01331_en

DTC P2119 4.42

GENERAL

Refer to Table 4-75. The Throttle Actuation Control (TAC) System sets DTC P2119 when the ECM determines that the throttle plate does not return to the correct de-energized position. This error primarily indicates that there may be non-electrical conditions which affect the throttle body range/performance.

Table 4-75. 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 (i.e. foreign material, debris, physical obstruction, or loosely/improperly mounted throttle plate).
- Damaged or broken throttle plate return spring.
- Defective mechanical component(s) internal to the TCA.

DIAGNOSTICS

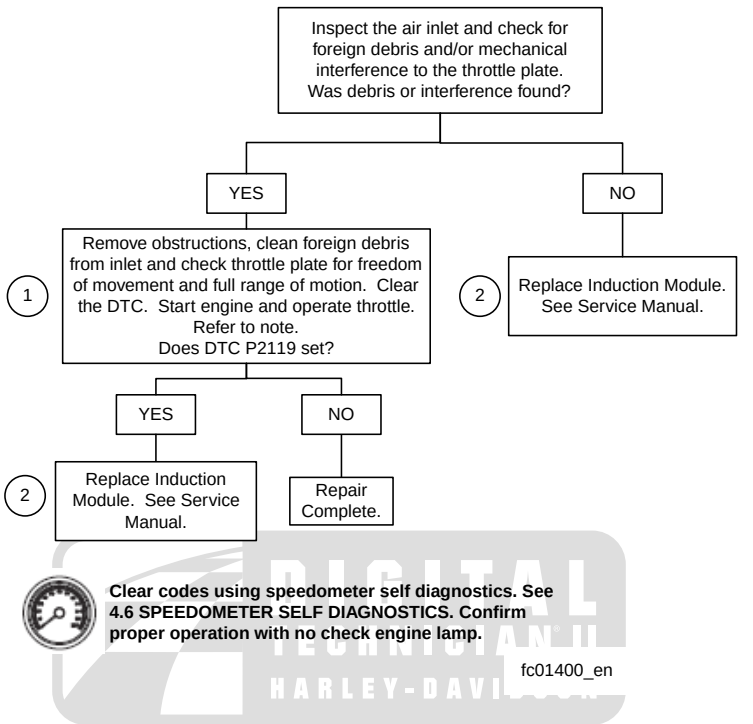
Diagnostic Notes

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

1. The ECM must see this fault during four consecutive ignition cycles in order to set DTC P2119. When testing to see if code resets, be sure to operate vehicle through four complete, consecutive ignition cycles.
2. Replace defective mechanical components in accordance with the Service Manual. Follow the flow chart steps provided, until component replacement directs you to the Service Manual.

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TAC System Throttle Body Range/Performance: DTC P2119



DTC P2122, P2123, P2127, P2128 4.43

GENERAL

The Twist Grip Sensor (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 Throttle Control Actuator (TCA) to move the throttle plate to the desired position.

The TGS receive 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 5.0 volts. If the sum of these voltages is not 5.0 volts, then DTCs will be 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 4-76.

Table 4-76. Code Description

DTC	DESCRIPTION
P2122	TGS1 low/open
P2123	TGS1 high
P2127	TGS2 low/open
P2128	TGS2 high

DIAGNOSTICS

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

Diagnostic Tips

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.

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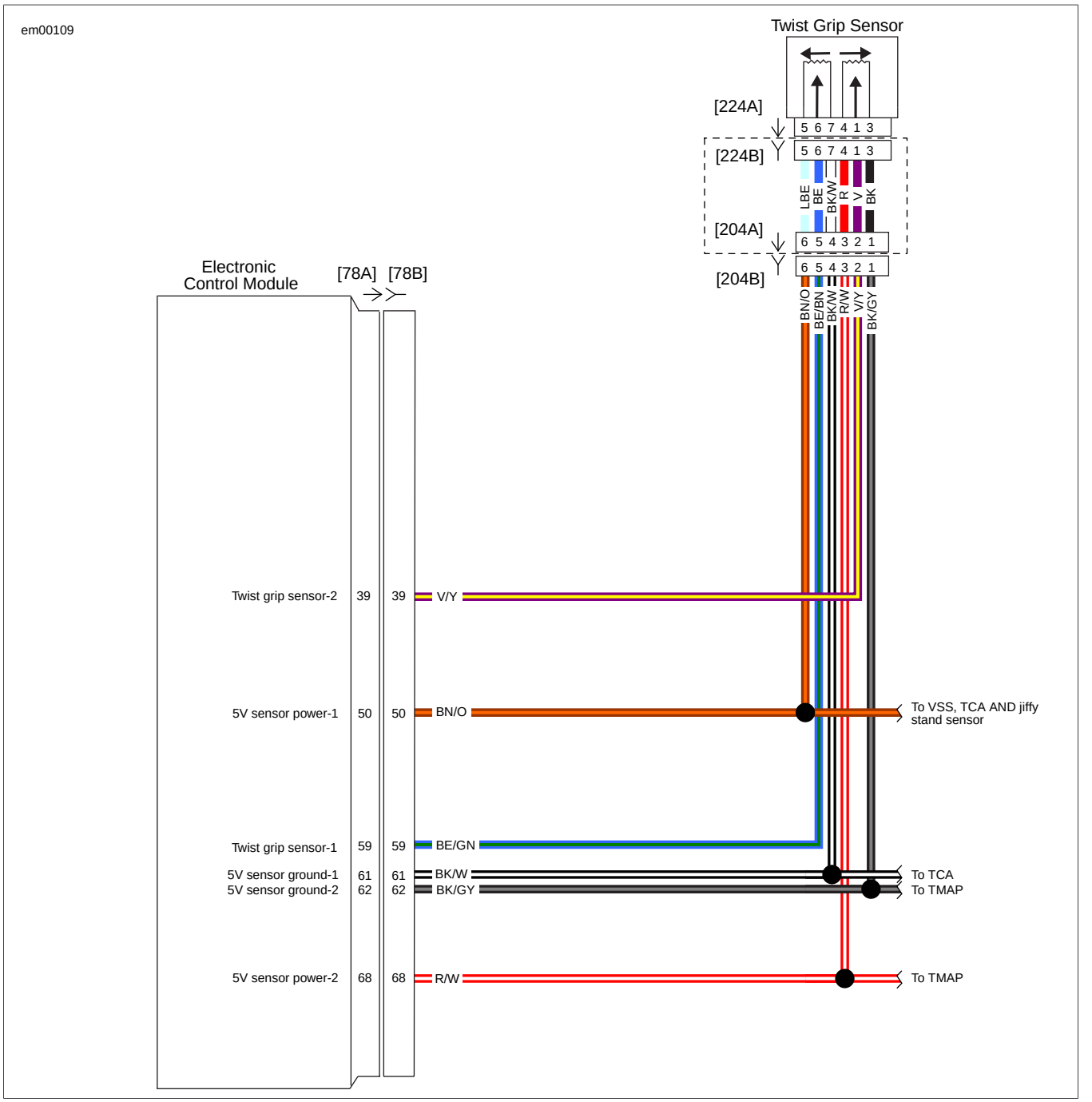
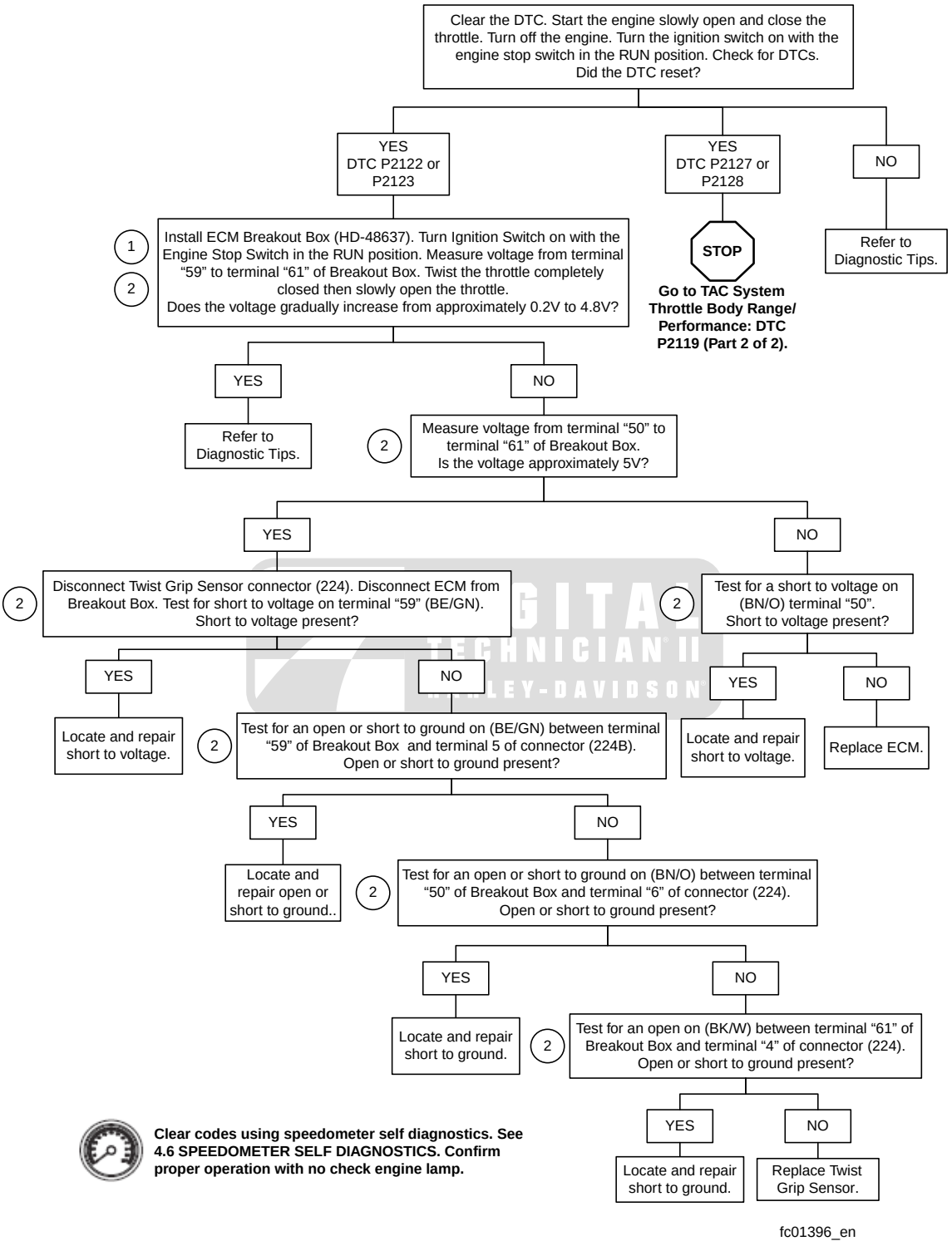


Figure 4-80. Twist Grip Sensor (TGS) Circuit

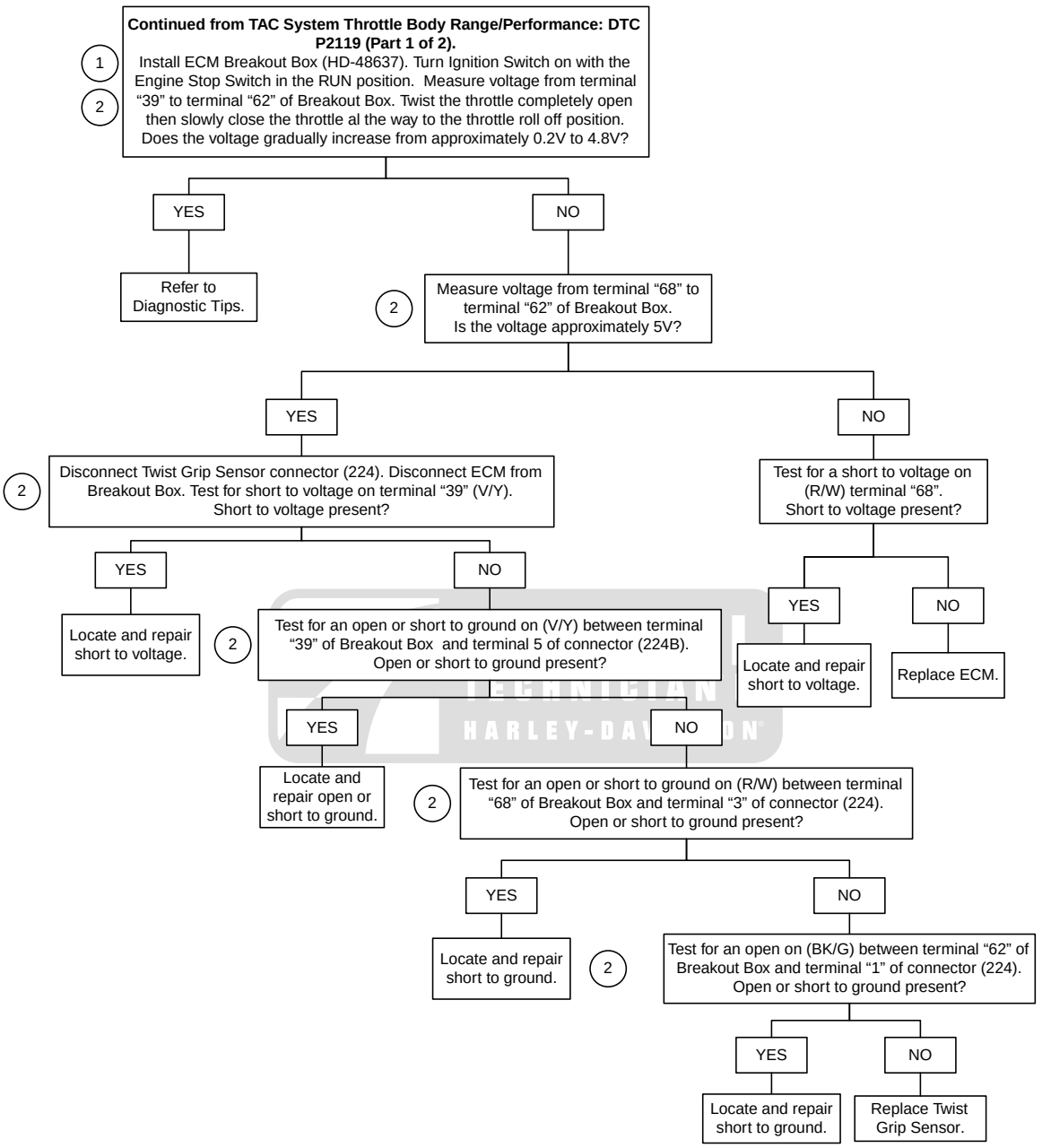
Table 4-77. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[204]	Harness connector - Twist Grip Sensor (TGS)	All except FLHR	6-place Molex	Inside fairing front (leading into handlebar right side)
		FLHR	6-place Molex	Inside nacelle
[224]	Twist Grip Sensor (TGS)	All	7-place Amp (Tyco)	Handlebar throttle (inside right side handlebar)

TAC System Throttle Body Range/Performance: DTC P2119 (Part 1 of 2)



TAC System Throttle Body Range/Performance: DTC P2119 (Part 2 of 2)



fc01397_en

DTC P2135, P2138 4.44

GENERAL

The Throttle Actuation Control (TAC) System uses DTC codes when the ECM determines that a correlation error exists for either the Throttle Position (TP) sensor or the Twist Grip Sensor (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 of these components fail to correlate the proper voltage, or has out-of-range voltage conditions, then the ECM will initiate a DTC. Refer to Table 4-78.

Table 4-78. Code Description

DTC	DESCRIPTION
P2135	TPS correlation error
P2138	TGS correlation error

DIAGNOSTICS

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

Diagnostic Tips

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

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48637) to the ECM and ECM harness. See 4.7 BREAKOUT BOX: EFI.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), purple pin probes, socket probes and patch cords.
3. Replace defective mechanical components in accordance with the Service Manual. Follow the flow chart steps provided until component replacement directs you to the Service Manual.

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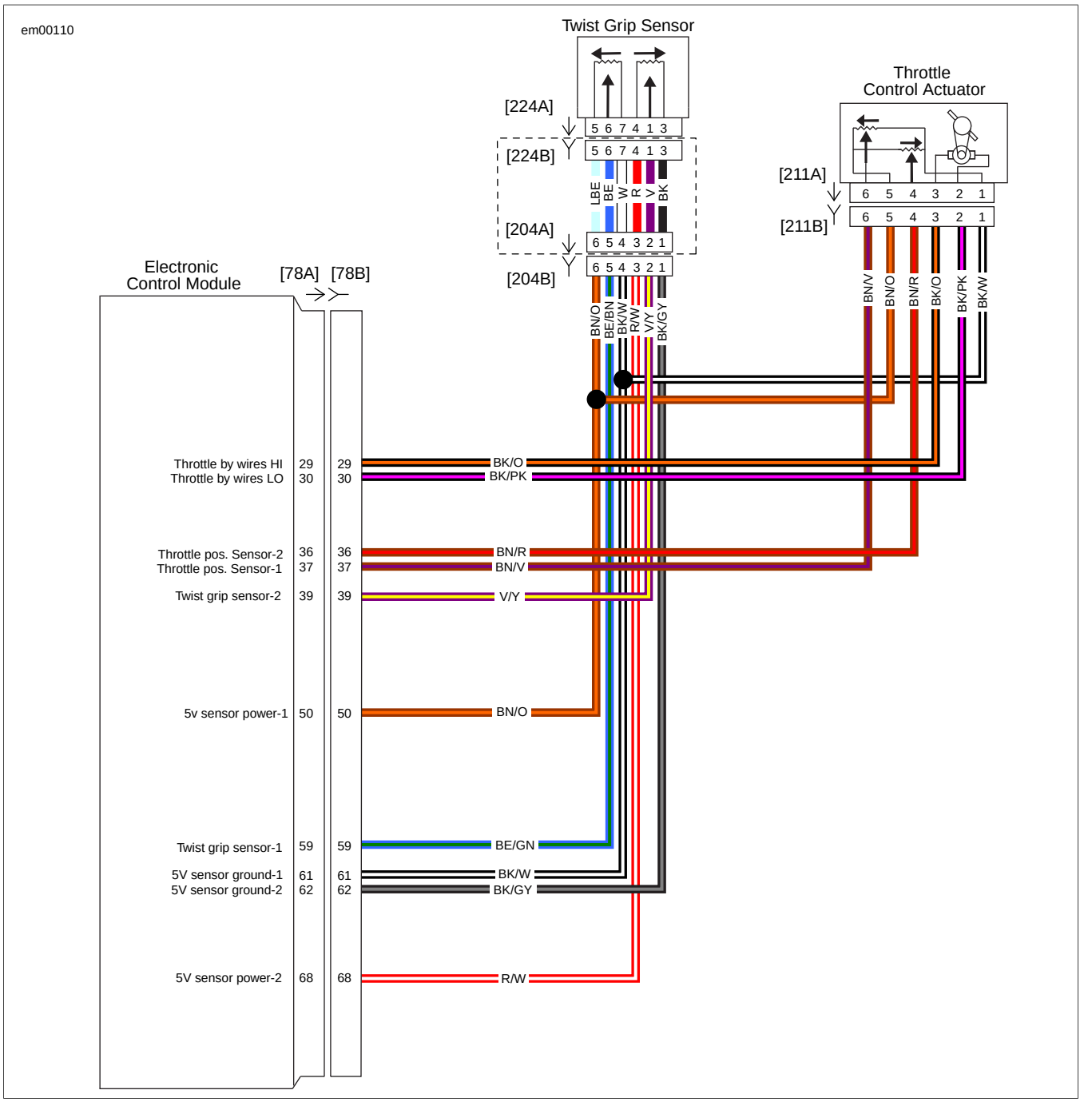
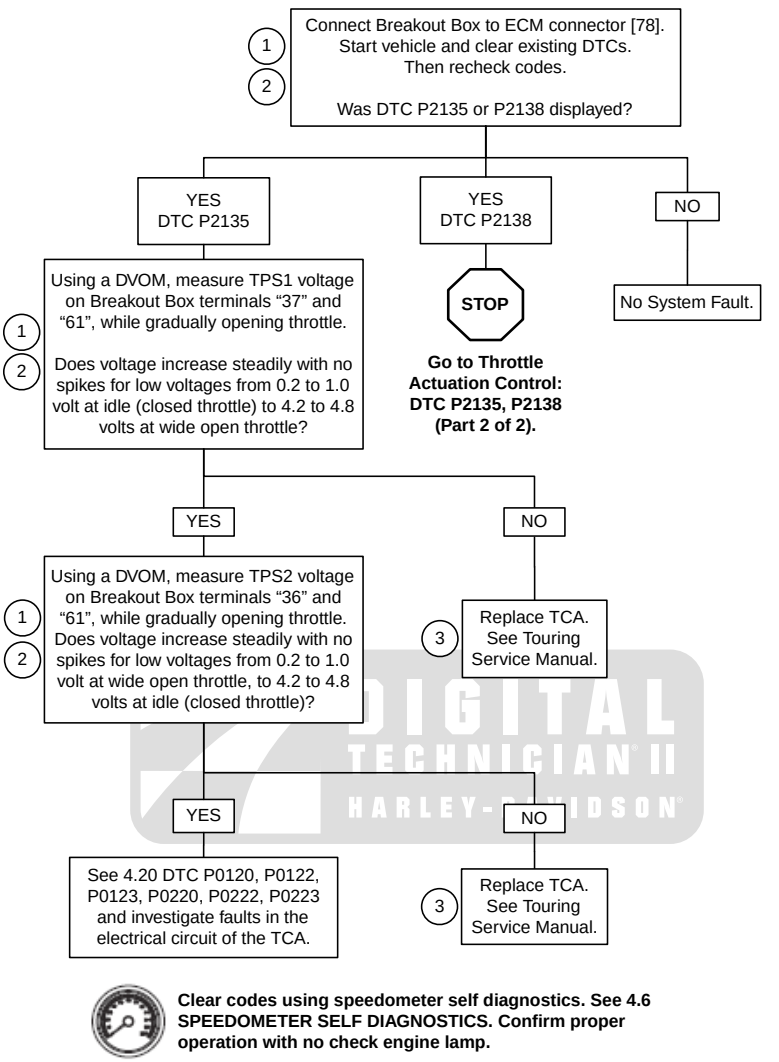


Figure 4-81. TGS/TPS Control Circuit

Table 4-79. Wire Harness Connectors

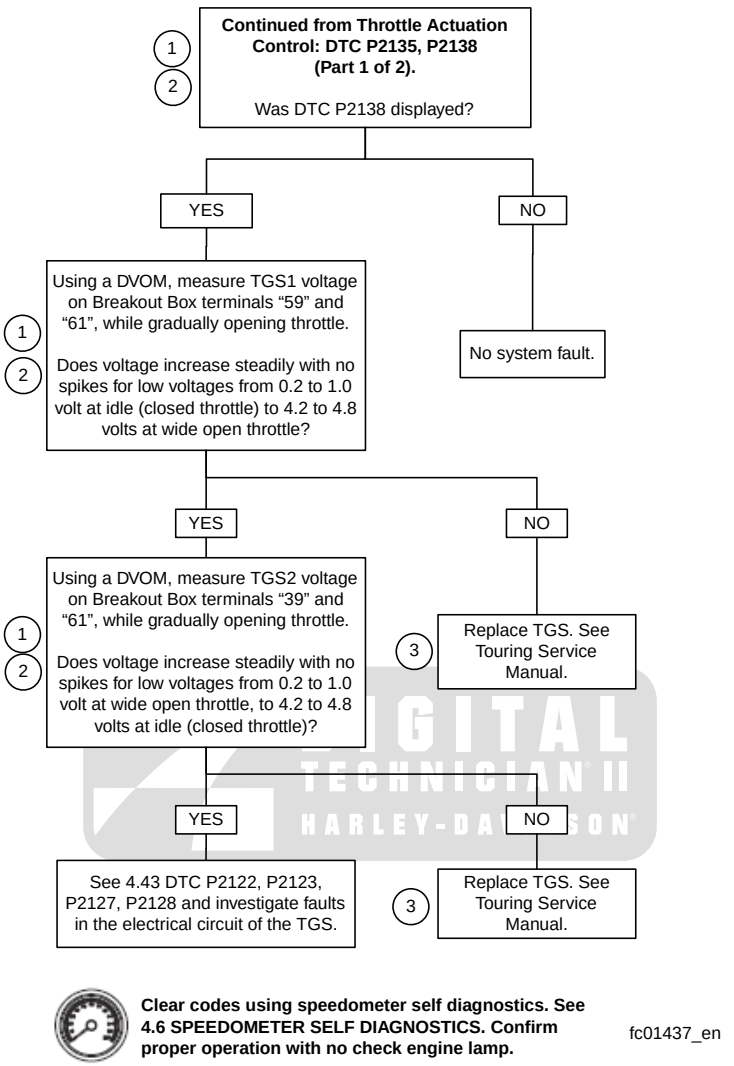
NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[204]	Twist Grip Sensor (TGS)	6-place Molex	Right hand control (inside right handlebar)
[211]	Throttle Control Actuator (TCA)	6-place Molex	Air inlet manifold (right side)

Throttle Actuation Control: DTC P2135, P2138 (Part 1 of 2)



fc01436_en

Throttle Actuation Control: DTC P2135, P2138 (Part 2 of 2)



Clear codes using speedometer self diagnostics. See 4.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

fc01437_en

DTC P2176 4.45

GENERAL

The Throttle Actuation Control (TAC) System sets DTC P2176 when the ECM determines that 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 will initiate a DTC P2176. Refer to Table 4-80.

Table 4-80. Code Description

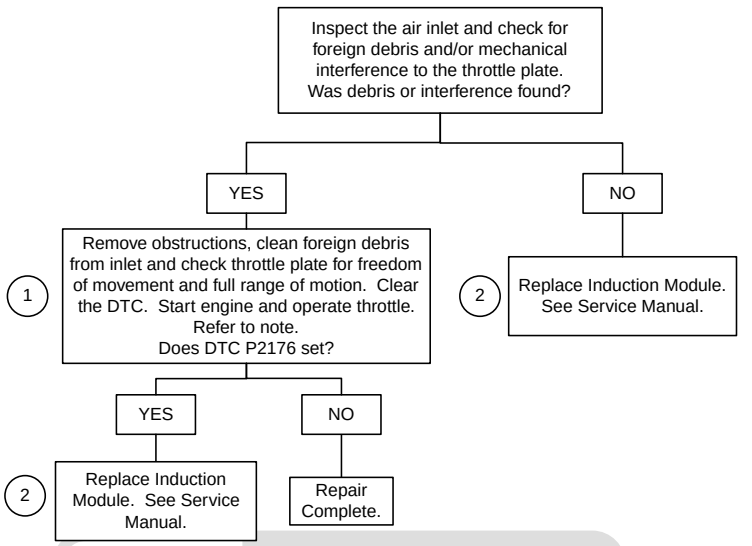
DTC	DESCRIPTION
P2176	TAC close position not learned

DIAGNOSTICS

Refer to and conduct diagnostics as identified on the flow chart.

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TAC Closed Position Not Learned: DTC P2176



DTC U1064 4.46

GENERAL

Loss of TSM/TSSM/HFSM Serial Data

The serial data connector provides a means for the Electronic Control Module (ECM), TSM/TSSM/HFSM and speedometer 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. A Diagnostic Trouble Code (DTC) U1064 indicates that the TSM/TSSM/HFSM is not receiving this state of health message. A DTC U1064 also indicates that there was communication on the data bus since power up, but communication was lost or interrupted during that key cycle.

Table 4-81. Code Description

DTC	DESCRIPTION
U1064	Loss of TSM/TSSM/HFSM serial data
U1255	Serial data error/missing message

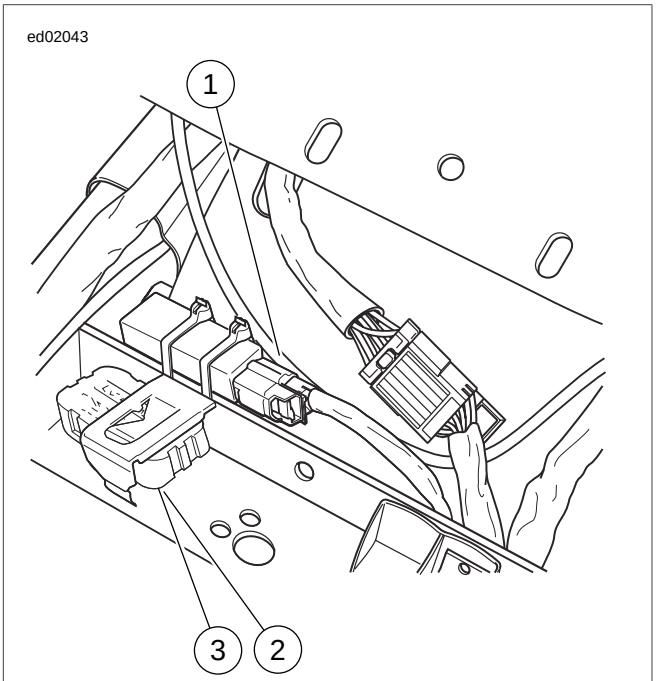
DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-48637	BREAKOUT BOX

Diagnostic Notes

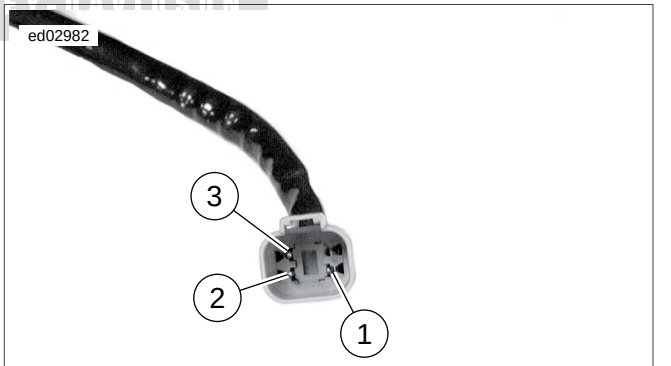
Each reference number below correlates to a circled number on the flow chart(s).

1. Connect BREAKOUT BOX (Part No. HD-42682) as follows:
   a. Mate gray socket housing on Breakout Box with TSM/TSSM/HFSM connector [30A].
   b. Mate gray pin housing on Breakout Box with harness connector [30B].
2. Connect BREAKOUT BOX (Part No. HD-48637).



1. **[30] TSM/TSSM/HFSM**
2. **[208] HFSM antenna jumper harness**
3. **[209] HFSM antenna**

Figure 4-82. TSM/TSSM/HFSM Location



1. **Terminal 2: ground (BK/GN)**
2. **Terminal 3: serial data (LGN/V)**
3. **Terminal 4: power (GY)**

Figure 4-83. Data Link Connector

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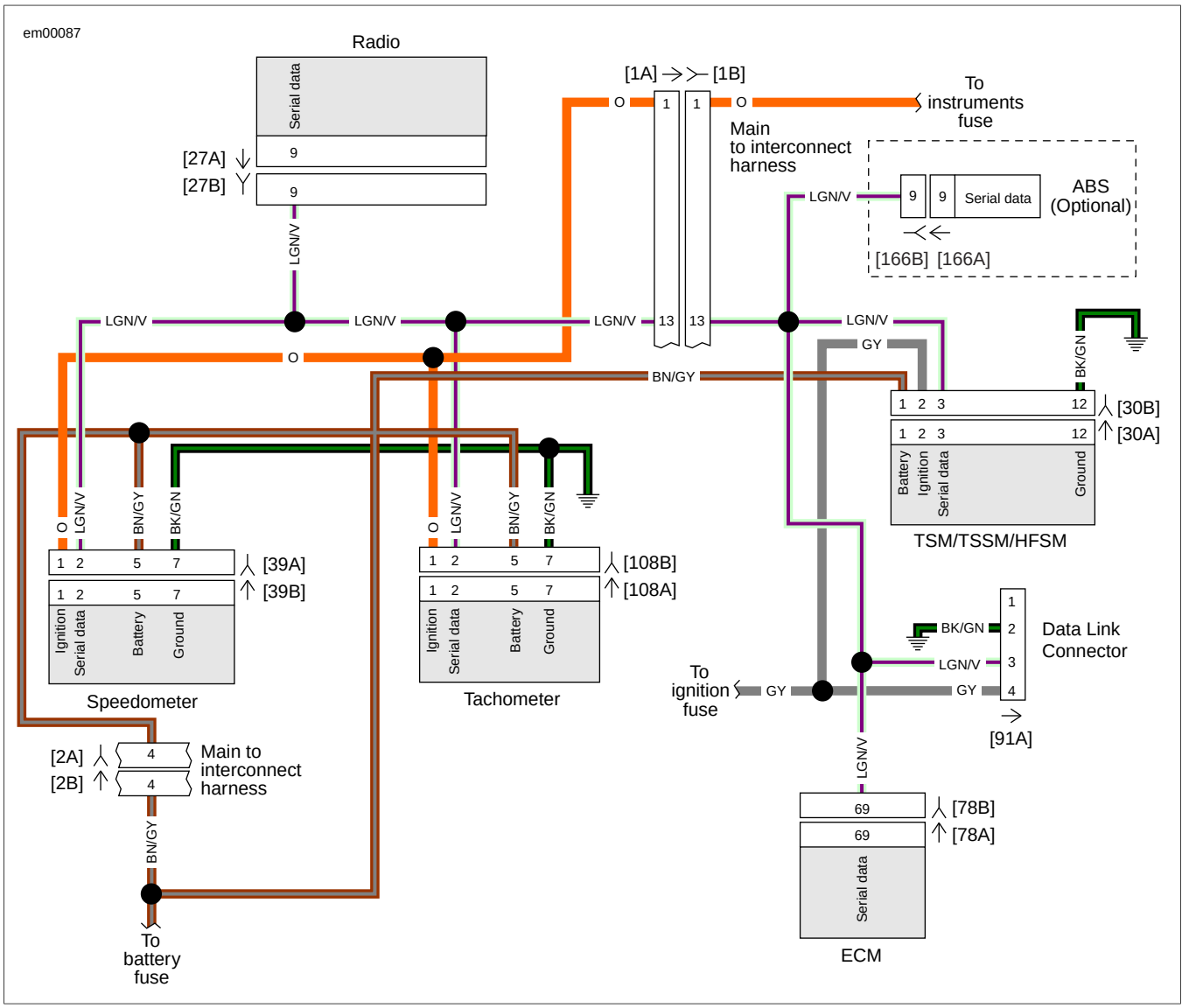


Figure 4-84. ECM and TSSM/HFSM Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-82. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (gray)	Inner fairing - right fairing support brace
		FLTR	12-place Molex (gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover

Table 4-82. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-place Molex	Under right side cover

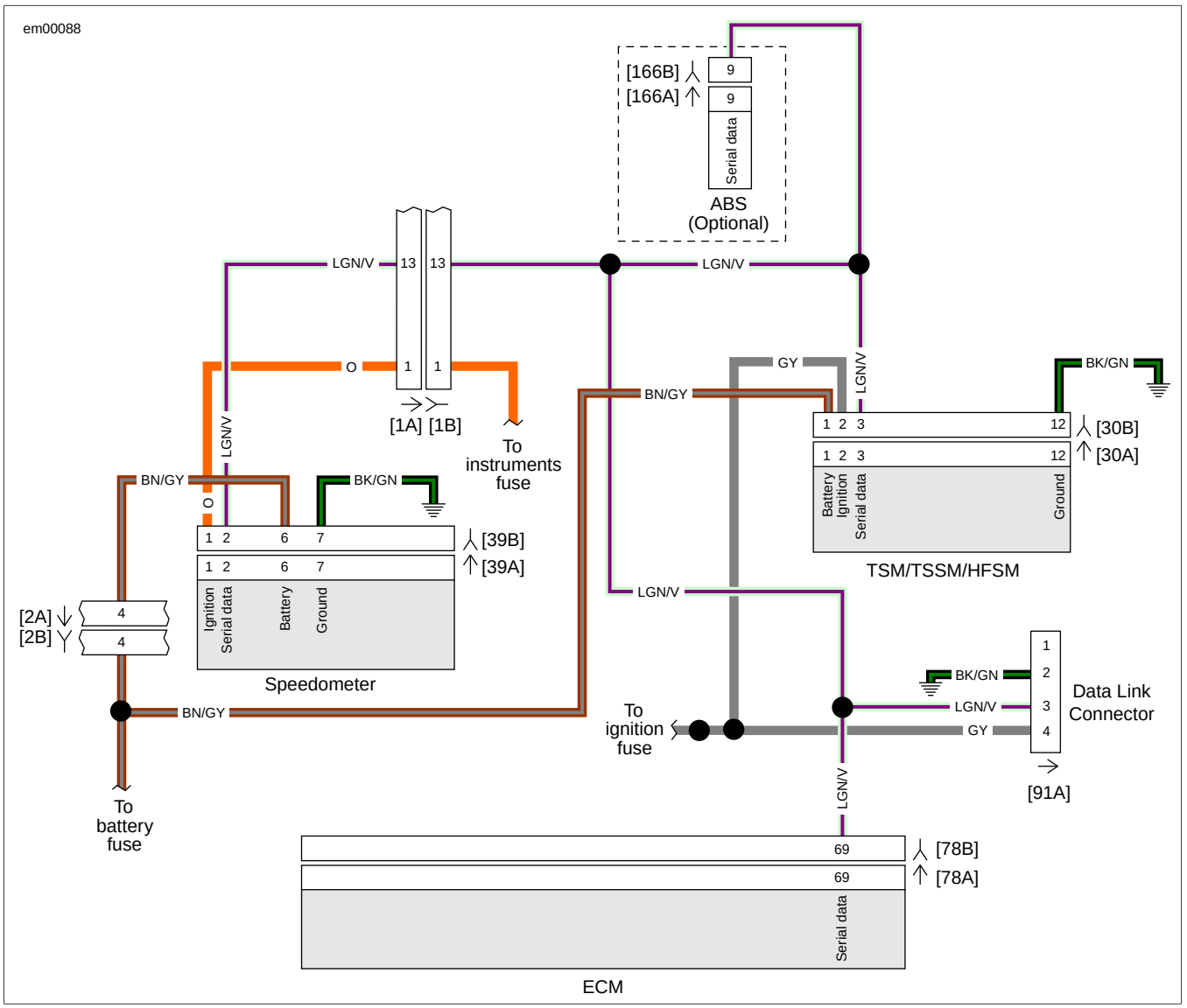


Figure 4-85. ECM and TSM/TSSM/HFSM Circuit (FLHR/C/S)

Table 4-83. Wire Harness Connectors

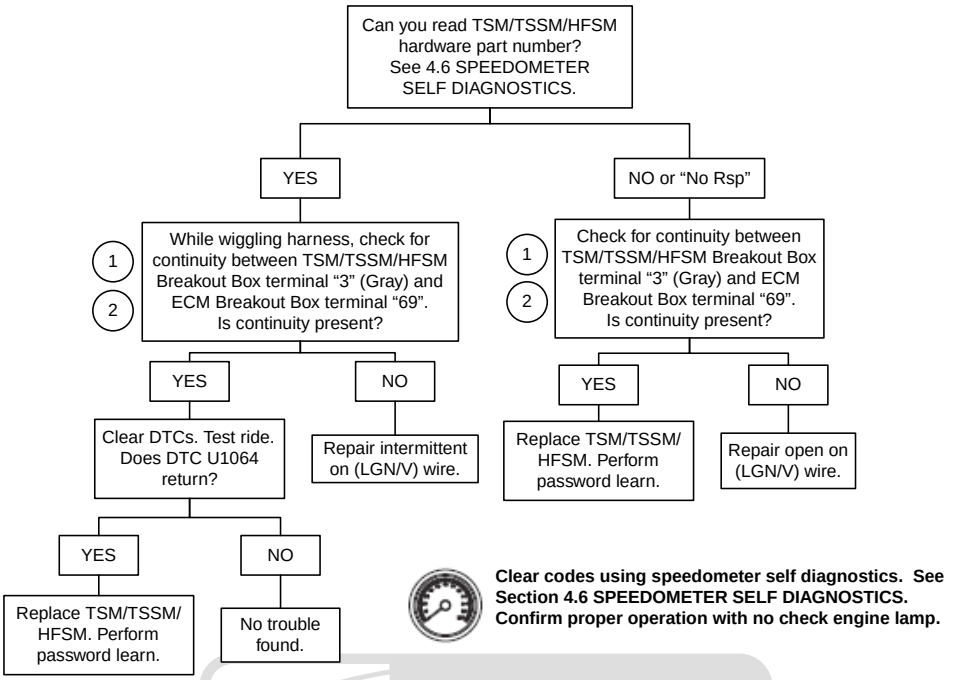
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (Black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (Gray)	Inner fairing - left radio support bracket

Table 4-83. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS module	20-place Molex	Under right side cover

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Loss of Speedometer Serial Data: DTC U1064



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1097 4.47

GENERAL

Loss of Speedometer Serial Data

The serial data connector provides a means for the speedometer, ECM, and TSM/TSSM/HFSM 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 U1097 indicates that the speedometer is not capable of sending this state of health message. DTC U1097 also indicates that there was communication on the data bus since power up, but communication was lost or interrupted during that key cycle.

Table 4-84. Code Description

DTC	DESCRIPTION
U1097	Loss of all speedometer serial data (state of health)

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-46601	INSTRUMENT HARNESS ADAPTERS
HD-48637	BREAKOUT BOX

NOTE

If DTC is historic and not current, wiggle wire harness while performing voltage and continuity tests to identify intermittents.

Diagnostic Notes

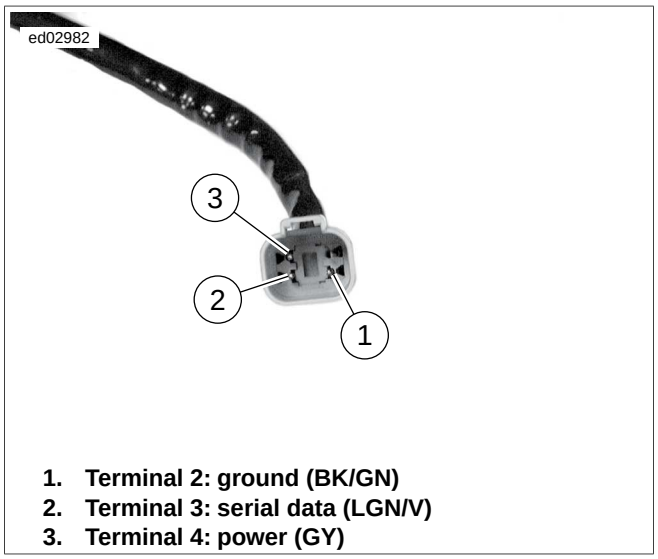
Each reference number below correlates to a circled number on the flow chart(s).

1. Mate black pin housing on Breakout Box with wire harness connector [39B] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601)Leave speedometer [39A] disconnected.
2. Connect BREAKOUT BOX (Part No. HD-48637) to wire harness connector [78B] Leave ECM connector [78A] disconnected. See 4.7 BREAKOUT BOX: EFI.

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Figure 4-86. ECM Data Link Connector



1. **Terminal 2: ground (BK/GN)**
2. **Terminal 3: serial data (LGN/V)**
3. **Terminal 4: power (GY)**

Figure 4-87. Data Link Connector

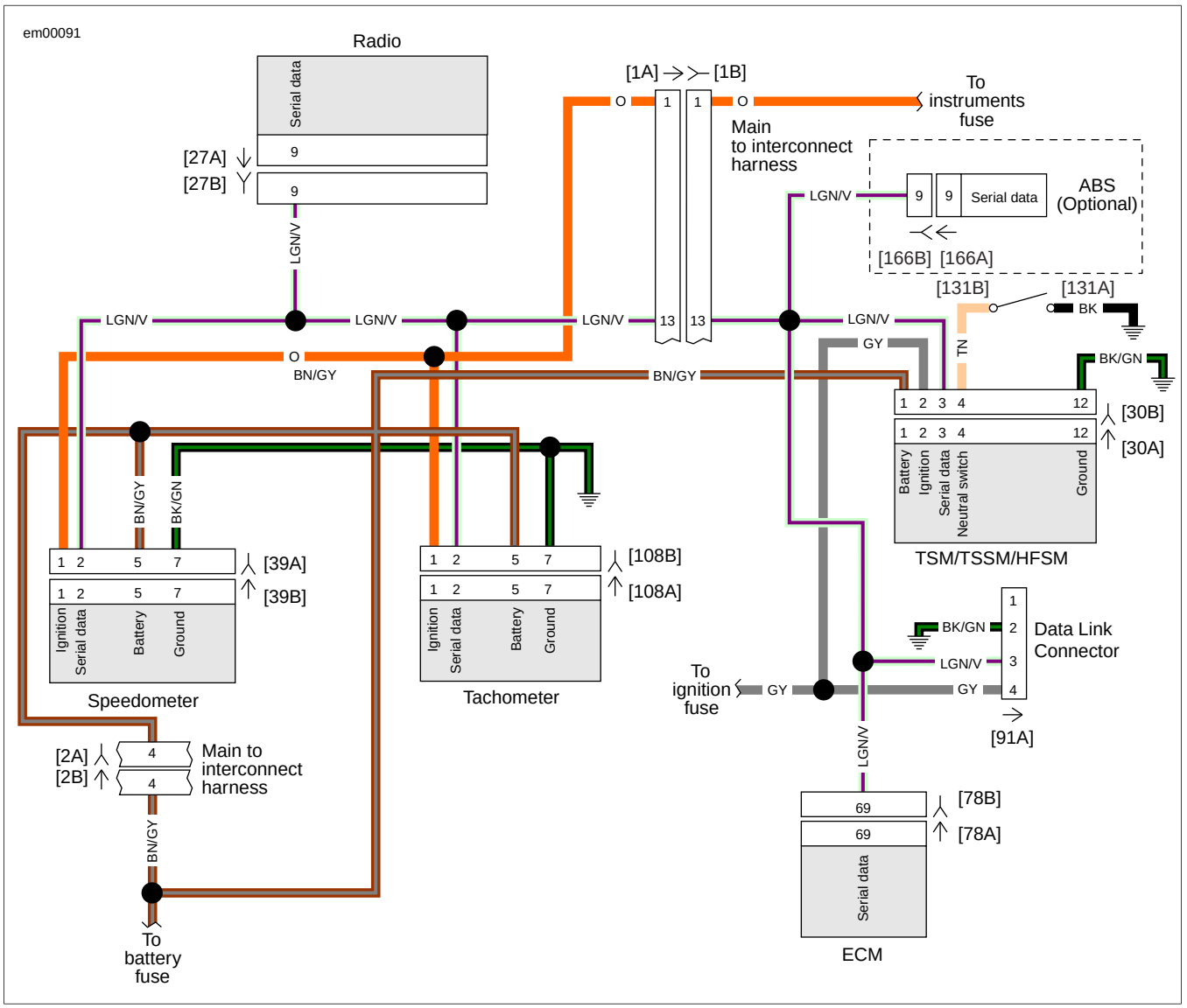


Figure 4-88. Serial Data Circuit (FLHX, FLHT/C/U, FLTR)

Table 4-85. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (gray)	Inner fairing - right fairing support brace
		FLTR	12-place Molex (gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Delphi	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[131]	Neutral switch	All	Post terminals	Top of transmission (right side)
[166]	ABS module	All	20-place Molex	Under right side cover

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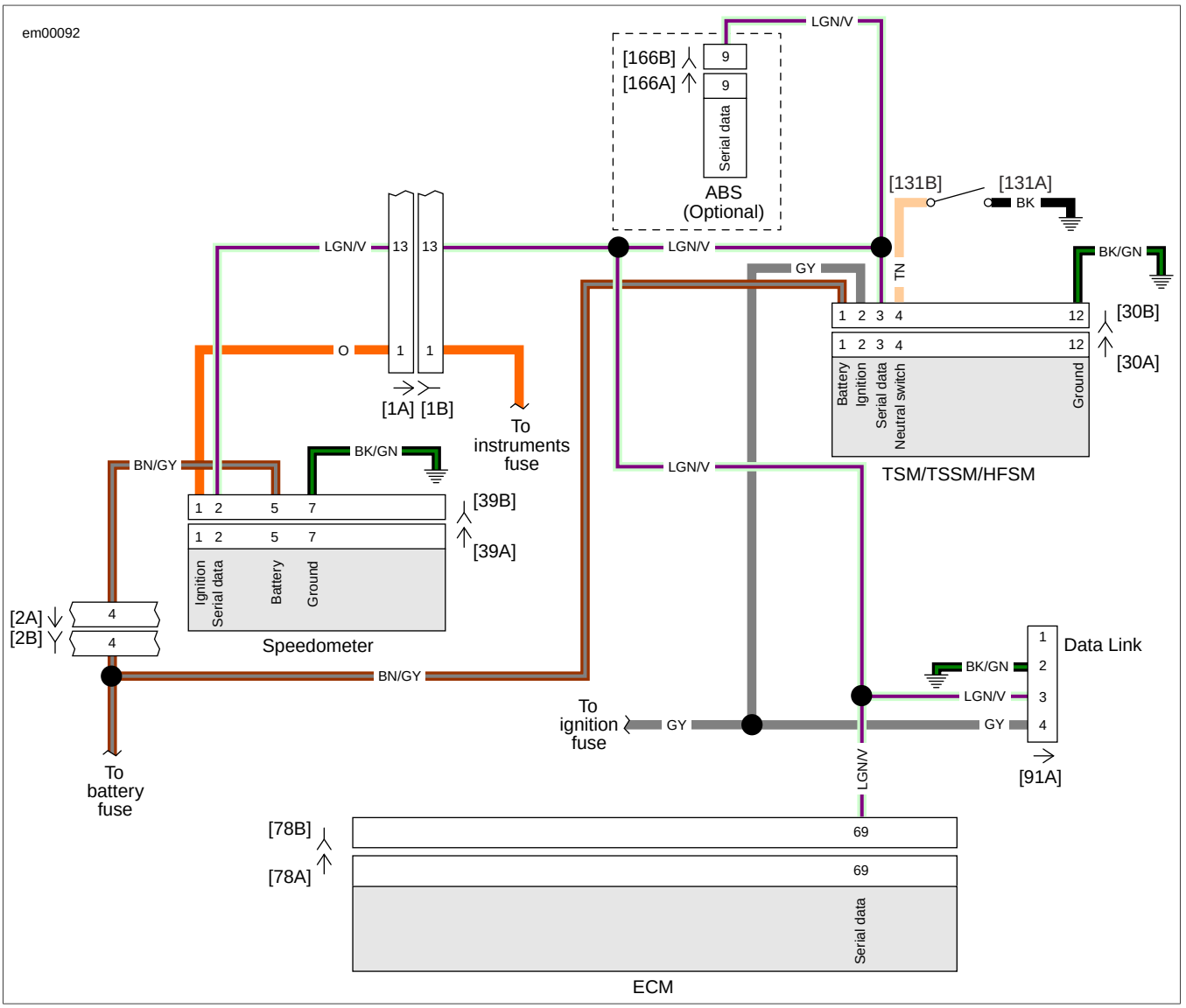
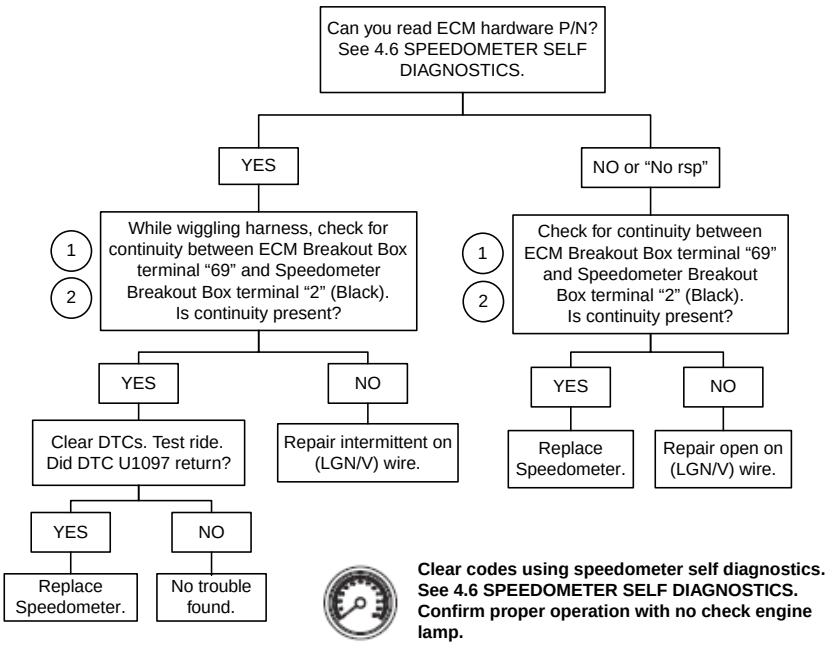


Figure 4-89. Serial Data Circuit (FLHR/C/S)

Table 4-86. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (Black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (Gray)	Inner fairing - left radio support bracket
[30]	TSM/TSSM/HFSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[131]	Neutral switch	Post terminals	Top of transmission (right side)
[166]	ABS module	20-place Molex	Under right side cover

Loss of Speedometer Serial Data: DTC U1097



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NOTES

RADIO DIAGNOSTICS 5.1

SYSTEM DESCRIPTION

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 that is 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 2008 sidecar equipped Ultra Classic, CVO Ultra Classic and also as an optional accessory; located under the luggage rack
- Optional accessory Bluetooth Hands-Free cell phone interface module and antenna; located inside Tour-Pak
- 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
- System also designed for the addition of future accessories.

ONBOARD DIAGNOSTICS

General

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 5.5 ADVANCED AUDIO SYSTEM SYMPTOMS.

Radio Diagnostic Display

Press the eject button to remove any CD that might be in the unit. Then, while depressing and holding any two softkeys (buttons 1-6), turn the Ignition sSwitch to 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 A of Figure 5-1.

If, after the intial 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 flow chart for resolution of the problem. See B of Figure 5-1.

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." 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 C of Figure 5-1.

Pressing softkey 1 while in the radio diagnostic display sets the system back to the factory defaults. See D of Figure 5-1. If a symptom is present without a DTC, restoring the factory default settings may sometimes resolve the issue. For more information, see 5.5 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.

To use this feature, start the motorcycle, 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. Refer to DTC U1016 for resolution of the problem if the system is configured correctly. See E of Figure 5-1.

Pressing softkey 3 displays the region and other configuration data, while softkey 4 shows the software version code. See F and G of Figure 5-1.

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.

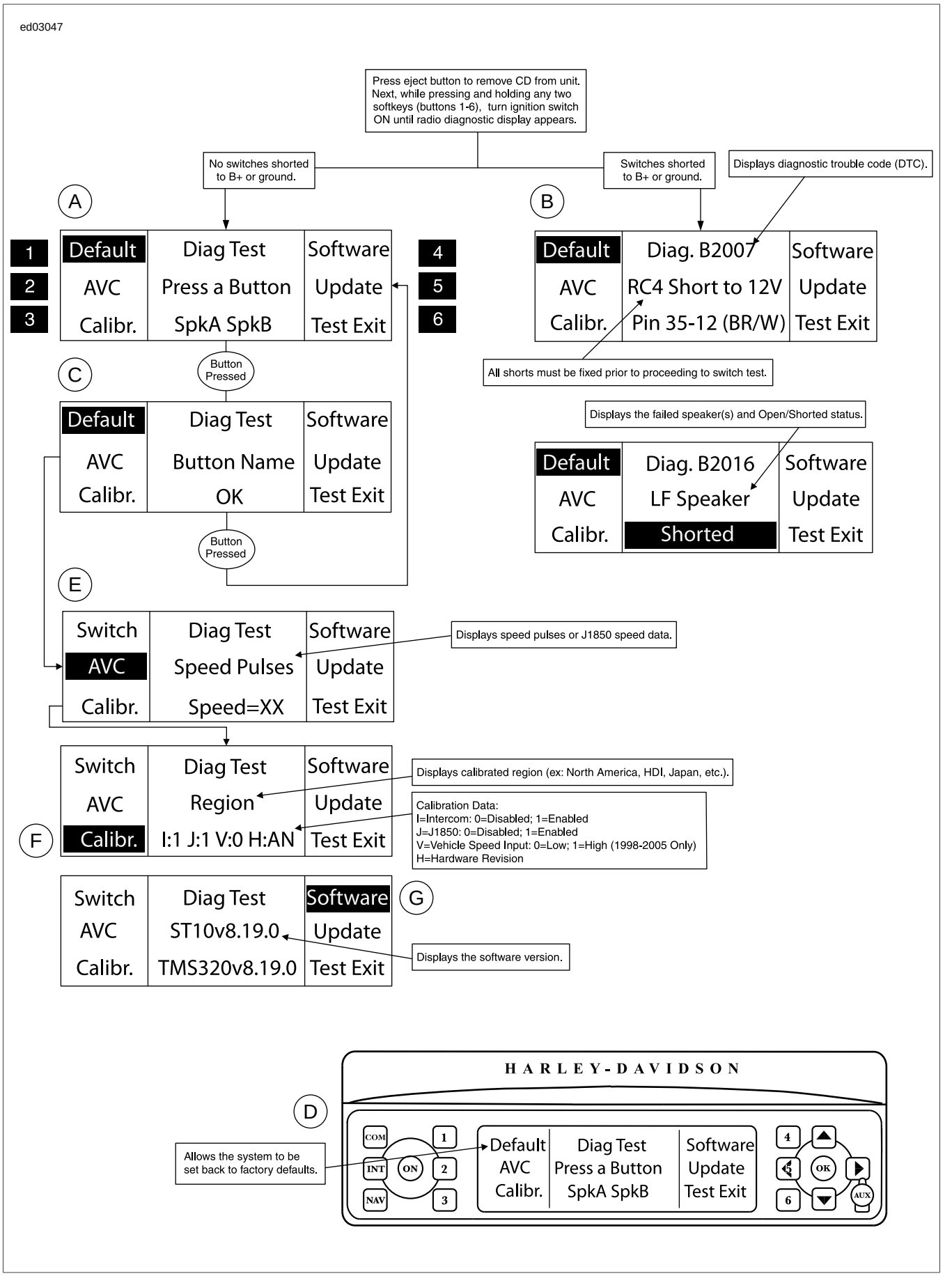


Figure 5-1. Initial Diagnostics - Radio Diagnostic Display

Table 5-1. 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>= 16 volts	Normal range for t>=15 seconds
RADIO SWITCH DIAGNOSTICS			
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
B2013	Sidecar switch shorted high	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds
B2014	Sidecar switch shorted low	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	Normal range for t>=15 seconds
B2015	Sidecar switch stuck or open	t>=15 sec.	Normal range for t>=15 seconds
SPEAKER DIAGNOSTICS			
B2016	Front speakers shorted	R<1.5 ohm tested 1 per ignition cycle R>TBD when setup as line out ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R>1.5 ohm tested per ignition cycle
B2017	Front speakers open	R>100 ohm tested 1 per ignition cycle ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R<100 ohm tested 1 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 ohm tested 1 per ignition cycle R>TBD when setup as line out ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R>1.5 ohm tested 1 per ignition cycle
B2021	Rear speakers open	R>100 ohm tested 1 per ignition cycle ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	R<100 ohm tested 1 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	
B2024	Sidecar speakers shorted	R<1.5 ohm tested 1 per ignition cycle R>TBD when setup as line out ignition ON or run diagnostics, t=instantaneous	R>1.5 ohm tested 1 per ignition cycle
B2025	Sidecar speakers open	R>100 ohm tested 1 per ignition cycle ignition ON or run diagnostics, t=instantaneous	R<100 ohm tested 1 per ignition cycle
B2026	Sidecar speakers shorted to ground	Ignition ON after Ignition OFF for at least 10 sec., t=instantaneous	

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Table 5-1. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC	DESCRIPTION	FAULT-SET CONDITION	FAULT-CLEAR CONDITION T=TIME; R=RESISTANCE
B2027	Sidecar 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 5-2. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC/SYMPTOM	DESCRIPTION	GO TO
SERIAL DATA BUS DIAGNOSTICS		
U1016	J1850 lost communications with ECM	DTC 1304 thru DTC 1317 can only be viewed as historic codes using Digital Technician. 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, see 5.5 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	
ADVANCED AUDIO SYSTEM SYMPTOMS		
1	Radio Inoperative	Radio Inoperative: Symptom 1
2	Poor or No Reception	Poor or No Reception: Symptom 2
3	Radio Beeps Every 30 Seconds	Radio Beeps Every 30 Seconds: Symptom 3
4	CD in Radio Will Not Eject	CD in Radio Will Not Eject: Symptom 4
5	Static Present With Engine Running	Static Present With Engine Running: Symptom 5

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table 5-2. Diagnostic Trouble Codes (DTCs) and Symptoms

DTC/SYMPTOM	DESCRIPTION	GO TO
6	Auxiliary Input Audio Distorted	Auxiliary Input Audio Distorted: Symptom 6
7	CB Transmitter Inoperative and SWR Adjustment	CB Transmitter Inoperative: Symptom 7 (Part 1 of 4)
8	CB Receiver Inoperative	CB Receiver Inoperative: Symptom 8 (Part 1 of 3)
9	Intercom Inoperative	Intercom Inoperative: Symptom 9
10	Handheld Microphone/PTT Inoperative	Handheld Microphone/PTT Inoperative: Symptom 10 (Part 1 of 2)
11	Speaker Switch Malfunction	Speaker Switch Malfunction: Symptom 11
12	Headset Speakers Inoperative	Headset Speakers Inoperative: Symptom 12 (Part 1 of 5)
13	No or Low Audio From Microphones	No or Low Audio From Microphones: Symptom 13 (Part 1 of 4)
14	No or Low Audio With High Output Amplifier	No or Low Audio With High Output Amplifier: Symptom 14 (Part 1 of 2)
15	No or Low Audio From XM or XM Inoperative	No or Low Audio From XM or XM Inoperative: Symptom 15 (Part 1 of 2)
16	XM - No or Intermittent Reception	XM - No or Intermittent Reception: Symptom 16
17	Navigation Inoperative	Navigation Inoperative: Symptom 17 (Part 1 of 2)
18	AVC Inoperative	AVC Inoperative: Symptom 18
19	Handlebar, Passenger or Sidecar Switches Inoperative	Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 1 of 4)
20	CD Skipping	CD Skipping: Symptom 20
21	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	Hands Free Phone Module Initial Diagnostics: Symptom 21 (Part 1 of 5)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

RADIO SWITCH DIAGNOSTICS: DTC B2006-B2015 5.2

GENERAL

The sound system is designed to capture faults for each of the radio switch inputs. When a fault is detected, a Diagnostic Trouble Code (DTC) is generated. The DTC and related data appears on the radio display when the system is in the diagnostic mode.

Table 5-3. 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
B2013	Sidecar switch shorted high
B2014	Sidecar switch shorted low
B2015	Sidecar switch stuck or open

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-47918	RADIO BREAKOUT BOX

Diagnostic Notes

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

1. Install RADIO BREAKOUT BOX (Part No. HD-47918)
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray socket probes and patch cord.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown socket probes and patch cord.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown pin probe and patch cord.

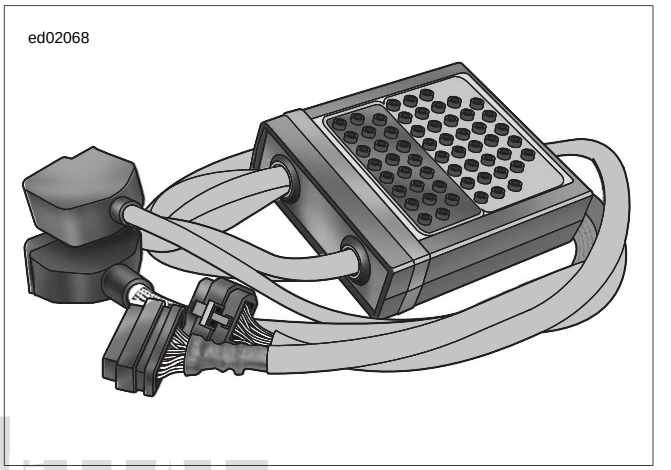
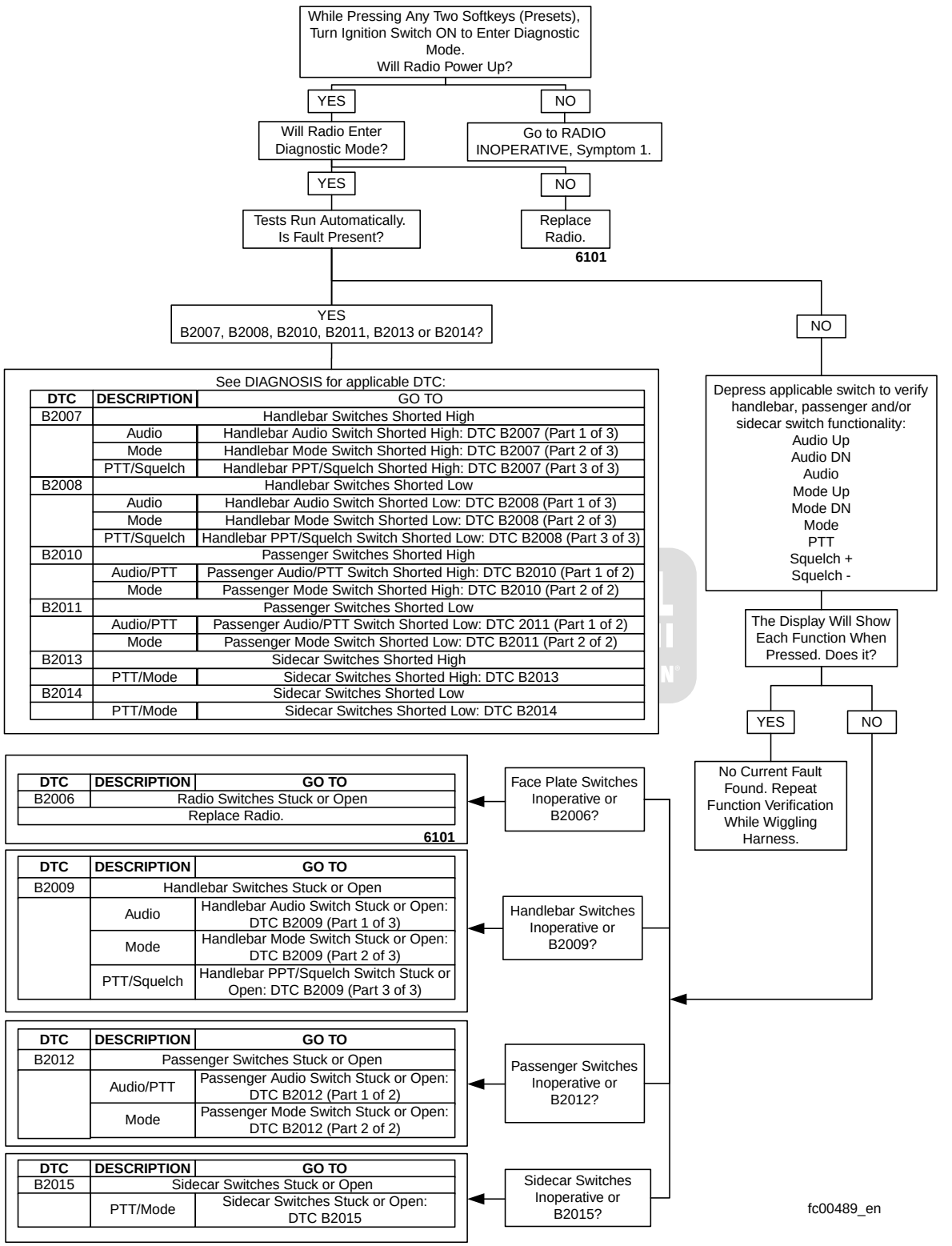


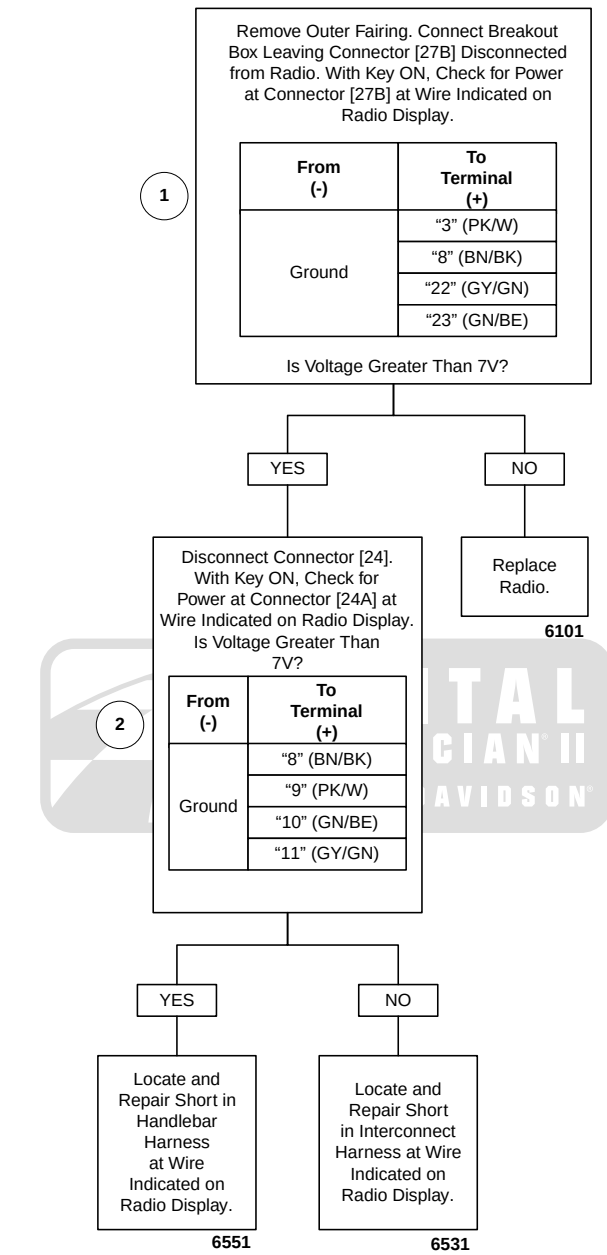
Figure 5-2. Radio Breakout Box (Part No. HD-47918)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B2006 Thru B2015



Handlebar Audio Switch Shorted High: DTC B2007 (Part 1 of 3)



Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00490_en

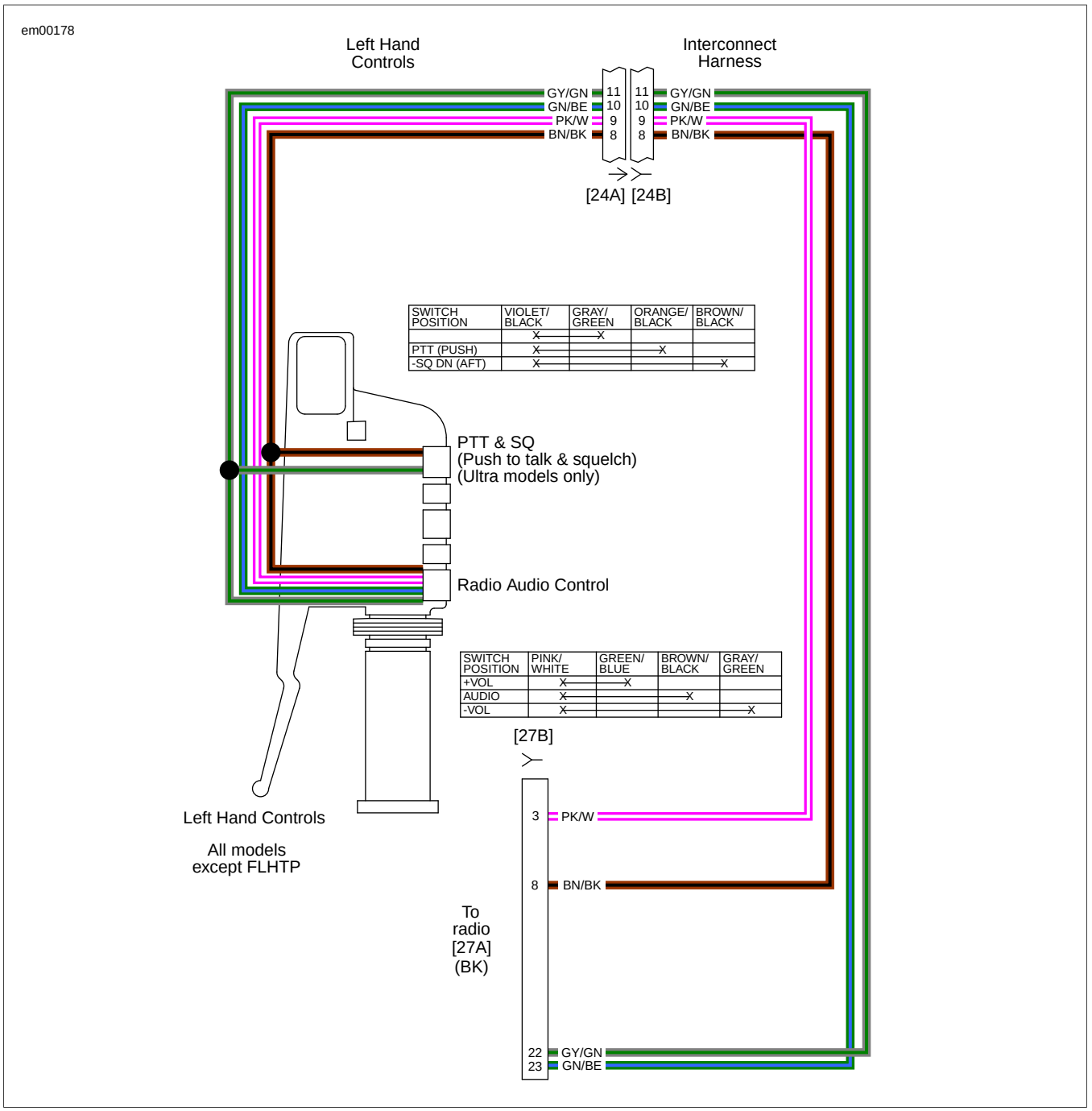
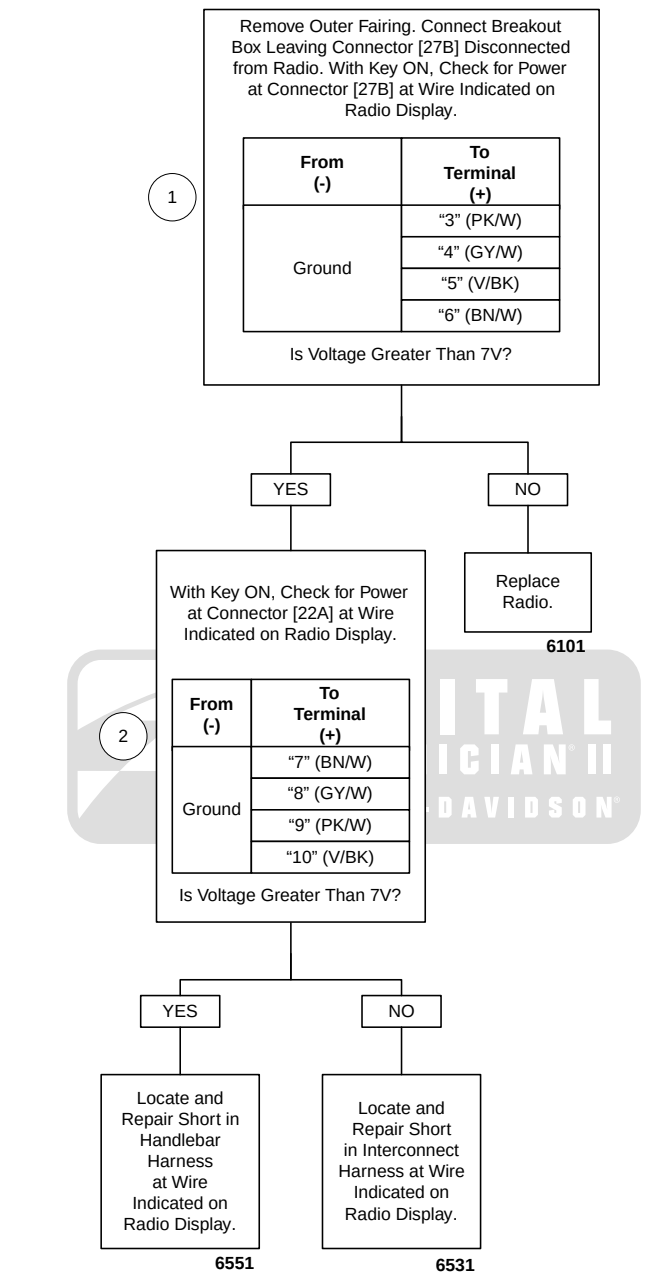


Figure 5-3. Handlebar Audio Switch Circuit

Table 5-4. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Interconnect harness to left handlebar switches	FLHX, FLHTC/U	16-Place Molex (Gray)	Inner fairing - left fairing support brace
		FLTR	16-Place Molex (Gray)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Handlebar Mode Switch Shorted High: DTC B2007 (Part 2 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00491_en

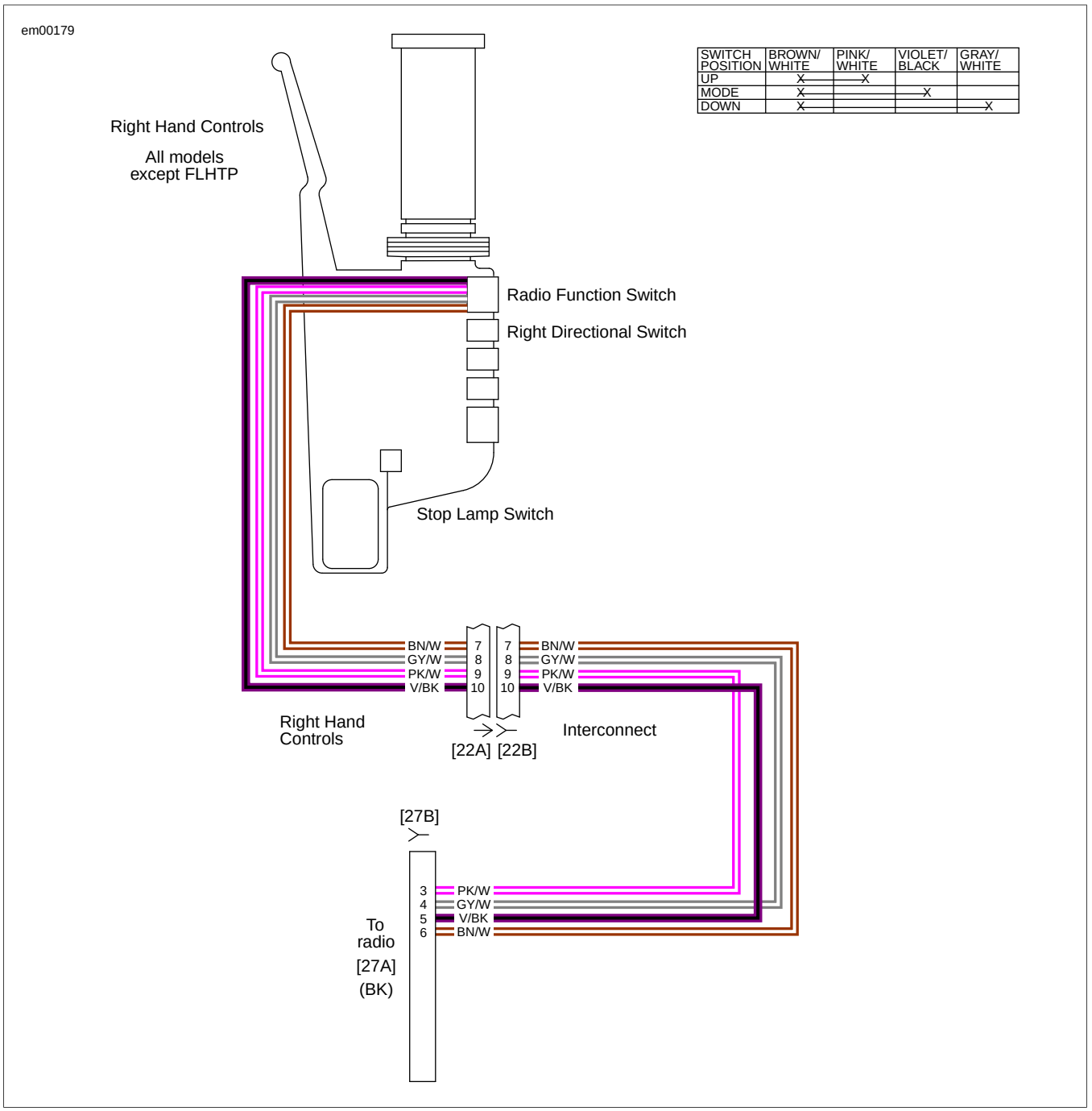
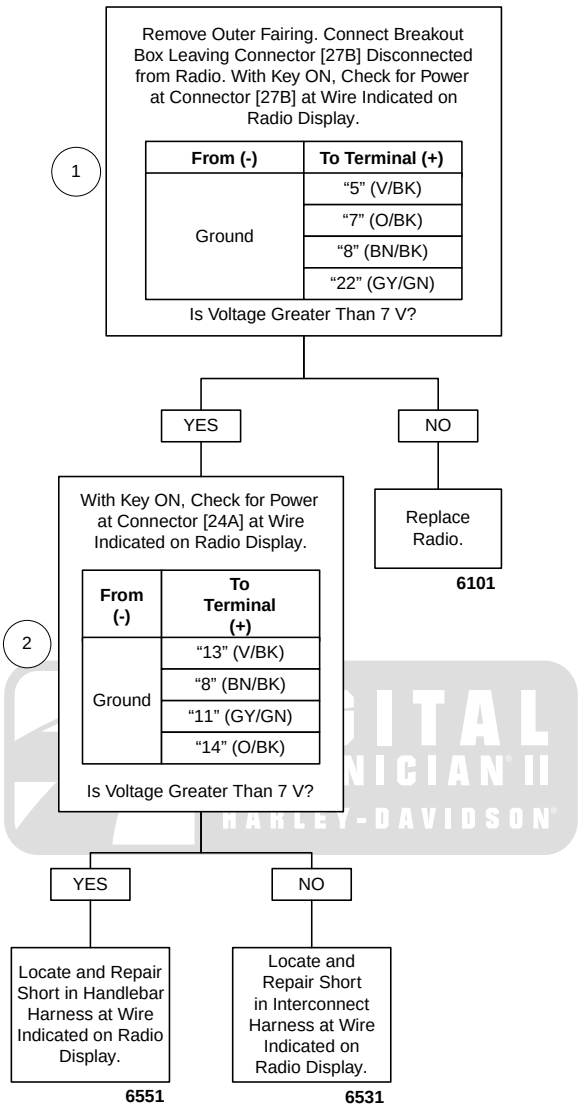


Figure 5-4. Handlebar Mode Switch Circuit

Table 5-5. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[22]	Interconnect harness to right handlebar switches	FLHX FLHTC/U	12-place Molex (Black)	Inner fairing - fork stern nut lock plate (left side)
		FLTR	12-place Molex (Black)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)

Handlebar PTT/Squelch Switch Shorted High: DTC B2007 (Part 3 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00492_en

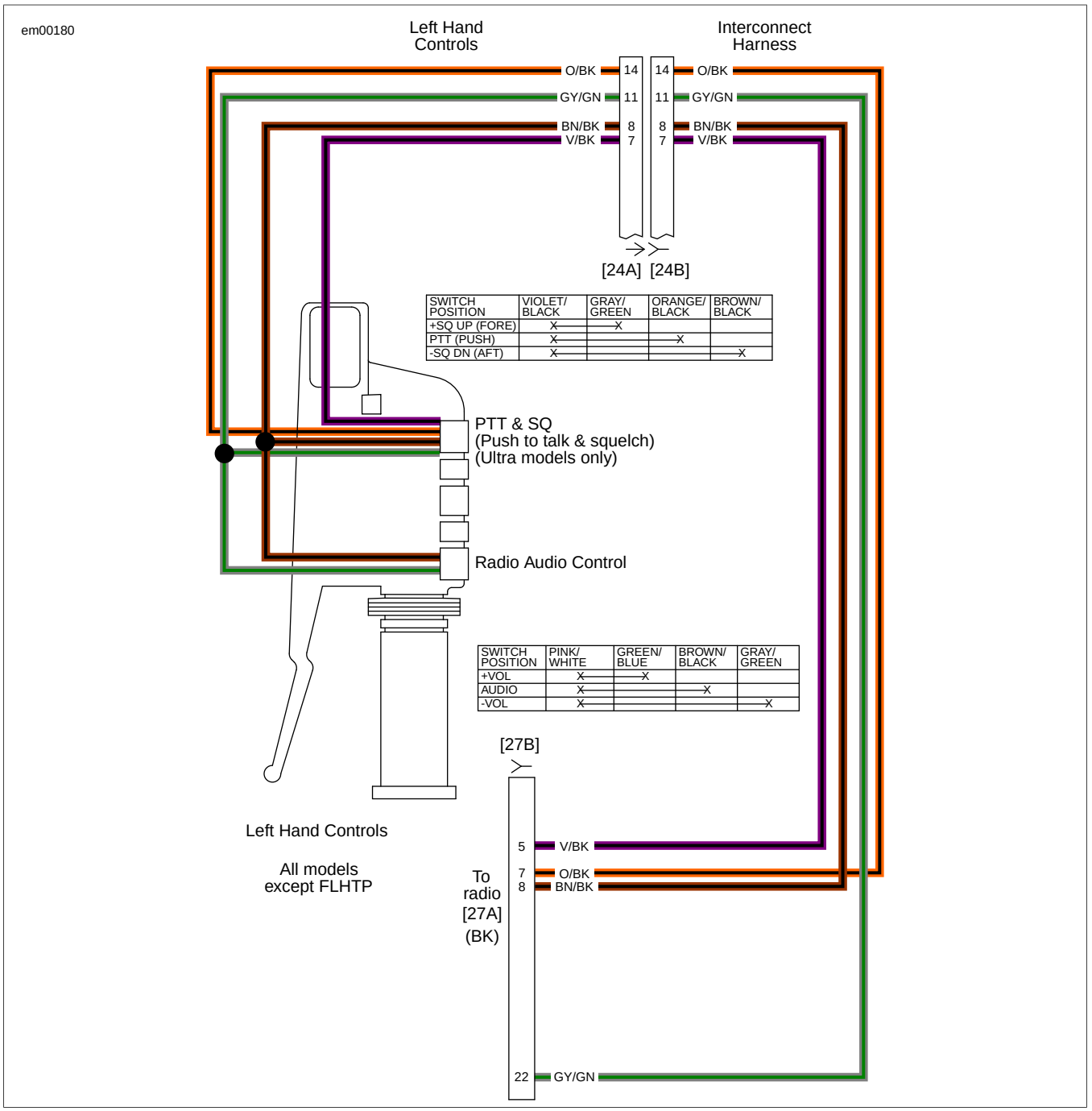
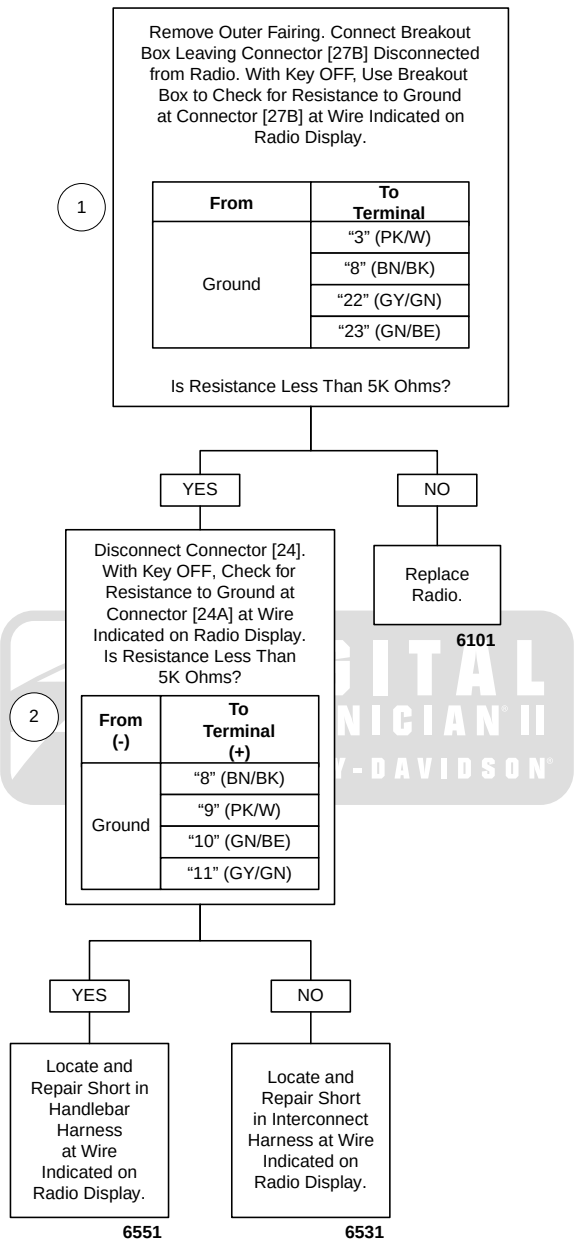


Figure 5-5. Handlebar PTT/Squelch Switch Circuit

Table 5-6. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Interconnect harness to left handlebar switches	FLHX, FLHTC/U	16-Place Molex (Gray)	Inner fairing - left fairing support brace
		FLTR	16-Place Molex (Gray)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Handlebar Audio Switch Shorted Low: DTC B2008 (Part 1 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00493_en

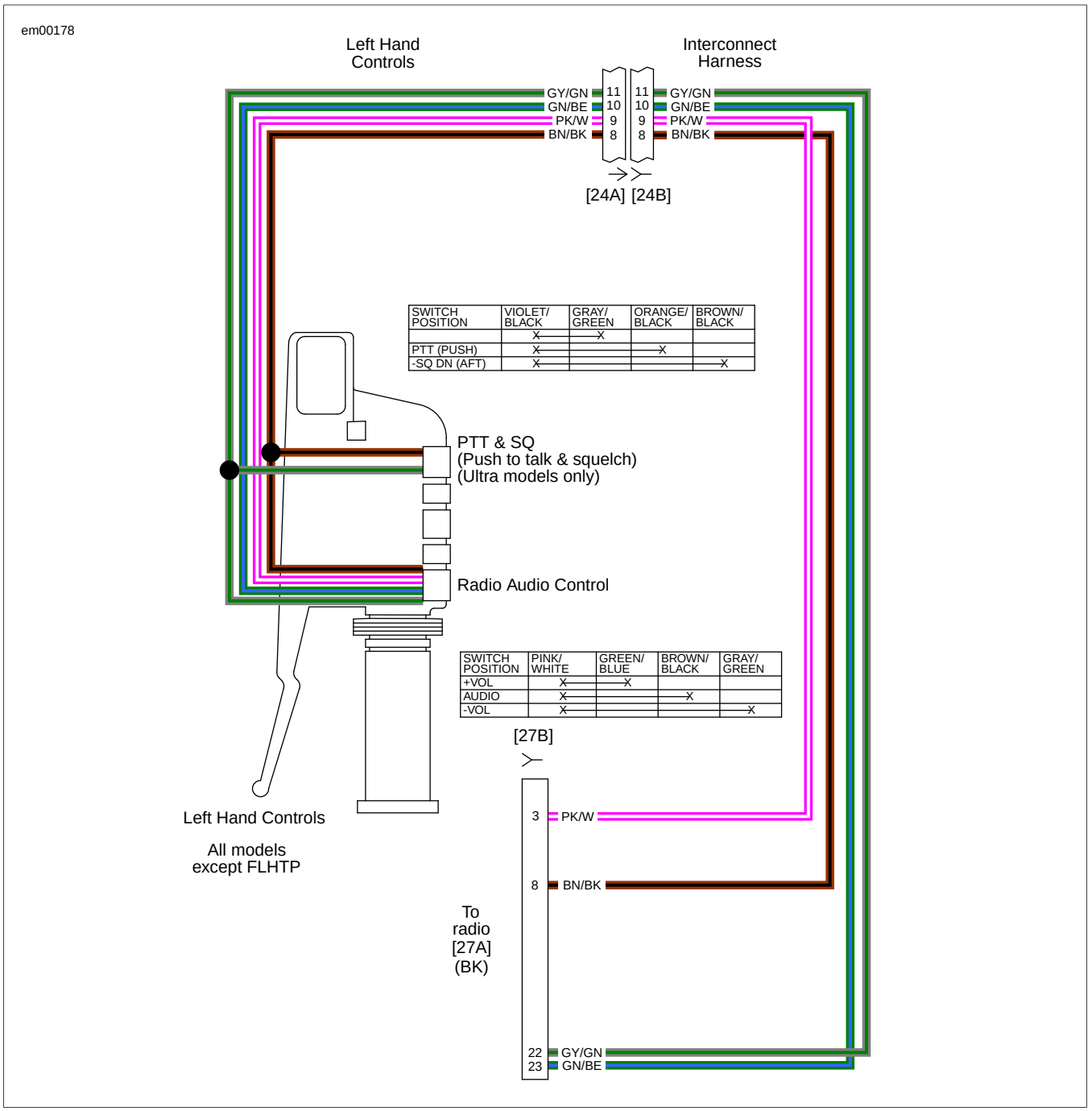
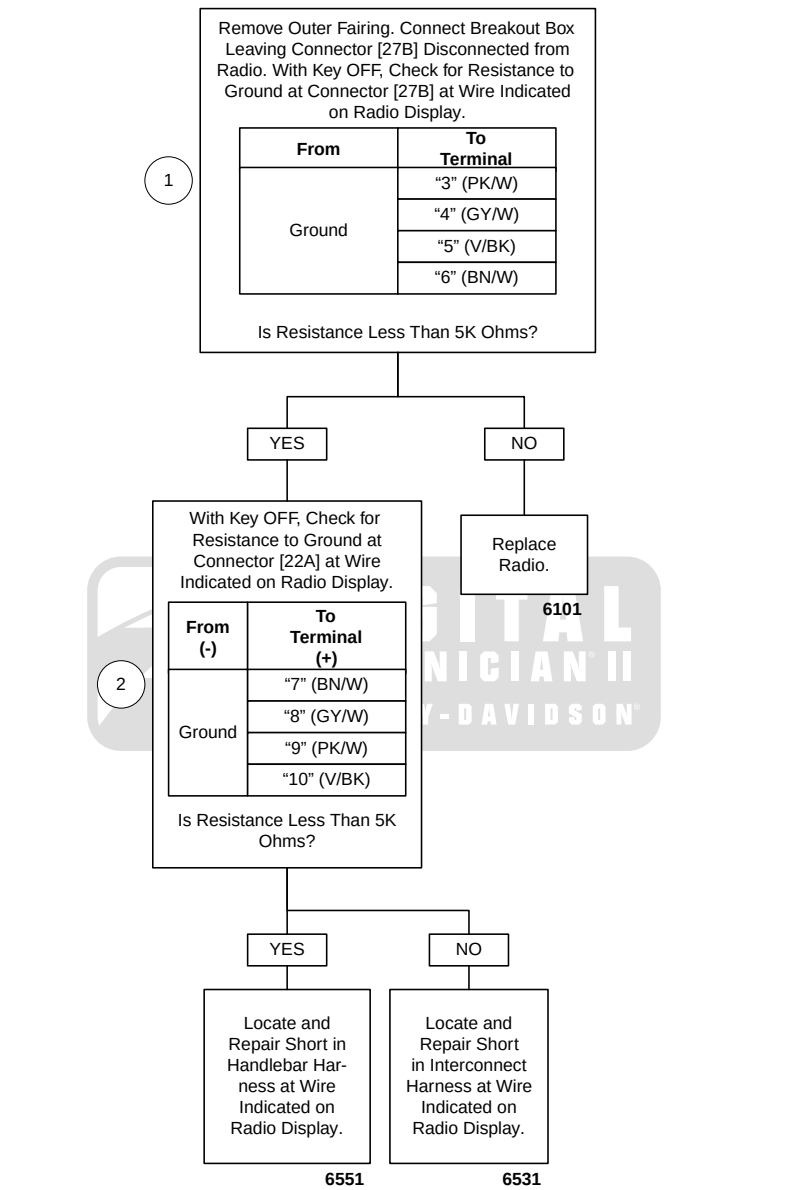


Figure 5-6. Handlebar Audio Switch Circuit

Table 5-7. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[22]	Interconnect harness to right handlebar switches	FLHX FLHTC/U	12-place Molex (Black)	Inner fairing - fork stern nut lock plate (left side)
		FLTR	12-place Molex (Black)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)

Handlebar Mode Switch Shorted Low: DTC B2008 (Part 2 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00494_en

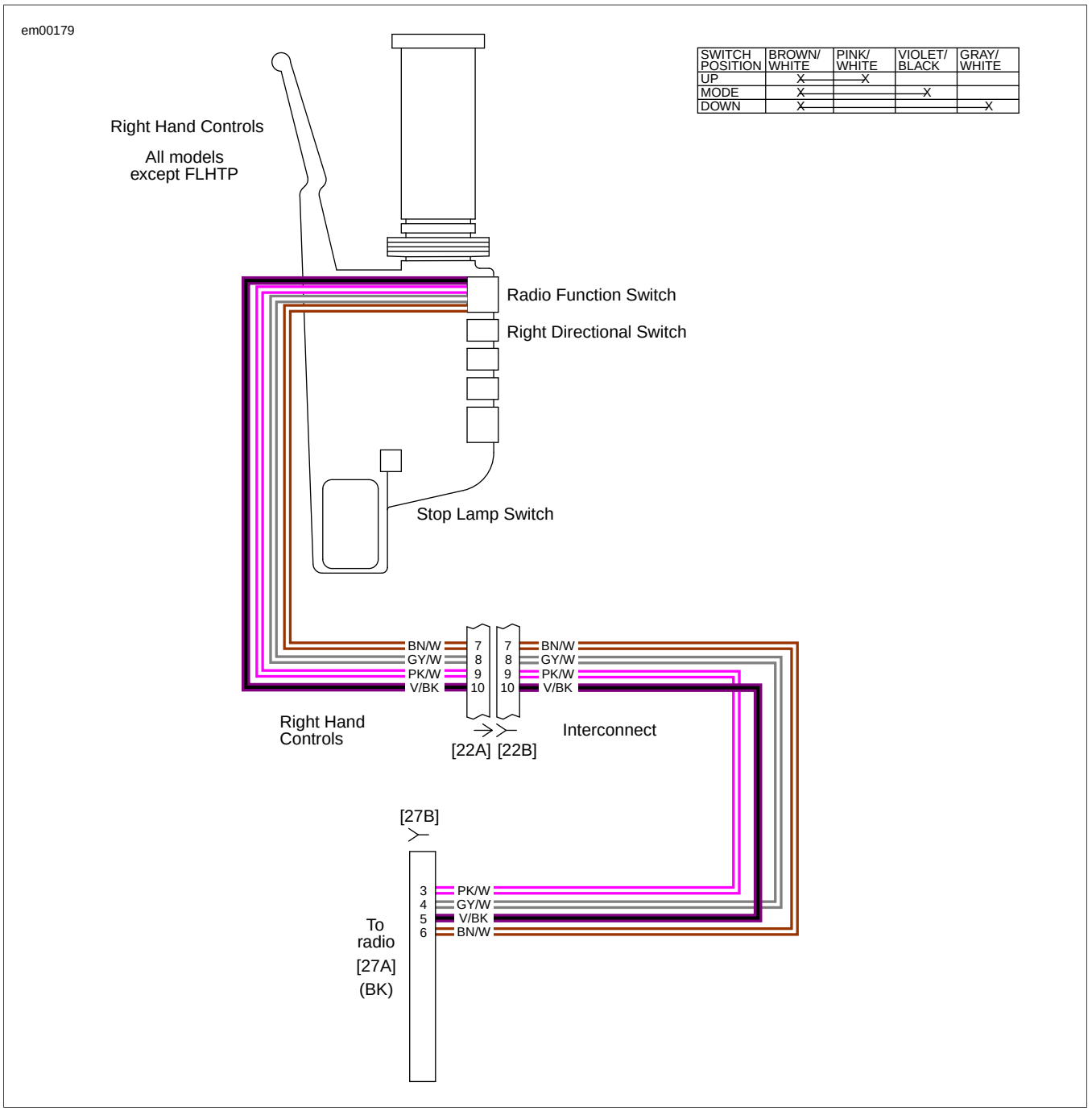
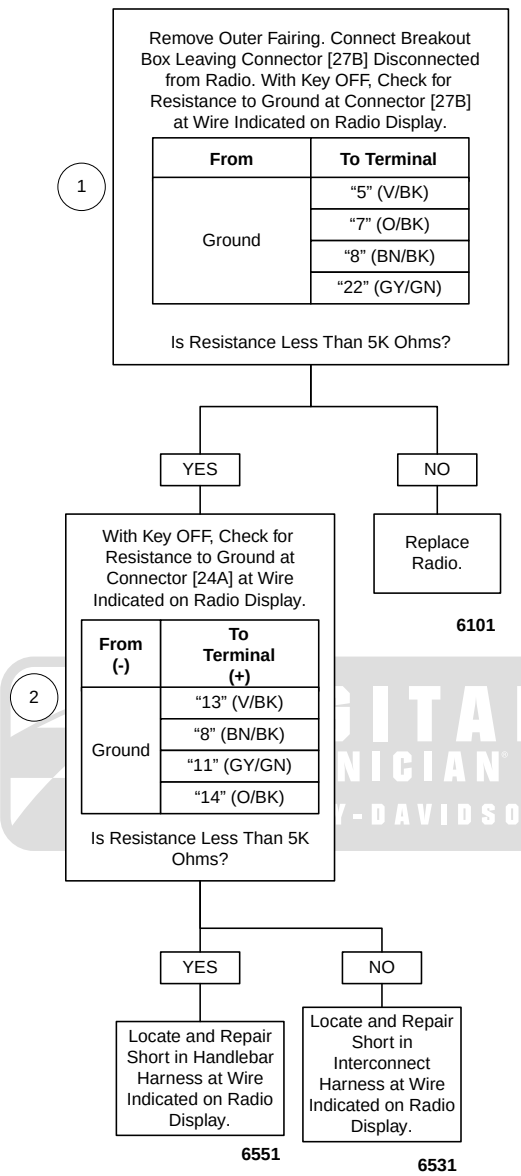


Figure 5-7. Handlebar Mode Switch Circuit

Table 5-8. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Interconnect harness to left handlebar switches	FLHX, FLHTC/U	16-Place Molex (Gray)	Inner fairing - left fairing support brace
		FLTR	16-Place Molex (Gray)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Handlebar PTT/Squelch Switch Shorted Low: DTC B2008 (Part 3 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00495_en

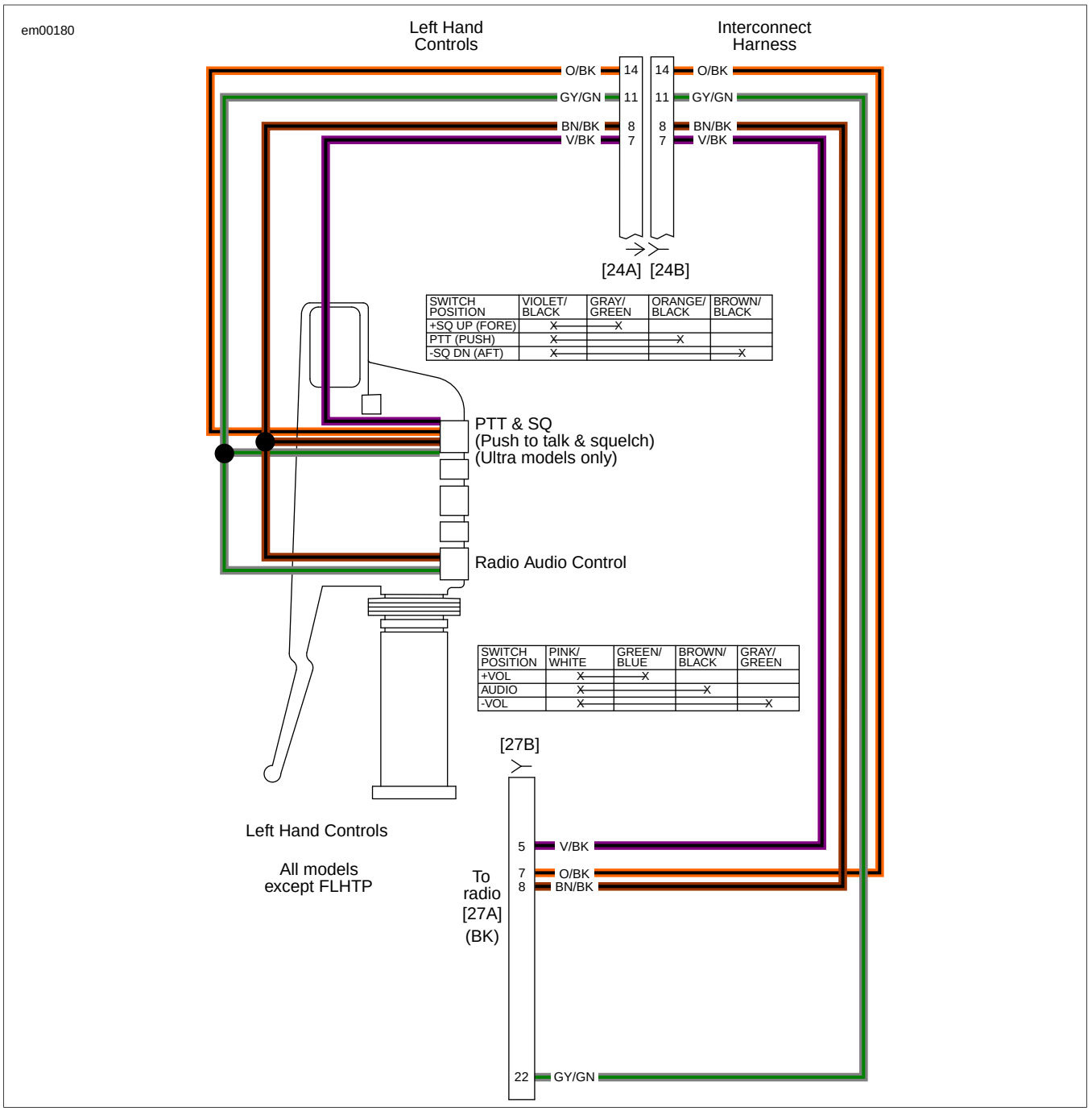
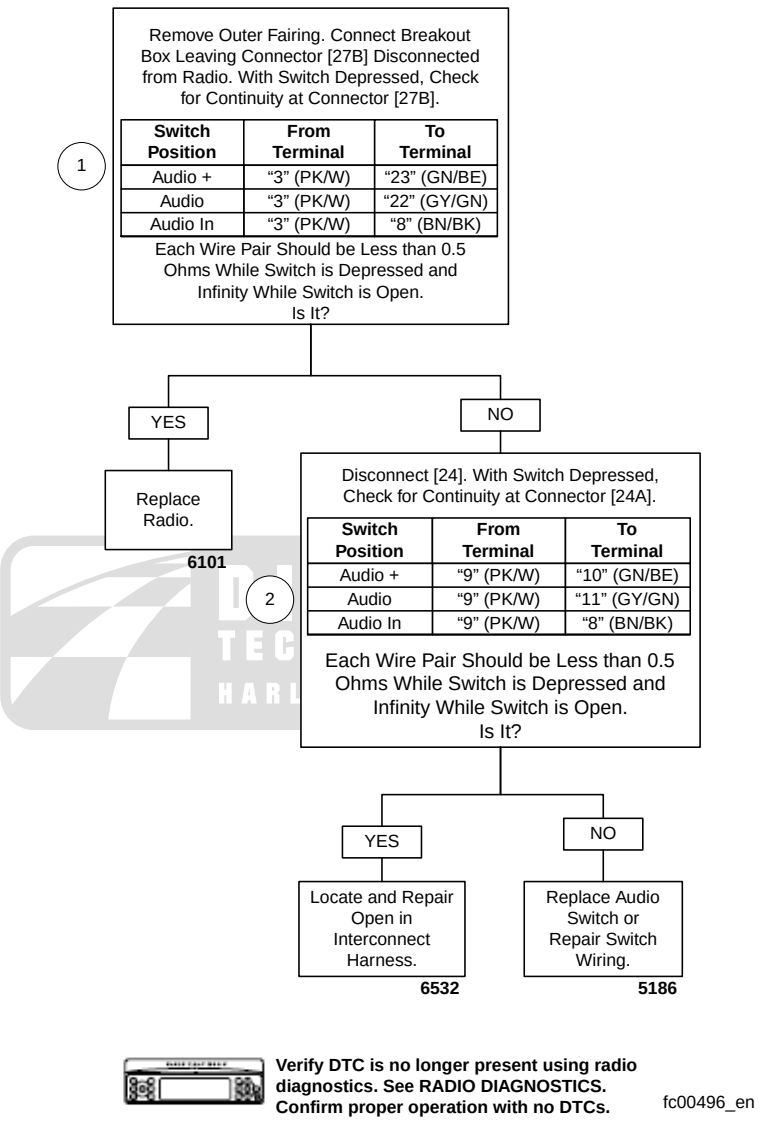


Figure 5-8. Handlebar PTT/Squelch Switch Circuit

Table 5-9. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[22]	Interconnect harness to right handlebar switches	FLHX FLHTC/U	12-place Molex (Black)	Inner fairing - fork stern nut lock plate (left side)
		FLTR	12-place Molex (Black)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)

Handlebar Audio Switch Stuck or Open: DTC B2009 (Part 1 of 3)



Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00496_en

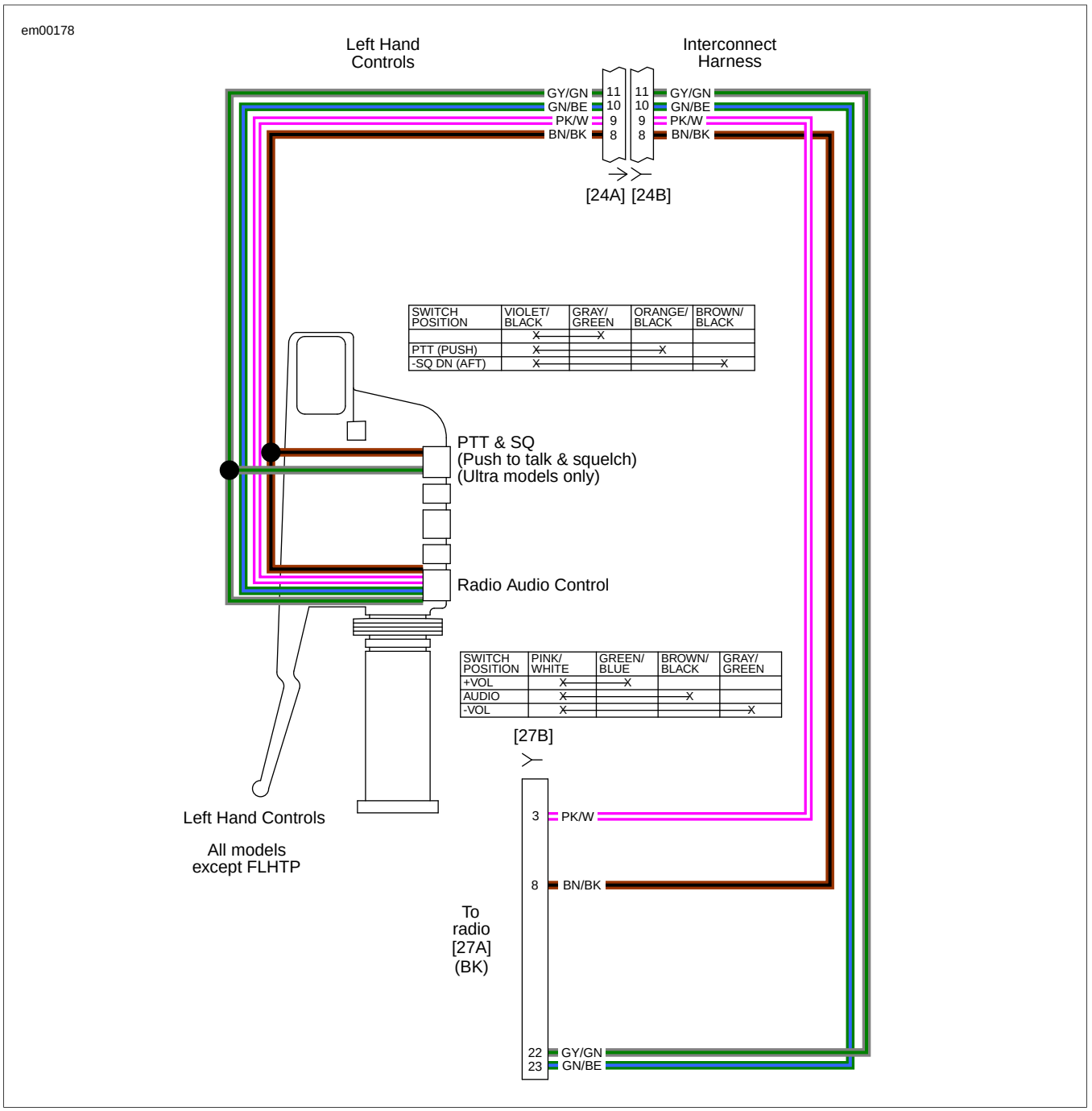
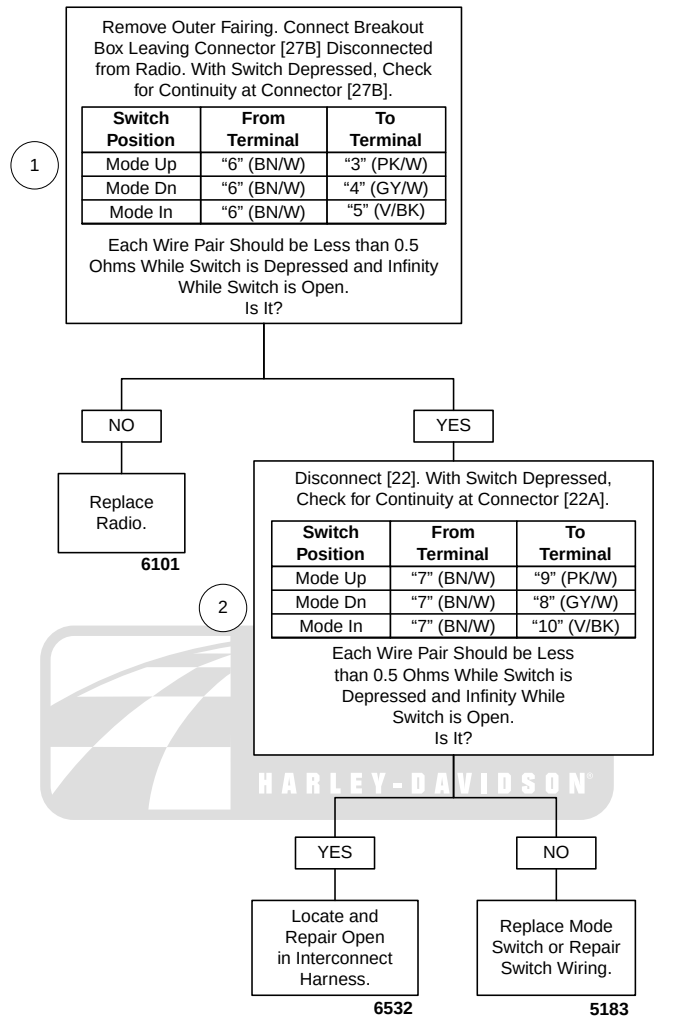


Figure 5-9. Handlebar Audio Switch Circuit

Table 5-10. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Interconnect harness to left handlebar switches	FLHX, FLHTC/U	16-Place Molex (Gray)	Inner fairing - left fairing support brace
		FLTR	16-Place Molex (Gray)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Handlebar Mode Switch Stuck or Open: DTC B2009 (Part 2 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00497_en

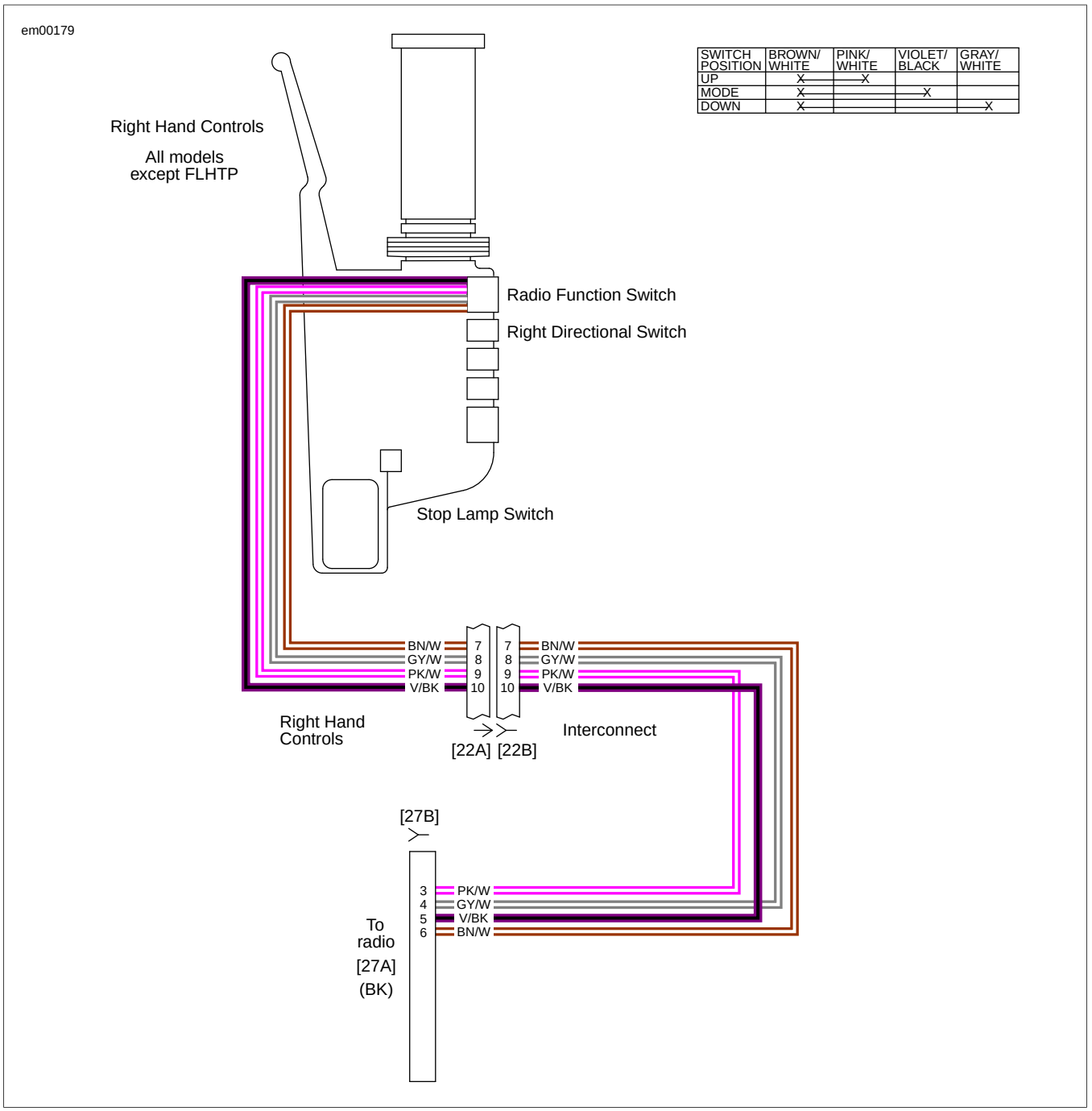
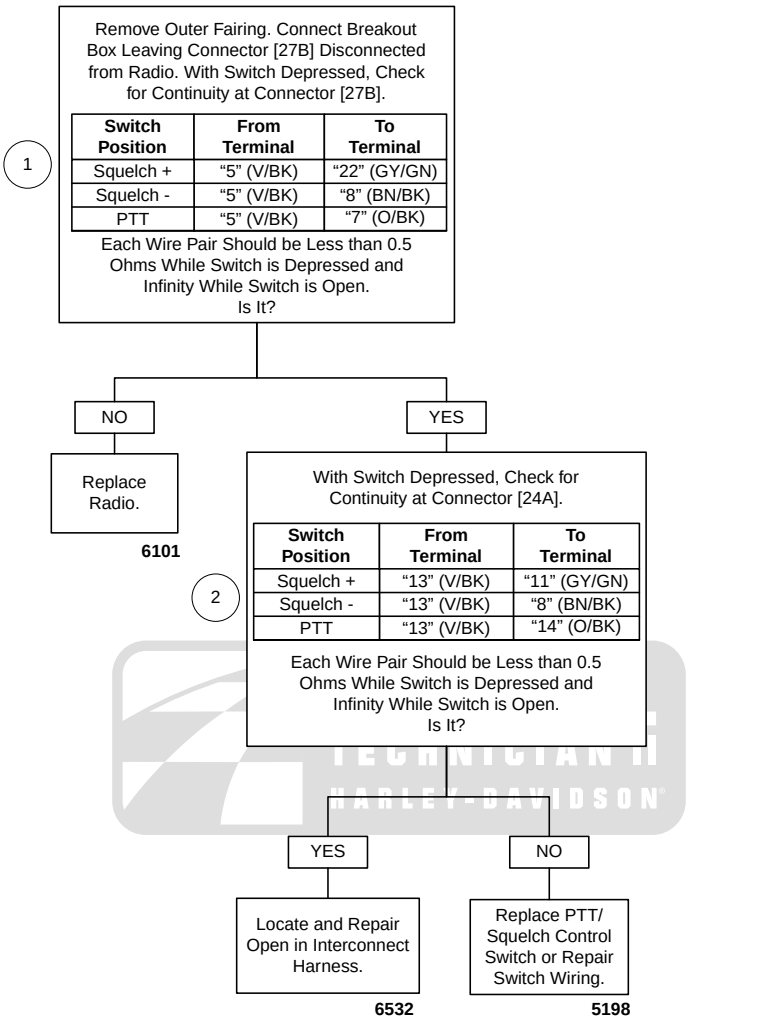


Figure 5-10. Handlebar Mode Switch Circuit

Table 5-11. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Interconnect harness to left handlebar switches	FLHX, FLHTC/U	16-Place Molex (Gray)	Inner fairing - left fairing support brace
		FLTR	16-Place Molex (Gray)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Handlebar PTT/Squelch Switch Stuck or Open: DTC B2009 (Part 3 of 3)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00498_en

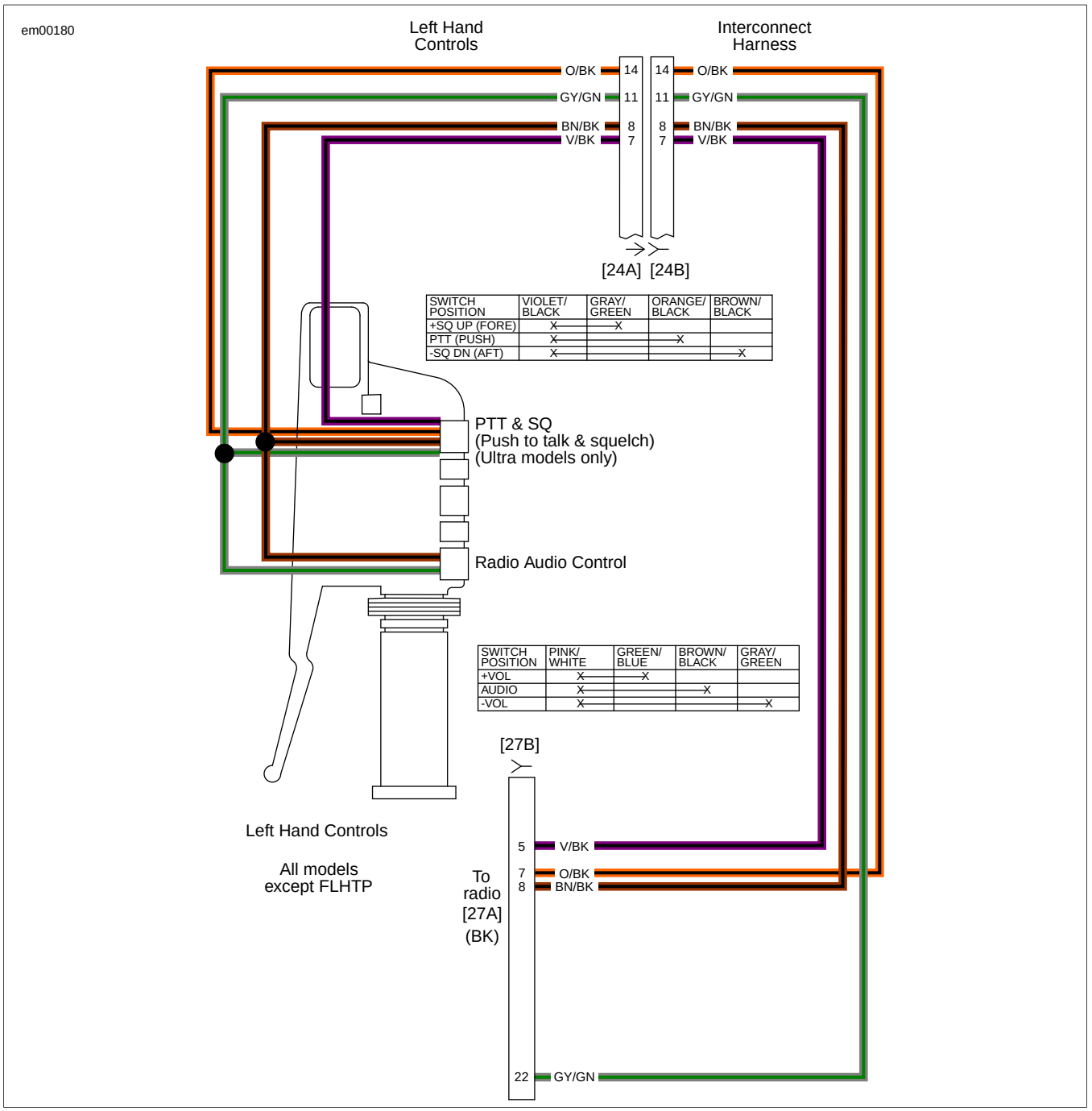
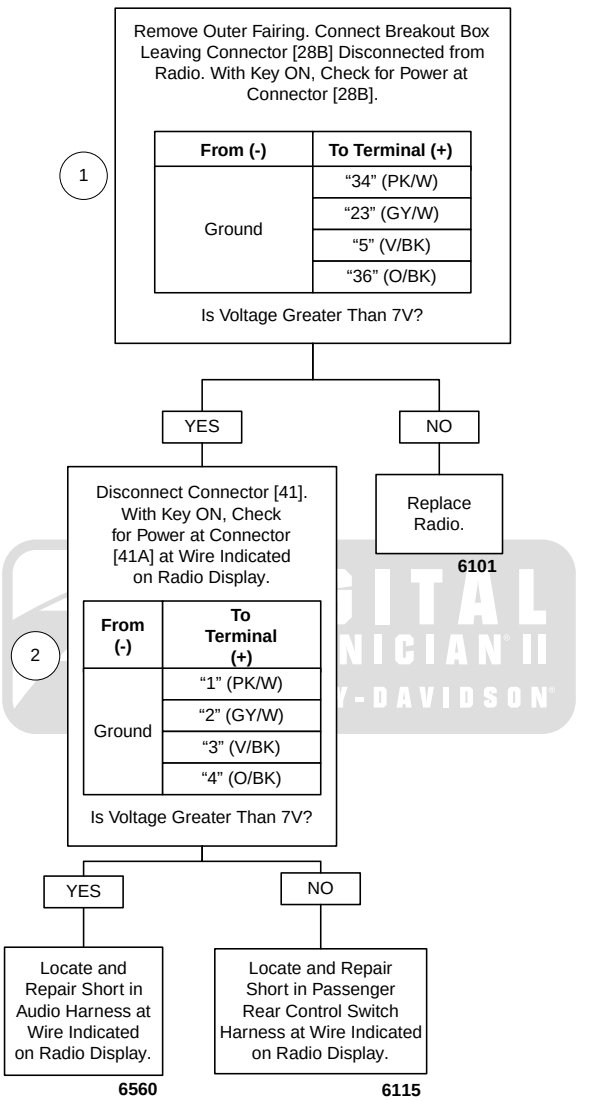


Figure 5-11. Handlebar PTT/Squelch Switch Circuit

Table 5-12. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[22]	Interconnect harness to right handlebar switches	FLHX FLHTC/U	12-place Molex (Black)	Inner fairing - fork stern nut lock plate (left side)
		FLTR	12-place Molex (Black)	Inner fairing - left side of radio bracket
[27]	Radio	All	23-place Amp (Tyco)	Inner fairing - back of radio (right side)

Passenger Audio/PTT Switch Shorted High: DTC B2010 (Part 1 of 2)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00499_en

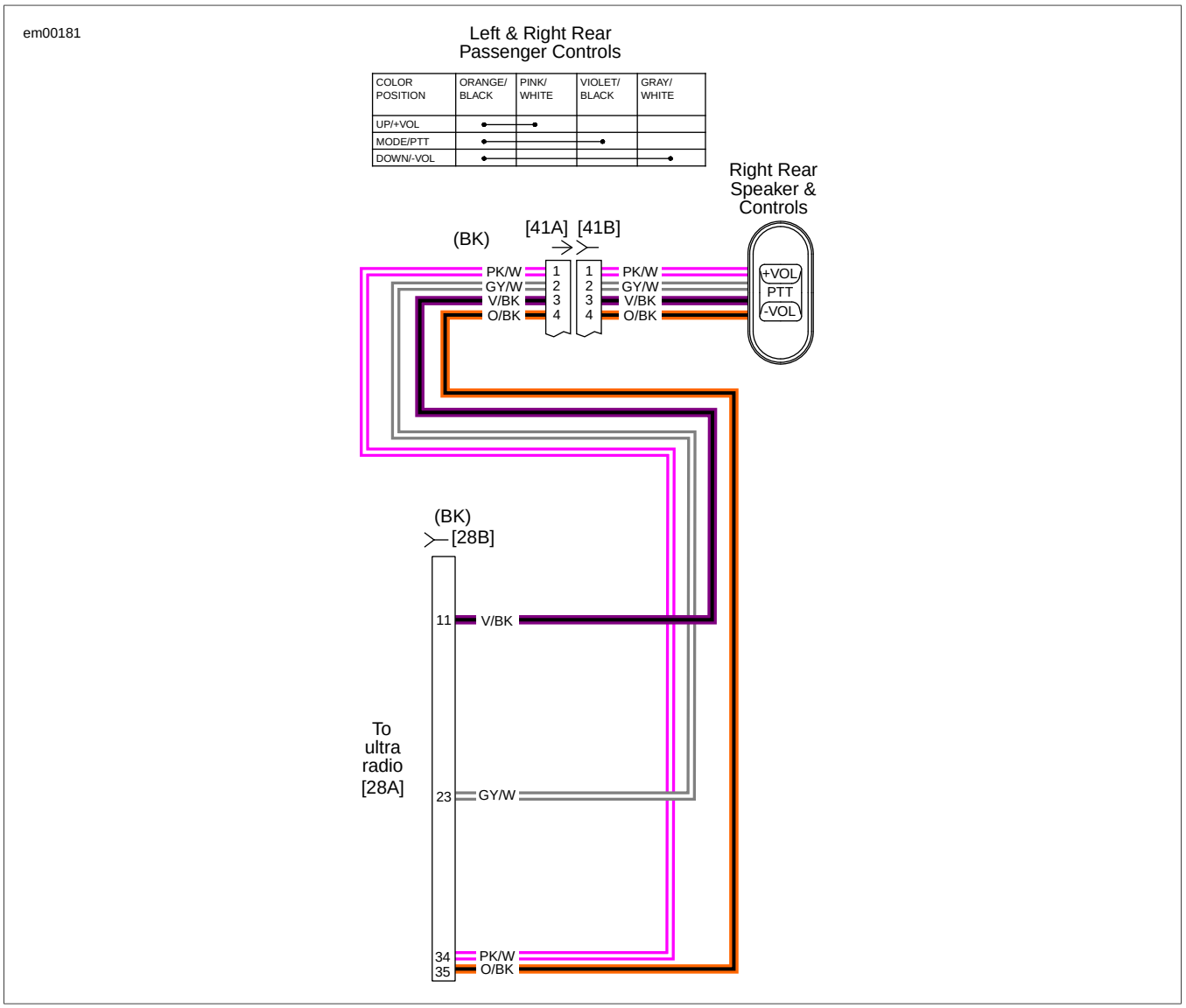
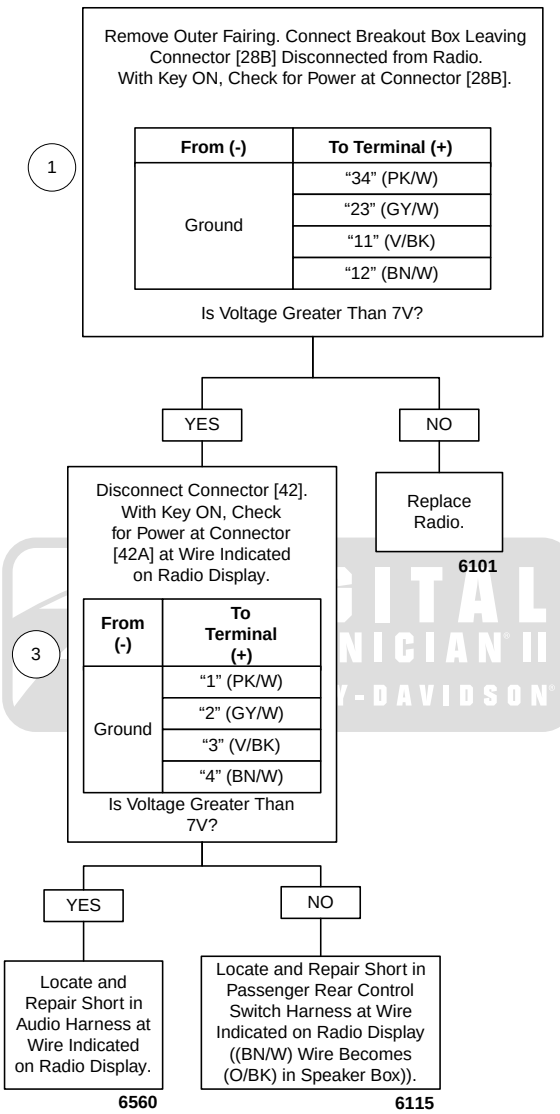


Figure 5-12. Passenger Audio/PTT Switch Circuit

Table 5-13. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box

Passenger Mode Switch Shorted High: DTC B2010 (Part 2 of 2)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00500_en

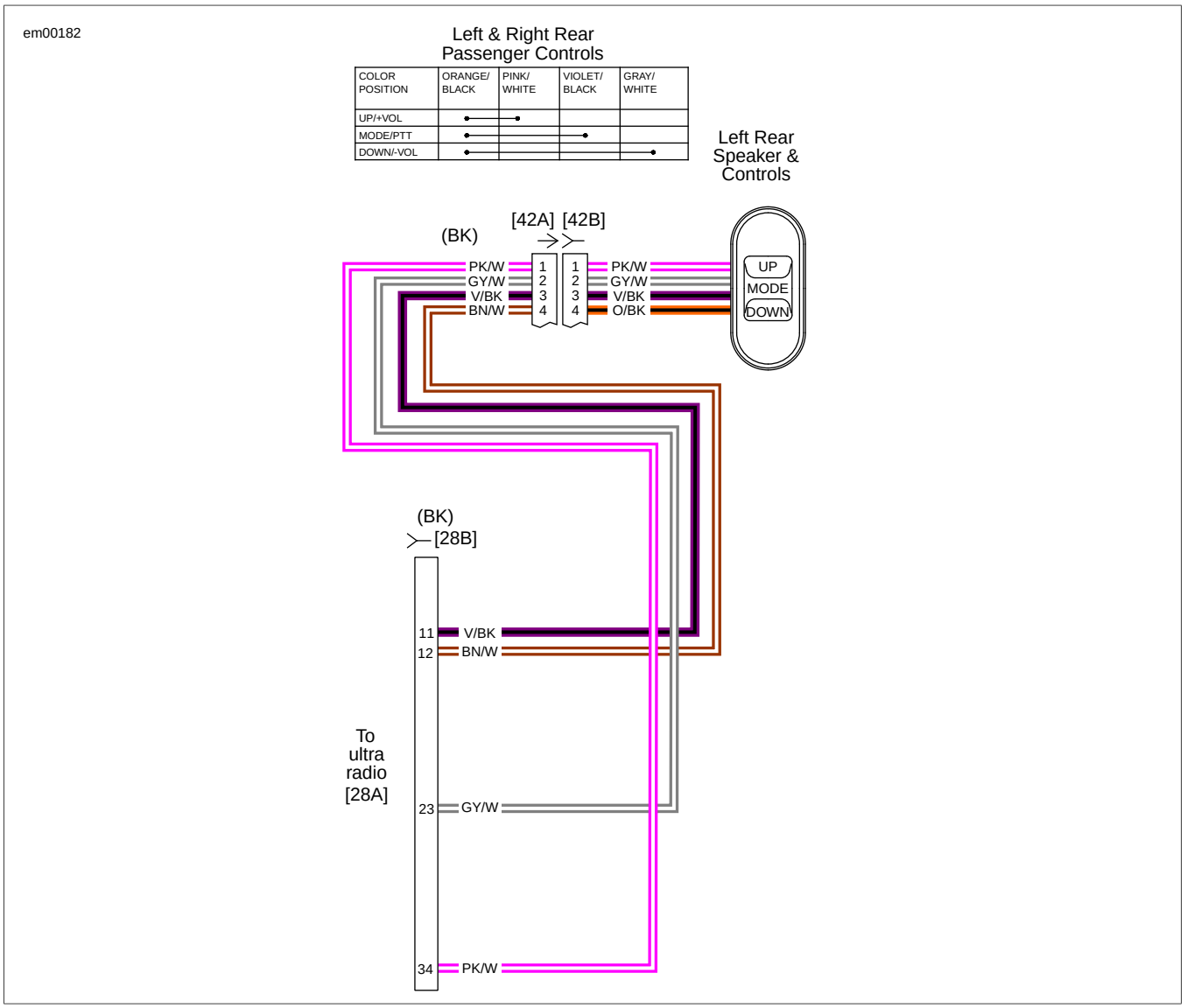
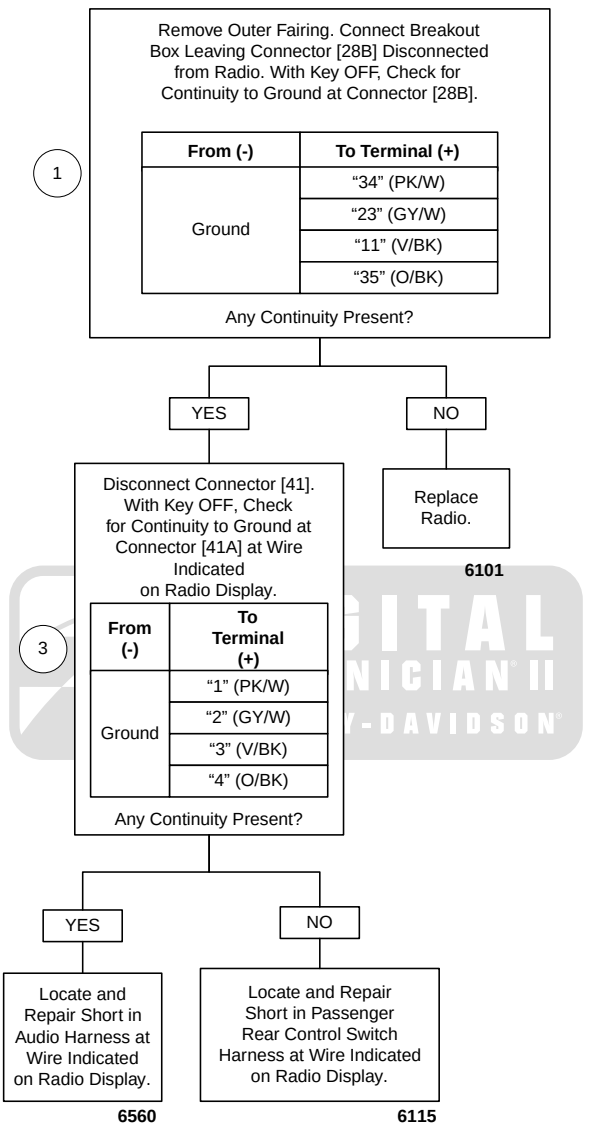


Figure 5-13. Passenger Mode Switch Circuit

Table 5-14. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box

Passenger Audio/PTT Switch Shorted Low: DTC B2011 (Part 1 of 2)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00501_en

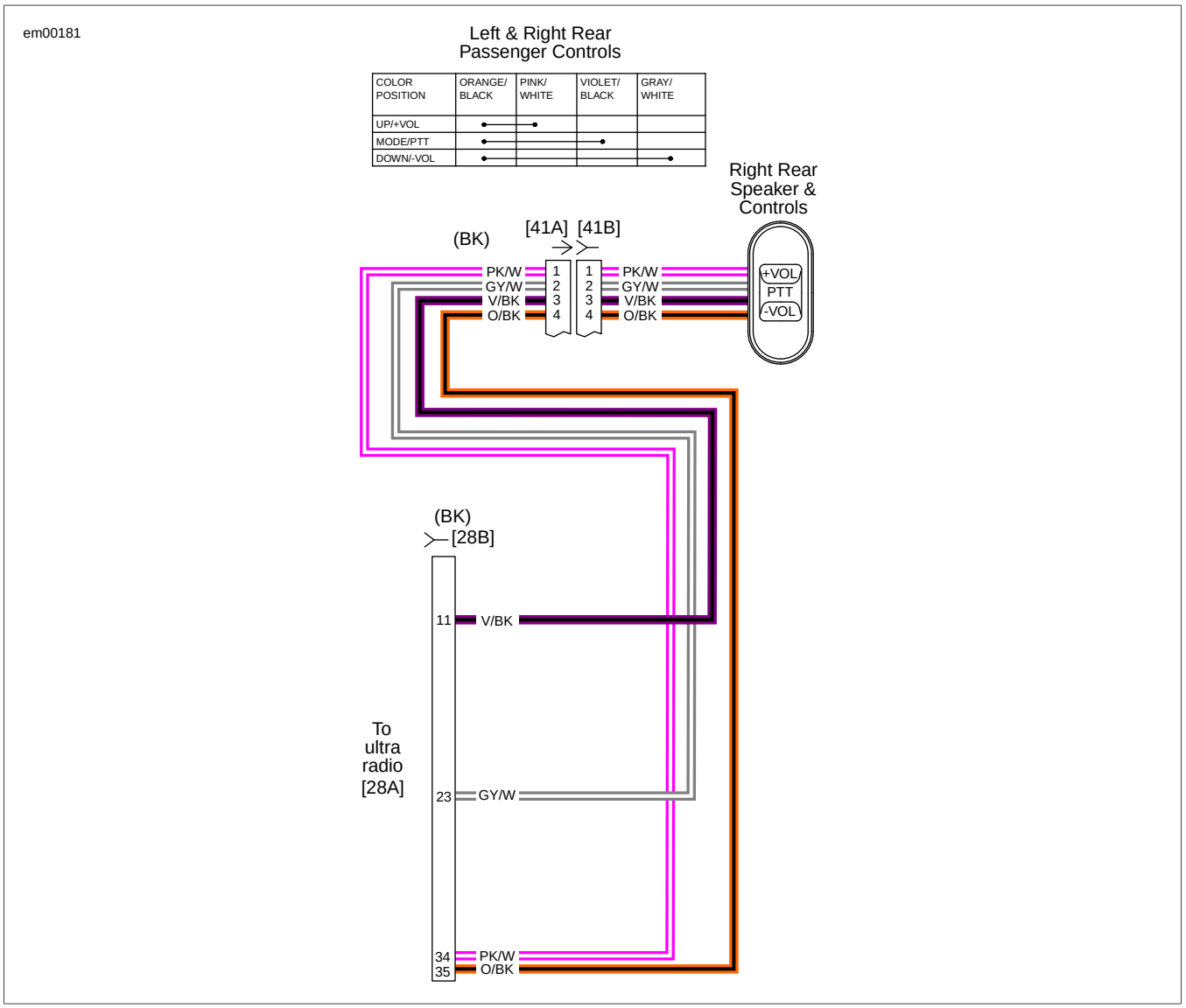
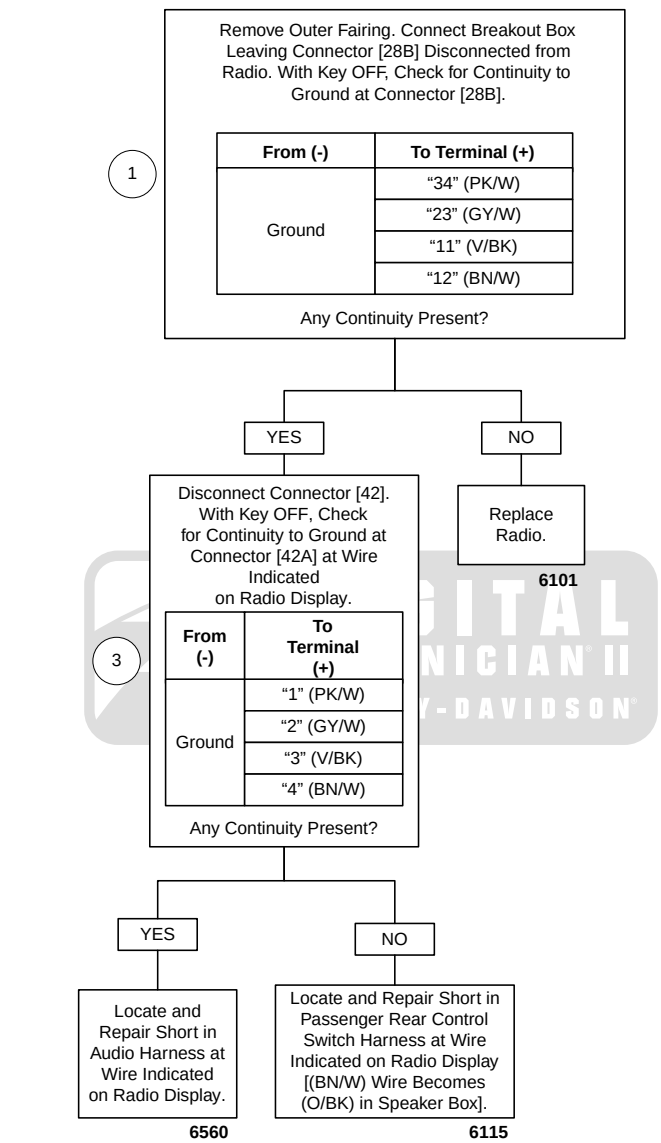


Figure 5-14. Passenger Audio/PTT Switch Circuit

Table 5-15. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box

Passenger Mode Switch Shorted Low: DTC B2011 (Part 2 of 2)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00502_en

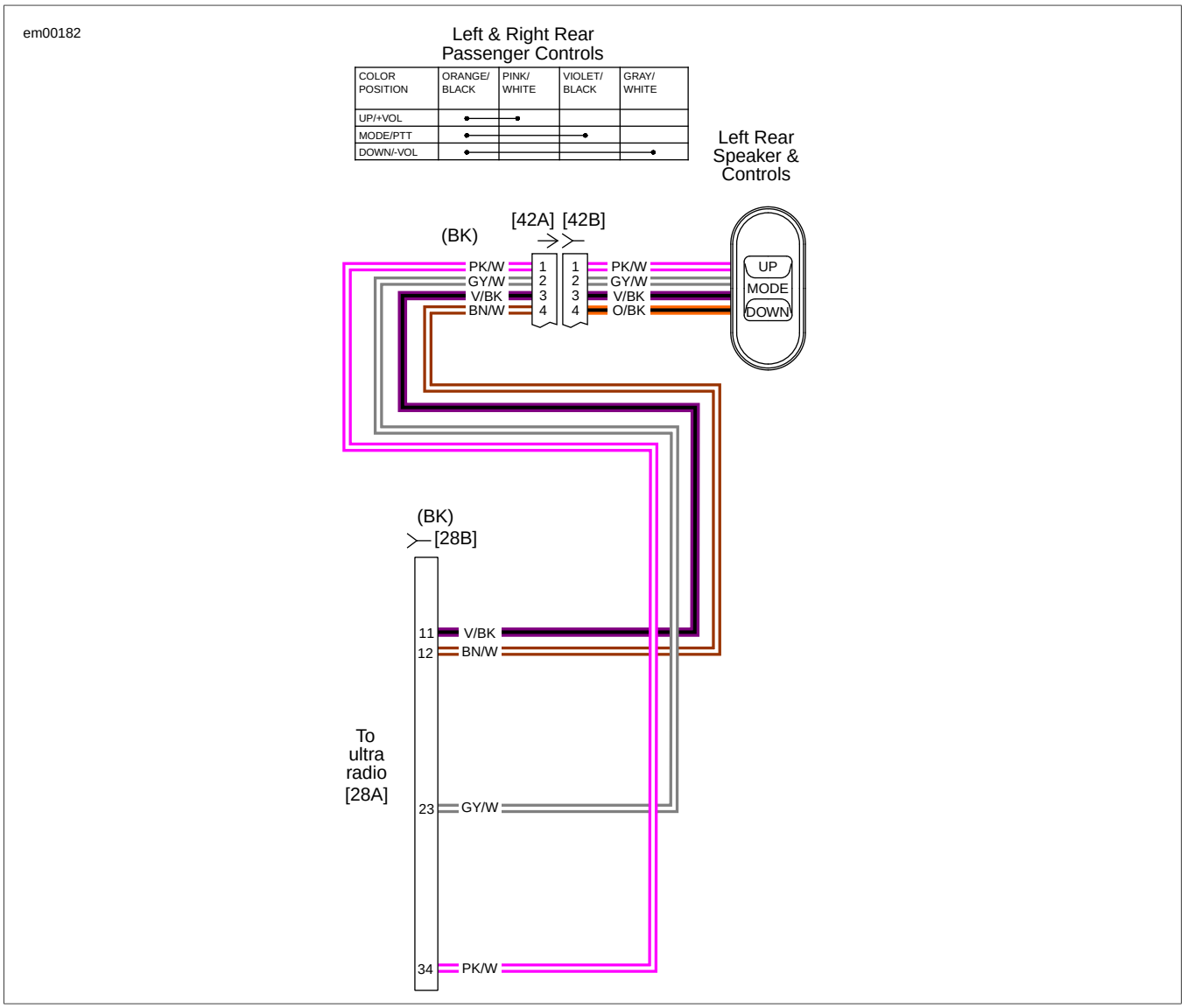


Figure 5-15. Passenger Mode Switch Circuit

Table 5-16. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box

Passenger Audio/PTT Switch Stuck or Open: DTC B2012 (Part 1 of 2)

1

Remove Outer Fairing. Connect Breakout Box Leaving Connector [28B] Disconnected from Radio. With Switch Depressed, Check for Continuity at Connector [28B].

