

# **160CLC Excavator Repair**

## **TECHNICAL MANUAL 160CLC Excavator Repair**

**TM1933 19JUN13 (ENGLISH)**

JP Doiron  
3664 Fossambault  
Ste-catherine De La Jacque Cartier QC G3N 1R5  
Canada

**For complete service information also see:**

160CLC Excavator Operation and Tests .....	TM1932
160CLC Excavator Operator's Manual .....	OMT188255
POWERTECH® 4.5 L & 6.8 L Diesel Engine .....	CTM104
POWERTECH 4.5 L & 6.8 L Diesel Engines	
Level 12 Electronic Fuel System with DE10	
STANADYNE® Pump.....	CTM331
Alternators and Starting Motors .....	CTM77
Undercarriage Appraisal Manual .....	SP326VOL1
SERVICE ADVISOR™ System Computer	
Connection.....	T133991

Email address:  
[jpdoiron@bkom.com](mailto:jpdoiron@bkom.com)

Phone:  
4184739648

**Worldwide Construction  
And Forestry Division**  
LITHO IN U.S.A.

# Introduction

## Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

 This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

DX,TMIFC -19-29SEP98-1/1

## Technical Information Feedback Form

We need your help to continually improve our technical publications. Please copy this page and FAX or mail your comments, ideas and improvements.

**SEND TO:** John Deere Dubuque Works  
18600 South John Deere Road  
Attn: Publications, Dept. 324  
Dubuque, IA 52004-0538  
USA

**FAX NUMBER:** 1-563-589-5800 (USA)

Publication Number: \_\_\_\_\_

Page Number: \_\_\_\_\_

Ideas, Comments: \_\_\_\_\_

Name: \_\_\_\_\_

**Phone:**

Email Address:

THANK YOU!!

TX TM FAX -19-03 II II 01-1/1

*Introduction*

# Contents

## **Section 00—General Information**

Group 0001—Safety  
Group 0003—Torque Values

## **Section 01—Tracks**

Group 0130—Track System

## **Section 02—Axles and Suspension Systems**

Group 0250—Axe Shaft, Bearings, and Reduction  
Gears  
Group 0260—Hydraulic System

## **Section 04—Engine**

Group 0400—Removal and Installation

## **Section 05—Engine Auxiliary Systems**

Group 0510—Cooling System  
Group 0560—External Fuel Supply Systems

## **Section 17—Frame or Supporting Structure**

Group 1740—Frame Installation  
Group 1749—Chassis Weights

## **Section 18—Operator's Station**

Group 1800—Removal and Installation  
Group 1810—Operator Enclosure  
Group 1821—Seat and Seat Belt  
Group 1830—Heating and Air Conditioning

## **Section 33—Excavator**

Group 3302—Buckets  
Group 3340—Frames  
Group 3360—Hydraulic System

## **Section 43—Swing or Pivoting System**

Group 4350—Mechanical Drive Elements  
Group 4360—Hydraulic System

## **Section 99—Dealer Fabricated Tools**

Group 9900—Dealer Fabricated Tools

*Original Instructions. All information, illustrations and specifications in this manual are based on the latest information available at the time of publication.*

*The right is reserved to make changes at any time without notice.*

COPYRIGHT © 2013  
DEERE & COMPANY  
Moline, Illinois  
All rights reserved.  
A John Deere ILLUSTRATION ® Manual  
Previous Editions  
Copyright © 2004, 2006, 2008, 2012

*Contents*

# Section 00

## General Information

### Contents

Page		Page	
<b>Group 0001—Safety</b>			
Recognize Safety Information .....	00-0001-1	Service Recommendations for 37° Flare and 30° Cone Seat Connectors .....	00-0003-7
Follow Safety Instructions.....	00-0001-1	Service Recommendations For Flared Connections—Straight or Tapered Threads .....	00-0003-8
Operate Only If Qualified .....	00-0001-1	Service Recommendations For Inch Series Four Bolt Flange Fittings .....	00-0003-9
Wear Protective Equipment.....	00-0001-2	Service Recommendations for Metric Series Four Bolt Flange Fitting.....	00-0003-10
Avoid Unauthorized Machine Modifications.....	00-0001-2		
Add Cab Guarding for Special Uses .....	00-0001-2		
Inspect Machine .....	00-0001-2		
Stay Clear of Moving Parts .....	00-0001-3		
Avoid High-Pressure Oils .....	00-0001-3		
Beware of Exhaust Fumes .....	00-0001-3		
Prevent Fires .....	00-0001-4		
Prevent Battery Explosions .....	00-0001-4		
Handle Chemical Products Safely.....	00-0001-4		
Dispose of Waste Properly .....	00-0001-5		
Prepare for Emergencies.....	00-0001-5		
Use Steps and Handholds Correctly .....	00-0001-5		
Start Only From Operator's Seat .....	00-0001-5		
Use and Maintain Seat Belt.....	00-0001-6		
Prevent Unintended Machine Movement.....	00-0001-6		
Avoid Work Site Hazards.....	00-0001-6		
Keep Riders Off Machine .....	00-0001-7		
Avoid Backover Accidents .....	00-0001-7		
Avoid Machine Tip Over .....	00-0001-8		
Use Special Care When Lifting Objects .....	00-0001-8		
Add and Operate Attachments Safely.....	00-0001-8		
Park and Prepare for Service Safely.....	00-0001-9		
Service Cooling System Safely .....	00-0001-9		
Remove Paint Before Welding or Heating .....	00-0001-9		
Make Welding Repairs Safely .....	00-0001-10		
Drive Metal Pins Safely .....	00-0001-10		
<b>Group 0003—Torque Values</b>			
Unified Inch Bolt and Screw Torque			
Values .....	00-0003-1		
Metric Bolt and Screw Torque			
Values .....	00-0003-2		
Additional Metric Cap Screw Torque Values .....			00-0003-3
Check Oil Lines And Fittings .....	00-0003-4		
Service Recommendations for			
O-Ring Boss Fittings.....	00-0003-4		
Service Recommendations For			
Flat Face O-Ring Seal Fittings .....	00-0003-6		

*Contents*

## **Recognize Safety Information**

This is the safety alert symbol. When this symbol is noticed on the machine or in this manual, be alert for the potential of personal injury.

Follow the precautions and safe operating practices highlighted by this symbol.

A signal word — DANGER, WARNING, or CAUTION — is used with the safety alert symbol. DANGER identifies the most serious hazards.

On the machine, DANGER signs are red in color, WARNING signs are orange, and CAUTION signs are yellow. DANGER and WARNING signs are located near specific hazards. General precautions are on CAUTION labels.



**DANGER**

**WARNING**

**CAUTION**

T133555—UN—15AUG13

T133588—19—28AUG00

TX03679,00016CC -19-03JAN07-1/1

## **Follow Safety Instructions**

Read the safety messages in this manual and on the machine. Follow these warnings and instructions carefully. Review them frequently.

Be sure all operators of this machine understand every safety message. Replace operator's manual and safety labels immediately if missing or damaged.



T133556—UN—24AUG00

TX03679,00016F9 -19-03JAN07-1/1

## **Operate Only If Qualified**

Do not operate this machine unless the operator's manual has been read carefully, and you have been qualified by supervised training and instruction.

Operator should be familiar with the job site and surroundings before operating. Try all controls and

machine functions with the machine in an open area before starting to work.

Know and observe all safety rules that may apply to every work situation and work site.

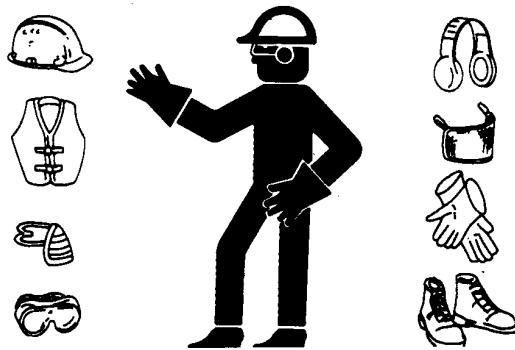
TX03679,00016FA -19-03JAN07-1/1

## Wear Protective Equipment

Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



TS206—UN—15APR13

TX03679,00016D0 -19-03JAN07-1/1

## Avoid Unauthorized Machine Modifications

Modifications of this machine, or addition of unapproved products or attachments, may affect machine stability or reliability, and may create a hazard for the operator or others near the machine.

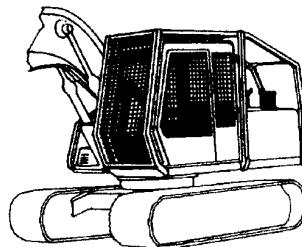
Always contact an authorized dealer before making machine modifications that change the intended use, weight or balance of the machine, or that alter machine controls, performance or reliability.

TX03679,00016B7 -19-30OCT00-1/1

## Add Cab Guarding for Special Uses

Special work situations or machine attachments may create an environment with falling or flying objects. Working near an overhead bank, doing demolition work, using a hydraulic hammer, or working in a wooded area, for example, may require added guarding to protect the operator.

FOPS (falling object protective structures) and special screens or guarding should be installed when falling or flying objects may enter or damage the machine. Contact your authorized dealer for information on devices intended to provide protection in special work situations.



T133733—UN—15SEP00

TX03679,00016CE -19-03JAN07-1/1

## Inspect Machine

Inspect machine carefully each day by walking around it before starting.

Keep all guards and shields in good condition and properly installed. Fix damage and replace worn or broken parts immediately. Pay special attention to hydraulic hoses and electrical wiring.



T6607AQ—UN—15APR13

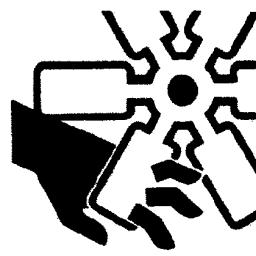
TX03679,0001734 -19-03JAN07-1/1

## Stay Clear of Moving Parts

Entanglements in moving parts can cause serious injury.

Stop engine before examining, adjusting or maintaining any part of machine with moving parts.

Keep guards and shields in place. Replace any guard or shield that has been removed for access as soon as service or repair is complete.



T133592—UN—15APR13

TX03679,00016D2 -19-03JAN07-1/1

## Avoid High-Pressure Oils

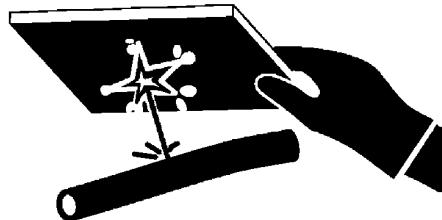
This machine uses a high-pressure hydraulic system. Escaping oil under pressure can penetrate the skin causing serious injury.

**Never search for leaks with your hands.** Protect hands. Use a piece of cardboard to find location of escaping oil. Stop engine and relieve pressure before disconnecting lines or working on hydraulic system.

**If hydraulic oil penetrates your skin, see a doctor immediately. Injected oil must be removed surgically within hours or gangrene may result.** Contact a knowledgeable medical source or the Deere & Company Medical Department in Moline, Illinois, U.S.A.



T133509—UN—15APR13



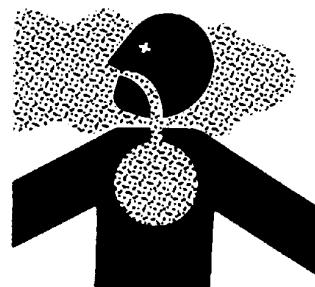
T133840—UN—20SEP00

TX03679,00016D3 -19-03NOV08-1/1

## Beware of Exhaust Fumes

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

If you must operate in an enclosed space, provide adequate ventilation. Use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring outside air into the area.



T133546—UN—24AUG00

TX03679,00016D4 -19-03NOV08-1/1

## Prevent Fires

**Handle Fuel Safely:** Store flammable fluids away from fire hazards. Never refuel machine while smoking or when near sparks or flame.

**Clean Machine Regularly:** Keep trash, debris, grease and oil from accumulating in engine compartment, around fuel lines, hydraulic lines, exhaust components, and electrical wiring. Never store oily rags or flammable materials inside a machine compartment.

**Maintain Hoses and Wiring:** Replace hydraulic hoses immediately if they begin to leak, and clean up any oil spills. Examine electrical wiring and connectors frequently for damage.

**Keep A Fire Extinguisher Available:** Always keep a multipurpose fire extinguisher on or near the machine. Know how to use extinguisher properly.



T133553 —UN—07SEP00



T133554 —UN—07SEP00



TX03679,00016F5 -19-03NOV08-1/1

## Prevent Battery Explosions

Battery gas can explode. Keep sparks, lighted matches, and open flame away from the top of battery.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



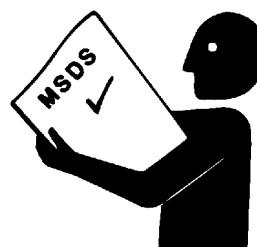
TS204 —UN—15APR13

TX03679,000174A -19-03NOV08-1/1

## Handle Chemical Products Safely

Exposure to hazardous chemicals can cause serious injury. Under certain conditions, lubricants, coolants, paints and adhesives used with this machine may be hazardous.

If uncertain about safe handling or use of these chemical products, contact your authorized dealer for a Material Safety Data Sheet (MSDS). The MSDS describes physical and health hazards, safe use procedures, and emergency response techniques for chemical substances. Follow MSDS recommendations to handle chemical products safely.



T133580 —UN—25AUG00

TX03679,00016D7 -19-31JAN07-1/1

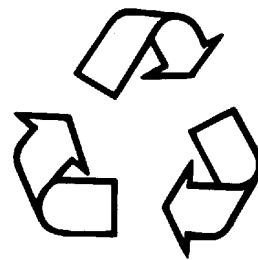
## Dispose of Waste Properly

Improper disposal of waste can threaten the environment. Fuel, oils, coolants, filters and batteries used with this machine may be harmful if not disposed of properly.

Never pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants can damage the atmosphere. Government regulations may require using a certified service center to recover and recycle used refrigerants.

If uncertain about the safe disposal of waste, contact your local environmental or recycling center or your authorized dealer for more information.



T133567 -UN-25AUG00

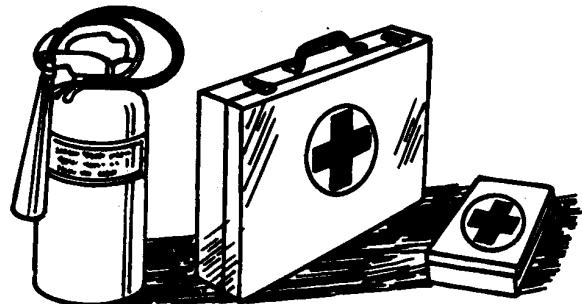
TX03679,0001733 -19-03JAN07-1/1

## Prepare for Emergencies

Be prepared if an emergency occurs or a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



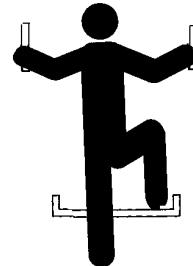
TS291 -UN-15APR13

TX03679,000174B -19-03JAN07-1/1

## Use Steps and Handholds Correctly

Prevent falls by facing the machine when getting on and off. Maintain 3-point contact with steps and handrails. Never use machine controls as handholds.

Use extra care when mud, snow, or moisture present slippery conditions. Keep steps clean and free of grease or oil. Never jump when exiting machine. Never mount or dismount a moving machine.



T133468 -UN-15APR13

TX03679,00016F2 -19-24APR13-1/1

## Start Only From Operator's Seat

Avoid unexpected machine movement. Start engine only while sitting in operator's seat. Ensure all controls and working tools are in proper position for a parked machine.

Never attempt to start engine from the ground. Do not attempt to start engine by shorting across the starter solenoid terminals.



T133715 -UN-15APR13

TX03679,0001799 -19-22APR10-1/1

## Use and Maintain Seat Belt

**Use seat belt when operating machine.** Remember to fasten seat belt when loading and unloading from trucks and during other uses.

Examine seat belt frequently. Be sure webbing is not cut or torn. Replace seat belt immediately if any part is damaged or does not function properly.

**The complete seat belt assembly should be replaced every 3 years, regardless of appearance.**



**USE  
SEAT  
BELT**

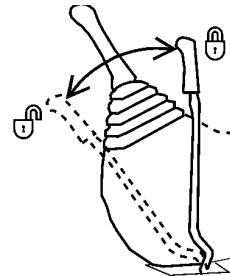
T133716 -19-17APR13

TX03679,00016DD -19-03NOV08-1/1

## Prevent Unintended Machine Movement

Be careful not to accidentally actuate control levers when co-workers are present. Pull pilot control shutoff lever to locked position during work interruptions. Pull pilot control shutoff lever to locked position and stop engine before allowing anyone to approach machine.

Always lower work equipment to the ground and pull pilot control shutoff lever to locked position before standing up or leaving the operator's seat. Stop engine before exiting.



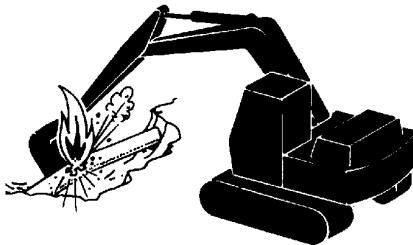
T133863 -UN-20SEP00

TX03679,0001746 -19-24JAN07-1/1

## Avoid Work Site Hazards

**Avoid contact with gas lines, buried cables and water lines. Call utility line location services to identify all underground utilities before you dig.**

**Prepare work site properly.** Avoid operating near structures or objects that could fall onto the machine. Clear away debris that could move unexpectedly if run over.



T134986 -UN-31OCT00

**Avoid boom or arm contact with overhead obstacles or overhead electrical lines.** Never move any part of machine or load closer than 3 m (10 ft.) plus twice the line insulator length to overhead wires.



T133650 -UN-27SEP00

**Keep bystanders clear at all times.** Keep bystanders away from raised booms, attachments, and unsupported loads. Avoid swinging or raising booms, attachments, or loads over or near personnel. Use barricades or a signal person to keep vehicles and pedestrians away. Use a signal person if moving machine in congested areas or where visibility is restricted. Always keep signal person in view. Coordinate hand signals before starting machine.

**Operate only on solid footing** with strength sufficient to support machine. When working close to an excavation, position travel motors away from the hole.



T133549 -UN-24AUG00

**Reduce machine speed** when operating with tool on or near ground when obstacles may be hidden (e.g., during snow removal or clearing mud, dirt, etc.). At high speeds, hitting obstacles (rocks, uneven concrete or manholes) can cause a sudden stop. Always wear your seat belt.

TX03679,0001748 -19-09JUL12-1/1

## Keep Riders Off Machine

Only allow operator on machine.

Riders are subject to injury. They may fall from machine, be caught between machine parts, or be struck by foreign objects.

Riders may obstruct operator's view or impair his ability to operate machine safely.



T7273AH -UN-08JUN90

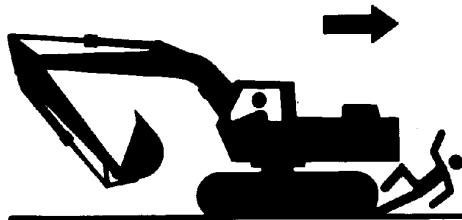
TX03679,0001726 -19-03JAN07-1/1

## Avoid Backover Accidents

**Before moving machine, be sure all persons are clear of both travel and swing paths.** Turn around and look directly for best visibility. Use mirrors to assist in checking all around machine. Keep windows and mirrors clean, adjusted, and in good repair.

**Be certain travel alarm is working properly.**

**Use a signal person when backing if view is obstructed or when in close quarters.** Keep signal person in view at all times. Use prearranged hand signals to communicate.



T133548 -UN-24AUG00

TX03679,00016F3 -19-03JAN07-1/1

## Avoid Machine Tip Over

**Use seat belt at all times.**

**Do not jump if the machine tips.** You will be unlikely to jump clear and the machine may crush you.

**Load and unload from trucks or trailers carefully.** Be sure truck is wide enough and on a firm level surface. Use loading ramps. Properly attach ramps to truck bed. Avoid trucks with steel beds because tracks slip more easily on steel.

**Be careful on slopes.** Use extra care on soft, rocky or frozen ground. Machine may slip sideways in these conditions. When traveling up or down slopes, keep the bucket on uphill side and just above ground level.

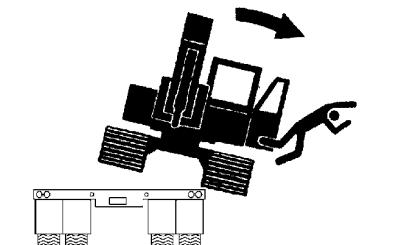
**Be careful with heavy loads.** Using oversize buckets or lifting heavy objects reduces machine stability. Extending a heavy load or swinging it over side of undercarriage may cause machine to tip.

**Ensure solid footing.** Use extra care when operating near banks or excavations that may cave-in and cause machine to tip or fall.

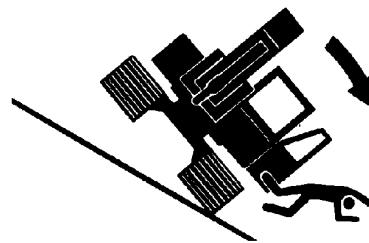


**USE  
SEAT  
BELT**

T133716 -19-17APR13



T133545 -UN-15SEP00



T133803 -UN-27SEP00

TX03679,00016DF -19-24JAN07-1/1

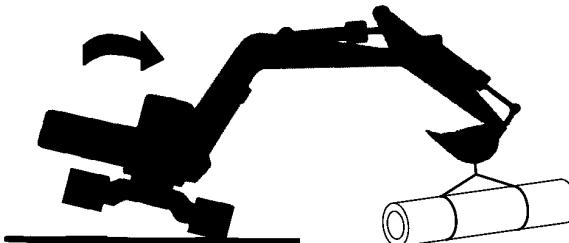
## Use Special Care When Lifting Objects

Never use this machine to lift people.

Never lift a load above another person. Keep bystanders clear of all areas where a load might fall if it breaks free. Do not leave the seat when there is a raised load.

Do not exceed lift capacity limits posted on machine and in this manual. Extending heavy loads too far or swinging over undercarriage side may cause machine to tip over.

Use proper rigging to attach and stabilize loads. Be sure slings or chains have adequate capacity and are in good condition. Use tether lines to guide loads and prearranged hand signals to communicate with co-workers.



T133839 -UN-27SEP00

TX03679,00016E1 -19-03JAN07-1/1

## Add and Operate Attachments Safely

Always verify compatibility of attachments by contacting your authorized dealer. Adding unapproved attachments may affect machine stability or reliability, and may create a hazard for others near the machine.

Ensure that a qualified person is involved in attachment installation. Add guards to machine if operator protection

is required or recommended. Verify that all connections are secure and attachment responds properly to controls.

Carefully read attachment manual and follow all instructions and warnings. In an area free of bystanders and obstructions, carefully operate attachment to learn its characteristics and range of motion.

TX03679,00016F0 -19-24JAN07-1/1

## Park and Prepare for Service Safely

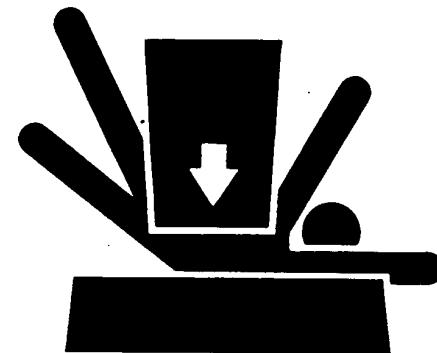
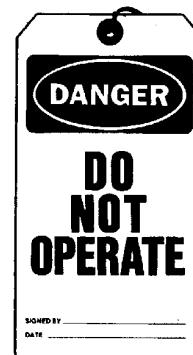
**Warn others of service work.** Always park and prepare your machine for service or repair properly.

- Park machine on a level surface and lower equipment to the ground.
- Place pilot control shutoff lever in “lock” position. Stop engine and remove key.
- Attach a “Do Not Operate” tag in an obvious place in the operator's station.

Securely support machine or equipment before working under it.

- Do not support machine with boom, arm, or other hydraulically actuated attachments.
- Do not support machine with cinder blocks or wooden pieces that may crumble or crush.
- Do not support machine with a single jack or other devices that may slip out of place.

Understand service procedures before beginning repairs. Keep service area clean and dry. Use two people whenever the engine must be running for service work.



TX03679.00016E9 -19-24JAN07-1/1

T133332 -19-17APR13

TS229 -UN-23AUG88

## Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



DX,RCAP -19-04JUN90-1/1

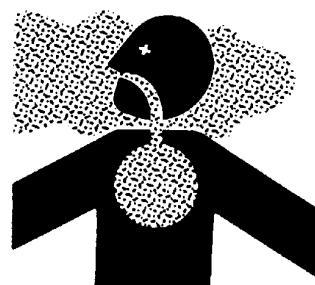
TS281 -UN-15APR13

## Remove Paint Before Welding or Heating

Hazardous fumes can be generated when paint is heated by welding or using a torch. Dust from sanding or grinding paint can also be hazardous.

Remove paint to at least 76 mm (3 in.) from area to be heated. Wear an approved respirator when sanding or grinding paint. If a solvent or paint stripper is used, wash area with soap and water. Remove solvent or paint stripper containers from work area, and allow fumes to disperse at least 15 minutes before welding or heating.

Work outside or in a well-ventilated area. Dispose of waste, paint, and solvents properly.



TX03679.0001732 -19-29AUG07-1/1

T133546 -UN-24AUG00

## Make Welding Repairs Safely

**IMPORTANT:** Disable electrical power before welding. Turn off main battery switch or disconnect positive battery cable. Separate harness connectors to engine and vehicle microprocessors.

Avoid welding or heating near pressurized fluid lines. Flammable spray may result and cause severe burns if pressurized lines fail as a result of heating. Do not let heat go beyond work area to nearby pressurized lines.

Remove paint properly. Do not inhale paint dust or fumes. Use a qualified welding technician for structural repairs.



T133547 -UN-15APR13

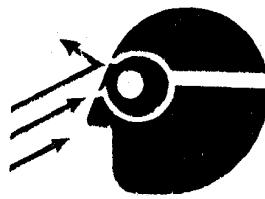
Make sure there is good ventilation. Wear eye protection and protective equipment when welding.

TX03679,00016D5 -19-25APR08-1/1

## Drive Metal Pins Safely

Always wear protective goggles or safety glasses and other protective equipment before striking hardened parts. Hammering hardened metal parts such as pins and bucket teeth may dislodge chips at high velocity.

Use a soft hammer or a brass bar between hammer and object to prevent chipping.



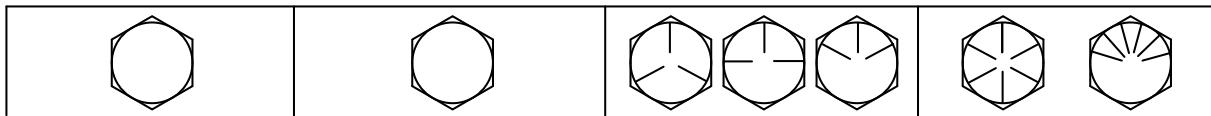
T133738 -UN-15APR13

TX03679,0001745 -19-03JAN07-1/1

Group 0003  
Torque Values

**Unified Inch Bolt and Screw Torque Values**

TS1671 —UN—01MAY03



Bolt or Screw Size	SAE Grade 1				SAE Grade 2 <sup>a</sup>				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>		Lubricated <sup>b</sup>		Dry <sup>c</sup>	
	N·m	Ib.-in.	N·m	Ib.-in.	N·m	Ib.-in.	N·m	Ib.-in.	N·m	Ib.-in.	N·m	Ib.-in.	N·m	Ib.-ft.	N·m	Ib.-ft.
1/4	3.7	33	4.7	42	6	53	7.5	66	9.5	84	12	106	13.5	120	17	150
5/16	7.7	68	9.8	86	12	106	15.5	137	19.5	172	25	221	28	20.5	35	26
3/8	13.5	120	17.5	155	22	194	27	240	35	26	44	32.5	49	36	63	46
7/16	22	194	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
	N·m	Ib.-ft.														
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For plastic insert or crimped steel type lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Replace fasteners with the same or higher grade. If higher grade fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

<sup>a</sup>Grade 2 applies for hex cap screws (not hex bolts) up to 6 in. (152 mm) long. Grade 1 applies for hex cap screws over 6 in. (152 mm) long, and for all other types of bolts and screws of any length.

<sup>b</sup>"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or 7/8 in. and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.

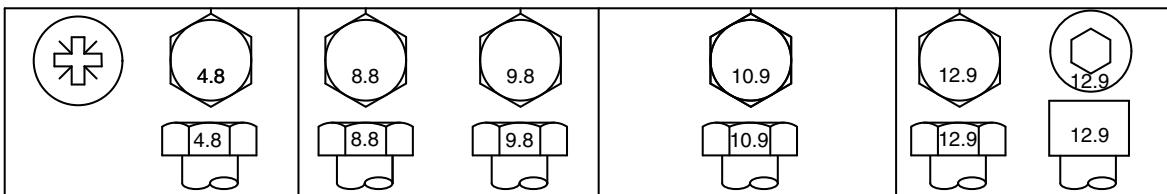
<sup>c</sup>"Dry" means plain or zinc plated without any lubrication, or 1/4 to 3/4 in. fasteners with JDM F13B, F13E or F13H zinc flake coating.

DX,TORQ1 -19-12JAN11-1/1

## Torque Values

### Metric Bolt and Screw Torque Values

TS1670 —UN—01MAY03



Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>		Lubricated <sup>a</sup>		Dry <sup>b</sup>	
	N·m	lb.-in.	N·m	lb.-in.												
M6	4.7	42	6	53	8.9	79	11.3	100	13	115	16.5	146	15.5	137	19.5	172
									N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.
M8	11.5	102	14.5	128	22	194	27.5	243	32	23.5	40	29.5	37	27.5	47	35
			N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.								
M10	23	204	29	21	43	32	55	40	63	46	80	59	75	55	95	70
	N·m	lb.-ft.														
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	255	320	235	400	300
M18	135	100	170	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	1080	800
M24	330	245	425	315	650	480	820	600	920	680	1150	850	1080	800	1350	1000
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	2000	1475
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1580	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For stainless steel fasteners or for nuts on U-bolts, see the tightening instructions for the specific application. Tighten plastic insert or crimped steel type lock nuts by turning the nut to the dry torque shown in the chart, unless different instructions are given for the specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class. Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

<sup>a</sup>"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.

<sup>b</sup>"Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.

DX,TORQ2 -19-12JAN11-1/1

## Torque Values

### Additional Metric Cap Screw Torque Values

**CAUTION:** Use only metric tools on metric hardware. Other tools may not fit properly. They may slip and cause injury.

Check tightness of cap screws periodically. Torque values listed are for general use only. Do not use these values if a different torque value or tightening procedure is listed for a specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fastener threads are clean and you properly start thread engagement. This will prevent them from failing when tightening.

Tighten cap screws having lock nuts to approximately 50 percent of amount shown in chart.

METRIC CAP SCREW TORQUE VALUES <sup>a</sup>						
Nominal Dia	T-Bolt		H-Bolt		M-Bolt	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
8	29	21	20	15	10	7
10	63	46	45	33	20	15
12	108	80	88	65	34	25
14	176	130	137	101	54	40
16	265	195	206	152	78	58
18	392	289	294	217	118	87
20	539	398	392	289	167	125
22	735	542	539	398	216	159
24	931	687	686	506	274	202
27	1372	1012	1029	759	392	289
30	1911	1410	1421	1049	539	398
33	2548	1890	1911	1410	735	542
36	3136	2314	2401	1772	931	687

<sup>a</sup>Torque tolerance is ±10%.

T6873AA



T6873AA—UN—15APR13

T6873AB



T6873AB—UN—18OCT88

T6873AC



T6873AC—UN—18OCT88

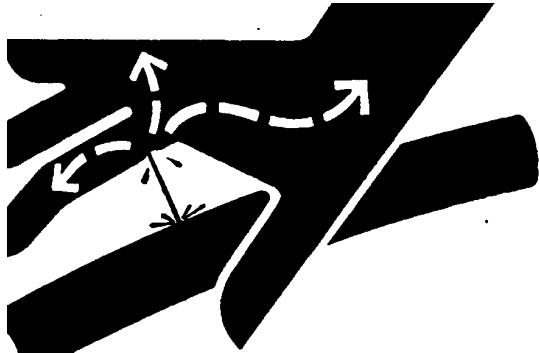
04T,90,M170 -19-29SEP99-1/1

## Check Oil Lines And Fittings

**CAUTION:** Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

Check all oil lines, hoses, and fittings regularly for leaks or damage. Make sure all clamps are in position and tight. Make sure hoses are not twisted or touching moving machine parts. If abrasion or wear occurs, replace immediately.



X9811 -UN-23AUG88

Tubing with dents may cause the oil to overheat. If you find tubing with dents, install new tubing immediately.

**IMPORTANT:** Tighten fittings as specified in torque chart.

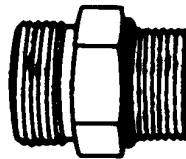
When you tighten connections, use two wrenches to prevent bending or breaking tubing and fittings.

TX,90,DH1559 -19-01AUG94-1/1

## Service Recommendations for O-Ring Boss Fittings

### Straight Fitting

1. Inspect O-ring boss seat for dirt or defects.
2. Lubricate O-ring with petroleum jelly. Place electrical tape over threads to protect O-ring. Slide O-ring over tape and into O-ring groove of fitting. Remove tape.
3. Tighten fitting to torque value shown on chart.



T6243AE -UN-15APR13

Continued on next page

04T,90,K66 -19-29SEP99-1/2

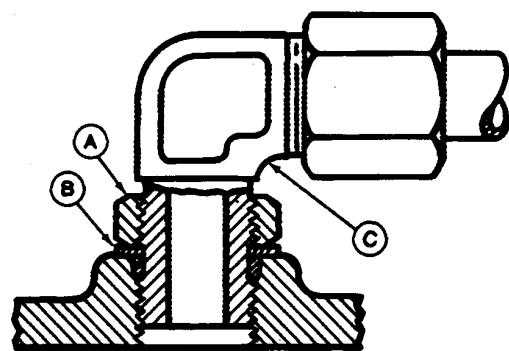
## Torque Values

### Angle Fitting

1. Back-off lock nut (A) and back-up washer (B) completely to head-end (C) of fitting.
2. Turn fitting into threaded boss until back-up washer contacts face of boss.
3. Turn fitting head-end counterclockwise to proper index (maximum of one turn).

*NOTE: Do not allow hoses to twist when tightening fittings.*

4. Hold fitting head-end with a wrench and tighten locknut and back-up washer to proper torque value.



T6520AB—UN—15APR13

STRAIGHT FITTING OR SPECIAL NUT TORQUE CHART		
Thread Size	N·m	lb·ft
3/8-24 UNF	8	6
7/16-20 UNF	12	9
1/2-20 UNF	16	12
9/16-18 UNF	24	18
3/4-16 UNF	46	34
7/8-14 UNF	62	46
1-1/16-12 UN	102	75
1-3/16-12 UN	122	90
1-5/16-12 UN	142	105
1-5/8-12 UN	190	140
1-7/8-12 UN	217	160

*NOTE: Torque tolerance is  $\pm 10\%$ .*

04T,90,K66 -19-29SEP99-2/2

## Torque Values

### Service Recommendations For Flat Face O-Ring Seal Fittings

1. Inspect the fitting sealing surfaces and O-ring. They must be free of dirt or defects.
2. Lubricate O-rings and install into grove using petroleum jelly to hold in place.
3. Index angle fittings and tighten by hand pressing joint together to insure O-ring remains in place.

