

CHARGING SYSTEM

GENERAL

The charging system consists of the alternator and regulator. See [page 7-25](#) 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.

Voltage Regulator

See [Figure 7-18](#). The voltage regulator is a series regulator with shunt control. The circuit combines the functions of rectifying and regulating.

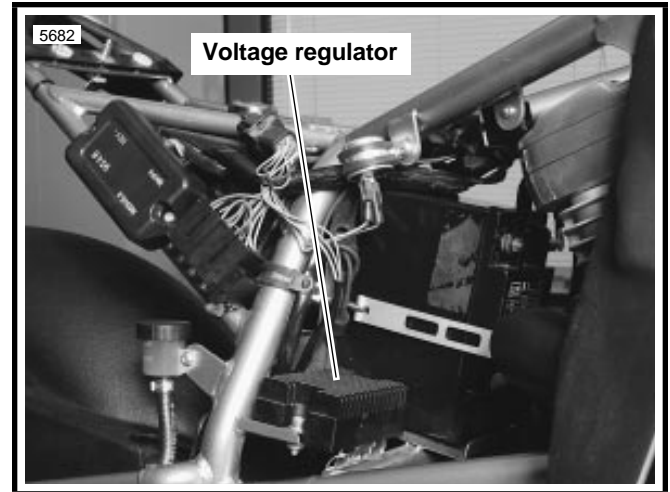


Figure 7-18. Voltage Regulator

TROUBLESHOOTING

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 [BATTERY](#) in Section 1. Battery must be fully charged in order to perform any electrical tests.

Wiring

Check for corroded or loose connections in the charging circuit. See [Figure 7-19](#).

Voltage Regulator Inspection

The voltage 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.

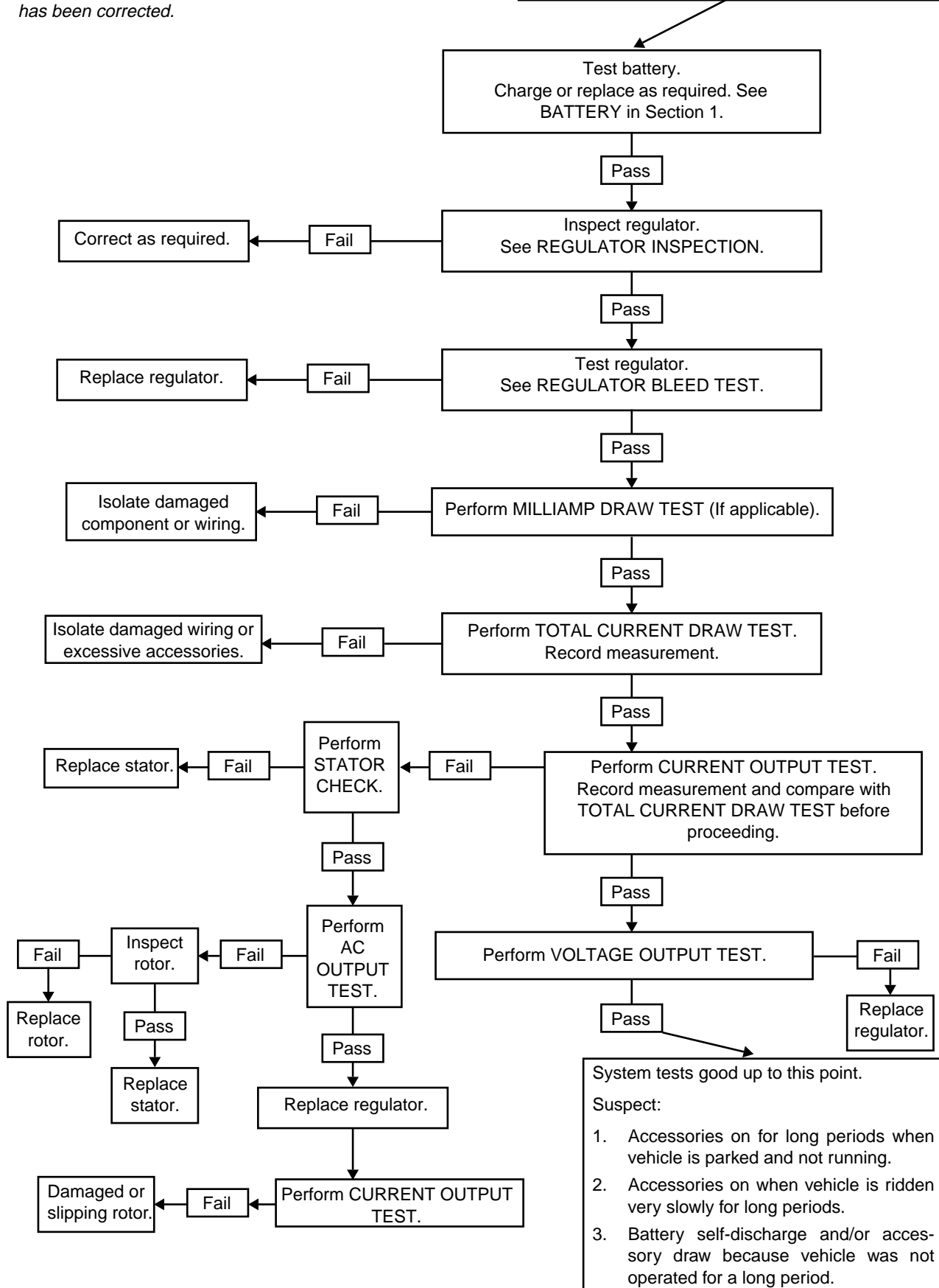
Connector plug to engine crankcase must be clean and tight.

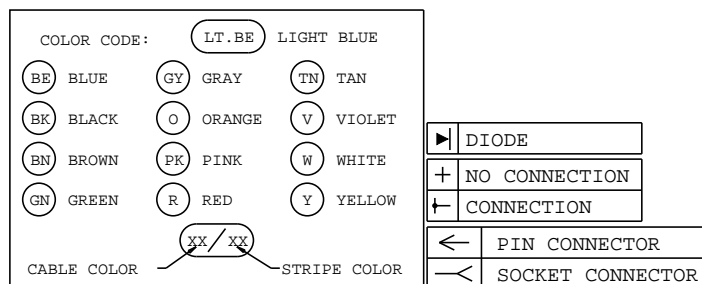
Charging System Troubleshooting

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.

SYMPTOM: BATTERY BECOMES DISCHARGED





7-25

TESTING

Voltage Regulator Bleed Test

Be sure regulator is connected to battery. Unplug regulator connector to engine crankcase. 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.

Milliampere 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 7-20. 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 LOCK, amperage reading should be 3 milliamperes maximum. A higher reading indicates excessive current draw.

Any accessories must be considered and checked for excessive drain.

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

NOTE

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

Total Current Draw Test

See Figure 7-21. 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.

With ignition and all continuously running lights and accessories turned on (headlamp on high beam), wait 10 seconds, and then 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 6.5 amps, minimum (3 amps for ignition and 3.5 amps for battery maintenance). If not, there may be too many accessories for the charging system to handle.

NOTE

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

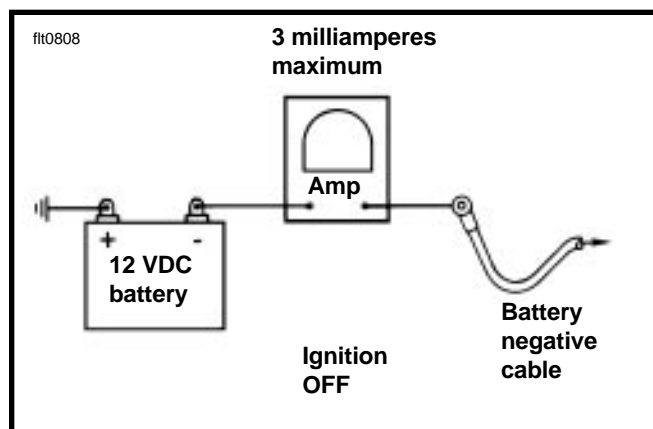


Figure 7-20. Milliampere Draw Test

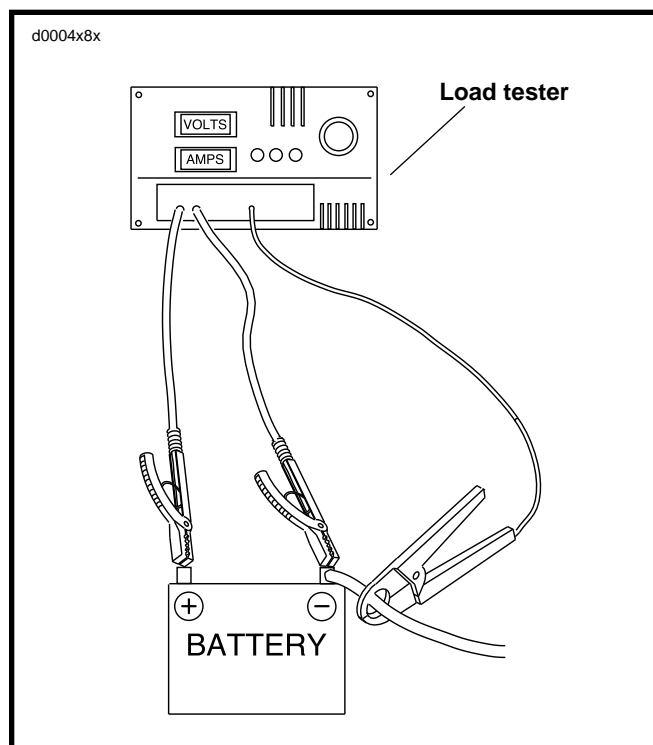


Figure 7-21. Check Current Draw (Ignition Switch On)

Current and Voltage Output Test

1. See [Figure 7-22](#). Connect load tester.
 - a. Connect negative and positive leads to battery terminals.
 - b. Place load tester induction pickup over positive regulator cable.
2. Run the engine at 2000 RPM. Increase the load as required to obtain a constant 13.0 VDC.
3. The current output should be 19-23 amps. Make note of measurement.

Voltage Output Test

See [Figure 7-22](#). After removing the load, read the load tester voltage meter. Voltage to the battery must not be more than 15 VDC. 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.

Stator Check

1. Turn ignition to LOCK.
2. Disconnect stator wiring from voltage regulator wiring at connector [P17].
3. See [Figure 7-23](#). Connect an ohmmeter on the RX1 scale between crankcase and either stator socket. Test for continuity.
 - a. A good stator will show no continuity (∞ ohms) across either test point.
 - b. Any other reading indicates a grounded stator which must be replaced.
4. See [Figure 7-24](#). Check the resistance using an ohmmeter set on the RX1 scale.
 - a. Resistance across the stator sockets or pins should be 0.2-0.4 ohms.
 - b. If the resistance is lower, the stator is damaged and must be replaced.

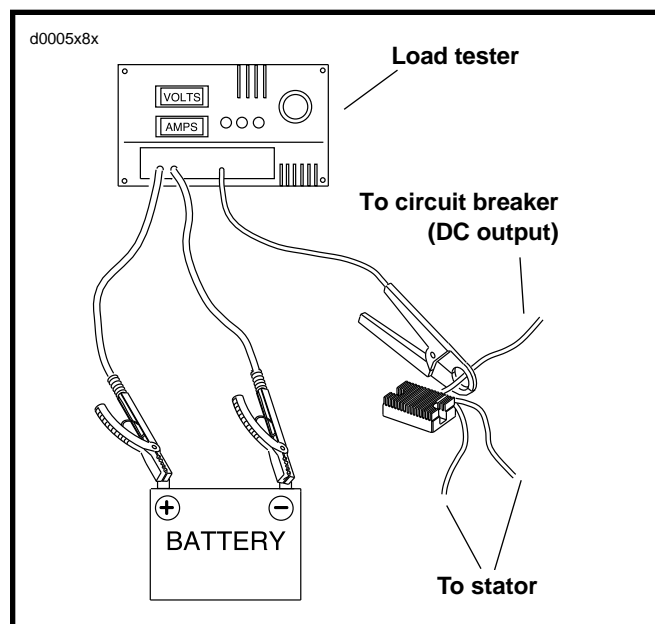


Figure 7-22. Current and Voltage Output Test



Figure 7-23. Test for Grounded Stator



Figure 7-24. Check for Stator Resistance

AC Output Check

1. See [Figure 7-25](#). Test AC output.
 - a. Disconnect voltage regulator wiring at connector [P17].
 - b. Connect an AC voltmeter across both stator sockets.
 - c. Run the engine at 2000 RPM. The AC output should be 38-52 volts AC.
2. Compare test results to specifications.
 - a. If the output is below specifications, charging problem could be a faulty rotor or stator.
 - b. If output is good, charging problem might be faulty regulator/rectifier. Replace as required.
3. Check the output again as described under [Current and Voltage Output Test](#).



