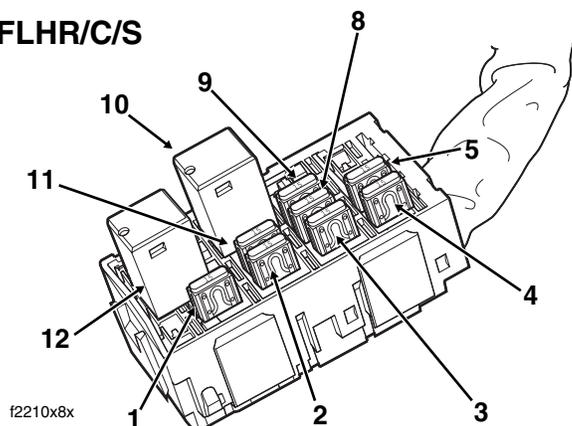


IGNITION	DATA
Spark timing advance	0°-45° BTDC (range) 12° BTDC@1000 RPM
Idle speed	975 ± 50 RPM
Spark plug size	12 mm
Spark plug gap	0.038-0.043 in
	0.97-1.09 mm
Spark plug type	Harley-Davidson No. 6R12 (no substitute)
Ignition coil primary resistance	0.3-0.5 ohms
Ignition coil secondary resistance	2500-3500 ohms

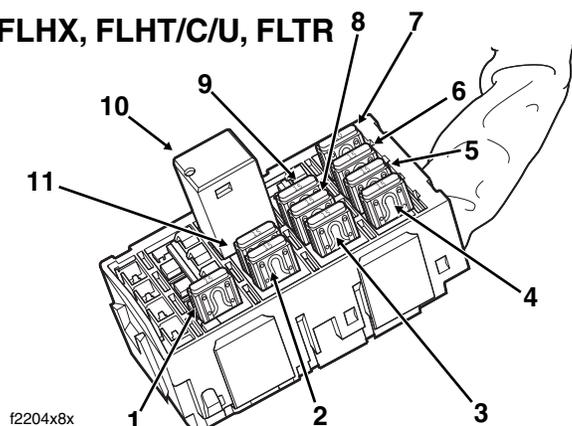
Circuit	Rating (Amperes)	Color
<b>System Fuses</b>		
Maxi-Fuse	40	Orange
Headlamp	15	Blue
Ignition	15	Blue
Lighting	15	Blue
Instruments	15	Blue
Brakes/Cruise	15	Blue
Radio Memory	15	Blue
Radio Power	10	Red
Accessory	15	Blue
Battery	15	Blue
P & A	15	Blue
<b>EFI Fuses</b>		
Fuel Pump	15	Blue
ECM Power	15	Blue

### System Fuse Block (Under Left Side Cover)

#### FLHR/C/S



#### FLHX, FLHT/C/U, FLTR



- |                  |                       |
|------------------|-----------------------|
| 1. Headlamp      | 7. Radio Power        |
| 2. Ignition      | 8. Accessory          |
| 3. Lighting      | 9. Battery            |
| 4. Instruments   | 10. Brake Light Relay |
| 5. Brakes/Cruise | 11. P&A               |
| 6. Radio Memory  | 12. Starter Relay     |

### EFI Fuse Block (Under Right Side Cover)

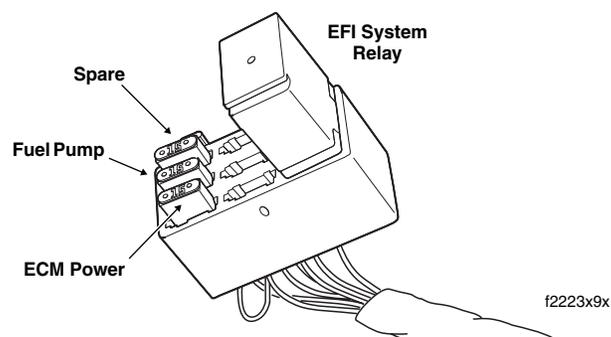


Figure 5-1. Fuse Locations

# NOTES

---

## GENERAL

---

The engine management system consists of the following components:

- ECM
- CKP sensor
- MAP sensor
- IAT sensor
- ET sensor
- IAC
- TP sensor
- VSS
- Turn signal module (TSM) or optional, factory-installed turn signal security module (TSSM). This includes an integrated bank angle sensor (BAS).
- Ignition coil.

The ECM is mounted to the electrical bracket under the right side cover. It computes the spark advance for proper ignition timing based on sensor inputs (from CKP, MAP and TP sensor) and regulates the low-voltage circuits between battery and ignition coil.

The ECM contains all of the solid state components used in the ignition system. The dwell time for the ignition coil is also calculated in the microprocessor and is dependent upon battery voltage. The programmed dwell is an added feature to give adequate spark at all speeds. (The ECM has added protection against transient voltages, continuous reverse voltage protection, and damage due to jump starts.) The ECM is fully enclosed to protect it from vibration, dust, water or oil. This unit is a non-repairable item. If it fails, it must be replaced.

The CKP sensor is located in the front left side of the crankcase. The CKP generates an AC signal which 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 MAP sensor is located on top of the intake manifold. The MAP sensor monitors the intake manifold pressure (vacuum) and sends the information to the ECM where the module adjusts the spark and fuel timing advance curve for optimum performance.

The bank angle sensor is within the TSM/TSSM. If the vehicle lean angle exceeds 45 degrees for one second, the fuel injectors are shut off. Once the sensor is tripped, the motorcycle must be uprighted, turned off and then on again before the engine can be restarted. This is communicated across the data bus.

Front and rear coils fire each spark plug independently (one cylinder at a time - no wasted spark). The coil also has an extra terminal to monitor current on the coil secondary circuit. This is used for knock detection and combustion diagnostics.

The ignition system gives a spark near top dead center for starting. At RPM and loads above this, the system gives a spark advance that varies between 0° and 50°.

The IAT, ET and TP sensors are used to provide information to the ECM to fine tune spark and fuel delivery. The VSS is used as an input for idle speed control.

## EFI ENGINE HEAT MANAGEMENT

---

### Injected Twin Cam High Temperature Idle

#### NOTE

*Fuel injected Twin Cam engines use a three phase heat management system to reduce engine temperature under extreme conditions. A rider with a very hot engine may notice the effects of this three phase heat management system and incorrectly assume an idle problem exists.*

### Phase 1

When the ET sensor signals that the cylinder head has reached approximately 291°F (144°C) the ECM will gradually reduce engine idle speed until the engine temperature drops or the engine reaches 800 rpm.

### Phase 2

If engine temperature reaches 320°F (160°C), the ECM richens the air/fuel ratio to provide additional cooling.

### Phase 3

If the engine temperature reaches 329° F (165° C), fuel injector pulses are interrupted. The air drawn in and expelled helps cool the engine further. Since there is no combustion it would be perceived as a misfire. This third stage will only happen when the motorcycle is stationary.

## TROUBLESHOOTING

---

See the diagnostic charts that follow for troubleshooting information.

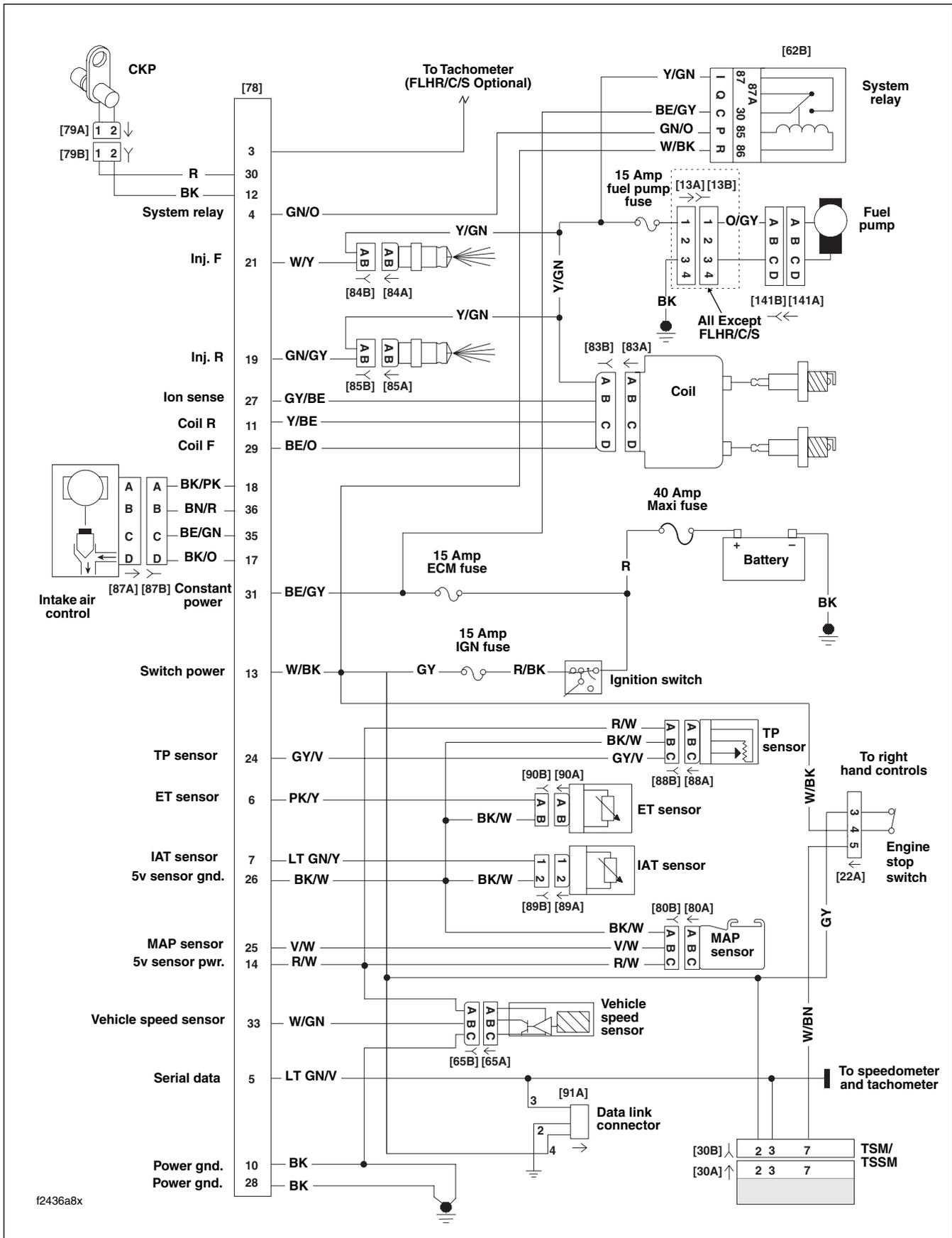


Figure 5-2. Simplified EFI System Circuit

## 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 5-3](#). The check engine lamp indicates the ECM has determined a fault condition exists. There may also be starting or performance problems.

## RESOLVING PROBLEMS

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

1. Check for DTC's by using speedometer self diagnostics. See [Section 5.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI](#).
2. Retrieve DTC's by using speedometer self diagnostics. See [Section 5.6 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 trouble codes and confirming proper vehicle operation as indicated by the lack of trouble codes.

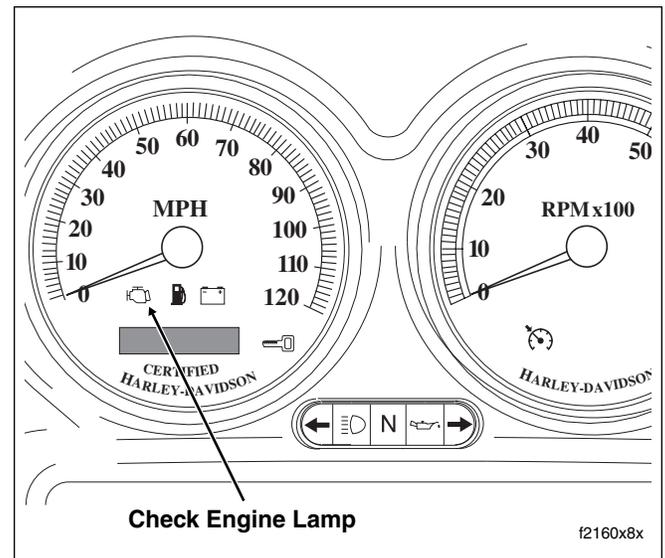


Figure 5-3. Speedometer

## CHECK ENGINE LAMP

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

## NOTES

- See [Figure 5-4](#). “Key ON” means that the ignition key is turned to IGN and the engine stop switch is set to RUN (although the engine is **not** running).
- When the ignition key is turned ON, the check engine lamp will illuminate for approximately four seconds and then turn off.
- If the check engine lamp is not illuminated at Key ON or if it fails to turn OFF after the initial four second period, then the speedometer may need to be replaced. See [Section 5.5 INITIAL DIAGNOSTIC CHECK: EFI](#).

1. 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. See A of [Figure 5-5](#).
  - b. Come back on for an 8 second period if only historic codes exist. See B of [Figure 5-5](#).
  - c. Come back on, and remain on, if a current trouble code exists. See C of [Figure 5-5](#).

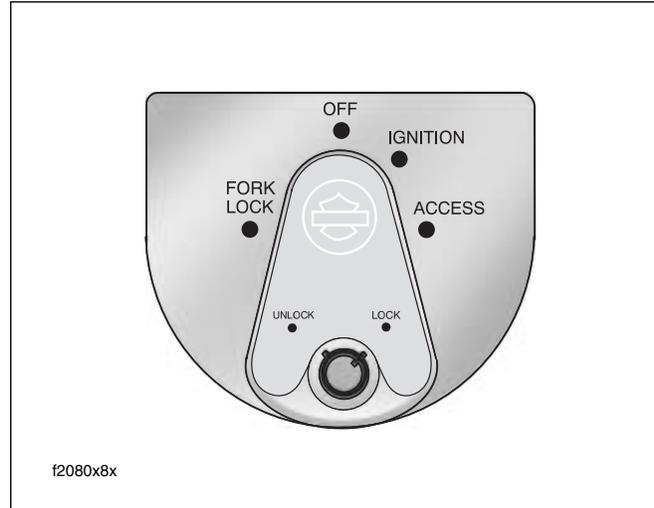


Figure 5-4. Ignition Switch (FLHX, FLHT/C/U, FLTR)

2. See [CODE TYPES](#) which follows for a complete description of trouble code formats.

## NOTE

Some trouble codes 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.

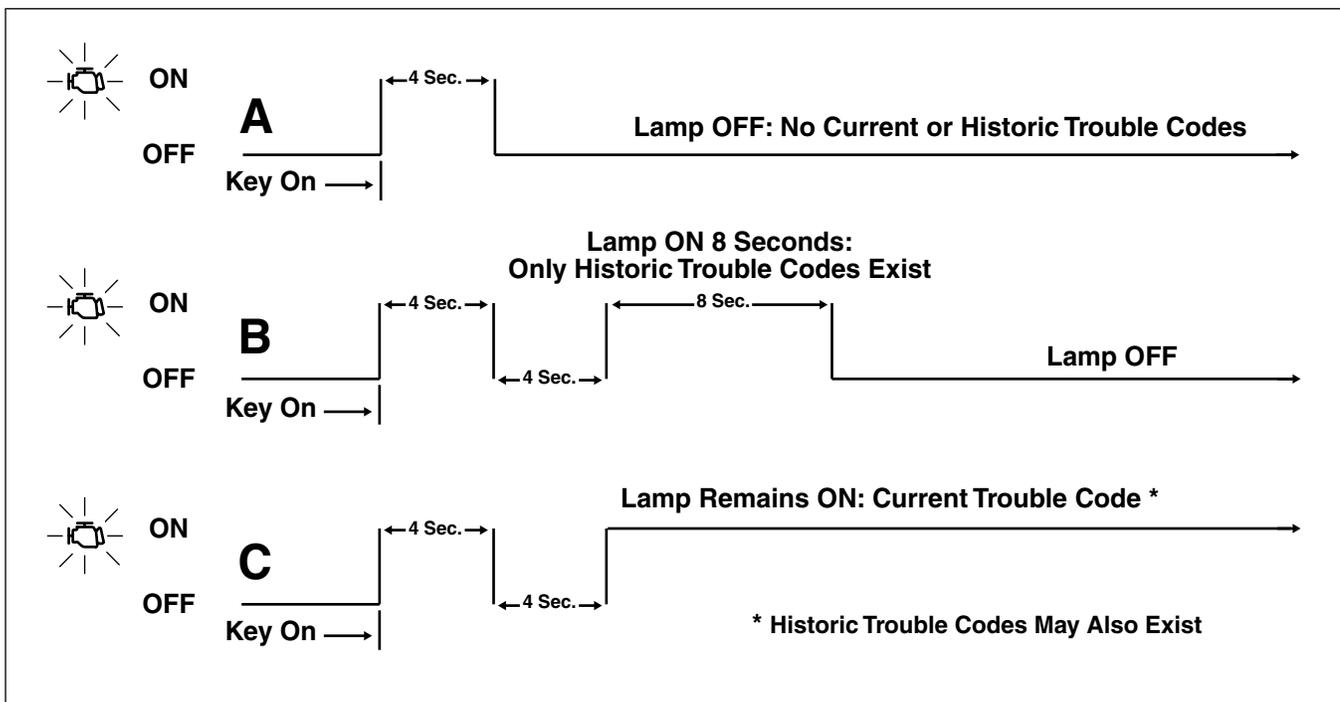


Figure 5-5. Check Engine Lamp Operation

## CODE TYPES

---

There are two types of DTC's: current and historic. If a DTC is stored, it can be read using speedometer self diagnostics. See Section [5.6 SPEEDOMETER SELF DIAGNOSTICS](#).

All DTC's reside in the memory of the ECM/ICM, TSM/TSSM, speedometer or tachometer until the code is cleared by use of the speedometer self diagnostics. See Section [5.6 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 trouble codes are those which occur during the present 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 5-5](#). 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 [MULTIPLE DIAGNOSTIC TROUBLE CODES](#) if multiple trouble codes are found.

Diagnostic charts are designed for use with current trouble codes 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 the part is faulty.

## RETRIEVING DIAGNOSTIC TROUBLE CODES

---

The engine management system provides 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 the speedometer self diagnostics. Speedometer, tachometer (if equipped), TSM/TSSM and ECM codes can be accessed and cleared. See Section [5.6 SPEEDOMETER SELF DIAGNOSTICS](#) for more information.

## 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 MAP sensor, TP sensor and VSS 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, P0122 and P0501).
- Serial data codes (DTC U1300, U1301, U1016, U1064, U1097 and U1255) may be accompanied by other codes. **Always** correct the serial data codes before resolving the other codes.

Refer to [Table 5-5](#). This table gives most ECM DTC's a priority ranking.

## GENERAL

To locate faulty circuits or other system problems, follow the diagnostic flow charts in this section. For a systematic approach, always begin with [INITIAL DIAGNOSTICS](#) which follows. 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 Section [5.7 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 Section [3.24 PASSWORD LEARN](#).

## INITIAL DIAGNOSTICS

### General Information

The diagnostic check (see [page 5-15](#)) is an organized approach to identifying a problem caused by an 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, tachometer (if equipped) or speedometer. For more information on speedometer diagnostic mode See Section [5.6 SPEEDOMETER SELF DIAGNOSTICS](#).
- Check for an open diagnostic test terminal between data Terminal 3 and ECM Terminal 5. With ignition key turned ON, transmit data should be typically 0.6-0.8 volts. The range of acceptable voltage is greater than 0 and less than 7.0 volts.
- If speedometer reads “BUS er” (serial data bus error), refer to flow charts in Section [5.12 STARTS, THEN STALLS](#).

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the diagnostic check flow charts. See [page 5-15](#).

1. Compare engine behavior to symptoms tables.
  - a. Starts hard. Refer to [Table 5-2](#).
  - b. Hesitates, stumbles, surges, misfires and/or sluggish performance. Refer to [Table 5-3](#).
  - c. Engine exhaust emits black smoke or fouls plugs. Refer to [Table 5-4](#).
2. Connect BREAKOUT BOX (Part No. HD-43682) to speedometer using HD-46601 adapters.

All EFI diagnostic codes are listed on [page 5-11](#) in [Table 5-5](#).

### Other Codes

See Section [3.9 INITIAL DIAGNOSTIC CHECK: TSM/TSSM](#) for any codes related to the turn signal module (TSM) or turn signal security module (TSSM).

See Section [2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER](#) for any codes related to the speedometer or tachometer.

**Table 5-1. Typical Scan Values for Engine Data**

ITEM	MIN. VALUE	MAX. VALUE	HOT IDLE
MAP sensor	10 kPa	104 kPa	10.3-13.3 in. Hg 35-45 kPa
	0 volts	5.1 volts	
TP sensor	0	100	0%
	0.2 volts	4.5 volts	0.2-1.0 volts
IAC pintle	0	155	30-45 steps
RPM	800	5600	975
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
IAT sensor	3° F (-16° C)	248° F (120° C)	104-140° F (40-60° C)
	0.0 volts	5.0 volts	2.0-3.5 volts
INJ PW front	0	50 mS	2-4 mSec
INJ PW rear	0	50 mS	2-4 mSec
Advance front	0	45°	10-15°
Advance rear	0	45°	10-15°
VSS	0	120	0 MPH
Battery voltage	10	15	14.5 volts
ENG RUN	off	Run	Run
Idle RPM	800	1300	940-975

**NOTE**

Hot idle specifications are with stock exhaust, the engine operating at 975 RPM and an engine temperature of approximately 260° F (127° C). Idle settings may be changed with the idle set procedure. See the Touring Service Manual.

**Table 5-2. Engine Starts Hard**

SYMPTOM	SOLUTION
Battery discharged	See charging system troubleshooting in this section.
Spark plugs	<a href="#">5.17 MISFIRE AT IDLE OR UNDER LOAD.</a>
Spark plug wires	<a href="#">5.17 MISFIRE AT IDLE OR UNDER LOAD.</a>
Ignition coil	<a href="#">5.17 MISFIRE AT IDLE OR UNDER LOAD.</a>
Valve sticking	See Section 3 in the Touring Service Manual.
Water or dirt in fuel system	Drain and refill with fresh fuel.
Loss of battery power to ECM terminal 31*	<a href="#">5.11 NO ECM POWER</a>

\* Codes will not clear (although they appear to).

**Table 5-3. Engine Performance Problems**

SYMPTOM	SOLUTION
Manifold leak  NOTE- When manifold leak is large enough, IAC will close to 0 and code P0505 will set	See <a href="#">5.9 INTAKE LEAK TEST</a> . A low IAC count may also indicate an air leak.
MAP sensor plugged or not operating properly	<a href="#">5.19 DTC P0107, P0108</a> .
Water or dirt in fuel system	Drain and refill with fresh fuel.
Spark plugs	<a href="#">5.17 MISFIRE AT IDLE OR UNDER LOAD</a> .
Throttle plate not opening fully	See throttle cable adjustment in the Touring Service Manual.
Low fuel pressure	<a href="#">5.15 FUEL PRESSURE TEST</a> .

**Table 5-4. Engine Exhaust Emits Black Smoke or Fouls Plugs**

SYMPTOM	SOLUTION
Clogged air filter	See <a href="#">AIR CLEANER FILTER</a> in the Touring Service Manual.
MAP sensor plugged or not operating properly	<a href="#">5.19 DTC P0107, P0108</a> .

