

SECTION : 303-00 General Information

VEHICLE APPLICATION : 2008.0 Falcon

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DESCRIPTION AND OPERATION

Engine

NOTE: This section contains information, steps and procedures that may not be specific to your engine.

This section covers general procedures and diagnosis and testing of the engine system, except for exhaust emission control devices, which are covered in the Chapter 303-14, Powertrain Control Module.

The engine incorporates the following features:

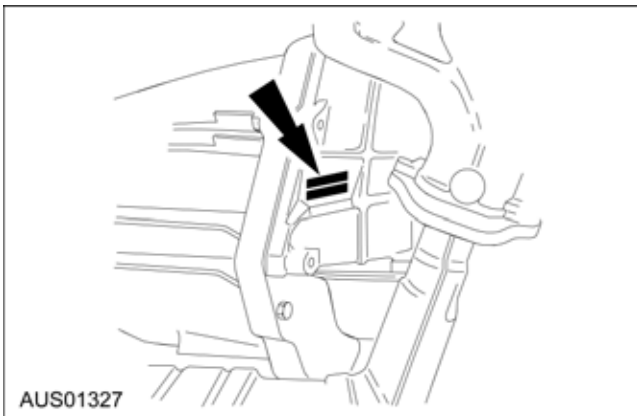
- a closed positive crankcase ventilation (PCV) system.
- an exhaust emission control system.
- an evaporative emission control system.

Some engines incorporate a fail-safe cooling system. Refer to the appropriate section in Group 303 for the procedure.

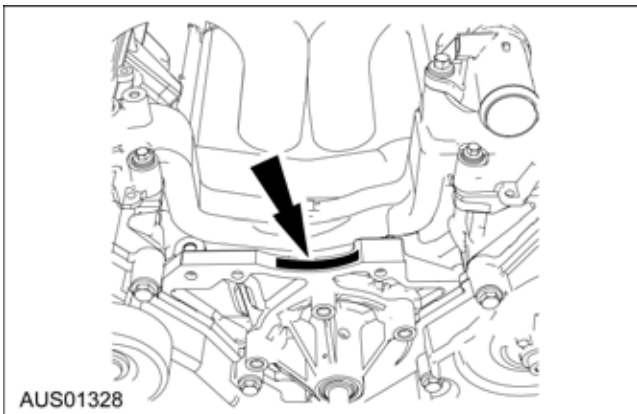
The engine, fuel system, ignition system, emissions system and exhaust system all affect exhaust emission levels and must be maintained according to the maintenance schedule. Refer to the scheduled Maintenance Guide.

For engine identification, refer to Section 100-01. For engine number location refer to figure.

Engine Number Locations (I6)



Engine Number Locations (V8)



DIAGNOSIS AND TESTING

Engine

Inspection and Verification

Since diagnosis and testing actually begins when repairs are taken on, the following procedure is recommended.

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical damage or electrical damage. If the concern cannot be reproduced, carry out a road test and/or visual check with the aid of the following table.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> • Coolant leaks • Oil leaks • Leaks in the fuel system • Visibly damaged or worn parts • Loose or missing nuts or bolts

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Condition	Source	Action
• Engine will not crank	• Faulty Starter System	• Refer to Section 303-06.
	• Transmission lever not in P or N.	• Place in P.
	• Seized engine	• Replace engine
	• Coolant in cylinders	• Replace engine
• Engine cranks but will not start	• Ignition system inoperative	• Refer to appropriate Section in group 303.
	• Fuel system inoperative	• Refer Section 310-00.
• Engine slow/difficult to start	• LPG engine requires "key-off" to regain starting enrichment after initial failed start.	• Key-off LPG engine if 1st starting attempt failed.
	• Variable Cam Timing (VCT) unit lock pin not engaged at start.	• Refer to appropriate Section in group 303.
	• VCT unit Oil Control Valve jammed.	• Clean Oil Control Valve. Refer to appropriate Section in group 303.
• Engine misfires	• Fail Safe Cooling in operation	• Repair coolant system
	• Ignition system faulty	• Refer to appropriate Section in group 303.
	• Fuel system faulty	• Refer Section 310-00.
	• Restricted exhaust system	• Inspect Exhaust system
	• Intake vacuum leak	• Carry out Intake Manifold Vacuum test in this section
	• Burned valve/poor seating	• Perform a compression check
	• Broken valve spring	• Inspect valve springs
	• Head gasket leakage	• Inspect head gasket
	• Piston damage	• Perform cylinder compression check
• Insufficient Power	• Broadband Intake Manifold not operative	• Check switching occurs at 3800 rpm - Refer to appropriate Section in group 303.
	• VCT unit(s) not operative	• Refer to appropriate Section in group 303.
	• Electronic Throttle Control Unit faulty	• Refer to appropriate Section in group 303.



DIAGNOSIS AND TESTING (Continued)

Condition	Source	Action
<ul style="list-style-type: none"> Excessive Fuel Consumption 	<ul style="list-style-type: none"> Green(low mileage) engine/vehicle City/stop-start driving 	<ul style="list-style-type: none"> Establish accurate fuel consumption using full to full method.
	<ul style="list-style-type: none"> Faulty Fuel System 	<ul style="list-style-type: none"> Refer to appropriate Section in group 303.
<ul style="list-style-type: none"> Excessive Oil Consumption 	<ul style="list-style-type: none"> Green engine 	<ul style="list-style-type: none"> Recheck at 15,000 km
	<ul style="list-style-type: none"> Valve stem seal damaged or missing. 	<ul style="list-style-type: none"> Inspect the seals. Refer to appropriate Section in group 303.
	<ul style="list-style-type: none"> Oil leakage 	<ul style="list-style-type: none"> Repair oil leakage
	<ul style="list-style-type: none"> Incorrect Oil viscosity 	<ul style="list-style-type: none"> Drain and fill with correct oil
	<ul style="list-style-type: none"> Piston/rings/cylinder worn or damaged 	<ul style="list-style-type: none"> Repair. Refer to appropriate Section in group 303.
	<ul style="list-style-type: none"> Diluted oil 	<ul style="list-style-type: none"> Determine cause. Correct. Drain and refill oil.
	<ul style="list-style-type: none"> Crankcase overfilled 	<ul style="list-style-type: none"> Adjust oil level.
	<ul style="list-style-type: none"> Faulty or incorrect PCV Valve 	<ul style="list-style-type: none"> Check and replace. Refer to appropriate Section in group 303.
<ul style="list-style-type: none"> Engine leaks oil 	<ul style="list-style-type: none"> Joint fasteners loose 	<ul style="list-style-type: none"> Tighten to specification.
	<ul style="list-style-type: none"> Out of position or damaged seal/RTV sealant omitted/inadequate. 	<ul style="list-style-type: none"> Pressurise crankcase to 35kPa. Apply soapy water, check for leak. Inspect and replace. Refer to appropriate Section in group 303.
	<ul style="list-style-type: none"> Worn/out of position crank rotary seal 	<ul style="list-style-type: none"> Inspect and replace. Refer to appropriate Section in group 303.
	<ul style="list-style-type: none"> Porous casting 	<ul style="list-style-type: none"> Clean suspect area, Perform pressurized crankcase check. Run engine, check for leak. Replace casting.
	<ul style="list-style-type: none"> Sealant in Crank Damper keyway omitted or inadequate 	<ul style="list-style-type: none"> Replace sealant. Refer to appropriate Section in group 303.
	<ul style="list-style-type: none"> Sealant between Rear Main Cap and block omitted or inadequate 	<ul style="list-style-type: none"> Perform pressurized crankcase leak check. Repair.
<ul style="list-style-type: none"> Engine Noise. 	<ul style="list-style-type: none"> Excessive Crankshaft Main bearing or big end clearance. Excessive Crankshaft end play Excessive camshaft end play Excessive piston to bore clearance/damaged piston/bent connecting rod. Excessive hydraulic valve adjuster clearance 	<ul style="list-style-type: none"> Inspect and repair. Refer relevant Section.
	<ul style="list-style-type: none"> Soft or spongy lash adjusters Worn cam lobe or roller finger follower Excessive valve guide clearance Broken valve spring Loose timing chain Loose crank damper Worn/noisy Front End Accessory Drive Belt Worn/noisy FEAD tensioner/idler pulley Exhaust gas leakage 	<ul style="list-style-type: none"> Check for excessively low or high oil level. Air leak in suction side of oil pump.
	<ul style="list-style-type: none"> Carbon in combustion chamber/top land of piston 	<ul style="list-style-type: none"> Remove carbon using proprietary carbon removal treatment



DIAGNOSIS AND TESTING (Continued)

Components Tests

Engine Oil Leaks

NOTE: Before installing new gaskets or oil seals, make sure that the fault is clearly established. If the oil leak cannot be identified clearly by a visual inspection, carry out a pressurized crankcase leak check:

Pressurised leak check

1. Clean the engine with a suitable cleaning fluid to remove all traces of oil.
2. Block off the line to the PCV valve.
3. Apply a regulated air supply line to the PCV fresh air entry point on the rocker cover.
4. Pressurise the crankcase to 35 kPa.
5. Check for air leaks by washing the suspect area with a solution of soapy water and watching for bubbles.
6. Repair all leaks as necessary.

