LS- 88/98/98A/98LC/108/108B Series - Master Keysheet

(1G, 1R, 9L, 9LG, 9LR, or 9LRA Prefix On Crane Serial Number)

AREA 00 GENERAL INFORMATION

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SM00- 000- 000.00 Service Manual General Usage & Instructions

AREA 02 CRAWLER LOWER

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SM02- 000- 003.00 Lower Frame - General
SM02- 002- 006.00 Traction Shaft (88/98 Standard & Long Wide Models)
SM02- 002- 012.00 Traction Shaft (98A, 98LC, 108B Models)
SM02- 003- 004.00 Tread Sprocket (98LC, 108B Models)
SM02- 003- 005.00 Tread Sprocket (88/98 Long Model)
SM02- 003- 009.00 Tread Sprocket (88/98 Standard & Long Wide Models)
SM02- 004- 002.00 Idler Roller
SM02- 005- 003.00 Track Carrier Rollers
SM02- 005- 004.00 Track Roller
SM02- 005- 007.00 Track Roller (Westrac)
SM02- 006- 002.00 Steering Mechanism
SM02- 008- 001.00 Side Frame Cylinder (108B Model)
SM02- 008- 001.01 Side Frame Cylinder (108B Model)
SM02- 010- 005.00 Rotating Joint
SM02- 010- 022.00 Hydraulic System Cleaning Procedure

AREA 03 UPPER REVOLVING FRAME

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SM03- 001- 031.00 Undecking Machine
SM03- 004- 005.00 Conical Roller Assembly
SM03- 005- 002.00 Gear Case Lube System
SM03- 006- 002.00 Swing Lock Control
SM03- 007- 002.00 Low Gantry Assembly
SM03- 008- 002.00 Retractable Gantry Assembly
SM03- 009- 001.00 Hydraulic Retractable Gantry
SM03- 010- 015.00 Hydraulic Counterweight Removal

AREA 04 VERTICAL SHAFTS

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SM04- 000- 006.00 Vertical Shaft Assembly - General
SM04- 001- 011.00 Vertical Travel Shaft
SM04- 002- 007.00 Vertical Center Drive Shaft
SM04- 002- 008.00 Swing Center Drive Shaft
SM04- 003- 015.00 Vertical Swing Shaft
SM04- 004- 003.00 Swing Brake Shaft
SM04- 005- 011.00 Swing Brake Assembly
SM04- 005- 012.00 Swing Brake Controls
SM04- 006- 005.00 Swing & Travel Shifters

AREA 05 HORIZONTAL SHAFTS

****

SM05- 000- 008.00 Horizontal Shafts General
SM05- 001- 002.00 Independent Travel Reverse Shaft
SM05- 001- 003.00 Independent Swing Reverse Shaft
SM05- 002- 005.00 Reduction Shaft
SM05- 003- 003.00 Front Drum Shaft
SM05- 003- 005.00 Front & Rear Drum Brakes
SM05- 004- 001.00 Rear Drum Shaft
SM05- 004- 002.00 Auxiliary Rear Drum Brake
SM05- 005- 001.00 Third Drum Shaft Assembly
SM05- 005- 002.00 Third Drum Brake

How To Use This Manual, General Service Instructions, And Safety Procedures

The following information is provided to help guide the user of this manual. An explanation of how this manual is organized, as well as general information and safety considerations which should be understood when performing any service or maintenance procedure, is given. This information is general in nature and should supplement any of the specific procedures in this manual along with a constant awareness of safety and common sense.

How To Use This Manual

This Service Manual is a collection of written procedures which are used to service and maintain a specific crane model. The index, which is called a "Keysheet", is used to organize the procedures within this manual and serve as a Table Of Contents as well. Each procedure, in this manual, is written so that it can stand alone and typically covers only one procedure. Procedures are given a numerical designation, or "SM Code" Number, (Example: SM01—005—034.00) which is unique to that procedure and that procedure only. The following is a listing of the general area definitions which are designated by the first digits in the SM Code Number sequence:

General Area Descriptions

SM01 — Rubber Tire Lower
SM02 — Crawler Lower
SM03 — Upper Revolving Frame & Machinery
SM04 — Vertical Shafts
SM05 — Horizontal Shafts
SM06 — Upper Engine
SM07 — Hydraulic Power Supply
SM08 — Angle Boom
SM09 — Tubular Boom
SM10 — Tagline Winder
SM11 — Fairleader
SM12 — Shovel Attachment
SM13 — Trench Hoe, Logger & Scrapper Attachment & Prop Handler
SM14 — Cab & House Assembly
SM15 — Rotascope Attachment (Discontinued)
SM16 — Wire Rope Requirements
SM17 — Hydraulic Boom And Attachments
SM18 — Special Attachments
SM19 — Diesel Pile Hammer (Discontinued)
SM20 — Tower, Climbing Assembly, Traveling Base & Gantry (Discontinued)
SM21 — Log Skidder (Discontinued)
SM22 — Hydraulic Hammer (Discontinued)

The procedures in this manual are collated by SM Code Number sequence. Use the Keysheet in the front of this manual, the general area descriptions shown previously, and the SM Code title shown on the Keysheet to find the specific procedure required to service the crane.

Throughout this manual, reference is made to the left, right, front, and rear, pertaining to directions and locations. These reference directions are relative to the operator, sitting in the operator's seat, with the upper directly over the front of the carrier, unless otherwise stated. (Crawler mounted cranes: upper over the front of the crane with travel motors to the rear.)

Danger, warning, and caution captions as well as special notes are used throughout this manual and on the crane to emphasize important and critical instructions. **If any instruction, caution, warning, or danger labels, decals, or plates become lost, damaged, or unreadable, they must be replaced.** Information contained on such labels, decals, and plates is important and failure to follow the information they contain could result in an accident. Replacement labels, decals, and plates can be ordered through a Link-Belt Distributor. For the purpose of this manual, danger, warning, and caution captions and notes are defined as follows:

DANGER

An operating procedure, practice, etc. which, if not correctly followed, may result in severe personal injury, dismemberment, or loss of life.

