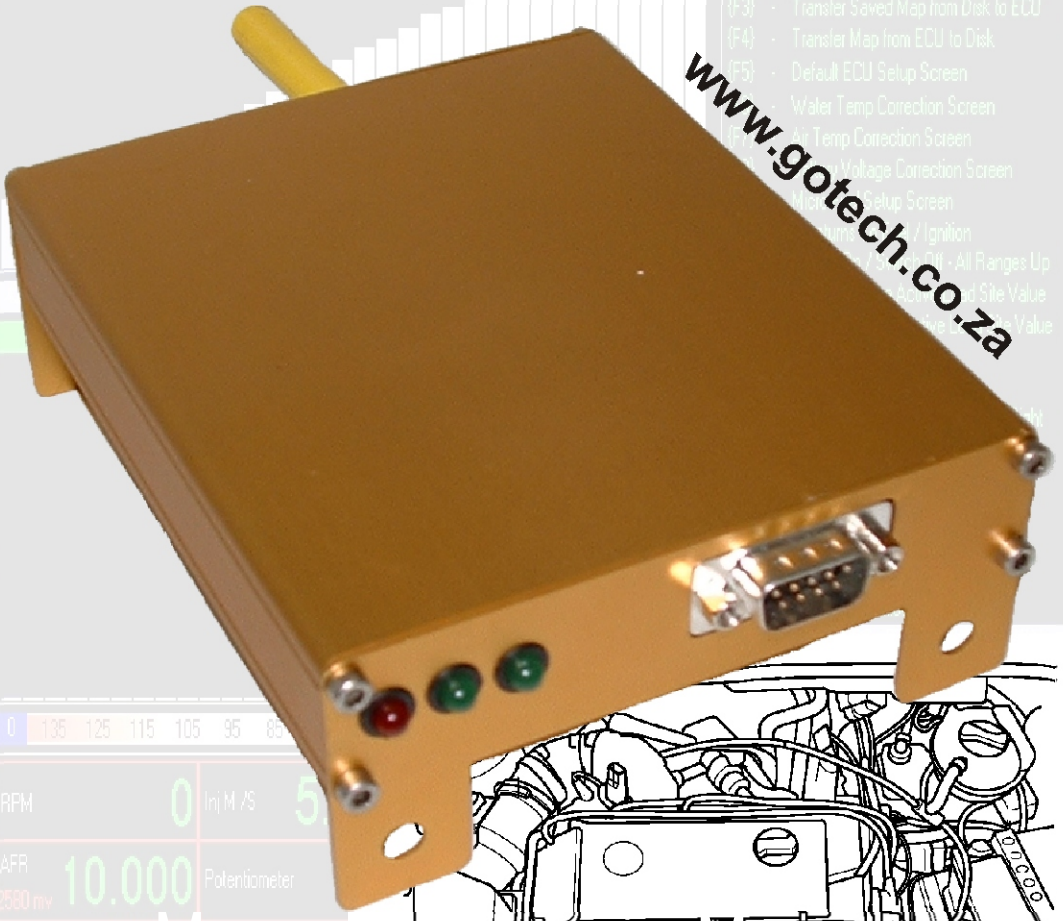
Gotech-MFI

Fuel Management Systems

58 Graniet Street, Jet Park, JHB - Tel: 011 3971953 - Fax: 011 3978197

www.gotech.co.za



MFI Pro - Instructional Manual
VW Golf/Jetta Vr6 - Version 07.03

Index:

Introduction:

Congratulations on choosing a Gotech engine management system for your vehicle. Gotech MFI systems have been successfully installed on thousands of vehicles, from twin turbo v8's, drag bikes to imported Japanese Toyotas. Over the past years many motor sport enthusiasts have discovered that the Gotech computer is easy to use and gets the job done correctly thus giving excellent reliability and enabling users to precisely control ignition timing and fuelling needs. Precise ignition and fuelling control leads to excellent drive ability and fuel economy.

Gotech MFI is suitable for most four stroke petrol engines from one to eight cylinders. MFI stands for Micro Fuel Injection. Don't be fooled by the "micro" part of the name. Considering the features of this unit, it could just as well been named "Mighty Fuel Injection" The Gotech MFI ecu can be used on normally aspirated or charged vehicles boosting up to 1.5 bar boost (+ - 21psi). A 3 bar (+- 42psi) map sensor is available on request.

Before you begin:

1. Read the entire manual before starting, the greater you knowledge of the Gotech system, the easier you will find it to understand what you are doing, and why. Throughout the manual are warnings and notes that will help your installation run smoothly and indicate the known dangers that exist.
2. Read any additional material accompanying this manual.
3. You may need special parts, additional tools or test equipment in order to complete the installation. Make sure that you have all these items before you begin to avoid frustration.
4. Don't do the minimal work possible. Carelessness in the early stages of installation can cause major headaches later on. Carelessness will cost you money and frustration in finding and fixing unnecessary problems.
5. Electromagnetic interference (EMI) from unsuppressed spark plug leads can cause the ecu to fail. Try keeping all signal wires as far away as possible from high EMI locations. Please use suppressed plug leads at all times. Never use copper or solid core plug leads.

