Dozer Repair Manual

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The purpose of this repair manual is to help the owners of the Jiansu Jianghuai and other related bulldozers produced in China and exported to the U.S.A.

The idea for writing this manual came from John Nelson of **Nelson Equipment Company(Tractorconnection.com)** and I extend my appreciation for his assistance in obtaining parts, technical information and advice in the writing of this manual. I am in no way a professional mechanic and I am writing this manual as a guide to other backyard mechanics, any omissions or errors are unintentional. **Read the entire repair manual before attempting repairs,** this is good practice and will familiarize you with the equipment.

I had some problems with the earlier model of my dozer due to accidents and couldn't find a repair manual. All I had was the parts diagrams, which were of not very high quality, and the descriptions were not translated well. So as I did repair work on my dozer I took pictures and wrote down the important instructions and short cuts to repair it. I did not go into deep detail on the replacement of the engine mains and connecting rod bearings because this information can be found in any automotive repair manual.

One of the first repair jobs I did was to replace the main and connecting rod bearings. I had been working at night in heavy brush and small oak trees and didn't realize that my oil filter had been struck and that I had lost oil pressure. When I discovered that I had lost oil pressure it was too late and the motor seized. I took the motor out of the dozer and mounted it on a motor stand. I removed the crankshaft and found only light scuffing on one of the connecting rod journals of the crankshaft. A local machinist told me that it wasn't too bad and that after buffing the scuffed area that it would be ok to install new bearings; these diesel engines are very low RPM and are generally made to last a long time. I re-installed the engine, but I also installed a device called a "Murphy Switch"(patented). This device will shut off the fuel supply if oil pressure is too low or the temperature gets too high. This is often used on larger pieces of equipment, like dozers, etc., that would be expensive to replace. So I continued to get an enormous amount of work done with my dozer on my 40 acres in San Andreas, CA.

After a time I noticed that the dozer shuttle clutch did not seem to respond as well as it used to. I had been doing very heavy ripping work for a 1500 ft. water line installed on my property that is very rocky. Sometimes the dozer would not go forward or backward right away after changing shuttle clutch direction. I originally thought that there was a pressure problem with the shuttle clutch hydraulic pump.

The straw that broke the camels back was when my neighbor was cutting a hefty rock ledge by ramming/chipping it away with the dozer and then heard a grinding noise and the dozer quit moving.

I eventually installed an inexpensive water pressure gauge that I tapped into an existing plug just below the shuttle clutch forward/neutral/reverse selector. This gauge showed that I had the required pressure to operate the shuttle clutch (40 psi max.). So I thought there was something wrong with the shuttle clutch. I removed the motor and the shuttle clutch to start my repair work. I replaced the shuttle clutch forward and reverse clutch discs and re-installed the shuttle clutch. Still didn't work.

I discovered that I could work on the shuttle clutch while it was still in the dozer by just removing the motor. After the motor is removed you can pull the front plate of the shuttle clutch and remove most of the internal parts.

Next I pulled the shuttle clutch clutch/discs assembly to a regulated house water supply to simulate what was happening inside the shuttle clutch. I made movies of the shuttle
clutch action and wrote down the actuation pressures for forward and reverse action of the clutch. Once I had a good understanding of how the shuttle clutch worked I reassembled it and reinstalled the motor. Again I could not get drive action to the rear drive sprockets with the transmission in gear. I did notice that when I put the shuttle clutch selector lever in forward or reverse that the upper hydraulic pump shaft (for back hoe hydraulic pump) would turn if the transmission was in gear. I also noticed that the main PTO shaft would turn when I put the selector into forward or reverse with the PTO speed selector in low. This meant to me that there was probably a problem with the transmission. I pulled the PTO assembly from the top of the transmission and discovered that my pinion/ring gears were chewed up. I pulled the rear end/transmission assembly and found lots of metal inside the assembly including parts of pinion shaft gear teeth that had broken off.