Figure 7-25. Check Stator AC Voltage Output

ALTERNATOR

REMOVAL/DISASSEMBLY

⚠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.

⚠CAUTION

Hold battery cable when loosening battery terminal hardware. Failure to hold cable may cause battery damage.

1. Disconnect battery cables, negative cable first.
2. Remove primary cover. See [PRIMARY CHAIN](#) in Section 6.
3. Remove clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. Refer to [PRIMARY DRIVE/CLUTCH](#) in Section 6. Remove/disassemble rotor and/or stator, as required. Refer to the following procedures.

Rotor

1. Remove bolts which secure alternator rotor to engine sprocket.
2. See [Figure 7-26](#). Position blocking under rotor. Press sprocket free of rotor.

NOTE

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

Stator

1. See [Figure 7-27](#). Disconnect stator wiring (4) from voltage regulator wiring at connector (5) [P17].
2. Remove cable straps holding stator wire to frame.
3. Withdraw stator wiring (4) from below starter.
4. Remove and discard the four Torx screws (2) which secure stator (1) to 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 could result in alternator damage.

5. Remove stator wiring grommet (3) from left crankcase half.
6. Withdraw stator wiring (4) from grommet hole in left crankcase half. Remove stator (1).

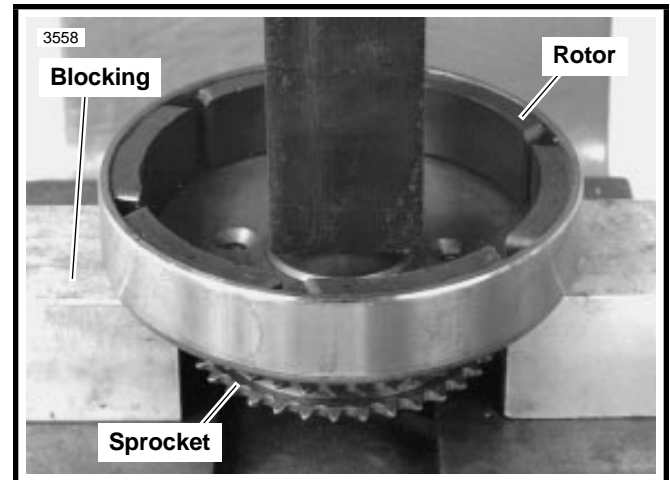


Figure 7-26. Removing Rotor From Sprocket

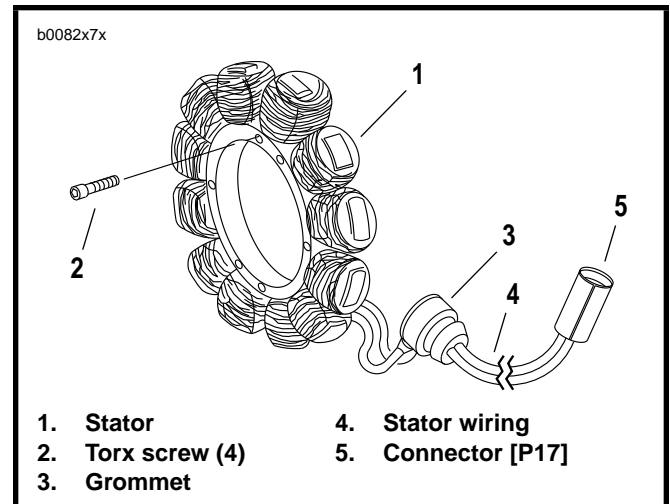


Figure 7-27. Stator Assembly

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/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 7-27](#). Feed stator wiring (4) with attached grommet (3) into open grommet hole in left crankcase half.
2. Apply a light coating of clean engine oil or chaincase lubricant to grommet. 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 could result in alternator damage.

3. Position stator (1) on left crankcase half. Secure stator using four **new** Torx screws (2). Tighten screws to 30-40 **in-lbs** (3.4-3.5 Nm).
4. Route stator wiring (4) below starter to frame upright.

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 upward along side of frame upright. Connect stator wiring connector [P17] to voltage regulator.
6. Secure stator wiring, along with any other wires and hoses routed in the same location, to frame using cable straps.

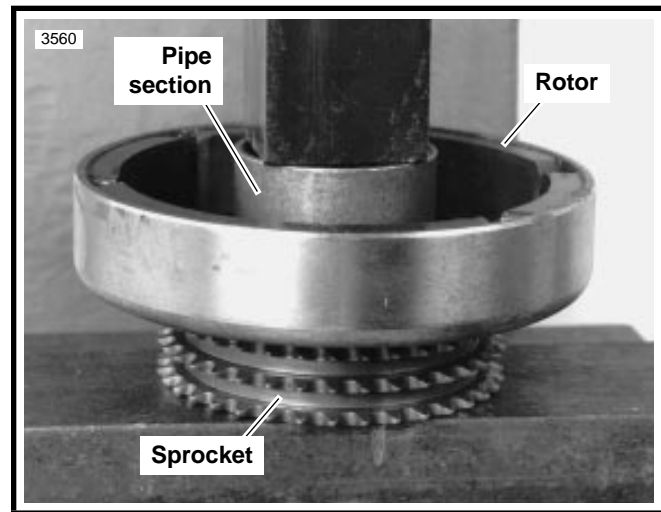


Figure 7-28. Pressing Rotor onto Sprocket

7. See [Figure 7-28](#). Attach rotor to sprocket.
 - a. Position rotor on sprocket. Align holes in sprocket with holes in rotor.
 - b. 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.
 - c. Position a section of pipe 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).
8. Install clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See [PRIMARY DRIVE/CLUTCH](#) in Section 6.
9. Install primary cover. See [PRIMARY CHAIN](#) in Section 6.

⚠WARNING

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

⚠CAUTION

Hold battery cable when loosening battery terminal hardware. Failure to hold cable may cause battery damage.

10. Connect battery cables, positive cable first.
11. Test charging system. See [CHARGING SYSTEM](#) on [page 7-23](#).

VOLTAGE REGULATOR

GENERAL

The voltage regulator is on the right side next to the battery. The voltage regulator is not repairable. Replace the unit if it fails.

REMOVAL

⚠ 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.

⚠ CAUTION

Hold battery cable when loosening battery terminal hardware. Failure to hold cable may cause battery damage.

1. Disconnect battery cables, negative cable first.

⚠ 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.

2. See [Figure 7-29](#). Disconnect voltage regulator connector [P17] from alternator stator wiring.
3. Disconnect charging wire (black) from gold terminal on the main circuit breaker.
4. See [Figure 7-30](#). Remove screws (1, 3), washers (2) and lockwasher (5). Detach and remove groundstrap from long screw (1).
5. Remove and discard voltage regulator (3).

INSTALLATION

1. See [Figure 7-30](#). Install **new** voltage regulator with longer screw (1) next to battery. Attach groundstrap under voltage regulator mount.
2. Connect voltage regulator connector [P17] to alternator stator wiring.
3. Route charging wire to gold post on main circuit breaker. Attach wire to frame with **new** cable straps.

⚠ WARNING

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

⚠ CAUTION

Hold battery cable when tightening battery terminal hardware. Failure to hold cable may cause battery damage.

4. Connect battery cables, positive cable first.
5. Test charging system. See [CHARGING SYSTEM](#) on [page 7-23](#).

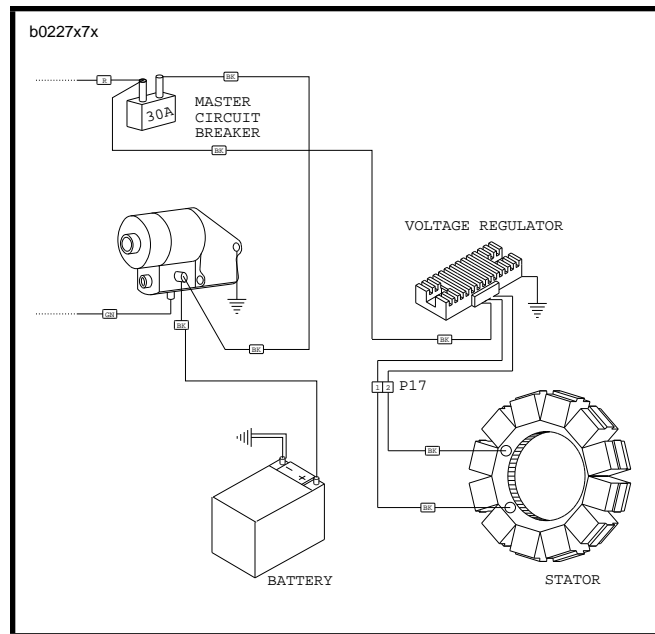


Figure 7-29. Voltage Regulator Connector [P17]

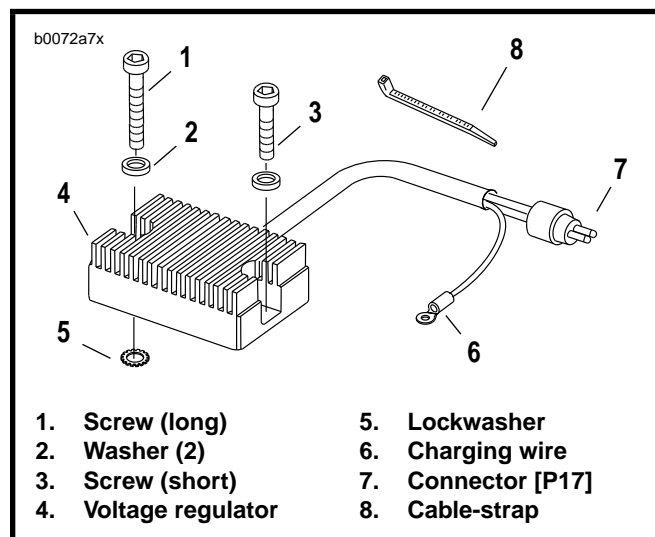


Figure 7-30. Voltage Regulator

BATTERY

GENERAL

⚠ WARNING

- Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing.
- Batteries produce explosive hydrogen gas at all times, especially when being charged. Keep cigarettes, open flame and sparks away from the battery at all times. Ventilate area when charging battery. Always protect hands and protect eyes with shield or goggles when working near a battery or acid. **KEEP BATTERIES AND ACID OUT OF THE REACH OF CHILDREN!**

See [Figure 7-31](#). The battery is below the seat in the center of the vehicle. The battery can be removed from the left side of the motorcycle without removing the tail section or fuel tank.

NOTE

The battery requires no additional fluid at any time. See [BATTERY](#) in Section 1 for removal/installation and charging procedures.

