

LAB - Compression Test



Students: 1. _____
 2. _____
 3. _____

Fill in each box with the appropriate information.
 Be sure to have the Instructor's initials before moving on to the next step.
 These are there to ensure everything is SAFE and CORRECT. Each team member must be able to answer questions from your instructor to receive credit for this lab.

LAB CREDITS			
INLINE ENGINES:	<u>1 LAB</u>	V-ENGINES:	<u>2 LABS</u>

VEHICLE IDENTIFICATION			
Year:		Make:	
Model:		Compression Spec (AllData):	

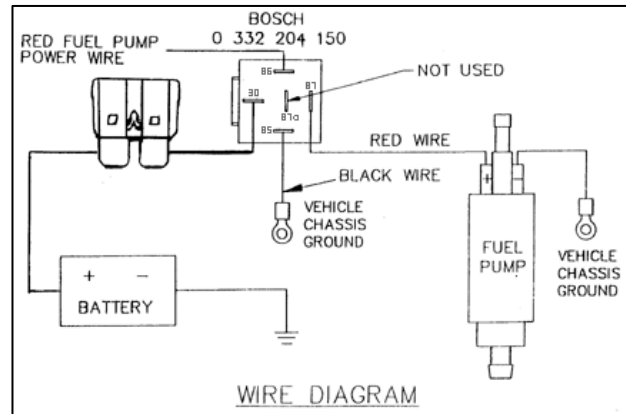
- A Compression Test is a good indicator of an engine's mechanical condition.
- The Compression Test measures how effectively each cylinder (ie: pistons, rings, valves, valve seats and head gaskets) seals the pressures of compression and power.
- For accurate results, the battery must be FULLY CHARGED , and the engine UP TO TEMPERATURE (be quick!)

DISABLE FUEL AND SPARK

1

DISABLE the fuel system (we don't want fuel spraying around).

- Reference a service manual
- If there is a "FUEL PUMP" fuse, you got lucky - pull it
- If there is a "FUEL PUMP" relay (there usually is), you got lucky - pull it
- If the vehicle is carbureted, this isn't going to be an issue.



Typical Wiring Diagram

It's fun to do this while the engine is running: it will burn off all the fuel to the injectors and the engine will stall. This is actually the safest way to disable the fuel system – because you KNOW it's dead.

DISABLE the ignition coil (we don't want any stray arcs shocking us or igniting anything).

- If there is an "IGNITION" Fuse, you got lucky – pull it
- If the ignition coil is inside the distributor cap, disconnect the distributor.
- If there is a coil on each plug, disconnect each coil from the wiring harness.

You don't really want to pull the fuse to the computer – while it will indeed kill both fuel AND ignition, losing its memory is becoming more and more of a problem as cars evolve.

SET the emergency brake


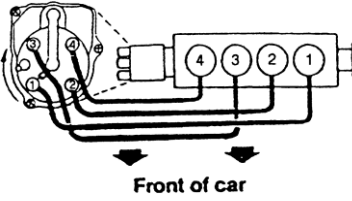
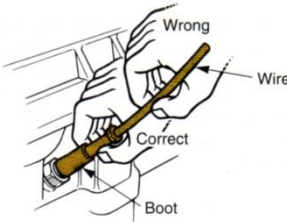

PLACE the transmission in PARK (automatic) or NEUTRAL (standard).




STOP!!!

INSTRUCTOR'S INITIALS:

SPARK PLUG REMOVAL - FOLLOW THESE STEPS CAREFULLY!!!

<p>2</p>	<p>CLEAN the areas around the Spark Plugs with compressed air</p> 	<p>Debris around the spark plugs can fall into the engine when the plug is removed, which could DAMAGE your engine!</p>
<p>3</p>	<p>LABEL the plug wires to prevent mixing them up.</p> 	<p>Every engine has a FIRING ORDER. The correct wire must go to the correct plug in the correct sequence or the engine may not run.</p>
<p>4</p>	<p>PULL the Spark Plug Wires by the BOOT NOT by the wire!</p> 	<p>PAY ATTENTION HERE!</p> <p>The wire can be DAMAGED if you don't pull with the boot. Sometimes it can be repaired, sometimes not.</p>
<p>5</p>	<p>Use a SPARK PLUG SOCKET to remove ALL the spark plugs. Lay them out IN ORDER so you know which plug came from which cylinder</p> 	<p>Spark Plug Sockets have a foam rubber insert PROTECT the VERY FRAGILE Spark Plug Ceramic. The wrong socket, or abuse, will crack the ceramic, RUINING the plug.</p> <p>ALSO – DO NOT DROP SPARK PLUGS!!!!</p>