4. Tighten fitting or nut to torque value shown on the chart. Do not allow hoses to twist when tightening fittings, use backup wrench on straight hose couplings.

**IMPORTANT:** Tighten fittings to 150% of listed torque value if indexing is necessary or if fitting is attached to an actuating device.

**Tighten fittings to 50% of listed torque value if used in aluminum housing.**

FLAT FACE O-RING SEAL FITTING TORQUE*						
Nominal Tube O.D.		Thread Size	Swivel Nut		Bulkhead Nut	
mm	in.	in.	N·m	lb·ft	N·m	lb·ft
6.35	0.250	9/16-18	16	12	12	9
9.52	0.375	11/16-16	24	18	24	18
12.70	0.500	13/16-16	50	37	46	34
15.88	0.625	1-14	69	51	62	46
19.05	0.750	1 3/16-12	102	75	102	75
22.22	0.875	1 3/16-12	102	75	102	75
25.40	1.000	1 7/16-12	142	105	142	105
31.75	1.250	1 11/16-12	190	140	190	140
38.10	1.500	2-12	217	160	217	160

\*Torque tolerance is +15 -20% unless otherwise specified.

### Stud End O-ring Seal Torque for Straight and Adjustable Fittings\*

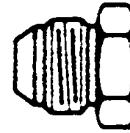
Thread Size	Straight Hex Size	Locknut Hex Size	Straight Fitting or Locknut Toque	
Inch	Inch	Inch	N·m	lb·ft
3/8-24	5/8	9/16	12	9
7/16-20	5/8	5/8	21	15
1/2-20	3/4	11/16	26	19
9/16-18	3/4	3/4	34	25
3/4-16	7/8	15/16	73	55
7/8-14	1 1/16	1 1/16	104	76
1 1/16-12	1 1/4	1 3/8	176	130
1 3/16-12	1 3/8	1 1/2	230	170
1 5/16-12	1 1/2	1 5/8	285	210

\*Torque tolerance is +15 -20% unless otherwise specified.

OUO6092,00010A4 -19-31MAY11-1/1

## Service Recommendations for 37° Flare and 30° Cone Seat Connectors

1. Inspect flare and flare seat. They must be free of dirt or obvious defects.
2. Defects in tube flare cannot be repaired. Overtightening a defective flared fitting will not stop leaks.
3. Align tube with fitting before attempting to start nut.
4. Lubricate male threads with hydraulic fluid or petroleum jelly.
5. Index angle fittings and tighten by hand.
6. Tighten fitting or nut to torque value shown on torque chart. Do not allow hoses to twist when tightening fittings.



T6234AC—JUN—15APR13

STRAIGHT FITTING OR SPECIAL NUT TORQUE CHART		
Thread Size	N·m	lb·ft
3/8 - 24 UNF	8	6
7/16 - 20 UNF	12	9
1/2 - 20 UNF	16	12
9/16 - 18 UNF	24	18
3/4 - 16 UNF	46	34
7/8 - 14 UNF	62	46
1-1/16 - 12 UN	102	75
1-3/16 - 12 UN	122	90
1-5/16 - 12 UN	142	105
1-5/8 - 12	190	140
1-7/8 - 12 UN	217	160

*NOTE: Torque tolerance is ± 10%.*

T82,BHMA,EL -19-29SEP99-1/1

## Service Recommendations For Flared Connections—Straight or Tapered Threads

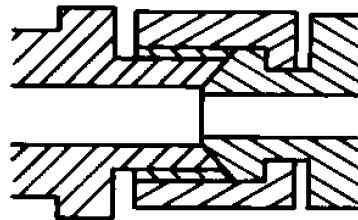
1. Inspect flare and flare seat. They must be free of dirt or obvious defects.
2. Defects in the tube flare cannot be repaired. Overtightening a defective flared fitting will not stop leaks.
3. Align the tube with the fitting before attempting to start the nut.
4. Lubricate the male threads with hydraulic fluid or petroleum jelly.
5. Index angle fittings and tighten by hand.
6. Tighten fitting or nut to torque value shown on the chart. Do not allow hoses to twist when tightening fittings.

TORQUE CHART <sup>a</sup>				
Thread Size	Straight Thread <sup>b</sup>		Tapered Thread	
	N·m	lb-ft	N·m	lb-ft
1/8	15	11		
1/4	20	15	45	33
3/8	29	21	69	51
1/2	49	36	93	69
3/4	69	51	176	130
1	157	116	343	253
1-1/2	196	145	539	398
2	255	188	588	434

<sup>a</sup>Torque tolerance is  $\pm 10\%$ .

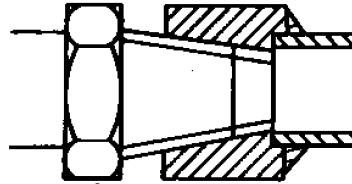
<sup>b</sup>With seat face.

NOTE: If female thread is cast iron (control valves, brake valves motors, etc.), torque must be reduced approximately 10%.



T6873AE

Straight Thread



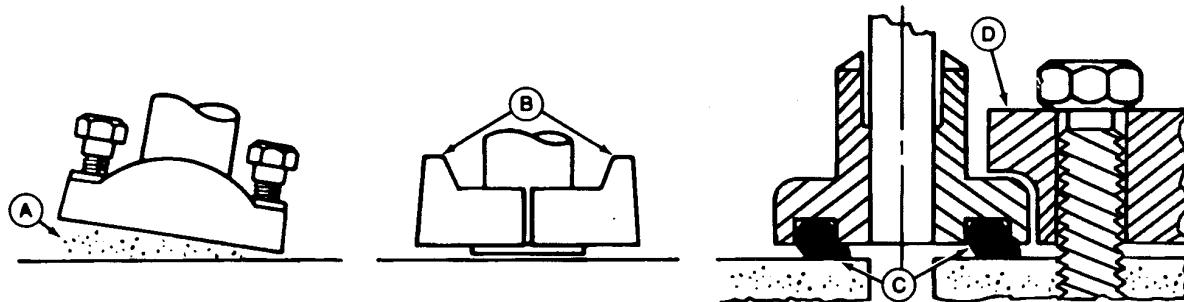
T6873AD

Tapered Thread

T6873AE -UN-15APR13

T6873AD -UN-15APR13

## Service Recommendations For Inch Series Four Bolt Flange Fittings



T6890BB -UN-15APR13

A—Sealing Surface  
B—Split Flange

C—Pinched O-Ring  
D—Single Piece Flange

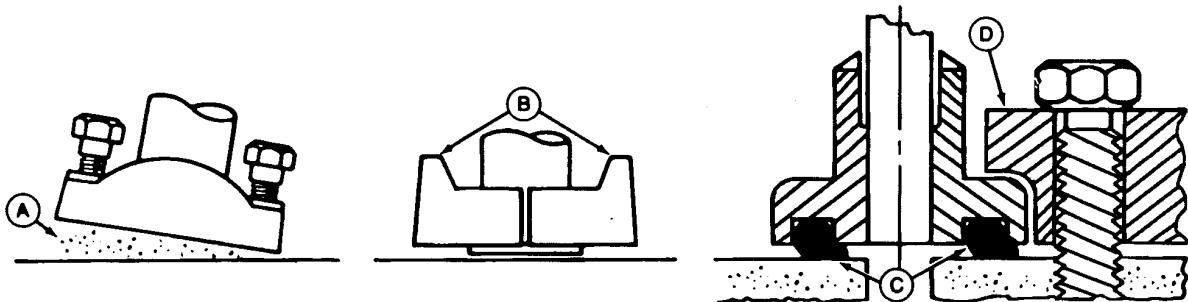
1. Clean sealing surfaces (A). Inspect. Scratches cause leaks. Roughness causes seal wear. Out-of-flat causes seal extrusion. If defects cannot be polished out, replace component.
2. Install O-ring (and backup washer if required) into groove using petroleum jelly to hold it in place.
3. Split flange: Loosely assemble split flange (B) halves. Make sure split is centrally located and perpendicular to port. Hand tighten cap screws to hold parts in place. Do not pinch O-ring (C).
4. Single piece flange (D): Place hydraulic line in center of flange and install cap screws. Flange must be centrally located on port. Hand tighten cap screws to hold flange in place. Do not pinch O-ring.
5. Tighten one cap screw, then tighten the diagonally opposite cap screw. Tighten two remaining cap screws. Tighten all cap screws as specified in the chart below.

DO NOT use air wrenches. DO NOT tighten one cap screw fully before tightening the others. DO NOT over tighten.

TORQUE CHART					
		N·m		lb·ft	
Nominal Flange Size	Cap Screw Size	Min	Max	Min	Max
1/2	5/16-18 UNC	20	31	15	23
3/4	3/8-16 UNC	28	54	21	40
1	3/8-16 UNC	37	54	27	40
1-1/4	7/16-14 UNC	47	85	35	63
1-1/2	1/2-13 UNC	62	131	46	97
2	1/2-13 UNC	73	131	54	97
2-1/2	1/2-13 UNC	107	131	79	97
3	5/8-11 UNC	158	264	117	195
3-1/2	5/8-11 UNC	158	264	117	195
4	5/8-11 UNC	158	264	117	195
5	5/8-11 UNC	158	264	117	195

04T,90,K174 -19-01AUG94-1/1

## Service Recommendations for Metric Series Four Bolt Flange Fitting



T6890BB — UN-15APR13

A—Sealing Surface      C—Pinched O-Ring  
B—Split Flange      D—Single Piece Flange

1. Clean sealing surfaces (A). Inspect. Scratches cause leaks. Roughness causes seal wear. Out-of-flat causes seal extrusion. If defects cannot be polished out, replace component.
2. Install the correct O-ring (and backup washer if required) into groove using petroleum jelly to hold it in place.
3. Split flange: Loosely assemble split flange (B) halves. Make sure split is centrally located and perpendicular to the port. Hand tighten cap screws to hold parts in place. Do not pinch O-ring (C).
4. Single piece flange (D): Place hydraulic line in center of flange and install four cap screws. Flange must be centrally located on port. Hand tighten cap screws to hold flange in place. Do not pinch O-ring.
5. After components are properly positioned and cap screws are hand tightened, tighten one cap screw, then tighten the diagonally opposite cap screw. Tighten two remaining cap screws. Tighten all cap screws as specified in the chart below.

DO NOT use air wrenches. DO NOT tighten one cap screw fully before tightening the others. DO NOT over tighten.

TORQUE CHART <sup>a</sup>		
Thread <sup>b</sup>	N·m	lb·ft
M6	12	9
M8	30	22
M10	57	42
M12	95	70
M14	157	116
M16	217	160
M18	334	246
M20	421	318

<sup>a</sup>Tolerance  $\pm 10\%$ . The torques given are enough for the given size connection with the recommended working pressure. Increasing cap screw torque beyond these amounts will result in flange and cap screw bending and connection failures.

<sup>b</sup>Metric standard thread.

04T,90,K175 -19-29SEP99-1/1

## **Section 01 Tracks**

### **Contents**

	<b>Page</b>
<b>Group 0130—Track System</b>	
Track Roller Repair.....	01-0130-1
Track Carrier Roller Repair.....	01-0130-3
Metal Face Seal Inspect.....	01-0130-6
Track Shoe Remove and Install .....	01-0130-7
Track Chain Repair.....	01-0130-8
Broken Track Chain Repair .....	01-0130-11
Sprocket Remove and Install.....	01-0130-12
Front Idler Repair.....	01-0130-13
Track Adjuster and Recoil Spring Repair .....	01-0130-16
Track Adjuster Cylinder Disassemble and Assemble .....	01-0130-21

*Contents*

## Track Roller Repair

### Remove and Install Track Roller

1. Swing upperstructure 90° and lower bucket to raise track off ground. Keep angle between boom and arm 90–110° and position round side of bucket on ground.

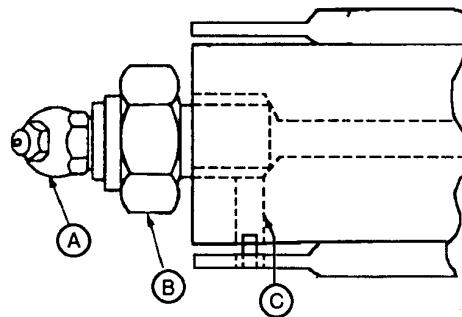
**CAUTION:** Prevent possible injury from unexpected machine movement. Put shop stands under frame to support machine while removing lower track roller.

#### Specification

Machine—Weight..... 15 875 kg (35 000 lb) approximate

2. Place shop stands under machine.

**CAUTION:** Prevent possible injury from high pressure grease. Do not remove grease fitting (A) from valve (B).



A—Grease Fitting  
B—Valve

C—Bleed Hole

3. Loosen valve (B) one to two turns to release grease through bleed hole (C).

OUOE049,0000063 -19-15APR02-1/4

**CAUTION:** Heavy component; use a hoist.

#### Specification

Track Roller—Weight..... 35 kg (77 lb) approximate

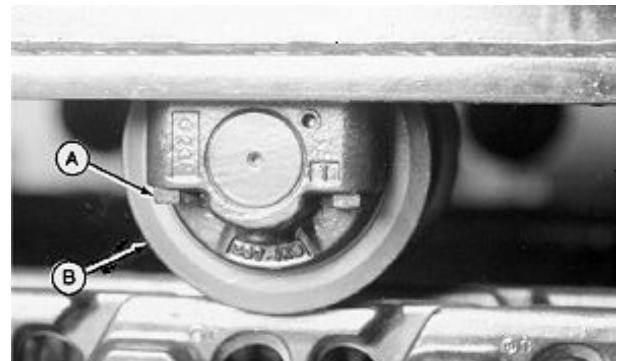
4. Attach hoist to track roller (B). Remove cap screws (A) and track roller (B).
5. Measure track roller tread diameter. See 160CLC, 200CLC, 230CLC, 2054, and 2554 Standard Track Roller Tread Diameter. (SP326 Undercarriage Appraisal Manual.)
6. Repair or replace parts as necessary.
7. Install track roller and tighten cap screws.

#### Specification

Roller-to-Frame Cap

Screw—Torque..... 460 N·m (340 lb-ft)

8. Perform Check and Adjust Track Sag. (Operator's Manual.)



A—Cap Screw (4 used)

B—Track Roller

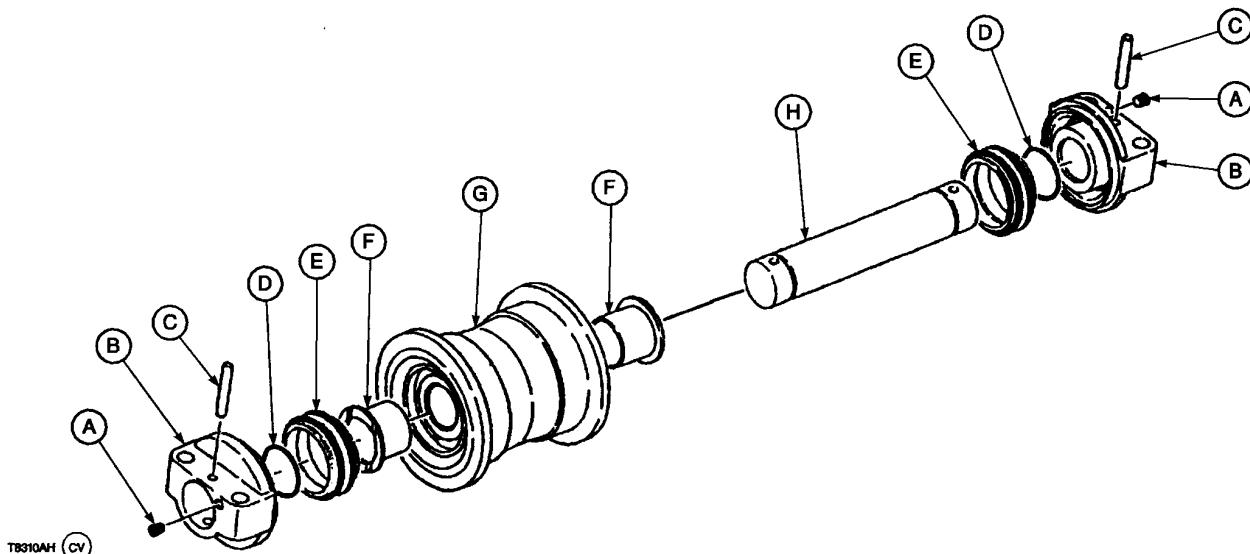
Continued on next page

OUOE049,0000063 -19-15APR02-2/4

T7396DZ—UN—28NOV90

T6585TN—UN—25OCT88

## Disassemble and Assemble Track Roller



TB310AH —UN—21SEP94

A—Plug (2 used)  
B—Bracket (2 used)

C—Pin (2 used)  
D—O-Ring (2 used)

E—Metal Face Seal (2 used)  
F—Bushing (2 used)

G—Roller  
H—Axe

1. Remove plug (A) and drain oil.
2. Remove pin (C).
3. Remove bracket (B) using a bearing puller attachment and adapters from puller set.

**IMPORTANT:** Metal face seals can be reused if they are not worn or damaged. A used seal must be kept together as a set because of wear patterns on seal ring face.

4. Remove metal face seal (E) from roller and bracket. Keep seal rings together as a matched set with seal ring faces together to protect surfaces.
5. Inspect metal face seals. See Metal Face Seal Inspect. (Group 0130.) For seals that will be reused, put a piece of cardboard between seal rings to protect seal face.

6. Remove axle (H) from roller.

*NOTE: Only remove bushing if replacement is necessary.*

7. Remove bushing (F) using a 2 jaw puller and adapters from puller set.
8. Repair or replace parts as necessary.
9. Apply a thin film of oil to bushings (F) and install.

**IMPORTANT:** O-rings and seat surfaces for O-rings must be clean, dry, and oil free so O-rings do not slip when roller is turning.

10. Thoroughly clean O-rings and seat surfaces in brackets (B) and in seal rings using volatile, non-petroleum base solvent and lint-free tissues.
11. Install seals (E) in brackets (B) and in roller (G). Apply equal pressure with fingers at four equally spaced points on seal face. Seal must "pop" down into place so O-ring is tight against seal bore. A volatile, non-petroleum base solvent or talcum powder may be used as a lubricant.
12. Wipe finger prints and foreign material off seal ring face using clean oil and lint-free tissues. Apply a thin film of oil to each seal ring face.
13. Apply a thin layer of anti-seize lubricant or equivalent to pin (C). Install pin even with flat surface of bracket.
14. Install axle to bracket.
15. Apply a thin layer of anti-seize lubricant or equivalent to pin (C). Install pin even with flat surface of bracket.
16. Fill track roller with oil. Use SAE 30 oil meeting API Service GL-5 (MIL-L-2105E).

**Specification**

Track Roller—Capacity..... 260 mL (8.8 oz)

17. Clean threads of plug using clean and cure primer. Apply pipe sealant to threads. Install and tighten plug.

**Specification**

Plug—Torque..... 20 N·m (177 lb-in.)

Continued on next page

OUOE049,0000063 -19-15APR02-3/4

**Test Track Roller for Oil Leakage**

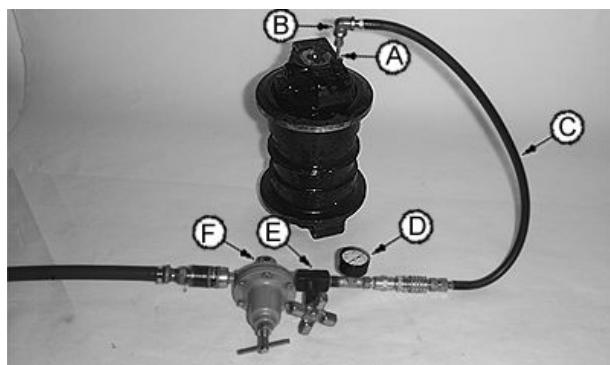
1. Hold the shaft and turn shell several turns to seat metal face seals.
2. Remove the plug.
3. Install parts (A—F). Plug, barbed adapter and connector are from a leak detector kit such as the D05361ST Rubber Stopper/Leak Detector Kit.
4. Holding plug so it is not pushed out, slowly pressurize oil cavity using air.

**Specification**

Oil Cavity Air

Test—Pressure..... $110 \pm 18 \text{ kPa}$  ( $1.1 \pm 0.3 \text{ bar}$ ) ( $16 \pm 4 \text{ psi}$ )

5. Close valve and wait for a minimum of 30 seconds. Check for oil leakage. Check gauge to see if air pressure has decreased.
6. If there is leakage, disassemble roller and replace parts as necessary.
7. Apply cure primer and pipe sealant to threads. Install plug.



T109691B—JUN—02JUN97

**A**—Plug, Barbed Adapter and Connector  
**B**—JT03001 Tee Fitting 7/16-20 M 37° x 7/16-20 F 37° SW x 7/16-20 M 37°  
**C**—Hose (2 used)  
**D**—Pressure Gauge  
**E**—Snubber (Needle) Valve  
**F**—Air Pressure Regulator

OUOE049,0000063 -19-15APR02-4/4

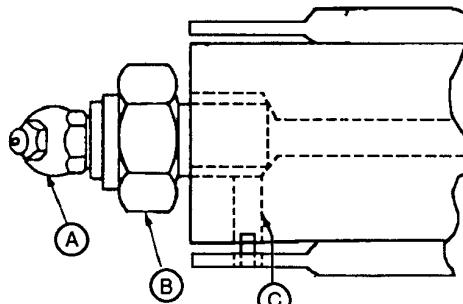
**Track Carrier Roller Repair****Remove and Install Track Carrier Roller**

**⚠ CAUTION:** Prevent possible injury from high pressure grease. Do not remove grease fitting (A) from valve (B).

1. Loosen valve (B) one to two turns to release grease through bleed hole (C).
2. Raise track link, using a jack, enough to permit carrier roller removal.

**⚠ CAUTION:** Prevent accidental lowering of track by securely supporting track before attempting service procedure.

3. Install wood blocks between track link and frame.



**A**—Grease Fitting  
**B**—Valve

**C**—Bleed Hole

T7396DZ—JUN—28NOV90

Continued on next page

CED,TX08227,2889 -19-15APR02-1/4

**⚠ CAUTION: Heavy component; use a hoist.**

**Specification**

Track Roller—Weight..... 18 kg (40 lb) approximate

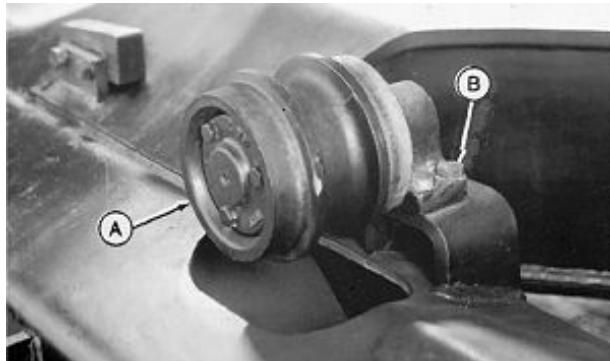
4. Remove cap screws (B) and carrier roller (A).
5. Measure track carrier roller tread diameter. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Carrier Roller Tread Diameter. (SP326 Undercarriage Appraisal Manual.)
6. Repair or replace parts as necessary.
7. Install carrier roller and tighten cap screws (B).

**Specification**

Roller-to-Frame Cap

Screw—Torque..... 270 N·m (200 lb-ft)

8. Perform Check and Adjust Track Sag. (Operator's Manual.)

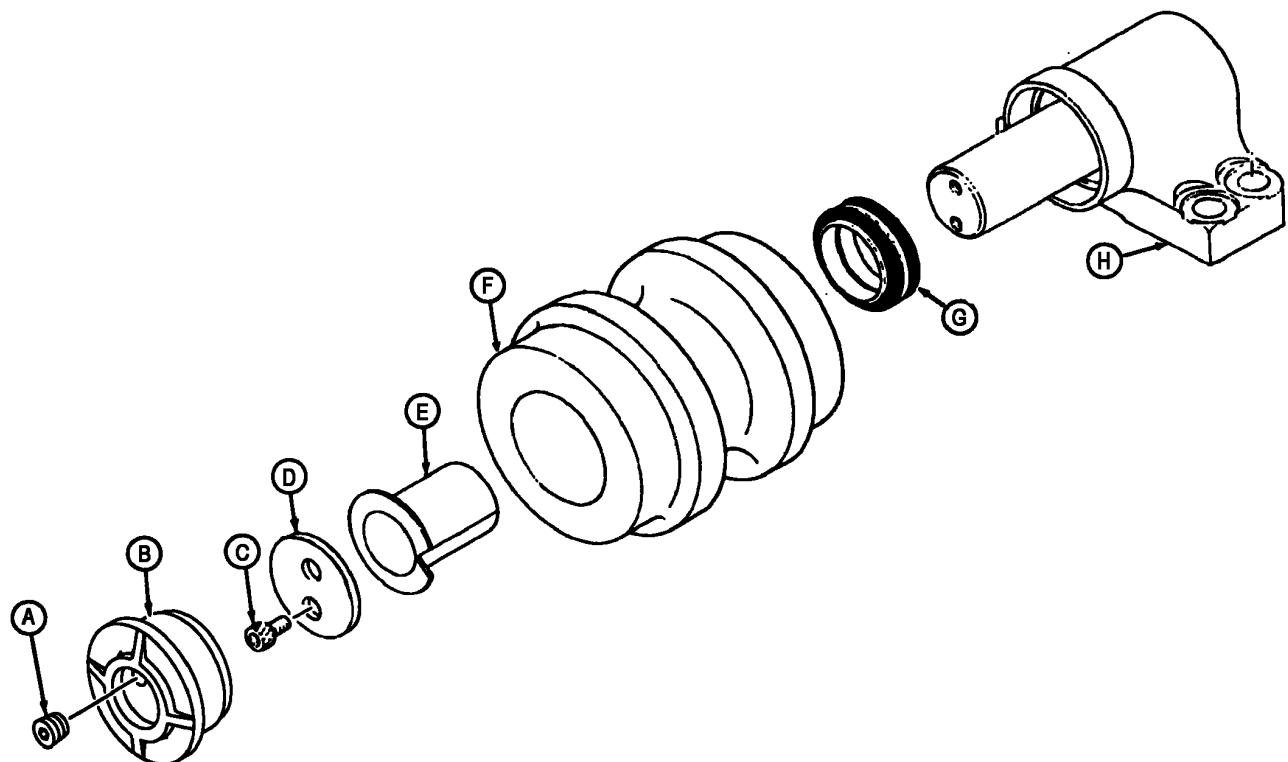


T6557DK -UN-25OCT88

Continued on next page

CED,TX08227,2889 -19-15APR02-2/4

## Disassemble and Assemble Track Carrier Roller



T114725

A—Plug  
 B—Cover  
 C—Cap Screw (2 used)

D—Thrust Washer  
 E—Bushing

F—Roller  
 G—Metal Face Seal

H—Support

1. Remove plug (A) and drain oil.
2. Remove cap screws (C) through oil plug drain hole.
3. Remove roller (F) from support (H).

**IMPORTANT:** Replace entire roller assembly if bushing (E) and shaft surfaces are damaged. Bushing (E) is no longer serviceable because cover (B) cannot be removed.

4. Inspect bushing (E) and shaft on support (H).

**IMPORTANT:** Metal face seals can be reused if they are not worn or damaged. A used seal must be kept together as a set because of wear patterns on seal ring face.

5. Remove metal face seal (G).

T114725—UN—30APR98

Continued on next page

CED,TX08227,2889 -19-15APR02-3/4

6. Inspect metal face seal. See Metal Face Seal Inspect. (Group 0130.) For seals that will be reused, put a piece of cardboard between seal rings to protect seal face.
7. Replace parts as necessary.

**IMPORTANT: O-rings may slip when roller is turning if O-rings and seat surfaces are not clean, dry and oil free.**

8. Thoroughly clean the O-rings and seat surfaces in roller, support, and seal bushings using a volatile, non-petroleum base solvent and lint-free tissue.
9. Install O-ring on seal rings.

*NOTE: Current carrier roller metal face seals use a tapered fit. There is no longer the "pop" into place fit previously used.*

*A volatile, non-petroleum base solvent or talcum powder may be used as a lubricant.*

10. Install one half of metal face seal into support (H).
11. Apply a thin coat of oil to the metal faces on each half of the seal.
12. Install the other half of metal face seal on the half already in place in support (H).
13. Install roller (F) over shaft on support (H) being sure to keep cap screws (C) in alignment with holes on shaft.
14. Tighten cap screws (C).
15. Fill carrier roller with oil through plug (A) hole. Use SAE 30 oil meeting API Service GL-5 (MIL-L-2105E).

#### Specification

Carrier Roller—Capacity..... 70 mL (2.4 oz)

16. Clean threads of plug using clean and cure primer. Apply pipe sealant to threads. Install plug.

CED.TX08227.2889 -19-15APR02-4/4

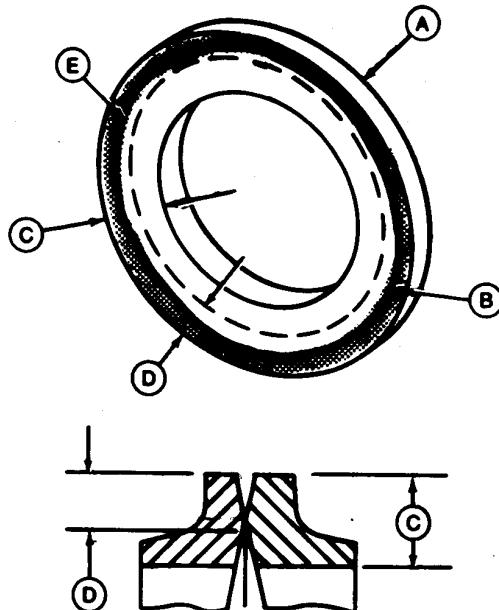
### Metal Face Seal Inspect

1. Inspect for the following conditions to determine if seals can be reused:
  - a. The narrow, highly polished sealing area (E) must be in the outer half of seal ring face (D).
  - b. Sealing area must be uniform and concentric with the ID and OD of seal ring (A).
  - c. Sealing area must not be chipped, nicked, or scratched.

A—Seal Ring

B—Worn Area (Shaded Area)  
C—Seal Ring Face

D—Outer Half of Seal Ring Face  
E—Sealing Area (Dark Line)



T85079—UN—24AUG93

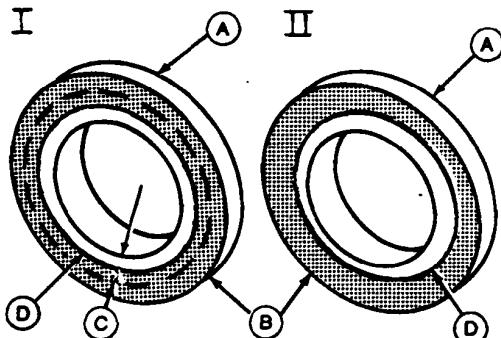
Continued on next page

TX19495,0000005 -19-02OCT02-1/3

## Track System

2. Illustration shows examples of worn seal rings (A).  
 I—Sealing area (D) is in inner half of seal ring face (C).  
 II—Sealing area (D) not concentric with ID and OD of seal ring.

**A**—Seal Ring      **C**—Inner Half of Seal Ring Face  
**B**—Worn area (Shaded Area)      **D**—Sealing Area (Dark Line)

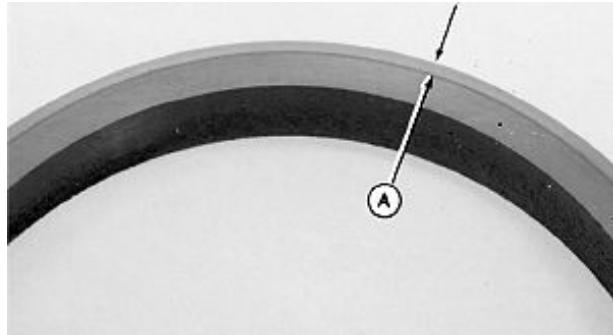


T85080—UN—05DEC96

TX19495,0000005 -19-02OCT02-2/3

3. Clean reusable seals by removing all foreign material from seal rings, except seal face (A), using a scraper or a stiff bristled fiber brush.  
 4. Wash seal rings and O-rings using a volatile, non-petroleum base solvent to remove all oil. Thoroughly dry parts using a lint-free tissue.  
 Apply a thin film of oil to seal ring face. Put face of seal rings together and hold using tape.

**A**—Seal Face



T82840—UN—23FEB89

TX19495,0000005 -19-02OCT02-3/3

### Track Shoe Remove and Install

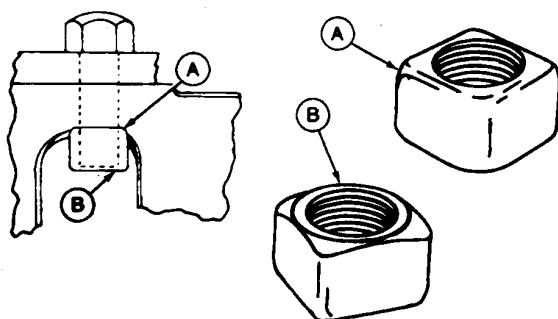
- Measure grouser height. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Three Bar Grouser Height. (SP326 Undercarriage Appraisal Manual.)
- Apply a light coat of oil to cap screw threads and install shoe.
- Install all track shoe nuts with rounded corners (A) against the link and chamfered edges (B) away from the link. Be sure nut is properly positioned in the link so there is full contact between the nut and the link.
- Tighten cap screws in pattern shown.

#### Specification

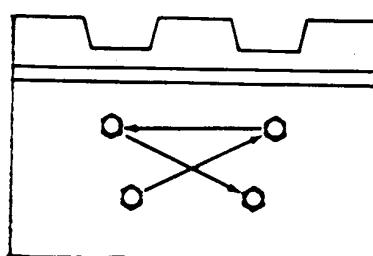
Shoe-to-Link Cap  
 Screw—Torque.....210 N·m (155 lb-ft) plus 1/2 (180°) turn

**A**—Rounded Edge

**B**—Chamfered Edge



T6794AM—UN—23FEB89



T6352AH—UN—23FEB89

TX19495,0000006 -19-02OCT02-1/1

## Track Chain Repair

### Remove and Install Track Chain

1. Swing upperstructure to side. Lower boom to raise track off the ground.

Keep the angle between boom and arm at 90—110° with the round side of bucket on the ground.

**⚠ CAUTION:** Prevent possible injury from unexpected machine movement. Put blocks or shop stands under machine frame to support machine while measuring track sag.

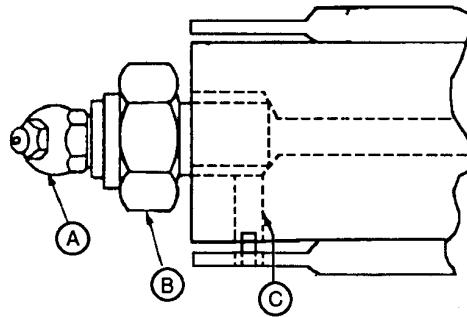
#### Specification

Machine—Weight..... 15 875 kg (35,000 lb) approximate

2. Place blocks or shop stands under the machine to support machine.

**⚠ CAUTION:** Prevent possible injury from high pressure grease. Do not remove grease fitting (A) from valve (B).

3. Loosen valve (B) one to two turns to release grease through bleed hole (C).



T7396DZ -UN-28NOV90

Continued on next page

TX,01,VV2526 -19-16APR02-1/4

**NOTE:** Disconnect track chain at the end of track frame where the work is to be done.

4. Move track chain so master pin (A) is over front idler or sprocket.
5. Remove the track shoe on each side of master pin.
6. Remove snap ring (G).
7. If removing chain at idler, put wood blocks in front of idler and under chain so chain does not fall when master pin is removed.
8. Remove master pin using a 50-Ton Master Pin Pusher Installer. Remove bushings (1).

