

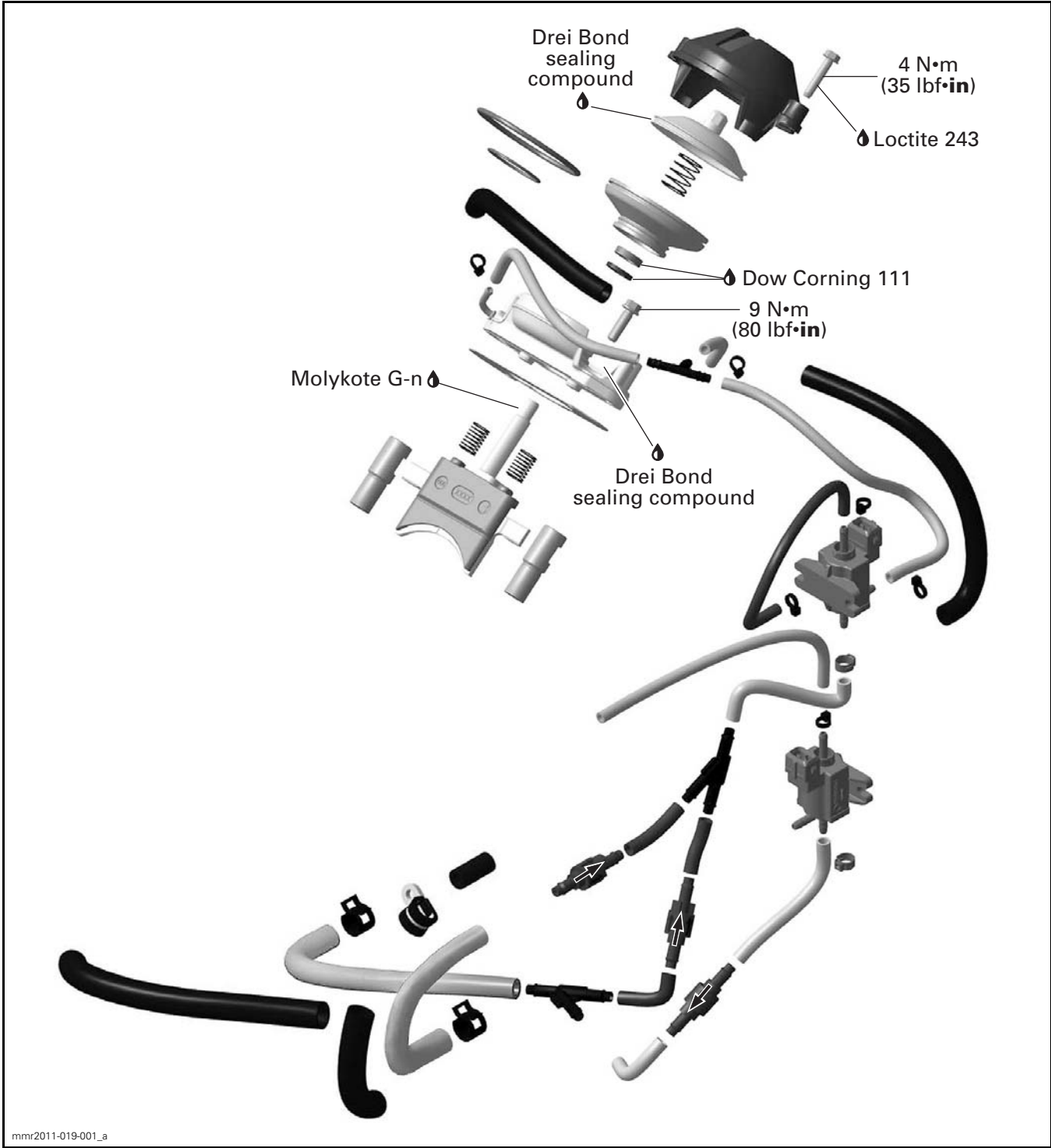
RAVE (800R POWER TEK)

SERVICE TOOLS

Description	Part Number	Page
VACUUM/PRESSURE PUMP	529 021 800	9

SERVICE PRODUCTS

Description	Part Number	Page
DREI BOND SEALING COMPOUND	420 297 906	13
MOLYKOTE G-N	420 297 433	13



mmr2011-019-001_a

GENERAL

During assembly/installation, use torque values and service products as shown in the exploded view.

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS PROCEDURE* and *LOCTITE APPLICATION PROCEDURE* at the beginning of this manual for complete procedure.

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to.

Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be replaced with new ones.

NOTICE Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION

3D RAVE Basic Operation

3-step RAVE valves are used. Their positions vary according to engine operating condition.

The RAVE valve steps are:

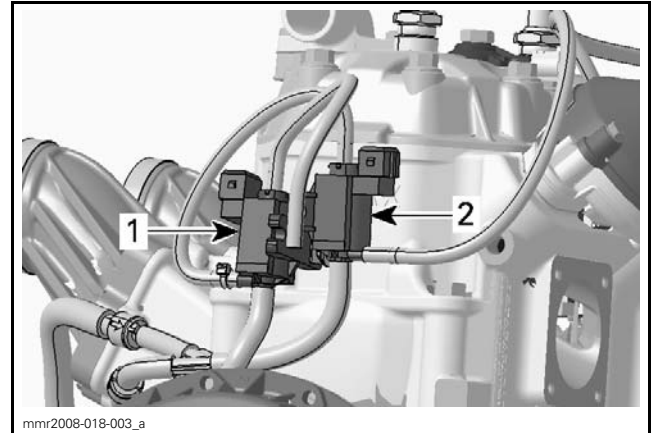
- Fully closed
- Partially opened
- Fully opened.

RAVE valves are activated by 2 solenoids that are controlled by the ECM through mappings.

Many different mappings are used by the ECM to control the 3D RAVE valves. The mappings are based on current engine RPM, crankshaft rate of acceleration or deceleration and the following inputs: intake temperature, TPS, knock sensor, engine coolant temperature and APS.

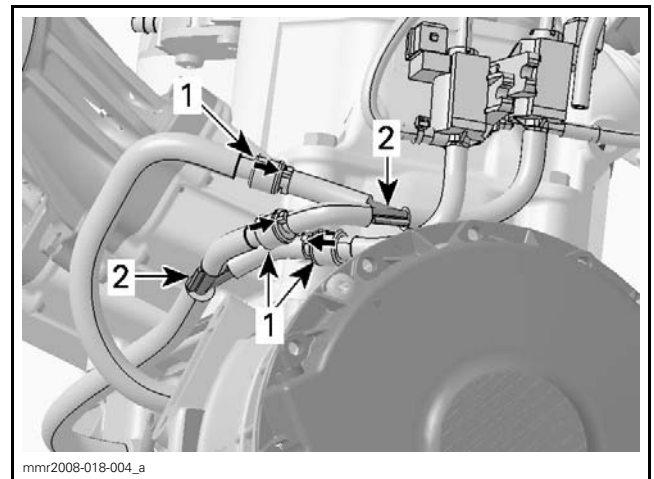
NOTE: 3D RAVE valves may go through all 3 positions or skip the partially open position and go directly to either the fully open or closed positions depending how quickly the throttle is depressed and the engine load.