**Table 5-5. EFI Diagnostic Trouble Codes (DTC) and Fault Conditions**

PRIORITY RANKING	DTC NO.	FAULT CONDITION	SOLUTION
1	P0605	ECM flash error	5.27 DTC P0603, P0605
2	P0603	ECM EEPROM error	5.27 DTC P0603, P0605
3	"BUS Er"	Serial data bus shorted low/open/high	5.12 STARTS, THEN STALLS
4	U1300	ECM serial data low	5.12 STARTS, THEN STALLS
5	U1301	ECM serial data open/high	5.12 STARTS, THEN STALLS
6	U1300	TSSM serial data low	5.12 STARTS, THEN STALLS
7	U1301	TSSM serial data open/high	5.12 STARTS, THEN STALLS
8	U1300	Speedometer/tachometer serial data low	5.12 STARTS, THEN STALLS
9	U1301	Speedometer/tachometer serial data open/high	5.12 STARTS, THEN STALLS
10	U1064	Loss of TSM/TSSM serial data at ECM	5.30 DTC U1064, U1255
11	U1064	Loss of TSM/TSSM serial data at speedometer	5.30 DTC U1064, U1255
12	U1016	Loss of all ECM serial data (state of health) at TSSM	3.21 DTC U1016, U1255
		Loss of all ECM serial data (state of health) at speedometer	3.21 DTC U1016, U1255
13	U1097	Loss of speedometer serial data at TSSM	5.31 DTC U1097, U1255
14	U1255	Missing response at TSSM	3.21 DTC U1016, U1255
15	U1255	Missing response at speedometer	5.31 DTC U1097, U1255
16	P1003	System relay contacts open	5.14 SYSTEM RELAY CHECK
17	P1002	System relay coil high/shorted	5.14 SYSTEM RELAY CHECK
18	P1001	System relay coil open/low	5.14 SYSTEM RELAY CHECK
19	P1004	System relay contacts closed	5.14 SYSTEM RELAY CHECK
20	P1009	Incorrect password	5.28 DTC P1009, P1010
21	P1010	Missing password (starts then stalls)	5.28 DTC P1009, P1010
22	P0373	CKP sensor intermittent	5.24 DTC P0373, P0374
23	P0374	CKP sensor synch error	5.24 DTC P0373, P0374
24	B1151	Sidecar BAS low	Sidecar DTC's apply only to Touring models equipped with sidecars. If these DTC's are present on non sidecar equipped motorcycles, the TSM/TSSM is not properly configured.
	B1152	Sidecar BAS high	
	B1153	Sidecar BAS out of range	
25	P0122	TP sensor open/low	5.22 DTC P0122, P0123
26	P0123	TP sensor high	5.22 DTC P0122, P0123
27	P0107	MAP sensor open/low	5.19 DTC P0107, P0108
28	P0108	MAP sensor high	5.19 DTC P0107, P0108
29	P0117	ET sensor voltage low	5.21 DTC P0117, P0118
30	P0118	ET sensor open/high	5.21 DTC P0117, P0118
31	P0112	IAT sensor voltage low	5.20 DTC P0112, P0113
32	P0113	IAT sensor open/high	5.20 DTC P0112, P0113
33	P1351	Front ignition coil open/low	5.29 DTC P1351, P1352, P1354, P1355
34	P1354	Rear ignition coil open/low	5.29 DTC P1351, P1352, P1354, P1355
35	P1352	Front ignition coil high/shorted	5.29 DTC P1351, P1352, P1354, P1355
36	P1355	Rear ignition coil high/shorted	5.29 DTC P1351, P1352, P1354, P1355
37	P1357	Front cylinder combustion intermittent	5.18 COMBUSTION ABSENT/INTERMITTENT
38	P1358	Rear cylinder combustion intermittent	5.18 COMBUSTION ABSENT/INTERMITTENT
39	P0261	Front injector open/low	5.23 DTC P0261, P0262, P0263, P0264
40	P0263	Rear injector open/low	5.23 DTC P0261, P0262, P0263, P0264

**Table 5-5. EFI Diagnostic Trouble Codes (DTC) and Fault Conditions**

<b>PRIORITY RANKING</b>	<b>DTC NO.</b>	<b>FAULT CONDITION</b>	<b>SOLUTION</b>
41	P0262	Front injector high	5.23 DTC P0261, P0262, P0263, P0264
42	P0264	Rear injector high	5.23 DTC P0261, P0262, P0263, P0264
43	P0562	Battery voltage low	5.26 DTC P0562, P0563
44	P0563	Battery voltage high	5.26 DTC P0562, P0563
45	P0501	VSS sensor low	5.25 DTC P0501, P0502
46	P0502	VSS sensor high	5.25 DTC P0501, P0502
47	P1356	Rear cylinder no combustion	5.18 COMBUSTION ABSENT/INTERMITTENT
48	P1353	Front cylinder no combustion	5.18 COMBUSTION ABSENT/INTERMITTENT
49	P0505	Loss of idle speed control	5.16 IDLE AIR CONTROL, DTC P0505
50	B1135	Accelerometer fault	3.19 DTC B1135
51	B1134	Starter output high	3.18 DTC B1134
52	B1121	Left turn output fault	3.15 TURN SIGNAL ERRORS
53	B1122	Right turn output fault	3.15 TURN SIGNAL ERRORS
54	B0563	Battery voltage high	3.16 DTC B0563
55	B1131	Alarm output low	3.17 DTC B1131, B1132
56	B1132	Alarm output high	3.17 DTC B1131, B1132
57	B1141	Ignition switch open/low	3.15 TURN SIGNAL ERRORS

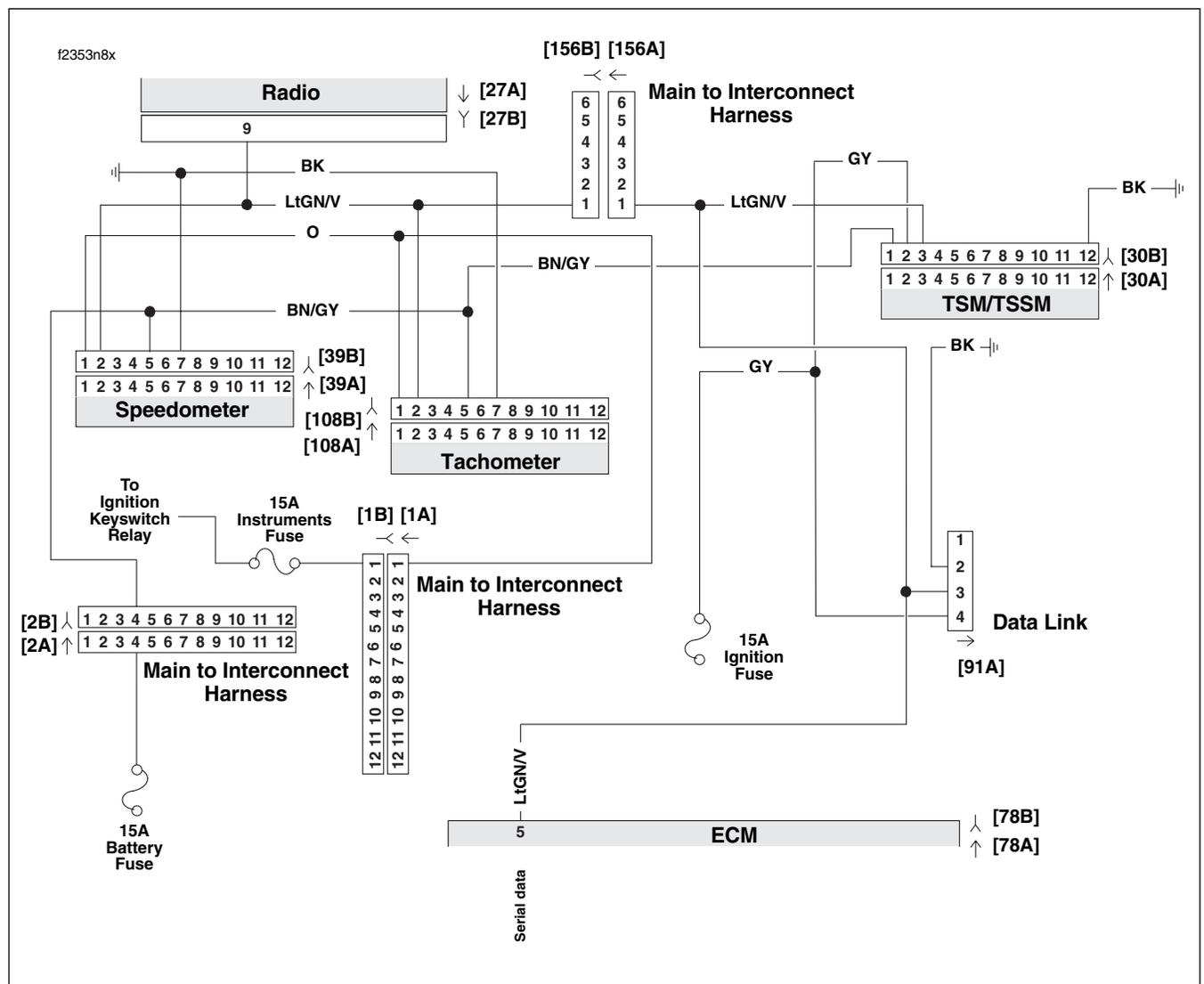


Figure 5-6. Diagnostic Check (FLHX, FLHT/C/U, FLTR)

Table 5-6. Wire Harness Connectors in Figure 5-6.

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[1]	Main to Interconnect Harness	FLHT/C	12-Place Deutsch (Black)	Inner Fairing - Right Radio Support Bracket
		FLTR	12-Place Deutsch (Black)	Inner Fairing - Below Radio (Right Side)
[2]	Main to Interconnect Harness	FLHT/C	12-Place Deutsch (Gray)	Inner Fairing - Right Fairing Support Brace
		FLTR	12-Place Deutsch (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	36-Place Packard	Under Right Side Cover
[91]	Data Link	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)
[156]	Main to Interconnect Harness	FLHT/C	6-Place Deutsch	Inner Fairing - Right Fairing Support Brace
		FLTR	6-Place Deutsch	Inner Fairing - Below Radio (Right Side)

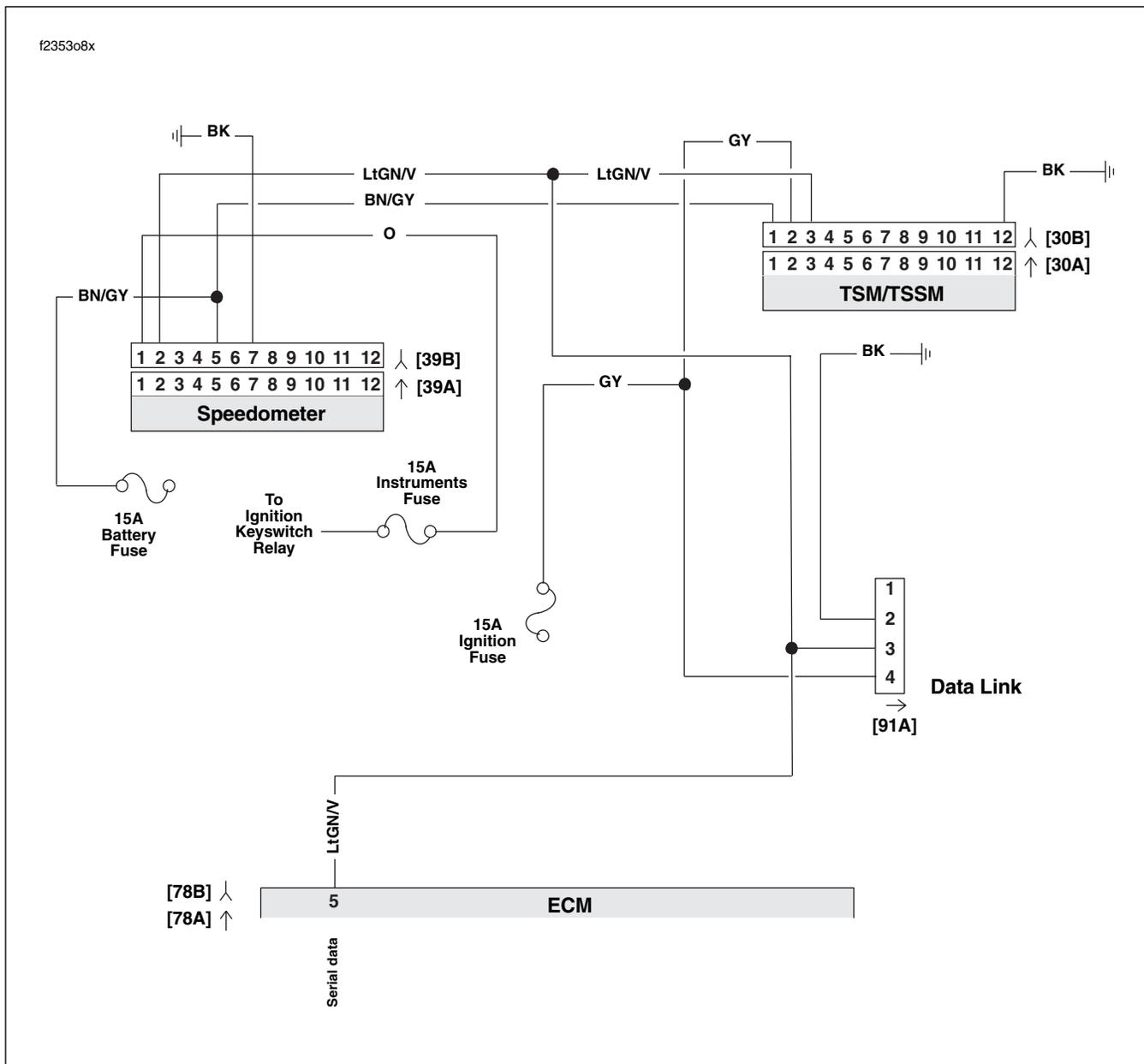
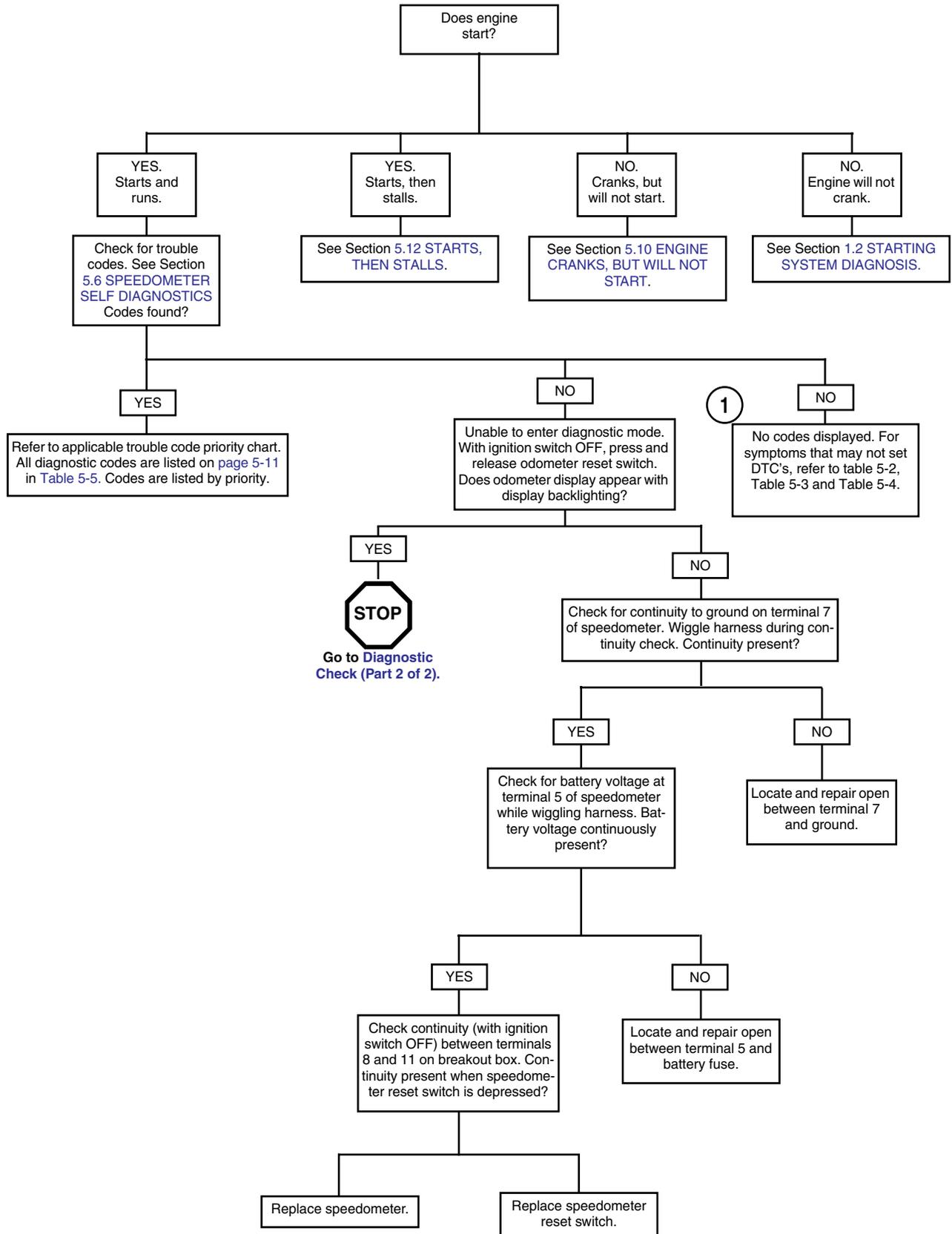


Figure 5-7. Diagnostic Check (FLHR/C/S)

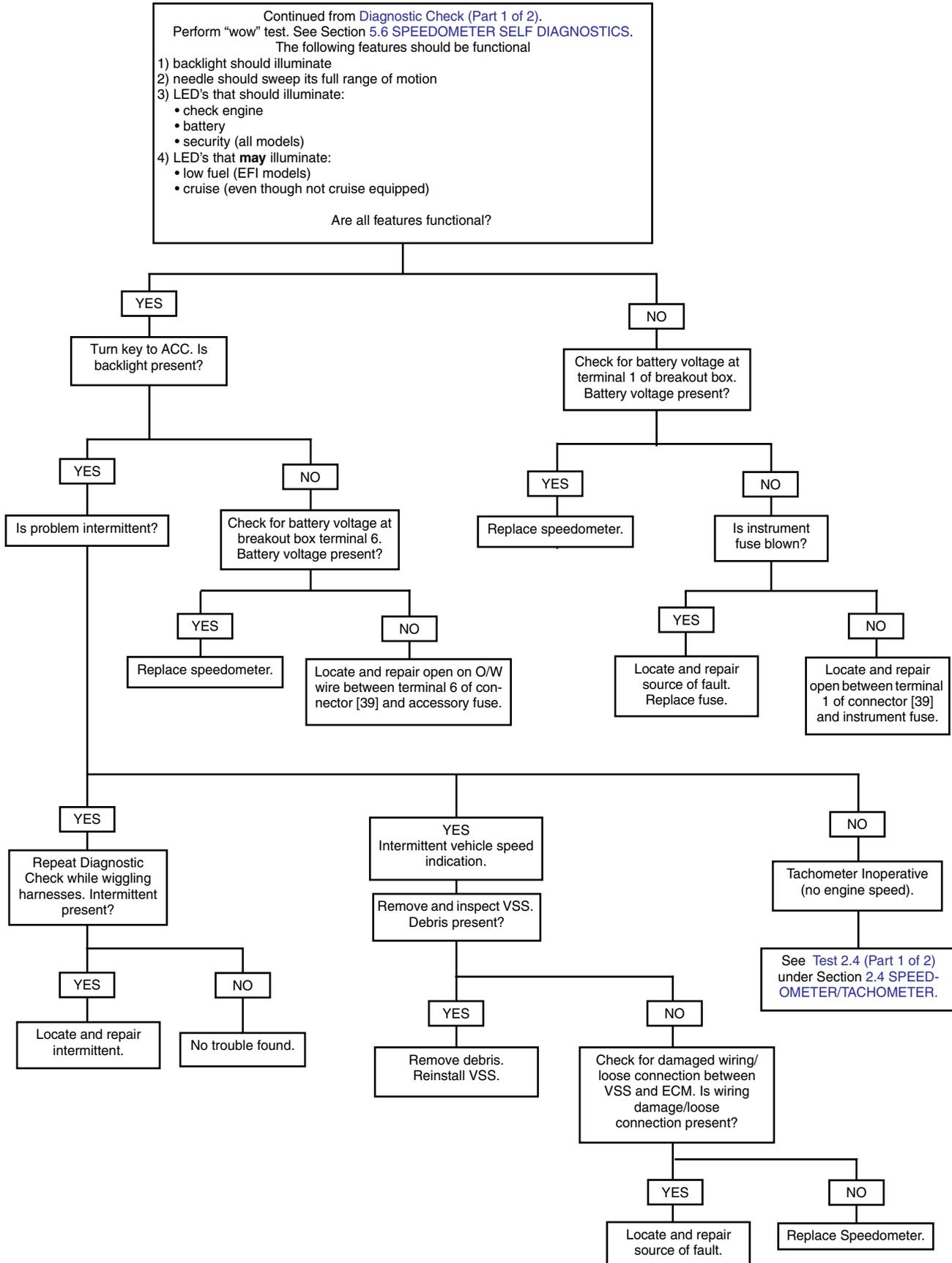
Table 5-7. Wire Harness Connectors in Figure 5-7.

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	36-Place Packard	Under Right Side Cover
[91]	Data Link	4-Place Deutsch	Under Right Side Cover

## Diagnostic Check (Part 1 of 2)



## Diagnostic Check (Part 2 of 2)



## GENERAL

The speedometer is capable of displaying and clearing speedometer, tachometer, TSM/TSSM, and ICM/ECM trouble codes (diagnostic mode).

## DIAGNOSTICS

### Diagnostic Tips

- For a quick check of speedometer function, a “wow” test can be performed. See [Figure 5-8](#). Press and hold odometer reset switch then turn ignition switch ON. Release reset switch. Background lighting should illuminate, speedometer needle should sweep its full range of motion, and indicator lamps [battery, security, low fuel (EFI models) check engine and cruise] should illuminate. Some lamps may illuminate even though they do not apply to the vehicle. For example, the cruise lamp may illuminate even though the motorcycle may not be equipped with cruise control.
- If instrument module fails “wow” test, check for battery, ground, ignition, speedometer reset switch and accessory to speedometer. If any feature in the speedometer is non-functional, See [Section 2.2 INITIAL DIAGNOSTIC CHECK: SPEEDOMETER](#).

### Diagnostic Notes

Use of speedometer self diagnostics assumes that DIGITAL TECHNICIAN (Part No. HD-44750) is **not** available.

The reference numbers below correlate with the circled numbers in the [Speedometer Self Diagnostics \(chart\)](#)

1. To exit diagnostic mode, turn ignition switch OFF.
2. To clear DTC's for selected module, press speedometer reset switch for more than 5 seconds when code is displayed. This procedure will clear all codes for selected module.

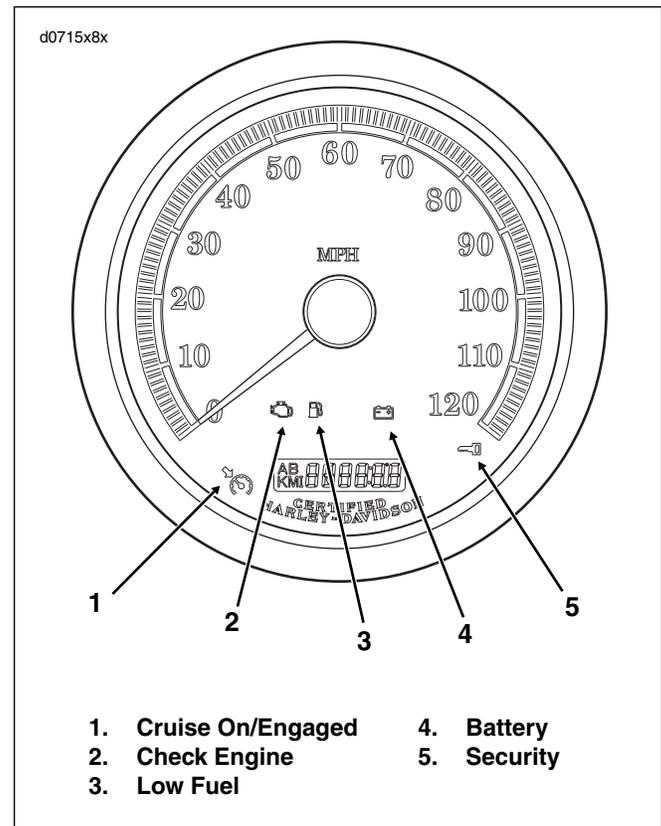


Figure 5-8. Speedometer (FLHR/C/S)

# Speedometer Self Diagnostics (chart)

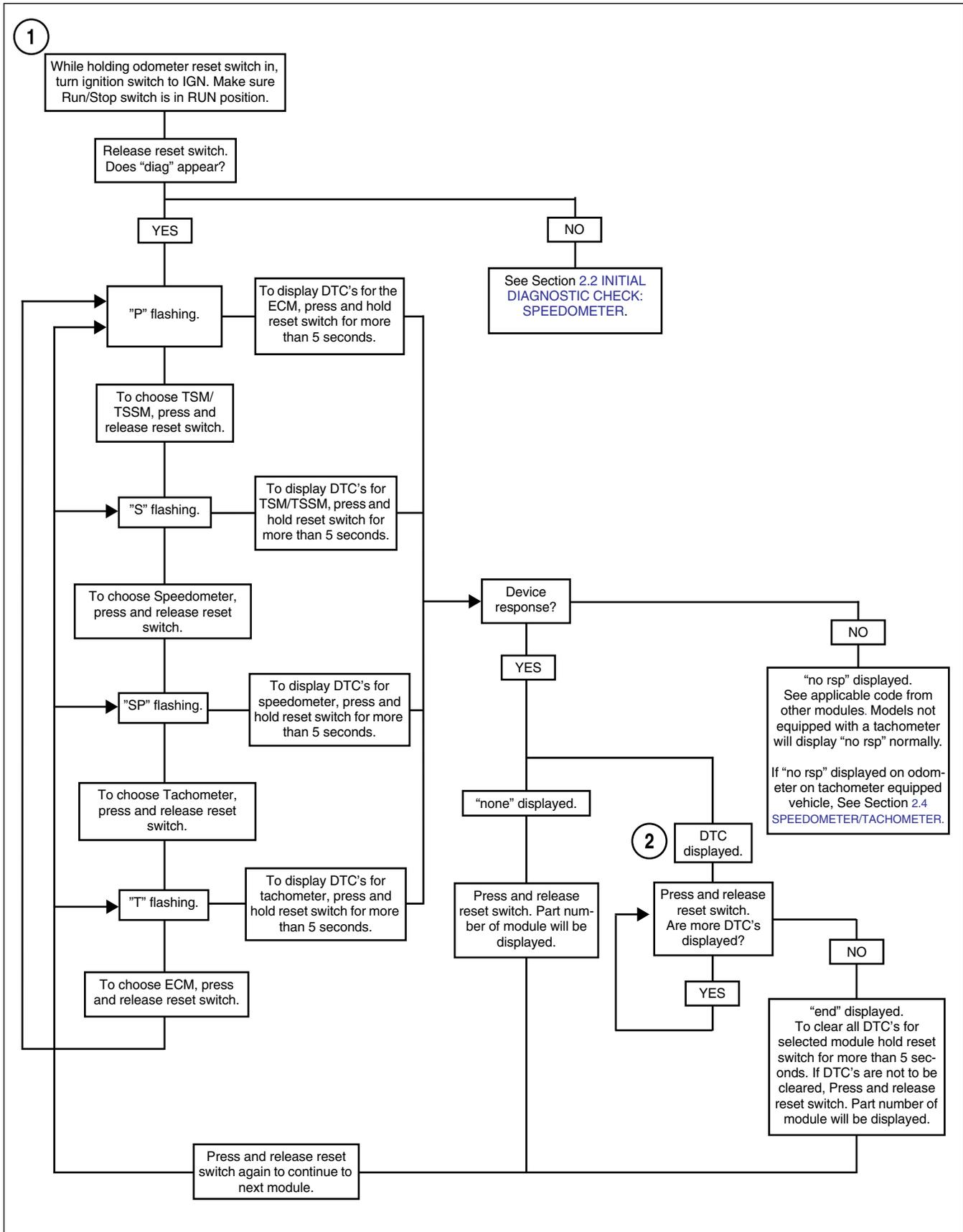


Figure 5-9. Speedometer Self Diagnostics

## GENERAL

The BREAKOUT BOX (Part No. HD-43876) 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 right saddlebag and side cover. See [Figure 5-10](#).
2. Depress latch and remove connector [78B] to release EFI harness from ECM.
3. Install connectors on Breakout Box to ECM and EFI harness connectors.

## REMOVAL

1. Separate connectors to remove Breakout Box between ECM and EFI harness.
2. Install connector [78B] to connect EFI harness to ECM.
3. Install right side cover and saddlebag.

