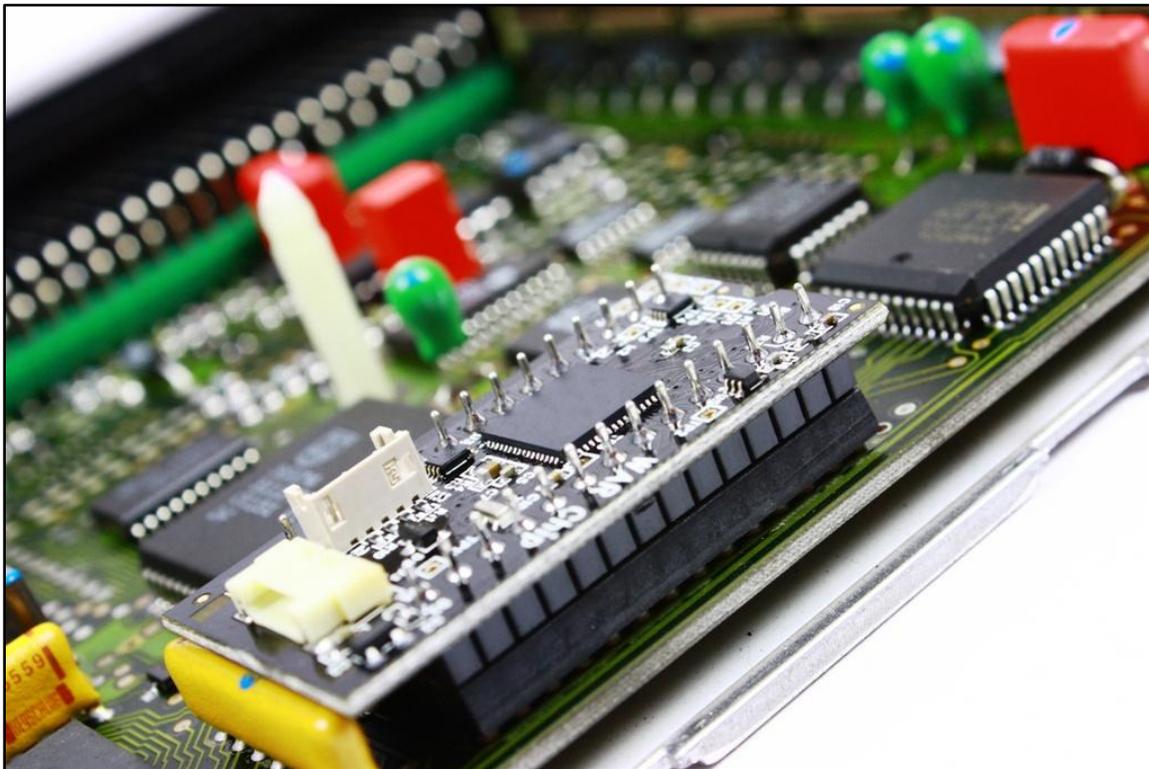


MILLER
W.A.R.
CHIP



W.A.R. Chip Installation and Software Manual

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Miller Performance Ltd. warrants that products manufactured by Miller Performance Ltd will be free from defects in materials and workmanship for the life that you own your vehicle. If any such product proves defective during the applicable warranty period, Miller Performance Ltd., at its option, either will repair the defective product with charge for parts and labor or will provide a replacement in exchange for the defective product. **Items not manufactured by Miller Performance Ltd. have a limited warranty of one year past the date of purchase.**

In order to obtain service under this warranty, the customer must notify Miller Performance Ltd. of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. In all cases the customer will be responsible for packaging and shipping the defective product back to the service center specified by Miller Performance Ltd., with shipping charges prepaid. Miller Performance Ltd. shall pay for the return of the product to the customer if the shipment is within North America, otherwise the customer shall be responsible for all shipping charges, insurance, duties and taxes, if the product is returned to any other location.

This warranty shall not apply to any defect, failure or damage caused by improper use or failure to observe proper operating procedures per the product specification or operators manual or improper or inadequate maintenance and care. Miller Performance Ltd. shall not be obligated to furnish service under this warranty 1) to repair damage resulting from attempts by personnel other than Miller Performance Ltd's. representatives to repair or service the product; 2) to repair damage resulting from improper use or connection to incompatible equipment; 3) to repair damage resulting from operation outside of the operating or environmental specifications of the product.

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W.A.R. Chip Disclaimer

THIS IS A HIGH PERFORMANCE PRODUCT. USE AT YOUR OWN RISK.

Do not use this product until you have carefully read the following agreement.

This sets forth the terms and conditions for the use of this product. The installation of this product indicates that the BUYER has read and understands this agreement and accepts its terms and conditions.

