Engine Bay Modifications

- Secondary firewall removal
- Weld in sheet metal to close up frame rails
- Some minor massaging of firewall/trans tunnel to gain clearance
- Lots of stitch welding in this chassis specifically.

Engine/Transmission mounts

- Mckinney Motorsports vk56 to z33 engine mounts
  - I modified them to move the engine forward 1 inch, and also dropped the engine about ¾” lower than the original mount dimensions.
- Collins Technologies 350z steel adjustable cross member.
  - This fit surprisingly well. Minor grinding to elongate the transmission mount holes was required. (under .100”)
  - I made a spacer to raise the back of the transmission around 1/2” to get the engine as level as I could, and the yoke/diff flange angle within reason. This spacer went in-between the cross member, and the energy suspension mount. (also compressed the mount slightly as the manufacturer requests preload on the polyurethane)
- Collins technologies vk56 to Cd009 bell housing adapter.
  - Steel adapter around 5/8” thick. Some modification was required to get it to fit correctly.
  - I drilled holes in the plate to be able to access the starter bolts so the transmission didn’t have to be dropped to replace it. Replaced oem starter bolts with m10 shcs bolts. 8mm allen.
  - Grinding was required on the sides of the adapter to allow ample header clearance.
  - The adapter comes with a billet piece for a crank angle sensor mount. This requires removing a section of the transmission bellhousing. I cut the section out, and welded in the boss using the supplied dowels, and having everything bolted in. Further modification was required to this piece due to the trigger wheel combo I opted to use.
  - This kit requires grinding a fair amount out of the starter and the transmission to get the starter to fit.
  - I had drilled a few more holes into the bellhousing to allow for more bolts to be used when mating the transmission.

Transmission/Clutch

- Maintained the factory cd009
  - Modifications to the transmission as previously mentioned for starter clearance.
  - Also had to grind ribs of the top of the transmission to allow clearance with the trans tunnel.
  - Replaced trans vent with a lower profile hose.
- Shifter:
  - Everything moved back around 5 inches from its original location. The gktech strikefast fit perfectly. I would assume the the regular gktech conversion shifter would work as well.
  - Fits perfectly in the original shifter opening (keep in mind I moved the engine forward 1” from the original motor mount location.)
- Driveshaft:
  - Custom driveshaft was required. Came out to about 2” longer than a factory 350z driveshaft. I used a local shop, CCI driveline. Very good place to do business with.

Transmission/Clutch

- Clutch setup:
  - I had already purchased a Mcleod street supreme vq35de 6 puck clutch and pressure plate, so I opted to use it.
  - I also had a Mcleod aluminum flywheel (for the vq35de)
  - Stock TOB and slave cylinder (fork style)
  - Flywheel spacer was required.
- Stackup:
  - Vk56de ring gear is required. I removed the VK trigger wheel from the flexplate setup, leaving only the ring gear.
  - I removed the vq35 ring gear from the mcleod flywheel. I kept the vq trigger wheel as I had concerns that the vk trigger would crack, given it is not supported by a torque convertor.
  - JWT hooked me up with a general dimension for clutch release.
    - .250”-.350” TOB movement at the shaft for clutch release. The .350” is at the upper end of what’s allowable before the pressure plate fingers hitting the clutch disk.
  - I couldn’t find any information on clutch stackup for the vq, but multiple measurements and mockups revealed that for the cd009, the pressure plate fingers needed to be around 3.83” from the face of the engine block side bellhousing face. This is highlighted a little more in the excel document. Some compromises were made, as I was also attempting to center the vq trigger wheel in the center of the crank sensor window.
  - So my stackup was as follows:
    - VK56de ring gear
    - Flywheel Spacer .750” thick
    - Mcleod vq35de flywheel with the supreme clutch/pressure plate
  - This ended up with the slave cylinder operating in the 25-75% range of its travel.
    - Note: .717” slave cyl movement equates rougly to .3425 TOB movement

Engine Build

- 2010 VK56de with VVT
  - VVT delete (I used stock non-vvt cam gears)
  - Stock truck crankshaft
  - Stock Truck pistons (these pistons have about a 13.8cc dish
  - Heads ported and decked
    - Heads decked .040. this went from a 57.4cc chamber to 51cc
    - Head porting was mild. Mainly casting cleanup and some divider work on the intake side. Minor bowl work and reshaping on the exhaust side.
  - Camshafts:
    - Oem camshafts. I used all vvt vk56 exhaust cams, as given the specs on JWT's website, there is a small amount of duration to be had. This required modifying the gears to obtain the desired ICL/ECL. There are several iterations of timing gear dowel positions. This changes the amount of teeth the gear needs to be moved to achieve proper cam timing. For bank 1, I retarded the cam gear 7 teeth from the mark to get an ICL of 115. 8 teeth would have been an ICL of 131. I Ended up notching the gear slightly in a rotary table to achieve the cam timing I wanted.
    - I milled off the trigger pattern on one gear to allow for a 1x cam flag for syncing the ecu.
    - Timing chains are OEM.

Engine Build

- Oil pump:
  - Factory oil pump with boundary billet gear.
  - PRV spring modified. 1 coil cut out, the crimped and ground.
    - The oil pan I am using gets rid of the PRV in the filter housing. The first time I ran the engine, I had well over 100psi oil pressure even at 200 deg F oil temp. (I also had a small shim).
    - Removing the shim, and cutting a coil out of the main pump prv gave me about 80psi @ 200 deg F oil temp.