Switch Position	From Terminal	To Terminal
Vol. Up	“35” (O/BK)	“34” (PK/W)
Vol. Dn	“35” (O/BK)	“23” (GY/W)
PTT	“35” (O/BK)	“11” (V/BK)

Each Wire Pair Should be Less than 0.5 Ohms While Switch is Depressed and Infinity While Switch is Open.
Is It?

YES

Replace Radio.

6101

NO

3

Disconnect Connector [41]. With Switch Depressed, Check for Continuity at Connector [41B].

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)

Each Wire Pair Should be Less than 0.5 Ohms While Switch is Depressed and Infinity While Switch is Open.
Is It?

YES

Locate and Repair Open or Replace Audio Harness.

6561

NO

Replace Rear Volume/PTT Switch or Repair Switch Wiring.

6627



Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00503_en

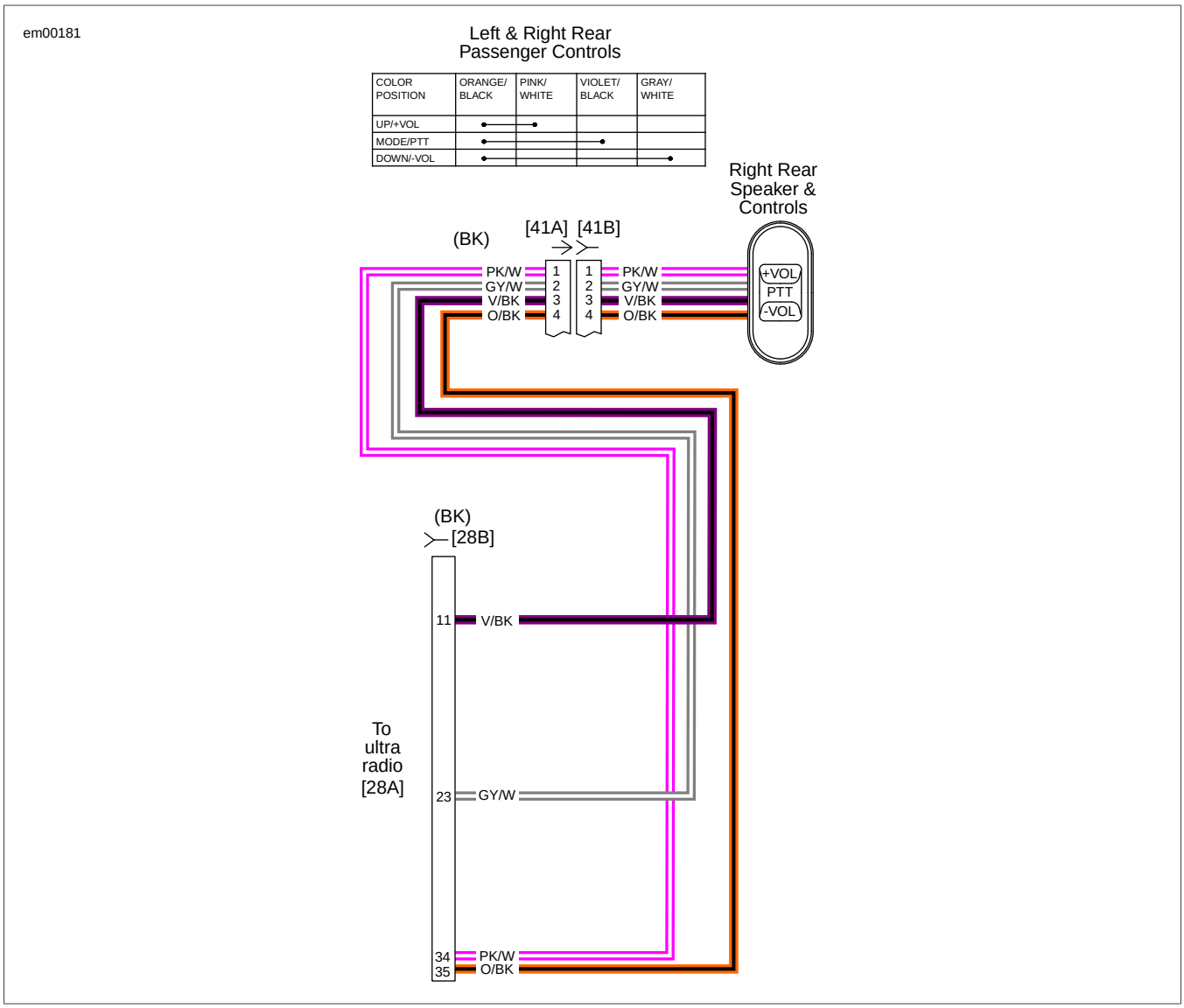
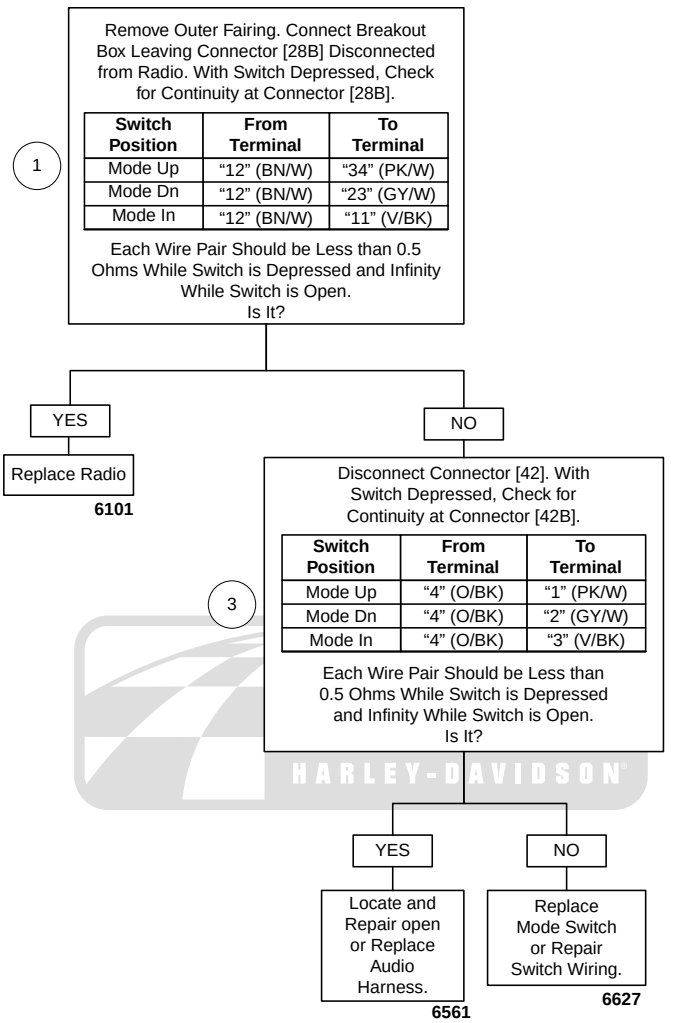


Figure 5-16. Passenger Audio/PTT Switch Circuit

Table 5-17. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box

Passenger Mode Switch Stuck or Open: DTC B2012 (Part 2 of 2)





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00504_en

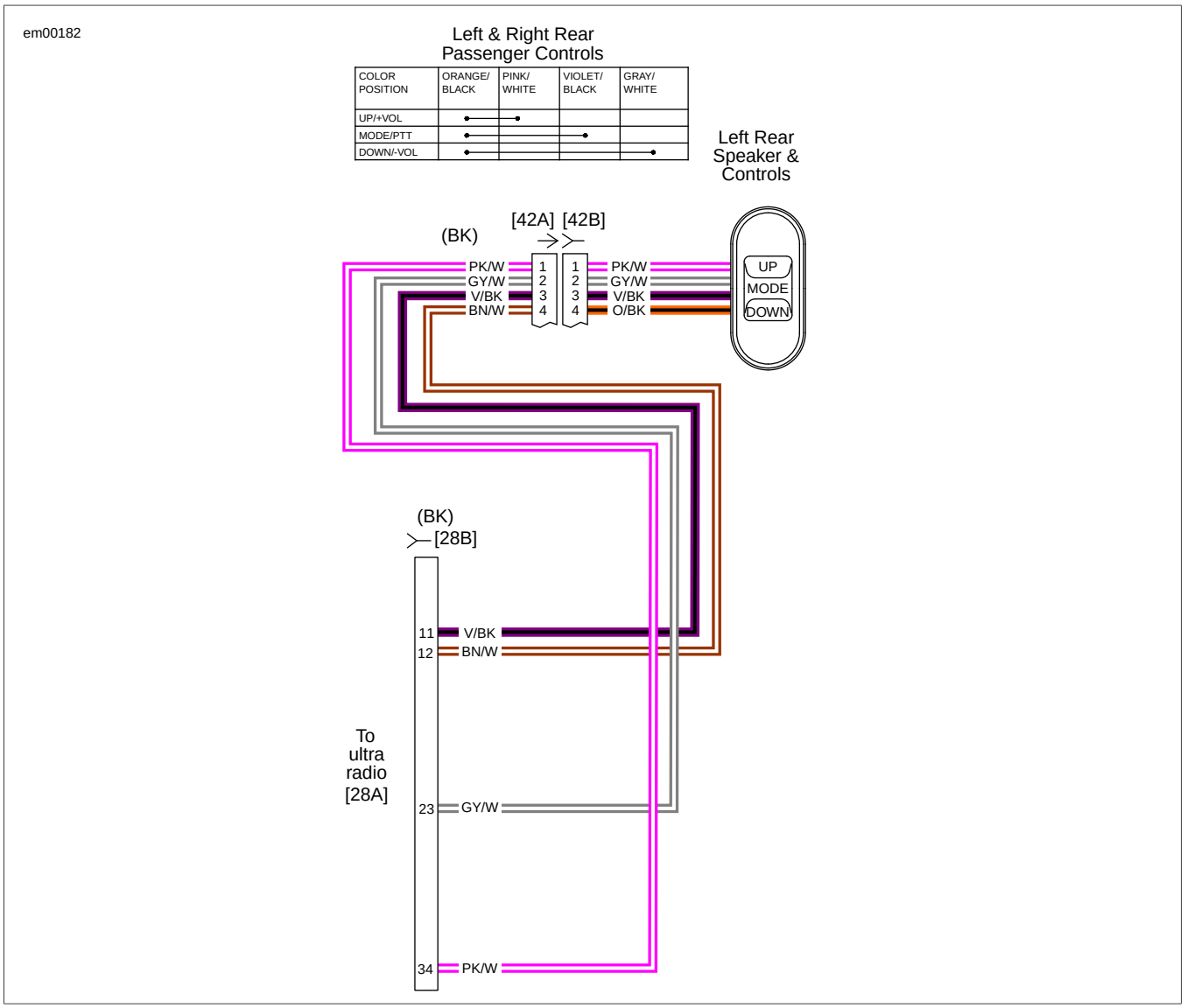
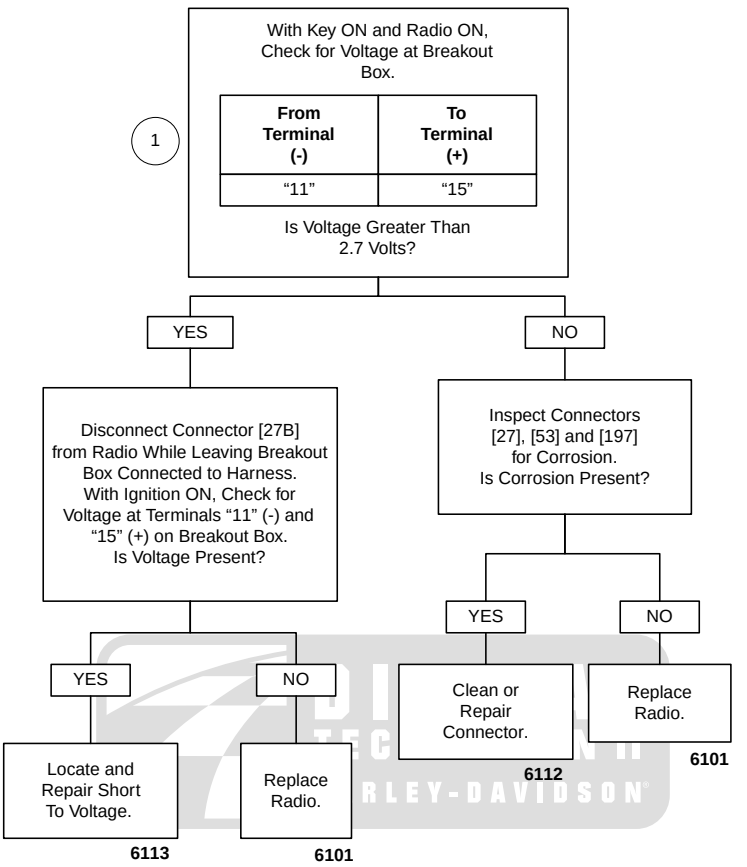


Figure 5-17. Passenger Mode Switch Circuit

Table 5-18. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box

Sidecar Switches Shorted High: DTC B2013





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00505_en

em00183

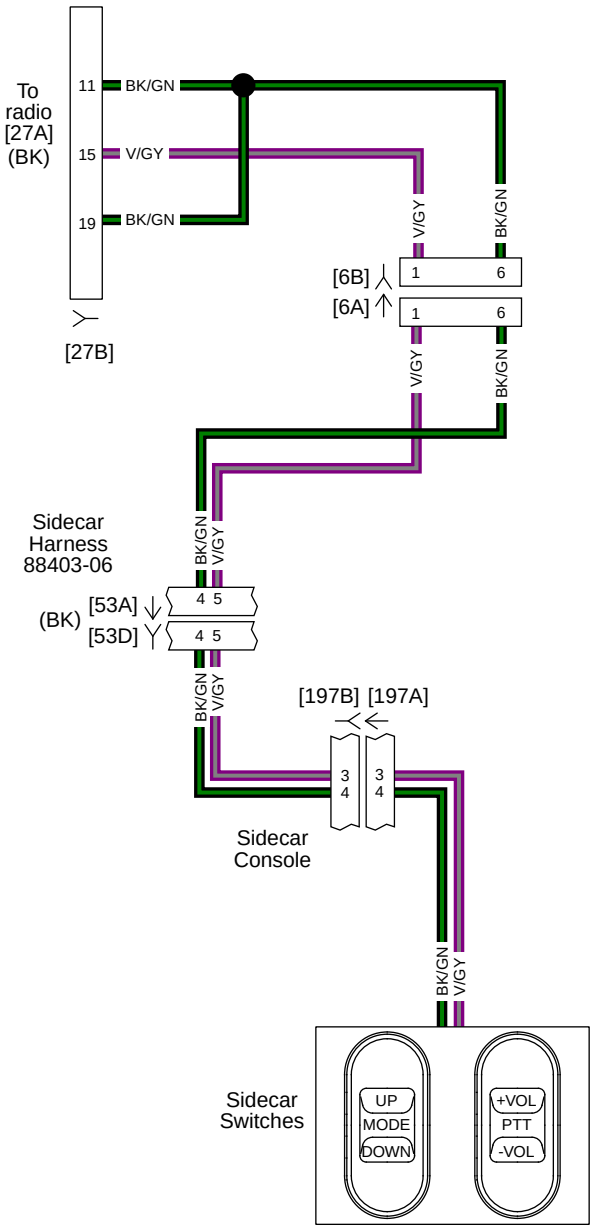
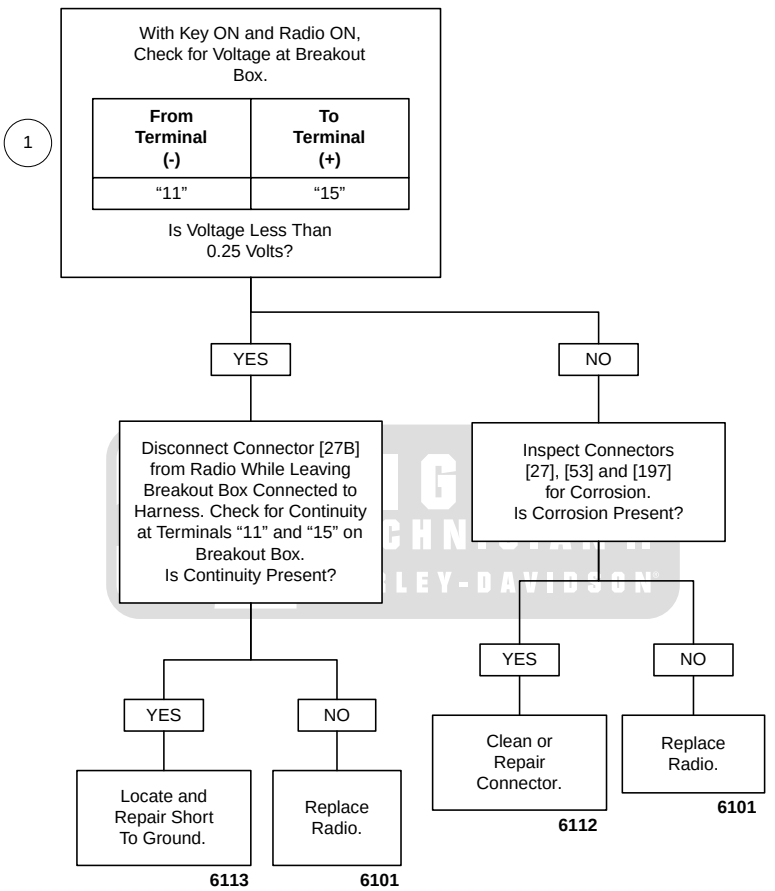


Figure 5-18. Sidecar Switch Circuit

Table 5-19. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect	6-Place Deutsch (Black)	Inner fairing - left side of radio
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[53]	Console pod	12-Place Mini-Deutsch (Black)	Rear of battery box (under seat)
[197]	Sidecar console	12-Place Mini-Deutsch (Black)	Inside sidecar console

Sidecar Switches Shorted Low: DTC B2014





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00506_en

em00183

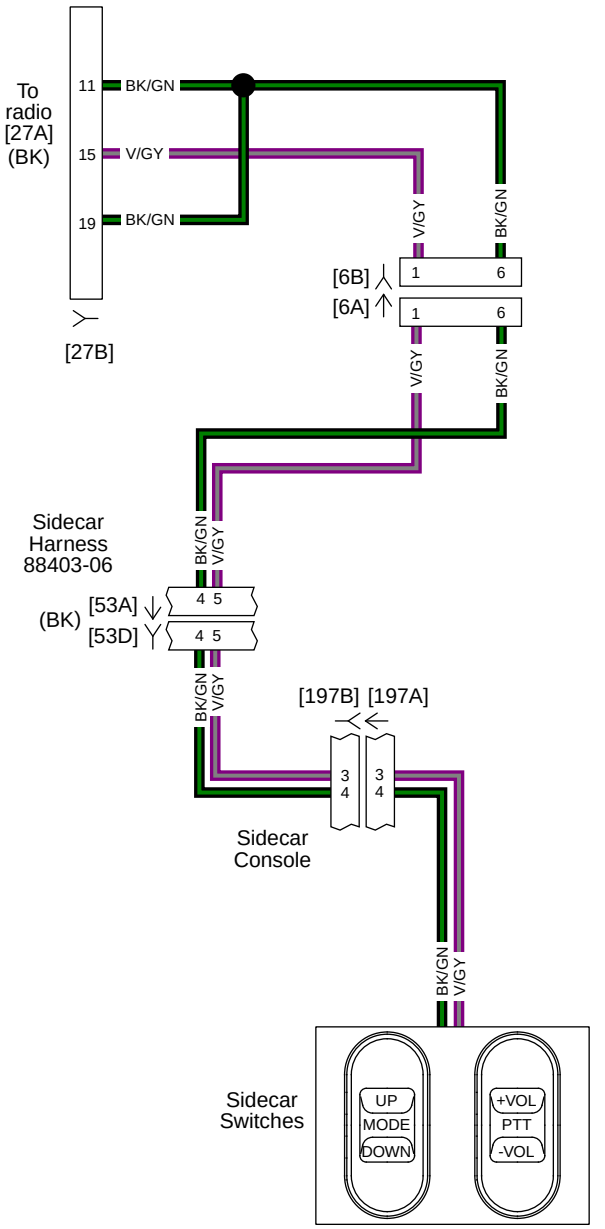


Figure 5-19. Sidecar Switch Circuit

Table 5-20. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect	6-Place Deutsch (Black)	Inner fairing - left side of radio
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[53]	Console pod	12-Place Mini-Deutsch (Black)	Rear of battery box (under seat)
[197]	Sidecar console	12-Place Mini-Deutsch (Black)	Inside sidecar console

Sidecar Switches Stuck or Open: DTC B2015

With Key ON, Check for Voltage Between Terminals "11" (-) and "15" (+) at Breakout Box.
Is Voltage Within Range for Each Function?

Sidecar Button	Minimum Voltage	Minimum Voltage
No Press	2.13	2.48
Mode	1.88	2.21
PTT	1.66	1.94
Tune (+)	1.33	1.67
Volume (+)	0.90	1.33
Tune (-)	0.55	0.89
Volume (-)	0.33	0.54

1

YES

Inspect Connectors [27], [53] and [197] for Corrosion.
Is Corrosion Present?

YES

Clean or Repair Connector.
6112

NO

Replace Radio.
6101

NO

0V

Replace Radio.
6101

Other

0.45-4.7V

Replace Sidecar Console Switch Assembly.
6952

5V

4

Disconnect Connector [197]. Measure Continuity Between Terminal "15" on Breakout Box and Terminal "3" on Connector [197A] and Also Between Terminal "19" on Breakout Box And Terminal "4" on Connector [197A].
Is Continuity Present?

YES

Replace Sidecar Console Switch Assembly.
6952

NO

Locate and Repair Open on (V/GY) or (BK/GN) Wire in Harness.
6113

Battery Voltage

Replace Radio.
6101



Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00507_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

em00183

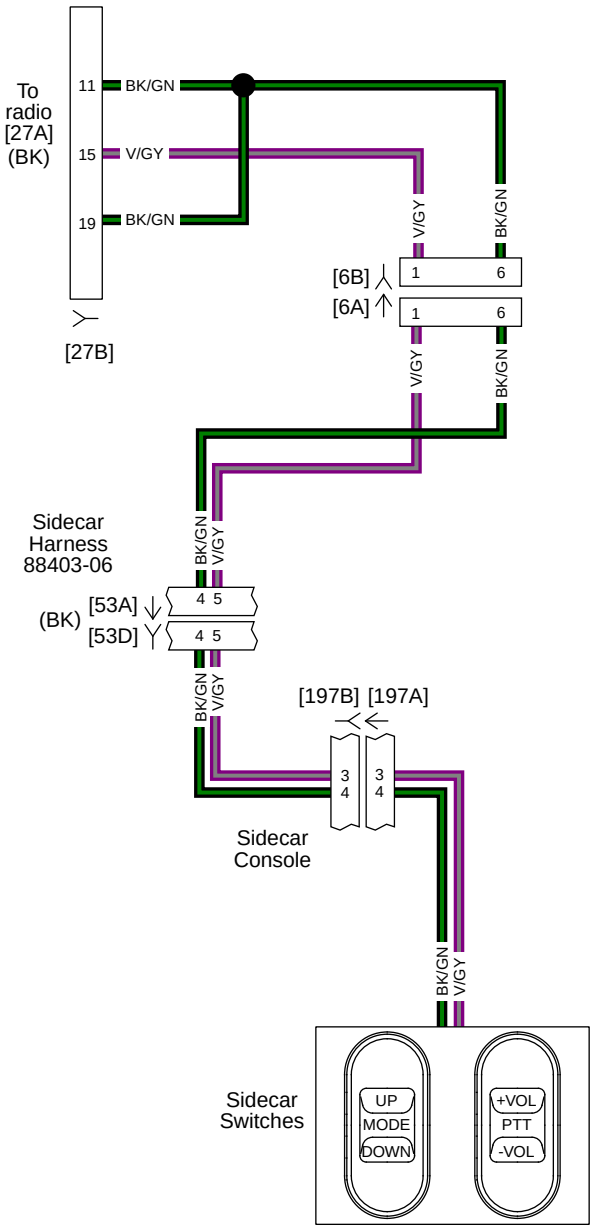


Figure 5-20. Sidecar Switch Circuit

Table 5-21. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect	6-Place Deutsch (Black)	Inner fairing - left side of radio
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[53]	Console pod	12-Place Mini-Deutsch (Black)	Rear of battery box (under seat)
[197]	Sidecar console	12-Place Mini-Deutsch (Black)	Inside sidecar console

RADIO SPEAKER DIAGNOSTICS: DTC B2016-B2027 5.3

GENERAL

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.

Table 5-22. 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
B2024	Sidecar speakers shorted
B2025	Sidecar speakers open
B2026	Sidecar speakers shorted to ground
B2027	Sidecar speakers shorted to battery

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-47918	RADIO BREAKOUT BOX

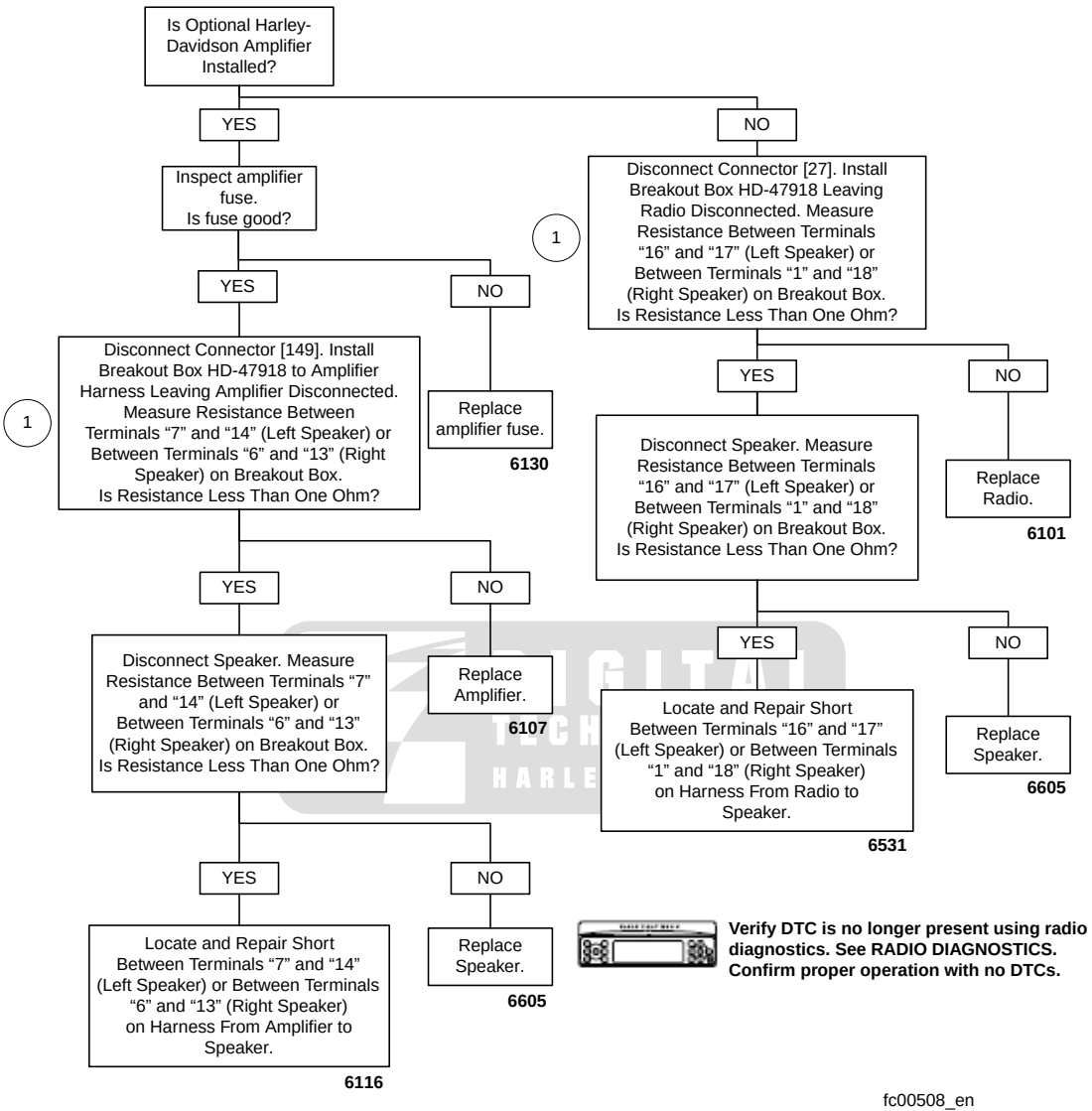
Diagnostic Notes

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

1. Install RADIO BREAKOUT BOX (Part No. HD-47918).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Front Speakers Shorted: DTC B2016



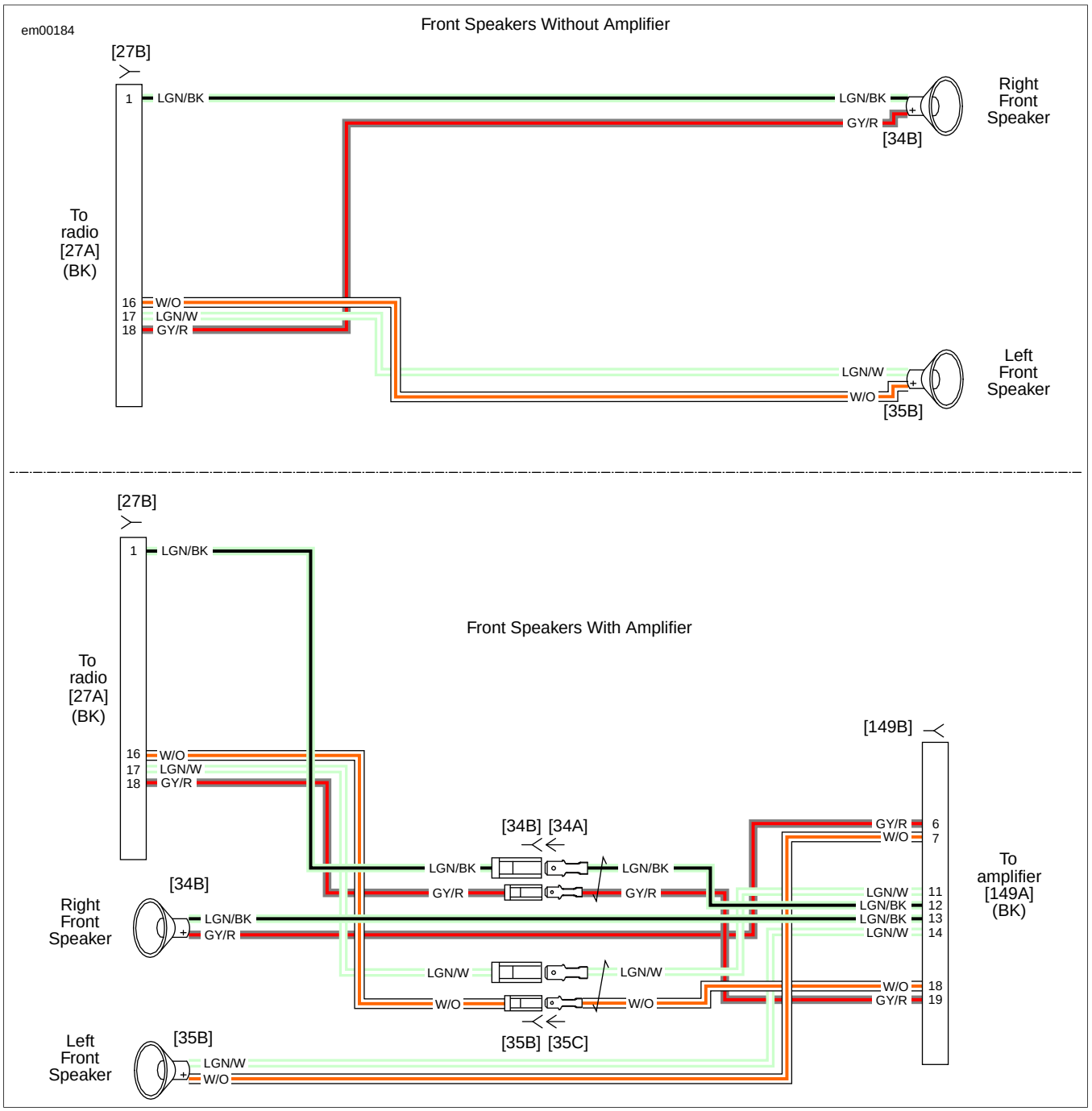
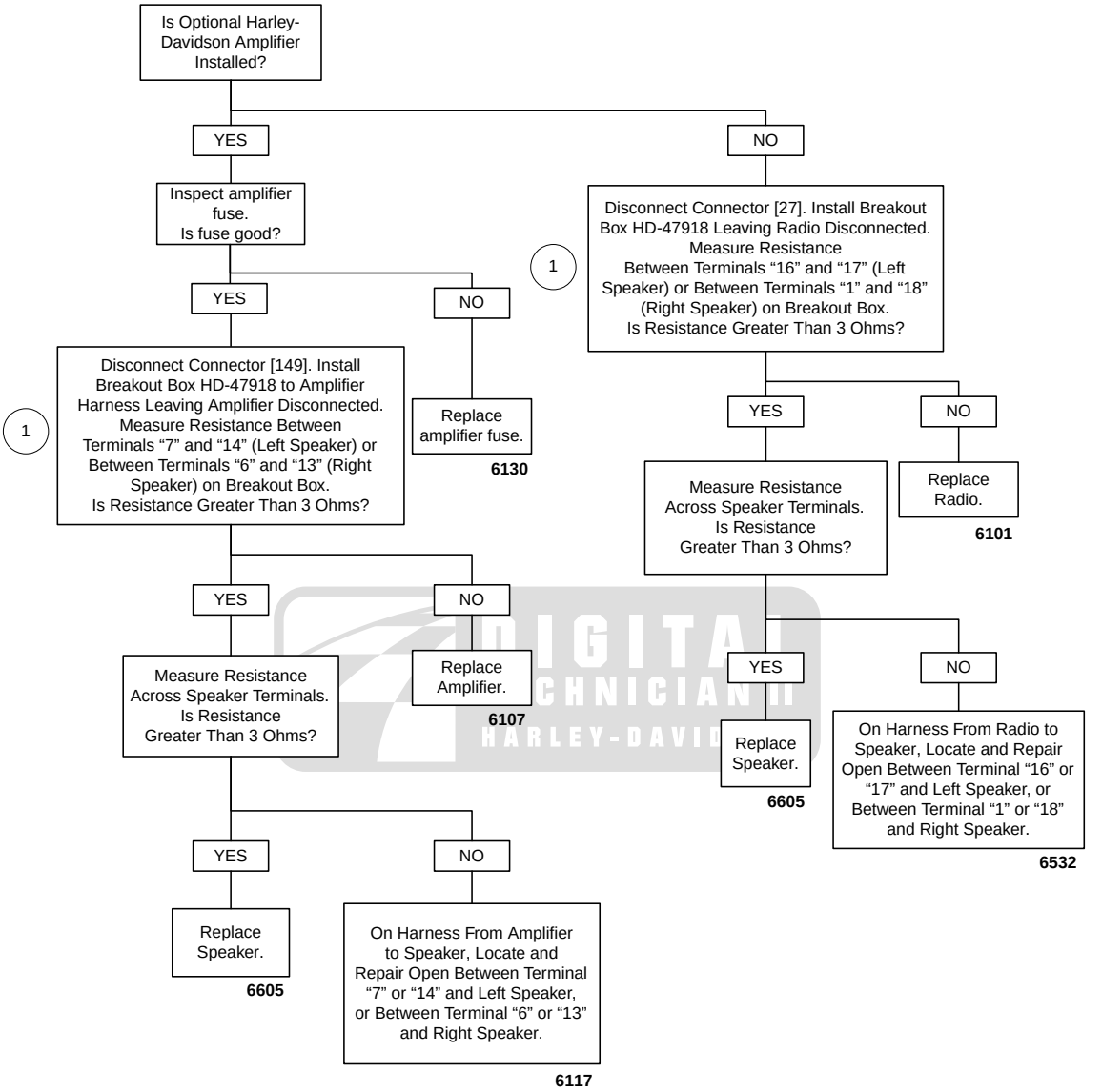


Figure 5-21. Front Speaker Circuit

Table 5-23. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[34]	Front right speaker	Spade Contacts	Inner fairing - back of right speaker
[35]	Front left speaker	Spade Contacts	Inner fairing - back of left speaker
[149]	High output amplifier	23-Place Amp	Under luggage rack (right side)

Front Speakers Open: DTC B2017

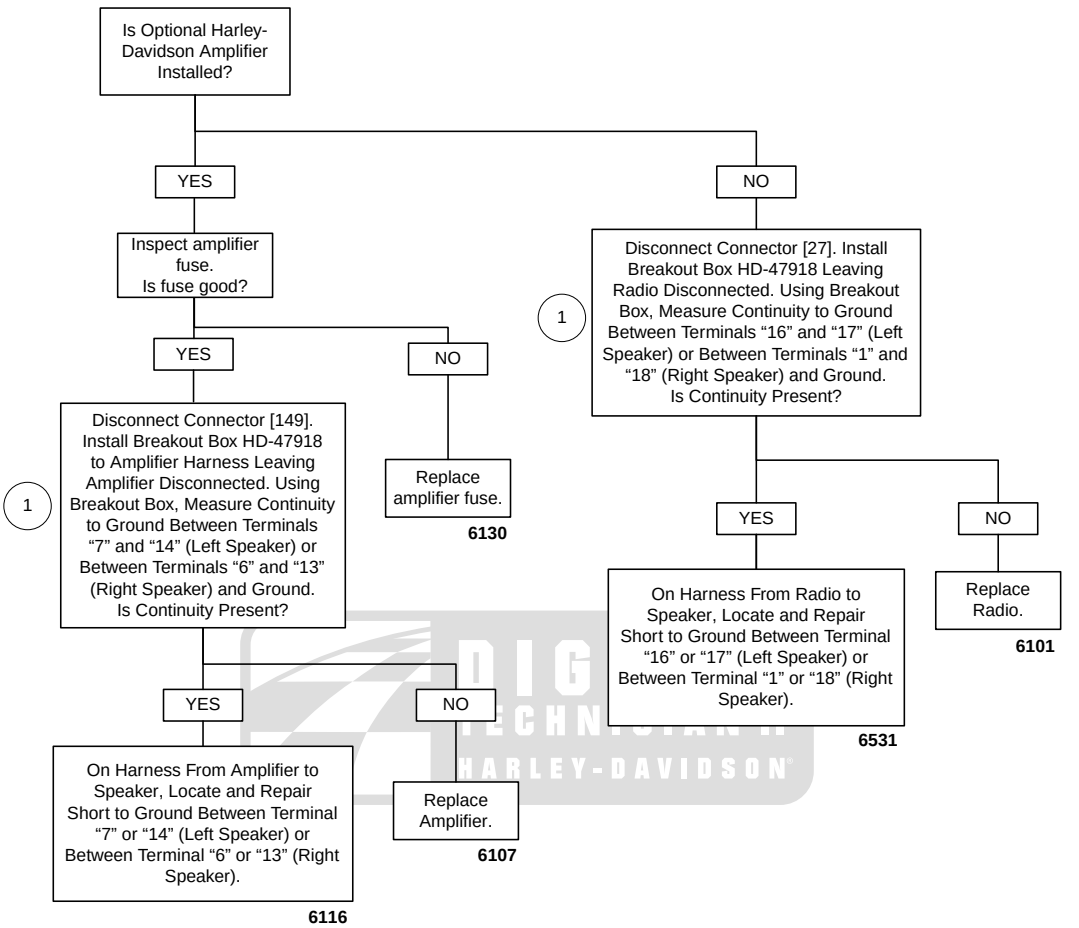




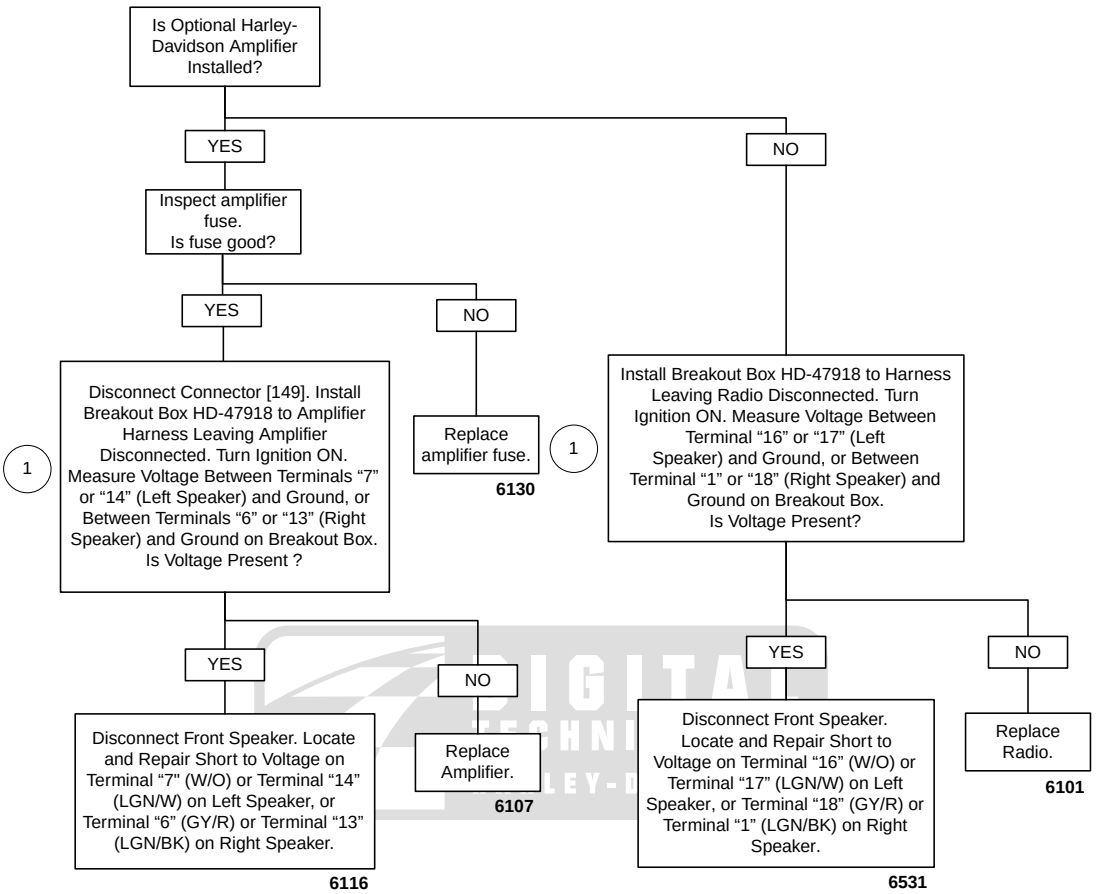
Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00509_en

Front Speakers Shorted to Ground: DTC B2018



Front Speakers Shorted to Battery: DTC B2019

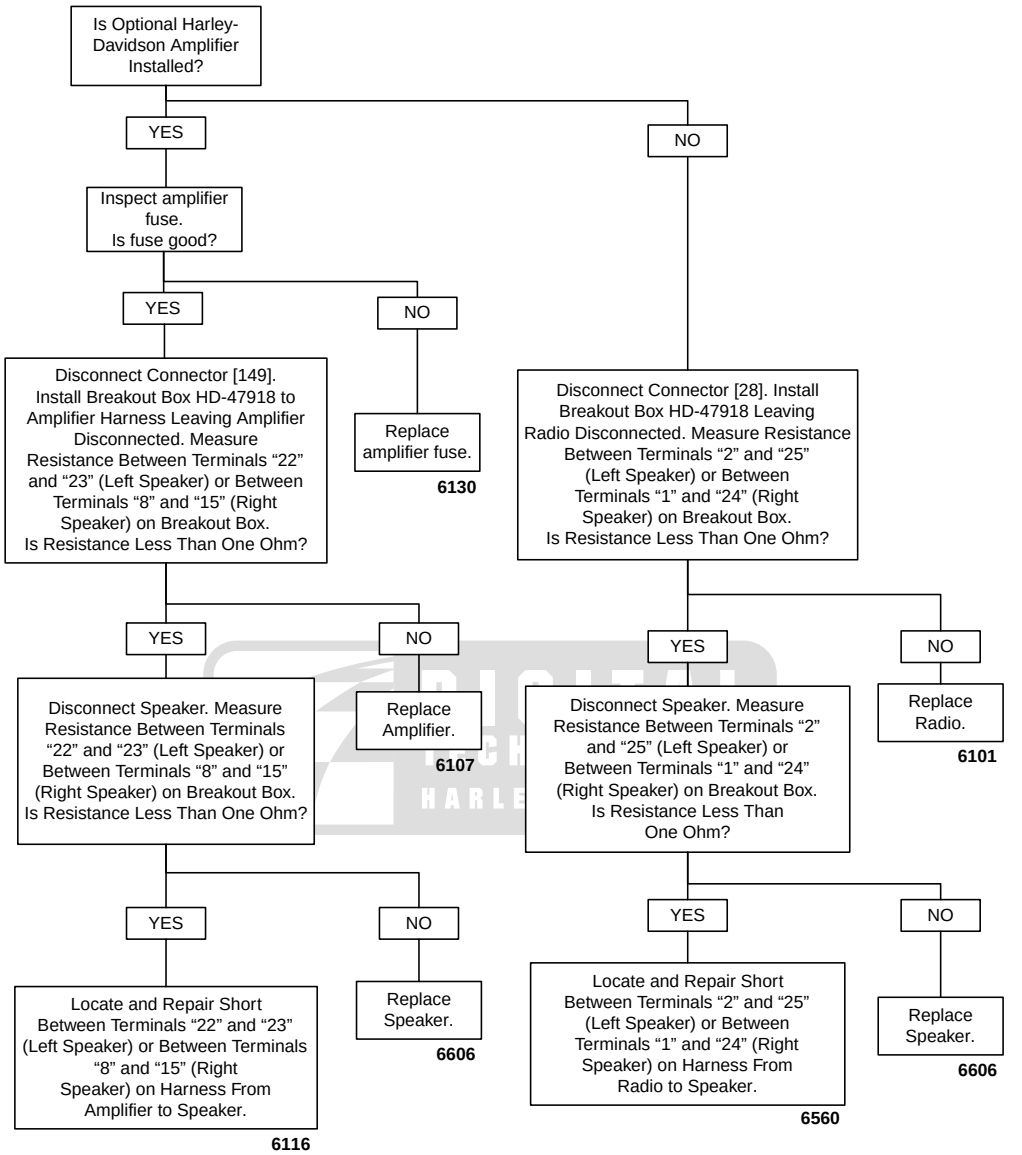




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00511_en

Rear Speakers Shorted: DTC B2020



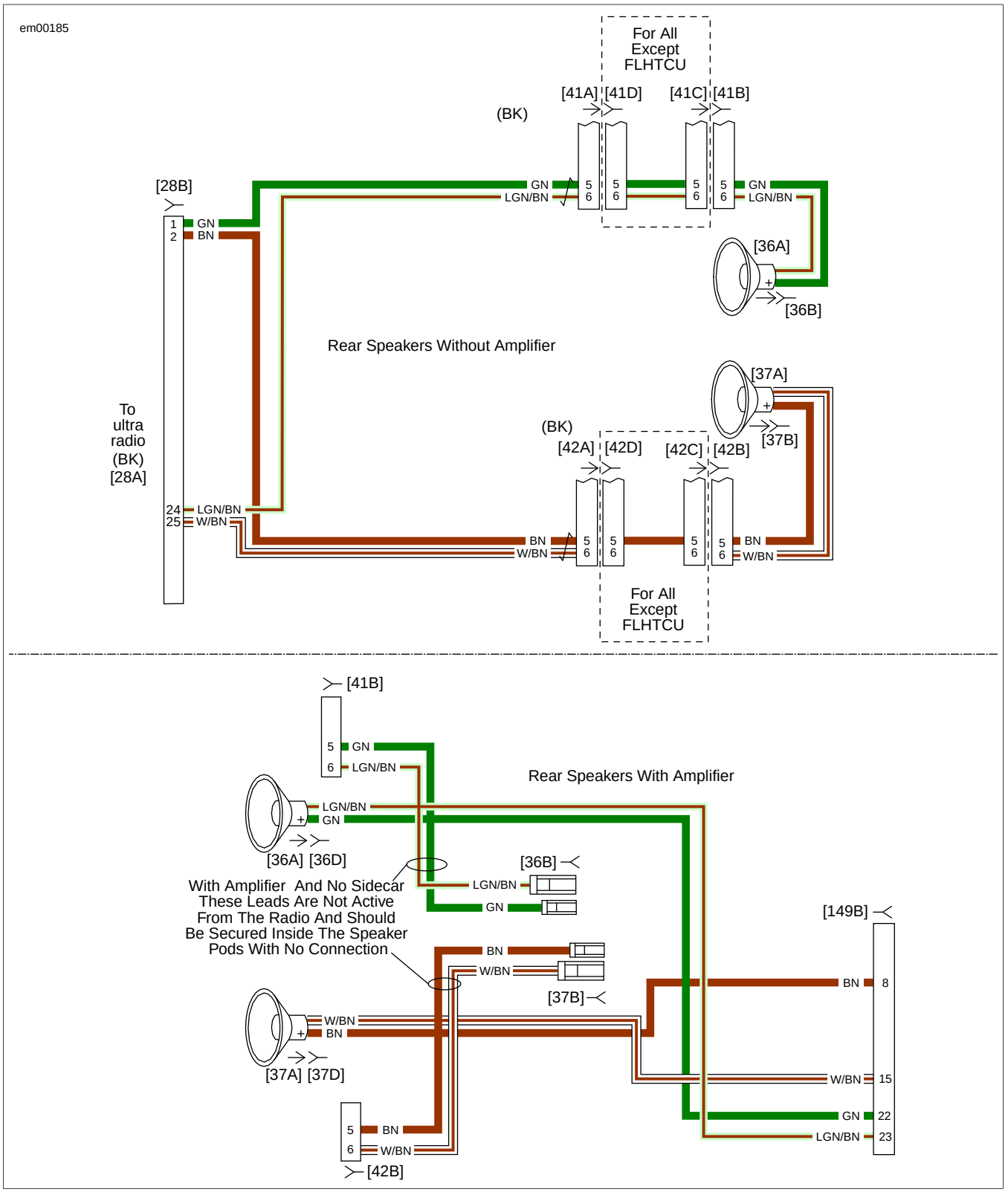


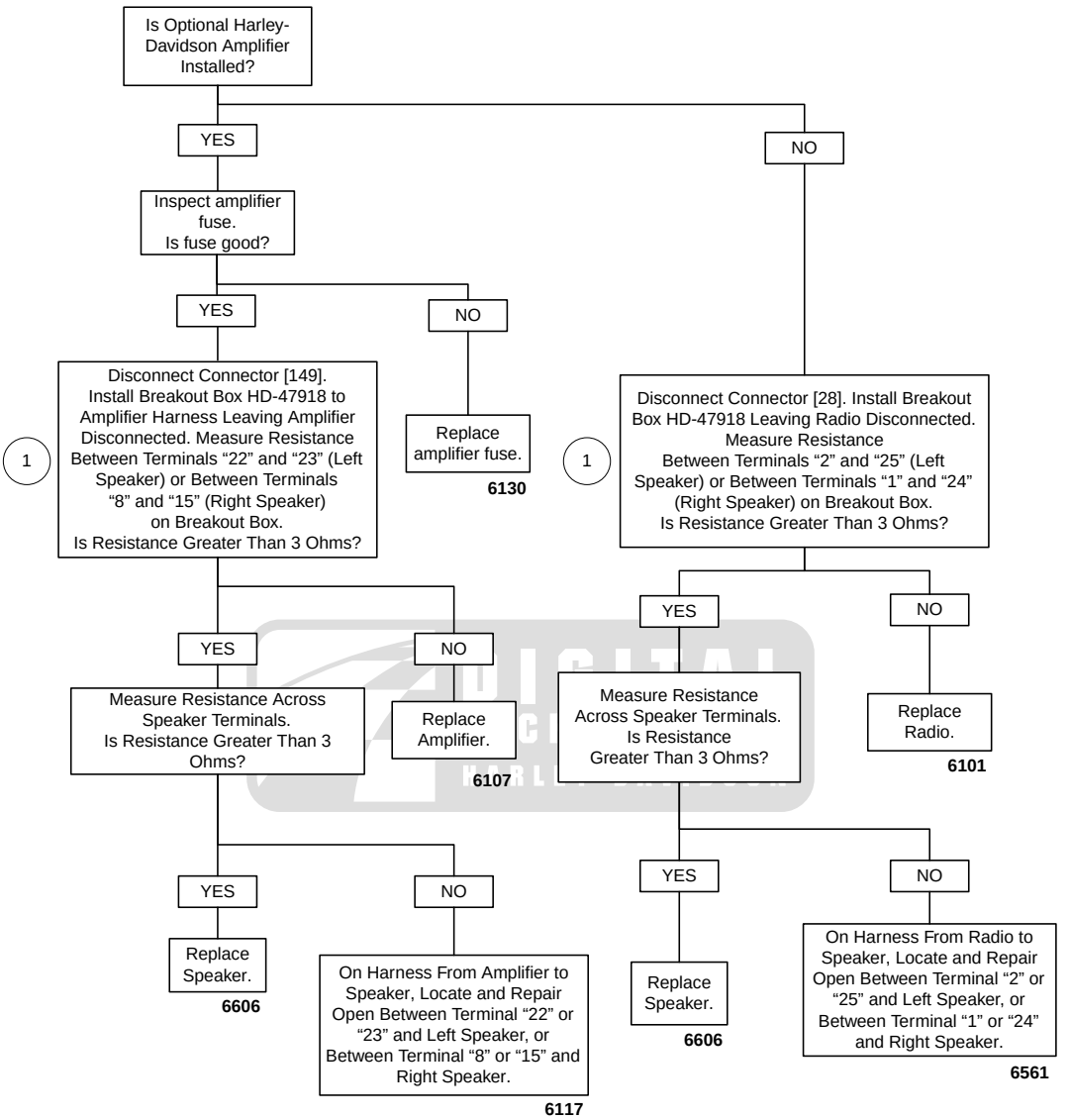
Figure 5-22. Rear Speaker Circuit

Table 5-24. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[36]	Rear right speaker	Spade Contacts	Inside rear right speaker box
[37]	Rear left speaker	Spade Contacts	Inside rear left speaker box
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box
[42]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box
[149]	High output amplifier	23-Place Amp	Under luggage rack (right side)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Rear Speakers Open: DTC B2021

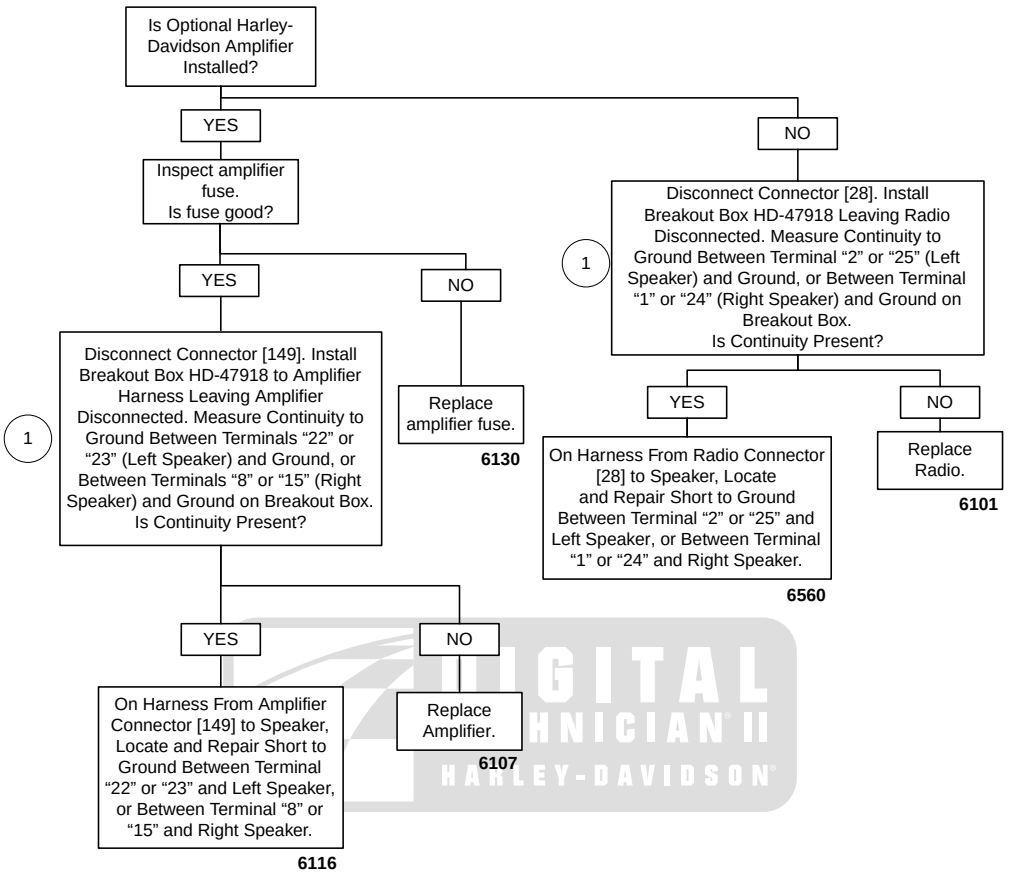




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00513_en

Rear Speakers Shorted to Ground: B2022

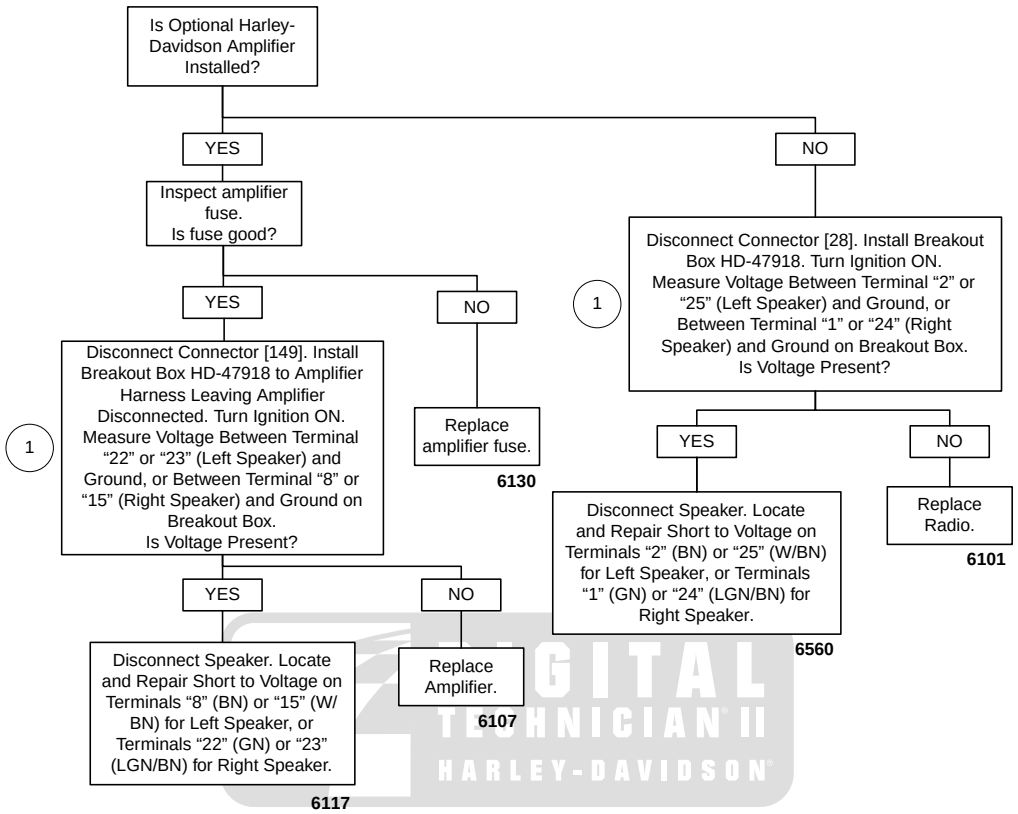




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00514_en

Rear Speakers Shorted to Battery: DTC B2023

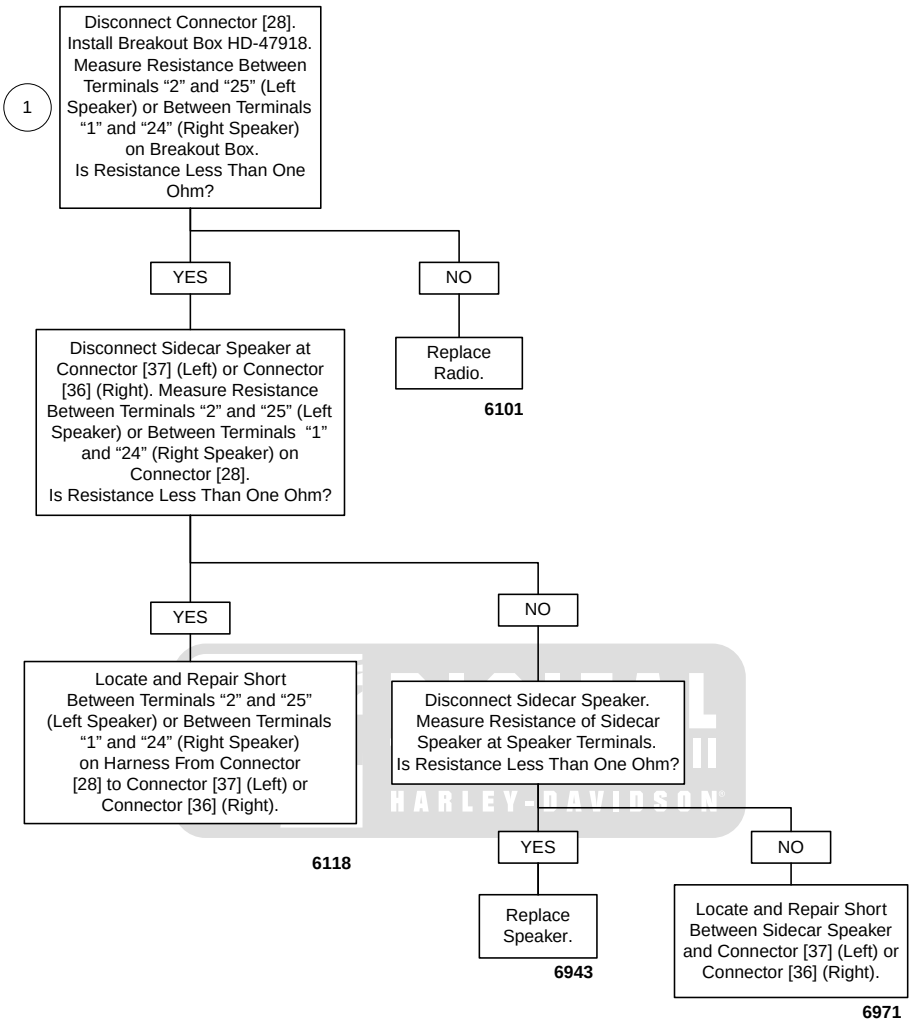




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00515_en

Sidecar Speakers Shorted: DTC B2024





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00516_en

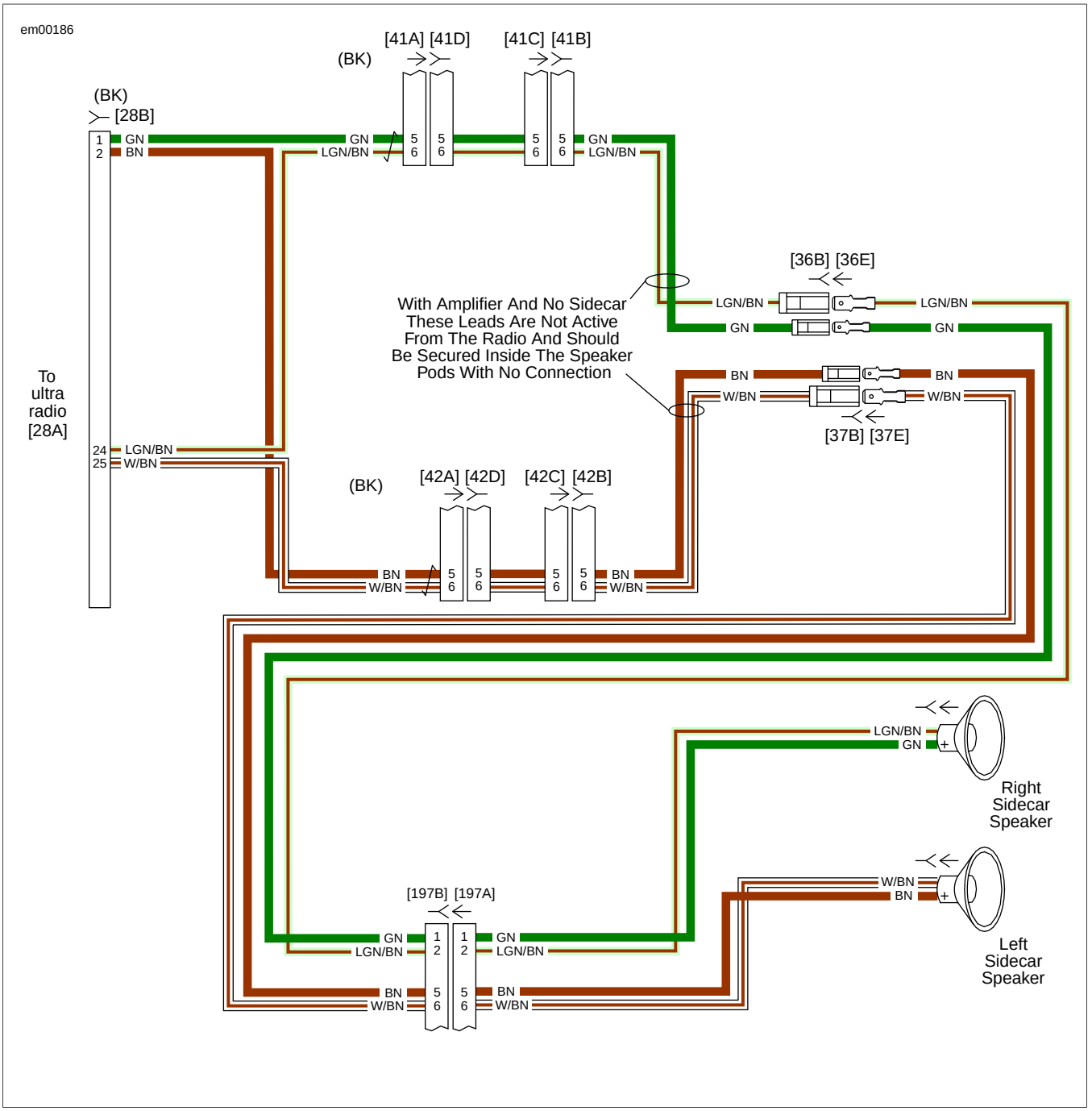
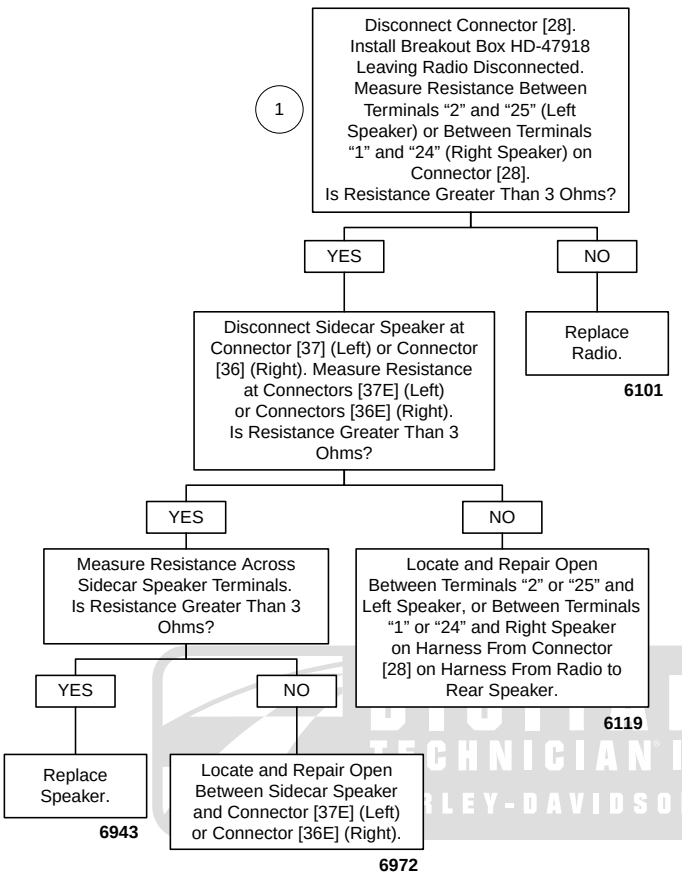


Figure 5-23. Sidecar Speaker Circuit

Table 5-25. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[36]	Rear right speaker	Spade Contacts	Inside rear right speaker box
[37]	Rear left speaker	Spade Contacts	Inside rear left speaker box
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box
[42]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box
[197]	Sidecar console	12-Place Mini-Deutsch	Inside sidecar console

Sidecar Speakers Open: DTC B2025

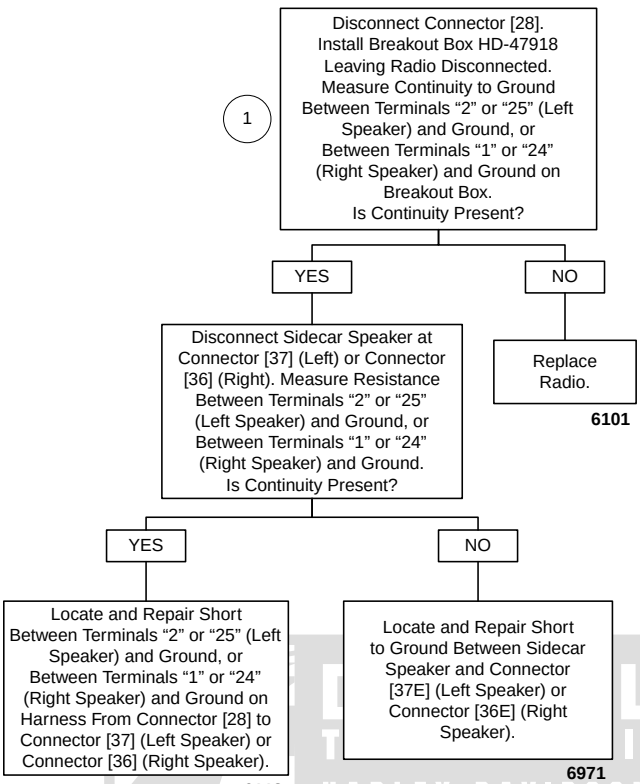




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00517_en

Sidecar Speakers Shorted to Ground: DTC B2026

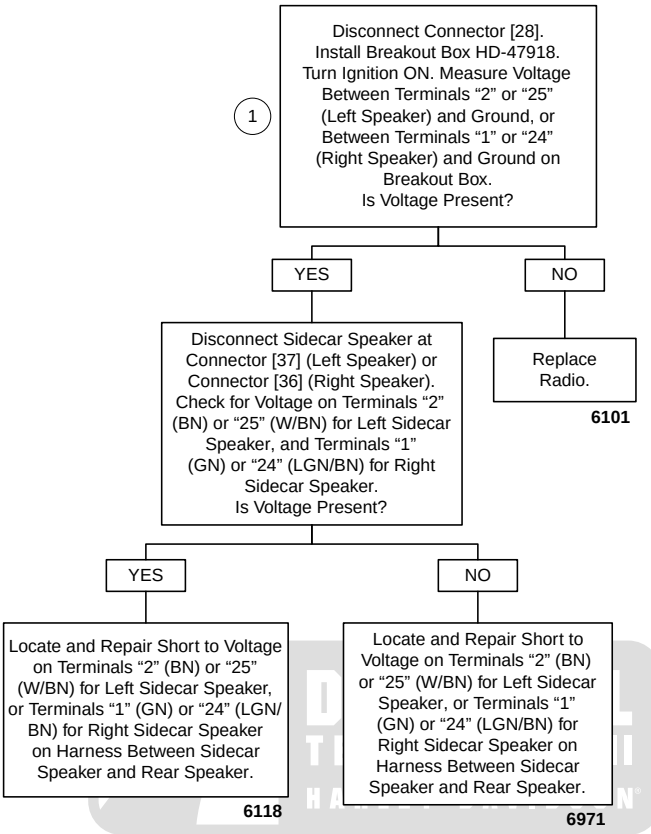




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00518_en

Sidecar Speakers Shorted to Battery: DTC B2027





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00519_en

SERIAL DATA BUS DIAGNOSTICS 5.4

GENERAL

There are two serial data BUSs. The first one is the J1850 serial data BUS which communicates between the radio and the ECM, TSSM and instruments. The second serial data BUS is the Infotainment BUS, which uses a CAN protocol to communicate between the radio and the other radio accessories. The radio captures any errors found on both serial data BUSs and stores them as DTCs.

Table 5-26. J1850 Serial Data Bus

DTC	DESCRIPTION
U1016	J1850 lost communications with ECM
U1300	J1850 bus shorted low
U1301	J1850 bus shorted high

Table 5-27. Infotainment BUS

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
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. A diagnostic trouble code (DTC) U1016 indicates that the ECM is not capable of sending this state of health message.

STARTS THEN STALLS: DTC U1300, U1301

The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a DVOM. In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6-0.8 volts. The range for acceptable operations is greater than 0 and less than 7.0 volts.

NOTE

Problems in the fuel system or idle air control system may also create this symptom.

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.

DIAGNOSTICS

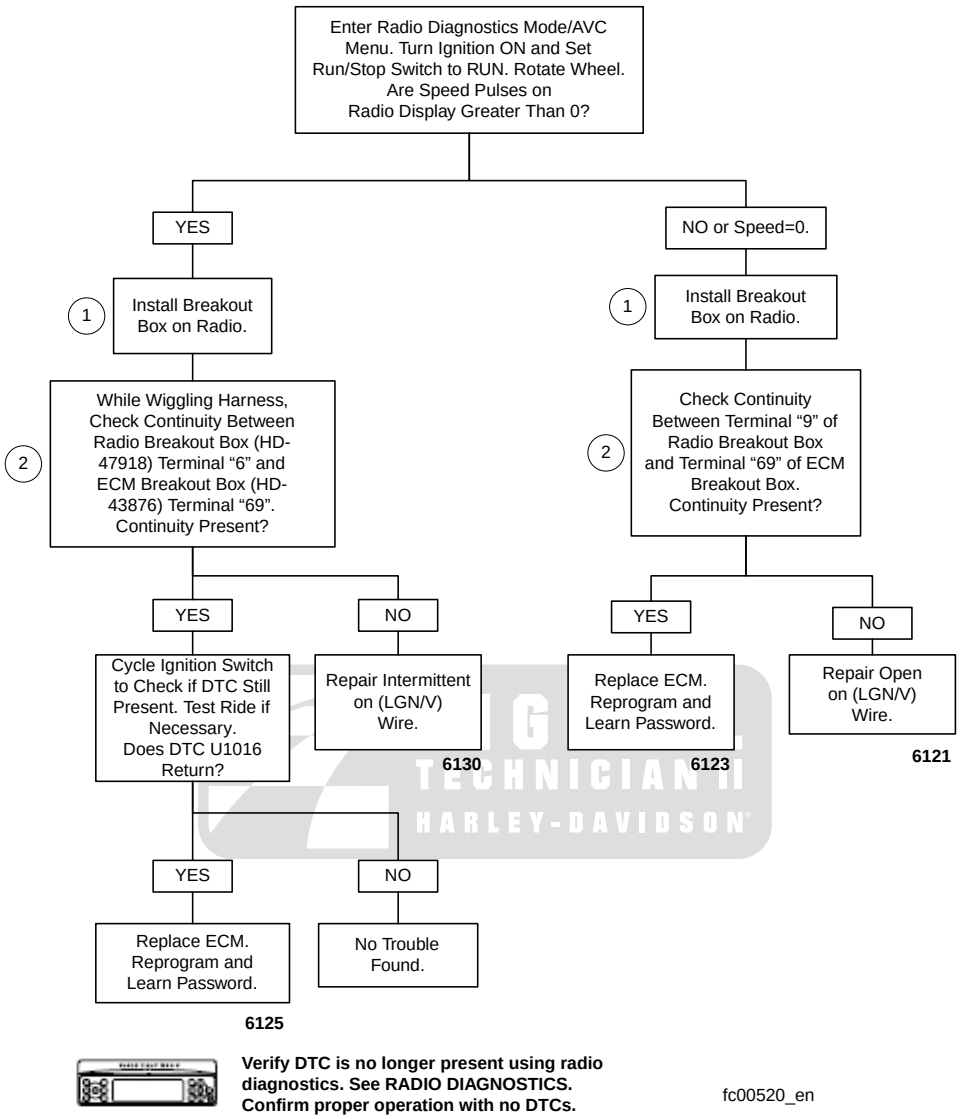
PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-43876	BREAKOUT BOX

Diagnostic Notes

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

1. Install RADIO BREAKOUT BOX (Part No. HD-47918).
2. Connect BREAKOUT BOX (Part No. HD-43876)between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.
3. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black socket probes and patch cord.
4. This 18-place connector is located on the hands free phone module. Disconnect the connector and GENTLY touch the probes to the terminals to make the measurement. Do not insert probe into connector.
5. The amplifier fuse is an inline fuse for all accessory installations and is mounted in the fuse block for FLHTCUSE models.

Loss of Serial Data: DTC U1016



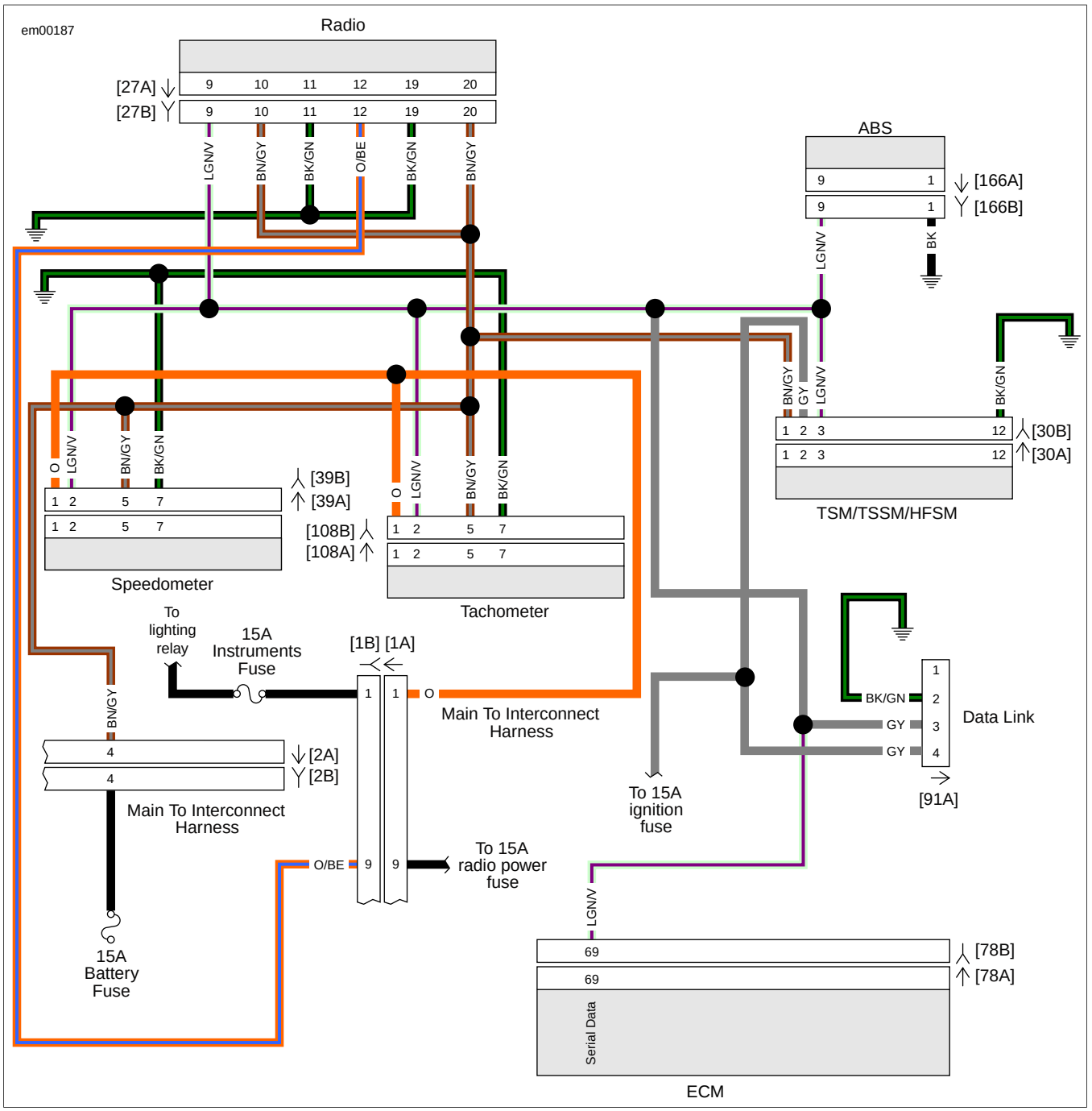


Figure 5-24. Serial Data Circuit: FLHX, FLHT/C/U, FLTR

Table 5-28. Wire Harness Connectors

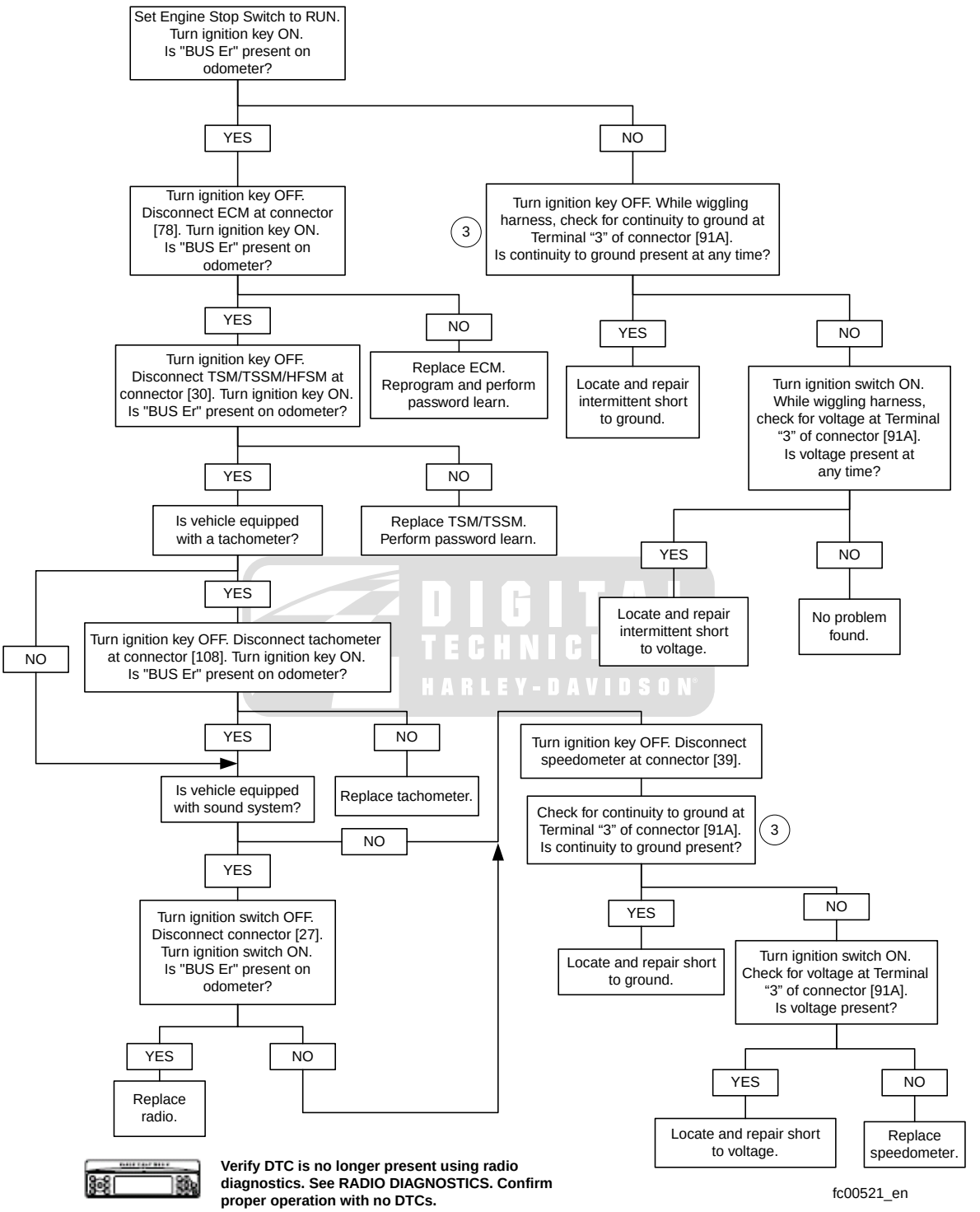
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-Place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-Place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-Place Molex (Gray)	Inner fairing - right fairing support brace
		FLTR	12-Place Molex (Gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-Place Amp	Inner fairing - back of radio (right side)

Table 5-28. Wire Harness Connectors

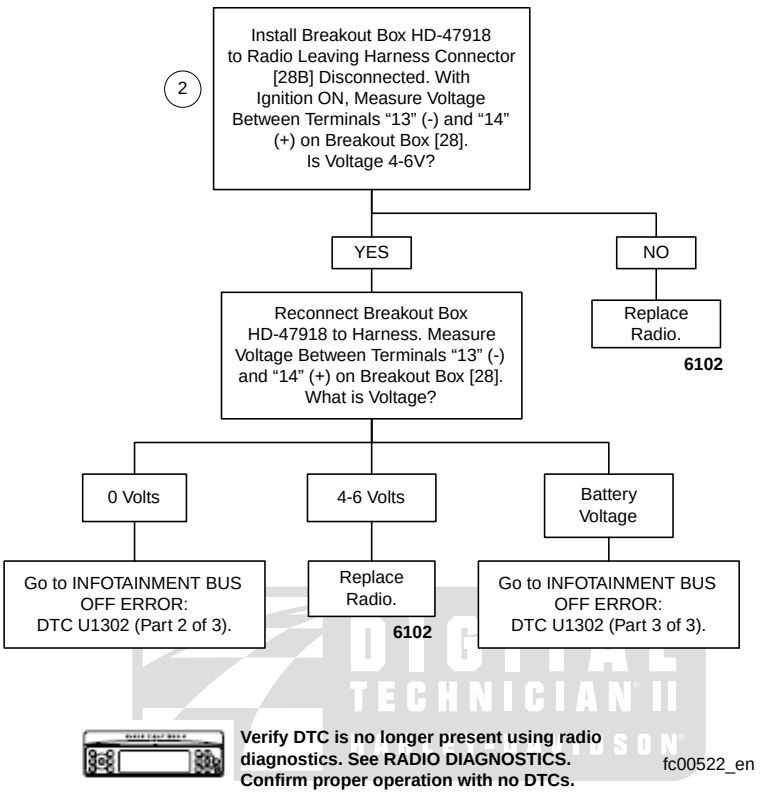
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[30]	TSM/TSSM/HFSM	All	12-Place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-Place Packard	Inner fairing (back of speedometer)
		FLTR	12-Place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-Place Packard	Under right side cover
[91]	Data link connector	All	4-Place Deutsch	Under right side cover
[108]	Tachometer	FLHT/C	12-Place Packard	Inner fairing (back of tachometer)
		FLTR	12-Place Packard	Under bezel (back of tachometer)
[166]	ABS module	All	20-Place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starts, Then Stalls: DTC U1300, U1301



Infotainment Bus Off Error: DTC U1302 (Part 1 of 3)



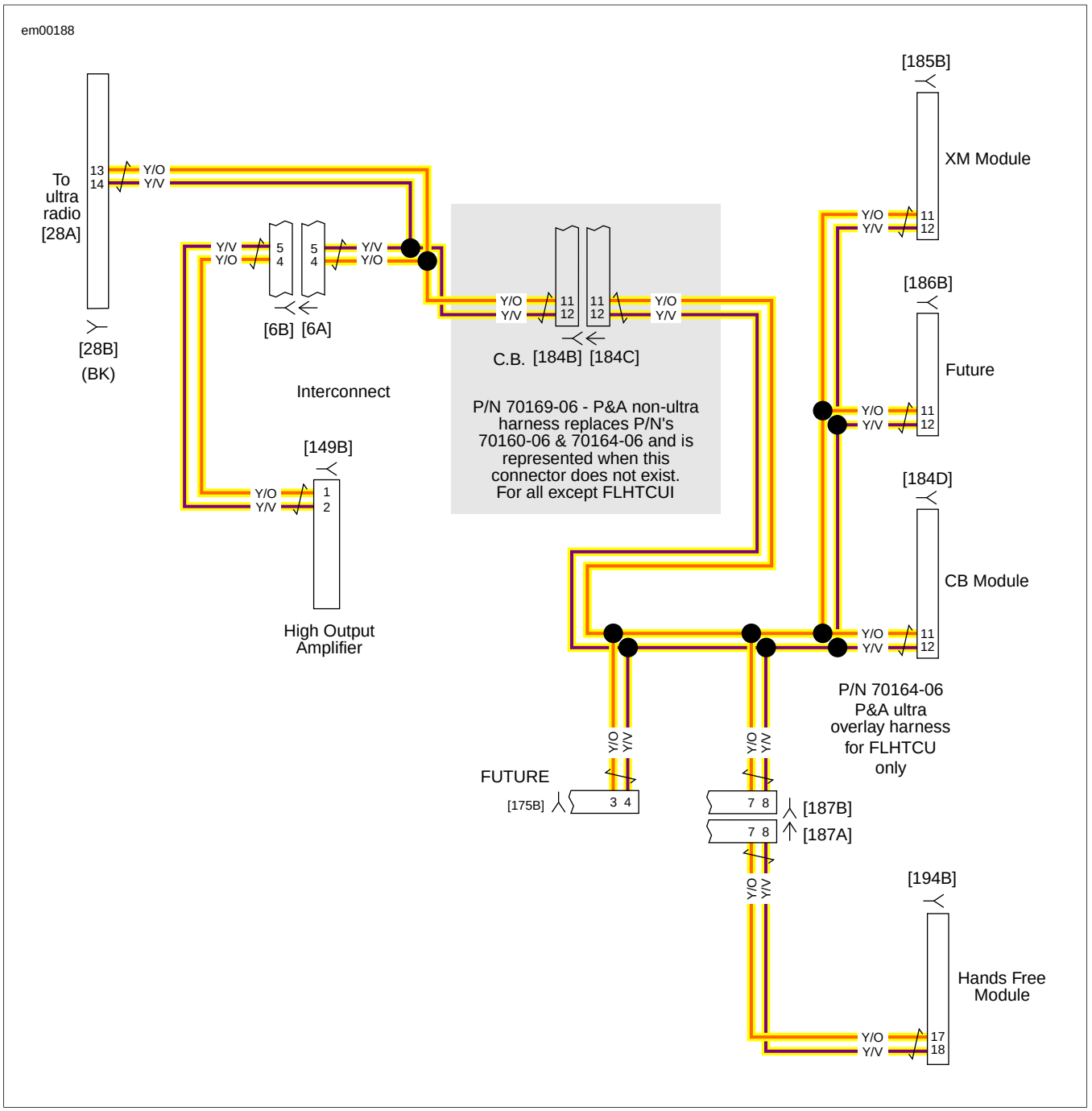


Figure 5-25. Infotainment BUS Circuit

Table 5-29. Wire Harness Connectors

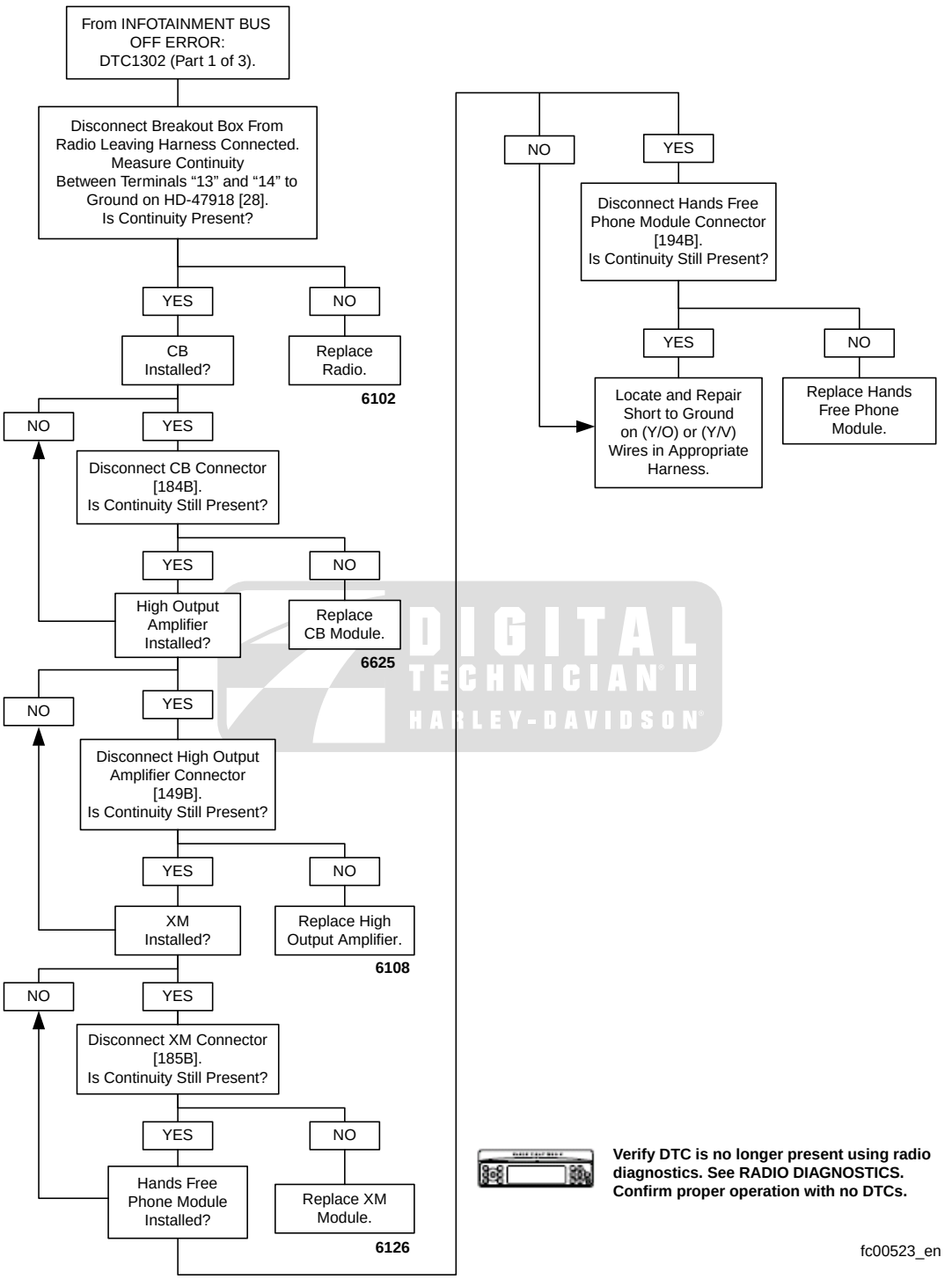
NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[149]	High output amplifier	23-Place Amp	Under luggage rack (right side)
[175]	Future	-	-
[184]	CB module	12-Place Mini-Deutsch	Inner fairing - left side of radio

Table 5-29. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[185]	XM module	12-Place Mini-Deutsch	Inner fairing - top of radio
[186]	Future	-	-
[187]	Hands-free phone module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)
[194]	Hands-free phone module	54-Place Amp	Inside Tour-Pak (left side)

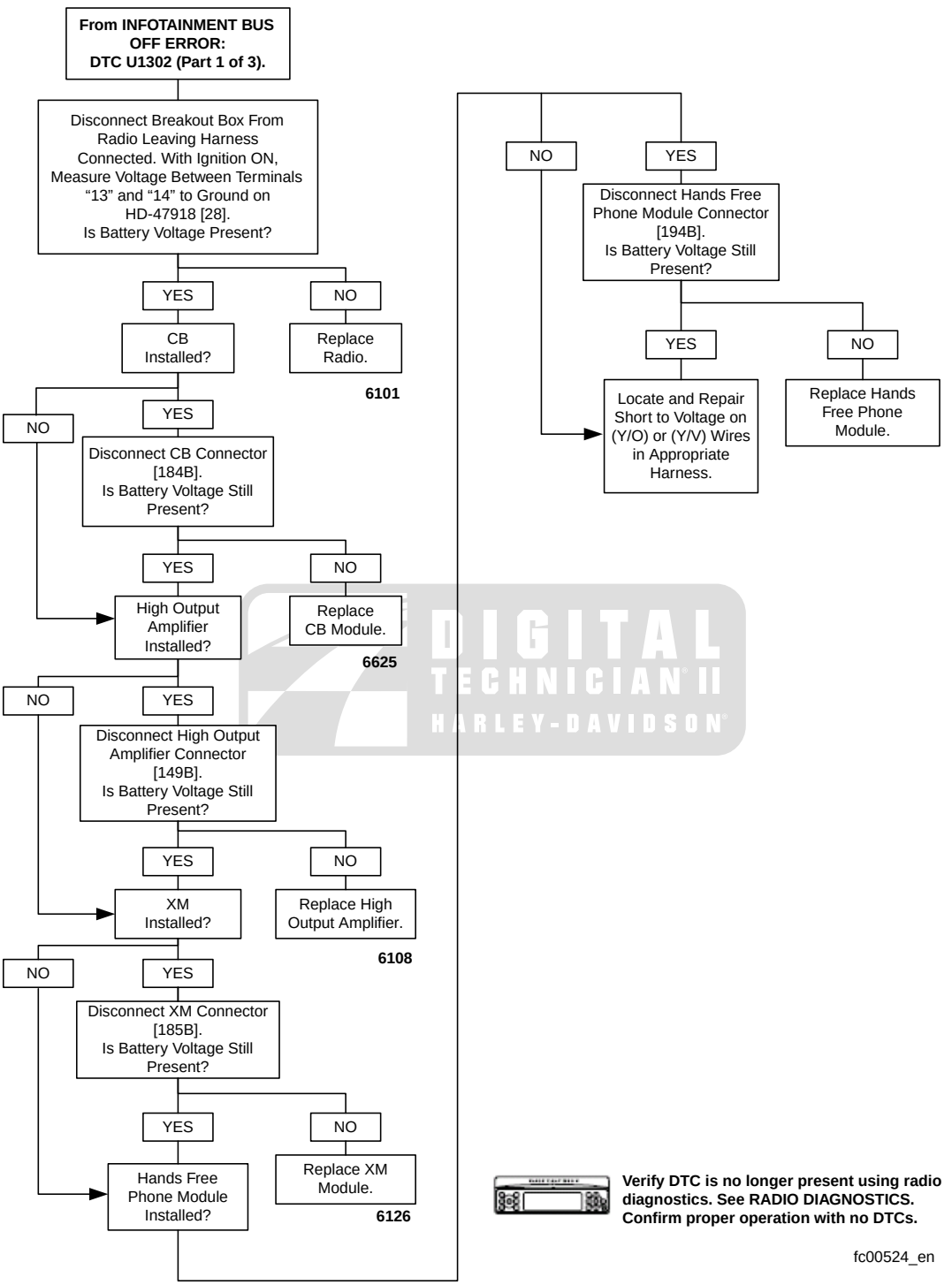
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Infotainment Bus Off Error: DTC U1302 (Part 2 of 3)



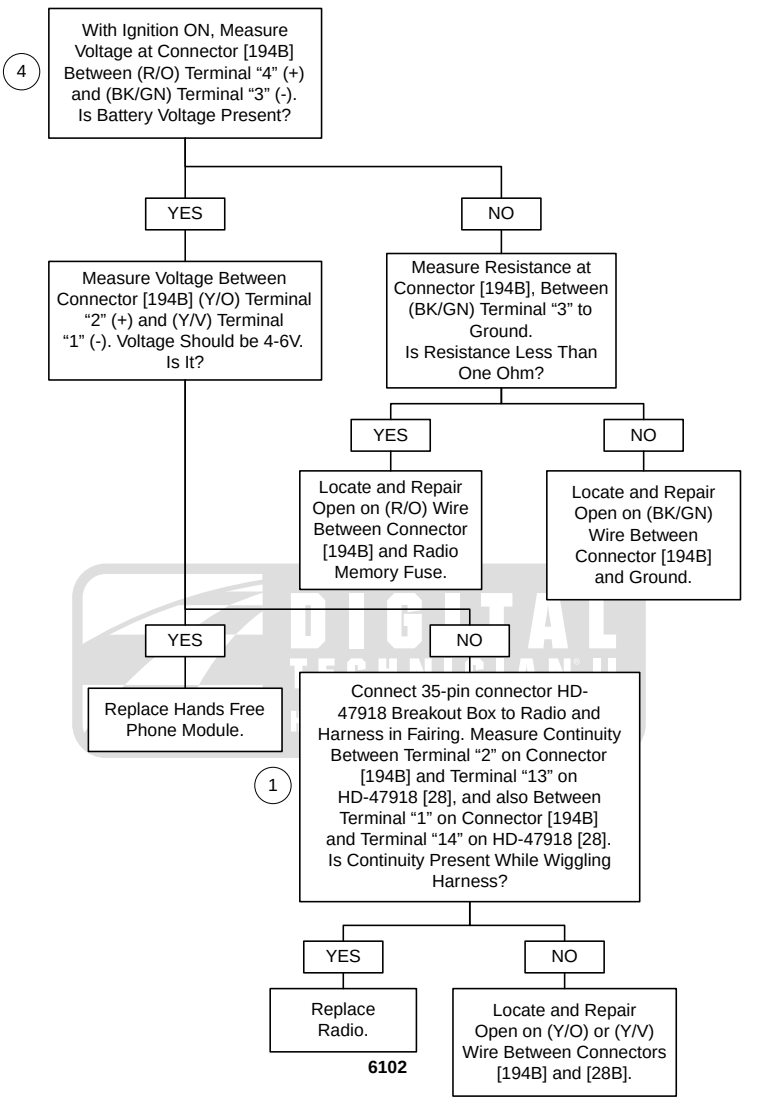
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Infotainment Bus Off Error: DTC U1302 (Part 3 of 3)



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Infotainment Bus Lost Communications with Hands-Free Phone Module: DTC U1306





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00525_en

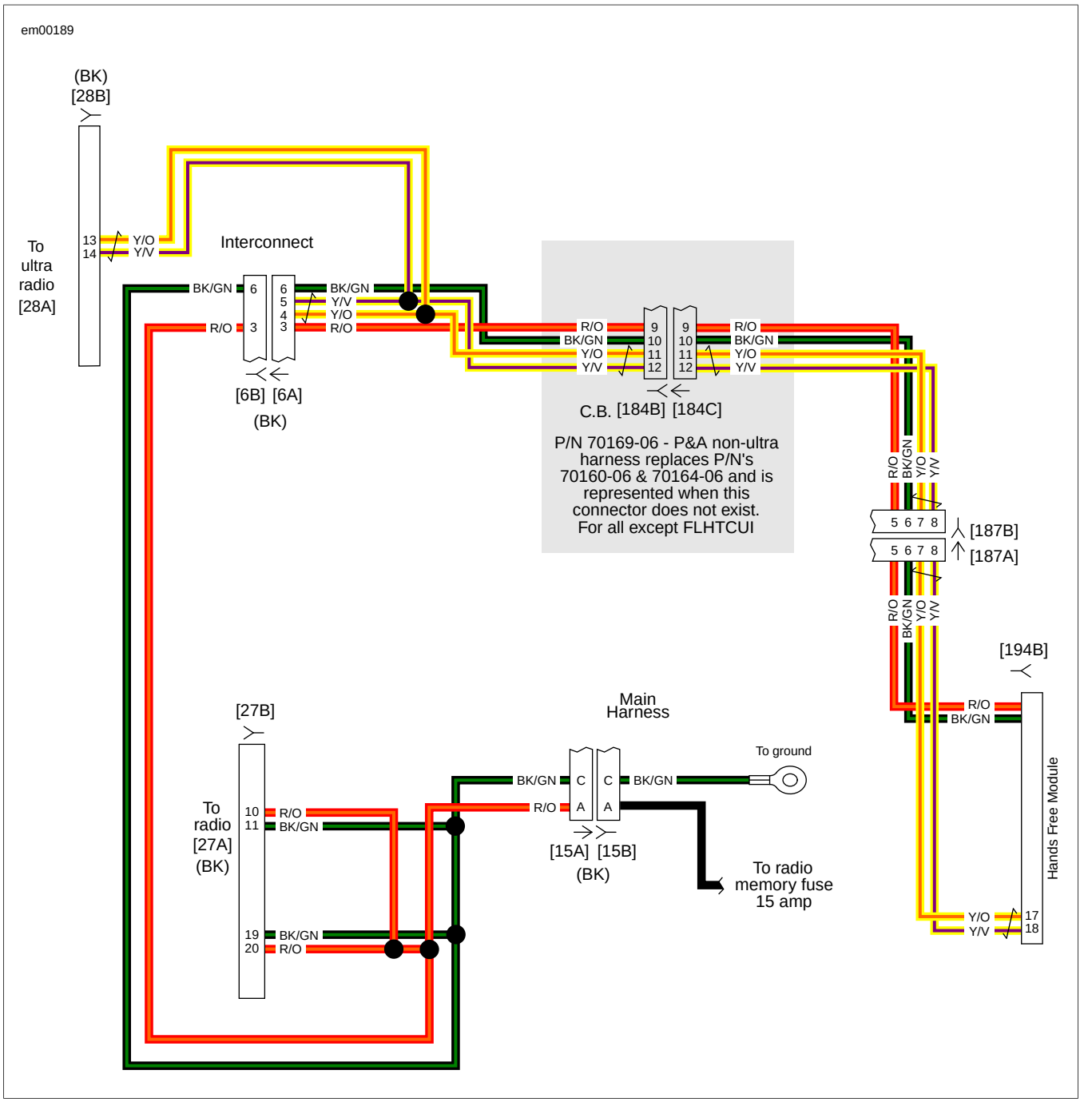


Figure 5-26. Hands-Free Phone Circuit

Table 5-30. Wire Harness Connectors

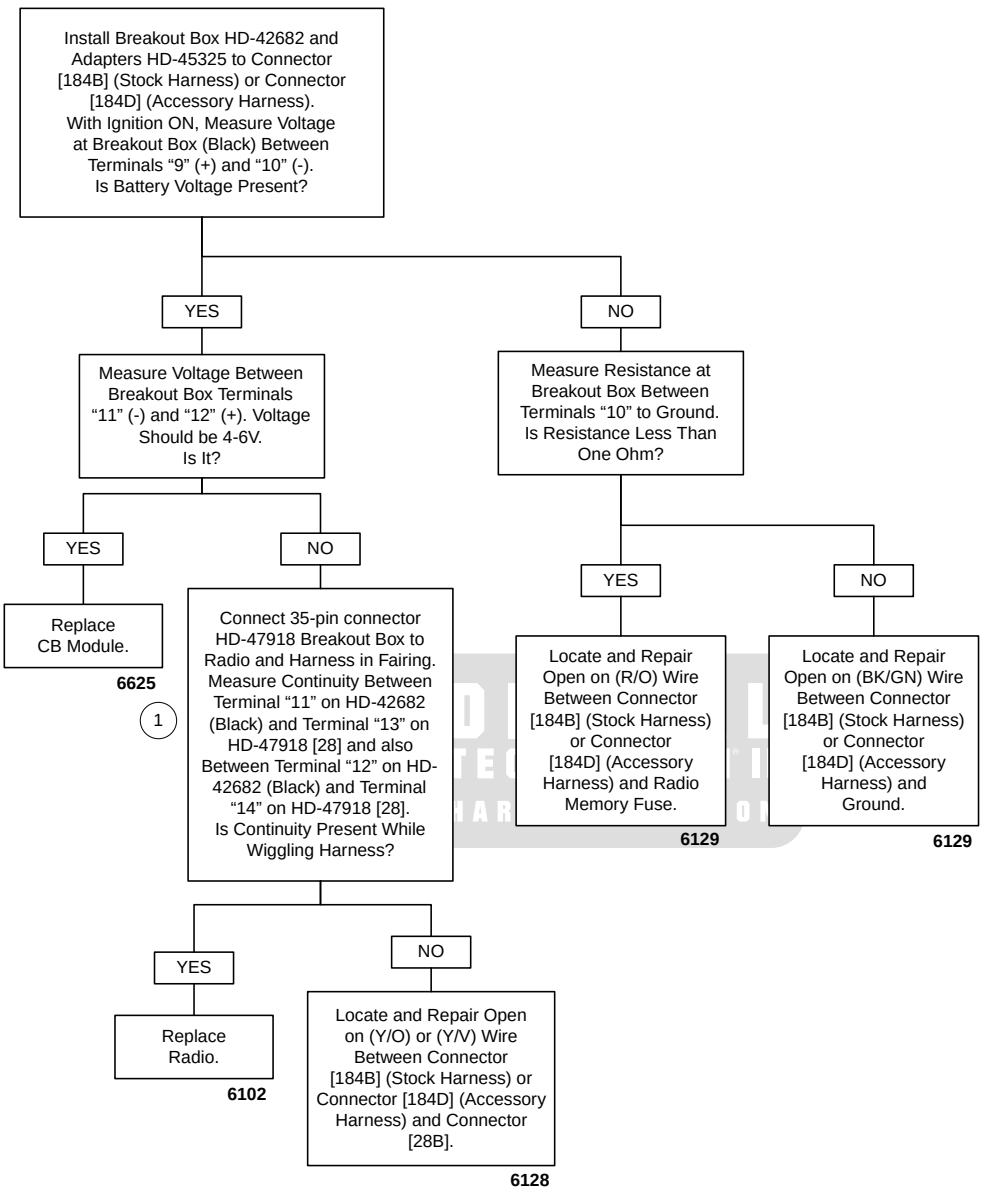
NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)

Table 5-30. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[187]	Hands-free phone module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)
[194]	Hands-free phone module	54-Place Amp	Inside Tour-Pak (left side)

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Infotainment Bus Lost Communications with CB Module: DTC U1307





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00526_en

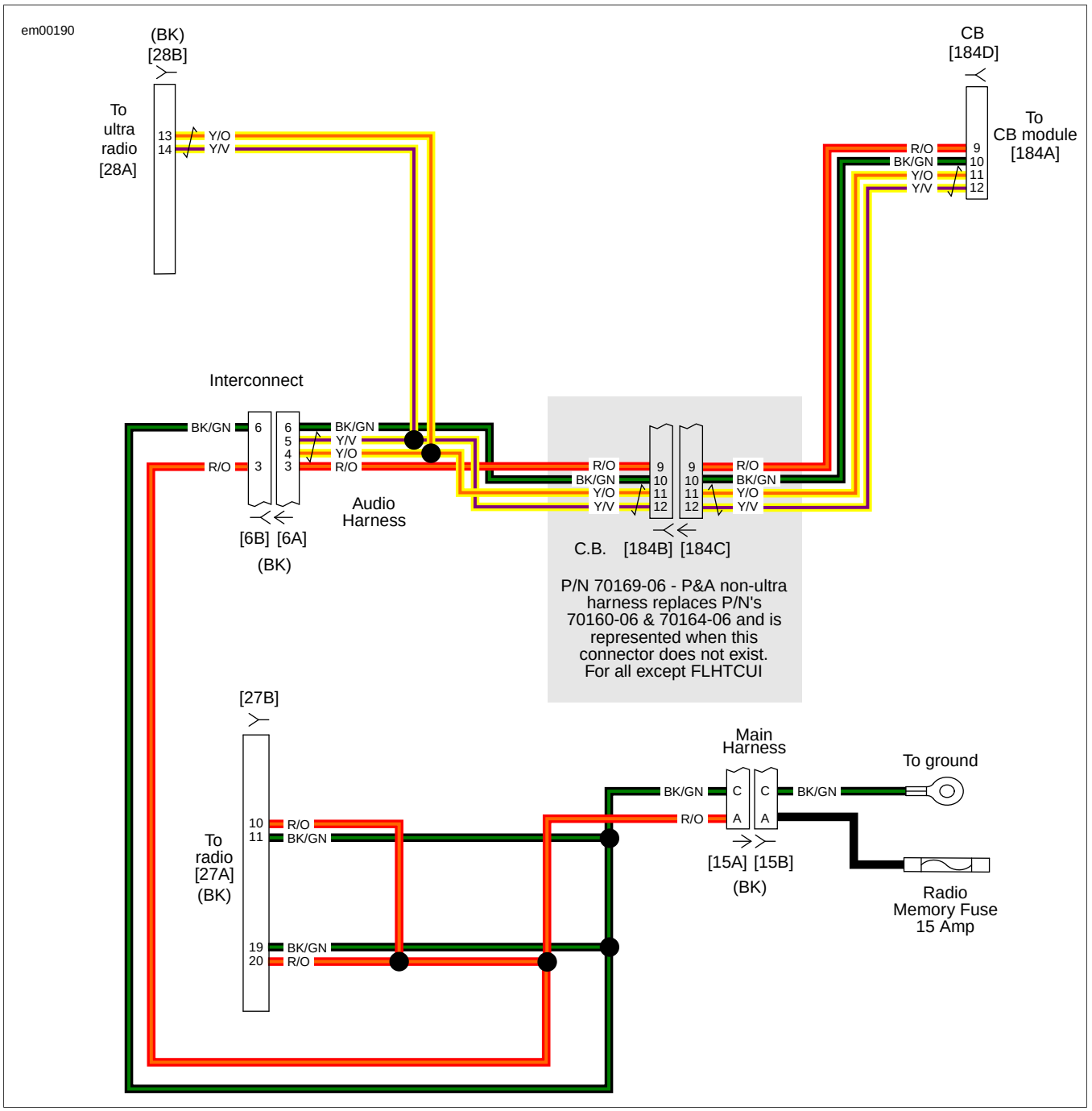
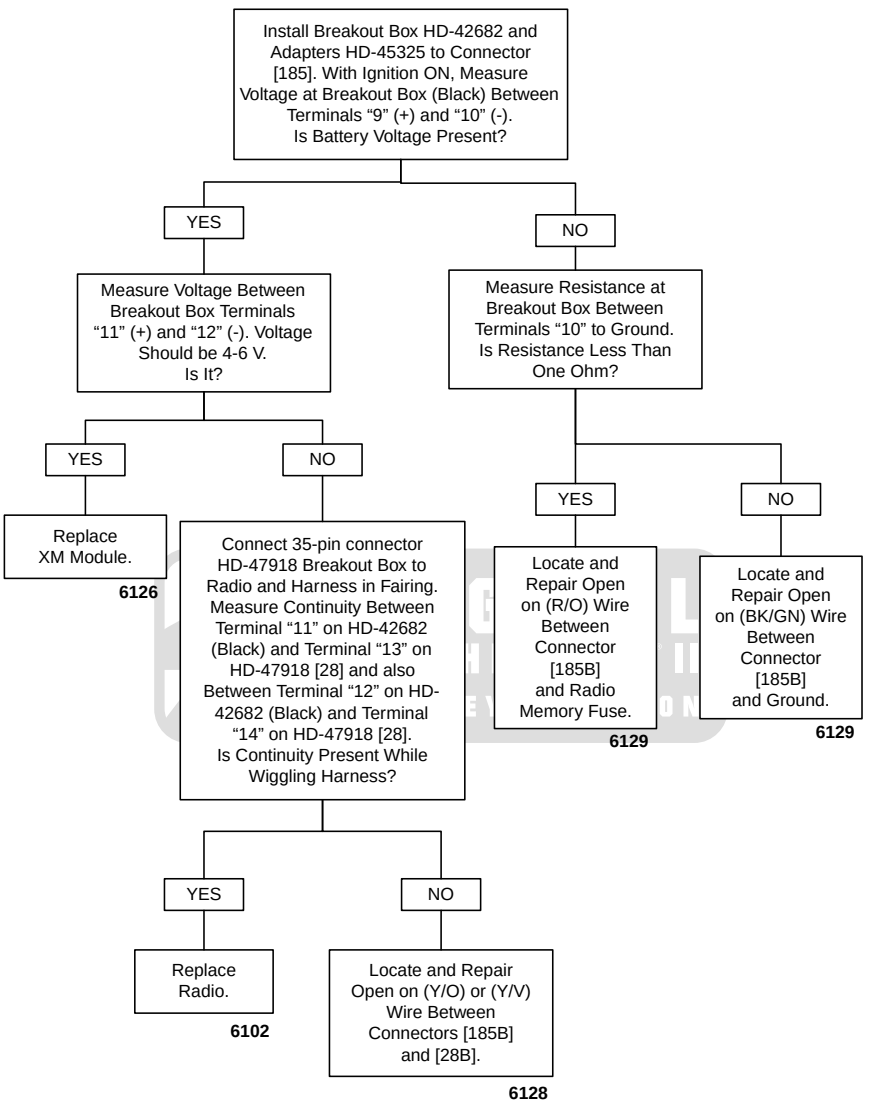


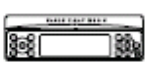
Figure 5-27. CB Circuit

Table 5-31. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[184]	CB module	12-Place Mini-Deutsch	Inner fairing - left side of radio

Infotainment Bus Lost Communications with XM Module: DTC U1313





Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00527_en

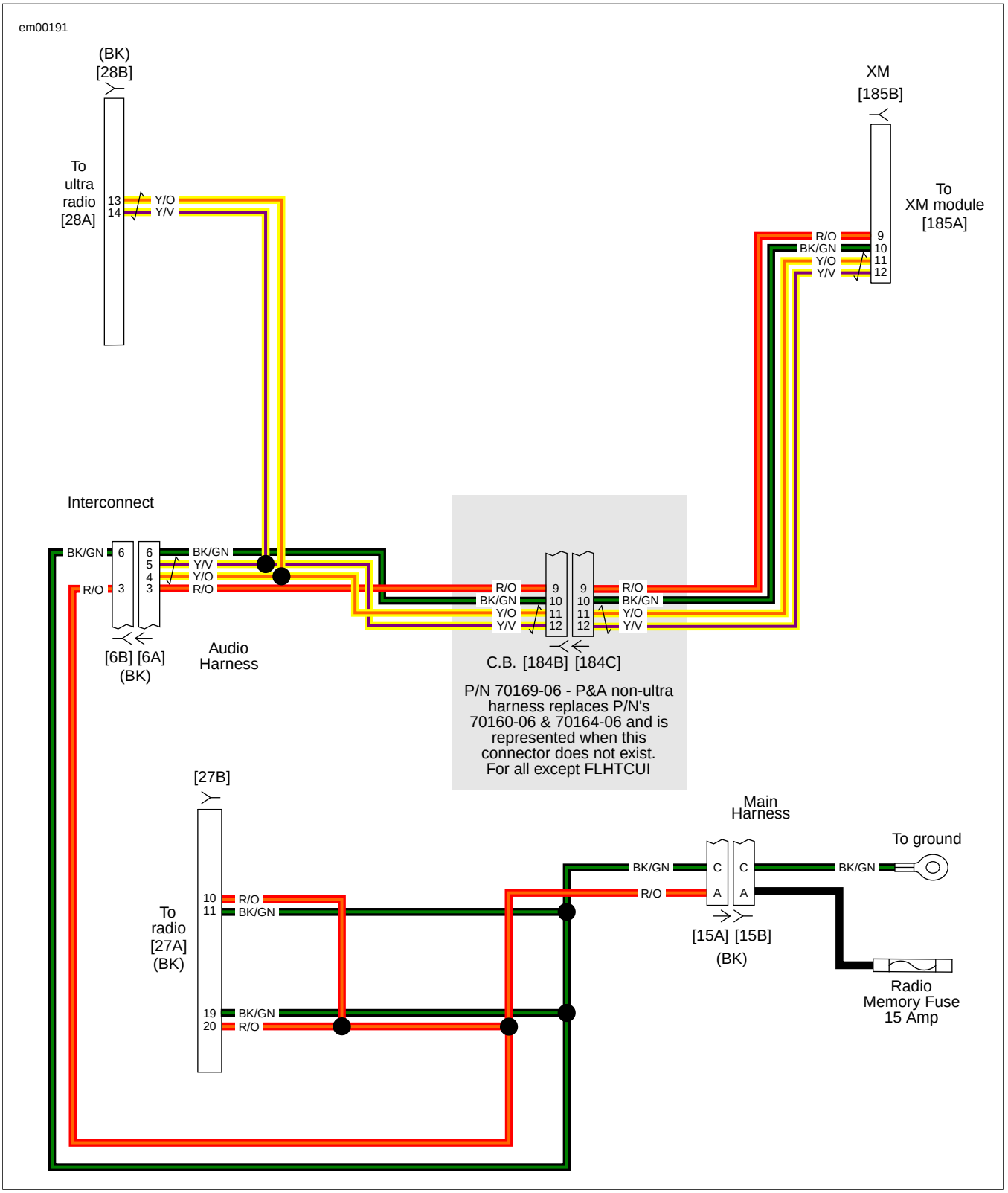


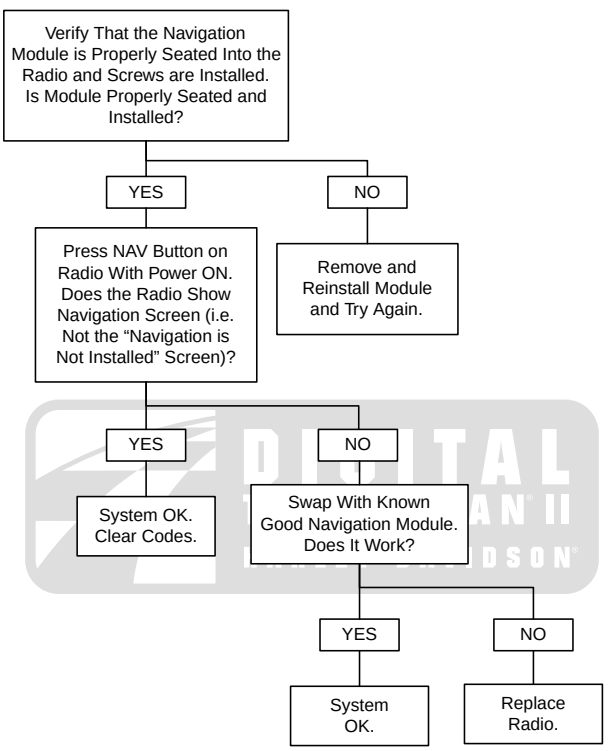
Figure 5-28. XM Circuit

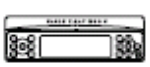
Table 5-32. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[185]	CB module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)

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Infotainment Bus Lost Communications with Navigation Module: DTC U1314

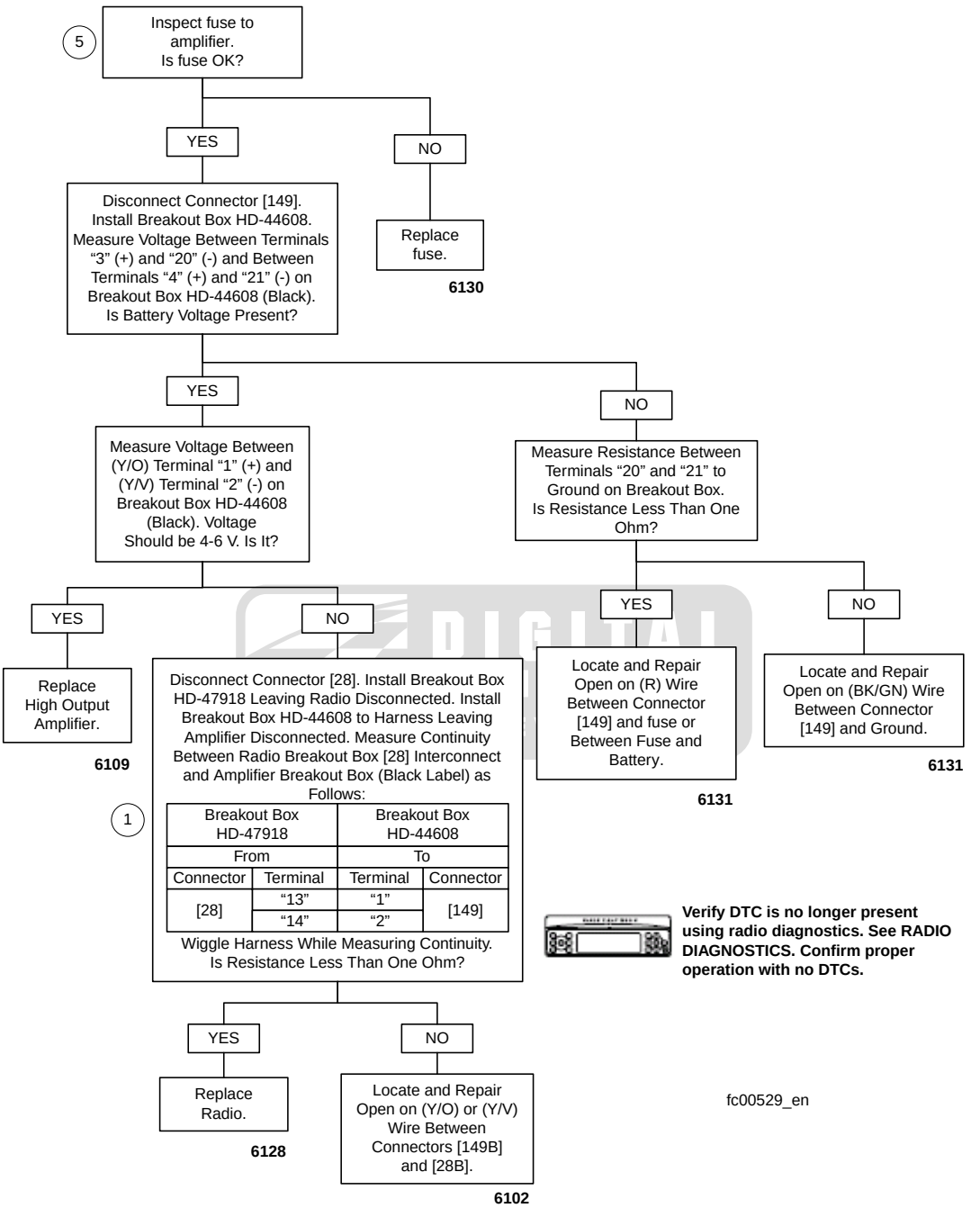




Verify DTC is no longer present using radio diagnostics. See RADIO DIAGNOSTICS. Confirm proper operation with no DTCs.

fc00528_en

Infotainment Bus Lost Communications with High Output Amplifier: DTC U1317



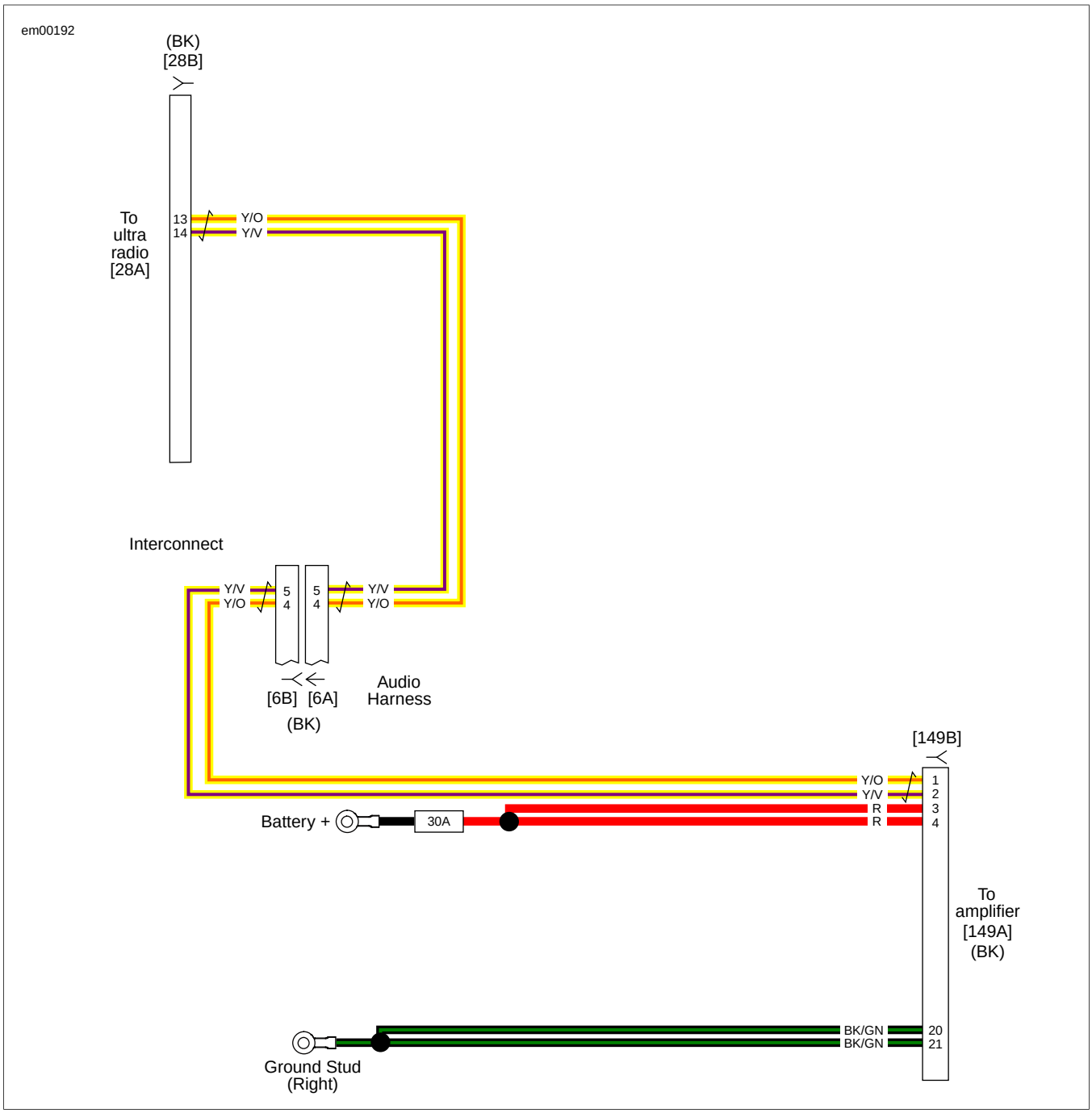


Figure 5-29. High Output Amplifier Circuit

Table 5-33. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[28]	Radio	35-Place Amp	Inner fairing - back of radio (right side)
[149]	High output amplifier	23-Place Amp	Under luggage rack (right side)

ADVANCED AUDIO SYSTEM SYMPTOMS 5.5

GENERAL

A number of faults may occur that will not set a DTC. These faults are listed in Table 5-34.

