

1990 Porsche 928 S4 Auto B2 Brake Band Piston Failure

EXECUTIVE SUMMARY

This report with procedures covers the failure and repair by replacement of the B2 Brake Band Piston Assembly, the maintenance undertaken whilst access was available and the re-assembly procedure with clearance checks for a 1990 928 S4 Automatic Gear box type A28.16/Mercedes Benz 722.3 Series Automatic Transmission.

In March 2005 the vehicle suffered a transmission failure and no forward movement was available in any of the forward gears, however, reverse gear was still operable.

Fault Finding Diagnostic research all pointed to the B2 Brake Band Piston Assembly failure with a possibility of a B2 Brake Band failure.

To check all aspect of the diagnosis it was decided to remove the B2 Piston Assemble, disassemble and inspect the B2 Piston, inspect the B2 Brake Band for breakage and wear and the B2 Clutch, measure the B2 Brake Band clearance and reset if required to Porsche's recommended clearance, change the ATF, filter and oil pan gasket, whilst the automatic transmission remained in situ within the vehicle.

The finding was that the B2 Brake Band Piston Assembly suffered a catastrophic failure that was repaired by replacement, using a new assembly with all modifications as undertaken by Mercedes-Benz since the 1980s to prevent such failures.

The B2 Brake Band and B2 Clutch were inspected and were both in near new condition and on installation of the new B2 Brake Band Piston Assembly the clearance of the B2 Brake Band with the existing thrust pin was measured and the clearance was at the lower valve as specified by Porsche.

The Automatic Transmission was boxed up, tested and worked satisfactory.

In conclusion there are three aspects to these procedures contained in this report:

1. If preventative maintenance is undertaken by any 928 Porsche owner to change out the B2 Brake Band Piston Assembly, due to the reported failures by Mercedes-Benz over many years, this can be done without removing the oil pan, filter, valve body or lower cover and the procedure to undertake this is covered in section 5 of the report.
2. However, if a decision is taken to also renew the B2 Brake Band Piston lip seal as well, it is difficult to remove and replace the seal without removing the oil filter, valve body, lower cover, intermediate plate and the B2 Brake Band Guide. The procedures for this are covered in sections 5 through 11 of this report. Currently the writer is designing a lip seal and bush removal puller that should work by installing it through the B2 Piston housing aperture.
3. If the automatic transmission suffers a catastrophic failure of the B2 Brake Band Piston Assembly, this report and procedures will assist the DIY owners

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of the 928 to accomplish the task of its replacement together with the recommended inspection and renewal of various parts.

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1. **Background**

The vehicle is a 1990 Porsche 928 S4 Automatic and at the time of the incident it had traveled 81,209 kilometres. The vehicle has been owned since November 1999 and at the date of purchase it had approximately 47,000 kilometres on the odometer. In February 2005 the 80,000 kilometre service was carried out, which included camshaft timing belt change, coolant change, engine oil and filter change, checking of all other fluid levels, flushed and recharged the PSD, starter motor and the alternator overhauled, flex plate checked for end loading on the engine thrust bearing, battery box cleaned and coated with 'fish oil' and all other items checked and serviced as per the Maintenance Schedule. All maintenance has been carried out by the writer except for the initial timing belt change, water pump and tensioner rollers renewal, just after the vehicle was purchased.

The Automatic Transmission was serviced in August 2003 at 71,018 kilometres.

2. **Failure**

On 7th March the automatic transmission lost forward motion from all forward gears, however, reverse still remained operational. The vehicle was towed home and reversed into the garage. ATF level was checked whilst car was still warm and in neutral 'N' as well as moving gear selector lever through all gears and again checked in 'N'. The level was satisfactory; sitting between the top two indicator marks. Reversed rear wheels onto portable ramps, jacked vehicle up at the front by trolley jack under the two tow/skid points forward until the vehicle was level. Whilst supporting the vehicle forward by jack stands the vehicle was jacked up higher at the rear with the trolley jack and placed on jack stands. The trolley jack was replaced with a jack stand under the rear suspension support member and the ramps moved forward and placed under the front wheels, which were chocked on their rear side to prevent any forward or rearward movement.

With the vehicle supported by 5 supports it was deemed safe to work under for an extended period.

3. **Diagnostics**

Workshop Manuals, Technical Articles, Technical Specifications, Service Information Technik, PET5 for clarification of locations and Porsche 928 forums were used.

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3.1 Initial checks and adjustments

Whilst awaiting a reply from one board the following checks and adjustments were carried out:

1. Checked idle speed – OK within specifications (675 rpm +/- 25).
2. Checked throttle linkage and adjusted as per WSM.
3. Adjusted Control Pressure Cable as per WSM.
4. Checked vacuum line to Pressure Modulator – OK no leaks or blockages.
5. Checked drive range selector lever operation on box and verified each indent position for each gear.
6. Checked setting of Starter Interlock Switch and Drive Range Selector Lever with 4mm drill shank.
7. Warmed up auto transmission and checked all forward and reverse gears.