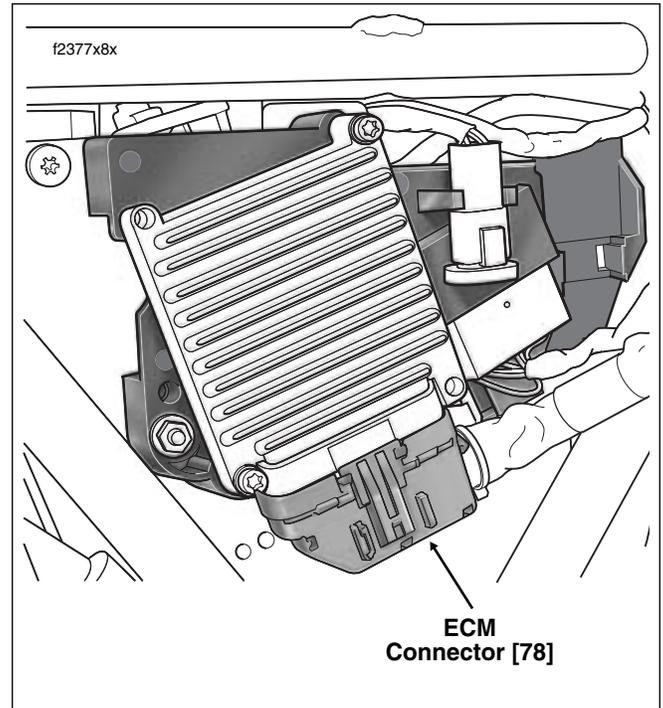


Figure 5-10. Electrical Bracket (Under Right Side Cover)

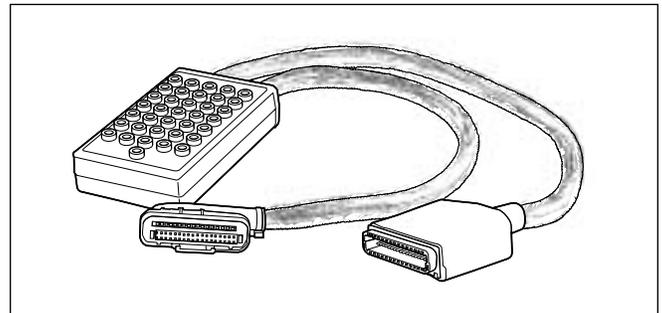


Figure 5-11. Breakout Box (Part No. HD-43876)

## GENERAL

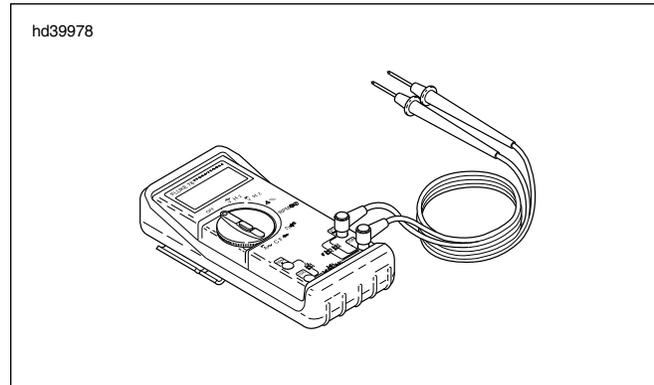
---

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

## PROCEDURE

---

1. See [Figure 5-12](#). Connect DVOM (Part No. HD-39978) to wiring harness between the suspect connections. When diagnosing ECM connections, use a BREAKOUT BOX (Part No. HD-43876) to simplify the procedure. See [Section 5.7 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 5-12. Fluke 78 Multimeter (DVOM)  
(Part No. HD-39978)**

## GENERAL

### **⚠ DANGER**

Propane is an extremely flammable liquid and vapor. Vapor may cause flash fire. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Failure to follow this alert can result in death or serious injury.

### **⚠ WARNING**

Read all directions and warnings on propane bottle. Failure to follow all directions and warnings on bottle could result in death or serious injury.

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

## LEAK TESTER

### Parts List

- Standard 14 oz. propane cylinder.
- Propane Enrichment Kit (HD-41417).
- 12 in. (304 mm) long-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 5-13](#). Flatten one end of copper tube to form a nozzle.
3. Insert round side of copper tube into end of tubing.

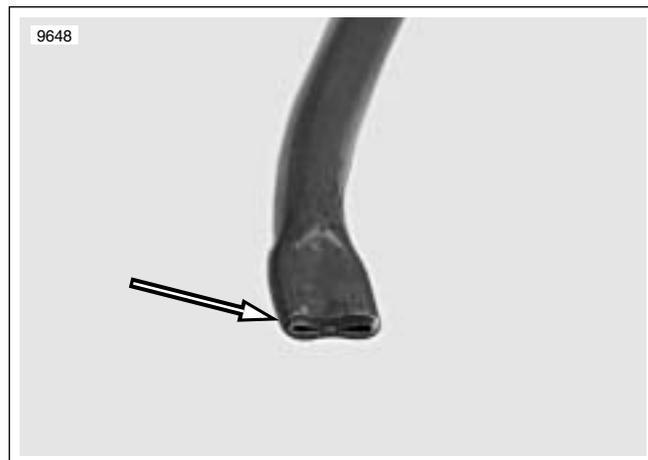
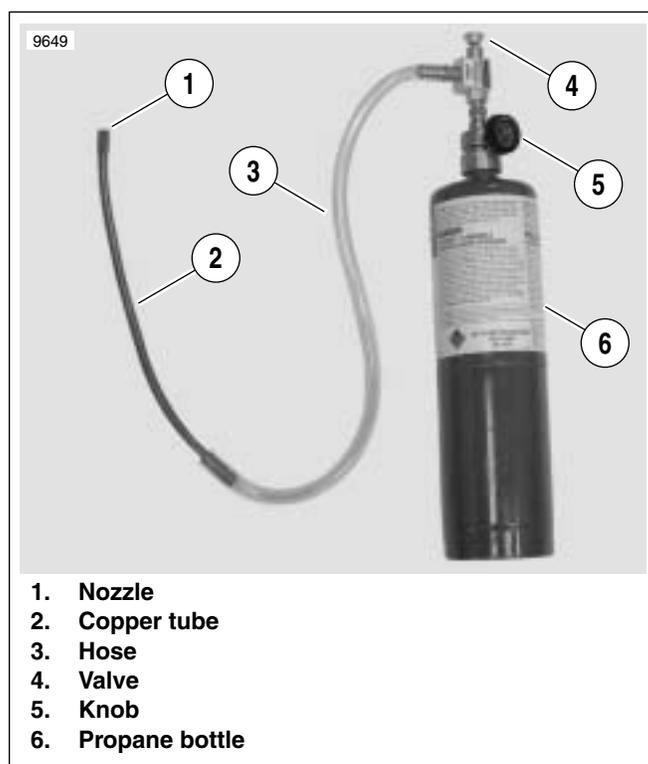


Figure 5-13. Nozzle



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

Figure 5-14. Leak Tester

## INTAKE LEAK TESTING

---

1. Start engine.
2. Warm engine to operating temperature.
3. See [Figure 5-14](#). Turn knob (5) counterclockwise to open propane bottle.

**DANGER**

Propane is an extremely flammable liquid and vapor. Vapor may cause flash fire. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation.

*NOTE*

*Do not direct propane stream toward front of engine. If propane enters air cleaner, a false reading will be obtained.*

4. See [Figure 5-15](#). Aim nozzle toward possible sources of leak such as fuel injectors and intake tract.
5. See [Figure 5-14](#). Push valve (4) to release propane. Tone of engine will change when propane enters source of leak.



Figure 5-15. Checking for Leaks

## GENERAL

If the starter will not crank the engine, the problem is not EFI related. Refer to SECTION 1-STARTING & CHARGING or SECTION 3-TSM & TSSM.

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.10 flow charts.

1. Check for trouble codes. See [RETRIEVING DIAGNOSTIC TROUBLE CODES](#) under Section [5.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI](#).
2. Check the condition of the battery. Perform a voltage test and recharge if below 12.60V. Check battery connections and perform load test. Replace the battery if necessary. See BATTERY in the Touring Service Manual.
3. Connect BREAKOUT BOX (Part No. HD-43876). See Section [5.7 BREAKOUT BOX: EFI](#).
4. Remove spark plug cable from spark plug.
  - a. Visually check condition of plug.
  - b. See [Figure 5-16](#). 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-41404A), gray pin probe and patch cord.
6. Typically, when IAC is not functioning, the engine will not start unless throttle is opened and the engine will stall when throttle is closed.
7. See [Figure 5-17](#). Plug IGNITION COIL CIRCUIT TEST ADAPTER (Part No. HD-44687) and FUEL INJECTOR TEST LAMP (Part No. HD-34730-2C) into Breakout Box Terminals 13 and 11. Start engine. If lamp flashes, no problem is found. Repeat for Breakout Box Terminals 13 and 29.
8. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), brown socket probe and patch cord.

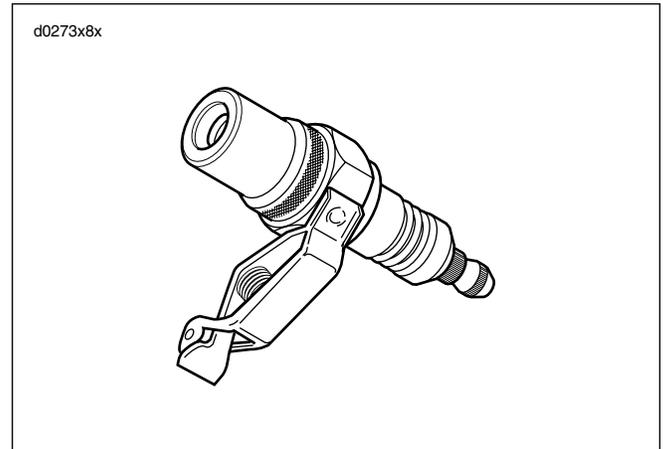


Figure 5-16. Spark Tester



Figure 5-17. Ignition Coil Circuit Test

### Diagnostic Tips

Check TP sensor value with DVOM. If TP sensor is equal to or greater than 3.8 volts, system is in “clear flood” mode and engine will not start. While spark is present, fuel is shut off. Problem can be mechanical, such as throttle cables stuck.

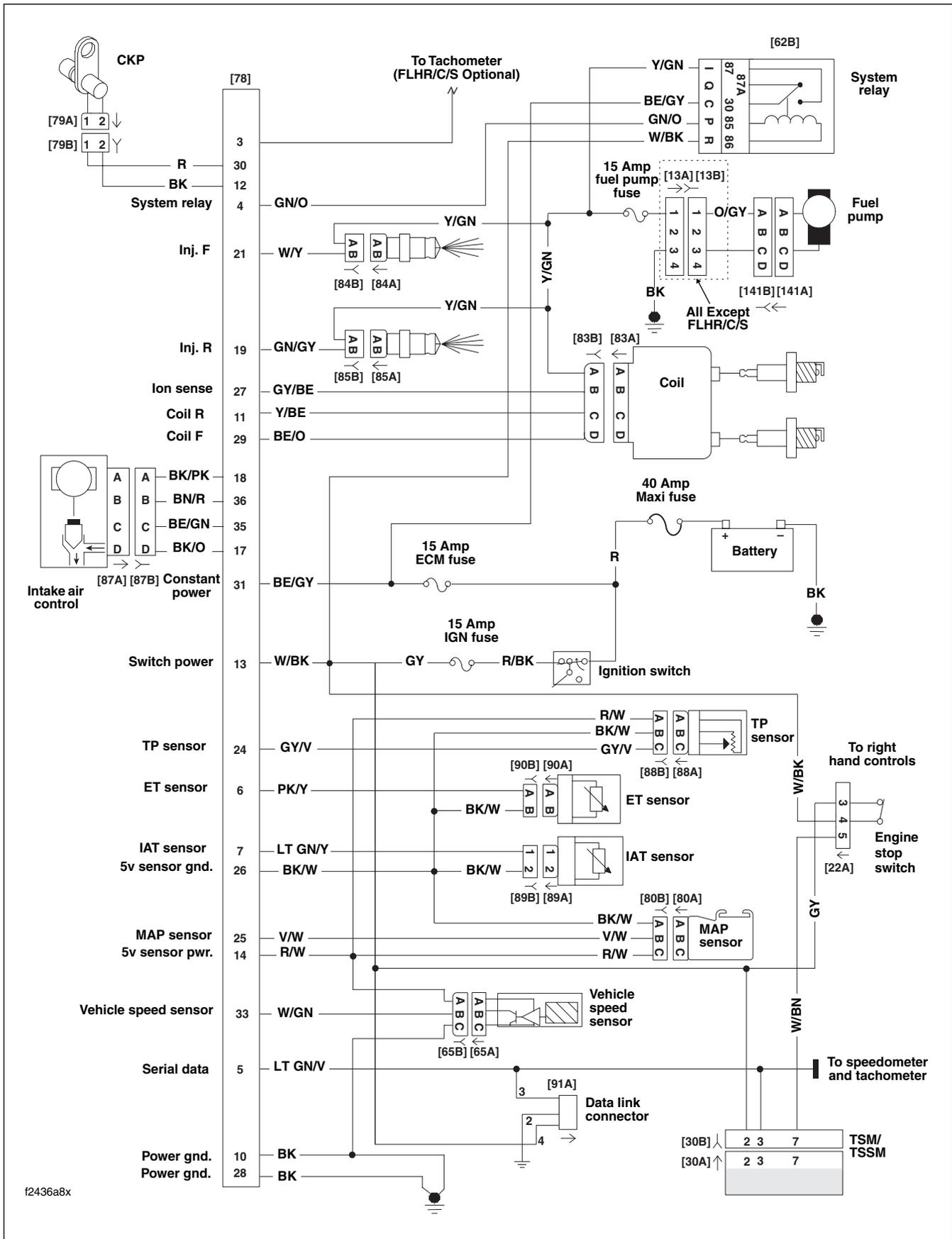


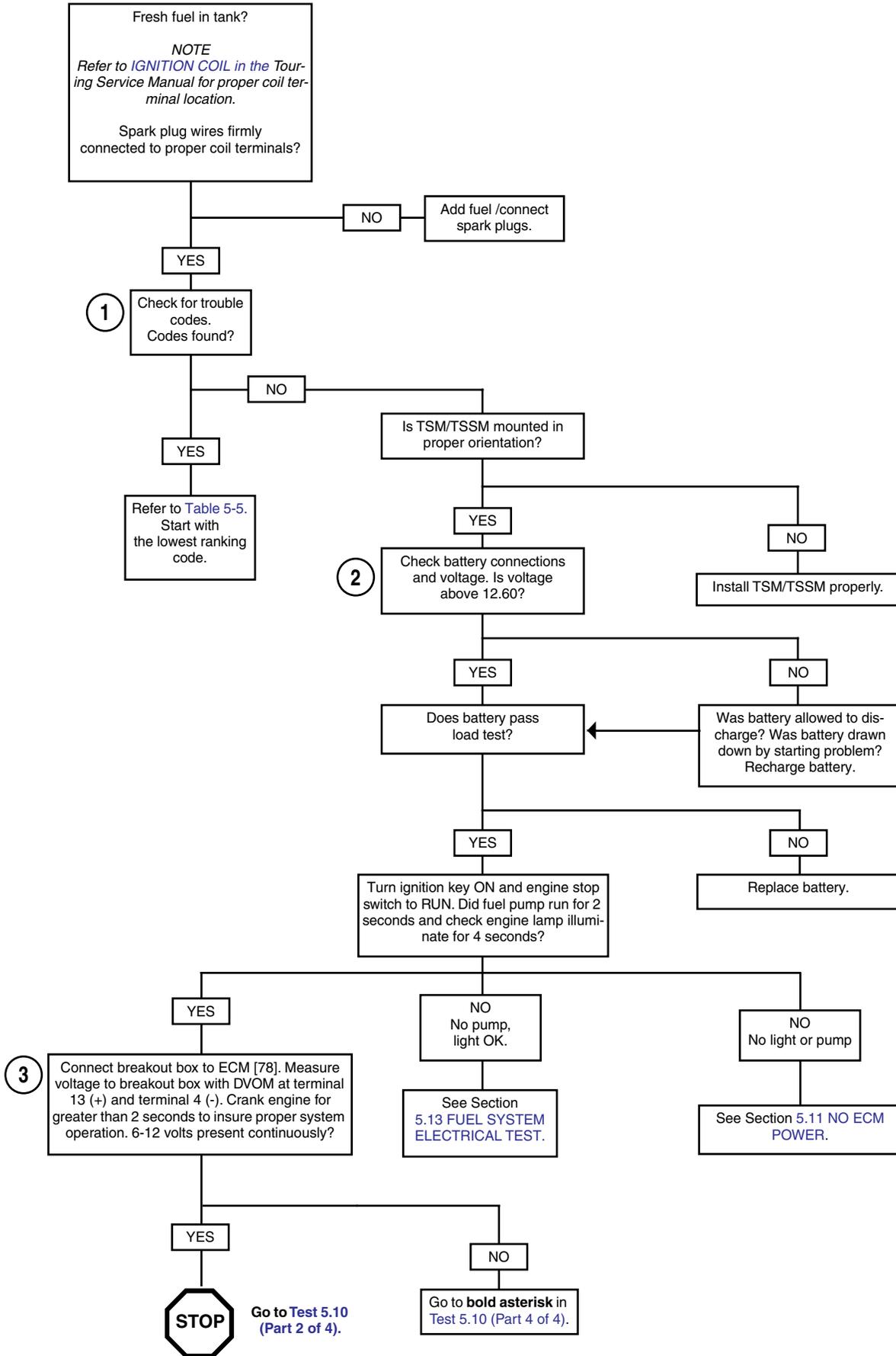
Figure 5-18. Simplified EFI System Circuit

**Table 5-8. Wire Harness Connectors in Figure 5-18.**

NO.	DESCRIPTION	MODEL	TYPE	LOCATION
[22]	Right Handlebar Switch Controls	FLHT/C/U	12-Place Deutsch (Black)	Inner Fairing - Fork Stem Nut Lock Plate (Left Side)
		FLTR	12-Place Deutsch (Black)	Inner Fairing - Left Side of Radio Bracket
		FLHR/C/S	6 - Place Deutsch	Inside Headlamp Nacelle - Fork Stem Nut Lock Plate (Right Side)
[30]	TSM/TSSM	All	12 - Place Deutsch	Cavity in Crossmember at Rear of Battery Box (Under Seat)
[65]	VSS	All	3 - Place Deutsch	Under Right Side Cover (Behind Electrical Bracket)
[78]	ECM	All	36-Place Packard	Under Right Side Cover
[79]	CKP sensor	All	2 - Place Mini-Deutsch	Bottom of Voltage Regulator
[80]	MAP sensor	All	3 - Place Packard	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)
[87]	IAC	All	4 - Place Delphi	Below Fuel Tank (Right Side)
[88]	TP sensor	All	3 - Place Delphi	Below Fuel Tank (Right Side)
[89]	IAT sensor	All	2 - Place Delphi	Below Fuel Tank (Right Side)
[90]	ET sensor	All	2 - Place Delphi	Back of Front Cylinder (Left Side)
[91]	Data Link	All	4 - Place Deutsch	Under Right Side Cover

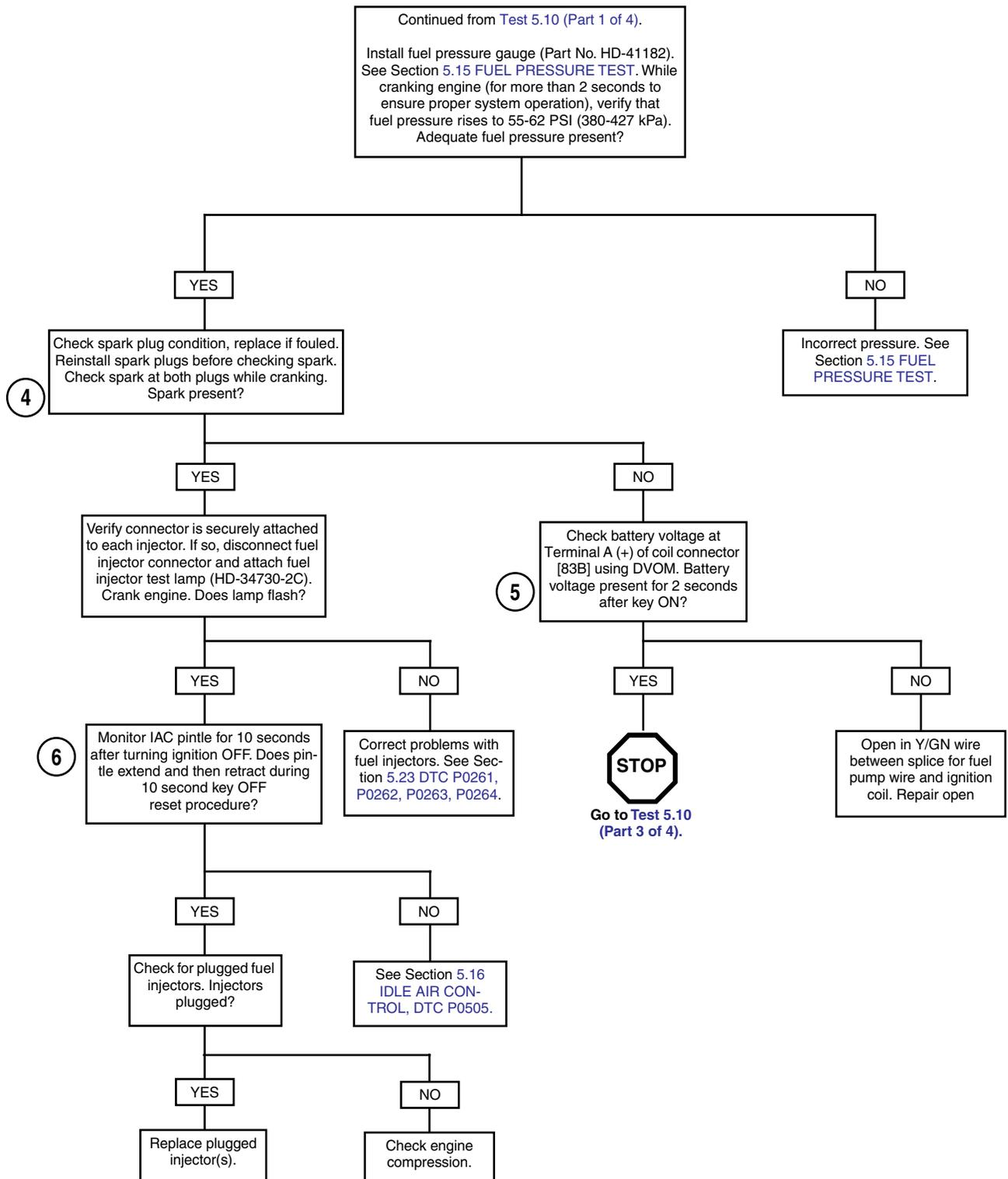
# Test 5.10 (Part 1 of 4)