DISCLAIMER OF LIABILITY

Miller Performance Ltd. and its distributors, jobbers, and dealers (hereafter SELLER) shall in no way be responsible for the product's proper use and service. **THE BUYER HEREBY WAIVES ALL LIABILITY CLAIMS.**

The BUYER acknowledges that he/she is not relying on the SELLER's skill or judgment to select or furnish tunes suitable for any particular purpose and that there are no liabilities which extend beyond the description on the face hereof and the BUYER hereby waives all remedies or liabilities, expressed or implied, arising by law or otherwise, (including without any obligations of the SELLER with respect to fitness, merchantability and consequential damages) or whether or not occasioned by the SELLER's negligence.

The BUYER is responsible to fully understand the capability and limitations of his/her vehicle according to manufacturer specifications and agrees to hold the SELLER harmless from any damage resulting from failure to adhere to such specifications.

The SELLER disclaims any warranty and expressly disclaims any liability for personal injury or damages. The BUYER acknowledges and agrees that the disclaimer of any liability for personal injury is a material term for this agreement and the BUYER agrees to indemnify the SELLER and to hold the SELLER harmless from any claim related to the item of the equipment purchased. Under no circumstances will the SELLER be liable for any damages or expenses by reason of use or sale of any such equipment.

The BUYER is responsible to obey all applicable federal, state/provincial and local laws, statutes, and ordinances when operating his/her vehicle, and the BUYER agrees to hold SELLER harmless from any violation thereof.

The SELLER assumes no liability regarding the improper installation or misapplication of its products. It is the installer's responsibility to check for proper installation and if in doubt, contact the manufacturer.

1. General Information

1.1 Introduction

Congratulations on purchasing your Miller W.A.R. Chip. You have joined the performance chip revolution and you are taking power of your car.

W.A.R. stands for “Write and Remap” and is a revolutionary performance chip for European cars up to 1996. It is the most powerful performance chip money can buy, rendering traditional aftermarket chips obsolete. The W.A.R. Chip is not your average chip because it has multiple functions. It can have up to four reprogrammable & user controllable tunes loaded onto it. It has a mini-USB port on the side of the circuit board so you can load different performance files from your laptop to your W.A.R. Chip. The Miller W.A.R. Chip even comes with software for your Windows™ based laptop to let you modify your tunes whenever you want!

You will soon ask yourself why a product like this took so long to come to market!

1.2 W.A.R. Gear

The Miller W.A.R. Chip features the following:

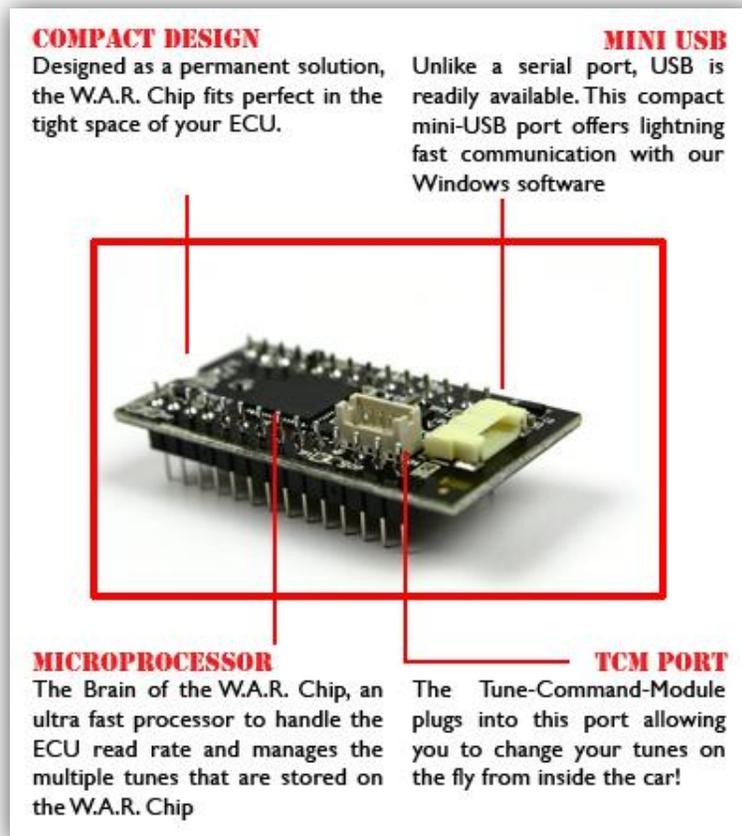


Figure 1

1.3 Gear Included

Standard Issue:

- W.A.R. Chip
- USB Cable
- Tune Command Module (TCM)
- Instruction Manual (Downloaded)
- W.A.R. Software for Windows (Preloaded on WAR Chip)