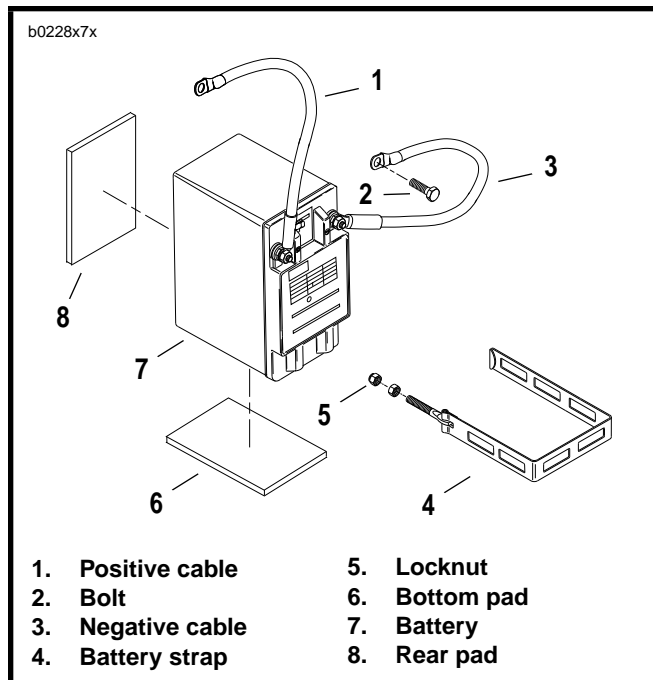


Figure 7-31. Battery

HEADLAMP

REMOVAL

Headlamp and Bulbs

1. See [Figure 7-32](#). Loosen screw (10) at bottom of headlamp.
2. Pry headlamp (9) from headlamp housing (13).
3. See [Figure 7-33](#). Press retaining clip (4) and remove position lamp bulb (3) from headlamp. Twist bulb to remove from harness.

⚠ WARNING

The bulb contains Halogen gas under pressure. Handle bulb careful and wear eye protect to avoid possible personal injury.

⚠ CAUTION

Never touch the bulb with your fingers. Fingerprints will etch the glass and cause the bulb to fail. Always wrap the bulb in paper or a clean, dry cloth during handling.

4. Remove headlamp bulb (6).
 - a. Detach headlamp bulb connector.
 - b. Open the wire retaining latch (1).
 - c. Pull bulb housing from headlamp housing.
5. Disconnect ground wire from headlamp.

Headlamp Housing and Brackets

1. See [Figure 7-32](#). Remove screw (1) (metric) and washer (2) on each side.
2. Detach speedometer cable from headlamp housing clip.
3. Remove seat and fuel tank. See [FUEL TANK, REMOVAL](#) in Section 4.
4. See [Figure 7-34](#). Cut as many cable straps as necessary to access headlamp connector [P4] along right side frame tube. Detach connector [P4] from wiring harness.
5. Remove headlamp housing from vehicle.
6. Remove headlamp brackets.
 - a. Remove front turn signals. See [TURN SIGNALS, REMOVAL](#) on [page 7-37](#).
 - b. Remove windscreen mounting brackets.
 - c. See [Figure 7-32](#). Remove four bolts (5) and locknuts (3).
 - d. Remove front forks and headlamp brackets (4). See [FRONT FORK, REMOVAL](#) in Section 2.

NOTE

Lower bolt on right headlamp bracket is longer than the three other bolts. A wire guide and two washers are installed on this bolt. The wire guide keeps cables away from the forks.

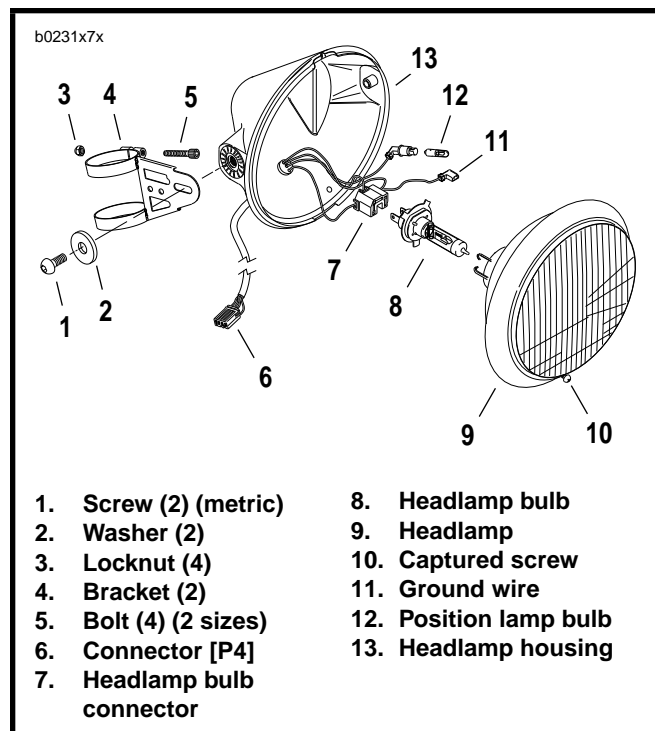


Figure 7-32. Headlamp Assembly

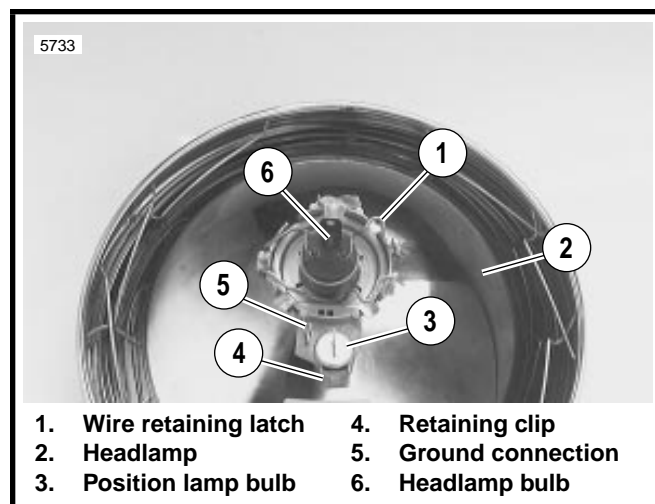


Figure 7-33. Headlamp Bulbs



INSTALLATION

Headlamp Brackets and Housing

1. Install headlamp brackets.
 - a. Install front forks through triple clamps and brackets. See [FRONT FORK, INSTALLATION](#) in Section 2.
 - b. See [Figure 7-32](#). Install four bolts (5) and locknuts (3). Wire guide and two washers go on lower bolt on right headlamp bracket. Place wires into wire guide.
 - c. Place windscreen brackets on the inside of the headlamp brackets.
 - d. Install front turn signals. See [TURN SIGNALS, INSTALLATION](#) on [page 7-37](#).
2. See [Figure 7-34](#). Route headlamp wire harness between front forks and along right side frame tube. Attach connector [P4] to wiring harness. Fasten wiring harness to frame with **new** cable straps.
3. See [Figure 7-32](#). Install headlamp housing using two screws (1) (metric) and washers (2). Tighten to 6-8 ft-lbs (8.1-10.8 Nm).
4. Install fuel tank and seat. See [FUEL TANK, INSTALLATION](#) in Section 4.
5. Attach speedometer cable to headlamp housing clip.

⚠WARNING

Check for proper headlamp operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper headlamp operation could lead to personal injury.

6. Check ignition/headlamp switch for proper operation.

Headlamp and Bulbs

⚠WARNING

The bulb contains Halogen gas under pressure. Handle bulb careful and wear eye protect to avoid possible personal injury.

⚠CAUTION

Never touch the bulb with your fingers. Fingerprints will etch the glass and cause the bulb to fail. Always wrap the bulb in paper or a clean, dry cloth during handling.

1. See [Figure 7-33](#). Install headlamp bulb (6).
 - a. Align tabs on bulb housing with tabs on headlamp. Insert bulb.
 - b. Close the wire retaining latch (1).
 - c. Connect the headlamp bulb connector.

NOTE

When replacement is required, see your Buell dealer. Not using the specified bulb may cause charging system problems.

2. Insert position lamp bulb (3).
3. Connect ground wire (5).
4. See [Figure 7-32](#). Place headlamp in housing (13). Tighten screw (10).
5. Align headlamp. See [HEADLAMP](#) in Section 1.

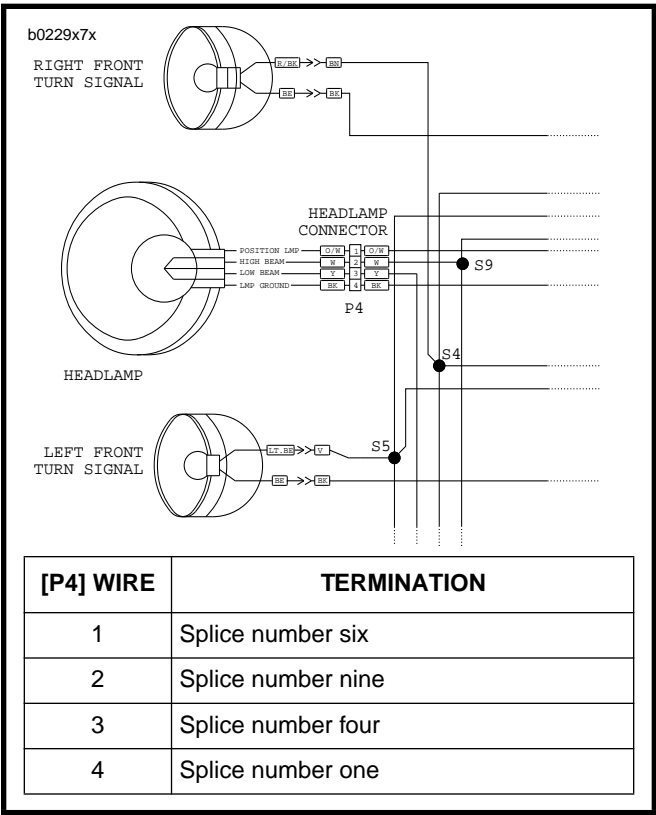


Figure 7-34. Headlamp Connector [P4]

TAIL LAMP

REMOVAL/DISASSEMBLY

Tail Lamp

1. See [Figure 7-35](#). If necessary, remove tail lamp bulb (3).
 - a. Remove two screws (1) to detach tail lamp lens.
 - b. Turn bulb counterclockwise and remove.
2. Remove two locknuts (7) (metric) and washers (6).
3. Disconnect the three terminals and remove tail lamp.

Tail Lamp Bracket

1. Remove seat and tail section. See [TAIL SECTION, REMOVAL](#) in Section 2.
2. See [Figure 7-36](#). Cut cable straps holding tail lamp wiring harness to rear frame. Detach connector [P11] from main wiring harness.
3. See [Figure 7-35](#). Remove seat wing screw (9).
4. Remove bolt (4) to detach bracket from frame.
5. Remove turn signals. See [TURN SIGNALS, REMOVAL](#) on [page 7-37](#).
6. Remove tail lamp.
7. Remove reflectors (8).

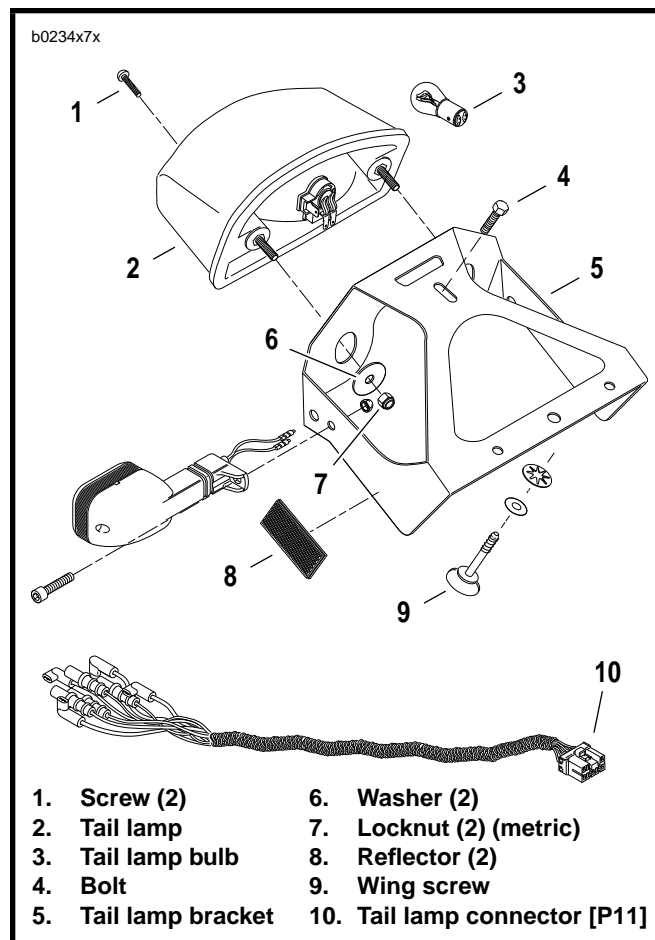


Figure 7-35. Tail Lamp

ASSEMBLY/INSTALLATION

Tail Lamp Bracket

1. See [Figure 7-35](#). Install reflectors (8).
2. Install tail lamp with washers (6) and locknuts (7) (metric).
3. Install turn signals. See [TURN SIGNALS, INSTALLATION](#) on [page 7-37](#).
4. Attach bracket (5) to frame with bolt (4) and seat wing screw (9).
5. Use **new** cable straps to secure tail lamp wiring harness to rear frame. Attach connector [P11] to main wiring harness. See [Figure 7-36](#).
6. Install tail section and seat. See [TAIL SECTION, INSTALLATION](#) in Section 2.

