

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

<b>SOURCE OF PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>SOLUTION</b>
Battery	Voltage drop due to discharged battery.	Charge battery.
	Short-circuited or open between electrodes.	Replace battery.
	Poor contact condition of battery terminal(s).	Clean and retighten.
Wiring	Poor or no connection at either battery positive or negative cable, at either end.	Repair or replace cable(s).
	Cracked or corroded battery cable ends.	Clean, tighten or replace cable(s) as needed.
	Open wire(s) or poor connection at handlebar switch or starter relay, especially relay ground wire.	Tighten connections or repair or replace wire(s).
Handlebar start switch	Poor switch contacts or open switch.	Replace switch.
Starter relay	Open coil winding.	Replace relay.
	Poor or no continuity at relay points.	Replace relay.
	TSM/TSSM has disabled starter relay.	Check for open on wire to TSM/TSSM. Correct lack of ground.
Solenoid	Poor contact condition caused by burnt contact.	Polish contact surface or replace solenoid assembly.
	Pull-in winding open or short-circuited.	Repair or replace solenoid assembly.
	Hold-in winding open or short-circuited.	Repair or replace solenoid assembly.
Starting motor	Brushes worn below specification.	Check brush spring tension. Replace field frame and holder.
	Commutator burnt.	Re-face or replace.
	Commutator high mica.	Correct by undercutting.
	Field winding grounded.	Replace.
	Armature winding grounded or short-circuited.	Replace.
	Reduction gears damaged.	Replace.
	Insufficient brush spring tension.	Replace.
	Disconnected lead wire between solenoid and field windings.	Repair or replace lead wire.
	Ball bearing sticks.	Replace bearing.

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

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

**Table 1-3. Starter Does Not Stop Running**

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

## DIAGNOSTICS

### Diagnostic Notes

The reference numbers below correlate with the circled numbers on the starter system flow charts.

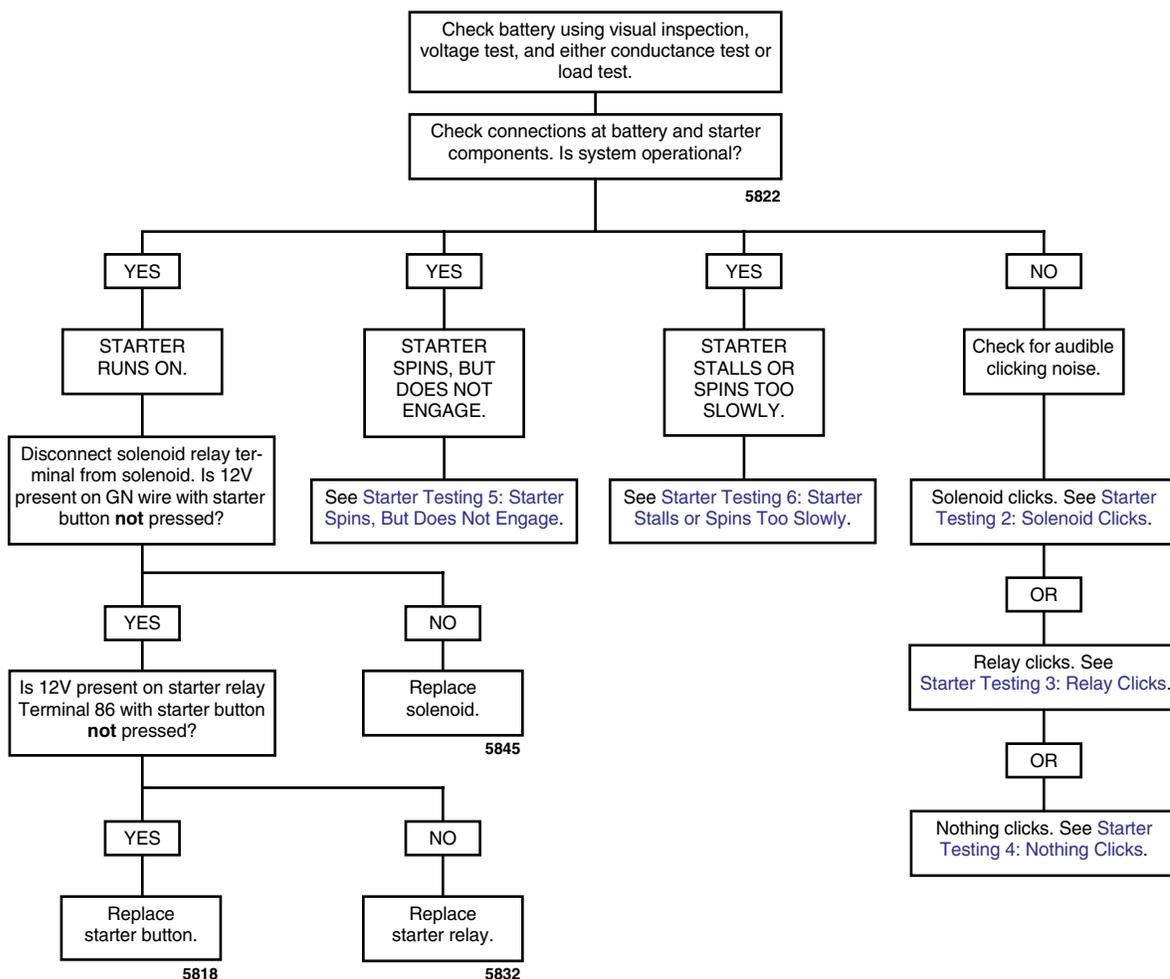
1. See Section 1.4 [DIAGNOSTICS/TROUBLESHOOTING, VOLTAGE DROPS](#).
2. Remove starter motor. Connect jumper wires as described under Section 1.6 [TESTING ASSEMBLED STARTER, FREE RUNNING CURRENT DRAW TEST](#).
3. Remove TSSM and use [HARNESSE CONNECTOR TEST KIT](#) (Part No. HD-41404A) to short Pin 9 on connector [30] to ground. If starter motor cranks, replace TSSM.

4. See Section 1.5 [STARTER SYSTEM TESTING, STARTER CURRENT DRAW TEST](#).
5. See Section 1.6 [TESTING ASSEMBLED STARTER, FREE RUNNING CURRENT DRAW TEST](#).
6. Connect [BREAKOUT BOX](#) (Part No. HD-42682) to TSM/TSSM. See [BREAKOUT BOX, TSM/TSSM](#).
7. Connect [BREAKOUT BOX](#) (Part No. HD-42682) (black) and 6-pin [Harness Adapters](#) (Part no. HD-42962) between wiring harness connector [22A] and Right Hand Control harness connector [22B] (adapters not used on FLHR/C/S models).