Compression Test

General Remarks

NOTE: Removing fuses and disconnecting electrical components causes the powertrain control module (PCM) to log an error message. After the measurements have been carried out this error message should be cleared from memory by connecting to PDU.

The compression pressure should be checked with the engine at operating temperature.

Check The Compression Pressure



WARNING: On manual transmissions, shift the transmission into neutral. On automatic transmission vehicles, select "P". Failure to follow these instructions may result in personal injury.

1. Remove the fuel pump relay.
2. Start the engine - the engine will start, run for a few seconds then stall.
3. Remove the spark plugs.
4. Install the compression tester.
5. Install an auxiliary starter switch in the starting circuit. With the ignition switch OFF, using the auxiliary starter switch, crank the engine a minimum of five compression strokes and record the highest reading.

NOTE: The approximate number of compression strokes required to obtain the highest reading.

6. Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.

7. Install the components in reverse order, observing the specified tightening torques.
8. Reset the PCM fault memory.

Interpretation of the Results

The indicated compression pressures are considered within specification if the lowest reading cylinder is within 75% of the highest reading.



CAUTION: If engine oil is sprayed into the combustion chamber, after carrying out the measurement run the engine at 2000 rpm for about 15 minutes, in order to burn the oil and prevent damage to the catalytic converter.

If the measurement on one or more cylinders is much lower than the specified value, spray some engine oil into the combustion chamber and repeat the compression measurement.

If the reading greatly improves, the piston rings are damaged.

If the reading stays the same, the cause is damaged valve seats.

If the measurements for two cylinders next to each other are both too low then it is very likely that the cylinder head gasket between them is burnt through. This can also be recognized by traces of engine oil in the coolant and/or coolant in the engine oil.

Excessive Engine Oil Consumption

The amount of oil an engine uses will vary with the way the vehicle is driven in addition to normal engine-to-engine variation. This is especially true during the first 15,000 km when a new engine is being broken in or until certain internal components become conditioned. Vehicles used in heavy-duty operation may use more oil. The following are examples of heavy-duty operation:

- trailer towing applications
- severe loading applications
- sustained high speed operation

Engines need oil to lubricate the following internal components:

- cylinder block cylinder walls
- pistons and piston rings
- intake and exhaust valve stems
- intake and exhaust valve guides
- all internal engine components

When the pistons move downward, a thin film of oil is left on the cylinder walls. As the vehicle is operated, some oil is also drawn into the combustion chambers past the intake and exhaust valve stem seals and burned.

The following is a partial list of conditions that can affect oil consumption rates:

- engine size
- operator driving habits



DIAGNOSIS AND TESTING (Continued)

- ambient temperatures
- quality and viscosity of oil

Operation under varying conditions can frequently be misleading. A vehicle that has been run for several thousand kilometres on short trips or in cold ambient temperatures may have consumed a "normal" amount of oil. However, when checking the engine oil level, it may measure up to the full mark on the oil level indicator due to dilution (condensation and fuel) in the engine crankcase. The vehicle then might be driven at high speeds on the highway where the condensation and fuel boil off. The next time the engine oil is checked it may appear that a litre of oil was used in a relatively short distance.

Make sure the selected engine oil meets the Ford specification and the recommended API performance category "SJ/CF" and SAE viscosity grade as shown in the vehicle Owner Literature. It is also important that the engine oil is changed at the intervals specified for the typical operating conditions.

Oil consumption Test.

The following diagnostic procedure is used to determine the source of excessive oil consumption.

NOTE: Oil use is normally greater during the first 15,000 km of service. As mileage increases, oil use decreases. High speed driving, towing, high ambient temperature and other factors may result in greater oil use.

1. Define excessive consumption, such as the number of kilometres driven per litre of oil used. Also determine customer's driving habits, such as sustained high speed operation, towing, extended idle and other considerations.
2. Verify that the engine has no external oil leaks as described under Engine Oil Leaks.
3. Verify that the engine has the correct oil level.
4. Verify that the engine is not being run in an overfilled condition. Check the oil level at least five minutes after a hot shutdown with the vehicle parked on a level surface.
5. Carry out an oil consumption test:
 1. Drain the engine oil and fill with one litre less than the recommended amount.
 2. Run the engine for three minutes (10 minutes if cold), and allow oil to drain back for at least five minutes with vehicle parked on level surface.
 3. Remove the oil dipstick and wipe clean. (Do not wipe with anything contaminated with silicone compounds.) Install the oil dipstick, making sure to seat the oil dipstick level firmly in the oil dipstick tube. Remove the oil dipstick and scribe a mark on the back (unmarked) surface at the indicated oil level. (This level should be about the same as the ADD mark on the face of the oil dipstick.)
4. Add 1 litre of oil. Start the engine and allow to idle for at least two minutes. Shut off the engine and allow the engine oil to drain back for at least five minutes. Mark the new oil level on the dipstick using the procedure above.
5. Record the vehicle's odometer reading.
6. Instruct the customer to drive the vehicle as usual and:
 - Check the oil level regularly at intervals of 250 km.
 - Return to the service point when the oil level drops below the ADD mark on the oil dipstick.
 - Add only full litres of the same oil in an emergency.

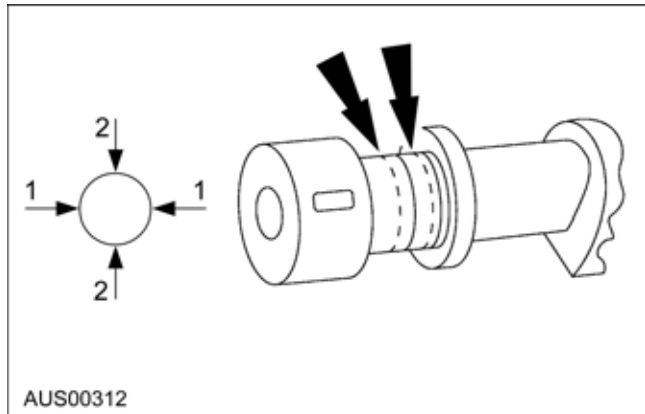
NOTE: The mileage at which the oil is added.
7. Check the oil level under the same conditions and at the same location as in steps 3-4.
 - Measure the distance from the oil level to the UPPER mark on the oil dipstick and record.
 - Measure the distance between the two scribe marks and record.
 - Divide the first measurement by the second.
 - Divide the distance driven during the oil test by the result. This quantity is the approximate oil consumption rate in kilometers per litre.
 - If the oil consumption rate is unacceptable go to Step 6.
6. Check the positive crankcase ventilation (PCV) system. Make sure the system is not plugged.
7. Check for plugged oil drain-back holes in the cylinder head and cylinder block.
8. If the condition still exists after carrying out the above tests go to Step 9.
9. Carry out a cylinder compression test. Refer to the procedure in this section: Compression Test. This can help determine the source of oil consumption such as valves, piston rings or other areas.
10. Check valve guides for excessive guide clearance. Install new valve stem seals after verifying valve guide clearance.
11. Worn or damaged internal engine components can cause excessive oil consumption. Small deposits of oil on the tips of the spark plugs can be a clue to internal oil consumption.



