General Instructions For Using The Timing Wedges For Cummins ISX Engines

Here are some quick tips and ideas for you to time the Cummins ISX. As always, you should refer to your owner’s manual for the most current and complete information.

The most important thing to remember before you begin is that the timing pin needs to be installed BEFORE the gears are removed. You also need to be sure that the pin remains seated until all the gears are tightened. Failure to do so can result in improper timing and possible engine failure.

Step 1:

Turn the crankshaft in a clockwise direction. Look for the ‘insert pin’ indicator with is on the outside diameter of the engine vibration damper – that must be aligned with the marking on the gear housing.

Step 2:

From timing pin boss, remove plug and register Crankshaft Locking Pin (3163020) into the boss hole. In this instance, the green band on the timing pin and the surface of the timing pin boss of block are aligned.

If the green band is not fully visible outside the block (or not visible at all), you have incorrectly seated the pin in the crank notch. Note: The pin should be fully seated to lock the crankshaft in place.

Step 3:

Remove the following:
EGR Crossover Tube

Rocker Lever Cover

Rocker Lever Gasket

(Caution: Review the timing code located on the engine data plate. Forcing the wedge into place may potentially cause damage to the engine)

Step 4:

Once the correct timing wedge is inserted to lock valve camshaft, lightly tap the top of the timing wedge using a mallet. If done correctly, it will be properly seated.

Step 5:

Remove the following:

Camshaft Position Sensor

Upper Gear Cover

Crankshaft Position Sensor

Lower Gear Cover (if required)

Once again, it’s important to check your owners manual for the most current information. The information provided here is a guideline and Apex Industries can not be held accountable for any damage caused by this information.

Choosing the Correct Heavy
Choosing the right tool the first time

When evaluating and shopping for a heavy-duty diagnostic tool, first look for a tool that assists in the repair process as well as the diagnosis process. Bi-directional testing capabilities are critical, as are any OEM guides or troubleshooting information to speed up the repair process. In addition, the best tools have very few glitches, hook up fast, and have most features available from one or two screens.

The right tool will be set up like a well-organized mechanic’s toolbox. Fault information is the wrench and socket drawer; they are used first and often without the requirement of opening multiple drawers. Other tools are not used as often but should never be hidden or hard-to-find; tools quit making a mechanic money as soon as it cannot be located. Too often techs do not use a function in a specific software simply because that feature is too hard to find; it is highly recommended to stay away from this type of tool.
A key indicator of a quality tool is one that provides reliable, accurate information within the software. Certain tools have glitches such as certain sensors reading incorrect numbers due to the sensor not being online until a future emissions update, so if a tool’s accuracy cannot be fully trusted it is best to continue shopping.

Many techs work on a variety of makes, models, and components so consistency across the look and feel of the software should be a requirement. Some tools provide a different visual experience depending on which OEM components are built into the truck, which can cause confusion and slow down technicians. Look for a tool that provides a consistent experience each time it is hooked up to a vehicle.

Finally, look for a tool that can be trusted for a long time. The best tool will be a single solution where one piece of software allows technicians to work on vehicles, regardless of the make, model, and components involved. Coverage needs to be constantly updated and features often added so technicians can continue to work on the newest vehicles with the latest tests available in the industry.
TE5699: Automatic Locking Grease Fitting Coupler

Spring is coming and everyone hates to hear the word ‘service’ but it has to be done. This last weekend we had a warm snap and it reached 68 degrees in February in Indiana. I probably should have spent the day enjoying the weather by going to a park, walking on a people trail, cleaning up the yard or anything outdoors. Instead I thought this would be a perfect time to service the zero turn before spring.

TE5699 Automatic Locking Grease Fitting Coupler

The thing I hate most on my Great Dane mower, beside where the oil filter is located, is having to crawl underneath the 72” deck to grease the spindles. A couple of weeks ago we received a new product — **TE5699 locking grease fitting coupler** — in inventory. I was thinking this would be perfect for the Great Dane. It is not big and bulky like most locking great fittings. This unit is real close to the same size as my stock fitting from Lumax so it will work fine on recessed grease fittings that are all over my John Deere tractor.

