TT473: SYMPTOM BASED DIAGNOSTICS

2020-10-02

Other
Category

APPLIES TO	SYMPTOMS
All	• Symptom-Based Diagnostics

PURPOSE FOR TECHNICAL TIP BULLETIN

To assist the technician with diagnostics based on symptoms. These tips are suggestions that may help in troubleshooting the customer concerns.

Harley-Davidson recommends that this bulletin is viewed on Service Information Portal (SIP) only. Viewing this bulletin in a Portable Document Format (PDF) results in the loss of working links.

MARKETS AFFECTED

All markets are affected

HELPFUL HINTS FOR USING THIS BULLETIN

- The troubleshooting of this technical tip is a guide only and not an absolute to diagnosing technical problems.
- All customer concerns must be verified (duplicated) by the technician before performing repairs.
- Use the concerns listed for general troubleshooting along with the appropriate service or electrical diagnostic manuals.
- More than one condition may be present at the same time.
- Each concern may list several possible conditions and each condition must be evaluated by the technician.
- Only perform a correction if the condition exists.
- The tables and lists in this bulletin are in no particular order of importance.

TABLE OF CONTENT

VEHICLE HANDING

⚠ WARNING

Travel at speeds appropriate for road and conditions and never travel faster than posted speed limit. Excessive speed can cause loss of vehicle control, which could result in death or serious injury. (00008a)

- Do not exceed the legal speed limit or drive too fast for existing conditions. Always reduce speed when poor driving conditions exist. High speed increases the influence of any other condition affecting stability and increases the possibility of loss of control.
- Pay strict attention to road surfaces and wind conditions and keep both hands on the handlebar grips at all times when riding the motorcycle. Any two wheeled vehicle may be subject to upsetting forces such as wind blasts from passing trucks, holes in the pavement, rough road surfaces, rider control error, etc. These forces may influence the handling characteristics of your motorcycle. If this happens, reduce speed and guide the motorcycle with a relaxed grip to a controlled condition. Do not brake abruptly or force the handlebar. This may aggravate an unstable condition.

Wobble, Weave or Hop

Was the customers concern reproduced?

a. **Yes:** Continue to Table 2.

b. **No:** Document the findings and process the work order.

⚠ WARNING

Harley-Davidson parts and accessories are designed for Harley-Davidson motorcycles. Using non-Harley-Davidson parts or accessories can adversely affect performance, stability or handling, which could result in death or serious injury. (00001b)

⚠ WARNING

Be sure tires are properly inflated, balanced, undamaged, and have adequate tread. Inspect your tires regularly and see a Harley-Davidson dealer for replacements. Riding with excessively worn, unbalanced, improperly inflated, overloaded or damaged tires can lead to tire failure and adversely affect stability and handling, which could result in death or serious injury. (00014b)

Table 2.

Condition	Correction	Helpful Hints
Incorrect tire pressure.	See the owner's manual.	Tire pressure varies with changes in ambient and tire temperature. Always maintain proper tire pressure. See Specifications. Do not load tires beyond the Gross Axle Weight Rating (GAWR) specified in Specifications. Under-inflated, over-inflated or overloaded tires can fail.*(2)*
Improperly loaded motorcycle. Non-standard equipment such as heavy radio receivers, extra lighting equipment excess or unsecured luggage may cause unstable handling.	See the owner's manual for proper loading.	
Total load (people and gear) exceeds maximum Gross Vehicle Weight Rating (GVWR).	See the owner's manual for proper loading.	GVWR is the sum of the weight of the vehicle, accessories, rider, passenger and cargo that can be safely carried. Do not exceed the GAWR.
Non-Original Equipment Manufacturer (OEM) parts or accessories.	Use only Harley-Davidson approved parts and accessories. Use of certain other manufacturer's performance parts void the **new** vehicle warranty. See the dealer for specifications. *(1)*	See the owner's manual.
Improper sized handlebars, handlebar mounting or handlebar-mounted accessories.	Use only genuine motor parts and accessories for approved fitments.	
Incorrect suspension adjustment.	See the owner's manual.	Adjust the shock absorber preload for the total weight the motorcycle is to carry. Increase the preload to accommodate more weight. Reduce the preload if carrying less weight.

