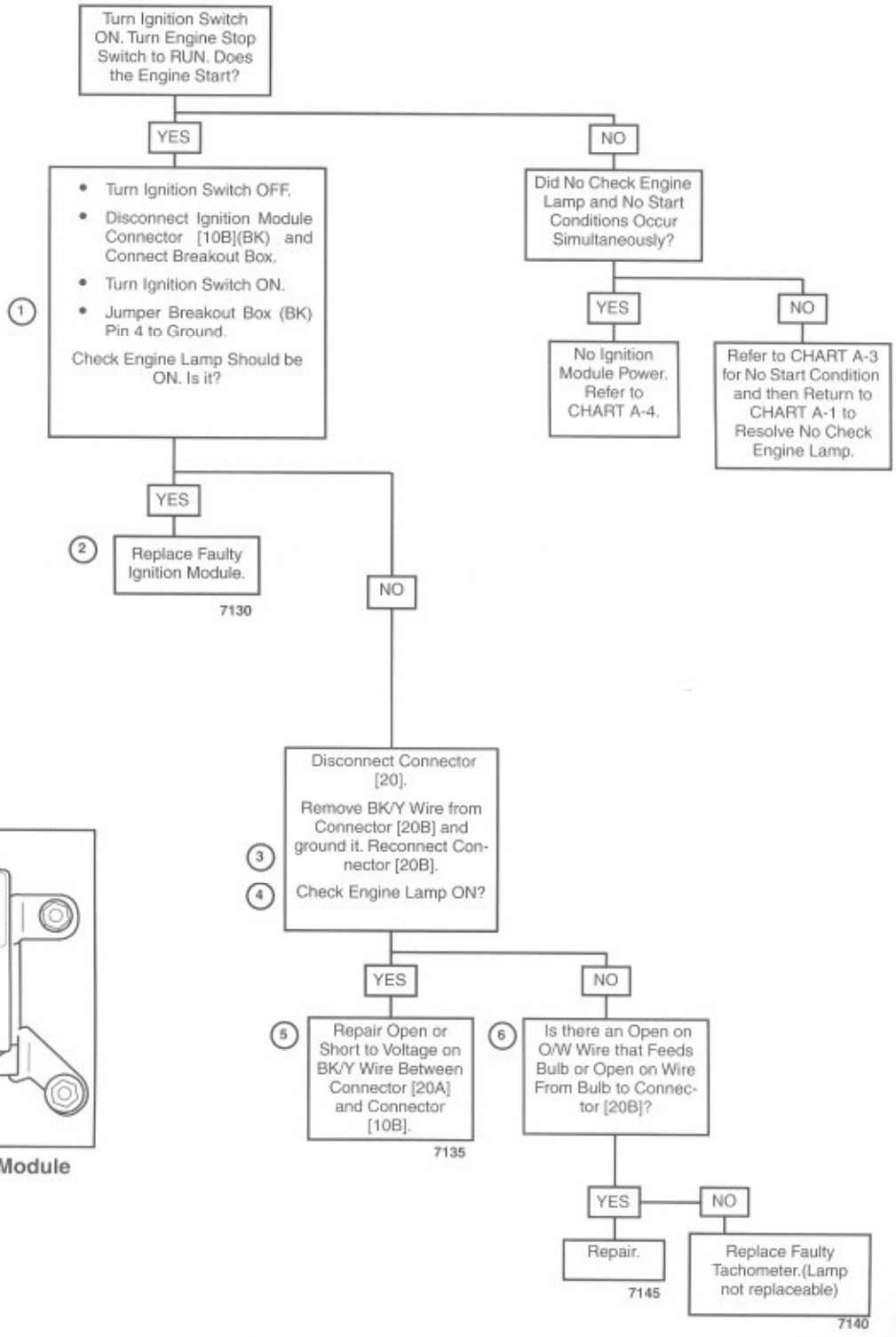
Chart A-1, No Check Engine Lamp at Key On



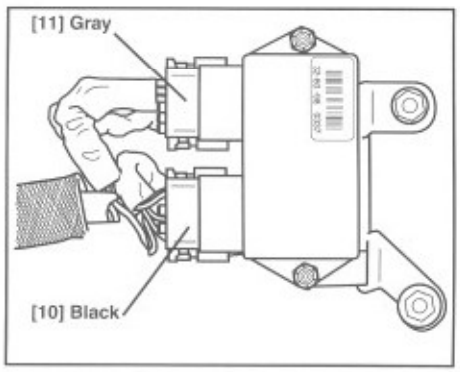


Figure 7-19. 1200S Ignition Module

Wire Harness Connectors

No.	Description	Type	Location
[20]	Main Harness to Instruments	14 - Place Multilock	Under Headlamp bracket
[10]	Ignition Module	12 - Place Deutsch (BK)	Under seat

CHART A-2, CHECK ENGINE LAMP ON CONTINUOUSLY

The Check Engine Lamp should illuminate for 4 seconds when the Ignition Switch is turned to ON (with the Engine Stop Switch at RUN and the engine off). Following the initial period of illumination, the lamp should go off for 4 seconds. It may then come back on for an 8 second period (for a stored functional error) or remain on continuously (current error).

Battery voltage is supplied to the lamp bulb. The lamp bulb is grounded by the Ignition Module through the BK/Y wire. A steady light may indicate a short to ground on the BK/Y wire.

DIAGNOSTIC NOTES

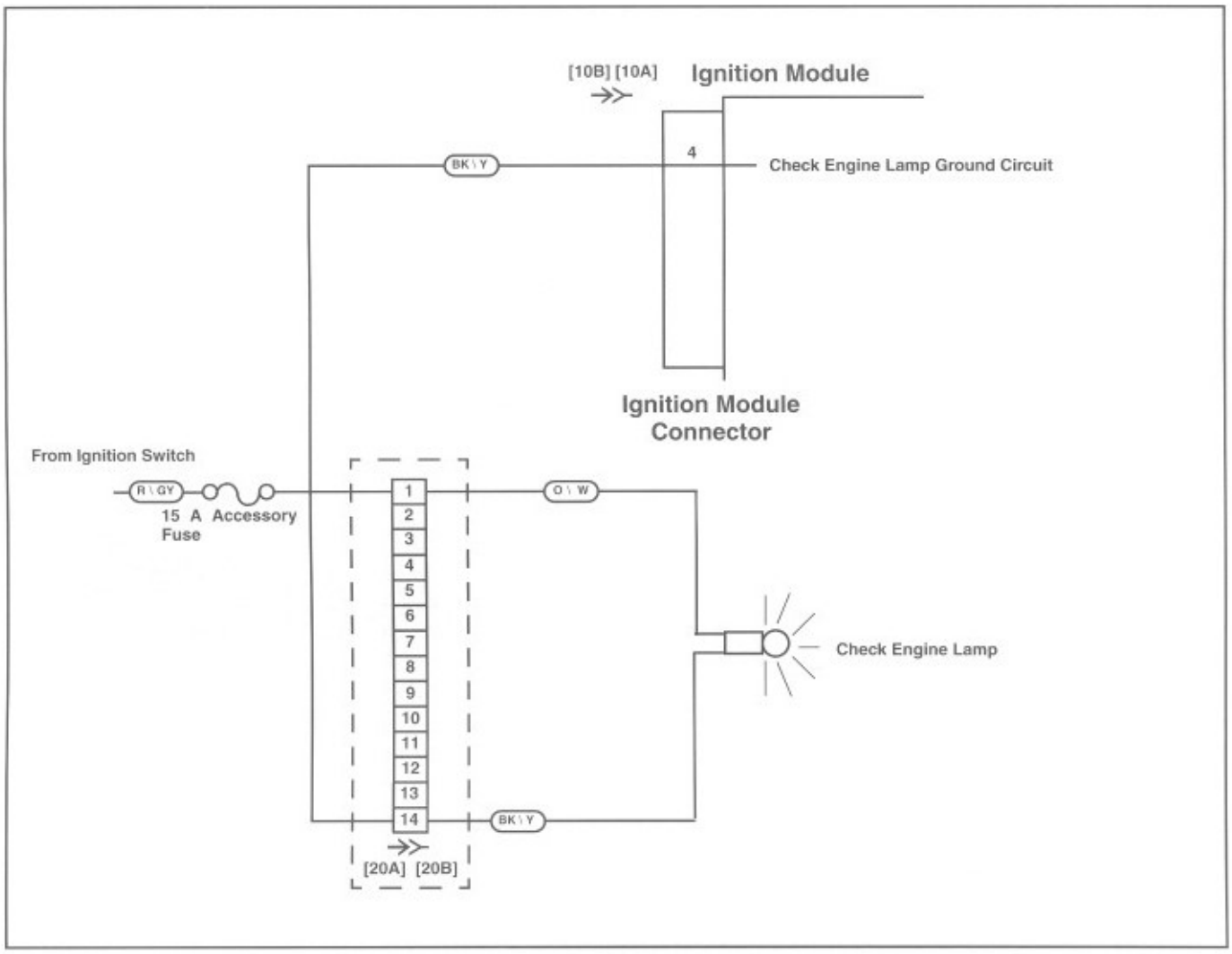
The reference numbers below correlate with those on the diagnostic flow chart.

① If the lamp goes off when Ignition Module connector is unplugged, BK/Y wire is not shorted to ground.

② See Retrieving Trouble Codes.

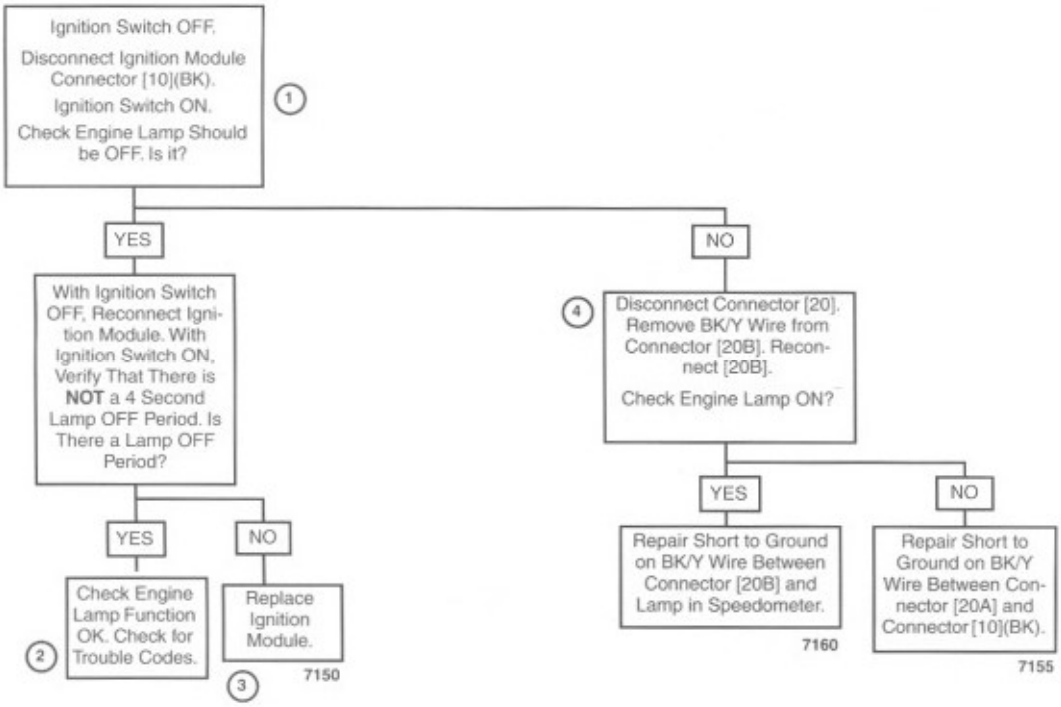
③ See Ignition Module, Removal/Installation.

④ Use special pick (Snap-On Tool TT600-3) as described under Amp Multilock Electrical Connectors in Section 7 of this Service Manual.



Check Engine Lamp Circuit Diagram

Chart A-2, Check Engine Lamp On Continuously



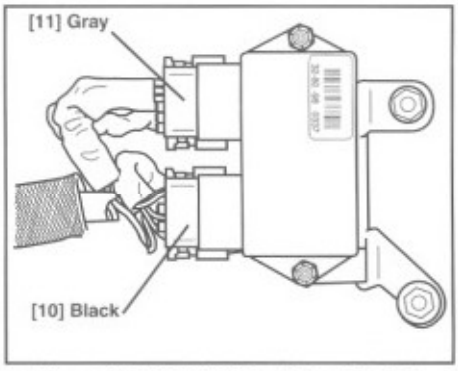


Figure 7-20. 1200S Ignition Module

Wire Harness Connectors

No.	Description	Type	Location
[20]	Main Harness to Instruments	12 - Place Multilock	Under Headlamp Bracket
[10]	Ignition Module	12 - Place Deutsch	Under Seat

CHART A-3, ENGINE CRANKS BUT WILL NOT START

GENERAL

NOTE

*If starter will not crank engine, the problem is **not** ignition related. Refer to Section 5 of this Service Manual, Electric Starter.*

NOTE

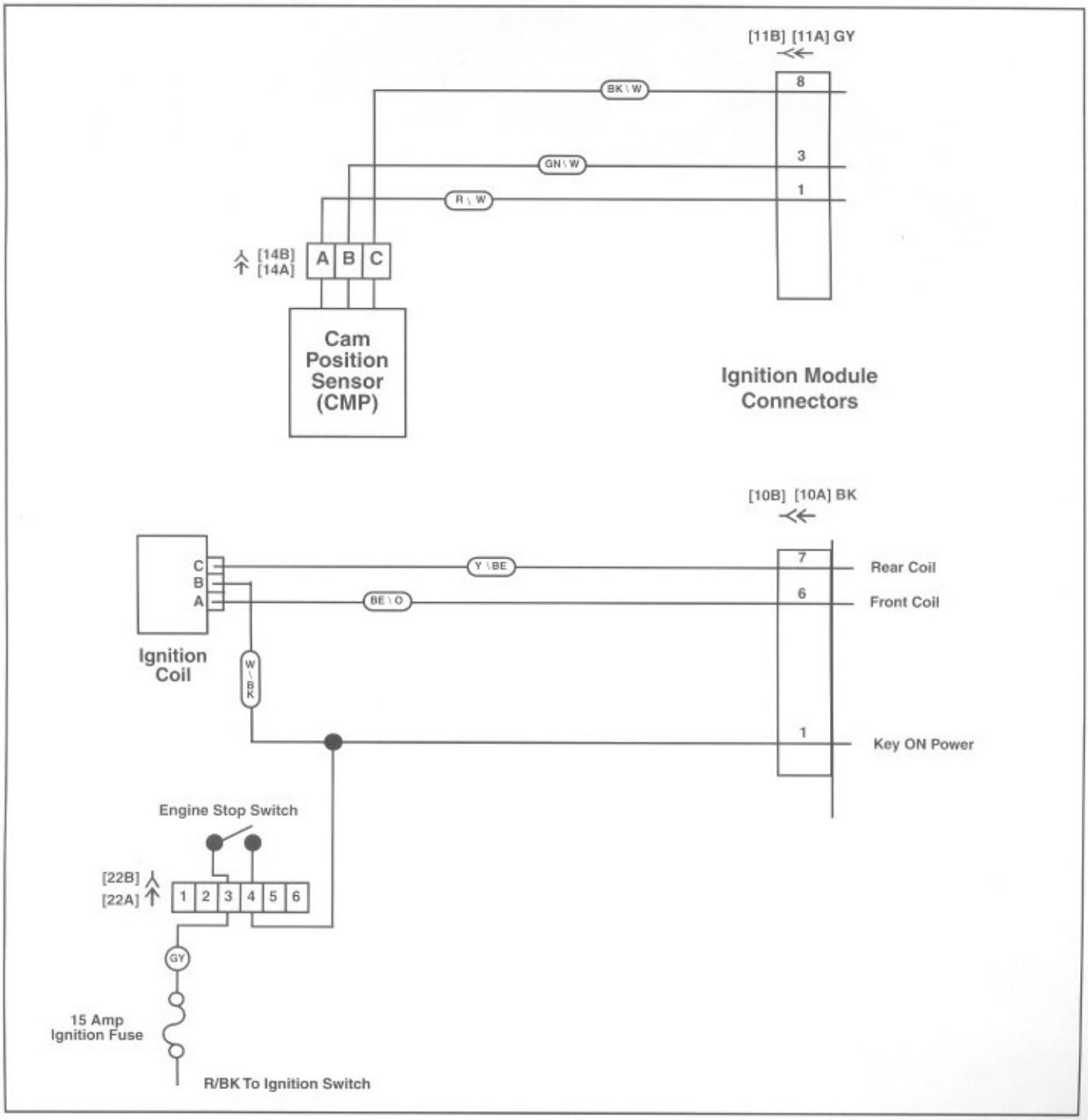
Engine can be started with Diagnostics Test wire installed or if Receive Data Line is grounded. Ignition/Light Key Switch must be turned to OFF after test wire is removed or check engine lamp will continue to flash stored codes.

DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

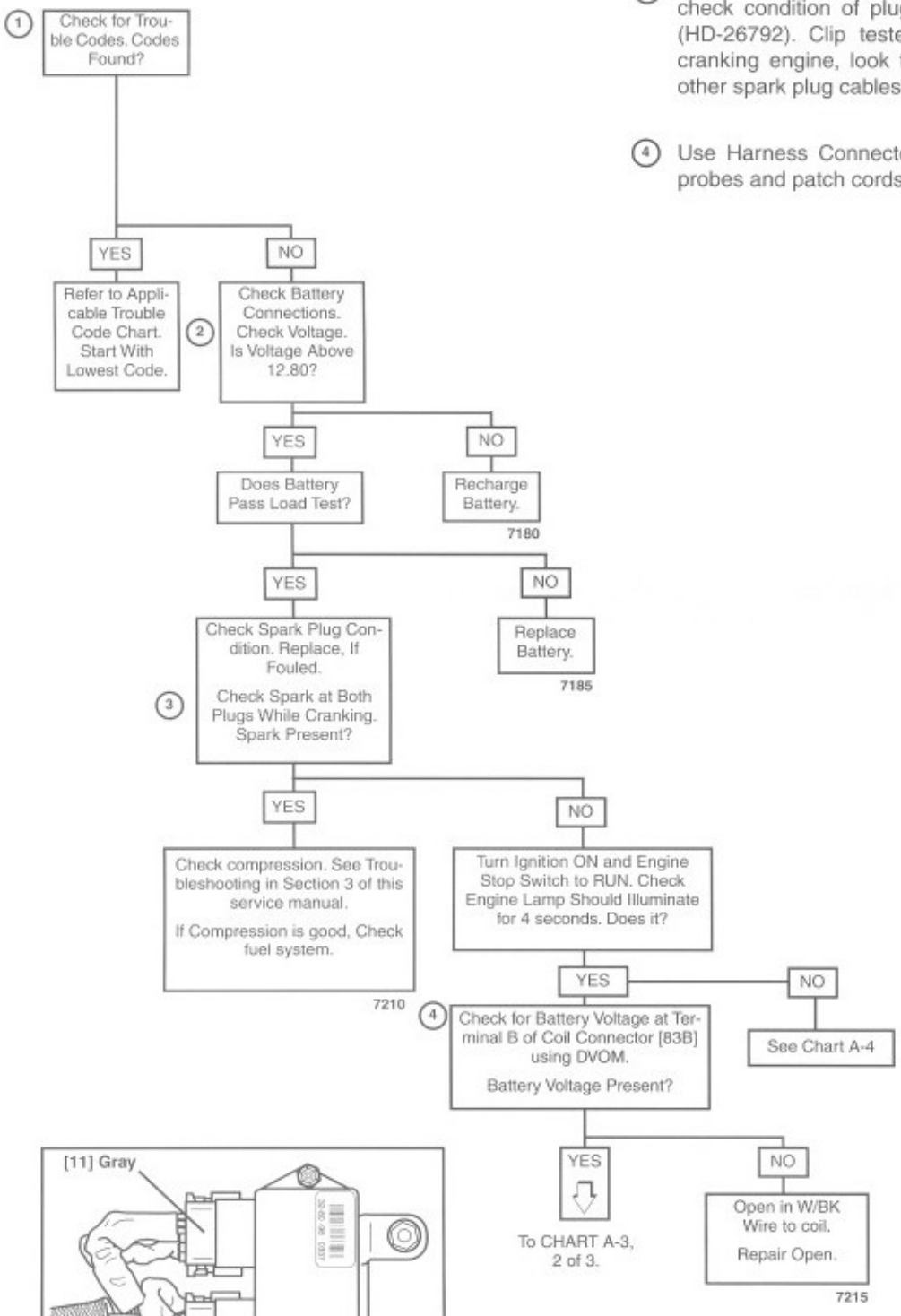
(1) See Retrieving Trouble Codes, page 7-14.

(2) Check the condition of the battery. Perform a voltage test and recharge if below 12.80. Check battery connections and perform load test. Replace the battery if necessary. See Section 7 of this Service Manual for detailed information.



Ignition Circuit Diagram

Chart A-3, Engine Cranks But Will Not Start (1 of 3)



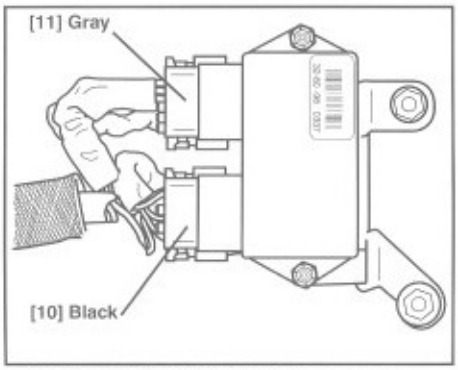


Figure 7-21. 1200S Ignition Module

3 Remove spark plug cable from spark plug. Visually check condition of plug. Attach cable to Spark Tester (HD-26792). Clip tester to cylinder head bolt. While cranking engine, look for spark. Repeat procedure on other spark plug cables.

4 Use Harness Connector test Kit (HD-41404) gray pin probes and patch cords.

Chart A-3, Engine Cranks But Will Not Start (2 of 3)

From CHART A-3, 1 of 3.

YES

(5) Disconnect Coil Connnector [83B]. See Figure 7-22. Gently Connect Test Lamp to Connector [83B] Terminal A (front cyl.) or Terminal C (rear Cyl.). Crank Engine. Does Light Flash?

YES

Faulty Coil Connection, Spark Plug Wires or Coil.

Proceed as follows:

- Check Coil Connections.
- Test Spark Plug Cable Resistance. See Chart C-2, Spark Plug Cable Resistance Test.
- Check Coil by Substituting One Known To Be Good

OR

Check Coil Resistance. See Troubleshooting.

7220

NO

(6) (7) Connect Breakout Box. Check continuity Between Ignition Coil Terminal A of Connector [83B] and Breakout Box (BK) Pin 6. Measure Resistance Between Ignition Coil Terminal C [83B] and Ignition Module Pin 7 [10B] on Breakout Box. Resistance Should be Less than 1.0 Ohm. Is it?

YES

To CHART A-3, 3 of 3.

NO

Poor Connection at Connector [10B] or Open in Harness Between Coil and Ignition Module. Repair Open.

7225

(5) Use Test lamp as shown in Figure 7-22.

(6) Connect Breakout Box (HD-42682) between harness and Ignition Module. See Breakout Box Installation, page7-18.

(7) Use Harness Connector Test Kit (HD-41404), gray pin probe and patch cord.

Wire Harness Connectors

No.	Description	Type	Location
[14]	CMP Sensor	3 - Place Deutsch	Bottom Frame Cross Member (Right Side)
[10]	Ignition Module	12 - Place Deutsch (BK)	Under Seat
[11]	Ignition Module	12 - Place Deutsch (GY)	Under Seat
[83]	Ignition Coil	3 - Place Packard	Below Fuel Tank

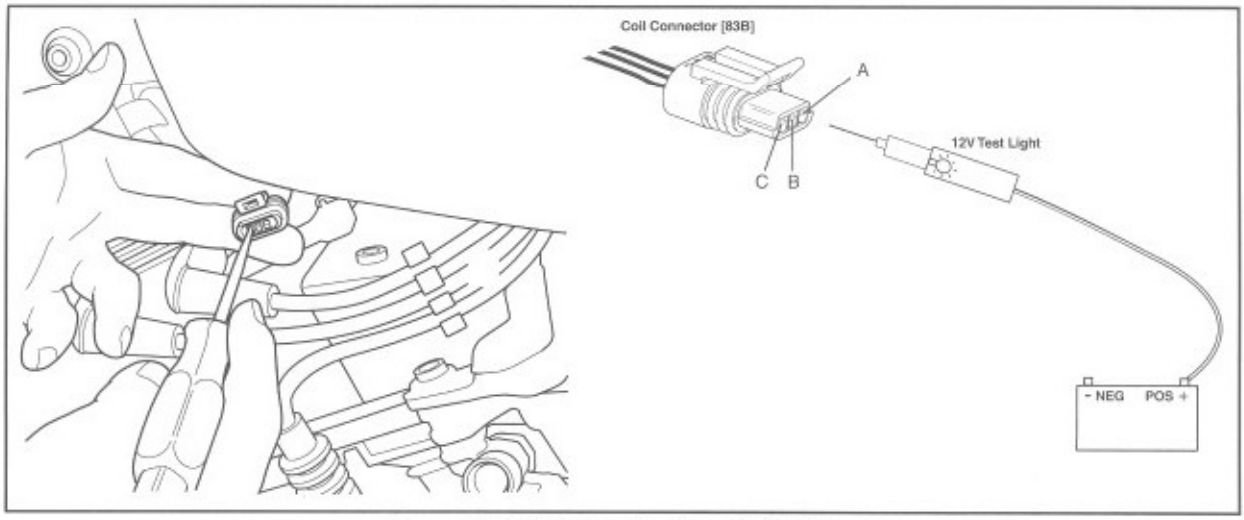


Figure 7-22. XL1200S Ignition Coil Test

Chart A-3, Engine Cranks But Will Not Start (3 of 3)

(8) Use Harness Connector Test Kit (HD-41404), black pin probe and patch cord.

(9) See Camshaft Position Sensor, Removal/Installation, page 7-53.

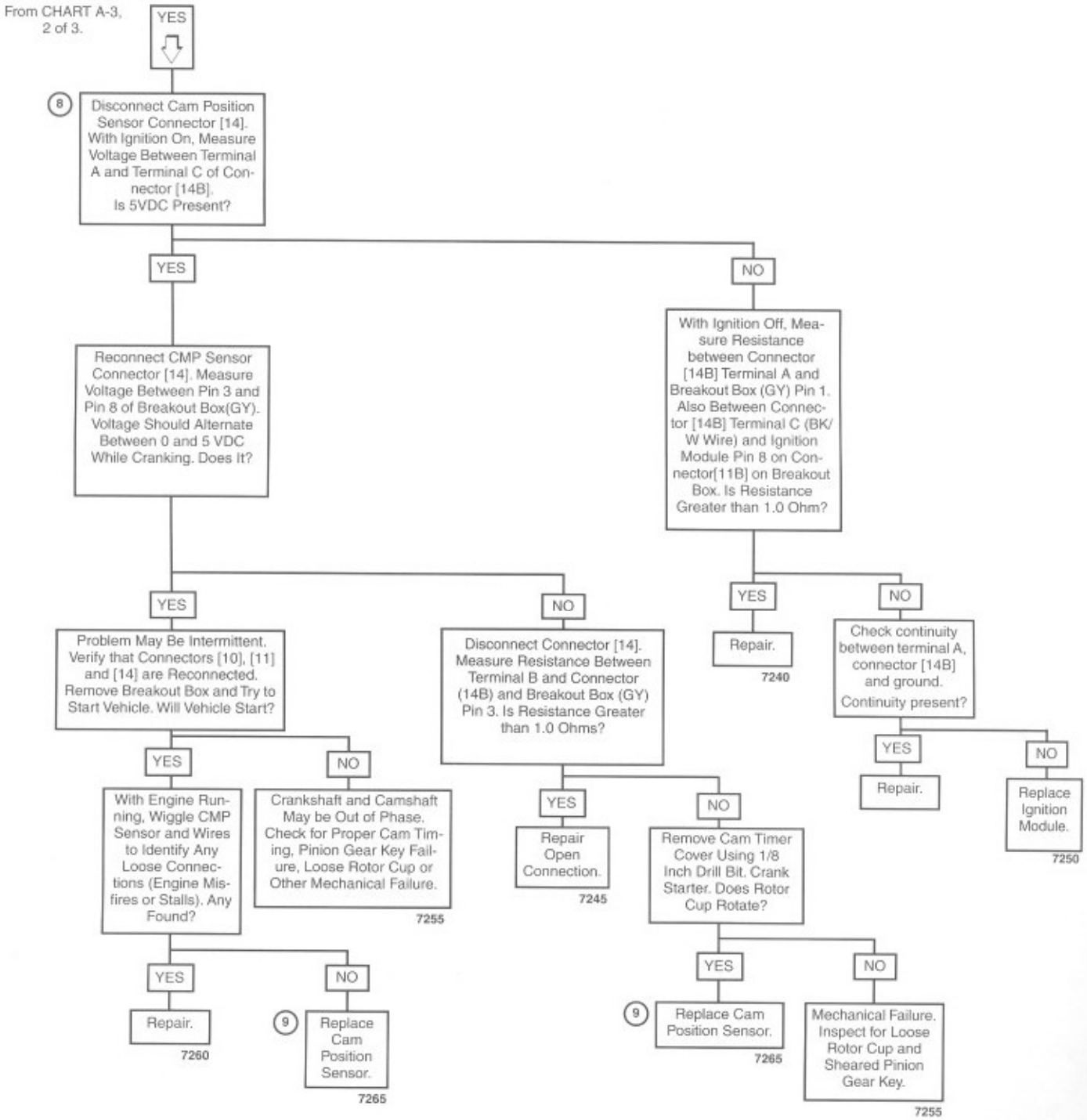


CHART A-4, NO SPARK, NO CHECK ENGINE LAMP AT KEY ON

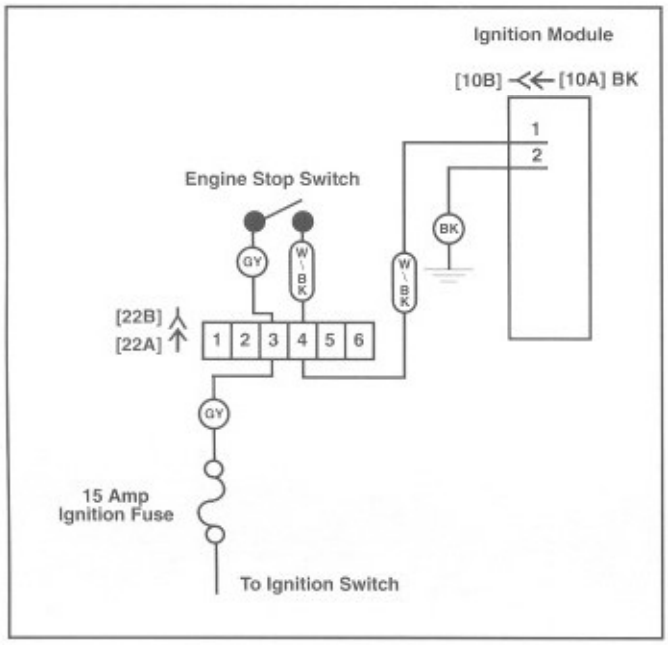
The Ignition Module turns on when power is applied to Pin 1 of [10], the black connector. The Ignition Module goes through an initialization sequence every time power is removed and re-applied to Pin 1. The only visible part of this sequence is the Check Engine Lamp. Upon starting, the Check Engine Lamp will illuminate for 4 seconds and then (if parameters are normal) go out.

DIAGNOSTIC NOTES

The reference numbers which follow correlate with those on the diagnostic flow chart.

(1) See Fuses, Removal/Installation, page 7-2.

(2) Use Harness Connector Test Kit (HD-41404), black pin probe and patch cord.



Ignition Module Power Circuit Diagram

Wire Harness Connectors

No.	Description	Type	Location
[10]	Ignition Module	12 - Place Deutsch (BK)	Under Seat
[22]	RT Handlebar Switch	6 - Place Deutsch (BK)	In Headlight

NOTE

With one exception (noted in flow chart), always turn Key ON prior to probing terminals with test lamp.

Chart A-4, No Spark, No Check Engine Lamp at Key On

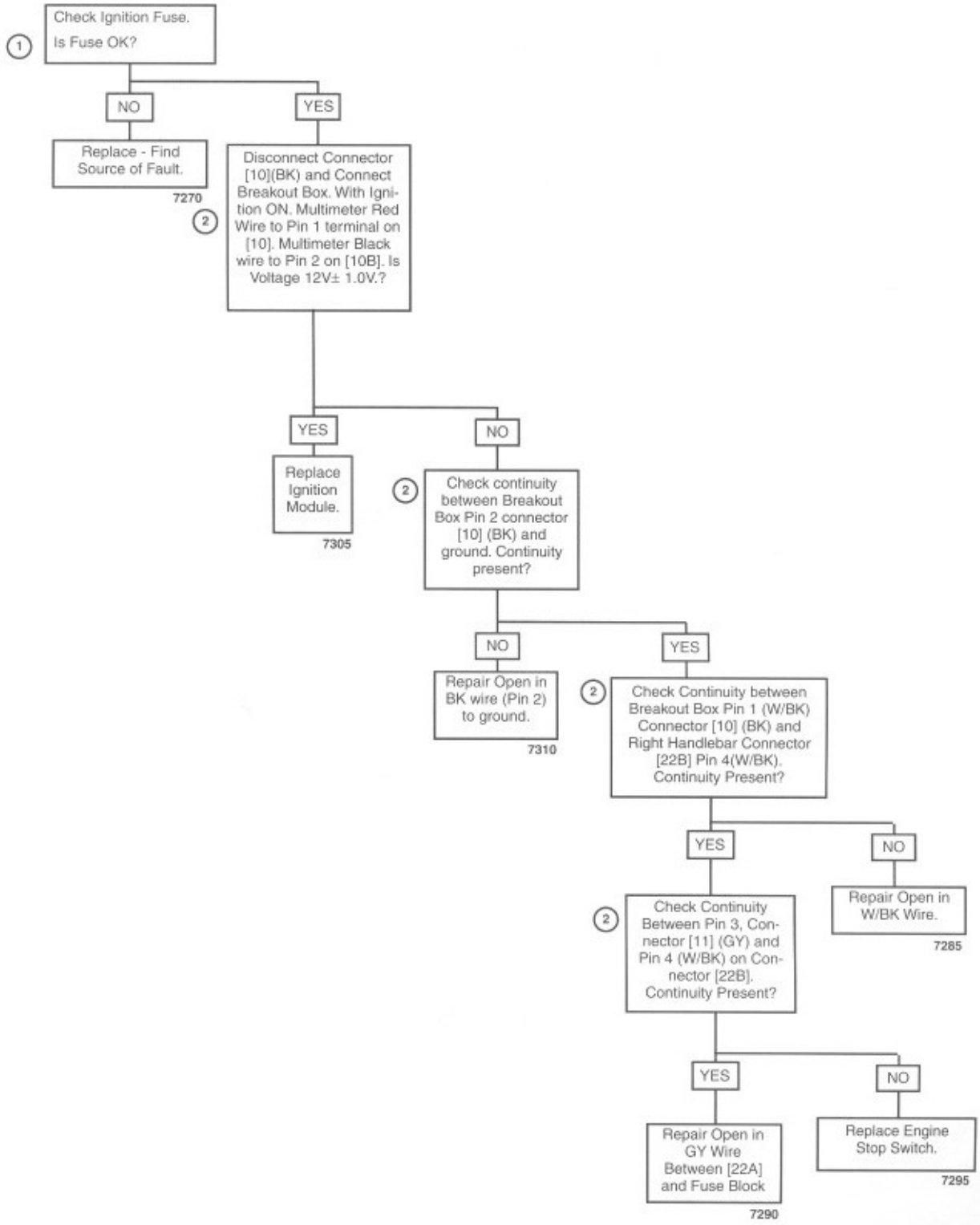


CHART C, MISFIRE

GENERAL

Battery condition and connections may also cause misfires. See Battery in Section 8 of this Service Manual for more information.

DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

⚠WARNING

Any open spark around gasoline or other combustibles may result in fire or explosion causing personal injury and/or property damage. Thoroughly wipe up any spilt fuel and dispose of rags in a suitable manner.

① A Spark Tester (HD-26792) must be used to verify adequate available secondary voltage at the spark plug (25,000 volts). Remove spark plug cable from spark plug. Visually check condition of plug. Attach cable to Spark Tester (HD-26792). Clip tester to cylinder head bolt. While cranking engine, look for spark. Repeat procedure on other spark plug cable.

② **SPARK PLUG CABLE RESISTANCE TEST:** Remove spark plug cable from spark plug and ignition coil. Using an ohmmeter, touch probes to terminals on each end of plug wire. Resistance must be within values shown in Table below. Reinstall and repeat on other cable. For best results, use a needle nose pliers for removal and installation on coil. Gently grasp cable as close to terminals as possible.

③ If carbon tracking is evident, replace the ignition coil and be sure spark plug wire to that coil is clean and tight. Excessive wire resistance or faulty connections can cause coil damage. See Ignition Coil, Removal/Installation.

④ See Ignition Coil, Removal/Installation,. This test can also be performed by substituting a known good coil for the one causing the no spark condition. The coil does not require full installation to be functional. Verify faulty coil by performing resistance test (see Troubleshooting).

⑤ Use Harness Connector Test Kit (HD-41404), GY pin probe and patch cord to the coil connector [83B].

⑥ Inspect for corrosion at battery terminals, main circuit breakers, ignition fuse terminals (GY and R/BK), right handlebar connector [22] and coil connector.

NOTE

Fuel system problems may also cause misfires. Refer to SYMPTOMS chart.

Spark Plug Cables Length / Resistance

No.	Position	Length in. (mm)	Resistance (ohms)
1	Front Left	20.2 (512)	5039-11758
2	Rear Center	18.7 (474)	4665-10886
3	Rear Left	23.1 (588)	5787-13504
4	Front Center	19.5 (496)	4882-11392

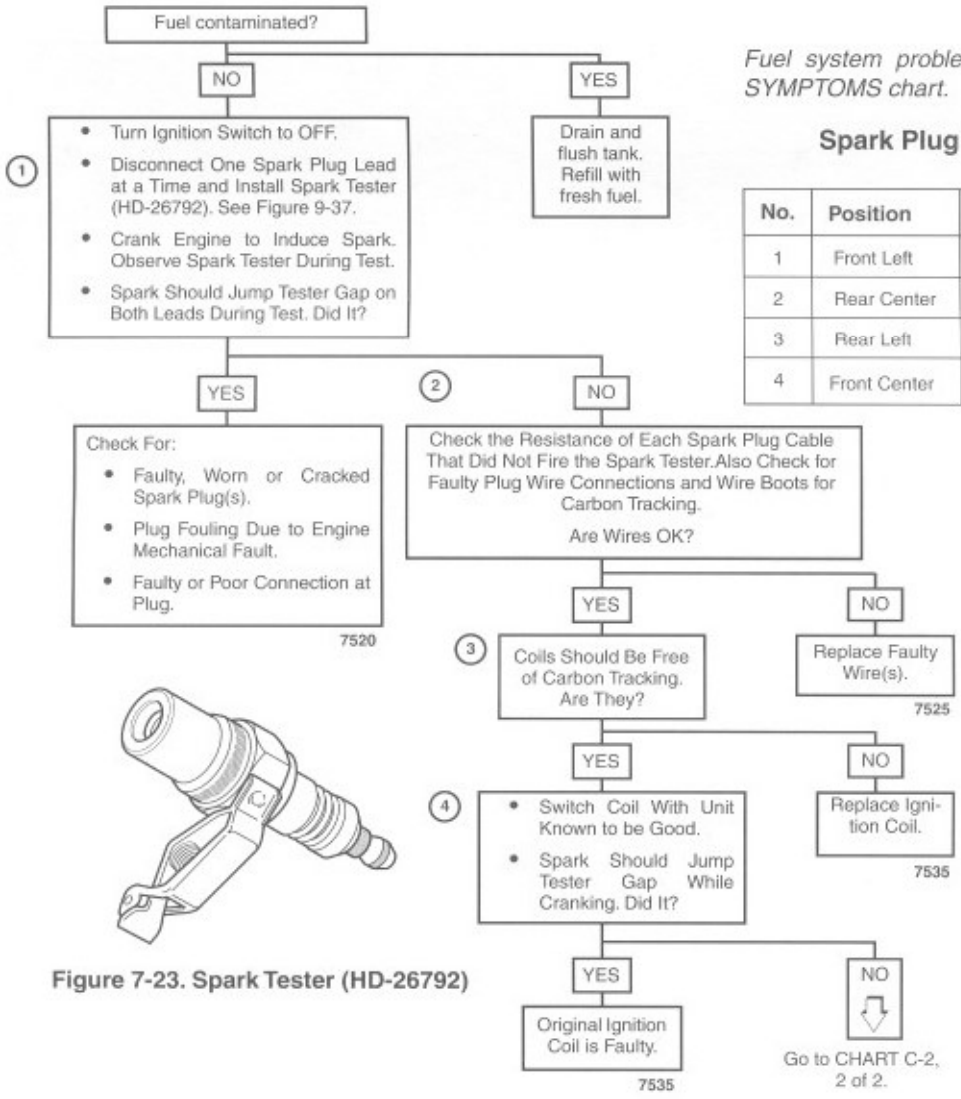
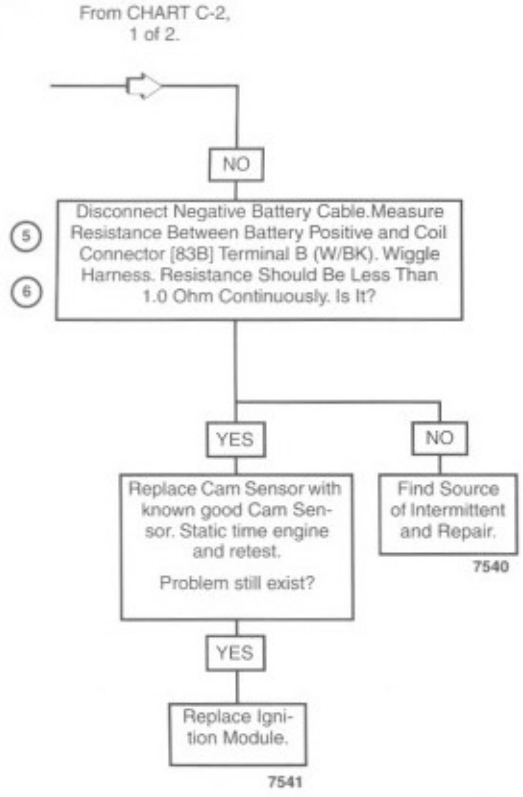


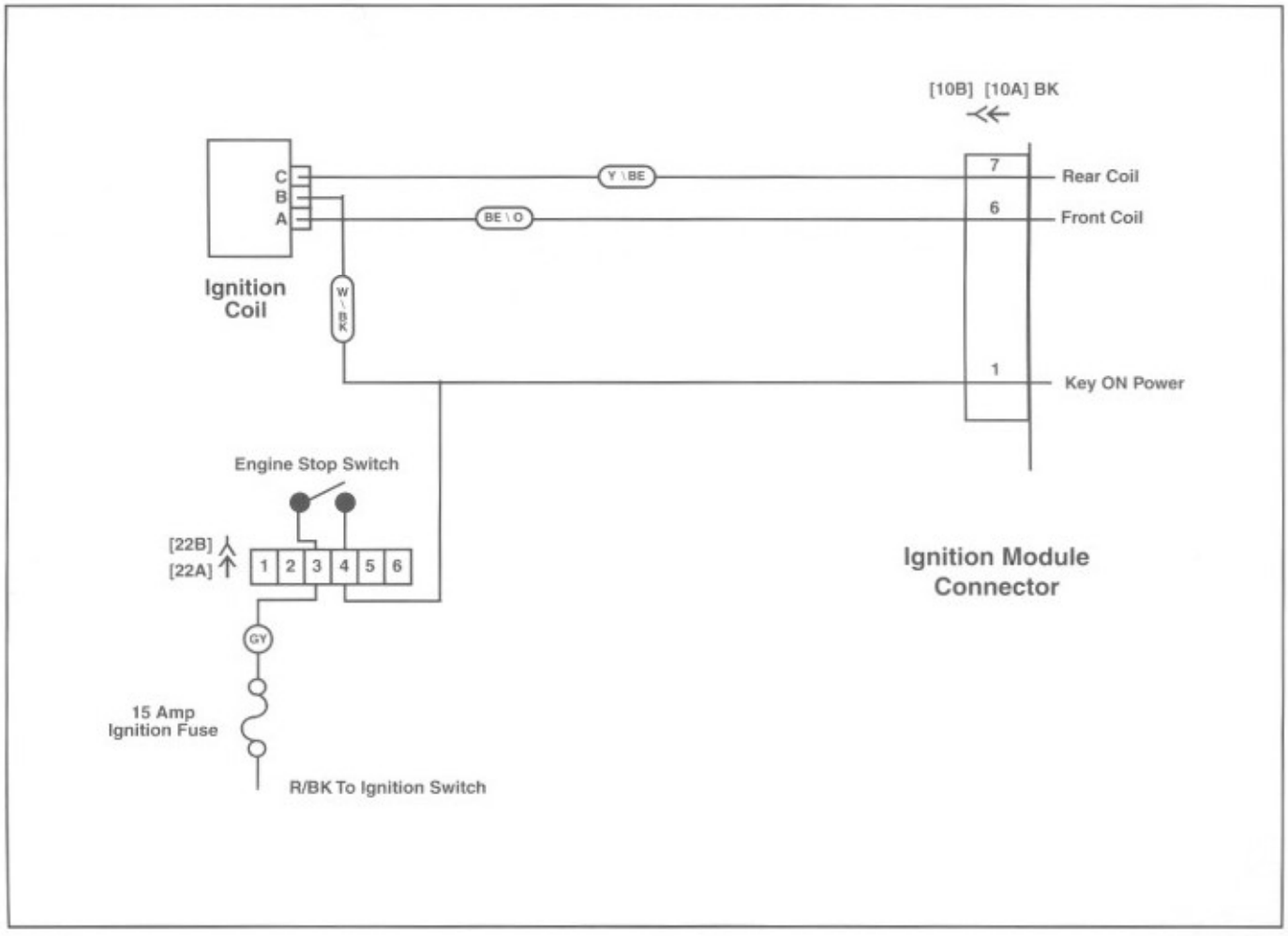
Figure 7-23. Spark Tester (HD-26792)

Chart C, Misfire At Idle Or Under Load (2 of 2)



Wire Harness Connectors

No.	Description	Type	Location
[10]	Ignition Module	12 - Place Deutsch (BK)	Under Seat
[22]	RT Handlebar Switch	6 - Place Deutsch (BK)	In Headlight
[83]	Coil	3 - Place Packard	Under Fuel Tank



Ignition Coil Circuit Diagram

TROUBLE CODE 12 MAP SENSOR

The Manifold Absolute Pressure Sensor (MAP Sensor) is supplied 5 volts from the Ignition Module and sends a signal back to the Ignition Module which varies in accordance with engine vacuum and atmospheric barometric pressure. Changes in barometric pressure are influenced by weather and altitude.

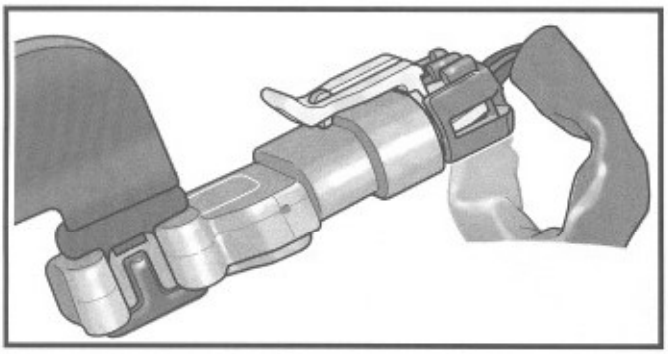


Figure 7-24. MAP Sensor

DIAGNOSTIC TIPS

- Code 12 will set if the MAP Sensor signal is out of range or fluctuates faster than normal operation.
- With the MAP Sensor disconnected, the Ignition Module and Scanalyzer should recognize a low voltage. If low voltage is observed, the Ignition Module and harness are not at fault.
- Gently place a jumper wire across MAP Sensor connector [80B] terminals 1 and 2 using Harness Connector Test Kit (HD-41404), purple male probes and patch cord. With the MAP Sensor connector jumper in place, the Ignition Module and Scanalyzer should recognize a high voltage. MAP Sensor Output Check. Using the vacuum pump (HD-23738A), apply a vacuum to the pressure port of the MAP Sensor. The signal voltage should lower as the vacuum is applied.

DIAGNOSTIC NOTES

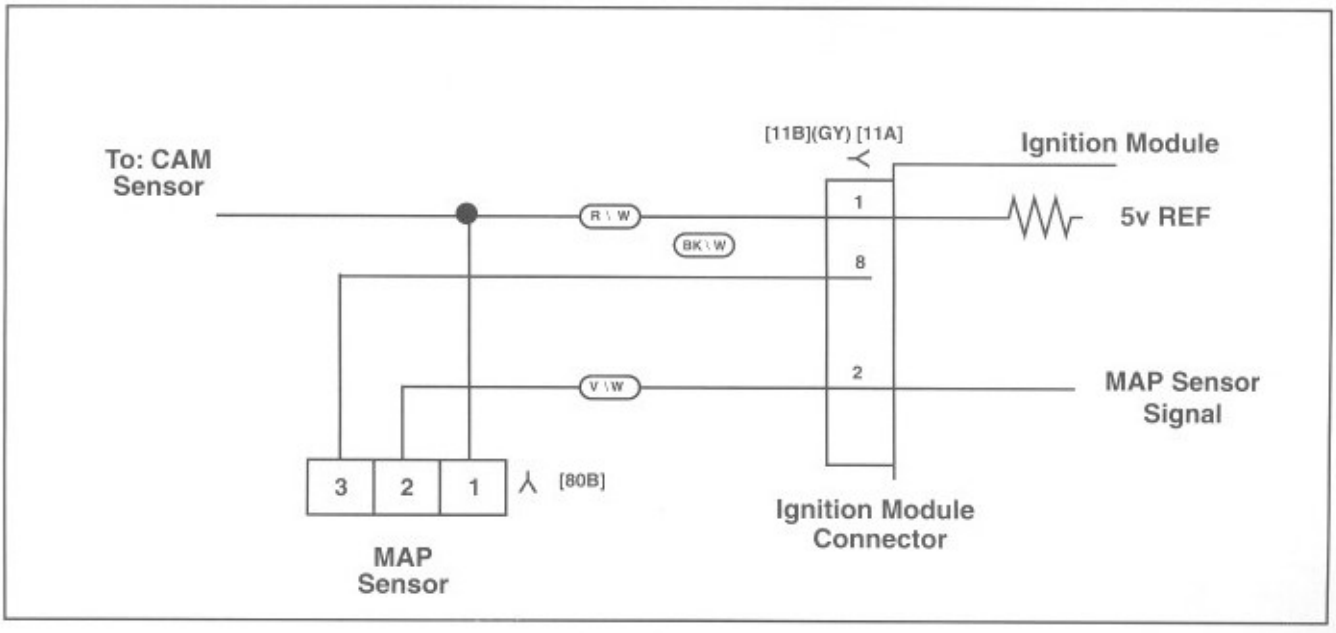
The reference numbers below correlate with those on the diagnostic flow chart.

(1) Connect Breakout Box (HD-42682) between wire harness and Ignition Module. See Breakout Box Installation page 7-18.

NOTE

Engine must be running for scanalyzer to work properly.

(2) Shake or wiggle harness with DVOM or Scanalyzer connected. Radical voltage changes on the DVOM will indicate the presence of intermittents, while the Scanalyzer (in Wiggle Test Mode) will beep, light the four corner LEDs and display a minus sign when a current trouble code is detected. (If a current trouble code is present when the wiggle test is entered, the Scanalyzer will respond as described immediately upon entering the wiggle test mode. With Key On and engine off, clear trouble codes and then perform wiggle test with vehicle running.)



MAP Sensor Circuit Diagram

Code 12, MAP Sensor

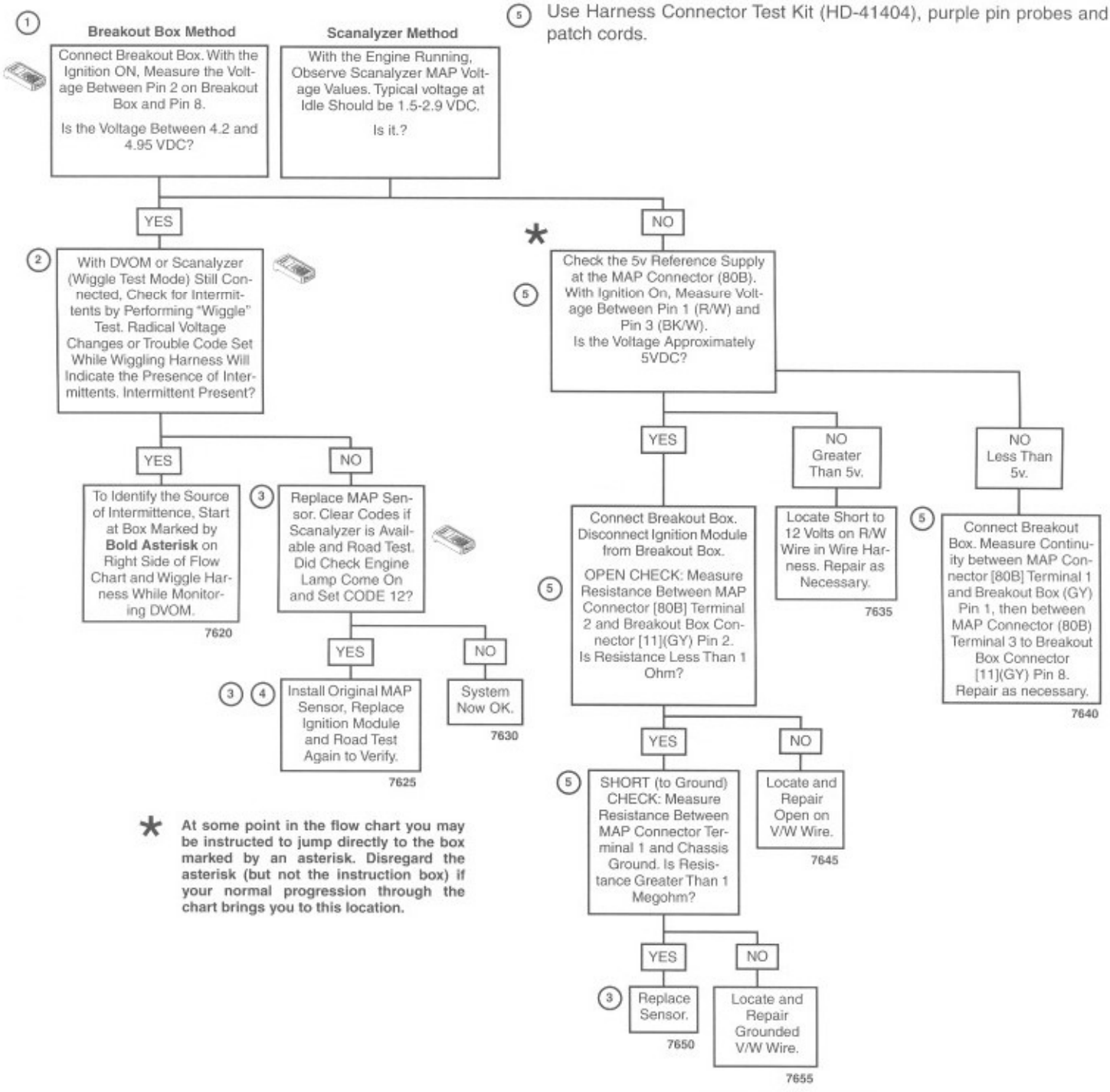
NOTE

*The **Scanalyzer icon** appears at those points in the flow chart where the Scanalyzer may be used.*

(3) See MAP Sensor, Removal/Installation, page 7-47.

(4) See Ignition Module Removal/Installation, page 7-52.

(5) Use Harness Connector Test Kit (HD-41404), purple pin probes and patch cords.



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

Wire Harness Connectors

No.	Description	Type	Location
[80]	MAP Sensor	3 - Place Amp	Under Fuel Tank
[10]	Ign. Module	12 - Place Deutsch (BK)	Under Seat
[11]	Ign. Module	12 - Place Deutsch (GY)	Under Seat

Clear Codes and Confirm Proper Operation with No Check Engine Lamp.

TROUBLE CODE 16, BATTERY VOLTAGE

A Code 16 is set if the Ignition Module sees battery positive voltage less than 8 or greater than 16 volts. Low voltage generally indicates loose wire and/or corroded connections or a charging system problem. A high voltage condition may be caused by a faulty voltage regulator.

DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

① Was battery allowed to discharge? Was battery drawn down by starting problem? Yes, Change battery. No - See Charging System Troubleshooting in Section 7 of this Service Manual.

