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My 2nd gen MM/D50 2.6 Turbo Swap

Note: Lots of info about the Starion/Conquest 2.6 turbo motors can be found on http://www.starquestclub.com

Starion/Conquest parts needed for swap:
Complete motor
Turbo w/ downpipe or pre-cat
Intercooler (1986-89)
Wire harness and ecu
MAF w/ intake hose and air canister lid
Ignition stuff (igniter, coil)
Fuel pump
Oil cooler w/ lines and bracket
Motor mounts (engine brackets)
Brake booster check valve
Powersteering pump bracket
Upper radiator hose
Heater hoses
Fuel rail hose

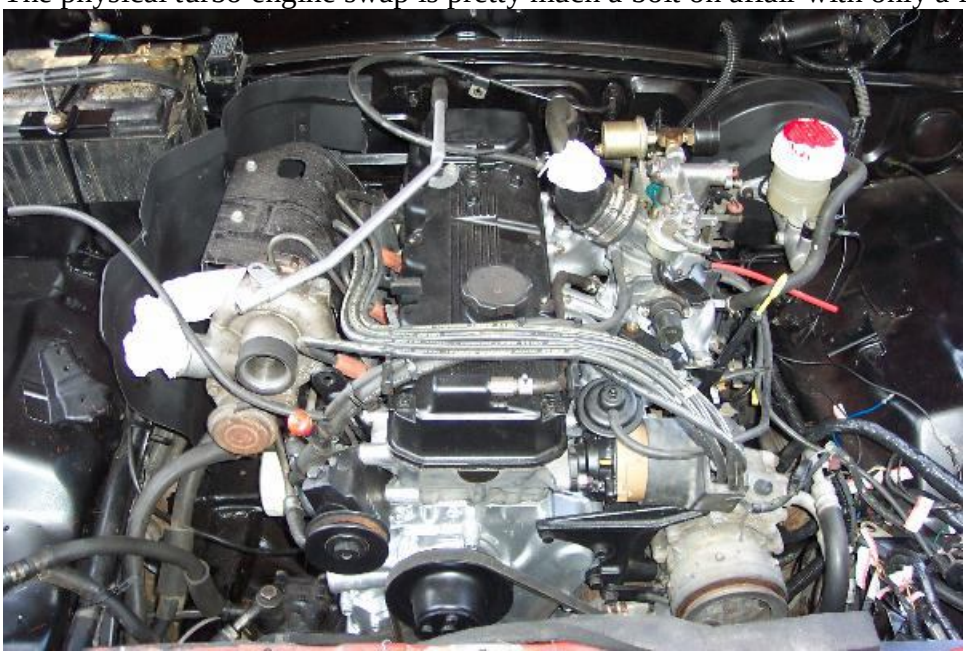
Other parts needed:
MM/D50 2.6 alternator/AC compressor bracket (if keeping AC)
AC idler pulley
2.5" exhaust tubing for downpipe
2.5" or larger exhaust
Custom intercooler piping
Electric cooling fans (Taurus fans work great)
K&N 1gen DSM air filter

Donor Starion/Conquest info:
Any 1983-1989 2.6 turbo Starion can be swapped. For best stock performance the 1988-89 years are best. The 1987 model year had the highest sales, thus will be more available. It is also easy to upgrade a 1987 to 1988-89 ecu. 1983 is the first year and had a different tbi fuel system then the others years and should be avoided due to parts availability. 1983-85 were non-intercooled, thus would make the swap simpler since don't need to install an intercooler and needed plumbing. 1986 came both intercooled and non-intercooled.

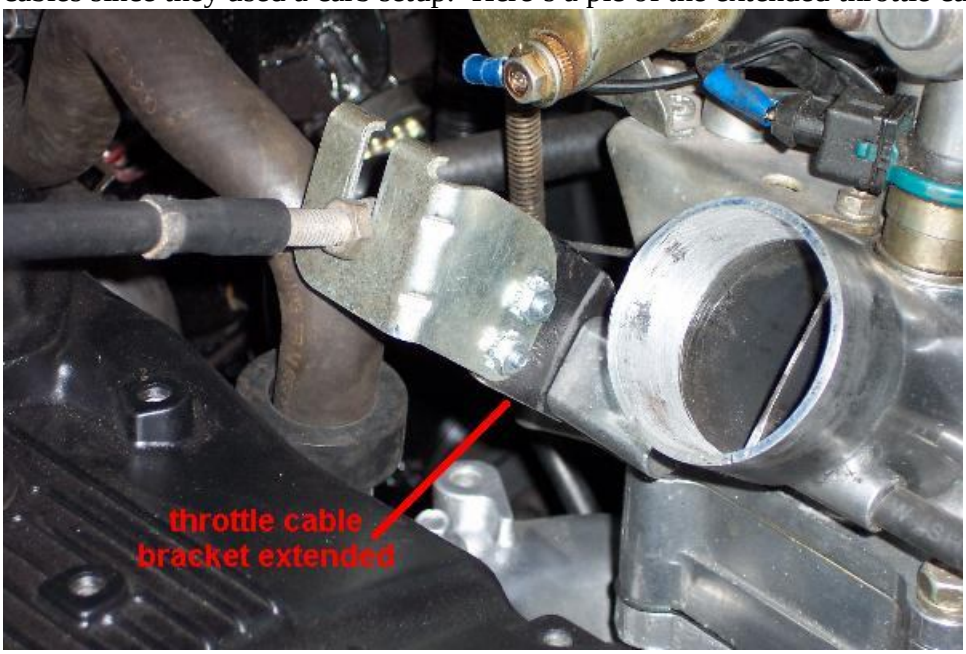
Donor MM/D50 info:
1987-1989 MM/D50 trucks would probably be the easiest to do the turbo swap since they came carbureted stock. Wiring would simpler and an external fuel pump can easily be adapted to the original fuel system. 1990 was the first year using fuel injection for the MM/D50 and was slightly different then 1991-95 years. The original 1990 2.4 fuel injection wiring is integrated with the chassis wiring, thus making it more difficult to separate. But the 1990 intake fuel pump has a higher flow rate then the 1991-95 fuel pumps and in fact has a higher flow rate then the stock Starion fuel pump. A 1990 fuel pump flows about 55 GPH or 208 L/H.
A 1990 fuel pump can easily be installed into a 1991-95 MM/D50 changing the intank wiring since they have different pigtails.

