TORQHEAD

Installation Instructions

24xLink – 24/1x Signal Kit

24xLINK

TORQHEAD LTD
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Revision 006

Introduction

For best results it is recommended that you read and understand these instructions completely prior to commencing installation. For best results this instruction manual should always be supplemented with a factory service manual or repair manual. Improper installation can result in damage to the components, the vehicle or yourself.

The TH 24xLink signal unit kit comes with the following components:

- 24x Sensing Unit (Spline drive or Pin Drive)
- Keyed Crank Hub with integrated 24x Dual Track Reluctor. Crank key included.
- Hub Spacer – Included and needed on 1992-1995 Vehicles. Not required on 1996+
- Crank sensor alignment tool
- Cam Sensor
- Dual Track 24x Crank Sensor with shims
- Crank sensor gap yellow shim gauge
- Water pump gaskets

The 24x sensing unit replaces the Optispark distributer currently installed on your LT1 or Lt4 engine. Due to the number of engines and vehicle platforms the Optispark originally came on, it is recommended that you have access to the service manual for your vehicle. This instruction will supplement the service manual.

Sensing unit drive types

The TH 24x sensing unit utilize the same drive mechanism(s) as the original Optispark distributors offered by GM. This allows the sensing unit to conveniently fit on all years of LT1 and LT4 engines. The two drive mechanisms are spline drive (92-95) and pin drive (95-97). B-Bodies received the dowel pin drive in 1994.

Let's take a moment to understand these drive types and how they properly index.

Spline Drive:

The early LT engine Optisparks were driven by Spline shaft. This spline shaft, on the optispark, has an index tab which correctly mates with the camshaft spline since it has a mating index notch. This notch indexed spline ensures that the TH 24x Signal unit installs and is oriented correctly with engine position.

Figure 1 – Spline drive shaft

Index tab/
Notch

Cam Dowel
flush with
cam gear

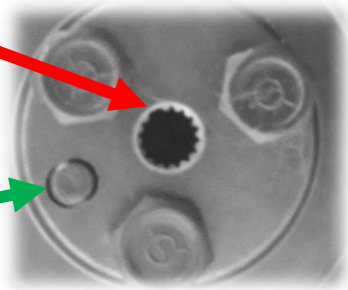


Figure 2 – Spline drive hole in camshaft timing gear

Pin Drive (aka Clover Drive):

The later LT engine Optisparks were driven via an extended camshaft timing gear dowel pin. The camshaft dowel pin is longer than the camshaft dowel pin on early year engines and protruded into the Optispark pin drive spindle. This pin drive ensures the later Optisparks only installed in one way and were properly oriented to engine position.

Figure 3 – Pin drive spindle. Has locating slot for cam dowel pin.

Drive Pin

Cam dowel
protrudes
through cam gear

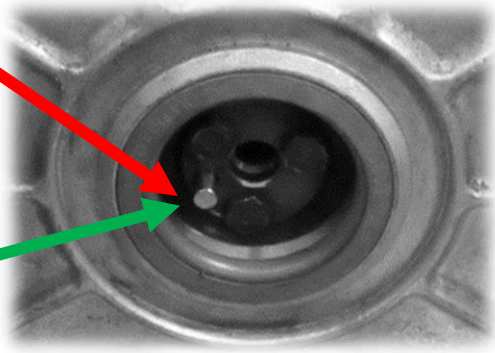


Figure 4 – Pin drive Optispark drive dowel pin.

Depending on the style of drive mechanism your vehicle has, ensure you understand how it mates with the driveshaft and ensure your alignment is correct during installation. **When either drive type is properly aligned the engagement should be smooth and effortless. Without proper alignment damage may occur if excessive force is used.**

IMPORTANT: Do NOT stick your fingers or any other tool into the sensing unit camshaft sensor hole. The internal timing disc is precisely setup for optimal performance during manufacturing. Interfering with disc in any way could result in damage.

