AIR DUCTING

FOR

SHORT TRACK STOCK CAR RACING

wilwood DISC BRAKES

Proper air ducting has become critical for effective performance of short track stock car disc brake systems. Faster cars, improved tires and better aerodynamics has changed the design requirements for brake ducting. Short tracks, and most road courses, require specific air duct considerations to maximize the brake system's effectiveness.

Channeling sufficient air from the front of the car through the front brakes is required to remove the large amounts of heat generated by severe and prolonged brake use. Just as proper brake components (calipers, rotors, pads) are required to convert the kinetic energy of the spinning rotor into heat, so must the necessary air be moved in, through, and out of the brake system to remove the heat (energy). An efficient air ducting system can prevent brake system overheating, greatly improve pad life and can make the difference between winning and losing a race.

This technical data sheet discusses the particular problems and solutions to stock car air ducting for short track and road racing. Check your rule book for any limitations on brake cooling, and use the maximum allowable for optimum cooling performance.

Short Track Stock Cars

New, more aerodynamically shaped stock cars have changed some of the air flow dynamics which affect brake air duct efficiency. Typically, cars have gone from a squared off shape to a more aerodynamic rounded shape.

Refer to Figure 1 for a typical old style stock car/air duct configuration. Figure 2 illustrates air flow patterns associated with this style vehicle.

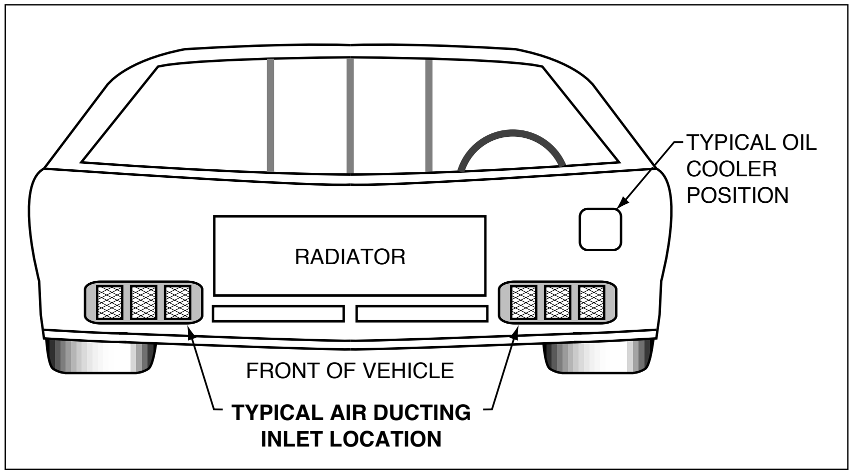

Figure 1. Typical Stock Car Air Ducting Inlets, Old Style Vehicles

As car design has evolved with less frontal area and more slippery front sections, the aerodynamics of the car's front end has changed, thereby affecting the air flow entering the front air scoops (plenum). Because of this change in air flow, the standard positioning of intake plenums should be re-evaluated.

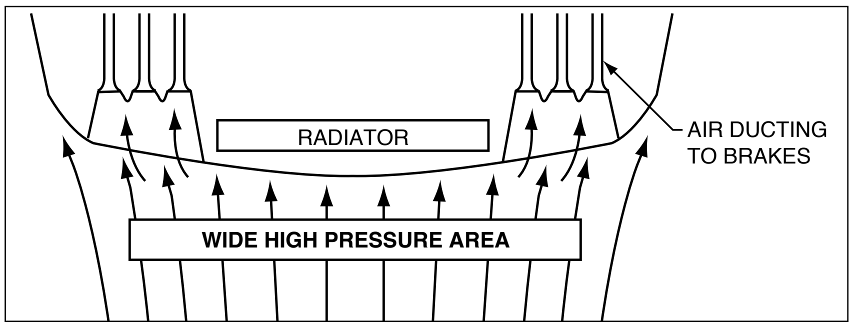

Figure 2. Example of Air Flow, Old Style Vehicles

Air flow can be diverted past air intakes by low pressure zones formed at the outward end of the intake opening. Figure 3 shows typical air flow with the newly designed front ends of today's aerodynamic efficient race cars. This results in a diminished volume of air flow into the air ducts and can greatly reduce the air flow to the brakes. The solution to this problem appears to lie in the repositioning of the plenum intakes as shown in Figure 4.

