How to stick a 3.4L engine into your Boxster.

When I purchased my '99 Boxster in January, it was already equipped with a TPC supercharger setup. While fun and a great improvement over the rather anemic stock 2.51 six, my plans when I purchased the car were to create a Ruf 3400S clone.

Step one was to locate a good engine, there are several paths to this step and I would leave them open to the individual and what they feel comfortable with. I sourced mine from a Pelican Parts Board member and the engine turned out to be as advertised. It came complete from intake to exhaust including the DME harness (although we won't be using this).



Once you have the engine there are a few other parts you will need. I took this opportunity to replace some of the gaskets and seals (including the spark plug tubes and o-rings which tend to leak). Do it now while the engine is out of the car. You may also want to replace the intermediate shaft seal and the rear main seal but if they are not leaking I would leave well enough alone since you can do more harm than good if you don't have the proper tools when installing these.

You will also want to purchase a new Sachs sport clutch setup and consider having the flywheel replaced or resurfaced if it shows signs of hot spots etc. (You won't know this until you remove the Boxster engine however since we will be using the Boxster flywheel.

In addition you will need a set of C2 motor mounts (which are actually used as trans mounts in the Boxster). Also 4 M10x1.5 bolts 100mm or so long. You will also need to

source 4 1.5" (a little less will work but this seems to be optimal) spacers that will be used in conjunction with the M10 bolts to lower the attachment of the front engine mount to the body. This is necessary since the 996 intake sits higher off of the engine then did the 986 intake.

Now you will also need to source someone to reprogram your current Boxster brain (unless you have a '97, some of these cannot be reprogrammed) to run the 996 engine. I used the local GIAC dealer (Imagine Auto, www.imagineauto.com great guys, highly recommended).

In addition you will need to run some wires from the DME to the vacuum solenoid that controls the resonance valve on the 996 intake. You will need to source the connector for the solenoid valve (the blue connector below) but that is readily available.



So you need to run a pair of wires from the connector back towards the DME. One wire needs a switched 12V source (I picked this up at a bundle on the DME harness (you could also pick this up by splicing into pin 54 since that is 12V out), look for the red/blue wires, this connects to pin 1 on the solenoid valve, on mine it was marked with '+') the other goes to pin 59 on the DME.



This requires sourcing a pin to add to the DME at this position. This is harder than it sounds as no one I contacted could obtain this part. What I ended up doing was removing the pin from position 83 (yellow wire) that provided the MPG output to the onboard computer since my car did not have this feature. I installed the pin in position 59 and wired it to pin #2 on the connector for the solenoid valve. This allows the DME to send a ground to the solenoid valve to complete the circuit and open the valve.

DME connector assignment

- Oxygen sensor heating behind catalytic converter
- 2 IACV make winding
- 3 Injector valve, cylinder 1
- 4 Injector valve, cylinder 3
- 5 Injector valve, cylinder 5
- 6 Ground, terminal 31
- 7 Carbon canister shutoff valve
- 8 Check Engine MIL
- 9 EX lamp
- 10 Free
- 11 Free
- 12 Electric fuel pump shutoff
- 13 Knock sensor 1
- 14 Medium pressure switch (A/C)
- 15 Intake temperature in HFM
- 16 NTC engine compartment temperature
- 17 Hot film mass air flow sensor signal
- 18 Signal, oxygen sensor 2 ahead of catalytic converter
- 19 Signal, oxygen sensor 1 ahead of catalytic converter
- 20 Ground, rpm sender
- 21 Signal, Hall-effect sensor
- 22 Ignition coil, igniter 4
- 23 Ignition coil, igniter 5
- 24 Ignition coil, igniter 6
- 25 Camshaft adjuster 2
- 26 Terminal 30
- 27 DME relay
- 28 Electronics ground
- 29 IACV break winding
- 30 Oxygen sensor heating ahead of catalytic converter

- 31 Injector valve, cylinder 2
- 32 Injector valve, cylinder 4
- 33 Injector valve, cylinder 6
- 34 Ground, sensors
- 35 Radiator fan
- 36 Radiator fan
- 37 Secondary air pump
- 38 Version coding
- 39 Indicator light, reserve
- 40 Free
- 41 Knock sensor 2
- 42 Automatic I/M test
- 43 Free
- 44 Signal, throttle potentiometer
- 45 Ground, hot film mass air flow sensor
- 46 Ground, oxygen sensors
- 47 5 Volt supply hot film mass air flow sensor
- 48 Spec. engine torque
- 49 Ignition coil, igniter 1
- 50 Ignition coil, igniter 2
- 51 Ignition coil, igniter 3
- 52 Camshaft adjuster 1
- 53 5 Volt supply for throttle potentiometer
- 54 Voltage output to loads
- 55 Ground, ignition
- 56 Terminal 15
- 57 Diagnosis tank pump
- 58 Actual engine torque
- 59 Free

- 60 Programming voltage
- 61 Tank vent (fuel evaporative valve)
- 62 Activation, A/C compressor on
- 63 Fuel pump relay
- 64 Free
- 65 Engine compartment purge fan
- 66 Activation, start inhibit
- 67 Signal, knocking Yes/No
- 68 Start enable
- 69 A/C request
- 70 Free
- 71 Ground, knock sensors
- 72 Free
- 73 Oil temperature
- 74 Double NTC thermistor (water temperature)
- 75 Free
- 76 Signal, oxygen sensor 2 behind catalytic converter
- 77 Signal, oxygen sensor 1 behind catalytic converter
- 78 Signal, rpm sender
- 79 Rpm sensor output, rear
- 80 Rpm signal
- 81 Free
- 82 Fan monitoring
- 83 Fuel consumption display
- 84 Free
- 85 Serial data transfer LOW
- 86 Serial data transfer HIGH
- 87 Free
- 88 Diagnosis lead

