REFURBING AND CALIBRATING A CIS WUR

Note to Reader: The first link is a pictorial discussion of the Warm Up Regulator (WUR), review it and be at ease with your plan to "Refurb the WUR" it is not a difficult task. The text that follows in this note is based on a 1977 Porsche, 911S, Targa with a 2.7 litre motor that had serious engine disturbances at 3100 RPM in any gear. The motor would not move past that speed and it would shudder and shake violently. Fuel testing showed that the WUR pressure was not above .5 BAR at any time. Cold testing should have read near 1 BAR and warm tests should have read roughly 3 BAR. Original test showed that .5 BAR was pressure limit for any condition. The reason the WUR did not provide any fuel regulation is attributed to a 25 cent O-Ring that had compressed over its 42 years of use. Second, third and fourth links are included to augment reader's system knowledge.

Reference for Teardown (Physical component discussion with pictures)
http://www.jtresto.com/e21/WURServicing.pdf

Jim's Basement Workshop-Continuous Injection Systems (CIS)
Site contains WUR Spec information and "How To" Steps Select the CIS Primer option and read it all.
http://jimsbasementworkshop.com/

Mercedes Forum link where experienced mechanic discusses WUR calibration. Pretty technical and somewhat intimidating for a newly exposed person to CIS fuel systems, you can compare it to the simple steps listed below and make your own conclusions as to which way you want to proceed.
http://www.benzworld.org/forums/w126-s-se-sec-sel-sd/1372083-warm-up-regulator-wur-calibration.html

(Link to forum thread where engine misfire issue began its history, 3rd page is where this effort located)
http://forums.pelicanparts.com/porsche-911-technical-forum/761699-engine-miss-fuel-pump-relay-question.html

WUR calibration Instructions from Pelican Forum Subject Matter Expert: OSSIEBLUE
(Author comments relating to actual subject vehicle are bolded and bracketed)

Here's my take on your situation. First, what we know: ***(WUR P/N 0438 140 033)***
1. The WUR does not hold pressure.
2. The heating element does work.
3. You get voltage at the WUR connector.
4. All parts are present inside the WUR.

Here's what I suggest. (This is how I calibrated my WURs)
Replace your O-ring for the diaphragm. ***(Used 14mm X 1.5mm (14mm=ring ID) (1.5mm=ring thickness))***
Before you reassemble the WUR, do the following: put the nut onto the stud that holds the bimetallic arm so it protects the threads at the end. Use a large C-clamp and press the stud upward in the housing of the WUR until the top of the stud is flush with the top of the WUR body (actually, it will be stopped by the upper foot of the C-clamp). This will ensure the bimetallic arm, when fully warmed, will be off the coil springs. ***(Worked very well and C Clamp use was simple)***

Next, you will need to move the housing of the diaphragm upward because you changed the 0-ring. Put the WUR upside down in a vise and use a large socket that fits the size of the diaphragm housing. Either using a large C-clamp or a mallet, tap/press the diaphragm housing upward in the body of the WUR. You want to move it far enough upward so that when you reassemble the WUR, the pin fits loosely in the hole, but does not fall out. ***(Measured old and new o ring thickness, .006" difference, drove diaphragm out .010", measured with vernier caliper)***

Reassemble the WUR. Put a little grease in the cup of the pin carrier to hold the pin while you put it together. Be sure the nut is tight on the bimetallic arm and the hole in the arm is centered around the pin.

Now, put the WUR back on the engine and connect you fuel gauge. Connect the electrical connection and give enough time to be sure it has fully heated the bimetallic arm. Turn on the fuel pump. Your fuel pressure should be very low, probably ~.5 bars. You can use the end of a socket extension or something similar to gently tap downward on the top of diaphragm housing. Watch your fuel pressure gauge as you gently tap. As the housing moves downward, you will notice the pressure rising. Work slowly until you reach warm control pressure (If you go too far and exceed warm control pressure, you will have to start all over by disassembling the WUR and pressing/tapping the housing upward.) You will now have to wait until the WUR is fully cooled to set the cold control pressure.

(Starting pressure 2.4 BAR, tapped to 3.1 BAR)

When the WUR is fully cooled to ambient temperature, you can set the cold pressure. You will need the temperature/pressure graph for your specific WUR. Initially, the cold pressure should be way too low because you moved the bimetallic arm upward. Unplug the electrical connection and start the fuel pump. Watch your fuel gauge as you tap downward on the small stud of the bimetallic arm. Gently tap downward until cold control pressure is reached.

Finally, plug the electrical connector back in, apply power, and watch your fuel pressure gauge. If all has gone well, it should rise from your cold to warm. ***(70 F, Starting pressure 3.1 BAR, tapped post down to .7 BAR. Connected electrical plug and pressure rose to 3.0 BAR, 4 minutes. Bleed test to 1.5 BAR, 15 minutes with WUR in flow path. Road test showed no RPM restrictions, successful rebuild.)***

Additional Note: Explains the second vacuum input at the bottom of this WUR

As to the bottom part of your WUR, that is for wide open acceleration. Notice that you have two coil springs. Without getting too complicated, the smaller, inner spring rests on the center of the bottom portion of the WUR which is also a diaphragm within a lower chamber. With wide open throttle, vacuum changes within the WUR allows this small spring to release tension, push downward, drop the diaphragm (which is basically lowering the "floor" of the spring) and lower the position of the pin, thus lowering fuel pressure. Result: a richer fuel mixture as long as the throttle is open.

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