

# Chrysler MDS

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MDS or multiple displacement system was put on vehicles to increase fuel economy. It enables the V-8 engine to run on four cylinders when cruising with light loads.

Vehicles equipped with the system have the 5.7 L Hemi Engine

- 2005 to current
  - 300C
  - Charger
  - Magnum
  - Grand Cherokee
- 2006 to current
  - Durango
  - Ram 1500
  - Commander
- 2007 to current
  - Aspen
- 2009 to current
  - Challenger

**Components:** The MDS equipped engine utilizes some different parts from the traditional 5.7L. The MDS requires the following:

- A special lifter to disengage the lifters from the camshaft
- Four MDS solenoids to direct oil pressure
- A unique cam shaft
- An oil temperature sensor
- A specially designed exhaust to keep the driver from noticing any difference between four and eight cylinder operation.

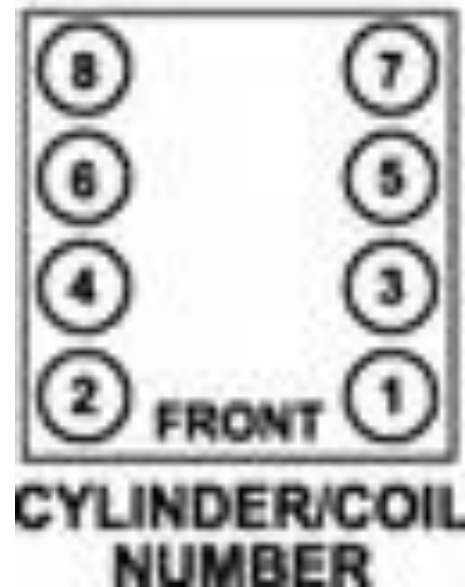


MDS Engine Cutaway(allpar.com)

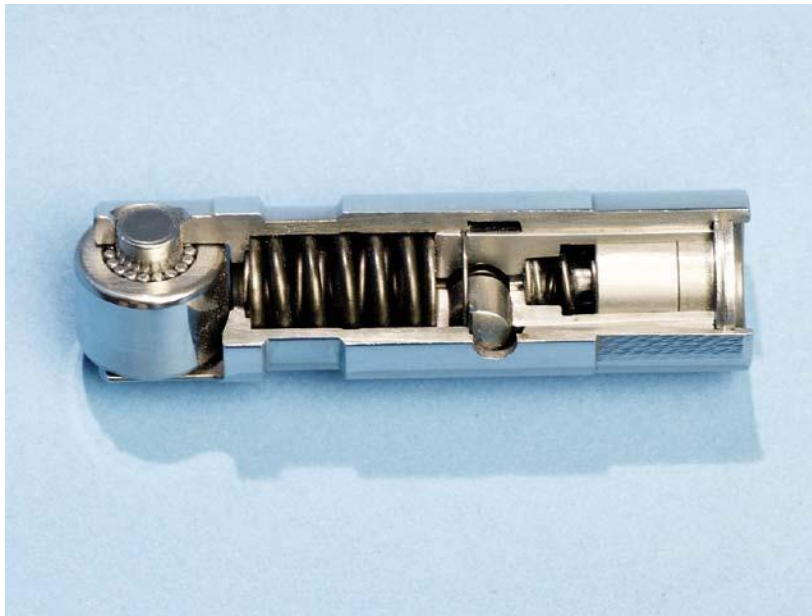
**Operation:** During MDS operation the same four cylinders are always shut down. They are 1, 4, 6, and 7. These are the only cylinders that have the deactivating lifters. The other four cylinders have normal hydraulic lifters.

Since the firing order is 1-8-4-3-6-7-2, the system can shut down every other cylinder in the firing order to avoid engine roughness and maintain balance.

When the operating conditions are met the PCM deactivates the cylinders in firing order within .04 seconds. To keep the valves from opening the PCM supplies power to the MDS solenoid for the cylinder it is shutting down. The solenoid directs oil pressure to the lifters for that cylinder, which pushes in the locking pins that allow the lifters to collapse so they no longer open the valves. The PCM will also shut off fuel and spark to the cylinders.



Cylinder ID (wkjeeps.com)



MDS Deactivating Lifter (carcraft.com)

