Document Information

Location: Chassis – Suspension Fluid Systems

Topic: Cyclic noise from the power steering pump with or without suspension warning message

Condition: Permanent and/or Intermittent

Diagnostic Trouble Codes:

CCU:

C121985 - APMU EPHS Pump Fluid Temp High

C11F192 - Charge / discharge failure in roll circuit 1

C11A193 - APMU EPHS Pump No Operation

C118A00 - APMU prolonged over or under pressure

Measure

In the event of a customer complaint for cyclic noise from the power steering pump – LINK to Video- follow the information outlined in this document.

This document is intended to assist with the correct diagnosis of the suspension hydraulic system and remedial work.

Care Point: Suspension accumulators and/or APMU should not be replaced before the measures outlined in this document have been completed and all data collected have been saved and submitted.

Note that this behaviour will also be accompanied by clicking noises emanating from the APMU valve block. You will find that the clicking is synchronous with the EHPAS pump speed oscillation and it is generated by the operation of the valves inside the APMU as they manage the pressure oscillations created by the cyclic of the pump.

Despite this unusual behaviour neither the APMU nor the EHPAS pump must be outright assumed faulty and no replacement of components is permitted at this stage.

The potential underlying reason is gas pressure loss from one or more hydraulic suspension accumulator spheres. The system is continuously adapting its operation in order to maintain the specified hydraulic suspension line pressures. This can therefore result in the audible oscillation of the pump speed accompanied by clicking from the APMU.

Depending on the severity of the gas loss from the accumulator spheres the oscillation may vary in intensity, may only be present in Track mode and may or may not be accompanied by the DTCs stated above.

Care Point: EHPAS pump continuous speed oscillation must not be diagnosed as a power steering pump failure (EPHAS) without further diagnosis

Care Point: APMU clicking noise must not be diagnosed as APMU failure without further diagnosis

Care Point: No visible leaks at the accumulators. Only gas from inside the accumulator has leaked an no hydraulic fluid

<u>The following steps must be followed before any further action is taken</u>

1. Record a video with good quality audio that shows the oscillation being heard from the EHPAS pump. Use the sample video attached here for guidance

2. Take a DTC log and save it before clearing any errors or carrying out any other actions

3. Identify if the pump cyclic/oscillation noise is present at all suspension modes or only in one of the firmer suspension settings (with engine running). Make a note of your observation

4. Carry out a suspension mode change assessment using the MDS line graph function. Log the following values with the engine running whilst following the below routine with the vehicle stationary and on the ground

<u>Select Values from CCU</u>

- EHPAS line pressure (bar)
- Nose Lift line pressure (bar)
- pCircuit 1 pressure (bar)

- pCircuit 2 pressure (bar)

Routine Steps

1. Start the engine

2. Pre-select Comfort mode and turn on the active panel

3. Switch from Comfort to Sport mode. Wait for 30 seconds

4. Switch from Sport to Track mode. Wait for 30 seconds

5. Switch from Track mode to Sport mode. Wait for 30 seconds

6. Switch from Sport mode to Comfort mode. Wait for 30 seconds

7. Locate the .txt file generated by this routine and save it

Next Steps

If the resulting line graph looks like '**Figure 1 – Degraded Vehicle Behaviour**' below, replace all 4 accumulators.

With new accumulators installed, repeat the routine steps described above and confirm the vehicle behaviour is now aligned with '**Figure 2 – Nominal Vehicle Behaviour**' and the cyclic noise from the EHPAS pump has been eliminated. Save both .txt files from the before and after assessment logs.

Figure 1 – Degraded Vehicle Behaviour

In Figure 1 the circled areas indicate the pressure oscillations in the EHPAS line, pressure circuit1 and pressure circuit2. These oscillations are a result of the decreased hydraulic circuit dampening effect of the accumulator(s) caused by the loss of gas. These oscillations themselves create a pressure data feedback loop to the CCU which activates the APMU valves and keeps the pump cyclic in order to compensate and try maintaining nominal pressures.

If the resulting line graph from the mode change assessment routine looks like Figure 2 below but you are still experiencing suspension errors, raise a Technical Request and supply all the information collected based on this document.

Figure 2 – Nominal Vehicle Behaviour

In Figure 2 we see a normal behaviour of the EHPAS line, pressure circuit 1 and pressure circuit 2. It is obvious that the system achieves the nominal pressure with minimum amount of oscillations as designed. The added green lines across the graph indicate the nominal pressures for each suspension mode. Starting from comfort with a stepped pressure increase to Sport and then Track mode as they are selected in succession during the Mode Change Assessment routine described above.

Parts Information

11B1538CP – Suspension Accumulator

Warranty Information

If the vehicle is under Warranty and you intend to submit a Warranty claim for the procedure, please ensure the below files are attached in the claim:

- Video recording of the concern with sound
- DTC log taken when upon vehicle arrival
- Line graph .txt data file taken before any repairs and with the issue present
- Line graph .txt data file taken after the repair has been successfully completed

Resolution Category

Casual Part Name: 11B1538CP

Casual Part Name: Accumulator-SOP-STD

Casual Issue: Internal Leak

Rectification: Replace

Time: 2.70 hrs (to replace all 4 accumulators)

Attachments

N/A

KA Updates Information

24/07/2020 - Warranty Information section update, Time updated to 2.70 hrs.