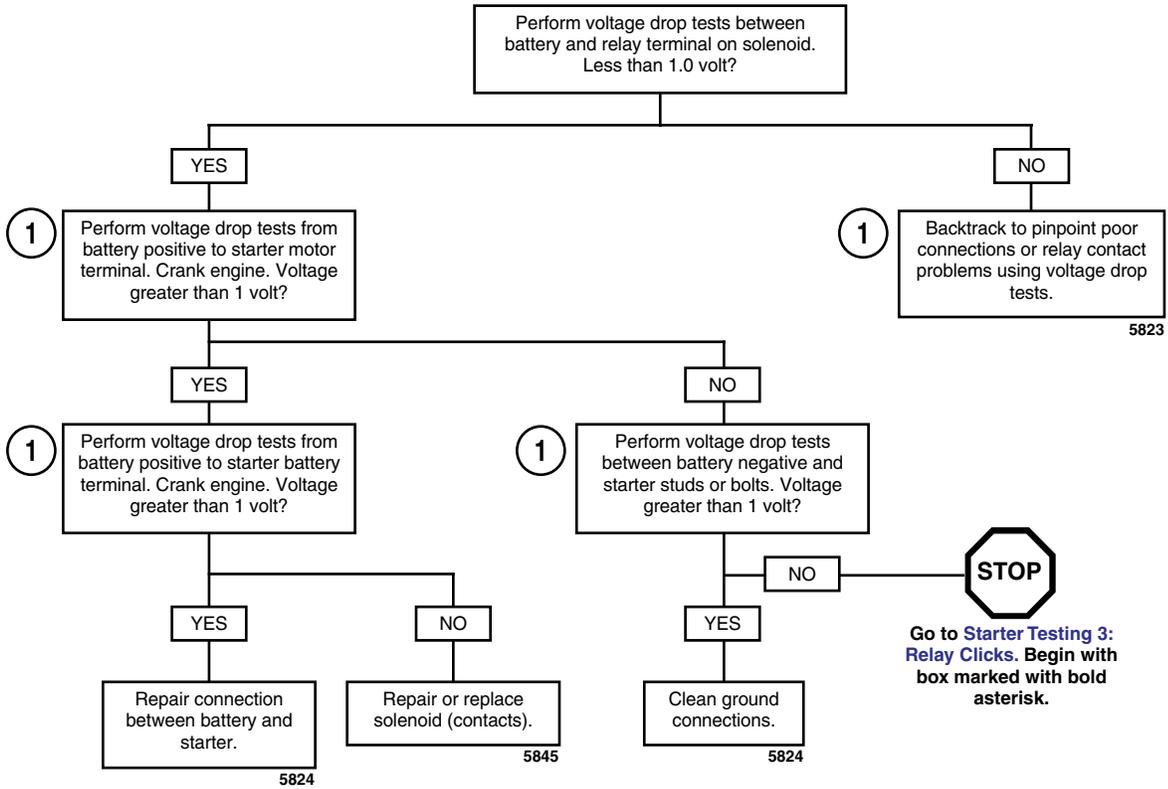
### Job/Time Code Values

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

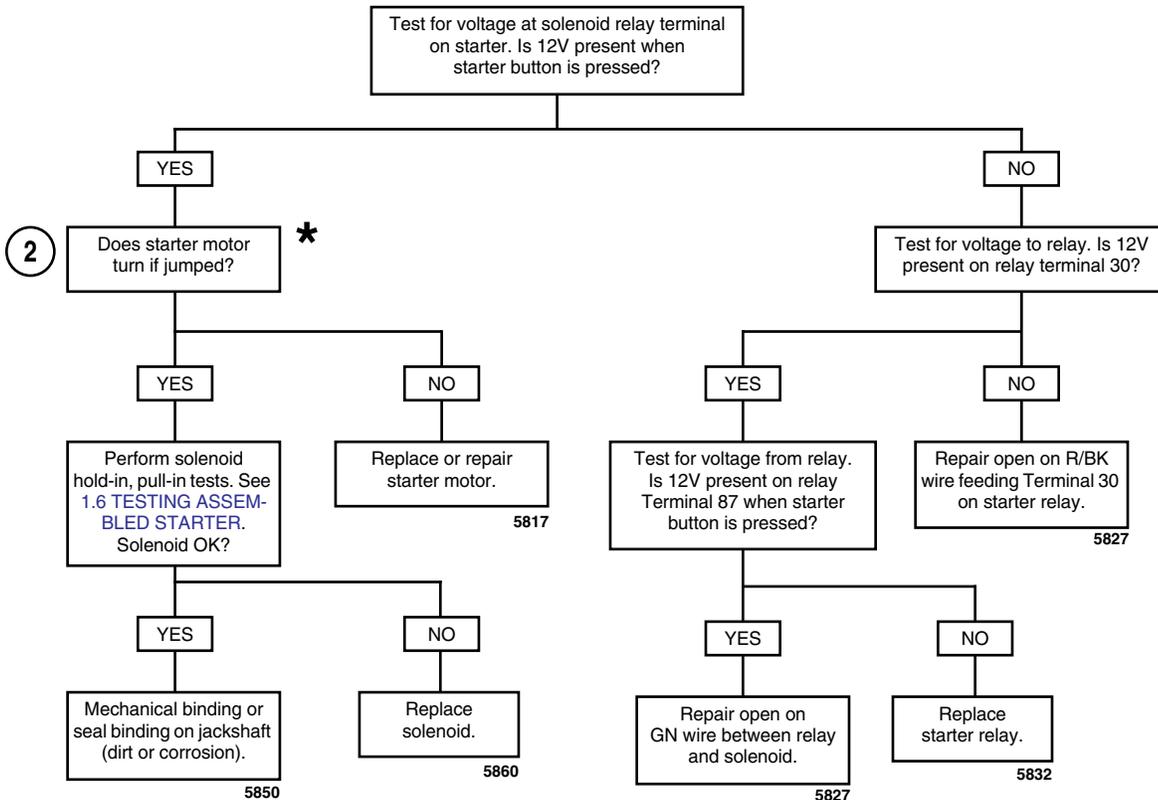
### Starter Testing 1



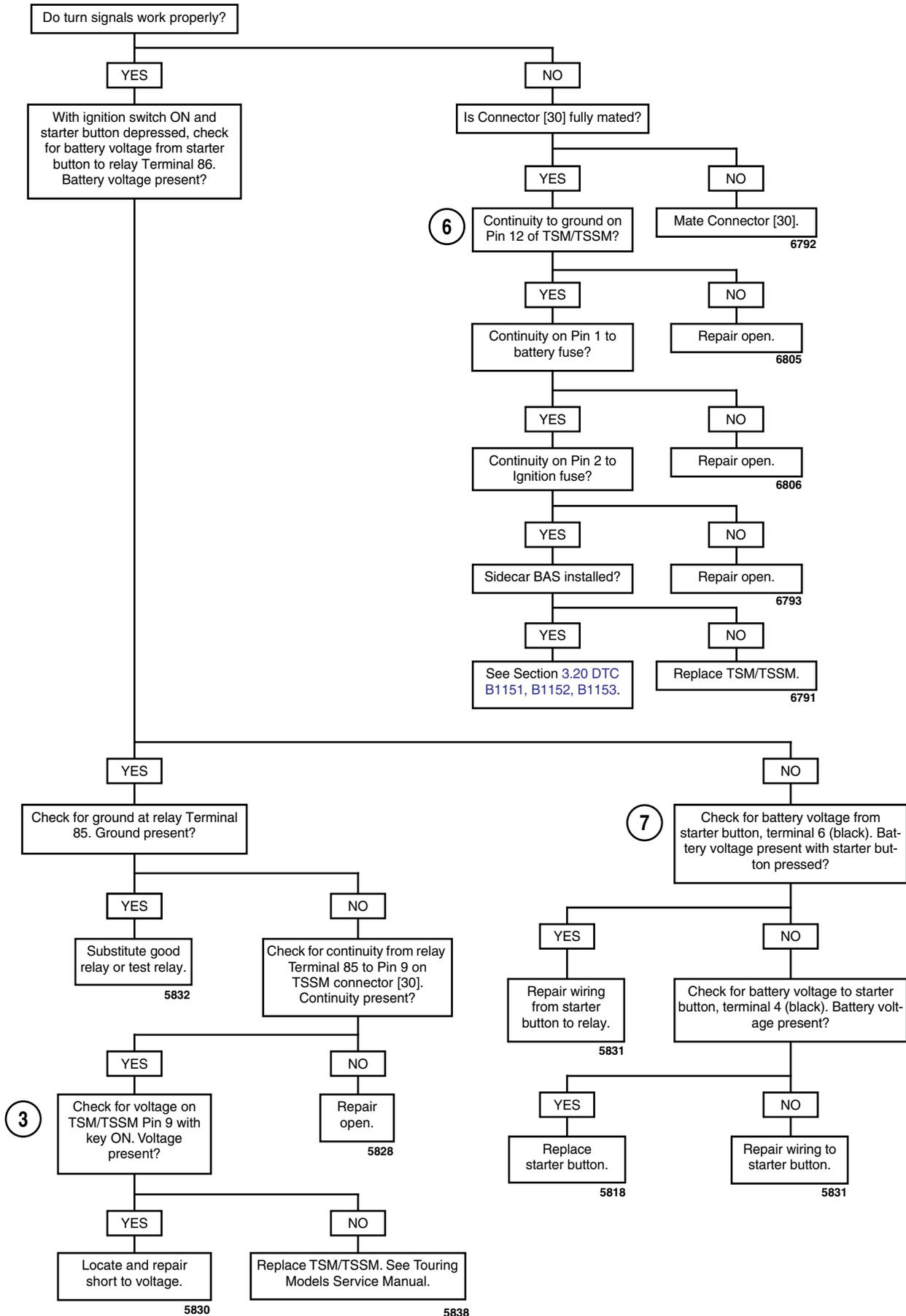
## Starter Testing 2: Solenoid Clicks



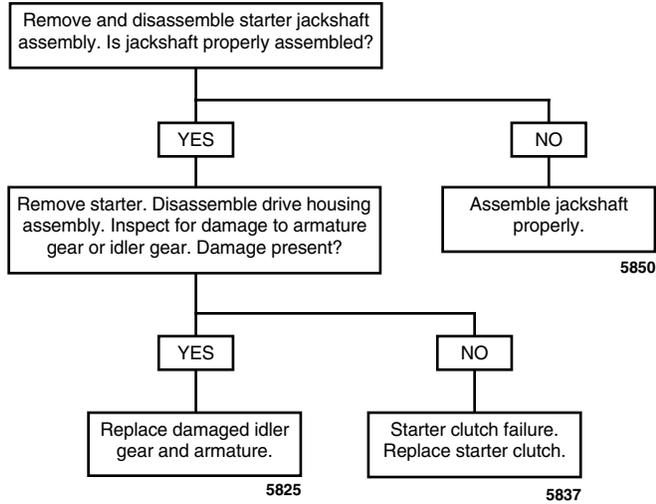
## Starter Testing 3: Relay Clicks



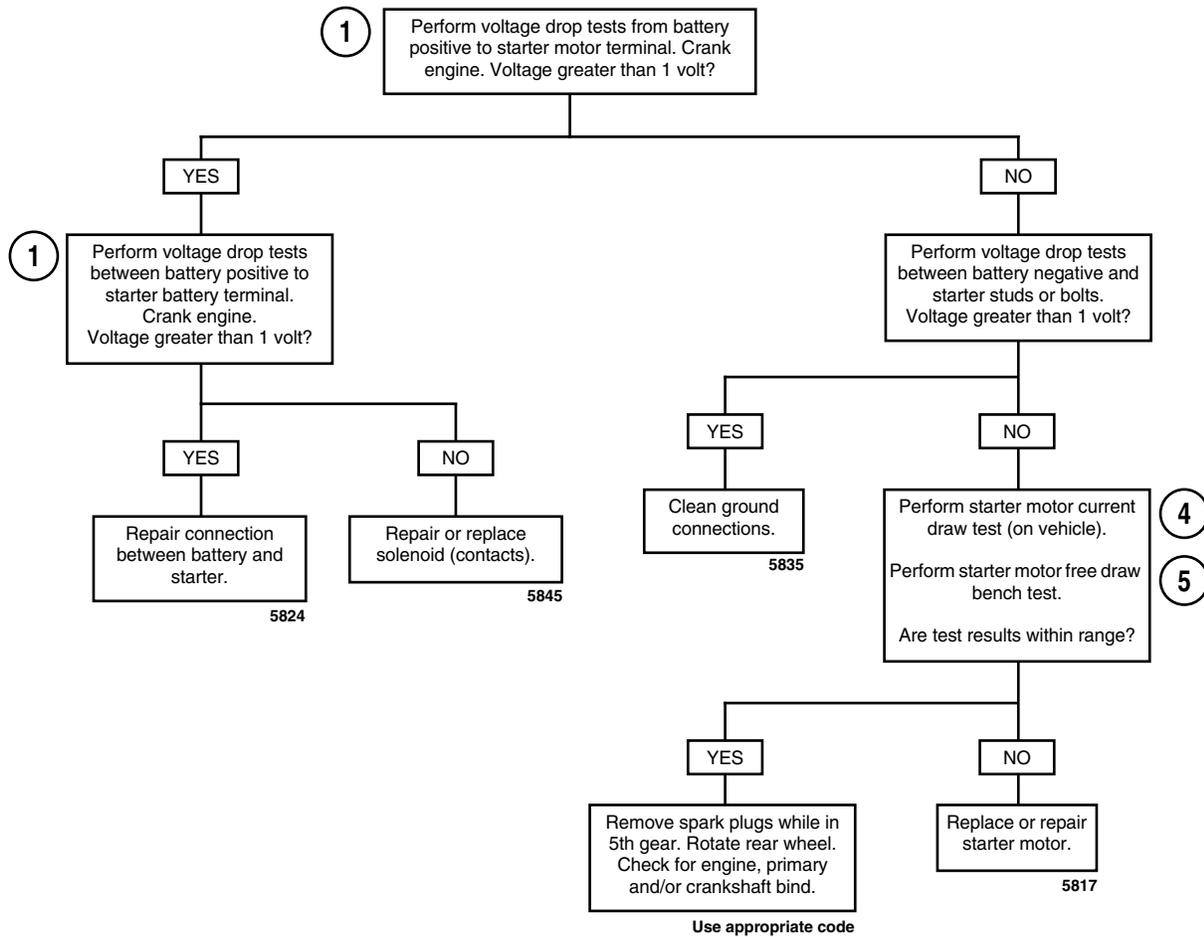
# Starter Testing 4: Nothing Clicks



## Starter Testing 5: Starter Spins, But Does Not Engage



## Starter Testing 6: Starter Stalls or Spins Too Slowly



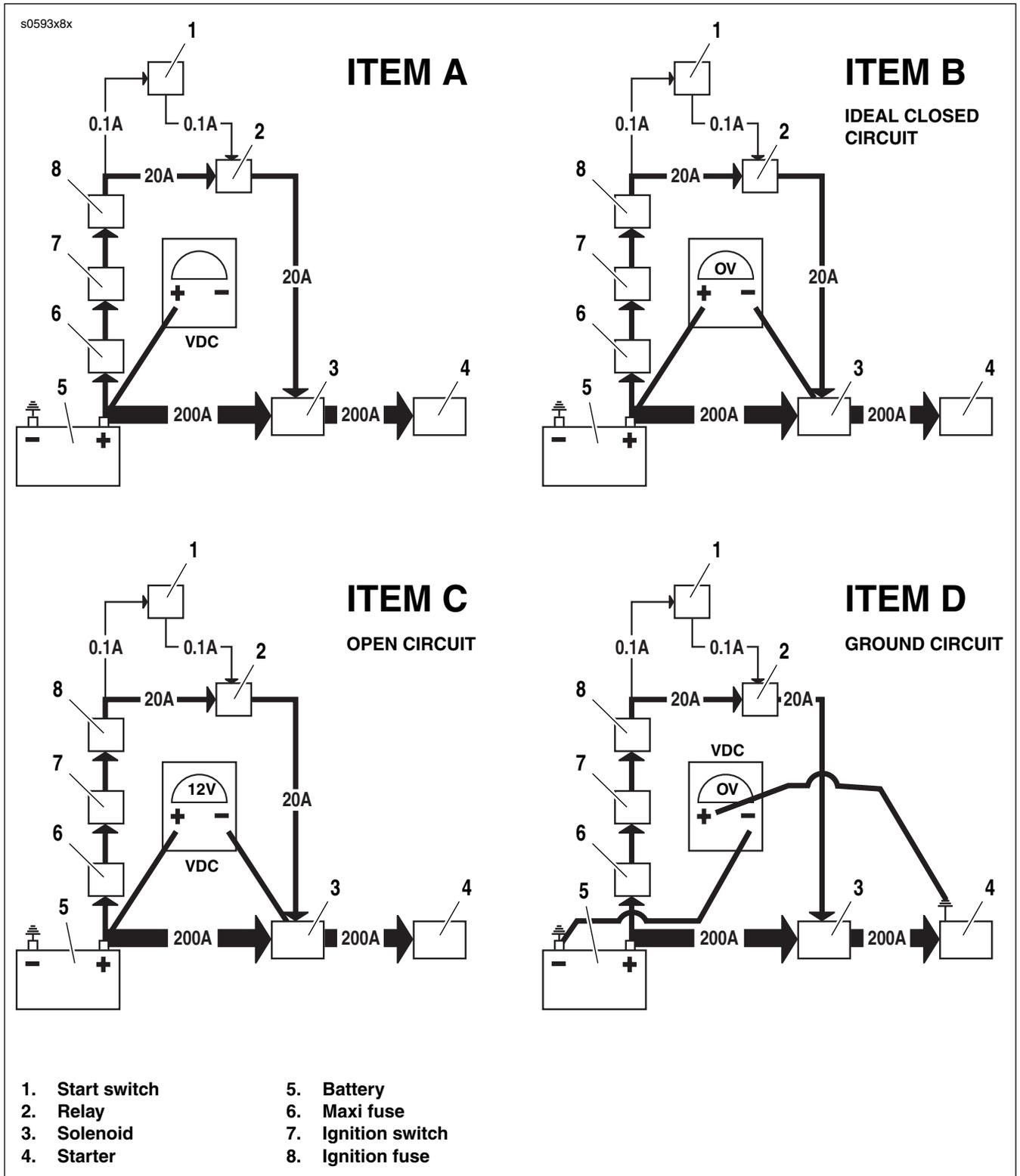


Figure 1-1. Typical Circuitry. Refer to wiring diagrams for more information.

## GENERAL

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The troubleshooting tables beginning on [page 1-1](#) contain detailed procedures to solve and correct problems. Follow the [1.2 STARTING SYSTEM DIAGNOSIS](#) diagram to diagnose starting system problems. The [VOLTAGE DROPS](#) procedure below will help you to locate poor connections or components with excessive voltage drops.

## VOLTAGE DROPS

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

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

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

### NOTE

*Open circuits on the ground side will read zero.*

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

## GENERAL

Before removing the starter, perform one of the Starter Relay Tests which follow. If the relay is known to be good, perform the [STARTER CURRENT DRAW TEST](#) in this section.

## STARTER RELAY TEST 1

1. Remove relay. For FLHR/C/S models, see upper frame of [Figure 1-2](#). For all other models, see upper frame of [Figure 1-3](#).
2. Substitute a **new** relay known to be good and verify operation. For convenience, use the brake light relay as a temporary substitute on FLHR/C/S models, or use the ignition keyswitch relay as a temporary substitute on FLTR and FLHT/C/U models.