Safety:

Before rushing in with excitement to upgrade your LT engine with TORQHEAD 24x components, take the time to ensure your safety is not jeopardized. This instruction is a guide only and the steps within are a suggestion only. It is up to you, the customer, to ensure during each step you use every precaution applicable to keep yourself safe. During the installation you will be in contact with tools, engine fluids, and other elements that must be treated with caution. It is assumed that you will have all the appropriate tools, knowledge and safety equipment to perform the job correctly. Never use a tool for a purpose it was not intended. If you do not feel capable of performing the installation or you do not have the basic tools to perform the installation, it is recommended that you seek help from a qualified person.

TORQHEAD LTD. will not be held liable for any injuries or damage.

Disassembly:

Warning: *Wait until the engine is completely cool before starting this procedure.*

1. Disconnect the negative battery terminal.
2. Locate the radiator petcock or optionally the lower radiator hose and drain the engine coolant from the system.
3. Disconnect the MAF, IAC, and IAT connectors. Remove the intake air duct work.
4. Once the coolant is drained, loosen and remove the upper radiator hoses from the radiator (Fig. 5).
5. Remove the heater core hoses from the water pump housing. Be prepared for these to drain additional fluid that was not completely drained during previous steps. (Fig. 5)

Figure 5 – Heater core hoses removed

6. Remove the serpentine drive belt by rotating the spring loaded idler pulley. Use caution as this pulley is spring loaded. Once the belt is removed the idler pulley will settle beyond its usual position.
7. Remove the three bolts that hold the crank pulley to the crank hub. (Fig. 6). Remove the pulley from the crank hub.

Figure 6 – Crank pulley bolts being removed

8. Disconnect the water pump ECT sensor connector. (Fig 7)

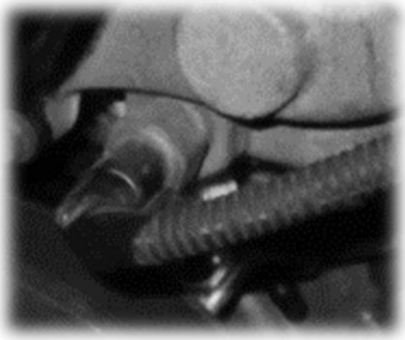


Figure 7 – ECT sensor connector

9. If not already performed, loosen and remove the lower radiator hose from the water pump. Coolant may still leak, so be prepared.
10. Remove the six bolts that secure the water pump housing to the engine. A small extension will help. Coolant may leak out, so be prepared.

11. You should now be able to remove the water pump. It may need some nudging to knock it loose from the engine. Do not use hammer, or high force as you may crack the housing. Again be prepared for coolant to leak. (Fig 8)

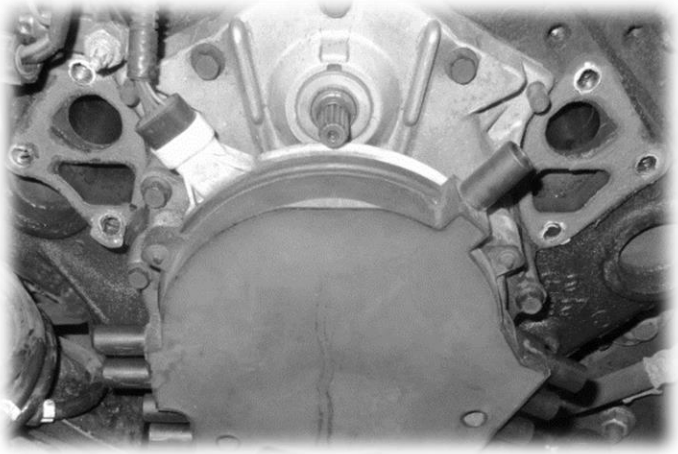


Figure 8 – Water pump removed

12. Complete access to the Optispark distributor is now complete. Disconnect the spark plug wires, coil wire, and distributor signal connector from the distributor. If equipped also disconnect the vacuum line from the distributor (late model Optisparks only).
13. Remove the three bolts that secure the Optispark distributor to the front timing cover of the engine. The Optispark can now be removed.