1.4 Tools Required

The Following tools and supplies (not included) or similar tools and supplies are required for fast and proper installation of this Miller Performance product:

Minimum requirements:

- Flathead Screwdriver
- Philips Screwdriver
- 10mm socket wrench
- 13mm Wrench
- Drill
- Metric Allen Set (with 1.5mm Allen)
- Loctite

1.5 Computer Software

System requirements:

- Windows Based Computer with **Windows XP**
- Latest Version of Java Runtime Environment (Free at www.java.com)
- Internet connection
- USB 1.0 or 2.0

1.6 Safety and Precautions

	Warning: Ensure vehicle cannot roll when working on the vehicle
	Warning: Disconnect the ground strap (negative) whenever doing work on electrical or fuel systems.
	Warning: Never run the engine unless the work area is well ventilated. Carbon monoxide kills!
	Caution: Before starting each procedure, ensure that you have all the necessary tools and parts on hand. Read all instructions thoroughly; do not attempt shortcuts use only parts and materials that are included in this kit or approved by Miller Performance.
	Caution: Miller Performance does not recommend “street tuning.” The safest place to tune your car is on a chassis dynamometer.

2. W.A.R. Chip Software

2.1 Introduction

The W.A.R. Chip software for Windows is where all the tuning, should you wish to tune your car, takes place; as well as the file uploading/downloading from remote tuning assistance. The W.A.R. Software is a powerful tool giving you total access to many features in the ECU such as control of your fuel and ignition, RPM limit, idle speed etc. This section is going to explain installation and use of the software.

2.2 Installation

The W.A.R. Chip comes preloaded with the W.A.R. Chip Setup Wizard. The first time you plug your W.A.R. Chip into the computer it will run the Wizard. Make sure you have a valid internet connection, as well as the latest JAVA installed on your computer. JAVA can be downloaded for free at www.java.com.

You must meet the above requirements or the Wizard will not run.

1. Plug the W.A.R. Chip into your computer and wait for a window to pop up asking if want to run the Wizard.
2. Follow the installation procedure.
 - a. Choose your ECU type
 - b. Choose your base files (all four fields must have a file in them)
 - c. Enter information as requested, and software will install
 - d. Choose to upload files to the W.A.R. Chip now.
3. Once installed, run the W.A.R. Chip program if it doesn't not do so automatically and it will upload your tunes you chose in the wizard. This process may take a few minutes.

NOTE: A video is available on our website to walk you through the Wizard.

Manually adding .ECU configuration files

You may add additional .ECU Configuration plug-ins for tuning different ECU types from the same software. To manually upload a new .ECU Configuration file:

1. Click Tools in the top menu bar and then click “Add ECU Type” or quick key “CTRL A” You will be prompted with the screen bellow asking for the .ECU File.



2. Select your .ECU configuration file and click, “Open” **You may or may not be prompted for an Access Code** to unlock the .ECU file.



3. Email us your request code, and your unique access code will be emailed back to unlock your new plug-in.

2.3 Using the W.A.R. Chip Software

Once you have gotten started and you wish to use the software you will need to know how things work. Let's focus on the layout.

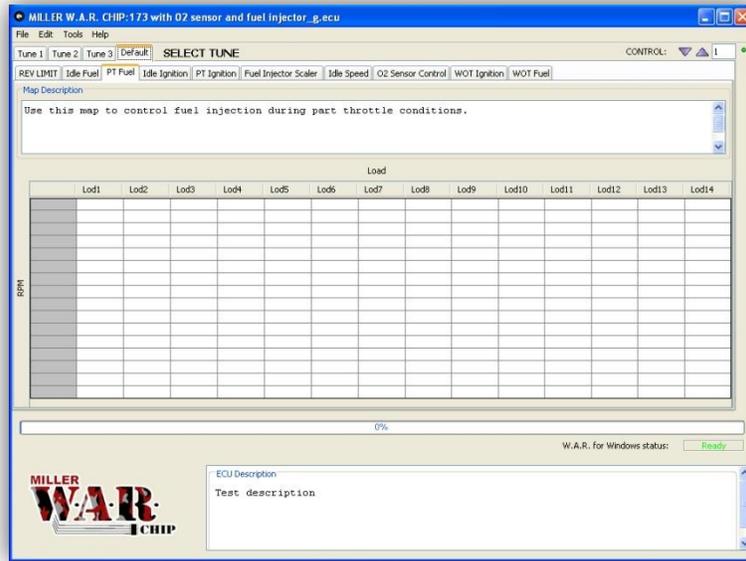
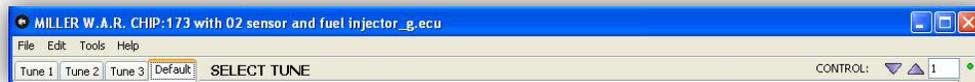


Figure 2

Focusing on the menu and tab functions

To get started, we will focus on the top menu bar where File, Edit, Tools & Help are located. This is the standard menu bar that nearly all windows programs have.