GENERAL PROCEDURES

Camshaft Journal — Diameter

1. Measure each camshaft journal diameter in two directions.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

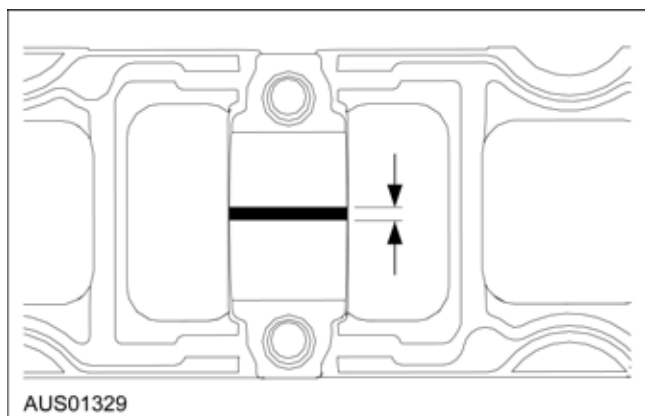


Camshaft Journal — Clearance, Plastigage Method

NOTE: The camshaft journals must meet specifications before checking camshaft journal clearance.

1. Remove the camshaft bearing cap and lay plastigage across the surface. Refer to the appropriate section in Group 303 for the procedure.
2. Position the camshaft bearing cap and install the bolts. Refer to the appropriate section in Group 303 for the procedure.

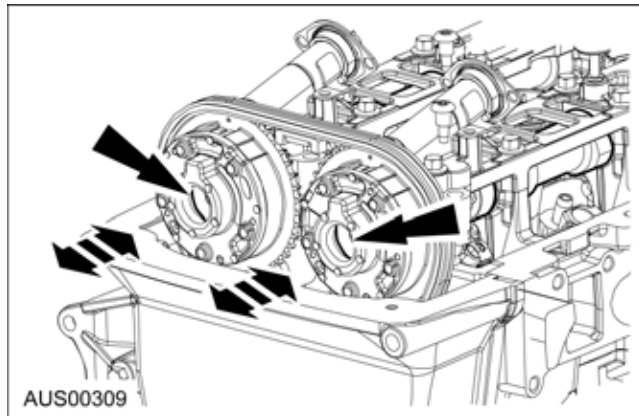
NOTE: Do not turn the camshaft while carrying out this procedure.



3. Use plastigage to verify the camshaft journal clearance.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

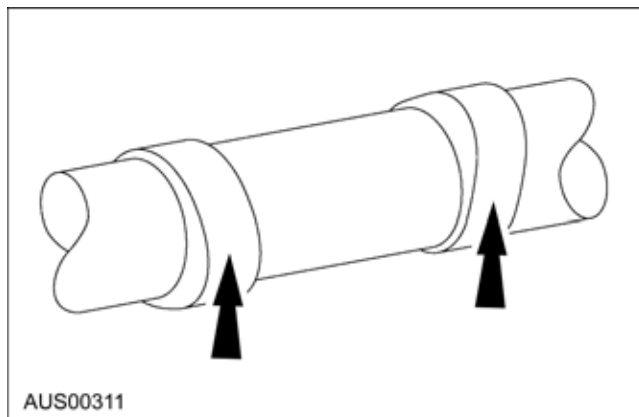
Camshaft — End Play, OHC Engines

1. Remove the roller followers. Refer to the appropriate section in Group 303 for the procedure.
2. Use a dial Indicator with bracketry to measure camshaft end play.
3. Position the camshaft to the rear of the cylinder head.
4. Zero the indicator.
5. Move the camshaft to the front of the cylinder head. Note and record the camshaft end play.
 - If camshaft end play exceeds specifications, install new camshaft and recheck end play. Refer to the appropriate section in Group 303 for the procedure.
 - If camshaft end play exceeds specification after camshaft installation, install a new cylinder head. Refer to the appropriate section in Group 303 for the procedure.



Camshaft — Lobe Surface

1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.
 - If excessive pitting or damage is present, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

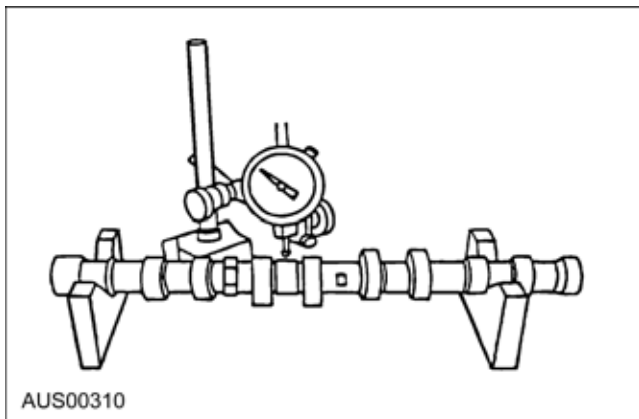


GENERAL PROCEDURES (Continued)

Camshaft — Runout

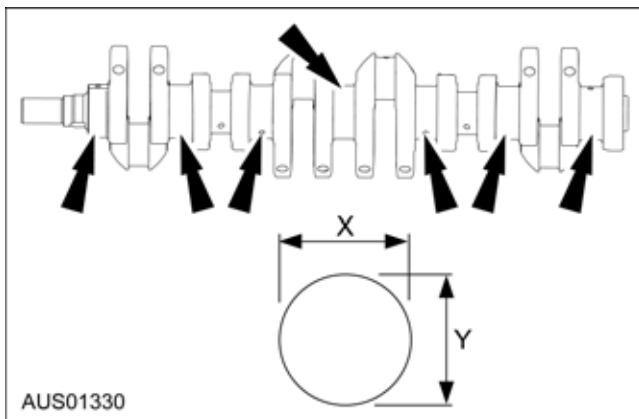
NOTE: Camshaft journals must be within specifications before checking runout.

1. Use a dial Indicator with bracketry to measure the camshaft runout.
 - Rotate the camshaft and subtract the lowest indicator reading from the highest indicator reading.
 - For additional information, refer to the specification chart in the appropriate engine section.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



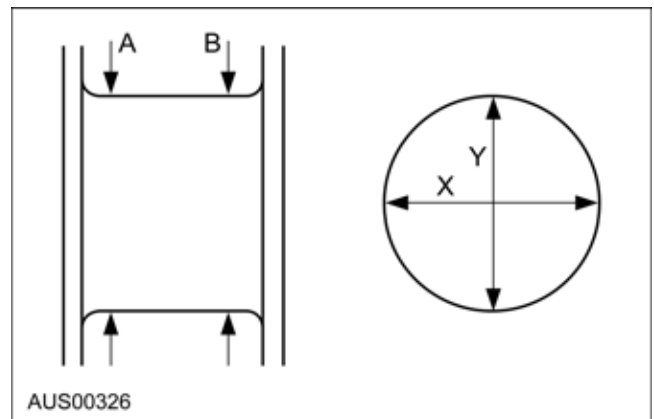
Crankshaft Main Bearing Journal — Diameter

1. Measure each of the crankshaft main bearing journal diameters in at least two directions.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Crankshaft Main Bearing Journal — Taper

1. Measure each of the crankshaft main bearing journal diameters in at least two directions at each end of the main bearing journal.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Crankshaft Main Bearing Journal — Clearance

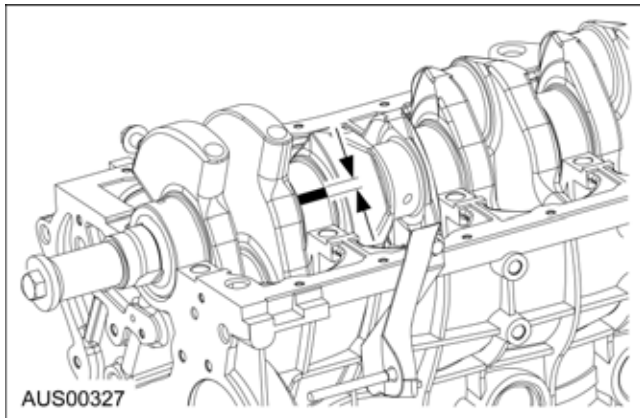
NOTE: Crankshaft main bearing journals must be within specifications before checking journal clearance.

1. Remove the crankshaft main bearing caps and crankshaft main bearing.
2. Lay a piece of plastigage across the face of each crankshaft main bearing surface.

