

HSP- 8020 Series - Master Keysheet
(47 Prefix On Crane Serial Number)**AREA 00 GENERAL INFORMATION**

SM00- 000- 000.00 Service Manual General Usage & Instructions

AREA 01 RUBBER TIRE LOWER

SM01- 002- 007.00 Front Axle, R & I
SM01- 002- 008.00 Axle, Recondition (Rockwell)
SM01- 002- 009.00 Axle, Recondition (Clark)
SM01- 003- 007.00 Bleeding & Adjusting The Brakes (Rockwell "H" Series)
SM01- 003- 008.00 Bleeding & Adjusting The Brakes (Clark)
SM01- 003- 009.00 Brakes, Recondition (Rockwell "H" Series)
SM01- 007- 005.00 Steer Cylinder, Recondition
SM01- 009- 003.00 Steer Selector Valve, R & I
SM01- 010- 005.00 Steer Pump, Recondition
SM01- 019- 002.00 Transmission, R & I
SM01- 019- 003.00 Transmission Shift Cylinder, Recondition
SM01- 022- 004.00 U- Joint Installation - Half Round Yokes
SM01- 027- 009.00 Air Dryer, Recondition
SM01- 027- 010.00 Air Throttle Control Cylinder, Recondition
SM01- 027- 019.00 Brake Actuator, Recondition
SM01- 027- 023.00 Air System Schematic Diagram
SM01- 029- 001.00 Rear Suspension Bearing, R & I
SM01- 030- 002.00 Park Brake Actuator, R & I
Park Brake Adjustment
SM01- 030- 004.00 Park Brake, R & I
SM01- 039- 003.00 Hydraulic System Cleaning Procedure
SM01- 043- 001.00 Solenoid Valves, General Recondition
SM01- 043- 004.00 Four Way Solenoid Valve, Recondition (Outrigger Directional/Steer)
SM01- 043- 015.00 Carrier Winch Directional Valve, Recondition
SM01- 043- 024.00 Throttle Lock Solenoid Valve, Recondition
SM01- 044- 007.00 Lock Valve, Recondition
SM01- 044- 008.00 Jack Cylinder Lock Valve, R & I
SM01- 045- 006.00 Outrigger Beam Cylinder, Recondition (Link- Belt)
SM01- 045- 007.00 Outrigger Beam Cylinder, Recondition (Iowa Industrial Hydraulics)
SM01- 045- 010.00 Outrigger Beam, Jack & Beam Cylinder, R & I
SM01- 046- 010.00 Jack Cylinder, Recondition
SM01- 046- 013.00 Jack Cylinder, Recondition
SM01- 046- 015.00 Jack Cylinder, R & I
SM01- 047- 006.00 Relief Valve, Recondition
SM01- 048- 007.00 Rotating Joint, R & I
Collector Ring Removal
Air Swivel & Tube Removal
Air Swivel Removal
SM01- 048- 008.00 Rotating Joint, Recondition
SM01- 060- 001.00 Transfer Case, R & I
SM01- 060- 002.00 Transfer Case, Recondition
SM01- 063- 074.00 Radiator, R & I
SM01- 063- 080.00 Alternator, R & I (GM 4- 53 Engine)
Alternator Precautions
SM01- 063- 081.00 Starter, R & I (GM 4- 53 Engine)
SM01- 063- 083.00 Starter, R & I (GM 8.2 Engine)
SM01- 063- 085.00 Alternator, R & I (GM 8.2 Engine)

SM01- 069- 005.00 Tire & Rim, R & I
 SM01- 076- 006.00 Collector Ring, Recondition (28 Brushes)
 SM01- 076- 009.00 Collector Ring, Recondition (31 Brushes)
 SM01- 078- 003.00 Axle Oscillation Cylinder, Recondition
 SM01- 078- 008.00 Axle Oscillation Lock Valve, Recondition
 SM01- 080- 006.00 Main Hydraulic Pump, R & I
 SM01- 080- 008.00 Pump Disconnect, Recondition
 SM01- 081- 009.00 Main Hydraulic Pump, Recondition
 SM01- 085- 002.00 Engine Preheater, R & I
 SM01- 085- 004.00 Engine Preheater, Recondition

AREA 03 UPPER REVOLVING FRAME

SM03- 001- 042.00 Upper Revolving Frame, R & I
 SM03- 006- 023.00 360 Degree Swing Lock, R & I
 360 Degree Swing Lock Adjustment

AREA 04 VERTICAL SHAFTS

SM04- 005- 017.00 Brake Caliper, Recondition
 SM04- 010- 007.00 Swing Speed Reducer, R & I
 To Remove The Swing Motor Only
 Swing Brake Adjustment
 SM04- 010- 008.00 Swing Speed Reducer, Recondition (Gear Products)
 SM04- 010- 012.00 Swing Speed Reducer, Recondition (Eskridge)