Before you begin continued:

6. In hot climates or with charged vehicles you might have to employ heat shielding to prevent heat soak to electrical and fuel parts.
7. We recommend you having your vehicle dynoed by professionals with the proper equipment.

WARNING - Before starting the Gotech installation:
1. Avoid open sparks, flames or operation of electrical devices near flammable substances.
2. Always disconnect the battery when doing electrical work on your vehicle.
3. Do not charge the battery with a 24 volt truck charger or reverse the polarity of the battery or any charging unit.
4. Do not charge the battery with the engine running as this could expose the ecu to an unregulated power supply that could destroy the ecu and other electrical equipment.
5. All fuel system components and wiring should be mounted away from heat sources, shielded if necessary and well vented.
6. Make sure that there are no leaks in the fuel system and that all connections are secure.
7. Disconnect the Gotech ecu when doing any arc welding on the vehicle by unplugging the ecu from the main wiring harness.
8. The engine should be earthed properly.

Basic Tools Required For Wiring Installation:

Some basic tools are required for the Gotech wiring installation, these tools include:

1. Side cutter
2. Wire stripper
3. Insulating tape
4. Soldering iron
5. Solder

Using heat shrink helps tidy up and insulate all the joints. A neat wiring harness makes fault finding easier and compliments the vehicle. Please use the Gotech wiring colour codes as far as possible.

You will need the following components fitted prior to the Gotech installation:

1. High pressure fuel pump capable of a continuos pressure of 3.5bar.
2. Fuel pressure regulator
3. Fuel injectors matched to the engine requirement.
4. Throttle body with throttle position sensor. Throttle position sensor is only required on vehicles with high duration camshafts or normally aspirated race cars.
5. Oil / Water temperature sender unit (Gotech calibrated preferred)
6. A locked (no internal advance) electronic distributor setup or a crank trigger wheel / sensor combination.
7. Good quality suppressed HT leads. Do not use solid core HT Leads

The list above is basic and some extra parts will be required for the complete Gotech installation. Please consult with a experienced Gotech technician on if any other parts are required for the Gotech installation on your specific vehicle.

NOTES:
Installation of engine management systems is a complex exercise to be undertaken only after careful planning and research into the application for which the project is to be used Damage to engine components is a distinct possibility if care is not taken during the installation and setup of the Gotech engine management system. If you are unsure about how to wire any components of your engine, please consult and experiences installer for advice.

Hardware Installation:

Locate a convenient mounting position for the ecu. It is recommended that the ecu should be installed in the drivers compartment and shielded from any water or moisture.

Plug the harness into the ecu, and feed all wires except for the potentiometer through the firewall. A good seal around the wiring is necessary to prevent engine fumes from entering the cockpit and to protect the wiring.

Plug Pinouts Gotech MFI Pro:

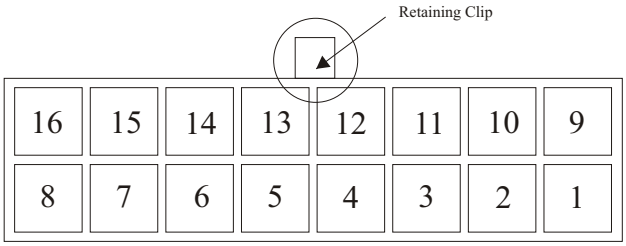


FIG 1.16 PIN MALE PLUG ON THE ECU

Plug Pin Out References - 16 Pin Plug - MFI PRO

1.	Ground 12 V -	Brown 1.5 mm
2.	Ign Input from Distributor or Trigger	Red Shielded 0.5 mm (C/P3)
3.	Ign Output to Coil Driver 1	Black / White 1 mm
4.	Shift Light or Fuel Pump Output	Black / Blue 1 mm
5.	Variable Valve Timing Output	Yellow / Black 1 mm
6.	RPM Output	Red / Black 0.5 mm
7.	Injectors Bank 1 - Positive	Red 1.5 mm
8.	Positive12 V From Relay Pin 87	Black 1.5 mm
9.	Ground 12 V -	Brown 1.5 mm
10.	Ign Output to Coil Driver 3	White / Green 1 mm
11.	Ign Output to Coil Driver 2	Red / White 1 mm
12	Injectors Bank 1 Neg Pulse Out	Brown / Orange 1.5 mm
13.	** Injectors Bank 3 Neg Pulse Out	Blue / White 1.5 mm
14.	Injectors Bank 2 Neg Pulse Out	Brown / Red 1.5 mm
15.	Injectors Bank 2 - Positive	Red 1.5 mm
16.	Positive 12 V From Relay Pin 87	Black 1.5 mm

** Output is used for Micro Fueller (4 Cyl)
Modified Pro V 4 mf Chipset on request
** Output is used for Micro Fueller (6 Cyl)
Modified Pro V 4 mf Chipset on request

WARNING:
Incorrect wiring connections will cause severe damage to the ecu and the vehicle. When routing the wiring harness try to keep is as far away as possible from HT leads and high heat sources like the turbo charger or exhaust headers. Always use good insulation tape and solder the wires properly.