NOTE: Do not turn the crankshaft while carrying out this procedure. Install and remove the crankshaft main bearing cap.
3. Verify the crankshaft journal clearance.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



GENERAL PROCEDURES (Continued)



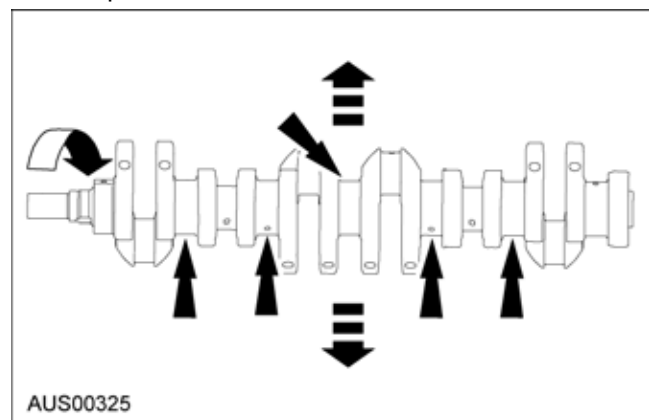
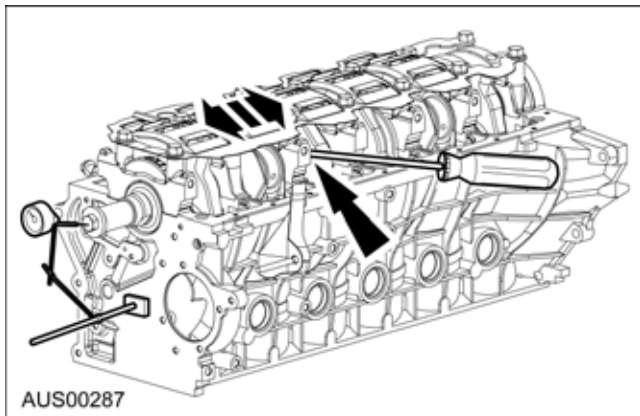
Crankshaft — Runout

NOTE: Crankshaft main bearing journals must be within specifications before checking runout.

1. Use the dial indicator with bracketry to measure the crankshaft runout.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - Rotate the crankshaft and subtract the lowest dial indicator reading from the highest dial indicator reading to figure the crankshaft runout. If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

Crankshaft — End Play

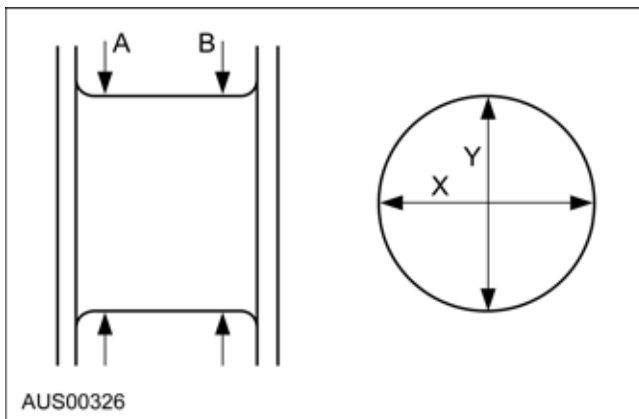
1. Measure the crankshaft end play. Use a dial indicator with bracketry to measure crankshaft end play.
2. Position the crankshaft to the rear of the cylinder block.
3. Zero the indicator.
4. Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
 - If crankshaft end play exceeds specifications, install a new crankshaft thrust washer (6334) or crankshaft thrust main bearing (6337). Refer to the appropriate section in Group 303 for the procedure.



GENERAL PROCEDURES (Continued)

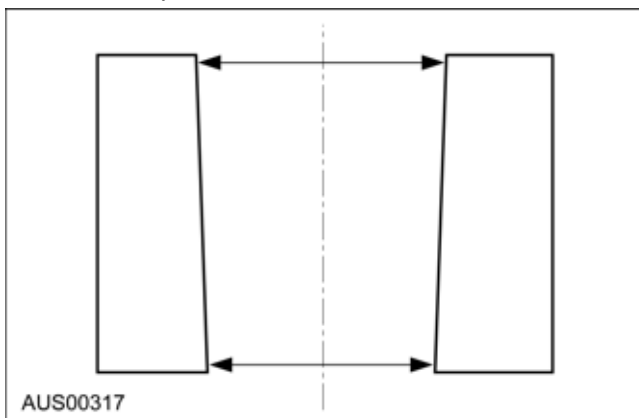
Crankshaft — Connecting Rod Journal Taper, Out of Round

1. Measure the crankshaft connecting rod journal diameters in two directions perpendicular to one another at each end of the connecting rod journal. The difference in the measurements from one end to the other is the taper. Verify measurement is within the wear limit.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



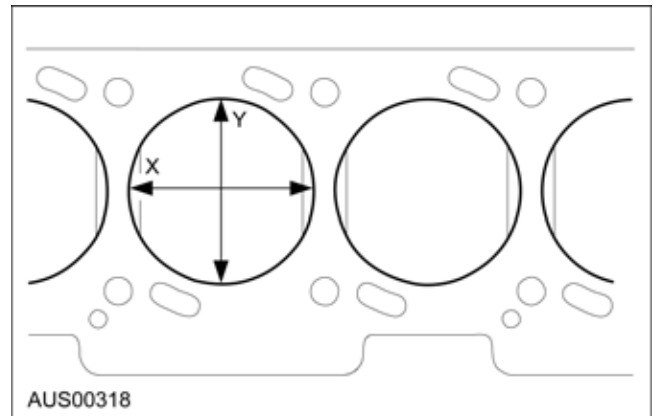
Cylinder Bore — Taper

1. Measure the cylinder bore at the top and bottom. Verify the cylinder bore is within the wear limit. The difference indicates the cylinder bore taper. Bore the cylinder to the next oversize.
 - For additional information, refer to Specifications in the appropriate section in Group 303.



Cylinder Bore — Out-of-Round

1. Measure the cylinder bore in two directions. The difference is the out-of-round. Verify the out-of-round is within the wear limit and bore the cylinder to the next oversize limit.
 - For additional information, refer to Specifications in the appropriate section in Group 303.

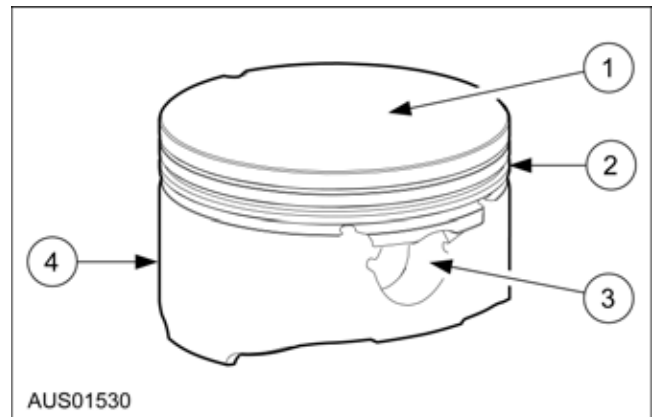


Piston — Inspection



CAUTION: Do not use a caustic cleaning solution or a wire brush to clean the pistons or damage can occur.

1. Clean and inspect the (2) ring lands, (4) skirts, (3) pin bosses, and the (1) tops of the pistons. If wear marks, scores or glazing is found on the piston skirt, check for a bent or twisted connecting rod.



2. Use the piston ring groove cleaner to clean the piston ring grooves.
 - Make sure the oil ring holes are clean.



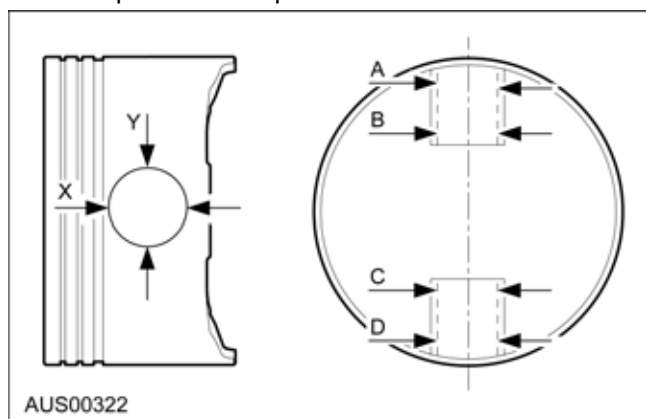
GENERAL PROCEDURES (Continued)

Piston — Pin to Bore Diameter

WARNING: Cover the end of the pin bore with a hand or shop rag when removing the retainer ring, since it has a tendency to spring out. Wear eye protection.