AREA 05 HORIZONTAL SHAFTS

SM05- 004- 006.00 Planetary Winch, R & I
 Automatic Hoist Brake, R & I
 Hoist Motor, R & I
 Hoist Planetary, R & I
 SM05- 007- 008.00 Hoist Planetary, Recondition
 SM05- 012- 033.00 Automatic Hoist Brake, Recondition

AREA 06 UPPER ENGINE

SM06- 008- 004.00 Treadle Valve, Recondition
 SM06- 024- 023.00 Audio/Visual Warning System Calibration
 SM06- 025- 002.00 Diesel Cab Heater, Recondition
 SM06- 025- 003.00 Propane Heater, Recondition
 SM06- 025- 007.00 Hydraulic Cab Heater, R & I
 SM06- 025- 008.00 Hydraulic Cab Heater, Recondition
 SM06- 025- 009.00 Hydraulic Heater - Troubleshooting
 SM06- 047- 000.00 Electrical System Wire Identification Code
 SM06- 047- 030.00 Electrical System Overview & Schematic

AREA 07 HYDRAULIC POWER SUPPLY

SM07- 000- 063.00	Hydraulic System Schematic Diagram
	Hydraulic System Troubleshooting
SM07- 000- 065.00	Hydraulic Relief Valve Adjustment
SM07- 001- 018.00	Piston Type Accumulator, Recondition
SM07- 002- 028.00	Relief Valve, Recondition (Hydraulic Heater)
SM07- 003- 006.00	Solenoid Valves, General Recondition
SM07- 005- 051.00	Hydraulic Heater Gear Pump, R & I
SM07- 005- 052.00	Hydraulic Gear Pump Assembly, Recondition (Hydraulic Heater)
SM07- 006- 011.00	Hoist Motor, Recondition
SM07- 006- 012.00	Two- Speed Hoist Valve, R & I
SM07- 006- 013.00	Hoist Counterbalance Valve, R & I
SM07- 006- 034.00	Swing Motor, Recondition
SM07- 006- 039.00	Hoist Motor, Recondition - Single Speed
SM07- 006- 040.00	Two Speed Hoist Motor, Recondition
SM07- 006- 061.00	Hydraulic Motor, Recondition (Hydraulic Heater)
SM07- 008- 012.00	Control Valves, Recondition (Gresen V42)
SM07- 008- 014.00	Winch Counterbalance Valve, Recondition
SM07- 008- 025.00	Two- Speed Hoist Valve, Recondition
SM07- 008- 028.00	Control Valve, Recondition (Commercial Shearing)
SM07- 008- 031.00	Control Valves, Recondition (Gresen V15)
SM07- 008- 032.00	Control Valves, Recondition (Gresen V20)
SM07- 008- 063.00	Priority Flow Control Valve Assembly, Recondition
SM07- 018- 001.00	Hydraulic System Tube Fittings
SM07- 022- 001.00	Steering Control Valve, R & I
SM07- 022- 002.00	Steering Column, R & I
SM07- 022- 003.00	Steering Control Valve, Recondition
SM07- 022- 004.00	Steering Column, Recondition
SM07- 026- 001.00	Suspended Pedal & Valve, Recondition

AREA 09 TUBULAR BOOM, FLY, & JIB

SM09- 001- 002.00	Repairing Damaged Tubular Booms, Flys, & Jibs
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AREA 17 HYDRAULIC CRANE ATTACHMENT

SM17- 001- 019.00	Two Section Boom, R & I
SM17- 001- 020.00	Two Section Boom, Recondition
SM17- 001- 021.00	Four Section Boom, Recondition
	Manual Section Only, R & I
	Manual Section & Bottom Cylinder, R & I
	Retrieval Bracket Adjustment
	Hose Wheel Hose Replacement
	Hose Wheel Cable Replacement
SM17- 001- 036.00	Hydraulic Boom Inspection
SM17- 002- 006.00	3 & 4 Section Boom Assembly, R & I
SM17- 002- 009.00	Telescope Counterbalance Valve, Recondition
SM17- 002- 010.00	Three Section Boom, Recondition
SM17- 002- 012.00	Hose Reel, R & I
SM17- 002- 013.00	Hose Reel (Without Sprag), Recondition
SM17- 002- 014.00	Boom Telescope Cylinder, Recondition
SM17- 003- 001.00	Boom Hoist Cylinder, R & I
	Boom Angle Indicator Adjustment
SM17- 003- 008.00	Boom Hoist Cylinder, Recondition
SM17- 003- 009.00	Boom Hoist Counterbalance Valve, Recondition

SM17- 003- 019.00 Boom Hoist Cylinder R & I
 Boom Angle Indicator Adjustment
 SM17- 003- 027.00 Boom Hoist Cylinder, Recondition

AREA 18 SPECIAL ATTACHMENTS

SM18- 000- 001.00 Capscrew Torques
 SM18- 000- 002.00 Bearing, Gear, Shaft, & Housing Inspection
 SM18- 001- 009.00 Boom Length/Angle Indicator Adjustment (Generation 1)
 SM18- 001- 011.00 Boom Angle Indicator Adjustment
 SM18- 001- 012.00 Boom Length/Angle Indicator Adjustment (Generation 2)
 SM18- 007- 001.00 Reeling Drum, R & I
 SM18- 007- 002.00 Reeling Drum, Recondition
 SM18- 017- 005.00 Carrier Winch Valve Controller, Recondition
 SM18- 018- 001.00 Air Conditioning Service Instructions

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 & Scraper 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

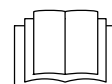
An operating procedure, practice, etc. which, if not correctly followed, may result in personal injury.