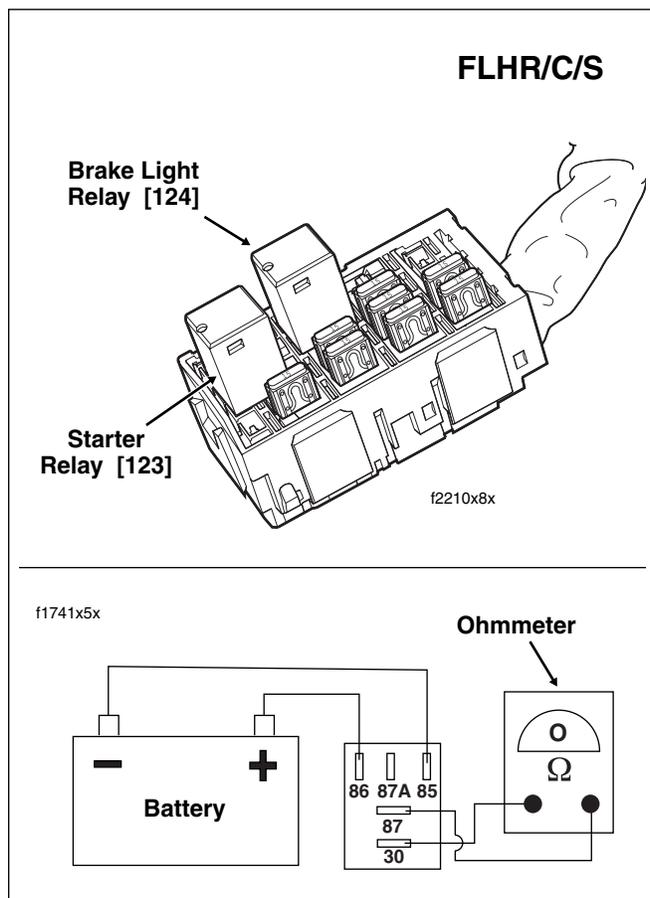


Figure 1-2. Locate Relay Under Left Side Cover

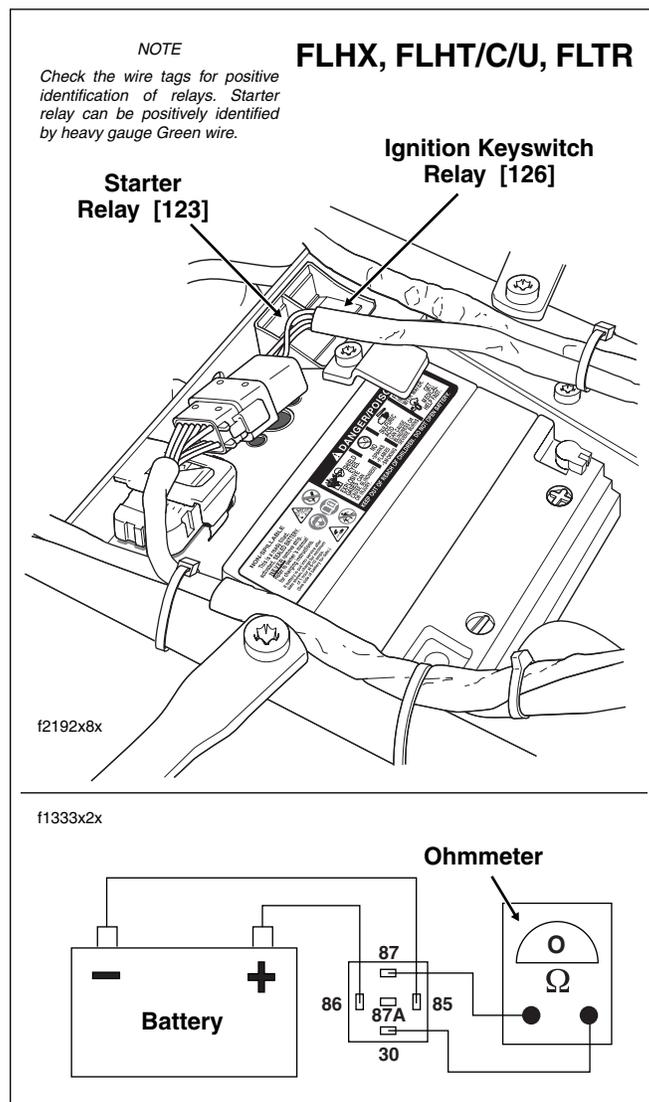


Figure 1-3. Locate Relay Under Seat

## STARTER RELAY TEST 2

The starter relay can be tested using the vehicle's 12 volt battery and a continuity tester or ohmmeter (HD-35500B). Proceed as follows:

1. Remove relay. For FLHR/C/S models, see upper frame of [Figure 1-2](#). For all other models, see upper frame of [Figure 1-3](#).
2. To energize the relay, connect the battery leads to terminals 86 and 85. For FLHR/C/S models, see lower frame of [Figure 1-2](#). For all other models, see lower frame of [Figure 1-3](#).
3. Check for continuity between terminals 30 and 87.

4. If the tester lamp illuminates or there is a zero ohm reading on the ohmmeter, then continuity is present and the relay is good. Replace the relay if continuity is not present.

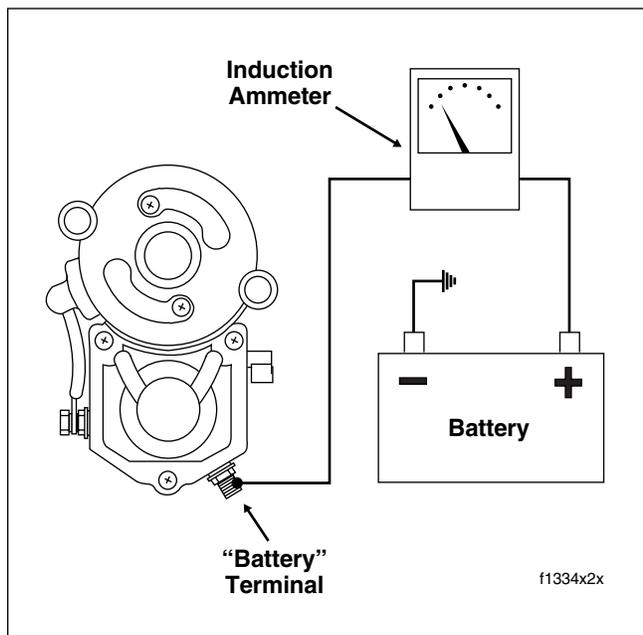
**CAUTION**

Relay terminal “85” must be connected to the negative battery terminal to avoid damaging the diode connected across the relay winding.

## STARTER CURRENT DRAW TEST

Check the starter current draw with an inductive amp probe (HD-39617) or induction ammeter. Before proceeding, be sure that the battery is fully charged and that the engine temperature is stable and at room temperature.

1. Verify that the transmission is in neutral.
2. Disconnect the spark plug wires from the spark plug terminals.
3. Clamp induction ammeter over the positive battery cable. See [Figure 1-4](#).
4. With the ignition ON, turn the engine over by pressing start switch while taking a reading on the ammeter. Disregard initial high current reading which is normal during time the engine is first turned over.
  - a. Typical starter current draw will range between 160 and 200 amperes.



**Figure 1-4. Starter Current Draw Test**

- b. If the starter current draw exceeds 250 amperes, the problem may be in the starter or starter drive.
5. Remove the starter for testing, if necessary. See the Touring Models Service Manual, STARTER, REMOVAL.
  6. See [Section 1.6 TESTING ASSEMBLED STARTER, FREE RUNNING CURRENT DRAW TEST](#).

## STARTER SOLENOID

### WARNING

Wear eye protection during this series of tests. These tests may produce flying sparks which could result in death or serious injury.

### NOTE

Do not disassemble solenoid. Before testing, disconnect field wire from motor terminal as shown in [Figure 1-5](#).

### CAUTION

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

### NOTE

The solenoid Pull-in, Hold-in, and Return tests must be performed together in one continuous operation. Conduct all three tests one after the other in the sequence listed.

## SOLENOID PULL-IN TEST

- See [Figure 1-5](#). Using a 12 volt battery, connect three separate test leads as follows:
  - Solenoid housing to negative battery post.
  - Solenoid motor terminal to negative battery post.
  - Solenoid relay terminal to positive battery post.
- Observe starter shaft.
  - If starter shaft extends strongly, solenoid is working properly.
  - If starter shaft does not extend strongly, replace the solenoid.

## SOLENOID HOLD-IN TEST

- See [Figure 1-6](#). With test leads still connected in the manner specified in the previous [SOLENOID PULL-IN TEST](#), disconnect solenoid motor terminal/battery negative test lead (B) at negative battery post only; reconnect loose end of this test lead to positive battery post instead.

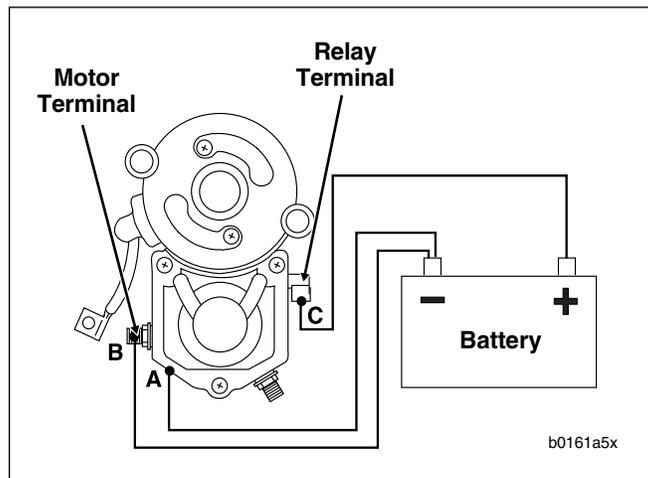


Figure 1-5. Test 1: Pull-In Test

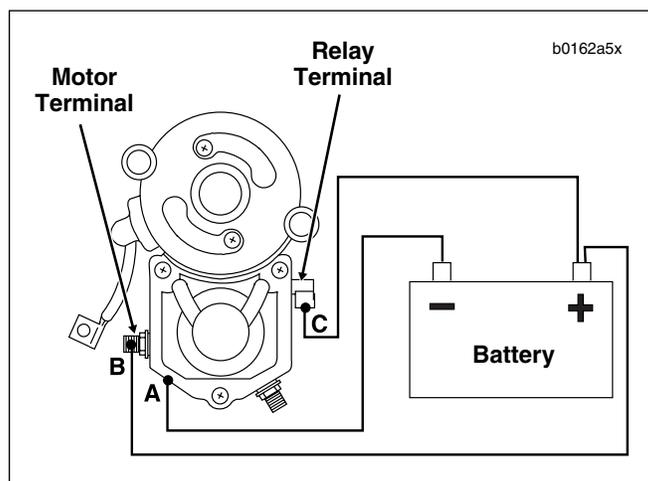


Figure 1-6. Test 2: Hold-In Test

- Observe starter shaft.
  - If starter shaft remains extended, solenoid is working properly.
  - If starter shaft retracts, replace the solenoid.
  - If starter shaft does not retract, replace the solenoid.

