E21 Water Heated Additional Air Slide Repair

Whilst a fair bit of information exists about repair and adjustment of the Warm Up Regulator fitted to E21 BMW's with the Bosch K Jetronic fuel injection system, I found very little information on one of the other key components of the K Jetronic system, the additional air slide valve.

Two variations of this valve were used in the E21 – the first was an electrically heated unit and later (in the second half of 1982), a water heated unit. Both units perform an identical function, namely to admit additional air into the intake manifold, beneath the throttle plate during cold starts for the purpose of raising the engine idle speed during cold starts.

Idle speed specs for my E21 323i are around 750rpm with the engine hot and about 1200 – 1500 rpm cold.

If you are experiencing hot or cold starting problems with your E21 and have checked the function of the Warm Up Reglator, fuel system pressure and have no vacuum leaks, the additional air slide could well be the culprit.

Fortunately, operation of the valve is fairly easy to test. If cold starts are a problem, try disconnecting a small vacuum line (like the vacuum advance line to the distributor) and see if this helps. More likely though is the prospect of an inordinately high idle speed with the engine warm—since the valve controlling the airflow to the manifold operates under spring pressure, it should be open when the engine is cold and if the car has not been started and run for some time, is likely to be frozen in this position. To test this condition, with the engine warm and running, simply pinch off the air line to the additional air slide (unless the valve is leaking externally, it doesn't matter on which side of the valve this is done, accessibility will dictate here).

If the warm idle speed drops significantly when the line is pinched off, the additional air slide is the problem, so read on.

The first step is to remove the valve. This involves disconnecting the two smaller diameter water hoses on the outside of the valve. The job is easy enough, but since there will be coolant loss from the ends of the disconnected hoses, a couple of 50mm lengths of any solid round material to plug the disconnected ends will help minimise the coolant loss—something around 10mm in diameter (dowel, a bolt shank or rod) is ideal.

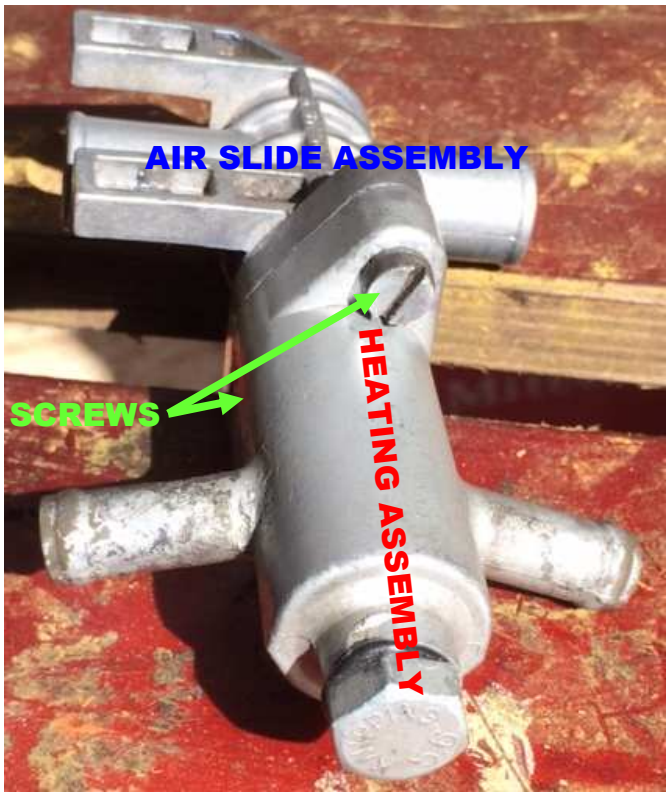
With the water hoses disconnected and plugged, remove the air hoses from the rear of the valve. Since the valve is secured in place beneath the intake manifold by two rubber mounted studs, which are tapped into the bottom of the manifold, accessibility is not that

great, so you may want to disconnect the air hoses at the intake manifold and T fitting to the intake boot, allowing the valve to be removed complete with the air hoses attached, so that you can take them off where there is a bit more elbow room.