Table 2.

Condition	Correction	Helpful Hints
Irregular front/rear tire tread wear.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Incorrect, non-specified tire mounted on front or rear wheel.	Use only genuine motor parts and accessories for approved fitments.	See the owner's manual for specified tire information.
Damaged tires including sidewall bulging, punctures or visible cord material.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Improper front-rear tire combination or oversized wheels/tires.	Use only specified tires.	See the owner's manual for specified tire information.
Loose spokes (laced wheel vehicles only).	See the service manual for repair procedure.	
Rims and/or tires out-of-round or eccentric with hub.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Rims and/or tires out-of-true laterally.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Loose wheel axle nuts.	Tighten to recommended torque specification. See the service manual for repair procedure.	
Excessive wheel hub bearing play, damaged bearing or incorrect spacer.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Shock absorber not functioning normally.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Inspect for visible leaks at the shock absorber shaft. See the service manual for what constitutes a leak.

Table 2.

Condition	Correction	Helpful Hints
Tire and wheel unbalanced.	See the service manual for repair procedure.	The maximum weight aloud to balance the tire is 3.5 oz (99.2 g) (total weight applied to the rim). If more than 3.5 oz (99.2 g) of weight is required, rotate the tire 180° on the rim and again balance the assembly. Balance wheels within 0.5 oz (14 g). If excessive weight is required to balance the assembly, remove the tire and check wheel balance without a tire installed.
Steering head bearings improperly adjusted.	See the service manual for repair procedure.	
Rear fork pivot assembly: improperly tightened or assembled, or loose/pitted or damaged pivot bearings.	Correct adjustment and replace pitted or worn bearings and races. See the service manual for repair procedure.	With the rear wheel off the ground, shift the rear fork side to side and check for excessive movement. See the service manual for repair procedure.
Engine mounts and/or stabilizer links loose, worn or damaged.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Incorrect fork oil level.	See the service manual for repair procedure.	
Broken front fork internal spring or component.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Compare the front suspension compression with a similar motorcycle.
Damaged frame.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Refer to document: Replacement of Certain Damaged Parts. (English only)
(1) Read and understand warning (0001b or current version) at the beginning of this table. *(2) Read and understand warning (0014b or current version) at the beginning of this table.*		

DRIVE

Primary - Transmission Whirring or Knocking Sounds

Was the customers concern reproduced?

a. **Yes:** Continue to Table 3.

b. **No:** Document the findings and process the work order.

Table 3.

Condition	Correction	Helpful Hints
Low oil level.	See the service manual for repair procedure.	
Damaged or worn rear wheel compensator isolator.	See the service manual for repair procedure.	With the rear wheel on the ground, rock the rear wheel compensator sprocket to check for excessive movement in the isolators. Replace as needed.
Neutral rattle.	No correction required.	Normal condition. Use a similar motorcycle to compare. See Service Bulletin M1304.
Tight or loose primary chain.	See the service manual for repair procedure.	
Loose, damaged or worn compensator.	See the service manual for repair procedure.	
Loose stator screws.	See the service manual for repair procedure.	
Damaged stator and/or stator rotor.	See the service manual for repair procedure.	
Damaged or worn bearing-clutch hub, primary, transmission.	See the service manual for repair procedure.	
Damaged or worn transmission components. (Retaining segments, thrust washers or gears)	See the service manual for repair procedure.	
Damage, worn or bent shift forks.	See the service manual for repair procedure.	

ELECTRICAL AND FUEL

A Spark Plug Fouls Repeatedly

Was the customers concern reproduced?

a. **Yes:** Continue to Table 4.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 4.

- DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)

Table 4.

Condition	Correction	Helpful Hints
Incorrect calibration installed.	Verify correct Electronic Control Module (ECM) calibration for the vehicle configuration.	Use Digital Technician II (DT II) and review the system ID page.
Fuel mixture too rich/not tuned properly.	Verify correct ECM calibration and vehicle is properly tuned.	
Poor fuel quality/contamination.	See the owner's manual.	Drain and fill fuel tank with fresh and properly rated fuel.

Table 4.