This is the TE5699 automatic locking grease fitting coupler.
It is standard grease fitting threads. I just unscrewed my old fitting from my Lumax pistol grip grease gun and screwed this one on. The locking mechanism works just like an air fitting coupler. You just snap it on to a grease zerk and the ball bearings grip and hold the unit securely. To release you pull back on the knurled sleeve and it comes right off.

The locking grease fitting coupler does have a pressure relief thumb screw to help in removing the unit if it is under a load. Do not worry about remembering if you closed the relief screw; it will let you know. Unfortunately my mind was not on what I was doing Saturday and kept getting a trail of grease out of the pressure relief hole. It is not hard to figure out if it is open or closed.

Just a couple of close-ups of how the TE5699 grabs the grease zerk. When these first came in, I received a text that they were broken and could not possibly grab a zerk fitting. You just push the coupler onto the zerk until you feel it snap. If it does not snap on to the zerk, push a little harder. I did find that I did need to wipe off my encrusted fittings a little.
Real World Testing

For those playing at home that might be new to our blogs, yes – we really do real world test everything we blog about. This is the TE5699 grease fitting coupler snapped onto my front pivot wheel on the Great Dane Mower. Before someone emails me – yes, I know the mower is filthy and yes, I know I should wipe off the 15 years worth of grease packed on the mower. I keep the mower immaculately serviced but it looks like it is on its last leg. The funny thing is nobody wants to borrow it when theirs will not start in the spring. I am also hoping this keeps the thieves away since anything not nailed down seems to come up missing anymore.

Ok to wrap this blog up… I like the TE5699 but would not want it as my primary end on the grease gun. I greased my zero turn and compact utility tractor last weekend and found myself using 2 grease guns. On the tractor bucket that only needed a couple of squirts each zerk and was easy to get to, I used my traditional 4 jaw Lumax grease gun. On the zerks that were a little bit of a pain to get to and needed a lot of grease, I used the locking grease fitting.

I counted 6 grease guns in my shop. There were 2 pistol grips,
lever action, air, mini for chainsaws and a mini for Ford Model A non locking zerks. I really want to play with a new high end battery operated one, so if a grease gun manufacturer is reading this, you can just send a sample in care of Fred Neff @ Apex Tool Company.

As always. happy wrenching.

—Fred

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**Proper Care and Repair of the Top Deck Counterbore Tool**

We often receive calls from customers saying “I need my [counterbore tool](#) rebuilt.” One of the largest complaints is that it is no longer cutting flat. This blog will give one simple and easy way to fix this problem without buying a new tool or sending your tool out for a rebuild.
Over torquing is the number one factor in needing counterbore rebuilds

This method will work with both the Porta-Tool/Kent-Moore shim cutter as well as the Apex /Monaco Tool. The number one factor causing this is over torquing. This tool needs to be torqued to 20ftlbs. The Kent-Moore counterbore tool is has a cast iron base plate, while the Apex counterbore tool has a forged base plate. It can withstand a little more abuse but over torquing will warp these base plates. It is very vital that you do not over torque this tool.

Inspecting the base plate is the first step in counterbore maintenance

The first step should be the easiest. Inspect the base plate of your counterbore tool for any damage or foreign matter. I
have seen these tools with rust and dings all over the bottom of the base plates. This is a precision tool so never toss it around. You also need to look at your cutter plate. If it has a ring cut around the plate it will have to be replaced. Never turn the cutter plate when centering your tool. Use gentle pressure on the plate and make sure you have space between the depth set collars and the top of the tool.

