# S4500


# Instructions
## Manual

injePro Tecnologia Automotiva

Av. Brasil, 2589, Região do Lago - Cascavel/PR
+55 (45) 3037-4040 | www.injepro.com

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## 1. TERMS OF USE

This guide deals with the functions and details of the Injepro product. Read it carefully so that you will be able to make the most of what the product can offer to you.

The installation of the product implies acceptance of our terms of use and indicates that you assume, at your own risk and responsibility, that the uses of the product do not violate any law or rule in the country that it will be used only for competition and/or closed track competitions purposes and is not intended for use on public roads.

## 2. INTRODUCTION

The INJEPRO S4500 module professionally manages 1 to 12 cylinders Otto cycle engines with injection map and complete high-resolution ignition. Operates with sequential injection on engines up to 4 cylinders and ignition sequential up to 6 cylinders. It features integrated electronic throttle management or stepper motor type idle actuator. It has individual adjustments per channel when connected to output by injector or coil.

S4500 features injection angle adjustment, integrated data logger, wide or narrowband closed loop probe, and air conditioning control, PWM control, Nitro PWM, 3-stage Boost, possibilities of using additional fuel injectors, fuel pump timed and two electro-fan drives, free and traction wheel reading and active control by unlocking.

Its configuration can be done through the dedicated software INJEPRO or by the module itself through the keys and display. It is also possible to configure by Bluetooth with the INJEPRO Connect Pro and Injepro Handset applications.

## 3. FEATURES

### 3.1. Signal Inputs

There are 07 signal inputs with white wires numbered from 1 to 7, and the possibility of setting between the options:

1. TPS Signal 1;
2. TPS Signal 2;
3. Pedal Signal 1;
4. Pedal Signal 2;
5. AIR Tempeture;
6. Engine Tempeture;
7. External Map;
8. Narrowband Probe;
9. Two-Step Button;
10. Burnout Button;
11. Nitro Button;
12. Boost Button;
13. Fuel Pressure;
14. Oil Pressure;
15. Pressure Sensor Air Conditioner;
16. Air Conditioner Button;
17. Analog 0-5v;
18. RPM Reference.
19. Phase Sensor;
20. Free wheel velocity;
21. Traction wheel velocity.

**NOTE:** The digital signal inputs can be configured as negative or positive signal input.

### 3.2. Blue wires activation outputs

There are 04 negative activation outputs with the possibility of setting between options:

1. Injector A1;
2. Injector A2;
3. Injector A3;
4. Injector A4;
5. Injector B1;
6. Injector B2;
7. PWM Nitro
8. Boost
9. PWM Variable Command
10. Idle Solenoid.

**NOTE:** The activation current of these outputs is 5A.

### 3.3. Gray wires activation outputs

There are 04 negative activation outputs with 0 - 5V current supply, with the possibility of setting between the options:

1. Ignition B;
2. Ignition C;
3. Ignition D;
4. Ignition E;
5. Ignition F;
6. Ignition Distributor 5V;
7. Idle Solenoid;
8. Electro-fan 01;
9. Electro-fan 02;
10. Shift Light;
11. Variable Command ON/OFF;
12. Nitro;
13. Fuel Pump;
14. Tachometer;
15. Air Conditioning.

**NOTE 1: The maximum current of gray outputs is 1A.**

### 3.4. Yellow wires activation outputs

They are 04 activation outputs for electronic throttle control or idle actuator. In addition to the functions already mentioned, it is also possible to configure them as:

1. Air Conditioning;
2. Tachometer;
3. Fuel Pump;
4. Nitro;
5. Variable Command;
6. Shift Light;
7. Electro-fan. 2;
8. Electro-fan. 1;

9. Throttle M2 – Only configurable on outputs 2 and 3;
10. Throttle M1 – Only configurable on outputs 2 and 3;
11. Stepper engine 2B;
12. Stepper engine 1B;
13. Stepper engine 2A;
14. Stepper engine 1A;
15. Idle Solenoid;
16. Ignition Distributor 12V;
17. Ignition F;
18. Ignition E;
19. Ignition D;
20. Ignition C;
21. Ignition B;
22. Ignition A;

**NOTE:** When becoming necessary using the yellow outputs for ignition with phonic wheel or distributor, it is mandatory the series use of 220Ohms resistor. You can find a example of this connection at "IGNITION COILS".

### 3.5. Features of the S4500

- USB Type C port;
- Communication with the dedicated software;
- CAN Communication;
- Communication with the AIM, Racepak VNET, Racepak FT, Racepak, and Dash Pro panel and InjePro modules;
- Integrated MAP sensor of 7 bar;
- Integrated Bluetooth, (Medium range, 8 meters clear of obstacles);
- Led Indicator (Alerts).

### 3.6. Functions

- Injector Control
    - Sequential for 4-cylinder engines;
    - Semi-sequential for 4-cylinder engines with the possibility of bench to supplement, Boost, Nitro PWM or PWM Command;

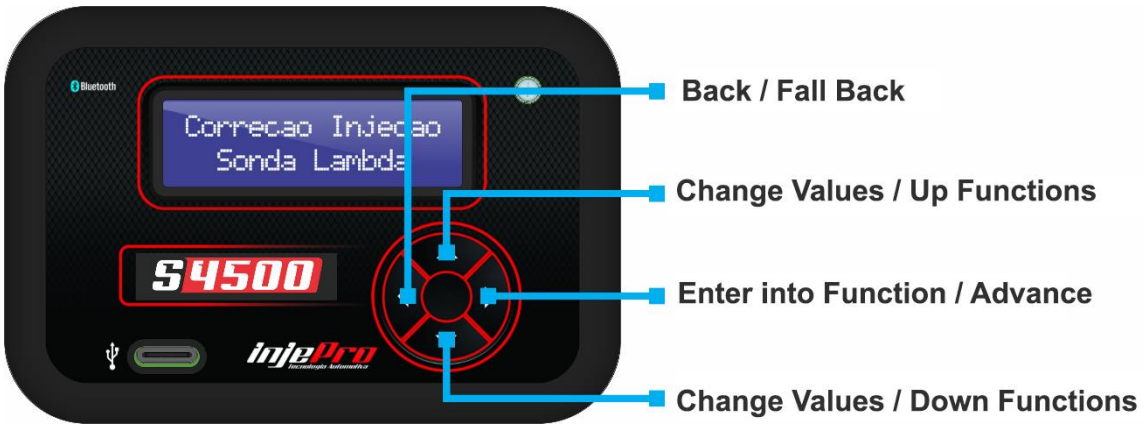
- Semi-sequential for 6-cylinder engines with the possibility of bench to supplement, Boost, Nitro PWM or PWM Command;
- Semi-sequential for 8-cylinder engine.

- Correction by narrow or wideband Lambda probe by the closed loop.;
- Injection Map at the Start;
- Timed ignition cut;
- Anti-Lag;
- Internal Data logger;
- Four (04) different configurable injection maps (Benchs A, B, C, D);
- Individual injection correction per cylinder (when using one output per injector);
- Synchronism of injection, with the possibility of setting for start or end of pulse;
- Injection Angle Map;
- Individual ignition correction per cylinder (when using one output per coil);
- Fixed or Normal Stepped Engine Control;
- Idle control by the ignition point, even when the solenoid is activated by temperature, the air conditioning is activated, and for a certain time at the start;
- Integrated electronic throttle controller;
- Sequential ignition for engines up to 6 cylinders and wasted spark up to 12 cylinders;
- Injection and ignition complete map (Injection Time Map x Rotation x MAP)
- Complete mapping for PWM control with 1300 setpoints (Table 50x26), which can activate variable command (VTI), progressive nitro and/or Boost PWM;
- Injection and ignition correction by engine temperature and air temperature with an adjustable 11-point scale;
- Ignition and injection correction by TPS;
- Ignition and injection correction by MAP;
- Quick injection adjustment for Bench A or Bench B;
- Quick adjustment of full ignition;
- Quick injection;
- Fuel Delivery Function;
- Injection correction by battery tension;
- Injection correction after start;

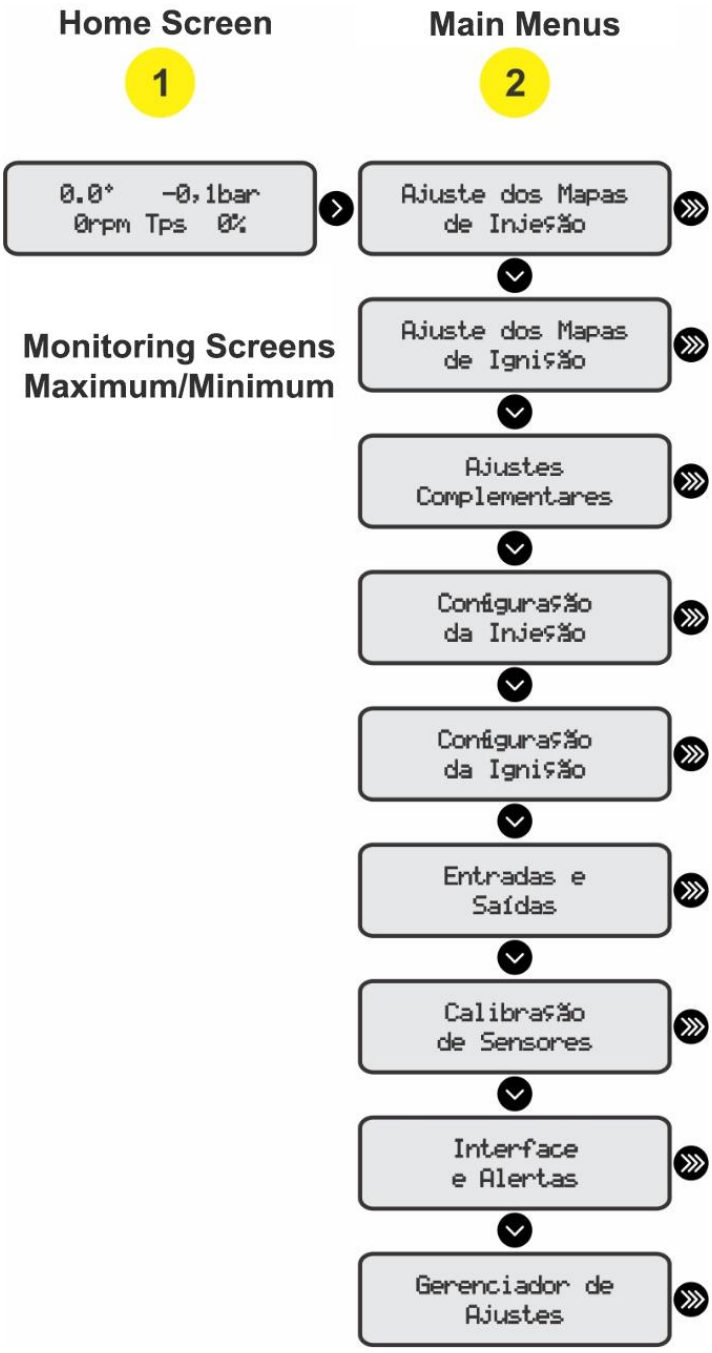
- Ignition point map for idle speed;
- Injection and ignition map for engine starting;
- Two-speed electro-fan control by engine temperature and fuel enrichment;
- Timed fuel pump control;
- 3-stage Boost control with activation by button, time or RPM;
- Configuration for air conditioning compressor activation;
- Burnout function with enrichment and point delay;
- Two-step function with enrichment and point delay;
- Starting control by rotation and time;
- Fuel cut on deceleration (*cut-off*);
- Rotation limiter by ignition, ignition and fuel or only fuel;
- Active torque control for start-up by time, unlocking, RPM variation or gear change.
- Point delay and fuel enrichment for nitro;
- Visual warnings for excess speed, pressure, engine temperature, excess injector opening and engine shutdown for minimum oil pressure (using SPI sensor 10/13/17);
- Anti-Lag for turbo;
- Output for Shift-Light;
- Led with configurable Alert functions.

## 4. MODULE DIMENSIONS: 126mm x 86mm x 26mm


## 5. S4500 KEYBOARD



## 6. VIEWING OF THE S4500 MAIN MENUS




## 7. TIPS BEFORE THE INSTALLATION

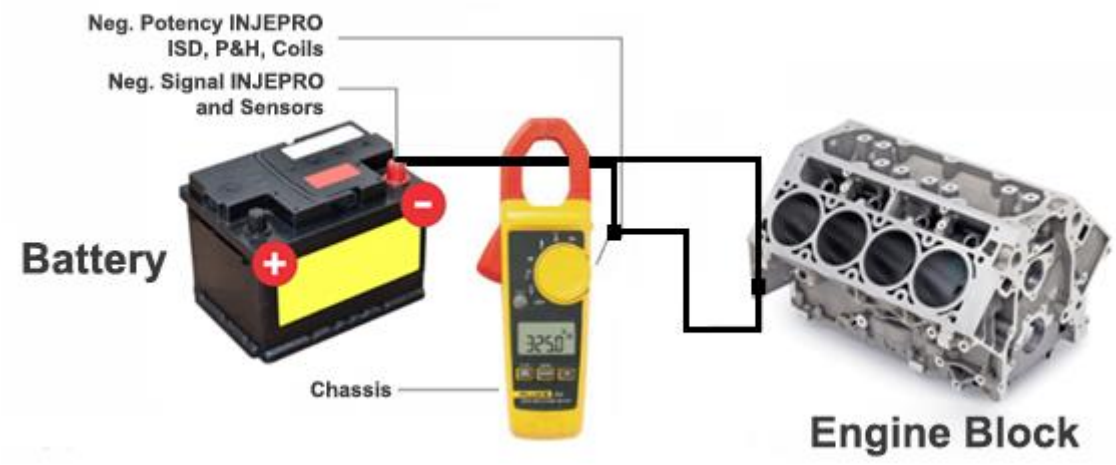
1. Choose a good location to accommodate the INJEPRO S4500 power station preferably in the vehicle, avoiding humidity, excessive heat, and dirt;
2. Never pass the whip next to spark plug wires, coils, alternators, speakers, and sources that may cause electrical noise;
3. Always place protection for power whips, such as corrugated cover and retractable heat tube for wires;
4. All wires must be soldered and insulated with retractable heat tube;

5. Check that the engine grounding cable is securely connected and free from bad contact;
6. Use good quality sensors and components for correct operation of the INJEPRO S4500;
7. Use only spark plugs and resistive spark plug wires that equip original injected cars;
8. The power whip must have special attention because it is one of the main causes of problems in the operation of the engine.

## 8. GROUNDING

The grounding of the Injepro module as well as the chassis and engine of the vehicle are extremely important. To facilitate the formatting and arrangement of the cables as well as their gauges we create tables with voltage and current references where the objective is to have the best use of the module and to size the gauge according to its design. If you do not have the technical specifications of your starter engine or the total current consumption of the components you can use a Pliers Ammeter to make this measurement, just place the clamp transforming involving the cable and start with all the components actuated, in this way it is possible to identify the total current consumption and apply the correct gauge by following the tables below.

Example of current measurement using an ammeter.




Must consider the total current consumption at startup and not only of the starter engine.

**Table A:**

Considered values:
Battery voltage 12V
Battery voltage at start 10V
Conductor Resistivity 1 ,72E-008 Ω.m
**Voltage drop Maximum on the cable 2.00%**
Maximum Cable Length 1 meter

| Cable Area | Cable Current |
|---|---|
| 25 mm² | Up to 250 A |
| 35 mm² | Up to 400 A |
| 50 mm² | Up to 550 A |
| 70 mm² | Up to 800 A |
| 95 mm² | Up to 1000 A |

**Table B:**

Considered Values:
Battery voltage 16V
Battery voltage at start 14V
Conductor Resistivity 1,72E-008 Ω.m
**Voltage drop Maximum on the cable 2.00%**
Maximum Cable Length 1 meter

| Cable Area | Cable Current |
|---|---|
| 16 mm² | Up to 250 A |
| 25 mm² | Up to 400 A |
| 35 mm² | Up to 550 A |
| 50 mm² | Up to 800 A |
| 70 mm² | Up to 1000 A |

Batteries with average distances of 4 meters:

**Table C:**

Considered Values:
Battery voltage 12V
Battery voltage at start 10V

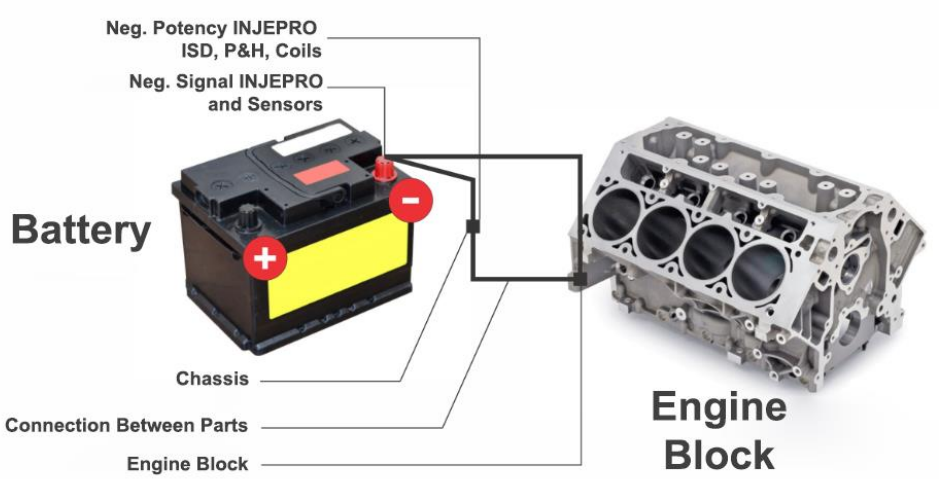
Conductor Resistivity 1,72E-008 Ω.m
**Voltage drop Maximum on the cable 5.00%**
Cable Length 4 meters

| Cable Area | Cable Current |
|---|---|
| 35 mm² | Up to 250 A |
| 50 mm² | Up to 350 A |
| 70 mm² | Up to 500 A |
| 95 mm² | Up to 650 A |
| 120 mm² | Up to 850 A |
| 150 mm² | Up to 1000 A |

**Table D:**
Considered Values:
Battery voltage 16v
Battery voltage at start 14v
Conductor Resistivity 1,72E-008 Ω.m
**Voltage drop Maximum on the cable 5,00 %**
Cable Length 4 meters

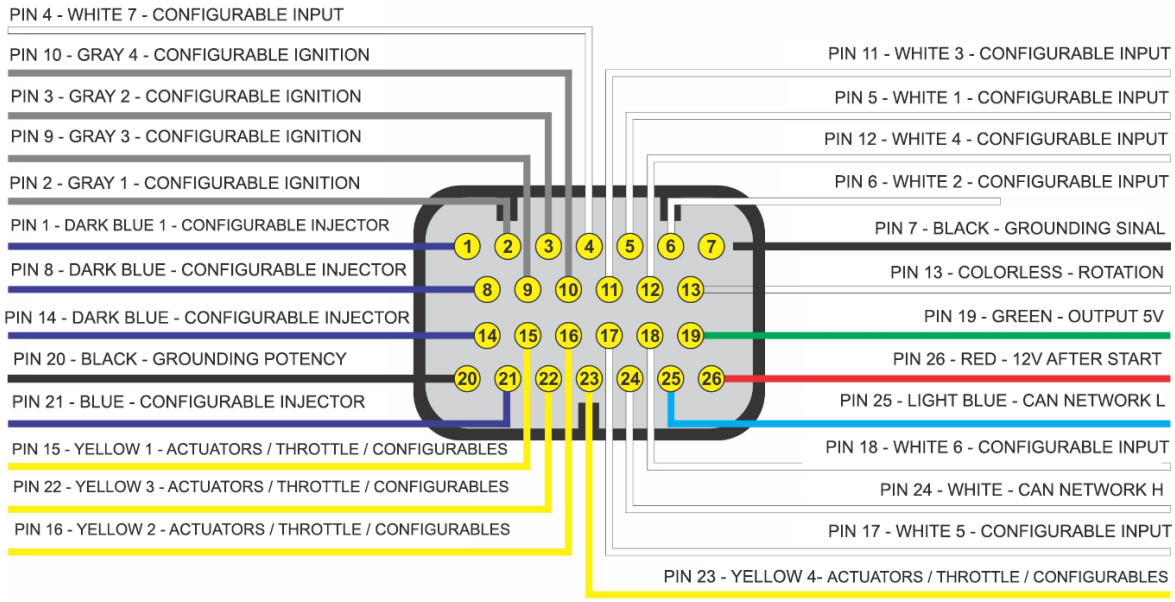
| Cable Area | Cable Current |
|---|---|
| 25 mm² | Up to 250 A |
| 35 mm² | Up to 350 A |
| 50 mm² | Up to 500 A |
| 70 mm² | Up to 700 A |
| 95 mm² | Up to 950 A |
| 120 mm² | Up to 1000 A |

The arrangement of the cables, as well as the location of the grounding points, must be as the image below:




## 9. ELECTRICAL CONNECTIONS

### 9.1. Rear View of 26-Way Connector




### 9.2. Default 26-way connector input configuration table

| Pin | Wire Color | Gauge | Function |
|---|---|---|---|
| 1 | Dark Blue 1 | 0,75 | Injector/Configurable |
| 2 | Gray 1 | 0,5 | Ignition/Configurable |
| 3 | Gray 2 | 0,5 | Ignition/Configurable |
| 4 | White 7 | 0,5 | Configurable Input |
| 5 | White 1 | 0,5 | Configurable Input |
| 6 | White 2 | 0,5 | Configurable Input |

| | | | |
|---|---|---|---|
| 7 | Black | 0,5 | Signal Ground |
| 8 | Dark Blue 2 | 0,75 | Injector/Configurable |
| 9 | Gray 3 | 0,5 | Ignition/Configurable |
| 10 | Gray 4 | 0,5 | Ignition/Configurable |
| 11 | White 3 | 0,5 | Configurable Input |
| 12 | White 4 | 0,5 | Configurable Input |
| 13 | Colorless | 0,5 | Rotation |
| 14 | Dark Blue 3 | 0,75 | Injector/Configurable |
| 15 | Yellow 1 | 0,75 | Throttle/Actuator/Configurable |
| 16 | Yellow 2 | 0,75 | Throttle/Actuator/Configurable |
| 17 | White 5 | 0,5 | Configurable Input |
| 18 | White 6 | 0,5 | Configurable Input |
| 19 | Green | 0,5 | 5V Output |
| 20 | Black | 1 | Power Ground |
| 21 | Dark Blue 4 | 0,75 | Injector/Configurable |
| 22 | Yellow 3 | 0,75 | Throttle/Actuator/Configurable |
| 23 | Yellow 4 | 0,75 | Throttle/Actuator/Configurable |
| 24 | White | 0,5 | CAN NETWORK H |
| 25 | Dark Blue | 0,5 | CAN NETWORK L |
| 26 | Red | 0,5 | 12 V After start |

The power supply of the INJEPRO S4500 module is made through 3 wires, with 1 positive after start, 1 power ground, and 1 signal ground.

