The E-Mail Mechanic
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Laycock de Normanville Overdrive

Compiled by John Sims
Internet Features Editor

In the last issue of *Austin Healey Magazine,* most of The E-Mail Mechanic article was devoted to the List Archives. In this issue, we are returning to our normal format with questions posted on the Healey Mail List and the responses to them.

One of the better features of Austin Healeys is the Laycock de Normanville overdrive unit. Properly maintained, it is a very reliable unit yet its operation and maintenance does prompt quite a few questions on the List.

How does the Overdrive work?

Recently a List member asked for an explanation of gearing and the overdrive operation in non-technical terms.

In a rather long, but very complete explanation, Bob Spidell wrote"

"The engine produces the most power at certain speeds, known as the "torque band." The transmission allows the driver to select the best gear to match the speed and load (basically, the resistance to movement: i.e. inertia) of the auto. Depending on the car, the most torque is usually achieved between 2,000 rpm and 5,000 rpm. After that, the torque usually drops off.

Lower gears allow the engine to overcome the most inertia. That's why you start the car rolling in first gear (Healeys can be started in second gear due to their low-end torque), then shift to second, third and fourth gears as the speed and momentum of the car increases (inertia is overcome).

"Top" gear ratio (3rd in a three-speed transmission, 4th in a four-speed) is usually 1:1; i.e. the output of the transmission is the same as the engine's. This speed is reduced by the differential; aka the "rear end", by a factor of 3.5 to 3.9 to 1, depending on the model (cars without overdrives have the lower number; "taller" rear end).

The overdrive allows the output of the transmission to turn faster than the speed of the engine. When not engaged, the overdrive is essentially a solid shaft. When

engaged, oil pressure, generated by a pump in the overdrive, separates the cone clutch which otherwise locks the ooverdrive into the “solid” shaft. When the cone separates, it locks a sun gear, around which two planetary gears rotate. An annular ring gear rotates around the sun gear/planetary gear assembly. The sun gear doesn't move. A carrier turns the planetary gears which are turned both by the carrier (turned by the transmission) and by their revolvement around the sun gear. The planetary gears turn the annular gears which encircles them. Because their revolvement around the sun gear causes the planetary gears to turn faster than the transmission output, the annular gear turns faster than (i.e. “overruns”) the planetary gear carrier (this is where the term “overdrive” comes from). The overdrive increases the rpm of the drive shaft allowing the engine to turn slower at a given speed, or to produce more speed at the same engine rpm.

The overdrive has a roller clutch which allows it to drive the rear wheels, but not the opposite (this would damage the overdrive). The overdrive is activated with an electric current that operates a solenoid (electro-magnetic device that produces linear motion), which allows the pressurized oil produced by the overdrive's pump to separate the cone clutch, lock the sun gear and thus “overdrive” the output shaft. Because of the electrical activation this type of overdrive is often called an “electric overdrive,” though it's only the activation mechanism that uses electricity. Healeys have a switch in the gearbox cover that only allows the overdrive to be activated in 3rd and 4th gears, otherwise the torque produced by the engine-and amplified by the lower gears-would damage the overdrive.

Healeys also have a switch on the firewall that detects throttle position and, if adjusted properly, will not allow the overdrive to disengage (“lock up” the shaft) when you are coasting; i.e. you have to be depressing the gas pedal a certain amount so that the engine is applying torque in the forward driven direction. If you are coasting and deactivate the overdrive with the switch and the overdrive immediately disengages the throttle-position switch is broken or needs adjustment-the overdrive should not disengage until you press the gas pedal the required amount.

For the record, the Laycock de Normanville overdrive used in Healeys (and other cars, including Volvos) is a marvelous and robust piece of engineering. Problems with the overdrive are usually in the electrical side or in the pump.”

Overdrive Solenoid

In a related exchange, Mark Endicott asked:

“I am sorting out the electrical on my BN1 Overdrive and I have a question for the group. When the solenoid engages it moves the valve operating shaft that goes all of the way through the O.D. It causes the valve setting lever on the far side to

move. Approximately how much should it move? It looks like a very small movement forward to engage the OD."

Bill Lawrence answered:

"There is a small hole in the end of the lever on the right side of the OD. When the OD solenoid is engaged, you should be able to put a drill bit or dowel (5/16) I think) through that hole and into a matching hole on the OD casting. If the holes don't line up you need to adjust the lever n the left side of the OD so that the do. From that point adjust the lever on the left to give the proper amount of slack with the solenoid relaxed."

Mike Salter of Precision Sports Car, Richmond Hill, Ontario cautioned that after making the mechanical adjustment, it is important to check the current draw of the solenoid when the overdrive is engaged to be sure that the adjustment is not drawing so much current that the solenoid fries itself. It should draw below 4 amps with an ammeter in series with the solenoid.

These messages and others can be found in the Healey Mail List Archives at " http://www.team.net/archive/healeys

If you are interested in joining the Healey Mail List, all that is necessary is to send an email message to: majordomo@autox.team.net and in the text field enter: **subscribe healeys** and send the message. Leave the subject line blank. Then follow the instructions in the automated email message that you will receive in return. You will not be disappointed. The procedure for subscribing is also described on page 141 of the 2001 ***Austin-Healey Resource Book***.