While doing my repair job I noticed that the one threaded end of the pinion gear shaft had a shredded keeper washer and that the round nut holding the end of the shaft was partly stripped. If the pinion and ring gears are not properly aligned they can bind and grind each other. A symptom of this could be the dozer stalling when you put it in gear when there is no load being applied or having increasing serious problems with going into reverse or forward. After I repaired the transmission by installing some new bearings (most available locally) and installing new ring gear/pinion shaft the transmission started to work again and the dozer is now working great. I made a small movie of the internal
workings of the ring/pinion gears so that people could better understand the mechanism.

This repair manual is mainly geared for the home mechanic that wants to repair his/her own machine under less than ideal conditions. It will also be of some aid to Professional mechanics who are just starting to repair these machines and want to save a lot of time. You will see in some of the following pictures various tools, such as heavy floor jack, motor hoist, large pry bar (concrete breaking bar), come-alongs, 4 ton jack stands, etc. With a reasonable amount of mechanical skills a single individual, like myself, working alone should be able to do each of the repair jobs that I will describe. As always, safety first! Use gloves, eye protection, position heavy jack stands in case of accidental slippage of heavy equipment.

Finally I hope that you get as much work done as I have with my dozer. I have a back hoe, post hole driller, 6 foot box scraper, single shank ripper, wood chipper and recently acquired a front loader. I am practically a one man construction company. Where I live a dozer is much better than a tractor because of the steep terrain and extra traction needed. The work I have done on my property so far has added value back to me far in excess of what I would have had to pay contractors to do the same work.

Sincerely yours,

Alvin P. Lamore Jr.
San Andreas, CA

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Pulling the Motor

Pulling the motor is pretty straightforward. You jack up the dozer and support it's tracks with large pieces of wood block so that your motor hoist legs will fit under the machine to pull the engine. I also use some sturdy jack stands under the dozer for added safety. Use your dozer manual and part diagrams to make the job go easier.

Disconnect the battery terminals. Drain fuel from fuel tank and disconnect fuel lines. Set the dozer blade on the supporting blocks and remove the two hoses to it. This will help stabilize the dozer for when you pull the motor. You can move it up or down if needed with a floor jack.

Remove the front grill and side grills. Remove the exhaust pipe. Remove the upper hinge screws to the hood and remove the hood. Disconnect hydraulic lines and move them to a higher level than the hydraulic tank, tie them out of the way. Remove the top front girder that is held by 4 bolts on each side. Remove engine compartment cover plates. Remove the radiator which is held by two studs and nuts at the bottom. Disconnect the throttle cable, the diesel cutoff cable at the injectors and the decompression mechanism assembly at the back of the motor.

Remove the air cleaner and heater wire near it.

Put strong jack stands under the ***equalizer swing shaft weldement*** which is just below the engine. Remove the front weight assembly which is held by very large bolts. I was able to eventually leave this assembly attached but it was harder to get the engine out in my circumstances.

Remove the swing shaft rear and front brackets bolts, sort of like motor mounts.

Remove all the bell housing bolts and nuts.

Sling the motor with heavy chains or web straps. Use a motor hoist to lift up on the engine and using a pry bar pry the engine away from the bell housing using equal pressure on both sides to prevent jamming at the shuttle clutch shaft. See Fig.1.

After you remove the engine place it on an engine stand so you can work on it. You can remove valve head and oil pan with the engine sitting on the ground or on a pallet as I did.

In order to remove the crankshaft you have to remove the front cover and hydraulic pumps. Then use a socket to knock out from behind the lower hydraulic pumps gear towards the front. Then put a bolt into the center of the drive gear to pull this gear (put a crescent wrench under the bolt head and knock off gear). Then you can get to the last hidden bolt holding the cover onto the block.

The rest of the job is just standard engine rebuild. You will need a 32 mm socket for the front crankshaft nut. This will also be used when you adjust valves. Use manufactures manual for specifications, such as allowable clearances.

When replacing the motor I found it helpful to use long pilot bolts through the bell housing to help pull the motor onto the bell housing. Be careful when doing this because

the shuttle clutch shaft, if the motor is not correctly aligned, can cause jamming.