WARNING

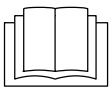
An operating procedure, practice, etc. which, if not correctly followed, may result in personal injury.

CAUTION

An operating procedure, practice, etc. which, if not correctly followed, may result in damage to, or destruction of, equipment or property.

NOTES

Note: An operating procedure step, condition, etc. which is essential in order for the process to be completed properly.



This symbol may appear in manuals or on a label on the crane to alert personnel that additional instructions are included in the crane Operator's Manual.

Figure 1
Keep hands and tools clear of moving parts.

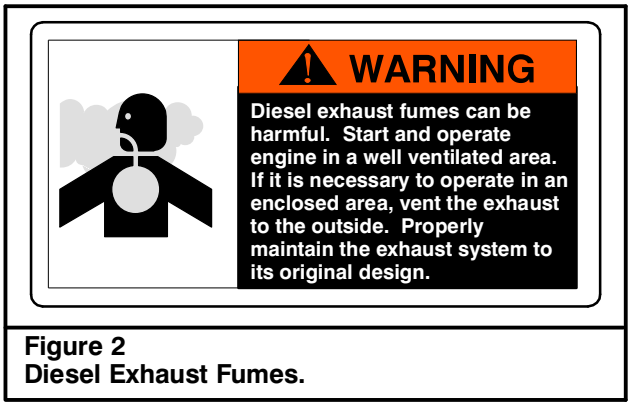


Figure 2
Diesel Exhaust Fumes.

Service Safety And Set Up Guidelines

The following is a list of safety and set up considerations which may apply to any service or maintenance procedure. Review the entire list and understand the type of things you must consider to perform a safe service procedure and then apply these guidelines to each specific service or maintenance procedure.

DANGER

Do not operate the crane unless you are qualified. Unauthorized operation by untrained personnel could result in an accident. Crane operation is to be performed by a certified operator only.

Service Safety

1. Read and understand the service or maintenance procedure to be performed before beginning work. By reading the procedure ahead of time, you can be sure to have the replacement parts and tools on hand that are required to complete the job.
2. Wear protective gear to prevent injury; hard hat, safety glasses, gloves, steel toed shoes, etc.

Figure 3
Pinch Point Label

3. First aid supplies and a fire extinguisher should be on the job site to assist in an unexpected situation. The location of these items should be known to all as well as access to a telephone for emergencies.
4. Work in a clean, dry, firm, level area whenever possible. Choosing the correct work site can make a big difference on how well the job goes.
5. Use caution around flammable materials. Be aware of all the materials in the work area which are a threat. Also make others aware of volatile materials; post signs if necessary.
6. Release all trapped pressure in air and hydraulic circuits before disconnecting any line or component. Shutdown the crane, exhaust all pressure from the crane's air reservoir(s) and work the hydraulic control levers back and forth before servicing the crane.
7. Do not disconnect any hydraulic line from a crane which has its attachment in the air. Trapped pressure may be all that is suspending it. Disconnecting a line could release the trapped pressure, causing the attachment to fall. Lower the attachment to the ground or on to its rest before servicing the crane.
8. Do not work on a crane which is in motion. Fans, belts, gear trains, etc. can catch an unexpecting person and quickly dismember them.
9. Do not climb on the attachment or other hard to reach areas. If the steps and/or ladders which are installed on the crane do not provide adequate access to the area of the crane which needs servicing, use a step ladder or other approved device.
10. Pinch points exists between the upper and lower frames. Death or dismemberment may result from personnel caught in these points. Learn where these pinch points are and stay clear of the rotating upper frame.

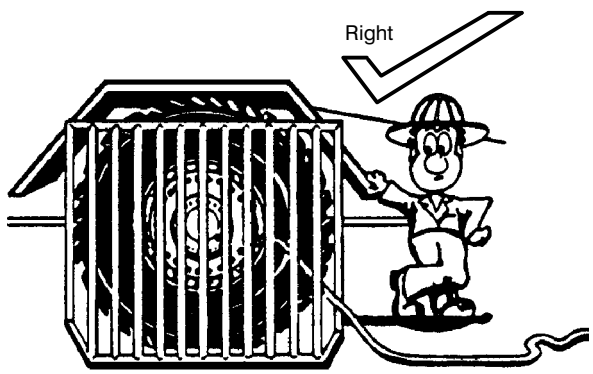


Figure 4
Use a guard when inflating tires.

11. If working in a confined area, be sure to provide adequate ventilation when running the engine(s), using toxic solvents, welding, or any other operation which contaminates the fresh air supply.
12. Post a sign in the operator's cab to alert others that the crane is under service. Starting the crane while it is being serviced could severely injure someone. Crane damage could also occur if systems are operated prematurely. Imagine starting the engine(s) before the oil is replaced.
13. Secure access panels, doors, and machinery hoods when in the open position to ensure they do not fall or slam shut due to wind or accidental disruption.
14. Crane parts may be heavy. Always use an appropriate lifting device to support work. Do not attempt to lift an object without knowing its weight. Get help if necessary.
15. Always use a safety rim cage when inflating or deflating tires. Worn or misassembled parts can "explode" from the assembly causing serious injury. Use a safety rim cage, clip on air chuck, and stand aside when inflating or deflating tires.

Crane Set Up And Disassembly

1. Properly park the crane as described in the Operator's Manual. Park the crane in an area which provides the most comfortable working conditions. However, do not park the crane where it will be an obstruction or an intrusion to traffic, coworkers, or to the public. Keep in mind that a major service procedure, or a repair part which requires a long lead time, could have the crane disabled for an extended period of time.
2. Keep in mind the mess which is sometimes caused by a crane under repair. Oil or other fluid leaks should be contained or prevented. Consider your responsibility of maintaining a safe clean work area and a healthy environment for all.