The next step we want to take is to mark one side of the tool. We will now bolt it down and cut a few thousands off the counterbore ledge.
Now remove the tool and measure all the way around the counterbore ledge noting the high or low points. If one side is lower than the other make a note of the difference. We are now going to turn the tool around and cut a few more thousands and check if the opposite side is now low. Sometimes the problem is not with the tool but with the block deck. By rotating the tool and making several test cuts you can track if you truly have a problem with your tool.
Adding a feeler gauge under the counterbore base plate

If the counterbore stays out of flat only on one side of the block when you rotate the tool, the problem is in the block deck and you can fix this problem by adding a feeler gauge under the base plate. This can also be done to fix a tool that is cutting out of flat. This is a fast but not permanent repair for a damaged tool.

Adding a shim to the counterbore

If your tool is consistently cutting low on one side you can shim the tool back into flat. This can be done with trimming down a feeler gauge to fit between the base and drive unit. The old school method is to use the cellophane from a cigarette pack. Be very careful when loosening the bolts. You will need to do additional test cuts to make sure that you do have the tool back cutting flat.

If your counterbore tool is cutting out of round or if it cuts out of flat but will not repeat unfortunately it is time for a new tool. Do not think of how much this is going to cost to replace, think about how many blocks this tool has cut.

These tools should last for many years with just some basic maintenance.
Best practices:

Keep the tool clean and store it in a temperature controlled environment. These tools do not like to work when they are cold. If it is cold and hard to turn, you are causing undo wear on the bushings.

I like to keep a thin coating of lubriplate on the shaft of our machines.

Never use an impact to tighten down and these tools should always be torqued down.

You will also want to use care in tightening the thumb screws on the depth set collars. These do have thread protecting buttons under them. They need to be checked every so often.

With proper care you should get many years life out of your counterbore tool. I have had many used Porta-Tool Green machines come to us used that even though made in the 1970’s are still cutting as good as a new machine. Use this guide on PT2250, PT2200, PT2205, PT2210, M50133, M50134, M50139, M50145 and all Porta Tool CBU tools

If you’re ever in Columbus, Indiana, you can stop in and see an original Cummins 5 1/8” counterbore machine in our lobby. This was one of the first machines ever made by Porta-Tool International. Feel free to contact us with any questions.

And as always happy wrenching –

Fred
Types of Oil Filter Removal Tools

I know everyone that has worked on a car or truck sometime in their life has run across an oil filter that just did not want to come off. I always hated when I heard someone say this is the first oil change for this car. I do not know how they put the oil filters on a new car but I personally think it is a combination of glue and a \( \frac{3}{4} \)" impact gun. Then again, the car can be a couple of years old and be coming in for the first oil change. Yes, the oil light was on and the little service light has been on for a couple of years. I am sure we have all heard if it was that important why didn’t it have a buzzer or send me a text. Here are some oil filter removal tools that are recommended for every tool box:

![Image of an oil filter removal tool](image)

First off – don’t be this guy. With all the choices on the market today you do not have to drive a screwdriver into the side of an oil filter to get it off. Yes, I know we have all done it.
End cap oil filter wrench: They come in many different sizes and in some cases of a recessed oil filter, this is about all you can use. Unfortunately with a really stuck or odd shaped oil filter these are just going to spin. Also with some Fram filters that have the rubber easy to install end-coating these will not even fit. You just slip the correct size over the end of the filter and try to remember ‘righty tighty – lefty loosy.’

The end cap remover: It also comes in a 2 or 3 jaw universal style. These are supposed to tighten on the bottom of the oil filter and grow tighter the more you turn. In theory, these should take the place of having a dozen of the special sized end cap filter sockets. I know I have one of these somewhere in my home garage. It was given to me. After a couple of times of trying to use it I guess I really need to pass this on and
chuckle after it leaves.