Engine:
The stock NA 2.6 that came with on the trucks can be used, but NOT recommended since it was not originally designed to run with a turbo (the Starion motor has some internal parts built to run with a turbo). But if one desires, you could at a minimum install the exhaust manifold with turbo, intake manifold with fuel injection, and all the wiring & ecu to run a turbo conversion.

The physical turbo engine swap is pretty much a bolt on affair with only a few mods.



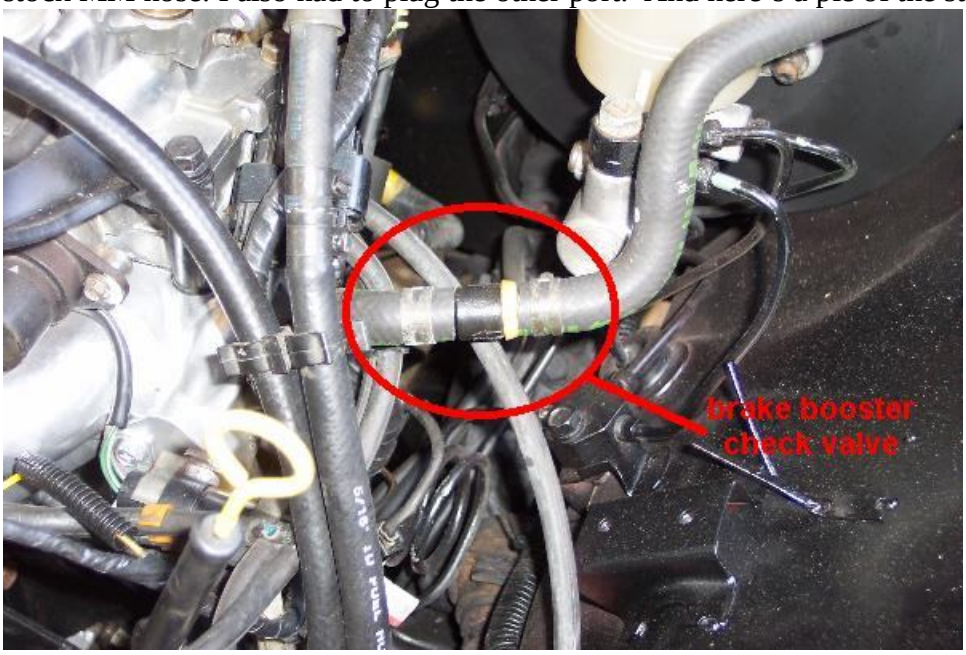
The throttlebody bracket will need to be extended for 1990+ throttle cables. I'm not sure for 1987-89 throttle cables since they used a carb setup. Here's a pic of the extended throttle cable bracket.



The Starion MAF should fit in a 1990 MM/D50 air canister, but will not fit the 1991+ plastic airbox. The 1987-89 MM/D50 had no airbox due to carb setups. To simplify installation of the air intake, a K&N air filter from a 1gen DSM can be used with the Starion MAF and air canister lid. The clips just need to bent or modified slightly to mount on the lip of the K&N air filter. I also made brackets and welded it to the lid for support.