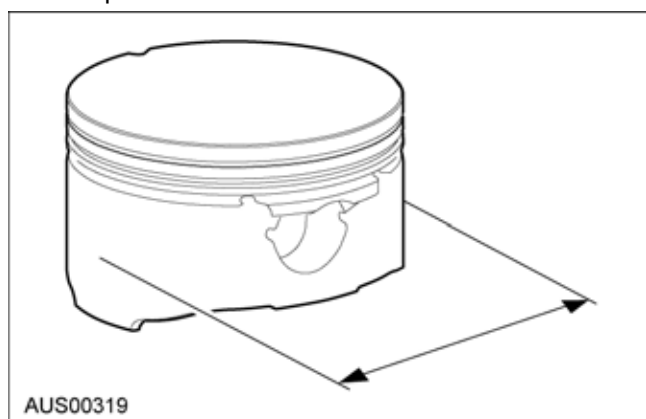
NOTE: Piston and piston pins are a matched set and should not be interchanged. Measure the piston pin bore diameter in two directions on each side. Verify the diameter is within specification.

1. If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Piston — Diameter

1. Measure the piston skirt diameter 90 degrees from the piston pin at the points indicated. For additional information, refer to Specifications in the appropriate section in Group 303.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Piston — to Cylinder Bore Clearance

1. Subtract the piston diameter from the cylinder bore diameter to find the piston-to-cylinder bore clearance. If the measurement is outside specification, replace the piston, or machine the cylinder block oversize and fit oversize pistons.

Piston — Ring End Gap

1. Use a piston without rings to push a piston ring in a cylinder to the bottom of ring travel.

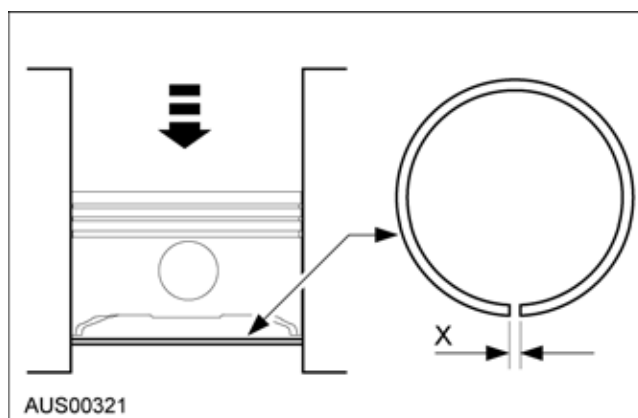


CAUTION: Use care when fitting piston rings to avoid possible damage to the piston ring or the cylinder bore.



CAUTION: Piston rings should not be transferred from one piston to another.

NOTE: Cylinder bore must be within specification for taper and out-of-round.



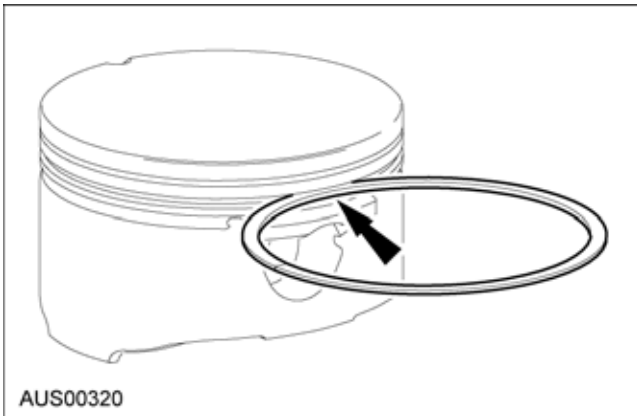
2. Use a feeler gauge to measure the top piston ring end gap and the second piston ring end gap.
 - For additional information, refer to Specifications in the appropriate section in Group 303.



GENERAL PROCEDURES (Continued)

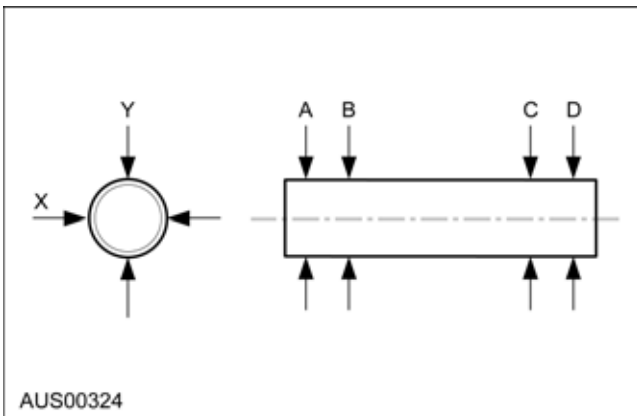
Piston — Ring-to-Groove Clearance

1. Inspect for a step in the grooves.
2. Measure the piston ring-to-groove clearance.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Piston — Pin Diameter

1. Measure the piston pin diameter in two directions at the points shown. Verify the diameter is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



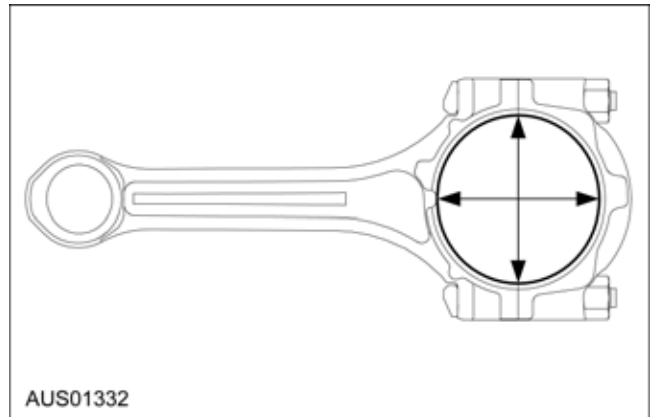
Connecting Rod — Cleaning



CAUTION: Do not use a caustic cleaning solution or damage to connecting rods can occur.

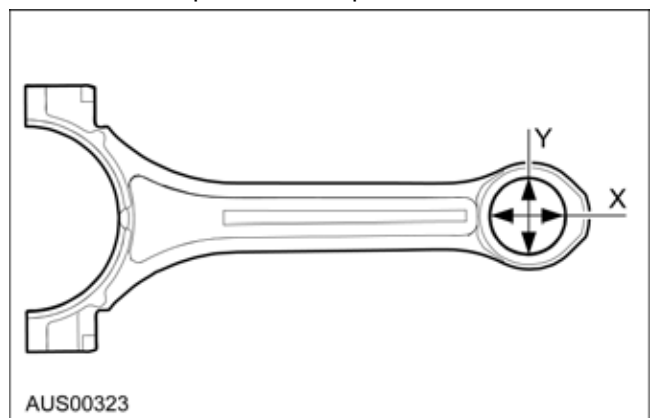
Connecting Rod — Large End Bore

1. Measure the bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Connecting Rod — Bushing Diameter

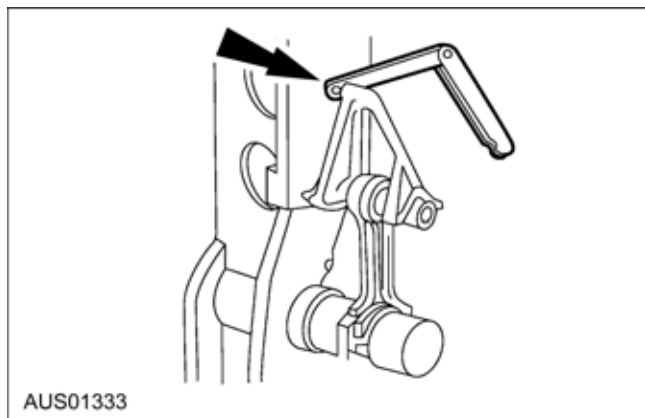
1. Measure the inner diameter of the connecting rod bushing, if equipped. Verify the diameter is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



GENERAL PROCEDURES (Continued)