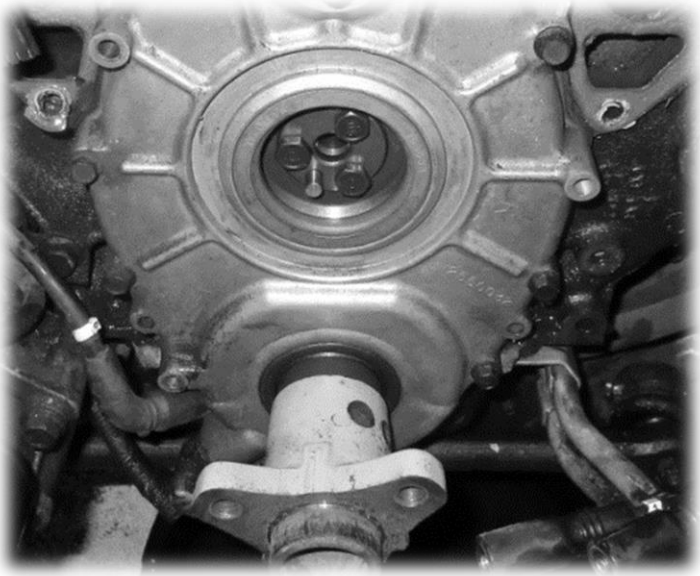


Figure 9 – Optispark Distributor removed. Late model type shown.

TIP: *To aid crank key installation step 14 can be followed. This will place the crank snout keyway upwards which allows easier installation of supplied crank key.*

14. Rotate the engine so that the cam dowel pin is in either position (8 o'clock or 2 o'clock) shown in Figure 10. If your engine is the early type spline drive rotate the engine so that the spline drive index notch is in either the 5 o'clock or 11 o'clock position (You will have to use a light to peer through the spline drive hole in the front timing cover).

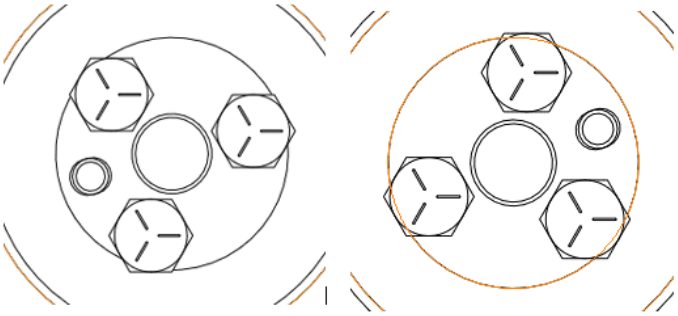


Figure 10 – Acceptable cam dowel positions when viewed straight on from front of engine. Viewable when using late model type pin drive.

15. Without rotating the engine, you can now remove the crankshaft hub retaining bolt.

16. Again without rotating the engine, the crankshaft hub can be removed. A puller will need to be used since the crank hub is press fit onto the crankshaft snout. The best and recommended tool for this task is J-39046 from Kent Moore or equivalent.
    TIP: *Use at your own caution.* A standard 3 bolt puller can be used to avoid purchasing a special tool. To use the 3 bolt puller you will need three (3) four inch long 5/16" grade 8 bolts, washers and nuts. You will also need a four inch long grade 8 allen head bolt, this must be an allen head. The standard 3 bolt puller's beveled tip will not fit through the crank hub retaining bolt hole to press against the crankshaft snout. This is where the four inch allen bolt will be used. Insert it in the crank hub retaining bolt hole, without engaging the threads, so that it presses against the crank. Now the beveled tip of the puller can engage and press against the allen head. The three standard grade 8 four inch bolt, washers and nut can be engaged in the puller and inserted through the three crank pulley bolt holes. Working slowly you can now pull the hub from the crankshaft. Again try not to rotate the crank.

17. With the stock crank hub removed, install the supplied crankshaft key. Gently tap it into place, ensuring that it is completely installed.

18. Now is a good time to remove and clean up any gasket surfaces, such as the water pump. It is recommended that you take this opportunity to replace any of the seals in the timing cover.