The handled band-style oil filter wrench: Growing up this is all I ever remember having available. They now come with a swivel handle so you do not have to have 3 of the same with the handle cut off at different lengths. In all honesty this is not a bad wrench unless the filter is welded onto the vehicle. I personally still use this style for changing the oil on my zero turns. Pretty simple to use. Slip in over the filter and turn. If it gets bigger flip it over and try it the other way. These will tighten down and remove most filters. If it starts slipping and can not get a bite on the filter you will have to go to a better method. Just having this style filter wrench is what has forced me to admit that yes, I have driven a screwdriver through a filter.
Filter pliers: These are now my go-to filter pliers and are actually in the top compartment of my service cart next to my lift. I have yet to have a filter I could not remove with them. Just do not plan on reusing the filter when you are done. In most cases these bite into the filter leaving four small dents. In the case of a welded on filter I have had these literally tear holes in the side of the filter. They will remove the filter or tear it to pieces in the process. These come in different sizes and also come with swivel handles. I am really thinking of liberating a nice swivel hand set out of the warehouse.
We sell a lot of **cloth strap wrenches** for removing large oil filters as well as unscrewing the covers off of cartridge style filters. These also do a wonderful job of removing the normal filter without damage. You just slip the strap and turn until the slack is out. Then you can use a ratchet wrench or breaker bar to turn the filter/cover loose.

**Chain wrenches:** These come with or without a handle. These are a cousin of the strap wrench but for that hard to remove filter. They will tighten down on the hardest to remove filter and literally crush the filter until it can get a strong enough bite to remove or to totally destroy the old filter.
Sorry if I did not cover your favorite. In doing a few minutes of research to make sure I did not miss any methods, I came across several different styles of a rubber strap T-style wrench. Then of course some manufacturers have to be special. I saw a key style for some Audi’s, Toyota also had a strange looking pin style. Then I just came across some that made me scratch my head. I saw a suction cup that grabbed the bottom of the filter. For fear of being sued I am not even going to give an opinion on the magnet one that stuck to bottom of the filter but also claimed that it would prevent dangerous metal shavings from being left in your engine block. I can see a magnetic oil drain plug. If you invented this please let me know how using a magnet on the bottom of an oil filter with the engine off will remove any metallic shavings that are not already stuck in the filter. If you have sold a few million of these you must be friends with the guy that invented the turbo air filter. I remember the infomercials when I was a young man and every car had a carburetor. This device went over the carb and was supposed to spin the air into the engine creating more horsepower and increased mileage. Sorry, I got off on a tangent there! Hey once again, thanks for checking out my blog and as always happy wrenching!

– Fred

Internal and external thread repair

I know – it sounds like I am repeating myself since I did a blog post not too long ago on external thread repair. But wait – didn’t the title for this blog post say internal and external thread repair? So why didn’t he cover internal in the
last blog post? The reason I didn’t cover ‘internal’ in the last blog post is because besides trying to start a tap in cross threading or in some instances using a back tap if they make it in that size. There was no good way to fix internal damaged threads.

Every year I try to make it out to the SEMA AAPEX show just to see what is new in the industry. As you can see from the photo the last few years I think everyone has this same idea. This show is a mad house and it is impossible to get near any booth with anything really interesting. I caught a glimpse of what looked like an interesting answer to how to fix the internal damaged thread problem. Forgetting even trying to get near the booth I formulated my plan. I would make my attack at sunrise or when the doors open. It is really surprising but for some reason mornings are not a big hit with most people in Las Vegas. With hardly a soul in sight, I made my way to the Anglo American NES booth and was totally impressed with their entire product line.
This is the ATCNES1015 basic thread repair starter kit.

The internal thread repair tool goes down inside past the damaged thread. You just expand the replaceable carbide cutter out into good threads and slowly turn the cutter backwards cutting and reshaping damaged threads. It also comes with a protective cap for working with aluminum threads.

This tool is simple to use and almost fool proof. It comes in different sizes for most of your common bolt sizes. No worry about thread count or if it is SAE or Metric. Plainly said, this tool is just amazing and needs to be in every tool box.
The kit also comes with an outside thread restoring tool. I am sure everyone has seen this tool and it has been around for years and I covered it in an earlier blog post.