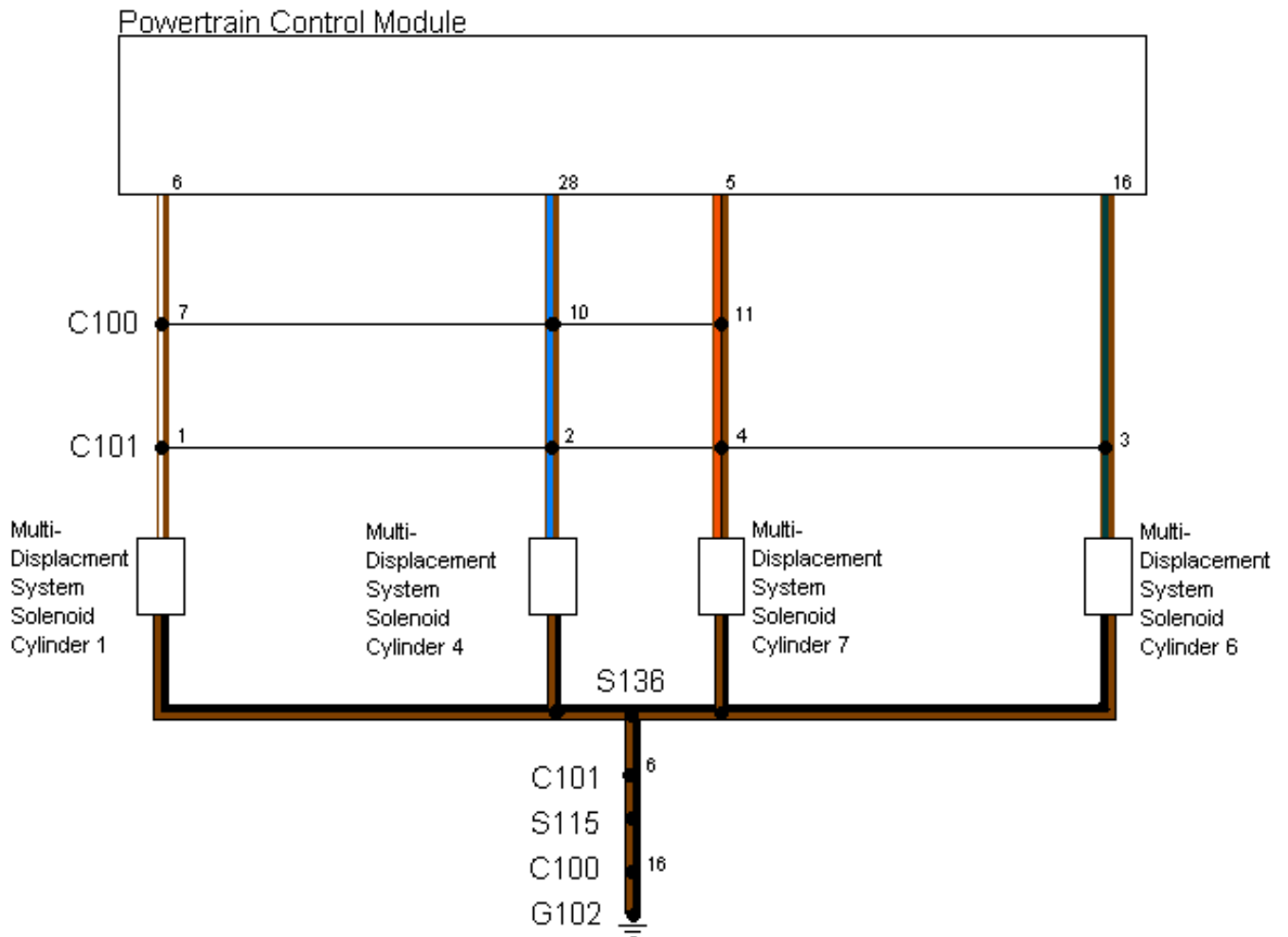
**Wiring:** The wiring is very simple for the MDS solenoids. They are provided power individually by the PCM and then they share a common ground. The power wires are all brown with tracers and the ground wire is black with a brown tracer.

<b>MDS SOLENOID RESISTANCE</b>	
<b>TEMPERATURE VALUE ± 20°</b>	<b>F RESISTANCE (OHMS) ± .25 ohms</b>
0° F	8.8 ohms
32° F	9.5 ohms
68° F	10.3 ohms
100° F	11 ohms
150° F	12.2 ohms
200° F	13.4 ohms
250° F	14.4 ohms
300° F	15.6 ohms

(justanswer.com)

**Things to Remember:** Chrysler recommends the use of 5W-20 motor oil or the MDS may not function properly. Also, after market exhaust systems will make the transition from eight to four cylinders very noticeable and probably cause an annoyance for the driver. According to tests from Chrysler after 150,000 customer equivalent miles in testing done on the motors, shutting down the same four cylinders every time did not lead to any negative wear patterns.

## Wiring Diagram



## DTC Diagnostics

### MDS Rationality DTC

**P3400** – MDS Rationality Bank 1

**P3497** – MDS Rationality Bank 2

**Description:** The monitor is run every time the engine switches between eight and four cylinder mode. It checks for a lean condition on banks 1 or 2. Since the fuel injectors are shut off on the

deactivated cylinders, if one of the cylinders fails to deactivate, fresh air will be pumped into the exhaust.