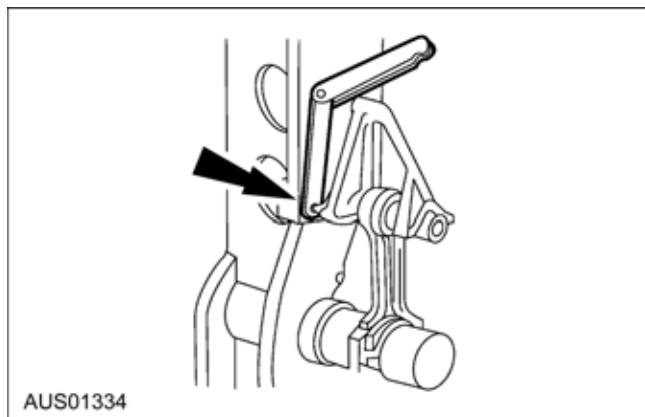
Connecting Rod — Bend

1. Measure the connecting rod bend on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the bend measurement is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Connecting Rod — Twist

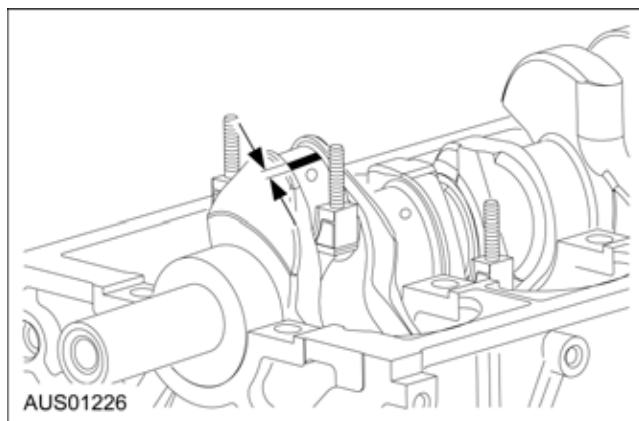
1. Measure the connecting rod twist on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the measurement is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Connecting Rod — Bearing Journal Clearance

NOTE: The crankshaft connecting rod journals must be within specifications to check the connecting rod bearing journal clearance.

1. Remove the connecting rod bearing cap.
2. Position a piece of plastigage across the bearing surface.



3. Install and tighten to specifications, then remove the connecting rod bearing cap.

NOTE: Do not turn the crankshaft during this step.
4. Measure the plastigage to get the connecting rod bearing journal clearance. The plastigage should be smooth and flat. A changing width indicates a tapered or damaged connecting rod or connecting rod bearing.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

Roller Follower — Inspection

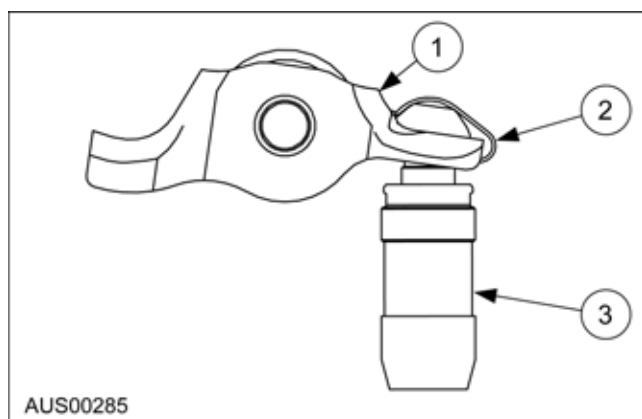
1. Inspect the roller for flat spots or scoring. If any damage is found, inspect the camshaft lobes and valve tappet for damage.

Valve Rocker Arm/Lash Adjuster Assembly — Inspection

1. Inspect the roller for flat spots or scoring, the valve pad for wear or pitting, and the ball socket for smooth motion.
 - Do not disassemble the clip unless replacing a part of the assembly. The clip must be a firm fit on the rocker arm, and replaced if removed.
 - Replace any parts that show significant wear or damage.



GENERAL PROCEDURES (Continued)



AUS00285

Item	Description
1	Valve rocker arm
2	Retaining clip
3	Lash adjuster

Hydraulic Lash Adjuster Diagnosis

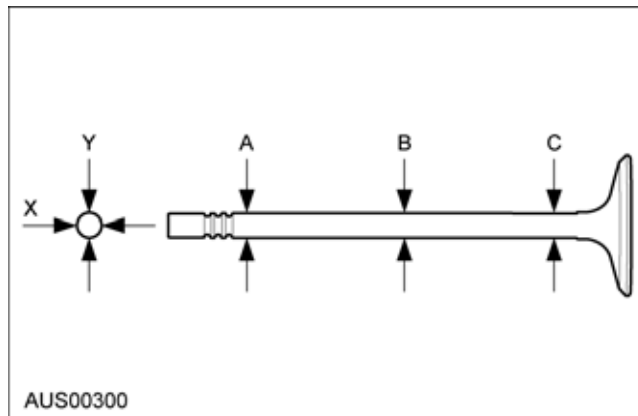
A suspected faulty lash adjuster can be located by removing the cam cover. Check all the rockers for signs of vertical play, or sponginess in the lash adjuster. Rotate the crankshaft so that all rockers are checked with the valve closed.

If necessary, operate the engine at idle and try to locate the noise by ear, or use a piece of thin dowel to feel the motion of the valve spring retainer. An indent will be felt on the valve with the faulty adjuster.

Air bubbles in the lubricating oil, caused by excessively high or low oil level may result in spongy lash adjusters. A leak in the oil pick-up tube, or its joint to the oil pump may allow air to be drawn into the lubricating system.

Valve — Stem Diameter

1. Measure the diameter of each intake and exhaust valve stem at the points shown. Verify the diameter is within specification.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



AUS00300

Valve — Stem to Valve Guide Clearance

Check the valve stem to valve guide clearance of each valve. With the cylinder head gasket face uppermost, slide a new inlet or exhaust valve as appropriate into the guide to be checked until the end of the stem is flush with the top of the valve guide.

Mount a dial indicator on the cylinder head gasket face so that the plunger can be positioned on the edge of the valve head at 90° to the camshaft axis.

With the dial indicator in this position and the end of the valve stem flush with the top of the guide, move the valve head from side to side at right angles to the camshaft axis as far as the clearance will allow and note the indicator reading.

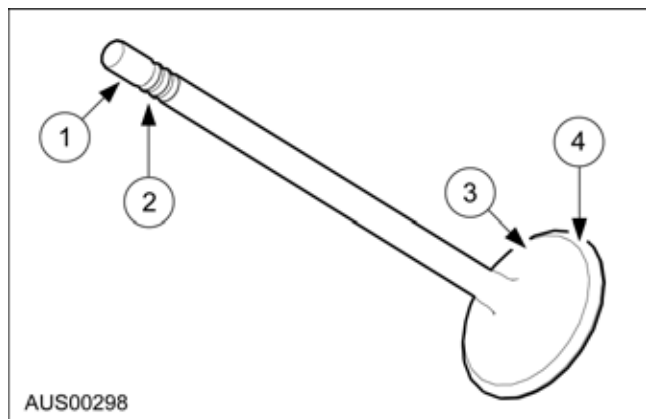
If the valve head deflection exceeds the specification for inlet or exhaust valves the guide in question is worn excessively and should be replaced.



GENERAL PROCEDURES (Continued)

Valve — Inspection

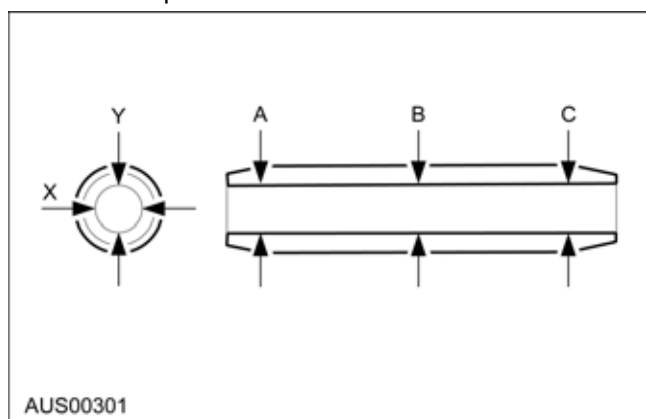
1. Inspect the following valve areas:
 1. The keeper grooves for burns and wear.
 2. The valve face and the edge for pits, grooves or scores.
 3. The valve head for signs of burning, erosion, warpage and cracking.
 4. The valve head thickness for wear.