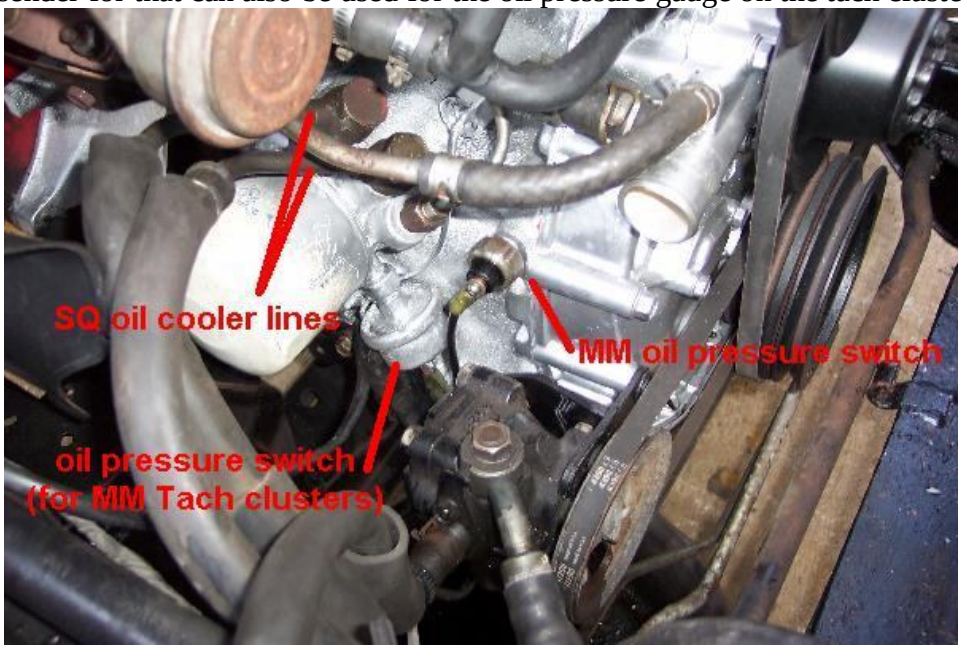
I also kept the Starion oil/air separator that was originally mounted on the stock Starion airbox instead of putting a breather filter on the valve cover. It's been shown that the Starion motor does not run well with a breather element and under boost causes oil to spit out into the engine bay. I mounted the oil/air separator by the radiator with a custom bracket.

I also installed the stock Starion brake booster check valve which usually overlooked on many turbo conversions. The Starion brake booster vacuum hose originally attached on top of the manifold, but due the position of the nipple on the brake booster, I moved the location to the back of the manifold. This port was used on the Starion for the cruise control, which I don't have anyway. I used a 90deg adapter and was able to use the stock MM hose. I also had to plug the other port. And here's a pic of the starion brake booster check valve.

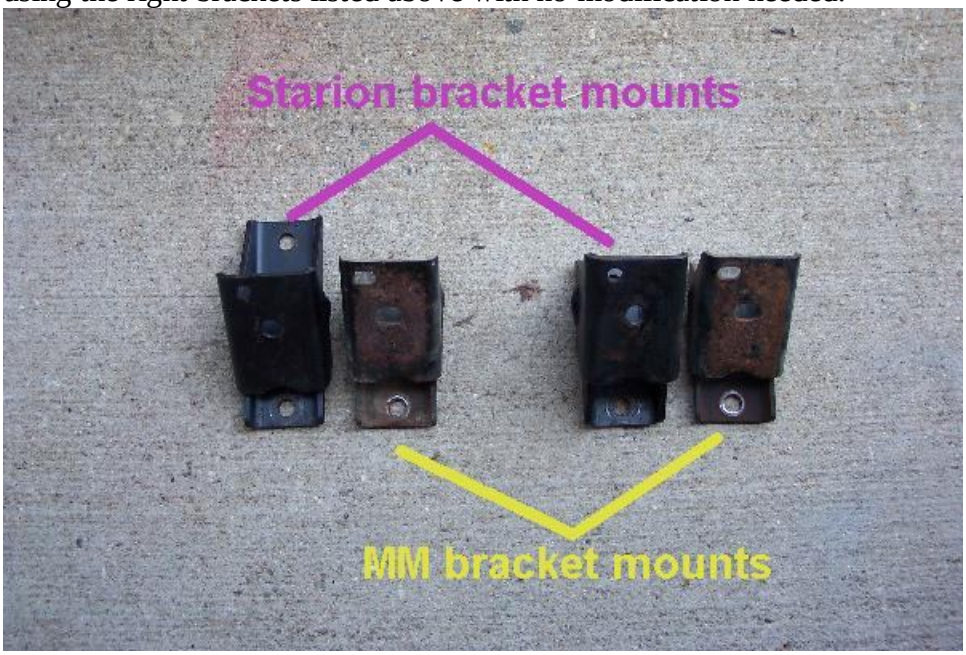


I used the Starion powersteering pump bracket to mount the stock MM/D50 powersteering pump and I also had do move my powersteering reservoir for clearance issues.

If you don't have a MM/D50 tach cluster the oil pressure switch must be installed on the Starion motor. The following pic. shows where the oil pressure can be installed. The pic also shows the stock Starion oil pressure sender for that can also be used for the oil pressure gauge on the tach cluster.



Engine Mounts:
The MM/D50 and Starion use 2 piece engine mounts. Brackets that mount to the engine and rubber mounts that attach to the crossmember and bracket. The rubber mounts from either the stock truck or starion can be used and are interchangeable. The stock 1987-1989 MM/D50 2.6 and the Starion brackets are the same. The Starion brackets will be needed for the swap for 2.0 and 2.4 trucks. The actual engine installation is straight forward using the right brackets listed above with no modification needed.



Trans:
The Starion 2.6 will bolt to any truck wideblock transmissions as listed below.
1987-89 2.6L 5-speed and automatic transmissions
1987-89 2.0L Automatic transmissions
1990-95 2.4L 5-speed and automatic transmissions

The above transmissions should bolt right in with no modifications.