Solenoids use crankcase pulses (pressure and vacuum) to open or close the valves.



1. Vacuum solenoid
2. Pressure solenoid

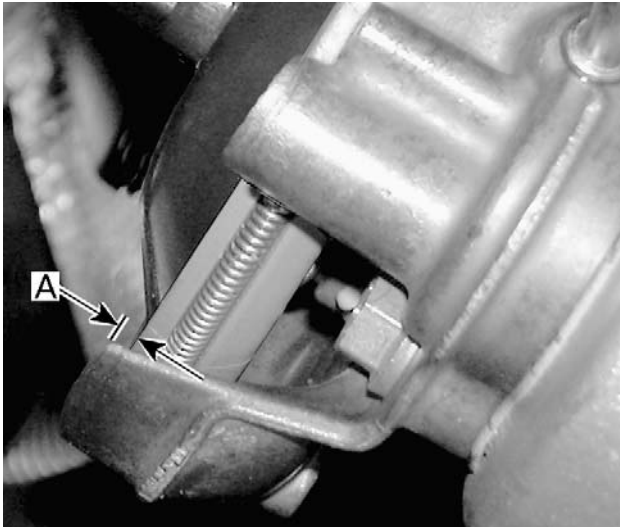
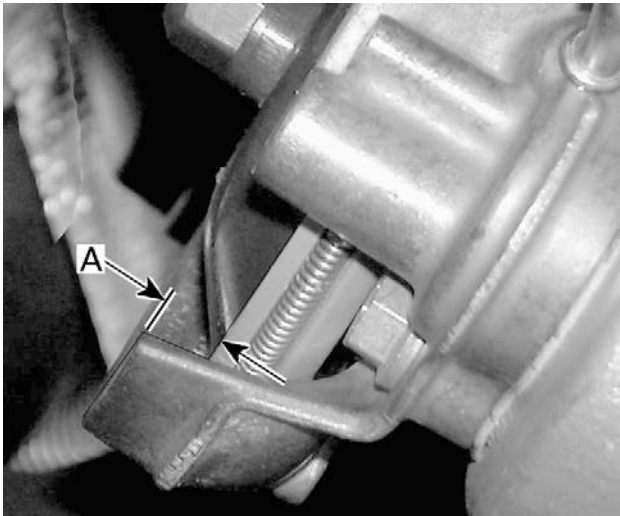
An arrangement of check valves and Y-fittings allows to separate the crankcase vacuum pulses from the pressure pulses.

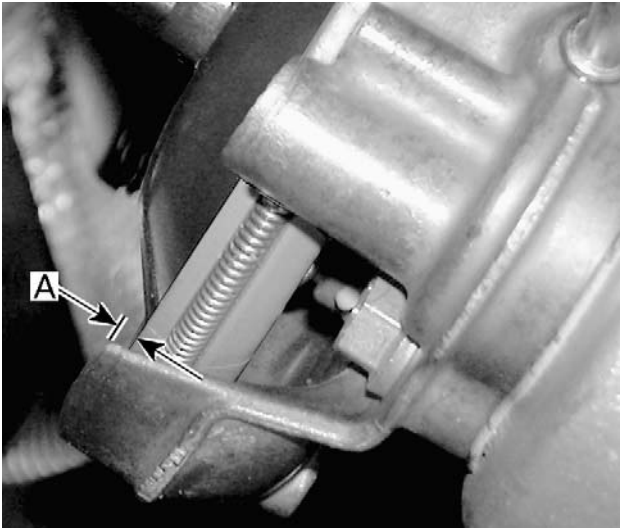
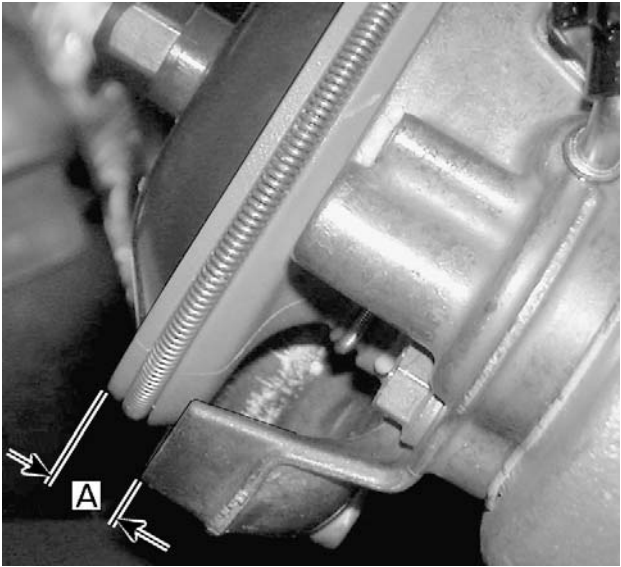


CHECK VALVE ORIENTATION

1. Arrows on check valves
2. Arrows on Y-fittings

3D RAVE Position According to Engine Operation

ENGINE OPERATION		RAVE VALVE POSITION MEASURED FROM TOP OF GREEN BELLOW TO EDGE OF RAVE HOUSING	
Engine stopped	Partially open		mbs2007-015-002_a A: Approximately 1 mm (1/32 in) down
Idle to approximately 6200 RPM	Fully closed		mbs2007-015-001_a A: Approximately 6 mm (1/4 in) down

ENGINE OPERATION	RAVE VALVE POSITION MEASURED FROM TOP OF GREEN BELLOW TO EDGE OF RAVE HOUSING	
Approximately 6200 to 7900 RPM (typical trail riding)	Partially opened	<p>NOTE: Same as engine stopped position.</p>  <p>mbs2007-015-002_a</p> <p>A: Approximately 1 mm (1/32 in) down</p>
Approximately 7900 RPM to top RPM	Fully opened	 <p>mbs2007-015-003_a</p> <p>A: Approximately 8 mm (5/16 in) up</p>

