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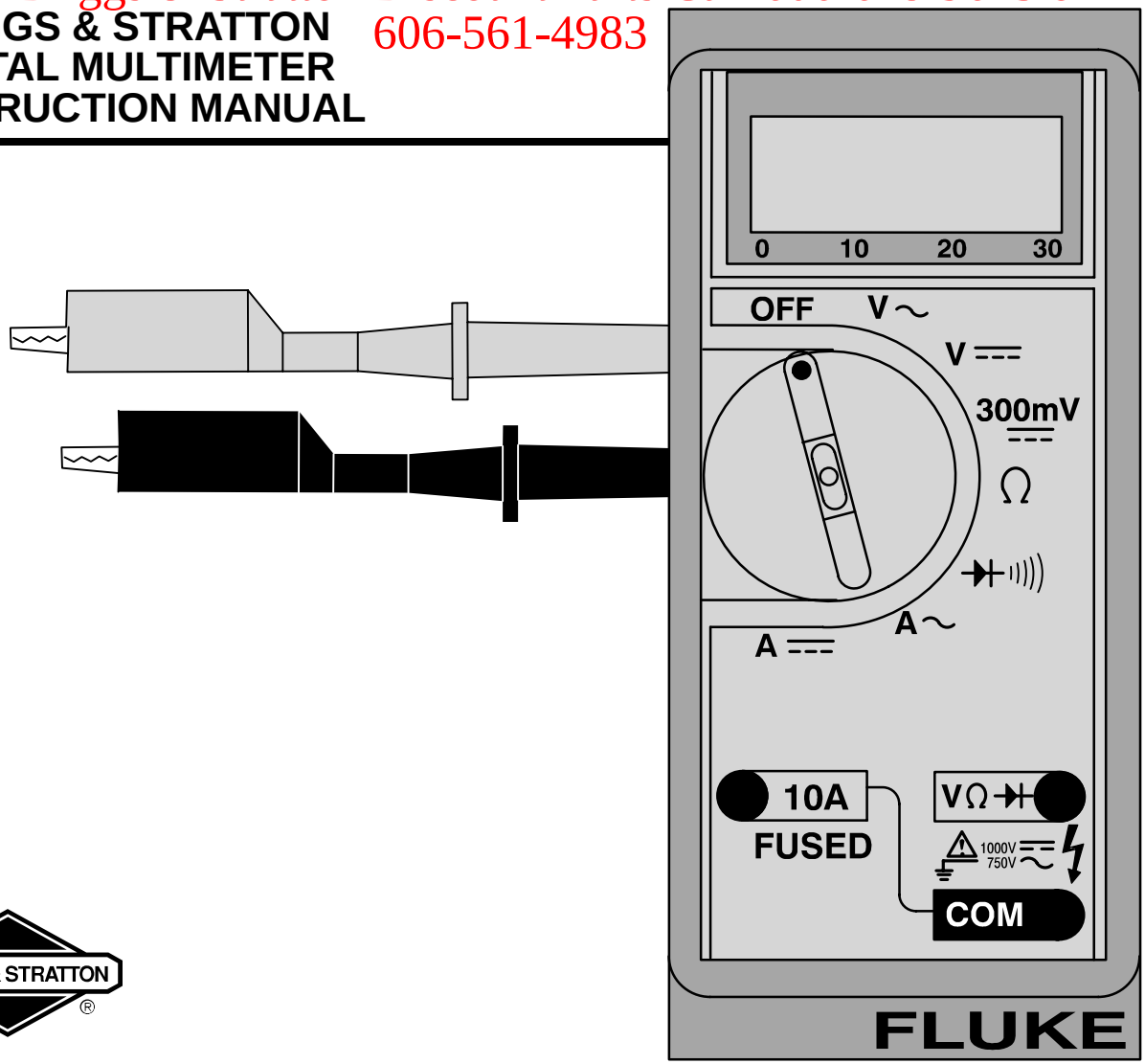
BRIGGS & STRATTON DIGITAL MULTIMETER INSTRUCTION MANUAL



BRIGGS & STRATTON ®

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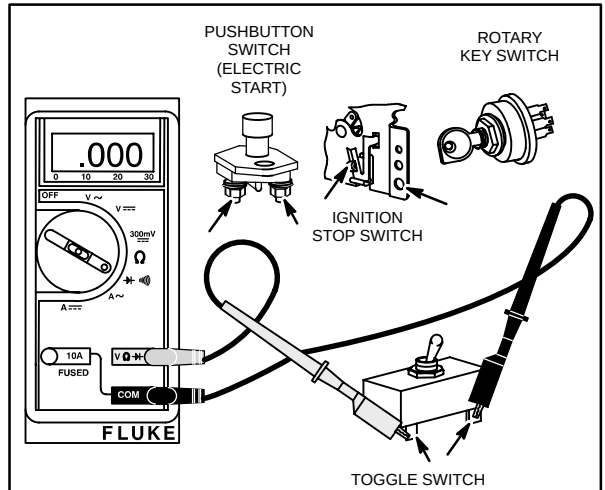
Table of Contents

NOTE: The Digital Multimeter is equipped with two fuses to prevent damage to the meter in the event that the input limits are exceeded. If the meter displays a reading of 0.00 when testing 12 volt starter motor current draw or DC amperage output, check fuses in meter. Refer to FLUKE Operator’s Manual for procedure for checking fuse. Order replacement fuse, Part No. 19449.

