



FREQUENTLY ASKED QUESTION SERIES

BANJO BOLTS – WHY THE BAD RAP?

6.0L Powerstroke Diesel



I have been getting a bunch more comments and questions from customers about our 6.0L fuel system kits, particularly about the use of banjo bolts in our design. I also keep seeing people make a point of "deleting the banjo bolts", including competitors that seem to think this is a big selling point. There seems to be a bad stigma around using banjo bolts in 6.0L fuel systems, but I'm not sure I understand why everyone thinks deleting them is some kind of significant advantage...

Let's start by taking a look at the sizes of the ports and fittings used in the 6.0L Powerstroke:

The fuel rail ports at the front and rear of the cylinder heads take a 12mm fitting. Your average 12mm fitting (90° or straight...doesn't matter) has a bore diameter of about .240-.260" (yes, you read that right...about 1/4"). The minor OUTSIDE diameter of the 12mm threaded portion of the fitting (where the o-ring sits) is about .380". Obviously you can't get a 3/8" (.375") hole through the middle of a fitting with that small of an outside diameter, hence the 1/4" bore.

Driven Diesel Banjo Bolts, which we have custom designed and made specifically for our kits, have (3) side holes that EACH have an inside diameter that is about 70% of the main 12mm fitting bore diameter...and a center bore that is larger than most other 12mm fittings. The banjo fitting on the end of our CNC produced tubes is larger and has more internal volume than the stock banjo fittings as well. **We DO NOT reuse or modify stock tubes or banjo fittings, our tubing and banjos are larger than stock and totally custom.**

So, in both cases (either banjo or 90° fitting) you are asking the fuel to make a 90° turn into a bore that is in the neighborhood of 1/4"...from a supply that is larger than 1/4" (generally 3/8" hose). Either way you go, the bore through the 12mm portion of the fitting will be your main restriction, which is not changeable unless you remove the heads, bore the threads out and re-tap to accept a larger fitting.

To further make my point, here are some calculated comparisons. The calculator I used was pretty basic. These numbers are NOT accurate flow measurements for diesel fuel in our truck engine application; they are based on water and a fixed pressure I couldn't adjust. They are for COMPARISON PURPOSES ONLY and do not reflect the actual flow rate of diesel fuel in your truck at 60psi, etc! No flow corrections were made for the 90° turn since both fittings in question are causing the fuel to do this:

Flow of .375" bore: **21 gph** (average #6 hose ID)

Flow of .250" bore: **9 gph** (small ID for average 12mm fitting)

Flow of .260" bore: **10 gph** (large ID for average 12mm fitting)

Ignore the actual flow numbers and look at the differences...**the inside diameter of a 12mm fitting will flow just LESS THAN 50% of what the 3/8" hose feeding it will flow!**

Even if you put a straight fitting in the end of the fuel rail and run straight 3/8" (or larger) hose to it, the actual flow of fuel into the fuel rail WILL be significantly reduced when it reaches the smaller bore of the 12mm fitting. There is simply no way around this!

The 3 side holes in the Driven Diesel Banjo Fitting will flow in the neighborhood of **4.8 gph** EACH! That's a combined flow rate of more than **14gph** (45-50% more than the average 12mm fitting) when taken on their own. The center bore of the Driven Diesel banjo fitting will flow about **12 gph** (20-30% more than most average 12mm fittings). Obviously the banjo fitting has the same limitations as any other 12mm fitting, the smallest point will determine the flow. In this case, it is **NOT** the side ports of the banjo fitting creating the limitation; it is still the center bore of the 12mm portion of the fitting.

So...tell me again how using a banjo bolt with side holes that will outflow the ID of the 12mm portion of the fitting is such a problem...