Looking below the top menu, you will see the W.A.R. Tune module. The yellow bar appears over the active tune you are viewing.



This tab layer allows you to view your tunes you can open new tunes into different modules, or read the associated tune from the W.A.R. Chip. They are labeled map 1, 2, 3 & Default. Also you will see the control up and down arrows. These arrows are used to adjust your values of your specific map's tables.

You can rename the tune modules. This will allow the WAR Chip to remember the tune name for easy reference in the future. To rename a tune's tab, double click on it and rename it.



In each Tune's module, you will find the various maps you are able to edit. Again, the active map is displayed with a yellow bar above the name. Depending on your ECU type, you may have many more features to edit than this example. Here you can adjust the values of the given data tables under a selected Tune module. You can choose which table you want to edit by clicking on PT (Part Throttle) Ignition, PT fuel, WOT (Wide Open Throttle) fuel and so on.

2.4 Reading From the W.A.R. Chip

To load your tune into the W.A.R. Software from the W.A.R. Chip you simply go, "File > READ. This will allow you to read the Map Module for the current tab you are working in. You can also use the appropriate shortcut key Ctrl+D.

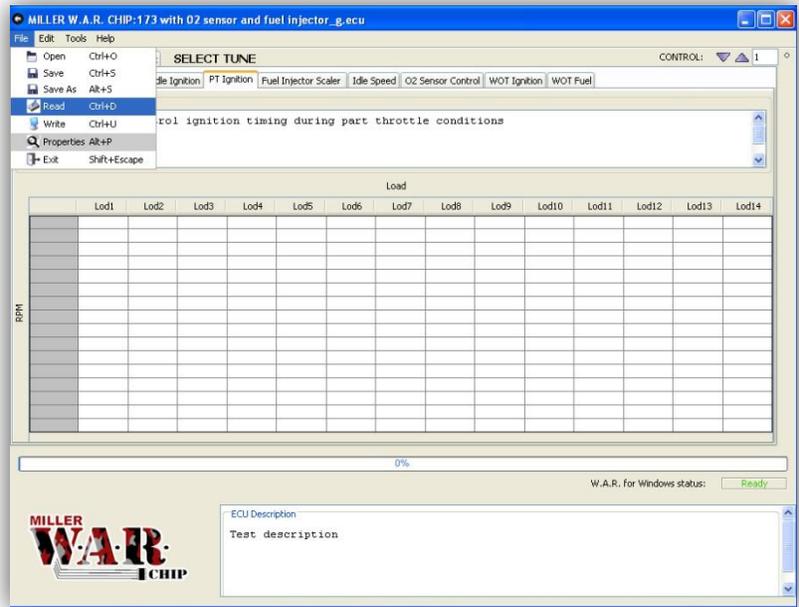


Figure 3

Once you have downloaded your data from the W.A.R. Chip to your computer you should see something like the following:

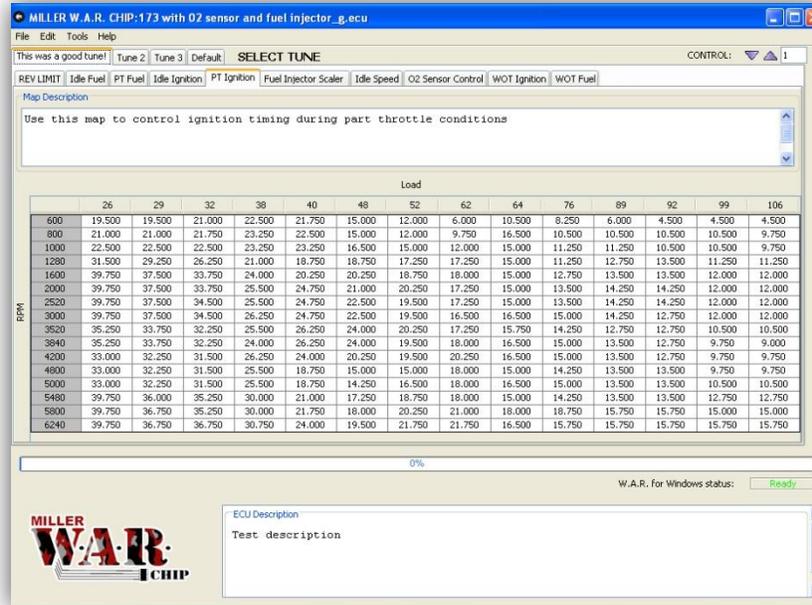
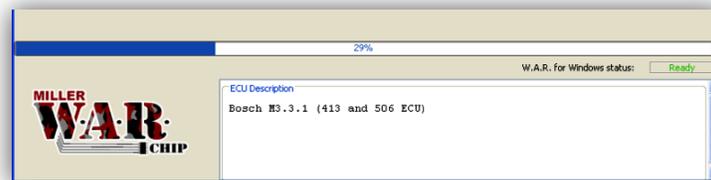


