Kawasaki KLR650 Upgrades

Improving the workhorse of dual-sport motorcycles

by Ken Freund

KAWASAKI'S **KLR650,** FIRST sold just after dirt was invented, has a well-earned reputation as a rugged, reliable and affordable machine which can be ridden almost anywhere. In fact, mine took me from California through Central America to Panama without a single problem. But even these work-horses have some weak points which are well documented in various online owner forums. In this article we'll address three areas for improvement: cooling, braking and engine internals.

Thermo-Bob

Kawasaki cut some corners in the KLR's cooling system, and the Thermo-Bob modifies it to work the same way that automotive systems have for decades. Stock KLRs run too cool in temperatures below about 80° F, and the colder it gets, the colder the engine runs. In chilly weather with the stock system, the engine never fully warms up, and surges of cold coolant reach the bottom of the cylinder about every 30 seconds.

Warmer operating temperatures have been shown to extend engine life and oil-change intervals, and improve fuel economy. Thermo-Bob raises the normal operating temperature of the upper cylinder from 160° to 195° F. and raises the coolant temperature near the bottom of

COOLING

1 The Thermo-Bob installation is straightforward, and only the radiator's inlet (shown) and return hoses need to be removed.

2 The return hose is a little more difficult to access but not terribly. Of course, the coolant is drained beforehand.

3 Clear directions tell you where to cut the hoses to place the new parts in the system and we've marked them before cutting.

4 This close-up shows the new Thermo-Bob billet aluminum thermostat housing and brass return line fitting installed.

5 Above shows the full length of the hoses and the positions of the new parts as they fit into the system.

6 With the hoses prepared, you can simply reinstall the parts. Here a new O-ring is fitted to be sure of a leak-free connection.

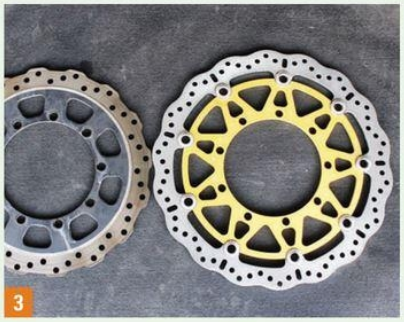
7 To accurately check on the changes with the Thermo-Bob installed, we added a calibrated face to the dashboard's temp gauge.

8 While the standard gauge gave an indeterminate scale from hot to cold, the new face plate adds accurate numbers to the range.

9 With the gauge reassembled, you can see how the face looks when illuminated. The numbers are claimed accurate within 2°-4°.

Installing the EBC disc kit starts with wheel removal. You'll also find it helpful to loosen the disc mounting bolts beforehand.

With the wheel off, the stock disc can be removed. Note that the old disc is fixed, not floating, which also reduces brake feel.



A comparison of the old 280mm disc with EBC's 320mm replacement. The new disc uses an alloy carrier for lighter weight.

The new disc is installed with the old bolts. Be sure to use Locktite on the bolt threads to prevent any loosening over time.

Use a screwdriver or tire iron to retract the caliper pistons before installing the new brake pads, so they allow room for the disc.

EBC's sintered HH pads installed. These pads have a higher coefficient of friction for even stronger bite on the larger disc.

The Eagle caliper adapter installed. Note how the brake hose routing clip now pulls on the stock brake line, making it too short.

With the longer Russell braided brake line, the bend is no longer a problem. The braided line expands less, for a better lever feel.

We found conventional bleeding of the dry brake hose too tedious (above), so we used a Mityvac pump to simplify this operation.

the cylinder from as cold as 30° in winter (according to the manufacturer's tests) to 185° F. Getting up to normal operating temperature and holding it steady should reduce problems with uneven cylinder wear, which is common in KLRs and leads to lost power and increased oil consumption. As a side benefit, a warmer engine also cleans up exhaust emissions.

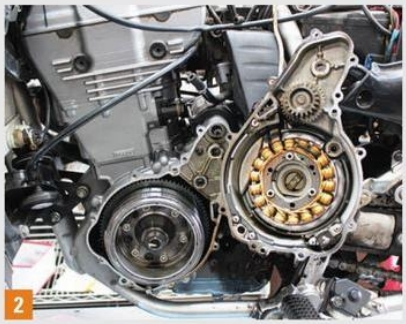
Thermo-Bob was designed and tested extensively by Bill Watson, who is a very detail-oriented mechanical engineer. Thermo-Bob consists of a precision-machined aluminum external thermostat housing with a 195° thermostat and bypass components. It allows coolant to circulate freely in the engine to eliminate hot spots, while bypassing the radiator during warm-up. This speeds warm-up and eliminates cold coolant surges.