As for why we designed our system using the banjo bolts and CNC bent tubing instead of just a 90° fitting and hose...**VEHICLE COVERAGE** and **CLEAN INSTALLATION**. When we were first building our prototype 6.0L kit, we tried the 90° fitting and hose route, but that would have eliminated every "dual alternator" truck since the bracketry for the second alternator would have hit the fitting. The hoses also didn't route as cleanly and made the installation look less "engineered" and "professional". When we located the high flow banjo fitting and built some prototypes, we found that we were able to still use the cast in tube guides in the heads and the tubes fit tighter to the heads and looked more "factory". The banjo style tubes also fit a lot better in the rear around the exhaust up-pipes. The high flow banjo setup gives our customers the best of both worlds, significantly increased flow over stock and OEM quality fit and finish.

Hopefully this answers some questions.

S DIESEL, LLC (dba STRICTLY DIESEL AND/OR DRIVEN DIESEL*) WARRANTY AND LIABILITY POLICY

MANY OF THE PRODUCTS SOLD BY S DIESEL, LLC, ARE DESIGNED TO INCREASE VEHICLE PERFORMANCE...USE AT YOUR OWN RISK!

Do not install or use any product(s) purchased from S DIESEL, LLC ("S DIESEL") until you have carefully read the following Warranty and Liability Policy (the "Warranty").

PRODUCT WARRANTY POLICY

Subject to the limitations, exclusions, and qualifications set forth below, the product or the products made and sold by S DIESEL (the "S Diesel Product" or "S Diesel Products") are warranted to Buyer as set forth in this Warranty. The installation of the S Diesel Products indicates that Buyer has read, understands and agrees to the terms and conditions of this Warranty. Any warranty on products that are made by another manufacturer which are resold by S DIESEL to Buyer is made to Buyer by the manufacturer of such products in accordance with and subject to all conditions and limitations of the manufacturer's warranty in effect on the date of the purchase by Buyer. S DIESEL makes no warranties to Buyer, express or implied, with respect to such products that are made by another manufacturer.

LIMITED WARRANTY

The S Diesel Products (except S Diesel Products specified to have different warranty terms) are warranted to be free from defects in material and workmanship, under normal use and service for a period (the "Product Warranty Period") of ninety (90) days from date of delivery to Buyer, unless S DIESEL performs the work installing the S Diesel Products, in which case the Product Warranty Period shall be extended to equal the Service Warranty Period (as defined below under "SERVICE WARRANTY POLICY"). S DIESEL's liability under this Warranty is limited to repair or replacement at its option, subject to the provisions set forth herein, of any S Diesel Products which upon examination S DIESEL are found to be defective. Buyer shall prepay cost of transportation of defective S Diesel Products to S DIESEL for inspection.

S DIESEL shall not have any responsibility under this Warranty unless (1) the defect in an S Diesel Product results in a claim arising within the Product Warranty Period, measured from the date of delivery to Buyer, (2) the S Diesel Product, if installed by an installer other than S DIESEL, was properly installed, (3) the S Diesel Product was normally maintained and not subject to misuse, negligence or accident, and (4) the S Diesel Product, system components and/or accessories were not repaired or altered in such a way that in the judgment of S DIESEL the S Diesel Product's performance or reliability was adversely affected.

EXCLUSIONS

Any of the above warranties by S DIESEL shall not apply if Buyer's vehicle is in an accident, misused, neglected, altered from the S Diesel Product's manufacturer original designs or specifications or serviced in connection with a warranty claim hereunder without prior written approval of S DIESEL.

REMEDIES EXCLUSIVE

Repair or replacement of defective S Diesel Products in accordance with the Limited Warranty above shall be Buyer's exclusive remedy for and shall constitute satisfaction of any and all liabilities of S DIESEL with respect to any defect in any S Diesel Product whether based in warranty, contract, tort, negligence, strict liability or otherwise.