### 9.3. Red Wire – Positive After start

The pin 26 is responsible for powering the control panel. Install a power relay of at least 30A for this connection. The positive powering relay pin 30, must come directly from the positive battery pole. In this same relay can be connected sensors using 12V power and other modules like WB-METER, EGT-METER, EBC-PRO, EGS-PRO, PEAK & HOLD, and Dash Pro.

### 9.4. Thick Black Wire – Power Ground

Pin 20 (black wire 1mm) is the power ground and must be connected directly to the chassis or engine block, do not connect the power grounds to the negative of the battery, they must be separated and connected to the chassis or in the engine block. It is very important that this ground has good electrical contact with the body/block; along with them can be connected the coil grounds that have integrated module, ISD, and PEAK & HOLD module grounds, probe heating and relay negative.

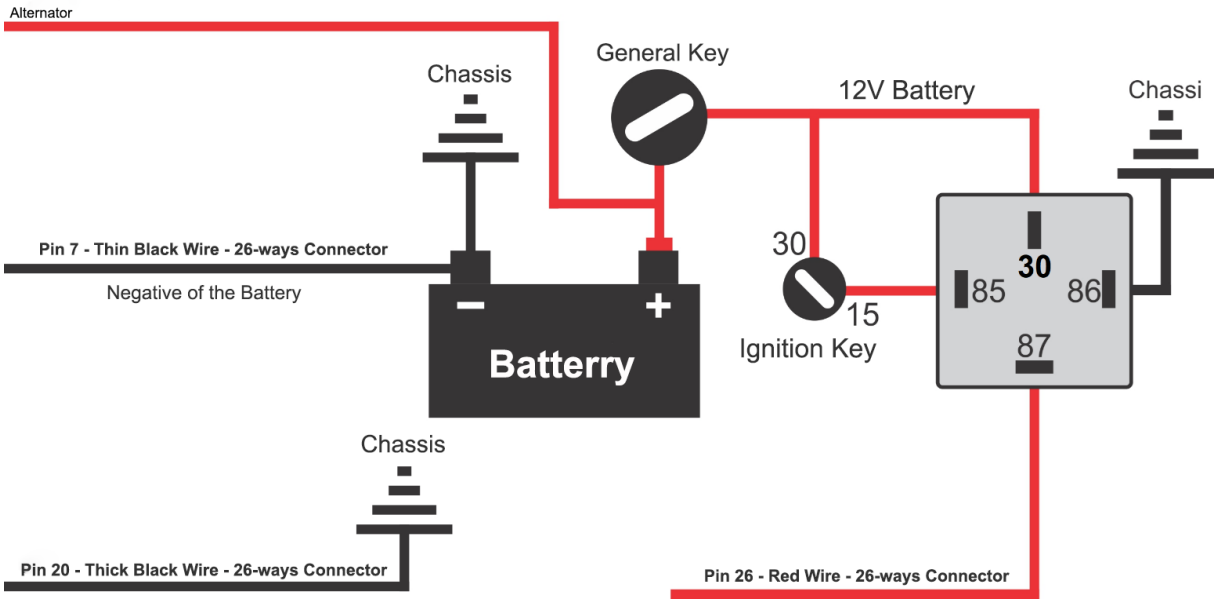
### 9.5. Black Wire – Signal Ground

Pin 7 (Black Wire 0.50mm) is the signal ground and must be connected directly to the negative pole of the battery, along with it must be connected all sensors negative such as engine temperature, air temperature, TPS, pressure sensors, probe signal negative, among others. Never connect this ground in the chassis or engine block.

**Note:** The S4500 features protection against reverse polarity power.

### 9.6. Master Key

For competition cars or others that use the master key, it is very important that the key turns off the POSITIVE of the battery and NEVER the negative. Any electronic equipment must have its power interrupted through the positive. Disconnection made through the ground can cause irreparable damage to the equipment or failure/interference problems when operating. The negative of the battery must be connected directly to the chassis through a common braided mesh, easily found in stores in the auto industry, this mesh helps to take off the noise that may cause interference in electronic equipment. Right below has a figure that shows how the power supply wires and the master key wires must be connected.

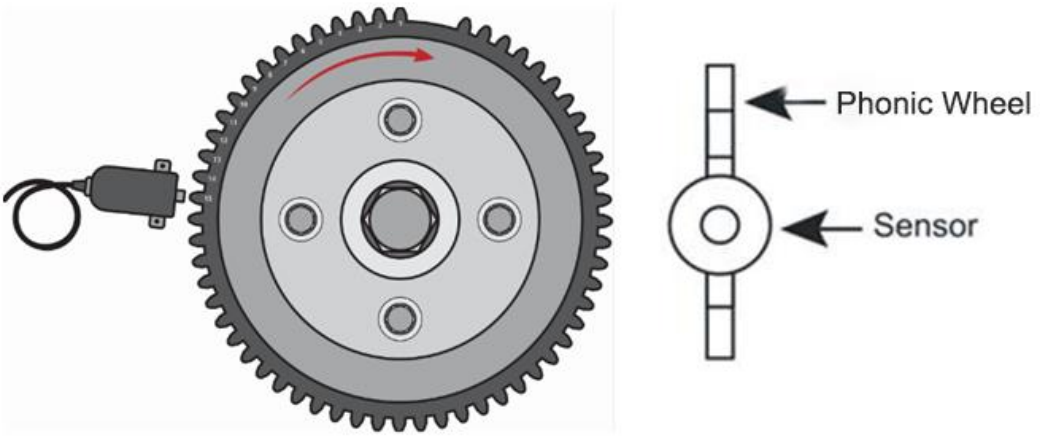



## 10. INSTALLATIONS AND ADJUSTMENTS FOR PHONICAL WHEEL OR DISTRIBUTOR

### 10.1. Rotation Sensor

This is the main sensor for engine operation. It tells INJEPRO the angular position of the crankshaft so that the S4500 calculates the ignition and injection parameters and accurately applies the values defined on the map to the engine.

There are rotation sensors of inductive type or hall type.



### 10.2. Inductive Sensor

The inductive sensors generate a sine wave signal that varies according to the engine rotation. The signal strength varies depending on the mounting distance from the sensor to the teeth of the phonic wheel, so in some cases, it will be necessary to move closer or further the phonic sensor when appearing errors in the signal reading at the start or at high rotations. It is also possible to operate on the signal edge of the rotation sensor (rising or falling edge). The vast majority of the inductive type sensors with phonic wheel are aligned on the falling edge. In addition to this configuration, it is possible to operate on the sensor sensitivity with the level 1 sensitivity meaning lower, and level 4 sensitivity meaning higher, and this level of sensitivity is related to the number of failure teeth: how much larger is the fault, lower is the sensitivity. We also can set the reference voltage for the sensor, this allows the sharing of original injection rotation signal, where we can measure the reference voltage used in the rotation sensor and adjust the reading voltage of this signal. For directly sensor connection on S4500 is recommended a 0,2V reference.

You can find the inductive sensor on most original cars with 60-2 and 36-1 phonic wheels and can be 2 or 3 wires. If you have a 2-wire sensor, connect the red wire (shielded cable) to the pin 1 and the white wire (shielded cable) to the pin 2. If you do not collect the rotation signal, change the red wire to the white wire. And when you have a 3-wire sensor, 2 pins of it are enough for it works because the third pin is just an insulation mesh. Discover the level connection sensor using a multimeter, adjusting it to measure resistance in the 20K scale, and put a ferrule on the middle pin and the other on the corner pin. You must connect the red wire to the pin marking resistance with the middle pin, and connect the white wire (signal) to the middle pin. Connect the negative of the battery or the insulation mesh of the shielded cable to the remaining pin. If the sensor has 3 wires and does not show any resistance between the pins, it may be burnt or be the hall type.

### 10.3. Hall Sensor

The hall-type sensors generate a square wave signal according to the size of the phonic wheel teeth and its intensity does not vary with engine rotation. This type of sensor is recommended for phonic wheels with few teeth or with a very small diameter, it necessarily has 3 wires and needs external power, so one pin will be the 5v or 12v positive. The other negative of the battery and the third pin is the signal. To

measure the hall connection use a multimeter on the diode and put the pins in all the possible positions. When you find a position which the multimeter marks roughly 0,700v, the red ferrule's pin will be the negative of the battery, and the black ferrule's pin will be the signal, the third pin will receive 5v or 12v power.

The inductive or hall rotation sensor approximation must stay between 0,6mm to 1,2mm.

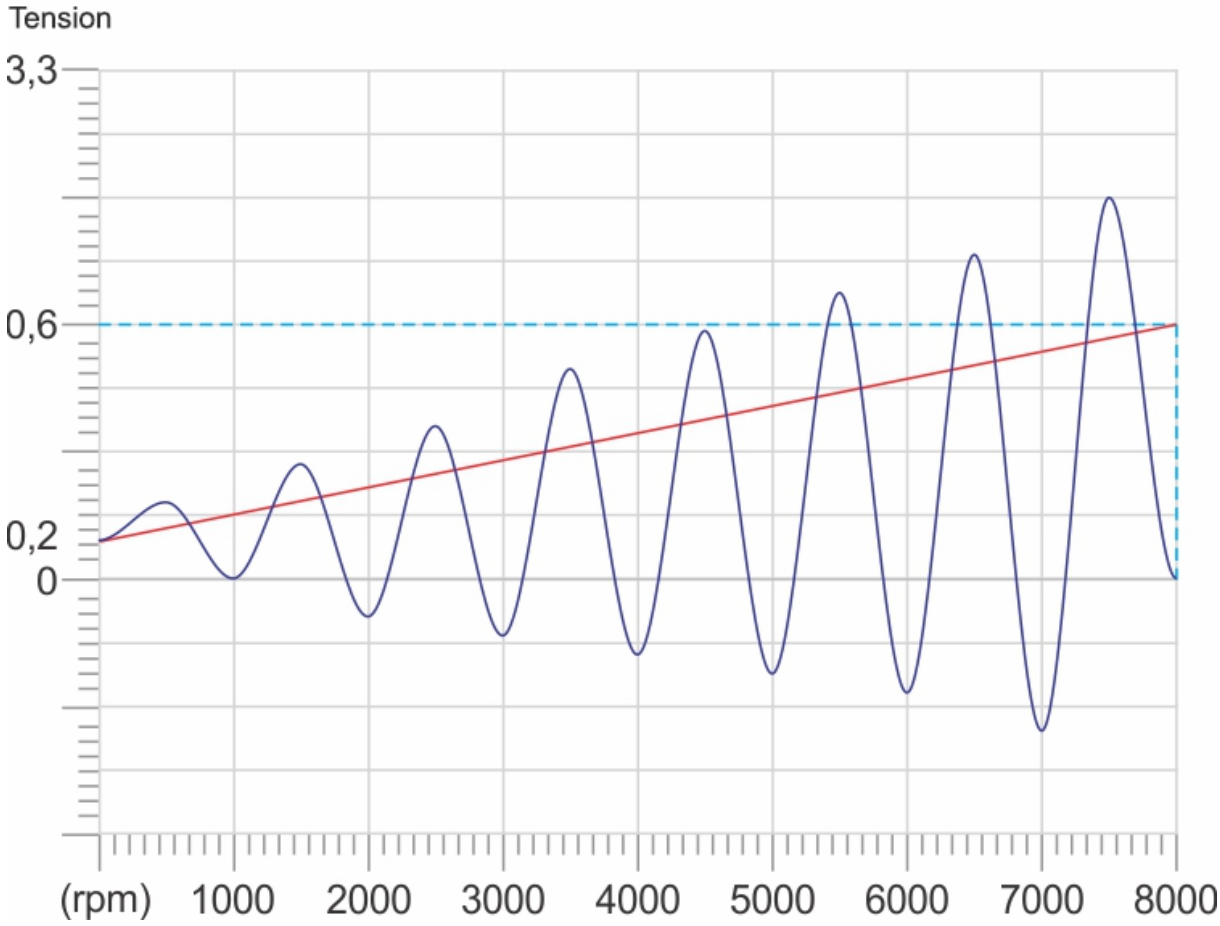
### 10.4. Reference Tension

This tension is the signal reference for the sensor reading. With these adjustments we can vary this tension according to the rpm, making possible to eliminate failures related to the sensor wave increase or even phonic wheel anomalies.

Reference Tension (Low RPM): This tension is related to the beginning of the rotation. If you been using an inductive sensor, must configure it closer to 0,2V. Otherwise, if you been using a hall sensor powered with 5V, configure it to 2,0V. In case of the hall powered with 12V, configure it to 2,5V. These values can vary according to the rotation sensor and its characteristics.

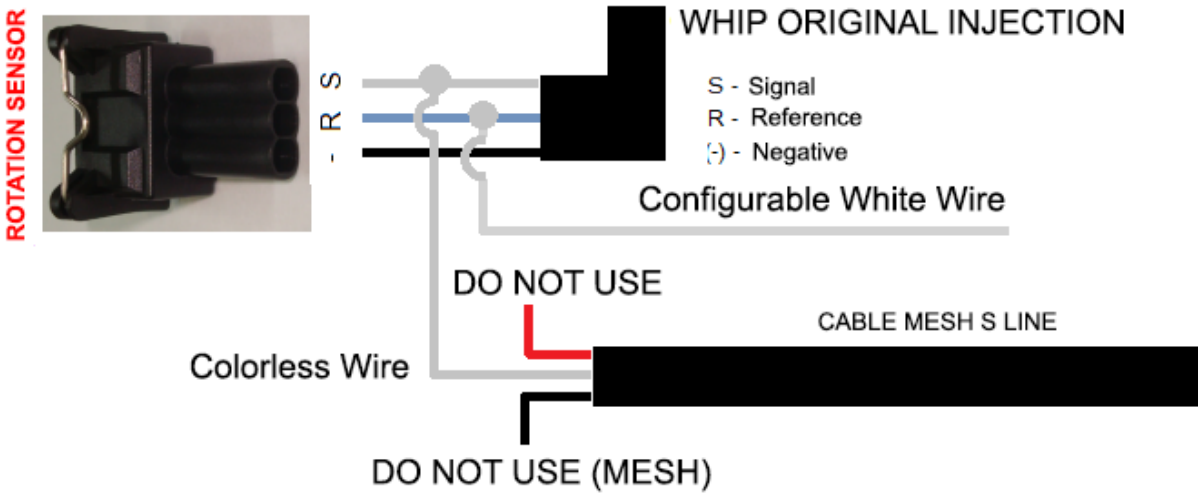
Reference Tension (High RPM): We know that with the rpm increase the sine waves of the inductive sensor increase considerably, so we should also increase the reference tension following its progression. If you been using an inductive sensor, use the final reference tension 0,6V. Otherwise, if you been using a hall sensor powered with 5V, the final reference tension must be closer to 2,5V, and for a hall sensor powered with 12V, the final reference tension must be closer to 3V. As the Low RPM tension, these values can also vary according to the final rpm, phonic wheel or sensor characteristics.

Example of a sine wave of an inductive sensor and low and high reference tensions.




### 10.5. Shared Rotation Sensor

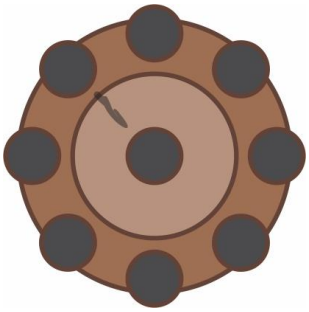
When we need to make a signal rotation sharing we should configure one of the white inputs as an "RPM Reference" and then connect this wire to the signal reference of the original sensor. The colorless wire of the Injection shielded cable must be connected to the signal wire of the rotation sensor. When we use this option the "Reference Tension (Low RPM)" and "Reference Tension (High RPM)" is ignored. A example of this connection is shown in the picture below.