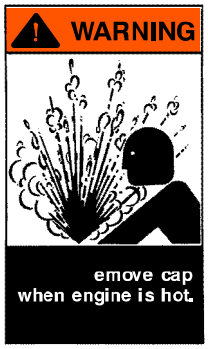


Figure 5
Allow engine to cool before removing the radiator cap.

3. If the crane is equipped with outriggers, it may be safer as well as an advantage to raise and level the crane on outriggers to provide easier access to areas underneath. Do not work under a crane that is improperly supported.
4. Shutdown the engine(s) per the instructions given in the Operator's Manual.
5. Post a sign in the operator's cab to alert others that the crane is being serviced.
6. Engines, transmissions, hydraulic systems, etc. generate extreme heat during operation. Temperatures can reach levels which may cause serious burns. Allow the crane to cool before attempting to service it.

WARNING

Engine coolant is hot. Failure to allow engine(s) to sufficiently cool before draining coolant could result in severe burns or other personal injury. Allow the engine(s) and radiator(s) to cool before draining coolant from the radiator(s).

7. Pressure is generated inside the engine's cooling system due to the heat transfer process from the engine(s) to the radiator(s). Do not attempt to open or drain the radiator(s) until it/they has/have had sufficient time to cool. Disconnecting hoses before the engine(s) and radiator(s) has/have cooled is even more dangerous. Wait until the engine(s) and radiator(s) have cooled and then drain the radiator(s) before disconnecting any hoses. Properly store or dispose of used coolant.

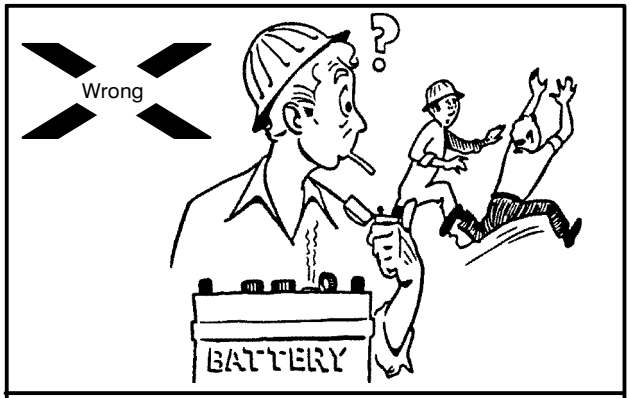


Figure 6
Do not use an open flame near the battery.

WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

8. Thoroughly clean the area of the crane which is to be serviced. Dirt or other contamination could enter the hydraulic, air, lubricating system, etc. and cause immediate and/or long term problems. Cleaning the service area not only prevents contamination problems but it also makes working on the crane easier and sometimes problems are more recognizable.
9. Before beginning any removal or disassembly procedure, take a moment to observe critical features of the assembly which may greatly simplify the installation or assembly process. Label electrical, hydraulic, air, or other connections. Index mark pump, motor, and valve sections. Lightly spray paint or count the threads of adjustment screws. Simple steps such as these can minimize the effort needed to put the crane back in service.

WARNING

Hydraulic oil is under pressure and may be hot. A sudden release of hot oil could cause severe burns and/or other serious injury. Shutdown the engine(s) and exhaust all trapped hydraulic pressure from the system before removing any line or component.

10. Hydraulic systems, while operating, are under high pressure. Even after the crane is shutdown these pressures can remain trapped in the hydraulic lines and system components. Some hydraulic systems utilize an air pressurized reservoir which maintains pressure on the system after the crane is shutdown. It is critical that all residual pressure, which is trapped in the system, be neutralized before disconnecting any line or hydraulic component. Use the following techniques to exhaust trapped hydraulic pressure from the system:
    a. Lower the attachment to the boom rest, onto blocking, or onto the ground and shutdown the engine(s).
    b. Open the drain valves on the air system reservoir(s), if equipped, to bleed the air system pressure.
    c. Relieve any residual or precharge pressure by pushing the button on the pressure relief valve, on the hydraulic reservoir, if equipped. Otherwise, loosen the filler cap 1/4 turn.
    d. Turn the ignition switch to the **ON POSITION**, but **DO NOT START THE ENGINE.**
    e. Operate the steering control(s) back and forth repeatedly until steering becomes hard. (On cranes equipped with emergency steering system, it will take several rotations of steering wheel before steering becomes hard.)
    f. Work the crane control levers and outrigger switches, if equipped, back and forth several times.
    g. Turn ignition switch to the **OFF POSITION.**
    h. When pressure is fully relieved, close the drain valves on the air system reservoir(s), if equipped.

WARNING

Air lines may contain high pressure. Opening lines and fittings before relieving air pressure may result in serious injury. Shutdown the engine(s) and drain the air system reservoir(s) before opening any line or fitting.

11. Air system circuits, like hydraulic circuits, contain high pressures also. Although the threat of a hot working fluid does not exist, highly pressurized lines and components can possibly "fly off" if lines are disconnected before the system pressure is relieved. Open the drain valve on the air system reservoir(s) to exhaust system pressure before working on the crane.

WARNING

Use care not to cause sparks at the battery terminals while disconnecting or connecting the battery. Battery gasses are volatile and could be ignited by a spark or flame causing the battery to explode. Keep the area around the battery well ventilated and disconnect the negative side of the battery first, with the ignition switch "OFF", to minimize hazard.

Battery posts, terminals, and related accessories contain lead and lead compounds. Eating or smoking with lead residue on hands may cause lead poisoning. Wash hands after handling lead products.

12. When working on electrical circuits, disconnect the battery to minimize shock, burn, spark, or other hazard. When disconnecting the battery, confirm that the ignition switch is in the "OFF" position. Disconnect the negative side of the battery first to minimize the potential for sparks at the battery. Battery gases which are exposed to such sparks, could cause an explosion. Likewise when connecting the battery, confirm that the ignition switch is in the "OFF" position and install the positive cable(s), first and the negative connection(s) last.
13. It is a good practice when disassembling hydraulic components to lay the parts out in the order that they were disassembled. Keeping the parts in this order during disassembly, cleaning, and inspection will aid in the assembly process.

