Replacing the Mach 460

Background

The Mustang Mach 460 audio system uses four midrange tweeters, four woofers and three amplifiers for a total maximum wattage of 460 (not RMS ratings), hence the name. It was the premier sound system available in certain Ford models until it was replaced by the Mach 1000.

Receiver

The MY 2001 Mustang Mach 460 system utilized a 6-disc AM/FM/CD receiver with 4-channel amplifier. The receiver included RDS which was displayed on a single text line that scrolled when required to display radio station information. The receiver is a custom size similar in size to a double DIN.

Although not commonly known, the head-unit had SSV (Speed Sensitive Volume) which Ford decided not to utilize. Tapping into the VSS circuit and connecting it to the correct pin in the back of the head unit was all that is needed to make the SSV functional. To adjust the SSV, hold the Volume knob in for several seconds until the SSV menu appears. I made this modification just after buying the car and it worked well.

Amplifier Specifications

The Mustang Mach 460 (MY01) uses the head-unit amplifier to provide the four-channel high and mid pass frequencies for the tweeters with a 120 W maximum capacity and a 60 W normal capacity (this is essentially the same as saying 15 W RMS per channel). A pair of mid and low pass amps each produce 170 W peak capacity and 85 W normal capacity. One amplifier powers the front door speakers and the other the rear parcel-shelf speakers (rear seat side mounted in the convertible) Each pair, the front two, and rear two, are wired in parallel. Thusly, the lower frequencies are essentially mono rather than stereo. Although lower frequencies are non-directional, this produces less left-right channel separation and results in reduced fidelity. The impedance rate for all circuits is 4 Ω at 2 % THD.

Speakers

The Mustang Mach 460 speakers in the coupe and convertible uses 2½" speakers in the front for high frequency signals and 5¼" x 7¼" (Ford specification although industry size is 6" x 8") speakers in the front for low frequency signals. The tweeters are mounted in removable enclosures located in the sail panels. The woofers are mounted lower in the door cards. In the rear, the coupe uses 2½" speakers for high frequency and 5¼" x 7¼" speakers for low frequency with all four speakers mounted in a four-compartment OE sound box under the rear parcel shelf. The convertible uses 2½" speakers for high frequency and 5¼" speakers for low frequency mounted in the rear seat-side panels.

My Plan

Some people argue (and rightly so) that the Mach 460 is a long way from being an audiophile's dream. I didn't buy my car because of the stereo system. I bought it because it was a 320 hp, 32 valve V8 limited production Mustang. Remember, back in 2001, only the Corvette (North American made cars) had more stock horsepower.

What started all this was two separate problems with the Mach 460. The first problem was the receiver started to have a mind of its own. While driving along the volume would suddenly become very loud. It often took a dozen turns of the volume knob before the volume would come back down to a listenable level. Sometimes I just had to shut the unit down. This problem was intermittent but very annoying. The

second problem was related to one of the amplifiers. Although it still functioned, the circuit that turned the amp on and off, a 5 V signal from the head unit, had failed. The failure resulted in a constant drain on the battery. After sitting for more than a few days the battery would be dead.

There was no easy fix for the receiver problem. There were several “fixes” on the internet that claimed to fix the amplifier problem. Most of them involved changing out a burned-out resistor. I tried the “fix” but the amp still drained the battery. I was first considering replacing the head unit with a mid-priced one and buying a used replacement amp. I decided that, if I did this, I would just be chasing one failed part after the next, eventually costing me too much money and still just having a Mach 460. After a lot of research, I decided to completely gut the old Mach 460 and replace it with a new system.

Receiver

A new head-unit would offer the advantages of Bluetooth, Hands-free-calling, and GPS (just to name a few). I decided to stay with a double DIN unit and wanted a touch screen. Something that would offer the same type of functionality as my F150 with Sync. After a lot a research (there are a lot of OEMs with each one offering many models) I settled on the Pioneer AVIC-8201NEX. This unit has a capacitive display like the iPhone and iPad, Apple Carplay, GPS, and a back-up camera. It also had 4 V RCA outputs, dual USB ports, and an auxiliary AV input.

Speakers

Since the factory tweeters are odd size and the woofers are an odd impedance (6 Ω or 8 Ω depending on the source of information), the only option to maintain compatibility with standard mobile audio amplifiers, is to replace the speakers with new 4 Ω units. I opted for some Rockford Fosgate T1675-S component speakers. Component speakers consist of a tweeter, a woofer, and a crossover unit which “splits” the full range output of an amplifier into high and low range frequencies, sending the high range to the tweeter and the low range to the woofer. The crossovers offer some system flexibility that is handy when “tuning” the entire system after installation.