Condition	Correction	Helpful Hints
Incorrect spark plugs for the vehicle.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Damaged/bad spark plug wire.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Corrosion on end of plug wires in coil.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Excessive oil carryover/consumption.	See the service manual for test procedure.	Verify that the oil tank is not overfilled.
Faulty or stuck fuel injector.	See the service manual for test procedure.	
Faulty oxygen sensor.	See the Electrical Diagnostic Manual (EDM) or DT II	Observe Live Data on DT II to verify function at operating temperature.
Pistons, piston rings and/or cylinders badly worn or damaged or second piston ring installed incorrectly.	See the service manual for repair procedure.	
Valve guides or seals badly worn.	See the service manual for repair procedure.	Visually inspect intake and exhaust ports before disassembly to isolate front or rear.

Pre-Ignition or Detonation (Knocks or Pings)

Was the customers concern reproduced?

a. **Yes:** Continue to Table 5.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 5.

- DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)
- INFRARED THERMOMETER (PART NUMBER: HD-50981)
- BORESCOPE (PART NUMBER: HD-50549)

Table 5.

Condition	Correction	Helpful Hints
Fuel octane rating too low.	See the owners manual.	
Poor fuel quality/contamination.	See the owners manual.	
Low fuel pressure.	See the service manual for test procedure.	
Incorrect calibration for the vehicle configuration.	Verify correct Electronic Control Module (ECM) calibration.	

Table 5.

Condition	Correction	Helpful Hints
Excessive heat/engine temperature.	Use Digital Technician II (DT II) to review Diagnostic Trouble Codes (DTCs) and to view Live Data.	Use the infrared thermometer to compare the variance of temperature between the front and rear cylinder heads. If a large variance is observed, removed oil/coolant manifold to verify that all passageways are clear in the manifold and the cylinder heads. If no variance is observed but excessive heat exists, see Service Bulletin M1450.
Faulty spark plugs.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Incorrect spark plugs for the kind of service.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Defective/damaged spark plug wire.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Intake manifold leak.	See the service manual for test procedure.	Propane injected into air cleaner can cause faulty readings. Always aim nozzle far away from air cleaner to prevent false readings.
Ignition timing advanced due to faulty sensor inputs (Crankshaft Position (CKP), Throttle Position Sensor (TPS), Temperature, Intake Air / Manifold Absolute Pressure (TMAP)).	See the Electrical Diagnostic Manual (EDM) or DT II.	Perform a Motorcycle Condition Report in DT II to verify typical scan values. Review the live or recorded data of the operating temperature. Look for values that are out of range and isolate a concern.
Ignition timing advanced due to defective ECM.	See the EDM or DT II.	Perform a Motorcycle Condition Report in DT II to verify typical scan values. Review the live or recorded data of the operating temperature. Look for values that are out of range and isolate a concern.
Excessive carbon build-up on top of piston.	Use the borescope in the front and rear cylinders to inspect for excessive carbon deposits.	Carbon build deposits are typical. Verify that the deposits are excessive by comparison to a comparable motorcycle that is not experiencing a concern.

Overheating

Was the customers concern reproduced?

a. **Yes:** Continue to Table 6.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 6.

- DIGITAL TECHNICIAN II (PART NUMBER: HD-48650)
- INFRARED THERMOMETER (PART NUMBER: HD-50981)
- CRANKSHAFT LOCKING TOOL (PART NUMBER: HD-52252)

Table 6.

Condition	Correction	Helpful Hints
Fuel mixture too lean/not tuned properly.	Verify correct Electronic Control Module (ECM) calibration and that the vehicle is properly tuned.	
Insufficient oil supply or oil not circulating.	See the service manual for repair procedure.	
Insufficient air flow over engine and/or radiators.	Use only genuine motor parts and accessories for approved fitments. Verify that there are no obstructions and/or restrictions to the engine and/or radiators.	
Low coolant level.(1)	See the service manual for repair procedure.	
Air in coolant system.(1)	See the service manual for repair procedure.	
Defective coolant pressure cap.(1)	See the service manual for repair procedure.	
Coolant pump or fans inoperative.(1)	See the Electrical Diagnostic Manual (EDM) or Digital Technician II (DT II).	
Vent hose crimped.(1)	Check for damage or pinched vent line.	
Defective coolant temperature sensor.(1)	See the EDM or DT II.	Observe Live Data on DT II to compare Engine Temperature (ET) sensor value and Engine Coolant Temperature (ECT) sensor value.

