AUTO106 Engine Worksheet

Name_____

1. Remove engines from create

   Install exhaust, air filter housing and add oil

   Remove spark plug and check compression with gauge

   Set choke to OFF, set throttle to 1/2

   Pull the engine over with 4 quick pulls and recorded your reading _____psi.

2. install the test fuel tank and test run engine

	Pass	Fail	symptoms
Be sure it runs with the choke off	_____	_____	_____
Check low speed idle	_____	_____	_____
Check high speed idle	_____	_____	_____

   Verify that it holds a steady speed with no surging or rough running

3. Remove valve cover and set engine to Top Dead Center (TDC)
   check valve lash with Feeler Gauge, have instructor verify your findings
   Clearance should be .004-006 intake and .006-.008 exhaust

	Clearance (before)	Clearance (after, if adjuster)
Intake valve lash	_____	_____
Exhaust valve lash	_____	_____

   Recheck compression **if** you adjusted the valves

   Pull the engine over with 4-5 quick pulls and recorded your reading _____psi.

   Drain oil back into the quart of oil you got it from

4. Begin disassembly

Air filter housing

muffler

Remove carburetor and throttle assemble

Remove cylinder head

Remove valves from head

Measure valve stem diameter

Intake valve stem _____

Exhaust valve stem _____

Measure valve guide diameter

Intake guide diameter _____

Exhaust guide diameter _____

Calculate valve stem to guide clearance

Intake guide dia. _____ Exhaust guide dia_____

Minus Minus

Intake stem dia. _____ Exhaust stem dia_____

Equals clearance _____ Clearance_____

Have the instructor check your work

Re-install the valve cover onto cylinder head

Stop

Disassembly of the lower end

1. Measure the bore and stroke of this engine

   Calculate displacement

   Bore2 x stroke x .7854 x number of cylinders

   To convert, CID/61.02 = liters

   Bore_____

   Stroke_____

   Displacement _____ in cubic inches

2. Remove any small items bolted to the block.
3. Measure crank shaft end play with the dial indicator

   record your reading_____ inches

4. Remove flywheel; use an impact gun to get the nut off. Have instructor help with removing flywheel from crankshaft

5. Remove engine cover, **DO NOT DAMAGE THE GASKET!** Have the instructor help if needed.

   Remove the low oil sensor

   Remove connecting rod cap and remove piston.

   Remove crankshaft from block

6. Measure crankshaft

Rod journal _____

Main bearing journal, flywheel side _____

Main bearing journal, output side _____

7. Measure oil clearance of the rod on the crank

Plastigage reading_____

8. Remove wrist pin and measure

Pin hole in piston _____

Pin hole in connecting rod _____

Measure wrist pin dia _____

Calculate clearances

Piston to pin_____

Rod to pin _____

9. Measure camshaft intake exhaust

Heel to Nose_____ Heel to Nose_____

Base circle_____ Base circle_____

Lobe lift_____ Lobe lift_____

10. Measure cylinder bore with T-gauge in 3 places top to bottom on the thrust surface then 3 more at 90 degrees.

Top _____ Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

11. Measure piston Skirt ½ inch above the bottom of skirt_____

12. Calculate piston to cylinder wall clearance

smallest bore measurement_____
Minus
Piston skirt measurement_____
Clearance _____

13. Reassemble the bottom end. Have your instruct inspect the cam timing before you install the cover.
14. Install the cylinder head and adjust the valves.
15. With the valve cover removed and the engine set to Top Dead Center (TDC)

check valve lash with Feeler Gauge, have instructor verify your findings
Clearance should be .004-006 intake and .006-.008 exhaust

	Clearance
Intake valve lash	_____
Exhaust valve lash	_____

16. Install the carburetor, muffler and other external components test fuel tank and test run engine.
17. The magneto must be set to .009-.012 clearance. Have you instructor assist and inspect

