BD AIR-FUEL CONTROL (AFC) SPRING KIT

NOTE: Unless this product has been identified with a CARB # it is only legal in California for racing vehicles which may never be used upon a highway

List of parts:
Medium tension AFC Spring. Light tension AFC spring.
Short, medium, and long break-off screws, M6 x 1.0 thread.
Short, medium, and long button-head Allen screws. M6 x 1.0 thread.3 & 4 mm Allen wrenches.

In the 1994-98 Dodge Rams with Cummins Diesel, the Bosch P7100 injection pump uses an AFC housing assembly to control maximum fuel delivery under low boost conditions. This housing has several adjustments, one of which is its position frontward-rearward on the governor part of the pump. When installing the **BD** Power Kit, the AFC housing is moved all the way forward. This adjustment minimizes the fuel holdback from the AFC link at low boost and also allows the governor rocker to move farther forward along the **BD** torque plate. This forward movement of the rocker corresponds to greater rack travel and more-fuel delivery.

The forward AFC link movement, which allows more fuel at low to medium boost, is accomplished by boost pressure acting on a diaphragm in the housing. The AFC housings, especially those on 215 hp engines, use a very stiff spring that opposes the movement of the AFC link forward. Full link travel in some cases requires 34 + pounds of boost.

You can adjust the pre-load on this spring by removing the steel plug from the top of the cast aluminum AFC housing and turning the "star wheel" as described in the installation instructions for the **BD** Power Kit. This plug takes a 8mm (5/16") Allen wrench. It can be difficult to minimize the smoke level without cutting full boost power due to excessive spring tension and mechanical interference to link travel by the spring seat (part of the "star wheel"). This situation reduces engine power below the level possible with the **BD** Power Kit, sometimes seriously with "bigger" kits.

Changing this spring to one included in the **BD** AFC Spring Kit ensures that full AFC link travel occurs with a reasonable amount of boost, and allows smoke control by adjusting the star wheel. The spring tension is sufficient to allow smoke adjustment without reducing power at usually attained boost levels, and the spring is a bit longer to give a bit of "pre-load "without turning the star wheel so far that full link travel may be impeded. Engine responsiveness and power under initial acceleration at medium rpm will be greater, as verified by dynamometer testing. Two springs are included in the kit. The medium tension one usually is best with 215 hp engines and the lighter tension one with the others (160, 175, and 180 hp).

The lighter spring can be used with the 215 hp engine for an even greater increase in low-boost responsiveness at the expense of more smoke if heavy throttle is used before sufficient boost is achieved. The medium tension spring can be used in the non-215 engines for better smoke control than is practical with the stock AFC spring, especially at high altitude, while retaining good responsiveness and full-boost power. Procedures for installing the **BD** AFC Spring Kit are described in the following paragraphs. The lighter of the two springs is made from thinner diameter wire and is noticeably easier to compress by hand.

Remove the rubber boost line (7 mm screw-head clamp) that goes to the turbocharger waste gate, if attached to the AFC housing. Remove the 13 mm nut that holds the boost line going from the rear of the AFC housing (towards the firewall) to the intake manifold. Remove the AFC housing in the same manner as is done to install a BD Power Kit. Using a clean cloth to prevent marring the housing, clamp it in a vise.

There are four screws, one at each corner, holding the back of the AFC housing to the main body. Three screws are slotted head and one is a break-off screw. The diaphragm is clamped between these two parts of the housing. One procedure is to drill the break-off screw about 1/8" deep with a 3/32" drill bit then drive in a T15 Torx bit with a small hammer and remove the screw with a 1/4" wrench to turn the Torx bit.

If the screw is tight, tap on the Torx bit while applying turning pressure with the wrench. Alternatively, you can use a T20 bit after drilling with a #32 drill bit. This larger Torx bit is better in case the screw turns out to be really tight. Or, you can cut a screwdriver slot in the screw head with a hacksaw, or use an "easy-out" screw extractor. Remove the other three screws with a large square-shank screwdriver (hold it tightly in the screw slot) and a wrench on the shank of the screwdriver to help turn the screws.

Remove the 10 mm nut from the center of the diaphragm. It is tight due to thread-locking compound. There are, in order, a wave washer under the nut, then a ribbed plate with its smooth side against the diaphragm, the red rubber diaphragm, a cup plate where the end of the AFC spring seats, and (with 215 hp engines) a small washer that seats on the shoulder of the long stud that goes through the middle of the AFC spring. This washer is approximately the same outside diameter as the stud and is about 0.040" thick. The other end of the spring seats on the star wheel.

Adjust the star wheel now, retracting it fully away from the diaphragm (the wheel threads into the AFC housing and butts against the housing when fully retracted by turning it clockwise as viewed from this direction). You can turn the sleeve protruding from the star wheel (and integral with it) easily with pliers. This retracted position corresponds to the fully rich direction on the star wheel. Usually, the **BD** spring works best when the star wheel is fully retracted (rich) or is only a little out from its maximum retracted position.

Install one of the springs from the **BD** AFC Spring Kit and reassemble the diaphragm. Reuse the 0.040" thick washer (if a 215 engine), the cup plate, diaphragm, ribbed plate, wave washer, and 10 mm nut. The nut has thread locker from Bosch, so you should degrease the threads and put on a bit of Loctite 242 (blue). Tighten the 10 mm nut enough to compress the diaphragm a little until significant, but not excessive, resistance to turning is felt. Then rotate the diaphragm on its stud back and forth and stop turning when it is centered in its travel. Reassemble the AFC housing cover with the three slotted head screws and the **BD** M6 x 1.0 x 14 mm break-off screw, or the medium length (16 mm long) button-head Allen screw.

Remove the slotted-head screw and the break-off screw holding the stamped steel cover on the back of the AFC housing. You can remove this break-off screw as you did the one holding the diaphragm cover. Often this screw is not too tight and has enough head that you can turn it out with pliers clamped on it. Under this cover is a stud held from turning by a 10 mm locknut. Hold the stud with a 3 mm Allen wrench and loosen the 10 mm nut.

Back off the stud a few turns (counterclockwise) until, when turning it gently by hand, you feel it just touching the diaphragm shaft inside the AFC housing. Then tighten the locknut while holding the stud with the 3 mm Allen wrench. This adjustment allows the diaphragm inside the AFC housing to retract fully against the inside of the housing cover.

Replace the stamped cover and install the **BD** M6 x 1.0 x 9 mm break off screw or the short (10 mm) button-head Allen screw (it takes a 4 mm Allen wrench). Be sure to replace the washers under the screw heads. In case you want a more finished appearance, most 1994-up engines use Cummins Titanium Black paint, Part Number 3824514. Replace the AFC housing on the P7100 pump with the M6 x 1.0 x 18 mm break-off screw, or the long (20 mm) button-head Allen screw in the front position close to the engine.

Use the 18 mm long slotted head screw in the rear position near the engine, and use the two hex-head 25 mm long screws, in the positions away from the engine that hold the fuel shut-down solenoid bracket. Be sure the AFC housing is positioned fully forward on its slots before tightening these four screws.