Table 6.

Condition	Correction	Helpful Hints
Restricted oil/coolant flow through cylinder heads, manifold or hoses.	See the service manual for repair procedure.	Use the infrared thermometer to compare the variance of temperature between the front and rear cylinder heads. If a large variance is observed, remove oil/coolant manifold to verify that all passageways are clear in the manifold and the cylinder heads.
Leaking cylinder head valves or low cylinder compression.	See the service manual for test procedure.	Use the crankshaft locking tool to keep the flywheel from moving for accurate measurements. Other tools may be used to keep the flywheel from moving on other that Milwaukee-Eight® models. See the service manual.[(2)]
Ignition timing retarded due to defective ECM or faulty sensors (Temperature, Intake Air / Manifold Absolute Pressure (TMAP) and/or Crankshaft Position (CKP)).	See the EDM or DT II.	
Excessive carbon build-up on top of piston.	Carbon build deposits are typical.	Verify that the deposits are excessive by comparison to a comparable motorcycle that is not experiencing a concern.

(1) Twin-Cooled™ and Precision Cooled engines only.

(2) The crankshaft locking tool (HD-52252) only apply to the Milwaukee-Eight engines only.

ENGINE

Engine Valve Train Sounds

Was the customers concern reproduced?

a. **Yes:** Continue to Table 7.

b. **No:** Document the findings and process the work order.

Proper use of a stethoscope helps isolate the location of the concern. Use a stethoscope to isolate the sound to a specific compartment.

Table 7.

Condition	Correction	Helpful Hints
Low or improper oil level.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	

Table 7.

Condition	Correction	Helpful Hints
Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.	See the service manual for test procedure.	
Incorrect pushrod length/ bent pushrod.	See the service manual for repair procedure.	
Parts and Accessories (P&A) adjustable pushrod contacting the inside of pushrod tube, adjustable pushrod out of adjustment or loose jamnut.	Adjust pushrods per I-Sheet.	Inspect the upper pushrod tube for witness marks of the P&A pushrod contacting the tube.
Rocker arm binding on shaft.	See the service manual for repair procedure.	Inspect rocker arm to verify that the oil passages are clear.
Loose rocker arm shaft or fastener.	See the service manual for repair procedure.	
Broken valve spring.	See the service manual for repair procedure.	Inspect the valve spring with the rocker covers off. Rotate the spring by hand to inspect the entire spring.
Damaged or worn hydraulic lifters.	See the service manual for repair procedure.	
Excessive clearance lifter to lifter bore.	See the service manual for repair procedure.	
Cam gear spacing incorrect.	See the service manual for repair procedure.	
Cam timing incorrect.	See the service manual for repair procedure.	
Damaged or worn cam chain tensioning spring or shoe.	See the service manual for repair procedure.	
Damaged cam gear or loose on pinion shaft.	See the service manual for repair procedure.	Remove bolt from pinion shaft and inspect gear to shaft fitment. Excessive movement can be observing while manually rocking the rear wheel (In gear) back and forth.
Damaged or worn cams, cam gears or cam bushings.	See the service manual for repair procedure.	
Damaged or worn cam bearing in crankcase or cam support plate.	See the service manual for repair procedure.	
Excessive valve to guide clearance.	See the service manual for repair procedure.	

Table 7.

Condition	Correction	Helpful Hints
Valve sticking in guide. Low cylinder compression or high leak-down.	See the service manual for test procedure.	Use flywheel locking tool for accurate measurements.
Valve seat loose in head.	See the service manual for repair procedure.	With engine running at operating temperature and noise present, apply cold water to the exhaust side of the cylinder head. If the noise quiets when cold water is applied, then a loose valve seat is likely.

Engine Knocking Sounds

Was the customers concern reproduced?

a. **Yes:** Continue to Table 8.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 8.

- BORESCOPE (PART NUMBER: HD-50549)

Proper use of a stethoscope helps isolate the location of the concern. Use a stethoscope to isolate the sound to a specific compartment.