Table 5-34. Advanced Audio System Symptoms

NO.	SYMPTOM	TEST
1	Radio Inoperative	Radio Inoperative: Symptom 1
2	Poor or No Reception	Poor or No Reception: Symptom 2
3	Radio Beeps Every 30 Seconds	Radio Beeps Every 30 Seconds: Symptom 3
4	CD in Radio Will Not Eject	CD in Radio Will Not Eject: Symptom 4
5	Static Present With Engine Running	Static Present with Engine Running: Symptom 5
6	Auxiliary Input Audio Distorted	Auxiliary Input Audio Distorted: Symptom 6
7	CB Transmitter Inoperative and SWR Adjustment	CB Transmitter Inoperative: Symptom 7
8	CB Receiver Inoperative	CB Receiver Inoperative: Symptom 8
9	Intercom Inoperative	Intercom Inoperative: Symptom 9
10	Handheld Microphone/PTT Inoperative	Handheld Microphone/PTT Inoperative: Symptom 10
11	Speaker Switch Malfunction	Speaker Switch Malfunction: Symptom 11
12	Headset Speakers Inoperative	Headset Speakers Inoperative: Symptom 12
13	No or Low Audio From Microphones	No or Low Audio From Microphones: Symptom 13
14	No or Low Audio With High Output Amplifier	No or Low Audio With High Output Amplifier: Symptom 14
15	No or Low Audio From XM or XM Inoperative	No or Low Audio From XM or XM Inoperative: Symptom 15 (Part 1 of 2)
16	XM - No or Intermittent Reception	XM - No or Intermittent Reception: Symptom 16
17	Navigation Inoperative	Navigation Inoperative: Symptom 17 (Part 1 of 2)
18	AVC Inoperative	AVC Inoperative: Symptom 18
19	Handlebar, Passenger or Sidecar Switches Inoperative	Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 1 of 4)
20	CD Skipping	CD Skipping: Symptom 20
21	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	Hands-Free Phone Module Initial Diagnostics: Symptom 21 (Part 1 of 5)

FACTORY DEFAULTS

If a symptom is present without a DTC, restoring ROM defaults back 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 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:

- Turn the ignition ON with the radio OFF
- Push and hold softkeys 1 and 3 and OK for 2 seconds
- Push the arrow up 2 times
- Push softkey 2
- Turn off ignition for 20+ seconds
- 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-41404-B	HARNESS CONNECTOR TEST KIT
HD-47918	RADIO BREAKOUT BOX
HD-48037	SWR METER ADAPTER
HD-48037	SWR METER ADAPTERS

Diagnostic Notes

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

1. If radio is uncalibrated, CB is not functional. The radio will beep periodically when it is not calibrated. If the CB is not allowed in a region (Japan, for example), then the unit will not operate.
2. Remove outer fairing. Disconnect antenna connector from CB and replace it with a dummy load, that is, the lamp included with tool HD-39448.

NOTE

The lamp acts as a load that allows the CB to be operated and provides a means of checking relative power output and modulation.

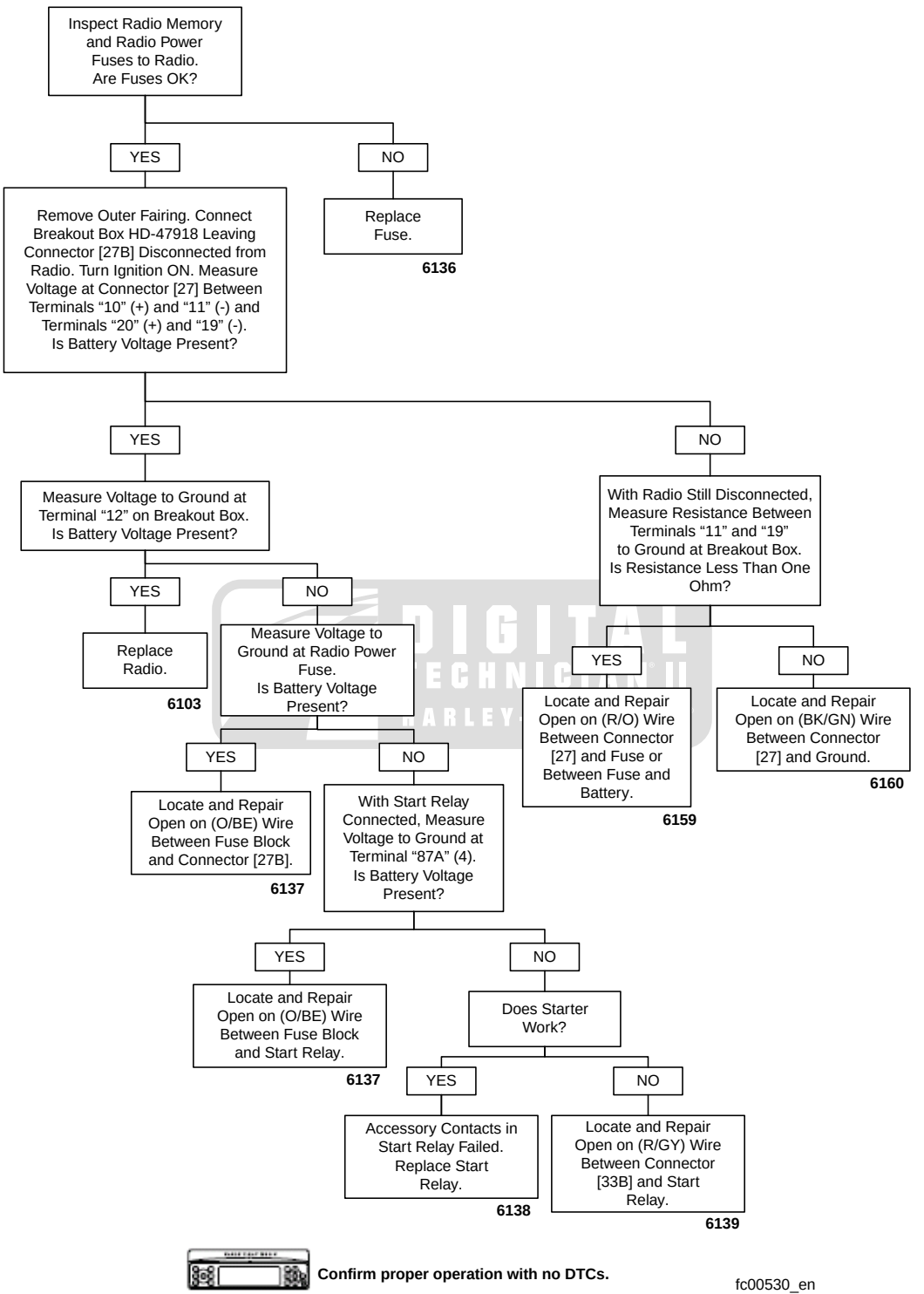
3. To use the load, screw the dummy load onto the antenna jack of the CB using the appropriate SWR METER ADAPTER (Part No. HD-48037). Depress the PTT switch. If the CB is transmitting a carrier wave, the lamp should illuminate. Speaking into the microphone should cause the lamp to flicker. It should get brighter and dimmer depending on how loud your voice is. A change in lamp brilliance means the CB is modulating.
4. Install RADIO BREAKOUT BOX (Part No. HD-47918).
5. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black pin probes and patch cords.
6. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), black socket probes and patch cord.
7. Part No. 70172-06 CVO CB/XM Y-Harness used on stock FLHTCUSE.
8. Part No. 70164-06 Ultra Overlay Harness used on upgraded FLHTCUSE.
9. Part No. 70169-06 Non-Ultra Overlay Harness used on upgraded FLHX, FLHTC and FLTR.
10. Part No. 70160-06 Audio Harness used on FLHTCU and FLHTCUSE.
11. The amplifier fuse is an inline fuse for all accessory installations and is mounted in the fuse block for FLHTCUSE models.
12. 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.

13. 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.
14. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), brown pin probe and patch cord.
15. Some aftermarket exhaust systems may cause excessive pressure on the rear mounts causing the exhaust system to be put into a bind that creates excessive vibration that the CD player may not be able to isolate.
16. This 18-place connector is located on the hands-free phone module. Disconnect the connector and GENTLY touch the probes to the terminals to make the measurement.
17. When prompt button is depressed, allow 10 seconds for voice prompt to respond.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Radio Inoperative: Symptom 1



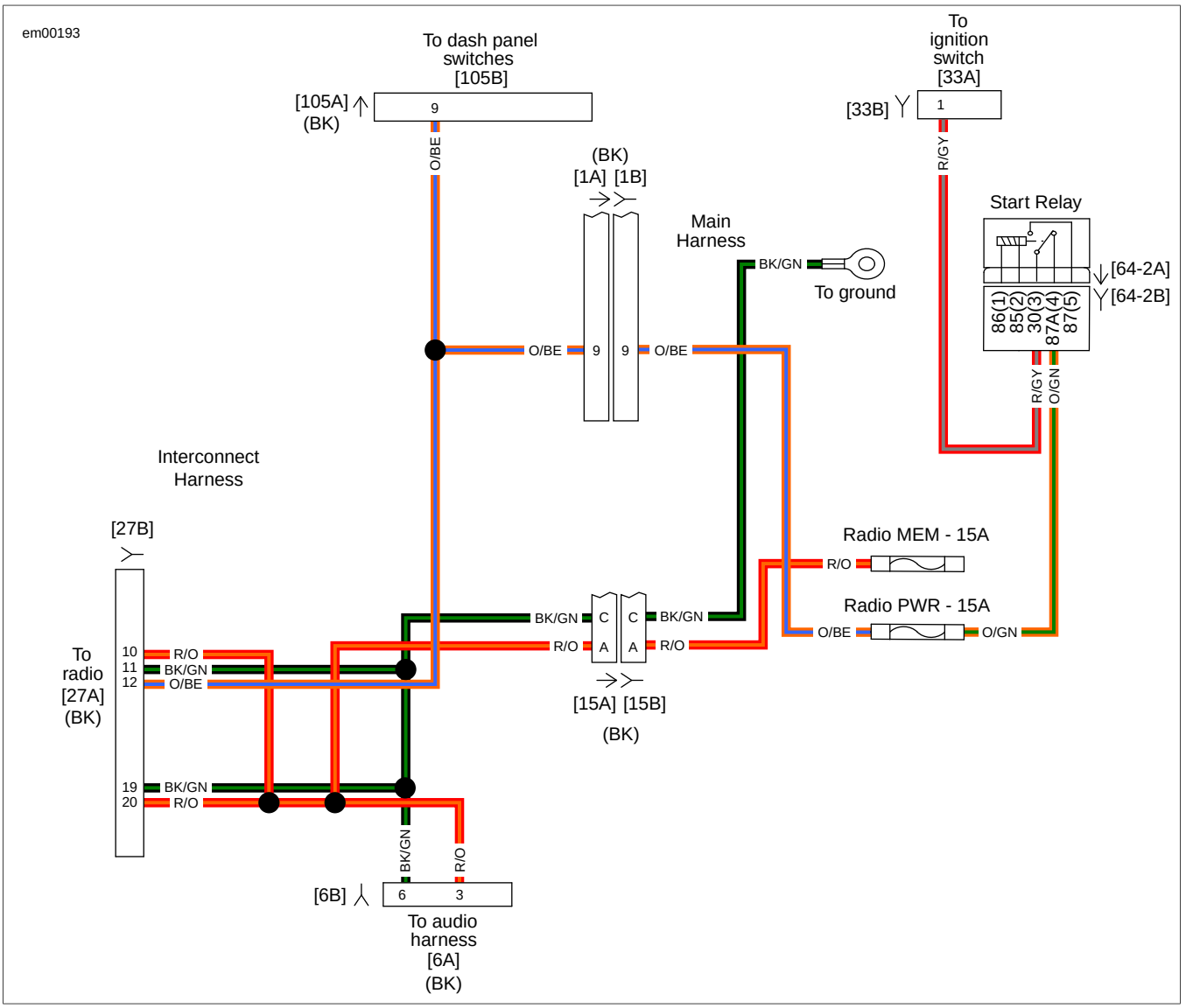
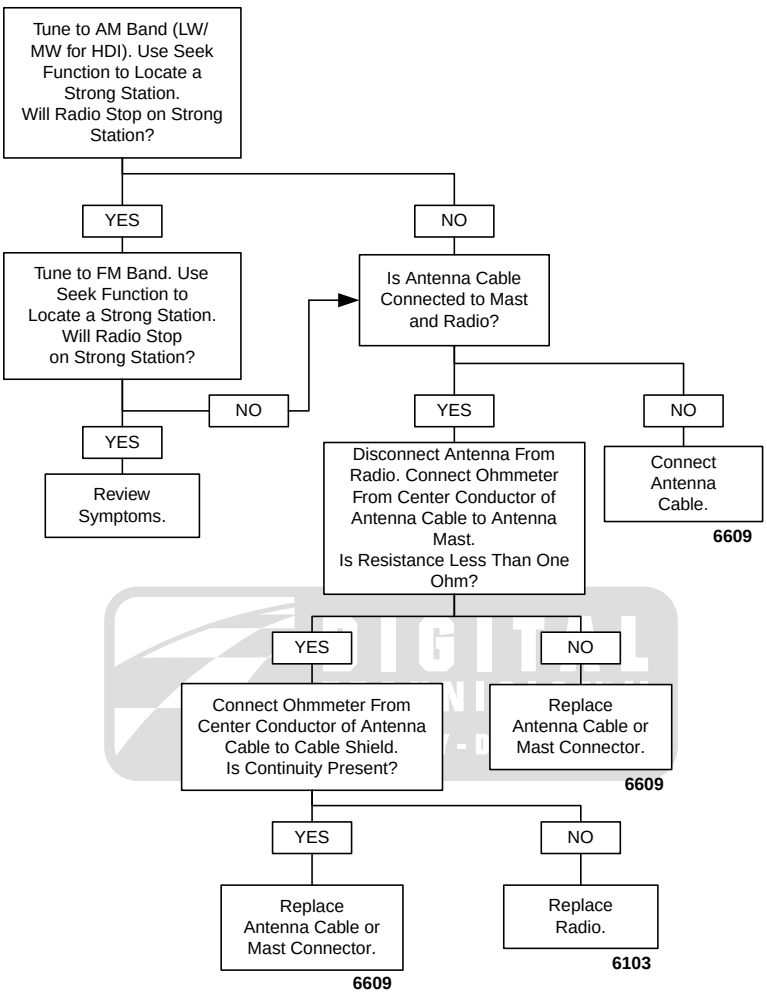


Figure 5-30. Radio Power

Table 5-35. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-Place Molex	Inner fairing - right radio support bracket
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[33]	Ignition/light key switch	3-Place Packard	Inner fairing - under radio
[64-2]	Start relay	Fuse block	In fuse block under left side cover
[105]	Fairing cap switches	12-Place Multilock	Inner fairing - above upper fork bracket (right side)

Poor or No Reception: Symptom 2



Confirm proper operation with no DTCs.

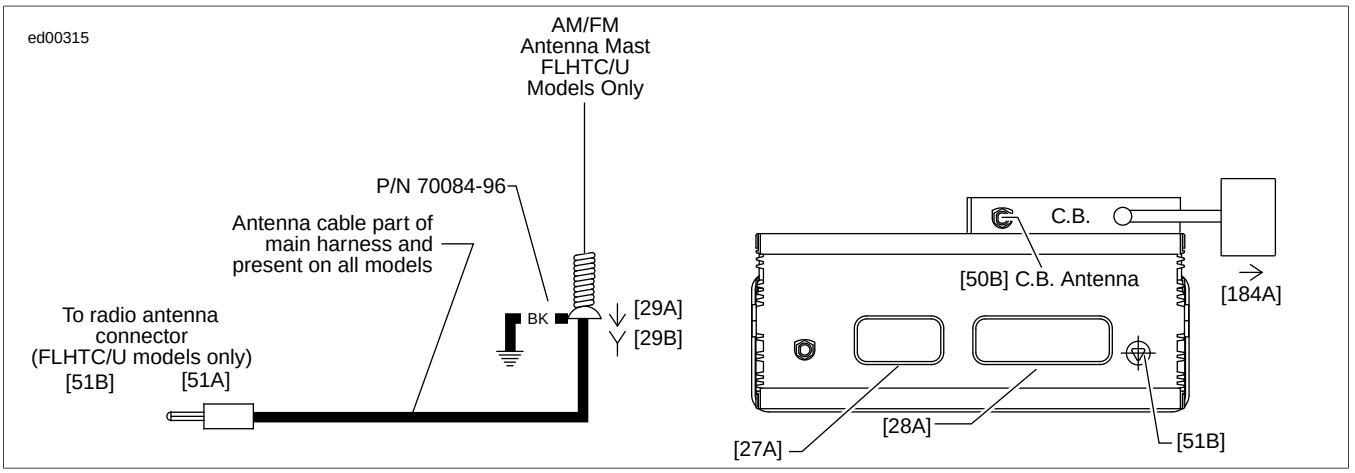


Figure 5-31. Radio Antenna Cable and Mast

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Radio Beeps Every 30 Seconds: Symptom 3

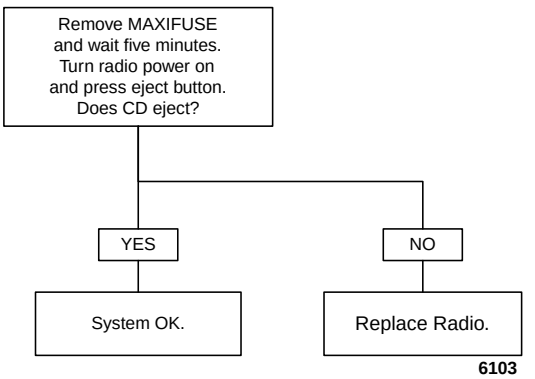
Radio Uncalibrated.
Calibrate Radio.



Confirm proper operation with no DTCs.

fc00532_en

CD in Radio Will Not Eject: Symptom 4



NOTE
Any disassembly of radio voids warranty.

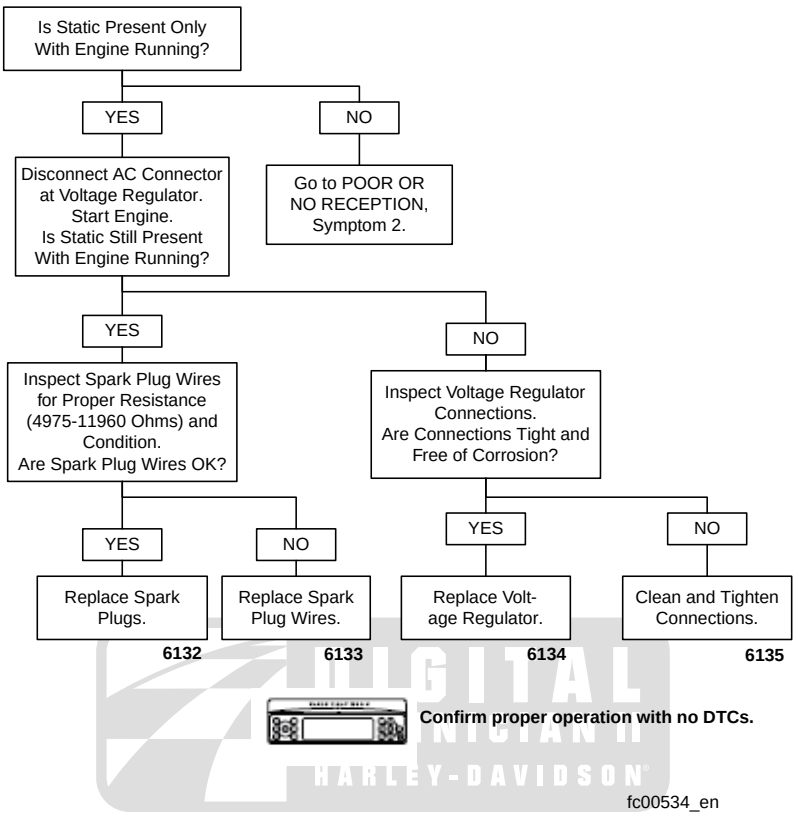


Confirm proper operation with no DTCs.

fc00533_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Static Present with Engine Running: Symptom 5



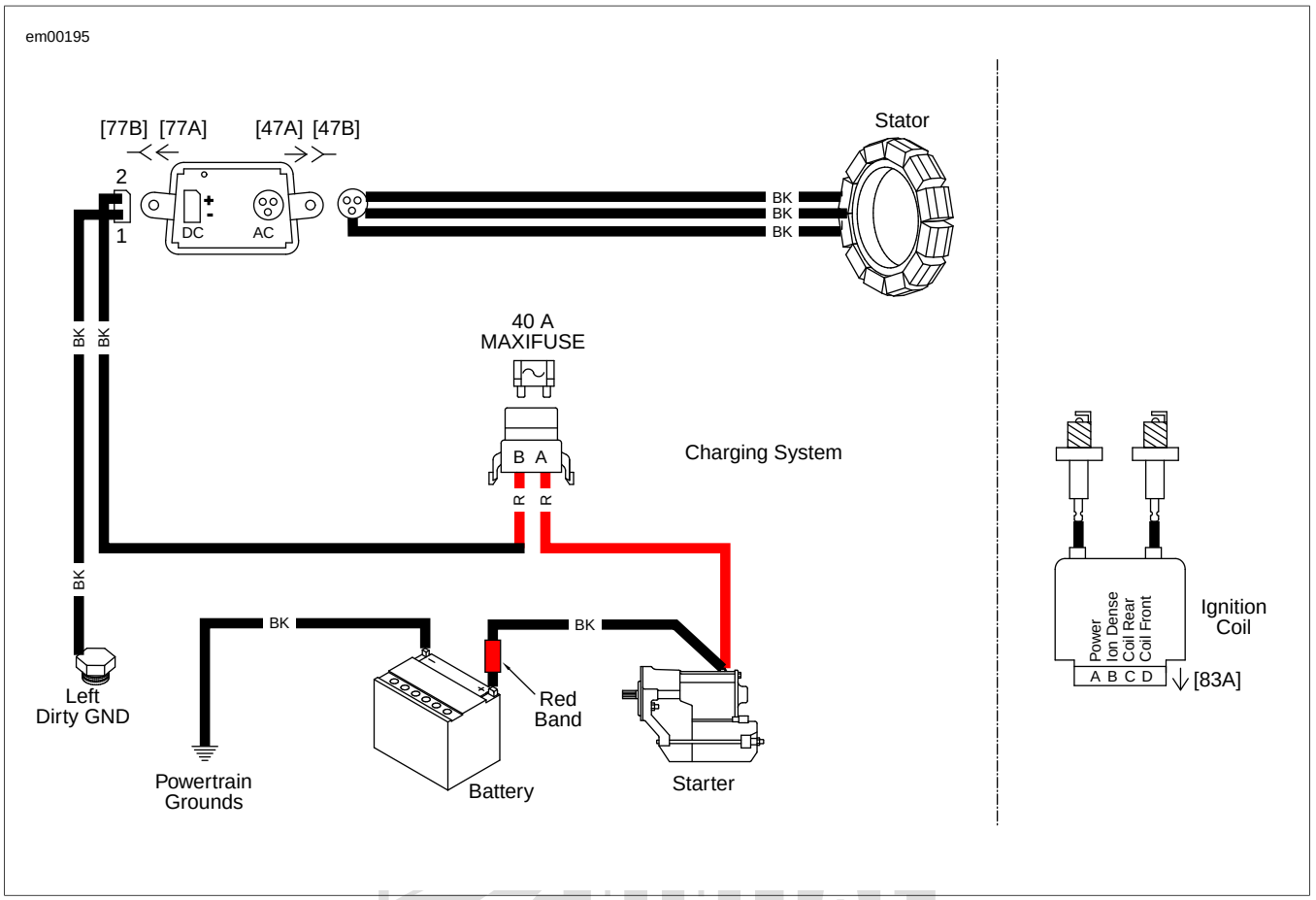


Figure 5-32. Voltage Regulator/Spark Plug Connections

Auxiliary Input Audio Distorted: Symptom 6

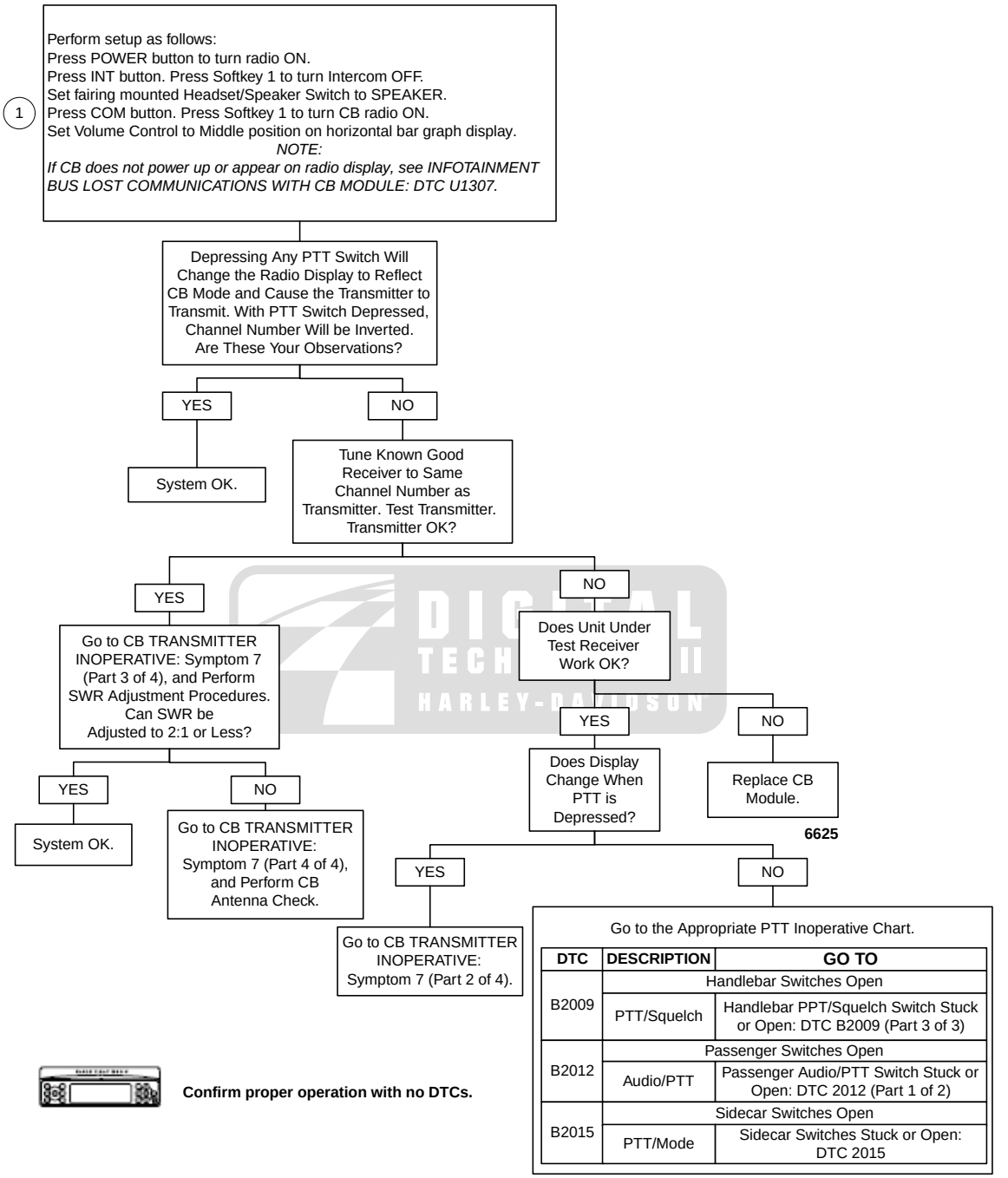
Turn Auxiliary Device Volume Down.



Confirm proper operation with no DTCs.

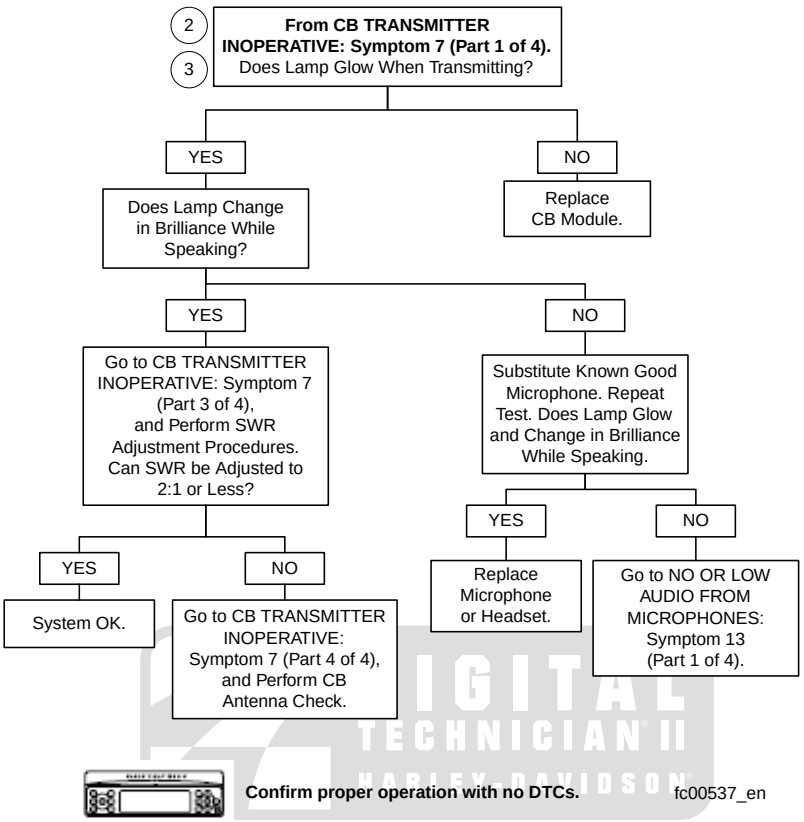
fc00535_en

CB Transmitter Inoperative: Symptom 7 (Part 1 of 4)



fc00536_en

CB Transmitter Inoperative: Symptom 7 (Part 2 of 4)



CB Transmitter Inoperative: Symptom 7: SWR Adjustment (Part 3 of 4)

CAUTION

Do not press PTT switches with antenna and SWR meter disconnected. Transceiver damage could result. (00522b)

Standing Wave Ratio (SWR) is a technical term for the procedure that checks how well the CB transmitter and antenna are matched. The SWR should be 2:1 or below on channel 20. A SWR of 1:1 is optimum. To check SWR, a SWR meter or bridge is required. Your Harley-Davidson dealer will either have a SWR meter or direct you to a CB repair shop for a SWR check. Since the operating procedures for SWR meters vary, be sure you carefully follow the operating instructions for the SWR meter being used.

1. Locate motorcycle outdoors or in a building with a ceiling of 11 ft. (3.4 m) minimum above floor. Also, there must be 8 ft. (2.4 m) of radial clearance around motorcycle. Adjusting the SWR in an area with a lower ceiling and/or less radial clearance may result in an inaccurate adjustment.
2. Remove the outer fairing. Obtain Radio Shack SWR Meter (Part No. 21-534) or equivalent and SWR METER ADAPTERS (Part No. HD-48037). Remove the antenna cable and connect the SWR meter to the CB module. Connect the antenna cable to the SWR meter.
3. Check that the antenna loading coil bracket in Tour-Pak is tight and that antenna cable is tightly connected to loading coil.
4. Check that antenna mast is threaded securely on to base and set screw is tight.
5. Before measuring the SWR, the SWR meter must be calibrated. Follow the instructions for the meter being used. The following procedure is the general calibration most meter instructions specify.

NOTE

Do not touch the antenna or meter during calibration or SWR measurement. Move CAL knob and then move your hand away from meter while calibrating.

6. With ignition and CB switches ON, the SWR meter set on "FWD", channel 20 selected, press either PTT switches. Hold the PTT switch and rotate the calibration (CAL) control until the meter needle aligns with the "CAL" mark.
7. Release the PTT switch and move the FWD/REF switch to "REF" (reflected).
8. Press and hold either PTT switch. The meter reading is the SWR.
9. If SWR is more than 3:1, remove antenna cable from CB module. Using clip-on test leads, connect one lead of ohmmeter to center pin in antenna lead and other lead to antenna mast. Meter must read 1 ohm or less. Wiggle or flex mast while observing meter. If resistance is more than 1 ohm or varies when mast is wiggled, replace mast. Inspect connections at base of loading coil and at mounting bracket. If the SWR is less than 3:1, loosen antenna set screw and change mast length.

NOTE

It is normal to observe a reading of less than one ohm between the center conductor and ground due to the configuration of the loading coil.

10. Repeat Step 8. If SWR became higher, adjust antenna mast in opposite direction. Continue adjusting antenna until the minimum SWR is achieved. If you cannot obtain an SWR of 2:1 or less by adjusting the antenna length, make the mast shorter to improve the SWR. Remove mast and use grinder to shorten mast (grind in small increments). If SWR cannot be adjusted to less than 2:1, see CB TRANSMITTER INOPERATIVE (Part 4 of 4).
11. After SWR is adjusted on channel 20, check SWR on channels 1 and 40. Adjust the mast length to obtain a balance between channels 1 and 40.

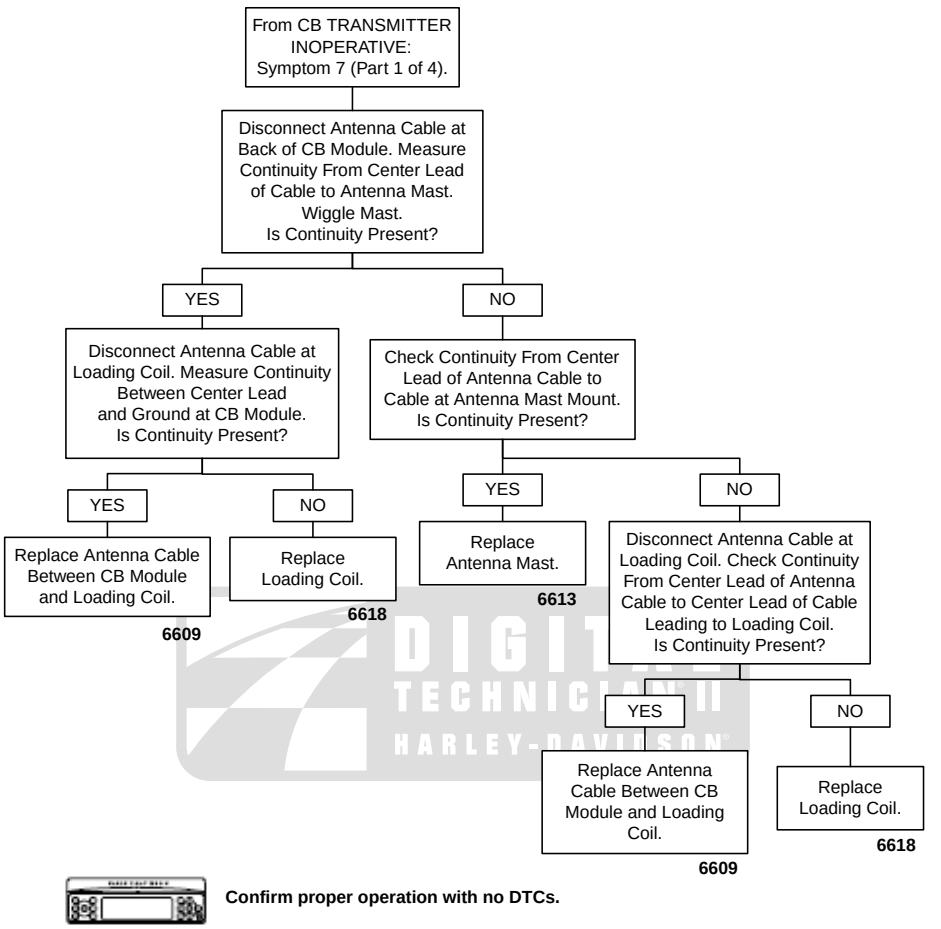
NOTE

Check the SWR if a luggage rack is installed on the Tour-Pak cover. Be sure that the Tour-Pak cover is closed when the check is performed. Accessories mounted on the Tour Pak may affect the SWR reading and broadcast range, so the luggage rack should be mounted as far forward as possible. The Ultra Tour-Pak chrome accent rail also can adversely affect SWR.



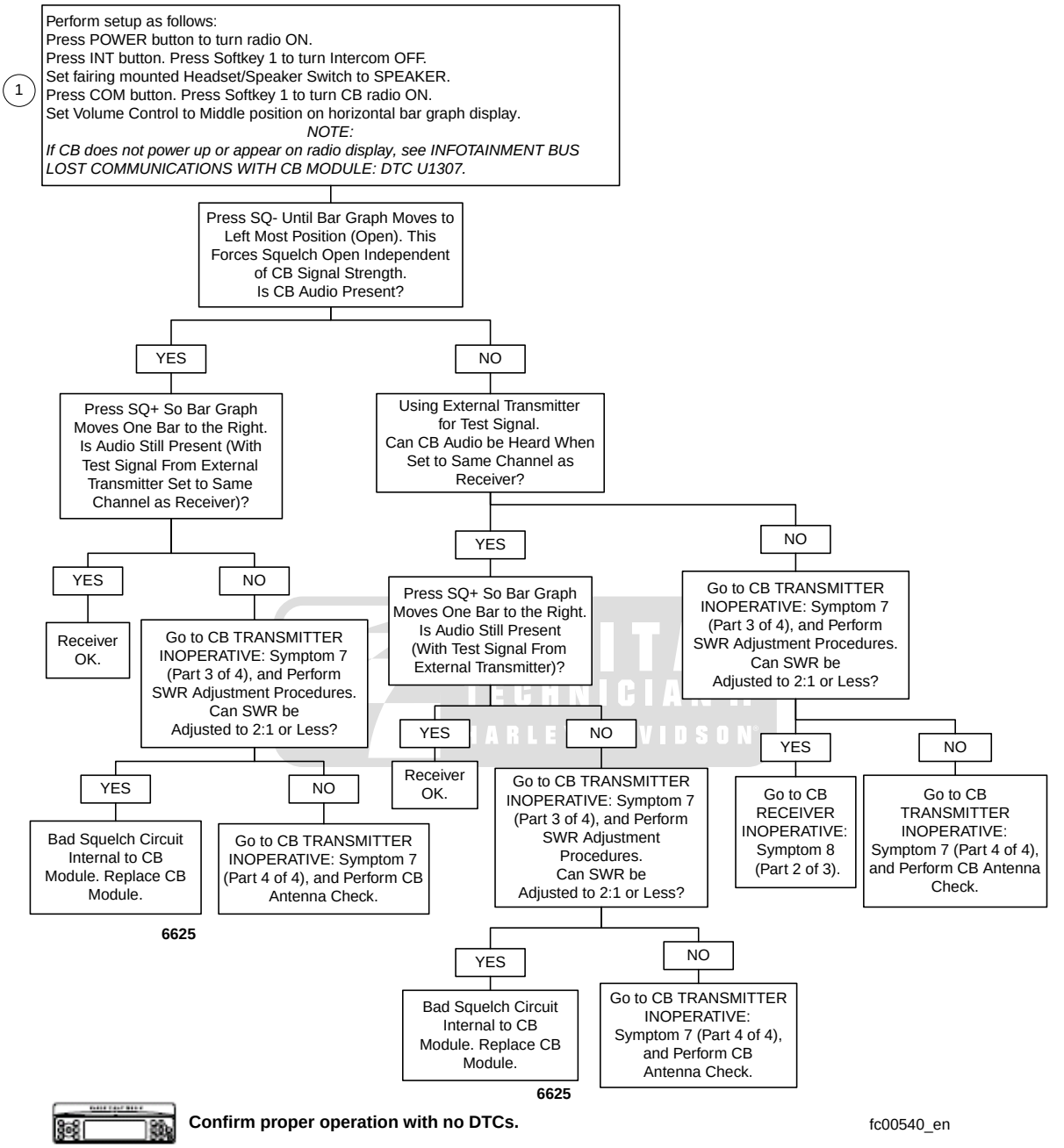
Figure 5-33. SWR Meter Adapters (Part No. HD-48037)

CB Transmitter Inoperative: Symptom 7 (Part 4 of 4)



fc00539_en

CB Receiver Inoperative: Symptom 8 (Part 1 of 3)



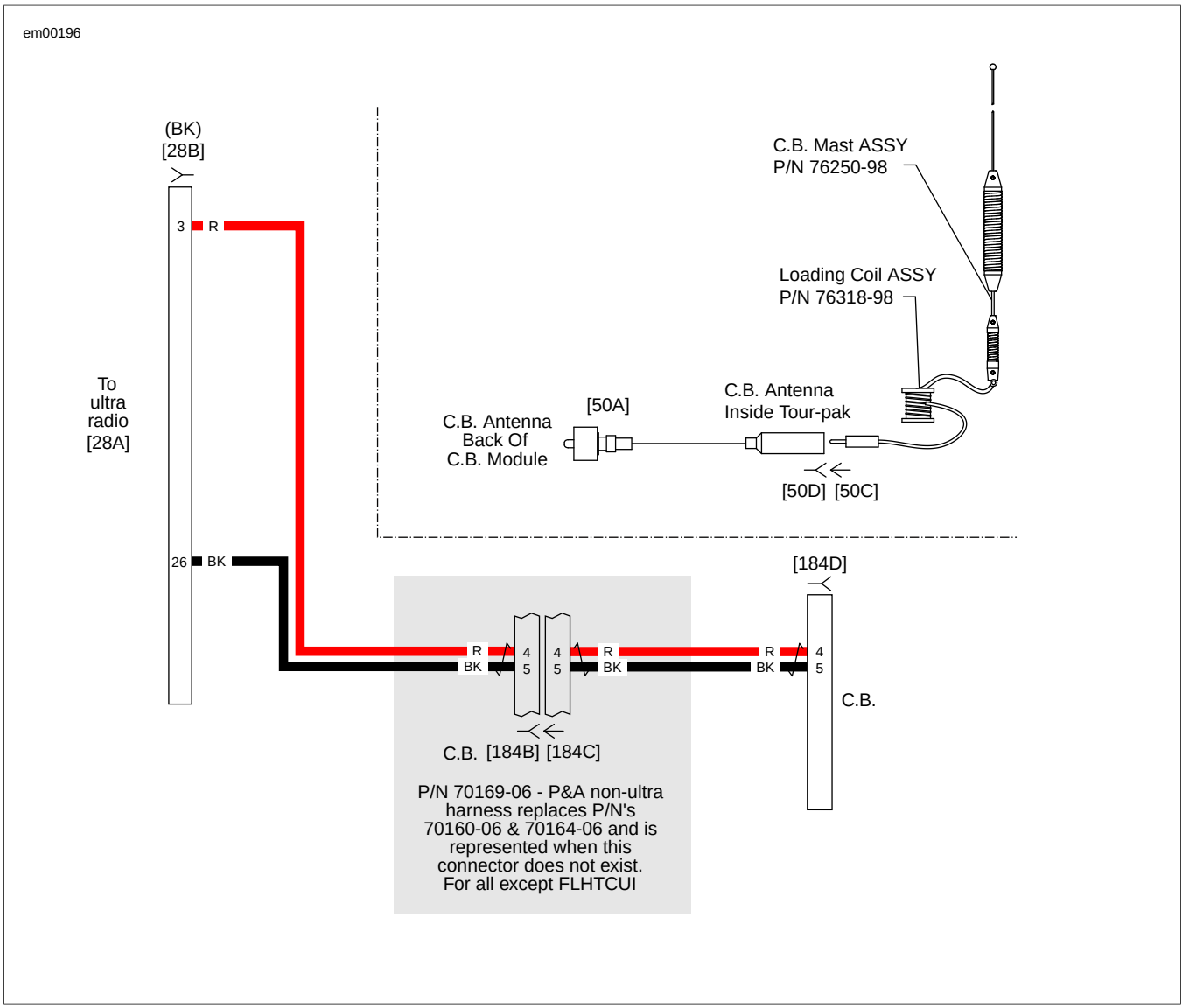
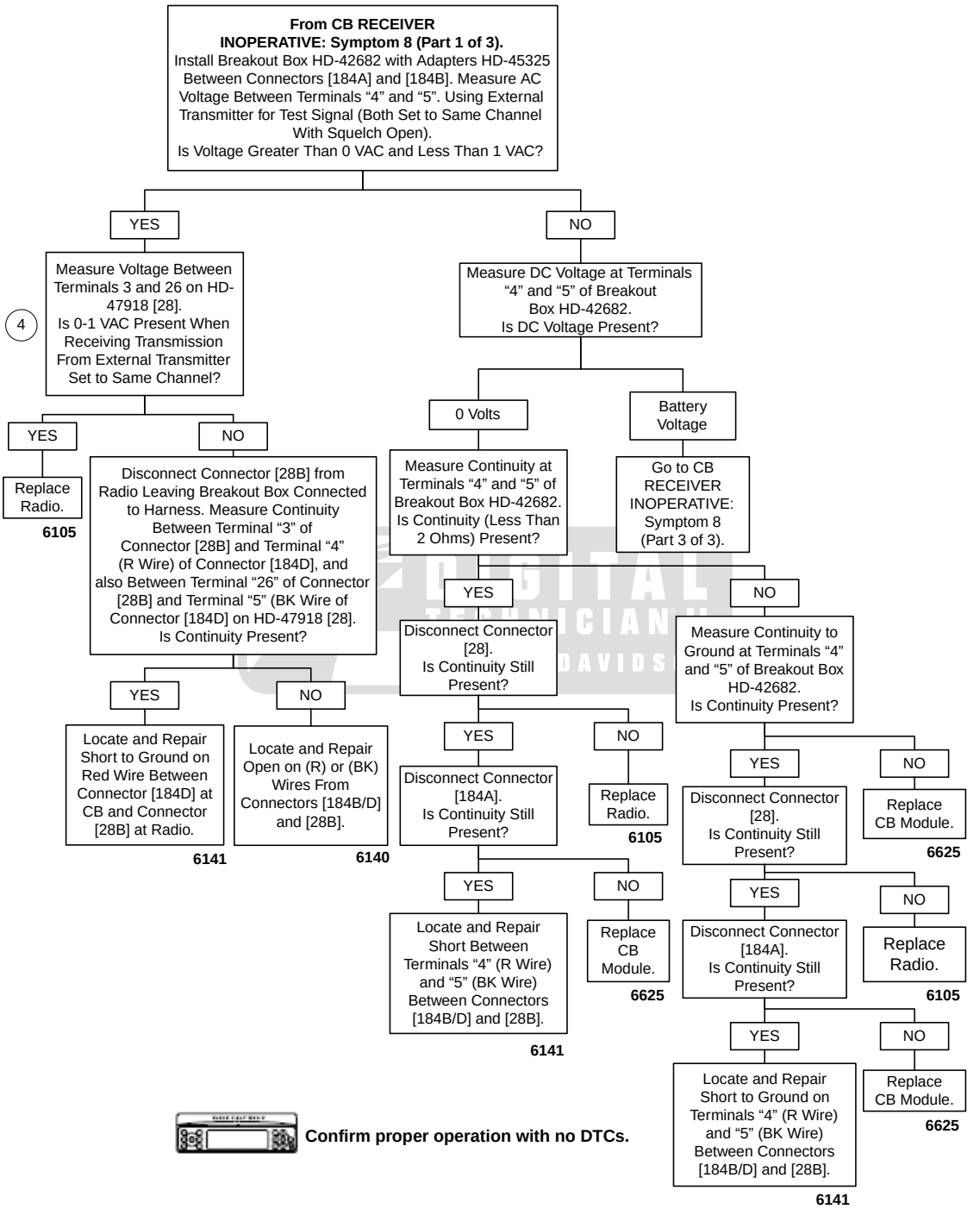


Figure 5-34. CB Receiver Audio Circuit

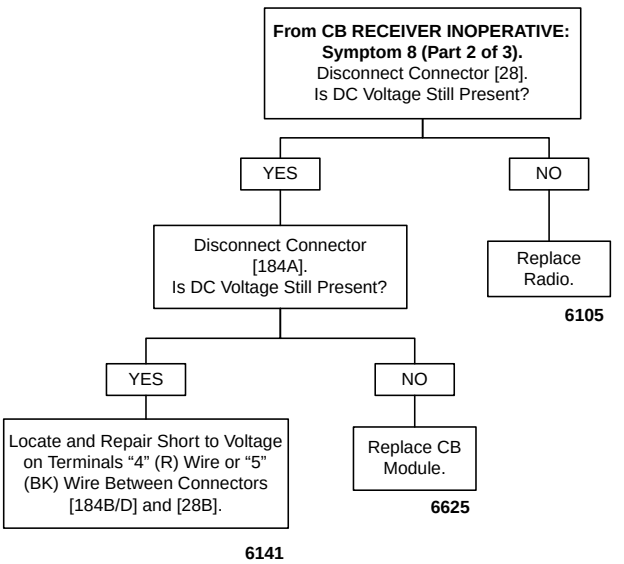
Table 5-36. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[50]	CB antenna cable	-	Inner fairing - back of CB module
[184]	CB module	12-Place Mini-Deutsch	Inner fairing - left side of radio

CB Receiver Inoperative: Symptom 8 (Part 2 of 3)



CB Receiver Inoperative: Symptom 8 (Part 3 of 3)

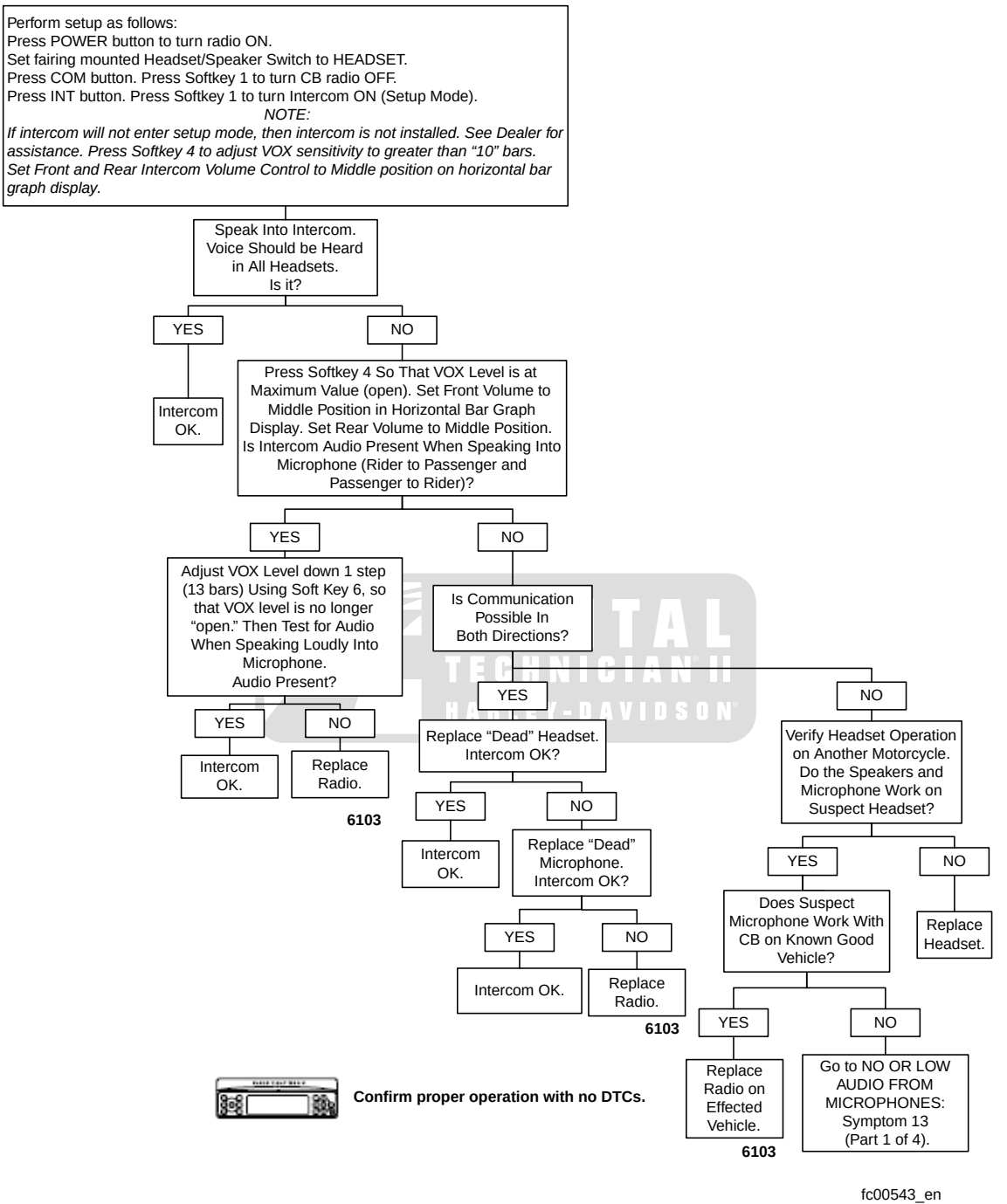




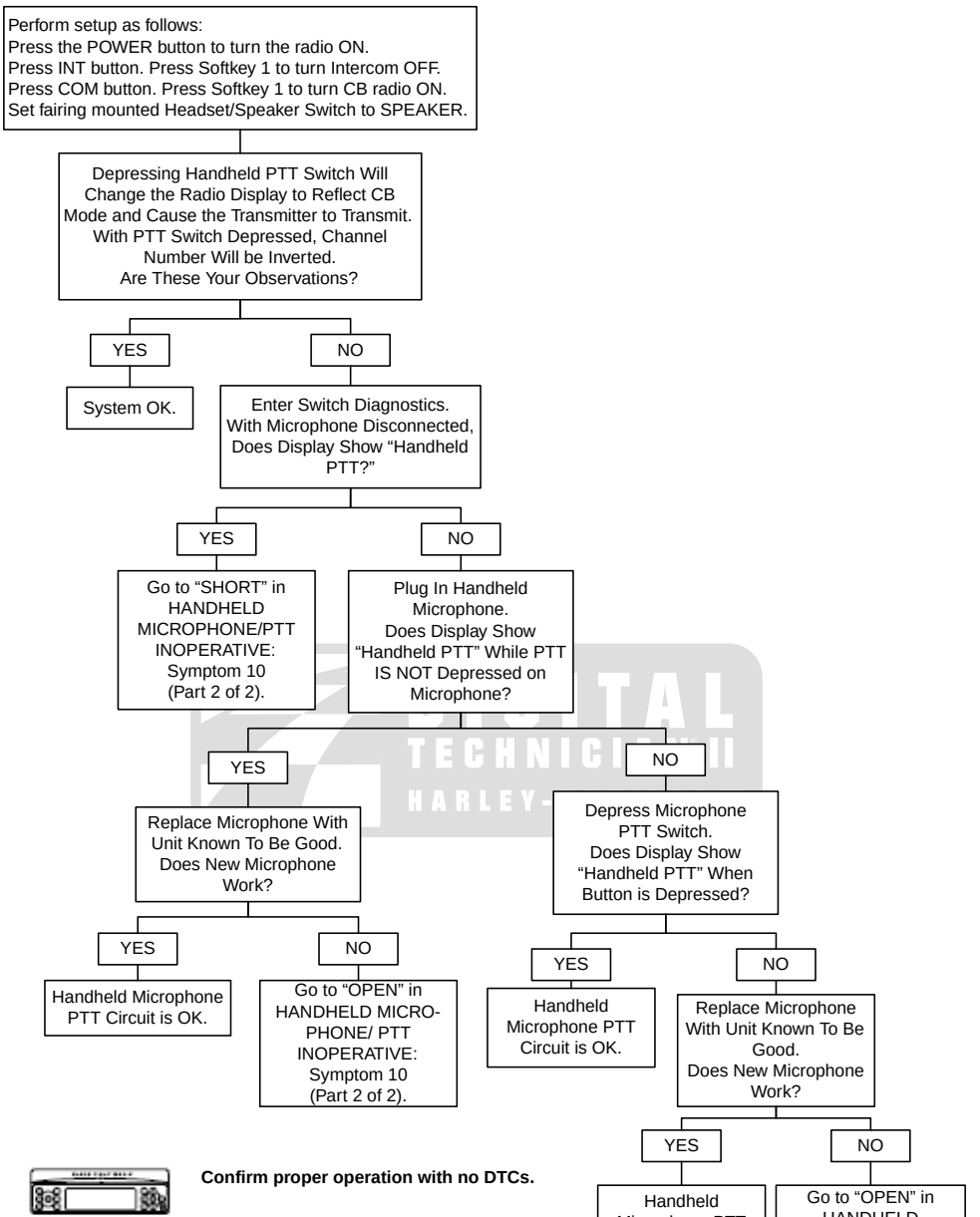
Confirm proper operation with no DTCs. fc00542_en

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Intercom Inoperative: Symptom 9

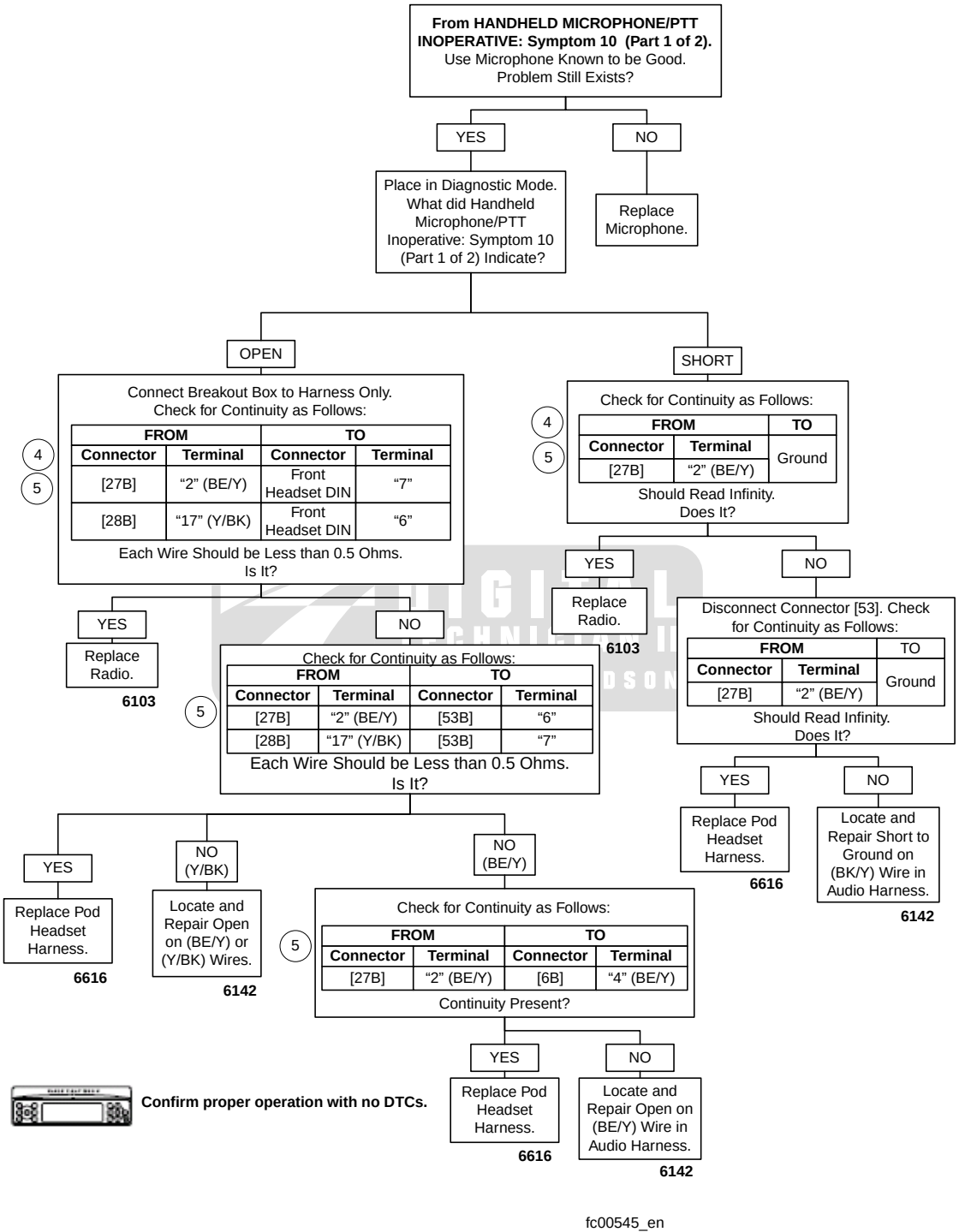


Handheld Microphone/PTT Inoperative: Symptom 10 (Part 1 of 2)



fc00544_en

Handheld Microphone/PTT Inoperative: Symptom 10 (Part 2 of 2)



fc00545_en

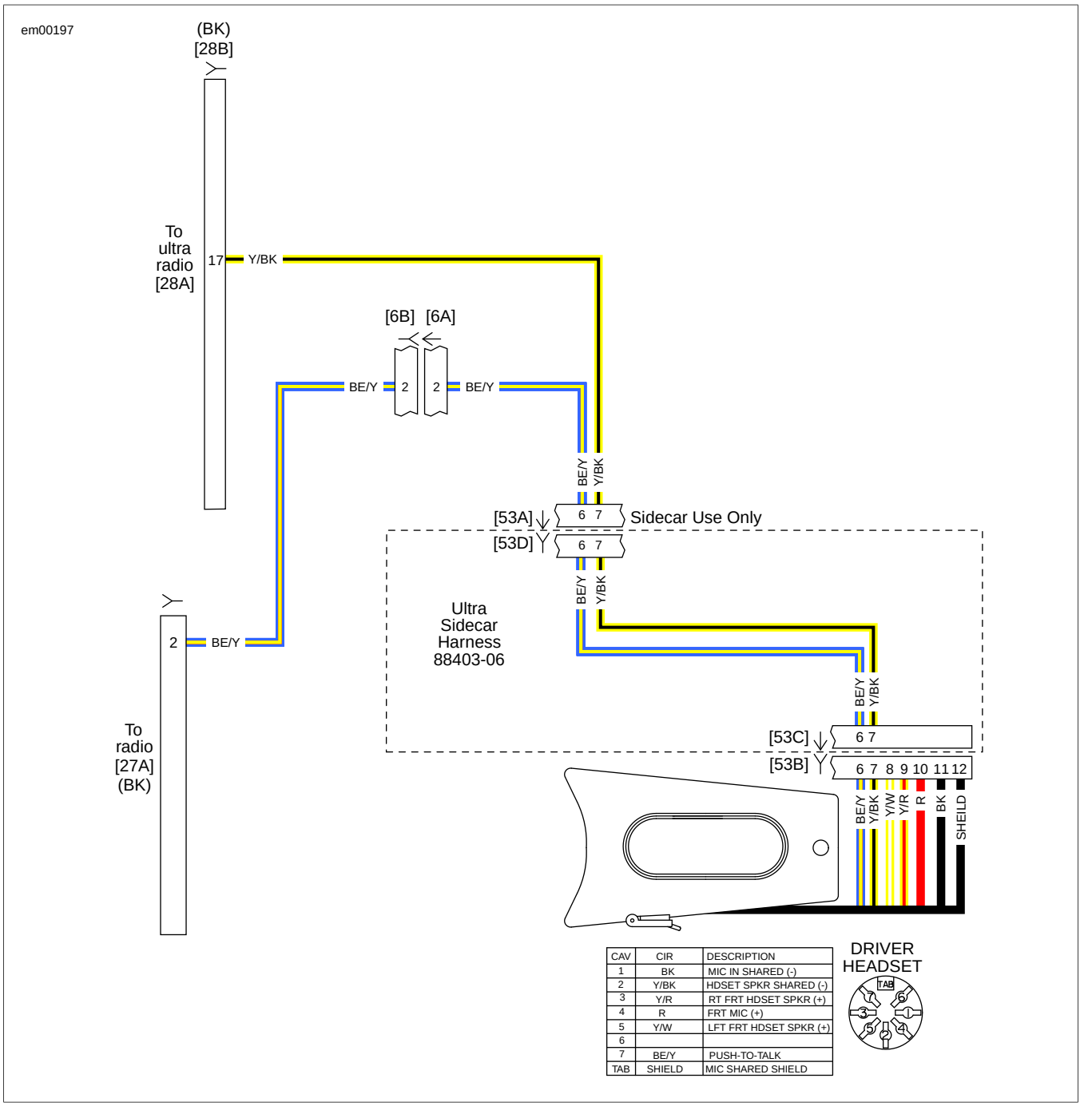
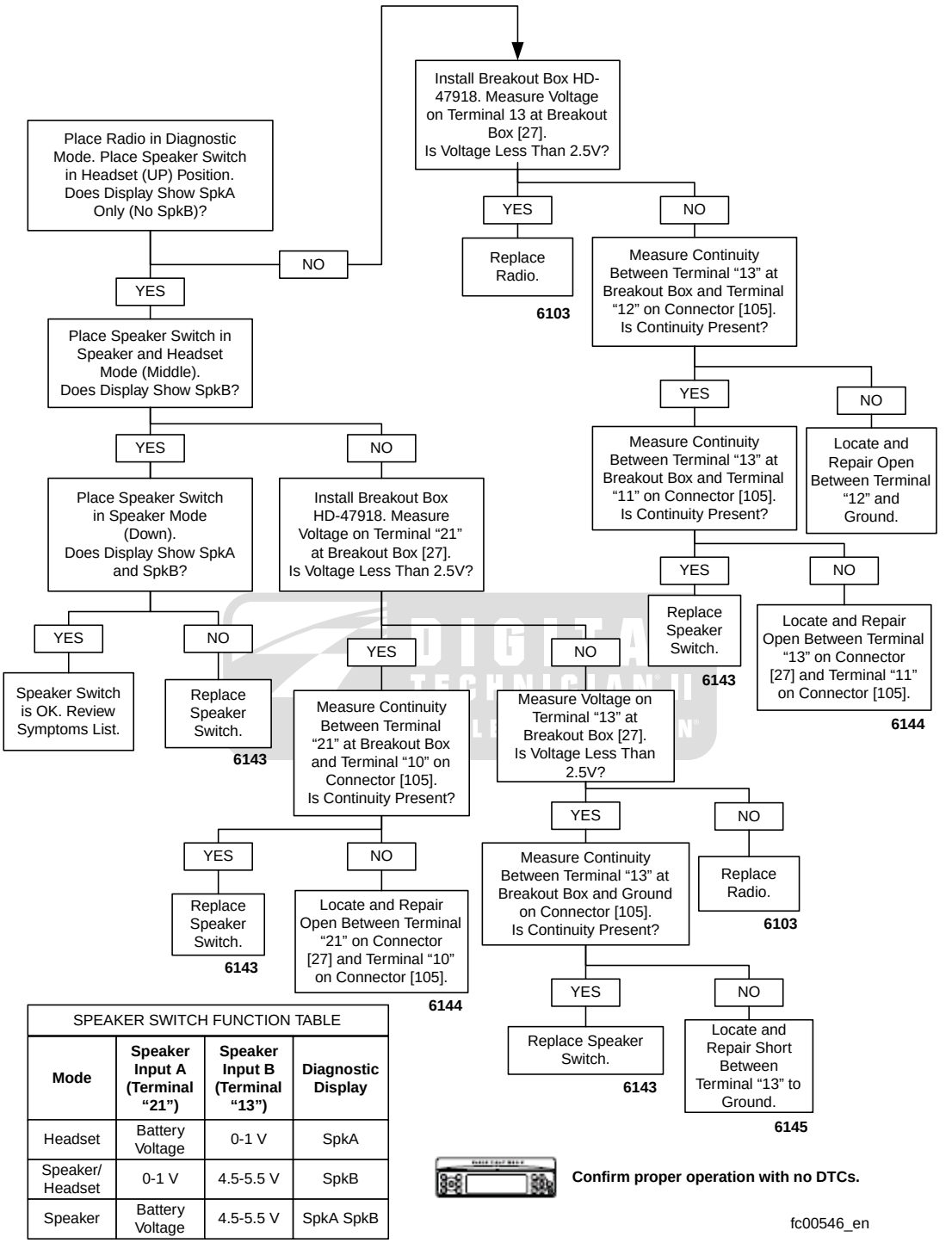


Figure 5-35. Handheld Microphone/PTT Circuit

Table 5-37. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - back of radio (left side) Inner fairing - left side of radio
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[53]	Console pod	12-Place Mini-Deutsch	Rear of battery box (under seat)

Speaker Switch Malfunction: Symptom 11



SPEAKER SWITCH FUNCTION TABLE			
Mode	**Speaker Input A (Terminal "21")**	**Speaker Input B (Terminal "13")**	**Diagnostic Display**
Headset	Battery Voltage	0-1 V	SpkA
Speaker/ Headset	0-1 V	4.5-5.5 V	SpkB
Speaker	Battery Voltage	4.5-5.5 V	SpkA SpkB

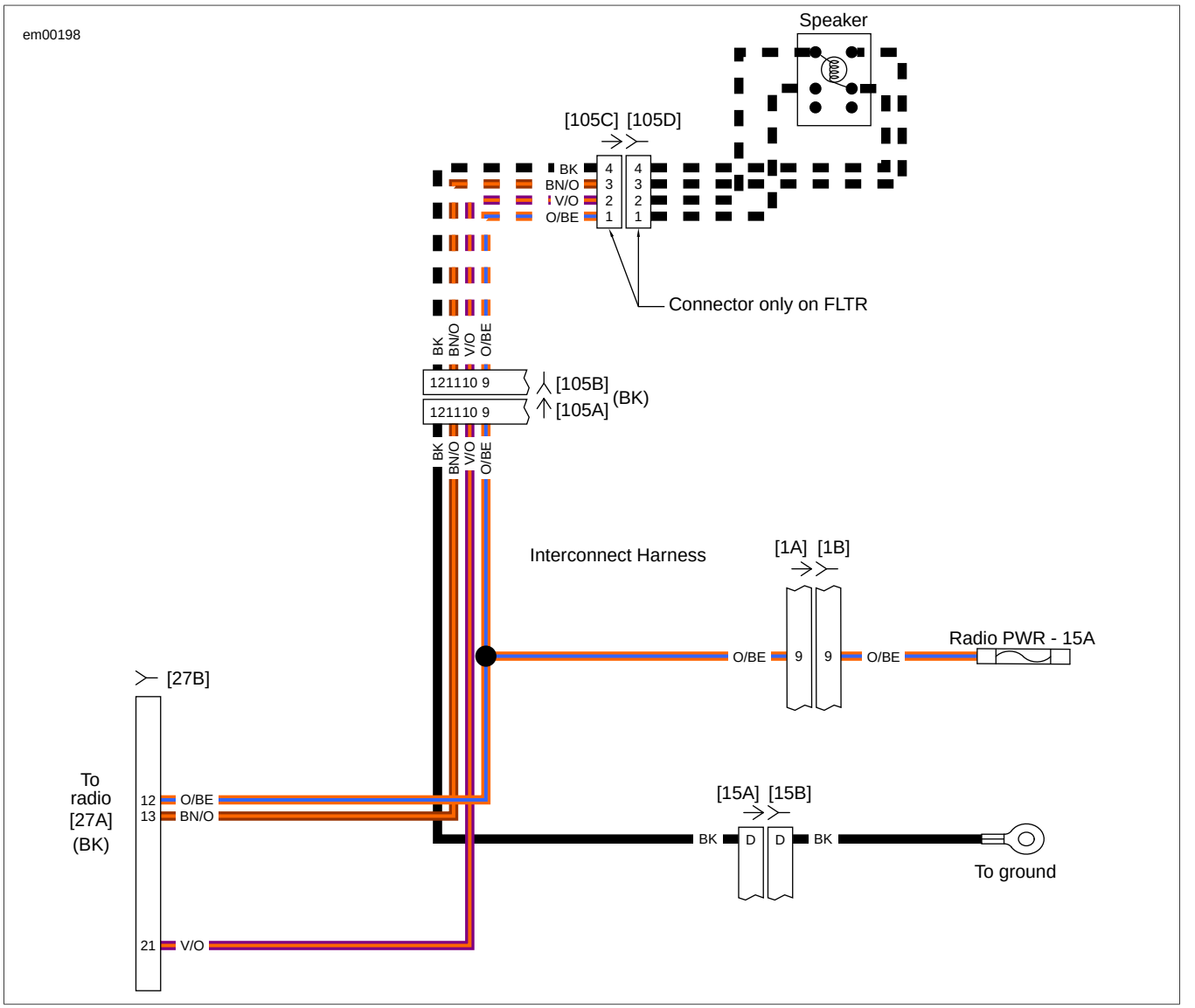
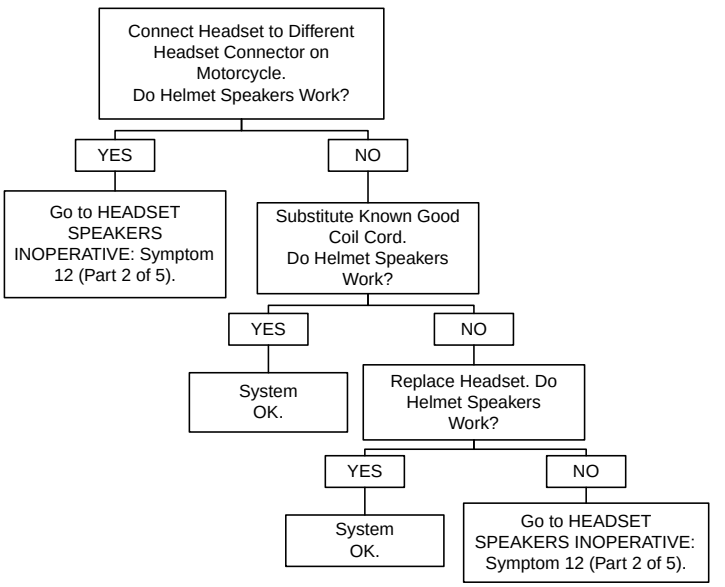


Figure 5-36. Speaker Switch Circuit

Table 5-38. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-Place Molex	Inner fairing - right radio support bracket
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[105]	Fairing cap switches	12-Place Multilock	Inner fairing - above upper fork bracket (right side)

Headset Speakers Inoperative: Symptom 12 (Part 1 of 5)

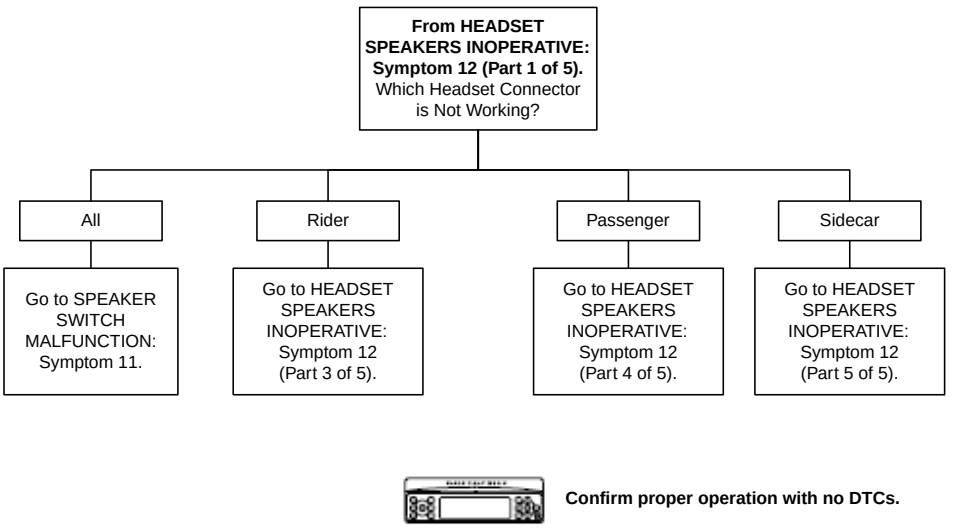




Confirm proper operation with no DTCs.

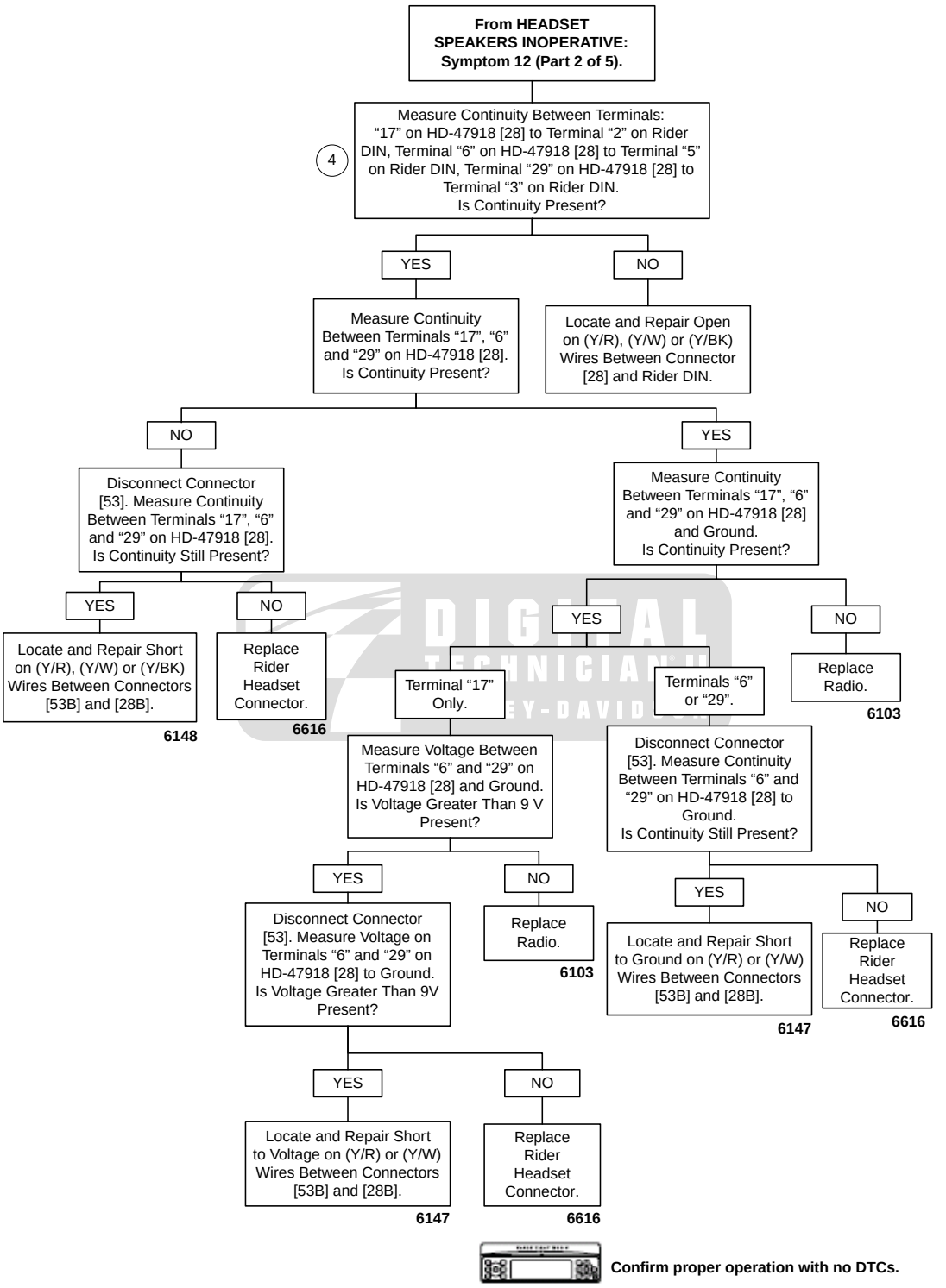
fc00547_en

Headset Speakers Inoperative: Symptom 12 (Part 2 of 5)

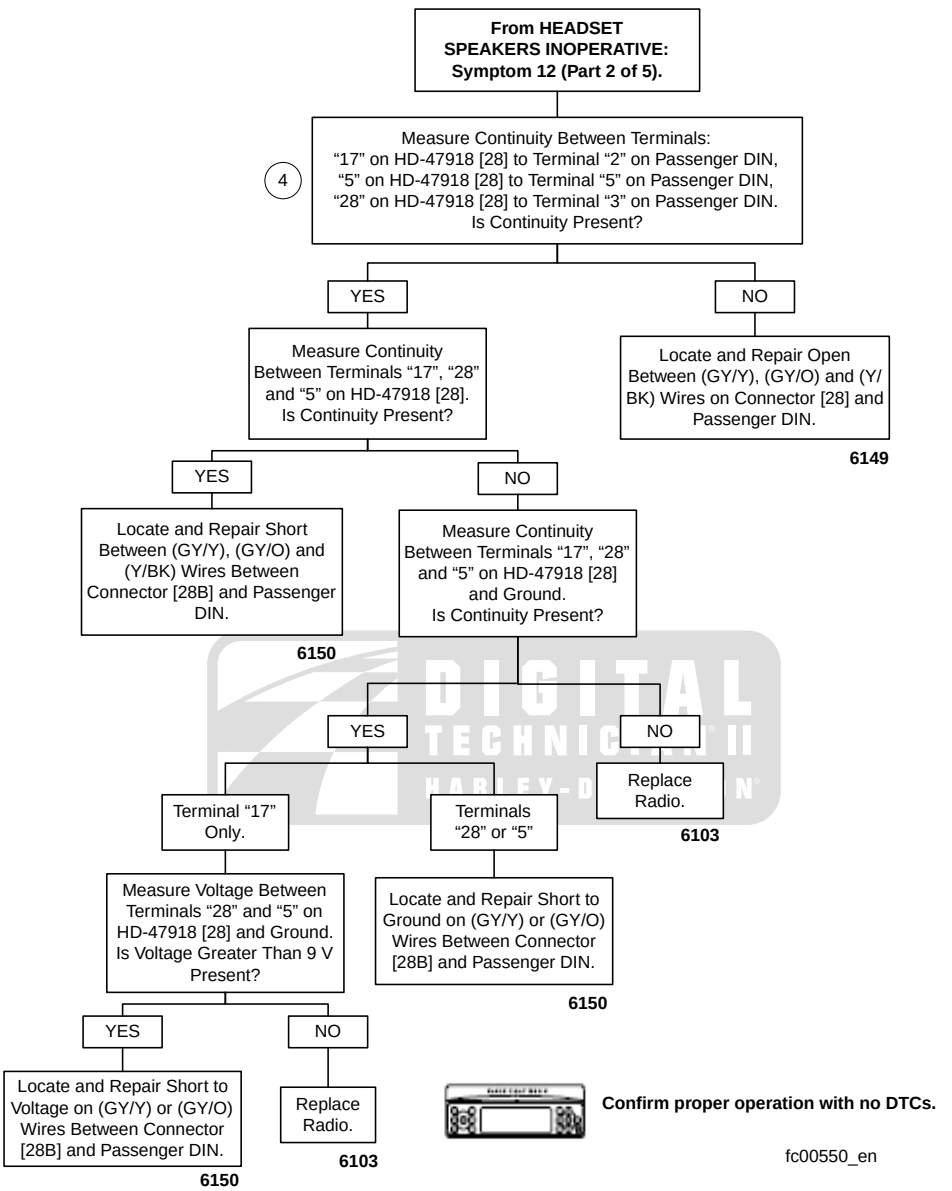


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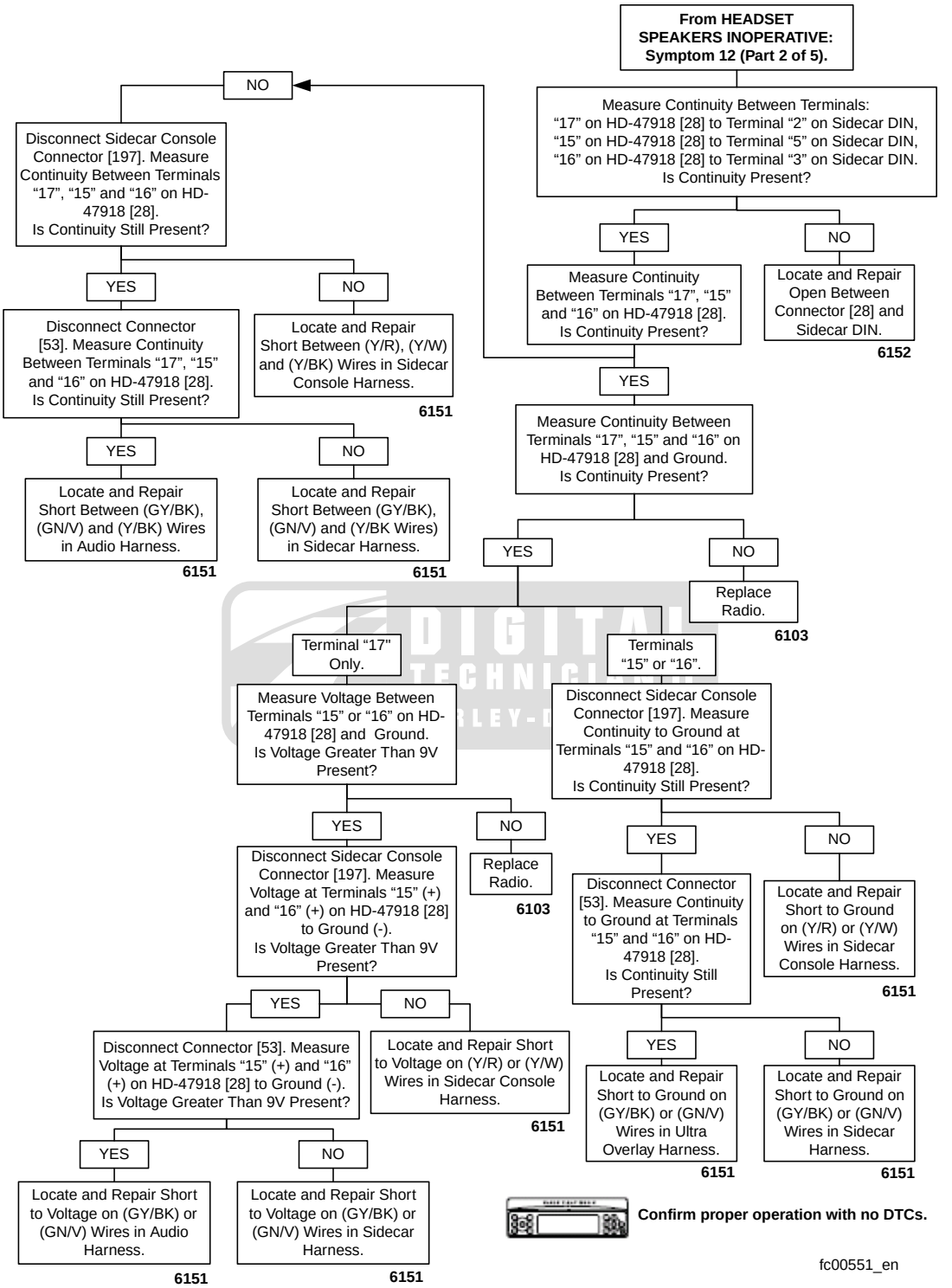
Headset Speakers Inoperative: Symptom 12 (Part 3 of 5)



Headset Speakers Inoperative: Symptom 12 (Part 4 of 5)



Headset Speakers Inoperative: Symptom 12 (Part 5 of 5)



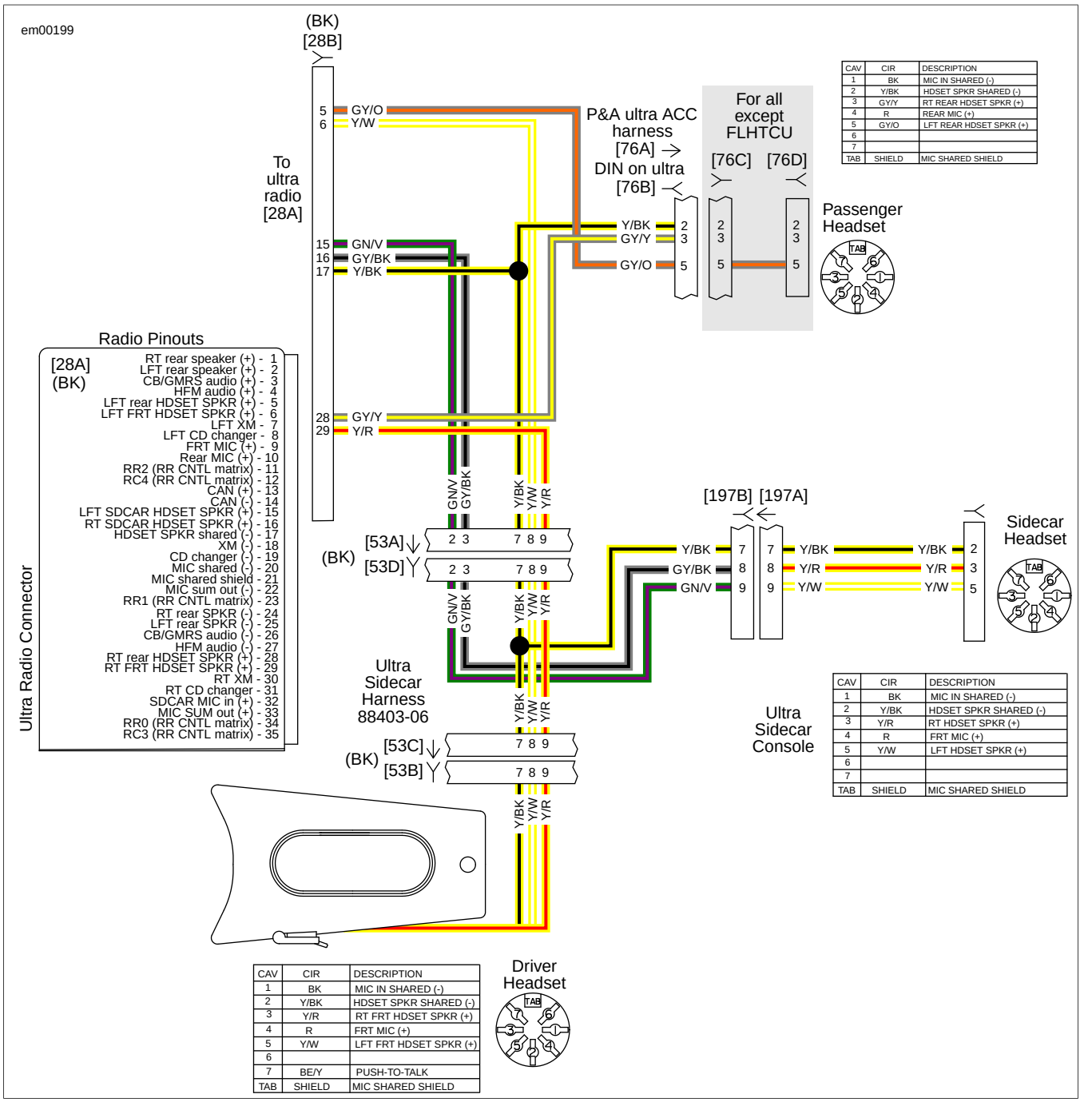
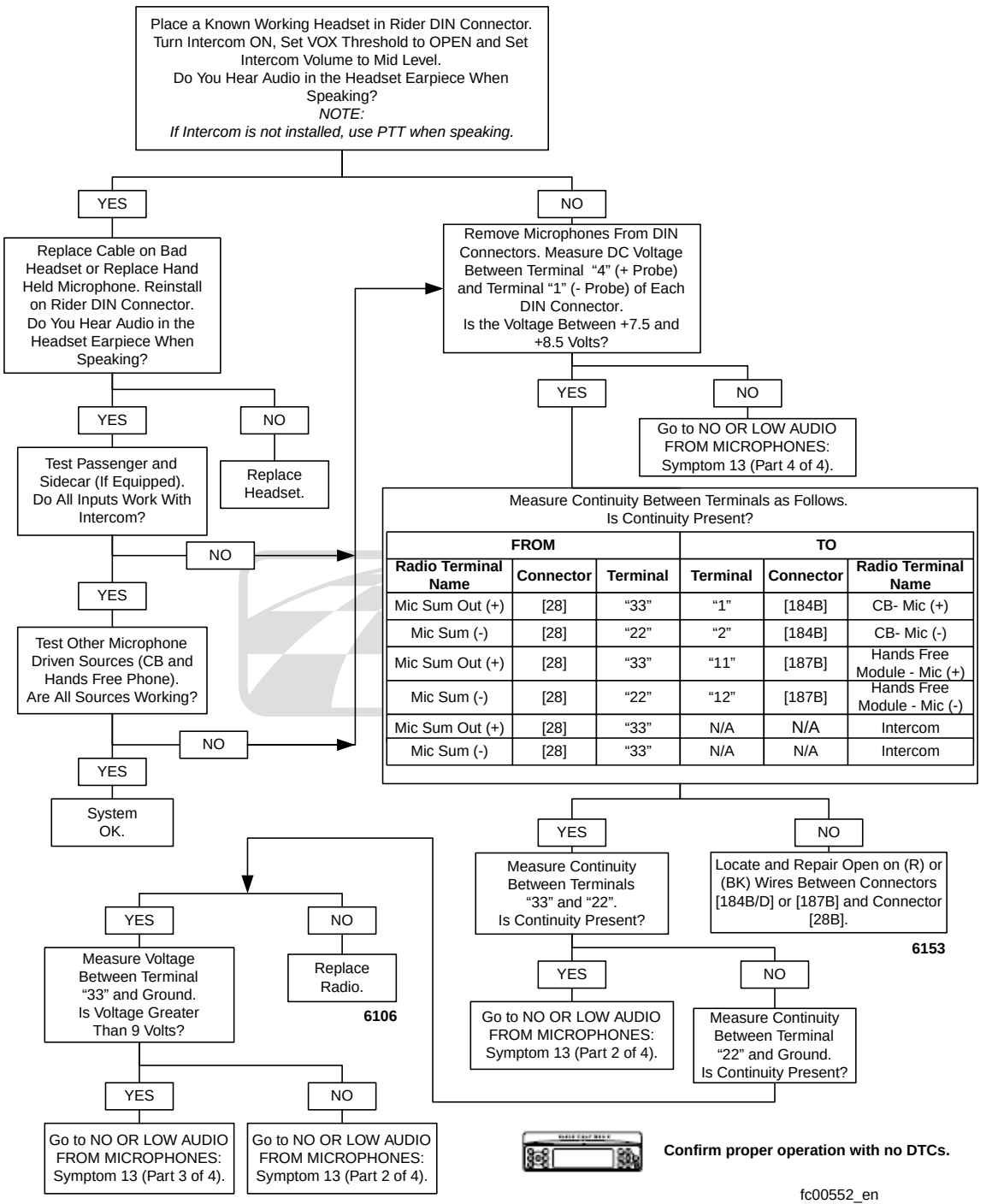


Figure 5-37. Headset Speaker Circuit

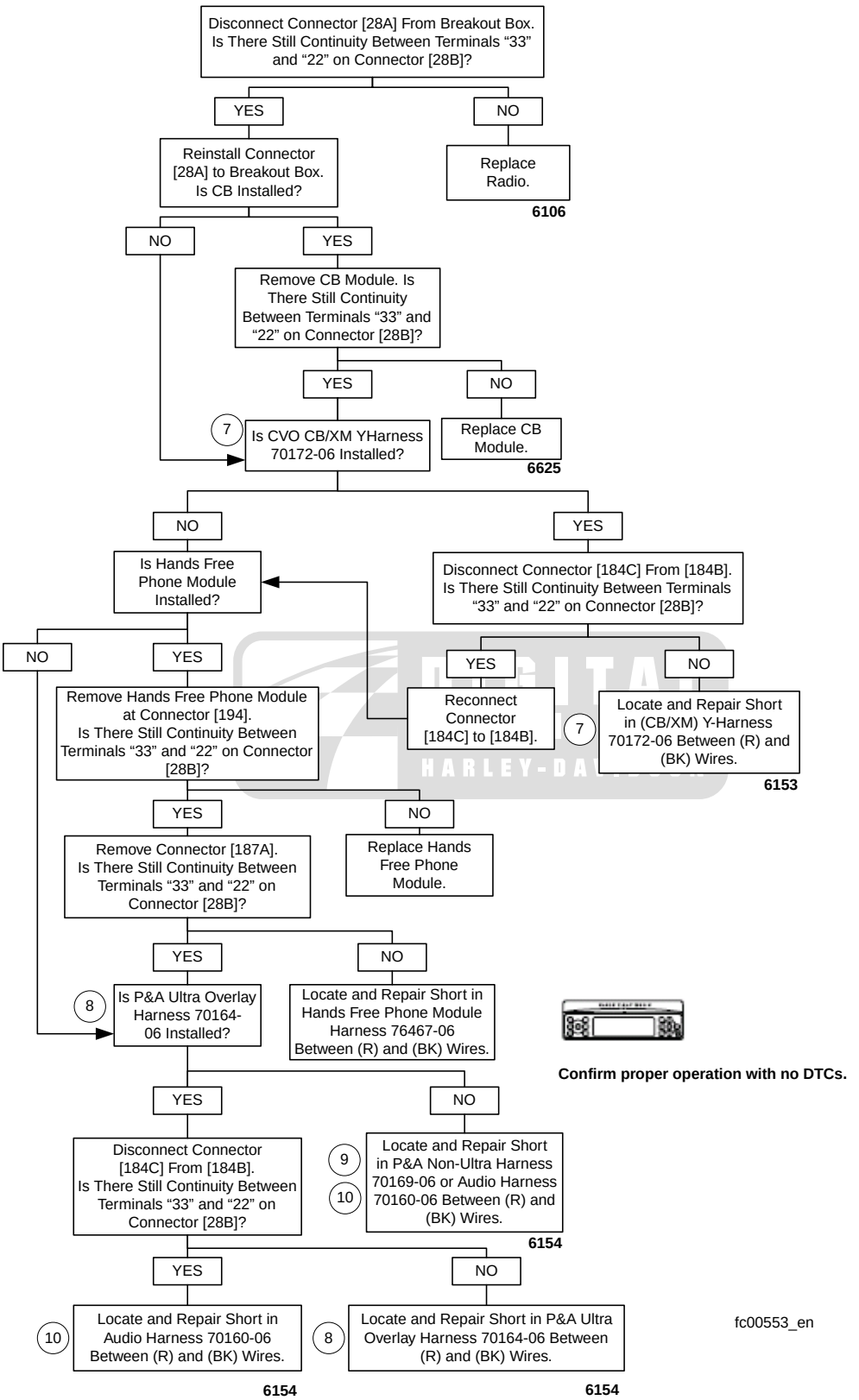
Table 5-39. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[53]	Console pod	12-Place Mini-Deutsch	Rear of battery box (under seat)
[197]	Sidecar console	12-Place Mini-Deutsch	Inside sidecar console

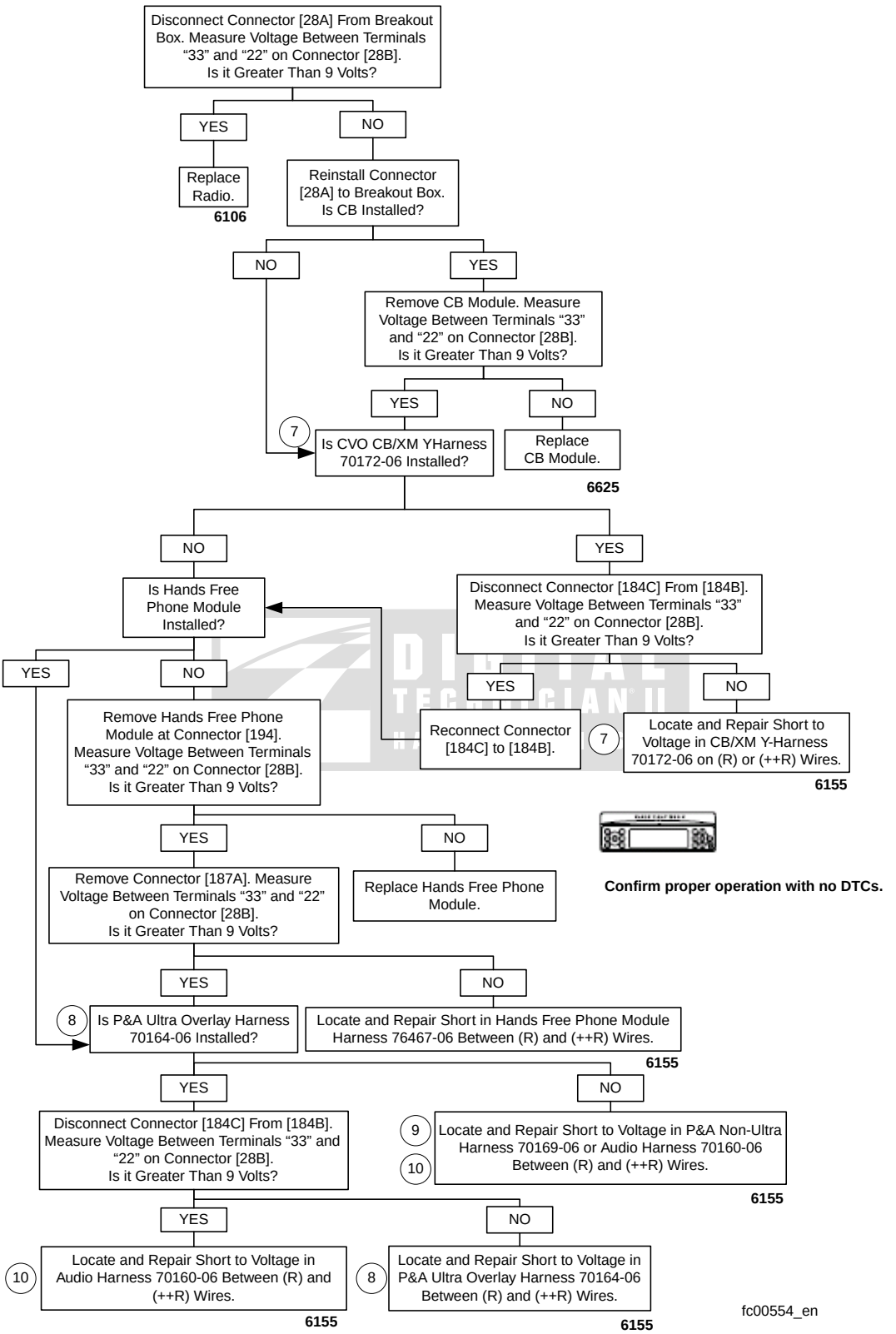
No or Low Audio From Microphones: Symptom 13 (Part 1 of 4)



No or Low Audio From Microphones: Symptom 13 (Part 2 of 4)



No or Low Audio From Microphones: Symptom 13 (Part 3 of 4)



No or Low Audio From Microphones: Symptom 13 (Part 4 of 4)

Remove All Microphones/Headsets. Measure Continuity Between Terminals as Follows.

	FROM		FROM	
Function	**Connector**	**Terminal**	**Connector**	**Terminal**
Shield	Rider DIN	Tab	[28B]	“21”
Mic (+)	Rider DIN	“4”	[28B]	“9”
Mic (-)	Rider DIN	“1”	[28B]	“20”
Shield	Passenger DIN	Tab	[28B]	“21”
Mic (+)	Passenger DIN	“4”	[28B]	“10”
Mic (-)	Passenger DIN	“1”	[28B]	“20”
Shield	Sidecar DIN	Tab	[28B]	“21”
Mic (+)	Sidecar DIN	“4”	[28B]	“32”
Mic (-)	Sidecar DIN	“1”	[28B]	“20”

Is Continuity Present?

YES

Install Breakout Box HD-44608. Measure Continuity Between Terminals “20” (Mic Shared -) and “21” (Mic Shared Shield) on Connector [28B] and Ground. Is Continuity Present?

YES

Measure Continuity Between Terminals “9”, “10” and “32” (Mic +) on Connector [28B] and Ground. Is Continuity Present?

YES

Disconnect Connector [28B] From Breakout Box. Measure Voltage at Terminals “9”, “10” and “32”. Is Voltage Between 7.5 and 8.5 Volts?

YES

Reconnect Connector [28B] to Breakout Box. Measure Voltage at Terminals “9”, “10” and “32”. Is Voltage Greater Than 8.5 Volts?

YES

Locate and Repair Short to Battery on (R) Wire Showing Short to Voltage.

6155

NO

Were You Directed to These Charts From NO OR LOW AUDIO TO HAND FREE MODULE?

YES

Replace Hands Free Phone Module.

NO

No Trouble Found.

NO

Locate and Repair Open on (R), (BK) and Shield Wires Between DIN Connector and Connector [28B].

6153

NO

Replace Radio.

6106

NO

Locate and Repair Short to Ground on (R) Wire Showing Continuity.

6155

NO

Replace Radio.

6106



Confirm proper operation with no DTCs.

fc00555_en

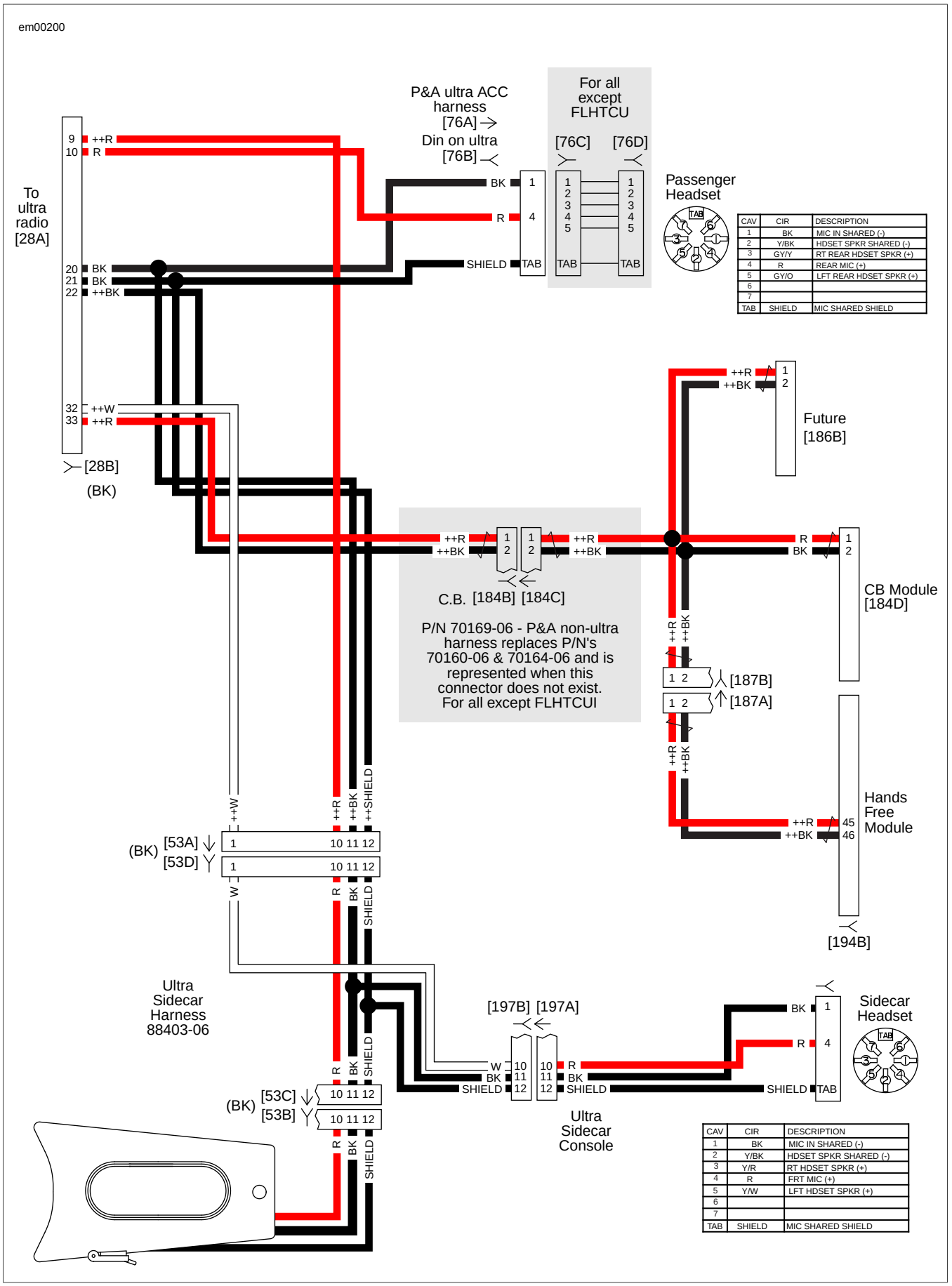
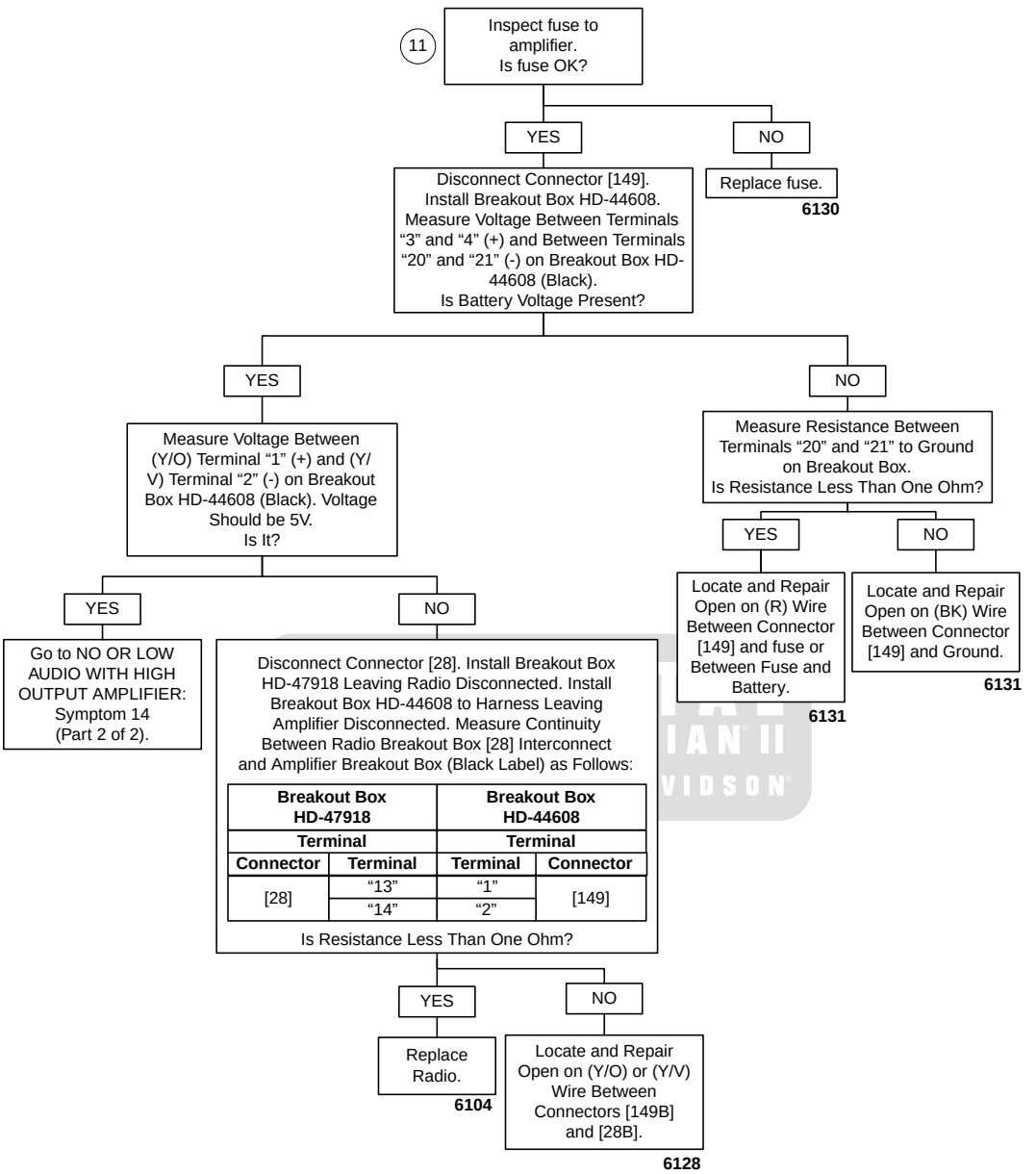


Figure 5-38. Microphone Audio Input Circuit

No or Low Audio with High Output Amplifier: Symptom 14 (Part 1 of 2)



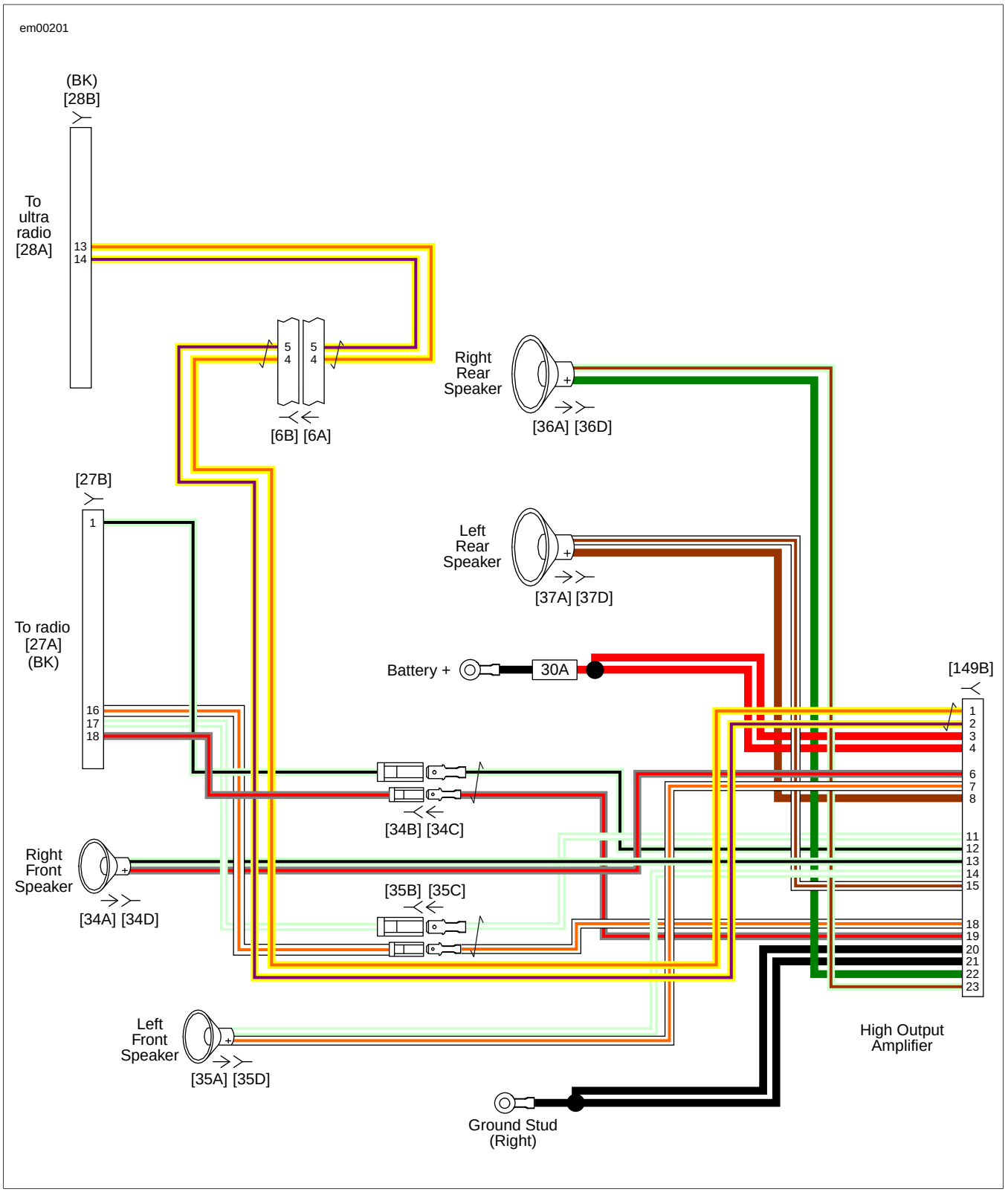


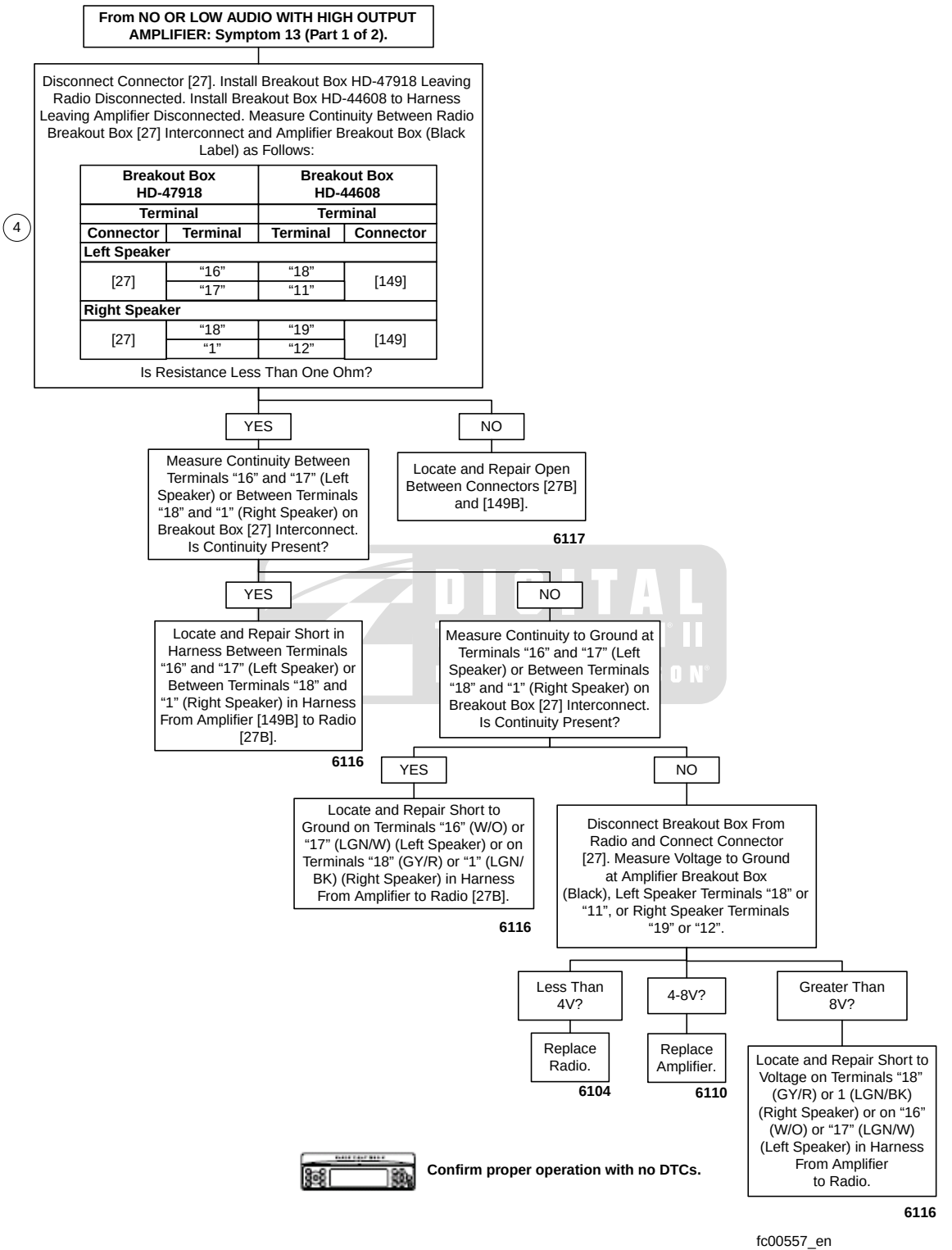
Figure 5-39. Front/Rear Speaker Circuits with Amplifier

Table 5-40. FLHT/C/U Wire Harness Connectors

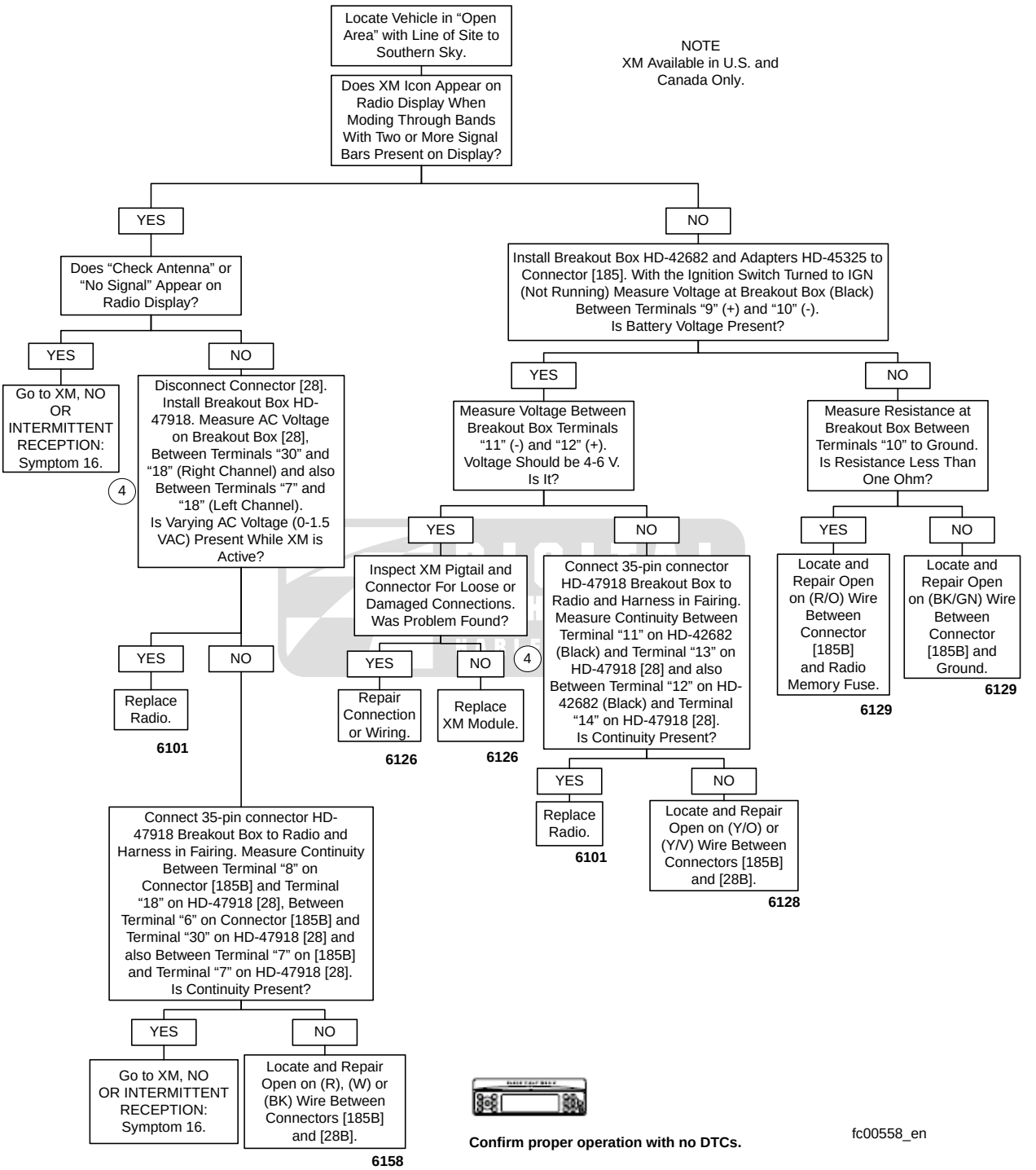
NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[34]	Front right speaker	Spade contacts	Inner fairing - back of right speaker
[35]	Front left speaker	Spade contacts	Inner fairing - back of left speaker
[36]	Rear right speaker	Spade contacts	Inside speaker box
[37]	Rear left speaker	Spade contacts	Inside speaker box
[149]	High output amplifier	23-Place Amp	Under luggage rack (right side)

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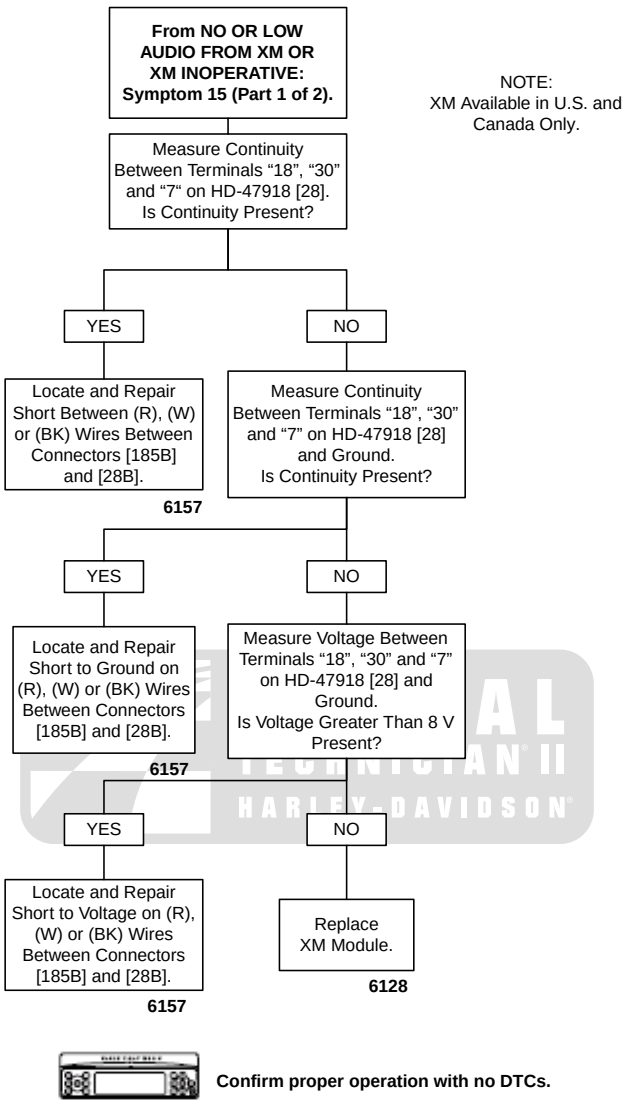
No or Low Audio with High Output Amplifier: Symptom 14 (Part 2 of 2)



No or Low Audio from XM or XM Inoperative: Symptom 15 (Part 1 of 2)



No or Low Audio from XM or XM Inoperative: Symptom 15 (Part 2 of 2)



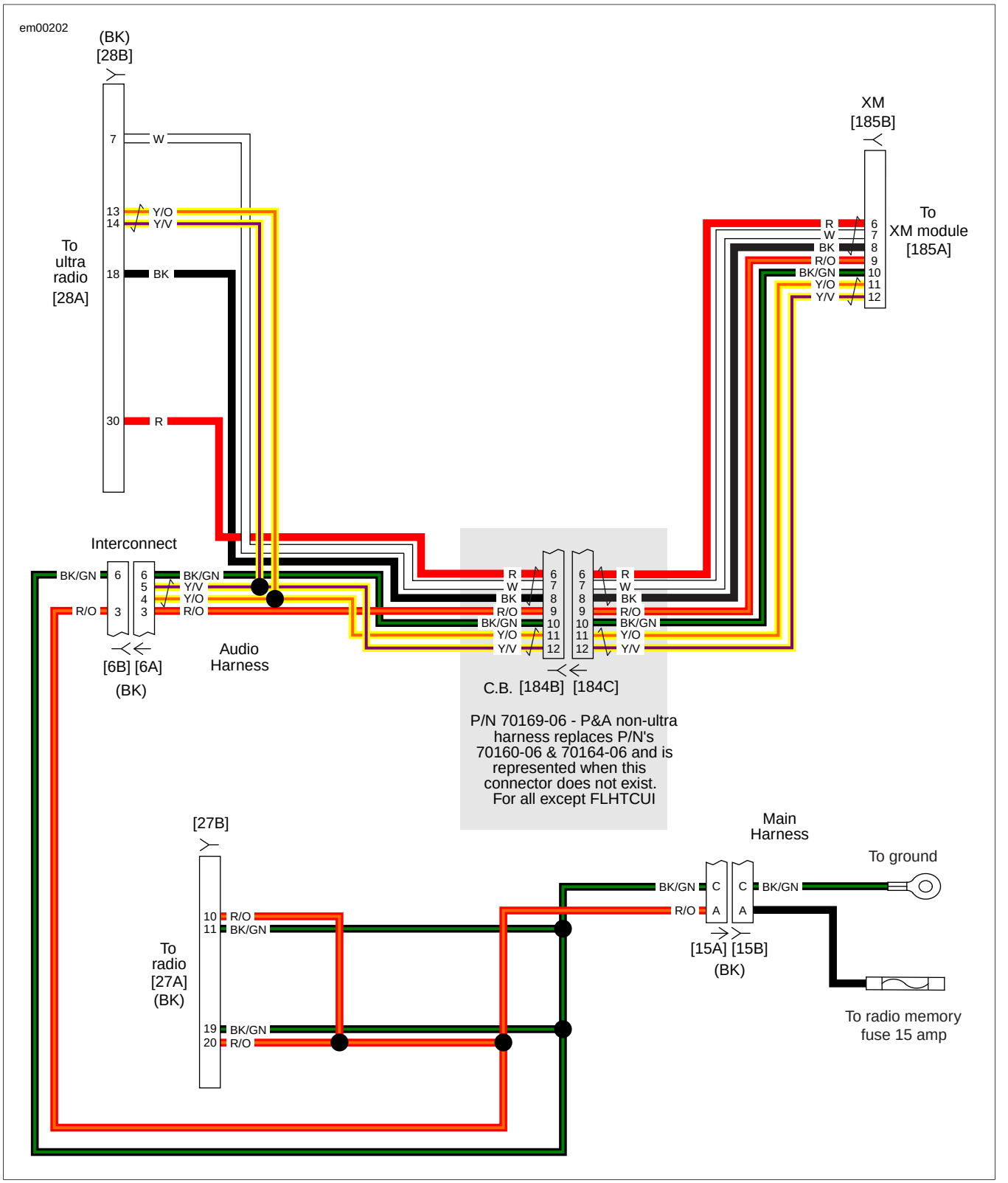


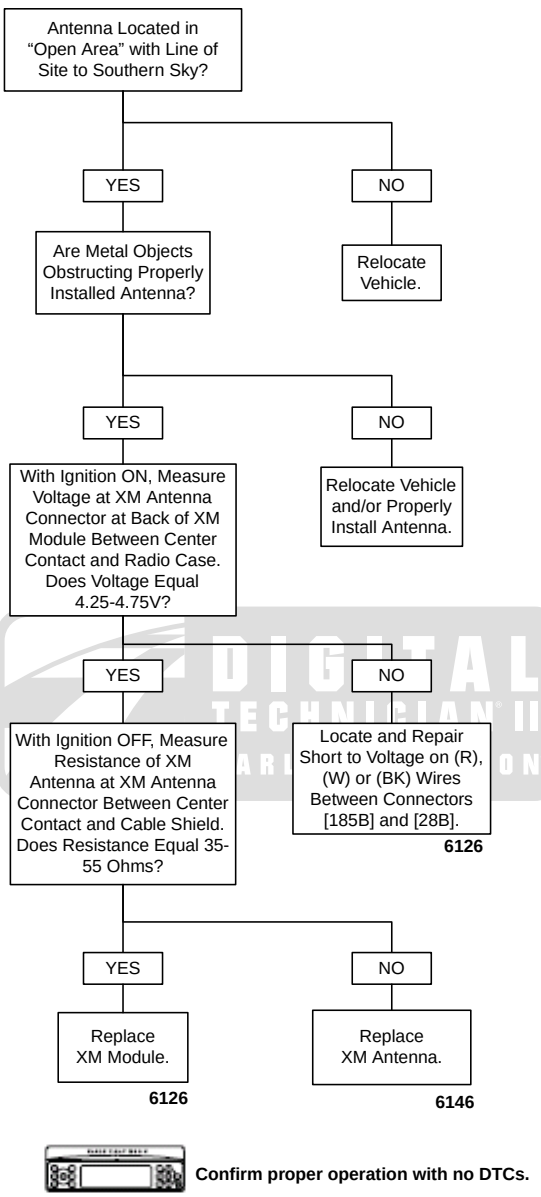
Figure 5-40. XM Circuit

Table 5-41. FLHT/C/U Wire Harness Connectors

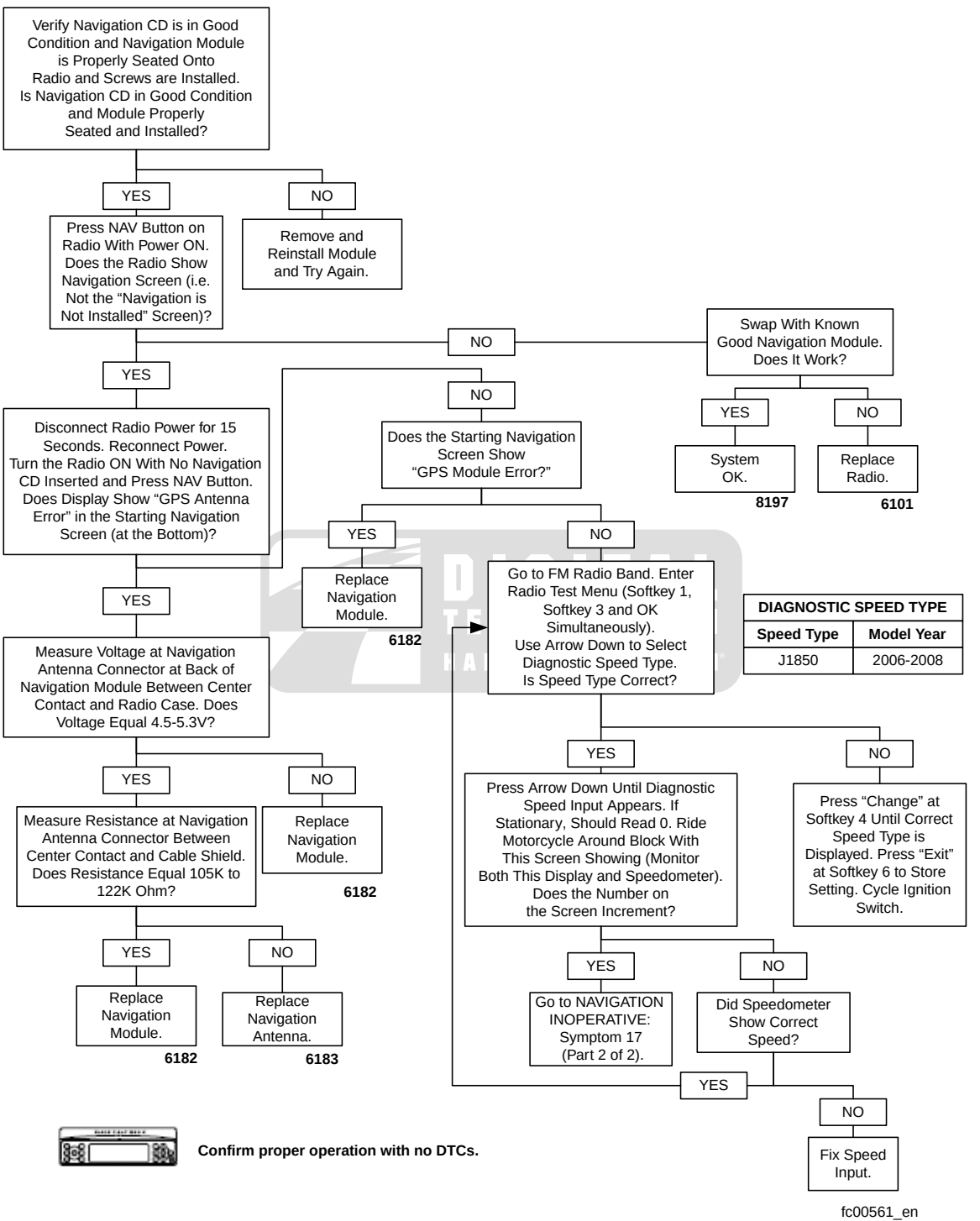
NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[184]	CB Module	12-Place Mini-Deutsch	Inner fairing - left side of radio
[185]	XM Module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)

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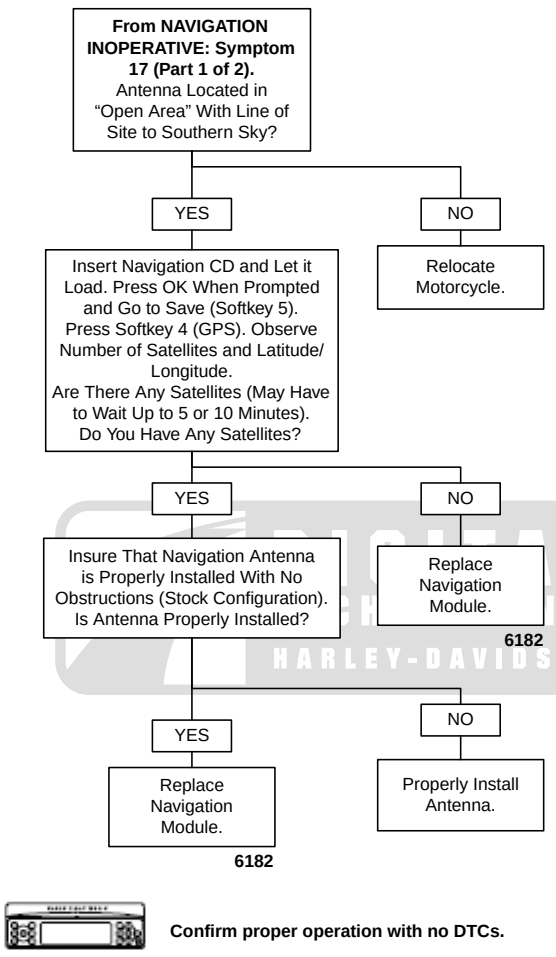
XM - No or Intermittent Reception: Symptom 16



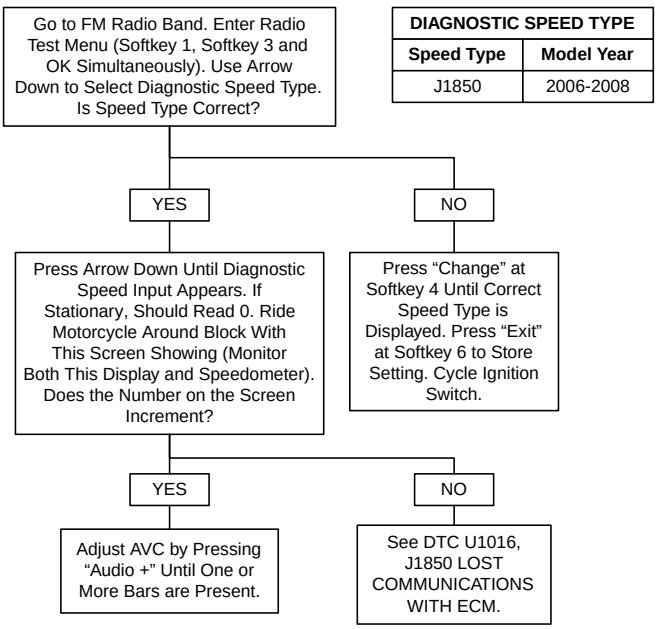
Navigation Inoperative: Symptom 17 (Part 1 of 2)



Navigation Inoperative: Symptom 17 (Part 2 of 2)



AVC Inoperative: Symptom 18



DIAGNOSTIC SPEED TYPE	
Speed Type	**Model Year**
J1850	2006-2008



Confirm proper operation with no DTCs.

fc00563_en

DIGITAL TECHNICIAN II HARLEY-DAVIDSON®

Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 1 of 4)

While Pressing Any Two Softkeys (Presets), Turn Ignition Switch ON to Enter Diagnostic Mode. Will Radio Enter Diagnostic Mode?