Leave it to NES to improve the outside thread chaser. I am sure everyone has dealt with damaged threads on a keyway sprocket. Time to break out the thread files because the outside thread chaser will not work with a keyway. NES has developed a keyway jumping attachment for the ATCNES3. This attachment allows you to turn the re-threader all the way around the spindle and maintain the cutting teeth at the proper depth and angle without falling in the keyway. I may be the only one that gets excited on seeing a truly revolutionary way to solve an existing problem. I know my employees look at me kind of funny when I get worked up over a new tool. Below is a video link on how the NES3 works with the keyway attachment. Sorry it is a factory demo, so it’s a little dry...

I didn’t go into more detail on how it works and all the sizes covered. Take a minute look at the photos. The internal thread restorer words great. Crisp clean threads just blow out the shavings. Enough said in the photo with the chips in the threads.

As always …. Happy Wrenching

– Fred
Choosing a 3 Jaw Puller

With the multitude of 3 jaw pullers on the market we are going to just hit one the major pullers in the class. When choosing a 3 jaw puller you need to ask yourself:

1) How often am I going to be using the puller?

2) How long has this part been on the engine and is it pressed on?

3) What is the spread and depth that I actually need?

To prevent damage to whatever puller you choose, make sure the threads have a thick coating of extreme pressure lubricant. I know I have done it but a three jaw puller is not intended to be used with an impact. If you use an impact and break a jaw or pull the threads do not blame the puller.

The best practice for use is to choose the correct size puller for the job. If possible choose a puller a little larger over a small puller spread to its max. Then place the puller on the object needing pulled and slowly remove the slack from the puller until semi-tight. When the puller is semi-tight, readjust the legs so than everything is centered on what you are pulling. You do not want your puller at an angle. Using a wrench or ratchet slowly tighten the forcing screw. If you feel the part moving then finish removing it. When you feel the puller go tight, it is like you hit a brick wall then
stop. You can spray a little penetrating oil on the part or even apply heat. I have sprayed a part and left it under tension overnight to come in to work in the morning to find my puller on the ground and the part loose. If it is not moving hitting the puller with an impact sometimes works but often just breaks the puller. Most pullers have a point on the end to bite into what they are pulling. If you are pulling something that you do not want to mark up, I have wrapped a couple of washers in masking tape and put under the point. This protected the surface that the forcing screw was pushing on.

Let us take a minute and go over the different types of three jaw pullers.

This (image 1) is your typical import tool store cheap 3 jaw puller. It will work in some cases. Just make sure if you are using it to wear safety glasses and have a paid up life insurance policy. Note this puller can only be used in the 3 jaw configuration.
This (image 2) is what a small three jaw puller should look like. T&E puts out a great line of pullers. This puller has fine threads, adjustable for both 3 & 2 jaw capabilities, second set of holes to shorten and lengthen the reach of the puller. This is a perfect all around puller.
When I was writing this blog, I was trying to decide between using the T&E basic 3 jaw (image 3) and the OTC 3 jaw (image 4). Both are wonderful pullers and decided to go with the T&E. I happened to be re-boxing the OTC when I noticed that OTC has removed the second set of holes from the puller legs. I am not sure why if it was to save a few pennies on manufacturing the legs this is just not the quality I would expect from OTC.

Sorry about the rust (image 5). This is a used puller that came into our store a while ago. Please take care of your tools. Now on to the puller, this puller is going to go home with me after this blog. It is a quick change 2 & 3 jaw puller by T&E Tools. No more removing nuts and bolts to change your puller over. Just loosen the large silver screw and pop the
legs out and reposition in the desired configuration. This is so nice. I guarantee you that I will have this puller all cleaned up and will be treating her like the jewel she is.

