The Early Valiant Barracuda Club
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Convert Your Dash Gauge Voltage Regulator To Solid State And Get Your Gauges Working

By Daryl Howland

This article will attempt to demonstrate how easy it is to remove the antiquated voltage regulator from your Chrysler product's gauge cluster and replace it with a solid state IC chip. For a while now, I've been planning to replace the internal regulator (mine is in the fuel gauge, but in most Chrysler models it plugs into the back of the instrument cluster and is therefore easily removeable) with an external one as demonstrated in this Chuck Rivers article on the SlantSix.org Web site. However, during my search for the external regulator, I stumbled onto this *Richard Ehrenberg* article on Allpar, which shows how to convert from an external regulator to a solid state one. So, I bodged them together and converted my 1964 Valiant gauge regulator from inside the gas gauge to an external solid state "7805" design. Before you begin, I would recommend reading both of these articles to gain a better understanding of what's going on in your gauges.

There are few parts needed for this conversion and they are pretty inexpensive. The Allpar article pretty much lays them out with Digi-Key part numbers. I went to Radio Shack and got comparable parts. The first part you need is the chip. It's what's known as a "7805". The "5" means the output is 5 volts which is what we need for this application. Evidently, this is a really common part. Radio Shack's part number is 276-1770 (7805 +5VDC Voltage Regulator-$1.59). This will convert up to 35V input to +5V output. Pretty neat. The second part you need is a capacitor. This is to protect the chip from any weird voltage fluctuations. I'm not sure how necessary this is seeing as the chip will handle up to 35V, but it's cheap insurance. Radio Shack part number 272-1025 is a 10uF and up to 35WVDC ($0.99). The third piece is a heat sink. This is where Radio Shack let me down. They only have one available and it has to be modified for this purpose. If you are more patient than I am you can order one listed in the Allpar article which has a nice indent for the regulator to fit into. The Radio Shack heat sink is part number 276-1368 ($1.69). But, it will take some grinding and drilling for it to play nicely with both the regulator and the circuit board. You'll also need:

- A couple of small lengths of wire, preferably different colors,
- Two ring lug connectors – one should fit snugly around the gauge post and the other should be a larger diameter with clearance around the post,
- Heat-shrink tubing (I got some at Radio Shack, #278-1627-$2.39) with at least one piece that slides snugly over the gauge post.

- An attaching screw that is slightly longer than the existing ground screw,
- And one isolating washer made either of fiber or rubber with an inside diameter the size of the gauge post and an outside diameter a little larger than the securing nut.

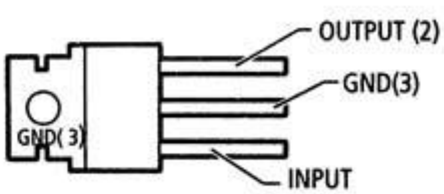
Once you've got your parts together, remove the instrument panel (after you disconnect the battery). It helps to lower the steering column partly, if not completely, out of the way. Be careful the chrome speedo cluster doesn't scratch the paint. Unfortunately, I don't have a picture of what my circuit board looked like originally, but it really doesn't look that much different than it does now.

My board did not have the clip thing that is normally mounted on the "A" post of the fuel gauge (the top post). If you have that, you're going to want to replace it with a nut similar to what the other posts have so you get a good final connection there.

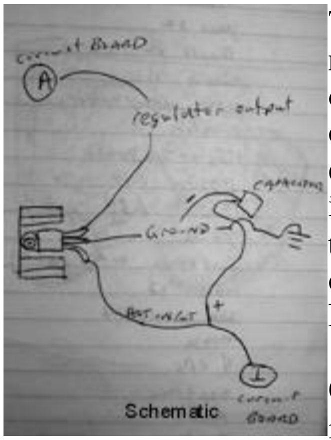
Before you start with the renovation, you should make sure your gauges work at all. Temporarily connect positive 12V to the "A" terminal post of either gauge and negative to the "S" terminal. Your needle should rise very quickly to maximum. DON'T DO THIS FOR VERY LONG! You'll fry your gauges. If they both respond to this test, you can proceed.