Welding

1. When making repairs which require welding, disconnect any electronic equipment (such as rated capacity limiters and engine computers) to prevent damage to them. Use the battery disconnect switch(es), if equipped.
2. Be aware of systems adjacent to areas being welded. Residual heat from the welding process could cause damage to other components. Heat may also vaporize materials which may become toxic or volatile.
3. Remove paint from areas to be welded to prevent toxic fumes.
4. The grounding connection should be within 3 feet (*1 m*) of the welded parts.
5. Connect the ground to the lower, if welding on the lower, or to the upper if welding on the upper. Electrical current through the turntable bearing could cause an arc which could damage it.
6. Do not position the ground connection where seals or bearing, as in transmissions or valves, will be between it and the welded parts.
7. Remove any flammable materials from the area.
8. Use the appropriate setting on the welder for the size of the welding operation. Do not use more than 200 Volts continuously.

Cleaning And Inspection

WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

1. All components should be thoroughly cleaned with an approved cleaning solvent, air dried and carefully inspected for damage, wear and corrosion.
2. All Loctite® or other sealant residue should be removed from threads of hardware and parts that are going to be reused.
3. All "soft parts", such as seals, gaskets, back up rings, and o-rings, should be replaced.
4. Replacement of bearings and bushings is generally a good preventive maintenance measure. Even though a bearing or bushing seems to be intact and is functioning properly, its life span is limited. Replacing a simple bearing or bushing while the opportunity is at hand could save a complete component failure later.
5. In the event of severe defects, contact factory personnel for directions whether to repair or replace any major component.

Crane Assembly

1. Loosely assemble parts to ensure all parts are in place and fasteners started before beginning torquing procedure. Always use a cross torquing sequence to ensure even and uniform installation.

WARNING

Lubricants, sealants, joint and thread locking compounds, etc. can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all manufacturer's recommendations concerning these products.

Figure 7
Proper disposal is important.

2. Unless otherwise stated, torque all fasteners per the instructions given in SM Code Area 18—000.
3. When installing hydraulic hoses, lines, and fittings, use two wrenches to ensure the hoses and lines are not twisted. One wrench must be on the male fitting, the other wrench on the female fitting.
4. Unless otherwise stated, torque all hydraulic fittings per the instructions given in SM Code Area 07—018.
5. Check all fluid levels before returning the crane to service; hydraulic reservoir oil level, transmission fluid level, engine(s) oil level, etc. Add oil as required. See Operator's Manual and/or engine(s) manufacturer's manual(s) for correct type of fluids and procedures.
6. Always replace guards, grilles, and other types of protective shields. Also, be sure that any systems which were disconnected such as load indicating systems, anti-two block devices, control cables, etc. are functioning properly before returning the crane to service.
7. Start the appropriate engine and let it idle for five minutes. Inspect the connections on the hydraulic, air, transmission, etc. lines for leaks. Repair if needed.
8. Check that all hydraulic, air, and electrical functions are operating normally before returning the crane to service.
9. After crane is assembled, refer to the Operator's Manual for any periodic type of adjustments which may have been affected by the service procedure.
10. Properly dispose of any used oils, solvents, cleaners, etc.

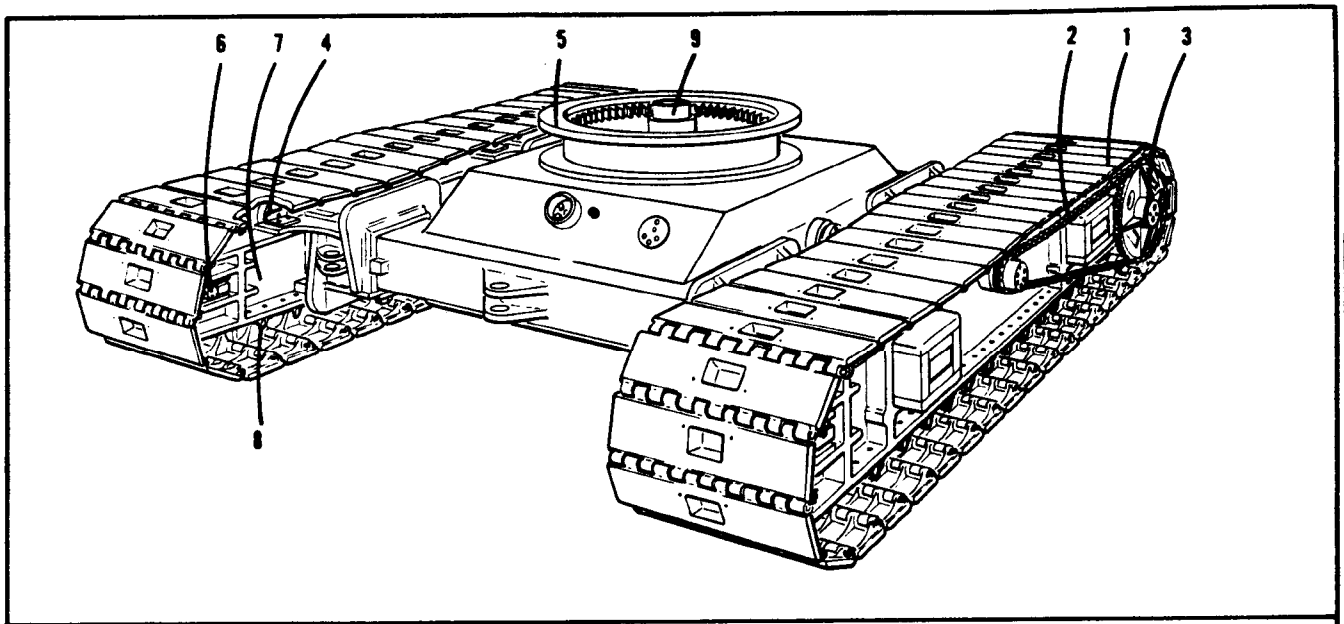


Fig. 1
Typical Flat Track Lower

(1) Track Shoe
(2) Drive Chain
(3) Track Drive Sprocket
(4) Track Carrier Roller
(5) Ring Gear
(6) Take Up Roller
(7) Side Frames
(8) Track Roller
(9) Center Pin

Lower Frame General

The lower frame is a weldment, and contains the travel and steering mechanism completely enclosed. Track side frames containing the drive sprockets, track rollers, carrier rollers, and idler rollers are attached to the frame.

