Playing with your K-Jetronic Warm Up Regulator, or WUR.

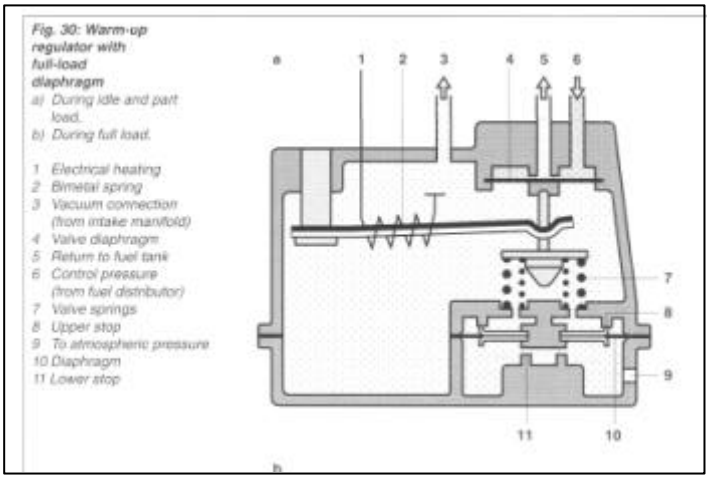
This little goody is a common culprit in K-jet or CIS problems, along with pumps, one-way valves, accumulators and fuel distributors.

Having recently sorted out a problem with mine, and hopefully understanding its workings now, with help from Jay Kempf, I think a few pictures and text might help others to have the confidence to attack this guy.

Apart form the normal caution related to working with gasoline, in a possibly hot environment, one other note. I found that after opening and closing the fuel fittings on the WUR a couple of times, and then removing the unit from engine, the fixing screws were bent. The base of the WUR only has a small area actually flat on the block, and there seems to be enough leverage at the top to load the screws significantly – be careful here.

This is the outside of it.

Threaded fitting facing upwards is inlet from distributor; facing away to the left is the return outlet line to the distributor. Right of the inlet is the electrical connector; also on top is one vacuum connection, with the other on the base. Some models might not have both vacuum connections. In some units (mine) there is a fine metal screen under the inlet fitting.

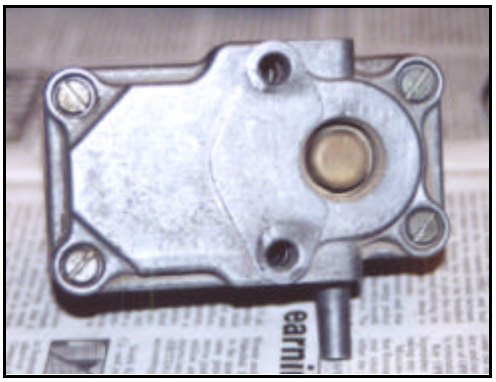


Schematic of the unit (courtesy Robert Bosch).

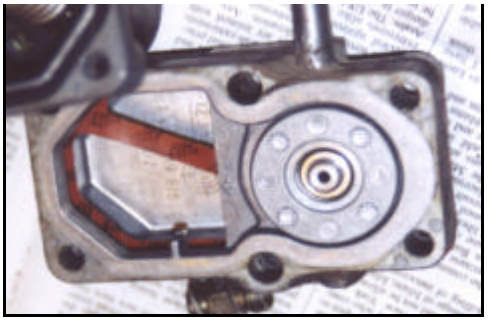
Basically the spring pressure on the regulator diaphragm (4) sets the hot control pressure – bimetallic strip fully heated, not pressing down on the spring. When the strip is cold, it presses down on the spring, which reduces the control pressure, which allows the air measuring plate to move further, enriching the mixture. The electric heater on the strip ensures that the maximum time for enriched mixture is limited – ie shorter than the time for engine heat to affect the strip. Once the engine is fully up to temp, the strip will stay away from the spring without electrical help. The bottom chamber is to reduce spring pressure for WOT enrichment – not fitted to all types. The vacuum in the top section will lean it out at idle/high vacuum situations.

