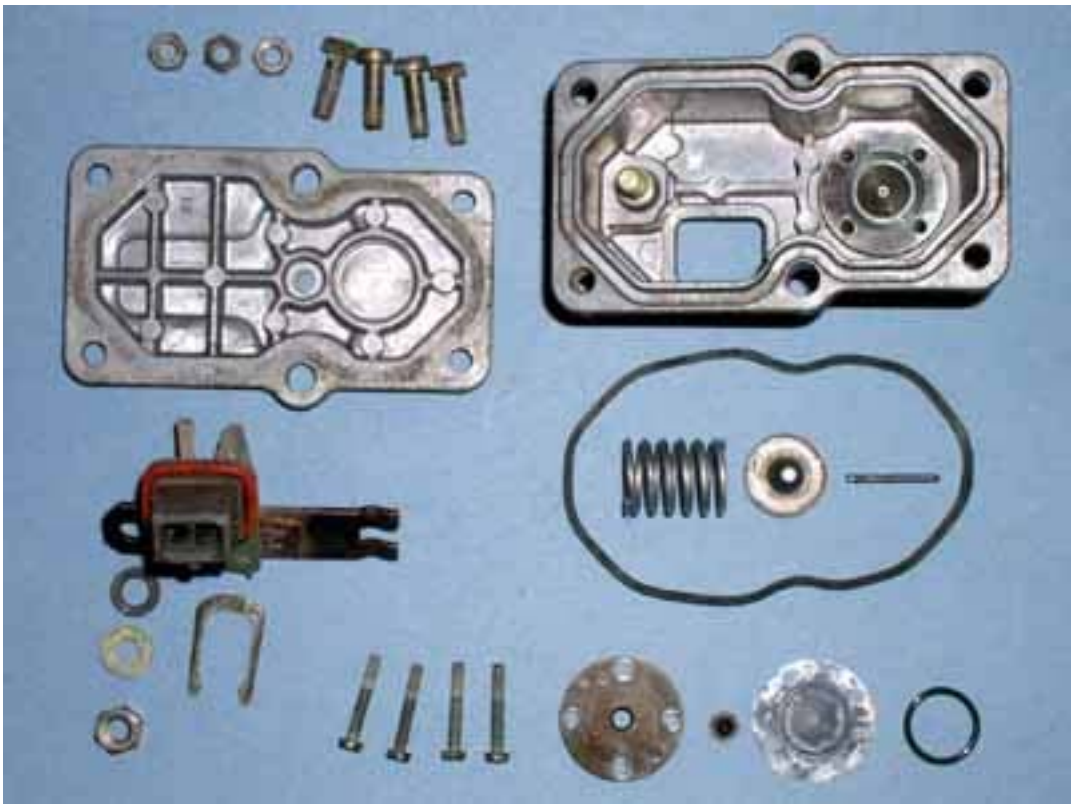
# Disassembly and Reassembly of a Bosch Warm-up Regulator

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## Introduction

The purpose of this guide is to provide information to allow someone to disassemble, clean and reassemble the Warm Up Regulator (WUR). It is important to note that Bosch does not consider the WUR a rebuildable part and there is no source of internal parts available. If you decide to work on your WUR you do it at your own risk. Portions of the WUR use very tight tolerances and must be kept absolutely clean. It is possible to ruin a WUR beyond repair by taking it apart. It is recommended that you have a source of another WUR (junkyard, etc) before you begin.

It is highly recommended that you verify that the WUR is in fact your problem by use of a kjet pressure gauge to confirm that the control pressures are incorrect. Also note that disassembly and reassembly of the WUR can and often does change its control pressures even without intentionally making changes.

I highly recommend the book "Bosch Fuel Injection & Engine Management" by Charles O. Probst as a reference book for working on and troubleshooting the Bosch Kjet fuel injection system.

The WUR used in this paper is taken from a 1977 BMW 320i. Differences will be found with warm-up regulators from other cars but all Bosch warm up regulators share the basic configuration of the one used here. The differences lie in the use of a second bimetal strip or the use of a vacuum or pressure actuator incorporated into the back plate at the base of the spring. The WUR is also referred to as the control pressure regulator in some texts and in some portions of this paper.

Tools Required:

- Large flat blade screwdriver for back cover screws
- Small flat blade screwdriver for valve body screws
- Needle nose pliers for electrical connector clip
- 10mm socket wrench for bimetal strip mounting nut
- Carb/Choke cleaner
- Soft, clean cloths for cleaning internal parts

## A Little WUR Theory

Before digging into the WUR, it is important to understand the basics of what it does so you understand what you are looking at when you disassemble it.