I wasn’t convinced I needed a sub-woofer. Although they add to the music, I was concerned about the amount of trunk space they can occupy. After installing the system and listening to it, I decided I wanted to add the sub-woofer. I added a Rockford Fosgate P3D4-10 10” subwoofer, mounted in a custom-built enclosure, and installed in the PS of the trunk.

Amplifier

I decided to install a five-channel amplifier even though I wasn’t sure I needed the subwoofer. The plan was to run all the wires needed for the sub. As mentioned, after install, I decided I had to add one. I opted for the Rockford Fosgate R600X5. The amp is a small size and will fit in the same basic location as one of the Mach amps. The unit also has a switch allowing the amp to operate 2, 4, or all 5 channels.

A large part of the amplifier system is the power wiring. Since amplifiers can require large amounts of amperage, it is essential to size the power wire correctly. Good wiring is made from OFC (Oxygen Free Copper). Wire size, or gauge, is determined by the wattage rating of the amp and the length of the run. I opted for the KnuKonceptz KOL-AKA4 amplifier wiring kit since it included most of what I needed.

System Installation

Preparation

I did a lot of planning before starting the project. Once all the components were specified and placed on order, I completely gutted the interior removing seats, centre console, carpeting, door cards, parcel shelf,

and rear side panels. There are several websites such as LMR with great videos on how to remove the interior components, so I won't go into details on this process.

Amplifier Wiring

The car is equipped with an Optima Red Top battery with both top posts and side terminals. I used a short positive side post power cable, cutting off the factory eyelet terminal and connecting that to the in-line fuse holder. The main in-line fuse needs to be mounted close to the battery to provide protection from a power cable short. Figure 1 shows the battery connection from the side post to the fuse holder (beside the caster/camber plate).

Figure 1 - Amplifier Battery Connection

Downstream of the in-line fuse, the power line was pulled through the main wire harness grommet in the firewall. This is located just left of the steering linkage. I used a ⅜" twist drill to open a hole. Pulling the 4 Ga wire through the hole took some doing as it was a tight fit. I ended up using some soapy water to lubricate the cable. Pure copper multi-strand wire is very flexible making it almost impossible to push it anywhere. Figure 2 shows the cable passing through the grommet and sealed with some RTV.

Figure 2 - Cable Running Through Firewall

The cable was then run down by the driver-side (DS) kick panel, along beside the existing OE wiring harness, up and over the rear seat hump, across the driveline hump, and up the wheel well to where the amp was to be mounted. This allowed for isolating the power cable from the signal and speaker wires, which is recommended. Figures 3, 4, and 5 show the cable routing.

Figure 3 - Amp Power Cable by Driver Seat

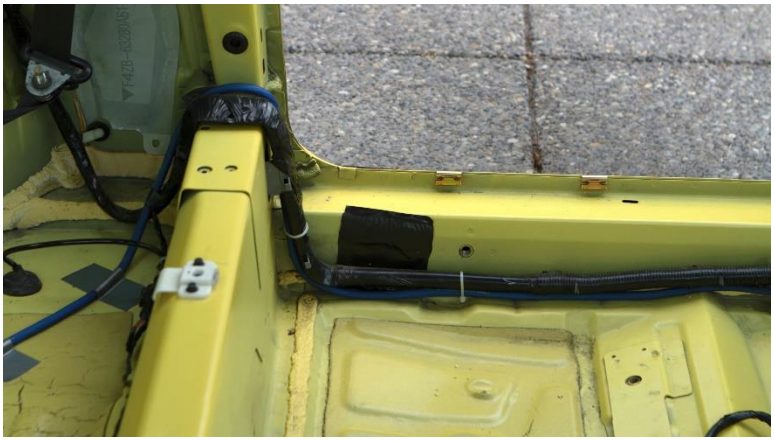

Figure 4 - Cable Routing Over Rear Seat Hump

Figure 5 - Under Rear Seat Routing

The amplifier uses a signal from the receiver to turn it on and off. I ran the amplifier signal wire from the head-unit location, across behind the glove box, down the passenger-side kick panel, and along the inside of the lower door jamb. The wire was then fed through a hole in the rear seat hump, around the B-pillar and fed back through an access hole in front of the wheel well. From there it was run up the wheel well to the amp location. Figure 6 shows the areas that the wiring passed through around the B-pillar.

