BMW 8 Series – H31 Power Assist System

This month I want to discuss a somewhat vintage BMW power brake system, the H31 “Hydro Boost” power brakes and steering system. BMW has always been a leader in technology and never was this more evident then when they introduced the H31 system in the E23 seven series cars in 1977. As is still typical the technology that was debut on the flagship Seven series became a proven design and used on various Five, Six and Seven series cars ending on the Eight series before being phased out with the last of the Eight Fifties in the mid nineties. Over the years I have received a great deal of calls and e-mails regarding the diagnosis and repair of this system. I will attempt to clarify some of the misconceptions and advise on accurate, straightforward diagnosis.

Unlike almost every other power assist braking system that uses engine vacuum to create the boost, the H31 system used hydraulic pressure from a special power steering pump to create the assist needed. This system allowed for more available assist that was highly controllable in a smaller package then any vacuum boost system available at that time. Soon after its introduction, BMW coupled its race proven BOSCH ABS technology to offer a braking system that became the performance standard that other manufactures where judged by.

Over the years the H31 system has caused a number of headaches for techs who where attempting to diagnosis this very sophisticated hydraulic system. Most of these headaches are due to a lack of understanding of the basic principles of operation. The original repair information involved the use of very high pressure gauges to test the pump output and the pressure controlled flow regulator known as the DS Regulator with its attached accumulator better known as “the Bomb” because of its cannonball shape. I have found the use of these gauges to be unnecessary in all but a few rare cases.

The most common failure of this system is the accumulator (the bomb). It is a round steel chamber with a high-pressure nitrogen filled balloon built inside it. On a normal working system, as the pumps hydraulic pressure builds up it moves fluid into one side of this sphere displacing the balloon and storing pressure and a volume of fluid. Over time the balloon loses its nitrogen charge causing the sphere to lose its spring affect of storing the pressure energy. The simple test of the bomb is to run the car for a minute to allow the pressures to normalize then shut off the engine and then pump the brake pedal until all power assist is lost and the pedal becomes hard. Typically a good accumulator will give you about eight pumps of the brake pedal before you loose assist. A bad one will be hard after one pump and the accumulator needs to be replaced. The second part of the test is to check the DS regulator. Again run the motor briefly to build pressure then shut it off. Now wait five minutes before applying the brakes. You should have at least half the pumps with assist that you had when you did the test the first time. If not the valves in the DS regulator are leaking down to quickly. The DS regulator cannot be serviced and would need to be replaced.

The common symptoms of a failed accumulator can be an intermittent brake warning light that can come on when the brakes are applied, or a too soft brake pedal that does not improve after bleeding the brake hydraulics. A good check for the brake hydraulics is to pump the pedal till all boost is gone, then if the pedal is still spongy then the problem is in the brakes. Other issues common to the booster system are leaking pressure switches at the DS regulator and leaks at the hydraulic booster. The brake booster leaking will vent power steering fluid (either ATF or Pentosin depending on the system) at a drain hole between the booster and the master cylinder.

The power steering pump supplying the pressure for this system has a maximum operating pressure of about 130 bar (1900 psi), however the working pressure for the H31 system is regulated at 35 57 bar and only needs about ten percent of the fluid volume that is needed for the power steering. With that in mind it is obvious that any problem with the pump pressure or volume would show itself first as a problem in the power steering.

To properly check the fluid level you must have the engine off, pump the brakes until the assist is gone then remove the cover from the reservoir. The fluid should be at the top of the screen. If not top off with the correct fluid for your car, most early cars used ATF but later BMW’s went to Pentosin fluid, do not mix them and NEVER use brake fluid in the pump hydraulics. Brake fluid will destroy the seals in the H31 system and ATF or Pentosin will destroy the seals in the brake hydraulics. They are separate systems and do not share fluids, IF IN DOUBT ADD NOTHING. If either system is contaminated by the other it can be very expensive to fix and potentially dangerous.

My last set of problems, are usually listed as power steering complaints. This system uses a very high-pressure,

high volume pump; any leaks in the system can be a big mess fast. Many of these cars develop noises in the pump and the pump is replaced only to find that the noise is still there! The problem is from air being pulled into the pump through loose hose connections on the inlet hose between the pump and the reservoir. The leak can be so small it will not lose any fluid but still allow air to be sucked in when the car is running. This problem is exaggerated by the fact that the filter in the reservoir has probably never been serviced and is plugging up with debris. Finally you must consider the condition of the drive belt, a belt failure will immediately cause a loss of power steering and the brakes will only have the stored pressure of the accumulator to assist you for stopping.

You can only imagine heading to the braking zone at turn three of BIR in your E28 M5 only to find that the belt broke. You would have no power steering and no power brakes if the accumulator were bad. No more M5, Bad day, really, really, bad day.