As the air flapper plate in the metering box is moved by the engine's intake airflow it moves the metering pin upward inside the fuel distributor. The further this metering pin is moved up the more fuel is delivered to the fuel injectors. A variable counter force to this movement is provided by means of a control pressure exerted on the end of the metering pin trying to push the pin back down against the air flapper. The higher this control pressure, the less the metering pin is moved up at any given airflow, this leans out the mixture. The lower the control pressure, the more the metering pin can be raised for any given airflow. This richens the mixture.

The control pressure is derived from a passage in the fuel distributor that provides the full main fuel pressure (about 70psi) to the top of the metering pin to push it down. This passage is connected via a hose to the WUR which acts as a variable pressure bleed valve to reduce the control pressure as needed. Fuel is allowed to pass through the WUR valve and return to the fuel tank. When the WUR is cold it allows a lot of pressure to bleed off resulting in a low control pressure and a richer mixture. As the WUR heats up it allows less pressure to bleed off and the control pressure is higher resulting in a leaner mixture.

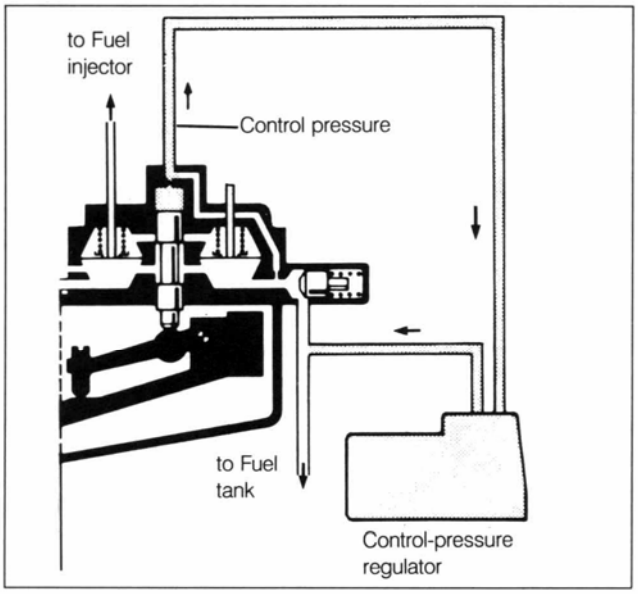



**Fig. 5-3.** Control pressure regulator adjusts control-pressure counterforce on the plunger by bleeding off fuel to the fuel tank.

Figure 5-3 taken from Chapter 5, page 19 of "Bosch Fuel Injection & Engine Management" Charles O. Probst; Robert Bentley Publishers ISBN 0-8376-0300-5

The WUR is a very simple device. It consists of a moveable metal diaphragm that is pushed against a valve body by a spring. The higher the spring pressure against the diaphragm the more the valve resists fuel flow and the higher the control pressure. When the WUR is cold this spring pressure is almost entirely held off the diaphragm by a bimetal strip. This allows for a higher fuel flow through the valve and a lower control pressure. As the bimetal strip is heated via a built in electric heater and by engine heat, it bends and allows the full spring force to push on the valve.

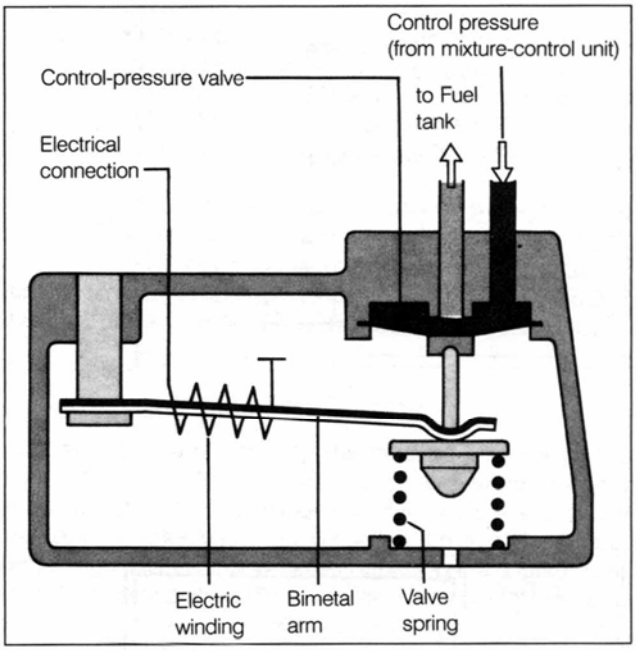



**Fig. 5-4.** K-basic control-pressure regulator. When cold, bi-metal arm bends down. This increases fuel return and lowers control pressure, reducing counterforce on the control plunger. When warm, spring lifts diaphragm to increase control pressure and counterforce on the plunger.