I personally have never used one of these (image 6) pullers short of just playing with one. This is an internal hydraulic press puller. Just tighten the puller down securely and tighten the little t-bar. This puller applies several tons of pulling strength from the internal hydraulic ram. This is something I really want to try but is a little out of the price range for the home mechanic that breaks more than he fixes (me).
Last but not least – (image 7) – the king daddy of heavy duty pullers. This is the posi-lock puller. The cage keeps the legs from flying loose and keeps the puller locked on the part. These pullers are great. Now the bad part. We do not carry these any longer at Apex Tool Company because they are unbelievably expensive. It is a great puller but you can pay someone to fix it for you cheaper than buying one of these. If you use a puller all the time on construction or agriculture equipment, then this is the puller for you.

Seriously everyone, please be careful using a 2 or 3 jaw puller. All joking aside, the forces being exerted on the legs and the part you are pulling is enormous. I know, we all like watching the You Tube videos of things going wrong. Trust me you do not want to be the star of the next viral video. Just like using a press, these pullers can break and parts go flying like a little bomb went off. Remember – safety first.

Thanks for taking the time to look at my blog, and as always happy wrenching.

Fred Neff

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**A basic guide to choosing the style of counterbore plate**

Here is a basic guide to choosing what style counterbore plate you need for the counterbore shim cutter and the counterbore sleeving tool. This should be easier than it seems to be.
If your tool looks like this, the T-handle is the easiest clue. This is the Porta-Tool – Kent-Moore Shim Cutter. It will be usually blue or green.
Above is the Apex – Monaco shim cutter.
Both the Porta-Tool and Apex counterbore shim cutters use the same screw on cutter plates. If your counterbore tool is black and has the T handle but the plate is fitted on a tapered shaft, look at the name plate – if it says BK Sweeney, then beg the owner for some money because this tool has been obsolete since bell bottoms were still in style.
The plates that go on this tool will look like this in the center. If it does not have threads it will not fit this tool.
This tool above is intended to install counterbore shims. It was never intended to install sleeves and can not be made to cut them as a poor man’s sleeving tool.
Above is an original model Porta-Tool counterbore sleeving tool. It can come in blue or green. It will always have a depth collar and the drive off to the side. It may have a ball or a flat plate. It will only have one depth collar.
This is a modern counterbore sleeving tool. It will be blue with a wrap around handle and the feed control is on the front. It will have the same depth collar and drive as the original tool.
Both the original and modern counterbore sleeving tool use the same bolt on plates.
All your Porta-Tool – Kent-Moore counterbore sleeving tools will use a plate that slides on with a key way. If your plate does not look like this (above) it will not fit this tool.
The top deck sleeving, shown above, is intended to remove a large amount of block material rapidly. The tool was designed to install sleeves in the top counterbore region on diesel engines. It was never meant to do both sleeving and shim cutting. A new tool out of the box will have a 5 thousands variation on depth of cutting. This will grow larger with some wear. I have known some very talented mobile machining guys that use this tool for everything but the key to this is they have a tool for every job and nobody touches their tools. They also make their money by speed and volume so little mistakes are something they know how to field fix.

I didn’t cover the mid-stop counterbore engines in this blog post but they are easy. All the tools have a T-Handle and they do not make a sleeving tool plate for these engines. So this
is pretty easy. But unfortunately the mid-stop and ISX are different tools, sorry.

I know this is a basically simple blog and to most, this is old hat. Unfortunately we are getting calls everyday confused on what they can do with their tools. If I asked my order department what they would want to convey, it would be that you can not put the 60 series sleeve cutting plate on the shim cutter nor can this tool cut sleeves on a 60 series.

As always happy wrenching!

— Fred

Cummins ISX Anti-Polishing Ring Piston Removal and Replacement

Guide to Cummins ISX Anti-polishing Ring piston removal and replacement

Fig 1
If you have worked on a Cummins ISX engine you will have figured out it is impossible to insert a piston with rings from the top of the liner.