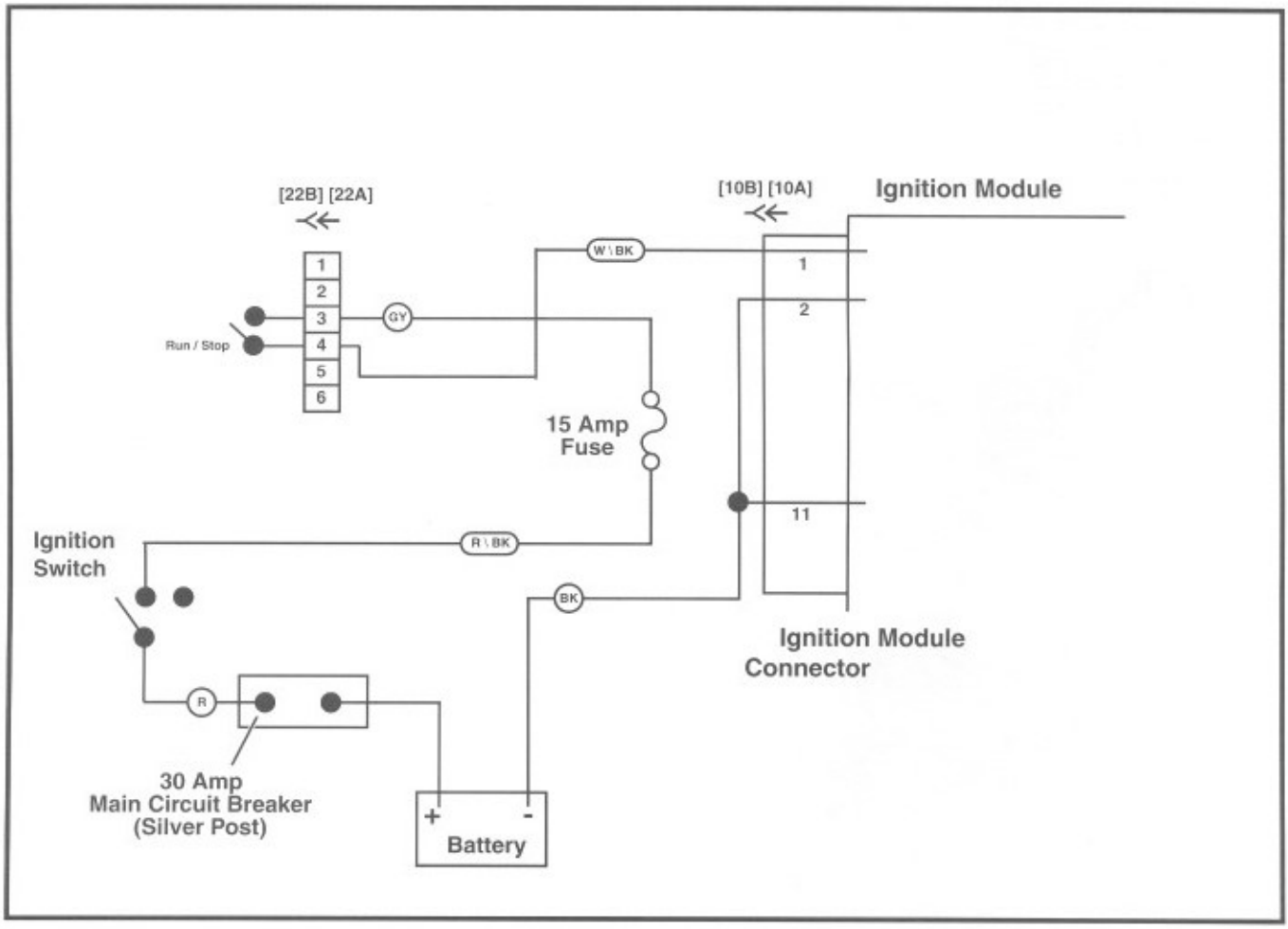
② Connect Breakout Box (HD-42682) between wire harness and Ignition Module. See Breakout Box Installation, page 7-18.

③ The Ignition Module is monitoring voltage at Ignition Module connector [10](BK) Pin1.

④ This checks for voltage drops in the Ignition Module power circuit.

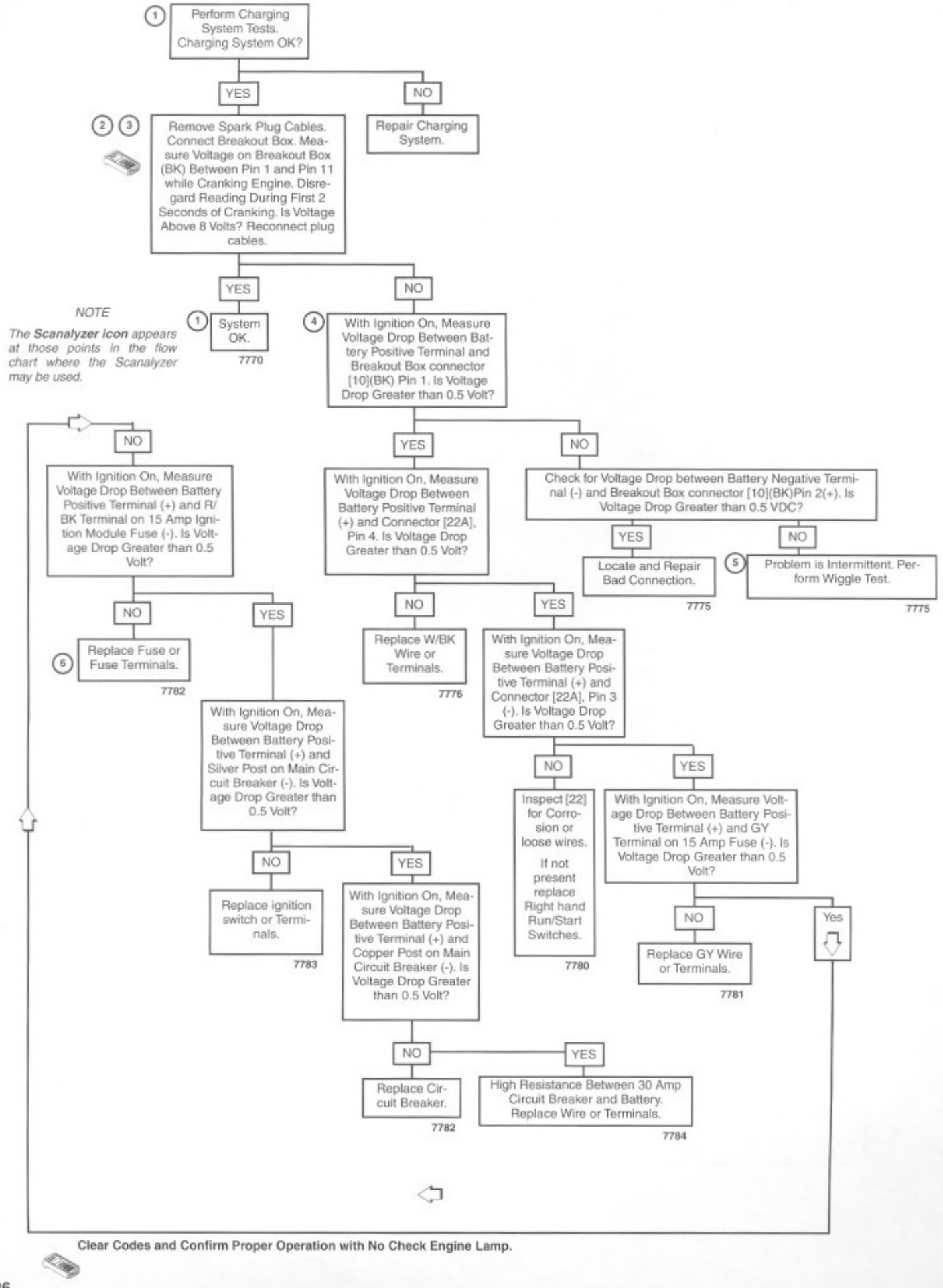
⑤ Perform Wiggle Test. Shake or wiggle harness with DVOM or Scanalyzer connected. Radical voltage changes on the DVOM will indicate the presence of intermittence, while the Scanalyzer (in Wiggle Test Mode) will beep, light the four corner LEDs and display a minus sign when a current trouble code is detected. (If a current trouble code is present when the wiggle test is entered, the Scanalyzer will respond as described immediately upon entering the wiggle test mode. With Key On and engine off, clear trouble codes and then perform wiggle test with vehicle running.)

⑥ See Fuses, Removal/Installation.



Battery Voltage Circuit Diagram

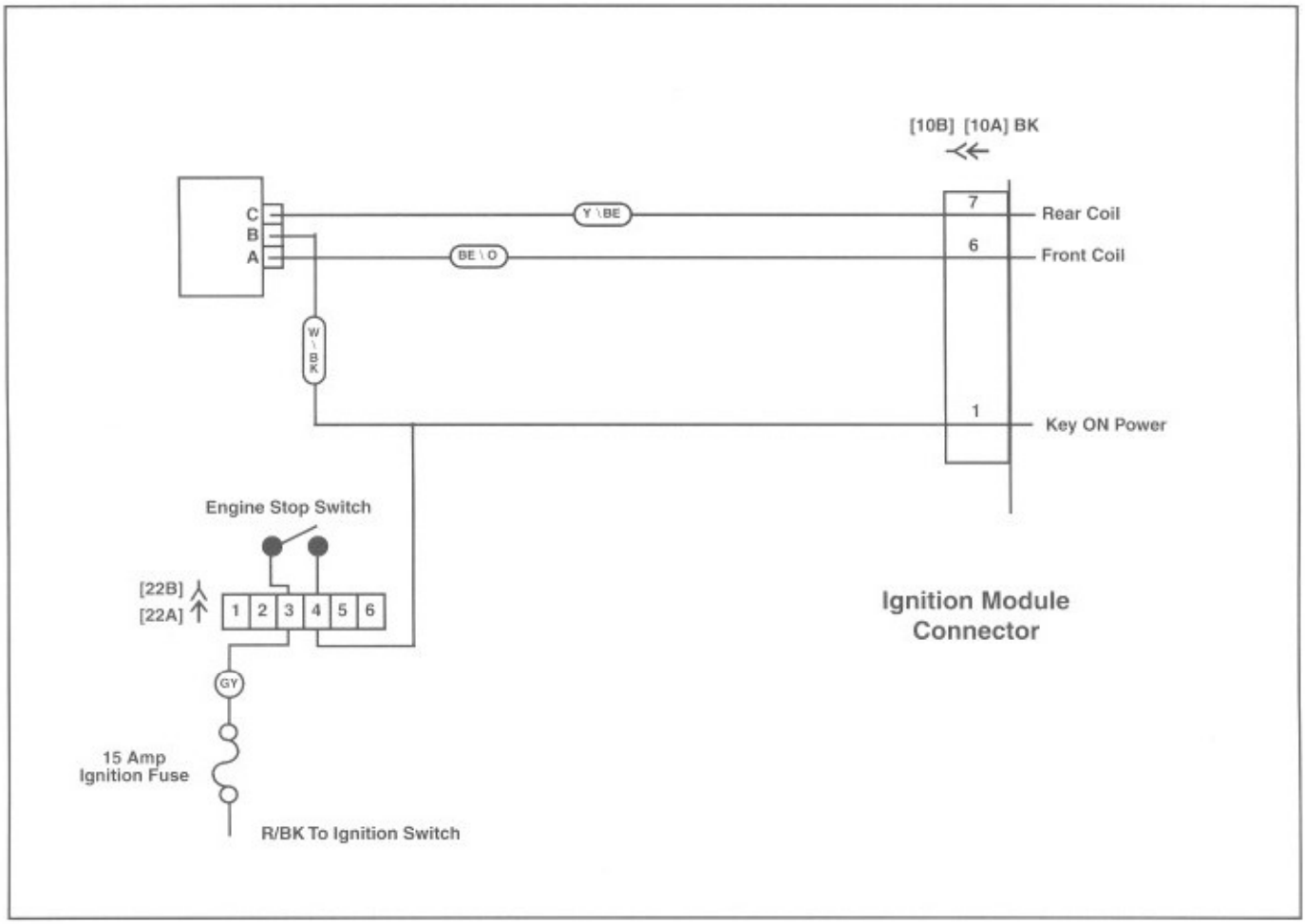
Code 16, Battery Voltage Test



TROUBLE CODE 24 and 25, IGNITION COIL

Code 24 = Front Coil **Code 25 = Rear Coil**

A Code 24 or 25 will set if the ignition coil voltage is out of range. This could occur if there is an open coil or loss of power to the coil. The coil receives power from the Run/Stop Switch.
The Ignition Module is responsible for turning the coils on by providing the ground to activate the coils, which in turn powers the coils. If both codes are set, it is likely a coil power failure or a coil failure.



Ignition Coil Circuit Diagram

Codes 24 and 25, Ignition Coil

DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

(1) Use Test Lamp as shown in Figure 7-25.

(2) See Ignition Coil, Removal/Installation.

(3) Use Harness Connector Test Kit (HD-41404), gray pin probe and patch cord.

(4) Connect Breakout Box (HD-42682) between wire harness and Ignition Module. See Breakout Box Installation.

(5) Shake or wiggle harness with DVOM or Scanalyzer (Engine running) connected. Radical voltage changes on the DVOM will indicate the presence of intermittents, while the Scanalyzer (in Wiggle Test Mode) will beep, light the four corner LEDs and display a minus sign when a current trouble code is detected. (If a current trouble code is present when the wiggle test is entered, the Scanalyzer will respond as described immediately upon entering the wiggle test mode. With Key On and engine off, clear trouble codes and then perform wiggle test with vehicle running.)

(6) See Ignition Module, Removal/Installation, page 7-57.

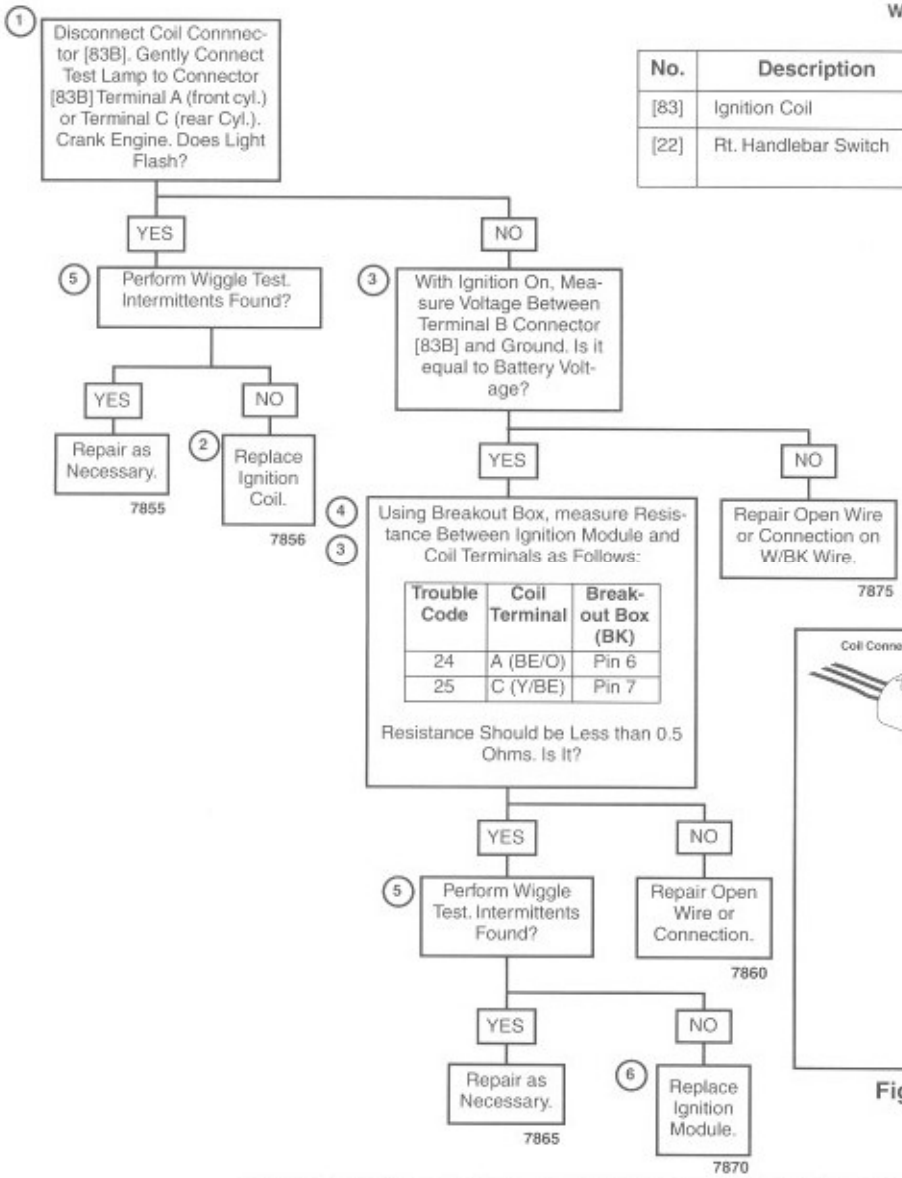
SCANALYZER NOTES

*The **Scanalyzer icon** appears at those points in the flow chart where the Scanalyzer may be used. If a number is printed next to the icon, then refer to the **Scanalyzer Notes** which follow.* 

With the engine off, Scanalyzer (Active Diagnostic Test Mode) can be used to energize either the front or rear coil once each second for a total of 5 seconds.

Wire Harness Connectors

No.	Description	Type	Location
[83]	Ignition Coil	3 - Place Amp	Below Fuel Tank
[22]	Rt. Handlebar Switch	6 - Place Deutsch (BK)	Inside Headlamp Housing



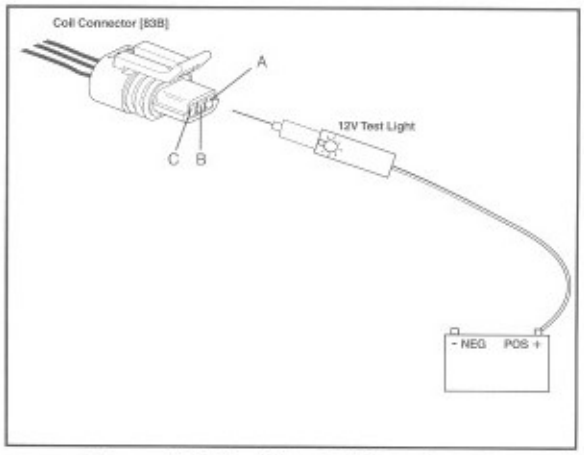


Figure 7-25. Ignition Coil Test Lamp

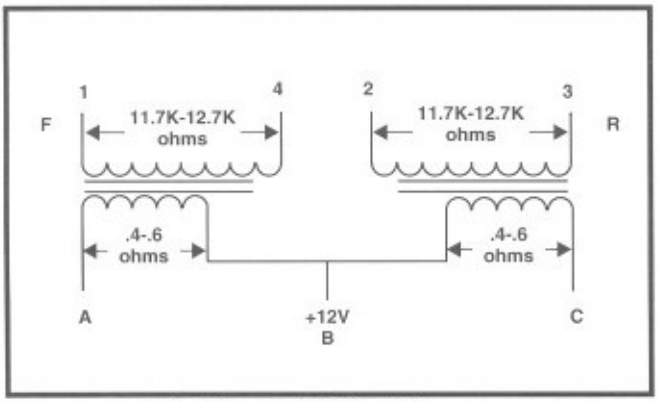
GENERAL

The ignition coil is a pulse type transformer that transforms or steps up low battery voltage to the high voltage necessary to jump the electrode at the spark plug in the cylinder head. Internally the coil consists of primary and secondary windings with a laminated iron core and sealed in waterproof insulating compound. The ignition coil cannot be taken apart or repaired. If the ignition coil is faulty it must be replaced.

Troubleshooting

When the engine will not start or when hard starting or missing indicates a faulty ignition system, see CHART C in this section. If the condition persists, check primary and secondary resistance of ignition coil with an ohmmeter. See Wiring Diagram below.

Resistances should be within the following limits: primary resistance 0.4-0.6 ohms, secondary resistance 11.7-12.7K ohms. Check ignition coil with a coil tester.



Ignition Coil Wiring Diagram

If a coil tester is not available, temporarily substitute a new ignition coil by attaching it at any convenient point near the old coil (coil will function without being secured). Transfer terminal wires to new coil.

Attach new spark plug cables to coil and plugs. If ignition trouble is eliminated by the temporary installation of new coil, carefully inspect old coil for damaged cables and insulation. The insulation on cables may be cracked or otherwise damaged allowing high tension current to short to metal parts. This is most noticeable in wet weather or after motorcycle has been washed.

TROUBLE CODE 35, TACHOMETER

Code 35 will set if the PK wire is shorted to power or ground.

DIAGNOSTIC NOTES

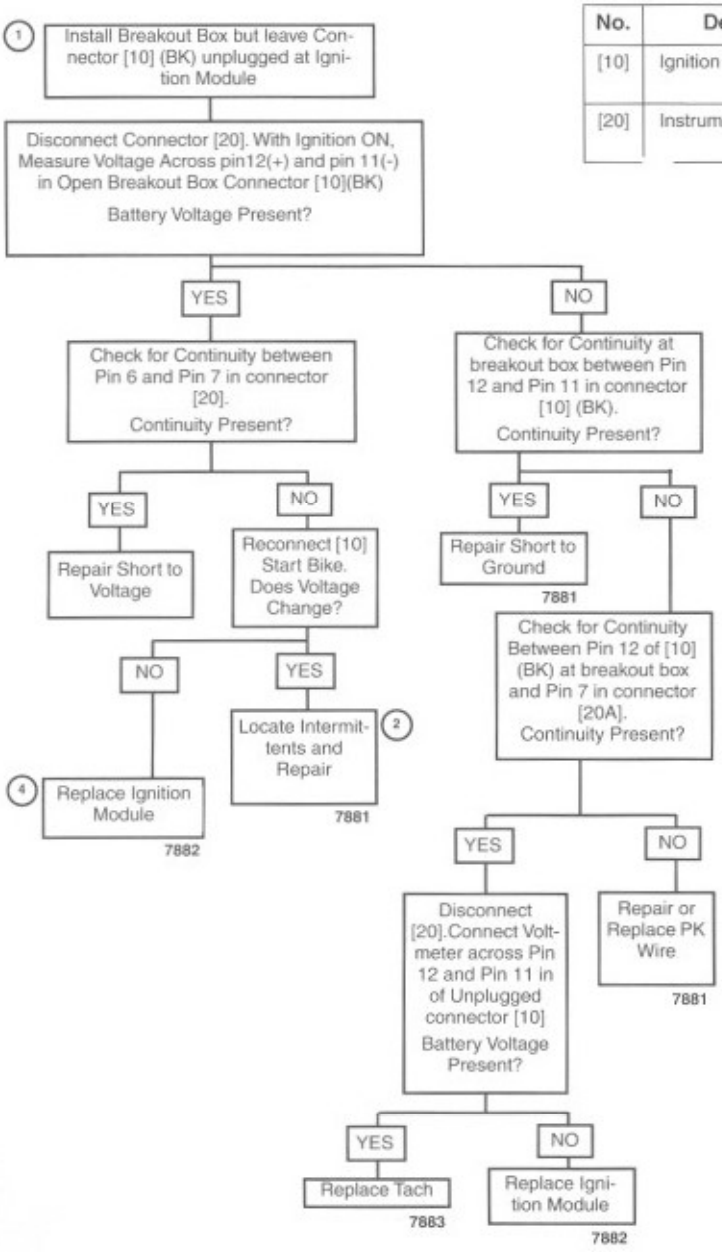
The reference numbers which follow correlate with those on the diagnostic flow chart.

(1) See page 7-18. Install Breakout Box HD-42682

(2) Shake or wiggle harness with DVOM or Scanalyzer (Engine running) connected. Radical voltage changes on the DVOM will indicate the presence of intermittents, while the Scanalyzer (in Wiggle Test Mode) will beep, light the four corner LEDs and display a minus sign when a current trouble code is detected. (If a current trouble code is present when the wiggle test is entered, the Scanalyzer will respond as described immediately upon entering the wiggle test mode. With Key On and engine off, clear trouble codes and then perform wiggle test with vehicle running).

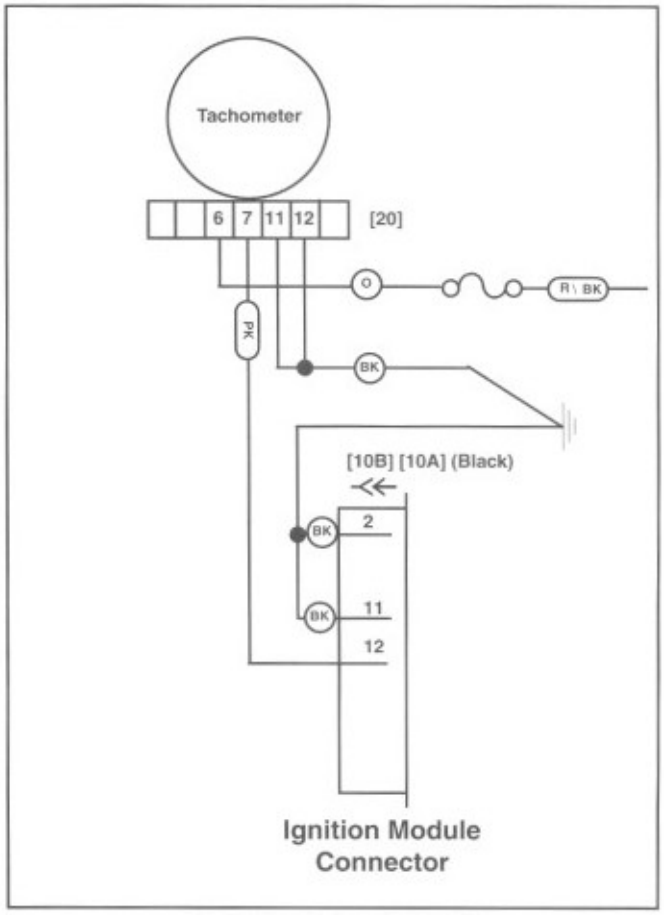
(3) See Tachometer Remove and Replace

(4) See Ignition Module Remove and Replace



Wire Harness Connectors

No.	Description	Type	Location
[10]	Ignition Module	12 - Place Deutsch (BK)	Below Fuel Tank
[20]	Instruments	14 - Place Multilock	Under Headlamp Bracket



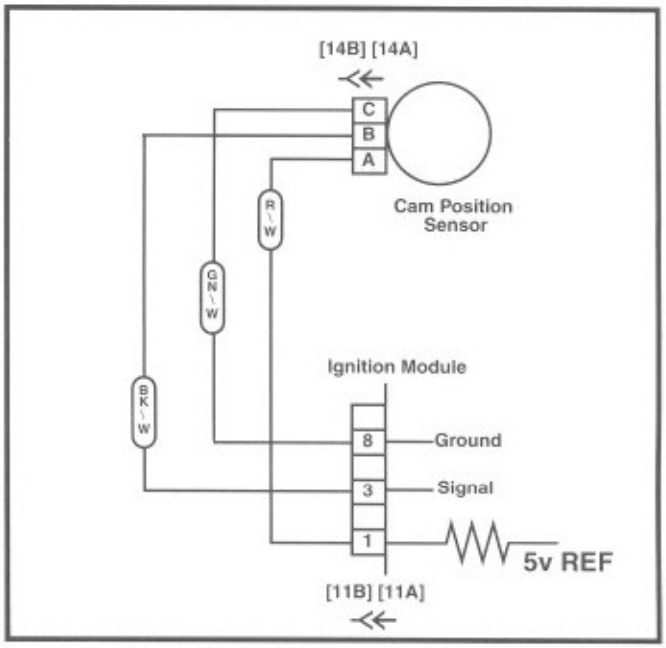
Tachometer Circuit Diagram

TROUBLE CODE 41, CAM SYNC FAILURE

GENERAL

This code occurs only when the engine is running if the ignition module either does not receive a signal from the timing plate or receives an unexpected signal. The motorcycle may continue to run, run poorly, or stop running altogether.

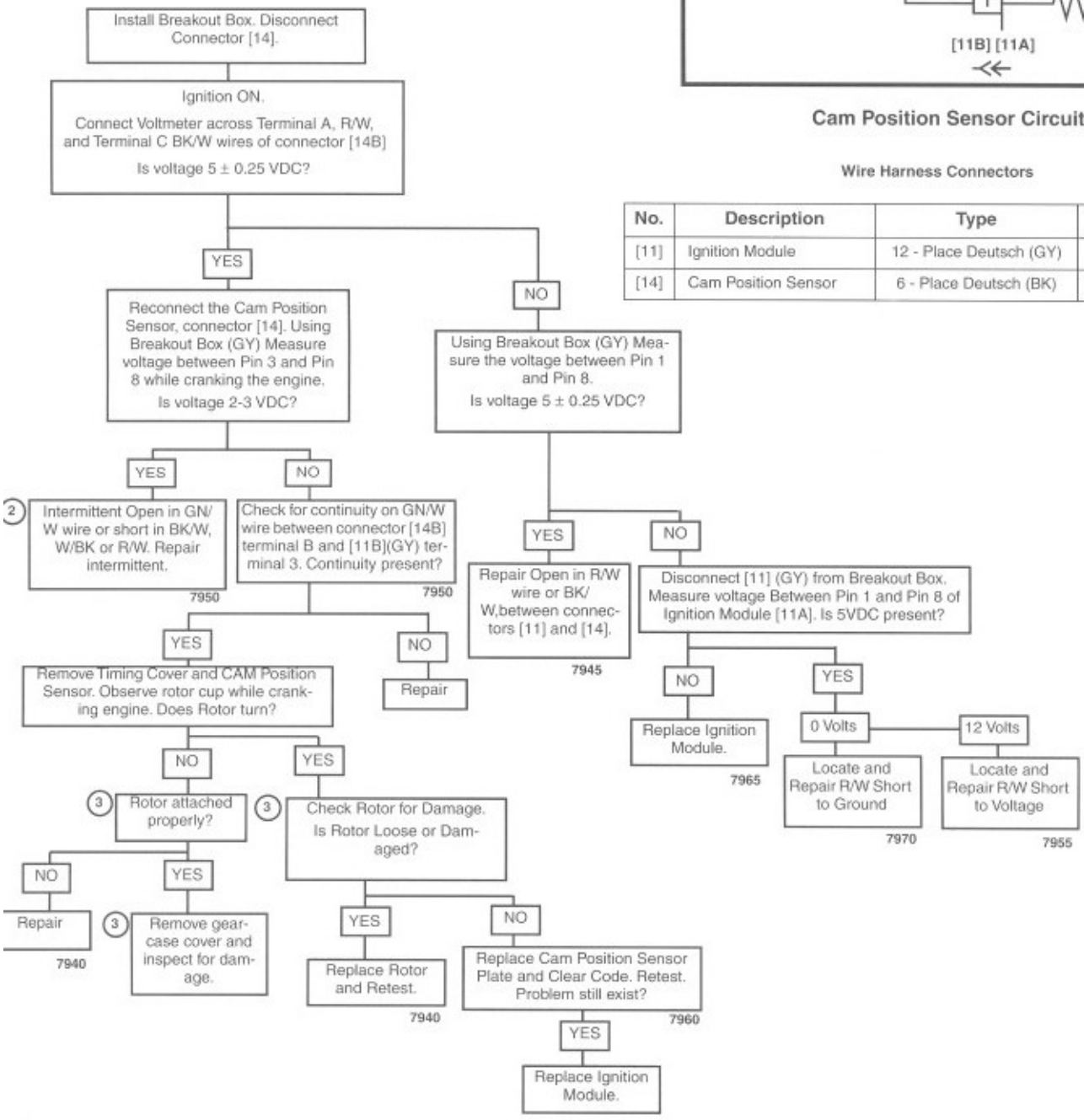
1. Install Breakout Box HD-42682
2. Perform Wiggle Test (Engine Running).
3. Refer to appropriate section of Service Manual and job time code for operation.



Cam Position Sensor Circuit

Wire Harness Connectors

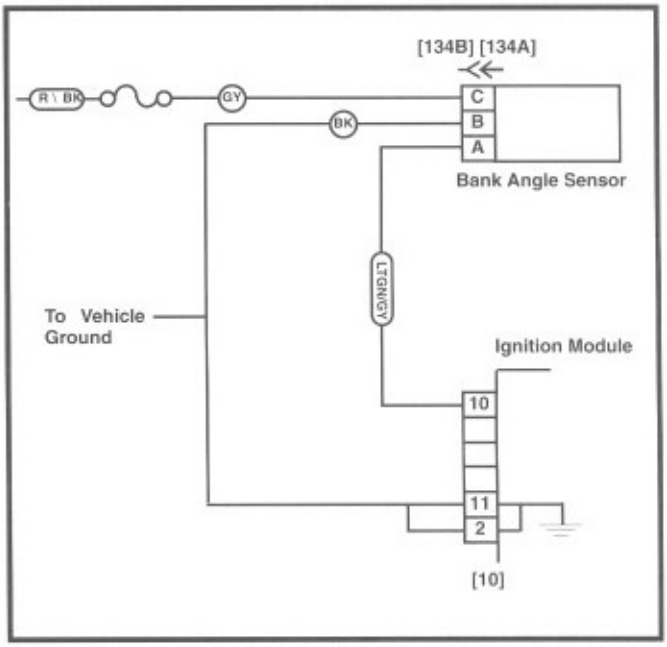
No.	Description	Type	Location
[11]	Ignition Module	12 - Place Deutsch (GY)	Below Seat
[14]	Cam Position Sensor	6 - Place Deutsch (BK)	Under Crankcase



TROUBLE CODE 44, Bank Angle Sensor

GENERAL

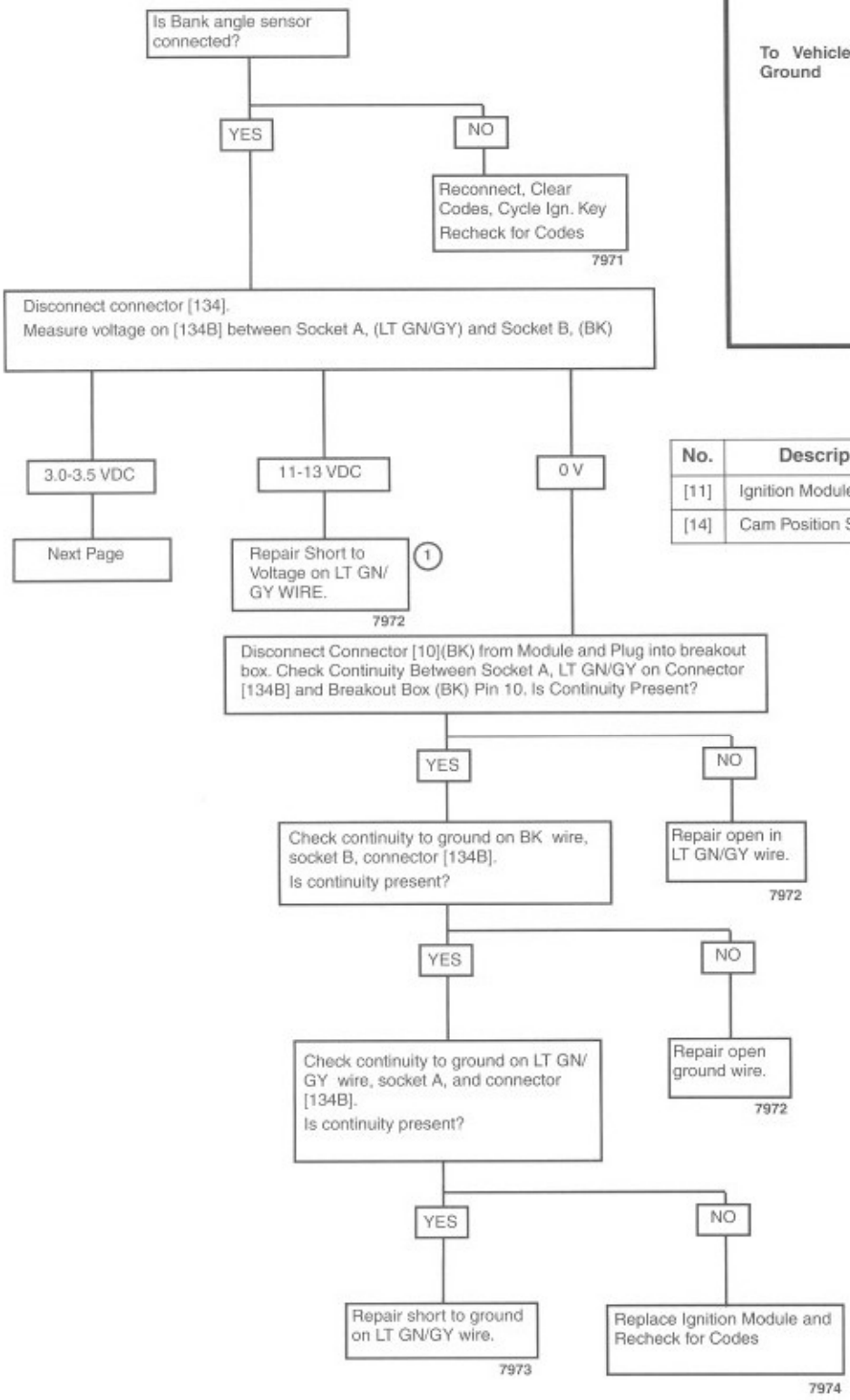
This code occurs when the Bank Angle Sensor voltage is outside of the normal operating range. This may be caused by a short to ground, or voltage in the harness between the ignition module and the Bank Angle Sensor, or a failed Bank Angle Sensor. If this code occurs, the engine may stop running. The engine may still be restarted and ridden to the dealership for repair



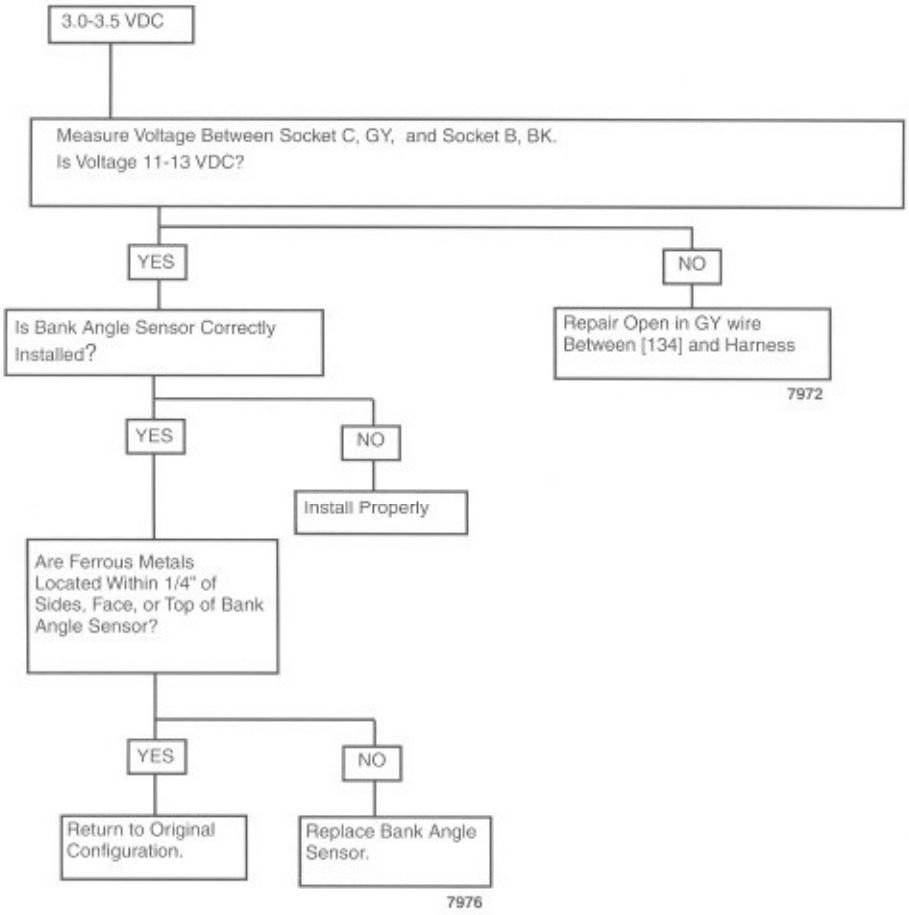
Bank Angle Sensor Circuit

Wire Harness Connectors

No.	Description	Type	Location
[11]	Ignition Module	12 - Place Deutsch (BK)	Below Fuel Tank
[14]	Cam Position Sensor	6 - Place Deutsch (BK)	Under Crankcase



(1) See page 7-18. Install Breakout Box HD-42682


3.0-3.5 VDC
Measure Voltage Between Socket C, GY, and Socket B, BK.
Is Voltage 11-13 VDC?
YES
NO
Is Bank Angle Sensor Correctly Installed?
Repair Open in GY wire Between [134] and Harness
7972
YES
NO
Install Properly
Are Ferrous Metals Located Within 1/4" of Sides, Face, or Top of Bank Angle Sensor?
YES
NO
Return to Original Configuration.
Replace Bank Angle Sensor.
7976

TROUBLE CODES 52, 54 and 55, IGNITION MODULE FAILURE

GENERAL

All of the following codes indicate an internal failure which requires replacement of the Ignition Module.

- Code 52 - RAM/ROM Failure
- Code 54 - EE PROM Failure
- Code 55 - Module Microprocessor Malfunction

See Ignition Module Removal/Installation page 7-52.

IGNITION TIMING

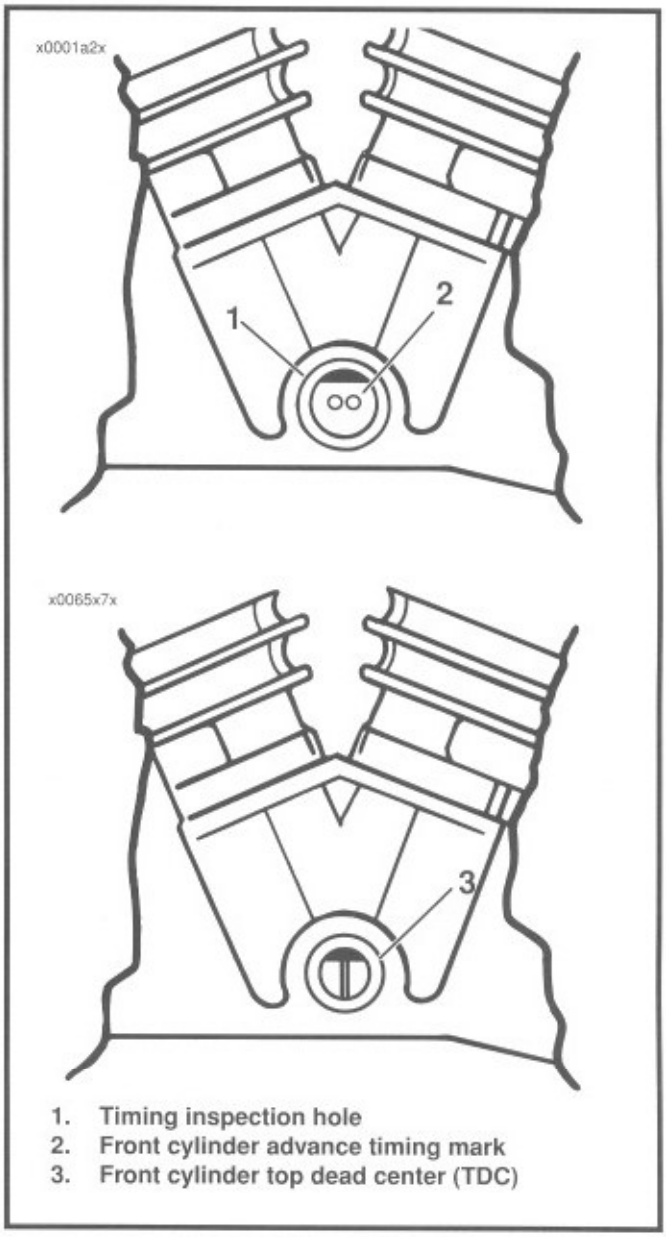
Static Timing - 1200S

1. See Figure 7-8. Locate outer timer cover (2) at bottom of gearcase cover (15) on right side of vehicle.

⚠WARNING

Always wear proper eye protection when drilling. Flying debris may result in eye injury.

2. Drill off heads of outer timer cover rivets (1) using a 1/8-inch drill bit. Use a punch to tap rivet shafts inboard through holes in outer timer cover. Remove outer timer cover (2).
3. Remove two Phillips screws (3) to free inner timer cover (4). If necessary, tap remaining rivet shafts through holes in inner timer cover.
4. Carefully check the gearcase cover timer bore for any rivet fragments.
5. Depress external latch on Cam position sensor connector (11) and use a rocking motion to separate pin and socket halves.
6. Remove the timing plug from the timing inspection hole centered below the cylinders on the right side of the crankcase.
7. Remove the spark plugs.
8. Jack up vehicle to allow rotation of the rear wheel.
9. Shift transmission into fifth gear, and standing on left side of vehicle, slowly rotate rear wheel in a counter-clockwise direction until front intake valve opens and closes (as viewed through spark plug holes).
10. Rotate rear wheel until TDC mark (vertical line, see lower frame Figure 7-10) is centered in timing inspection hole.
11. See page 7-18. Connect Breakout Box (HD-42682). Connect DVOM Red (+) lead to Pin 1 (Gray) [11] and Black lead to Pin 8 (Gray) [11].
12. Turn the Ignition/Light Key Switchh to IGNITION.
13. Loosen two screws and rotate the cam position sensor plate just until the voltmeter registers the change from 5 VDC (+)- 0.5 volts) to 0-1.0 VDC.
14. Tighten sensor plate screws to 15-30 **in-lbs** (1.7-3.4 Nm).
15. Install spark plugs, shift transmission into Neutral and remove jack.
16. Remove test harness and mate pin and socket halves of Cam position sensor connector [14]. Place large end of slot on attachment clip over T-stud. Push connector assembly forward to engage small end of slot.
17. Proceed to DYNAMIC TIMING. Begin at step 2.



1. **Timing inspection hole**
2. **Front cylinder advance timing mark**
3. **Front cylinder top dead center (TDC)**

Figure 7-26. Timing marks.

Adjust Timing using Scanalyzer (HD-41325) - 1200S only

1. Gently pull left side cover from frame downtubes (no tools required).
2. See Figure 7-27. Note the Data Link connector (pin side of 4-place Deutsch) on the side cover.
3. Remove rubber protective plug from open end of Data Link connector.
4. Plug the Scanalyzer (HD-41325) into the Data Link Connector.
5. Turn the Ignition/Light Key Switch to IGNITION. Turn the handlebar mounted Engine Stop Switch to the RUN position (but do not start the engine).

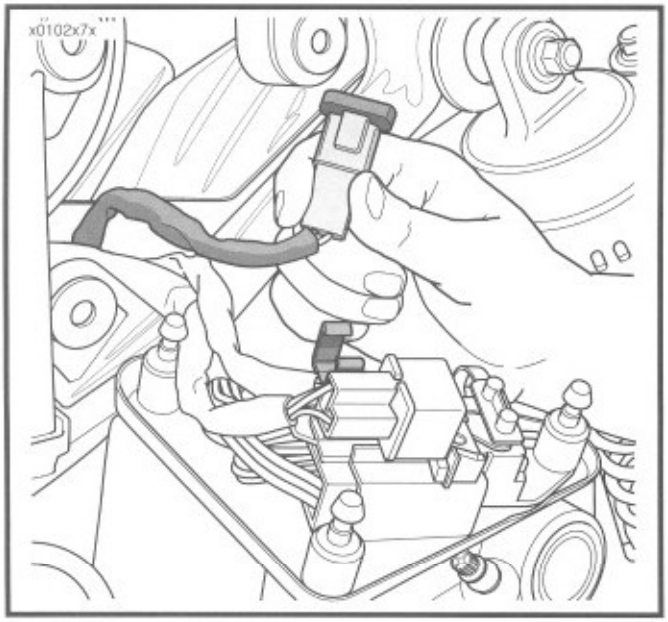


Figure 7-27. Data Link Connector - 1200S

6. Insert the diagnostic application cartridge HD-41325-95A, into the Scanalyzer. Once communications is established with the ignition module, the DIAGNOSTIC MENU appears. See Figure 7-12.
7. Select item 7- CALIBRATION from the DIAGNOSTIC MENU.
8. Press 1, TDCO Adjust on the key pad.
9. Connect Timing light (See Dynamic Timing) and observe timing mark.
10. Timing may be electronically adjusted by pressing the up arrow key to advance the timing offset or the down arrow key to retard the timing offset. Each press of the arrow key will change the timing one degree.
11. Press MODE to exit.

Static Timing - All except 1200S

1. Follow steps 1 - 12 on page 7-45.
2. Slowly rotate module plate until red LED illuminates. Tighten in position.
3. Proceed to DYNAMIC TIMING. Begin at step 2

Dynamic Timing

1. Remove hex socket timing plug from timing inspection hole, which is located on right crankcase half and centered below engine cylinders. Install TIMING MARK VIEW PLUG (Part No. HD-96295-65D) into timing inspection hole. Make sure view plug does not touch flywheel.
2. Connect leads of INDUCTIVE TIMING LIGHT (Part No. HD-33813) to front spark plug cable, battery positive (+) terminal, and suitable ground.
3. Make sure vacuum hose is properly installed at carburetor and V.O.E.S. (MAP sensor on 1200S). Start engine.

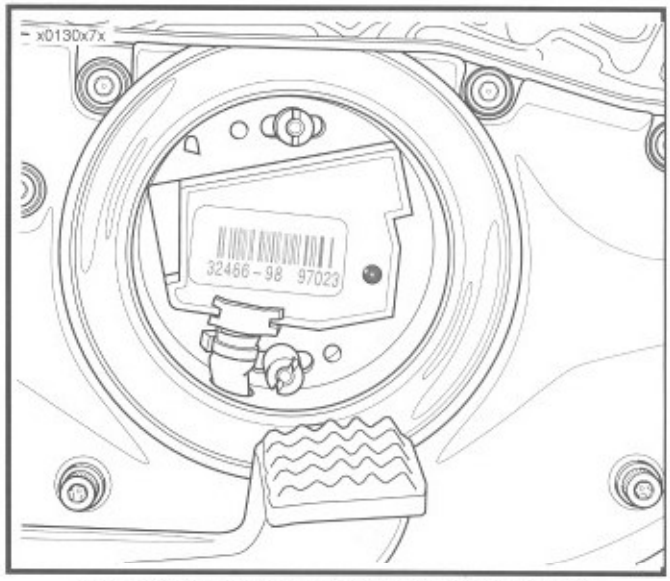


Figure 7-28. Ignition timing - all except 1200S

Set engine speed to1000-1050 rpm on all models.

⚠CAUTION

When checking ignition timing, always check V.O.E.S. operation (see VACUUM-OPERATED ELECTRIC SWITCH). Failure to do so may result in running engine with too much spark advance, and may cause extreme engine knock and engine failure.

4. See Figure 7-10. Timing light will flash each time an ignition system spark occurs. Aim timing light into timing inspection hole. Front cylinder advance timing mark (2) should be centered in timing inspection hole. If this is the case, ignition timing is properly adjusted. Remove TIMING MARK VIEW PLUG from timing inspection hole and install hex socket timing plug. If timing mark is not centered or is not visible in the timing inspection hole, proceed to Step 5.
5. See Figure 7-8. Remove outer cover rivets (1), outer cover (2), inner cover screws (3), and inner cover (4).
6. Loosen cam position sensor screws (5) just enough to allow sensor plate (7) to be rotated using a screwdriver in the plate's notch (6).
7. With timing light aimed into inspection hole, rotate cam position sensor (7) until front cylinder advance timing mark is centered in timing inspection hole (as shown in Figure 7-10).
8. See Figure 7-8. Tighten cam position sensor screws (5).
9. Install inner cover (4), inner cover screws (3), outer cover (2) and new outer cover rivets (1).
10. Remove TIMING MARK VIEW PLUG from timing inspection hole. Install hex socket timing plug.

BANK ANGLE SENSOR

General

The Bank Angle Sensor turns off the ignition system if the motorcycle lean angle exceeds 80 degrees.

Bank Angle Sensor operation may be verified by placing a magnet at top of switch - Engine will stop if switch is operating correctly. Remove magnet and turn Ignition switch OFF to reset.

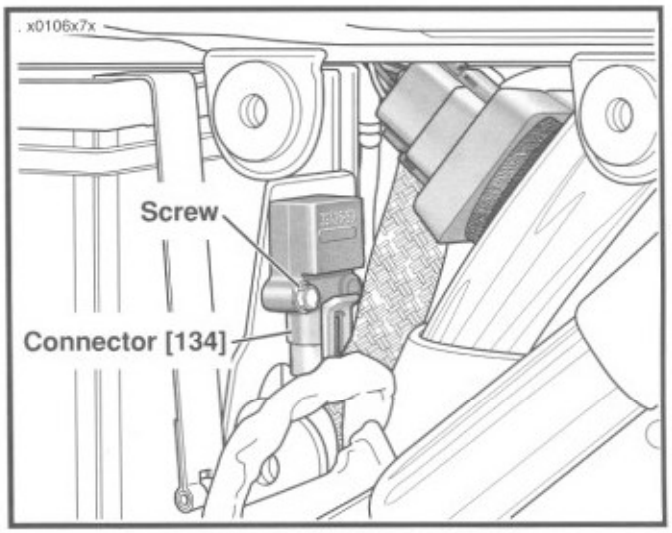


Figure 7-29. Bank Angle Sensor

Removal

1. Gently pull left side cover from frame downtubes (no tools required).

2. See Figure 7-29. Locate Bank Angle Sensor on battery box. Remove screw.

NOTE

To avoid damage to terminals, remove Bank Angle Sensor from side of battery box before disconnecting connector [134].

3. Carefully un-plug connector [134].

Installation

1. Plug-in new sensor.

2. Install new sensor - make sure locating pin on sensor body is positioned in hole.

3. Install sensor screw. Torque to 15-20 in. lbs (1.7-2.3 Nm).

4. Install left side cover.

MAP (Manifold Absolute Pressure) Sensor - 1200S

1. Loosen fuel tank rear mounting bolt.
2. Remove fuel tank front mounting bolt. Carefully pivot tank upward and prop in position to allow acess to the MAP sensor.
3. Remove vacuum hose from bottom of MAP sensor.
4. See Figure 7-28. Using appropriate tool gently release tang holding sensor - Push sensor down.
5. Remove connector [80].
6. Plug connector [80] into new MAP sensorr.
7. Slide MAP Sensor upward onto holding bracket untill tang is engaged.
8. Attach vacuum hose to MAP Sensor.
9. Lower fuel tank into position and install front mounting bolt.
10. Tighten fuel tank rear mounting bolt.

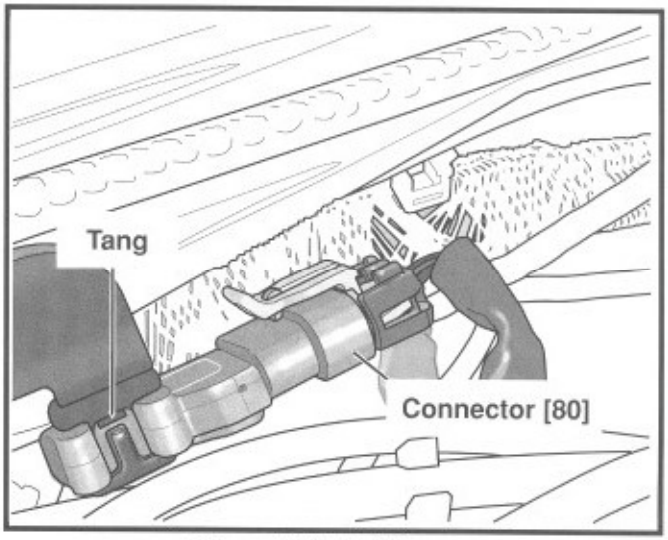


Figure 7-28. MAP Sensor

VACUUM-OPERATED ELECTRIC SWITCH (V.O.E.S)

ADJUSTMENT/TESTING

Timing Mark Method

Verify engine ignition timing. See IGNITION SYSTEM, ADJUSTMENT/TESTING, IGNITION TIMING. Adjust ignition timing, if necessary, and then perform the following V.O.E.S. check:

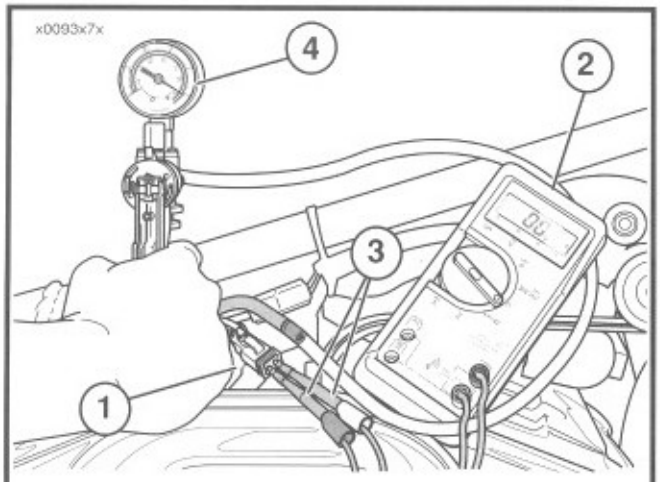
1. With engine running at 1000-1050 rpm, disconnect V.O.E.S. vacuum hose from carburetor fitting.
2. Temporarily plug the open carburetor fitting. Ignition timing should retard (front cylinder advance timing mark disappears from view in timing inspection hole) and engine rpm should decrease.
3. Connect V.O.E.S. vacuum hose to carburetor fitting. Timing mark should reappear and engine speed should increase to previous rpm.