Figure 4

2.5 Writing to the W.A.R. Chip

Once you have made changes to your software and wish to write the revised tune to your W.A.R. Chip save your project first. You don't want to lose all the work you have done. Simply click, File > Save As. Once you have saved your file, you can go ahead and write it by clicking, File > Write.

The writing process takes about a minute to complete. During this time, **DO NOT REMOVE THE USB CABLE.**



For even more information and detailed instructions check out our video section online, it has loads of "How To" videos for the W.A.R. Chip.

3. Installation

3.1 Introduction

The following section provides information that **MUST** be read and understood before proceeding with the installation of your Miller W.A.R Chip. The information included in this section is considered basic essential information and may not include any or all possible complications you may experience during the installation of this system.

Limit the number of distractions while installing this product. Pay close and careful attention to the instructions and information provided in this manual during the installation. Damage to your vehicle and/or personal injury may result due to lack of attention.

3.2 Battery Disconnect



Figure 5

Disconnect the Negative terminal on the battery.

3.3 ECU Removal

This section will guide you through the process of accessing your ECU to replace your current chip with the W.A.R. Chip. There are three possible locations for the ECU. If you don't have any signs of an engine bay ECU location its probably in the glove box.

Glove Box Location:



1. Open the glove box and remove plastic cover to expose the ECU located on the top of the glove box compartment.
2. Now the ECU will be exposed. Using a 10mm socket Wrench, undo the two 10mm nuts.
3. Unplug the ECU from its connector harness.

E-box Location:



1. Open the hood and access the ECU in the E-box on the passenger side of the engine bay (Upper Side). Using a Philips screwdriver undo the four screws.
2. ECU is closest module to firewall. Using a 10mm socket, undo the two 10mm nuts or pull the locking clips.
3. Unplug the ECU from its connector harness.

Firewall Location:



1. Open the hood and access the ECU in the firewall compartment on the passenger side of the engine bay (Upper Side). Using a Philips screwdriver undo the Three screws.
2. Now the ECU will be exposed. Using a 10mm socket Wrench, undo the two 10mm nuts.
3. Unplug the ECU from its connector harness.

3.4 Chip Removal

The Chip contains the software required for your vehicle to operate. Avoid high static areas. Also avoid dropping the chip or spilling liquids on it.

You need to take the metal case off of the ECU. There are tabs all the way around the bottom side. There may also be small screws depending on your ECU model. Using a small flat screwdriver gently lift up the tabs to release the ECU. Be careful not to bend the tabs too far as they may break.

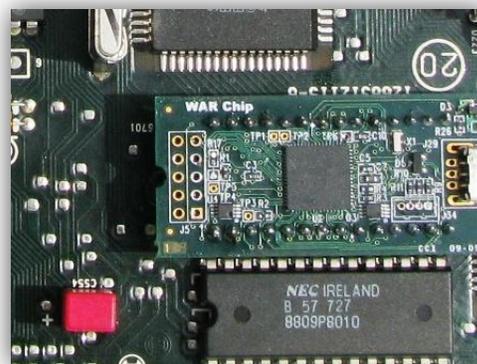
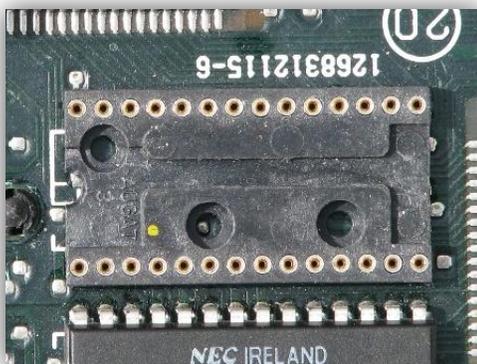
Once you have the ECU open and the chip side exposed you are ready to replace your current chip.

Carefully pry with a small flathead screwdriver evenly on each side of the chip back and forth until it is free from its holder. If you are not careful you may damage the pins on the Chip.



Figure 6 - Damaged Chip

Take the W.A.R. Chip and install it in place of the original one. Make sure that you align the small notch (half circle) on the W.A.R. Chip, to the small notch on the ECU; this will insure your chip is installed properly. Do not reinstall the ECU cover just yet.