On some lowers the side frames are integrally welded to the lower. On others, the side frames are removable to reduce transportation weight, or retractable to reduce overall width.

A double flange roller path with an integral ring gear is welded to the top of the lower frame. This roller path connects the upper frame to the lower frame by means of the conical rollers. These rollers, supporting the upper weight, revolve around the double flange ring gear when power is applied to the swing pinion to swing the upper.

Power to propell the machine is tranferred from the traction shaft to the track drive sprocket assemblies by the track drive chains.

The steering mechanism consists of a pair of jaw clutches, and steer brakes, which work in conjunction with one another. When the jaw clutch is engaged, power is transferred out to the track. When the steer brake is engaged, the track will be locked. The brake is spring applied an hydraulically released, and is designed so the jaw clutch has to engage to disengage the steer brake and the steer brake must engage to disengage the jaw clutch. The machine is steered by locking one track belt, and pivoting the machine on the locked track.

A series of track rollers are mounted on the bottom of each side frame, to support the machines weight against the track pads. Track carrier rollers on top of the frame support the weight of the track belt as it crosses the top of the side frame.

Track shoe tension is adjusted by moving the idler roller in and out with adjusting bolts located on each side of the roller.

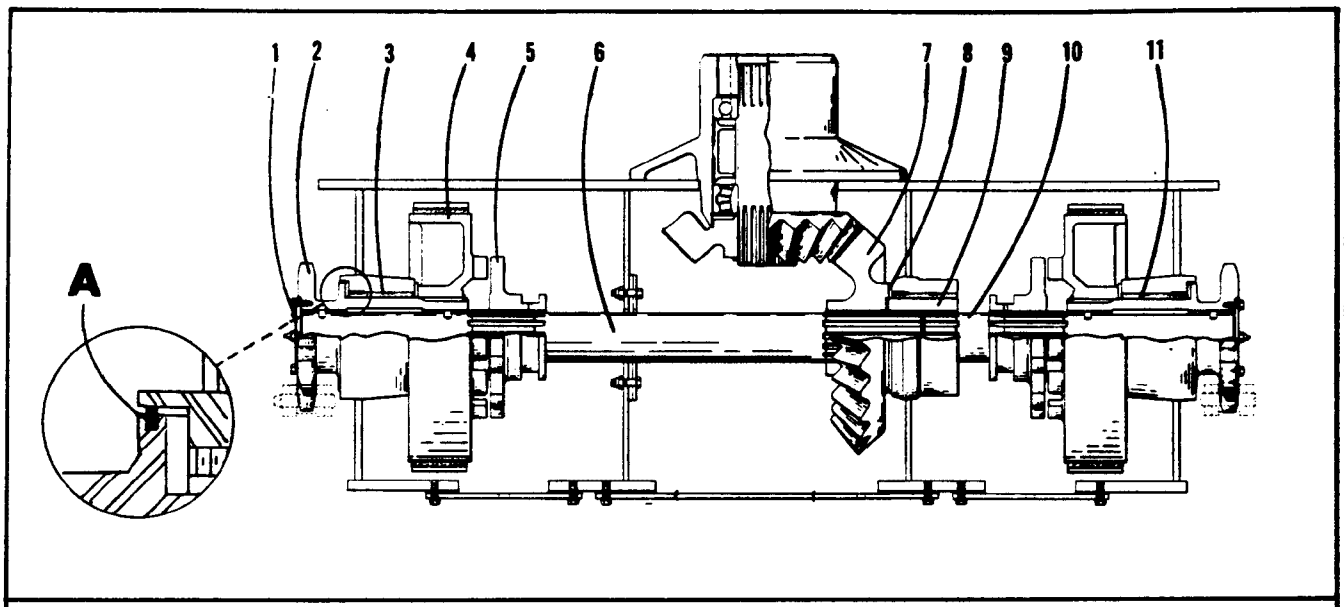


Fig. 1
Traction Shaft Assembly
(A) Piston Ring (Pipeliners Only)
(1) End Cap
(2) Sprocket
(3) Bushing
(4) Brake Drum
(5) Jaw Clutch
(6) Traction Shaft
(7) Bevel Gear
(8) Thrust Washer
(9) Coupling
(10) Traction Shaft
(11) Bushing

Traction Shaft Assembly

The traction shaft is driven by the vertical travel shaft, through a pair of bevel gears. The shaft in turn drives the track drive sprockets through the track drive chains. The shaft, is in two sections, and is supported in the lower frame by three brass bushings. The traction shaft floats in the chain sprockets until the steer jaw clutches, which are splined to the shaft, are engaged. When the clutches are engaged, power from the shaft is transferred to the sprockets, and then to the drive chains and drive sprockets, to travel the machine.

Traction Shaft Removal: The traction shaft may be removed from the machine as follows:

(a) Remove the side frame center cover plate.
(b) Loosen the drive chain on each side of the machine to remove any bind from the chain sprocket (See SM2-3-6.0).
(c) Drain the lower bevel gear case.
(d) Remove the bottom cover plates from the machine.
(e) Block up under the bevel gear, jaw clutches, and drums, to prevent movement when the shaft is removed.
(f) Engage the jaw clutches. Block between the brake spring and the carbody, to remove spring tension when the clutches are released. Release the clutches.
(g) Remove the pin from the clevis, which connects the brake spring rod to the shift yoke.
(h) Back off on the steer brake adjusting bolt.
(i) Remove the shaft end cap and shims.
(j) Remove each section of the shaft out its respective side of the machine.