Installation is fairly simple and can be done by most intermediate DIYers in about an hour. The kit comes with everything needed and thorough instructions are emailed when you order the kit. Essentially, the gas tank is removed for access, the coolant is drained, and the stock thermostat is removed. Preparation can be done on a workbench. A few hoses must be trimmed to size and clamped in place, along with mounting the Thermo-Bob housing. After everything is in place and clearances are checked, the coolant is replenished and the tank reinstalled.

To monitor the engine's temperatures, we also installed a temperature gauge overlay, which provides actual numbers in place of the graphic lines on the stock gauge. Installation requires that the gauge cluster be removed and disassembled. This should be done carefully with clean hands on a clean work bench. Bill told us that his tests have shown that actual temperatures are within 2°–4° of the temperatures displayed on the new gauge face. It's a worthy addition to the Thermo-Bob. Complete instructions are at: www.wattman.com/uploads/LF_install.pdf

DOOHICKEY

Tackling the doohickey begins with draining the oil, removing the skid plate and getting the shift lever out of the way.

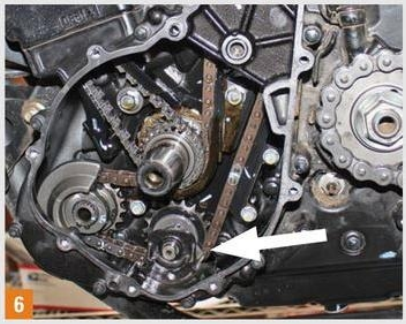


The outer cover isn't particularly hard to remove but the magnets make it harder than you'd figure after the 10 bolts are removed.

To remove the rotor's holding bolt, you must use a holding tool. Use a fresh bolt for refitting as it requires 130–144 lb.-ft. of torque.

Because it's tightly mounted on a tapered shaft, the rotor requires a puller to remove, here shown in position.

The intermediate gears must also be removed. Note their exact orientations so you can easily replace in the same position.



With everything out of the way, the doohickey itself is visible at the bottom center of the engine, tensioning the lower chain.

With the Thermo-Bob installed, the engine warms up much faster, and then levels off, maintaining a steady 185°–195°. The only time it goes above that is during hot weather and extended idling, which the thermostat cannot control because it is already wide open. I've used it now for several months during winter and it has performed flawlessly.

Costs: The Thermo-Bob kit is $125.

Brakes

The KLR650's small fixed single disc front brake continues to be a weak point, particularly at highway speeds. Although the KLR's brakes were upgraded in 2008—switched to a 280mm front disc from a 260mm with a twin-piston caliper to replace a single-piston unit—they still could use some help. EBC Brakes sells an oversize semi-floating 320mm front rotor which bolts to the stock hub along with an adapter bracket that repositions the original caliper to fit. The larger disc diameter gives the caliper more leverage against the spinning wheel. EBC also manufactures HH-rated replacement brake pads (# FA228HH for models 2008 & newer) which have a much higher coefficient of friction than the stock pads, further aiding stopping power.

EBC's pads use sintered metal technology and its HH rating is the highest friction rating available for stronger stopping power. The pads contain molybdenum and tungsten additives to improve friction performance for the life of the pad. EBC notes that there's no lead, iron or steel in the matrix and the lining material was designed for heat-cycle stability so the pads cool quickly and perform consistently.

The larger-diameter brake rotor was designed with super-motard conversions in mind, but also reduces ground clearance a bit when rock crawling off-road, so keep that in mind. Kits are available for both early, 2007-and-older models and 2008-and-newer models. Installation should typically require about an hour. The bike needs to be jacked up so the front wheel is off the ground. The front wheel, rotor and caliper are removed and the new parts installed with blue Loctite on the threads. However, we had a slight interference problem between caliper and rotor using the EBC-supplied extender bracket, and switched over to an ingenious bracket designed and made by Eagle Manufacturing which replaces the stock caliper mount and fits perfectly using all stock fasteners.

We also found that when the caliper is moved out, the stock brake hose is too short. A Russell braided-stainless-sheathed brake line kit (RO8380, available from Eagle) proved to be longer and is more resistant to swelling under pressure, which improves brake lever feel and looks nice, too. Whenever you change brake hoses, bleeding can be very time-consuming, but a Mityvac suction pump saved the day. The end result of the rotor swap is shorter, more confidence-inspiring stops from higher speeds. Lever effort is also reduced, yet it's still easy to modulate the front brake, even during hard braking.

