3FE Install into 10/72 FJ40

This truck came to me with a V8/SM465/3spd TC drive train. The V8 mounts including the transfer case propeller mount were removed and the frame cleaned up/painted. I used a 3FE from an 89 FJ62. Used the 4 speed bell housing, H55F and slit transfer case. The bell housing is slightly modified to fit the H55F as documented elsewhere. I used the 4 speed pilot bearing, flywheel, clutch and pressure plate, and throw out bearing without modification. I de-smogged the engine using the 3FE de-smog write up by Dan Moeller, linked in the tech section. I fabricated the EGR block off plate from aluminum and used an oil drain plug for the exhaust manifold. I removed all the extra metal vacuum tubes and mounted the VSV on the manifold. Oil drain plug with correct 26mm x 1.5 threads to plug the exhaust manifold, PN 78-93. Plug can be seen in this picture:



I had the engine re built, bored 0.5mm over and took 1mm off the head. New main, rod, and cam bearings, rings and pistons. Stayed with the stock cam, re used the lifters and push rods. The valves and guides were good, just had the valves ground/lapped in. I used the OEM Toyota gasket set and all engine internal parts. I provided the Toyota parts to the machine shop, they assembled the short block. They were excellent to work with and it turned out well. I also took the opportunity to clean things up. The intake manifold was full of crud, boiled it out on the stove then hit it with the wire wheel. I used the

electrolysis rust removal method on the exhaust manifolds and for cleaning the valve cover. Also tried my hand at zinc plating:



Then added the yellow chromate:



Engine, H55f and TC ready to go in:





And in its new home:



Interface Issues (note may be different for other years):

Front Motor mounts – I spent a lot of time on this. I started with the back end mounted on the bell housing ears, and then lined engine up to sit parallel with the frame rails. I used the stock 2F frame mounts, these had to be bolted in with grade 8 hardware since they had been removed for the V8 conversion. I found it was easier to insert the bolt from inside the frame and put nuts on from the outside. Had to slot both frame engine mounts about 1" toward passenger side. I used the 3FE front engine mount ears both sides because I wanted the AC compressor mount on the passenger side. Most people use the 2F passenger side ear. I used the later rectangular 2F rubber motor mounts because the top bolt and bottom stud are in line with each other, the 3FE rubber mounts are offset top and bottom. The shims obviate the need to remove the raised round ridge or machine the 3FE ears to accept the raised ridge on top of the rubber mount – see below. These pictures show where I installed the shims, before I drilled them and installed permanently.

Driver side mount with 3 spacers:

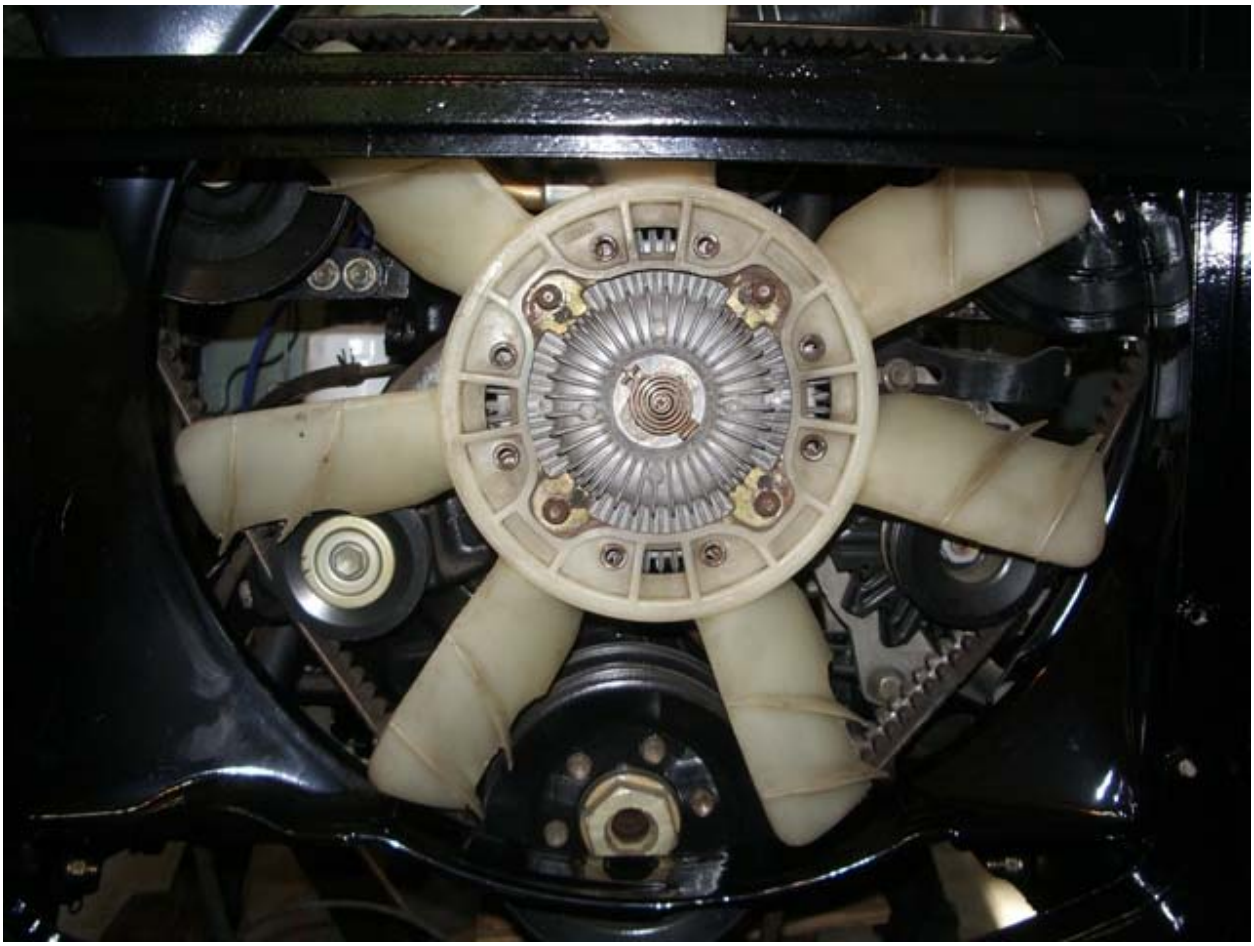


Passenger side mount with one spacer:



Radiator – I used the late FJ40 radiator for stock AC. This radiator is about 1.5" wider than the non AC version, also takes the special wide radiator mount and shroud. I had to modify (move) the driver side stud to fit in the frame mounting hole. The passenger side stud lined up correctly. I used the stock "fire hose" looking pieces under the radiator mount. With this set, I added shims under the engine mount ears to raise the driver side 3/4 inch and the passenger side 1/4 inch. I made up 1/4 inch plates about the size of the top of the motor mount to use as shims and added as needed. The engine sits level side to side and true with the frame with the fan approximately centered in the shroud (side to side). The shimming allowed about 1/2" space between the radiator shroud and bottom of fan blade. I purchased the correct length bolts for the top of the engine mounts after the shimming was set. I am using the FJ62 fan, I'm not sure which fan clutch I ended with, it may be mini truck, FJ40 2F or FJ62. I swapped around to get something to fit length wise, not much room between fan and radiator. I sourced the support and shroud from James Wade and the radiator from SOR.

Fan located in shroud:



Driver side radiator mount stud relocated further outboard:



Transmission Mount – I used an early FJ60 cross member and transmission mount, nothing new here. The long side is about 2” too long, cut it off, re-drilled the mounting holes. The FJ40 frame and FJ60 frame are angled differently so the L brackets do not fit exactly straight to the cross member, the holes have to be slotted slightly. I welded a 4” x 12” plate to the inside of each frame then welded the L brackets to the plate. The bell housing mounts were removed.

Clutch Slave Cylinder – Since the slave cylinder mounts on the passenger side bell housing mount, I used an FJ60 slave cylinder mount, drilled the mounting holes to fit the bolts to the bell housing. This was documented in Poser’s write up.

Accelerator cable – I used the accelerator cable from the FJ62. The holes in the plastic mount on the pedal end are slightly drilled out to fit those in the firewall, works great.