DISCLAIMERS AND LIMITATIONS

THE EXPRESS WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS AND TERMS AS TO QUALITY OR FITNESS OF ALL PRODUCTS SUPPLIED BY S DIESEL TO BUYER, WHETHER WRITTEN, ORAL OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH OTHER WARRANTIES, CONDITIONS AND TERMS ARE HEREBY DISCLAIMED AND EXCLUDED BY S DIESEL. IN NO EVENT SHALL S DIESEL BE LIABLE FOR ANY LOSS OF ACTUAL OR ANTICIPATED PROFITS, LOSS OF ANTICIPATED BUSINESS, COST OF SUBSTITUTE PRODUCTS, LOSS OF USE OR DOWNTIME COSTS OR DELAY CLAIMS (WHETHER DIRECT OR INDIRECT) NOR FOR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATING TO THIS WARRANTY OR THE SUPPLY OF S DIESEL PRODUCTS TO BUYER, WHETHER BASED IN WARRANTY, CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. BUYER ACKNOWLEDGES THAT (A) THE PRODUCTS PURCHASED FROM S DIESEL WILL BE USED IN CONNECTION WITH ACTIVITIES, UNDER EXTREME CONDITIONS AND/OR SUBJECT TO MODIFICATIONS REQUESTED BY BUYER FOR WHICH THE PRODUCTS MAY OR MAY NOT BE SUITABLE; (B) THE WARRANTY OF SUCH PRODUCTS FOR PERFORMANCE IN CONNECTION WITH SUCH ACTIVITIES, UNDER SUCH EXTREME CONDITIONS AND/OR SUBJECT TO SUCH MODIFICATIONS REQUESTED BY BUYER IS NOT POSSIBLE; AND (C) ANY MANUFACTURER'S WARRANTY MAY BE VOIDED BY USE OF THE PRODUCTS IN CONNECTION WITH SUCH ACTIVITIES, UNDER SUCH EXTREME CONDITIONS AND/OR SUBJECT TO SUCH MODIFICATIONS REQUESTED BY BUYER. BUYER ACKNOWLEDGES THAT THE INSTALLATION OF ANY S DIESEL PRODUCTS THAT ARE NOT LEGAL FOR USE ON POLLUTION CONTROLLED MOTOR VEHICLES IS DONE SOLELY AT THE REQUEST OF BUYER AND ALL RESPONSIBILITY FOR ANY EFFECTS ON THE ORIGINAL VEHICLE MANUFACTURERS WARRANTY, ABILITY TO PASS ANY EMISSIONS INSPECTIONS OR FOR ANY FINES THAT MAY OCCUR DUE TO THE REMOVAL OF FEDERALLY MANDATED EMISSION CONTROL EQUIPMENT IS ON BUYER. No employee or representative of S Diesel has the authority to make any representation, promise or agreement which in any way varies from the terms and conditions of this Warranty. No suit or claim based on any cause of action, regardless of form, arising out of or relating to this Warranty or any of the S Diesel Products supplied by S DIESEL may be brought by Buyer or anyone claiming by, through or under Buyer against S DIESEL more than one year after the date that such cause of action arose.

IN THE EVENT BUYER DOES NOT AGREE WITH THE TERMS AND CONDITIONS OF THIS WARRANTY, BUYER MAY PROMPTLY RETURN THE PRODUCT TO S DIESEL FOR A FULL REFUND. THE PRODUCT MUST BE IN NEW, UNUSED AND RESELLABLE CONDITION, BE RECEIVED

WITHIN FIFTEEN (15) DAYS OF THE ORIGINAL PURCHASE AND BE ACCOMPANIED BY A DATED PROOF OF PURCHASE (RECEIPT). PRODUCTS RETURNED IN NEW, UNUSED AND RESELLABLE CONDITION WILL NOT BE SUBJECT TO ANY RESTOCKING FEES.

THE INSTALLATION OR USE OF ANY PRODUCT PURCHASED FROM S DIESEL INDICATES THAT BUYER HAS READ, UNDERSTANDS AND AGREES TO THE TERMS AND CONDITIONS OF THIS WARRANTY.

SERVICE WARRANTY POLICY

Subject to the limitations, exclusions, and qualifications set forth below, the service or services performed by S DIESEL (the "S Diesel Service" or "S Diesel Services") are warranted to Buyer as set forth in this Warranty.