Let's start with the heat sink. If you use the Radio Shack heat sink, you're going to need to do some grinding. The heat sink is designed to have the chip mounted to the large flat underside. We want it attached from the top. So grind away the base next to the screw hole until there is a nice alcove for the chip to fit into and the holes line up. Now find the new screw you are going to attach everything with. If possible, find one with a smaller diameter head than the ones on the board so you can drill out a smaller hole in the heat sink. I started with a small drill bit and just went up one size at a time until the screw head could sit flush on the base of the sink. You also need to drill out the heat sink hole slightly as it comes tapped for a 4-40 screw.

You'll notice in the completed picture, the wires are at a pretty hard angle. If I were doing this again, I'd position the wires differently. That's because I cut the wires and soldered them to the chip before I mounted the chip and heat sink. What you should do is mount the chip and heat sink first. Then you will have a very stable platform to solder the wires to. Make sure the bottom of the heat sink is completely in contact with the top of the chip. Use thermal grease if you have some. Also, make sure your heat sink isn't shorting to another part of the circuit board. I put a small piece of electrical tape under the part that seems to be resting on the printed circuit of the adjacent light socket.



Now you need to make the electrical connections. There are three pins that come from the chip. In the pictures, the input is the lowest pin, the ground is in the middle, and the output is at the top. First, bend the middle pin upwards slightly. Then, angle the input pin towards the "I" post.



The “I” post gets 12V directly. The “I” post will also get the larger hole lug. The reason for this is that we want to isolate the old voltage regulator from the 12V; otherwise you’ll also have an oscillating 5V at the “A” post from the internal connection. Remove the nut from the ”I” post and find the heat shrink that barely fits over it. Cut some so that it comes up just above the height of the lug after it is installed. This will insulate the post from the 12V at the circuit board and the 12V of the lug. Now cut a piece of your wire to fit nicely between the lug and the input of the chip. If you’re uncomfortable with how short it is you can always route it the long way like I did.

Cut your other piece of wire to fit between the output pin and the smaller lug when it’s in position on the “A” post. Crimp or solder your wire to your lugs. Then, solder the capacitor in place. The negative leg of the capacitor attaches to the middle ground pin. The other leg will be attached to the input pin along with the “I” wire. With both lugged wires held in place with their retaining nuts (don’t forget to isolate the “I” post with a fiber or rubber washer), position the wires neatly to contact the pins. If you have the room or desire to heat shrink the connection, now’s the time. Solder the wires in place. You should end up with something that looks similar to this.

Now you should test everything to see what’s working. You want to apply 12V to the pin connector that goes to “I” on the circuit board. Don’t connect it to the terminal post at “I” or you’ll be bypassing all of your work. Also, be careful not to connect it to the output side (“A”). I’ve read that these IC chips are really sensitive to current flowing in the wrong direction. One slip and it’s dead. Now connect your negative lead from your battery to the chassis of the gauge cluster. Connect your fuel gauge “S” terminal to the chassis. The dial on your gauge should now climb slowly to maximum full. Remember, this shows full with zero ohms of resistance. If your needle only goes half or three quarters, you have more work to do because the smallest resistance your tank sender is going to give is about 10 ohms (when full). Now connect the temp gauge “S” to the chassis. Your temp gauge should act the same way. If both gauges are not working at this point, verify that you have 12V at the input and 5V at the output. If all is well, reinstall the instrument panel. You’re done.

FUEL GAUGE ADDENDUM:

In my case, my fuel gauge still would not read full at this point. I finally decided to open the gauge to see what was going on. If you very carefully grind away the back of one of the rivets (I decided the one under the “E” would be best), you can push the rivet out and rotate the face of the gauge out of the way.

What I could see was that when I applied 5V to the gauge, the needle moved from where you see it (which corresponds to below my left elbow if I were driving) up to a slightly more than half way. The whole span was shifted counter-clockwise. I decided this was due to a bow in the bimetallic arm that you can see clearly in the picture. I gently persuaded it to start out straight, which moved the needle to just below the “E”.

There are a couple of slots you can see in the back of the gauge that also give you a little adjustment. The lower one moves the pivot point of the needle with respect to the bimetallic arm. The upper one shifts the whole thing right or left. Not a lot of adjustment in either case, but if you’re just a little off one way or the other it can help. It’s also hard to make either adjustment a slight one. They tend to be sticky.

After making the internal adjustments, I rotated the face of the gauge back into position. Luckily, the rivet snapped back into place when I pushed it through the hole so no extra work required.

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