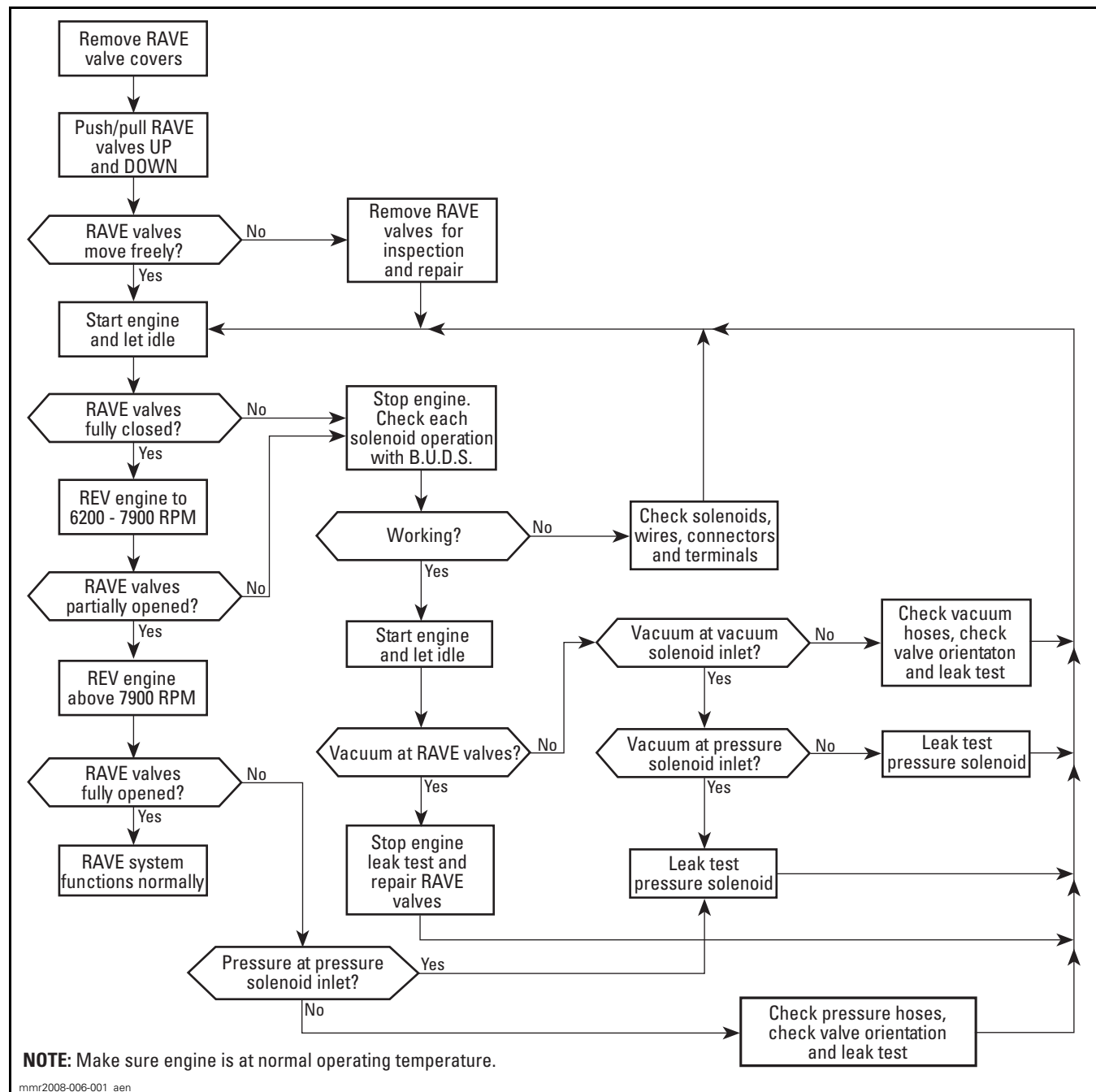
ENGINE OPERATION	VACUUM SOLENOID	PRESSURE SOLENOID	DIAGRAM
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ENGINE OPERATION	VACUUM SOLENOID	PRESSURE SOLENOID	DIAGRAM
Approximately 6200 to 7900 RPM (typical trail riding)	OFF	OFF	<p>Diagram illustrating the vacuum and pressure solenoid system in the OFF state. The vacuum solenoid is OFF, allowing vacuum to be pulled from the engine through the vacuum check valve. The pressure solenoid is OFF, allowing pressure to be pushed from the engine through the pressure check valve. The PTO RAVE and MAG RAVE lines are connected to the top of the solenoids. The atmosphere is shown above the solenoids.</p> <p>mmr2008-018-010_a</p>
Approximately 7900 RPM to top RPM	ON	ON	<p>Diagram illustrating the vacuum and pressure solenoid system in the ON state. The vacuum solenoid is ON, allowing vacuum to be pulled from the engine through the vacuum check valve. The pressure solenoid is ON, allowing pressure to be pushed from the engine through the pressure check valve. The PTO RAVE and MAG RAVE lines are connected to the top of the solenoids. The atmosphere is shown above the solenoids.</p> <p>mmr2008-018-011_a</p>

TROUBLESHOOTING

DIAGNOSTIC FLOW CHART



TROUBLESHOOTING TIPS

Intermittent Engine Performance Problem

If engine does not always reach maximum RPM:

- Make sure problem is not related with transmission (belt, drive and driven pulleys).
- Check 3D RAVE valves operation. Refer to *DIAGNOSTIC FLOW CHART* in this subsection.

NOTE: Make sure there are no fault codes (active or occurred).

Solenoid Troubleshooting

Refer to the following table for engine behavior related to solenoid malfunction.

ENGINE RPM	VACUUM SOLENOID	PRESSURE SOLENOID	RAVE POSITION	ENGINE BEHAVIOR
Idle to approximately 6200 RPM	Defective	Defective	Partially open	Poor acceleration
	Defective	Functional	Partially open	Poor acceleration
	Functional	Defective	Fully closed	Normal operation
Approximately 6200 to 7900 RPM	Defective	Defective	Partially open	Normal operation
	Defective	Functional	Partially open	Normal operation
	Functional	Defective	Partially open	Normal operation
Approximately 7900 RPM to top RPM	Defective	Defective	Partially open	Cannot reach top RPM
	Defective	Functional	Fully open	Normal operation
	Functional	Defective	Fully closed	Cannot reach top RPM

PROCEDURES

3D RAVE VALVE

3D RAVE Valve Adjustment

There are no adjustments to be periodically checked.

3D RAVE Valve Leak Test

NOTE: Test each RAVE valve individually.

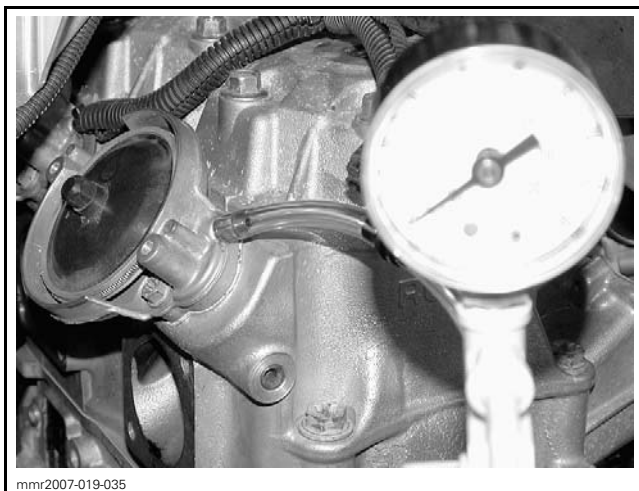
1. Use the VACUUM/PRESSURE PUMP (P/N 529 021 800).