CONTINUITY CHECKS-SWITCHES

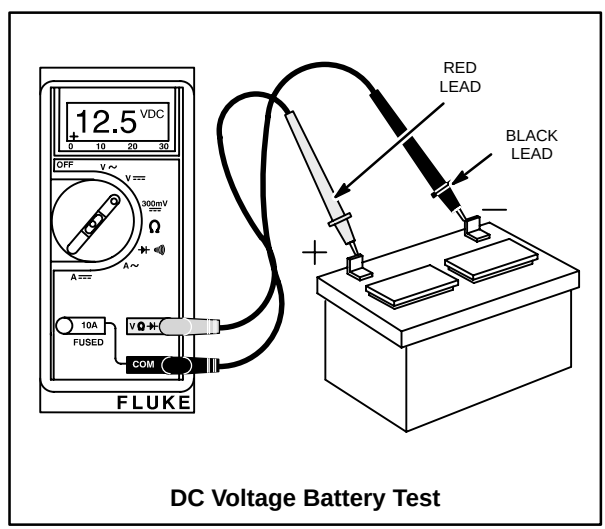
1. Insert red test lead into V Ω ⊣⊢ receptacle in meter.
2. Insert black test lead into COM receptacle in meter.
3. Rotate selector to ⊣⊢ position.
4. When meter test leads are attached to switch terminals and switch is in "ON" position, a continuous tone indicates continuity. With switch in "OFF" position, no tone indicates no continuity (incomplete circuit). An incomplete circuit will be displayed as "OL".



Continuity Checks

DC VOLTAGE BATTERY TEST V ⎓

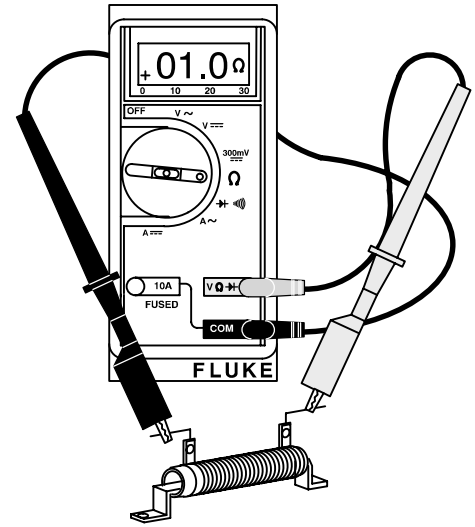
1. Insert red test lead into V Ω ⊣⊢ receptacle in meter.
2. Insert black test lead into COM receptacle in meter.
3. Rotate selector to V ⎓ position.
4. Connect red test lead to + (positive) terminal on battery and black test lead to – (negative) terminal. Battery voltage can be checked as shown.



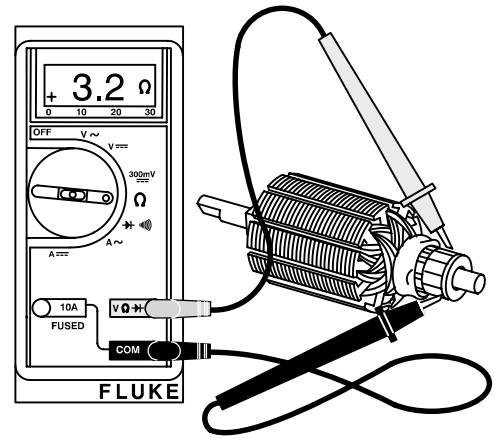
DC Voltage Battery Test

RESISTANCE CHECKS Ω

1. Insert red test lead into V Ω ⊣⊢ receptacle in meter.
2. Insert black test lead into **COM** receptacle in meter.
3. Rotate selector to Ω position.
4. Attach test leads to component being tested.
5. Meter will display amount of resistance in component being tested.