Table 8.

Condition	Correction	Helpful Hints
Fuel octane rating too low causing pre-ignition or detonation (use pre-ignition or detonation worksheet).	See the owners manual.	
Loose fuel tank fasteners.	Verify torque of fuel tank fasteners.	
Damaged, worn or loose engine mounts/stabilizer.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Low or improper oil level.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Low or no oil pressure.	See the service manual for test procedure.	
Damaged, worn or loose compensator.	See the service manual for repair procedure.	
Excessive piston to cylinder clearance or abnormal piston wear/scuffing.		See Service Bulletin M1450.
Excessive connecting rod to piston pin clearance.	See the service manual for repair procedure.	

Table 8.

Condition	Correction	Helpful Hints
Damaged, worn, tight or binding connecting rods/rod bearings	See the service manual for repair procedure.	
Counterbalancer scissors gear not preloaded. (1)	See the service manual for repair procedure.	
Counterbalancer bearings worn or damaged.(1)	See the service manual for repair procedure.	
Flywheels runout exceeds service wear limit.	See the service manual for measuring procedure.	
Crankcase main bearings that are loose in crankcase.	See the service manual for repair procedure	
Excessive carbon build-up on top of piston.	Use the borescope in the front and rear cylinders to inspect for excessive carbon deposits.	Carbon build deposits are typical. Verify that the deposits are excessive by comparison to a comparable motorcycle that is not experiencing a concern.
(1) Milwaukee-Eight® engine only.		

Oil Does Not Return To Oil Reservoir

Was the customers concern reproduced?

a. **Yes:** Continue to Table 9.

b. **No:** Document the findings and process the work order.

Table 9.

Condition	Correction	Helpful Hints
Low or improper oil level.	See the owners manual.	See Service Bulletin M1450.
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Restricted oil filter.	Replace oil filter. Use only genuine motor parts and accessories for approved fitments.	Cut the oil filter open and inspect for blockage.
Damaged/worn or malfunctioning oil pump.	See the service manual for repair procedure.	Always perform the "Milwaukee-Eight® (MKE-8) - Cam Support Plate Tightening Sequence" when installing the oil pump.
O-ring damaged or missing from oil pump/crankcase junction.	See the service manual for repair procedure.	See Service Bulletin M1450.
Restriction in oil lines, oil manifold, oil cooler or cylinder heads.	See the service manual for repair procedure.	Remove oil manifold to verify that all passageways are clear in the manifold and the cylinder heads.

Oil Consumption or Smoking

Was the customers concern reproduced?

a. **Yes:** Continue to Table 10.

b. **No:** Document the findings and process the work order.

Table 10.

Condition	Correction	Helpful Hints
Oil reservoir overfilled.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Restricted oil filter.	Use only genuine motor parts and accessories for approved fitments.	Cut the oil filter open and inspect for blockage.
Restriction in oil lines, oil manifold, oil cooler or cylinder heads.	See the service manual for repair procedure.	Remove oil manifold to verify that all passageways are clear in the manifold and the cylinder heads.
Restricted breather operation.	See the service manual for repair procedure.	Always inspect for restricted breather passages or breather tubes to air cleaner.
Fuel mixture too rich/not tuned properly.	Verify correct Electronic Control Module (ECM) calibration and that the vehicle is properly tuned.	
Damaged/worn or malfunctioning oil pump.	See the service manual for repair procedure.	Always perform the "Milwaukee-Eight® (MKE-8) - Cam Support Plate Tightening Sequence" when installing the oil pump.
Piston rings badly worn or broken.	See the service manual for repair procedure.	
Valve guides or seals worn or damaged.	See the service manual for repair procedure.	
Damaged, worn or missing oil pump O-ring.	See the service manual for repair procedure.	
Blockage in the crankcase scavenge port.	See the service manual for repair procedure.	See Service Bulletin M1450.
Oil diluted with gasoline.	Use only genuine motor parts and accessories for approved fitments.	

Engine Leaks Oil From Cases, Pushrods, Hoses or Covers

Was the customers concern reproduced?

a. **Yes:** Continue to Table 11.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 11.