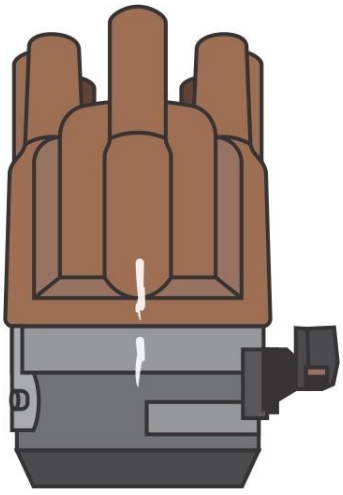

### 10.6. Distributor Adjustment

With the objective of generating better performance and operation, INJEPRO recommends for engines above 4 cylinders, with distributor, the following orientations:

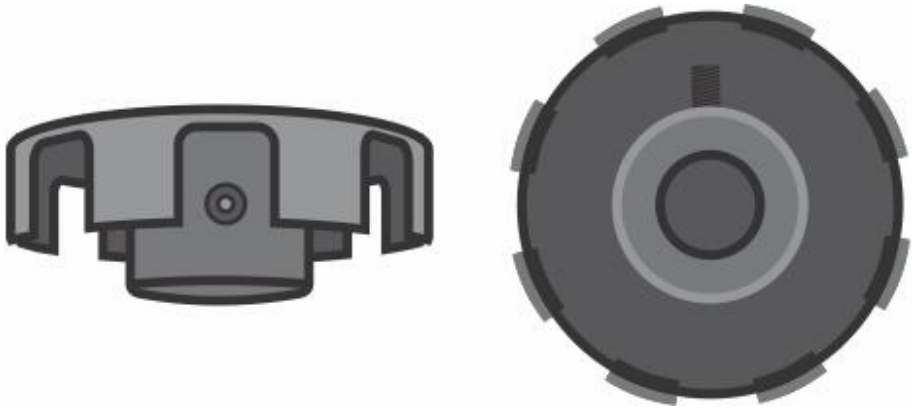
1. Put the engine into TDC (top dead center)
2. Check wich borne is responsible for sending power to the cylinder 1



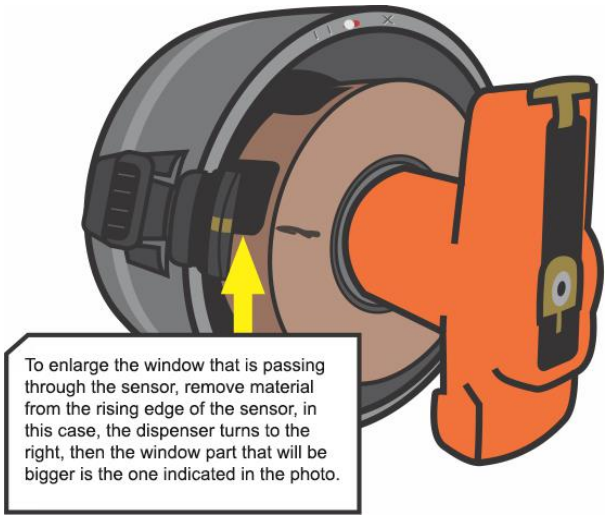
3. Mark that borne and distributor bodywork



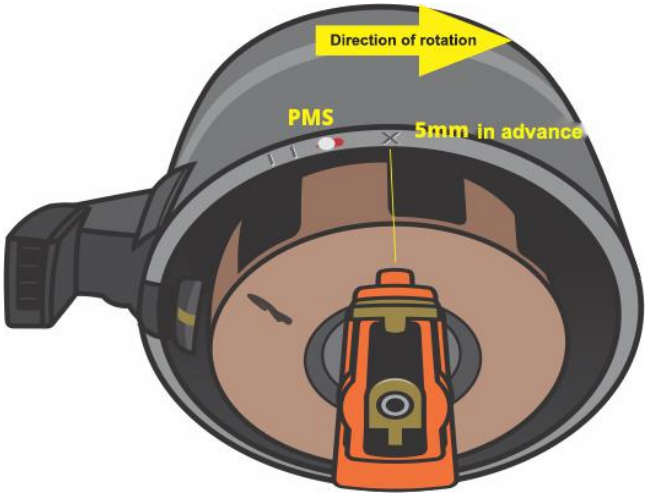
4. Unmount the distributor and create a mobile table relative to the distributor axis, this will allow the ideal adjustment of the ignition point without change the distributor position and the rotor position relative to the distributor cover.



5. Alignment of the table relative to the sensor is very important. This joint is responsible for engine ignition point and fuel injection in the right moment, so is necessary that this "window" is on average 1mm greater than one of the other sides for the module has TDC reference of cylinder 01. (Choose the side that will pass through the sensor to remove material).




6. Considering that this distributor spins to the right, is necessary to arrange all the parts to point the rotor on average 5mm ahead relative to TDC mark, as shown in the picture above. Considering that this distributor spins to the right, is necessary to arrange all the parts to point the rotor on average 5mm ahead relative to TDC mark, as shown in the picture above. This arrangement is important because when the engine is in high rotations, usually the ignition point map of the module is ahead, so when the module fire sparks the rotor will be before the TDC, thus have a high possibility to the spark fall on the previous cylinder, because this cylinder does not have compression. Moreover, the spark always looks for the easier route.




7. When everything is arranged and fixed, mount the distributor on the engine.

**Note:** Whenever you move or remove the distributor position, you must calibrate the point. You can find this adjustment on the "Sensor Calibration" section.

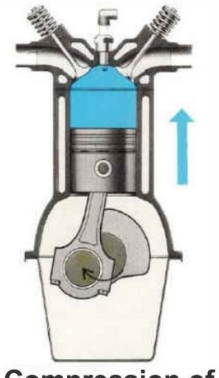
### 10.7. Connection Table of the most used Rotation Sensors

| Sensor | Utilization | Type | Shielded Cable Connection S4500 |
|---|---|---|---|
| FIAT/Magneti Marelli 3-wires | Uno, Palio, Siena 1.0, Strada | Inductive | Pin 1: White Wire<br>Pin 2: Red Wire<br>Pin 3: Shielded Cable Mesh |
| GM/VW/FIAT Bosch 3-wires | Astra, Calibra, Corsa 8V MPFI, Golf, Marea 5-cylinder, Omega 2.0, 2.2 and 4.1, S10 2.2, Silverado 4.1, Vectra, Passat | Inductive | Pin 1: White Wire<br>Pin 2: Red Wire<br>Pin 3: Shielded Cable Mesh |
| VW/Audi 20V Bosch 3-wires | A3 1.8 20V, Bora 2.0, Golf 1.6, Golf 1.8 20V | Inductive | Pin 1: Shielded Cable Mesh<br>Pin 2: White Wire<br>Pin 3: Red Wire |
| Ford 2-wires | Ka, Fiesta, Focus Zetec, Ranger V6 | Inductive | Pin 1: Red Wire<br>Pin 2: White Wire |

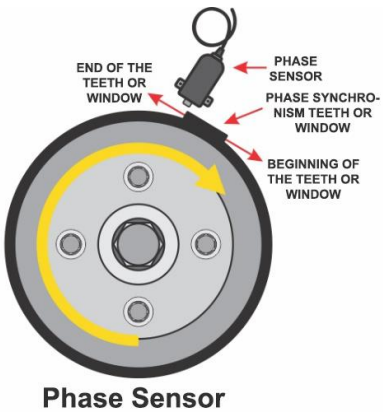
| | | | |
|---|---|---|---|
| Siemens 2-wires | Clio, Megane, Scenic | Inductive | Pin 1: Red Wire<br>Pin 2: White Wire |
| VW/Total Flex | AP Power/Flex, GTI 16V | Hall | Pin 1: 5 or 12 Volts<br>Pin 2: White Wire<br>Pin 3: Shielded Cable Mesh |
| FIAT/E-Torq 1.8 16V | Bravo, Strada, Palio Sporting | Hall | Pin 1: Shielded Cable Mesh<br>Pin 2: White Wire<br>Pin 3: 5 or 12 Volts |
| Dense | Honda Civic Si | Hall | Pin 1: 5 or 12 Volts<br>Pin 2: Shielded Cable Mesh<br>Pin 3: White Wire |

### 10.8. Phase Sensor

This sensor informs the TDC cylinder 1 to the S4500 (at the moment cylinder 1 is in bursting) to timing the drive outputs of both ignition and injection. Is required the use of the phase sensor when using the ignition in sequential mode. The installation of the phase sensor must be made on valve control or adjusted on the distributor where a complete cycle is concluded with two rounds on the crankshaft. The position of the sensor relative to the phonic wheel can be configured in two ways: If the phase is positioned in the round where the explosion is in cylinder 1 must be set to 0 to 360 degrees in the menu, if it is on the next round set to 361 to 720 degrees.



Compression of First Cylinder




Phase Sensor Position

### 10.9. Connection Table of the most used Phase Sensors

| Sensor | Utilization | Type | Connector Connection |
|---|---|---|---|
| Audi/VW 3 fios | All of Audi/VW 1.8 20V | Hall | Pin 1: 5 Volts<br>Pin 2: White/Red Wire<br>Pin 3: Negative of the Battery |
| Bosch 3-wires | Astra 16V, Calibra, Citroen 2.0, Marea 5-cylinder, Omega 4.1, Peugeot 306 2.0 16V, Vectra GSI | Hall | Pino 1: 5 Volts<br>Pino 2: White/Red Wire<br>Pino 3: Negative of the Battery |
| FIAT/E-Torq 1.8 16V | Bravo, Strada, Palio Sporting | Hall | Pino 1: Negative of the Battery<br>Pino 2: White/Red Wire<br>Pino 3: 5 Volts |
| Dense | Honda Civic Si | Hall | Pino 1: 5 Volts<br>Pino 2: Negative of the Battery<br>Pino 3: White/Red Wire |
| EA 111 | Gol G5, Saveiro G5 | Hall | Pino 1: 12 Volts<br>Pino 2: White/Red Wire<br>Pino 3: Negative of the Battery |

**Note:** The sensor used in the S4500 for phase should be hall-type. It is not possible to use an inductive sensor to this function.

### 10.10. Engine Temperature Sensor

This sensor informs the S4500 the engine temperature. It is of the utmost importance to that the injections and ignition corrections are made in all the engine temperature ranges, mainly cold. It is very important for cold/hot engine starting settings. The installation of the sensor must be made at the water output from the

cylinder head to the radiator, preferably at the original sensor in injected cars; or panel temperature on older cars. In engines air cooled or those what do not use water, it must be installed in the engine oil.

We recommend the sensors of the Fiat/VW line. (3,3 ohms at 20 degrees).

Codes:
VW/FIAT: 026.906.161.12 – MTE: 4053 – IG: 802


**10.11. Air Temperature Sensor**

This sensor informs the air temperature to the S4500. The use of it is optional and is useful to make corrections on the injection and ignition according to the admitted air temperature. For turbocharged engines, the installation must be done at the intake or in the pressurization. Engines Aspirated installation must be done on admission or near to TBI.

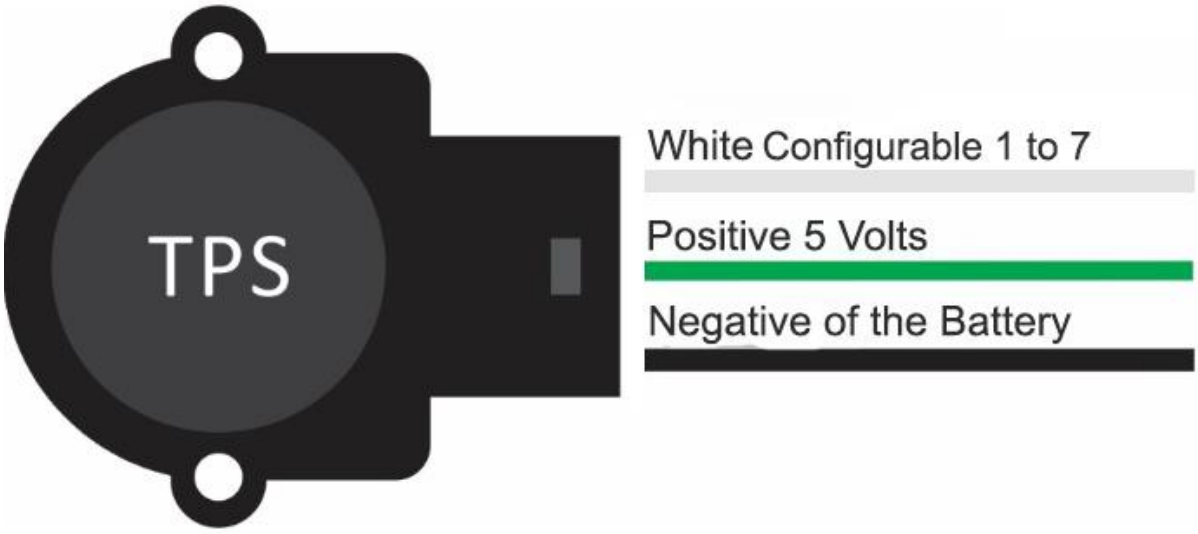
We recommend the sensors of Fiat line. (3,3 ohms at 20 degrees).

Codes:
FIAT: 75.479.76 – MTE: 5053 – IG: 901

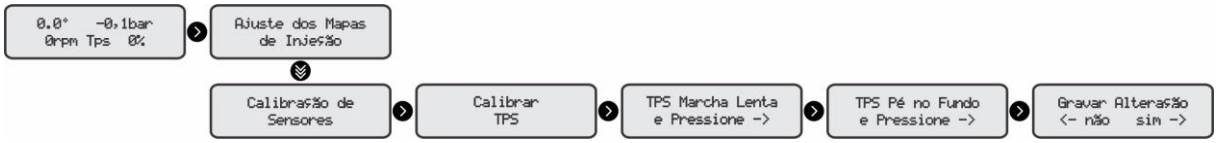

**10.12. Throttle Position Sensor (TPS)**

This sensor informs S4500 the position of the throttle relative to the gas pedal. The use of it is of extreme importance when the main injection map is by TPS. In configurations where the main map is by MAP, the use of it becomes optional

being useful only for idle corrections, fuel cut in deceleration, among others. We recommend using the original sensor that accompanies the throttle housing by of its fixation and proper course to the TBI model. In cases of adaptation, it is recommended to use the model that best fits the flap shaft. When the sensor is screwed on, it is ideal that in the idle position (TPS 0%) there is already a "precharge" in the sensor course, and when accelerating (TPS 100%) the sensor must not stop; this initial "precharge" is a prevention against oscillations in the sensor reading at the beginning of the pedal course (at the idle output) and the final clearance to prevent sensor damages.



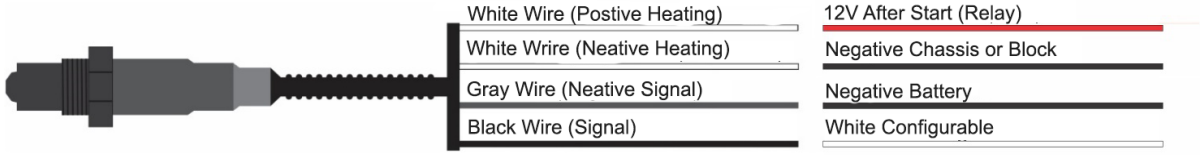

The S4500 accepts any linear analog TPS sensor model. All sensor models have 3 wires (Power Supply 5 Volts, Signal and Negative). It is important that the sensor connection is made according to the manufacturer's specification. The correct connection and calibration allow the user to define the idle (TPS 0%) and the acceleration (TPS 100%). However, if you do not have the manufacturer's specification we will help you with that. To configure it, leave the TPS sensor whip disconnected, settle the multimeter to measure resistance in the 20K range, and look for two sensor pins where idling until maximum acceleration resistance does not vary. (These pins will be positive and negative sensor power). Then measure the resistance between the remaining pin and the power supply pins one at a time, the pin that has the greatest resistance at idle will be positive of the power supply, and the third remaining pin will be the signal.




## 10.13. Narrowband Lambda Probe

This sensor informs INJEPRO the Air/Fuel ratio that results from the gases burnt on the exhaust. The signal of this probe type is measured in millivolts and can be directly connected on S4500 through one of the configurable white wires. It is very important to configure the main map and correct the injection, and once the best configuration is defined the user can enable the probe automatic correction and define values in millivolts from the S4500 table, to seek the best configuration in any condition of Charge X RPM. We recommend the utilization of a planar probe used in Flex original vehicles:

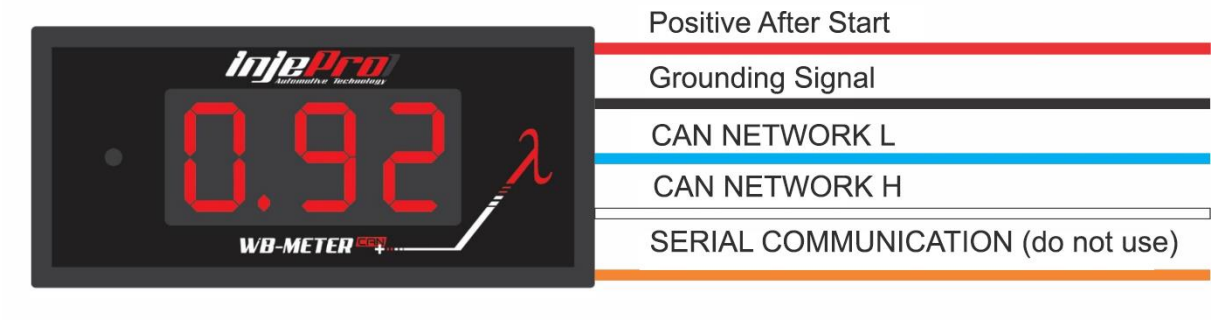
Codes:
Bosch código 0258010011 - NTK código OZA532-V1 - VW código 03090626Rz




## 10.14. Wideband Lambda Probe

This sensor informs S4500 the Air/Fuel ratio that results from the gases burnt on the exhaust. To manage the wideband lambda probe is necessary to use the external conditioner WB-METER. It will inform S4500 of the lambda value relative to the mix. The communication between WB-METER and S4500 must be done only through CAN NETWORK. The Wideband Probe is very important to configure the main map and correct the injection, and once the best configuration is defined the user can enable the probe automatic correction and define values in lambda from the S4500 table, to seek the best configuration in any condition of Charge X RPM.

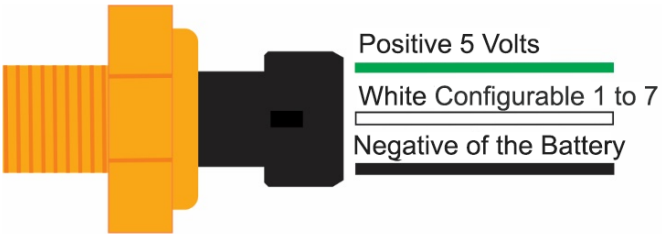
We recommend using the Bosch LSU 4.2 probe
Code: 0 258 007 351

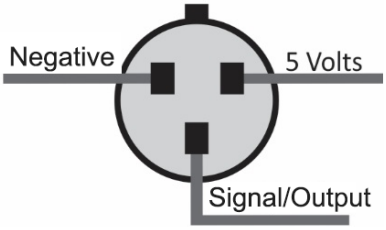



### 10.15. Pressure Sensor SPI-17, SPI-14 and SPI-10

These linear pressure sensors inform INJEPRO of oil pressure, fuel, water, exhaust back pressure, among others. The number beside the SPI refers to the maximum pressure of each sensor in BAR. Usually, it is installed for monitoring S4500 data logger and for security too. In the settings menu is possible to program a minimum oil pressure for engine shutdown, in case the oil pressure stays into a level under the programmed the engine immediately turn off, and to turn on again is necessary to reboot the ignition. The power supply of it is 5V and came through the negative of the battery. The signal must be connected in one of the 6 white inputs and manually configured.

SPI sensors 10,14 and 17 are already calibrated on S4500. If you choose to use another pressure sensor, it is necessary to inform the voltage and the initial and final pressure of the sensor, as well as the voltage. This option is available in the Software.

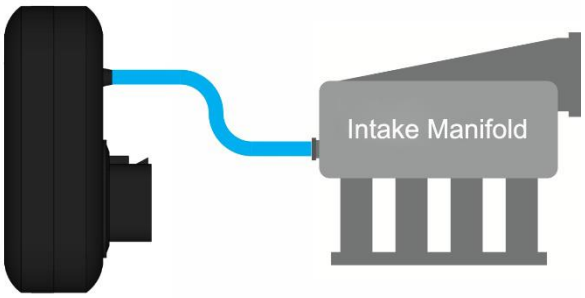



### 10.16. Integrated MAP sensor

This sensor informs INJEPRO of the absolute pressure in the intake manifold. The reading of vacuum/pressure is made by a hose that must be connected to intake manifold between TBI and the head, preferentially away from the throttle valve for the reading be precise with the engine charge. The vacuum/pressure line should not be shared with valves or clocks. We recommend the use of a PU type

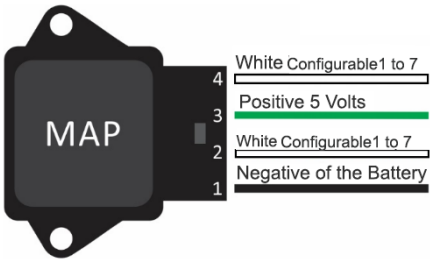
hose with 6mm external and 4mm internal and the less as possible length to avoid reading mistakes on the sensor response. When using a multiple throttle valve system is necessary to interconnect all cylinders to have a correct and no variations reading.