The final step required to remove the valve is to undo the 2 stud mounting nuts holding it to the underside of the intake manifold. The studs are M6 x 1.0mm, so a small 10mm socket should handle this task.

Inspection and disassembly of the valve

The valve consists of two major components—the actual air slide assembly which is the section of the valve which connects to the air lines, and the heating assembly, which is connected to the water hoses.

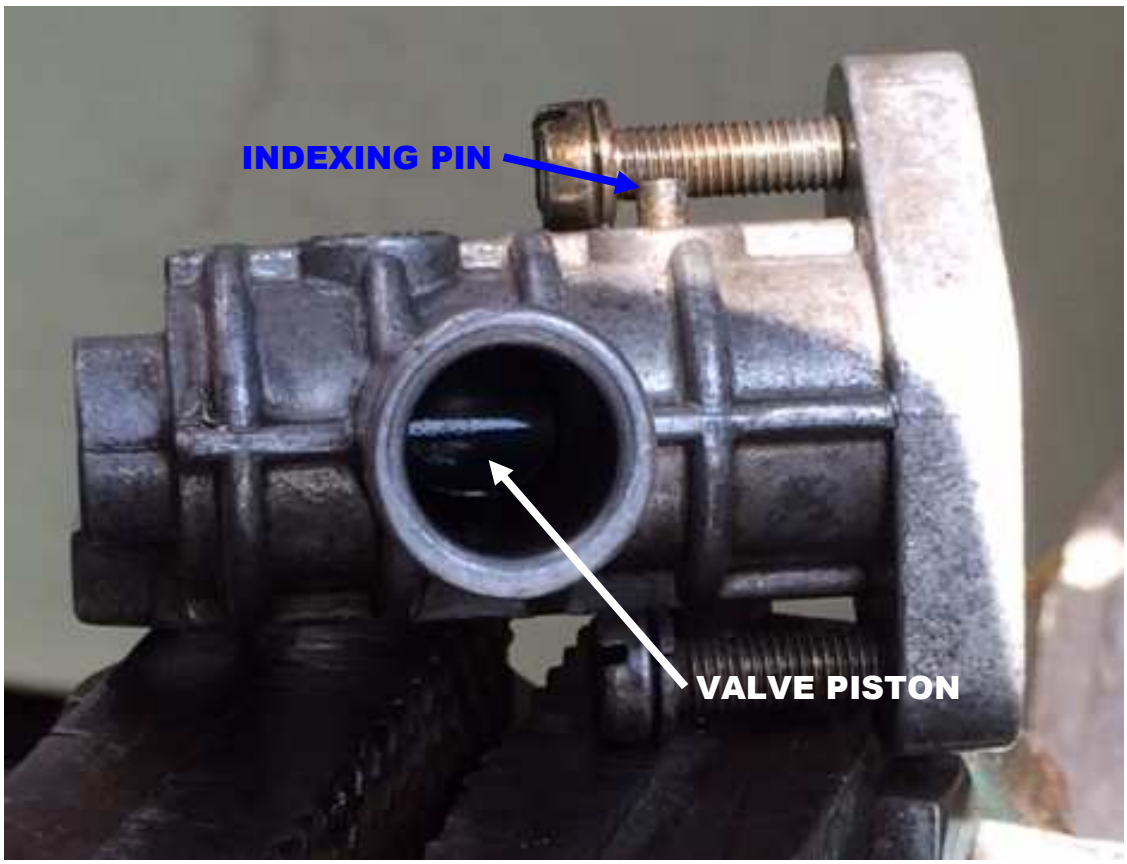


As I mentioned earlier, the valve itself is spring-loaded, so the default position is open. This spring force is countered by a thermally actuated control pin, which pushes against the valve face, causing it to close as the engine temperature increases.

Begin disassembly by separating the valve body into its two subassemblies—a simple matter of removing the two screws from the flanges of the valve body.

This shows the heating assembly and control pin after removal from the air slide assembly.

The sharpened end of the control pin points outward toward the heating assembly, whilst the blunt end of the control pin acts upon the flat face of the air slide valve piston.