If speed does not first decrease and then increase as described, check V.O.E.S. wire connection to ignition module.

Ohmmeter and Vacuum Pump Method

The V.O.E.S. can also be checked using an ohmmeter, a Harley-Davidson VACUUM PUMP (Part No. HD-23738) and Harness Connector Test Kit (HD-41404).

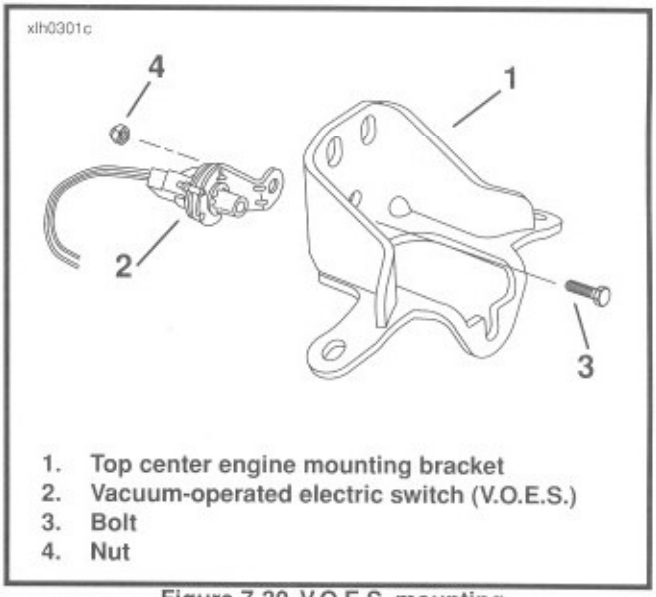
1. Disconnect V.O.E.S. Deutsch connector.
2. Insert black male probes in socket terminals of 2-place Deutsch connector.
3. Disconnect vacuum hose and connect vacuum pump to V.O.E.S. vacuum fitting.



1. V.O.E.S. Deutsch connector
2. Ohmmeter
3. Ohmmeter probes
4. Vacuum pump

Figure 7-29. Checking V.O.E.S. Using Ohmmeter and Vacuum Pump

4. Slowly squeeze vacuum pump handle. Observe vacuum gauge and ohmmeter readings. Ohmmeter should indicate switch closed (zero ohms) with an applied vacuum of 3.5-4.5 inches (89-114 mm) mercury (Hg). If a vacuum reading of more than 4.5 in. (114 mm) Hg or less than 3.5 in. (89 mm) Hg is required to close the switch, then the switch must be replaced.



1. **Top center engine mounting bracket**
2. **Vacuum-operated electric switch (V.O.E.S.)**
3. **Bolt**
4. **Nut**

Figure 7-30. V.O.E.S. mounting

REMOVAL

1. Remove air cleaner. See AIR CLEANER, REMOVAL in Section 4.
2. Remove rear mounting bolt, locknut and 2 flat washers to free fuel tank from frame member.
3. Standing on vehicle right side, raise rear of fuel tank slightly and push 2-pin Deutsch connector on top motor mount rearward to unsnap attachment clip from T-stud.
4. Depress latch on connector to separate pin and socket housings. For best results, use a rocking motion while pulling the halves apart.
5. Remove bolt and nut attaching V.O.E.S. to top center engine mounting bracket..
6. Pull V.O.E.S. assembly out of cavity and disconnect hose from V.O.E.S. fitting. Note the blue mark on hose fitting.

INSTALLATION

⚠CAUTION

Verify that V.O.E.S. switch, wiring and hose connection do not contact engine rocker box. Normal engine vibration and heat can damage V.O.E.S. assembly if it is mounted in contact with the engine.

NOTE

The correct V.O.E.S. for XLH Sportster models is identified by a blue paint mark on the hose fitting.

1. Install hose on V.O.E.S. fitting.
2. Insert bolt through hole in back of top center engine mounting bracket. Mount tab of V.O.E.S. on bolt and Rotate V.O.E.S. so that rounded edge of bracket faces upward toward fuel tank. Install nut to secure V.O.E.S. to top center engine mounting bracket. Tighten locknut to 5-12 ft-lbs (7-16 Nm) torque.
3. Press socket housing into pin housing until it snaps in place. Place large end of slot on attachment clip over T-stud on right side of top motor mount; push assembly forward to engage small end of slot.
4. Slide flat washer on rear fuel tank mounting bolt. Insert bolt through grommet of right fuel tank flange, frame member and grommet of left fuel tank flange. Install flat washer and locknut on end of bolt. Tighten bolt to 8-16 ft-lbs (11-22 Nm) torque.
5. Install air cleaner. See AIR CLEANER, INSTALLATION in Section 4.

IGNITION/LIGHT SWITCH

GENERAL (Figure 7-31)

The ignition/light switch is not repairable and must be replaced as a unit if it fails.

⚠WARNING

DO NOT modify the ignition/light switch wiring to circumvent the automatic-on headlight feature. High visibility is an important safety consideration for motorcycle riders.

The vehicle is provided with a three-position combination ignition/light switch. The three positions are as follows:

OFF - Ignition locked, lights off; key removable.

ACC(ESSORY) - Ignition locked, instrument lights on; key removable (HDI- position lamp and tail lamp on).

IGNITION - Ignition unlocked, lights on; key not removable.

Note that the key locks the ignition system and is removable in both the OFF and ACC(ESSORY) positions. The accessory position is located between the OFF and IGNITION positions and allows the rider to remove the key while leaving the instrument lights on. In this position, the instrument (icon) lamps, 4-way flashers (front and rear directionals) and tail/brake light are on or can be activated. On HDI vehicles the position lamp and taillight are on.

⚠CAUTION

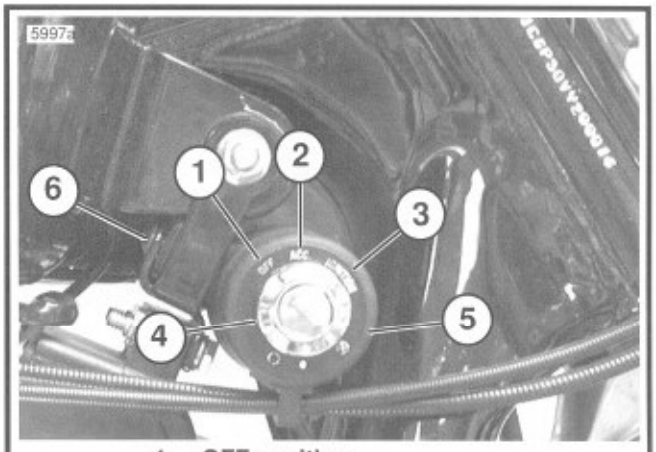
When turning off the ignition, verify that the key is removed in the OFF position or that the lights are not left on. If the rider stops the engine and inadvertently removes the key in the ACC(ESSORY) position, the battery will be drained of its charge if the vehicle is left standing too long.

REMOVAL (Figure 7-32)

⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before proceeding. Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

1. Remove seat.
2. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL in this section.
3. Remove ignition switch face nut.
4. Remove Fuel tank. See FUEL TANK REMOVAL, Section 4.
5. Remove mounting screw. Remove switch cover. Remove switch from switch cover.
6. Remove harness covering and cut switch wires 3 inches from switch.



1. OFF position
2. ACC(ESSORY) position
3. IGNITION position
4. Face nut
5. Switch cover
6. Mounting screw

Figure 7-31. Ignition/Light Switch

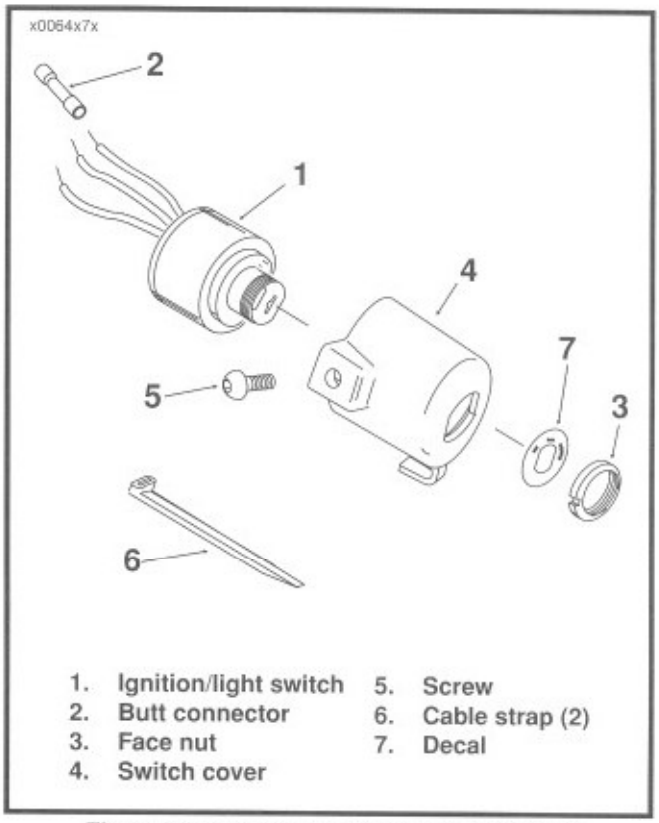
INSTALLATION (Figure 7-32)

1. Slide replacement conduit on harness wires.
2. Observing color codes, install butt connectors to harness wires. Complete butt splice to **new** ignition switch. Seal butt splice connectors using UltraTorch UT-100 or other radiant heating device. See SEALED BUTT CONNECTORS in this section for more detailed information.
3. Slide conduit over butt splice connectors.
4. Insert ignition switch into hole of switch cover. The word "TOP" stamped on the switch body should face upward toward the lettering on the switch position decal. Loosely install face nut.
5. Install and tighten mounting screw to 3-7 ft-lbs (4-9 Nm) torque.
6. Tighten face nut to secure switch within cover.
7. Using two **new** cable straps, secure main harness to frame backbone.

⚠WARNING

Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

8. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this section.
9. Check ignition/light switch for proper operation.



1. Ignition/light switch
2. Butt connector
3. Face nut
4. Switch cover
5. Screw
6. Cable strap (2)
7. Decal

Figure 7-32 Ignition/Light Switch Assembly

IGNITION MODULE - 1200S

GENERAL

See Figure 7-33. The ignition module is mounted to a bracket located under the seat.

Refer to IGNITION SYSTEM in this section for information on the function and testing of the ignition module. The ignition module is not repairable and must be replaced if defective.

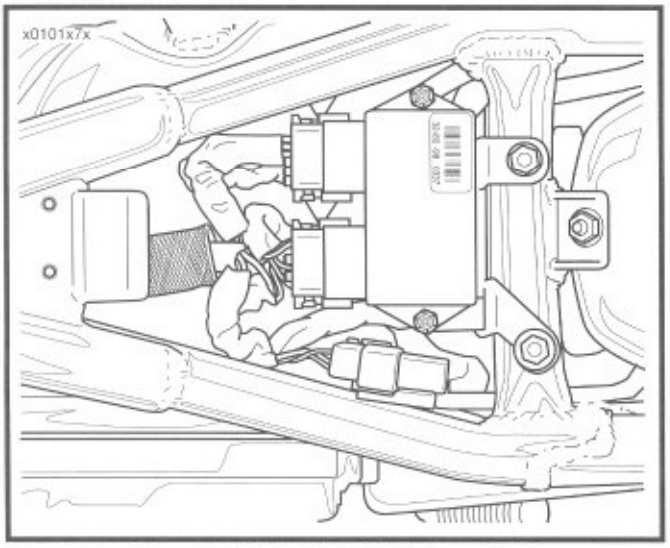


Figure 7-33. Ignition Module - 1200S

REMOVAL

1. Remove seat. See SEAT REMOVAL in Section 2.

⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before proceeding. Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

2. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL.
3. See Figure 7-6. Disconnect ignition module (17) from wiring harness at Deutsch connectors .
4. Depress external latches on socket housing side and use a rocking motion to separate pin and socket halves.
5. Remove screws (18) to free the ignition module (17) from the frame-mounted bracket.

INSTALLATION

1. See Figure 7-6. Align holes in ignition module with those in frame-mounted bracket.
2. Secure module to bracket using screws (18). Tighten screws to 15-21 **in-lbs** (1.7-2.4 Nm) torque.
3. Connect ignition module (17) Deutsch connectors [10] and [11] to module.

   Align tabs on socket housing with grooves on pin housing. Push connector halves together until latches "click." If latches do not click (latch), press on one side of the connector until that latch engages, then press on opposite side to engage other latch.

   Fit attachment clip to pin housing, if removed. Place large end of slot on attachment clip over T-stud on battery tray. Push assembly toward plug end (socket side) to engage small end of slot.

⚠WARNING

Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

4. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this Section.
5. Install seat. See SEAT INSTALLATION in Section 2.
6. Test engine for proper ignition system operation.

CAM POSITION SENSOR AND ROTOR - 1200S

GENERAL (Figure 7-6)

The cam position sensor (7) and rotor (9) are located in the gearcase cover (14) on the right side of the vehicle. The rotor is mounted on the camshaft and operates at one-half crankshaft speed. The cam position sensor wiring is connected to the ignition module (17) wiring harness. Refer to IGNITION TIMING in this Section for information on the function, testing and adjustment of the cam position sensor and rotor assembly.

REMOVAL (Figure 7-6)

⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before attempting any service procedure.

1. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL.
2. Disconnect cam position sensor (7) wiring at connector (11) located on left frame tube under motor.
3. Note position of each cam position sensor wiring terminal in plug end of connector (11).
4. Remove terminals following procedure outlined under DEUTSCH ELECTRICAL CONNECTORS at the end of this section.
5. Drill off heads of outer timer cover rivets (1) using a 1/8-inch drill bit. Tap remaining rivet shafts inboard through holes in outer timer cover (2) and inner timer cover (4). Remove outer cover.
6. Remove inner cover screws (3) and inner cover (4). Carefully remove any remaining pieces of rivets from gearcase cover timer bore.
7. To obtain approximate ignition timing during installation, mark position of cam position sensor screws (5) on cam position sensor (7).
8. Remove cam position sensor screws. Carefully remove cam position sensor. Remove rotor bolt (8) and rotor (9).
9. Carefully remove camshaft oil seal (10) if damaged or if there is any evidence of oil leakage past the seal.

INSTALLATION (Figure 7-6)

1. With the lipped side facing inboard, install **new** camshaft oil seal (10) into gearcase cover (14), if removed. Press seal into position until flush with surface of timer bore.
2. Position rotor (9) onto end of camshaft aligning notch with camshaft slot. Apply LOCTITE THREADLOCKER 242 (blue) to rotor bolt (8). Install bolt to secure rotor. Tighten bolt to 43-53 **in-lbs** (4.9-6 Nm) torque.
3. Install cam position sensor (7) and cam position sensor screws (5). Rotate sensor plate to its previously marked position to obtain approximate ignition timing.
4. Route cam position sensor wiring leads downward through hole (7 o'clock position) in timer bore of gearcase cover (15). Route leads upward through bottom opening between right crankcase half and rear of gearcase cover.

⚠CAUTION

Route cam position sensor wires about 1-1/2 inches (38 mm) forward of gearcase cover rear edge. If wires are routed too far to the rear of this position, they could contact the moving secondary drive belt and/or sprocket resulting in damage to cam position sensor wiring.

5. Install cam position sensor wiring terminals into correct positions in plug end of connector (11). Red, green and black wires of plug end (from cam position sensor) must match same color wires in receptacle end of connector (from ignition module wiring harness). Install terminals following procedure outlined under DEUTSCH ELECTRICAL CONNECTORS at the end of this section.

   Connect cam position sensor (7) wiring to ignition module (12) at wiring harness connector (11).
6. Check ignition timing as described under IGNITION TIMING, Static Timing if cam position sensor has been replaced or proceed to Dynamic Timing Pages 14 in this Section if algning marks on original sensor. Final tighten cam position sensor screws (5) to 12-20 **in-lbs** (1.4-2.3 Nm) torque.
7. Install inner cover (4) using screws (3). Tighten screws to 12-20 **in-lbs** (1.4-2.3 Nm) torque.
8. Secure outer cover (2) to inner cover using **new** rivets.

⚠CAUTION

Use only H-D Part No. 8699 rivets to secure outer timing cover. These rivets are specially designed so that no rivet end falls off into the timing compartment. Use of regular rivets can damage ignition system components and may allow water to enter the timing compartment.

9. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this Section.

IGNITION MODULE - All except 1200S

GENERAL (Figure 7-8)

The cam position sensor (7) and rotor (9) are located in the gearcase cover (15) on the right side of the vehicle. The rotor is mounted on the camshaft and operates at one-half crankshaft speed. The cam position sensor wiring is connected to the ignition module (12) wiring harness. Refer to IGNITION TIMING in this Section for information on the function, testing and adjustment of the cam position sensor and rotor assembly.

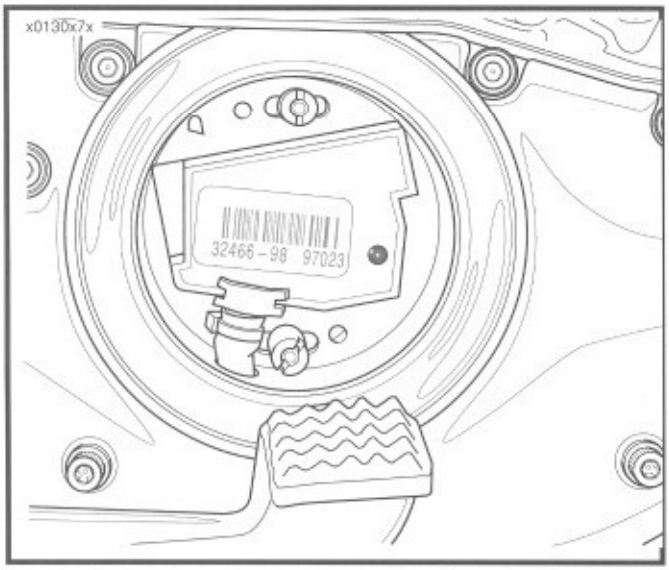


Figure 7-34. Ignition Module

REMOVAL (Figure 7-8)

⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before attempting any service procedure.

1. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL.
2. Drill off heads of outer timer cover rivets (1) using a 3/8-inch (9.525 mm) drill bit. Tap remaining rivet shafts inboard through holes in outer timer cover (2) and inner timer cover (4). Remove outer cover.
3. Remove inner cover screws (3) and inner cover (4). Carefully remove any remaining pieces of rivets from gearcase cover timer bore.
4. To obtain approximate ignition timing during installation, mark position of cam position sensor screws (5) on cam position sensor (7).
5. Remove cam position sensor screws. Carefully remove cam position sensor. If oil leak is present inside timer cover, remove rotor bolt (8) and rotor (9).
6. Carefully remove camshaft oil seal (10) if damaged or if there is any evidence of oil leakage past the seal.

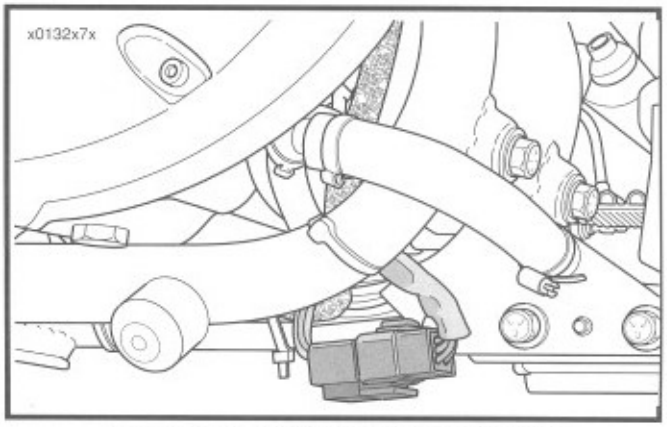


Figure 7-35. Ignition Module Connector

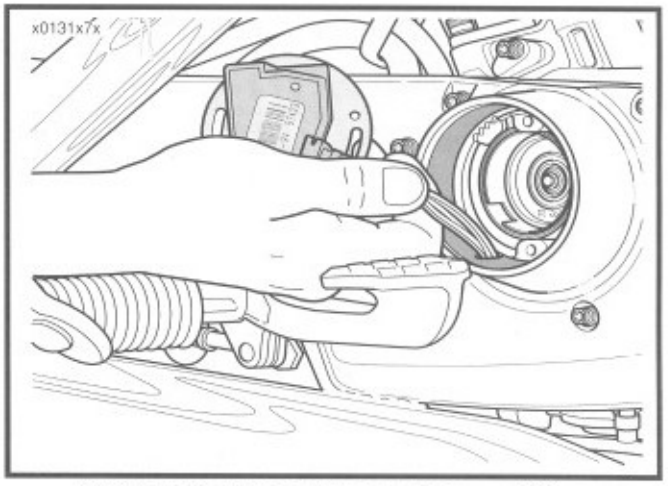


Figure 7-36. Remove Module Plate and Wires

INSTALLATION (Figure 7-8)

1. If the camshaft oil seal was removed, install as follows: With the lipped side facing inboard, install **new** camshaft oil seal (10) into gearcase cover (15), if removed. Press seal into position until flush with surface of timer bore.
2. Position rotor (9) onto end of camshaft aligning notch with camshaft slot. Apply LOCTITE THREADLOCKER 242 (blue) to rotor bolt (8). Install bolt to secure rotor. Tighten bolt to 43-53 **in-lbs** (4.9-6 Nm) torque.
3. Install cam position sensor (7) and cam position sensor screws (5). Rotate sensor plate to its previously marked position to obtain approximate ignition timing.
4. Route cam position sensor wiring leads downward through hole (7 o'clock position) in timer bore of gearcase cover (15). Route leads upward through bottom opening between right crankcase half and rear of gearcase cover.

⚠CAUTION

Route cam position sensor wires about 1-1/2 inches (38 mm) forward of gearcase cover rear edge. If wires are routed too far to the rear of this position, they could contact the moving secondary drive belt and/or sprocket resulting in damage to cam position sensor wiring.

5. Install cam position sensor wiring terminals into correct positions in plug end of connector (11). Red, green and black wires of plug end (from cam position sensor) must match same color wires in receptacle end of connector (from ignition module wiring harness). Install terminals following procedure outlined under DEUTSCH ELECTRICAL CONNECTORS at the end of this section.

   Connect cam position sensor (7) wiring to ignition module (12) at wiring harness connector (11).

6. Check ignition timing as described under IGNITION TIMING, Static Timing if cam position sensor has been replaced or proceed to Dynamic Timing Pages14 in this Section if algning marks on original sensor. Final tighten cam position sensor screws (5) to 12-20 **in-lbs** (1.4-2.3 Nm) torque.
7. Install inner cover (4) using screws (3). Tighten screws to 12-20 **in-lbs** (1.4-2.3 Nm) torque.
8. Secure outer cover (2) to inner cover using **new** rivets.

⚠CAUTION

Use only H-D Part No. 8699 rivets to secure outer timing cover. These rivets are specially designed so that no rivet end falls off into the timing compartment. Use of regular rivets can damage ignition system components and may allow water to enter the timing compartment.

9. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this Section.

SPARK PLUGS

GENERAL

Harley-Davidson 6R12 spark plugs have a resistor element to reduce the radio interference which originates in the motorcycle ignition system. Spark plugs should be replaced every 10,000 miles (16,000 km). Use only the resistor-type spark plugs specified.

ADJUSTMENT

Spark plug gap is 0.038-0.043 in. (0.96-1.09 mm). Use only a wire-type feeler gauge. Bend the outside electrode so a slight drag on the gauge is felt when passing it between electrodes. Never make adjustments by bending the center electrode.

CLEANING AND INSPECTION

Inspection

Examine spark plugs as soon as they have been removed. The deposits on the plug base are an indication of the plug efficiency and are a guide to the general condition of pistons, piston rings, valves, valve guides, valve seals, carburetor and ignition system.

Spark Plug Condition

Compare your observations of the plug deposits with the descriptions provided below.

A. A wet, black and shiny deposit on plug base, electrodes and ceramic insulator tip indicates an oil fouled plug. The condition may be caused by one or more of the following: worn pistons, worn piston rings, worn valves, worn valve guides, worn valve seals, a weak battery or a faulty ignition system.

B. A dry, fluffy or sooty black deposit indicates a carburetor air-fuel mixture that is too rich, engine idling for excessive periods of time and/or enrichener usage for excessive periods of time.

C. A light brown, glassy deposit indicates an overheated plug. This condition may be accompanied by cracks in the insulator or by erosion of the electrodes and is caused by an air-fuel mixture that is too lean, a hot-running engine, valves not seating or improper ignition timing. The glassy deposit on the spark plug is a conductor when hot and may cause high-speed misfiring. A plug with eroded electrodes, heavy deposits or a cracked insulator must be replaced.

D. A plug with a white, yellow, tan or rusty brown powdery deposit indicates balanced combustion. Clean off spark plug deposits at regular intervals. See CLEANING.

Cleaning

Inspect spark plugs every 5,000 miles (8047 km). Replace spark plugs every 10,000 miles (16,093 km). If the plugs require cleaning between tune-ups, proceed as follows:

1. Degrease firing end of spark plug using ELECTRICAL CONTACT CLEANER. Dry spark plug with compressed air.
2. Use a thin file to flatten spark plug electrodes. A spark plug with sharp edges on its electrodes requires 25%-40% less firing voltage than one with rounded edges.
3. Adjust spark plug gap. See ADJUSTMENT in this section.

INSTALLATION

1. Before installing spark plugs, check condition of threads in cylinder head and on plug. If necessary, soften deposits with penetrating oil and clean out with a thread chaser.
2. Apply a very light coating of ANTISEIZE LUBRICANT to spark plug threads. Install spark plug. Tighten spark plug to 11-18 ft-lbs (15-24 Nm) torque.

   If a torque wrench is not available, finger-tighten spark plug and then using a spark plug wrench, tighten plug an additional 1/4-turn.
3. Check engine idle speed. Adjust as necessary.

SPARK PLUG CABLES

GENERAL

Resistor-type high-tension spark plug cables have a carbon-impregnated fabric core (instead of solid wire) for radio noise suppression and improved reliability of electronic components. Use the exact replacement cable for best results.

REMOVAL

⚠WARNING

Never disconnect a spark plug cable with the engine running. If you disconnect a spark plug cable with the engine running, you may receive a potentially fatal electric shock from the ignition system.

⚠CAUTION

When disconnecting each spark plug cable from its spark plug terminal, always grasp and pull on the rubber boot at the end of the cable assembly (as close as possible to the spark plug terminal). Do not pull on the cable portion itself. Pulling on the cable will damage the cable's carbon core.

Disconnect spark plug cables from ignition coil and spark plug terminals.

INSPECTION

Check cables for cracks or loose terminals.

Check spark plug cable resistance with an ohmmeter. Resistance must be 1,625-3,796 ohms for 6-1/2-in. (165 mm) cable, and 5,000-11,680 ohms for 20-in. (508 mm) cable. For 1200S resistance values see chart on page 7-31.

Replace cables that are worn/damaged or that do not meet resistance specifications. Check cable boots/caps for cracks or tears; also check for loose fit on ignition coil and spark plugs. Replace boots/caps if you find any of the detrimental conditions mentioned above.

INSTALLATION

Connect spark plug cables to ignition coil and spark plugs. Make sure boots/caps are secured properly; this will provide the necessary moisture-proof environment for the ignition coil and spark plug terminals.

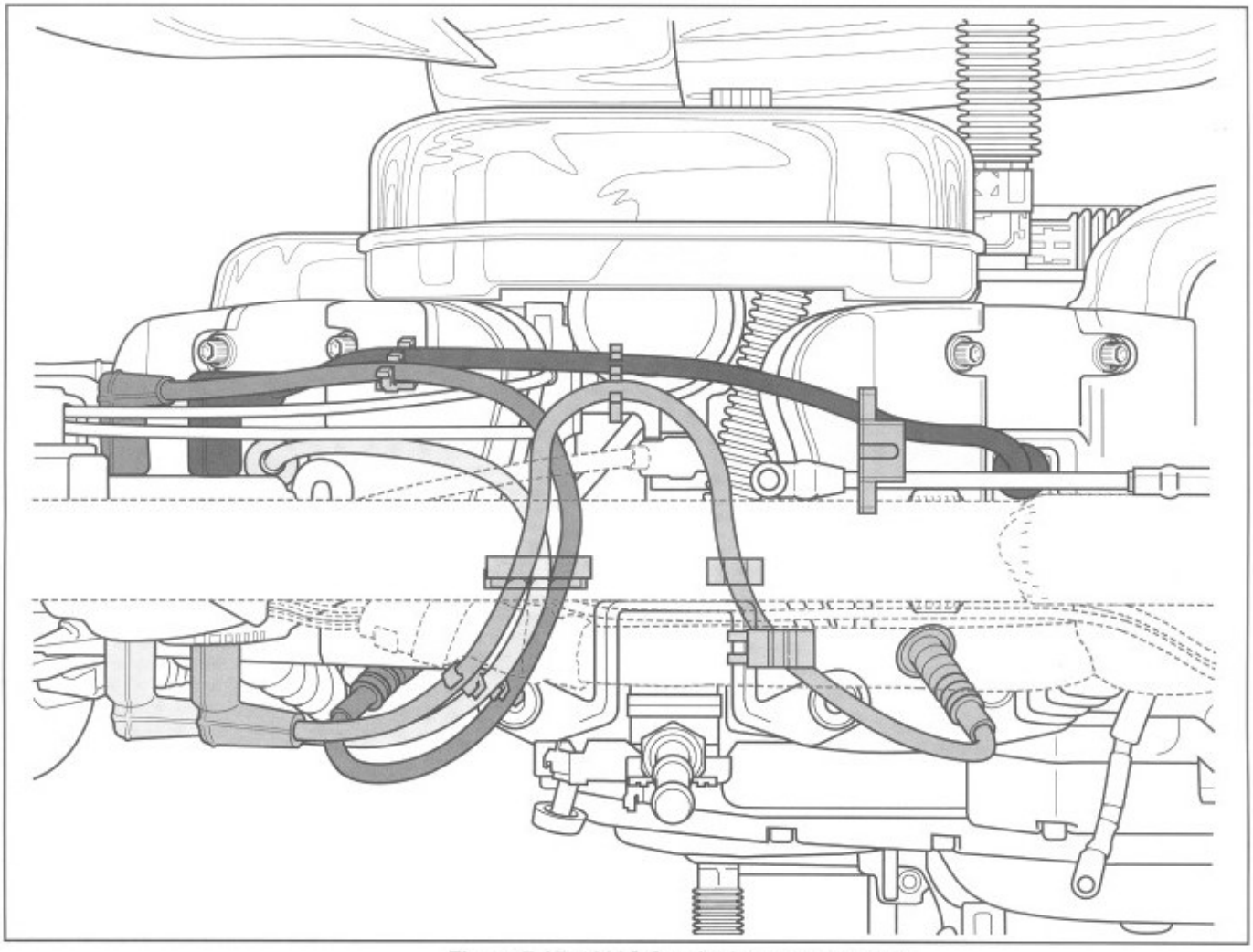


Figure 7-37. 1200S Spark plug cable routing

IGNITION COIL

GENERAL

The ignition coil is attached to a mounting bracket secured by the fuel tank front mounting bolt.

See Figure 7-5 or 7-6. The ignition coil is a pulse-type transformer. Internally, the coil consists of primary and secondary windings with a laminated iron core. The contents are sealed in a waterproof insulating compound. The ignition coil is not repairable. Replace the ignition coil if it is not functioning properly.

The low-voltage ignition primary circuit consists of the coil primary winding, ignition module and battery. When the circuit is closed, current flows through the coil primary winding creating a strong magnetic field in the iron core of the ignition coil.

When the ignition module receives a signal from the ignition sensor plate and rotor, the ignition module interrupts (opens) the ignition primary circuit, which causes the magnetic field in the coil core to collapse suddenly.

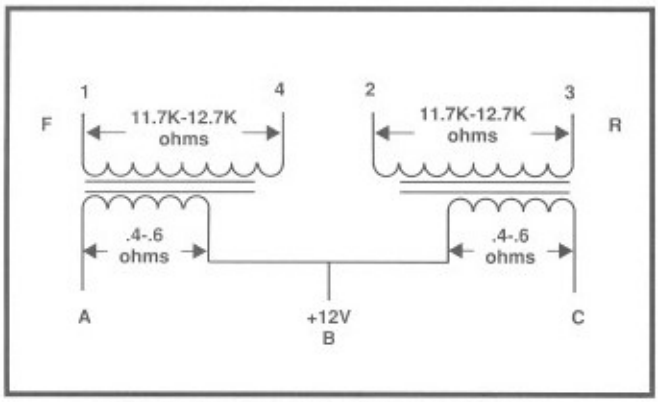
The collapsing magnetic field induces a high-voltage electrical discharge in the ignition secondary circuit, which consists of the coil secondary winding, spark plug cables and spark plugs. The high-voltage discharge produces a spark to bridge the electrode gap of each spark plug.

The ignition coil fires both spark plugs simultaneously. In one spark plug, the spark jumps from the center electrode to the outer electrode, but on the other plug, the spark jumps in the reverse direction (from the outer electrode to the center electrode).

TROUBLESHOOTING

Follow the troubleshooting procedures listed under IGNITION SYSTEM if the engine will not start, is difficult to start or runs roughly. Also check condition of spark plug cables. Insulation on cables may be cracked or damaged allowing high tension current to short to metal parts. This problem is most noticeable when cables are wet.

If poor starting/running condition persists, check resistance of ignition coil primary and secondary windings using an ohmmeter. See Figure 7-38. Resistance values should be within the limits shown in the following table:



1200S Ignition Coil Winding Resistance

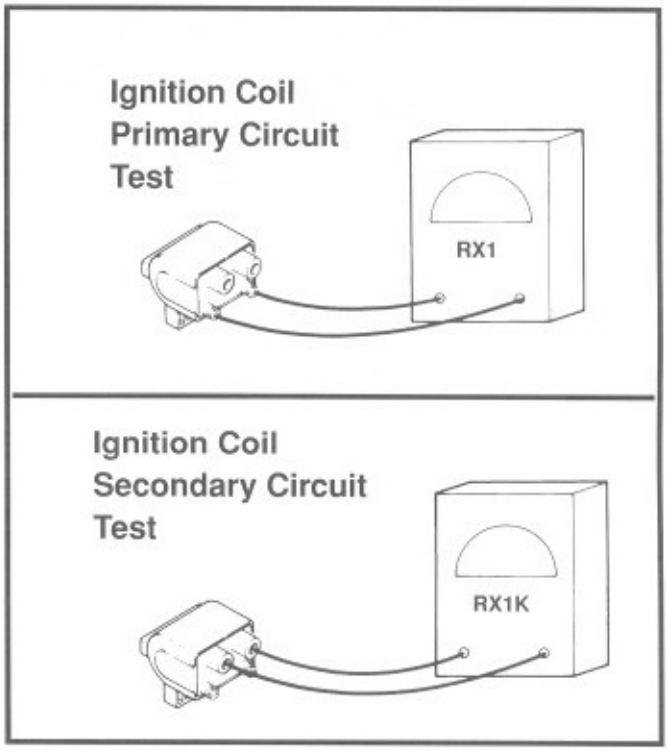


Figure 7-38. Test Ignition Coil Resistance Tests

Ignition Coil Winding Resistance - All except 1200S

Ignition Coil Winding	Ohmmeter Scale	Normal Resistance Range (in Ohms)
Primary	R x 1	2.5-3.1
Secondary	R x 1K	10,000-12,500

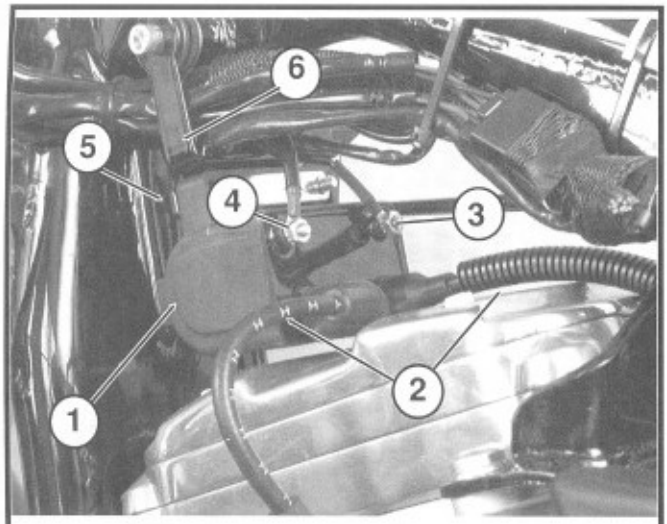
- A low resistance value indicates a short in the coil winding; replace coil.
- A high resistance value might indicate that there is some corrosion/oxidation of the coil terminals; clean terminals, and repeat resistance test. If resistance is still high after cleaning terminals, replace coil.
- An infinite ohms (no continuity) resistance value indicates an open circuit – a break in the coil winding – replace coil.

REMOVAL - ALL EXCEPT 1200S (Figure 7-39)

⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before proceeding. Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

1. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL in this section.



1. Ignition coil
2. Spark plug cables
3. Positive terminal (white with black tracer)
4. Negative terminal (pink)
5. Bolt and lockwasher (2)
6. Ignition coil mounting bracket

Figure 7-39. Coil Mounting- All except 1200S

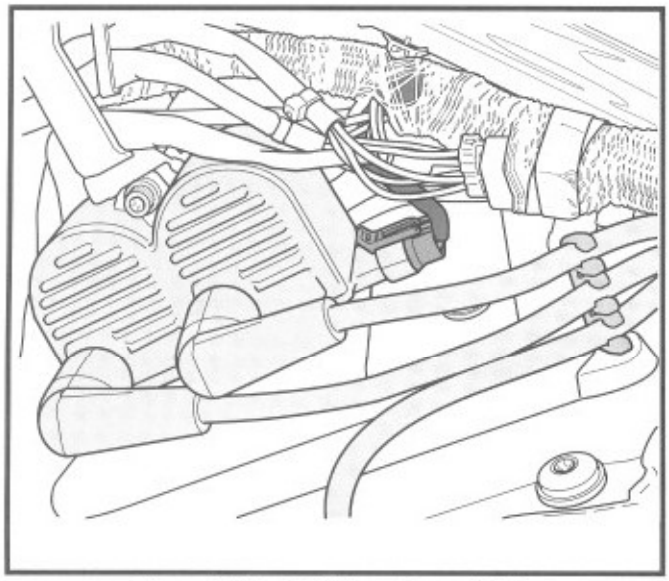


Figure 7-40. Coil Mounting - 1200S

2. Disconnect spark plug cables (2) from ignition coil (1).

3. Disconnect ring terminals of white with black tracer from coil positive terminal (3). Disconnect ring terminal of pink wires from coil negative terminal (4).

4. Remove two bolts and lockwashers (5). Remove nut plate (6) and ignition coil.

INSTALLATION - ALL EXCEPT 1200S (Figure 7-39)

1. Position ignition coil (1) onto ignition coil mounting bracket (6).

2. Secure ignition coil using nut plate and two bolts and lockwashers (5). Tighten bolts to 2-6 ft-lbs (3-8 Nm) torque.

3. Connect ring terminal of pink wires to coil negative terminal (4). Connect ring terminals of white with black tracer wires to coil positive terminal (3).

4. Connect spark plug cables (2) to ignition coil (1).

⚠WARNING

Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

5. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this Section.

REMOVAL - 1200S (Figure 40)

1. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL in this section.

2. Remove fuel tank front mounting bolt and raise tank.

3. Remove plug wires from coil towers (note location,see Figure 7-37).

4. Disconnect primary wires connector [83B].

5. Remove mounting bolt to free coil.

INSTALLATION - 1200S (Figure 40)

1. Position coil under mounting bracket and install bolt.

2. Torque coil mounting bolt to 2-6 ft-lbs (2.7-8.1 Nm).

3. Connect primary wire connector [83B].

4. Attach plug wires to coil towers (see Figure 7-37).

5. Lower fuel tank into position and install bolt.

CHARGING SYSTEM

GENERAL

The charging system consists of the alternator and regulator. See pages 7-62 for charging system circuits.

Alternator

The alternator consists of two main components: the rotor which is mounted on the engine sprocket shaft, and the stator, which is bolted to the engine crankcase.

Regulator

The regulator is a series regulator with shunt control. The circuit combines the functions of rectifying and regulating.

TROUBLESHOOTING

Special Tools	Torque Values
Ammeter Load tester Ohmmeter AC voltmeter	None

Preliminary Checks

When the charging system fails or does not charge at a satisfactory rate, it is recommended that the following checks be made:

Battery

Check for a weak or dead battery. See the BATTERY section. Battery must be fully charged in order to perform any electrical tests.

Wiring

Check for corroded or loose connections in the charging circuit.

Regulator Inspection

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

The stator connector plug located on the right front downtube must be clean and tight.

Regulator Bleed Test

Be sure regulator is connected to battery. See Figure 7-28. Unplug two-pin stator connector. Use a trouble light and touch one probe to a known good ground and the other to the regulator pins, one at a time. If light glows, replace regulator.

MILLIAMP DRAW TEST

NOTE

Be sure accessories are not wired so they stay on at all times. Check for this by connecting ammeter between negative battery terminal and battery.

See Figure 7-18. Connect ammeter between negative battery terminal and battery. With this arrangement, you will also pick up any regulator drain. With ignition switch and all lights and accessories turned to OFF, amperage reading should be 3 milliamperes maximum. A higher reading indicates excessive current draw.

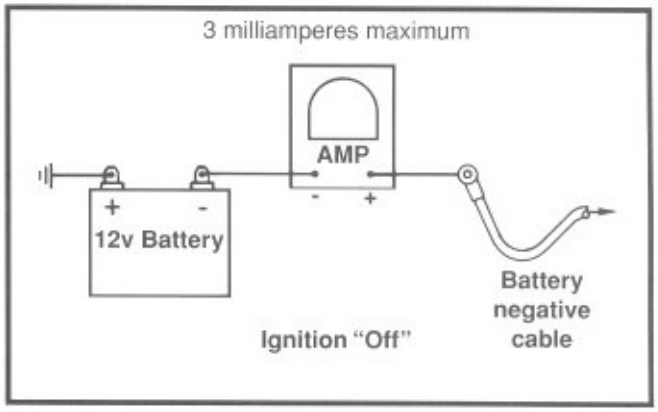


Figure 7-41. Milliampere Draw Test

Any accessories must be considered and checked for excessive drain. Isolate the source of the excessive current draw by disconnecting regulator or accessories until current draw is reduced.

This condition could drain battery completely if vehicle is parked for a long time.

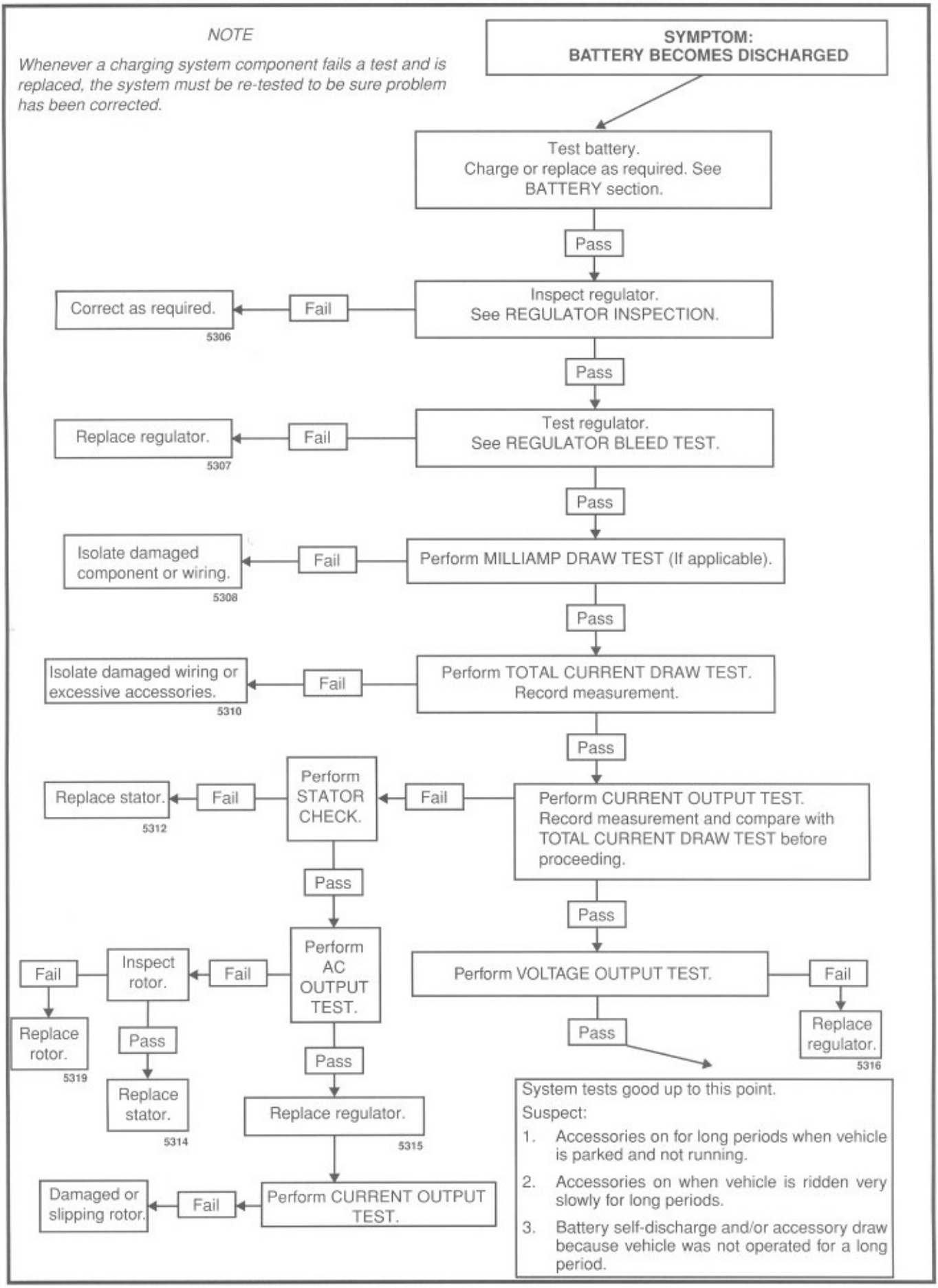
NOTE

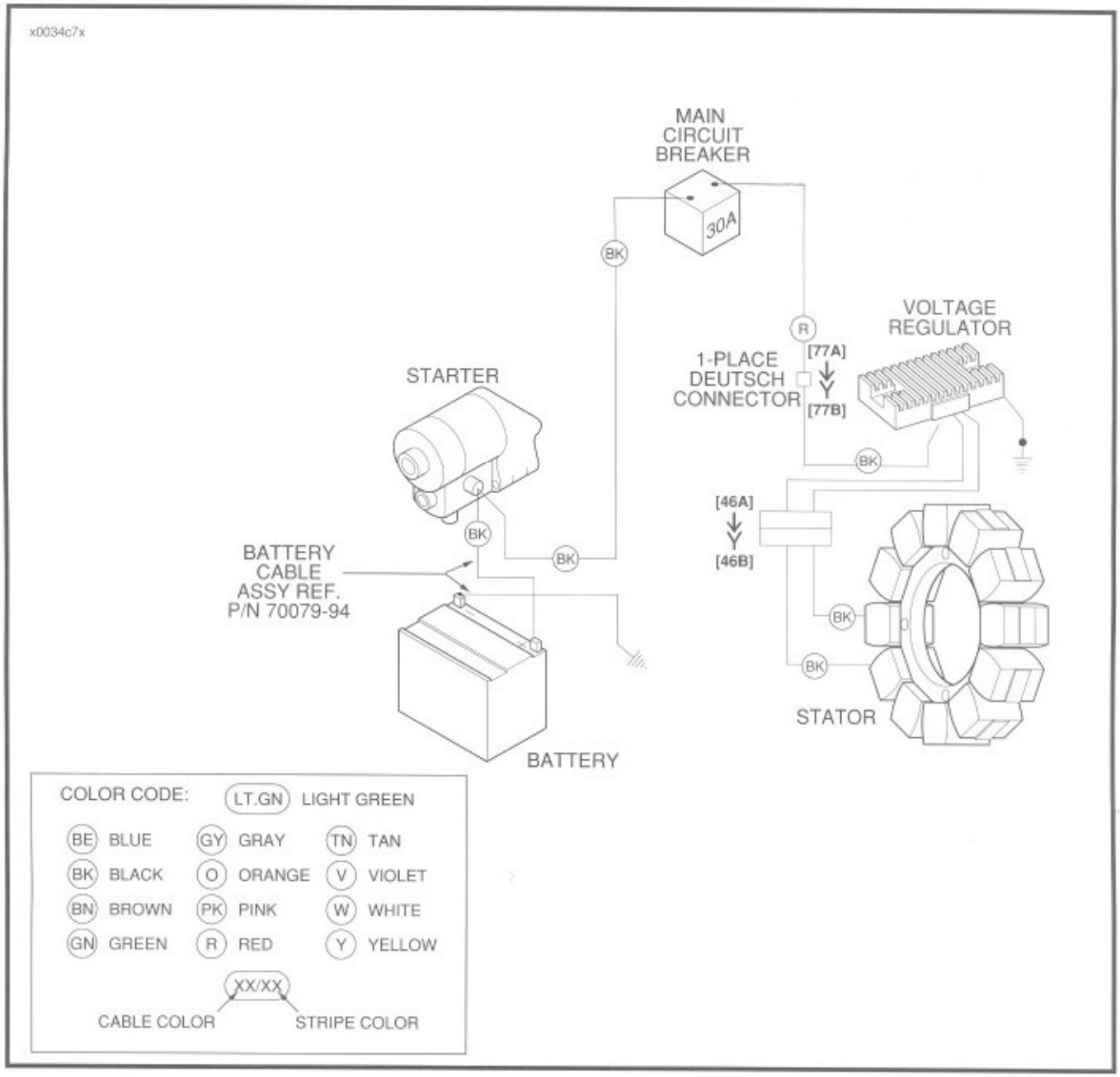
A battery with surface discharge condition could cause a static drain. Correct by cleaning battery case.

CHARGING SYSTEM TROUBLESHOOTING

NOTE

Whenever a charging system component fails a test and is replaced, the system must be re-tested to be sure problem has been corrected.





XLH Models Charging System Circuit

Total Current Draw Test

See Figure 7-42. If battery runs down during use, the current draw of the motorcycle components and accessories may exceed output of the charging system. To check for this condition, place load tester induction pickup or current probe pickup, over battery negative cable as shown below.

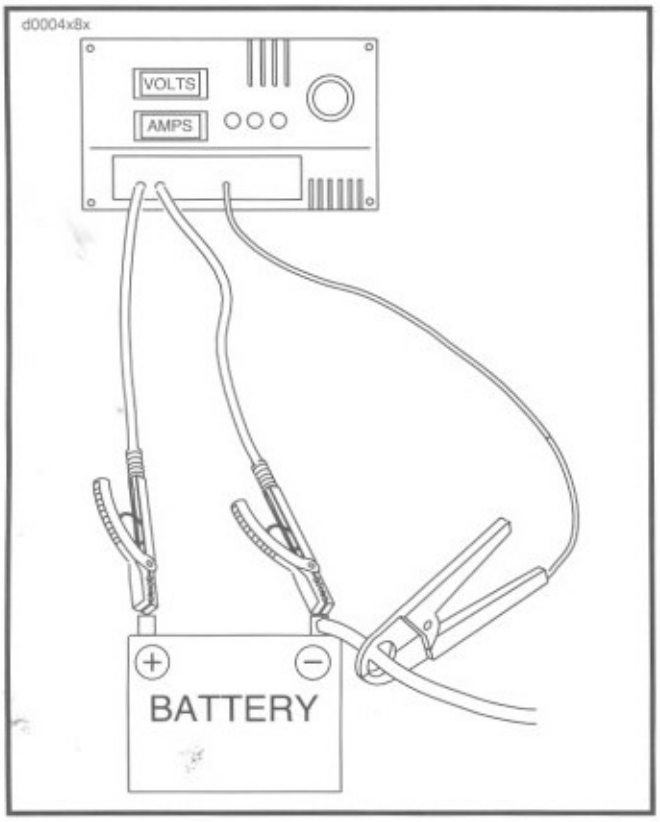


Figure 7-42. Check Current Draw (Ignition Switch On)

Disconnect the regulator from the stator at the connector on the right front downtube (see Figure 7-28) and start the motorcycle. Start engine and run at 2000 rpm.

With ignition and all continuously running lights and accessories turned on (headlamp on high beam) read the total current draw. Compare this reading to the reading obtained in CURRENT AND VOLTAGE OUTPUT TEST. The current output should exceed current draw by 3.5 amps, minimum. If not, there may be too many accessories for the charging system to handle.

Reconnect the regulator after the test.

NOTE

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

Current and Voltage Output Test

1. Connect load tester negative and positive leads to battery terminals and place load tester induction pickup over positive regulator cable as shown in Figure 7-21.

2. Run the engine at 2,000 R.P.M. Increase the load as required to obtain a constant 13.0 volts.

3. The current output should be 19-23 amps. Make note of measurement.

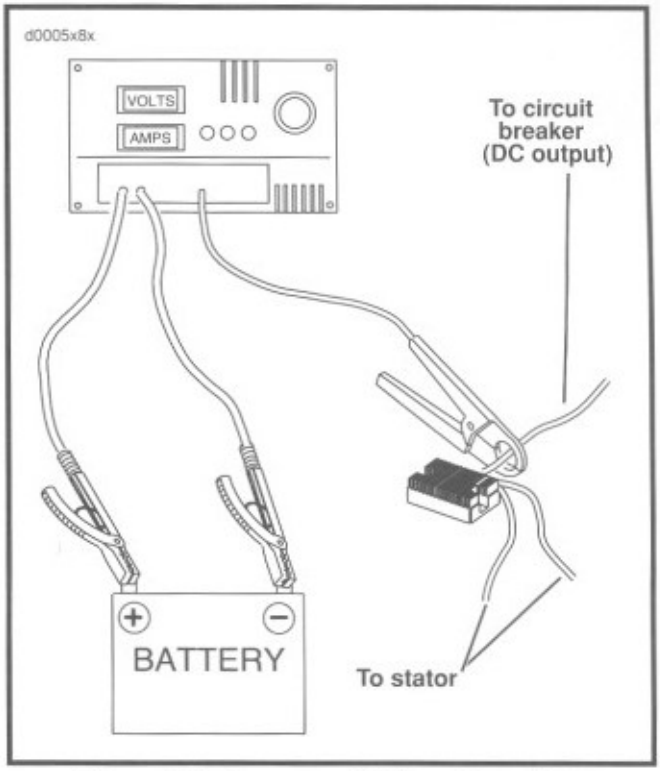


Figure 7-43. Current and Voltage Output Test

Voltage Output Test

See Figure 7-43. After removing the load, read the load tester voltage meter. Voltage to the battery must not be more than 15 volts. If voltage is higher, regulator is not functioning properly or connections are loose or dirty.

⚠CAUTION

Do not leave any load switch turned on for more than 20 seconds or overheating and tester damage are possible.

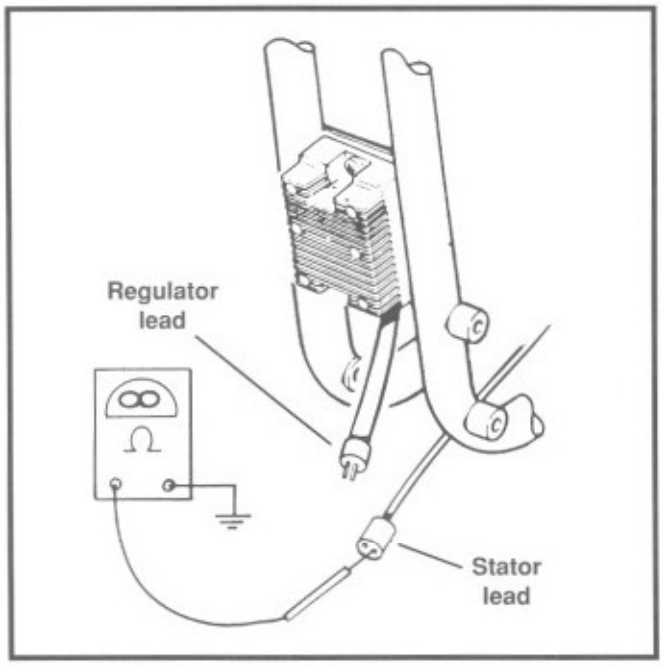


Figure 7-44. Test for Grounded Stator

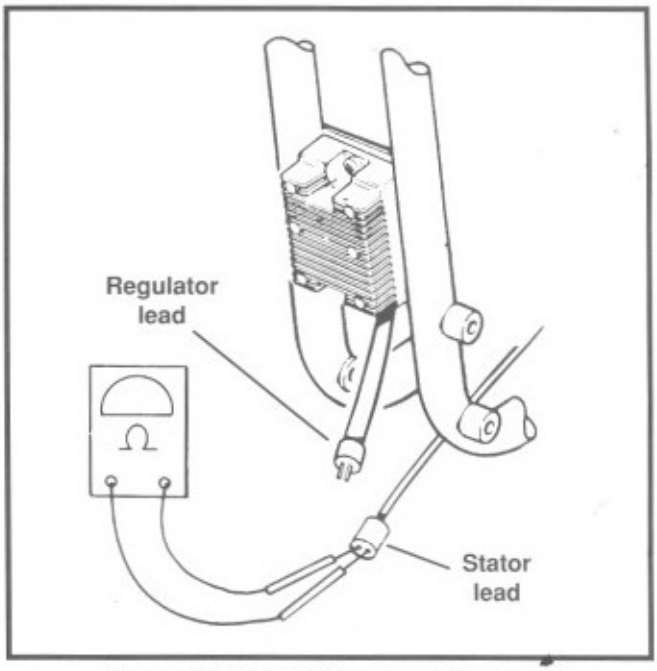


Figure 7-45. Check for Stator Resistance

Stator Check

1. To check for a grounded stator, turn off ignition and disconnect the regulator from the stator at the connector on the right front frame downtube (see Figure 7-28).