YES

Is DTC Present?

YES

See DIAGNOSIS for applicable DTC:

DTC	DESCRIPTION	GO TO
B2006	Radio Switches Stuck or Open	
	Replace Radio.	
B2007	Handlebar Switches Shorted High	
	Audio	Handlebar Audio Switch Shorted High: DTC B2007 (Part 1 of 3)
	Mode	Handlebar Mode Switch Shorted High: DTC B2007 (Part 2 of 3)
	PTT/Squelch	Handlebar PPT/Squelch Switch Shorted High: DTC B2007 (Part 3 of 3)
B2008	Handlebar Switches Shorted Low	
	Audio	Handlebar Audio Switch Shorted Low: DTC B2008 (Part 1 of 3)
	Mode	Handlebar Mode Switch Shorted Low: DTC B2008 (Part 2 of 3)
	PTT/Squelch	Handlebar PPT/Squelch Switch Shorted Low: DTC B2008 (Part 3 of 3)
B2009	Handlebar Switches Stuck or Open	
	Audio	Handlebar Audio Switch Stuck or Open: DTC B2009 (Part 1 of 3)
	Mode	Handlebar Mode Switch Stuck or Open: DTC B2009 (Part 2 of 3)
	PTT/Squelch	Handlebar PPT/Squelch Switch Stuck or Open: DTC B2009 (Part 3 of 3)
B2010	Passenger Switches Shorted High	
	Audio/PTT	Passenger Audio/PPT Switch Shorted High: DTC B2010 (Part 1 of 2)
	Mode	Passenger Mode Switch Shorted High: DTC B2010 (Part 2 of 2)
B2011	Passenger Switches Shorted Low	
	Audio/PTT	Passenger Audio/PTT Switch Shorted Low: DTC B2011 (Part 1 of 2)
	Mode	Passenger Mode Switch Shorted Low: DTC B2011 (Part 2 of 2)
B2012	Passenger Switches Stuck or Open	
	Audio/PTT	Passenger Audio/PTT Switch Stuck or Open: DTC B2012 (Part 1 of 2)
	Mode	Passenger Mode Switch Stuck or Open: DTC B2012 (Part 2 of 2)
B2013	Sidecar Switches Shorted High	
	PTT/Mode	Sidecar PPT/Mode Switches Shorted High: DTC B2013
B2014	Sidecar Switches Shorted Low	
	PTT/Mode	Sidecar PPT/Mode Switches Shorted Low: DTC B2014
B2015	Sidecar Switches Stuck or Open	
	PTT/Mode	Sidecar PPT/Mode Switches Stuck or Open: DTC B2015

NO

Replace Radio.

6101

NO

Depress applicable switch to verify handlebar, passenger and sidecar switch functionality:
Audio Up
Audio DN
Audio
Mode Up
Mode DN
Mode
PTT
Squelch +
Squelch -
The Display Will Show Each Function When Pressed.
Does it?

YES

No Current Fault Found. Repeat Function Verification While Wiggling Harness.

NO

Which Switches Are Inoperative?

If equipped with a sidecar, disconnect connector [197B] and perform Functionality Test. If problem is no longer present proceed to “Sidecar Switch”.
If problem is still present disconnect connector [28B] from rear of Radio and perform Functionality Test again. If problem does not appear proceed to “Passenger Switches”. If problem is still present proceed to “Handlebar Switches”.

Handlebar Switches

Go to HANDLEBAR SWITCHES INOPERATIVE: Symptom 19 (Part 3 of 4).

Passenger Switches

Go to PASSENGER SWITCHES INOPERATIVE: Symptom 19 (Part 2 of 4).

Sidecar Switches

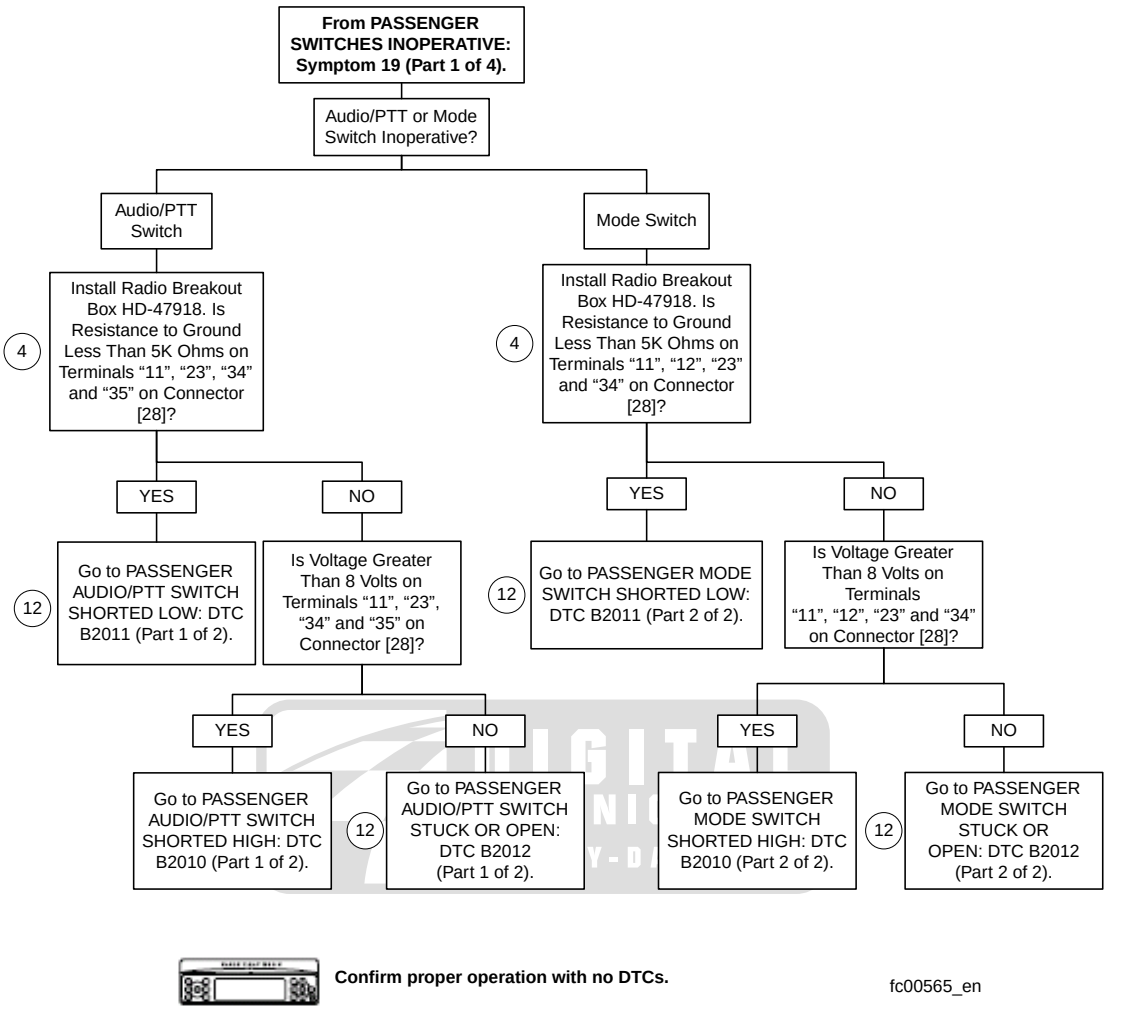
Go to SIDECAR SWITCHES INOPERATIVE: Symptom 19 (Part 4 of 4).



Confirm proper operation with no DTCs.

fc00564_en

Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 2 of 4)



Confirm proper operation with no DTCs.

fc00565_en

em00203

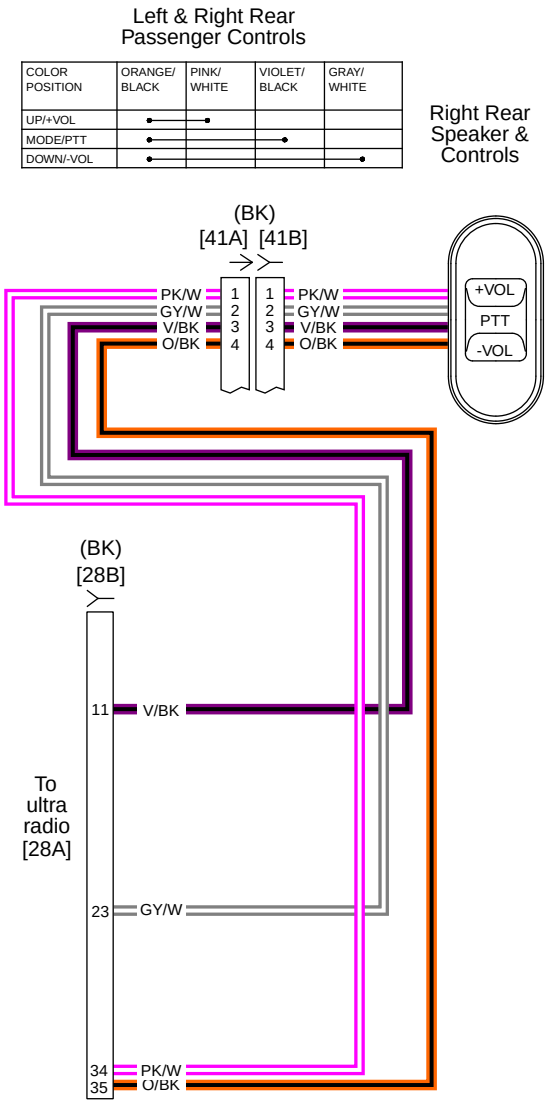


Figure 5-41. Passenger Audio/PTT Switch Circuit

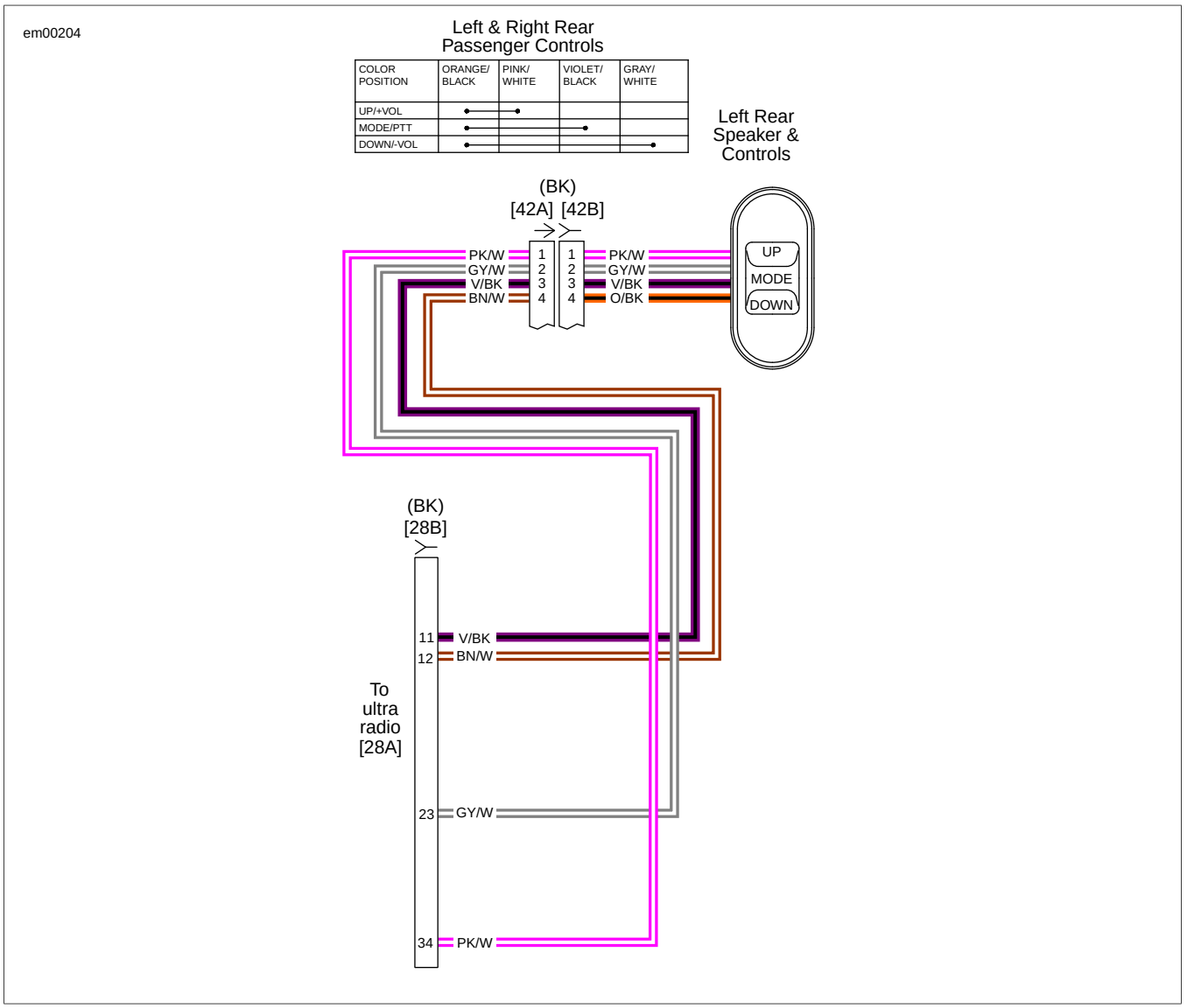
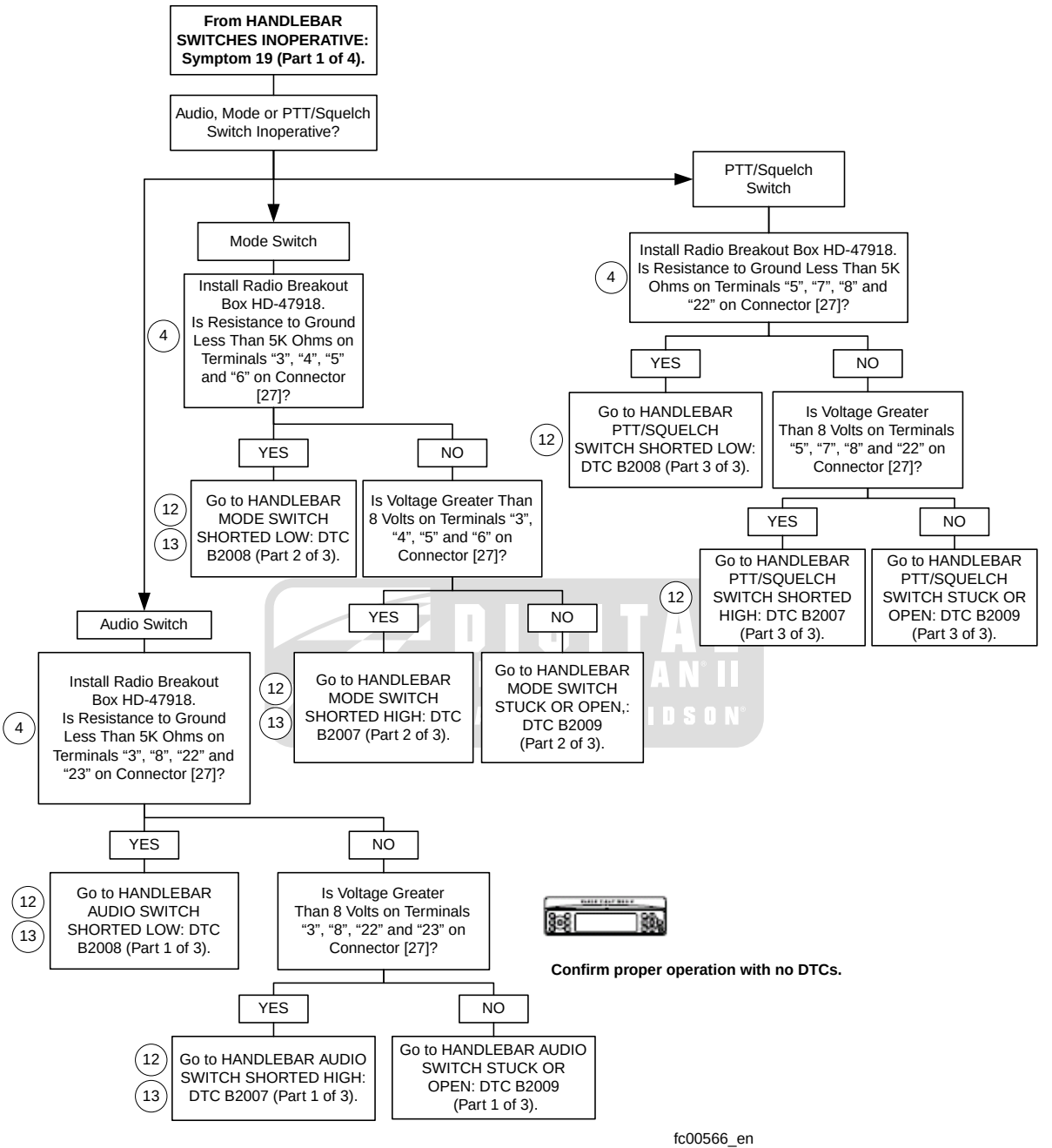


Figure 5-42. Passenger Mode Switch Circuit

Table 5-42. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Interconnect harness to right handlebar switches	12-Place Molex (Black)	Inner fairing - fork stem nut lock plate (left side)
[24]	Interconnect harness to left handlebar switches	16-Place Molex (Gray)	Inner fairing - left fairing support brace
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[41]	Rear right speaker/passenger controls	6-Place Mini-Deutsch	Inside rear right speaker box
[42]	Rear left speaker/passenger controls	6-Place Mini-Deutsch	Inside rear left speaker box

Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 3 of 4)



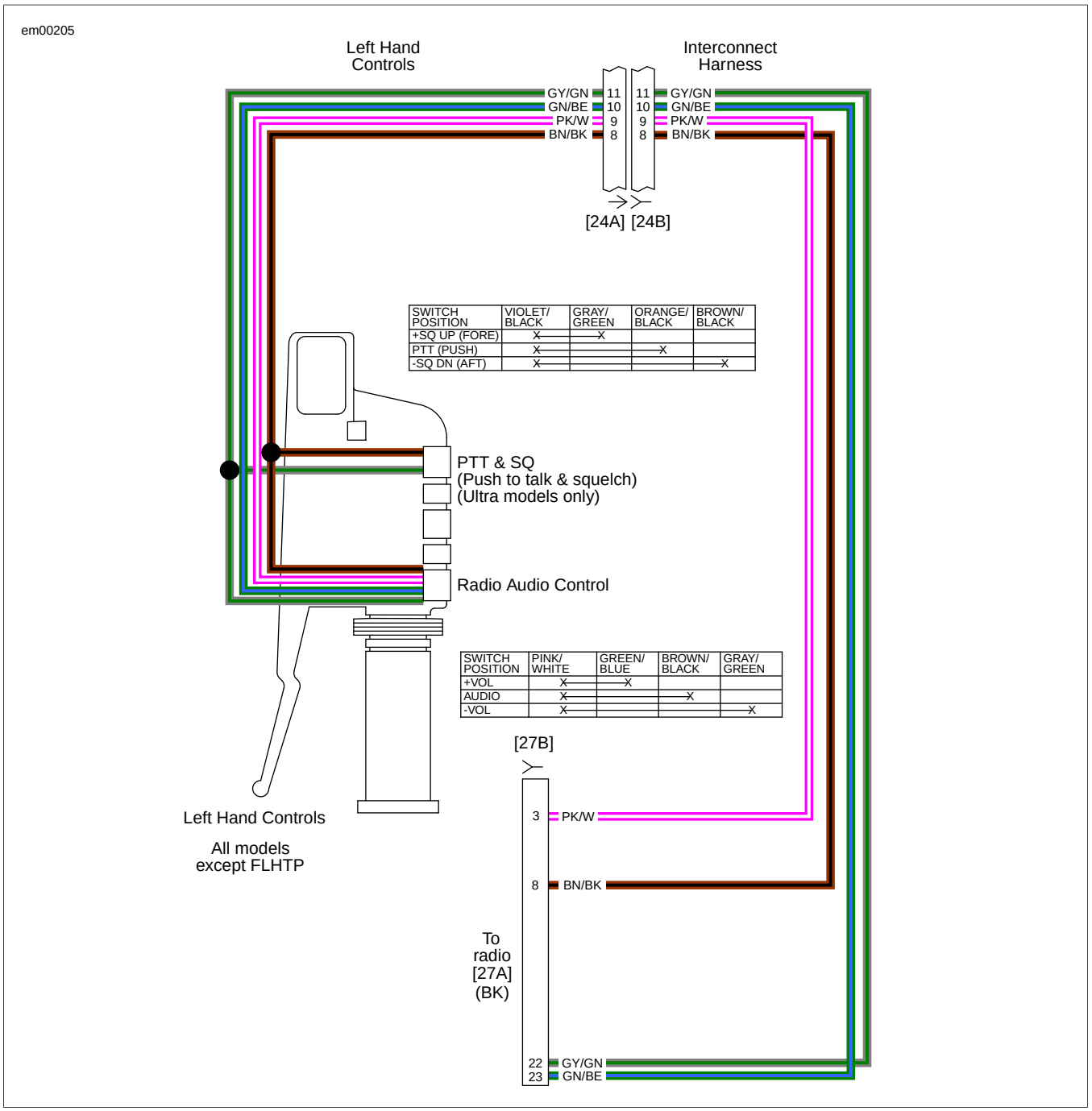


Figure 5-43. Handlebar Audio Switch Circuit

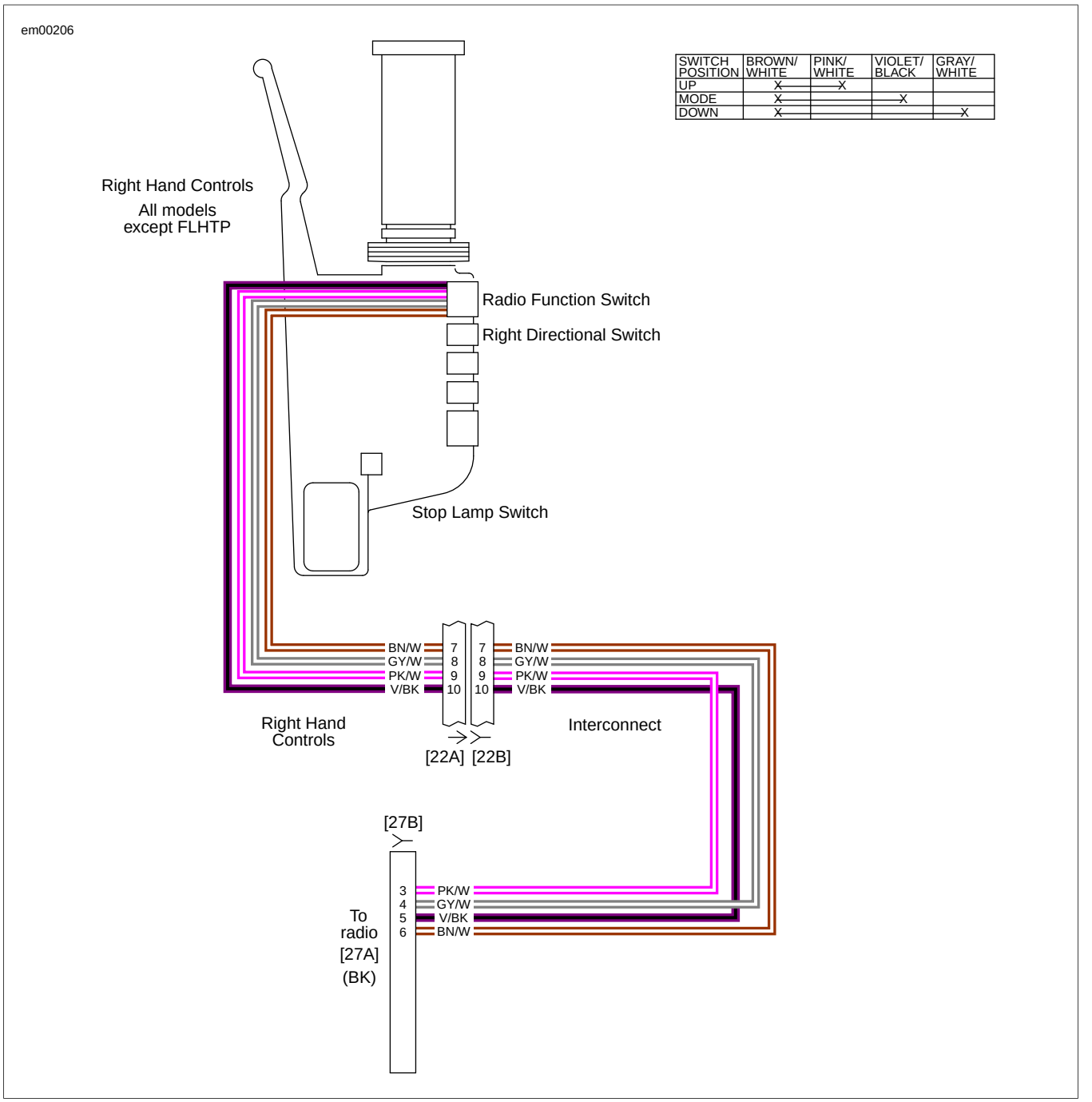


Figure 5-44. Handlebar Mode Switch Circuit

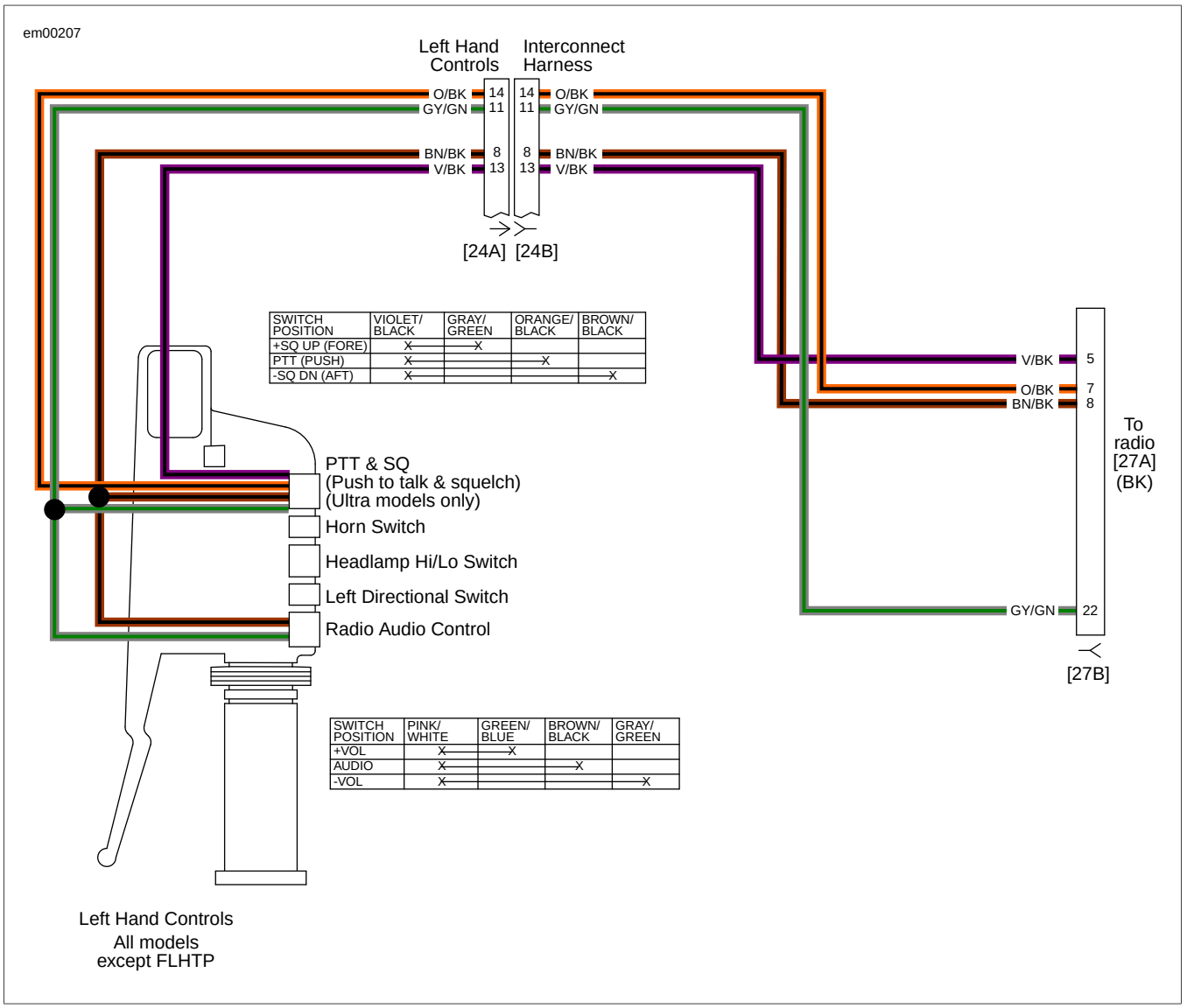
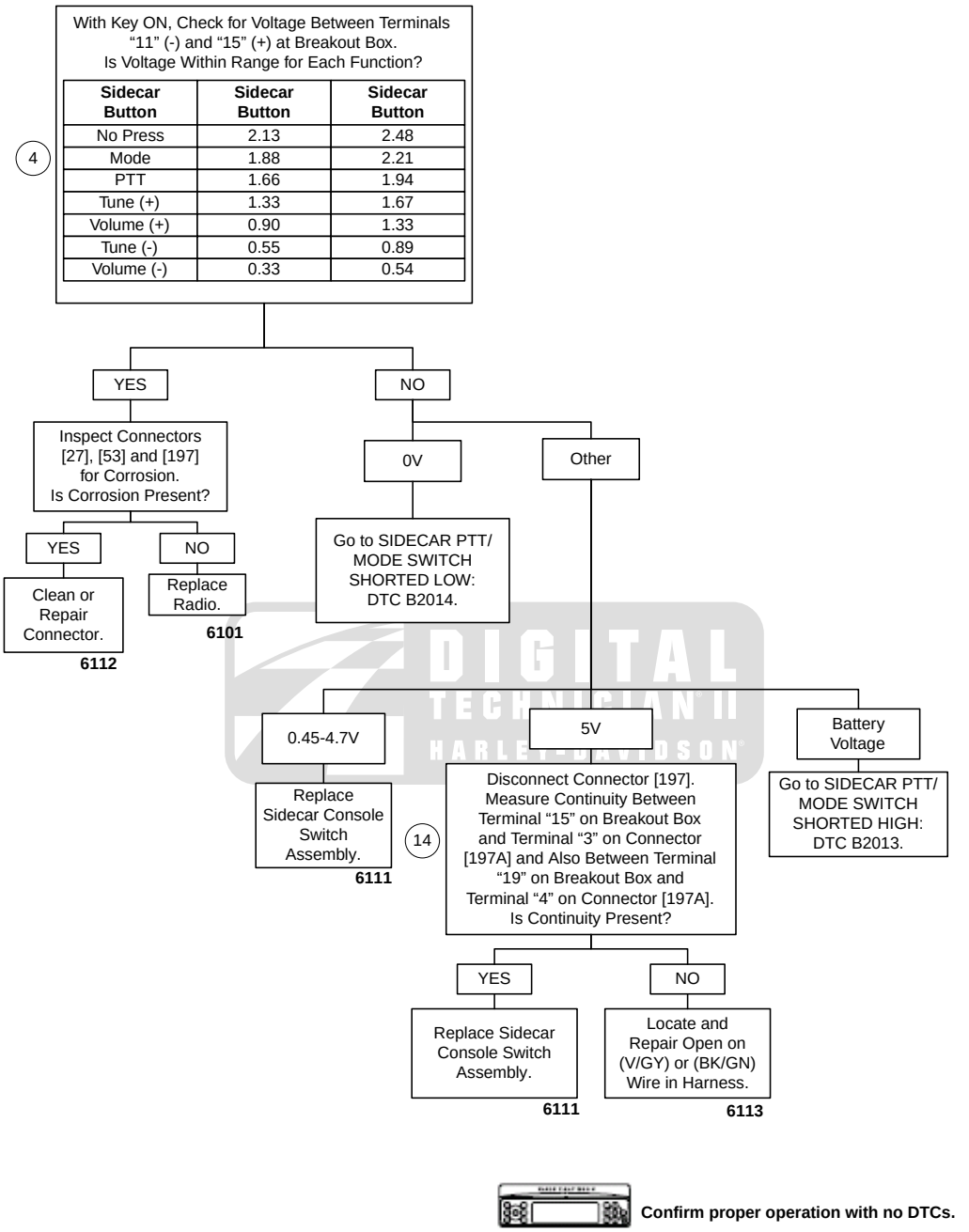
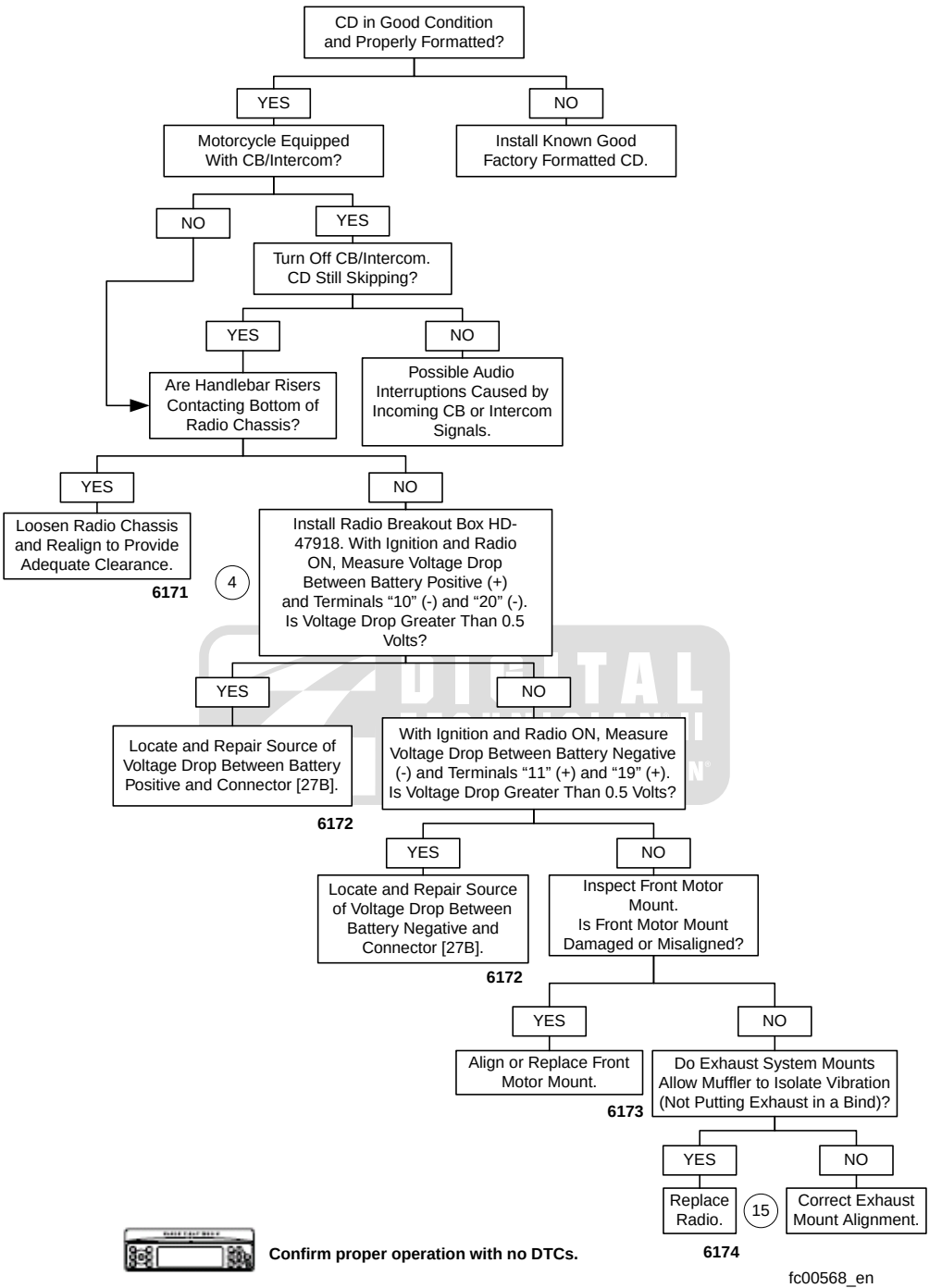


Figure 5-45. Handlebar PTT/Squelch Switch Circuit

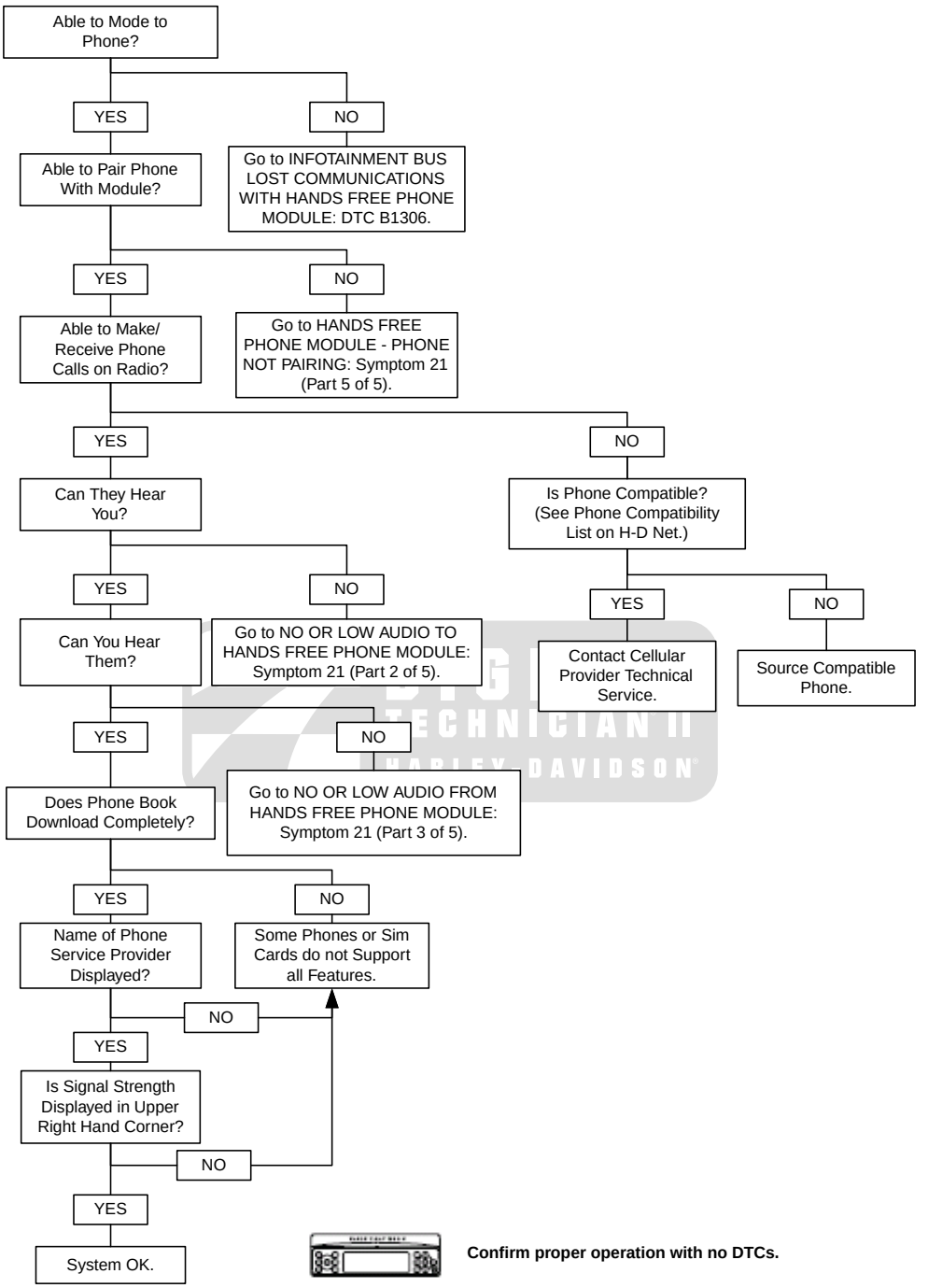
Handlebar, Passenger or Sidecar Switches Inoperative: Symptom 19 (Part 4 of 4)



CD Skipping: Symptom 20

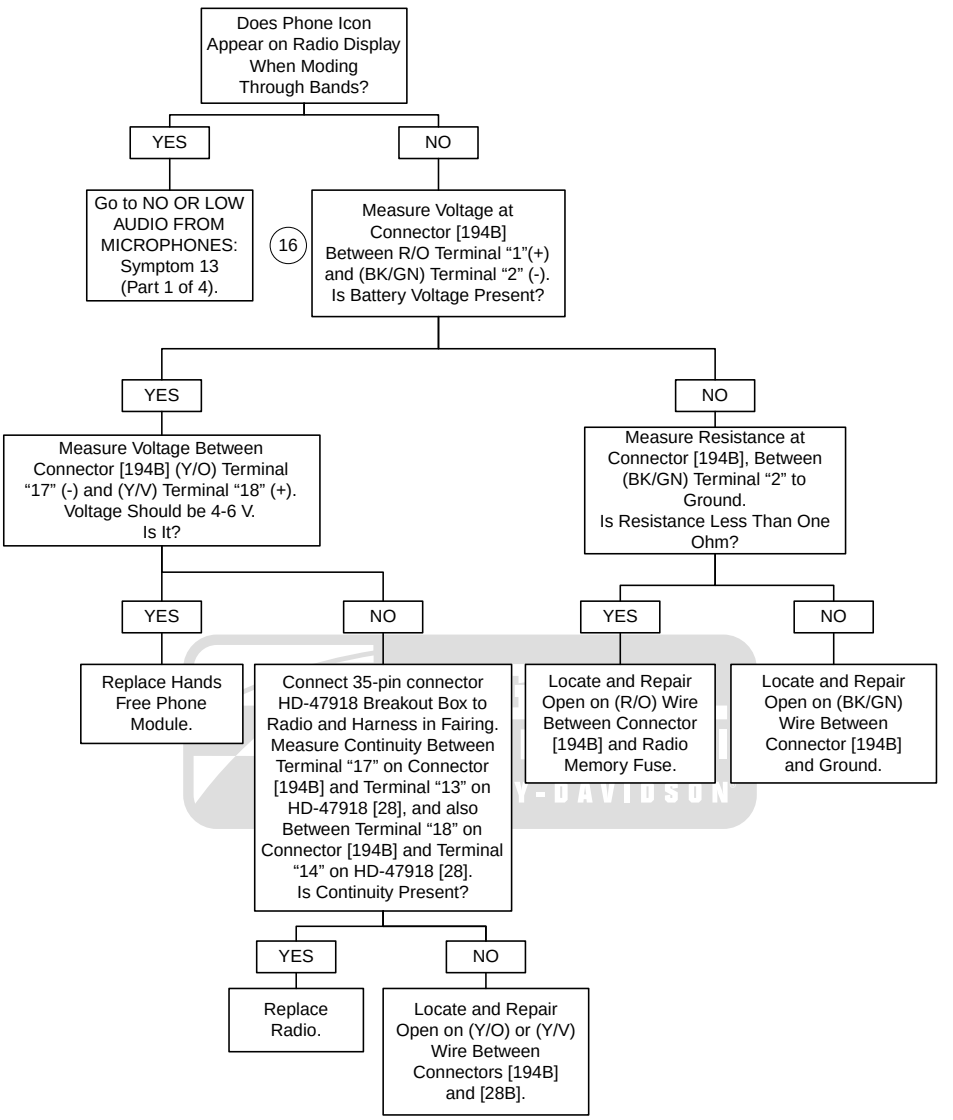


Hands-Free Phone Module Initial Diagnostics: Symptom 21 (Part 1 of 5)



fc00569_en

No or Low Audio To Hands-Free Phone Module: Symptom 21 (Part 2 of 5)





Confirm proper operation with no DTCs.

fc00570_en

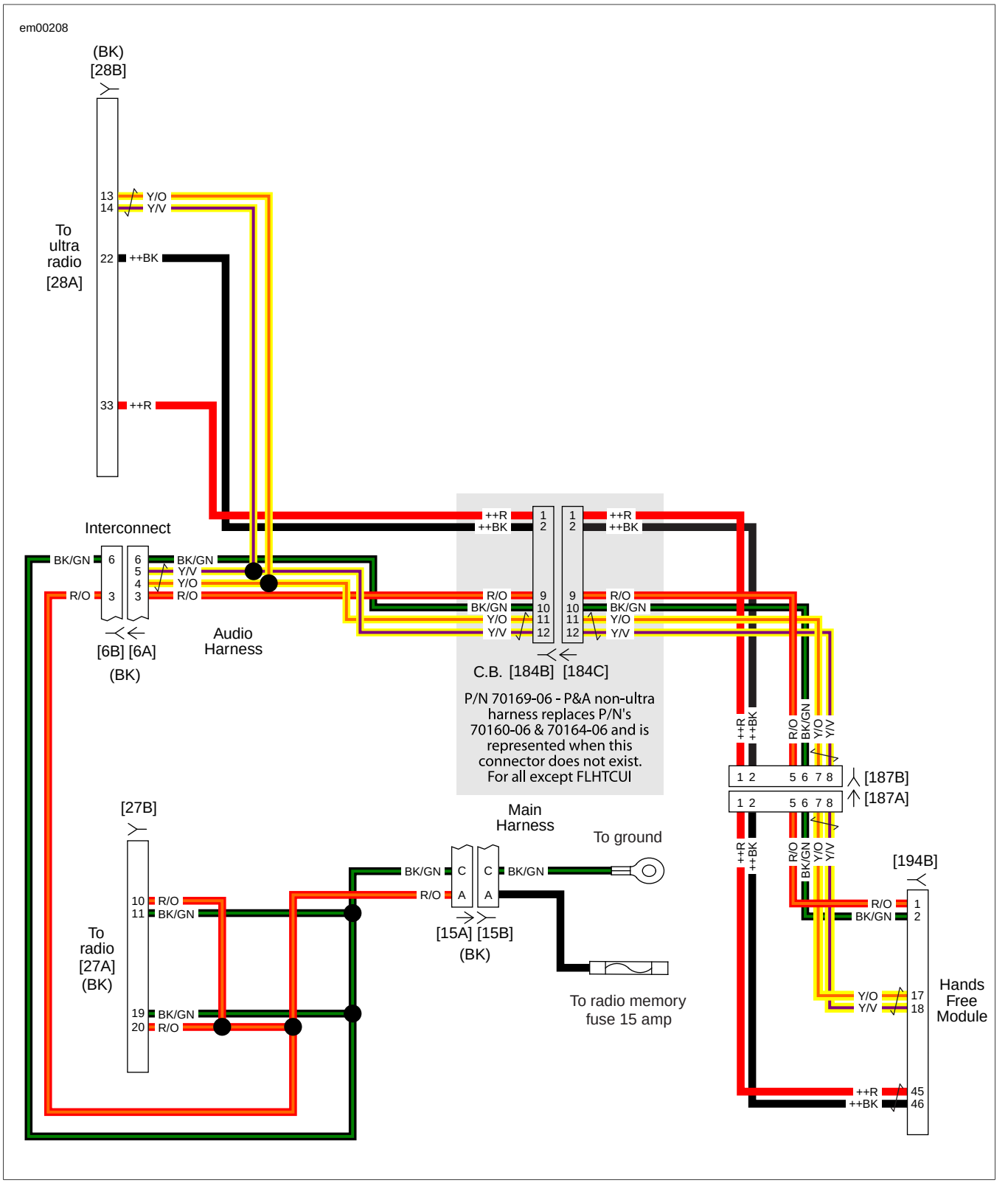


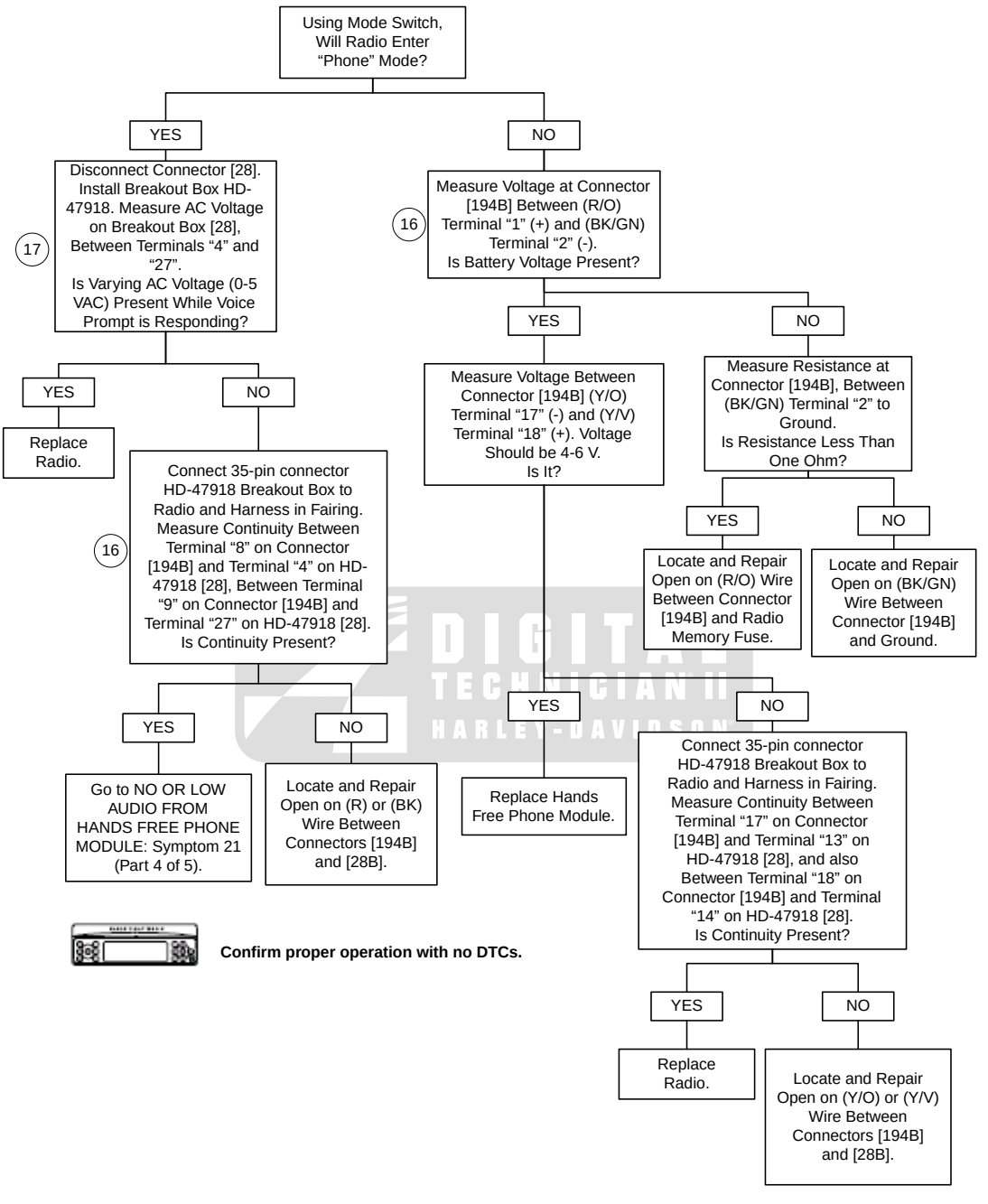
Figure 5-46. Hands-Free Phone Circuit

Table 5-43. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[187]	Hands-free phone module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)
[194]	Hands-free phone module	54-Place Amp	Inside Tour-Pak (left side)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

No or Low Audio From Hands-Free Phone Module: Symptom 21 (Part 3 of 5)



fc00571_en

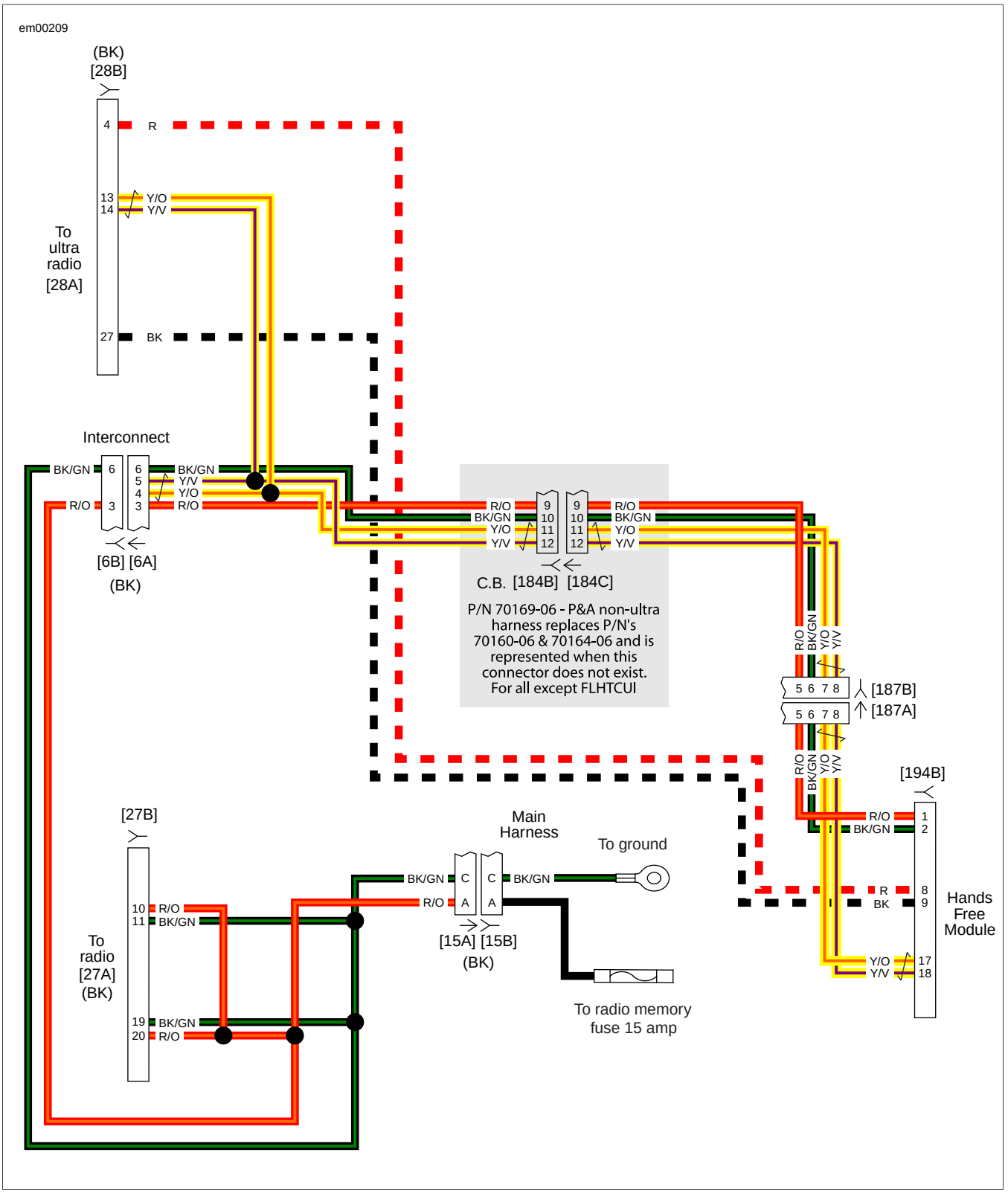


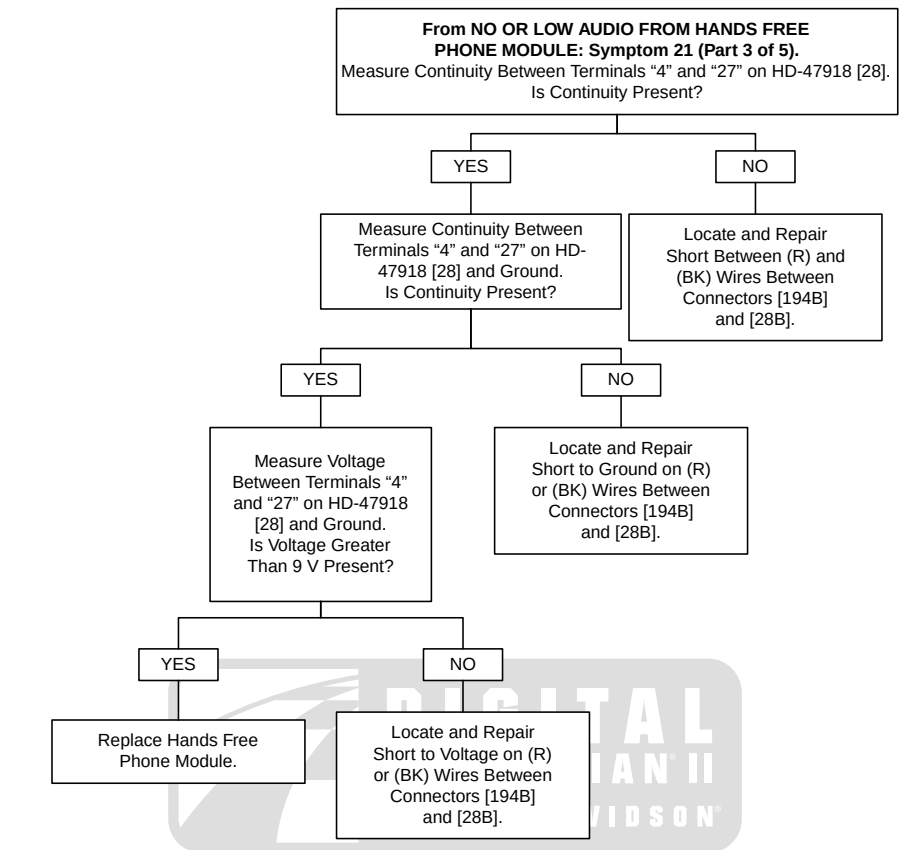
Figure 5-47. Hands-Free Phone Circuit

Table 5-44. FLHT/C/U Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[6]	Audio to interconnect harness	6-Place Deutsch (Black)	Inner fairing - left side of radio
[15]	Main to interconnect harness	4-Place Packard	Inner fairing - right fairing bracket
[27]	Radio	23-Place Amp	Inner fairing - back of radio (right side)
[28]	Radio	35-Place Amp	Inner fairing - back of radio (left side)
[187]	Hands-free phone module	12-Place Mini-Deutsch	Inner fairing - top of radio (left side)
[194]	Hands-free phone module	54-Place Amp	Inside Tour-Pak (left side)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

No or Low Audio From Hands-Free Phone Module: Symptom 21 (Part 4 of 5)

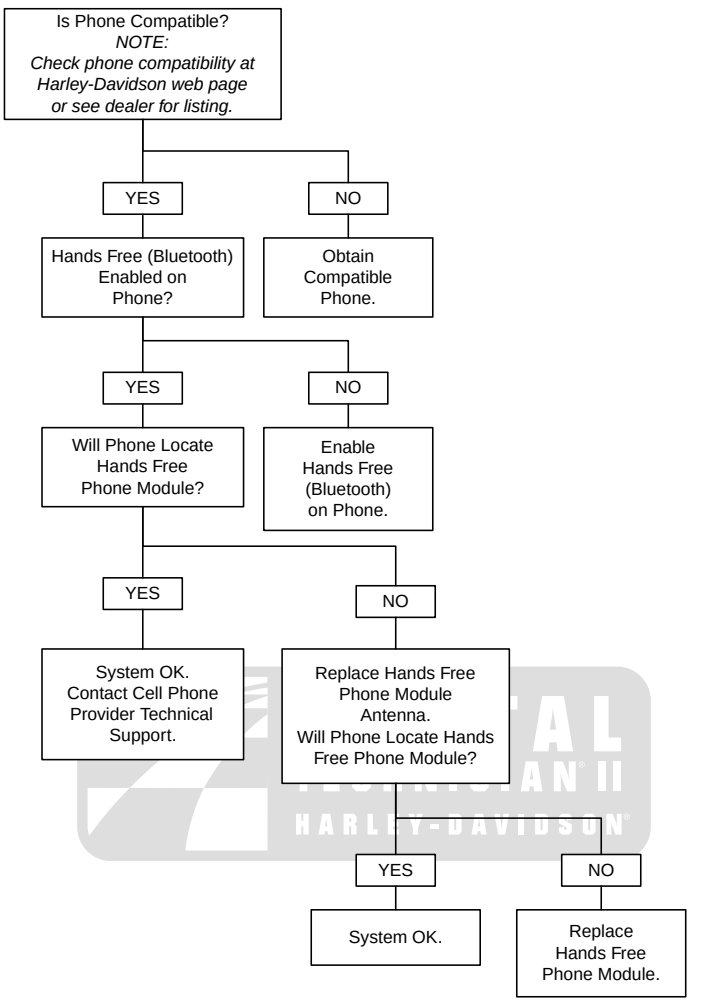




Confirm proper operation with no DTCs.

fc00572_en

Hands-Free Phone Module - Phone Not Pairing: Symptom 21 (Part 5 of 5)



Confirm proper operation with no DTCs.

fc00573_en

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

ANTILOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION 6.1

ANTILOCK BRAKE SYSTEM (ABS) DESCRIPTION

Antilock Brake System (ABS)

The Antilock Brake System (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.

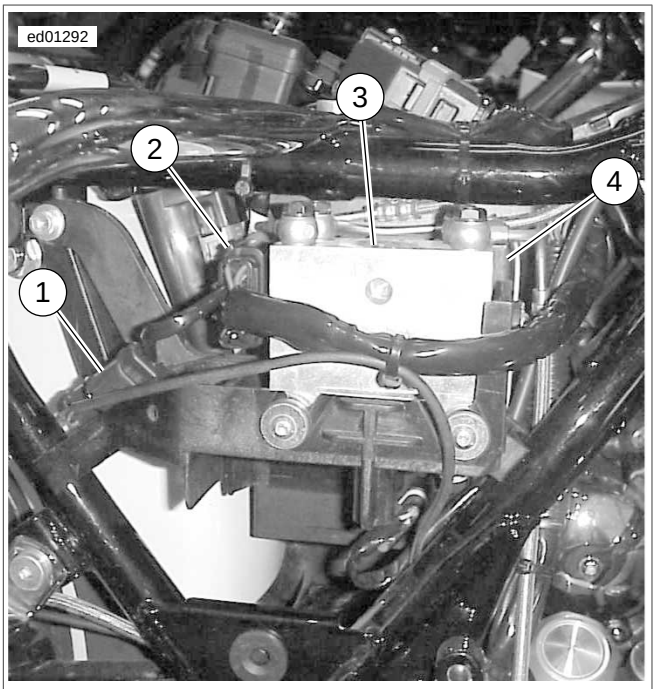
During an ABS event, a series of rapid pulsations may be felt in either the front brake lever or rear brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the ABS responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pulsations are present only during initialization and antilock 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 antilock braking on dry pavement intermittent chirping noises may be heard as the tires approach slipping. These noises and pulsations are considered normal during antilock 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 Antilock Brake System consists of the following components.

- See Figure 6-1. Electronic Control Unit (ECU): The ECU contains the motor relay, valve relay, system enable relay, and the solenoids.
- See Figure 6-1. Hydraulic Control Unit (HCU): The HCU contains the four valves (an apply valve and release valve for each wheel), two pumps, pump motor, and accumulators.
- See Figure 6-2. Front Wheel Speed Sensor.
- See Figure 6-3. Rear Wheel Speed Sensor.
- See Figure 6-4. ABS Diode Pack.

When referencing the ECU and the HCU as a unit they are referred to as the Antilock Brake System (ABS) module.



1. **Rear Wheel Speed Sensor Connector**
2. **Electronic Contol Unit (ECU) Connector**
3. **Hydraulic Control Unit (HCU)**
4. **Electronic Control Unit (ECU)**

Figure 6-1. ABS Module

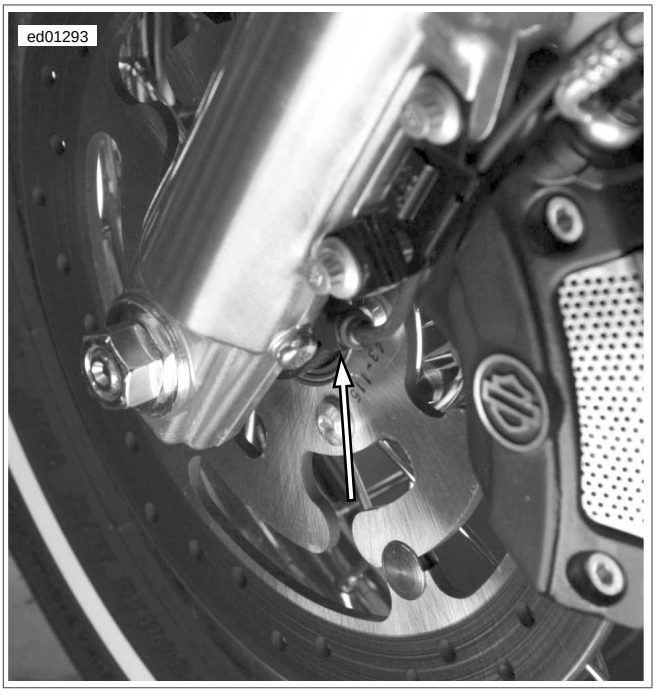


Figure 6-2. Front Wheel Speed Sensor

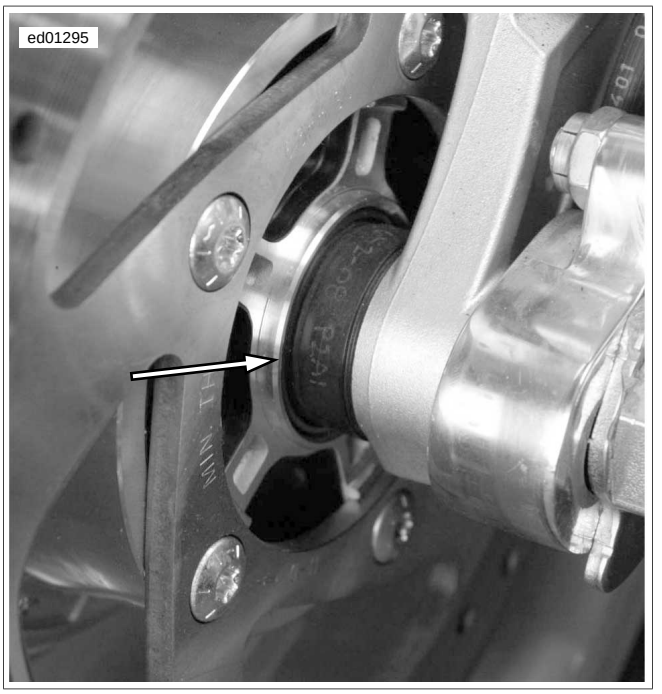


Figure 6-3. Rear Wheel Speed Sensor

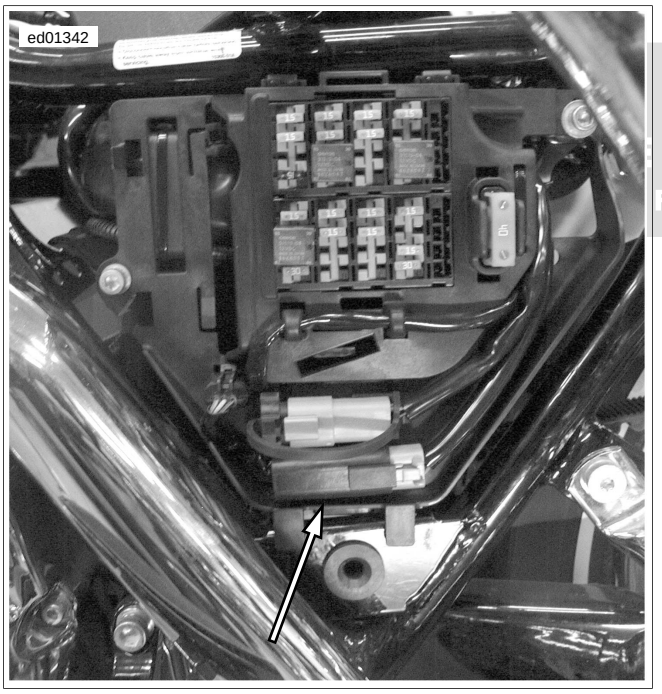


Figure 6-4. ABS Diode Pack

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 modular 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:

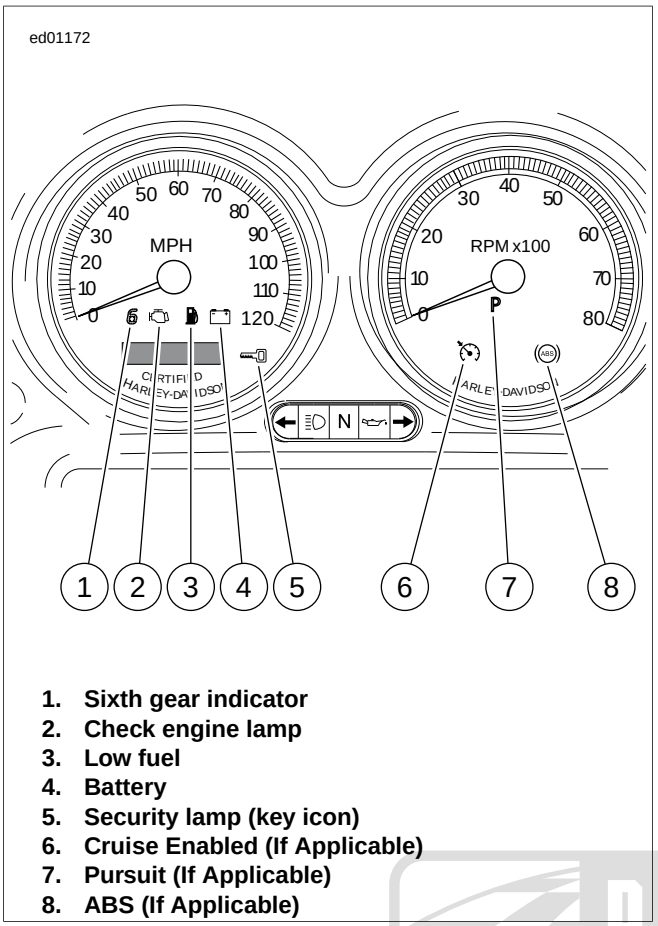
- Brake switch is not applied.
- Engine is above 500 RPM.
- No ABS event present.
- The system ECU is enabled.
- The ABS system is not communicating with Digital Technician.

ABS Indicator

See Figure 6-5. The Instrument Module (IM) 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 IM performs a bulb check.
- The IM 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.



1. **Sixth gear indicator**
2. **Check engine lamp**
3. **Low fuel**
4. **Battery**
5. **Security lamp (key icon)**
6. **Cruise Enabled (If Applicable)**
7. **Pursuit (If Applicable)**
8. **ABS (If Applicable)**

Figure 6-5. Instrument

CODE TYPES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

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 (Part No. HD-44750) or Speedometer Self Diagnostics. See 6.2 SPEEDOMETER SELF DIAGNOSTICS.

NOTES

- *Speedometer Self Diagnostics will display both current and historic DTCs. To differentiate between current and historic DTCs a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750) must be employed.*
- *All DTCs reside in the memory of ECM, TSM/TSSM/HFSM, speedometer, tachometer, or ABS module until the DTC is cleared by using Speedometer Self Diagnostics. See 6.2 SPEEDOMETER SELF DIAGNOSTICS.*
- *A historic DTC is also cleared after a total of 50 ignition cycles (start and run cycle) has 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 are present during the current ignition cycle. See the appropriate flow charts for solutions.

Historic

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

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 may also be present whenever the system indicates the existence of a current fault. See 6.1 ANTILOCK BRAKE SYSTEM (ABS) GENERAL INFORMATION, Multiple Trouble Codes if multiple DTCs are found.

Diagnostic charts are designed for use with current DTCs and as a result they frequently suggest wire repair or part replacement. When diagnosing a historic DTC the charts can be helpful but should not lead to part replacement without verification the part is faulty.

RETRIEVING DIAGNOSTIC TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

There are two levels of diagnostics:

- The most sophisticated mode uses a computer-based diagnostic package called the DIGITAL TECHNICIAN (Part No. HD-44750).
- The second mode requires using speedometer self diagnostics. TSM/TSSM/HFSM, ABS, and ECM codes can be accessed and cleared. See 6.2 SPEEDOMETER SELF DIAGNOSTICS for more information.

MULTIPLE TROUBLE CODES

While it is possible for more than one fault to occur and set more than one DTC, there are several conditions which may result in **one** fault setting **multiple**DTCs:

Serial data codes (DTC U1300, U1301, U1016, U1097 and U1098) may be accompanied by other codes. **Always** correct the serial data codes before resolving the other codes.

SPEEDOMETER SELF DIAGNOSTICS 6.2

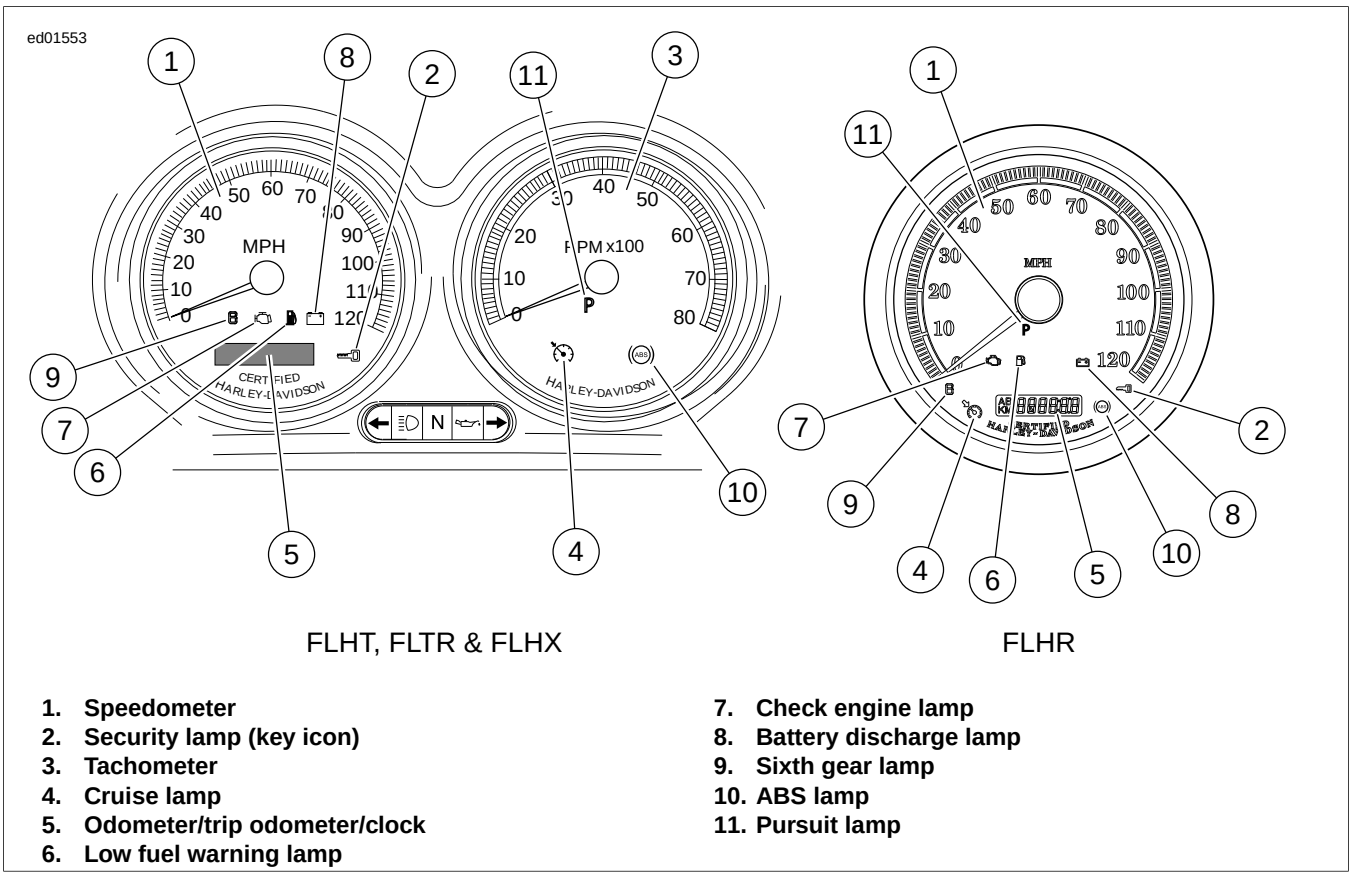
GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/HFSM, ABS, and Electronic Control Module (ECM) Diagnostic Trouble Codes (DTCs) (diagnostic mode).

DIAGNOSTICS

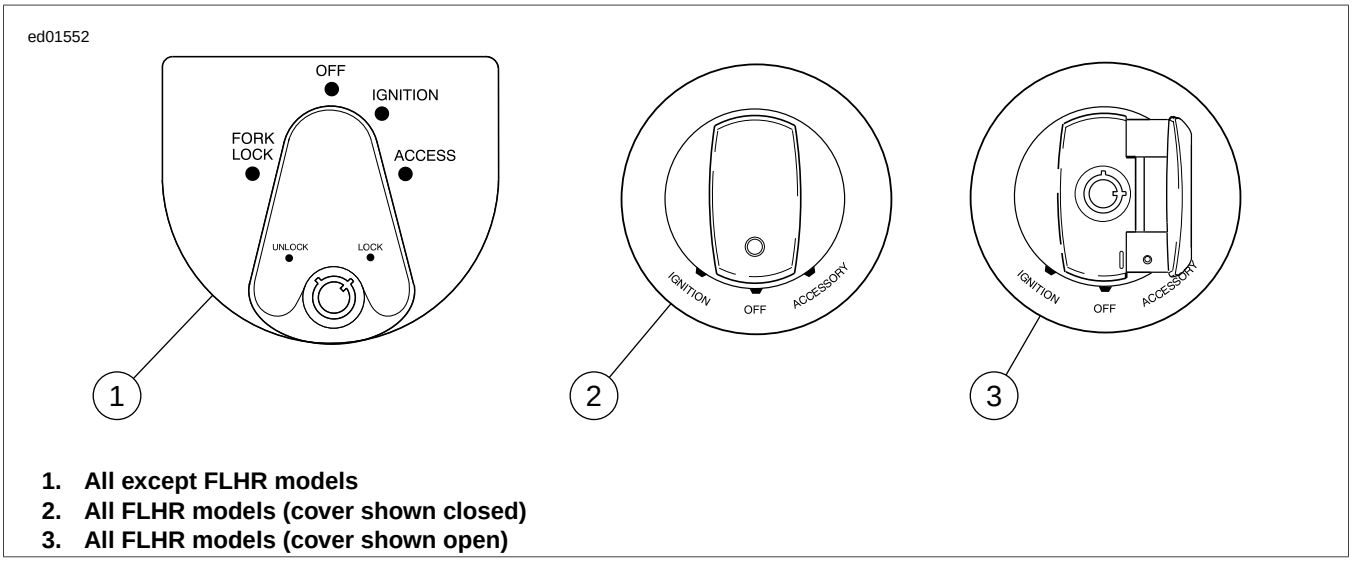
Diagnostic Tips

- For a quick check of speedometer function, a "WOW" test can be performed. See Figure 6-6. While pressing the Trip Odometer Reset Switch, turn Ignition Switch to ON. Background lighting should illuminate, gauge needles should sweep their full range of motion and indicator lamps controlled by the serial data bus (battery and check engine) should illuminate.
- If speedometer fails "WOW" test, check for battery, ground and accessory to speedometer. If any feature in the speedometer is non-functional, see 6.4 INITIAL DIAGNOSTIC CHECK: ABS.



1. **Speedometer**
2. **Security lamp (key icon)**
3. **Tachometer**
4. **Cruise lamp**
5. **Odometer/trip odometer/clock**
6. **Low fuel warning lamp**
7. **Check engine lamp**
8. **Battery discharge lamp**
9. **Sixth gear lamp**
10. **ABS lamp**
11. **Pursuit lamp**

Figure 6-6. Instrument



1. **All except FLHR models**
2. **All FLHR models (cover shown closed)**
3. **All FLHR models (cover shown open)**

Figure 6-7. Ignition Switch: Touring Models

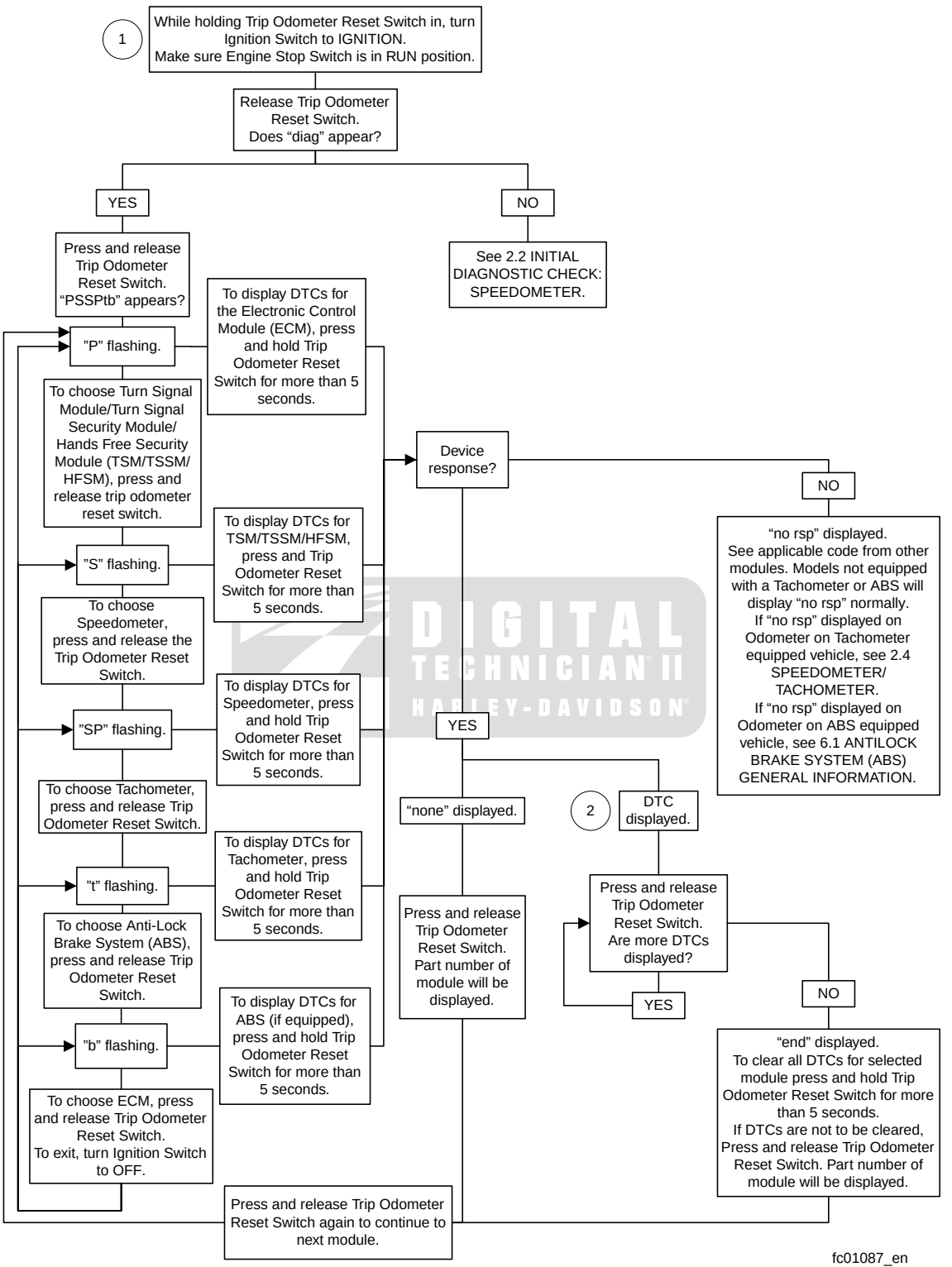
Diagnostic Notes

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

1. To exit diagnostic mode, turn ignition switch OFF.
2. To clear DTCs for selected module, press Trip Odometer Reset Switch for more than 5 seconds when code is displayed. This procedure will clear all DTCs for selected module.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Speedometer Self Diagnostics



BREAKOUT BOX: ABS 6.3

GENERAL

PART NUMBER	TOOL NAME
HD-48642	BREAKOUT BOX

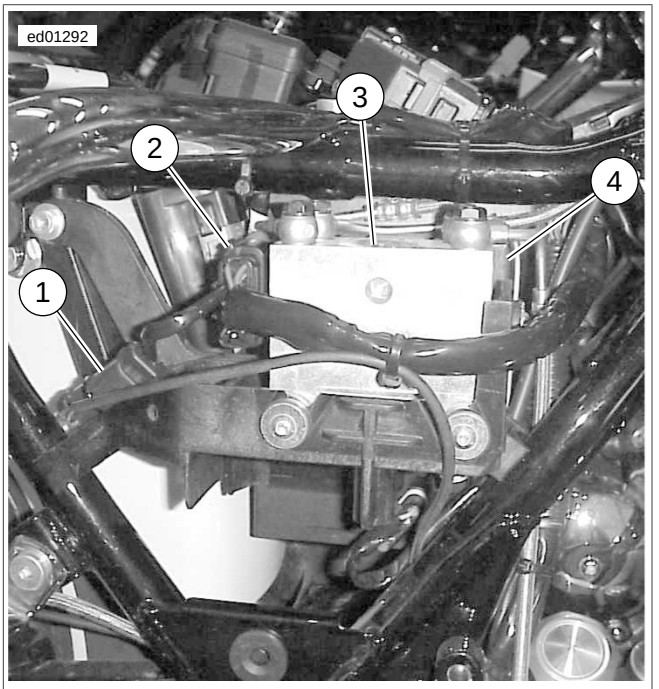
The BREAKOUT BOX (Part No. HD-48642) connects to the Antilock Brake System (ABS) module connector [166]. Used in conjunction with a DVOM, it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects.

NOTE

See wiring diagrams for ABS terminal functions.

INSTALLATION

1. Depress latch on connector [166B].
2. Connect Harness Adapters to connectors [166A] and [166B].
3. Attach Breakout Box to connector(s).
4. Attach connectors from Breakout Box to Harness Adapters.



1. Rear Wheel Speed Sensor Connector
2. Electronic Control Unit (ECU) Connector [166A]
3. Hydraulic Control Unit (HCU)
4. Electronic Control Unit (ECU)

Figure 6-8. Electronic Control Unit (ECU) Location

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REMOVAL

1. Detach connectors from Breakout Box to Harness Adapters.
2. Detach Harness Adapters from connectors [166A] and [166B].
3. Install connector [166B] to ABS Module.

INITIAL DIAGNOSTIC CHECK: ABS 6.4

GENERAL

To locate faulty circuits or other system problems, follow the diagnostic flow charts and tests in this section. For a systematic approach, always begin with 6.4 INITIAL DIAGNOSTIC CHECK: ABS, Initial Diagnostics. Read the general information and then work your way through the flow chart box by box.

Diagnostic Notes

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

Circuit Diagram/Wire Harness Connector Table

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

In order to perform most diagnostic routines, a Breakout Box and a DVOM are required. See 6.3 BREAKOUT BOX: ABS.

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

Job/Time Code Values

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

INITIAL DIAGNOSTICS

Diagnostic Tips

- If speedometer reads "No Response" with the ignition switch turned to IGNITION (engine stop switch at RUN with the engine off), check data link for an open or short to ground between data link connector [91A] terminal "3" and ECM, TSM/TSSM/HFSM, speedometer connector or tachometer (if equipped) connector. See 3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM.
- Check for an open data test terminal between data link connector [91A] terminal "3" and ECM. With Ignition Switch turned to IGNITION, serial data bus voltage should be typically 0.6-0.8 volts. The range of acceptable operation is 0-7.0 volts.
- If speedometer reads "BUS Er" (serial data bus error), refer to flow charts in 4.5 INITIAL DIAGNOSTIC CHECK: EFI.

Diagnostic Notes

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

1. Compare engine behavior to symptoms tables in 4.5 INITIAL DIAGNOSTIC CHECK: EFI.

All ABS Diagnostic Trouble Codes (DTCs) are listed in Table 6-1.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table 6-1. ABS Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	RANKING	FAULT CONDITION	SOLUTION
C0562	18	Device voltage low	6.6 DTC C0562
C0563	19	System voltage high	6.7 DTC C0563
C1014	10	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1017	17	Pump motor power circuit open fault	6.8 DTC C1017
C1018	16	Pump motor ground high resistance fault	6.9 DTC C1018
C1021	22	Front wheel speed sensor equals 0	6.10 DTC C1021, C1023
C1023	23	Rear wheel speed sensor equals 0	6.10 DTC C1021, C1023
C1025	24	Front wheel speed signal intermittent	6.11 DTC C1025, C1027, C1206, C1208
C1027	25	Rear wheel speed signal intermittent	6.11 DTC C1025, C1027, C1206, C1208
C1032	20	Front wheel speed sensor circuit open or shorted	6.12 DTC C1032, C1034
C1034	21	Rear wheel speed sensor circuit open or shorted	6.12 DTC C1032, C1034

Table 6-1. ABS Diagnostic Trouble Codes (DTCs) and Fault Conditions

DTC	RANKING	FAULT CONDITION	SOLUTION
C1042	11	Pump motor open	6.13 DTC C1042
C1043	12	Pump motor stalled	6.14 DTC C1043
C1055	1	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1056	2	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1057	3	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1061	4	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1062	4	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1065	6	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1066	7	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1094	28	Front brake switch always on	6.15 DTC C1094
C1095	29	Front brake switch open	6.16 DTC C1095
C1118	8	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1121	9	ECU internal fault	6.23 DTC C1014, C1055-C1066, C1118, C1121
C1151	33	Front wheel release too long	6.17 DTC C1151
C1153	34	Rear wheel release too long	6.18 DTC C1153
C1158	15	Calibration programming required	6.19 DTC C1158
C1206	26	Wheel speed sensor frequency out of range	6.11 DTC C1025, C1027, C1206, C1208
C1208	27	Wheel speed sensor frequency out of range	6.11 DTC C1025, C1027, C1206, C1208
C1212	32	Front or rear brake not applied with decel	6.20 DTC C1212
C1214	30	Rear brake switch always on	6.21 DTC C1214
C1216	31	Rear brake switch open	6.22 DTC C1216
U1300	13	Serial data low	6.24 DTC U1300, U1301 OR BUS ER
U1301	14	Serial data open/high	6.24 DTC U1300, U1301 OR BUS ER

Other Diagnostic Trouble Codes (DTCs)

See 3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM for any DTCs related to the Turn Signal Module (TSM), Turn Signal Security Module (TSSM) or Hands-Free Security Module (HFSM).

See 4.5 INITIAL DIAGNOSTIC CHECK: EFI for any DTCs related to the Electronic Control Module (ECM).

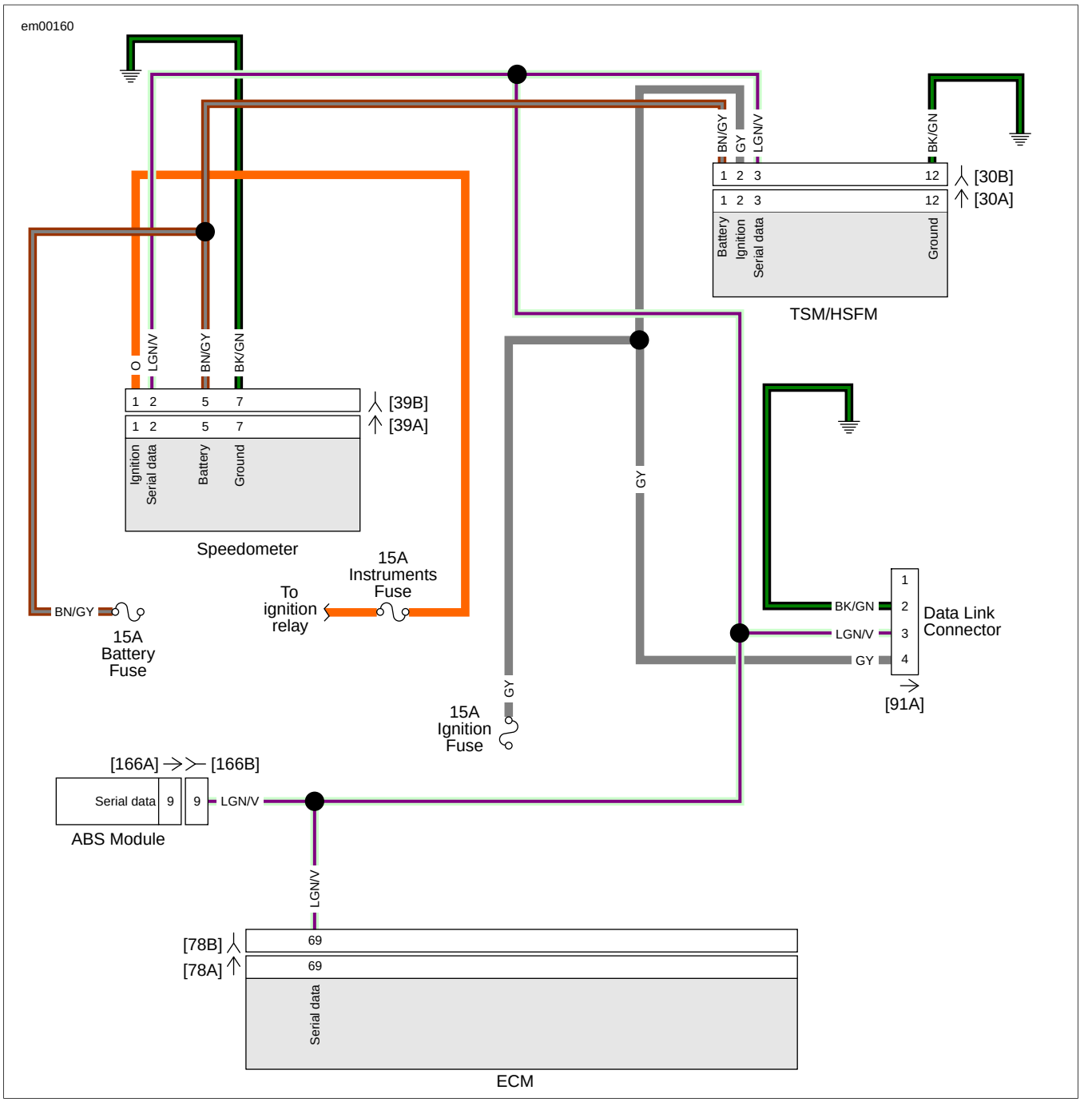


Figure 6-9. Diagnostic Check

Table 6-2. Wire Harness Connectors

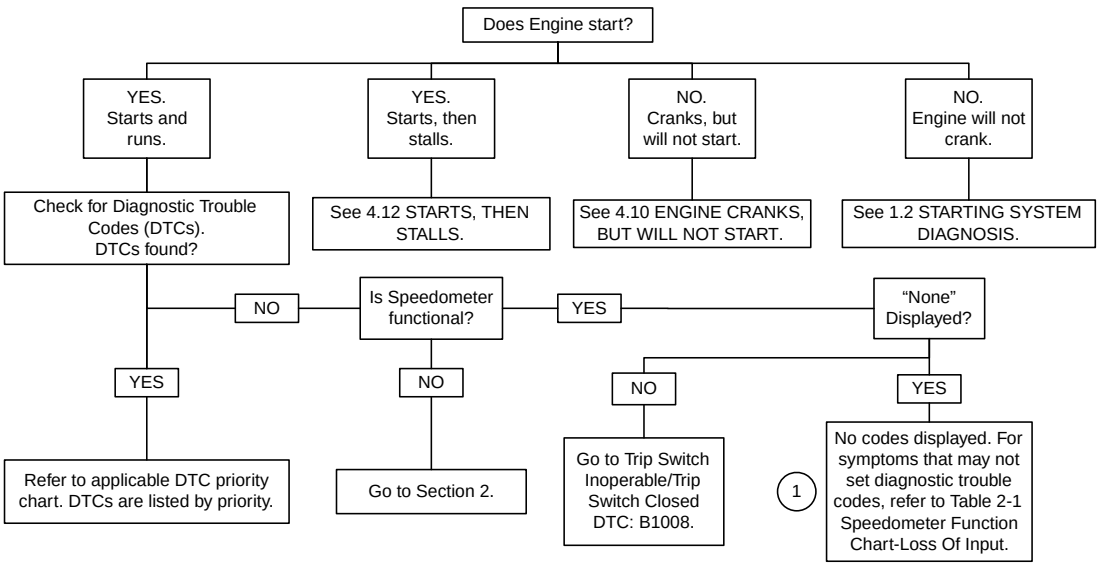
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[30]	TSM/TSSM/HFSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C/U	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat

Table 6-2. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[91]	Data link connector	All	4-place Deutsch	Under left side cover
[166]	ABS module	All	20-place Molex	Under right side cover

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Diagnostic Check



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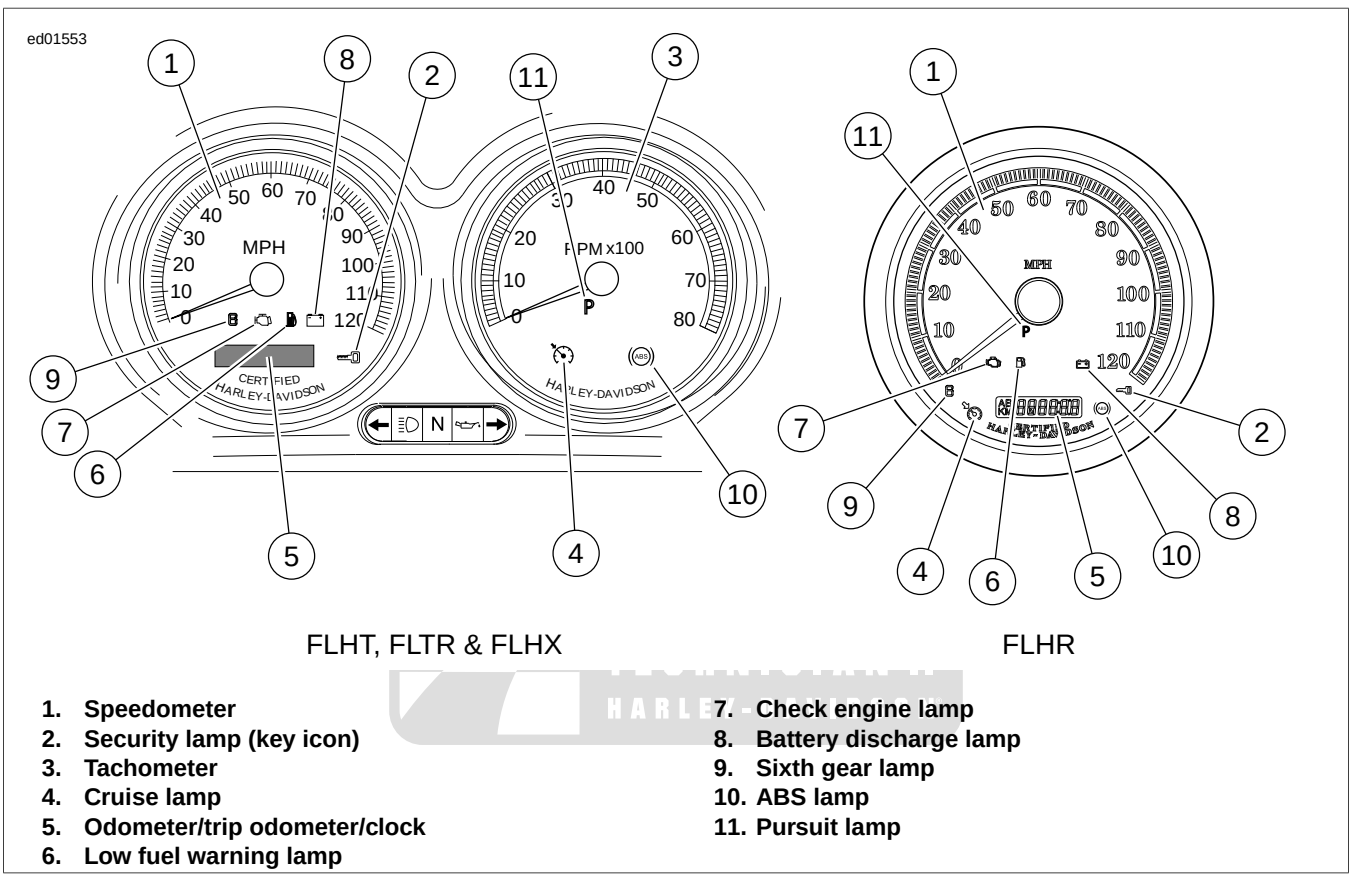
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ABS INDICATOR DIAGNOSTICS 6.5

ABS INDICATOR ALWAYS ON OR INOPERATIVE

Circuit Description

See Figure 6-10. The Instrument illuminates the ABS indicator by supplying ground to the lamp. The ABS module sends a serial data message to the instrument in order to command the indicator ON or OFF.



1. **Speedometer**
2. **Security lamp (key icon)**
3. **Tachometer**
4. **Cruise lamp**
5. **Odometer/trip odometer/clock**
6. **Low fuel warning lamp**
7. **Check engine lamp**
8. **Battery discharge lamp**
9. **Sixth gear lamp**
10. **ABS lamp**
11. **Pursuit lamp**

Figure 6-10. Instrument

Diagnostic Tips

The malfunction must be present during diagnosis in order to prevent unnecessary parts replacement.

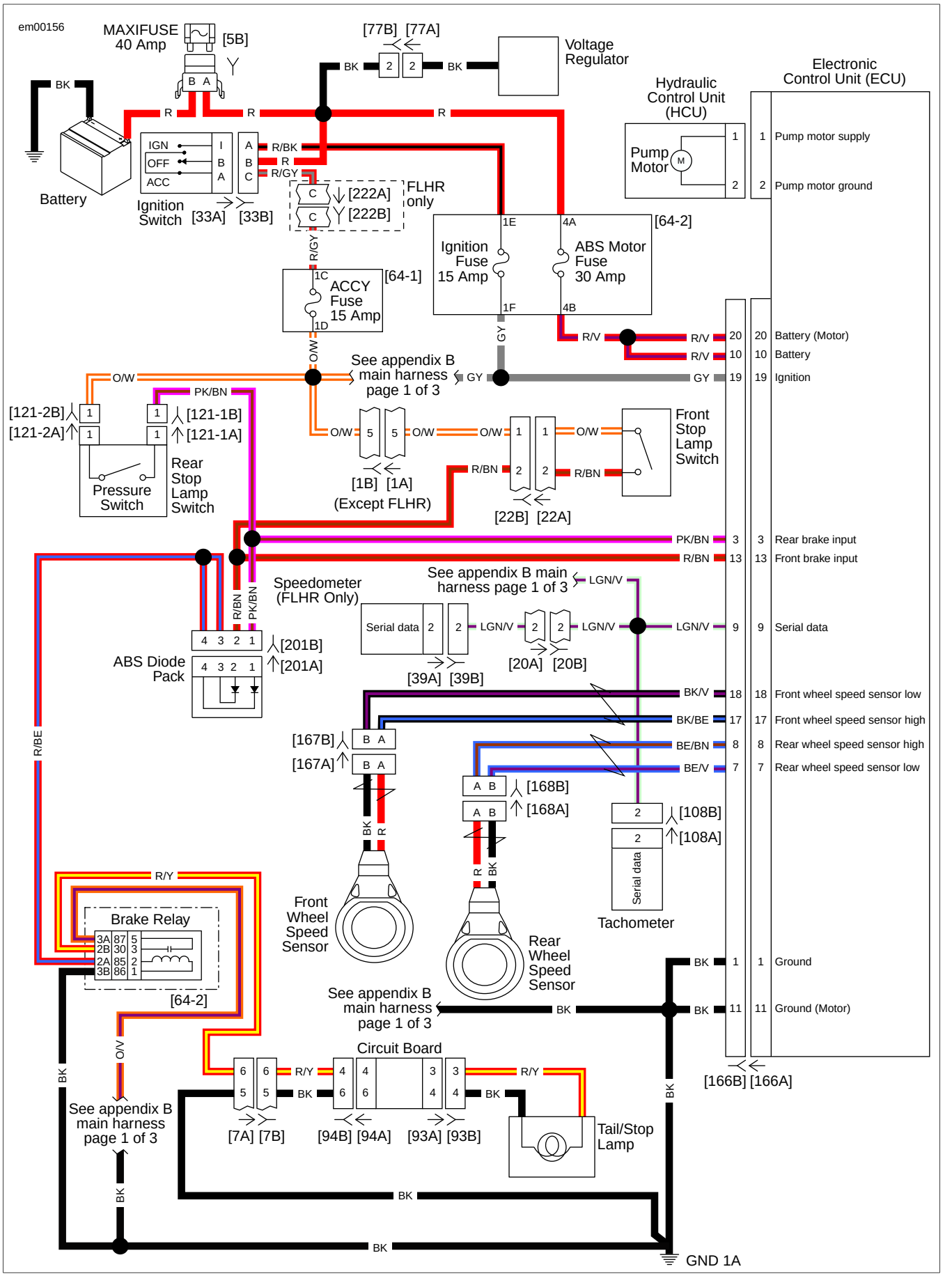


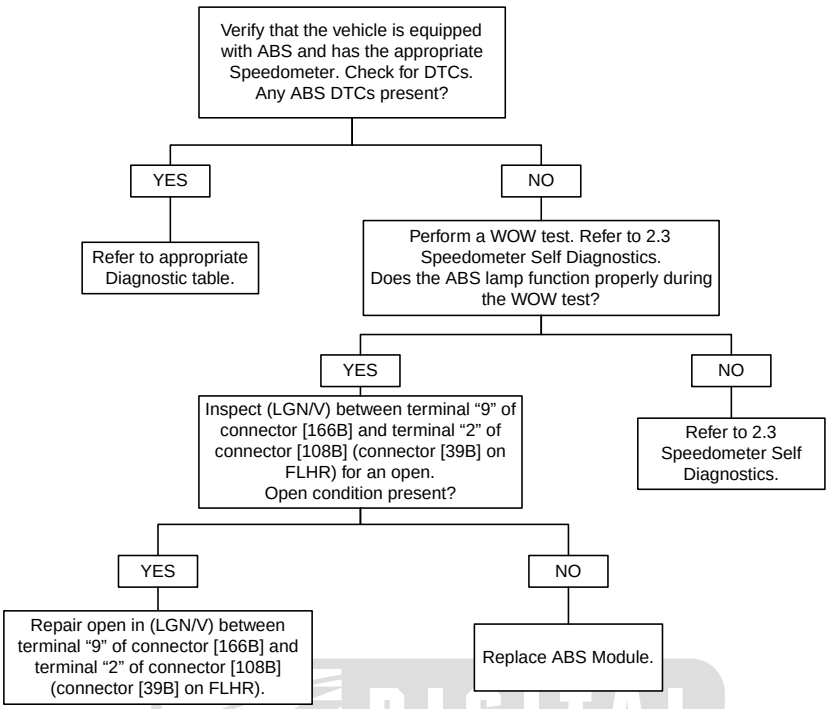
Figure 6-11. ABS Schematic

Table 6-3. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	ALL	16-place Molex (black)	Inner fairing - right radio support bracket
[5]	MAXIFUSE	ALL	2-place Packard	Under left side cover
[7]	Rear fender lights harness	ALL	8-place Multilock	Top of rear fender (under seat)
[20]	Console harness	ALL	16-place Molex	Under seat
[22]	Interconnect to right handlebar switches	ALL	12-place Molex (black)	Inner fairing - right fairing support brace
[33]	Ignition switch	ALL	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[39]	Speedometer	FLHT/C/U	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[64-1]	Fuse block	ALL	Packard	Under left side cover
[64-2]	Fuse block	ALL	Packard	Under left side cover
[77]	Voltage regulator	ALL	2-place Lyall	Bottom of voltage regulator (right side)
[93]	Tail lamp	ALL	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	ALL	6-place Multilock	Circuit board under tail lamp assembly
[108]	Tachometer	ALL	12-place Packard	Inner fairing (back of tachometer)
[121-1]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[121-2]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[166]	ABS module	ALL	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	ALL	2-place Packard	Below fuel tank (left side)
[168]	Rear wheel speed sensor	FLHX/FLHT/FLTR	2-place Packard	Fairing
		FLHR		Inside headlamp nacelle
[201]	ABS diode pack	ALL	4-place Deutsch	Under left side cover
[222]	Main to ignition harness	ALL	4-place Packard	Rear of fuel tank

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ABS Indicator Always On or Inoperative



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DTC C0562 6.6

DTC C0562: DEVICE VOLTAGE LOW

Circuit Description

The ABS module monitors the voltage level available for system operation. A low voltage condition prevents the system from operating properly.

Conditions for Running the DTC

Ignition voltage is greater than 6.5V and the vehicle speed is above 5 MPH (8 km/h).

Conditions for Setting the DTC

One of the following conditions exists for at least 0.72 seconds:

- During initialization or when the system is active the system voltage is below 9.0V.
- The system voltage drops below 10.5V with the system enabled and the pump not running.
- The ignition voltage is below 8.7V.
- Battery voltage is below 8.7V with vehicle speed above 5 MPH (8 km/h) and engine speed above 500 RPM.

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 either a "WOW" test or Digital Technician.

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:

- Charging system malfunction.
- Excessive battery draw and/or extended idling in heavy traffic.
- A weak battery.
- A faulty system ground.

Diagnostic Notes

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

1. The ignition circuit between wire harness connector [166B] and ABS connector [166A] consists of all the circuitry back to and including the Ignition Switch.

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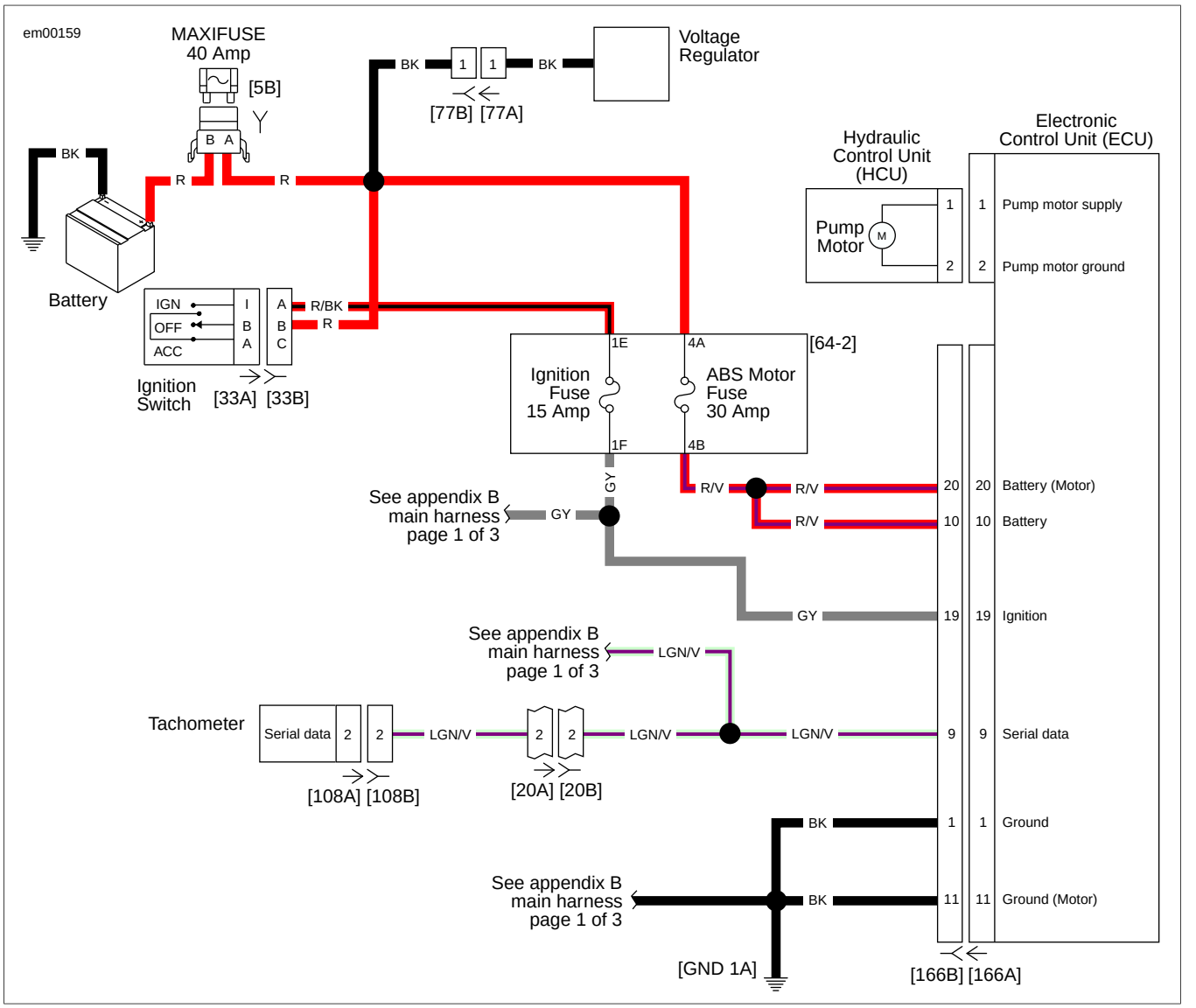
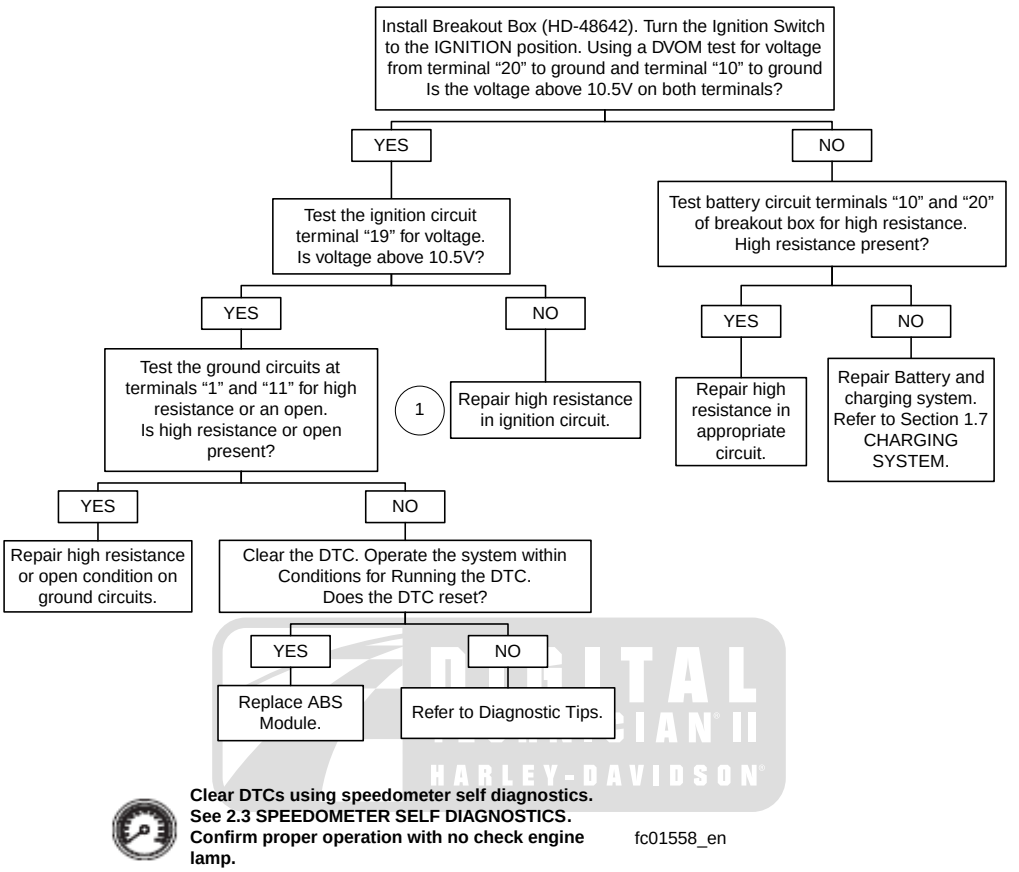


Figure 6-12. ABS Power and Ground Schematic

Table 6-4. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[20]	Console harness	16-place Molex	Under seat
[33]	Ignition Switch	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[64-2]	Fuse block	Packard	Under left side cover
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)
[108]	Tachometer	12-place Packard	Inner fairing (back of tachometer)
[166]	ABS module	20-place Molex	Under right side cover

Device Voltage Low: DTC C0562



DTC C0563 6.7

DTC C0563: DEVICE VOLTAGE HIGH

Circuit Description

The ABS module monitors the system voltage level. If the voltage level is too high, damage may result to the system. When the ABS module detects a high voltage condition, it disables the ABS.

Conditions for Running the DTC

Ignition voltage is greater than 6.5V.

Conditions for Setting the DTC

One of the following conditions exists for at least 0.72 seconds:

- When the system is active the system voltage is above 18.0V.
- The ignition voltage is above 18.0V.

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 either a "WOW" test or Digital Technician.

The ABS module automatically clears the historic DTC when a current DTC is not detected in 50 consecutive drive cycles.

Diagnostic Tips

This fault could be caused by an overcharging condition with either the vehicle's charging system or an external charging system.

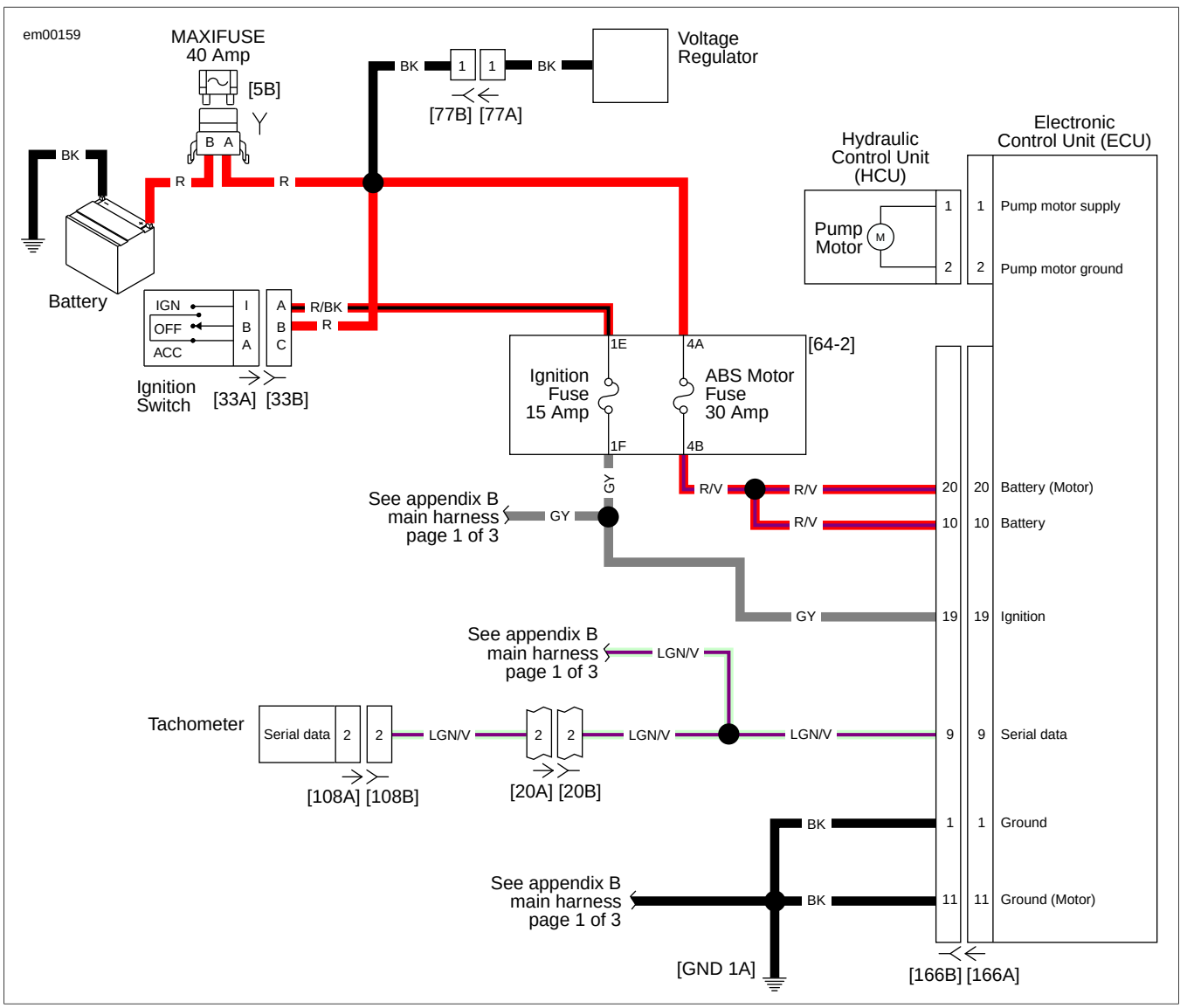


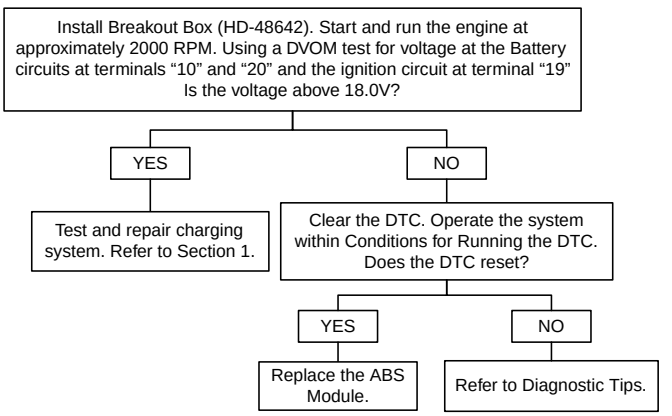
Figure 6-13. ABS Power and Ground Schematic

Table 6-5. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[20]	Console harness	16-place Molex	Under seat
[33]	Ignition Switch	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[64-2]	Fuse block	Packard	Under left side cover
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)
[108]	Tachometer	12-place Packard	Inner fairing (back of tachometer)
[166]	ABS module	20-place Molex	Under right side cover

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Device Voltage High: DTC C0563



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Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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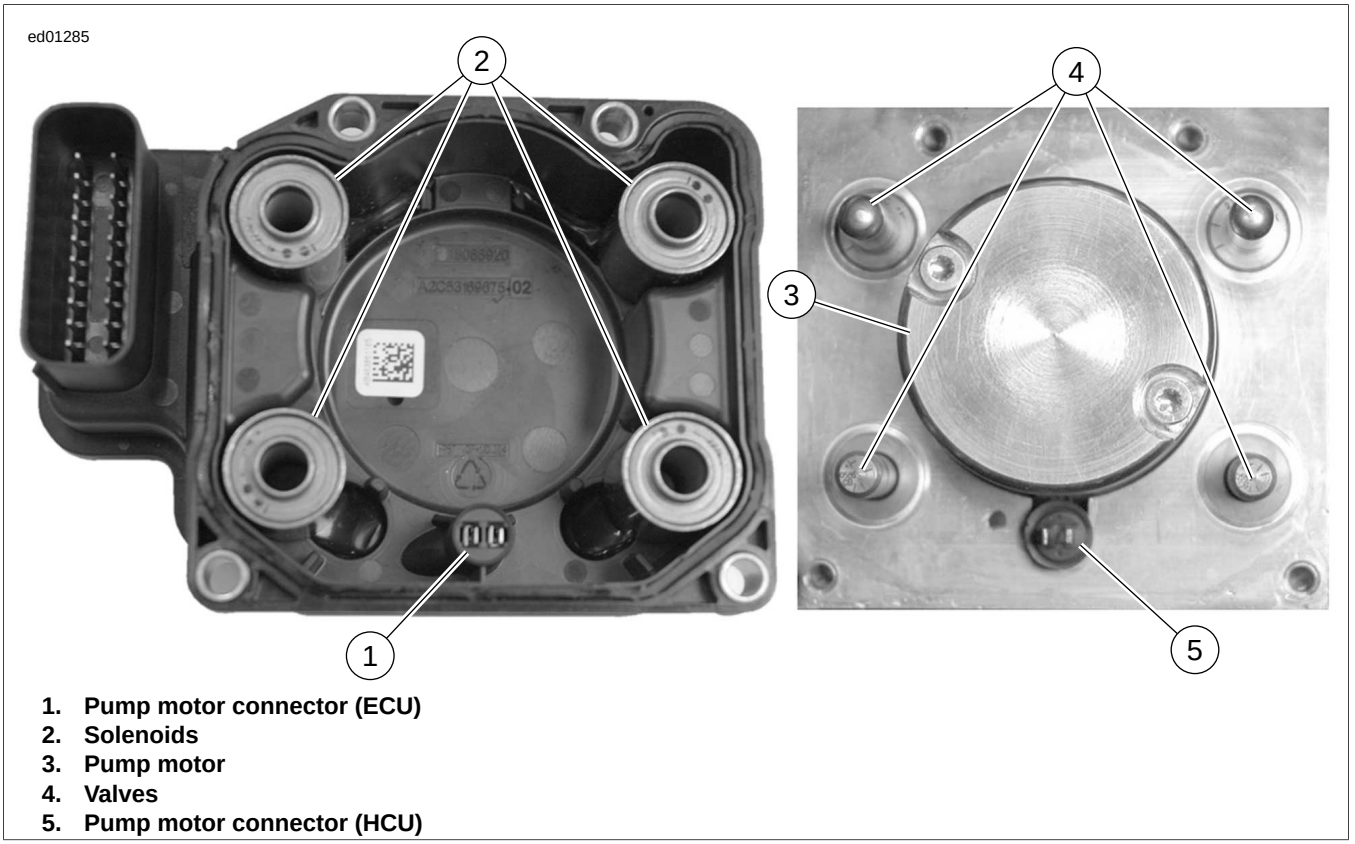
DTC C1017 6.8

DTC C1017: PUMP MOTOR POWER CIRCUIT OPEN FAULT

PART NUMBER	TOOL NAME
HD-48642	BREAKOUT BOX

Circuit Description

See Figure 6-14. The ABS module monitors the internal relay for the pump motor along with the power circuit going to it.



