

BEW ACTUATOR REPLACEMENT

GARRETT ACTUATOR TO BORG WARNER TURBO

Pictures at the bottom of the page

Summary:

I was able to successfully replace the stock turbo vacuum actuator for the Borg Warner KP39 turbocharger (standard equipment on the BEW motor) with a Garret Smart Actuator (typically found on Garret VNT17 replacement turbochargers). The Garret Smart Actuator has the same stroke and sensor output as the Borg Warner unit since the VNT17 is meant to be a bolt on replacement for the KP39.

The Details:

1. Garret Smart Actuators
2. The Garret unit mounts with (2) M6x1 studs to a mounting plate.
3. The Garret unit uses a ball and socket mechanism to attach to the vane lever on the VNT17. This can be removed and an extension rod can be fabricated to attach to the Borg Warner vane lever.

The Solution:

1. The key to making this swap is getting the (2) bolts that hold the actuator bracket onto the turbo housing out. If you break them you will either need to come up with a clever mounting bracket to mount the actuator to the exhaust down pipe studs or remove and disassemble the turbo. There is not enough clearance (i.e. a straight drill path) to drill and tap the holes. Use lots of

penetrating oil and be patient. It does not take a lot of force to snap an M6 bolt. I know this from experience.

2. Once the (2) bolts are removed, remove the 10mm nut on the top of the actuator rod.
3. Remove the actuator/actuator bracket assembly from the car.
4. The actuator is tack welded in (4) holes located on top of the actuator. Drill these out. Gently use a small chisel to separate the bracket from the actuator body. To drill out the welds I had to bend the actuator rod out of the way.
5. The bracket is made of (2) pieces (the actual bracket that holds the actuator and heat shield) that are riveted together. To make machining easier drill out the rivets to separate the bracket pieces.
6. Drill (2) 0.25" holes in the actuator bracket with a center to center spacing of 1.3". These holes will most likely run into the existing holes. The center line between these holes should be parallel with the flange on the bracket such that when the actuator is attached the connector and vacuum port points towards to passenger side of the car.
7. Drill and tap the rivet holes for a 10-32 screw.
8. Mount the Garret actuator the actuator bracket using (2) M6x1 flanged nuts.
9. Reattach the heat shield to the actuator bracket using a couple 10-32 screws and lock washers.
10. Install rod extension onto Garret actuator rod.
11. Install M6x1 nut on actuator rod (lower stop nut).
12. Reinstall actuator assembly in car.
13. Draw a vacuum of 20in on the actuator.
14. Adjust the nuts on the actuator rod such that the vane lever is at the mechanical stop at 20in vacuum.
15. Install M6x1 nut on top of actuator lever (upper stop nut).

16. Verify that movement of lever starts at 3-5in and stops at 18-20in. This took me a couple times to get right. Reattach vacuum line from N75 and position sensor connector.

17. Hook up VCDS and go for a test drive.

18. From Bentley you need the car to be at operating temperature and under load. A good long hill lugging in 4th gear at 1500 RPM make for a good plot.

19 Go to measuring block 11 and use the VC Scope to plot the RPM, specified Boost and Actual boost.

These should closely match as detailed in the 1000q testing section. Testing with no load will not produce obvious results. You must be under load. Overshoots and undershoots are expected but in general they should track with each other.