### 10.17. External MAP Sensor

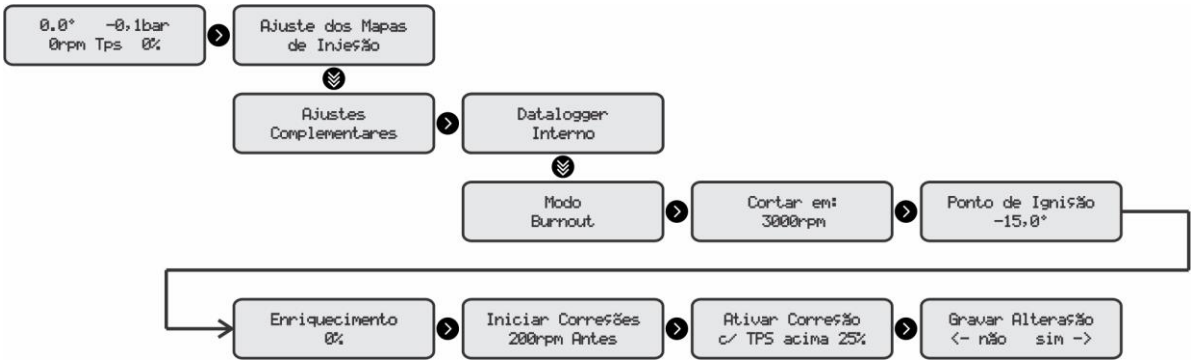
On aspirated engines that use original intake manifold, is possible to use the signal of the MAP sensor fixed on the intake. The signal of the original MAP can be connected to any of the 7 configurable inputs (white 1 to 7) and when the input is configured with an external MAP, the integrated MAP is ignored. After switch on and configure the input is necessary to calibrate the sensor for the reading stays on 0,0 BAR with the engine off.

Example of GM / VW MAP sensor connection with integrated air temperature:




## 11. BURNOUT MODE

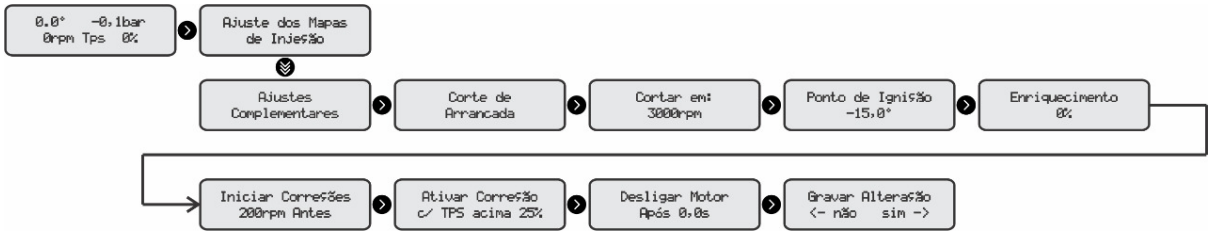
This function has been developed to facilitate the heating of the tires in vehicles that compete in the started mode and works as follows:




- Cut off at: It is the rpm that will limit the spin when the burnout button is pressed
- Ignition Point: This is the point that S4500 will assume
- Enrichment: The S4500 will add this percentage to the main map
- Initiate corrections: It means that before the cutting rpm the corrections can be anticipated
- Activate correction: only above a percentage of TPS is that the corrections will be applied

## 12. TWO-STEP FUNCTION

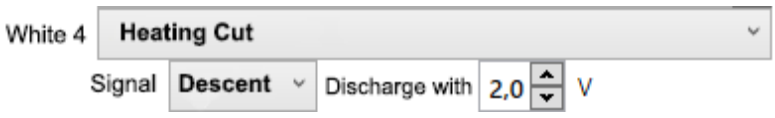
Start-up control is a function used to control the vehicle unlocking at the start moment, increasing the adhesion of the tires with the track. This function is widely used in cars for the sport.




- Cutting rotation when the two step button is pressed
- Ignition point that the S4500 will assume
- Injection correction, the S4500 will add this percentage to the main map
- RPM to initiate corrections, in other words, before the cutting rpm corrections can be anticipated
- Minimum TPS for activation.
- Switch off the engine after a few seconds after the Two-Step.

Previously we mentioned that the S4500 can receive positive or negative digital signal input, for this we must configure the S4500 as Rising if the voltage goes from 0v and it comes close to 12v and Descent if the voltage goes out from 12v and arrives near 0v; we can also configure this voltage as the basis for the drive, so if we have a resistance that makes it impossible for the signal to reach the module correctly this can be corrected.

Example: If the digital signal that should reach S4500 is 0v (descent), but instead is reaching 1,5v, so we can configure the input voltage as 2v so the S4500 understands that if appear a low voltage of 2v, the function will be activated.




## 13. ACTUATORS

### 13.1. Fuel Injectors

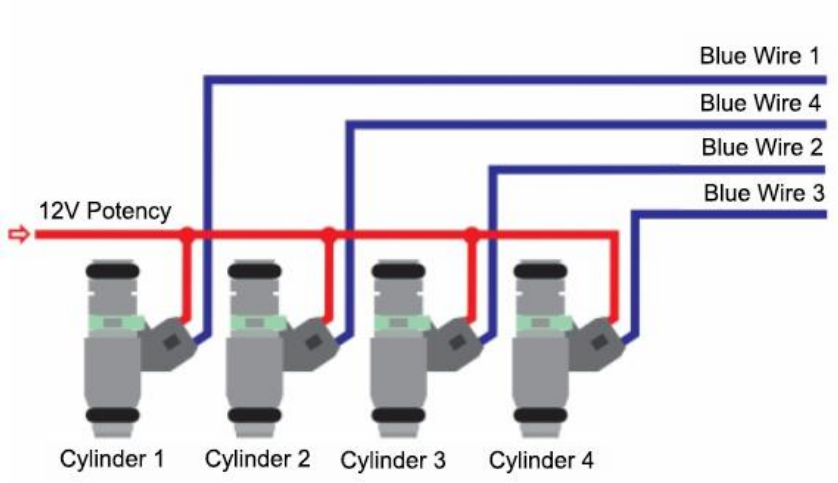
The S4500 has 4 outputs for direct control of injectors. In each of them is possible de turn on up to 6 high impedance injectors (higher than 12 ohms) or 4 of medium impedance (8 to 12 ohms). To turn on a bigger number of high impedance injectors per output or low impedance injectors (2 to 8 ohms) you must use the external module PEAK HOLD.

The outputs are composed of blue wires, numbered from 1 to 4. Is recommended the individual connection of injector to use the sequential injector features and individual corrections per cylinder. Plus, the ignition order should fallow the engine ignition order, example: 4-cylinder engine with ignition order 1-3-4-2: Output 1 cylinder 1, output 2 cylinder 3, output 3 cylinder 4, output 4 cylinder 2. The order of injection pulses and injection mode (Sequential, Semissequential, or All at The Same Time) will be defined in the "Injection Setup" by the user or in S4500 dedicated software.

To use the sequential injection feature, it is necessary that the rotation reading is done by the phonic wheel together with the phase sensor in the command for the synchronism, if the rotation reading is done using the distributor, it must be with the 1st largest window (same system that equips the VW AP Mi). For semi-sequential injection only the phonic wheel or the distributor with the 1st largest window.

### 13.1.1. Example 01 – 4-cylinder Sequential

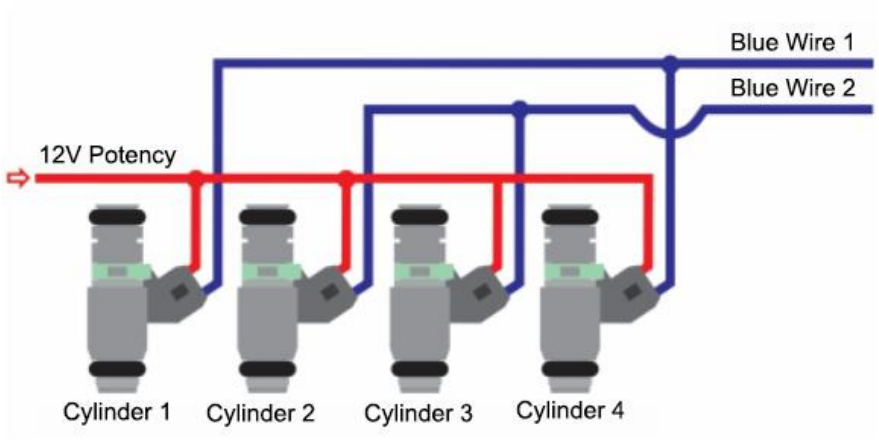
4-cylinder in-line engine (Explosion Order 1-3-4-2) with injectors in sequential mode. The injection outputs are connected according to the explosion order of the cylinders.




Blue Output 1 – Injector A-1 – Cylinder 01
Blue Output 2 – Injector A-2 – Cylinder 03
Blue Output 3 – Injector A-3 – Cylinder 04
Blue Output 4 – Injector A-4 – Cylinder 02

### 13.1.2. Example 02 - 4-cylinders semi-sequential using 2 blue outputs

4-cylinder in-line engine (Explosion Order 1-3-4-2) with injectors in semi-sequential mode using 2 outputs. The output 1 activate the injectors of the pairs 1/4 and the output 2 activate the injectors of the pairs 2/3.

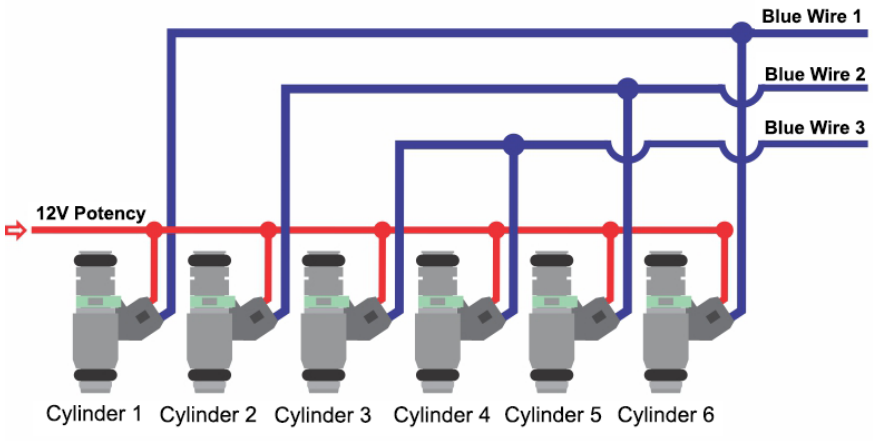



Blue Output 1 – Injector A-1 – Cylinder 01 and 04
Blue Output 2 – Injector A-2 – Cylinder 02 and 03

**Note:** In this configuration the blue wires 03 and 04 can be used for Boost, Nitro PWM, PWM Command or Supplementary Bench.

### 13.1.3. Example 03 - Semi-sequential for 6-cylinders engine

If you choose to install S4500 in a 6 cylinder engine, it is also possible to do it in semi-sequential mode using the 3 injector outputs and connect them at their respective cylinders pairs. The formatting would look like this: A-1 cylinders 1-6, A-2 cylinders 2-5, and A-3 cylinders 3-4.

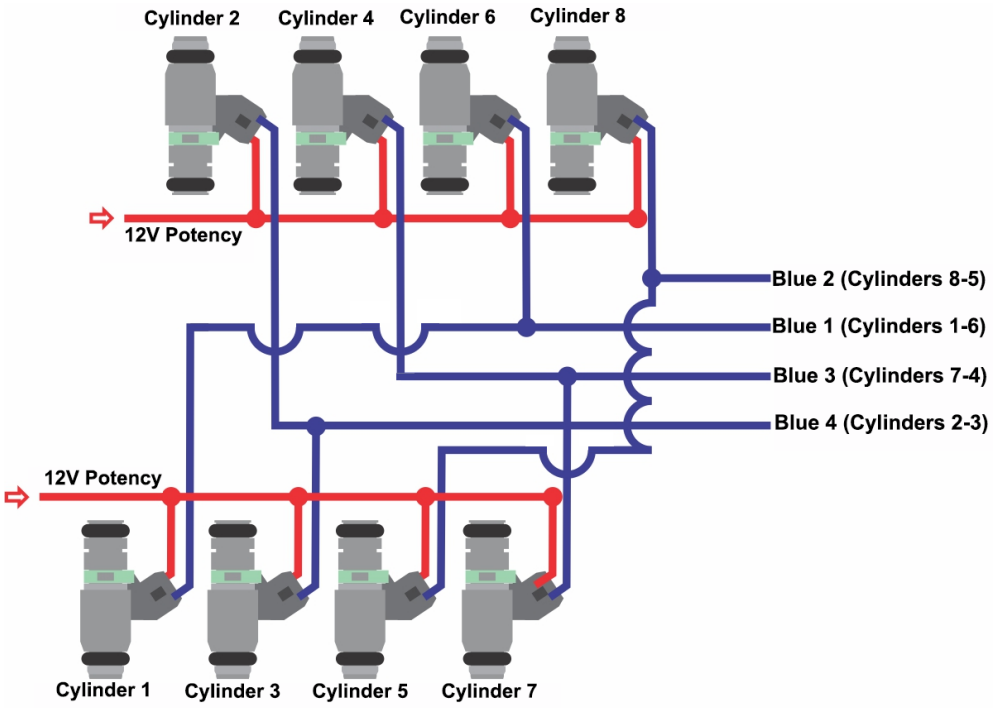



Blue Output 1 – Injector A-1 – Cylinder 01 and 06
Blue Output 2 – Injector A-2 – Cylinder 02 and 05
Blue Output 3 – Injector A-3 – Cylinder 03 and 04

Note: In this configuration the blue wire 04 can be used for Booster, Nitro PWM, PWM Command or Supplementary Bench.

### 13.1.4. Example 04 – Semi-sequential for 8-cylinders engine

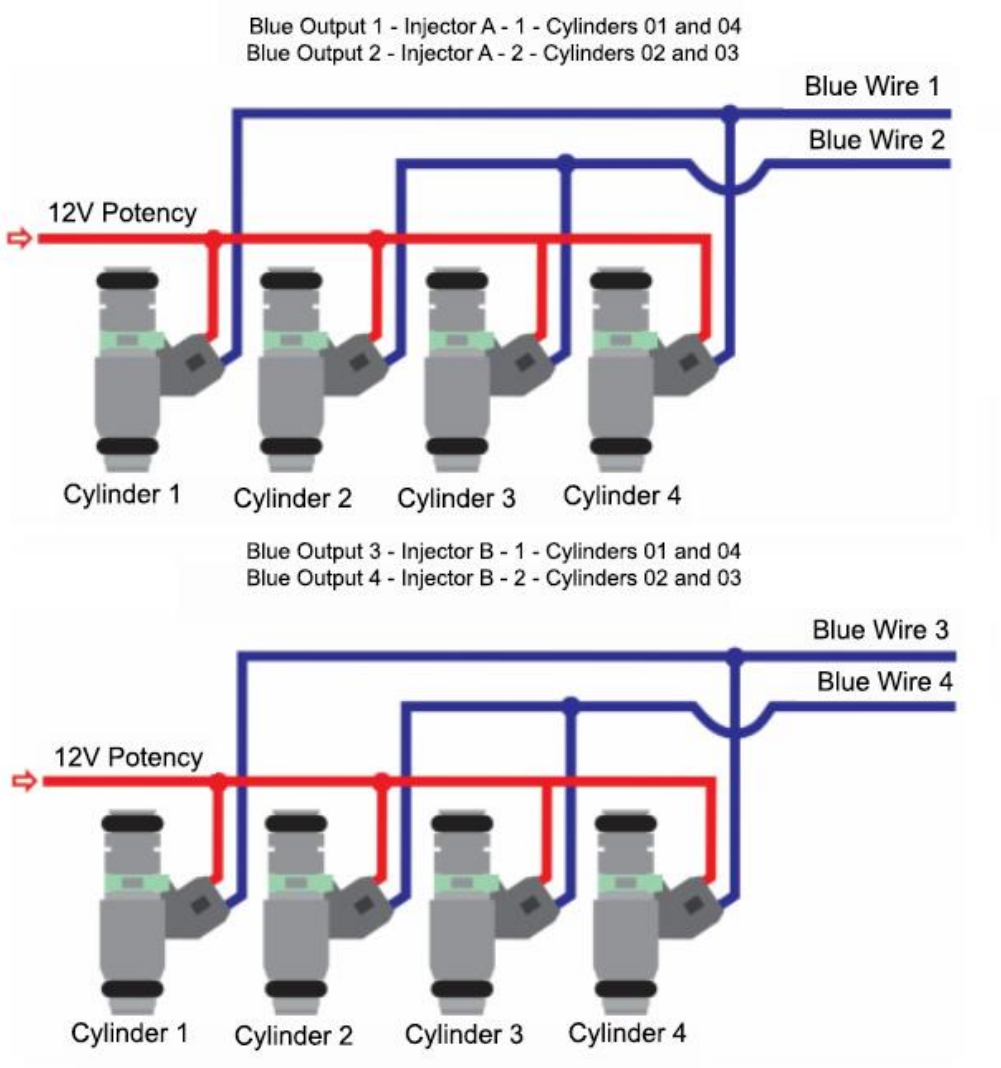
Example of an 8-cylinder engine with Explosion Order 1-8-7-2-6-5-4-3 working in semi-sequential mode. Injection outputs will be connected at injectors pairs.




Blue Output 1 – Injector A-1 – Cylinder 01 and 06
Blue Output 2 – Injector A-2 – Cylinder 05 and 08
Blue Output 3 – Injector A-3 – Cylinder 04 and 07
Blue Output 4 – Injector A-4 – Cylinder 02 and 03

### 13.1.5. Example 05 - 4-cylinders semi-sequential using supplementary

4-cylinder in-line engine (Explosion Order 1-3-4-2) with injectors in semi-sequential mode using 2 outputs. The output 1 activate the injectors of the pairs 1/4 and the output 2 activate the injectors of the pairs 2/3. The second bench will be configured as B-1 and B-2.




### 13.2. Injection Angle Correction per RPM:

The S4500 has a feature that allows the adjustment of injection angle, ie it is possible to control when the injector should open or close always taking into account the TDC.

The difference between the opening of the injector and its cycle end before the piston reaches the TDC denominates injection angle.

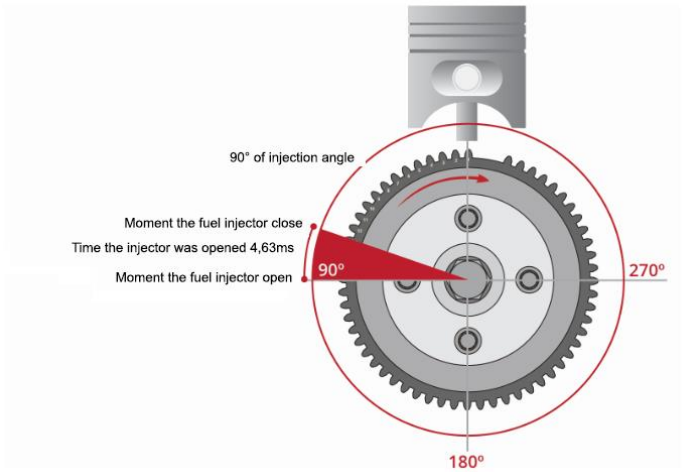
In the first example we will consider the following information:

1. Synchronization of Injection: Pulse Start
2. Injection Angle Correction: 90º
3. Injection time at a specific moment: 4,63ms

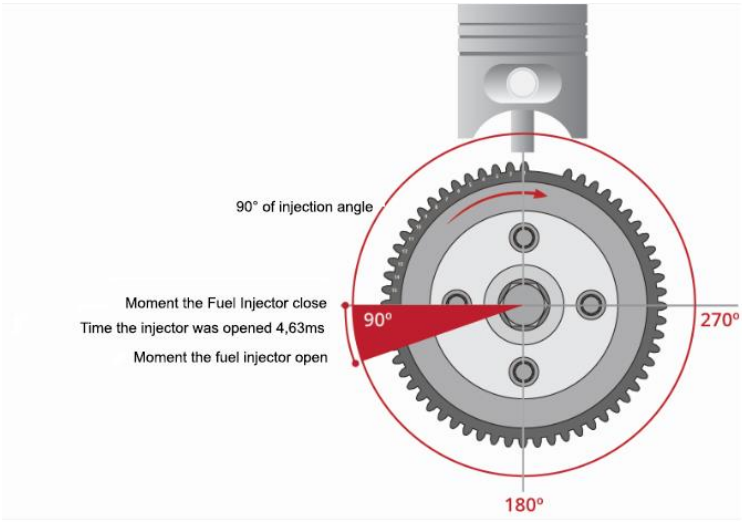
Then when configured "Pulse start" and injection angle programmed to 90° the S4500 starts the pulse at the exact 90° before the TDC, thus the fuel injector will finish its cycle 4.63ms after the start of the injection angle.