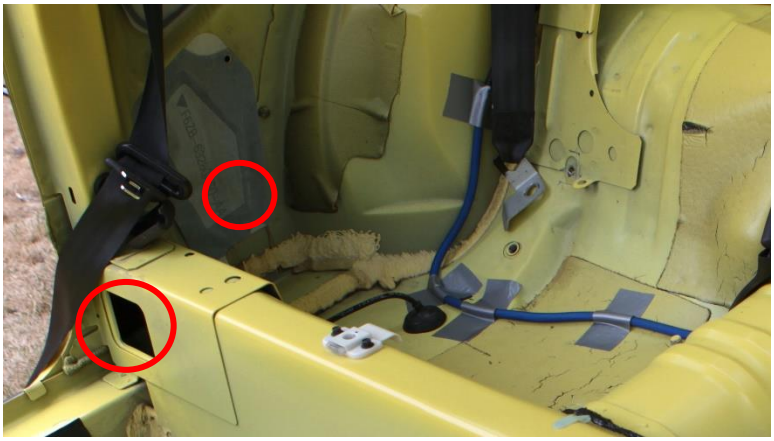

Figure 6 - B-Pillar Routing

I used a piece of vacuum tubing which I split longitudinally and wrapped this around the sharp metal edges, similar to a grommet, to help prevent chafing damage to the cables.

Cables were then tape wrapped where possible and held in place by duct tape when not wrapped. Under the hood the cable was protected with split-loom from the kit. The fuse holder was held in place by two zip-strips, one on each side, which is shown in Figure 2.

> Note: Using a high-quality electrical tape results in an OE quality finish and look. I used some high-quality duct tape, but Gorilla tape would also work. Don't skimp here. The quality of the tape makes a big difference.

Speaker Wiring

The amp wiring kit included 20 ft of 12 Ga OFC speaker wire. Figure 7 shows the wiring kit contents.

Figure 7 - Amplifier Wiring Kit

I knew this was not enough for all the speaker wiring and purchased 50 ft more 14 Ga OFC speaker wire from a local auto-parts surplus store. The 14 Ga is adequate for all the wiring except for the subwoofer. The wiring for the front speakers utilized the 14 Ga wire followed the path as describe for the amp signal wire. At the passenger-side (PS) kick panel the PS speaker wire was pulled through the flexible wiring conduit into the door. The DS speaker wire was run along the amp signal wire straight through to the DS and pulled through the conduit to the door. I run the wires through the doors to reach the door latches so that I had plenty of wire for the cross-over connection.

I used all the 12 Ga wire for the rear speakers and subwoofer (even though I have not yet installed the sub). After pulling the sound box from the parcel shelf, I removed the speakers and all the associated OE wiring for the amps and speakers. The new wires were run through the holes used for the OE wires and sealed with RTV. By chance, the speaker cross-overs fit perfectly in the two recesses in the front of the box.

I used almost all the speaker wire for the installation for a total requirement of 70 ft. I would have never guessed I would use that much before I started.

RCA Cabling

The RCA cables are used to connect the low-level outputs from the receiver to the amplifier. The amp wiring kit included a 17 ft 2-channel RCA as shown in Figure 7 above. I purchased a second 6 m [20 ft] 4-channel RCA cable from KnuKoncetz, P/N KRY4.6M. The 2-channel was used for the two subwoofer channels and the other was for the two front and two rear channels. The RCA cables were routed from the head-unit location, down the transmission tunnel to the parking brake, over to the PS door jamb. From there it followed the signal wire path to the amp location. Figure 8 shows the unique 4-channel cable from KnuKonceptz.

Figure 8 - KnuKonceptz 4-Channel RCA Cable

Receiver Wiring

Although I purchased the complete Metra wiring kit P/N 70-5701, I only used the large connector since I was not using any of the OE speaker or amp wiring. I could have saved some money by buying just the connector, Metra 70-1771, shown below in Figure 9.

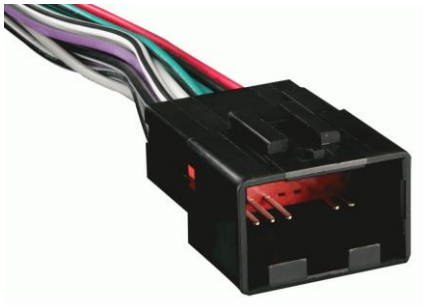

Figure 9 - Metra Receiver Connector

Wiring for the receiver consisted of mating the appropriate wires from the head-unit's connector pigtails to the pigtails on the Metra connector (which plus into the OE harness). Both connectors included 8 pigtails for speakers which I was not using, so I wrapped them in tape to separate them from the rest of the wiring. The Metra connector pigtails were colour coded and labelled. Matching them to the head-unit's pigtails was straight forward. These connections were all individually twisted, soldered, and sealed with heat-shrink tubing. These connections were as follows:

a) For full time power (memory power), Metra yellow to Pioneer yellow (connects to Pin 9 of OE connector -violet/light blue wire);
b) For ignition/accessory power, Metra red to Pioneer red (Pin 10 – black/pink);
c) For lighting control (dimming when lights are on), Metra orange to Pioneer orange/white (Pin 1 – light blue/red);
d) For ground, Metra black to Pioneer black (Pin 2 – black);
e) For VSS, from Pin 68 of the PCM (Powertrain Control Module located in the PS kick panel) black 104-pin plug (a white/orange wire) to Pioneer pink;
f) For reverse gear signal, from Pin 20 of the GEM (Generic Electronic Module located in the DS kick panel) white 26-pin plug (black/pink wire) to Pioneer violet/white; and
g) For parking brake, from Pin 4 of the GEM black 12-pin plug (violet/yellow) to Pioneer light green.

These wires were than wrapped into a harness where possible which was plugged into the OE harness.

GPS Wiring

The GPS antenna wire was just long enough to allow for it to be mounted in the rear window on the parcel shelf. I mounted the antenna on the supplied metal plate using some on the provided two-sided tape. I then mounted the antenna/plate in the middle of the parcel shelf cover. The plate was provided with a PSA (Pressure Sensitive Adhesive) to make that easy. I ran the wire back underneath the panel, up to the front of the speaker box, along the speaker box, down behind the PS seat post, across the rear seat area, over the rear seat hump, along the transmission tunnel to the head-unit location. I protected the cable from damage as much as possible with duct tape. The cable proved to be just long enough. Another 3 or 4 ft would have been nice, but you can't cut the cable to lengthen or shorten.

Rear Camera

The rear camera wiring is permanently attached to the camera. This means that the camera must be mounted before running the wires. The camera installs with some 2-sided PSA tape that has already been applied to the camera base. I decided to mount the camera to the horizontal surface just above the license plate. I removed the DS license plate lamp and using a rat-tail file, I notched the hole making room for the wire. I sealed the area with a little clear RTV to make sure I had a water-tight connection. The wire was routed down the trunk and wrapped to the existing OE wiring harness, then run down to the rear seat area. The camera wire was then attached to the connector which splits the camera signal and power into two separate cables. I routed these cables following the amp signal wire.

At this point the wiring was all installed and I wrapped the separate cables into a harness. Where the harness passed through the access port (just in front of the wheel well), I used a piece of 5/16" vacuum tubing which I cut through on one side (longitudinally down the hose) and placed this over the edge of the steel body as a grommet. I repeated this on a second piece of metal that was at the bottom of the B-pillar. This ensures that the harness will not be damaged by the metal edges.

Microphone

I mounted the microphone for the hands-free system by clipping it to the sun visor near the pivot. I then removed the A-pillar cover and ran the cable down the pillar, through a small hole at the base and over to the receiver. Once the pillar cover was replaced, the cable and microphone are almost unnoticeable.

Speaker Adapter Plates

My research had suggested that I could use the adapter plates supplied with the speakers to mount both the front door mounted and the rear sound-box mounted woofers. That turned out to be incorrect. The new woofers had to mount into the centre of the oval holes for the OE speakers. The Rockford Fosgate adapter plates mounted the speaker to one end of the hole. To make these adapter plates work I would have had to add a spacer and this would likely raise the speakers up too high and caused interference with the parcel shelf and door cards. I decided to fabricate new adapter plates, with one design for the front woofers and one for the rear. I used the OE speaker hardware to mount the adapter plates, using some RTV to ensure a good seal. Then I tried to use the RF supplied speed nuts to attach the speakers to the but purchased some regular speed nuts and used them instead. The plates were made from 0.188" ABS plastic sheeting.

Front Door Tweeters

Adapter plates for the tweeters were simple to make using the OE tweeter as a template. A hole saw was then used to cut the 1.75” hole required for the RF tweeters. The speakers were then flush mounted using the supplied DDC (Discrete Dual Clamp) system as shown below in Figure 10.

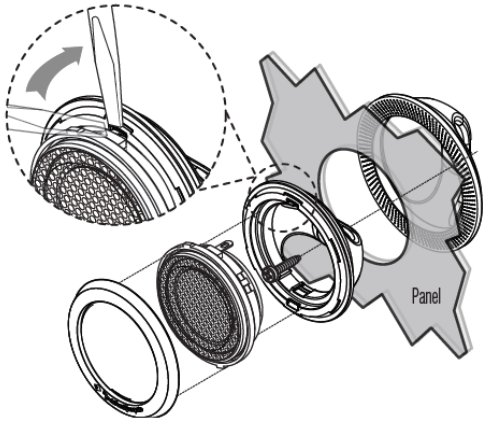

Figure 10 - Tweeter Flush Mounting System

Figure 11 shows the tweeter adapter plates along with the OE speaker which was used for the template. A 1¾” diameter hole was cut in the centre using a hole saw. I reused the OE screws to mount the new tweeters and adapter plates in the sail panel enclosures.