Replacement Of Traction Shaft Bushings: These bushings are held to the shaft with dowels, which must be replaced when new bushings are installed. To install new bushings, proceed as follows:

(a) Heat the bushings to approximately 300° F. in a hot oil bath.
(b) Slide the bushings into place, making sure the dowel holes line up.
(c) Install the dowel pins. Dress the ends of the pins lightly with a file, to make them match the curvature of the bushings.

Removal Of The Chain Sprocket And Brake Drum:

(a) Remove the traction shaft as explained previously.
(b) Remove the steer jaw clutch by removing the entire assembly, including the steer yoke.
(c) Remove the snap ring holding the brake drum drain to the chain sprocket.
(d) Remove the brake drum.
(e) Remove the chain sprocket.

Reassembly Of The Brake Drum And Chain Sprocket:

(a) Thoroughly clean, and inspect all parts. Replace any worn parts.
(b) Install the thrust washer on the chain sprocket. Install piston ring seal on sprocket (P.L. lowers only). Install chain sprocket in place.
(c) Install a thrust washer on the other end of the sprocket, inside the carbody.
(d) Install the steer brake drum, and snap ring.
(e) Install the steer jaw clutch and yoke assembly.

Traction Shaft Frame Bushings: Maintenance of the lower frame bushings is extremely important. Excessive wear on the bushings may cause shaft misalignment, and result in shaft failure. Periodically check the bushings, by observing movement of the chain sprockets when a load is applied to the drive chains. Excessive movement is an indication of worn bushings. Replace the bushings whenever a new traction shaft is installed, or new traction shaft bushings are installed.

Traction Shaft Reassembly: The traction shaft may be reassembled as follows:

(a) Thoroughly clean and inspect all parts. Replace any worn parts.

(b) Install the long shaft, and check the bevel gear backlash. New bevel gears are punch marked, with one mark on one gear and two marks on the other. The backlash should be .005" with the single mark placed between the two marks on the other gear. Measure at center line of teeth.

On 78,4000,4200 and 4500 machines backlash is adjusted by adding or subtracting shims behind the bevel gear on the vertical travel shaft, and using one of three thicknesses of thrust washer behind the bevel gear on the traction shaft. The following shims are available for this purpose:

(1) Shims
  (a) 8G20.....28 Ga.
  (b) 8G21.....16 Ga.

(2) Thrust Washers
  (a) 8A114.....1/4"
  (b) 8A326.....7/32"
  (c) 8A327.....9/32"

On LS98 machines, the backlash is adjusted by adding or subtracting shims behind the bevel gears on the vertical travel shaft. The following shims are available for this purpose:

(1) Shims
  (a) 1G19.....28 Ga.
  (b) 1G18.....16 Ga.

(c) Install the long shaft first so the splines may be aligned by sight through the other end of the bore.

(d) Bolt down the traction shaft wiper seal.

(e) Install the end cap, with enough shims under it to push the splined coupling behind the bevel gear, flush with its housing. This is to make sure that the lateral force from the bevel gears is taken on the thrust washer, and not the short shaft and its end cap. The following shims are available for use at this point:

(1) 78,4000,4200,4500 machines
  (a) 8A261.....16 Ga.

(2) 98 machines
  (a) 1A14.....16 Ga.

(f) Install the short shaft.

(g) Install the shaft end cap, with just enough shims to prevent lateral movement of the shaft. The following shims are available for use at this point:

(1) 78,4000,4200,4500 machines
  (a) 8A261.....16 Ga.

(2) 98 machines
  (a) 1A14.....16 Ga.

(h) Install the brake spring clevis on each side of the machine.

(i) Remove all blocking. Adjust the steer brakes as explained in SM2-6-2.0.

(j) Install the lower cover plates.

(k) Install the track, and track drive chains, and adjust as explained in SM2-3-5.0.

(l) Fill the bevel gear case with the lubricant specified in section 2 of the operators manual. Lubricate all traction shaft and steering mechanism fittings before traveling the machine. Consult the lubrication chart in section 2 of the operators manual for fitting locations.

