

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	4
FLUKE 115 MULTIMETER	529 035 868	5

GENERAL

STARTING SYSTEM OPERATION

When the START button is pressed, 12 Vdc is applied through the start switch (MG1) to the starter solenoid coil. If the engine cranking conditions are met, the ECM completes the starter solenoid control circuit by providing a ground. The starter solenoid then closes its contacts and battery power is applied to the starter for cranking the engine.

Engine Cranking Conditions

The following conditions must be met to allow engine cranking.

- Ignition switch turned ON
- Engine stop switch to RUN
- Transmission in Park, Neutral or a brake pedal/lever is applied
- Start button is pressed and held.

TROUBLESHOOTING

Check for fault codes. Refer to: *DIAGNOSTIC AND FAULT CODES* subsection.

ENGINE WILL NOT TURN

If the starter cranks over the engine with the brakes applied, check the following:

1. Shifter rod adjustment, (refer to appropriate *SHIFTER* subsection)
2. Gearbox position indicator switches or the gearbox position sensor (GBPS), (refer to appropriate *GEARBOX AND 4X4 COUPLING UNIT* subsection)
3. Switches or sensor wires and connectors, (refer to appropriate *WIRING DIAGRAM*).

If the “Engine cranking conditions” are met and the starter will not crank the engine, check the following:

1. Battery and connections (refer to *CHARGING SYSTEM*)
2. Starter solenoid
3. Start button switch

4. Starter (refer to *MAGNETO AND STARTER* subsection)

5. Wiring and connections.

ENGINE TURNS

Starting system is OK.

1. Verify ignition system. Refer to *IGNITION SYSTEM* subsection.
2. Verify EFI systems. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
3. Verify mechanical condition of engine. Refer to *ENGINE, CVT AND GEARBOX* section.

PROCEDURES

Ensure battery is fully charged.

Refer to applicable *WIRING HARNESS AND CONNECTORS* for harness layout and connector locations on vehicle.

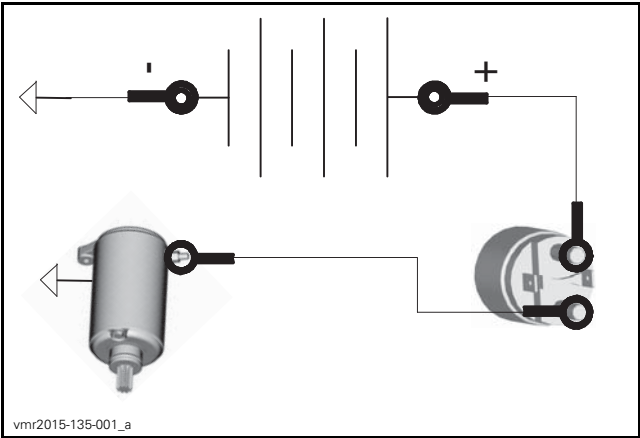
Refer to applicable *WIRING DIAGRAM* for additional information.

WARNING

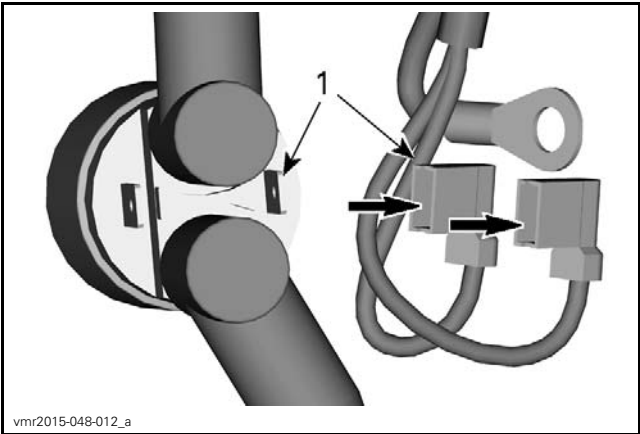
Ensure vehicle is in PARK when performing starting system tests.