## ENGINE CRANKS, BUT WILL NOT START



## Test 5.10 (Part 2 of 4)

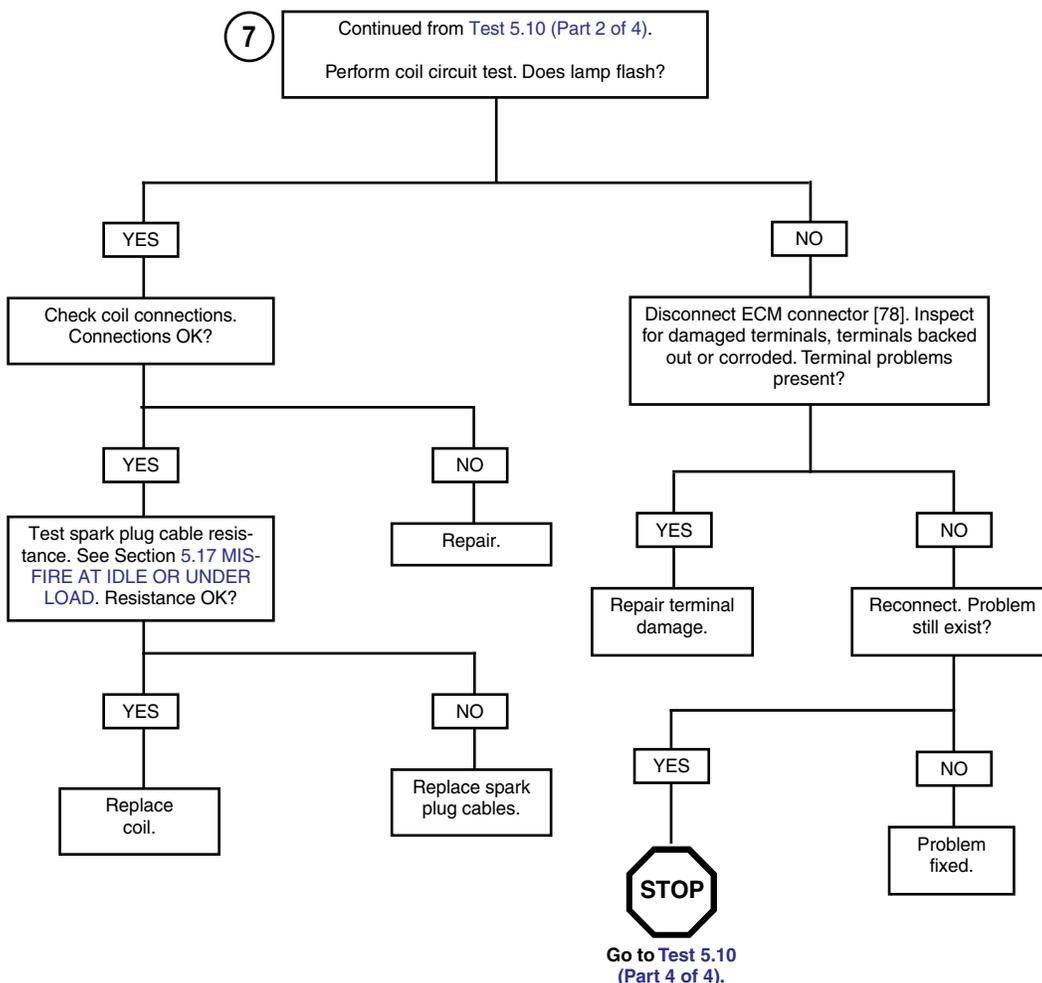
## ENGINE CRANKS, BUT WILL NOT START



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

### Test 5.10 (Part 3 of 4)

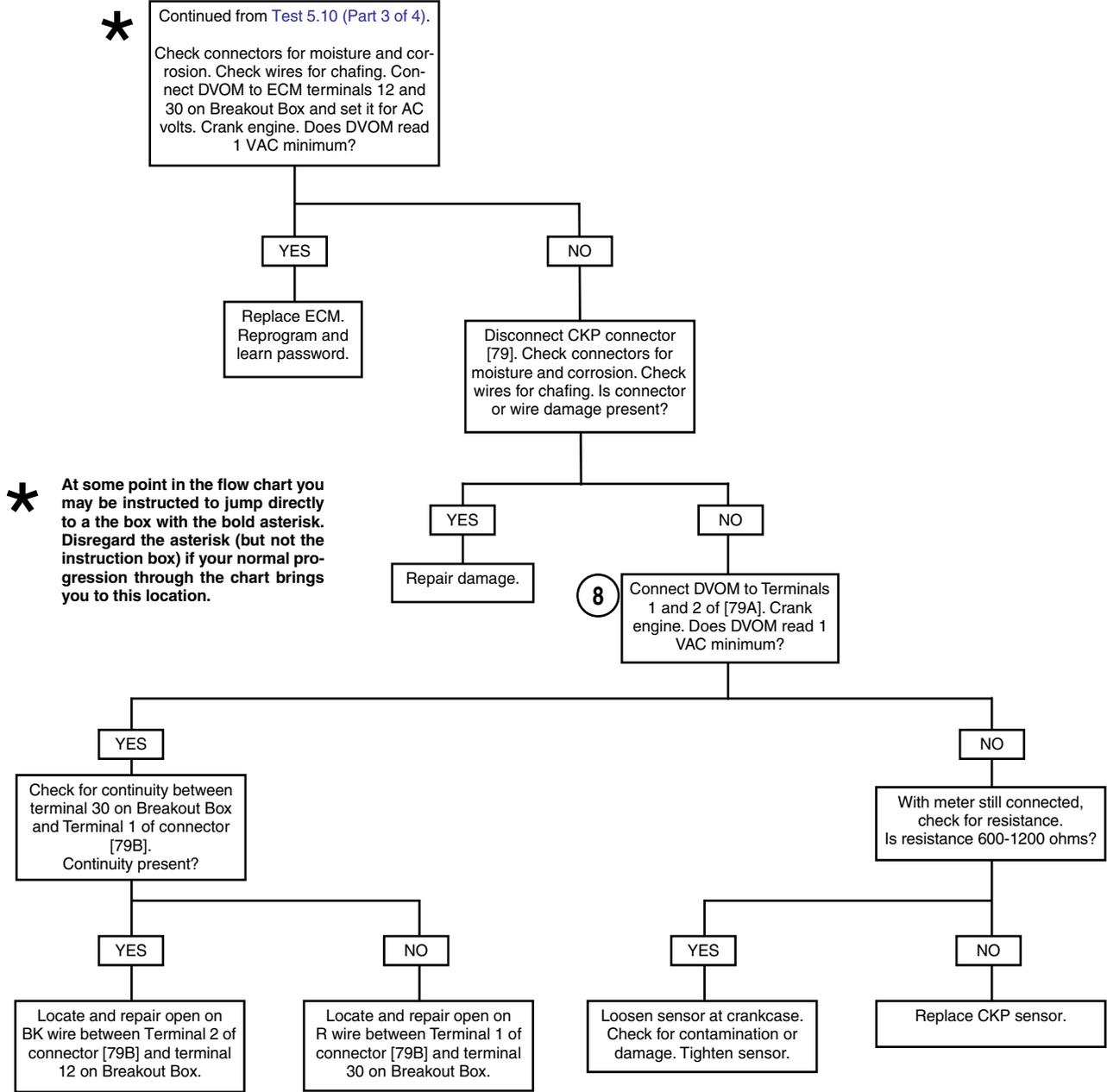
#### ENGINE CRANKS, BUT WILL NOT START



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## Test 5.10 (Part 4 of 4)

### ENGINE CRANKS, BUT WILL NOT START



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## GENERAL

### No Spark/No Check Engine Lamp at Key ON

Constant power is supplied to the ECM through terminal 31. The ECM turns on when power is applied to terminal 13 of connector [78]. The ECM goes through an initialization sequence every time power is removed and re-applied to terminal 13. 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.

If battery power is absent at ECM terminal 31:

- DTC's cannot be cleared. Tool will show them as cleared but will be present next time ignition key is cycled.
- ECM cannot be re-flashed.
- Vehicle will start but IAC pintle will not reset at key OFF. Eventually pintle will be out of position causing performance problems.

#### NOTE

The key ON sequence also activates the IAC motor. If power from terminal 31 is disrupted (blown fuse, etc.) always turn the key OFF wait 10 seconds then turn the key ON to reset the motor to the default position.

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.11 flow charts.

1. Connect BREAKOUT BOX (Part No. HD-43876). See Section 5.7 BREAKOUT BOX: EFI.

#### NOTE

Adapters not used on FLHX, FLHT/C/U and FLTR models.

2. Connect BREAKOUT BOX (Part No. HD-42682) between connectors [22A] and [22B] using Adapters (HD-42962) on FLHR/C/S models.

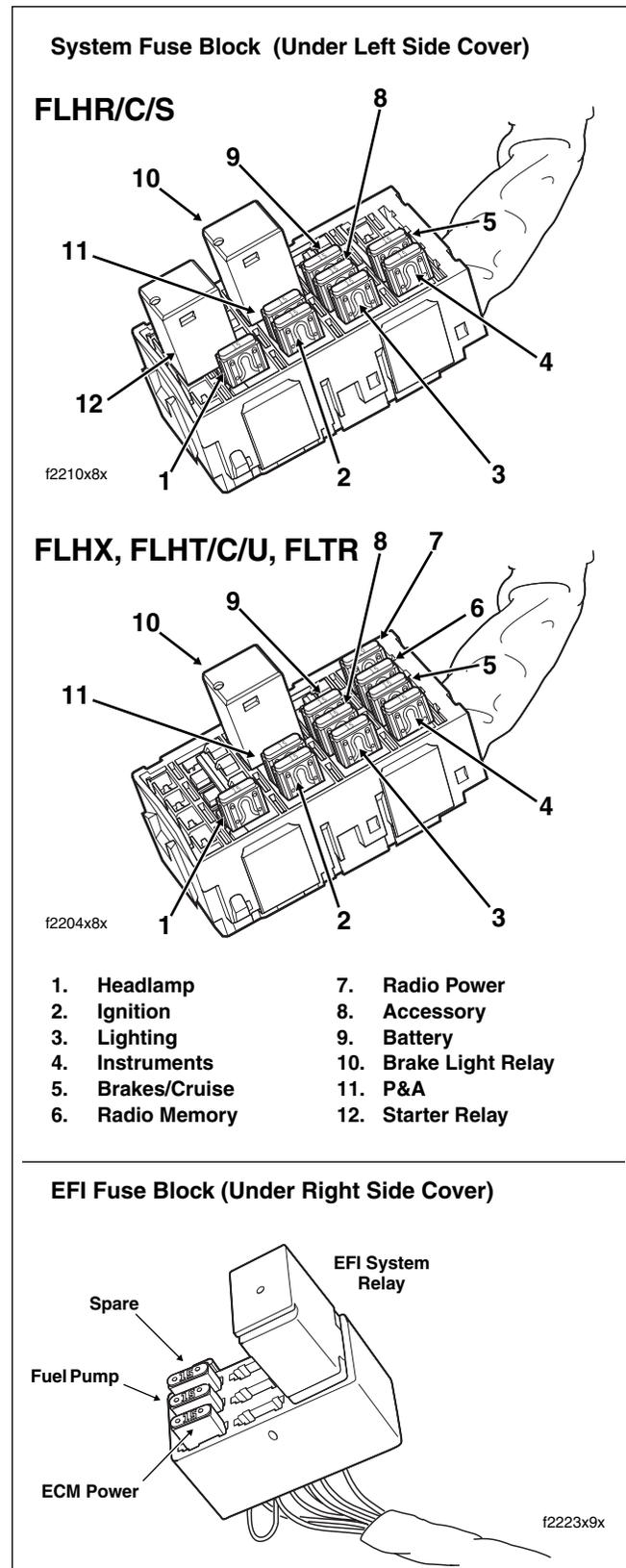


Figure 5-19. Fuse Locations

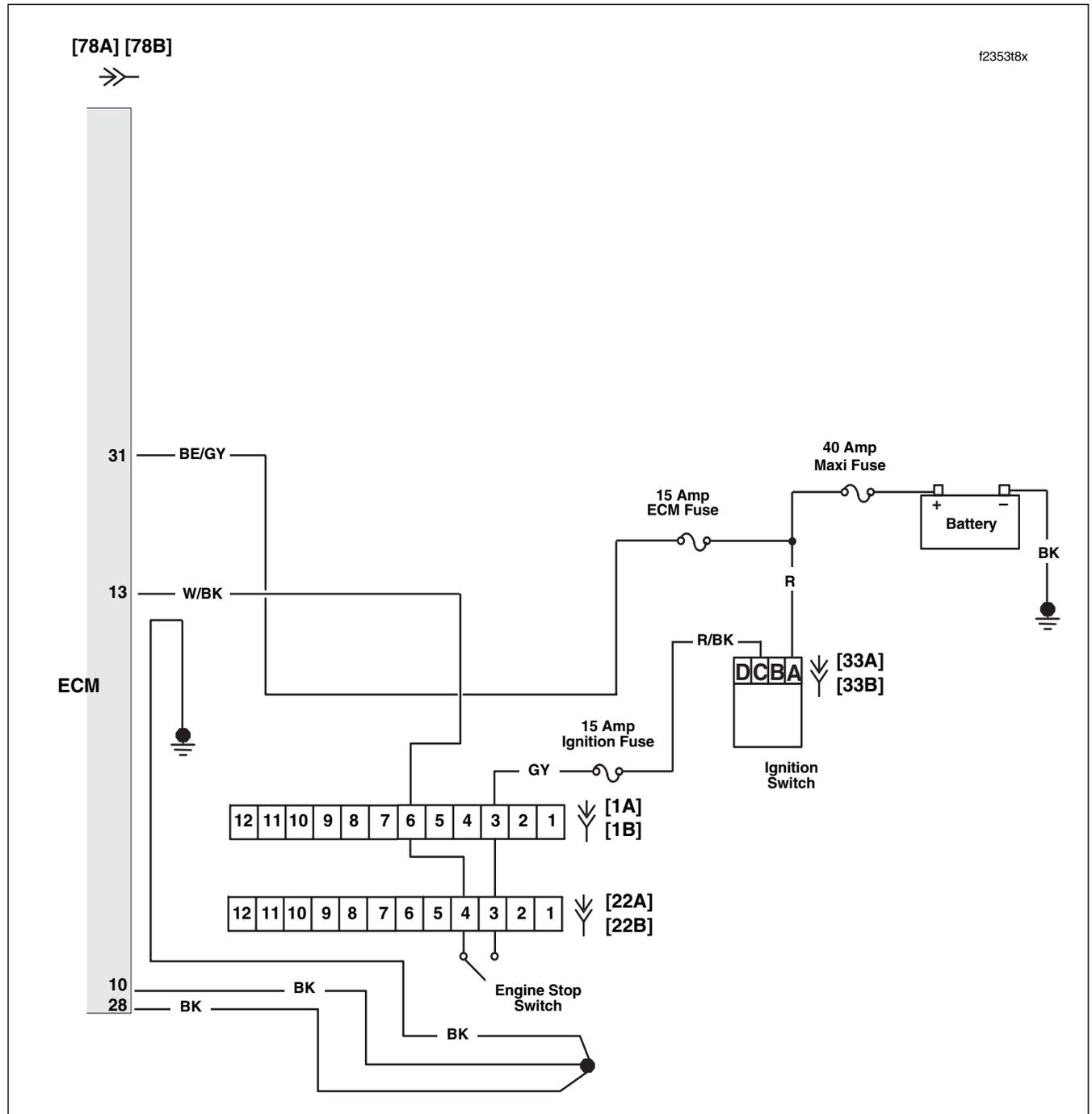


Figure 5-20. ECM Power Circuit (FLHX, FLHT/C/U, FLTR)

Table 5-9. Wire Harness Connectors in Figure 5-20.

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to Interconnect Harness	12-Place Deutsch (Black)	Inner Fairing (Right Radio Support Bracket)
[22]	Right Handlebar Switches	12-Place Deutsch (Black)	Inner Fairing (Fork Stem Nut Lock Plate)
[33]	Ignition/Light Key Switch	3-Place Packard	Inner Fairing -Under Radio
[78]	ECM	36-Place Packard	Under Right Side Cover

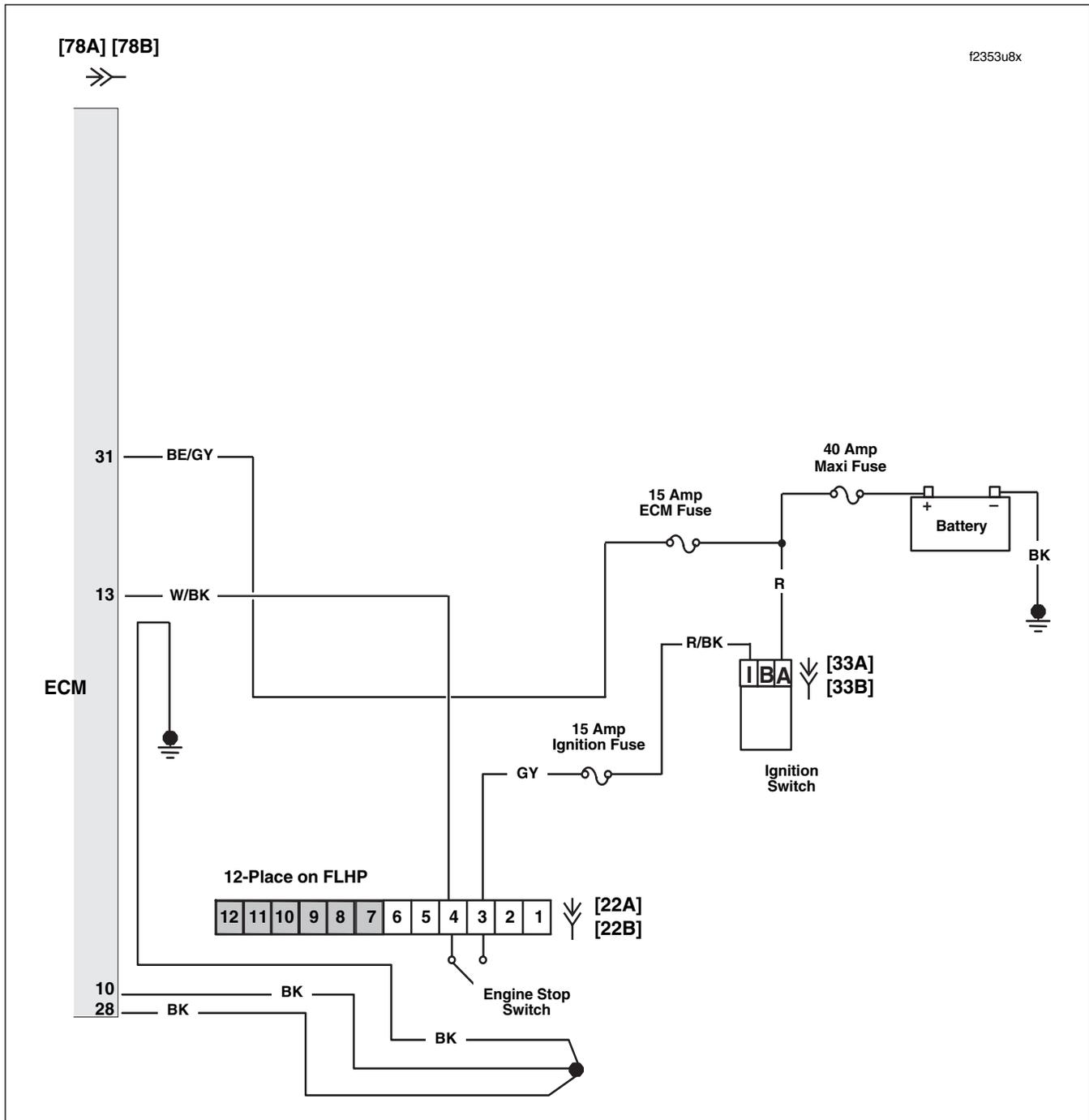


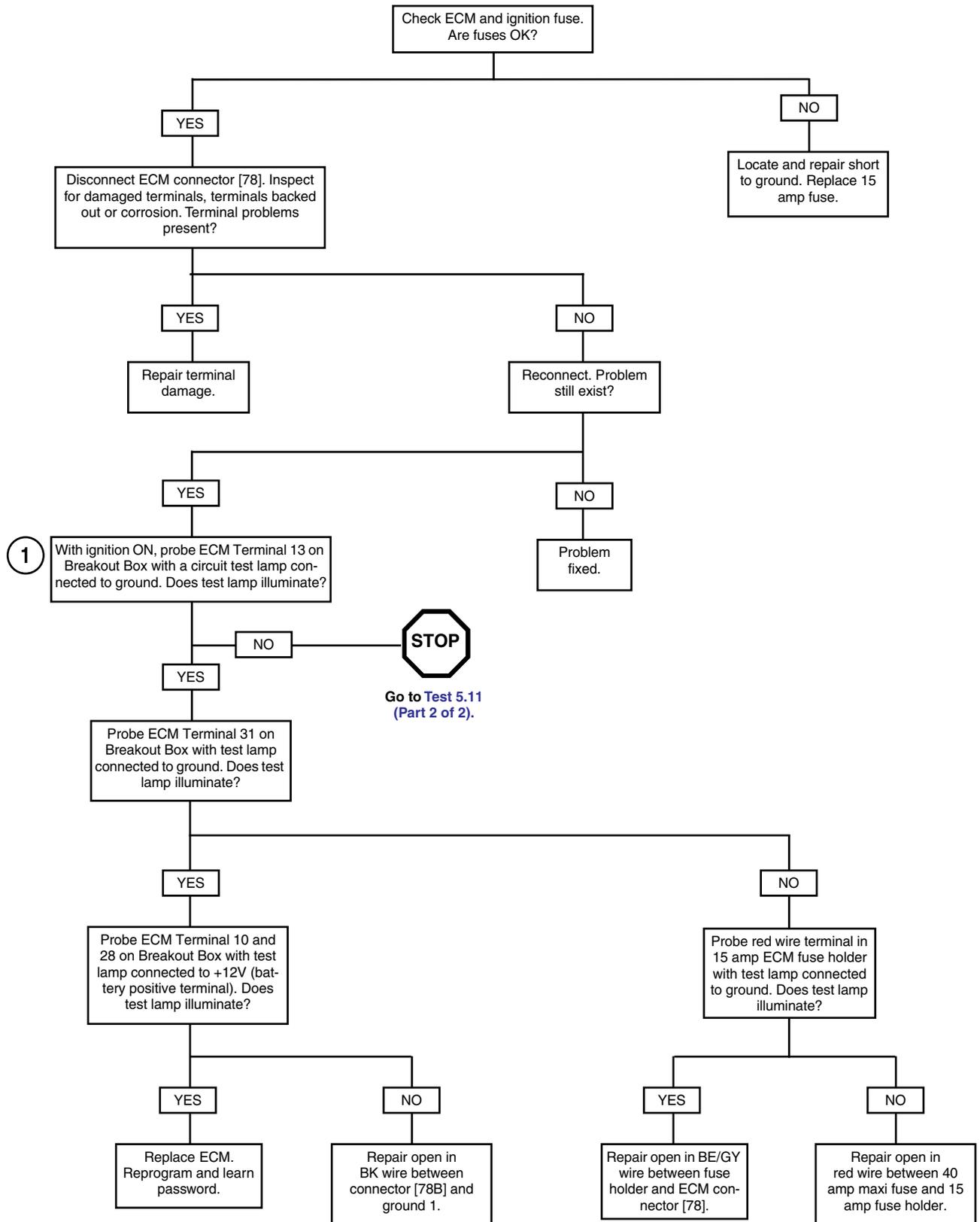
Figure 5-21. ECM Power Circuit (FLHR/C/S)

Table 5-10. Wire Harness Connectors in Figure 5-21.

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Right Handlebar Switches	6-Place Deutsch (Black)	Inside Headlamp Nacelle
[33]	Ignition/Light Key Switch	3-Place Packard	Under Console
[78]	ECM	36-Place Packard	Under Right Side Cover

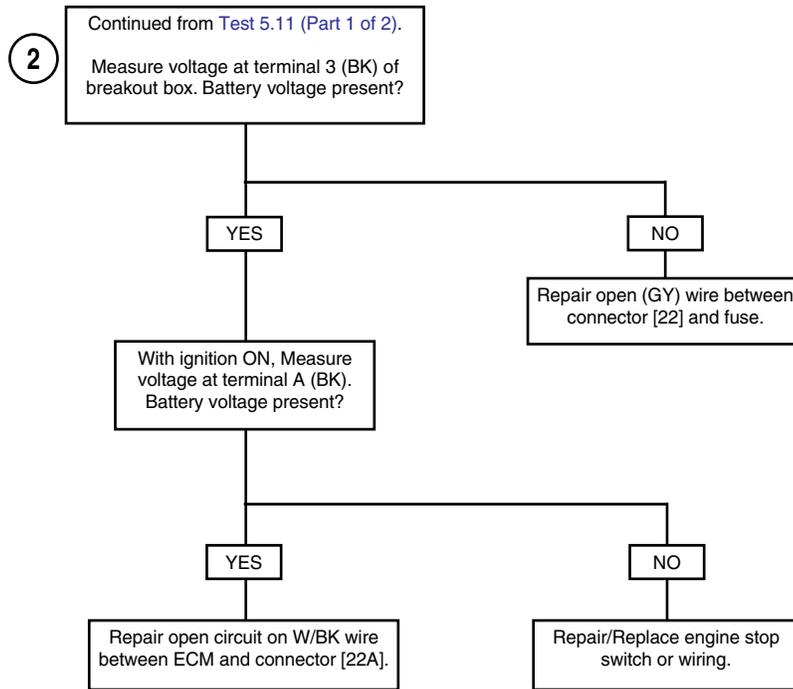
## Test 5.11 (Part 1 of 2)

### NO ECM POWER



## Test 5.11 (Part 2 of 2)

### NO ECM POWER



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## GENERAL

### Diagnostic Trouble Codes U1300, U1301 or “BUS Er”

See [Figure 5-22](#). 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 IAC system may also create this symptom.*

**Table 5-11. Code Description**

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

## DIAGNOSTICS

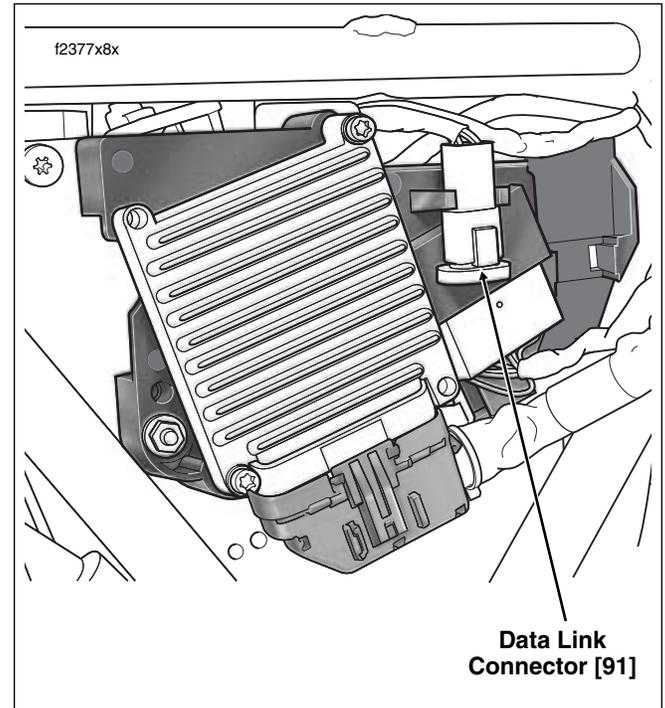
### Diagnostic Tips

- If serial data is shorted, these codes will automatically trip the check engine light.
- DTC's P1009 and P1010 may accompany DTC's U1300 and U1301.

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.12 flow charts.

1. Check for trouble codes. See [RETRIEVING DIAGNOSTIC TROUBLE CODES](#) under Section [5.4 CHECKING FOR DIAGNOSTIC TROUBLE CODES: EFI](#).
2. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), black socket probes and patch cord.