Adjusting the Valves

Use 32 mm deep socket on lower front crankshaft pulley nut and use long extensions with ratchet wrench at front of machine to crank the engine for valve adjustment. Take off valve cover and fuel inductors. Use long Rod in fuel injector hole to find Top Dead Center (TDC), take care not to bend the rod while you are turning the engine over. You can put a finger in the injector hole while turn the engine over to feel the compression stroke. At TDC adjust front most intake valve first then the exhaust valve. Do this for the remaining valves. Put everything back together when done except leave injector pipe open to see if you are getting fuel when you try to start motor with starter fluid. If it takes too long to get fuel vent the top front (of two) bleed off valves of fuel injector to purge air then retighten and try to get fuel to pump to #1 injector again. Once fuel is flowing turn off motor and tighten pipe to injector. There is a built in manual fuel pump plunger in the injector but it is hard to replace once the injector pipe is primed. Adjust inlet valve 0.35mm and exhaust 0.40mm at tappets; cold adjustment. Otherwise follow manufacturers manual on this and setting up the injector pump to deliver fuel to each injector at the proper time.

Shuttle Clutch Repair

After removing the engine the shuttle clutch can be entirely removed, if you need to get at the rear bearings/seals or you can leave it in the dozer if you are just repairing or replacing the other parts. Removing the entire shuttle clutch is done by removing its hydraulic lines and unscrewing the nuts holding the two supply lines at the top plate. Drain the remaining oil in the shuttle clutch. You should be able to reuse it if not contaminated.

Tie off the hydraulic lines at a higher level than the oil reservoir. The oil used for my shuttle clutch is plain 30 or 40 weight oil (regular tractor hydraulic oil is too light for shuttle clutch and is only used in the main hydraulics). After unbolting the top plate it can be lifted off , this can be assisted by tapping on the two threaded hydraulic pipes with an object that won't damage the threads. Unbolt the bolts holding the shuttle clutch in the dozer and remove the shuttle clutch through the front. See Fig 2-4.

If working on the shuttle clutch while still in the dozer; remove the front plate bolts. Use two jacking screws at holes provided on the cover to start moving the plate forward. You can fashion a puller by using a chain attached to the jacking screws and using a gear puller screw at the center of the front shaft, but be careful not to cock the cover, because attached on the other side of the cover is a bronze oil distribution bushing that is attached by screws and springs to the cover and you don't want to bind it on the main clutch pack shaft.

The two hydraulic supply pipes that come in from the top of the shuttle clutch are attached to this bushing by two screws each. The flow of hydraulic fluid one way or the other causes the front or rear clutch disks to engage as actuated by a large central piston, which is hydraulically connected by holes in the bushing and the shuttle clutch main

shaft. See Fig. 5.

Use a gear puller and remove gear with the 2 screw holes at front of shuttle clutch. Use a gear separator (upside down) to remove large pin holding other front small gear.
Once these gears are removed you pull the entire shuttle clutch assembly forward and out of the shuttle clutch housing. This assembly has two clutch packs for forward and reverse action. See Figs. 6-9.
Remove the first spring clip and keepers. 6 inch C-clamps can take the pressure off the springs inside the clutch pack to remove the keepers. Remove the first clutch pack.
After removing spring clips and keepers, the clutch drum can be driven forward by tapping with a hammer using a flat punch or bolt, evenly around the drum moving it forward and exposing the second clutch disk pack. See Figs 10-13.
Lay out all the components on cardboard or some clean surface in order removed.
Note that there is a round grooved keeper called a key that has a circle clip about it. Manufacturer # 402.21H.151.
When reassembling the shuttle clutch disk packs you can use stacked wooden tongue depressors that are taped together with front of shaft up under the clutch pack to keep them on the ***driving drums***. Then put on end piece. Then use 2, 6-inch C-clamps to hold them together. Then move front end downward and slowly remove wooden spacers while evenly tightening clamps until you get the keys on the end piece over the shaft. Then you flip the assembly back upwards to install the keys. Also note that after repairing the shuttle clutch, before replacing motor, verify that motor and shuttle clutch shaft are not jammed.