Plug Pinouts Gotech MFI Pro Continued:

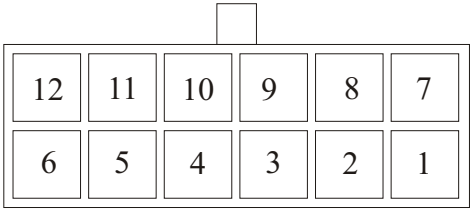


FIG 2. 12 PIN MALE PLUG ON THE ECU

Plug Pin Out References - 12 Pin Plug - MFI PRO

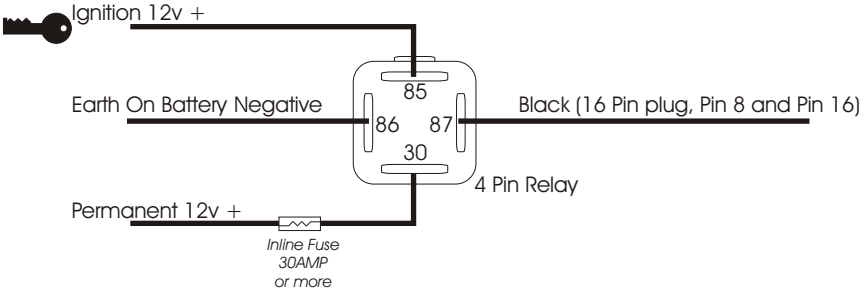
1.	Positive 5 V to TPS Sensor	Orange 0.5 mm
2.	Signal Ground Output to Sensors	Brown / White 0.5 mm
3.	Signal Ground Output to Sensors	Brown / White 0.5 mm
4.	Not used	
5.	Lambda Sensor Input	Black / Green 1 mm
6.	Air Temp Sensor Input	Blue 0.5 mm
7.	Positive 5 V to Potentiometer	Orange 0.5 mm
8.	Launch Control	Green / White 0.5mm
9.	Input Signal from Potentiometer	Yellow 0.5 mm
10.	External Map Sensor Input	Not Used
11.	Water Temp Sensor Input	Blue / Orange 0.5 mm
12.	Throttle Position Sensor Input	Blue / Yellow 0.5 mm

WARNING:
Always disconnect the car's battery before working on the wiring. Avoid open sparks, flames or operation of electrical devices near flammable substances. Disconnect the Gotech ecu when doing any arc welding on the vehicle by unplugging the ecu from the main wiring harness.

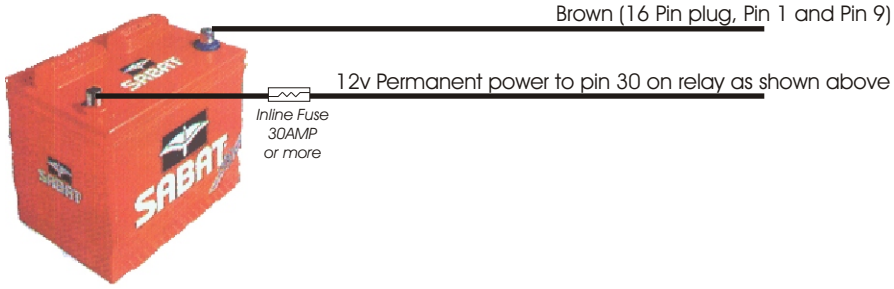
Gotech ECU Power Supply:

The Gotech ecu requires a stable power and earth feed to function properly. It is recommended to fit a high quality 4 pin relay with a inline fuse on the 12v + input of the Gotech ecu. **The two Brown wires (16 Pin Plug, Pin 1and Pin 9) should be connected straight onto the battery negative terminal. Do not earth onto the chassis.**

Connecting the ECU Power Supply:



The ignition 12v + wire should give power to the relay pin 85 when the ignition is turned on and while the engine is cranking.



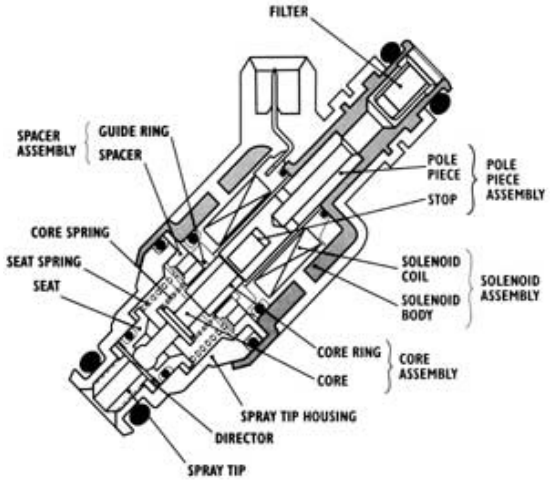
WARNING:
Do not reverse the polarity on the Gotech ecu. Reverse polarity will cause severe damage to the Gotech ecu and other electrical parts. Always earth the Gotech ecu directly onto the battery negative

Fuel injectors:

The fuel injectors is electronically controlled with the ecu. The main purpose of the fuel injector is to deliver fuel to the engine.