3.5 Your W.A.R. Chip's Accessories

USB Cable

You are almost ready to reassemble the ECU and install it back in place. This is the point where you need to decide on how you want to access your W.A.R. Chip should you decide to tune your car. It is fine to install your W.A.R. Chip and drive or tune your car with the ECU cover off. Just make sure that you aren't exposing the ECU to water. When you are done tuning you can remove the USB Cable and reinstall your ECU as normal.

Or while you are making the slot for the TCM in the next step, you can make sure the opening is large enough to incorporate both the TCM and the USB Cables. The USB Cable can safely be permanently plugged into the W.A.R. Chip. When not in use, you can wind the USB cable up and tuck it in beside the ECU in its appropriate compartment.

NOTE: You cannot start the car with the W.A.R. Chip plugged into your laptop. Simply unplug the USB cable from your laptop's USB port.

Tune Command Module (TCM)

The TCM is the module that allows you to select between the 4 different tunes you have saved on your W.A.R. Chip. The TCM is meant to be installed permanently. Because the TCM controls the W.A.R. Chip from the cabin, it is meant to be installed with the W.A.R. Chip in the ECU.

There are a number of locations you can mount the TCM itself. You can mount it on the driver's side under the dash, in the glove box, in an accessory button position on the dash, or even in the engine bay. Because there are so many locations to mount the TCM, we can't instruct every outcome. For idea's you can always visit our online forum.

Once you have successfully mounted your TCM you need to plug it into the TCM port on your W.A.R. Chip. In order to switch between your 4 tunes the TCM must be plugged in at all times. In order to have your TCM plugged in while the ECU is installed in its proper location you will have to modify your aluminum ECU cover.

You can safely cut a small notch in the side of the ECU cover to allow the TCM to exit the ECU without fear of pinching the cable. Because the ECU is in an enclosed environment, you don't have to worry about water getting into your ECU.

Installation

1. The TCM knob has 5 wires going to it. One wire is loose on purpose. This is for your optional Anti-theft device integration.
2. To mount the TCM, you must first remove the dial. Using the 1.5mm Allen wrench, undo the set screw on the side of the knob.
3. Once you have removed the knob, you must undo the nut on the TCM module and remove it along with the lock washer. Drill a hole in the location you want to mount the TCM.
4. You will notice a small ring left on the TCM, this is the position lock. Depending on where you set the lock, will determine how many “clicks” or positions you will have. Position 1 is all the way counter-clockwise. Make sure that the lock is set so that you have 4 positions available. You will have 3 “clicks”
5. Mount the TCM through the hole with the lock set in place, and secure the TCM with the nut that you removed. You can now reinstall the TCM knob. Below is a picture of the TCM unit.



Figure 7

Once you are satisfied with your W.A.R. Chip’s accessories, you can re assemble your ECU and start driving your car. Before you permanently reinstall your ECU, hook up your battery and start your car to make sure there are no problems. If you have a problem, please refer to the troubleshooting guide in section 5.

4. W.A.R. Software and Tuning

4.1 Introduction

This section is a BREIF description of tuning theory to help guide you through the absolute basics. It is advised that you educate yourself further if you don't feel comfortable with the following basic descriptions. If you have any questions, please use our online forum.

Miller Performance is not responsible for your engine. Tuning your car is done at your own risk.

4.2 Understanding Ignition

With the W.A.R. Chip Software, you can control your vehicles actual timing. Like back in the day, you can advance and retard ignition timing. However, you don't need all those tools and timing lights you once had to use. With the simple increase or decrease of a value you can either advance or retard your timing.

The following diagram will help explain timing and how it is measured.

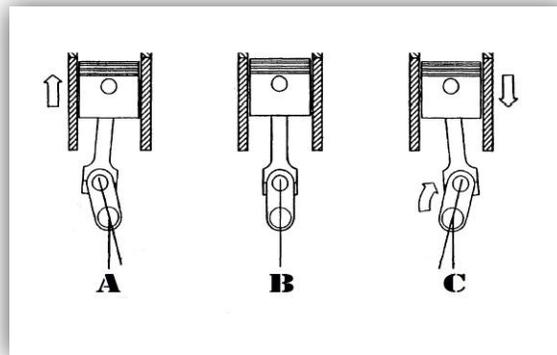


Figure 8

Top Dead Center (TDC) - B

In a reciprocating engine, the **TDC** is the position of a piston in which it is farthest from the crank. Top dead center is the datum point from which engine timing measurements are made. For example, ignition system timing is normally specified as degrees before top dead center (BTDC).

Before Top Dead Center - A

Ignition timing advance refers to the amount of degrees before TDC the ignition is triggered. The higher the ignition number the sooner the ignition is triggered and therefore the more advanced the timing is.