**CAUTION: Heavy component; use a hoist.**

**Specification**

Track With 600 mm (24

in.) Shoes—Weight..... 889 kg (1,960 lb) approximate

Track With 700 mm (28

in.) Shoes—Weight..... 1006 kg (2,220 lb) approximate

9. Remove track chain.

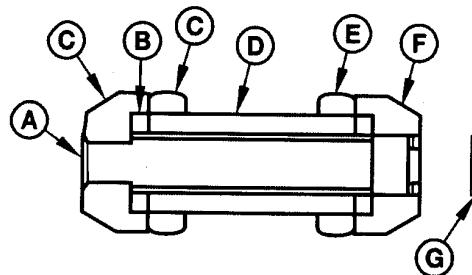
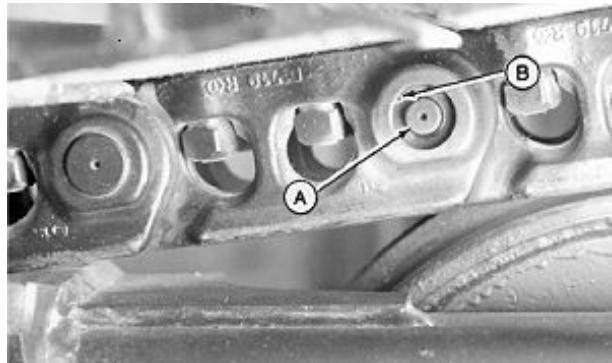
10. Measure track chain link, bushing, and pitch. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Link Height. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Bushing Outer Diameter. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Chain Pitch—190.0 mm (7.48 in.). (SP326 Undercarriage Appraisal Manual.)

11. Repair or replace parts as necessary.

12. Position track chain so section on ground has pin boss on links toward rear of machine.

13. Install end of chain on sprocket and slowly turn sprocket in forward direction to pull chain across top of frame to front idler.

14. Pull ends of chain together. Install bushings and master pin (2) using 50-Ton Master Pin Pusher Installer from snap ring side of track. Install snap ring.



**T7945AA CV**

A—Master Pin  
B—Spacer (2 used)  
C—Link  
D—Master Bushing

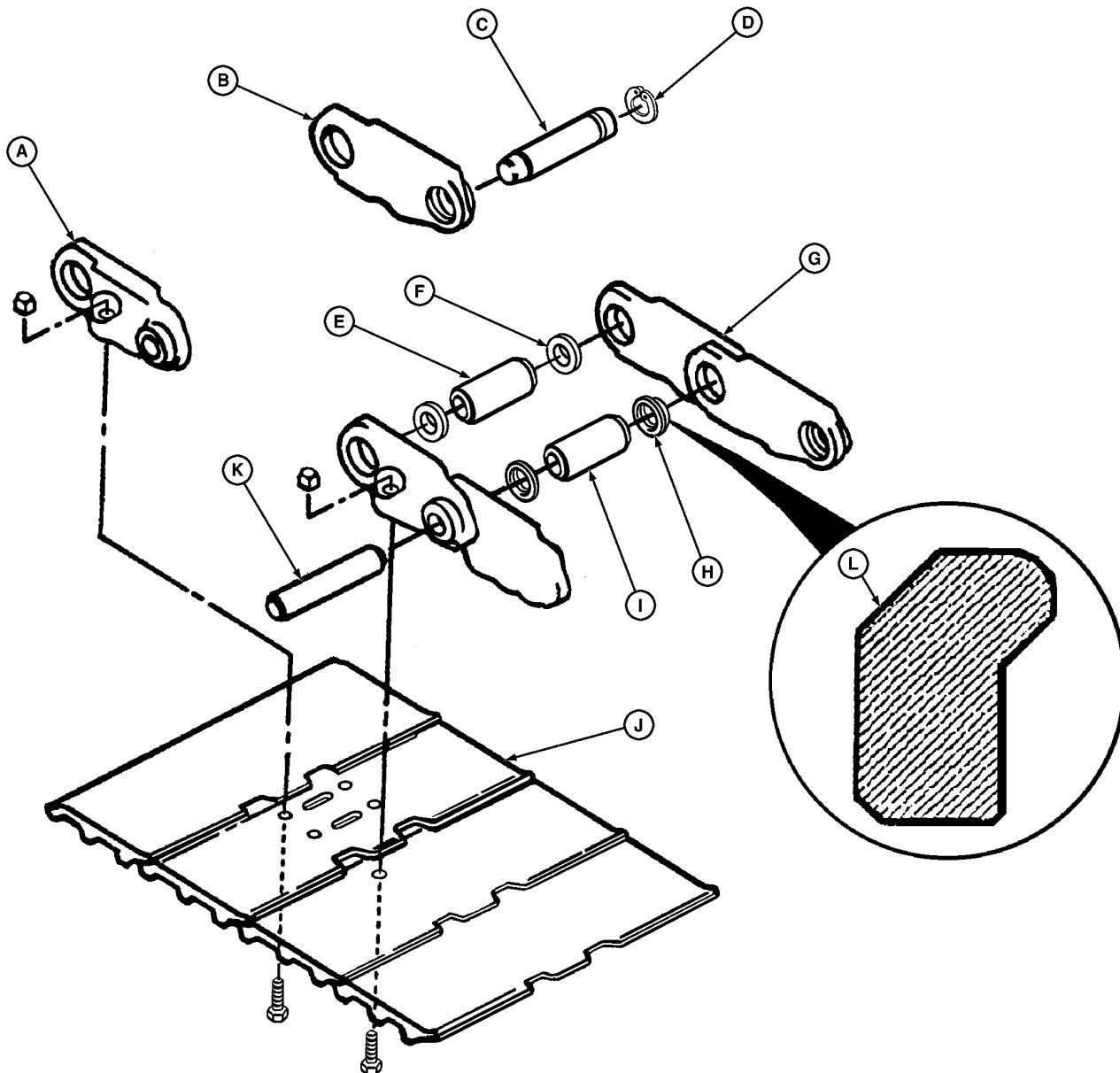
E—Link  
F—Master Link  
G—Snap Ring

15. Install track shoe. See Track Shoe Remove and Install. (Group 0130.)
16. Check and Adjust Track Sag. (Operator's Manual.)

Continued on next page

TX.01,VV2526 -19-16APR02-2/4

## Disassemble and Assemble Track Chain



T117027—UN—09SEP98

T117027

A—Track Link (43 used)  
 B—Master Track Link  
 C—Master Pin

D—Snap Ring  
 E—Master Bushing  
 F—Spacer (2 used)  
 G—Track Link (42 used)

H—Seal (84 used)  
 I—Bushing (42 used)  
 J—Shoe (43 used)

K—Pin (42 used)

- Measure track components (A—K). See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Link Height. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Bushing Outer Diameter. See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Chain Pitch—190.0 mm (7.48 in.). See 160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Three Bar Grouser Height. (SP326 Undercarriage Appraisal Manual.)

*NOTE: Wear on pins and bushings does not extend over the entire surface. Turning pins and bushing is determined by the amount of wear.*

- Turn pins (C and K) and bushings (E and I) as required.
- Clean any dust or rust from the surfaces of track link pin bores and counterbores and the ends of bushings.

Continued on next page

TX.01.VV2526 -19-16APR02-3/4

## Track System

4. Apply grease to the counterbore in track links, the seals, and the ends of bushings.
5. For each joint, fill the clearance between the pin OD and bushing ID with grease.
6. Install seal (H) so tapered side (L) is toward bushing.

TX,01,VV2526 -19-16APR02-4/4

### Broken Track Chain Repair

#### Disassemble and Assemble Track Chain to Replace Broken Part

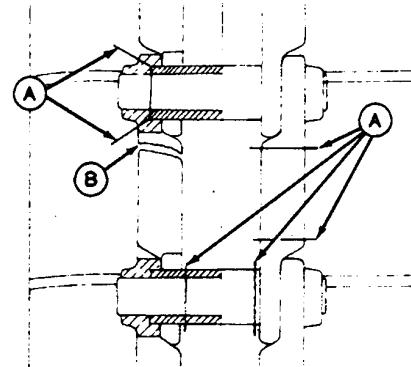
1. Remove track shoes from each side of broken link assembly. See Track Shoe Remove and Install. (Group 0130.)

**IMPORTANT: When making cuts using cutting torch, be careful not to cut or gouge good parts.**

2. Cut links, bushing, and pin at points (A) to remove broken link (B).

A—Cut Locations

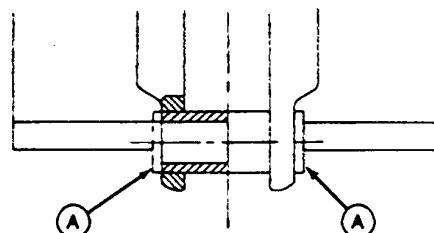
B—Broken Link



T5821AG—UN—26OCT88

3. Grind the ends of bushing (A) even with links to make it into a master bushing.

A—Bushing

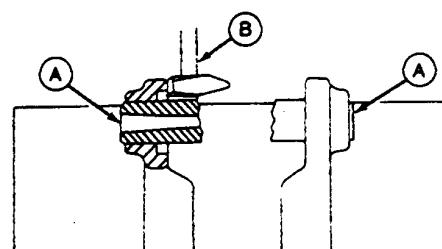


T5821AH—UN—26OCT88

4. Burn holes through center of pin stubs (A).
5. Hold a heavy hammer (B) against the link while pin stub is being driven out.

A—Pin Stub

B—Hammer



T5821AI—UN—26OCT88

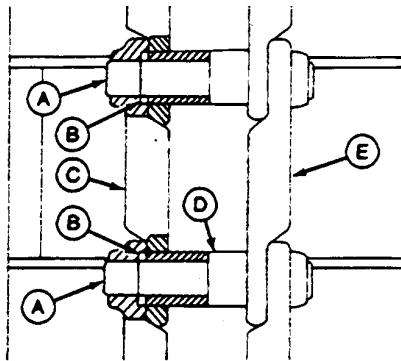
Continued on next page

TX,01,VV2529 -19-16APR02-3/4

6. Install links (C and E) on master bushing (D). Check cap screw hole spacing using a track shoe.
7. Instal spacers (B) into counterbore of links.
8. Install link assembly. Install master pins (A).
9. Install track shoes. See Track Shoe Remove and Install. (Group 0130.)

A—Master Pin  
B—Spacer  
C—Right Link

D—Master Bushing  
E—Left Link



T5821AJ—UN—24MAY89

TX,01,VV2529 -19-16APR02-4/4

## Sprocket Remove and Install

**IMPORTANT:** Sprocket must be replaced when the tooth tips become excessively rounded, worn, or chipped to prevent excessive wear to chain. If machine driven in one direction a majority of the time, wear will be on one side of teeth. To extend service life, change sprockets from one side of machine to the other.

1. Disconnect track chain. See Track Chain Repair. (Group 0130.)
2. Lift side of machine so sprocket teeth clear chain.

**CAUTION: Heavy component; use a hoist.**

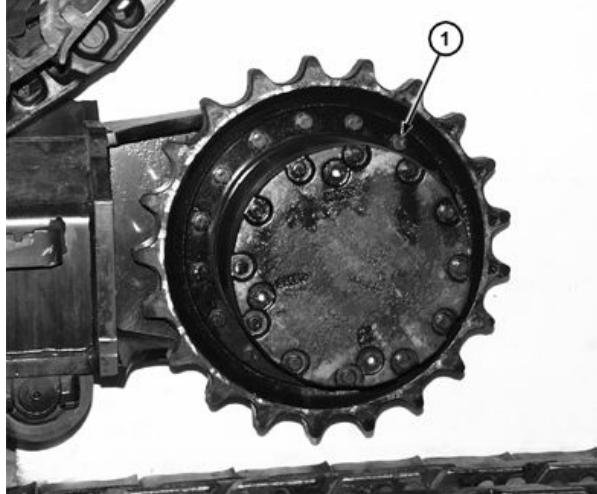
### Specification

Sprocket—Weight  
(approximate).....50 kg (110 lb)

3. Remove cap screws (1) and sprocket.
4. Apply cure primer and thread lock and sealer (high strength) to threads of cap screws (B).
5. Install sprocket and cap screws (1).

### Specification

Sprocket-to-Propel  
Gearbox Cap  
Screw—Torque.....460 N·m (340 lb-ft)



T145912B—UN—01FEB02

1—Cap Screw (16 used)

6. Lower machine.
7. Install track chain. See Track Chain Repair. (Group 0130.)

TX19495,0000007 -19-02OCT02-1/1

## Front Idler Repair

### Remove and Install Front Idler

1. Disconnect track chain. [See Track Chain Repair.](#) (Group 0130.)
2. Slide front idler (A) forward, using pry bar.

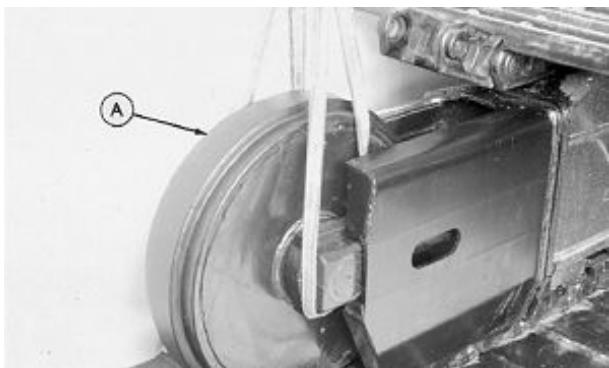


**CAUTION: Heavy component; use a hoist.**

#### Specification

Front Idler—Weight.....116 kg (255 lb) approximate

3. Attach front idler to hoist and remove from frame.
4. Measure front idler wear. See [160CLC, 200CLC, 230CLC, 2054, and 2554-Standard Front Idler Flange Height.](#) (SP326 Undercarriage Appraisal Manual.)
5. Repair or replace parts as necessary.
6. Install front idler.
7. Connect track chain. [See Track Chain Repair.](#) (Group 0130.)



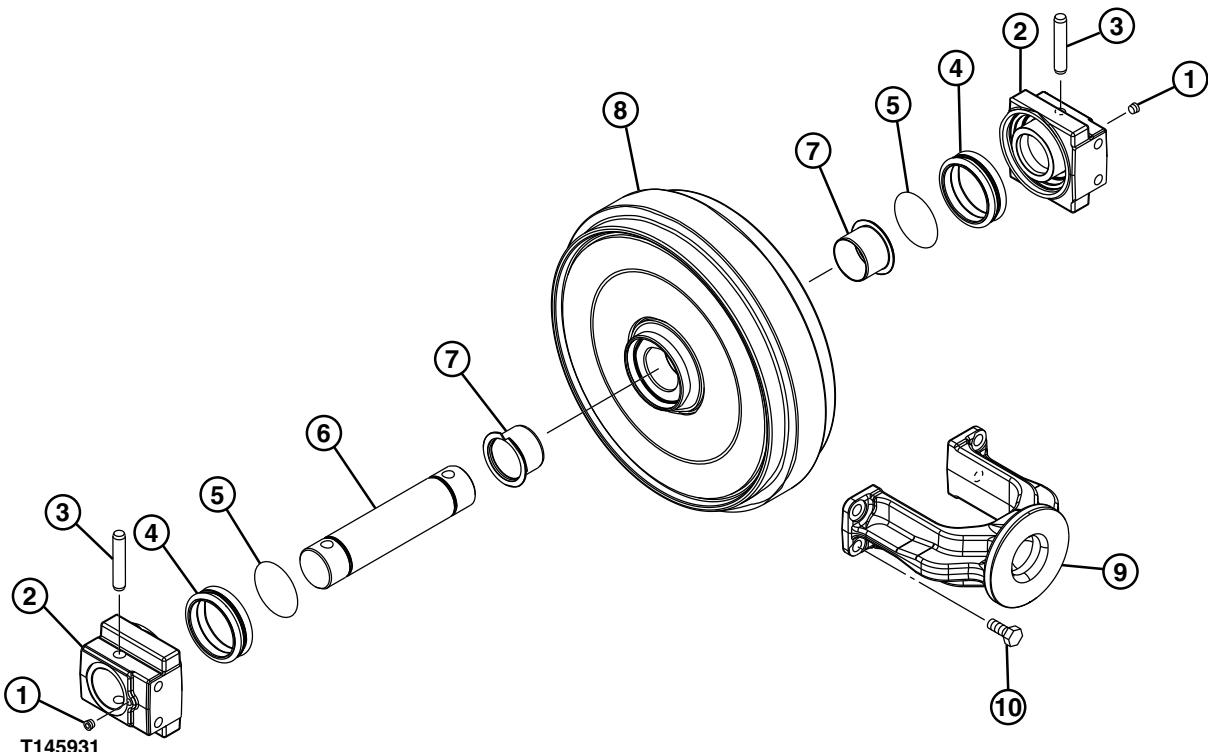
A—Front Idler

Continued on next page

TX,01,VV2533 -19-16APR02-1/4

T6876BU-JN-25OCT88

## Disassemble and Assemble Front Idler



T145931 -UN-01FB02

Front Idler, Exploded View

1—Plug (2 used)  
2—Bracket (Bearing) (2 used)

3—Pin (2 used)  
4—Metal Face Seal (2 used)  
5—O-Ring (2 used)

6—Axle  
7—Bushing (2 used)  
8—Idler  
9—Yoke

10—Cap Screw (4 used)

1. Remove cap screws (10) and yoke (9).

2. Remove drain plugs (1) and drain oil.

**IMPORTANT:** Metal face seals can be reused if they are not worn or damaged. A used seal must be kept together as a set because of wear patterns on seal ring face.

3. Remove pins (3), brackets (2), O-rings (5) and metal face seals (4).

4. Inspect metal face seals. See Metal Face Seal Inspect. (Group 0130.) Keep seal rings together as a matched set with seal ring faces together to protect surfaces.

5. Remove axle (6). Inspect axle and bushing for scoring or excessive wear.

*NOTE: Remove bushings only if replacement is necessary.*

6. Remove bushing using a 2-jaw puller and adapters from 17-1/2 and 30-ton puller set.

7. Replace parts as necessary.

8. Apply a thin film of oil to bushings (7). Install bushings so flange is tight against shoulder of idler.

9. Install O-rings (5) on axle.

10. Apply a thin layer of NEVER-SEEZ® anti-seize lubricant or equivalent to end of axle from O-ring to end of axle and to bore in bracket (2).

11. Install axle into bracket.

12. Apply NEVER-SEEZ® anti-seize lubricant or equivalent to pin (3). Install pin.

**IMPORTANT:** Metal face seal O-rings and seat surfaces for O-rings must be clean, dry, and oil free so O-rings do not slip when idler is turning.

13. Thoroughly clean the metal face seal (4) O-rings and seat surfaces in idler, brackets, and seal rings using volatile, non-petroleum base solvent and lint-free tissues.

14. Install metal face seal O-ring on seal rings.

*NOTE: A volatile, non-petroleum base solvent or talcum powder may be used as a lubricant.*

15. Install metal face seals (4) in bracket and idler. Apply equal pressure with fingers at four equally spaced points on seal face. Seal must "pop" down into place so O-ring is tight against seal bore.
16. Wipe finger prints and foreign material off seal ring face using clean oil and lint-free tissues. Apply a thin film of oil to each seal face.
17. Fill front idler with oil. Use SAE 30 oil meeting API Service GL-5 (MIL-L-2105E).

**Specification**

Front Idler—Capacity.....265 mL (9.0 oz)

*NEVER-SEEZ is a trademark of Emhart Chemical Group.*

18. Install axle (6) into idler.
19. Apply cure primer to threads of drain plug (1).
20. Apply thread lock and sealer (medium strength) to threads of plug. Install and tighten plug.
21. Install yoke (9). Tighten cap screws (10).

**Specification**

Yoke-to-Bracket Cap Screw—Torque.....	210 N·m (156 lb·ft)
---------------------------------------	---------------------

TX,01,VV2533 -19-16APR02-3/4

**Test Front Idler for Oil Leakage**

1. Turn the shaft several turns to seat metal face seals.
2. Remove the plug (G).
3. Install parts (A—F) as shown. Plug barbed adapter, and connector are from a leak detector kit such as the D05361ST Rubber Stopper/Leak Detector Kit.
4. Holding plug so it is not pushed out, slowly pressurize oil cavity using air.

**Specification**

Oil Cavity Air

Test—Pressure.....110 ± 28 kPa (1.1 ± 0.3 bar) (16 ± 4 psi)

5. Close valve and wait for a minimum of 30 seconds to check for oil leakage. Check gauge to see if air pressure has decreased.
6. If there is external leakage, disassemble idler and replace parts as necessary.
7. Check oil level in idler. If the oil level is down and there is no external leakage, check for a leak from oil cavity to interior of idler wheel.
8. Clean threads of plug using cure primer.
9. Apply thread lock and sealer (medium strength) to threads of plug. Install and tighten plug.

A—Plug, Adapter and Connector

B—Connector 1/8 M NPT x 7/16-20 M 37°

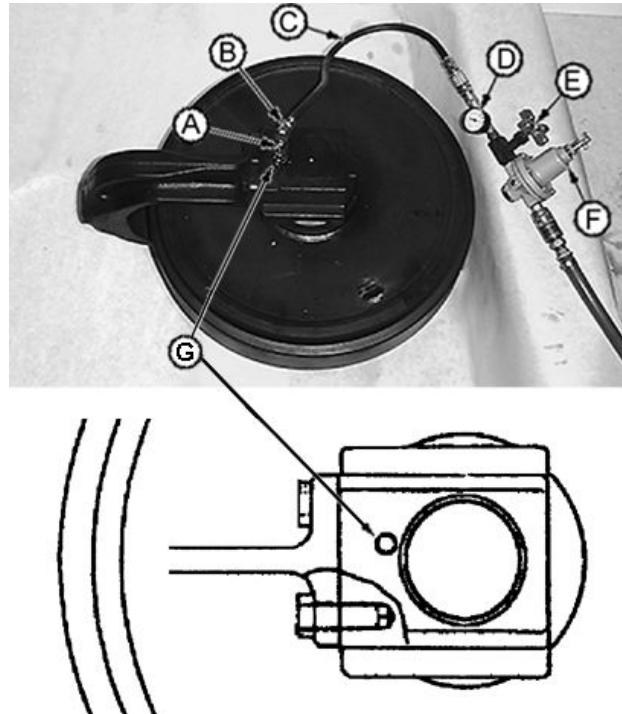
C—Hose

D—Pressure Gauge

E—Snubber (Needle) Valve

F—Air Pressure Regulator

G—Drain Plug



T109791B

T109791B—JUN—13JUN97

TX,01,VV2533 -19-16APR02-4/4

## Track Adjuster and Recoil Spring Repair

### Remove and Install Track Adjuster and Recoil Spring

1. Remove track chain. [See Track Chain Repair](#). (Group 0130.)
2. Remove front idler. [See Front Idler Repair](#). (Group 0130.)

**⚠ CAUTION:** Spring or rod may break if dropped while handling, transporting or disassembling. Nicks or weld craters in spring and rod assembly can cause stress concentration resulting in a weak spot. Weak spots may result in immediate or eventual failure creating a risk of personal injury. Place a heavy protective covering around spring assembly when handling, transporting, or disassembling track adjuster.

**A compression tool must be used for disassembly and assembly because of the extreme preload on spring.**

3. Slide track adjuster (A) forward, using a pry bar.

**⚠ CAUTION: Heavy component; use a hoist.**

#### Specification

Track Adjuster  
Cylinder and Recoil  
Spring—Weight..... 102 kg (225 lb) approximate



T6557CX -UN-25OCT88

A—Track Adjuster

4. Attach track adjuster to hoist and remove from frame.
5. Repair or replace parts as necessary.
6. Install front idler. [See Front Idler Repair](#). (Group 0130.)
7. Install track chain. [See Track Chain Repair](#). (Group 0130.)

Continued on next page

TX,01,VV2537 -19-16APR02-1/5

### Disassemble and Assemble Track Adjuster and Recoil Spring

**CAUTION:** Spring or rod may break if dropped while handling, transporting or disassembling. Nicks or weld craters in spring and rod assembly can cause stress concentration resulting in a weak spot. Weak spots may result in immediate or eventual failure creating a risk of personal injury. Place a heavy protective covering around spring assembly when handling, transporting, or disassembling track adjuster.

A compression tool must be used for disassembly and assembly because of the extreme preload on spring.

**CAUTION:** Heavy component; use a hoist.

#### Specification

Track Recoil Spring

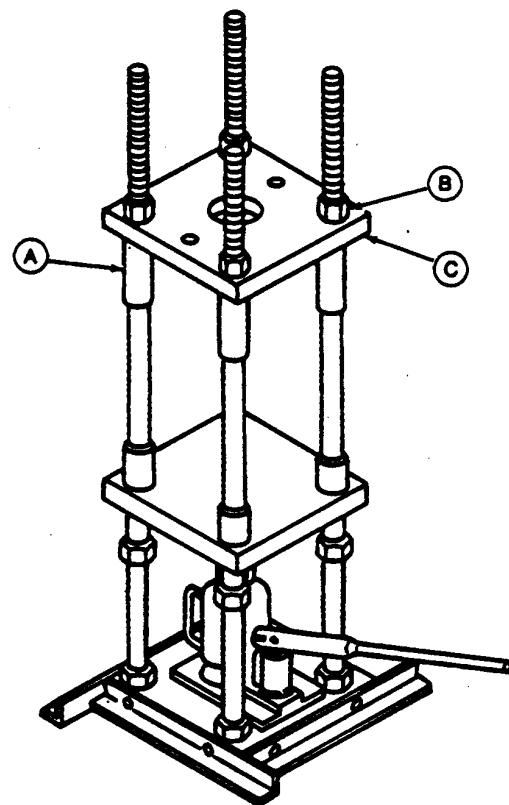
Disassembly and

Assembly Tool—Weight..... 225 kg (496 lb) approximate

1. Place an 18-t (20-ton) jack on bottom of track recoil spring disassembly and assembly tool (A), see ST4920 Track Recoil Spring Disassembly and Assembly Tool. (Group 9900.) Remove nuts (B) and top plate (C).

*NOTE: It is not necessary to remove the recoil spring to replace wear ring and U-ring packing on piston. To replace O-ring in the cylinder, remove recoil spring and rod. See Track Adjuster Cylinder Disassemble and Assemble. (Group 0130.)*

2. Remove nuts (B). Remove top plate (C).



A—ST4920 Track Recoil Spring Disassembly and Assembly Tool  
B—Nut  
C—Top Plate

Continued on next page

TX,01,VV2537 -19-16APR02-2/5

T6557DY—JUN—25OCT88

**CAUTION: Heavy component; use a hoist.**

**Specification**

Track Adjuster

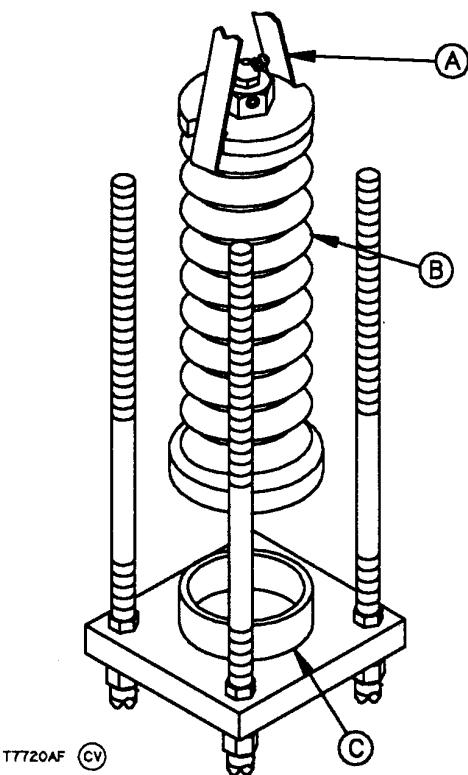
Cylinder and Recoil

Spring—Weight..... 102 kg (225 lb) approximate

3. Connect track adjuster (B) to a hoist using a lifting strap (A).
4. Put track adjuster in assembly tool with cylinder end on spacer (C), see DFT1112 Spacer. (Group 9900.)
5. Remove lifting strap.

A—Lifting Strap  
B—Track Adjuster

C—DFT1112 Spacer



T7720AF -UN-28APR92

Continued on next page

TX,01,VV2537 -19-16APR02-3/5

*Track System*

6. Install Track Recoil Spring Disassembly and Assembly Guard Tool (F), see DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool (Group 9900.)
7. Install plate top (A) and nuts (B) with smallest opening to allow access to nut (D).
8. Extend jack ram to provide enough travel to release spring to the approximate free length.

**Specification**

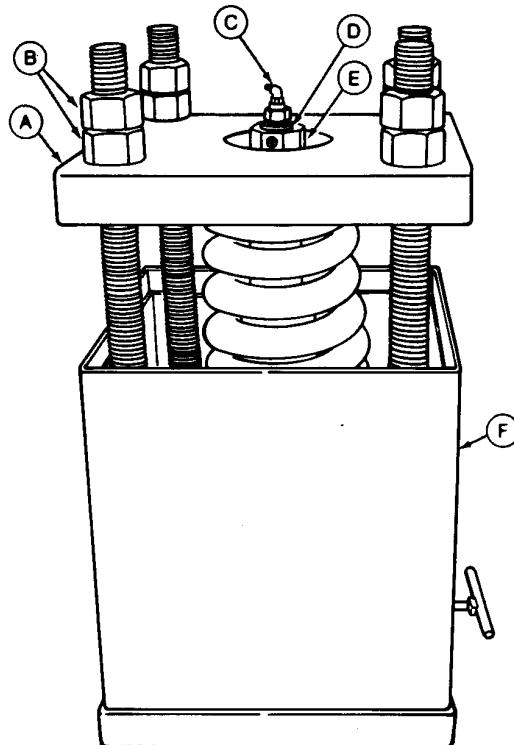
Recoil Spring—Free

Length..... 521 mm (20.5 in.) approximate

9. Tighten nuts (B) so plate is tight against retainer plate.
10. Remove valve (C) and special plug (E).

A—Top Plate  
B—Nut (8 used)  
C—Valve

D—Nut  
E—Special Plug  
F—DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool



T7720AG—JUN—28APR92

Continued on next page

TX,01,VV2537 -19-16APR02-4/5

## Track System

11. Raise upper half of guard tool (F). Tighten T-handles.
12. Operate jack to compress spring just enough so nut (D) can be removed.
13. Lower jack ram to release spring force.
14. Repair or replace parts as necessary.
15. If disassembly of track adjuster cylinder is necessary, See Track Adjuster Cylinder Disassemble and Assemble. (Group 0130.)
16. Put track adjuster cylinder in assembly tool with cylinder end on spacer.
17. Install spacer on rod.
18. Install spring using a hoist and lifting strap.
19. Install retainer plate.
20. Install guard tool.
21. Install top plate. Install nuts.
22. Raise upper half of guard tool. Tighten T-handles.
23. Operate jack to compress spring to the compressed length.

**Specification**

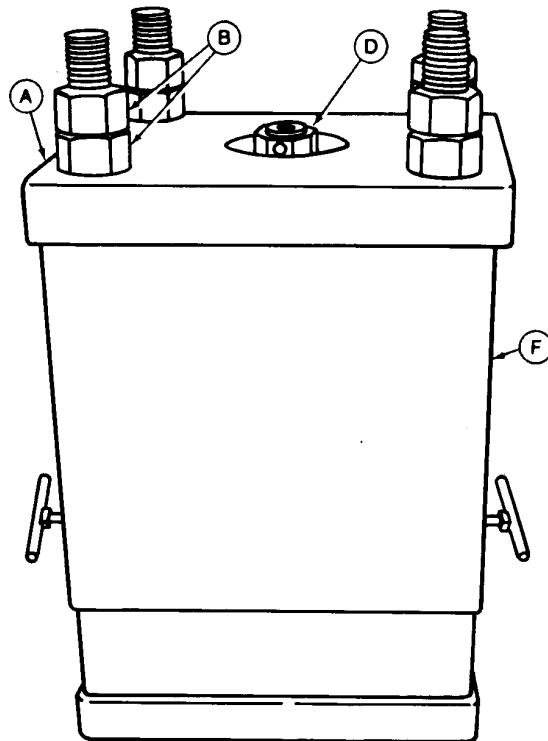
Recoil Spring—Compressed Length..... 424.5 mm (16.7 in.)

24. Install nut (D) so hole is aligned with hole in rod. Install special plug.

25. Tighten valve.

**Specification**

Valve—Torque..... 88 N·m (65 lb-ft)



A—Top Plate  
B—Nut (8 used)

D—Nut  
F—DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool

T7720AH -UN-28APR92

TX,01,VV2537 -19-16APR02-5/5

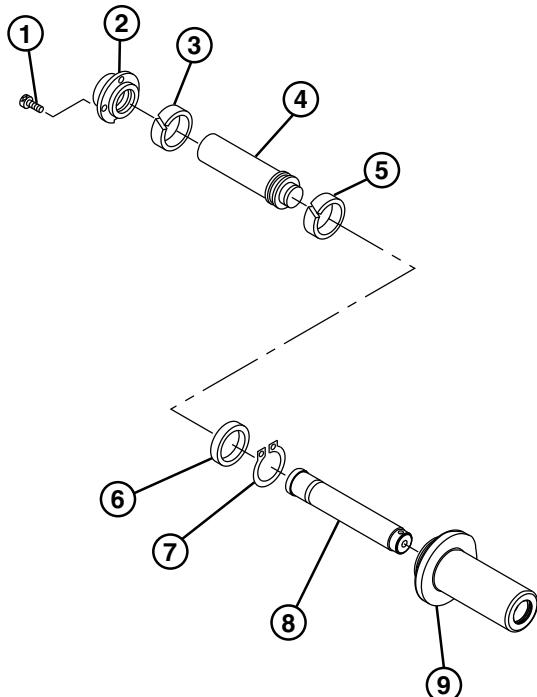
## Track Adjuster Cylinder Disassemble and Assemble

**CAUTION:** Spring or rod may break if dropped while handling, transporting or disassembling. Nicks or weld craters in spring and rod assembly can cause stress concentration resulting in a weak spot. Weak spots can result in immediate or eventual failure of spring or rod creating a risk of personal injury. Place a heavy protective covering around spring assembly when handling, transporting, or disassembling.

A compression tool must be used for disassembly and assembly because of the extreme preload on spring.

*NOTE: It is not necessary to remove the recoil spring to replace wear ring (4) and U-ring packing (5). It is necessary to remove the recoil spring to replace O-ring (8).*

1. Remove recoil spring if necessary. See Track Adjuster and Recoil Spring Repair. (Group 0130.)
2. If necessary, remove rod (8) from cylinder (9) using a press.
3. Repair or replace parts as necessary.
4. Apply multi-purpose grease to U-ring packing (6) and wear rings (3 and 5). Fill grooves inside flange (2) with grease.
5. Install U-ring packing (6) with lip towards inside of cylinder.
6. Tighten cap screws (1).