This is the business end of the valve—the air slide valve. Note that in this photo the valve is jammed fully closed, it was initially jammed in the fully open position and closed as the result of me spraying it with copious amounts of Inox (like WD-40) and tapping the flat area of the valve piston in an attempt to free it up.

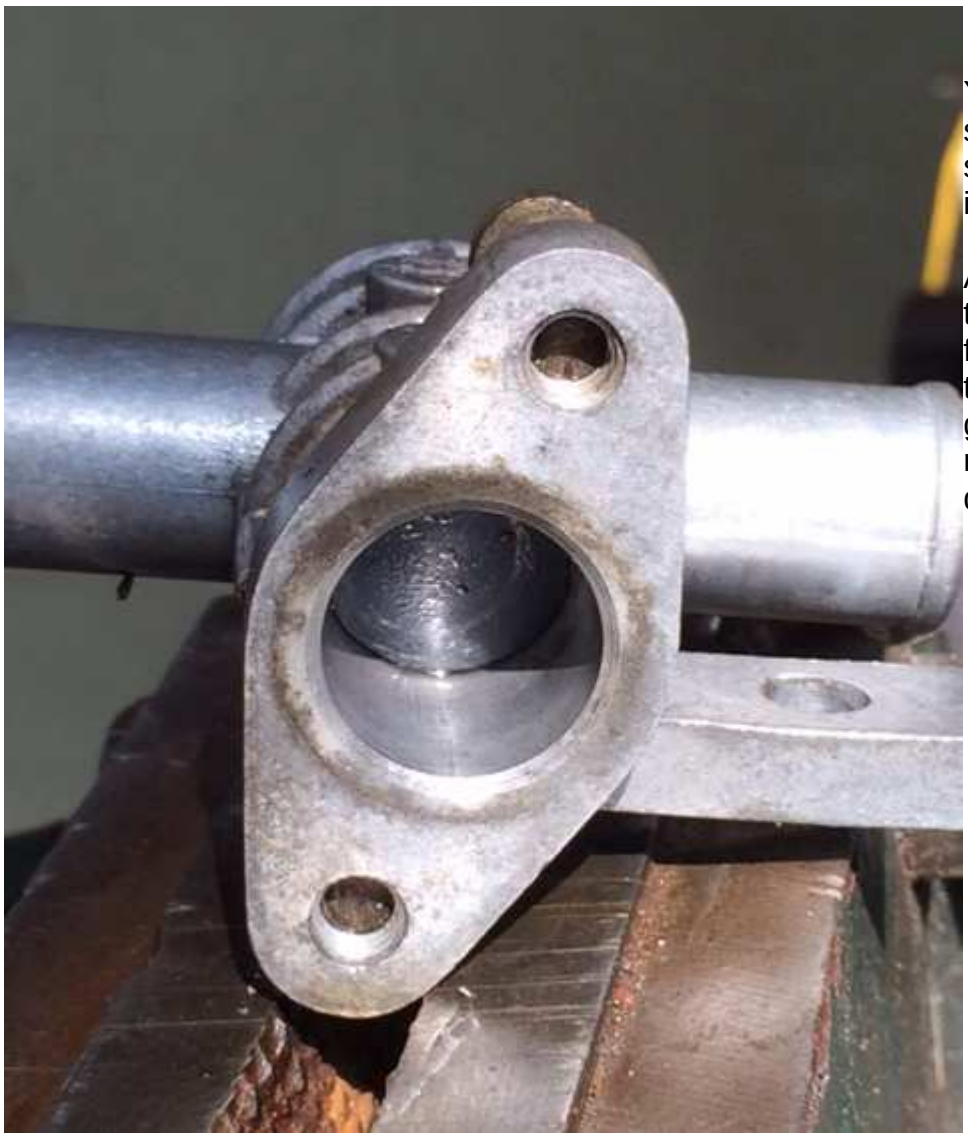
Ignore the presence of the 2 screws in the flange of the valve, I have a tendency to misplace small parts and have screwed them into the reverse side of the mounting flange so that I didn't lose them.