Figure 11 - Tweeter Adapter Plates

Front Door Woofers

The door woofers required custom made adapter plates. I used DraftSight, a free 2D CAD software package, to create templates for the plates. I then printed them full scale, glued them to the acrylic sheet,

and cut out the adapter plates. Care needs to be exercised if using acrylic as the adapter material to prevent cracking the sheet while working. I used blocking under the plates, especially during drilling operations. Figure 12 shows the door speaker adapter plates.

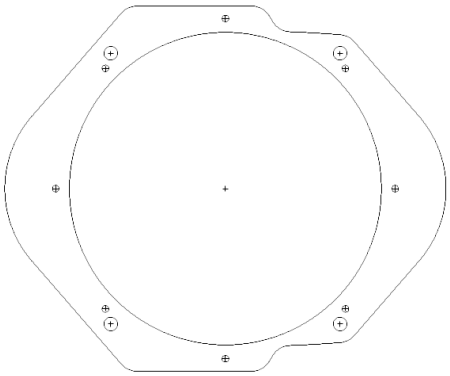

Figure 12 – Door Woofer Adapter Plate

The four larger screw holes were countersunk and I used drywall screws to attach the plates to the OE door speaker mounts. I sealed the plates to the OE mounts with RTV. I used speed nuts at four locations of the small holes to mount the speakers to the adapter plates using the screws supplied with the speakers.

Front Door Crossovers

Mounting the crossovers was a simple process. I established a location on the door where the crossovers would fit between the door and the door panel. The crossovers had PSA adhesive applied to the back side. I simply used that to attach the crossover to the door skin. I added a piece of tape to add a little extra support until the door panels were remounted. Figure 13 shows the crossovers mounted and wired.

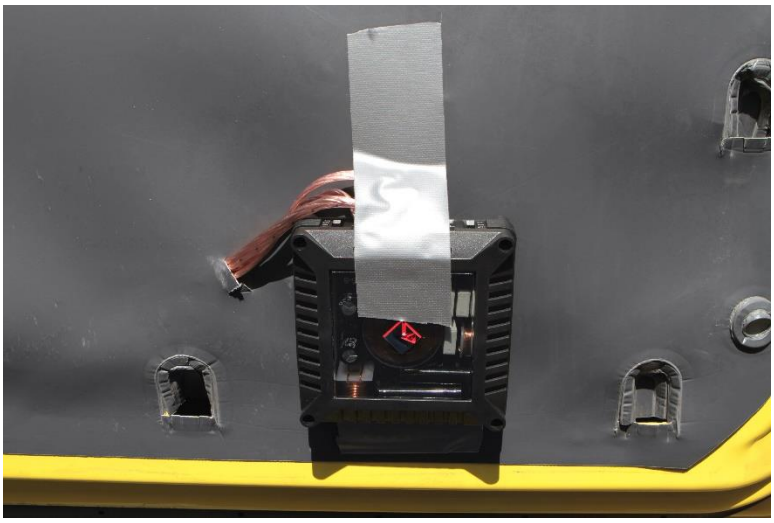

Figure 13 – Door Mounted Crossovers

A small portion of the door panel foam insulation was removed to provide clearance for the crossovers. The cutout makes a pocket which the crossover fits within. Once the door panels were installed, the crossovers were well secured between the foam and the inner skin of the door.

Rear Speakers and Sound-box

The sound-box was stripped of all OE parts and wiring. I designed speaker adapter plates as shown below in Figure 14.

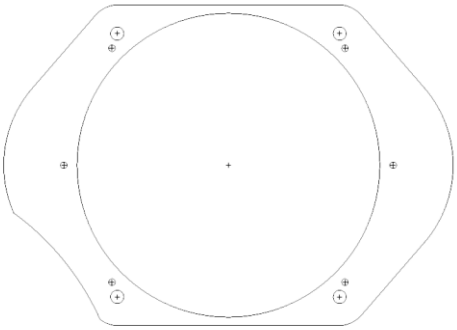

Figure 14 – Rear Speaker Template

I added two more larger holes which were countersunk and I used flat head screws to mount them to the sound-box. The adapter plates were sealed using RTV. Figure 15 shows the speaker location prior to mounting the adapter plate. Figure 16 shows the mounted adapter plate.