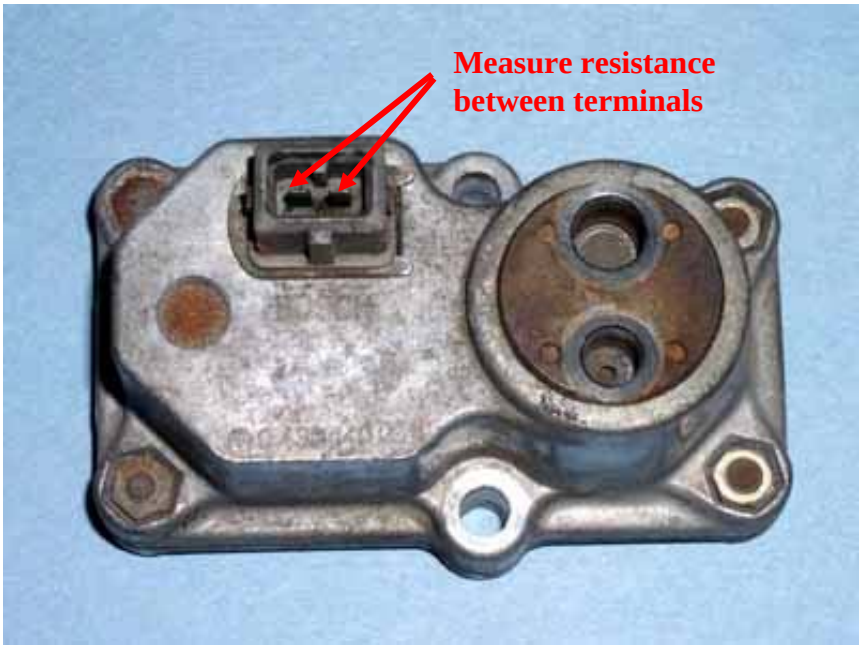
Figure 5-4 taken from Chapter 5, page 20 of "Bosch Fuel Injection & Engine Management", Charles O. Probst; Robert Bentley Publishers ISBN 0-8376-0300-5

## Disassembly

To disassemble the WUR first remove it from the car. Be careful when you loosen the banjo bolts on the fuel lines, as there might be high-pressure fuel still in the system. Use some black electrical tape on the ends of the banjo fittings on the hoses to keep dirt from entering the fuel lines once removed.

Next, clean the outside of the WUR as much as possible. This will help keep the inside clean once it is disassembled.

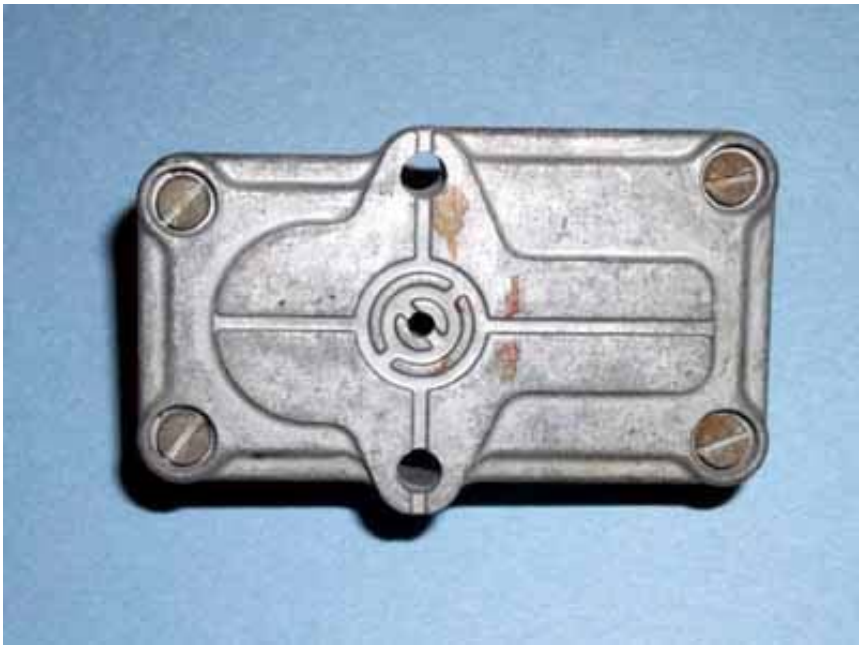
Check the resistance across the two heater terminals. The resistance is typically between about 15 and 30 ohms depending on the WUR.



