



Installation Guide for 5X Racing Adjustable Timing Wheel for 1999-2005 Mazda Miata

5X Racing recommends using your repair manual for step by step instructions to perform this installation. Your factory repair manual will provide fine details on the removal, re-installation, torque settings, and adjustment procedures of the components associated with the installation of our timing wheel. Our timing wheel is very simple to use and install, however, it lives behind the crankshaft pulley and there are several parts and components that must be removed to access the timing wheel area. While it is easy to remove these components, our guide will focus mostly on the installation of the wheel and how to set it.

This is a guide and is not as comprehensive as a factory repair manual, and you must use your own discretion on whether or not you can perform this installation on your own. Sometimes things don't loosen up so easily, or something might go a little different on your car then it was on the car we used to make this guide, so although our guide will explain how to install and set our wheel, we might have not included ALL of the fine details about working with the other components involved in the process of installing our wheel.

The installation is not that hard, really! You can perform this install in your driveway, but be sure to have all of the tools needed before you start. If you don't feel 100% about this install, please bring your car to a reputable performance shop familiar with Miatas, not a dealership, as they will not know about aftermarket parts as well as your local race shop will. If a local repair shop is the only choice, just tell them to remove the factory timing wheel and install ours in its place, then use our wheel to advance the timing to 14. And if you have any questions, please feel free to email us and we'll be sure to help you.

Lastly, we must thank Erik Cardenas for providing the pictures and process to his install for us to use in making this guide!

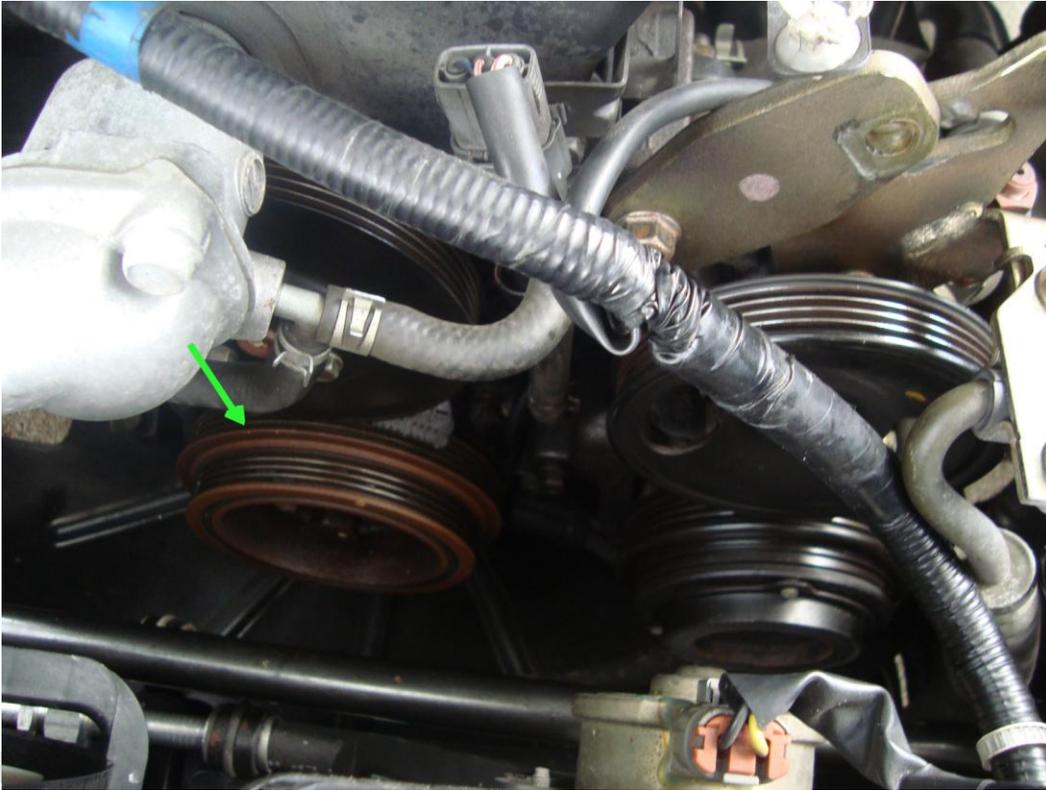
Thanks for purchasing our Timing Wheel, now go forth and enjoy the cheap horsepower!