Item	Description
1	End of stem
2	Keeper grooves
3	Valve head
4	Valve head thickness

Valve — Guide Inner Diameter

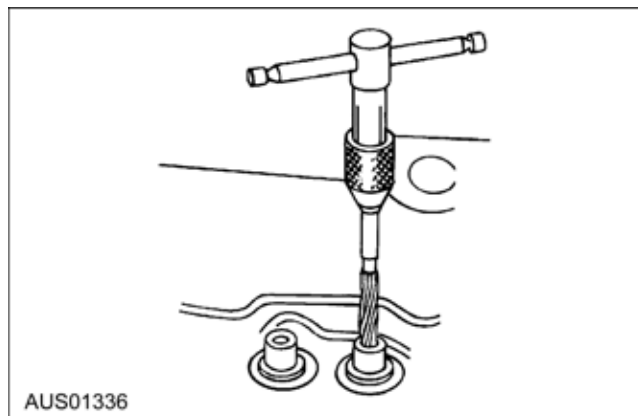
1. Measure the inner diameter of the valve guides in two directions where indicated.
 - For additional information, refer to Specifications in the appropriate section in Group 303.



2. If the valve guide is not within specifications, remove the valve guide and install a new valve guide.

Valve — Guide Reaming

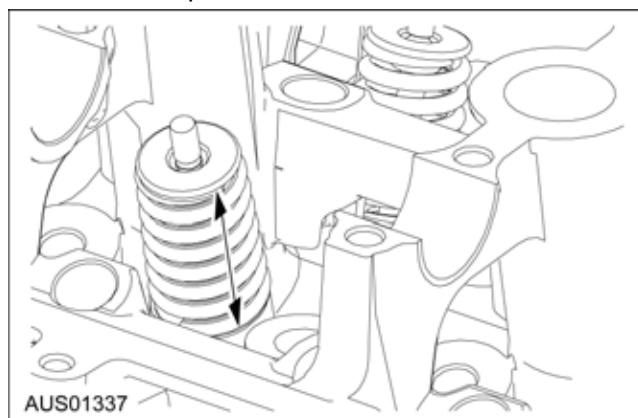
1. Use a hand-reaming kit to ream the valve guide.



2. Reface the valve seat.
3. Clean the sharp edges left by reaming.

Valve — Spring Installed Length

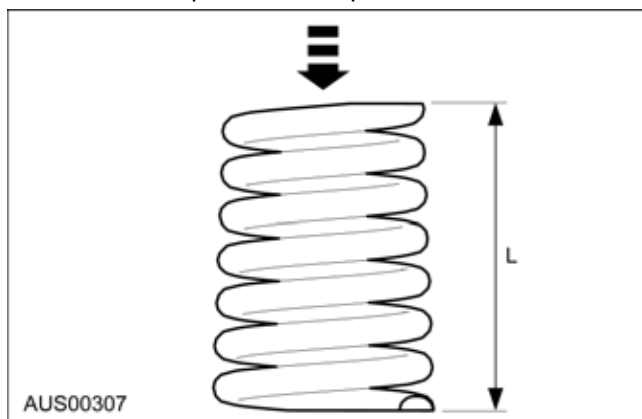
1. Measure the installed length of each valve spring.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components. Refer to the appropriate section in Group 303 for the procedure.



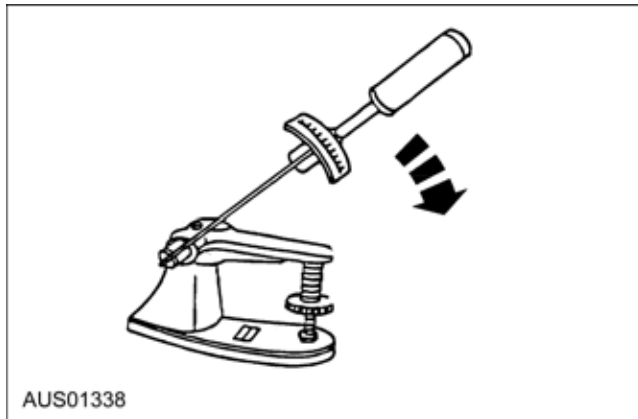
GENERAL PROCEDURES (Continued)

Valve — Spring Free Length

1. Measure the free length of each valve spring.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.

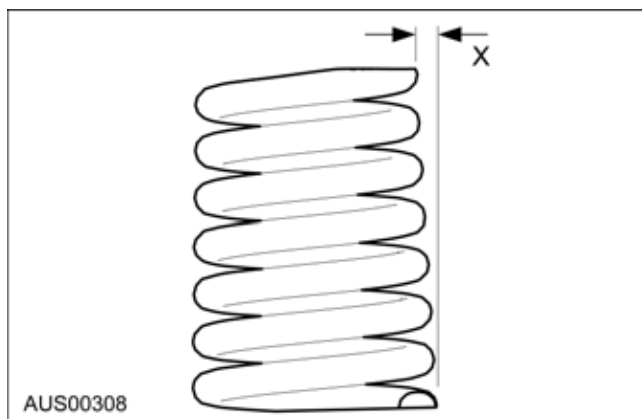


1. Use a valve/clutch spring tester to check the valve spring for correct strength at the specified valve spring length.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group 303 for the procedure.



Valve — Spring Squareness

1. Measure the out-of-square on each valve spring.
 - Turn the valve spring and observe the space between the top of the valve spring and the square. Install a new valve spring if out of square. Refer to the appropriate section in Group 303 for the procedure.

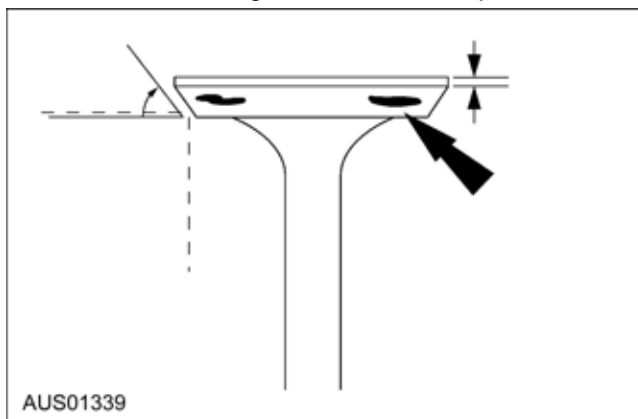


Valve — Seat Inspection


Valve and Seat Refacing Measurements

CAUTION: After grinding valves or valve seats, check valve clearance.

1. Check the valve head and seat.
 - Check valve angles.
 - Check margin width.
 - For additional information, refer to Specifications in the appropriate section in Group 303.
 - Be sure margin width is within specification.



Valve — Spring Strength

Special Tool(s)	
	Valve/Clutch Spring Tester 303-006 (TOOL-6513-DD) or equivalent

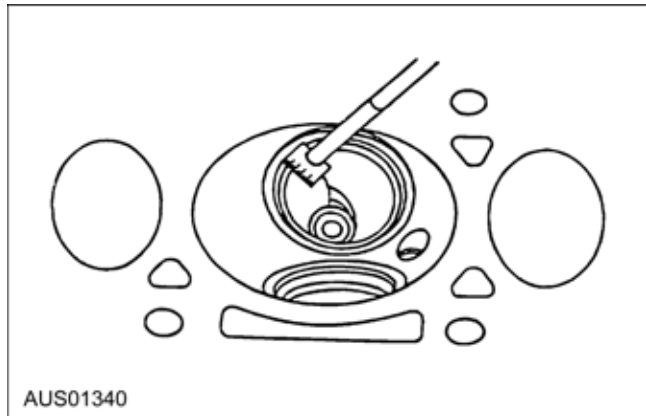
2. Inspect for abnormalities on the valve face and seat.