Removal of the Rear End /Transmission Assembly

Remove the PTO assembly by removing the seat, top hydraulic hose (put it temporarily high to stop leakage of hydraulic fluid, you can reattach it to the removed PTO assembly later; on the right side of the dozer step). Tie up the hydraulic hoses over the PTO to the front grab bar with a rope to facilitate removal of PTO assembly. Remove nuts on studs holding PTO assembly and pry up on PTO assembly and remove. This exposes the ring and pinion gears also exposed is the central drive shaft and upper PTO drive shaft.
Remove shift lever assembly (H-L, 1-4) above forward part of transmission and place aside.
This exposes the shift forks and rods at the top and the #1 and #2 transmission shafts. The top #1 transmission shaft is the shaft that is connected to the shuttle clutch via splines. See Figs. 14-19.
Remove brake and steering clutch rods. Drain oil from the transmission. Remove any shackles or other apurtances attached to transmission assembly. Loosen the rear drive sprocket nuts a little. Jack up the front end of the dozer (I used 3 ton spider floor jack) and place two strong jack stands (I used 2- 4 Ton jack stands) under the the back front skid plate. Jack up the rear of the dozer and place two strong jack stands at each

end of the swing shaft (shaft that the rear of dozer shackles are attached to). Make sure the machine is high enough to remove the drive tracks. Adjust the track tension to

slacken the tracks. Use a bolt cutter to cut one each side drive track pin retainer nut for each track. Use a come-along to hold the drive track together while you remove the pin. I suggest removing a pin near upper quadrant of drive sprocket. Let the tracks down to the ground and move aside a little. Remove the loosened drive sprocket nuts and remove drive sprockets. Remove the 4 bolts each side that hold the dozer cab to the transmission assembly. Remove the nuts/washers holding transmission to shuttle clutch. Put a floor jack under the transmission and remove the 4 large shackle bolts holding the transmission /rearend assembly to the swing arm. Lift the rear of the cab (I used a 4 ft. farm jack) so that you can block it up high enough so that the rearend/transmission assembly can slide out the back. Note there will be no other support at the rear of the cab once you have removed the rear end and it could flop down if not supported. Chain up the rearend/transmission assembly (the rear end) and use a motor hoist to lift up on it. Using a pry bar and floor jack you can slide the rear end back a few inches at a time. For extra safety you can place wooden blocks or jack stands under the
final drives. See Fig.20. After the rear end is far enough from the dozer to work on you can place it on wooden blocks. Next remove the 8 nuts from each side holding the final drive/brake/steering clutch assemblies and remove both left and right assemblies.
You will see on each side of the drive axels the spring loaded steering clutches. Remove the large 36mm nut from each of these and pry off the steering clutches. Remove the keepers from the left side seal/bearing race assembly and remove this assembly.
Remove the cotter key to the coupler for the top PTO shaft. Loosen the ring clips from the PTO shaft (also both sides of PTO shaft bearing) and drive the PTO shaft back towards the rear to get at the ring gear bolts. Remove the ring gear nuts and keepers.
Totally loosen the large round nuts at each side of the transmission case (used for adjusting the ring gear sideways) and the keepers that hold them. Figs.21-23.
Remove the ring gear shaft (drive shaft) from right to left with a piece of wood and hammer leaving the nut on the end of the shaft to prevent thread damage. Remove ring gear. Be careful not to injure the bearing races. Fig.24.

Removing Transmission Shafts #1 and #2.

Use a large nail or punch to remove the roll pins holding the shift forks on their carrier rods (shafts). Figs.18-19.
Use a punch or small bolt to drive the shift fork shafts out of the transmission body towards the front. Be careful not to lose the 4 small spring loaded ball bearing that maintain a pressure on grooves cut into the shafts that help hold you in a particular gear.
Note the carrier rods have notches facing down.
Carefully put each shift fork back on it's shaft in proper order.
Loosen snap rings that hold PTO shaft so you can drive it backwards so #2 shaft will clear.
Remove the top shaft #1 front bearing carrier and drive #1 shaft forward to remove sliding gears and shaft; loosen any snap rings to do this. See Fig. 25a.