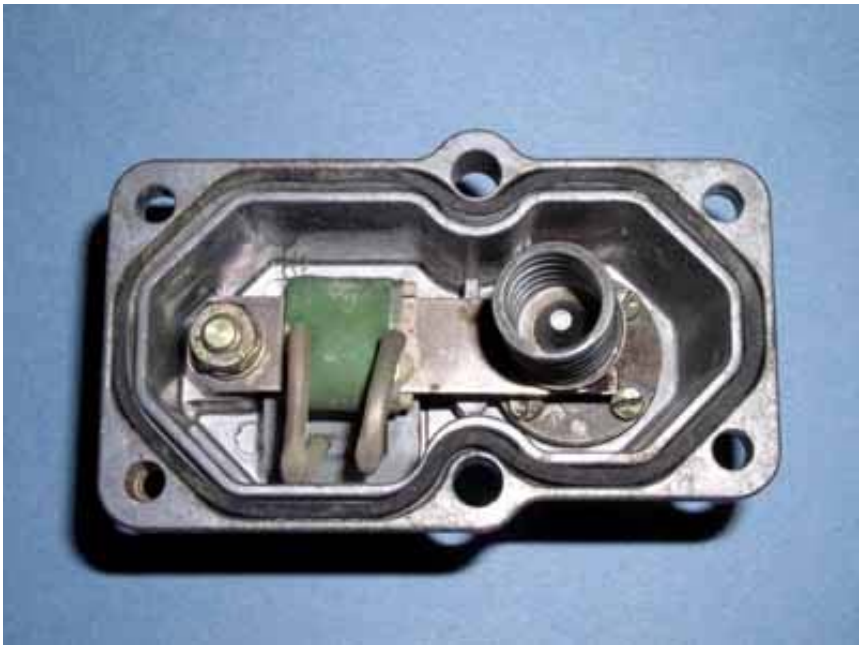
Remove the spring clip that holds the electrical connector on the front of the WUR.



Remove the four screws on the back of the WUR



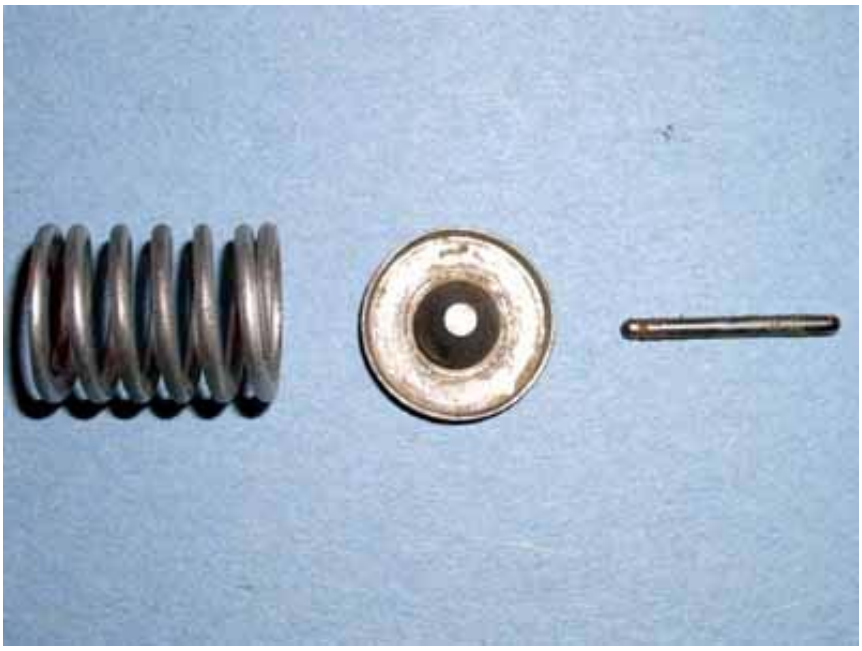
Carefully pull the back of the WUR straight up. There is a rubber gasket between the front and back parts. Be very careful not to damage it. Note the position of the spring and pin in relation to the bimetal strip and valve body as you remove the back plate.