## SOLENOID RETURN TEST

1. See [Figure 1-7](#). With test leads still connected in the manner specified at the end of the previous [SOLENOID HOLD-IN TEST](#), disconnect solenoid relay terminal/positive battery post test lead (C) at either end.
2. Observe starter pinion.
  - a. If starter shaft retracts, solenoid is working properly.
  - b. If starter shaft does not retract, replace the solenoid.

## FREE RUNNING CURRENT DRAW TEST

1. Place starter in vise, using a clean shop towel to prevent scratches or other damage.
2. Connect a heavy jumper cable (6 gauge minimum) to starter mounting flange as shown in [Figure 1-8](#).
3. Connect other end to the negative (-) terminal of a fully charged battery.
4. Connect a heavy jumper cable (6 gauge minimum) to the positive (+) terminal of the battery.
5. Attach an inductive ammeter to positive cable and connect the other end of the positive cable to the "Battery" terminal of the starter solenoid.
6. Use a smaller jumper cable (14 gauge) and connect to the positive (+) terminal of the battery.
7. Connect other end of small jumper cable to the solenoid "Relay" terminal.
8. Check ammeter reading. Ammeter should show 90 amps maximum. If reading is higher, disassemble starter for inspection.

### NOTE

If starter current draw on vehicle was over 200 amps and the starter [FREE RUNNING CURRENT DRAW TEST](#) was within specification, there may be a problem with engine, primary drive or starter jackshaft.

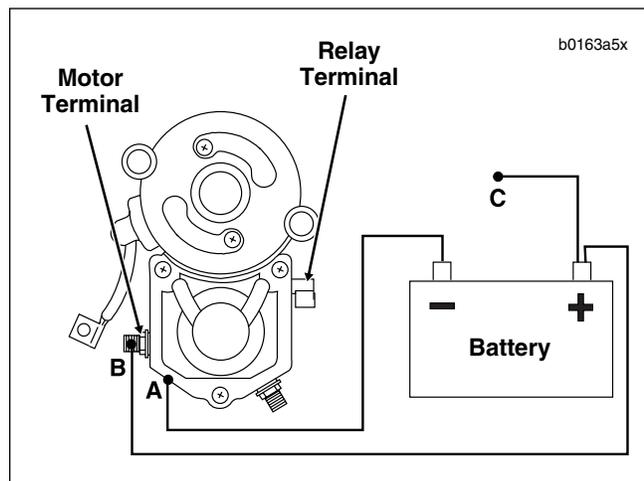


Figure 1-7. Test 3: Return Test

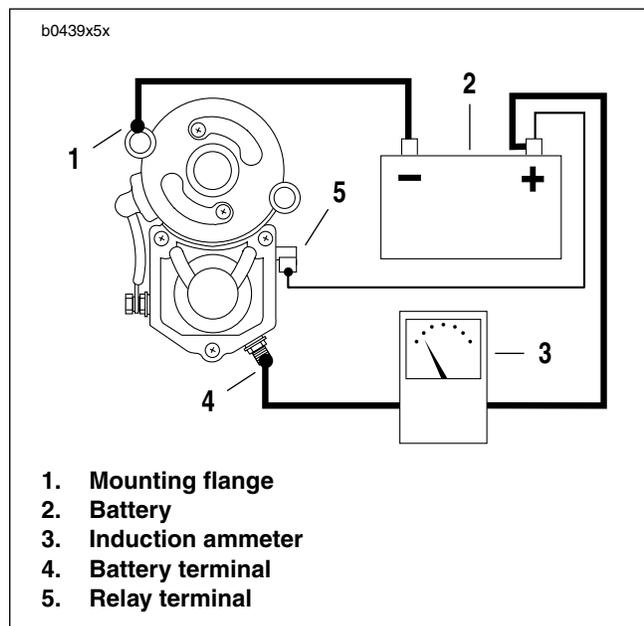


Figure 1-8. Free Running Current Draw Test

## GENERAL

The charging system consists of the alternator and voltage regulator. Charging system circuits are shown in [Figure 1-9](#).

### Alternator

The alternator consists of two main components:

- the rotor mounted on the engine sprocket shaft
- the stator bolted to the engine crankcase.

### Voltage Regulator

The voltage regulator is a series regulator with a circuit that combines the functions of rectifying and regulating. See [Figure 1-10](#).

## TROUBLESHOOTING

When the charging system fails to charge 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 Section [1.8 BATTERY TESTING](#) for battery testing procedures. Battery must be fully charged in order to perform a load test, or starting or charging tests. However, a partially discharged battery may be tested using the BATTERY TEST function of the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (HD-48053).

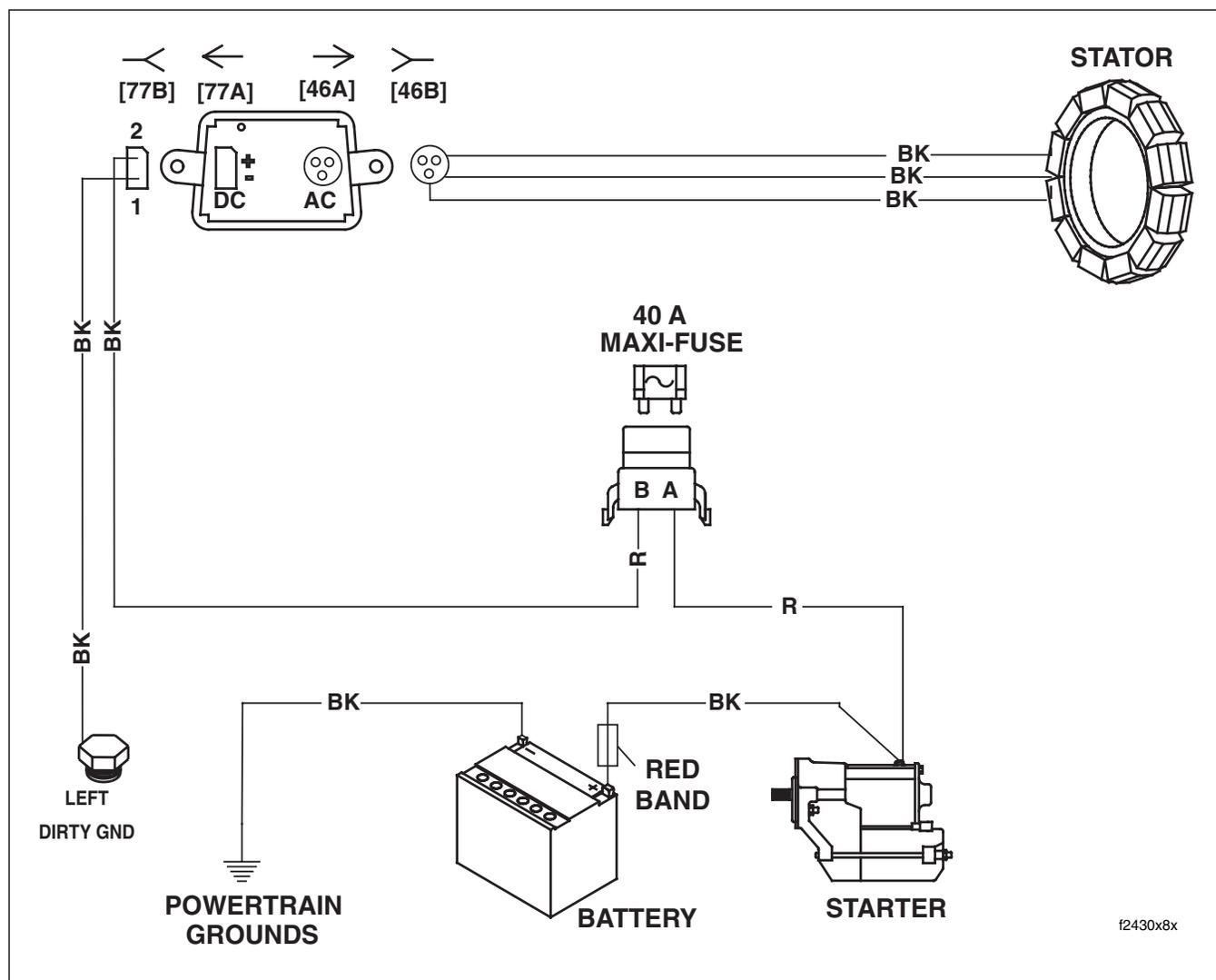
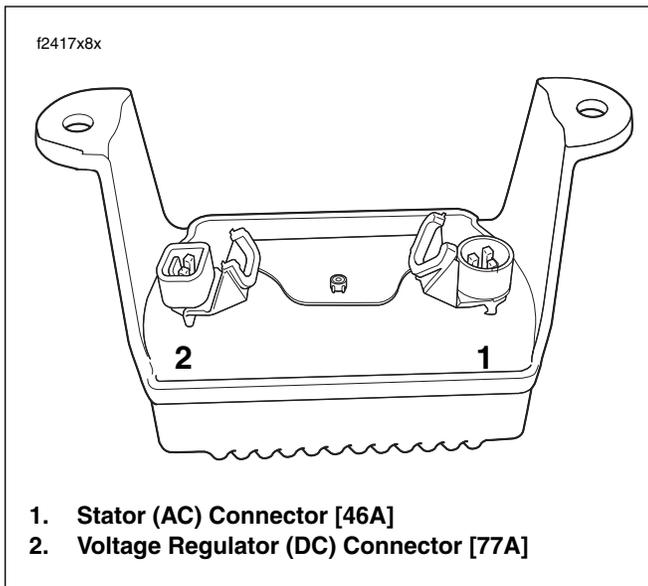


