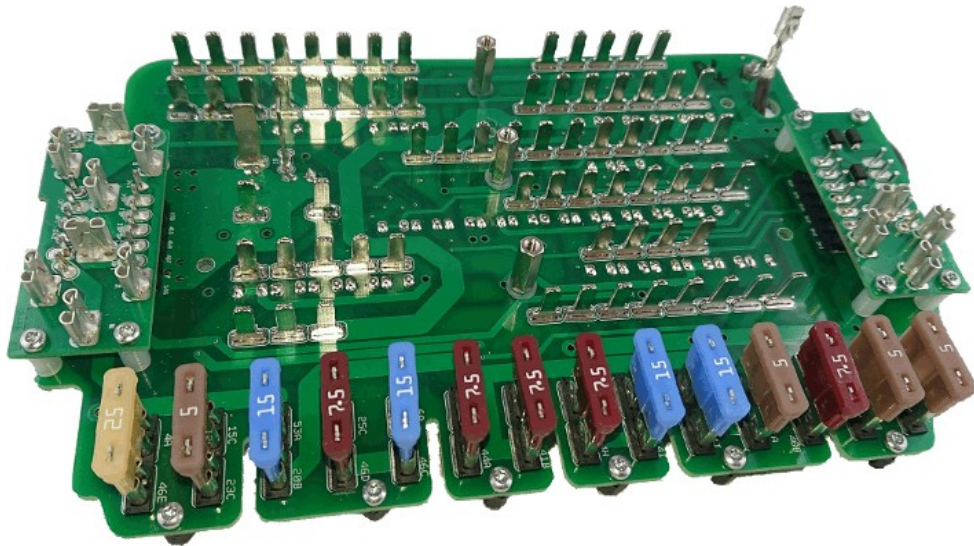


BITURBOX

“the end of the Biturbo gremlins”

A “plug and play” replacement for the fuse box of the Maserati BITURBO family
Compatible with all Biturbo type cars made from 1981 to 1994 (Biturbo to Shamal, no ABS)
Replaces Maserati part No. 313020104 (inside board only) and 313020339 (fuse cover)



User manual

Foreword

Dear customer,

As the proud owner of a 2.24v and a Maserati enthusiast, I too struggled with the recurrent electrical gremlins that affect our objects of automotive passion, the Maserati Biturbo and its derivatives.

As an electrical engineer and with my own company's tools and knowledge at my own disposal, in year 2017 I started toying with the idea of designing a replacement for the inner circuit of the dreaded fuse box. After much work, eventually, it became a real product that enabled me to enjoy my car without worrying about the reliability of the fuse box itself!

Thank you for purchasing your BITURBOX! I sincerely hope that it will help you enjoy a trouble free ride on your car.

Maurizio Ferrari, Galileo Engineering

Content

Description	Quantity
Main BiturBOX board, assembled	1
Fuse Cover	1
Manual	1
M3x10 cross head screw	3

Compatible with all Biturbo family models equipped with fuse box Maserati No. 313020104:

Biturbo / Biturbo S / Biturbo i / Biturbo Si / Biturbo E / Biturbo ES / Biturbo Si 2500
222 / 222 E / 222 SE / 222 SR / 222.4v / 2.24v / Racing

425 / 425i

420 / 420 S / 420i / 420 Si

430 / 430 4v.

422 / 4.24v

Spyder / Spyder i / Spyder III / Spyder III (2800)

228

Karif

Shamal

Racing

Ghibli / Ghibli 2.8 (non ABS)

The Biturbox was not tested on animals and no Maserati cars were harmed during testing, either, and it is packaged in recycled cardboard.

What can you expect from the BITURBOX

The old fuse box board, which routes the power supply for most of the car's services, is known to be a source of electrical gremlins: it is in fact a late 1970s design with obvious electrical issues: the fuse box cannot properly handle the required currents. The most evident symptoms were, even then, the slow speed of the power windows, the obvious drop in the battery voltage when the direction lights were switched on, a weak sound from the horn, other intermittent malfunctions of essential electrical parts.

The higher the required service load, the greater the voltage drop inside the box, which could even lead to, in extreme cases, the melting of the 'torpedo' fuse holders. Moreover, after thirty or even forty years, the aging of the flexible circuit board and of the soldering of the male faston pins often leads to interruption of the connections.

BITURBOX solves those weaknesses with a state of the art printed circuit board designed to distribute all the power needed for the car's services, using state of the art 2020 technology, with double thickness copper routes as well as modern ATO type fuses.

The improvement is immediately noticeable by checking, for example, the speed with which the windows close, the sound of the horn, the stability of the battery voltage as the direction indicators do their job, but all services and loads served through the fuse box are will benefit of an improved supply.

Operations remains stable even when many loads are activated at the same time.

We have also replaced the external diodes' box with three diodes soldered directly on the BITURBOX boards.

The rating of some fuses has changed from 5A to 7.5A (fuses No.2, 7) and from 8A to 10A (fuse No. 8). There are two reasons to this:

- The internal, undesired resistance of the old box worked against the flow of the desired current through the fuses to the loads. In other words, the Biturbox allows higher currents to flow through, as the loads require.
- Blade fuses are better and more precise: a 5A 'torpedo' fuse withstands a 10A current for at least 60", whereas a 7.5A blade fuse withstands a 10A current for a time between 3" and 10", that is to say, blade fuses trip within a more narrow time/current 'window': they work better as they are more reliable and more strict.

What you shouldn't expect from the BITURBOX

The board addresses power supply problems and delivers all the needed current to every load which is attached to the fuse box itself. In general, it will make most systems work to the best of their capability.

There are devices, on the other hand, such as the door lock control unit, which are known to be troublesome due to their own design flaws. While a proper power supply can always help, malfunctions that do not depend on the power supply cannot be solved by simply replacing the fuse box.

Warranty

Please read the following conditions of sale carefully before purchasing.

The board reproduces, from the point of view of the electrical circuit, the original circuit diagram of the fuse box 313020104, re-engineered to the state of the art of electronic design technology. Therefore, it is a pin-to-pin replacement of what is inside the old 'Biturbo fuse box'.

To this end, reverse engineering work was carried out to maximize the current carrying capabilities so that the devices served by the board may function correctly, according to the required loads.

Having said that, it is implied that this product is going to be installed on historic vehicles, with electrical systems that over time may have been altered or aged in a completely unpredictable way.

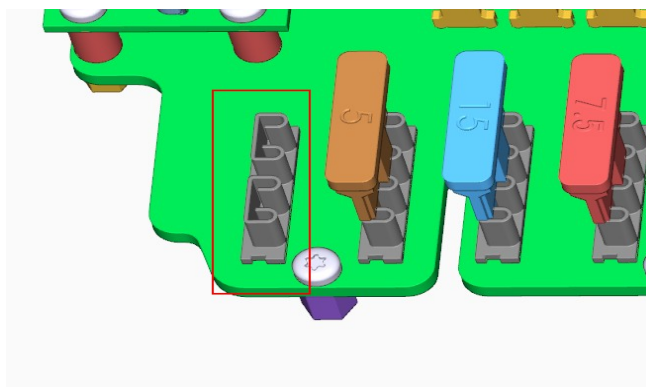
Therefore, the Biturbox card is covered by a two-year warranty against product defects only. We guarantee the construction quality but the installation and its application on the vehicle system are the sole responsibility of the buyer.

In the event of a complaint, it may be necessary to return the piece for our technical evaluation. In case of ascertained manufacturing defect, we guarantee the replacement of the Biturbox spare part.

It is understood that in no case the responsibility of Galileo Engineering may exceed the value of the component. Galileo Engineering is not responsible for any consequential damages.

Before you start

Depending on the model, fuse No.1 may be rated 25A or 16A. We supply both, **leaving fuse position No.1 without fuse (empty)**. Please check you car's manual and install the appropriate fuse for your model in your Biturbox!



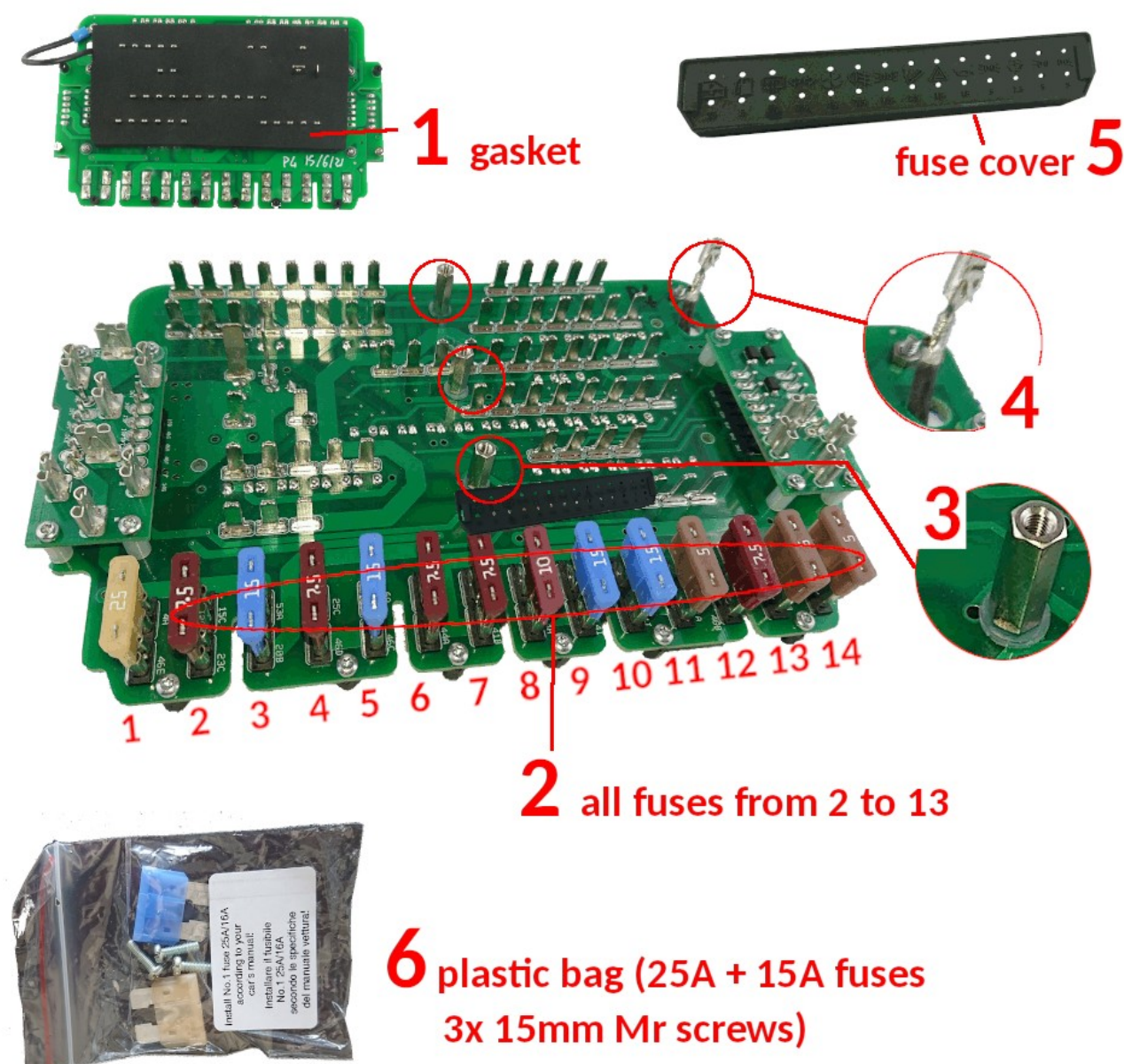
Also, please check the picture and verify that all of the following is assembled on your Biturbox:

- 1) rear black rectangular gasket, assembled on the board
- 2) all the fuses except fuse No.1, which is found in the plastic bag at point 5 below
- 3) 3 hexagonal spacers, 15mm long, on the front of the board.
- 4) ground cable
- 5) fuse cover

Also, on the bottom of the box, under the Biturbox circuit:

- 6) plastic bag with 25A, 16A fuse, 3 pieces of M10 screws

If any of the above is missing, please contact us.



It is always best practice to check the latest version of the manual.

Before installation

Please pay attention to the following

The Biturbox card improves the operation of electrical accessories connected to it, directly or indirectly. It cannot, however, obviously, repair what is broken. Furthermore, installation requires a series of maneuvers which, if not carried out correctly, could damage the car's electrical system. It is therefore important to check, before installation, what are the defects present on the electrical system, to verify that no new ones have been introduced through wrong maneuvers, and to also be able to check the proper functioning of the Biturbox board after installation.

Our advice: before upgrading, following the order of the fuse box, check the operation of the devices and take note:

Fuse No.	Device	Test	Old board	Biturbox
1	Power windows [*]	open/close (all)		
1	Reverse lights [*]	check on/off		
2	Fuel pump	check on / start engine		
3	Rear defroster	check relay clicks		
4	Direction indicators	on/off		
5	Air conditioner	turn on, check fans		
6	Anti fog lights and beam height adjustment	check on/off		
6	Beam height adjustment	check adjustment		
7	Parking, licence plate, instrument lights	check on/off		
8	Cigar lighter	check working		
8	Door locking [**]	check working [*]		
9	Stop lights, fuel and trunk opening	check working		
10	Horn, courtesy lights [**]	check working [*]		
11	Air Cond. lights, lock lights, etc	check working		
12	Windshield wiper, vacuum pump	check working		
13	Parking light lh front and rear	check on/off		
14	Parking light rh front and rear	check on/off		

[*] on Ghibli models, and possibly other late models, the power windows and reverse lights are fed through an external relay and are therefore they are not under the control of fuse No.1. Thus they are not controlled by the Biturbox.

[**] For reasons related to the original electrical system and completely independent from the board, the tripping of fuse No.8 causes the central door locking board to be fed erroneously and very badly through the courtesy lights power circuit, causing a loud buzz coming from the door locking box itself (located behind the passenger side air vent), and also a malfunction of both the ceiling lights and the door mechanism itself. If you experience these symptoms, fuse No. 8 is bad. Replace Fuse No.8 with a 10A ATO blade fuse.

May the not be with you!



I am unlikely to be a Jedi, because so far pretty much every time I've tried to USE THE FORCE while attempting repairs on any of my cars, I ended up with a broken piece (or worse, a small personal injury). There are no steps in this guide that require to apply significant force, so: unless your family name is Skywalker, if you need to use the force, take one step back, a deep breathe, and check what's wrong. This may save you troubles and expenses!

Removal of the old Biturbo fuse box

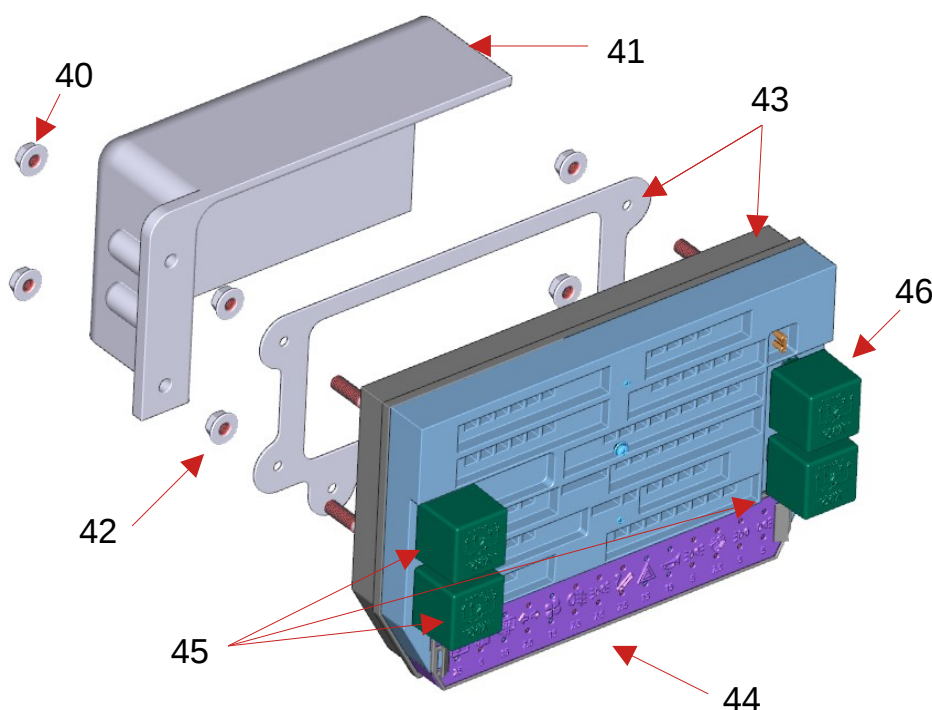
We assume that you've already removed the old fuse box from the car, and that you have it in your hands. If not, ask your car's electrician or mechanic to do it for you. It's not too difficult, and you can hardly damage anything while doing it, but some experience is required.



Disconnect the negative wire of the battery before attempting any work on your car.

Do not reconnect it until all work is done and verified.

Remember: the BITURBOX only replaces the inner part of your fuse box; keep aside everything that you remove from the car!

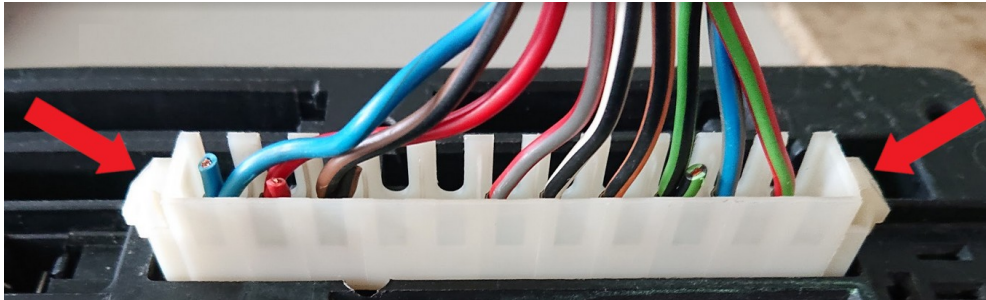


Anyway, the fuse box (43) is located between the engine bay and the passenger's side of the cockpit, and is held in place by its own four M6 screws (42), tightened by corresponding nuts on the engine bay's side. On top of that, a fuse box guard (41) is also kept in place by two further M6 nuts (40).

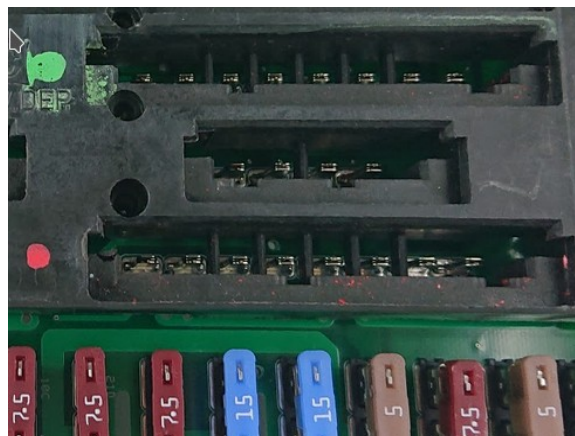
Remove the diode box (46) and the three relays (45). Keep relays aside (45). **Do not mix them with the diode box (46)**, which will not be used anymore as the diodes are now an integral part of the new circuit board.

Use a T-handle cardan M6 (10mm) wrench to remove the two (40) nuts, used to keep the fuse box guard (41) in place, and then remove the said guard.

With care, remove all the connectors that go into the fuse box from either side of the car: to do so, most connectors (but two) must be pressed from both sides to release the locking clips. This is why the relay and diode boxes must be removed before removing the connectors.



There is no risk of mismatch as all the connectors can only go into their matching female. An exception to this may be a green and red connector, in some older cars. If so, the red connector is the one near the fuses, as shown by the dots in the picture below:



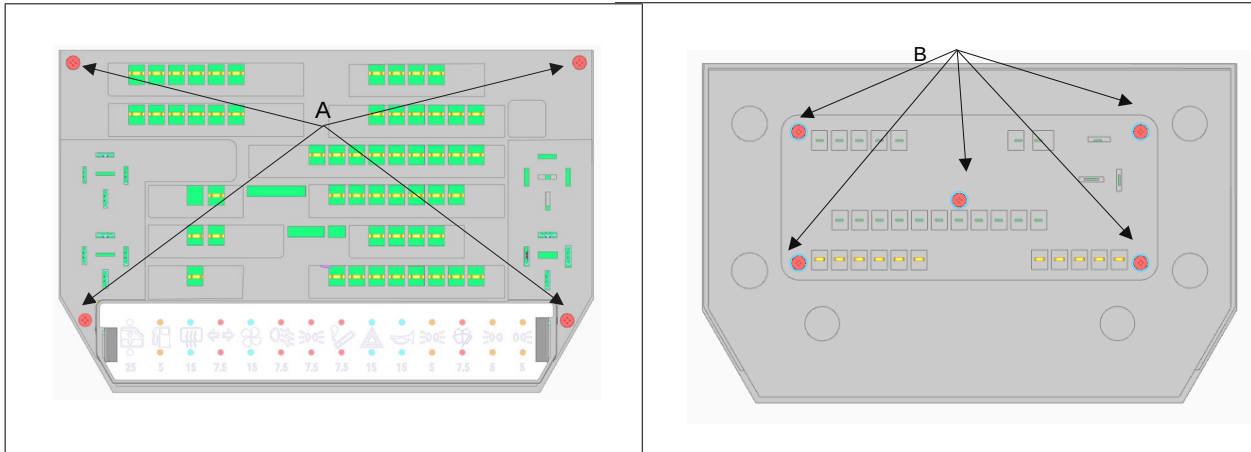
To unscrew the two nuts (42) which are on the opposite side to the nuts (40), i.e. those close to the vehicle's mudguard, it is likely that it will be necessary to remove the relay supports which are between the right dome and the bulkhead between the engine and interior: use a thin flat-tip screwdriver to release the plastic supports on which the relays are mounted from their fixing flange: insert it from the top, in the central part of each relay holder, and carefully separate the support from the flange. Repeat for all supports, and gently move them aside, making sure not to damage the underlying wiring.

Now unscrew the remaining four M6 nuts (42), and finally take your fuse box (43) out of the car.

Opening the fuse box and removal of the old PCB

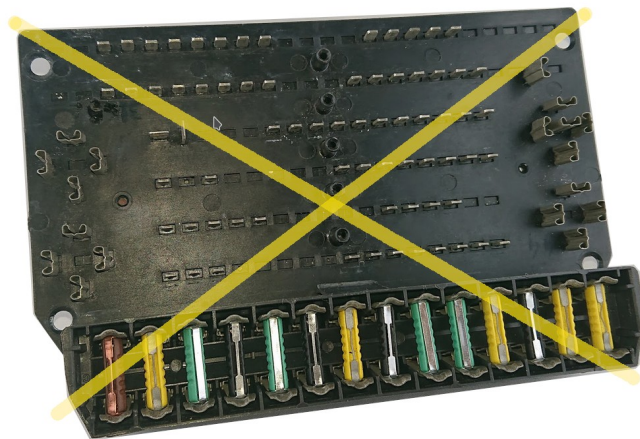
Now it's time to disassemble the core of the old fuse box.

Unscrew the four screws (A) then remove these screws (B). Keep them all aside



Gently open the two halves of the fuse box and remove its old printed circuit board, including the fuses, from the shell. The old printed circuit board is now a thing of the past and it's gone for good!

Now it's time to replace the old fuse box with the new one. You can use the Biturbox packaging to keep the old fuse box.



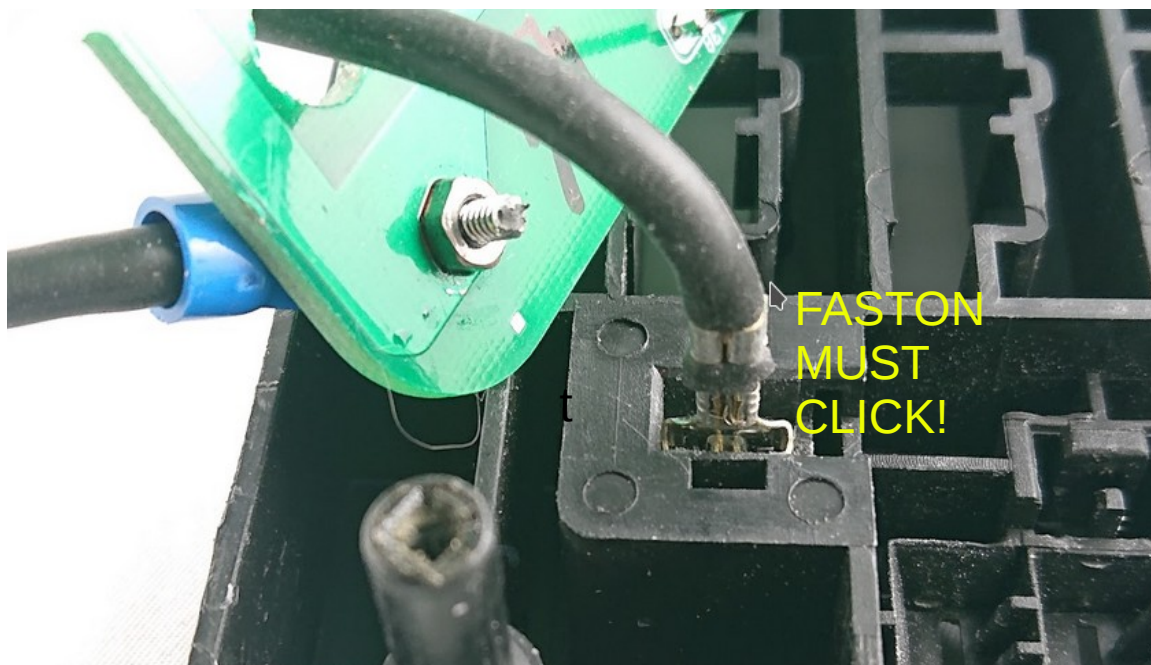
Putting the BITURBOX circuit in place

It is an easy procedure, but **there are TWO points requiring attention** - they are marked with a warning sign: read the manual with care!

The flexible, 2.5mm cable on your BITURBOX is a ground connection and it is very important. Leave it disconnected, or worse, badly connected, and regardless of your new BITURBOX upgrade, gremlins will raise their ugly head.

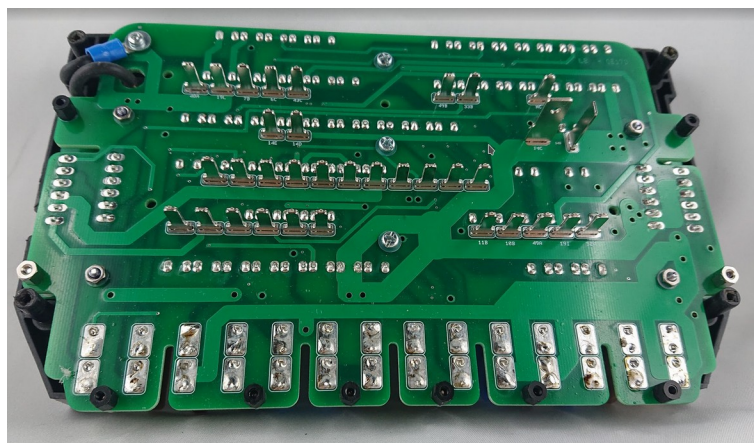


Make sure that the ground wire's faston is inserted in the matching hole in the old case. The faston has a little retaining tab that MUST "click" when inserted in place.

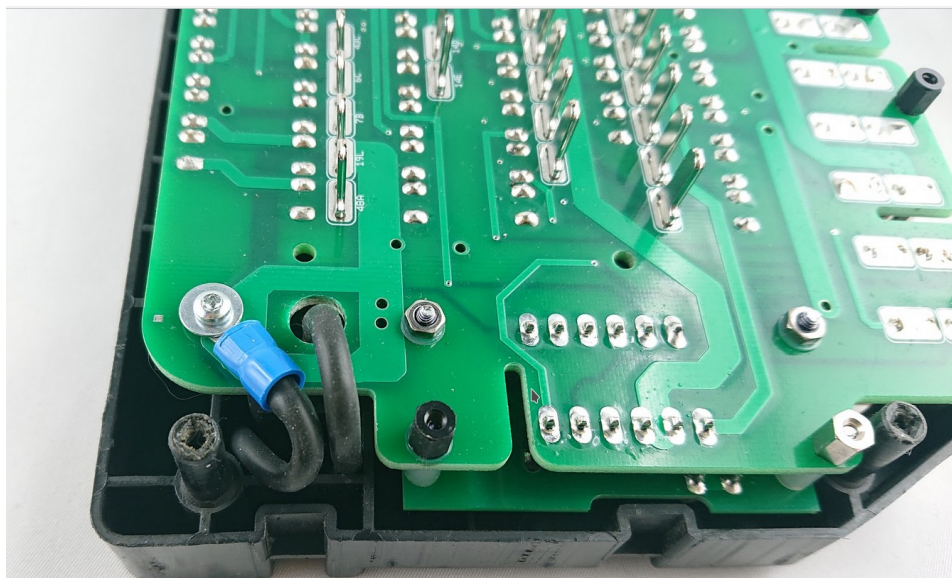


After you've inserted the ground wire, pull it gently back: if it's properly inserted, it won't come back.

Now you may position the BITURBOX PCB in place.

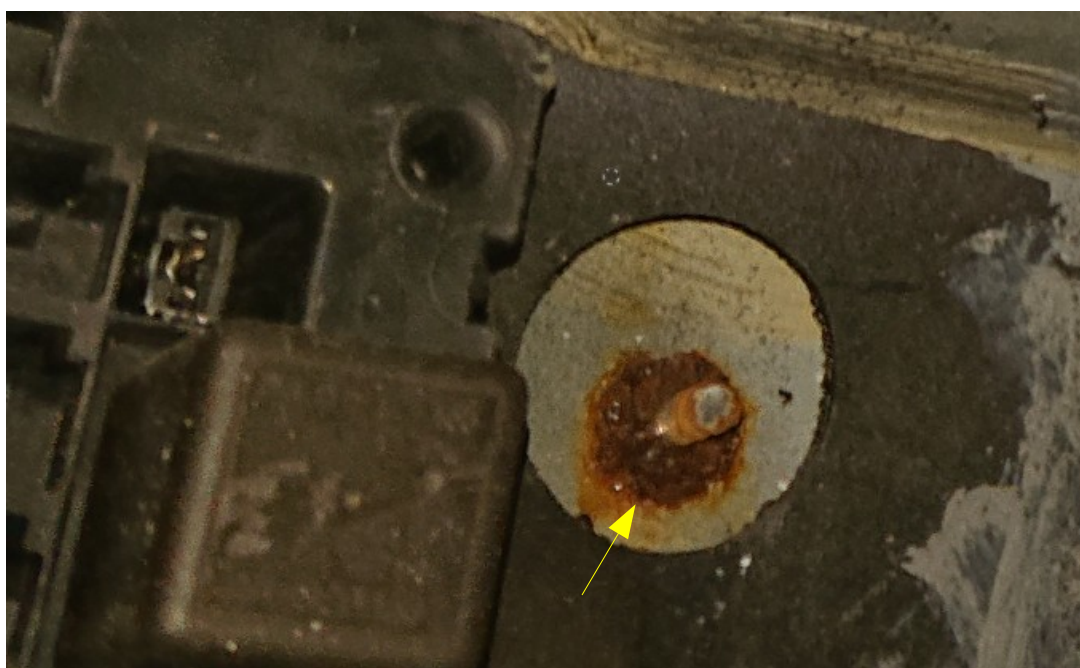


Verify that the ground wire is folded like this:



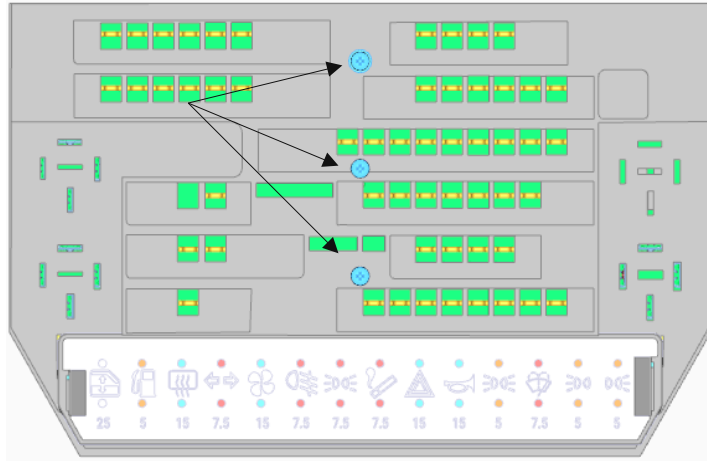
A note regarding the ground connection: your BITURBOX comes, as you can see, with a premium quality ground wire. However, this is of no use if the ground connection on your car is poor.

The fuse box is grounded externally through a black cable which runs all the way to a ground connection on the right side of the box itself. Take the time to verify that the ground connection on your car is good: if necessary, remove the M6 nut, clean the connection from any rust (iron oxide is non conductive!), and reassemble it. The following picture details how the ground connection near the fuse box should NOT look like! Note, in the left hand side of the picture, the ground connector of the fuse box right above the diode box

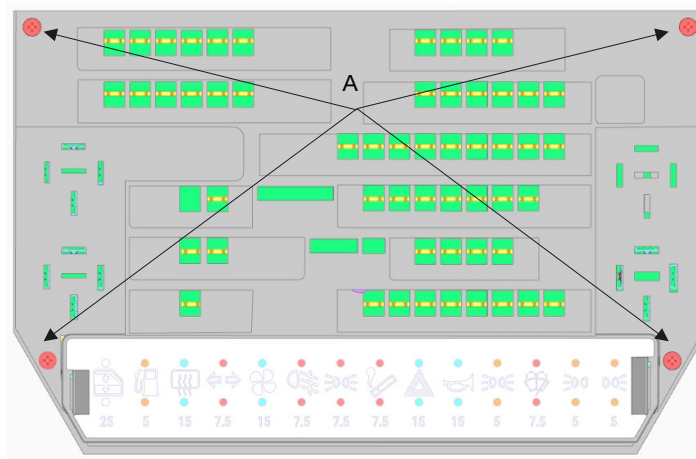


On the motor side of the box, the protective 4mm foam gasket (automotive grade, sulphur free) prevents dust, water and heat from damaging your BITURBOX. *Do not remove it.*

Reassemble the shells, using the 'A' screws that were previously removed, and secure the BITURBOX to the passenger's side half shell with the three provided M3 screws and washers:



Put the four 'A' screws back in place.



Putting it all together

Depending on the model, fuse No.1 may be rated 25A or 16A. As a safety measure, **we supply both, but leaving fuse position No.1 without fuse**. If you haven't done it yet check you car's manual and **install the appropriate fuse for your model in your Biturbox's fuse position No.1!**

Now it's time to put the three relays back. The diode box must NOT be put back as it is integrated on the PCB. Make sure you're not mistakenly putting the diode box in place of one of the relays!



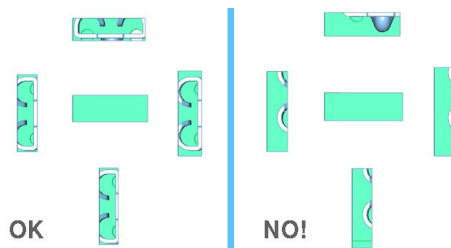
BE VERY CAREFUL WHEN INSERTING THE RELAYS FOR THE FIRST TIME.

We've done it twice during the final factory test of each BITURBOX, but you must make sure that all the male pins of each of the relays are entering in the females properly.

Therefore

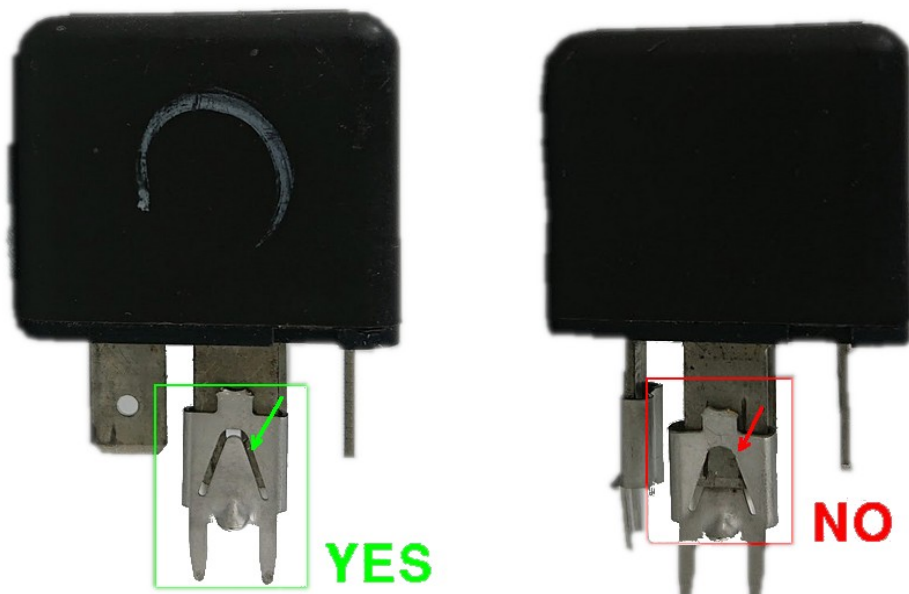
1 - check alignment of the female with regards to the slots in the shells. The male pins must enter properly and fully in each female. This must be true for each pin of each relay.

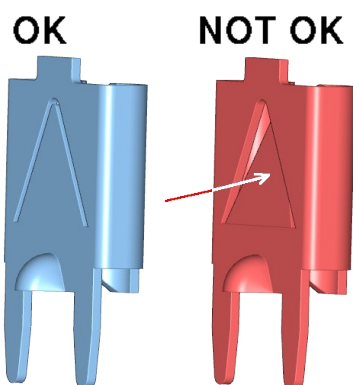
If they are not aligned, check that the two halves of the box are properly closed together. With a small screwdriver, from the outer side of the assembled box, realign faston females and relay slots.



2 - if the relay enters halfway through and then refuses to enter, DO NOT FORCE IT IN.

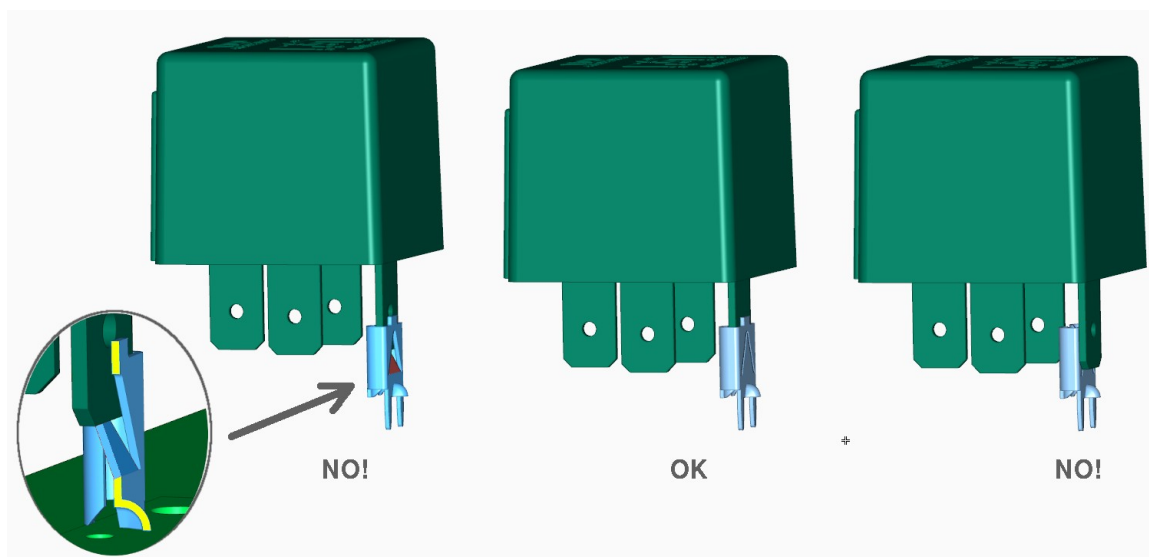
Remove the relay, and make sure that the little tab of the female is not 'crossed' in a way to refuse insertion of the male pin.





Make sure that all the three relays are inserted properly with ALL pins correctly inside their female counterparts!

In doubt, remove the relays, verify that the slots in the plastic case are aligned with the females, check that the little tab is not in the way, and reinsert the relay.

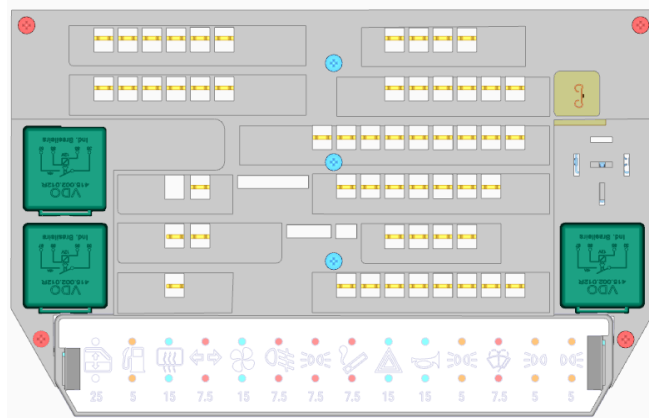


You must feel that the relay goes in properly, and that it doesn't stop halfway through. Also, it must seat itself properly on the plastic case of the box.

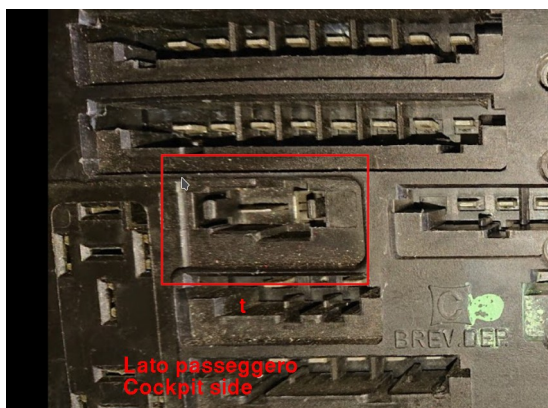
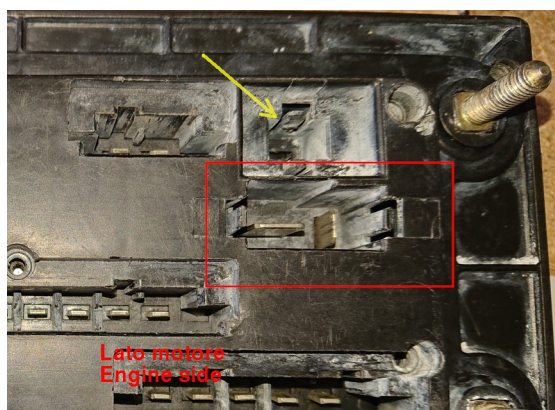


Please note: relays with fuses (example: GE609) ARE NOT COMPATIBLE and MUST NOT BE USED directly on the Biturbox. Use only standard relays without integrated fuse, that is, of the same type as found normally on the old fuse box.

Now you're almost done:



Put the complete box back in place, securing it with nuts (42, page 6) , and click all connectors is, making sure that both ends (left and right) of each connector are securely fastened to the box. The following connectors are an exception to it and must be properly pressed in place.

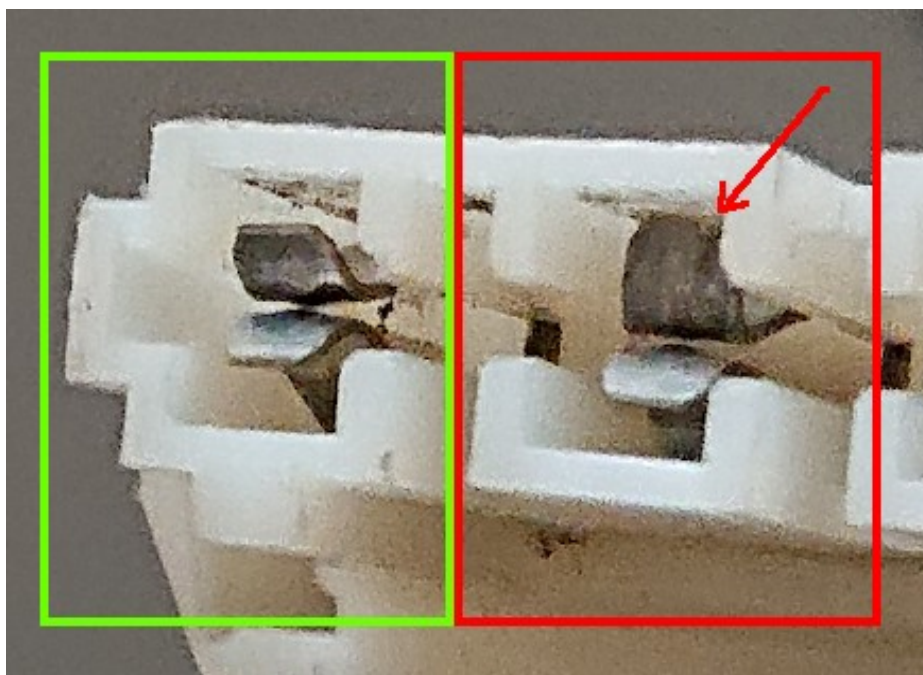


Important note No.1: these two connectors, unlike all the others, are not held in place by retaining hooks: therefore the thickness of three of the four male blades has been increased in order to guarantee a better lock and electrical connection. For this reason, the first insertion of these connectors after assembly, may be more difficult: press them fully in place making sure that the connectors properly slide fully into the housing.

Less important note No.2: the pin indicated by the arrow (engine side) is not connected to anything.



Do NOT apply excessive force on the connector: if you encounter excessive resistance and the connector refuses to 'click' properly, look at all the female metal contact inside the connector and make sure that the edges of the metal females are not bent.



Fuses

I know we've said this before, but... Depending on the model, fuse No.1 may be rated 25A or 16A. As a safety measure, **we supply both**, but **leaving fuse position No.1 without fuse**. Please check your car's manual and **install the appropriate fuse for your model in your Biturbox's fuse position No.1!**

Original 'torpedo' fuses have been replaced by more modern units, following the same order and convention used by Maserati in all the Biturbo family cars.

During the years of development of the Biturbo family, some functions have been changed. For example, fuse No.1, initially rated 25A for power windows, was reduced to 16A and used for electronically controlled suspension. This is not a problem for the BITURBOX board, which has been sized for the worst case. We supply the board with the fuses of the maximum admissible value, but please read the carefully all that follows.

In general, keep the following in mind:

- It is always advisable to use the fuse with the minimum rating compatible with the load: in other words, keep in mind that the fuse must be sized according to the load it must protect. If it 'trips', it means that it is doing its job, which is to protect the rest of the electrical circuit, the car, the passengers from a short circuit.
- Fuse No.1 as supplied is rated 25A, as it was for models where such fuse is connected to power windows. If your instruction manual states that fuse No.1 is connected to the electronic suspension system and instructs you to use a 16A fuse, use 16A.
- The internal voltage drops of the old box did not allow full current to pass through the fuses and from the fuses to the loads. Therefore, a smaller fuse was sufficient. Since the current now encounters a much lower resistance inside the box and the loads have all the necessary current available, in some cases it was necessary to update the smaller fuses to a slightly higher value:
 - Fuse No.2 has been increased to 7.5A compared to the original 5A, for models equipped with a sunroof. Models without sunroof can keep the 5A fuse.
 - Fuse No. 7 has been raised to 7.5A compared to the original 5A, for all models.
 - Fuse No.8 has been raised to 10A for models with four doors. Two doors models can keep the original 7.5A fuse.

The fuse image on top of the fuse cover and on the printed circuit board are the maximum reference values only. Fuse type is APR/ATO/ATC/ATS blade type, fast acting. Standard size (19.1 × 5.1 × 18.5 mm)

The small holes on the fuse cover are designed to be used to access the fuses with a tester, or with a fuse/extractor tool such as the one in the picture.



Testing

Make one last final check to verify that all the cables are correctly in place.

Only now you can connect negative (ground) wire of your battery to the negative pole.

Now that the complete fuse box is back in your car, it's about time to refer to the table on page 5, and check out one by one all the loads attached to each fuse.

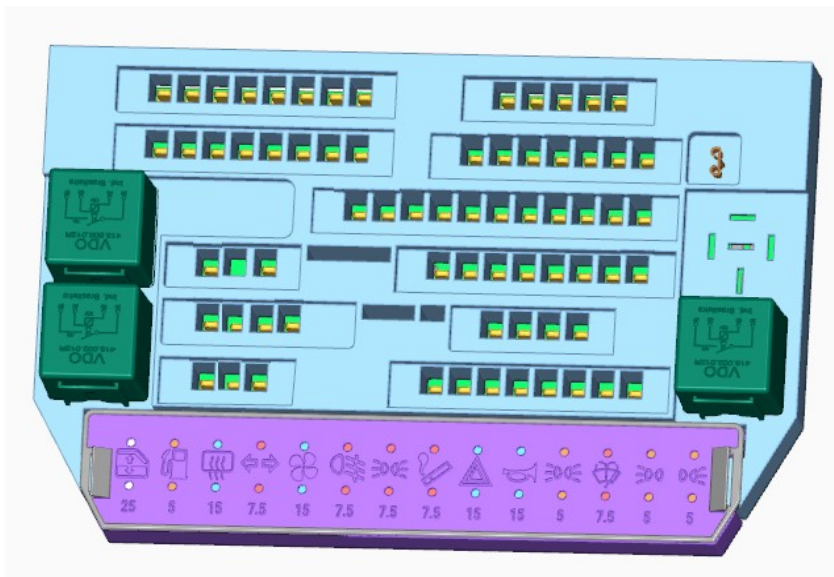
Troubleshooting

If one test fails, first of all compare the result to what it was like before – that's what the table is for.

If you find something that doesn't work, whereas it was working before, check the following:

- Did you check the manual for the rating of fuse No.1 and install it accordingly?
- Has any of the fuses tripped? Have a multimeter, or a fuse tester at hand.
- Are you sure the relays are well in place? Go back to page 12 and 13 and take a look at the possible causes. Symptoms of a badly inserted relay are an inclined top surface of the relay. Also, if the relay went in too easily, its pins could be out of their female counterparts altogether.
- Have you connected the ground cable? Page 9-10.
- Funny noise from the door locking system? Odd behaviour from the courtesy light? Check fuse n.8, it is probably gone. Read under the [*] note on page 5.
- Make sure that all connectors are properly inserted on both sides of the fuse box (engine/cockpit).

When all is well, you can put in place the protective cover 41 with nuts 40, cover the fuse compartment with the lid and you're ready to go!



Removal of the BITURBOX

Should you need to remove the board from the box:



Disconnect the negative wire of the battery before attempting any work on your car.

Do not reconnect it until all work is done and verified.

Remove the three external relays. Remove the four 'A' screws and the three M3 screws (see diagrams on page 10).

Now open the two halves of the box gently, **keeping in mind that the ground cable is locked in place by a retaining pin**. With an extractor, or a small screwdriver, press the locking pin so that the ground female connector is released from the box. Do not force it out, **do not pull hard on the ground cable!**



Need help?

Press the large friendly orange button



and contact us at this address:

Galileo Engineering srl
Via Cavallotti 16
42122 Reggio Emilia, Italy
ph. +39 0522 920496

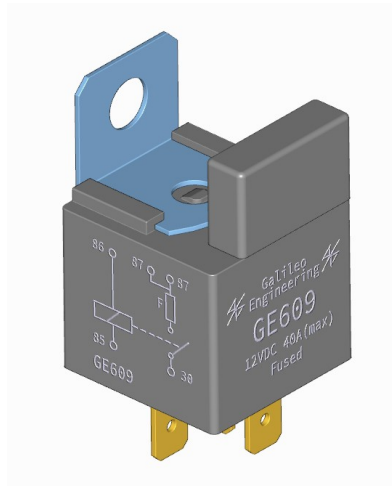
www.galileo.engineering
sales@galileo.engineering



This manual is an integral part of the product and must be kept for future reference; we advise you to keep it inside the original packaging. In the unlikely event that you wish to recycle the latter, please note that it is made of cardboard and should therefore be recycled as paper.

ALSO FROM GALILEO ENGINEERING FOR YOUR MASERATI BITURBO MODEL

GE609: a plug in replacement for the original Biturbo fused relays



Biturbo Oil Pan: like the now unobtainable original unit but freshly made in 2023