	Pass	Fail	symptoms
Be sure it runs with the choke off	_____	_____	_____

Check low speed idle _____ _____ _____

Check high speed idle _____ _____ _____

Verify that it holds a steady speed with no surging or rough running

Write down the Torque specs for the bolts

6mm

8mm

10mm

AUTO114

Student Name	Pre-Alignment Inspection	Tie Rod Replacement, Outer	Tie Rod Replacement, Inner	Ball Joint, Replace Press-In	Ball Joint, Replace Bolt-In	Wheel Bearing, Replace Bolt-In	Wheel Bearing, Replace Press-In	Wheel Bearing, Repack	Wheel Bearing, Adjust	McPhearson Strut Replacement	Shocks/Damped Replacement	Leaf Spring/Shackle Replace	Bushing Replacement, Press-In	Dismount and Mount Tires	Balance and Road Force	TPMS Reset	Steering Rack Replacement	Steering Rack Adjustment	Steering Box Replacement	Steering Box Adjustment	Pitman Arm Replacement	Clock Spring Replacement	U Joint	Perform Four Wheel Alignment	Power Steering Pump, Replace	Power Steering Line, Replace	Power Steering Pressure Test	Sway Bar Bushing/end link

AUTO227

Task List	Fluid inspection, dip stick	Fluid inspection, w/o dipstick	Fluid flush, pan drop w/filter	Fluid flush, machine	Fluid leak	replace park nuetral switch	Stall test	Lock up test	diag trans related issue	pressure test	NVH diag, mounts	NVH, non mount issue	Diag incorrect gear ratio/power flo	Diag electrical fault	Shift cable adjustment	scan tool work sheet				R&R transmission RWD	R&R transmission, FWD	complete trans teardown rebuild
Student Name																						

Name_____

AUTO228 Main Journal Dia. Spec_____

Crankshaft Measurements Rod Journal Dia. Spec_____

Out-of-Round_____

INSTRUCTION: Crank shaft end play_____

1. Measure crank shaft end play.

2. Remove the crankshaft. See instructor for instructions on how to remove the main caps. DO NOT USE A PLYBAR OR SCREWDRIVER!

3. Make measurements of the Main and Rod journals at one point then at 90deg. from first measurements to determine wear and out-of-round.

4. Measure crankshaft run-out with a dial indicator.

End play measurement_____ In spec YES / NO

MAIN JOURNALS Diameter

First Measurement	Second Measurement 90deg from first
1. _____	_____
2_____	_____
3._____	_____
4._____	_____
5._____	_____
6._____	_____
7._____	_____

ROD JOURNALS

1._____ _____

2._____ _____

3._____ _____

4._____ _____

5._____ _____

6._____ _____

7._____ _____

8._____ _____

Measure crankshaft run out with dial indicator._____

Measure Cylinder Bore:

Cylinder bore specification_____

Cylinder Taper specification_____

Out of round specification_____

Piston skirt measurement_____

Skirt to cylinder wall clearance_____

Cylinder #1 Top_____ 90 degrees_____

Middle_____ 90 degrees_____

Bottom_____ 90 degrees_____

Taper_____ In spec YES / NO

Out of Round _____ In spec YES / NO

Largest bore measurement_____ In spec YES / NO

Piston skirt measurement_____ In spec YES / NO

Skirt to cylinder wall clearance_____ In spec YES / NO

Cylinder #2 Top_____ 90 degrees_____

Middle_____ 90 degrees_____

Bottom_____ 90 degrees_____

Taper_____ In spec YES / NO

Out of Round _____ In spec YES / NO

Largest bore measurement_____ In spec YES / NO

Piston skirt measurement_____ In spec YES / NO

Skirt to cylinder wall clearance_____ In spec YES / NO

Cylinder #3 Top_____ 90 degrees_____

Middle_____ 90 degrees_____

Bottom_____ 90 degrees_____

Taper_____ In spec YES / NO

Out of Round _____ In spec YES / NO

Largest bore measurement_____ In spec YES / NO

Piston skirt measurement_____ In spec YES / NO

Skirt to cylinder wall clearance_____ In spec YES / NO

Cylinder #4 Top_____ 90 degrees_____

Middle_____ 90 degrees_____

Bottom_____ 90 degrees_____

Taper_____ In spec YES / NO

Out of Round _____ In spec YES / NO

Largest bore measurement_____ In spec YES / NO

Piston skirt measurement_____ In spec YES / NO

Skirt to cylinder wall clearance_____ In spec YES / NO

Valve and Valve Guide Measurements and Cylinder head inspection

SPECS: Intake

1. Valve Guide Specs New_____ Service Limit_____
2. Valve Stem Specs New_____ Service Limit_____
3. Valve Stem-to-Guide Clearance New_____ Limit_____
4. Valve margin New _____Service limit_____
5. Valve face angle_____Valve seat angle_____