Injection Angle Correction by RPM

| RPM | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |




In the second example, when configured "Pulse End" and Injection Angle programmed to 90° the S4500 starts the pulse 4.63ms before the 90° TDC, so the fuel injector will finish its cycle and then the injection angle begins. This mode is the most used and most accurate too.



## 14. IGNITION COILS

The S4500 has 6 outputs for ignition control. The outputs can directly control coils with integrated ignition module; if the coil does not have an integrated module it is necessary to use ISD INJEPRO.

The outputs are composed of Gray wires numbered from 1 to 4; and Yellow wires numbered from 1 to 4; when using the multi-coil system (one per cylinder), it is recommended to connect the outputs in the order of ignition. The type of ignition (sequential or wasted spark) will be defined by the user in the dedicated software, or via the S4500 module in the menu "**Ignition Settings**".

The sequence of the ignition order is in alphabetical order and the sequence of the numbered wires follows the ascending order. Example: Ignition output A is related to the gray wire 1, ignition output B related to the gray wire 2, ignition output C related to the gray wire 3 and so on. However, the user can change this relation between output and wire. For example, the user can correlate Output B with gray wire 01, gray 02, gray 03 or gray 04.

**NOTE:** When necessary to use the yellow outputs to make ignition, a resistor of 220Ohms in series in the corresponding wire should be placed. Not using the resistors may cause the burnt of the coil drive or ISD module.

Example of connection:


### 14.1. Example of arrangement of the outputs and wires connections for individual coils

#### 14.1.1. 4-cylinder engine with ignition order 1-3-4-2 sequential connection (use phase)

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 03 - Ignition Output B – Gray Wire 02
Cylinder 04 - Ignition Output C – Gray Wire 03

Cylinder 02 - Ignition Output D – Gray Wire 04

### 14.1.2. 4-cylinder engine with ignition order 1-3-4-2 wasted spark connection

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 03 - Ignition Output B – Gray Wire 02
Cylinder 04 - Ignition Output A – Gray Wire 03
Cylinder 02 - Ignition Output B – Gray Wire 04

### 14.1.3. Subaru 4-cylinders engine with ignition order 1-3-2-4 senquential connection (use phase)

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 03 - Ignition Output B – Gray Wire 02
Cylinder 02 - Ignition Output C – Gray Wire 03
Cylinder 04 - Ignition Output D – Gray Wire 04

### 14.1.4. Subaru Engine with ignition order 1-3-2-4 sequential wasted spark connection

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 03 - Ignition Output B – Gray Wire 02
Cylinder 02 - Ignition Output A – Gray Wire 03
Cylinder 04 - Ignition Output B – Gray Wire 04

### 14.1.5. Air engine with ignition order 1-4-3-2 sequential connection (use phase)

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 04 - Ignition Output B – Gray Wire 02
Cylinder 03 - Ignition Output C – Gray Wire 03
Cylinder 02 - Ignition Output D – Gray Wire 04

### 14.1.6. Air engine with ignition order 1-4-3-2 wasted spark connection

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 04 - Ignition Output B – Gray Wire 02
Cylinder 03 - Ignition Output A – Gray Wire 03
Cylinder 02 - Ignition Output B – Gray Wire 04

### 14.1.7. Marea 5-cylinder engine with ignition order 1-2-4-5-3 sequential connection (use phase)

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 02 - Ignition Output B – Gray Wire 02
Cylinder 04 - Ignition Output C – Gray Wire 03
Cylinder 05 - Ignition Output D – Gray Wire 04
Cylinder 03 - Ignition Output E – Yellow Wire 1 to 4

### 14.1.8. Inline 6-cylinder engine with ignition order 1-5-3-6-2-4 sequential connection (use phase)

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 05 - Ignition Output B – Gray Wire 02
Cylinder 03 - Ignition Output C – Gray Wire 03
Cylinder 06 - Ignition Output D – Gray Wire 04
Cylinder 02 - Ignition Output E – Yellow Wire 1 to 4
Cylinder 04 - Ignition Output F – Yellow Wire 1 to 4

### 14.1.9. Inline 6-cylinder engine with ignition order 1-5-3-6-2-4 wasted spark connection

Cylinder 01 - Ignition Output A – Gray Wire 01
Cylinder 05 - Ignition Output B – Gray Wire 02
Cylinder 03 - Ignition Output C – Gray Wire 03
Cylinder 06 - Ignition Output A – Gray Wire 04
Cylinder 02 - Ignition Output B – Yellow Wire 1 to 4
Cylinder 04 - Ignition Output C – Yellow Wire 1 to 4

## 14.2. Example of arrangement of the outputs and wires connections for double coils

### 14.2.1. 4-cylinder engine with ignition order 1-3-4-2 with double coil

Cylinder 01 and 04 - Ignition Output A – Gray Wire 01
Cylinder 02 and 03 - Ignition Output B – Gray Wire 02

### 14.2.2. Subaru engine with ignition order 1-3-2-4 with double coil

Cylinder 01 and 02 - Ignition Output A – Gray Wire 01
Cylinder 03 and 04 - Ignition Output B – Gray Wire 02

### 14.2.3. Air engine with ignition order 1-4-3-2 with double coil

Cylinder 01 and 03 - Ignition Output A – Gray Wire 01
Cylinder 02 and 04 - Ignition Output B – Gray Wire 02

### 14.2.4. Inline 6-cylinder engine with ignition order 1-5-3-6-2-4 with double coil

Cylinder 01 and 06 – Ignition Output A – Gray Wire 01
Cylinder 02 and 05 – Ignition Output B – Gray Wire 02
Cylinder 03 and 04 – Ignition Output C – Gray Wire 03

### 14.2.5. V8 engine with double coil

Cylinder 01 and 06 – Ignition Output A – Gray Wire 01
Cylinder 03 and 05 – Ignition Output B – Gray Wire 02
Cylinder 04 and 07 – Ignition Output C – Gray Wire 03
Cylinder 02 and 08 – Ignition Output D – Gray Wire 04

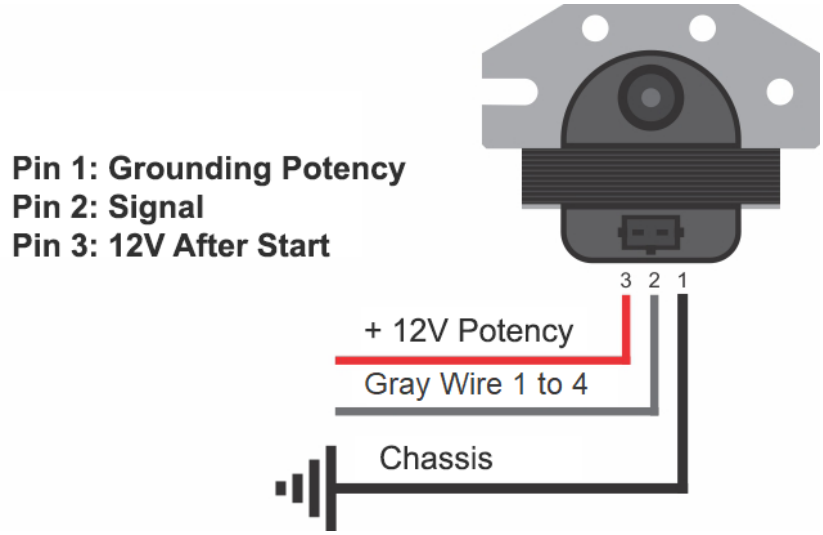
**Note:** When the rotation reading is made by the distributor, or when you are using the distributor just to spread the spark, you must use the Gray Wire 1 to 4.

## 14.3. Examples of coil connection and arrangement

### 14.3.1. Example 01 – 3-wires Ignition Coil with ignition drive (Distributor)

A system with only one 3-wire simple coil with integrated ignition module using the distributor to spread the spark. In this case, is not necessary to connect the ignition output on the **gray wire number 1 to 4**. In the settings menu of inputs and outputs, set this output as "**Distributor Ignition**" and in the settings menu of ignition set the ignition output as "**Distributor**" and select ignition signal as "**ISD/Coil with ignition**". In this type of configuration, the gray outputs from 1 to 6 are free to be used by other functions.

Recommended Dwell: 3,20 Initial X 2,80 Final.

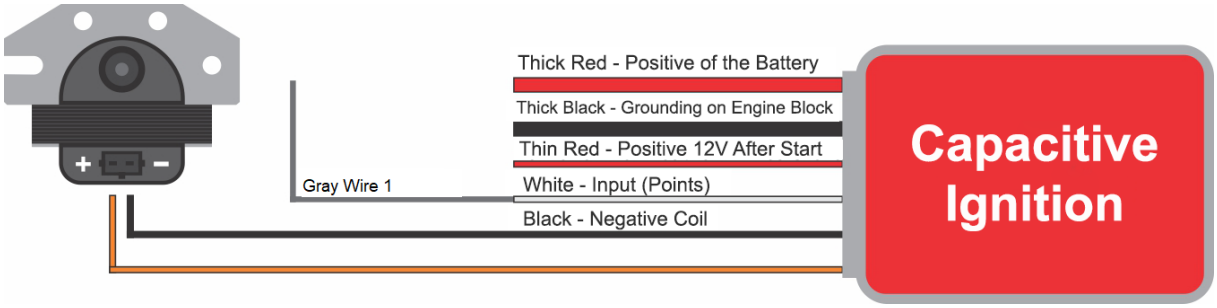



**Tip:** The higher the number of cylinders, the shorter the time for the coil to charge, discharge and rest, then monitor the temperature of the coil's ignition module and if it is overheating, quickly reduce the Dwell.

### 14.3.2. Example 02 – Capacitive Module.

A system with only one 2-wire simple coil without integrated ignition module and with spark amplifier (capacitive ignition module) using the distributor or phonic wheel to read the rotation, and using the distributor just to spread the spark. In this case, you must connect the ignition output on the **gray wire number 1 to 4**. In the settings menu of inputs and outputs set this output as "**Distributor Ignition**", and in the settings menu of ignition set the ignition output as "**Distributor**" and select ignition signal as "**MSD/Negative Signal**".

This type of module applies a fixed Dwell to the coil, making unnecessary configure this in the menu.

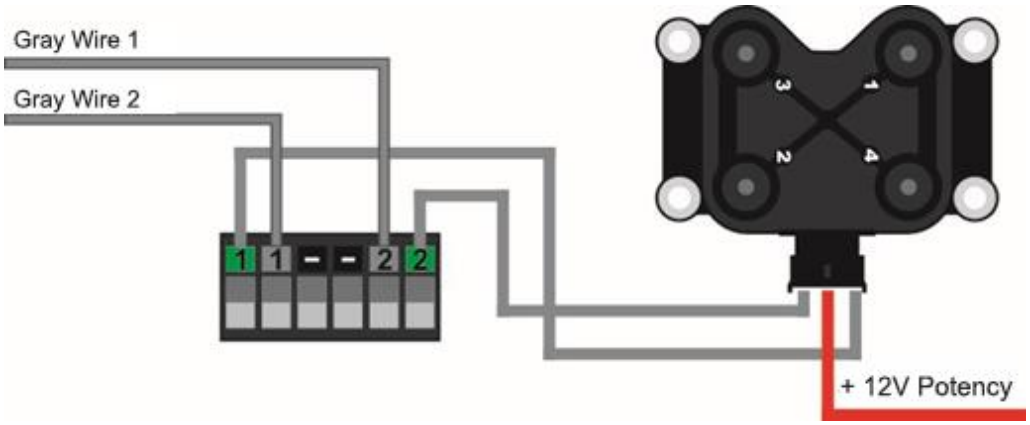



### 14.3.3. Example 03 – Double coil, without ignition drive.

4-cylinder engine with a double coil WITHOUT IGNITION DRIVE like an Astra/Vectra GM with the ISD-2 working at wasted spark. The gray wire 1 activate the

ISD channel relative to cylinders 1 and 4, and the gray wire 2 activate the ISD channel relative to cylinders 2 and 3. The ignition setting must be set as "**Wasted Spark**" in the settings menu of the ignition, then select the ignition signal as "**ISD/Coil with ignition**" and output ignition as "**Multi Coil**".

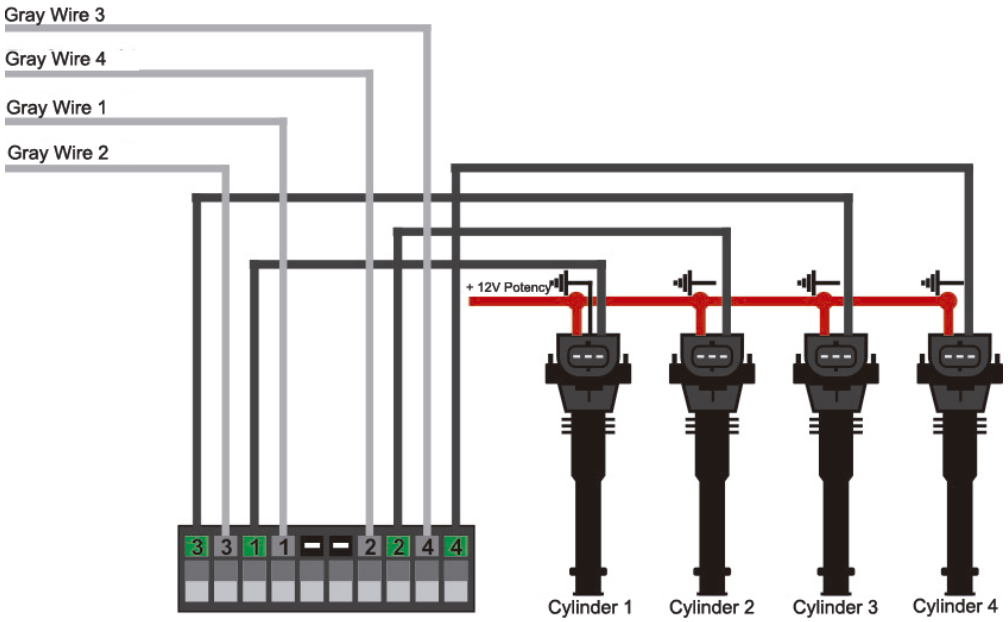
Recommended Dwell: 3,40 Initial x 3,20 Final.




### 14.3.4. Example 04 – Individual coils, without ignition drive.

4-cylinder in-line engine (Explosion Order 1-3-4-2) with 4 coils WITHOUT IGNITION DRIVE of FIAT Marea, with the ISD-4 working at sequential mode. The inputs of ISD must be connected according to the ignition order of the cylinders; the ignition must be set as "**Sequential**" (this option only will be available when one of the inputs be configured as "**Phase Signal**"). Select the ignition signal as "**ISD/Coil with Ignition**" and the ignition output as "**Multi Coil**".

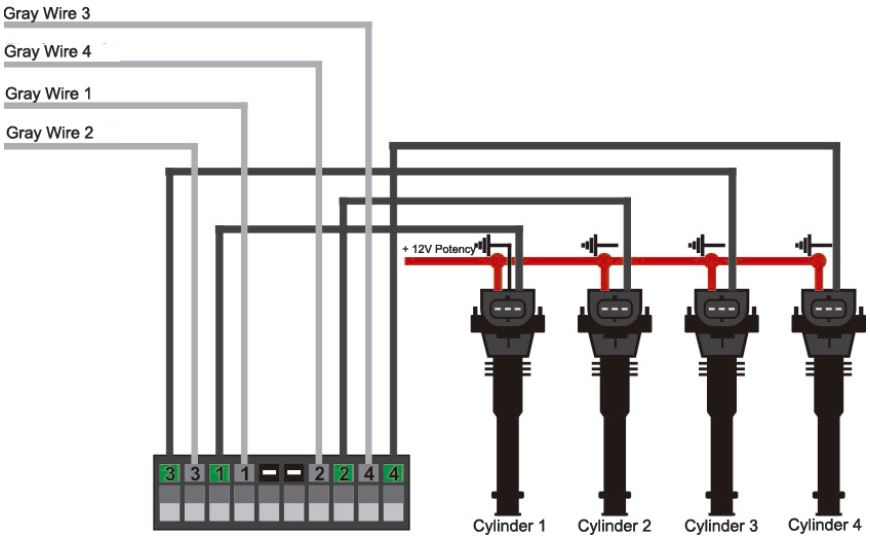
Recommended Dwell: 2,80 Initial x 2,20 Final.




### 14.3.5. Example 05 – Individual coils, without ignition drive.

4-cylinder in-line engine (Explosion Order 1-3-4-2) with 4 coils WITHOUT IGNITION DRIVE of FIAT Marea, with ISD-4 working at wasted spark mode using 4 ignition outputs. The ISD inputs must be connected according to the ignition order of the cylinders. The ignition setting must be set as "**Wasted Spark**". Select the ignition signal as "**ISD/Coil with ignition**" and ignition output as "**Multi Coil**".

Recommended Dwell: 2,80 Initial x 2,20 Final.

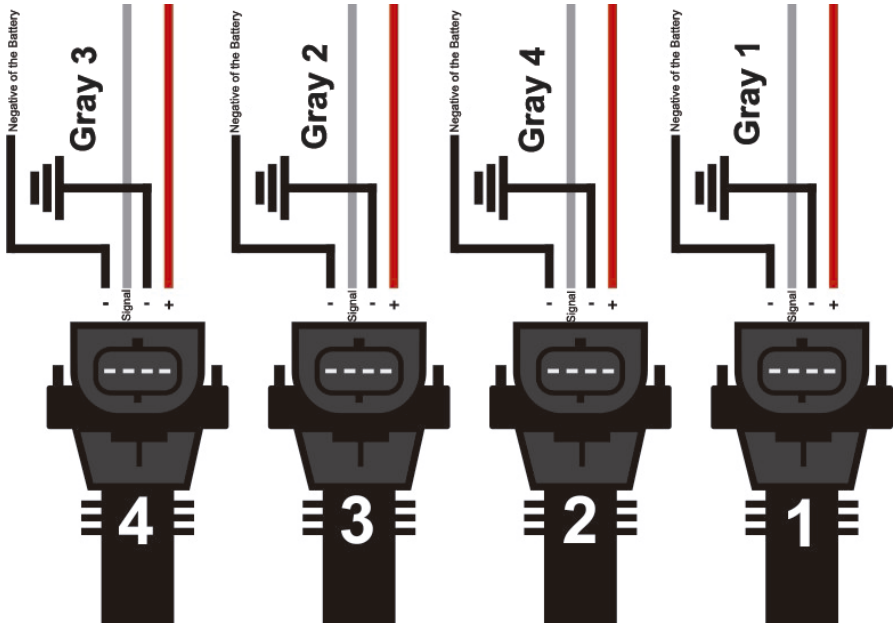


### 14.3.6. Example 06 – Individual coils, with ignition drive.

Coil from Gol G6, Code 030905110b

4-cylinder in-line engine (Explosion Order 1-3-4-2) with 4 coils from Gol G6 at sequential mode. The gray wires must be connected according to the ignition order of cylinders. The ignition setting must be set as "**Sequential**" (this option only will be available when one of the inputs be adjusted as "**Phase Signal**"). Select the ignition signal as "**ISD/Coil with Ignition**" and ignition output as "**Multi Coil**".

Recommended Dwell: 2,60 Initial x 2,20 Final.