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.

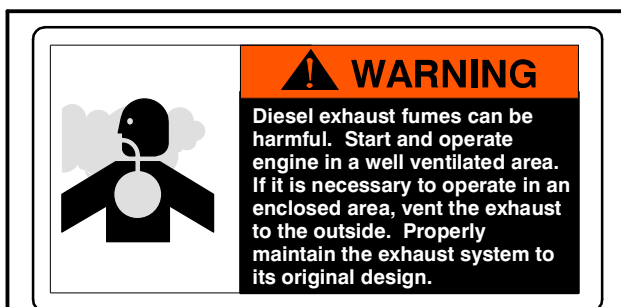
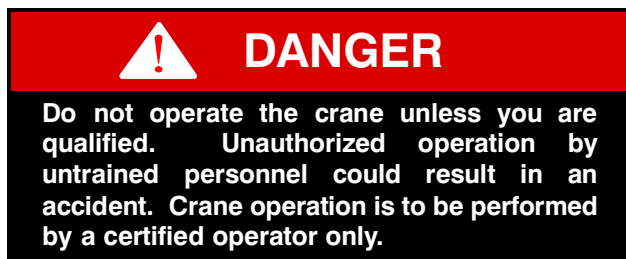


Figure 2
Diesel Exhaust Fumes.

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.



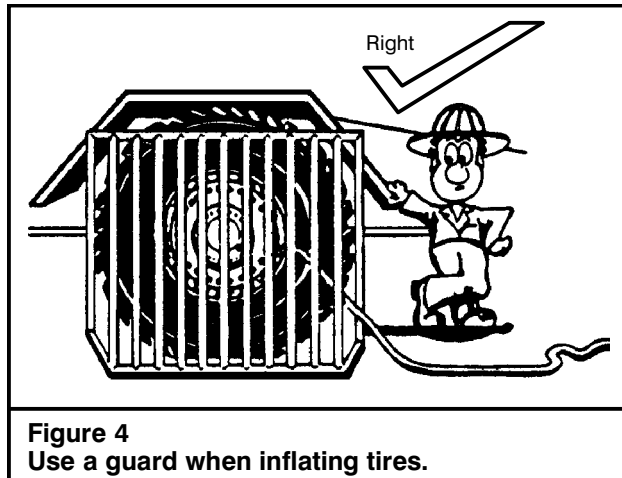
Service Safety

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

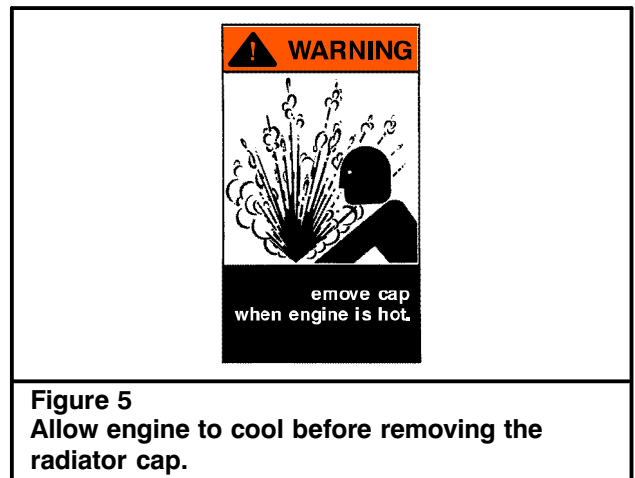
3. First aid supplies and a fire extinguisher should be on the job site to assist in an unexpected situation. The location of these items should be known to all as well as access to a telephone for emergencies.
4. Work in a clean, dry, firm, level area whenever possible. Choosing the correct work site 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 unexpected 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 exist 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.



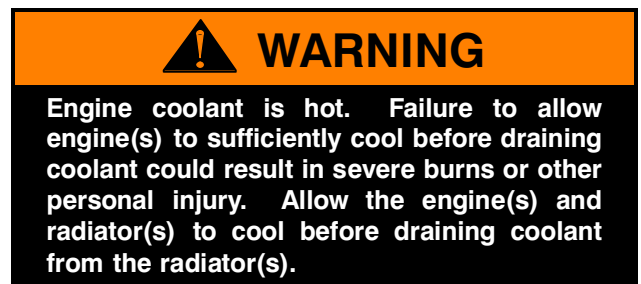
11. If working in a confined area, be sure to provide adequate ventilation when running the engine(s), using toxic solvents, welding, or any other operation which contaminates the fresh air supply.
12. Post a sign in the operator's cab to alert others that the crane is under service. Starting the crane 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.



