

## Intakes, Header & Exhausts

### **Intakes**

The philosophy behind an intake system is the colder the intake charge, the better. There is a variety of Intake Systems available for the EM1; there are Cold Air Intakes (CAI), Short Ram Intakes (SRI) and Filter Box Intakes (FBI). CAI is an intake that goes from the throttle body all the way to the front of the vehicle, usually to the passenger's side inner fender-well behind the front bumper. A SRI (AKA, filter on a stick) is just a pipe from the throttle body to a forward location usually ending up above the transmission or behind the headlight. A FBI is an intake system the either retains the stock filter box, or incorporates a custom filter box. Within those 3 main categories, there are several different variables to distinguish an Intake system, those variables are Filter Element, Piping Material, Pipe Diameter, Pipe Shape, Inlet Location/Air Temperature and Box Size. Below, I listed some ways to figure out how to determine a good intake from a not-so good intake.

**Inlet Location** - This is an important part of the function of the intake. An intake that pulls its air from a cooler location will work the best. I have seen some SRI's that place the filter directly behind the radiator. With it there, the only air it will be taking in is hot air. Remote locations are great, or a location that blocks it from the hot air.

**Filter Element** - There are 3 main types of filter elements, paper, foam and the K&N type material filter. The main focus on the filter element is the restriction of air flow. Between the K&N type and foam filter there really is no difference both are very free-flowing. A paper filter is basically what comes stock and is very restrictive.

**Piping Material** - Since the piping is what transfers the intake charge from the inlet (filter) to the throttle body, it's good to have a material that will not transfer heat. Aluminum seems to be the most popular used, but aluminum does transfer a lot of heat through itself. Steel is sometimes found in the DIY intakes, although it takes a lot of heat in order for it to transfer through, the steel will stay warm longer than the aluminum. Plastic transfers heat and holds the heat; I don't even know why companies even use plastic. Aluminum seems to be the best material. Of course you will find some made with C/F, like the J's Racing intakes, these also seem to work very well.

**Pipe Diameter** - The wider the better, a lot of intakes use 2.5" diameter (i.e. AEM's infamous CAI), what seems to work the best is something that is 3" in diameter. This seems to move a lot of air and not restrict velocity.

**Pipe Shape** - I have seen some crazy things in my lifetime, but some of the intake shapes that I have come across completely boggle my mind. I have seen some intake that look like they are just exploding in the middle with crazy bulges and what not. They claim it increases velocity using aerodynamics, but I think that they are smoking some crack. Straight flow-through designs are efficient.

**Box Size** - This is for the FBI type intakes, basically, the larger the box, the more efficient.

## **Popular Intakes:**

Manufacturer / System Type / Filter Type / Piping Material / Piping Diameter

AEM / Short Ram / SRI / K&N / Aluminum / 2.5"

Injen / Intake System / SRI / K&N / Aluminum / 2.5"

J's Racing / SRI / K&N / Carbon Fiber / Varies

AEM / CAI / CAI / K&N / Aluminum / 2.5"

AEM / V2 / CAI / K&N / Aluminum / 4"

Injen / Race Division / CAI / K&N / Aluminum / 2.5"

Comptech / Ice Box / FBI / Foam / ABS/Aluminum / 3"

Mugen /none / FBI / K&N / ABS / N/A

**Also check out the *DIY* section of this CD.**

Atmospheric conditions have a direct effect on your engines output. Hotter, less dense air will do nothing for your engine, expanded air does not add more air to the mix, and it only takes up more space that could be used for more air. Cooler, denser air will allow more air to be added with the fuel. Keep in mind, that every 11 degrees F you lower your intake air temperature, you gain approximately 1% horsepower increase. So, if the under the hood temperature is 200 degrees F, and the atmospheric temperature outside is 68 degrees F and you duct the outside air in, you just bumped your horsepower from 160hp to 179.2hp.