1. **Pump motor connector (ECU)**
2. **Solenoids**
3. **Pump motor**
4. **Valves**
5. **Pump motor connector (HCU)**

Figure 6-14. ECU and HCU Pump Motor Connectors

Conditions for Running the DTC

- The system is enabled and the system voltage is above 10.5V.
- The ignition voltage is between 8.7V and 18.0V.

Conditions for Setting the DTC

The DTC 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.

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 either a "WOW" test or Digital Technician.

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:

- High resistance or open pump motor battery circuit.
- Internal ECU pump relay fault.
- Battery or charging malfunction.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48642) between wire harness connector [166B] and ABS connector [166A].

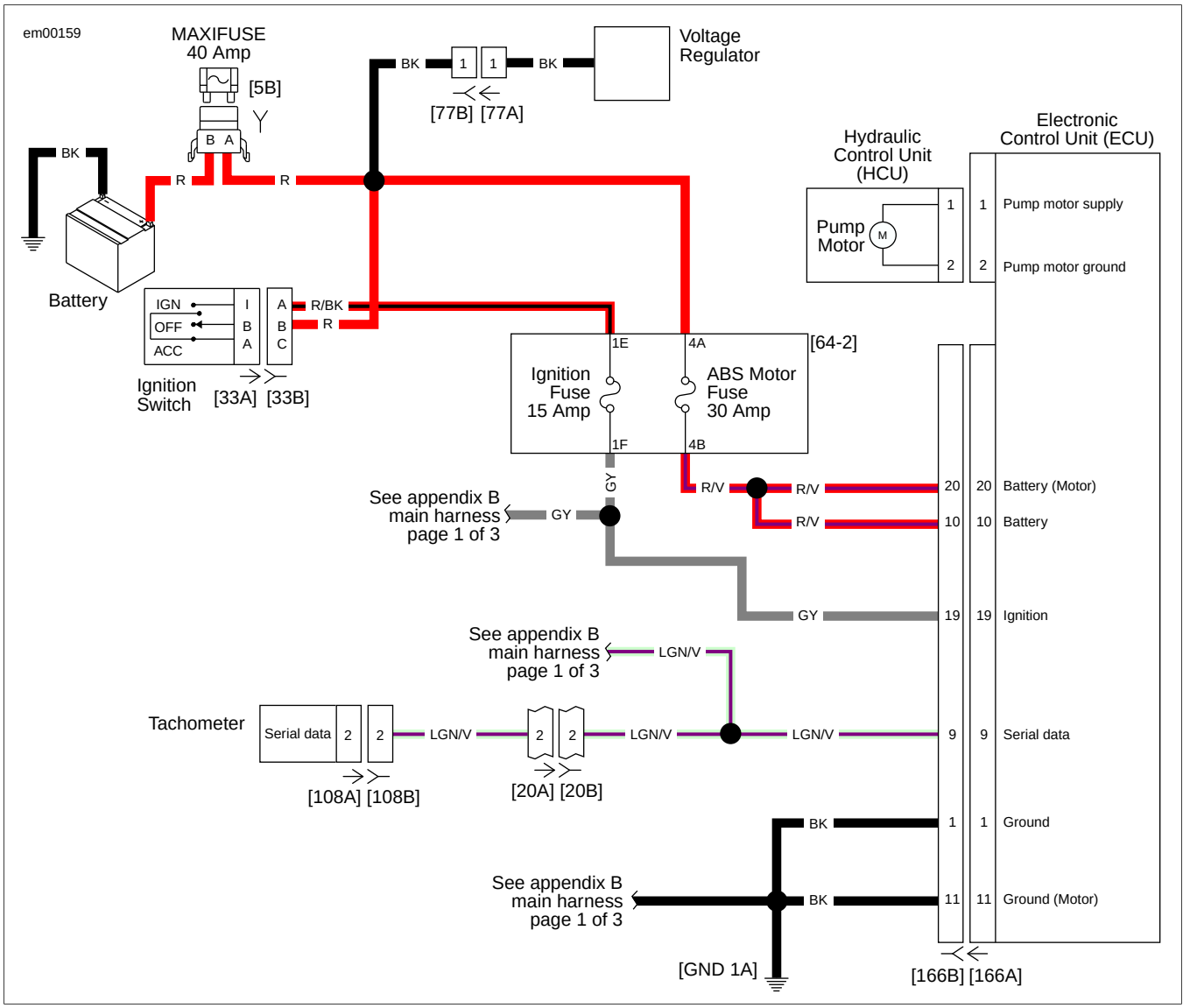


Figure 6-15. ABS Power and Ground Schematic

Table 6-6. FLHX, FLHT/C/U Connector Locations

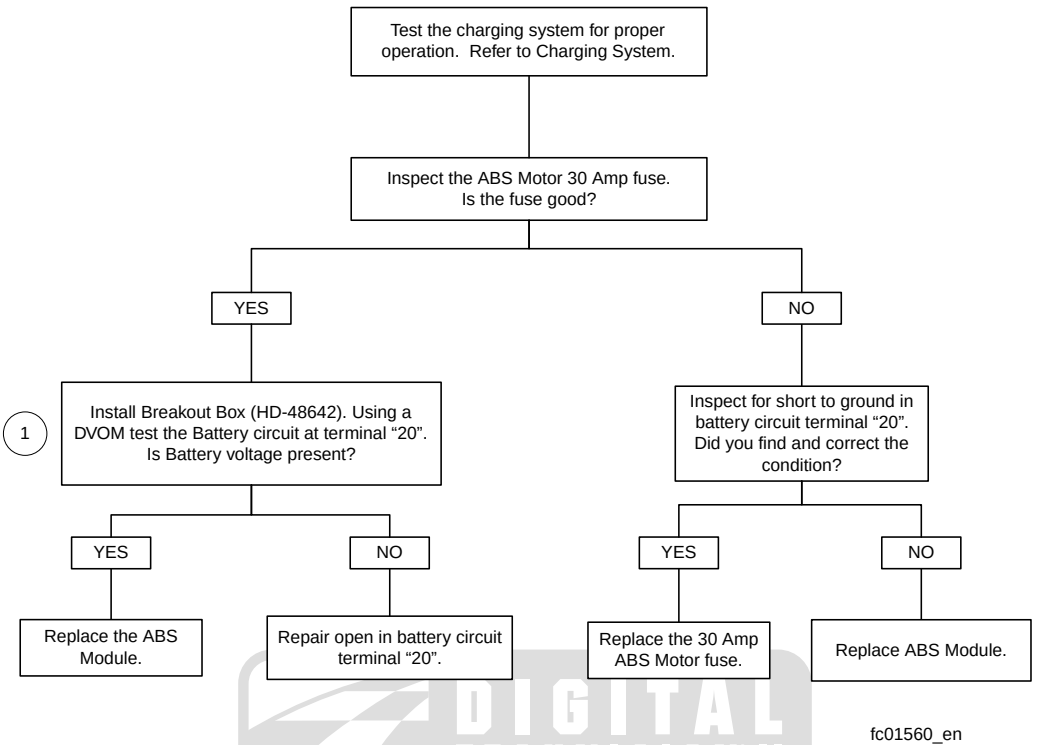
NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[20]	Console harness	16-place Molex	Under seat
[33]	Ignition Switch	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[64-2]	Fuse block	Packard	Under left side cover
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)

Table 6-6. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[108]	Tachometer	12-place Packard	Inner fairing (back of tachometer)
[166]	ABS module	20-place Molex	Under right side cover

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Pump Motor Power Circuit Open Fault: DTC C1017



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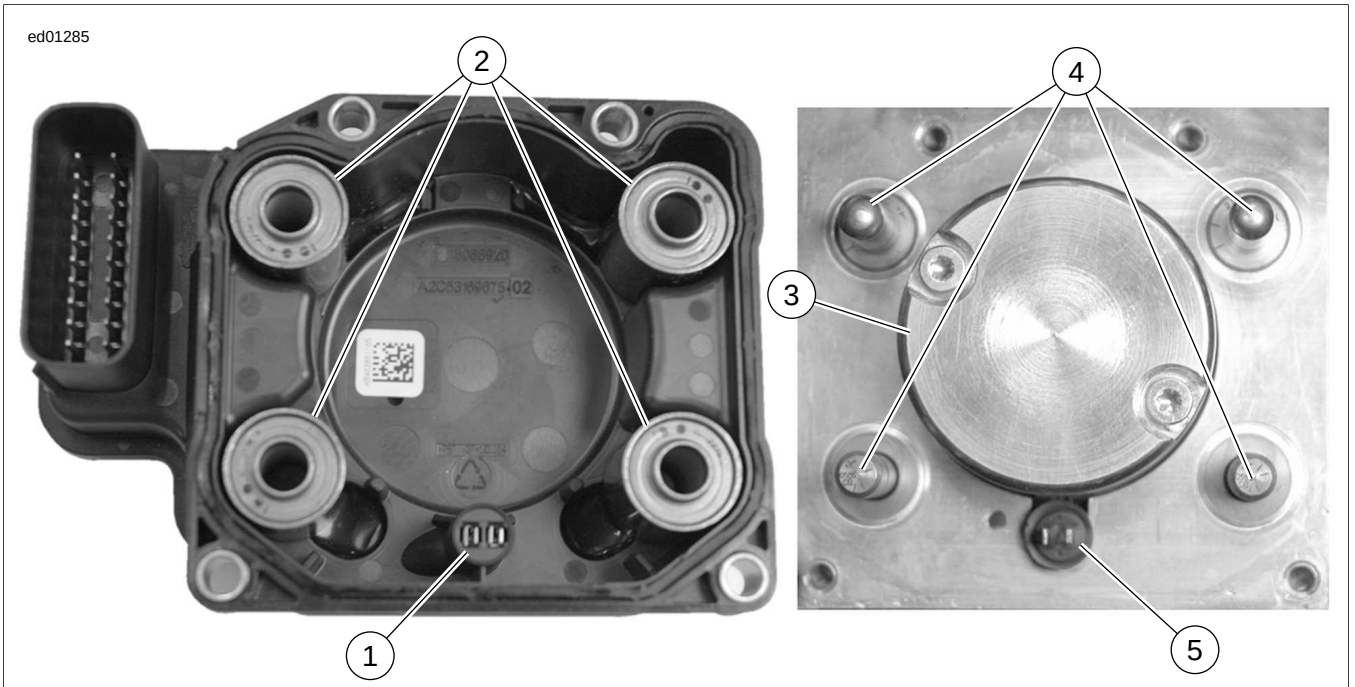
DTC C1018 6.9

DTC C1018: PUMP MOTOR GROUND HIGH RESISTANCE FAULT

PART NUMBER	TOOL NAME
HD-48642	BREAKOUT BOX

Circuit Description

See Figure 6-16. The ABS module monitors the internal pump motor and the circuit supplying ground to the pump motor.



1. **Pump motor connector (ECU)**
2. **Solenoids**
3. **Pump motor**
4. **Valves**
5. **Pump motor connector (HCU)**

Figure 6-16. ECU and HCU Pump Motor Connectors

Conditions for Running the DTC

- The ignition voltage is between 8.7V and 18.0V.
- The system is enabled.

Conditions for Setting the DTC

The DTC will set if the following conditions exist when the pump motor is commanded off.

- The system voltage is between 8.0V and 18.0V.
- The voltage at the low side of the pump is greater than 1.7V.

The DTC will set if the following conditions exist when the pump is commanded on.

- The system voltage is between 10.0V and 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 with either a "WOW" test or Digital Technician.

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:

- Pump motor ground circuit has high resistance or open.
- Battery or charging malfunction.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-48642) between wire harness connector [166B] and ABS connector [166A].

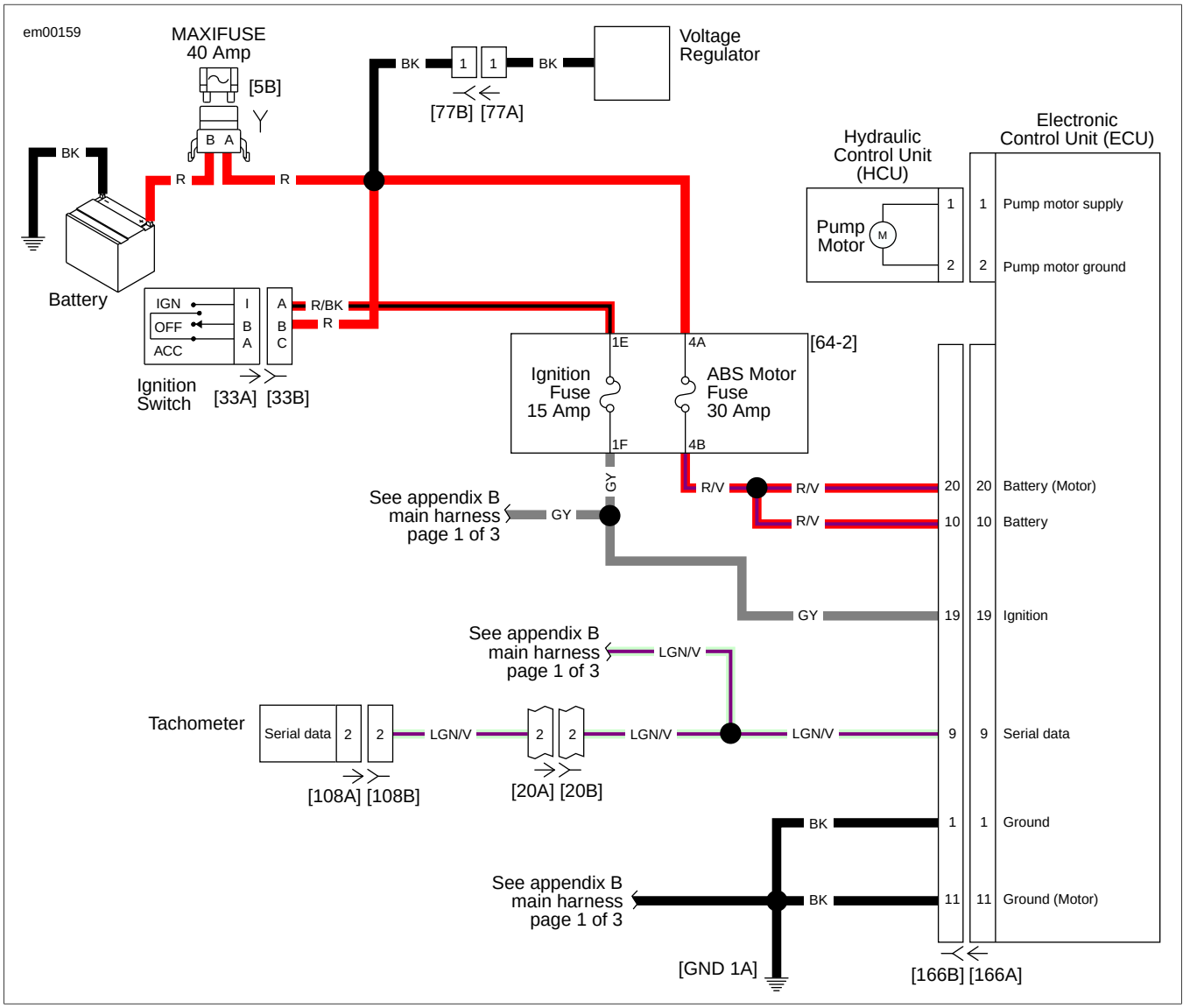


Figure 6-17. ABS Power and Ground Schematic

Table 6-7. FLHX, FLHT/C/U Connector Locations

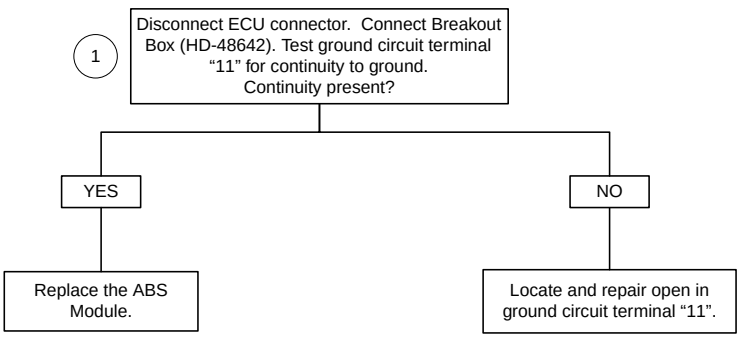
NO.	DESCRIPTION	TYPE	LOCATION
[5]	MAXIFUSE	2-place Packard	Under left side cover
[20]	Console harness	16-place Molex	Under seat
[33]	Ignition Switch	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[64-2]	Fuse block	Packard	Under left side cover
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)

Table 6-7. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[108]	Tachometer	12-place Packard	Inner fairing (back of tachometer)
[166]	ABS module	20-place Molex	Under right side cover

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Pump Motor Ground High Resistance Fault: DTC C1018



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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC C1021, C1023 6.10

DTC C1021, C1023: WHEEL SPEED SENSOR EQUALS ZERO (FRONT OR REAR)

Circuit Description

The active wheel speed sensor is supplied system voltage from the ABS module. The sensor then returns a 7 milliamp to 14 milliamp signal back to the ABS module.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- The ABS is inactive.
- The brake is not depressed.
- There are no wheel speed sensor circuit malfunctions.
- Vehicle must be driven above 10 MPH (16 km/h) for 20 seconds without a brake input.

Conditions for Setting the DTC

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 with either a "WOW" test or Digital Technician.

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).

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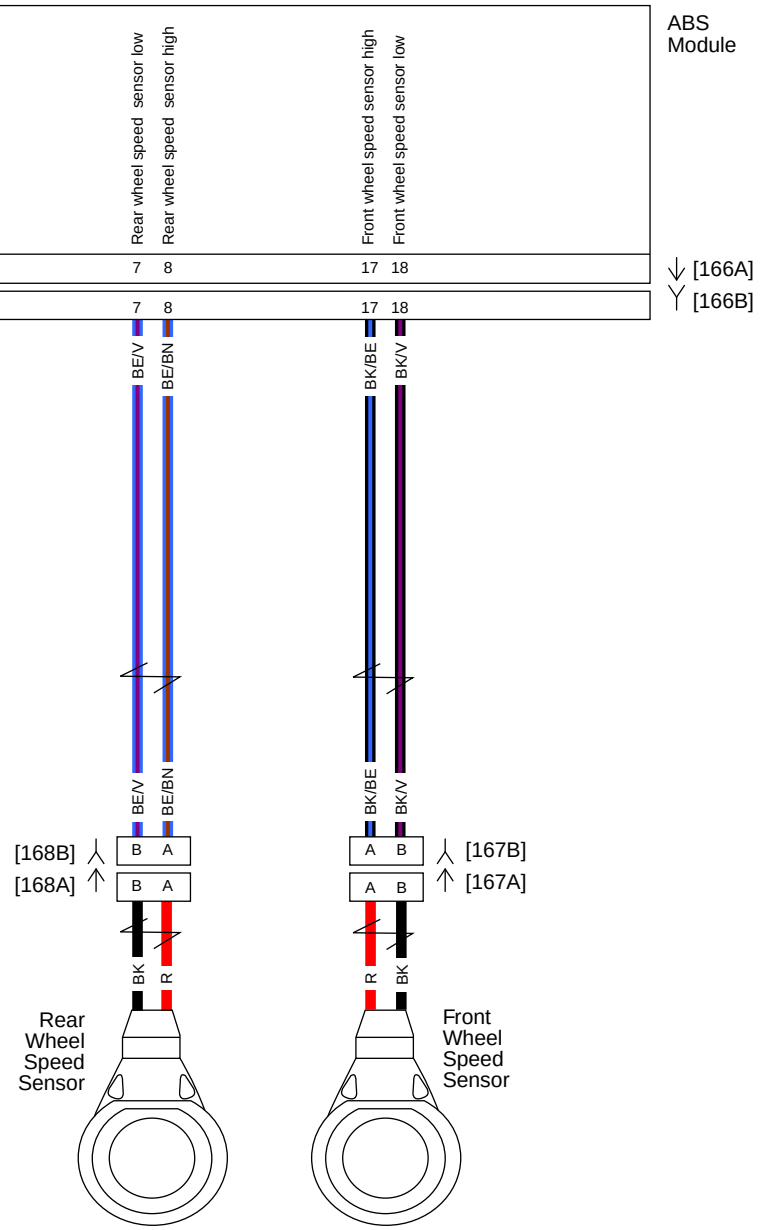


Figure 6-18. Wheel Speed Sensor Schematic

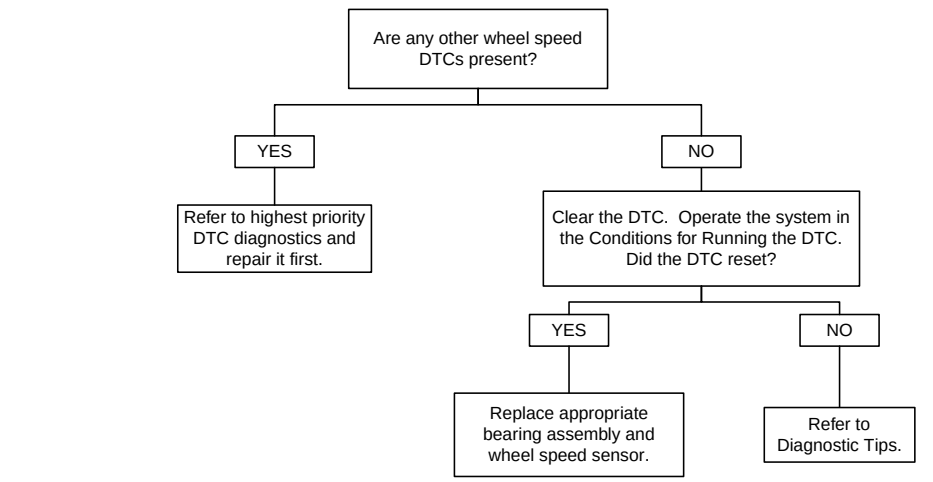
Table 6-8. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Lower right side behind exhaust

Wheel Speed Sensor Equals Zero: DTC C1021 (Front), DTC C1023 (Rear)

NOTE

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).



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no ABS lamp.

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DTC C1025, C1027, C1206, C1208 6.11

DTC C1025, C1027, C1206, C1208: WHEEL SPEED SIGNAL INTERMITTENT OR FREQUENCY OUT OF RANGE

PART NUMBER	TOOL NAME
HD-48642	BREAKOUT BOX

Circuit Description

The active wheel speed sensor is supplied system voltage from the ABS module. The sensor then returns a 7 milliamp or 14 milliamp signal back to the ABS module.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- The brake is not depressed.
- There are no front or rear wheel speed sensor circuit malfunctions.

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 with either a "WOW" test or Digital Technician.

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 wheel speed 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.

Diagnostic Notes

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

1. A possible cause of the DTC is electrical noise on the wheel speed sensor harness wiring. Electrical noise could result from the wheel speed sensor wires being routed to close to high energy ignition system components, such as spark plug wires.
2. Connect BREAKOUT BOX (Part No. HD-48642) between wire harness connector [166B] and ABS connector [166A].

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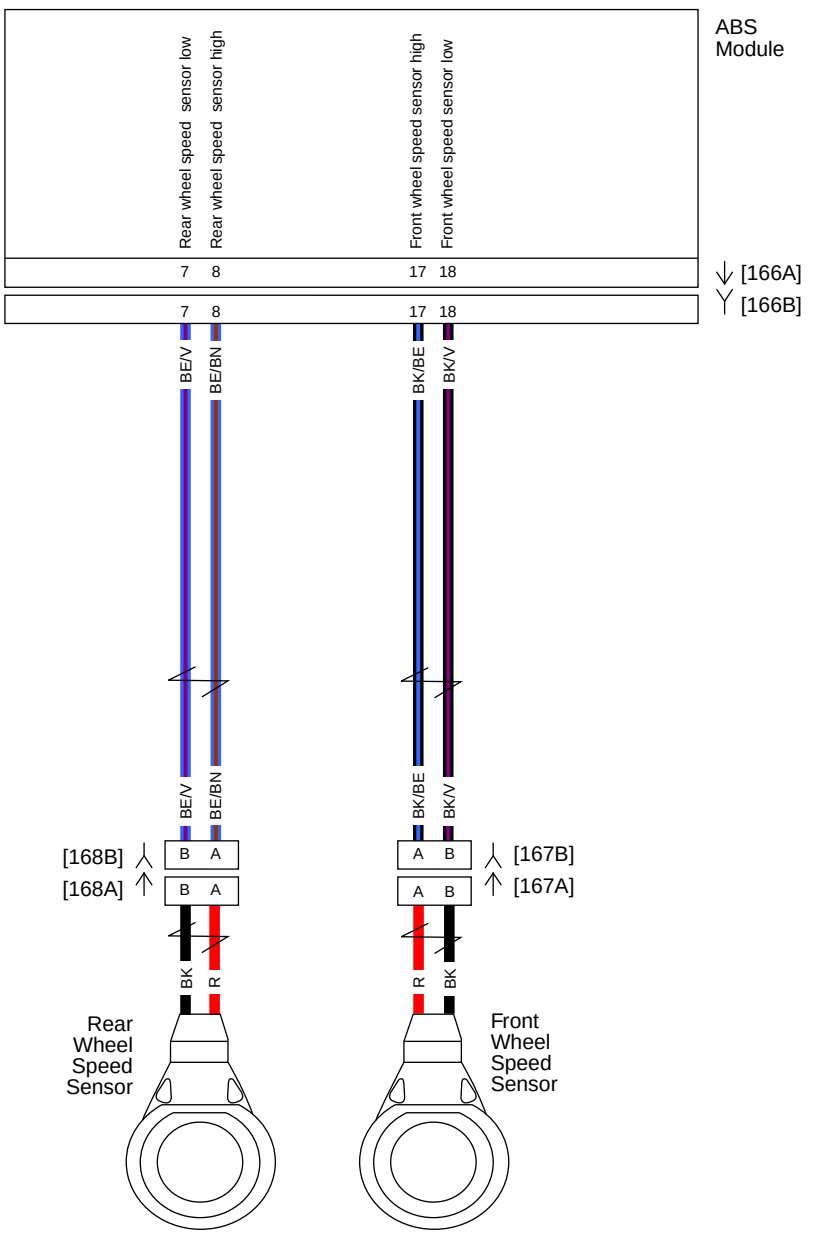
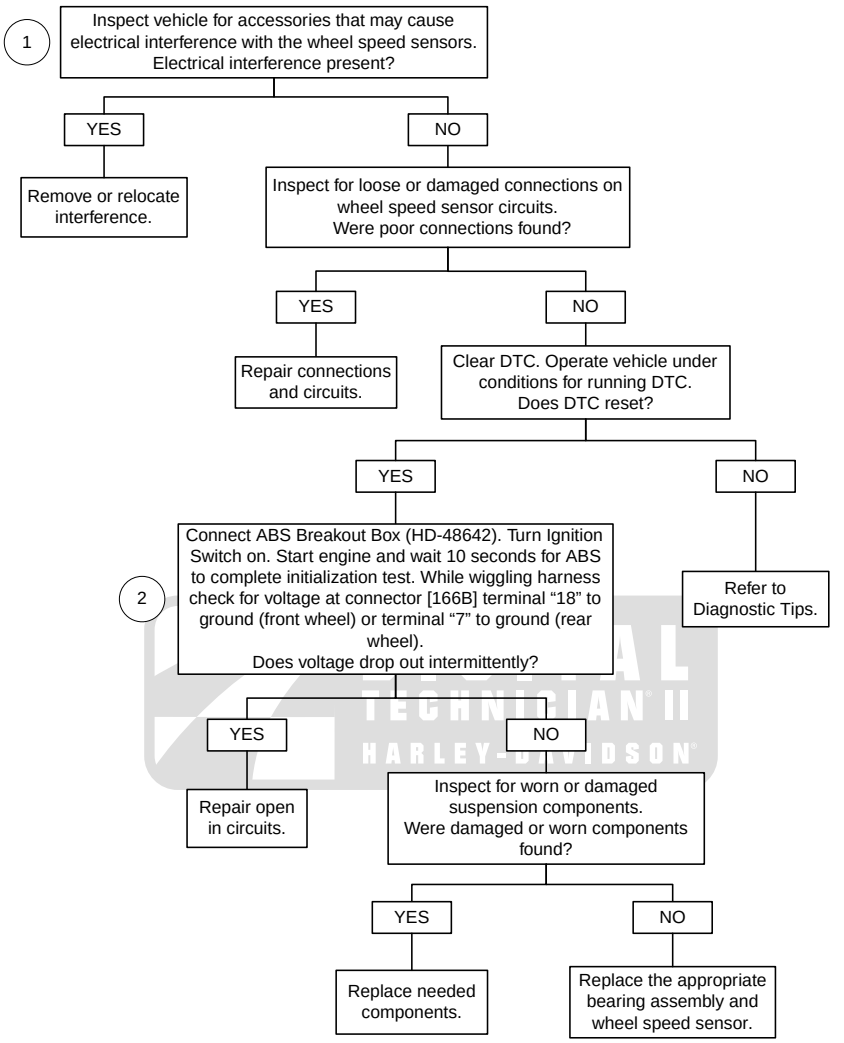


Figure 6-19. Wheel Speed Sensor Schematic

Table 6-9. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Lower right side behind exhaust

Wheel Speed Signal Intermittent or Frequency Out of Range: DTC C1025 (front), C1027 (rear), C1206, C1208



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no ABS lamp.

fc01564_en

DTC C1032, C1034 6.12

DTC C1032, C1034: WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORTED (FRONT OR REAR)

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-48642	BREAKOUT BOX

Circuit Description

The active wheel speed sensor is supplied system voltage from the ABS module. The sensor then returns a 7 milliamp to 14 milliamp signal back to the ABS module.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- There are no front or rear wheel speed sensor circuit malfunctions.

Conditions for Setting the DTC

The DTC will set if the following conditions exist:

- Short to ground on either the high or low side circuits of the front wheel speed sensor.
- Open on either the high or low side circuits of the front wheel speed sensor.
- Short to voltage on the low side causing the voltage to go above 0.79V.
- Wheel speed sensor 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 either a "WOW" test or Digital Technician.

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 either of the front wheel speed sensor circuits.
- Short to ground in either of the front wheel speed sensor wires.
- Front wheel speed sensor open.
- Front wheel speed circuit low shorted to battery.

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.

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) with gray male probes and patch cords.
2. Connect BREAKOUT BOX (Part No. HD-48642) between wire harness connector [166B] and ABS connector [166A].

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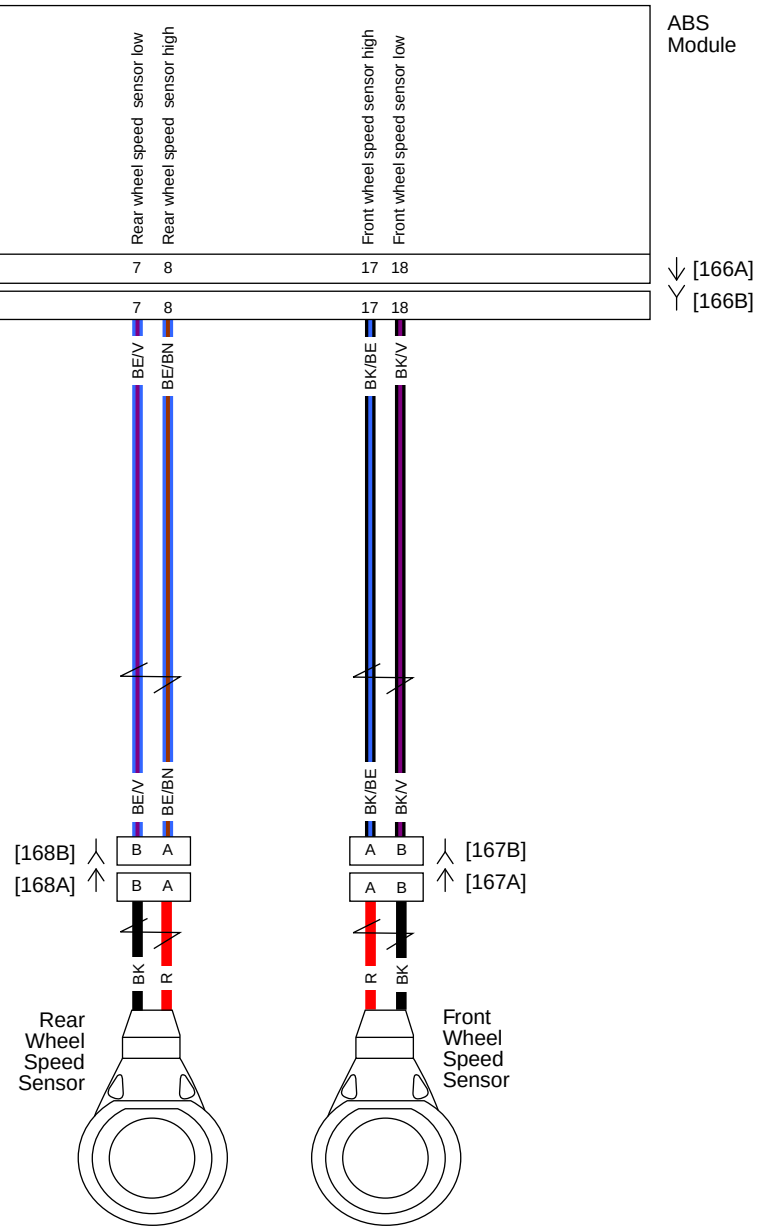
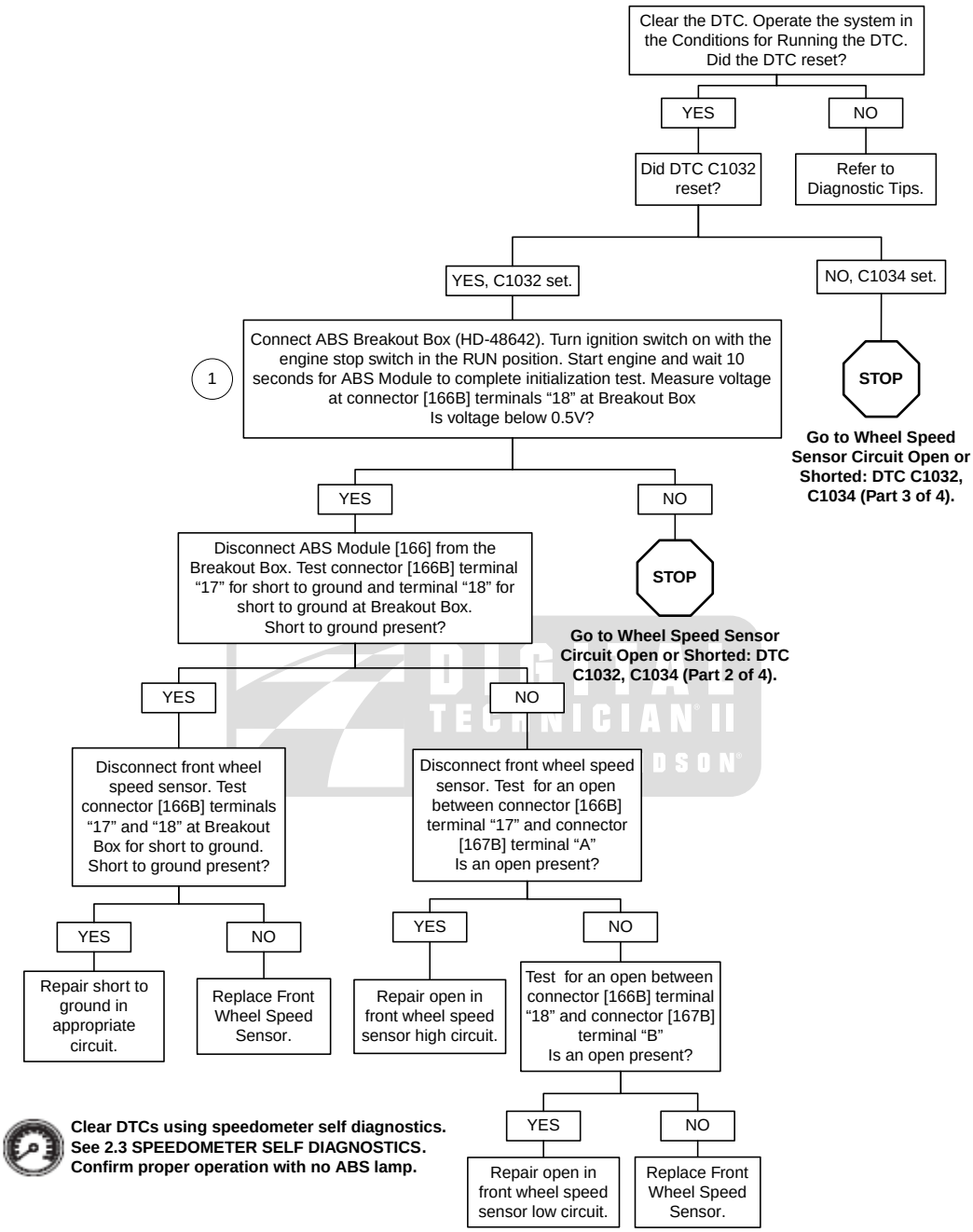


Figure 6-20. Wheel Speed Sensor Schematic

Table 6-10. FLHX, FLHT/C/U Connector Locations

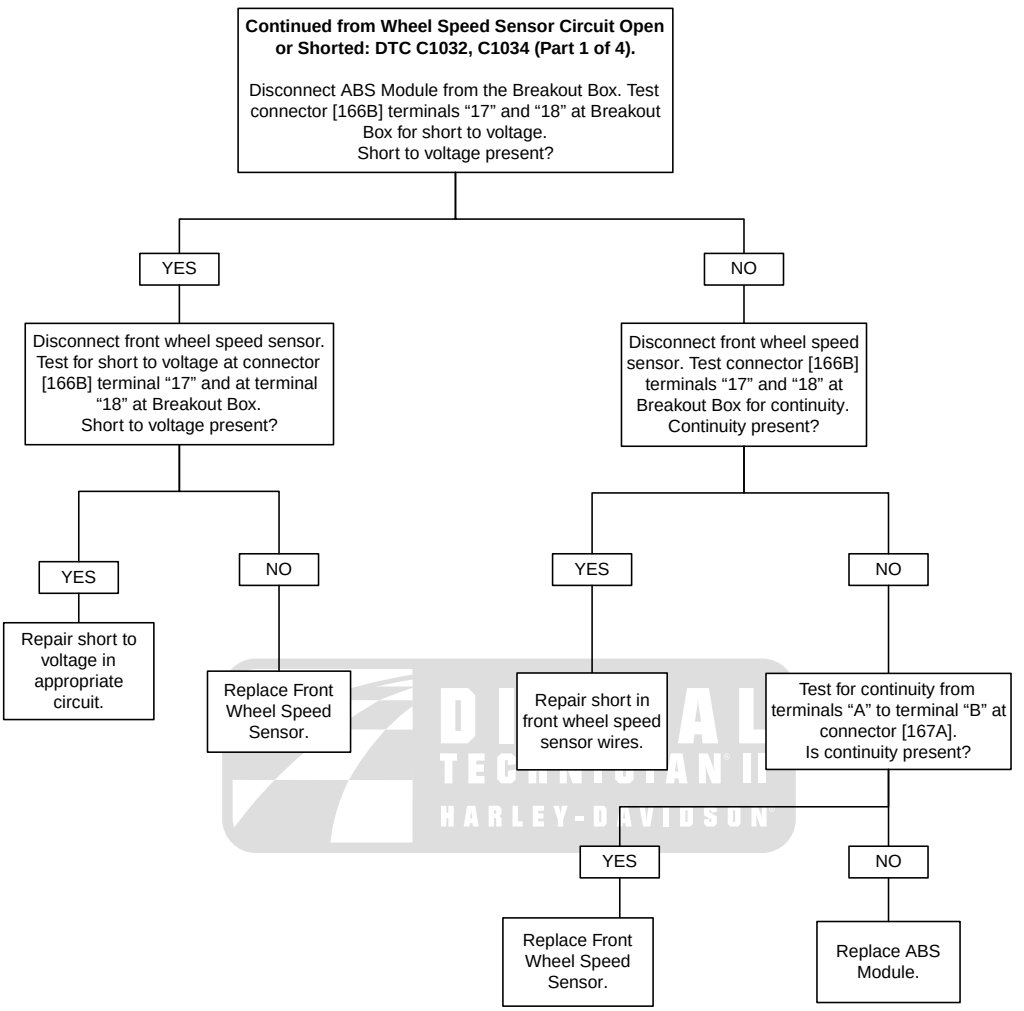
NO.	DESCRIPTION	TYPE	LOCATION
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Lower right side behind exhaust

Wheel Speed Sensor Circuit Open or Shorted: DTC C1032, C1034 (1 of 4)



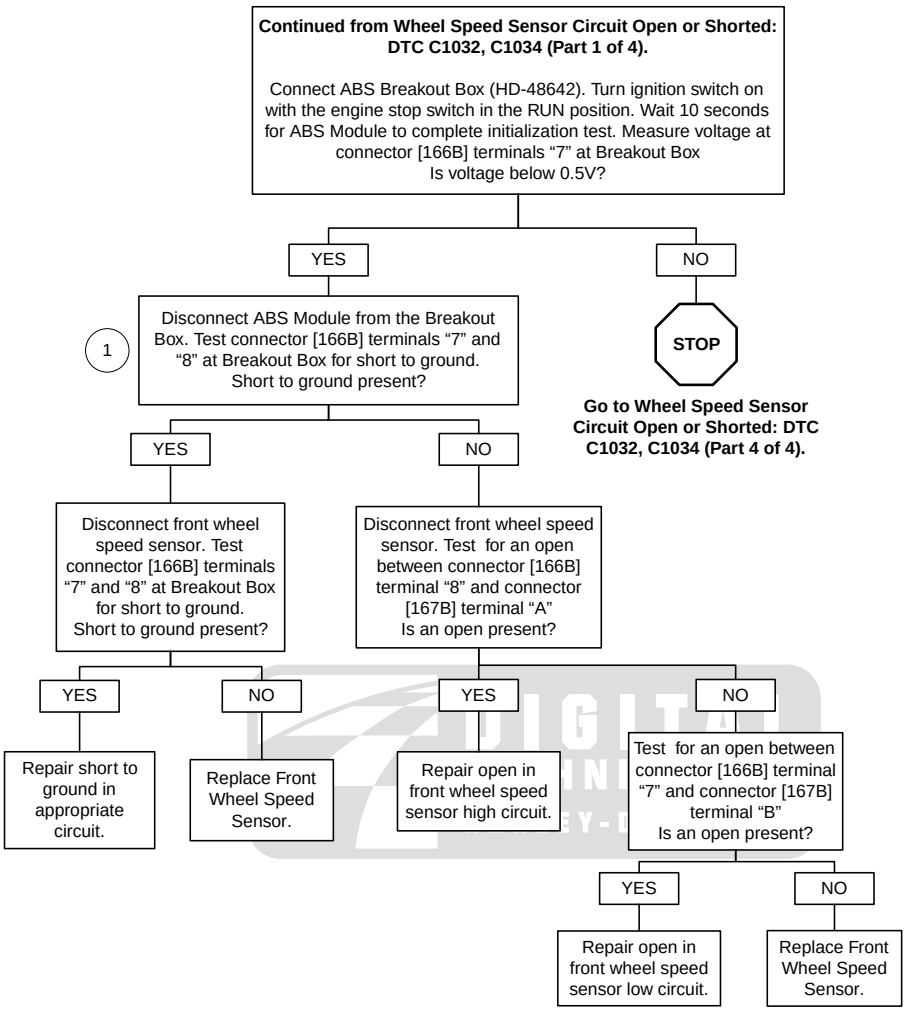
fc01563_en

Wheel Speed Sensor Circuit Open or Shorted: DTC C1032, C1034 (2 of 4)



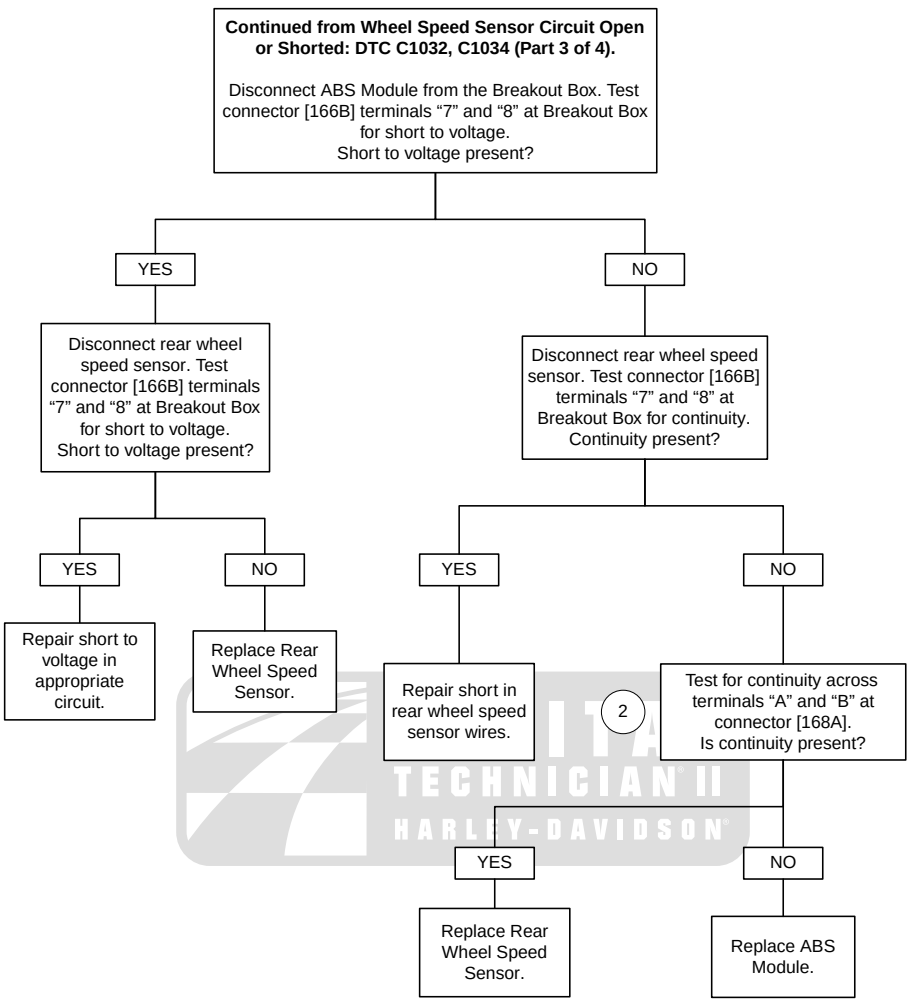
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Wheel Speed Sensor Circuit Open or Shorted: DTC C1032, C1034 (3 of 4)



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Wheel Speed Sensor Circuit Open or Shorted: DTC C1032, C1034 (4 of 4)



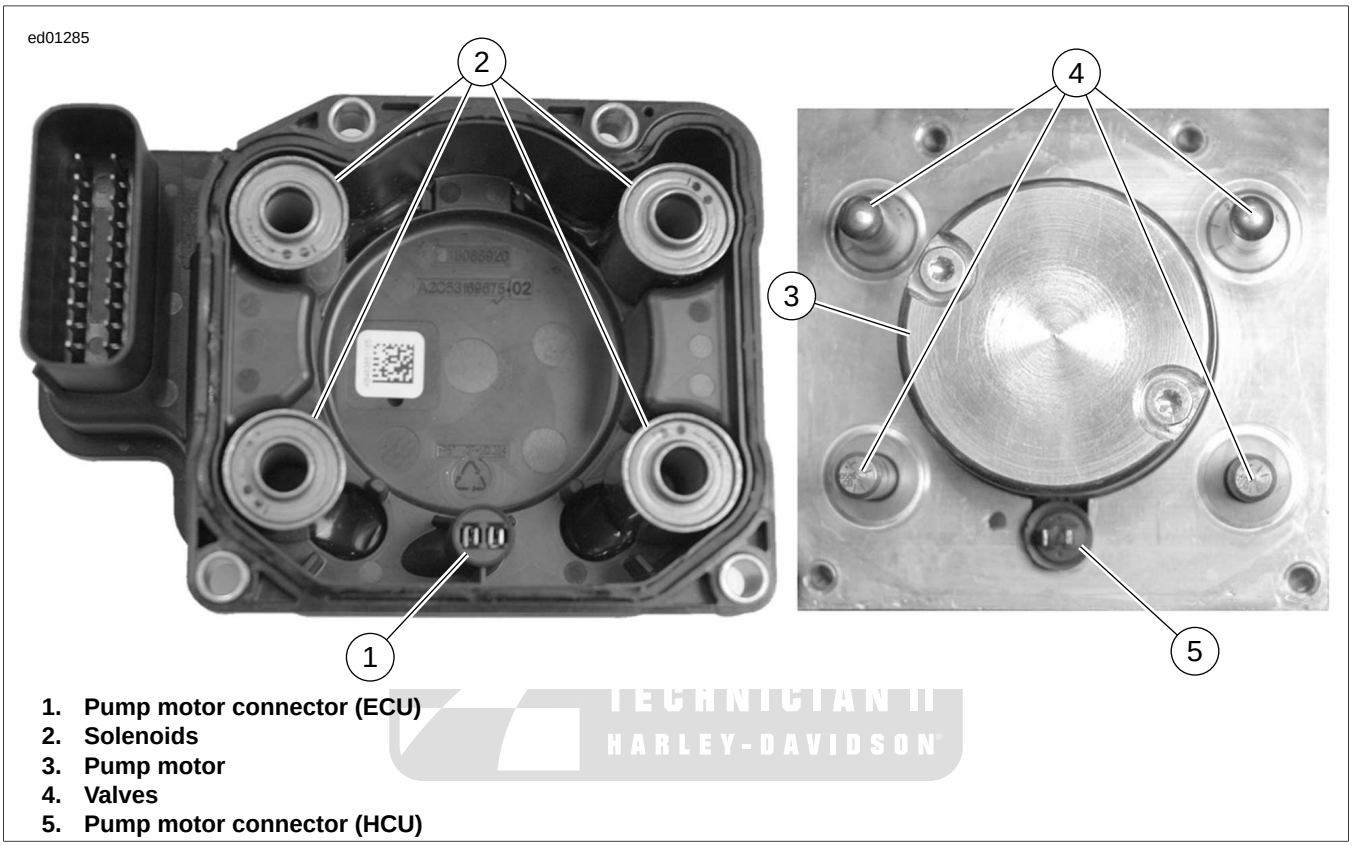
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DTC C1042 6.13

DTC C1042: PUMP MOTOR OPEN

Circuit Description

See Figure 6-21. 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.



1. **Pump motor connector (ECU)**
2. **Solenoids**
3. **Pump motor**
4. **Valves**
5. **Pump motor connector (HCU)**

Figure 6-21. ECU and HCU Pump Motor Connectors

Conditions for Running the DTC

- Ignition voltage is between 8.7V and 18.0V.
- System voltage is between 8.0V and 18.0V.
- System is enabled.
- The pump motor has been commanded off for 2.4 seconds.

Conditions for Setting the DTC

The DTC will set if the following condition exists:

- Current did not exceed 15.6A within 0.1 seconds 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 with either a "WOW" test or Digital Technician.

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:

- Open or high resistance at the pump motor connector.
- Open or high resistance in the pump motor windings.

Diagnostic Procedure

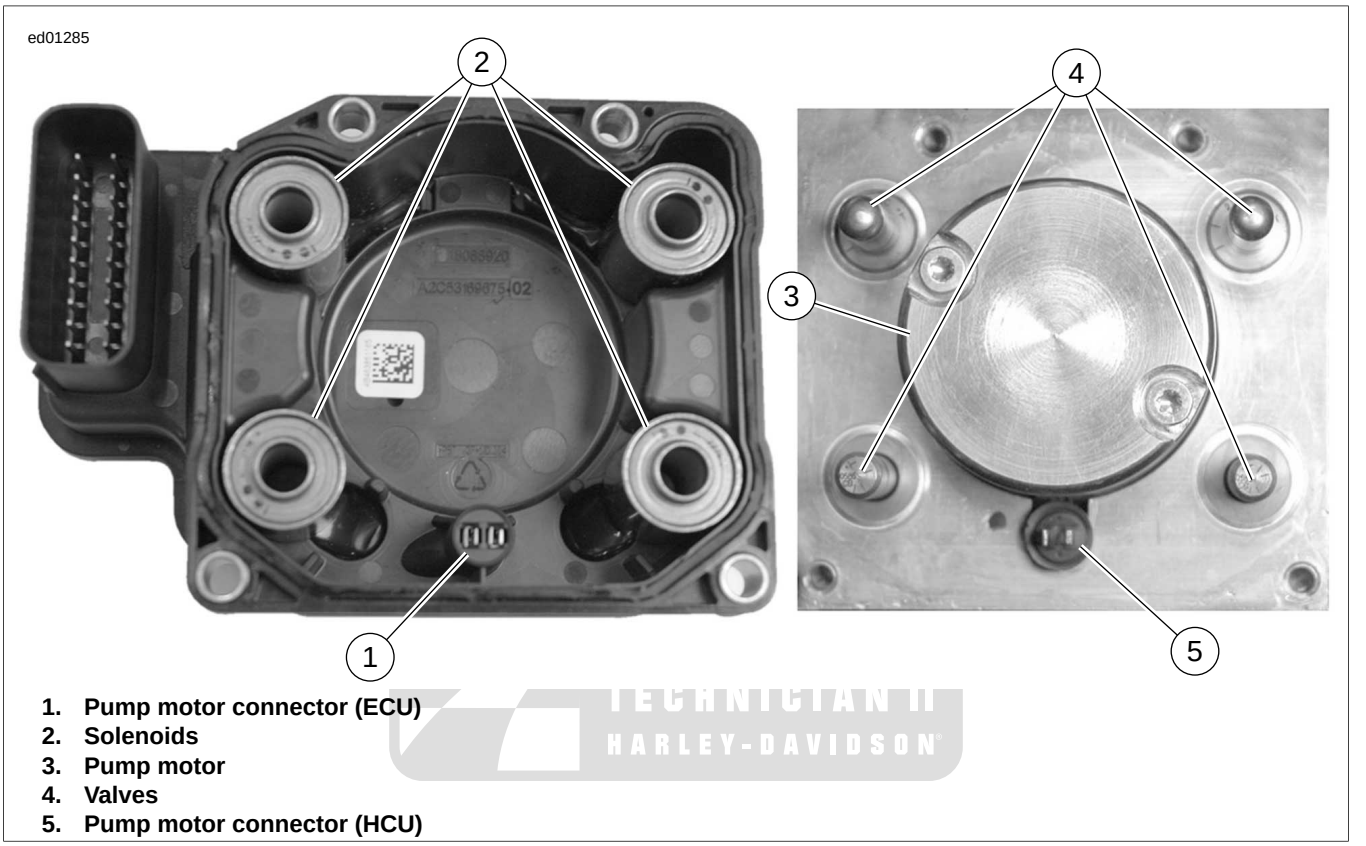
If this code exists clear the code. Operate the system under conditions for running the DTC and if it resets replace the ABS Module.

DTC C1043 6.14

DTC C1043: PUMP MOTOR STALLED

Circuit Description

See Figure 6-22. 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.



1. **Pump motor connector (ECU)**
2. **Solenoids**
3. **Pump motor**
4. **Valves**
5. **Pump motor connector (HCU)**

Figure 6-22. ECU and HCU Pump Motor Connectors

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- System voltage is between 8.0V and 18.0V.
- System is enabled.
- The pump motor has been commanded on for 0.3 seconds.

Conditions for Setting the DTC

The DTC 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 with either a "WOW" test or Digital Technician.

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:

- 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.

Diagnostic Procedure

If this code exists clear the code. Operate the system under conditions for running the code and if it resets replace the ABS module.

DTC C1094 6.15

DTC C1094: FRONT BRAKE SWITCH ALWAYS ON

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

Circuit Description

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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/second (8 km/h/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 with either a "WOW" test or Digital Technician.

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.

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) wit gray male probes and patch cords.

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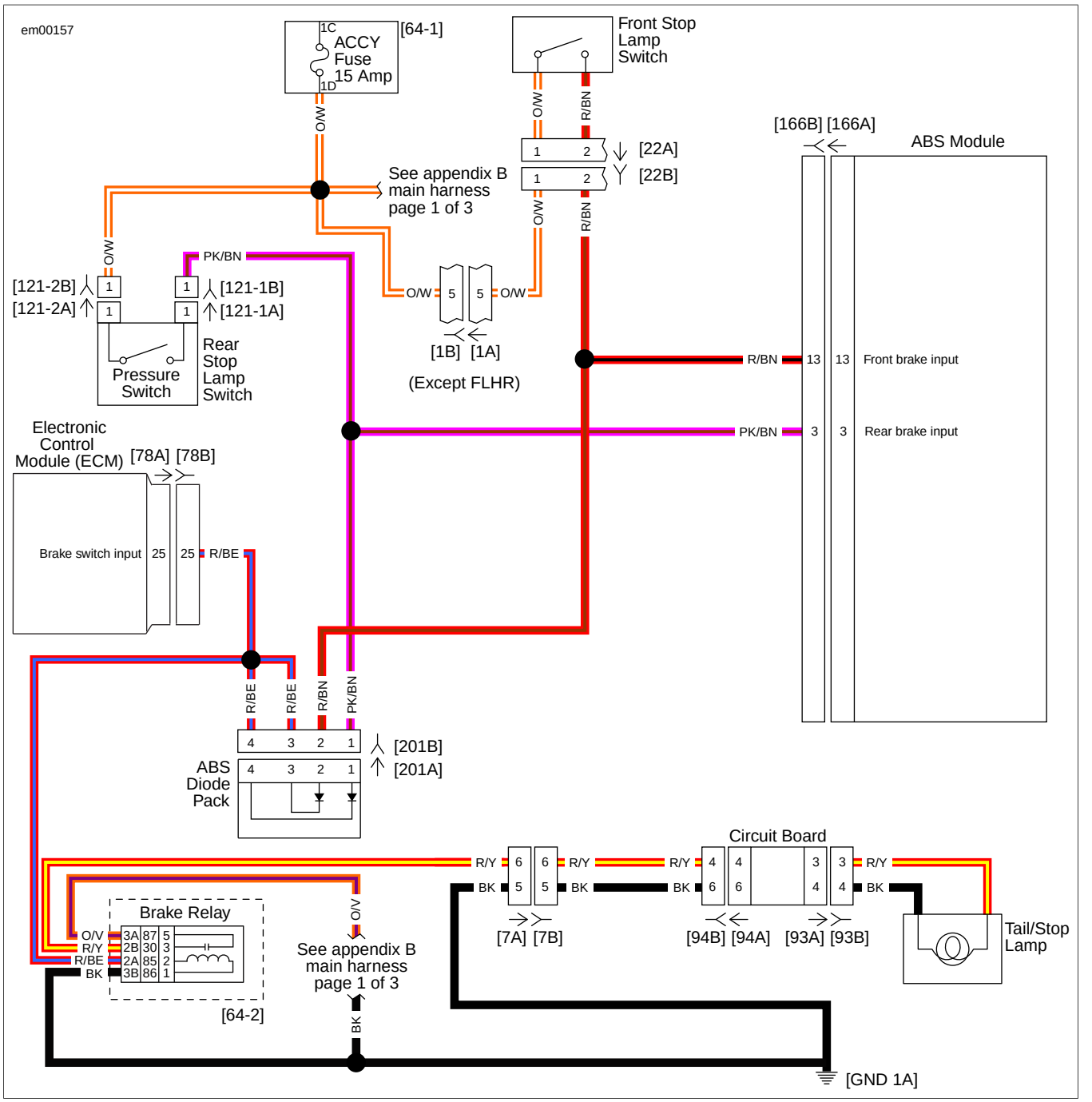


Figure 6-23. Brake Switches Schematic

Table 6-11. FLHX, FLHT/C/U Connector Locations

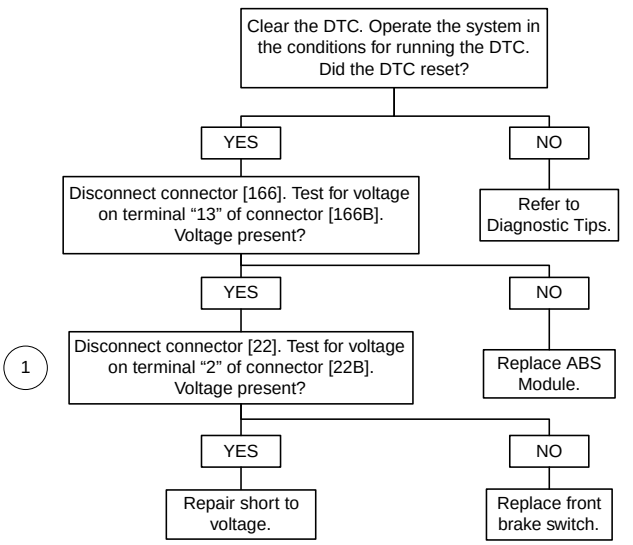
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[64-1]	Fuse block	Packard	Under left side cover
[64-2]	Fuse block	Packard	Under left side cover

Table 6-11. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	6-place Multilock	Circuit board under tail lamp assembly
[121-1]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[121-2]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[166]	ABS module	20-place	Behind right side cover
[201]	ABS diode pack	4-place	Behind left side cover

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Front Brake Switch Always On: DTC C1094



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC C1095 6.16

DTC C1095: FRONT BRAKE SWITCH OPEN

Circuit Description

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- The rear brake switch is not closed (brake applied).

Conditions for Setting the DTC

The DTC will set if 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 with either a "WOW" test or Digital Technician.

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 in the front brake input circuit.
- Open coil in the brake lamp relay.
- The ground path to the brake lamp is open.
- Internal ABS module problem in the front brake circuitry.

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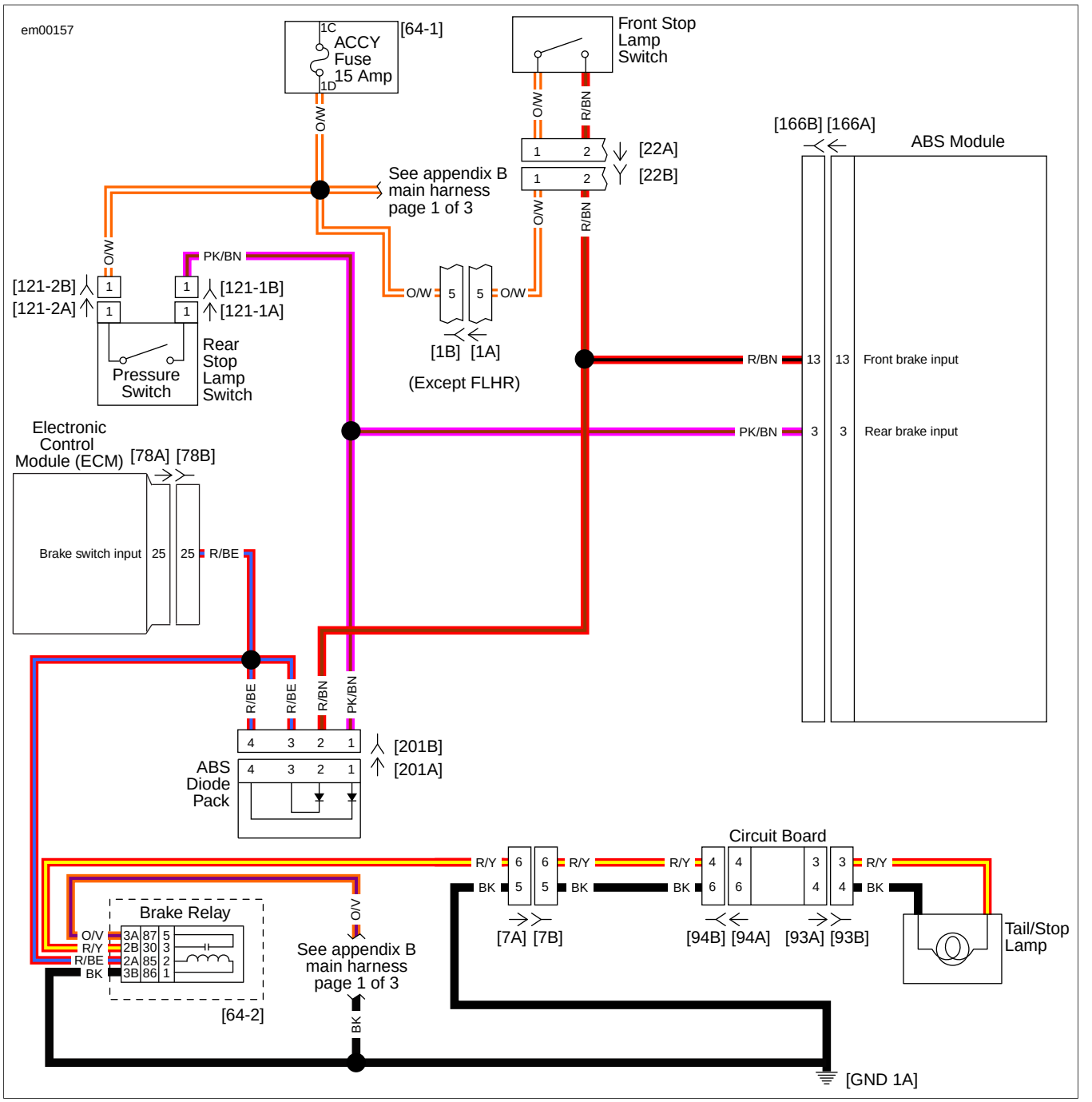


Figure 6-24. Brake Switches Schematic

Table 6-12. FLHX, FLHT/C/U Connector Locations

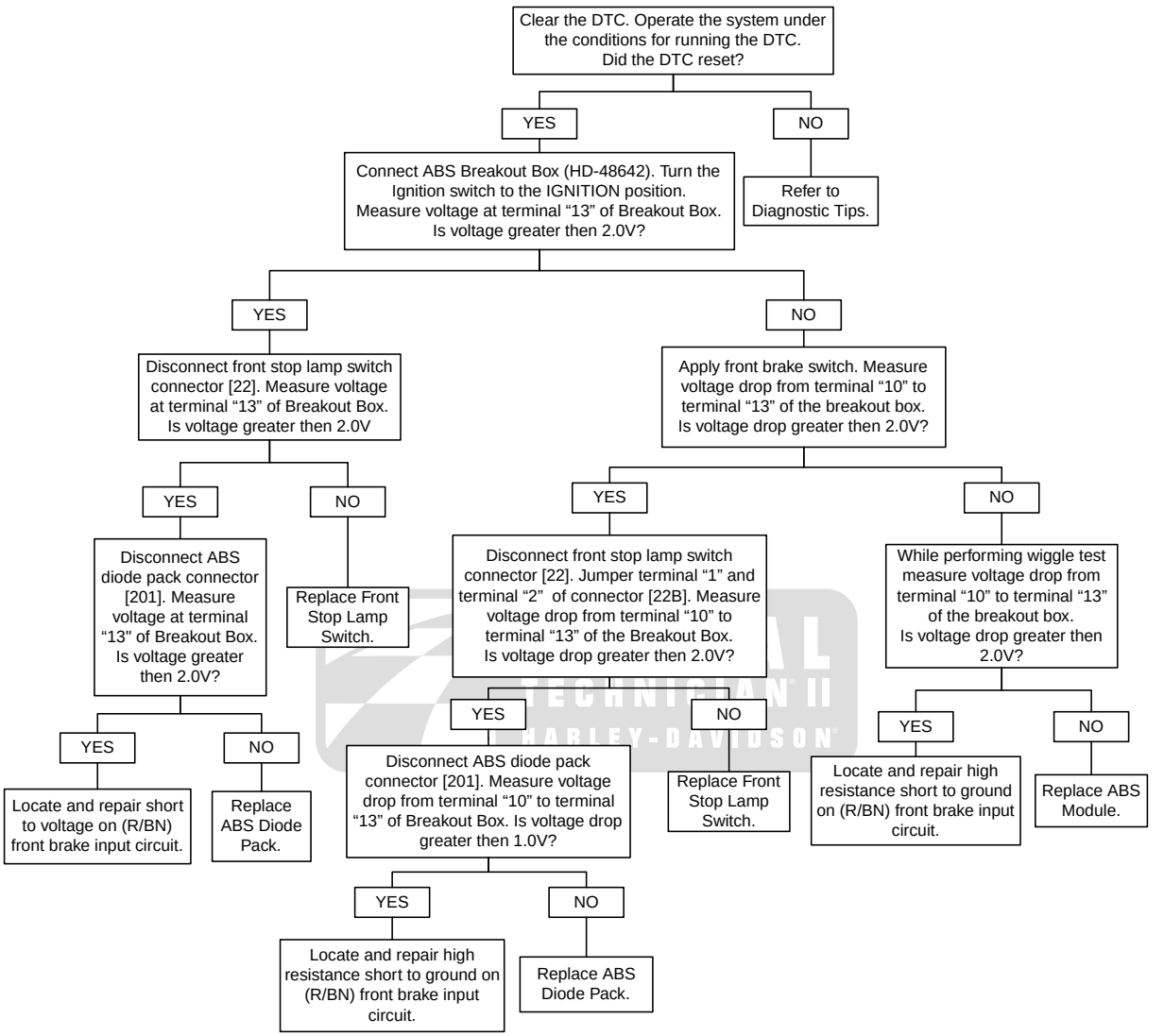
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[64-1]	Fuse block	Packard	Under left side cover
[64-2]	Fuse block	Packard	Under left side cover

Table 6-12. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	6-place Multilock	Circuit board under tail lamp assembly
[121-1]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[121-2]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[166]	ABS module	20-place	Behind right side cover
[201]	ABS diode pack	4-place	Behind left side cover

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Front Brake Switch Open: DTC C1095



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC C1151 6.17

DTC C1151: FRONT WHEEL RELEASE TOO LONG

Circuit Description

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.

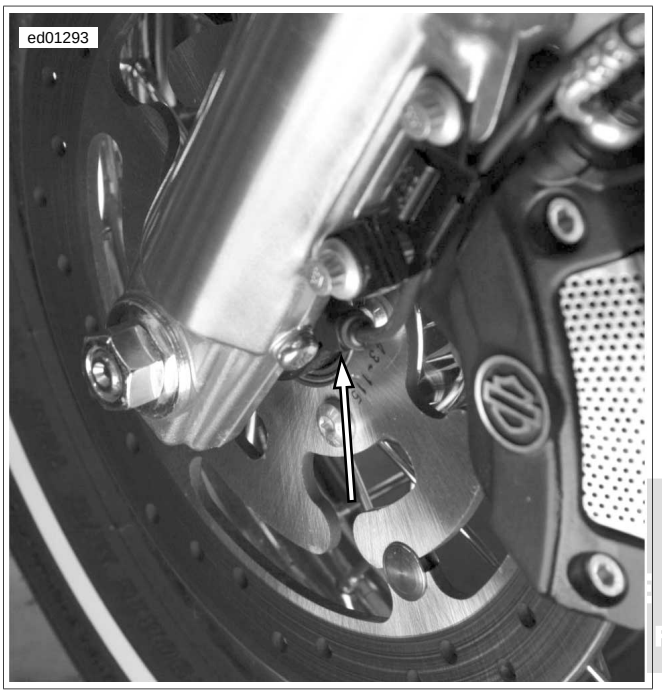


Figure 6-25. Front Wheel Speed Sensor

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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 with either a "WOW" test or Digital Technician.

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 wheel speed sensor.
- Wheel speed sensor 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.
- A stuck or seized caliper or bald tires could contribute to this code setting.

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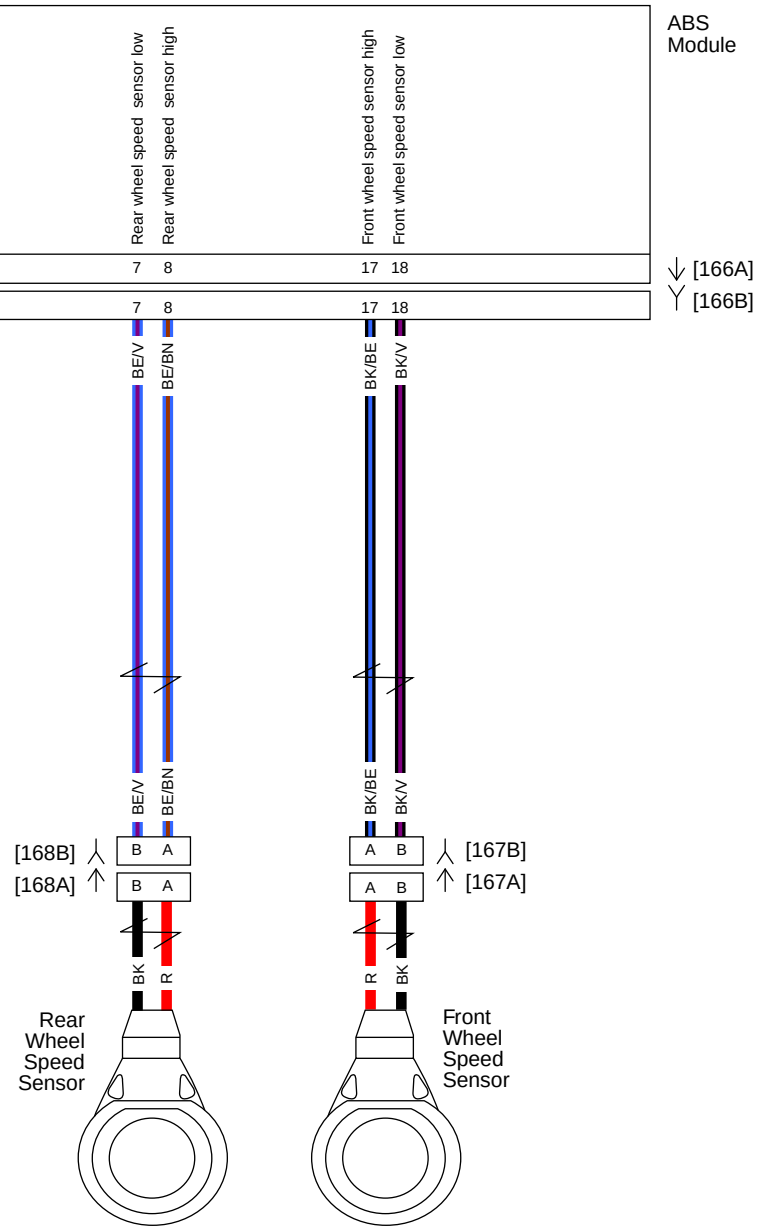
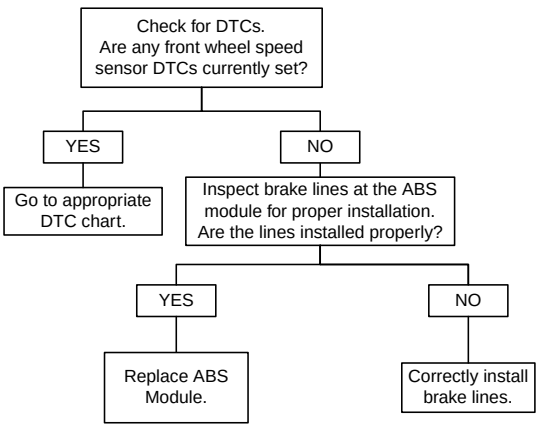


Figure 6-26. Wheel Speed Sensor Schematic

Table 6-13. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Lower right side behind exhaust

Front Wheel Release Too Long: DTC C1151



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC C1153 6.18

DTC C1153: REAR WHEEL RELEASE TOO LONG

Circuit Description

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.

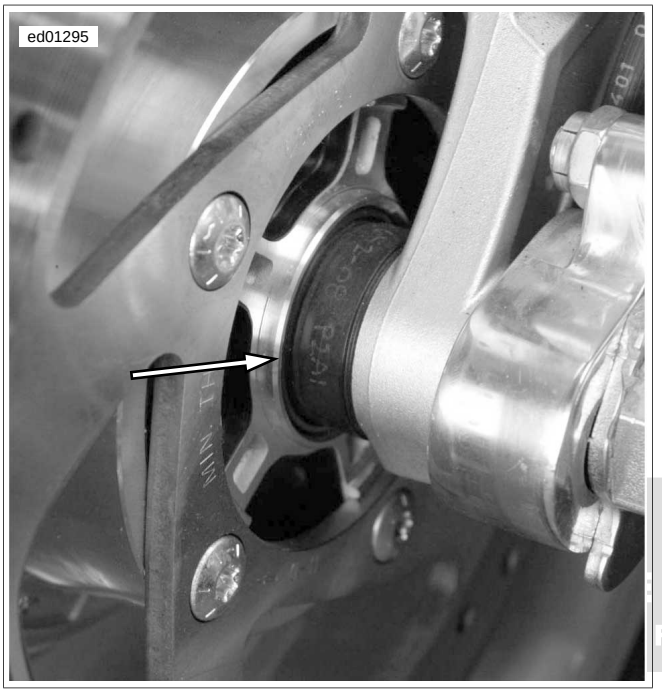


Figure 6-27. Rear Wheel Speed Sensor

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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 with either a "WOW" test or Digital Technician.

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 wheel speed sensor.
- Wheel speed sensor 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.
- A stuck or seized caliper or bald tires.

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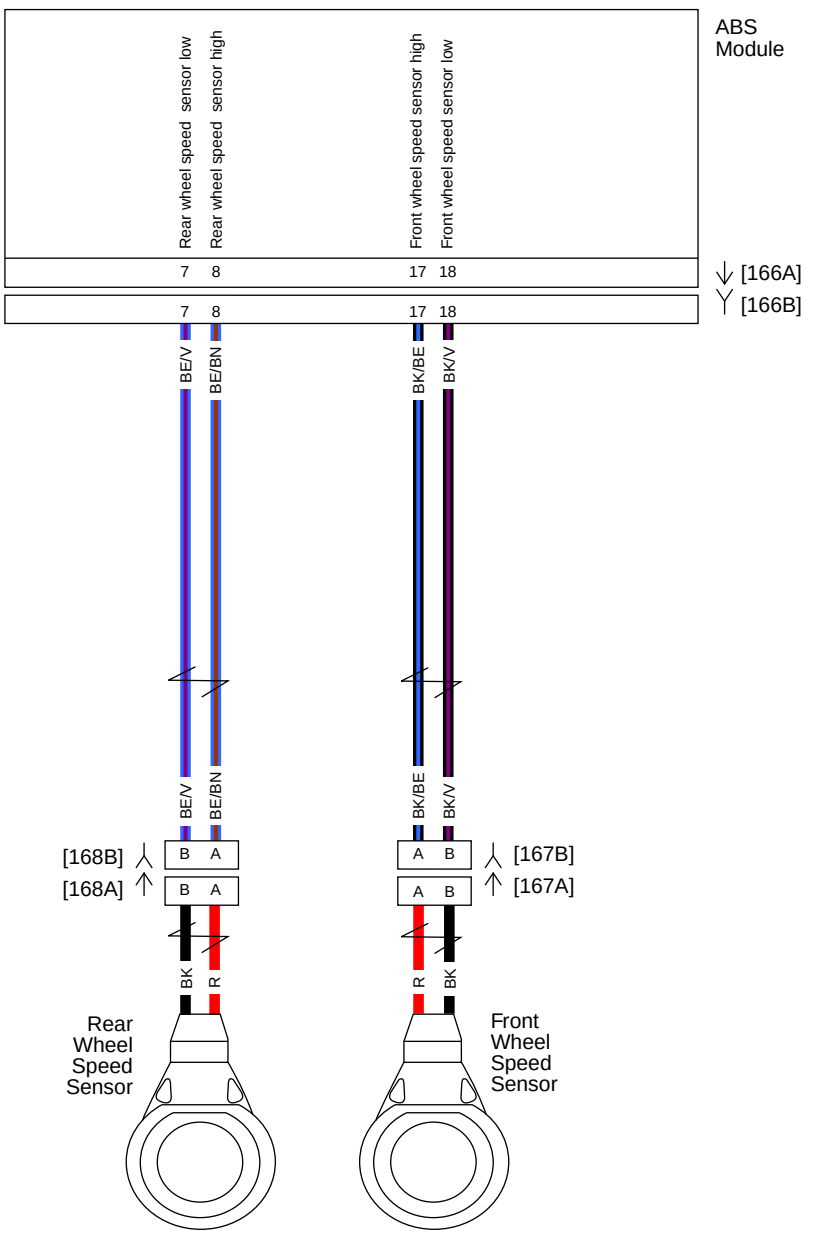
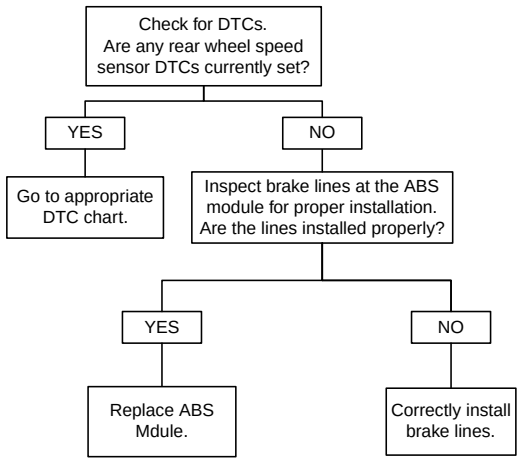


Figure 6-28. Wheel Speed Sensor Schematic

Table 6-14. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Lower right side behind exhaust

Rear Wheel Release Too Long: DTC C1153



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC C1158 6.19

DTC C1158: CALIBRATION PROGRAMMING REQUIRED

Circuit Description

The ECU is calibrated to maximize ABS performance. If the correct calibration is not in the module the ABS may not perform correctly.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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. This code may be set whenever an ABS module is replaced. The code on the new module will have to be cleared using Digital Technician.

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 ECU that is not calibrated correctly or has an internal fault.
- All replacement ABS modules will have this DTC set.

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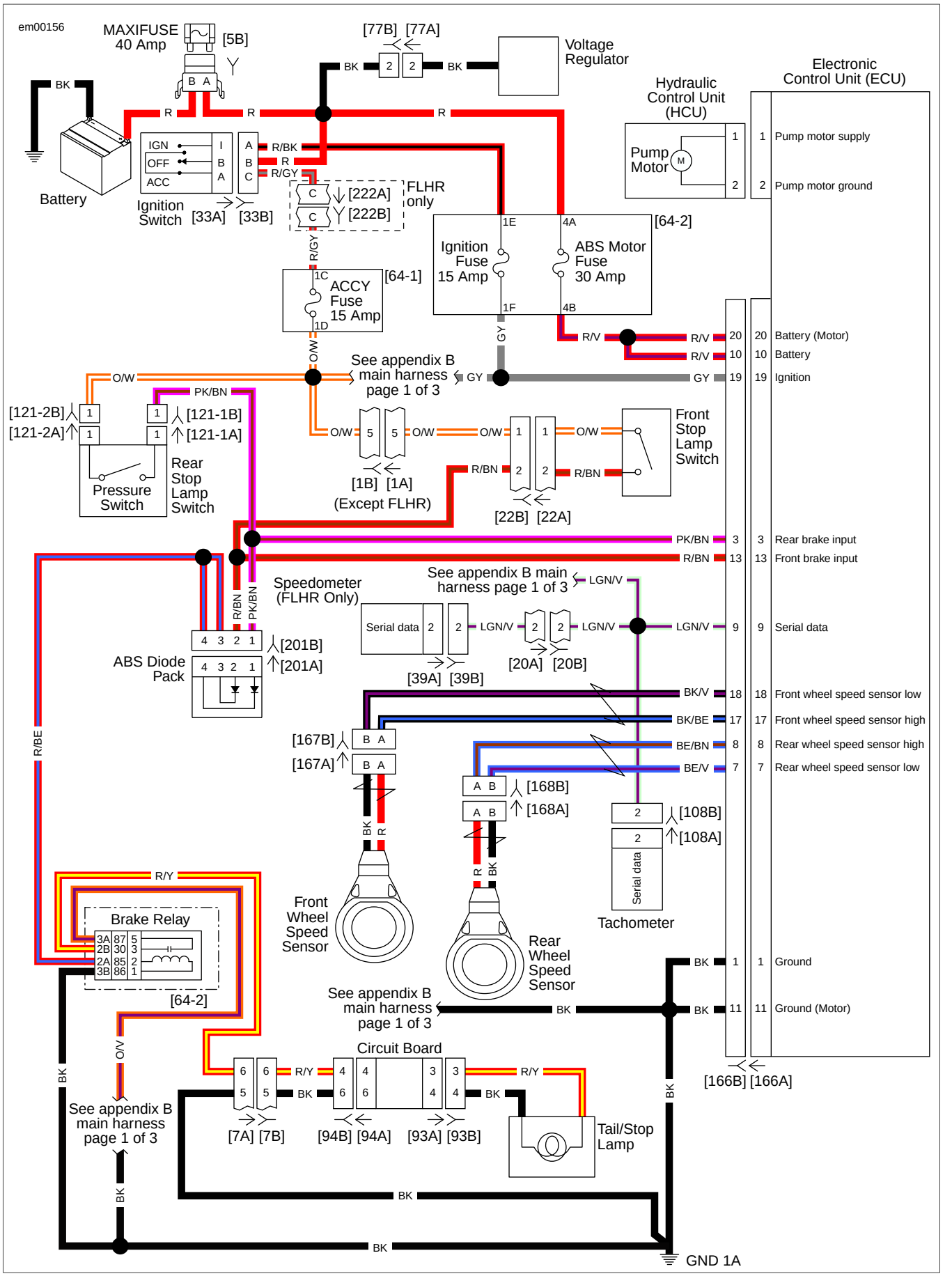


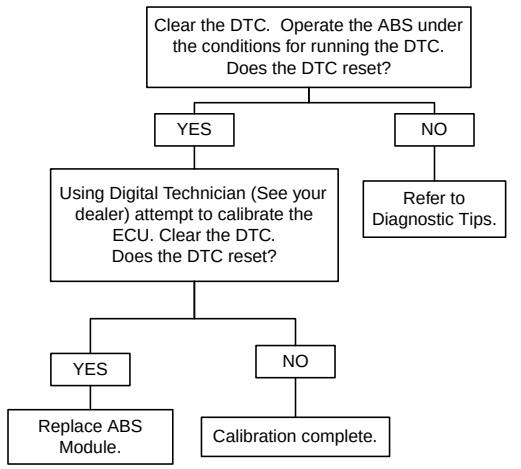
Figure 6-29. ABS Schematic

Table 6-15. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	ALL	16-place Molex (black)	Inner fairing - right radio support bracket
[5]	MAXIFUSE	ALL	2-place Packard	Under left side cover
[7]	Rear fender lights harness	ALL	8-place Multilock	Top of rear fender (under seat)
[20]	Console harness	ALL	16-place Molex	Under seat
[22]	Interconnect to right handlebar switches	ALL	12-place Molex (black)	Inner fairing - right fairing support brace
[33]	Ignition switch	ALL	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[39]	Speedometer	FLHT/C/U	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[64-1]	Fuse block	ALL	Packard	Under left side cover
[64-2]	Fuse block	ALL	Packard	Under left side cover
[77]	Voltage regulator	ALL	2-place Lyall	Bottom of voltage regulator (right side)
[93]	Tail lamp	ALL	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	ALL	6-place Multilock	Circuit board under tail lamp assembly
[108]	Tachometer	ALL	12-place Packard	Inner fairing (back of tachometer)
[121-1]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[121-2]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[166]	ABS module	ALL	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	ALL	2-place Packard	Below fuel tank (left side)
[168]	Rear wheel speed sensor	FLHX/FLHT/FLTR	2-place Packard	Fairing
		FLHR		Inside headlamp nacelle
[201]	ABS diode pack	ALL	4-place Deutsch	Under left side cover
[222]	Main to ignition harness	ALL	4-place Packard	Rear of fuel tank

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Calibration Programming Required: DTC C1158



Clear DTCs using speedometer self diagnostics.
See 2.3 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

fc01574_en

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DTC C1212 6.20

DTC C1212: FRONT OR REAR BRAKE NOT APPLIED WITH DECEL

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

Circuit Description

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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 with either a "WOW" test or Digital Technician.

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 consecutive times could cause this code.

Diagnostic Notes

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

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) with gray male probes and patch cords.

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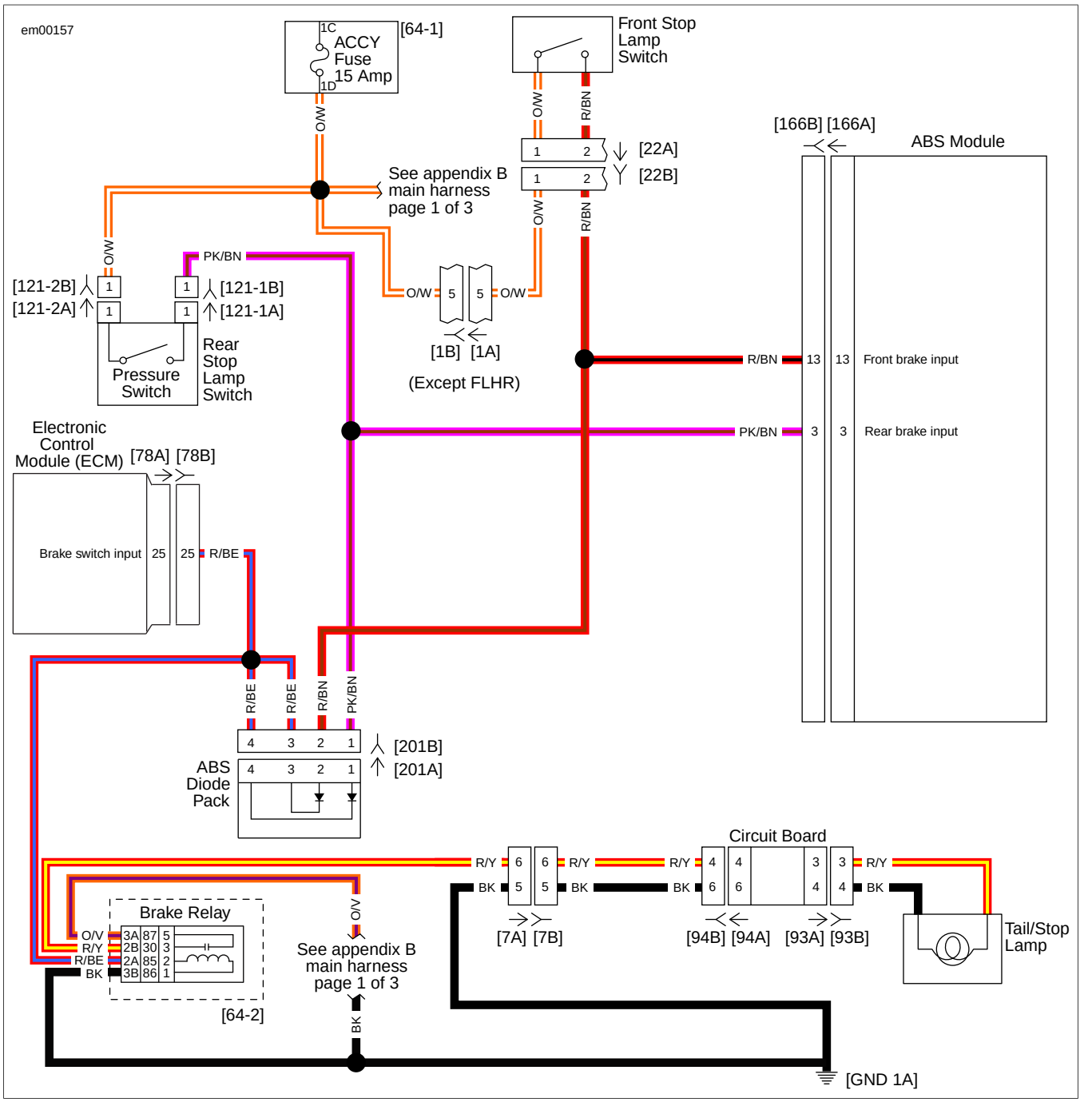


Figure 6-30. Brake Switches Schematic

Table 6-16. FLHX, FLHT/C/U Connector Locations

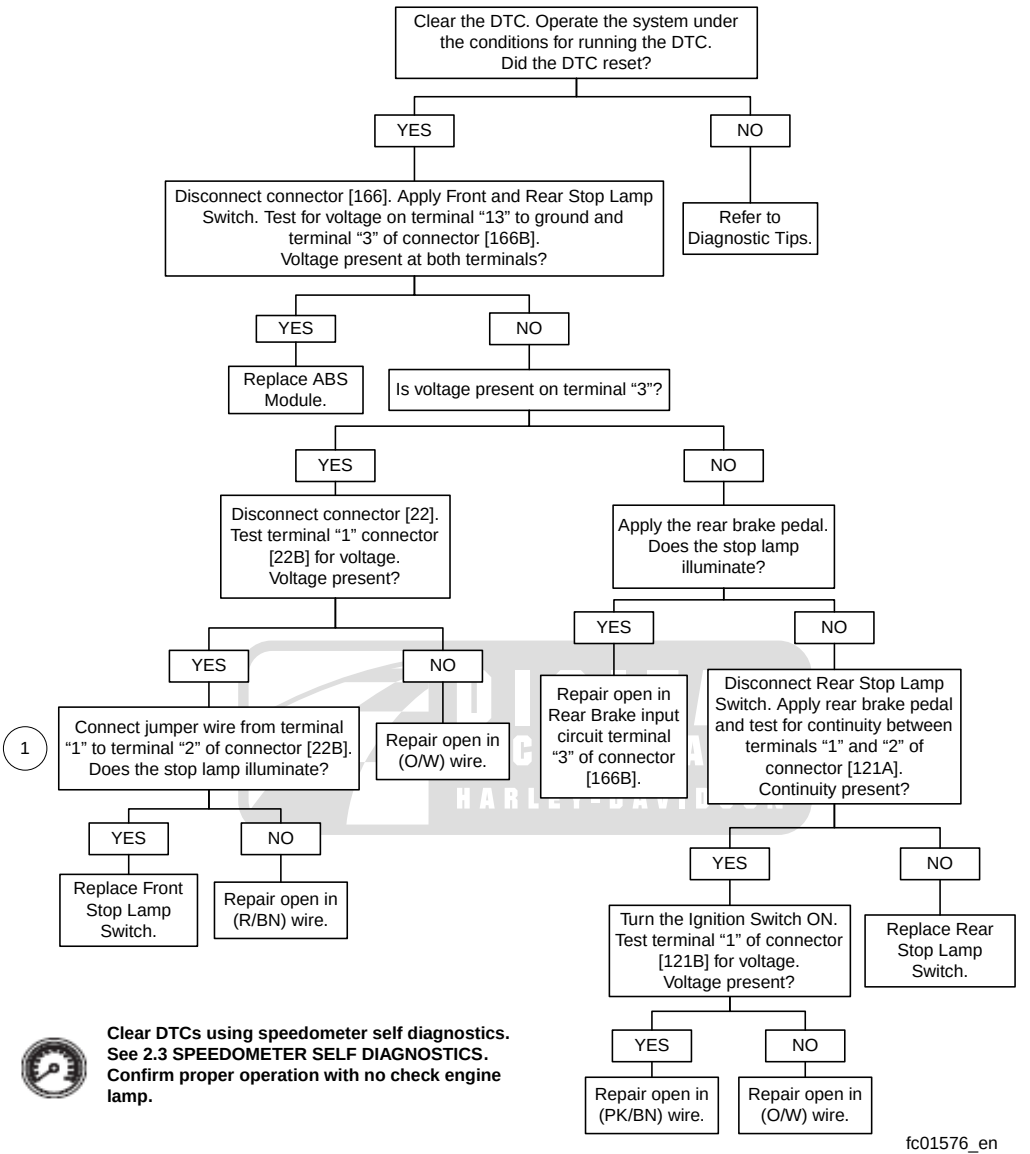
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[64-1]	Fuse block	Packard	Under left side cover
[64-2]	Fuse block	Packard	Under left side cover

Table 6-16. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	6-place Multilock	Circuit board under tail lamp assembly
[121-1]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[121-2]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[166]	ABS module	20-place	Behind right side cover
[201]	ABS diode pack	4-place	Behind left side cover

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Front or Rear Brake Not Applied with Decel: DTC C1212



DTC C1214 6.21

DTC C1214: REAR BRAKE SWITCH ALWAYS ON

Circuit Description

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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/second (8 km/h/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 with either a "WOW" test or Digital Technician.

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:

- Short to voltage between the rear brake switch and the ABS module.
- Rear brake switch stuck closed or applied during acceleration.
- Internal rear brake sensing malfunction.

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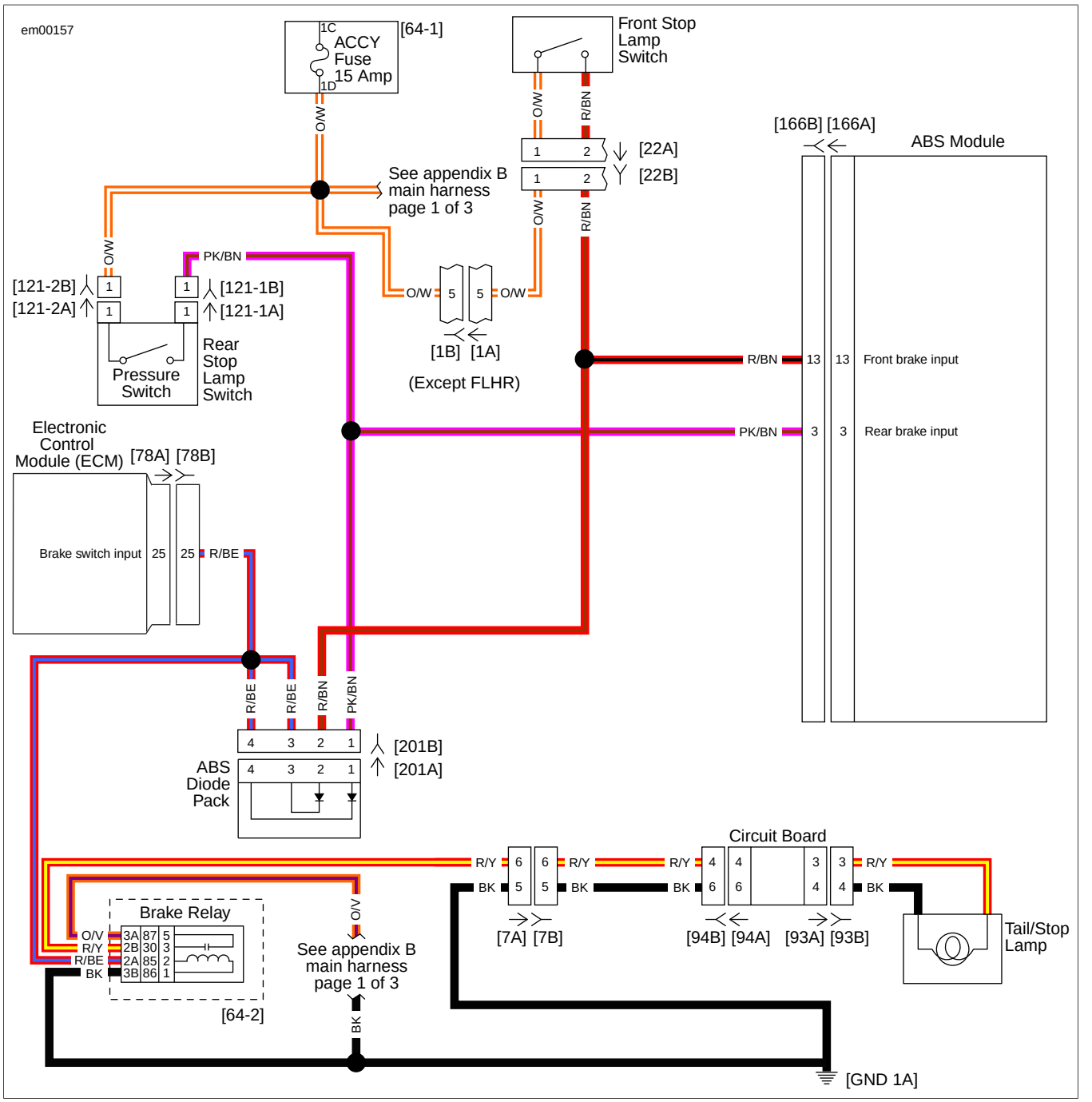


Figure 6-31. Brake Switches Schematic

Table 6-17. FLHX, FLHT/C/U Connector Locations

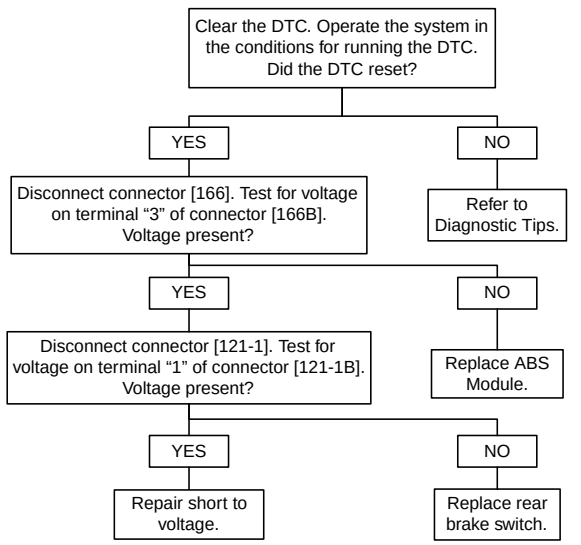
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[64-1]	Fuse block	Packard	Under left side cover
[64-2]	Fuse block	Packard	Under left side cover

Table 6-17. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	6-place Multilock	Circuit board under tail lamp assembly
[121-1]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[121-2]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[166]	ABS module	20-place	Behind right side cover
[201]	ABS diode pack	4-place	Behind left side cover

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Rear Brake Switch Always On: DTC C1214



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Clear DTCs using speedometer self diagnostics.
See 2.3 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

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DTC C1216 6.22

DTC C1216: REAR BRAKE SWITCH OPEN

Circuit Description

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.
- The front brake switch is not closed (brake applied).

Conditions for Setting the DTC

The DTC will set if 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 with either a "WOW" test or Digital Technician.

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.
- The ground path to the brake lamps is open.
- Internal ABS module problem in the rear brake input circuitry.

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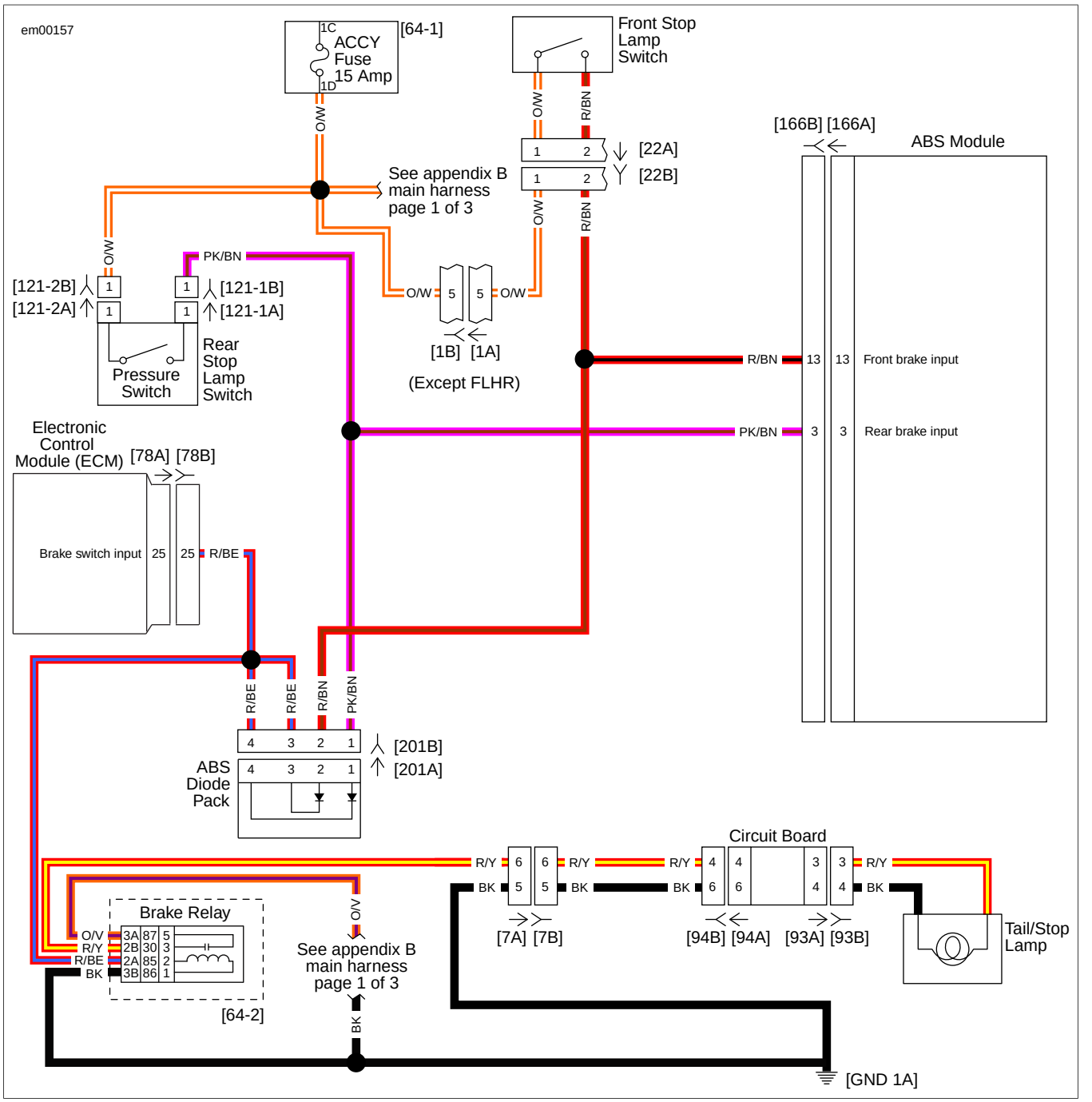


Figure 6-32. Brake Switches Schematic

Table 6-18. FLHX, FLHT/C/U Connector Locations

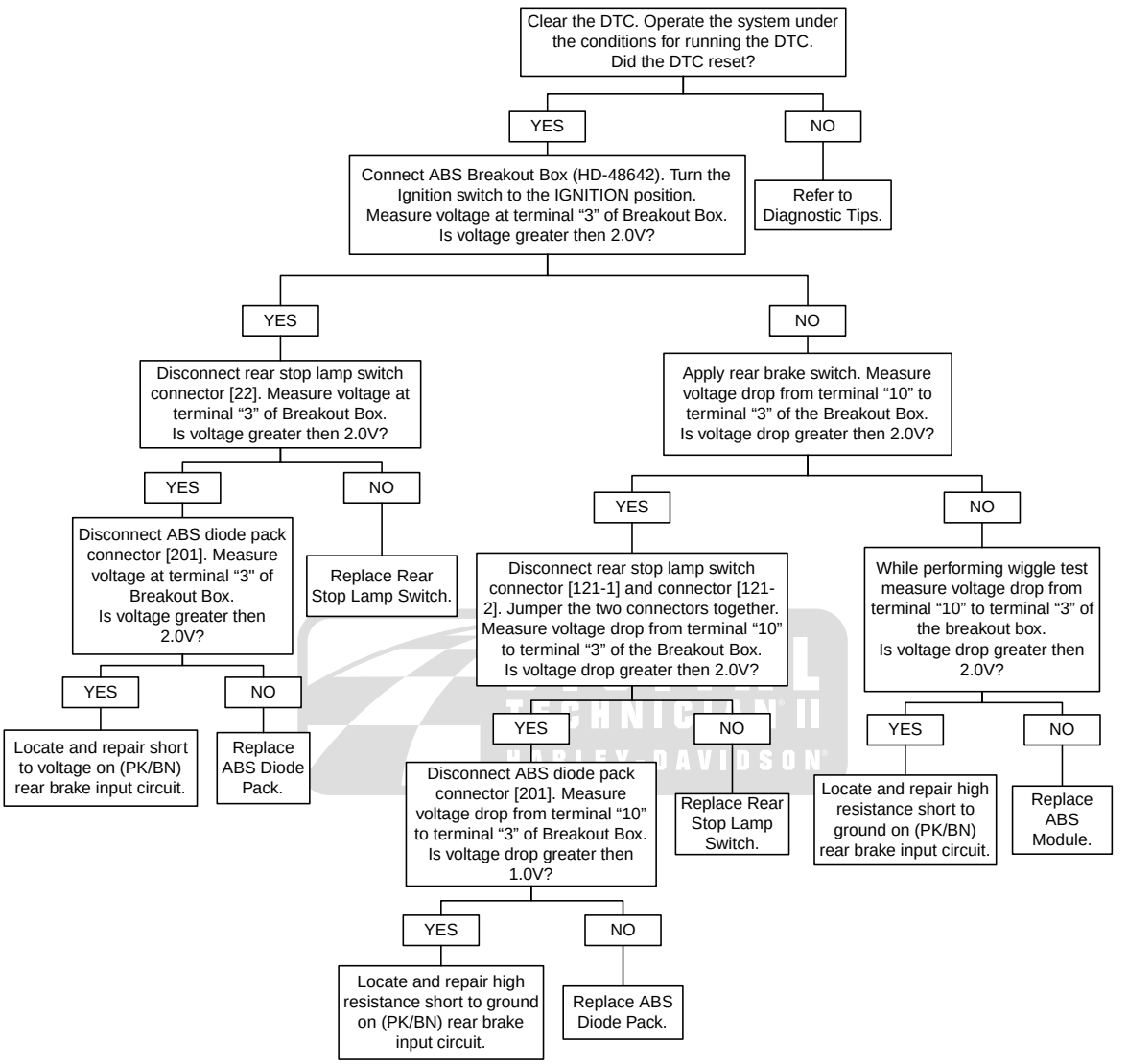
NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[64-1]	Fuse block	Packard	Under left side cover
[64-2]	Fuse block	Packard	Under left side cover

Table 6-18. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	6-place Multilock	Circuit board under tail lamp assembly
[121-1]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[121-2]	Rear brake switch	Spade terminals	Lower right side behind exhaust
[166]	ABS module	20-place	Behind right side cover
[201]	ABS diode pack	4-place	Behind left side cover

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Rear Brake Switch Open: DTC C1216



Clear DTCs using speedometer self diagnostics. See 2.3 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC C1014, C1055-C1066, C1118, C1121 6.23

DTC C1014, C1055-C1066, C1118, C1121: ECU INTERNAL FAULT

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.

Conditions for Running the DTC

- Ignition voltage is greater than 6.5V.

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, with either a "WOW" test or Digital Technician.

Diagnostic Tips

The following conditions are possible causes for this fault:

- Internal system malfunction.
- A faulty system voltage supply to the module.
- A faulty system ground.

Diagnostic Notes

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

1. The ignition circuit consists of all the circuitry back to and including the ignition switch.

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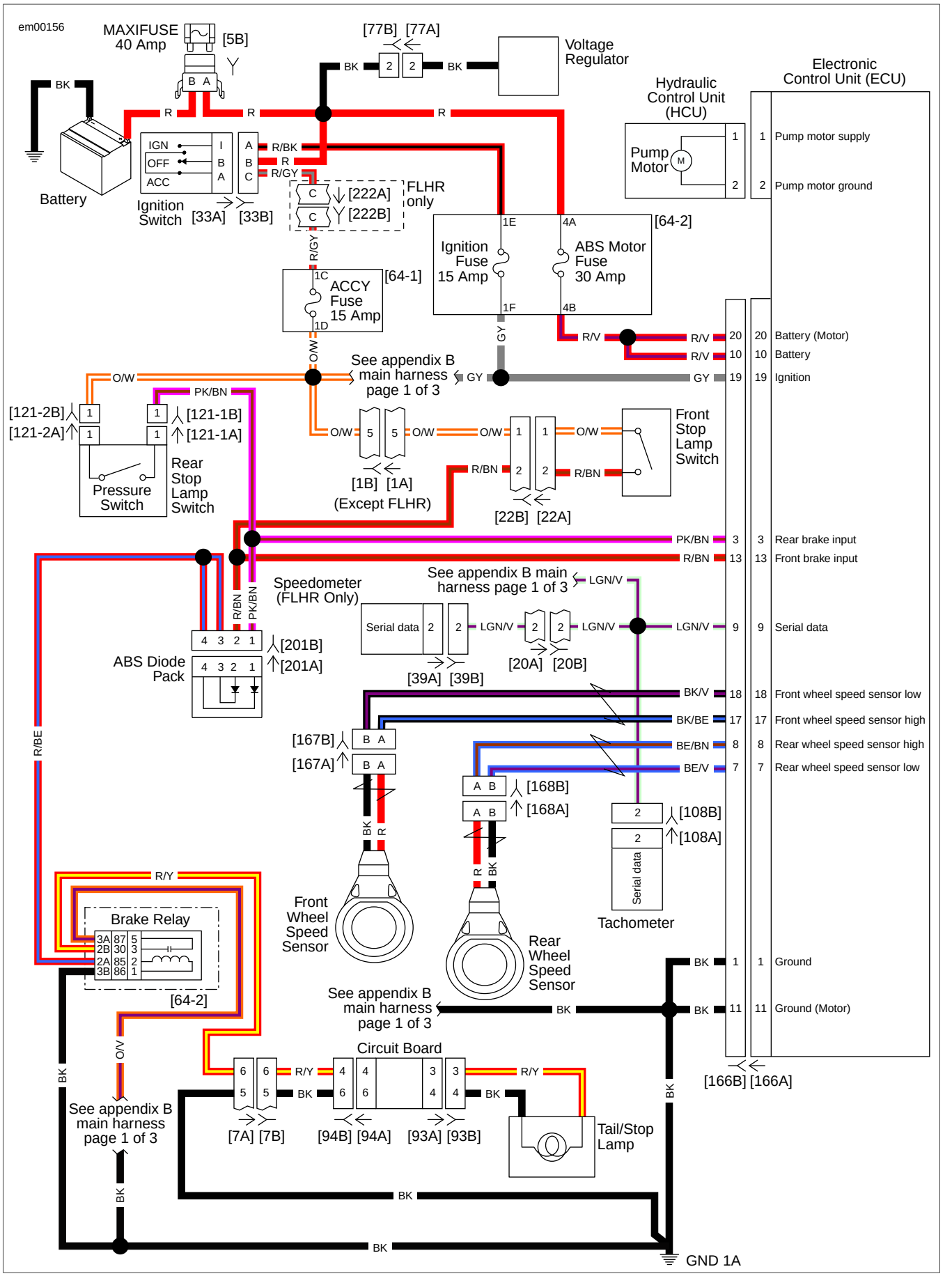


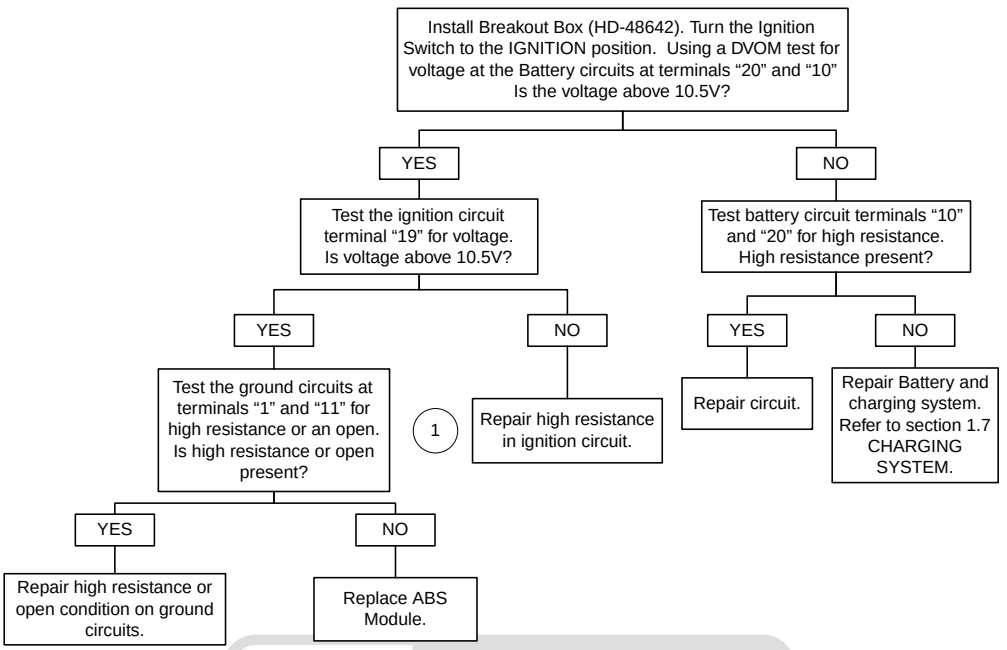
Figure 6-33. ABS Schematic

Table 6-19. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	ALL	16-place Molex (black)	Inner fairing - right radio support bracket
[5]	MAXIFUSE	ALL	2-place Packard	Under left side cover
[7]	Rear fender lights harness	ALL	8-place Multilock	Top of rear fender (under seat)
[20]	Console harness	ALL	16-place Molex	Under seat
[22]	Interconnect to right handlebar switches	ALL	12-place Molex (black)	Inner fairing - right fairing support brace
[33]	Ignition switch	ALL	3-place Packard	Inner fairing - under radio (front of Ignition Switch housing)
[39]	Speedometer	FLHT/C/U	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[64-1]	Fuse block	ALL	Packard	Under left side cover
[64-2]	Fuse block	ALL	Packard	Under left side cover
[77]	Voltage regulator	ALL	2-place Lyall	Bottom of voltage regulator (right side)
[93]	Tail lamp	ALL	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender light harness to circuit board	ALL	6-place Multilock	Circuit board under tail lamp assembly
[108]	Tachometer	ALL	12-place Packard	Inner fairing (back of tachometer)
[121-1]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[121-2]	Rear brake light switch	ALL	Spade terminals	Bottom of rear frame downtube (right side)
[166]	ABS module	ALL	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	ALL	2-place Packard	Below fuel tank (left side)
[168]	Rear wheel speed sensor	FLHX/FLHT/FLTR	2-place Packard	Fairing
		FLHR		Inside headlamp nacelle
[201]	ABS diode pack	ALL	4-place Deutsch	Under left side cover
[222]	Main to ignition harness	ALL	4-place Packard	Rear of fuel tank

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ECU Internal Fault: DTC C1014, C1055-C1066, C1118, C1121

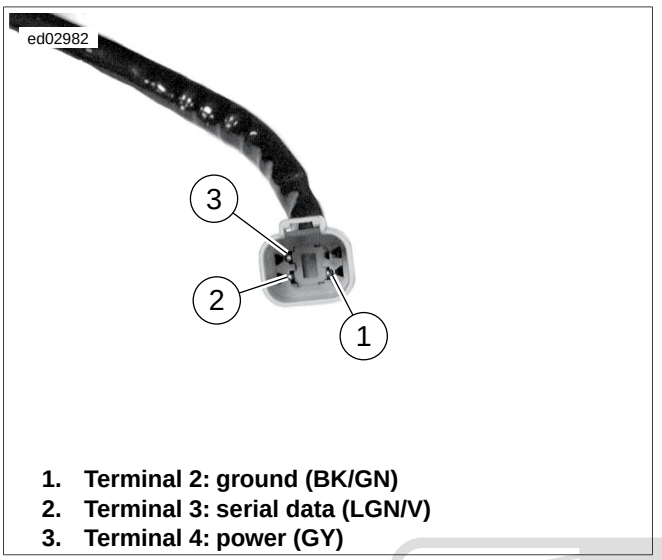


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DTC U1300, U1301 OR BUS ER 6.24

DIAGNOSTICS

The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a DVOM. In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6-0.8 volts. The range for acceptable operations is 0-7.0 volts.



1. **Terminal 2: ground (BK/GN)**
2. **Terminal 3: serial data (LGN/V)**
3. **Terminal 4: power (GY)**

Figure 6-34. Data Link Connector

Diagnostic Tips

- If serial data is shorted, these Diagnostic Trouble Codes (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.

Diagnostic Notes

If a U1300, U1301 or "BUS Er" is present, perform diagnostic procedures listed in 4.12 STARTS, THEN STALLS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

AMP 1-PLACE CONNECTORS A.1

AMP 1-PLACE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-39621-27	SOCKET TERMINAL TOOL
HD-39621-28	PIN TERMINAL REMOVER

General

Obtain the necessary tools to repair the connector or terminals.

For terminal crimping, use the PACKARD TERMINAL CRIMPER (Part No. HD-38125-7).

Separating Pin and Socket Housings

Bend back the ears on the pin housing slightly and separate the pin and socket halves of the connector.

Mating Pin and Socket Housings

Push the pin and socket halves of the connector together until the latches click.

Removing Socket Terminals

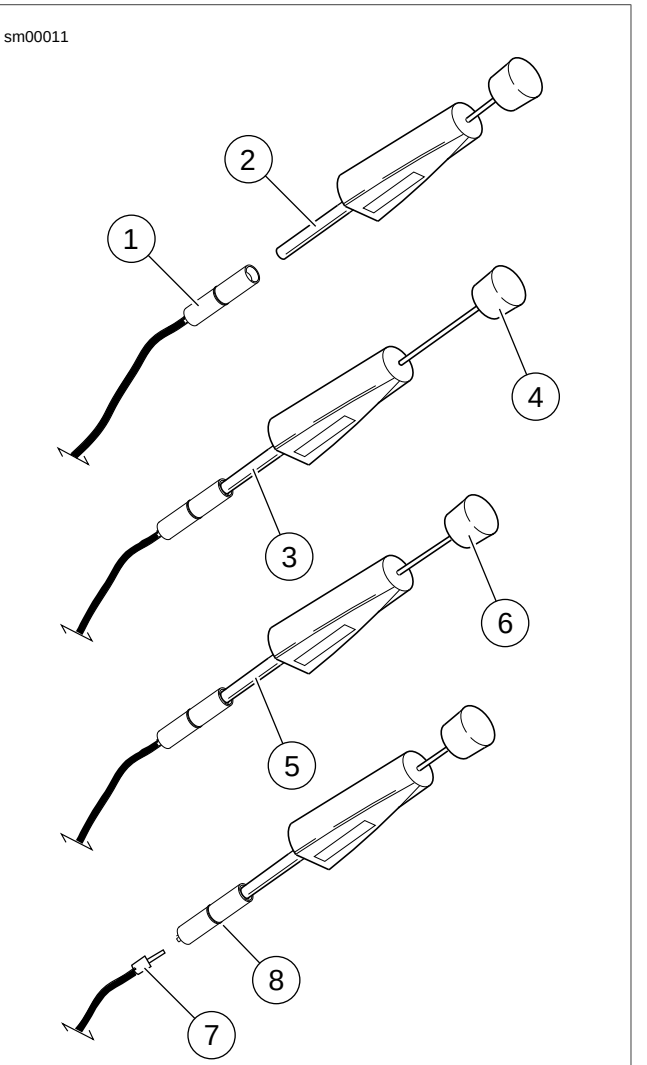
1. See Figure A-1. Grasp the lead on the wire end of the socket housing (1) and push the terminal forward toward the mating end of the connector until it stops. This will disengage the locking tang from the groove in the connector.
2. Fit the barrel (2) of the SOCKET TERMINAL TOOL (Part No. HD-39621-27) over the socket.
3. While rotating the tool slightly, push until it bottoms (3) in the socket housing.
4. Allow the plunger (4) to "back out" of the handle.
5. Holding the socket housing while keeping the tool firmly bottomed (5), depress the plunger (6). The terminal (7) pops out the wire end of the connector.

NOTE

If the terminal is not released from the socket housing, then the terminal was not pushed forward far enough before placement of the tool or the tool was not bottomed in the connector housing.

Installing Socket Terminal

1. Note the lip at the middle of the socket housing. One side of the lip is flat while the other side is tapered. Insert the wire terminal into the socket housing on the flat (lip) side.
2. Push the lead into the socket housing until it stops. A click is heard when the terminal is properly seated.
3. Gently tug on the lead to verify that the terminal is locked in place.



1. **Socket housing**
2. **Barrel**
3. **Barrel bottomed in connector**
4. **Plunger "backed out"**
5. **Hold barrel bottomed**
6. **Plunger pressed**
7. **Socket terminal**
8. **Connector lip**

Figure A-1. Socket Terminal Tool (HD-39621-27)

Removing Pin Terminal

1. Grasp the lead on the wire end of the pin housing and push the terminal forward toward the mating end of the connector until it stops. This will disengage the locking tang from the groove in the connector.

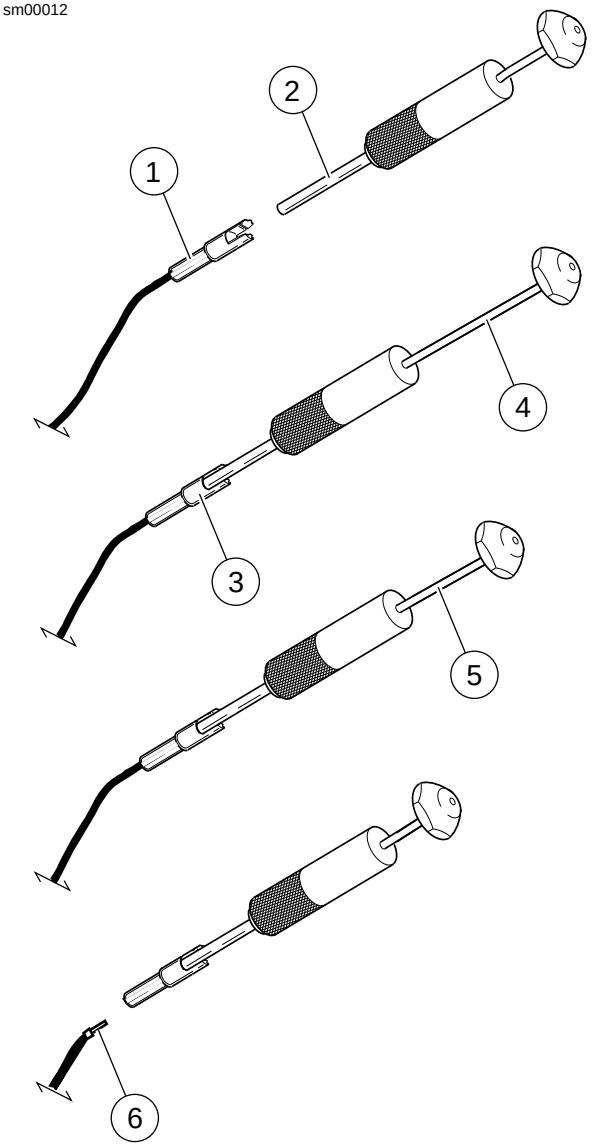
2. See Figure A-2.
   a. Fit the barrel of the PIN TERMINAL REMOVER (Part No. HD-39621-28) over the pin, and while rotating the tool slightly, push until it bottoms in the housing. Allow the plunger to "back out" of the handle.
   b. Holding the pin housing while keeping the tool firmly bottomed, depress the plunger. The terminal pops out the wire end of the connector.

NOTE

If the terminal is not released from the pin housing, then the terminal was not pushed forward far enough before placement of the tool or the tool was not bottomed in the connector housing.

Installing Pin Terminal

1. Push the lead into the pin housing until it stops. A click is heard when the terminal is properly seated.
2. Gently tug on the lead to verify that the terminal is locked in place.



1. **Pin housing**
2. **Barrel**
3. **Barrel bottomed in connector**
4. **Plunger backed out of the handle**
5. **Depressed plunger**
6. **Pin terminal**

Figure A-2. AMP Pin Terminal Remover (HD-39621-28)

AMP MULTILOCK CONNECTORS A.2

AMP MULTILOCK CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41609	AMP MULTILOCK CRIMPER

General

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

See Figure A-3. Attachment clips (1) on the pin housings are fitted to T-studs on the motorcycle frame. The T-studs identify OE connector locations. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

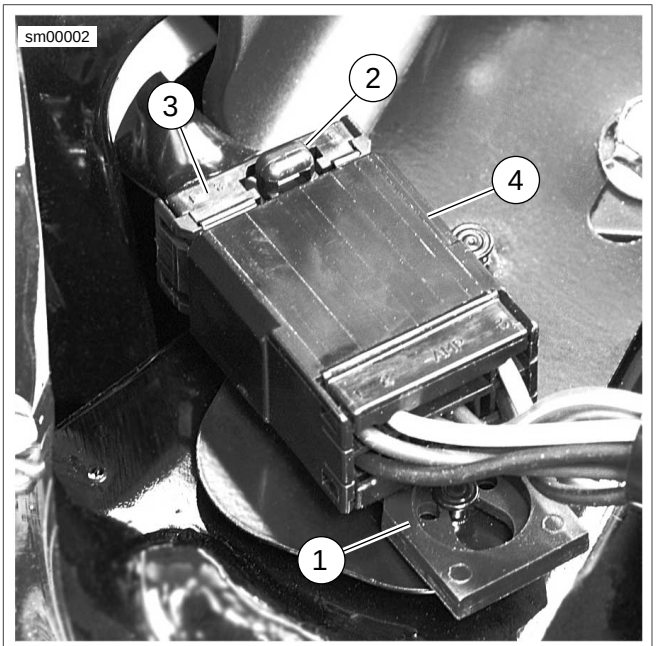
For terminal crimping use the AMP MULTILOCK CRIMPER (Part No. HD-41609).

Separating Pin and Socket Housings

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

Mating Pin and Socket Housings

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



1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

Figure A-3. AMP Multilock Connector

Removing Terminals from Housing

1. See Figure A-4. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Insert a pick or pin into the terminal cavity until it stops.

NOTE

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

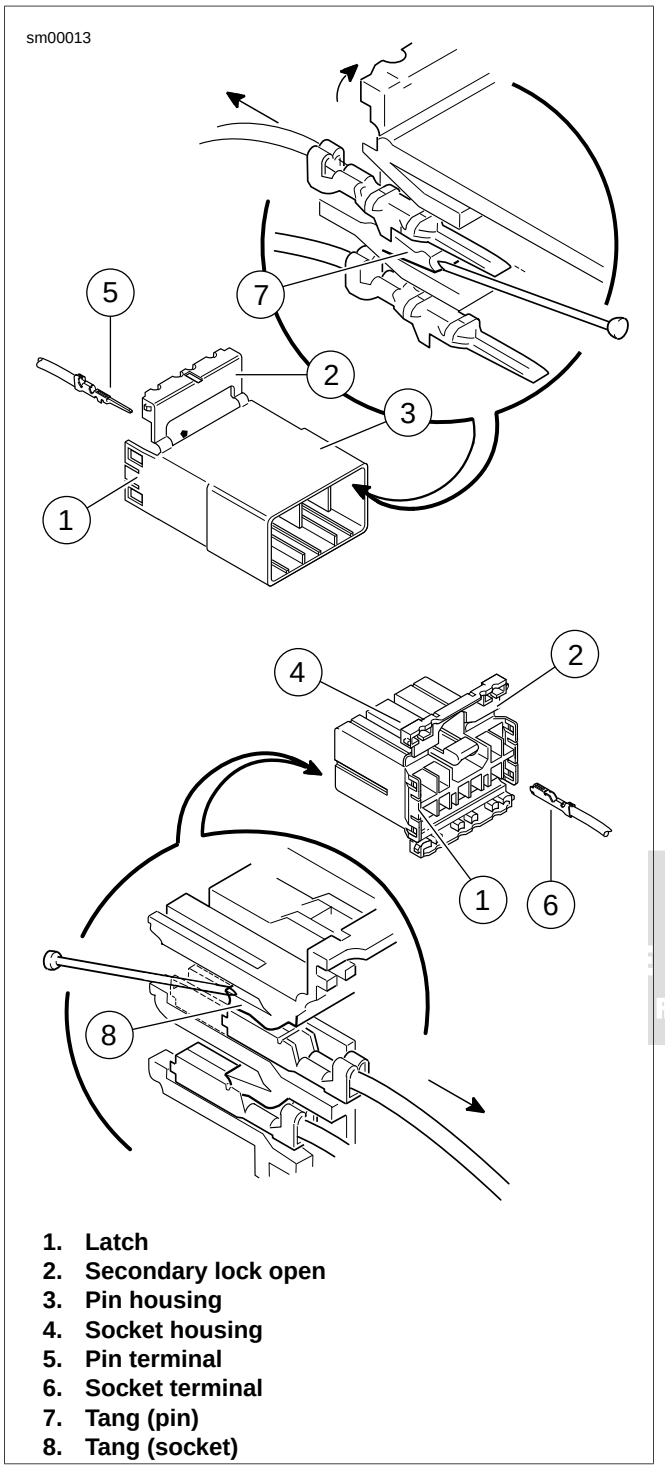
4. Press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

NOTE

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

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

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

Figure A-4. AMP Multilock Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

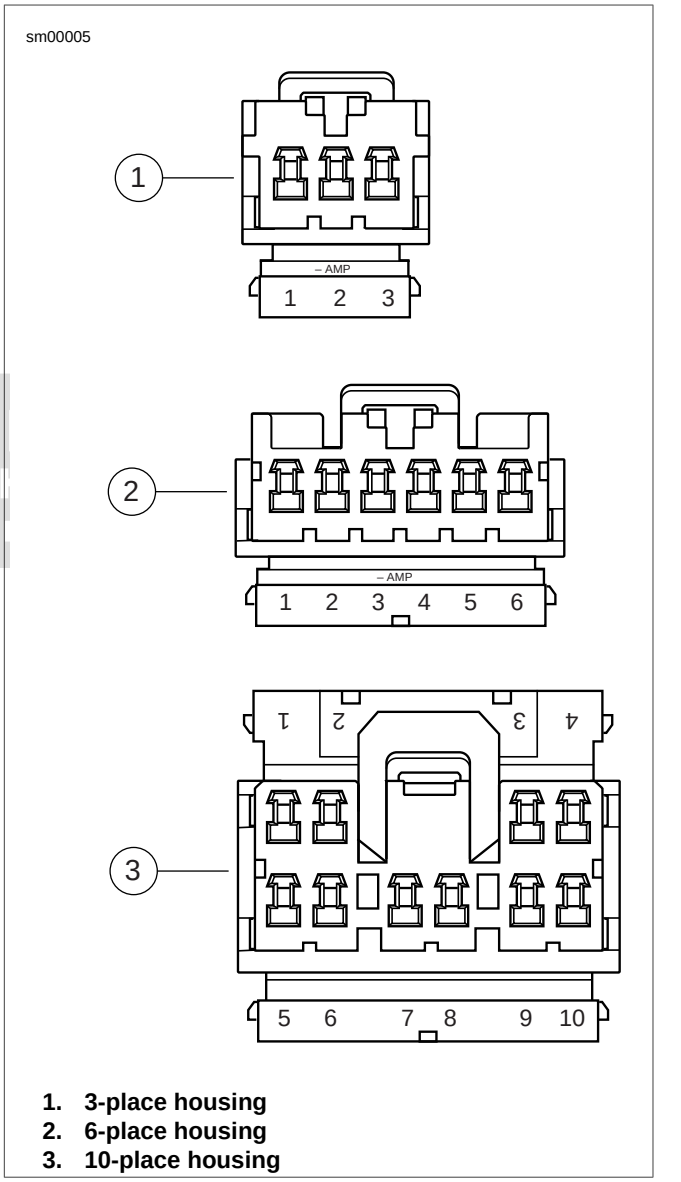
See Figure A-5. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

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.