Radiator hoses - I used FJ40 hose upper and FJ62 hose lower. Bottom FJ62 hose required trimming of the radiator end as it is too long. All other coolant hoses on the engine are stock. Lower hose can be seen in this picture with AC compressor removed.



Power steering – I installed the mini truck PS box at the same time. I took the FJ62 pressure hose and mocked it up with the mini truck hose, taping them together where they overlapped, then took it to the local hose place and had a custom hose made. Passenger side metal tube is a bit shorter and the driver side hose longer. The metal tubes were routed just in front of the radiator on the frame cross member. I flipped the mounting clips to mount one tube on top of the cross member and one tube under. This keeps them behind the front bib for protection.



Battery tray – moved the battery tray mount rearward on the frame to allow room for the AC compressor. Trimmed the outside of front upright of the mount slightly and added about 1” spacers between mount and tray to clear the fender. This is just a matter of fitting it to the required location.

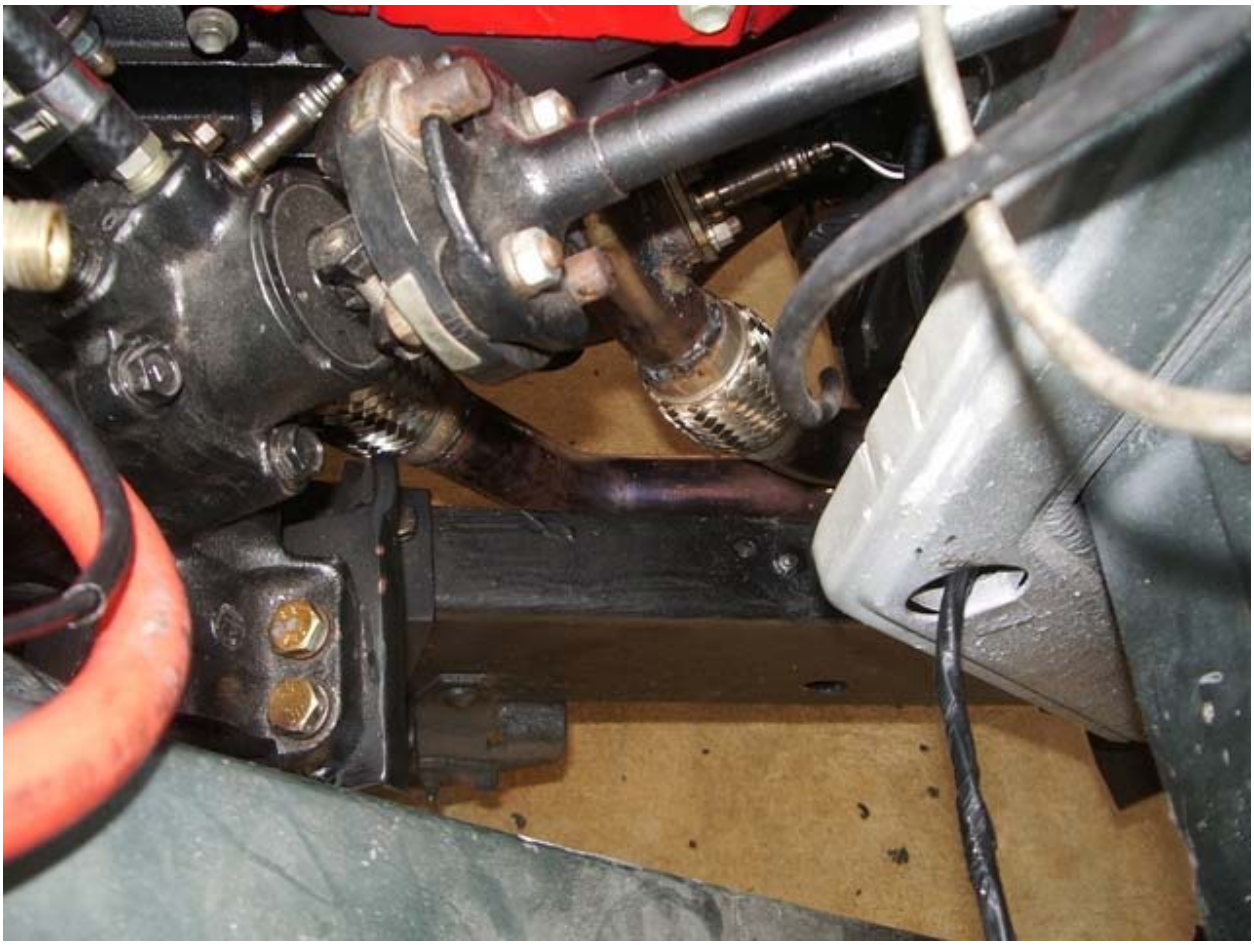
I re-purposed the smog pump mount to hold the York on board air compressor. I had to trim the back of the fan blade to clear the compressor clutch. It may be possible to use the rearward pulley groove to avoid this – a future enhancement.