STARTING SYSTEM TESTS

Starter Solenoid



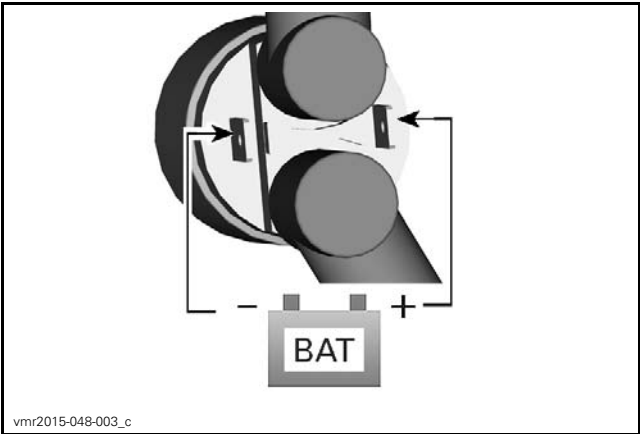
1. Disconnect SS1 and SS2



1. SS1

2. Activate the starter solenoid.

- 2.1 Apply 12Vdc to SS1
- 2.2 Ground SS2

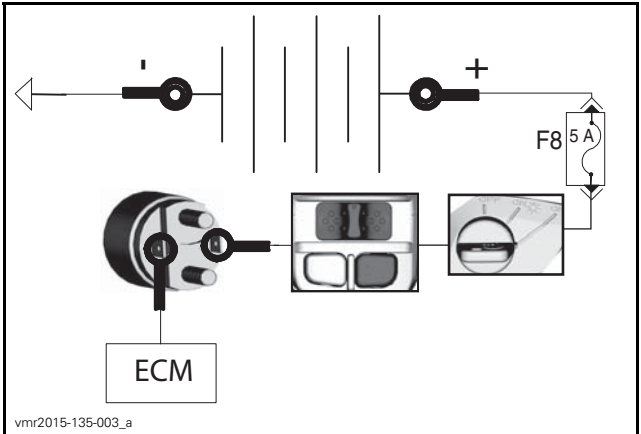


SS1 IS ON THE RIGHT

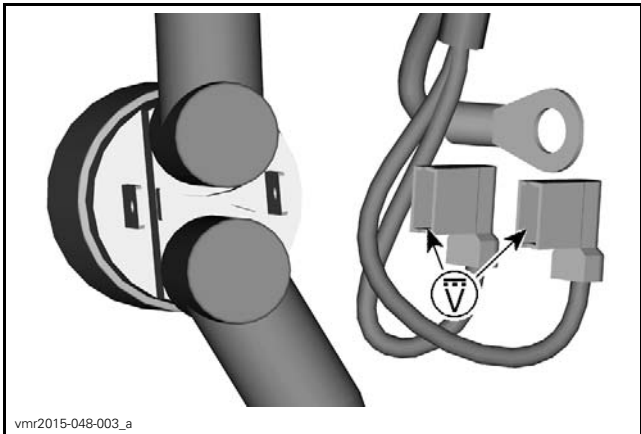
3. If starter turns, verify *STARTER SOLENOID CONTROL CIRCUIT*.

4. If starter does not turn, verify *STARTER SOLENOID CONTINUITY*.

Starter Solenoid Control Circuit



TEST CONDITION	
Engine stop switch	RUN
Ignition switch	ON
Start button	Pressed



SS1 IS ON THE RIGHT

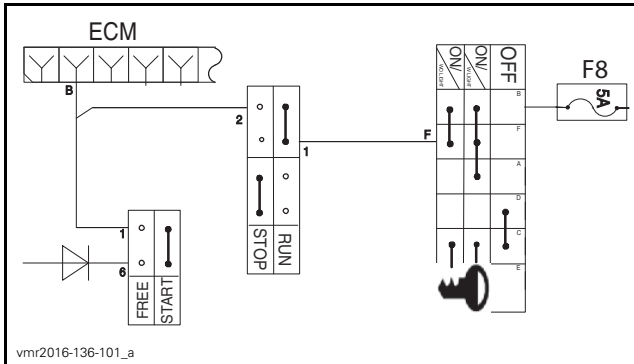
PROBE	PROBE	SPECIFICATION
SS1	SS2	Battery voltage
SS1	BAT -	Battery voltage
BAT +	SS2	Battery voltage

If voltage is as per specification replace starter solenoid.