TYPICAL 1 OHM RESISTOR
FOR TRI-CIRCUIT ALTERNATOR

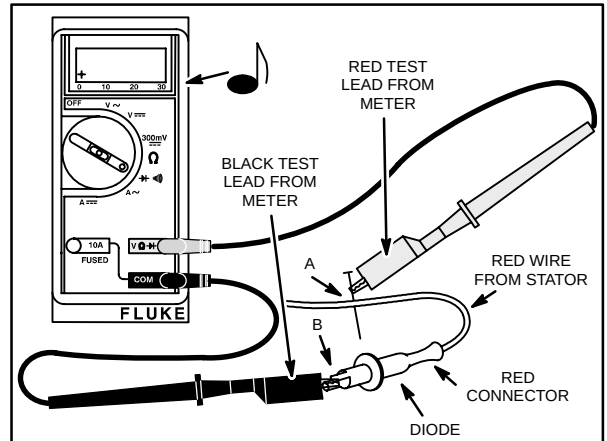


Resistance Checks

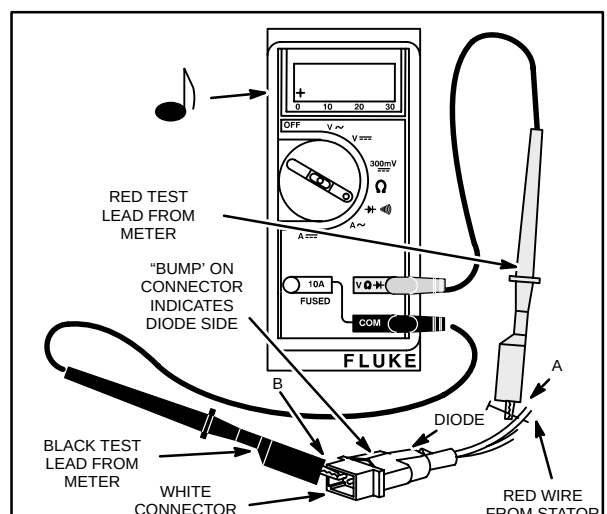
DIODE CHECKS ⊣))))

In the Diode Test position, the meter will display the forward voltage drop across the diode(s). If the voltage drop is less than 0.7 volts, the meter will "beep" once, as well as display the voltage drop. A continuous tone indicates continuity (shorted diode). An incomplete circuit (open diode) will be displayed as "OL".

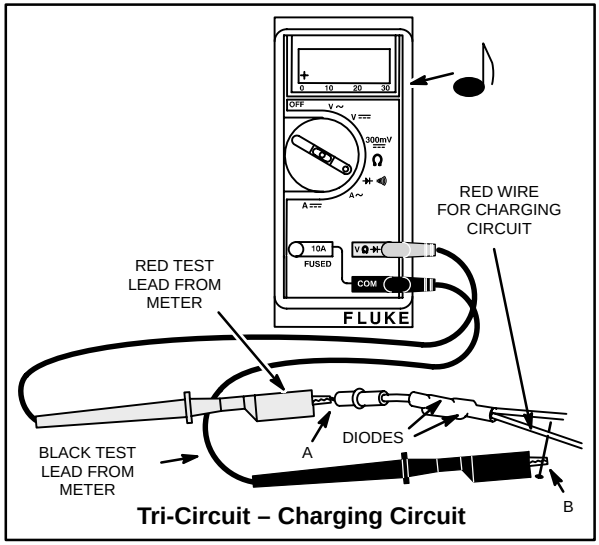
1. Insert red test lead into V Ω ⊣ receptacle in meter.
2. Insert black test lead into COM receptacle in meter.
3. Rotate selector to ⊣)))) position.
4. Attach red test lead to point "A" and black test lead to point "B". (It may be necessary to pierce wire with a pin as shown.)
   A. If meter "beeps" once, diode is OK.
   B. If meter makes a continuous tone, diode is defective (shorted).
   C. If meter displays "OL", proceed to step 5.
5. Reverse test leads.
   A. If meter "beeps" once, diode is installed backwards.
   B. If meter still displays "OL", diode is defective (open).



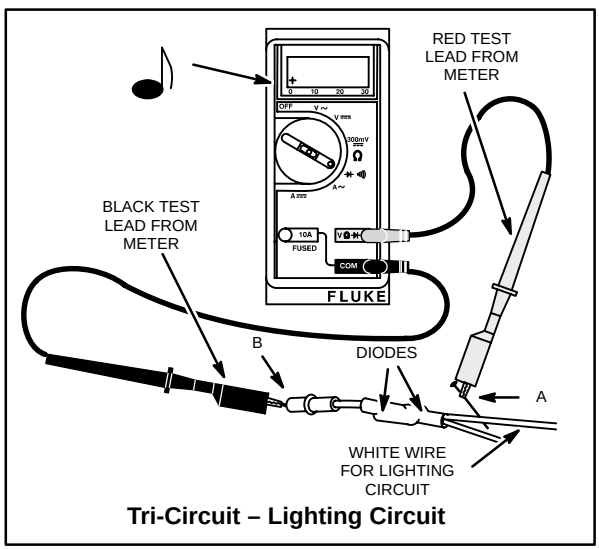
3 Amp DC



Dual Circuit – Charging Circuit

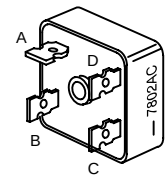


Tri-Circuit – Charging Circuit



Tri-Circuit – Lighting Circuit

Red Test Lead	Black Test Lead	Beep
B	A	Yes
C	B	Yes
C	D	Yes
D	A	Yes



120 Volt Rectifier

NOTE: Metal cased rectifiers must also be tested for "grounds", as follows:

With BLACK test lead probe contacting rectifier case, touch each terminal, A – D, with RED test lead probe. Meter should display "OL" at each terminal. If meter makes a continuous tone at any terminal, rectifier is defective ("grounded").