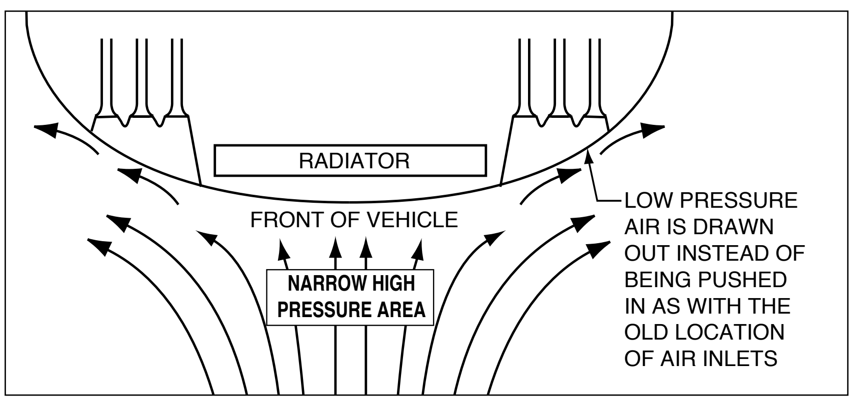

Figure 3. Example of Air Flow, New Style Vehicles

By repositioning the plenum intakes vertically as close as possible to the center of the vehicle, air flow is increased. Vertically placed intakes reduce the unwanted effect of air skimming past the duct openings. Locating the intake ducts closer to the center of the vehicle positions them in a high pressure area. Note that the position of the oil cooler has been changed to allow a vertical placement of the air ducts. Protective screen mesh should be made as open as is practical. Fine mesh can severely restrict air flow.

Air duct hosing should be the type with smooth interior facing. Intake plenums should be smooth and contoured for minimum air restriction, usually fabricated of aluminum, plastic or composite material. Air duct hoses should run as straight and short as possible; every turn and bend restricts air flow.

Ideally, air ducting should run straight from the front section into the front wheel plenum, with flexibility and allowance for the turning of the wheels (see Figure 5, top view).

Placement of front fender support struts should be made with consideration for running brake duct hoses straight from the scoops to the wheel plenum. Avoid “snaking” the hoses as any bending reduces air flow.

All three hoses should run parallel (one on top of the other, Figure 5, side view), and exit into the front wheel plenum at the front of the spindle. From a cooling stand point, it is preferred that the caliper be placed in front of the spindle so that a plenum built around the caliper allows the air to flow across the inboard half of the caliper and then into the center of the rotor. This will substantially decrease the operating temperature of the caliper (and brake fluid).