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.



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.

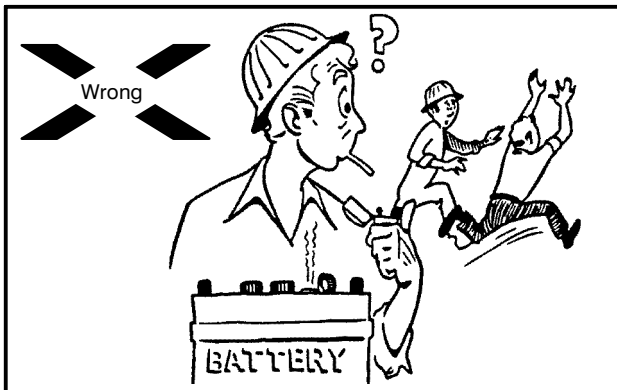


Figure 6
Do not use an open flame near the battery.

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.

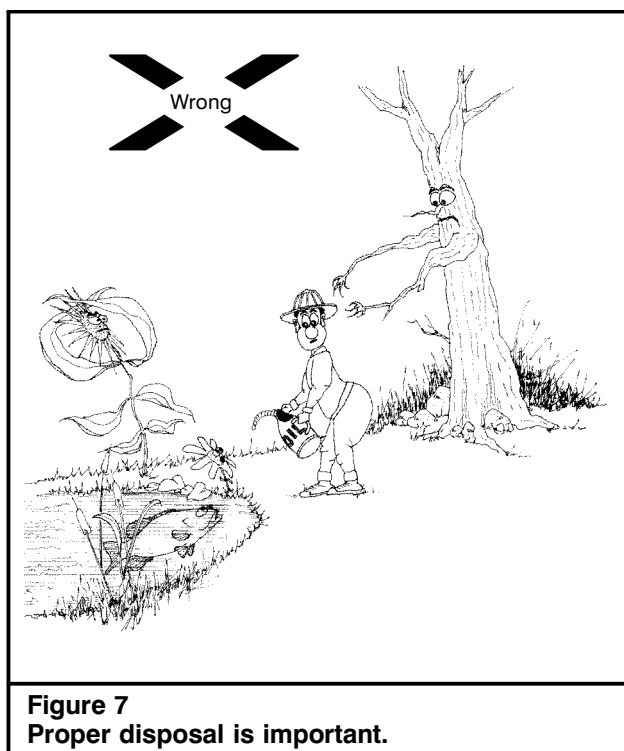
Crane Assembly

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.