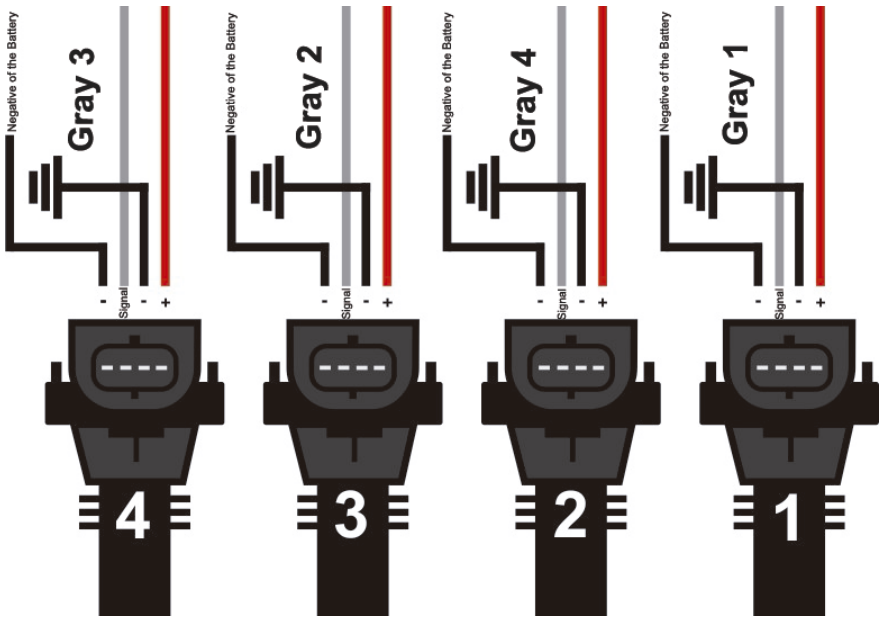



### 14.3.7. Example 07 - Individual coils, with ignition drive.

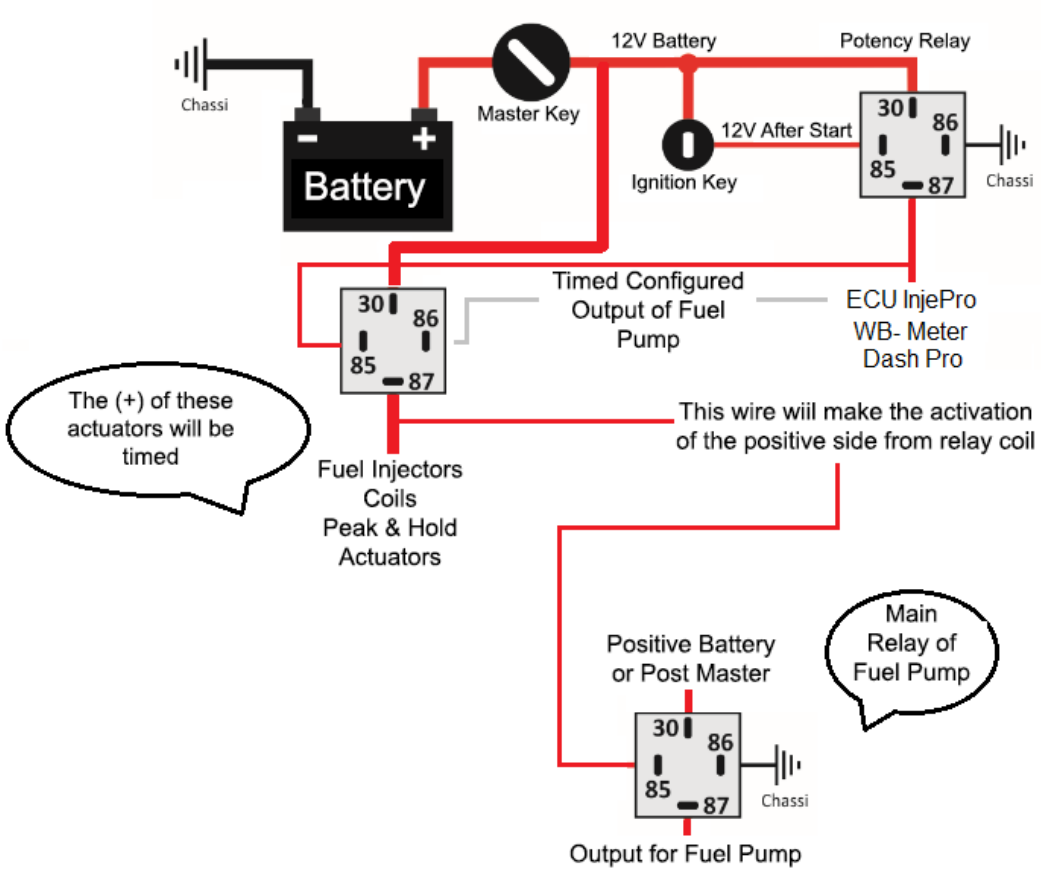
Coil from Gol G6, Code 030905110b

4-cylinder in-line engine (Explosion Order 1-3-4-2) with 4 coils of Gol G6 at wasted spark mode. The gray wires must be connected according to the ignition order of the cylinders. The ignition setting must be set as "**Wasted Spark**". Select the ignition signal as "**ISD / Coil with Ignition**" and ignition output as "**Multi Coil**".

Recommended Dwell: 2,60 Initial x 2,20 Final.




## 14.4. Tip for timing positive of fuel injectors and coils.



### 14.5. Connection table of most used individual coils

| Coil | Utilization | Type | Pin Connections |
|---|---|---|---|
| FIAT/Bosch<br>0 221 504 014 | Marea 5-cylinders 2.0 Turbo, 2.4 | Without Ignition Module | Pin 1: Output of ISD<br>Pin 2: Grounding Potency<br>Pin 3: 12V After Start (relay) |
| VW/Audi 20V, BMW | Audi 1.8 20V Turbo, BMW 328, Golf 1.8 20V Turbo | Without Ignition Module | Pin 1: Output of ISD<br>Pin 2: Grounding Potency<br>Pin 3: 12V After Start (relay) |
| FIAT/Hitachi<br>CM 11-202 | Brava 1.8HGT, Marea 1.8 HGT | With Ignition Module | Pin 1: 12V After Start (relay)<br>Pin 2: Grounding Potency<br>Pin 3: Individual Output |
| Honda/Dense 099700-101 | New Civic | With Ignition Module | Pin 1: 12V After Start (relay)<br>Pin 2: Grounding Potency<br>Pin 3: Individual Output |
| GM 12611424 | Prisma, Cobalt, Onix, LS2 LS3, LS7 e LS9 | With Ignition Module | Pin 1: Grounding Potency<br>Pin 2: Grounding Potency<br>Pin 3: Individual Output<br>Pin 4: 12V After Start (relay) |

| | | | |
|---|---|---|---|
| Volkswagen 030905110b | Gol G6 | With Ignition Module | Pin 1: Neg Battery<br>Pin 2: Individual Output<br>Pin 3: Grounding Potency<br>Pin 4: 12V After Start (relay) |

### 14.6. Connection table of most used double coils

| Coil | Utilization | Type | Pin Connections |
|---|---|---|---|
| FIAT/Bosch F000ZS0103 | Uno 1.0, 1.5, Palio (two outputs) | Without Ignition Module | Pin 1: Output of ISD<br>Pin 2: 12V After Start (relay) |
| GM/Bosch F 000 ZSO 203 F 000 ZSO 205 | Astra, Ipanema, Kadett, Vectra 8V | Without Ignition Module | Pin 1: Output 1 of ISD<br>Pin 2: 12V After Start (relay)<br>Pin 3: Output 2 of ISD |
| GM/FIAT/Bosch F 000 ZSO 213 F 000 ZSO 222 | Celta, Corsa, Gol AP Flex, Montana, Vectra 16V | Without Ignition Module | Pin 1: Output 2 of ISD<br>Pin 2: 12V After Start (relay)<br>Pin 3: Output 1 of ISD |
| VW/Bosch 4-wires F000ZS0212 | Audi A3 e A4, Gol 1.0 16 Turbo, Gol/Golf 1.6 EA 111 | With Ignition Module | Pin 1: Gray Wire 01<br>Pin 2: 12V After Start (relay)<br>Pin 3: Gray Wire 02<br>Pin 4: Grounding Potency |

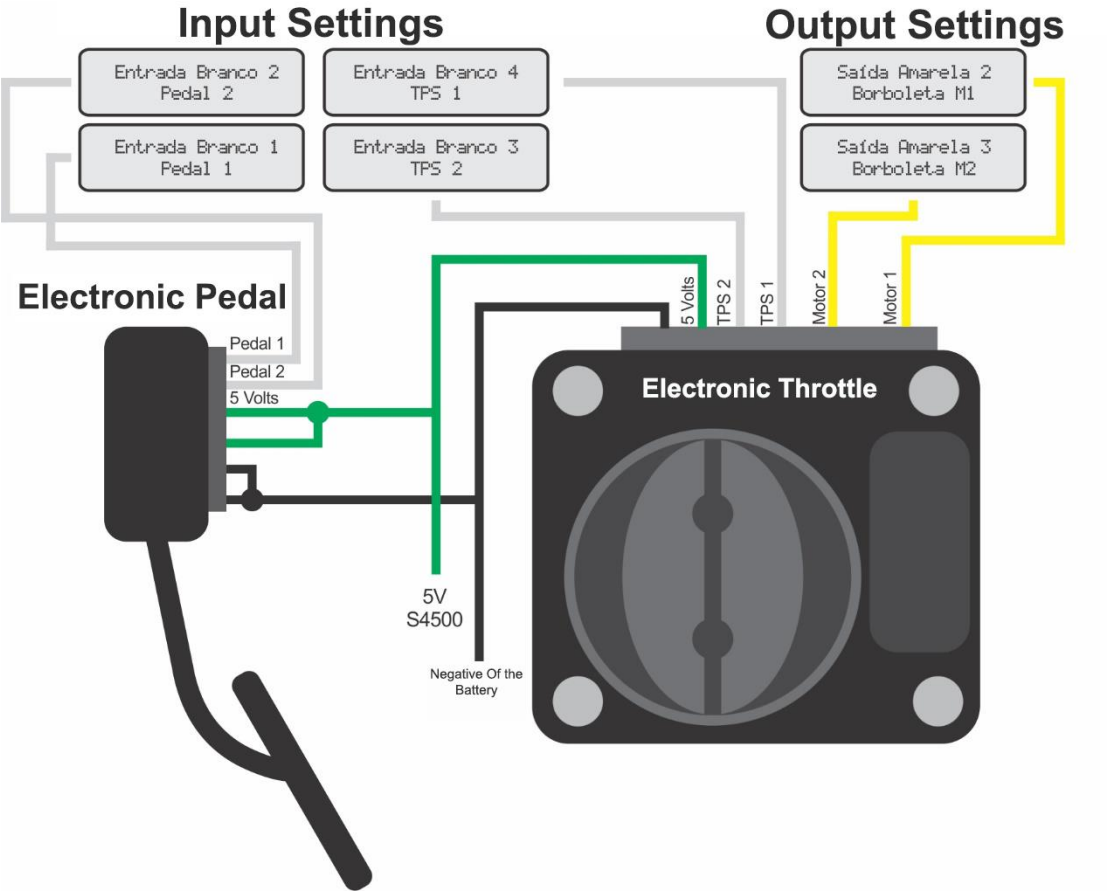
| | | | |
|---|---|---|---|
| GM/Delphi (rounded) | Corsa MPFI<br>from 1998 up to 2002 | With Ignition Module | Pin A: Gray Wire 02<br>Pin B: Gray Wire 01<br>Pin C: Grounding Potency<br>Pin D: 12V After Start (relay) |
| GM/Delphi (square) | Corsa MPFI<br>up to 1997 | With Ignition Module | Pin 1: 12V After Start (relay)<br>Pin 2: Grounding Potency<br>Pin 3: Gray Wire 01<br>Pin 4: Gray Wire 02 |

## 15. ELECTRONIC THROTTLE

The electronic throttle is a throttle valve with an engine that makes an electrical connection with the pedal. In the cable accelerator, this connection is mechanical.

The advantage of the electronic throttle is in the automatic controls that it has, such as idle speed control, starting, acceleration curve, etc.

S4500 has an integrated electronic throttle controller, allowing you to use its inputs and outputs directly on the sensors and actuators that are part of the entire control. These include the pedal sensors (Pedal 1 and 2), the throttle position sensors (TPS 1 and 2), and the outputs M1 and M2, which control the throttle engine activator.

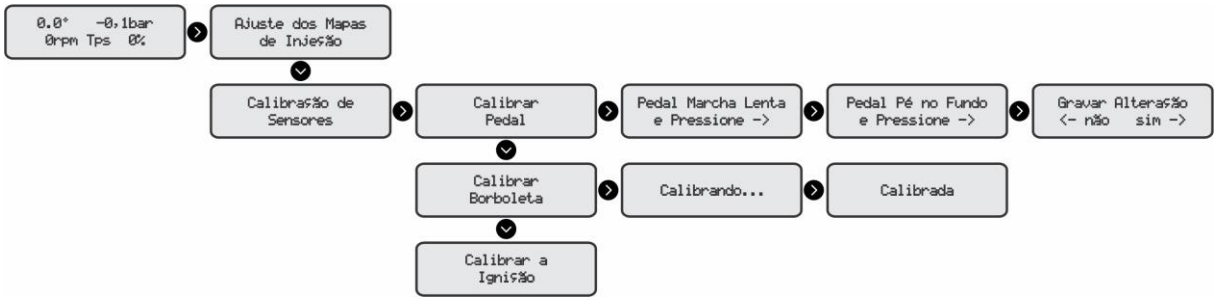



## 15.1. Pedal / TPS Input Configuration


## 15.2. Configuration of the Throttle M1 / Throttle M2 Outputs

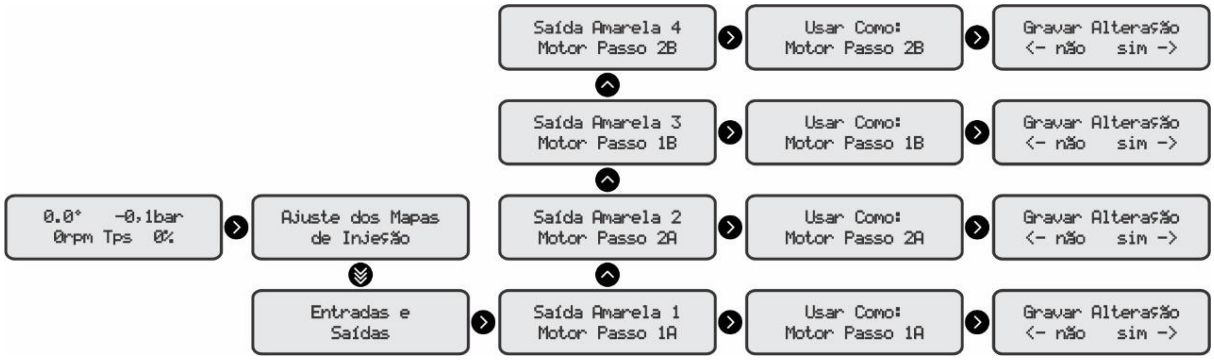

**NOTE:** The engines of the electronic throttle must be connected to the yellow outputs 2 and 3

## 15.3. Pedal and Throttle Calibration



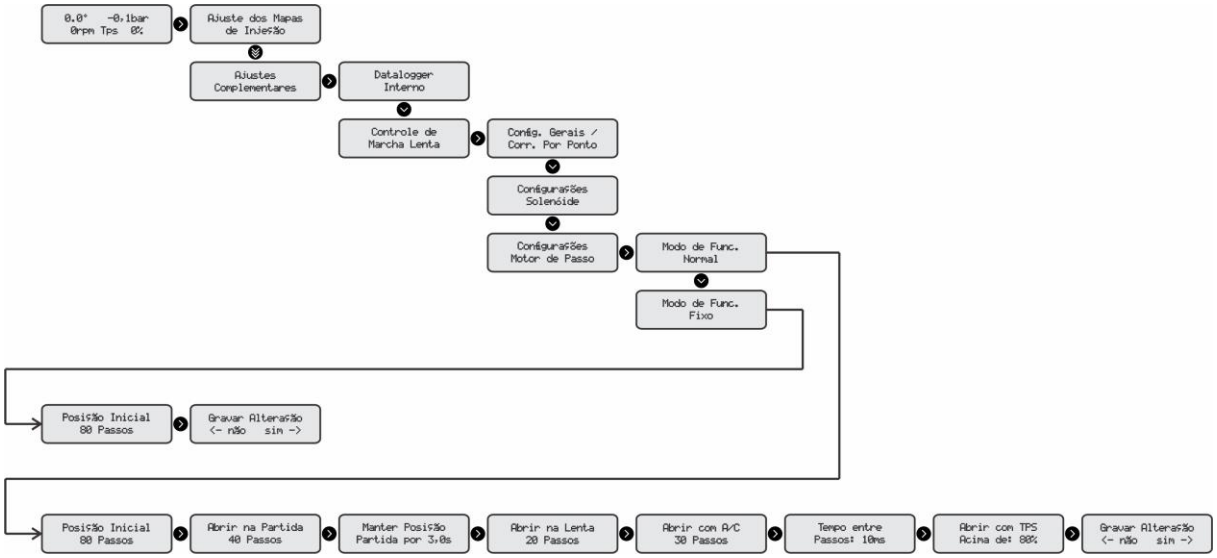

## 16. STEPPER MOTOR

IAC (Idle Air Control) has the function of stabilizing the idle speed when there are variations of charges or engine temperature. To enable it we must use the 4 Yellow outputs and configure them as in the image below.




Subsequently, configure the S4500 for such a function by clicking on the "Complementary Settings" directory and then "Idle Speed Control" and then "Stepper Motor Settings".

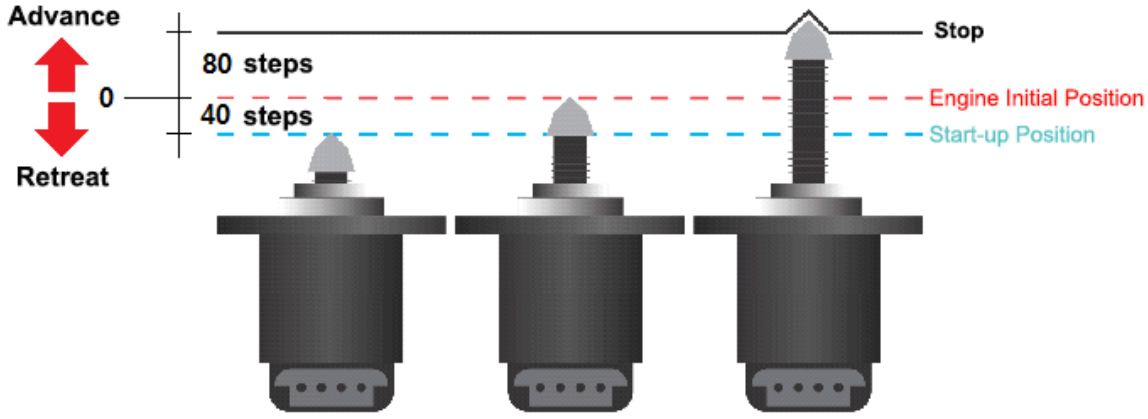
The operating mode is Normal or Fixed.



**Normal Mode** – Operate forward or backward with up to 260 steps.
**Fixed Mode** – Once calibrated, the piston is fixed in the configured position.

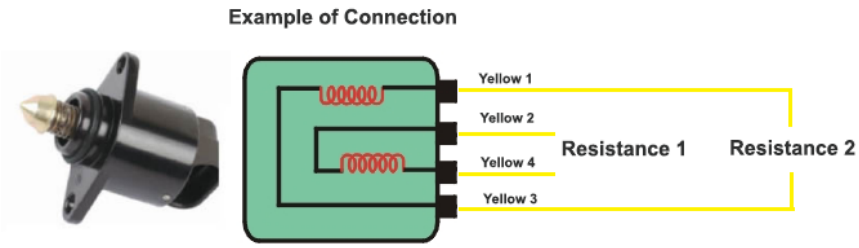
As soon as we power the S4500 with 12v, the module calibrates the stepper motor giving a command to advance to the maximum position, which we call a stop. In the drawing, it is shown in black color. The piston then moves back to the initial position determined by the user. The stop serves as a reference for the injection "count" the "steps" and then reach the position of 0 mark or initial position, shown in red. In the example, we use 80 steps between the stop and the initial position. The piston then retracts 40 steps from the initial position to the starting position.

In the example below, we'll show you how the stepper motor will operate.



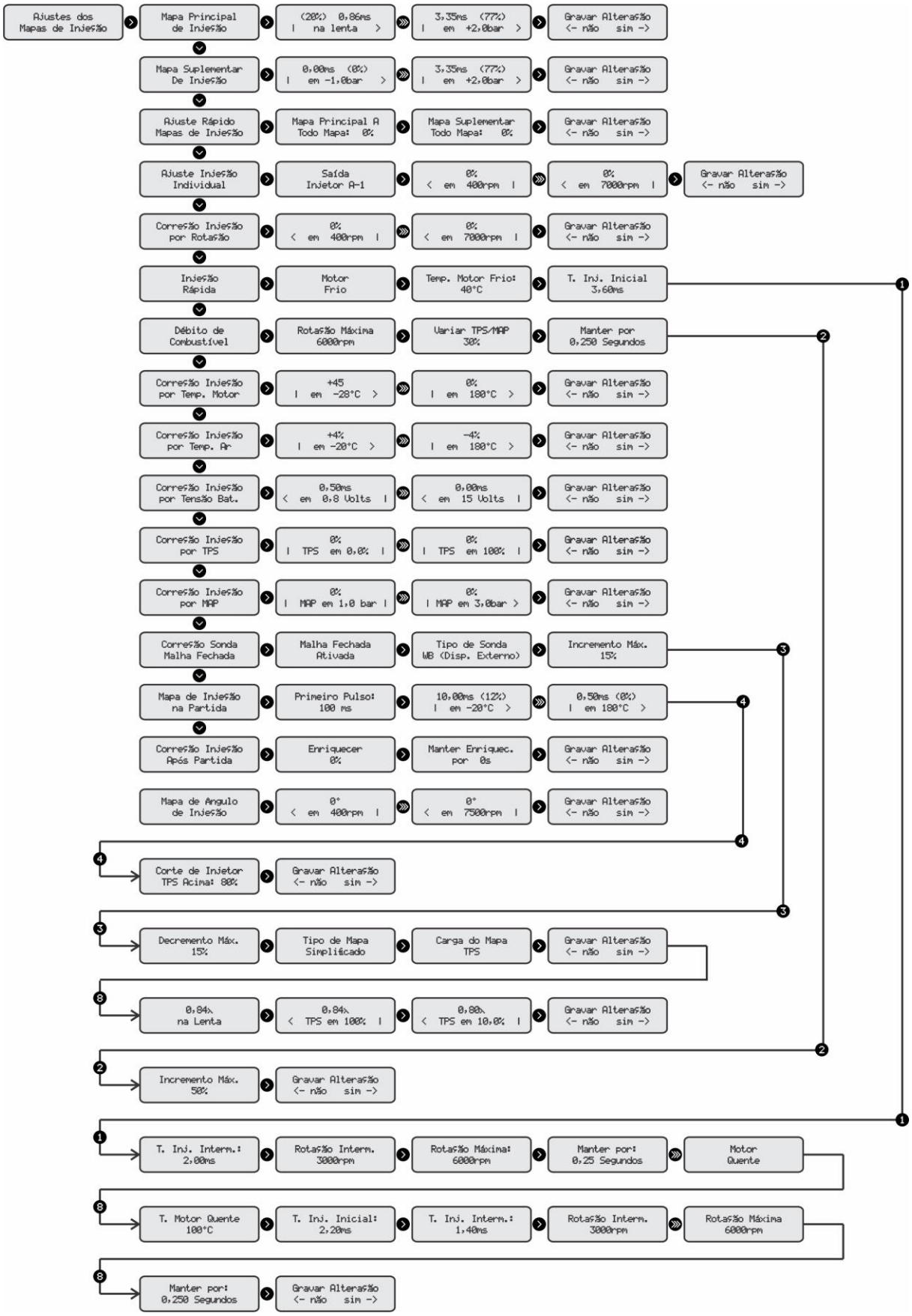

## 16.1. Stepper motor connection

With a multimeter, place the selector on the 200 Ohms scale and the probes on 2 pins in the Stepper Motor. The intention here is to find resistance near to 50 Ohms. Then make sure that the other 2 pins also have resistance near to 50 Ohms.



When the pairs are identified, connect the Yellow wire 1 and Yellow wire 3 in one pair, and Yellow wire 2 and Yellow wire 4 in the other pair.

## 17. SETTING OF INJECTION MAPS

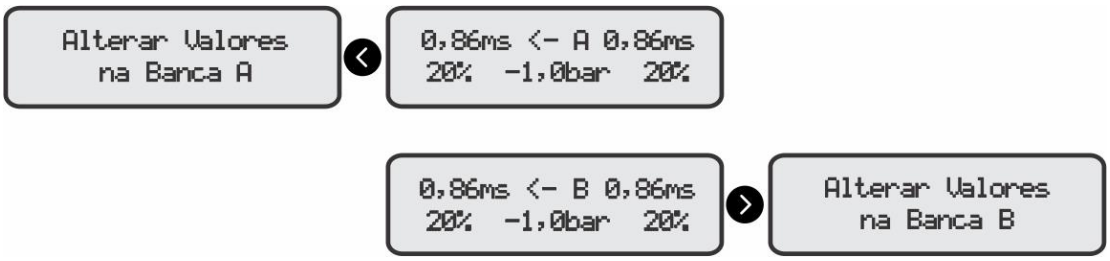


This menu above is responsible for all fuel injection control such as Map of Injectors A-1, A-2, A-3, A-4, B-1, and B-2. The letter A refers to the main bench, and the numbers, refers to the numbering of the wires used for each injector, while the letter B refers to the band of supplementary injectors.

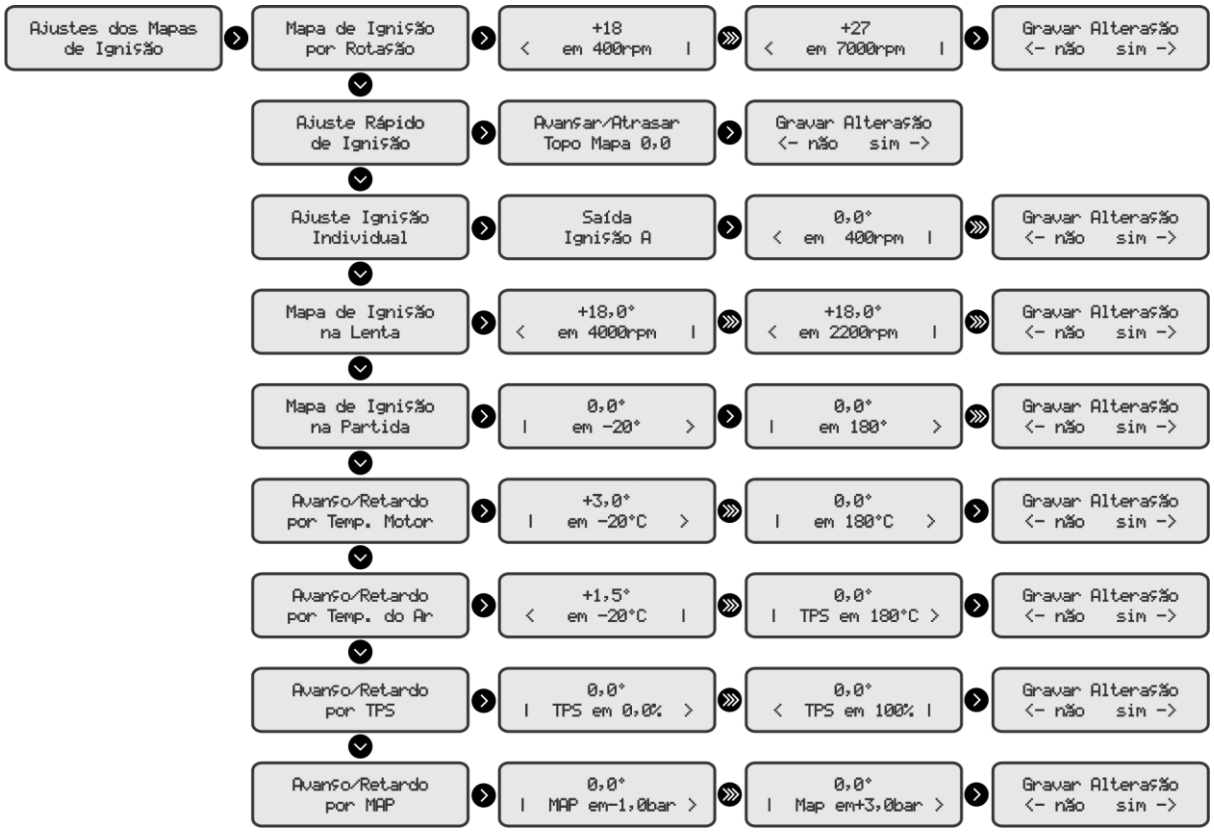
In the Main Map of Injection tab, you can find the injection map A and B, shown on the same screen when the two benches are selected in the "Inputs and Outputs" and configured as semi-sequential, both bench A and bench B in the field "Configuration of Injection".

To do this change in bench A it is necessary that the arrow is pointed to the left side and the letter A appears on the screen. Already to change values of bench B is necessary to press the module button to the right and then the arrow is pointed to the right and letter B appears.

To change the values of MAP or TPS it is necessary to pass through the two injector benches by pressing the right button 2 times.

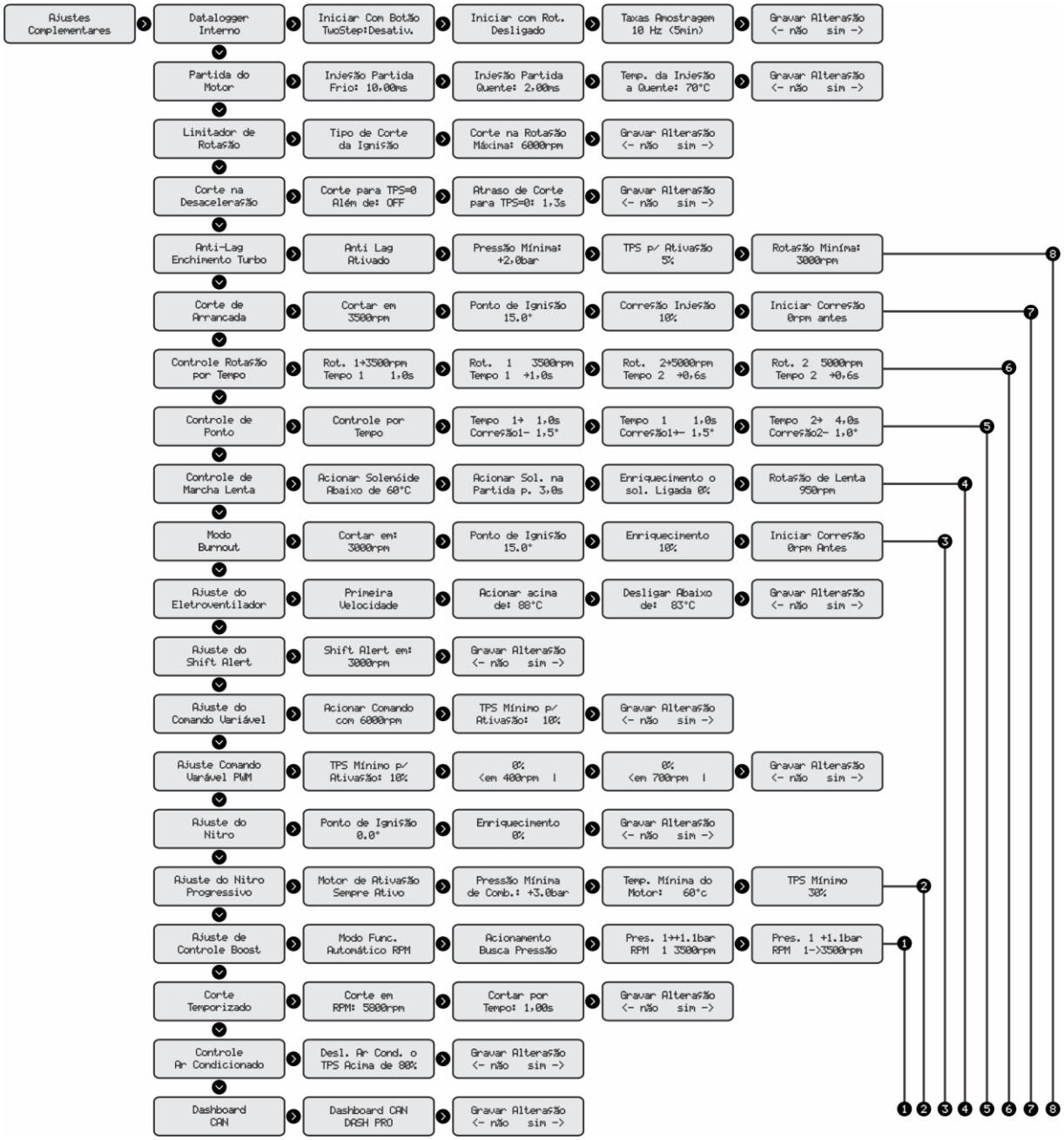


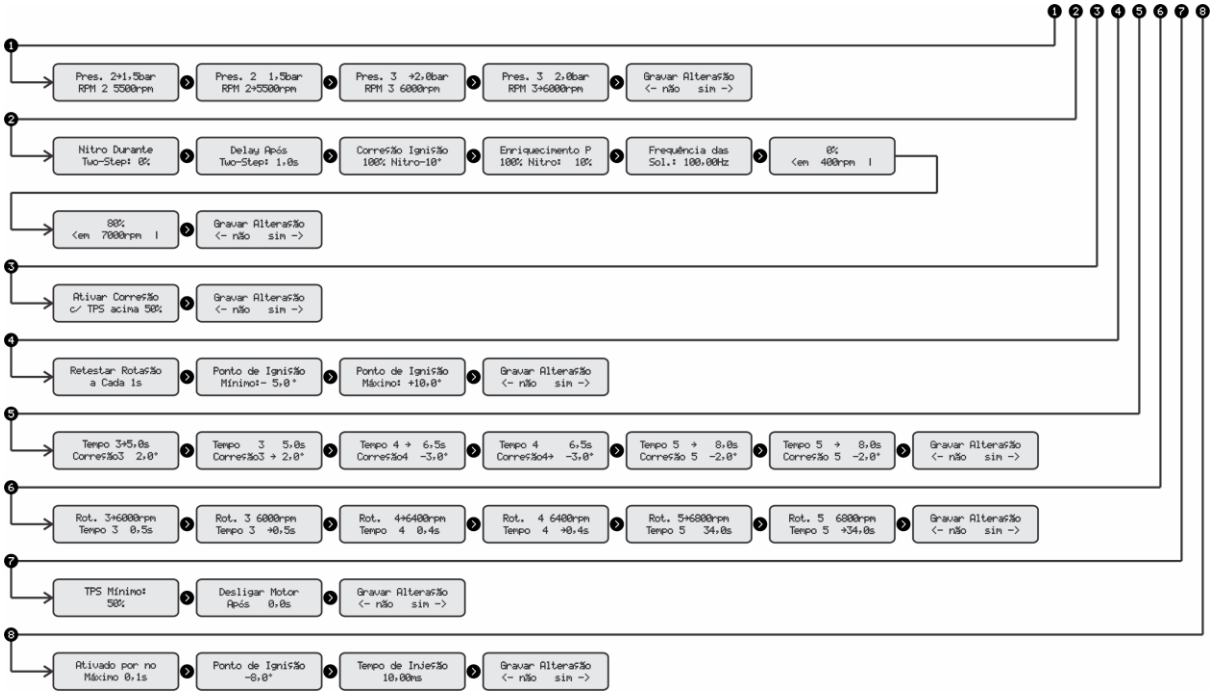
## 18. SETTING OF IGNITION MAPS



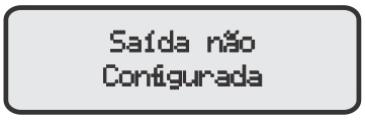

In the setting of ignition maps, the user has total control of the engine point, as well the creation of point main map and ignition corrections by engine temperature, air, TPS, and Map. Also is possible to do the advancement or retardment in every map by making a quick injection adjustmentIn addition, the idle speed map adjustment allows a more stable control having a specific map for this function.

## 19. ADDITIONAL SETTINGS

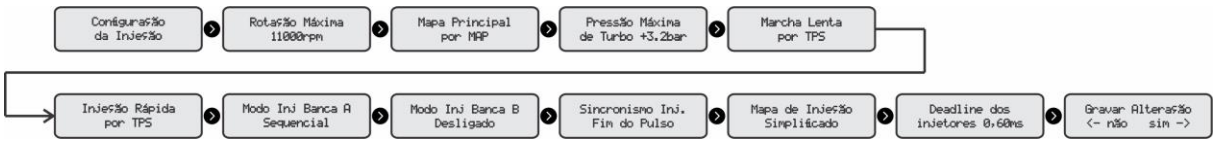





In this menu, it is possible to adjust the drive commands of the electro-fan, Shift Alert, Variable Command, PWM Command, Nitro, Progressive Nitro and Air Conditioning Compressor Control. However, to have access to this adjustment it is necessary that an output has been destined to it, otherwise the message that appears will be the following



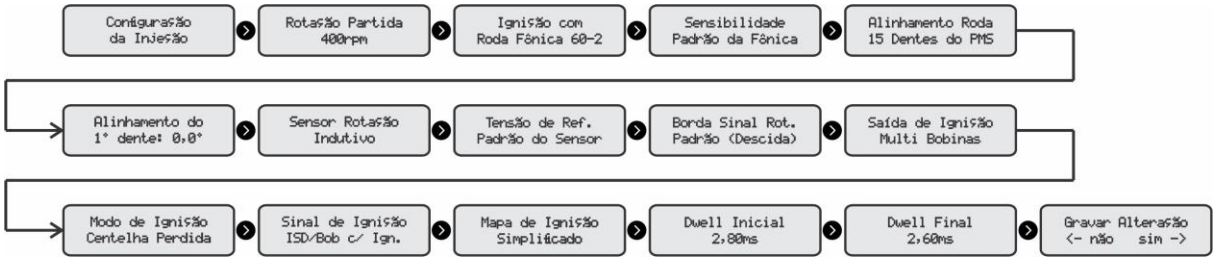
## 20. INJECTION SETTING




In the injection settings, you can define the maximum rotation of the engine. It is according to this rotation that the Duty Cycle will be calculated, ie the opening percentage of the injector related to the engine cycle (RPM).

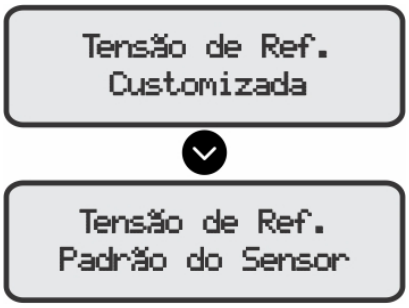
Here, you can also define if the management will be by MAP or TPS. If MAP is selected, the MAP pressure will be set on the "Maximum Turbo Pressure" screen. In the S4500 it is possible to set a positive pressure even for aspirated cars, this is very common when the assembly has a very efficient air collection.

## 21. IGNITION SETTING



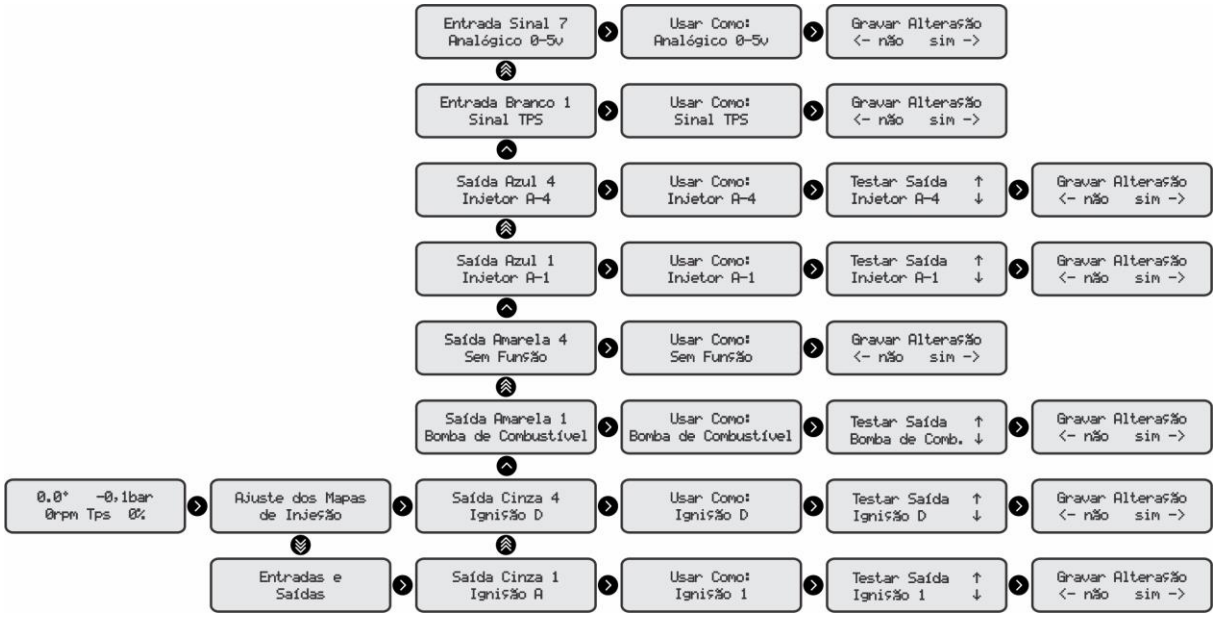

The menu above is responsible for the main ignition configuration where we will define the number of cylinders and the mode of rotation capture. This is undoubtedly the most important configuration of the module. If it is not set correctly the engine will not work and may still cause serious damage to the engine or its components.

