



UK MKIII Supra Owners Group

Dump Valves and Wastegates



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This seems to be coming up a lot so here's a bit of information for you :-

Dump valves - The purpose of a dump valve (also called a blow off valve or BOV) is to try and reduce 'compressor surge'. When you are boosting in a turbo charged application and come off the throttle suddenly (e.g. when changing gear) you have a load of compressed air with nowhere to go (because the throttle flap is closed). The danger is that this can 'back up' towards the turbo which is merrily spinning away and try to push it the wrong way. To avoid this, the dump valve is fitted.

Basically when you come off throttle the engine's still trying to suck air in (from the action of the pistons and valves still rotating away) so you create a vacuum. This vacuum can be used to actuate (operate) the dump valve and relieve the pressure built up by the turbo. It should be clear then that the dump valve will have a feed from a vacuum source (small pipe) and a feed from the intake pipe work after the turbo - normally the 3000 pipe.

What to do with the compressed air generally falls into 2 categories

1. You can recirculate it back to the intake. This is how the stock setup works and air feed into the accordion hose post AFM. When recirculating the air like this you don't get any noise (well, not much) from the dump valve.
2. Vent to atmosphere - atmospheric dump valves allow the air to escape straight to atmosphere as the name implies. The act of air escaping the valve body makes the ptssscchhh noise you often hear from turbo charged motors. The side effect of this is that metered air (air that has passed through the AFM and been 'seen' by the ECU) is allowed to escape in an unexpected manner as far as the ECU is concerned. As a side effect you may get stalling and idling issues.

There are many dump valves that are in use on mk3 Supras without issues, I've had personal experience with the HKS SSQBOV and The Bailey DV26 dual piston variant without issue.

Wastegates - The purpose of a wastegate is to limit the amount of boost you allow the turbo to build. The turbo uses the movement of exhaust gases to compress the fresh inlet air from the air filter. The more air you compress, the more potential for power so high boost = more power. Obviously there are limits to this and you can't just run 20+psi. Here's the problem a wastegate addresses:

1. We have air coming in which is combusted and creates exhaust gases
2. The exhaust gases cause the turbo to spool (spin)
3. The act of the turbo causes more air to enter the combustion chamber and create even more exhaust gas

So the more the turbo spools, the more fresh air comes in and thus the more the turbo spools! This is a runaway condition where the turbo would just boost infinitely until something explodes! To prevent this, the wastegate relieves the pressure build up.

Basically, the wastegate (or actuator) is fed a small pipe 'post-turbo' which contains the compressed air. As the amount of boost increases, the pressure in this pipe rises and at a set level it will overcome the force of a spring and opens a wastegate valve to allow exhaust gases to escape from the engine without going through the turbo. The act of bypassing the turbo means that the exhaust gas doesn't create more boost so we don't have this runaway boost condition.

Boost controllers - Whilst we're on the topic, boost controllers might as well get a mention. By manipulating the compressed air supply the wastegate 'sees' you can alter the boost characteristics of the car and make the wastegate open at different times. Some methods of doing this are:

1. A pretty crude method such as 'bleeding' off a small amount of the air supply to the wastegate thus making the wastegate valve open later
2. Use a ball and spring setup where a level of boost overcomes the force of a spring before any air hits the wastegate (a manual boost controller)
3. Manipulation of the wastegate via an electronic controller which uses solenoids

Changing from a stock dump valve to a vent-to-atmosphere style :

With a stock dump valve you have 3 connections -

1. The vacuum hose which actuates (operates) the valve
2. The 3000 pipe feed which is pressurised by boost
3. The return to the accordion hose

When the vac hose operates the valve, pressurised air is allowed to escape to the inlet at the accordion hose connection

If you want to dump to atmosphere you remove the accordion hose connection and the dump valve body will effectively act as the escape route for air. Therefore you now have 2 connections:

1. The vacuum hose (which you can replace with silicone if you prefer)
2. The 3000 pipe connection which is the boost source

If you get a fitting kit with your dump valve then you may have the silicone vac hose and connection from the dump valve to the 3000 pipe which makes fitting easier.

Ensure you get a good bung in the accordion hose or you'll have a boost leak