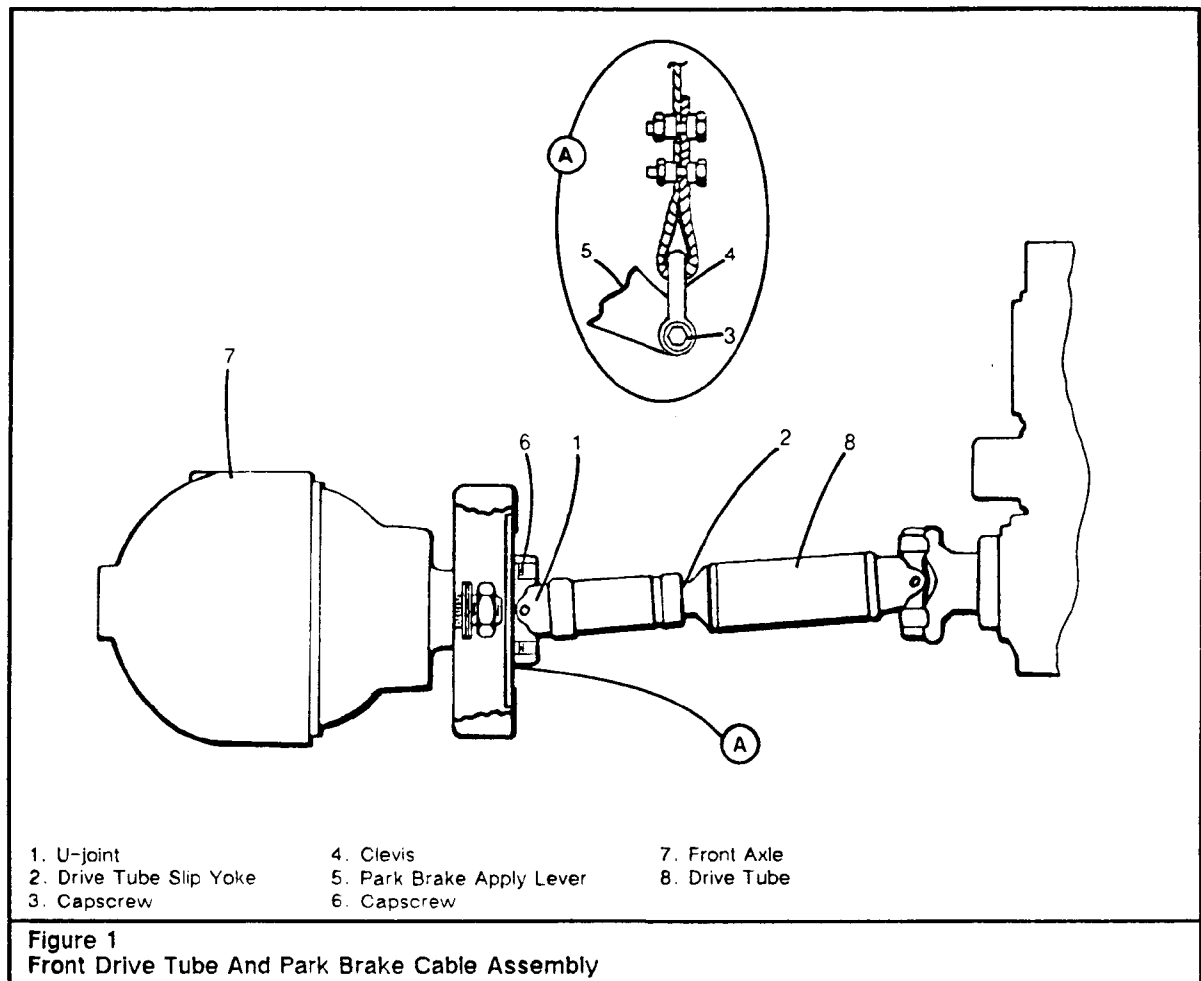


WARNING

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.



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.

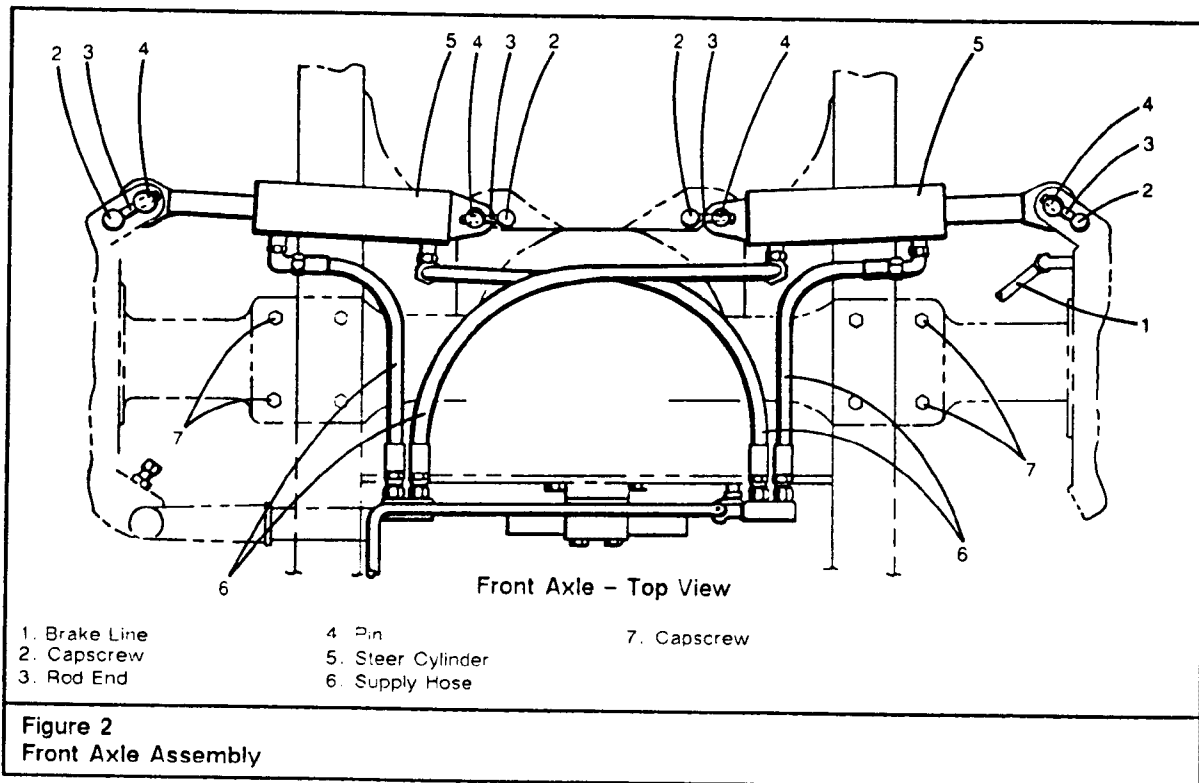


Front Axle, R & L

Removal

1. Level the crane on fully extended outriggers with all tires clear of the ground. Fully retract and the boom, swing the upper over the front of the carrier and engage the swing lock. Release the park brake. Shutdown the engine.
2. Remove both front wheels. Refer to SM Keysheet area 1-69 for correct procedure. Lower the front outriggers approximately 1 ft (.3m). Shutdown the engine. Refer to Figure 1.
3. From under the carrier, remove the four cap screws (6) connecting the u-joint (1) to the yoke of the front axle (7).