Now since we will be using the 996 fuel rail setup you will need to make some changes to the fuel lines on the Boxster. The return line fitting will fit to the 996 fuel rail but the hose that connects to the chassis is too short. I removed the fittings from the stock lines and secured them in some -6 socketless aeroquip hose with hose clamps (www.racerpartswholesale.com). Now the fuel supply line is on the wrong side of the chassis for the 996 rails. So you will need to get an adapter fitting to mate to the female end coming off of the car and a female fitting to connect to the fuel rail. This fitting is



larger than the fuel return line fitting. I had these fittings kicking around from other projects but it shouldn't be too difficult to find them. Again these fittings were attached to -6 aeroquip fuel hose.

You will also need to modify the fuel return connection on the rail. I ended up cutting the one support and bending in down to allow better access to the connection when the engine is installed as well as prevent a clearance problem with the factory air box (shown below).



If you are adding a cone intake setup this may not be an issue. But it is easier to do now with the engine on a stand than when the engine is installed (ask me how I know).

You may be able to get around this by reusing the Boxster fuel rail setup and swap injectors in from the 996 rails since they use the same fuel pressure reg, but it really isn't that big of an issue.

The vacuum connection for the brake booster is also in the wrong spot and the connection needs to be lengthened. This can be done by removing the fitting from the stock hose and splicing in a short section of rubber vacuum hose to lengthen the piece.



On the 996 engine you will want to remove the intake, the exhaust and motor mount bar (if they are still there) and the wiring harness.

The wiring harness is also removed from the Boxster motor, along with the dipstick tube, and the oil filler tube and the coolant hose



from the top of the oil cooler and the starter and wiring.

Also remove the hose from the throttle body on the Boxster and the associated valve, and attach it to the 996 throttle body.

Attach the oil filler tube, dipstick tube and oil cooler hose to the 996 motor.



You will also need to replace the piece shown below from the 996 motor



with the piece from the Boxster motor



this will require removing the lower idler pulley.

While you are at it, swap the PS lines from the Boxster engine onto the 996 engine.



Now if you are lucky and your 996 engine has the extra mounting boss shown you will just need to swap the indicated parts from the 986 oil pump to the 996 oil pump,





remove the mounting studs from the 996 case,



and mount the Boxster engine mount with the bolts that mounted it to the Boxster engine.



In my case the 996 oil pump did not have the extra mount boss indicated below



and I had to swap the entire oil pump on the 996 engine.



Not a big deal, just make sure you have the gaskets and read the procedure in the factory service manual.

Now remove the factory oil pressure gauge, I swapped in a 996 gauge cluster so I used this, but it needs to be moved to the same location as the idiot light sender on the Boxster

motor. (the other side of where it is on the 996 engine, the left front of the motor when installed . Alternatively put the Boxster sender in the same location on the 996 engine as it was on the 986 engine, and put the sealing plug removed from that location in the position originally occupied by the 996 oil pressure sender. I would use the stock 996 sender and just hook up the idiot light side (indicated with wk) then you can always add a gauge at a later date).

Now that we have the parts swapped, install the Boxster DME harness making all the necessary connections. You can also swap the oil separator from the Boxster motor since the 996 part has two extra connections. I chose to just plug the extra connections rather than swap the part. No we can attach the intake. Turning it around in relation to its original position which places it in an orientation similar to the Boxster engine, with the throttle body being oriented toward the rear of the car.



I would however recommend installing the intake after the engine is installed in the car. I couldn't seem to install the AC compressor with the intake installed so I ended up having to remove the right hand $\frac{1}{2}$ and install the compressor and then reinstall the intake. If you don't install the intake you also won't have to lift the engine quite as high.

Once this is taken care of you can install the flywheel and your new clutch and reinstall the trans.



Then simply reinstall the engine, mounting it to your new C2 rear mounts, and placing the spacers between the front mount and the body and attaching with your new longer bolts.

Once the engine is bolted up you can follow the old adage of installation is the reverse of removal, and reattach all the components you removed when you took out the old motor.

Make all the hose connections, in short, the fuel lines, the vacuum lines (make sure you correctly plumb the actuation valve for the resonance valve), the coolant lines, and the PS lines. Don't forget to install the AC compressor now.

When you reinstall the intake rotate the front cross plenum clockwise (if you are standing on the drivers side of the car looking at the motor so that the vacuum can that actuates the resonance valve is up as high as you can go. This will prevent conflicts with the AC hoses. Do the same with the rear plenum so that the throttle body points down toward the trans.

This picture shows the stock position of the cross plenums



and this the position of the resonance valve actuator and throttle body after rotation



Now you will need to connect the throttle body to the MAF and air box. As shown above I used 3.5" high temp silicon ducting from Racers Parts Wholesale. I didn't have the stock piece since it was gone from when the car was supercharged, but you may be able to use this piece or at least the ends and run a hose section in the middle.

Make sure you have added the new pin to the DME harness, and have power to the solenoid valve.

Hook up your new DME and enjoy.

Originally I am using the stock exhaust and headers (until I found more \$\$). But you really need to source a proper set of headers, high flow cats and a good muffler. I recommend this setup from Steve Timmins, who by the way can provide you with an installation kit, instructions and the DME programming as well (www.instant-g.com).