- BLACK LIGHT LEAK DETECTOR (PART NUMBER: HD-35457)

Table 11.

Condition	Correction	Helpful Hints
Oil reservoir overfilled.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) parts or accessories.	Use only genuine motor parts and accessories for approved fitments.	
Restricted breather operation.	See the service manual for repair procedure.	Always inspect for restricted breather passages or breather tubes to air cleaner.
Non-OEM oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Restricted oil filter.	Use only genuine motor parts and accessories for approved fitments.	Cut the oil filter open and inspect for blockage.
Loose fasteners.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	When using threadlocker, always use the proper type and follow the instructions listed in the service manual.
Damaged or worn seals, gaskets or O-rings.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Incorrectly installed gasket, seal or O-ring (upside down).	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	
Restriction in oil lines, oil manifold, oil cooler or cylinder heads.	See the service manual for repair procedure.	Remove oil manifold to verify that all passageways are clear in the manifold and the cylinder heads.
Damaged, worn or imperfect machined surfaces.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Always check sealing surfaces to verify that they are flat and straight.
Porosity in engine components.	See the service manual for repair procedure. Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Use black light detector.

Low Oil Pressure

Was the customers concern reproduced?

a. **Yes:** Continue to Table 12.

b. **No:** Document the findings and process the work order.

Table 12.

Condition	Correction	Helpful Hints
Low or improper oil level.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Damaged or malfunctioning oil pressure sending unit.	Use only genuine motor parts and accessories for approved fitments.	Verify actual oil pressure by performing the test procedure in the service manual.
Damaged or worn oil check valve.(1)	See the service manual for repair procedure.	
Pressure regulating valve stuck open.	Check for debris holding valve open or weak/broken spring.	
Damaged/worn or malfunctioning oil pump.	See the service manual for repair procedure.	Always perform the "Milwaukee-Eight® (MKE-8) - Cam Support Plate Tightening Sequence" when installing the oil pump.
O-ring damaged or missing from oil pump/crankcase junction.	See the service manual for repair procedure.	See Service Bulletin M1450.
O-ring damaged or missing from the crankcase/cam support plate junction.	See the service manual for repair procedure.	
(1) Oil cooled Milwaukee-Eight® engine only.		

High Oil Pressure

Was the customers concern reproduced?

a. **Yes:** Continue to Table 13.

b. **No:** Document the findings and process the work order.

Table 13.

Condition	Correction	Helpful Hints
Improper oil level.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) oil & oil filter that does not meet Harley-Davidson specifications.	Use only genuine motor parts and accessories for approved fitments.	
Damaged or malfunctioning oil pressure sending unit.	Use only genuine motor parts and accessories for approved fitments.	Verify actual oil pressure by performing the test procedure in the service manual.
Damaged or worn oil check valve.(1)	See the service manual for repair procedure.	
Restricted oil filter.	Use only genuine motor parts and accessories for approved fitments.	Cut the oil filter open and inspect for blockage.

Table 13.

Condition	Correction	Helpful Hints
Restriction in oil lines, oil manifold, oil cooler or cylinder heads.	See the service manual for repair procedure.	Remove oil manifold to verify that all passageways are clear in the manifold and the cylinder heads.
Pressure regulating valve stuck closed.	Verify smooth operation of plunger in oil pump body.	
Damaged/worn or malfunctioning oil pump.	See the service manual for repair procedure.	Always perform the "Milwaukee-Eight® (MKE-8) - Cam Support Plate Tightening Sequence" when installing the oil pump.
(1) Oil cooled Milwaukee-Eight® engine only.		

LOAD AND MOVMENT OF ITEMS

Proper use of a stethoscope helps isolate the location of the concern. Use a stethoscope to isolate the sound to a specific compartment.

Components That are Typically Affected by Loading the Powertrain

- Rods & rod bearings
- Cylinders & pistons
- Compensator components
- Primary chain & chain adjuster components
- Clutch shell & clutch hub bearing
- Drive belt
- Rear wheel compensator
- Transmission

Components That are Not Typically Affected by Loading the Powertrain

- Balancer & balancer bearings
- Cam & lifters
- Pushrods, rocker arms, valves & valve seats

Components That Move at Flywheel Speed

- Pistons
- Rods & rod bearings
- Main bearings

Components That Move at 50% of Flywheel Speed

- Cam & lifters
- Pushrods, rocker arms, valves & valve seats

Excessive Vibration

Was the customers concern reproduced?

a. **Yes:** Continue to Table 14.

b. **No:** Document the findings and process the work order.