Intake – I used the stock intake tubes. I fabbed a mount on the engine head to support the MAF sensor then assembled tubes to get things to fit. I flipped the metal tube around and shortened the valve cover breather tube to fit. I used a piece of heater hose for now to supply the IAV. I used the 2 3/4” round filter adapter and cone filter as others have done. Intake is now near the front of the engine bay so it should breathe well. I wanted to try to use a stock filter housing but could not get it to fit with the battery moved back to fit the AC compressor. The BJ40 air filter housing mounts to the fender and would make a nice job of it.



The stock speedo cable worked without modification.

Exhaust – I purchased a few pieces of mandrel bends and straight parts from Columbia River Mandrel Bending and welded up new down pipes into a Y collector and dough-nut type connector to the existing V8 exhaust. The angle from the outlet of the manifolds to the horizontal is about 56 degrees. I used the stock O2 sensor and manifold flanges. There is very little room where the exhaust passes between the bell housing, frame and transmission mount. The flex connectors make the job a lot easier and they are not that expensive.



Heater hoses – rummaged around in the odd hose bends I had to fit. The supply hose to the heater valve (from a mini truck) is an S bend and has to be a pre bent part to fit without kinking.

Drive shafts – had front lengthened and rear shortened and balanced at local drive line shop (fleet pride). The 3 speed transfer case had the 3 speed flange pattern on the rear (E brake drum) and 4 speed flange pattern on the front. I sourced a couple of 4 speed flanges for the split case and a 4 speed yoke for the rear drive shaft. Note the 4 speed flanges for the split transfer case were discontinued by Toyota; I got the last one, according to the dealer. I also got the last one Kurt had at Cruiser Outfitters (he may have more now). I used the same flange P/N TCF60020SC on the front and rear of the split case, even though the book has a different part number for front and rear.

Trans Hump – patched existing mess and cut new holes. Since I had the V8/SM465 previously, it was pretty hacked up so I cut a larger hole and pieced in a larger flat section to make a nicer job of it. I also modified it to accept the late floor mounted e brake handle.



Shift cane – heated and bent forward slightly at the factory bend to clear center console.

Wiring – This can be daunting. I merged the required 3FE bits from the FJ62 cowl harness into the FJ40 harness. From memory:

I used the heavy FJ62 alternator wire. I used the existing switched hot wire from the engine fuse for the alternator. Re used the FJ40 alternator wire for misc power supplies required for the ECU.

I converted a stock oil pressure gauge to use as a volt meter in the stock cluster in place of the 30 amp ammeter.

I used the VSS in the speedo to interface with the ECU, it is the 6 pulse unit but seems to be working fine. The ECU is looking for a 4 pulse/rev signal when the vehicle is moving.

I tied the new oil pressure and temperature sender wires from the FJ62 harness to the FJ40 harness for the gauge cluster. I initially had trouble with my oil gauge, found it was messed up. The 3FE oil and temperature senders work with my stock FJ40 gauge cluster.

Tied into the start wire for the start signal to the ECU. The ECU is looking for 12V signal when the starter is engaged.

Tied in the Brake light for brake signal to the ECU. The ECU is looking for 12V signal when the brakes are applied.

Re-located the head light switch to the right of the steering wheel to accommodate dash speaker installation.