Figure 15 – Bare Speaker-Box

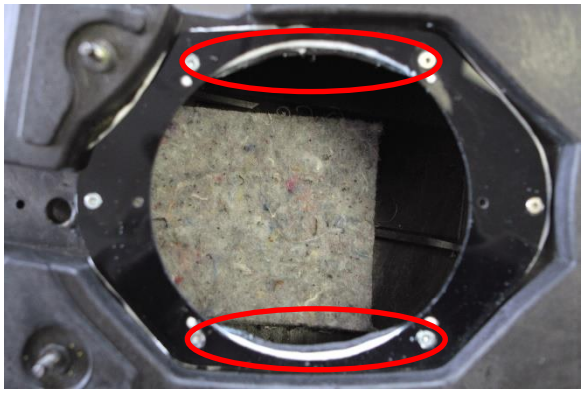

Figure 16 – Mounted Adapter Plate

Two of the small holes used speed nuts and the speaker supplied screws to mount the speaker to the adapter plate. The other four holes used the OE speaker screws for mounting. I coped out part of the sound-box flange on each side to provide clearance for the new speakers. The area removed is shown by the red circles. The speaker wiring was run though the same holes as the OE wiring was originally fitted. All pass-through holes were then sealed with RTV. I felt this was important to maintain the separation between the woofer and tweeter enclosures. Figure 17 shows the speaker fitted to the adapter plate prior to the screws being installed.

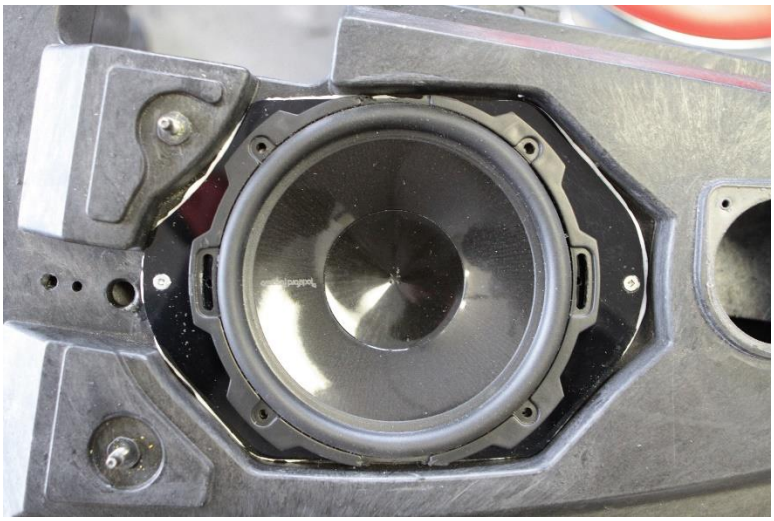

Figure 107 – Speaker Ready to Mount

Amplifier

The Rockford Fosgate R600X5 amplifier was mounted in the same area as the passenger side Mach 460 OE amplifier. I removed the original protector “wall” from the sound-box. Figure 18 shows the modified area of the sound-box.

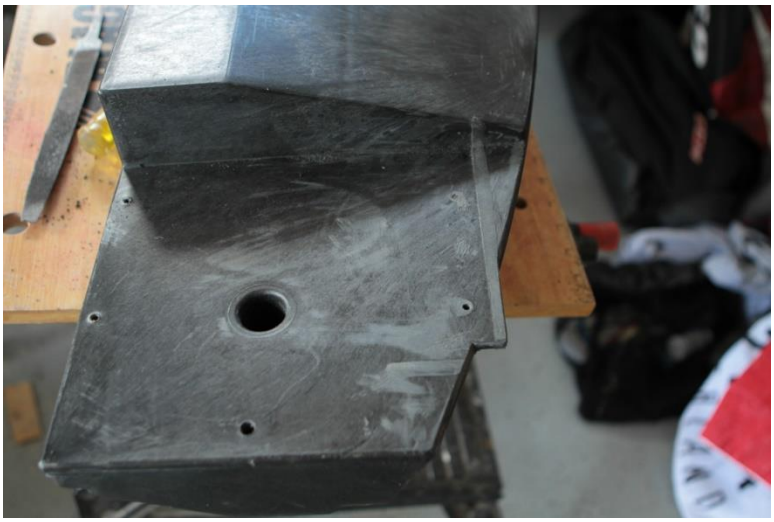

Figure 11 - Sound-box Modification for Amp Mounting

I purchased 3 ft of 0.75" square aluminum tubing from Home Depot. Large holes (big enough for the original amp mounting screws to go through) were drilled on the bottom side and small holes on the top side of the tubing. Pilot holes were drilled in the sound-box and mounted the 2 brackets. The large holes allow the screws to go through the one side of the tubing and tighten up on the other leaving them countersunk in the tubing. The ends of the tubing were cut off at 45° for clearance to install and tighten the nuts for mounting the amp. Holes were then drilled for the amp mounting screws. The amp was then attached to the brackets using Nylock nuts. The amp was mounted with about 2" extending ahead of the sound-box. It fits nicely where the PS OE amp was mounted. The OE screws are for plastic with special threads and bite well. This mounting offers cooling on all sides of the amp. Figure 19 shows the mounted amplifier.