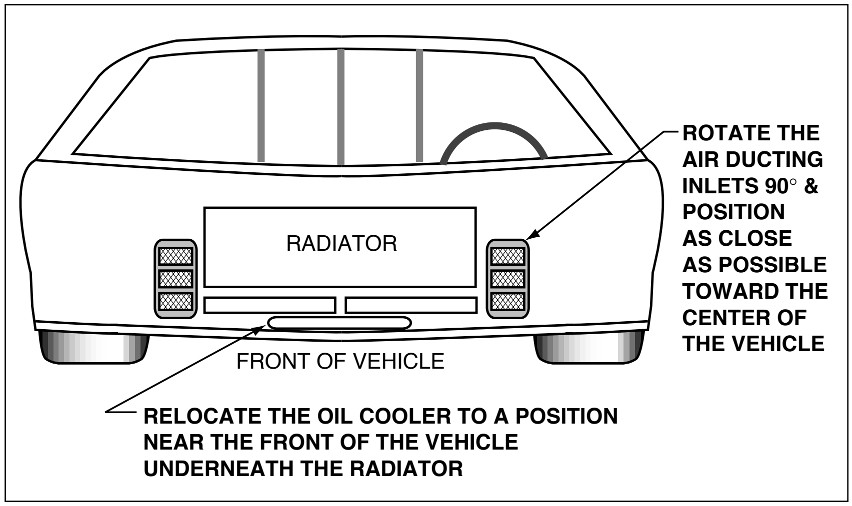

Figure 4. Repositioning of Air Duct Openings and Oil Cooler

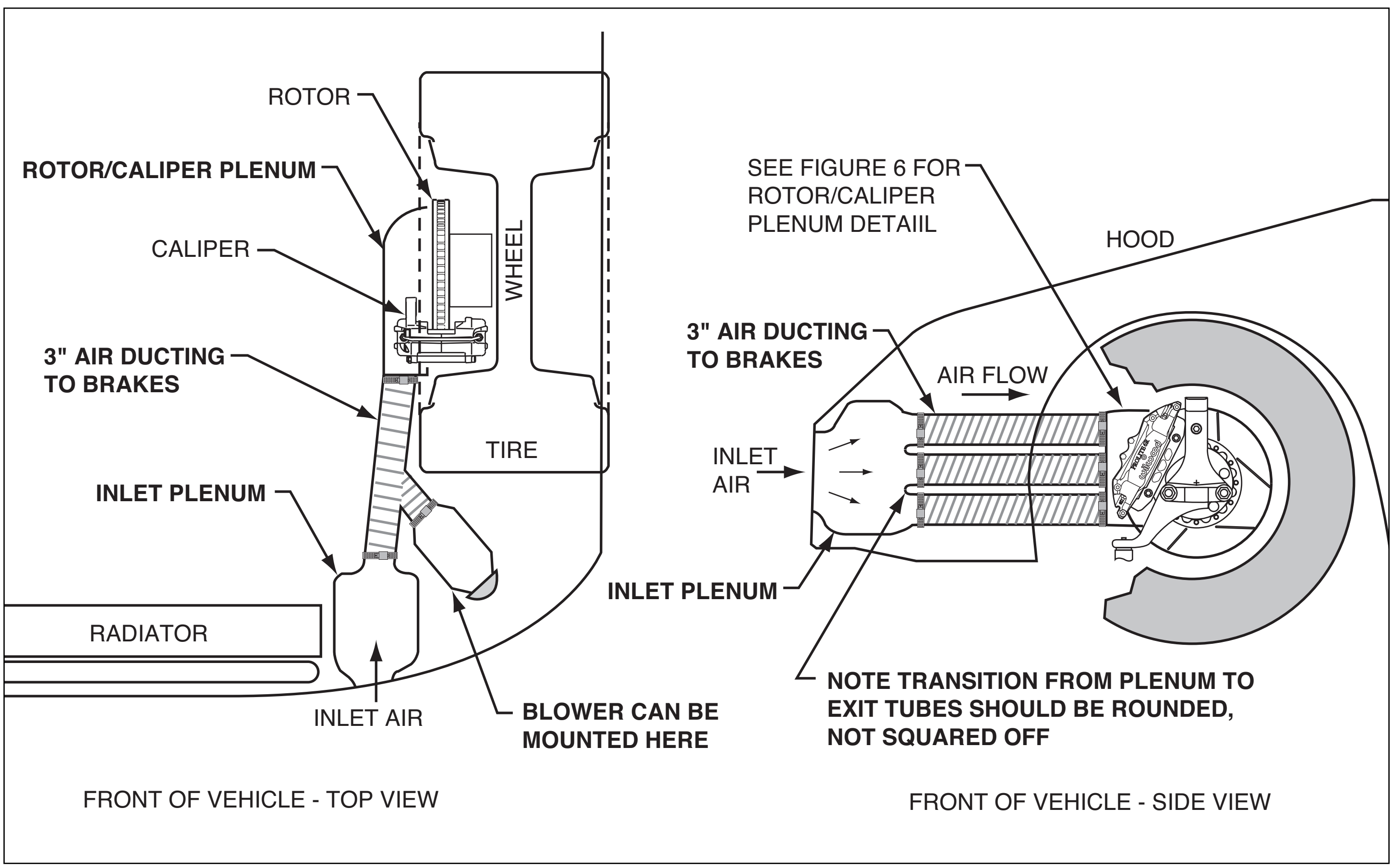

Figure 5. Air Ducting Plumbing Diagram

The plenum should surround the spindle and caliper assembly with the open edges as close to the inner diameter of the rotor as possible (see Figure 6). Air forced into the center of the spindle/rotor area creates a high pressure area of air which is forced/pumped through the vanes of the rotor, and to a lesser extent, the small gaps between the hat and rotor. The plenum should avoid restrictions to air flow and take advantage of all possible means of getting air to the center of the rotor.