- |                      |                  |
|----------------------|------------------|
| 1—Cap Screw (3 used) | 6—U-Ring         |
| 2—Flange             | 7—Retaining Ring |
| 3—Wear Ring          | 8—Rod            |
| 4—Piston Rod         | 9—Cylinder       |
| 5—Wear Ring          |                  |

### Specification

Flange-to-Cylinder Cap  
Screw—Torque..... 50 N·m (37 lb-ft)

TX19495.0000008 -19-03OCT02-1/1

T145945—UN—01FEB02

*Track System*

## Section 02

# Axles and Suspension Systems

### Contents

	Page
<b>Group 0250—Axe Shaft, Bearings, and Reduction Gears</b>	
Propel Gearbox Repair.....	02-0250-1
<b>Group 0260—Hydraulic System</b>	
Propel Motor .....	02-0260-1
Start-Up Procedure .....	02-0260-20
Rotary Manifold .....	02-0260-21

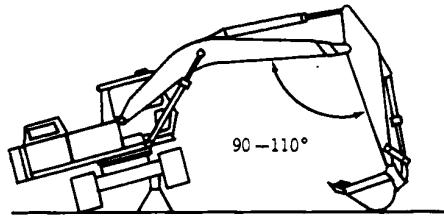
*Contents*

Group 0250  
**Axle Shaft, Bearings, and Reduction Gears**

### Propel Gearbox Repair

#### Remove and Install Propel Gearbox

1. Disconnect track. See Track Chain Repair. (Group 0130.)
2. Swing upperstructure 90° and lower bucket to raise track off the ground. Keep angle between boom and arm 90—110° and position round side of bucket on ground. Put a support stand under the undercarriage.



**⚠ CAUTION:** The hydraulic oil tank is pressurized.  
High pressure release of oil can cause serious burns or penetrating injury.

3. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)

Continued on next page

TX19495.0000009 -19-09OCT02-1/27

T6876FG-JUN-06DEC88

- Remove cap screws (G). Remove propel motor cover (F).

**CAUTION:** To avoid injury from escaping fluid under pressure, stop engine, and relieve the pressure in the system before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

- Disconnect lines (A, B, H, and I) from the propel motor.

**CAUTION: Heavy component; use a hoist.**

**Specification**

Propel Gearbox and  
Motor—Weight..... 230 kg (510 lb) approximate

*NOTE: The propel motor is removed with the propel gearbox because motor housing is part of gearbox. For propel motor repair See Propel Motor Repair. (Group 0260.)*

- Connect propel gearbox and motor (E) to a hoist using lifting straps.
- Remove cap screws (C). Remove propel gearbox and motor (E).
- Repair or replace parts as necessary.
- Install propel gearbox and motor. Tighten cap screws (C).

**Specification**

Propel Motor  
Housing-to-Frame Cap  
Screw—Torque..... 140 N·m (103 lb-ft)

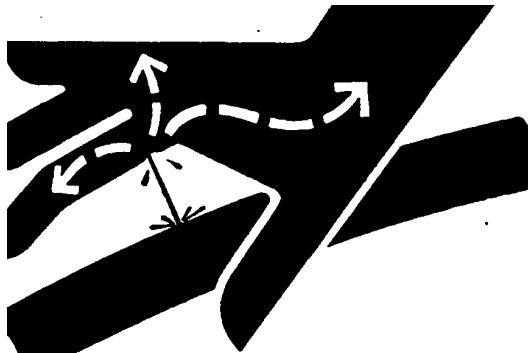
- Connect lines (A, B, H, and I).
- Fill propel gearbox with oil to level check plug hole. See 160CLC Drain and Refill Capacities. (Operator's Manual.)

**IMPORTANT:** Propel motor will be damaged if not filled with oil before starting engine. Procedure must be performed whenever a new propel motor is installed or oil has been drained from the motor.

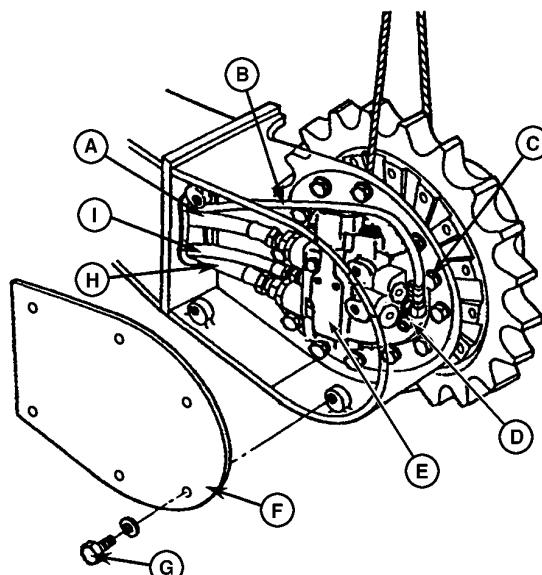
- Perform Propel Motor Start-Up Procedure. (Group 0260.)
- Install propel motor cover (F). Tighten cap screws (G).

**Specification**

Propel Motor  
Cover-to-Frame Cap  
Screw—Torque..... 98 N·m (72 lb-ft)



X9811-UN-23AUG88



T111641-UN-15OCT97

T111641

Right Propel Motor Shown

A—Propel Motor Left Top Port-to-Rotary Manifold	F—Propel Motor Cover
Right Drain Port Line	G—Cap Screw and Washer (6 used)
B—Propel Motor Right Port-to-Rotary Manifold	H—Propel Motor Left Bottom Port-to-Rotary Manifold
Right Speed Change Port Line	I—Propel Motor Left Middle Port-to-Rotary Manifold
C—Cap Screw and Washer (16 used)	Right Forward Port Line
D—Cap Screw (9 used)	E—Propel Gearbox and Motor

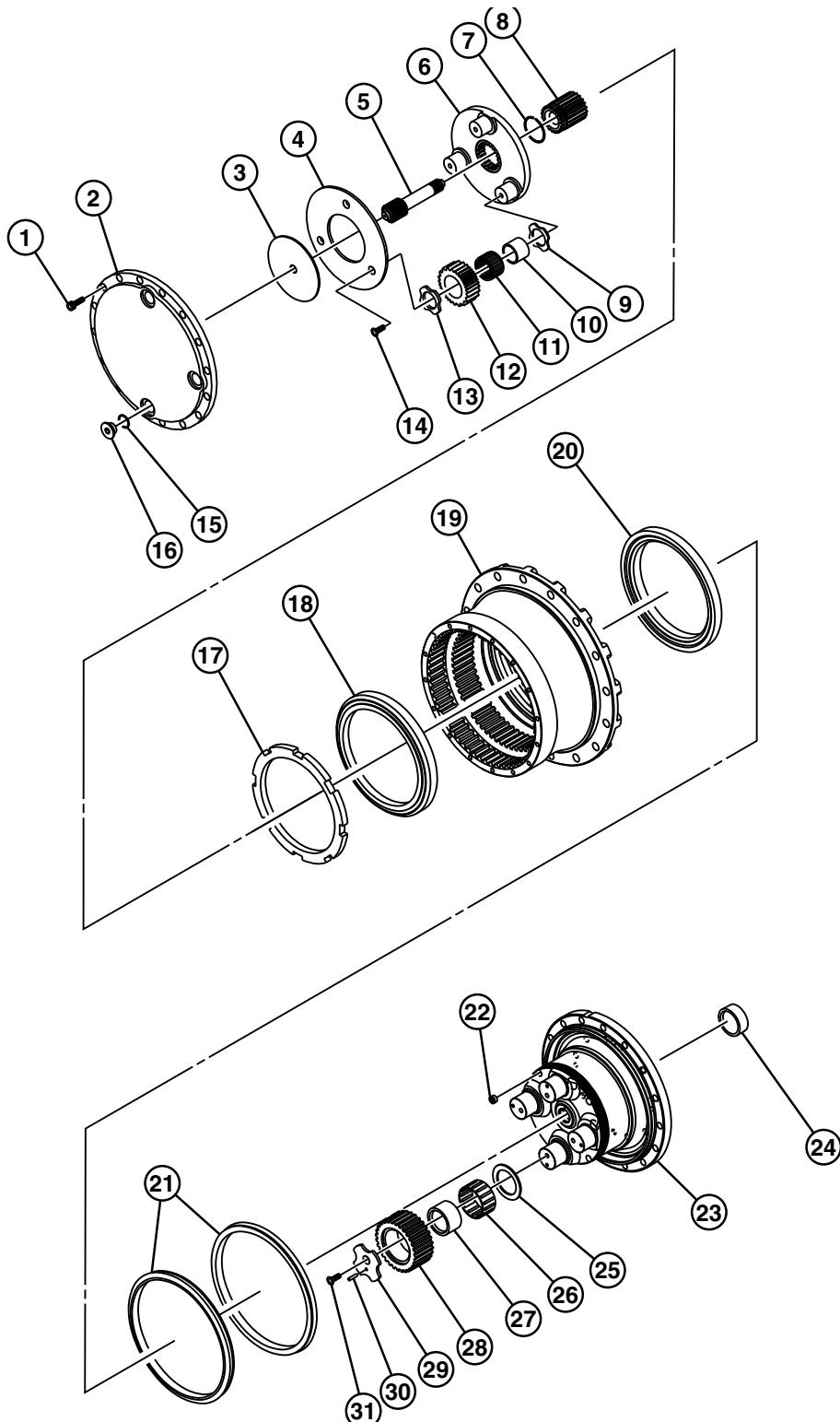
- Connect track. See Track Chain Repair. (Group 0130.)

Continued on next page

TX19495.0000009 -19-09OCT02-2/27

Axle Shaft, Bearings, and Reduction Gears

Disassemble Propel Gearbox



T154206

Propel Gearbox

T154206—UN—19APR02

Continued on next page

TX19495.0000009 -19-09OCT02-3/27

## Axe Shaft, Bearings, and Reduction Gears

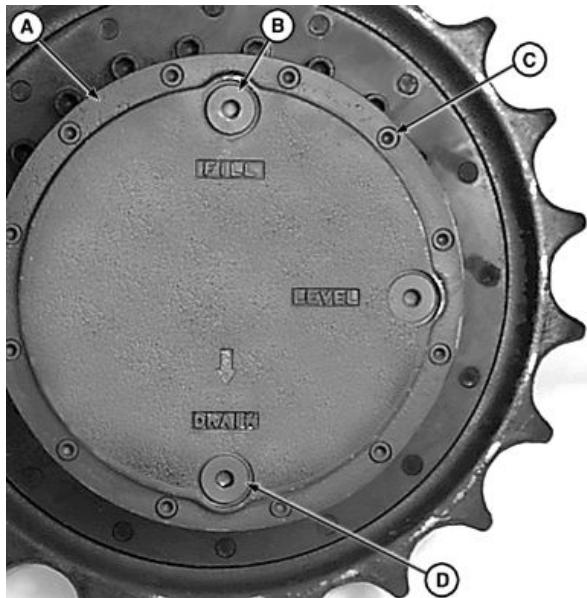
1—Cap Screw (16 used)	10—Inner Bearing Race (3 used)	17—Bearing Nut	26—Needle Bearing (4 used)
2—Cover	11—Needle Bearing (3 used)	18—Bearing (2 used)	27—Inner Bearing Race (4 used)
3—Thrust Plate	12—First Stage Planet Gear (3 used)	19—Ring Gear	28—Second Stage Planet Gear (4 used)
4—Thrust Plate	13—Thrust Washer (3 used)	21—Metal Face Seal	29—Wear Plate (4 used)
5—First Stage Sun Gear	14—Cap Screw (7 used)	22—Plug (4 used)	30—Spring Pin (4 used)
6—First Stage Carrier	15—O-Ring (3 used)	23—Propel Motor Housing and Second Stage Carrier	
7—Snap Ring	16—Plug (3 used)	24—Oil Seal	
8—Second Stage Sun Gear		25—Thrust Washer (4 used)	
9—Thrust Washer (3 used)			

TX19495,0000009 -19-09OCT02-4/27

1. Remove fill plug (B).
2. Remove drain plug (D) and drain gear oil. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Remove cap screws (C).
4. Remove propel gearbox cover (A).

A—Propel Gearbox Cover  
B—Fill Plug

C—Cap Screw (12 used)  
D—Drain Plug



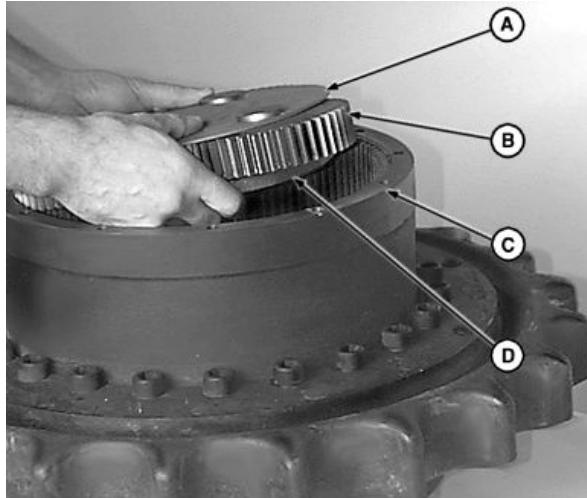
T111824 —UN—22OCT97

TX19495,0000009 -19-09OCT02-5/27

5. Remove thrust plate (A), first stage planet gears (B) and first stage carrier (D) as an assembly.

A—Thrust Plate  
B—First Stage Planet Gear (3 used)

C—Propel Gearbox Housing  
D—First Stage Carrier



T111823 —UN—22OCT97

Continued on next page

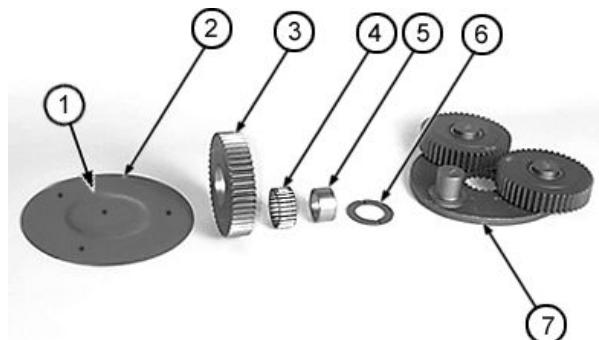
TX19495,0000009 -19-09OCT02-6/27

## Axle Shaft, Bearings, and Reduction Gears

6. Remove parts (1—6) from first stage carrier (7).

1—Thrust Plate  
2—Thrust Plate  
3—Planet Gear  
4—Needle Bearing

5—Inner Bearing Race  
6—Thrust Washer  
7—First Stage Carrier



T160478B—UN—14OCT02

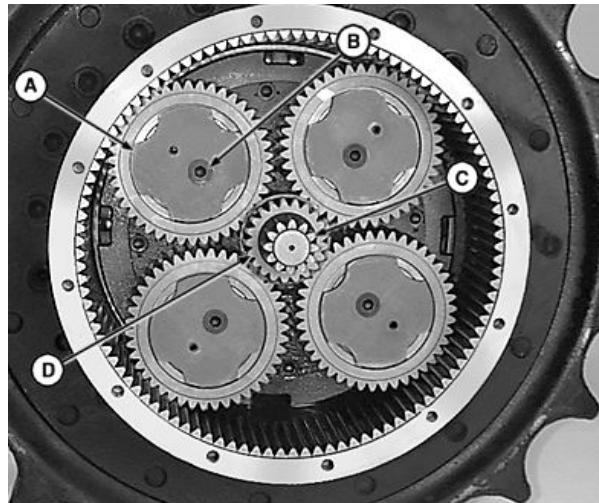
First Stage Carrier Assembly

TX19495,0000009 -19-09OCT02-7/27

7. Remove cap screws (B).
8. Remove wear plate (A).
9. Remove first stage sun gear (C).
10. Remove second stage sun gear (D).

A—Wear Plate (4 used)  
B—Cap Screw (4 used)

C—First Stage Sun Gear  
D—Second Stage Sun Gear



T11822—UN—28OCT97

Continued on next page

TX19495,0000009 -19-09OCT02-8/27

*Axle Shaft, Bearings, and Reduction Gears*

11. Remove parts (B—E) from second stage carrier (A).

12. Remove spring pins (F) only if replacement is necessary.

A—Second Stage Carrier

B—Thrust Washer (4 used)

C—Inner Bearing Race (4 used)

D—Needle Bearing (4 used)

E—Second Stage Planet Gear (4 used)

F—Spring Pin (4 used)



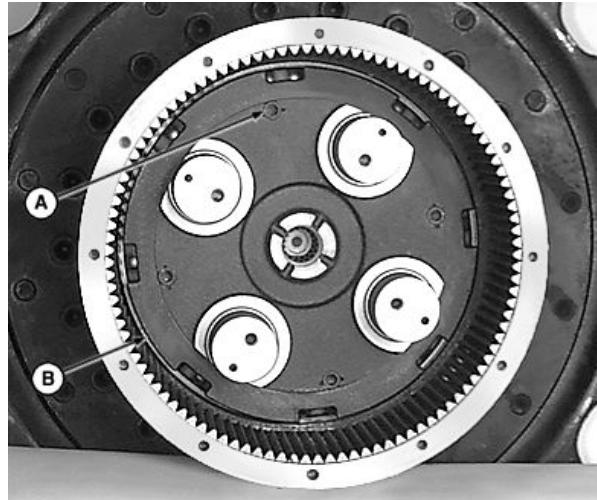
T111821—UN—22OCT97

TX19495,0000009 -19-09OCT02-9/27

13. Remove plugs (A).

A—Plug (4 used)

B—Second Stage Carrier



T111820—UN—22OCT97

Continued on next page

TX19495,0000009 -19-09OCT02-10/27

14. Remove bearing nut (B) using propel gearbox bearing nut wrench (C). See DFT1155 Propel Gearbox Bearing Nut Wrench. (Group 9900.) Discard bearing nut.

B—Bearing Nut

C—DFT1155 Propel Gearbox Bearing Nut Wrench



T111819—UN—29OCT97

TX19495,0000009 -19-09OCT02-11/27

**CAUTION: Heavy component; use a hoist.**

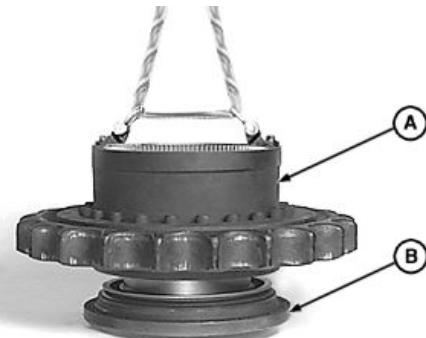
Specification

Sprocket—Weight.....50 kg (110 lb) approximate  
Ring Gear—Weight.....45 kg (100 lb) approximate

15. Remove sprocket and ring gear (A) as an assembly from second stage carrier (B) using lifting brackets such as JT01748 Lifting Brackets, straps and hoist.

A—Sprocket and Ring Gear

B—Second Stage Carrier



T111818—UN—29OCT97

Continued on next page

TX19495,0000009 -19-09OCT02-12/27

**IMPORTANT: Do not remove ball bearing assemblies unless replacement is necessary.**

16. Remove O-rings (B) and metal face seals (A). Keep metal face seals together as a matched set with metal faces together to protect surfaces.

**IMPORTANT: Metal face seals can be reused if they are not worn or damaged. A used seal should be kept together as a set because of wear patterns on the seal ring face.**

17. Inspect metal face seals. See Metal Face Seals Inspect. (Group 0130.) For seals that are reused, place a piece of cardboard between rings to protect seal ring face.

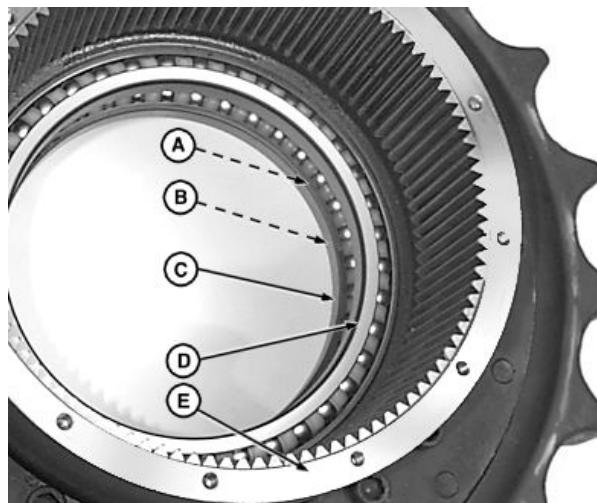
18. If replacing, remove inner ball bearing (D) and outer ball bearing (C).

A—Metal Face Seal (2 used)  
B—O-Ring (2 used)  
C—Outer Ball Bearing

D—Inner Ball Bearing  
E—Ring Gear  
F—Propel Motor Housing and Second Stage Carrier



T111816 -UN-23OCT97



T111817 -UN-22OCT97

TX19495,0000009 -19-09OCT02-13/27

**CAUTION: Heavy component; use a hoist.**

**Specification**

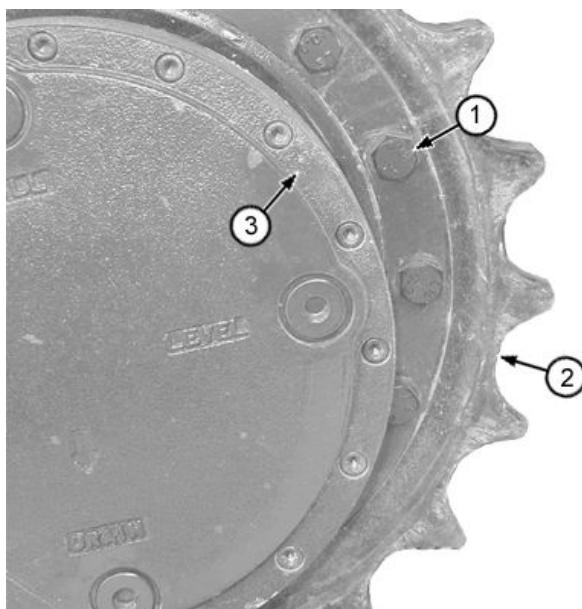
Sprocket—Weight..... 50 kg (110 lb) approximate  
Ring Gear—Weight..... 45 kg (100 lb) approximate

19. Remove cap screws (1).

20. Remove sprocket (2) from ring gear (3).

1—Cap Screw (16 used)  
2—Sprocket

3—Ring Gear



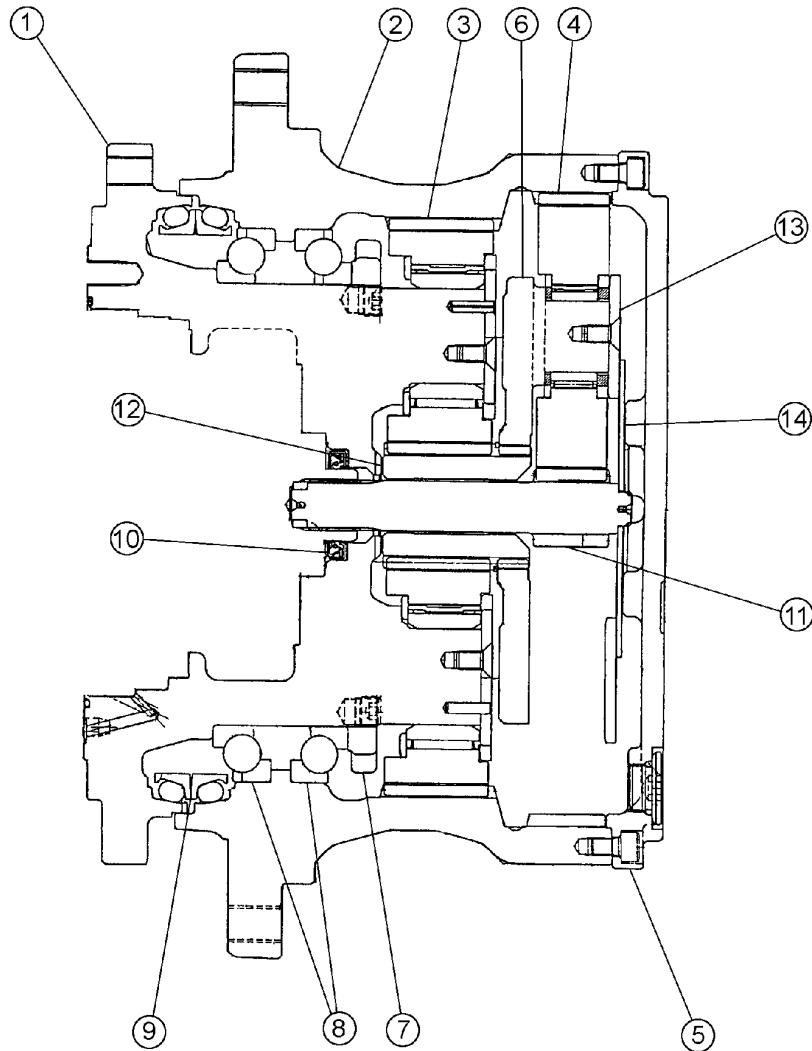
T160462B -UN-11OCT02

Sprocket Removal

Continued on next page

TX19495,0000009 -19-09OCT02-14/27

**Assemble Propel Gearbox**



T160479

*Propel Gearbox Cross Section*

T160479—UN—24OCT02

Continued on next page

TX19495.0000009 -19-09OCT02-15/27

## Axle Shaft, Bearings, and Reduction Gears

1—Propel Motor Housing and Second Stage Carrier	4—First Stage planet Gear	8—Ball Bearing	13—Thrust Plate
2—Ring Gear	5—Cover	9—Metal Face Seal	14—Thrust Plate
3—Second Stage Planet Gear	6—First Stage Carrier	10—Oil Seal	
	7—Bearing Nut	11—First Stage Sun Gear	
		12—Second Stage Sun Gear	

TX19495,0000009 -19-09OCT02-16/27

### **CAUTION: Heavy component; use a hoist.**

#### Specification

Sprocket—Weight.....50 kg (110 lb) approximate  
Ring Gear—Weight.....45 kg (100 lb) approximate

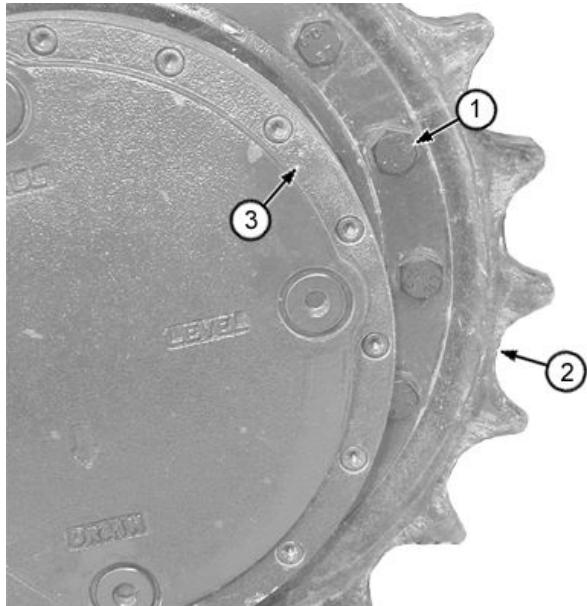
1. Install sprocket (2) onto ring gear (3).
2. Install cap screw (1) and tighten.

#### Specification

Sprocket-to-Ring Gear  
Cap Screw—Torque.....460 N·m (340 lb-ft)

1—Cap Screw (16 used)  
2—Sprocket

3—Ring Gear



*Sprocket Installation*

T160462B—UN—11OCT02

Continued on next page

TX19495,0000009 -19-09OCT02-17/27

3. Install inner ball bearing (D).
4. Install outer ball bearing (C).

**IMPORTANT:** O-ring and seat surfaces for O-ring must be clean, dry, and oil free so O-ring does not slip.

5. Thoroughly clean O-ring and seat surfaces in housing, drum, and seal ring using volatile, non-petroleum base solvent and lint-free tissues.
6. Install O-ring on seal ring.

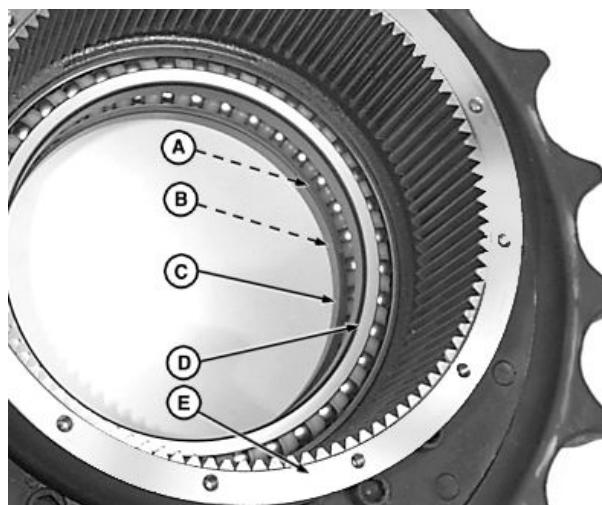
**NOTE:** A volatile non-petroleum base solvent or talcum powder can be used as a lubricant. Solvent must not damage the O-ring or leave an oil residue.

7. Apply equal pressure with fingers at four equally spaced points on seal face. Seal must "pop" down into place so O-ring is tight against seal bore and seal ring is installed squarely.
8. Wipe finger prints and foreign material off seal ring face using clean oil and lint free tissues.
9. Apply a thin film of oil on each seal ring face.

A—Metal Face Seal (2 used)	D—Inner Ball Bearing
B—O-Ring (2 used)	E—Ring Gear
C—Outer Ball Bearing	F—Propel Motor Housing and Second Stage Carrier



T111816—UN—23OCT97



T111817—UN—22OCT97

TX19495,0000009 -19-09OCT02-18/27

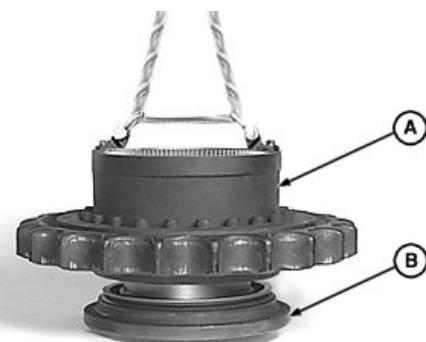
### ⚠ CAUTION: Heavy component; use a hoist.

#### Specification

Sprocket—Weight.....50 kg (110 lb) approximate  
Ring Gear—Weight.....45 kg (100 lb) approximate

10. Install sprocket and ring gear (A) as an assembly onto second stage carrier (B) using lifting brackets such as JT01748, straps and hoist.

A—Sprocket and Ring Gear      B—Second Stage Carrier



T111818—UN—29OCT97

Continued on next page

TX19495,0000009 -19-09OCT02-19/27

Axle Shaft, Bearings, and Reduction Gears

11. Install new bearing nut (B) using propel gearbox bearing nut wrench (C). See DFT1155 Propel Gearbox Bearing Nut Wrench (Group 9900.)

Tighten nut.

**Specification**

Bearing Nut—Torque..... 1245 N·m (920 lb-ft)

**B—Bearing Nut**

**C—DFT1155 Propel Gearbox Bearing Nut Wrench**



T111819—UN—29OCT97

TX19495,0000009 -19-09OCT02-20/27

12. Chase threads in holes for plugs (A).

13. Install plugs (A) and tighten.

**Specification**

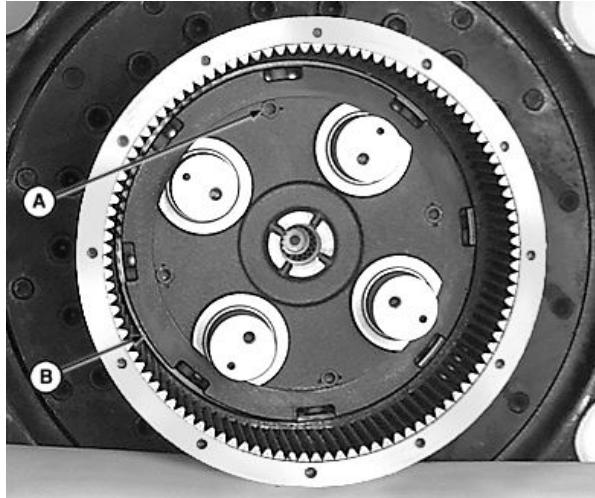
Bearing Nut Retaining

Plug—Torque..... 39 N·m (29 lb-ft)

14. Stake plugs (A) in two places with a punch.

**A—Plug (4 used)**

**B—First Stage Carrier**



T111820—UN—22OCT97

Continued on next page

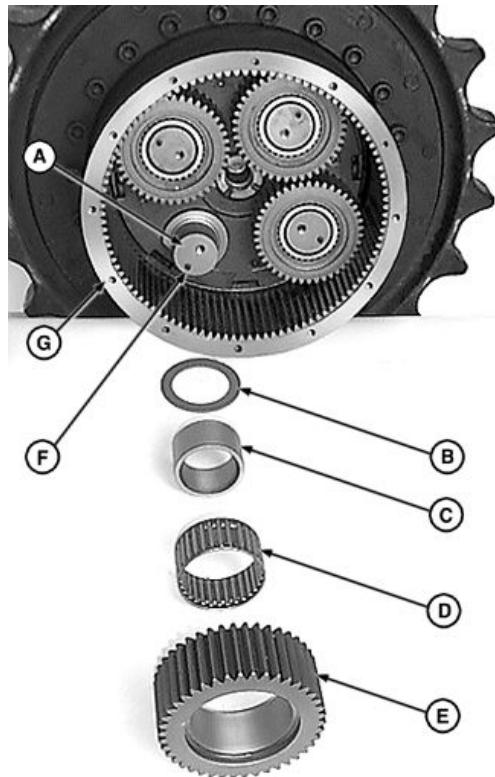
TX19495,0000009 -19-09OCT02-21/27

**IMPORTANT: Install spring pins (F) with slit toward the ring gear (G).**

15. Install spring pins (F) on second stage carrier.

16. Install parts (B—E).

A—Second Stage Carrier	E—Second Stage Planet Gear (4 used)
B—Thrust Washer (4 used)	F—Spring Pin (4 used)
C—Inner Bearing Race (4 used)	G—Ring Gear
D—Needle Bearing (4 used)	



Continued on next page

TX19495,0000009 -19-09OCT02-22/27

T111838—UN—29OCT97

17. Install wear plates (A) with tapered hole (E) towards propel gearbox cover.

18. Install cap screws (B) and tighten.

**Specification**

Wear Plate-to-Second

Planet Carrier Cap

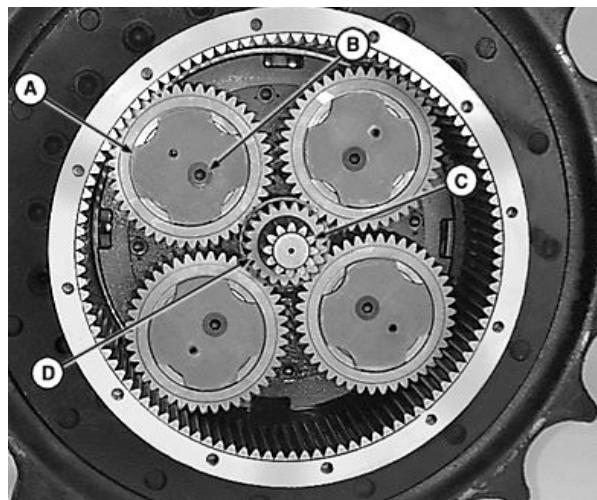
Screw—Torque..... 64 N·m (49 lb·ft)

19. Install second stage sun gear (D).

20. Install first stage sun gear (C).

A—Wear Plate (4 used)  
B—Cap Screw (4 used)  
C—First Stage Sun Gear

D—Second Stage Sun Gear  
E—Tapered Hole



T111822 —UN—29OCT197

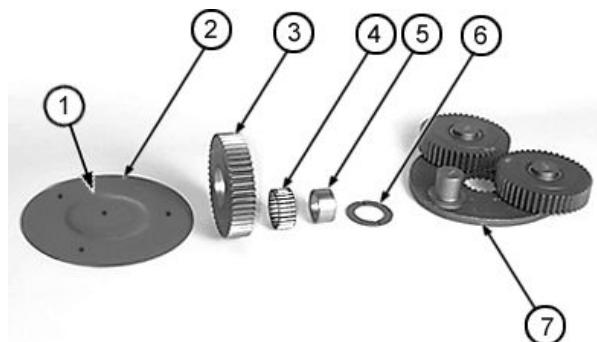


T111840 —UN—25NOV97

TX19495,0000009 -19-09OCT02-23/27

21. Install parts (1—6) on first stage carrier (7).

1—Thrust Plate	5—Inner Bearing Race
2—Thrust Plate	6—Thrust Washer
3—Planet Gear	7—First Stage Carrier
4—Needle Bearing	



T160478B —UN—14OCT02

*First Stage Carrier Assembly*

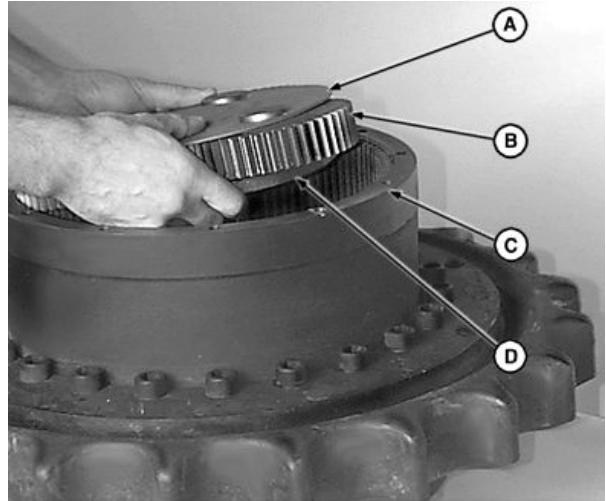
Continued on next page

TX19495,0000009 -19-09OCT02-24/27

22. Install first stage carrier assembly.

A—Thrust Plate  
B—First Stage Planet Gear (3 used)

C—Propel Gearbox Housing  
D—First Stage Carrier



T11823—UN—22OCT97

TX19495,0000009 -19-09OCT02-25/27

23. Measure depth from end face of ring gear (1) to face of thrust plate (2).

24. Use appropriate thrust plate (3) in accordance with specification.

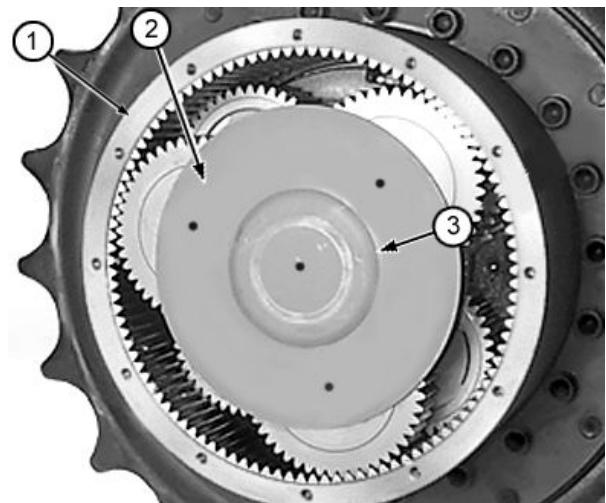
SPECIFICATIONS	
Ring Gear-to-Thrust Plate Depth	Thrust Plate to be Used
2.88—2.22 mm (0.113—0.087 in.)	2.3 mm (0.091 in.)
2.21—1.84 mm (0.087—0.072 in.)	2.8 mm (0.110 in.)
1.83—1.64 mm (0.072—0.065 in.)	3.0 mm (0.118 in.)
1.63—1.36 mm (0.064—0.054 in.)	3.2 mm (0.126 in.)
1.35—1.12 mm (0.053—0.044 in.)	3.6 mm (0.142 in.)