Assembly:

1. Before proceeding, or installing the TORQHEAD 24x crank hub, it is recommended that you rotate the engine such that the camshaft gear dowel or spline drive notch is in the following position based on your drive mechanism.

   Pin Drive (Late style): Camshaft gear dowel in the 9 o'clock position when viewed from front.

   Spline Drive (Early Style): Camshaft gear spline drive notch in the 6 o'clock position when viewed from front (peer through spline drive shaft hole using light).

2. Install the TORQHEAD 24x sensing unit. Refer to the beginning of this instruction to re-familiarize yourself with the two types of drive mechanisms and how each is correctly aligned. If you have a pin drive late style sensing unit, apply some engine **oil to the two O-Rings** on the pin drive spindle. This will aid insertion of the sensing unit.

Important:

If you correctly aligned the camshaft and drive mechanism the sensing unit should engage easily and smoothly. The sensing units mounting face will land flush with the timing cover. If it does not fully seat to the timing cover you probably do not have correct alignment. DO NOT APPLY FORCE, realign and try again. Patience for a few minutes is required, please take your time.

If you followed assembly step 1, rotate your sensing unit drive mechanism into one of the following two positions:

Pin Drive: Drive pin slot pointing at #1 indicator (Fig 11.)

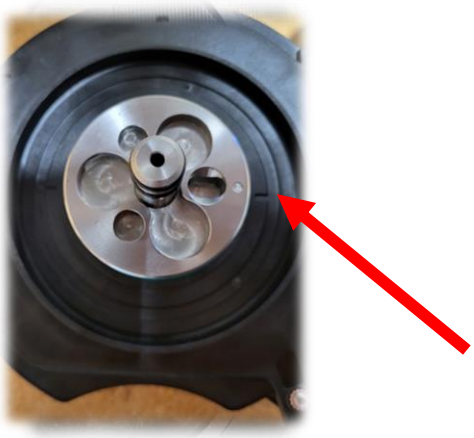


Figure 11 – Pin drive slot pointing at #1 indicator marking.

Spline Drive: Sensing unit drive tab in 6 o'clock position as shown in Figure 12

Figure 12 – Spline drive tab in 6 O'clock position.

If your dowel or spline drive notch are not in one of the position indicated in step 1, then you must ensure you correctly index the sensing unit to the appropriate position before attempting installation of the sensing unit. **Incorrect alignment and unnecessary force can result in damage to the sensing unit**.

3. With the sensing unit installed and seated correctly you can now install the three sensing unit retaining bolts that were used to retain the original Optispark. Torque to manufacturers spec.

4. If not already installed, install the camshaft position sensor in the front cover of the sensing unit. Do not overtighten the camshaft retaining bolt. Just snug it up.

Figure 13

Figure 14

5. Install the TORQHEAD 24x crank hub, ensuring to align the crank hub keyway with the crankshaft key. Install the supplied crank hub spacer prior to installing the hub if your vehicle is a 1992-1995 vehicle (Fig 15). Do not use the supplied spacer if you vehicle is 1996+ (Fig 16). Note: This hub is a press fit onto the crank snout so it will need to be pulled on. **NEVER** use a hammer to drive it on.

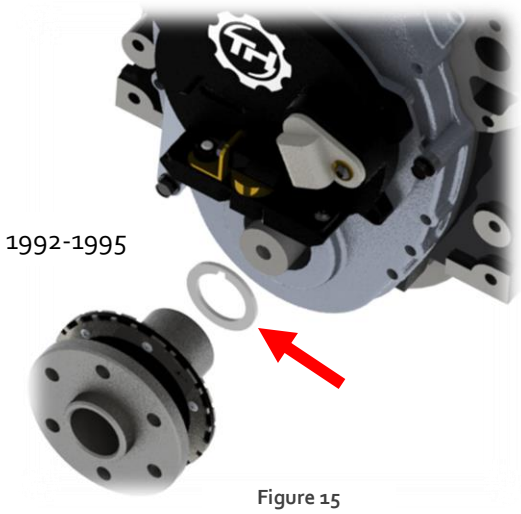


Figure 15

Figure 16

6. Install and torque the crank hub retaining bolt to manufacturer spec.

7. If not already performed, install the crank sensor mount onto the sensing unit. Two small M5x0.8mm bolts and serrated washers retain the crank sensor mount (Fig 17). Do not fully tighten the two screws, leave them loose enough that the crank sensor mount can slide back and forth.