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

Figure A-5. AMP Multilock Connector: Cavity Numbers on Secondary Locks (Socket Housings Shown)

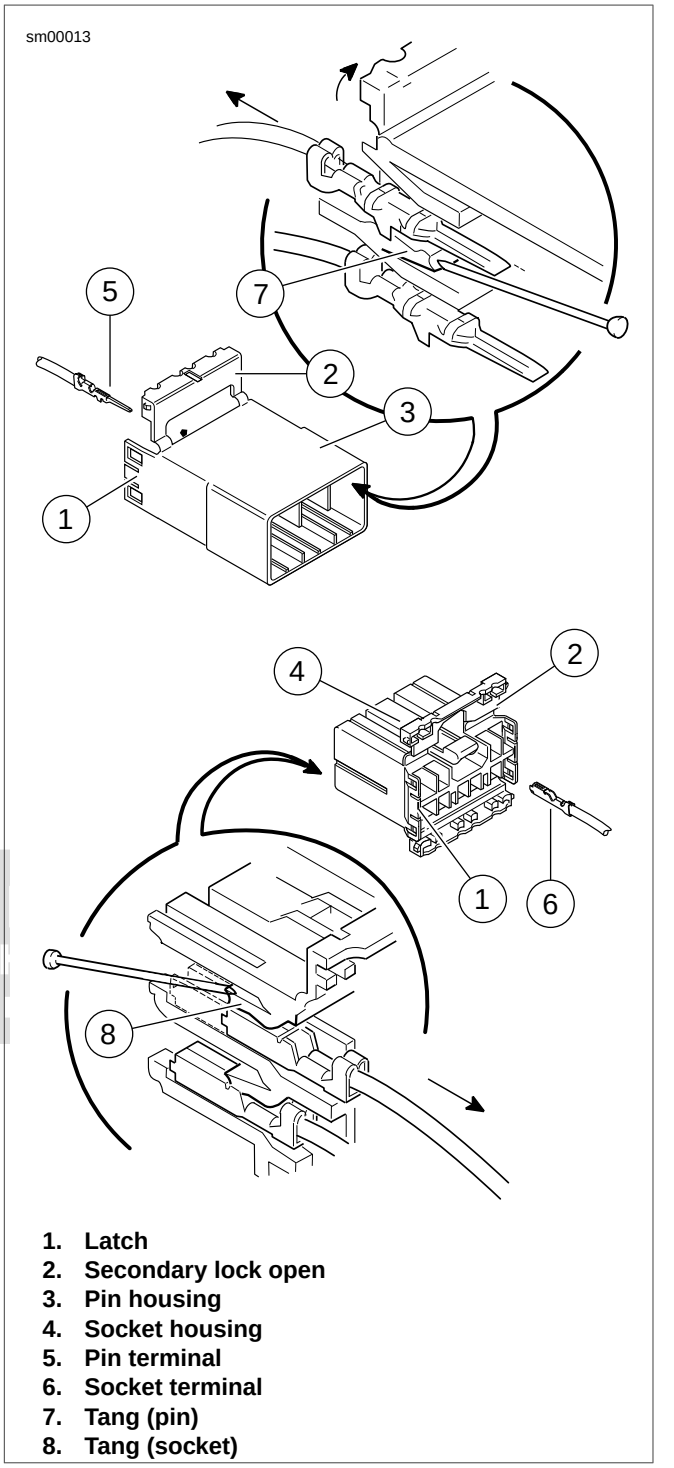
Preparing Wire Leads for Crimping

1. Strip 5/32 in. (4.0 mm) of insulation from the wire lead.

2. See Figure A-4 and Figure A-7. Select the pin/socket terminals from the parts catalog and identify the insulation crimp tails (1) and the wire crimp tails (2) and the groove for the crimp tool locking bar (3).
3. Identify the wire lead gauge and the corresponding crimper tool and nesting die. Refer to Table A-1.

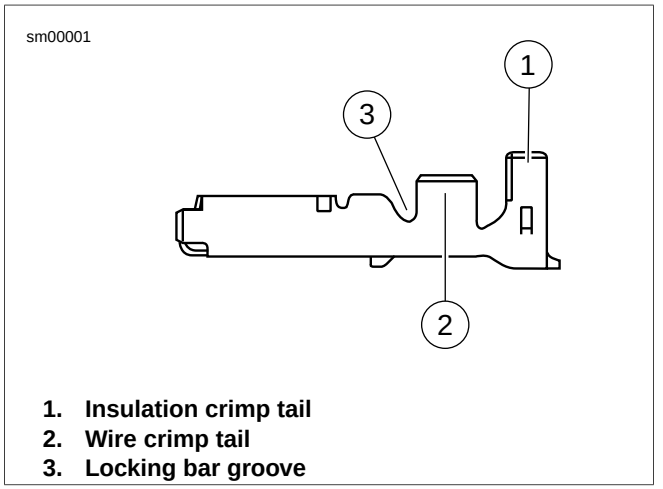
Table A-1. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest

WIRE GAUGE	NEST
20	Front
16	Middle
18	Rear



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

Figure A-6. AMP Multilock Connector: Socket and Pin Housings



1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

Figure A-7. AMP Multilock Connector: Socket Terminal

Crimping Terminals to Leads

NOTE

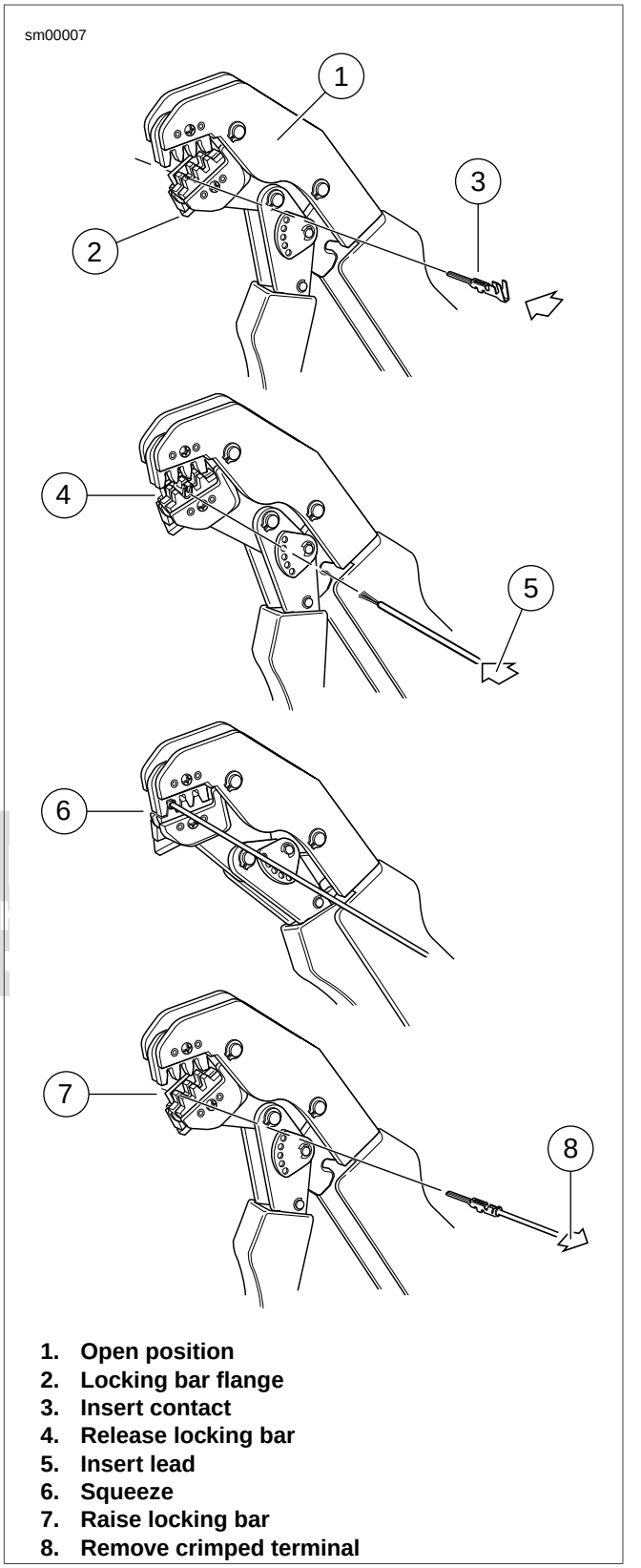
Crimping with an Amp Multilock tool is a one step operation. One squeeze crimps both the wire core and the insulation tails.

1. See Figure A-8. Squeeze the handles to cycle the AMP MULTILOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

NOTE

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

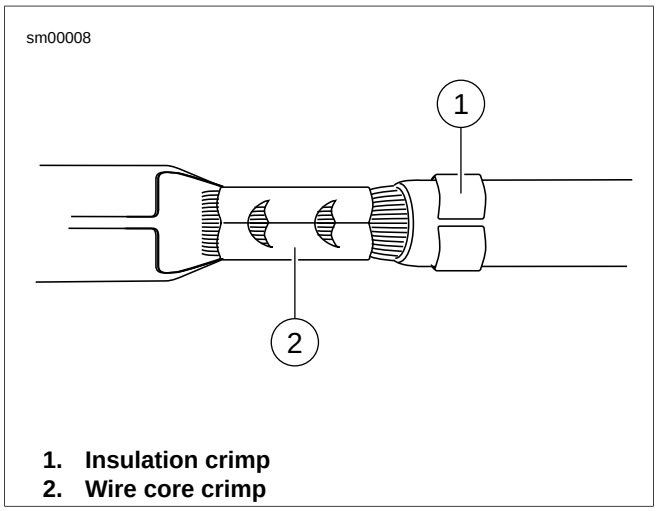


1. **Open position**
2. **Locking bar flange**
3. **Insert contact**
4. **Release locking bar**
5. **Insert lead**
6. **Squeeze**
7. **Raise locking bar**
8. **Remove crimped terminal**

Figure A-8. AMP Multilock Connector: Terminal Crimping Procedure

Inspecting Crimped Terminals

See Figure A-9. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. **Insulation crimp**
2. **Wire core crimp**

Figure A-9. AMP Multilock Connector: Terminal Crimp

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DELPHI CONNECTORS A.3

DELPHI CONNECTOR REPAIR

General

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

Separating Pin and Socket Housings

See Figure A-10. Bend back the external latch(es) slightly and separate pin and socket halves of connector.

Mating Pin and Socket Housings

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

Removing Socket Terminals

NOTE

Although the parts of the different Delphi connectors vary in appearance, the instructions which follow will work for all. The only exception is the oil pressure sender connector [139B], the terminals of which are removed like the Packard push-to-seat connectors. Therefore, see A.10 150 METRI-PACK CONNECTORS to remove/install terminals in this connector.

1. See Figure A-11. If present, free one side of wire lock (1) from ear on wire end of socket housing, then release the other side. Release wires from channels in wire lock and remove from socket housing.
2. Use a fingernail to pry colored terminal lock (2) loose and then remove from mating end of socket housing.
3. Using a thin flat blade, like the unsharpened edge of a hobby knife, gently pry tang (3) outward away from terminal, and then tug on wire to back terminal out wire end of chamber. Do not pull on wire until tang is released or terminal will be difficult to remove.

Installing Socket Terminals

NOTE

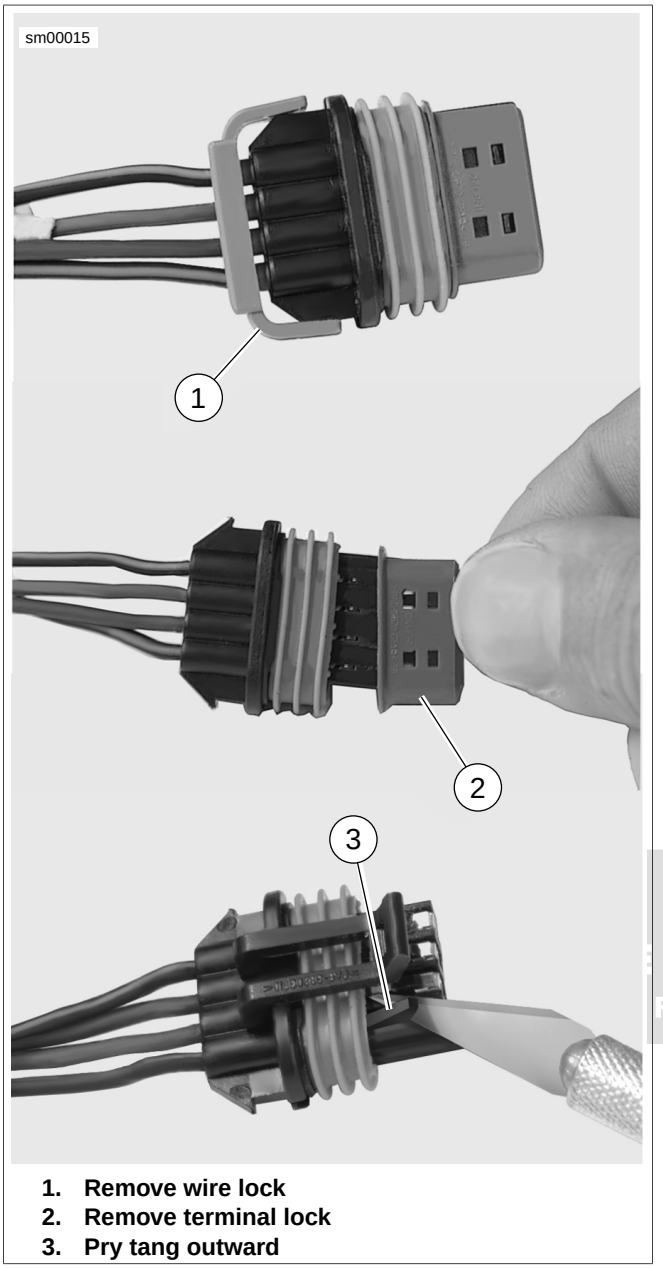
For wire location purposes, alpha or numeric characters are stamped into the wire end of each socket housing.

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



Figure A-10. Delphi Connector: Socket Housing Latch

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

Figure A-11. Delphi Connector: Removing Socket Terminals

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DEUTSCH 1-PLACE ELECTRICAL CONNECTORS A.4

DEUTSCH 1-PLACE CONNECTOR REPAIR

Separating Pin and Socket Housings

Depress external latch and separate the pin and socket housings of the Deutsch one place connector found on voltage regulators.

Mating Pin and Socket Housings

Orient the housings so the latch faces the catch and push the housings together until it clicks.

Removing Socket Terminals

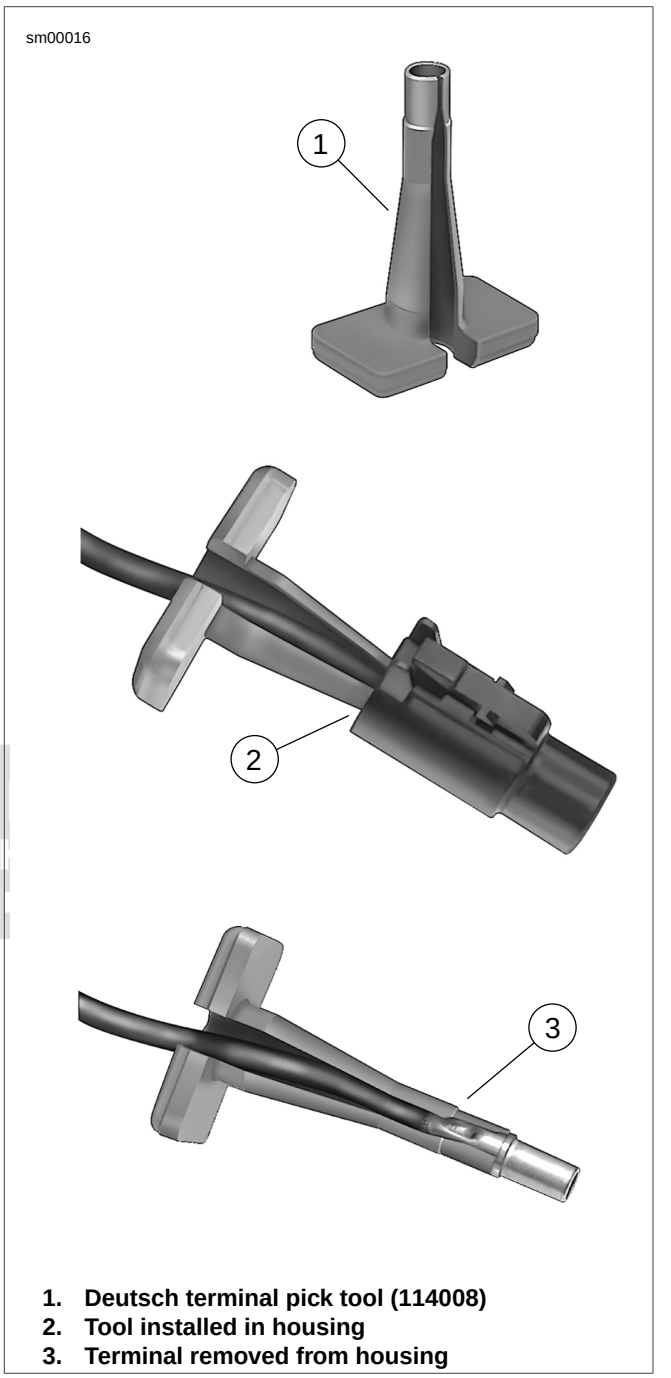
NOTE

Rough handling or careless storage can result in tool damage. Exercise care to avoid cracking or breaking the thin plastic construction.

1. Pull rear wire seal from back of housing and slide down voltage regulator cable to move out of the way.
2. See Figure A-12. Using terminal pick tool (Deutsch® 114008) (1), install tool onto voltage regulator cable so that the tapered end is in the wire end of the housing (2).
3. Push tool into wire end of housing until it bottoms. Gently tug on housing to pull from terminal (3).
4. Remove tool from voltage regulator cable.

Installing Socket Terminals

1. Insert terminal into wire end of housing until it "clicks" in place. Verify that terminal will not back out of housing. A slight tug on the voltage regulator cable will confirm that it is properly locked in place.
2. Fit rear wire seal into back of housing.



1. Deutsch terminal pick tool (114008)
2. Tool installed in housing
3. Terminal removed from housing

Figure A-12. Deutsch 1-Place Connector: Remove Socket/Pin Housing

DEUSCH ELECTRICAL CONNECTORS A.5

DEUTSCH CONNECTOR REPAIR

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

General

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

NOTE

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

Separating Pin and Socket Housings

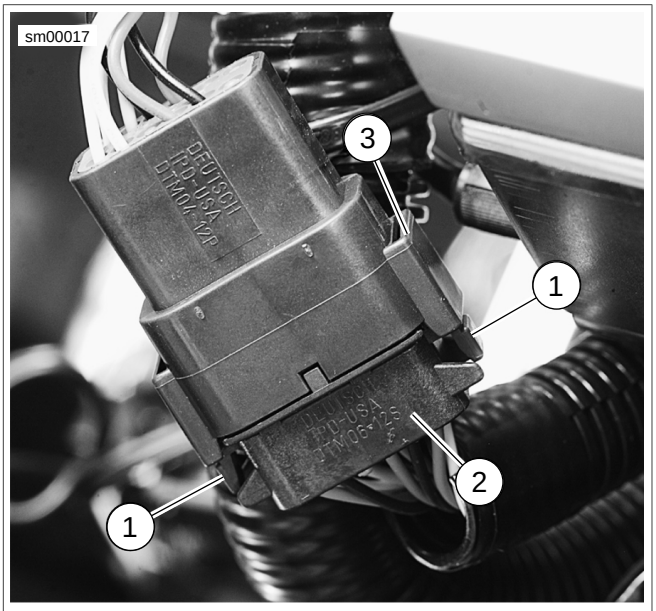
See Figure A-12. To separate the connector halves, depress the external latch(es) (1) on the socket housing (2) while rocking the pin (3) and socket housings.

NOTES

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

Mating Pin and Socket Housings

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.



1. **External latch**
2. **Socket housing**
3. **Pin housing**

Figure A-13. Deutsch Connector

Removing Socket Terminals

1. See Figure A-14. 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-17. Use a pick or small screwdriver to depress terminal latches inside socket housing and back out sockets through holes in rear wire seal.

NOTE

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

Installing Socket Terminals

1. Match wire lead color to connector cavity.
2. See Figure A-16. 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.

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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-15. 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.*

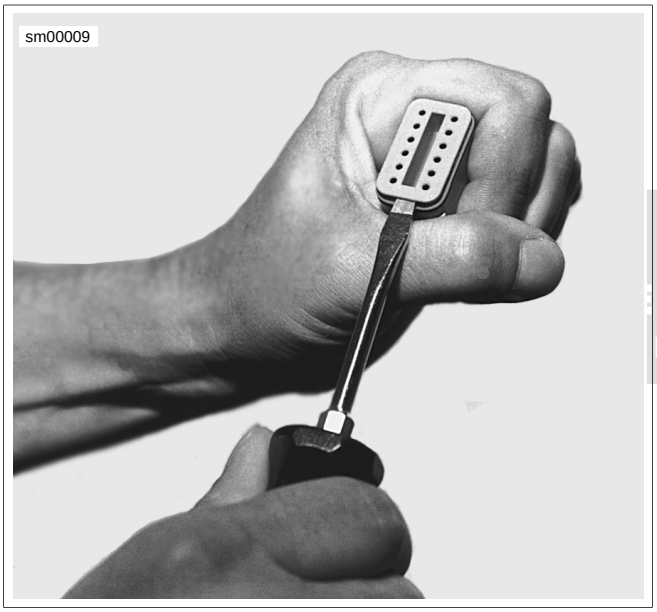
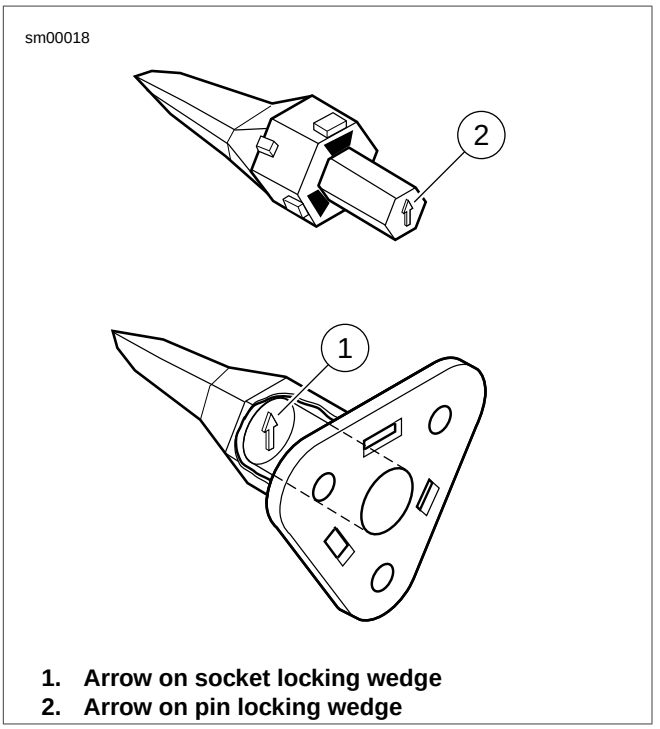


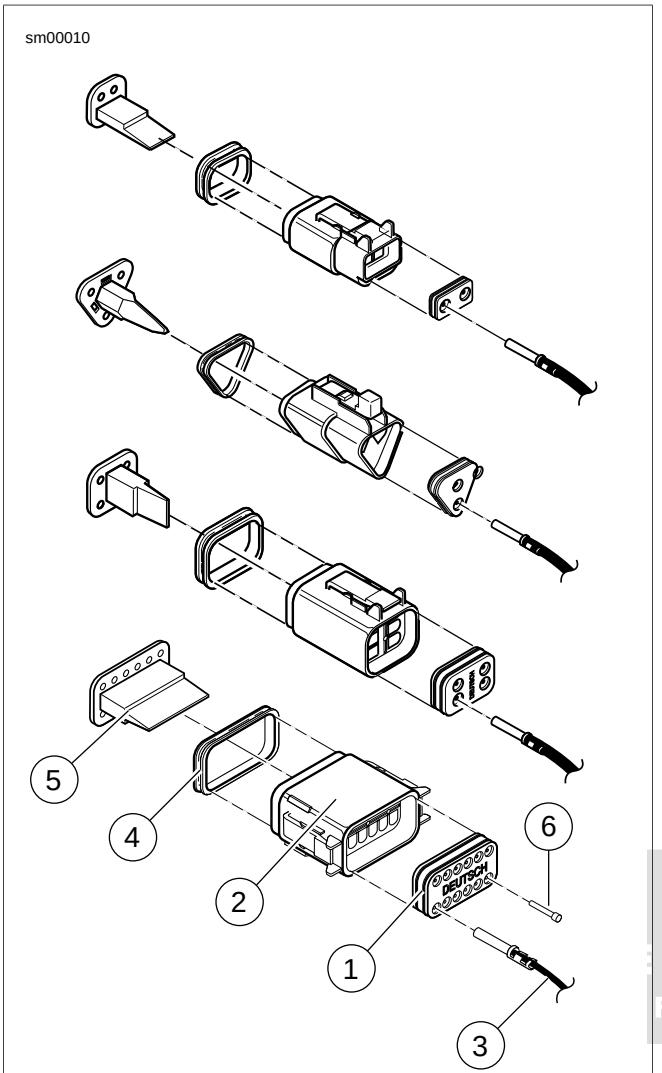
Figure A-14. Deutsch Connector: Remove Secondary Locking Wedge



1. Arrow on socket locking wedge
2. Arrow on pin locking wedge

Figure A-15. Deutsch Connector: 3-Place Locking Wedges

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1. **Wire seal**
2. **Socket housing**
3. **Wire lead**
4. **Internal seal**
5. **Secondary locking wedge**
6. **Seal plug**

Figure A-16. Deutsch Connector: 2, 3, 4 and 12-Place Socket Housings

Removing Pin Terminals

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

NOTES

- *If wire leads require **new** terminals, see the instructions for crimping terminals.*
- *If it should become necessary to replace a pin or socket housing, please note that the 8-place and 12-place gray and black connectors are not interchangeable. Since location of the alignment tabs differ between the black and gray connectors, plugs or receptacles must be replaced by those of the same color.*
- *When replacing both socket and pin housings, then the black may be substituted for the gray, and vice versa. The socket and pin housings of all other connectors are interchangeable, that is, the black may be mated with the gray, since the alignment tabs are absent and the orientation of the external latch is the same.*

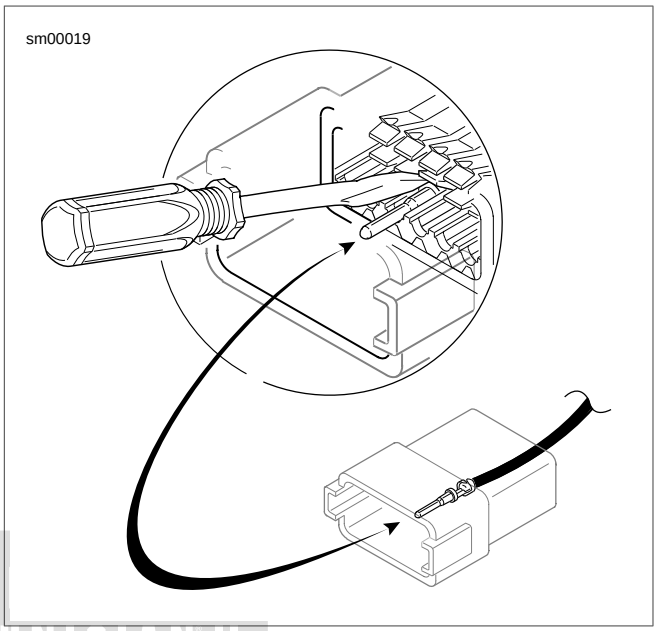


Figure A-17. Deutsch Connector: Depress Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See Figure A-18. 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.

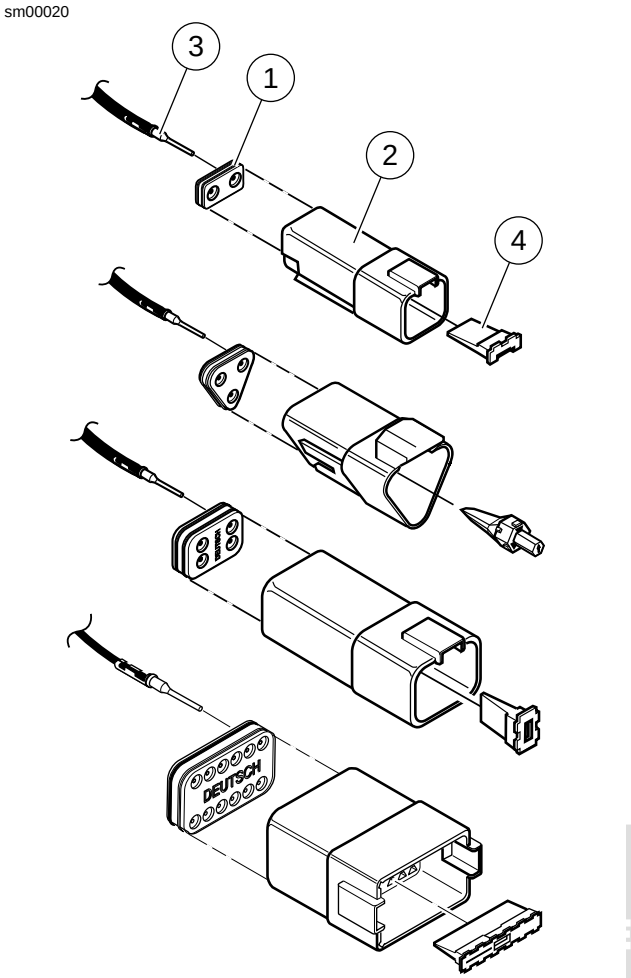
NOTE

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-15. 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.*



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

Figure A-18. Deutsch 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-2.

Table A-2. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
Standard (with crimp tails)	A.6 DEUTSCH STANDARD TERMINALS
Mini Terminal (solid barrel)	A.8 DEUTSCH SOLID BARREL TERMINALS
Mini Terminal (with crimp tails)	A.7 DEUTSCH MINI-TERMINAL CRIMPS

DEUTSCH STANDARD TERMINALS A.6

DEUTSCH STANDARD TERMINAL CRIMPS

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

Preparing Wire Leads for Crimping

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

Crimping Terminal to Lead

1. See Figure A-19. Squeeze the handles of the DEUTSCH TERMINAL CRIMP TOOL (Part No. HD-39965-A) to open the jaws. Push the locking bar (1) up.
2. Insert (2) terminal (socket/pin) through hole of the locking bar, so that the rounded side of the contact barrel rests in the nest (concave split level area) with the crimp tails facing upward. To match the wire gauge to the crimp tool die, refer to Table A-3.
3. Release locking bar to lock terminal in die.

NOTE

If the crimp tails are slightly out of vertical alignment, the crimp tool automatically rotates the terminal so that the tails face straight upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

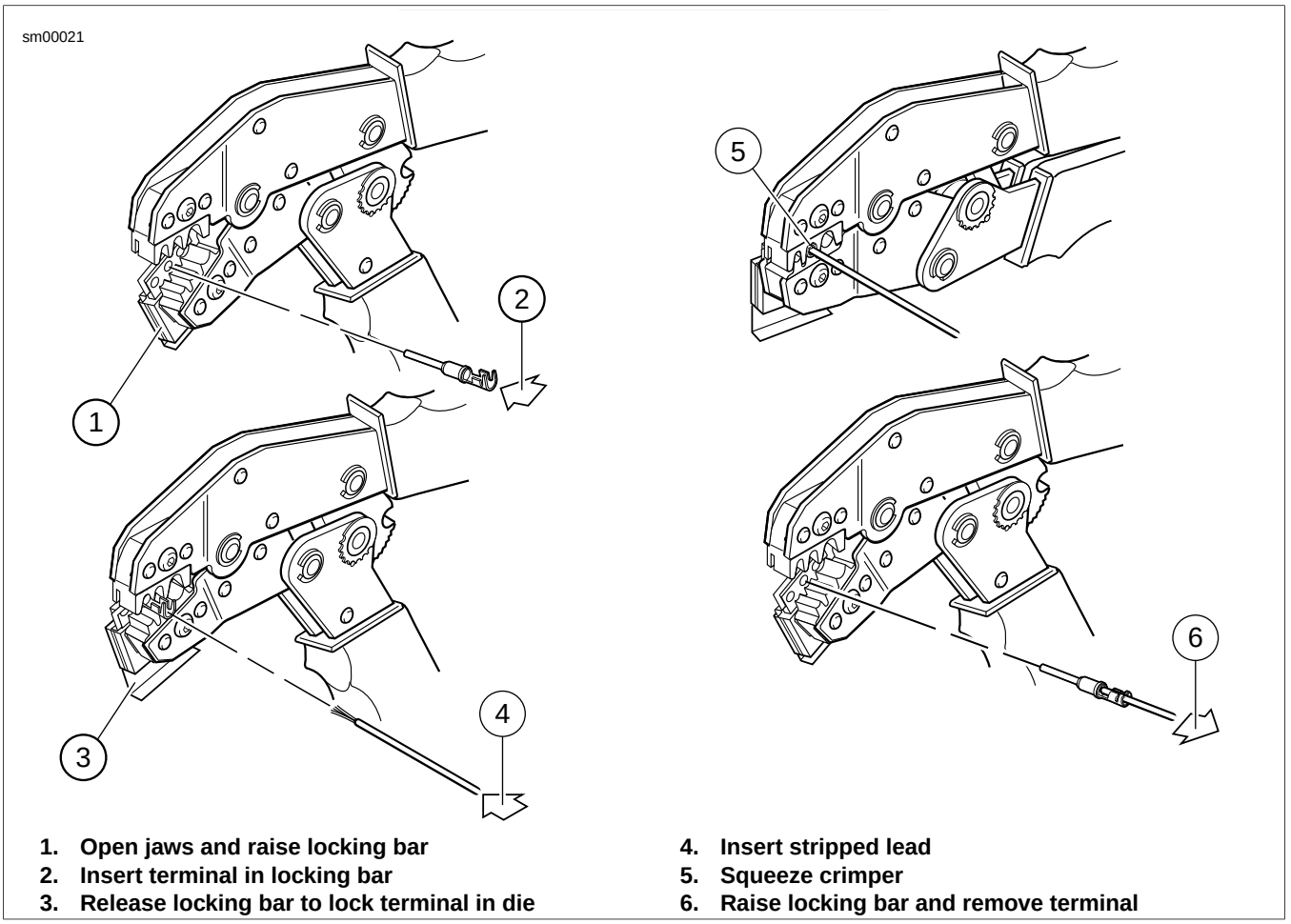
4. Insert stripped wire core between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that short pair of crimp tails squeeze bare wire strands, while long pair folds over the insulation.
5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens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

Inspecting Crimps

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

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

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



1. **Open jaws and raise locking bar**
2. **Insert terminal in locking bar**
3. **Release locking bar to lock terminal in die**
4. **Insert stripped lead**
5. **Squeeze crimper**
6. **Raise locking bar and remove terminal**

Figure A-19. Crimping a Deutsch Standard Terminal

DEUTSCH MINI-TERMINAL CRIMPS A.7

DEUTSCH 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-20. 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.

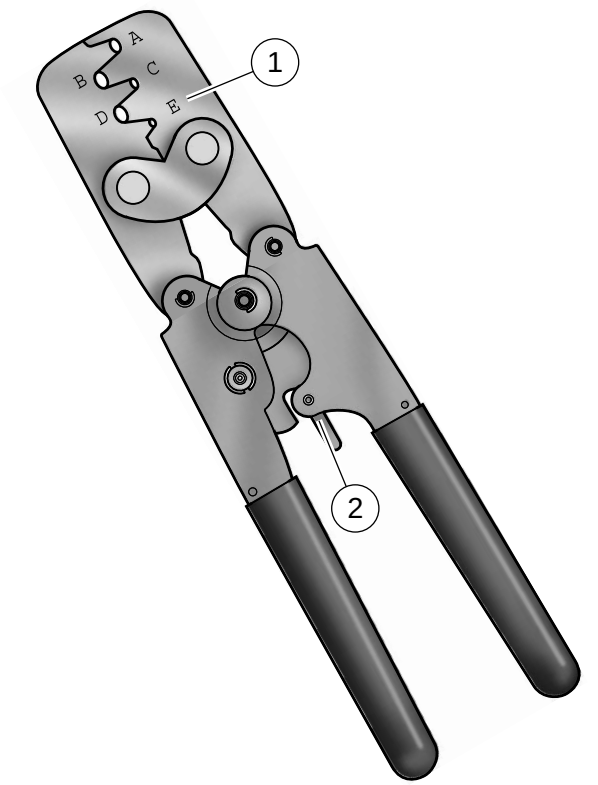
NOTE

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.



1. E die
2. Crimper ratchet trigger

Figure A-20. Packard Terminal Crimper (HD-38125-7)

DEUTSCH SOLID BARREL TERMINALS A.8

DEUTSCH 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-21. 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-22. Turn tool over and drop contact barrel (1) into indentor cover (2) hole with the wire end out.
2. Turn adjusting screw counterclockwise (out) until contact is flush with bottom of depression in indentor cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact is centered between the four indentor 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 indentor.

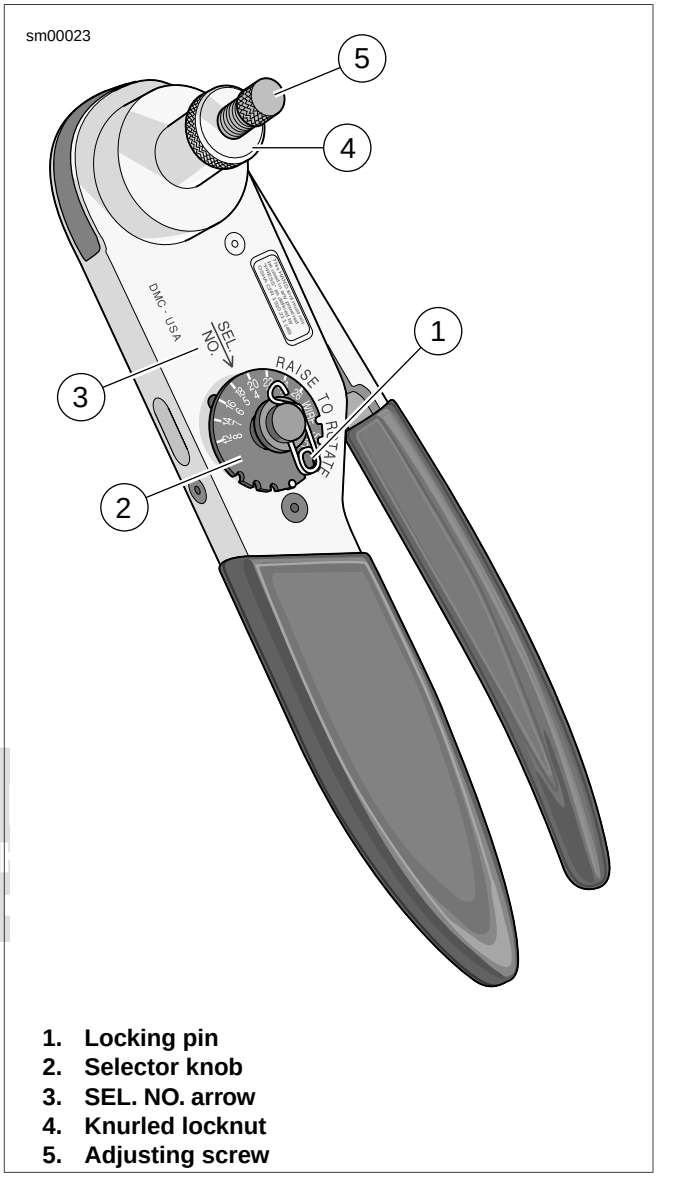
NOTE

Tool must be readjusted when changing contact size/type.

6. Install pin to lock selector knob.

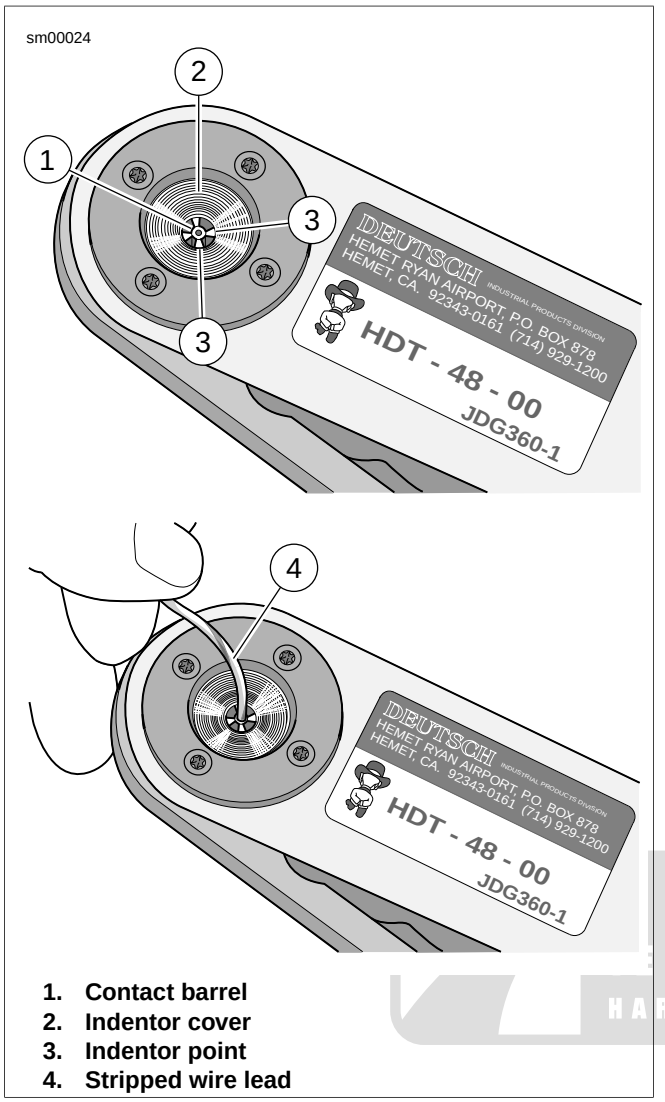
Inspecting Crimps

Inspect the crimp. All core wire strands are to be crimped in the barrel.



1. **Locking pin**
2. **Selector knob**
3. **SEL. NO. arrow**
4. **Knurled locknut**
5. **Adjusting screw**

Figure A-21. Electrical Crimper Tool (HD-42879)



1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

Figure A-22. Deutsch Solid Barrel

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RELAY AND FUSE BLOCKS A.9

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See Figure A-23. 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-24. 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.

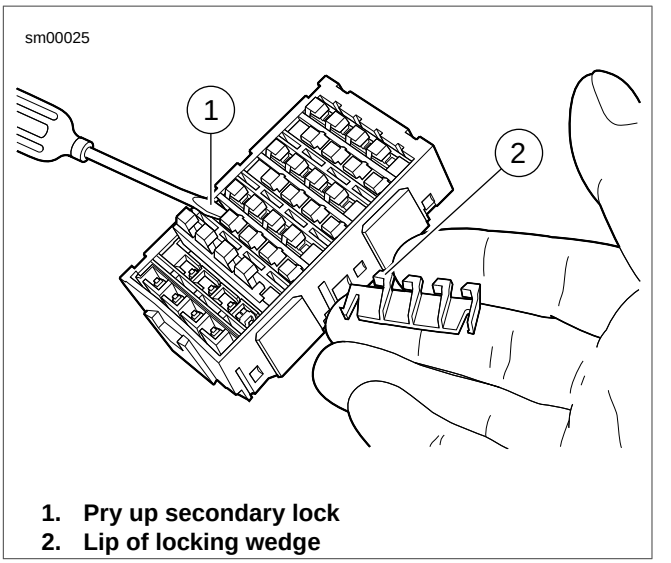
Crimping Terminals

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.

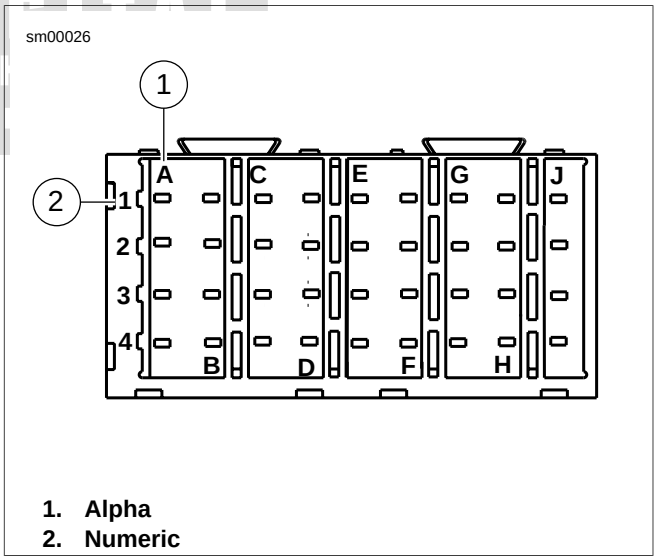
NOTE

The wiring diagram indicates when one socket terminal is be crimped to two wire leads.



1. Pry up secondary lock
2. Lip of locking wedge

Figure A-23. Fuse Block: Remove Secondary Locks



1. Alpha
2. Numeric

Figure A-24. Fuse Block: Coordinates (typical)

150 METRI-PACK CONNECTORS A.10

150 METRI-PACK CONNECTOR REPAIR

General

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

There are two types of connectors in this series:

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

Separating Pin and Socket Housings

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

Mating Pin and Socket Housings

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

Removing Socket Terminal

1. See Figure A-25 for pull-to-seat connector or Figure A-26 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

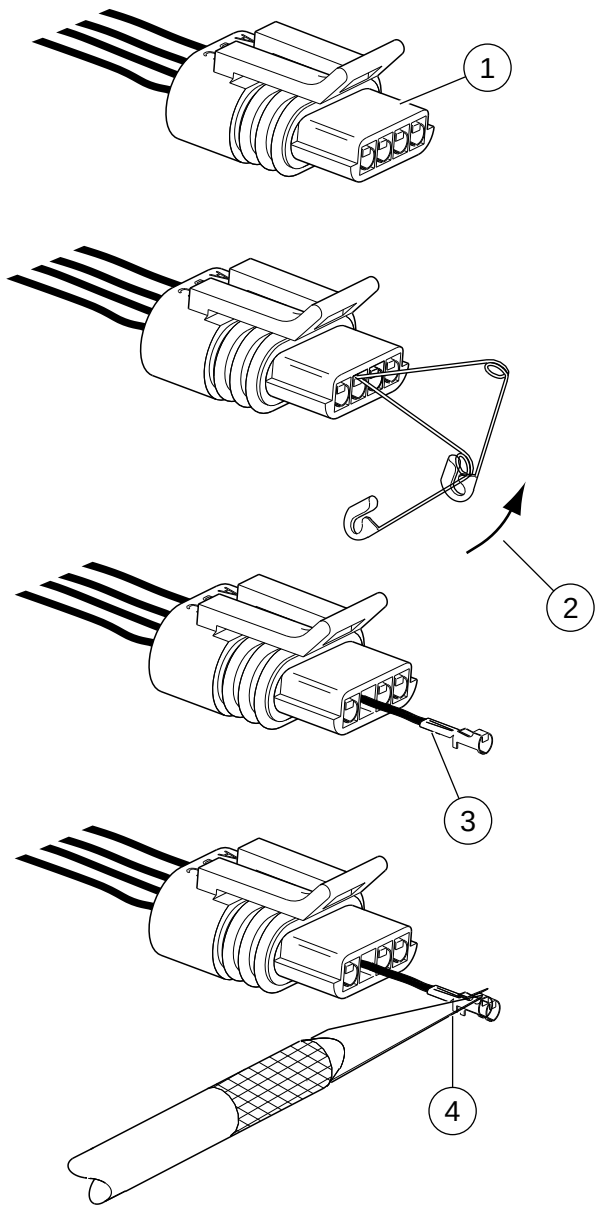
For wire location purposes, alpha characters are stamped into the socket housings.

1. See Figure A-25 for pull-to-seat connector or Figure A-26 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-26. 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.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

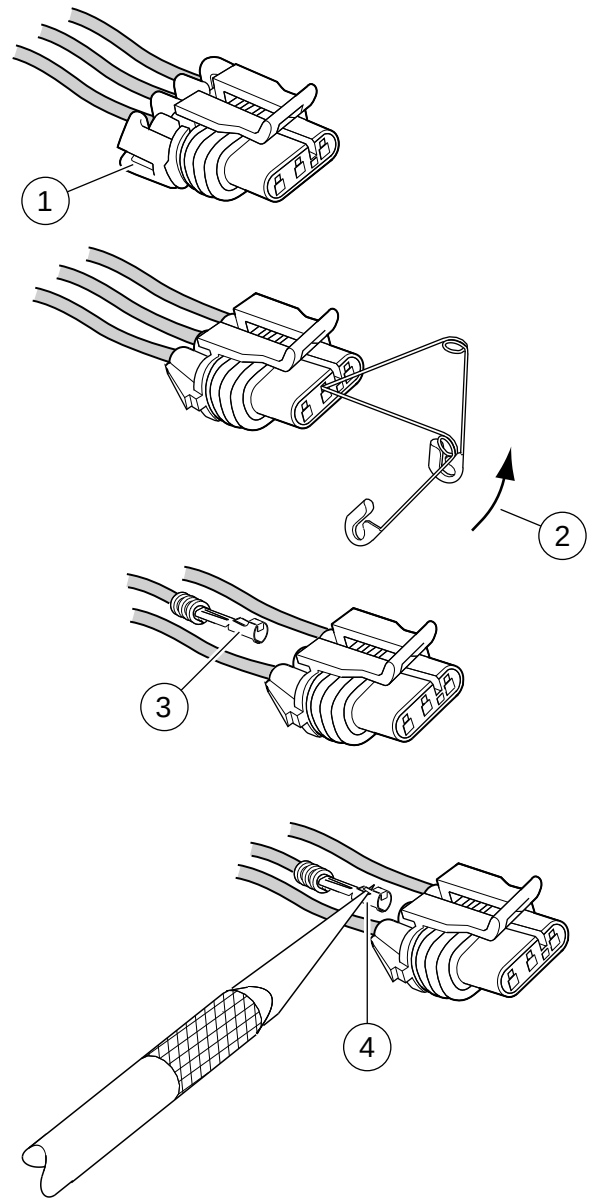
sm00027



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

Figure A-25. 150 Metri-Pack Connector: Pull-to-Seat

sm00028



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

Figure A-26. 150 Metri-Pack Connector: Push-to-Seat

280 METRI-PACK CONNECTORS A.11

280 METRI-PACK CONNECTOR REPAIR

General

See Figure A-27. Called Packard connectors, Metri-Pack series connectors are embossed with the initials (P.E.D.)

Separating Pin and Socket Housings

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

Mating Pin and Socket Housings

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

Removing Socket Terminals

1. See Figure A-28. Pry rubber seal from wire end of connector and move seal down wires (1) toward conduit. Hold the connector so that the wireform is facing down.
2. Looking into the wire end of the connector, insert the point of a safety pin (2) between the top of the terminal and the inside chamber wall.
3. Push safety pin completely into chamber while watching terminal on mating end of connector. When terminal is observed moving forward slightly, tang is depressed. Remove safety pin.

NOTE

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

4. Push on wire end of the lead to extract the terminal from the mating end of the connector.
5. If necessary, crimp new terminals on wires. See A.15 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps.

Installing Socket Terminals

NOTE

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

1. See Figure A-28. Using a thin flat blade, like an X-Acto knife (4), carefully bend the tang outward away from the terminal body.
2. Gently pull on the wire lead (5) to draw the terminal back into the chamber. The tang faces opposite the wireform as it enters the chamber.

NOTE

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

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

Crimping Terminals

If necessary, crimp new terminals on the wire leads. Refer to A.15 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps.

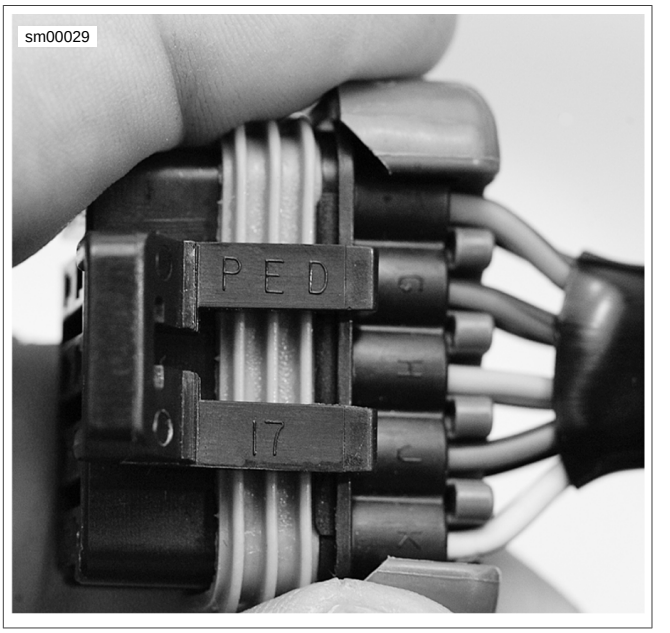
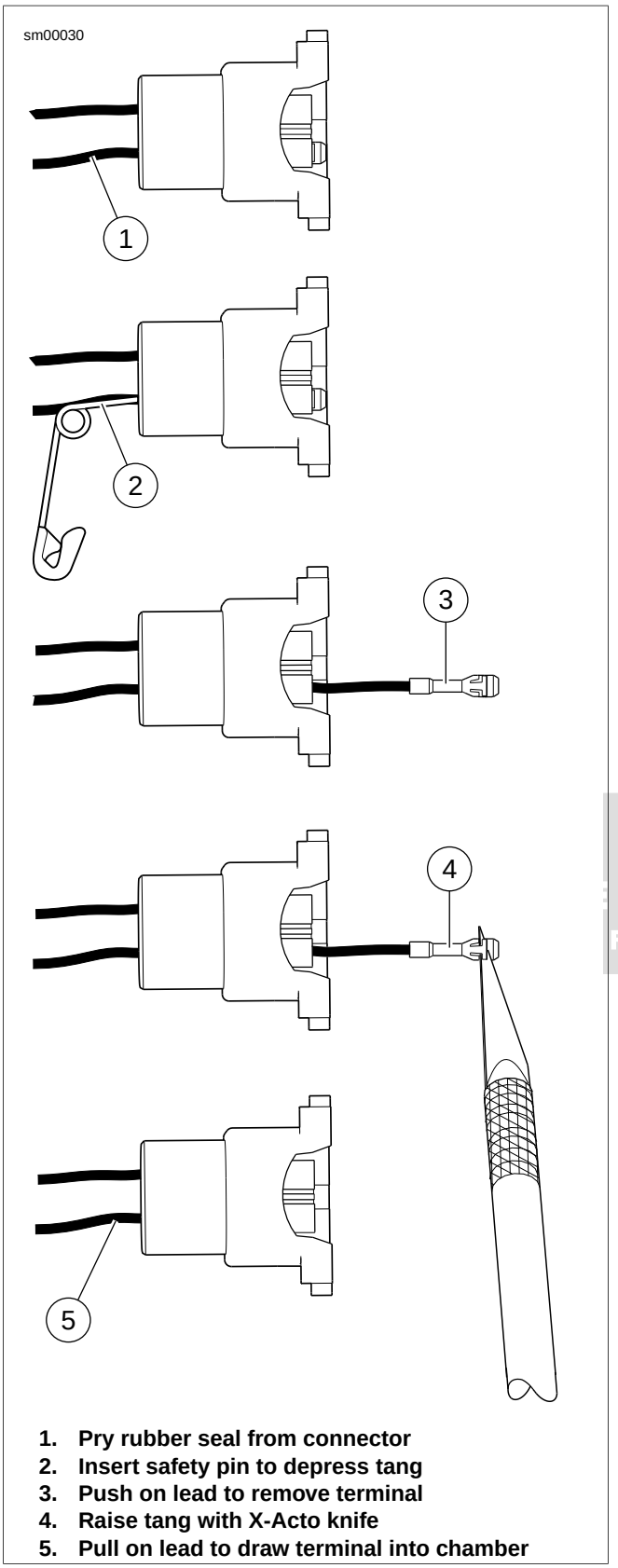


Figure A-27. 280 Metri-Pack Connector (P.E.D.)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Pry rubber seal from connector
2. Insert safety pin to depress tang
3. Push on lead to remove terminal
4. Raise tang with X-Acto knife
5. Pull on lead to draw terminal into chamber

Figure A-28. 280 Metri-Pack Connector: Remove/Install Socket Terminal

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480 METRI-PACK CONNECTORS A.12

480 METRI-PACK CONNECTOR REPAIR

General

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

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

Separating Pin and Socket Housings

NOTE

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

See Figure A-29. Using small flat blade screwdriver, depress button (1) on pin housing (red wire) side of the connector and pull apart the pin and socket housings.

Mating Pin and Socket Housings

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

Removing Socket Terminals

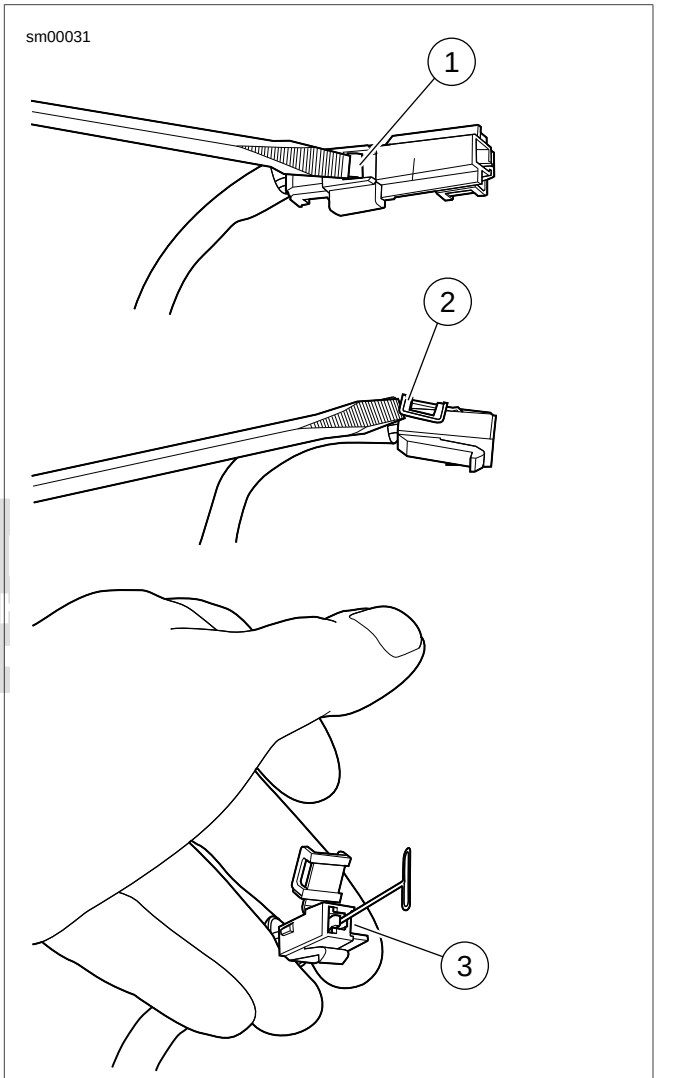
1. See Figure A-29. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped opening centered next to the terminal. Gently insert the point of a stick pin or large safety pin into the opening (3) between the tang and the chamber wall until it stops.
3. Pivot the end of the pin toward the terminal body to depress the tang.
4. Remove the pin and then pull terminal out of the wire end of connector housing.
5. If necessary, crimp **new** terminals on wires. See A.15 METRI-PACK TERMINALS.

Installing Socket Terminals

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

NOTE

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



1. **Button on pin housing**
2. **Secondary lock latch**
3. **Opening between tang and chamber wall**

Figure A-29. 480 Metri-Pack Connector: Remove Socket Terminal

630 METRI-PACK CONNECTORS A.13

630 METRI-PACK CONNECTOR REPAIR

PART NUMBER	TOOL NAME
TT600-3	SNAP-ON PICK

General

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

Separating Pin and Socket Housings

NOTE

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

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

Mating Pin and Socket Housings

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

NOTE

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

Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails and engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, take note of the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to depress the locking tang.
5. Remove the pick and gently tug on the wire to pull the terminal from the wire end of the connector. Repeat steps if the terminal is still locked in place.
6. If necessary, crimp **new** terminals on wires. Refer to A.15 METRI-PACK TERMINALS.

Installing Socket Terminal

NOTE

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

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

DIGITAL TECHNICIAN HARLEY-DAVIDSON

800 METRI-PACK CONNECTORS A.14

DELPHI MAXI-FUSE HOUSING REPAIR

General

A Delphi Maxi-fuse connector completes the circuit through the main fuse (Maxi-fuse).

Removing Maxi-Fuse

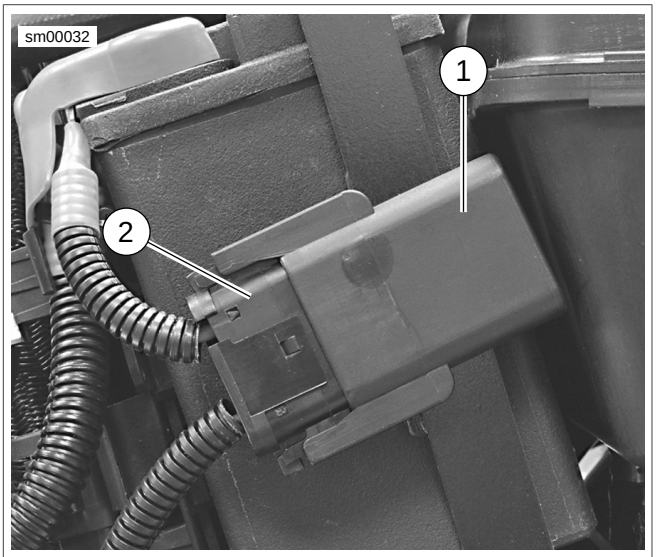
1. See Figure A-30. Depress latches on Maxi-fuse cover (1) and then slide cover off of connector (2).
2. Holding the connector (fuse holder), pull the Maxi-fuse out of the connector.

Installing Maxi-Fuse

1. Insert the blade terminals of the Maxi-fuse into the sockets of the connector and press the Maxi-fuse into the connector.
2. Slide the cover over the fuse until the cover clicks into place.

NOTE

If removed from an OE attachment such as a grooved fuse block cover, engage cover and slide into place.



1. **Maxi-fuse cover**
2. **Delphi Maxi-fuse housing**

Figure A-30. Delphi Connector Housing: Maxi-Fuse

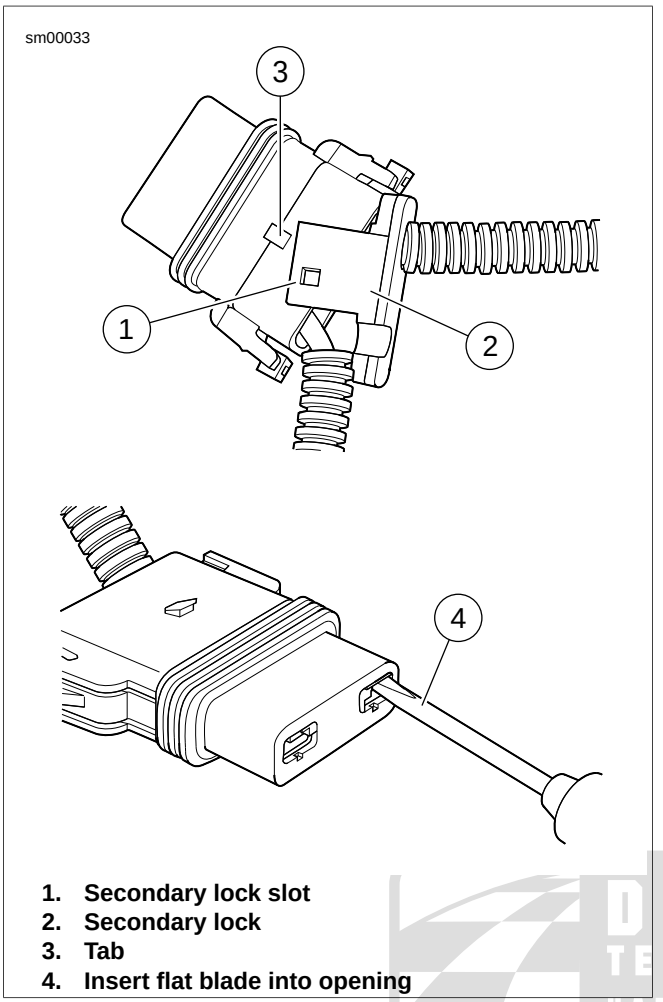
Removing Socket Terminals

1. See Figure A-31. Gently pull socket housing to disengage slots (1) on secondary lock (2) from tabs (3) on socket housing. Free secondary lock from cables and set aside.
2. Take note of the opening on one side of the socket terminal. Gently insert flat blade of pick (Snap-On TT600-5) or small screwdriver into opening (4) until it stops. Pivot the pick toward the terminal body and hold in position.
3. Tug on cable to pull socket from wire end of socket housing. A firm tug is necessary to overcome the resistance of the rubber seal.
4. Repeat to remove remaining socket terminal.

Installing Socket Terminals

1. See Figure A-32. Carefully bend tang outward away from the terminal body.
2. Feed socket into wire end of socket housing until it clicks in place. Verify that socket will not back out of chamber. A slight tug on the cable will confirm that it is locked.
3. Push rubber seal into wire end of socket housing.
4. Repeat to install remaining socket terminal.
5. Install secondary lock onto cables and then push onto wire end of socket housing until slots engage tabs on sides of socket housing.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Secondary lock slot
2. Secondary lock
3. Tab
4. Insert flat blade into opening

Figure A-31. Delphi Maxi-Fuse Housing: Remove Socket Terminals

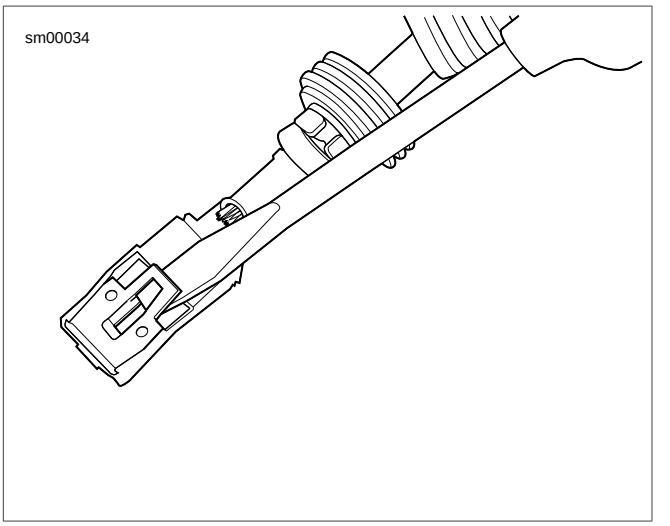


Figure A-32. Delphi Maxi-Fuse Housing: Bend Tang

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

METRI-PACK TERMINALS A.15

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-33. 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

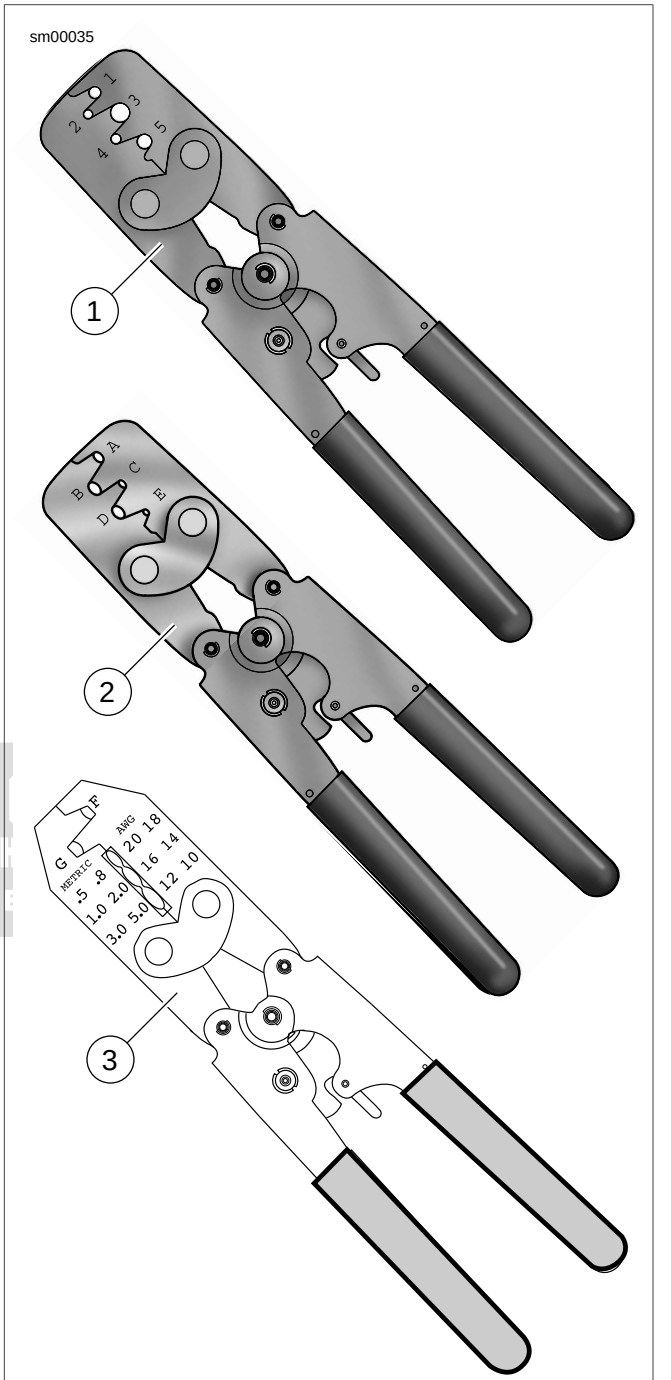
Use a wire striper to strip off the insulation and expose 5/32 in. (4.0 mm) of wire core.

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.



1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

Figure A-33. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

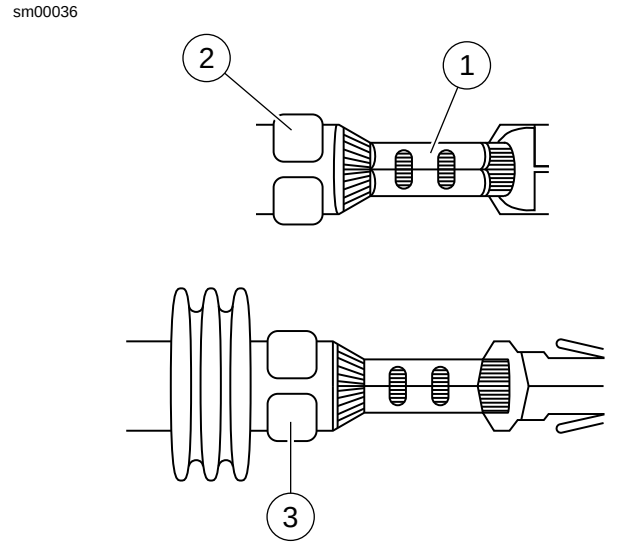
NOTE

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

1. See Figure A-34. 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-34. 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.



1. **Wire core crimp**
2. **Insulation crimp**
3. **Seal crimp**

Figure A-34. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MOLEX CONNECTORS A.16

MOLEX CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-48114	MOLEX ELECTRICAL CONNECTOR TERMINAL REMOVER

Separating Pin and Socket Housings

See Figure A-35. Depress 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-36. 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-37. 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-38. Insert MOLEX ELECTRICAL CONNECTOR 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-39. 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.

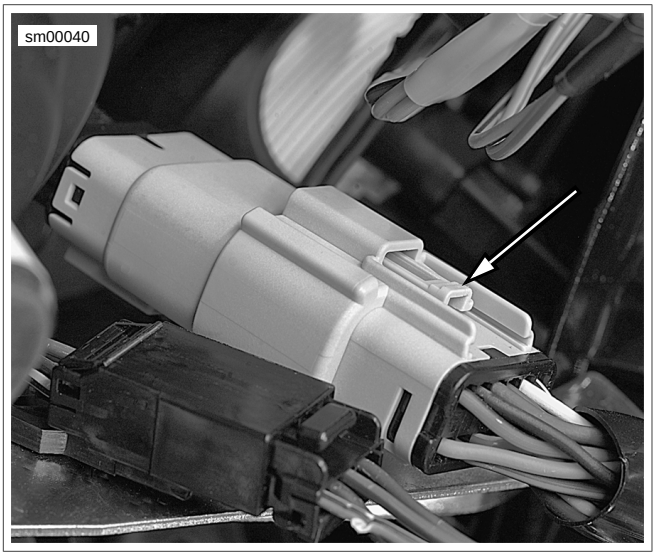


Figure A-35. Molex Connector: Latch

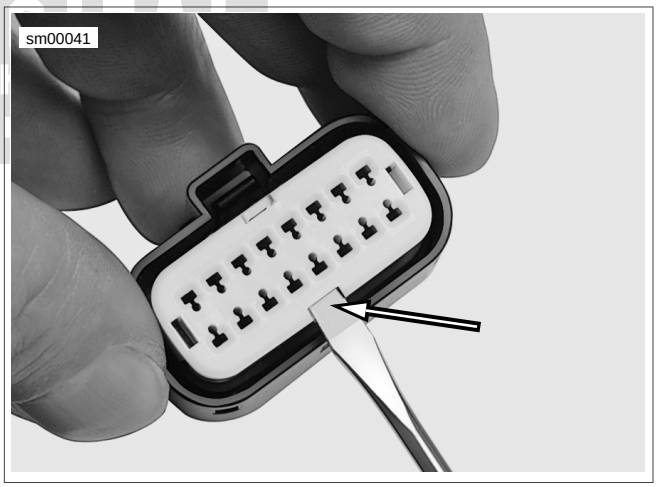


Figure A-36. Molex Connector: Secondary Lock Pry Slot (Socket Housing)

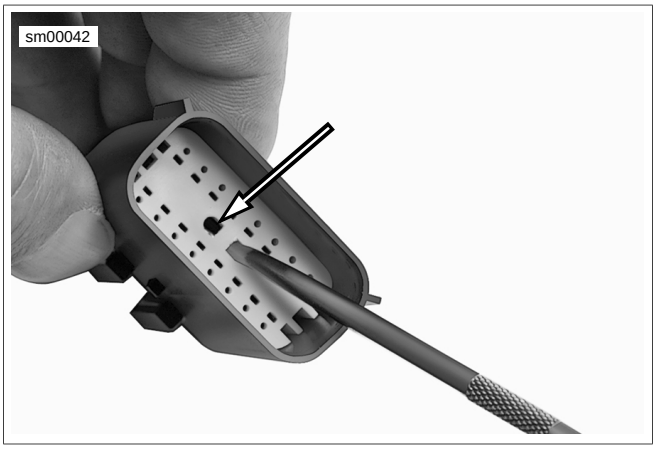


Figure A-37. Molex Connector: Secondary Lock D-Holes (Pin Housing)

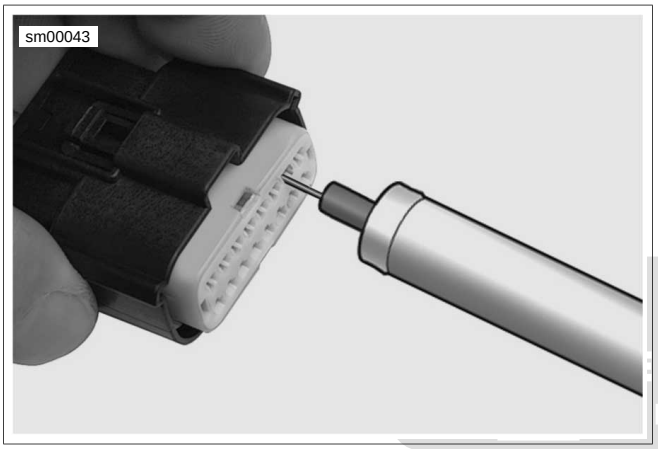
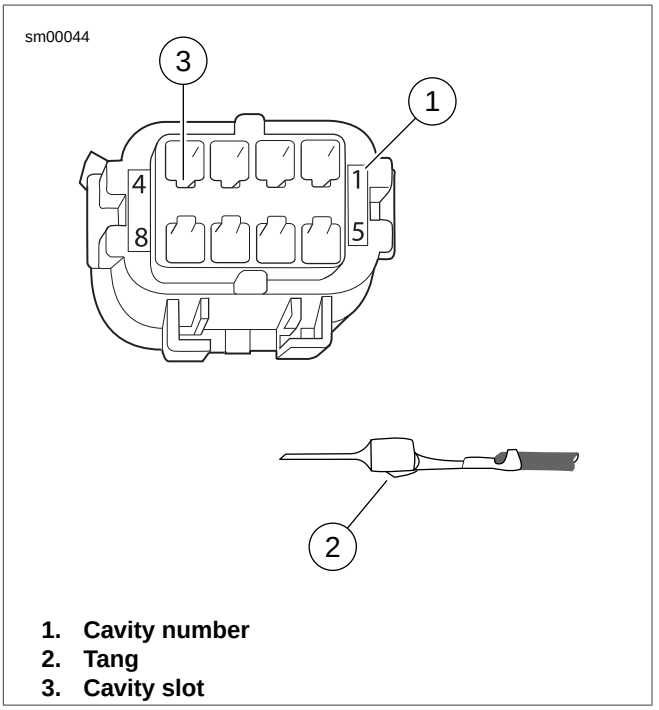


Figure A-38. Molex Connector: Terminal Remover (HD-48114)



1. **Cavity number**
2. **Tang**
3. **Cavity slot**

Figure A-39. Molex Connector: Pin Cavities and Wire Terminal

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PACKARD ECM CONNECTOR A.17

PACKARD 100W CONNECTOR REPAIR

General

A Packard 100W connector connects the the electronic control module (ECM) to the main harness.

NOTE

For vehicles with 73-pin connectors, see A.18 PACKARD MICRO-64 CONNECTORS and A.15 METRI-PACK TERMINALS.

Separating Socket Housing From ECM

See Figure A-40. 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

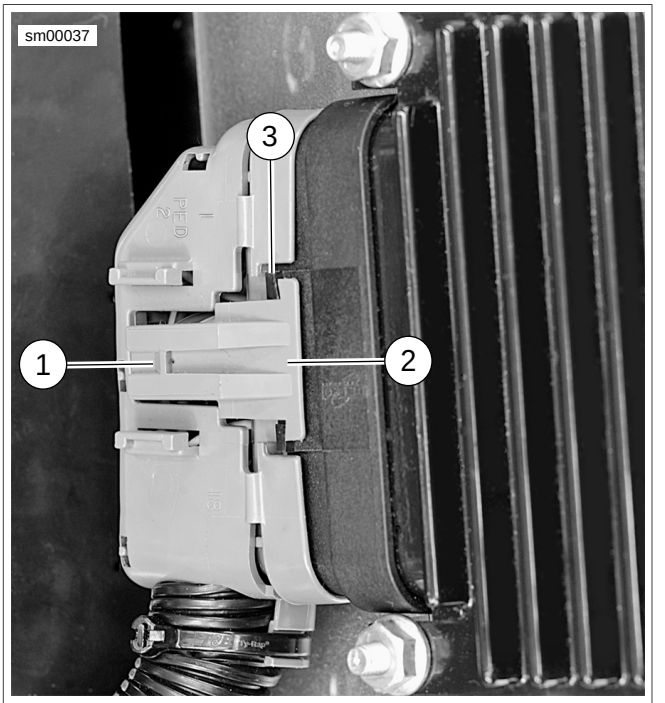
1. See Figure A-41. Gently depress latch (1) on each side of the clear plastic secondary lock (2) and remove. For best results, release one side at a time.
2. Carefully cut cable strap (3) to free strain relief collar (4) from conduit (5).
3. See Figure A-42. Using a thin blade, gently pry at seam at 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

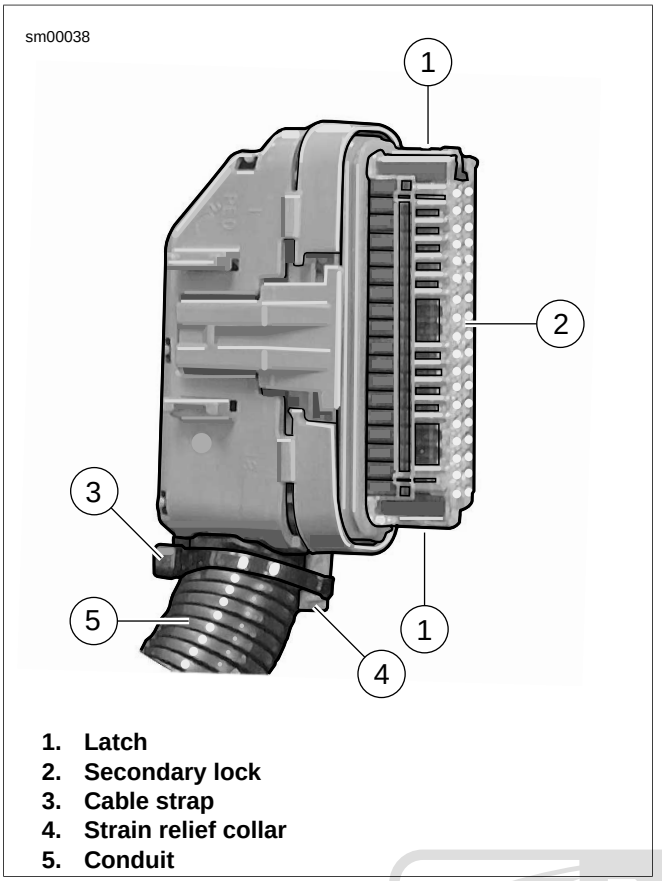
If necessary, crimp new terminals on wire leads. See A.15 METRI-PACK TERMINALS.



1. **Thumb lever**
2. **Latch**
3. **Catch (ECM)**

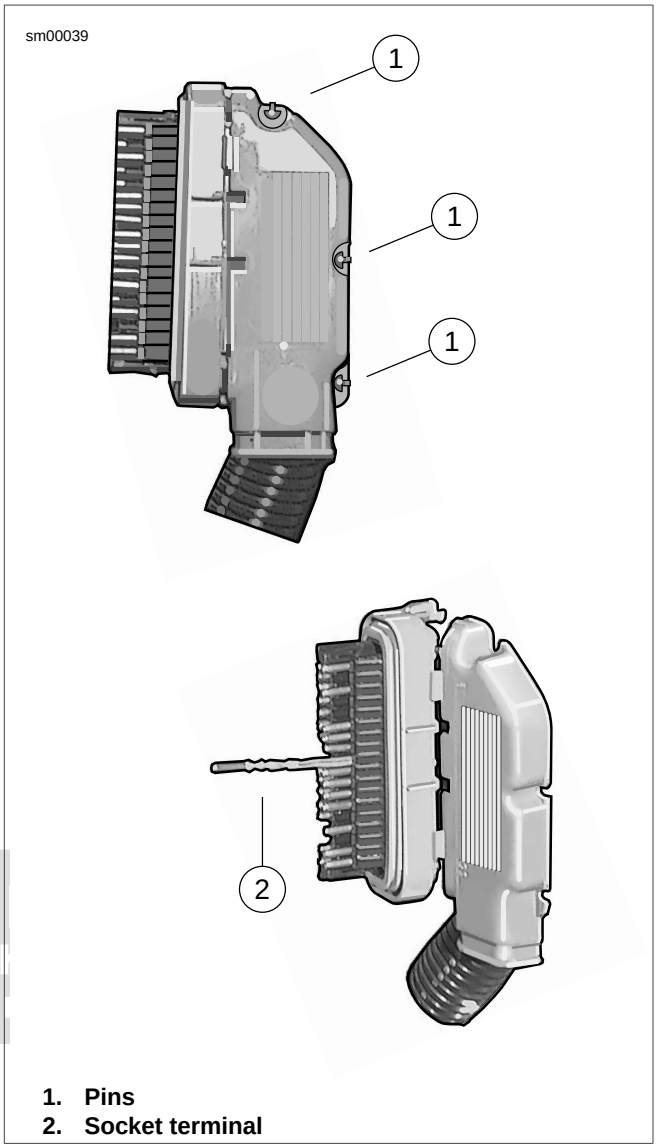
Figure A-40. Packard 100W to ECM (Typical)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Latch
2. Secondary lock
3. Cable strap
4. Strain relief collar
5. Conduit

Figure A-41. Packard 100W Connector



1. Pins
2. Socket terminal

Figure A-42. Packard 100W Connector: Separate Halves of Socket Housing

PACKARD MICRO-64 CONNECTORS A.18

PACKARD MICRO-64 CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-45928	PACKARD MICRO-64 TERMINAL REMOVER
HD-45929	PACKARD MICRO-64 TERMINAL CRIMPER

General

Packard Micro-64 connectors are frequently found on speedometers, tachometers and the ECM of Touring Models. For pin 73 of these ECMs, see A.10 150 METRI-PACK CONNECTORS.

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-45. 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.
4. See Figure A-46. Obtain the PACKARD MICRO-64 TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-44. 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.

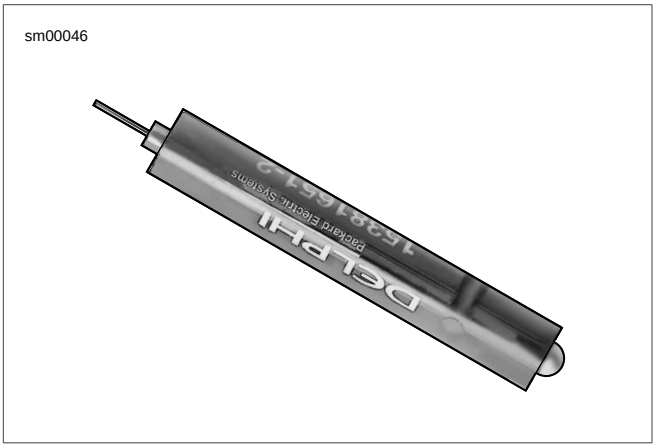


Figure A-43. Packard Micro 64 Terminal Remover (HD-45928)

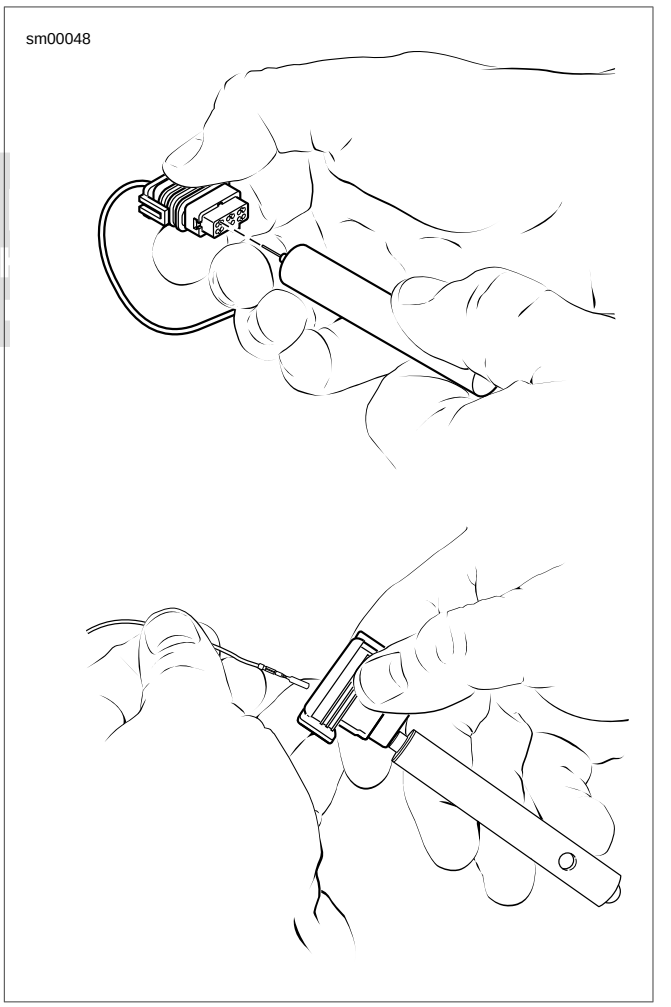


Figure A-44. Packard Micro 64 Connector: Insert Tool and Remove Terminal

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-45. 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 reinstalled. 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.

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-47. Squeeze the handles of the PACKARD MICRO-64 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.

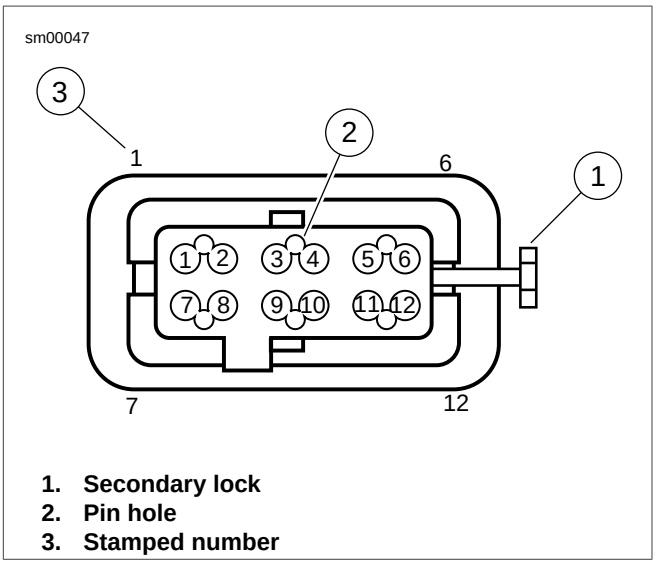
6. Insert wires between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.

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.



1. **Secondary lock**
2. **Pin hole**
3. **Stamped number**

Figure A-45. Packard Micro 64 Connector: Housing

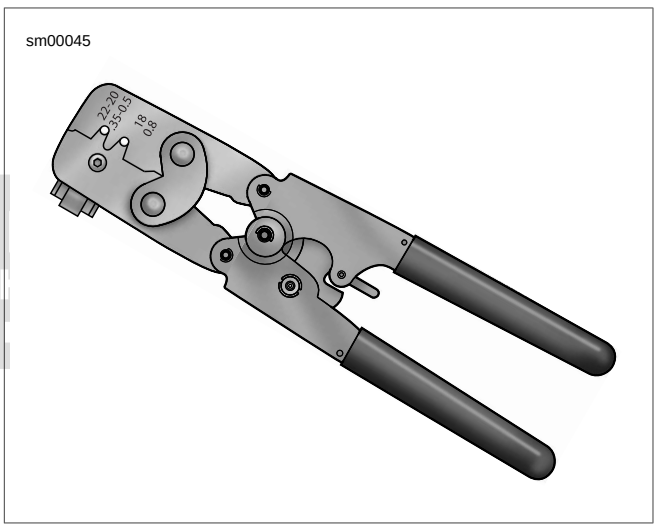
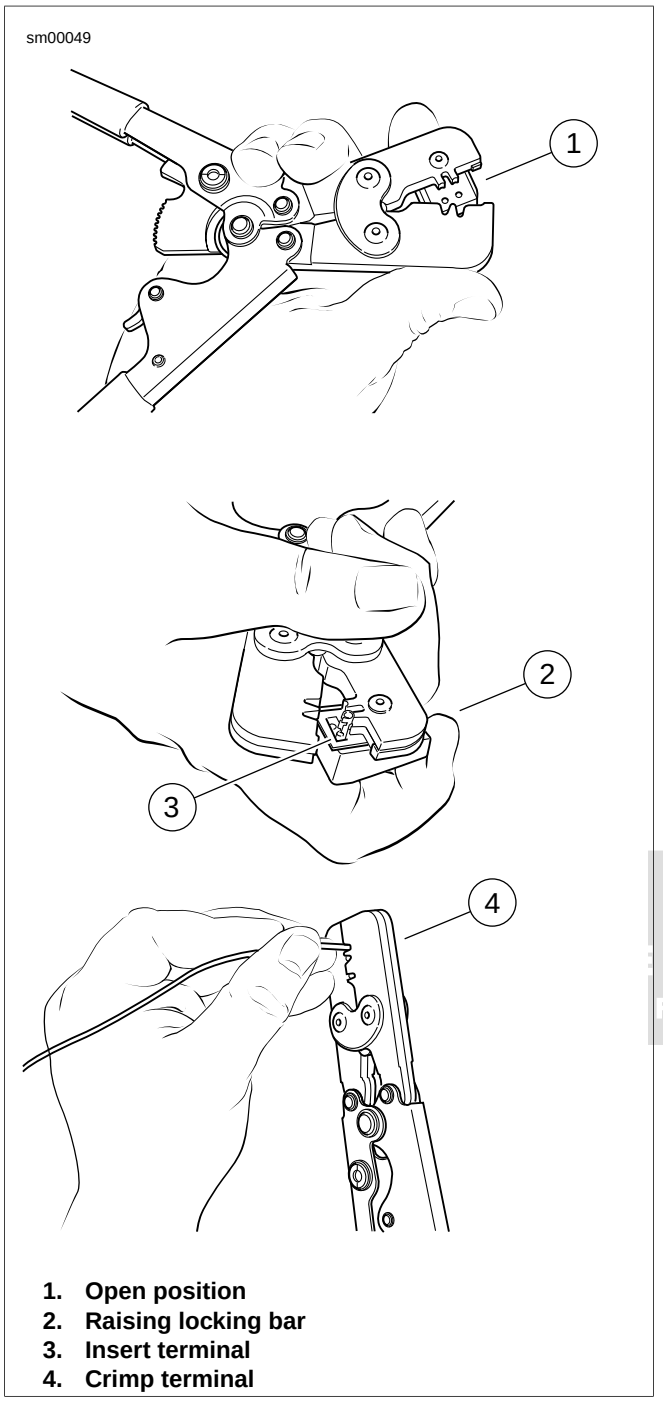


Figure A-46. Packard Micro 64 Terminal Crimper (HD-45929)



1. **Open position**
2. **Raising locking bar**
3. **Insert terminal**
4. **Crimp terminal**

Figure A-47. Packard Micro 64 Connector: Terminal in Crimper

IGITAL
CHNICIAN® II
RLEY-DAVIDSON®

SEALED SPLICE CONNECTORS A.19

SEALED SPLICE CONNECTOR REPAIR

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

General

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

Preparing Wire Leads

NOTE

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

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

Table A-4. Sealed Splice Connectors

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

NOTE

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

Splicing Wire Leads

NOTE

See Figure A-49. The connector is crimped twice - one side and then the other.

1. See Figure A-48. Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws and insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-49. Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).
5. Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.
6. Slide the connector to the other half of the metal insert. Insert the stripped wire lead (1) until it stops, and crimp the lead in the insert (2).

⚠WARNING

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

- Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.
- Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.
- Always keep hands away from tool tip area and heat shrink attachment.

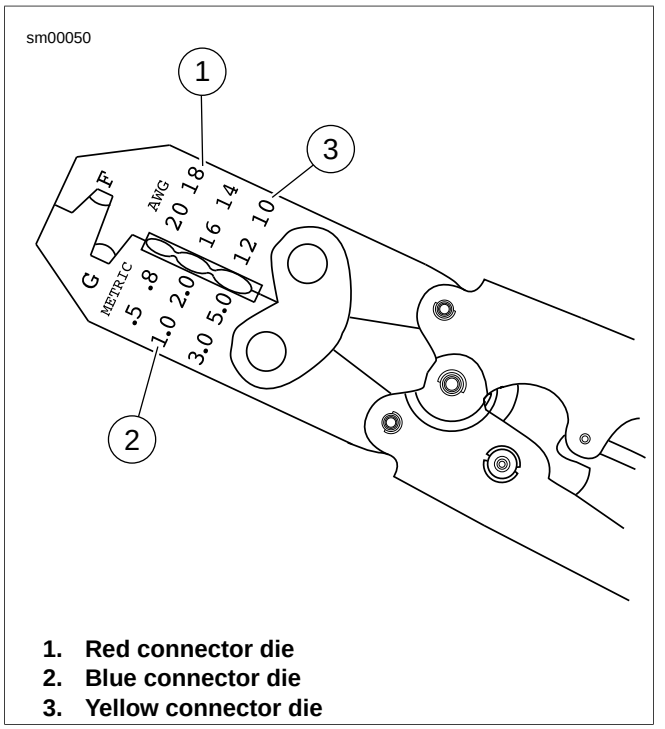
7. Use an ULTRA-TORCH UT-100 (Part No. HD-39969), or a ROBINAIR HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

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

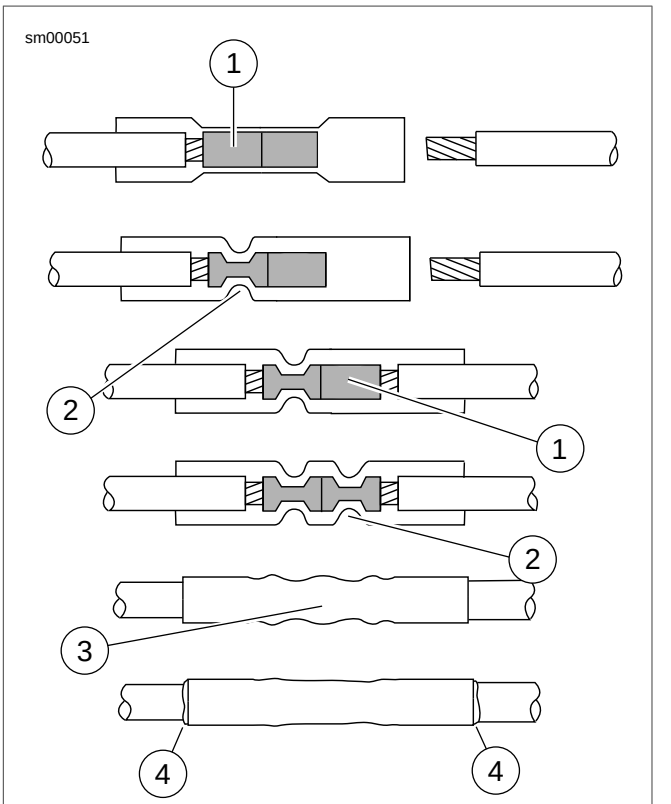
Inspecting Seals

See Figure A-49. 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.



1. Red connector die
2. Blue connector die
3. Yellow connector die

Figure A-48. Packard Crimping Tool (HD-38125-8)



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

Figure A-49. Sealed Splice Connector

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TABLE OF CONTENTS

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B.2 WIRING DIAGRAMS.....B-18

DIGITAL TECHNICIAN® II
HARLEY-DAVIDSON®

NOTES

CONNECTORS B.1

CONNECTOR LOCATIONS

Function/Location

Refer to Table B-1, Table B-2 or Table B-3. On the motorcycle, a connector can be identified by its function and location.

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-2 or Table B-3.

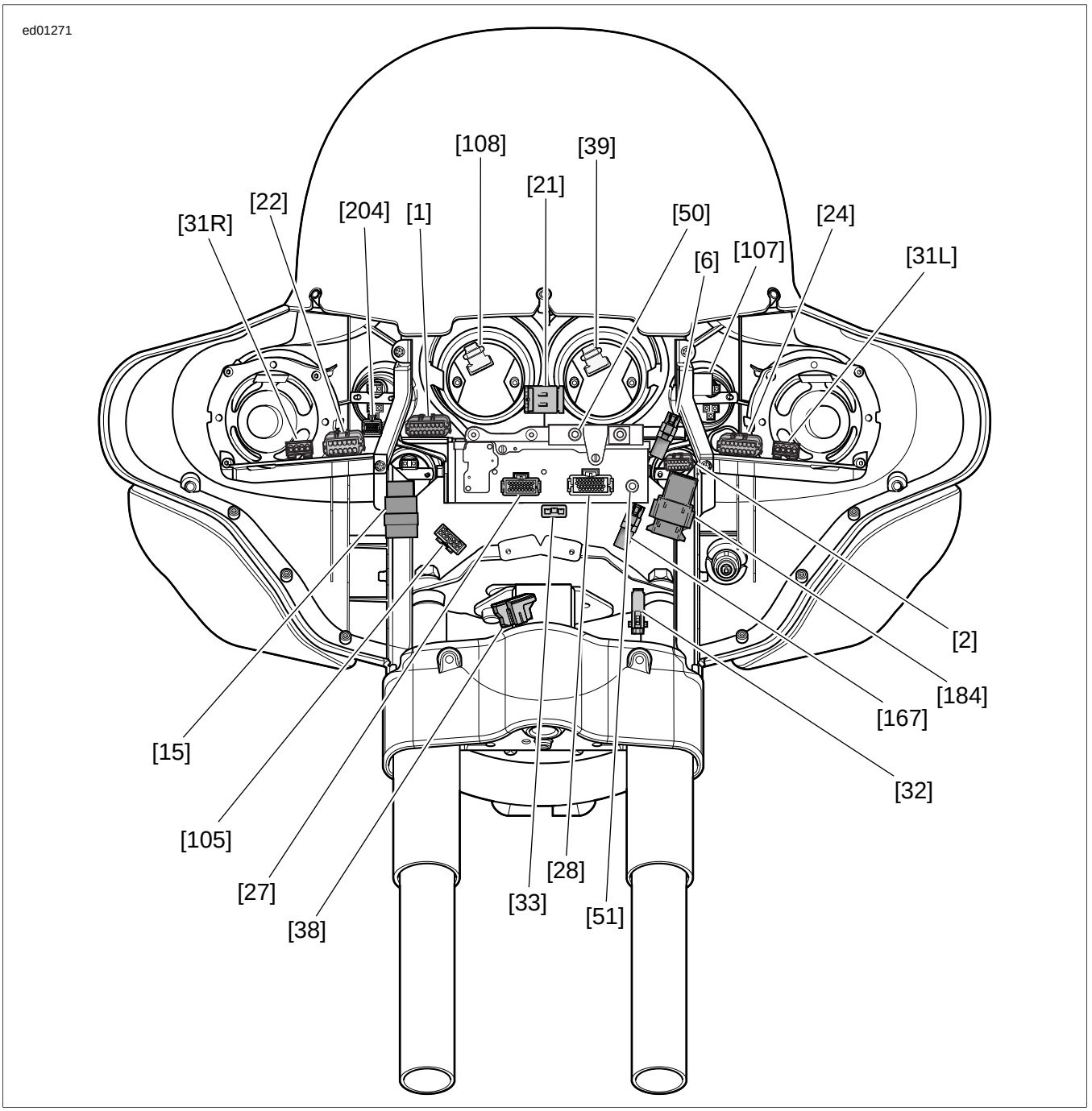


Figure B-1. Inner Fairing Connectors (FLHX, FLHT/C/U)

Table B-1. FLHX, FLHT/C/U Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (gray)	Inner fairing - left radio support bracket
[4]	Accessory	4-place Deutsch	Under seat
[5]	MAXIFUSE	2-place Packard	Under left side cover
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[12]	Tour-Pak lights (rear facia lamp on FLHX)	3-place Multilock	Inside Tour-Pak (inboard of upper frame tube on FLHX)
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[15]	Main to interconnect harness	4-place Delphi	Inner fairing - right fairing bracket
[18]	Left rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[20]	Console harness	16-place Molex	Under seat
[21]	Indicator lamps	10-place Multilock	Inner fairing - above radio
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[24]	Interconnect to left handlebar switches	16-place Molex (gray)	Inner fairing - left fairing support brace
[27]	Radio*	23-place Amp (Tyco)	Inner fairing - back of radio (right side)
[28]	Radio**	35-place Amp (Tyco)	Inner fairing - back of radio (left side)
[30]	TSM/TSSM/HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31L]	Left front turn signal/auxiliary lamp	4-place Multilock	Inner fairing - left fairing support brace (outboard side)
[31R]	Right front turn signal/auxiliary lamp	4-place Multilock	Inner fairing - right fairing support brace (outboard side)
[32]	Front fender tip lamp jumper harness (DOM)	2-place Multilock (black)	Inner fairing - below upper for bracket (left side)
[33]	Ignition Switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[34]	Right front speaker	Spade terminals	Inner fairing (back of speaker)
[34]	Left front speaker	Spade terminals	Inner fairing (back of speaker)
[38]	Headlamp	Headlamp connector	Inner fairing (back of headlamp)
[39]	Speedometer	12-place Packard	Inner fairing - back of speedometer
[41]	Rear right speaker/passenger controls**	6-place Deutsch	Inside rear right speaker box
[42]	Rear left speaker/passenger controls**	6-place Deutsch	Inside rear left speaker box
[45]	Rear fender tip lamp (DOM)	3-place Multilock	Circuit board under tail lamp assembly
[47]	Stator	3-place Lyall	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)
[53]	Console pod**	12-place Deutsch	Rear of battery box (under seat)
[64]	Fuse block	Packard	Under left side cover
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[76]	Passenger headset	7-place DIN	Below rear left speaker box
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table B-1. FLHX, FLHT/C/U Connector Locations

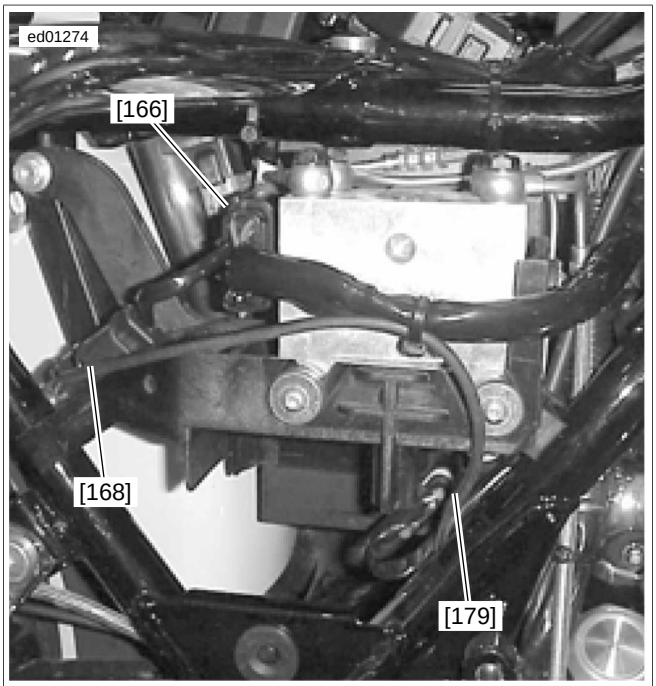
NO.	DESCRIPTION	TYPE	LOCATION
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Deutsch	Electrical caddy at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Bosch	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[87]	Idle Air Control (IAC)	4-place Delphi	Top of induction module
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Multilock	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[105]	Fairing cap switches	12-place Multilock	Inner fairing - above upper fork bracket (right side)
[107]	Ambient Air Temperature (AAT) sensor*	3-place Multilock	Inner fairing - left fairing bracket (outboard side)
[108]	Tachometer	12-place Packard	Inner fairing (back of tachometer)
[111]	Voltmeter lamp	Spade terminals	Inner fairing (back of voltmeter)
[112]	Oil pressure gauge lamp	Spade terminals	Inner fairing (back of oil pressure gauge)
[113]	Oil pressure gauge	Spade terminals	Inner fairing (back of oil pressure gauge)
[114]	Air temperature gauge lamp	Spade terminals	Inner fairing (back of air temperature gauge)
[115]	Air temperature gauge	Spade terminals	Inner fairing (back of air temperature gauge)
[116]	Fuel gauge lamp	Spade terminals	Inner fairing (back of fuel gauge)
[117]	Fuel gauge	Spade terminals	Inner fairing (back of fuel gauge)
[119]	EFI fuses	Fuse terminals	Fuse block (under right side cover)
[121]	Rear brake light switch	Spade terminals	Bottom of rear frame downtube (right side)
[122]	Horn	Spade terminals	Between cylinders (right side)
[126]	Lighting relay	Relay	Crossmember at rear of battery box (under seat)
[128]	Starter solenoid	Spade terminals	Top of starter
[129]	Harness grounds	Ring terminals	Upper frame crossmember (under seat)
[131]	Neutral switch	Post terminals	Top of transmission (right side)
[132]	Cigarette lighter*	Spade terminals	Inner fairing
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie at bottom of lower frame crossmember.
			HDI: Electrical caddie at bottom of lower frame crossmember.
[134]	Sidecar Bank Angle Sensor (BAS)	3-place Packard	Under seat

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table B-1. FLHX, FLHT/C/U Connector Locations

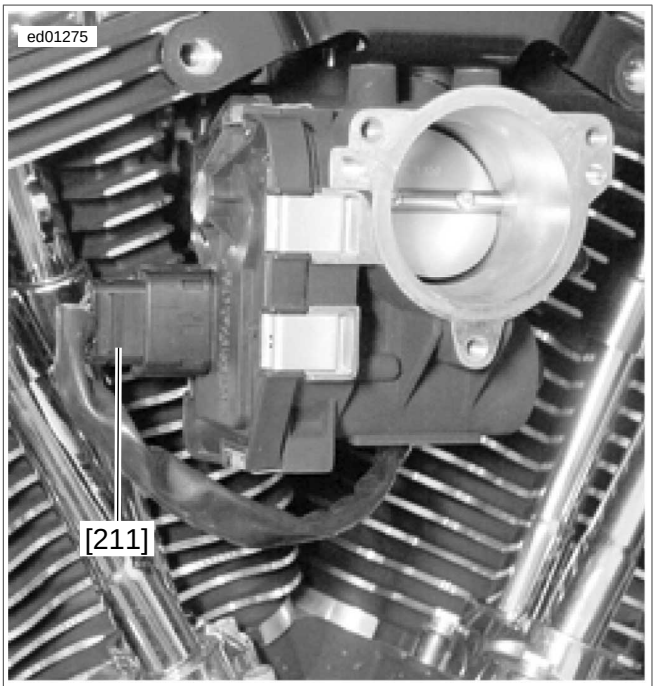
NO.	DESCRIPTION	TYPE	LOCATION
[136]	Neutral switch	1-place molded jumper, black	Right side frame, beneath gearcase cover
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace between front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Front right crankcase
[142]	Security siren (optional)	3-place Delphi	Under right side cover (behind electrical bracket)
[143]	Front fender tip lamp (DOM)	2-place Multilock	Under front fender tip lamp bracket
[160]	B+	1-place Delphi	Upper frame crossmember (under seat)
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Packard	Inner fairing - below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Packard	Under right side cover
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover
			HDI: Under right side cover (behind electrical bracket)
[184]	CB module	12-place Deutsch	Inner fairing - left side of radio
[201]	ABS diode	4-place Deutsch	Under left side cover (below fuse box)
[204]	Twist Grip Sensor (TGS) harness	6-place Molex (black)	Inner fairing - right radio support bracket
[208]	HFSM antenna jumper harness	4-place Deutsch	HFSM in crossmember at rear of battery box (under seat)
[209]	HFSM antenna	2-place Molex	Top of rear fender - under seat
[211]	Throttle Control Actuator	6-place Molex	Throttle body
[222]	Main to ignition harness	4-place Packard	Rear of fuel tank
[224]	Twist Grip Sensor (TGS)	7-place Amp (Tyco)	Handlebar throttle (inside right side handlebar)
*Classic and Ultra **Ultra Only			

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



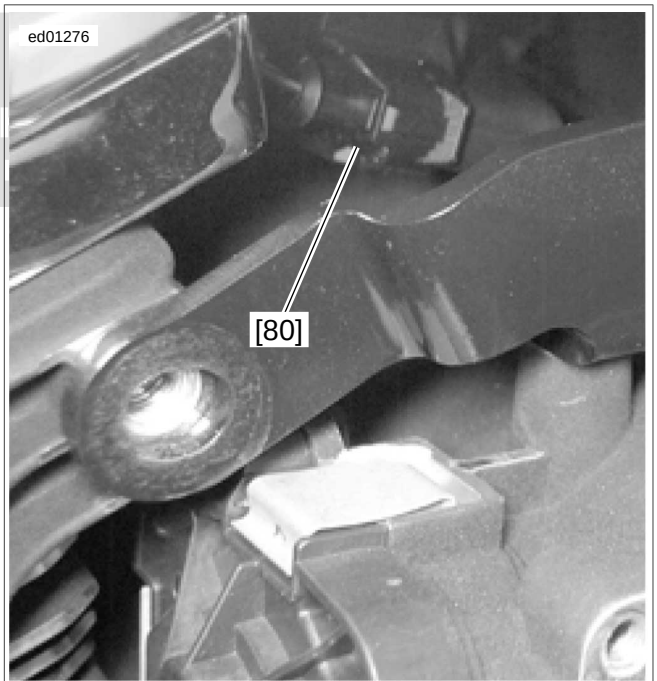
1. [166] ABS Control Module
2. [167] Front Wheel Speed Sensor
3. [168] Rear Wheel Speed Sensor

Figure B-2. ABS Connector



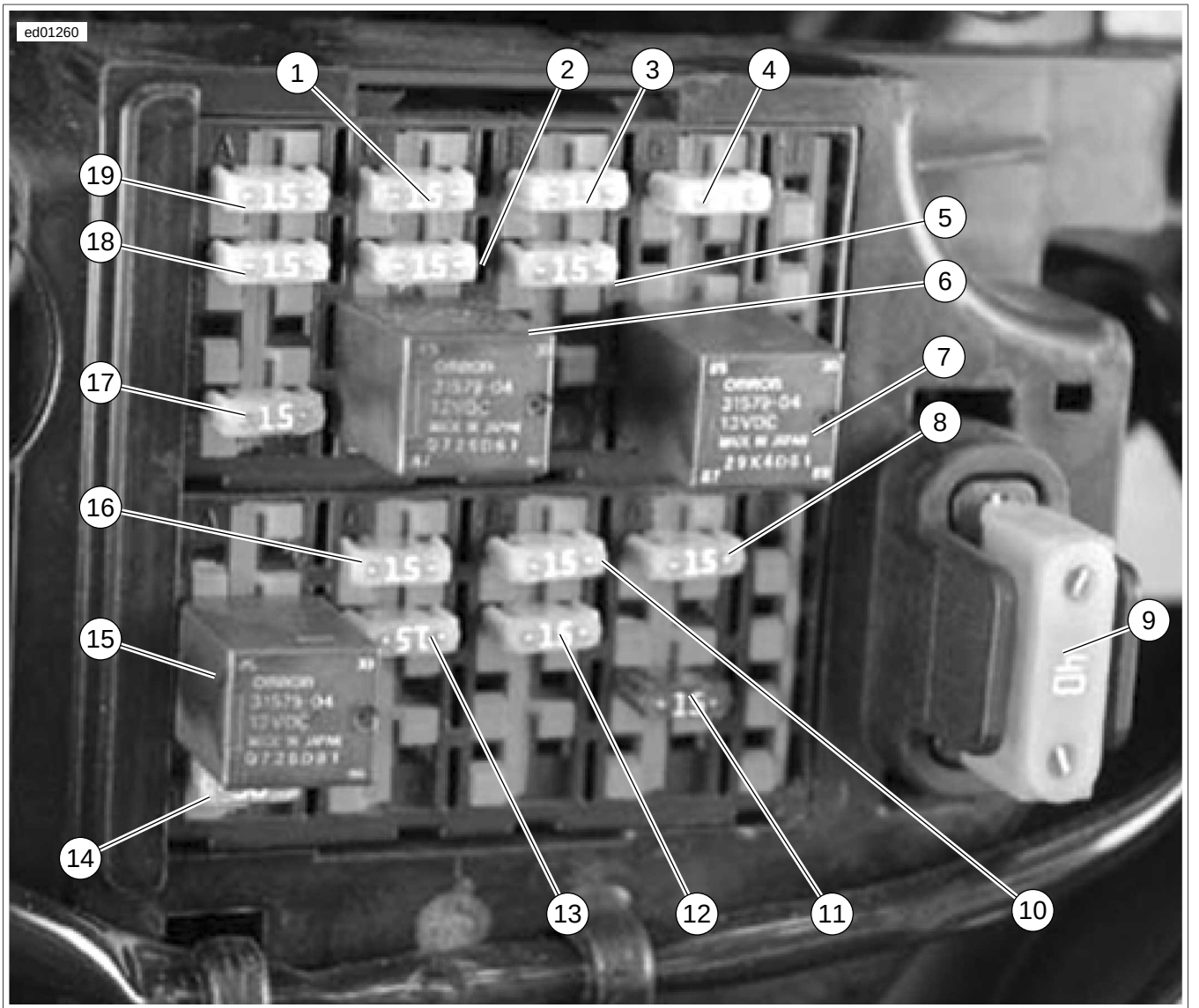
1. [211] Throttle Control Actuator and TP Sensor

Figure B-3. Throttle Control Connector



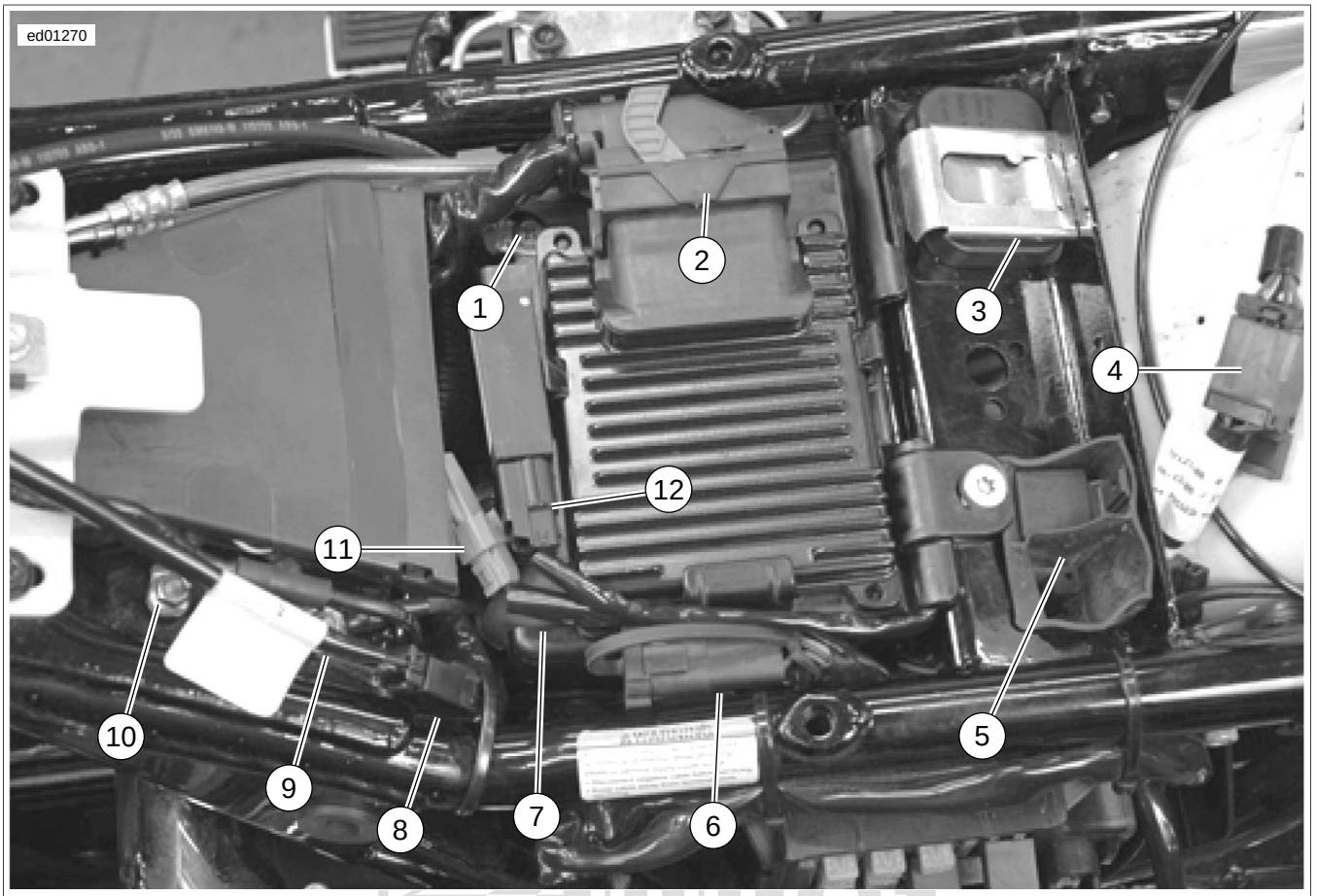
1. [80] TMAP Sensor

Figure B-4. TMAP Connector



1. Accessory
2. Battery
3. P&A
4. Radio power/Siren (if equipped)
5. ECM power
6. System relay
7. Start relay
8. Engine control
9. MAXIFUSE
10. Ignition
11. Spare
12. Lights
13. Headlamp
14. ABS (if equipped)
15. Brake relay
16. Instruments
17. Fuel pump
18. Radio memory (if equipped)
19. Brake/Cruise

Figure B-5. Fuse and Relay Locations



1. Negative Battery Terminal
2. [78] ECM
3. [30] HFSM
4. [7] Tail Light Connector
5. [126] Lighting Relay
6. [4] P&A Accessory Connector
7. Positive Battery Terminal
8. [13] Fuel Pump Subharness Connector
9. [GND2] Rear (clean) Ground
10. [GND1] Front (dirty) Ground
11. [160] B+ Connector
12. [209] Hands-Free Antenna Connector

Figure B-6. Electrical Connectors - Under Seat

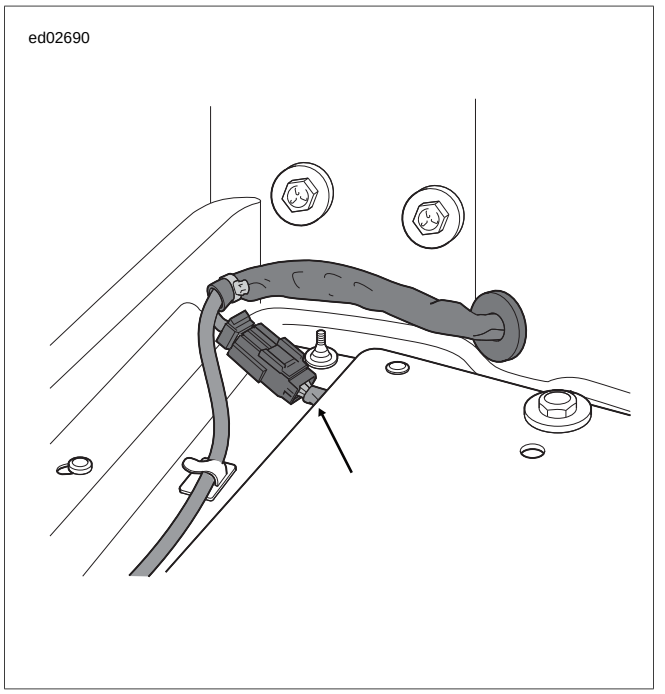


Figure B-7. Tour-Pak Connectors (Left Side)

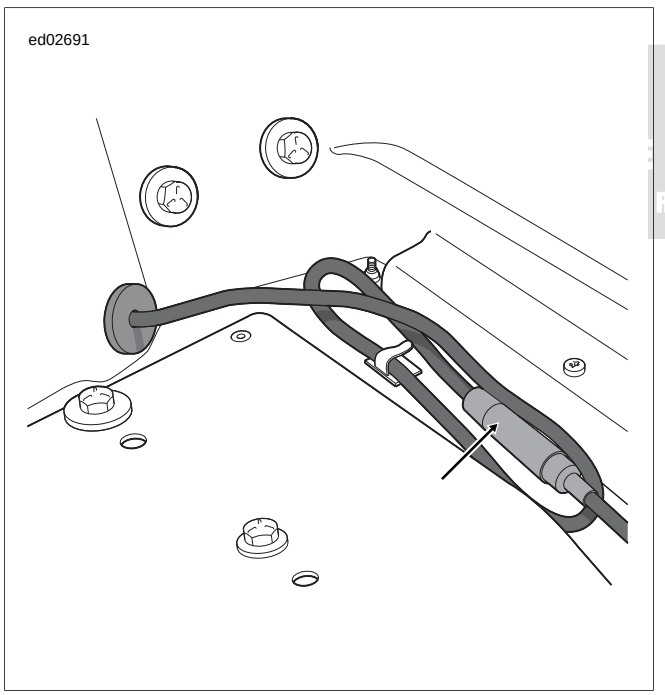
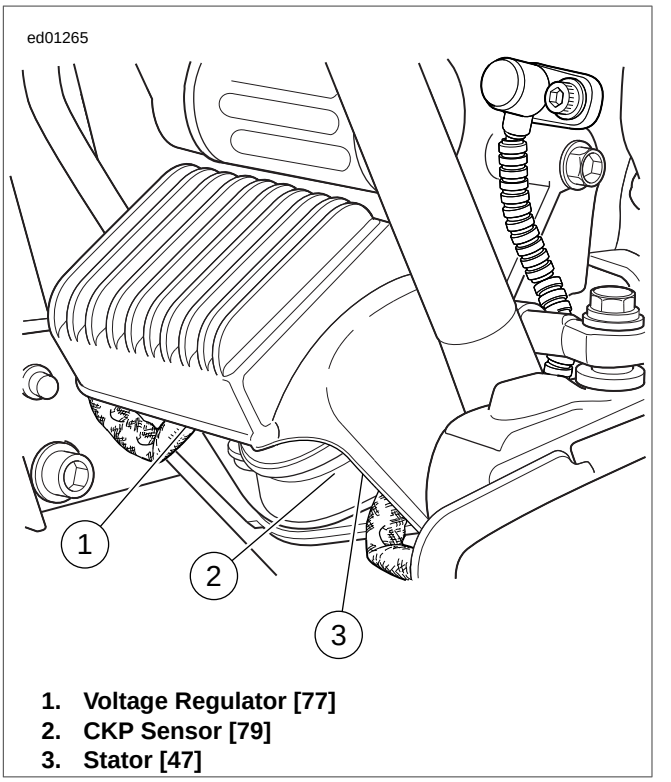
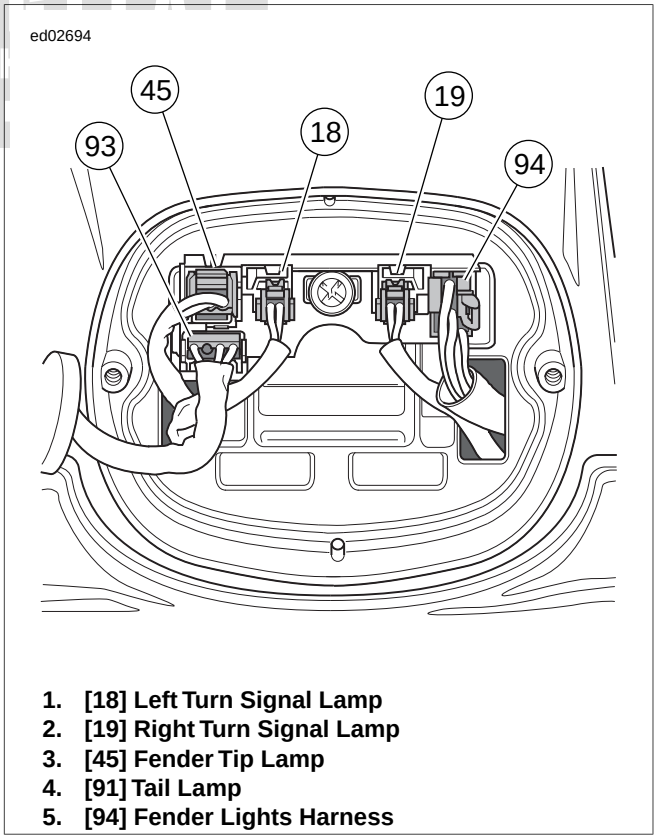


Figure B-8. Tour-Pak Connectors (Right Side)



1. **Voltage Regulator [77]**
2. **CKP Sensor [79]**
3. **Stator [47]**

Figure B-9. Voltage Regulator (Left Side View)



1. **[18] Left Turn Signal Lamp**
2. **[19] Right Turn Signal Lamp**
3. **[45] Fender Tip Lamp**
4. **[91] Tail Lamp**
5. **[94] Fender Lights Harness**

Figure B-10. Rear Fender Lights Assembly

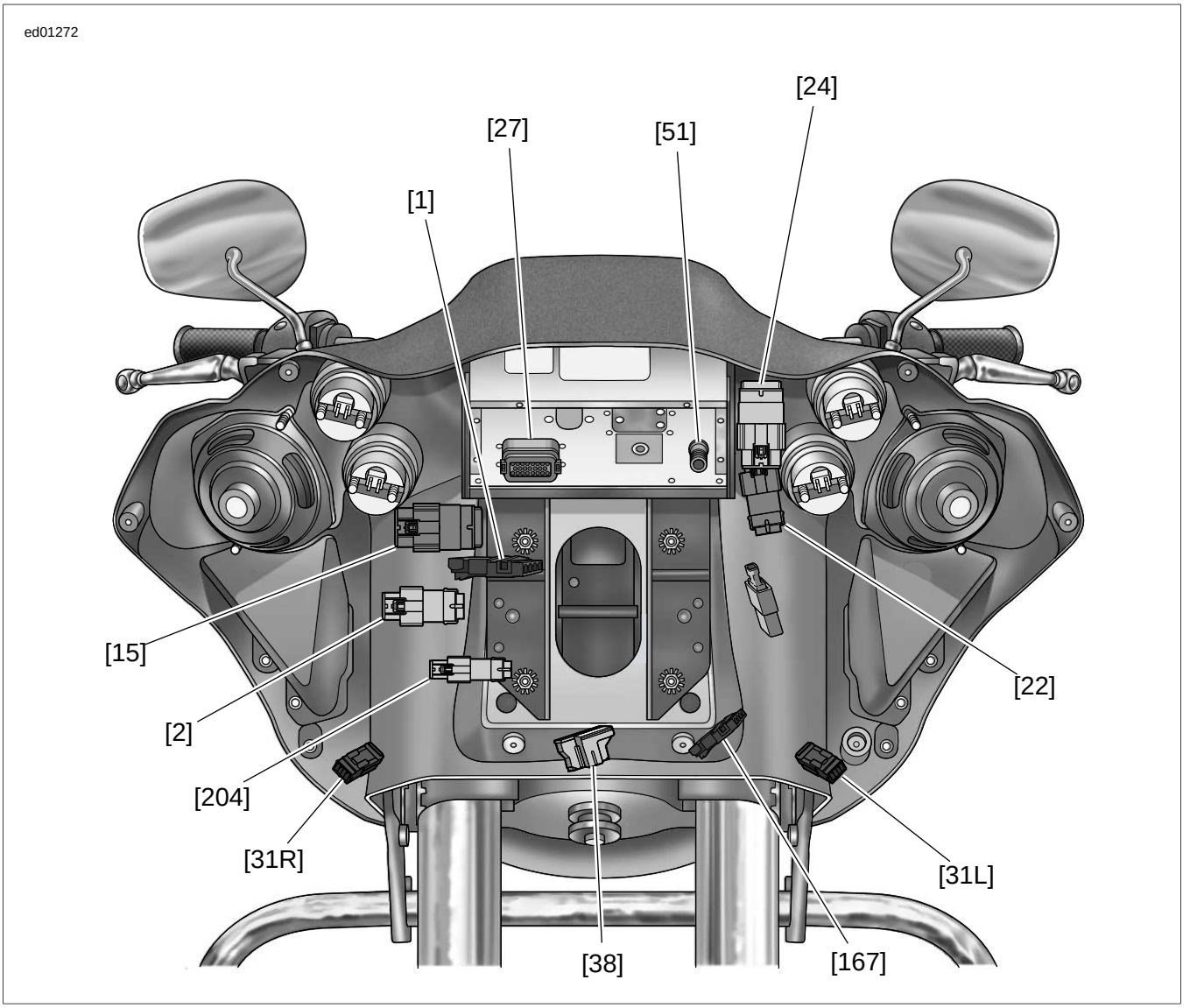
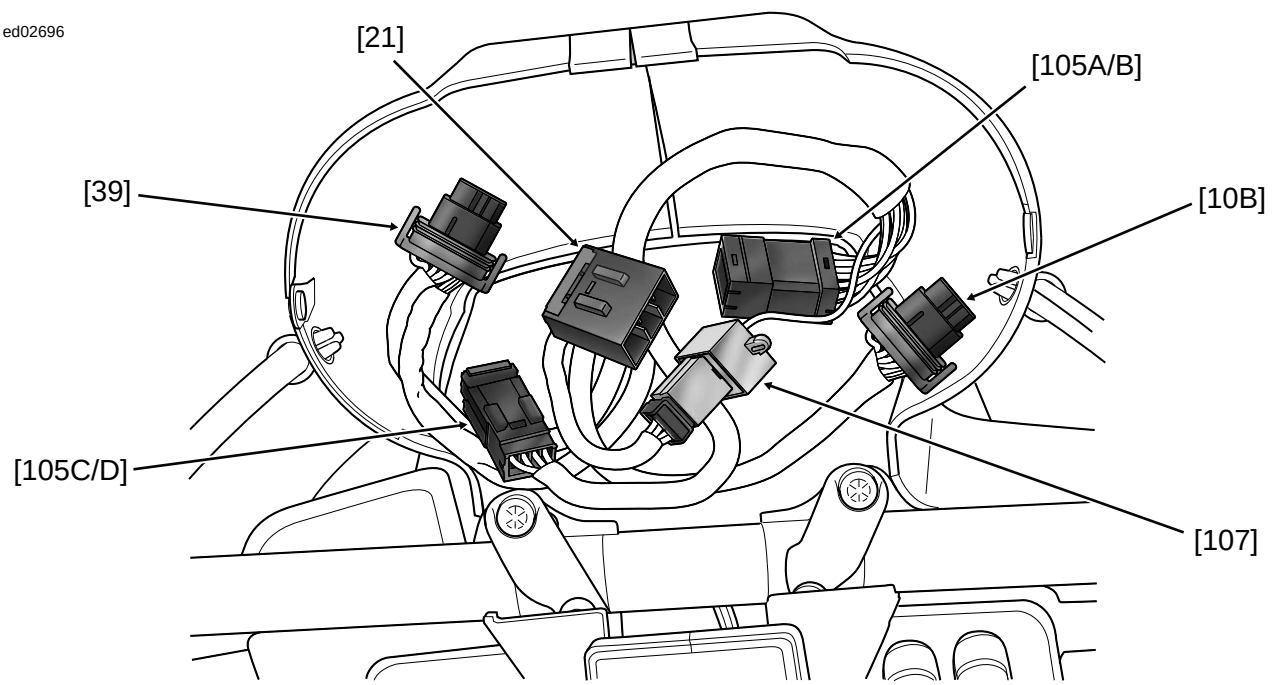


Figure B-11. Inner Fairing Connectors (FLTR)



1. **[21] Indicator Lamps**
2. **[39] Speedometer**
3. **[105A/B] Instrument Nacelle Switches**
4. **[105C/D] Speaker Switch**
5. **[107] Ambient Temperature Sensor**
6. **[108] Tachometer**

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Figure B-12. Instrument Nacelle Connectors (FLTR)

Table B-2. FLTR Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to interconnect harness	16-place Molex (black)	Inner fairing - right radio support bracket
[2]	Main to interconnect harness	12-place Molex (gray)	Inner fairing - leftt radio support bracket
[4]	Accessory	4-place Deutsch	Upper frame crossmember (under seat)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[7]	Rear fender lights harness	8-place Multilock	Top of rear fender (under seat)
[13]	Fuel tank harness	4-place Multilock	Behind fuel tank (under seat)
[15]	Main to interconnect harness	4-place Delphi	Inner fairing - below radio (right side)
[18]	Left rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[21]	Indicator lamps	10-place Multilock	Inner fairing - above radio
[22]	Interconnect to right handlebar switches	12-place Molex (black)	Inner fairing - right fairing support brace
[24]	Interconnect to left handlebar switches	16-place Molex (gray)	Inner fairing - left fairing support brace
[27]	Radio	23-place Amp (Tyco)	Inner fairing - back of radio (right side)

Table B-2. FLTR Connector Locations

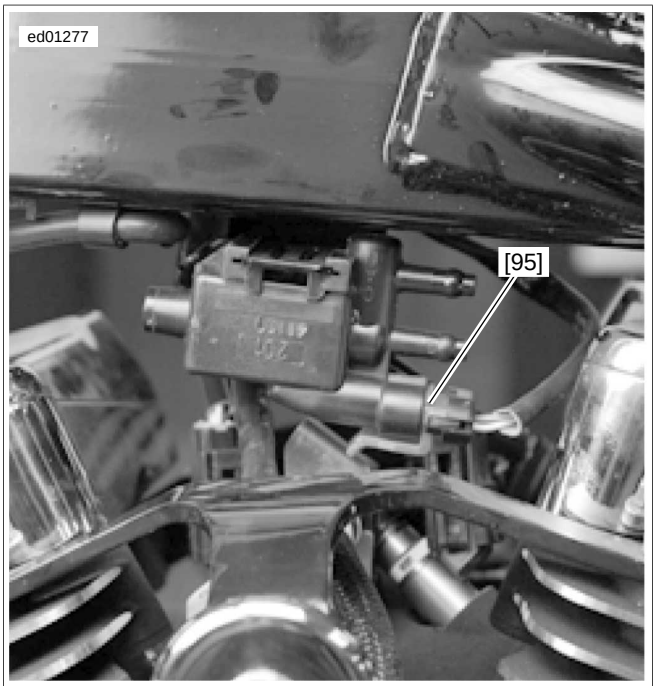
NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31L]	Left front turn signal/auxiliary lamp	4-place Multilock	Inner fairing - left fairing support brace (outboard side)
[31R]	Right front turn signal/auxiliary lamp	4-place Multilock	Inner fairing - right fairing support brace (outboard side)
[33]	Ignition switch	3-place Packard	Inner fairing - under radio (front of ignition switch housing)
[34]	Right front speaker	Spade terminals	Inner fairing (back of speaker)
[34]	Left front speaker	Spade terminals	Inner fairing (back of speaker)
[38]	Headlamp	Headlamp connector	Inner fairing (back of headlamp)
[39]	Speedometer	12-place Packard	Inner fairing - back of speedometer
[45]	Rear fender tip lamp (DOM)	3-place Multilock	Circuit board under tail lamp assembly
[47]	Stator	3-place Lyall	Bottom of voltage regulator (left side)
[51]	Radio antenna cable	-	Inner fairing - back of radio (left side)
[64]	Fuse block	Packard	Under left side cover
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	4-place Bosch	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[87]	Idle Air Control (IAC)	4-place Delphi	Below fuel tank (right side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under left side cover
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Multilock	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[105]	Instrument nacelle switches		
	Interconnect to nacelle switch harness (105A, 105B)	12-place Multilock	Inside instrument nacelle (under bezel)
	Nacelle switch harness to speaker switch (105C, 105D)	4-place Multilock	Inside instrument nacelle (under bezel)
[107]	Ambient Air Temperature (AAT) sensor	3-place Multilock	Inside instrument nacelle (under bezel)
[108]	Tachometer	12-place Packard (gray)	Inside instrument nacelle (back of tachometer)
[111]	Voltmeter lamp	Spade terminals	Inner fairing (back of voltmeter)
[112]	Oil pressure gauge lamp	Spade terminals	Inner fairing (back of oil pressure gauge)
[113]	Oil pressure gauge	Spade terminals	Inner fairing (back of oil pressure gauge)

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Table B-2. FLTR Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[114]	Air temperature gauge lamp	Spade terminals	Inner fairing (back of air temperature gauge)
[115]	Air temperature gauge	Spade terminals	Inner fairing (back of air temperature gauge)
[116]	Fuel gauge lamp	Spade terminals	Inner fairing (back of fuel gauge)
[117]	Fuel gauge	Spade terminals	Inner fairing (back of fuel gauge)
[119]	EFI fuses	Fuse terminals	Fuse block (under right side cover)
[121]	Rear brake light switch	Spade terminals	Bottom of rear frame downtube (right side)
[122]	Horn	Spade terminals	Between cylinders (right side)
[123]	Start relay	Relay	Fuse block (under left side cover)
[124]	Brake light relay	Relay	Fuse block (under left side cover)
[126]	Lighting relay	Relay	Crossmember at rear of battery box (under seat)
[128]	Starter solenoid	Spade terminals	Top of starter
[129]	Harness grounds	Ring terminals	Upper frame crossmember (under seat)
[131]	Neutral switch	Post terminals	Top of transmission (right side)
[132]	Cigarette lighter	Spade terminals	Inner fairing
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie at bottom of lower frame crossmember.
			HDI: Electrical caddy at bottom of lower frame crossmember.
[135]	EFI system relay	Relay	Fuse block (under right side cover)
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace between front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Top of canopy (under console)
[142]	Security siren (optional)	3-place Delphi	Under right side cover (behind electrical bracket)
[160]	B+	1-place Delphi	Upper frame crossmember (under seat)
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Delphi (black)	Inner fairing - below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Delphi (black)	Under right side cover
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover
			HDI: Under right side cover (behind electrical bracket)
[201]	ABS diode	4-place Deutsch	Under left side cover (below fuse box)
[204]	Twist Grip Sensor (TGS)	6-place Molex (black)	Inner fairing - right radio support bracket
[208]	HFSM antenna jumper harness	4-place Deutsch	HFSM in crossmember at rear of battery box (under seat)
[209]	HFSM antenna	2-place Molex	Top of rear fender - under seat
[211]	Throttle Control Actuator (TCA)	6-place Molex	Throttle body
[222]	Console ignition switch interconnect	4-place Packard	Under seat

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1. **[95] Purge Solenoid**

Figure B-13. Below Fuel Tank (Left Side)

Table B-3. FLHR/C/S Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[4]	Accessory	4-place Deutsch	Upper frame crossmember (under seat)
[5]	MAXIFUSE	2-place Packard	Under left side cover
[7]	Rear fender lights harness	6-place Multilock	Top of rear fender (under seat)
[18]	Left rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	2-place Multilock	Circuit board under tail lamp assembly
[20]	Console harness	16-place Molex	Under seat
[21]	Indicator lamps	8-place Deutsch	Under console
[22]	Right handlebar switches	6-place Molex (black)	Inside headlamp nacelle - fork stern nut lock plate (right side)
[24]	Left handlebar switches	8-place Molex (gray)	Inside headlamp nacelle - fork stern nut lock plate (left side)
[30]	TSM//HFSM	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31]	Front turn signals	6-place Multilock	Inside headlamp nacelle - fork stern nut lock plate (left side)
[32]	Front fender tip lamp jumper harness (DOM)	2-place Multilock	Inside headlamp nacelle
[33]	Ignition switch	3-place Packard	Under console
[38]	Headlamp	Headlamp connector	Inside headlamp nacelle
[39]	Speedometer	12-place Packard	Back of speedometer (back of console)
[45]	Rear fender tip lamp (DOM)	3-place Multilock	Circuit board under tail lamp assembly
[47]	Stator	3-place Lyall	Bottom of voltage regulator (left side)
[64]	Fuse block	Packard	Under left side cover
[65]	Vehicle Speed Sensor (VSS)	3-place Delphi	Top of transmission case (under starter)
[67]	Accessory switch	4-place Amp (Tyco)	Inside headlamp nacelle

Table B-3. FLHR/C/S Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[73]	Auxiliary lamps	2-place Multilock (white)	Inside headlamp nacelle
[75]	Cruise roll-off switch**	Spade terminals	Right side of steering head
[77]	Voltage regulator	2-place Lyall	Bottom of voltage regulator (right side)
[78]	Electronic Control Module (ECM)	73-place Delphi	Under seat
[79]	Crankshaft Position (CKP) sensor	2-place Deutsch	Electrical caddie at bottom of lower frame crossmember
[80]	Temperature Manifold Absolute Pressure (TMAP) sensor	3-place Packard	Top of induction module
[83]	Ignition coil	4-place Delphi	Below fuel tank (left side)
[84]	Front injector	2-place Delphi	Below fuel tank (left side)
[85]	Rear injector	2-place Delphi	Below fuel tank (left side)
[87]	Idle Air Control (IAC)	4-place Delphi	Below fuel tank (right side)
[90]	Engine Temperature (ET) sensor	2-place Delphi	Back of front cylinder (left side)
[91]	Data link connector	4-place Deutsch	Under right side cover
[93]	Tail lamp	4-place Multilock	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Multilock	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi	Below fuel tank (left side)
[108]	Optional tachometer	1-place Amp (Tyco)	Inside headlamp nacelle
[109]	Auxiliary lamps switch	4-place Amp (Tyco)	Inside headlamp nacelle
[117]	Fuel gauge	Spade terminals	Inner fairing (back of fuel gauge)
[119]	EFI fuses	Fuse terminals	Fuse block (under right side cover)
[121]	Rear brake light switch	Spade terminals	Bottom of rear frame downtube (right side)
[119]	Oil pressure switch	Post terminal	Front right crankcase
[122]	Horn	Spade terminals	Between cylinders (right side)
[123]	Start relay	Relay	Fuse block (under left side cover)
[124]	Brake light relay	Relay	Fuse block (under left side cover)
[126]	Lighting relay	Relay	Crossmember at rear of battery box (under seat)
[128]	Starter solenoid	Spade terminals	Top of starter
[129]	Harness grounds	Ring terminals	Upper frame crossmember (under seat)
[131]	Neutral switch	Post terminals	Top of transmission (right side)
[133]	Jiffy Stand Sensor	3-place Molex (black)	Domestic (not used): Electrical caddie at bottom of lower frame crossmember.
			HDI: Electrical caddie at bottom of lower frame crossmember.
[135]	EFI system relay	Relay	Fuse block (under right side cover)
[137]	O_2 sensor rear exhaust header	2-place Amp (Tyco)	Under chrome starter cover
[138]	O_2 sensor front exhaust header	2-place Amp (Tyco)	Back of cross brace between front frame downtubes (left side)
[141]	Fuel pump and fuel level sender	4-place Packard	Top of canopy (under console)
[142]	Security siren (optional)	3-place Delphi	Under right side cover (behind electrical bracket)
[143]	Front fender tip lamp (DOM)	2-place Multilock (black)	Under front fender tip lamp bracket

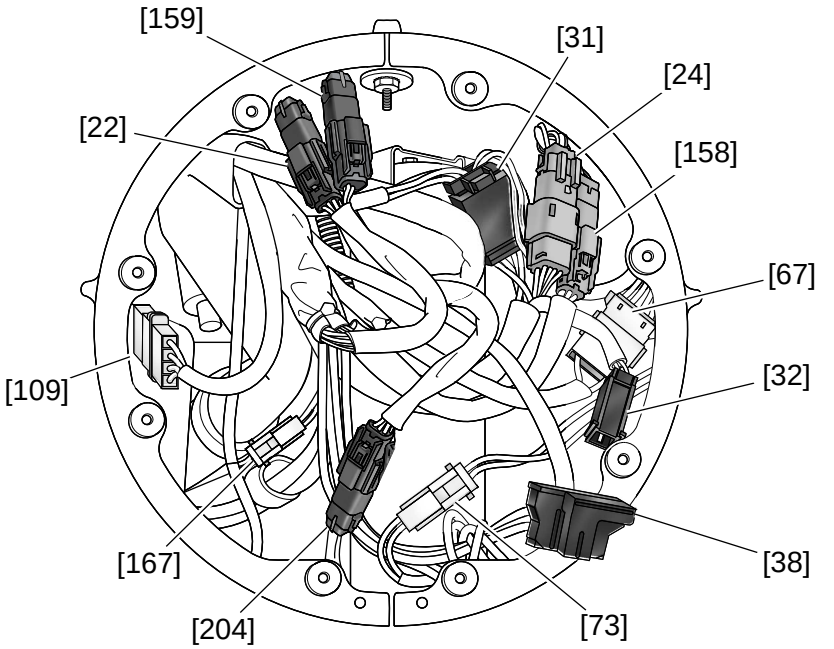
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Table B-3. FLHR/C/S Connector Locations

NO.	DESCRIPTION	TYPE	LOCATION
[158]	Left handlebar switches (cruise control)**	3-place Molex (black)	Inside headlamp nacelle
[159]	Right handlebar switches (cruise control)**	3-place Molex (gray)	Inside headlamp nacelle
[160]	B+	1-place Packard	Upper frame crossmember (under seat)
[166]	ABS module	20-place Molex	Under right side cover
[167]	Front wheel speed sensor	2-place Delphi (black)	Inner fairing - below upper fork bracket (left side)
[168]	Rear wheel speed sensor	2-place Delphi (black)	Under right side cover
[178]	Active intake solenoid	2-place Amp (Tyco)	
[179]	Active exhaust actuator	5-place Amp (Tyco)	Domestic (not used): Under right side cover
			HDI: Under right side cover (behind electrical bracket)
[201]	ABS diode	4-place Deutsch	Under left side cover (below fuse box)
[204]	Twist Grip Sensor (TGS)	6-place Molex (black)	Inner fairing - right radio support bracket
[208]	HFSM antenna jumper harness	4-place Deutsch	HFSM in crossmember at rear of battery box (under seat)
[209]	HFSM antenna	2-place Molex	Top of rear fender (under seat)
[211]	Throttle Control Actuator (TCA)	6-place Molex	Throttle body
[222]	Console ignition switch interconnect	4-place Packard	Under seat
** FLHRC Only			

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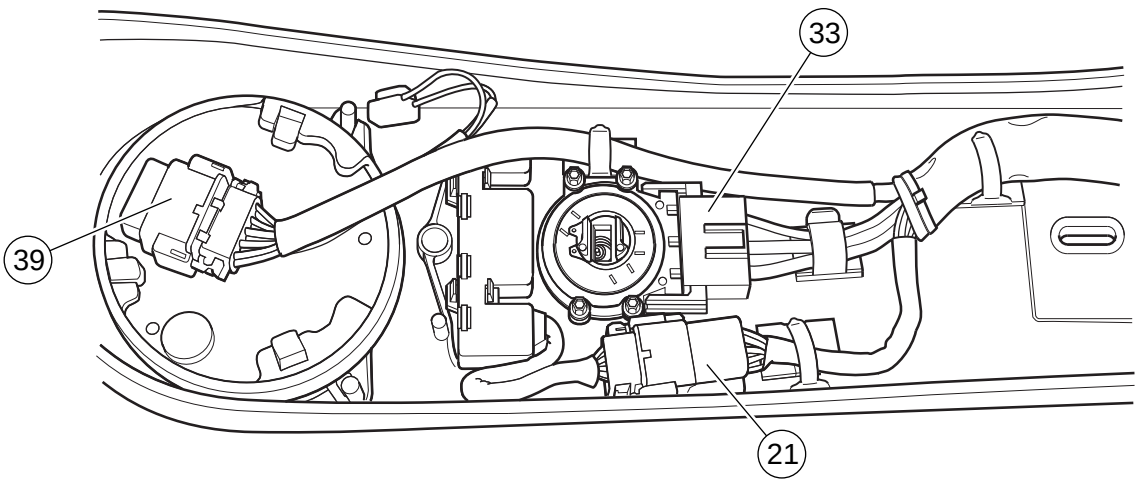


1. **[22] Right Handlebar Switches**
2. **[24] Left Handlebar Switches**
3. **[31] Front Turn Signals**
4. **[32] Front Fender Tip Lamp (Used on FLHR Only)**
5. **[38] Headlamp**
6. **[67] Accessory Switch**
7. **[73] Auxiliary Lamps (Used on FLHR/C Only)**
8. **[109] Auxiliary Lamps Switch (Used on FLHR/C Only)**
9. **[158] Cruise On/Off Switch (Used on FLHR/C Only)**
10. **[159] Cruise Set/Resume Switch (Used on FLHR/C Only)**

Figure B-14. Headlamp Nacelle Connectors (FLHR/C/S)

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1. **[21] Indicator Lights**
2. **[33] Ignition/Light Key Switch**
3. **[39] Speedometer**

Figure B-15. Instrument Console Connectors (FLHR/C)

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WIRING DIAGRAMS B.2

WIRING DIAGRAM INFORMATION

Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to Table B-4.