**Figure 5-22. Electrical Bracket (Under Right Side Cover)**



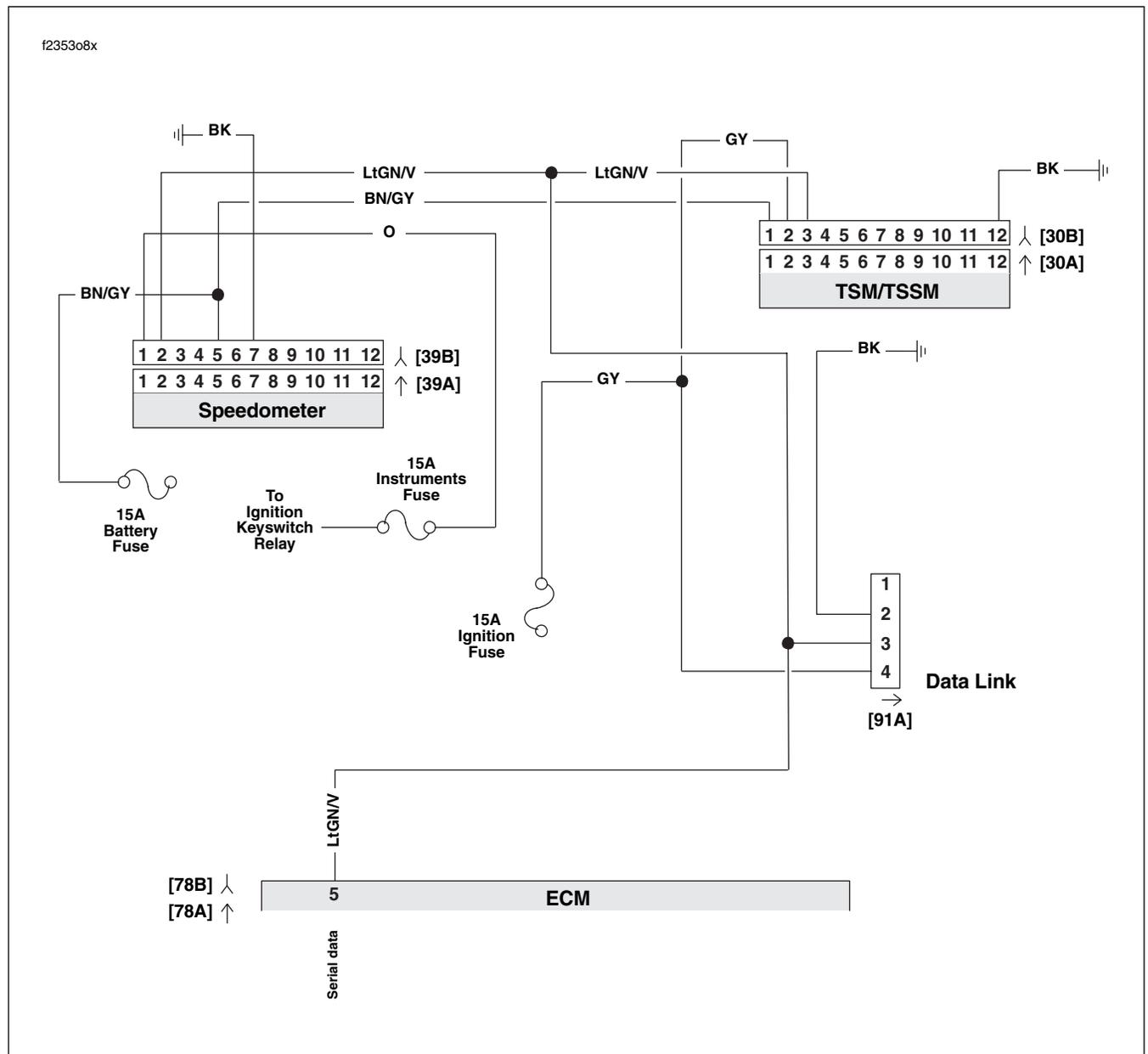


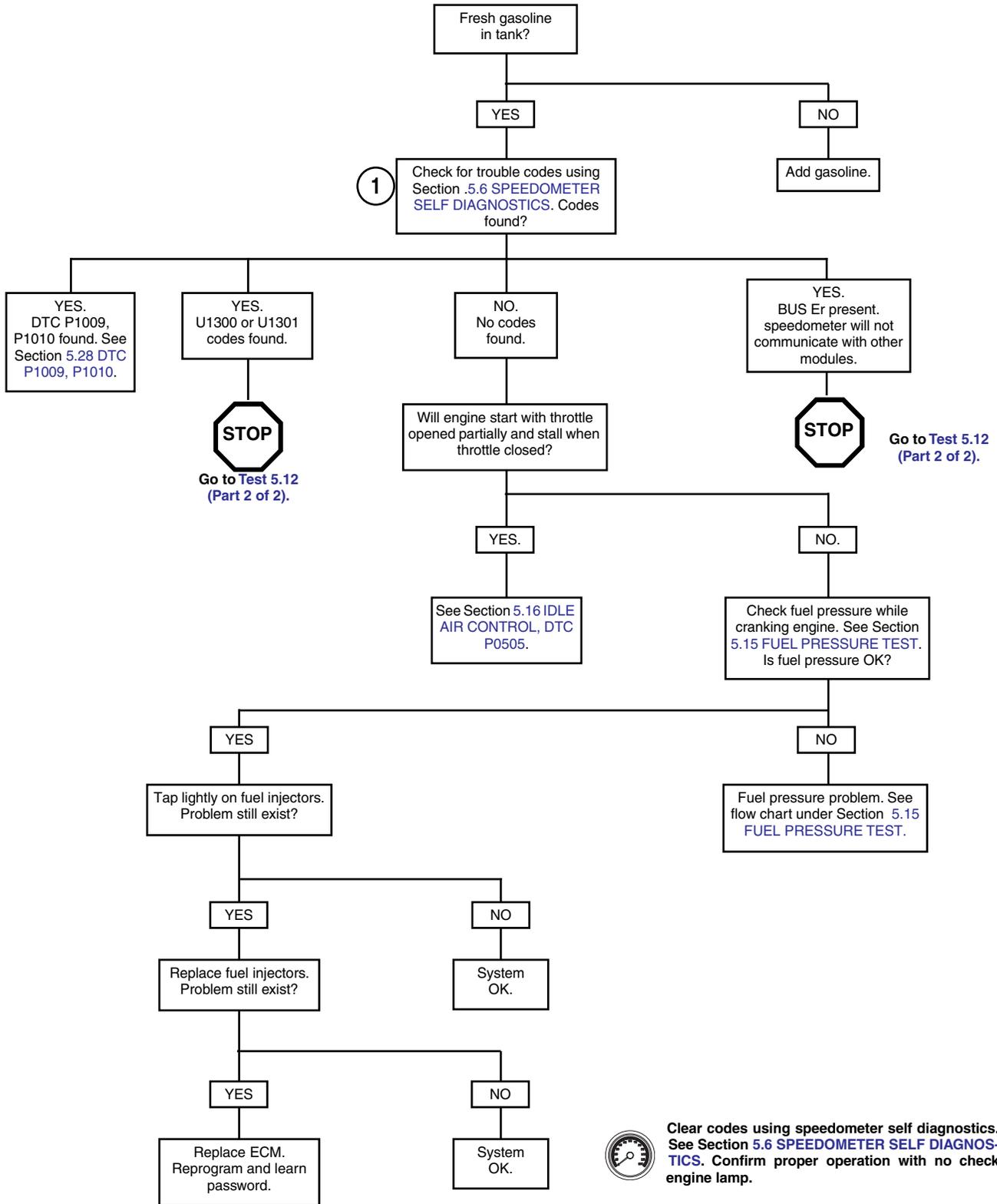
Figure 5-24. Serial Data Circuit (FLHR/C/S)

Table 5-13. Wire Harness Connectors in Figure 5-24.

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	36-Place Packard	Under Right Side Cover
[91]	Data Link	4-Place Deutsch	Under Right Side Cover

### Test 5.12 (Part 1 of 2)

STARTS, THEN STALLS: DTC U1300, U1301 or "BUS Er"



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.



## GENERAL

With ignition switch turned to IGNITION and the engine stop switch at RUN, the ECM will energize the system relay to complete the circuit to the in-tank fuel pump. It will remain on as long as the engine is cranking or running, and the ECM is receiving ignition reference pulses from the CKP. 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]. The fuel pump connector is located on the canopy at the top of the fuel tank. 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 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 and IAC to reset.

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.13 flow charts.

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-41404A), brown pin probe and patch cord.
3. Connect BREAKOUT BOX (Part No. HD-43876). See Section 5.7 BREAKOUT BOX: EFI.
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), purple pin probe and patch cord.

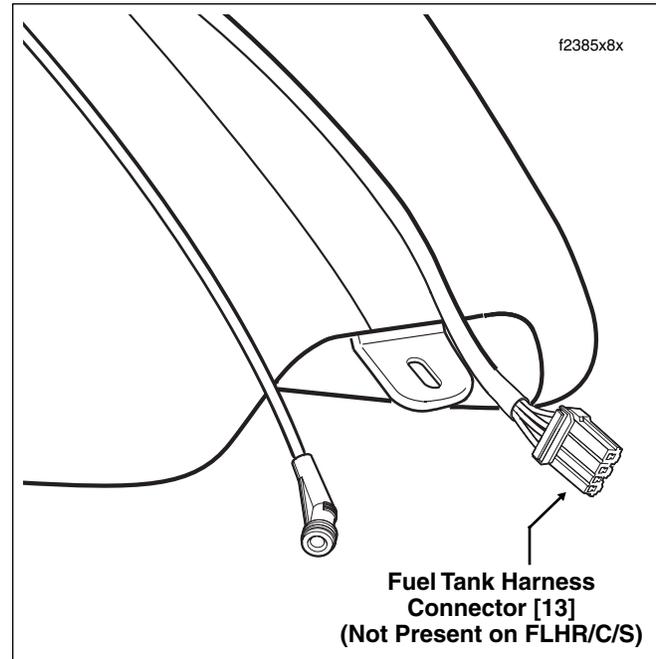


Figure 5-25. Fuel Pump/Fuel Level Sender Connector (FLHX, FLHT/C/U, FLTR)

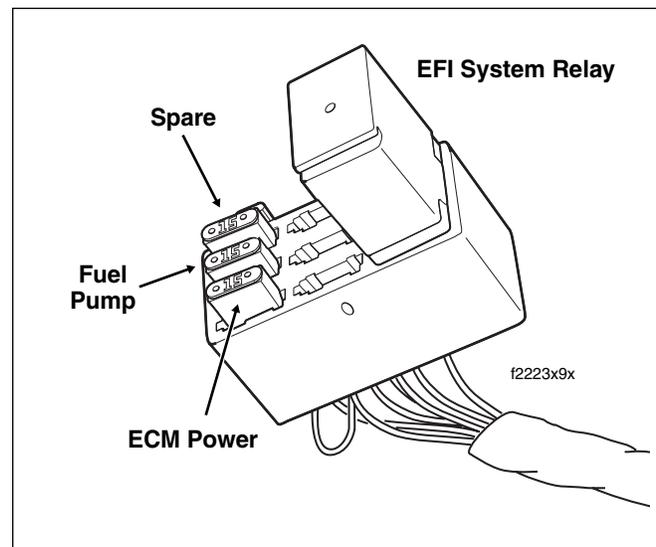


Figure 5-26. EFI Fuse Block

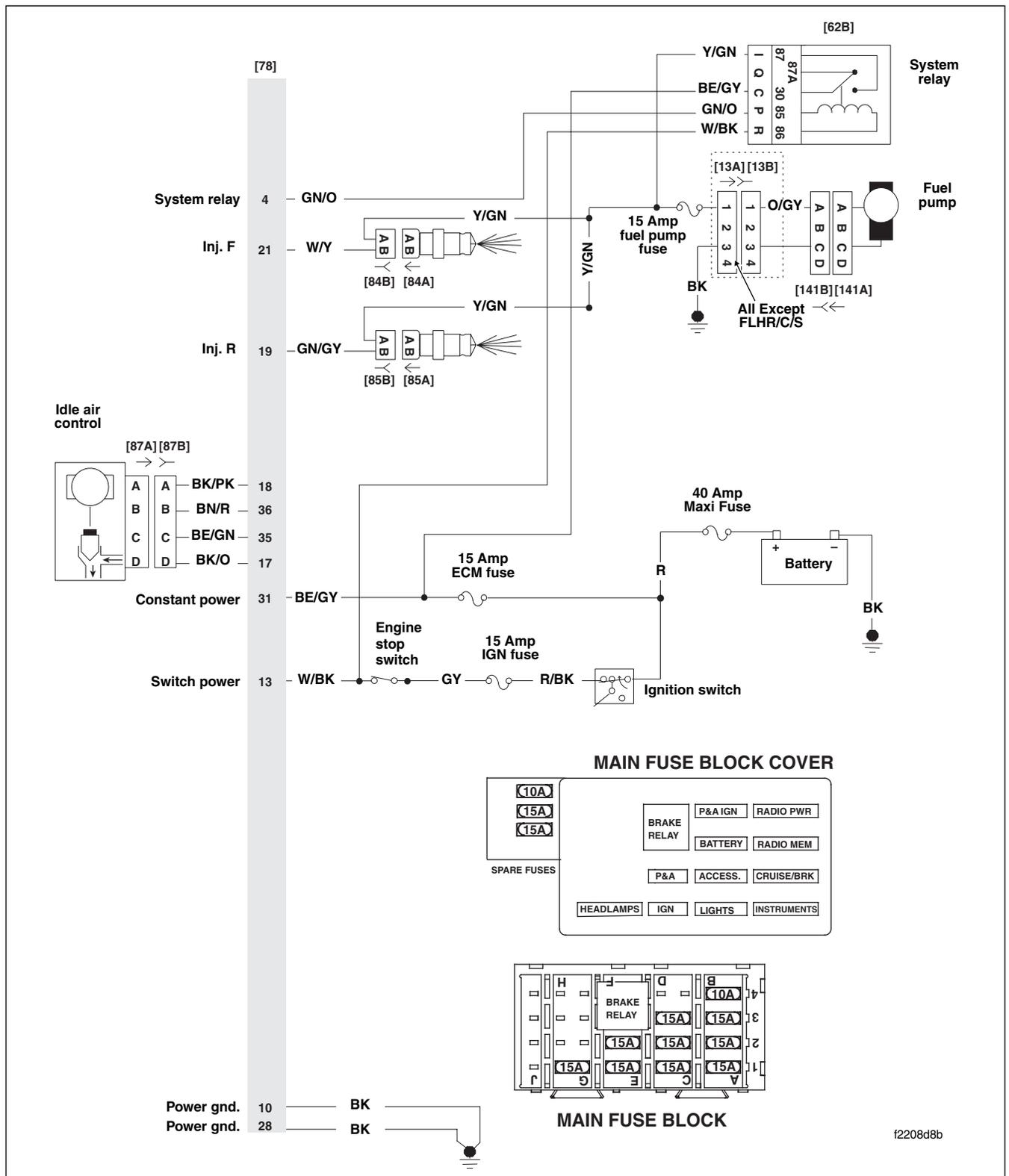


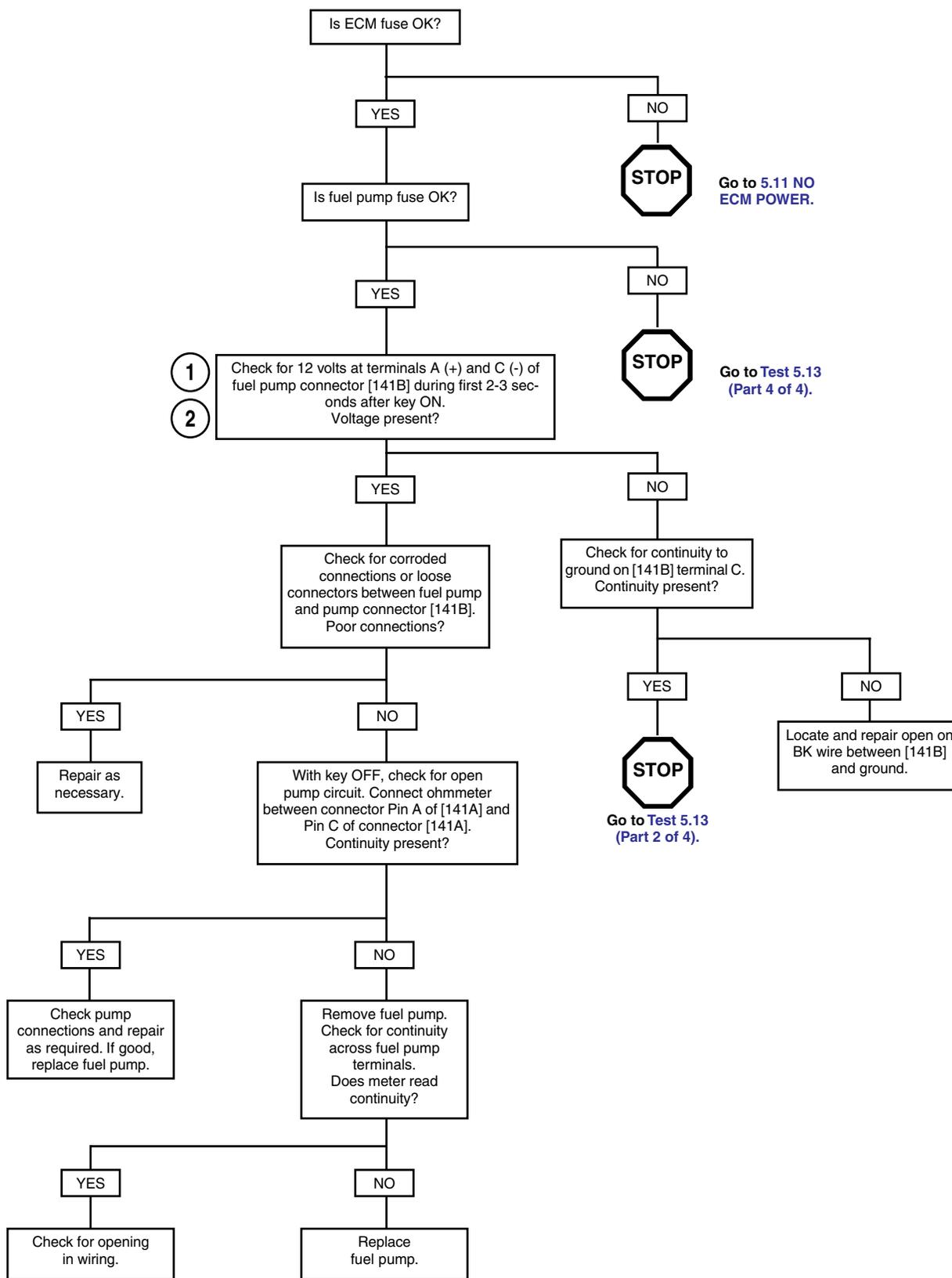
Figure 5-27. Fuel Pump Circuit

Table 5-14. Wire Harness Connectors in Figure 5-27.

NO.	DESCRIPTION	TYPE	LOCATION
[13]	Fuel Tank Harness	4-Place Multilock	Behind Fuel Tank (Under Seat)
[78]	ECM	36-Place Packard	Under Right Side Cover
[141]	Fuel Pump/Fuel Level Sender	4-Place Packard	Top of Canopy (Under Console)

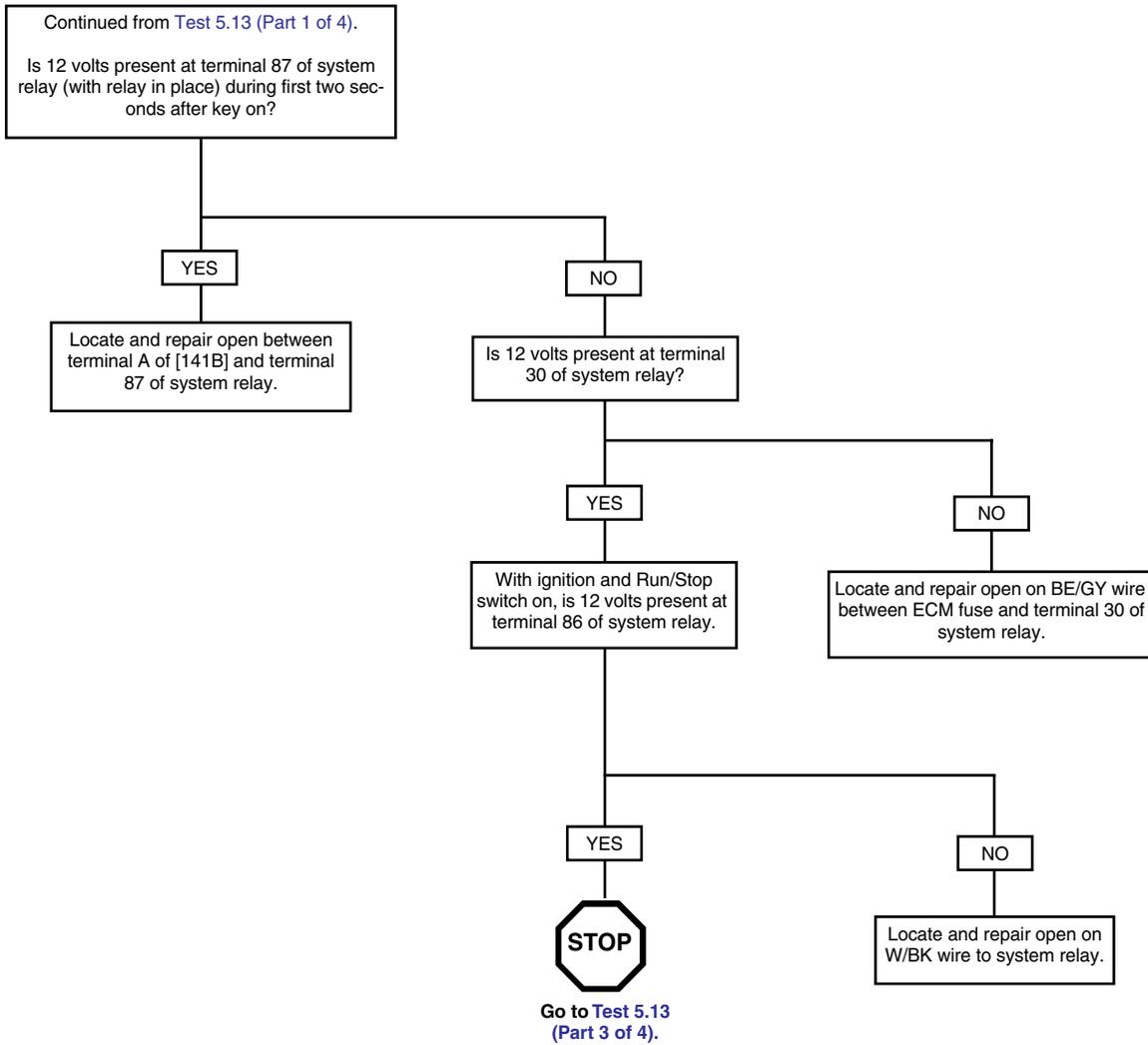
## Test 5.13 (Part 1 of 4)

### FUEL SYSTEM ELECTRICAL TEST



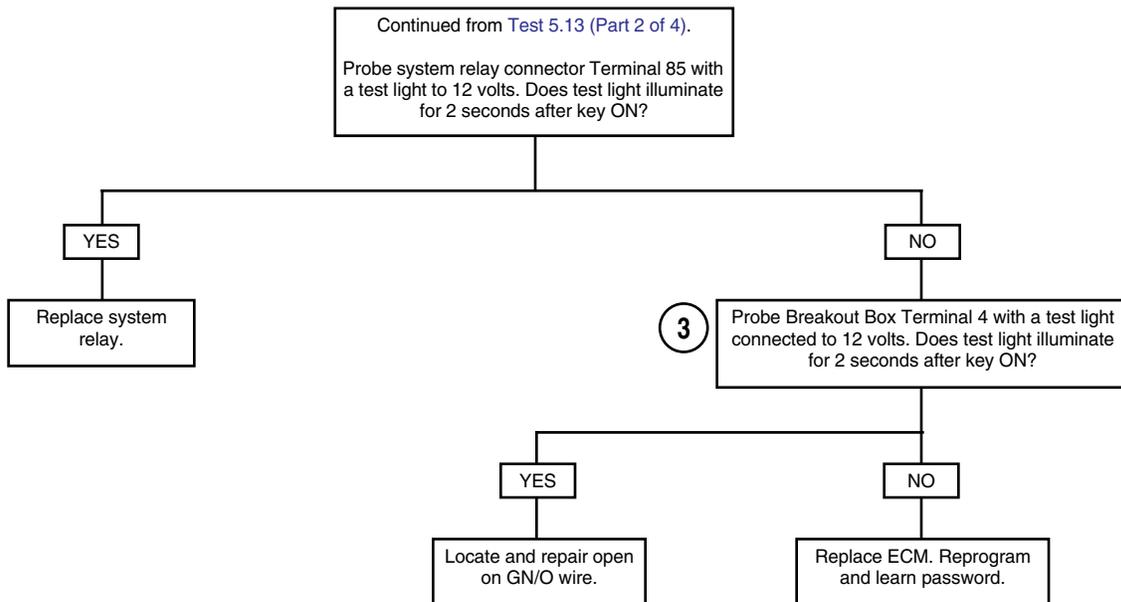
## Test 5.13 (Part 2 of 4)

### FUEL SYSTEM ELECTRICAL TEST



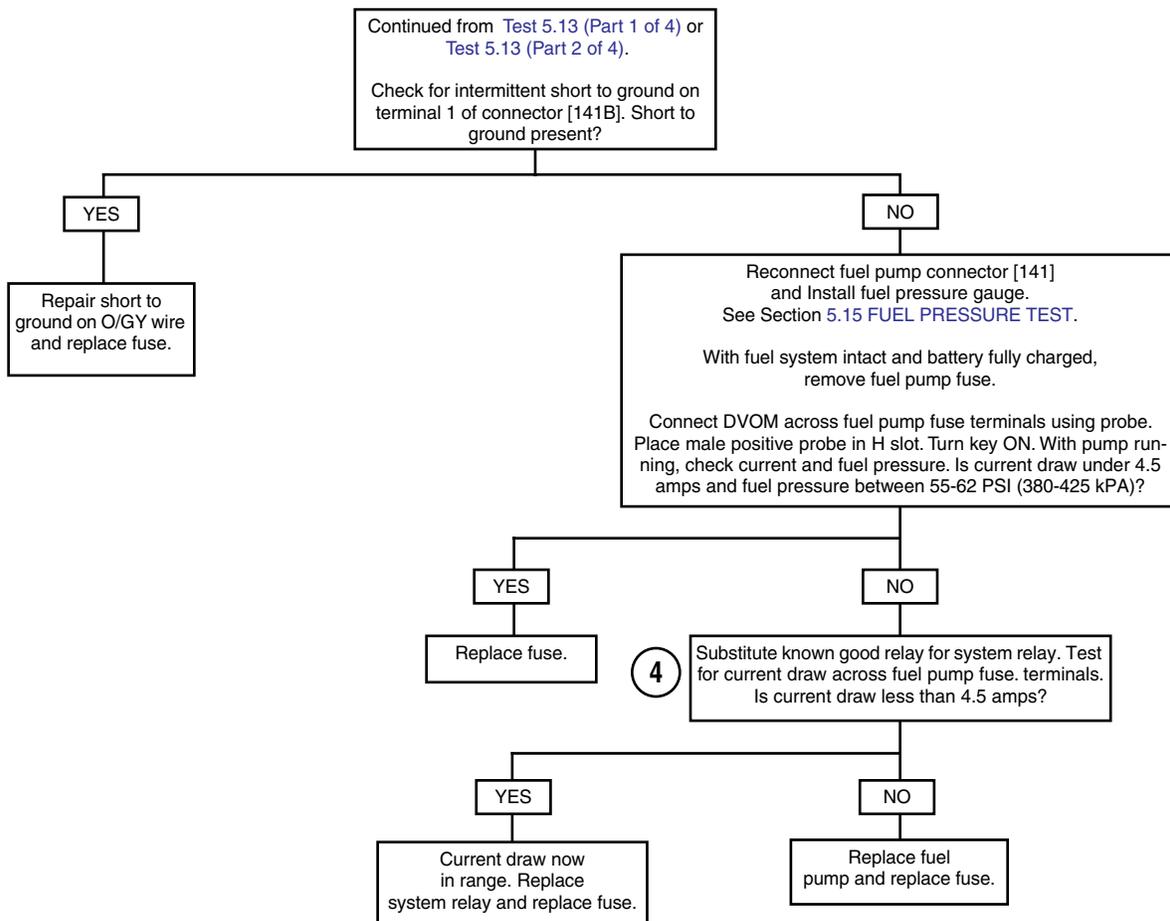
## Test 5.13 (Part 3 of 4)

### FUEL SYSTEM ELECTRICAL TEST



## Test 5.13 (Part 4 of 4)

### FUEL SYSTEM ELECTRICAL TEST



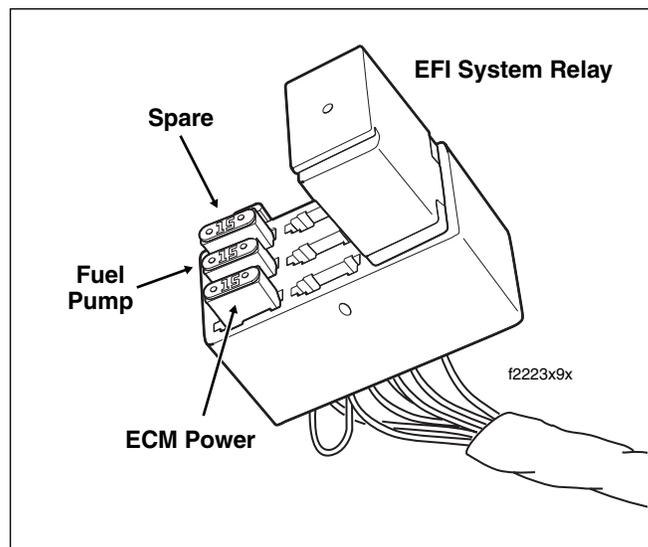
## GENERAL

### System Relay

See [Figure 5-28](#). With ignition switch turned to IGNITION and the engine stop/run switch at RUN, the ECM energizes 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. If there are no reference pulses, the ECM will de-energize the system relay within 2 seconds after ignition is ON or engine has stalled, or immediately after the ignition is shut OFF.