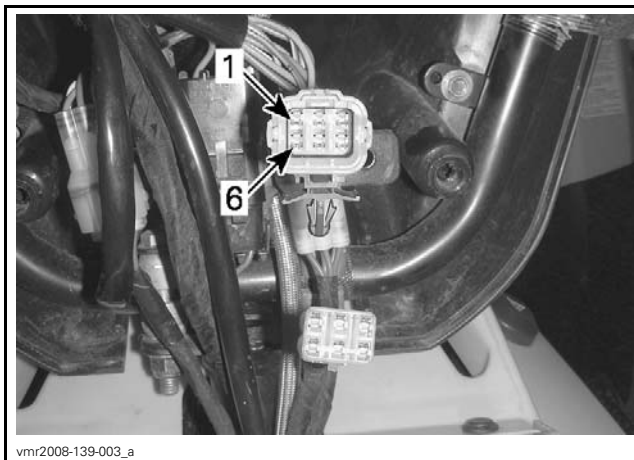
If voltage is not as per specification, verify *STARTER SOLENOID CONTROL POWER CIRCUIT* or *STARTER SOLENOID CONTROL GROUND CIRCUIT* as applicable.

Starter Solenoid Control Power Circuit

NOTE: This procedure also tests the start button.



1. Disconnect MG2 connector.



TYPICAL - MG2 STEERING HARNESS CONNECTOR PIN-OUT

TEST CONDITION		
Engine stop switch	RUN	
Ignition switch	ON	
PROBE	PROBE	SPECIFICATION
MG2-1	BAT -	Battery voltage.

2. If voltage is not as per specification:

1. Check fuse(s)
2. Test engine stop switch. Refer to *IGNITION SYSTEM* subsection
3. Test ignition switch Refer to *IGNITION SYSTEM* subsection.

3. Test start button.

TEST CONDITION		
Start button	Pressed	
PROBE	PROBE	SPECIFICATION
MG2-1	MG2-6	Close to 0Ω

If start button does not test as specified, replace the multifunction switch assembly.

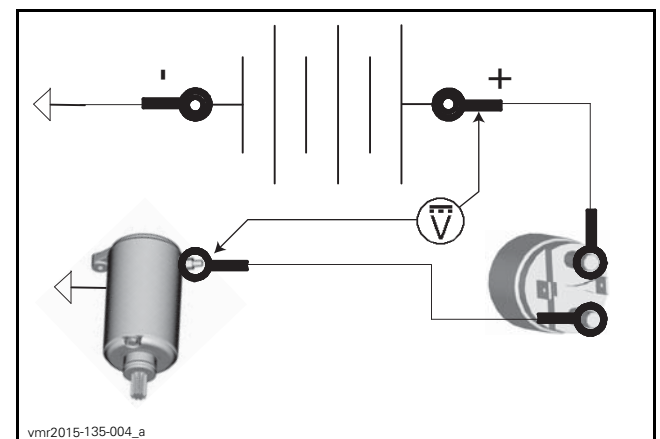
If start switch tests as specified, repair wire to starter solenoid SS1 terminal.

Starter Power Circuit Voltage Drop

NOTE: Engine must be in starting condition for this test. Do not perform on a «No Start» vehicle.