2. See Figure 7-44. Connect an ohmmeter on the RX1 scale between crankcase and either stator socket. There should be no continuity (∞ ohms) across either test point. Any other reading indicates a grounded stator which must be replaced.

3. See Figure 7-45. Check the resistance using an ohmmeter set on the RX1 scale. Resistance across the stator sockets or pins should be 0.2-0.4 ohms. If the resistance is lower, the stator is damaged and must be replaced.

AC Output Check

1. See Figure 7-46. To test AC output, disconnect the regulator and connect an AC voltmeter across both stator sockets. Run the engine at 2000 R.P.M. The AC output should be 38-52 volts AC.

2. If the output is below specifications, charging problem could be a faulty rotor or stator. If output is good, charging problem might be faulty regulator/rectifier. Replace as required.

3. Check the output again as described under CURRENT AND VOLTAGE OUTPUT TEST.

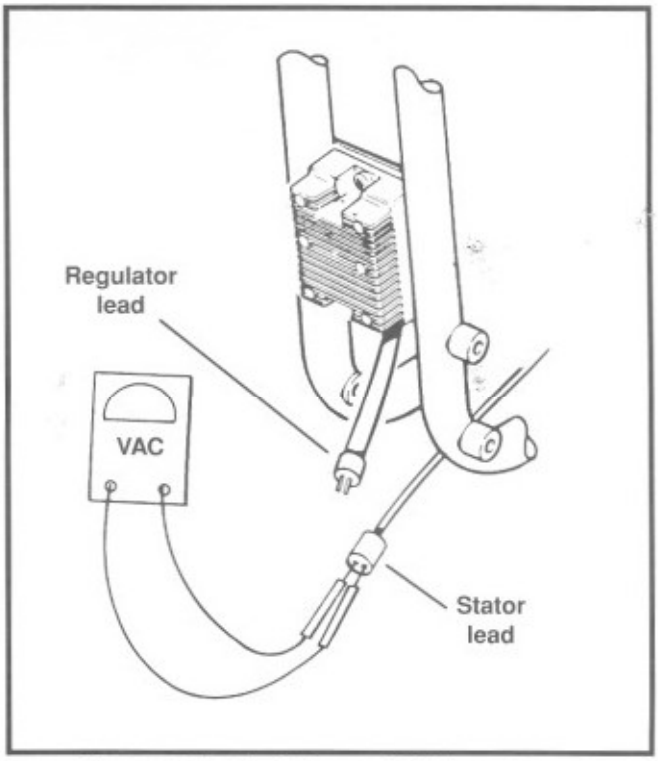


Figure 7-46. Check Stator AC Voltage Output

REMOVAL AND DISASSEMBLY

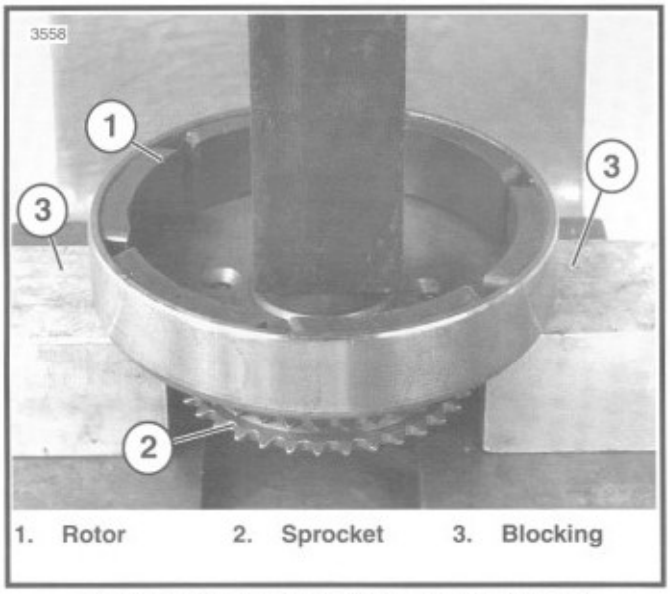
⚠WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables (negative cable first) before performing any of the following procedures.

1. Remove primary cover. See PRIMARY CHAIN, REMOVAL, PRIMARY COVER in Section 6.
2. Remove clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. Refer to PRIMARY DRIVE/CLUTCH, REMOVAL in Section 6. Remove/disassemble rotor and/or stator, as required. Refer to the following procedures.

Rotor (Figure 7-47)

1. Remove bolts which secure alternator rotor (1) to engine sprocket (2).



1. Rotor 2. Sprocket 3. Blocking

Figure 7-47. Removing Rotor From Sprocket

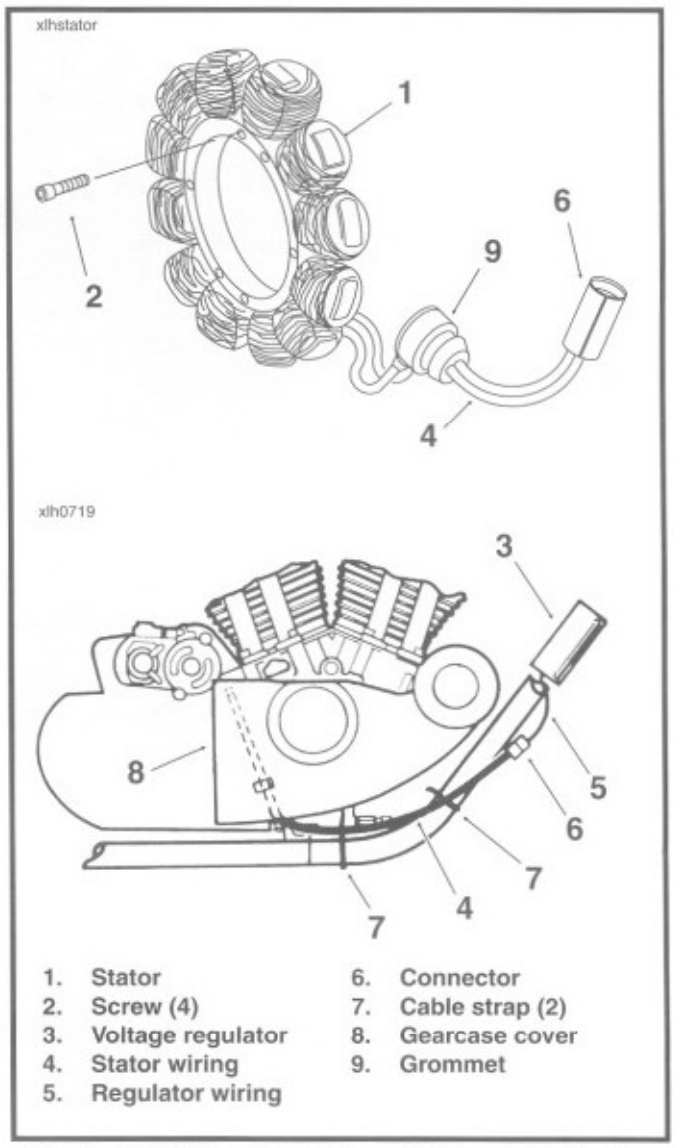
2. Position blocking (3) under rotor (1). Press sprocket (2) free of rotor.

NOTE

Resistance to sprocket/rotor disassembly is due in part to the magnetic force of the permanent rotor magnets.

Stator (Figure 7-48)

1. Disconnect stator wiring (4) from voltage regulator wiring (5) at connector (6).
2. Remove cable straps (7).
3. Withdraw stator wiring (4) from opening between right crankcase half and gearcase cover (8).
4. Using a T-27 TORX driver, remove and discard screws (2) which secure stator (1) to left crankcase half.



1. Stator
2. Screw (4)
3. Voltage regulator
4. Stator wiring
5. Regulator wiring
6. Connector
7. Cable strap (2)
8. Gearcase cover
9. Grommet

Figure 7-48. Stator Assembly and Stator Cable Routing

⚠CAUTION

Stator TORX screws contain a thread locking compound. Do not reuse existing screws. Always use new screws with the proper thread locking compound. Loss of torque on TORX fasteners could result in alternator damage.

5. Remove stator wiring grommet (9) from left crankcase half.
6. Withdraw stator wiring (4) from grommet hole in left crankcase half. Remove stator (1).

CLEANING, INSPECTION AND REPAIR

⚠CAUTION

Do not strike or drop alternator rotor or damage to magnet adhesive may occur. Magnet adhesive damage can result in rotor failure.

1. Clean rotor with a petroleum-base solvent. Remove all foreign material from rotor magnets. Replace rotor if rotor magnets are cracked or loose.
2. Clean stator by wiping with a clean cloth.
3. Examine stator leads for cracked or damaged insulation.

NOTE

The rotor and stator can be replaced individually if either is damaged.

ASSEMBLY AND INSTALLATION

Depending on whether the rotor, the stator, or both the rotor and stator were removed/disassembled, perform the applicable procedures which follow:

1. See Figure 7-48. Feed stator wiring (4) with attached grommet (9) into open grommet hole in left crankcase half.
2. Apply a light coating of clean engine oil or chaincase lubricant to grommet (9). Install grommet into hole in left crankcase half.

⚠CAUTION

Stator TORX screws contain a thread locking compound. Do not reuse existing screws. Always use new screws with the proper thread locking compound. Loss of torque on TORX fasteners can result in alternator damage.

3. Position stator (1) on left crankcase half. Secure stator using **new** Torx screws (2). Use a T-27 TORX driver to tighten screws to 30-40 **in-lbs** (3.4-3.5 Nm) torque.

⚠CAUTION

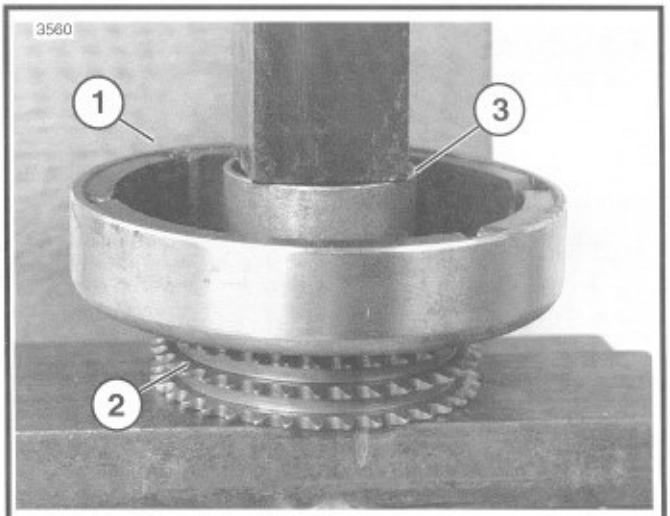
Make sure stator wiring is routed about 1-1/2 in. (38 mm) forward of gearcase cover rear edge. If routed too far to the rear of this position, wiring could contact the moving secondary drive belt and/or sprocket, resulting in damage to stator wiring and charging system.

4. Route stator wiring (4) across top of crankcase halves to right side of engine. Route stator wiring downward through opening between right crankcase half and gearcase cover (8).

NOTE

Temporarily attach a thin flexible "feed" or mechanic's wire to the connector end of the stator wiring to assist in the routing of the wiring.

5. Route stator wiring (4) forward and then upward along inboard side of right frame downtube. Connect stator wiring (4) to voltage regulator wiring (5) at connector (6).
6. Secure stator wiring (4), along with any other wires and hoses routed in the same location, to right frame downtube using cable straps (7).
7. See Figure 7-49. Position rotor (1) on sprocket (2). Align holes in sprocket with holes in rotor. Apply a drop of LOCTITE THREADLOCKER 242 (blue) to threads of each mounting bolt. Insert mounting bolts through rotor and start bolts into tapped holes in sprocket. Position a section of pipe (3) with an inside diameter larger than the sprocket mounting hub over center of rotor. Press rotor onto sprocket. Tighten bolts to 90-110 **in-lbs** (10.2-12.4 Nm) torque.



1. Rotor 2. Sprocket 3. Pipe section

Figure 7-49. Pressing Rotor onto Sprocket

8. Install clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See PRIMARY DRIVE/CLUTCH, INSTALLATION in Section 6.
9. Install primary cover, left footrest assembly and gear shift lever. See PRIMARY CHAIN, INSTALLATION, PRIMARY COVER in Section 6.
10. Connect battery cables to battery (positive cable first).
11. Test charging system. See CHARGING SYSTEM, ADJUSTMENT/TESTING in this section.

VOLTAGE REGULATOR

GENERAL

The voltage regulator is not repairable. The unit must be replaced if it fails.

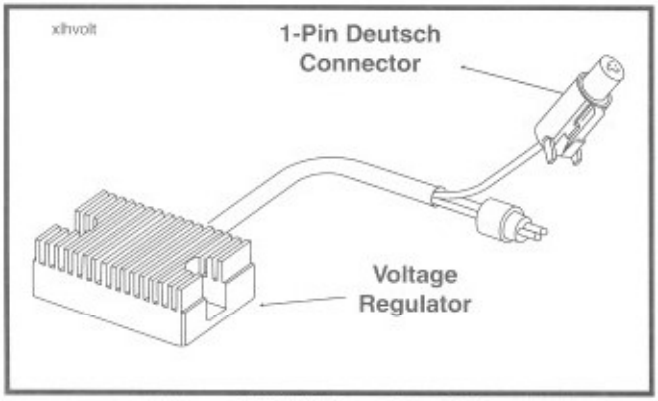


Figure 7-50. Voltage Regulator

REMOVAL (Figure 7-51)

⚠WARNING

To avoid accidental vehicle start-up and possible personal injury, disconnect the battery cables (negative cable first) before proceeding.

⚠CAUTION

When disconnecting the alternator stator wiring, pull apart the connector by firmly grasping both connector halves. Do not pull on leads or damage to the wires and/or terminals may result.

1. Locate the voltage regulator (2) between the right and left frame downtubes at the front of the vehicle.
2. Disconnect voltage regulator wiring to alternator stator wiring at 2-pin connector (7).
3. Disconnect voltage regulator charging wire to 50 amp main circuit breaker at 1-pin Deutsch connector (6). Depress the external latch on the socket housing side and use a rocking motion to separate the pin and socket halves.
4. Cut upper cable strap (5) which secures voltage regulator wiring to right side motorcycle frame downtube.
5. Remove bolts (3) and lockwashers (4) to free voltage regulator from frame downtubes.
6. Discard voltage regulator.

INSTALLATION (Figure 7-51)

1. Install **new** voltage regulator (2) between frame downtubes using mounting bolts (3) and lockwashers (4). Tighten locknuts or bolts to 36-60 **in-lbs** (4.1-6.8 Nm) torque.
2. Connect voltage regulator charging wire to 50 amp main circuit breaker at 1-pin Deutsch connector (6). Insert socket housing into pin housing until it snaps in place.
3. Connect voltage regulator wiring to alternator stator wiring at 2-pin connector (7).
4. Secure voltage regulator wiring to right side motorcycle frame downtube using **new** cable strap (5).
5. Connect battery cables to battery (positive cable first). Test charging system. See CHARGING SYSTEM, ADJUSTMENT/TESTING.

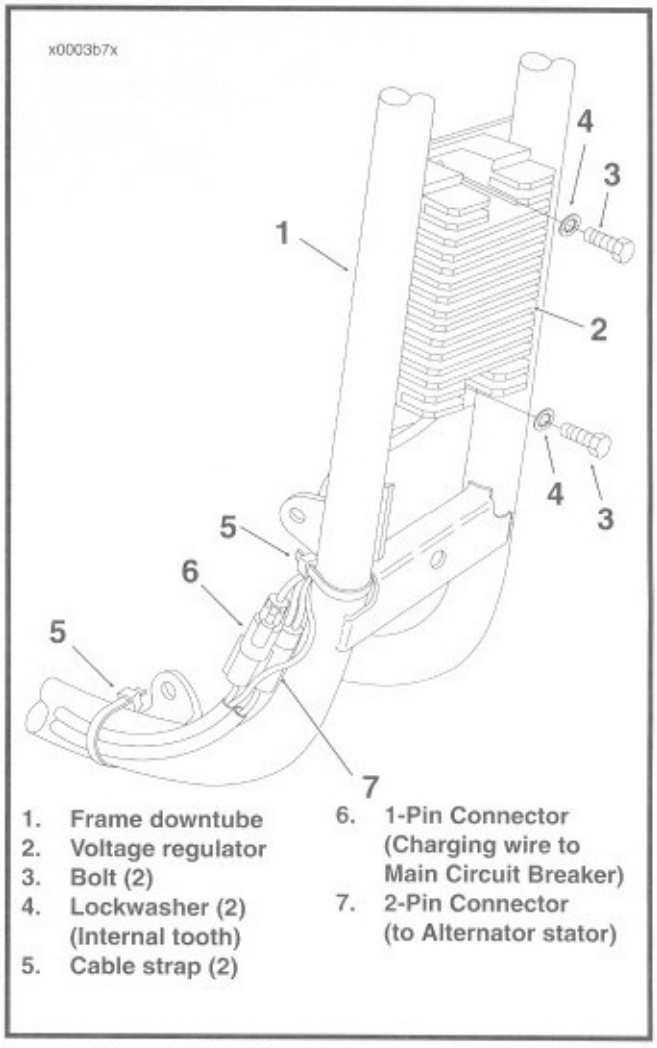


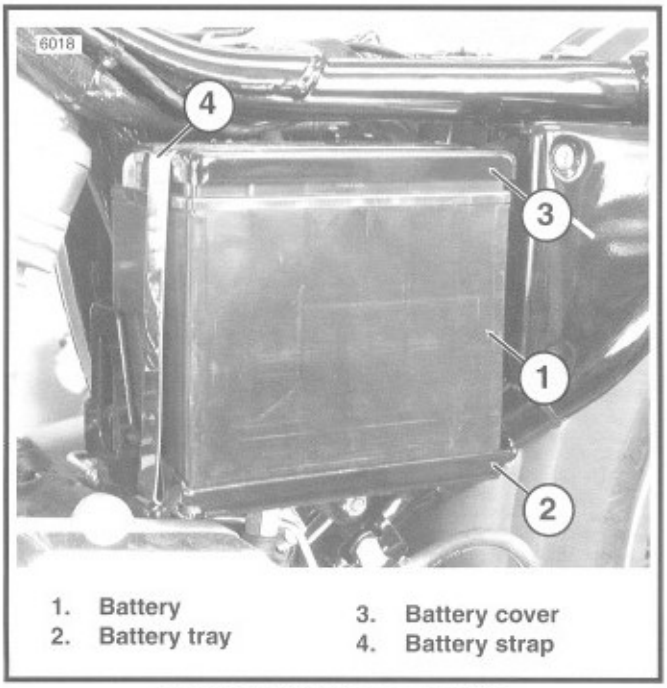
Figure 7-51. Voltage Regulator Mounting

BATTERY

GENERAL (Figure 7-52)

The battery (1) is located below the seat on the left side of the vehicle. The battery stores electrical energy for the purposes of starting the motorcycle, operating accessories when the engine is not running and providing additional current (above that generated by the alternator) when required. The battery will remain in good condition if the current draw is balanced by the current input.

The YTX20L-BS battery installed in 1998 XLH Sportster motorcycles is a permanently sealed, maintenance-free, lead/calcium and sulfuric acid battery. Do not remove the cap strip to add water, or when charging the battery.



1. Battery
2. Battery tray
3. Battery cover
4. Battery strap

Figure 7-52. Battery assembly

⚠DANGER – EXPLOSIVE GASES

Cigarettes, flames, or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge without proper instruction and training. Securely connect cables to the proper terminals.

POISON – CAUSES SEVERE BURNS

Contains sulfuric acid. Avoid contact with skin, eyes, and clothing. In event of accident, flush with water and call a physician immediately.

KEEP OUT OF REACH OF CHILDREN

⚠WARNING

Batteries contain sulfuric acid which is highly corrosive and can cause chemical burns. Avoid contact with skin, eyes or clothing. Always wear approved eye protection when working around batteries. Battery electrolyte is poisonous. Keep children away from battery.

ANTIDOTE

External – Flush with water.

Internal – Drink large quantities of milk or water, followed by Milk of Magnesia, vegetable oil or beaten eggs. Call doctor immediately.

Eyes – Flush with water, get immediate medical attention.

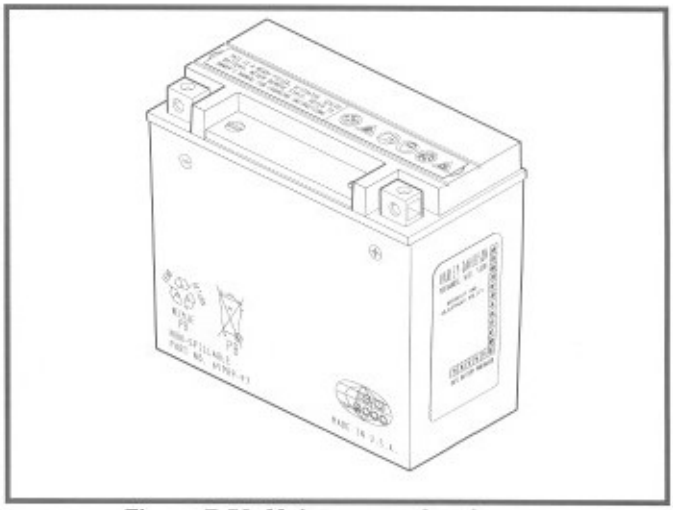


Figure 7-53. Maintenance-free battery

ACTIVATION/TESTING

Maintenance-free batteries are shipped pre-charged; however a voltage check should be performed before putting the battery into service.

Voltmeter Test

The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to make sure it is in a 100% charged condition. If the open circuit voltage (no loads applied) reading is below 12.8 V, charge battery and recheck voltage after battery has sat 1-2 hours. If battery reads below 12.8 Volts, after 10 hours of charging using a constant current charger (set at 1.8 amps), replace the battery. Tapered-rate chargers or trickle chargers will require longer charge times.

State of Charge	Voltage
100%	13.0 V
75%	12.8 V
50%	12.5 V
25%	12.2 V

Load Test

The load test measures battery performance under full current load and is the best indicator of battery condition.

⚠CAUTION

Fully charge the battery before testing. If battery is not fully charged, test readings will be incorrect.

Load battery to three times amp hour rating using the load tester. See Figure 7-54. Connect tester leads to battery posts and place induction pickup over negative (black) cable. The Harley-Davidson 18 amp-hour battery should be loaded to three times its amp-hour rating, or 54 amps for 15 seconds. Voltage reading throughout the test should be 9.6V or more at 70˚F (21˚ C).

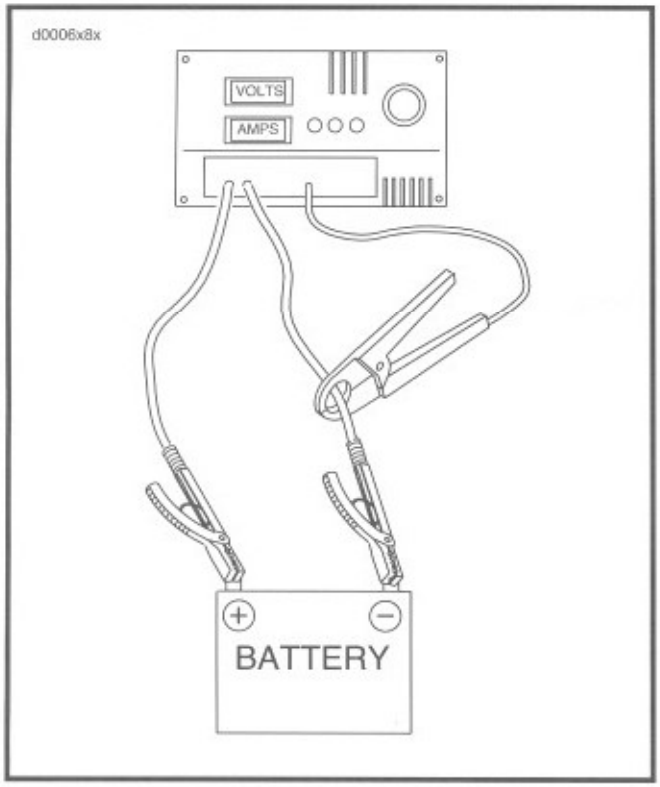


Figure 7-54. Battery Load Test

CLEANING AND INSPECTION

1. Battery top must be clean and dry. Dirt on the top of battery may cause the battery to self-discharge at a faster than normal rate.
2. Inspect battery screws and cables for breakage, loose connections and corrosion. Clean clamps. Coat terminals with grease.
3. Inspect battery for discoloration, raised top, or warped case which may indicate battery has been overheated or overcharged.
4. Inspect the battery case for cracks or leaks.

CHARGING BATTERY

⚠WARNING

Always unplug or turn battery charger OFF before connecting or disconnecting charger clamps from battery. Connecting or disconnecting clamps with charger ON could cause a spark and a possible battery explosion. A battery explosion may rupture the battery case and spray sulfuric acid resulting in personal injury.

⚠CAUTION

Never add water to the maintenance free battery, and never remove the sealed caps on top of the battery. Never allow a battery to stand in a discharged condition.

1. Remove battery from motorcycle and place battery on a level surface.

⚠CAUTION

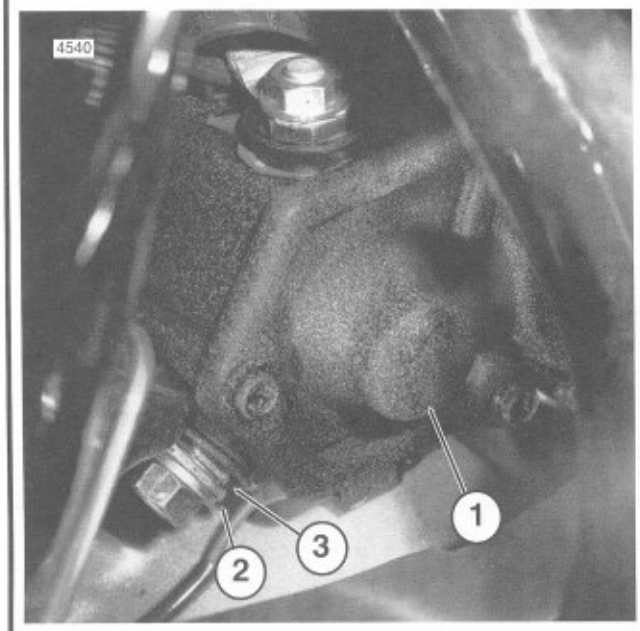
Refer to the charging instructions on the top of the battery. Do not reverse the charger connections described in the next step, or the charging system of the motorcycle could be damaged.

2. Connect the red battery charger lead to the positive terminal of the battery and the black charger lead to the negative terminal. With a constant current charge, charge for the recommended times shown below. Tapered-rate chargers or trickle chargers will require longer charge times.

State of Charge	Voltage	Charge Period (using a constant current charger @ 1.8 amps)
100%	13.0 V	NONE
75%	12.8 V	3-5 hours
50%	12.5 V	4-7 hours
25%	12.2 V	10 hours

3. If battery gets hot, over 110˚F (44˚C) (warm to the touch), discontinue charging and let battery cool down.

3. Tighten starter post nut (positive battery cable) to 60-85 **in-lbs** (7-10 Nm) torque. Bias negative battery cable toward center of vehicle (to compensate for opposite torque reaction) and tighten bolt on rear engine mount bolt to 25-30 ft-lbs (34-41 Nm) torque.
4. Install screws, flat washers and lockwashers to secure rear brake line clamps to left rear fork and frame down-tube. Tighten clamp screws to 15-21 **in-lbs** (1.7-2.4 Nm) torque.
5. Install battery onto battery tray. Install battery cables, positive cable first. See BATTERY, INSTALLATION AND CONNECTION in this section.
6. Install seat. See SEAT, INSTALLATION in Section 2.



1. Starter
2. Positive cable terminal
3. Positive lead (to main circuit breaker)

Figure 7-55. Positive Cable Starter Post Connection (Right Side View)

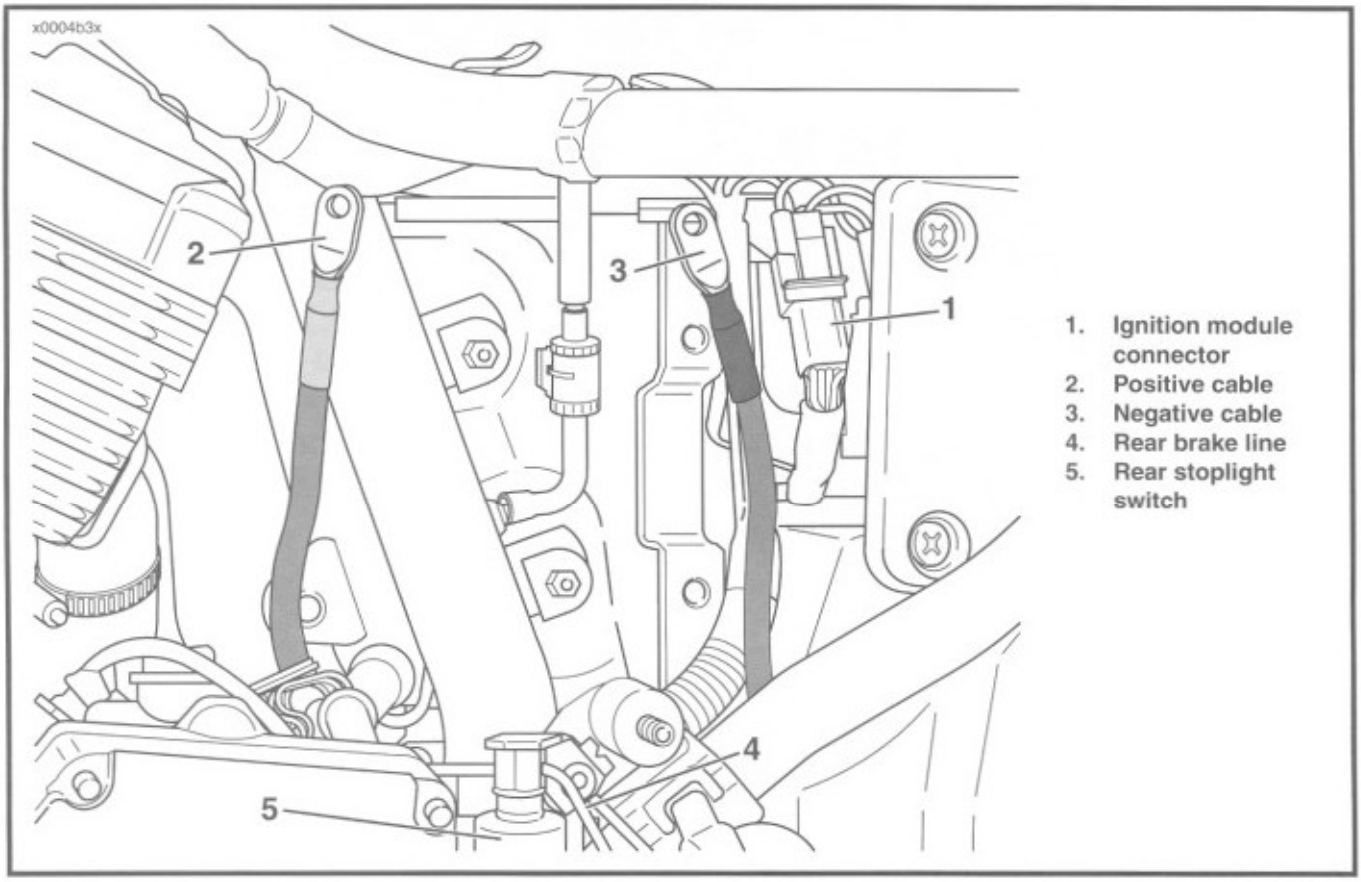


Figure 7-56. Battery cable routing (Left Side View)

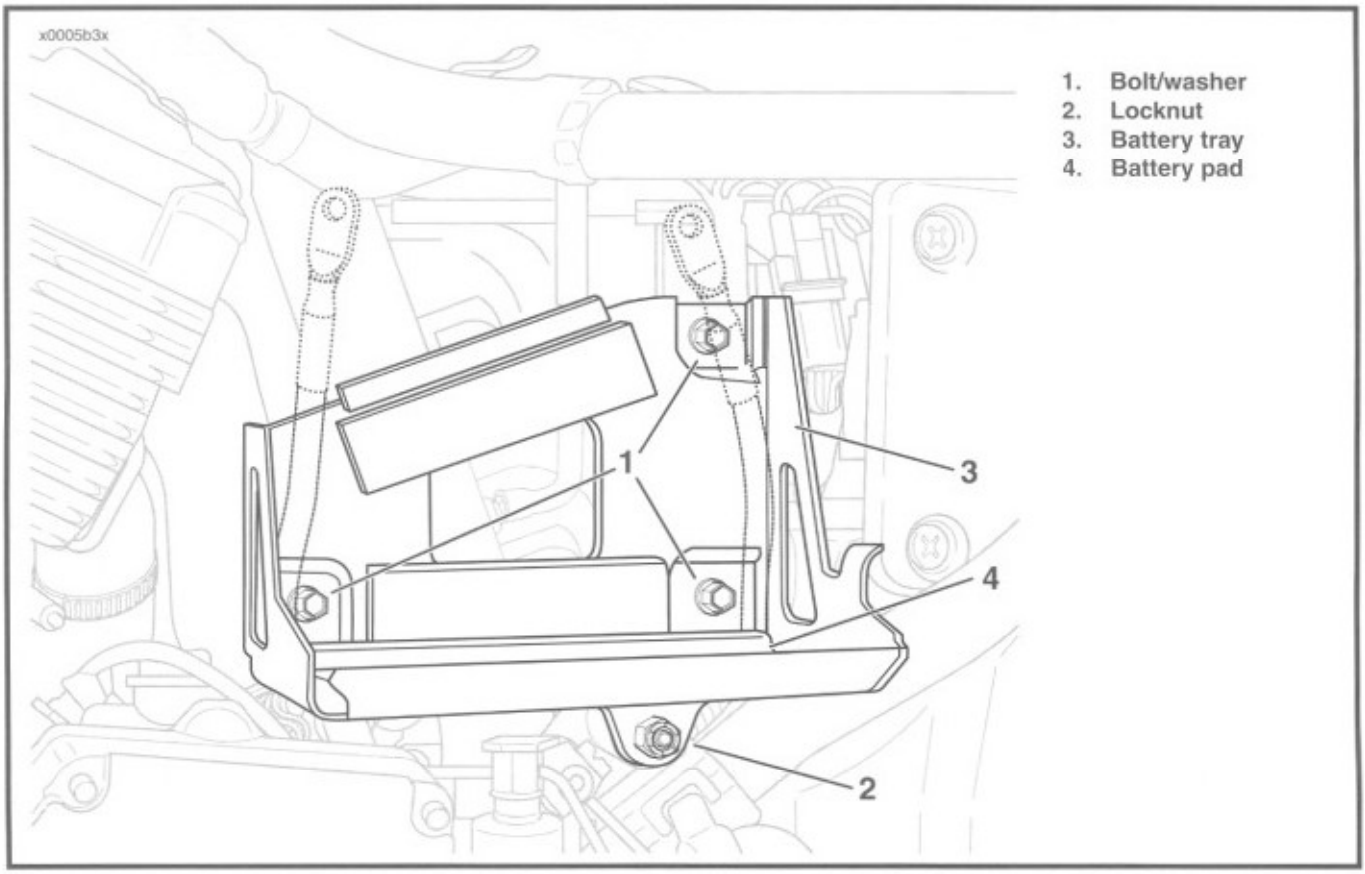


Figure 7-57 Battery tray

GENERAL

The headlamp is a replaceable bulb (element) type. When bulb replacement is required, use only the specified "H4" halogen bulb (Part No. 67697-81).

The high beam, oil pressure, neutral, and turn signal indicator lamps do not have replaceable bulbs; the entire unit must be replaced if faulty.

The speedometer has two illumination lamps; the tachometer has one. See SPEEDOMETER AND TACHOMETER, REMOVAL/INSTALLATION in Section 2 for bulb replacement instructions.

Domestic front directional/running lamps have double-filament bulbs. HDI front directional and all rear directional lamps have single-filament bulbs.

The tail lamp uses a double-filament bulb.

ADJUSTMENT

Headlamp (Figure 7-58)

⚠WARNING

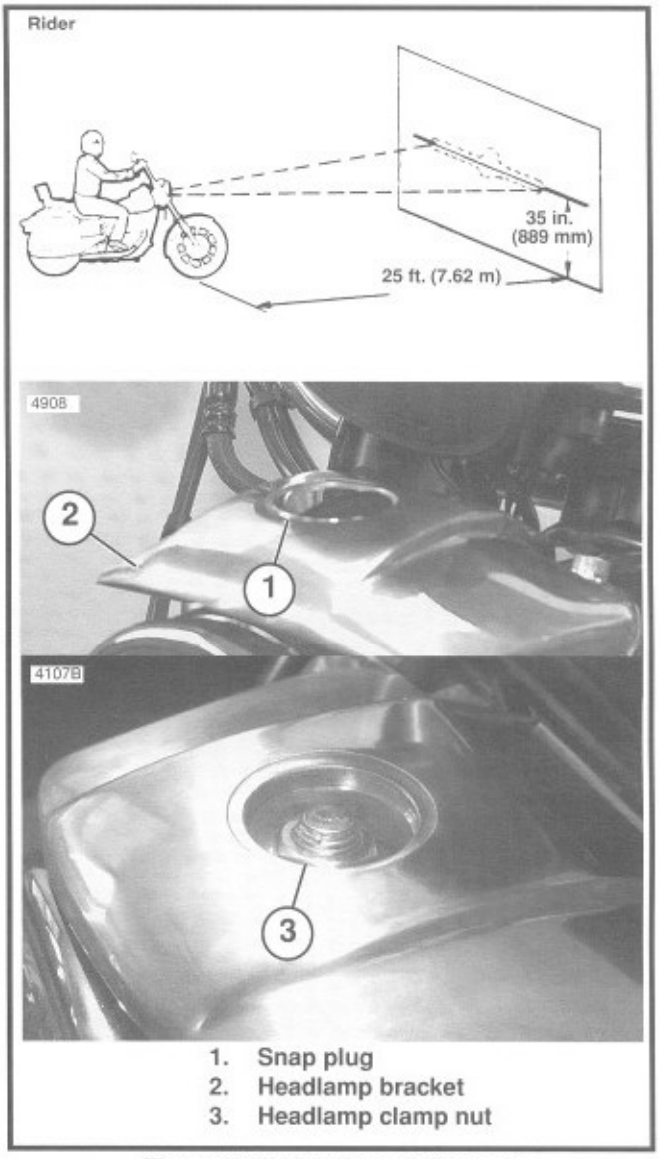
Do not modify ignition wiring to permit motorcycle operation with headlamp off. Operation without headlamp reduces your visibility to other motorists and may lead to an accident.

Check headlamp beam for proper height and lateral alignment. Proceed as follows:

1. Verify correct front and rear tire inflation pressure.
2. Place motorcycle on level floor (or pavement) in an area with minimum light.
3. Point front of motorcycle toward a screen or wall which is 25 ft (7.62 m) away from front tire contact patch on floor (i.e. directly below front axle).
4. Draw a horizontal line, on screen or wall, which is 35 in. (889 mm) above floor.
5. Have a person, whose weight is roughly the same as that of the principal rider, sit on motorcycle seat. Weight of rider will compress vehicle suspension slightly.
6. Stand motorcycle upright with both tires resting on floor and with front wheel held in straight alignment (directly forward).
7. Turn ignition/light switch to "IGNITION" position. Set handlebar switch to high beam position.
8. Check light beam for proper height alignment. Main beam of light (broad, flat pattern of light) should be centered on horizontal line of screen or wall (i.e. equal area of light above and below line).
9. Check light beam for proper lateral alignment. Main beam of light should be directed straight ahead (i.e. equal area of light to right and left of center).

   Adjust headlamp alignment, if necessary.

1. Remove snap plug (1) on top of headlamp bracket (2). Loosen headlamp clamp nut (3).
2. Tilt headlamp up or down to properly aim it in relation to the horizontal line and, at the same time, turn it right or left to direct light beam straight ahead.
3. Tighten headlamp clamp nut to 10-20 ft-lbs (14-27 Nm) torque after lamp is properly positioned. Install snap plug in headlamp bracket.



1. **Snap plug**
2. **Headlamp bracket**
3. **Headlamp clamp nut**

Figure 7-58. Headlamp Alignment

REMOVAL/INSTALLATION

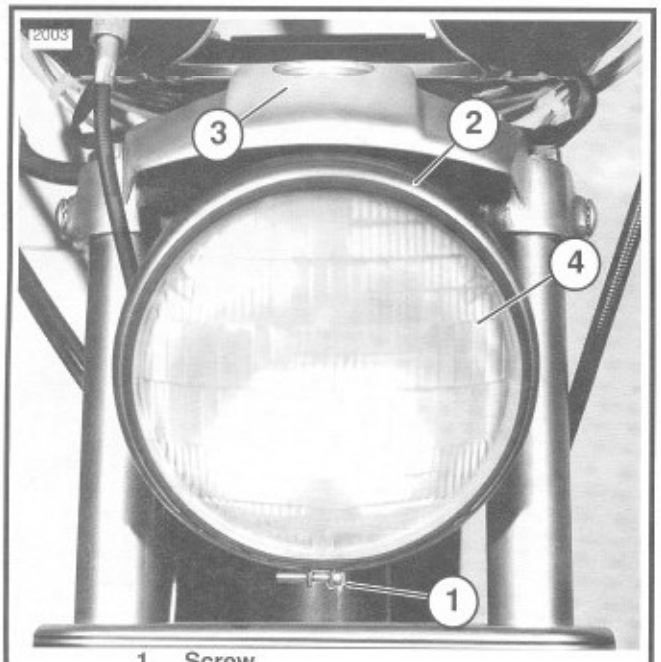
Headlamp and Bulb (Element)

1. See Figure 7-59. Remove screw (1) and outer molding ring (2). Pry headlamp assembly (4) from rubber mounting.
2. See Figure 7-60. Firmly depress lock release tabs (3) on left and right sides of locking connector (2). While holding both lock release tabs down, carefully pull connector from headlamp (1) terminals.
3. Remove rubber boot (4) from back of headlamp assembly (1).
4. See Figure 7-61. Depress ends (3) of retaining clip (4) to unhook them from slots in headlamp assembly (1).

⚠CAUTION

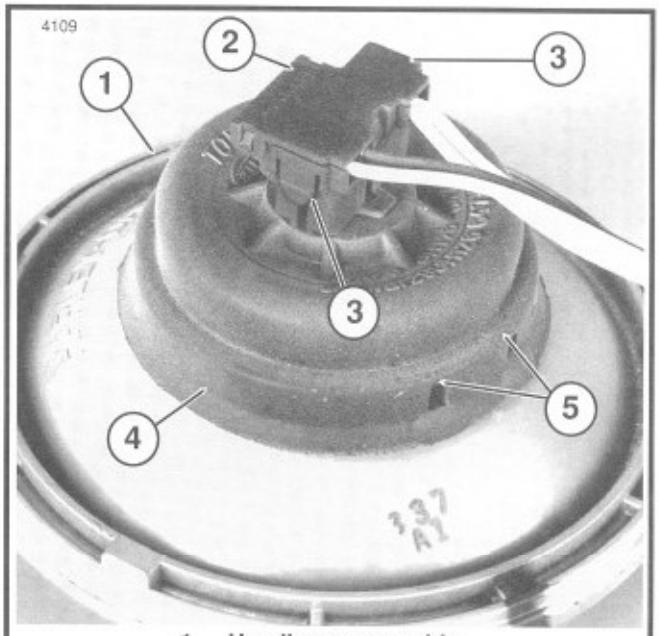
Do not touch glass bulb portion of headlamp bulb with bare hands. Oil from your skin deposited on the bulb will create temperature variances in the glass during normal lamp operation; this can cause the bulb to fracture. When removing or installing any halogen bulb, touch only the terminal side or metal base of the bulb. Keep glass bulb clean and free of any foreign material.

5. Pivot wire retaining clip (4) away from bulb (2). Remove bulb from headlamp assembly (1).
6. See Figure 7-37. Installation is the reverse order of removal. When installing rubber boot (4), position vent/drain holes (5) to the bottom. Be sure headlamp and connector block terminals are clean to ensure a good electrical contact.
7. After final assembly, align headlamp as described under LAMPS, ADJUSTMENT, HEADLAMP in this section.



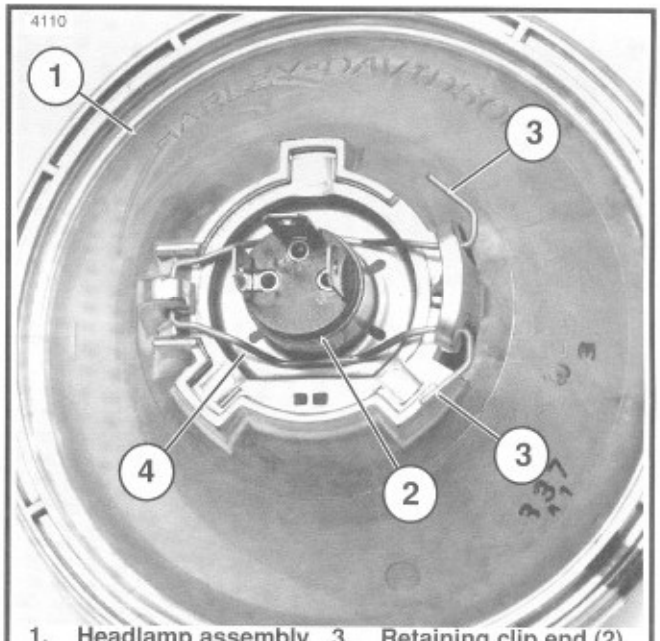
1. Screw
2. Molding ring
3. Headlamp bracket
4. Headlamp assembly

Figure 7-59. Headlamp Assembly



1. Headlamp assembly
2. Locking connector
3. Lock release tab (2)
4. Rubber boot
5. Vent/drain hole

Figure 7-60. Headlamp Locking Wiring Harness Connector



1. Headlamp assembly
2. Bulb (element)
3. Retaining clip end (2)
4. Retaining clip

Figure 7-61. Replaceable Headlamp Bulb

Indicator Lamp socket

Replace indicator assemblies as follows:

1. Remove two bolts with lockwashers to remove headlamp bracket (with attached headlamp assembly) from upper stem bracket.
2. See Figure 7-62. On XL Custom remove top and bottom pair of screws from the rear of the riser cover. See Figure 7-64 and 7-65. Remove front of riser cover to expose electrical bracket. Slide electrical bracket off center screws. Indicator lamp socket is on backside of bracket.

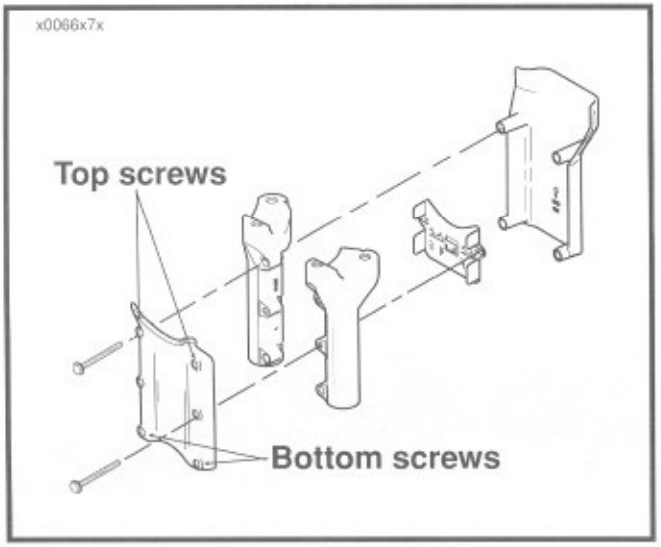


Figure 7-62. XL Custom riser cover

3. Locate the black 14-pin Multilock connector located between the headlamp bracket and element housing. Depress the button and separate pin and socket halves.
4. Open the secondary lock from the socket side (plug end of connector). See AMP MULTILOCK ELECTRICAL CONNECTORS in this section.
5. Gently depress terminal latches inside socket housing and back out all sockets through holes in rear wire seal.
6. Cut cable strap on wire bundle leading to Multilock connector and remove conduit.
7. Use a rocking motion while pulling on indicator lamp to remove indicator lamp from housing.
8. See Figure 7-63. Cut wire from bulb assembly approximately 1-1/2 inches before the splices (this leaves the splice as well as the other bulb connections intact). The neutral and oil lamps lead to a 3-wire splice on 883 and Custom, 4-wire on 1200S. The turn signal and high beam lamps lead to the 4-wire splice.
9. Push on bulb socket to move bulb assembly out through the front of indicator lamp housing. Discard.
10. Trim wires of replacement bulb assembly to proper lengths. Install new Multilock socket terminal to lead of replacement bulb assembly. The correct lead can be identified by the colored tape. If necessary, see AMP MULTILOCK ELECTRICAL CONNECTORS, CRIMPING INSTRUCTIONS in this section.

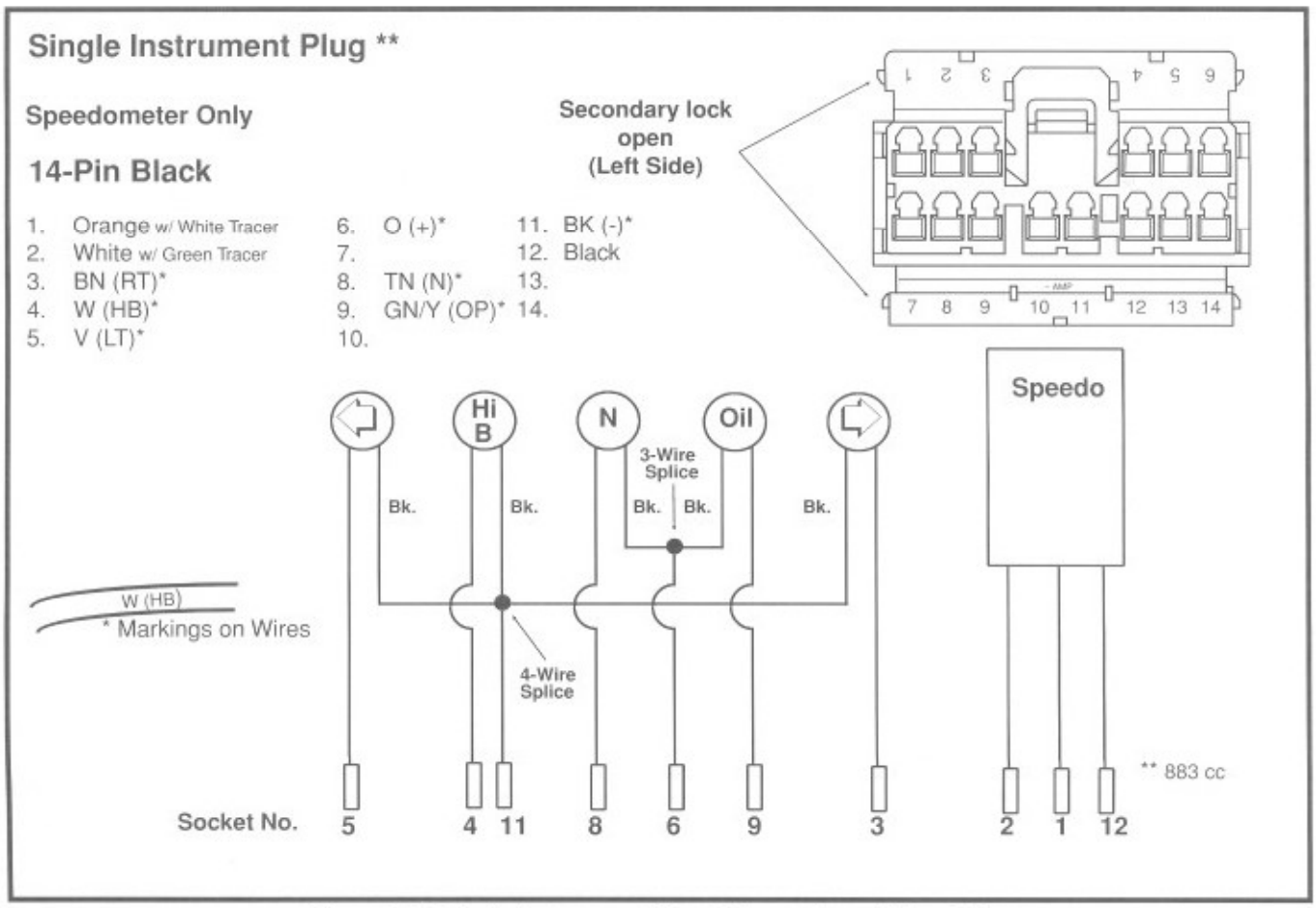


Figure 7-63. Single Instrument Plug- Schematic and Wire Colors

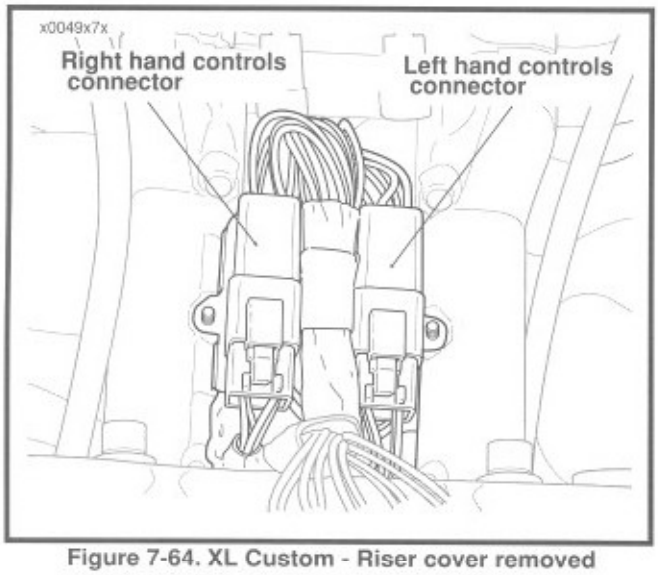


Figure 7-64. XL Custom - Riser cover removed

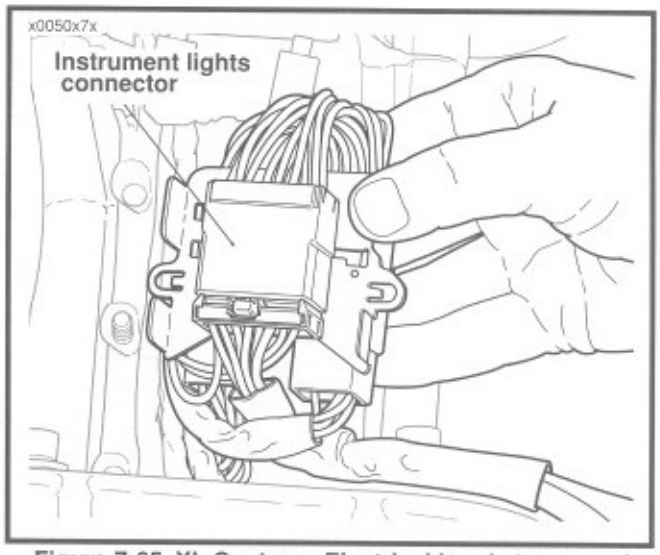
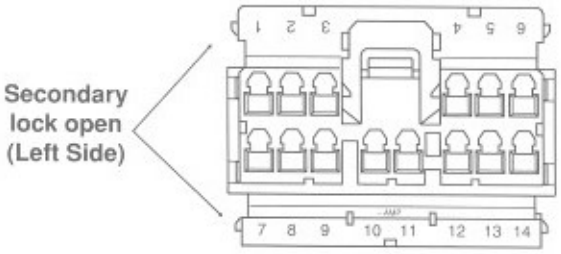


Figure 7-65. XL Custom - Electrical bracket removed

Dual Instrument Plug **

Speedometer and Tachometer

14-Pin Black



W (HB)

* Markings on Wires

1.	Orange w/ White Tracer	5.	V (LT)*	9.	GN/Y (OP)*	13.	
2.	White w/ Green Tracer	6.	O (+)*	10.		14.	BK/Y***
3.	BN (RT)*	7.	Pink	11.	BK (-)*		
4.	W (HB)*	8.	TN (N)*	12.	Black		

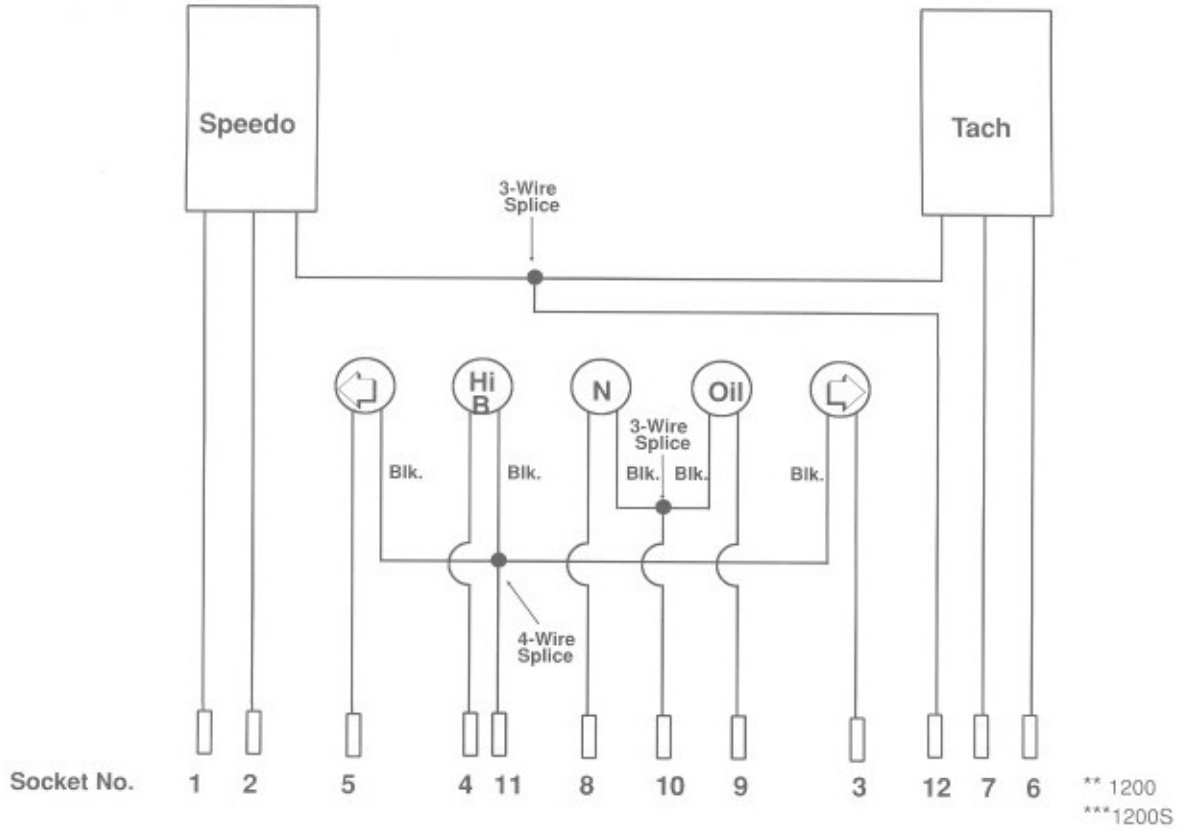
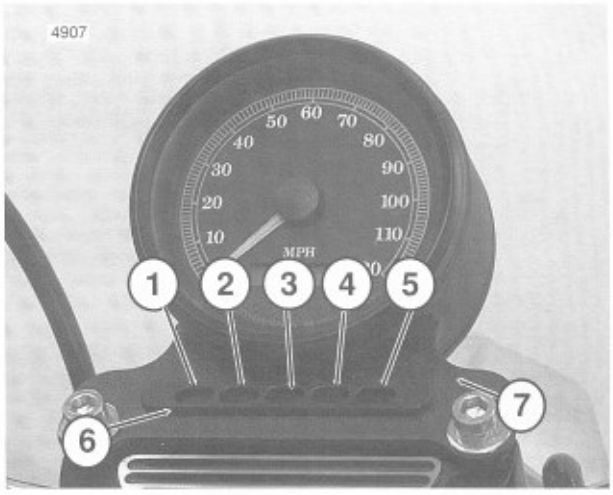


Figure 7-66. Dual Instrument Plug- Schematic and Wire Colors

11. Socket end first, insert replacement bulb back into housing.
12. Install butt connector to remaining wire (black, untaped) of replacement bulb assembly. Complete butt splice to 1-1/2 inch lead remaining from old bulb assembly. See SEALED BUTT CONNECTORS in this section.
13. Slide conduit over butt splices and wire crimps. Install **new** cable strap to secure conduit to wire bundle.
14. Fit rear wire seal into back of socket housing, if removed. Grasp sockets approximately 1 inch (25.4 mm) behind contact barrel. Push sockets into their respective chambers. For correct wire color locations, see Figure 7-63 (no tachometer) or Figure 7-66 (tachometer). Feed each socket into chamber until it "clicks" in place. Verify that socket will not back out of chamber; a slight tug on the wire will confirm that it is locked in place.
15. Push on secondary lock of socket housing and press down until it snaps in place.
16. Align the tabs on the socket housing with the grooves on the pin housing. Push the connector halves together until the latch "clicks".
17. Position Multilock connector beneath bracket at back of headlamp assembly (inside riser cover on XL 1200C).
18. Align holes in headlamp bracket with holes in upper stem bracket. Install two bolts with lockwashers. Tighten bolts to 10-16 ft-lbs (14-22 Nm) torque. On XL 1200C, install riser covers.