Figure 12 - Mounted R600X5 Amplifier

Rear Crossovers

The crossovers fit within the two front indents in the sound-box. The PSA strips on the back of the crossovers was used to secure the crossovers to the sound-box. Drywall screws were also used to ensure the crossovers would remain in place.

The wiring for the crossovers and speakers were then completed, making the required connections to the amplifier as well. Figure 20 shows the completed sound-box prior to installation on the parcel shelf.

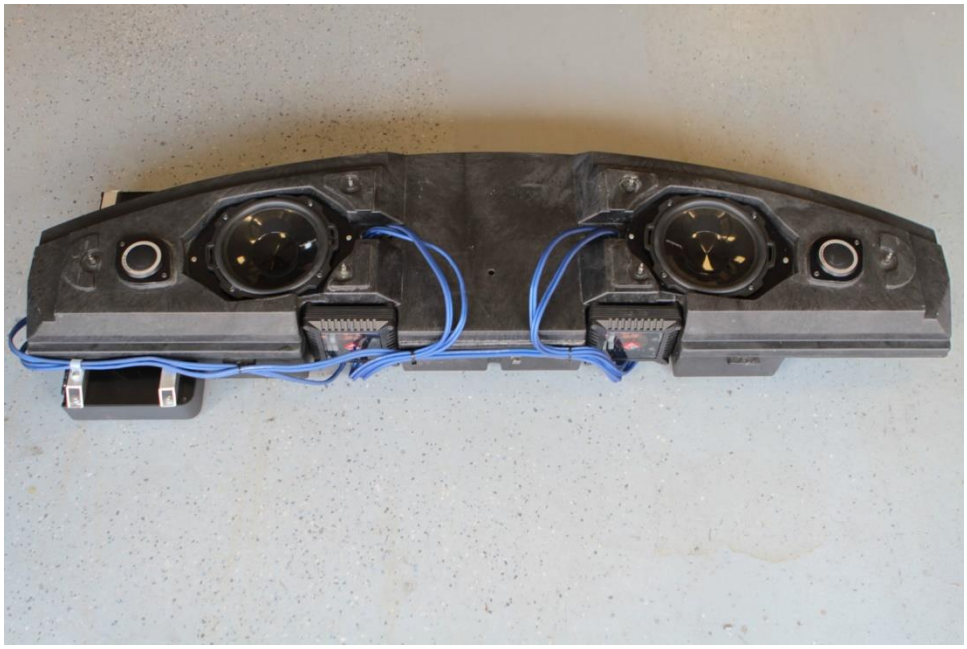

Figure 13 - Completed Sound-box Assembly

Receiver

Installation was straight forward. I used the Metra 95-5026 double DIN adapter kit. The plastic pieces fit nicely of the head-unit, but I was careful not to overtighten any screws or break any of the parts. I used the screws provided with the new receiver. Figure 21 shows the adapter kit parts.

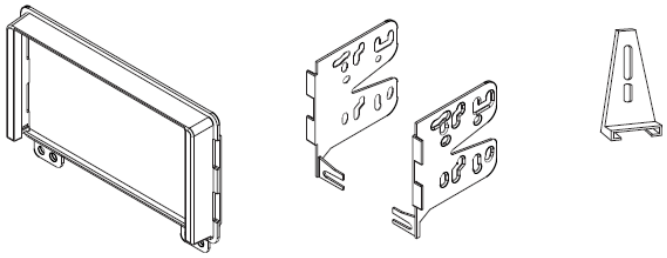

Figure 214 - Metra Double DIN Adapter

I cut off the top of the rear bracket per the instructions and attached it using a M4 x 8 mm long machine screw from my inventory (although one was supposed to be included with the kit). Before installing the rear bracket, make sure the mounting screw is not too long as it can cause damage if it extends too far into the receiver. Figure 22 shows the back of the receiver where the rear support bracket is installed.