For Solid Color Wires: See Figure B-16. The alpha code identifies wire color (3).

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

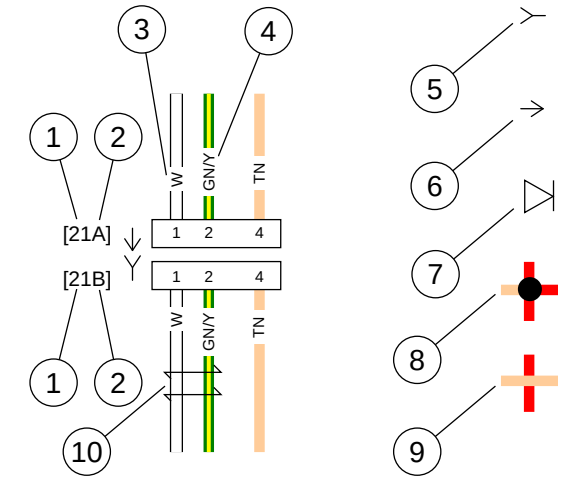
Wiring Diagram Symbols

See Figure B-16. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets (1). The letter (2) inside the brackets identifies whether the housing is a socket or pin housing.

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

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

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



1. **Connector number**
2. **Terminal code (A=pin, B=socket)**
3. **Solid wire color**
4. **Striped wire color**
5. **Socket symbol**
6. **Pin symbol**
7. **Diode**
8. **Connection**
9. **No connection**
10. **Twisted pair**

Figure B-16. Connector/Wiring Diagram Symbols (typical)

Table B-4. Wire Color Codes

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

2008 TOURING WIRING DIAGRAMS

Wiring Diagram List

DIAGRAM	LOCATION
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS, MAIN HARNESS (1 OF 2)	Figure B-17
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS	Figure B-18
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS (2 of 2)	Figure B-19
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS INTERCONNECT HARNESS	Figure B-20
2008 FLT, FLHX, FLHTC, FLHTCU, FLTR & FLTRU DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS	Figure B-21
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING	Figure B-22
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLTHP DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, INDICATOR LAMPS, FAIRING CAP/INSTRUMENT NACELLE SWITCHES AND HFSM/ANTENNA	Figure B-23
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU, & FLTHP DOMESTIC & INTERNATIONAL MODELS TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS & TOUR-PAK LIGHTS	Figure B-24
2008 TLE, TLE-U SIDECARS DOMESTIC & INTERNATIONAL MODELS AMPLIFIER, SIDECAR SPEAKERS AND SWITCHES	Figure B-25
2008 FLHX, FLHTC, FLHTCU AND FLTR DOMESTIC & INTERNATIONAL MODELS RADIO, CB/INTERCOM, REAR SPEAKERS, XM, HANDS-FREE PHONE AND NAVIGATION	Figure B-26
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS	Figure B-27
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS	Figure B-28
2008 FLHR, FLHRC, FLHRS, FLHP & FLHP/E DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS	Figure B-29
2008 FLHR, FLHRC AND FLHRS DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING	Figure B-30
2008 FLHR, FLHRC DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, SPEEDOMETER, INDICATOR LAMPS, TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS, FENDER TIP LAMPS AND AUX LAMP/ACCESSORY SWITCHES	Figure B-31

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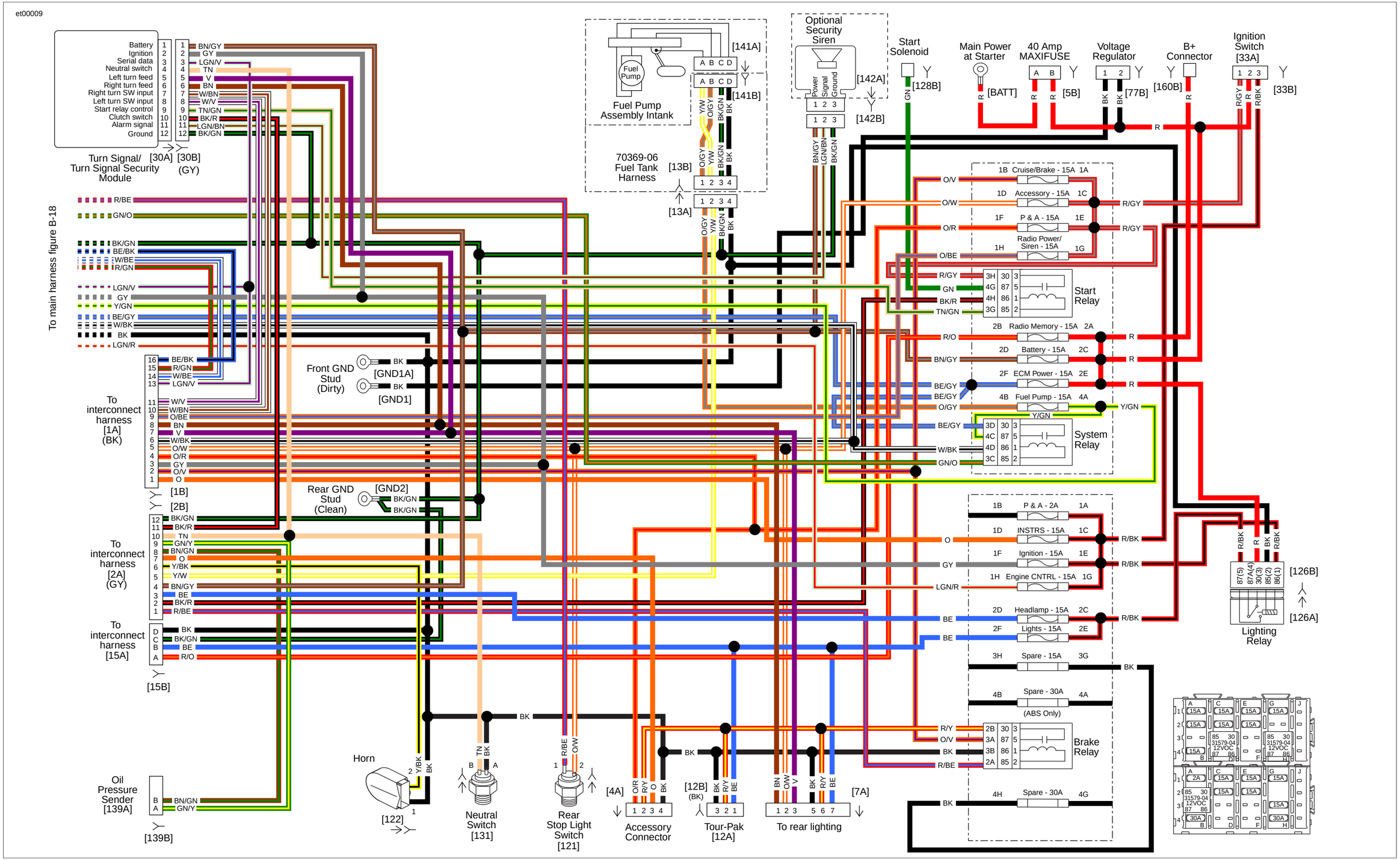


Figure B-17. 2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS, MAIN HARNESS (1 OF 2)

Figure B-17.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS, MAIN HARNESS (1 OF 2)

Figure B-17.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS, MAIN HARNESS (1 OF 2)

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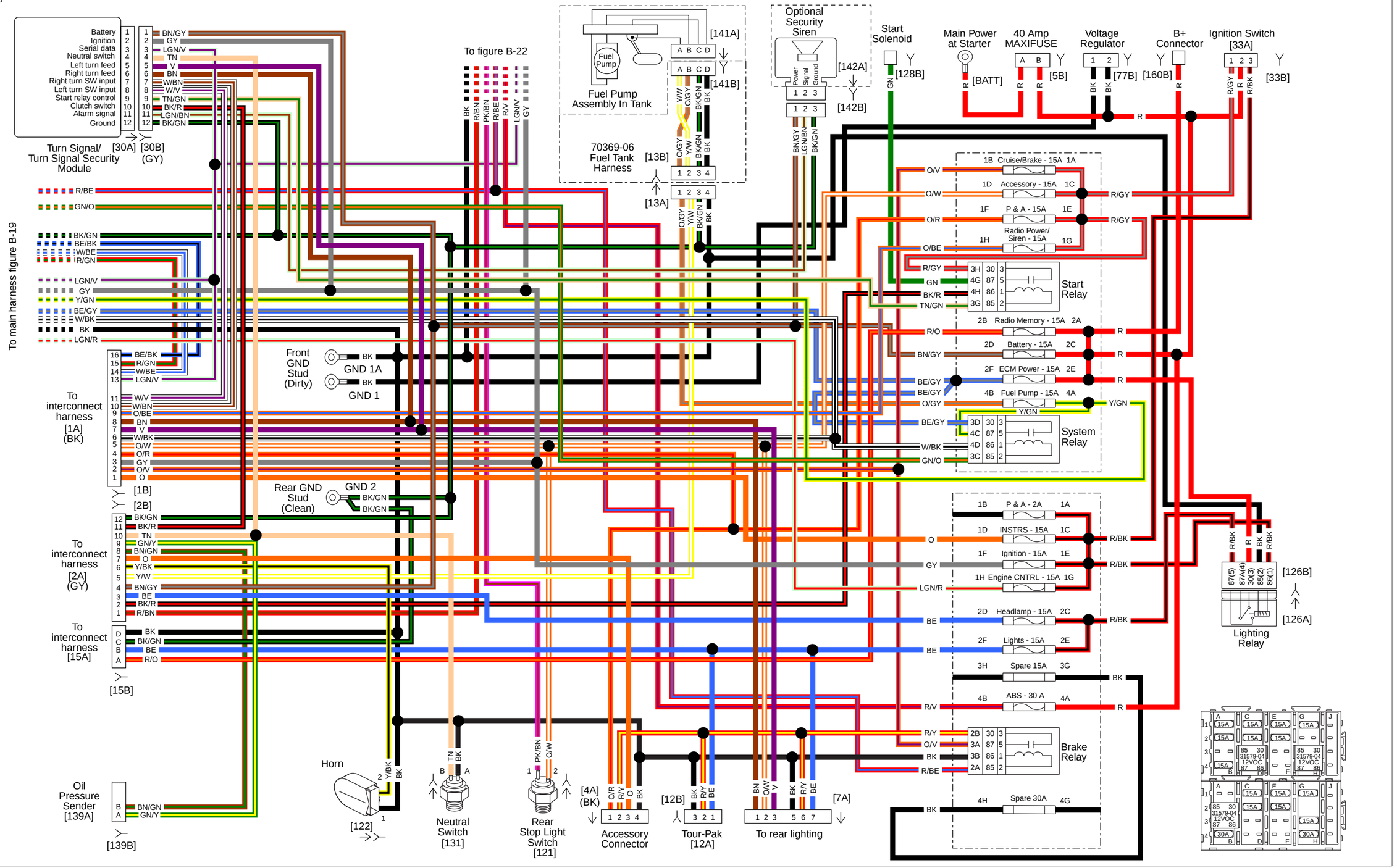


Figure B-18. 2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

Figure B-18.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP
DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

Figure B-18.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP
DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

DIGITAL TECHNICIAN II
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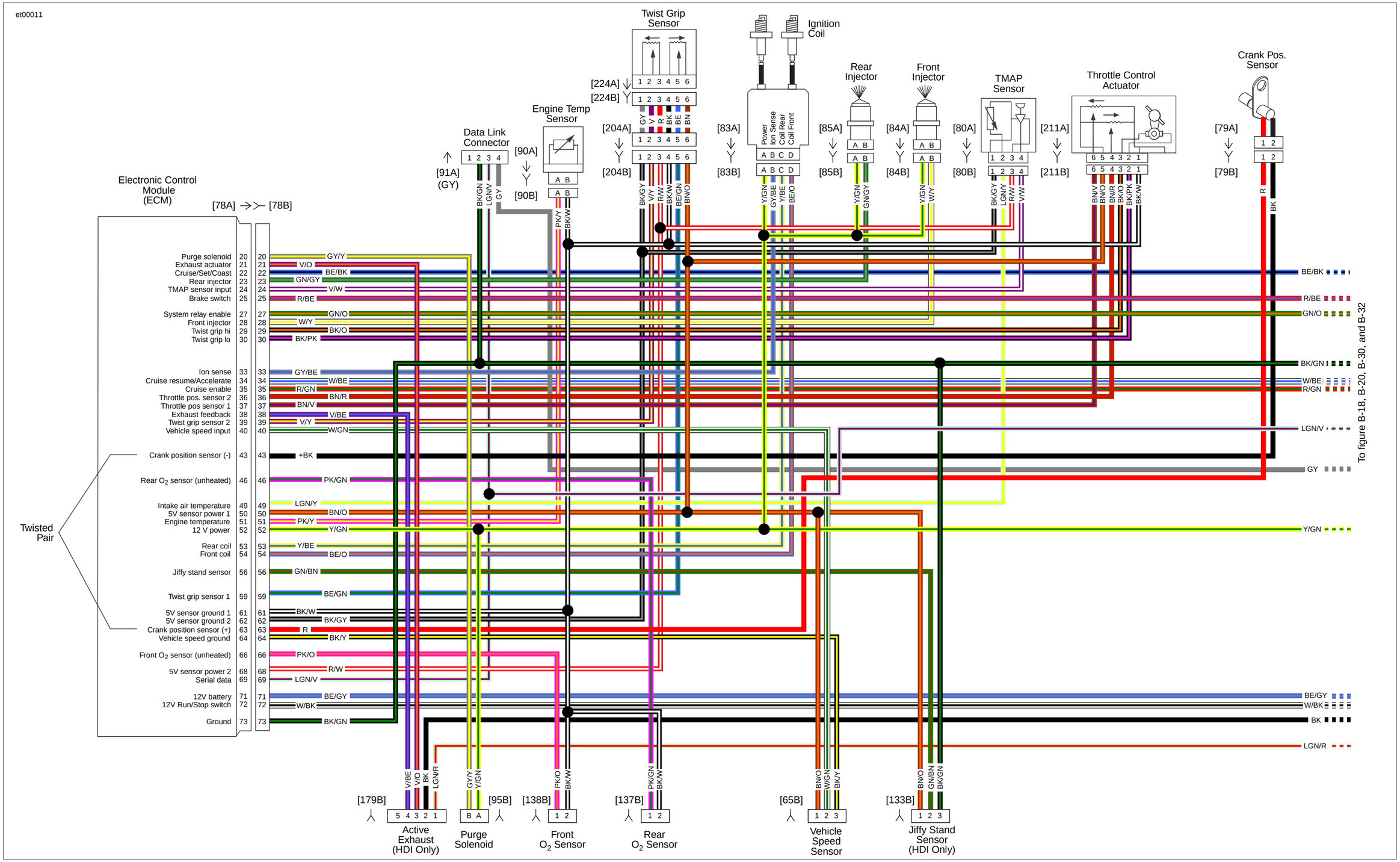


Figure B-19. 2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS (2 of 2)

Figure B-19.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS (2 of 2)

Figure B-19.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLHTP DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS (2 of 2)

DIGITAL TECHNICIAN II
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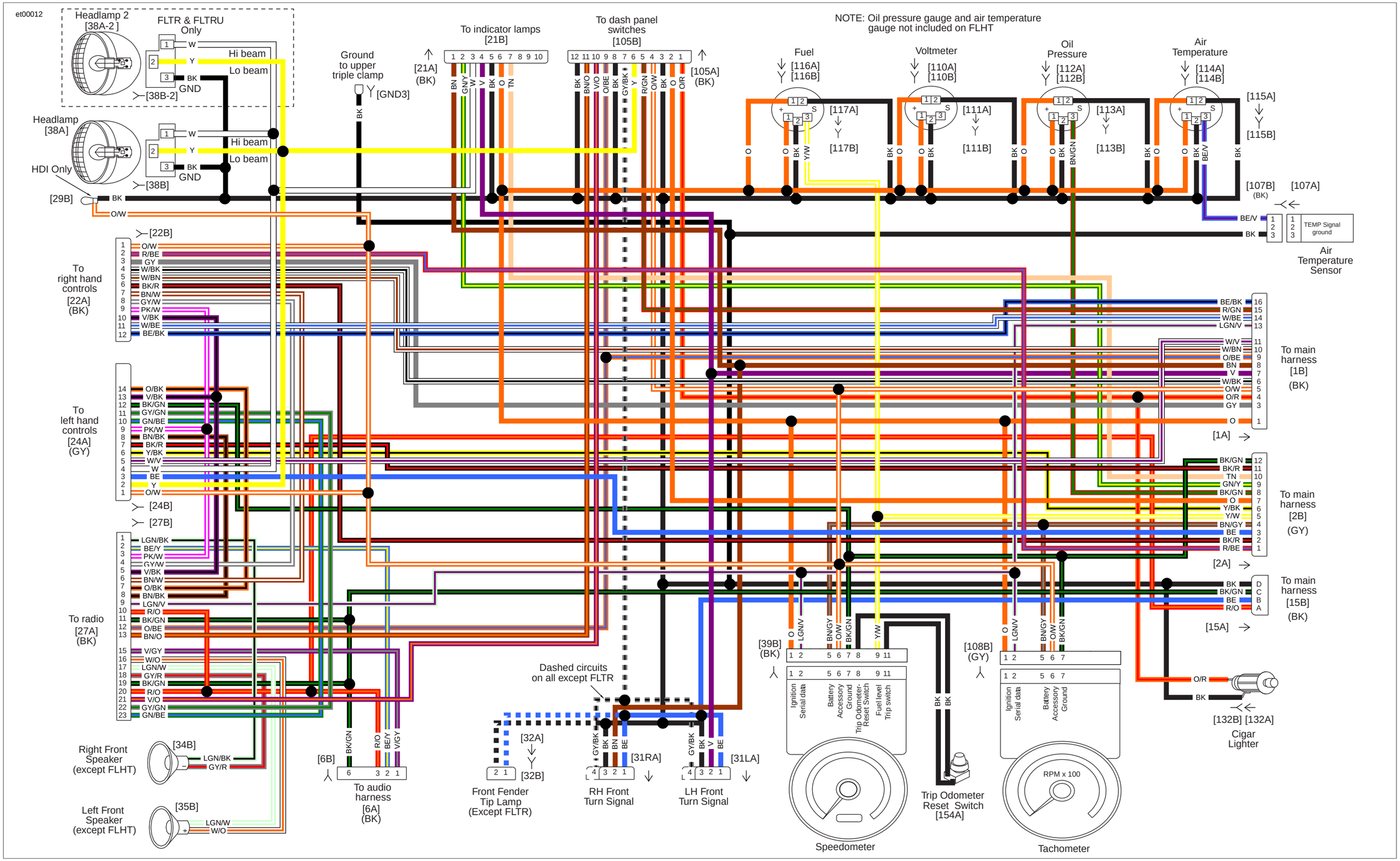


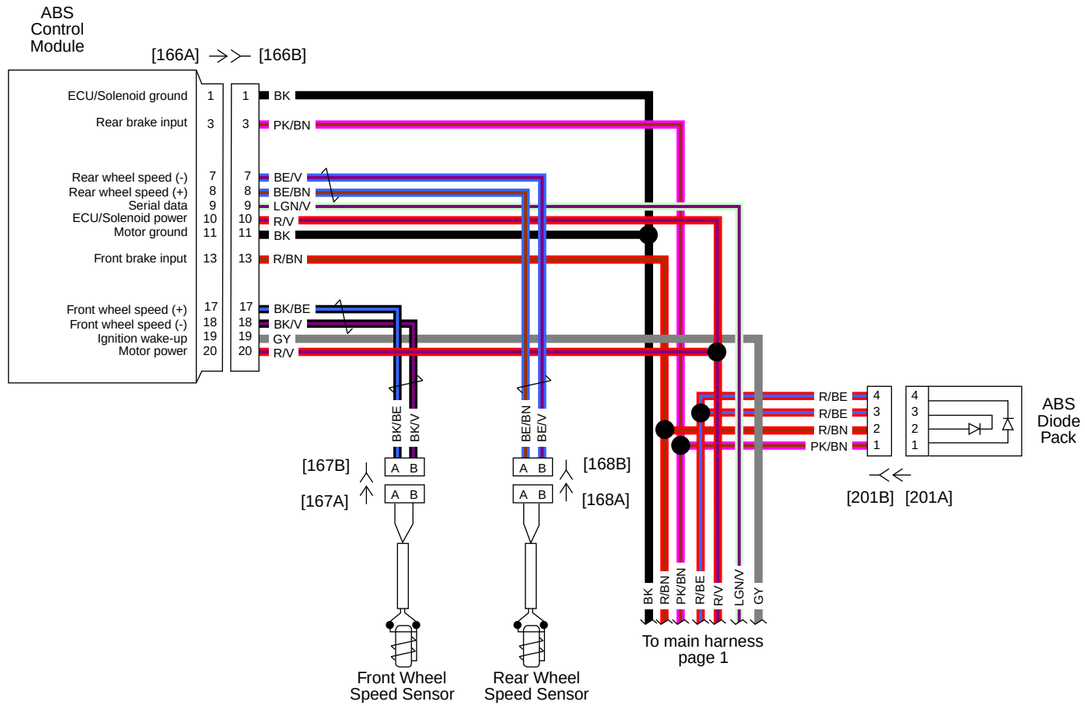
Figure B-20. 2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS INTERCONNECT HARNESS

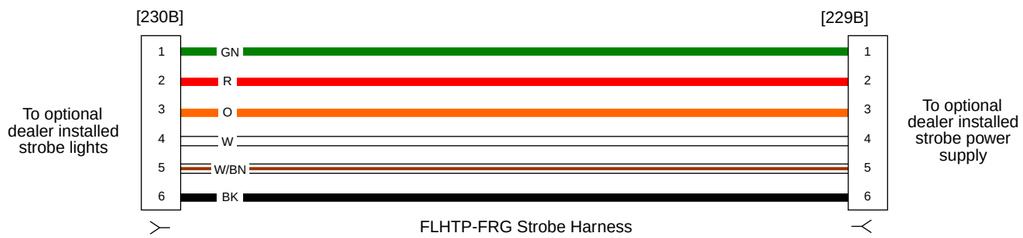
Figure B-20.
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS INTERCONNECT HARNESS

Figure B-20.
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS INTERCONNECT HARNESS

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

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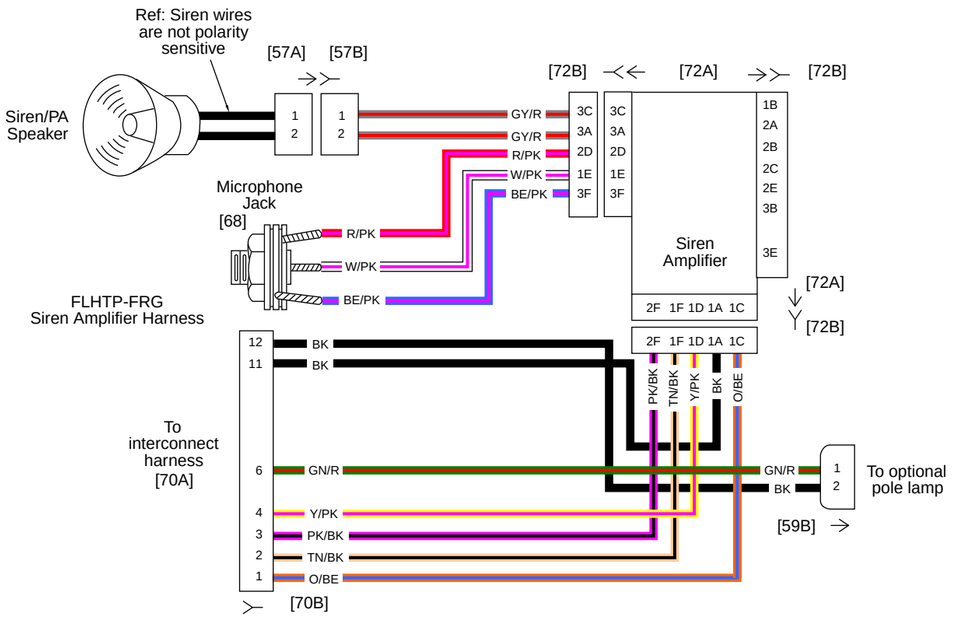


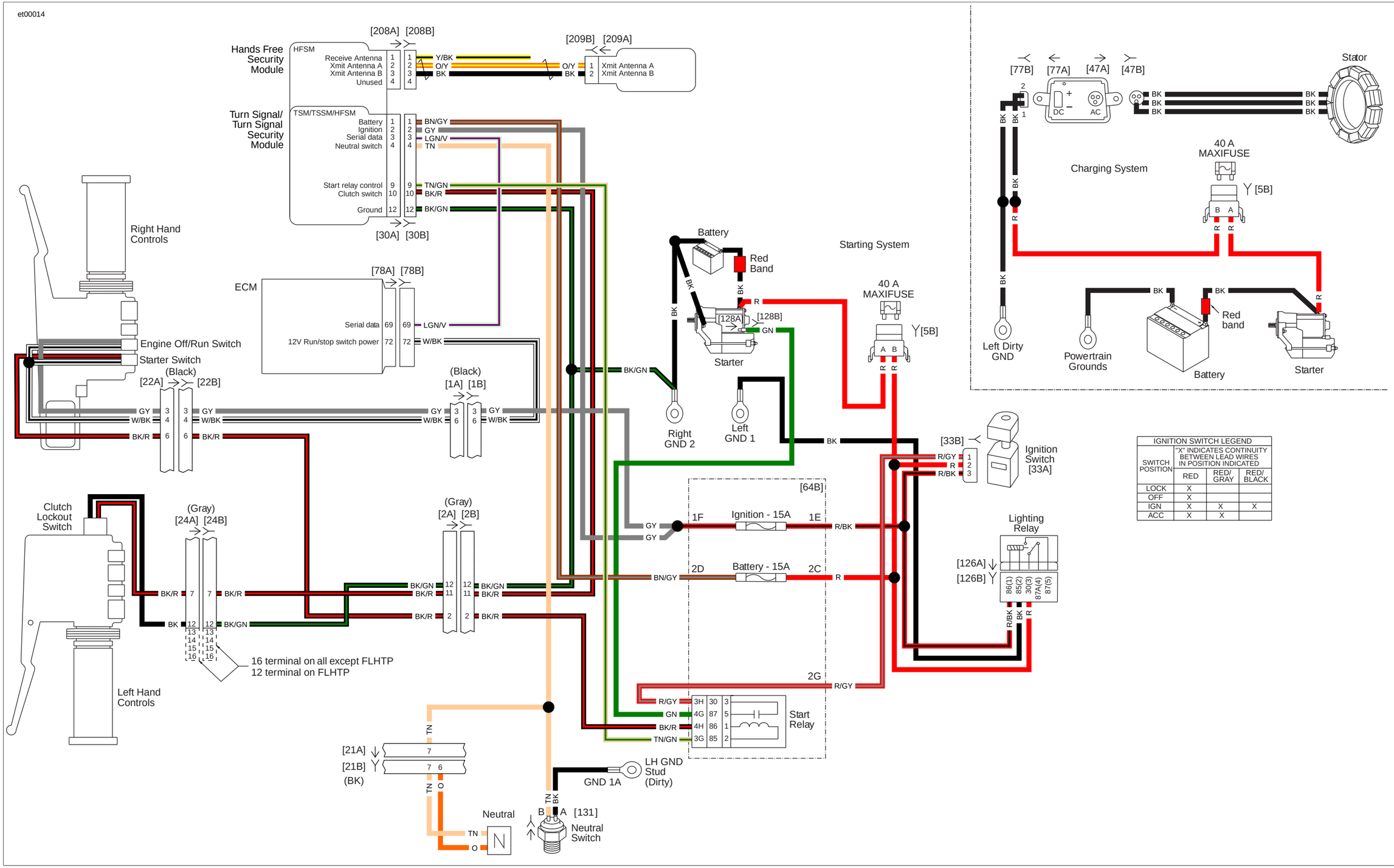
Figure B-21. 2008 FLT, FLHX, FLHTC, FLHTCU, FLTR & FLTRU DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-21.
2008 FLT, FLHX, FLHTC, FLHTCU, FLTR & FLTRU DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-21.
2008 FLT, FLHX, FLHTC, FLHTCU, FLTR & FLTRU DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

et00014



IGNITION SWITCH LEGEND			
SWITCH POSITION	"X" INDICATES CONTINUITY BETWEEN LEAD WIRES IN POSITION INDICATED		
	RED	RED/ GRAY	RED/ BLACK
LOCK	X		
OFF	X		
IGN	X	X	X
ACC	X	X	

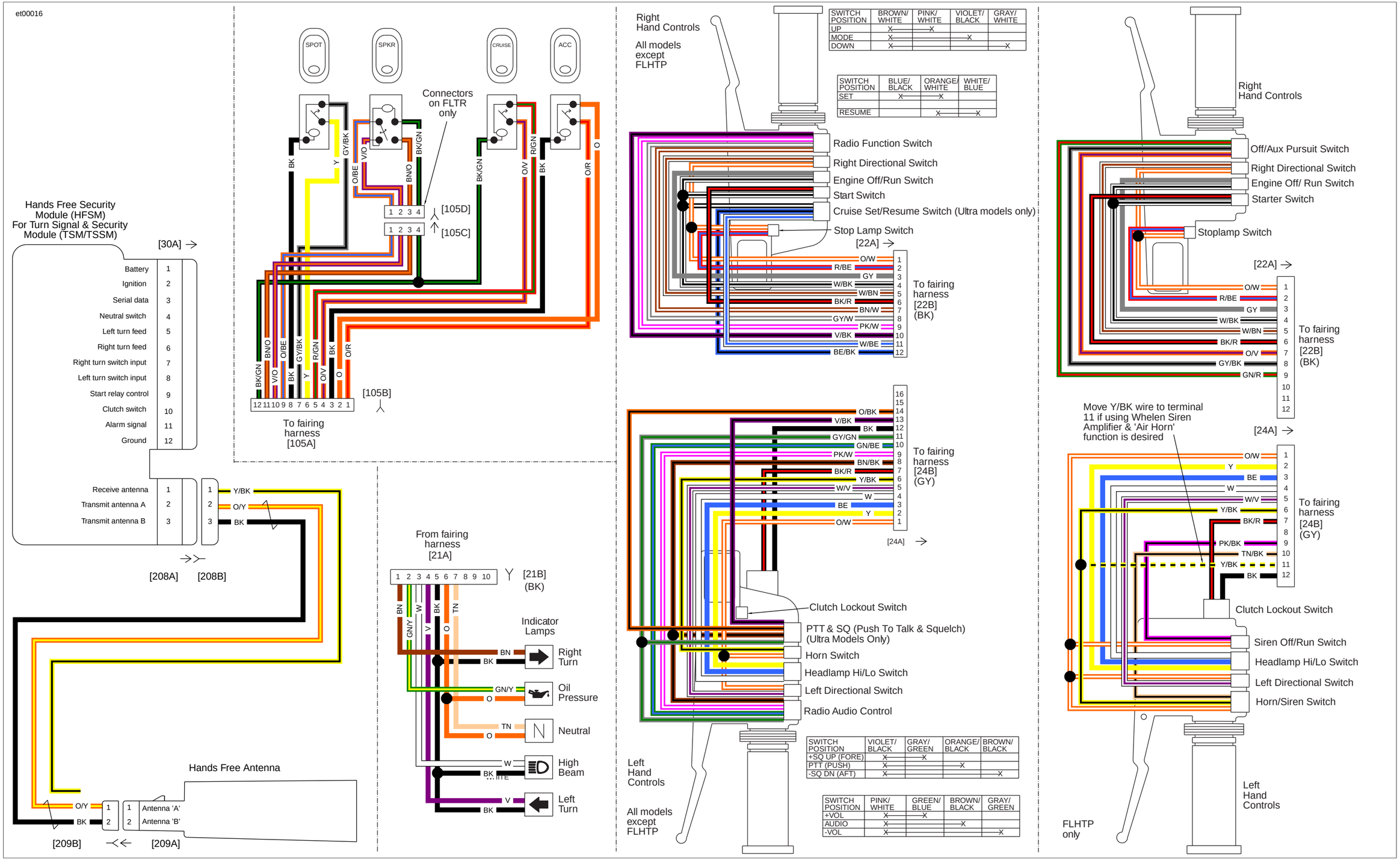
Figure B-22. 2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

Figure B-22.
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

Figure B-22.
2008 FLHT, FLHX, FLHTC, FLHTCU & FLTR DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

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et00016



SWITCH POSITION	BROWN/ WHITE	PINK/ WHITE	VIOLET/ BLACK	GRAY/ WHITE
UP	X	X		
MODE	X		X	
DOWN	X			X

SWITCH POSITION	BLUE/ BLACK	ORANGE/ WHITE	WHITE/ BLUE
SET	X	X	
RESUME		X	X

SWITCH POSITION	VIOLET/ BLACK	GRAY/ GREEN	ORANGE/ BLACK	BROWN/ BLACK
+SQ UP (FORE)	X	X		
PTT (PUSH)	X		X	
-SQ DN (AFT)	X			X

SWITCH POSITION	PINK/ WHITE	GREEN/ BLUE	BROWN/ BLACK	GRAY/ GREEN
+VOL	X	X		
AUDIO	X		X	
-VOL	X			X

Figure B-23. 2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLTHP DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, INDICATOR LAMPS, FAIRING CAP/INSTRUMENT NACELLE SWITCHES AND HFSM/ANTENNA

Figure B-23.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLTHP DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, INDICATOR LAMPS, FAIRING CAP/INSTRUMENT NACELLE SWITCHES AND HFSM/ANTENNA

Figure B-23.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU & FLTHP DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, INDICATOR LAMPS, FAIRING CAP/INSTRUMENT NACELLE SWITCHES AND HFSM/ANTENNA

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

et00017

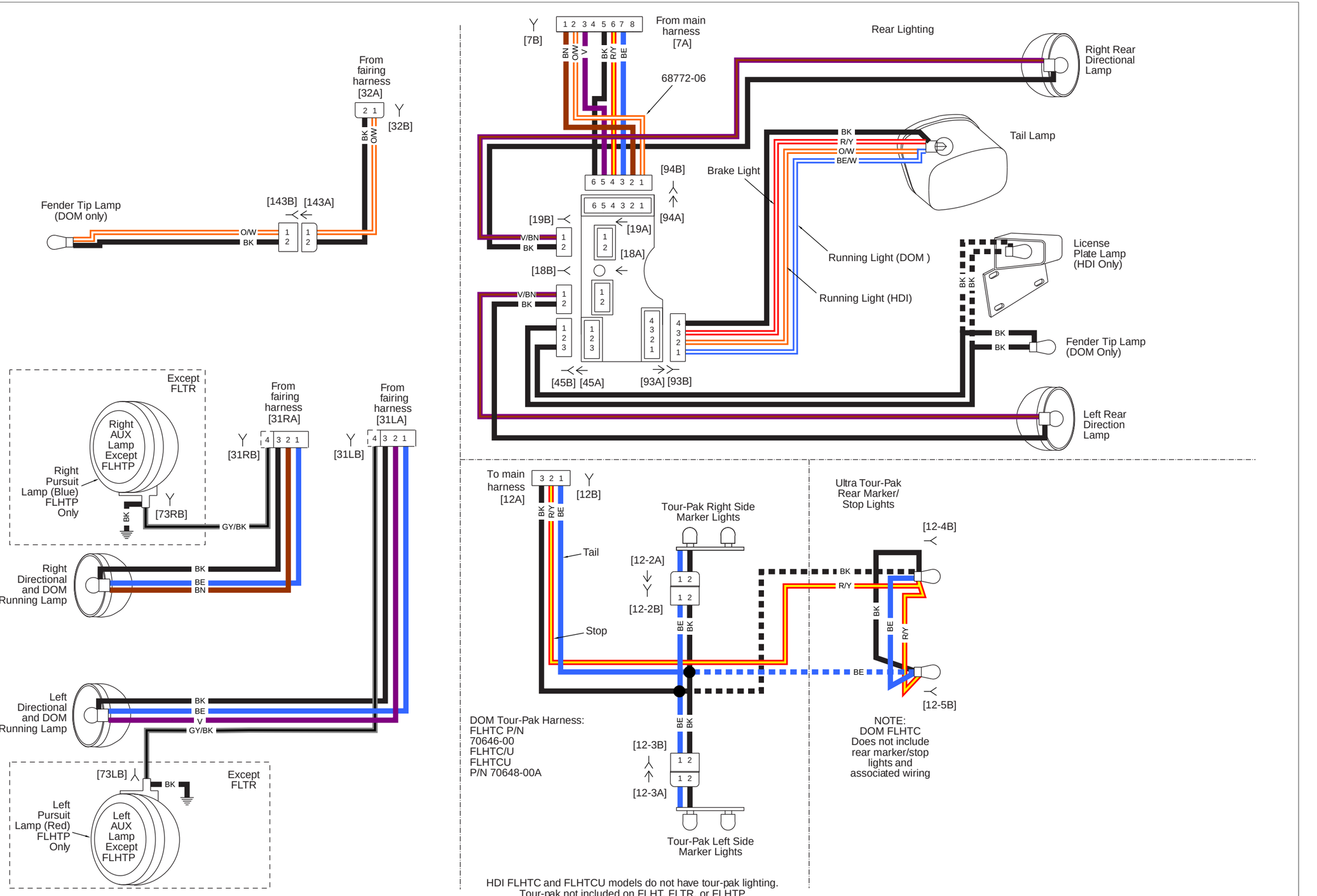


Figure B-24. 2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU, & FLTHP DOMESTIC & INTERNATIONAL MODELS TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS & TOUR-PAK LIGHTS

Figure B-24.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU, & FLTHP DOMESTIC & INTERNATIONAL MODELS TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS & TOUR-PAK LIGHTS

Figure B-24.
2008 FLHT, FLHX, FLHTC, FLHTCU, FLTR, FLTRU, & FLTHP DOMESTIC & INTERNATIONAL MODELS TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS & TOUR-PAK LIGHTS

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

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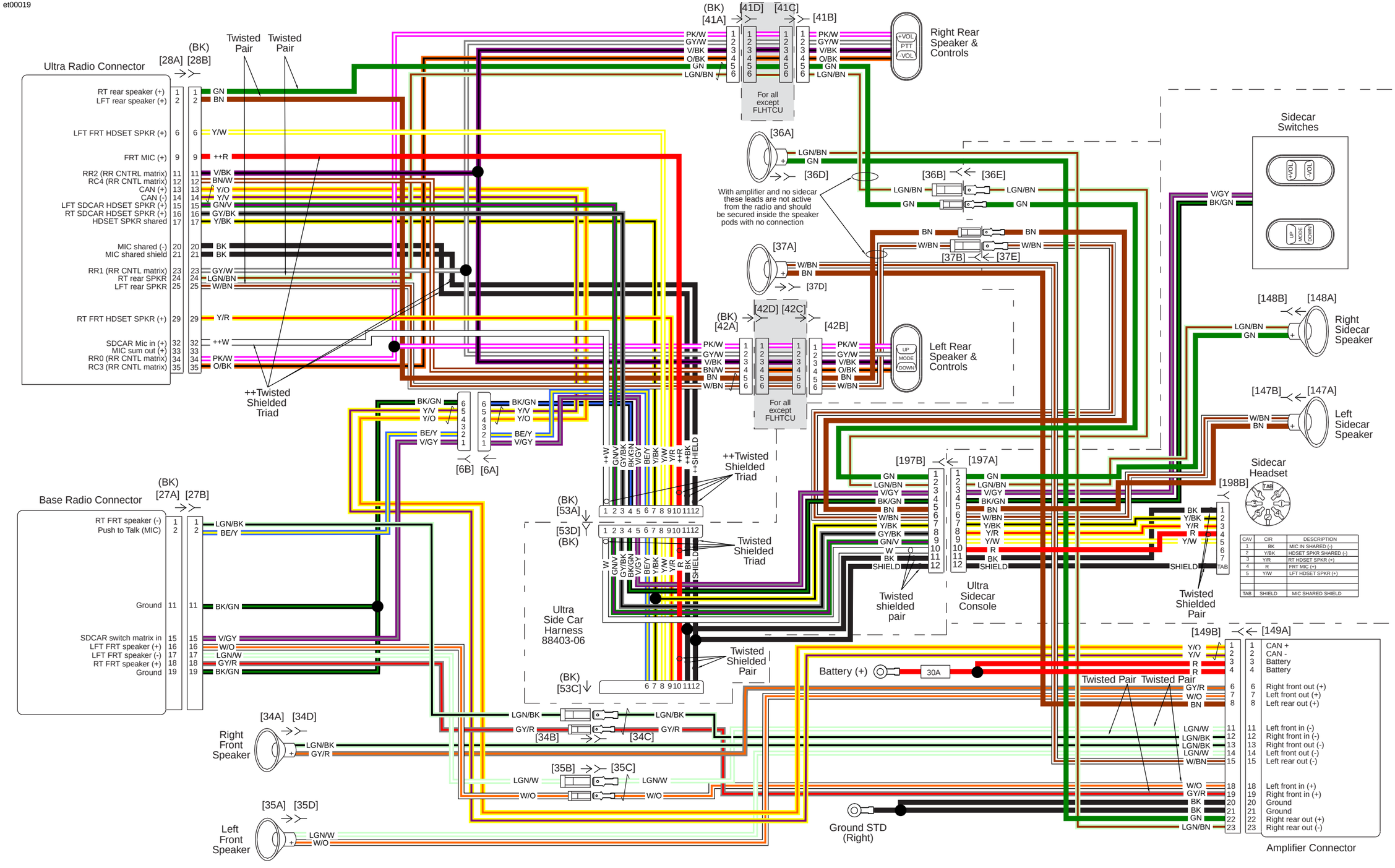


Figure B-25. 2008 TLE, TLE-U SIDECARS DOMESTIC & INTERNATIONAL MODELS AMPLIFIER, SIDECAR SPEAKERS AND SWITCHES

Figure B-25.
2008 TLE, TLE-U SIDECARS DOMESTIC & INTERNATIONAL MODELS AMPLIFIER, SIDECAR SPEAKERS AND SWITCHES

Figure B-25.
2008 TLE, TLE-U SIDECARS DOMESTIC & INTERNATIONAL MODELS AMPLIFIER, SIDECAR SPEAKERS AND SWITCHES

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HARLEY-DAVIDSON

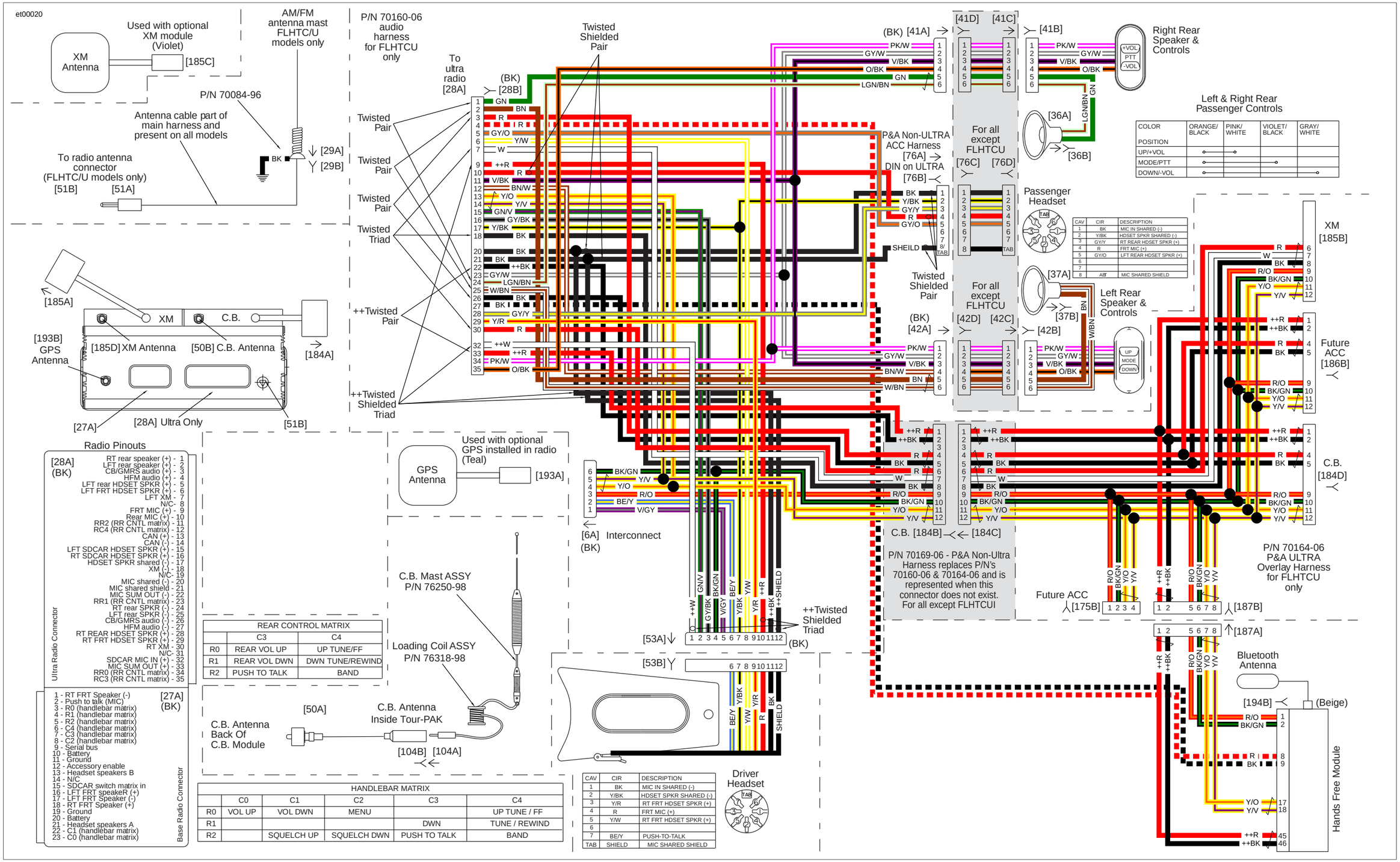


Figure B-26. 2008 FLHX, FLHTC, FLHTCU AND FLTR DOMESTIC & INTERNATIONAL MODELS RADIO, CB/INTERCOM, REAR SPEAKERS, XM, HANDS-FREE PHONE AND NAVIGATION

Figure B-26.
2008 FLHX, FLHTC, FLHTCU AND FLTR DOMESTIC & INTERNATIONAL MODELS RADIO, CB/INTERCOM, REAR SPEAKERS, XM, HANDS-FREE PHONE AND NAVIGATION

Figure B-26.
2008 FLHX, FLHTC, FLHTCU AND FLTR DOMESTIC & INTERNATIONAL MODELS RADIO, CB/INTERCOM, REAR SPEAKERS, XM, HANDS-FREE PHONE AND NAVIGATION

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

et00021

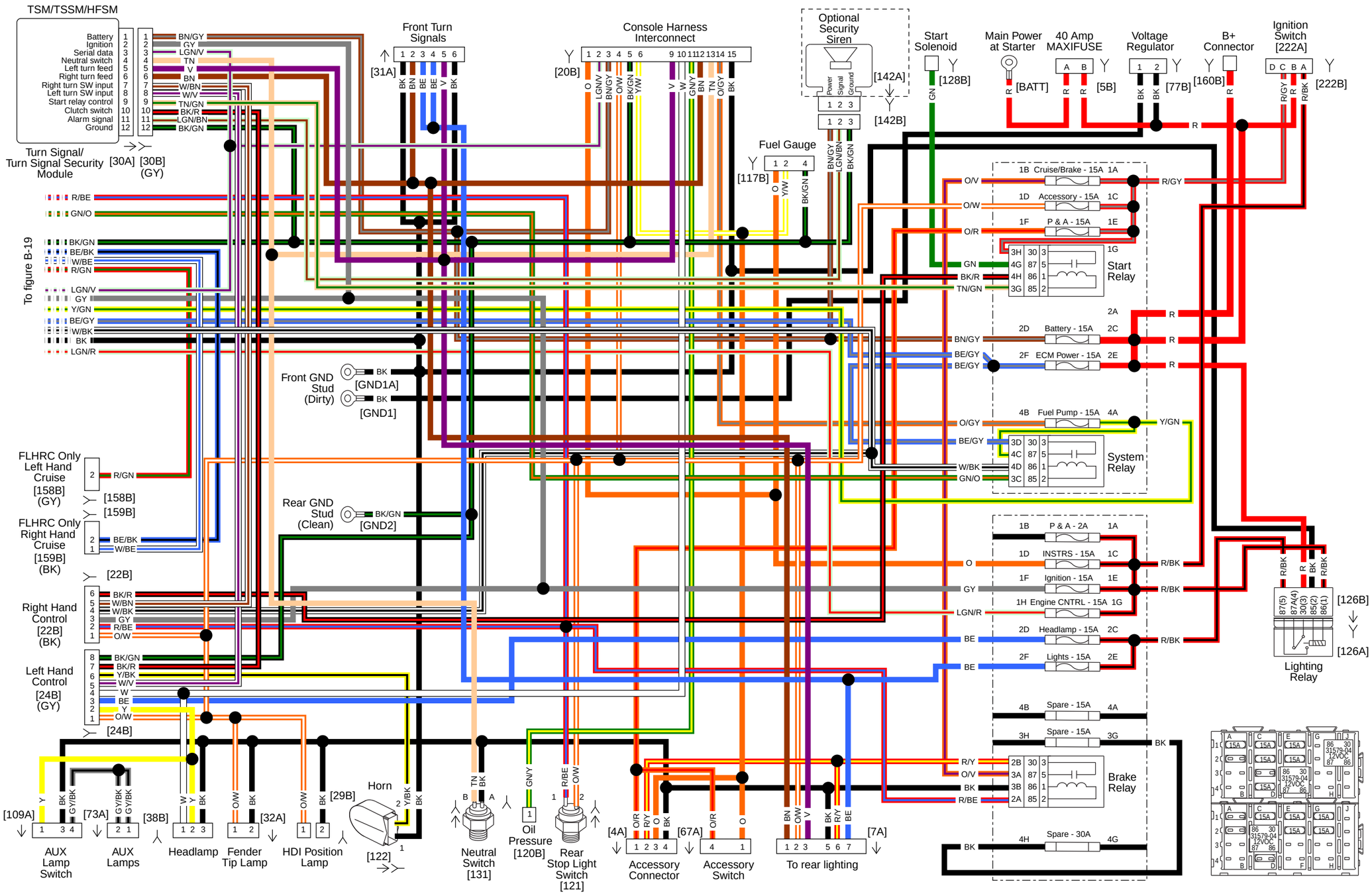


Figure B-27. 2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-27.
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-27.
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

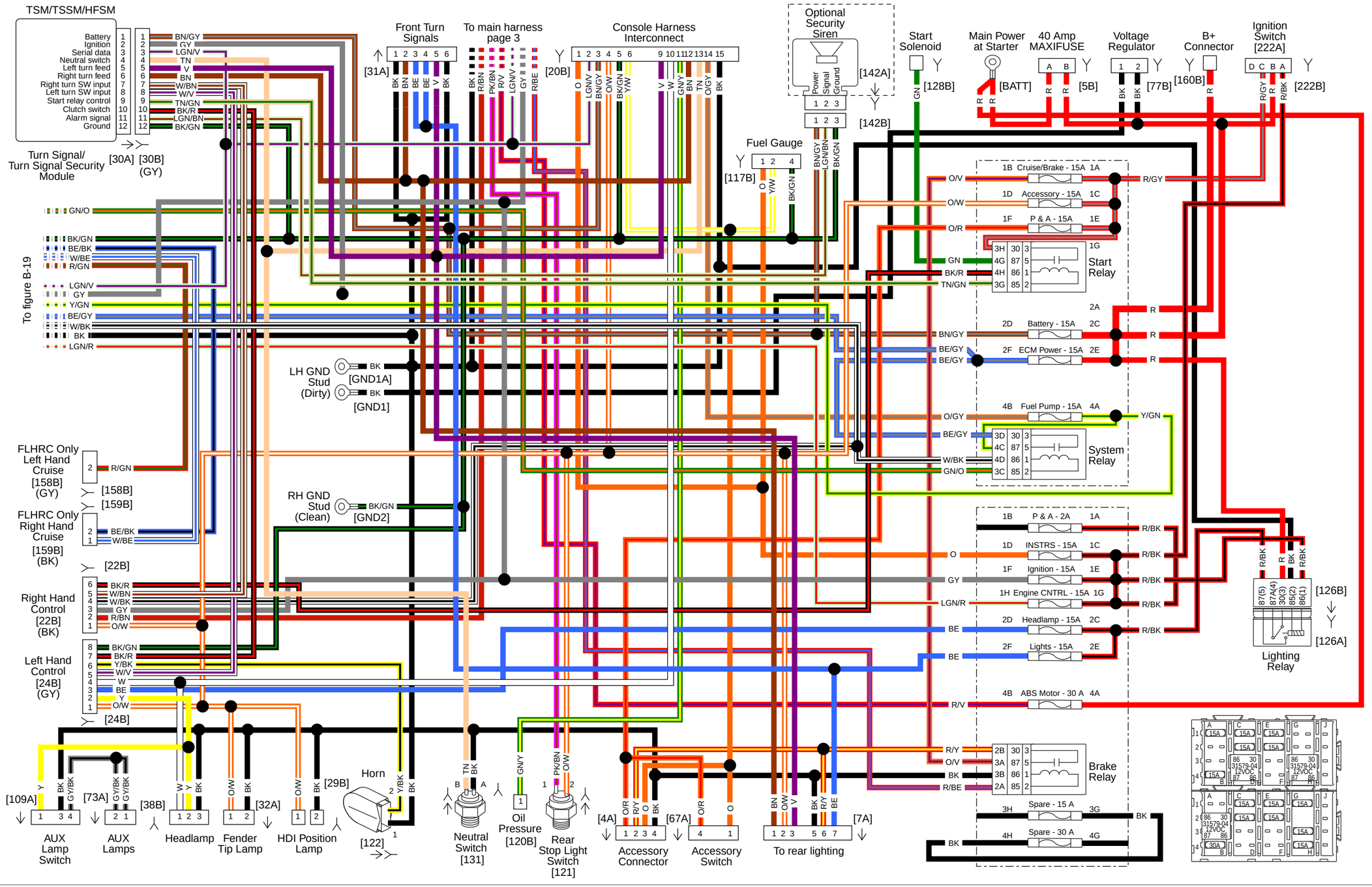


Figure B-28. 2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

Figure B-28.
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

Figure B-28.
2008 FLHR, FLHRC & FLHRS DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS W/ABS

et00023

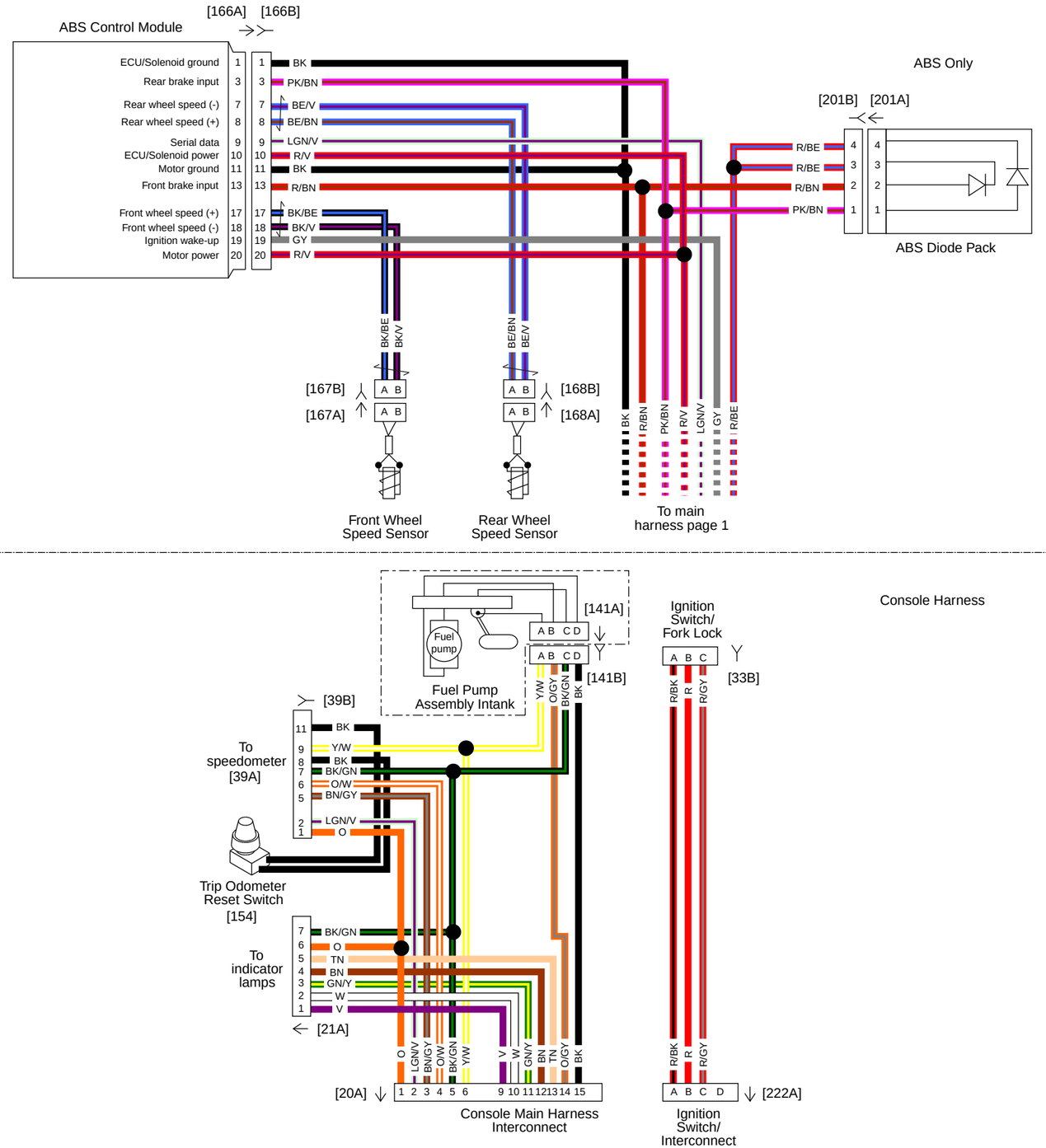


Figure B-29. 2008 FLHR, FLHRC, FLHRS, FLHP & FLHP/E DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-29.
2008 FLHR, FLHRC, FLHRS, FLHP & FLHP/E DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

Figure B-29.
2008 FLHR, FLHRC, FLHRS, FLHP & FLHP/E DOMESTIC & INTERNATIONAL MODELS MAIN HARNESS

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et00015

TSM/TSSM/HFSM

Turn Signal/ Turn Signal Security Module

Battery 1 1 BN/GY
Ignition 2 2 GY
Serial Data 3 3 LGN/V
Neutral Switch 4 4 TN
Start Relay Control 9 9 TN/GN
Clutch Switch 10 10 BK/R
Ground 12 12 BK/GN

[30A] [30B]

ECM [78A] [78B]

Serial Data 69 69 LGN/V
12V Run/Stop Switch 72 72 W/BK

Right Hand Controls

Engine Off/Run Switch
Start Switch
GY

[22A] [22B]
GY 3 4 3 4 GY
W/BK W/BK
BK/R 6 6 BK/R

[24A] [24B]
BK/R 7 8 7 8 BK/R
BK BK/GN

Clutch Lockout Switch

Left Hand Controls

[21A] [21B] (BK)
TN 5 5 6 BK
Neutral
TN BK

TN 13 13 TN
[20A] [20B]

[131]
TN BK
B A
Neutral Switch

GND 1A
LH GND Stud (Dirty)

BK/GN

Rear GND 2

Front GND 1

Starting System

MAXIFUSE 40 Amp
[5B]
A B
R R

BK BK
Battery
Red Band
R
[128A] [128B]
GN
Starter
BK

[64B]
GY 1F Ignition - 15A 1E R/BK
BN/GY 2D Battery - 15A 2C R
R/GY
R/GY 3H 30 3
GN 4G 87 5
BK/R 4H 86 1
TN/GN 3G 85 2
Start Relay

[33B] [33A]
R/GY 3 2 1 R/GY
R R
R/BK 1 2 3 R/BK
[222B] [222A]
C B A
A B C I
Ignition Switch

Lighting Relay
[126A]
[126B]
86(1) 85(2) 30(3) 87A(4) 87(5)
R/BK BK R

Charging System

[77B] [77A] [47A] [47B]
2
DC + − AC
1
BK BK BK BK BK BK
Stator

40 Amp MAXIFUSE
[5B]
B A
R R

R
BK
Front Dirty GND
Powertrain Grounds
Red Band
Battery
Starter

IGNITION SWITCH LEGEND

SWITCH POSITION	"X" INDICATES CONTINUITY BETWEEN LEAD WIRES IN POSITION INDICATED		
	RED	RED/ GRAY	RED/ BLACK
LOCK	X		
OFF	X		
IGN	X	X	X
ACC	X	X	

Figure B-30. 2008 FLHR, FLHRC AND FLHRS DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

Figure B-30.
2008 FLHR, FLHRC AND FLHRS DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

Figure B-30.
2008 FLHR, FLHRC AND FLHRS DOMESTIC & INTERNATIONAL MODELS STARTING AND CHARGING

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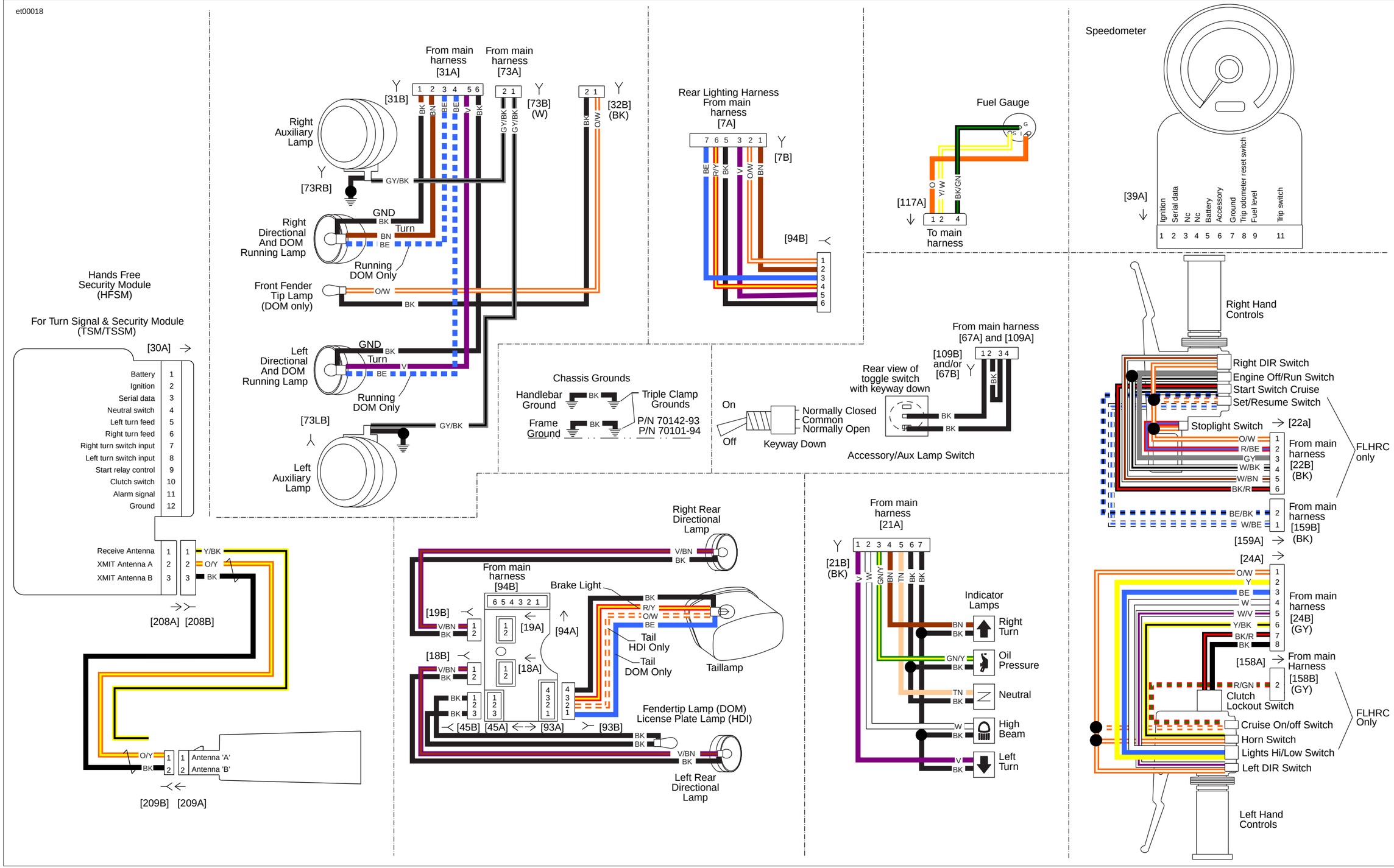


Figure B-31. 2008 FLHR, FLHRC DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, SPEEDOMETER, INDICATOR LAMPS, TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS, FENDER TIP LAMPS AND AUX LAMP/ACCESSORY SWITCHES

Figure B-31.
2008 FLHR, FLHRC DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, SPEEDOMETER, INDICATOR LAMPS, TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS, FENDER TIP LAMPS AND AUX LAMP/ACCESSORY SWITCHES

Figure B-31.
2008 FLHR, FLHRC DOMESTIC & INTERNATIONAL MODELS HANDLEBAR SWITCHES, SPEEDOMETER, INDICATOR LAMPS, TAIL LAMP, AUXILIARY LAMPS, DIRECTIONAL LAMPS, FENDER TIP LAMPS AND AUX LAMP/ACCESSORY SWITCHES

DIGITAL TECHNICIAN II
HARLEY-DAVIDSON

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C.2 FLUID CONVERSIONS.....C-2
C.3 TORQUE CONVERSIONS.....C-3

DIGITAL TECHNICIAN® II
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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 from U.S. units-of-measure to metric units-of-measure (or vice versa), refer to the following:

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

BRITISH IMPERIAL SYSTEM

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

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

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

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

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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) X 12.00000 = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs).

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs).
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs).**
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm).
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm).

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

NOTES

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

GLOSSARY D.1

ACRONYMS AND ABBREVIATIONS

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
AC	Alternating Current
ACC	Accessory
ACR	Automatic Compression Release
AGM	Absorbed Glass Mat (battery)
AMP	Ampere
AWG	American Wire Gauge
B+	Battery Voltage
BAS	Bank Angle Sensor
BTDC	Before Top Dead Center
C	Celsius (Centigrade)
CA	California
CAL	Calibration
CC	Cubic Centimeters
CCA	Cold Cranking Amps
CKP	Crankshaft Position
cm	Centimeter
DC	Direct Current
DLC	Data Link Connector
DOM	Domestic
DTC	Diagnostic Trouble Code
DVOM	Digital Volt Ohm Meter
ECM	Electronic Control Module
ECT	Engine Coolant Temperature
EEPROM	Electrically Erasable Programmable Read Only Memory
EFI	Electronic Fuel Injection
ET	Engine Temperature
EVAP	Evaporative Emissions Control System
F	Fahrenheit
ft-lbs	Foot-Pounds
fl oz.	Fluid Ounce
g	Gram
GAL	Gallon
GAWR	Gross Axle Weight Rating
GND	Ground (electrical)
GVWR	Gross Vehicle Weight Rating
HDI	Harley-Davidson International
H-DSSS	Harley-Davidson Smart Security System
HFSM	Hands Free Security Module
Hg	Mercury

DIGITAL TECHNICIAN II HARLEY-DAVIDSON®

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
IAC	Idle Air Control
IAT	Intake Air Temperature
ID	Inside Diameter
IGN	Ignition Light/Key Switch
IM	Instrument Module
In.	Inch
INJ PW	Injector Pulse Width
in-lbs	Inch-Pounds
Kg	Kilogram
Km	Kilometer
kPa	Kilopascal
km/hr	Kilometers Per Hour
L	Liter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
mA	Milliampere
MAP	Manifold Absolute Pressure
ml	milliliter
mm	millimeter
MPH	Miles Per Hour
ms	millisecond
Nm	Newton-Meter
N/A	Not Applicable
no.	Number
O2	Oxygen
OD	Outside Diameter
OEM	Original Equipment Manufacturer
oz	Ounce
P&A	Parts and Accessories
PN	Part Number
PSI	Pounds per Square Inch
RES	Reserve
RPM	Revolutions Per Minute
SCFH	Cubic Feet per Hour at Standard Conditions
TCA	Throttle Control Actuator
TDC	Top Dead Center
TGS	Twist Grip Sensor
TP	Throttle Position
TMAP	Intake Air Temperature/Manifold Absolute Pressure
TSM	Turn Signal Module
TSSM	Turn Signal/Security Module
V	Volt
VAC	Volts of Alternating Current

Table D-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
VDC	Volts of Direct Current
VIN	Vehicle Identification Number
VSS	Vehicle Speed Sensor

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NOTES

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NOTES

TSM/TSSM (JAPAN/KOREA) OVERVIEW E.1

GENERAL

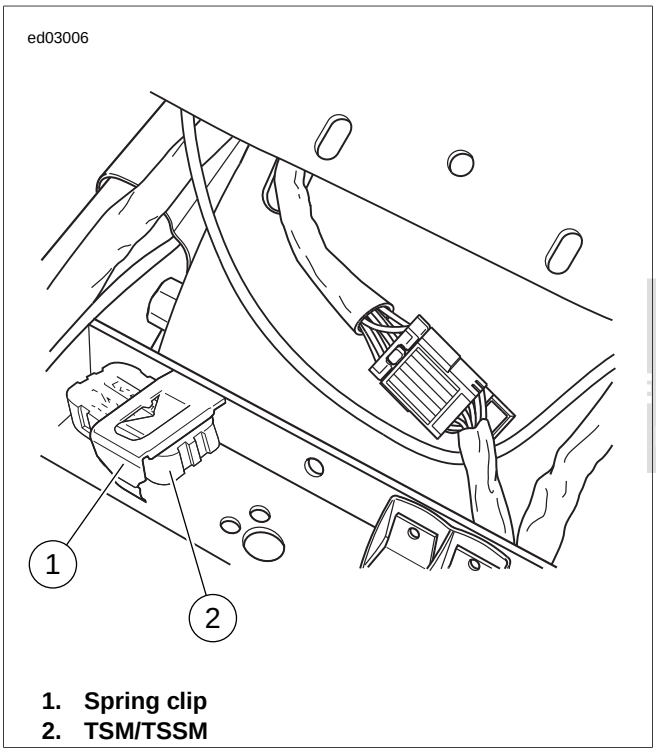
TSM

See Figure E-1. The Turn Signal Module (TSM) has two major functions:

- Control turn signals.
- Serve as Bank Angle Sensor (BAS).

TSSM

See Figure E-2. The optional, factory-installed, Harley-Davidson Factory Security System (**H-DFSS**) includes a Turn Signal Security Module (**TSSM**) which provides the same functions as the TSM, but also includes security and immobilization functions.



1. **Spring clip**
2. **TSM/TSSM**

Figure E-1. TSM/TSSM

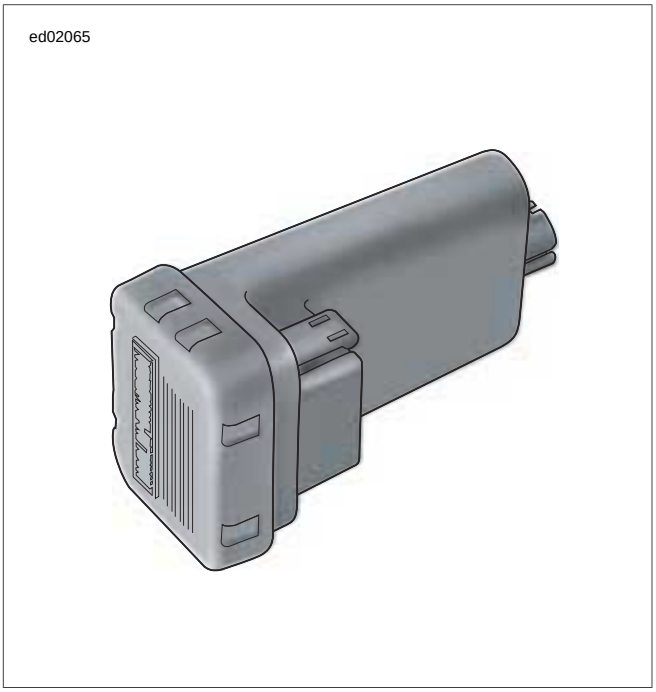


Figure E-2. TSSM (Japan/Korea)

TROUBLESHOOTING

Problems fall into at least one of five categories:

- Turn signal malfunction.
- Bank angle (engine disable).
- Clutch/neutral interlock (starter enable).
- Security lamp problem.
- Security system malfunction.

To resolve TSM/TSSM problems, four basic steps are involved. In order of occurrence, they are:

1. Retrieve Diagnostic Trouble Codes (DTCs) using speedometer self diagnostics. See E.10 SPEEDOMETER SELF DIAGNOSTICS.
2. Diagnose system problems. This involves using special tools and the diagnostic flow charts in this section.
3. Correct problems through the replacement and/or repair of the affected components.
4. After repairs are performed, the work must be validated. This involves clearing the DTCs and confirming proper vehicle operation as indicated by the behavior of the turn signals.

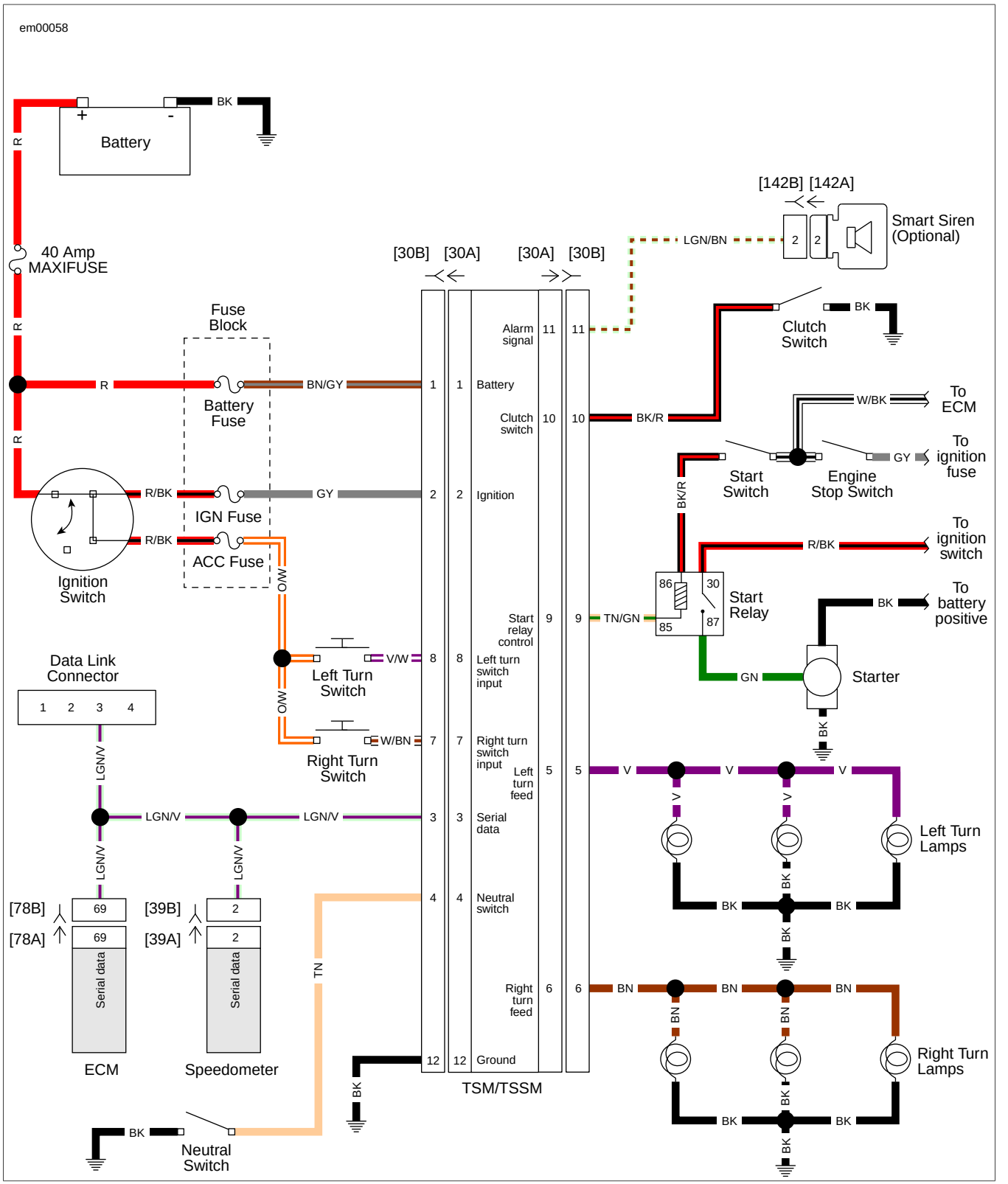


Figure E-3. Simplified TSM/TSSM Wiring

TSM/TSSM FEATURES E.2

GENERAL

The Turn Signal Module (TSM) and the Turn Signal Security Module (TSSM) provide the following capabilities.

TURN SIGNAL FUNCTIONS

TSM/TSSM Features

See E.4 TSM/TSSM TURN SIGNAL FUNCTIONS for complete details.

- **Manual turn signal control:** Manual activation/deactivation of left and right turn signal flashing sequences.
- **Automatic turn signal cancellation:** Automatic cancellation of left and right turn signal flashing sequences based on either vehicle speed, vehicle acceleration or turn completion.
- **Emergency flashers:** Four-way left and right turn signal flashing capability.
- **Turn signal lamp diagnostics:** Self-diagnostics for short circuit and open lamp conditions on both left and right turn signal systems.

BANK ANGLE FUNCTION

See E.5 TSM/TSSM BANK ANGLE FUNCTION for complete details.

- **Emergency engine shutdown:** Monitors vehicle lean and will provide engine shutdown when lean exceeds 40° from vertical for more than one second.
- **Emergency outputs disable:** Monitors vehicle lean and will disable turn signal lamps and starter motor when lean exceeds 40° from vertical for more than one second.

CLUTCH/NEUTRAL INTERLOCK FUNCTIONS

TSM/TSSM Features

- **Disables starter:** Disables starter until either the clutch lever is pulled in or transmission neutral is selected.
- **Diagnostics:** Provides diagnostics for clutch and neutral switch faults.

SECURITY ALARM AND IMMOBILIZATION FUNCTIONS

TSSM Feature

The following information applies only to motorcycles with the security option (TSSM). See E.6 SECURITY SYSTEM FUNCTIONS (TSSM ONLY) for more information.

- **Remote arming/disarming:** See Figure E-4. 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.
- **Security lamp:** See Figure E-5. A lamp within the speedometer face tells the rider if the system is armed or disarmed.
- **PIN disarming:** If a key fob is not available, the TSSM allows the rider to disable the security alarm and immobilization functions if the rider knows the previously entered personal identification number (PIN).
- **Arming/disarming confirmation:** When the TSSM is armed, the system provides visual feedback to the rider by flashing the turn signals and sounding the optional Smart Siren.
- **Auto-arming:** Automatically enables the security alarm and immobilization functions within 30 seconds after the Ignition Switch is switched OFF.



Figure E-4. Key Fob: TSSM

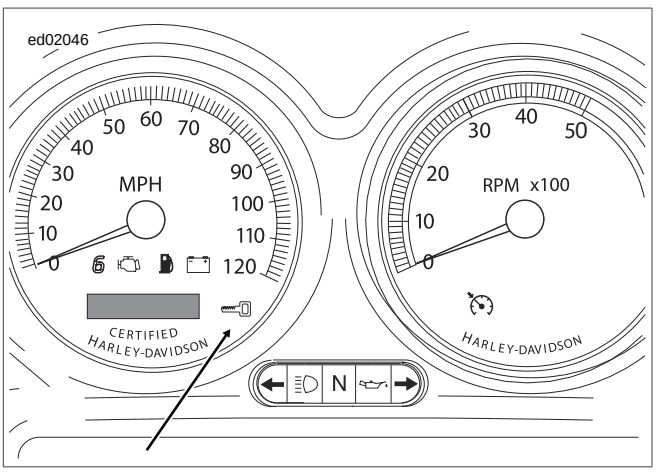


Figure E-5. Security Lamp (Key Icon)

NOTE

Motorcycles sold with a TSSM have auto-arming disabled, but it can be activated. See E.3 TSM/TSSM VEHICLE DELIVERY.

- **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:** Should the security alarm and immobilization functions be triggered by a vehicle security condition, the starter and ignition system will be disabled.
- **Security system alarm:** See Figure E-6. 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.



Figure E-6. Security Siren

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TSM/TSSM VEHICLE DELIVERY E.3

GENERAL

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

Setting up a vehicle TSM/TSSM depends on whether the vehicle has a Turn Signal Module (TSM) or the optional Turn Signal Security Module (TSSM) installed.

All motorcycles ship with the TSM/TSSM set for use **without** a sidecar installed. If a motorcycle is equipped with a TSM, no further configuration is required.

However, if a motorcycle has an optional security system (TSSM) installed, perform the following steps as necessary.

1. Configure TSSM motorcycles by assigning both key fobs to the vehicle. See E.3 TSM/TSSM VEHICLE DELIVERY, Key Fob Assignment: TSSM.
2. Configure TSSM motorcycles by entering a Personal Identification Number (PIN) picked by the owner. The PIN allows the owner to operate the system if the key fob is lost or inoperable. Record this PIN in the Owner's Manual and instruct the customer to carry a copy.

CONFIGURING A TSSM

NOTE

Do not forget to enter a Personal Identification Number (PIN) for TSSM motorcycles. If a PIN is not assigned and both key fobs are lost or damaged while the motorcycle is armed, the TSSM must be replaced.

Changes to TSSM settings are made by a series of programming operations involving the ignition switch, left/right turn signal switches and key fob (security systems).

At certain steps in the programming sequence, the motorcycle 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.

SIDECAR CONFIGURATION

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

POWER DISRUPTION AND CONFIGURING

The TSM/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 situations:

- Battery disconnect or power drain.
- Battery fuse removal.
- Connecting Breakout Box to TSM/TSSM connector.

Therefore, after all battery reconnects, the configuration sequence must be modified as follows.

1. Set Engine Stop Switch to **OFF**, cycle Ignition Switch **ON**-OFF-**ON**-OFF-**ON** and press left turn signal switch twice.
2. Repeat step listed above.
3. Continue with configuration sequence listed.

KEY FOB ASSIGNMENT: TSSM

Refer to Table E-1 to assign a key fob to a motorcycle equipped with a TSSM.

The key fob on TSSM motorcycles 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 Switch to 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 E-1. Key FOB Assignment: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF**.		Verify the security lamp is not blinking (vehicle is disarmed). This assignment procedure must be completed with no pauses between steps greater than 10 seconds.
2	Cycle the Ignition Switch **IGN** - OFF - **IGN** - OFF - **IGN**.		

Table E-1. Key FOB Assignment: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
3	Press **left** turn switch **2** times and release.	One to four flashes turn signals and indicators depending on vehicle configuration (See E.3 TSM/TSSM VEHICLE DELIVERY regarding battery disconnects.)	1 flash - Worldwide TSM, no security. 2 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 Switch to **OFF**.		

PIN ENTRY: TSSM

NOTE

Do not forget to enter a Personal Identification Number (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 E-2 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 E-2. 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 blinking (vehicle is disarmed). This assignment procedure **must** be completed with no pauses between steps greater than 10 seconds.
2	Cycle the Ignition 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 E.3 TSM/TSSM VEHICLE DELIVERY regarding battery disconnects).	One flash - Worldwide TSM, no security. Two flashes - Japan/Korea configuration TSSM.

Table E-2. Entering an Initial TSSM PIN (Example: 3-1-3-1-3) with No PIN Previously Entered

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
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 blinks.	Vehicle is in PIN entry mode ready to enter or modify first digit.
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 is 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 is 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 is 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 is 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 is entered.

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Table E-2. Entering an Initial TSSM PIN (Example: 3-1-3-1-3) with No PIN Previously Entered

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
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.
20	Turn Ignition Switch to OFF.		
21	Write down code in Owner's Manual.		
22	Arm the security system and attempt to disarm using PIN entry. Refer to Table E-2.		

CHANGING THE PIN: TSSM

If a PIN has been previously entered, the security lamp will flash the equivalent digit, and the odometer will display the existing PIN with the active digit blinking. Each additional press of the left turn switch will increment the digit.

- 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).

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TSM/TSSM TURN SIGNAL FUNCTIONS E.4

GENERAL

The TSM/TSSM turn signal feature has several modes:

- Automatic cancellation.
- Manual cancellation.
- Four-way flashing.
- Diagnostics mode.

The turn signals cannot be activated or deactivated when the Ignition Switch is in the ACC position. The turn signals can only be activated or deactivated with the Ignition Switch in the IGNITION position.

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

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 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 at more than 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 km/h) and will automatically cancel when the count total equals 20 as stated above.
- The turn signals will cancel within two seconds upon turn completion. A sensor inside the TSM/TSSM 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 motorcycle 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.

MANUAL CANCELLATION

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

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

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

DIAGNOSTICS MODE

The TSM/TSSM measures the current when the turn signals are used. If there is a burned out light bulb on one side, the remaining light and the corresponding turn signal indicator flash at double the normal rate starting with the fifth flash.

Other diagnostic conditions monitored include:

- Short circuit in the turn signal wiring.
- Open circuit in the turn signal wiring.
- Stuck turn signal switch.

NOTES

- *A stuck turn signal switch will disable the automatic turn signal cancellation feature.*
- *If a stuck switch is detected, you must hold the left and right turn signal switches in for more than one second to activate the four-way flashers.*

See E.8 DIAGNOSTIC TROUBLE CODES (DTC) for more information.

TSM/TSSM BANK ANGLE FUNCTION E.5

GENERAL

The turn signals, starter motor, ECM, fuel pump, and ignition coil will be disabled in the event the vehicle is tipped over.

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

OPERATION

The engine will shut off automatically if the vehicle tilts more than 40° from vertical for longer than one second. The engine will automatically shut off even if the tilt occurs at a very slow speed. The odometer displays "tIP" when a tip over condition is detected.

To restart the motorcycle after shutdown has occurred:

1. Return the motorcycle to an upright position.
2. Cycle the Ignition Switch OFF-**ON** before restarting.

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SECURITY SYSTEM FUNCTIONS (TSSM ONLY) E.6

GENERAL

Security System Operation

The TSSM provides security and immobilization functions not found on the TSM. The TSSM 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.

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 alarm cycles.
- **Detecting that a battery or ground disconnect has occurred while armed:** Siren, if installed, activates its self-alarm mode. Turn signals will not flash.

See E.7 ARMING/DISARMING (TSSM ONLY) for more information.

NOTE

Always disarm the TSSM 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.

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.

ALARM SENSITIVITY: TSSM

Sensitivity

The TSSM has four sensitivity settings: extremely low, low, medium or high. The selection picked controls the sensitivity of the security system in regards to motion detection.

To set alarm sensitivity, refer to Table E-3.

Table E-3. TSSM Alarm Sensitivity

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set RUN/OFF Switch to **OFF**.		Verify the security lamp is not blinking (vehicle is disarmed).
2	Cycle the Ignition Switch **ON**-OFF-**ON**-OFF-**ON**.		
3	Press **left** turn switch **2** times and release.	Two flashes turn signals & indicators depending on vehicle configuration (See E.3 TSM/TSSM VEHICLE DELIVERY 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 Ignition Switch to OFF.		

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 picked up and moved in an armed state. In this mode, any attempt to hot-wire the vehicle will trigger the security system.

- To enter the transport mode, refer to Table E-4.
- To exit from transport mode and return the system to normal operation/functions, disarm the system using either the key fob or Personal Identification Number (PIN).

NOTE

Transport mode is especially useful when working on the motorcycle. If it is not used, the alarm will activate under many typical service activities.

Table E-4. Transport Mode: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF**.		Verify the security lamp is not blinking (vehicle is disarmed).
2	Turn Ignition Switch to **ON**.		
3	Press and hold **key fob** button until confirmation is received.	Three flashes turn signals & indicators.	
4	Turn Ignition Switch to OFF.		
5	Press and hold **key fob** button until confirmation is received.	Three flashes turn signals & indicators.	The vehicle can be moved without tripping the alarm.

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 on solid 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 rearm itself when auto-arming is enabled.

Japan and Korea motorcycles 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 E-5.

Table E-5. Selecting TSSM Auto-Arming Function

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF**.		Verify the security lamp is not blinking (vehicle is disarmed).
2	Cycle the Ignition Switch **IGN**-OFF-**IGN**-OFF-**IGN**.		
3	Press **left** turn switch **2 times** and release.	Two flashes turn signals and indicators (See E.3 TSM/TSSM VEHICLE DELIVERY 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 Ignition Switch to OFF.		

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 Electronic Control Module (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 E-6.

Table E-6. Storage Mode Preferences: TSSM

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF**.		Verify the security lamp is not blinking (vehicle is disarmed).
2	Cycle the Ignition Switch **IGN**-OFF-**IGN**-OFF-**IGN**.		
3	Press **left** turn switch **2 times** and release.	Two flashes turn signals and indicators depending on vehicle configuration (See E.3 TSM/TSSM VEHICLE DELIVERY 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 Ignition Switch to OFF.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ARMING/DISARMING (TSSM ONLY) E.7

GENERAL

There are two methods to arm the security system:

- Using the key fob.
- Using auto-arming. See E.6 SECURITY SYSTEM FUNCTIONS (TSSM ONLY).

NOTE

The vehicle cannot be armed with the Ignition Switch turned to IGN.

There are two ways to disarm the system:

- Using the key fob. This method works in all situations **except** before turning Ignition Switch to IGN when TSSM storage mode is activated.
- Using a Personal Identification Number (PIN).

SECURITY LAMP

Refer to Table E-7. The security lamp within the speedometer provides feedback to the rider confirming armed or disarmed status.

Table E-7. Security Lamp Status: TSSM

LAMP	MODE
Does not flash.	No security system (TSM), security system not armed or storage mode active.
Flashes every second.	Ten minute timeout after failed PIN entry attempt or a battery reconnect has occurred while armed.
Flashes every 2 seconds.	Security system armed.
Flashes 4 times a second.	PIN entry mode.
Stays on solid with Ignition Switch turned OFF.	Auto-arming is starting up. You have 30 seconds before system is armed.
Stays on solid with Ignition Switch turned to IGN.	If solid for more than 4 seconds after Ignition Switch is turned to IGN, a current DTC is present.

USING KEY FOB: TSSM

General

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.

USING THE PIN

General

The Personal Identification Number (PIN) consists of five digits entered using the left and right turn signal switches. Each digit can be any number from 1-9. The PIN is intended to be used to disarm the motorcycle in case the key fob becomes unavailable or inoperable.

See E.3 TSM/TSSM VEHICLE DELIVERY to set a PIN.

Disarming the System

Refer to Table E-8. 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.**

Table E-8. Disarming TSSM with the PIN (Example: 3-1-3-1-3)

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Set Engine Stop Switch to **OFF**.		
2	Turn Ignition Switch to **ACC**.		

Table E-8. Disarming TSSM with the PIN (Example: 3-1-3-1-3)

NO.	ACTION	WAIT FOR CONFIRMATION	NOTES
3	Hold **both** turn switches in until confirmation.	Security lamp blinks 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 lamp stops blinking.	

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

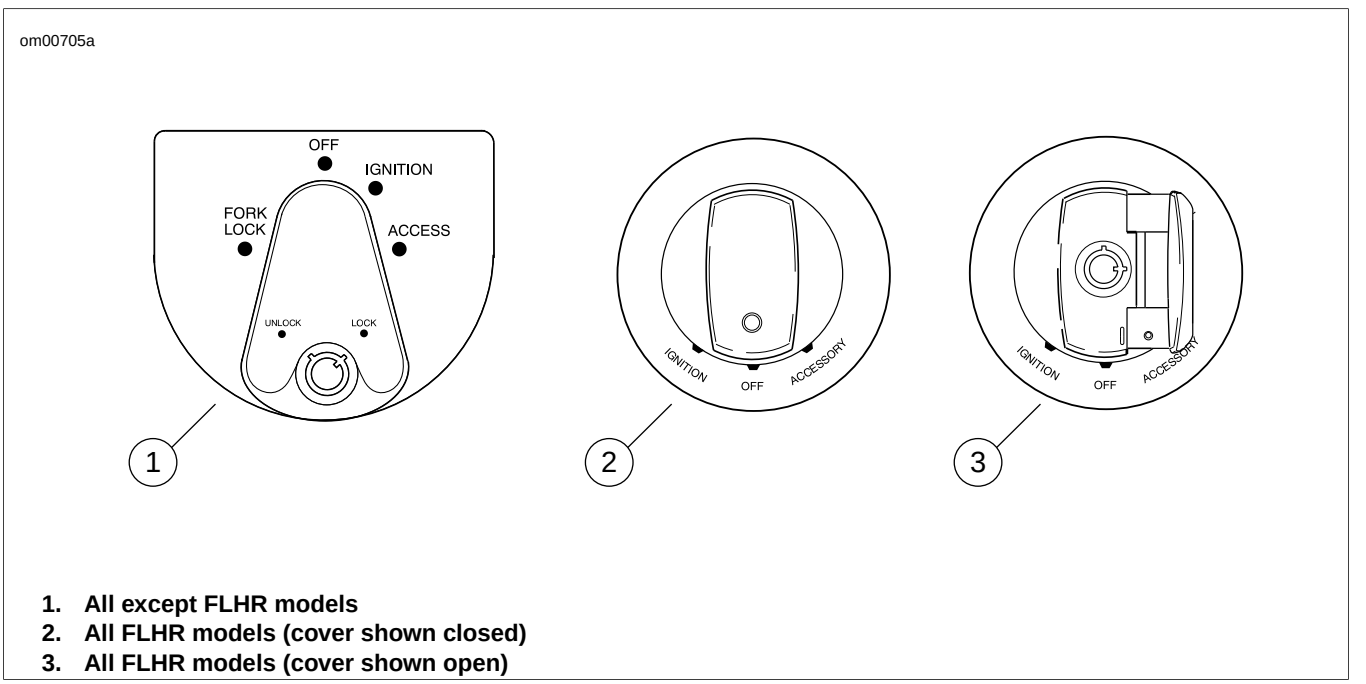
DIAGNOSTIC TROUBLE CODES (DTC) E.8

TSM/TSSM

To diagnose system problems, start by observing the behavior of the security lamp.

NOTES

- *See Figure E-7. "Key ON" means that the Ignition Switch is turned to IGNITION and the Engine Stop Switch is set to RUN (although the engine is not running).*
- *See Figure E-8. When the Ignition Switch is turned IGNITION, the security lamp will illuminate for approximately four seconds and then turn off.*
- *If the security lamp is not illuminated at Key ON or if it fails to turn OFF after the initial four second period, the speedometer may need to be replaced. See E.10 SPEEDOMETER SELF DIAGNOSTICS. If "BUS Er" is displayed on the odometer, it may take up to twenty seconds for the security lamp to illuminate.*
- *The security lamp will also light for eight seconds after the bulb check if historic Diagnostic Trouble Codes (DTCs) are present. The security lamp will stay on if current DTCs are set. If a historic DTC is present, the security lamp will light for 2 ignition cycles or until the DTC is cleared manually.*



1. **All except FLHR models**
2. **All FLHR models (cover shown closed)**
3. **All FLHR models (cover shown open)**

Figure E-7. Ignition Switch: Touring Models

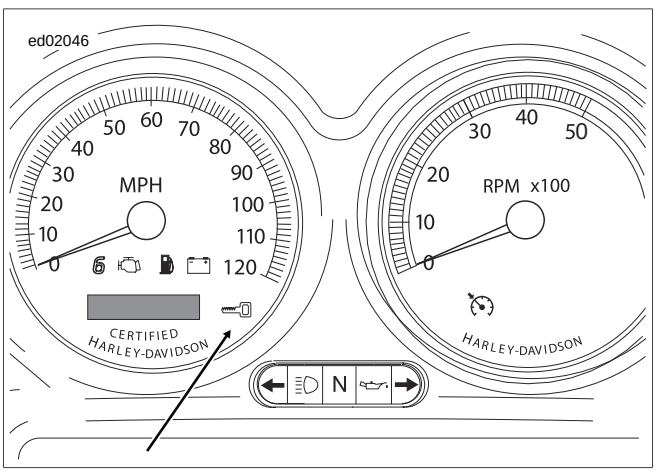


Figure E-8. Security Lamp (Key Icon)

1. See Figure E-9. After the lamp turns off after being illuminated for the first four-second period, one of three events may occur:
   a. The lamp remains off. This indicates there are no current fault conditions or stored historic DTCs currently detected by the TSSM.
   b. The lamp stays off for only four seconds and then comes back on for an eight-second period. This indicates a historic 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 E.8 DIAGNOSTIC TROUBLE CODES (DTC), Code Types for a complete description of DTC formats.

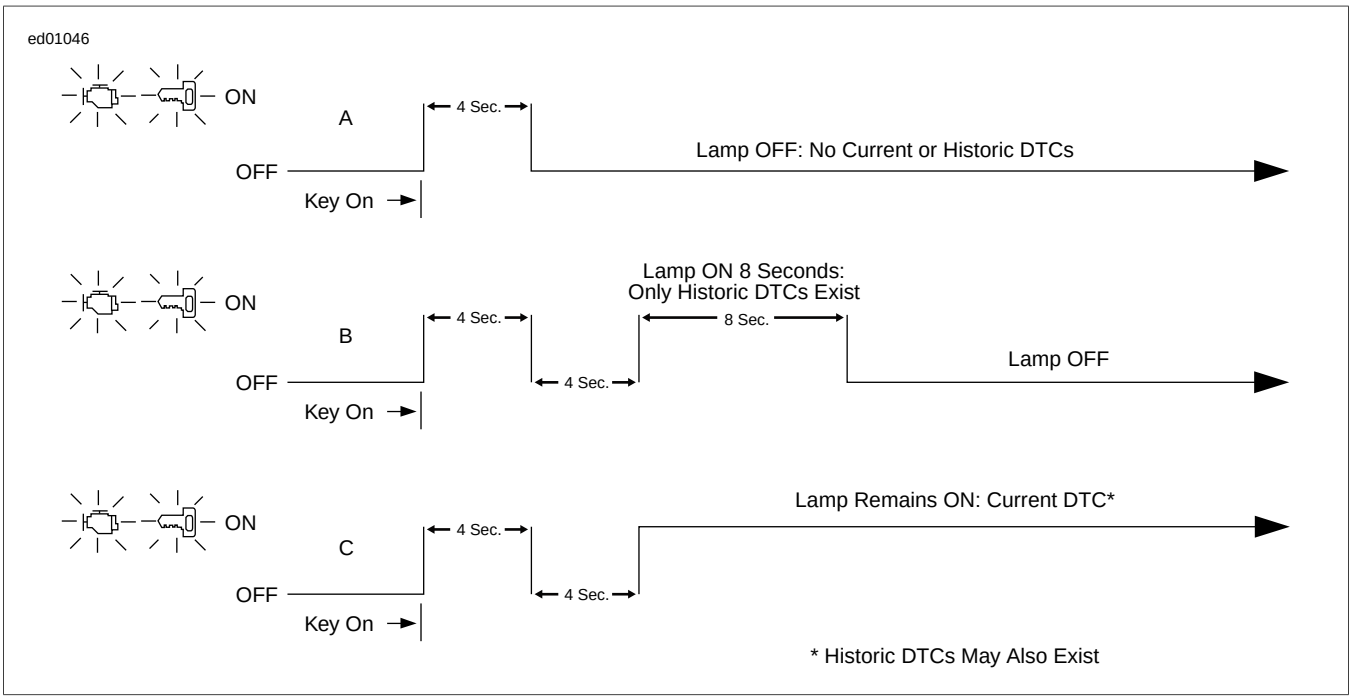


Figure E-9. Security Lamp Operation

CODE TYPES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

There are two types of Diagnostic Trouble Codes (DTCs): current and historic. If a DTC is stored, it can be read using either a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750) or speedometer self diagnostics. See E.10 SPEEDOMETER SELF DIAGNOSTICS.

NOTES

- *Speedometer self diagnostics will display both current and historic DTCs. To differentiate between current and historic DTCs, a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750) must be employed.*
- *All DTCs reside in the memory of the ECM, TSM/TSSM, speedometer or tachometer until the DTC is cleared by use of the speedometer self diagnostics. See E.10 SPEEDOMETER SELF DIAGNOSTICS.*
- *A historic DTC is also cleared after a total of 50 ignition cycles has elapsed. After the 50 ignition cycles 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 are present during the current ignition cycle. See the appropriate flow charts for solutions.

Historic

If a particular problem happens to resolve itself, the active status problem is dropped and it becomes a historic DTC rather than a current DTC. For example, intermittent output shorts can become typical historic DTCs.

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 only 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 E.8 DIAGNOSTIC TROUBLE CODES (DTC), Multiple Diagnostic Trouble Codes if multiple DTCs are found.

Diagnostic charts are designed for use with current DTCs and as a result they frequently suggest part replacement. When diagnosing an historic DTC the charts can be helpful but should not lead to part replacement without verification the part is faulty.

RETRIEVING DIAGNOSTIC TROUBLE CODES

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

The TSM/TSSM supports two levels of diagnostics.

- The most sophisticated mode employs a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).
- The second mode requires using speedometer self diagnostics. Speedometer, tachometer (if equipped), TSM/TSSM and ECM DTCs can be accessed and cleared. See E.10 SPEEDOMETER SELF DIAGNOSTICS.

MULTIPLE DIAGNOSTIC TROUBLE CODES

While it is possible for more than one fault to occur and set more than one DTC, there are several conditions which may result in **one** fault setting **multiple** DTCs:

Serial data DTCs (U1016, U1255, U1300 and U1301) may be accompanied by other DTCs. **Always** correct the serial data DTCs before resolving the other DTCs.

Refer to Table E-9. This table gives most TSM/TSSM DTCs a priority ranking.

Table E-9. TSM/TSSM Diagnostic Trouble Codes (DTCs) and Fault Conditions

PRIORITY	DTC	FAULT CONDITION	SOLUTION
1	U1300	Serial data low	E.21 DTC U1300, U1301 OR BUS ER.
2	U1301	Serial data high	E.21 DTC U1300, U1301 OR BUS ER.
3	U1016	Loss of ECM serial data	E.20 DTC U1016.
4	U1255	Serial data error	E.20 DTC U1016.
5	B1135	Accelerometer failed	E.17 DTC B1135.
6	B1151	Sidecar Bank Angle Sensor (BAS) short-to-ground	E.18 DTC B1151, B1152, B1153
7	B1152	Sidecar Bank Angle Sensor (BAS) short-to-battery	E.18 DTC B1151, B1152, B1153
8	B1153	Sidecar Bank Angle Sensor (BAS) high	E.18 DTC B1151, B1152, B1153
NOTE: Sidecar DTCs apply only to Touring models equipped with sidecars, If DTCs B1151, B1152 and/or B1153 are present on non-sidecar equipped motorcycles, the TSM/TSSM is not properly configured.			
9	B1154	Clutch switch input short-to-ground	E.19 DTC B1154, B1155.
10	B1155	Neutral switch input short-to-ground	E.19 DTC B1154, B1155.
11	B1134	Start relay output high	E.16 DTC B1134.
12	B1121	Left turn lamp output fault	E.13 TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141.
13	B1122	Right turn lamp output fault	E.13 TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141.
14	B0563	Battery voltage high	E.14 DTC B0563.
15	B1131	Alarm output low	E.15 DTC B1131, B1132.
16	B1132	Alarm output high	E.15 DTC B1131, B1132.
17	B1141	Ignition switch low/open	E.13 TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141.

INITIAL DIAGNOSTIC CHECK: TSM/TSSM E.9

GENERAL

PART NUMBER	TOOL NAME
HD-44750	DIGITAL TECHNICIAN

To locate faulty circuits or other system problems, follow the diagnostic flow charts. For a systematic approach, always begin with E.9 INITIAL DIAGNOSTIC CHECK: TSM/TSSM, Initial Diagnostics. Read the general information and then work your way through the flow chart box by box.

Diagnostic Notes

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

Circuit Diagram/Wire Harness Connector Table

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

In order to perform most diagnostic routines, a Breakout Box and a digital volt/ohmmeter (DVOM) are required. See E.11 BREAKOUT BOX: TSM/TSSM or 3.12 BREAKOUT BOX: TSM/HFSM.

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

Job/Time Code Values

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

Reprogramming ECM

Diagnostic charts frequently suggest Electronic Control Module (ECM) replacement. In the event an ECM needs to be replaced, it must be reprogrammed using a computer-based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750). See your dealer. Password learn procedure must also be performed. See E.22 TSM/TSSM: PASSWORD LEARN.

INITIAL DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-46601	INSTRUMENT HARNESS ADAPTERS

Diagnostic Tips

- If speedometer reads "BUS Er" with the Ignition Switch turned ON (Engine Stop Switch at RUN with the engine off), check data bus for an open or short to ground between Data Link connector [91A] terminal "3" and ECM connector [78B] terminal "69", TSSM connector [30B] terminal "3", speedometer connector [39B] terminal "2" or tachometer (if equipped) connector [108B] terminal "2".
- Check for an open diagnostic test terminal between Data Link connector [91A] terminal "3" and TSM/TSSM connector [30B] terminal "3". With Ignition Switch turned ON, serial data bus voltage should be typically 0.6-0.8 volt. The range of acceptable voltage is 0-7.0 volts.
- To identify intermittents, wiggle vehicle harness while performing steps in the Diagnostic Check charts.

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) between wire harness connector [39B] and speedometer connector [39A] using INSTRUMENT HARNESS ADAPTERS (Part No. HD-46601). See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.
2. Compare TSM/TSSM system behavior to symptoms in Table E-10.

All TSM/TSSM Diagnostic Trouble Codes (DTCs) are listed in Table E-11.

Table E-10. Symptoms That May Not Set Diagnostic Trouble Codes

SYMPTOM	SOLUTION
Fails to disarm	E.1 TSM/TSSM (JAPAN/KOREA) OVERVIEW.
Turn signal will not cancel or cancels erratically	E.13 TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141.
Turn signal flashes double normal rate, all bulbs good	E.13 TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141.

Other Diagnostic Trouble Codes (DTCs)

See 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER for any DTCs related to the speedometer.

See 4.5 INITIAL DIAGNOSTIC CHECK: EFI for any DTCs related to the electronic control module (ECM).

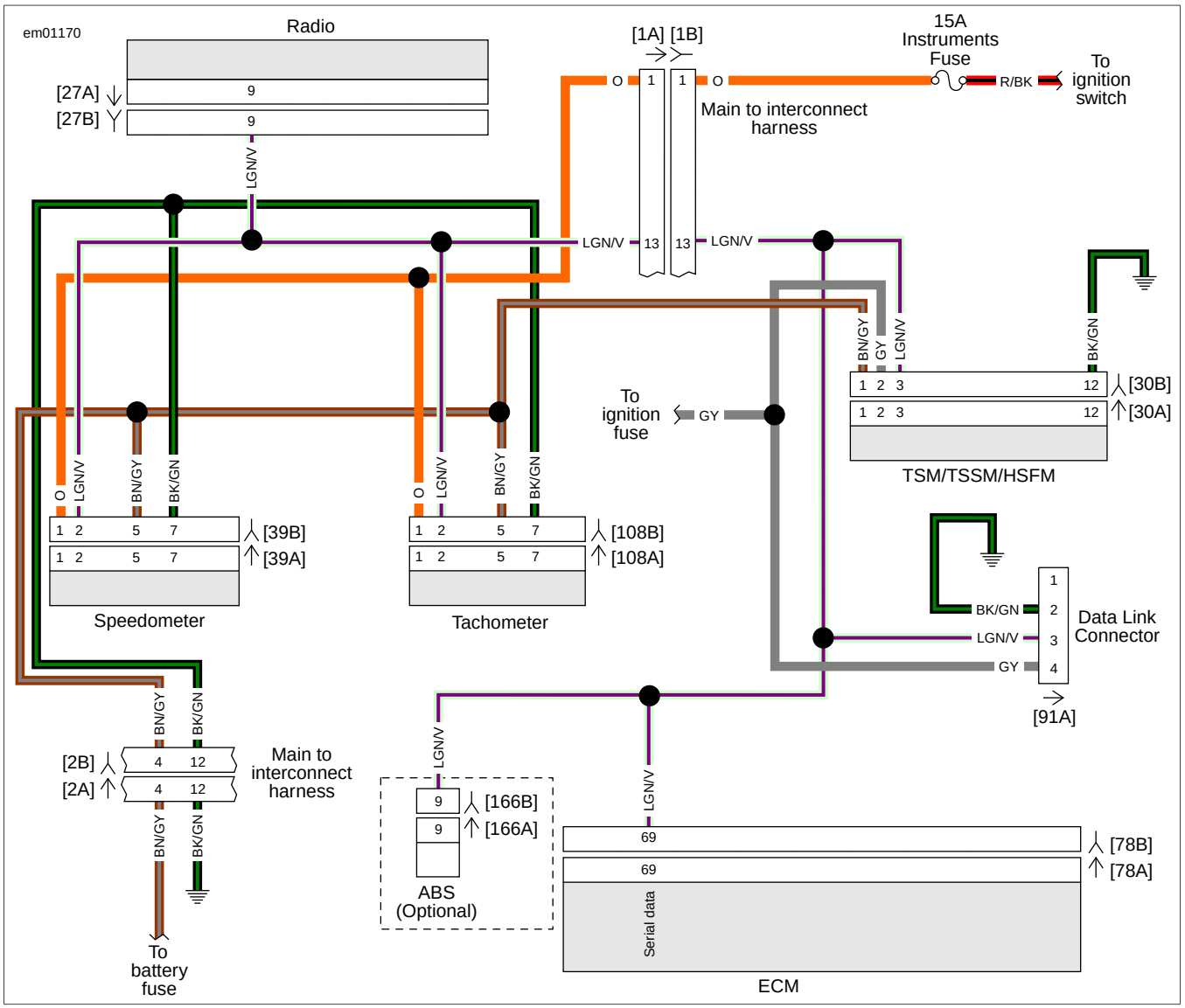


Figure E-10. Initial Diagnostic Check (FLHX, FLHT/C/U, FLTR)

Table E-11. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - right fairing support brace
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[27]	Radio	All	23-place Amp	Inner fairing - back of radio (right side)
[30]	TSM/TSSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	ECM	All	73-place Packard	Under seat
[91]	Data link	All	4-place Deutsch	Under left side cover

Table E-11. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS (If equipped)	All	20-place Molex	Under right side cover

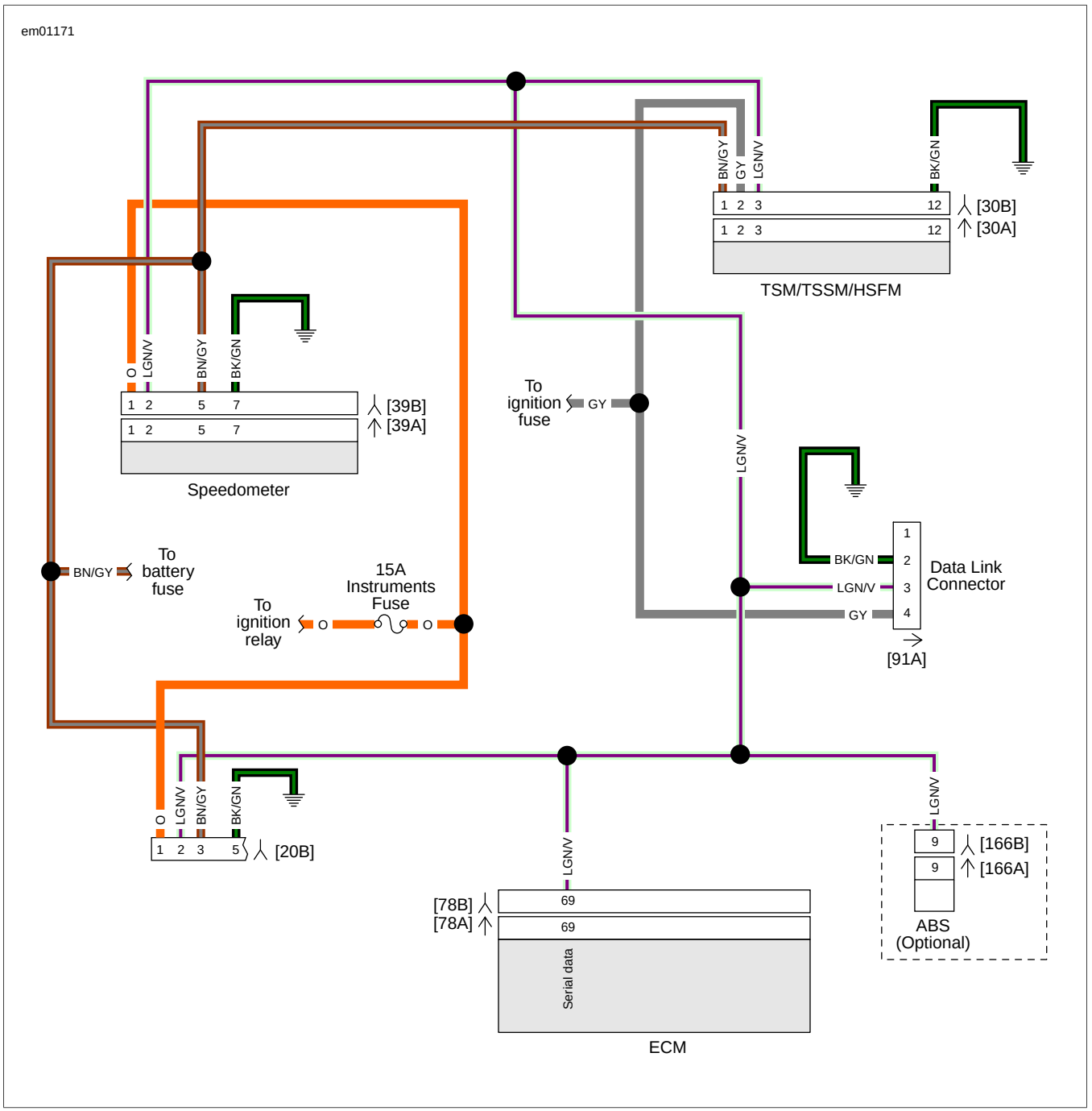


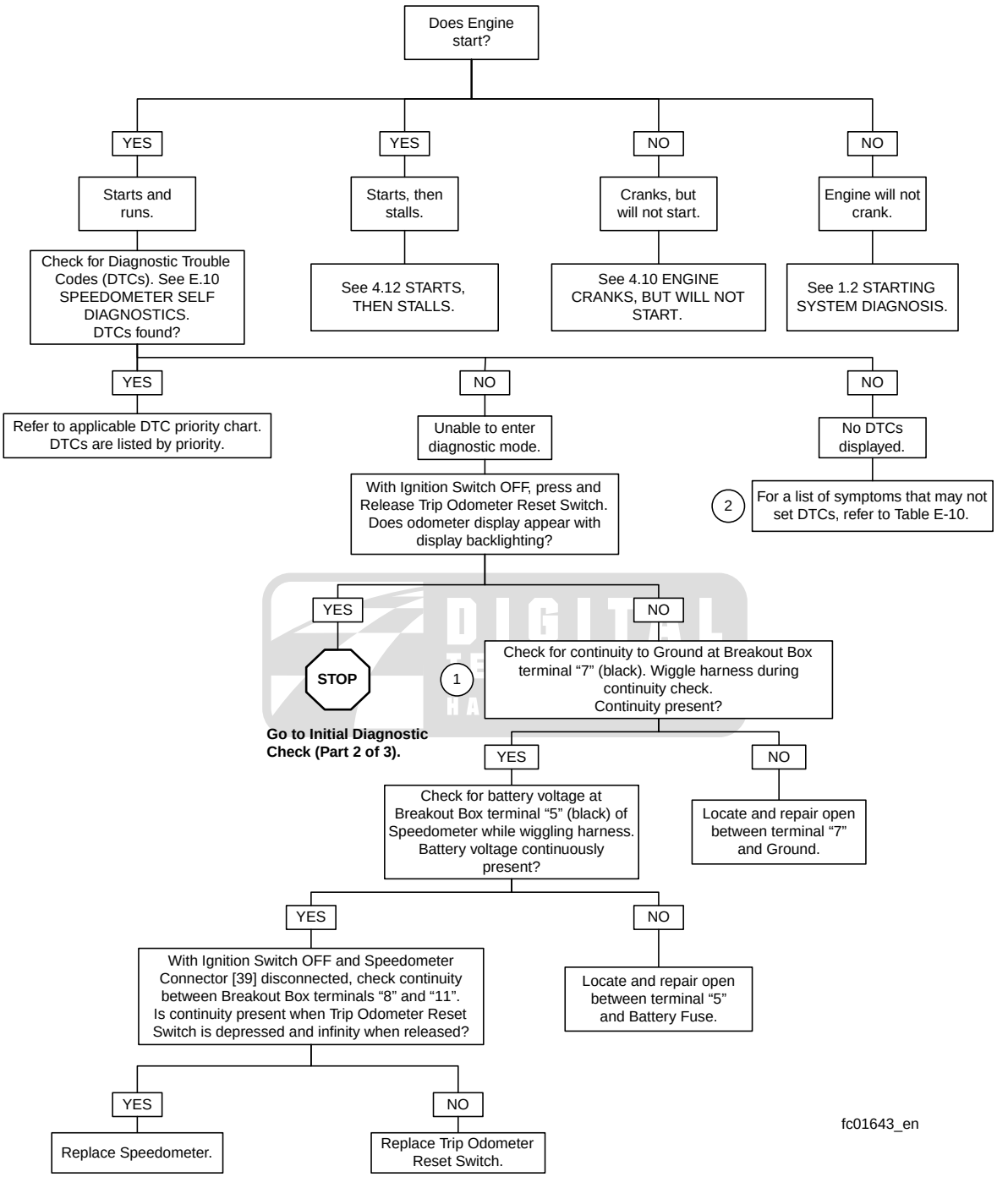
Figure E-11. Initial Diagnostic Check (FLHR/C/S)

Table E-12. Wire Harness Connectors

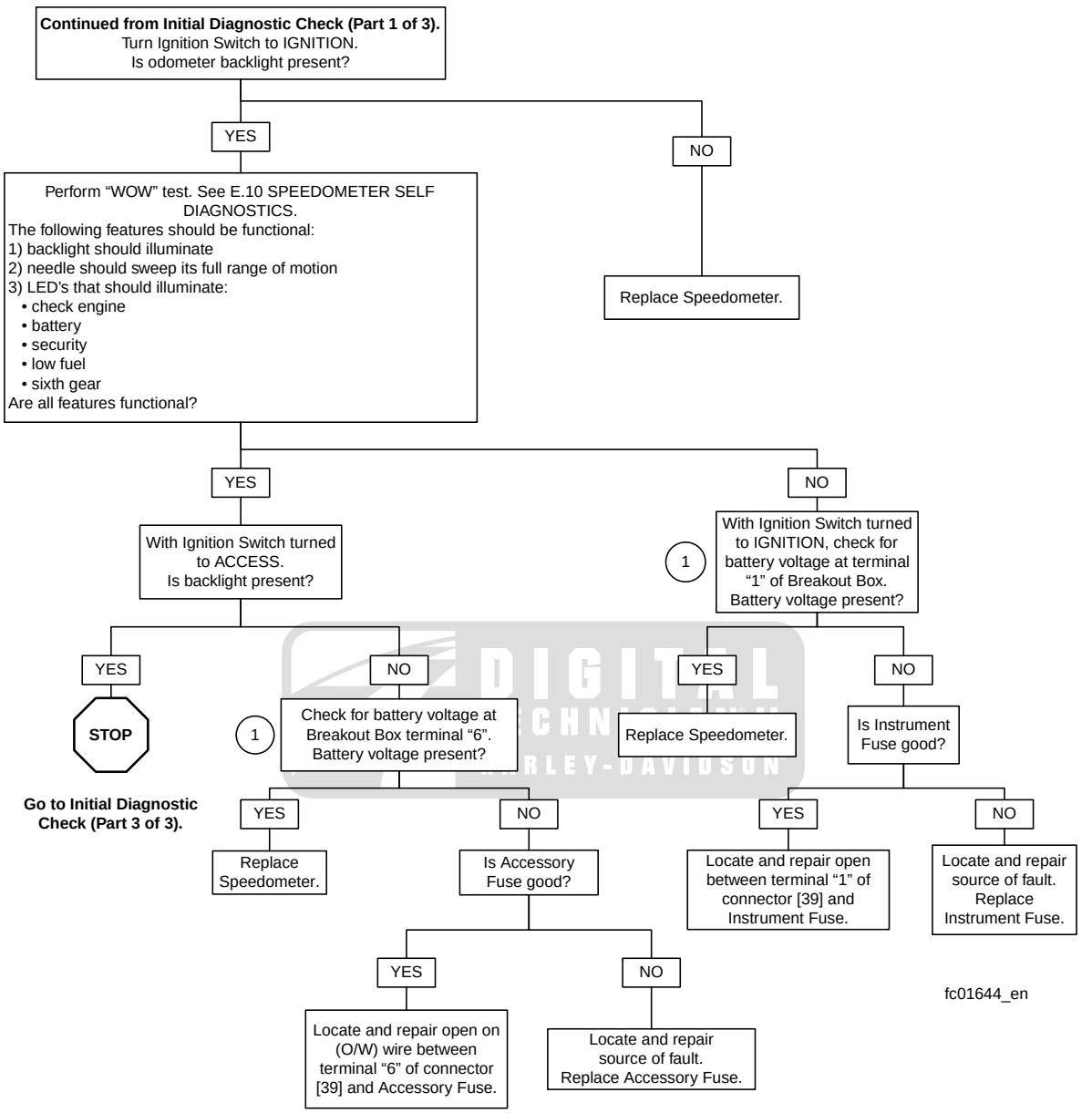
NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	ECM	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS (If equipped)	20-place Molex	Under right side cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

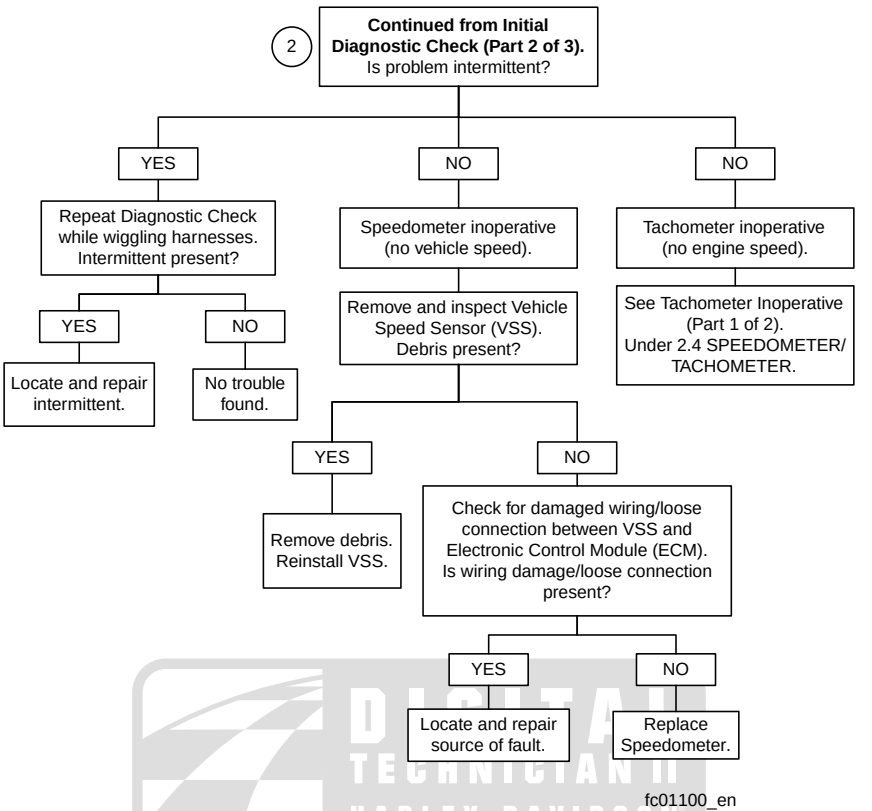
Initial Diagnostic Check (Part 1 of 3)



Initial Diagnostic Check (Part 2 of 3)



Initial Diagnostic Check (Part 3 of 3)



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPEEDOMETER SELF DIAGNOSTICS E.10

GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/TSSM, and Electronic Control Module (ECM) Diagnostic Trouble Codes (DTCs) (diagnostic mode).