2. Unplug the RAVE valve inlet hose.
3. Install test pump on nipple and apply pressure.
 - Piston should fully rise. Otherwise or if it lowers rather quickly, check bellow and seals inside RAVE valve.



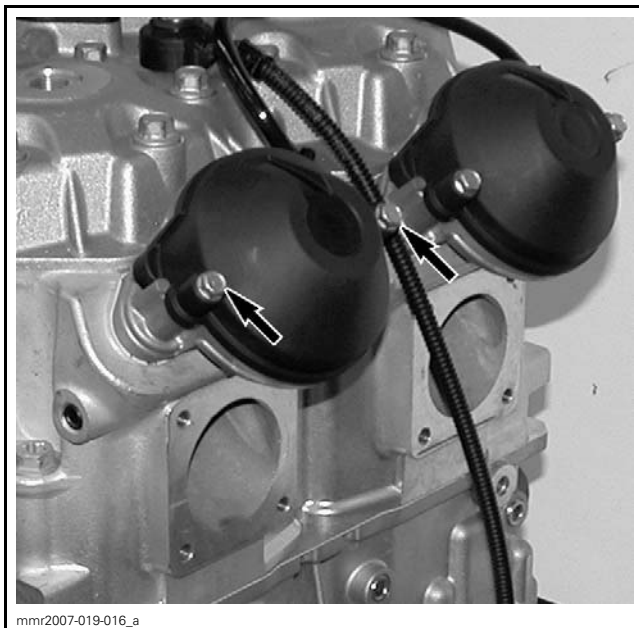
4. Apply vacuum.
 - Piston should fully lower. Otherwise or if it rises rather quickly, check bellow and seals inside RAVE valve.



5. For check valves and solenoids leak tests, refer to *SOLENOIDS AND CHECK VALVES* in this subsection.

3D RAVE Valves Removal

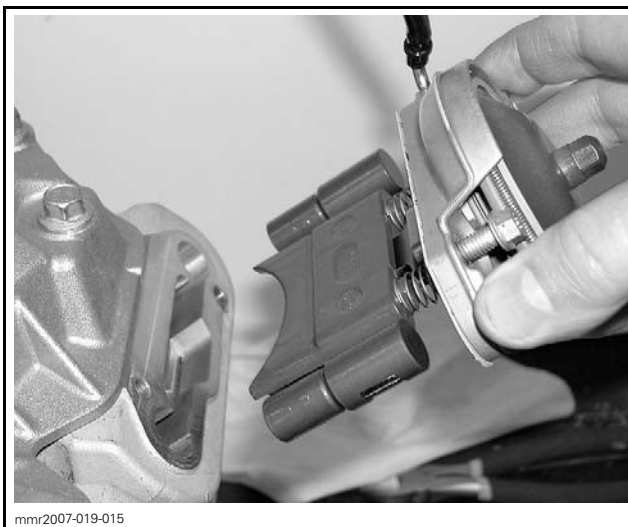
1. Remove LH side panel.
2. Remove *DRIVE BELT GUARD*. Refer to *DRIVE BELT* subsection.
3. Remove 3D RAVE valve cover by removing screws.



COVER RETAINING SCREWS



4. Remove screws securing the RAVE valve housing to cylinder block.
5. Pull valve assembly out.



NOTE: Be careful not to loose springs underneath housing.

3D RAVE Valve Disassembly

1. Carefully remove spring retaining bellow to valve piston.

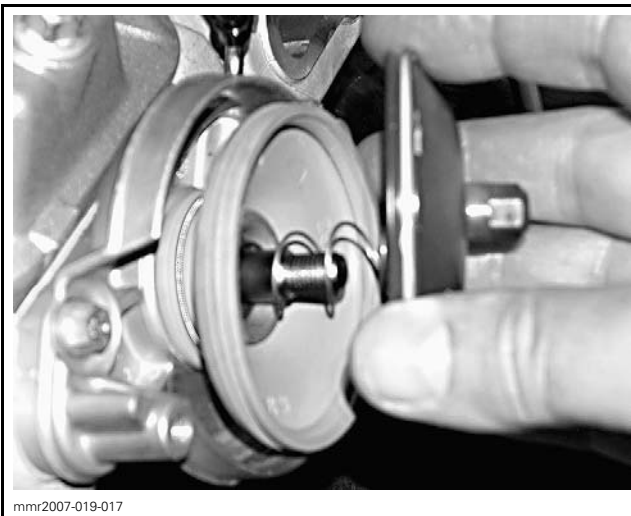


TYPICAL

2. Free bellow from valve piston.
3. Carefully unscrew valve piston then remove compression spring.

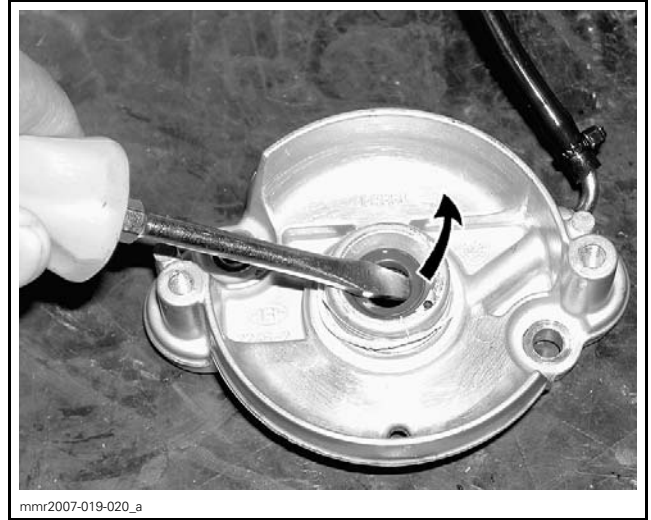
⚠ WARNING

Firmly hold valve piston. The compression spring inside the valve applies pressure against the piston.



TYPICAL

4. Carefully remove bellow from valve housing.
- NOTE:** If oil is found in housing area, replace seals.
5. Extract RAVE valve from housing.
 6. To remove seals, carefully pry them out.



3D RAVE Valve Cleaning

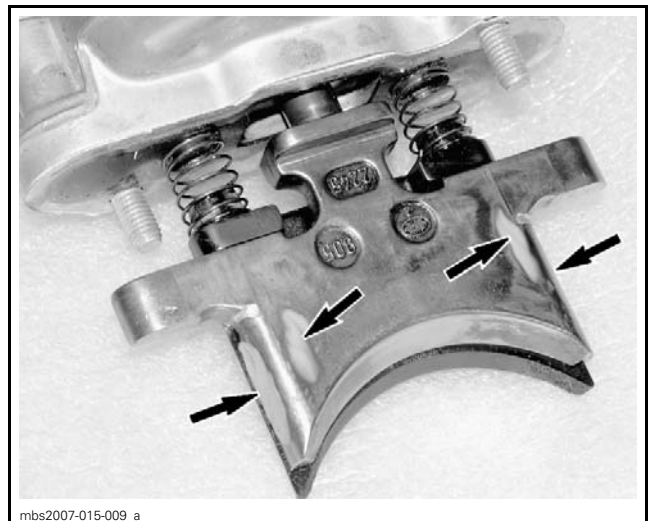
Clean carbon deposits. Cleaning intervals depend upon the user's riding style and the quality of the oil used.