Every engine is different, but there is a preferred range of timing that produces the most amount of power. And theoretically, the more advance you can run, the more power you will make. Too much timing advance can cause pre-detonation otherwise known as pinging. This is when the fuel mixture ignites before, or at, TDC which as you can see by the above illustration works against the rotational direction of the engine. Too much pre-detonation can be catastrophic.

After Top Dead Center - C

ATDC is when the fuel mixture actually ignites and provides power. The more advance you can run, the sooner ATDC your mixture will actually ignite giving you more power during the ignition stroke.

This section was meant to give a basic explanation of ignition timing. If you want to learn more, there are plenty of document online explaining in detail, the ignition process.

4.3 Understanding Fuel

The W.A.R. Chip software give you control of your engines fuel injection as well. Like ignition there are some key principals one should understand to effectively tune their own vehicle.

Air Fuel Ratio (AFR) is the mass ratio of air to fuel present during combustion. When all the fuel is combined with all the free oxygen, typically within a vehicle's combustion chamber, the mixture is chemically balanced the AFR is called the stoichiometric mixture (often abbreviated to stoich) and appears as 14.7 on a wideband O2 sensor.

Typically, on part throttle cruising; your vehicles O2 sensor will try to keep your fuel mixtures as close to 14.7:1 as possible. To help make your vehicle maintain its fuel efficiency, tuning of your part throttle ignition and fuel maps will help you bring the AFR closer to 14.7:1

To run more timing, you typically need more fuel. Running too much timing with not enough fuel can lead to pre-detonation.

On Wide open throttle, you typically want to see AFR's in the mid to high 12's (12.5:1 AFR) if possible. Again, every engine is different, and you will learn where your vehicles AFR's for part throttle and wide open throttle will need to be as you gain experience.

4.4 Ignition & Fuel Working Together

The combination of the amount of fuel being injected and the timing of the ignition will help you achieve your desired AFR. Too lean of an AFR can be catastrophic to an engine. Too rich of a mixture can also ruin an engine but it is always safer to be on the rich side of the scale while base tuning. As you refine your tune, you can find the limits of how lean you can run to maximize the power output of your tune.

4.5 Changing Table Values

Once you are confident in your understanding of ignition and fuel, you can begin to tune your vehicle. Here is a screen shot of a part throttle timing map for a 173 ECU.

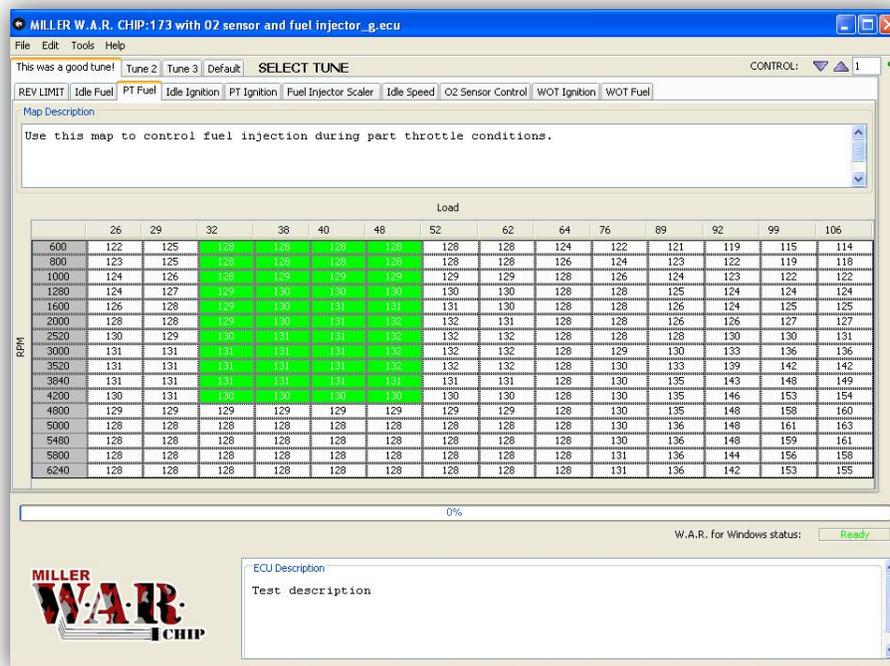


Figure 9

Changing the values is easy. You can select one cell at a time, or multiple cells. To select a cell, simply click the cell to highlight it.

- 1) **Typing Method:** When typing a value, you can only change one cell at a time.
- 2) **Control buttons:** In the software you will see two purple buttons. These can be used to increase or decrease the values. Beside the purple arrows, you will see an input box with a default value of 1. You can change that value to increase or decrease in larger increments.
- 3) **+ & - Keys:** You can also use the +/- keys on the key board. These keys will also follow the increment value set in the top right.