DIAGNOSTICS

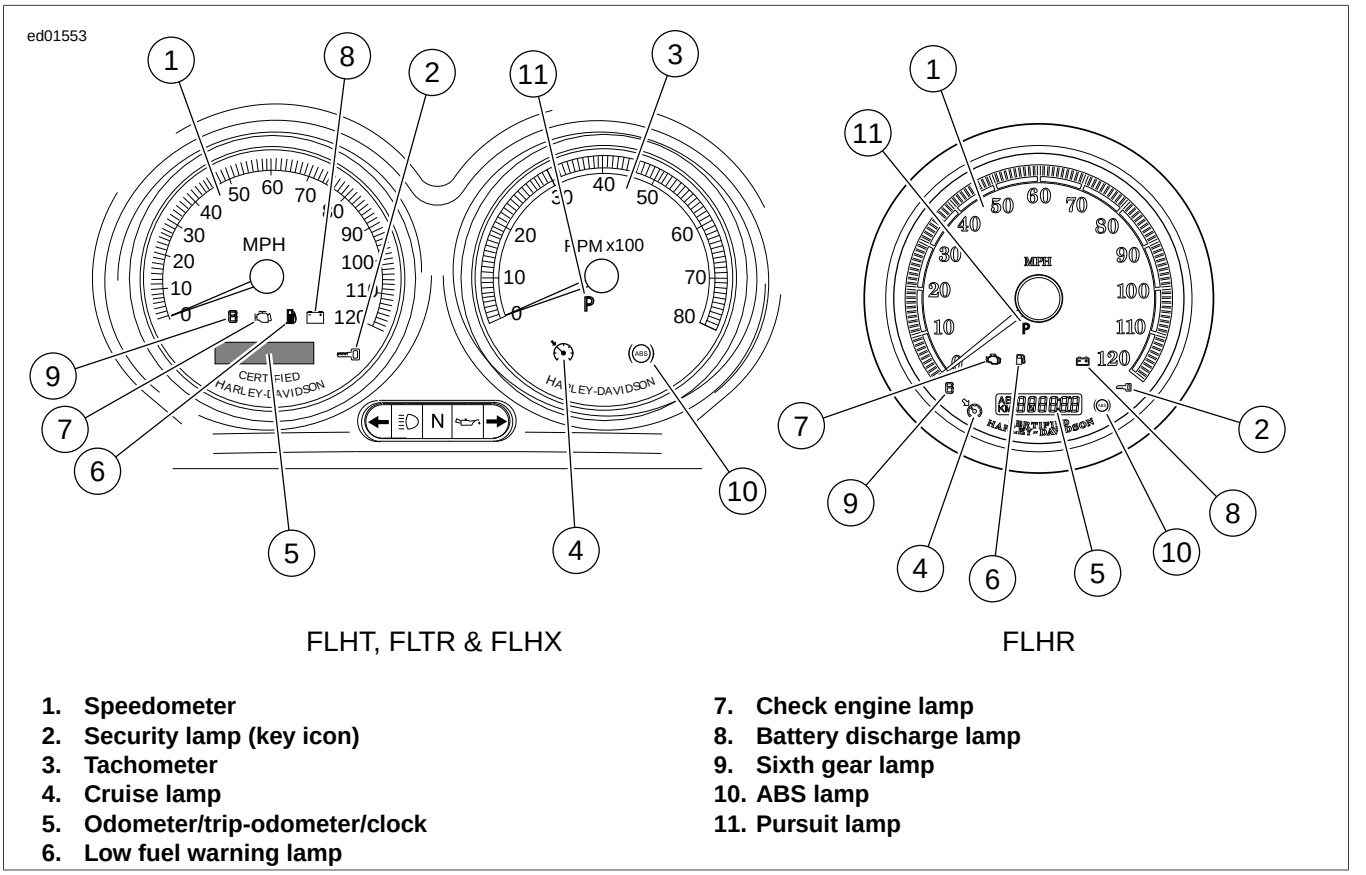
Diagnostic Tips

- For a quick check of speedometer function, a "WOW" test can be performed. Press and hold trip odometer reset switch then turn Ignition Switch ON. Release trip odometer reset switch. See Figure E-12. Background lighting should illuminate, gauge needles should sweep their full range of motion, and indicator lamps (battery, security, low fuel, check engine, ABS, cruise, pursuit and sixth gear) should illuminate. All lamps should illuminate, even those not used in normal vehicle operations.
- If speedometer fails "WOW" test, check for battery, ground, ignition, trip odometer reset switch and accessory wiring to speedometer. If any feature in the speedometer is non-functional, see 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER.

Diagnostic Notes

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

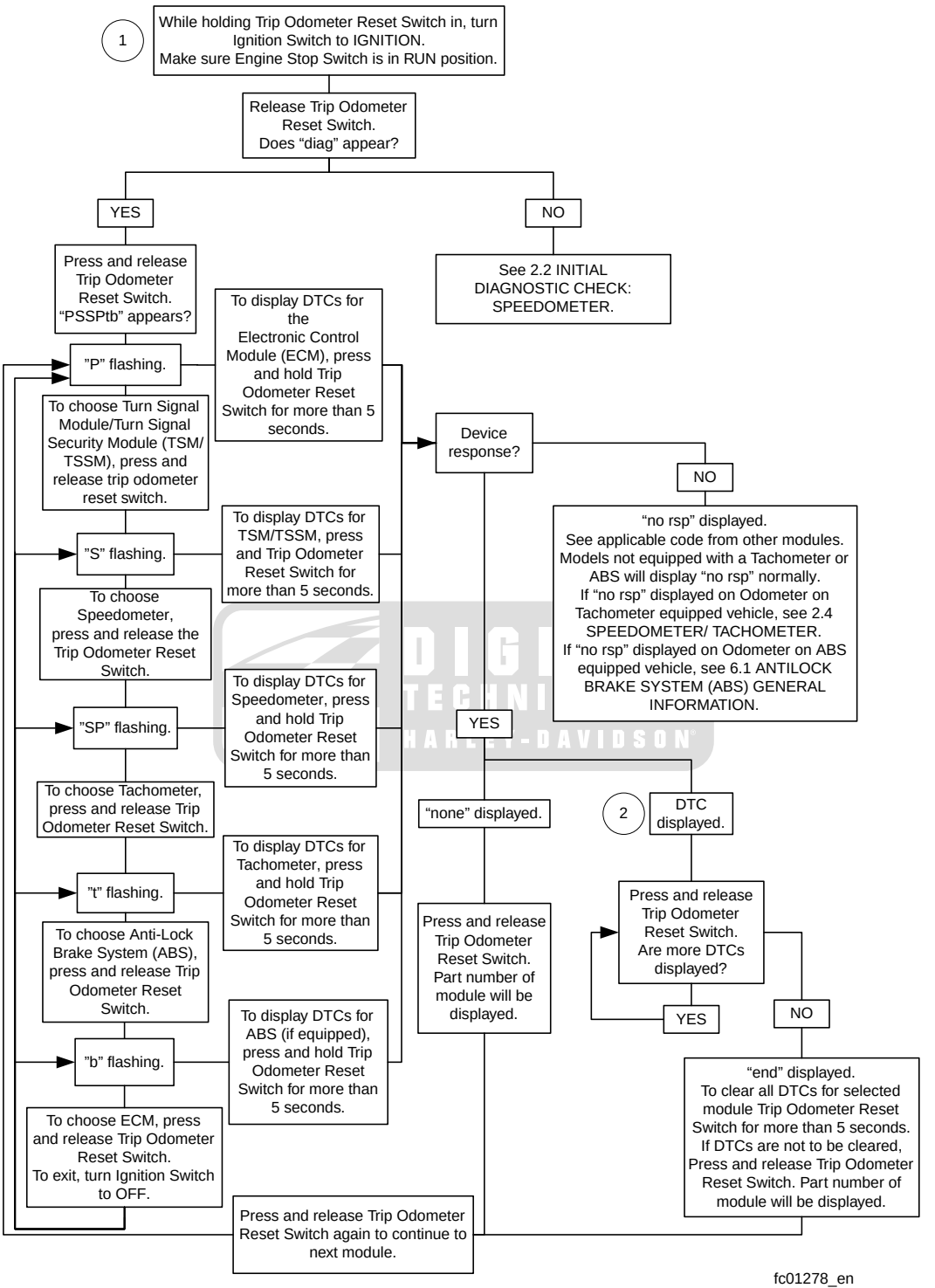
1. To exit diagnostic mode, turn Ignition Switch OFF.
2. To clear DTCs for the selected module, press the trip odometer reset switch for more than 5 seconds when a DTC is displayed. This procedure will clear all DTCs for the selected module.



1. **Speedometer**
2. **Security lamp (key icon)**
3. **Tachometer**
4. **Cruise lamp**
5. **Odometer/trip-odometer/clock**
6. **Low fuel warning lamp**
7. **Check engine lamp**
8. **Battery discharge lamp**
9. **Sixth gear lamp**
10. **ABS lamp**
11. **Pursuit lamp**

Figure E-12. Icons

Speedometer Self Diagnostics



BREAKOUT BOX: TSM/TSSM E.11

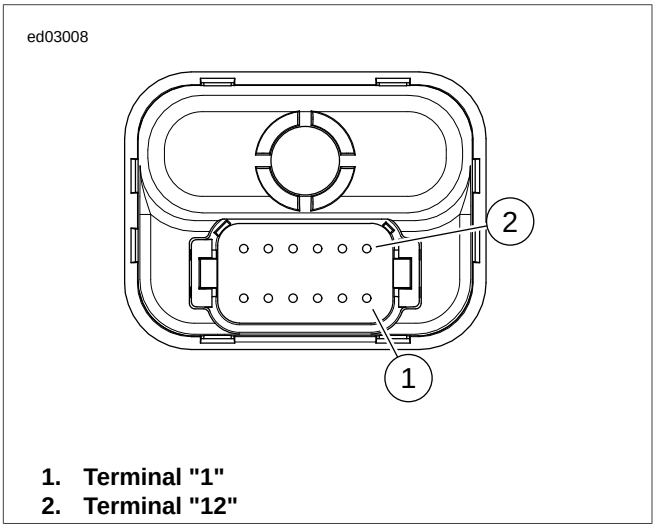
GENERAL

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

The BREAKOUT BOX (Part No. HD-42682) splices into the main harness. Used in conjunction with a digital volt/ohmmeter (DVOM), it allows circuit diagnosis of wiring harness and connections without having to probe with sharp objects.

INSTALLATION

1. Disarm security system
2. Gain access to TSM/TSSM. See Service Manual.
3. See Figure E-13. Depress latches on harness connector [30B].
4. Attach Breakout Box to connector.
   a. Mate gray socket housing on Breakout Box with TSM/TSSM connector [30A].
   b. Mate gray pin housing on Breakout Box with harness connector [30B].



1. **Terminal "1"**
2. **Terminal "12"**

Figure E-13. TSM/TSSM Connector Pins

REMOVAL

1. See Figure E-13. Depress latches on connector [30B].
2. Detach gray Breakout Box connector from TSM/TSSM connector [30A].
3. Detach gray Breakout Box connector from wire harness connector [30B].
4. Reinstall TSM/TSSM. See Service Manual
5. Install parts removed for access.

NOTE

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

Table E-13. TSM/TSSM Connector [30B]

TERMINAL	FUNCTION	TERMINAL	FUNCTION
1	Battery	7	Right turn switch input
2	Ignition	8	Left turn switch input
3	Serial data	9	Start relay control
4	Neutral switch	10	Clutch switch
5	Left turn feed	11	Alarm signal
6	Right turn feed	12	Ground

FAILS TO DISARM (TSSM ONLY) E.12

GENERAL

Security Equipped Vehicles Only

This section applies only to those vehicles equipped with the optional Turn Signal Security Module (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 flow chart.

Job/Time Code Values

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

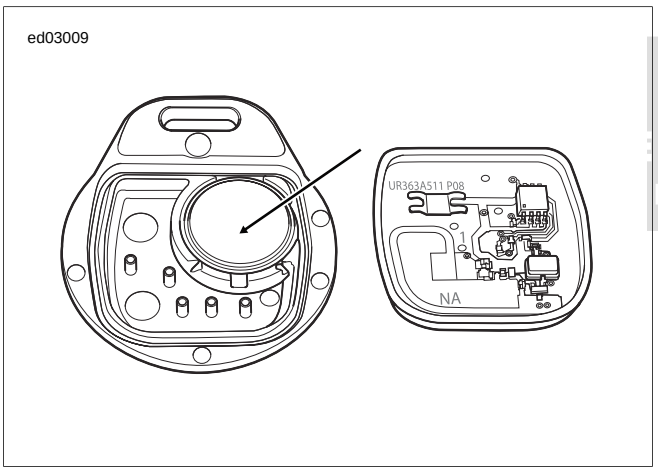


Figure E-14. Key Fob Battery: TSSM

DIAGNOSTICS

Diagnostic Tips

- Verify key fob battery voltage is at least 2.9 volts. See E.23 TSSM MAINTENANCE.
- Interference from physical surroundings may affect RF transmission. Place fob next to left handgrip and disarm with two clicks or move motorcycle to a new location and retest.
- Check for damage to antenna wire. Does left turn signal work?

NOTE

See E.7 ARMING/DISARMING (TSSM ONLY). Use only the proper key fob for your market and TSSM package.

Diagnostic Notes

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

1. After a battery disconnect, the TSSM will not enter the configuration mode on the first attempt. All attempts to assign a fob or enter the configuration mode will require at least two attempts.

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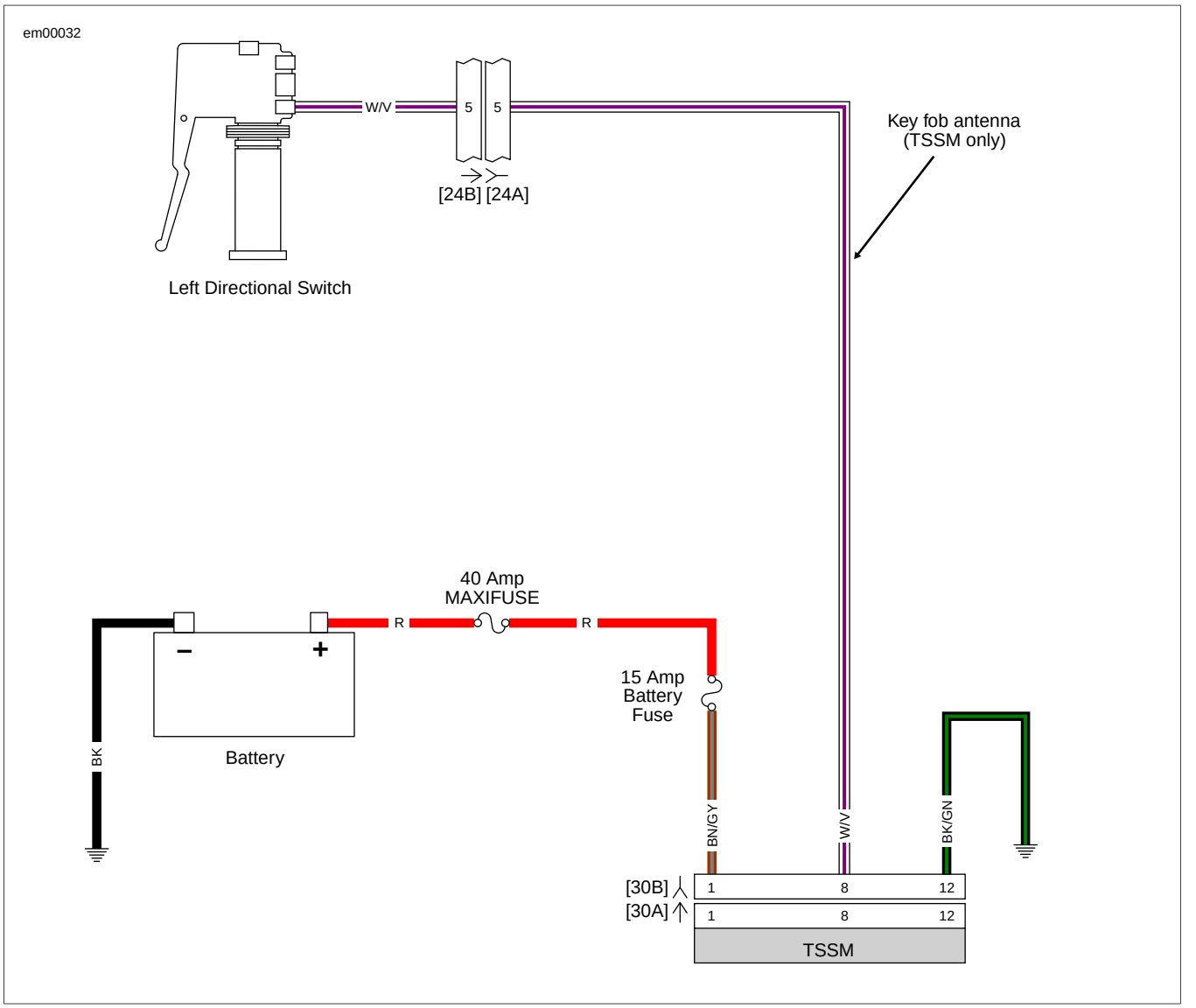
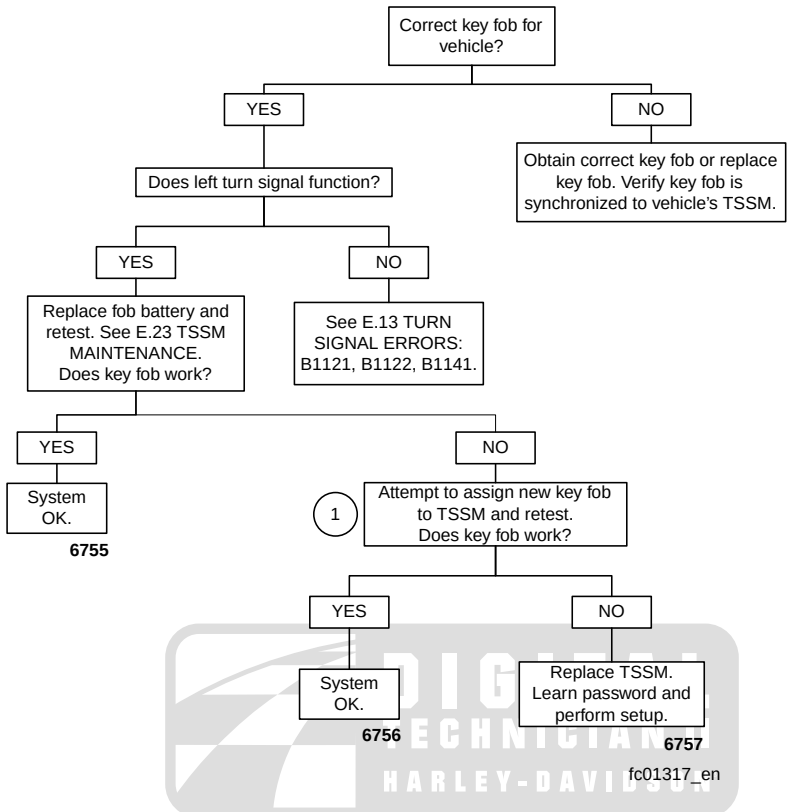


Figure E-15. Antenna Circuit

Table E-14. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (gray)	Inside headlamp nacelle
		FLHX, FLHT/C/U	16-place Molex (gray)	Inner fairing - left fairing support brace
		FLTR	16-place Molex (gray)	Inner fairing - left side of radio bracket
[30]	TSM/TSSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)

Fails to Disarm



TSM/TSSM TURN SIGNAL ERRORS: B1121, B1122, B1141 E.13

GENERAL

The turn signals will automatically cancel either based on the speed/acceleration of the vehicle or based upon turn completion. See E.4 TSM/TSSM TURN SIGNAL FUNCTIONS.

For turn signal diagnostics, refer to Table E-15.

Job/Time Code Values

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

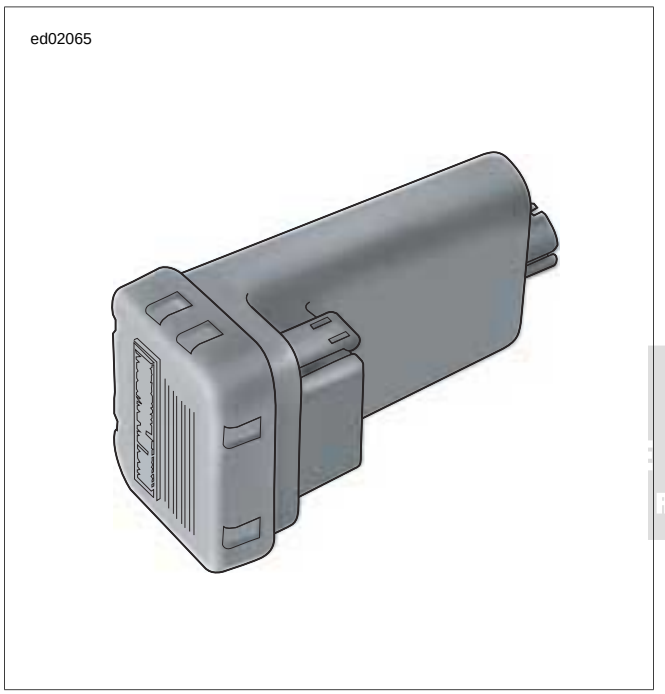


Figure E-16. TSM/TSSM

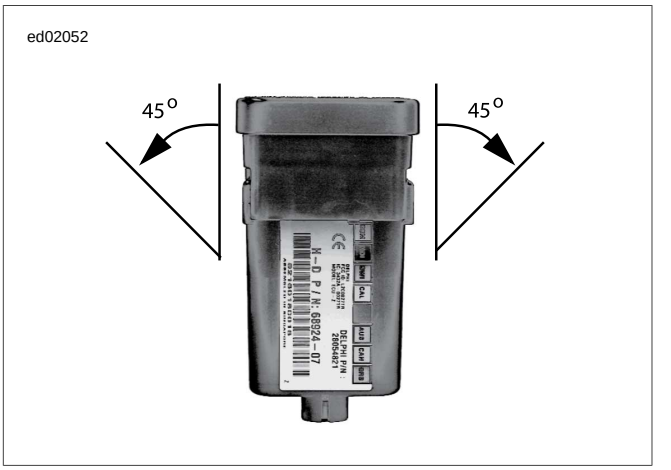


Figure E-17. Tilting TSM/HFSM

DIAGNOSTICS

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

Diagnostic Tips: All

- Diagnostic Trouble Codes (DTCs) B1121 and B1122 will illuminate the security lamp.
- DTC B1141 will not illuminate the security lamp.
- When the TSM/TSSM is in 4-way flasher mode, a fault on either the left or right turn lamp output will not cause either DTC B1121 and DTC B1122 to be set. If fault occurs on both left and right outputs, then both DTC B1121 and DTC B1122 will be set.
- When the TSM/TSSM detects an over current or short to ground condition, it will turn off the turn lamp outputs. The outputs will be automatically reactivated once the fault is removed.

Table E-15. Turn Signal Errors: TSM/TSSM

DTC	SYMPTOM	START WITH FLOW CHART
N/A	Turn signals cancel erratically	Turn Signal Error 1A Cancels Erratically (Part 2 of 2)
B1121, B1122, B1141	Turn signals will not flash, 4-way flashers inoperable	Turn Signal Error 2A Will Not Flash, 4-way Flashers Inoperable: DTC B1121, B1122, B1141
N/A	Turn signals will not cancel upon turn completion	Turn Signal Error 1A Will Not Cancel Upon Turn Completion (Part 1 of 2)
N/A	Left or right turn signals flash at double the normal rate while all bulbs are working	Turn Signal Error 3A Flash at Double Normal Rate, All Bulbs Working

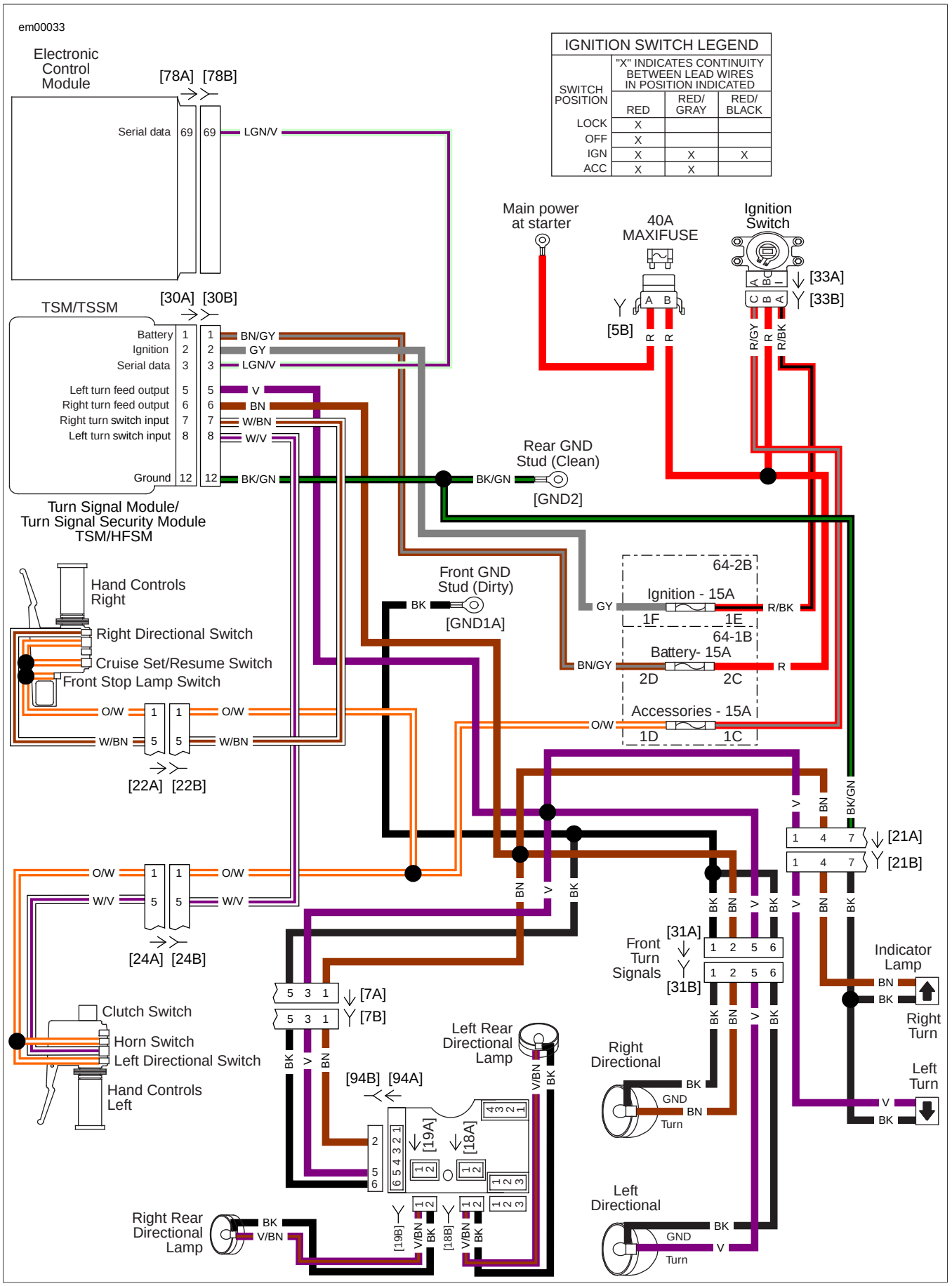


Figure E-18. Turn Signal Circuit (FLHR/C/S)

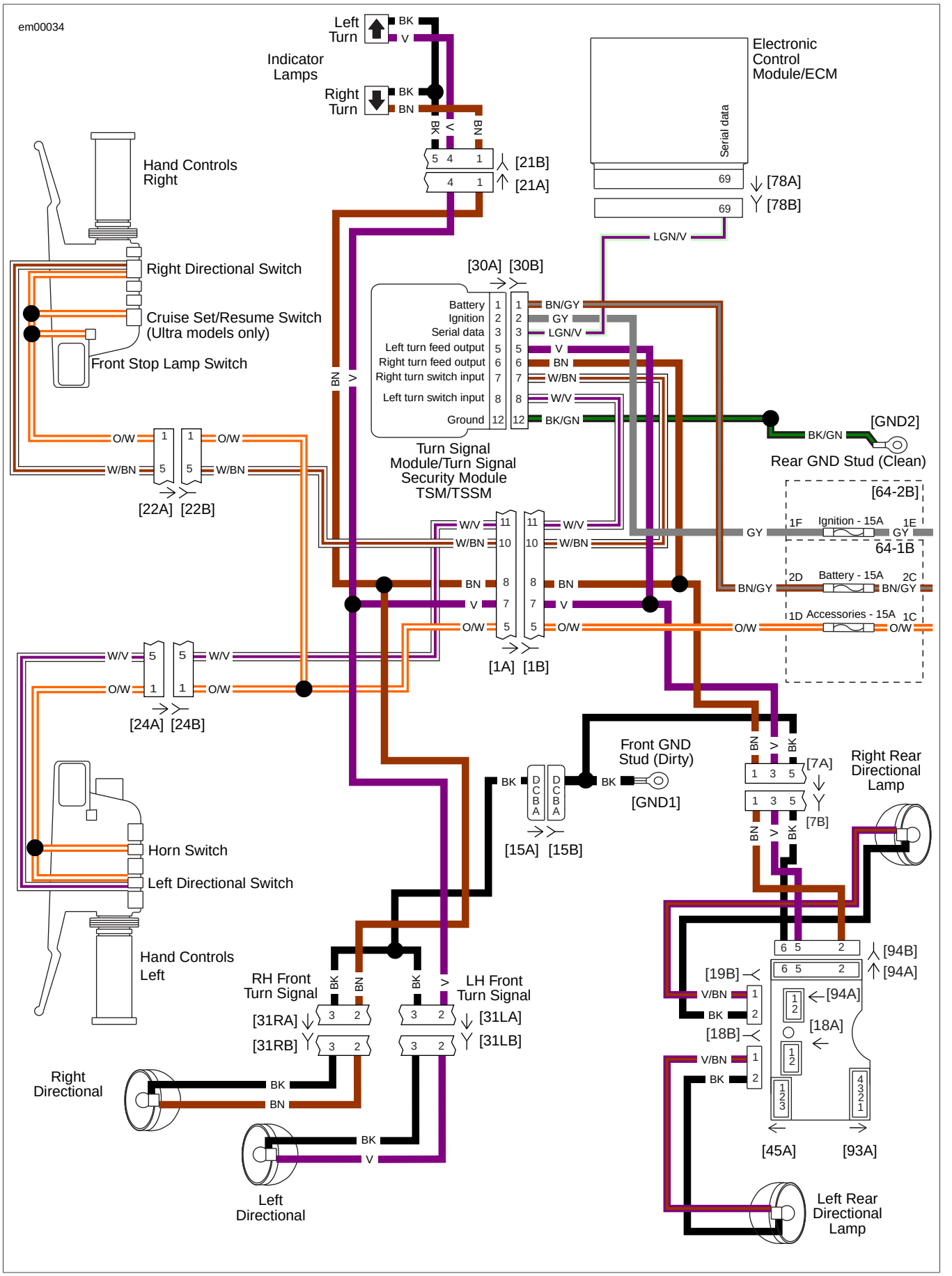


Figure E-19. Turn Signal Circuit (FLHX, FLHT/C/U, FLTR)

Table E-16. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C/U	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[5]	MAXIFUSE	All	2-place Packard	Under left side cover
[7]	Rear fender lights harness	All	8-place Multilock	Top of rear fender (under seat)
[15]	Main to interconnect harness	FLHT/C/U	4-place Packard	Inner fairing - right fairing bracket
		FLTR	4-place Packard	Inner fairing - below radio (right side)
[18]	Left rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[19]	Right rear turn signal	All	2-place Multilock	Circuit board under tail lamp assembly
[21]	Indicator lamps	FLHR/C/S	8-place Deutsch	Under console
		FLHT/C/U	10-place Multilock	Inner fairing - above radio
[22]	Right handlebar switches	FLHR/C/S	6-place Molex (Black)	Inside headlamp nacelle
		FLHT/C/U	12-place Molex (Black)	Inner fairing right fairing support brace
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (Gray)	Inside headlamp nacelle
		FLHT/C/U	10-place Molex (Gray)	Inner fairing left fairing support brace
[30]	TSM/TSSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[31]	Left/right front turn signal/auxiliary lamp	FLHR/C/S	6-place Multilock	Inside headlamp nacelle
		FLHT/C/U	4-place Multilock	Inner fairing left/right fairing support brace
[33]	Ignition Switch	FLHR/C/S	3-place Packard	Under console
		FLHT/C/U	3-place Packard	Inner fairing - under radio
[78]	Electronic Control Module (ECM)	All	36-place Packard	Under seat

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Diagnostic Notes: All Turn Signal Flow Charts

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

1. Gain access to vehicle's TSM/TSSM:
   a. See Figure E-18. Position TSM/TSSM in same orientation it is mounted on vehicle. Turn on Ignition Switch. Turn on 4-way flashers by depressing both left and right turn signal switches simultaneously. Turn Ignition Switch off; 4-way flashers should continue to flash.
   b. Tilt module greater than 45 degrees to the left.
   c. Repeat step a.
   d. Tilt module greater than 45 degrees to the right.
2. To enable diagnostic mode, see E.10 SPEEDOMETER SELF DIAGNOSTICS.
3. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/TSSM connector [30A] and wiring harness connector [30B]. See E.11 BREAKOUT BOX: TSM/TSSM.
4. Closely inspect handlebar controls for pinched wiring.
5. Connect gray HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B) adapters and patch cords to connector [22] (right) or connector [24] (left).

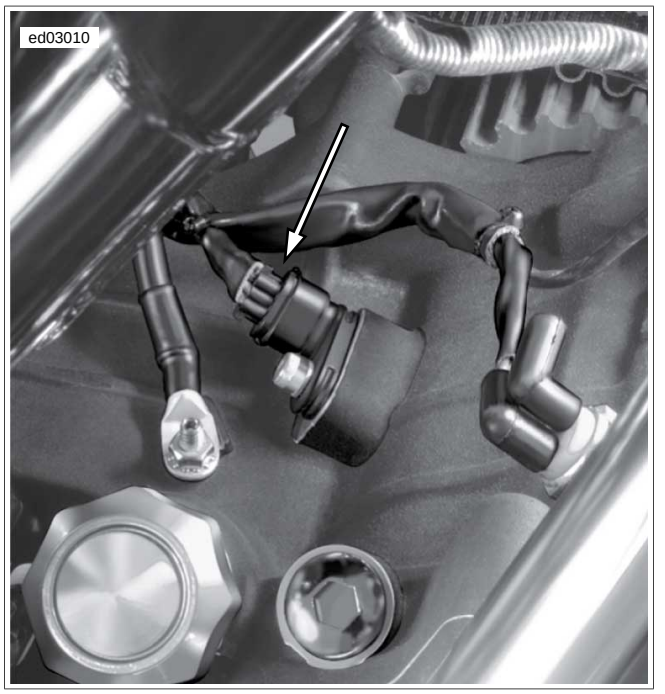
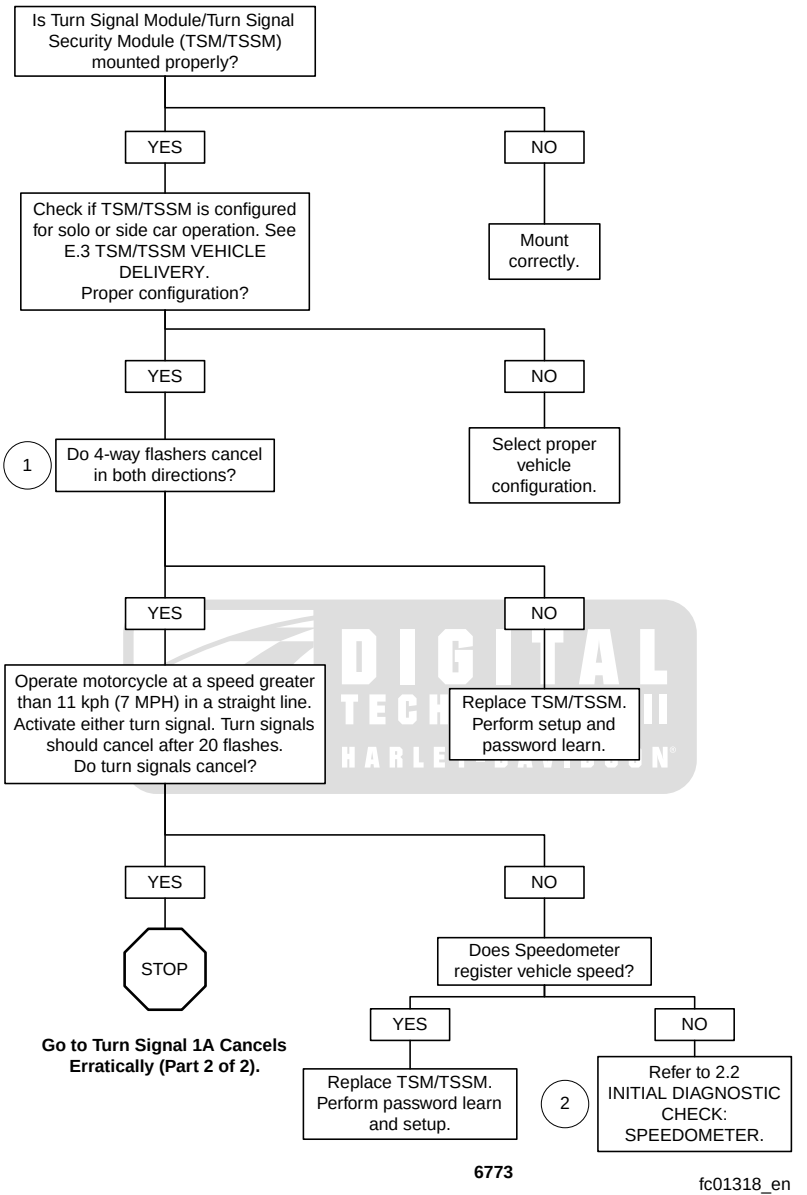


Figure E-20. VSS Location (Under Starter)

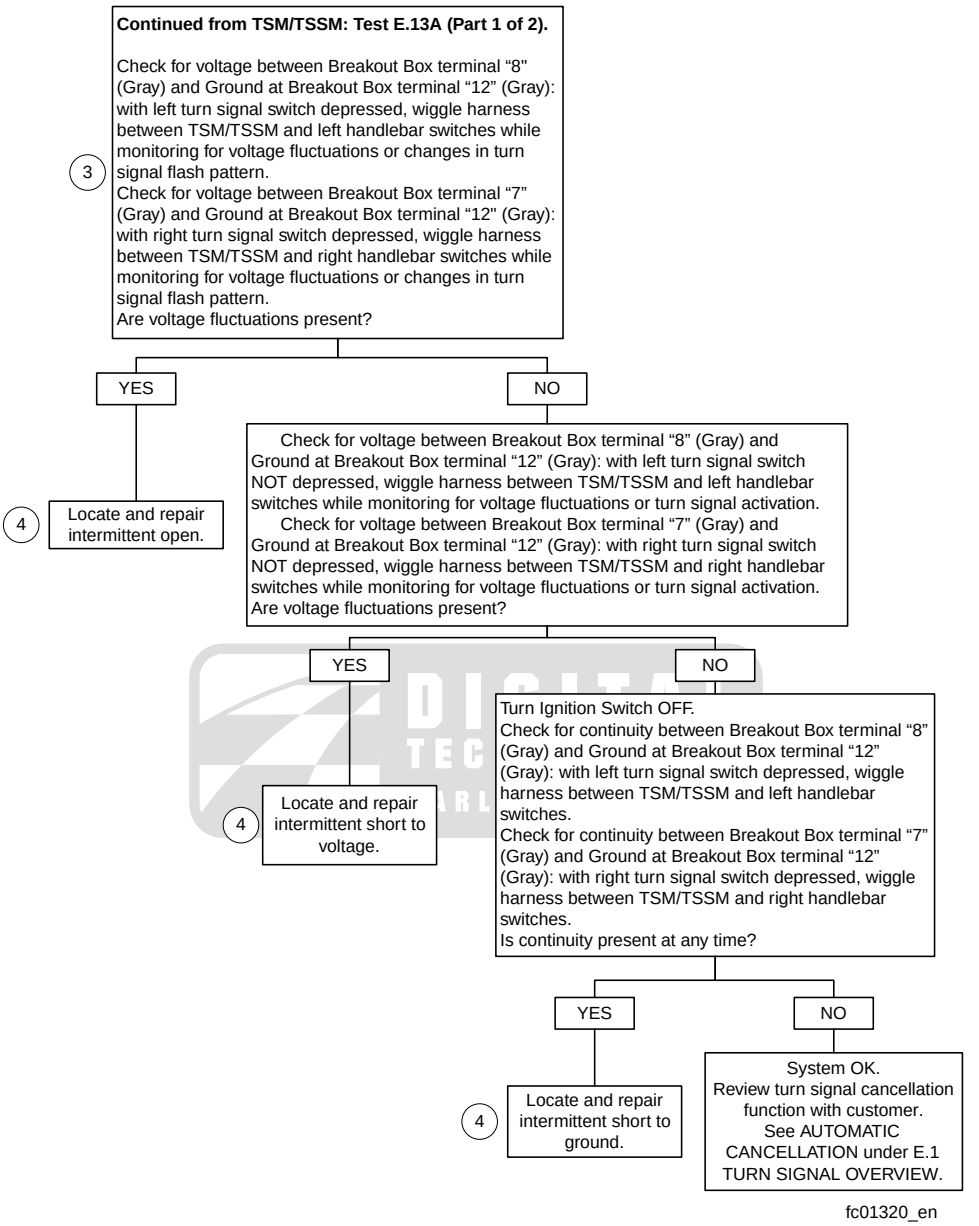
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Turn Signal Error 1A Will Not Cancel Upon Turn Completion (Part 1 of 2)

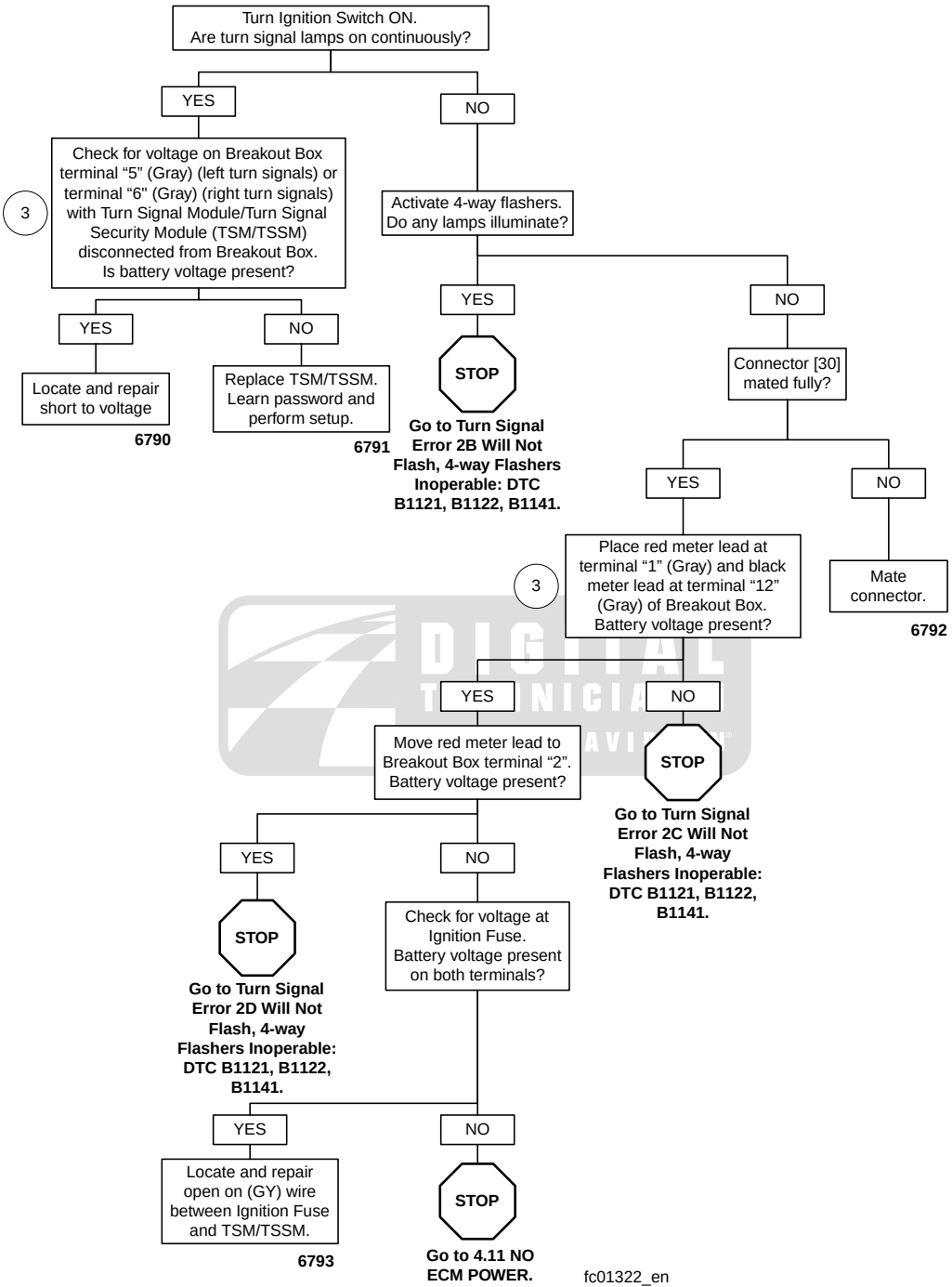


Go to Turn Signal 1A Cancels Erratically (Part 2 of 2).

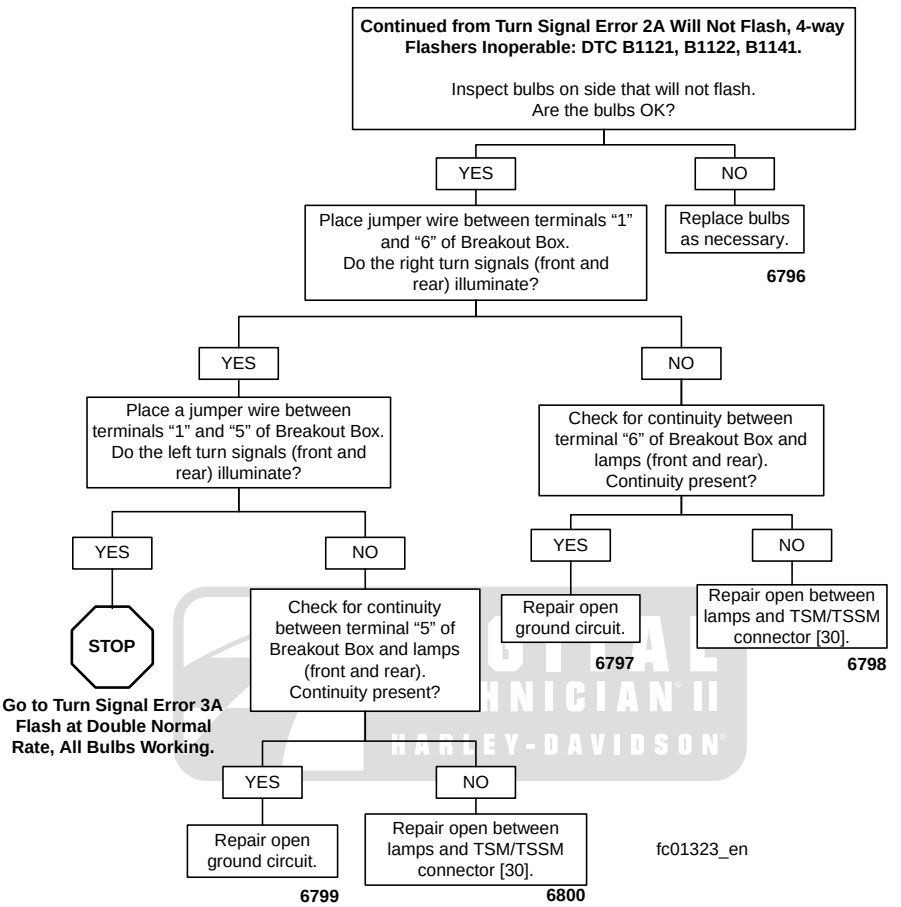
Turn Signal Error 1A Cancels Erratically (Part 2 of 2)



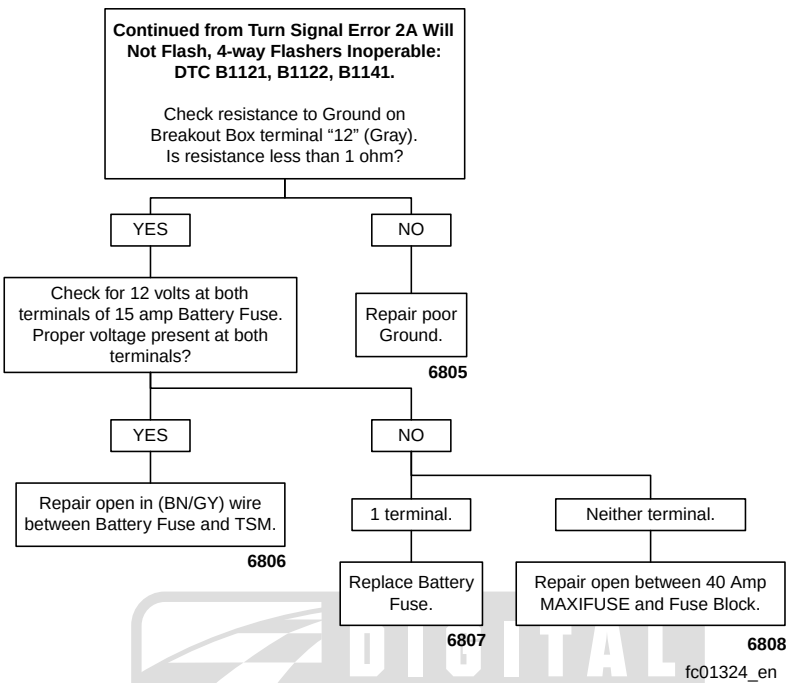
Turn Signal Error 2A Will Not Flash, 4-way Flashers Inoperable: DTC: B1121, B1122, B1141



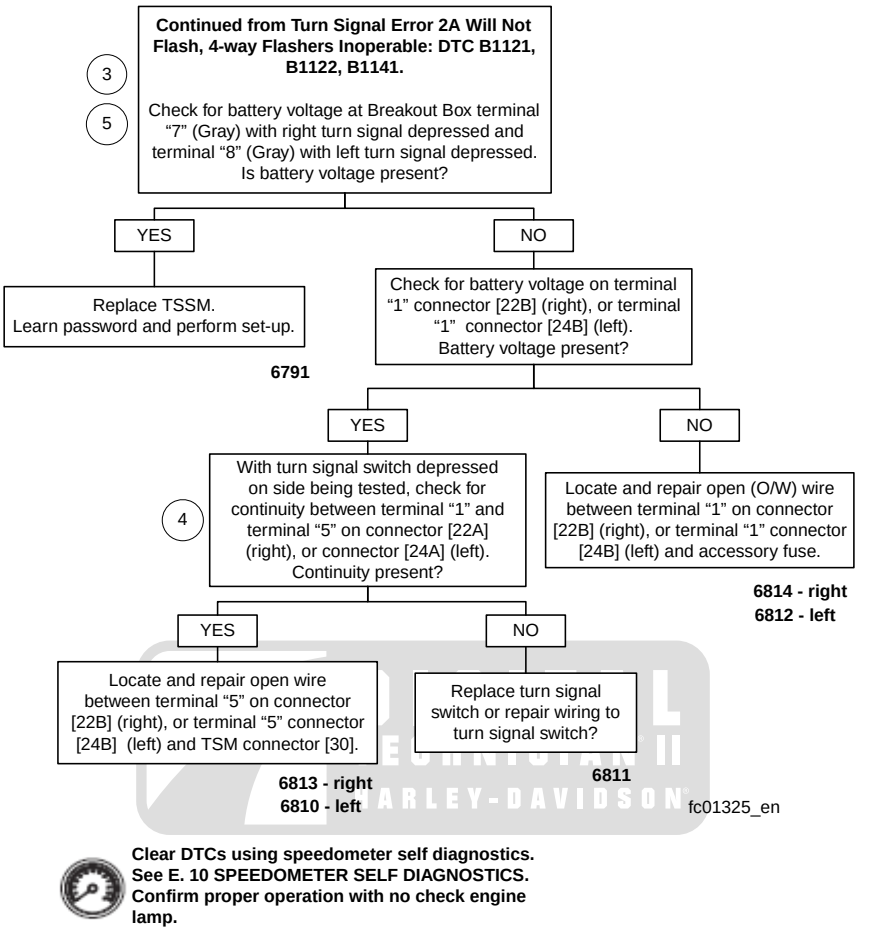
Turn Signal Error 2B Will Not Flash, 4-way Flashers Inoperable: DTC: B1121, B1122, B1141



Turn Signal Error 2C Will Not Flash, 4-way Flashers Inoperable: DTC: B1121, B1122, B1141

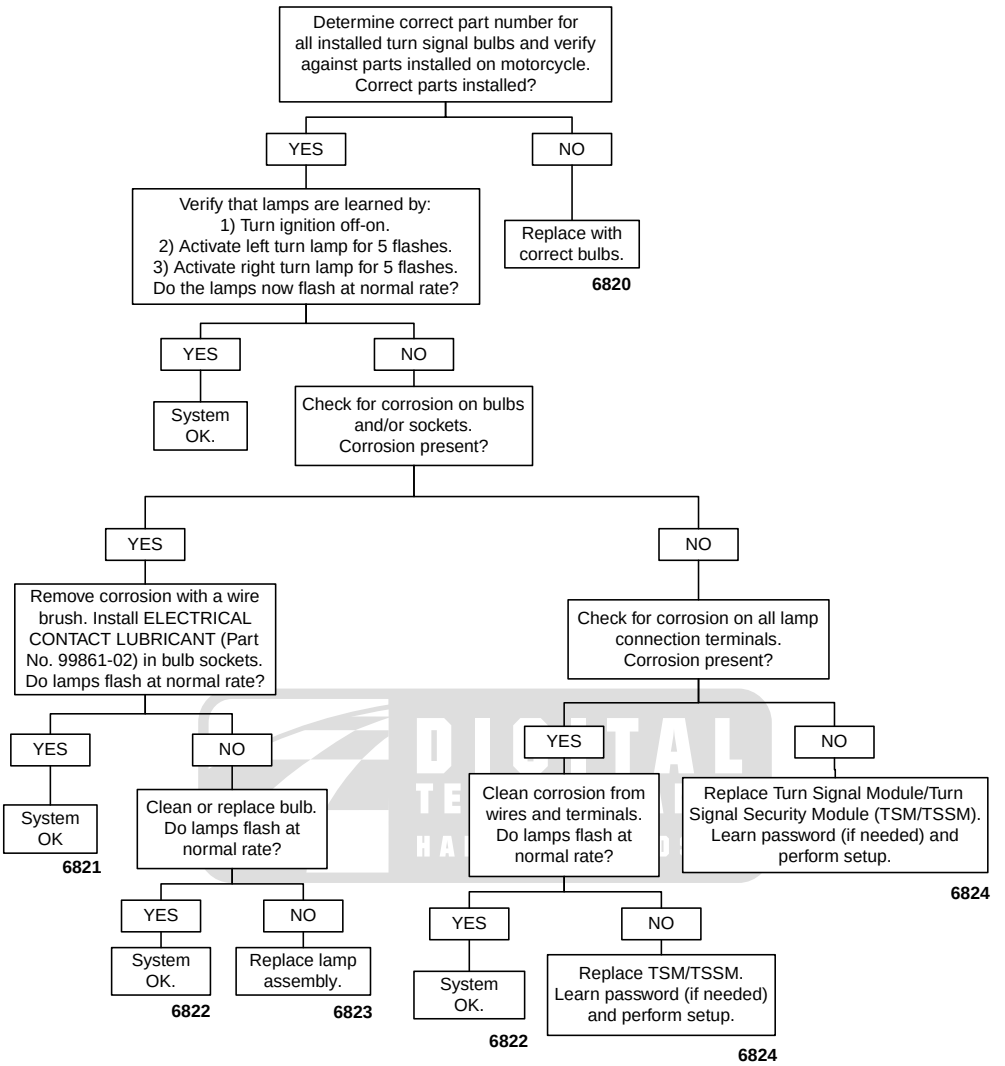


Turn Signal Error 2D Will Not Flash, 4-way Flashers Inoperable: DTC: B1121, B1122, B1141



Clear DTCs using speedometer self diagnostics. See E. 10 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

Turn Signal Error 3A Flash at Double Normal Rate, All Bulbs Working



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DTC B0563 E.14

GENERAL

Battery Voltage High

The TSM/TSSM continually checks the battery voltage during IGN/OFF and IGN/RUN power modes. If the voltage exceeds 16.0 volts for more than 5.0 ±0.5 seconds, the TSM/TSSM sets Diagnostic Trouble Code (DTC) B0563.

DIAGNOSTICS

Diagnostic Tips

- This DTC may set when the vehicle is placed on a battery charger, on fast charge, for a long period of time.
- The TSSM does not illuminate the security lamp when this DTC is set.

Diagnostic Notes

See 1.7 CHARGING SYSTEM tests to correct. Problem may be faulty voltage regulator.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1131, B1132 E.15

GENERAL

NOTE

This section applies only to those vehicles equipped with the optional security system.

Alarm Output Low (DTC B1131) or Alarm Output High (DTC B1132)

See Figure E-21. An alarm cycle is activated when the TSSM is connected, the siren has been armed by the TSSM and a security event occurs. See E.6 SECURITY SYSTEM FUNCTIONS (TSSM ONLY). Under normal armed operation, the siren input (terminal "2") is driven low by the TSSM to trigger the audible alarm. When the siren input is driven high by the TSSM the audible alarm stops.

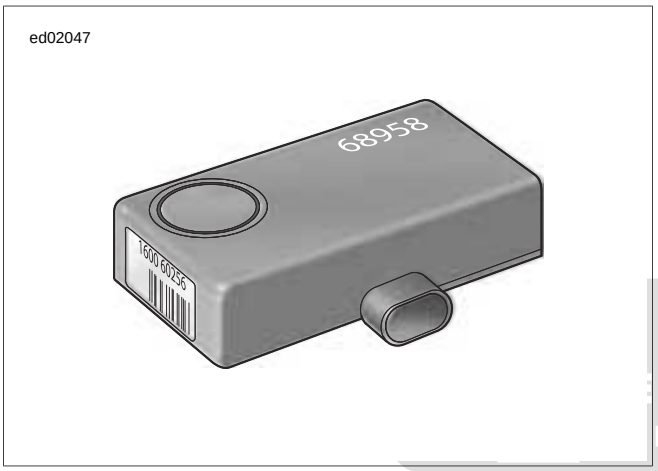


Figure E-21. Security Siren

DIAGNOSTICS

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

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 12.5 volts.
- If the siren does not chirp two or three times on a valid arming command from the TSSM, 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 nine-volt battery, the turn-signal lamps will not alternately flash. If the TSSM 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 to 30 seconds and then turn off for 5 to 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 TSSM output or siren input may be shorted to ground, or the siren vehicle battery connection is open or shorted to ground, or the siren vehicle ground connection is open, or a security event has occurred. See E.6 SECURITY SYSTEM FUNCTIONS (TSSM ONLY) for a description of alarm functions.

Diagnostic Notes

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

1. Use BREAKOUT BOX (Part No. HD-42682) and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord. See E.11 BREAKOUT BOX: TSM/TSSM.
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray socket probe and patch cord.
3. Having the correct multimeter ohm scale is important for this test. Some meters may read infinity for high ohm values. If this is the case, check your ohm scale and retest.

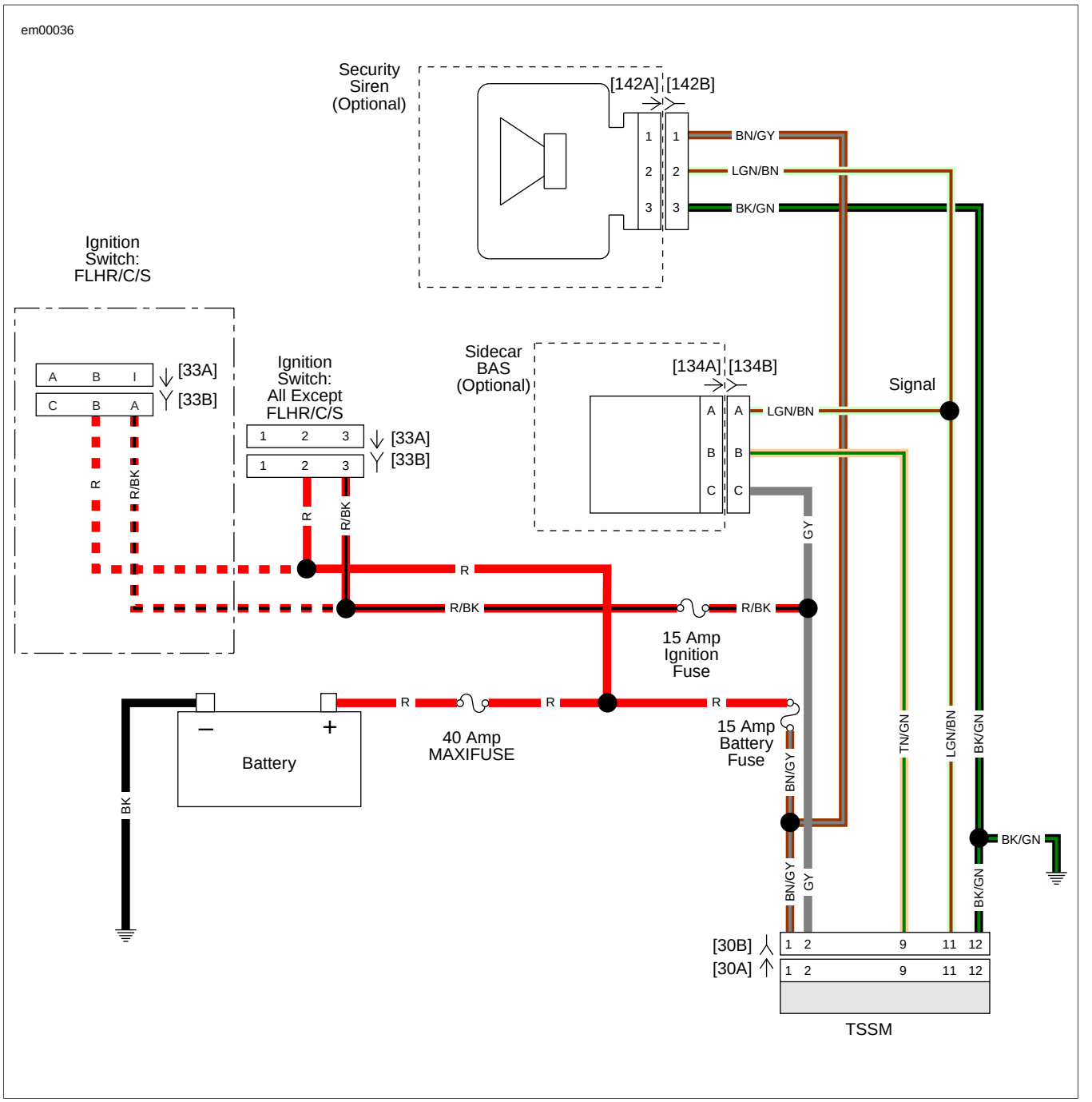
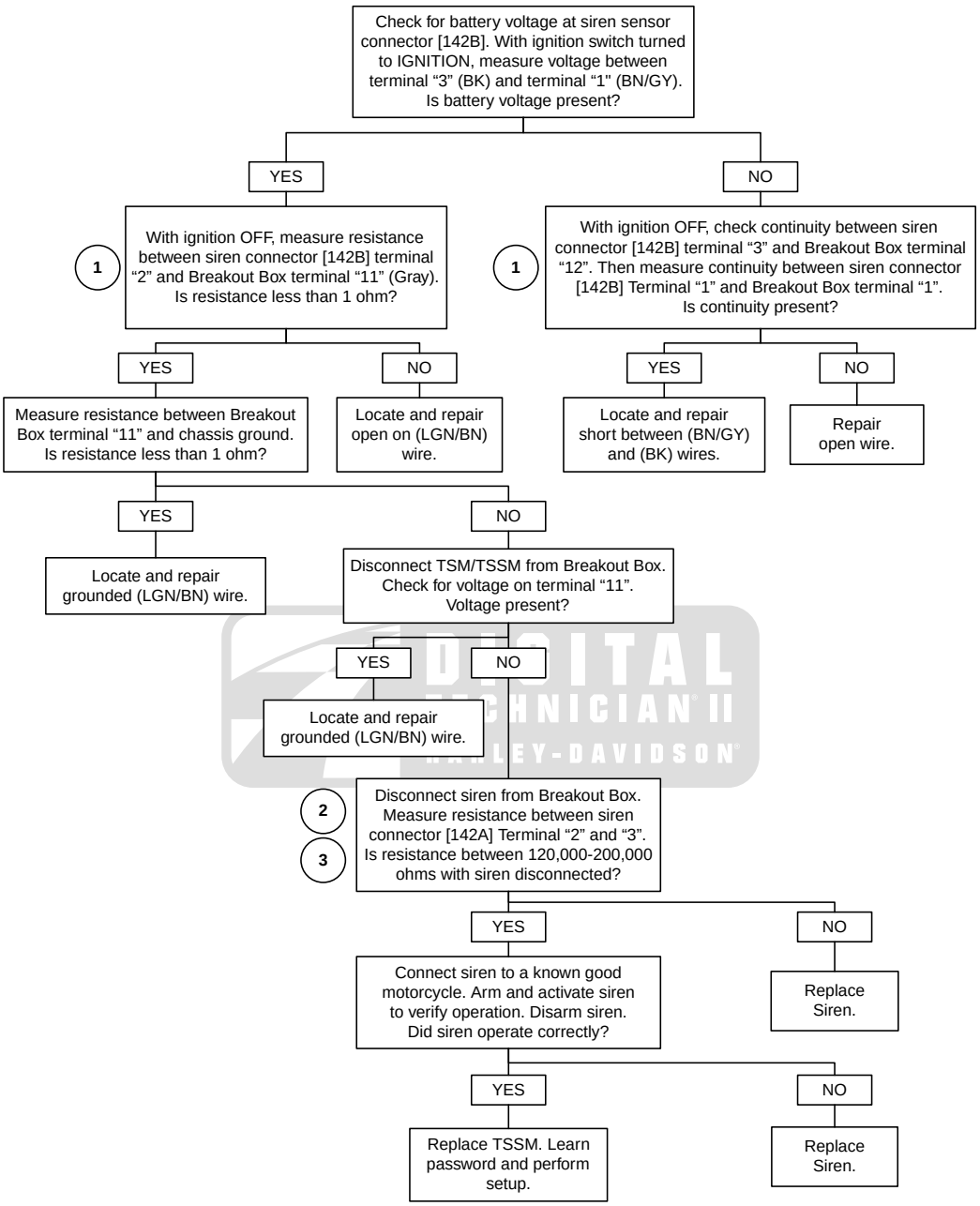


Figure E-22. Siren Circuit

Table E-17. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[142]	Siren	3-place Delphi	Under left side cover (behind fuse box)

Alarm Output Low: DTC B1131; Alarm Output High: DTC B1132



Clear DTCs using speedometer self diagnostics. See E.10 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

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DTC B1134 E.16

GENERAL

Starter Output High

With the TSM/TSSM disarmed, Ignition Switch ON, Engine Stop Switch set to RUN and transmission in neutral of clutch lever pulled in, the start relay is grounded. Battery voltage is applied to the start relay and coil which are grounded through the TSM/TSSM. This Diagnostic Trouble Code (DTC) is set when that ground is not established through the TSM/TSSM.

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) to wire harness connector [30] leaving TSM/TSSM disconnected. See E.11 BREAKOUT BOX: TSM/TSSM.

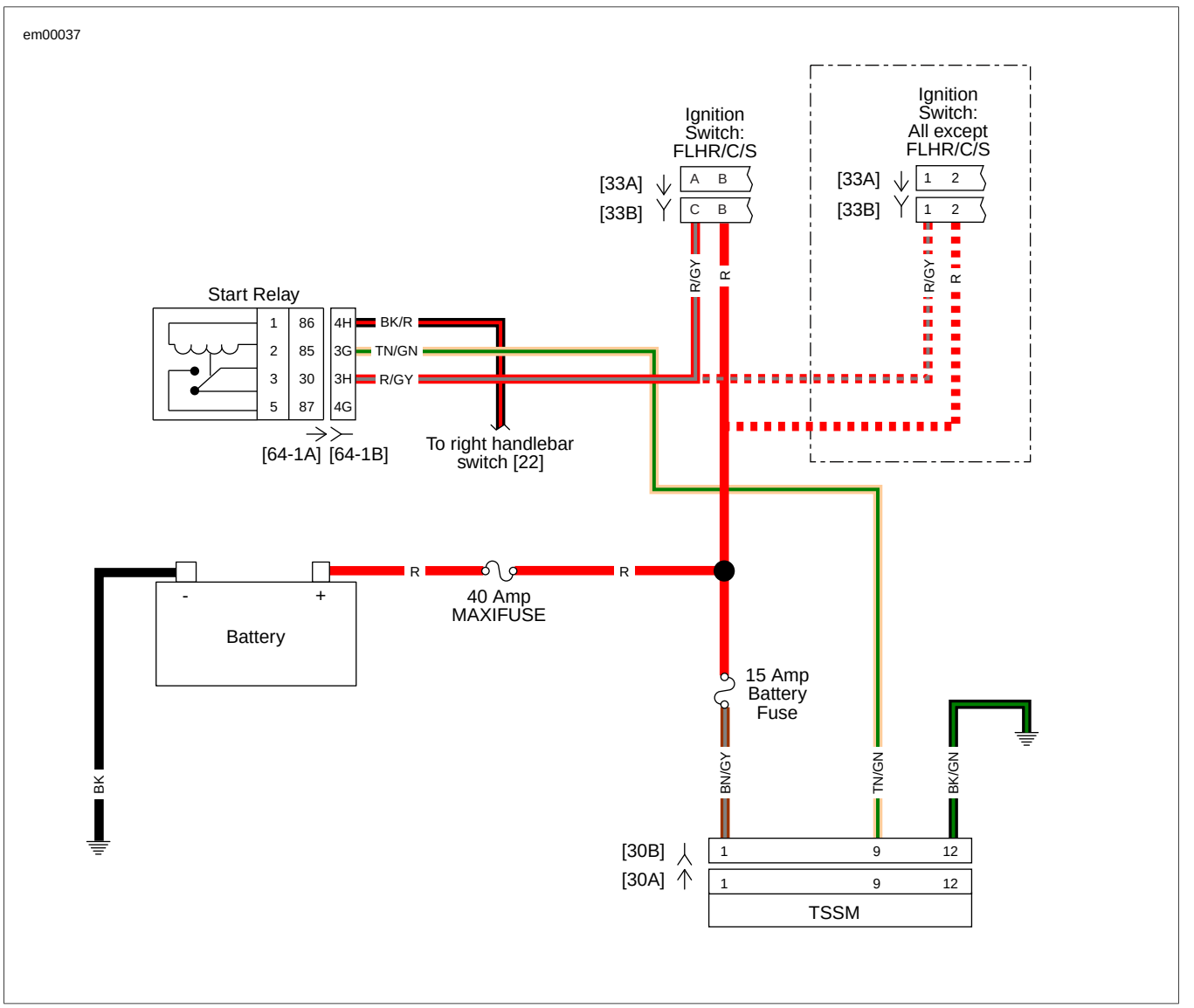


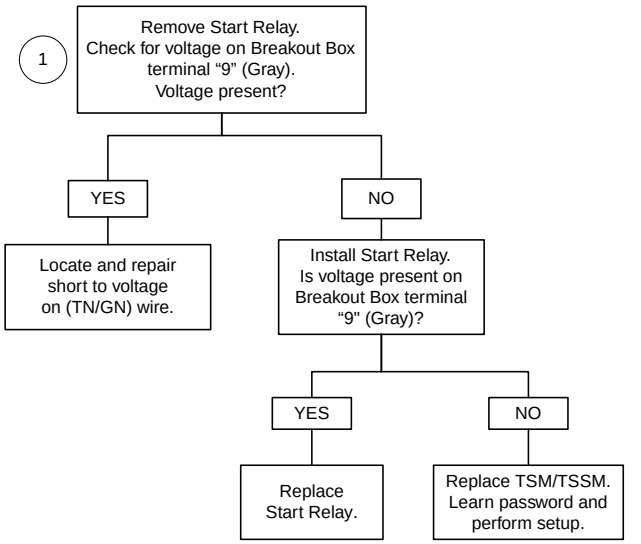
Figure E-23. Starter/TSSM Circuit

Table E-18. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[119]	Start relay	Fuse Block	Fuse block (under left side cover)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Starter Output High: DTC B1134



Clear DTCs using speedometer self diagnostics.
See E. 10 SPEEDOMETER SELF DIAGNOSTICS.
Confirm proper operation with no check engine lamp.

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1135 E.17

GENERAL

Accelerometer Fault: B1135

Diagnostic Trouble Code (DTC) B1135 indicates a failure which requires replacement of the TSM/TSSM.

NOTE

When DTC B1135 is set, the tip-over engine shutdown, TSSM tamper alarm and bank angle sensors are disabled. The security lamp will also illuminate when this code is set.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC B1151, B1152, B1153 E.18

GENERAL

Sidecar Bank Angle Sensor (BAS)

These Diagnostic Trouble Codes (DTCs) are set when a TSM/TSSM is configured for sidecar use and a fault is detected with the sidecar Bank Angle Sensor (BAS).

Table E-19. Code Description

DTC	DESCRIPTION
B1153	Sidecar BAS high
B1151	Sidecar BAS short to ground
B1152	Sidecar BAS short to battery

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-41404-B	HARNESS CONNECTOR TEST KIT
HD-42682	BREAKOUT BOX
HD-44750	DIGITAL TECHNICIAN

Diagnostic Tips

- The smart siren cannot be disarmed when the ignition switch is turned to IGNITION and a bank angle sensor is installed. If the ignition switch triggers the security alarm, then the switch must be turned off to disarm the siren.
- Use DIGITAL TECHNICIAN (Part No. HD-44750) to ensure sidecar learn.
- Ensure that no other circuits are tied to terminal "11" of the TSM/TSSM.
- If a sidecar is installed without the bank angle sensor kit then the TSM/TSSM will continue to operate in Solo mode on a sidecar bike.
- If the bank angle sensor is removed without disabling sidecar learning then the TSM/TSSM will set a DTC until sidecar learning is disabled using DIGITAL TECHNICIAN, or the bank angle sensor is reinstalled.
- The software is designed to prevent the TSM/TSSM from switching to sidecar mode unless the entire system is operating properly (no DTCs set).
- The bank angle sensor cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A sidecar tip-over event cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A short to ground fault cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).
- A short to battery fault cannot be detected **unless** the security function is in the alarm mode (that is, lights flashing, siren sounding).
- An out-of-range fault cannot be detected when the security function is in the alarm mode (that is, lights flashing, siren sounding).

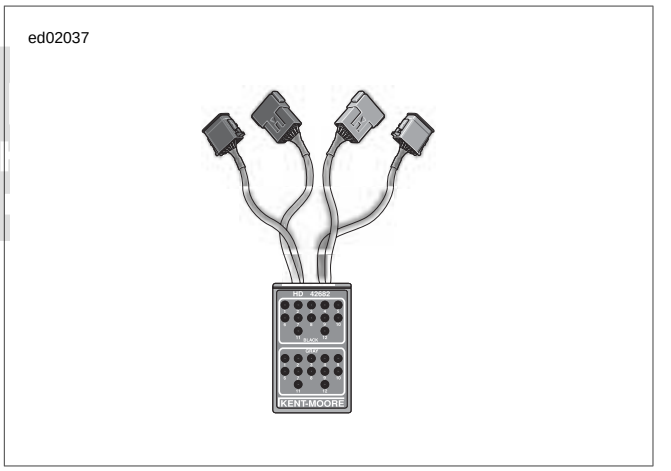


Figure E-24. Breakout Box (Part No. HD-42682)

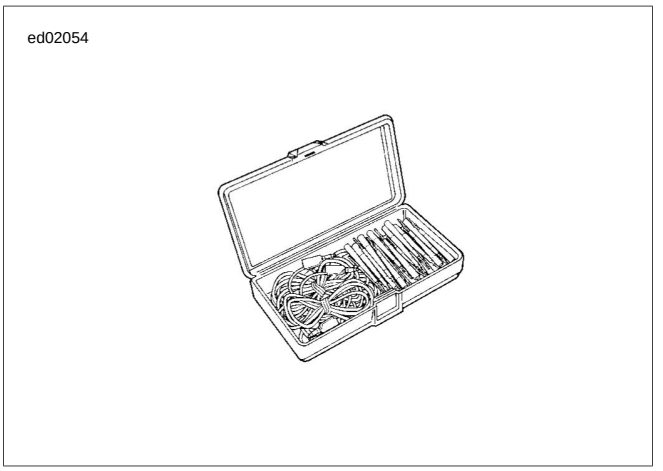


Figure E-25. Harness Connector Test Kit (Part No. HD-41404-B)

Diagnostic Notes

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

1. Use BREAKOUT BOX (Part No. HD-42682) and HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord. 3.12 BREAKOUT BOX: TSM/HFSM
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404-B), gray pin probe and patch cord.

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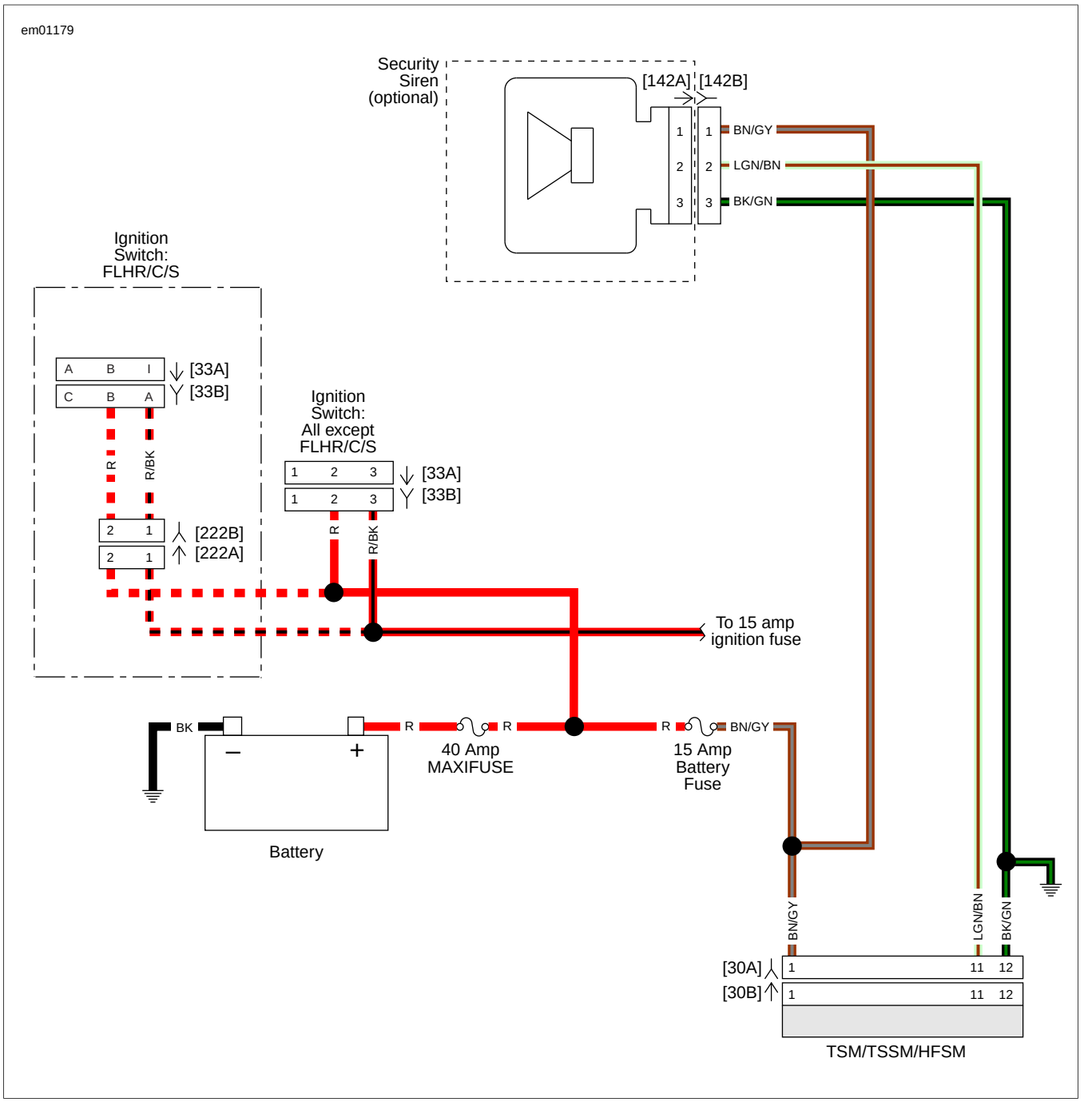
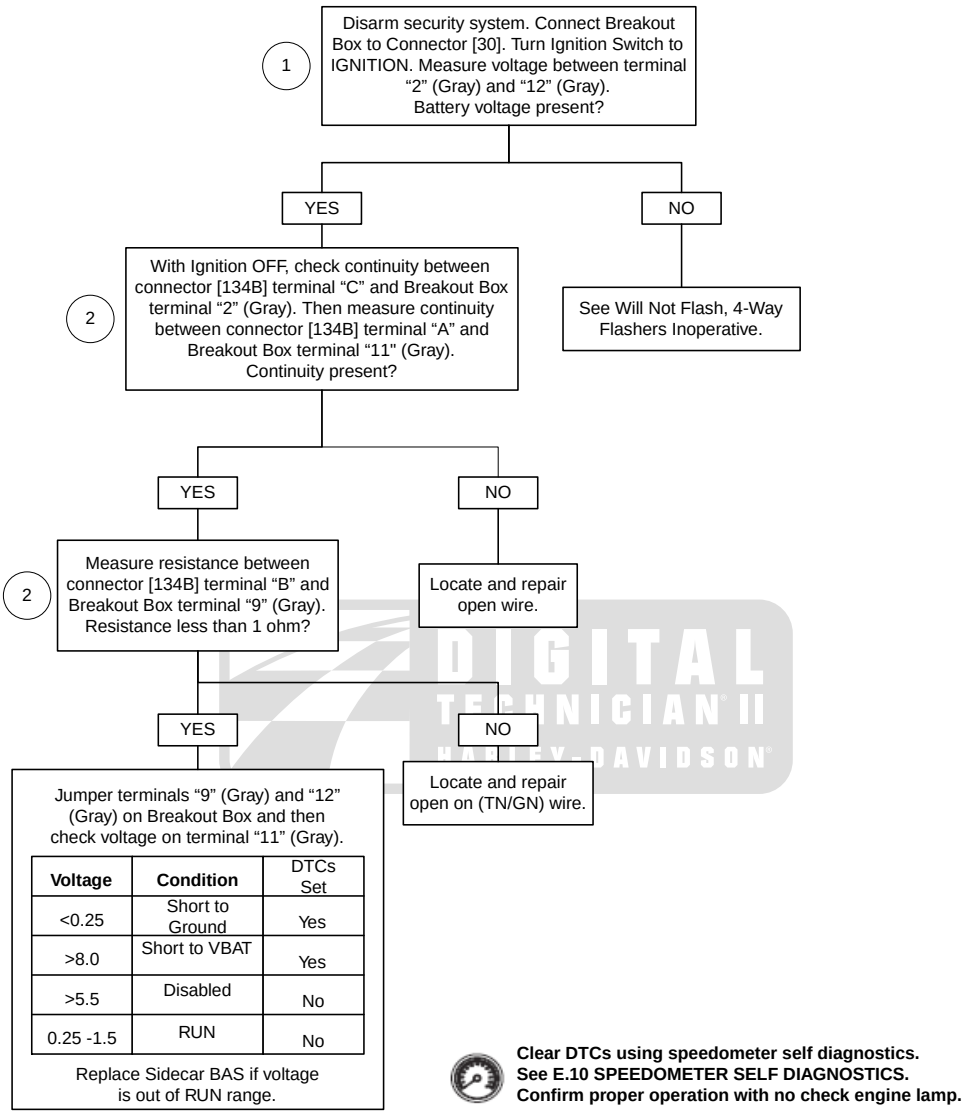


Figure E-26. Siren Circuit

Table E-20. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat
[134]	Sidecar BAS	3-place Packard	Under seat
[142]	Siren	3-place Packard	Under left side cover (behind fuse box)

Sidecar BAS Short-to-Ground: DTC B1151; Sidecar BAS Short-to-Battery: DTC B1152; Sidecar BAS High: DTC B1153



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DTC B1154, B1155 E.19

GENERAL

Diagnostic Trouble Codes (DTCs) B1154 and B1155 may occur if the motorcycle is ridden with the clutch disengaged (pulled in) at speeds greater than 10 MPH (16 KMH)for more than 60 seconds (as in coasting down a long mountain road).

DIAGNOSTIC NOTES

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX

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

1. Connect BREAKOUT BOX (Part No. HD-42682) to TSSM. See E.11 BREAKOUT BOX: TSM/TSSM.
2. If DTC is current (lamp) on continuously, clear codes return during operation), replace HFSM. If DTC is historic, check for intermittents.
3. A reading of several hundred ohms is normal due to the neutral indicator lamp (LED).

Table E-21. Clutch/Neutral Switch DTCs

DTC	DESCRIPTION	GO TO
B1154	Clutch switch short-to-ground	Clutch Switch Short-to-Ground: DTC B1154
B1155	Neutral switch short-to-ground	Neutral Switch Short-to-Ground: DTC B1155

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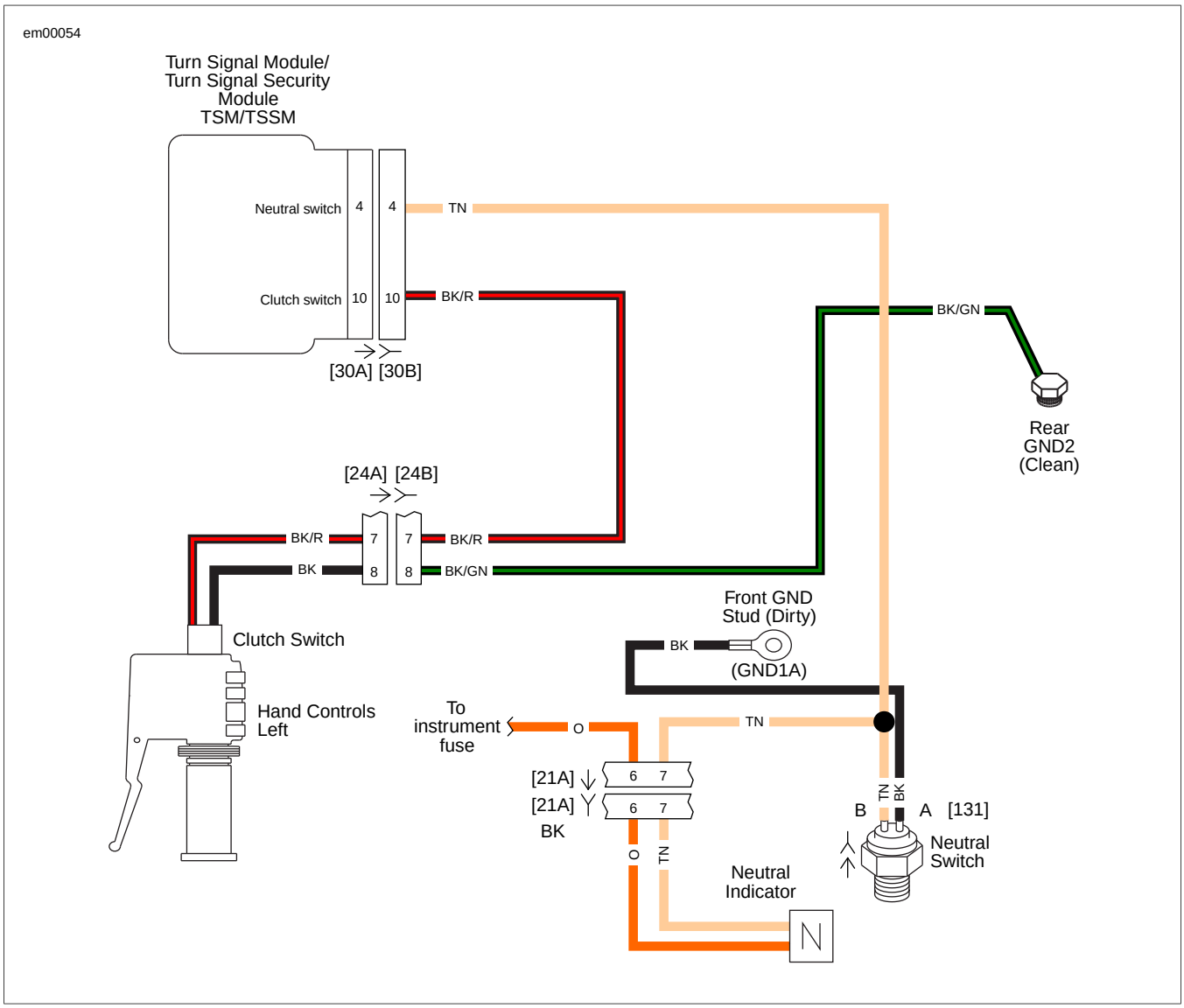


Figure E-27. Clutch and Neutral Interlock Circuits (FLHR/C/S)

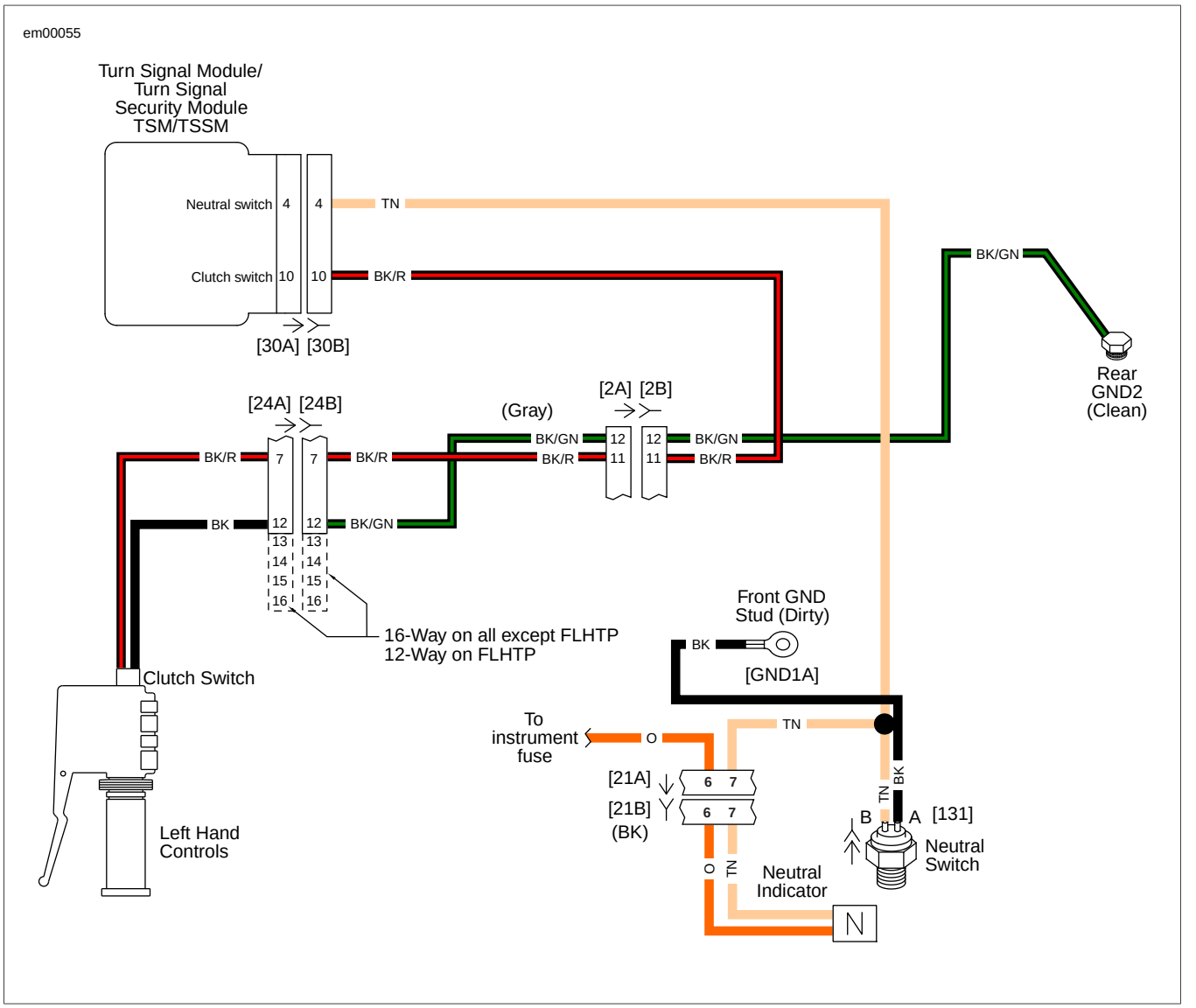
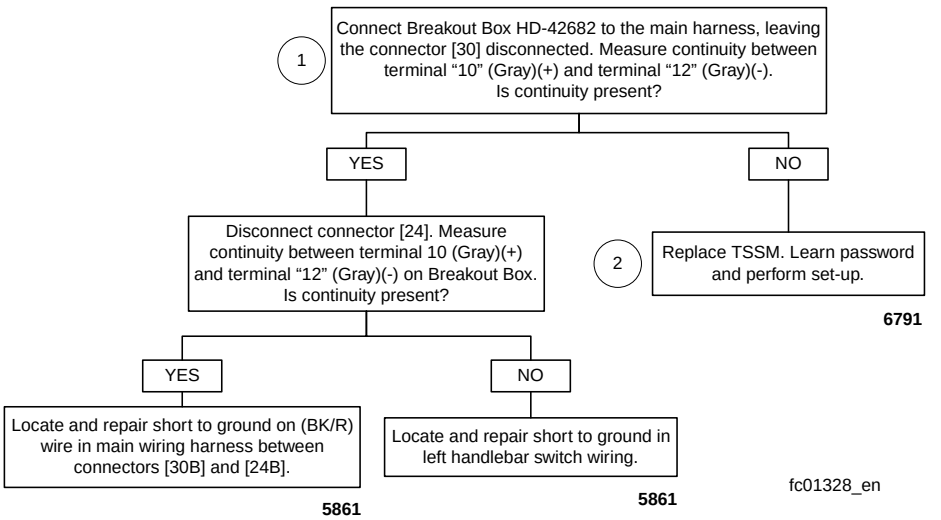


Figure E-28. Clutch and Neutral Interlock Circuits (FLHX, FLHT/C/U, FLTR)

Table E-22. Wire Harness Connectors

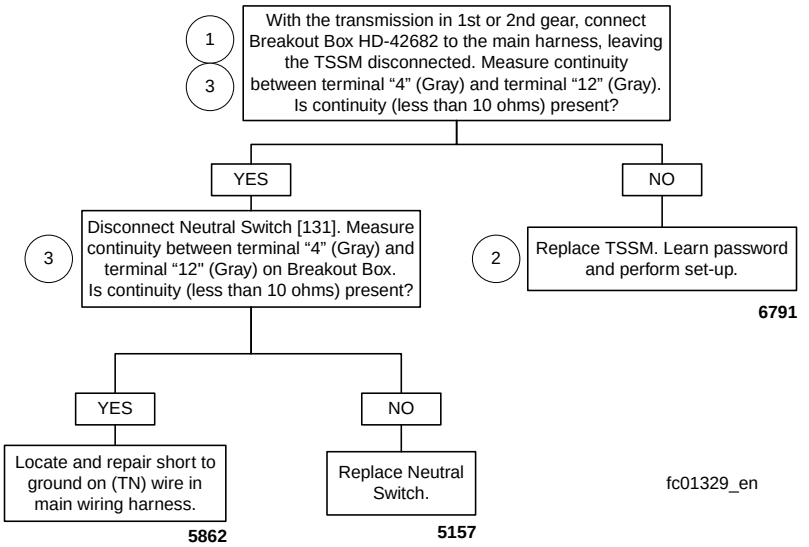
NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[21]	Indicator lamps	FLHR/C/S	8-place Delphi	Under console
		FLHT/C/U/R	8-place Delphi	Inner fairing - above radio
[24]	Left handlebar switches	FLHR/C/S	8-place Molex (gray)	Inside headlamp nacelle - fork stem nut lock plate
		FLHT/C/U/R	16-place Molex (gray)	Inner fairing - left fairing support brace
[30]	TSM/TSSM	All	12-place Deutsch	Crossmember at rear of battery box (under seat)
[131]	Neutral switch	All	Post terminals	Top of transmission (right side)

Clutch Switch Short-to-Ground: DTC B1154



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Neutral Switch Short-to-Ground: DTC B1155



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DTC U1016 E.20

GENERAL

Loss of ECM Serial Data

See Figure E-29. The serial data connector provides a means for the Electronic Control Module (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. A Diagnostic Trouble Code (DTC) U1016 indicates that the ECM is not capable of sending this state of health message. A DTC U1016 also indicates that there was communication on the data bus since power up, but was lost or interrupted during that key cycle.

Table E-23. Code Description

DTC	DESCRIPTION
U1016l	Loss of all ECM serial data



Figure E-29. Electronic Control Module (ECM)

DIAGNOSTICS

PART NUMBER	TOOL NAME
HD-42682	BREAKOUT BOX
HD-43876	BREAKOUT BOX

Diagnostic Notes

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

1. Connect BREAKOUT BOX (Part No. HD-42682) (gray) between TSM/TSSM connector [30A] and wire harness connector [30B]. See E.11 BREAKOUT BOX: TSM/TSSM.
2. Connect BREAKOUT BOX (Part No. HD-43876) between wire harness and ECM. See 4.7 BREAKOUT BOX: EFI.

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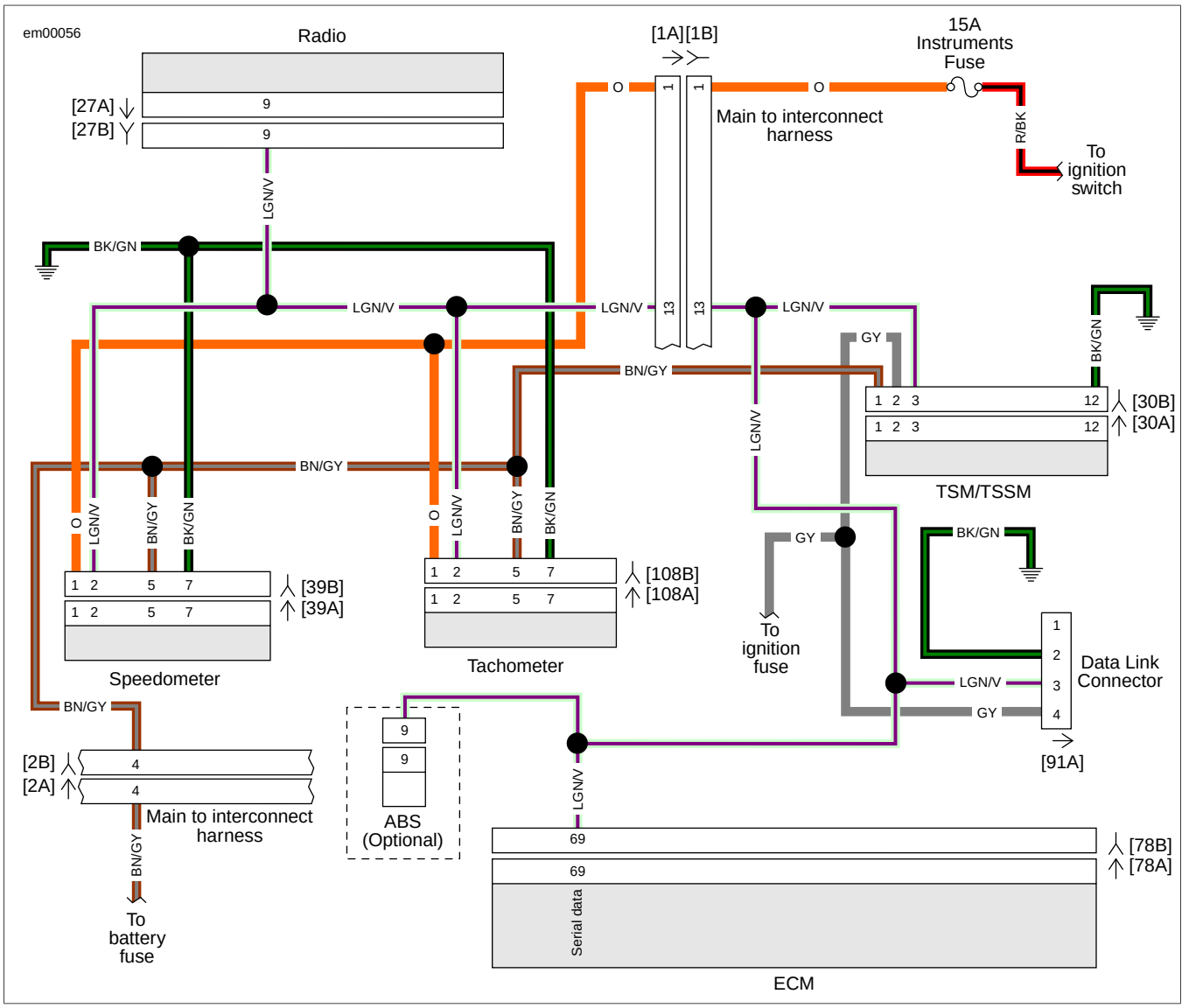


Figure E-30. Serial Data Circuit: FLHX, FLHT/C/U, FLTR

Table E-24. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to interconnect harness	FLHT/C	16-place Molex (Black)	Inner fairing - right radio support bracket
		FLTR	16-place Molex (Black)	Inner fairing - below radio (right side)
[2]	Main to interconnect harness	FLHT/C	12-place Molex (Gray)	Inner fairing - right fairing support brace
		FLTR	12-place Molex (Gray)	Inner fairing - below radio (right side)
[20]	Radio	All	23-place Amp	Inner fairing - back of radio (right side)
[30]	TSM/TSSM	All	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	FLHT/C	12-place Packard	Inner fairing (back of speedometer)
		FLTR	12-place Packard	Under bezel (back of speedometer)
[78]	Electronic Control Module (ECM)	All	73-place Packard	Under seat
[91]	Data link connector	All	4-place Deutsch	Under left side cover

Table E-24. Wire Harness Connectors

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[108]	Tachometer (If equipped)	FLHT/C	12-place Packard	Inner fairing (back of tachometer)
		FLTR	12-place Packard	Under bezel (back of tachometer)
[166]	ABS (if equipped)	All	20-place Molex	Under right side cover

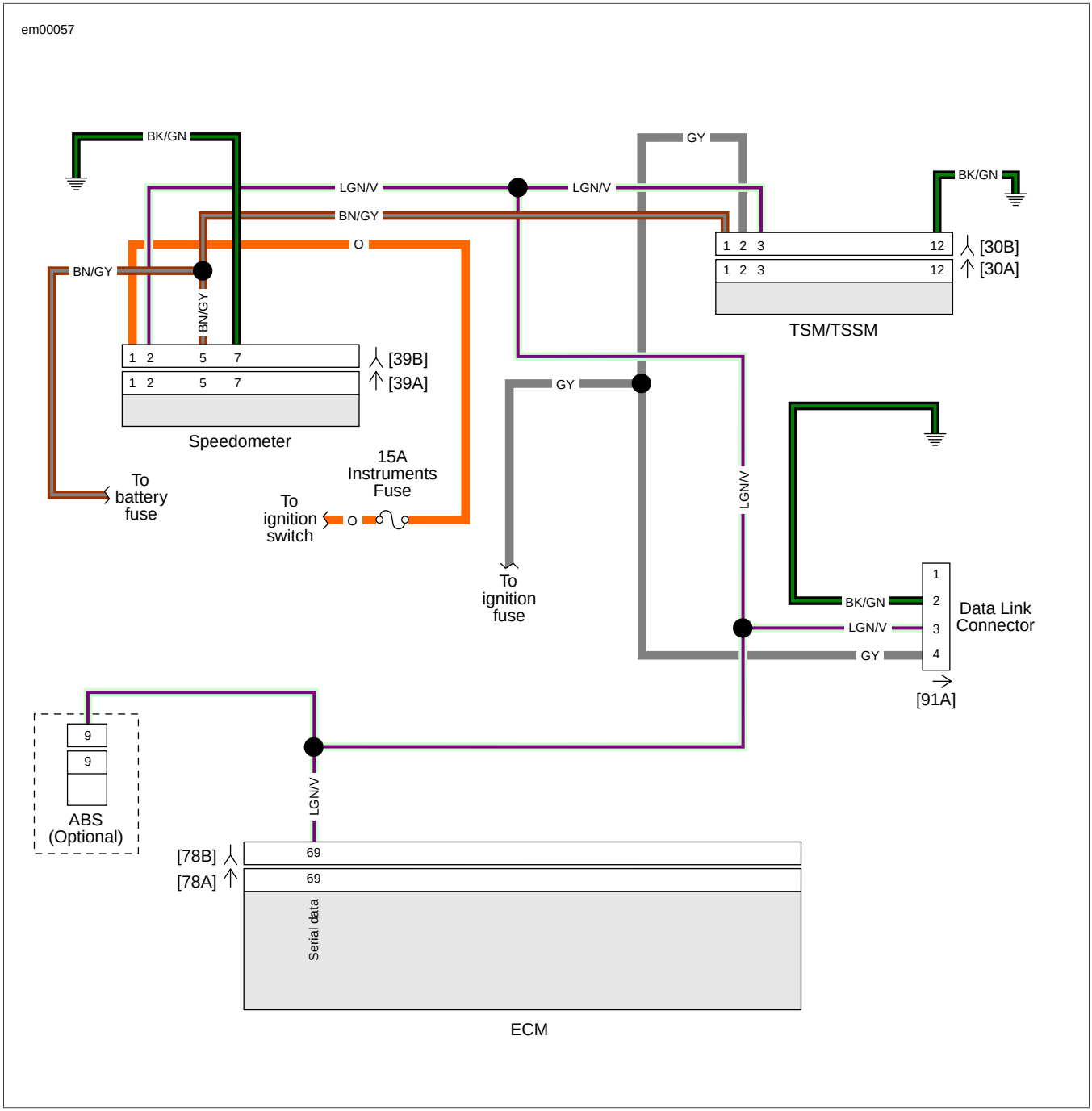


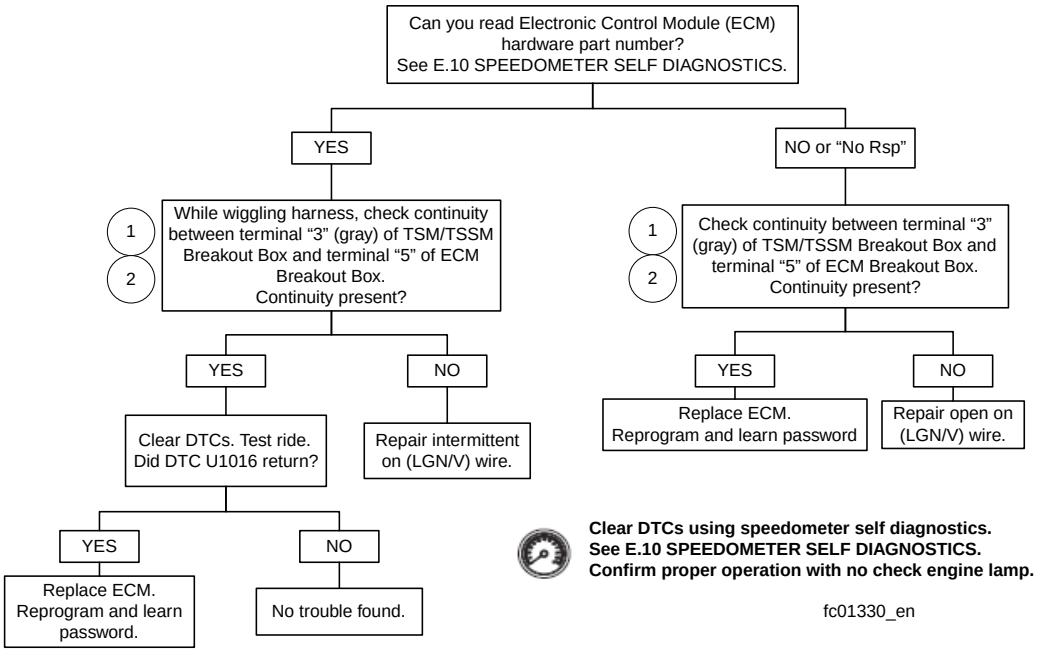
Figure E-31. Serial Data Circuit: FLHR/C/S

Table E-25. Wire Harness Connectors

NO.	DESCRIPTION	TYPE	LOCATION
[30]	TSM/TSSM	12-place Deutsch	Cavity in crossmember at rear of battery box (under seat)
[39]	Speedometer	12-place Packard	Under console (back of speedometer)
[78]	Electronic Control Module (ECM)	73-place Packard	Under seat
[91]	Data link connector	4-place Deutsch	Under left side cover
[166]	ABS (If equipped)	20-place Molex	Under right side cover

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Loss of ECM Serial Data: DTC U1016



DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DTC U1300, U1301 OR BUS ER E.21

GENERAL

Serial Data Low or Serial Data Open/High

The typical serial data voltage range is 0 volts (inactive) to 7 volts (active). Due to the short pulse, voltages will be much lower on a digital/voltmeter (DVOM). In analog mode, a DVOM reading serial data will show continuous voltage when active, typically 0.6 to 0.8 volts. The range for acceptable operations is 0 to 7.0 volts.

Table E-26. Code Description

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



Figure E-32. Electronic Control Module (ECM)

DIAGNOSTICS

Diagnostic Tips

- If serial data is shorted, these Diagnostic Trouble Codes (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.

Diagnostic Notes

If a U1300, U1301 or "BUS Er" is present, perform diagnostic procedures listed in 4.12 STARTS, THEN STALLS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TSM/TSSM: PASSWORD LEARN E.22

GENERAL

If the ECM or TSM/TSSM is faulty, follow the instructions in the Service Manual for ECM or TSM/TSSM replacement. Then, to determine if password learn is necessary, refer to Table E-27.

Table E-27. Password Learn

DEVICE REPLACED	IS PASSWORD LEARN NECESSARY?
ECM	Yes
TSM	No *
TSSM	Yes
* If a TSM has been replaced by a TSSM, or a TSSM has been replaced by a TSM, password learn is necessary.	

PASSWORD LEARNING

To perform password learning procedure, refer to Table E-28. When finished, continue with all instructions under E.3 TSM/TSSM VEHICLE DELIVERY.

Always perform all appropriate instructions under E.3 TSM/TSSM VEHICLE DELIVERY after TSM/TSSM replacement or removal.

NOTE

Do not forget to enter a Personal Identification Number (PIN) for TSSM vehicles. If a code is not assigned and the key fob is lost or damaged while the vehicle is armed, the TSSM must be replaced.

Table E-28. Setting TSM/TSSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
	Ignition must be turned off for at least 15 seconds.	With ignition turned off, Check Engine Lamp and Security Lamp will be off.	
1	Install new TSM/TSSM or ECM. Perform all steps under E.3 TSM/TSSM VEHICLE DELIVERY.		
2	Set Engine Stop Switch to RUN.		
3	Turn Ignition Switch ON.	Verify Check Engine Lamp and Security Lamp illuminate and then turn off.	TSM/TSSM enables starter relay.
4	Attempt normal start one time.	Engine starts and stalls. Check Engine Lamp illuminates and stays on.	Password has not been learned. ECM sets DTC P1009.
5	Wait ten seconds. Security Lamp will illuminate and stay on.	Security Lamp illuminates.	ECM enters Password Learning mode for ten minutes. Do not cycle Ignition Switch or interrupt vehicle power or Password Learn will be unsuccessful.
6	Wait until Security Lamp turns off.		This takes ten minutes.
7	Quickly (within one second) turn Ignition Switch OFF-ON.		ECM must not be allowed to shutdown.
8	Wait until Security Lamp turns off.		This takes ten minutes.
9	Quickly (within one second) turn Ignition Switch OFF-ON.		ECM must not be allowed to shutdown.
10	Wait until Security Lamp turns off.		This takes ten minutes.
11	Quickly (within one second) turn Ignition Switch OFF-ON.		ECM must not be allowed to shutdown.

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Table E-28. Setting TSM/TSSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
12	Turn Ignition Switch OFF. Wait 15 seconds before turning Ignition Switch ON. Turn Ignition Switch ON and start engine to confirm successful Password Learn procedure. Clear Diagnostic Trouble Codes (DTCs).		
13	Perform all steps under E.3 TSM/TSSM VEHICLE DELIVERY.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TSSM MAINTENANCE E.23

GENERAL

The TSSM system uses batteries in the key fob and siren. These are the only parts requiring periodic maintenance.

KEY FOB

Schedule

Replace the key fob battery every 2 years.

Battery Replacement

1. See Figure E-33. Open the key fob case.
   a. Place a thin blade between the 2 halves of the case.
   b. Slowly twist the blade.
2. Replace battery (1).
   a. Remove the original battery.
   b. Install a **new** battery with the positive (+) side down. Use a Panasonic® 2032 or equivalent.
3. Align case and circuit board (3) as shown. Snap case halves together.
4. While standing next to the motorcycle, press and hold the key fob button for 10-15 seconds until the security system responds with two turn signal flashes/siren chirps.

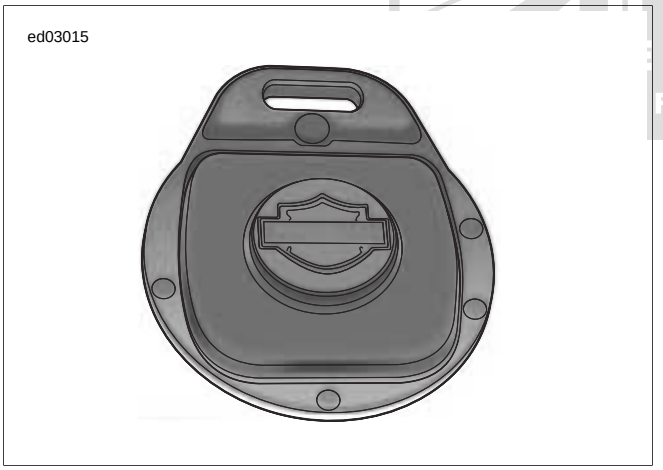
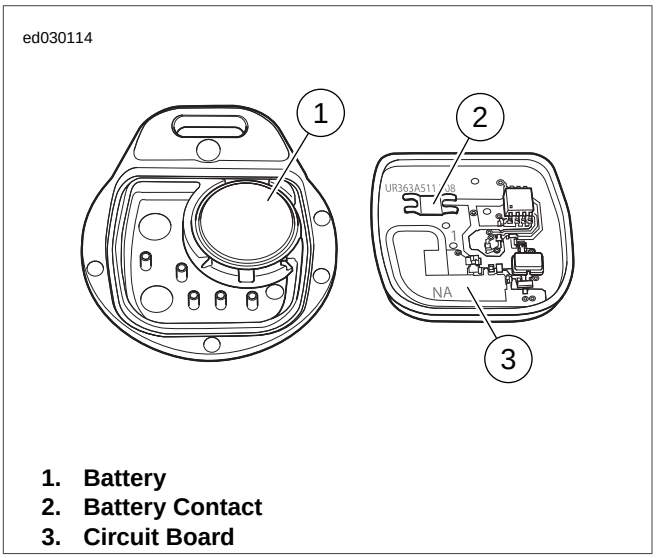


Figure E-33. Key Fob Assembly: TSSM



1. **Battery**
2. **Battery Contact**
3. **Circuit Board**

Figure E-34. Open Key Fob: TSSM

SIREN (IF INSTALLED)

Schedule

The siren's internal 9 volt battery is rechargeable and does not need to be replaced on a regular basis. Battery life under normal conditions is approximately three to six years.

NOTES

- *See Figure E-35 and Figure E-36. Early style siren will work with both TSSM and HFSM. Late style siren will only work with HFSM.*
- *The internal siren battery may not charge if the vehicle's battery is less than 12.5 volts.*

Battery Replacement: Early Style Siren

1. Disarm system and remove siren.
2. See Figure E-35. Remove battery cover.
   a. Place the siren module on a flat and sturdy table with the potted section (area with epoxy covering circuit board) facing up and towards you.
   b. Position a knife blade at a 45 degree angle to the long side of the siren case. Insert the knife blade between the siren case and battery cover at one of the two accessible corners of the battery cover. Keep the blade slightly higher towards the battery cover as this helps keep the blade away from the battery seal.
   c. Slowly twist the blade towards the battery cover and the cover will pop off.

NOTES

- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe*

away this substance. Apply all available existing grease to terminals on new battery.

- *Only a 9 volt nickel metal hydride battery should be used in the siren.*

3. Replace battery by removing old battery from polarized battery clip. Install a **new** 9 volt nickel metal hydride battery.
4. Reinstall battery cover.
   a. Carefully replace the rubber seal.
   b. Align battery cover with case placing round corners on cover away from connector [142A]. Snap cover into place.
5. Install siren and check operation. If siren is working properly, it will respond with two chirps after receiving the arm command.

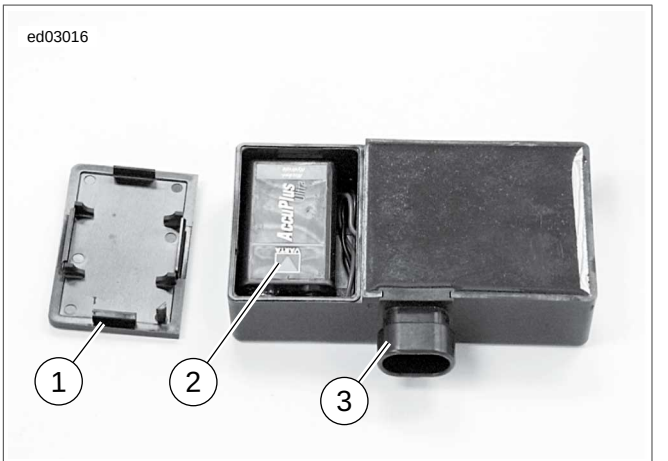
Battery Replacement: Late Style Siren

1. Disarm system and remove siren.
2. See Figure E-36. With a small screwdriver or pick, push the catches (1) in through the two slots (2) in the end of the siren to release the battery cover (3).

NOTES

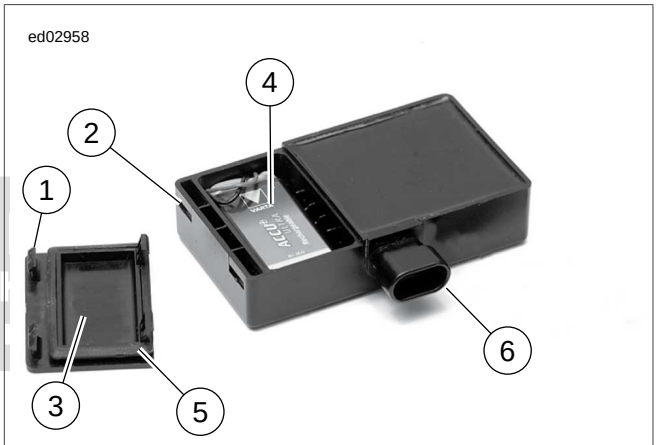
- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on new battery.*
- *Only a 9 volt nickel metal hydride battery should be used in the siren.*

3. Replace battery (4) by removing old battery from polarized battery clip.
4. Recharge and re-install or install a **new** 9 volt nickel metal hydride battery.
5. Reinstall battery cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.
6. Install siren and check operation. If siren is working properly, it will respond with two chirps after receiving the arm command.



1. **Cover**
2. **Battery**
3. **Connector [142A]**

Figure E-35. Battery Compartment (Early Style Siren)



1. **Catch**
2. **Slot**
3. **Cover**
4. **9 volt battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure E-36. Siren Battery Compartment (Late Style Siren)

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-23738	VACUUM PUMP	4.18 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-25070	ROBINAIR HEAT GUN	A.19 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-26792	SPARK TESTER	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics
HD-26792	SPARK TESTER	4.16 MISFIRE AT IDLE OR UNDER LOAD, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	4.22 DTC P0261, P0262, P0263, P0264, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	4.24 DTC P0444, P0445, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	4.24 DTC P0444, P0445, Diagnostics
HD-34730-2C	FUEL INJECTOR TEST LAMP	4.33 DTC P1351, P1352, P1354, P1355, Diagnostics
HD-35500	MULTI-METER	2.6 FUEL GAUGE, Fuel Gauge and Sender Test
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.15 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.1 AMP 1-PLACE CONNECTORS, AMP 1-Place Connector Repair
HD-38125-7	PACKARD TERMINAL CRIMPER	A.7 DEUTSCH MINI-TERMINAL CRIMPS, Deutsch Mini Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.15 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.15 METRI-PACK TERMINALS, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.19 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39621-27	SOCKET TERMINAL TOOL	A.1 AMP 1-PLACE CONNECTORS, AMP 1-Place Connector Repair
HD-39621-28	PIN TERMINAL REMOVER	A.1 AMP 1-PLACE CONNECTORS, AMP 1-Place Connector Repair
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.6 DEUTSCH STANDARD TERMINALS, Deutsch Standard Terminal Crimps
HD-39969	ULTRA-TORCH UT-100	A.19 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39978	DVOM	4.8 WIGGLE TEST, Procedure
HD-41182	FUEL PRESSURE GAUGE	4.15 FUEL PRESSURE TEST, Testing
HD-41183	HEAT SHIELD ATTACHMENT	A.19 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41404-B	HARNESS CONNECTOR TEST KIT	1.2 STARTING SYSTEM DIAGNOSIS, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	1.7 CHARGING SYSTEM, Testing
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.4 SPEEDOMETER/TACHOMETER, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	2.7 OIL, AIR AND VOLTMETER GAUGES, Oil Pressure Gauge and Indicator Light
HD-41404-B	HARNESS CONNECTOR TEST KIT	3.15 TSM/HFSM: TURN SIGNAL ERRORS AND DTCS, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	3.16 DTC B1131, B1132 (HFSM ONLY), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	3.20 DTC B1141 (HFSM ONLY), Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	3.22 DTC B1151, B1152, B1153, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.11 NO ECM POWER, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.13 FUEL SYSTEM ELECTRICAL TEST, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.16 MISFIRE AT IDLE OR UNDER LOAD, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.17 COMBUSTION ABSENT/INTERMITTENT, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.18 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.18 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.19 DTC P0117, P0118, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.22 DTC P0261, P0262, P0263, P0264, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.23 DTC P0373, P0374, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.24 DTC P0444, P0445, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.25 DTC P0501, P0502, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.28 DTC P0577, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.30 DTC P0641, P0651, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.33 DTC P1351, P1352, P1354, P1355, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.33 DTC P1351, P1352, P1354, P1355, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.34 DTC P1475, P1477, P1478, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.35 DTC P1501, P1502, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.36 DTC P1510, P1511, P1512, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.39 DTC P2100, P2101, P2102, P2103, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.43 DTC P2122, P2123, P2127, P2128, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	4.44 DTC P2135, P2138, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	5.2 RADIO SWITCH DIAGNOSTICS: DTC B2006-B2015, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	5.4 SERIAL DATA BUS DIAGNOSTICS, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	5.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Diagnostics
HD-41404-B	HARNESS CONNECTOR TEST KIT	6.12 DTC C1032, C1034, DTC C1032, C1034: Wheel Speed Sensor Circuit Open Or Shorted (Front or Rear)
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HD-41475-100	FLAT BLADE L-HOOK	A.5 DEUSCH ELECTRICAL CONNECTORS, Deutsch Connector Repair
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HD-42682	BREAKOUT BOX	2.4 SPEEDOMETER/TACHOMETER, Diagnostics
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HD-42682	BREAKOUT BOX	2.11 DTC B1008, Diagnostics
HD-42682	BREAKOUT BOX	2.12 DTC U1016, Diagnostics
HD-42682	BREAKOUT BOX	2.13 DTC U1064, U1255, Diagnostics
HD-42682	BREAKOUT BOX	3.3 H-DSSS ACTUATION, Power Disruption and Configuring
HD-42682	BREAKOUT BOX	3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM, Initial Diagnostics
HD-42682	BREAKOUT BOX	3.12 BREAKOUT BOX: TSM/HFSM, General
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HD-42682	BREAKOUT BOX	E.9 INITIAL DIAGNOSTIC CHECK: TSM/TSSM, Initial Diagnostics
HD-42682	BREAKOUT BOX	E.11 BREAKOUT BOX: TSM/TSSM, General
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HD-43876	BREAKOUT BOX	2.12 DTC U1016, Diagnostics
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HD-43876	BREAKOUT BOX	4.13 FUEL SYSTEM ELECTRICAL TEST, Diagnostics
HD-43876	BREAKOUT BOX	5.4 SERIAL DATA BUS DIAGNOSTICS, Diagnostics
HD-43876	BREAKOUT BOX	E.20 DTC U1016, Diagnostics
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HD-44687	IGNITION COIL CIRCUIT TEST ADAPTER	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics
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HD-44750	DIGITAL TECHNICIAN	3.3 H-DSSS ACTUATION, Sidecar Configuration
HD-44750	DIGITAL TECHNICIAN	3.7 SERVICE/EMERGENCY FUNCTIONS, Service Mode
HD-44750	DIGITAL TECHNICIAN	3.22 DTC B1151, B1152, B1153, Diagnostics
HD-44750	DIGITAL TECHNICIAN	4.2 EFI SYSTEM, General
HD-44750	DIGITAL TECHNICIAN	4.15 FUEL PRESSURE TEST, General

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HD-44750	DIGITAL TECHNICIAN	E.8 DIAGNOSTIC TROUBLE CODES (DTC), Code Types
HD-44750	DIGITAL TECHNICIAN	E.18 DTC B1151, B1152, B1153, Diagnostics
HD-45928	PACKARD MICRO-64 TERMINAL REMOVER	A.18 PACKARD MICRO-64 CONNECTORS, Packard Micro-64 Connector Repair
HD-45929	PACKARD MICRO-64 TERMINAL CRIMPER	A.18 PACKARD MICRO-64 CONNECTORS, Packard Micro-64 Connector Repair
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER, Initial Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.4 SPEEDOMETER/TACHOMETER, Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.5 BREAKOUT BOX: SPEEDOMETER/TACHOMETER, General
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.9 DTC B1004, B1005, Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.11 DTC B1008, Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	2.13 DTC U1064, U1255, Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	3.10 INITIAL DIAGNOSTIC CHECK: TSM/HFSM, Initial Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	4.5 INITIAL DIAGNOSTIC CHECK: EFI, Initial Diagnostics
HD-46601	INSTRUMENT HARNESS ADAPTERS	4.47 DTC U1097, Diagnostics
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HD-47918	RADIO BREAKOUT BOX	5.2 RADIO SWITCH DIAGNOSTICS: DTC B2006-B2015, Diagnostics
HD-47918	RADIO BREAKOUT BOX	5.3 RADIO SPEAKER DIAGNOSTICS: DTC B2016-B2027, Diagnostics
HD-47918	RADIO BREAKOUT BOX	5.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Diagnostics
HD-48037	SWR METER ADAPTER	5.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Diagnostics
HD-48037	SWR METER ADAPTERS	5.5 ADVANCED AUDIO SYSTEM SYMPTOMS, Diagnostics
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER	1.7 CHARGING SYSTEM, Troubleshooting
HD-48053	ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER	1.7 CHARGING SYSTEM, Testing
HD-48114	MOLEX ELECTRICAL CONNECTOR TERMINAL REMOVER	A.16 MOLEX CONNECTORS, Molex Connector Repair
HD-48637	BREAKOUT BOX	4.5 INITIAL DIAGNOSTIC CHECK: EFI, Initial Diagnostics
HD-48637	BREAKOUT BOX	4.7 BREAKOUT BOX: EFI, General
HD-48637	BREAKOUT BOX	4.8 WIGGLE TEST, Procedure
HD-48637	BREAKOUT BOX	4.10 ENGINE CRANKS, BUT WILL NOT START, Diagnostics
HD-48637	BREAKOUT BOX	4.11 NO ECM POWER, Diagnostics

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HD-48637	BREAKOUT BOX	4.16 MISFIRE AT IDLE OR UNDER LOAD, Diagnostics
HD-48637	BREAKOUT BOX	4.17 COMBUSTION ABSENT/INTERMITTENT, Diagnostics
HD-48637	BREAKOUT BOX	4.18 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-48637	BREAKOUT BOX	4.18 DTC P0107, P0108, P0112, P0113, Diagnostics
HD-48637	BREAKOUT BOX	4.19 DTC P0117, P0118, Diagnostics
HD-48637	BREAKOUT BOX	4.20 DTC P0120, P0122, P0123, P0220, P0222, P0223, Diagnostics
HD-48637	BREAKOUT BOX	4.21 DTC P0131, P0132, P0134, P0151, P0152, P0154, Diagnostics
HD-48637	BREAKOUT BOX	4.22 DTC P0261, P0262, P0263, P0264, Diagnostics
HD-48637	BREAKOUT BOX	4.24 DTC P0444, P0445, Diagnostics
HD-48637	BREAKOUT BOX	4.25 DTC P0501, P0502, Diagnostics
HD-48637	BREAKOUT BOX	4.30 DTC P0641, P0651, Diagnostics
HD-48637	BREAKOUT BOX	4.31 DTC P1009, P1010, Diagnostics
HD-48637	BREAKOUT BOX	4.33 DTC P1351, P1352, P1354, P1355, Diagnostics
HD-48637	BREAKOUT BOX	4.34 DTC P1475, P1477, P1478, Diagnostics
HD-48637	BREAKOUT BOX	4.35 DTC P1501, P1502, Diagnostics
HD-48637	BREAKOUT BOX	4.36 DTC P1510, P1511, P1512, Diagnostics
HD-48637	BREAKOUT BOX	4.39 DTC P2100, P2101, P2102, P2103, Diagnostics
HD-48637	BREAKOUT BOX	4.43 DTC P2122, P2123, P2127, P2128, Diagnostics
HD-48637	BREAKOUT BOX	4.44 DTC P2135, P2138, Diagnostics
HD-48637	BREAKOUT BOX	4.46 DTC U1064, Diagnostics
HD-48637	BREAKOUT BOX	4.47 DTC U1097, Diagnostics
HD-48642	BREAKOUT BOX	6.3 BREAKOUT BOX: ABS, General
HD-48642	BREAKOUT BOX	6.12 DTC C1032, C1034, DTC C1032, C1034: Wheel Speed Sensor Circuit Open Or Shorted (Front or Rear)
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FASTENER	TORQUE VALUE	NOTES
No torque values were found in this manual.		

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