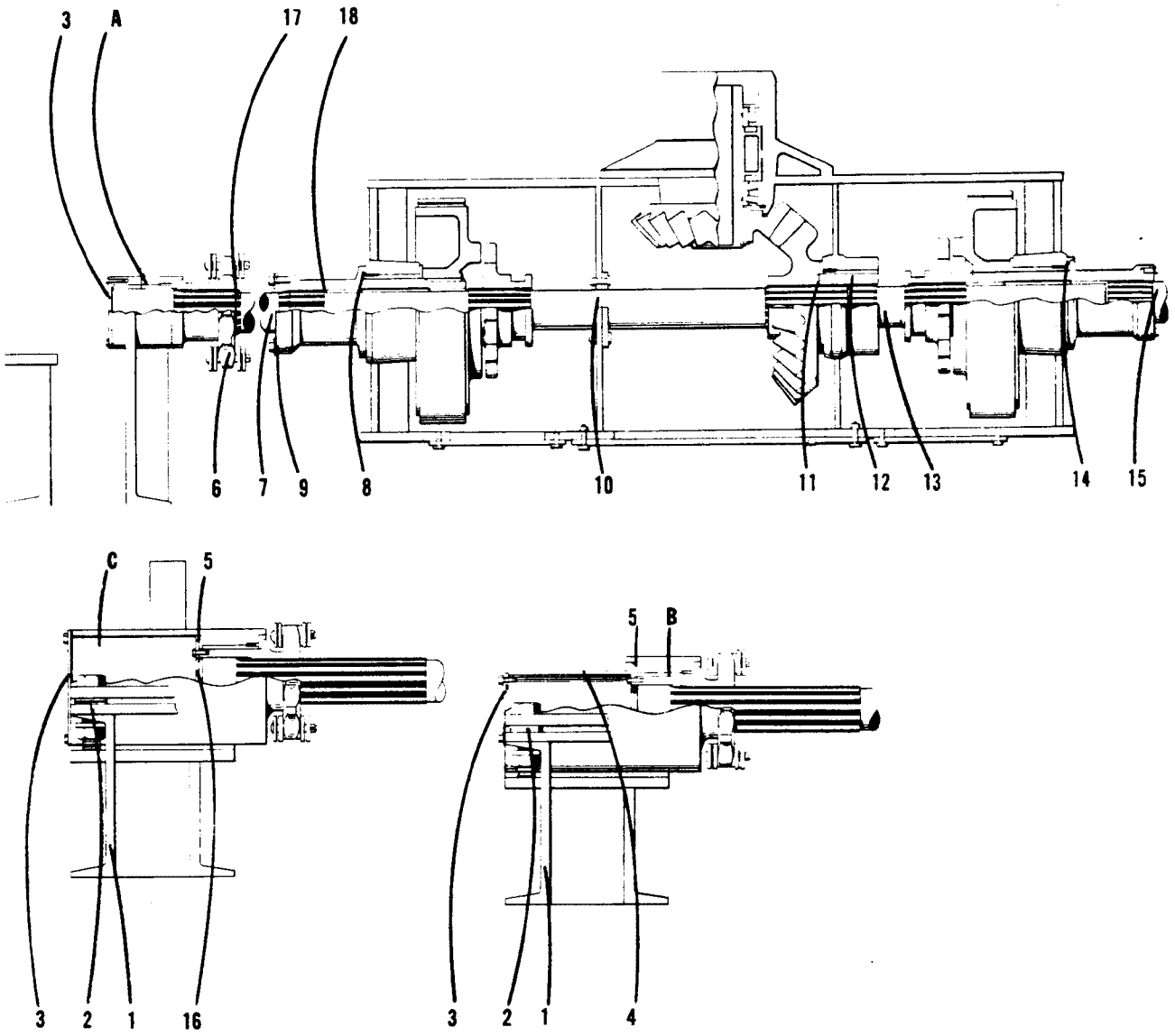


Fig. 1
Traction Shaft Assembly
(98A,98LC, And 108B Lowers)
(A) 98A Hub
(1) Side Frame
(2) Shim Washers
(3) End Cap
(4) Cover (Old Style Hub)
(5) Thrust Washer & Shims
(6) Sprocket
(B) Old Style 98LC, 108B Hub
(7) Outer Shaft
(8) Thrust Washer
(9) Flange & Shims
(10) Long Shaft
(11) Thrust Washer
(12) Coupling
(C) New Style 98LC, 108B Hub
(13) Short Shaft
(14) Thrust Washer
(15) Outer Shaft
(16) End Cap (New Style Hub)
(17) Snap Ring (98A Lower)
(18) Shims (98A Lower)

Traction Shaft Assembly
98A,98LC,108B Lowers)

On these lowers, there is a splined coupling mounted in the position that would normally be occupied by the chain sprocket on a standard machine. The chain sprocket is mounted in a hub, that is either welded or bolted to the side housing, depending on which lower is used. A short shaft connects the chain sprocket to the coupling on the machine. Two different styles of hubs have been used on 98LC,108B lowers. Disassembly and repair procedures for both styles are included in

this section.

Outer Shaft Removal (LS98A): The outer traction shafts may be removed as follows:
(a) Remove the end cap from the hub on the side frame.
(b) Remove the snap ring which holds the chain sprocket in place on the outer shaft.
(c) Remove the split flange which holds the outer shaft in place in the splined coupling.
(d) Install the 1P222 puller which is supplied with the machine, on the outer shaft.
(e) Remove the outer shaft. When the shaft is removed, there will be no longer any support for the chain sprocket, and it may be removed.

Outer Shaft Removal (Old Style 98LC & 108B): The outer traction shafts are removed as follows:
(a) Unbolt and remove the end cap from the outer traction shaft cover.
(b) Unbolt and remove the cover.

Note: If the chain sprocket will not be removed, bolt the sprocket retainer plate, supplied in the machines tool box, to the sprocket in place of the cover.

(c) Remove the split flange which holds the outer shaft in place in the splined coupling.
(d) Install the 1P222 puller which is supplied with the machine, on the outer shaft.
(e) Remove the outer shaft.

Chain Sprocket Removal:
(a) Remove outer traction shaft as explained above.
(b) Remove the track drive chain.
(c) Slide chain sprocket out of the hub.

Thoroughly clean and examine all parts. Replace any parts that are worn or damaged. Reassemble by following the above procedures in reverse. Shim between the outer cover and the outer thrust washer. Use just enough shims to eliminate end play in the sprocket. The following shims are available for this adjustment:
(1) 1A3736.....22 Ga.

Hub Removal:
(a) Remove the outer traction shaft, and the chain sprocket as explained previously.
(b) Unbolt the hub from the side frame. Mark all shims so they may be put back in the same position to maintain shaft alignment.

Reassemble by following the above procedures in reverse.

Outer Shaft Removal (New Style 98LC & 108B): The outer traction shafts are removed as follows:
(a) Remove the end cap from the outer hub.
(b) Remove the split flange which holds the outer shaft in place in the splined coupling.
(c) Install the 1P222 puller which is supplied with the machine, on the outer shaft.
(d) Remove the outer shaft.

Chain Sprocket Removal:
(a) Remove the outer traction shaft as explained above.
(b) Remove the track drive chain.
(c) Remove the sprocket end plate and shims.
(d) Slide the sprocket out of the hub.