The ecu uses switched injector drivers that can control the current passing through an injector by switching the low side of the injector between 12v and ground while the injector is open.

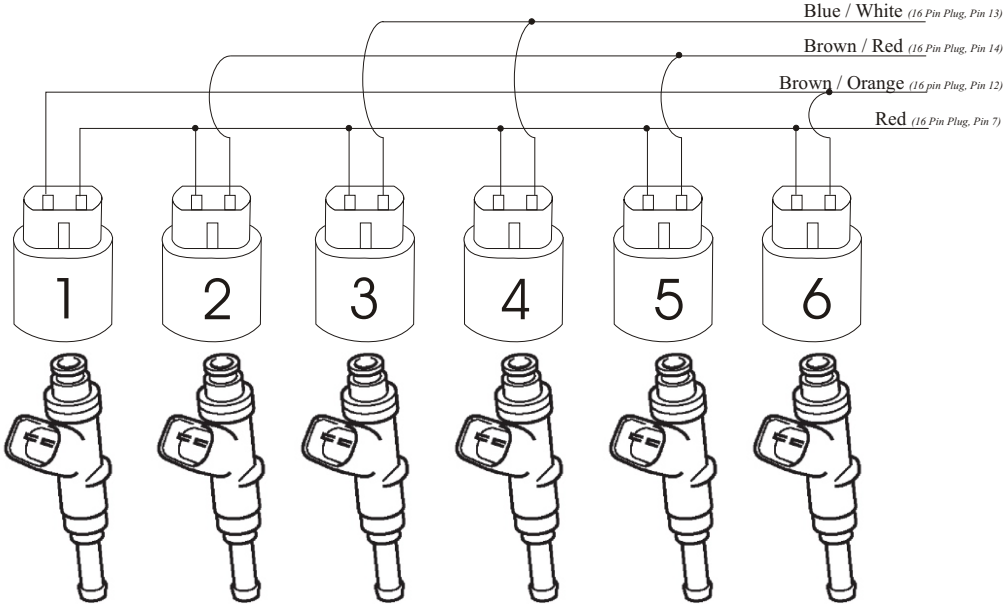
When using second hand fuel injectors it is recommenced to clean them with a fuel injector cleaning machine. The most important cause for fuel injector failure or damage is a deep heat soak cycle after the engine is turned off. The remaining fuel inside the injector evaporates, leaving a residual coating and fuel deposits. As these deposits build up, it slowly chokes off the fuel volume at the injector nozzle, and continues to form inside the injector body, until the injector is clogged. Fuel volume is reduced, spray pattern is de-formed, and atomization quality diminishes. Some-times, deposits can result in injector leakage or sluggish operation which can cause rich running conditions. Various drive ability and emission problems can result from this condition. Gotech offers fuel injectors cleaning at reasonable prices.

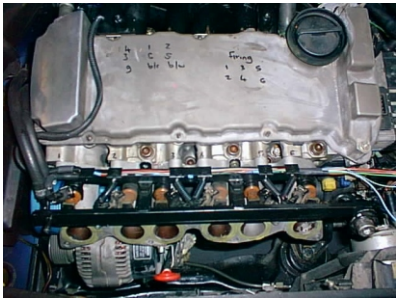


Fuel injector Outputs:

The Gotech MFI Pro ecu offers three fuel injector outputs. These outputs are negative switching and can drive twelve 12 ohm fuel injectors. The injectors are batch fired in mode 0 and phased fired in mode 2 upwards. The injector time is configurable up to 14ms (milliseconds). On the VW Golf / Jetta Vr6 Engine all three fuel injector outputs are used.

Fuel Injector Connection:





The intake manifold will need to be removed to wire up the fuel injectors. Note the fuel injectors on the bottom just above the intake holes.

Ignition Outputs Gotech MFI Pro:

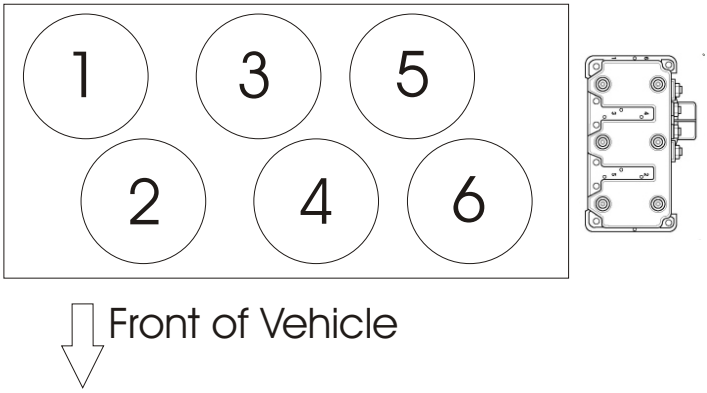
The ignition outputs on the Gotech MFI Pro ecu is used to trigger the coil pack. The coil pack can be triggered directly from the ecu or external coil drivers can be used if preferred. The coil pack should be negative triggering, a special ecu can be built for positive triggering coils on request. Take great care when setting up the Gotech main settings especially the internal / external features and coil charge time.