Costs: The EBC big brake kit is $229, the HH pads are $34.95, the Eagle Mike caliper adapter is $29.95 and the brake line is $43.95, plus fresh brake fluid.

Doohickey

Perhaps the best-known weak point in the KLR650 is the counterbalancer shaft's chain-tensioner assembly, affectionately known as the "doohickey." The doohickey adjustment lever, which is held in place by a bolt near the bottom of the left engine cover, and its tensioning spring, are quite prone to problems and failure. During routine maintenance, when the adjusting bolt is momentarily loosened, the spring's tension is *supposed* to pull the chain tensioner tight, removing the slack that accumulates in the balancer's drive

Close-up of the doohickey shows the stock *unstretched* coil spring which is meant to keep the chain tight, but doesn't.

Here, the new torsion spring is located in position. A 1/16" hole has been drilled to accept the stationary end of the spring.

The round torsion spring must be fitted into the new hole before securing the other end to the doohickey lever.

The new stainless steel doohickey in position over the squared shaft, ready to last forever and keep the chain tight.

With pliers and a screwdriver for assistance, the torsion spring is hooked over the end of the slot in the new doohickey.

With the adjusting bolt in position, you can visualize how it works, loosened at TDC on the compression stroke and retightened.

chain as it wears.

KLR650s of all years are subject to this problem, and the likelihood of failure increases with mileage. Up through 2007, the stock doohickey (tensioner lever) is made of two pieces welded together. Starting in 2008, Kawasaki began using a one-piece lever, but it typically is excessively loose on the shaft, and the spring is too long to provide sufficient tension (on my 2008, the spring provided no tension whatsoever and was just sitting there uselessly).

Failure typically occurs when the welded parts separate or the mounting collar fractures, the lever separates from the idler shaft and bits drop into the oil sump. Tension is then held only by the spring, which will vibrate until it either breaks or stretches. As tension is lost, the chain can jump its sprockets, throwing the counterbalancer out of phase, or the chain can derail entirely, jamming the cam chain and locking up the engine. This happened to the 2007 KLR650 I rode around Bolivia several months ago, not long after I turned it back in to the tour company. And with just over 30,000 miles on the clock, I could hear an unsettling internal chain rattle when my own 2008 KLR was idling.

Mike Cowlishaw, known as Eagle Mike, of Eagle Manufacturing, designed and manufactures a sturdy adjuster arm and also sells a tensioner spring which together virtually eliminate doohickey related failures. The Eagle one-piece billet doohickey lever is produced on a CNC-machine from special heat-treated stainless steel alloy. This makes for a rugged, but not brittle, piece that's more than twice as strong as the original. The part also has increased bearing surface and allows adequate adjustment range for the full life of the counterbalancer chain.

Along with the new Eagle doohickey lever, you can choose between either a coil spring or a torsion spring for tensioning; we recommend the torsion spring. It requires drilling a small hole, but the bit is included in the kit. Before installation, you should also obtain new inner and outer left side cover gaskets, and since the oil needs to be drained, pick up some fresh oil and a filter.

The conversion requires intermediate, or better, DIY skills and you can expect the job to take several hours. To complete the conversion you will need an alternator rotor puller, a rotor holding wrench, a new rotor bolt (don't reuse the old one) and a torque wrench. Everything but the torque wrench is available from Eagle Manufacturing.

After the oil is drained and the left outer side cover is removed, the rotor is removed, then the inner cover, and finally the doohickey lever and spring can be replaced. After the rotor bolt is torqued properly, reassembly is in the reverse order of disassembly, as they say. The new doohickey has eliminated the internal chain-slap noise I was hearing and given me peace of mind knowing the otherwise rugged engine should last a long time.

Although our pictures don't cover every step, they should give you a good idea of what to expect so you can decide if you want to DIY or hire a mechanic.

For detailed printable doohickey installation instructions visit www.happy-trail.com/pdf/KLR650-doohickey.pdf

SOURCES

Thermo-Bob: Watt-Man LLC, 6501 E. Greenway Pkwy. #103-296; Scottsdale, AZ 85254; 602-380-5756, www.watt-man.com

Doohickey & Brakes: Eagle Mfg. & Engr., 380 Vernon, Suite D; El Cajon, CA 92020; 619-261-1281; www.eaglemike.com

EBC Brakes USA Inc., 6180 S. Pearl St., Las Vegas, NV 89120; 702-826-2400, www.ebcbrakes.com
(Note: EBC sells through dealers, its KLR items are available through Eagle Mfg.)