1. **Left turn**
2. **High beam**
3. **Neutral**
4. **Oil pressure**
5. **Right turn**
6. **Trim cover**
7. **Instrument bracket**

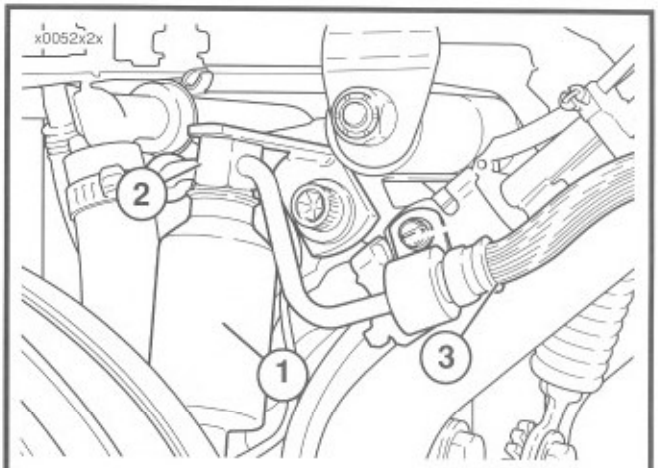
Figure 7-67. Indicator Lamp Assembly

REAR BRAKE SWITCH

The rear stoplight switch is threaded into a tee in the rear brake line. A protective rubber boot keeps out dust and dirt.

The stoplight switch is an open type switch which closes with hydraulic pressure. The individual parts of the switch are not serviceable, so the unit must be replaced if it fails.

1. Pull terminal sockets from spade connections at bottom of stoplight switch.
2. Stretch rubber boot (1) to remove from switch body. Unthread switch from tee nut (2) on rear brake line (3).
3. Thread **new** stoplight switch to tee nut (2) on brake line (3). Tighten switch assembly to 7-10 ft-lbs (9-14 Nm) torque.
4. Install boot (1) on stoplight switch.
5. Install terminal sockets on switch spade connections.
6. Refill master cylinder and bleed brakes. See BLEEDING HYDRAULIC SYSTEM. Test operation of rear brake.
7. Test operation of brake lamp with the rear brake applied and the ignition/light switch turned ON.



1. **Rubber boot**
2. **Tee nut**
3. **Brake line**

Figure 7-68. Rear Stoplight Switch (Left Side View)

HANDLEBAR SWITCHES

GENERAL

The switches are of rugged construction and feature a superior seal to protect electrical contacts and components from dirt and moisture in harsh environments.

The left handlebar switches include the headlamp HI - LO switch, horn and left turn signal switch. The right handlebar switches include the engine start and RUN - OFF switch and right turn signal switch. The individual switches are non-repairable and must be replaced if they malfunction.

NOTE

To replace or repair individual switches in either the right or left handlebar switch assemblies, see SWITCH REPAIR/ REPLACEMENT following the REMOVAL/INSTALLATION procedures.

The following removal and installation steps apply when replacing the entire switch assembly, switch housing, or handlebars.

REMOVAL

Right Handlebar Controls

⚠CAUTION

Do not remove the switch housing assembly without first placing a 5/32 inch cardboard insert between the brake lever and lever bracket. Removing the assembly without the insert in place may result in damage to the rubber boot and plunger of the front stoplight switch.

1. See Figure 7-69. Place the cardboard insert between the brake lever and lever bracket.

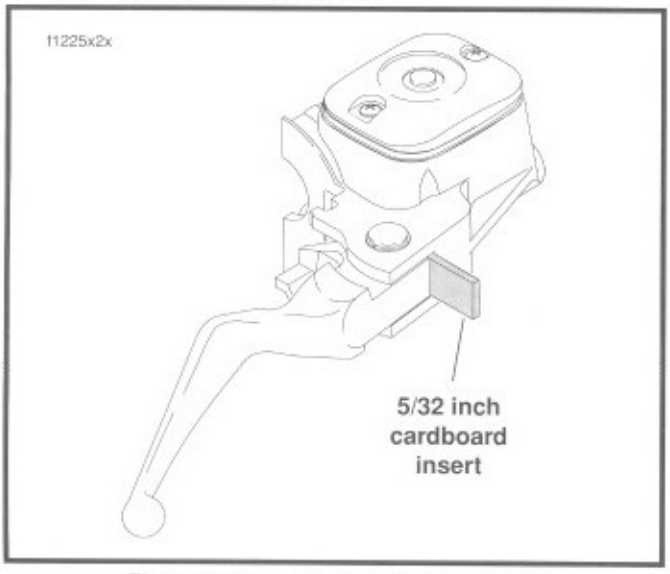


Figure 7-69. Install Cardboard Insert

2. Using a T27 TORX drive head, remove the two screws with flat washers securing the handlebar clamp to the master cylinder housing. Remove the brake lever/master cylinder assembly and clamp from the handlebar.
3. Using a T25 TORX drive head, remove the upper and lower switch housing screws.
4. Remove the friction shoe from the end of the tension adjuster screw.

NOTE

The friction screw is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

5. Remove the brass ferrules from the notches on the inboard side of the throttle control grip. Remove the ferrules from the cable end fittings.
6. Remove the throttle control grip from the end of the handlebar.
7. Pull the crimped inserts at the end of the throttle and idle control cable housings from the lower switch housing. For best results, use a rocking motion while pulling. Place a drop of light oil on the retaining rings, if necessary. Remove the cables from the switch housing.

Left Handlebar Controls

1. Using a T27 TORX drive head, remove the two screws with flat washers securing the handlebar clamp to the clutch lever bracket. Remove the clutch hand lever assembly and clamp from the handlebar.
2. Using a T25 TORX drive head, remove the upper and lower switch housing screws.
3. Remove the grip sleeve from the end of the handlebar if damaged.

INSTALLATION

Right Handlebar Controls

1. With the concave side facing upward, install the friction shoe so that the pin hole is over the point of the adjuster screw.

NOTE

The friction screw is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

2. Push the throttle and idle control cables into the lower switch housing until they snap in place. Proceed as follows:

   Note the different diameter inserts crimped into the end of the throttle and idle cable housings. See Figure 7-70.

   Push the larger diameter insert (silver colored, 5/16 inch; 7.9 mm) of the throttle cable housing into the larger hole in front of the tension adjuster screw.

   Push the smaller diameter insert (gold colored,1/4 inch; 6.3 mm) of the idle cable housing into the smaller hole at the rear of the tension adjuster screw.

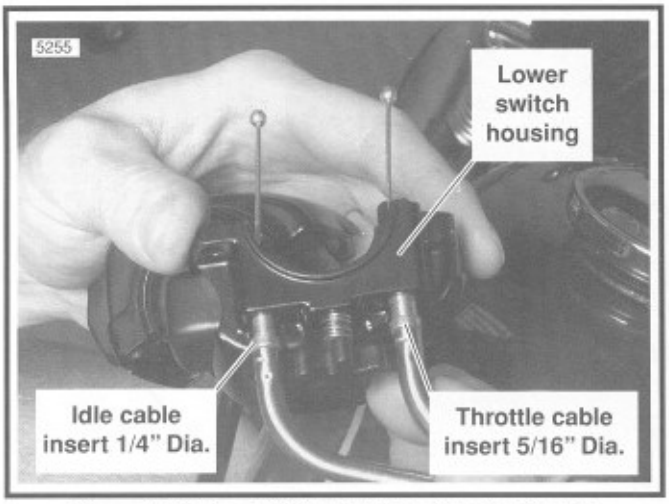


Figure 7-70. Install Throttle/Idle Control Cables in Lower Switch Housing

NOTE

To aid assembly, place a drop of light oil on the retaining rings of the crimped inserts. Always replace the retaining rings if damaged or distorted.

3. See Figure 7-71. Route the cable to the upper switch housing as shown.

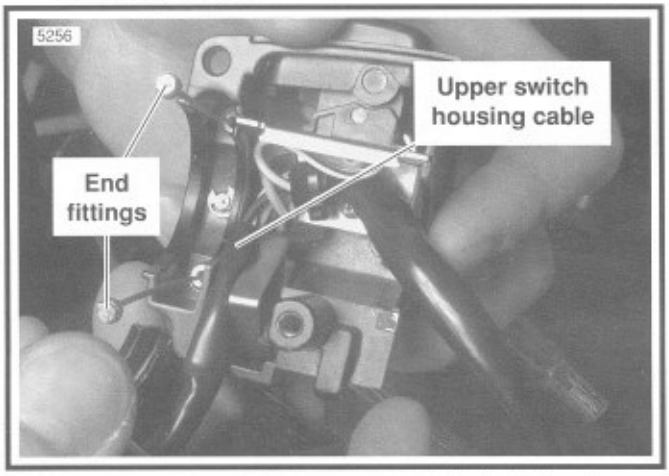


Figure 7-71. Route Cable to Upper Switch Housing

4. Slide the throttle control grip over the end of the right handlebar until it bottoms against the closed end. Rotate the grip so that the ferrule notches are at the top. To prevent binding, pull the grip back about 1/8 inch (3.2 mm).

5. See Figure 7-72. Position the lower switch housing beneath the throttle control grip. Install the brass ferrules onto the cable so that the end fittings seat in the ferrule recess. Seat the ferrules in their respective notches on the throttle control grip. Verify that the cables are captured in the grooves molded into the grip.

6. Position the upper switch housing over the handlebar and lower switch housing.

7. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar. Be sure that the upper switch housing harness will not be pinched under the handlebar when the switch housing screws are tightened.

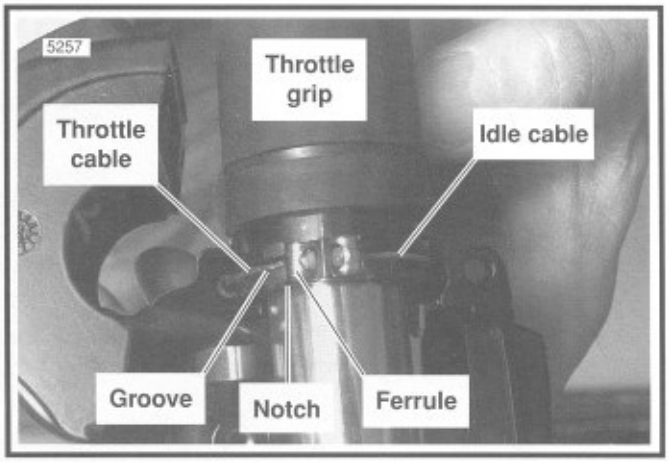


Figure 7-72. Install Throttle/Idle Control Cables on Throttle Control Grip

8. Start the upper and lower switch housing screws, but do not tighten.

⚠CAUTION

See Figure 7-73. Do not remove the 5/32 inch cardboard insert wedged between the brake lever and lever bracket. Removal will result in damage to the rubber boot and plunger of the front stoplight switch during installation of the master cylinder assembly.

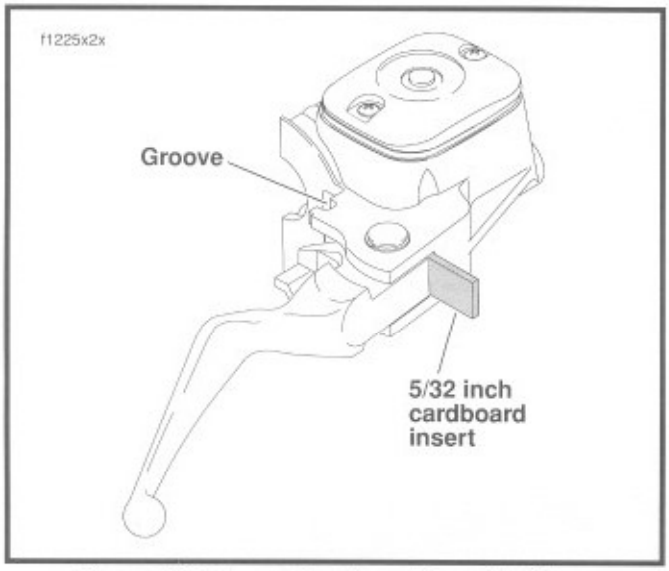


Figure 7-73. Leave Cardboard Insert in Place

9. See Figure 7-74. Position the brake lever/master cylinder assembly inboard of the switch housing assembly, engaging the tab on the lower switch housing in the groove at the top of the brake lever bracket.

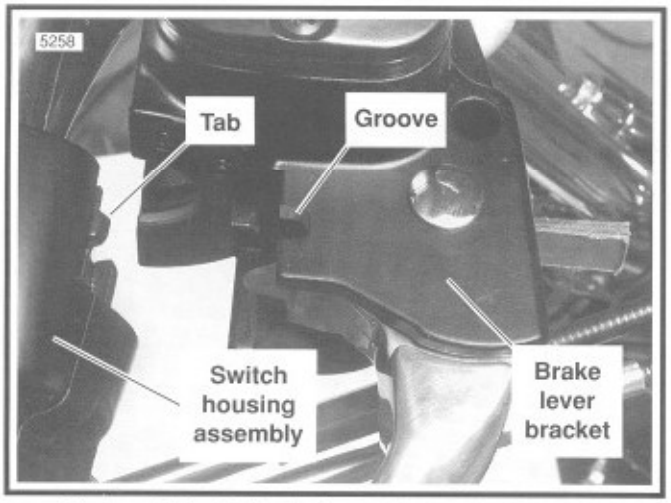


Figure 7-74. Fit Brake Lever/Master Cylinder to Right Handlebar Switch Housings

10. Align the holes in the handlebar clamp with those in the master cylinder housing and start the two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) using a T27 TORX drive head.

11. Using a T25 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (3.4-4.5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

12. Remove the cardboard insert between the brake lever and lever bracket.

13. Test the switches for proper operation.

14. If necessary, secure wire harness conduit to handlebar using **new** cable strap. Position cable strap approximately 4-5 inches from handlebar clamp. Cut any excess cable strap material.

Left Handlebar Controls

1. If the grip sleeve was removed, thoroughly clean handlebar to remove all adhesive residue.

   a. Using a piece of emery cloth, rough grip end of left side of handlebar.

NOTE

Before applying adhesive in the next step, clean the left side of handlebar with acetone.

   b. Apply LOCTITE PRISM PRIMER (770) to inside of handgrip. Remove any excess PRISM PRIMER. Wait two minutes for PRISM PRIMER to set before beginning the next step.

   c. Apply LOCTITE PRISM SUPERBONDER (411) to inside of handgrip. Place new handgrip on left buckhorn handlebar.

NOTE

SUPERBONDER will set in four minutes and be fully cured in 24 hours.

   Roll grip to evenly distribute adhesive on inside surfaces. Install grip on handlebar with a twisting motion.

2. See Figure 7-75. Install upper and lower switch housings on handlebar. Be sure that ribs on outboard side of switch housings fit in grooves molded into grip.

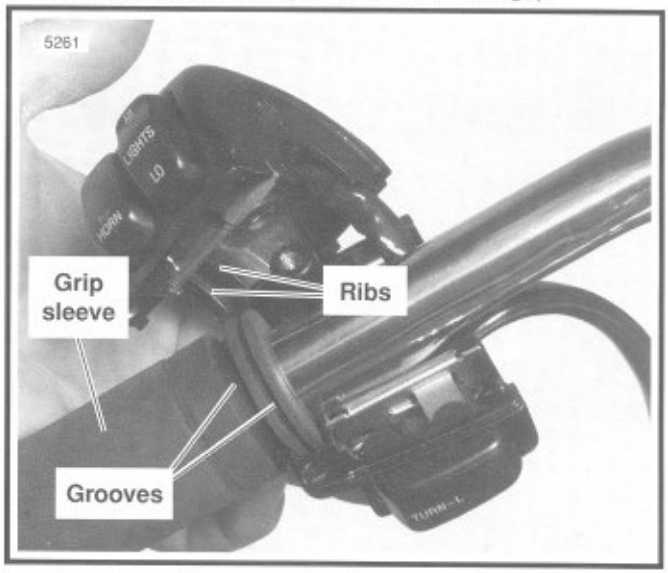


Figure 7-75. Install Left Handlebar Switch Housings

⚠CAUTION

See Figure 7-73. Do not remove the 5/32 inch cardboard insert wedged between the brake lever and lever bracket. Removal will result in damage to the rubber boot and plunger of the front stoplight switch during installation of the master cylinder assembly.

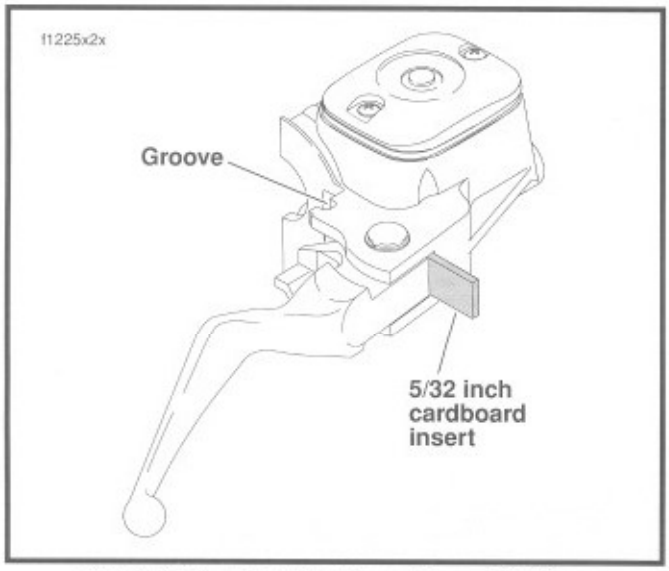


Figure 7-73. Leave Cardboard Insert in Place

9. See Figure 7-74. Position the brake lever/master cylinder assembly inboard of the switch housing assembly, engaging the tab on the lower switch housing in the groove at the top of the brake lever bracket.

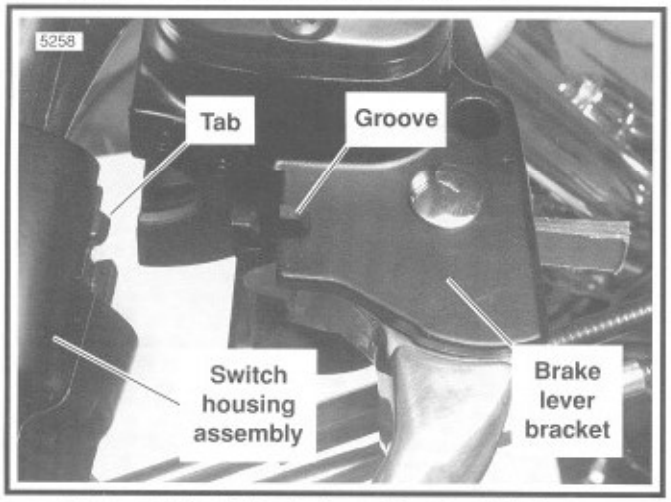


Figure 7-74. Fit Brake Lever/Master Cylinder to Right Handlebar Switch Housings

10. Align the holes in the handlebar clamp with those in the master cylinder housing and start the two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) using a T27 TORX drive head.

11. Using a T25 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (3.4-4.5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

12. Remove the cardboard insert between the brake lever and lever bracket.

13. Test the switches for proper operation.

14. If necessary, secure wire harness conduit to handlebar using **new** cable strap. Position cable strap approximately 4-5 inches from handlebar clamp. Cut any excess cable strap material.

Left Handlebar Controls

1. If the grip sleeve was removed, thoroughly clean handlebar to remove all adhesive residue.

   a. Using a piece of emery cloth, rough grip end of left side of handlebar.

NOTE

Before applying adhesive in the next step, clean the left side of handlebar with acetone.

   b. Apply LOCTITE PRISM PRIMER (770) to inside of handgrip. Remove any excess PRISM PRIMER. Wait two minutes for PRISM PRIMER to set before beginning the next step.

   c. Apply LOCTITE PRISM SUPERBONDER (411) to inside of handgrip. Place new handgrip on left buckhorn handlebar.

NOTE

SUPERBONDER will set in four minutes and be fully cured in 24 hours.

   Roll grip to evenly distribute adhesive on inside surfaces. Install grip on handlebar with a twisting motion.

2. See Figure 7-75. Install upper and lower switch housings on handlebar. Be sure that ribs on outboard side of switch housings fit in grooves molded into grip.

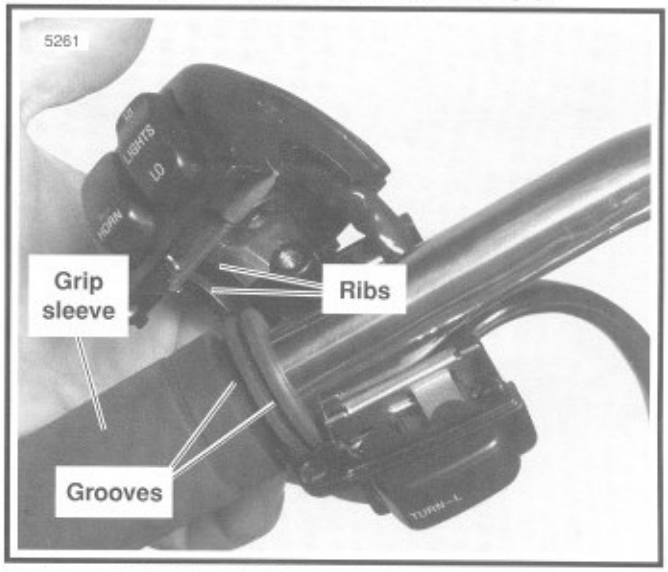


Figure 7-75. Install Left Handlebar Switch Housings

3. Verify that the wire harness conduit runs in the groove at the bottom of the handlebar. Be sure that the upper switch housing harness will not be pinched under the handlebar when the switch housing screws are tightened.
4. Start the upper and lower switch housing screws, but do not Tighten.
5. See Figure 7-76. Position the clutch hand lever assembly inboard of the switch housing assembly, engaging the tab on the lower switch housing in the groove at the bottom of the clutch lever bracket.

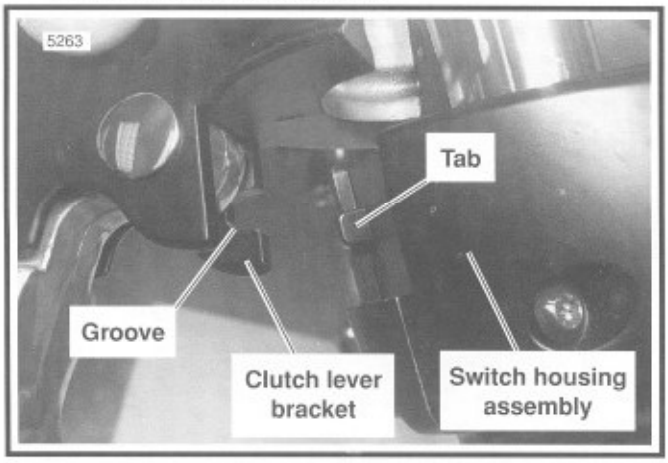


Figure 7-76. Fit Clutch Lever Bracket to Left Handlebar Switch Housings

6. Align the holes in the handlebar clamp with those in the clutch lever bracket and start the two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) using a T27 TORX drive head.
7. Using a T25 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (3.4-4.5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

8. Test the switches for proper operation.
9. If necessary, secure wire harness conduit to handlebar using **new** cable strap. Position cable strap approximately 4-5 inches from handlebar clamp. Cut any excess cable strap material.

SWITCH REPAIR/REPLACEMENT

Right Handlebar Switches–Disassembly

⚠CAUTION

See Figure 7-76. Do not remove the switch housing assembly without first placing a 5/32 inch cardboard insert between the brake lever and lever bracket. Removing the assembly without the insert in place may result in damage to the rubber boot and plunger of the front stoplight switch.

1. Place the cardboard insert between the brake lever and lever bracket.
2. Using a T25 TORX drive head, remove the upper and lower switch housing screws.
3. If replacing lower housing switches, perform steps 4 through 7 before continuing to repair section. If replacing upper housing switches, proceed directly to repair section.
4. Using a T27 TORX drive head, loosen the upper screw securing the handlebar clamp to the master cylinder housing. Remove the lower clamp screw with flat washer.
5. Remove the brass ferrules from the notches on the inboard side of the throttle control grip. Remove the ferrules from the cable end fittings.
6. Remove the friction shoe from the end of the tension adjuster screw.

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

7. Remove the throttle control grip from the end of the handlebar.

Right Handlebar Upper Switch Housing Repair

NOTE

Replace the engine stop and engine start switches as a single assembly even if only one switch is determined to be faulty.

1. See Figure 7-77. From inside the switch housing, remove the Phillips screw with lockwasher to release the bracket. Remove the bracket and switch assembly from the housing.

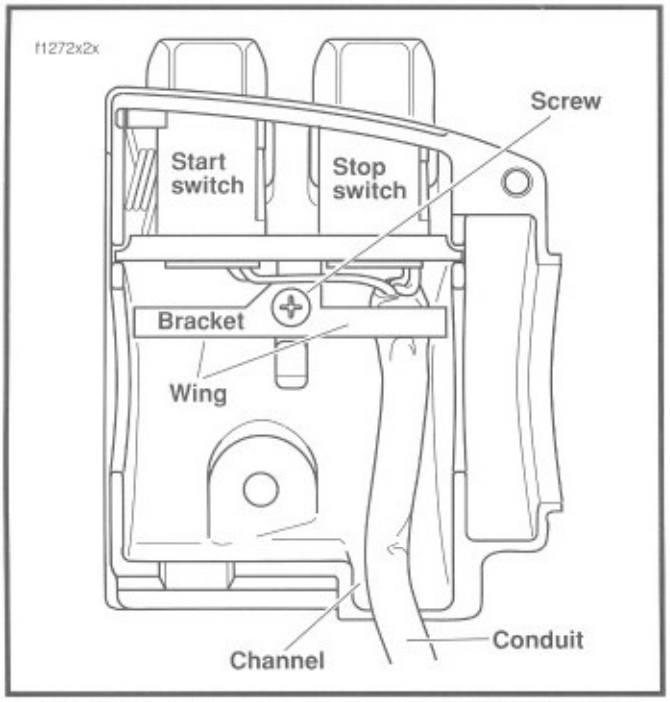


Figure 7-77. Upper Right Handlebar Switch Housing (Without Splices)

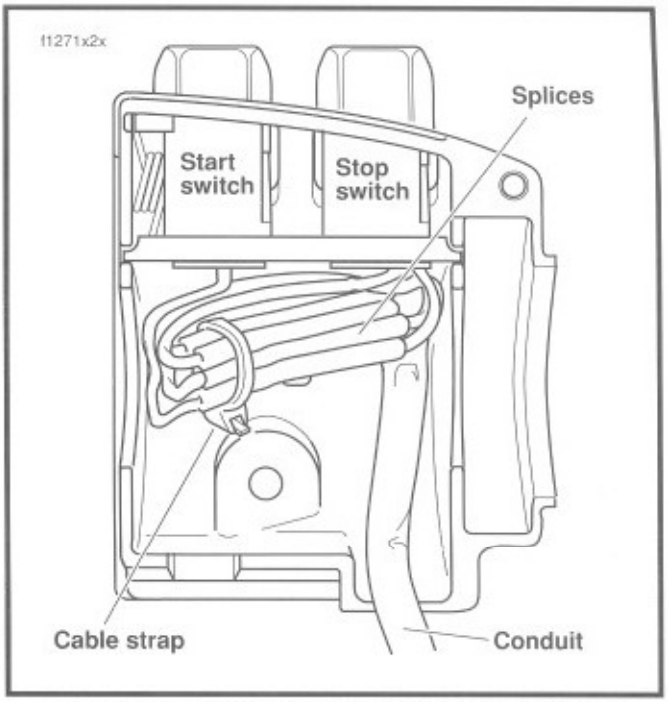


Figure 7-78. Upper Right Handlebar Switch Housing (With Splices)

2. Move cable conduit from beneath wing of bracket. Cut wires 1/4 inch from old switches. Discard old switch and bracket assembly.

3. Slide conduit forward over cut ends of switch wires and cut off 1/2 inch of conduit material. Push conduit back to access switch wires.

4. Separate **new** engine stop switch and engine start switch wires into two bundles.

NOTE

Replacement stop switch and start switch wires are cut to length (2-1/2 inches and 2 inches, respectively) and partially stripped.

5. See the last part of switch repair/replacement, GENERAL REPAIR PROCEDURES for information on repair practices.

6. Loop switch wires so that spliced lengths are positioned as shown in Figure 7-78. Route wires downstream of splices beneath wing on engine stop switch side of bracket as seen in Figure 7-76.

7. Install a **new** 7 inch cable strap beneath wing on engine start switch side of bracket and capture wire splices.

8. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Be sure that bracket is fully seated. The step at the edge of the boss captures the bottom edge of the bracket, while tabs on each side of the bracket fit in slots cast into the housing.

9. Install Phillips screw (with lockwasher) to secure bracket inside housing. Verify that wing on engine stop switch side of bracket captures edge of conduit as shown in Figure 7-77.

10. Securely tighten cable strap to draw splices to bracket. Remove any excess cable strap material.

11. See RIGHT HANDLEBAR SWITCHES–ASSEMBLY.

Right Handlebar Lower Switch Housing Repair

1. From inside the switch housing, carefully cut cable strap to free conduit from the turn signal switch bracket.

2. Remove the Phillips screw with lockwasher to release the turn signal switch bracket. Remove the bracket and switch assembly from the housing.

TURN-RIGHT SIGNAL SWITCH

1. Cut wire 1-1/2 inches from old switch. Discard old switch assembly.

NOTE

Replacement turn-right signal switch wires are cut to length (1-1/2 inches) and partially stripped.

2. See the last part of switch repair/replacement, GENERAL REPAIR PROCEDURES for information on repair practices.

3. See RIGHT HANDLEBAR SWITCHES–ASSEMBLY.

FRONT STOPLIGHT SWITCH

1. Carefully remove the wedge between the switch and switch housing, if present. To remove the switch from the housing, depress the plunger and slowly rotate switch upward while rocking slightly.

2. Cut wires 1 inch from old switch. Discard old switch.

NOTE

Replacement stoplight switch wires are cut to length (2-1/2 inches) and partially stripped.

3. See the last part of switch repair/replacement, GENERAL REPAIR PROCEDURES for information on repair practices.

4. Carefully depress plunger against inside wall of switch housing. With thumb over plunger bore, move switch into the installed position in the switch housing cavity. When plunger is positioned against thumb, slowly rotate switch downward while rocking slightly. Release the plunger only after switch is properly positioned in the cavity.

5. Verify that the plunger is square in the bore and that the boot is not compressed, collapsed, or torn. If necessary, gently work the plunger in and out until boot is fully extended.

6. See Figure 7-79. Push down on switch so that it bottoms against housing and wires run in groove at base of cavity. With the concave side facing outward, insert wedge between switch and outboard side of switch housing.

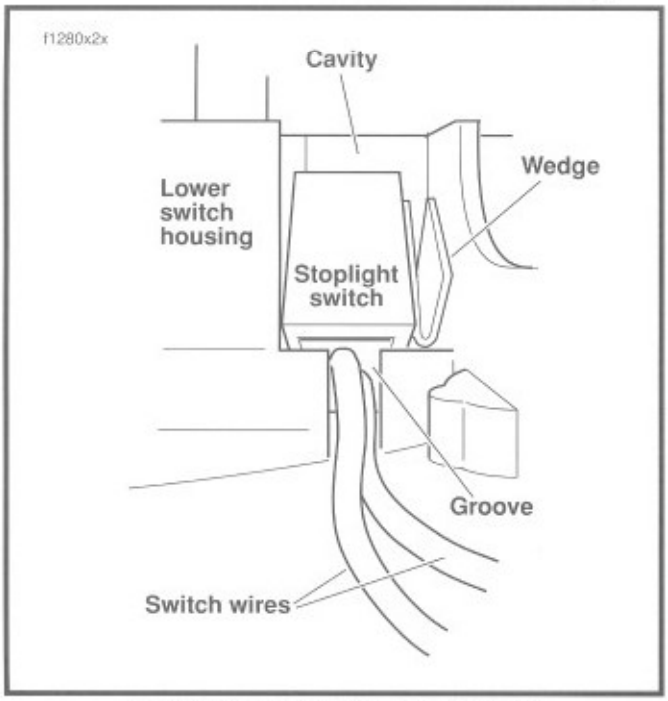


Figure 7-79. Install Stoplight Switch

7. Push wedge down until it also bottoms against housing. Verify that the plunger is still square in the bore and then place a drop of RTV Silicone Sealant on upper corner of wedge.

8. See RIGHT HANDLEBAR SWITCHES–ASSEMBLY.

Right Handlebar Switches–Assembly

1. See Figure 7-80. Insert tapered end of **new** 7 inch cable strap into round hole in turn signal switch bracket and then feed back through using the adjacent hole. Reserve the oblong hole for the bracket screw.

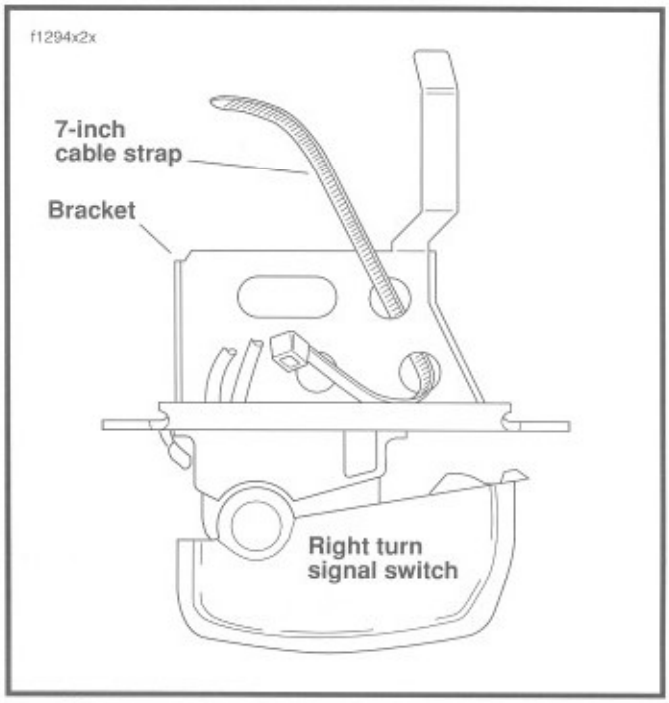


Figure 7-80. Insert Cable Strap in Switch Bracket

NOTE

Be sure that all splices are positioned above the turn signal switch bracket.

2. Place the turn signal switch assembly into the housing, aligning the oblong hole in the bracket with the threaded hole in the boss. Be sure that the bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.

3. Start Phillips screw (with lockwasher) to secure bracket inside housing.

⚠CAUTION

If routed incorrectly, wires may be pinched by casting or handlebar resulting in switch failure.

4. Loop switch wires so that spliced lengths are positioned as shown.

5. Capturing conduit about 1/4 inch from end, securely tighten cable strap to draw conduit to bracket. Remove any excess cable strap material.

6. Install second 7 inch cable strap capturing conduit and wire splices. Securely tighten cable strap to draw splices to conduit. Remove any excess cable strap material.

7. Tighten Phillips screw to secure bracket inside housing.

8. Route wire bundle to upper switch housing by gently pressing conduit into channel next to angular arm of bracket. Secure bundle to arm using third cable strap. Cut any excess cable strap material. If necessary, bend angular arm of bracket downward to firmly secure front stoplight switch in position.

9. If lower housing switches were replaced, proceed to step 10. If upper housing switches were replaced, proceed to step 17.

10. With the concave side facing upward, install the friction shoe so that the pin hole is over the point of the adjuster screw.

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

11. Slide the throttle control grip over the end of the right handlebar until it bottoms against the closed end. Rotate the grip so that the ferrule notches are at the top. To prevent binding, pull the grip back about 1/8 inch.

12. Position the lower switch housing beneath the throttle control grip. Install the brass ferrules onto the cables so that the end fittings seat in the ferrule recess. Seat the ferrules in their respective notches on the throttle control grip. Verify that the cables are captured in the grooves molded into the grip.

13. Position the upper switch housing over the handlebar and lower switch housing. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar.

14. Start the upper and lower switch housing screws, but do not tighten.

15. Position the brake lever/master cylinder assembly inboard of the switch housing assembly engaging the tab on the lower switch housing in the groove at the top of the brake lever bracket.

16. Align the holes in the handlebar clamp with those in the master cylinder housing and start the lower screw (with flat washer). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) using a T27 TORX drive head.

17. Using a T25 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (3.4-4.5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

18. Remove the cardboard insert between the brake lever and lever bracket.

19. Test the switches for proper operation.

Left Handlebar Switches–Disassembly

1. Using a T25 TORX drive head, remove the upper and lower switch housing screws.

2. If replacing lower housing switches, perform step 3 before continuing to repair section. If replacing upper housing switches, proceed directly to repair section.

3. Using a T27 TORX drive head, loosen the upper screw securing the handlebar clamp to the clutch lever bracket. Remove the lower clamp screw with flat washer.

Left Handlebar Upper Switch Housing Repair

NOTE

Replace the horn switch and high/low beam switch as a single assembly even if only one switch is determined to be faulty.

1. See Figure 7-81. From inside the switch housing, remove the Phillips screw and lockwasher to release the bracket. Remove the bracket and switch assembly from the housing.

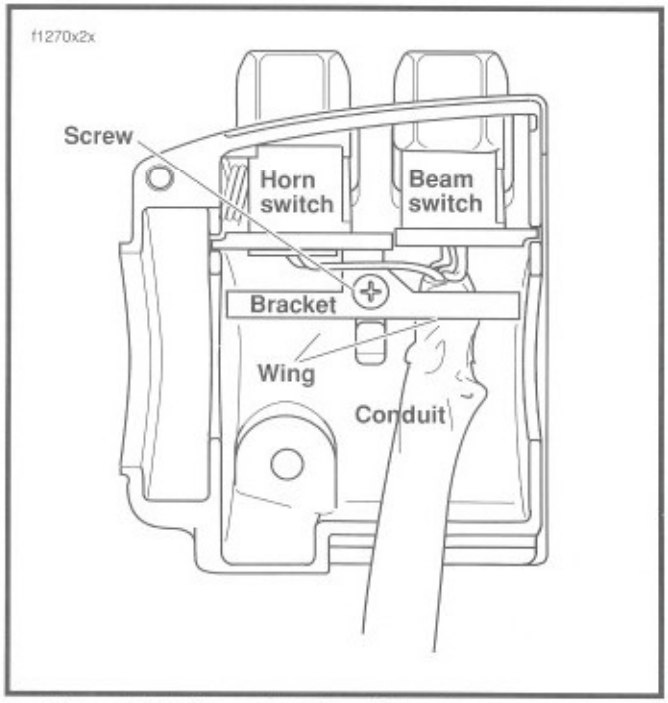


Figure 7-81. Upper Left Handlebar Switch Housing (Without Splices)

2. Move cable conduit from beneath wing of bracket. Cut wires 1/4 inch from old switches. Discard old switch and bracket assembly.

3. Slide conduit forward over cut ends of switch wires and cut off 1/2 inch of conduit material. Push conduit back to access switch wires.

4. Separate new horn switch and high/low beam switch wires into two bundles.

NOTE

Replacement high/low beam switch wires and horn switch wires are cut to length (2-1/2 inches and 2 inches, respectively) and partially stripped.

5. See the last part of switch repair/replacement, GENERAL REPAIR PROCEDURES for information on repair practices.

6. Loop switch wires so that spliced lengths are positioned as shown in Figure 7-82. Route wires downstream of splices beneath wing on high/low beam switch side of bracket as seen in Figure 7-81.

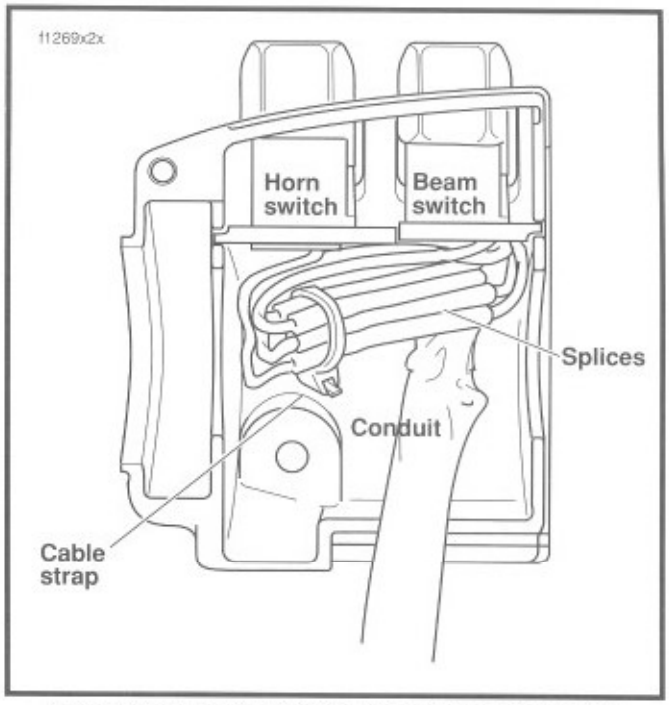


Figure 7-82. Upper Left Handlebar Switch Housing (With Splices)

7. Install a new 7 inch cable strap beneath wing on horn switch side of bracket and capture wire splices.

8. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Be sure that bracket is fully seated. The step at the edge of the boss captures the bottom edge of the bracket, while tabs on each side of the bracket fit in slots cast into the housing.

9. Install Phillips screw (with lockwasher) to secure bracket inside housing. Verify that wing on high/low beam switch side of bracket captures edge of conduit as shown in Figure 7-81.

10. Securely tighten cable strap to draw splices to bracket. Remove any excess cable strap material.

11. See LEFT HANDLEBAR SWITCHES–ASSEMBLY.

Left Handlebar Lower Switch Housing Repair

1. From inside the switch housing, carefully cut cable strap to free conduit from the turn signal switch bracket.

2. Remove the Phillips screw with lockwasher to release the turn signal switch bracket. Remove the bracket and switch assembly from the housing.

3. Cut wires 1-1/2 inches from old switch (Turn-L(eft) Signal Switch). Discard switch assembly.

4. See the last part of switch repair/replacement, GENERAL REPAIR PROCEDURES for information on repair practices.

5. See LEFT HANDLEBAR SWITCHES–ASSEMBLY.

Left Handlebar Switches–Assembly

1. See Figure 7-83. Insert tapered end of **new** 7 inch cable strap into round hole in turn signal switch bracket and then feed back through using the adjacent hole. Reserve the oblong hole for the bracket screw.

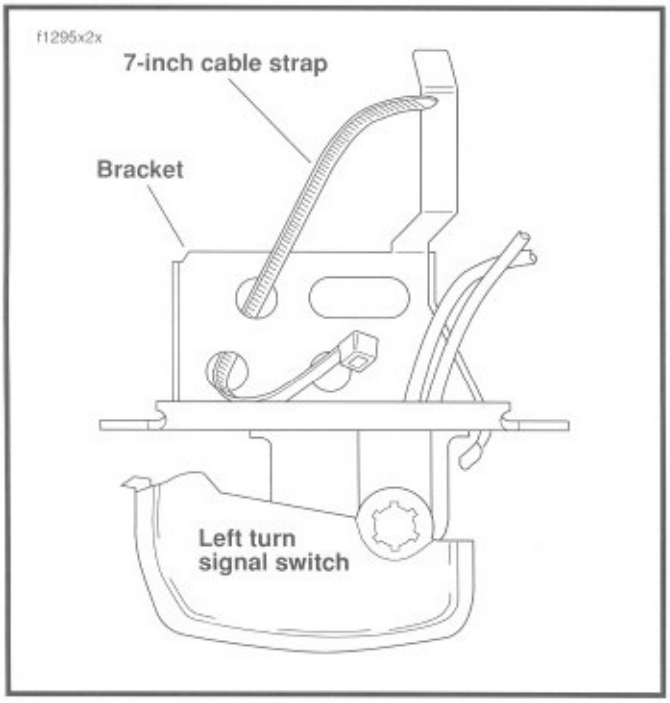


Figure 7-83. Insert Cable Strap in Switch Bracket

NOTE

Be sure that all splices are positioned above the turn signal switch bracket.

2. Place the turn signal switch assembly into the housing, aligning the oblong hole in the bracket with the threaded hole in the boss. Be sure that the bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.
3. Start Phillips screw (with lockwasher) to secure bracket inside housing.
4. See Figure 7-61. Loop switch wires so that spliced lengths are positioned as shown.
5. Capturing conduit about 1/4 inch from end, securely tighten cable strap to draw conduit to bracket. Remove any excess cable strap material.
6. Tighten Phillips screw to secure bracket inside housing.
7. Route wire bundle to upper switch housing below and then forward of the main wire harness, positioning conduit in channel next to angular arm of bracket. Secure bundle to arm using **new** cable strap. Cut any excess cable strap material.
8. If lower housing switches were replaced, proceed to step 9. If upper housing switches were replaced, proceed to step 13.
9. Install upper and lower switch housing on handlebar. Be sure that ribs on outboard side of switch housings fit in grooves molded into grip. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar.
10. Start the upper and lower switch housing screws, but do not tighten.
11. Position the clutch hand lever assembly inboard of the switch housing assembly, engaging the tab on the lower switch housing in the groove at the bottom of the clutch lever bracket.
12. Align the holes in the handlebar clamp with those in the clutch lever bracket and start the lower screw (with flat washer). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) using a T27 TORX drive head.
13. Using a T27 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (3.4-4.5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch.

14. Test the switches for proper operation.

General Repair Procedures

1. To better access wires and avoid damaging conduit with radiant heating device, push conduit back and secure with extra 7 inch cable strap in kit.
2. Strip 1/2 inch of insulation off switch wires. Twist stripped ends of switch wires until all strands are tightly coiled.
3. Cut dual wall heat-shrink tubing (supplied in kit) into one-inch segments. Slide tubing over each wire of new switch assembly.
4. Splice existing and new switch wires, matching wire colors. Solder the spliced connections. For best results, do one wire at a time.
5. Center the heat-shrink tubing over the soldered splices.

⚠WARNING

Use caution when operating the UltraTorch UT-100, or any other radiant heating device. Read the manufacturer's instructions carefully before use. Improper handling can result in personal injury. Always keep hands away from tool tip area and heat shrink attachment. Avoid directing the heat towards any fuel system component. Extreme heat can cause fuel ignition or explosion.

6. Using the UltraTorch UT-100 Robinair Heat Gun with heatshrink attachment, or other suitable radiant heating device, uniformly heat the heat-shrink tubing to insulate and seal the soldered connections. Apply heat just until the meltable sealant exudes out both ends of tubing and it assumes a smooth cylindrical appearance.

⚠CAUTION

Electrically connected solder outside the tubing may cause a short to ground.

7. Inspect the melted sealant for solder beads. Excess solder or heat may force some solder out with the melted sealant. Use a small needle nose pliers to remove any solder found. Briefly heat the connection to reseal the tubing if solder beads were removed. Use less solder or reduce heating time or intensity when doing subsequent splices.

HORN

GENERAL

XLH-883 See Figure 7-84

Removal

1. Turn wheel to the right to access horn area. The horn is located between the front downtubes.
2. Remove terminal clips from horn spade connections.
3. Remove the two screws (2) threaded into well nuts (10) on horn bracket.

Installation

1. Thread two screws (2) into well nuts (10) and torque to 6-9 in/lbs (.7-1 Nm).
2. Install harness terminal clips on horn spade connections. Attach the yellow wire with black tracer to rear terminal, black wire to front terminal.

XLH 1200/S See Figure 7-84

Removal

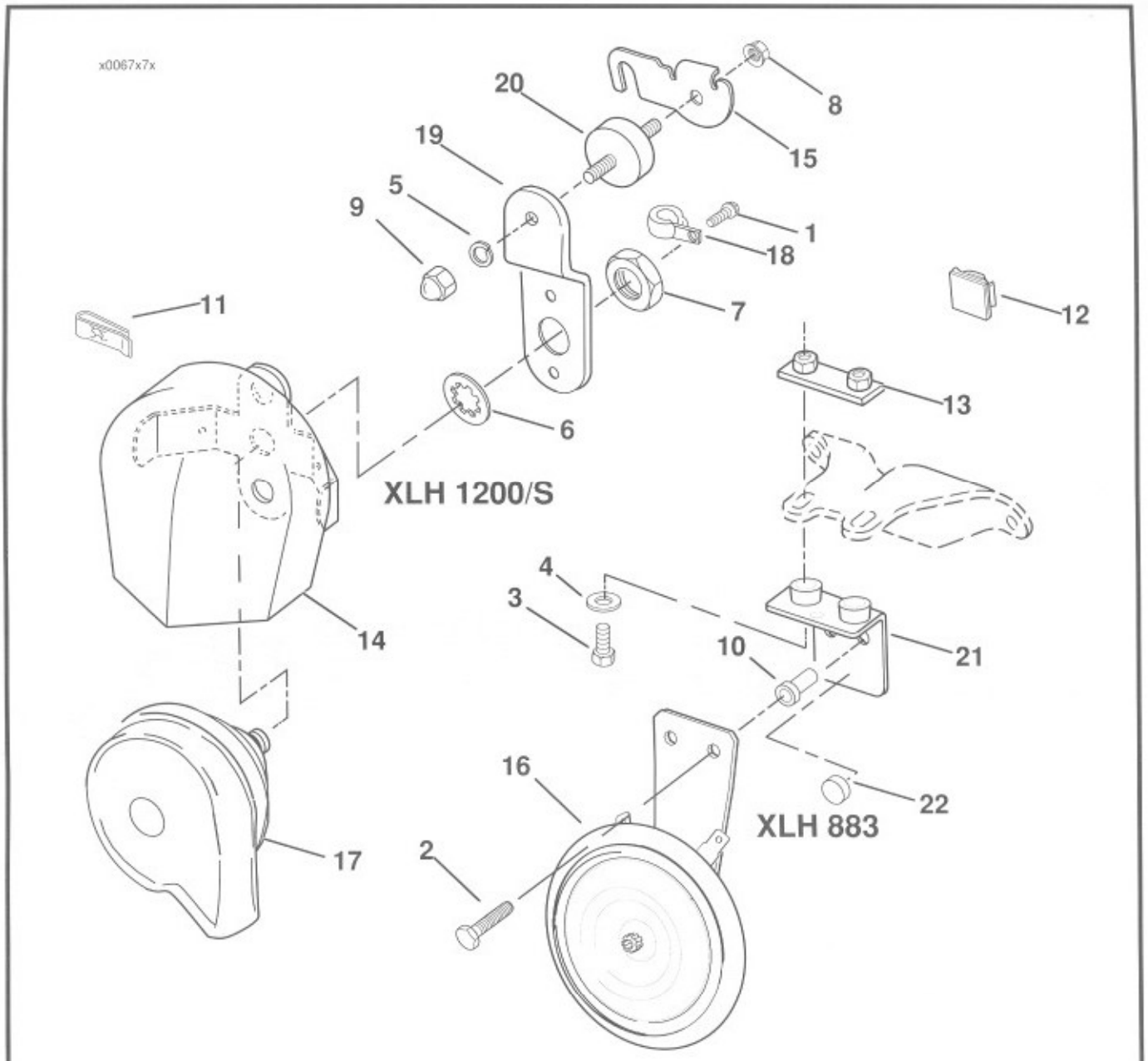
1. Locate the horn on the left side of the vehicle.
2. Remove terminal clips from horn spade connections.
3. Remove acorn nut (9) and lockwasher (5) to free horn assembly from rubber mount stud (22).
4. Remove wire conduit from clamp (18) at back of horn bracket (19).
5. Remove locknut (7) from circular recess at back of horn bracket. Remove horn (17) from chrome horn cover (14). Remove internal tooth lockwasher (6) from horn stud.

Installation

1. Install internal tooth lockwasher (6) on horn stud.
2. Slide horn (17) into chrome cover (14) pushing stud at back of horn assembly through hole in horn bracket (19). Apply two drops of LOCTITE THREADLOCKER 222 (purple) to threads of locknut (7). Install locknut on horn stud and tighten to110 in/lbs (7-14 Nm) torque.
3. Install harness terminal clips on horn spade connections. Attach the yellow wire with black tracer to front terminal, black wire to rear terminal. Push wire conduit into clip at back of horn bracket.
4. Install horn on rubber mount stud (20) of frame mounting bracket. Install lock washer (5) and acorn nut (9) on rubber mount stud. Tighten acorn nut to 5-15 ft-lbs (7-20 Nm) torque.