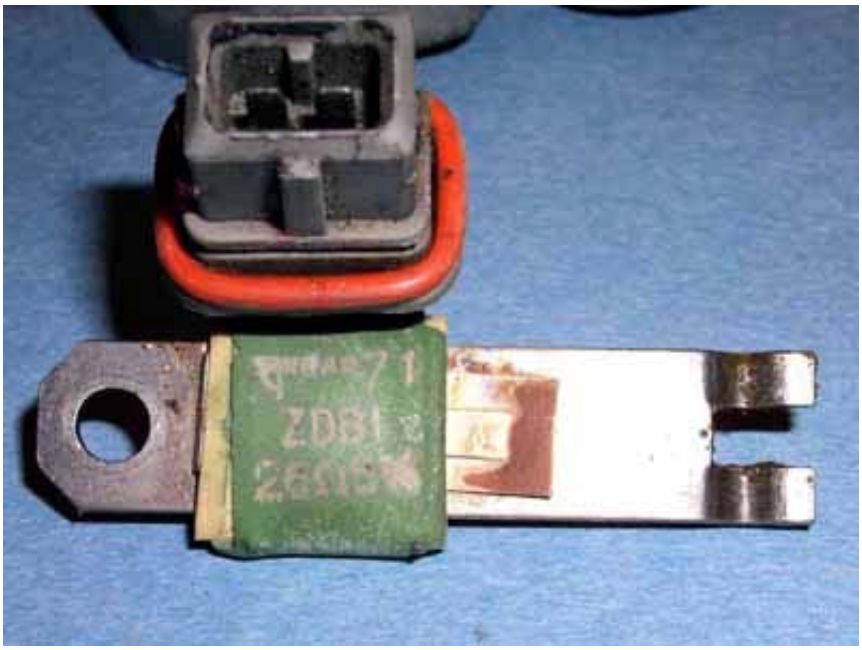
Look at the WUR with the back removed, you can see that the spring which is normally compressed against the back, pushes on a pin that rests in the center of the valve body. That pin transmits the spring force to the metal diaphragm in the valve. The bimetal strip pushes against the spring and controls how much spring force is applied.



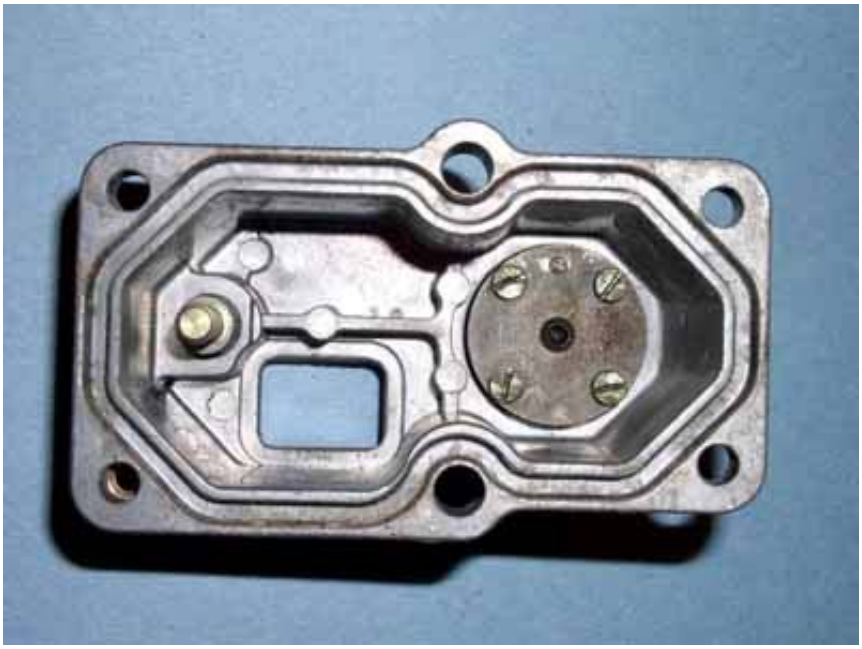
Remove the spring and the pin.



Carefully remove the bimetal strip by loosening the nut holding it on its mounting pin. Inspect the bimetal strip for damage in the ceramic coating on the heater. The heater element resistance should be printed on the heater. In this case it is 26 ohms +/- 5%.