**Table 5-15. 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



**Figure 5-28. EFI Fuse Block**

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.14 flow charts.

1. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), gray pin probe and patch cord.
2. Connect BREAKOUT BOX (Part No. HD-43876) to ECM. See [Section 5.7 BREAKOUT BOX: EFI](#).

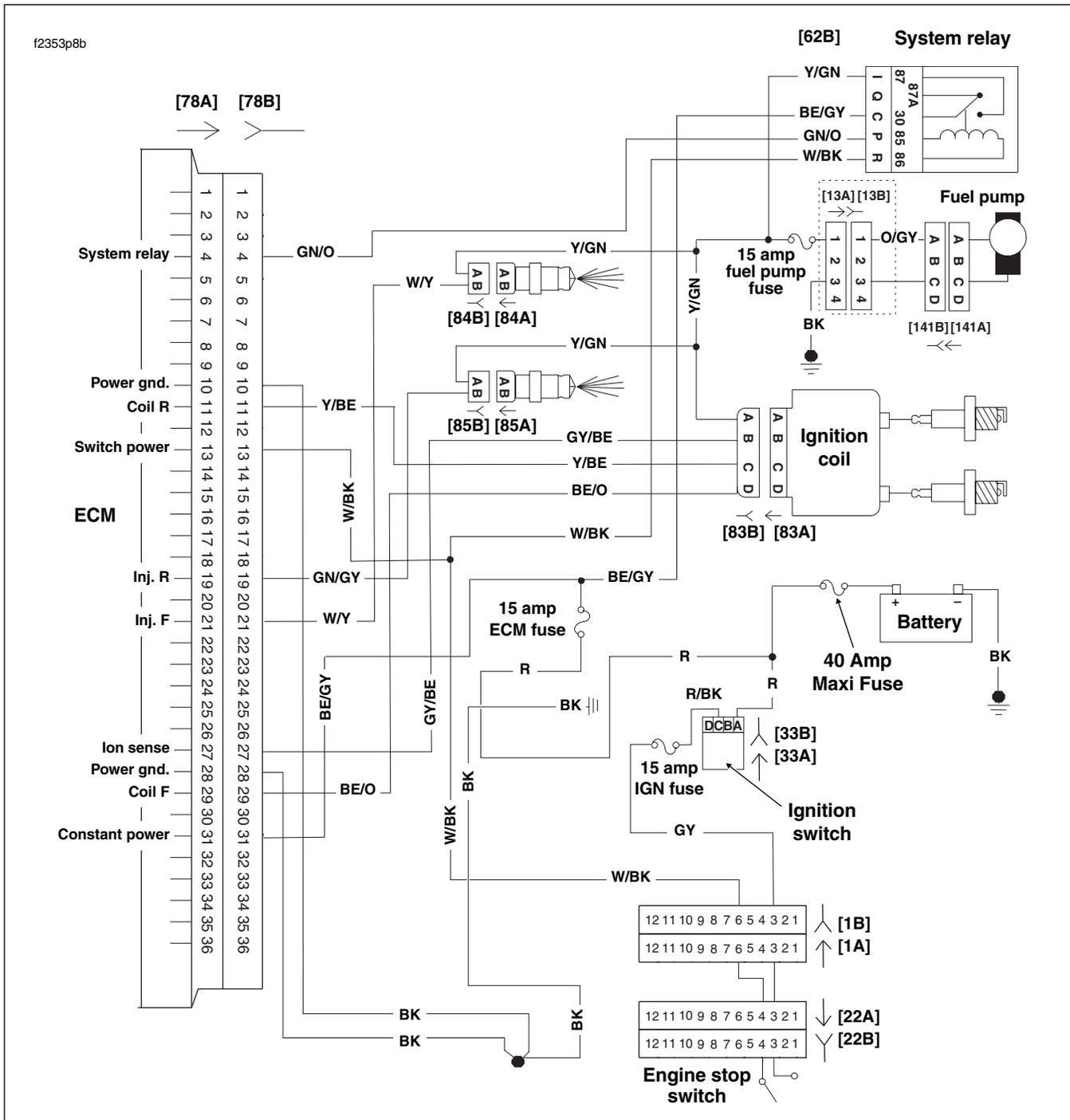


Figure 5-29. System Relay Circuit (FLHX, FLHT/C/U, FLTR)

Table 5-16. Wire Harness Connectors in Figure 5-29.

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to Interconnect Harness	12-Place Deutsch (Black)	Inner Fairing (Right Radio Support Bracket)
[22]	Right Handlebar Switches	12-Place Deutsch (Black)	Inner Fairing (Fork Stem Nut Lock Plate)
[33]	Ignition/Light Key Switch	3-Place Packard	Inner Fairing -Under Radio
[78]	ECM	36-Place Packard	Under Right Side Cover
[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)

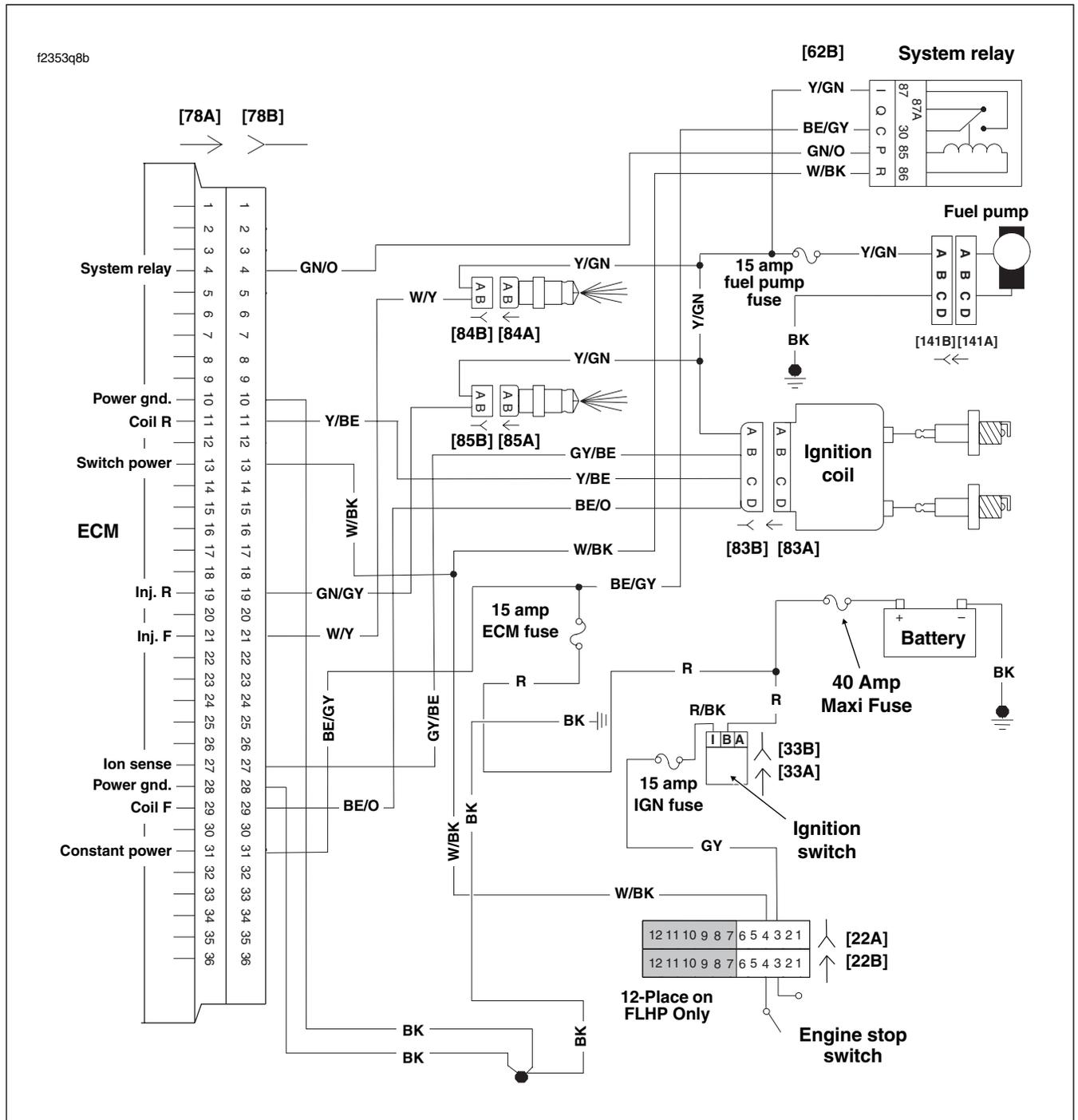


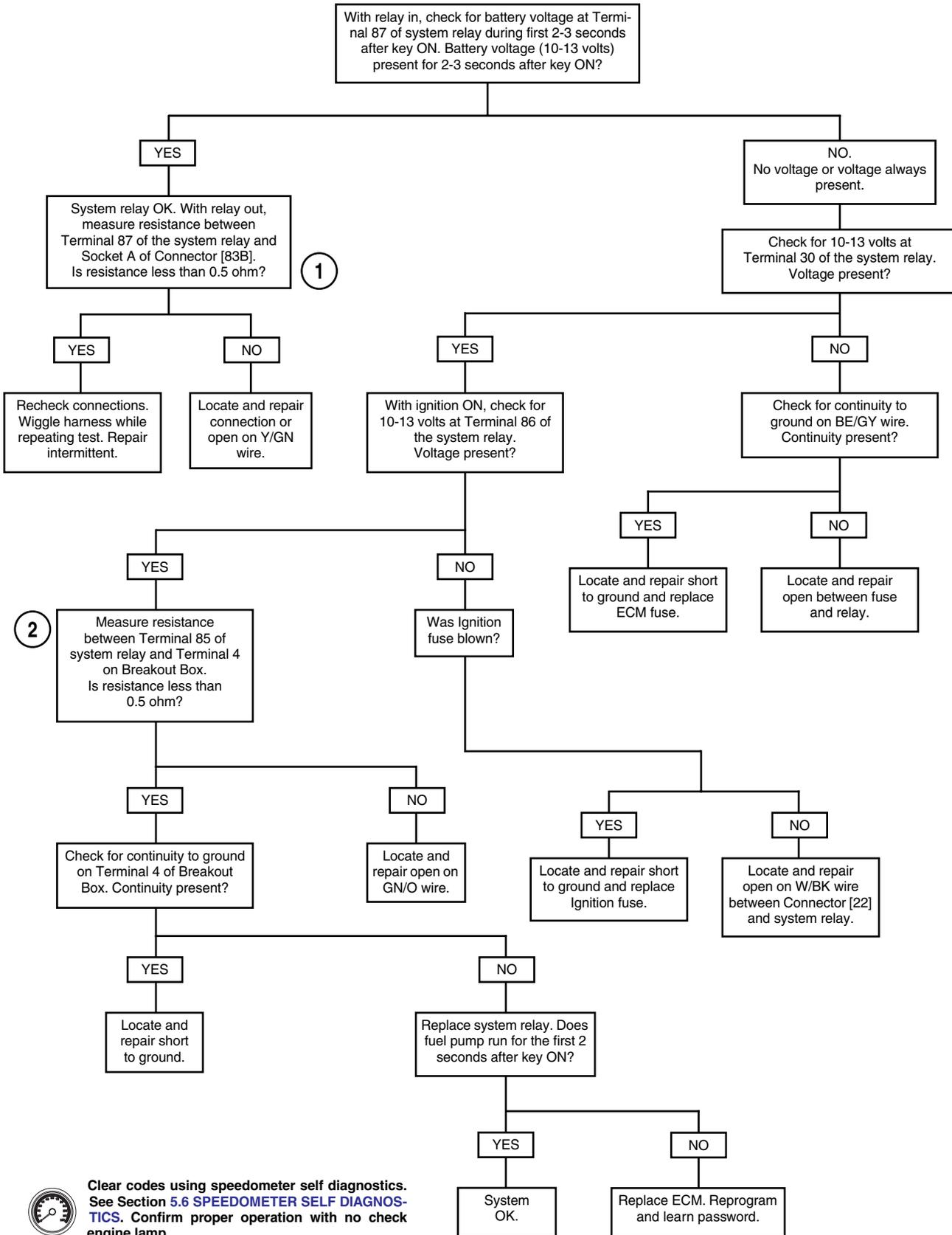
Figure 5-30. System Relay Circuit (FLHR/C/S)

Table 5-17. Wire Harness Connectors in Figure 5-30.

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Right Handlebar Switches	12-Place Deutsch (Black)	Inside Headlamp Nacelle
[33]	Ignition/Light Key Switch	3-Place Packard	Under Console
[78]	ECM	36-Place Packard	Under Right Side Cover
[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)

Test 5.14 (Part 1 of 3)

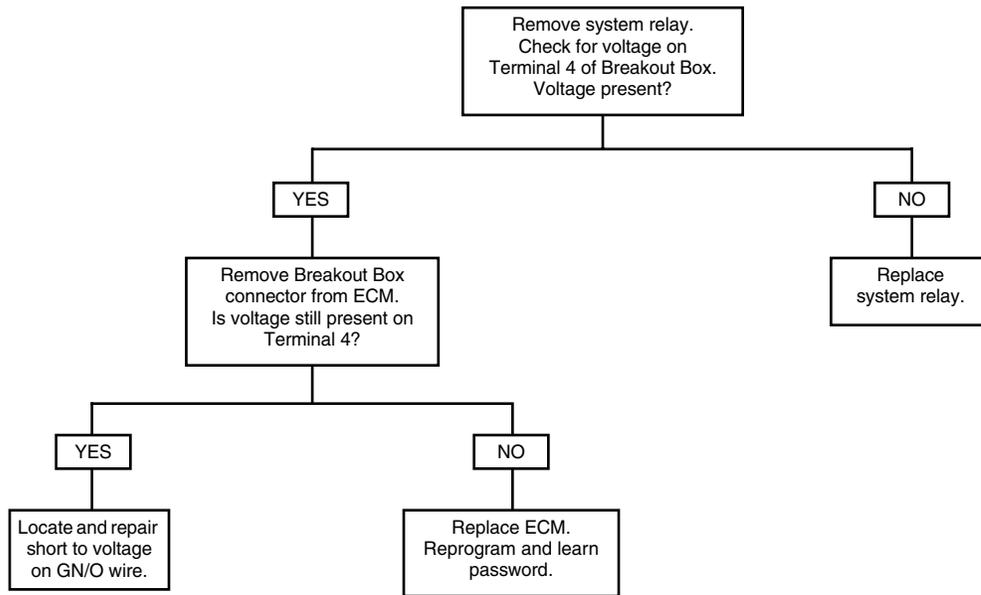
SYSTEM RELAY: DTC P1001, P1003



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

### Test 5.14 (Part 2 of 3)

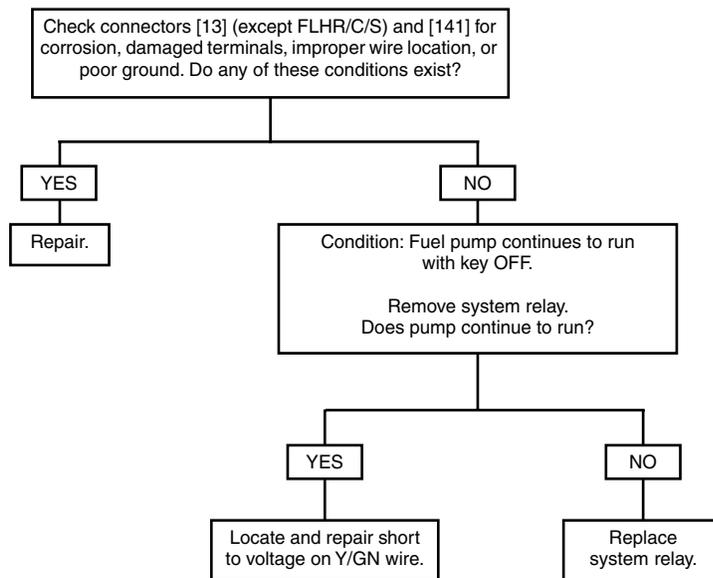
#### SYSTEM RELAY: DTC P1002



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

### Test 5.14 (Part 3 of 3)

#### SYSTEM RELAY: DTC P1004



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## GENERAL

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 5-31](#). The fuel pump fuse is located in the fuse block under the right side cover. The fuel pump can be turned on with the Scanalyzer 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.

## TESTING

The fuel pressure gauge (0-100 PSI) allows for fuel injector and fuel system pressure diagnosis. Special adapters allow the gauge to be attached to the external fuel supply line.

PART NO.	SPECIALTY TOOL
HD-41182	Fuel pressure gauge
HD-44061	Fuel pressure gauge adapters (2)

1. Remove right side saddlebag and side cover.

### WARNING

The gasoline in the fuel supply line downstream of the fuel pump is under high pressure (58 psi). To avoid an uncontrolled discharge or spray of gasoline, always purge the system of high pressure gas before removing the fuel supply line from the fuel tank. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

2. Purge the fuel supply line of high pressure gas.
  - a. See [Figure 5-31](#). Pull the fuel pump fuse from the EFI fuse block.
  - b. Start the engine and allow the vehicle to run.
  - c. When the engine stalls, operate the starter for 3 seconds to remove any remaining fuel from the fuel lines.

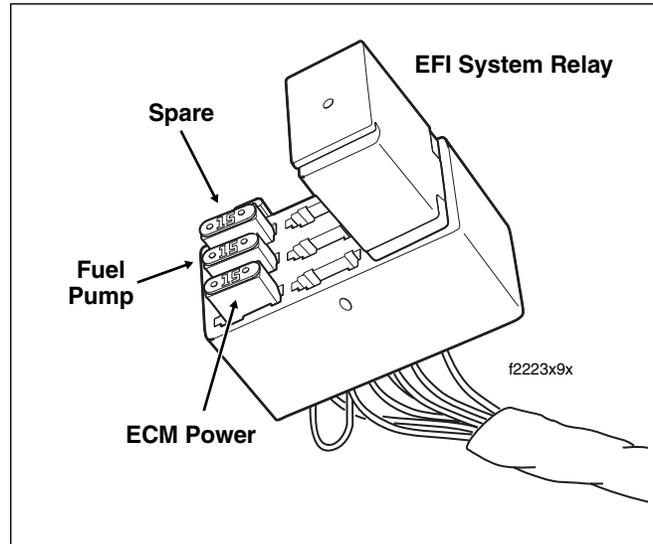


Figure 5-31. EFI Fuse Block

### WARNING

A small amount of gasoline may drain from the quick-connect fitting when the fuel supply line is removed. Thoroughly wipe up any spilled fuel immediately. Dispose of rags in a suitable manner. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

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

### CAUTION

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

4. Attach fuel line to gauge assembly.
  - a. See [Figure 5-32](#). Install a second adapter in series with the first.
  - b. See [Figure 5-33](#). Pull up on chrome sleeve of 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 that it will not come free.

- d. See [Figure 5-34](#). In the same manner, install neck of second fuel supply line fitting into quick-connect fitting on fuel tank. Tug on fuel supply line to be sure that it will not come free.

**⚠ WARNING**

To avoid an uncontrolled discharge or spray of gasoline, always be sure the quick-connect fittings are properly mated. A slight tug on the fuel pressure gauge adapter and fuel supply line will verify this condition. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

5. Verify that the fuel valve and air bleed petcock on the FUEL PRESSURE GAUGE (Part No. HD-41182) are closed.
6. See [Figure 5-32](#). Remove protective cap from free end of fuel pressure gauge adapter. Connect fuel pressure gauge to Schroeder valve.
7. See [Figure 5-31](#). Install fuel pump fuse.
8. Start and idle engine to pressurize the fuel system. Open the fuel valve to allow the flow of fuel down the hose of the pressure gauge.
9. Position the clear air bleed tube in a suitable container and open and close the air bleed petcock to purge the gauge and hose of air. Repeat this step several times until only solid fuel (without bubbles) flows from the air bleed tube. Close the petcock.
10. Open and close throttle to change engine speed. Note the reading of the pressure gauge. Fuel pressure should remain steady at 55-62 psi (380-425 kPa).
11. Turn the engine off. Position the air bleed tube in a suitable container. Open the air bleed petcock to relieve the fuel system pressure and purge the pressure gauge of gasoline.

**⚠ WARNING**

A small amount of gasoline may drain from the adapter when the gauge is removed. Thoroughly wipe up any spilt fuel immediately. Dispose of rags in a suitable manner. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

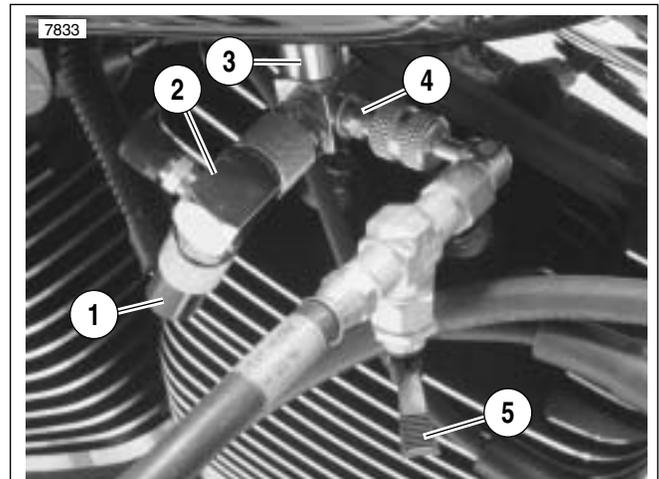
12. Remove fuel pressure gauge from the adapter. Install protective cap over Schroeder valve.

**⚠ WARNING**

A small amount of gasoline may drain from the fuel supply line and adapter when these items are removed. Thoroughly wipe up any spilt fuel immediately. Dispose of rags in a suitable manner. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.



Figure 5-32. 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 5-33. Fuel Line

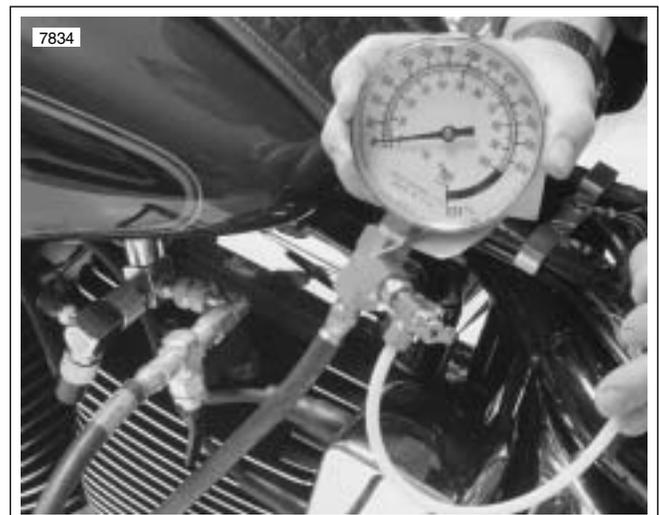
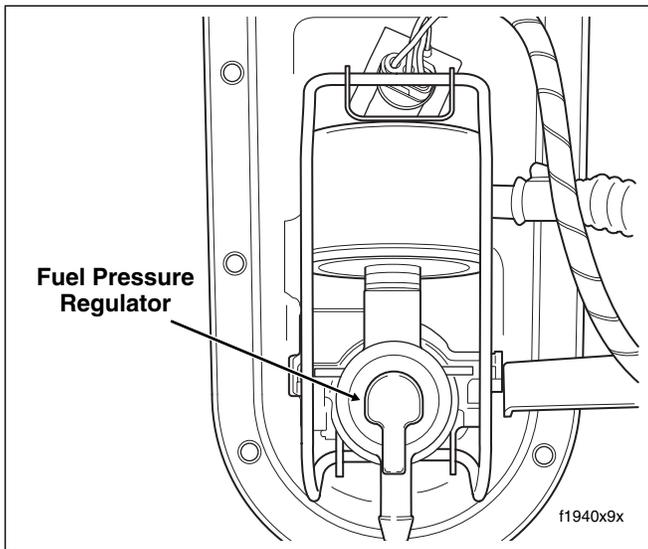


Figure 5-34. Fuel Pressure Gauge Installed (Typical)



**Figure 5-35. Underside of Canopy**

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.