TROUBLESHOOTING

1. If the horn does not sound or fails to function satisfactorily, check for the following conditions.
   - Discharged battery
   - Loose, frayed or damaged wiring leading to horn terminal
2. If battery has a satisfactory charge and wiring appears to be in good condition, check for the following:
   - Poor ground to frame through mounting hardware or ground wire (see Steps 3-6 below)
   - Inoperative horn switch (see Steps 3-6 below)
3. Remove terminal clips from horn spade connections.
4. Connect a voltmeter as follows:
   - Positive (+) lead to wire terminal
   - Negative (–) lead to ground
5. Turn ignition switch ON. Depress horn switch. If battery voltage is present, horn or horn grounding is faulty. If battery voltage is not present, either horn switch or wiring to horn is faulty.
6. If the horn is faulty, then it must be replaced as an assembly. The horn is not repairable. If the horn switch is faulty, replace the switch according to the procedures outlined in Section 2, HANDLEBAR SWITCHES, REMOVAL AND INSTALLATION.



1. Screw
2. Screw
3. Bolt
4. Washer
5. Lockwasher
6. Lockwasher
7. Nut
8. Locknut
9. Acorn nut
10. Well nut
11. Clip nut
12. Clip
13. Nut plate
14. Cover
15. Support bracket
16. Horn
17. Horn
18. Clamp
19. Horn bracket
20. Rubber mount
21. Horn bracket
22. Bumper

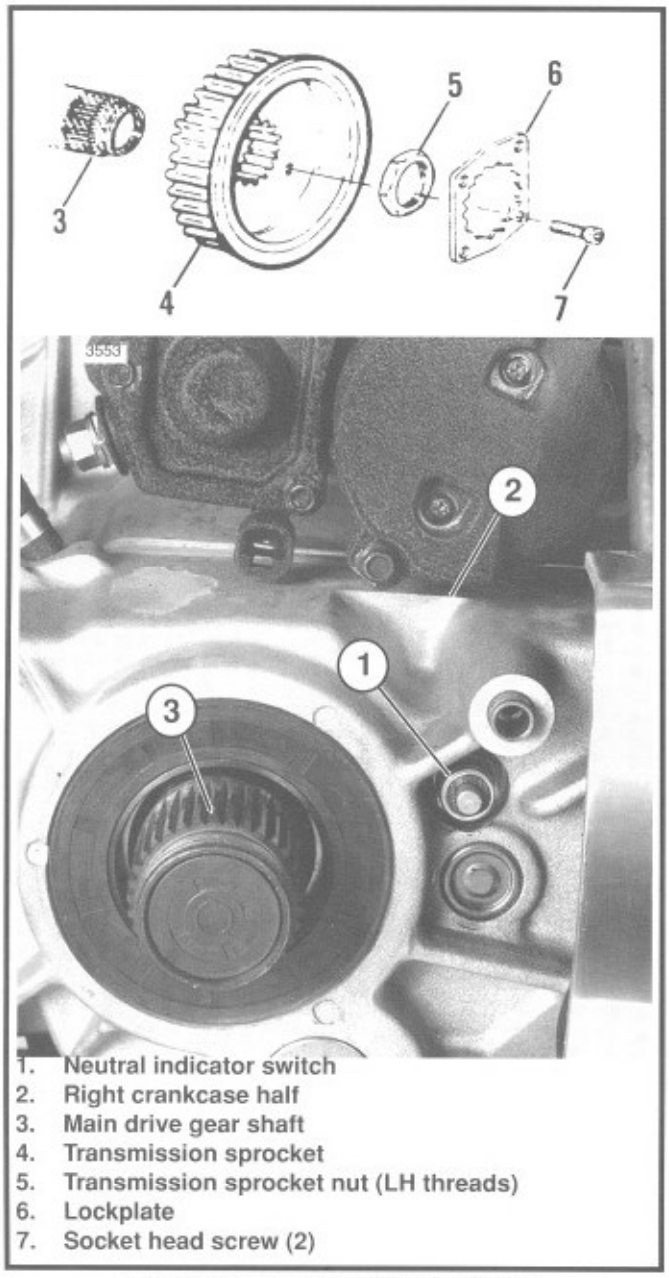
Figure 7-84. Horn assemblies

NEUTRAL INDICATOR SWITCH

GENERAL (Figure 7-85)

The neutral indicator switch (1) is threaded into the transmission portion of the right crankcase half (2); it is immediately forward of the main drive gear shaft (3). The sprocket cover must be removed to test the switch. If switch requires replacement, secondary drive belt and transmission sprocket must also be removed; there is not enough clearance to allow the removal of the switch without first removing the transmission sprocket.

A pin on the shifter drum contacts the neutral indicator switch plunger, completing the neutral indicator circuit. The switch is not repairable; if it malfunctions, it must be replaced.



1. Neutral indicator switch
2. Right crankcase half
3. Main drive gear shaft
4. Transmission sprocket
5. Transmission sprocket nut (LH threads)
6. Lockplate
7. Socket head screw (2)

Figure 7-85. Neutral Indicator Switch

TESTING (Figure 7-85)

1. Remove sprocket cover; see REAR BRAKE LINKAGE AND SPROCKET COVER, REMOVAL in Section 2.
2. Disconnect wire lead from neutral indicator switch (1).
3. With ignition switch ON, touch the neutral indicator wire lead to a suitable ground.
   - If indicator lamp lights, then problem is at indicator switch. Replace switch.
   - If indicator lamp does not light, then problem is elsewhere in circuit (i.e. indicator lamp burned out, loose connection, or faulty wiring).
4. After testing, connect wire lead to indicator switch (1). Install sprocket cover and any other removed components; see REAR BRAKE LINKAGE AND SPROCKET COVER, INSTALLATION in Section 2.

REMOVAL AND INSTALLATION (Figure 7-85)

1. Verify that the ignition/light switch is turned to OFF.
2. Remove sprocket cover; see REAR BRAKE LINKAGE AND SPROCKET COVER, REMOVAL in Section 2.
3. Place transmission in first gear. Remove two socket head screws (7) and lockplate (6).

⚠CAUTION

Transmission sprocket nut has left-hand threads. Turn nut clockwise to loosen and remove from main drive gear shaft.

4. Remove transmission sprocket nut (5) from main drive gear shaft (3).
5. Decrease secondary drive belt tension according to the applicable procedures listed in SECONDARY DRIVE BELT, REMOVAL in Section 6. Remove transmission sprocket (4) (with secondary drive belt) from main drive gear shaft (3).
6. Remove wire lead from neutral indicator switch (1). Remove switch from right crankcase half (2).
7. Apply a light coating of LOCTITE THREADLOCKER 242 (blue) to new neutral indicator switch (1) threads. Install switch in crankcase (2), and tighten switch to 3-5 ft-lbs (4-7 Nm) torque. Connect wire lead to switch.
8. Install transmission sprocket (4) (with secondary drive belt) onto main drive gear shaft (3) according to applicable procedures listed in TRANSMISSION INSTALLATION AND SHIFTER PAWL ADJUSTMENT in Section 6.
9. Install sprocket cover and any other removed components; see REAR BRAKE LINKAGE AND SPROCKET COVER, INSTALLATION in Section 2.
10. Adjust secondary drive belt tension; see SECONDARY DRIVE BELT, ADJUSTMENT in Section 6.

DIRECTIONAL (TURN SIGNAL) CANCELLER

OPERATION (Figure 7-86)

General

Both the directionals (turn signals) and 4-way flashers are controlled by an electronic module (self-canceller).

The module is secured to the rear fender, under the seat.

The canceller contains circuitry to generate pulses for "flashing" the appropriate directional lamps, thereby eliminating the previously used directional and hazard flashers. Steps 1 and 2 below explain canceller operation when a rider signals for a left turn; step 3 explains canceller operation when a right turn is signalled.

1. Pressing and releasing the left turn signal switch causes a momentary 12 vdc to be applied to Pin 8. The module sends a series of 12 vdc pulses (Pin 4) to flash the left directional lamps (front and rear).

2. The module monitors the number of vehicle speed sensor pulses from the speedometer at Pin 5. The switch closures indicate vehicle distance traveled. When the number of switch closure pulses equals a quantity preset in the self-cancelling module, the left turn signal is automatically canceled.

3. Pressing and releasing the right turn signal switch causes a momentary 12 vdc to be applied to Pin 7 and an output at Pin 3 identical to that just described for a left turn signal.

Manual or Rider Control

Directionals may be cancelled by pressing the turn signal switch a second time. Pressing the left turn signal switch while the right turn signal lamps are flashing will cancel the right turn lamps and activate the left turn lamps (and vice versa).

Hazard Flasher (4-Way)

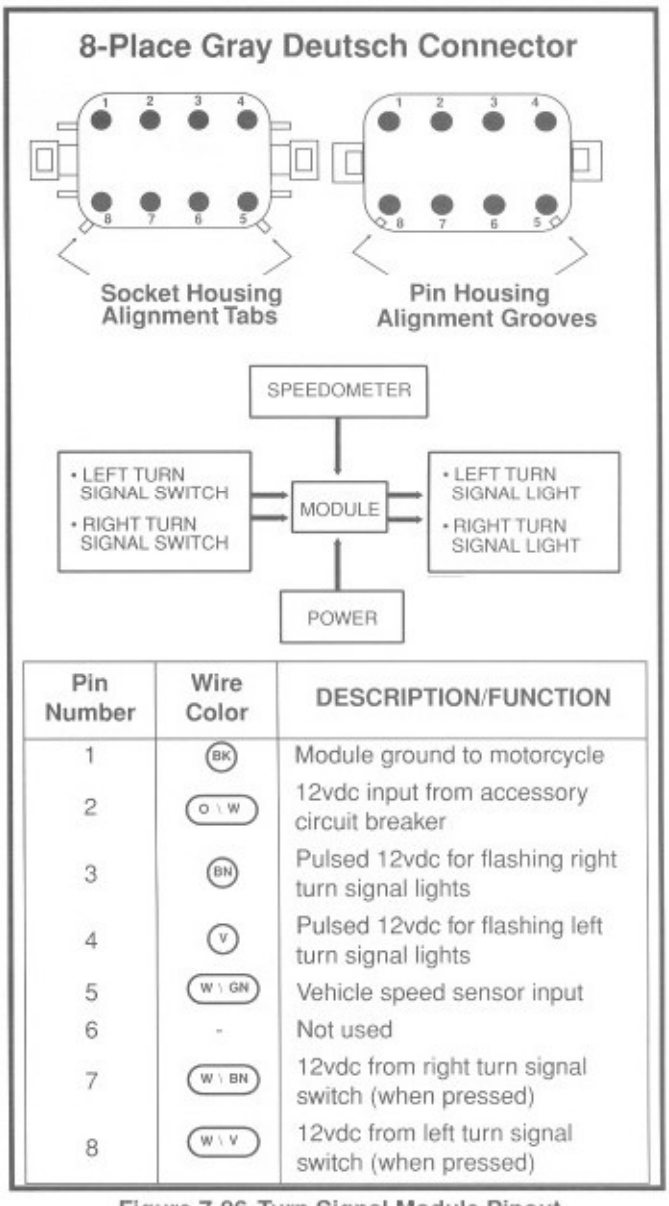
To activate the hazard flashers, simultaneously press and hold both right and left turn signal switches for 1-1/2 seconds. To cancel hazard flashers, momentarily press and release right and left turn signal switches simultaneously.

DISTANCE TEST

Directionals cancel after rear wheel travels a certain distance at a specific speed. Turn signal module begins measuring the distance traveled immediately upon release of the turn signal switch button.

Directionals will remain flashing for the following distances within the speed ranges specified:

Speed range #1	0-34 mph 0-48 km/h	221 ft. (0.04 mi.) 67 m
Speed range #2	35-44 mph 56-71 km/h	339 ft. (0.06 mi.) 103 m
Speed range #3	45-60 mph 74-97 km/h	680 ft. (0.13 mi.) 207 m
Speed range #4	61+ mph 98+ km/h	1051 ft. (0.20 mi.) 320 m



Pin Number	Wire Color	DESCRIPTION/FUNCTION
1	BK	Module ground to motorcycle
2	O \ W	12vdc input from accessory circuit breaker
3	BN	Pulsed 12vdc for flashing right turn signal lights
4	V	Pulsed 12vdc for flashing left turn signal lights
5	W \ GN	Vehicle speed sensor input
6	-	Not used
7	W \ BN	12vdc from right turn signal switch (when pressed)
8	W \ V	12vdc from left turn signal switch (when pressed)

Figure 7-86. Turn Signal Module Pinout

NOTE

Distance test and time test can also be performed using the speedometer tester (HD-41354) as an input device.

To check module operation, proceed as follows:

1. Operate the motorcycle at 15 mph (24 km/h), which is the midpoint of speed range #1.
2. Press and release right turn switch button. Closely monitor vehicle speed and odometer reading. Measure the distance traveled from the time the button is released to the time the directional cancels.
3. Repeat steps 1 and 2 for left turn.

NOTE

Since the odometer's smallest unit-of-measure for distance (0.1 mile) is larger than the distance you will be measuring for speed range #1 (0.04 mile), you will need to release the turn signal switch button when a number is completely centered on the odometer's tenths wheel and watch for the point where the tenths wheel has rotated 4/10 of the way toward the next number.

4. Repeat steps 2 and 3 for right and left turns at midpoint of speed ranges 2 through 4.
5. If the distances observed in Steps 1 through 4 are not correct, check the following:
   a. Turn signal module ground and module pin connections.
   b. Vehicle speed sensor operation, connections and grounds.
   c. Replace module with one known to be good and repeat DISTANCE TEST.

NOTE

Turn signal module and turn signal lamps must have the same ground potential; grounds for both module and lamps must have good continuity to one another.

ALTERNATE TIME TEST

Another way of checking the self-cancelling turn signal module is to measure the length of time the directional operates at a constant vehicle speed. From the instant the turn signal switch button is released, measure the number of seconds that elapse before the directional cancels.

The approximate elapsed times at four constant speeds should be as follows:

CONSTANT SPEED	TURN SIGNAL ELAPSED TIME (in seconds)
25 mph (40 km/h)	5-7
38 mph (61 km/h)	5-7
52 mph (84 km/h)	8-10
65 mph (105 km/h)	10-12

RIDER PREFERENCE AND CONTROL

To extend the distance/time that directionals flash, simply press and hold the turn signal switch button. Since the module does not begin to measure distance traveled and time elapsed until the switch button is released, the flashing sequence is prolonged.

To shorten the distance/time that directionals flash, press the turn signal switch button a second time while the directionals are still flashing. This procedure immediately cancels the turn signal.

TROUBLESHOOTING

See the following chart for troubleshooting procedures.

⚠CAUTION

Do not apply 12 vdc to self-cancelling module without pin 1 connected to ground or module will be damaged.

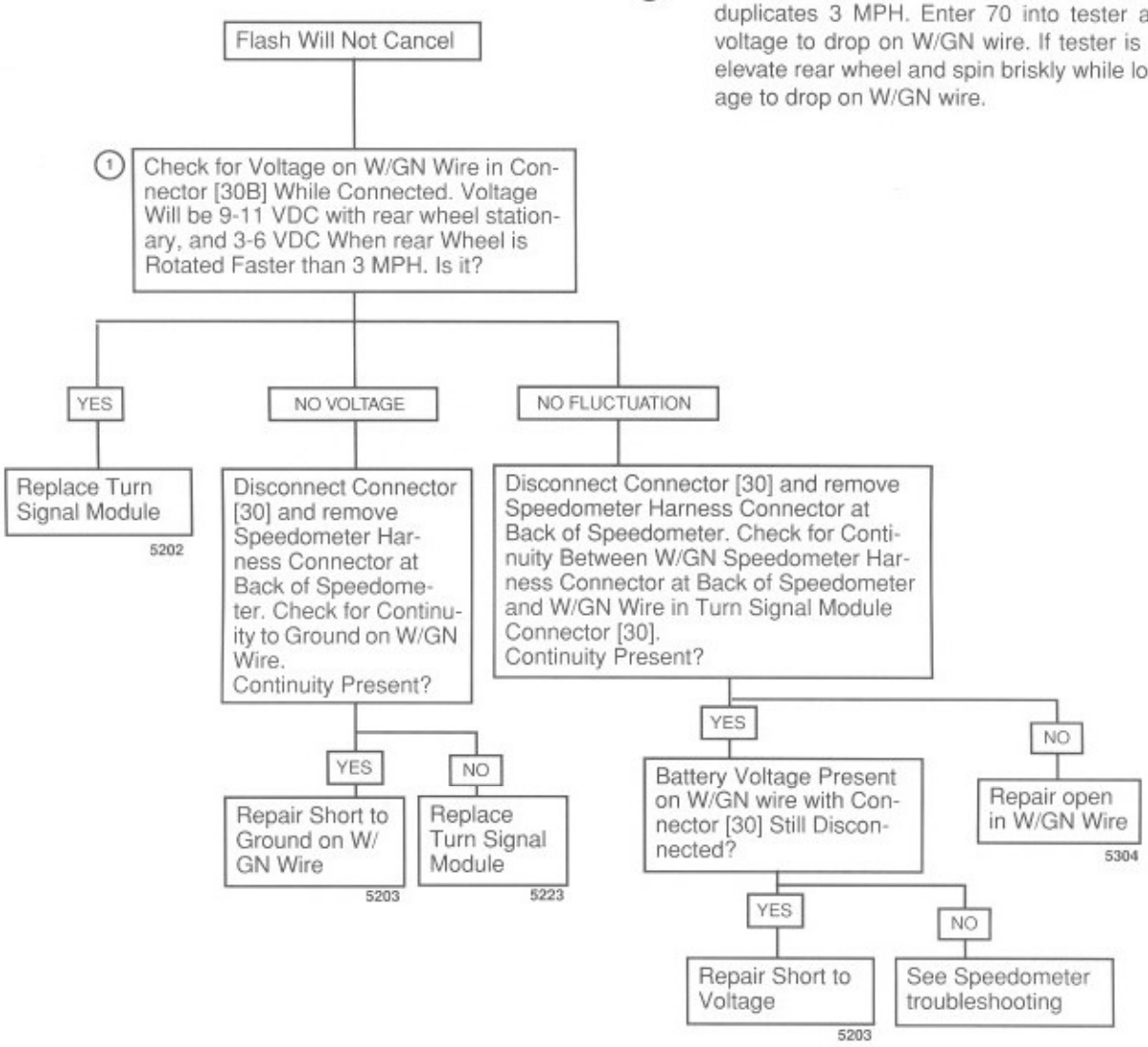
Turn Signal Troubleshooting - 883 Only

Use this chart for Speedometer trouble codes 9 (speed output shorted high) and 10 (speed output shorted low or open).

DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

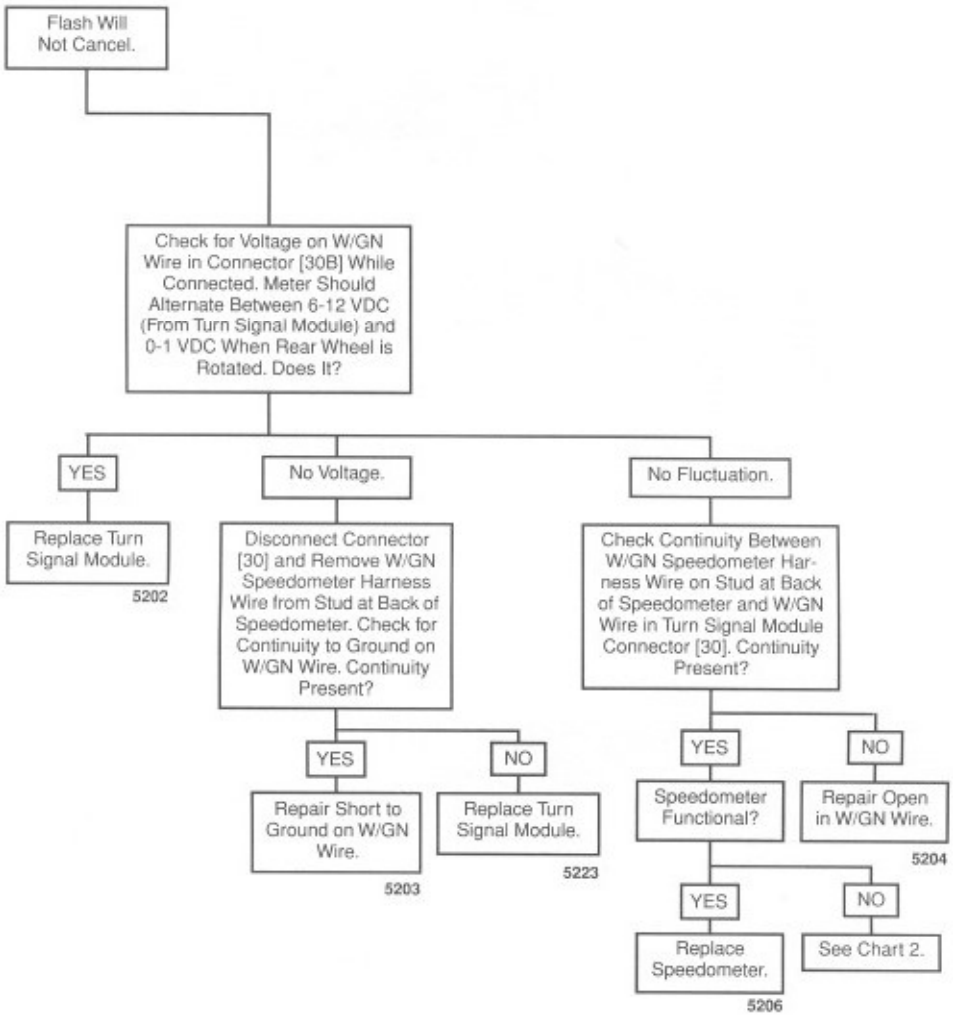
① Use Speedometer tool HD-41354 to input a signal which duplicates 3 MPH. Enter 70 into tester and watch for voltage to drop on W/GN wire. If tester is not available, elevate rear wheel and spin briskly while looking for voltage to drop on W/GN wire.



Numbers below boxes refer to the Warranty Code

Turn Signal Troubleshooting -1200 Models

Chart 1: Turn Signals Will Not Cancel.



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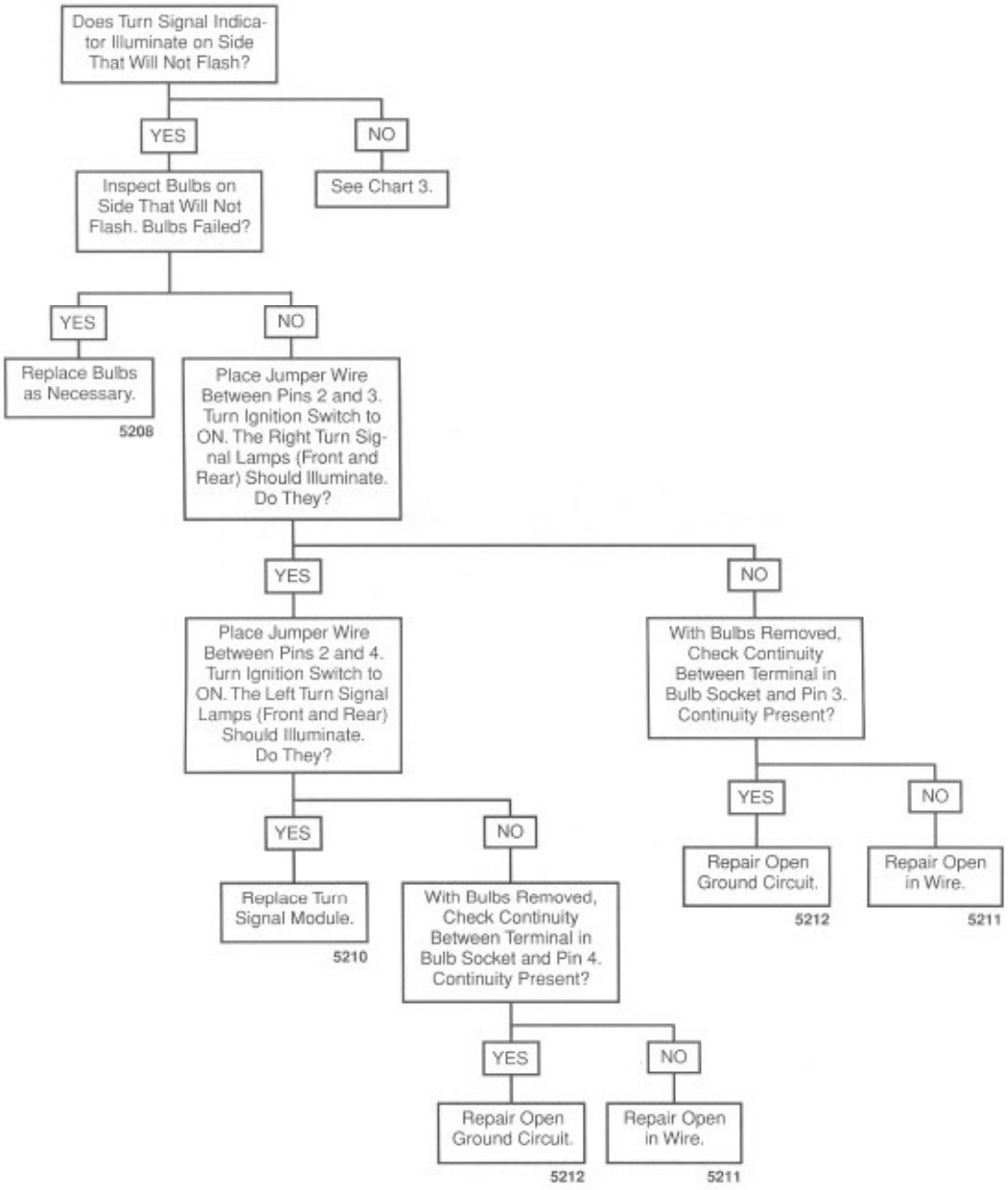
Turn Signal Troubleshooting - 1200 Models

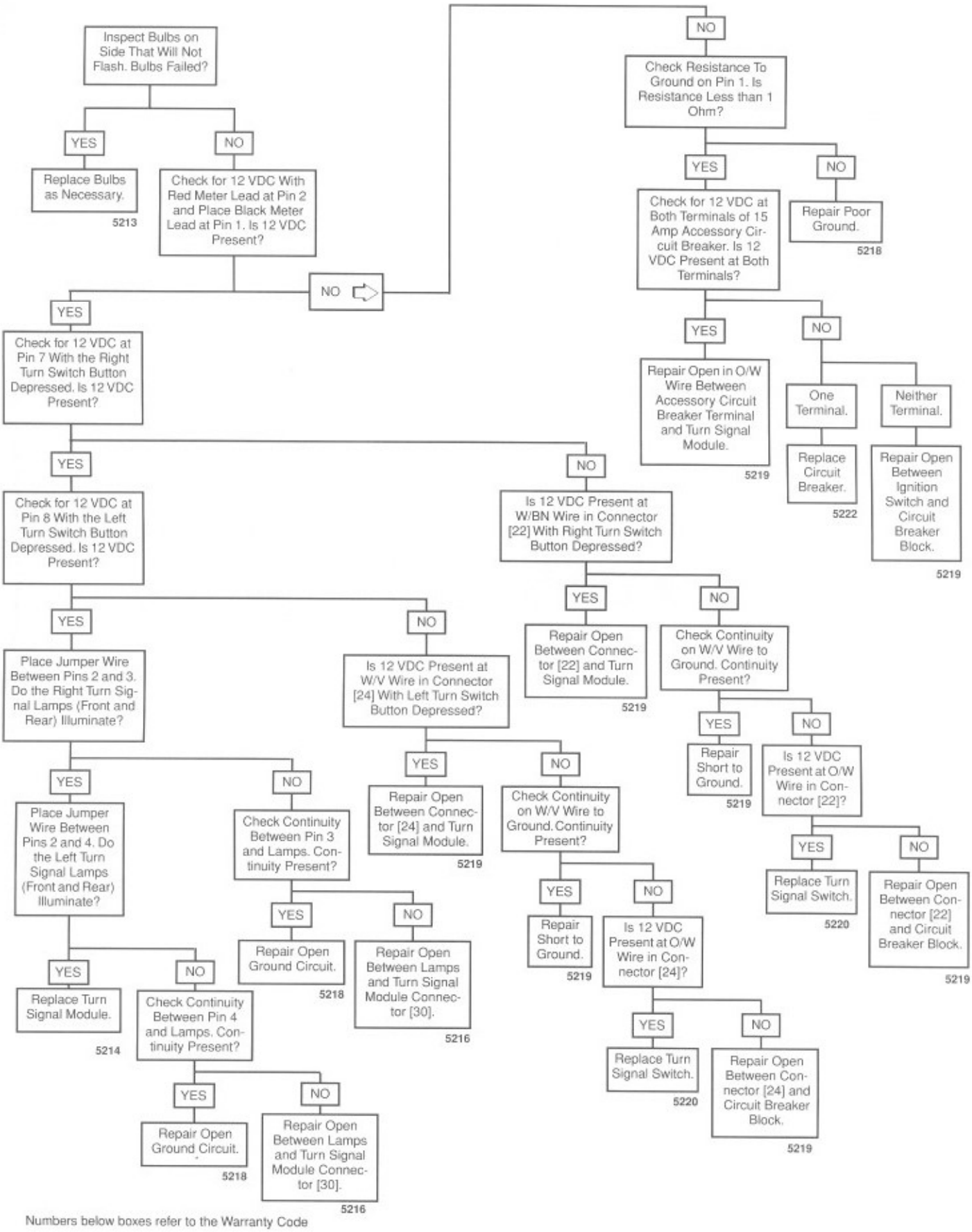
Chart 2: Turn SignalsWill Not Flash Right, Will Not Flash Left.



Numbers below boxes refer to the Warranty Code

Turn Signal Troubleshooting

Chart 3: Turn Signals Will Not Flash, 4-Way Flashers Inoperable.



Numbers below boxes refer to the Warranty Code

REMOVAL/INSTALLATION - DIRECTIONAL CANCELLER

1. Remove seat. See SEAT, REMOVAL in Section 2.
2. Verify that the ignition/light switch is turned to OFF.
3. On 1200S models:
   - Remove two bolts to detach electrical bracket from frame cross member.
   - Lift up electrical bracket.
4. Disconnect connector [30B]. Simultaneously depress the two external latches and use a rocking motion to separate pin and socket halves of directional canceller connector.
5. Remove screw securing module to rear fender. Remove module.
6. Align new self-cancelling turn signal module and insert screw. Tighten screw to 3-5 **in-lbs** (.3-.6 Nm)
7. Align tabs on socket housing with grooves on socket plug of module. Push connector until latches "click."
8. On 1200S models:
   - Align holes in electrical bracket with wellnuts in cross member of motorcylcle frame.
   - Install two bolts in electrical bracket.
   - Tighten bolts to 6-9 **in-lbs** (0.7-1.0 Nm) torque.
9. Test all turn signal functions. See DISTANCE TEST OR ALTERNATE TIME TEST in this section.
10. Install seat. See SEAT INSTALLATION in Section 2.

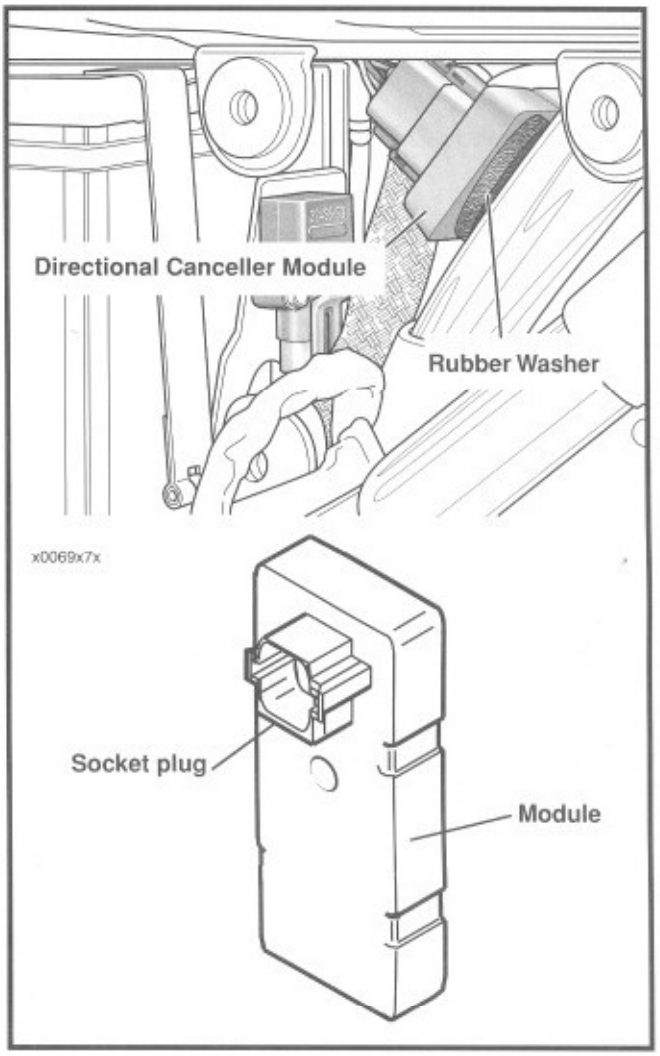


Figure 7-87. Directional Canceller

FUSES and MAIN CIRCUIT BREAKER

GENERAL (Figure 7-88)

Fuses function to prevent electrical overload of a circuit. The fuse completes the circuit as long as current (amperage) flowing through the fuse does not exceed the ampere rating of the fuse. If the circuit current happens to exceed the fuse ampere rating, the fuse opens and the current flow in the circuit is interrupted.

The Main circuit breaker is the automatic-reset type, the bimetallic breaker contact automatically closes (completing the circuit) once it has cooled down from the initial overload. If the overload condition still exists, the breaker contact will again open to interrupt current flow. This "cycling effect" (opening and closing) of the breaker contact continues as long as the current circuit overload condition exists.

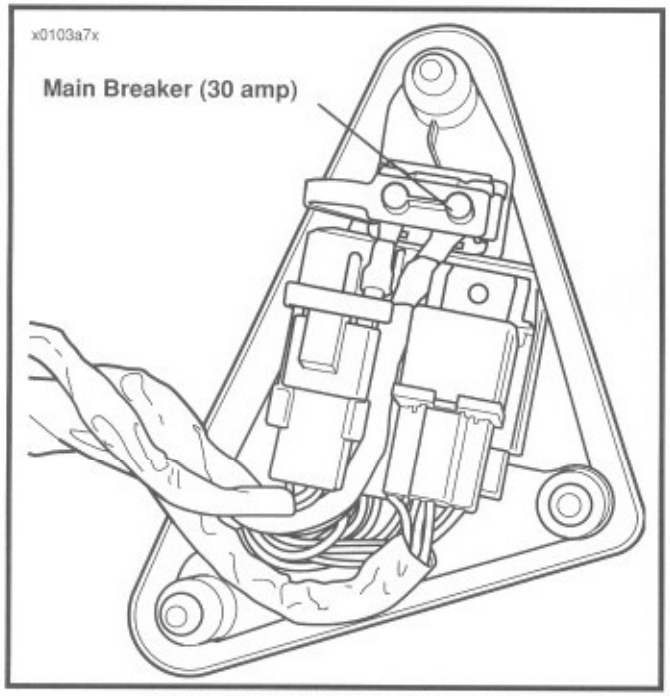


Figure 7-88. Main Circuit Breaker

⚠WARNING

To prevent accidental start-up of vehicle and possible personal injury, disconnect battery cables (negative cable first) before performing any electrical work.

XLH models have 4 fuses and one circuit breaker, all of which are installed on the electrical bracket (under side cover). The fuses are all rated at 15 amperes. The main circuit breaker is rated at 30 amperes.

- See ELECTRICAL BRACKET, REPLACE FUSES in this section.
- See ELECTRICAL BRACKET, REPLACE MAIN CIRCUIT BREAKER in this section

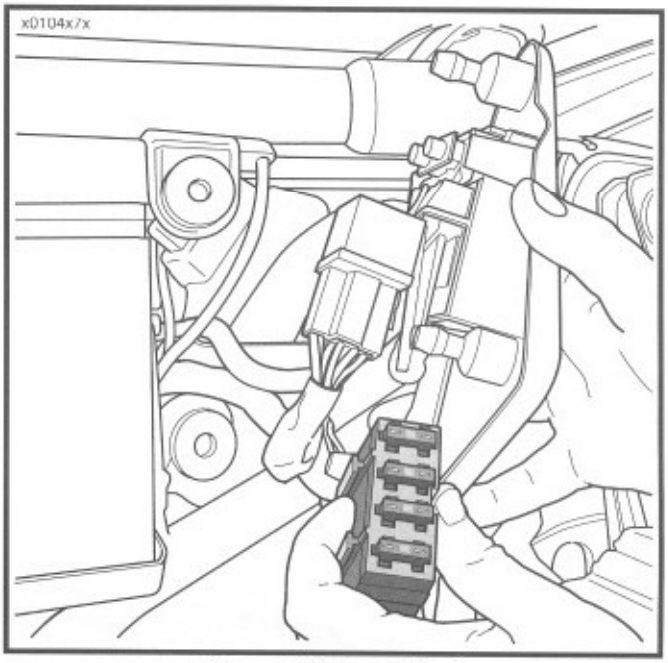


Figure 7-89. Fuse Block

ELECTRONIC SPEEDOMETER - HOW IT WORKS

The electronic speedometer consists of a speed sensor, function switch and the speedometer. The speed sensor is mounted on the right side of transmission case below the starter. The sensor circuitry is that of a Hall-Effect sensor that is triggered by the gear teeth of 5th gear on the transmission mainshaft. The output from the sensor is a series of pulses that are interpreted by speedometer circuitry to control the position of the speedometer needle and the liquid crystal display (LCD) odometer display. The odometer mileage is permanently stored and will not be lost when electrical power is turned off or disconnected. The function switch allows switching or "toggling" between the odometer and trip odometer displays. To zero the trip odometer, have the odometer display visible, press and keep the function switch depressed. The trip odometer mileage will be displayed for 2-3 seconds and then the mileage will return to zero miles.

The odometer can display seven numbers to indicate a maximum of 999999.9 miles. The trip odometer can display five numbers for a maximum of 9999.9 miles.

Circuitry in the speedometer also conditions the sensor input to provide an input to the turn signal canceller.

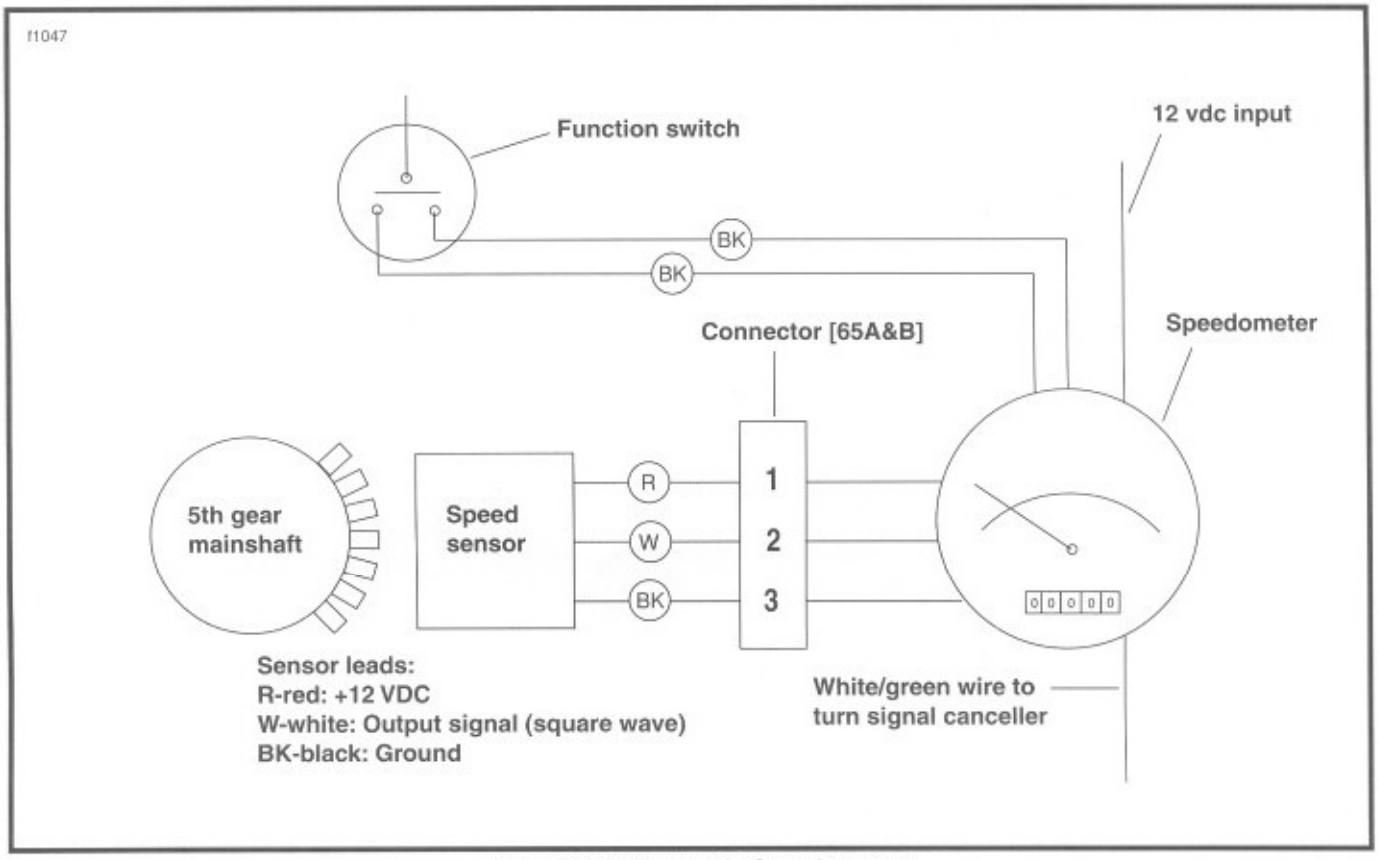


Figure 7-90. Electronic Speedometer

ELECTRONIC SPEEDOMETER AND TACHOMETER

Speedometer Removal - 1200 models

1. Remove seat and fuel tank. Detach speedometer sensor plug from frame T-stud. Unplug connector [65]. Cut cable straps holding sensor harness. Free harness from battery area and allow to hang free from front of motorcycle.
2. Detach headlight assembly from top of fork bracket to allow removal of speedometer sensor harness. On 1200 Custom remove fork bracket cover and riser cover.
3. Remove odometer reset boot from back of housing.
4. Remove socket head screws holding back of speedometer housing.
5. See Figure 7-92. Remove nuts from terminal studs 1, 2, and 4. Remove wires from studs. On vehicles where speedometer wires may have been wired directly into the speedometer, cut the wire approximately 1" from the speedometer. Strip 3/16" off of end of wire and crimp the ring terminal from the new speedometer kit onto the wire using the Packard crimper 115 (HD-38125-8) using the 20-18 crimping die for the core crimp.
6. Loosen back gasket and push instrument through front of housing toward rear of motorcycle. Remove gasket from instrument.

Speedometer Installation - 1200 models

1. Install gasket removed in Step 6, above.
2. Slide speedometer into instrument housing and press firmly until fully seated.
3. See Figure 7-92. Install wires back on terminals 1, 2, and 4.
4. Route wires through slot in back of instrument housing. Install gasket on back of housing.
5. Position reset switch in squared boss on back of speedometer housing.
6. Align back cover. Install back cover screws and tighten. Replace rubber boot on odometer reset switch.
7. Route speedometer sensor cable along main wiring harness. Route connector behind battery up through frame. Reconnect sensor.

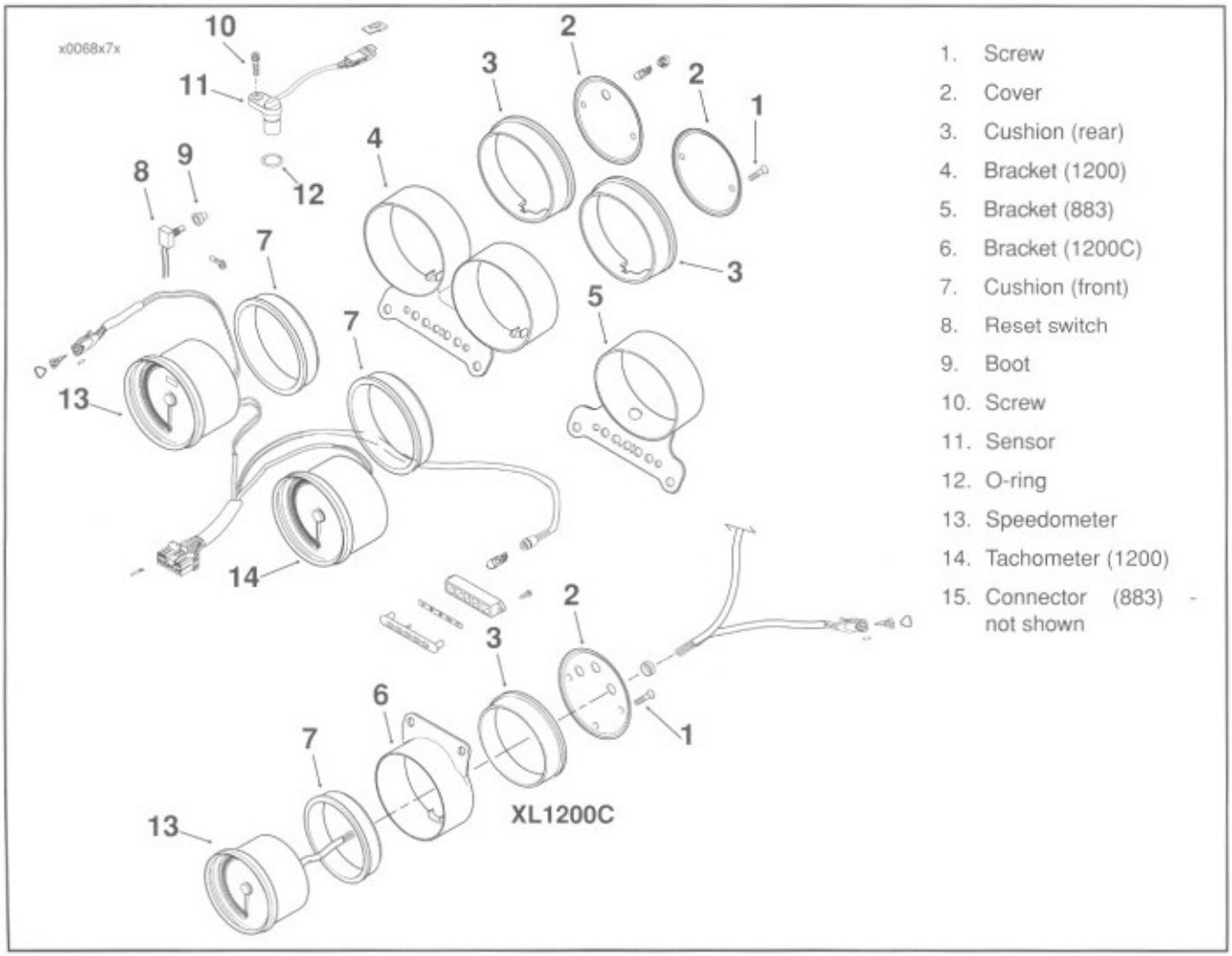


Figure 7-91. Speedometer and Tachometer

8. Position toward frame (away from spark plug cable). Replace cable straps.
9. Install headlamp bracket to top fork bracket.
10. On 1200 Custom install riser and fork bracket cover.
11. Install fuel tank.
12. Install seat.
13. Check headlamp alignment.
14. Check speedometer for proper operation.

Speedometer Removal - 883 models

1. Remove odometer reset boot from back of housing.
2. Remove socket head screws holding back of speedometer housing.
3. Depress tab and remove connector.
4. Loosen back gasket and push instrument through front of housing toward rear of motorcycle. Remove gasket from instrument.

Speedometer Installation - 883 models

1. Install gasket removed in Step 4, above.
2. Slide speedometer into instrument housing and press firmly until fully seated.
3. Insert connector.
4. Route wires through slot in back of instrument housing. Install gasket on back of housing.
5. Position reset switch in squared boss on back of speedometer housing.
6. Align back cover. Install back cover screws and tighten. Replace rubber boot on odometer reset switch.

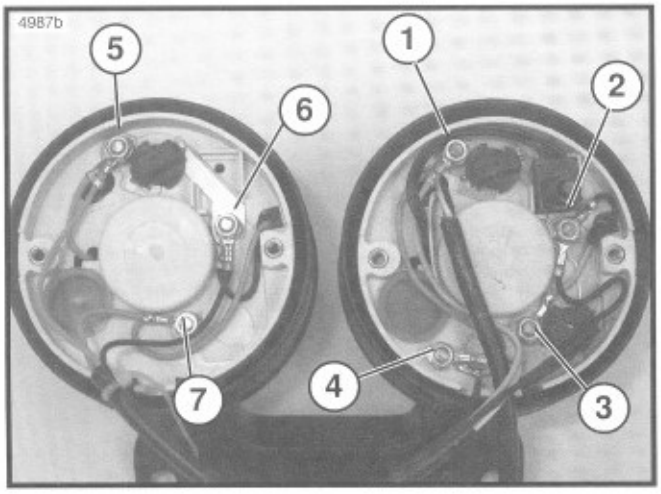


Figure 7-92. Speedometer and Tachometer

Tachometer Replacement

Removal

1. Remove socket head screws holding back of tachometer housing.
2. See Figure 7-92. Remove 9/32" nuts from terminal studs 5, 6, and 7. Remove wires from studs.
3. Loosen back gasket and push instrument through front of housing toward rear of motorcycle. Remove gasket from instrument.

Installation

1. Install gasket removed in Step 3, above.
2. Slide Tachometer into instrument housing and press firmly untill fully seated.
3. See Figure 7-92. Install wires back on terminals 5, 6, and 7.
4. Route wires through slot in back of instrument housing. Install gasket on back of housing.
5. Align back cover. Install back cover screws and tighten.

Speedometer Sensor Replacement

Removal

1. Remove seat. See SEAT, REMOVAL in Section 2.
2. Disconnect battery cables, negative cable first. See BATTERY, DISCONNECTION AND REMOVAL. Remove battery from tray.
3. See Figure 7-93. Push the 3-place connector [65] located on the frame underneath the seat forward to dislodge connector from t-stud and disconnect the connector. Cut the cable straps that retain sensor wires to main harness bundle.
4. Remove sensor mounting screw using allen socket tool (Snap-On P/N TMAXS6) and lift sensor from crankcase.

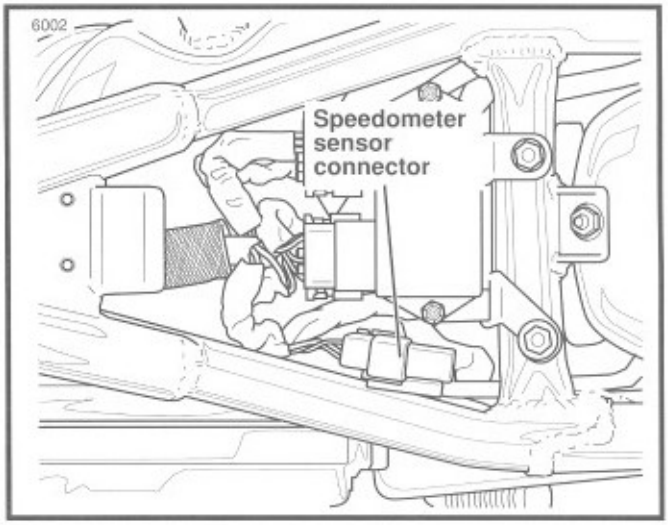


Figure 7-93. Speedometer sensor connector (1200S shown

Remove assembly from left side by lifting the transmission vent hose up far enough to allow the sensor to pass and then remove it.

Installation

1. Route the speedometer sensor underneath the transmission vent hose from left and install sensor into crankcase from right side of vehicle. Install sensor mounting screw and torque to 80-100 in/lbs (9-11 Nm).
2. Route the sensor cable back into position along main wiring harness bundle and retain with cable straps.
3. Check speedometer for proper operation.

Reset switch Replacement

Removal

1. Remove odometer reset boot from back of housing.
2. Remove socket head screws holding back of speedometer housing.
3. Cut wires from switch

Installation

1. Follow instructions for installing SEALED WIRE SPLICES.
2. Position reset switch in squared boss on back of speedometer housing.
3. Align back cover. Install back cover screws and tighten. Replace rubber boot on odometer reset switch.

883 Speedometer (Late Model)

Late model 1998 XLH 883 Models have a speedometer with self-diagnostic capabilities.

A "late-model" Speedometer can be identified by the following means:

- Amber backlight.
- At power-up the Speedometer will "over drive" at zero momentarily and the needle will "quiver" or "vibrate" visibly.
- Removing cover will show 12 pin connector.
- Press and hold in odometer reset at "key ON" will enable diagnostic mode.

General
The reset switch is used to change the odometer display between mileage and trip values and to reset the trip odometer. It is also used to identify the speedometer calibration and to enter the diagnostic mode, clear diagnostic codes and exit diagnostic mode.

Diagnostic Mode
The diagnostic mode is entered by turning the ignition from OFF to ON while holding the reset switch in. The normal power-up sequence will occur before entering the diagnostic mode. Diagnostic codes set during this power-up sequence will be stored as well.

IMPORTANT NOTE

Be sure no Diagnostic codes are indicated before reset is held in for more than 5 seconds or diagnostic information will be lost.

When in the diagnostic mode the odometer will display the first diagnostic code. When the trip switch is pressed again the next code will be shown. If the trip switch is pressed for more than 5 seconds at any time while in the diagnostic mode, **all of the diagnostic codes will be erased whether they have been displayed or not**.

There are 7 different diagnostic codes available. They are as follows:

d01 - Speed sensor power output shorted low

d02 - Speed sensor power output shorted high or open

d03 - Not used

d04 - Not used

d05 - Speed sensor return shorted high

d06 - Speed sensor return shorted low

d07 - Not used

d08 - Speedometer power overvoltage

d09 - Speed output shorted high

d10 - Speed output shorted low or open

CAL XX - Speedometer application calibration number:

14 = Domestic

15 = HDI

When in the diagnostic mode, all codes are displayed in sequence from d01 to d10.

As a code appears in the display (for instance d02), it will read "d02SEt" if set or "d02CLr" if clear.

The diagnostic mode is exited either by turning ignition from ON to OFF to ON again without depressing the reset switch or if a speed signal greater than 5 MPH is detected.

Diagnostics cannot be performed if system voltage is less than 9 VDC or greater than 16 VDC. The only exception is **d08** which is set when system voltage is greater than 16VDC.

After all the diagnostic codes are displayed, the speedometer calibration number is displayed (**CAL 14** for example).

SPEEDOMETER/TACHOMETER PERFORMANCE CHECK

GENERAL

The performance (proper operation and sweeping action) of the speedometer and tachometer (if equipped) can be evaluated with the speedometer tester, HD-41354. This tester generates a signal that simulates the signal from the speedometer sensor for checking speedometer operation. The tester can also be connected to the cam position sensor connector to introduce a signal to the ignition module that simulates the signal from the cam position sensor. This configuration is used to test tachometer performance.

Also, the signal generated by the speedometer tester can be used to simulate running engine conditions for ignition system troubleshooting. See IGNITION SYSTEM for more information on performing tests.

NOTE

Use the following procedures in conjunction with the manual supplied with the speedometer tester.

SPEEDOMETER TESTS

NOTE

The speedometer tester, HD-41354, cannot be used to verify the calibration of a speedometer and it will not verify the speedometer's function to support legal proceedings. It's purpose is to verify speedometer function when performing service diagnosis or repair, and to assist in determining if speedometer replacement is necessary.

Operation Test

1. See Figure 7-94. Disconnect speedometer sensor connector [65]. Install speedometer tester connector into speedometer sensor connector [65B] as shown.

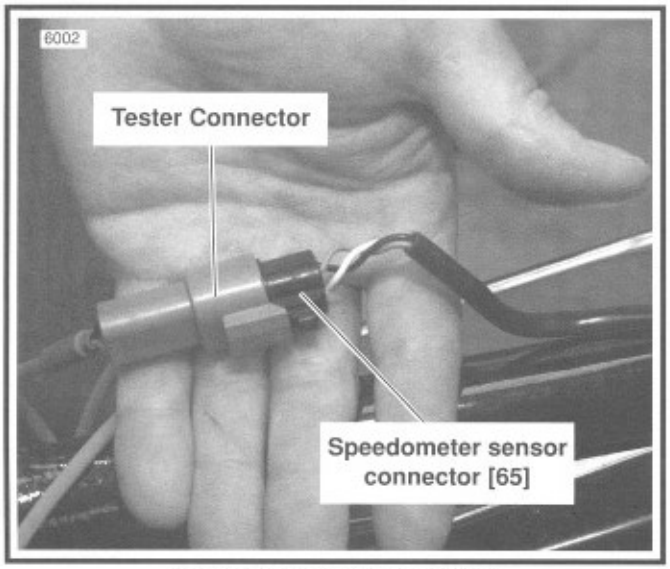


Figure 7-94. Test Connection

2. See Figure 7-71. Place speedometer tester power switch in the "ON" position, and the signal switch in the "OUT" position.