25. Clean cover and ring gear mounting surfaces. Apply cure primer.

26. Apply plastic gasket to ring gear mounting surface.

1—Ring Gear  
2—First Stage Planet Gear

3—Thrust Plate



T160477B—UN—14OCT02

Continued on next page

TX19495,0000009 -19-09OCT02-26/27

27. Install cover (A) and tighten cap screws (C).

**Specification**

Cover-to-Ring Gear Cap

Screw—Torque..... 77 N·m (57 lb-ft)

28. Add gear oil. See 160CLC Drain and Refill Capacities. (Operator's Manual.)

29. Clean threads of fill plug (A). Apply cure primer and pipe sealant to threads.

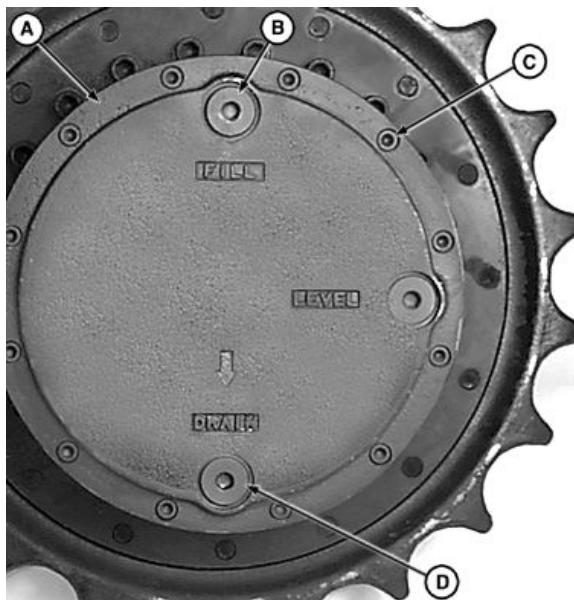
30. Install fill plug and tighten.

**Specification**

Fill Plug—Torque..... 49 N·m (36 lb-ft)

A—Propel Gearbox Cover  
B—Fill Plug

C—Cap Screw (12 used)  
D—Drain Plug



T111824 -UN-22OCT97

TX19495,0000009 -19-09OCT02-27/27

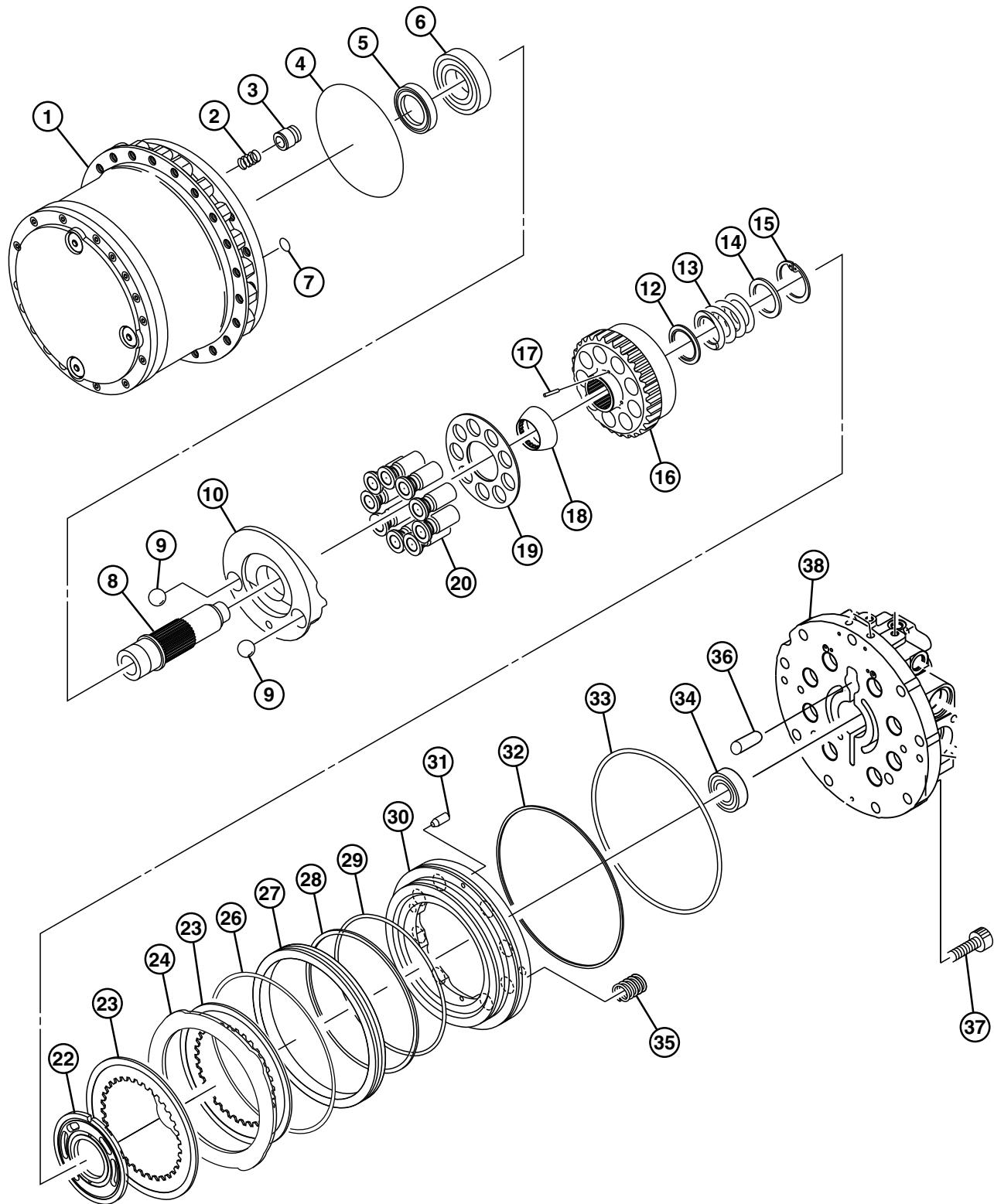
### Propel Motor Repair

#### Remove and Install Propel Motor

*NOTE: Propel motor is an integral part of propel gearbox.*

If removal is required. See Propel Gearbox Repair.  
(Group 0250.)

#### Disassemble and Assemble Propel Motor



T160623

T160623—UN—24OCT02

Continued on next page

## Hydraulic System

### Propel Motor

1—Propel Gearbox	12—Collar	23—Friction Plate (2 used)	33—Back-up Ring
2—Spring (2 used)	13—Spring	24—Brake Disk	34—Bearing
3—Piston (2 used)	14—Collar	26—O-Ring	35—Spring (8 used)
4—O-Ring	15—Snap Ring	27—Collar	36—Pin
5—Seal	16—Cylinder Block	28—Back-up Ring	37—Cap Screw (9 used)
6—Bearing	17—Pin (3 used)	29—O-Ring	38—Propel Motor Cover
7—O-Ring (4 used)	18—Bushing	30—Brake Piston	
8—Shaft	19—Retainer	31—Pin (4 used)	
9—Ball (2 used)	20—Piston (9 used)	32—O-Ring	
10—Swash Plate	22—Valve Plate		

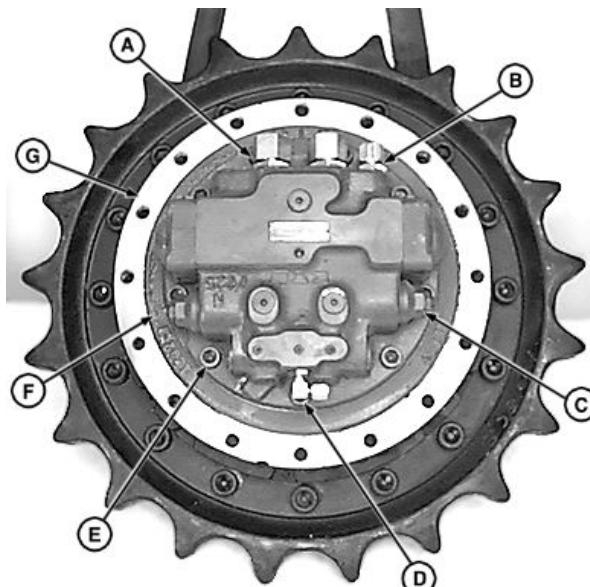
TX,02,VV2551 -19-19APR02-2/35

1. Remove relief valve (C).
2. Remove fittings (A and B).
3. Remove elbow fitting (D).
4. Loosen cap screws (E) uniformly to relieve spring compression.

**IMPORTANT:** When removing propel motor brake valve housing (F), valve plate may come off. Slowly remove propel motor brake valve housing from propel motor housing and second planet carrier (G).

5. Remove cap screws (E) to remove propel motor brake valve housing (F).

A—Fitting	E—Cap Screw (9 used)
B—Fitting	F—Propel Motor Brake Valve Housing
C—Relief Valve	G—Propel Motor Housing and Second Planet Carrier
D—Elbow Fitting	

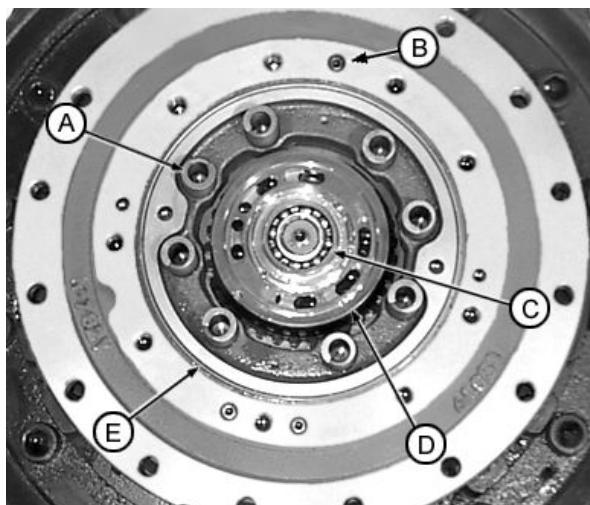


T111769—UN—23OCT97

TX,02,VV2551 -19-19APR02-3/35

6. Remove springs (A).
7. Remove O-rings (B).
8. Remove ball bearing (C).
9. Remove valve plate (D).
10. Remove O-ring (E).

A—Spring (8 used)	D—Valve Plate
B—O-Ring (3 used)	E—O-Ring
C—Ball Bearing	



T160635B—UN—21OCT02

*Ball Bearing And Valve Plate Removal*

Continued on next page

TX,02,VV2551 -19-19APR02-4/35

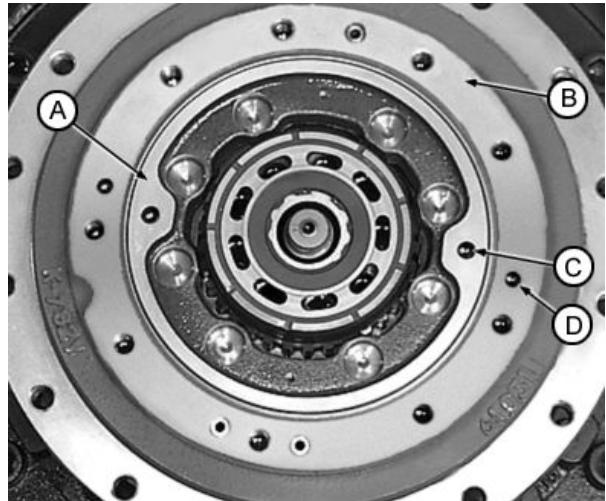
11. Remove park brake piston (A).

A—Brake Piston

B—Propel Motor Housing and  
Second Stage Carrier

C—Dowel Pin Hole (2 used)

D—Dowel Pin Hole (2 used)



T160636—UN—21OCT02

Park Brake Piston

TX,02,VV2551 -19-19APR02-5/35

12. Remove collar (1).

Remove O-ring (2).

1—Collar

2—O-ring



T160979B—UN—25OCT02

Collar Removal

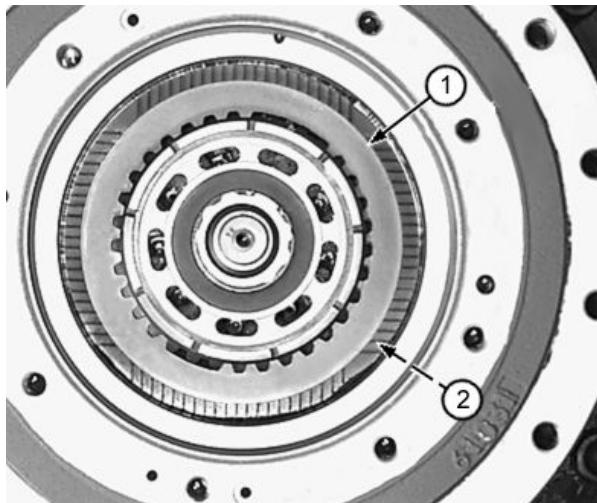
Continued on next page

TX,02,VV2551 -19-19APR02-6/35

13. Remove friction plates (1) and brake disk (2).

1—Friction Plate (2 used)

2—Brake Disk



T161031 —UN—28OCT02

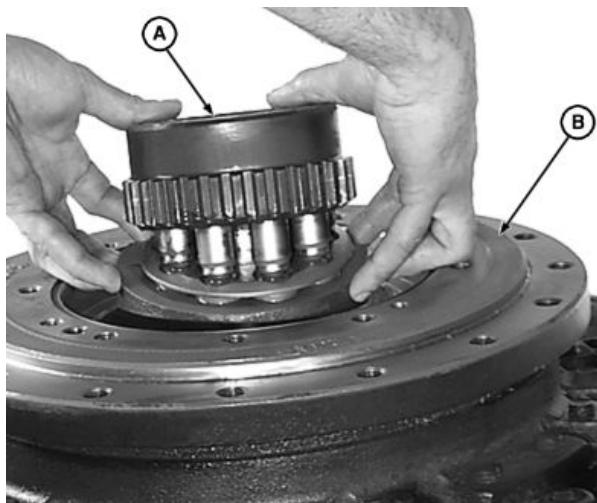
TX,02,VV2551 -19-19APR02-7/35

**IMPORTANT:** Pistons must be installed into the same bore in cylinder block because of their wear pattern. Mark piston and respective cylinder bore to ensure correct installation. Failure to do so may cause premature propel motor failure.

14. Remove rotor assembly (A) from propel motor housing (B).

A—Rotor Assembly

B—Propel Motor Housing



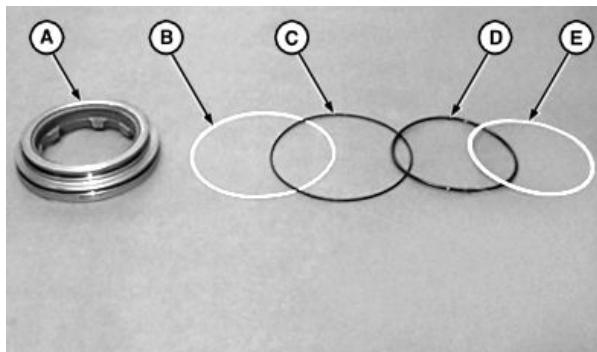
T111774 —UN—22OCT97

TX,02,VV2551 -19-19APR02-8/35

15. Remove backup rings (B and E) and O-rings (C and D) from brake piston (A).

A—Brake Piston  
B—Backup Ring  
C—O-Ring

D—O-Ring  
E—Backup Ring



T111775 —UN—22OCT97

Continued on next page

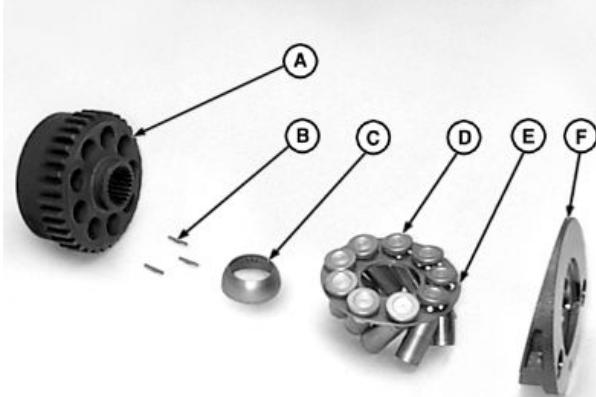
TX,02,VV2551 -19-19APR02-9/35

**IMPORTANT:** Pistons must be installed into the same bore in cylinder block because of their wear pattern. Mark piston and respective cylinder bore to ensure correct installation. Failure to do so may cause premature propel motor failure. The cylinder block and pistons are serviced as an assembly.

16. Remove parts (B—F).

A—Cylinder Block  
B—Pin (3 used)  
C—Ball Guide

D—Piston (9 used)  
E—Retainer  
F—Swash Plate



T111776—UN—22OCT97

TX,02,VV2551 -19-19APR02-10/35

**CAUTION:** Spring inside of cylinder block is under pressure. Remove spring force from snap ring before removing it.

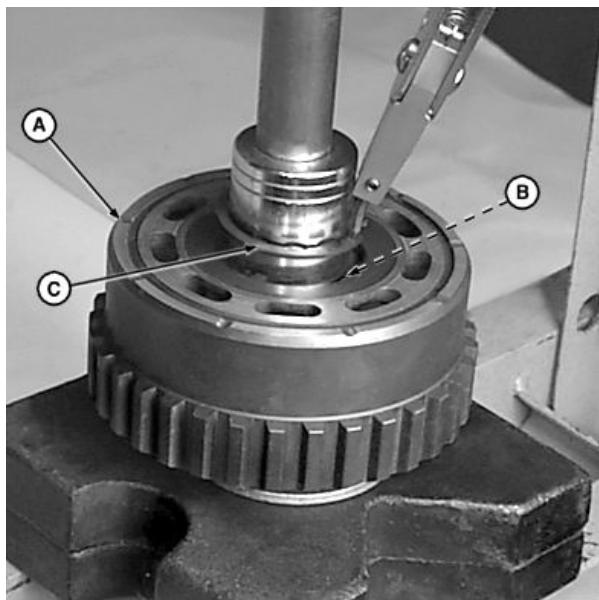
17. Push bushing (B) down to remove spring force on snap ring (C) using a press.

Remove snap ring from cylinder block (A).

Slowly release the spring.

A—Cylinder Block  
B—Bushing

C—Snap Ring



T111777—UN—22OCT97

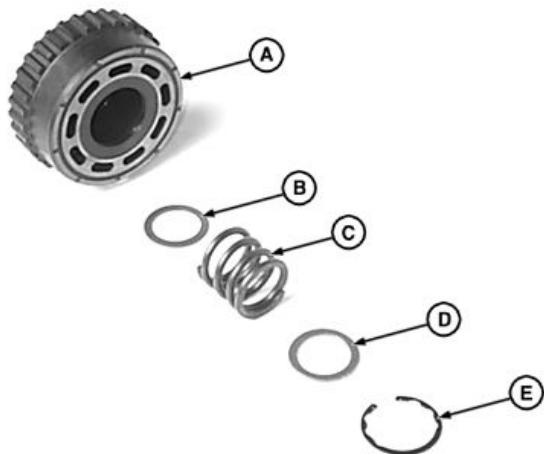
Continued on next page

TX,02,VV2551 -19-19APR02-11/35

18. Remove parts (A—E).

A—Cylinder Block  
B—Bushing  
C—Spring

D—Bushing  
E—Snap Ring



T111778—UN—22OCT197

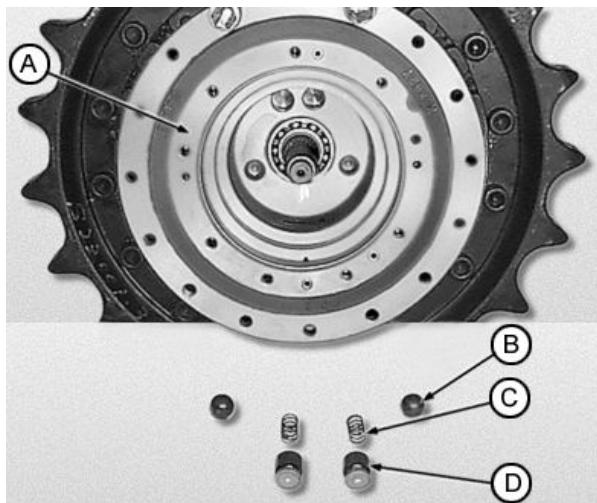
TX,02,VV2551 -19-19APR02-12/35

19. Remove steel balls (B) from propel motor housing (A).

20. Remove swash plate piston (D) and spring (C) from  
propel motor housing.

A—Propel Motor Housing  
B—Steel Ball (2 used)

C—Spring (2 used)  
D—Swash Plate Piston (2 used)



T160647—UN—21OCT02

Swash Plate Piston Assembly

Continued on next page

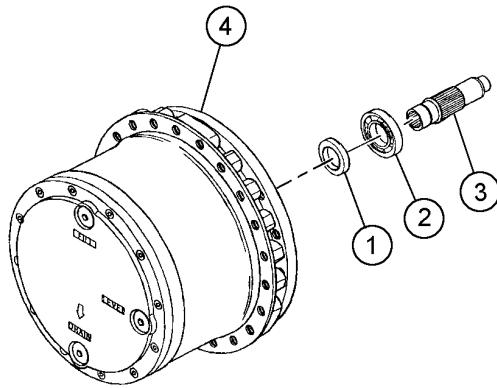
TX,02,VV2551 -19-19APR02-13/35

Hydraulic System

21. Remove drive shaft (3) and ball bearing (2).
22. Remove oil seal (1).
23. Repair or replace parts as necessary.

1—Oil Seal  
2—Ball Bearing

3—Drive Shaft  
4—Propel Gearbox



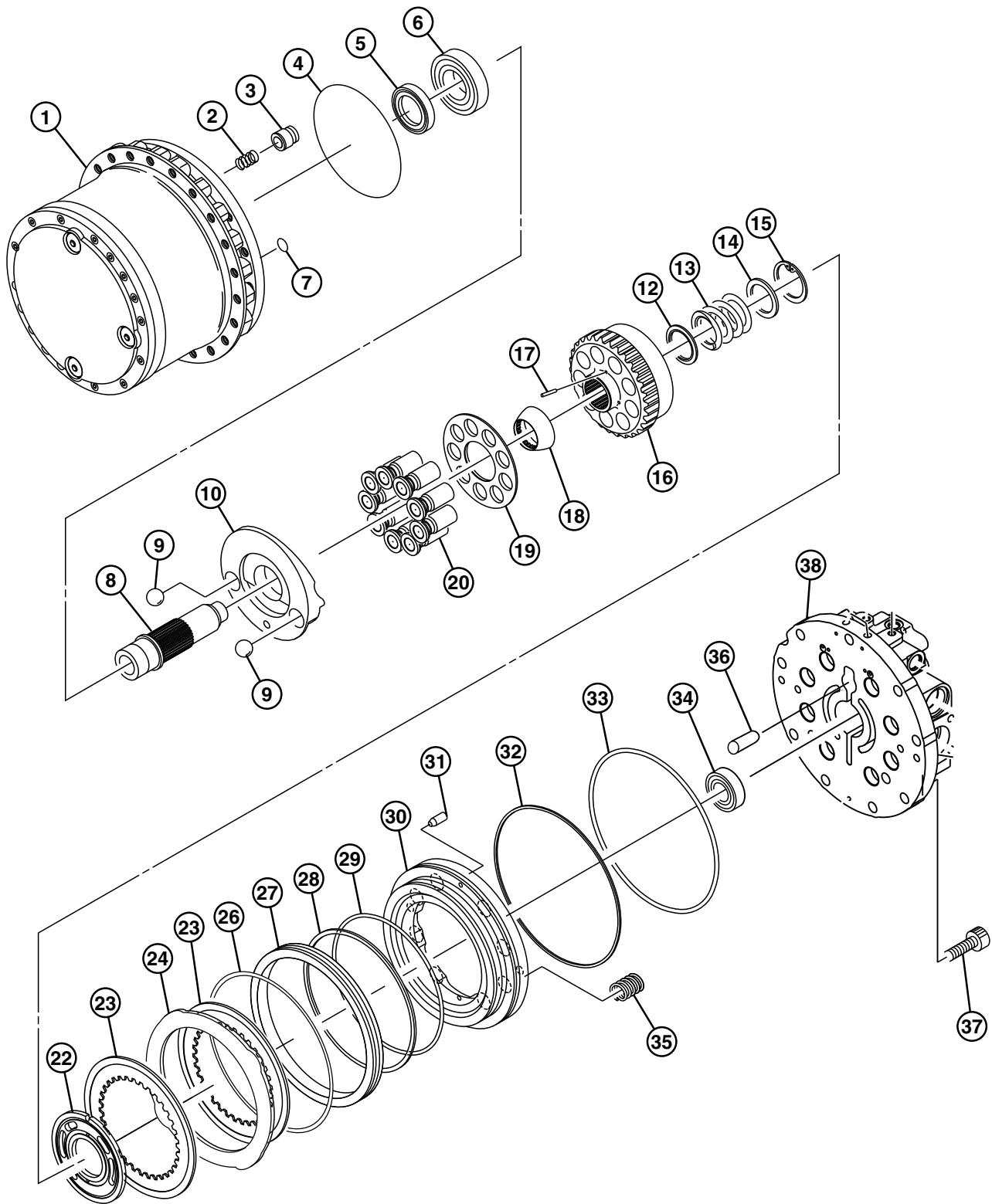
T160652—UN—23 OCT 02

*Drive Shaft And Ball Bearing Removal*

Continued on next page

TX.02,VV2551 -19-19APR02-14/35

Hydraulic System



T160623

Propel Motor

T160623 -UN-24OCT02

Continued on next page

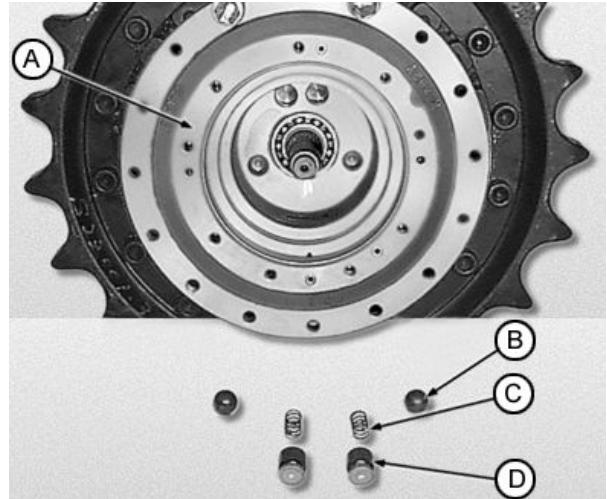
TX.02,VV2551 -19-19APR02-15/35

## Hydraulic System

1—Propel Gearbox	12—Collar	23—Friction Plate (2 used)	33—Back-up Ring
2—Spring (2 used)	13—Spring	24—Brake Disk	34—Bearing
3—Piston (2 used)	14—Collar	26—O-Ring	35—Spring (8 used)
4—O-Ring	15—Snap Ring	27—Collar	36—Pin
5—Seal	16—Cylinder Block	28—Back-up Ring	37—Cap Screw (9 used)
6—Bearing	17—Pin (3 used)	29—O-Ring	38—Propel Motor Cover
7—O-Ring (4 used)	18—Bushing	30—Brake Piston	
8—Shaft	19—Retainer	31—Pin (4 used)	
9—Ball (2 used)	20—Piston (9 used)	32—O-Ring	
10—Swash Plate	22—Valve Plate		
A—Propel Motor Housing	C—Spring (2 used)		
B—Steel Ball (2 used)	D—Swash Plate Piston (2 used)		

24.

Install steel balls (B), springs (C) and swash plate pistons (D) in propel motor housing and second stage carrier.



T160647—UN—21OCT02

*Swash Plate Piston Assembly*

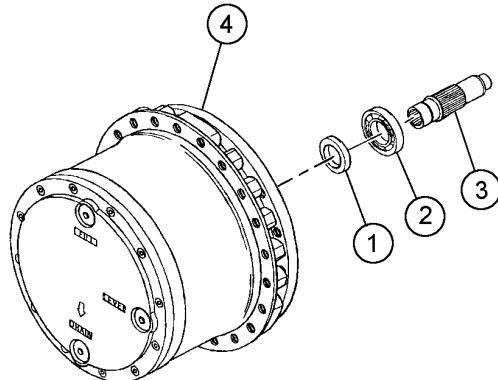
TX,02,VV2551 -19-19APR02-16/35

25. Install oil seal (1).

26. Install drive shaft (3) and ball bearing (2).

1—Oil Seal  
2—Ball Bearing

3—Drive Shaft  
4—Propel Gearbox



T160652—UN—23OCT02

*Drive Shaft And Ball Bearing Installation*

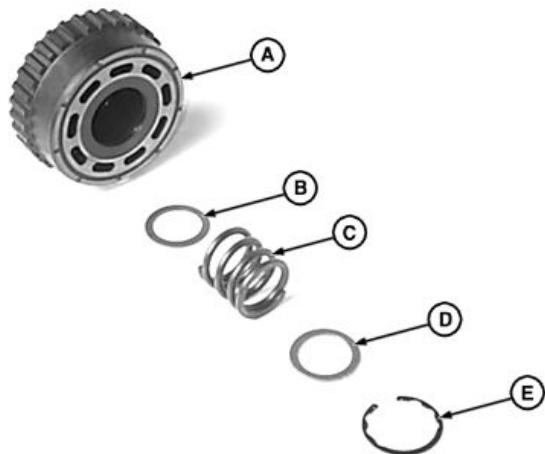
Continued on next page

TX,02,VV2551 -19-19APR02-17/35

27. Install parts (B—E) into cylinder block (A).

A—Cylinder Block  
B—Bushing  
C—Spring

D—Bushing  
E—Snap Ring



T111778—UN—22OCT97

TX,02,VV2551 -19-19APR02-18/35

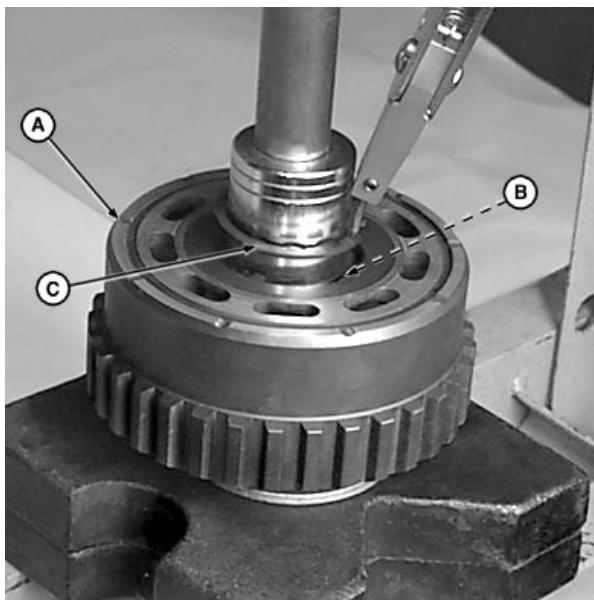
**CAUTION:** Spring inside of cylinder block will be under pressure. Snap ring must be seated in groove before releasing press.

28. Press bushing (B) downward using a press. Install snap ring (C) into groove in cylinder block (A).

Slowly release press checking to be sure snap ring is seated in groove.