Clutch and flywheel:
The 6-bolt MM/D50 flywheel and Starion flywheels are interchangeable. The stock trucks flywheels and the 1983-87 Starions have a 225mm diameter flywheel. It is recommended to use the Starion clutch & pressure plate with either flywheel. The 1988-89 Starion had a larger 240mm flywheel, clutch and pressure plate thus is preferred if your going to run a lot of hp. It is also recommended that the firewall be reinforced around the clutch cable area due to some flex or failure of the factory spot welds.

Here's my reinforced firewall.

Wiring:
The wiring for the turbo conversion wasn't that bad. I used the complete main ecu harness from the Starion and had to make a few connections to the truck harness. I used the trucks stock starting and charging circuit. Basically, I just added the Starion fuel and ignition wiring. Since both the Starion and MM/D50 locate the ecu on the passenger side of the cabin, I ran the wire harness through the passenger side of the truck and located the Starion ecu in the same spot. Connect the wire harness to all the sensors, fuel injectors, distributor and ignition system as originally installed in the Starion. Be sure to properly wire the Starion igniter and coil. Consult the service manual for further installation. Pdf files can be download at starquestclub.com.

In my case, the 1990 MM/D50 ecu harness is integrated with the trucks front chassis harness, so I had to remove the whole harness to separate the two. The 1987-89 MM/D50 ecu harness was separate and just needed to be unplugged from the front harness and removed. I believe the 1991-1995 ecu harness was also separate which makes it easy to install and remove the ecu wire harness.

Once the wire harness and ecu is installed, the truck harness can be connected to the Starion wire harness. I only have schematics on the 1990 MM/D50, 1988-89 Starion, and 1986 Starion. Consult a service manual for more info.

1988 Starion ecu harness plug B-38

Y	**BY*1**	B	**L**	YG	**RB**	
LgB	YG	**YL**	**BY*2**	**BR**		

connect SQ B-38 RB to MM D-27 BY (battery -10amp fuse)
connect SQ B-38 BR to MM S-27 Y (self. Diag. Check)
connect SQ B-38 YL to MM D-27 YR (eng.coolant temp. Gauge unit)
connect SQ B-38 L to MM D-27 BW (IGN ON (+coil)
connect SQ B-38 BY*1 to ground
connect SQ B-38 BY*2 to MM D-26 BY (IGN ST)

1986 Starion control harness

BY	Br	R		RY	--	**B**	**L**
R	Lg	**B**	Y	--	Y	YL	**YG**	**BY**

connect 1986 SQ B to MM D-27 BY (battery -10amp fuse)
connect 1986 SQ LY (self diag. Connector) to MM D-27 Y (self. Diag. Check)
connect 1986 SQ YG to MM D-27 YR (eng.coolant temp. Gauge unit)
connect 1986 SQ L to MM D-27 BW (IGN ON (+coil)
connect 1986 SQ B to ground
connect 1986 SQ BY to MM D-26 BY (IGN ST)

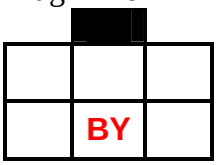
Here are the 1990 MM/D50 plugs

Plug D-27

R	GL	RG	R	GW	L	LR	Y	W	**LgR**	**BY**	**Y**	**BW**
RW	GY	WB	RL	GB	LB	LW	L	**YR**	YG	**YW**	**GW**	

Cut wires @ connector D-27
LgR = check engine light =====> Not Used
BY = battery (10amp fuse) =====> connect SQ B-38 RB
YW = reed switch (speedo) =====> Not Used
GW= self. diag. Check =====> Not Used
Y= self. Diag. Check =====> connect to SQ B-38 BR
YR = eng.coolant temp. Gauge unit =====> connect SQ B-38 YL
BW = IGN ON (+coil) =====> connect SQ B-38 L

