Dual Battery Installation for ’85 4Runner
Part I: Making Room
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Content:

Problem:

My ’85 Toyota 4Runner is a vehicle primarily intended as a moderate-to-heavy duty 4x4 rock climbing rig with winch, ham and CB radios, auxiliary lights and other electrical and electronic devices. I had already installed a high power alternator (see my ’85 Toyota 4Runner Alternator Upgrade Project paper, dated Nov. 2004). The purpose of this Part I: Making Room paper is to document the physical installation of a dual battery into my ’85 4Runner and what I learned during the process.

Part I of this paper deals only with the physical modifications necessary to install a dual battery into my ’85 4Runner. Since I have not yet bought the second battery (an Optima Yellow Top), wiring and actual installation of the second battery will be documented in Part II of this paper.

Vehicle Modifications:

I reviewed a number of locations on my 4Runner including the engine bay, under the body and rear cargo area. Of all those areas, I decided on the engine bay as the most convenient, the safest location and the easiest to wire and protect the batteries. Careful measurement of the OEM battery location showed that by rotating the OEM battery 90 degrees, another battery could be shoehorned in with some minor modifications. See figure 1 for a photo of the OEM battery location.

The first problem to solve when mounting batteries in this location is to move the OEM fuse box approximately 1” towards the rear of the truck. See figure 2 on how I was able to move my fuse box 1” inch. There is just enough slack in the factory wiring harness to make this move without having to redo wiring harnesses or putting undo pressure or tension on the harness.

Figure 1. OEM battery location with battery and tray removed. The area needed for a dual battery tray is approximately 10” x 14”. Space limitations are as follows: A/C lines and sensor to the right; radiator on the right; left headlight harness and connector (be careful here!) to the front i.e. lower left in the picture; the left fender on the left; and the left fender well area and OEM fuse block to the rear.

Figure 2. OEM fuse box moved to the rear approximately 1". The wiring harness visible to the left has just enough play to allow this movement without rewiring.

A standard Optima battery is approximately 7" x 10". Therefore, for 2 batteries side-by-side, you'll need approximately 10" x 14". There is enough room in the OEM battery area for this space, with one exception: the left fender well area interferes near the bottom of the battery tray area. To correct this problem, I measured the horizontal distance I would need to clear the left headlight harness and connector back to the fender well and marked this off. I then drilled a ½" hole on one end of this measured area and are then took the sawzall to it. See Figure 3 for the result.

Figure 3. Left fender well area cleared out to make room for dual battery tray. Note the black/muddy fender flare material to the left of the cut out area plus the tire just below it. Cut these areas carefully! The bottom horizontal cut is level with the raised OEM battery tray in the center of the picture. The top black A/C sensor to the right is about ¼" higher than the raised battery tray area and therefore interferes with the dual battery tray. See the text on how I dealt with this.

Dual Battery Tray:

The next step was to deal with the ¼" or so interference with the A/C line sensor plus provide the base structure for the dual battery tray. For this, a friend (Doc) designed and fabricated the "H" base structure out of 3/8" x 2" bar. See Figure 4.