Removal

1. Begin by removing the intake tube



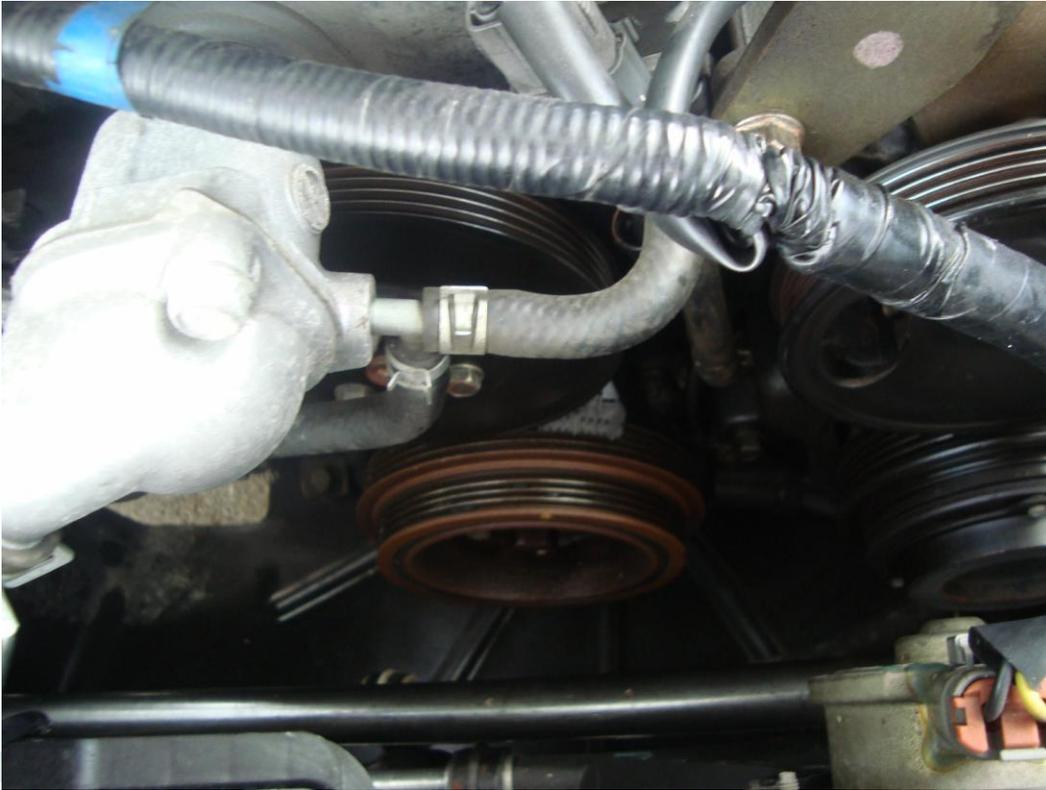
2. Find the crank pulley within the engine bay



3. Reach down with a 10mm deep socket and loosen (but not remove) the 4 bolts inside the crank pulley. There is no need to remove the large crank pulley bolt, leave this as it is.



4. Remove the alternator belt, and the air conditioning/power steering belt.



5. Once the belts have been removed, completely remove the four 10mm bolts inside the crank pulley and remove the entire crank pulley by pulling it towards the radiator. It will most likely not be easy to remove, so tapping it with a soft faced hammer will most likely be necessary:



This marks the end of the removal process, now you must reverse the process and instead of installing the black OEM wheel, install ours.