Figure 1-9. Charging System Circuit (Typical)



**Figure 1-10. Voltage Regulator (Bottom View)  
AC and DC Connectors**

## Job/Time Code Values

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

## Wiring

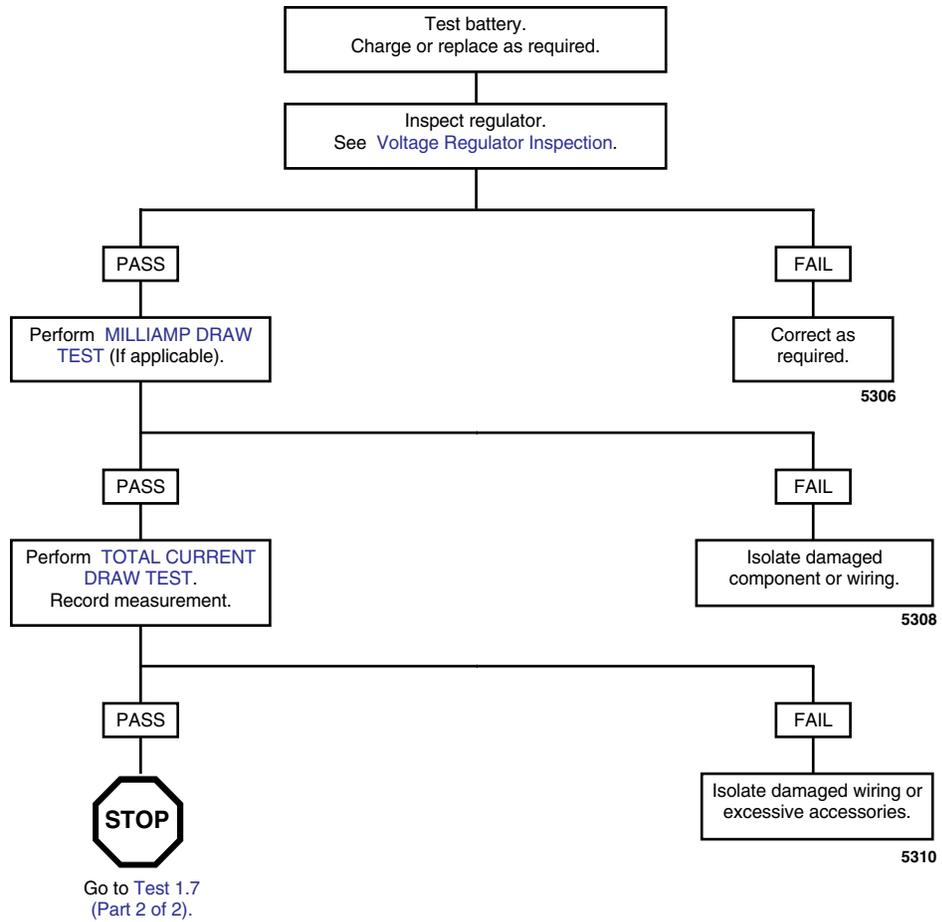
See charging system circuit in [Figure 1-9](#). Check for corroded or loose connections.

## Voltage Regulator Inspection

The regulator must have a clean, tight ground connection for proper operation. Using an ohmmeter with one lead on the battery ground cable and the other on the regulator ground terminal, check with the voltage regulator DC connector disengaged. The electrical continuity test is performed with the ohmmeter set to the RX1 scale. A resistance value below 1 ohm should be observed.

## Test 1.7 (Part 1 of 2)

### SYMPTOM: BATTERY BECOMES DISCHARGED

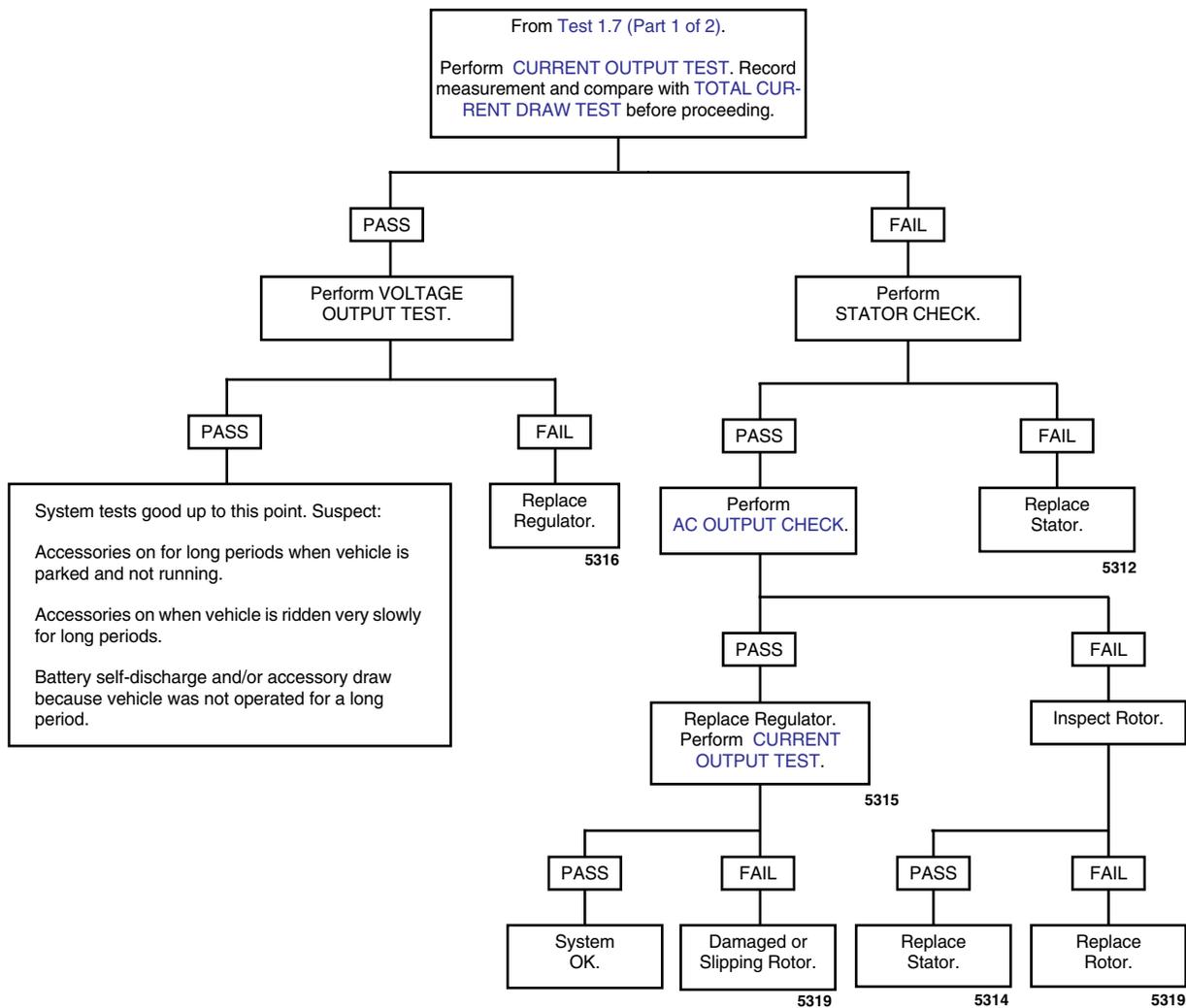


#### NOTE

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

## Test 1.7 (Part 2 of 2)

### SYMPTOM: BATTERY BECOMES DISCHARGED



**NOTE**

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

# TESTING

## MILLIAMPERE DRAW TEST

### NOTES

- 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.
- TSM/TSSM will continue to draw 16-25 mA for 30 seconds after ignition is turned OFF. Any disruption and reconnection of battery power, such as disconnecting the battery to place a meter in series, will cause TSM/TSSM to draw 16-25 mA for 30 seconds.

See Figure 1-11. Remove maxi-fuse. Connect ammeter using HARNESS CONNECTOR TEST KIT (HD-41404A) red pin probes and patch cords. With this arrangement, you will also pick up any regulator drain.

The limits for these drains are listed in Table 1-4.

- Any accessories must be considered and checked for excessive drain.
- This condition could drain battery completely if vehicle is parked for a long time.

### NOTES

- A battery with surface discharge condition could cause a static drain. Correct by cleaning battery case.
- Any reading that exceeds the "Average Meter Reading" values below indicates excessive current draw. Check for bad radio, voltage regulator or short in the interconnecting wiring. Alarms and customer accessories are also prime suspects. Isolate problem by disconnecting suspect components and observe change in meter reading.

**Table 1-4. Milliampere Draw Test (Ignition Switch OFF)**

COMPONENT	DRAW IN MILLIAMPERES Average Meter Reading
ECM (EFI models)	1.0
Speedometer	0.5
Tachometer	0.5
TSM (no security)	0.5
TSSM (armed)	3.0
TSSM (disarmed)	3.0
TSSM (storage mode)	0.5
Security Siren (Optional)	20.0*
Voltage Regulator	2.0
Radio	2.0
High Output Amplifier	0.2
CB Module	0.4
XM Module	0.1

\* Siren will draw for 2-24 hours from time motorcycle battery is connected and 0.05 milliamperes once siren battery is charged. For best results, disconnect siren during milliampere draw test.