Repairing the valve

Before we go any further, a couple of words of warning—to my knowledge there is no source of replacement parts for these units. Used valves in good condition are hard to find and at the time of writing, a new replacement (also nearly impossible to obtain) has a list price of over 170 Euros. The valve/piston is manufactured to form a nearly gas-tight fit within the body of the valve, so **on no account should any attempt be made to probe or pry on the internal components of the valve** as doing so may result in rendering it beyond economical repair.

The actual piston has a couple of cutouts in each side, requiring it to be indexed into position over the full extent of its travel. This is achieved by means of a small indexing pin (see photo above), which is press fit into the valve body. The pin maintains correct alignment of the piston by means of a corresponding slot machined into the side of the piston.

If the bore of the valve is badly pitted, the only options are replacement, use of a used donor valve for parts or to have an engineering shop rebore and sleeve the valve body with a stainless steel sleeve.



You can see the air slide piston here, stuck at the bottom of its bore.

After soaking, hold the valve with the flanged end (facing in the picture) down, and give it a few sharp raps on a flat scrap of dressed hardwood.

Fortunately, unless the heating end of the valve is damaged and has allowed engine coolant into the valve piston bore, it is normally only exposed to oil contaminated crank-case gases and the operation of the piston may be restored by soaking .I mounted the air slide at about a 60 degree angle by clamping it gently in a vice with both one of the air intakes and piston bore facing upwards so that I could fill them with a suitable penetrating liquid and allow them to soak. I used a mixture of Inox and CLP Break-Free (a military spec cleaning and lubricating fluid used for firearms), but WD-40, a mixture of mineral tur-pentine and light machine oil, penetrating oil or the like would probably work just as well.

Resist the urge to intervene too early in the soaking process— the longer it soaks, the better. I left it 14 hours and up to 2 days would be fine for a badly stuck valve.

If you feel the need to do something in the meantime, entertain yourself by cleaning all of the accumulated debris out of the water passage in the heating end of the valve. Some kerosene and gun cleaning brushes do a good job here—you can remove the hex head bolt from the end of the valve to improve access if need be as this is just used to provide access to a brass adjusting screw for factory calibration of the valve. I strongly advise against attempting to fiddle with this adjustment as aged brass which has been immersed in coolant for the past 30 or so years is not the most resilient of materials and you are more likely to do more harm than good by tampering with this adjustment.

Whilst soaking the valve should significantly weaken any physical bonding of the valve piston to the valve body, it is unlikely to completely release the piston. The method I used to accomplish this was to tap the valve body, with the open piston bore/flanged end facing downwards onto a small hardwood block—20 or 30 short, sharp raps should do it.

Once the piston has moved noticeably, mount the valve body in a vice with the piston bore facing upwards and work the piston up and down against the spring in the valve body by flooding the bore with lubricant and pressing against the piston face with a short piece of dowel.

Continue this process until the piston moves freely in the bore, then wash the entire valve body by immersing it in acetone. The reason for this is simple—the bulk of oil based lubricants break down as the result of prolonged exposure to heat and time, leaving a sticky residue that is likely to lead to the valve sticking again.

Once the piston has been fully freed up, the spring should force the valve wide open.

I used this opportunity to give the spring and its housing a good rinse with carburettor cleaner after the acetone dip, then applied a couple of drops of gun oil onto the spring and piston skirt.

Valve lubrication and reassembly

As I said previously, whilst use of an oil– based lubricant in the actual air passage of the valve is not a problem due to that portion of the valve being constantly exposed to oil-laden crankcase gases during the course of its operation, I used what I consider to be a far more suitable and reliable treatment for lubricating the piston bore and heating end of the valve.