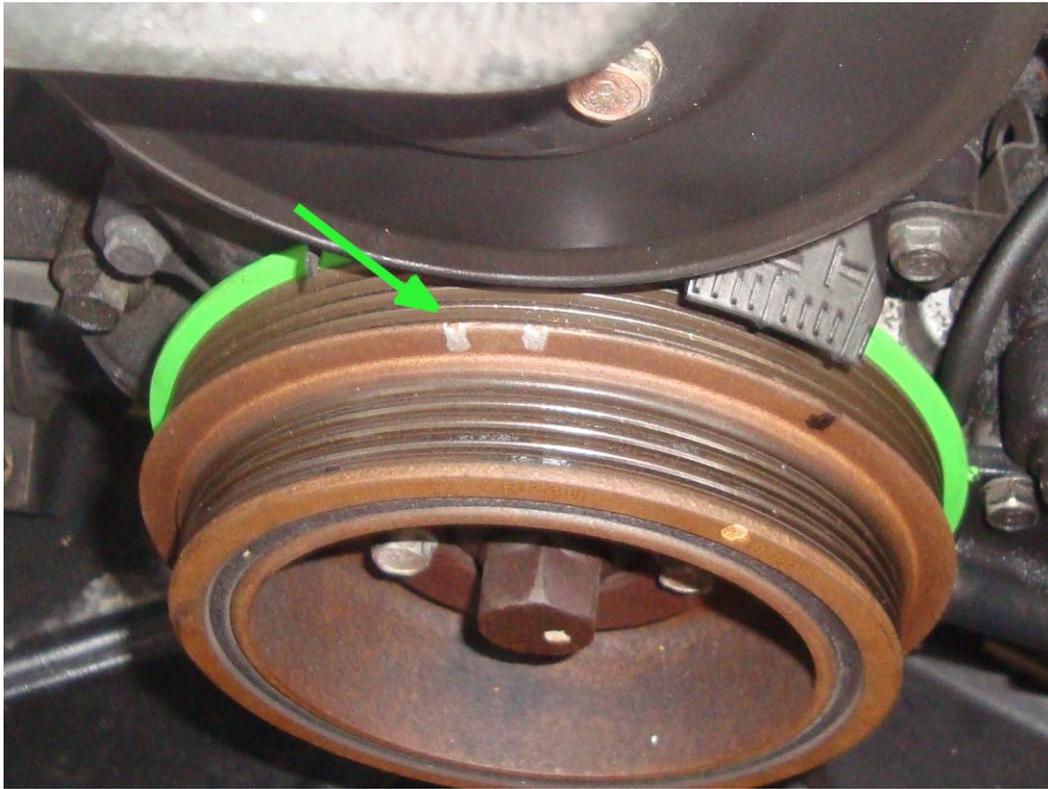
Installation

This is what you will have after the pulley has been removed. Notice the factory OEM wheel next to ours. Ours will replace the black OEM wheel.