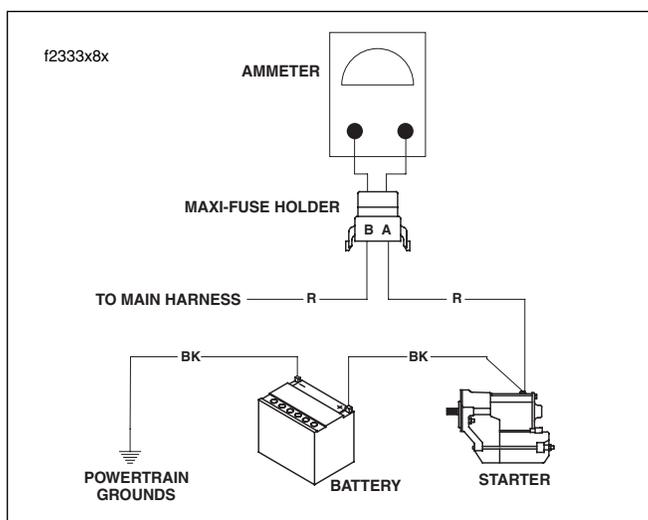
## TOTAL CURRENT DRAW TEST

If the battery runs down during use, the current draw of the motorcycle components and accessories may exceed the 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 in Figure 1-12. Disconnect regulator from stator. Start engine and run at 3000 rpm.

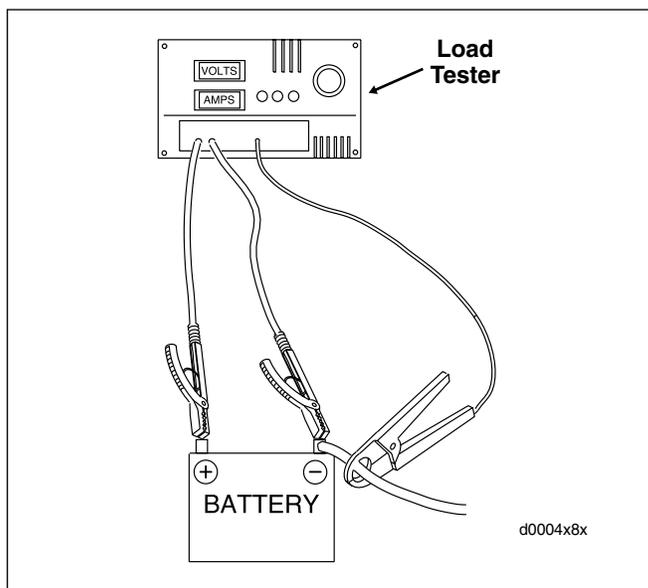
With ignition and all continuously running lights and accessories turned on (headlamp on high beam), read the total current draw. Compare this reading to the reading obtained in CURRENT OUTPUT TEST. The current output should exceed current draw by 3.5 amps, minimum. If not, there may be too many accessories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

### NOTE

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



**Figure 1-11. Milliamp Draw Test**



**Figure 1-12. Check Current Draw (Ignition Switch On)**

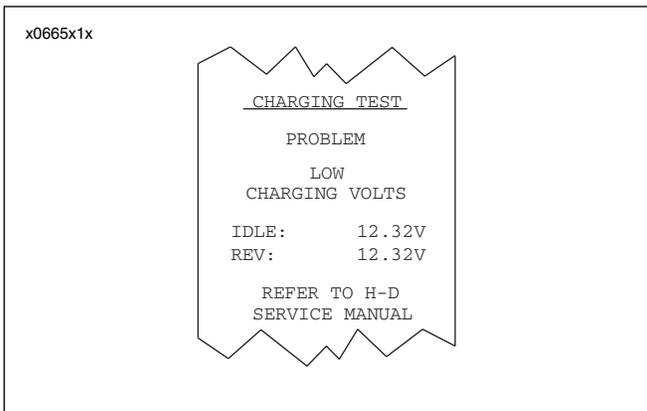


Figure 1-13. Charging System Test Results-Printout

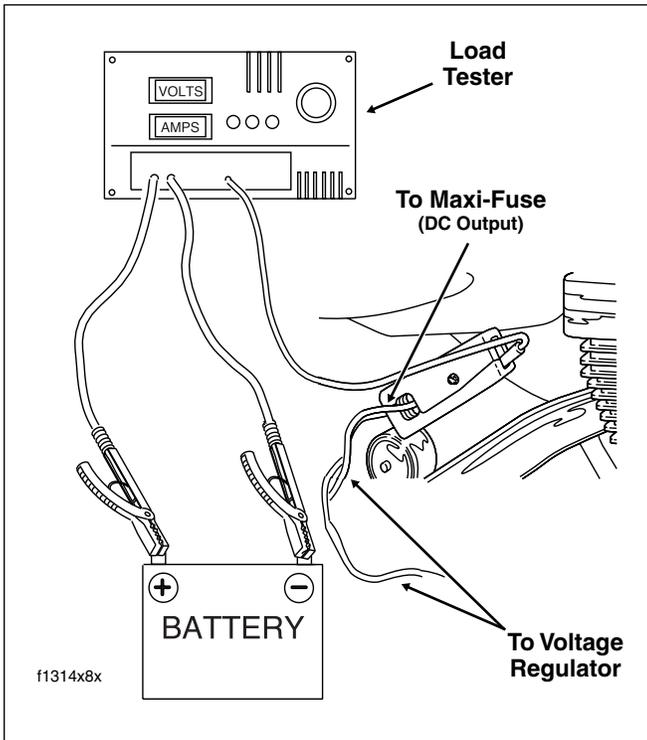


Figure 1-14. Current and Voltage Output Test

## CURRENT OUTPUT TEST

For this test, you may use either the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (HD-48053) or a load tester.

## ELECTRICAL SYSTEM ANALYZER

1. Connect the analyzer leads to the battery.
2. Follow the instructions in the analyzer instruction manual to perform a charging system test.

The test results will include a decision on the condition of the charging system and the measured output voltage at idle and at 3000 RPM.

See Figure 1-13. The analyzer printer will provide a printout including one of two possible test results:

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

## LOAD TESTER

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 1-14.
2. Run the engine at 3000 rpm and increase the load as required to obtain a constant 13.0 volts DC.
3. The current output should be 45-60 amps.

## VOLTAGE OUTPUT TEST

See Figure 1-14. After removing the load, read the load tester voltage meter. Voltage to the battery must be less than 15 volts. If voltage is higher, the voltage 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

### Grounded Stator

1. Turn ignition keyswitch OFF.
2. Connect ohmmeter as follows:
  - a. Disconnect stator from voltage regulator.
  - b. Insert ohmmeter probe into one of the three stator connector sockets. See Figure 1-15.
  - c. Attach the other ohmmeter probe to a suitable ground point on the engine. Check several places to ensure good continuity is made.
3. Test for continuity between all three stator connector sockets and the ground point with ohmmeter.
  - a. A GOOD stator will show a large resistance to ground (infinite ohms) between stator socket and ground.
  - b. A BAD stator will show continuity between stator socket and ground.
4. Replace stator if grounded (BAD).

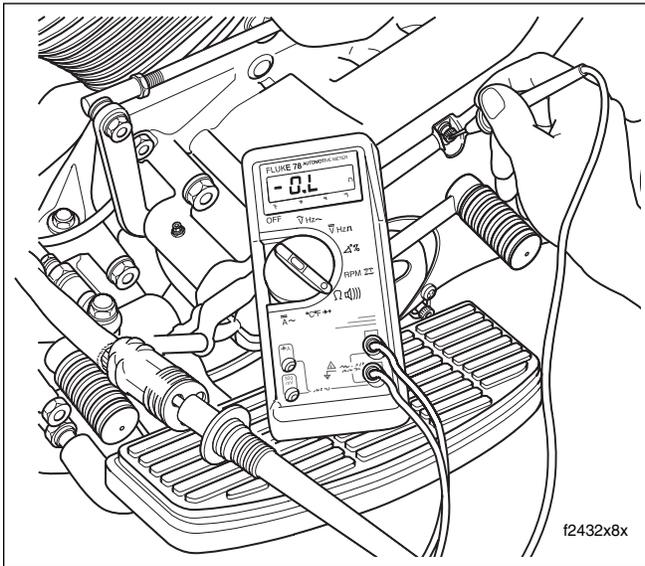


Figure 1-15. Test for Grounded Stator

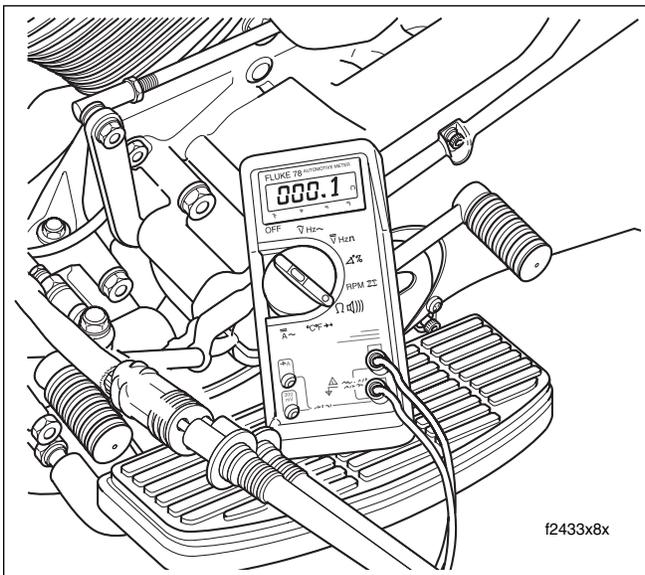


Figure 1-16. Check for Stator Resistance

## AC OUTPUT CHECK

1. See [Figure 1-17](#). To test AC output:
2. Disconnect stator from voltage regulator.
  - a. Connect an AC voltmeter across any two stator connector socket combinations.
  - b. Run the engine at 2000 rpm. The AC voltage output should be greater than 30-40 volts AC.
  - c. Repeat AC voltage test across the other two stator socket combinations.
3. If the output is below specifications, charging problem could be a faulty rotor or stator. Replace the rotor or stator.
4. Check the output again as described under [CURRENT OUTPUT TEST](#) given earlier.