The three ignition outputs on the Gotech MFI Pro ecu are:

Black / White *(16 Pin Plug, Pin 3)*	Cylinder 1-6
White / Green *(16 Pin Plug, Pin 10)*	Cylinder 3-4
Red / White *(16 Pin Plug, Pin 11)*	Cylinder 2 - 5

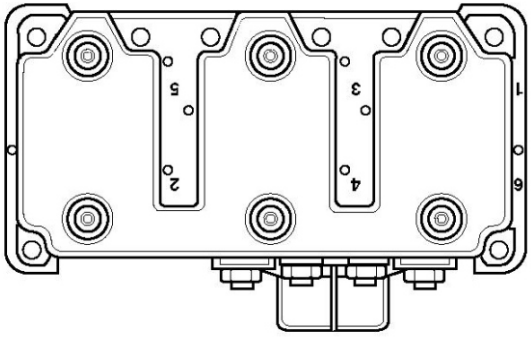
Coil charge time:

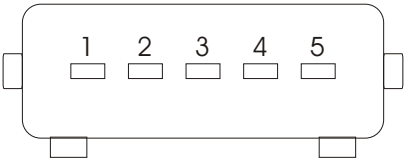
Coil charge time is the milli seconds (ms) that the coil or ignition module will be charged. This value is fully configurable through the Gotech dealer tune software. The recommended coil charge time is 2.00 ms. The coil charge time can be increased up to 4.00 ms. When running a higher coil charge time be sure to keep an eye on the ecu, ignition module and coil temperatures. If the coil charge time is too high or too low the engine will missfire or hesitate to rev up. The Golf Vr6 coil pack has a built in ignition module which can be used. Be sure to switch the Gotech ecu to external fire when the original module is used.



Ignition Outputs Gotech MFI Pro Continued:

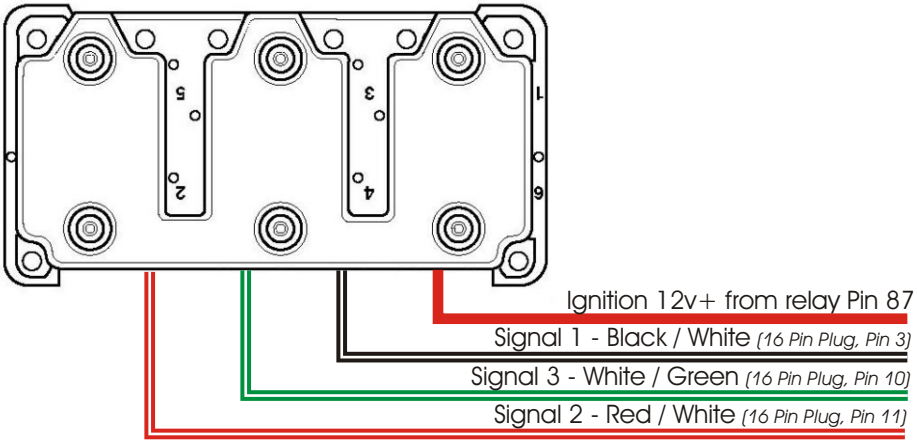
Connecting the coils and ignition modules:
Using the Original Coil Pack With Ignition Module





Pin 1	Earth		Brown(Relay Pin 86)
Pin 2	Signal 2	Cylinder 2 and 5	Red/White
Pin 3	Signal 3	Cylinder 3 and 4	White/Green
Pin 4	Signal 1	Cylinder 1 and 6	Black/White
Pin 5	12v Ignition Power		Red (Relay Pin 87)

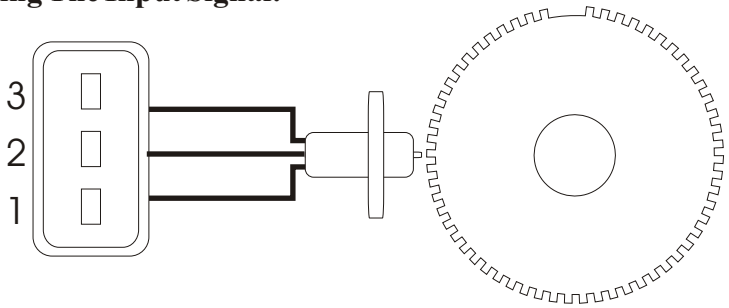
Using The Original Ignition Coil With The Module Removed:



Signal Input Gotech MFI Pro:

The signal input *(Red in shielded 16 Pin Plug, Pin 2)* is used as a reference by the Gotech ecu of the engine speed. A magnetic, optical or hall effect sensor can be used for the signal input. The crank sensor on a VW Golf/Jetta vr6 engine is magnetic.