Ignition values:

Ignition is displayed in the GUI as actual timing in degrees. If it says 14, you are running 14 degrees of timing BTDC (advance).

If it says -14, you are running 14 degrees of timing ATDC (extremely retarded timing)

Fuel Values:

The Fuel values displayed are the values the ECU uses. To reduce complexity and understanding the values are raw. They are not displayed in Lambda as it may confuse people. The Fuel values are basic. The higher the number, the more fuel you are injecting, the lower the value, the less fuel.

RPM:

The RPM value has been converted to show its real world value. The RPM of your engine should remain below 7000 RPM, unless you have a modified engine that can handle a higher RPM.

Min and Max Values:

Because of the ECU's structure some values are limited in their range. The W.A.R. Chip software takes care of these values and will not let you enter something higher or lower than the ECU can possibly accept. If you are trying to exceed a value or one that is typed reverts to a different value, you are at this limit.

It is rare to be at these extremes. If this happens to you, call us and we can help accomplish what you need done through different means in the software you may not have access to.

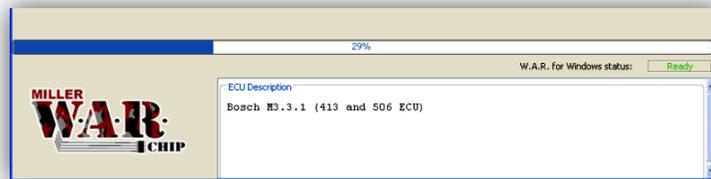
4.6 Write Your New Tune(s)

Once you have modified your table values and want to try your change(s) out simply save your project(s). You must save each Map Set individually.

Once you have saved your file(s) you can now write them to the W.A.R. Chip. Plug your W.A.R. Chip USB cable in if you haven't already. The W.A.R. Chip will overwrite existing maps (map 1, 2, 3 & default) if you have data loaded into the corresponding maps in the windows software

For example, if you are working with Map 1 and 2 and go to upload your work, Map 1 and 2 will be overwritten on the W.A.R. Chip while map 3 and default will remain unchanged.

To upload your work, "File > Write" It will ask if you are sure you want to upload your Data, click "Yes."



Do not unplug you W.A.R. Chip while the data is wirting. Once your write process completes, unplug the USB cable from your computer. Remember, you cannot start the car while the USB cable is plugged into your computer.

If you are unsatisfied with your changes simply repeat the process described in section 2.5, make your changes and upload your new data once again. There is no limit to the amount of times you can change your tune.

4.7 Special Features

Set Your Default

With the W.A.R. Chip for Windows software, you can set your default. This is very useful in the case that you want to revert back to the last working tune.

Let's say that you have a base tune that you have made that isn't 100% perfect, but definitely something that you are proud of. You can set that as the default Map Set the W.A.R. Chip for windows software can always revert to with one click. This helps speed up the tuning process.

To do this, you can press, "Alt+D" or go, "Tools > Set as default tune" One day you will experience the need for this option and you will be glad it's there.

Select & Add ECU Type

This is another great feature. If you have more than one W.A.R. Chip, or, you use your W.A.R. Chip in more than one different car you will be able to use ONE software to edit your different ECU types.

To Add another ECU after you initial installation you can click "CTRL+A" or you can go, "Tools > Add ECU Type" You will be prompted again to get a request code unique to your computer and .ECU file. After you enter your request code, W.A.R. Chip for Windows will close.

To select between your .ECU Configuration files, you must go to, "Tools > Select ECU Type" Once you click on the desired ECU, W.A.R. For Windows will close and need to be re-opened.

5. Troubleshooting

5.1 Possible problems

Car doesn't start

If your car does not start make sure of the following:

- Your W.A.R. Chip is installed in the correct orientation.
- You have loaded the PROPER base files onto the software
- Your W.A.R. Chip is properly seated in the ECU
- Your USB cord is not plugged into the laptop
- Your battery was reconnected

If all of the above is determined to be ok, simply install the factory chip. If the car runs off the stock chip, contact Miller Performance.

Check Engine Lights

If you are getting a check engine light turn the vehicle off and follow these steps

- Unplug the ECU for 30 seconds
- Plug the ECU back in
- Change the position of the TCM to access a different Map
- Start the car

If your Check engine light does not come back after three start cycles reload the problematic map. If all TCM settings produce a check engine light, please contact us.

W.A.R. Chip not communicating

If you are having trouble communicating with the W.A.R. Chip make sure of the following:

- You are using a XP based computer
- Your USB Cable is properly inserted in the W.A.R. Chip
- Make sure your USB cable isn't broken
- Make sure your car isn't running