**Possible Causes:** The MDS system requires several steps in order to function. The solenoid must be activated, oil pressure allowed to build up, and the lock pin in the lifter to disengage. Anything preventing these steps from occurring will set this code. Common causes are, insufficient oil pressure, blocked oil passages, faulty lifters, solenoids, and wiring faults.

**Diagnostics Tests:**

- Activate the MDS solenoids using the scan tool, listen for them.
- MDS solenoid resistance should be at  $10.3\Omega \pm .25$  at  $68^{\circ}\text{F} \pm 20$
- Check for blockages inside the MDS solenoid.
- Ensure there are no blockages or restrictions in the oil passages.
- Check the lifters for a frozen lock pin.

**MDS Solenoid Circuit DTC**

**P3401** – MDS Solenoid 1 Circuit

**P3424** – MDS Solenoid 4 Circuit

**P3441** – MDS Solenoid 6 Circuit

**P3449** – MDS Solenoid 7 Circuit

**Description:** The monitor is run every time the engine switches from eight to four cylinder modes. It monitors the electrical circuit for each solenoid to determine if there are any opens, powers, or grounds.

**Possible Causes:** The MDS solenoids are individually powered by the PCM and share a common ground. Common causes are faulty solenoid, wiring, corroded connectors, and a failed PCM.

**Diagnostic Tests:**

- Check for power at the MDS solenoid using a test light. The light should illuminate brightly.
- Check for voltage at the solenoid when not commanded on. There should be less than 1v.
- Disconnect the connector at the solenoid and check the resistance between the control side and battery ground. There should be more than 100  $\Omega$ .
- Use a breakout box to check the resistance of the PCM connector. There should be less than 1  $\Omega$ .
- MDS solenoid resistance should be at  $10.3\Omega \pm .25$  at  $68^{\circ}\text{F} \pm 20$

**Cylinder Deactivation Control Performance DTC**

**P3402** – Cylinder 1 Deactivation Control Performance  
**P3425** – Cylinder 4 Deactivation Control Performance  
**P3442** – Cylinder 6 Deactivation Control Performance  
**P3450** – Cylinder 7 Deactivation Control Performance

**Description:** The monitor is run when the engine transitions between eight and four cylinder modes. This monitor determines if the engine was actually able to deactivate the cylinder properly.

**Possible Causes:** The MDS system requires several steps in order to function properly. The MDS solenoid must activate allow oil pressure to build, and finally disengage the lifter's lock pin. Anything that would cause a step to fail will cause these DTCs. Common causes are faulty wiring, solenoid, lifters, corroded connectors, insufficient oil pressure, blocked oil passages, and a defective PCM.

**Diagnostic Tests:**

- Activate the MDS solenoids using the scan tool. Listen for them activating.
- Check for power at the MDS solenoid using a test light. The light should illuminate brightly.
- Check for voltage at the solenoid when not commanded on. There should be less than 1v.
- Disconnect the connector at the solenoid and check the resistance between the control side and battery ground. There should be more than 100 Ω.
- Use a breakout box to check the resistance of the PCM connector. There should be less than 1 Ω.
- Check for blockages inside the MDS solenoid.
- Ensure there are no blockages or restrictions in the oil passages.
- Check the lifters for a frozen lock pin.
- MDS solenoid resistance should be at  $10.3\Omega \pm .25$  at  $68^{\circ}\text{F} \pm 20$

**Cylinder Reactivation Control Performance**

**P1411** – Cylinder 1 Reactivation Control Performance  
**P1414** – Cylinder 4 Reactivation Control Performance  
**P1416** – Cylinder 6 Reactivation Control Performance  
**P1417** – Cylinder 7 Reactivation Control Performance

**Description:** The monitor is run when the engine transitions between eight and four cylinder modes. This monitor determines if the engine was actually able to reactivate the cylinder properly when returning to eight cylinder mode.

**Possible Causes:** For the MDS system to be stuck in deactivation mode, anything that will cause oil pressure to be applied to the lifter lock pin when not commanded to will cause these DTCs. Common causes are a faulty solenoid, lifter, wiring, and a defective PCM.

**Diagnostic Tests:**

- Activate the MDS solenoids using the scan tool. Listen for them activating.
- Check for voltage at the solenoid when not commanded on. There should be less than 1v.
- Check that the MDS solenoid is capable of closing.
- Check the lifters for a broken return spring.

**Symptom based**

It is unlikely that MDS would fail without setting any codes but if it did this is what you would most likely find. For the MDS not deactivating the symptom would be either a rough running engine if 3 or less cylinders were not reactivating or if not all cylinders activated. There would be a lack of power if all 4 cylinders were not reactivating. If all 4 cylinders were not deactivating there would be no symptom. When doing your normal checks for these symptoms you would find the following

- No compression
- Acceptable cylinder leakage

**Scan Tool PIDS and Tests**

- MDS criteria met
- MDS enable
- MDS solenoid on/off for 1,4,6,7
- MDS solenoid test 1,4,6,7