Note that there is no obvious visible means of adjustment of either the hot or cold control pressures. When you talk to JK however you find out how it's done. The regulator unit (iron) is pressed into the die cast WUR body, and it's position determines the hot control pressure. Similarly, the post that holds the bimetallic strip is pressed in to the die cast body, and its position determines the effect the strip has when cold.

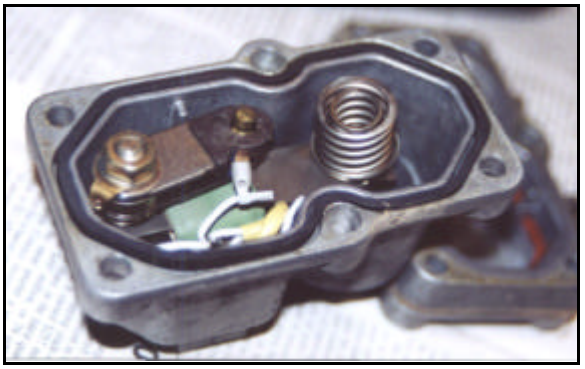
Tapping the pressure regulator body inwards will increase the control pressure, and vice-versa; tapping the strip post inwards will reduce the cold start control pressure and vice-versa. NOTE that the regulator body may take some force to move in the body, and it should only be done carefully, AND with the regulator dismantled – cap, button, shim and O-ring removed, otherwise the unit may be fatally damaged.



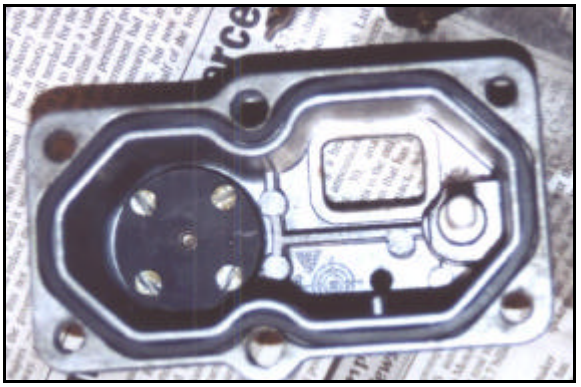
This is the base of the unit showing the screws that hold it together, and the external centre of the pad the springs rest on. When you remove the 4 screws you will see:



Inside the base unit – not much except the spring pad. One spring goes on the fixed part, and the smaller inner spring on the WOT enrichment diaphragm.



Inside the upper part is where it all happens. The spring is resting on the fingers of the bi-metallic strip; the green stuff is the electrical heater for the strip. Remove the spring with hat and pin, put on the base unit. The smaller strip is a secondary bimetallic unit – I think it cuts the power to the main heater when fully hot, but don't quote me. If you undo the nut on the strip post, and release the external clip holding the electrical connection in place, and carefully wriggle the strip and all its fittings out, you will see:-



the pressure regulator itself!

(Sorry, no more pictures, forgot to do any of the regulator dismantled.)

Remove the 4 screws, and you will find the steel cover disc comes off, then a small steel button with a hollow on the bottom (for the spring pushrod) then a steel shim, and an O ring. This should all be nice and clean – if not – clean it well. If the O ring is damaged, or hard and brittle or badly flattened by age, replace it. While it is apart, verify that you can readily blow through the inlet and outlet fittings on the exterior. If not (my case), find out why and fix it! Mine was obstructed by crud in the metal gauze filter under the inlet fitting. Soaking in Carb/Brake cleaner and blowing out with air cleared it fairly well, but some people recommend removal altogether. I took the halfway course, and pushed a pin through it, which seemed to do the job. The outlet port in the centre seems less likely to block up, but check it anyway. If you know you had a high control pressure, now is the time to tap the regulator outwards in the casting – see below.

Re-assembly.