To install the piston rings, **ATC7040** (fig 3) a piston ring compressor is required to install the piston, rings and connecting rod assembly into an anti-polishing ring cylinder liner.

The piston, piston ring, and connecting rod will not install into the anti-polishing liner with the anti-polishing ring installed. The inside diameter of the anti-polishing ring (fig 1) is smaller than the actual engine liner bore so the piston with rings can not pass through the anti-polishing ring.

To replace the piston, piston rings and connecting rod in the Cummins you must first remove the anti-polishing rings. **M20187** (fig 2) can be used to remove the anti-polishing rings from the cylinder liner. Removing the anti-polishing rings can usually be done by hand but when they are difficult to remove you place the snap ring supplied in the M20187 under the anti-polishing ring and rotate the engine. The M20187 includes two snap rings so two anti-polishing rings can be removed on each
rotation of the engine. You can now place the special spacer ring included in the M20187 into the top of the liner and install the piston, piston rings and connecting rod as you do in any other engine. When installed, remove the spacer insert the anti-polishing ring and move to the next cylinder.

The ATC 529948 (fig 4) is the equivalent of the Cummins kit and will give you everything you need to install the piston rings in the Cummins ISX.

As always please refer to your owner’s manual for the most up to date procedure.
Installing & Removing Injector Cups on Detroit Diesel 60 Series EPA-07 and Pre-EPA07

M30161 J46904 Pre EPA-07

Removing and installing PreEPA07

M30162 J47907 EPA07
Drain Engine Coolant before removing injector tube.

Injector tubes may be damaged if excessive force is used during removal.

Install injector cup removal/installation tool into injector bore. See pictures for correct tool. Aligning tool with slots in tube. Turn injector cup removal/installation tool and injector tube counter clockwise to remove.

Check injector tube for cracks or defects. Replace if damaged.

Paying careful attention not to score cylinder head to injector tube sealing surface, clean injector tube threads with fine wire brush. M30139

For cleaning injector tube interior sealing surface, a chemical solvent may be used.

Thoroughly clean injector bore, install new O’Ring into injector tube groove.

Use high temperature nickel based antiseize lubricant to coat injector tube threads. Install injector tube on injector cup removal/installation tool.

Using injector cup removal /installation tool install injector tube in injector bore.

Tighten injector tube to torque specs. (please refer to owners manual. 26-33ftlb loosen 180 degrees tighten 26-33 ftlb.

**Removing and installing EPA07**

Drain Engine Coolant before removing injector tube.

Injector tubes may be damaged if excessive force is used during removal.

Install injector cup removal/installation tool into injector bore. See pictures for correct tool. Aligning tool with slots
in tube. Turn injector cup removal/installation tool and injector tube counter clockwise to remove.

Check injector tube for cracks or defects. Replace if damaged.

Paying careful attention not to score cylinder head to injector tube sealing surface, clean injector tube threads with fine wire brush. M30139 Use of power tools or compressed air is strongly discouraged. Pay strict attention to keep debris out of fuel supply line.

For cleaning injector tube interior sealing surface, a chemical solvent may be used.

Thoroughly clean injector bore, install new O’Ring with a silicone based lubricant into injector tube groove.

Use high temperature nickel based antiseize lubricant to coat injector tube threads. Install injector tube on injector cup removal/installation tool.

Using injector cup removal /installation tool install injector tube in injector bore.

Tighten injector tube to torque specs. (please refer to owners manual. 26-33ftlb loosen 180 degrees tighten 26-33 ftlb.

Tip of the injector must be flush with the fire deck or sunk into the cylinder head. Ensure tube does not protrude past fire deck into cylinder.

Re-install or replace shim. Ensure NEW shim is of same thickness as original one. To insure proper tube depth after fire deck has been milled a shim is used between tube and cylinder head in remanufactured cylinder heads.

Please refer to your service manual for most up to date procedure.