TEST CONDITION	
Fuse F5	Removed‡
Engine stop switch	RUN
Ignition switch	ON
Start button	Pressed
Engine	Cranking
‡ Will prevent engine from starting	

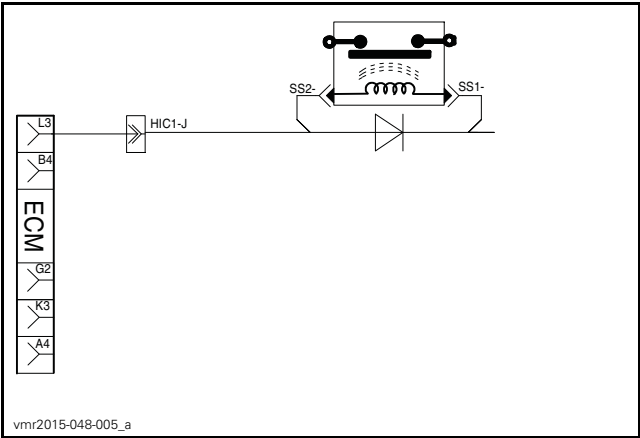
1. Measure voltage drop.



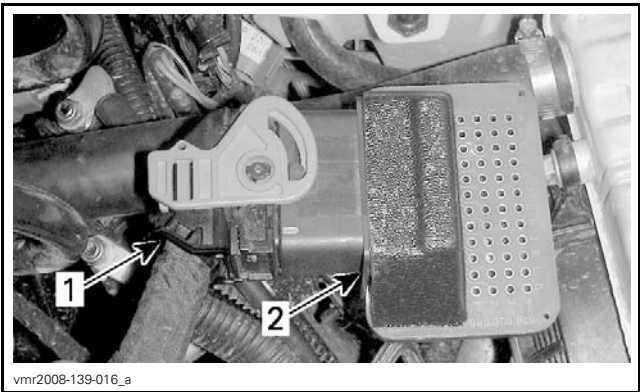
PROBE	PROBE	SPECIFICATION
BAT1	Starter B+ terminal	Below 0.4 Vdc

If voltage drop is above specification, repair or replace sources of high resistance in circuit.

Starter Solenoid Control Ground Circuit



- 1. Disconnect SS2.
- 2. Install the ECM connector onto the ECM ADAPTER TOOL (P/N 529 036 166)



- 1. ECM connector
- 2. ECM adapter tool

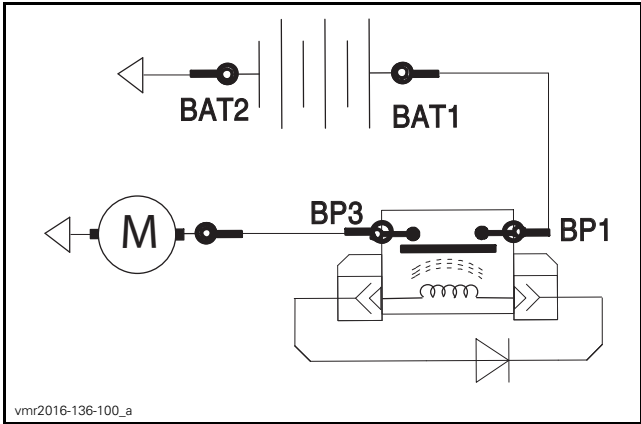
PROBE	PROBE	SPECIFICATION
SS2	ECM-L3	Close to 0Ω

If resistance is not as specified, repair or replace wiring/connections.

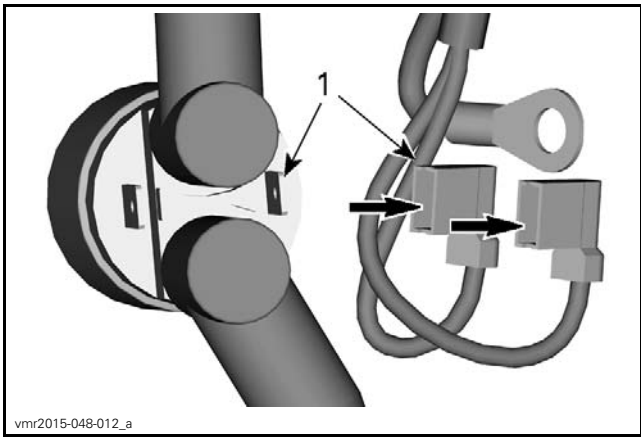
If solenoid power control circuit and ground control circuit both test good, test ECM ground circuits. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

NOTE: Supply a ground with a jumper wire if you suspect that the ECM is not supplying a ground to the solenoid.