A—Cylinder Block  
B—Bushing

C—Snap Ring



T111777—UN—22OCT97

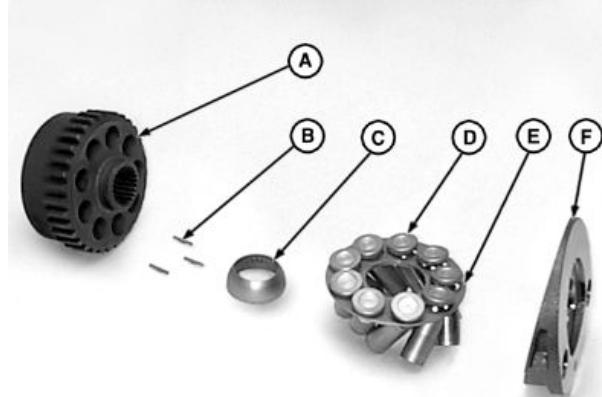
Continued on next page

TX,02,VV2551 -19-19APR02-19/35

**IMPORTANT: Pistons must be installed into the same bore in the cylinder block because of their wear patterns. Refer to marks made during disassembly. The cylinder block and pistons are serviced as an assembly.**

29. Apply clean oil to parts (B—F) to aid in installation.
30. Install parts (B—F) into cylinder block (A).

A—Cylinder Block  
B—Pin (3 used)  
C—Ball Guide  
D—Piston (9 used)  
E—Retainer  
F—Swash Plate

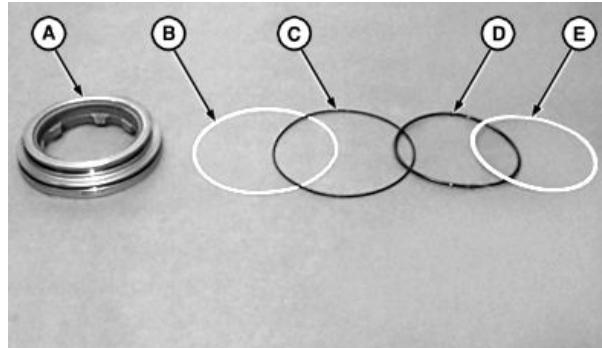


T111776—UN—22OCT97

TX,02,VV2551 -19-19APR02-20/35

31. Install backup ring (B) and O-ring (C).
32. Install O-ring (D) and backup ring (E).
33. Align holes on bottom of swash plate with the steel balls in propel motor housing.

A—Brake Piston  
B—Backup Ring  
C—O-Ring  
D—O-Ring  
E—Backup Ring

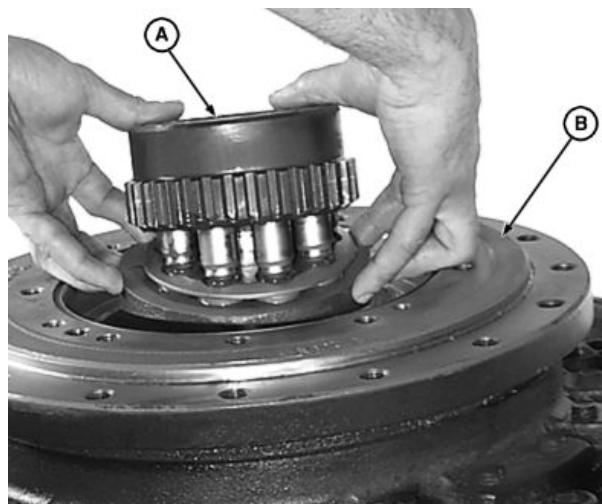


T111775—UN—22OCT97

TX,02,VV2551 -19-19APR02-21/35

34. Install rotor assembly (A) into propel motor housing (B).

A—Rotor Housing      B—Propel Motor Housing



T111774—UN—22OCT97

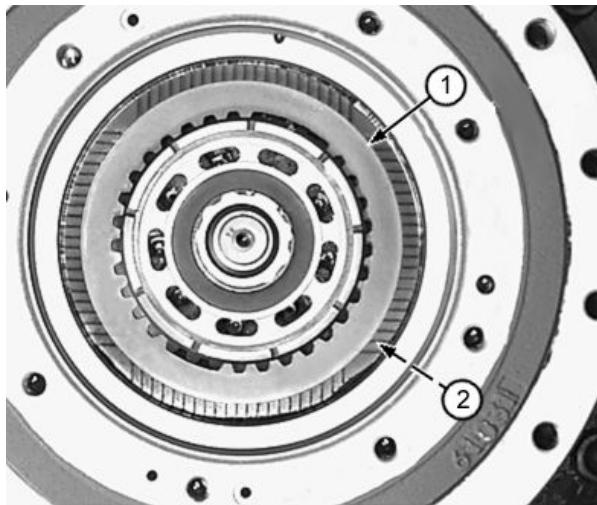
Continued on next page

TX,02,VV2551 -19-19APR02-22/35

35. Install friction plate (1), brake disk (2) and friction plate.

1—Friction Plate (2 used)

2—Brake Disk



T161031 —UN—28OCT02

TX,02,VV2551 -19-19APR02-23/35

36. Install O-ring (2).

Install collar (1).

1—Collar

2—O-ring



T160979B —UN—25OCT02

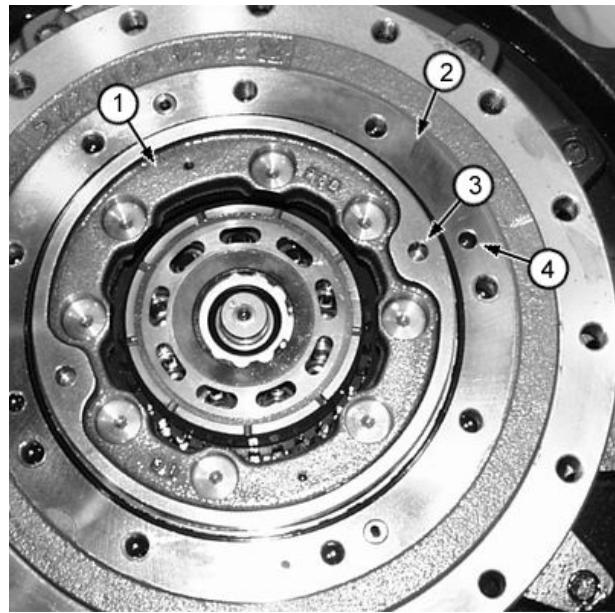
*Collar Installation*

Continued on next page

TX,02,VV2551 -19-19APR02-24/35

37. Apply petroleum jelly to O-rings and backup rings on brake piston (A) to aid in installation. The brake piston may need to be tapped into place.

1—Brake Piston                    3—Dowel Pin Hole (2 used)  
2—Propel Motor Housing and    4—Dowel Pin Hole (2 used)  
Second Stage Carrier

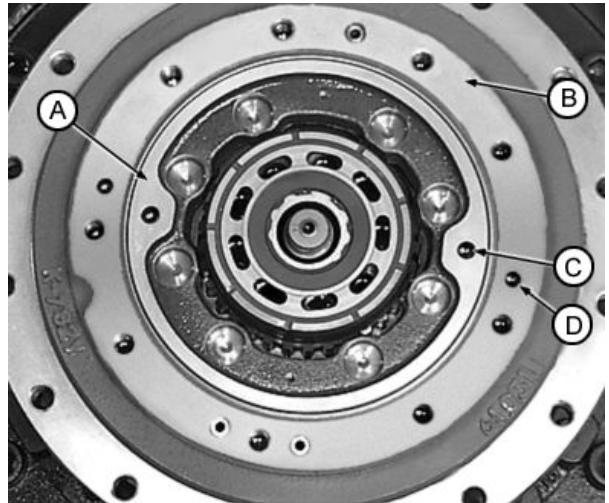


Brake Piston Installation

T160980B—JUN—25OCT02

TX,02,VV2551 -19-19APR02-25/35

38. Align dowel pin holes (C and D).  
39. Install brake piston (A) into propel motor housing and second stage carrier (B).



Park Brake Piston

T160636 —JUN—21OCT02

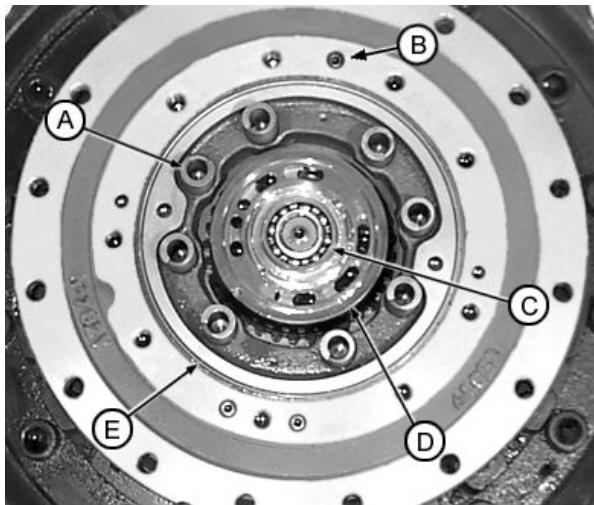
Continued on next page

TX,02,VV2551 -19-19APR02-26/35

40. Install O-rings (B).
41. Install springs (A).
42. Install O-ring (E).

A—Spring (8 used)  
B—O-Ring (3 used)  
C—Ball Bearing

D—Valve Plate  
E—O-Ring



T16063BB—UN—21OCT02

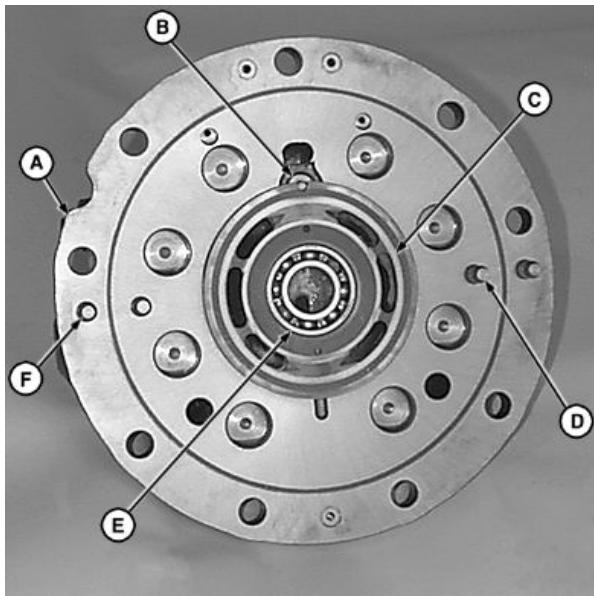
*Spring And O-Ring Installation*

TX,02,VV2551 -19-19APR02-27/35

43. Align slot on outer diameter of valve plate (C) with pin (B).
44. Install ball bearing (E) into propel motor brake valve housing (A).
45. Apply petroleum jelly to valve plate (C).
46. Install valve plate (C).

A—Propel Motor Brake Valve Housing  
B—Pin  
C—Valve Plate

D—Pin (2 used)  
E—Ball Bearing  
F—Pin



T111790—UN—22OCT97

*Continued on next page*

TX,02,VV2551 -19-19APR02-28/35

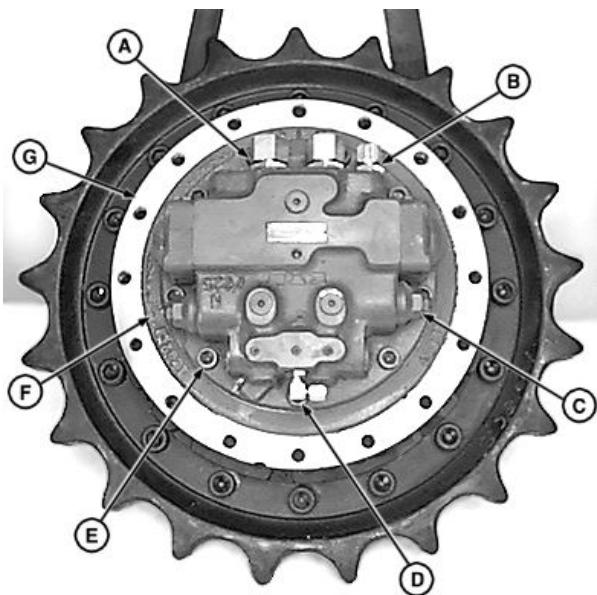
47. Align pins in propel motor brake valve housing with alignment holes in brake piston and propel motor housing and second stage carrier.
48. Install propel motor brake valve housing (F).
49. Install cap screws (E). Tighten cap screws in equal steps using a criss-cross pattern.

**Specification**

Valve Housing-to-Housing Cap  
Screw—Torque..... 205 N·m (152 lb·ft)

50. Install elbow fitting (D).
51. Install relief valve (C).
52. Install fittings (A and B).

A—Fitting	E—Cap Screw (9 used)
B—Fitting	F—Brake Valve Housing
C—Crossover Relief Valve (2 used)	G—Propel Motor Housing and Second Stage Carrier
D—Elbow Fitting	

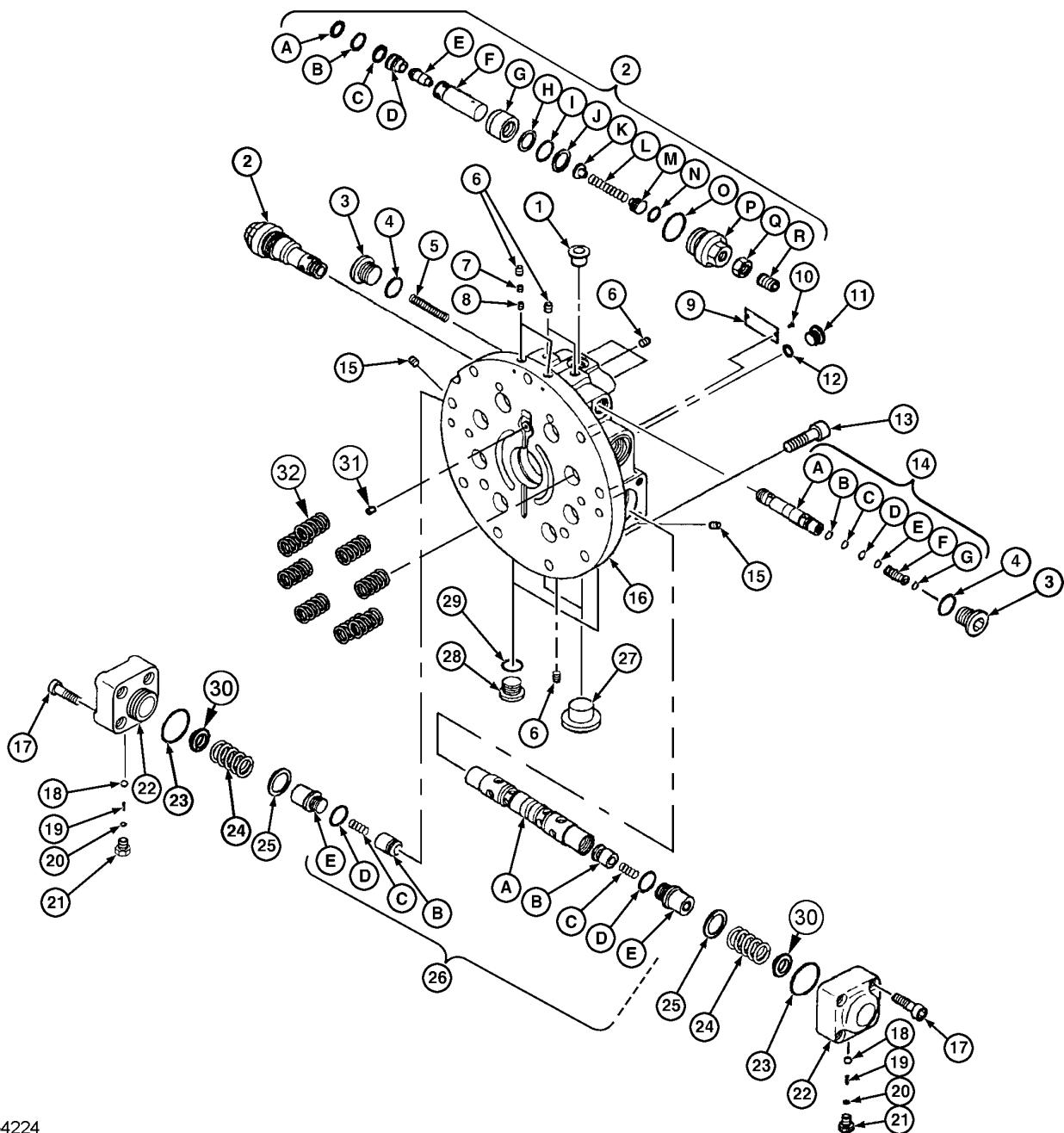


T111769 -UN-23OCT97

Continued on next page

TX.02,VV2551 -19-19APR02-29/35

**Disassemble and Assemble Propel Motor Cover**



T154224

T154224 -UN-19APR02

Continued on next page

TX.02,VV2551 -19-19APR02-30/35

## Hydraulic System

1—Plug	3—Fitting Plug (2 used)	A—Valve Spool	22—Cap (2 used)
2—Crossover Relief Valve (2 used)	4—O-Ring	B—Backup Ring	23—O-Ring (2 used)
A—Backup Ring	5—Spring	C—O-Ring	24—Spring (2 used)
B—O-Ring	6—Pipe Plug (9 used)	D—O-Ring	25—Spring Seat (2 used)
C—Backup Ring	7—Orifice (2 used)	E—Backup Ring	26—Counterbalance Valve
D—Housing	8—Orifice (2 used)	F—Filter	27—Plug (2 used)
E—Poppet	9—Identification Plate	G—Snap Ring	28—Fitting Plug (2 used)
F—Housing	10—Cap Screw (2 used)	15—Orifice (2 used)	29—O-Ring (2 used)
G—Piston	11—Fitting Plug (3 used)	16—Propel Motor Brake Valve	30—Spring Seat (2 used)
H—Backup Ring	12—O-Ring (3 used)	Housing	31—Pin
I—O-Ring	13—Cap Screw (9 used)	17—Cap Screw (8 used)	32—Spring (8 used)
J—Backup Ring	14—Speed Change Valve	18—Ball (2 used)	
K—Guide		19—Spring (2 used)	
L—Spring		20—O-Ring (2 used)	
M—Guide		21—Plug (2 used)	
N—O-Ring			
O—O-Ring			
P—Plug			
Q—Nut			
R—Adjusting Screw			

*NOTE: Remove pipe plugs (6) only if necessary to clean passage in propel motor brake valve housing*

(16). Orifices (7, 8, and 15) are staked to valve housing and must not be removed.

TX,02,VV2551 -19-19APR02-31/35

### Disassemble and Assemble Crossover Relief Valve

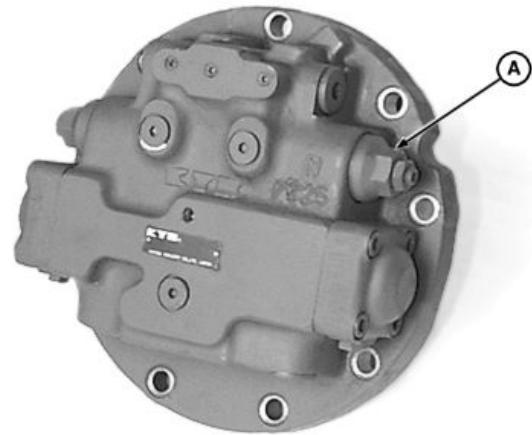
*NOTE: Valves can be removed with propel motor on the machine.*

*Crossover relief valves are disassembled for cleaning and inspection only. Valves are serviced as an assembly only except for the O-ring and backup rings.*

1. Remove parts (1-32).
2. Inspect and replace parts as necessary.
3. Install parts (1-32).
4. Tighten crossover relief valve (A).

#### Specification

Crossover Relief  
Valve Cartridge-to-  
Housing—Torque..... 37 N·m (28 lb-ft)



A—Crossover Relief Valve (2 used)

Continued on next page

TX,02,VV2551 -19-19APR02-32/35

T111880 —UN—29OCT97

5. Measure dimension from the top surface of adjusting screw (K) to nut (J). Record measurement for assembly.

Tighten nut (J).

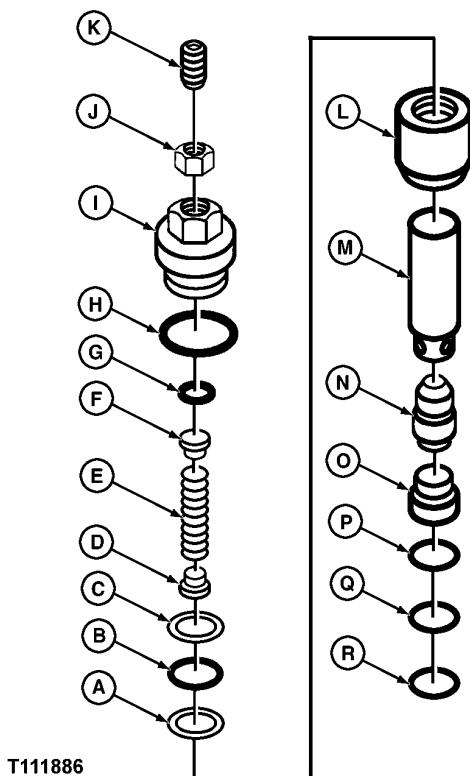
**Specification**

Crossover Relief Valve  
Adjusting Screw-to-Plug  
Nut—Torque..... 44 N·m (33 lb·ft)

A — Backup Ring	J—Nut
B—O-Ring	K—Adjusting Screw
C—Backup Ring	L—Piston
D—Guide	M—Housing
E—Spring	N—Poppet
F—Guide	O—Housing
G—O-Ring	P—Backup Ring
H—O-Ring	Q—O-Ring
I— Plug	R—Backup Ring



T111883—UN—29OCT97



T111886—UN—29OCT97

Continued on next page

TX,02,VV2551 -19-19APR02-33/35

**Disassemble and Assemble Counterbalance Valve**

*NOTE: Valve can be removed with propel motor on the machine.*

1. Remove cap screws (B) and caps (A) from propel motor brake valve housing.

**IMPORTANT:** Counterbalance valve is a selective fit in propel motor brake valve housing. If valve does not come out smoothly, do not use force to remove it. Tap gently into bore while turning to loosen.

2. Remove valve by softly tapping end face of valve to push it out the other end of housing. Hold the protruding end of valve and pull it out of housing while turning it slowly.
3. Install counterbalance valve spool (C), spring seats (D), springs (E), and O-rings (F) into brake valve housing.
4. Install caps (A). Tighten cap screws (B).

**Specification**

Counterbalance Valve

Cap-to-Housing Cap

Screw—Torque..... 59 N·m (43 lb-ft)

5. Install check valve parts (G—J) into caps (A). Tighten plugs (J).

**Specification**

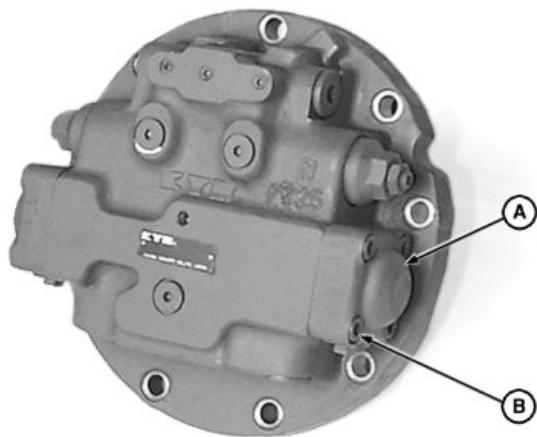
Counterbalance Valve

Check Valve-to-Cap

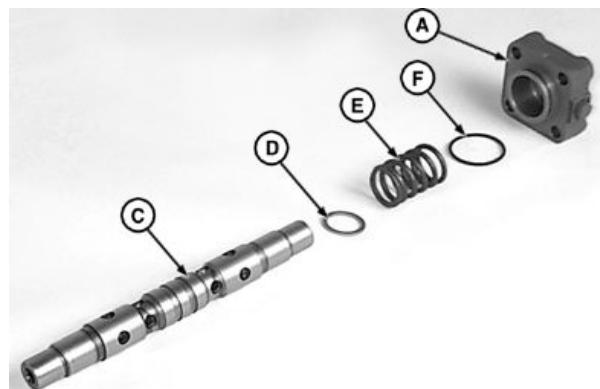
Plug—Torque..... 21 N·m (15 lb-ft)

A—Cap (2 used)  
B—Cap Screw (8 used)  
C—Counterbalance Valve Spool  
D—Spring Seat (2 used)  
E—Spring (2 used)

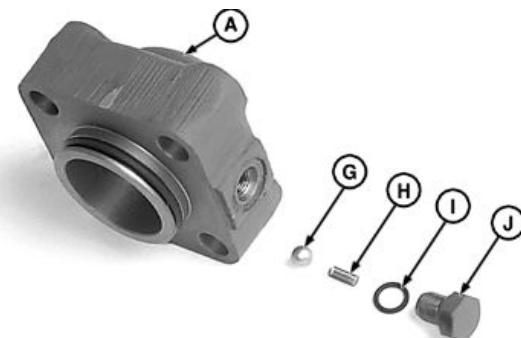
F—O-Ring (2 used)  
G—Ball (2 used)  
H—Spring (2 used)  
I—O-Ring (2 used)  
J—Plug (2 used)



T111890—UN—29OCT97



T111892—UN—29OCT97



T111895—UN—29OCT97

Continued on next page

TX,02,VV2551 -19-19APR02-34/35

### Disassemble and Assemble Propel Speed Change Valve

*NOTE: Valve can be removed with propel motor on the machine.*

*Propel speed change valve is disassembled for cleaning and inspection only. Valve is serviced as an assembly only, except for the O-ring and backup rings.*

1. Remove two plugs (A) from propel motor brake valve housing.

**IMPORTANT:** Propel speed change valve is a selective fit in propel motor brake valve housing. If valve does not come out smoothly, do not use force to remove it. Tap gently into bore while turning to loosen.

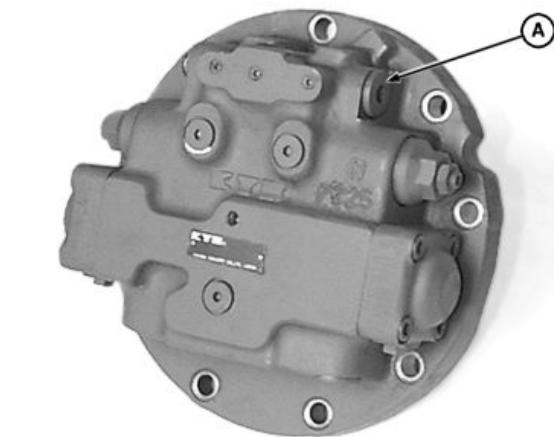
2. Remove valve by softly tapping end face of valve to push it out the other end of housing. Hold the protruding end of valve and pull it out of housing while turning it slowly.
3. Install propel speed change valve (B), spring (C), O-rings (D), and plugs (A).
4. Tighten plugs (A).

#### Specification

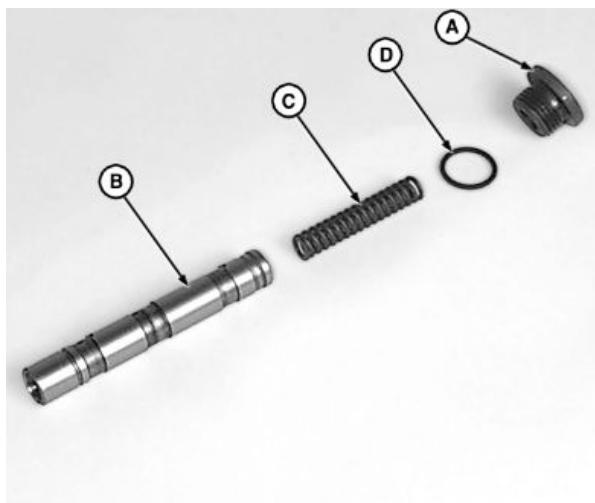
Propel Speed Change  
Valve-to-Housing  
Plug—Torque.....118 N·m (87 lb-ft)

A—Plug (2 used)  
B—Speed Change Valve

C—Spring  
D—O-Ring (2 used)



T111888—UN—29OCT97



T111903—UN—29OCT97

TX,02,VV2551 -19-19APR02-35/35

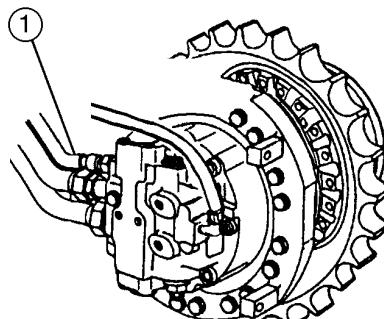
### Propel Motor Start-Up Procedure

**IMPORTANT:** Propel motor will be damaged if not filled with oil before starting engine. Procedure must be performed whenever a new propel motor is installed or oil has been drained from the motor.

1. Disconnect drain line (1).
2. Fill propel motor with hydraulic oil until oil reaches top of drain port. See Hydraulic Oil. (Operator's Manual.)

*NOTE: Use a funnel with suitable diameter neck to allow air to escape while filling.*

3. Connect drain line.



Propel Motor

T160175—UN—07OCT02

1—Drain Line

TX,9025,GG2473 -19-14DEC01-1/1

## Rotary Manifold Repair

### Remove and Install Rotary Manifold

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil from pressurized system can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Disconnect upper hydraulic lines.
3. Remove cap screws (1) and bracket (2).
4. Attach the rotary manifold to a hoist using a lifting strap and two rotary manifold lifting tools. See Rotary Manifold Lifting Tool. (Group 9900.)
5. Disconnect lower hydraulic lines.

1—Cap Screw (2 used)

2—Bracket



Rotary Manifold

T160184B—JUN—04OCT02

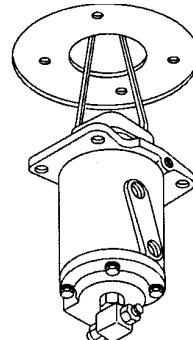
OUOE049,0000051 -19-04OCT02-1/4

**CAUTION:** Heavy component; use a hoist.

#### Specification

Rotary Manifold—Weight..... 27 kg (60 lb) approximate

6. Remove four mounting cap screws. Lower rotary manifold.
7. Repair or replace parts as necessary.
8. Install rotary manifold. Tighten four mounting cap screws.



T7685JC—JUN—27APR92

#### Specification

Manifold-to-Frame Cap

Screw—Torque..... 90 N·m (66 ft-lb)

9. Install stop bracket. Tighten cap screws.

10. Connect upper and lower hydraulic lines. See Propel Hydraulic System Line Connection. (Group 9025-15.)

#### Specification

Stop Bracket-to-Frame

Cap Screw—Torque..... 140 N·m (103 lb-ft)

Continued on next page

OUOE049,0000051 -19-04OCT02-2/4

**Disassemble and Assemble Rotary Manifold**

1. Make alignment marks on spindle (B), housing (G) and cover (K) to aid in assembly.
2. Remove parts (H—L). Carefully remove spindle assembly (B) from housing (G).
3. Remove plugs in spindle and clean ports.
4. Remove parts (C—F).
5. Inspect and repair as necessary.
6. Install parts (C—F).
7. Install spindle assembly (B) in housing (G), aligning marks made during disassembly.
8. Install parts (H—L), aligning marks made during disassembly and tighten cap screws.

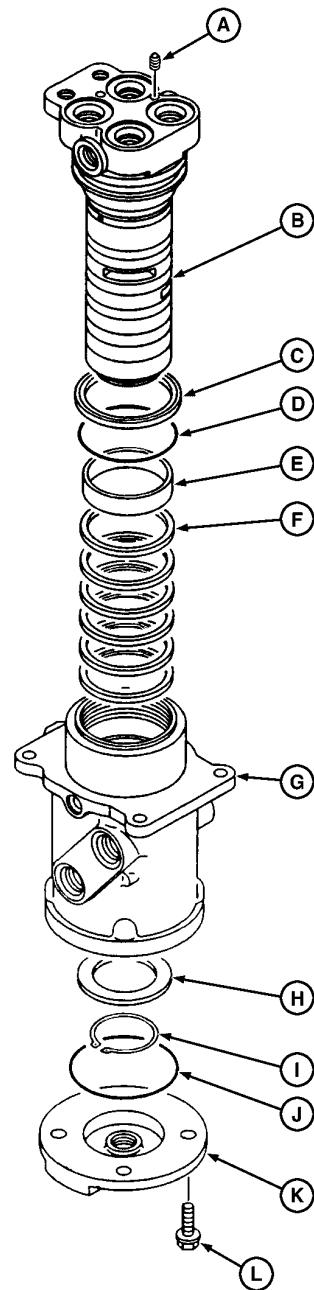
**Specification**

Cover-to-Housing Cap

Screw—Torque..... 49 N·m (36 lb·ft)

9. Install plugs.

A—Plug	G—Housing
B—Spindle Assembly	H—Ring
C—Oil Seal	I— Snap Ring
D—O-Ring	J— O-Ring
E—Bushing	K—Cover
F—Oil Seal Rings (6 used)	L—Cap Screw (4 used)



T115530—UN—17JUN98

Continued on next page

OUOE049,0000051 -19-04OCT02-3/4

**Rotary Manifold Air Test**

1. Install a plug in one port.
2. Apply air pressure using JDG185 Air Test Plug and shop air pressure through the other port in that passage.
3. Listen for air leaks at ports on either side of pressurized port.



T6557JB—UN—01NOV88

OUOE049,0000051 -19-04OCT02-4/4

*Hydraulic System*

## **Section 04 Engine**

### **Contents**

	<b>Page</b>
<b>Group 0400—Removal and Installation</b>	
Remove Engine .....	04-0400-1
Install Engine .....	04-0400-4
Engine Repair .....	04-0400-5

*Contents*

# Group 0400 Removal and Installation

## Remove Engine

**CAUTION:** Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Remove filler cap when cool to touch. Slowly loosen filler cap to first stop to relieve pressure, then remove.

1. Disconnect battery ground (negative) cable.
2. Drain coolant. Approximate capacity is 26.5 L (7.0 gal).
3. Remove fan guard, radiator shroud, fan blade and spacer. See Fan, Fan Guard and Fan Shroud Remove and Install. (Group 0510.)
4. Disconnect charge air cooler hoses, radiator hoses, and air intake hose.
5. Remove muffler and muffler bracket.

*NOTE: Label wiring to aid installation.*

6. Disconnect engine wiring. See Machine Harness (W2) Component Location and see Engine Harness (W20) Component Location. (Group 9015-10.)



*NOTE: It is not necessary to discharge the air conditioning system.*

7. Disconnect air conditioner compressor bracket from engine. Secure compressor and bracket so it will not interfere with engine removal.
8. Perform Relieve Fuel System Pressure. (CTM331.)
9. Disconnect fuel filter input line, fuel filter overflow tube, and fuel pump overflow tube.
10. Disconnect heater hoses.

TX,04,DH5305 -19-16FEB05-1/4

11.