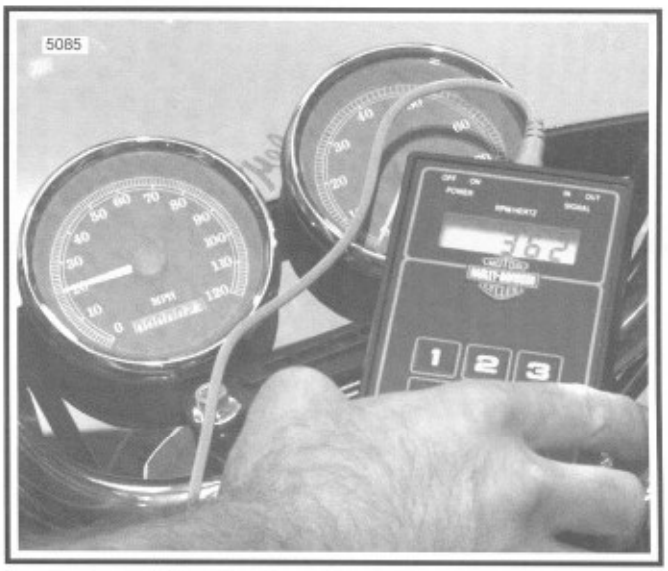


Figure 7-95. Speedometer Tester

3. Turn the ignition switch "ON". Press "ENTER" on the tester keypad. Enter the frequency shown on the table below, press "ENTER", then check that the speedometer reads the corresponding speed. To change the frequency, press "CLEAR" to cancel, and enter the new frequency, and press "ENTER" to begin. The speedometer should be accurate within -0 mph to +4 mph (-0 kph to +6.5 kph).

Model (units)	Tester Frequency (in Hz) Corresponding to			
	20 mph (30 kph)	40 mph (60 kph)	60 mph (100 kph)	80 mph (130 kph)
1200 DOM & GB	408	814	1216	1613
1200 HDI	381	760	1259	1629
883 DOM & GB	439	874	1306	1733
883 HDI	409	816	1353	1750

Sweep Test

The tester's sweep function moves the speedometer needle through the full range of needle movement to allow testing for smoothness of operation, hesitancy, or needle sticking.

1. With tester connected as in operation test, place speedometer tester power switch in the "ON" position, and the signal switch in the "OUT" position.
2. Turn the ignition switch "ON". Press 0, then press "ENTER" on the tester keypad. The tester will scan for two seconds, then the tester will put out 1 Hz.
3. Use the 2, 5, and 8 keys to select one of three ranges, LO (1-20 Hz), CEN (21-999 Hz), or HI (1000-20,000 Hz).
4. After selecting a range, use the corresponding arrow keys to accelerate through the range. For example keys 1 and 3 move through the LO range. As you move through the speed range, check for smooth needle movement.

TACHOMETER TEST

Operation Test

1. Connect the speedometer tester to the cam position sensor Deutsch socket housing [14B]. The tester frequency you enter will now travel to the ignition module and the module will open and close circuits to fire the spark plugs. This allows you to simulate engine running and generate tachometer readings.
2. Because tester frequency is in Hertz, and you will be interested in measuring rpm on the tachometer being tested, convert the tachometer reading you want to Hz, then enter the frequency just as you did in the speedometer operation test above.

   For example:

   2000 rpm (tachometer reading) ÷ **60**
   = **33.3** (enter 33 into tester)

   In this example, entering 33 Hz into the tester should result in an rpm reading of 2000 on the tachometer. Test the tachometer at several different rpm readings to verify proper operation.

Tachometer Accuracy Tolerances at 68˚-77˚F (20˚-25˚C)				
Indication (rpm)	2000	4000	6000	7500
Tolerance (rpm)	±100	±120	±210	±320

Sweep Test

Just as in the speedometer sweep test above, variable frequency signals can be generated by the speedometer tester to help verify proper tachometer sweep operation. With the speedometer tester installed at the cam position sensor connector [14B], perform the tachometer sweep test following the speedometer sweep test steps described above.

SPEEDOMETER SENSOR TEST

If the speedometer is inoperative, but backlighting and odometer work, the speedometer sensor may not be working.

To test the speedometer sensor as described below, as well as the cam position sensor test using the tachometer tester (described in IGNITION SYSTEM), a test harness is required. Fabricate the test harness by splicing together two Deutsch 3-place socket housings (72113-94BK) and one Deutsch 3-place pin housing (72103-94BK). Use six inch lengths of 18 gage wire. Install the test harness at the cam position sensor connector [14].

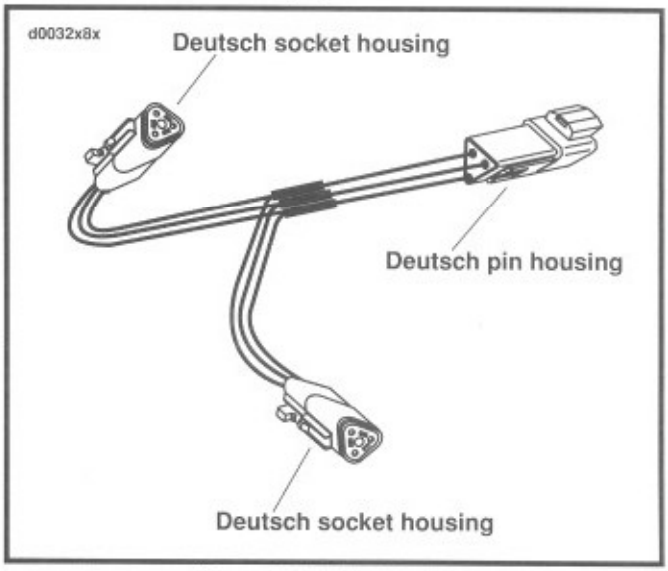


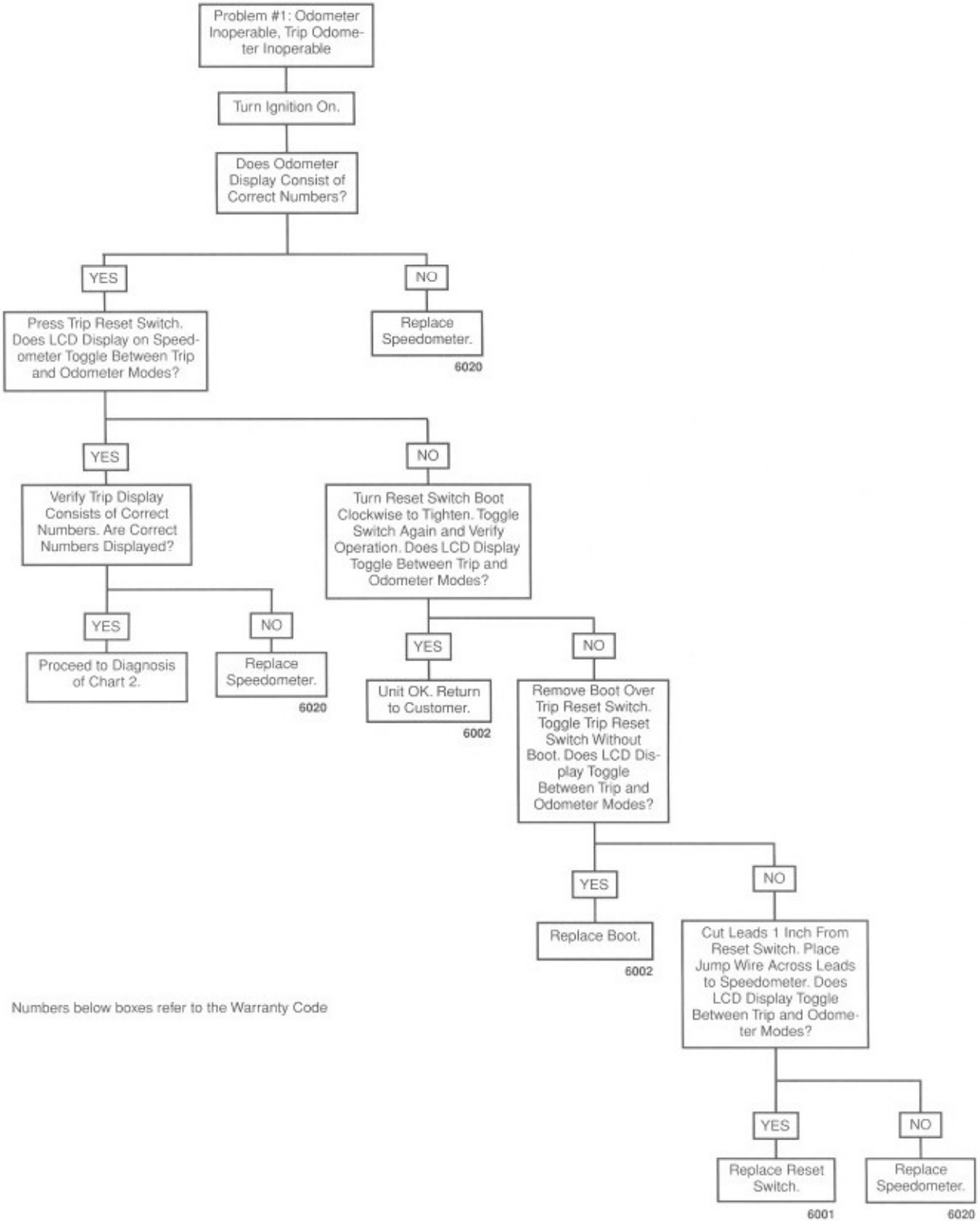
Figure 7-96. Test Harness

To diagnose the speedometer sensor, first test for voltage to sensor by checking for 8-12 VDC on Red wire in connector [65B]. Then check for continuity to ground on Black wire in connector [65B]. The following test will only work if voltage and proper ground are present at speedometer sensor.

Install the test harness between the speedometer sensor connectors [65A & B]. Turn tester power switch to ON, and place signal switch in the IN position. Plug the speedometer tester into the test harness and turn the ignition ON. Press ENTER on the keypad. Rotate the motorcycle's rear wheel. The numbers on the speedometer tester readout should change with changes in wheel speed. If the readout doesn't change, the speedometer sensor is suspect. Install a known, good speedometer sensor and test again for proper operation.

Speedometer Troubleshooting

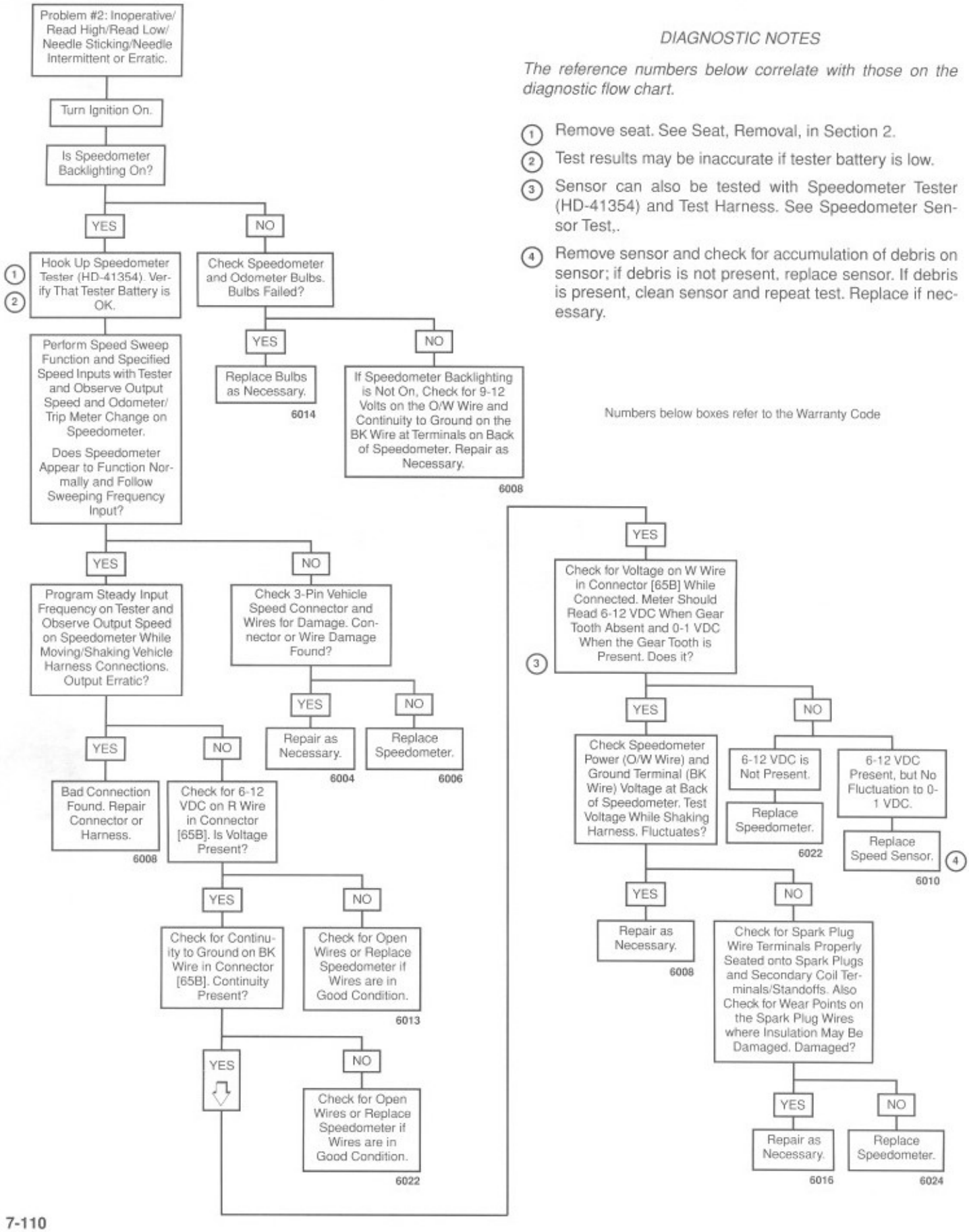
Chart 1: Odometer, Trip Odometer and Reset Switch



Numbers below boxes refer to the Warranty Code

Speedometer Troubleshooting

Chart 2: Inoperative, Inaccurate or Erratic Speedometer.



DIAGNOSTIC NOTES

The reference numbers below correlate with those on the diagnostic flow chart.

1. Remove seat. See Seat, Removal, in Section 2.
2. Test results may be inaccurate if tester battery is low.
3. Sensor can also be tested with Speedometer Tester (HD-41354) and Test Harness. See Speedometer Sensor Test,.
4. Remove sensor and check for accumulation of debris on sensor; if debris is not present, replace sensor. If debris is present, clean sensor and repeat test. Replace if necessary.

Numbers below boxes refer to the Warranty Code

DEUTSCH ELECTRICAL CONNECTORS

The XLH models utilize Deutsch DT Series Electrical Connectors. The Deutsch Connector features a superior seal to protect electrical contacts from dirt and moisture in harsh environments. The connector also provides better pin retention than previous connectors.

A 12-pin connector is illustrated in Figure 7-98 to show the various parts of the Deutsch connector. The following instructions may be followed for all 2-pin through 12-pin Deutsch connectors.

Socket housing: alignment tabs and/or external latch, secondary locking wedge, internal seal, wire seal, seal pin.

NOTE

Seal pins or plugs are installed in the wire seals of unused pin and socket locations. If removed, seal pins must be replaced to maintain the integrity of the environmental seal.

Pin housing: alignment grooves and/or external latch cover, attachment clip, secondary locking wedge, wire seal, seal pin.

REMOVING/DISASSEMBLING

Attachment clips are attached to the pin housings of most connectors. The clips are then attached to T-studs on the motorcycle frame. T-studs give positive location to electrical connectors and wire harness. Consistent location reduces electrical problems and improves serviceability.

1. Push the connector toward the rear to disengage small end of slot on attachment clip fromT-stud. Lift connector off T-stud.
2. Depress the external latch(es) on the socket housing side and use a rocking motion to separate the pin and socket halves. Two-, three-, four- and six-pin Deutsch connectors have one external latch, while eight- and twelve-pin connectors have two, both of which must be pressed simultaneously to separate the connector halves.

NOTE

With one exception (see number 10 in Figure 7-59), the socket housing can always be found on the accessory side, while the pin side of the connector is plumbed to the wiring harness.

REMOVING/INSTALLING SOCKETS

1. See Figure 7-99. Remove the secondary locking wedge. Insert the blade of a small screwdriver between the socket housing and locking wedge inline with the groove (inline with the pin holes if the groove is absent). Turn the screwdriver 90 degrees to pop the wedge up.
2. Gently depress terminal latches inside socket housing and back out sockets through holes in rear wire seal.

NOTE

An Electrical Terminal Crimp Tool (Part No. HD-39965) is used to install Deutsch pin and socket terminals on wires. If new terminals must be installed, follow the instructions included with the crimping tool or see Crimping Instructions in this section.

3. Fit rear wire seal into back of socket housing, if removed. Grasp socket approximately 1 inch (25.4 mm) behind the contact barrel. Gently push sockets through holes in wire seal into their respective chambers (see Figure 7-77 for wire color locations). Feed socket into chamber until it "clicks" in place. Verify that socket will not back out of chamber; a slight tug on the wire will confirm that it is properly locked in place.

4. Install internal seal on lip of socket housing, if removed. Insert tapered end of secondary locking wedge 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.

NOTE

While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-pin connector must be installed with the arrow pointing toward the external latch. See Figure 7-99.

NOTE

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.

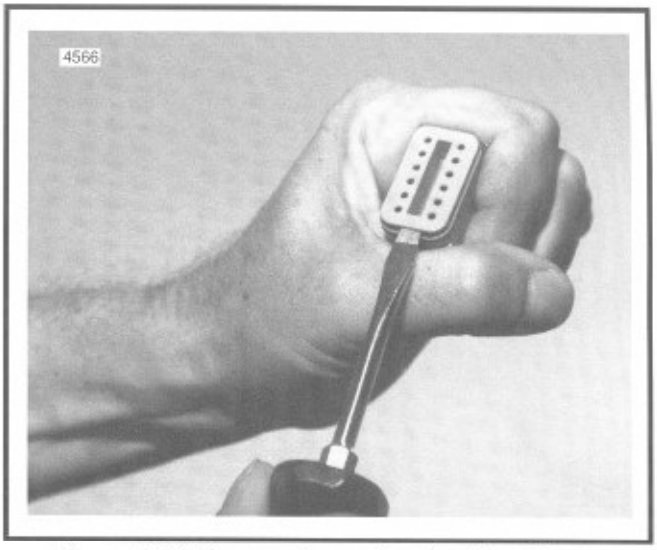
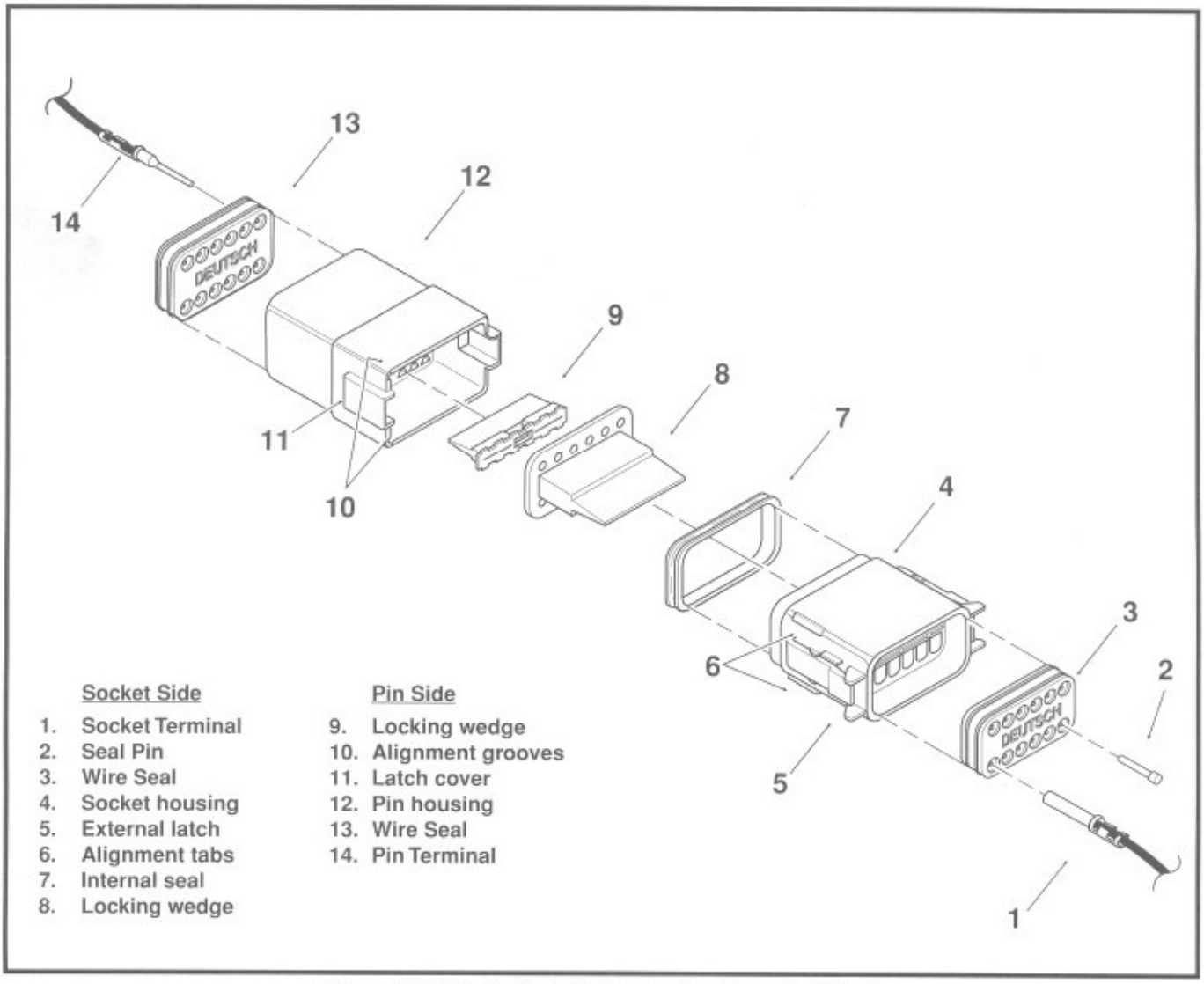


Figure 7-98. Remove Secondary Locking Wedge



Socket Side		Pin Side	
1.	Socket Terminal	9.	Locking wedge
2.	Seal Pin	10.	Alignment grooves
3.	Wire Seal	11.	Latch cover
4.	Socket housing	12.	Pin housing
5.	External latch	13.	Wire Seal
6.	Alignment tabs	14.	Pin Terminal
7.	Internal seal		
8.	Locking wedge		

Figure 7-97. 12-pin Deutsch Connector (Exploded View)

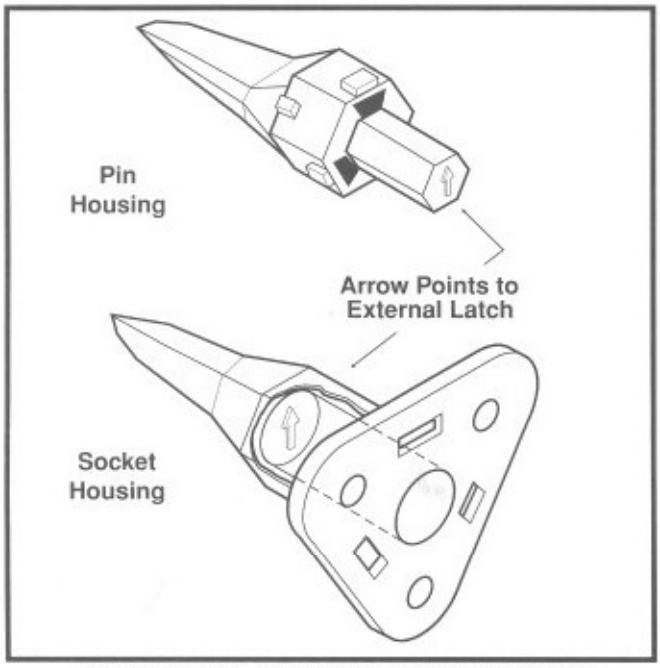


Figure 7-99. 3-pin Locking Wedge Orientation

REMOVING/INSTALLING PINS

1. Remove the secondary locking wedge. Use the hooked end of a stiff piece of mechanics wire or a needle nose pliers, whichever is most suitable.

2. Gently depress terminal latches inside pin housing and back out pins through holes in wire seal.

NOTE

An Electrical Terminal Crimp Tool (Part No. HD-39965) is used to install Deutsch pin and socket terminals on wires. If new terminals must be installed, see Crimping Instructions in this section.

3. Fit wire seal into back of pin housing. Grasp crimped pin approximately 1 inch (25.4 mm) behind the contact barrel. Gently push pins through holes in wire seal into their respective numbered locations. Feed pin into chamber until it "clicks" in place. Verify that pin will not back out of chamber; a slight tug on the wire will confirm that it is properly locked in place.

4. Insert tapered end of secondary locking wedge into pin housing and press down until it snaps in place. The wedge fits in the center groove within the pin housing and holds the terminal latches tightly closed.

NOTE

While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-pin connector must be installed with the arrow pointing toward the external latch. See Figure 7-99.

NOTE

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.

ASSEMBLING/INSTALLING

1. Insert socket housing into pin housing until it snaps in place. Two-, three-, four- and six-pin Deutsch connectors have one external latch on the socket half of the connector. To fit the halves of the connector together, the latch on the socket side must be aligned with the latch cover on the pin side.

   For those connectors with two external latches (8-pin and 12-pin), a different system is used to prevent improper assembly. Align the tabs on the socket housing with the grooves on the pin housing. Push the connector halves together until the latches "click." 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.

NOTE

*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.*

If it should become necessary to replace a plug or receptacle, please note that the 8-pin and 12-pin 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. If replacing both the socket and pin halves, then the black may be substituted for the gray, and vice versa. The socket and pin halves 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.

2. Fit the attachment clip to the pin housing, if removed. Place large end of slot on attachment clip over T-stud on frame; push assembly forward to engage small end of slot.

CRIMPING INSTRUCTIONS (Figure 7-100)

1. Squeeze the handles to cycle the crimp tool to the fully open position.

2. Raise locking bar by pushing up on bottom flange. With the crimp tails facing upward and the rounded side of the contact barrel resting on the concave split level area of the crimp tool, insert contact (socket/pin) through middle hole of locking bar.

3. Release locking bar to lock position of contact. If the crimp tails are slightly out of vertical alignment, the crimp tool automatically rotates the contact so that the tails face straight upward. When correctly positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

4. Strip lead removing 5/32 inch (3.96 mm) of insulation. Insert wires 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 insulation material.

5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete. Raise up locking bar and remove contact.
6. Inspect the quality of the core and insulation crimps. Distortion should be minimal.

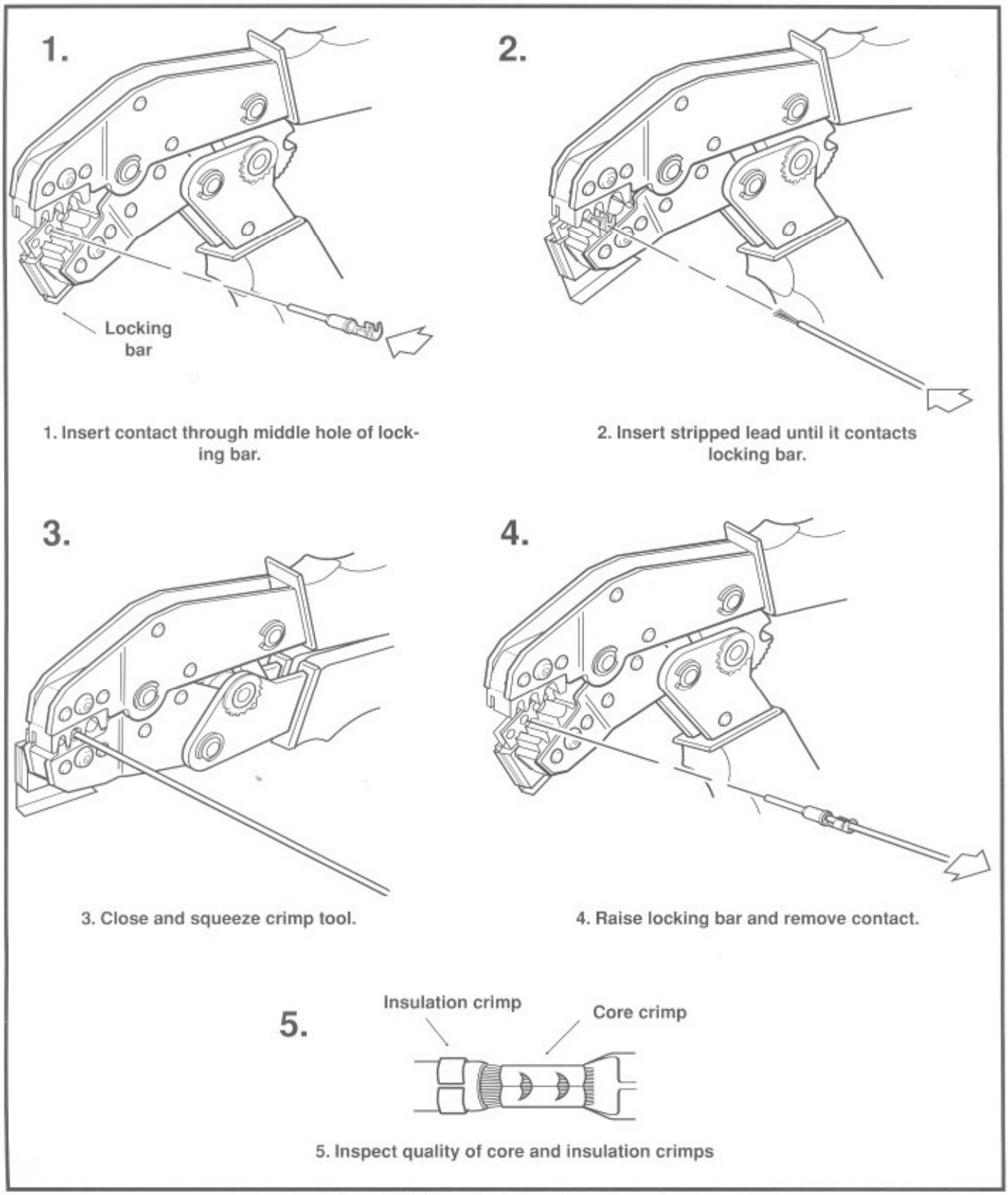


Figure 7-100. Deutsch Crimping Procedure

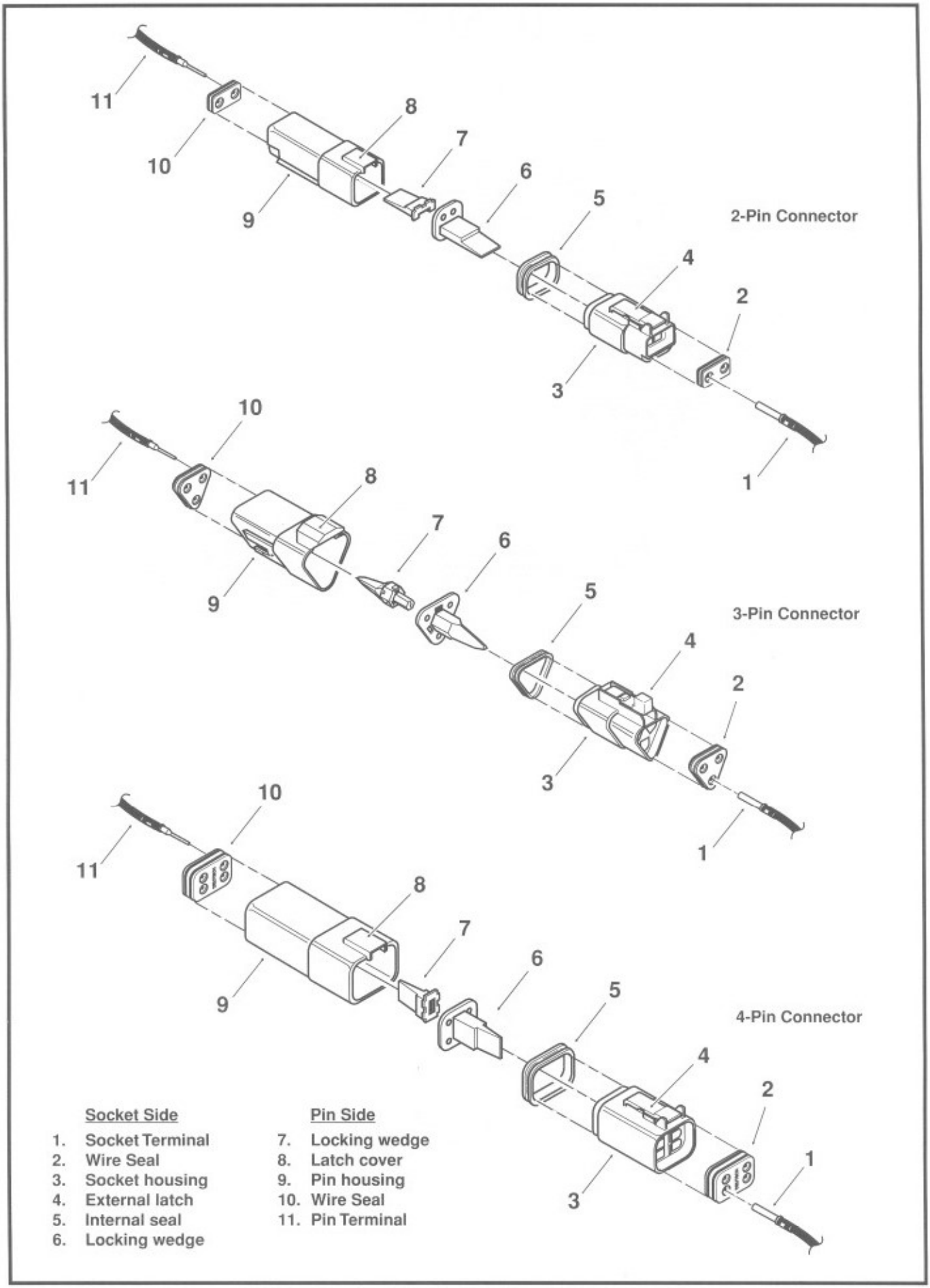


Figure 7-101. 2-Pin, 3-Pin and 4-Pin Deutsch Connectors

AMP MULTILOCK ELECTRICAL CONNECTORS

REMOVING SOCKET/PIN TERMINALS

1. Remove connector from the retaining device, either attachment or rosebud clip.

2. Depress the button on the socket terminal side of the connector (plug) and pull apart the pin and socket halves.

3. Bend back the latch slightly and free one side of secondary lock, then repeat the step to release the other side. Rotate the secondary lock outward on hinge to access terminals in chambers of connector housing.

4. Looking in the terminal side of the connector (opposite the secondary lock), take note of the cavity next to each terminal.

5. See Figure 7-103. With the flat side against the terminal, insert the pick tool (Snap-On TT600-3) into the cavity until it stops. Pivot the end of the pick away from the terminal and gently tug on wire to pull terminal from chamber. Do not tug on the wire until the tang is released or the terminal will be difficult to remove. A "click" is heard if the tang is engaged but then inadvertently released. Repeat the step without releasing the tang.

NOTE

An Electrical Terminal Crimp Tool (Part No. HD-41609) is used to install Amp Multilock pin and socket terminals on wires. If new terminals must be installed, see Crimping Instructions on the next page.

INSTALLING SOCKET/PIN TERMINALS

NOTE

For wire location purposes, numbers are stamped into the secondary locks of both the socket and pin housings. See Figure 7-104.

1. From the secondary lock side of the connector, insert the terminal into its respective numbered chamber until it snaps in place. For proper fit, the slot in the terminal must face the tang in the chamber.

NOTE

The tang in the chamber engages the slot to lock the terminal in position. On the pin side of the connector, tangs are positioned at the bottom of each chamber, 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

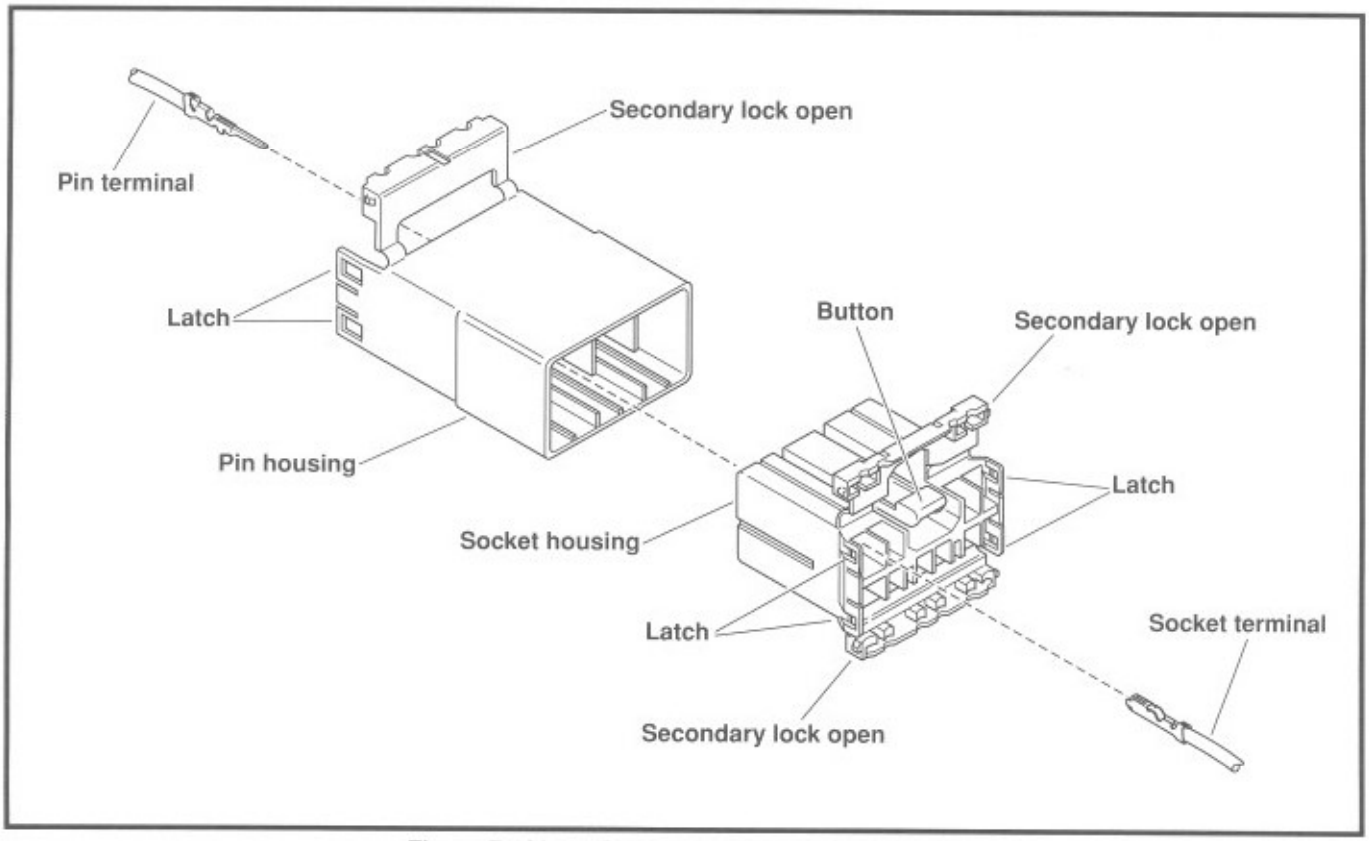


Figure 7-102. 10-Place Amp Multilock Connector

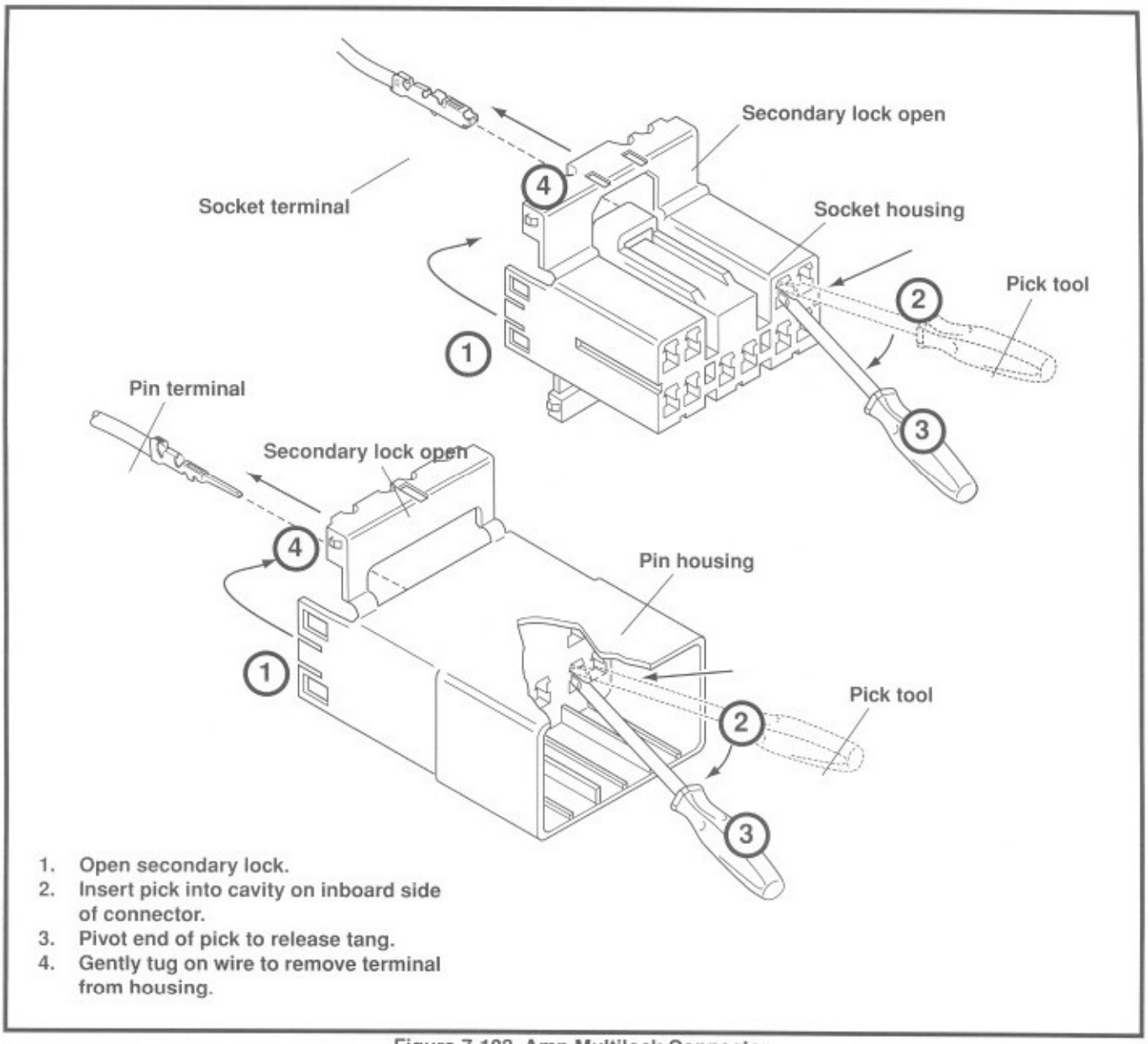


Figure 7-103. Amp Multilock Connector

each chamber, so the socket terminal slot (on the same side as the crimp tails) must face upward. Up and down can be determined by the position of the release button (used to separate the pin and socket halves), the button always being the top of the connector.

2. Gently tug on wire end to verify that the terminal is locked in place and will not back out of chamber.

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

4. Insert the socket housing (plug) into the pin housing (receptacle) until it snaps in place.

5. Install connector on retaining device, either attachment or rosebud clip.

CRIMPING INSTRUCTIONS

1. Squeeze the handles to cycle the crimp tool (Part No. HD-41609) to the fully open position.

2. Raise locking bar by pushing up on bottom flange. With the crimp tails facing upward, insert contact (socket/pin) through locking bar, so that the closed side of the contact rests on the front nest (concave split level area of the crimp tool). See Figure 7-105.

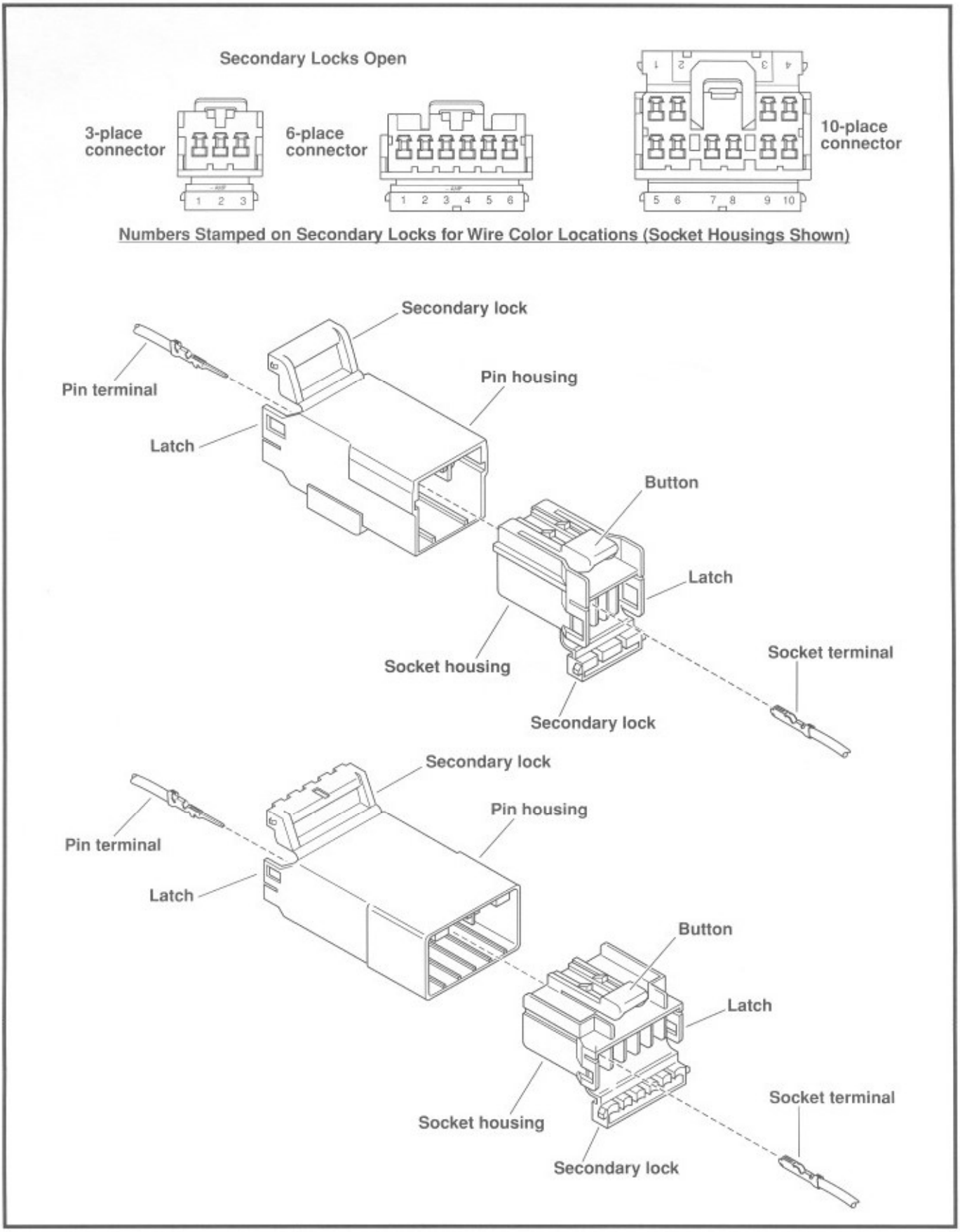


Figure 7-104. 3-Place and 6-Place Amp Multilock Connectors

3. 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.

4. Strip lead removing 5/32 inch (4 mm) of insulation. Insert wires 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 insulation material.

5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete. Raise up locking bar and remove contact.

6. Inspect the quality of the core and insulation crimps. Distortion should be minimal.

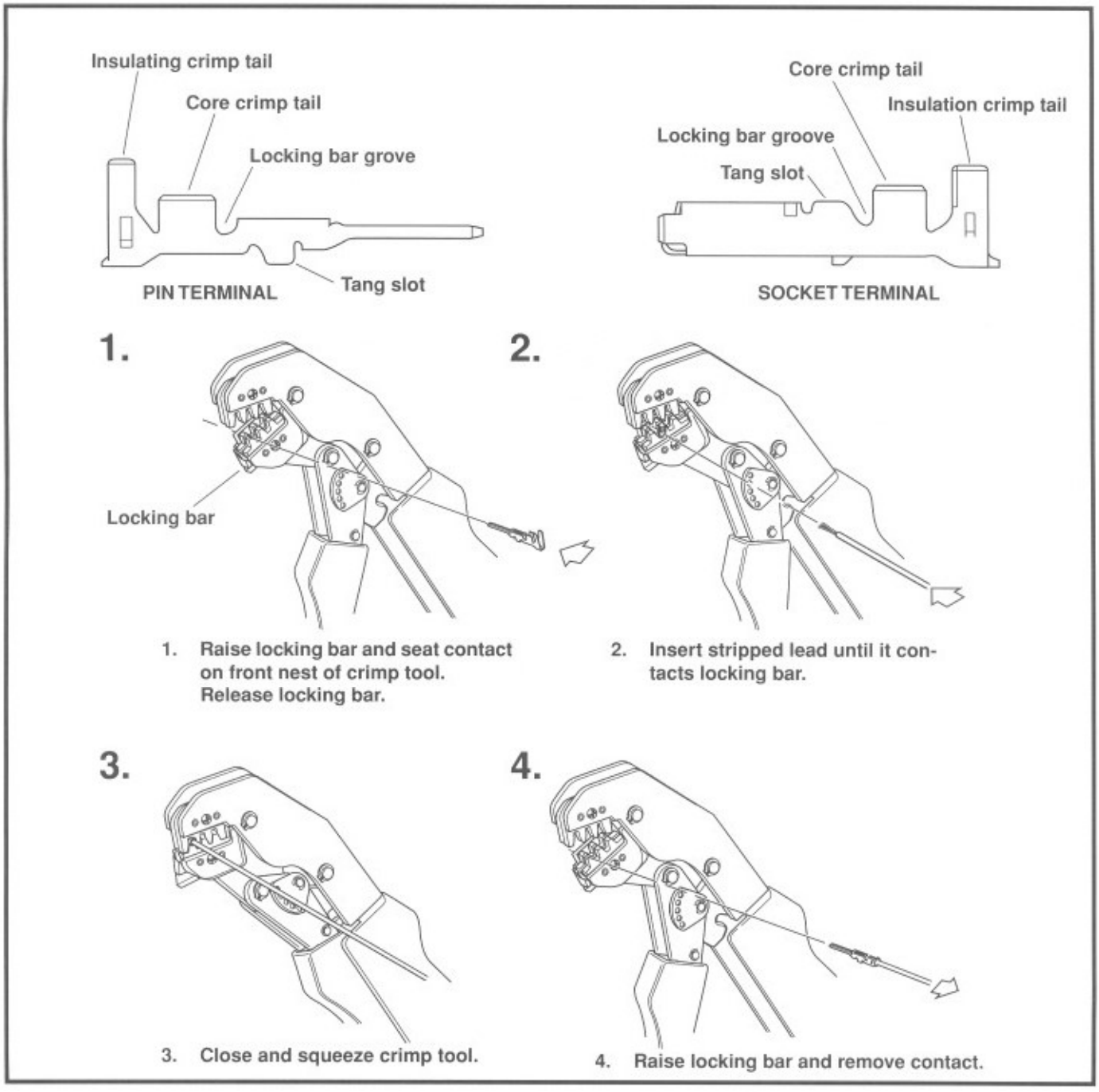


Figure 7-105. Amp Multilock Crimping Procedure

PACKARD ELECTRICAL CONNECTORS

GENERAL

From a servicing standpoint, there are two basic types of Packard electrical connectors, those with pull-to-seat terminals and those with push-to-seat terminals.

Look into the mating end of the connector. If it appears that the terminal can be extracted from this side, then it is probably the pull-to-seat type.

At least one Packard pull-to-seat terminal can be easily recognized by the presence of a locking ear. The ear engages a slot in the connector housing and prevents the terminal from being removed from the wire end side of the connector. The ear also acts as a strain relief in the event that the wires are pulled and further inhibits movement of the terminal inside the chamber. PULL-TO-SEAT TERMINALS

Unlike most connectors, where the terminals are pulled out the wire end of the connector, to remove the terminals from the pull-to-seat connectors, the terminal is pushed out the mating end of the connector. Once a new terminal is crimped onto the end of the wire, the wire is pulled to draw the terminal back inside the chamber of the connector housing.

The Packard pull-to-seat terminal connectors found on XL model vehicles are listed below.

- Bank Angle Sensor [134]
- 1200S Coil [83]
- MAP Sensor [80]

Packard pull-to-seat electrical connectors have an external latch to lock the pin and socket halves together.

Removing Pull-to-seat Terminals External Latch Type

To remove a pull-to-seat terminal from connectors with external latches, proceed as follows:

1. Remove the connector from the retaining device, if present.
2. Bend back the external latch(es) slightly and separate the pin and socket halves of the connector.
3. To free a pull-to-seat terminal from the connector housing, first look into the mating end of the connector to find the locking tang. See A in Figure 110. The tangs are always positioned in the middle of the chamber and are on the same side as the external latch. On those connectors with locking ears, the tang is on the side opposite the ear.
4. At a slight angle, gently insert the point of a one inch safety pin down the middle of the chamber (about 1/8 inch) and pivot the end of the pin toward the terminal body. When a click is heard, remove the pin and repeat the procedure. See B in Figure 110. The click is the sound of the tang returning to the locked position as it slips from the point of the pin. Pick at the tang in this manner until the clicking stops and the pin seems to slide in at a slightly greater depth than it had previously. This is an indication that the tang has been depressed.

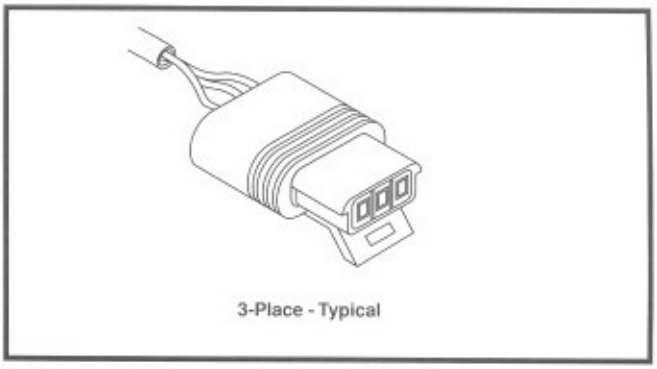


Figure 7-106. Packard Pull-to-Seat Terminal Connectors (Socket Sides)

NOTE

On those terminals that have been extracted on a previous occasion, no clicking sound may be heard when the pin is pivoted to depress the tang, but proceed as if the clicking is audible and then push on the wire end of the lead to check if the terminal is free.

NOTE

When picking multiple terminals, the end of the pin may become malleable. For best results, continue the procedure with a new safety pin.

5. Remove the pin and push on the wire end of the lead to extract the terminal from the mating end of the connector. See C in Figure 110. If necessary, pull back the conduit and remove the wire seal at the back of the connector to introduce some slack in the wires.

NOTE

A series of Packard Electrical Terminal Crimp Tools are available to install Packard pin and socket terminals on wires. If new terminals must be installed, see Crimping Instructions on page 7-121.