Remove cover over lower #2 shaft end and remove smaller round nut and keeper from it's
threaded end. Drive #2 shaft forward at pinion gear so you can get at large round nut and

keeper washer and bend down a little the one inner tab. After removing this large round nut and keeper washer you should be able to drive #2 shaft backward. If PTO shaft is in the way unclip it's snap rings and drive it back so you can remove the #2 shaft (splined) from the front to the rear. Outer gears rest on this shaft and can be removed. See Figs. 25-28.
You will notice on both shafts #1 and #2 needle bearings which will fall out; collect and count these and put in plastic bags for later reassembly.
Check all components for wear or damage and replace as necessary. Make sure new ring clips are tight. After cleaning bearings check them for smoothness, if rough, replace.

Transmission Reassembly

Transmission reassembly is basically a reversal of removal procedure except for some twists. It is very important to clean out the transmission before reassembly and use a magnet and a vacuum cleaner to make sure no metal fragments or debris remain. Vacuuming and use of a magnet more than once may be necessary.
Most of the needle bearings are at the end of the shafts and easy to get to. You apply thick assembly lube grease (comes in small tube most automotive supply stores) into the annular space that the needles go into and slowly re-install the needles from the bottom to the top. Before installing the #2 shaft (at pinion end) use a large cut and tied rubber band to temporarily hold the 36 needles on the shaft. After you engage this shaft enough into the annular space you can cut the rubber band and the needles will remain where they are supposed to be. These rear needle bearings are held in place with rings at both ends of the needles and an end C-clip. See Fig.34. Then you can tap on the front main bearing driving the assembly to the rear. The last thing you do is install the rear main bearing and it's large C-clip.
Before installing #1 (top) transmission shaft you can use a C-clamp through the front top hole of the transmission to help adjust the #2 shaft for proper alignment of it's pinion gear end with the ring gear. Using manufacturers instructions you can use the two large internal ring nuts to move the ring gear left or right and the C-clamp to help move the pinion forward or backward; this can also be assisted by tapping on either side of the #2 shaft using a piece of wood so as not to damage metal parts. See Figs.29-32.
Using the manufacturers manual, supplied with the machine, adjust the ring/pinion gears to get the desired gear pattern. Use some special white marking grease used by mechanics to adjust rear ring/pinion gear alignment patterns. Use original spacers for shaft #2 front bushing as needed. Should be able to have smooth action between the pinion shaft #2 and the ring gear if alignment is done properly (see my picture Fig.32). After alignment reinstall lock keepers for two large ring adjusting nuts.

After shafts #1 and #2 are re-installed (Figs.33-35) reassemble all the shift fork carriers and their forks. The carriers are installed from front to back; one of them can not be

installed from back to front. You will need to replace the 4 small spring loaded ball bearings removed earlier; use a screwdriver or punch to hold pressure against these balls against their springs so that carrier rod can be driven backwards. Note that all shift forks

in contact with gears have small built up races that they fit into. The manufacturers drawings of this are very poor. You can re-use the roll pins (if not damaged) to refasten the shift forks/stops to the carrier rods.
Use some reassembly lube inside your bearings.
The very large roller bearing nearest the #2 shaft pinion gear might be a little tight fitting into it's hole in the transmission. You might have to use some emery cloth to remove dirt or grime so that it fits in the hole.
I used a little epoxy glue at the end of the smaller round end nut of shaft #2 keeper to help hold this nut more securely (See Fig.35.). If you see any stripping of this nut threads upon removal replace it and it's keeper, these are inexpensive.
Reinstall the steering cluthes and final rear drives.

Reinstalling the rear end/ transmission assembly.

Raise the rear end/ transmission (R E/T) assembly with engine hoist. Use floor jack and jack stands or blocks to slowly move the R E/T assembly forward to reconnect with shuttle clutch. Two come-a-longs attached to the left and right final drives and attached towards the front of the machine can assist with reattaching the R E/T assembly. Another come-a-long attached to the motor hoist boom can help with balancing the assembly. See Figs.36-37.

Final Adjustments

After reattaching the R E/T assembly and bolting it's large two shackles to the swing arm and if the motor is still in the dozer and the dozer is firmly supported and the shifting mechanism is re-installed you can add several gallons of oil to the R E/T assembly and run it with the PTO assembly off. The PTO assembly is placed on the right step of the dozer and it's one hydraulic line is attached to it. You can verify that there is no jamming of parts before starting the engine by moving shaft parts and changing gears. If you run
the opened R E/T this way watch out for higher gears because the ring gear will throw a rooster tail. If proper action of the transmission is observed you can reinstall the PTO and put the final drive sprockets back on.