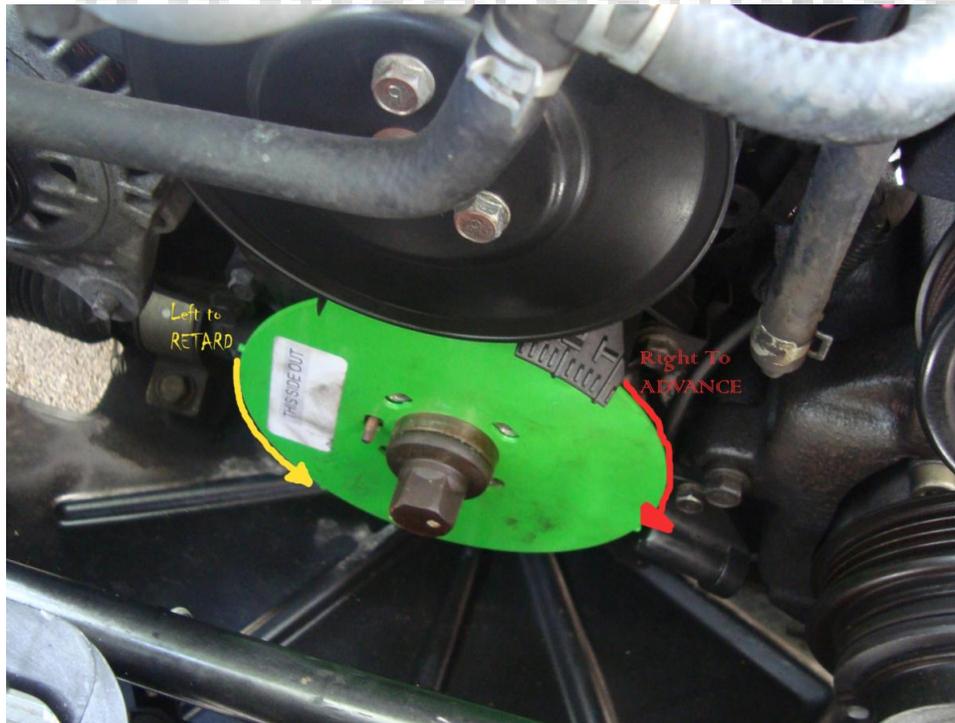


This might be a good time to clean the timing indicator (black plastic gauge in the 1 o'clock position in reference to the timing wheel) as it will most likely be dirty. Also, we use a paint pen or whiteout marker to highlight the lines on the gauge so you can see it easier when timing the ignition later.

1. Use a paint pen or whiteout pen to mark the notches in the crank pulley. This will help you later



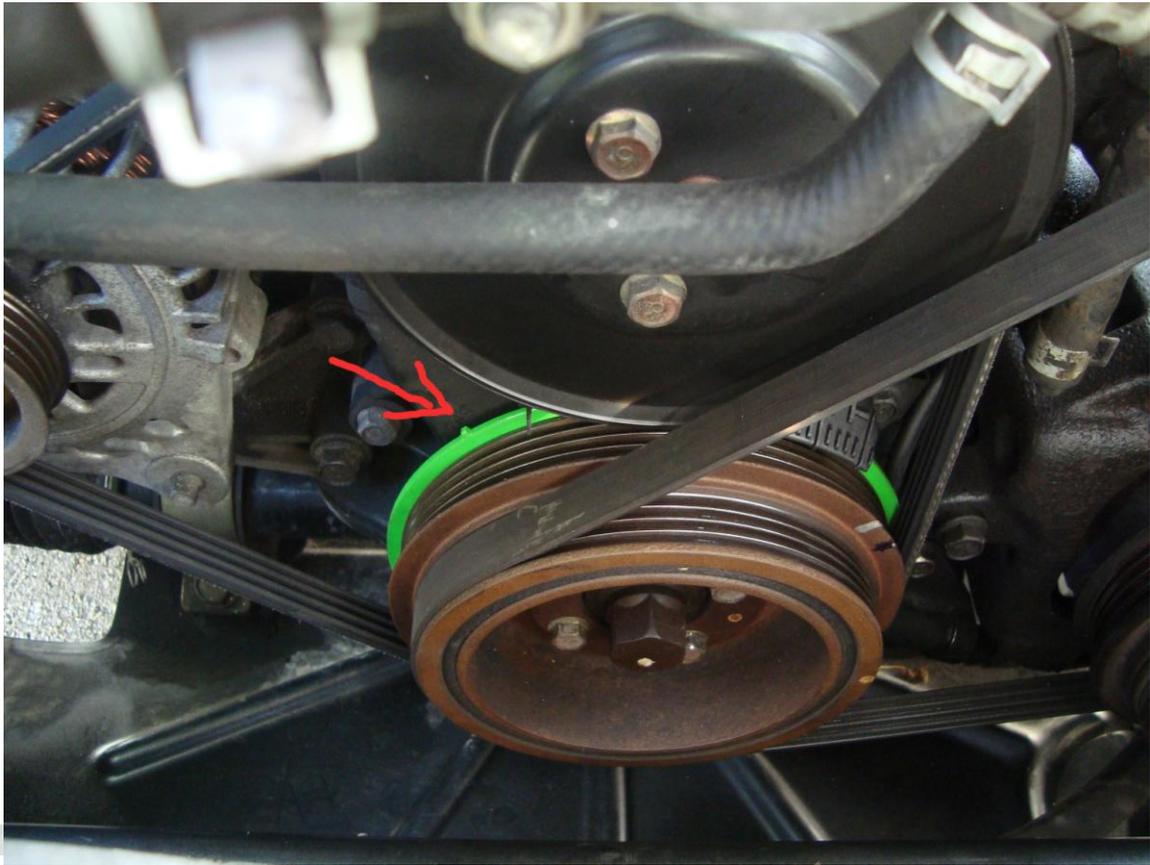
2. Place the 5XR timing wheel onto the crank nose, over the bolt head making sure that you can read the "THIS SIDE OUT" sticker. The dowel pin on the crank is used as the locating pin, and it needs to be inserted into the centermost hole on the timing wheel under the sticker. You can see this in the picture. Also, be sure the other holes on the wheel are properly lined up with the bolt holes within the crank, as shown in the picture:



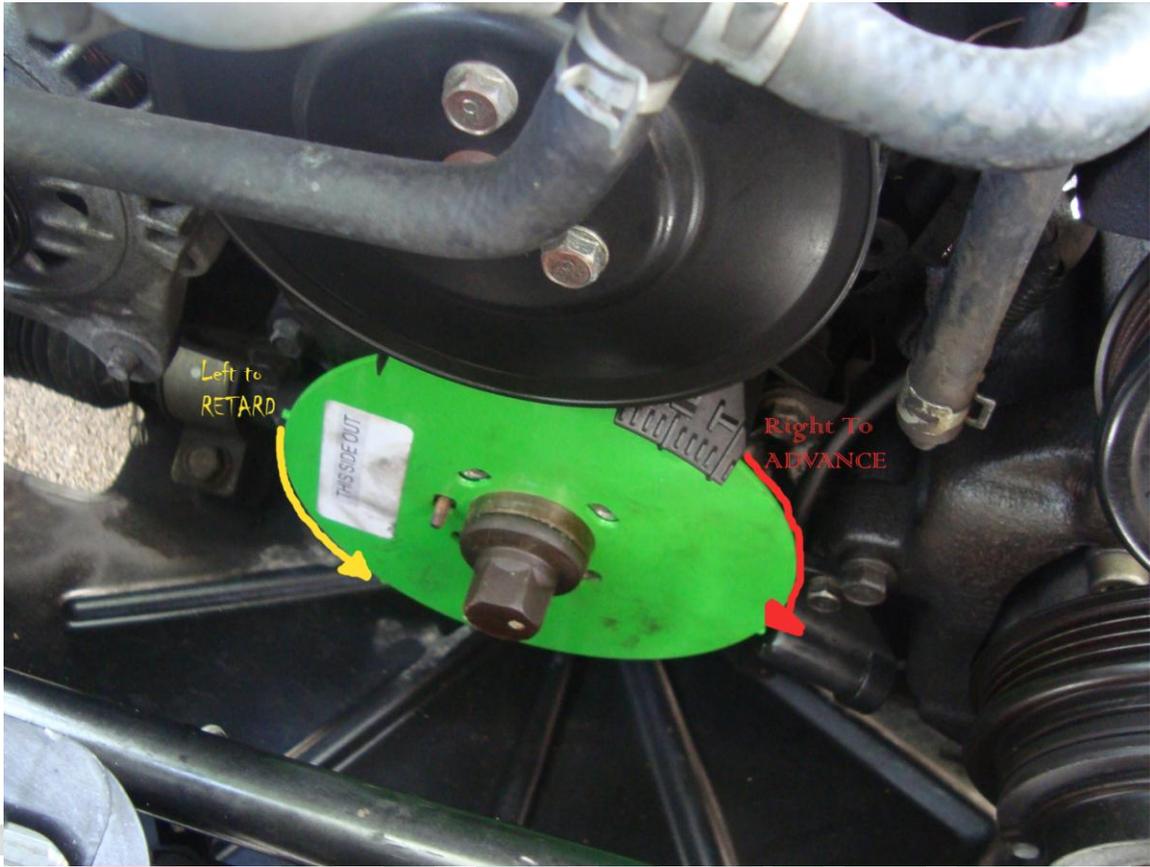
- a. Positioning the wheel is not necessary at this point. Be sure to clean up your crank pulley and associated hardware, take the whiteout pen and highlight the two grooves on the pulley rib so you can see them better when timing the system. It's a good idea to use two different colors to mark the two grooves, with focus on making the left groove more obvious. We would recommend even using a black sharpie to mark the right groove (TDC indicator) as it will not be used to show your actual timing, it's just a reference as to where TDC is. You can see this in the picture, they are about an inch apart from each other. Now reinstall the whole assembly back onto the crank nose. The dowel pin will make sure you cannot put the pulley on wrong. Install the 4 bolts finger tight using the socket held in your finger tips, just enough to bottom out the pulley assembly properly.
- i. SIDE NOTE: The groove on the right will line up with the "T" mark on the gauge, which is top dead center, and the groove on the left is the mark used to show the actual time of when the ignition is firing. From the factory, the timing is set at 10° BTDC (BTDC is "before top dead center", essentially 10° advanced from the mark on the right). So when you line the mark on the right (TDC) up with the TDC mark on the gauge, the mark on the left (10° BTDC) will line up with the "10" mark on the gauge, which signifies 10° BTDC and is your factory setting. This means the ignition will fire 10° before the piston reaches the top of its travel within the cylinder from the factory. This is a safe setting that is geared more towards fuel efficiency than max power, and the ability to use cheaper 87 octane fuel without the side effect of piston knocking. 10° does not produce the most horsepower though, and we've found that setting the timing to 14° BTDC produces the best results with a good blend of power and torque, with the side effect of possibly needing to use 93 octane fuel (your results may vary). If you want to really see what setting makes the most horsepower for your specific needs (all cars are different), take the car to the dyno and start at 10° BTDC, which is the OEM setting, make a pull and see what you get. Move the timing up by 2° and try it again to see what you get. Keep doing this until you see your horsepower numbers start to drop off again, for instance: 10° produces 120hp, 12° produces 122hp, 14° produces 125hp, 16° produces 122hp. You've found your peak at 125hp at 14° , so dial it back to 14° and you have found your peak HP setting. You might try 15° or 13° and monitor your torque numbers, 13° might produce more torque, and 15° might produce more HP. We'd recommend going with the 13° setting as a bit more torque is probably worth it in this case.