Engine Build

- Intake:
  - I tested a few different iterations.
    - OEM intake with 90mm ls throttle body flange (plastic welded on) and mild runner porting.
    - Deepmotor vk56 intake
    - Modified Deepmotor Vk56 intake
      - I don’t have a good comparison from the “as received deepmotor intake and the modified on as I had also changed cam timing”
      - Deepmotor intake requires shorter fuel rail stanchions to fit the vk56 injectors.
      - I had milled the intake flanges to drop the injector nozzle down to be flush with the base of the flange. I also lifted the plenum roof to allow more distance between the intake runner entry and the top of the plenum.
      - The throttle body flange was welded at an angle to promote airflow moving up to feed the rear of the manifold.
  - Injectors:
    - I used the oem injectors (flex fuel) as the spray pattern is perfect and they flow reasonably well. At this power level they are very close to maxing out with e85 @ 80psi fuel pressure

Engine Build

- Oil Pan:
  - I had to make a custom pan to fit the engine in the car. By dropping the engine low in the bay, it would hit the steering rack with the oem pan. There was only around 1 to 1.5 in of clearance between the pan rail on the block, and the highest point of the rack.
  - A custom front sump pan was made.
    - Simple trap door setup and some stationary baffling was welded into the sump.
    - On track issues exhibited. Oil flows to back of pan (since pan height is around 1" below cyl head drainbacks this seems to have blocked oil from returning to the sump on extended banks.
      - Off throttle the catch can would immediately overfill as the crankcase pressure increased and pushed the oil stuck in the cyl heads out of the valve cover vents.
      - Oil pressure drops only exhibited while level was low (due to the above, after it had blown oil out of sump) no oil pressure issues on bank.
      - Resolution: increased crankcase venting with a primary catch can retuirning to sump. Then a secondary catch can to separate the remainder of oil/air.
      - Best resolution: rear sump. Tbd.
- Front drive:
  - I didn't run ac for simplicity. I maintained the original vq power steering pump and alternator. Minor spacing for the alternator pulley was required.
  - Custom brackets/stanchions were required to fit idlers.
  - VK56 crank pulley is close to the same diameter as the vq35, so pulley speeds remained close.
  - Slightly under-driven waterpump pulley:
    - I found a march pulley (believe it was a mustang crank pulley) a small adapter spacer was required to fit. Water temp issues were exhibited with underdriven pump. Replaced with stock vk water pump pulley. Temp seemed ok. Using koyorad g35 rad. Seems to require a bigger rad as temps will climb.

Engine Build

- Final build specs:
  - Compression: 10.5:1 with heads decked, .040 headgasket.
  - Camshaft Centerline:
    - Intake: 115 ATDC
    - Exhaust: 100 BTDC
  - OEM displacement
  - 430hp to flywheel gasoline
  - 400trq to flywheel gasoline

Engine Controls

- I went with a Link g4x xtreme. It did everything I needed, fairly priced, easy to use, good customer support.
  - Allowed for equal spaced missing tooth crank patterns.
  - Vq crank trigger is 36-2-2-2. Oem vk56 is 36-2-2
    - Wheel diameter is different. I had to move the crank sensor inward about .040 to get a decent air gap when mounted in the oem vk location.
    - Track use: vq flywheel seemed to expand a fair amount. Im sure this can be calculated with assumptions. Trigger wheel contacted crank sensor. I would assume target air gap cold would be .060 using the aluminum flywheel

Misc Swap Info

- Headers:
  - I used the generic ebay long tube headers. The passenger side was pretty close to fitting out of the box. I had to move the collector to clear the chassis.
  - Driver side had to be completely fabricated from scratch.
- Steering rack:
  - I have the FDF rack relocation, which created some issues in regards to space constraints. I had to redo the fittings on the rack to allow for a lower profile fit. Drilled/tapped for an fittings. Welded an fittings onto rack.
- Brakes/Clutch.
  - I swapped to a manual wildwood setup to gain some room in the bay
- Body controls:
  - I ripped out all modules and most of the factory wiring.
    - Manual switches/relays.
    - Old AIM MXL dash which interfaced with the link ecu nicely. (have to use VIPEC ecu in aim ecu selection for CAN protocol)
- Fuel Pump:
  - Had issues with cornering fuel pressure loss
    - Resolution: dual oem fuel pump assemblies. One on each side of tank. Removed driver sending unit. Level sender is still on driver side, but now part of fuel pump bucket.
    - Teed into one single feed. Bypass return reg at engine. Return fed into passenger bucket. Gutted oem fuel pressure regulators, removed diaphragm and seal. Welded up. Drilled .030 hole to feed venturis. Pressure can drop to 30psi, and the bucket will still fill.

Misc Swap Info

- Issues found on track:
  - Running “hot”
    - Resolution:
    - Cooling: running koyo rad (off the shelf g35)
    - Oem fans
    - Water/water wetter
    - Was running oem g35 overflow for coolant, switched to expansion tank style with -10an welded to suction side of rad. Constant pressure. Helped, still could use bigger rad.
  - Crankcase venting:
    - Front sump, running the bank, the oil would flow to the back of the pan, covering the cyl head drainbacks. This would pressurize the crankcase, and when I lifted, the crankcase would vent, and blow oil out of the catch can. I was only venting through valve covers
    - Resolution: I made a rear sump, and vented the front cam covers, and valve covers to a larger catch can with a swirl effect design. The catch can also has a drain back into the sump

Collins crossmember

Mckinney motor mounts as received