Plug D-26

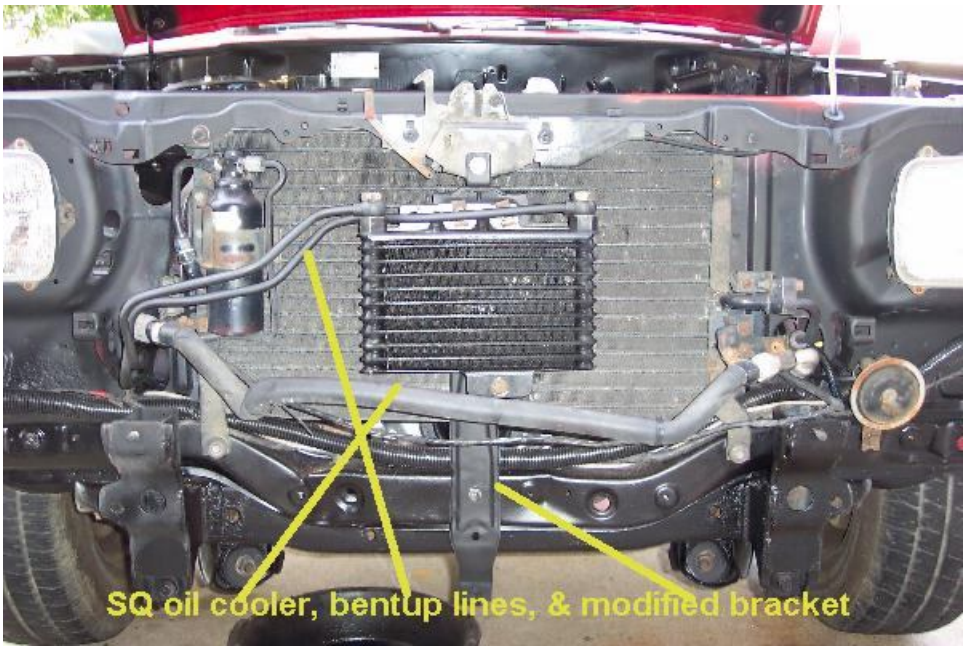


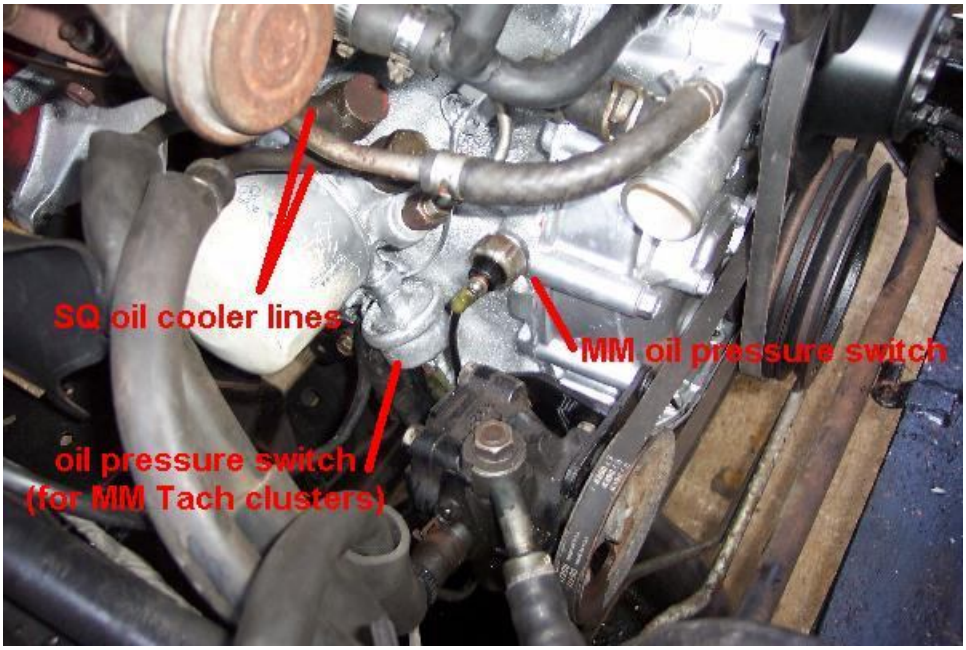
BY = IGN ST =====> connect SQ B-38 BY
Also cut BY, BR W & WB to separate harness

Fuel system:
The 1990 MM/D50 stock intank fuel pump can be retained for the turbo swap. For 1991+ MM/D50 the fuel pump should be upgraded to a 1990 fuel pump or other aftermarket pump with high flow rate. For 1987-89 MM/D50 the Starion external fuel pump or other aftermarket external fuel pump can be spliced into the fuel hose coming out from the tank. Splice the Starion fuel rail hose into the MM/D50 fuel line from the fuel filter and then install fuel rail hose into the fuel rail. The return fuel hose can be installed directly to the Starion fuel rail nipple.

Exhaust:
I made a downpipe using the starion pre-cat flange. I cut off the flange from the pre-cat and welded a 2.5” piece of exhaust tubing and then connected to the exhaust. A 2.5” or larger exhaust system is recommended due to the stock MM/D50 exhaust is rather small for turbo applications.

Other info:
Oil cooler - I was also able to mount the Starion oil cooler in front of the AC condenser and radiator just like the stock starion setup. This may not be possible if you plan on mounting the intercooler in front due to limited space on the truck (I used a top mount intercooler setup). I was also able to use the stock Starion oil cooler lines by making few bends to get it fit behind the grill (slight trimming of grill maybe needed). I used and modified the stock Starion oil cooler bracket by basically flattening out the bend in the bracket and used a small "L" bracket to attach the top of the bracket to the hood latch and drilling a hole at the bottom bracket for a existing bolt hole in the frame.