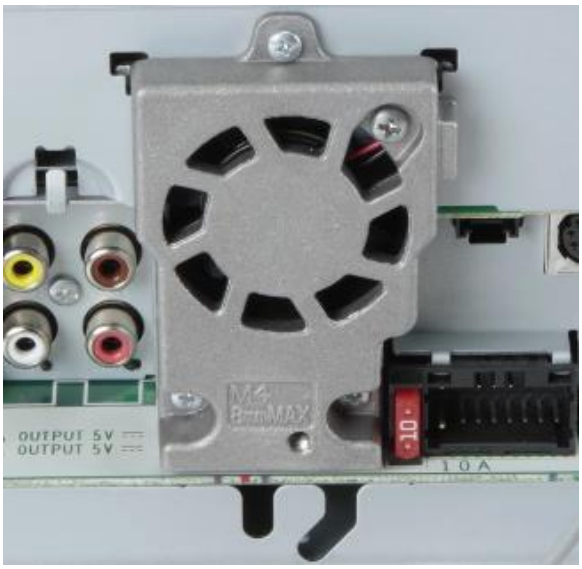

Figure 22 - Rear Support Bracket Mount

Subwoofer

The subwoofer was added after the original installation was complete. I designed a custom enclosure based on Rockford Fosgate requirements for a non-vented enclosure. I covered the completed enclosure with a trunk liner material and fixed the enclosure to the passenger side of the trunk using the exposed portion of the trunk hinge studs to attach a bracket I made. Figure 23 shows the completed sub-woofer enclosure from the backside to show the wiring terminals.

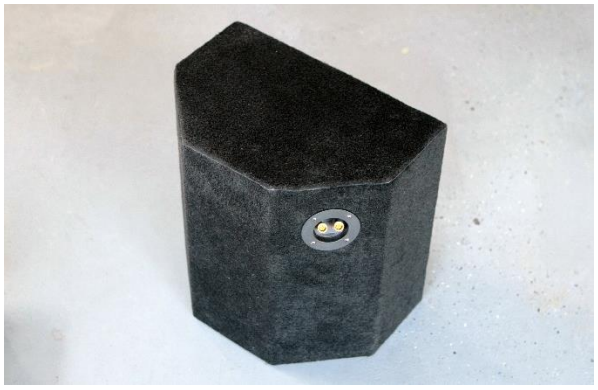

Figure 23 - Sub-woofer Terminals

The enclosure interior surfaces were insulated with 1” thick rigid foam as recommended. The trunk liner was glued to the bare cabinet with 3M Super 77 Spray Adhesive. A simple metal bracket was fabricated to hold the top of the enclosure in place. Figure 24 shows the completed sub-woofer installation.

Figure 15 – Installed Sub-woofer

The trunk liner material grips the OE trunk cover so the single bracket on the top has been sufficient to hold the assembly in place. Wiring from the sub-woofer to the amplifier was 12 ga OFC from the wiring installation kit. A protective triple cross speaker grille has been added but was installed after the Figure 23 picture was taken.

Install Completion

Completing the installation of the entire system consisted of mounting of the sound-box under the parcel shelf using the OE fasteners. All interior parts of the car were then re-installed.

The amplifier was adjusted per the manufacturer’s instructions. After several sessions of adjustments of the amplifier and the receiver, the installation was considered complete.

A couple of things I would do differently is: install the main power cable fuse closer to the battery (although I’m not anticipating and issues since the cable has a fairly thick insulation cover and I have added a corrugated protector sleeve); and use 14 ga speaker wire throughout.

Would I do this again? Yes – without question.

Materials List

1. Pioneer AVIC-8201NEX GPS Receiver with Camera, Qty 1
2. Rockford Fosgate T1675-S Component Speakers with 1” Tweeter, 6.5” Woofer and Cross-over, Qty 2 (Total 4 tweeters and 4 woofers)
3. Rockford Fosgate P3D4-10 10” Subwoofer Speaker, Qty 1
4. Rockford Fosgate R600X5, 600 W, 5-channel Amplifier, Qty 1
5. KnuKonceptz KOL-AKA4 Amplifier Wiring Kit, Qty 1
6. 12 Ga OFC Speaker Wire, Qty 50 ft
7. KnuKoncetz KRY4.6M 6 m [20 ft] 4-channel RCA cable, Qty 1
8. Metra 70-1771 Wiring Connector, Qty 1
9. Metra 95-5026 Double DIN Adapter Kit, Qty 1
10. Aluminum Tubing 0.75” Square, Qty 3 ft
11. 3M Super 77 Spray Adhesive, Qty 1 (24 oz can)
12. RTV (Rome Temperature Vulcanizing) Silicone
13. 4 Ga SAE Positive Side Post Battery Cable x 12” long, Qty 1
14. Sheet 0.188” Thick ABS, as required
15. Sheet 18 Ga Steel, as required
16. Heat Shrink Tubing, as required
17. Miscellaneous hardware and shop materials