**⚠ WARNING**

**To avoid an uncontrolled discharge or spray of gasoline, always be sure the quick-connect fitting is properly mated. A slight tug on the fuel supply line will verify this condition. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.**

14. Pull up on chrome sleeve of 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 will not come free.
15. Install right side cover and saddlebag.

## DIAGNOSTICS

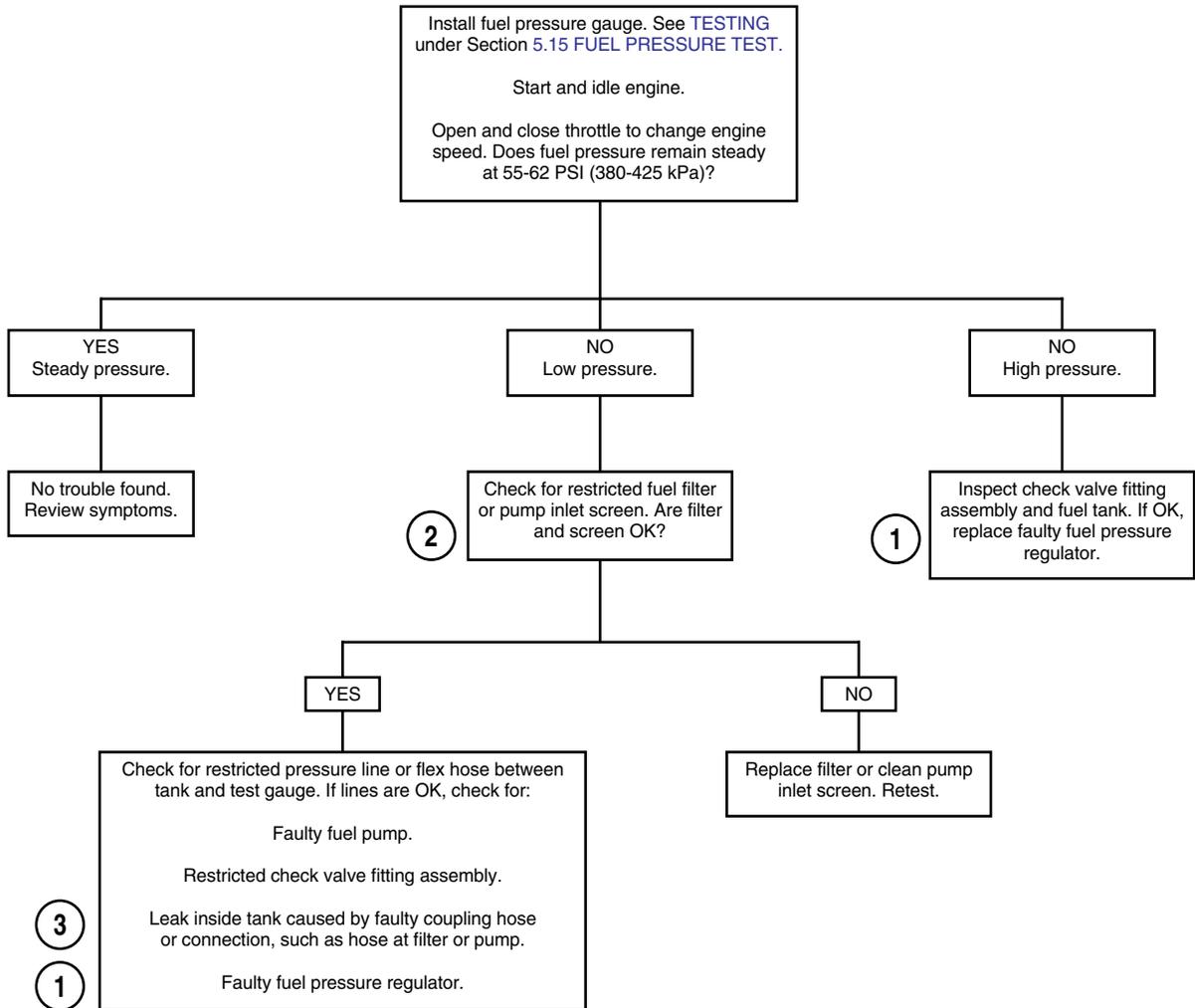
### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.15 flow chart.

1. See FUEL PRESSURE REGULATOR, REMOVAL/INSTALLATION, in the Touring 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 cold 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 and 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 key ON. A metallic ringing sound can be heard as the high pressure fuel is sprayed against the inside wall of the fuel tank.

## Test 5.15

### FUEL PRESSURE TEST



## GENERAL

### IAC Operation

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

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

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

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

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

#### NOTE

*Warm idle speed is controlled by the ECM and can only be adjusted by using a computer based diagnostic package called DIGITAL TECHNICIAN (Part No. HD-44750).*

### Diagnostic Trouble Code P0505: Loss of Idle Speed Control

Loss of idle speed control will result if the idle RPM is  $\pm 200$  from preset idle speed and IAC motor is at zero or maximum for greater than 5 seconds. This code may occur with others for a multiple code situation. Resolve the other codes first to correct.

**Table 5-18. Code Description**

DTC	DESCRIPTION
P0505	Loss of idle speed control

## DIAGNOSTICS

### Diagnostic Tips

Engine idle speed can be adversely affected by the following:

- A loss of idle speed control does not necessarily imply the IAC actuator or wiring has failed. It can be caused by a number of conditions such as an intake air leak, improperly adjusted throttle stop or a misfiring cylinder.
- Leaking injectors will cause fuel imbalance and poor idle quality due to different air/fuel ratios in each cylinder. To check for leaky injectors, first remove the air cleaner. With the throttle wide open, turn key ON for 2 seconds and then OFF for 2 seconds five consecutive times. Replace the fuel injector if there is any evidence of raw fuel in the bores. See FUEL INJECTORS, REMOVAL/INSTALLATION, in the Touring Service Manual.
- Vacuum leaks. To check for vacuum, See Section 5.9 INTAKE LEAK TEST.
- Contaminated fuel.
- Excessive oil in the crankcase (oil sumping).
- TPS reading greater than 1% (possible throttle cable misadjustment) or battery voltage reading of less than 9 volts or a VSS greater than 0 will disable idle speed control.
- Loss of battery power to ECM pin 31.

## Diagnostic Notes

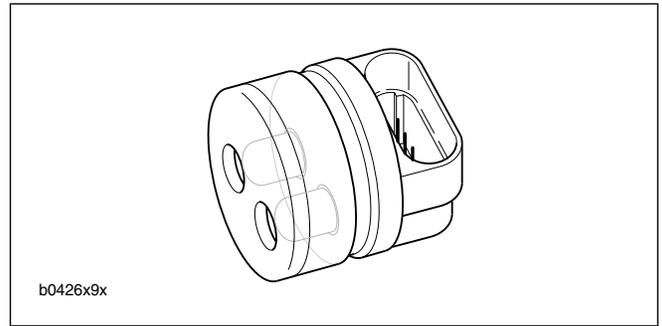
The reference numbers below correlate with the circled numbers on the Test 5.16 flow charts.

1. When the engine is stopped, the IAC pintle extends and then retracts to a fixed "Park" position for increased air-flow and idle speed during the next engine start sequence. This key OFF reset procedure takes 10 seconds to perform.
2. Test lamp behavior may follow two patterns. The color of the lights is not relevant to IAC operation.
  - a. **Normal behavior:** At key ON, test lights will alternately flash and then remain steady on to confirm ECM signals. At key OFF lights alternately flash and go out after 10 second reset procedure.
  - b. **Problem indicated:** One or more lights fail to illuminate during key ON/key OFF cycle.

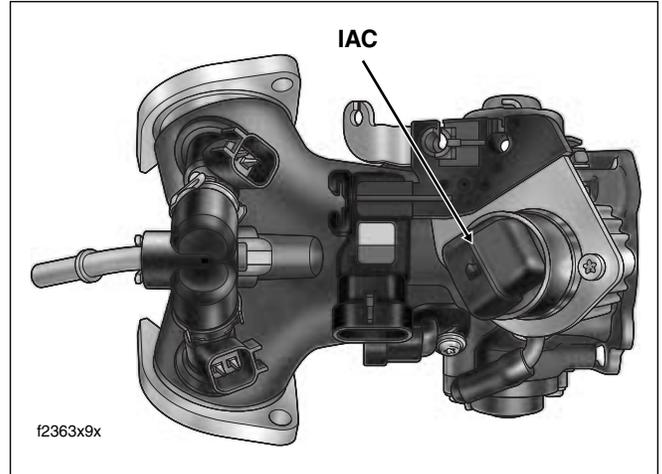
### NOTE

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

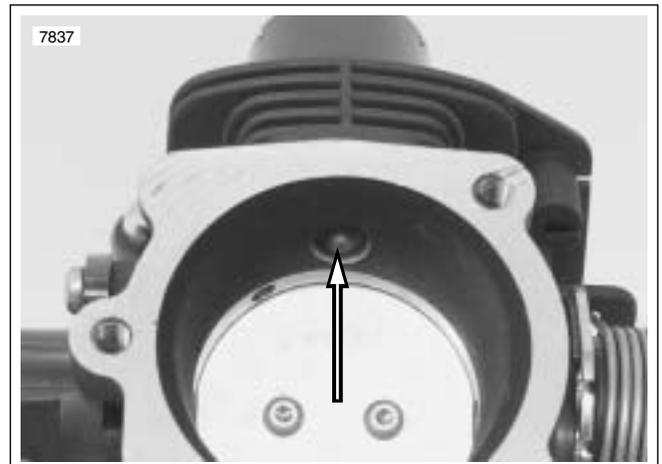
3. Connect BREAKOUT BOX (Part No. HD-43876) to EFI wire harness only, leaving ECM disconnected. See Section 5.7 [BREAKOUT BOX: EFI](#).
4. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), gray pin probe and patch cord.
5. Repair faulty ECM connection or replace ECM.



**Figure 5-36. IAC Test Lamp (Part No. HD-41199-3)**



**Figure 5-37. Induction Module (Top View)**



**Figure 5-38. IAC Pintle**

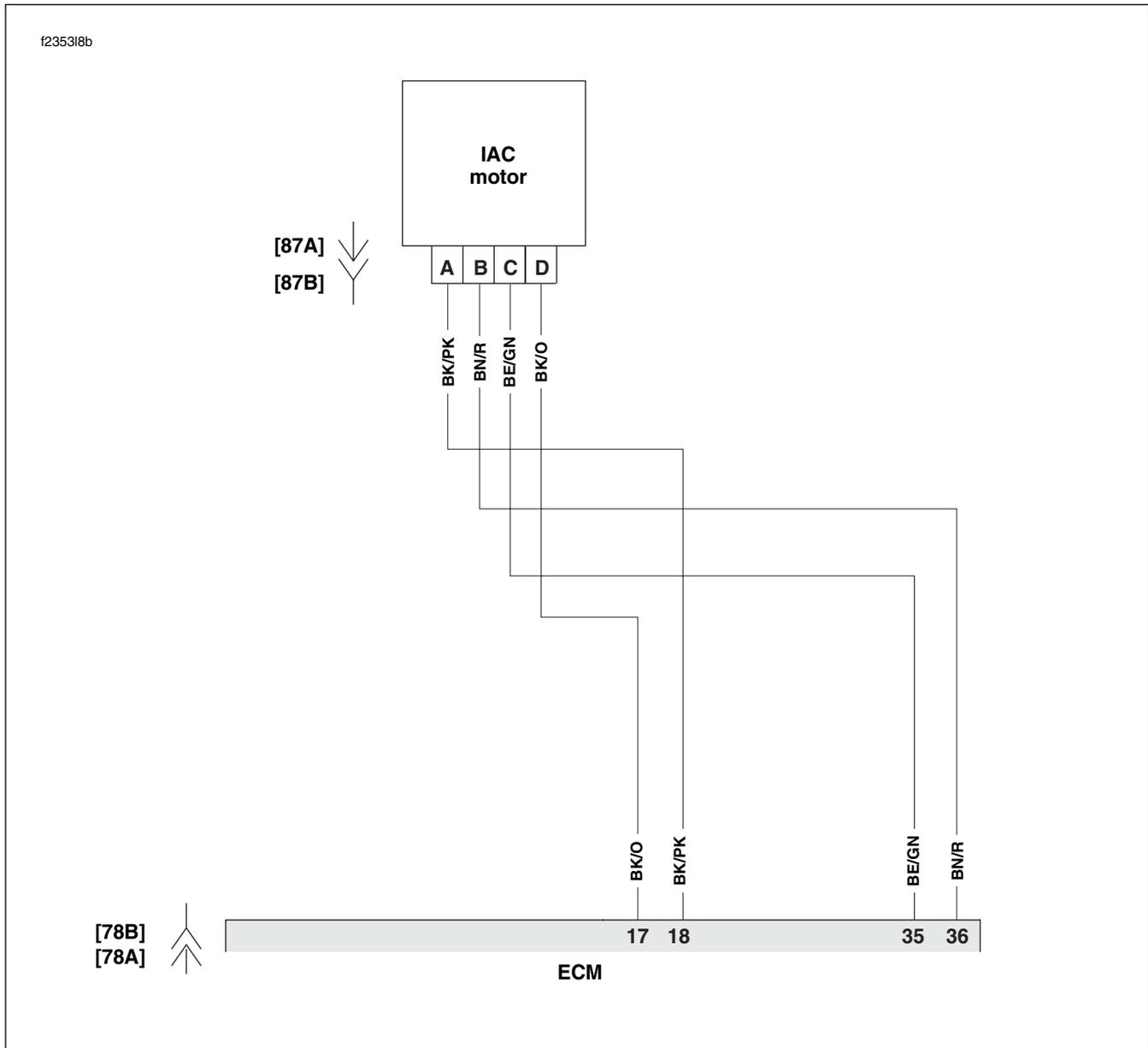


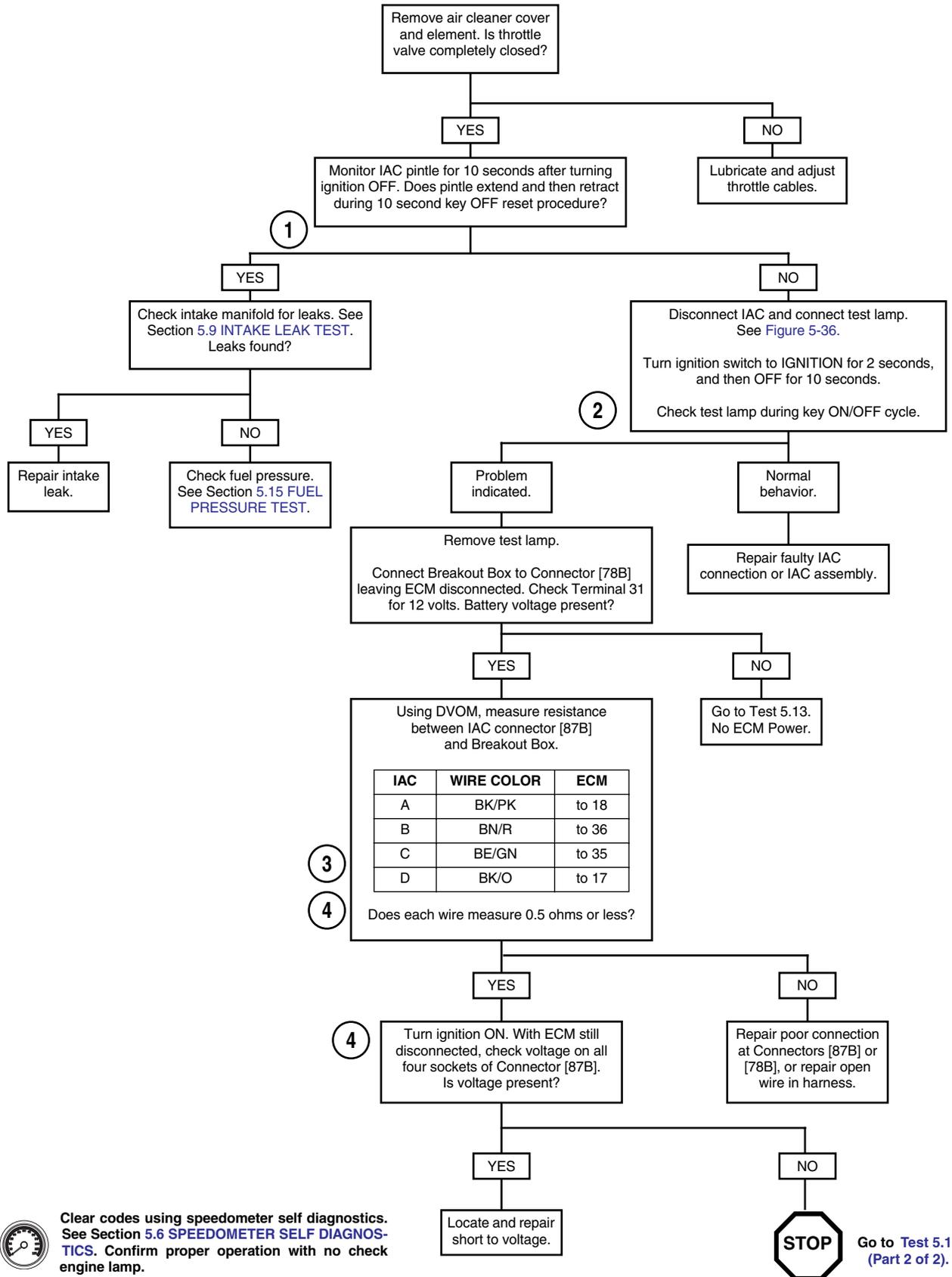
Figure 5-39. IAC Circuit

Table 5-19. Wire Harness Connectors in Figure 5-39.

NO.	DESCRIPTION	TYPE	LOCATION
[78]	ECM	36-Place Packard	Under Right Side Cover
[87]	IAC	4-Place Delphi	Below Fuel Tank (Right Side)

Test 5.16 (Part 1 of 2)

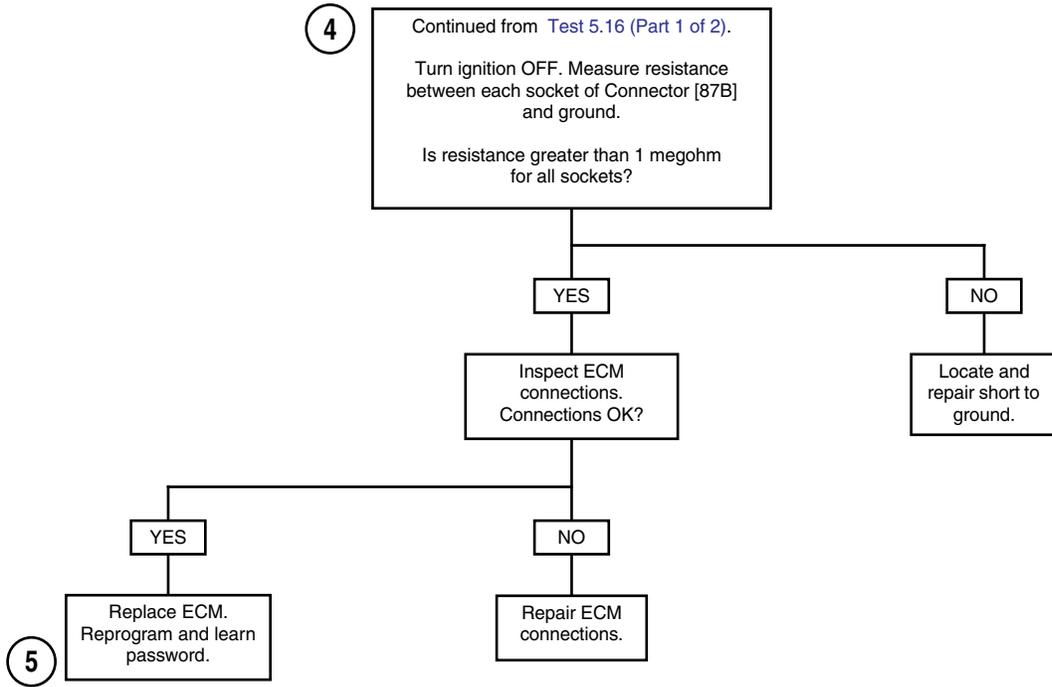
IDLE AIR CONTROL: DTC P0505



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

### Test 5.16 (Part 2 of 2)

#### IDLE AIR CONTROL: DTC P0505



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## GENERAL

### Misfire at Idle or Under Load

- Battery condition and connections may also cause misfires. See BATTERY in the Touring Service Manual for more information.
- Fuel system problems may also cause misfires. Consult Section 5.15 FUEL PRESSURE TEST and then see symptom tables under Section 5.5 INITIAL DIAGNOSTIC CHECK: EFI.
- Mechanical problems with the engine may cause misfires. See Section 3 of the Touring Service Manual for more information.
- Vehicle modifications including intake and exhaust may cause misfires.

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the Test 5.17 flow charts.

#### ⚠ WARNING

**Any open spark around gasoline or other combustibles may result in fire or explosion. Thoroughly wipe up any spilt fuel and dispose of rags in a suitable manner. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.**

1. Connect BREAKOUT BOX (Part No. HD-43876) between wire harness and ECM. See Section 5.7 BREAKOUT BOX: EFI.
2. See Figure 5-40. A SPARK TESTER (Part No. HD-26792) must be used to verify adequate secondary voltage (25,000 volts) at the spark plug.

#### 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.*

- a. Turn ignition key 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.

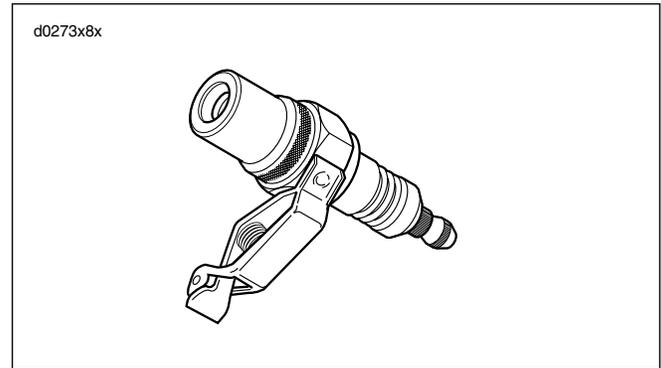


Figure 5-40. Spark Tester

Table 5-20. Spark Plug Cables

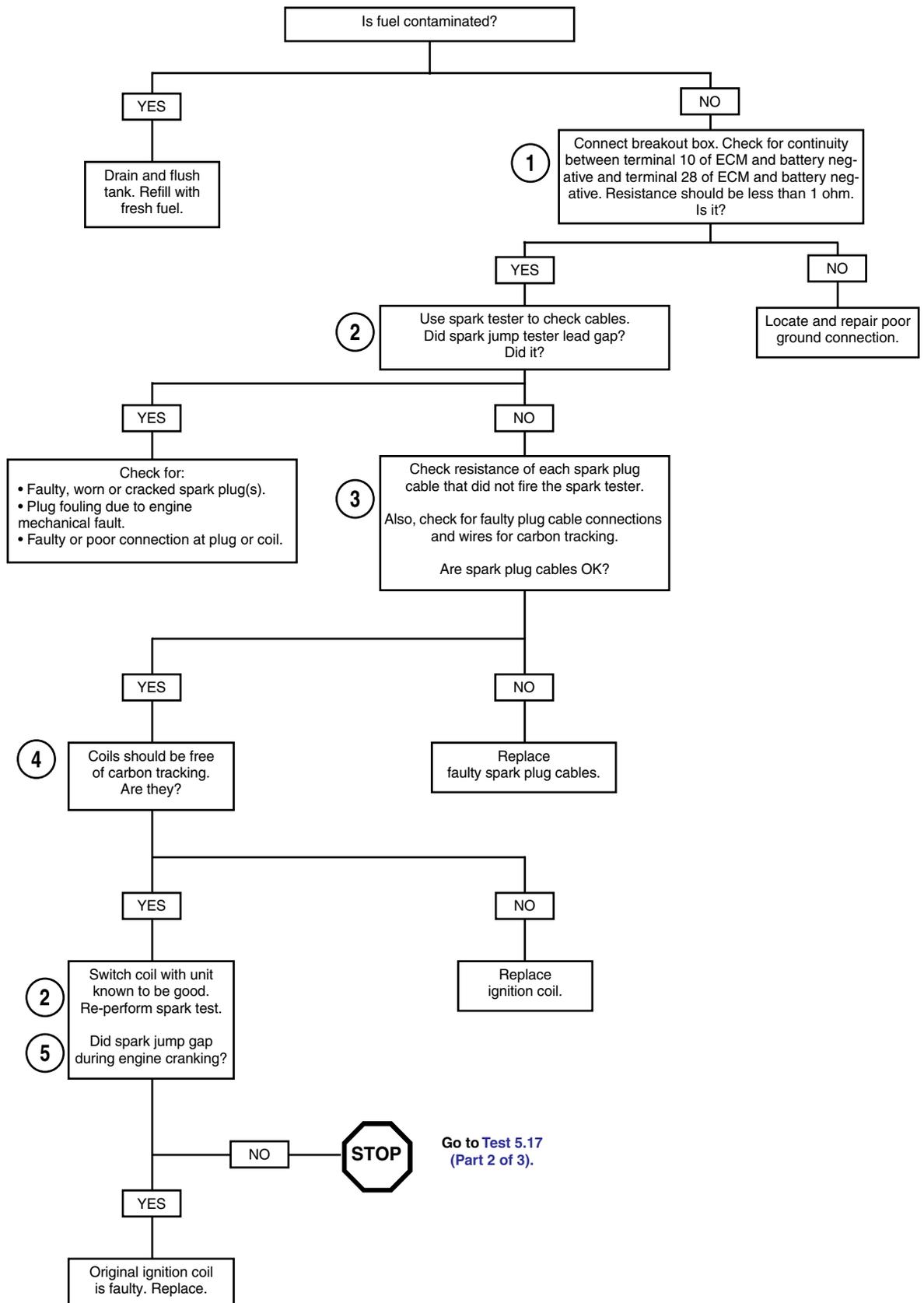
LOCATION	LENGTH	RESISTANCE
Front/Rear	20.2 inch (513 mm)	4975-11960

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 plug cable.
  - c. Compare resistance values to Table 5-20. 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 Touring Service Manual.
6. Use HARNESS CONNECTOR TEST KIT (Part No. HD-41404A), red pin probe and patch cord to relay and gray pin probe and patch cord to the coil connector [83B].