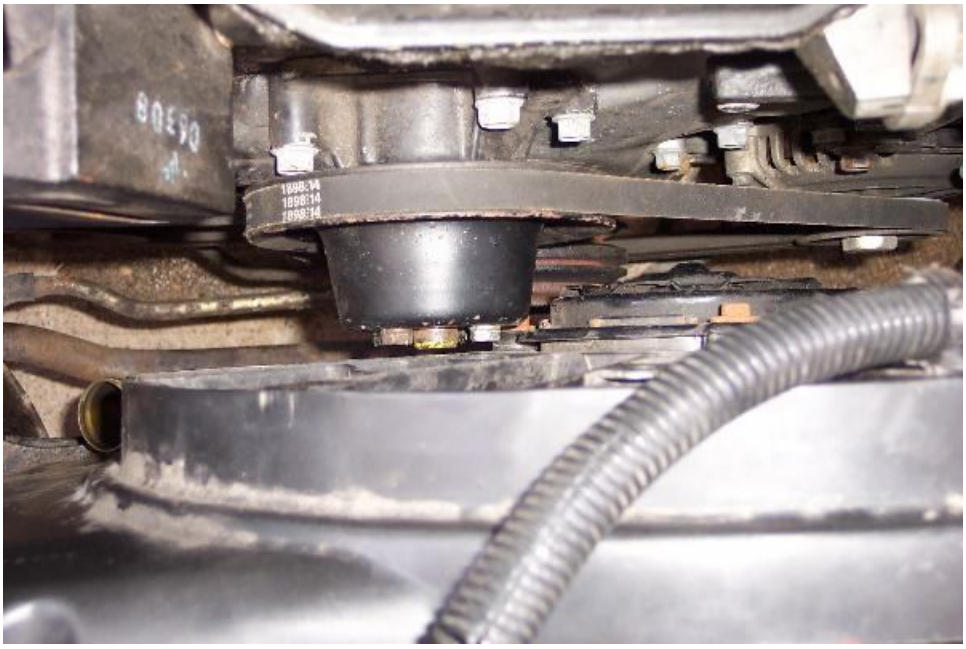




Radiator Fan:
I originally used the stock MM/D50 clutch fan, but later found that it did not keep the turbo motor cool enough during the summer months, so I upgraded to an electric cooling fan. I also noticed that the stock MM/D50 radiator was only a 1 row radiator. If more cooling is needed the radiator can be rebuilt to a 2 or 3 row radiator at a local radiator shop. It's also been mentioned that the Montero radiator is larger capacity and bolts on with minimal mods.

For my electric fan I used one Ford Taurus. Do search on Google and you'll find it's a common upgrade for other vehicles. The Taurus electric fan pulls about 2500cfm at low speed and 4000cfm at hi-speed.

I had to trim quite a bit of the plastic shroud to fit the MM/D50 radiator and make it sit close as possible to the radiator for clearance. It was a really tight fit and I had to move the radiator.



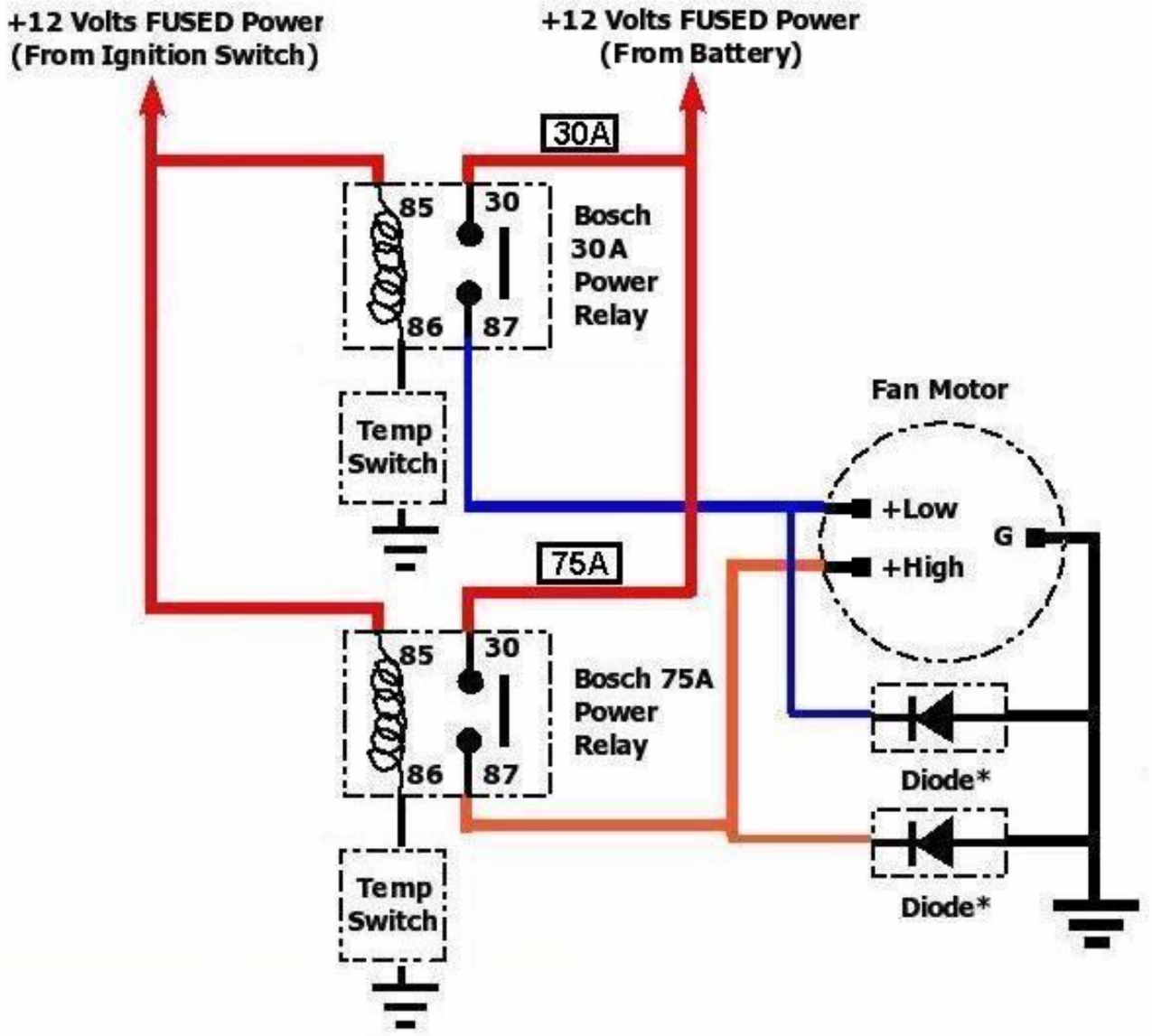
I had to shift the radiator about 1" so the water pulley would not hit. I made some brackets and added a plate to cover the gap.