Special tool that could be used in Table 14.

- FAT JACK (PART NUMBER: HD-45968)

Table 14.

Condition	Correction	Helpful Hints
Improper tire inflation.	See the owners manual.	
Non-Original Equipment Manufacturer (OEM) parts or accessories.	Use only genuine motor parts and accessories for approved fitments.	
Unbalanced weight distribution or excessive weight in saddlebags/tour-pack.	See the owners manual.	
Incorrect drive belt adjustment.	See the service manual for repair procedure.	
Incorrect suspension settings or damaged components.	See the owners manual.	
Wheels/tires out of balance.	See the service manual for repair procedure.	If excessive weight is required to balance a wheel and tire, remove tire and check wheel balance without a tire installed.
Wheels bent or damaged and/or tires worn or damaged.	See the service manual for repair procedure.	
Engine mounts and/or stabilizers loose/worn/damaged or binding. Misaligned and/or out of position engine mounts.	See the service manual for repair procedure.	• Raise rear wheel off the ground using a fat jack and supporting the frame only. • Loosen engine mounts and stabilizer fasteners. • Verify that the notches on engine mounts align with the tabs on the mount brackets. • Loosen the exhaust mount fasteners. • Start engine, allow it to idle for 1 min. • Torque all fasteners to specification and test again.

Table 14.

Condition	Correction	Helpful Hints
Exhaust system binding, exhaust contacting the frame or footboard brackets.	See the service manual for repair procedure.	• Raise rear wheel off the ground using a fat jack and supporting the frame only. • Loosen engine mounts and stabilizer fasteners. • Verify that the notches on engine mounts align with the tabs on the mount brackets. • Loosen the exhaust mount fasteners. • Start engine, allow it to idle for 1 min. • Torque all fasteners to specification and test again.
Foreign object lodged in a position that impedes engine mounts from functioning correctly.		Road debris or a lost fastener can become lodged between the powertrain and the frame or the powertrain and the belt.
Engine to transmission mounting bolts loose.	See the service manual for repair procedure.	
Rear fork pivot shaft fasteners loose.	See the service manual for repair procedure.	
Damaged or worn primary drive components.	See the service manual for repair procedure.	
Damaged or worn internal engine components.	See the service manual for repair procedure.	
Damaged frame.	Replace worn or damaged parts. Use only genuine motor parts and accessories for approved fitments.	Refer to document: Replacement of Certain Damaged Parts. (English only)

DRIVE AND TRANSMISSION

Motorcycle Shifts Hard

Was the customers concern reproduced?

a. **Yes:** Continue to Table 15.

b. **No:** Document the findings and process the work order.

Table 15.

Condition	Correction	Helpful Hints
Non-Original Equipment Manufacturer (OEM) parts or accessories.	Use only genuine motor parts and accessories for approved fitments.	
Binding, obstructed or corroded shifter lever shaft and/or linkage.	See the service manual for repair procedure.	
Shifter arm and pawl assembly binding.	See the service manual for repair procedure.	
Clutch not adjusted properly or fully disengaging/dragging.	See the service manual for repair procedure.	• Verify proper clutch adjustment and/or clutch cable adjustment. • Verify clutch lift with a dial indicator. • Inspect sliding surfaces of the clutch hub and shell for damage and/or wear.
Excessive mainshaft runout.	See the service manual for repair procedure.	
Excessive mainshaft end play.	See the service manual for repair procedure.	
Shifter return spring (inside transmission) bent or otherwise damaged.	See the service manual for repair procedure.	
Bent shift fork shaft and/or shift forks.	See the service manual for repair procedure.	
Damaged or worn transmission bearings.	See the service manual for repair procedure.	
Corners worn off shifter clutch dog rings and/or pockets (inside transmission).	See the service manual for repair procedure.	