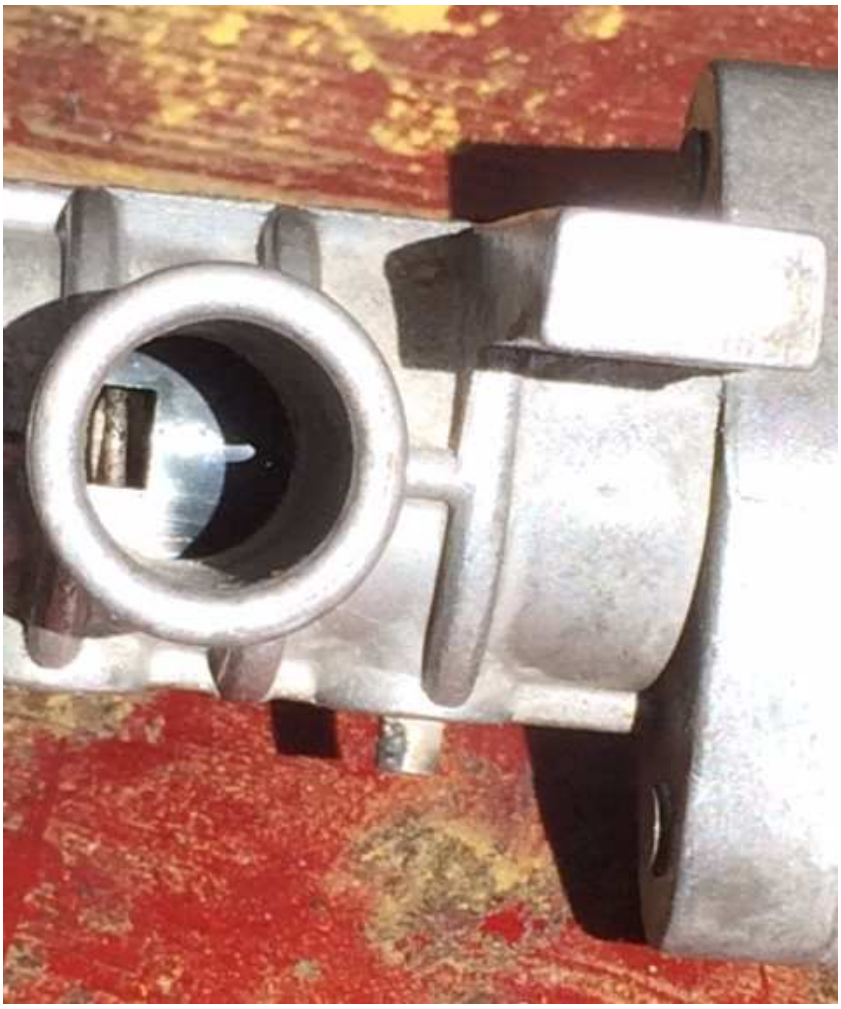
Whilst powdered graphite is a good high pressure lubricant, graphite does have one negative property making it not ideal for use in lubricating the bore of a close-fitting valve. That property is that, unlike powdered Molybdenum Disulphide, graphite can actually stick to itself, building up on the walls of the bore and reducing the already tight piston

clearance. For this reason, I elected to use powdered Molybdenum Disulphide to lubricate the valve piston bore, then used a thin smear of Zinc Oxide Grease to lubricate and seal the control pin and face of the heating assembly before reassembling the valve.

Lubricate the piston bore by pushing the piston to the bottom of its stroke with a piece of dowel, then introduce a small amount of molybdenum disulphide power and work the piston up and down in the bore to evenly distribute the powder.

You can see the control pin back in place in the lubricated end of the heating assembly below.

Valve testing and refitting



This photo shows the reassembled valve in the open position. As you can see, additional air is admitted into the intake manifold during cold starts by means of the notch in the valve piston skirt.

The specs for the valve say that it should be open at 20 degrees Celsius, so unless it is unseasonably hot, this is how it should look at room temperature.

To test the operation of the valve, all that is required is to boil some water and pour it into the water passages on the heating assembly end of the valve.

The valve should be fully closed at 60 degrees Celsius, see picture below.

Now its time to refit the valve—just a matter of reversing the removal procedure followed earlier.

Don't forget to top up the coolant and use the recommended antifreeze/ anticorrosion treatment.

Job Done.

David Mc
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