Connecting The Input Signal:



Pin 1	Shielded Cable Red	16 Pin Plug, Pin 2
Pin 2	Shielded Cable Blue	16 Pin Plug, Pin 1
Pin 3	Shielded Cable Screen	16 Pin Plug, Pin 1

Trigger Teeth Compensation MFI PRO ECU:

The usable range is 9 to 16 teeth. This function is used to compensate for the mounting position of the crank trigger signal generator (pickup).When matching the timing the appropriate trigger tooth value should be selected according to your engine setup. The trigger tooth setting is adjustable in the Gotech software main setup screen. On the VW Golf Vr6 Engine, tooth number 13 can be selected in the software.

Throttle position Sensor:

Most modern fuel injected vehicles are fitted with a TPS (Throttle position sensor). The ecu uses the TPS as a reference to how far the throttle is opened. A TPS is not a critical element of the input sensors and can be substituted with the built in map sensor. If the vehicle is equipped with high duration camshafts then a TPS is required. On turbo or super charged vehicles using forced induction it is recommended to run the map sensor as primary input. (Mode 0 in TPS map mix on the f5 configuration screen). A TPS is basically a variable resistor as shown below. On the VW Golf/Jetta vr6 engines a TPS/MAP (Mode2) Mix can be used.

TPS connection on Gotech harness:

Blue / Yellow *(12 Pin Plug, Pin 12)* - Signal
Orange *(12 Pin Plug, Pin 7)* - Positive
Brown / White *(12 Pin Plug, Pin 2)* - Negative

Determining the pinouts of a tps:

Take a multimeter and switch it to measure ohmage. On a three pin tps when measuring between positive and negative the ohmage will stay the same when opening the throttle. Between positive and signal the ohmage will go less when opening the throttle. Between negative and signal the ohmage will increase when opening the throttle.

VW Golf/Jetta vr6 Specific TPS

Pin 1 - Negative (Brown/White)
Pin 2 - Signal (Blue/Yellow)
Pin 3 - Positive (Orange)

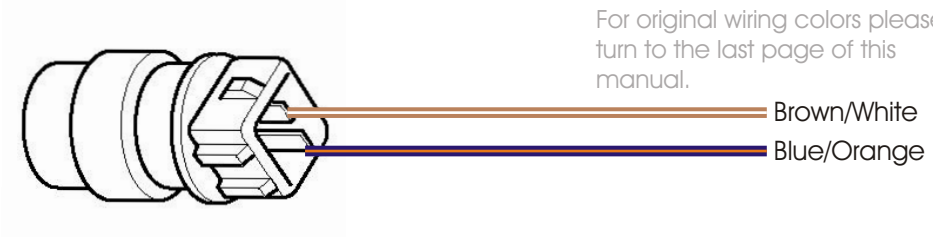
For original wiring colors please turn to the last page of this manual.

Water Temperature:

The Gotech ecu uses the water temperature sensor as a reference to see how hot the engine is for cold starting purposes. For good cold startup this sensor must be connected. **A temp sender unit cannot be shared by the gauge and the Gotech ECU. Connecting both the gauge and Gotech on a single sender unit will damage the ecu**.

Water Temperature Sensor Connection:

Blue / Orange *(12Pin Plug, Pin 11)* - Signal
Brown / White *(12 Pin Plug, Pin 2)* - Negative

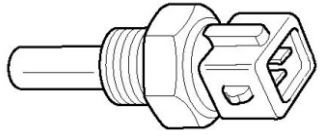


Air Temperature:

The air temperature sensor is supplied with the Gotech wiring harness. This sensor gives the ecu an indication of the outside air temperature and then enriches the fuel mixtures accordingly. The air temperature sensor should be fitted on the vehicle so that it does not receive hot air from the engine compartment. The original air temperature sender unit can be used as well, but the air temp map should be compensated accordingly. (For advanced users only)

Air Temperature Sensor Connection:

Blue *(12 Pin Plug, Pin 6)* - Signal
Brown / White *(12 Pin Plug, Pin 2)* - Negative



For original wiring colors please turn to the last page of this manual.

Lambda Sensor:

When setting up the ecu a Lambda sensor should be used, but it is not required for everyday driving. The lambda sensor is pre-fitted from the factory in most VW production cars. The sensor uses the exhaust gas to detect if the engine is running lean or rich.