DC SHUNT INSTRUCTIONS

The DC shunt, #19468 readily adapts to standard mount, side mount or tab type battery terminals. The shunt **must** be installed on the – (**negative**) terminal of the battery.

For standard terminals, attach ring terminal on shunt to post terminal on battery.

For tab terminal batteries, attach shunt to battery terminal using 1/4”-20 stud and wing nut.

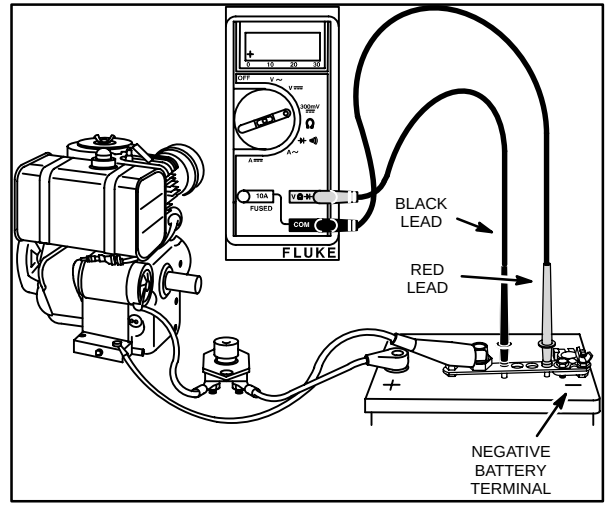
For side terminal batteries, remove post terminal from shunt and thread into side terminal on battery. Attach battery cable to shunt using 3/8” -16 nut from post terminal.

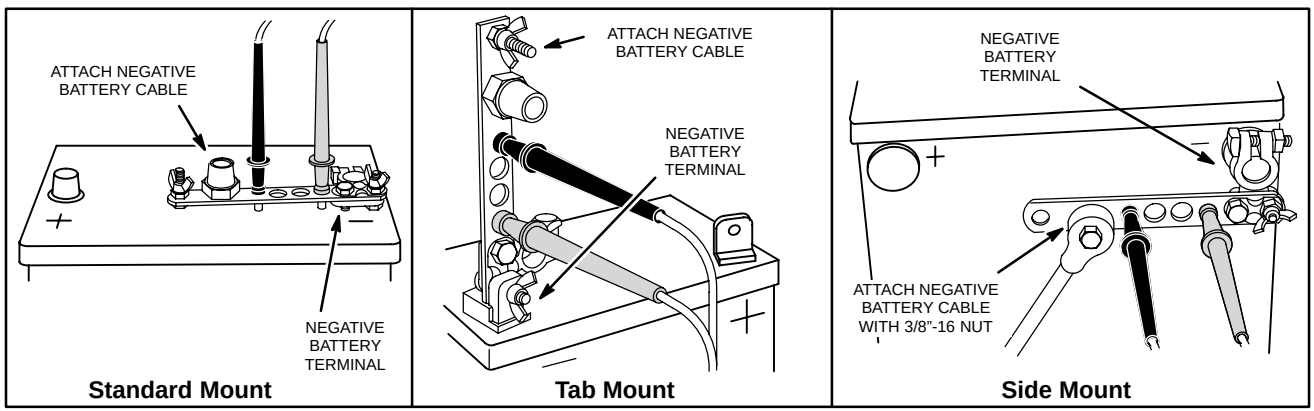
The Digital Multimeter will withstand DC input of 10 – 20 Amps for up to **30** seconds. To avoid blowing fuse in meter, use the DC shunt when checking current draw of 12 volt starter motors or DC output on 16 Amp regulated alternator.

Charging output can be checked with the engine running.

All connections must be clean and tight for correct amperage readings.

1. Install shunt on **negative** battery terminal.
2. Insert red test lead into **V Ω →|–** receptacle in meter and red receptacle on shunt.
3. Insert black test lead into **COM** receptacle in meter and black receptacle on shunt.
4. Rotate selector switch to **300mV** ⎓ position.





NO-LOAD STARTER CURRENT DRAW 12 VOLT STARTER MOTORS 300mV ⎓

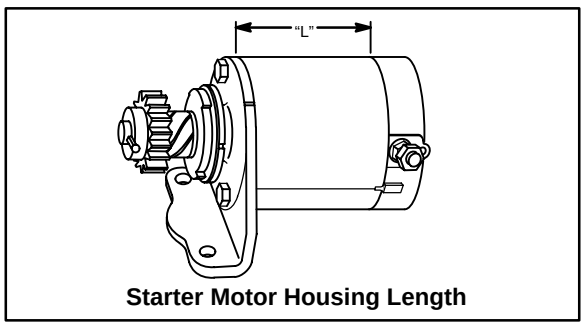
(STARTER MOTOR REMOVED FROM ENGINE)

To check the no-load amperage draw of a 12 volt starter motor that is removed from the engine, a fixture as shown in the figure should be used. See the diagram for the parts necessary to make a test set-up.