2. Initial setting of the timing wheel. Our timing wheel is setup to advance the timing, not necessarily to retard (go lower than 10° BTDC). The timing is set by clocking the wheel from left to right while installed behind the pulley. The grooves in the timing wheel bolt holes allow this movement, and by clocking the wheel, the wheel rotates around the crank nose within the space of the slots in the wheel, and is essentially causing the little tabs protruding from the outer edge of the wheel to trigger the sensor sooner, in turn advancing the timing. Our recommendation for a good timing setting is $12-14^{\circ}$ BTDC, which loosely translates to clocking the wheel to locate the bolts in the middle of the timing wheel slots. Here is how to set the position of the wheel:
 - a. Once our timing wheel is snugged into position and the crank pulley is back on, loosen the 4 bolts just enough to be able to turn the timing wheel by pushing the tabs on the outer edge of the wheel. The wheel might be too hard to turn with your hands as the tabs are very small and hard to grab, we have found that using a long shafted flat bladed screwdriver to tap the tabs in the direction you want to go will make it easier.



- b. We recommend clocking the wheel all the way to the left, or in other words, rotate the wheel towards the alternator until it does not rotate anymore (bottoms out in its slots), which will give you a timing setting of 9-10 BTDC, which is factory. If you're fairly confident with the install and grasp the concepts of how the timing wheel works, you can take a guess at the timing you desire by presetting the wheel now. We have found that after bottoming out the wheel all the way to the left (9-10 BTDC), if you slightly clock it back the other direction (advancing it) to where you think the bolts are in the middle of the slot, you can get close to 12-14 BTDC on the first shot.
- c. Once you are satisfied with your best guess at an initial setting, or have just set it to the factory setting by clocking the wheel all the way to the left, tighten the four 10mm bolts inside the crank pulley to a torque that you can remove easily, for instance use a $\frac{1}{4}$ " ratchet and just use your normal strength. Do not tighten them to full torque as you will most likely need to readjust the timing again.