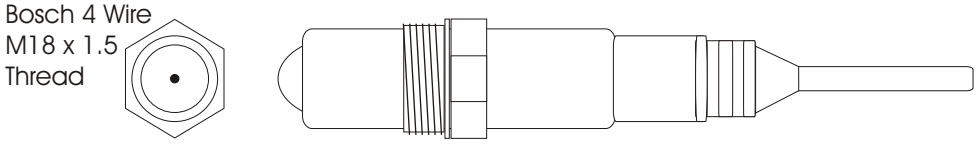
Lambda Sensor Installation:

The most common sensor used is a four wire Bosch Lambda sensor. This sensor is equipped with a built in heater element.

Colour codes for the Bosch four wire Lambda sensor:
White - 12v positive (Can be on either one of the white wires)
White - Earth (Can be on either one of the white wires)
Grey - Earth from instrument (brown / white, *12 Pin Plug, Pin 2*)
Black - Signal (Black / Green, *12 Pin Plug, Pin 5*)

Closed Loop Lambda Control: (v4 chipset upwards)

Closed loop lambda control uses the Lambda sensor to check the exhaust o2 content and then changes the fuel maps accordingly. All the parameters are fully configurable in the Gotech software. It is not recommended to use the closed loop lambda control on turbo charged vehicles or more than 25% throttle on normally aspirated vehicles. For more info on setting up the closed loop please refer to closed loop user manual on the software cd.



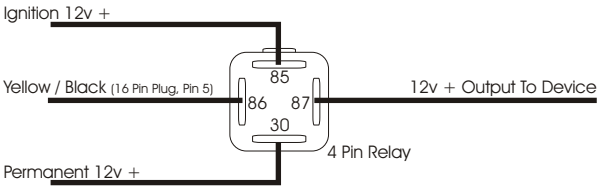
WARNING:
A lambda sensor can easily be damaged by oil and debris in the exhaust system. Take care never to drop the lambda sensor as it may lead to permanent damage. Most Lambda sensors are intended for unleaded gasoline only and will not last long with leaded gasoline. Normally when a lambda sensor packs up the reading goes to 14.7 and does not change when you enrich the engine.

Optional Output Gotech MFI Pro:

The optional output on the Gotech MFI Pro ecu *(Yellow / Black, 16 Pin Plug, Pin 5)* can be used for various purposes including the activation of Nitrous oxide.

The optional output is RPM based and can be switched on at a certain RPM and switched off again at another RPM. The output is switched negatively and a relay should always be used. The on and of RPM values is fully configurable with the Gotech software.

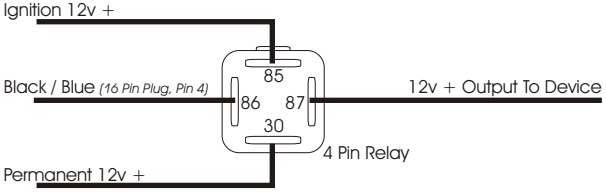
Connecting The Optional Output:



Fuel Pump Output Gotech MFI Pro:

The fuel pump output on the Gotech MFI Pro ecu *(Black / Blue, 16 Pin plug, Pin 4)* can be used to switch on a fuel pump relay. The output is switched negatively and a relay should always be used. The on RPM is fully configurable with the Gotech software.

Connecting The Fuel Pump Output:

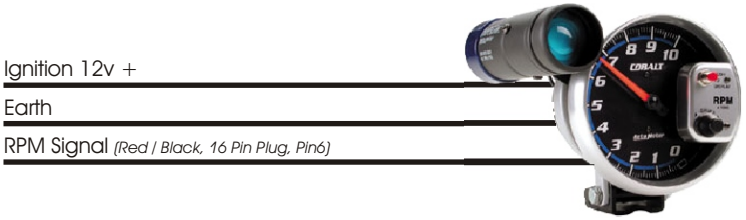


The original fuel pump relay can also be used. On certain models the Yellow/Green wire (From original ECU Pin 6) can be connected to the Black/Blue (Gotech). This will activate the original relay. Double check before connecting.

Rev Counter Output Gotech MFI Pro:

The rev counter output *(Red / Black 0.5mm, 16 Pin Plug, Pin6)* on the Gotech MFI Pro ecu can be used to drive a externally mounted rev counter. In some cases the RPM output from the Gotech MFI Pro ecu is not strong enough to drive the rev counter, a tach adaptor is then required for the rev counter to operate normally.

Connecting The Rev Counter:

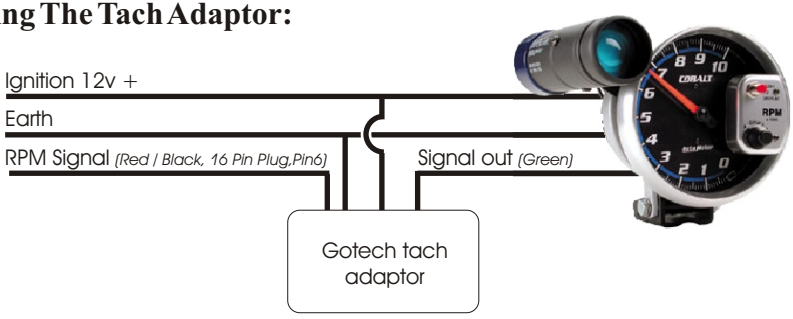


On some VW Golf/Jetta vr6 models the original tach wire is Green/Black, this wire can be found on the original ECU plug. The original tach does not require a Gotech tach adaptor. Please double check the tach wire before connecting.