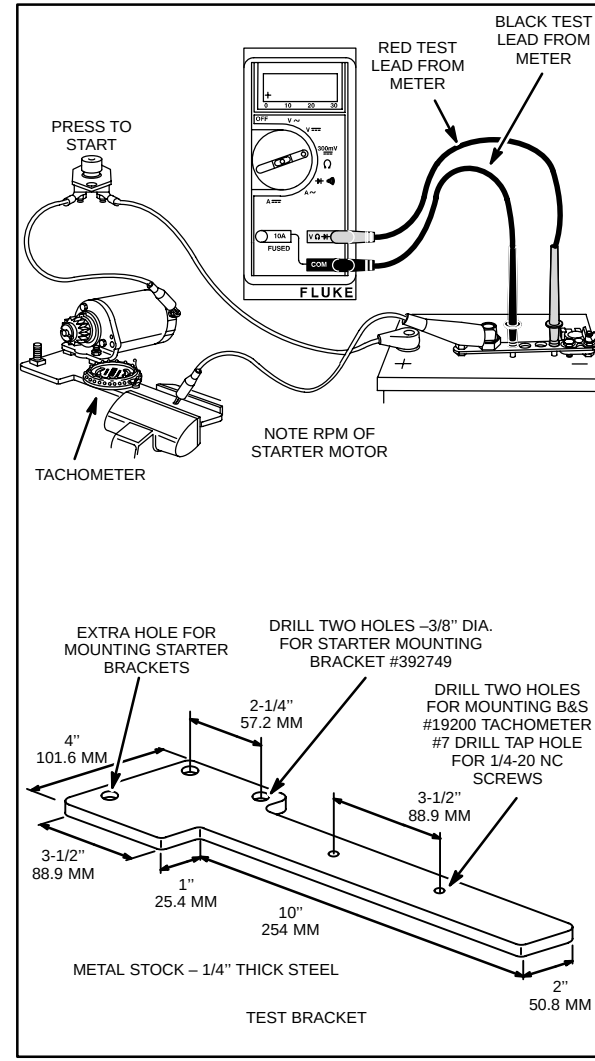
CAUTION: DO NOT clamp motor housing in a vise. Starter motors contain two ceramic magnets which can be broken or cracked if the motor housing is deformed or dented.

Note: When checking starter current draw, battery voltage must not be below 11.7 volts.

1. Install shunt on – (**negative**) battery terminal.
2. Insert red test lead into V Ω ⊣◗⊢ receptacle in meter and red receptacle on shunt.
3. Insert black test lead into COM receptacle in meter and black receptacle on shunt.



Starter Motor Housing Length



12 Volt Starter Current Draw – DC Shunt

TABLE 1

12 VOLT STARTER MOTOR SPECIFICATIONS

MOTOR HOUSING LENGTH	MINIMUM RPM	MAXIMUM AMPERAGE
3”	6500	18
3-5/8”	6500	18
3-3/4”	6900	19
4-3/8”	6500	20
4-1/2”	6500	35

4. Rotate meter selector to **300mV** ⎓ position.
5. Activate the starter switch:
   A. Note RPM on vibration tachometer.
   B. Note amperage on meter.
6. Note starter motor housing length and refer to Table 1 for test specifications for starter motor being tested.
7. If the starter motor does not meet the specifications shown in the chart, refer to the Repair Instruction Manual, Section 7, for service and repair procedure.

STARTER CURRENT DRAW – 12 VOLT STARTER MOTORS 300mV ⎓

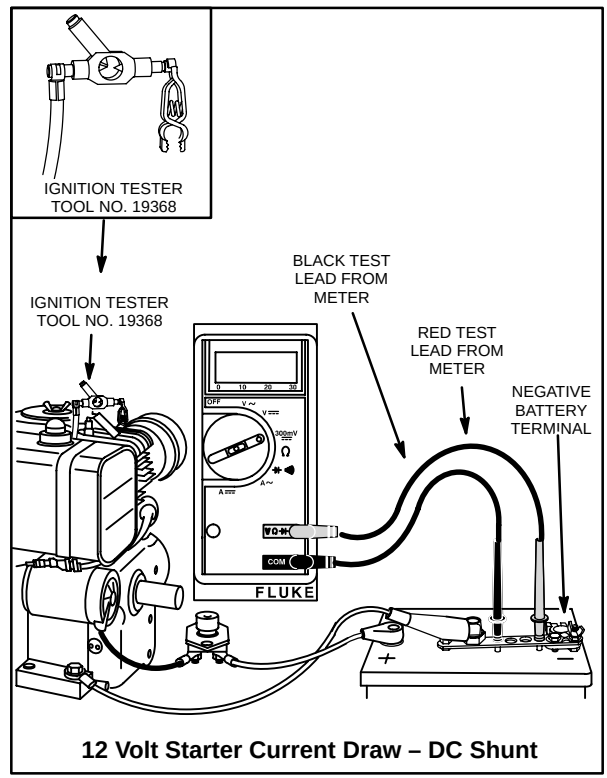
(STARTER MOTOR MOUNTED ON ENGINE)

To check the amperage draw of a starter motor mounted on the engine, the procedure is similar to checking the starter motor off the engine. The battery cable and key switch harness installed in the equipment may be substituted for the test harness shown.