Reinstalling the drive tracks

The drive tracks are heavy. Use come-a-longs to muscle them if you are doing the job by your self. Once you get the open track close to the back of the dozer, under the drive sprocket, you can use a come-a-long attached to the bracket that fastens the roll cage at the back of the dozer and pull the heavy track end up and over the sprocket by using a second come-a-long to pull it forward. Then using two come-a-longs working together

pull the track together and re-insert the drive link/shoe pin. Next use a small bolt and nut through the end of this pin, cutting off any excess bolt thread, then weld the end of this

bolt so it doesn't come loose.

After the tracks are re-installed and pre-tightened and steering clutch/brake rods are reattached and the machine is firmly braced up above the ground with the tracks not touching the ground you can do some initial adjustments. You want to see how the steering clutches are working and how the tracks are moving in forward and reverse. If all is ok then you can put the dozer back on the ground and adjust the steering clutches and brakes.

How to adjust the dozer steering clutches and brakes

With the dozer on a flat surface adjust the 2 bolts for each side of the brake bands per manufacturer. Tighten these bolts snug then back out one full turn and tighten the lock nuts. Back the brake adjusting nuts at the sequent fork all the way out taking all tension off the brake bands.

Start adjusting each steering clutch adjuster nut so that when you depress the steering/brake pedal you can disengage that sides steering clutch and the opposite track side will then be free to turn the dozer. Do this adjustment to each side to get even reliable turning action. You can feel for even steering clutch action by noticing turning action of the machine when you the depress the steering clutch pedal and check for eveness by depressing both pedals together and individually to see if you have equal action from each steering clutch. While checking the steering clutch action in forward and reverse drive directions. After both steering clutches are adjusted and have approximately equal positive (not weak action like a partially disengaged steering clutch) action you can adjust the brakes. Both the steering clutch pedals should be activating towards the top of the pedal travel. You want the brakes to activate towards the bottom of pedal travel, nearer the bulkhead.

Start tightening the brake adjustment nut on one side. Keep doing this until the brake will engage. You should now get a faster turning action from the opposite track because the brake is locking the side you are working on and the steering clutch is disengaged on that side also. Repeat this procedure for the opposite track side. Your goal is to be able to disengage the steering clutch on the side you are adjusting and engage the brake at the bottom of pedal travel. You should have good steering action in both directions now.

Final test and adjustment of brakes

Back the dozer up a small hill. Keep the dozer running. If anything goes wrong you can bury the dozer blade and stop the machine. Put the shuttle clutch in drive and try turning and braking. If braking is weak adjust the brakes tighter. Once your brakes will hold you on the hill you can depress the steering clutches just enough so that the dozer starts to roll down the hill, then you can push the pedals all the way down to stop the

machine. Notice the action of the steering clutches and brakes by depressing the clutch/brake pedals both individually and together and making appropriate adjustments.

Adjust brakes as needed, each time checking your adjustment. There should be some room between the pedal and bulk head when brake(s) are fully engaged. By this

procedure you also verify that the brakes are not interfering with the steering clutch action.

Now your dozer can turn quickly and stop when needed. If a particular pedal is too low there is an adjustment where the brake and steering clutch linkages are attached. Always recheck steering clutch/brakes after any adjustments. Finally tighten all lock nuts so that adjustments will not change.

Final observations

Looking at how the dozer transmission system works I recommend that several seconds be allowed to pass while in neutral before the shuttle clutch direction is changed. This should help reduce shock to all drive train parts. Also try not to tackle solid rock with ramming motions, this is a tremendous shock to the transmission parts.

You should install a **"Murphy Switch" (patented)**, which can be obtained at tractor supply stores. Also install a pressure gauge (I used a brass **(Rainbird, patened)** water gauge that is used to check water pressure on hose faucets for the shuttle clutch that I mentioned earlier. These two items could save you a lot of troubleshooting time.

Apl:10/29/07