4. Compress the drive tube slip yoke (2) to disengage the u-joint (1). Let the drive tube (8) rest on the ground.
5. Remove the cap screw (3) from the clevis (4) at the park brake apply lever (5). Refer to Figure 2.
6. Disconnect the brake lines (1) from the fittings at the inside of each wheel. Cap all open lines to prevent contamination.
7. Remove the cap screws (2), rod ends (3) and pins (4) from both ends of each steer cylinder (5). Slide the cylinders off the axle and secure them out of the way so as not to damage the cylinders and/or supply hoses (6).
8. Firmly block the axle up on a dolly or other movable device.
9. Remove the cap screws (7) attaching the axle to the carrier frame.



10. Raise the front outriggers (that were lowered in Step 2). Roll the axle out from under the carrier.

Installation

Installing the axle is essentially the reverse of removal. Lube and torque capscrews (7, Figure 2)

to 325-330 ft-lb (240-243 Nm). Torque the drive tube u-joint capscrews (6, Figure 1) to 70-80 ft-lb (52-59 Nm). Route the brake lines to prevent interference when wheels are turned. Bleed and adjust the brakes if required. Refer to SM Keysheet area 1-3 for appropriate procedures.

Service Manual

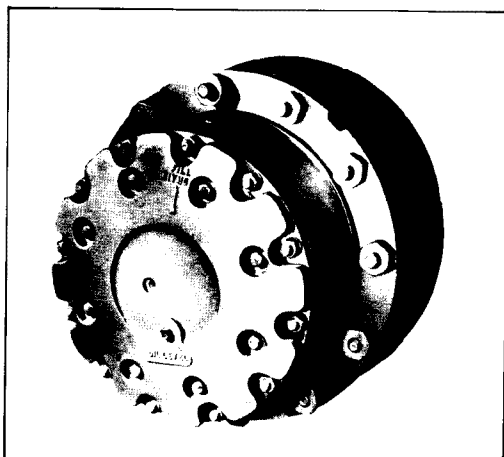
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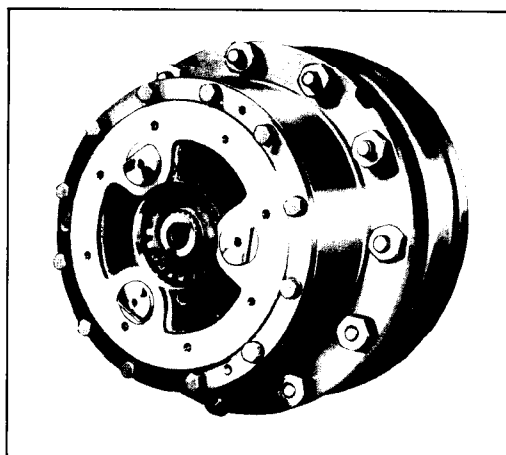
AXLE, RECONDITION (ROCKWELL)

Slight variations in parts and assembly procedures may exist due to design changes by the axle manufacturer. The procedures required to recondition a typical axle are contained in this SM.

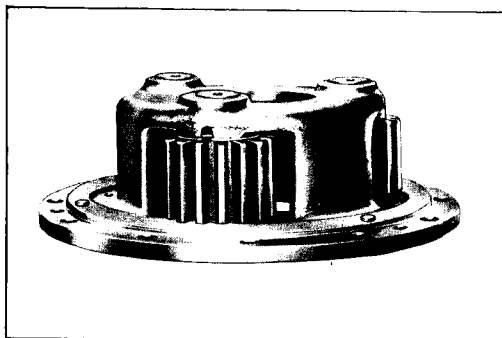
To Disassemble The Planetary Assembly



1. Remove the planetary spider cover capscrews.
2. Remove the planetary spider cover.



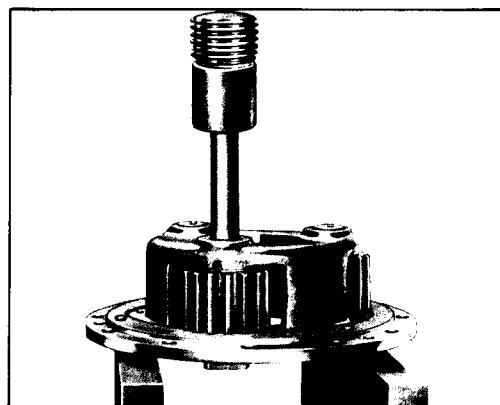
3. Remove the planetary spider stud nuts or capscrews and flat washers.



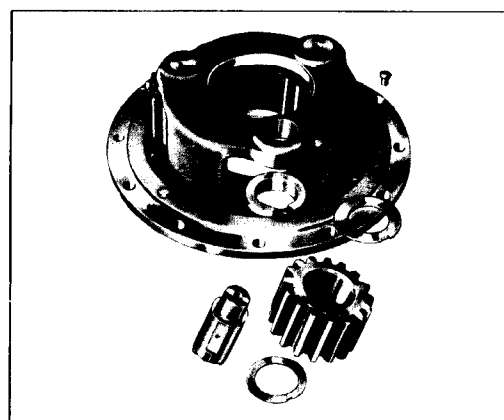
4. Separate and remove planetary spider assembly from the wheel hub assembly; use puller screws in threaded holes when provided in the spider flange.