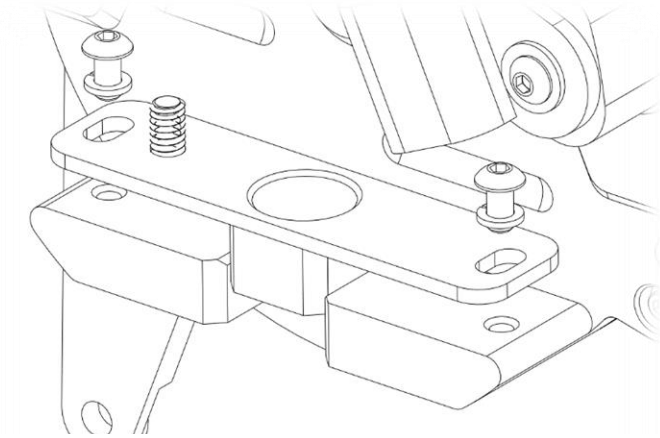


Figure 17

8. Insert the crank sensor alignment tool into the crank sensor mount. Once fully inserted this tool will setup the position of the crank sensor mount such that it, and the crank sensor, are centered over the 24x reluctor wheel. When inserting the tool ensure the slot/notch in the tool runs side to side and engages the 24x crank reluctor on the hub. Also ensure the tool is fully seated. See figures 18 and 19.