3. Reinstall the belts and tighten them to the proper tension
4. Reinstall the intake tube

You are now finished with the install, however you now must check the timing and adjust the wheel to the desired setting.

Checking and Setting Ignition Timing

Since the 1999+ Miata uses a preset, non-adjustable ignition timing system, there is not much information out there on how to adjust it obviously. There is information in your factory service manuals and repair manuals on how to check it however. We suggest referencing your repair manuals as well as this guide as there might be additional information that could prove to be useful to you.

It is absolutely essential to have a timing light to perform timing checks and adjustments, and we've found what we consider to be the easiest to use, best timing light in the industry in the Flaming River Self Powered One Wire Timing Light.



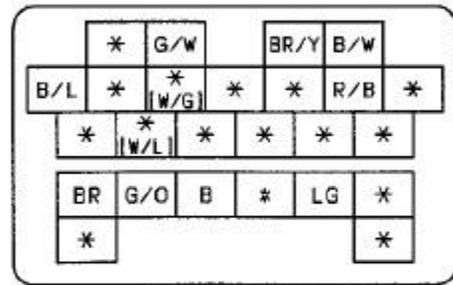
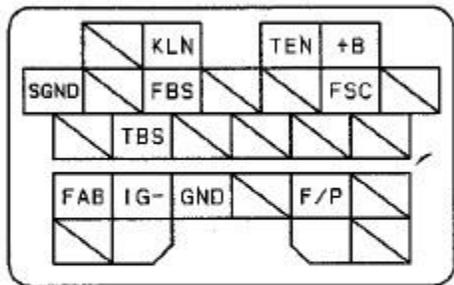
We sell this light on our online store and we highly recommend using this light to anyone that is in need of one. You can order this light from us here:

<http://5xrcing.com/i-8520777-flaming-river-self-powered-single-wire-timing-light.html>

Our instructions on checking timing will reference the Flaming River light.