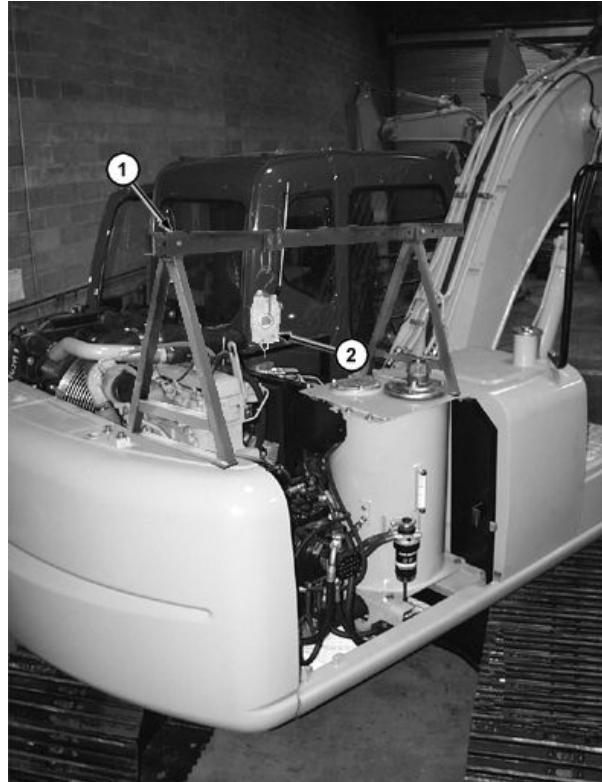
**CAUTION: Heavy component; use DFT1119 pump support and hoist.**

### Hydraulic Pump—Specification

Hydraulic Pump—Weight..... 82 kg (180 lb) approximate

Support main hydraulic pump using DFT1119 Pump Support (1) and a small hoist winch (2). (Group 9900.)

1—DFT1119 Pump Support      2—Hoist Winch



TS281—UN—15APR13

T146004B—UN—01FEB02

Continued on next page

TX,04,DH5305 -19-16FEB05-2/4

**IMPORTANT: Ensure that the lifting eyes are secured with Class 12.9 or higher class cap screws.**

12. Install JD244-1 and JD244-2 Lifting Eyes to engine.  
Tighten lifting eye cap screws.

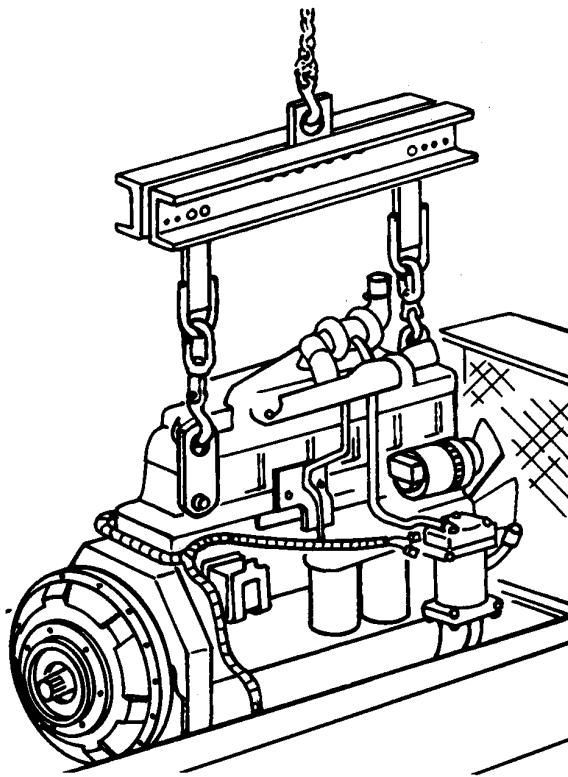
**⚠ CAUTION: Prevent possible crushing injury from heavy component. Use appropriate lifting device.**

**Engine—Specification**

Engine—Weight..... 451 kg (993 lb)

**IMPORTANT: The recommended method for lifting the engine is using the JDG23 Lifting Sling. The lifting force must be at 90° at the lifting points.**

13. Attach JDG23 Lifting Sling to engine as shown.
14. Remove cap screws securing main hydraulic pump to engine flywheel housing.



*Engine Lifting Sling JDG23*

Continued on next page

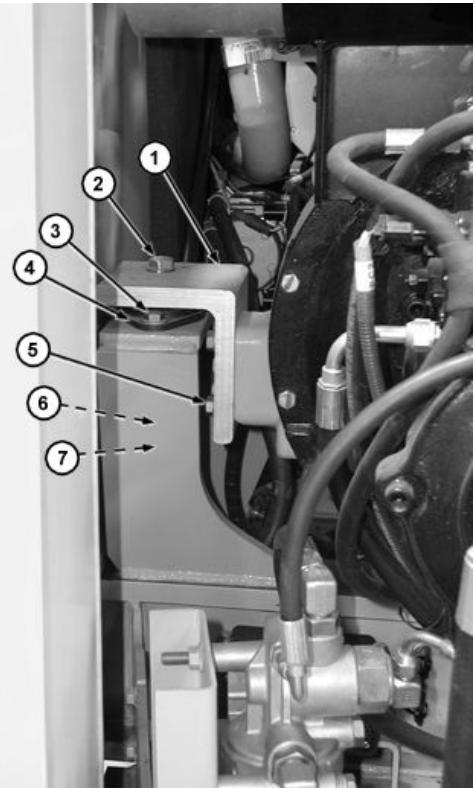
TX,04,DH5305 -19-16FEB05-3/4

T6683FQ -UN-18OCT88

*Removal and Installation*

15. Remove nuts (7) cap screws (2) and washers (6) from engine mounts.
16. Raise engine slightly. Move engine away from hydraulic pump. Lift and remove engine when disengaged from hydraulic pump drive coupling.
17. Repair or replace parts as necessary. If disassembly is necessary, see Engine Disassembly Sequence. (CTM104.)

1—Bracket (4 used)  
2—Cap Screw (4 used)  
3—Cap Screw (8 used)  
4—Isolator (4 used)  
5—Cap Screw (16 used)  
6—Washer (4 used)  
7—Nut (4 used)



T146443B -UN-01FEB02

TX,04,DH5305 -19-16FEB05-4/4

## Install Engine

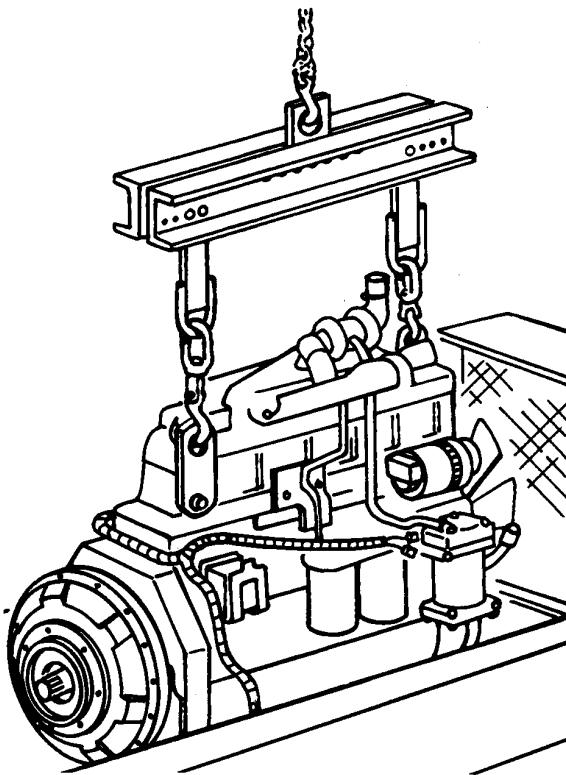
**⚠ CAUTION: Prevent possible crushing injury from heavy component. Use appropriate lifting device.**

### Engine—Specification

Engine—Weight..... 451 kg (993 lb)

**IMPORTANT:** The recommended method for lifting the engine is using the JDG23 Lifting Sling. The lifting force must be at 90° at the lifting points.

1. Use JDG23 Lifting Sling to install engine. Carefully lift and install engine.



T6683FQ -UN-18OCT88

*Engine Lifting Sling JDG23*

Continued on next page

OUT1738,00000B2 -19-16FEB05-1/2

- Install engine mount cap screws (2), washers (6) and nuts (7). Tighten cap screws.

**Specification**

Engine Mount-to-Isolator

Cap Screw—Torque..... 129 N·m (95 lb-ft)

**NOTE:** Each isolator (4) will have a stack of washers on one of the two mounting cap screws (3). A gap of 4-7 mm (0.15-0.27 in.) must be maintained between the bottom of bracket (1) and top of cap screw (3). Add or remove washers as necessary to maintain this gap. The cap screw will act as a motion limiter to reduce isolator wear.

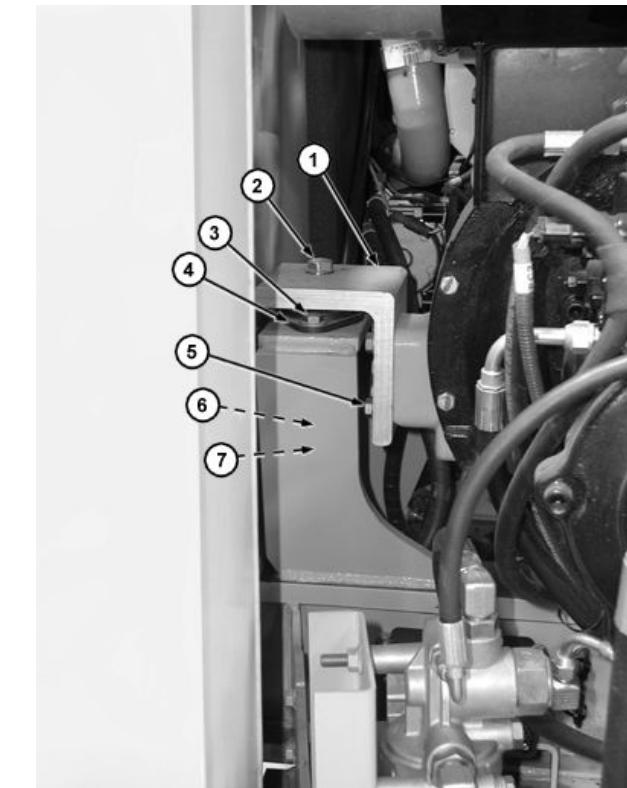
- Remove JDG23 Lifting Sling and JD244-1 and JD244-2 Lifting Eyes from engine.
- Align hydraulic pump to engine and tighten cap screws.

**Engine—Specification**

Hydraulic Pump-to-Flywheel Housing Cap

Screws—Torque..... 50 N·m (37 lb-ft)

- Connect engine wiring. See Machine Harness (W2) Component Location and see Engine Harness (W20) Component Location. (Group 9015-10.)
- Fill radiator and reservoir with coolant. Perform Cooling System Fill And Deaeration Procedure. (Operator's Manual.)
- Perform Bleed Fuel System. (Operator's Manual.)



1—Bracket (4 used)  
2—Cap Screw (4 used)  
3—Cap Screw (8 used)  
4—Isolator (4 used)

5—Cap Screw (16 used)  
6—Washer (4 used)  
7—Nut (4 used)

OUT1738,00000B2 -19-16FEB05-2/2

T146443B—UN—01FEB02

**Engine Repair**

This machine features a John Deere POWERTECH® 4.5 L diesel engine with a Level 12 electronic fuel system, Stanadyne DE10 fuel injection pump and integrated fuel cooler.

- To remove and install starter motor, Go to Remove and Install Starter. (CTM104.)  
To repair starter, See John Deere / Nippondenso Conventional Starting Motor Repair. (CTM77.)
- To remove and install alternator, Go to Remove and Install Alternator. (CTM104.)  
To repair alternator, See Robert Bosch Alternator Repair. (CTM77.)

- To remove fuel injection pump, Go to Remove Injection Pump. (CTM331.)  
To install fuel injection pump, Go to Install Injection Pump. (CTM331.)
- For engine rebuild information, Go to Engine Overhaul Guidelines. (CTM104.)

For any base engine repair information, please refer to CTM104 POWERTECH® 4.5 L and 6.8 L Diesel Engines—Base Engine.

For any fuel system related repair information, please refer to CTM331 POWERTECH® 4.5L and 6.8 L Diesel Engines—Level 12 Electronic Fuel Systems with Stanadyne DE10 Pump.

POWERTECH is a trademark of Deere &amp; Company

OUT1738,00000B1 -19-10OCT02-1/1

*Removal and Installation*

## Section 05 Engine Auxiliary Systems

### Contents

#### Page

#### **Group 0510—Cooling System**

Cooling Package Remove and	
Install .....	05-0510-1
Fan, Fan Guard, and Fan Shroud	
Remove and Install.....	05-0510-2
Fan Belt Remove and Install .....	05-0510-3

#### **Group 0560—External Fuel Supply Systems**

Fuel Tank.....	05-0560-1
Primary Fuel Filter (Water Separator) .....	05-0560-2
Final Fuel Filter.....	05-0560-2

*Contents*

## Cooling Package Remove and Install

**⚠ CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull a vacuum in hydraulic oil tank using a vacuum pump or drain hydraulic oil tank. Approximate oil capacity is 76 L (20 gal).

**⚠ CAUTION:** Explosive release of fluids from pressurized cooling system can cause serious burns.

**Shut off engine.** Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

3. Drain coolant from radiator. Approximate capacity is 26.5 L (7.0 gal).
4. Disconnect upper and lower radiator hoses, overflow hose, upper and lower oil cooler line, and upper and lower charge air cooler hoses.

**NOTE:** It is not necessary to discharge the air conditioning system.

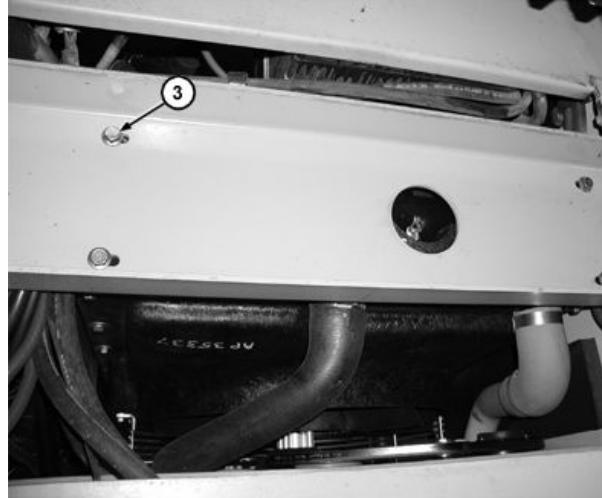
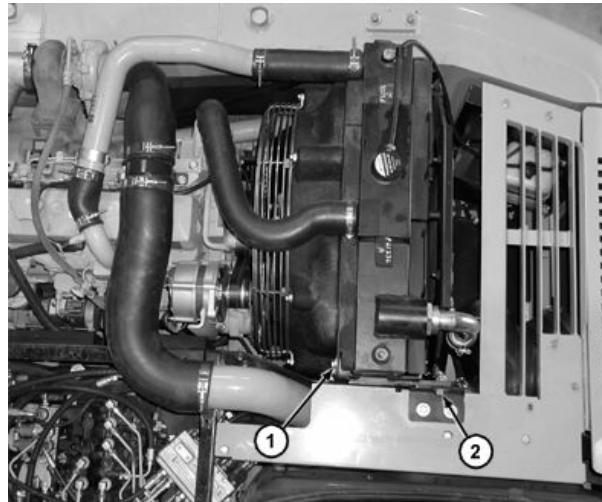
5. Disconnect air conditioner condenser and fuel cooler bracket from frame. Secure condenser, fuel cooler and bracket so it will not interfere with radiator removal.
6. Remove cap screws (1—3).

**⚠ CAUTION: Heavy component; use a hoist.**

### Specification

Radiator—Weight..... 55 kg (120 lb) approximate

7. Attach radiator to hoist and remove.
8. Repair or replace as necessary.
9. Install radiator and tighten cap screws (1—3).
10. Fill radiator and reservoir with coolant. See Cooling System Fill and Deaeration Procedure. (Operator's Manual.)
11. Fill and check hydraulic oil level. See Hydraulic Oil. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
12. Start engine and check for leaks.



*Lower Radiator Support*

1—Cap Screw (8 used)  
2—Cap Screw (2 used)

3—Cap Screw (4 used)

TS281—UN—15APR13

T146104B—UN—01FEB02

T146105B—UN—01FEB02

## Fan, Fan Guard, and Fan Shroud Remove and Install

**⚠ CAUTION:** Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281—UN—15APR13

TX,05,DH5318 -19-02OCT01-1/2

1. Remove cap screws (1) and fan guard.
2. Remove cap screws (2). Slide fan shroud towards engine.
3. Remove cap screws (3). Remove fan, and fan shroud.
4. Replace parts as necessary.
5. Install fan. Tighten cap screws.

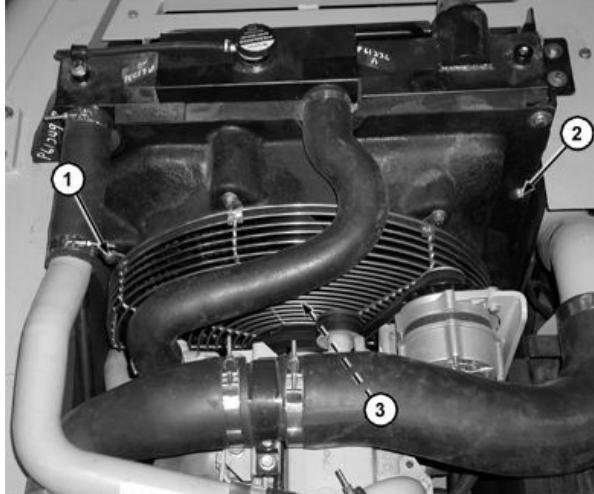
### Specification

Engine Fan-to-Pulley

Cap Screw—Torque..... 47 N·m (35 lb·ft)

1—Cap Screw (4 used)  
2—Cap Screw (4 used)

3—Cap Screw (4 used)



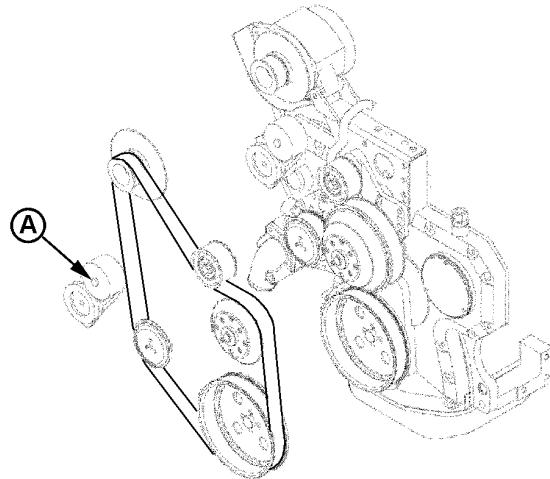
T146107B—UN—01FEB02

TX,05,DH5318 -19-02OCT01-2/2

## Fan Belt Remove and Install

1. Remove fan guard. See Fan, Fan Guard, and Fan Shroud Remove and Install. (Group 0510.)
2. Remove air conditioning compressor belt.
3. Place a 15 mm wrench on hex head of cap screw (A) in center of tension adjuster idler.
4. Pull idler away from belt to release belt tension.
5. Remove fan belt.
6. Inspect belt for wear or cracks. Replace as necessary.
7. Install fan belt.

A—Hex Head of Cap Screw



T108219

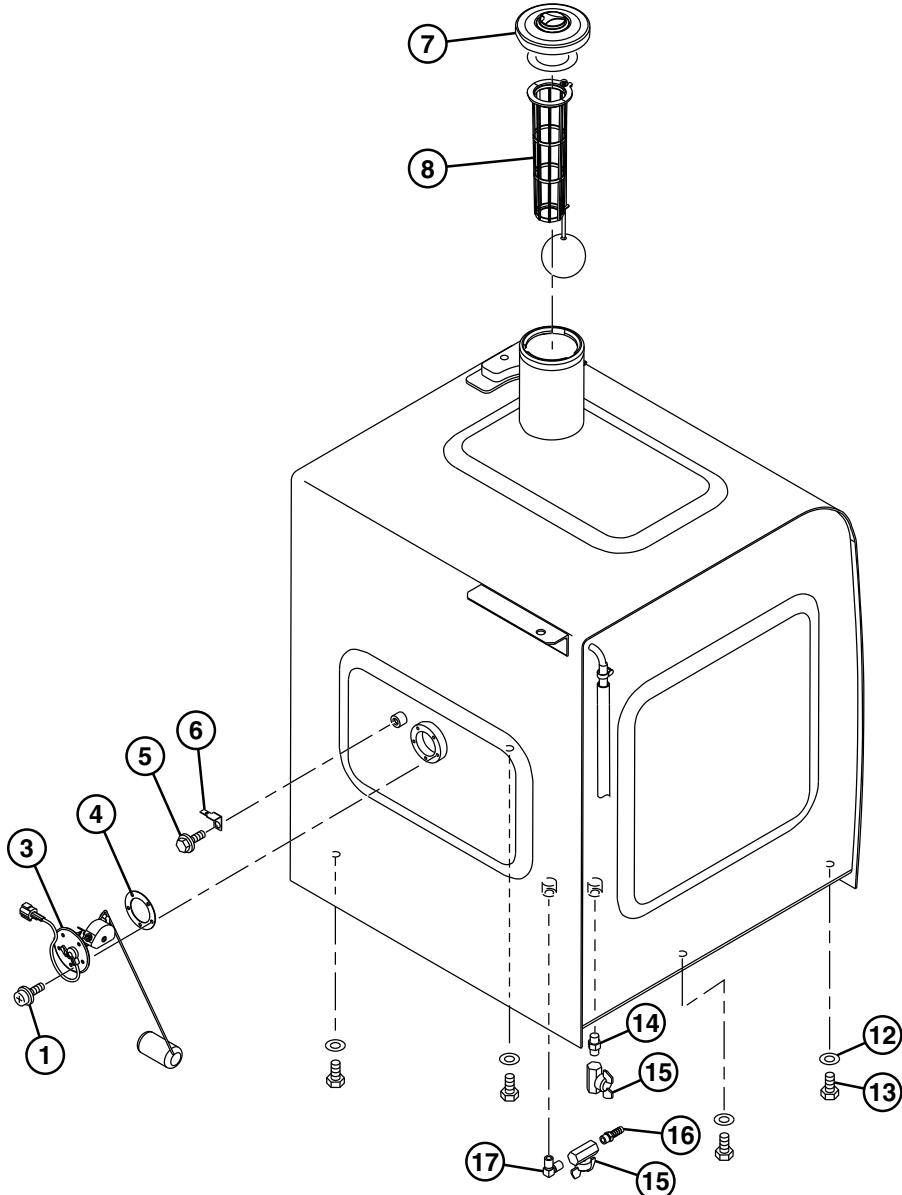
T108219—UN—25MAR97

TX,0510,DU283 -19-19DEC01-1/1

*Cooling System*

Group 0560  
External Fuel Supply Systems

**Fuel Tank Remove and Install**



T160151

1—Cap Screw (5 used)	5—Cap Screw	11—Fuel tank	16—Elbow Fitting
2—Connector	6—Bracket	12—Washer (4 used)	17—Adapter
3—Float (Fuel Level Sender)	7—Filler Cap	13—Cap Screw (4 used)	
4—Gasket	8—Fuel Strainer	14—Fitting	
	9—Hose Clamp	15—Drain Valve (2 used)	
	10—Hose (Fuel Return)		

1. Drain fuel from fuel tank. Approximate capacity is 250 L (66 gal).
2. Disconnect wiring connector (2).
3. Disconnect fuel return hose (10) and plug hose end.

**CAUTION: Heavy component; use a hoist.**

**Fuel Tank—Specification**  
Fuel Tank—Weight..... 91 kg (200 lb) approximate without fuel

4. Remove cap screws (13), washers (12) and fuel tank (11).
5. Repair or replace as necessary.

Continued on next page

T160151—UN—25OCT02

## *External Fuel Supply Systems*

6. If float (fuel level sender) (3) was removed, apply thread lock and sealer (medium strength) to threads of cap screws (1), install float and gasket (4) and tighten cap screws.
7. Install fuel tank (11), washers (12) and cap screws (13).
8. Attach fuel return hose (10) and connect connector (2).
9. Fill fuel tank with proper fuel. See Diesel Fuel. (Operator's Manual.)

### **Fuel Tank—Specification**

Float-to-Fuel Tank Cap  
Screw—Torque..... 4.5 N·m (40 lb-in.)

10. Perform Bleed Fuel System. (Operator's Manual.)

TX.0560,DW246 -19-03OCT02-2/2

## **Primary Fuel Filter (Water Separator) Repair**

To remove and install, repair, or replace the primary fuel filter (water separator), see Fuel Pre-Filter/Water Bowl Assembly (Optional). (CTM331.)

TX.0560,DW247 -19-03OCT02-1/1

## **Final Fuel Filter Repair**

To remove and install, repair, or replace the final fuel filter, see Remove and Install Final Fuel Filter/Water Bowl and/or Pre-Filter/Water Bowl Base. (CTM331.)

TX.05.VV2575 -19-19MAR97-1/1

## Section 17 Frame or Supporting Structure

### Contents

#### Page

##### **Group 1740—Frame Installation**

Welding On Machine .....	17-1740-1
Welding Repair of Major Structure.....	17-1740-1

##### **Group 1749—Chassis Weights**

Counterweight Remove and Install .....	17-1749-1
---	-----------

*Contents*

## **Welding On Machine**

**IMPORTANT:** Electrical current traveling from the welder through the machine electrical system may damage the machine electrical system, including battery, engine control unit, and pump and valve controller. Disconnect battery ground cable, engine control unit, and pump and valve controller electrical connectors before welding on the machine.

Before welding on the machine, follow the steps listed below to protect the machine electrical system.

1. Disconnect the battery ground and positive cables.

**NOTE:** See *Engine Control Unit Harness (W19) Component Location Diagram* for connector information. (Group 9015-10.)

2. Open left rear engine access door. Disconnect electrical connectors from engine control unit.

**NOTE:** Rear cover located behind seat in cab, must be removed to gain access to pump and valve controller connectors.

See Cab Harness (W1) Component Location Diagram for connector information. (Group 9015-10.)

3. Remove rear cover. See *Rear Cover Remove and Install*. (Group 9015-20.) Disconnect electrical connectors from pump and valve controller.

TX,33,GG2399 -19-22APR02-1/1

## **Welding Repair of Major Structure**

**CAUTION:** Avoid potentially toxic fumes and dust. Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

If you sand or grind paint, avoid breathing the dust. Wear an approved respirator. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

1. Remove paint before welding or heating.

**IMPORTANT:** Disconnect battery ground strap or turn battery disconnect switch to "OFF". Also disconnect the wiring harness connectors to the engine and pump controller.

Have only a qualified welder do this job. Connect welder ground clamp close to each weld area so electrical current does not pass through any bearings. Remove or protect all parts that can be damaged by heat or weld splatter.

2. Use one of the following weld processes:

- AWS-E-7018 covered electrode with shielded metal arc welding (SMAW) process.
- AWS-ER-70S-3 wire electrode with gas metal arc welding (GMAW) process.

- AWS-E70T-1 or E71T-1 wire electrode with flux core arc welding (FCAW) process.

### **Welding Repair of Major Structure—Specification**

Weld Metal—Tensile	
Strength.....	482.6 mPa (70,000 psi)
Yield Strength .....	413.7 mPa (60,000 psi)
Elongation.....	22%

**IMPORTANT:** Area to be repaired must be preheated to allow better weld penetration.

3. To repair weld metal failure, remove failed weld metal using arc or grinding equipment. Thoroughly clean area to be welded. Preheat structural assemblies to a minimum of 38°C (100°F). Preheat ground engaging tools (cutting edges, skid shoes, and teeth shanks) to 177°C (350°F).

To repair base metal failure remove enough material to allow weld to penetrate to the bottom of crack. Preheat structural assemblies to a minimum of 38°C (100°F). Preheat ground engaging tools (cutting edges, skid shoes, and teeth shanks) to 177°C (350°F).

### **Welding Repair of Major Structure—Specification**

Structural Assemblies—Preheat	
Temperature.....	38°C (100°F)
Ground Engaging Tools—Preheat	
Temperature.....	177°C (350°F)

TX,17,GG2439 -19-19SEP98-1/1

*Frame Installation*

# Group 1749 Chassis Weights

## Counterweight Remove and Install

1. Park machine on level ground.
2. Remove two plastic caps from top of counterweight (1).



**CAUTION: Heavy component; use a hoist.**

**The lifting capacity of a lifting eyebolt decreases as the lift angle increases from vertical. A spreader bar should be used to obtain, as close as possible, a vertical lift from eyebolts.**

### Specification

Counterweight—Weight..... 3000 kg (6610 lb) approximate

3. Connect counterweight to hoist (2) using spreader bar (3) and JT05554 Metric Lifting Eyebolts.
4. Remove cap screws and washers (4).
5. Remove counterweight.
6. Repair or replace as necessary.
7. Install cap screws and washers (4) and tighten.

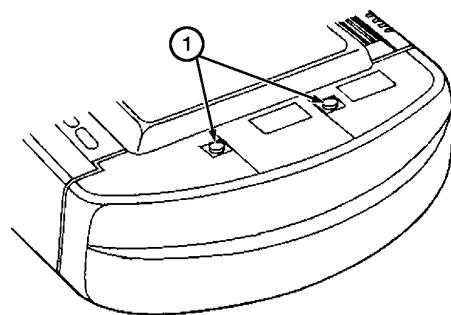
### Specification

Frame-to-Counterweight

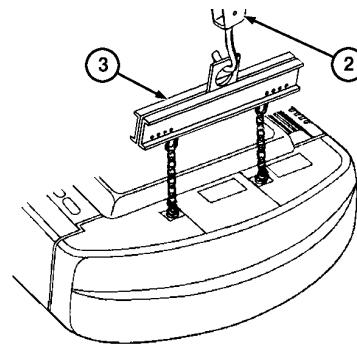
Cap Screw—Torque..... 1150 N·m (830 lb-ft)

1—Counterweight  
2—Hoist

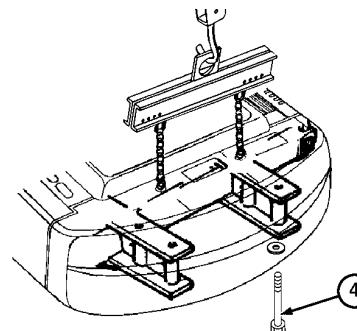
3—Spreader Bar  
4—Cap Screw and Washer (4 used)



T143043—UN—20JUL01



T143044—UN—03SEP02



T143045—UN—20JUL01

TX.17.SB601 -19-10DEC01-1/1

*Chassis Weights*

## **Section 18 Operator's Station**

### **Contents**

	<b>Page</b>
<b>Group 1800—Removal and Installation</b>	
Cab Remove and Install .....	18-1800-1
<b>Group 1810—Operator Enclosure</b>	
Windowpane and Molding Remove and Install .....	18-1810-1
Bonded Windowpane Remove and Install .....	18-1810-3
Sliding Window Remove and Install .....	18-1810-3
<b>Group 1821—Seat and Seat Belt</b>	
Seat Repair.....	18-1821-1
Seat Belt Remove and Install .....	18-1821-8
<b>Group 1830—Heating and Air Conditioning</b>	
Refrigerant Cautions and Proper Handling .....	18-1830-1
Flush and Purge Air Conditioner System.....	18-1830-2
R134a Refrigerant Oil Information.....	18-1830-4
R134a Refrigerant Recovery/Recycling and Charging Station Installation Procedure .....	18-1830-5
Recover R134a Refrigerant.....	18-1830-5
Evacuate R134a System .....	18-1830-6
Charge R134a System .....	18-1830-6
Compressor.....	18-1830-7
Receiver-Dryer .....	18-1830-7
Air Conditioner and Heater .....	18-1830-8
Condenser.....	18-1830-9

*Contents*

# Group 1800 Removal and Installation

## Cab Remove and Install

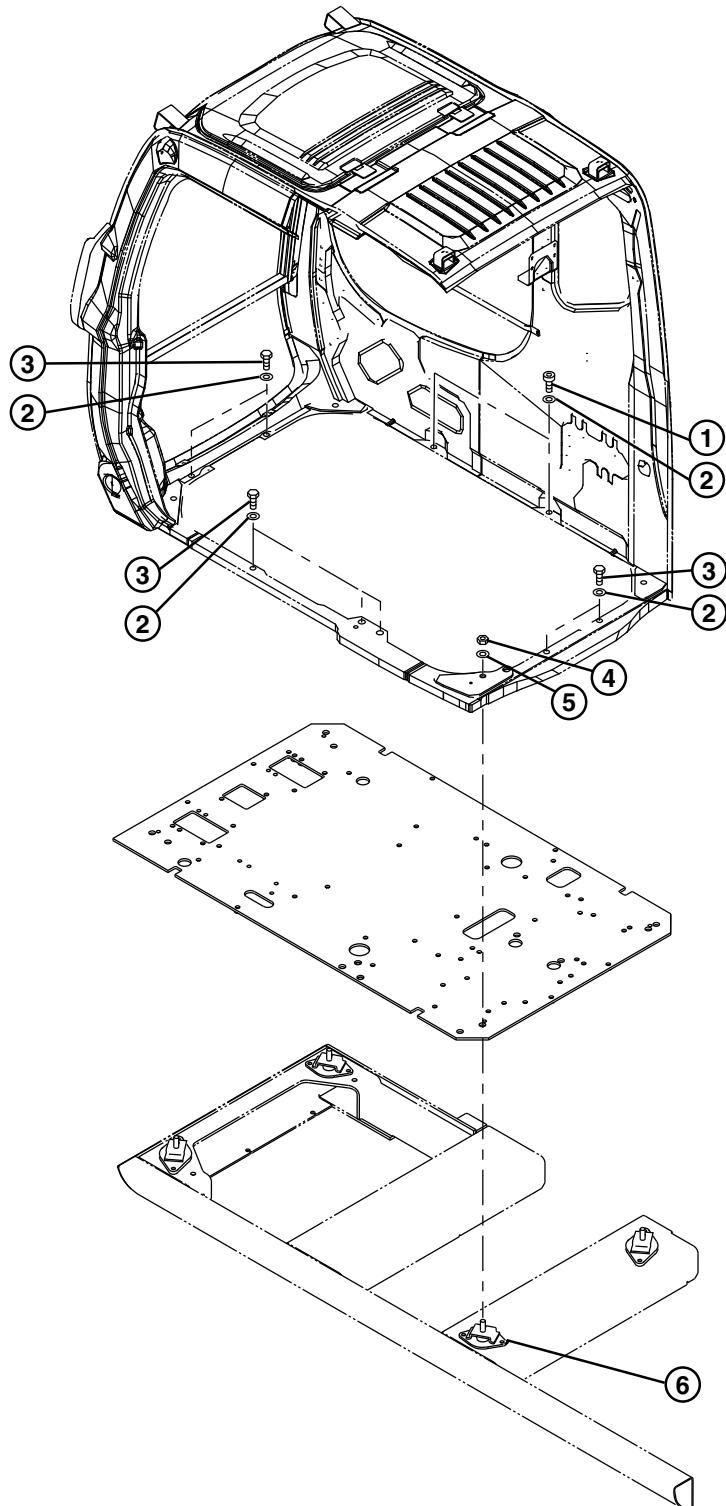
*NOTE: Seat removal is optional.*

1. Disconnect battery ground (-) cable at battery.
2. Remove monitor controller. See Monitor Controller and Display (A5) Remove and Install. (Group 9015-20.)
3. Disconnect electrical connectors.
4. Remove fresh air intake cowl.
5. Disconnect windshield washer hose.