Now for the sensitive part, cleanliness in this area is very important. Carefully remove the four screws holding the back plate of the valve body. Very carefully remove the valve back plate. Be careful not to lose the little “button” in the center of the back plate.



If it did not come off with the back plate, try to very carefully lift the thin metal diaphragm off the valve body. Take your time; if you damage this piece in any way you have just ruined your WUR.

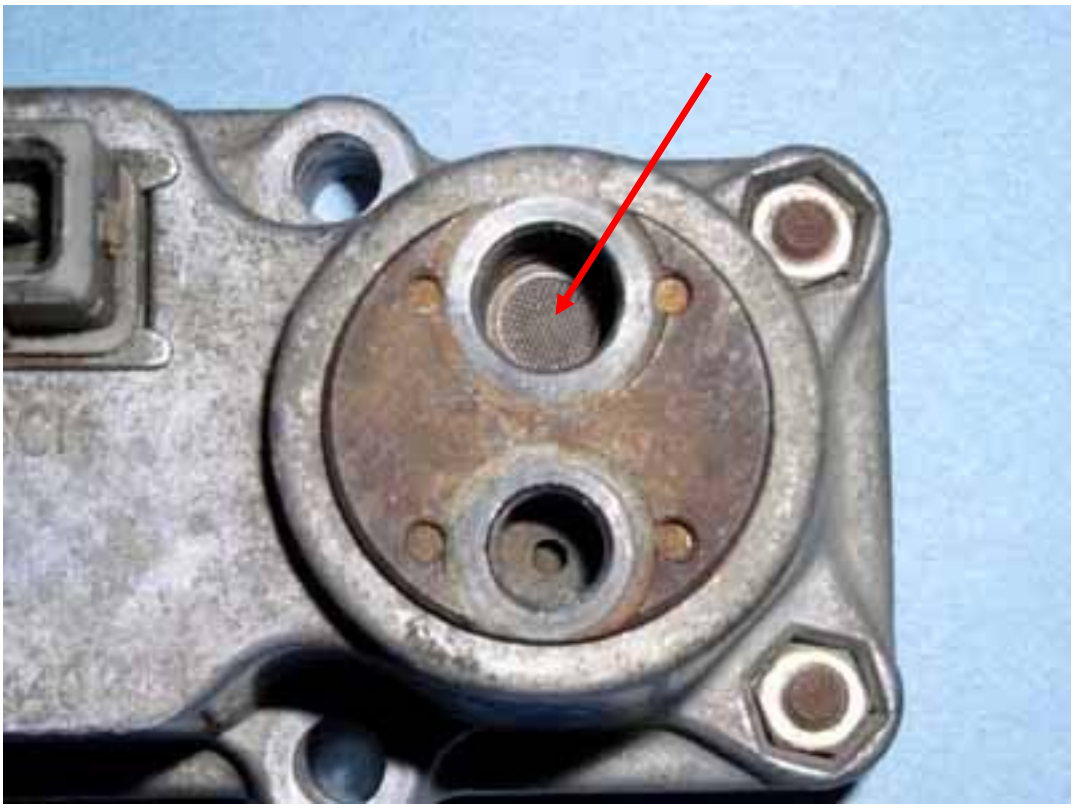


Remove the rubber o-ring.  You can replace this o-ring but it will change the WUR control pressure by a few psi.  I have found that a new o-ring can lower the control pressure by as much as 5psi in some cases.



With everything apart, clean all the metal pieces with some choke/carb cleaner to remove any dirt and fuel varnish.  Do not use anything other than a soft cloth to clean the internal surfaces of the valve.  If there is visible rust on the flat machined surfaces of the valve then the WUR is bad.

Check the filter screen in the inlet port of the valve body; this is one of the most common causes of WUR problems.



## Assembly

Assembly of the valve is just the reverse order of disassembly. Make sure everything is absolutely clean. Make sure the o-ring in the valve is correctly positioned. Tighten the four mounting screws as uniformly as possible using a cross pattern to tighten them.

Install the bimetal strip making sure as you tighten its mounting nut that the end cutout is centered over the valve body.

Place the pin in the button on the valve. A small dap of general purpose grease will help keep the pin in place.



Place the spring in place on the bimetal strip.

Install the back cover making sure the spring is seated correctly in its recess in the back cover. Make sure the rubber gasket is installed correctly.

Tighten the four back cover screws as uniformly as possible using a cross pattern to tighten them.