When making this current draw test, it is important to monitor the engine RPM, amperage draw and battery voltage. On all 12 volt starter systems, make sure the test is performed with the correct oil in engine, and belts removed from the PTO shaft. Remove the spark plug(s) and ground the spark plug wire(s) using Ignition Tester(s), Tool No. 19368. Also the engine temperature should be at least 68 to 70 degrees.

Note: When checking starter current draw, battery voltage must not be below 11.7 volts.

1. Install shunt on – (**negative**) battery terminal.
2. Insert red test lead into **V Ω ⏚** receptacle in meter and red receptacle on shunt.
3. Insert black test lead into **COM** receptacle in meter and black receptacle on shunt.
4. Rotate meter selector to **300mV** ⎓ position.
5. Activate the starter switch:
   A. Note RPM on vibration tachometer.
   B. Note amperage on meter.
6. If the amperage draw exceeds 100 amps and the engine RPM is less than 350, it could indicate a starter motor problem. Check the starting system, such as the battery, cables, solenoid and connections. Then proceed to check the starter motor by performing the no-load starter motor test as indicated on page 8 or refer to the Briggs & Stratton Repair Instruction Manual, Section 7.



12 Volt Starter Current Draw – DC Shunt

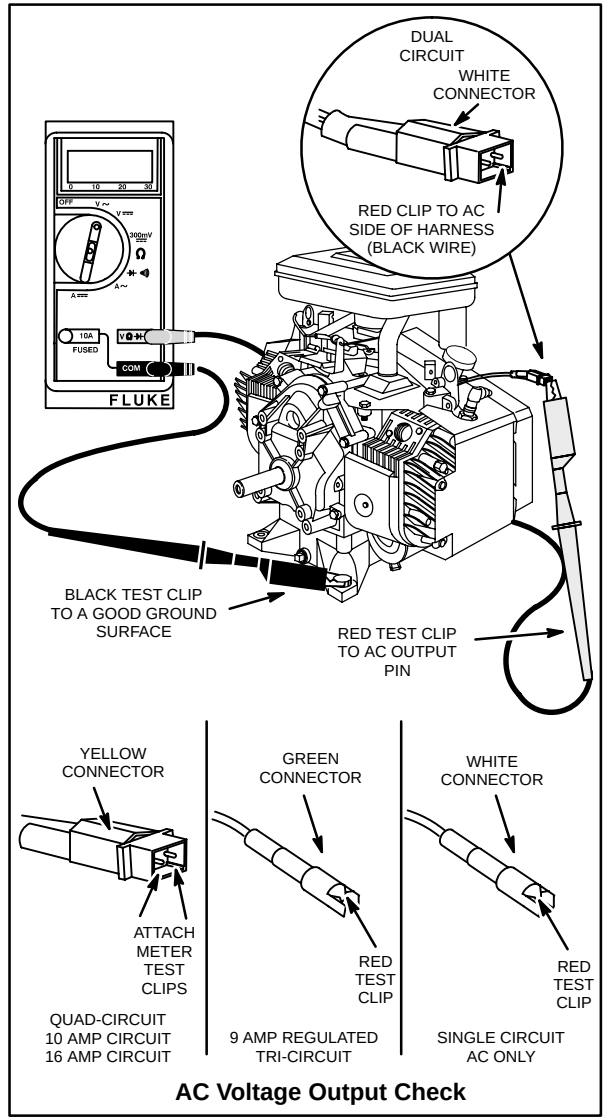
AC VOLTAGE OUTPUT CHECK V~

1. Insert red test lead into V Ω ⊣◀ receptacle in meter.
2. Insert black test lead into COM receptacle in meter.
3. Rotate selector to V~ position.
4. Attach red test clip to alternator AC output terminal(s).
5. Attach black test clip to engine ground.

Note: When checking AC voltage output of stator on 10–16 and 20 amp regulated or Quad-Circuit alternator systems, attach one meter test clip to each output pin terminal in yellow connector from stator. Test clip leads may be attached to either output pin.

6. With engine running at 3600 RPM, AC output reading should be close to specification listed for alternator type in Table 2.