BRP suggests annual cleaning of the valve. If a customer uses lower quality oil than recommended, more frequent cleaning may be required.

No special solvents or cleaners are required when cleaning the valve.

3D RAVE Valve Inspection

1. Check valves for breakage.
2. Check valves for wear at sliding points and straightness.



SIGNS OF WEAR

3. Check spring condition and straightness.

NOTE: Oil dripping from draining hole indicates a loosen spring or damaged bellows.

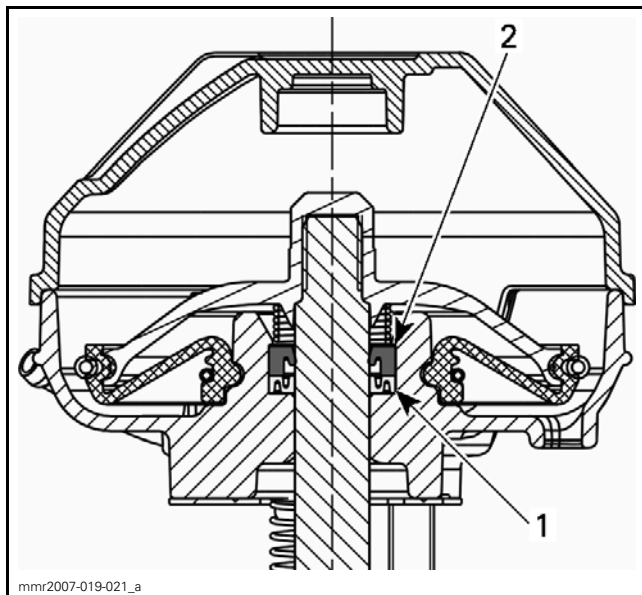
Subsection XX (RAVE (800R POWER TEK))

4. Check for cracked, dried or perforated bellows.

NOTE: Make sure hoses are not leaking, kinked or damaged.

3D RAVE Valve Assembly

1. Position parts as per illustrations.



- 1. Oil seal
- 2. Gasket ring

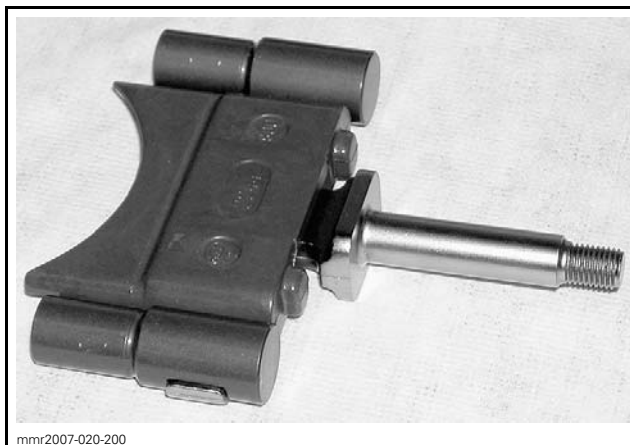


- 1. Lettering of oil seal on top

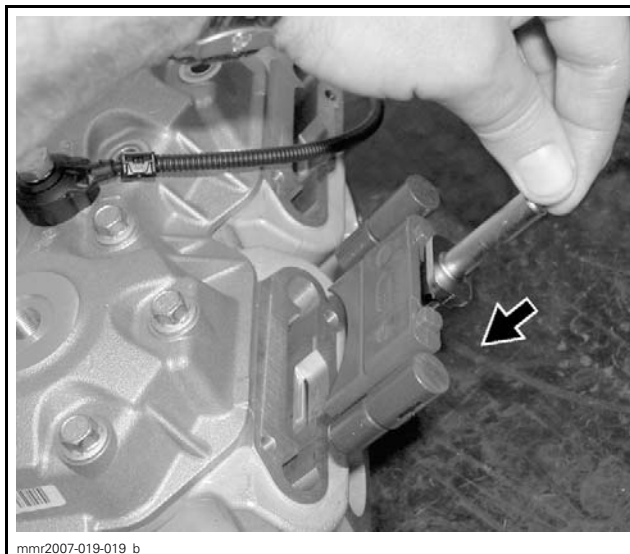
2. Use an appropriate pusher to reinstall seals.



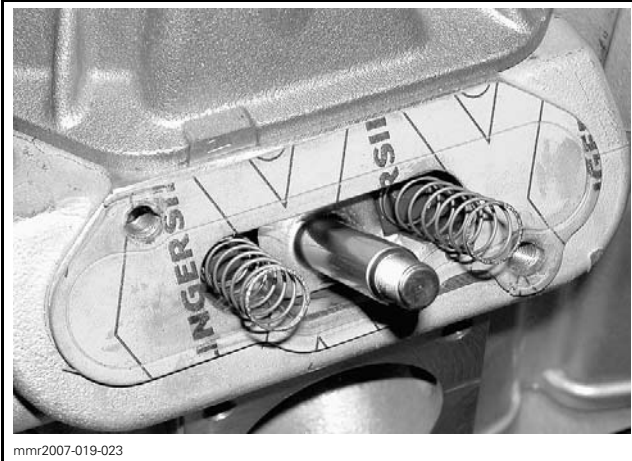
3. Assemble together the main and side valves.



4. Insert valves together in cylinder. Install gasket.



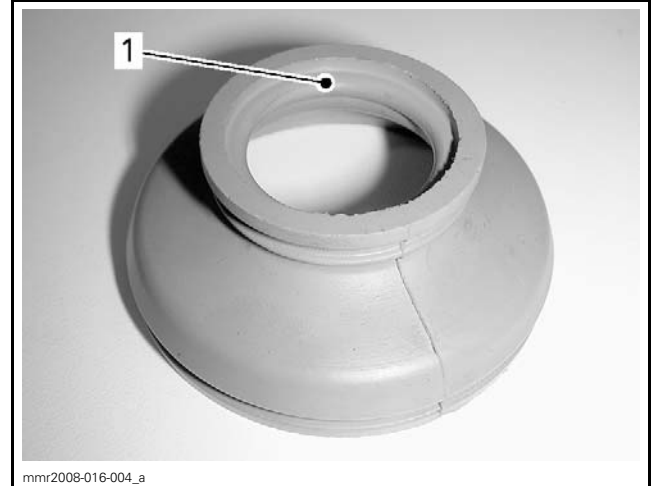
5. Align springs on stud ends of valves.