Permanently jumpered the transmission P/N switch

Changed connector on the transmission reverse switch to a mating pair I robbed from a mini truck harness (to get something I could connect to).

Tied AC compressor clutch power from AC switch to the ECU AC Idle UP connection. 12V on this terminal increases idle speed when the AC clutch is engaged.

I added new wiring to the rear chassis harness for the dome light, 2m radio, fuel pump and E brake light switch. Reworked the terminals in the plastic housings at the firewall. I'm using an 81 axle with E brake and moving the handle to the floor.

Re worked the circuit for the brake warning light. The FJ60 master cylinder I used has the float type cap vs the pressure switches in the FJ40 MC. Note, the float cap is very expensive new, I found one at the pick n pull for 2 bucks. I wasn't planning to replace the MC at this time but found it was leaking. I picked the FJ60 MC because I could get a new AISIN unit for a good price, and with the front disk and 81 rear axle, I essentially have FJ60 brakes anyway. Be sure to adjust the push rod inside the booster to the proper length when changing MC like this. The MC must

be allowed to fully retract or fluid pressure will remain on the calipers. The float switch gets wired in parallel with the switch at the E brake handle to turn on the warning light if either contact is closed.

I used the stock connectors for everything. The 6.3mm spade lugs and plastic housings can be sourced from Coolerman. I purchased mine from Vintage Connections. I also used the stock green Toyota fusible link connectors that take the wider 8mm lugs; I purchased mine from 1770rick on ebay, he has both male and female connectors but may not have both listed. Coolerman may have these as well if you don't want to get them from Australia. I used appropriate fusible link wire size to make up the links. I scored the fusible link wire on ebay for cheap. All splice connections in the harness were soldered and heat shrink tubing applied. I wrapped the harness with the non stick 1" wide harness wrapping tape. I used two rolls of tape, probably could have used a third to add a second layer to some areas. Wrap the ends of the non stick tape with regular black electrical tape to keep it from unwinding. Note, I obtained a mini truck harness and FJ60 harness for cheap and robbed wires and connector bodies from these.

Ran check engine light (CEL) wire to light installed on the dash, used a spare unused switched power source in the FJ40 harness to power the CEL. This was a blue/red stripe wire with a bullet connector that did not connect to anything and it was in the right location. Mr. Toyota planning ahead?

The 3FE ECU requires a switched 12 V source that receives power when the ignition switch is in RUN. To accommodate this, the FJ62 (and most other Toyota EFI models of the era) has two switched power contacts in the ignition switch. The FJ40 ignition switch only has one switched power contact in the ignition switch. I added a relay that picks up when the ignition switch is in RUN to supply 12V to the ECU. This 12V supply is a dedicated source from the battery. I did this to provide a dedicated switched power source for the ECU per the Toyota design, and not overload the existing single switched power contact in the ignition switch. The relay coil was powered from the ENGINE fuse. I also took the opportunity to replace the ignition switch with an aftermarket part since the original was becoming intermittent.

The ECU requires an always hot supply, I ran a new dedicated supply from the battery to new 15 amp and 7.5 amp EFI fuses. I used blade type fuses and holders to ensure good positive connection for the ECU power. Ran these pig-tail type fuse holders so they are taped to the harness near my new aux fuse block on the passenger side – see below.

I added wiring into the harness to supply power to the front spot lights, York compressor clutch, stereo, 2M radio, dome light, AC compressor clutch and AC fan. I mounted a second stock FJ40 fuse panel with a fabricated sheet metal bracket on the passenger side post similar to the stock location on the driver side. This has the power fuses for my add-on accessories. It works well for this since it has a switched and un-switched section. I added a second relay to provide a switched power source to the auxiliary fuse block similar to the EFI switched supply. Relay coil

supply is from a connection to the existing switched power so it picks up when the ignition switch is in the RUN position. The new switched and un-switched 12V supply for the aux fuse panel is a new dedicated wire from the battery. I used the round Toyota aux relays from the various harnesses I had.