⚠ WARNING

Check for proper tail lamp and turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper lamp operation could lead to personal injury.

7. Check tail lamp and turn signals for proper operation.
8. Use **new** cable straps to bundle the tail lamp wiring harness under the tail section.



Tail Lamp

1. See Figure 7-37. Install the three tail lamp wires.

NOTE

Early 1996 models may have a blue wire in slot 7 of connector [P11]. This wire does not have a terminating connection. Cable strap this wire to the other harness wires.

2. See Figure 7-35. Attach tail lamp to bracket with two locknuts (7) (metric) and washers (6).
3. If removed, install tail lamp bulb.
 - a. Turn bulb clockwise to install.
 - b. Install tail lamp lens with two screws (1).

⚠WARNING

Check for proper tail lamp and turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper lamp operation could lead to personal injury.

4. Check tail lamp and turn signals for proper operation.
5. Use **new** cable straps to bundle the tail lamp wiring harness under the tail section.

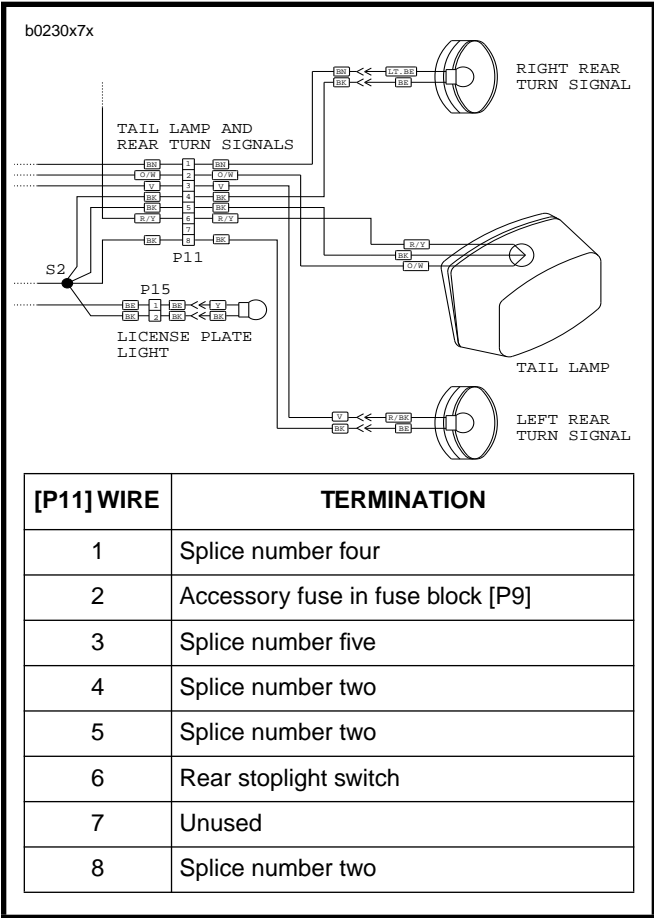


Figure 7-36. Tail Lamp Connector [P11]

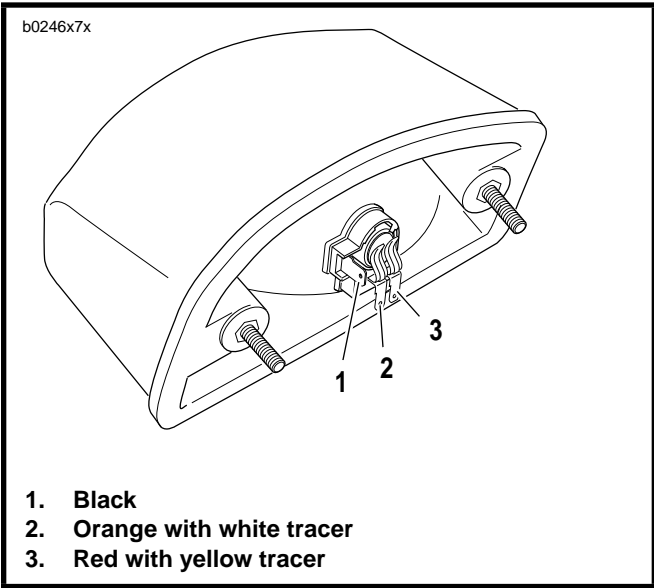


Figure 7-37. Tail Lamp Bulb Wires

TURN SIGNALS

REMOVAL

Front

1. Remove headlamp mounting screws (metric) and washers.
2. See [Figure 7-38](#). Disconnect bullet connectors (5).
3. Remove screws (1) (metric) and locknuts (6) (metric).
4. Remove turn signals and standoffs (4).

Rear

1. See [Figure 7-38](#). Cut cable straps to access bullet connectors under tail section. Disconnect bullet connectors.
2. Remove screws (9) (metric) and nuts (6) (metric).
3. Remove turn signals from tail lamp bracket (7).

INSTALLATION

NOTE

New turn signal bulbs may be installed by removing screw on turn signal lens.

Front

1. See [Figure 7-38](#). Install turn signals and standoffs using screws (1) (metric) and nuts (6) (metric).

NOTE

Install turn signal with lens drain hole facing downward.

2. Attach bullet connectors to wiring harness as shown in [Figure 7-34](#).
3. Install headlamp housing using two screws (metric) and washers. Tighten to 5-7 ft-lbs (6.8-9.5 Nm).

⚠ WARNING

Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could lead to personal injury.

4. Check turn signals for proper operation.

Rear

1. See [Figure 7-38](#). Install turn signals using screws (9) (metric) and nuts (6) (metric).

NOTE

Install turn signal with lens drain hole facing downward.

2. Attach bullet connectors to wiring harness as shown in [Figure 7-36](#).

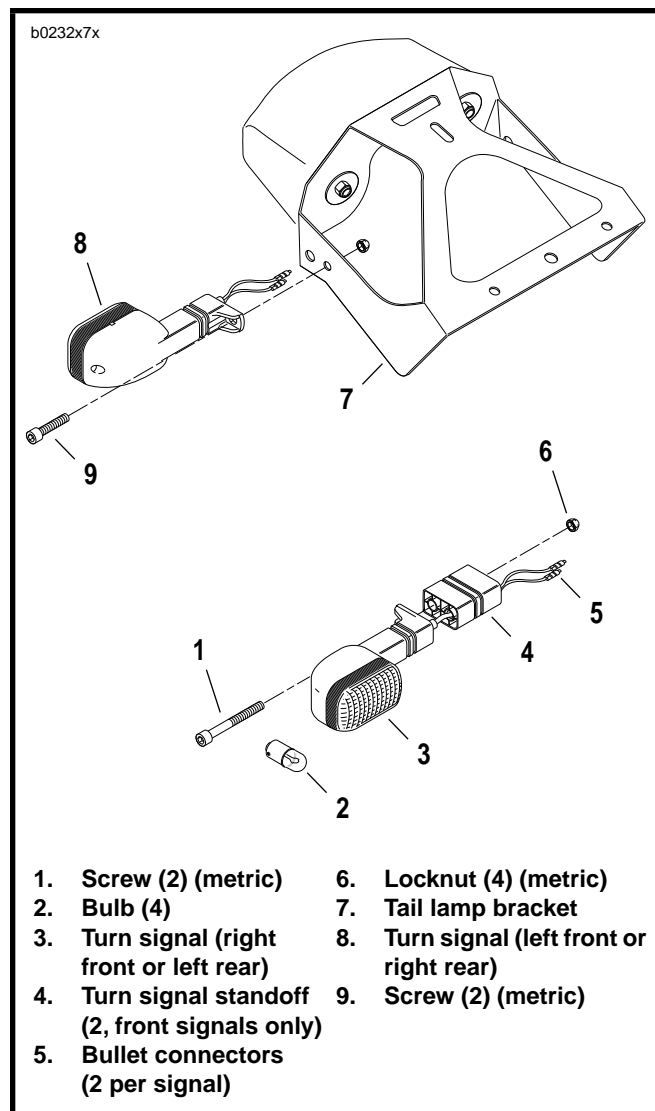


Figure 7-38. Turn Signals

3. Cable strap turn signal wires into a bundle beneath the tail section.

⚠ WARNING

Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could lead to personal injury.

4. Check turn signals for proper operation.

TURN SIGNAL FLASHER

REMOVAL

NOTE

The turn signal flasher is not repairable. Replace the unit if it fails.

1. Remove seat and tail section. See [TAIL SECTION, REMOVAL](#) in Section 2.
2. See [Figure 7-39](#). Remove screw from clamp.
3. Remove turn signal flasher and detach both wires.

INSTALLATION

1. See [Figure 7-39](#). Connect both wires to flasher.
2. Place flasher inside clamp so prongs on flasher face inside and down.
3. Install on flasher and clamp on frame with screw.

⚠ WARNING

Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could lead to personal injury.

4. Check turn signals for proper operation.

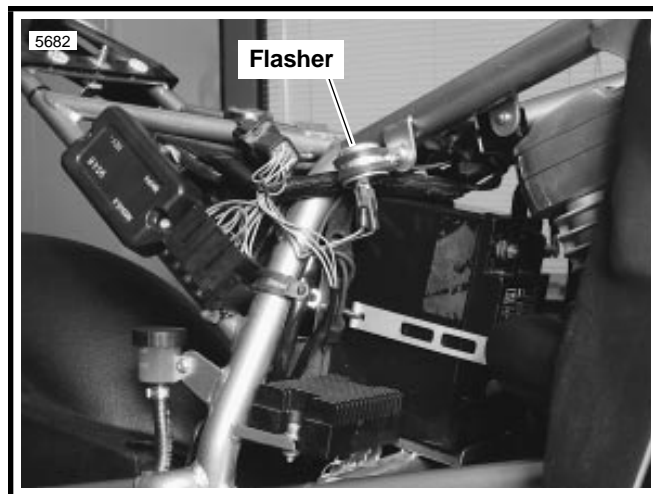


Figure 7-39. Turn Signal Flasher

HANDLEBAR SWITCHES

REMOVAL

NOTE

The individual handlebar switches are not repairable. Replace the switch assembly upon switch failure.

Right Side

1. See Steps 1-5 of [THROTTLE CONTROL, REMOVAL/DISASSEMBLY](#) in Section 2.
2. Remove seat and fuel tank. See [FUEL TANK, REMOVAL](#) in Section 4.
3. See [Figure 7-40](#). Cut as many cable straps as necessary to access right handlebar switch connector [P1] along right side frame tube. Detach connector [P1] from wiring harness.

Left Side

1. Remove three screws (metric) from handlebar switch.
2. Separate switch housings and remove from handlebar.
3. Remove seat and fuel tank. See [FUEL TANK, REMOVAL](#) in Section 4.
4. See [Figure 7-41](#). Cut as many cable straps as necessary to access left handlebar switch connector [P6] along right side frame tube. Detach connector [P6] from wiring harness.