SERVICE

6	<p>GENTLY THREAD the compression tester into cylinder #1</p> <ul style="list-style-type: none">• It does not have to be tight; there is an o-ring to seal it. <p>OPEN the throttle FULLY</p> <ul style="list-style-type: none">• This lets the engine draw in as much air as easily as possible• This also enables "FLOOD CLEAR" on EFI vehicles (shuts off the injectors)	
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7	<p>Crank the engine over for 5 cranks (you can tell by the sound)</p> <p>Record your results below:</p> <p>[1] _____ [2] _____</p> <p>[3] _____ [4] _____</p> <p>[5] _____ [6] _____</p> <p>[7] _____ [8] _____</p>	<p>A low <i>initial</i> stroke (#1 of the 5) suggests that the rings are getting tired.</p> <p>Record Manufacturer's Spec (page 1) here:</p> <div style="border: 1px solid black; height: 80px; margin: 10px 0;"></div> <p style="text-align: center;">Rules of Thumb: <i>(In the absence of manufacturer's specs)</i></p> <ul style="list-style-type: none">• Cylinder pressure should be no lower than 90psi• All cylinders should be within 80% of each other
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<p>Causes of LOW compression readings:</p> <ul style="list-style-type: none">• Rings are not sealing• Valves are not sealing<ul style="list-style-type: none">○ Worn or burned• Head gasket is not sealing• Cam timing is incorrect (valves closing too late)	<p>Causes of HIGH compression readings:</p> <ul style="list-style-type: none">• Carbon buildup in cylinder• Exhaust valves not opening fully• Cam timing is incorrect (valves closing too soon)
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"WET" TEST

8	<p>Pour about a tablespoon of motor oil into the LOWEST READING cylinder, and re-test.</p> <p>What happened?</p> <div style="border: 1px solid black; height: 30px; margin-bottom: 10px;"></div> <p>What does it mean if the reading went up?</p> <div style="border: 1px solid black; height: 30px; margin-bottom: 10px;"></div> <p>What does it mean if the reading stayed the same?</p> <div style="border: 1px solid black; height: 30px; margin-bottom: 10px;"></div>	
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STOP!

INSTRUCTOR'S INITIALS:

REASSEMBLY

9	<p>Apply ANTI-SIEZE compound to the spark plug threads (vitaly important with Aluminum Heads)</p> 
10	<p>PAY ATTENTION HERE!!</p> <p>CAREFULLY thread each spark plug back into the engine BY HAND</p> <p><i>Tip: using a piece of rubber hose that grips the plug ceramic can make it easier to start plugs deep in a cylinder head</i></p>
11	<p>When the hand-tightened plugs have seated, tighten them just SNUGLY with the spark plug socket</p>
12	<p>CONNECT the Spark Plug Wires to the correct plugs</p>
13	<p>CONNECT the ignition system and fuel system</p>
14	<p>START the engine and ensure that the engine runs correctly and smoothly</p>

CAUTION!
PAY ATTENTION!

Spark Plugs must be threaded into the engine **fully by hand FIRST.**

It is **VERY** easy to “**cross-thread**” spark plug holes in an engine, *especially* an aluminum engine.

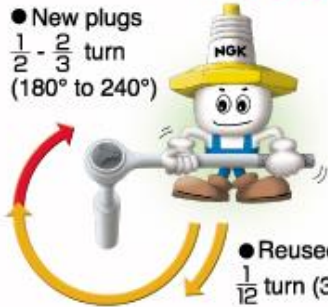
FORCING a cross-threaded spark plug with a wrench could result in a **LOT** of time and money to repair.

If you do not have a **TORQUE SPEC** or cannot get a torque wrench in there:

Spark plugs with thread diameter of 18 and 14 mm

♦♦ is excluded.

- New plugs
 $\frac{1}{2} - \frac{2}{3}$ turn
(180° to 240°)
- Reused
 $\frac{1}{12}$ turn (30°)



T O R Q U E S P E C	Spark plug type	Thread Diameter	Cast Iron Cylinder Head (lb.-ft.)	Aluminum Clyinder Head (lb.-ft.)
	Flat seat type (with gasket)	18 ø mm	25.3~32.5	25.3~32.5
	"	14 ø mm	18.0~25.3	18.0~21.6
	"	12 ø mm	10.8~18.0	10.8~14.5
	"	10 ø mm	7.2~10.8	7.2~8.7
	"	8 ø mm	--	5.8~7.2
	Conical seat type (without gasket)	18 ø mm	14.5~21.6	14.5~21.6
	Conical seat type (without gasket)	14 ø mm	10.8~18.0	7.2~14.5

STOP!

INSTRUCTOR'S INITIALS: