GFB Reactor Dual-Stage Boost Controller Installation

The GFB Reactor dual-stage boost controller is designed to take over boost control duties from the factory ECU, allowing boost to be varied by the user. GFB recommends this installation is carried out by experienced turbo mechanics, and should **NEVER** be done without the use of an accurate boost gauge. Make sure to take note of the factory boost level for reference **BEFORE** installing the GFB Reactor.

Included in kit:

- GFB Reactor dual-stage boost controller
- Missile switch
- Brass t-piece
- 3mm hex key
- 5mm (3/16") silicone vacuum hose
- Wiring harness
- Wire tap
- Crimp-on spade connector

Required tools:

- Wire cutters
- Pair of pliers to crimp spade connector
- Methylated spirits
- 12mm drill
- Multi-meter / voltmeter

1) Locate the wastegate actuator, which is the can-shaped component found attached to the side of the turbo compressor. Trace the path of the small diameter rubber hose that connects to it. There are generally three types of layout found in boost control systems, and you will need to identify the type your car is fitted with from the guide on page 4 before installing the Reactor.

2) Once the factory boost control type is identified, remove the hoses from both the compressor cover and the wastegate actuator nipples. If your factory system has a solenoid valve, you will need to plug the solenoid valve's nipples to isolate it from the system. The best way to do this is to use a short length of hose and just connect two of the nipples together.

3) Measure and cut two short sections of the supplied hose, and use these to connect the supplied t-piece to the compressor cover and wastegate actuator nipples. The barb on the t-piece with the small hole **MUST FACE TOWARD THE COMPRESSOR COVER NIPPLE** (see figure 1 opposite and schematic layout on page 5).

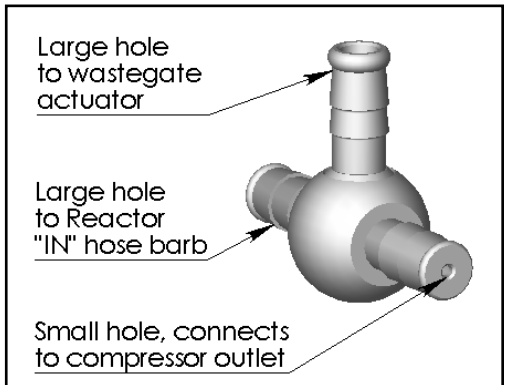


Figure 1

4) Find a suitable flat surface to mount the Reactor, at least 20cm from the turbo. Connect the remaining length of the supplied hose to the third barb of the t-piece, and ensure the other end will reach the Reactor once it is mounted (or cut to length if the distance is shorter). For best boost response, GFB recommends that the length of hose connecting the t-piece to the Reactor does not exceed 50cm.

5) Once the final position of the Reactor is determined, clean the flat surface of grease, dust and oil using methylated spirits or a similar suitable cleaner (non-residual type). Peel the backing from the double-sided tape and fasten the Reactor firmly to the cleaned area, in a way that the adjusting screws are easily accessible.

6) Connect the hose from the t-piece to the inlet hose barb of the Reactor, marked "IN" (figure 2). The second hose barb is where the bleed-off air exits, marked "OUT", and this can either be left open or connected to the turbo inlet via the factory hose from the solenoid (see final schematic for details).

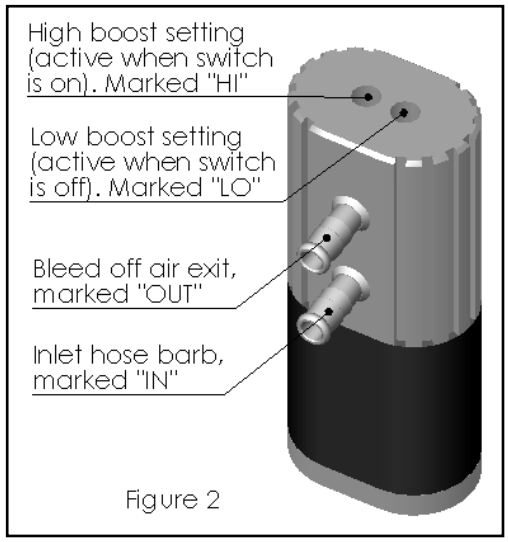


Figure 2

7) Plug the wiring harness into the Reactor connector, and attach the black earth lead eyelet to a suitable earthing bolt on the chassis. Make sure the bolt head is free of paint/rust for a good connection.

8) Run the red lead of the wiring harness to the firewall and find a suitable hole through which the lead can be passed into the cabin. Make sure where the wire passes through there are no sharp edges that could abrade the insulation and cause a short. Usually it is easiest to use an existing rubber grommet through which wiring passes from the engine bay to the cabin.

9) Decide on the position of the missile switch in the cabin, and drill a 12mm hole to accommodate it. Ensure there is sufficient room behind the switch once the wires are attached. Measure and cut the red lead from the engine bay to length so that it reaches the switch with a little slack to spare.

10) Strip the end of the lead and crimp on the spare spade connector with pliers or a crimping tool, ensuring the connection is firm. This terminal then pushes onto one of the spades on the switch.

11) Push the other spade connector with the fuse wiring onto the remaining switch spade, then using a voltmeter, find a suitable +12V wire that is only active when the ignition is turned on. Cut the end of the fuse wire to length and simply use the supplied wire tap to connect the fuse wire to the 12 volt source wire. It isn't necessary to strip either of these wires, the wire tap cuts though it automatically.

12) Test the set-up by switching on the ignition and flip the switch on and off. You should hear a click from the Reactor each time the switch is flipped.

Adjusting Your Reactor Boost Controller

ALWAYS use an accurate boost gauge when making boost adjustments. It is important to note that due to the nature of turbochargers, the boost level can increase in cold ambient temperatures or as engine load increases (i.e. in high gears or up hills). Therefore it is a good idea to perform boost level checks in **at least 3rd gear.** If this is not practical, use 2nd gear and briefly load the engine as the turbo spools up by applying the brakes with your left foot whilst accelerating – this will simulate the load encountered when using higher gears.

1) Using the hex key supplied, ensure both the adjusting screws are turned clockwise until they stop. Set the switch to OFF, then measure the boost level at full throttle through the rev range. **WARNING: carry out testing in a safe environment, and be ready to lift off if for some reason the boost shoots up rapidly.** If your factory boost control system is a type 1, you should see the same boost as standard. If your factory boost control system is of type 2 or 3, you should see a lower boost level.

2) Turning the low boost adjusting screw (marked with "LO") counter-clockwise will increase the low-boost setting. Wind it out one (1) revolution at a time until you reach the level you wish to use for your low-boost setting. Be aware that the boost level when the screw is wound fully clockwise is the lowest setting you can use, which is determined by the wastegate spring. It is not possible to lower the boost further.

3) To set the high-boost setting, the same procedure is followed. Set the switch to ON, use 3rd gear and turn the high-boost screw (marked with "HI") anti-clockwise one turn at a time until the desired peak level is reached. When boosting above the factory level, make **SMALL** adjustments (about 1/2 turn) each time because it is far better to undershoot rather than overshoot the desired level. Use common sense when making adjustments, since it is not recommended to increase the boost more than 20% above standard unless it is performed on a dyno by a professional where it can be checked that the engine is not detonating.

NOTE: DO NOT be tempted to adjust your high-boost setting to an unsafe level, with the intention of only using it for short bursts. Detonation can destroy an engine in less than a few seconds, so for the maximum limit you should use for your car, consult an experienced motor mechanic.

Troubleshooting

Problem: No matter how far the adjusting screws are opened, the boost doesn't increase much.
Solution: The t-piece is incorrectly oriented. Check that the hose barb with the small restrictor hole is facing the turbo compressor nipple.

Problem: The boost skyrockets uncontrollably.
Solution: A hose has come loose or is connected to the wrong place. Check that both the wastegate actuator nipple and the turbo compressor nipple are connected to the t-piece, and that the t-piece is connected to the correct hose barb on the Reactor. There should be no leaks or other joins, and ensure the adjusting screws are turned fully clockwise.

Problem: The boost tends to taper off at high RPM.
Solution: This is usually a sign that the turbo system is nearing the limits of its capacity. There are two causes of the boost drop, restrictions in the inlet tract and wastegate creep. High air velocities create turbulence and can cause a pressure drop between the turbo and the throttle in the inlet and intercooler piping. Wastegate creep can occur in small factory turbos at high RPM as exhaust backpressure builds enough to push the wastegate open. This is usually a design feature of factory turbo systems as a safety measure to protect the turbo and engine at high RPM.

Problem: The Reactor does not switch from low to high boost.
Solution: Check the fuse first, then double check all electrical connections. Use a voltmeter to ensure power is available to the boost controller plug, and if not, trace the wiring back and measure the voltage at each join to isolate the problem.

Alternative Set-Up Suggestions

Front wheel drive cars: Getting off the line in a turbo front wheel drive can be aided by setting up the Reactor to switch to low boost in 1st gear. To do this, you can use a small micro-switch (can be purchased at any electronics store – just check the current rating, it needs to be at least 1 amp) that is mounted on the gear selector to switch the Reactor to low boost in 1st gear.

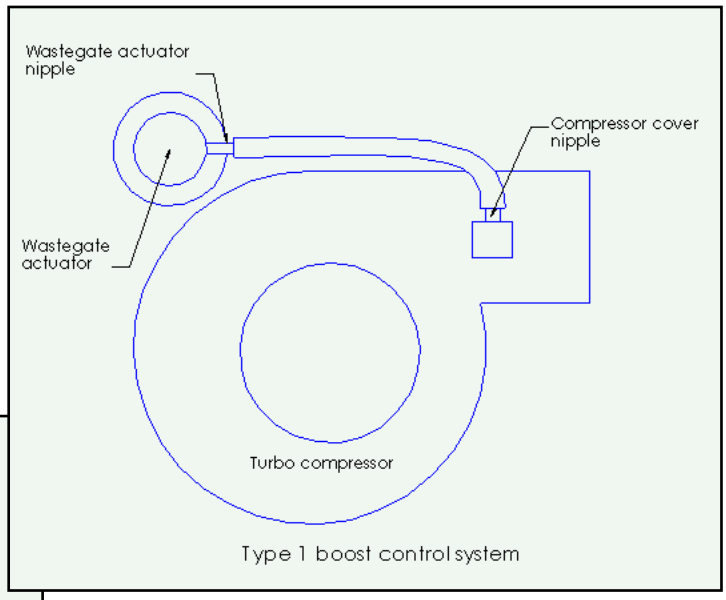
Alternative switching: There are a range of different ways you can use your Reactor. You could for example, use a hidden or key-type switch that prevents others who drive your car from using high boost. You could mount a micro-switch on the throttle pedal, so that you only get high boost when the throttle is floored. You could even tap in a temperature switch that prevents high boost from being used when the engine is cold.

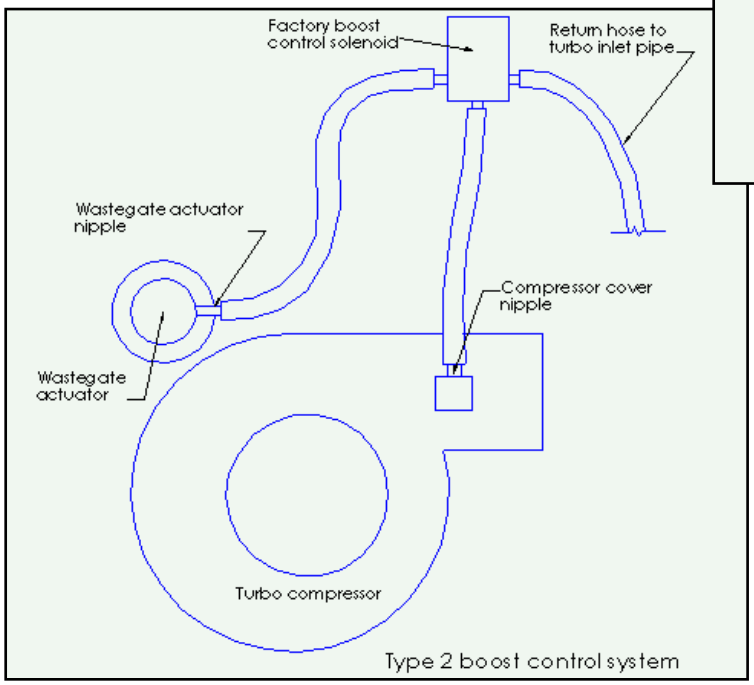
This product is intended for racing use only, and it is the owner's responsibility to be aware of the legalities of fitting this product in his or her state/territory regarding noise, emissions and vehicle modifications.

GFB products are engineered for best performance, however incorrect use or modification of factory systems may cause damage to or reduce the longevity of the engine/drive train components.

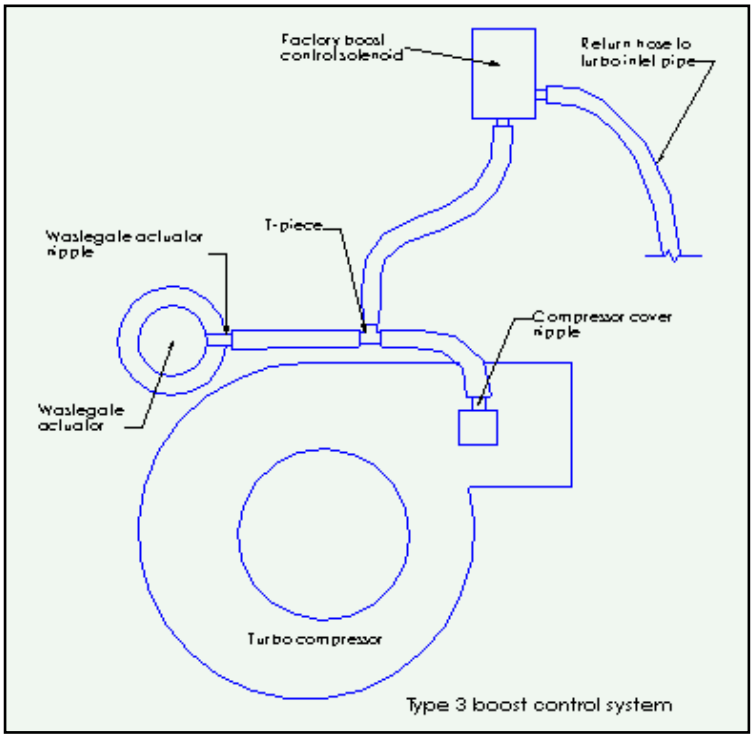
GFB recommends that only qualified motor engineers fit this product. Warranty is for the period of one year from the date of purchase and is limited only to the repair or replacement of GFB products provided they are used as intended and in accordance with all appropriate warnings and limitations. No other warranty is expressed or implied.

Type 1 boost control is usually found in older turbo cars, using the pre-set wastegate spring to set the level of the boost. A single hose is used to join the turbo compressor cover nipple to the wastegate actuator.



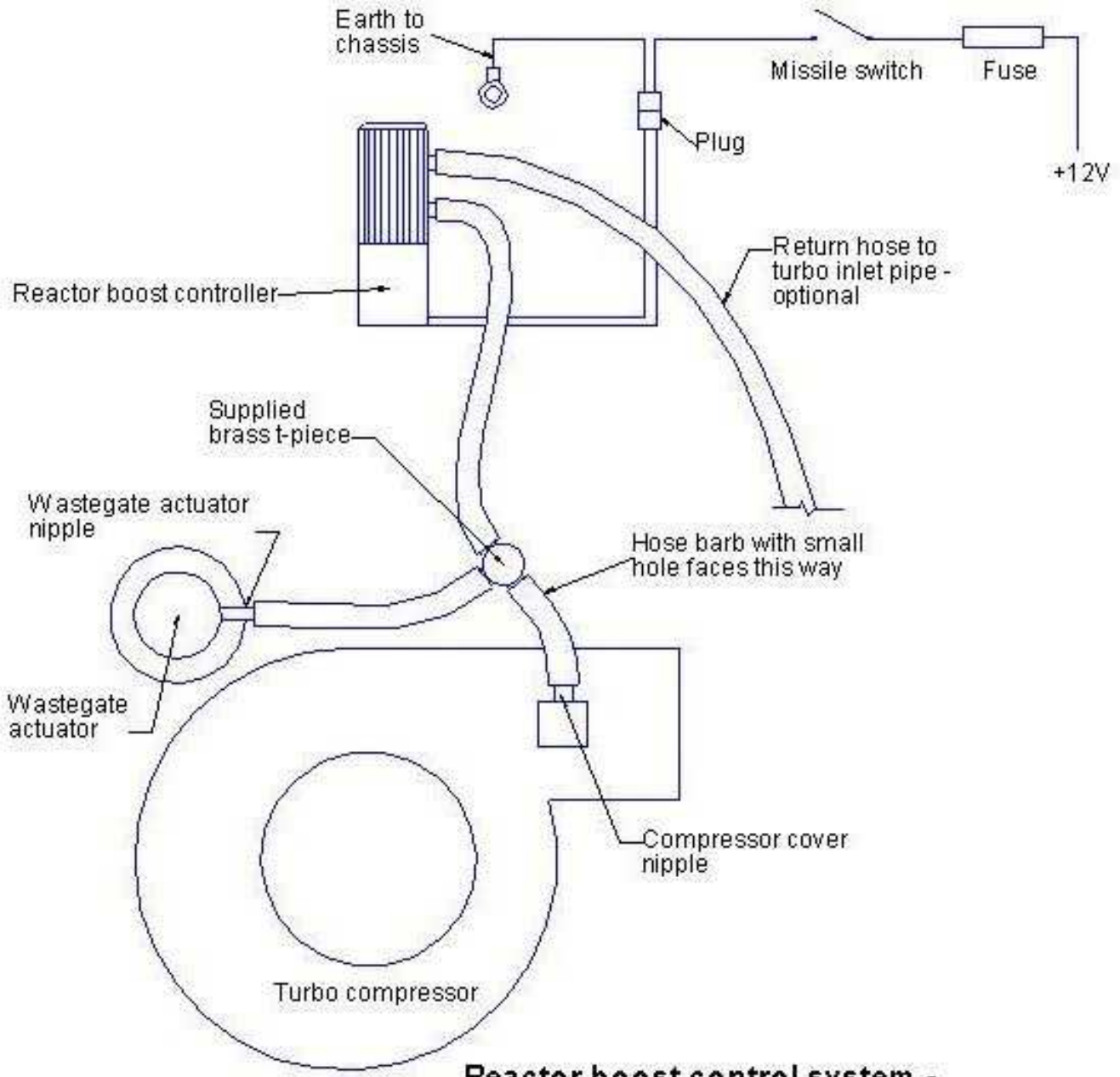


Type 2 boost control systems use a 3 port electric solenoid valve to alternately switch the flow of air from the compressor cover nipple on and off (this pulsing is controlled by the ECU) to raise and control the boost level. The return hose vents the excess air back to the turbo inlet as the solenoid is pulsed on and off.



Type 3 boost control systems use a 2 port solenoid valve "teed" into the wastegate actuator hose. As the ECU pulses the solenoid on and off, it bleeds air from the wastegate actuator hose to control the boost level.

In this type of set-up, there is usually a small restrictor found in the hose between the compressor cover nipple and the t-piece. Without that restrictor, the turbo would be able to pump air into the hose faster than the solenoid could vent it, therefore stopping any boost increase. Also note that the pressure pick-up point is not always on the compressor cover, sometimes it can be on the pipe between the turbo and the throttle (Nissan 200SX's for example have the nipple on the plastic pipe after the intercooler).



Reactor boost control system - Final schematic