To Disassemble Planetary Spider Assembly

Planetary spur gears rotate on planet pins. Each gear rotates between hardened thrust washers.



5. Press out the planet gear pins as shown.
6. Remove the planet gears and their respective thrust washers.



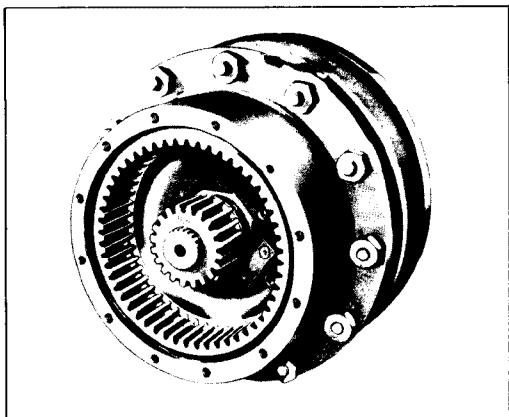
NOTE: Thrust washers are designed for opposite sides of planet gears and can only be installed in their correct locations.

Service Manual

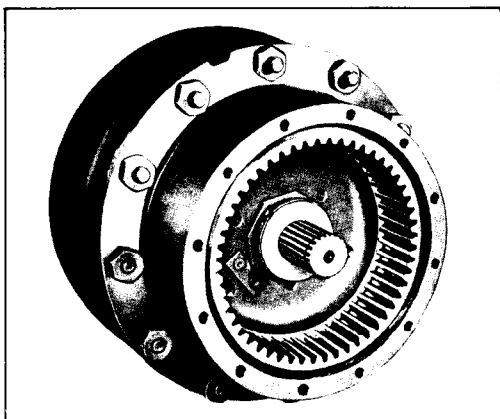
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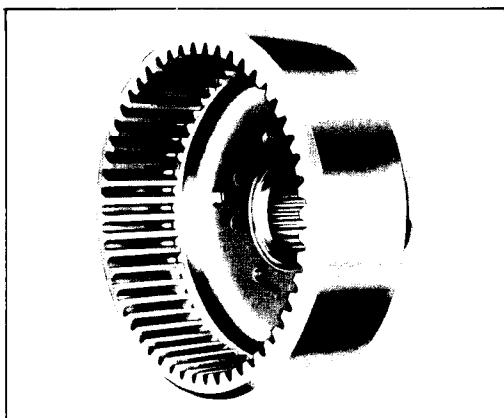
To Remove The Floating Ring Gear Assembly



7. Remove floating ring gear (on models where gear is not secured to ring gear hub).
8. Remove the snap ring from end of axle shaft.



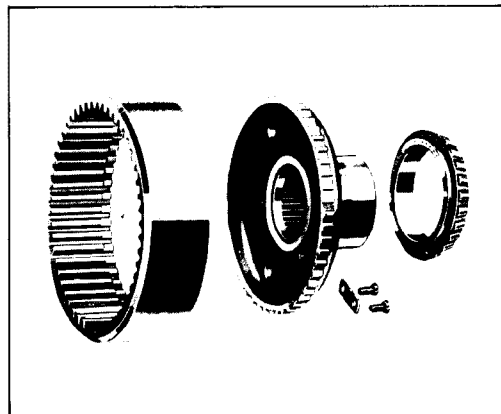
9. Remove the axle shaft sun gear.
10. Remove the sun gear thrust washer.
11. Remove the wheel bearing adjusting nut lock. (Wheel bearing adjusting nuts are all of the single nut construction and may be locked to the hub spindle in different methods depending on model.)
12. Remove the wheel bearing adjusting nut.



13. Remove the ring gear hub. Puller screw holes are provided in the ring gear hub flange to remove hub.

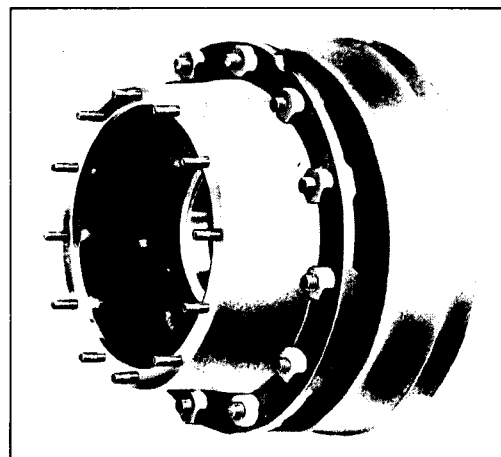
NOTE: Some axles may secure the ring gear to the ring gear hub with capscrews and plates on the back side of the assembly.

The outer wheel bearing is mounted on the ring gear hub.