3.2 Outcome of initial checks and adjustments

Still no forward motion in any forward gear, however, reverse gear was still operable.

3.3 Further research

Wally Plumley of 928 Specialists and GarthS/GS535i responded to a request posted on a Porsche Forum. Wally advised the Porsche Fault Finding Diagnostic advice from the WSM and GarthS/GS535i advised links to various web sites. By using this information, undertaking my own review of the WSMs and ‘surfing the web’ a host of information was found.

The Porsche Fault Finding Diagnostic search turned up three sets of information.

3.4 Wally’s advice from the WSM

1. Brake band B2 seriously worn or broken.
2. Adjust brake band B2 by installing a longer pressure pin.
3. Replace brake band, if seriously worn or broken.

No power flow for a brief time after cranking the engine

4. Torque converter drains partially via leaky or defective lubricating ring or valve in put shaft.

3.5 WSM group 38, page 112

3.5.1 Condition

1. Transmission slips when moving off in 1st or 2nd gear, or moving off not possible in forward gear. Reverse gear is still good.

3.5.2 Cause/Correction

1. Service shift valve B2, replacing shift valve housing if necessary.
2. Replace brake band B2 Piston.
3. Adjust brake band B2 by installing a longer thrust pin. Replace brake band in case of excessive wear or broken brake band.

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3.6 Outcome

All advice pointed to problems with the B2 Brake Band Piston Assembly.

3.7 Articles to support outcome decision

3.7.1 GarthS/GS535i advised:

1. B2 Piston is often implicated in failure and he suggested reading the article <http://transmission.articles.mbz.org/b2/> and following the links contained within the article.
2. B2 Piston Failure in Mercedes-Benz 722.xxx Automatic Transmissions at http://business.baylor.edu/Richard_Easley//autofaqs/b2piston.htm.
3. A Google search located an excellent article titled AUTO TRANS DIAGNOSIS – 722 SERIES relating to a 1996 Mercedes-Benz C220 at <http://transmission.articles.mbz.org/akp722.pdf> , as well as various other articles. This article directly relates to the MB 722.3 series transmissions.
4. “The B2 Piston” article by Richard Sexton with photographs and an update titled: “B2 Odyssey Updated”.

Armed with all the above data together with information from the “Porsche 928S Automatic Transmission A28-Description of Operation” manual and the WSM’s Group 37 pages 1 to 179 relating to the six bolt pan 4 speed transmission and the Technical Publications contained in the Jim’s CDs, CD No.1 version 2.15, it was deemed time to proceed with the a course of action, **investigate the B2 Brake Band Piston Assembly**.

Note: In assessing data make sure the correct model/series and serial number of the transmission fitted to the vehicle is correctly identified.

4. *Vehicle Automatic Transmission make and model*

The Automatic Transmission installed is:

4.1 **A28.16 model**

The Porsche gearbox number on the transmission was located at the aft end of the transmission on the intermediate casing at the junction of the transmission and the transaxle and is: **A2816 3L02446**.

On checking the specification obtained from the local Porsche Centre the original automatic transmission fitted was A2816 3L01363, so the gear box was a newer transmission. The automatic transmissions fitted to the Porsche 928s are manufactured by Mercedes-Benz and MB’s production numbers and gear box type and serial numbers are stamped on the horizontal surface just above the oil pan landing on the RHS of the gear box just forward of the B2 Piston Cover, so the transmission also has a MB Serial number for reference.

4.2 **Mercedes-Benz Automatic Transmission 722.3 Series**

The transmission production and serial number is:

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722 270 3201 722 360 03 371586.

It is believed the first 10 numerals are MB production numbers (This is not confirmed however Porsche states “The digits stamped on the right side of the transmission case above the ATF sump are for production purposes only) and the last 14 numerals can be interpreted as follows:

1. 722 is the type of transmission and designated that it is an Automatic Transmission.
2. 3 is the Model of Transmission and in this case it is designated as a 722.3 series, which is a 4 Speed/6Bolt/Large Case type transmission.
3. 60 designates the Type of Automobile or Version Number.
4. 371586, the last six numbers, is the Serial Number of the Transmission. There is no explanation of what the 03 means.

This information was gathered from Mercedes-Benz Transmissions and Oil Reference Guide found on the web.

The spare part numbers used in Porsche’s PET5 are Mercedes-Benz spare part numbers, so parts are in fact identical. This statement contradicted advice received from an independent transmission mechanic during investigations, that they were not identical.