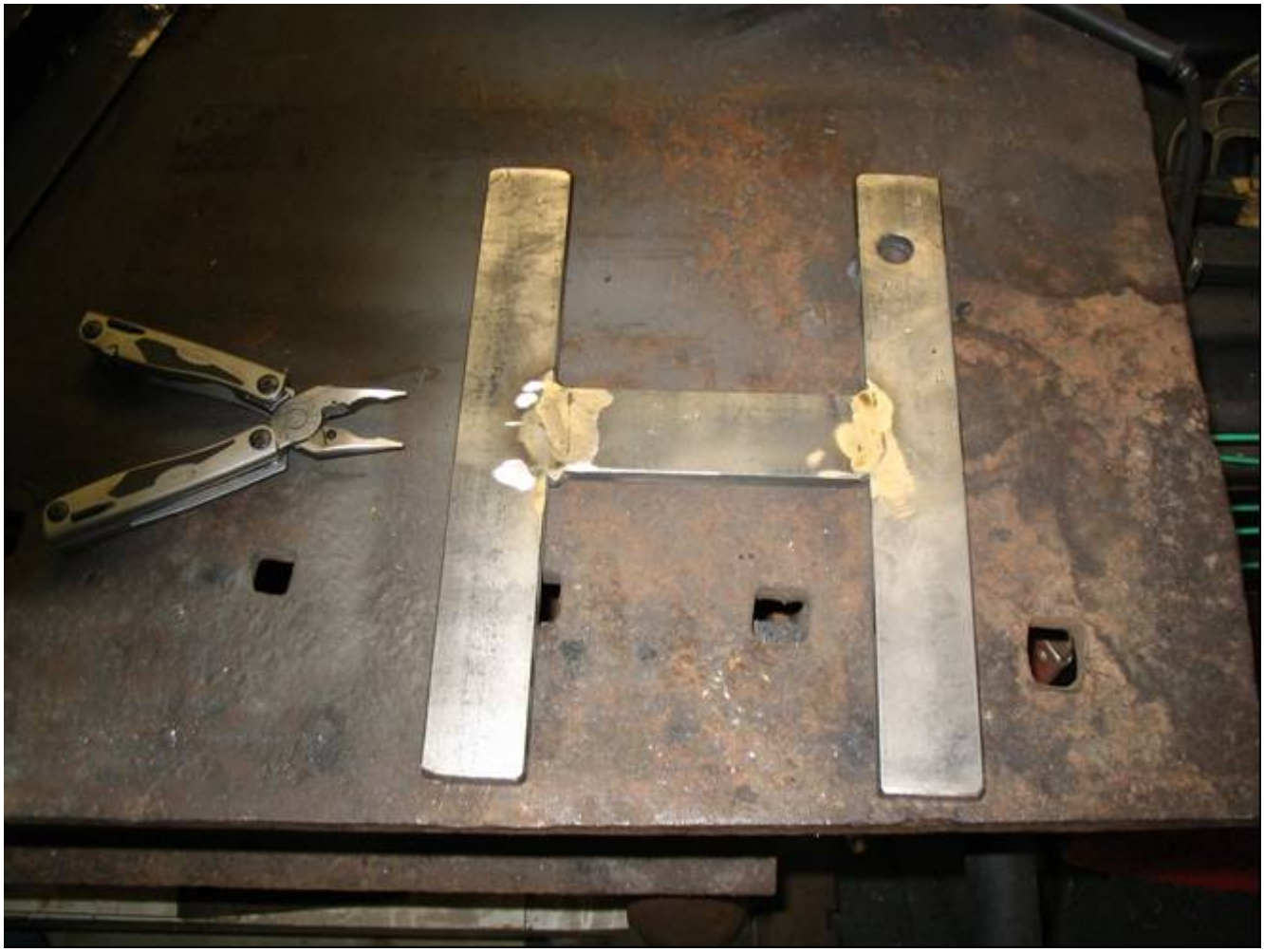

Figure 4. The “H” base substructure for the dual battery tray, designed and fabricated by Doc. This substructure provides the interface with the OEM battery tray area plus ensures the dual battery tray vertically clears the A/C line sensor. Hole at top right is an artifact of previous work and is not part of the installation. Note the good welding and grinding/cleanup work by Doc. This assembly is dead flat indicating good construction.

Next, I fabricated the dual battery tray itself. This was fabricated out of bed frame material, which is 1 ½” angle. You need to be careful working with this material since it is hardenable. When you are done welding on this material, it needs to be thermally tempered so weld areas do not crack during service. Note that regular angle material does not require this tempering. See figure 5 for a picture of the dual battery tray on top of the “H” substructure.