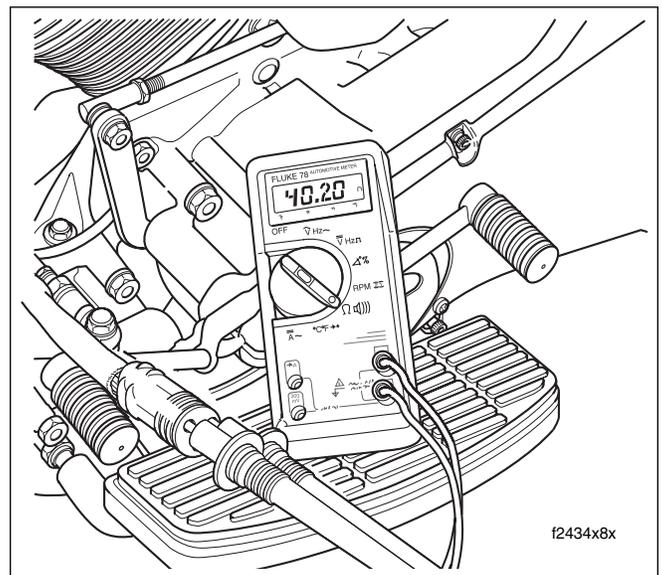


Figure 1-17. Check AC Output

## Open Stator

1. Turn ignition keyswitch OFF.
2. Using ohmmeter probe, test for electrical continuity between all three stator connector socket combinations, that is, 1-2, 2-3, 1-3.
  - a. See [Figure 1-16](#).
  - b. Resistance across all three stator socket combinations should be less than 1 ohm (typically 0.1-0.3 ohms).
  - c. If resistance is greater than 1 ohm, then stator is OPEN and must be replaced.

## GENERAL

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

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

## VOLTMETER TEST

Refer to [Table 1-5](#). The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is in a 100% fully charged condition. If the open circuit (disconnected) voltage reading is below 12.6V, charge the battery and then recheck the voltage after the battery has set for one to two hours. If the voltage reading is 12.7V or above, perform the [LOAD TEST](#) described in this section.

**Table 1-5. Voltmeter Test**

Voltage (OCV)	State of Charge
12.7	100%
12.6	75%
12.3	50%
12.0	25%
11.8	0%

## CONDUCTANCE TEST

Test battery using the ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER (HD-48053). Proceed as follows:

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

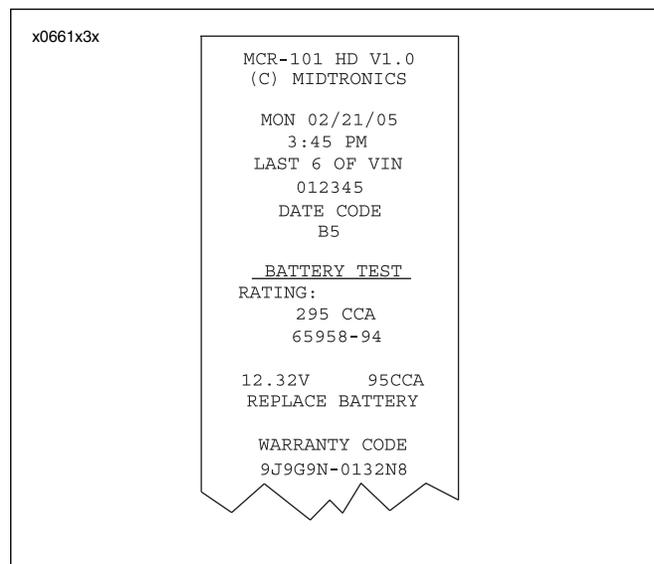
The test results will include a decision on the battery condition, the measured state of charge and the measured CCA.

See [Figure 1-19](#). The analyzer printer will provide you with a printout including one of five possible test results:

- GOOD BATTERY—return the battery to service.
- GOOD-RECHARGE—fully charge the battery and return to service.



**Figure 1-18. Advanced Battery Conductance and Electrical System Analyzer (Part No. HD-48053)**



**Figure 1-19. Battery Test Results—Printout**

- CHARGE & RETEST—Fully charge the battery and retest.
- REPLACE BATTERY—replace the battery and retest.
- BAD CELL-REPLACE—replace the battery and retest.

### NOTE

A *REPLACE BATTERY* test result may also mean a poor connection between the battery cables and the motorcycle. After disconnecting the battery cables from the battery, retest the battery using the out-of-vehicle test before replacing.

## LOAD TEST

The load test measures battery performance under full current load and is the best indicator of battery condition. To load test the battery, proceed as follows:

1. Remove seat.

### WARNING

**Always disconnect the negative battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

2. Unthread bolt and remove battery negative cable (black) from battery negative (-) terminal.
3. Unthread bolt and remove battery positive cable (red) from battery positive (+) terminal.
4. Using a T-40 TORX drive head, loosen bolt to move lip of hold-down clamp off edge of battery. Remove battery from battery box.

### CAUTION

**Load testing a discharged battery can result in permanent battery damage.**

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

### WARNING

**Always turn the battery load tester OFF before connecting the tester cables to the battery terminals. Connecting tester cables with the load tester ON could cause a spark resulting in a battery explosion. A battery explosion may rupture the battery case causing a discharge or spray of sulfuric acid which could result in death or serious injury.**

7. Connect tester leads to battery posts and place induction pickup over negative (black) cable. See [Figure 1-20](#).

### CAUTION

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

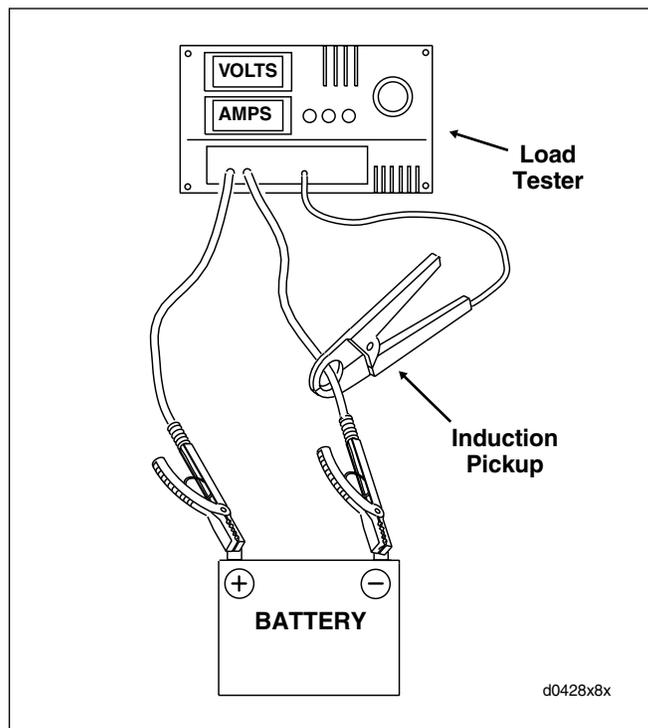


Figure 1-20. Load Test Battery

8. Load battery at 50% of CCA rating using the load tester. Voltage reading after 15 seconds should be 9.6V or more at 70°F. (21°C).

Table 1-6. Battery Load Test

COLD CRANKING AMPERAGE (CCA)	100%	50%
TOURING	300	150

### WARNING

**Always turn the battery load tester OFF before disconnecting the tester cables from the battery terminals. Disconnecting tester cables with the load tester ON could cause a spark resulting in a battery explosion. A battery explosion may rupture the battery case causing a discharge or spray of sulfuric acid which could result in death or serious injury.**

9. Place the fully charged battery into the battery box, terminal side forward.

### CAUTION

**Connect the cables to the correct battery terminals or damage to the motorcycle electrical system will occur.**

 **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 which could result in death or serious injury.**

**CAUTION**

**Overtightening bolts can damage battery terminals.**

10. Insert bolt through battery positive cable (red) into threaded hole of battery positive (+) terminal. Tighten bolt to 60-96 **in-lbs** (6.8-10.9 Nm).

11. Insert bolt through battery negative cable (black) into threaded hole of battery negative (-) terminal. Tighten bolt to 60-96 **in-lbs** (6.8-10.9 Nm).
12. Apply a light coat of petroleum jelly or corrosion retardant material to both battery terminals.
13. Rotate the hold-down clamp so that the lip (with rubber pad) rests on the edge of the battery. Using a T-40 TORX drive head, tighten the clamp bolt to 15-20 ft-lbs (20-27 Nm).
14. Install seat.