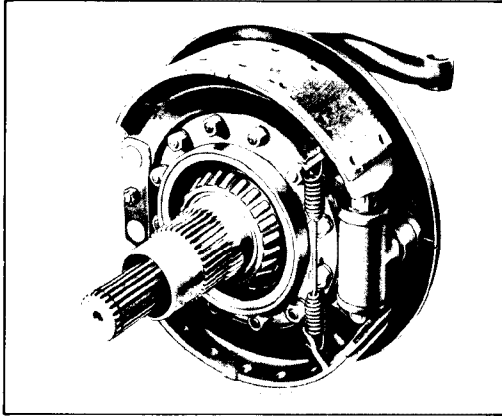
14. Remove outer wheel bearing from ring gear hub.
15. The ring gear hub assembly is made up of the hub and a ring sleeve insert which is pressed into the hub from the outer side.

Remove The Wheel Hub And Drum Assembly



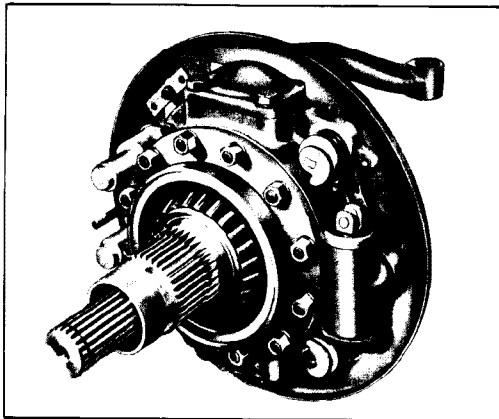
16. Lift the hub and drum slightly to relieve the hub weight and drum to brake shoe drag and remove the assembly from the hub spindle.
17. If wheel bearings are to be replaced, remove wheel bearing cups with a suitable puller.

Disassemble Brake Shoe And Lining Assembly



Complete disassembly of the brakes is not necessary for the removal of the hub spindle. Adequate working clearance is provided by removing the brake shoe return spring.

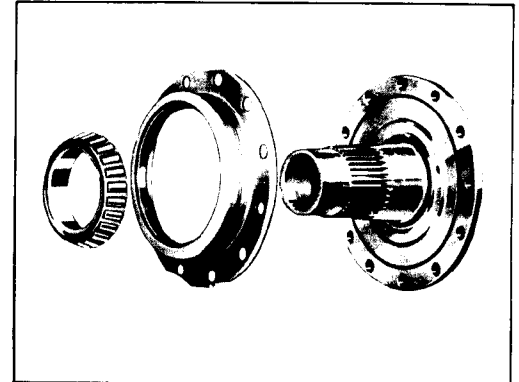
18. If the brake shoe and liner assemblies are to be removed for service or inspection, unhook and remove the brake shoe return spring.
19. Remove the anchor pin plate cotter key, stud nut and plate or anchor pin "C" clips and plate.



20. Remove the brake shoe and liner assemblies. For complete disassembly, remove push rods and brake cylinder.

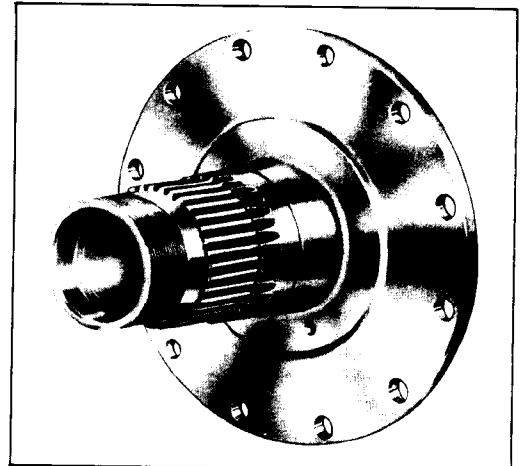
Disassemble Hub Spindle Assembly

21. Remove the inner wheel bearing. The oil seal assembly is held in place by the knuckle flange stud nuts.



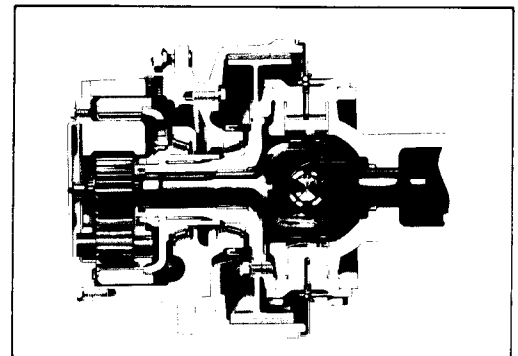
NOTE: Do not remove the oil seal from the retainer unless replacement is necessary.

22. Remove the hub spindle stud nuts and washers.



23. Remove the hub spindle. Care must be taken on steering models not to damage the inner oil seal, in the bore of the spindle, while sliding it past the axle shaft splines.

Planetary Steering Knuckles



Remove the axle shaft and universal joint assembly from the housing assembly. Care must be exercised not to damage the oil seal in the housing.