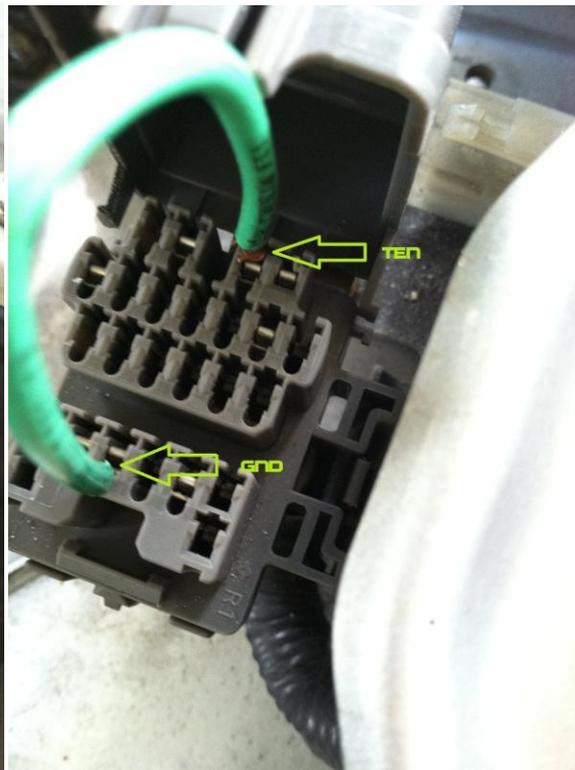
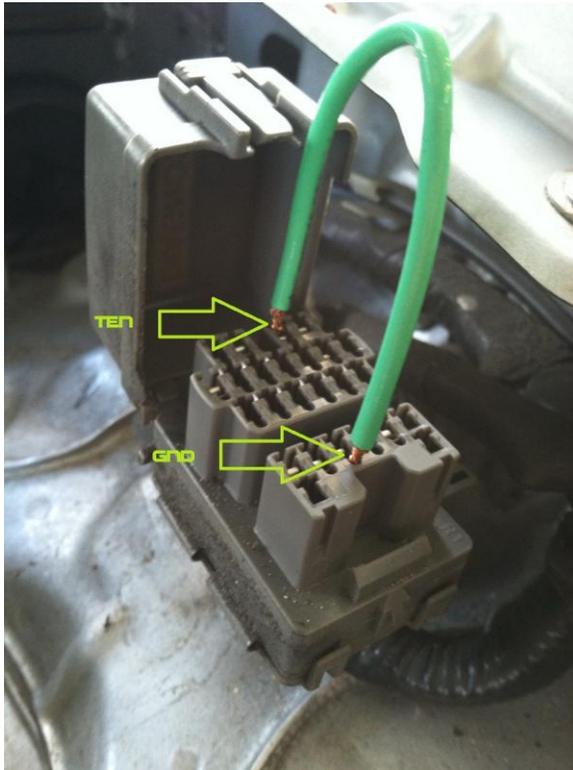
1. The first thing that must be done is to bring the engine up to operating temperature. This is why it is best to set the timing wheel initially at the factory 10° BTDC, so you can safely warm up the engine with a factory setting.
2. After the engine has come up to temp, shut off the engine and find the diagnostics port located on the left front shock tower and insert a jumper wire between the **TEN** and **GRD** pins.
 - a. **TEN** = Timing Lock (Grounding this locks the timing at 10°)
 - b. **GND** = Ground

99-2000 Datalink



NOTE: THIS IS THE CONNECTOR AS SEEN FROM THE TERMINAL SIDE.

Jumping the TEN and GRD pins will lock the engine timing at 10° BTDC and slow the engine down as to not allow the timing to jump around while measuring it.



3. Restart the engine with the jumper inserted, and connect the inductive clamp of the timing light to the #1 spark plug wire. You're now ready to check the timing.
4. Point the timing light at the "T-10" gauge above the pulley and you should see the timing marks on the pulley dancing around somewhere on the gauge.



You will notice that the timing marks will be jumping around on the gauge regardless, this is impossible to avoid and be aware to turn off everything that might draw a load on the alternator, like the: a/c, radio, heater, fans, lights, windshield wipers, and anything else that uses electricity to run. Also, it is important to make sure you are not checking the timing when the radiator fans are running, these will really throw off the timing readings.

5. Notice the left mark on the pulley and see where it is located on the gauge. If it is on the "10" mark, then that is the factory setting. Every line on the gauge signifies 2° , so the next line to the left of the "10" line is going to be 12° , then the next is 14° , and so on until the last line on the left, which is 18° BTDC.
6. Chances are you are going to need to adjust the timing by clocking the wheel. Start by turning off the engine, removing the intake tube, then loosen the four 10mm bolts inside the crank pulley and clock

the timing wheel to the right to advance, or the left to retard. There is no need to remove the belts as you can turn the timing wheel in place with the four bolts loosened, however, the belts do add an enormous amount of tension to the crank pulley, so it is imperative that you do not remove the four bolts completely. Once the bolts are loosened, from our experiences, you will most likely have to use the screwdriver method to turn the wheel as we outlined previously during the installation process.

7. After you've adjusted the wheel and obtained the timing setting you desire, be sure to tighten the four 10mm crank pulley bolts to their appropriate torque (in repair manual). We've had good luck with a 3/8" ratchet using moderate force. Be aware that these bolts are only 10mm and can possibly break, so be careful!
8. Don't forget to remove the jumper from the Diagnostics port and remove the timing light.

Complete!

You have now finished installing our adjustable timing wheel! Enjoy, and we are here for your questions. Please visit our site and use the "Contact Us" form on the bottom of every page on our