Motorcycle Jumps Out of Gear

Was the customers concern reproduced?

a. **Yes:** Continue to Table 16.

b. **No:** Document the findings and process the work order.

Table 16.

Condition	Correction	Helpful Hints
Rider error (keeping foot rested on shifter)	See the owners manual.	Educate rider and create realistic expectations.
Aftermarket modifications	Use only genuine motor parts and accessories for approved fitments.	
Shifter rod and/or shift peg improperly adjusted.	See the service manual for repair procedure.	Adjust shift rod and shift peg for the riders-specific footwear.

Table 16.

Condition	Correction	Helpful Hints
Damaged or worn shift drum detent.	See the service manual for repair procedure.	
Damaged or worn shifter forks.	See the service manual for repair procedure.	
Damaged or worn transmission gears.	See the service manual for repair procedure.	
Damaged or worn shifter dog ring.	See the service manual for repair procedure.	
Damaged or worn transmission bearings.	See the service manual for repair procedure.	

Clutch Slips, Drags or Does Not Release Properly

Was the customers concern reproduced?

a. **Yes:** Continue to Table 17.

b. **No:** Document the findings and process the work order.

Table 17.

Condition	Correction	Helpful Hints
Rider abuse.	See the owners manual.	Educate rider and create realistic expectations.
Aftermarket modifications.	Use only genuine motor parts and accessories for approved fitments.	
Clutch master cylinder reservoir overfilled.	See the service manual for repair procedure.	
Clutch lever not returning completely.	See the service manual for repair procedure.	Inspect clutch lever and master cylinder for damage.
Improper clutch/cable adjustment.	See the service manual for repair procedure.	
Damaged or binding clutch cable.	See the service manual for repair procedure.	
Improperly routed clutch cable.	See the service manual for repair procedure.	Verify proper routing and visually inspect line.
Damaged/pinched clutch line.	See the service manual for repair procedure.	
Damaged or binding secondary clutch actuator.	See the service manual for repair procedure.	
Insufficient clutch spring tension.	See the service manual for repair procedure.	Verify that the proper clutch spring is installed for the current vehicle configuration.
Damaged or worn clutch hub and/or clutch shell.	See the service manual for repair procedure.	
Damaged or worn friction discs.	See the service manual for repair procedure.	

Brake Not Operating As Expected

Was the customers concern reproduced?

a. **Yes:** Continue to Table 18.

b. **No:** Document the findings and process the work order.

NOTICE

Do not allow dirt or debris to enter the master cylinder reservoir. Dirt or debris in the reservoir can cause improper operation and equipment damage. (00205c)

Special tool that could be used in Table 18.

- DOT 4 BRAKE FLUID MOISTURE TESTER (PART NUMBER: HD-48497-A)

Table 18.

Condition	Correction	Helpful Hints
Brake fluid contamination.	See the service manual for repair procedure.	• At every service, check moisture content of fluid using moisture tester. Follow the instructions included with tool. • Flush brake system every two years. Replace DOT 4 Brake Fluid sooner if brake fluid test shows that moisture content is 3% or greater. • Brake fluid is never added or removed from the system during **normal** wear. The exception for brake fluid replacement, see the maintenance schedule. • With normal brake wear, the fluid level in reservoir decreases. Reservoir volume is adequate to provide fluid to the wear limits of the pads and rotors. *(1)*
Aftermarket modifications.	Use only genuine motor parts and accessories for approved fitments.	
Brake fluid reservoir low.	See the service manual for repair procedure.	
Brake system leaks.	See the service manual for repair procedure.	

Table 18.

Condition	Correction	Helpful Hints
Brake system contains air bubbles.	See the service manual for repair procedure.	
Damaged or worn brake line.	See the service manual for repair procedure.	
Damaged, worn or warped brake disc.	See the service manual for repair procedure.	
Damaged or worn wheel bearing.	See the service manual for repair procedure.	
Damaged or worn brake master cylinder.	See the service manual for repair procedure.	
Damaged or worn brake caliper.	See the service manual for repair procedure.	
Damaged or worn Anti-lock Braking System - Hydraulic Control Unit (ABS HCU)	See the service manual for repair procedure.	
(1) Read and understand warning (00205c or current version) at the beginning of this table.		