GENERAL PROCEDURES (Continued)

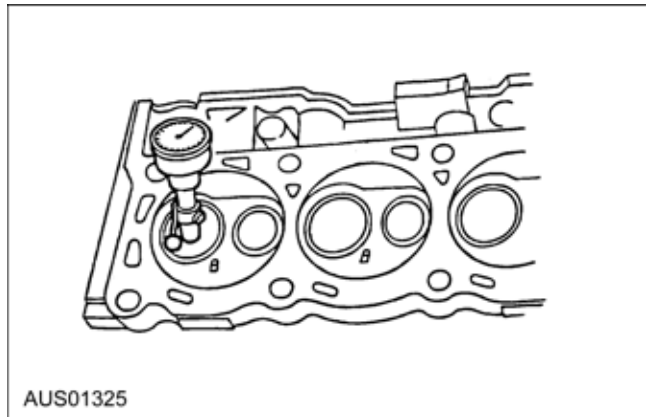
Valve — Seat Width

1. Measure the valve seat width. If necessary, grind the valve seat to specification.
 - Measure the intake valve seat width.
 - Measure the exhaust valve seat width.
 - Recheck the valve spring installed length after the seats have been ground.
 - For additional information, refer to Specifications in the appropriate section in Group 303.



Valve — Seat Runout

1. Use the valve seat runout gauge to check valve seat runout.




Cylinder Bore — Cleaning

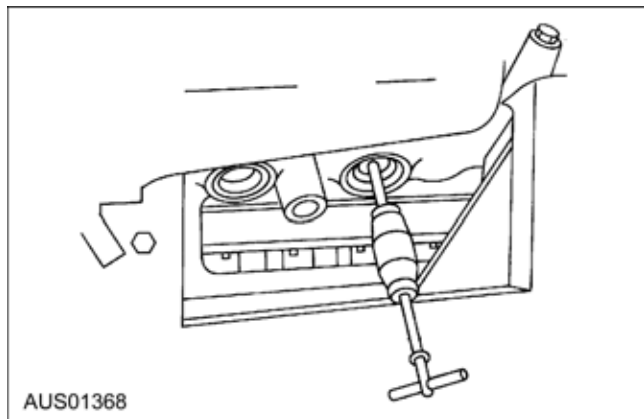
CAUTION: If these procedures are not followed, rusting of the cylinder bores may occur.

1. Clean the cylinder bores with soap or detergent and water.
2. Thoroughly rinse with clean water and wipe dry with a clean, lint-free cloth.
3. Use a clean, lint-free cloth and lubricate the cylinder bores.
 - Use super premium SAE motor oil meeting Ford specification.

Cylinder Block — Core Plug Replacement

Special Tool(s)	
 SST100-001	Impact Slide Hammer 100-001 (T50T-100-A)

1. Use a slide hammer or tools suitable to remove the cylinder block core plug.



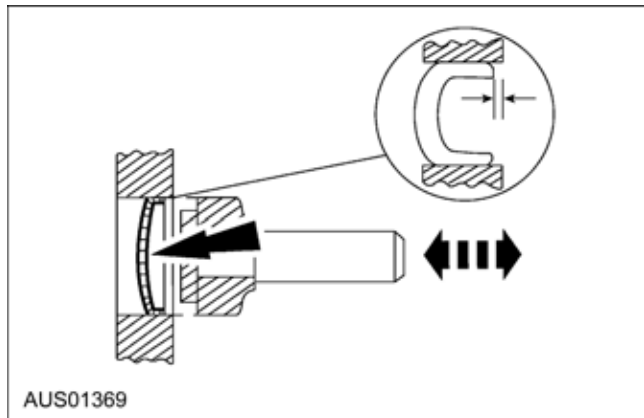
2. Inspect the cylinder block plug bore for any damage that would interfere with the correct sealing of the plug.

Cup-Type

CAUTION: Use care during this procedure so as not to disturb or distort the cup sealing surface.

CAUTION: When installed, the flanged edge must be below the chamfered edge of the bore to effectively seal the bore.

1. Use a tool suitable to seat the cup-type cylinder block core plug.

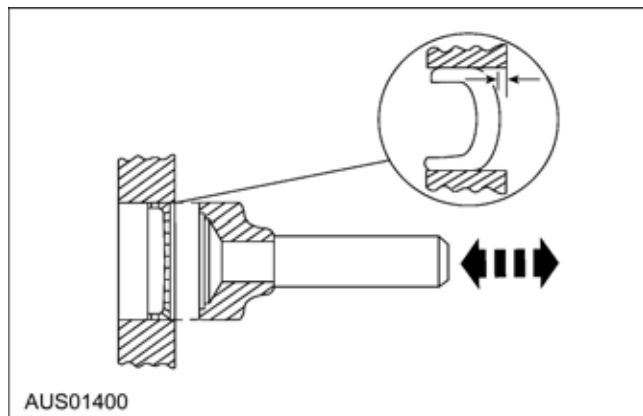


GENERAL PROCEDURES (Continued)

Expansion-Type

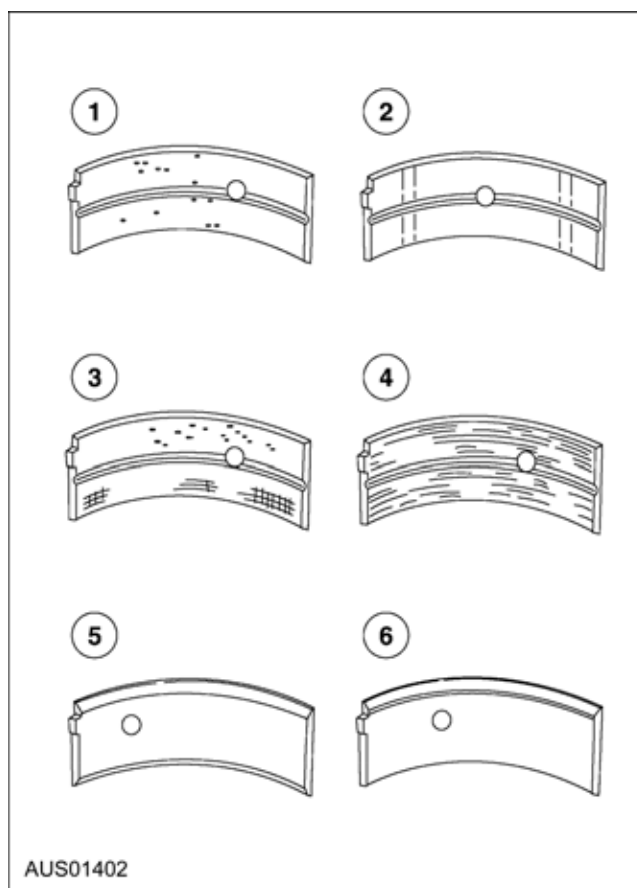
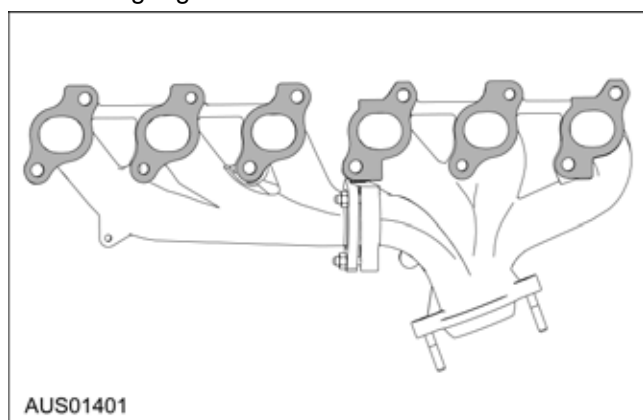
⚠ CAUTION: Do not contact the crown when installing an expansion-type cylinder block core plug. This could expand the plug before seating and result in leakage.

1. Use tool suitable to seat the expansion-type cylinder block core plug.



Exhaust Manifold — Inspection

1. Place a straight edge across the exhaust manifold flanges and check for warping with a feeler gauge.



Item	Description
1	cratering-fatigue failure
2	spot glazing-improper seating
3	scratching-dirty
4	base exposed-poor lubrication
5	both edges worn-journal damaged
6	one edge worn-journal tapered or bearing not seated

Bearing -Inspection

1. Inspect bearings for the following defects.
Possible causes are shown:
 1. cratering-fatigue failure
 2. spot glazing-improper seating
 3. scratching-dirty
 4. base exposed-poor lubrication
 5. both edges worn-journal damaged
 6. one edge worn-journal tapered or bearing not seated