I've got low speed wired up to turn on at about 180-185deg. and the high speed at 200-205 deg. Due to the high amp draw on the initial fan startup 10 gauge wire is recommended with a 30amp relay for low speed and a

75amp relay for high speed. It also recommended to have a higher output (75amp or more) alternator to handle the extra load then the stock MM/D50 45amp alternator.

Here is the wiring for the Taurus fan.
Black = ground
Black/orange = low speed
Black/yellow or blue = high speed

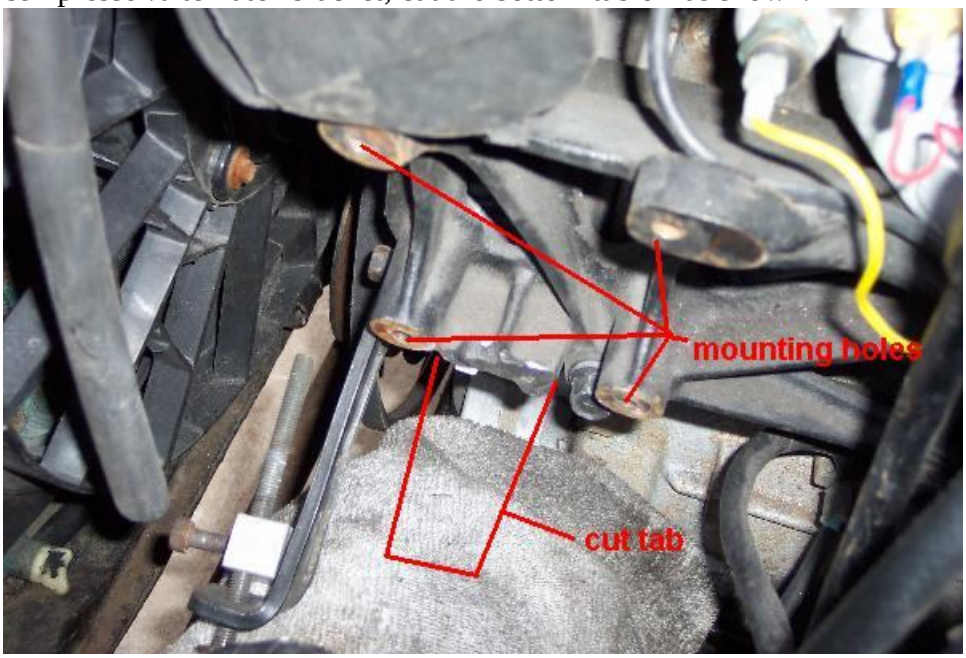
I'm using two thermosensors to turn on the electric fans. For the low speed thermosensor I used a thermosensor from a Starion (from the Starion radiator) mounted in the intake manifold near the thermostat. The other is a programmable sensor integrated into a CSI water temp gauge. Below is the wiring schematic I used.