6. Apply MOLYKOTE G-N (P/N 420 297 433) to valve shaft and on seals in housing.
7. Install housing and carefully align springs on stud ends of housing.

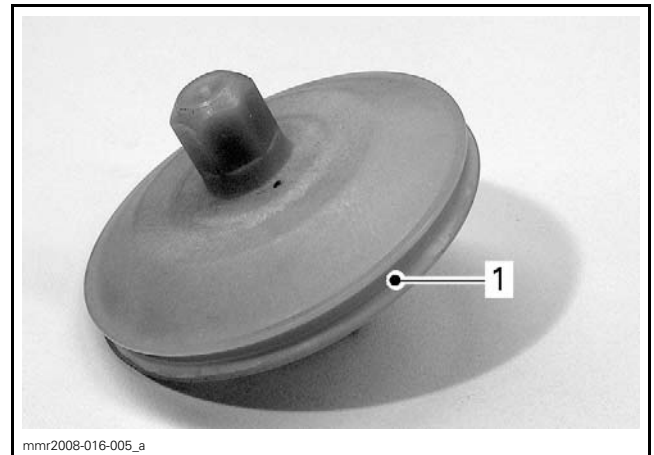


8. Install lower spring on bellow.
9. Apply DREI BOND SEALING COMPOUND (P/N 420 297 906) on the bellow's lower rib, then install bellow and spring.



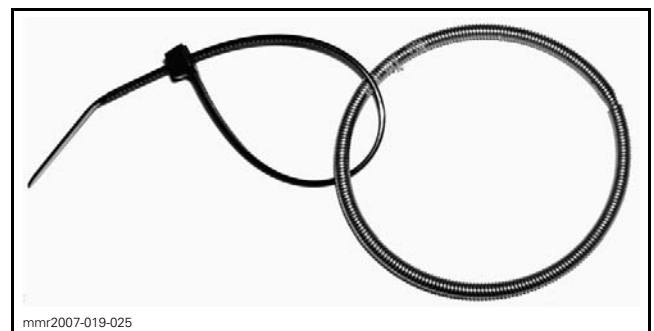
1. Apply Drei Bond here

10. Install compression spring then tighten valve piston.
11. Apply DREI BOND SEALING COMPOUND (P/N 420 297 906) on valve piston groove.

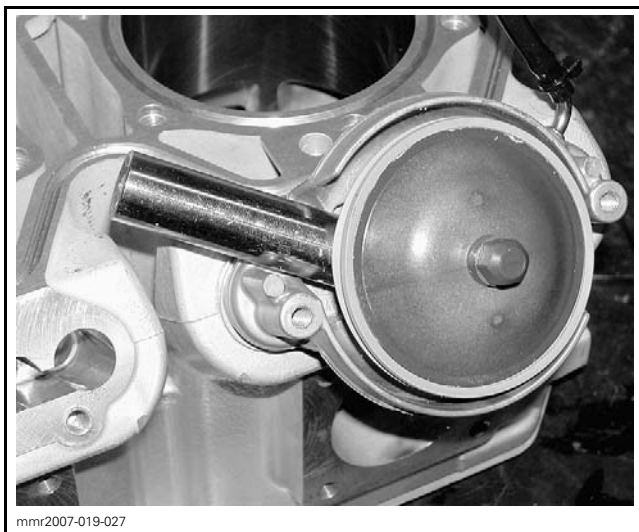


1. Apply Drei Bond here

12. Position bellow on valve piston then secure top spring as follows.
 - 12.1 Attach a locking tie to spring.

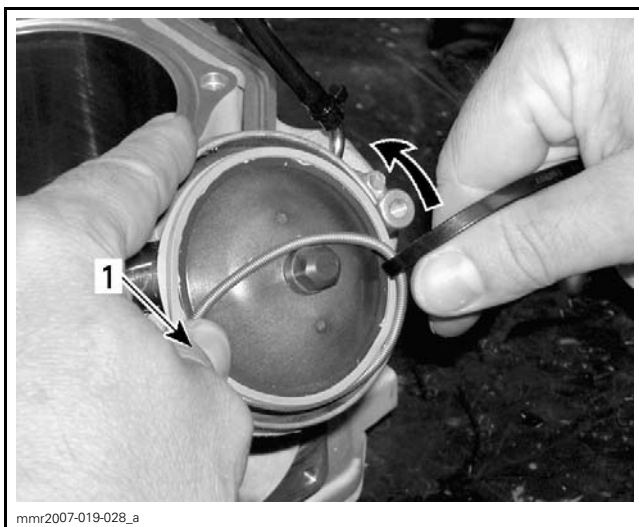


- 12.2 Block valve piston with a suitable socket.



12.3 Position joint of spring under your thumb.

12.4 Hold spring with your thumb while sliding spring on the other side using the locking tie.



1. Joint of spring under thumb

12.5 Continue sliding locking tie all around the edge of valve piston.

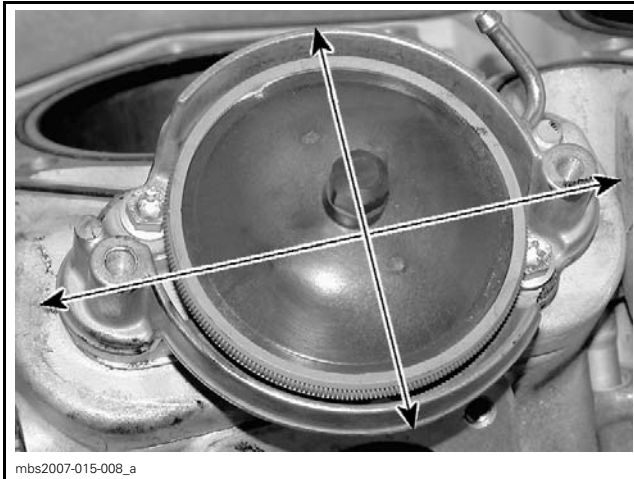


NOTE: Take care there is no strain in the bellow that could apply some bending force or torsion to the 3D RAVE valve. That may contribute to a RAVE valve jam.

13. Push and pull valve piston to make sure it moves freely.



14. When installing valve assembly in its housing, center valve horizontally and longitudinally then hand tighten screws.