TABLE 2	
ALTERNATOR	**AC OUTPUT AT 3600 RPM**
AC ONLY	14 VOLTS
DUAL CIRCUIT	14 VOLTS
● 5 AMP REGULATED	28 VOLTS
● 9 AMP REGULATED	40 VOLTS
TRI-CIRCUIT	28 VOLTS
QUAD-CIRCUIT	30 VOLTS
● 10 AMP REGULATED	20 VOLTS
● 16 AMP REGULATED	30 VOLTS
● 16 AMP REGULATED	26 VOLTS
● Alternator output is determined by flywheel alternator magnet size.	



AC Voltage Output Check

DC AMPERAGE OUTPUT CHECK A ⎓

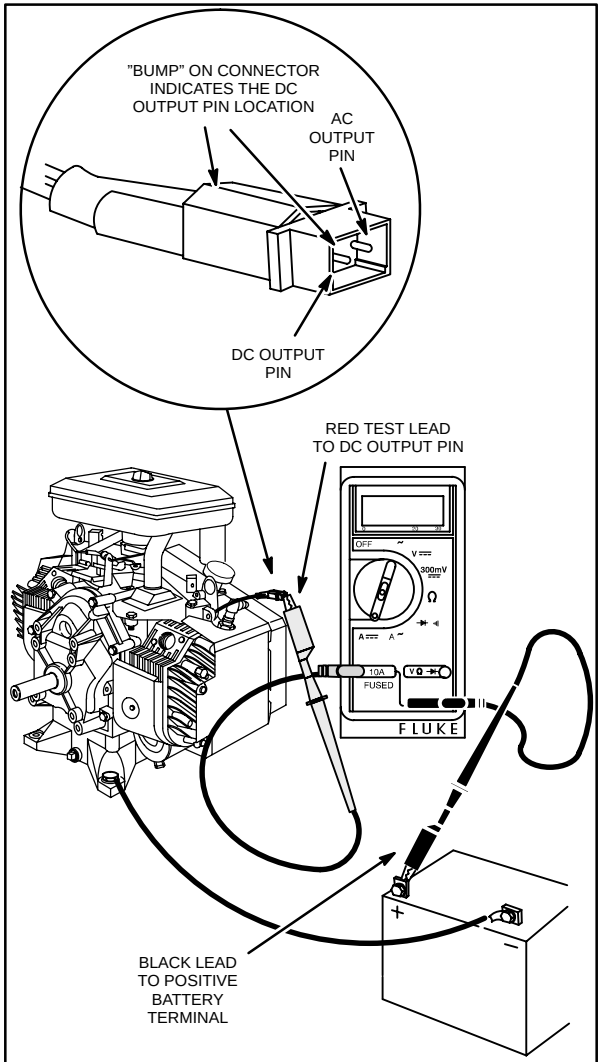
See Note Below For 1/2 Amp And System 3® & 4® Alternators

See Page 14 for Special Instructions on Checking DC Amperage Output of 16 and 20 Amp Regulated System

1. Insert red test lead into 10A receptacle in meter.
2. Insert black test lead into COM receptacle in meter.
3. Rotate selector to A ⎓ position.
4. Attach red test clip to DC output terminal.
5. Attach black test clip to + (positive) battery terminal. (See note for System 3® & 4® alternators.)
6. With engine running at **3600 RPM**, DC output reading should be close to specifications listed for alternator type shown in Table 3.

NOTE: 1/2 AMP AND SYSTEM 3® & 4® DC AMPERAGE OUTPUT CHECK:

At step 6, with engine running at **2800 RPM**, DC output should be no less than 0.5 amps.



DC Amperage Output Check

TABLE 3

ALTERNATOR TYPE	DC OUTPUT
1/2 AMP, SYSTEM 3® & 4®	.5 AMPS
DC ONLY (VANGUARD) (1.2 AMP)	1.2 AMPS
DC ONLY (MODEL 130000) (1.5 AMP)	1.2 AMPS
DC ONLY (3 AMP)	**2–4 AMPS
DUAL CIRCUIT	**2–4 AMPS
*QUAD-CIRCUIT	**3–8 AMPS
*5 AMP REGULATED	**3–5 AMPS
*9 AMP REGULATED	**3–9 AMPS
*10 AMP REGULATED	**3–10 AMPS
*16 AMP REGULATED	**3–16 AMPS
*20 AMP REGULATED	**3–20 AMPS

* Connect test leads before starting engine. Be sure connections are secure. If a test lead vibrates loose while engine is running, the regulator – rectifier may be damaged.