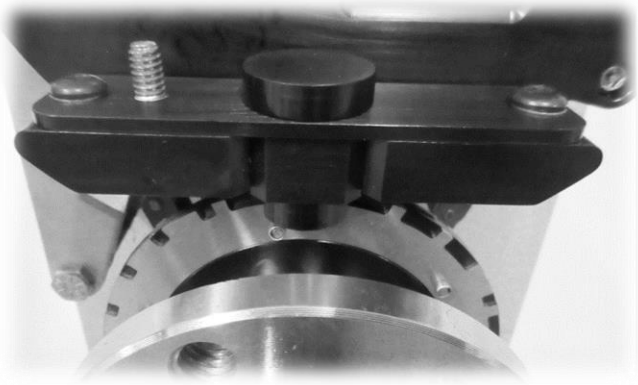


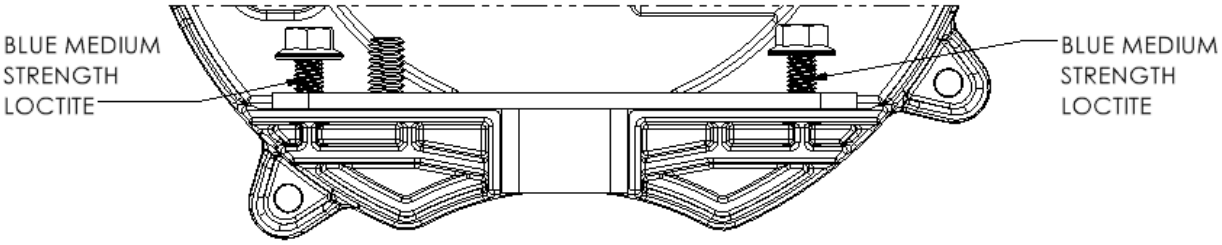
Figure 18

Figure 19

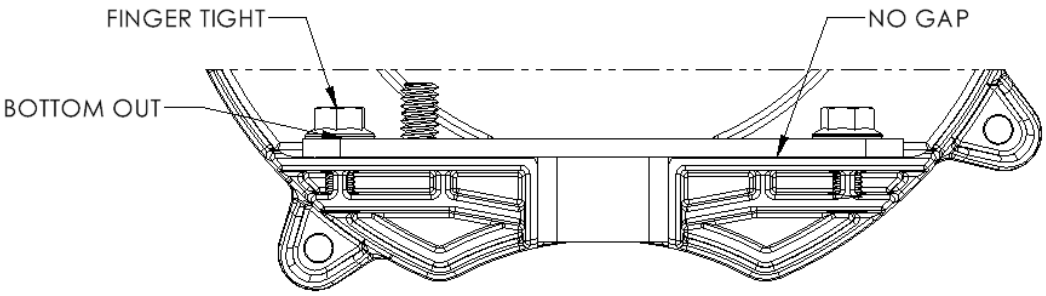
IMPORTANT: The instruction steps below must be followed to ensure successful installation and to avoid damage. Failure to follow this instruction may result in damage.

Crank sensor mount – Fastener torquing and Loctite procedure. While the Loctite is not mandatory it is recommended for added assurance. Blue medium strength Loctite only is recommended. DO NOT USE permanent Red grade Loctite.

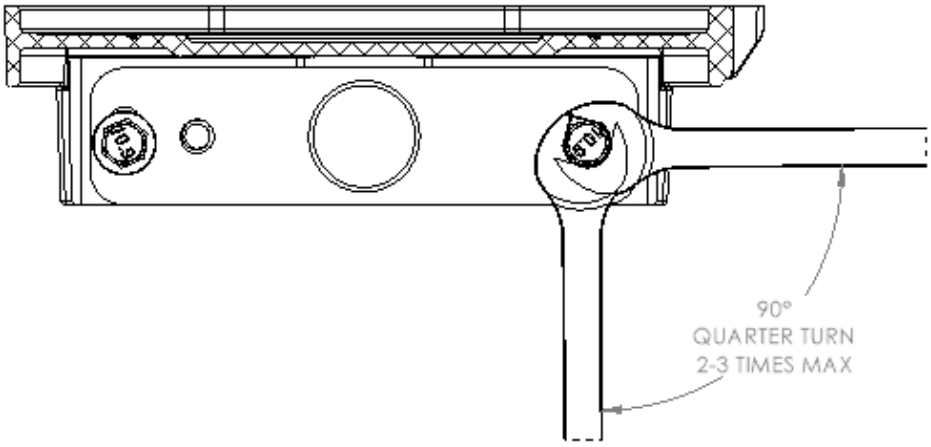
9. With the centering tool in place from step 8, now back off the two crank mount screws and apply a small amount of blue Loctite to the bolt threads. See figure below.



10. Thread the two screws down by hand and bottom them each out to a fairly strong FINGER TIGHT. There should also be no gap between sensing unit shelf and crank mount. The goal is to take out all the gaps, with finger tightening, prior to the final torquing procedure. See figure below.



11. Now using 8mm (or 5/16") wrench apply two to three quarter (1/4) turns of the wrench to each screw. See figure below. This is equal to turning the screw <u>one half turn to three quarters turn in total</u>. It is recommended to do a quarter turn on one screw at a time to tighten them evenly and progressively. Quarter turn on one screw, quarter turn on the other screw, final quarter turn on first screw and then final quarter turn on 2nd screw. After two quarter turns it should have felt quite tight, if it felt like it still wanted to become tighter you can do one final third quarter turn. Three quarter turns is only needed (absolute maximum) due to perhaps the finger tightening/gap removal from step 10 might have been smidge loose before using wrench. You should never need to exceed three quarter turns after doing step 10 above or you risk damage.



12. The crank sensor mount is now centered over the reluctor, and is securely tightened down.

13. Remove the crank mount alignment tool.
14. Install the crank sensor **without** any of the stainless adjustment shims. Install the ¼-20 flange head nut that retains the crank sensor.

15. Dial in crank sensor air gap: Using the supplied yellow feeler gauge, test the crank sensor to reluctor air gap. Do this by trying to slide the yellow feeler gauge between the crank sensor and 24x reluctor as shown in Figure 21. Without any crank sensor adjustment shims installed (as per step 14) the yellow feeler gauge should not slide thru. If it does slide thru, with no shims, then loosen the three retaining bolts and ever so slightly pull down on the sensing unit. Then re-tighten the three retaining bolts. It might have been the case where the sensing unit was bolted down, ever so slightly, too high.