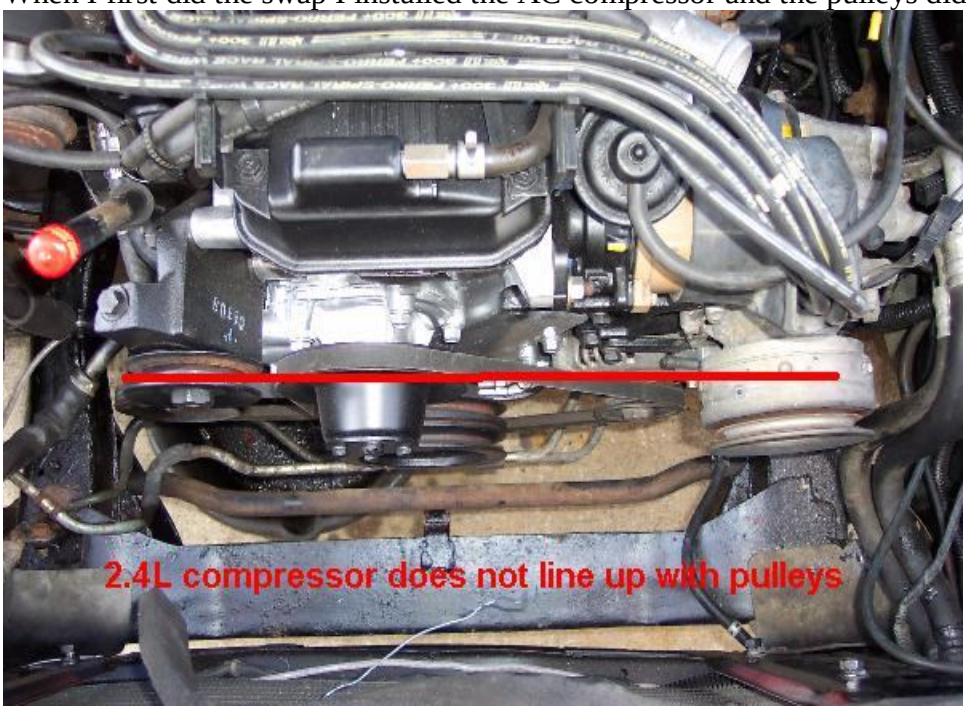
Upgraded alternator:
Due to the electric fan upgrade I also had to upgrade my alternator. I originally ran the stock MM/D50 45amp alternator on my swap due to the stock Starion 65amp alternator kept draining my battery. I ended up using a 75amp alternator from a Mitsubishi van which bolted up with no problems. I only had to swap the pulleys.

AC system:
For those doing the turbo swap on a NA 2.6L 1987-89 MM/D50 just use the same AC compressor that came with the NA 2.6 truck. Just swap the AC compressor/alternator bracket onto the Starion motor. I don't have any info for those swapping from the 2.0 to a 2.6. The following should apply to 1990+ 2.4L AC system.

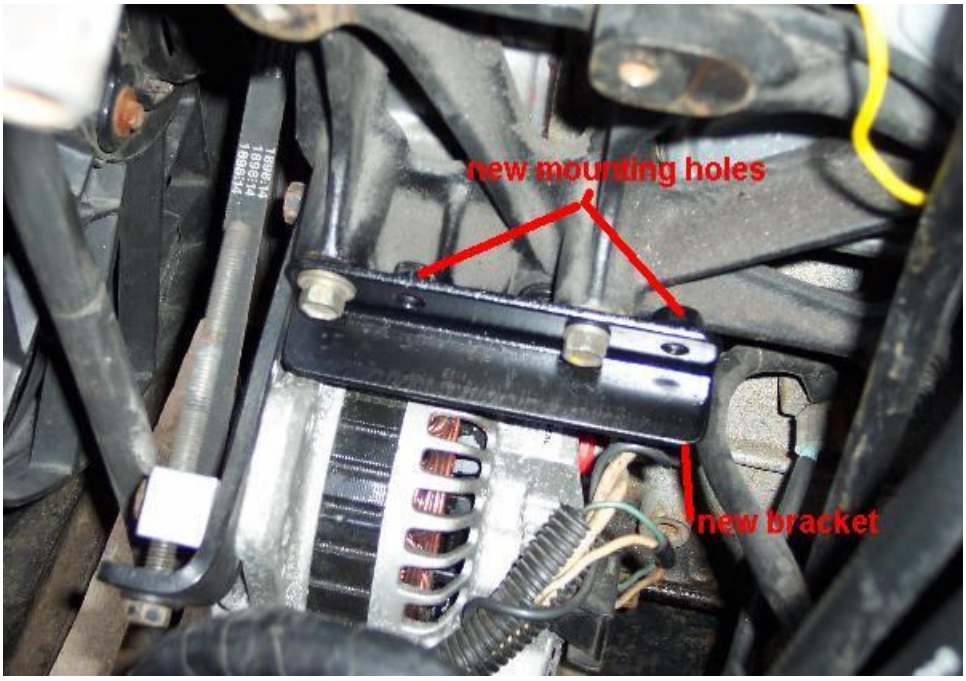
For my turbo swap I needed to use an alternator/AC compressor bracket from a 1987-89 MM/D50 2.6 to attach the 1990+ 2.4L AC compressor onto my Starion 2.6L. Before mounting the MM/D50 2.6 AC compressor/alternator bracket, cut the bottom tab off as shown.



When I first did the swap I installed the AC compressor and the pulleys did not lineup.



I had to make a bracket to move the AC compressor back about 1” to line up the pulleys. Here the lower bracket shown below.



And the upper bracket with the AC compressor installed.

The belts line up now.

On my swap I ended up with one electrical plug to deal with to wire up the AC. It's a BLUE plug with 3 wires: Blue, Green w/ red stripe, and White w/ black stripe. My 1990 FSM labels it as plug A-38.

NOTE: 1991-1995 maybe slightly different, the wiring schematic shows plug A-38 with only 2 wires.

White/Black wire is connected back to the fusible link or any 10amp +12V source.

Green/Red wire (which originally went to the 2.4 ecu) is grounded.

Blue wire to the AC switch. "T" into the Blue/Black wire coming from the AC switch. You should be able to access the AC switch wiring plug thru the glove box.

Here's a wire diagram of my AC wiring hookups.