Fit the O-ring, steel shim, button and cover plate, ensuring that the button sticks through the cover, with the flat side to shim, and fit the 4 screws. Drop the electrical connector through the top hole from the inside, slide the bimetallic down its post, and the wiring should fall into place. As you tighten the nut and washer holding this in place, ensure that the bimetallic strip end fingers are centered over the regulator centre button, so the spring push rod fits into the button cavity – mine had a spot of grease here, and on the other end of the push rod. Clip the electrical connector in place on the top.
The only hard part of reassembly I found was fitting the base back on so the spring fitted its seat correctly. I held the upper body inverted in one hand, or in a vise, with the push rod, spring cap and spring balanced in place on the bimetallic fingers. Carefully bring the base plate down so the spring goes into it's seat – it will meet with about 3mm (1/8") gap. Once it is located hold the base plate firmly down and fit a fixing screw in each of 2 corners – should only take 4 hands to do quickly. Easy wasn't it? Fit the remaining screws and tighten evenly. Refit to engine.

Testing.

To test the pressures in the system you NEED a gauge set that can be connected in the line from the distributor to the WUR, with a tap in the leg connected to the WUR. This consists of a T fitting with a gauge (0-100psi) on the stem, a hose than can fit to the WUR inlet pipe on one side, an open/closed tap on the other, then a hose that will connect to the WUR inlet.

You will also need the following pressure data to evaluate your readings:

928	System pressure		65-75 psi
	Control pressure at	50F	17psi
		75F	30psi
		100F	44psi
	Warm Control		41-46psi

If you need more data, get Ben Watson, How to Tune and Modify Bosch Fuel Injection, from Amazon or nearest available source.

You could do some empirical adjustments based on observations without a gauge (eg, sooty exhaust when hot = rich mixture=low control pressure), but there could be other causes, such as maladjustment of the mixture screw on the distributor, and you could just make things worse.

The actual tests you need to do will vary with the problem you are chasing, but this is what I did based on Watson.
Connect your gauge in the inlet line, with tap on the WUR side of the gauge. Start engine, preferably from cold. Note the initial gauge reading, and then wait until it stabilizes at the warm setting. If you now close the valve, you will see the System pressure – if you leave the valve closed, Control will equal System, and the mixture will go lean and probably stall it, so open the valve again once you have a reading. Bad system pressures are probably produced in the main regulator in the distributor – talk to JK here, as it remains (thankfully) outside my knowledge. Also check the pump and filter for delivery rate etc.

Now, if you are VERY lucky (and chasing a problem), you have a low control pressure, rather than high. Note from above that to increase control, we need to push the regulator INWARDS in the WUR body – with a driver or a brass drift, give the centre of the regulator a smart rap, and watch the pressure – it should rise a bit. Take this slowly, as overdoing it will mean remove, dismantle, tap the regulator outwards, assemble, refit, and retest. As you lift the control reading, the mixture should lean out and you should notice an improvement in the idle, exhaust note change, and soot should disappear from the exhaust.

If, like me, your control is high (more likely), you need to find out if it is due to incorrect calibration of the regulator, or a blockage in the system somewhere. Watson recommends locating blockages by – loosen the nearest connector in the direction of flow of fuel, and see if the pressure drops; if it does, the problem is further along; if it does NOT, the problem is one step back up the flow. That is, if you open the return line from WUR to distributor, and the control does not drop (mine didn't), the problem is in the WUR (mine was)! If it hadn't, I would then have opened the connection of the return to distributor, then on to the line to the tank, then hose at the tank entry, then pipe in the tank. Blocked pipes should clear with some solvent like Carb/Brake cleaner, and application of compressed air – WITH CARE!

Remember to take all appropriate precautions when opening connections with high-pressure fuel inside!

Okay, we have a high Control pressure, and WUR is the cause. Dismantle as above, and clear any blockage found. I have seen reports that the little metal gauze filters were deleted in late models, so if you have trouble clearing the restriction and believe it is caused by the filter, use your best judgment here. I found that replacing the O-ring in the

regulator (old one was well flattened) produced a 4psi drop in control pressure, so make some allowance for that.