Thoroughly clean and inspect all parts. Replace any parts that are worn or damaged. Reassemble by following the above procedures in reverse. Shim between the sprocket end cap and thrust washer. Use just enough shims to eliminate end play in the sprocket. The following shims are available for use at this point:
(1) 1A3736.....22 Ga.

Hub Removal: The procedure is the same as listed for the old style hub.

Traction Shaft Removal: The procedures for removing the two inner shaft sections are the same for the 98A, 98LC, and 108B lowers. The shafts may be removed as follows:
(a) Drain the lower bevel gear case.
(b) Remove the lower cover plates.
(c) Engage the jaw clutches. Block between the brake spring and the frame so the springs will remain compressed when the jaw clutches are disengaged. Disengage the jaw clutches.
(d) On 98LC and 108B lowers, remove the hub and sprocket assembly as explained earlier in this section.
(e) Block up under the bevel gear, the jaw clutches, and the brake drums.
(f) Remove the pin that connects the brake spring rod clevis to the shift yoke.
(g) Back off on the brake band adjusting bolt. Remove the large shifter yoke by removing the 4 pins which locate it.
(h) Slide the jaw clutches inward. This will provide enough clearance to remove the snap ring on the inner side of the outer coupling.
(i) Remove the outer couplings.
(j) Remove the shafts.

Replacement Of Traction Shaft Bushings: These bushings are held to the shaft with dowels, which must be replaced when new bushings are installed. To install new bushings, proceed as follows:
(a) Drill out dowels. Remove old bushings.
(b) Heat the bushings to approximately 300° F. in a hot oil bath.
(c) Slide the bushings into place, making sure the dowel holes line up.
(d) Install the dowel pins. Dress the ends of the pins lightly with a file, to make them match the curvature of the bushings.

Traction Shaft Frame Bushings: Maintenance of the lower frame bushings is extremely important. Excessive wear on the bushings may cause shaft misalignment, and result in shaft failure. Periodically check the bushings, by observing movement of the inner flange and splined coupling when a load is applied to the drive chains. Excessive movement is an indication of worn bushings. Replace the bushings whenever a new traction shaft is installed, or new traction shaft bushings are installed.

Traction Shaft Reassembly: The traction shaft may be reassembled as follows:

(a) Thoroughly clean and inspect all components. Replace any worn parts.
(b) Install the long shaft, and check the bevel gear backlash. The bevel gears are match marked, and the backlash must be checked with the single match mark on the one gear, in between the two match marks on the outer gear. The backlash is set to .005" by adding or subtracting shims behind the bevel gear on the vertical travel shaft, (See Area 4)& Replacing Thrust Washer if necessary . The following shims are available at this point:
(1) 1G18.....16 Ga.
(2) 1G19.....28 Ga.
(c) Install the long shaft first so the splines may be aligned by sight through the outer end of the bore. Slide the shaft in until the splined coupling behind the bevel gear is flush with its bore. The shaft must pass through a thrust washer, the brake drum, and the jaw clutch as it is installed.
(d) Install the short shaft. The shaft must pass through a thrust washer, the brake drum, and the jaw clutch as it is installed.
(e) Install a thrust washer on the outer coupling, and slide the coupling into place in its bore.
(f) Install a thrust washer over the inner end of the coupling.
(g) Slide the brake drum onto the coupling, and install the retaining snap ring.
(h) Install the shifter yoke. Reinstall the pin which connects the brake spring rod clevis to the shift yoke.
(i) Tighten the brake band bolt. Engage the jaw clutches, and remove the rest of the blocking.
(j) Adjust the steer brakes as explained later in this section.
(k) Replace the lower cover plates.
(l) Fill the bevel gear case with lubricant as explained in Section 2 of operators manual.
(m) On 98LC and 108B lowers, replace the chain sprocket and hub as explained earlier in this section.

Outer Shaft Replacement (98LC, And 108B): The outer traction shafts may be replaced in the machine as follows:
(a) Install the outer shaft, which contacts the short inner shaft first. Slide the shaft through the chain sprocket, and into the splined coupling until it just contacts the inner shaft.

Note: The inner coupling behind the bevel gear must be flush with its bore at this point.

(b) Install the split flange which holds the outer shaft in position in the coupling. Shim between the flange and the coupling, until the outer shaft just touches the inner shaft when the flanges are tightened down. The following shims are available to make this adjustment:
(1) 1A3735.....22 Ga.
(c) Install the other coupling shaft. Install the flange with just enough shims behind it to stop shaft end play. The following shims are available for use at this point:
(1) 1A3735.....22 Ga.
(d) Replace the end cap on new style hubs, or the end cover, shims, and end cap on old style hubs.
(e) Replace and adjust the track drive chains as explained previously in this section.

Outer Shaft Replacement (98A Lowers): The outer traction shafts may be replaced in the machine as follows:
(a) Slide the outer shaft through the chain sprocket, and into the coupling until it touches the short inner shaft. Hold the chain sprocket in position, and measure the distance between the edge of the snap ring groove, and the chain sprocket.

Note: The inner coupling behind the bevel gear must be flush with its bore during this procedure. Pull the shaft back out of its coupling, and place a shim pack equal in thickness to the measurement taken previously, inside the coupling. Grease the shims before installation. The following shims are available for use at this point:
(1) FC181.....16 Ga.

(b) Install the snap ring which holds the chain sprocket against its thrust washer. Install the end cap on the outer bushing housing.
(c) Install the other shaft, with enough shims to just prevent shaft end play when the snap ring which holds the chain sprocket in place, is installed. The following shims are available for use at this point:
(1) FC181.....16 Ga.
(d) Install the split flanges which retain the outer shafts in the couplings. Shim between the flange and the coupling, to prevent end play in the shaft. The following shims are available for use at this point:
(1) 1A3735.....22 Ga.
(e) Install the other end cap.
(f) If the track chins were removed, replace and adjust them as explained previously in this section.

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