FuelTech

FuelTech
BoostController2

MULTI STAGE BOOST CONTROLLER

BOOSTCONTROLLER2

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Multi-Stage Electronic Boost Contro

Installation and Operation Guide

Contents

1. Warnings and Warranty Terms

The use of this equipment implies the total accordance with the terms described in this manual and exempts the manufacturer from any responsibility regarding to product misuse.

Read all the information in this manual before starting the product installation.

This product must be installed and tuned by specialized auto shops and/or personnel with experience on engine preparation and tuning.

Before starting any electric installation, disconnect the battery.

The inobservance of any of the warnings or precautions described in this manual might cause engine damage and lead to the invalidation of this product warranty. The improper adjustment of the product might cause engine damage.

This product does not have a certification for the use on aircrafts or any flying devices, as it has not been designed for such use purpose.

Important warnings for the proper installation of this product:
- Always cut the unused parts of cables off – NEVER roll up the excess as it becomes an interference capturing antenna and it can result on equipment malfunction.

- The black wire in the cable MUST be connected directly to the **battery's negative terminal**, as well as each one of the sensors' ground wires.

- The black/white wire MUST be connected directly to the engine block or head. By doing so, many interference problems are avoided.

Limited Warranty

This product warranty is limited to one year from the purchase date and covers defects from manufacturing origin only.

Defects and damages caused by the misuse of this product are not covered by the warranty.

The violation of the seal results in the invalidation of the Product Warranty and the loss of any access to new upgrade releases.

Manual version 1.3 – April/2015

2. Presentation

FuelTech BoostController is a boost pressure controller with multiple stages which manages with precision up to six turbo stages in addition to one launch stage, allowing an accurate and efficient traction control for cars and motorcycles. On each one of the stages it is also possible to determine a double ramp for boost pressure increase, which allows easing the response of the turbine on each gear shift, making the generation of engine power ideal for the currently available traction.

Important: The pressure controlled by FuelTech BoostController is the pressure on the top part of the Wastegate valve, not the boost pressure in the intake manifold.

2.1 Calculating the Boost Pressure

This equipment controls the pressure on the top part of the Wastegate valve (which regulates de boost pressure in the exhaust) in accordance with the selected stage (commonly, each stage is referred to a specific gear in addition to the pressure for the launch stage). Therefore, the pressure that this equipment controls is not the boost pressure directly, which is determined by the load of the Wastegate valve spring PLUS the pressure on the top part of the valve MINUS the effect of backpressure in the exhaust, and it is better explained below.

For low pressures, if your valve, with no electronic control, regulates the boost pressure in the intake manifold in 7.2psi and 4.3psi of pressure is put on the top part of the valve by FuelTech BoostController, boost pressure in the intake manifold will be of approximately 11.6psi (7.2psi + 4.3psi = 11.5). This rule can be used as an estimative of boost pressure in the intake manifold, but this relation cannot be assured for all cases.

2.2 Boost Line or CO2 tank

In high boost pressures, the exhaust backpressure generates a force against the Wastegate valve spring and results on the reduction of end boost pressure. Therefore, the final equation is:

MAP = SPRING + BC – (% x EMAP)

Where,

MAP: Boost Pressure
SPRING: Initial Pressure from the Wastegate
BC: Pressure applied by the BoostController on the top part of the Wastegate
%: Percentage of the exhaust pressure transferred to the pressure on the valve stem
EMAP: Exhaust backpressure

Example 1:

MAP: 11.6psi
SPRING: 7.2psi
BC: ?
%: 25% = 0.25
EMAP: 11.6psi

11.6 = 7.2 + BC – (0.25 x11.6) → BC: 7.2psi

In this example, the desired boost pressure is 11.6psi. Estimating a percentage of 25% of transference, it can be calculated that the pressure on the top part of the Wastegate must be of 7.2psi, in this case inferior to the boost pressure. Therefore, the boost line can be used as a source, as it is higher than the pressure needed.

Example 2:

MAP: 43psi
SPRING: 7.2psi
BC: ?
%: 25% = 0.25
EMAP: 58psi

43 = 7.2 + BC – (0.25 x 58) → BC = 50psi

In the second example, the desired boost pressure is 43psi. Estimating a percentage of 25% of transference, it can be calculated that the pressure needed on top of the Wastegate is of 58psi, which is <u>higher</u> than the boost pressure. As the pressure that the BoostController receives come from boost line, <u>lower</u> than the pressure that has to be applied on top of the Wastegate, it will not be able to keep the boost pressure in 43psi. To correct this problem, there are 3 alternatives:

a) Increase the pressure on Wastegate valve spring: by doing so, the amount required from equipment action is reduced (the minimum pressure will be a little higher);

b) Reduce the exhaust backpressure: generally it requires the turbine to be replaced and results in other collateral effects such as an increase in turbo lag;

c) Substitute the pressure source used by the BoostController to a CO_2 tank with controlled pressure superior to 50psi with a margin of 15 to 29psi of pressure more than the necessary.

Therefore, in this example, the indicated correction is the installation of a CO_2 tank in order to reach the desired pressure.

2.3 Wastegate Valve

The Wastegate valve is one of the most important items for the correct operation of FuelTech BoostController. It is critical that the valve has the following characteristics:

1. Capacity to relieve the engine to a constant pressure between 4.3psi and 13psi and with acceptable levels of backpressure in the exhaust manifold;
2. Perfect seal with the manifold;
3. Diameter and ports flow adequate to the engine power (i.e., engines between 500cv and 850cv need one 60mm valve or two 40mm valves; for engines with more than 850cv, the use of two 60mm Wastegate valves is recommended);
4. Seal on the bottom and top parts of the diaphragm. The valve shall not have any air leak (verify if your valve does not have a whole on the top, which is common in mechanic boost controllers);

Before any test with the BoostController, verify what pressure the Wastegate valve you have in use allows. If your valve has mechanic adjustment, reduce the entire load on the spring, and check what is the boost pressure reached and maintained in this situation. If, for example, the minimum pressure reached with a Wastegate valve was 8.7psi, the boost pressure work rate will not be lower than that, which means that the FuelTech BoostController will not run a pressure control that results in less than 8.7psi.

Your turbo compressor/wastegate system has a minimum and maximum pressure level. The BoostController does not change these limits, it only controls them. Therefore, it can't be affirmed that the values regarding to pressure adjusted on the equipment will be reached in fact, as that also depends on turbine dimensions, manifold backpressure and the valves used in your engine. You should know such features to have the BoostController helping you to get the best performance possible from your engine.

2.4 CO_2 Tank

For high boost pressures, we recommend the installation of a CO_2 tank to supply the pressure that will be applied to the top part of the Wastegate valve.

As the BoostController consumes little to control the Wastegate, the cylinder to be used can be as small as a bottle of nitrous oxide used in motorcycles or a small fire extinguisher bottle.

When the tank is used, it is obligatory the use of an industrial pressure regulator, limiting to 43.5, 58 or 72.5psi the pressure on the line. Two manometers must be use, one before the regulator, indicating the pressure in the tank, and the other after the regulator, showing the pressure on the line.

During the configuration of the BoostController, it will be necessary to inform what is the source of pressure, if Boost line or CO_2 Tank with 43.5, 58 or 72.5psi.

2.5 Characteristics

Features:

- Boost pressure controller through Wastegate valve;
- Burnout Mode, Launch Stage plus 6 Boost Pressure Stages;
- Individual and Sequential operation modes;
- Entries for Scramble (Boost+) and Reduce (Boost-) buttons for the instant increase or decrease of boost pressure;
- Control with double ramp for boost pressure increase per stage;
- Two solenoids for pressure control;
- Pressure control on the valve with the use of boost line or a compressed CO_2 tank for better precision and response;
- LCD display and buttons that allow all the adjustments to be made without the need of a computer.

Dimension: 120mm x 80mm x 30mm.

3. BoostController Electric Installation

The BoostController has a 12-way connector that is responsible for the feeding (12V), the control of the boost increase and relief solenoids and the input for the stages change.

The use of the Scramble (Boost+) and Reduce (Boost-) Buttons is optional. When pressed, they increase or reduce the pressure instantly in accordance with the values set on the menu. The Sequential Mode allows the use of both buttons; in the Individual Mode, the user defines if the Boost+ button or a sixth stage will be used (the Boost- button is not functional in this mode as it is used to activate the third stage).

The Gear Shift Button is used for changing to the next pressure stage when in the Sequential Mode. In the Individual Mode, this button activates the stage 2.

The cable for the Launch Button, which use is also optional, must be connected in conformity with the selected operation mode: when in Sequential Mode, it must be connected with the two-step button because, when activated, it makes the boost pressure rise up to what has been set in the "Launch Stage Pressure" parameter. When in the Individual Mode, this button activates the stage 1.

The solenoids must be connected to the purple and brown cables (which are activated from the negative) and to the switched positive (12V) in order to avoid them to be active when the car is turned off. Special attention must be given to the installation of valves, as the air flow course must be respected (there's a sign on each valve).

The buttons "Activate Stage 4" and "Activate Stage 5" are used only when in Individual Mode and trigger the stages 4 and 5, respectively.

3.1 Electrical Wiring Table

Cable color	Pin	Sequential Mode	Individual Mode	Note
Gray	3	Not used	Activate Stage 5	Activated by negative
Yellow	4	Not used	Not used	Future expansion
White	5	Gear Shift Button	Activate Stage 2	Activated by negative
Yellow	6	Not used	Not used	Future Expansion
Pink	7	Launch Button	Activate Stage 1	In the Sequential Mode, it's connected with FuelTech RacePRO-1Fi's Launch Cut button Activated by negative
Blue	9	Scramble (Boost+)	Scramble (Boost+) or Activate Stage 6	In the Sequential Mode and in the Individual Mode with 5 or less stages, it is the Boost+ Button. In the Individual Mode with 6 stages, it is the sixth stage Activated by negative
Orange	11	Not used	Activate Stage 4	Activated by negative
Yellow/Red	13	MAP Signal Output		Used with a datalogger system, it informs the pressure applied to the wastegate valve
Green	17	Reduce (Boost-)	Activate Stage 3	Activated by negative
Black	19	Battery's Negative Terminal		Must be directly connected to the battery; no add-ons or seams allowed.
Red	21	Switched 12V Supply		The use of a 10A fuse is recommended
Black and White	22	Chassis Ground		Power ground, connected to the vehicle's chassis.
Brown	23	Boost Increase Solenoid		Connected to the negative of the Boost Increase Solenoid
Purple	24	Boost Relief Solenoid		Connected to the negative of the Boost Relief Solenoid

Pins 1, 2, 8, 10, 12, 14, 15, 16, 18 e 20 are not used, that's why they are not at the harness.

Note: 13 pin connector (yellow/red wire) is an analog output signal from the BoostController MAP sensor. To setup it in a FuelTech Datalogger select "MAP FT (x bar)" (where 'x' is the pressure used on the BoostController).

For other brands datalogger, use the following table:

Voltage (V)	Pressure (bar)
0,2	-0,85
4,7	6

3.2 Electrical Wiring Diagram
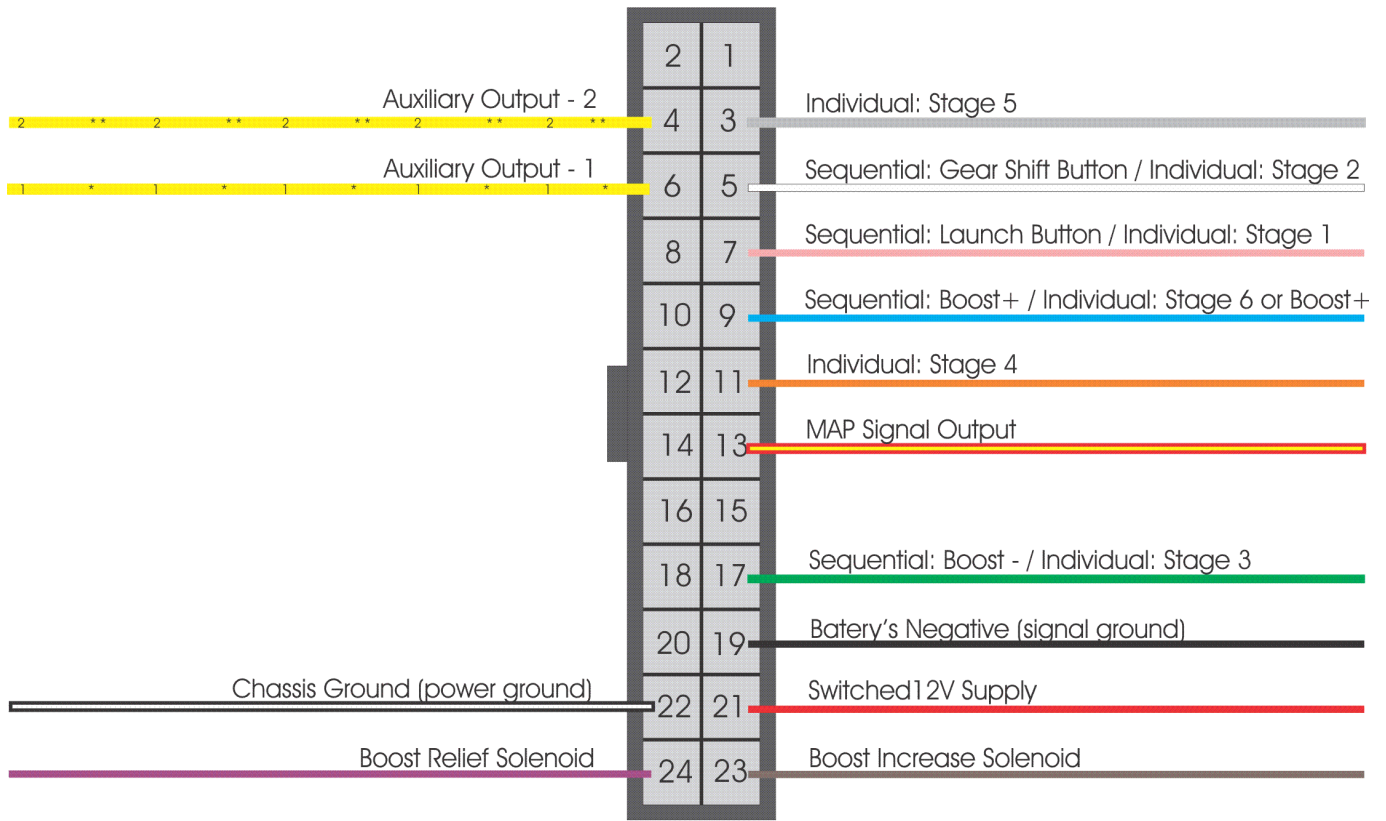
Harness Conector Rear View

3.3 USB/CAN Converter

On the back of the module is a 4-way connector with the nomenclature CAN. This connection will be used in the future with the USB/CAN Converter for communication with the PC and update via internet.

4. Solenoids Installation
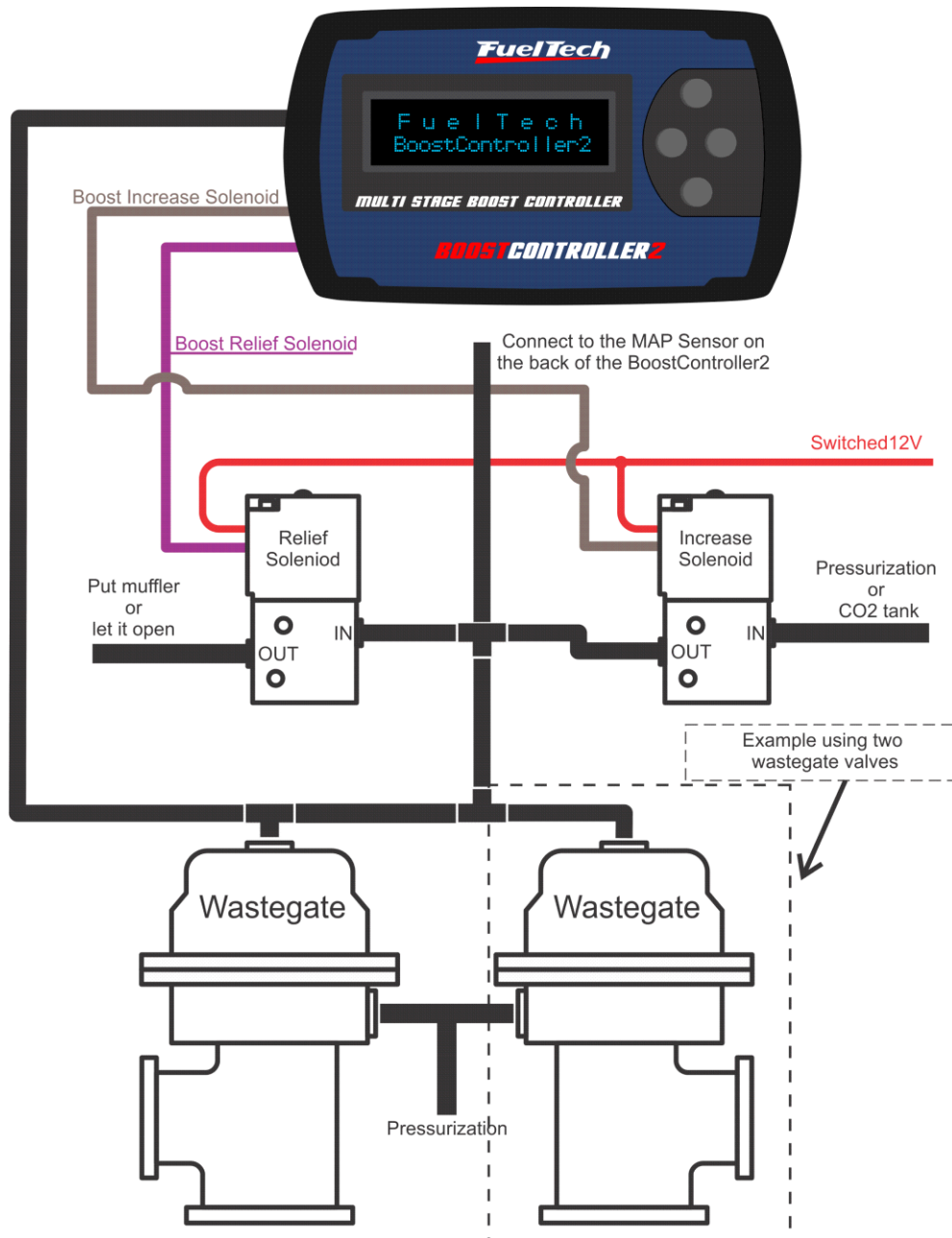
The purple wire must be connected to the solenoid that reduces the pressure on the top part of the Wastegate valve when necessary. A muffler can be put on this valve output.

The brown wire must be connected to the boost increase solenoid, which commands the valve that opens the pressure inflow coming from the boost line or the CO2 Tank to the top part of the valve. The source of pressure must be informed on the BoostController Configuration parameter.

The two solenoids must be connected to the switched positive (12V) and receive negative from the cables from the module. Two T-adapters or one X-adapter must be used for connections among the Wastegate valve, the two solenoids and the Module MAP sensor.

Important: A common problem that hinders the equipment proper functioning is the air leak on the Wastegate valve, either through a screw thread with a seal defect, or through the hoses and connectors used. Verify the system with an air compressor or with compressed CO2 from the tank (be careful not to lose tank load with a leak) to make sure that the seal is secure.

The solenoid should be fitted with rubber pads to absorb engine vibration. This prevents the vibration interferes with the functioning of the valves, particularly at high rpms.

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5. Settings and operation

When turning on the BoostController, the following opening screens is shown:

Opening Screen

Configurable
Initial Screen

```
F u e l T e c h
BoostController
```

```
Multi Stage
Boost Control
```
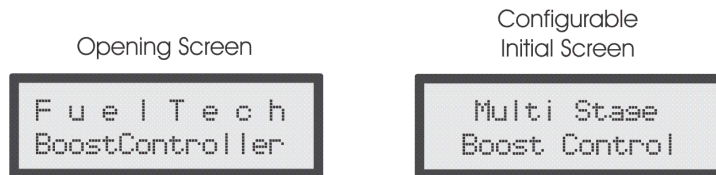
Then, the message "Boost Controller Activated!" is shown, and the screen will soon change to a stand-by

```
BoostController
ON!
```

```
Boost      16.6psi
(-) Ready
```

Current Boost Level
(Inactive Stage) Awaits command

When the Launch Button or the Gear Shift Button is pressed, the screen shows that the Controller has been activated.

```
Boost      16.60psi
(1) Targ.16.60psi
```

Current Boost Level
(Active Stage) Target Boost Level

Current Boost Level: displays the current pressure on the top part of the Wastegate valve.

Active Stage: informs in which stage the BoostController currently is. When the equipment is turned on, this indicator shows "(-)", meaning that no stage has been activated yet.

Target Boost Level: displays the pressure on the top part of the valve that the BoostController must reach.

When in the "BoostController ON!" mode, press the right button to deactivate the system ("BoostController Disabled!"). To return, press and hold the up button for 1 second.

5.1   Scramble Button (Boost+ Button)

```
Boost      16.6psi
(1)+Targ.16.6psi
```
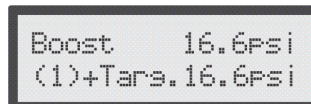
The Boost+ Button (or Scramble Button) is used to increase the boost pressure on the top part of the Wastegate valve while pressed. When this button is being used, a "+" symbol is shown by the number of the current stage, and the target boost for that stage is added to the pressure set for Boost+. On the screen above, for example, the target boost for stage 1 is 14.5psi and the pressure set for Boost+ is 7.2psi. When the button was pressed, the target boost changed to 21.7psi, for 14.5psi + 7.2psi = 21.7psi.

Note: This function is not available when having 6 stages in Individual Mode.

5.2   Reduce Button (Boost– Button)

```
Boost      16.6psi
(1)-Targ. 7.2psi
```
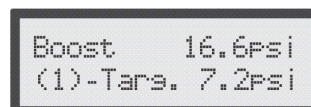
When the Boost- Button (or Reduce Button) is being used, the symbol "-" is shown by the number of the current stage, and the pressure set for Boost- is subtracted from the target boost for that stage. On the screen above, for example, the target boost for stage 1 is 14.5psi and the pressure set for Boost- is 7.2psi. When the button was pressed, the target boost changed to 7.2psi, for 14.5psi – 7.2psi = 7.2psi.

Note: This function is not available in the Individual Mode.

5.3 Launch Button

```
Boost    16.6psi
(0) Targ.14.5psi
```

Projected to be used along with the two-step button, this button makes the pressure on the top part of the Wastegate valve to be the one that has been configured in the "Launch Stage Setup" parameter, in the Boost Stages Setup menu. A "0" is shown to indicate that the current stage is the Launch Stage followed by the target boost for the current stage. Whenever this button is pressed while the equipment is running, the module returns to the first stage. **Note:** This function is only available in the Sequential Operation Mode.

5.4 Burnout Mode

```
Burnout Pressure       Burnout Pressure
    Adjust                  65psi
```
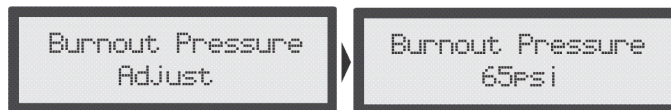
Allows keeping a different boost pressure during the burnout.
To enable it, press **up** button on BoostController2. The display will show the target boost, i.e. "Burnout 45psi".
To disable it, after the burnout, and go back to the boost ramps previously configured, press the **up** button again. The BoostController will now show "Ready" on the screen.

5.5 File Quick Change

```
Boost     0.0psi       Sett. X ENABLED
Control Disabled          Label X
```
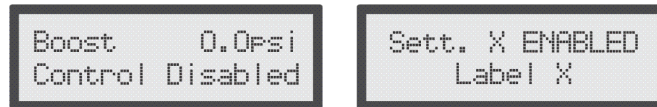
When keeping the down button pressed for 2 seconds at the "Control Disabled" screen, the BoostController makes a quick change of settings and displays the newly activated setting.

6. Menu and Programming

When pressing the right button, the equipment enters in the disabled mode ("BoostController Disabled!") and opens the Programming menu showing the screen below:

```
BoostController          Boost     0.0psi      Current Boost
   Disabled!             Control Disabled
```

From this screen on, it is possible to access and change BoostController configurations. Press the right button to navigate through the configuration menu. Press the up and down buttons to scroll among the three main configuration menus shown below:

```
Boost Stages
   Setup
     ▲▼
    Main
   Setup
     ▲▼
  Interface
  Settings
     ▲▼
   Files
  Manager
```
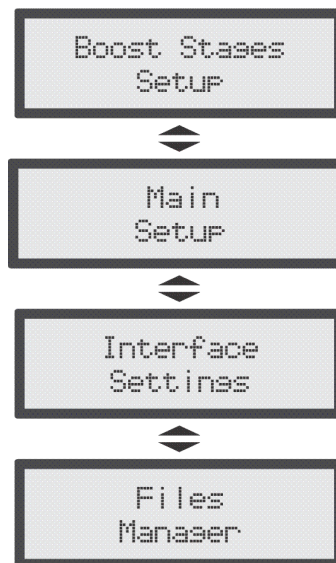
6.1 BoostController Main Setup

In this menu, the basic configurations must be inserted to the BoostController. Find below a brief description of each.

6.1.1 Operation Mode

It is possible to choose from "Sequential" or "Individual" Mode. The main difference between these two modes is the way the stages are activated.

In the Sequential Model, each time the Gear Shift Button is pressed, the BoostController will activate the next stage. Therefore, only one button is needed for the activation of stages. This button can be installed on the steering wheel, on the clutch or on the gear shift lever (or device).

In the Individual Mode, the stages are activated individually, meaning that each stage has a key, and therefore the number of keys will depend on the number of stages the user would like to have. Generally, these keys are installed on the gear shift lever (or device) and activated along and in accordance with the gear shift.

6.1.2 Number of Boost Stages

This configuration defines the number of stages to be used.

6.1.3 Adjust mode

There are three options in the "Adjust Mode" menu: "Boost and Ramp", "Time and Ramp" and "Time and Boost". Notice that the title of each one of the options indicates exactly which values must be inserted for the configuration of the stages. For example:

- With the "Boost and Ramp" adjust mode, it is necessary to insert Boost values (Pivot and End) and Boost Ramp values (Pivot and End) for each stage. In this case, the BoostController will calculate the time needed to reach the conditions set for each stage.

```
P.Interm 0.50bar
Rampa    0.9bar/s
```

- With the "Time and Ramp" adjust mode, it is necessary to insert Time values (Pivot and End) and Boost Ramp values (Pivot and End) for each stage. In this case, the BoostController will calculate the pressure needed to reach the conditions set for each stage.

  Note: This Stage Adjust Mode is not available in the Individual Operation Mode.

```
T.Inter.   0.60 s
Rampa  0.25bar/s
```

- With the "Time and Boost" adjust mode, it is necessary to insert Time values (Pivot and End) and Boost values (Pivot and End) for each stage. In this case, the BoostController will calculate the boost ramp needed to reach the conditions set for each stage.

```
T.Inter.   0.60 s
P.Inter. 0.25bar
```

6.1.4 Stages increase

In the "Stages Increase" menu, the user can choose from "Time Based" or "Shift Based" options. (Depending on the selected stage adjust mode, the user can lock the preferred option). The difference between the alternatives is that the change of stages is triggered either by the time elapsed, or by an external intervention (activation of keys that indicate a specific stage or gear shift).

The stages increase based on "Time" means that whenever the time configured for a specific stage has elapsed, the BoostController will move on to the next stage automatically (no key or external signal is needed).

When the stages increase is based on "Shift", an external signal (key activation) is needed to trigger the change to the next stage. The external signal is either the "Gear Shift Button" (when in Sequential Operation Mode), or the assignment of a specific Gear (when in Individual Operation Mode).

Operation Mode	Adjust type	Stages Increase
Sequential	Time and Boost	Time or Shift Based
	Time and Ramp	Time Based
	Boost and Ramp	Shift Based
Individual	Boost and Ramp	Shift Based
	Time and Ramp	

6.1.5 Pressure source

This option refers to the source of pressure used by the BoostController. It makes some corrections on the activation of the solenoids as well as on the system general operation, in accordance with the selected option.

Lastly, the user must select which source of pressure is being used. When choosing "Boost Line", the pressure applied on the top of the Wastegate valve comes from the vehicle's boost line. When opting for "CO2 with 43.5psi, 58psi, or 72.5psi", the user must install a CO2 tank with an industrial pressure regulator, limiting to 43.5psi, 58psi, or 72.5psi the pressure transferred to the circuit controlled by the BoostController.

```
Air Provided by
CO2 at 72.5psi
        ⇕
Air Provided by
CO2 at 58psi
        ⇕
Air Provided by
CO2 at 43.5psi
        ⇕
Air Provided by
Boost Line
```

6.2 Individual Operation Mode

```
┌──────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌────────────────┐   ┌──────────────┐
│   Main   │ ▸ │Operation Mode│ ▸ │Number of Boost│ ▸ │  Adjust Mode │ ▸ │Stages Increase │ ▸ │Air Provided by│
│  Setup   │   │  Individual  │   │      6       │   │Time and Boost│   │  Shift Based   │   │ CO2 at 72.5psi│
└──────────┘   └──────────────┘   └──────────────┘   └──────────────┘   └────────────────┘   └──────────────┘
                                          ⬍                  ⬍                                        ⬍
                                   ┌──────────────┐   ┌──────────────┐                         ┌──────────────┐
                                   │Number of Boost│   │  Adjust Mode │                         │Air Provided by│
                                   │ 5 with Boost+│   │Boost and Ramp│                         │ CO2 at 58psi │
                                   └──────────────┘   └──────────────┘                         └──────────────┘
                                          ⬍                                                           ⬍
                                   ┌──────────────┐                                            ┌──────────────┐
                                   │Number of Boost│                                           │Air Provided by│
                                   │ 4 with Boost+│                                            │CO2 at 43.5psi│
                                   └──────────────┘                                            └──────────────┘
                                          ⬍                                                           ⬍
                                   ┌──────────────┐                                            ┌──────────────┐
                                   │Number of Boost│                                           │Air Provided by│
                                   │ 3 with Boost+│                                            │  Boost Line  │
                                   └──────────────┘                                            └──────────────┘
                                          ⬍
                                   ┌──────────────┐
                                   │Number of Boost│
                                   │ 2 with Boost+│
                                   └──────────────┘
                                          ⬍
                                   ┌──────────────┐
                                   │Number of Boost│
                                   │ 1 with Boost+│
                                   └──────────────┘
```

The Individual Operation Mode was projected to be used in street cars with traction difficulties, giving them the possibility of using up to 6 boost stages, configured on the relation between "Time and Boost" or "Boost and Ramp". In this mode, the stages increase can only be based on "Shift", and it is done through the activation of the key corresponding to the gear that is being used at the moment.

After selecting the operation mode, the user must inform the number of boost stages desired (commonly, this number is related to the number of gears the vehicle has). When selecting up to 5 stages, the Boost+ button can be used. If 6 stages are selected, it is not possible to use the Boost+ button.

```
┌──────────────┐
│ Boost Number │
│      6       │
└──────────────┘
       ⬍
┌──────────────┐
│ Boost Number │
│ 5 with Boost+│
└──────────────┘
       ⬇
┌──────────────┐
│ Boost Number │
│ 1 with Boost+│
└──────────────┘
```

```
┌──────────────┐
│  Adjust Mode │
│Time and Boost│
└──────────────┘
       ⬍
┌──────────────┐
│  Adjust Mode │
│Boost and Ramp│
└──────────────┘
```

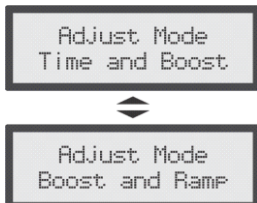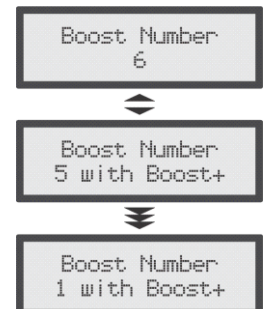On the next screen, the user has to select the Adjust Mode choosing from "Time and Boost" or "Boost and Ramp". When selecting the first option, the stage adjust will be based on time as a function of boost (the BoostController will calculate the boost ramp needed). When selecting the second option, the stage adjust will be based on boost as a function of its boost ramp (the BoostController will calculate the time needed).

As for the Stages Increase parameter, only the "Shift Based" option is available when in Individual Operation Mode. That is because, as gear shifting occurs frequently, the stages will be activated according with the button that is being pressed. Such buttons must be installed on the gear shift lever (or device) in a way that, when shifting, the button that corresponds to that gear can be pressed.

```
┌──────────────┐
│Stages Increase│
│  Time Based  │
└──────────────┘
       ⬍
┌──────────────┐
│Stages Increase│
│  Shift Based  │
└──────────────┘
```
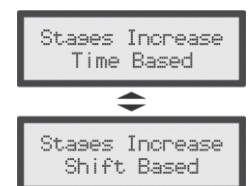
Note: Due to vibration on the gear shift lever, a stage can only be changed when another stage is activated by pressing on the corresponding button. Therefore, even if the sensor of the stage is disabled, the corresponding stage will still be active.

6.3 Sequential Operation Mode

```
┌─────────────┐   ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
│    Main     │ ▶ │ Operation Mode  │ ▶ │ Number of Boost │ ▶ │   Adjust Mode   │ ▶ │ Stages Increase │ ▶ │ Air Provided by │
│    Setup    │   │   Sequential    │   │        6        │   │  Time and Boost │   │   Time Based    │   │  CO2 at 72.5psi │
└─────────────┘   └─────────────────┘   └─────────────────┘   └─────────────────┘   └─────────────────┘   └─────────────────┘
                                                 ⇕                     ⇕                     ⇕                     ⇕
                                        ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
                                        │ Number of Boost │   │   Adjust Mode   │   │ Stages Increase │   │ Air Provided by │
                                        │        5        │   │  Time and Ramp  │   │   Shift Based   │   │  CO2 at 58psi   │
                                        └─────────────────┘   └─────────────────┘   └─────────────────┘   └─────────────────┘
                                                 ⇕                     ⇕                                           ⇕
                                        ┌─────────────────┐   ┌─────────────────┐                       ┌─────────────────┐
                                        │ Number of Boost │   │   Adjust Mode   │                       │ Air Provided by │
                                        │        4        │   │  Boost and Ramp │                       │  CO2 at 43.5psi │
                                        └─────────────────┘   └─────────────────┘                       └─────────────────┘
                                                 ⇕                                                               ⇕
                                        ┌─────────────────┐                                           ┌─────────────────┐
                                        │ Number of Boost │                                           │ Air Provided by │
                                        │        3        │                                           │   Boost Line    │
                                        └─────────────────┘                                           └─────────────────┘
                                                 ⇕
                                        ┌─────────────────┐
                                        │ Number of Boost │
                                        │        2        │
                                        └─────────────────┘
                                                 ⇕
                                        ┌─────────────────┐
                                        │ Number of Boost │
                                        │  1 with Boost+  │
                                        └─────────────────┘
```
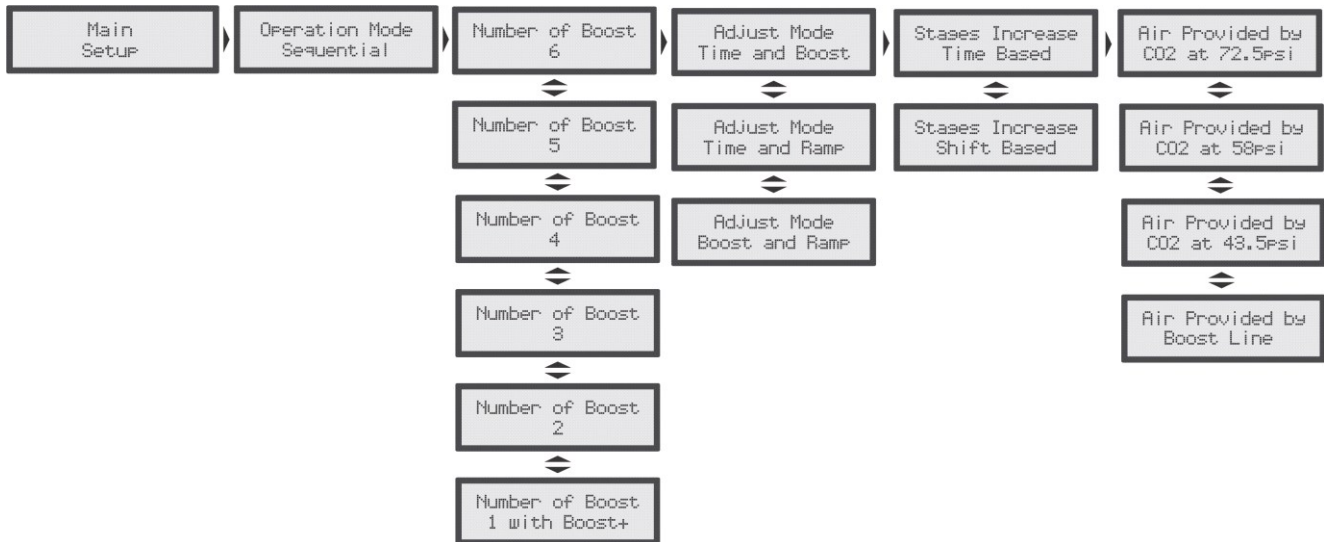
The Sequential Operation Mode was projected to be used in competition cars (drag racing cars) to facilitate their launch with the lowest traction loss possible.

This mode allows the user to select up to 6 boost stages, including the Boost+, Boost- and Launch buttons.

```
┌─────────────────┐
│ Number of Boost │
│        6        │
└─────────────────┘
         ⇕
┌─────────────────┐
│ Number of Boost │
│        1        │
└─────────────────┘
```
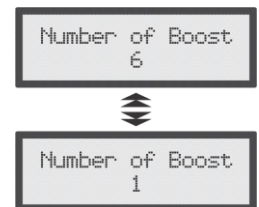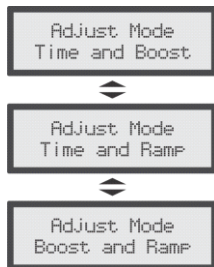
In the Sequential mode, the user must select the stage adjust mode from "Time and Boost", "Time and Ramp" or "Boost and Ramp". The Stages Increase options vary according to the chosen adjust mode.

```
┌─────────────────┐
│   Adjust Mode   │
│  Time and Boost │
└─────────────────┘
         ⇕
┌─────────────────┐
│   Adjust Mode   │
│  Time and Ramp  │
└─────────────────┘
         ⇕
┌─────────────────┐
│   Adjust Mode   │
│  Boost and Ramp │
└─────────────────┘
```

As previously stated, the Stage Increase menu options vary according to the chosen adjust mode:

- When the "Time and Boost" adjust mode has been selected, the user must choose from a Stages Increase based on "Time" or "Shift".
- When the "Time and Ramp" adjust mode has been chosen, the Stages Increase based on "Time" is selected automatically.
- When the "Boost and Ramp" adjust mode has been chosen, the Stages Increase based on "Shift" is selected automatically.

6.4 Error Messages

6.4.1 Pivot time greater than End time

This message is shown when the Pivot Time selected by the user is greater than the Target Time (End Time). When the BoostController displays this message, the configuration is not saved; therefore the user must restart the configuration for that stage.

```
Piv.Time greater
than End Time
```

6.4.2 Configuration Can't Be Reached

This message is displayed in the "Boost and Ramp" stage adjust mode when the user inserts a configuration that can't be completely achieved because the selected boost ramps are too low, resulting in a total execution time too long for the stage. When this error occurs, the configurations set by the user are saved, but the stage does not carry out until the end. The solution for this case is to insert values a little higher for the boost ramps.

```
Configuration
Cant be Reached!
```

6.4.3 Pivot Ramp Stage #X Changed

The BoostController displays this message in two situations, when in the "Boost and Ramp" and in the "Time and Ramp" stage adjust modes.

```
Pivot Ramp
Stage #X Changed
```

In the "Boost and Ramp" parameter, it occurs when the End Boost of a stage is changed to a value that, combined with the Pivot Boost of the next stage, needs an opposite ramp to the one that has been set as the Pivot Ramp for the next stage. Example: the Pivot Boost for stage 3 was configured as 29psi with 14.5psi/s ramp. But the End Boost for stage 2 has been changed from 21.7psi to 36.2psi. Therefore, the Pivot Ramp for stage 3 must be revised to a negative value, as the boost must decrease from 36.2 to 29psi. When this happens, the BoostController corrects the values automatically and warns the user with the message.
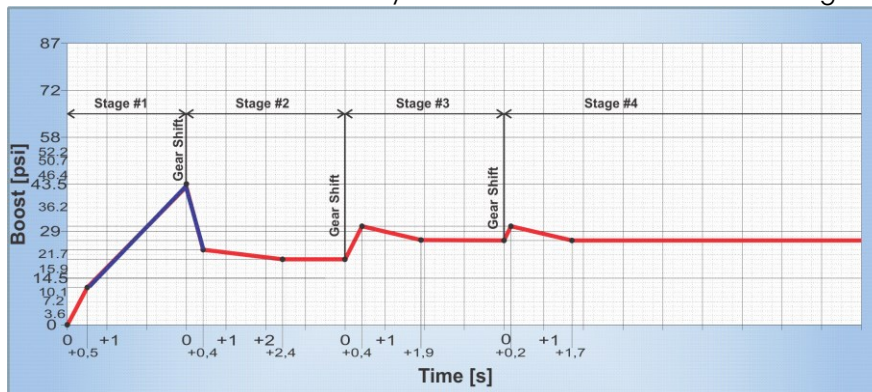
At the graphic beside, the blue slope shows the final pressure drop of the first stage, according to the second intermediate pressure.

In the "Time and Ramp" parameter, the message is shown when the End Time of a stage is set with the same value as the Pivot Time of the next stage. As two different boost targets cannot exist in the same period of time, the Pivot Ramp of the next stage is revised to 0.00psi/s.

Note: The boost values that the BoostController inserts to correct the ramp are the lowest possible (+0.05bar/s, 0.00bar/s, or -0.05bar/s, according to the boost ramp needed).

6.4.4 Pivot Boost Stage #X Changed

In the "Time and Boost" adjust mode, when the user inserts an End Time equal to the Pivot Time of the next stage, the BoostController displays this message and makes the Pivot Boost value of the next stage the same as the End Boost value of the current stage.

```
Pivot Boost
Stage #X Changed
```

6.4.5 Longer than Maximum Time

In the BoostController, there is a time limit of 20 seconds for the execution of all the programming. Therefore, when the total sum of the stages times in the "Time and Ramp" mode with stages increase based on "Shift" go over this limit, the BoostController displays the "Longer than Maximum Time" message and truncates the last stages. For example, if the total time is of 22 seconds and the last stage had been set with a time of 5 seconds, this time will be altered to 3 seconds, resulting in a total time of 20 seconds.

```
Longer than
Maximum Time
```

6.5 Boost Pressure Control

The boost ramp is the speed with which the pressure increases and it is expressed in the "psi per second" (psi/s) unit. As an example, a 29psi/s ramp is one that, beginning at 0psi, in 1 second progressively reaches 29psi, and in 2 seconds reaches 58psi of boost pressure. The ramp is determined having in consideration the vehicle and the track conditions.

```
Time      0.00psi
Boost     0.00psi

Overall Adjust      Time      0.00psi
  (all stages)      Ramp    0.00psi/s

                    Boost     0.00psi
                    Ramp    0.00psi/s
```

The first gears are the most critical ones when it comes to traction, therefore, lower boost pressures are generally used. A first gear ramp will likely be around 2.9psi/s and 11.6psi/s in a car with radial tires, for example. But a 4th gear ramp for a track or drag racing car with competition slick tires will most probably be at its maximum high, which means that the target boost can be reached immediately.
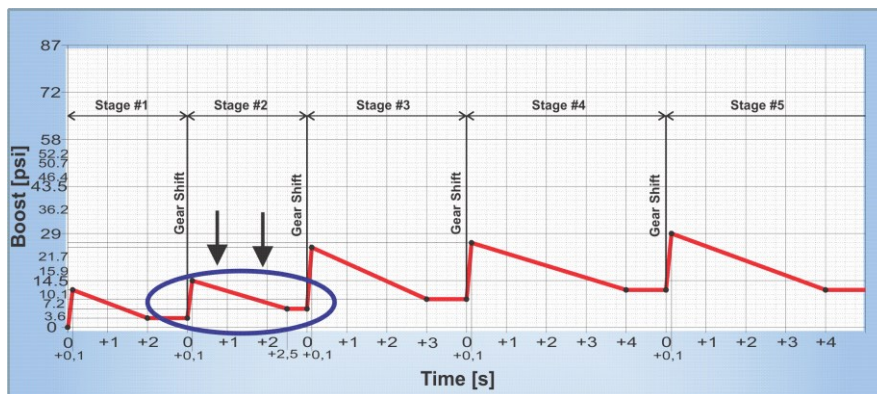
Within each stage, 2 ramps can be set with their respective target boost level. That is, when the stage starts (and it starts with the target boost level of the previous stage) it is determined that the pressure on top of the Wastegate valve must increase up to a pivot pressure with a chosen speed (pivot ramp). Soon after, the pressure increases up to the target boost pressure for that specific stage with a second speed (target ramp), and then the end boost is maintained until the shift gear button is activated, and the BoostController moves on to the next stage.

Within each stage, there are two ramps at different rates of pressure rise, as indicated. This is done to insure the progressivity of increased pressure, to prevent loss of traction.

The Pivot Ramp of each stage sets the response of the turbine when shifting gears. With a low pivot ramp (such as 4.3psi), the turbine response is softer and progressive (which is recommended for the first gears, particularly in cars with traction problems). A high pivot ramp (such as 79psi/s) makes the turbine to quickly jerk on to a faster response when shifting gears.

The Target Ramp is triggered in the phase between the Pivot Boost and the Target (End) Boost. The target ramp determines how the boost pressure increases at the end of the stage. A lower ramp (such as 2.9psi/s) makes the boost pressure increase slowly until reaching the target boost (it is possible that the boost pressure does not even reach the target level if the next stage is activated in the meantime). A higher ramp (such as 87psi/s) makes

There is also the possibility of controlling the boost pressure using time as a reference (Stages increase based on Time). With this configuration, the user must set the Pivot Time parameter, which determines for how long the Pivot Ramp will be in action. When this time is up, the controller moves on to the Target (End) Ramp, which starts performing as soon as the Pivot Time is over and stops when the time set for the End Time parameter elapses, stabilizing the boost pressure.

It is important to remember that "End Time" refers to the stage's total time, and the Pivot Time is part of the End Time. Therefore, if the End Time is of 4 seconds with a 14psi/s ramp and the Pivot Time is of 2 seconds with a 29psi/s ramp, it will result in 2 seconds with the pressure rising with a speed of 29psi/s and 2 seconds with the pressure rising with a speed of 14psi/s. Therefore, in this control mode, the pressured reached is determined multiplying the time by its respective ramp. In the example above, the End Boost for that stage would reach 87psi [(2s x 29psi/s= 58psi) + (2s x 14psi/s= 29psi)].
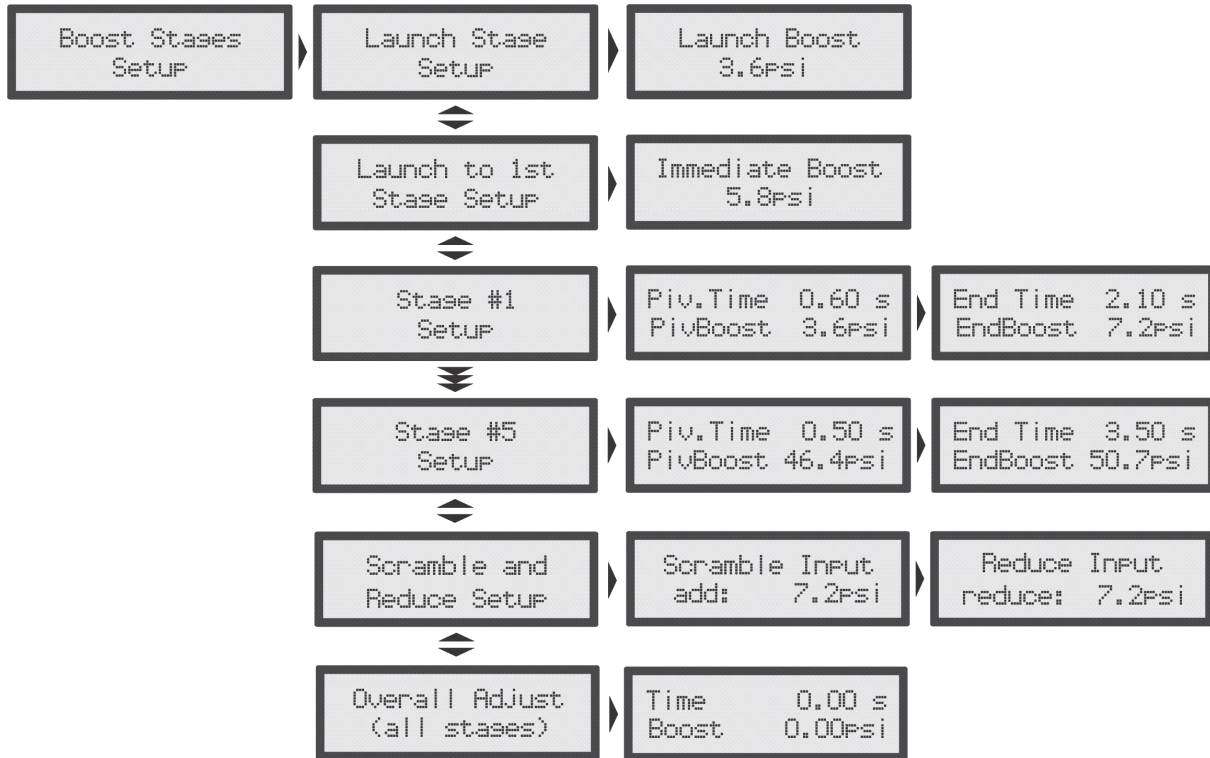
Moreover, it is possible to have negative ramps, which occur when the intention is to decrease the boost pressure. For example, if the End Boost for stage 1 is 43.5psi and the Pivot Boost for stage 2 is 29psi, the boost pressure must be reduced, thus a negative ramp is necessary.

6.6 Stages settings menu

6.6.1 Overall Adjust (all stages)

This menu is employed when the user wishes to modify the whole map quickly. When this menu is altered, the BoostController calculates and applies the corrections in each step of the configuration. This setting is based on the selected Stage Adjust Mode, changing the values for Time, Boost or Ramp.

6.6.2 Adjust Mode based on Time and Boost

```
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│  Boost Stages    │ ▶ │  Launch Stage    │ ▶ │  Launch Boost    │
│     Setup        │   │     Setup        │   │     3.6psi       │
└──────────────────┘   └──────────────────┘   └──────────────────┘
                              ▲▼
                       ┌──────────────────┐   ┌──────────────────┐
                       │  Launch to 1st   │ ▶ │  Immediate Boost │
                       │   Stage Setup    │   │     5.8psi       │
                       └──────────────────┘   └──────────────────┘
                              ▲▼
                       ┌──────────────────┐   ┌──────────────────────┐   ┌──────────────────────┐
                       │    Stage #1      │ ▶ │ Piv.Time   0.60 s     │ ▶ │ End Time    2.10 s    │
                       │     Setup        │   │ PivBoost   3.6psi     │   │ EndBoost    7.2psi    │
                       └──────────────────┘   └──────────────────────┘   └──────────────────────┘
                              ▼▼
                       ┌──────────────────┐   ┌──────────────────────┐   ┌──────────────────────┐
                       │    Stage #5      │ ▶ │ Piv.Time   0.50 s     │ ▶ │ End Time    3.50 s    │
                       │     Setup        │   │ PivBoost  46.4psi     │   │ EndBoost   50.7psi    │
                       └──────────────────┘   └──────────────────────┘   └──────────────────────┘
                              ▲▼
                       ┌──────────────────┐   ┌──────────────────────┐   ┌──────────────────────┐
                       │  Scramble and    │ ▶ │ Scramble Input        │ ▶ │  Reduce  Input        │
                       │  Reduce Setup    │   │   add:     7.2psi     │   │  reduce:   7.2psi     │
                       └──────────────────┘   └──────────────────────┘   └──────────────────────┘
                              ▲▼
                       ┌──────────────────┐   ┌──────────────────────┐
                       │  Overall Adjust  │ ▶ │ Time       0.00 s     │
                       │  (all stages)    │   │ Boost      0.00psi    │
                       └──────────────────┘   └──────────────────────┘
```

When the "Time and Boost" adjust mode is selected, the Boost Stages Setup menu is shown as the image above. The user must inform the time and boost preferred, and the BoostController will calculate the ramp necessary to comply with the configuration. For example, let's suppose we have the stage 5 set as the image above: if the End Time is 3.50s and the Pivot Time is 0.50s, it means that when the user press the button to activate the 5th stage, in 0.5s the boost pressure will be 46.4psi and 3 seconds later the boost pressure will be 50.7psi, once the Pivot Time is part of the End Time. Therefore, the Pivot Ramp (which is the result of Pivot Time x Pivot Boost) will perform for 0.50s and the End Ramp (End Time x End Boost) will be active for 3.00s (3.50s – 0.50s = 3.00s).
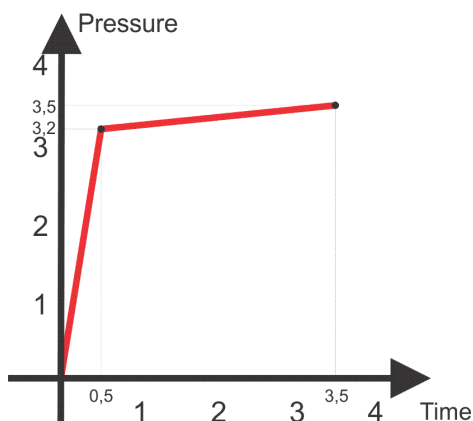

Final time = 3,5s
0,5s to 3,5s (3,5 – 0,5= 3s) the pressure varied only 0,3 bar, so:

Ramp end: 0,3 bar / 3s = 0,1 bar/s

To arrange the stages in this adjust mode, do as follows:

1. At the "Control Disabled" screen, press the right button to enter the programming menus.
2. Press the right button once again in "Boost Stages Setup" and scroll through the submenus with the up and down buttons.
3. The "Launch Stage Setup" screen will only be displayed when the BoostController is in Sequential Mode. In it, the user must inform the boost pressure applied on the top part of the Wastegate valve when the "Launch Button" is depressed. Press the right button to confirm.
4. The screen will display "Stage #1 Setup". Press the right button to set the Pivot Time (Piv. Time) using the up and down buttons and then confirm pressing the right button again.
5. The next step is to adjust the Pivot Boost (Piv. Boost), which indicates the boost pressure reached when the Pivot Time is over. Press the right button to confirm.
6. On the next screen, set the target end time (End Time) for this stage. Press the right button to move to the target boost (End Boost) parameter, which indicates the boost pressure reached at the end of the stage. Press the right button and, in case of any alteration, confirm by pressing the right button once more.
7. Repeat the steps above to adjust the settings for the other stages.
8. To configure the scramble or reduce buttons, enter the Boost Stages Setup again and press the down button until finding the "Scramble and Reduce Setup" screen. Press the right button to enter.
9. The "Scramble Input" screen will be displayed. Press the up and down buttons to adjust the value for the boost increase when the Boost+ button is activated. If the valued is altered, the program will request a confirmation.
10. The "Reduce Input" is the next screen, and it is displayed only when the BoostController is in Sequential Mode. Adjust the value for the boost decrease, i.e. the amount of boost relief given when the Boost- button is depressed. Press the right button to confirm in case of alteration.
11. In the "Overall Adjust" menu, it is possible to modify all the adjustments for the parameters with only one alteration.
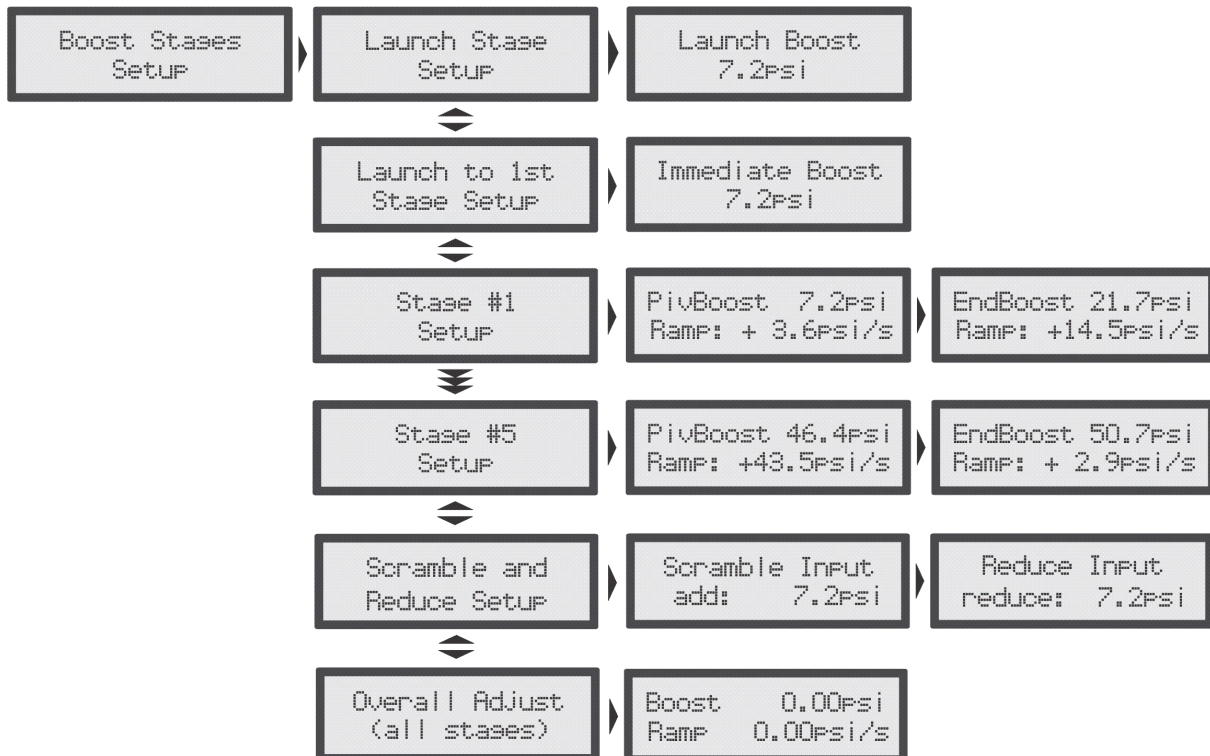
6.6.3 Adjust Mode based on Time and Ramp
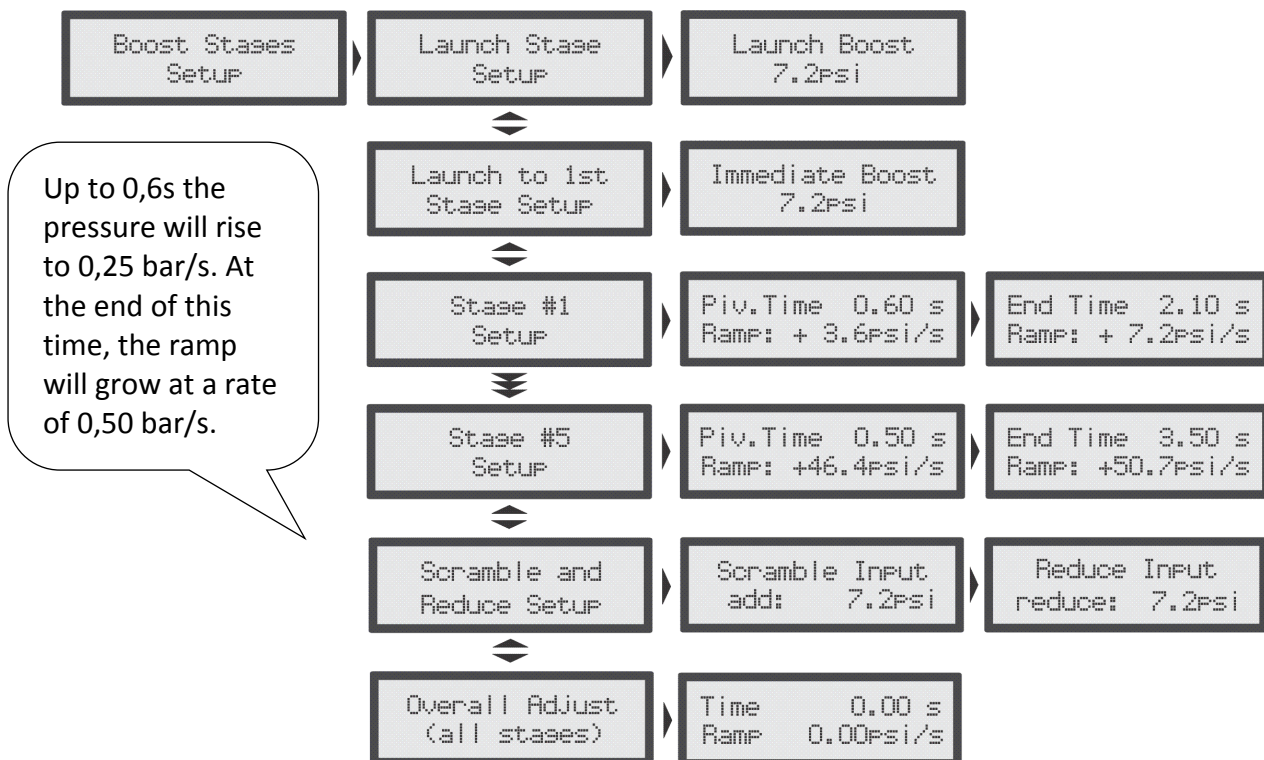
When adjusting the Boost Stages Setup in the "Time and Ramp" mode, the menu is shown as the image above. The user must inform the time and ramp, and the BoostController will calculate the boost pressure necessary to comply with the configuration. This configuration is only available when in Sequential Mode. For example, let's suppose we have the stage 1 set as the image above in which the Pivot Time (Piv. Time) is 0,60s and the Pivot Ramp (Piv. Ramp) is 3.60psi/s, meaning that by the beginning of the stage, the boost pressure ramp will be 3.6psi/s during 0.60s; from that moment on, the Ramp starts performing at a 7.2psi/s, during 2.10s.

To arrange the stages in this adjust mode, do as follows:

1. At the "Control Disabled" screen, press the right button to enter the programming menus.
2. Press the right button once again in "Boost Stages Setup" and scroll through the submenus with the up and down buttons.
3. At the "Launch Stage Setup" screen, the user must inform the boost pressure applied on the top part of the Wastegate valve when the "Launch Button" is activated. Press the right button to confirm.
4. The screen will display "Stage #1 Setup". Press the right button to set the Pivot Time (Piv. Time) using the up and down buttons and then confirm pressing the right button again.
5. The next step is to adjust the Pivot Ramp (Ramp), which indicates the boost ramp that will be in action during the Pivot Time. Press the right button to confirm.
6. On the next screen, set the target end time (End Time) for this stage. Press the right button to move to the target ramp (Ramp) parameter, which indicates the boost ramp that will be in action during the End Time. Press the right button and, in case of any alteration, confirm by pressing the right button once more.
7. Repeat the steps above to adjust the settings for the other stages.
8. To configure the scramble or reduce buttons, enter the Boost Stages Setup again and press the down button until finding the "Scramble and Reduce Setup" screen. Press the right button to enter.
9. The "Scramble Input" screen will be displayed. Press the up and down buttons to adjust the value for the boost increase when the Boost+ button is activated. If the valued is altered, the program will request a confirmation.
10. The "Reduce Input" is the next screen, and it is displayed only when the BoostController is in Sequential Mode. Adjust the value for the boost decrease, i.e. the amount of boost relief given when the Boost- button is depressed. Press the right button to confirm in case of alteration.
11. In the "Overall Adjust" menu, it is possible to modify all the adjustments for the parameters with only one alteration.

### 6.6.4 Adjust Mode based on Boost and Ramp

The third adjust mode is the one based on "Boost and Ramp", in which the user must inform the boost and boost ramp, and the BoostController will calculate the time necessary to comply with the configuration. In the example above, the Pivot Boost (Piv. Boost) is 7.2psi and the Pivot Ramp (Ramp) is 3.6psi/s, which means that the pivot boost pressure will be reached in 2 seconds, for 7.2psi / 3.6psi/s = 2s. Then, the End Ramp (Ramp) comes into action, and the End Boost, set for 21.7psi, will be reached in 1 second, because the End Ramp is 14.5psi/s and the pressure still to be reached is 14psi (21 – 7psi= 14psi), once the system had already reached 7.2psi from the Pivot Boost.

To arrange the stages in this adjust mode, do as follows:

1. At the "Control Disabled" screen, press the right button to enter the programming menus.
2. Press the right button once again in "Boost Stages Setup" and scroll through the submenus with the up and down buttons.
3. The "Launch Stage Setup" screen will only be displayed when the BoostController is in Sequential Mode. In it, the user must inform the boost pressure applied on the top part of the Wastegate valve when the "Launch Button" is activated. Press the right button to confirm.
4. The screen will display "Stage 1 Setup". Press the right button to set the Pivot Boost (Piv. Boost), reached with the Pivot Ramp (Ramp) using the up and down buttons and then confirm pressing the right button again.
5. The next step is to adjust the target end Boost (End Boost) for this stage. Press the right button to move to the target ramp (Ramp) parameter, in which the value for the boost ramp that will be in action until the boost pressure reaches the amount set in the system as End Boost. Press the right button and, in case of any alteration, confirm by pressing the right button once more.
6. Repeat the steps above to adjust the settings for the other stages.
7. To configure the scramble or reduce buttons, enter the Boost Stages Setup again and press the down button until finding the "Scramble and Reduce Setup" screen. Press the right button to enter.
8. The "Scramble Input" screen will be displayed. Press the up and down buttons to adjust the value for the boost increase when the Boost+ button is activated. If the valued is altered, the program will request a confirmation.
9. The "Reduce Input" is the next screen, and it is displayed only when the BoostController is in Sequential Mode. Adjust the value for the boost decrease, i.e. the amount of boost relief given when the Boost- button is depressed. Press the right button to confirm in case of alteration.
10. In the "Overall Adjust" menu, it is possible to modify all the adjustments for the parameters with only one alteration.
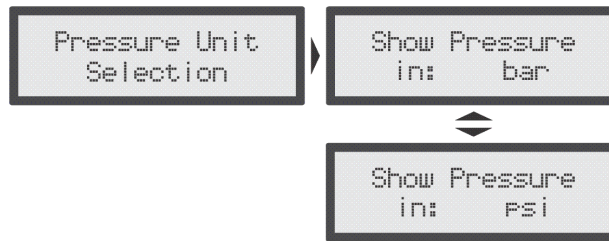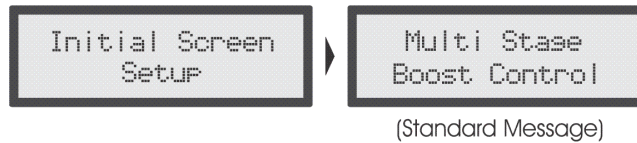
6.7 Interface Settings
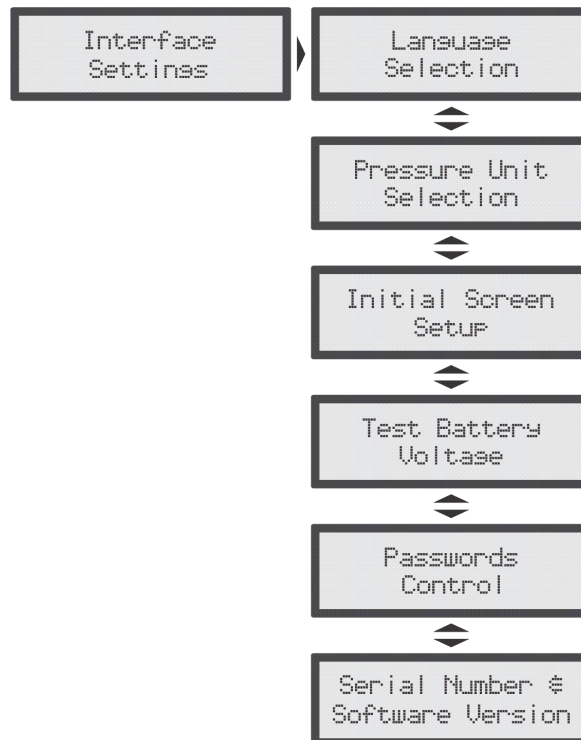
1. At the "Control Disabled" screen, press the right button and then the down button to find the "Interface Settings" menu. Press the right button to enter.
2. Press the up and down buttons to scroll through the Interface Settings menu.

6.7.1 Pressure Unit Selection

Select here if the pressure will be shown in "psi" or in "bar".

```
┌─────────────────┐     ┌─────────────────┐
│  Pressure Unit  │  ►  │  Show Pressure  │
│    Selection    │     │   in:     bar   │
└─────────────────┘     └─────────────────┘
                                ▲
                                ▼
                        ┌─────────────────┐
                        │  Show Pressure  │
                        │   in:     psi   │
                        └─────────────────┘
```

6.7.2 Initial Screen Setup

```
┌─────────────────┐     ┌─────────────────┐
│  Initial Screen │  ►  │   Multi Stage   │
│      Setup      │     │  Boost Control  │
└─────────────────┘     └─────────────────┘
                          (Standard Message)
```

It is possible to customize the Initial Screen Message. When the BoostController is turned on, the following screen with the product's name is displayed:

```
┌─────────────────┐
│  F u e l T e c h│
│ BoostController │
└─────────────────┘
```

And soon after, another message is shown. This second screen can be customized by the user:

```
┌─────────────────┐
│   Multi Stage   │
│  Boost Control  │
└─────────────────┘
```

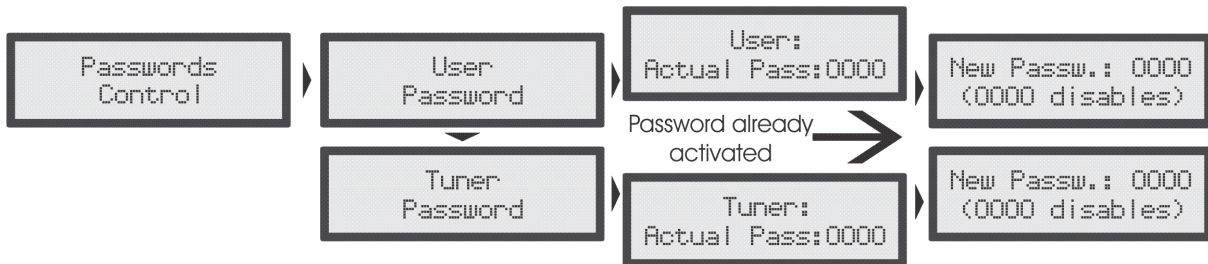To edit the message, enter the "Initial Screen Setup" menu by doing the following:
1. At the "Control Disabled" screen, press the right button. The "Boost Stages Setup" menu will be displayed.
2. Press the down button to find the "Interface Settings" menu and press the right button to enter.
3. Press the down button until finding the "Initial Screen Setup" menu. Press the right button to enter.
4. The current message will be displayed with an editing prompt.
5. To erase the line in full, press the up or down button. To edit the current text letter by letter without erasing the line, press the left button.
6. To scroll through the characters, press the up and down buttons. To pass on a character, press the right button.
7. To finish the line, put three blank spaces in a row.
8. To finish editing, put three blank spaces in a row again and confirm pressing the right button.

6.7.3 Battery Voltage Test

```
+-------------------+      +-------------------+
|   Test Battery    |  ▶   |  Battery Voltage  |
|     Voltage       |      |      12.8V        |
+-------------------+      +-------------------+
```

In this parameter, it is possible to verify the module's feed voltage. (It is presumed that the module is connected to the vehicle battery).
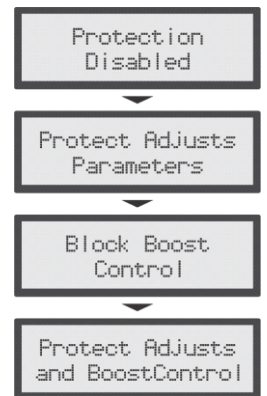
6.7.4 Password Control

```
+--------------+    +--------------+    +--------------------+    +---------------------+
|  Passwords   | ▶  |    User      |    |       User:        |    |  New Passw.: 0000   |
|   Control    |    |   Password   |    | Actual Pass:0000   |    |   (0000 disables)   |
+--------------+    +--------------+    +--------------------+    +---------------------+
                           ▼            Password already  ───▶
                    +--------------+        activated
                    |    Tuner     |    +--------------------+    +---------------------+
                    |   Password   |    |      Tuner:        |    |  New Passw.: 0000   |
                    +--------------+    | Actual Pass:0000   |    |   (0000 disables)   |
                                        +--------------------+    +---------------------+
```

6.7.5 User Password

When activating the user password, it is possible to make 4 different types of adjustments for blocking and protection purposes:

- **No Protection:** this option must be selected when the user wants to insert a password but keep free access to all menus. It must be chosen to avoid that any password is inserted without the user's consent, as it is only possibly to activate a blocking option after entering the current password.
- **Protect Menu Only:** with this option, all menus are protected against alterations. Open access is given only for information reading and equipment operation.
- **Block Boost Control:** this option blocks the operation of the BoostController until the password is inserted. All menus are open for visualization and alteration, but the boost control will not be done.
- **Protect Menus and Boost Control:** in this mode, the BoostController operation and the visualization of menus are blocked until a password is inserted

```
+-------------------+
|    Protection     |
|     Disabled      |
+-------------------+
         ▼
+-------------------+
|  Protect Adjusts  |
|    Parameters     |
+-------------------+
         ▼
+-------------------+
|    Block Boost    |
|      Control      |
+-------------------+
         ▼
+-------------------+
|  Protect Adjusts  |
| and BoostControl  |
+-------------------+
```

To enable or disable the password, do as follows:
1. With no protection active and with the control disabled, press the right button. The "Boost Stages Setup" menu will be displayed.
2. Press the down button to find the "Interface Settings" menu and press the right button to enter.
3. Press the down button until finding the "Passwords Control" menu. Press the right button to enter.
4. Press the down button to find the "User Password" option. Press the right button to enter.
5. If a password has already been set, the system will request it to be inserted. If not, the system will move directly to the edition of a new user protection password.
6. Use the up and down buttons to edit the characters, and the left and right buttons to move the prompt back and forth. (To disable the protection, insert "0000"). Press the right button to confirm.
7. Choose from the 4 types of protection explained above and press the right button to confirm.

6.7.6 Tuner Password

This password only blocks the "Boost Stages Setup" and the "Main Setup" menus, leaving the "Interface Settings" menu and the BoostController operation commands open for access.

To enable or disable the password, do as follows:
1. With no protection active and with the control disabled, press the right button. The "Boost Stages Setup" menu will be displayed.
2. Press the down button to find the "Interface Settings" menu and press the right button to enter.
3. Press the down button until finding the "Passwords Control" menu. Press the right button to enter.
4. Press the down button to find the "Tuner Password" option. Press the right button to enter.
5. If a password has already been set, the system will request it to be inserted. If not, the system will move directly to the edition of a new tuner protection password.

6. Use the up and down buttons to edit the characters, and the left and right buttons to move the prompt back and forth. (To disable the protection, insert "0000").
7. To finish, press the right button and confirm pressing the right button again.

Important Note: The BoostController leaves FuelTech headquarters with all passwords disabled. Once inserting a protection password, the user will be blocking other people from accessing the equipment and even blocking him/herself. When choosing a password, make sure you will remember it, as, for safety matters, this password can only be changed at FuelTech headquarters (being the owner in charge of shipment and related expenses), and it will be subject to a service fee.

6.8 Files Manager

With the Settings Manager, it is possible to configure three different boost pressure settings for distinct situations, such as track, street, drag racing, etc.
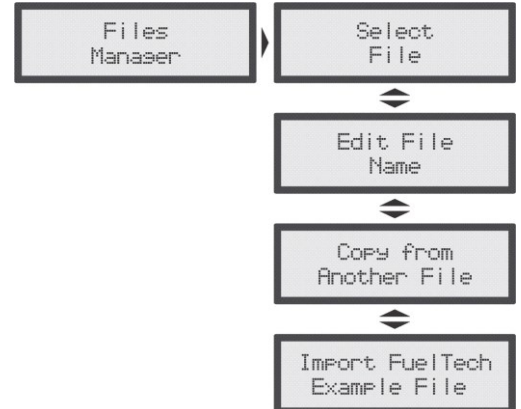
6.8.1 Select a File
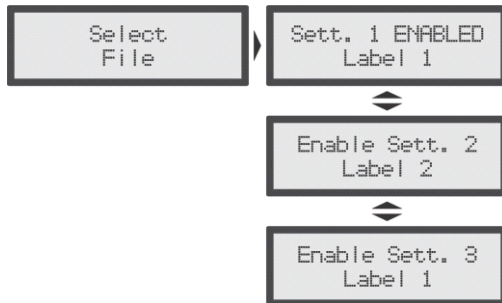
Each one of the three files can be configured in a different way. This menu is where the settings can be selected.
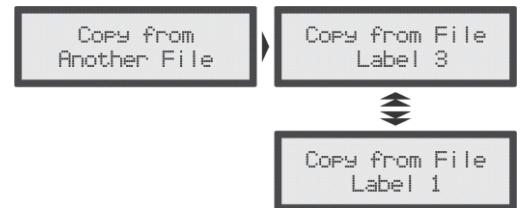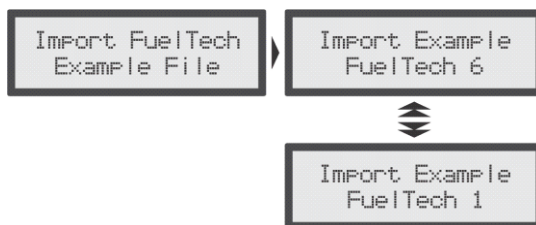
6.8.2 Edit File Name

In this menu, it is possible to edit the title of the currently active file, in order to identify the adjust modes more easily.

6.8.3 Copy from another File

This function can be applied when the user adjusts a configuration for the vehicle in Setting 1, for example, and wants to copy it to another setting.

6.8.4 Import FuelTech Example File

The BoostController has six different files recorded in its memory, which can be loaded at any time and serve as a basis for more specific adjustments according to the user's preferences. Find below the configurations and graphs of each example setting found in the BoostController (including the example setting #5, which is the standard setting used by FuelTech for all new BoostController).

6.8.5 Serial Number and Software Version

In this menu, it is possible to verify the software version and the equipment's serial number.

Make sure to have these numbers in hand whenever the FuelTech Technical Support is contacted to facilitate and optimize the assistance.
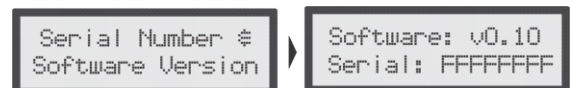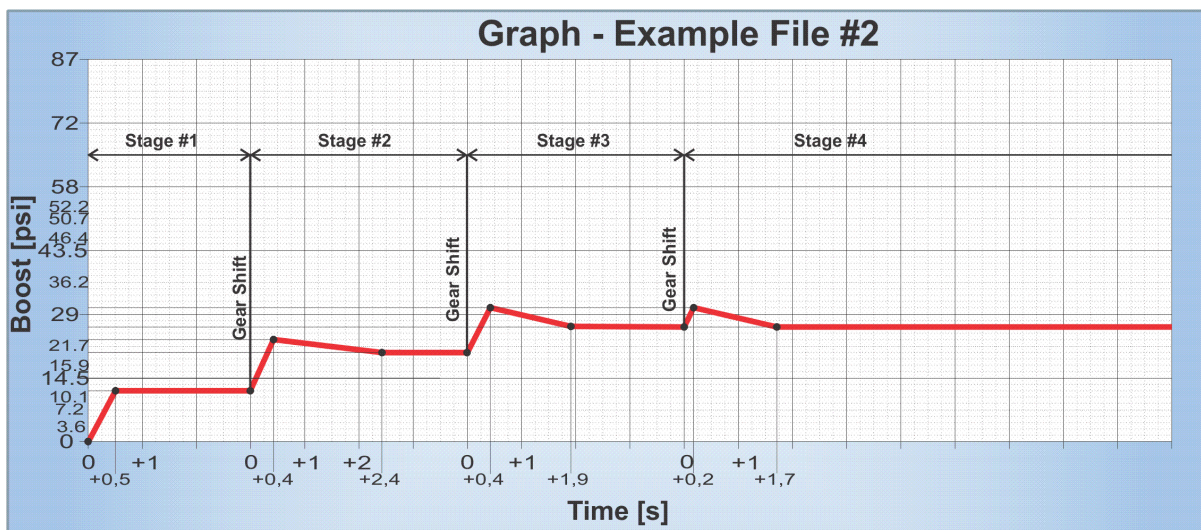
7. Example Settings

Configuration for Example File #1												
Operation Mode:				Sequential (or Individual)								
Boost Stages:				6								
Adjust Mode:				Boost and Ramp								
Stages Increase:				Shift Based								
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Boost (psi)	3.6	7.2	10.1	15.9	21.7	29	36.2	43.5	46.4	50.7	52.2	58
Ramp (psi/s)	5.8	42	3.6	1.4	17.4	5.8	43.5	3.6	43.5	2.9	43.5	2.1

Graph - Example File #1
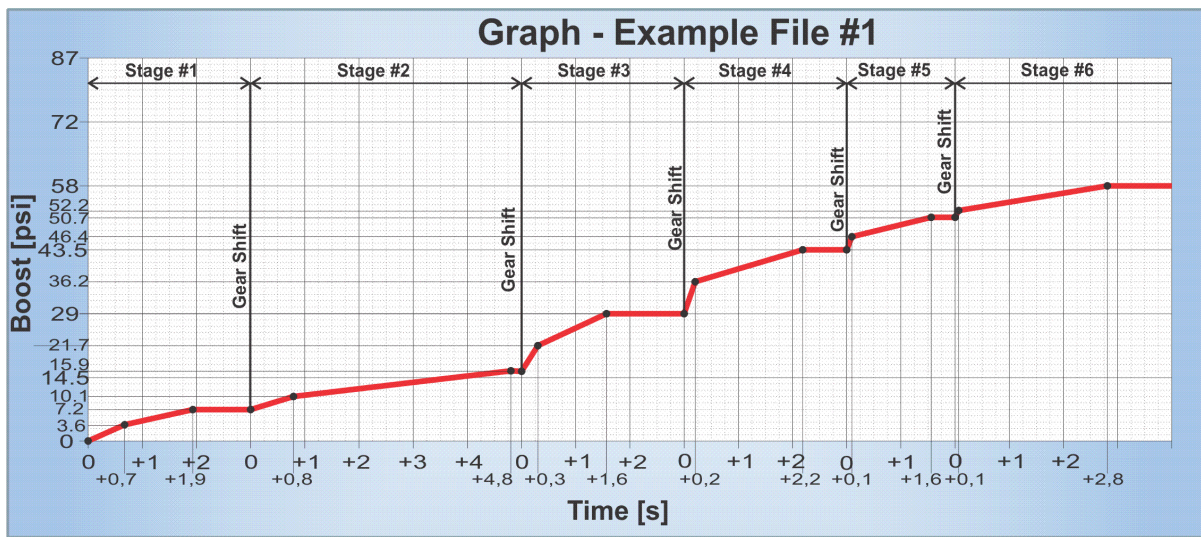
Configuration for Example File #2												
Operation Mode:				Individual (or Sequential)								
Boost Stages:				4								
Adjust Mode:				Boost and Ramp								
Stages Increase:				Shift Based								
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Boost (psi)	11.6	11.6	23.2	20.3	30.4	26.1	30.4	26.1				
Ramp (psi/s)	23,2	0	29	-1.4	29	-2.9	29	-2.9				

Graph - Example File #2

Configuration for Example File #3 – One fix boost per stage												
Operation Mode:				Sequential (or Individual)								
Boost Stages:				6								
Adjust Mode:				Boost and Ramp								
Stages Increase:				Shift Based								
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Boost (psi)	3.6	3.6	7.2	7.2	14.5	14.5	21.7	21.7	29	29	36.2	36.2
Ramp (psi/s)	43.5	0	43.5	0	43.5	0	43.5	0	43.5	0	43.5	0

Graph - Example File #3
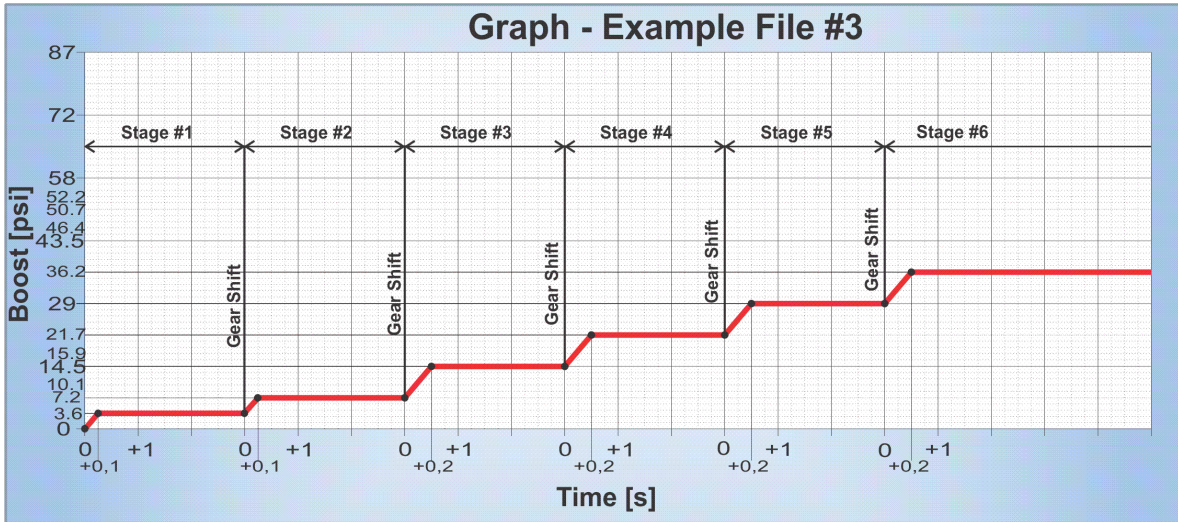
Configuration for Example File #4												
Operation Mode:				Sequential								
Boost Stages:				5								
Adjust Mode:				Time and Ramp								
Stages Increase:				Time Based								
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Time [s]	1	2	3	5	6	8	9	11	12	15		
Ramp [psi/s]	11.6	0	11.6	-1.4	10.1	-2.1	4.35	-1.4	0	0		
Operation Mode:				Sequential								
Boost Stages:				5								
Adjust Mode:				Time and Boost								
Stages Increase:				Time Based								
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Time [s]	1	2	3	5	6	8	9	11	12	15		
Boost (psi)	11.6	11.6	23.2	20.3	30.4	26.1	30.4	26.1	26.1	26.1		

Graph - Example File #4
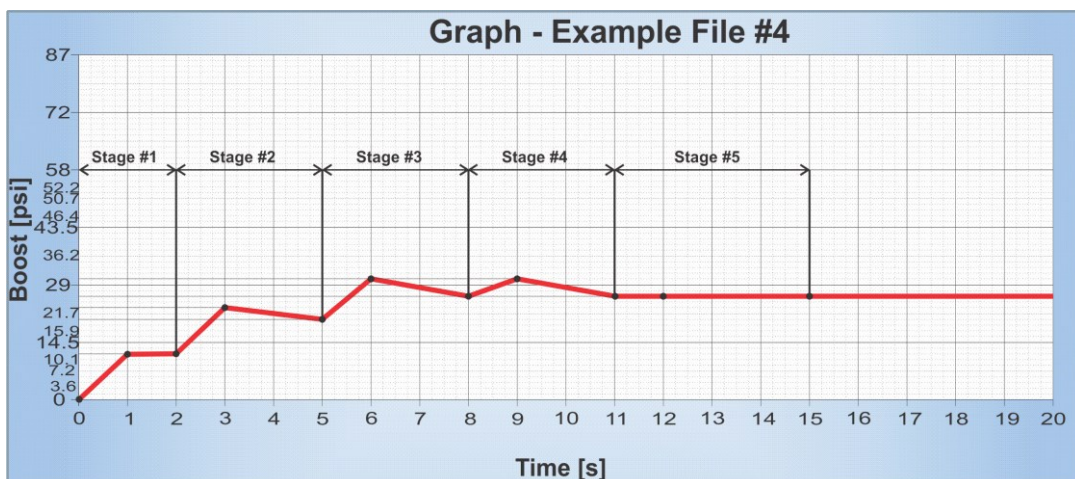
Configuration for Example File #5 – Boost Standard											
Operation Mode:		Sequential									
Boost Stages:		4									
Adjust Mode:		Time and Boost									
Stages Increase:		Shift Based									
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Time [s]	0,1	3,1	0,8	3,3	0,6	3,1	0,3	2,8				
Boost (psi)	2.9	5.8	8.7	13	15.9	23.2	26.1	31.9				

Graph - Example File #5
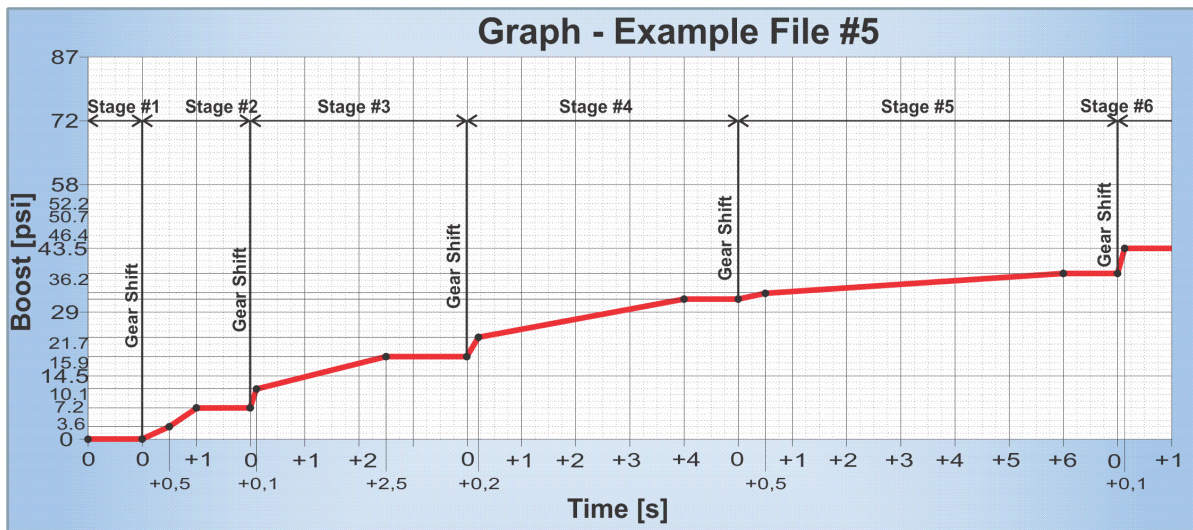
Configuration for Example File #6 – Street with torque, Overboost in low RPM (original turbo style)											
Operation Mode:		Individual (or Sequential)									
Boost Stages:		5									
Adjust Mode:		Time and Boost									
Stages Increase:		Shift Based									
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Time [s]	0,1	2	0,1	2,5	0,1	3	0,1	4	0,1	4		
Boost (psi)	11.6	2.9	14.5	5.8	24.6	8.7	26.1	11.6	29	11.6		
Operation Mode:		Sequential									
Boost Stages:		5									
Adjust Mode:		Time and Boost									
Stages Increase:		Time Based									
	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6	
	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End	Pivot	End
Time [s]	0,1	2	2,1	4,5	4,6	7,5	7,6	11,5	11,6	15,5		
Boost (psi)	11.6	2.9	14.5	5.8	24.6	8.7	26.1	11.6	29	11.6		

Graph - Example File #6