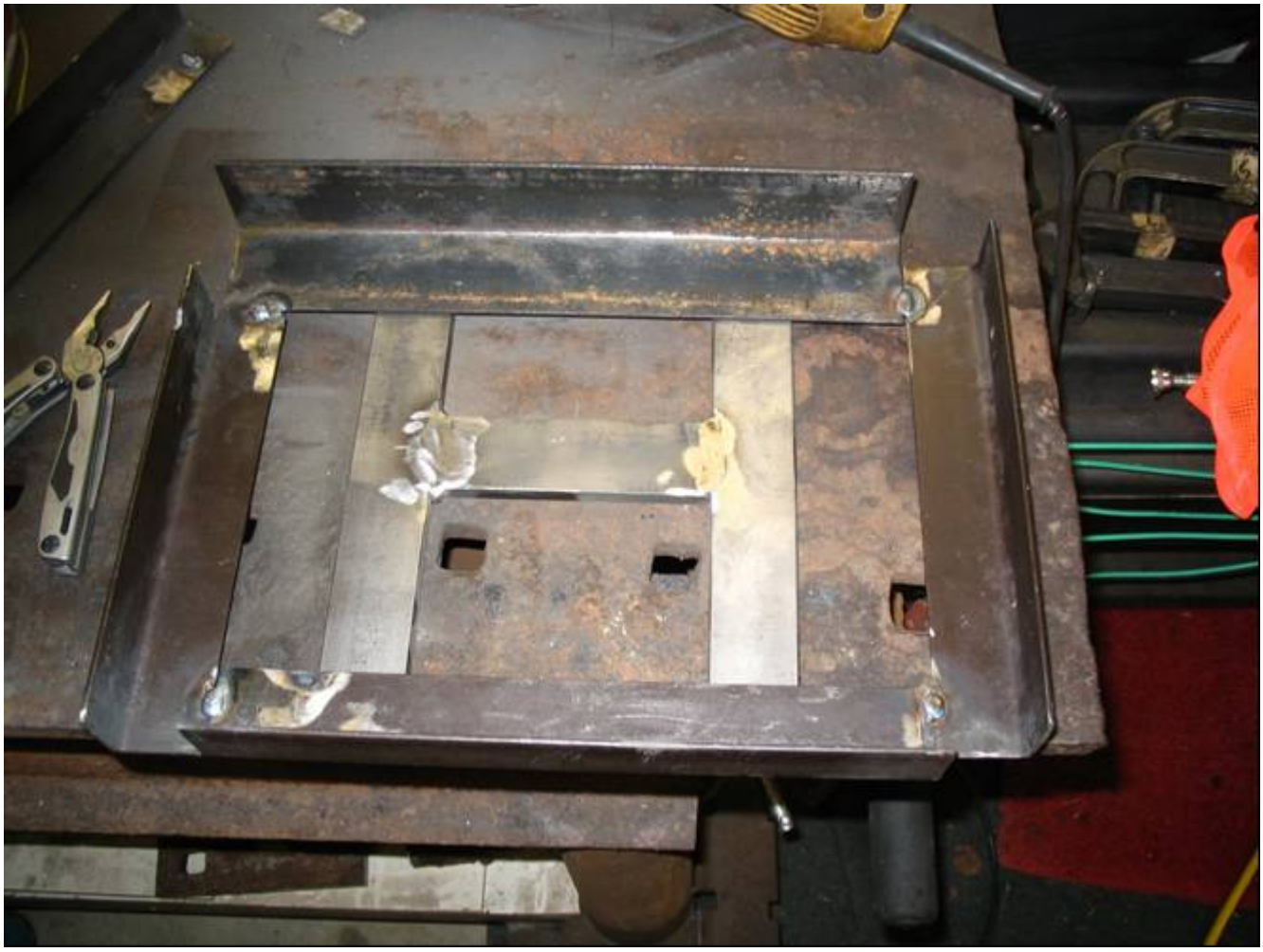

Figure 5. Dual battery tray on top of "H" substructure. Note that the tray has been tack welded and cracks have already formed on the upper right of the tray. The battery tray material is 1 ½" bed frame angle and is hardenable. You must "temper" this material after welding to prevent cracks during service. Regular angle material does not require this tempering. Inside dimensions of the tray is 10" x 14" plus about a ¼" in both directions; just enough to clear two Optima batteries.

After ensuring everything fits correctly, I final welded the dual battery tray and the "H" substructure together, including welding ½" threaded rods to the side of the tray to act as the battery hold downs and drilled 4 holes for the four 5/16" carriage bolts that hold the entire assembly in the vehicle. After welding and while the material was still hot, I cleaned the assembly up with hot water and dish washing soap. Immediately after, I put it into an oven and soaked the entire assembly for about 2 hours at 550 degrees. This "tempering", although not hot enough to qualify as real steel tempering, reduced the hardness of the bed frame material and made it less susceptiple to cracking during service. Note that regular

angle material does not require this tempering. I then painted the assembly and installed it. See Figure 6 for a near final installation.

Figure 6. Near final installation of the "H" substructure and dual battery tray. Note the clearances with the A/C line, radiator, left headlight connector, left fender and fender well and the air tube. It fits though. Note ½" threaded rod at each of the tray for the battery hold down bar. The black material on the left threaded rod is rubber hose to protect the wiring harness right next to it. What's not shown: four 5/16" carriage bolts to hold down the assembly (although the four holes are shown); the clearance into the left fender to clear the hold down bar and the closeout of the left fender well cutout, plus painting of the fender area.

Figure 7. A picture taken for another reason, but the only I have that shows my one Optima battery installed in the dual battery tray. Note the battery hold down bar, the left fender clearance in the upper left and the black 175 amp fuse block for the high power 140 amp alternator just to the right of the battery and below the OEM fuse block. Although it's not clear from this photo, there is room for 2 Optima batteries. Ignore white wire at top: I was in the middle of an aux light install when taking this pic.

See Figure 7 for final installation with one Optima battery installed. While it's not clear from the photos, be aware that you will not have clearance for use of the side terminals of an Optima battery for the battery installed on the left in this installation. You will also have to cover the positive side terminal to prevent a battery short in case of even a small fender bender to the left front area of the vehicle. However, I plan to install the Optima Red Top on the left side and since the only thing that battery will have to power in the dual battery

configuration is the starter and the OEM 40 amp fuse, I can use just the top terminal without any problems. I'll install the Optima Yellow Top on the right side where there is clearance to use both the top and side terminals of this battery.

Epilogue:

Installing a second battery in the OEM battery location in a '85 4Runner is possible. However, there are some tradeoffs and downsides: You will have to cut into the fender well area to make room for the second battery and you will lose the side terminal capability, if any, of the left hand battery. However, neither of these tradeoffs are insurmountable and the positive benefits of having a second battery far outweighs the negatives.

Appendix: Sources

Optima Batteries:	http://www.optimabatteries.com	Source of spiral cell batteries