LIMITED WARRANTY

The S Diesel Services (except S Diesel Services specified to have different warranty terms) are warranted to have been performed in a workmanlike manner and to hold up under normal use and service for a period (the "Service Warranty Period") of twelve months from date the S Diesel Services are performed or twelve thousand miles from the documented odometer reading at the time the S Diesel Services are performed, whichever occurs first. S DIESEL's liability under this Warranty is limited to replication, subject to the provisions set forth herein, of any S Diesel Services which upon examination S DIESEL are found to have not been performed in a workmanlike manner.

S DIESEL shall not have any responsibility under this Warranty unless (1) the defect in an S Diesel Service results in a claim arising within the Service Warranty Period, measured from the date the S Diesel Service is performed, (2) the vehicle upon which the S Diesel Service was performed was normally maintained and not subject to misuse, negligence or accident, and (3) the vehicle upon which the S Diesel Service was performed was not repaired or altered in such a way that in the judgment of S DIESEL the S Diesel Service's durability was adversely affected.

EXCLUSIONS

Any of the above warranties by S DIESEL shall not apply if Buyer's vehicle is in an accident, misused, neglected, or serviced in connection with a warranty claim hereunder without prior written approval of S DIESEL.

REMEDIES EXCLUSIVE

Replication of unsatisfactory S Diesel Services in accordance with the Limited Warranty above shall be Buyer's exclusive remedy for and shall constitute satisfaction of any and all liabilities of S DIESEL with respect to any defect in any S Diesel Service whether based in warranty, contract, tort, negligence, strict liability or otherwise.

WITHOUT LIMITING THE FOREGOING, IN NO EVENT SHALL S DIESEL BE LIABLE FOR ANY LOSS OF ACTUAL OR ANTICIPATED PROFITS, LOSS OF ANTICIPATED BUSINESS, COST OF SUBSTITUTE SERVICES, LOSS OF USE OR DOWNTIME COSTS OR DELAY CLAIMS (WHETHER DIRECT OR INDIRECT) NOR FOR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATING TO THIS WARRANTY OR THE PERFORMANCE OF S DIESEL SERVICES FOR BUYER, WHETHER BASED IN WARRANTY, CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE.

GENERAL PROVISIONS APPLICABLE TO BOTH PRODUCT AND SERVICE WARRANTIES

ASSIGNABILITY OF WARRANTY

This Warranty is for the exclusive benefit of Buyer and is not assignable.

WARRANTY CLAIMS PROCEDURE

Warranty claim forms can be printed from the company websites (<http://www.drivendiesel.com> (Products) and <http://www.strictlydiesel.com> (Services)). A properly completed warranty claim form and a copy of the invoice for any defective Product or Service must be received by the Seller within the earlier of 30 days after the expiration of the Warranty Period or the incident giving rise to the claim. To qualify for an adjustment under this Warranty a defective Product must be returned prepaid to the Seller for inspection and must be accompanied by a dated proof of purchase receipt. In addition, the serial number of the defective Product, if any, must match the serial number on Buyer's invoice. All Warranty claims are subject to approval by the Seller and/or the Product's manufacturer. Buyer must pay all applicable service charges and taxes. Defective Products accepted for warranty compensation become the property of the Seller. To qualify for an adjustment under this Warranty a vehicle upon which S Diesel Services have been performed must be delivered to the Seller during Seller's hours of operation for inspection and must be accompanied by a dated proof of purchase receipt.

WAIVER

Any failure of the part of S Diesel to insist on strict compliance with the Warranty Provisions shall no way constitute a waiver of such right. No claim or rights arising out of a breach of the Warranty Provisions by Buyer may be discharged in whole or in part by a waiver of the claim or right, unless the waiver is in writing signed by an authorized representative of S Diesel. S Diesel's waiver or acceptance of any breach by Buyer of any provisions of the Warranty Provisions shall not constitute a waiver of or an excuse for nonperformance as to any other provision of the Warranty Provisions nor as to any prior or subsequent breach of the same provision.

APPLICABLE LAW

The Warranty shall be governed by the laws of the State of Arizona (excluding Arizona law with respect to conflicts of law).

* Driven Diesel was formerly known as ITP Diesel, LLC and Sinister Diesel, LLC.