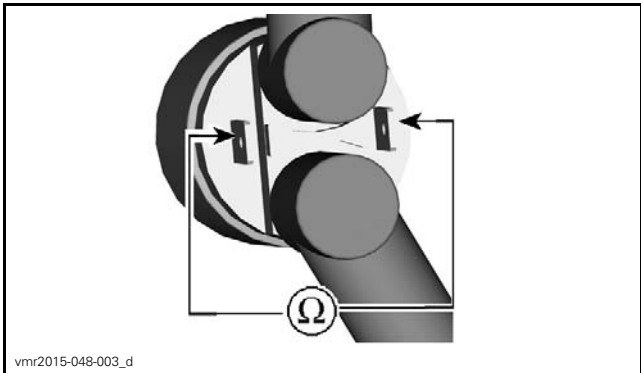
Starter Solenoid Continuity



- 1. Disconnect the BLACK (-) negative battery cable.
- 2. Disconnect SS1 and SS2



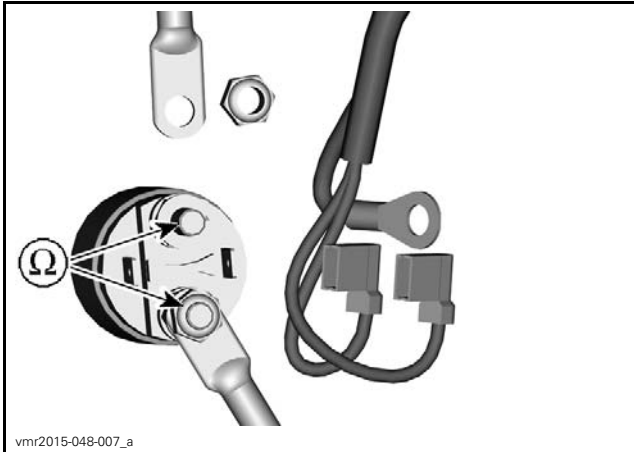
- 1. SS1



PROBE	PROBE	SPECIFICATION @ 20°C (68°F)
SS1	SS2	Close to 6Ω

If resistance is not as per specification, replace the solenoid.

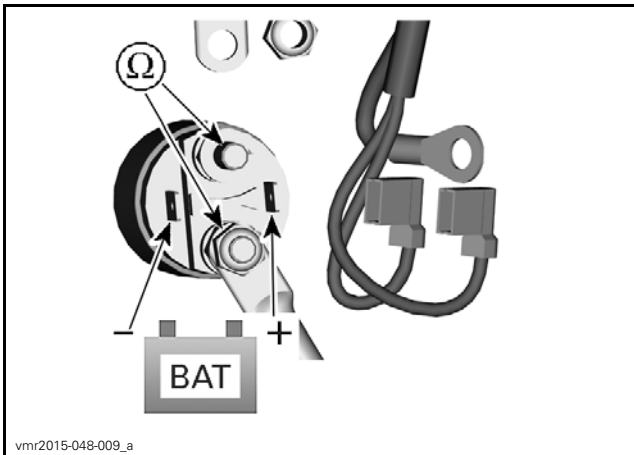
- 3. Disconnect BP3.



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PROBE	PROBE	SPECIFICATION
BP3	Terminal to starter motor	O.L.

4. Jump starter solenoid.



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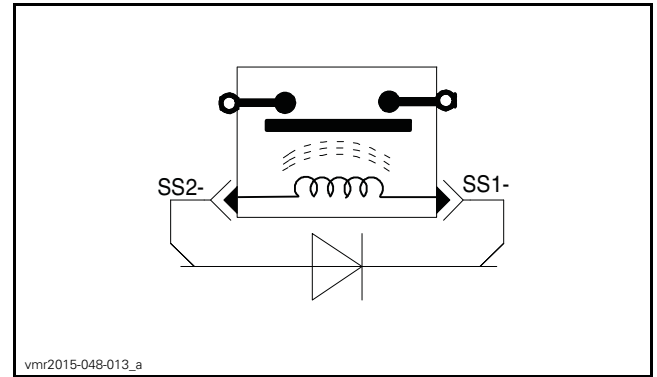
SS1 IS ON THE RIGHT

PROBE	PROBE	SPECIFICATION
BP3	Terminal to starter motor	Close to 0Ω

If resistance is not as per specification, replace the solenoid.