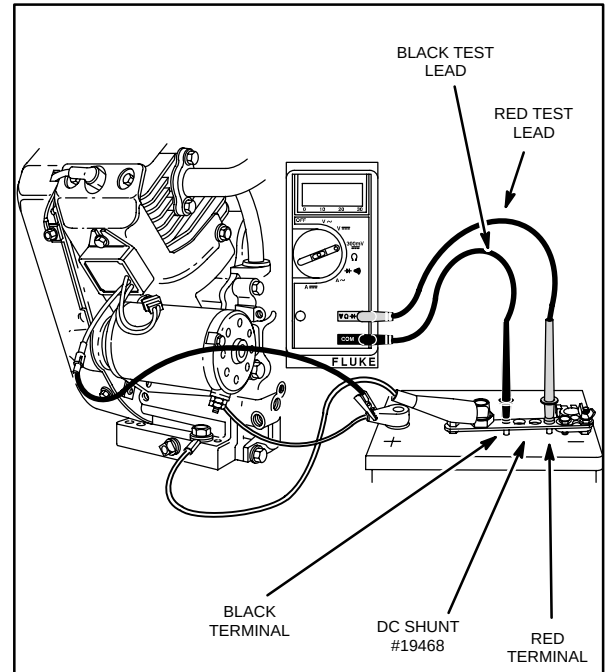
** Amperage will vary with battery voltage. If battery voltage is at its maximum, the amperage will be less than the higher value shown.

CHECKING DC AMPERAGE OUTPUT 16 & 20 AMP REGULATED ALTERNATOR

To avoid blowing fuse in meter when testing DC output of 16 and 20 Amp system the DC Shunt, Tool No. 19468, is required.

The DC Shunt **must** be installed on the – (**negative**) terminal of the battery. All connections must be clean and tight for correct amperage readings.

1. Install shunt on negative battery terminal.
2. Insert red test lead into V Ω ⊣⊢ receptacle in meter and red receptacle on shunt.
3. Insert black test lead into COM receptacle in meter and black receptacle on shunt.
4. Rotate selector to **300mV** ⎓ position.
5. With engine running at 3600 RPM, DC output reading should be close to specifications listed in Table 3.



DC Amperage Output Check 16 and 20 Amp System – DC Shunt

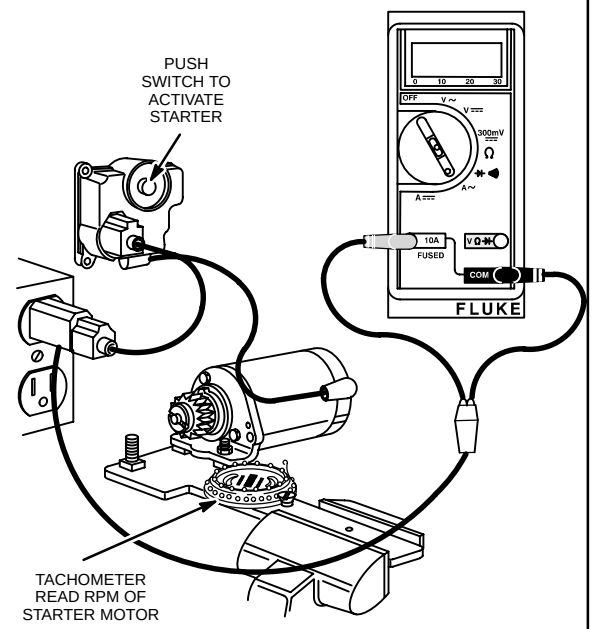
STARTER MOTOR CURRENT DRAW 120 VOLT STARTER MOTORS A~

Use Line Current Adapter, Tool No. 19358, when checking current draw on 120 volt starter motors. Use the same test fixture used in the 12 volt starter test to check the current draw and free running RPM of motor.

The following test procedure must be used to avoid any accidental shock hazard to the service technician.

1. Insert black test lead from adapter, Tool No. 19358, into the **COM** receptacle in meter.
2. Insert white test lead from adapter, Tool No. 19358, into the **10A** receptacle in meter.
3. Plug the adapter cord (female end) into the switch box receptacle of the starter motor.
4. Plug the adapter cord (male end) into the previously tested wall outlet.
5. Rotate selector to A~ position.
6. Refer to specifications, Table 4, and note maximum allowable amperage draw for motor being tested.
7. Depress starter switch button. When meter reading stabilizes, (approximately 3 seconds) amperage should **not** exceed the specification shown in Table 4.

CAUTION: If amperage is higher than specification in Table 4, *immediately stop the test!* An amperage reading higher than number in chart, indicates a shorted starter motor, which could be dangerous.



120 Volt AC Starter Motor Current Draw With Line Current Adapter

TABLE 4

120 VOLT STARTER MOTOR SPECIFICATIONS

STARTER MOTOR IDENTIFICATION	MAXIMUM AMPERAGE	MINIMUM RPM
American Bosch SME–110–C3 SME–110–C6 SME–110–C8	3.5	7400
American Bosch 06026–28–M030SM	3.0	7400
Mitsubishi J282188	3.5	7800
Briggs & Stratton 3-1/2” Motor Housing	2.7	6500

8. If starter motor amperage is within specification, check RPM using vibration tachometer, Tool No. 19200.
9. RPM should be close to specifications listed in Table 4.
10. If the starter motor does not meet the given specifications, refer to the Repair Instructions Manual, Section 7.