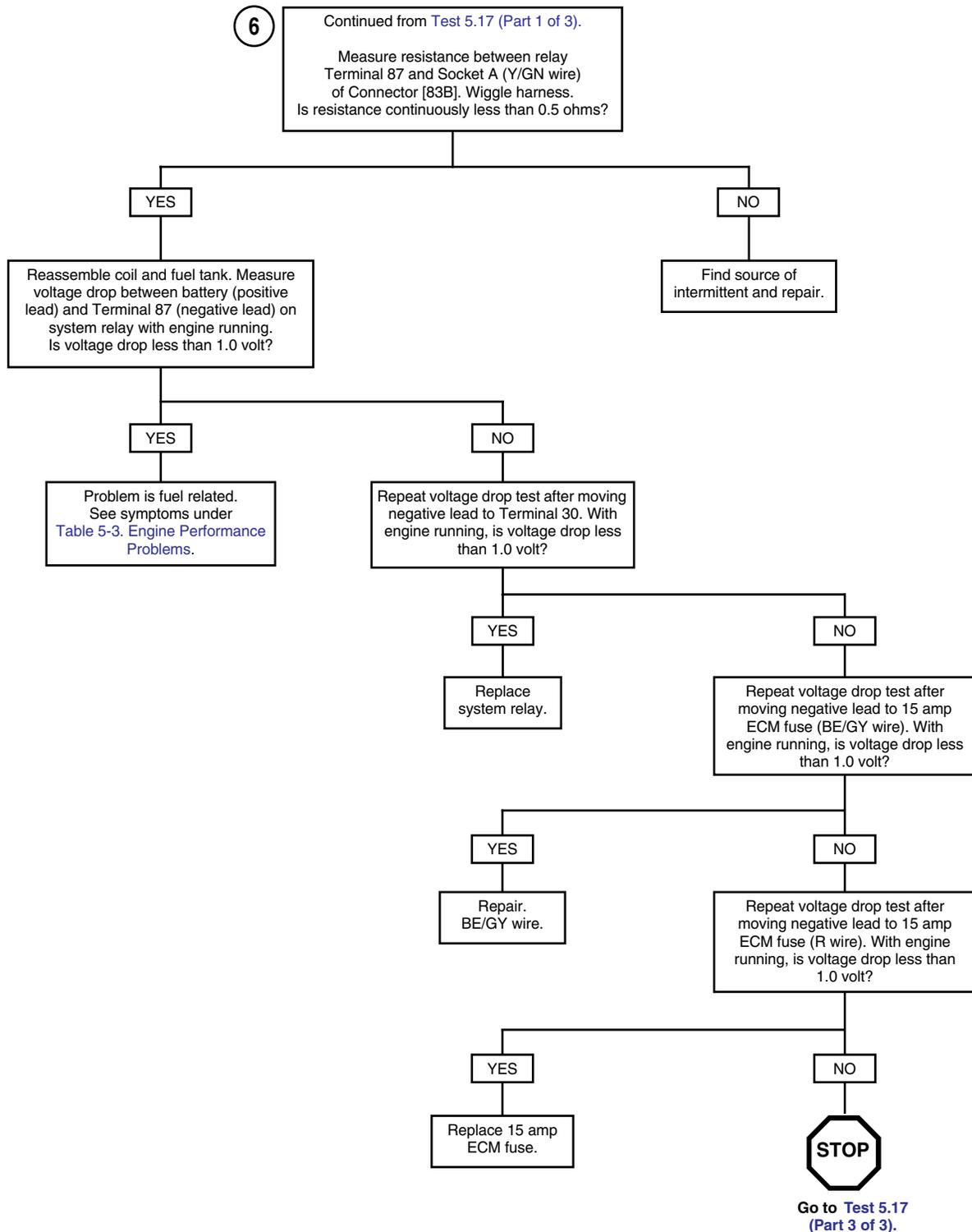
## Test 5.17 (Part 1 of 3)

### MISFIRE AT IDLE OR UNDER LOAD



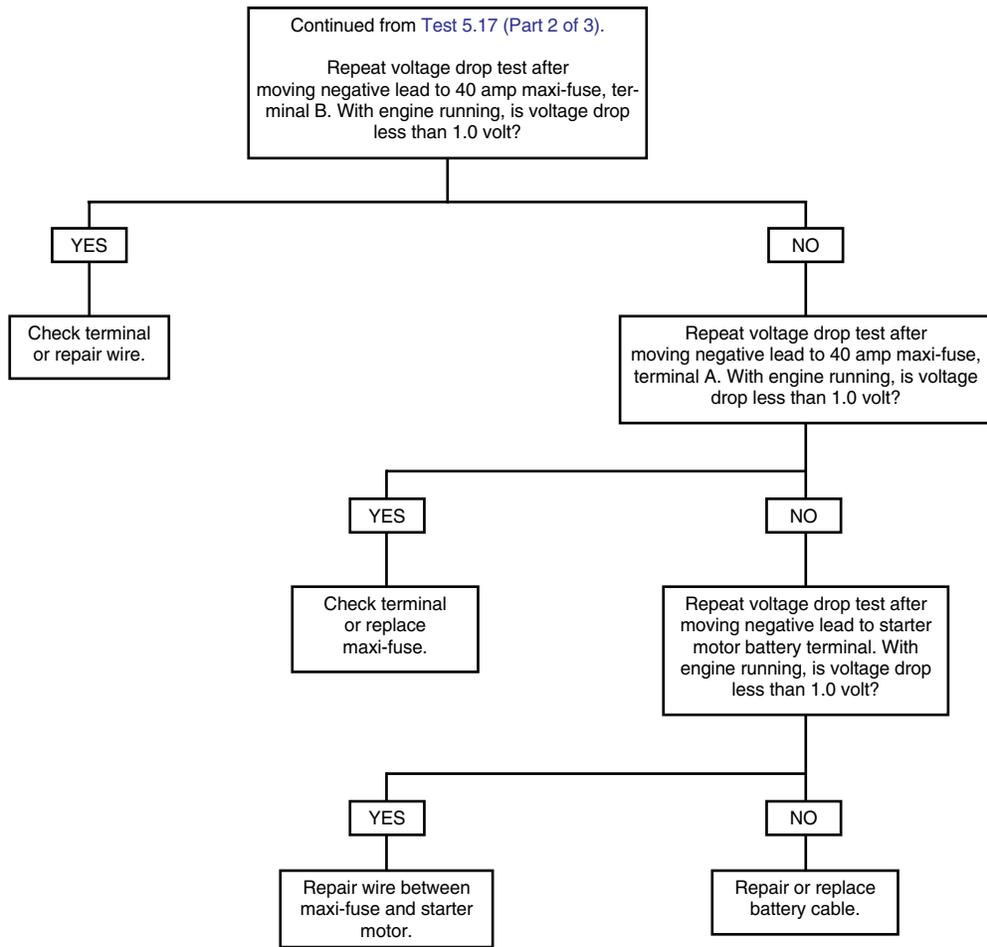
### Test 5.17 (Part 2 of 3)

#### MISFIRE AT IDLE OR UNDER LOAD



### Test 5.17 (Part 3 of 3)

#### MISFIRE AT IDLE OR UNDER LOAD



## GENERAL

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

See [Figure 5-42](#). A feedback voltage signal in the secondary ignition circuit detects the presence of combustion each time a cylinder fires on ECM Pin 27. 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 5-22. Code Description**

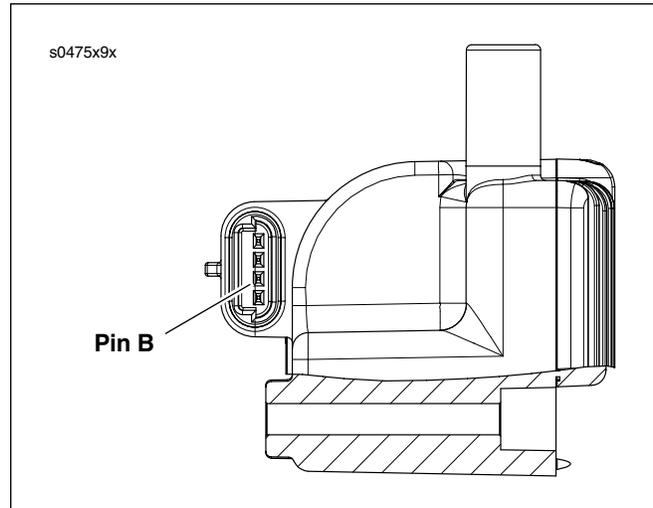
DTC	DESCRIPTION
P1353	Front cylinder no combustion
P1356	Rear cylinder no combustion
P1357	Intermittent secondary front
P1358	Intermittent secondary rear

## DIAGNOSTICS

### Diagnostic Notes

The reference number below correlates with the circled numbers on the Test 5.18 flow charts.

1. Connect BREAKOUT BOX (Part No. HD-43876) between wire harness and ECM. See Section [5.7 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-41404A), gray 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.



**Figure 5-42. Ignition Coil**

- b. Using an ohmmeter, touch probes to terminals on each end plug wire.
- c. Compare resistance values to [Table 5-20](#). Replace cables not meeting specifications. Reinstall and repeat procedure on other spark plug cable.

**Table 5-23. Spark Plug Cables**

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

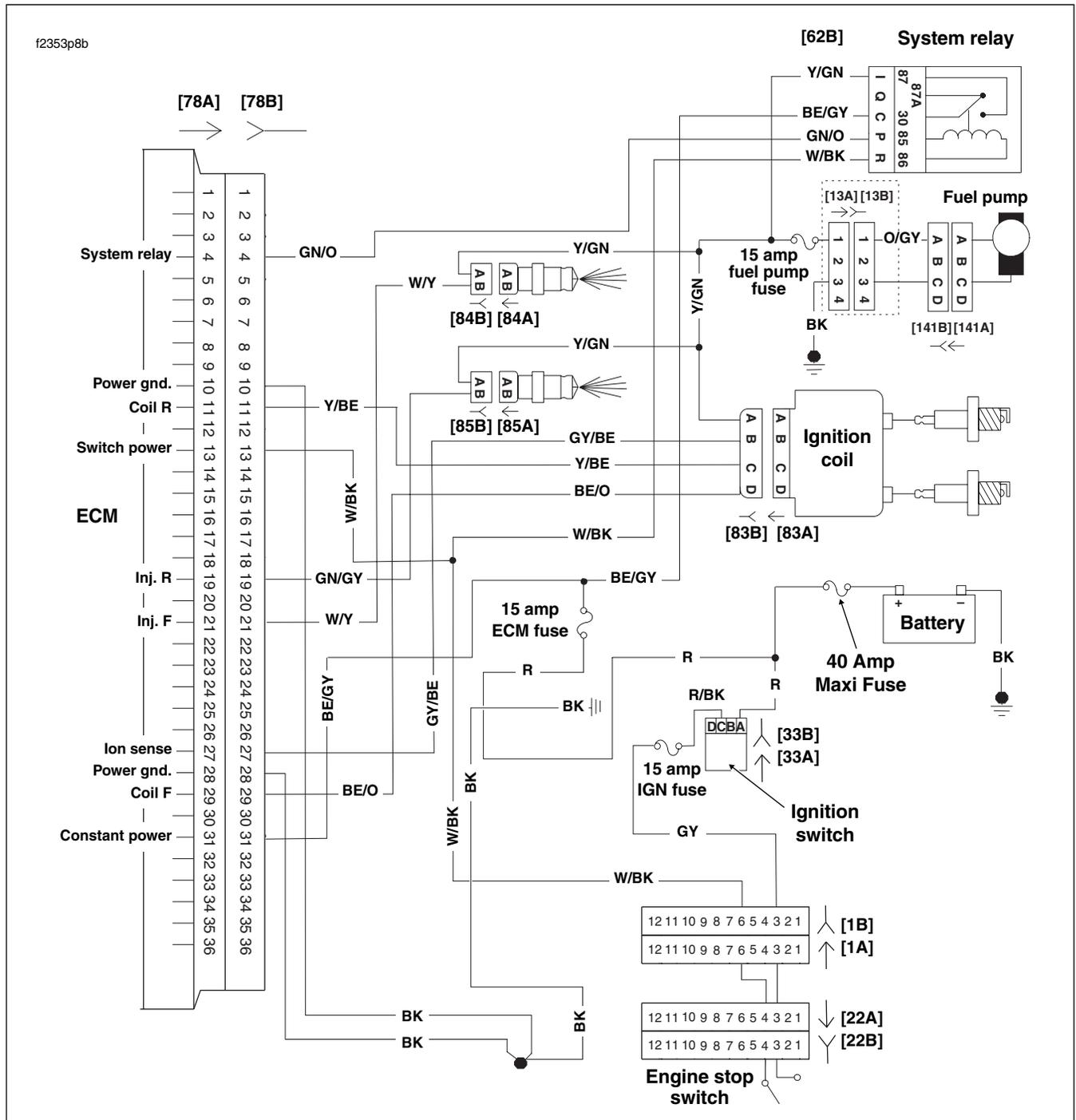


Figure 5-43. Battery Voltage Circuit (FLHX, FLHT/C/U, FLTR)

Table 5-24. Wire Harness Connectors in Figure 5-43.

NO.	DESCRIPTION	TYPE	LOCATION
[1]	Main to Interconnect Harness	12-Place Deutsch (Black)	Inner Fairing (Right Radio Support Bracket)
[22]	Right Handlebar Switches	12-Place Deutsch (Black)	Inner Fairing (Fork Stem Nut Lock Plate)
[33]	Ignition/Light Key Switch	3-Place Packard	Inner Fairing -Under Radio
[78]	ECM	36-Place Packard	Under Right Side Cover
[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)

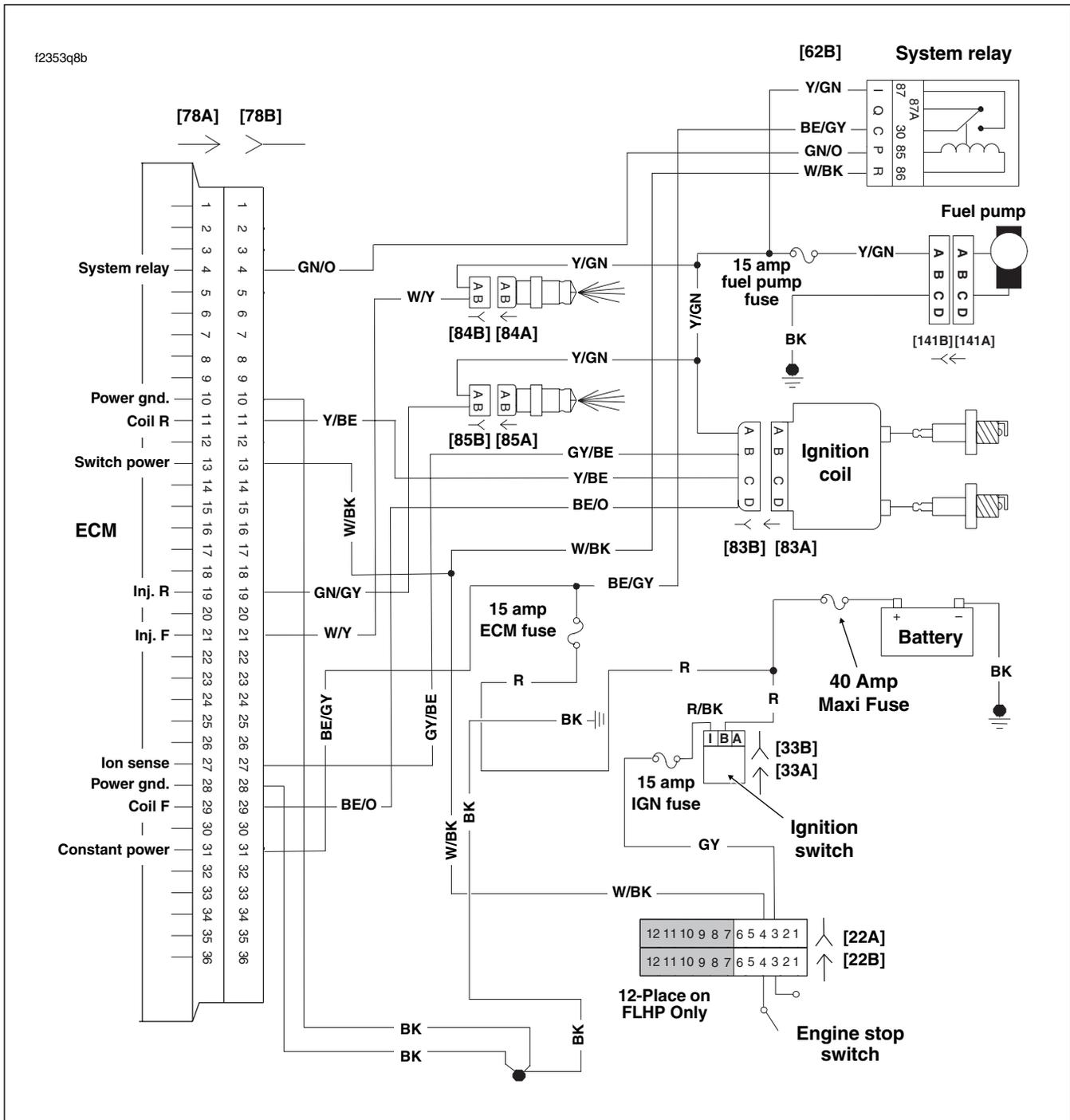


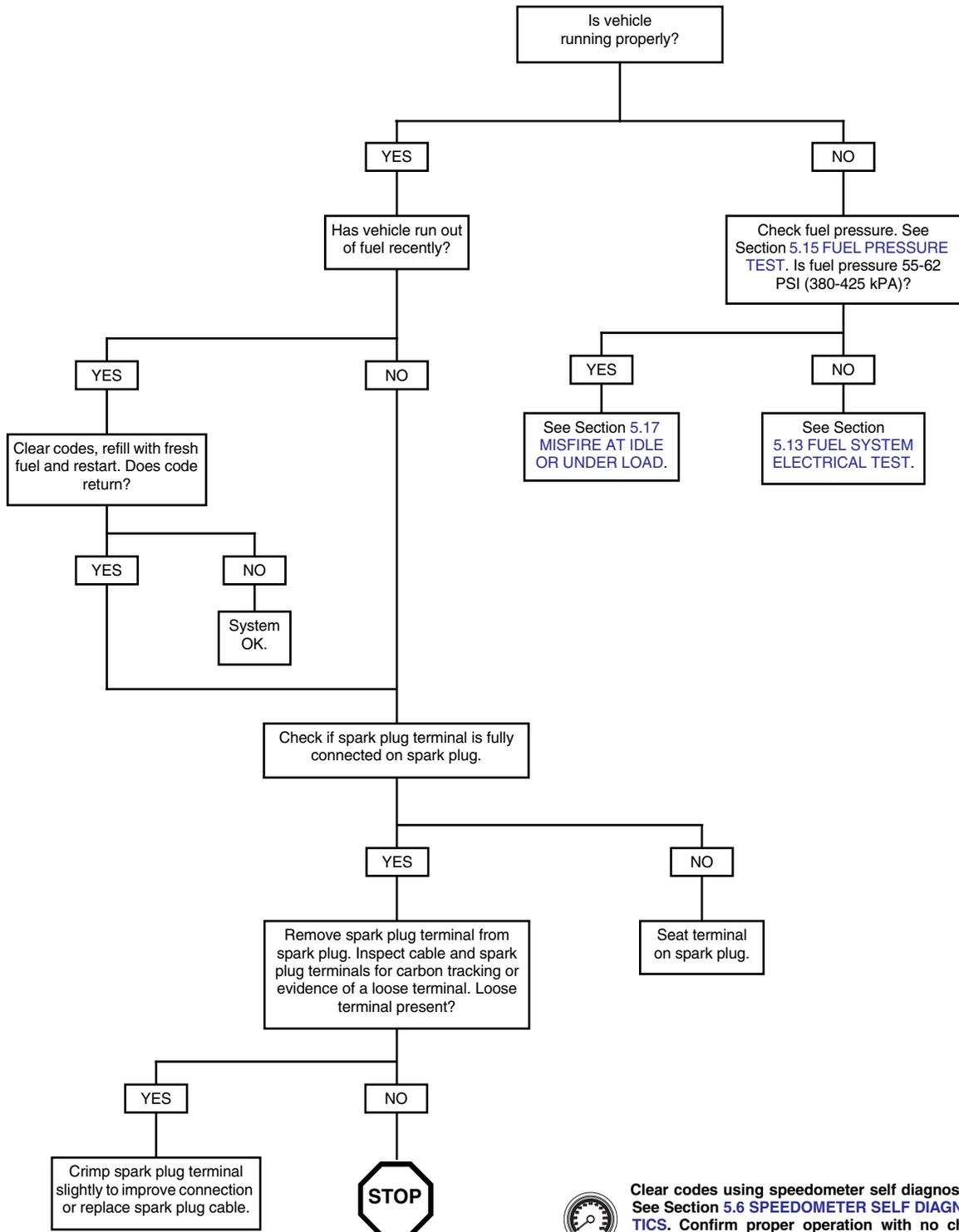
Figure 5-44. Battery Voltage Circuit (FLHR/C/S)

Table 5-25. Wire Harness Connectors in Figure 5-44.

NO.	DESCRIPTION	TYPE	LOCATION
[22]	Right Handlebar Switches	12-Place Deutsch (Black)	Inside Headlamp Nacelle
[33]	Ignition/Light Key Switch	3-Place Packard	Under Console
[78]	ECM	36-Place Packard	Under Right Side Cover
[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)

Test 5.18 (Part 1 of 2)

COMBUSTION ABSENT: DTC P1353, P1356, P1357, P1358



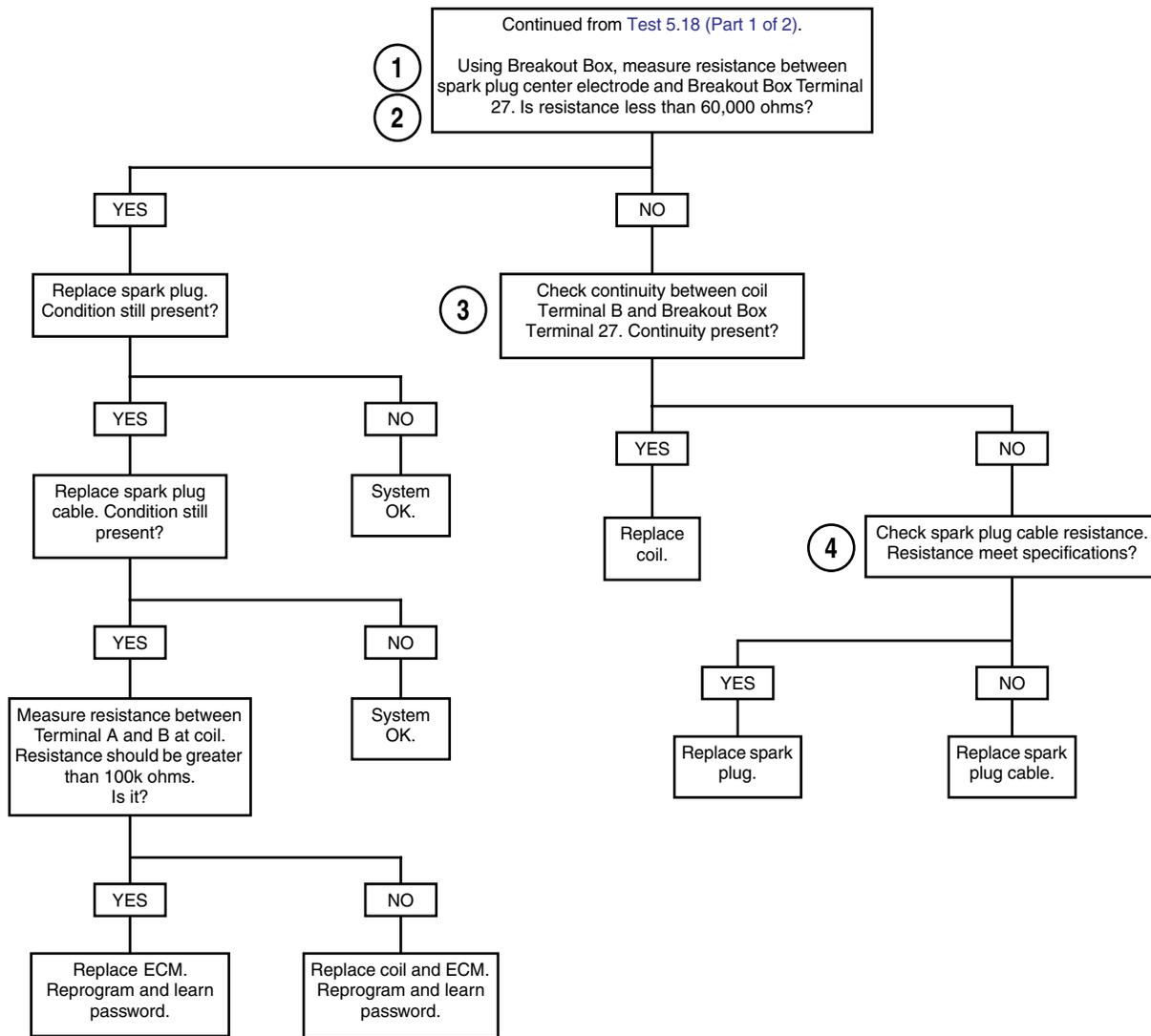
Go to Test 5.18 (Part 2 of 2).



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.

## Test 5.18 (Part 2 of 2)

COMBUSTION ABSENT: DTC P1353, P1356, P1357, P1358



Clear codes using speedometer self diagnostics. See Section 5.6 SPEEDOMETER SELF DIAGNOSTICS. Confirm proper operation with no check engine lamp.