15. Tighten screws and check valve for free movement.

15.1 If some friction is felt, slightly loosen screws and readjust housing then retighten screws.

15.2 Repeat the process until a free movement is obtained.

16. Start engine and recheck RAVE system operation.

17. Reinstall remaining parts.

CHECK VALVES

Check Valve Leak Test

1. Disconnect check valve.
2. Install test pump as shown.
3. Pressurize check valve to specification.

CHECK VALVE LEAK TEST
34 kPa (5 PSI)

4. Valve should stand pressure.



5. Install test pump in the opposite side.

6. Pressurize check valve.

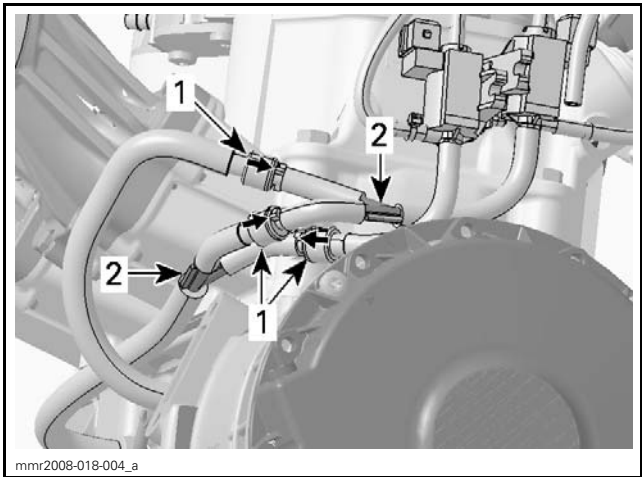
7. Air should flow freely.



8. Replace valve if any test failed.

Check Valve Installation

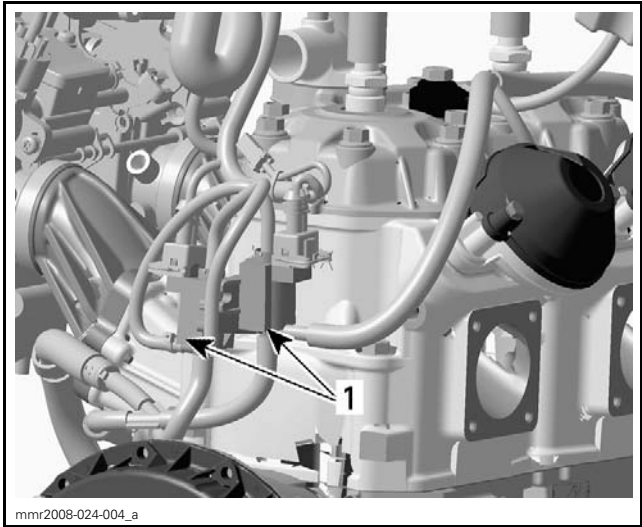
Ensure to reinstall all check valves in the proper direction.



CHECK VALVE ORIENTATION
1. Arrows on check valves
2. Arrows on Y-fittings

SOLENOIDS

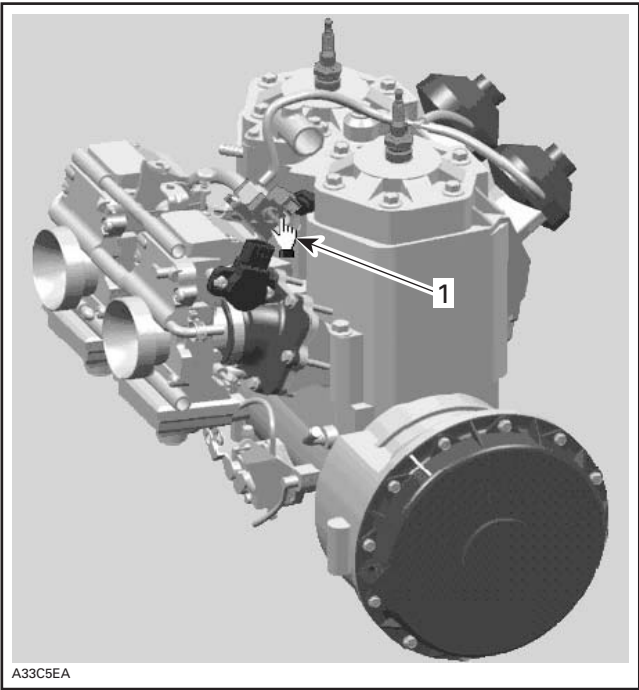
Solenoid Location



TYPICAL
1. RAVE solenoids

Solenoid Test with B.U.D.S.

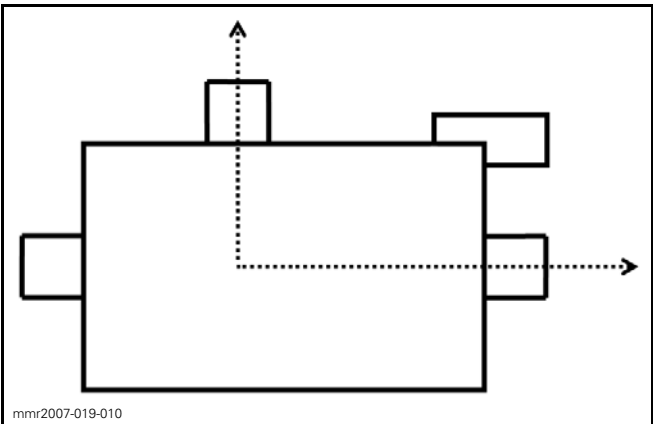
1. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection for proper connection to vehicle.
2. Using B.U.D.S. software, energize RAVE solenoids from **Activation** tab.



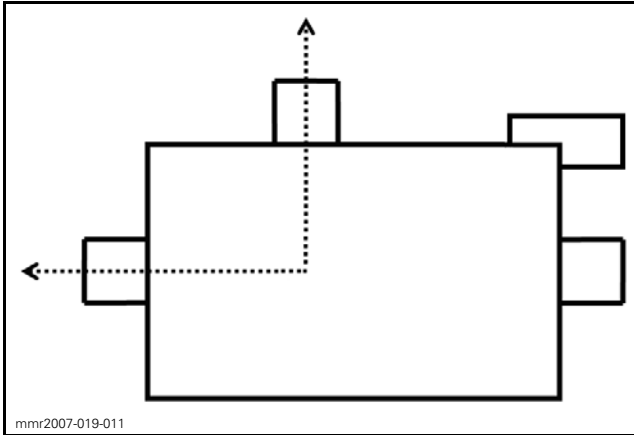
TYPICAL
1. Activate here

3. This will validate the RAVE solenoid mechanical and electrical operation.
4. If the solenoid does not work, proceed with *SOLENOID INPUT VOLTAGE TEST*.

Solenoid Leak Test



SOLENOID OPERATION (OFF)

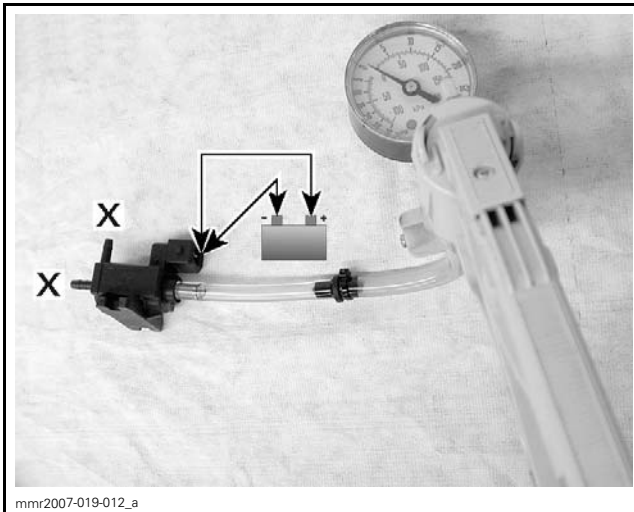


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SOLENOID OPERATION (ON)

NOTE: Test each solenoid individually.