SPECS: Exhaust

1. Valve Guide Specs New_____ Service Limit_____
2. Valve Stem Specs New_____ Service Limit_____
3. Valve Stem-to-Guide Clearance New_____ Limit_____
4. Valve margin New_____ Service limit_____
5. Valve face angle_____Vlave seat angle_____

Cylinder head flatness_____

OBJECTIVES:

1. To identify the intake and exhaust valves and combustion chamber type.
2. Check cylinder head for flatness.
3. To disassemble the cylinder head using the appropriate valve spring compressor.
4. To measure the valve guide using the small hole gauge or Sunnex clearance gauge
5. To measure the valve stem using the micrometer.
6. To calculate the valve stem to guide clearance.

INSTRUCTIONS/STEPS:

1. Look up the needed Specs and write them in the space provide below.
2. Measure the valve and guide and calculate the clearance.
3. Have your Instructor check your work.

Cylinder head flatness_____

First Valve Set

Intake Valve Guide Top_____ Intake Valve Stem Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance_____ In Spec YES / NO

Exhaust valve Guide Top_____ Exhaust Stem Valve Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the valve Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance _____In Spec YES /NO

Second Valve Set

Intake Valve Guide Top_____ Intake Valve Stem Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance_____ In Spec YES / NO

Exhaust valve Guide Top_____ Exhaust Stem Valve Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the valve Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance _____In Spec YES /NO

Third Valve Set

Intake Valve Guide Top_____ Intake Valve Stem Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance_____ In Spec YES / NO

Exhaust valve Guide Top_____ Exhaust Stem Valve Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the valve Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance _____In Spec YES /NO

Fourth Valve Set

Intake Valve Guide Top_____ Intake Valve Stem Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance_____ In Spec YES / NO

Exhaust valve Guide Top_____ Exhaust Stem Valve Top_____

Middle_____ Middle_____

Bottom_____ Bottom_____

The largest measurement from the Guide _____ In Spec YES / NO

Minus

The smallest measurement from the valve Stem_____ In Spec YES / NO

This Is your Valve-to-Guide Clearance _____In Spec YES /NO

Bottom end reassembly 1

Plastigage Work Sheet

Objective: To determine the oil clearance of the main bearings.

Torque Spec, Main Bearing Caps _____

Oil Clearance Spec_____

Crank Endplay Spec_____

Clean the crank, blocks and bearings. Install the crank and place one strip of plastigage on each of the main journal. Torque the main bearing cap to spec in the order given by the service manual.

DO NOT SPIN THE CRANK.

Remove the caps and read the thickness of the plastigage with supplied scale (the wrapper).

Write the measurements down.

1._____

2_____

3._____

4._____

5._____

6._____

7._____

Are the clearances within spec? _____

Have the instructor go over the reading with you.

Remove the plastigage with your fingernail, oil the crank, install the caps and torque to spec. The crank should spin easily by hand, with your figure tips. If not, see the instructor.

Using a dial indicator

Measure crankshaft endplay_____ endplay spec_____

Bottom end reassembly 2

Objective: To install pistons and rods and to measure oil clearance and end play of the rods.

Torque Spec, connecting rod bolt/nut _____

Connecting rod side/ axial clearance spec_____

Connecting rod oil clearance_____

Before installing pistons have the instructor demonstrate the installation process

If there are studs on the connecting rod place rubber protectors on them to protect the cylinder wall and crank.

Install one piston at a time.

Once the piston is in the cylinder, check that there are no scratches on the cylinder wall.

The piston should move smoothly with firm pressure.

Plastigage the rod bearings

1._____ 5._____

2._____ 6._____

3._____ 7._____

4._____ 8._____

Oil the bearing and torque to spec.

Measure the connecting rod side / axial clearance.

Rotate the crank two to three revolutions. The crank should turn freely with no noises. Have the instructor check your work.

Install the next piston and rod.

Using a Feeler gauge or dial indicator

Connecting rod side/ axial clearance

Is the endplay on the rods is in spec?

1._____ YES /NO

2._____ YES /NO

3._____ YES /NO

4._____ YES /NO

5._____ YES /NO

6._____ YES /NO

7._____ YES /NO

8._____ YES /NO