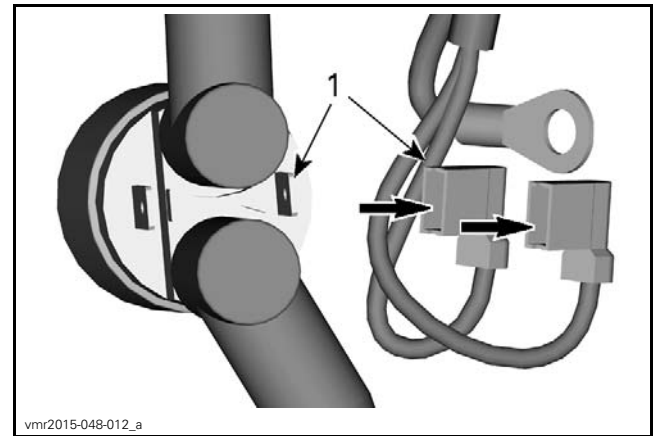
If starter power and ground circuits are good, refer to *MAGNETO AND STARTER* subsection for starter diagnosis and replacement.

Solenoid Diode Test



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1. Disconnect SS1 and SS2 from starter solenoid.



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1. SS1

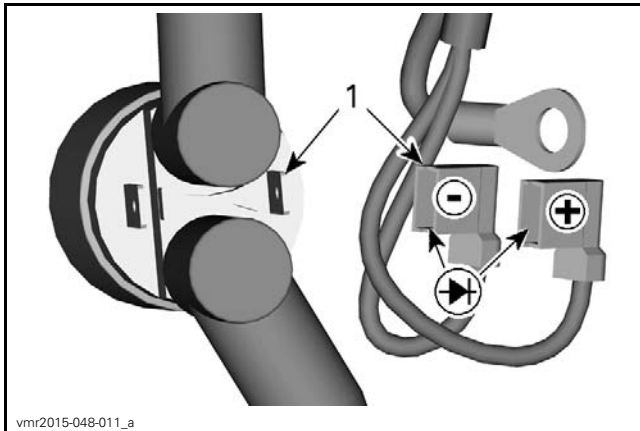
2. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and set it to the diode symbol as shown.



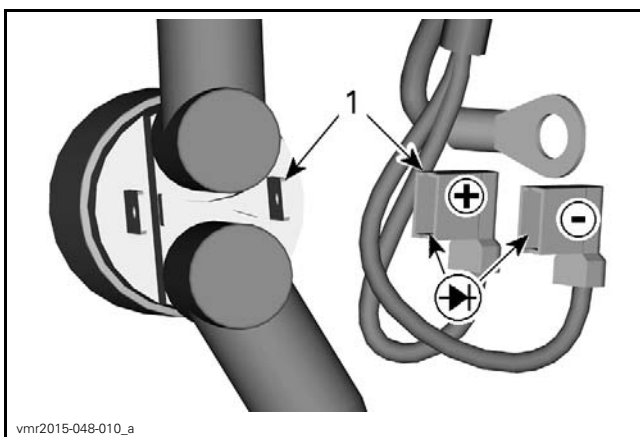
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3. Probe wires while paying attention to the diode polarity.

Subsection 05 (STARTING SYSTEM)



FORWARD POLARITY, MUST BE AROUND 0.5 V



REVERSE POLARITY, MUST BE OPEN CIRCUIT

1. SS1

If test failed, replace diode. Refer to *WIRING HARNESS AND CONNECTORS* for diode location.

NOTE: The diode is integrated in the harness near the starter solenoid.