INSTALLATION

Right Side

1. See Steps 1-3 of [THROTTLE CONTROL, ASSEMBLY/INSTALLATION](#) in Section 2.
2. Position housings on right handlebar by engaging stud on front housing with hole in handlebar. Fasten housings with two screws (metric). Tighten to 12-17 **in-lbs** (1.4-1.9 Nm).
3. See [Figure 7-40](#). Route switch housing wiring harness between front forks and along right side frame tube. Attach connector [P1] to wiring harness. Fasten wiring harness to frame with **new** cable straps.
4. Install fuel tank and seat. See [FUEL TANK, INSTALLATION](#) in Section 4.
5. Adjust throttle cables as described under [CARBURETOR, CABLE ADJUSTMENT](#) in Section 1.

⚠ WARNING

Check all handlebar switch operations before riding motorcycle. Handlebar switches not operating properly could lead to personal injury.

6. Check handlebar switch for proper operation.

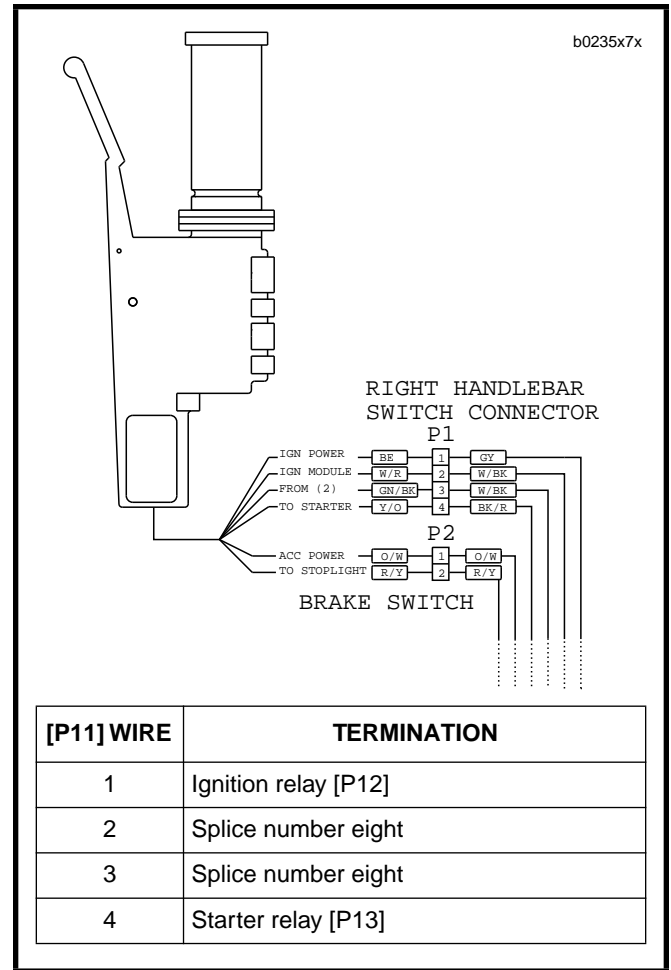


Figure 7-40. Right Handlebar Switch Connection [P1]



Left Side

- 1. Attach switch housing to handlebar with three screws (metric). Tighten screws to 25-33 **in-lbs** (2.8-3.7 Nm).
- 2. See [Figure 7-41](#). Route switch housing wiring harness between front forks and along right side frame tube. Attach connector [P6] to wiring harness. Fasten wiring harness to frame with **new** cable straps.
- 3. Install fuel tank and seat. See [FUEL TANK, INSTALLATION](#) in Section 4.

⚠WARNING

Check all handlebar switch operations before riding motorcycle. Handlebar switches not operating properly could lead to personal injury.

- 4. Check handlebar switch for proper operation.

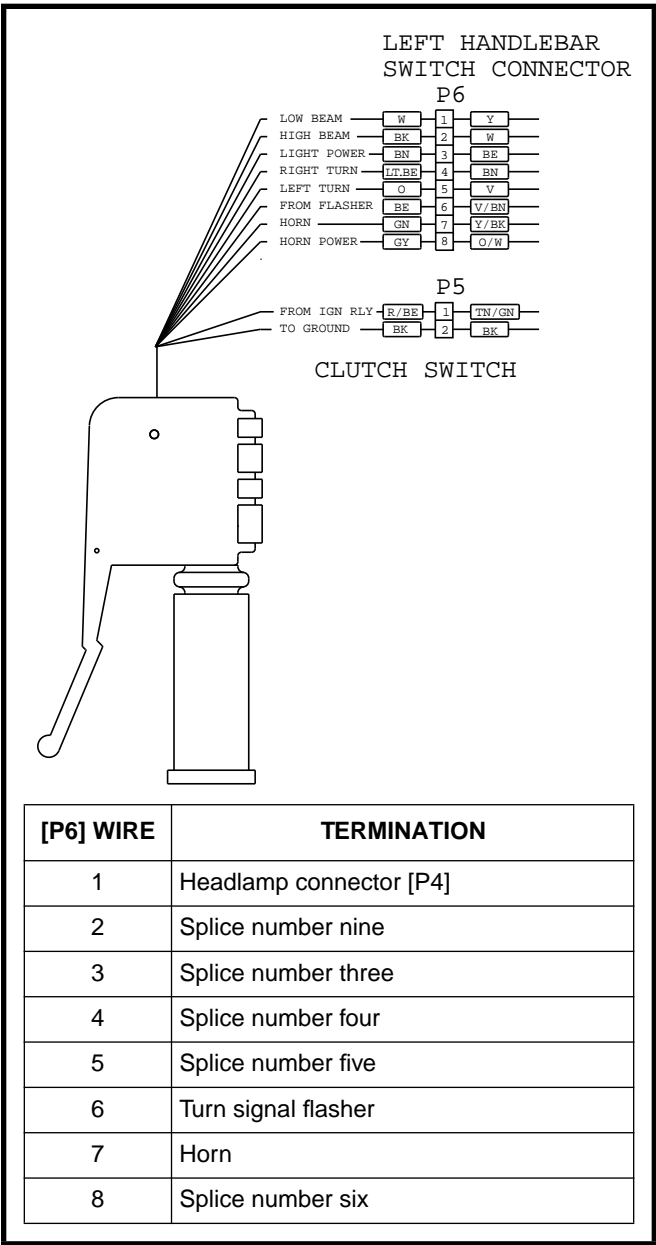


Figure 7-41. Left Handlebar Switch Connection [P6]

HORN

REMOVAL

1. Remove ignition coil to detach horn bracket from frame. See [IGNITION COIL, REMOVAL](#) on [page 7-17](#).
2. See [Figure 7-42](#). Remove power wire (6) from spade connection.
3. Detach ground wire (4) from horn by removing locknut (1) (metric) and washer (3).

INSTALLATION

1. See [Figure 7-42](#). Install horn on bracket with ground wire (4), washer (3) and locknut (1) (metric).
2. Attach power wire (6).
3. Install horn and ignition coil. See [IGNITION COIL, INSTALLATION](#) on [page 7-17](#).

TROUBLESHOOTING

1. If the horn does not sound or fails to function satisfactorily, check for the following conditions.
 - a. Discharged battery.
 - b. 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.
 - a. Poor ground to frame through mounting hardware or ground wire (see Steps 3-5 below).
 - b. Inoperative horn switch (see Steps 3-5 below).
3. Remove terminal clips from connections.
4. Connect a voltmeter as follows.
 - a. Positive (+) lead to wire terminal.
 - b. Negative (–) lead to ground.
5. Turn ignition switch to IGN. 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.
 - a. If horn is faulty, then it must be replaced as an assembly. The horn is not repairable.
 - b. If horn switch is faulty, replace left handlebar switch. See [HANDLEBAR SWITCHES, REMOVAL](#) on [page 7-39](#).

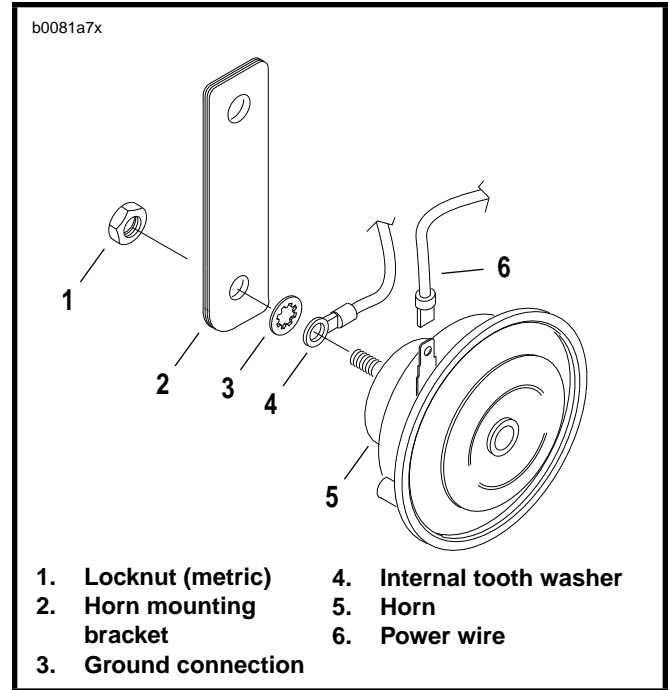


Figure 7-42. Horn Assembly

NEUTRAL INDICATOR SWITCH

GENERAL

See [Figure 7-43](#). 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. Replace the switch if it malfunctions.

TESTING

1. Remove sprocket cover. See [SPROCKET COVER](#) in Section 2.
2. See [Figure 7-43](#). Disconnect wire lead from neutral indicator switch (1).
3. With ignition switch ON, touch the neutral indicator wire lead to a suitable ground.
 - a. If indicator lamp lights, then problem is at indicator switch. Replace switch.
 - b. If indicator lamp does not light, then problem is elsewhere in circuit (i.e. indicator lamp burned out, loose connection, or faulty wiring).
 - c. After testing, connect wire lead to indicator switch.
4. Install sprocket cover. See [SPROCKET COVER](#) in Section 2.

REMOVAL/INSTALLATION

1. Verify that the ignition/headlamp switch is turned to LOCK.
2. Remove sprocket cover. See [SPROCKET COVER](#) in Section 2.
3. See [Figure 7-43](#). 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. Transmission sprocket nut will be damaged if turned counterclockwise to remove.

4. Remove transmission sprocket nut (5) from main drive gear shaft (3).
5. Decrease secondary drive belt tension by loosening axle adjusting nuts. See [REAR BELT DEFLECTION](#) in Section 1. 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).

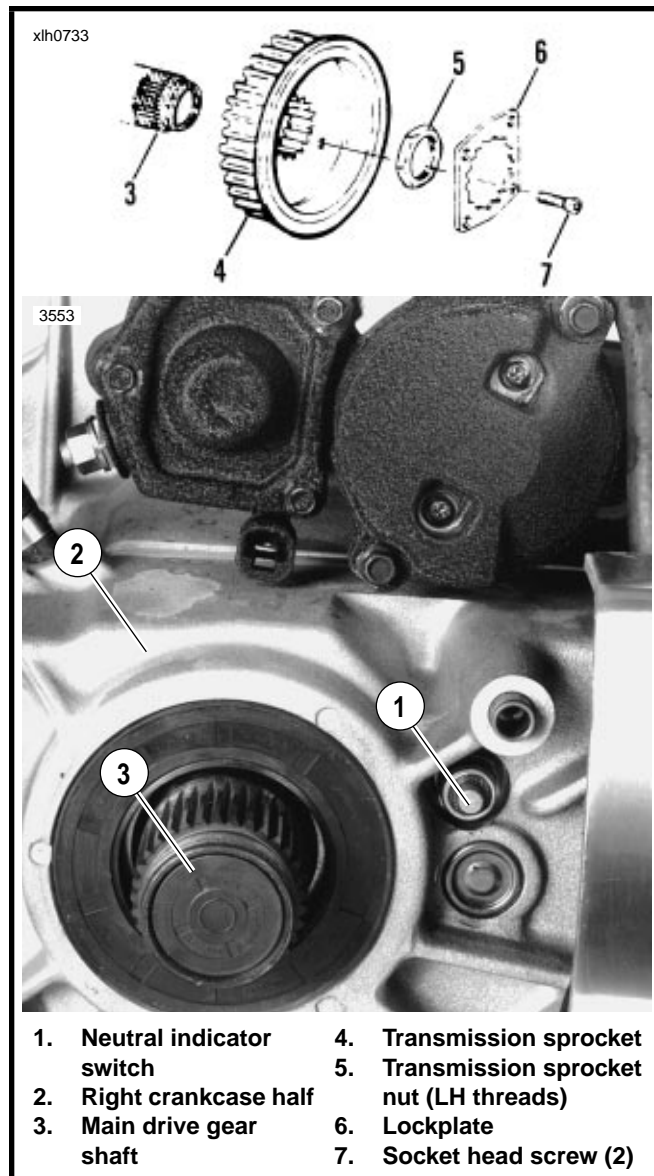


Figure 7-43. Neutral Indicator Switch

7. Apply a light coating of LOCTITE THREADLOCKER 242 (blue) to **new** neutral indicator switch (1) threads. Install switch in crankcase, and tighten switch to 3-5 ft-lbs (4.0-6.8 Nm). Connect wire lead to switch.
8. Install transmission sprocket (4) (with secondary drive belt) onto main drive gear shaft (3). See [TRANSMISSION INSTALLATION AND SHIFTER PAWL ADJUSTMENT](#) in Section 6.
9. Install sprocket cover. See [SPROCKET COVER](#) in Section 2.
10. Adjust secondary drive belt tension. See [REAR BELT DEFLECTION](#) in Section 1.

FUSES AND CIRCUIT BREAKERS

GENERAL

The S1 Lightning features two components which protect the electrical system.

⚠ WARNING

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before servicing motorcycle. 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.

Fuses

See [Figure 7-44](#). Four replaceable fuses are located in the fuse block on the right side of the frame. A spare fuse is attached to the fuse block.

The ignition, lights and accessory circuit breakers are each rated at 15 amperes.

Always investigate the cause of blown fuses before replacing them. See your Buell dealer for more information.

Circuit Breakers

See [Figure 7-45](#). The main circuit breaker is on the frame beneath the tail section. The main circuit breaker is rated at 30 amperes.

Circuit breakers prevent electrical overload of a circuit. The circuit breaker electrical contacts remain closed (completing the circuit) as long as current (amperage) flowing through the circuit does not exceed the ampere rating of the breaker. If the circuit current exceeds the breaker ampere rating, then the circuit breaker contacts open and the current flow in the circuit is interrupted.

Since the circuit breakers are of the automatic-reset type, the bimetallic breaker contacts automatically close (completing the circuit) once they have cooled down from the initial overload. If the overload condition still exists, the breaker contacts will again open to interrupt current flow. This cycling effect, or opening and closing of the breaker contacts, continues as long as the current circuit overload condition exists.

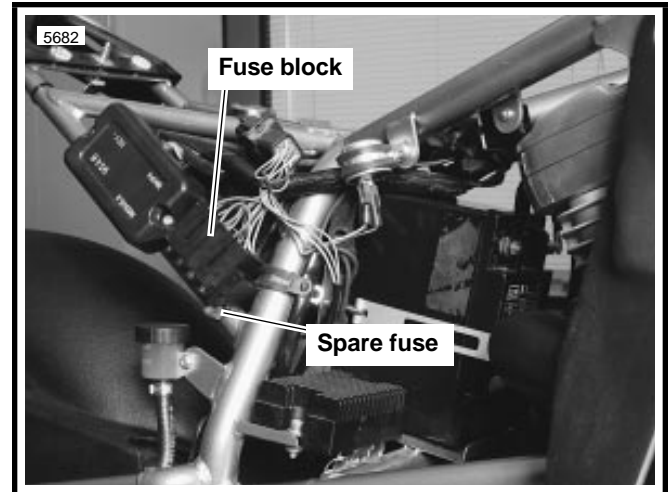


Figure 7-44. Fuse Block

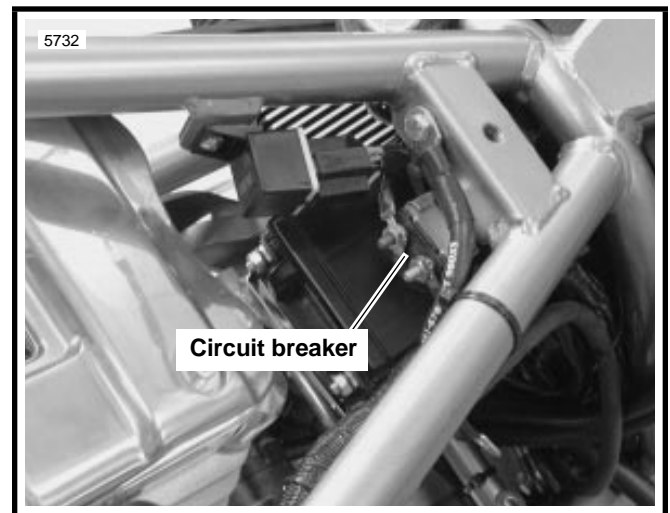


Figure 7-45. Circuit Breaker

ELECTRICAL CONNECTORS

GENERAL

The following table provides a brief description of the connectors found on the S1 Lightning. Approximate locations of each connector are shown in [Figure 7-46](#).

Connector numbers are listed in [brackets] in this manual.

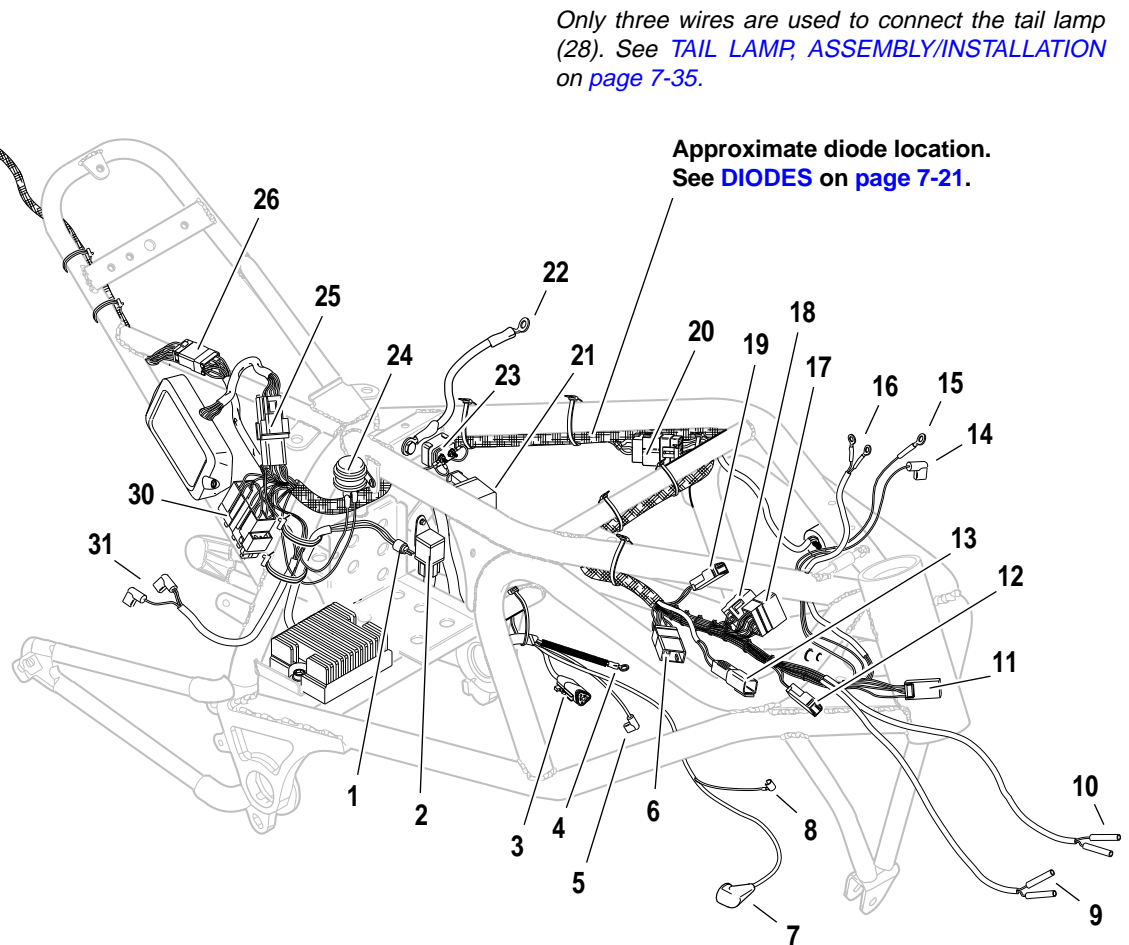
Table 7-5. Electrical Connectors

CONNECTOR NUMBER	DESCRIPTION	COMPONENT(S)	ALSO SEE
[P1]	4-place Amp Multilock	right handlebar switch housing-ignition power, module and starter	page 7-39
[P2]	2-place Amp Multilock	front brake switch	page 7-51
[P3]	12-place Amp Multilock	instruments and indicator lamps	page 7-51
[P4]	4-place Amp Multilock	headlamp	page 7-34
[P5]	2-place Amp Multilock	clutch switch	page 7-21
[P6]	8-place Amp Multilock	left handlebar switch housing-horn, turn signals, lights	page 7-40
[P7]	2-place Deutsch	vacuum-operated electric switch	page 7-10
[P8]	4-place PED	ignition/headlamp switch	page 7-12
[P9]	4-slot fuse block	four 15 amp fuses for ignition, instruments, lights and accessories	page 7-43
[P10]	8-place Deutsch	ignition module	page 7-13
[P11]	8-place Amp Multilock	tail lamp and rear turn signals	page 7-36
[P12]	4-place relay	ignition relay	page 7-22
[P13]	4-place relay	starter relay	page 7-22
[P14]	2-place Amp Multilock	side stand switch	page 7-21
[P15]	2-place Amp Multilock	license plate light	page 7-36
[P16]	3-place Deutsch	timer and pickup	page 7-13
[P17]	2-place plug	voltage regulator	page 7-31

NOTE

Only three wires are used to connect the tail lamp (28). See [TAIL LAMP, ASSEMBLY/INSTALLATION](#) on page 7-35.

Approximate diode location.
See [DIODES](#) on page 7-21.



- | | | |
|-----------------------------------------|----------------------------|--------------------------------------|
| 1. Voltage regulator/stator [P17] | 12. Brake switch [P2] | 25. Ignition module [P10] |
| 2. Starter relay [P13] | 13. Vacuum switch [P7] | 26. Tail lamp and turn signals [P11] |
| 3. Timer and pickup [P16] | 14. Horn power wire | 27. Rear right turn signal |
| 4. Battery positive cable | 15. Horn ground | 28. Tail lamp |
| 5. Starter | 16. Ignition coil | 29. Rear left turn signal |
| 6. Left handlebar switch housing [P6] | 17. Instruments [P3] | 30. Fuse block |
| 7. Oil pressure switch | 18. Headlamp [P4] | 31. Rear brake lamp switch |
| 8. Neutral indicator switch | 19. Clutch switch [P5] | |
| 9. Right front turn signal | 20. Ignition switch [P8] | |
| 10. Left front turn signal | 21. Ignition relay [P12] | |
| 11. Right handlebar switch housing [P1] | 22. Master circuit breaker | |
| | 23. Battery negative cable | |
| | 24. Turn signal flasher | |

Figure 7-46. Wiring Harness

DEUTSCH ELECTRICAL CONNECTORS

GENERAL

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.

Three and eight pin connectors are of similar construction with one exception: eight pin connectors use two external latches on the socket side.

NOTE

The **DEUTSCH 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** on page 7-47.

REMOVING/INSTALLING SOCKETS

1. See [Figure 7-47](#). Remove the secondary locking wedge (6). 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° to pop the wedge up.
2. Gently depress terminal latches inside socket housing (3) and back out socket terminals (1) through holes in rear wire seal (2).
3. Fit rear wire seal (2) into back of socket housing, if removed. Grasp socket terminal approximately 1 in. (25.4 mm) behind the contact barrel. Gently push sockets through holes in wire seal into their respective chambers. 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 (5) on lip of socket housing, if removed. Insert tapered end of secondary locking wedge (6) 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

- The conical secondary locking wedge of the 3-pin connector must be installed with the arrow pointing toward the external latch. See [Figure 7-48](#).
- 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.

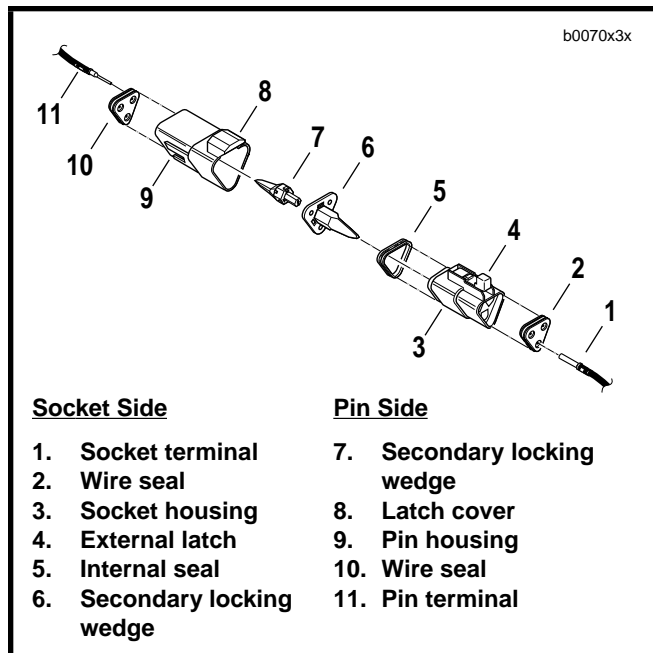


Figure 7-47. 3-Pin Connector

REMOVING/INSTALLING PINS

1. See [Figure 7-47](#). Remove the secondary locking wedge (7). Use the hooked end of a stiff piece of mechanic's wire or a needle nose pliers, whichever is most suitable.
2. Gently depress terminal latches inside pin housing (9) and back out pin terminals (11) through holes in wire seal (10).
3. Fit wire seal (10) into back of pin housing (9). Grasp crimped pin approximately 1 in. (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 (7) into pin housing (9) 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.

ASSEMBLY/INSTALLATION

Insert socket housing (3) into pin housing (9) until it snaps in place. To fit the halves of the connector together, the latch (4) on the socket side must be aligned with the latch cover (8) on the pin side.

CRIMPING INSTRUCTIONS

1. See Figure 7-49. Squeeze the handles to cycle the **DEUTSCH TERMINAL CRIMP TOOL** (Part No. HD-39965) 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 in. (4.0 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.

NOTE

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

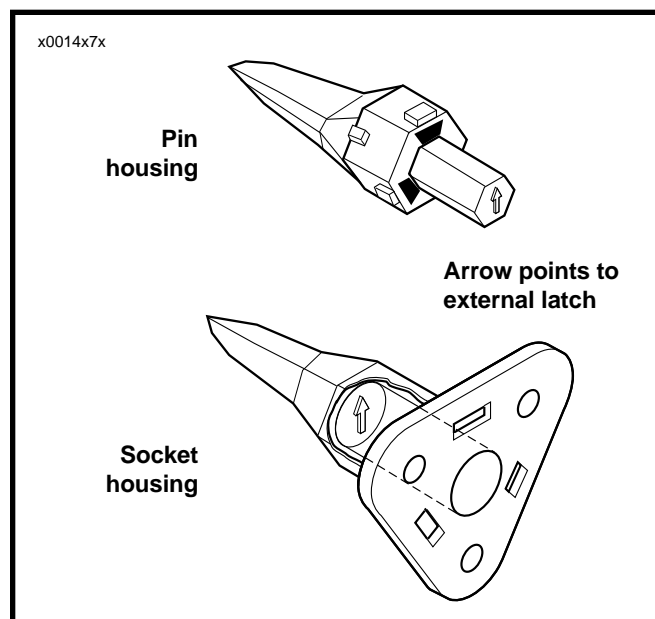


Figure 7-48. 3-pin Locking Wedge Orientation

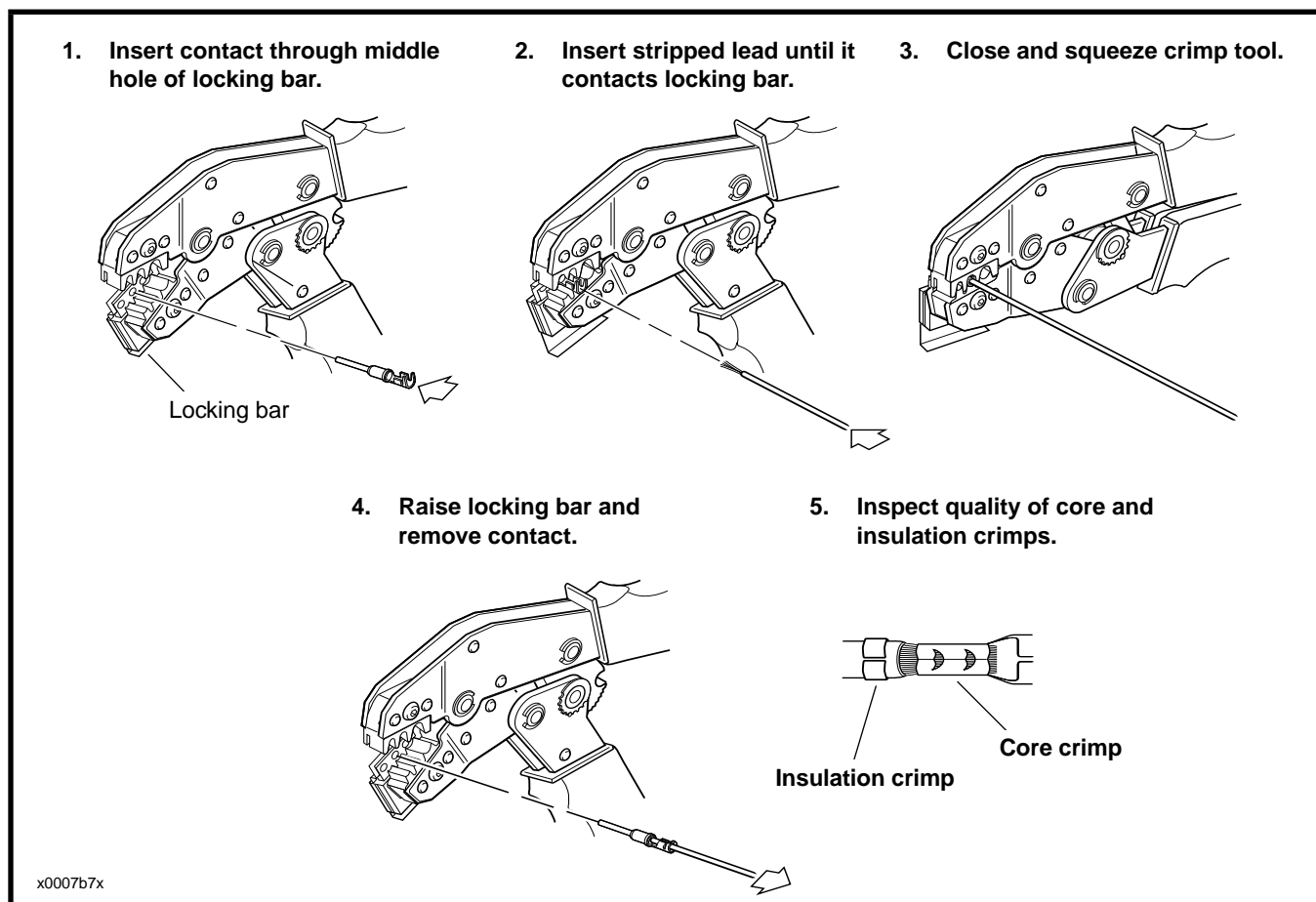


Figure 7-49. Deutsch Crimping Procedure

AMP MULTILOCK ELECTRICAL CONNECTORS

REMOVING SOCKET/PIN TERMINALS

1. If necessary, cut any surrounding cable straps to gain access to the connector.
2. See [Figure 7-50](#). 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 7-51](#). With the flat edge against the terminal, insert the pick (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 [AMP 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 [page 7-50](#).

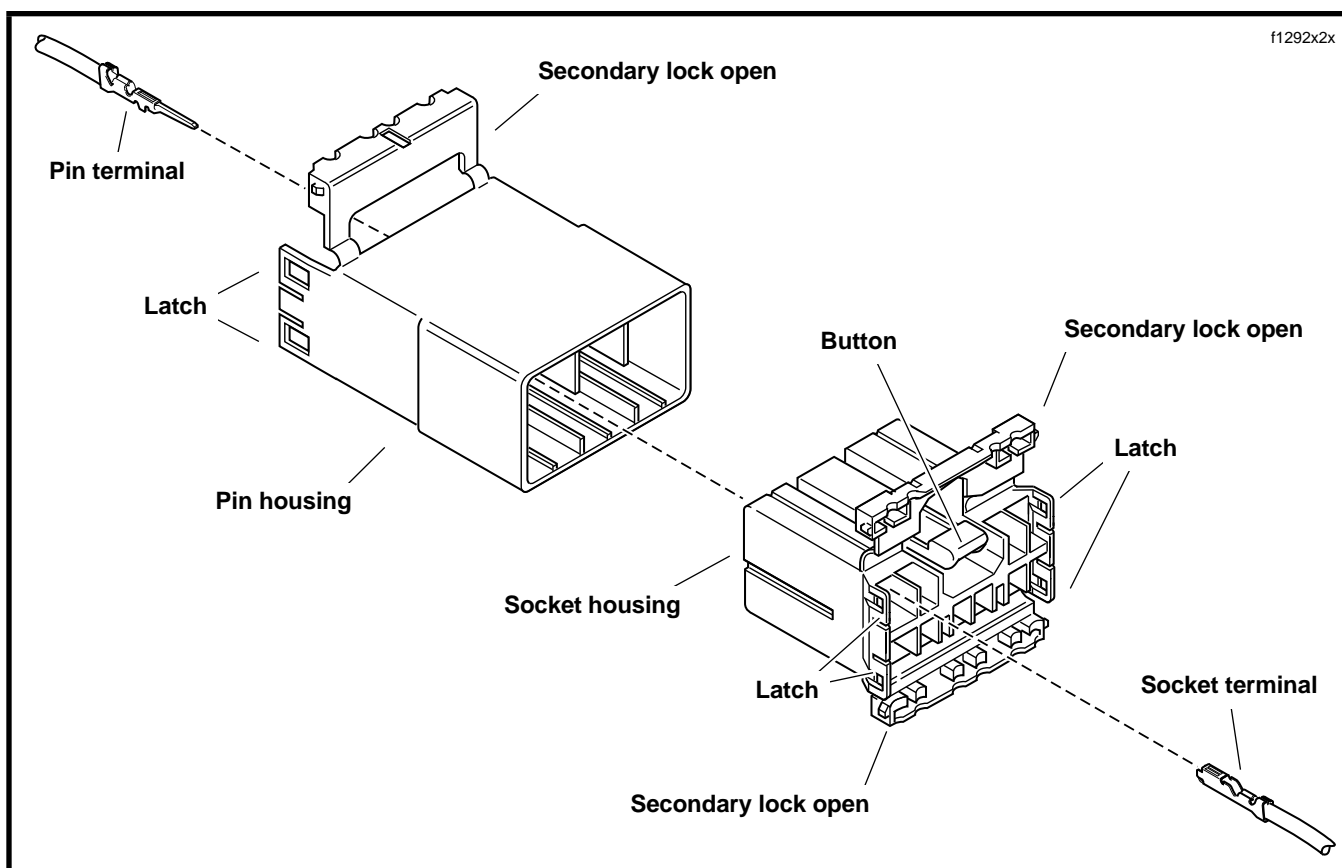


Figure 7-50. Amp Multilock Connector (Exploded View)

INSTALLING SOCKET/PIN TERMINALS

NOTE

For wire location purposes, numbers are stamped into the secondary locks of both the socket and pin housings.