Gotech Tach Adaptors: (optional extra if required)

The Gotech tach adaptor amplifies the RPM signal from the Gotech MFI Pro ecu so that the rev counter can work properly. A tach adaptor is not required on all rev counters.

Connecting The Tach Adaptor:



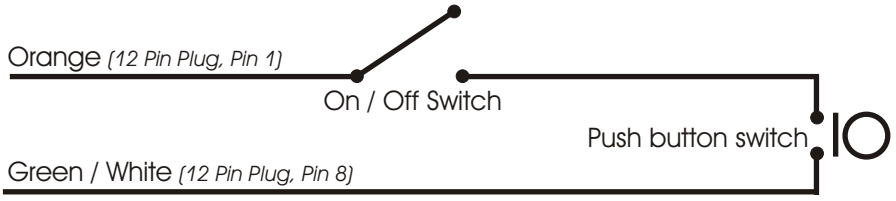
Launch Control:

The launch control feature is available on Gotech MFI Pro v4 and upward ecu's. Please specify to have the launch control activated when you purchase your ecu as this is an optional feature.

When the launch control is activated the ignition timing is retarded (amount configurable) and the soft and hard launch rpm limit is used (rpm configurable). With your foot flat on the throttle the engine will limit on the launch rpm limit. As soon as you pull away you release the button and the timing will be advanced again to the original ignition map after a couple of ms (time configurable) and the rpm limit will go back to the standard value. With the launch control activated on a turbo vehicle you will notice that the engine will start to boost when the launch rpm limit is reached. This will help to bring down the turbo lag on a vehicle with a big turbo setup. Setting up the launch control may take a while and you will need to spend a couple of hours at the race track to perfect your settings and win that extra couple of tenths at the end of the 1/4 mile.

Activating The Launch Control:

Connect the green / white *(12 Pin Plug, Pin 8)* wire and the orange to activate the launch control. We recommend fitting a on/of switch in your vehicle with a push button on the steering.



WARNING:
The launch control function should only be used by advanced users. By setting the launch control values incorrectly you can seriously damage your vehicle's engine and the Gotech ecu. This function is intended for track use only.

Original Wiring Colors:

On certain models these are the original wiring colors. Please note, these are for reference purposes only as the colors and ecu pin numbers may change between models.

Ignition Coil			
1. Brown	Earth		
2. Black/Brown	Signal		Pin 8
3. Black/Blue	Signal		Pin 60
4. Black/Violet	Signal		Pin 52
5. Black	Ignition power		
Fuel Pump relay			
Yellow/Green	Signal		
Engine temp sender unit			
Blue	Signal		Pin 14
Brown/Green	Earth		Pin 33
Air temp			
Blue/Green	Signal		Pin 36
Brown/Green	Earth		Pin 33
Throttle Position Sensor			
Brown/Green	Earth		Pin 33
Black/Green	Positive		Pin 41
Green/White	Signal		Pin 40
Fuel Injectors			
Grey	Injector 1	Signal	Pin 24
Grey/Green	Injector 2	Signal	Pin 3
Grey/Red	Injector 3	Signal	Pin 26
Grey/Blue	Injector 4	Signal	Pin 4
Grey/Black	Injector 5	Signal	Pin 25
Grey/Yellow	Injector 6	Signal	Pin 2
Red/Blue	Positive for all injectors		
Crank Angle Sensor			
Red			Pin 67
Green			Pin 68
Black	Earth		

Extra:
We recommend starting off with the following f5 screen settings for the VW Golf/Jetta Vr6 engines.

Number of cylinders	6
Ignition divide	3
Coil charge time	2ms
Mode	4
RPM Limit	6025 (Or closest value)
Optional output on	6025 (Or closest value)
Optional output off	6025 (Or closest value)
AFR preset	0mv
Throttle position/ map mix	0
Launch retard	1
Trigger tooth	14
MF Mode	0
Load Start	0
Load increment	(Normally aspirated 0); (Charged 8)
Accel sens %	14
Accell DV/DT	0.406
Altitude correction	16
Launch init time	0.015
Start up fuelling	10
Lambda ramp interval	15
Lambda limit	7
Lambda switch off load	10
Lambda RPM	6025 (Or closest value)
Invert trigger	0
Launch DR/DT	0.015
Maximum boost	255
Rotary trail split degrees	0
Launch RPM limit	6025 (Or closest value)
Direct/External fire	0 External fire if built in module is used
Soft RPM Launch	6025 (Or closest value)
Shift light set/Fuel pump	-400
Noise filter	1