1. Unplug supply hose from solenoid.
2. Install test pump on solenoid nipple.
3. Supply 12 Vdc to solenoid terminals. Ensure to respect polarity.
4. Pressurize solenoid.



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SOLENOID LEAK TEST

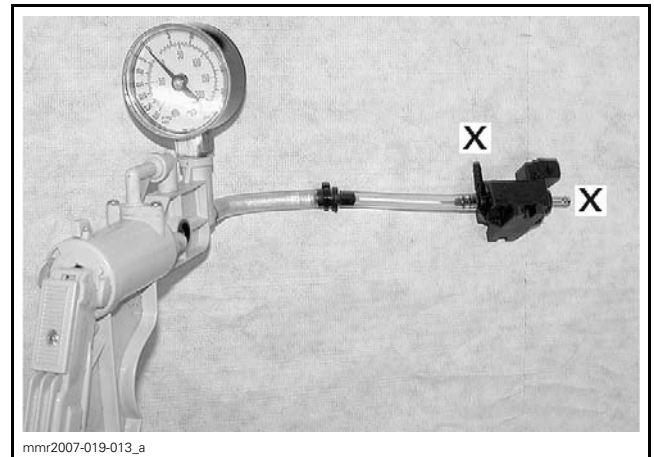
69 kPa to 103 kPa (10 PSI to 15 PSI)

5. Wait some time to see if pressure drops:
 - 5.1 If pressure does not build up or drops, replace solenoid.
 - 5.2 If pressure is maintained, continue testing.
6. Disconnect solenoid. Pressure should evacuate through upper nipple.



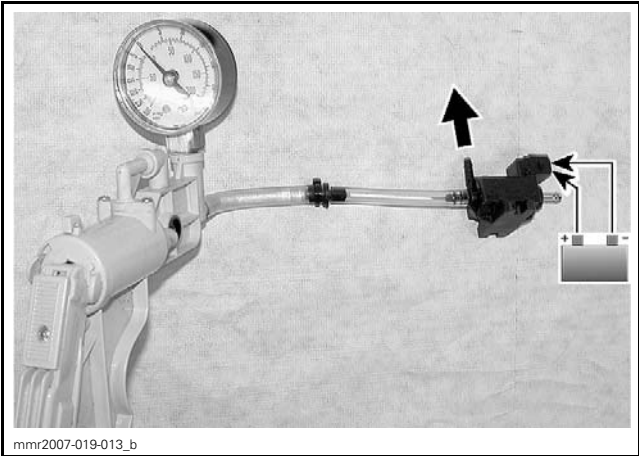
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7. Unplug outlet hose from solenoid.
8. Install test pump on solenoid nipple. Pressurize to the same pressure as before.



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9. Wait some time to see if pressure drops:
 - 9.1 If pressure does not build up or drops, replace solenoid.
 - 9.2 If pressure is maintained, continue testing.
10. Supply 12 Vdc to solenoid terminals. Ensure to respect polarity.
11. Pressure should evacuate through upper nipple.



12. If any test failed, replace solenoid.

Solenoid Input Voltage Test

- 1. Remove muffler. Refer to *EXHAUST SYSTEM* subsection.
- 2. Remove the acoustic panel.



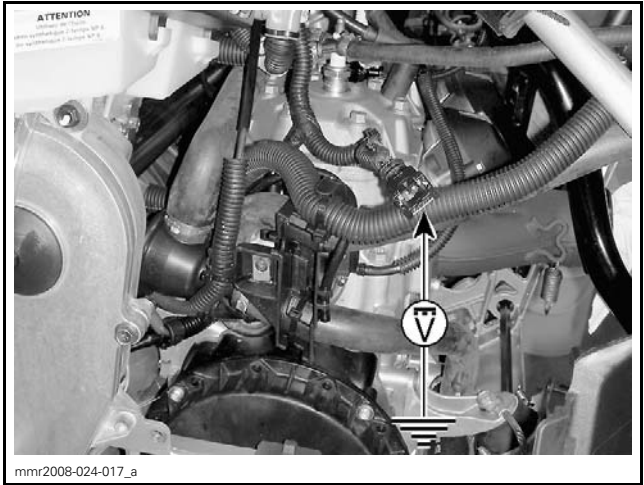
ACOUSTIC PANEL

3. Disconnect the connector from the solenoid.



4. Measure voltage on connector as follows.

TEST PROBE		MEASUREMENT
Pin 2 (solenoid connector)	Engine ground	Battery voltage

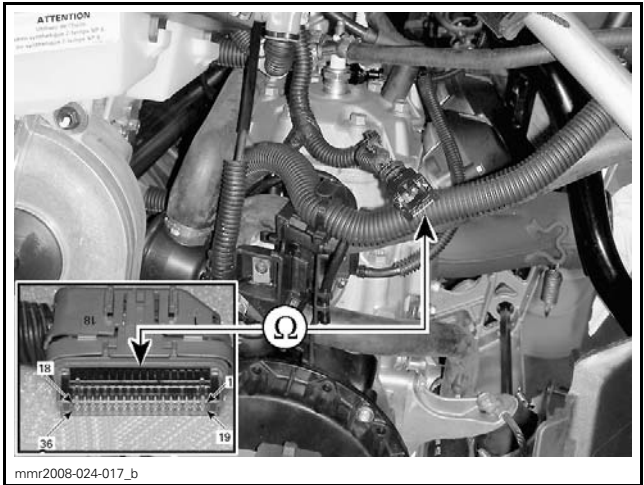


5. If reading is not as per specification, perform the *SOLENOID CIRCUIT TEST*.

Solenoid Circuit Test

- 1. Disconnect ECM connector.
- 2. Measure wiring resistance as follows.

SOLENOID	SOLENOID CONN- ECTOR PIN	ECM CONN- ECTOR PIN	RESIS- TANCE
Vacuum	1	DA-13	Close to 0 Ω
Pressure	1	DA-30	Close to 0 Ω



3. If the solenoid circuit test failed, repair or replace wiring and connectors.

Solenoid Replacement

1. Remove muffler. Refer to *EXHAUST SYSTEM* subsection.
2. Remove the acoustic panel.



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ACOUSTIC PANEL

3. Mark hose locations of RAVE solenoid then unplug them.
4. Disconnect solenoid.
5. Remove solenoid screws and solenoid.
6. For installation, reverse the removal procedure.