1. See Figure 7-51. 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 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. Secure wiring harness with **new** cable straps.

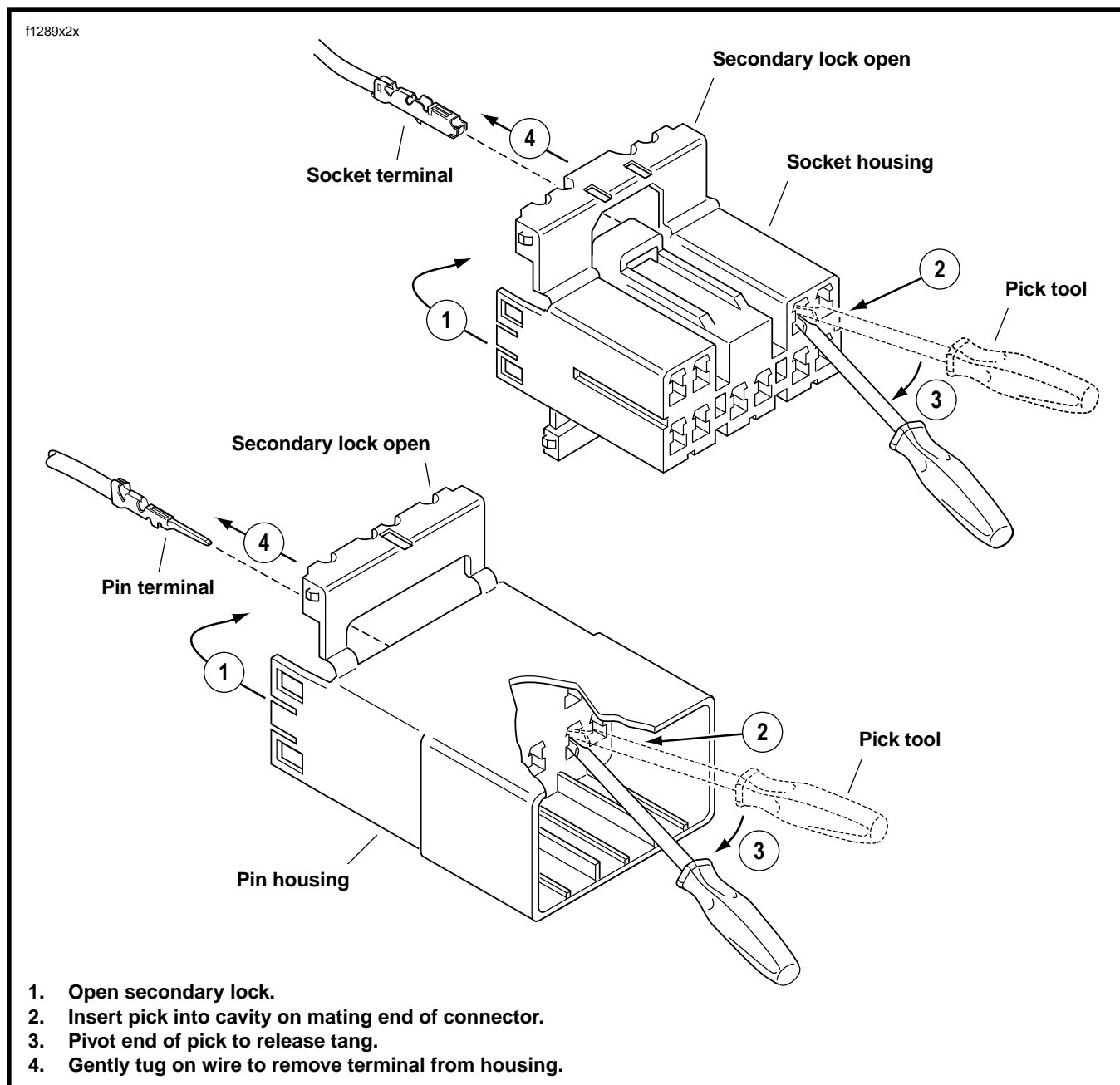
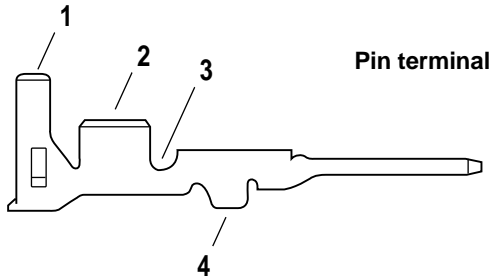


Figure 7-51. Release Tang and Back Out Terminals

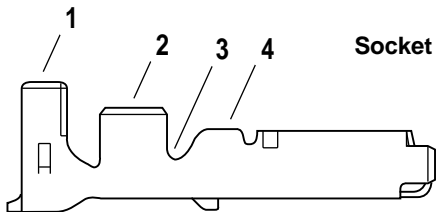
CRIMPING INSTRUCTIONS

1. See [Figure 7-53](#). Squeeze the handles to cycle the **AMP TERMINAL 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 nest (concave split level area) of the crimp tool. Use the front nest for 20 gauge wire, the middle for 16 gauge and the rear for 18 gauge.
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 in. (4.0 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. See [Figure 7-52](#). Inspect the quality of the core and insulation crimps. Distortion should be minimal.

b0239x7x



Pin terminal

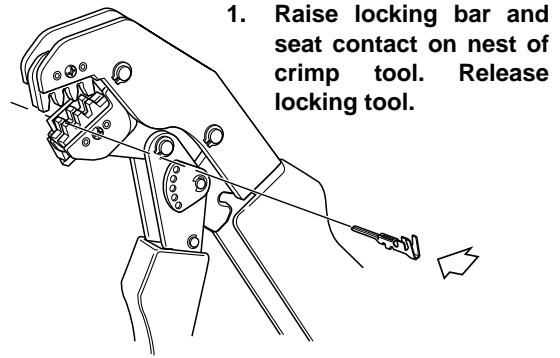


Socket terminal

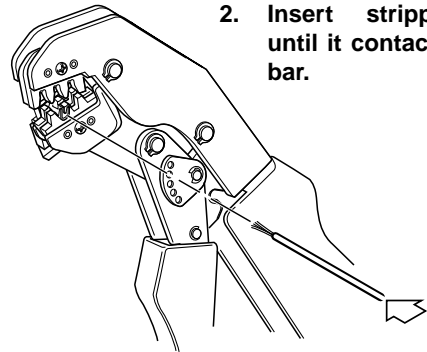
1. Insulation crimp tail
2. Core crimp tail
3. Locking groove bar
4. Tang slot

Figure 7-52. Crimps

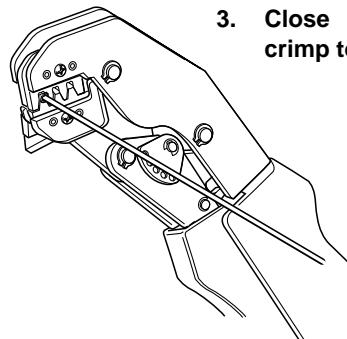
b0238x7x



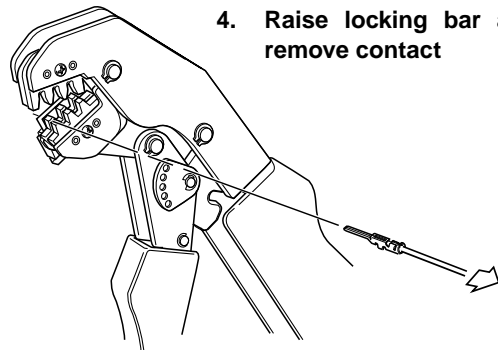
1. Raise locking bar and seat contact on nest of crimp tool. Release locking tool.



2. Insert stripped lead until it contacts locking bar.



3. Close and squeeze crimp tool.



4. Raise locking bar and remove contact

Figure 7-53. Amp Multilock Crimping Procedure

b0245x7x

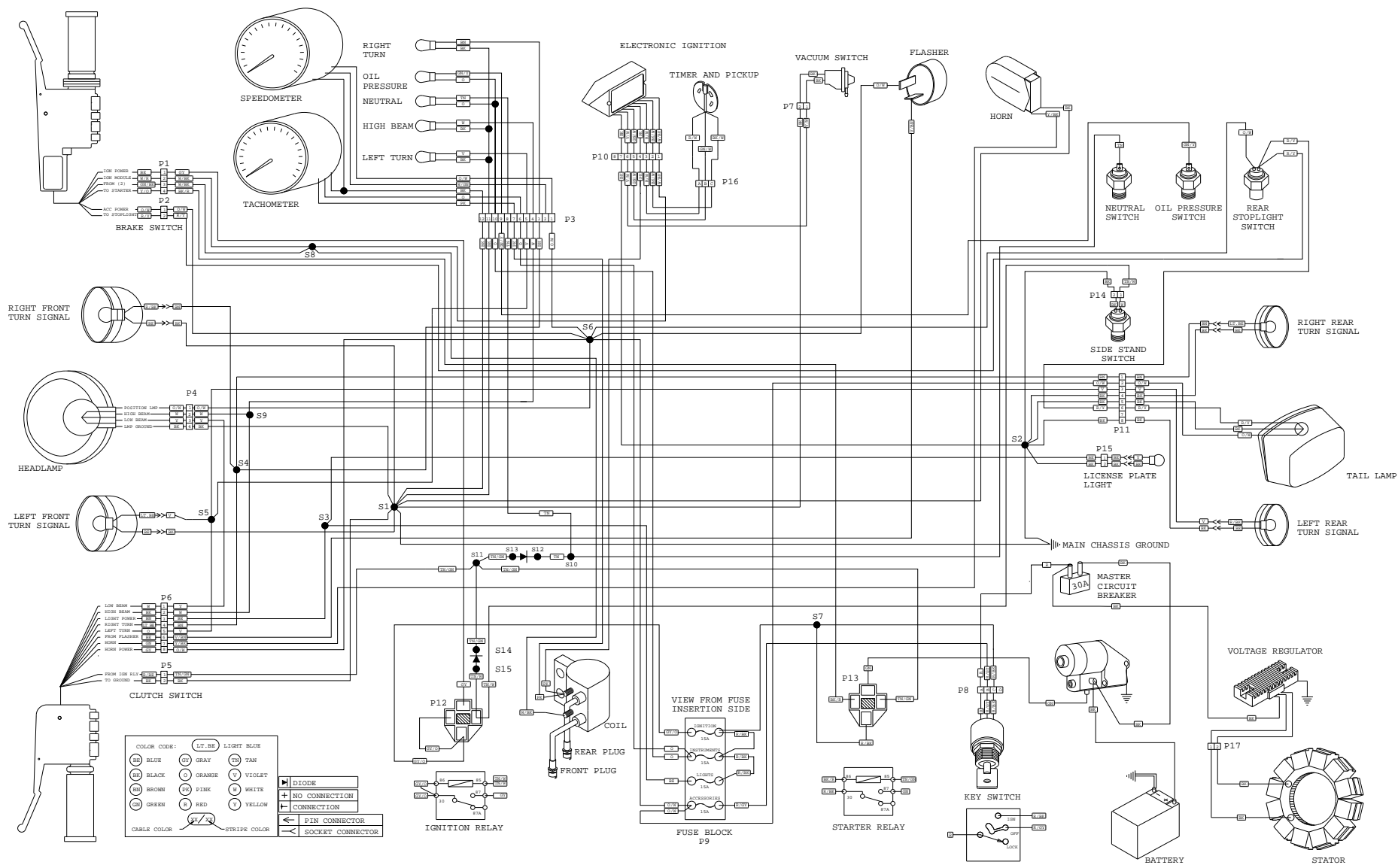


Figure 7-54. 1996 S1 Lightning Wiring Diagram