Figure 21

16. Remove the crank sensor and add one of the supplied round stainless shims under the crank sensor. Reinstall the crank sensor, ensure it seats fully and ensure to tighten the retaining nut down. See Figure 22.

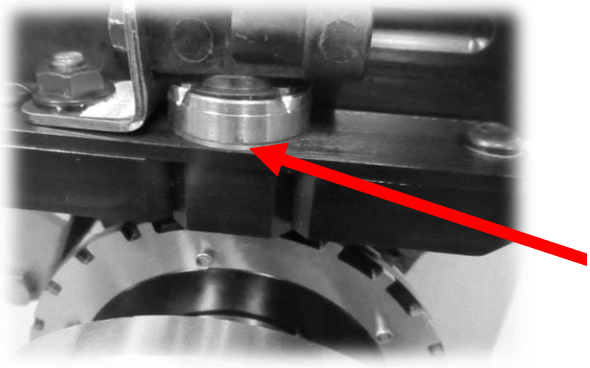


Figure 22

17. Test the air gap again with the yellow feeler gauge. If it passes through, even if slightly tight, that is OK the crank sensor air gap is now set (Figure 23). If it still does not pass through repeat step 16 & 17, adding one shim at a time, until the yellow feeler gauge passes through. What you want to shoot for is light drag on feeler gauge or one shim extra. Don't make it too tight by trying to force the feeler gauge thru.

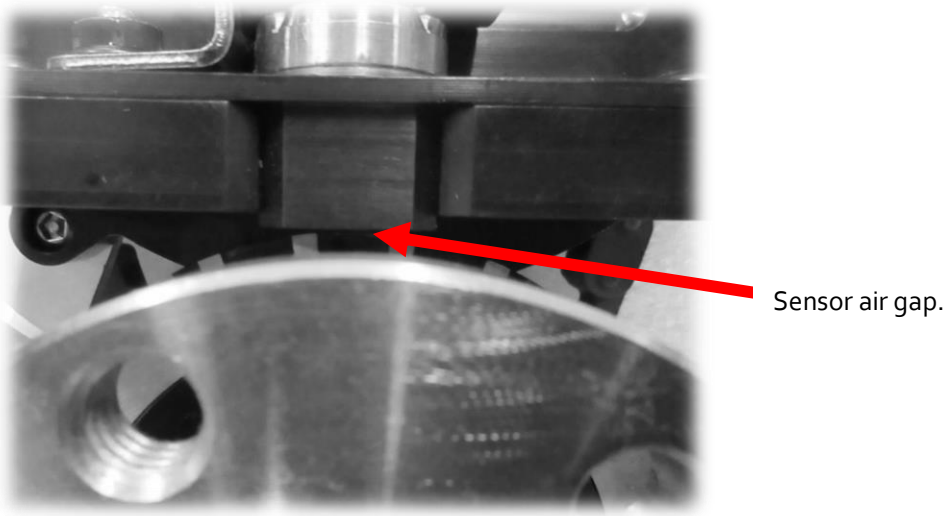


Figure 23

18. Double check all fasteners are tight and/or torqued to spec.
19. Installation of the 24x/1x mechanical sensing unit and hub is now complete. All that remains is to connect the cam and crank sensor wiring connectors to the sensors.
20. The remaining installation steps are the reverse of removal. This includes reinstalling the water pump (using the supplied new gaskets), installing the crank pulley, serpentine belt, coolant hoses, etc. Consult your service or repair manual for additional guidance. Do not forget to install new knock sensor(s) before filling the cooling system (1992-1995 vehicles only).