Drilled out the new firewall hole for the engine harness grommet. Enlarged the existing firewall holes for the grommets for the newly created FJ40/FJ62 cowl harness. I used the grommets from the FJ62 harness. I test fit the harness after getting it put together and before wrapping, just had it taped enough to hold it together. This allowed me to trim the wires to the items in the engine compartment and my new fuse block. After test fit, I removed, installed rest of the connectors and wrapped up the harness. To enlarge the existing grommet hole in the firewall, I tack welded a piece of flat stock across the existing hole to provide a place for the hole saw pilot bit to go.

Fuel Pump – I sourced a NOS Bosch pump on e-bay for 50 bucks. It is a 48 psi unit. I also found a fuel pump mount from a Kawasaki motor cycle that had rubber mounting feet that worked perfectly. I used a stock Fj62 fuel filter and connecting hoses. I mounted the filter to an angle welded to the top of the frame under the heater blower. The fuel pump was mounted to an angle welded to the inside of the passenger side frame near the T/C. A pre-flared piece of 10 mm brake line was used to connect between the stock fj62 filter inlet hose and the fuel pump outlet. This fuel pump had an odd DIN type discharge fitting (I think for a Jag car) that took some doing to find the correct ferrule and nut. The suction side of the pump is regular rubber fuel line with hose clamps. A return line is required, using 10 mm tubing (Used the rest of the 4 ft brake line I purchased) and rubber hose/hose clamps. I ran the return line inside the frame, exiting near the hole in the floor up to the fuel tank. There was a spare connection on the side of the stock FJ40 fuel tank I used for the return.

E brake – The split case I have does not have the e brake conversion. Comparing options, I chose to install an 81 rear axle with the E brake. I purchased an 81 axle housing and brake backing plates from mud member mel lowe. I found that the bearings and axle shafts for the 81 are different than those in my 73 axle, changed in 74 I believe. I was able to find a set of stock axles on ebay. This ebrake setup is pretty good, it actually stops the truck.

Lessons Learned:

There is a lot of information on the Mud web site for this conversion; however, some of the details were missing. Hopefully I have included something in this write up that helps someone else. Some things I learned:

When the 3FE is out of the truck, replace all the coolant hoses, especially if you plan to remove any of them for cleaning up the engine. I tried to re-use some that were in good condition but have had a dickens of a time with nagging coolant drips. They are expensive but it has to be done and there will be no easier time. The short one behind the AC compressor is tough to get to without taking the compressor and bracket out. Also use new hose clamps, the stock ones are still available from Toyota.

Remove the 3FE throttle body, clean it, and make idle stop adjustment and throttle position sensor adjustments per the FSM. I had a high idle issue until I did this. The TPS switch was closed at idle so the ECU should have entered the idle control mode but it would never idle down correctly. I ended up removing the throttle body and found that the throttle butterfly was not closing far enough even with the stop adjustment screw flush with the locking nut. I removed the nut and screwed the stop in a couple more turns then put the nut on the bottom side of the screw. The stop screw should hit just before the butterfly makes contact with the inside of the throttle body. Set up the TPS with the feeler gauges. Now idles perfectly.

In my limited experience, some parts are best purchased from Toyota, however, I had good luck with a few aftermarket AISIN parts. I used an aftermarket ignition switch, water pump, IAV and brake MC. All (except ignition switch) came with AISIN cast on them. The IAV even had the Toyota part number on it. Maybe authentic or maybe a clever copy, time will tell. Most all parts for this engine are still available from Toyota but they are pricey. I support the discount OEM Toyota parts suppliers when it is reasonable to do so.

When you have the harness out of the truck, test everything. I ended up forgetting the transmission P/N switch jumper and the power connection to the start injector. I had to remove the harness and figure this out. PITA after it has been wrapped up. Make a list of things to test and check them off as you go, it is easy to forget things like this. I knew better but blew this off and paid for it later.

Clean out your fuel tank and all lines. My first fuel pump locked up due to ingesting a piece of crud. I added a 100 micron strainer on the suction of the fuel pump to prevent recurrence of this.

I've run this setup for about 4 months and am used to it now. The engine, transmission and steering all feel different. It is like a new truck. The 3FE has plenty of power and the 5 speed is great for the highway. I did this conversion mainly because I wanted to, no really good reason to remove the V8 as it ran fine. It's my money and I enjoyed the project, mostly.