Jay Kempf suggested that the regulator should be tapped out of the die cast casing about 1mm (.040") to correct a high control condition, as it is then easy to correct a low control pressure from outside without removal or disassembly again. Measure the height of the iron part above the die cast case first, and then tap from inside until it is 1mm higher.

Support the body on a firm piece of wood or soft jaw vise to do this, with the iron part protruding. Jay also pointed out that since the base cold start settings are controlled by the position of the bimetallic post in the WUR body, this post might need attention. If your car does start cold, and can be warmed up, leave it alone. If you think it needs adjustment, as with the main regulator body, tap the post outwards from the inside, so that adjustment consists of tapping it inwards from outside later. This will reduce cold start pressure reduction, so if the engine is COLD, or ambient temperature is low, starting may be a problem. In order to remove any cold start aspects from interfering with warm running pressure tests, Jay suggests leaving the whole bimetallic kit out, or at least fitting it so it has no effect – don't tighten the post nut. This will allow you to resolve hot running pressures separately, and do the cold start part later. Mine had no cold start problems, so I replaced it as I found it.

Now it's time to refit to engine, with gauge connected as before and test it. If the engine will start you are nearly there. If not, jumper the pump, and see what pressure you get, taking ambient temperature into consideration.

You should be able to get the Control pressure somewhere near spec, by tapping the regulator inwards, if you tapped it far enough out to get low Control. Once running and warmed, tap regulator in until you get into specified range (40-46 psi in Watson). You may find that it will start, but run a bit rough initially, as mine did, but I put this down to a cold WUR on a warm engine – the mixture is rich, but the extra air valve is closed by engine heat – it got so I could remove, dismantle, reassemble and refit before the engine cooled down much after a few practice runs!

Once you have the Control pressure in range, your idle should be nice and steady, and throttle response good – go for a test drive, leaving the gauge in place, and get it warmed up thoroughly. Mine seemed ok after first try to clear the WUR, but after 10-20 minutes driving to soak it with heat, the Control pressure went high again, so I had to go in again.

Also don't forget that if the CO adjuster on the distributor has been played with, you may have a separate problem there.

If you have a cold start problem, you will need to allow it to cool right off – overnight, depending on ambient temperature. With the bimetallic secured properly, jumper the pump and check the cold Control pressure. If higher than specification, tap the post inwards CAREFULLY until it comes into range. Try to start the car, after connecting the electrical lead to the WUR. If you do this in warm weather, and get acceptable cold starts,

you may need to adjust the post more as the temperature drops. You should recheck the warm Control pressure as well – if it is now lower than before, you have probably gone too far, or there is another problem inside the WUR.

Other things being equal, you should now be home free.

By 'Other things being equal', I mean WUR problems may not be all you have to contend with, but if you get the hot and cold control pressures right, at least you can eliminate it from consideration. YMMV

Good luck.

Postscript.

A month or so after the original success, the control pressure started to rise again, and performance went down a bit. Based on the state of the little metal gauze filter under the inlet connection, I thought I would just rip it out in place, and it would be no big deal. Wrong!

After removing the filter (2 pieces of gauze, with some fibrous material in between), and closing up again, I could only get 15psi control warm, and of course it was way too rich. I knocked the regulator body inwards with no improvement.

Hmm!

Okay, off it came (hot by now), and opened up. No apparent problems. Knocked the regulator back out, and replaced the metal filter gauzes (not the fibrous material, I think it was foreign), reassembled and refitted.

After a bit of tapping in, control came up to 45psi, but the regulator was deeper in the body than before – in fact I doubt it will go in much further without the outlet fitting hitting the outer body.

Next cold start was poor, so I had to tap in the post end that held the cold start bimetallic strip, and now its behaving fairly well.

The question this raises is – what is that filter supposed to be composed of, and how big a part does it play in the pressure drop? More research needed here.