Troubleshooting:

Symptom	Cause	Action
Sensing unit is tough to install or will not fully seat against timing cover	Improper spline alignment and engagement (Early years)	Do not apply additional force. Realign spline shaft and camshaft to attempt installation again.
	Improper camshaft dowel pin engagement (Late years)	Do not apply additional force. Realign spline shaft and camshaft to attempt installation again.
	Foreign debris preventing engagement	Check to make sure there are no obstructions in the camshaft gear, camshaft dowel pin, or sensing unit drive mechanism. If debris, clean as required.
Crank sensor air gap too large	Too many adjustment shims added under crank sensor	Remove one ship at a time and recheck air gap with supplied yellow 0.020" feeler gauge.
	If no adjustment shims present, then the sensing unit is mounted slightly high.	Loosen the three sensing unit mounting bolts and apply a very slight downward pressure on the sensing unit. While applying this light pressure tighten the three mounting bolts. Do not apply to much pressure, only a very slight movement is needed. Re-check crank sensor gap and adjust with shims as required.
No Crank (RPM) signal	Crank sensor air gap not set properly.	Set air gap as per instruction steps 13 and 14.
	Crank sensor not centered over 24x crank reluctor	Center crank sensor mount using supplied alignment tool as per instructions.
	Bad crankshaft position sensor	Replace with new or known working crank sensor.
	Crank sensor connector not connected	Connect crank sensor.
	Bad wiring connection	Check for continuity of crank sensor connector wires to 16 Pin PCM Connector (Center Connector). Do this my matching the wire colors at each connector.

	The best way to diagnose the crank sensor signal is using an automotive or other appropriate oscilloscope. Tap into the blue/white wire at the crank sensor and monitor the signal on the oscilloscope while cranking. If it looks as it should, then the signal is good.	
Hub will not press on or fully seat	Debris on crank snout or hub bore	Clean crank snout and hub bore of any debris.
	Hub keyway not aligned with crank key	Remove hub and ensure keyway alignment is proper.
	Crankshaft Snout OD too large. (Aftermarket crank snout tolerances can be larger than OEM).	Hone hub ID .0005" to .001" larger.
Crank alignment tool will not full engage with 24x Reluctor	Hub not fully seated	Fully seat the crank hub using proper tools. Re-Torque crank hub retaining bolt.
	Crank hub spacer not installed	If your car is a 1992-1995 you require the installation of the supplied crank hub spacer. Or if your car is a 1996+ and has the stock LT1 4x crank reluctor removed you will also require this spacer. Remove the hub and install this spacer. See assembly step 5
	Crank hub spacer installed.	If you vehicle is a 1996+ you do not require the supplied crank spacer. Installing the spacer will only result in the hub being installed farther forward.
	Crank sensor mount adjusting screws are tight.	Loosen the crank sensor mount screws slightly so that the mount can slide back and forth while inserting the crank sensor alignment tool. If these screws are tight they will not allow the mount to center.

Important Specifications:

Crank Sensor Air Gap – 0.020" to 0.025" (Yellow feeler gauge is 0.020")

Warranty:

This product (not included sensors) is warrantied against defects in material and workmanship for two years from the date of purchase. If, within two years, you find this product to be defective then please return the product to us and we will – at our discretion – either repair or replace it at no cost to you. Sensors carry a 1 year warranty from date of purchase. This warranty is your sole remedy in the event that the product fails in any way. We hereby also disclaim all liability for incidental or consequential damages arising from the use of this product. Misuse, abuse, or any failure to follow the instructions provided with the product, will result in voiding this warranty. **Call 226-289-3369 for any warranty or technical related issues**.

Emissions:

This part is legal for sale and use on Uncontrolled (Non-Emissions Controlled) Vehicles and Racing Use Only Vehicles.
The following vehicles are considered Uncontrolled (Non-Emissions Controlled) Vehicles:

- 1965 and older U.S. manufactured California Certified vehicles
- 1967 and older U.S. manufactured Federally Certified vehicles
- 1967 and older Foreign manufactured vehicle

The following vehicles are considered Racing Use Only Vehicles:

- Racing Use Only Vehicles are vehicles that are used exclusively for competition and that are not registered and that may never be used on the street

WARNING: It is against the law to install this part on an Emissions Controlled Vehicle
The following vehicles are considered Emissions Controlled Vehicles:

- 1966 and newer U.S. manufactured California Certified vehicles
- 1968 and newer U.S. manufactured Federally Certified vehicles

1968 and newer Foreign manufactured vehicle