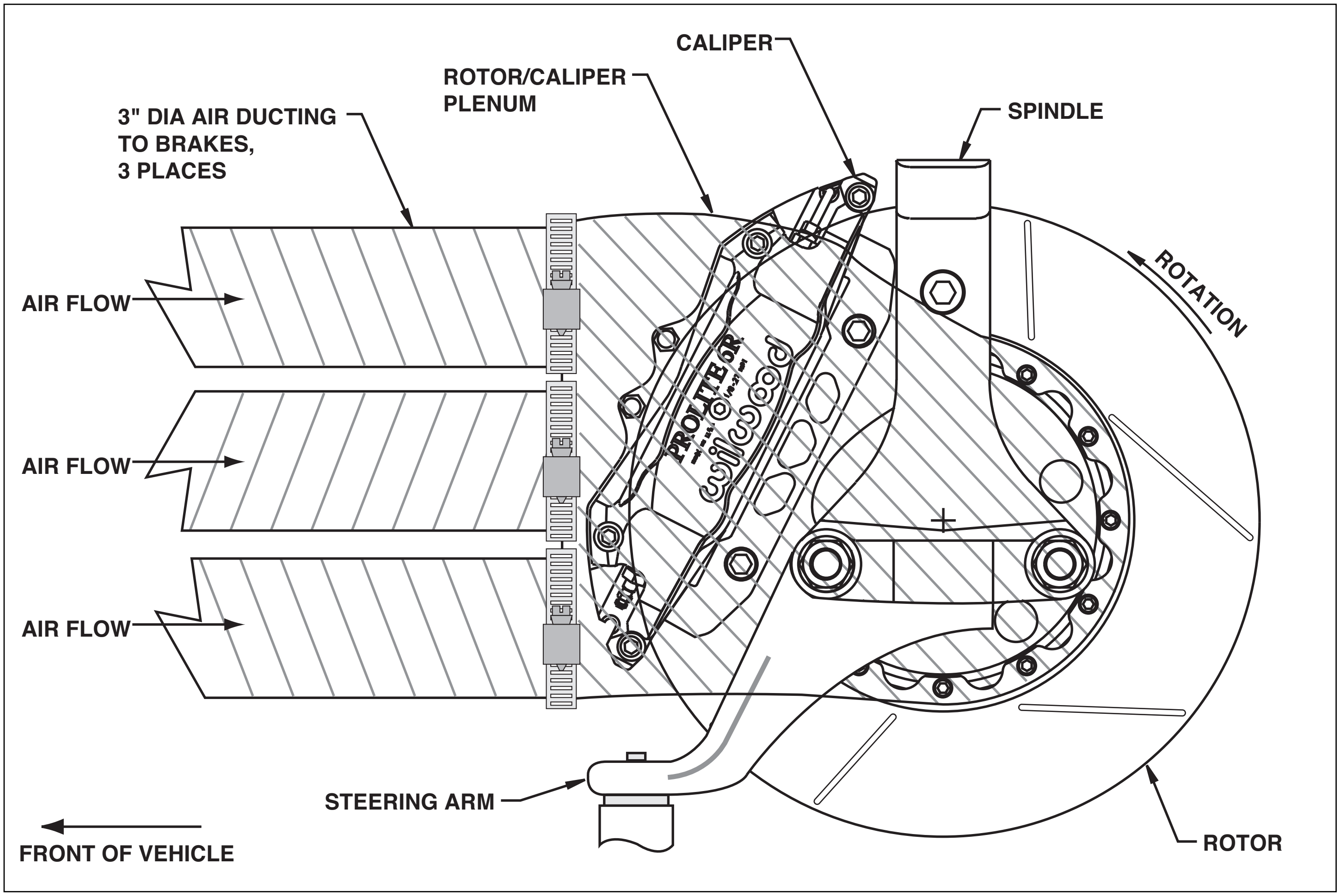

Figure 6. Rotor/Caliper Plenum Installation Diagram

The shock should be mounted behind the spindle to avoid interfering with brake ducts and plenum openings.

Inline blowers, or blowers fitted to a “Y” pipe (see Figure 5) should be used to enhance air flow. Bumper-to-bumper racing, caution periods, pit stops - all these conditions may require supplemental air flow from inline impeller-type blowers which can be operated from inside the cockpit. Make sure to read the rules which dictate if and how many blowers may be used. Place blowers near inlet plenum.

Rear air ducts are usually not required on stock car brakes. However, they are recommended for use at short flat tracks with heavy vehicles (NASCAR Winston Cup, Busch GN and Craftsman Truck Series). When used, a single three (3) inch duct run from inside the cockpit to each rear rotor is usually adequate. Install an inline blower which can be manually switched from inside the cockpit.