In the field "Ref. Voltage " (Reference Voltage) it is possible to customize it or to choose the option "Sensor Pattern" by clicking only down.




The signal edge refers to the way the S4500 will receive the rotation signal whether it will be on the rising edge of the teeth or on the descent.

## 22. INPUTS AND OUTPUTS




Because the outputs and inputs are configurable the possibility of signal capture and actuator management increases considerably. Thus the user has the possibility to use the largest number of inputs and outputs, and will not get stuck in those fixed inputs or outputs. All available options for each wire are described in "Features".

## 23. SENSOR CALIBRATION


In the field of sensor calibrations, it is possible to calibrate TPS and Engine Ignition. The calibration of TPS must be done before running the engine because if it is out of calibration it can influence the adjustment of idle or Fast Injection.

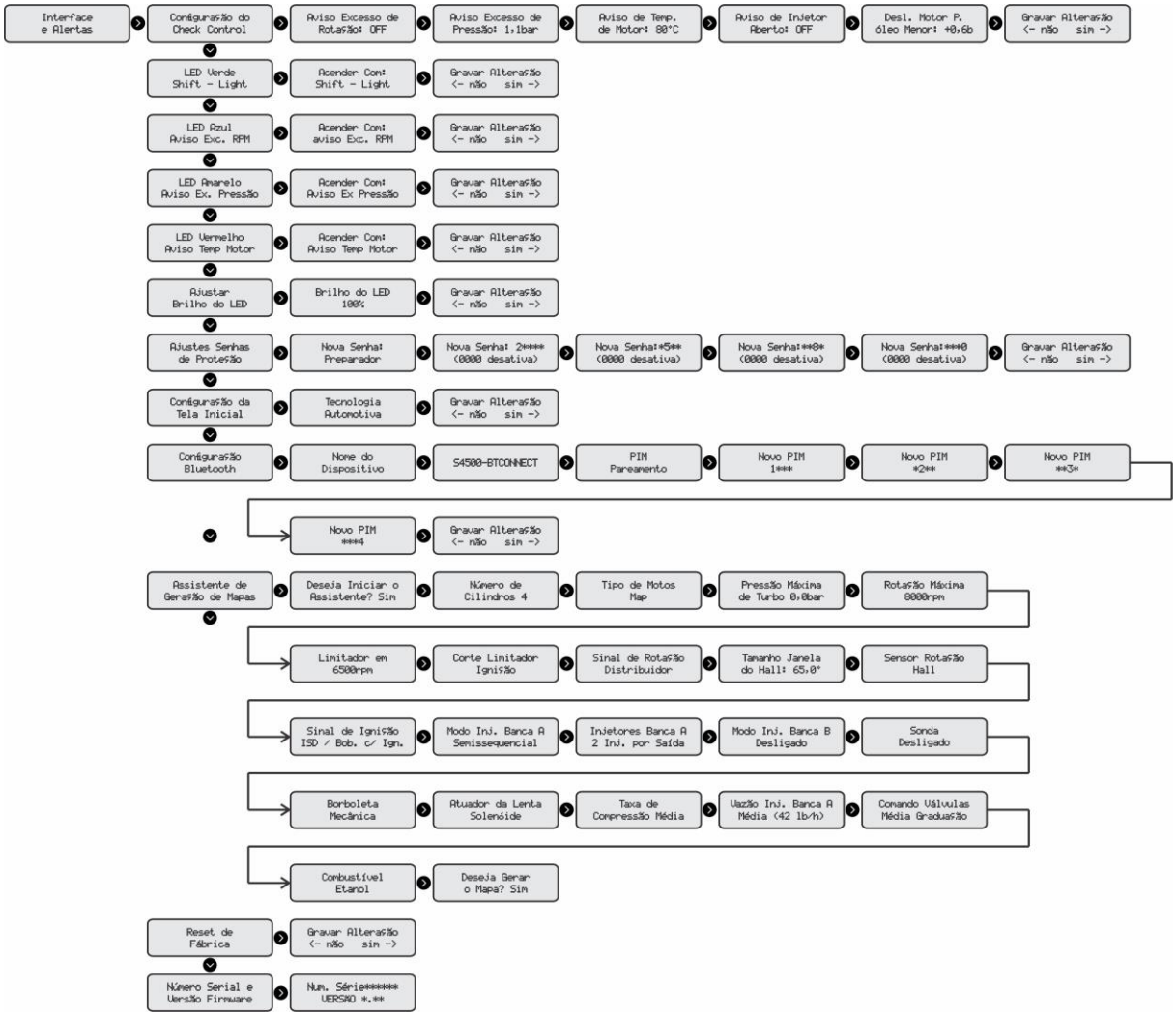
When the engine is running and stable, the ignition point must be calibrated. To do this, go to the "correct 0.0° until reading 20°" menu (if using Phonic Wheel) then S4500 will set the point at 20°. Then you should pass the point gun and check the reading. If it matches the same 20° or 40° (wasted spark) the calibration is correct. Otherwise, adjustment can be made by pressing the up button to add point to the engine, or down to take out point of the engine. This should be done until you get 20°. If this difference exceeds 6 degrees in the case of a 60-2 phonic wheel, probably one tooth is out of the correct alignment. For example, the alignment is on the 16th tooth when it should be on the 15th tooth.

When working with a distributor, the option we will find after the "Calibrate the Ignition" field will be "CALIBRATE DISTRIBUTOR WITH 20°", so when we are in this screen the S4500 sets the point to 20° and the distributor must be advanced or withdrawn until the point gun shows 20°.


**Note:** When configured as a distributor, you should calibrate the window size before calibrating the ignition; if this calibration is not made, may happen a divergence at the ignition point.

To calibrate the window size, hold the right key for approximately 2 seconds on the screen "Hall Window Size".

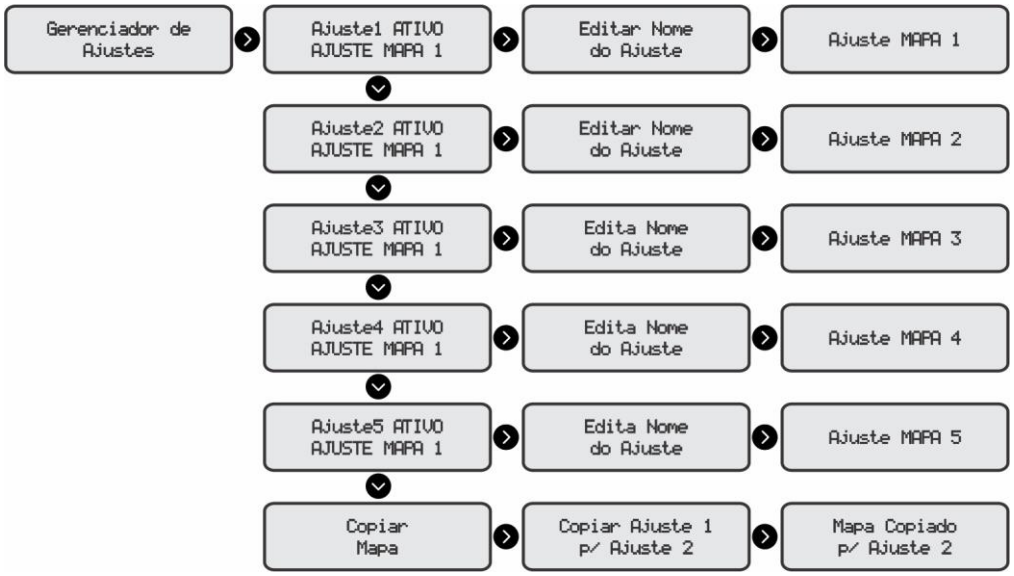

## 24. INTERFACE AND ALERTS




S4500 has an LED on the front of the module located on the right side. This LED can show 4 different colors, one for each different setting. Colors may be Green, Blue, Yellow, and Red.

In the password protection setting the factory default password for preparer is 2580; already the default Bluetooth password is 1234.

## 25. ADJUSTMENT MANAGER



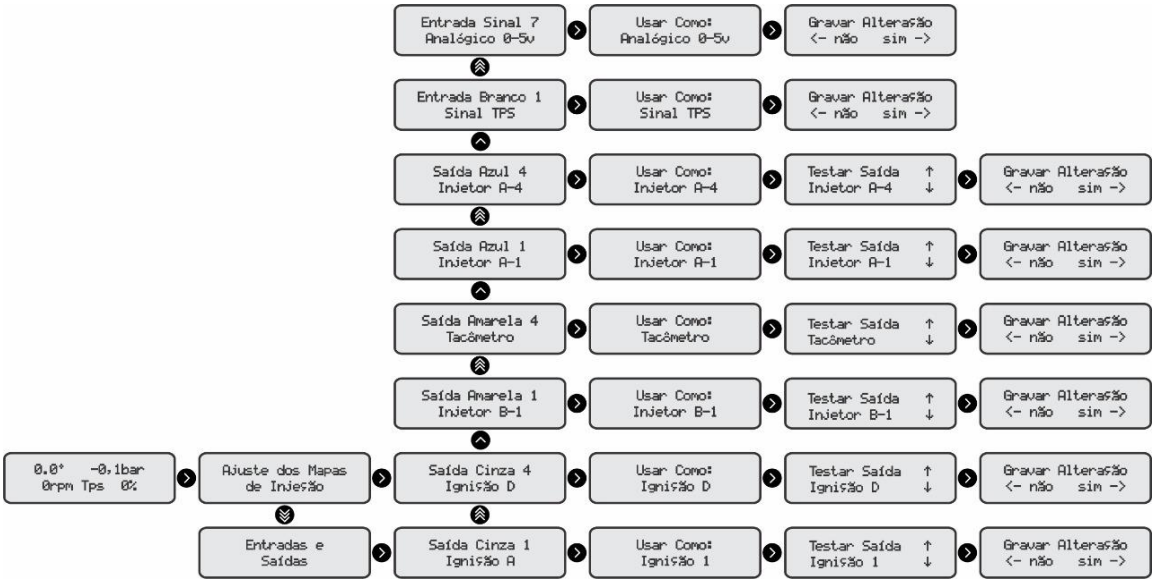

On S4500 you can make a copy of your map to 4 other maps available on the S4500 itself, plus thousands of maps on the notebook.

## 26. SETTING UP YOUR S4500 STEP BY STEP

It is possible to configure the S4500 in two ways, using software connected via USB or through the injection screen itself. To configure by the software, remove the protection from the USB - Type C port and connect it to the computer with the accompanying USB cable.

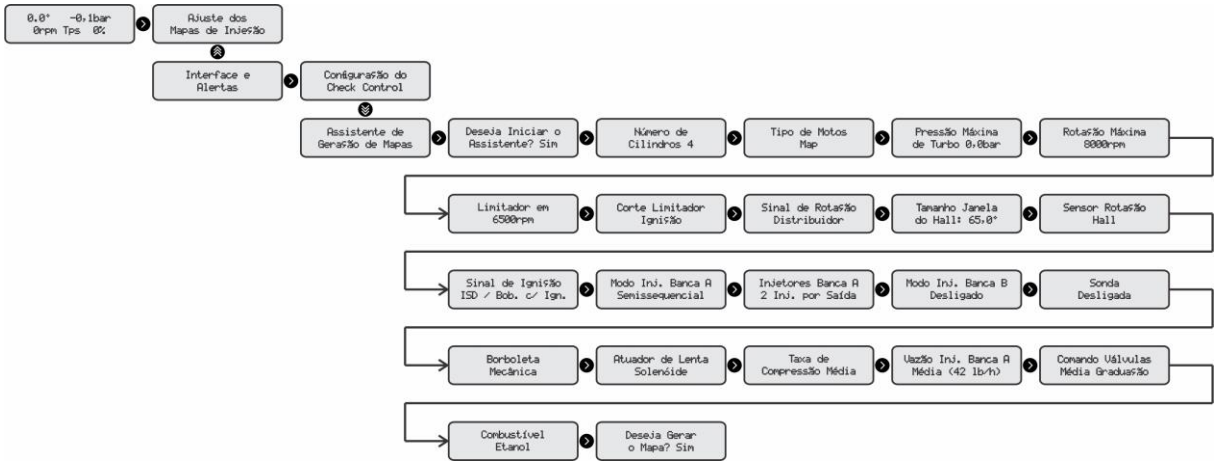
The on-screen setting can be assisted by the "**Map Generation Assitant**" that appears on the screen the first time the module is powered up. You can also access the assistant by the "**Interfaces and Alerts**" screen. With the help of it, configure the S4500 according to the characteristics of your engine by clicking up or down inside each function.

In the "Use as" screen the user can change the function by clicking the S4500 button up or down.

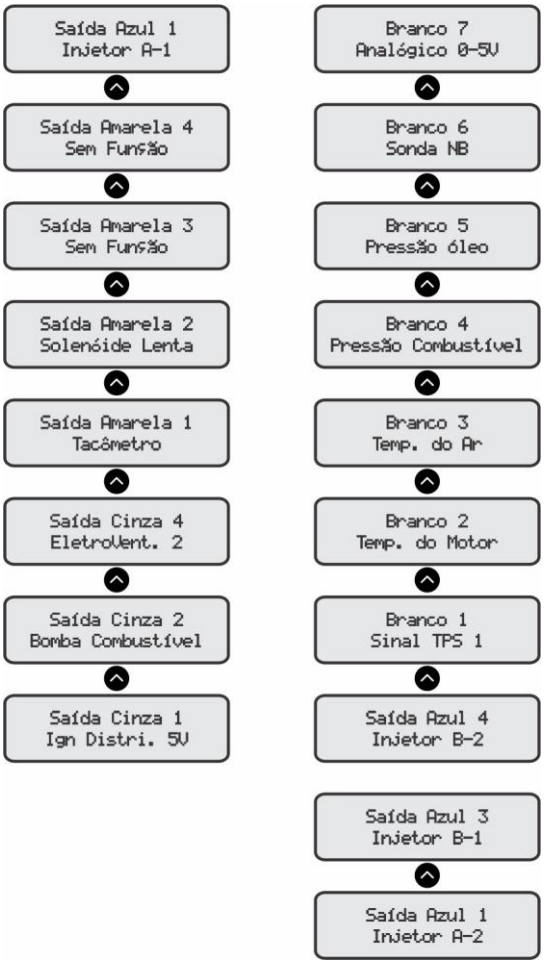



The "Test Output" screen is a function that allows you to test the module channel. When clicking the up or down button, the module sends pulses when the output is configured as a fuel injector or coil, or approximately 3s negative signal when configured with another function.

1. With the help of the "Map Generation Assistant" configure the S4500 according to the characteristics of your engine by clicking up or down within each function.




2. Right after the "Do you want to generate the map?" field, the "Cfg. In/ Outputs" appears on the screen, so we have the possibility to configure the inputs and outputs in "**Default**" or "**Custom**" mode. The next screen asks for confirmation of this option "Generate Cfg. In/Outputs?", and then if you choose "**Default**" the setting will look like this:




The functions and characteristics for each wire color are described at the beginning of this manual in the "Features" section.

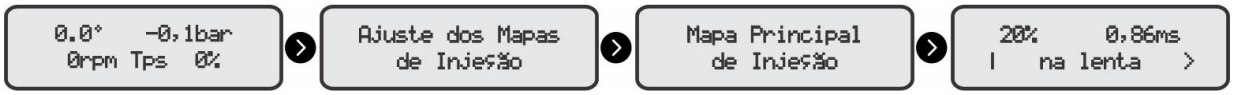
If you choose the Custom option, the assistant shows you the option to configure each function for each corresponding wire. Right below, you can see the configurations of the custom functions.

3. Right after, the assistant asks for a pedal calibration, this option can also be found in the tab "Sensor Calibration".

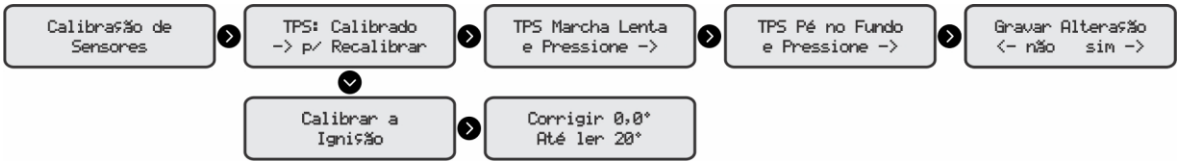

## 27. FIRST ENGINE START

After configuring all the items and generate the map by the assistant, we return to the main screen where we will see the ignition point, MAP, RPM, and TPS, so we can start the engine. Look on the screen for the item RPM located on the lower left side; at the moment of starting the RPM must mark a rotation, and then the injectors will pulse as well as the ignition. If it does not happen, check the rotation sensor and its connection or the configuration of the sensor in the menu "Ignition Configuration".

For the first start, we recommend that the idle speed be configured by TPS, since the access to this field is quicker and practical, so with the engine running the user can adjust the injection time by putting more or less fuel in order to adjust idle and stabilize it.




After, is necessary to calibrate the ignition point that is in the "Sensor Calibration" menu.




When the engine is running and stable, the ignition point must be calibrated. To do this, go to the "correct 0.0° until reading 20°" menu (if using Phonic Wheel) then S4500 will set the point at 20°.

Then you should pass the point gun and check the reading. If it matches the same 20° or 40° (wasted spark) the calibration is correct. Otherwise, adjustment can

be made by pressing the up button to add point to the engine, or down to take out point of the engine. This should be done until you get 20°. If this difference exceeds 6 degrees in the case of a 60-2 phonic wheel, probably one tooth is out of the correct alignment. For example, the alignment is on the 16th tooth when it should be on the 15th tooth.

When working with a distributor, the option we will find after the "Calibrate the Ignition" field will be "CALIBRATE DISTRIBUTOR WITH 20°", so when we are in this screen the S4500 sets the point to 20° and the distributor must be advanced or withdrawn until the point gun shows 20°.

With everything running and with idle stabilized it is possible to calibrate the injection map. We recommend this adjustment with the aid of a Wide Band probe and a Lambda Injepro conditioner (WB METER CAN +). With this product, you can get the most precise adjustment.

## 28. WARRANTY

**INJEPRO** provides a 5-year warranty from the date of purchase described in the invoice for manufacturing defects. **INJEPRO** is not responsible for:

- Defects caused by misuse;
- Wrong installation;
- Improper maintenance;
- Damage caused by incorrect settings.

The breach of the manufacturer's seal implies in the total loss of the warranty, not being entitled to free maintenance if there is a need.

For the complete use of this product, it is necessary that the mechanical and electrical parts are in perfect condition. Installation and operation should be performed by qualified professionals with extensive knowledge in preparation and regulation of engines with electronic fuel injection.

**FOR QUESTIONS AND INFORMATION CONTACT US**:

INJEPRO AUTOMOTIVE TECHNOLOGY
ADRESS: AV. BRASIL, 2589 – REGIÃO DO LAGO – CASCAVEL PR CEP 85812500
PHONE: (45) 3037-4040
SITE: www.injepro.com
E-MAIL: suporte@injepro.com