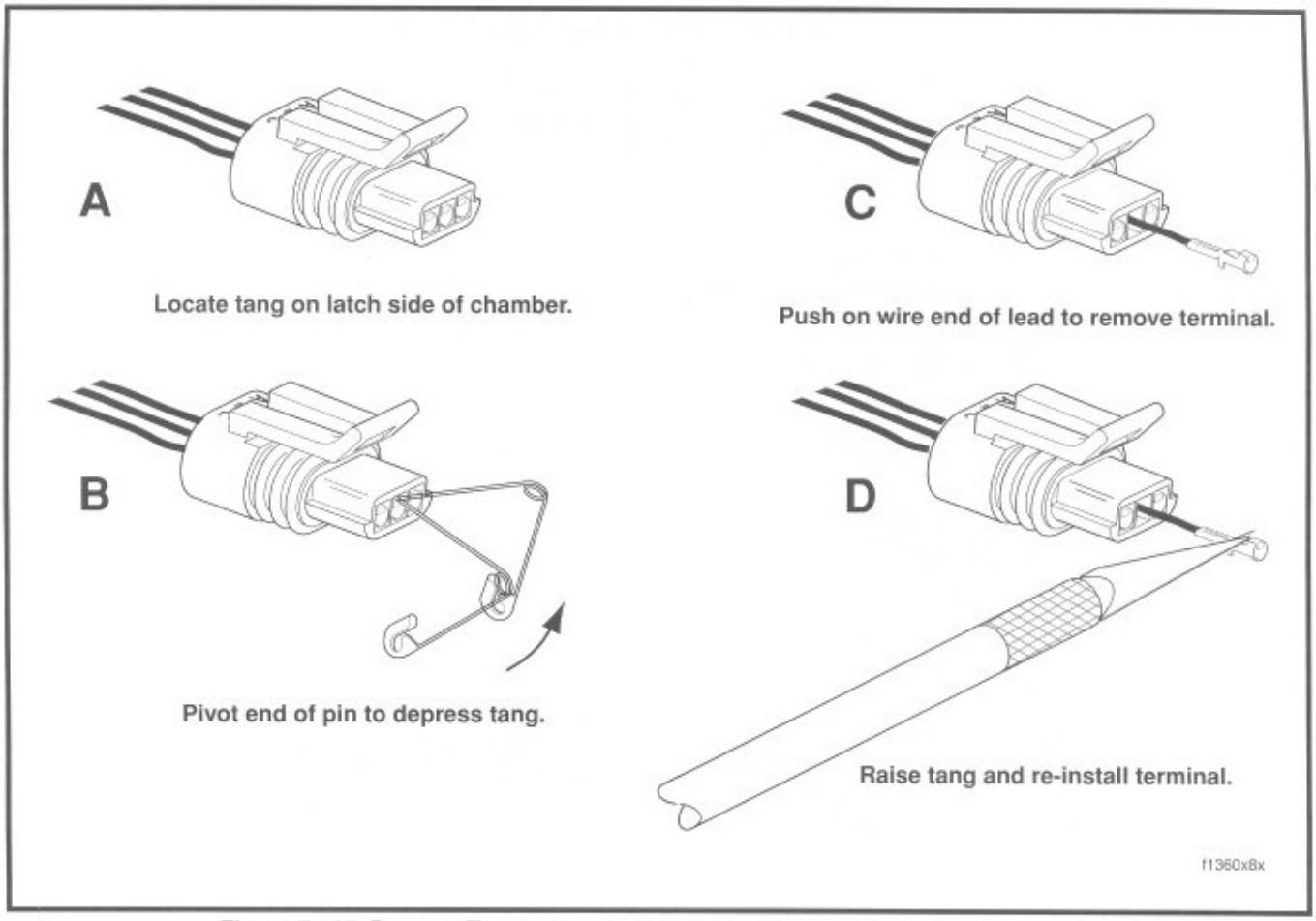


Figure 7-107. Depress Tang and Extract Terminal From Mating End of Connector

Installing Pull-to-seat Terminals External Latch Type

NOTE

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

1. To install a terminal back into the chamber of the connector housing, use a thin flat blade, like that on an X-Acto knife, and carefully bend the tang outward away from the terminal body. See D in Figure 110.
2. Gently pull on the lead at the wire end of the connector to draw the terminal back into the chamber. A click is heard when the terminal is properly seated.
3. Push on the lead to verify that the terminal is locked in place.
4. Push the pin and socket halves of the connector together until the latches "click."

CRIMPING INSTRUCTIONS

1. Strip wire lead removing 5/32 inch (4 mm) of insulation.
2. Compress handles until ratchet automatically opens.

NOTE

Always perform core crimp before insulation/seal crimp.

3. Determine the correct dye or nest for the core crimp based on the information presented in the Crimp Tables.

INSTALLING SEALED BUTT CONNECTORS

Butt splicing is a necessary procedure for replacement of several components. These components are:

- Ignition switch
- Indicator (icon) lamps

Proceed as follows:

1. Strip 3/8 inch of insulation off the ends of the wires.
2. Insert wires into opposite ends of the butt splice connector (see Figure 7-108). Feed the wires into the connector until the stripped ends are housed within the metal insert. Since the size of the connectors vary with the gauge of the wire, reference the following table to ensure properly sealed splices.
3. Crimp the wires within the connector using the Packard Crimp Tool (HD-38125-8). Be sure to match the color or gauge wire marked on the butt splice connector with the corresponding crimp cavity on the crimp tool (see Figure 7-85).

NOTE

If adjacent wires are being spliced, stagger the splices so that the butt splice connectors are spaced at different positions along the length of the wires.

⚠WARNING

Use extreme caution when operating the UltraTorch UT-100 or any other radiant heating device. Read the manufacturers instructions carefully before use. Improper handling can result in personal injury and/or vehicle damage. Always keep hands aways from tool tip area and heat shrink attachment. Avoid directing the heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion. Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed. Be sure to turn the "ON/OFF" switch to the "OFF" position after use.

4. Using the UltraTorch UT-100 (HD-39969), Robinair Heat Gun (HD-25070) with heatshrink attachment (HD-41183) or other suitable radiant heating device, heat the crimped splice to encapsulate the butt splice connection. Apply heat from the center of the crimp out to each end until the meltable sealant exudes out both ends of the connector (see Figure 7-108).

NOTE

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

5. Heat the center of the splice until the crimp indentations disappear and the tubing assumes a smooth cylindrical appearance.

Gauge Wire	Connector Color	Part Number
18-20	Red	P/N 70585-93
14-16	Blue	P/N 70586-93
10-12	Yellow	P/N 70587-93

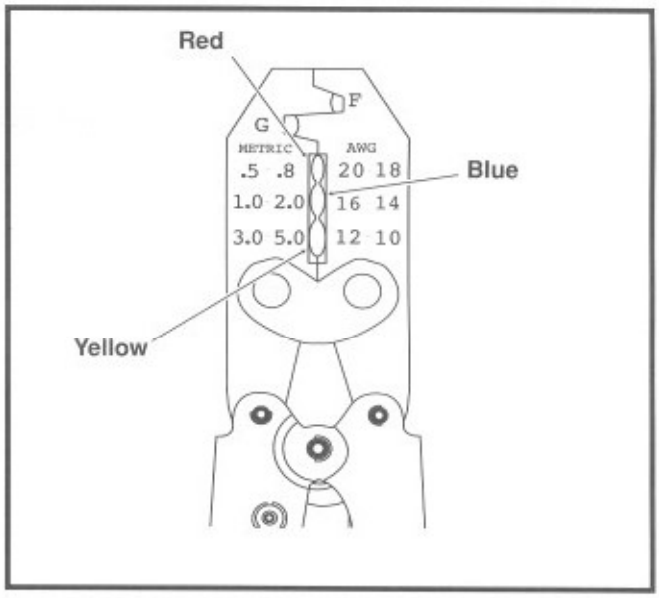


Figure 7-109. Packard Crimp Tool (HD-38125-8)

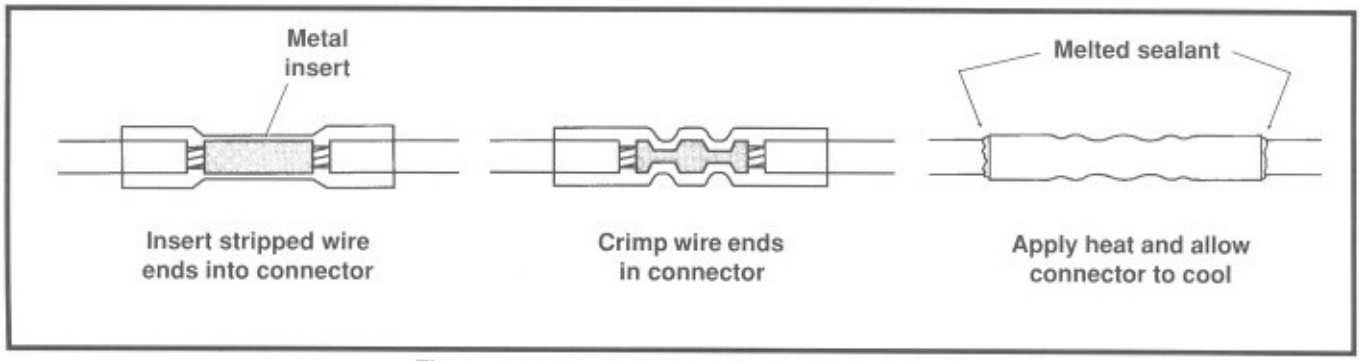


Figure 7-108 Installing Sealed Butt Connectors

CRIMP TABLES

Table 1. 1998 Components

CONNECTOR	POSITION	TERMINAL PART NUMBER	CRIMPER	WIRE GAUGE	CORE CRIMP	INSULATION CRIMP
IGNITION MODULE [14A] (except 1200S)	ALL	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
CAM POSITION SENSOR [14A] (1200S)	ALL	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TRAP DOOR SOLENOID [15A]	ALL	72039-71A	PACKARD 270	20	2	4
REAR LIGHTING [7B]	ALL	73191-96	HD-41609	18	REAR POSITION	REAR POSITION
REAR DIRECTIONALS [18B, 19B]	ALL	73191-96	HD-41609	18	REAR POSITION	REAR POSITION
V.O.E.S. [11B]	ALL	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
FRONT DIRECTIONALS [31B]	ALL	73191-96	HD-41609	18	REAR POSITION	REAR POSITION
HEADLAMP (XL CUSTOM ONLY) [38B]	ALL	73191-96	HD-41609	16	MIDDLE POSITION	MIDDLE POSITION
INSTRUMENT CLUSTER [20B]	ALL	73191-96	HD-41609	18	REAR POSITION	REAR POSITION
LEFT HANDLEBAR CONTROL [24B]	ALL	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
RIGHT HANDLEBAR CONTROL [22B]	ALL	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
SPEED SENSOR [65A]	ALL	72190-94	DTT-16-00	20 (a)	CENTER POSITION	CENTER POSITION
SPEED SENSOR [65B]	ALL	72191-94	DTT-16-00	20 (a)	CENTER POSITION	CENTER POSITION
SPEEDOMETER TERMINALS		72241-94 (q)	PACKARD 271	18	C	A
POSITION LAMP		9898	PACKARD 271		TIP	
POSITION LAMP		9898	PACKARD 115		TIP	
HEADLAMP 68705-93A	ALL	70586-93(j)	PACKARD 115	16	14-16 GA.	
REGULATOR [77B]		72197-94	HD-42879	12	12	

Table 2. 1998 XL Custom Main Wiring Harness, Part No. 70153-98

CONNECTOR	POSITION	TERMINAL PART NUMBER	CRIMPER	WIRE GAUGE	CORE CRIMP	INSULATION CRIMP
STARTER TERMINAL		9842 (a)	PACKARD 270,271	12	B	3
CIRCUIT BREAKER TERMINAL (BK)		9843 (a)	PACKARD 270,271	14	B	3
CIRCUIT BREAKER TERMINAL (2-R)		9866 (h)	PACKARD 115	12,14	12-10 GA. (h)	12-10 GA. (h)
STARTER RELAY (BK,BK/R)	85,86	9937	PACKARD 271	18	C	D
STARTER RELAY (R/BK)	30	9937	PACKARD 271	14	C	A
STARTER RELAY (2-GN)	87	9937 (h)	PACKARD 271	14,16	C (h)	A (h)
FUSE BLOCK (2-GY)	1	72219-94(h)	PACKARD 271	16, 18	C (h)	B (h)
FUSE BLOCK (O)	2	72217-94	PACKARD 271	18	E	A
FUSE BLOCK (2-BE)	3	72220-94 (h)	PACKARD 271	16	A (h)	G (h)
FUSE BLOCK (2-O/W)	4	72220-94 (h)	PACKARD 271	16	A (h)	G (h)
FUSE BLOCK (2-R/BK)	5	72220-94 (h)	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (2-R/BK)	6	72220-94 (h)	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (R/BK)	7	72218-94	PACKARD 271	14	C	A
FUSE BLOCK (R/GY)	8	72218-94	PACKARD 271	14	C	A
OIL PRESSURE SENDING UNIT		72241-94 (q) (z)	PACKARD 271	18	C	A
REAR STOP LIGHT SWITCH (O/W)		9937 (b)	PACKARD 271	18	C	D
REAR STOP LIGHT SWITCH (2-R/Y)		9937 (b)	PACKARD 271	18	C (h)	D (h)
MAIN GROUND-CHASSIS		9860	PACKARD 115	14	16-14 GA.	16-14 GA.
MAIN GROUND-CHASSIS (2-BK)		72242-94 (a)	PACKARD 115,270	14,16(h)	G (h)	3 (h)
SOLENOID		72291-94	PACKARD 271,115	14	A	G
HORN		9898	PACKARD 271	18	TIP	X
HORN		9898	PACKARD 115	18	TIP	X
NEUTRAL SWITCH		9905	PACKARD 115	18	20-18 GA.	20-18 GA.
COIL (W/BK)		72241-94 (q)	PACKARD 271	18	C (q)	A
TAIL LIGHT [7A]	ALL	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	B,C	73190-96	DTT-16-00	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	A	73190-96	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO V.O.E.S. [11A]	ALL	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO IGNITION MODULE [14B]	EXCEPT 6	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO IGNITION MODULE [14B]	6	72191-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO REAR DIRECTIONALS [18A,19A]	ALL	73190-96	DTT-16-00	18	REAR POSITION	REAR POSITION
INSTRUMENT CLUSTER [20A]	EXCEPT 1	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
INSTRUMENT CLUSTER [20A]	1	73190-96	HD-41609		CENTER POSITION	CENTER POSITION
TO RIGHT HAND CONTROLS [22A]	EXCEPT 3	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO RIGHT HAND CONTROLS [22A]	3	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO LEFT HAND CONTROLS [24A]	1,5,6	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO LEFT HAND CONTROLS [24A]	2,3,4	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO TURN SIGNAL MODULE [30A]	EXCEPT 2	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO TURN SIGNAL MODULE [30A]	2	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
HEADLAMP [38A]	1	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
HEADLAMP [38A]	2,3,4	73190-96	HD-41609	16	CENTER POSITION	CENTER POSITION
FRONT TURN SIGNALS [31A]	ALL	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
HEADLAMP 68705-93A	ALL	70586-93 (j)	PACKARD 115	16	14-16 GA.	
IGNITION SWITCH KIT 71441-94	ALL	70586-93 (j)	PACKARD 115	14	14-16 GA.	
BANK ANGLE SENSOR [134B]	All	72033-93	PACKARD 271	18	E	C
REGULATOR [77A]		72196-94	HD-42879	12	12	

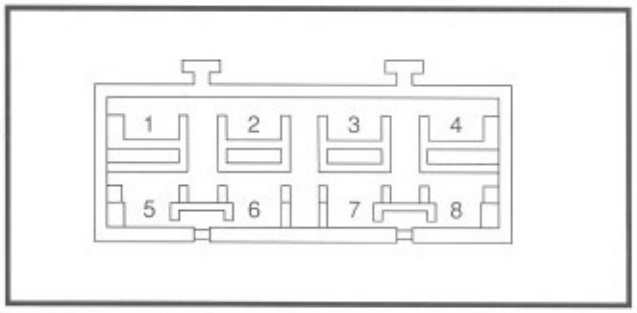
CRIMP TABLES

Table 3. 1998 XL Main Wiring Harness, Part No. 70135-98

CONNECTOR	POSITION	TERMINAL PART NUMBER	CRIMPER	WIRE GAUGE	CORE CRIMP	INSULATION CRIMP
STARTER TERMINAL		9842 (a)	PACKARD 270,271	12	B	3
CIRCUIT BREAKER TERMINAL (BK)		9843 (a)	PACKARD 270,271	14	B	3
CIRCUIT BREAKER TERMINAL (2-R)		9866 (h)	PACKARD 115	12,14	12-10 GA. (h)	12-10 GA. (h)
STARTER RELAY (BK,BK/R)	85,86	9937	PACKARD 271	18	C	D
STARTER RELAY (R/BK)	30	9937	PACKARD 271	14	C	A
STARTER RELAY (2-GN)	87	9937 (h)	PACKARD 271	14,16	C (h)	A (h)
FUSE BLOCK (2-GY)	1	72219-94(h)	PACKARD 271	16, 18	C (h)	B (h)
FUSE BLOCK (O)	2	72217-94	PACKARD 271	18	E	A
FUSE BLOCK (2-BE)	3	72220-94 (h)	PACKARD 271	16	A (h)	G (h)
FUSE BLOCK (2-O/W)	4	72220-94 (h)	PACKARD 271	16	A (h)	G (h)
FUSE BLOCK (2-R/BK)	5	72220-94 (h)	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (2-R/BK)	6	72220-94 (h)	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (R/BK)	7	72218-94	PACKARD 271	14	C	A
FUSE BLOCK (R/GY)	8	72218-94	PACKARD 271	14	C	A
OIL PRESSURE SENDING UNIT		72241-94 (q) (z)	PACKARD 271	18	C	A
REAR STOP LIGHT SWITCH (O/W)		9937 (b)	PACKARD 271	18	C	D
REAR STOP LIGHT SWITCH (2-R/Y)		9937 (b)	PACKARD 271	18	C (h)	D (h)
MAIN GROUND-CHASSIS		9860	PACKARD 115	14	16-14 GA.	16-14 GA.
MAIN GROUND-CHASSIS (2-BK)		72242-94 (a)	PACKARD 115,270	14,16(h)	G (h)	3 (h)
SOLENOID		72291-94	PACKARD 271,115	14	A	G
HORN		9898	PACKARD 271	18	TIP	X
HORN		9898	PACKARD 115	18	TIP	X
NEUTRAL SWITCH		9905	PACKARD 115	18	20-18 GA.	20-18 GA.
COIL		72241-94 (q)	PACKARD 271	18	C (q)	A
COIL (2 PK)		72241-94 (h)(q)	PACKARD 271	18	A (h)	B (h)
TAIL LIGHT [7A]	ALL	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	B,C	73190-96	DTT-16-00	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	A	73190-96	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO V.O.E.S. [11A]	ALL	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO IGNITION MODULE [14B]	EXCEPT 6	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO IGNITION MODULE [14B]	6	72191-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO REAR DIRECTIONALS [18A,19A]	ALL	73190-96	DTT-16-00	18	REAR POSITION	REAR POSITION
INSTRUMENT CLUSTER [20A]	EXCEPT 1	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
INSTRUMENT CLUSTER [20A]	1	73190-96	HD-41609		CENTER POSITION	CENTER POSITION
TO RIGHT HAND CONTROLS [22A]	EXCEPT 3	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO RIGHT HAND CONTROLS [22A]	3	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO LEFT HAND CONTROLS [24A]	1,5,6	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO LEFT HAND CONTROLS [24A]	2,3,4	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
TO TURN SIGNAL MODULE [30A]	EXCEPT 2	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TO TURN SIGNAL MODULE [30A]	2	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
FRONT TURN SIGNALS [31A]	ALL	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
HEADLAMP 68705-93A	Y	70586-93 (j)	PACKARD 115	16	14-16 GA.	
HEADLAMP 68705-93A	W,BK	70586-93 (j)	PACKARD 115	16,18	14-16 GA	
IGNITION SWITCH KIT 71441-94	ALL	70586-93 (j)(h)	PACKARD 115	14	14-16 GA.	
BANK ANGLE SENSOR [134B]	All	72033-93	PACKARD 271	18	E	C
REGULATOR [77A]		72196-94	HD-42879	12	12	

Crimp Table Legend

(a) - requires solder after crimping
(b) - 9937 terminals require use of 72249-94 heat shrink tubing
(h) - double lug crimp
(j) - heat sealed butt splice connector
(q) - requires use of 72249-94 heat shrink tube
(z) - use with 7629 nut



The cavity numbers or positions in the fuse block are identified in the above illustration.

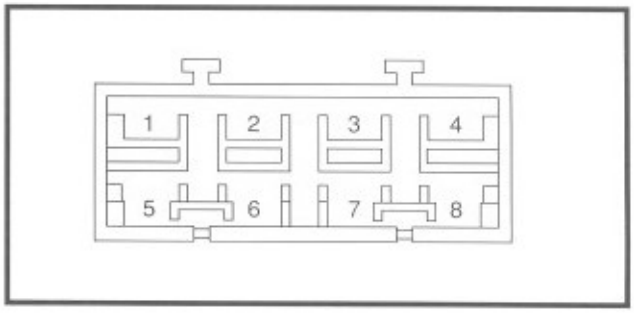
CRIMP TABLES

Table 4. 1997 XL Sport Main Wiring Harness, Part No. 70139-98

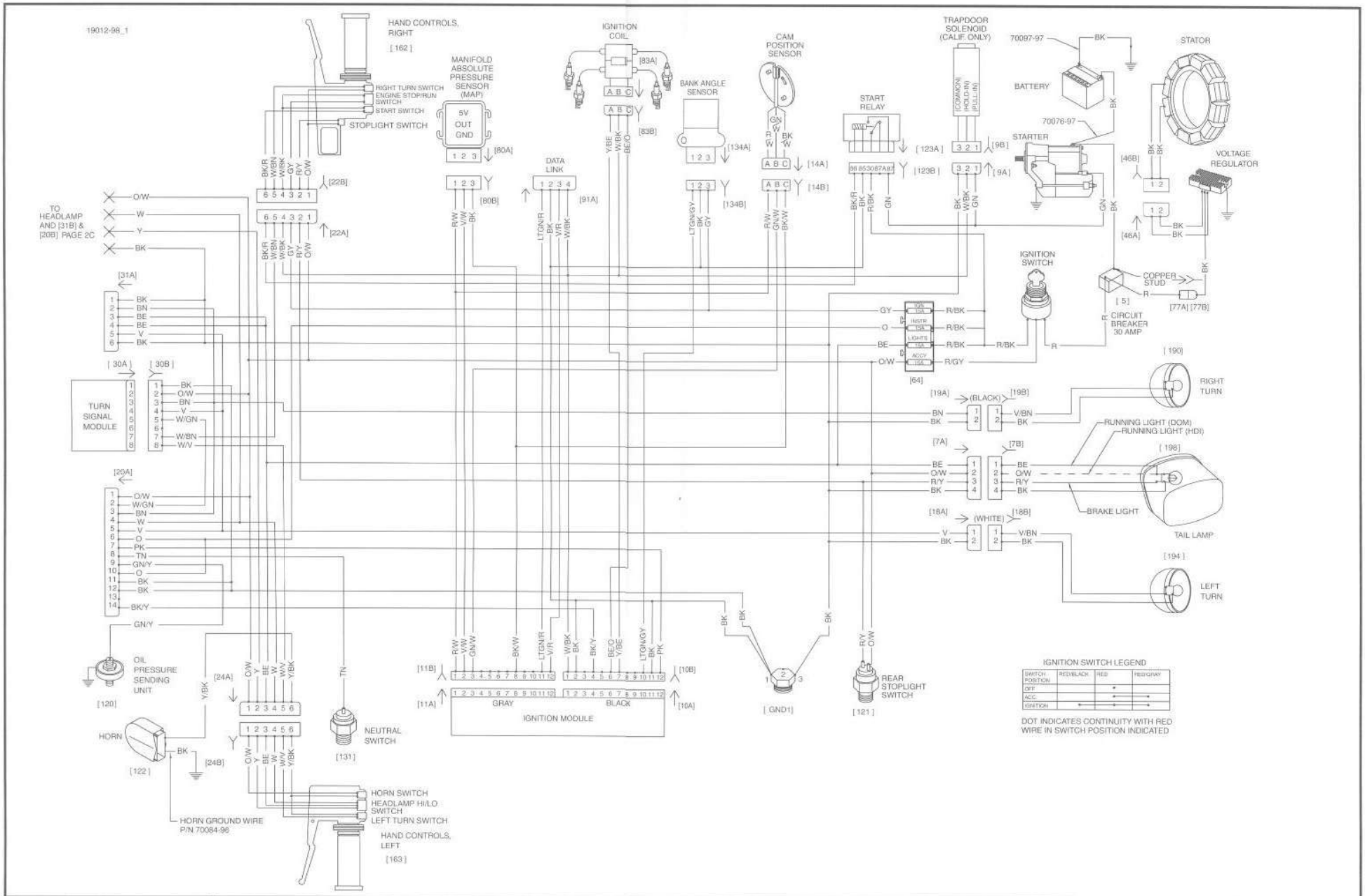
CONNECTOR	POSITION	TERMINAL PART NUMBER	CRIMPER	WIRE GAUGE	CORE CRIMP	INSULATION CRIMP
STARTER TERMINAL		9842 (a)	PACKARD 270,271	12	B	3
CIRCUIT BREAKER TERMINAL (BK)		9843 (a)	PACKARD 270,271	14	B	3
CIRCUIT BREAKER TERMINAL (2-R)		9866	PACKARD 115	12,14	12-10 GA.	12-10 GA. (h)
STARTER RELAY (BK,BK/R)	85,86	9937	PACKARD 271	18	C	D
STARTER RELAY (R/BK)	30	9937	PACKARD 271	14	C	A
STARTER RELAY (2-GN)	87	9937	PACKARD 271	14,16	C (h)	A (h)
FUSE BLOCK (2-GY)	1	72217-94	PACKARD 271	16,18	C (h)	B (h)
FUSE BLOCK (2-O)	2	72219-94	PACKARD 271	18	C (h)	B (h)
FUSE BLOCK (2-BE)	3	72219-94	PACKARD 271	18	C (h)	B (h)
FUSE BLOCK (2-O/W)	4	72219-94	PACKARD 271	18	C (h)	B (h)
FUSE BLOCK (2-R/BK)	5	72220-94	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (2-R/BK)	6	72220-94	PACKARD 271,115	14	A (h)	G (h)
FUSE BLOCK (R/BK)	7	72218-94	PACKARD 271	14	C	A
FUSE BLOCK (R/GY)	8	72218-94	PACKARD 271	14	C	A
OIL PRESSURE SENDING UNIT		9857 (z)	PACKARD 115	18	C	A
REAR STOP LIGHT SWITCH (O/W)		9937 (b)	PACKARD 271	18	C	D
REAR STOP LIGHT SWITCH (2-R/Y)		9937 (b)	PACKARD 271	18	C (h)	D (h)
MAIN GROUND-CHASSIS		9860	PACKARD 115	14	16-14 GA.	16-14 GA.
MAIN GROUND-CHASSIS (2-BK)		72242-94 (a)	PACKARD 115,270	14,16(h)	G (h)	3 (h)
SOLENOID		72291-94	PACKARD 271,115	14	A	G
HORN		9898	PACKARD 271	18	TIP	X
HORN		9898	PACKARD 115	18	TIP	X
NEUTRAL SWITCH		9905	PACKARD 115	18	20-18 GA.	20-18 GA.
COIL [130B]	ALL	72033-93	PACKARD 271	18	E	C
TAIL LIGHT [7A]	ALL	73190-96	HD-41609	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	B,C	73190-96	DTT-16-00	18	REAR POSITION	REAR POSITION
EVAP. SOLENOID (CAL.) [9A]	A	73190-96	DTT-16-00	16	CENTER POSITION	CENTER POSITION-
CAM POSITION SENSOR [14B]	ALL	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
MAP SENSOR [39B]	ALL	72213-94 (x)	PACKARD 271, 270	18	E	1
IGNITION MODULE [10B] (BL)	EXCEPT 2,11	72191-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
IGNITION MODULE [10B] (BL)	2,11	73191-94	DTT-16-00	18	REAR POSITION	REAR POSITION
IGNITION MODULE [11B] (GY)	ALL	73191-9	DTT-16-00	18	REAR POSITION	REAR POSITION
REAR DIRECTIONALS [18A,19A]	ALL	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
INSTRUMENT CLUSTER [20A]	EXCEPT 1	72190-94	HD-41609	16	CENTER POSITION	CENTER POSITION
INSTRUMENT CLUSTER [20A]	1	72190-94	HD-41609	18	CENTER POSITION	CENTER POSITION
RIGHT HAND CONTROLS [22A]	EXCEPT 2	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
RIGHT HAND CONTROLS [22A]	2	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
LEFT HAND CONTROLS [24A]	1,5,6	72190-94	DTT-16-00	14	CENTER POSITION	CENTER POSITION
LEFT HAND CONTROLS [24A]	2,3,4	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TURN SIGNAL MODULE [30A]	EXCEPT 2	72190-94	DTT-16-00	18	CENTER POSITION	CENTER POSITION
TURN SIGNAL MODULE [30A]	2	72190-94	DTT-16-00	16	CENTER POSITION	CENTER POSITION
FRONT TURN SIGNALS	ALL	73190-94	HD-41609	18	REAR POSITION	REAR POSITION
HEADLAMP 68705-93A	Y	70586-93 (l)	PACKARD 115	16	14-16 GA.	
HEADLAMP 68705-93A	W,BK	70586-93 (l)	PACKARD 115	16,18	14-16 GA.	
IGNITION SWITCH KIT 71441-94	ALL	70586-93 (l)	PACKARD 115	14	14-16 GA.	
BANK ANGLE SENSOR [134B]	ALL	72033-93	PACKARD 271	18	E	C
REGULATOR [77A]		72196-94	HD-42879	12	12	

Crimp Table Legend

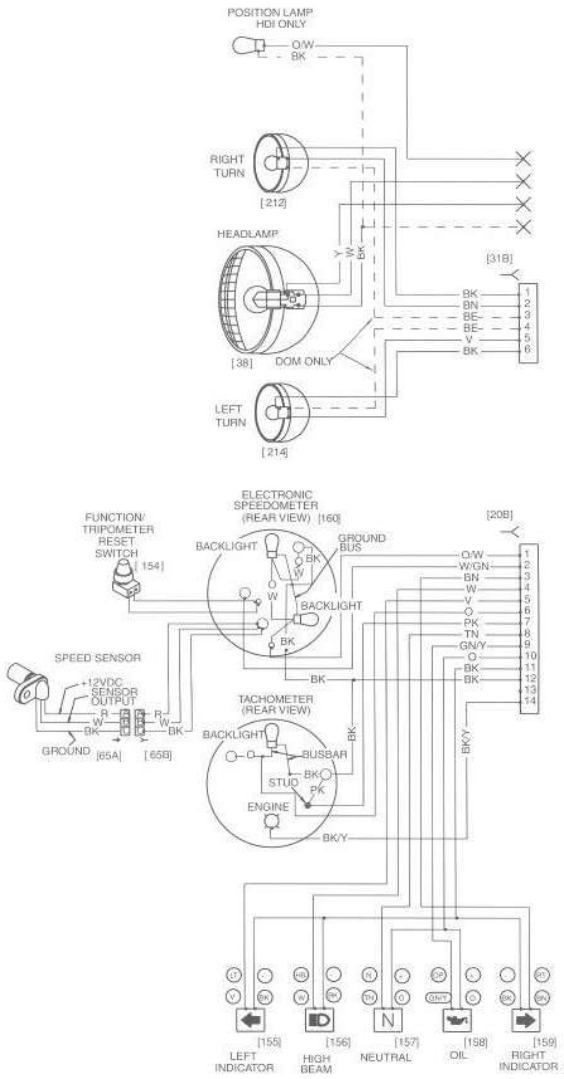
(a) - requires solder after crimping
(b) - 9937 terminals require use of 72249-94 heat shrink tubing
(h) - double lug crimp
(j) - heat sealed butt splice connector
(q) - requires use of 72249-94 heat shrink tube
(x) - use 72214-94 seal
(z) - use with 7629 nut



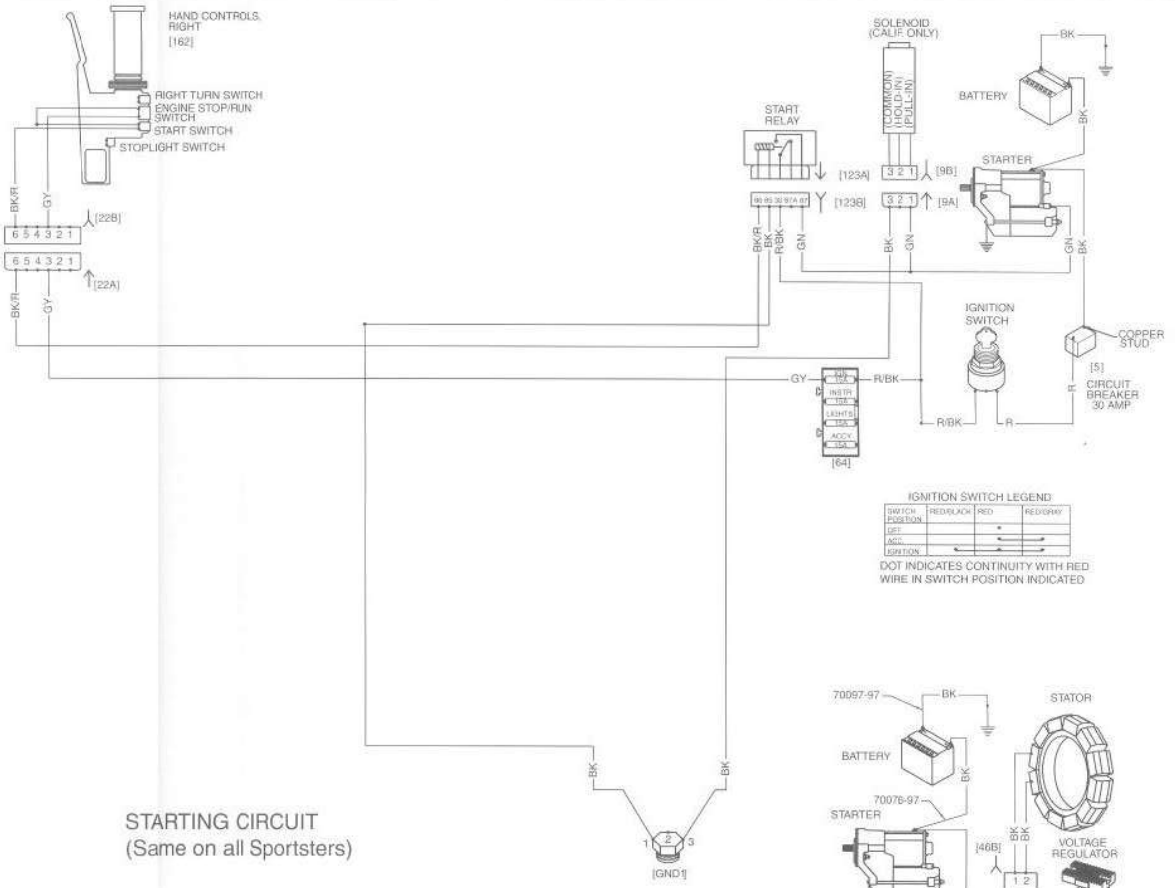
The cavity numbers or positions in the fuse block are identified in the above illustration.



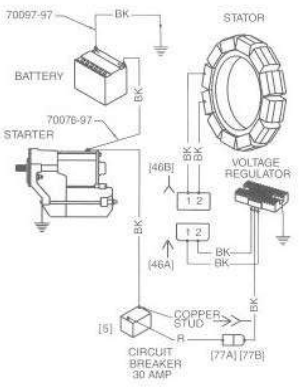
XL 1200S Domestic and International Models - Main Harness



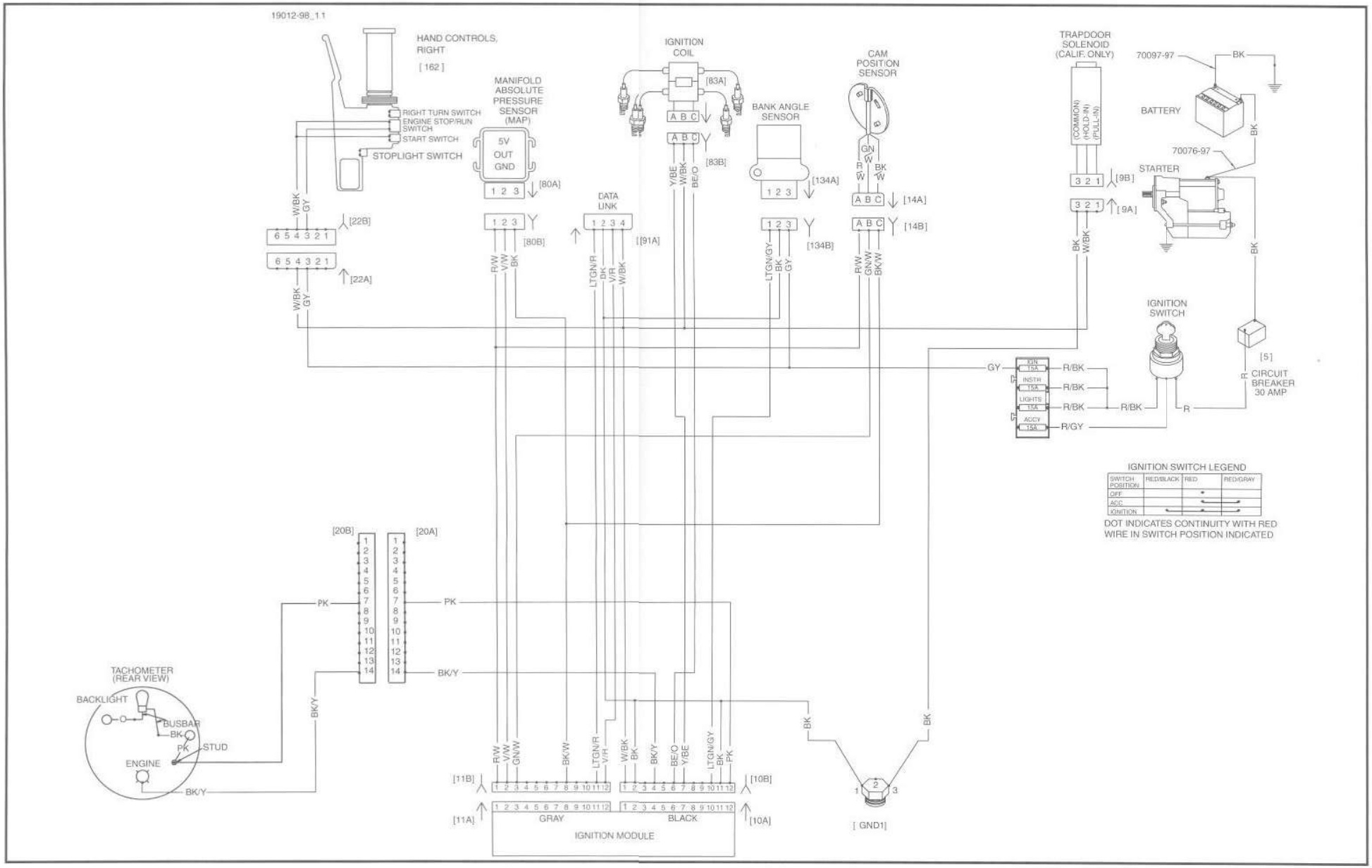
XL 1200S Front Lamps



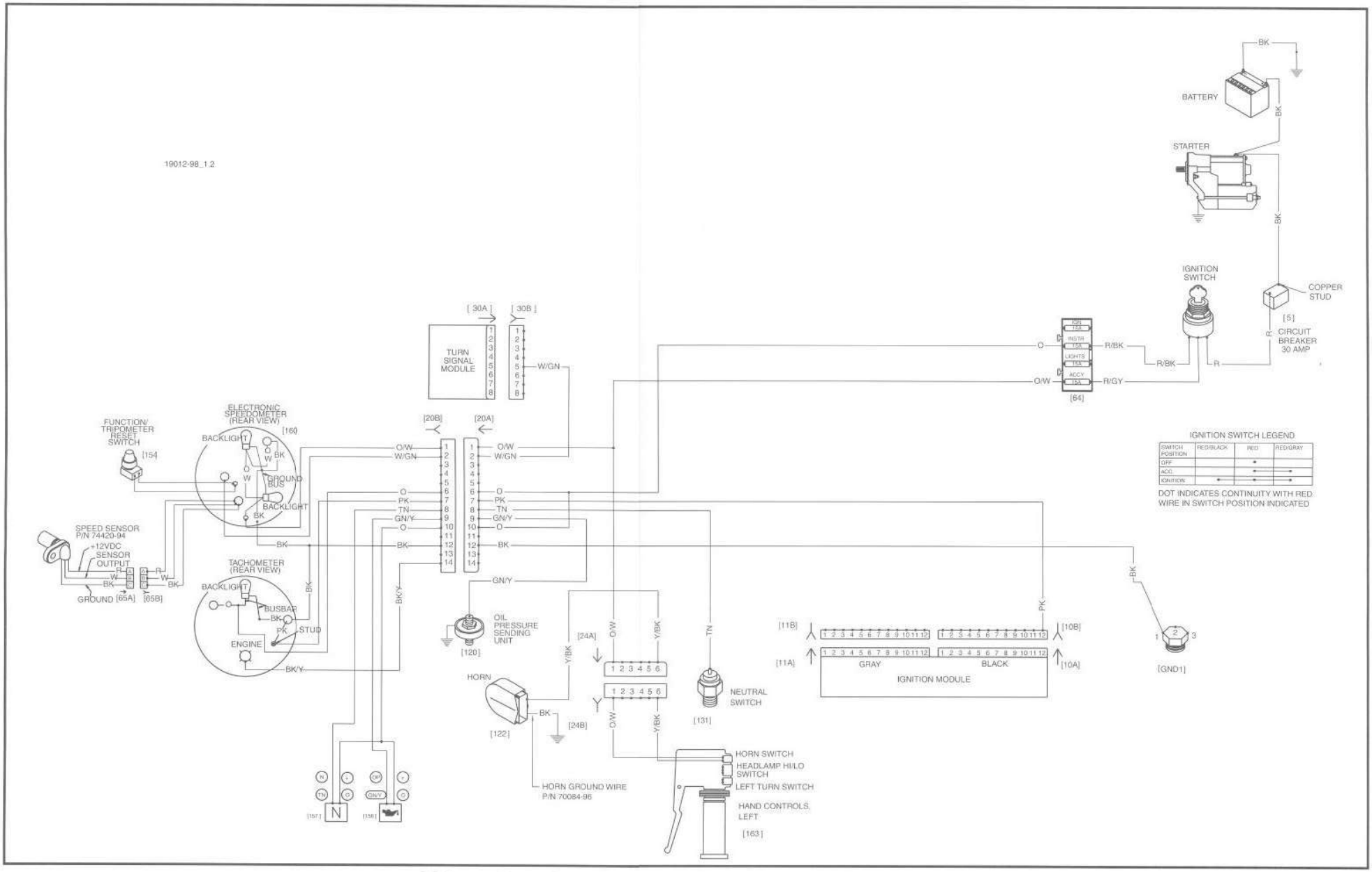
STARTING CIRCUIT
(Same on all Sportsters)



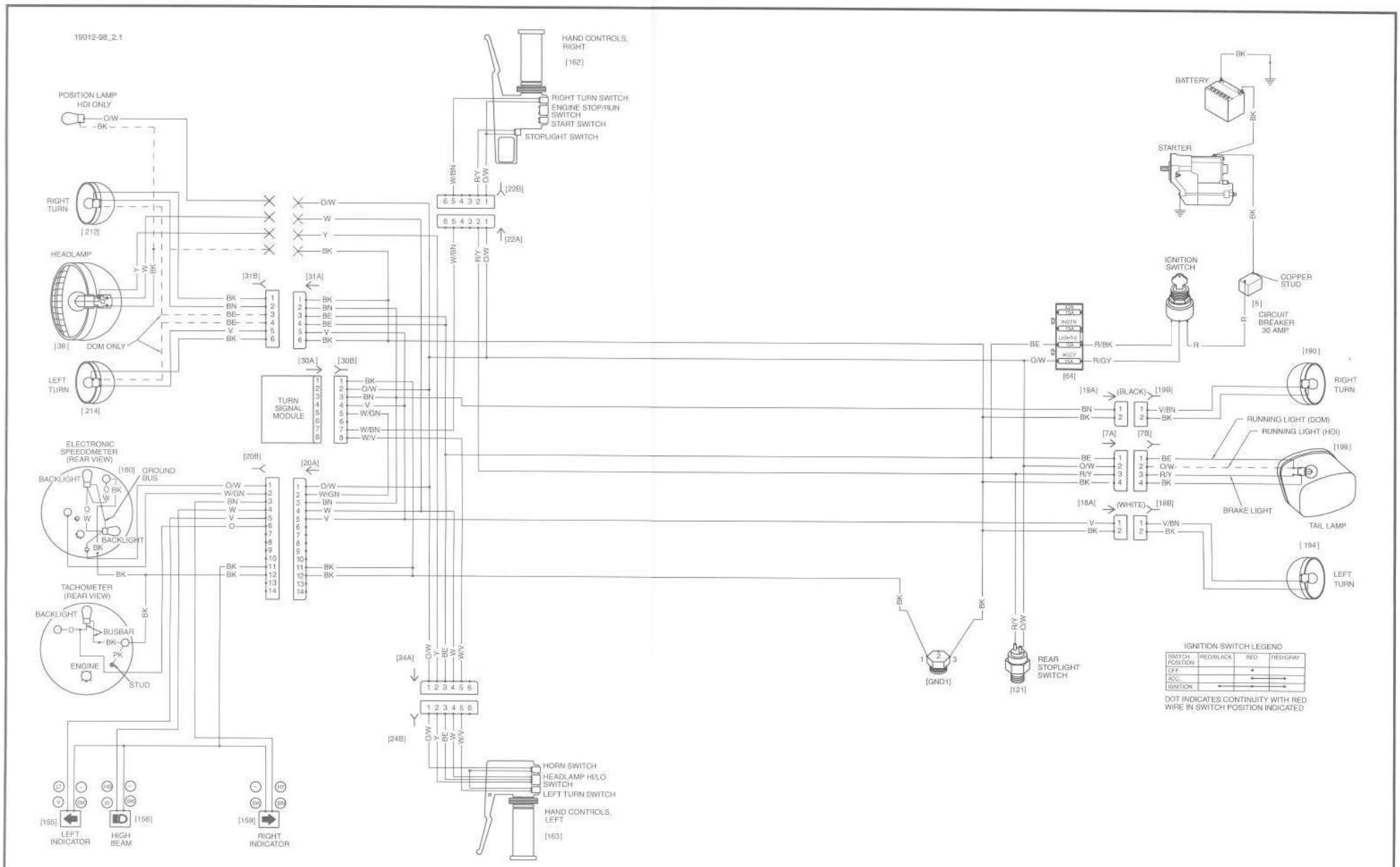
CHARGING CIRCUIT
(Same on all Sportsters)



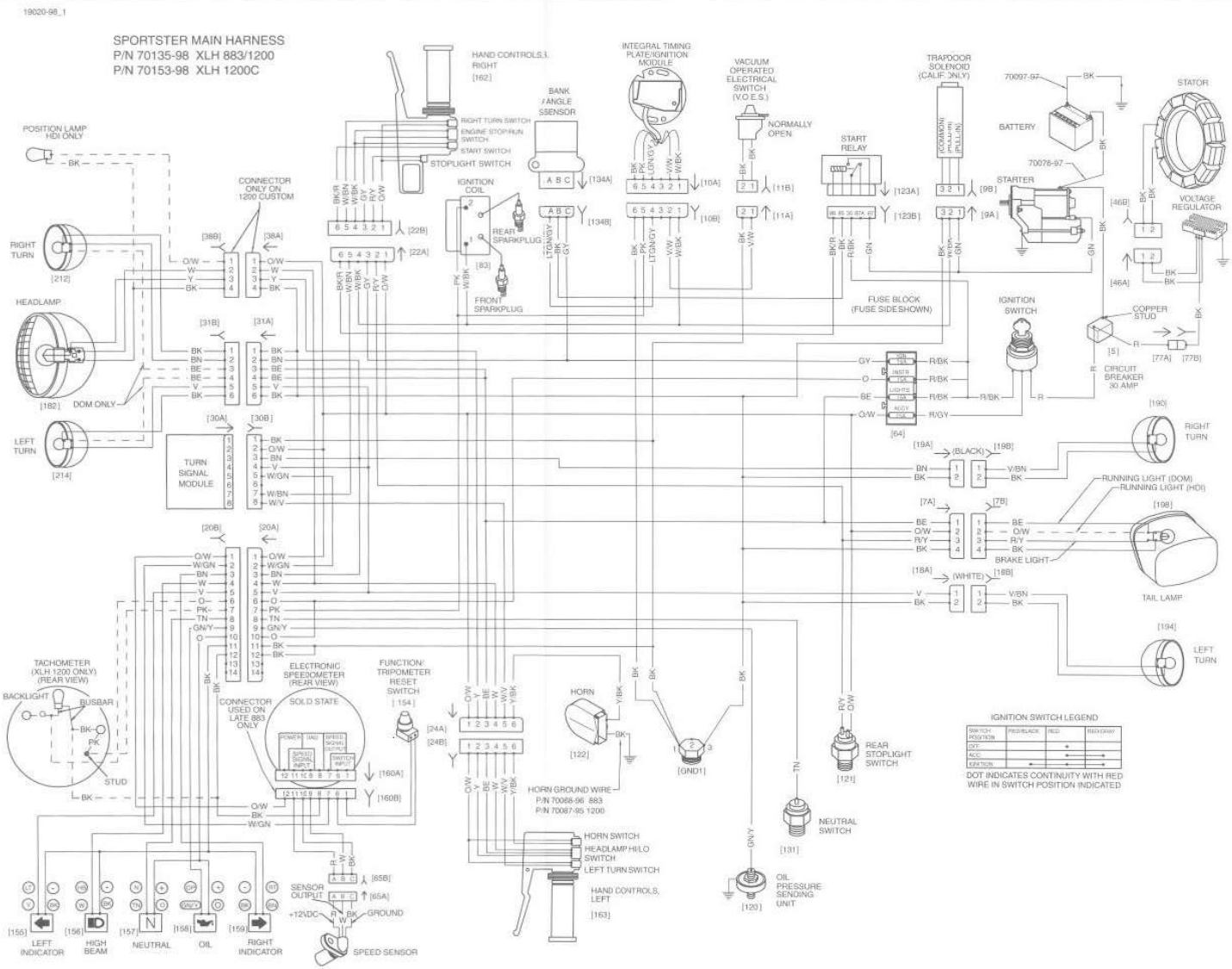
XLH 1200S Domestic and International - Ignition Circuit



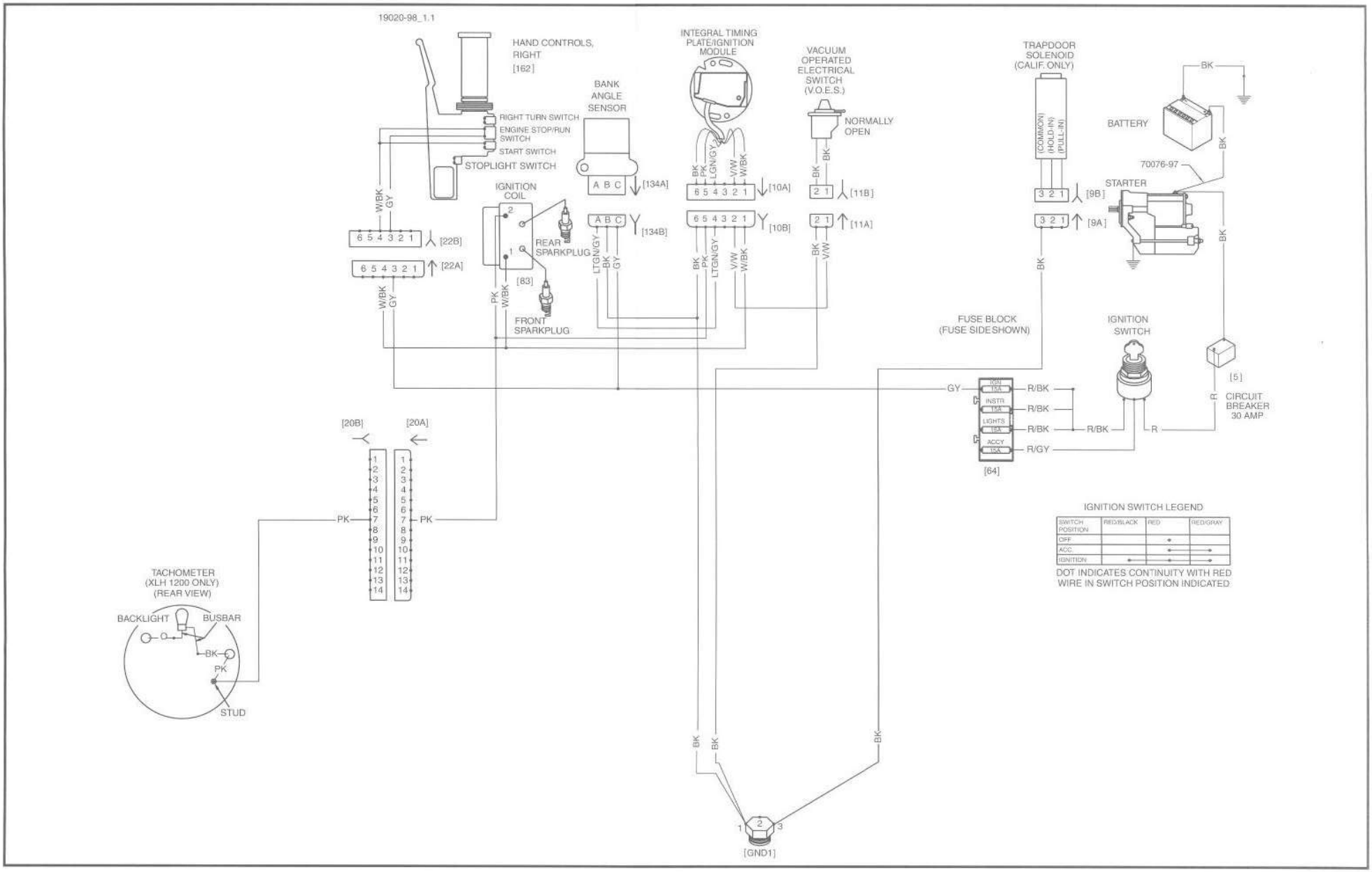
XLH 1200S Domestic and International - Horn and Instruments



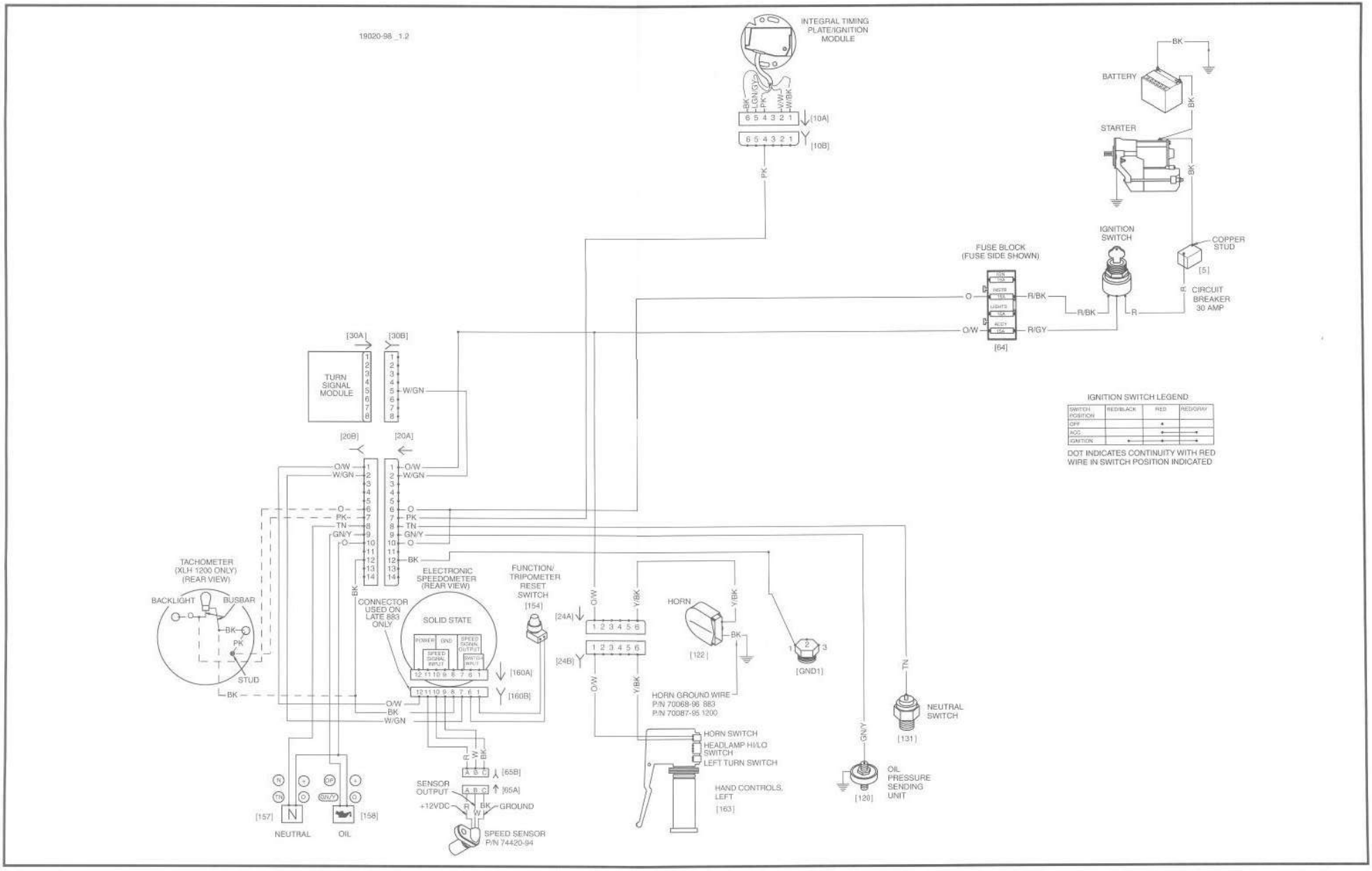
XLH 1200S Domestic and International - Lights



All XL Domestic and International (Except 1200S) - Main Harness



All XL Domestic and Interrational (Except 1200S) - Ignition Circuit



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