A wonderful question often brought up about cold air intakes is, "Will a cold air intake hydro-lock my engine?" Well, to answer that question, yes and no. I personally ran a cold air intake year round, through driving rain storms and Northeastern Ohio blizzards. Never have I hydro-locked my engine. However, I have heard of stories of people hydro-locking driving through shallow puddles. Although I really do not understand how it could happen seeing how I have driven through puddles as deep as 6 inches, some precautionary tactics may want to be taken to avoid the possibilities of a hydro-lock situation. One tactic that can be used is when driving through a deep puddle, push in the clutch and let off the gas. This will eliminate the intake vacuum and lower your chances of giving your engine a drink.

To install most intakes, you'll need a 10mm socket, 12mm socket, flat head screwdriver, #2 phillips screw driver and needle nose pliers. Most CAI's require the removal of the front bumper for installation. Set aside 2 hours for installation for first-timers.

## **Headers**

A good header will give you the most power out of the 3 basic bolt ons. There is a variety of shapes and sizes of headers, the 2 main categories are 4-2-1 & 4-1. This is referring to the how the primaries step down to the collector. There are also different sized collectors, primaries and secondaries as well. A 4-1 header is designed to give more power at higher RPMs and a 4-2-1 header will give more power at mid-range RPMs. Large primaries and large collectors are a plus, 1.5"-1.75" primaries on a 4-1 along with a 2.5" collector is the supreme choice for Supercharger equipped EM1's. Larger primaries are not as great on N/A EM1's, but the larger collector is always a plus. The other things to look for are ceramic and stainless steel. Ceramic will look dull and tends to rust fast, stainless is shiny and will bronze from heat. NOTE: a 2.5" collector will require an after-market catalytic converter to accept the collector.

### **Popular Headers:**

Manufacturer / Design / Collector Size / Material  
DC Sports / 4-1 / Stock / Ceramic/Stainless  
DC Sports / 4-2-1 / Stock / Ceramic/Stainless  
DC Sports / JDM 4-1 / 4-1 / 2.5" / Ceramic/Stainless  
'98 Spec JDM ITR / 4-1 / 2.5" / Mild Steel  
Comptech / none / 4-2-1 / Stock / Stainless  
APEXi / GT / 4-2-1 / Stock / Stainless  
Kamikaze / 4-1 / 2.5" / Ceramic  
GReddy / none / 4-2-1 / Stock / Stainless  
Mugen / none / 4-1 / Stock / Stainless  
JG Edelbrock / 4-2-1 / Stock / Ceramic

If completely wild, big gains is what you're looking for, look into the Erik's Racing headers for equal length priaries.

You will need 10mm, 12mm, 14mm sockets, and 19mm open wrench (for O2 sensor). Allow 3 hours for first-timers.

### **Exhausts:**

Cat-Backs are the Cat's ass. Exhausts are generally sold as cat-backs, tail-sections and universal mufflers. A cat-back system goes from the catalytic converter all the way to the muffler tip. A tail section (AKA, axle back) goes from the axle to the muffler tip. A universal muffler... is just a muffler. The most important thing to look for in an exhaust is 60mm or 2.5" piping from the cat-back for N/A and 3" for boosted cars. You don't want to go too small on the piping because it will be too restrictive. Too large of a piping will and your exhaust gases will loose velocity. Retaining the stock piping gets you no gains. The muffler is not a factor on performance, the only thing to look for in a muffler is your sound preference and make sure it is a free flowing muffler.

### **Popular Cat-Back Exhausts:**

Manufacturer / Style / Piping Diameter / Piping Material / Muffler Material  
APEXi / N1 / 60mm / Aluminized / Stainless  
APEXi / WS / 60mm / Aluminized / Stainless  
GReddy / EVO / 60mm / Aluminized / Stainless  
Thermal R&D / Classic / 2.25" / Stainless / Stainless  
Thermal R&D / Stealth / 2.25" / Stainless / Stainless  
Thermal R&D / Turbo / 3" / Stainless / Stainless  
Mugen / TL / 60mm / Stainless / Stainless

You will need 12mm and 14mm sockets. Allow 4 hours for installation and be prepared for broken bolts.

A high flow cat or test pipe will compliment your 3 basic bolt ons rather nicely.