Continued on next page

TX,18,VV2505 -19-22APR02-1/3

*Removal and Installation*



T143008

1— Cap Screw (2 used)  
2— Washer (9 used)

3— Cap Screw (7 used)  
4— Lock Nut (4 used)

5— Washer (4 used)  
6— Rubber Mount (4 used)

T143008—UN-20JUL01

Continued on next page

TX,18,VV2505 -19-22APR02-2/3

*Removal and Installation*

6. Remove lock nuts (4). Discard lock nuts.

7. Remove cap screws (1 and 3).

TX,18,VV2505 -19-22APR02-3/3



**CAUTION: Heavy component; use a hoist.**

**Specification**

Cab—Weight..... 290 kg (640 lb) approximate

8. Use lifting straps to connect cab to hoist.

*NOTE: Move cab forward slightly to clear propel pedals during removal.*

9. Remove cab.

10. Repair or replace parts as necessary.

*NOTE: Check that all lines and cables are out of the way before installing cab.*

11. Install cab. Tighten cap screws (1 and 3).

**Specification**

Cab to Platform Cap

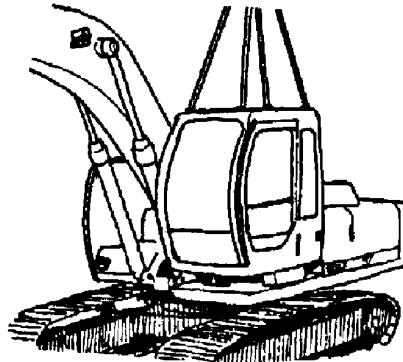
Screw—Torque..... 50 N·m (37 lb-ft)

12. Install washers (5) and new lock nuts (4). Tighten lock nuts.

**Specification**

Cab Mount Lock

Nut—Torque..... 205 N·m (152 lb-ft)



T106453

T106453—UN—15JAN97

13. Connect electrical connectors. See Monitor Harness (W3) Component Location Diagram and see Cab Harness (W1) Component Location. (Group 9015-10.)

14. Install monitor controller. See Monitor Controller and Display (A5) Remove and Install. (Group 9015-20.)

TX,18,VV2505 -19-22APR02-4/3

*Removal and Installation*

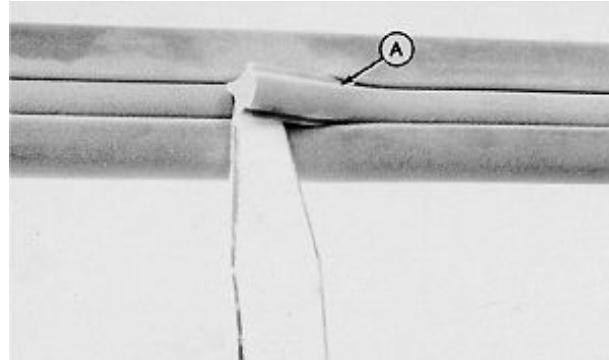
# Group 1810 Operator Enclosure

## Windowpane and Molding Remove and Install

### Windowpane and Two Piece Molding Remove and Install

1. Use insertion tool to remove locking strip (A) from molding.

A—Locking Strip



T5903AI—UN—19OCT88

TX,1800,VV2501 -19-07MAR02-1/6

**IMPORTANT: Extreme care is required to prevent windowpane damage.**

2. Carefully push windowpane out from molding.
3. Inspect molding for damage; replace if necessary.

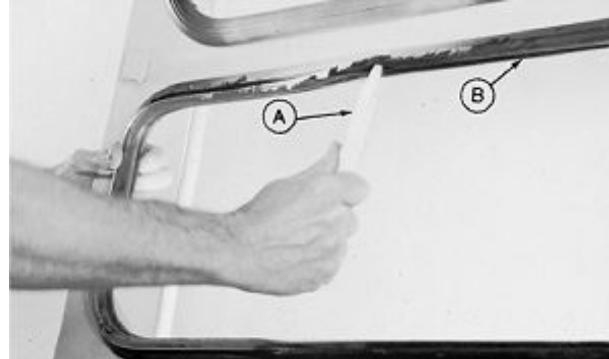


T5903AJ—UN—19OCT88

TX,1800,VV2501 -19-07MAR02-2/6

4. Apply instant gel adhesive in molding (B) frame channel. Install molding.
5. Install windowpane using insertion tool (A) and soap lubricant.

A—Windowpane Insertion Tool    B—Molding



T5903AK—UN—19OCT88

Continued on next page

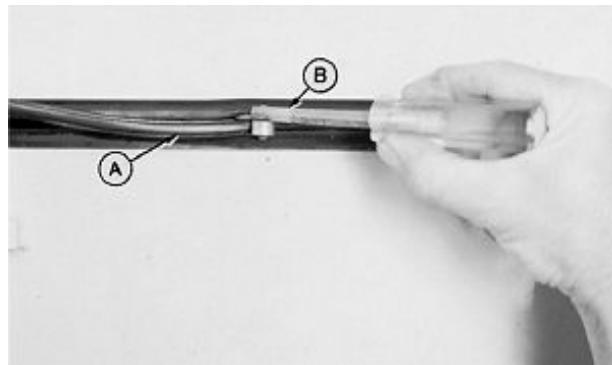
TX,1800,VV2501 -19-07MAR02-3/6

*Operator Enclosure*

6. Use weather strip installation tool (B) to install locking strip (A).

A—Locking Strip

B—Weather Strip Installation Tool



T5903AL—UN—19CCT88

TX,1800,VV2501 -19-07MAR02-4/6

**Windowpane and One Piece Molding Remove and Install**

1. Lift inside of molding over cab frame and carefully push windowpane and molding out.
2. Remove molding from windowpane; replace if necessary.



T6439XE—UN—19OCT88

TX,1800,VV2501 -19-07MAR02-5/6

3. Install molding on windowpane. Position drain notches (A) at bottom and towards outside of windowpane.
4. Install windowpane and molding. Lift inside of molding over cab frame.

A—Drain Notches



T6439XD—UN—19OCT88

TX,1800,VV2501 -19-07MAR02-6/6

## Bonded Windowpane Remove and Install

Adhesive used to secure windowpanes is urethane adhesive used on automobile windshields. Urethane adhesive, manufactured by Loctite Corporation or equivalent, is recommended. DO NOT use any other type of adhesive. It is recommended that auto glass dealer install windowpanes.

**IMPORTANT: Windowpanes must include an ultra-violet barrier around edge so adhesive will not deteriorate. Windowpanes ordered through John Deere Parts have this ultra-violet barrier. If windowpane is purchased through glass dealer, the dealer must incorporate an ultra-violet barrier on the glass. DO NOT paint border of glass.**

If auto glass dealer does not install windowpanes, proceed as follows:

1. Remove windowpane frame from cab.
2. Scrape any broken glass off existing adhesive. DO NOT remove adhesive from window frame or cab.

**IMPORTANT: Adhesive will not stick to bare metal.**

3. If existing adhesive is removed and paint is scraped, paint window frame. Paint must be fully cured before installing windowpane.
  4. Trim existing adhesive to form smooth surface.
- IMPORTANT: Follow manufacturer's instructions for using adhesive.**
5. Apply 6 mm (1/4 in.) bead of adhesive over existing adhesive.
  6. Position windowpane in cab frame. Use hand pressure to force windowpane down until edges are even with metal frame.
  7. Secure windowpane with duct tape until adhesive cures. Allow adhesive to cure for 24 hours before operating machine.

T52,1810,C19 -19-07MAR02-1/1

## Sliding Window Remove and Install

1. Remove molding (3) from inside of window.
2. Use putty knife to cut adhesive (4) between cab flange and window frame (1).

**IMPORTANT: Work carefully to avoid damaging frame and windowpane. Two technicians are required during window removal; one to push window out of cab, and one to prevent window from falling.**

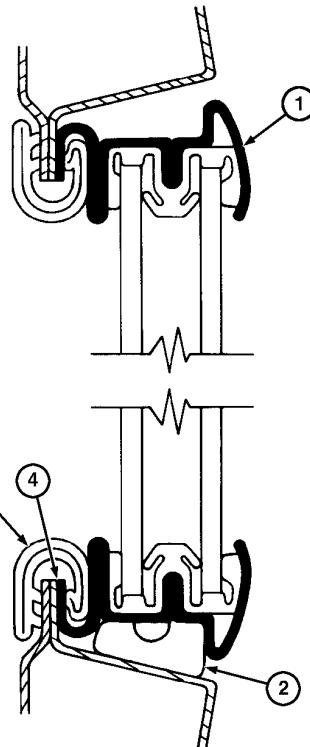
3. Carefully remove window frame from cab.
4. Lift frame slightly at top-center to remove and install windowpanes.
5. Apply instant gel adhesive to cab flange.
6. Install windows and frame with spacers (2) at bottom.
7. Using water as lubricant, push window frame tight against cab flange.
8. Install molding (3) around window and cab flange.

1—Window Frame

2—Bottom Spacer (4 used)

3—Molding

4—Adhesive



T140968

T140968—UN—30APR01

TX,18,VV2503 -19-07MAR02-1/1

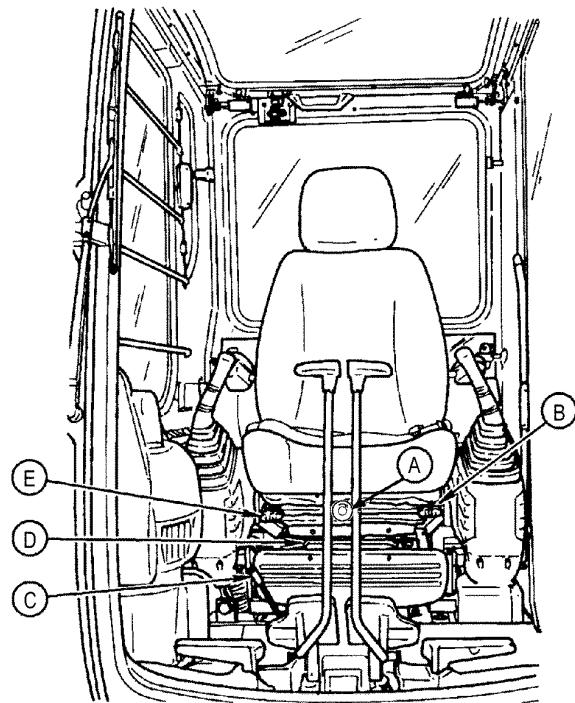
*Operator Enclosure*

## Seat Repair

### Check Seat Adjustments

1. Turn weight adjustment knob (A) to adjust seat to weight of operator. Weight is displayed on knob.
2. Push seat height and angle adjustment lever (B) down while sitting on seat or while standing and pulling up on seat to obtain desired height. Release lever. Push down lever while sitting on seat to adjust seat to desired angle. Release lever.
3. Push console and seat fore-aft adjustment lever (C) down to adjust seat and both right and left consoles to desired distance from propel pedals and levers. Release lever to lock seat and consoles into position.
4. Pull seat fore-aft adjustment lever (D) up to unlock seat from both consoles. Slide the seat to desired distance from control levers. Release the lever.
5. Pull backrest adjustment lever (E) up to release backrest lock. Move backrest to desired position. Release the lever.

A—Weight Adjustment Knob	D—Seat Fore-Aft Adjustment Lever
B—Seat Height and Angle Adjustment Lever	E—Backrest Adjustment Lever
C—Console and Seat Fore-Aft Adjustment Lever	



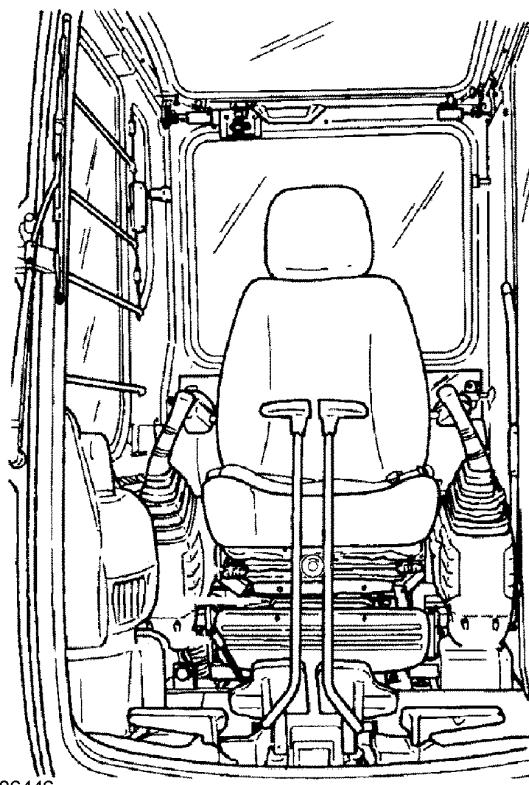
T102204 -UN-26JUL96

Continued on next page

TX,18,GG2448 -19-22APR02-1/7

**Seat Remove and Install**

1. Pull the seat and consoles as far forward as possible.



T106446—UN-15/AN97

Continued on next page

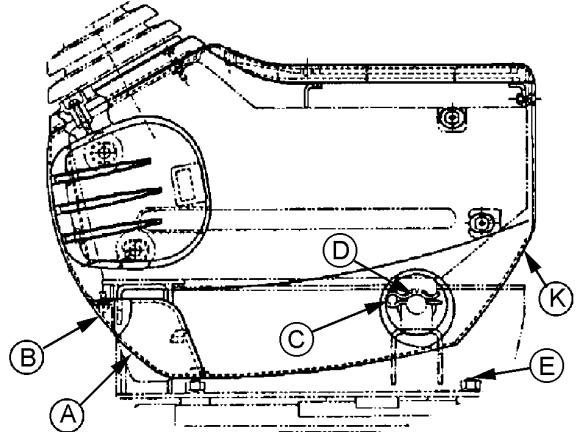
TX,18,GG2448 -19-22APR02-2/7

*Seat and Seat Belt*

2. Remove the screws (B) to remove cover (A).
3. Remove cap screws (L).
4. Tip the console up.
5. Remove a quick lock pin (C) to remove pin (D).
- Lay the console on cover behind the seat.
6. Remove nuts and washers (E).

A—Cover  
B—Screw (2 used)  
C—Quick Lock Pin  
D—Pin

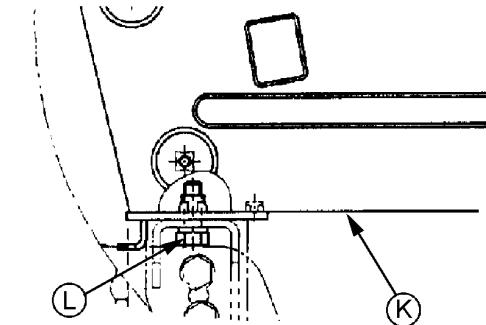
E—Nut and Washer (4 used)  
K—Console  
L—Cap Screw and Washer



T106445

*Left Console Shown*

T106445—JUN—15JAN97



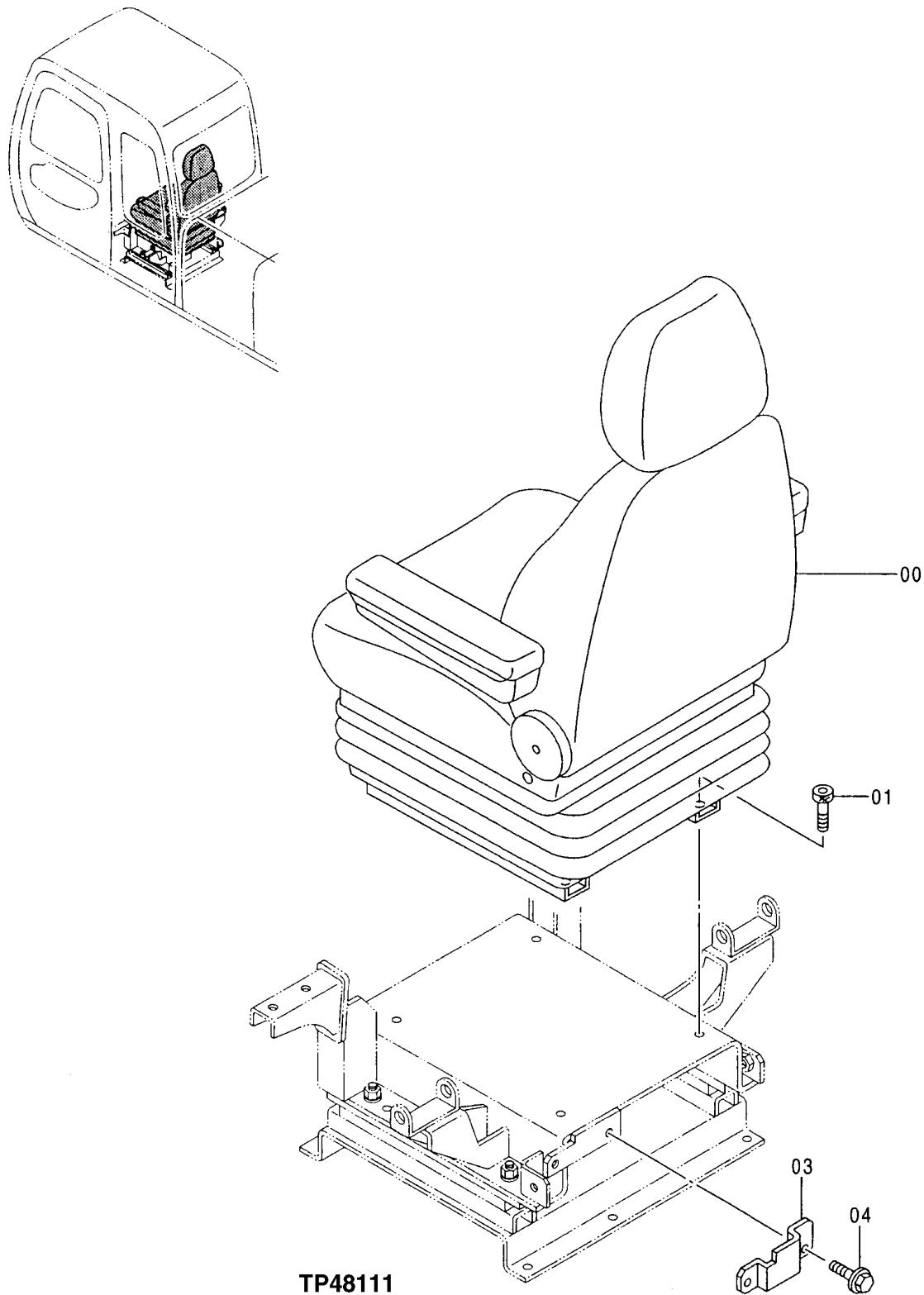
T105912

T105912—JUN—02JAN97

*Continued on next page*

TX,18,GG2448 -19-22APR02-3/7

*Seat and Seat Belt*



TP48111 -UN-05AUG96

Continued on next page

TX,18,GG2448 -19-22APR02-4/7

*Seat and Seat Belt*

0—Seat  
1—Cap Screw (4 used)

3—Bracket  
4—Cap Screw, Lock Washer and  
Washer (2 used)

**! CAUTION: Heavy component; use a hoist.**

7. Remove the seat (0) and carrier.

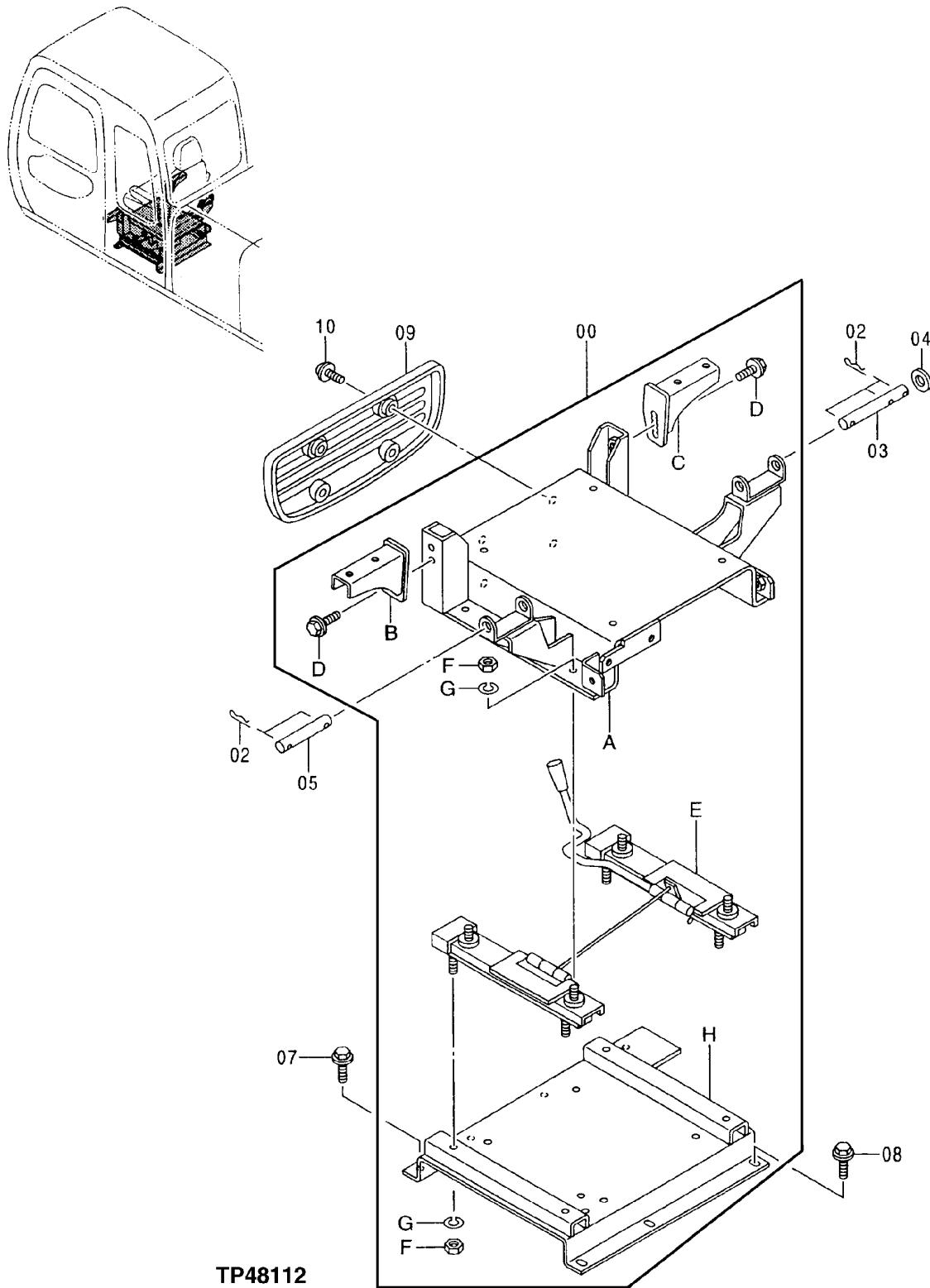
**Specification**

Seat—Weight..... 35 kg (75 lb) approximate

Continued on next page

TX,18,GG2448 -19-22APR02-5/7

*Seat and Seat Belt*



TP48112-JUN-07AUG96

Continued on next page

TX,18,GG2448 -19-22APR02-6/7

## Seat and Seat Belt

00— Seat Stand

A—Carrier

B—Bracket

C—Bracket

D—Cap Screw, Lock Washer and  
Washer (4 used)

E—Seat Slide

F—Nut (8 used)

G—Lock Washer (8 used)

H—Seat Base

2—Quick Lock Pin (4 used)

3—Pin

4—Washer

5—Pin

7—Cap Screw, Lock Washer and  
Washer (4 used)

8—Cap Screw, Lock Washer and  
Washer (3 used)

9—Cover

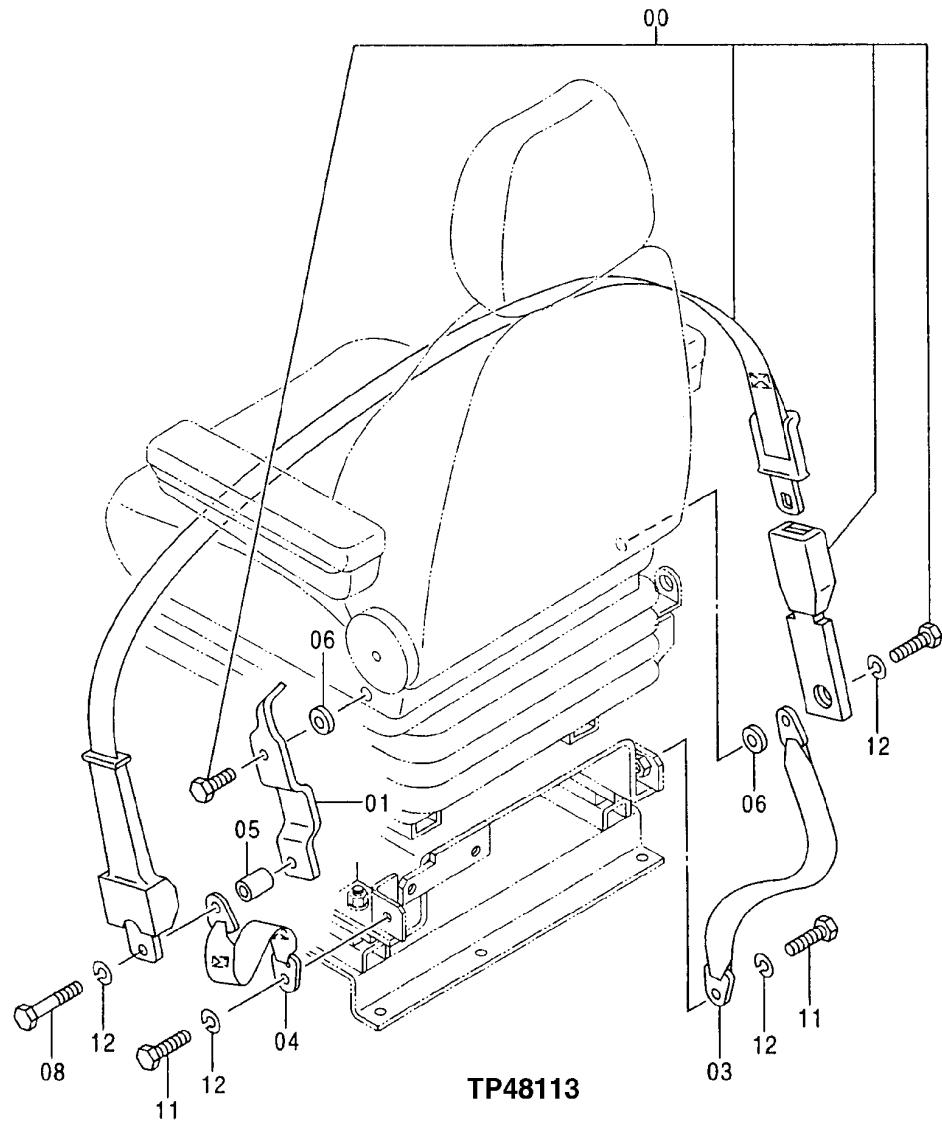
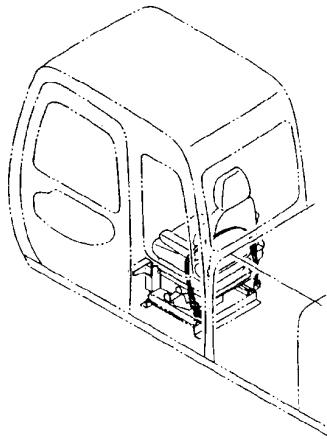
10—Screw, Lock Washer and  
Washer (4 used)

8. Remove the seat base (H) if replacement of seat slides (E) is necessary.

9. Repair or replace parts as needed.

TX,18,GG2448 -19-22APR02-7/7

**Seat Belt Remove and Install**



TP48113 -UN-05AUG96

Continued on next page

TX,18,GG2446 -19-29NOV01-1/2

*Seat and Seat Belt*

0—Seat Belt  
1—Bracket  
3—Belt  
4—Belt

5—Spacer (Sleeve)  
6—Spacer (Sleeve) (2 used)

8—Cap Screw  
11—Cap Screw (2 used)  
12—Spring Washer (4 used)

TX,18,GG2446 -19-29NOV01-2/2

*Seat and Seat Belt*

Group 1830  
Heating and Air Conditioning

### Refrigerant Cautions and Proper Handling

**CAUTION:** DO NOT allow liquid refrigerant to contact eyes or skin. Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

If liquid refrigerant contacts eyes or skin, DO NOT rub the area. Splash large amounts of COOL water on affected area. Go to a physician or hospital immediately for treatment.

DO NOT allow refrigerant to contact open flames or very hot surfaces such as electric welding arc, electric heating element and lighted smoking materials.

DO NOT heat refrigerant over 52°C (125°F) in a closed container. Heated refrigerant will develop high pressure which can burst the container.

Keep refrigerant containers away from heat sources. Store refrigerant in a cool place.

DO NOT handle damp refrigerant container with your bare hands. Skin may freeze to container. Wear gloves.

If skin freezes to container, pour COOL water over container to free the skin. Go to a physician or hospital immediately for treatment.

**IMPORTANT:** To meet government standards relating to the use of refrigerants, R134a is used in the air conditioning system. Because it does not contain chlorine, R134a is not detrimental to the ozone in the atmosphere. However, it is illegal to discharge any refrigerant into the atmosphere. It must be recovered using the appropriate recovery stations.

Use correct refrigerant recovery, recycling and charging stations. Never mix refrigerants, hoses, fittings, components or refrigerant oils.

Use only John Deere approved R134a refrigerant products. Mixing of products not compatible will cause system damage and contaminate recovery, recycling and charging station equipment. Care must be taken to identify and use equipment, refrigerant oil and refrigerant designed only for R134a refrigerant systems. Refrigerant should be tested for type and purity before recovery, recycling or charging of system. JT02167A refrigerant test instrument should be used before any testing or repair to system is performed.

TX,9031,DY5073 -19-16JUN10-1/2

Prism Pro Refrigerant Identification Instrument.. JT02167A

To safely identify type and check purity of refrigerant prior to recovery, recycling and recharging of A/C systems.

TX,9031,DY5073 -19-16JUN10-2/2

## Flush and Purge Air Conditioner System

**⚠ CAUTION:** Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

**See Refrigerant Cautions and Proper Handling. (Group 1830.)**

*NOTE: Flushing can be performed on machine.*

1. **Perform Recover R134a Refrigerant. (Group 1830.)**  
Add flushing solvent to system with JT02075 Flusher and JT02098 Flusher Fitting Kit.
2. Remove and discard receiver/dryer.
3. Connect flusher outlet hose to inlet end of compressor discharge line using JT02102 Adapter.
4. Fill flusher tank with solvent and fasten all connections. Dispose of solvent properly.

**Flush and Purge System—Specification**

Flusher Tank—Capacity..... 4 L (1 gal)

*NOTE: Air pressure must be at least at specification for flushing and purging.*

**Flush and Purge System—Specification**

Air Pressure—Minimum

Pressure..... 620 kPa (90 psi)  
(6.2 bar) for flushing and purging

5. Connect supply line of moisture-free compressed air or dry nitrogen to flusher air valve.
6. Open air valve to force flushing solvent into condenser circuit. Flusher tank is empty when hose pulsing stops. Additional flushing cycles are required if system is heavily contaminated with burned oil or metal particles.

**7. Clean compressor as follows:**

- a. Remove compressor and measure oil drained from both manifold ports.
- b. Connect flusher outlet hose to inlet end of compressor discharge line using JT02102 Adapter.
- c. Pour flushing solvent into suction port and discharge port. Plug both ports in compressor manifold, using JT02099 and JT03194 Caps.

**Flush and Purge System—Specification**

Flushing Solvent in Suction Port—Volume..... 240 mL (8 fl oz)

Flushing Solvent in Discharge Port—Volume..... 120 mL (4 fl oz)

- d. Turn compressor end for end and roll it side to side.
- e. Remove both plugs from manifold ports and drain solvent from compressor.

f. Connect battery power to compressor clutch coil. Rotate pulley at least five revolutions to move solvent out of cylinders.

- g. Invert compressor. Roll end for end and side to side. Drain thoroughly.
- h. Repeat previous two steps at least three times.

**8. Divide system into two circuits:**

- Condenser circuit, including inlet and outlet hoses.
- Evaporator circuit, including inlet and outlet hoses.

**9. Condenser:**

**IMPORTANT: DO NOT attempt to flush through compressor or receiver/dryer. Flushing through expansion valve is acceptable if refrigerant oil has a normal odor and appearance.**

- a. Flush/Purge Condenser:

- b. Remove and discard receiver/dryer.
- c. Connect flusher outlet hose to inlet end of compressor discharge line using JT02102 Adapter.
- d. Fill flusher tank with solvent and fasten all connections.

**Flush and Purge System—Specification**

Flusher Tank—Capacity..... 4 L (1 gal)

*NOTE: Air pressure must be at least to specification for flushing and purging.*

**Flush and Purge System—Specification**

Air Pressure—Minimum  
Pressure..... 620 kPa (90 psi)  
(6.2 bar) for flushing and purging

- e. Connect supply line of moisture-free compressed air or dry nitrogen to flusher air valve.
- f. Open air valve to force flushing solvent into condenser circuit. Flusher tank is empty when hose pulsing stops. Additional flushing cycles are required if system is heavily contaminated with burned oil or metal particles.
- g. Attach return hose and aerator nozzle to end of receiver/dryer inlet hose using JT03197 Adapter. Put nozzle in container to collect flushing solvent.

*NOTE: Purging the condenser circuit takes 10—12 minutes to thoroughly remove solvent.*

- h. Disconnect hose from aeration nozzle to check circuit for solvent. Hold hose close to piece of cardboard; continue purging until cardboard is dry.

10. See flush evaporator, if evaporator requires flushing.

If system is contaminated with burned refrigerant oil or debris, remove and bench flush evaporator. See following steps to flush evaporator through expansion valve, if oil appears normal.

**11. Flush evaporator:**

- a. Remove evaporator and expansion valve. See Air Conditioner and Heater Repair. (Group 1830.)
- b. Force flushing solvent through evaporator inlet with compressed air.
- c. Purge system until dry.
- d. Install evaporator and then go to step 13.

**12. Flush evaporator through expansion valve:**

- a. Connect flusher outlet hose to connection of receiver/dryer outlet hose using JT03188 adapter.
- b. Fill flusher tank and fasten all connections.

**Flush And Purge System—Specification**

Flusher Tank—Capacity..... 4 L (1 gal)

*NOTE: Air pressure must be at least to specification for flushing and purging.*

**Flush And Purge System—Specification**

Air Pressure—Minimum

Pressure..... 620 kpa (90 psi)  
(6.2 bar) for flushing and purging.

- c. Connect supply line of moisture-free compressed air or dry nitrogen to flusher air valve.
- d. Attach hose and aerator nozzle to compressor inlet line using JT02101 adapter. Put nozzle in container to collect solvent.

*NOTE: Purging evaporator circuit takes 12—15 minutes to thoroughly remove solvent.*

13. Disconnect hose from aeration nozzle to check circuit for solvent. Hold hose close to piece of cardboard and continue purging until cardboard is dry.
14. Install new receiver/dryer compatible with R134a refrigerant. Fasten connections and mounting bracket. See Receiver-Dryer Repair. (Group 1830.)
15. Add required oil. See R134a Refrigerant Oil Information. (Group 1830.)
16. Install compressor and connect refrigerant lines to manifold.
17. Connect clutch coil wire and install drive belt.

## R134a Refrigerant Oil Information

**⚠ CAUTION:** All new compressors are charged with a mixture of nitrogen, R134a refrigerant and TY22025 (R134a) refrigerant oil. Wear safety goggles and discharge the compressor slowly to avoid possible injury.

**IMPORTANT:** Do not add any more oil than required or maximum cooling will be reduced.

**DO NOT** leave system or R134a compressor oil containers open. Refrigerant oil easily absorbs moisture. **DO NOT** spill R134a compressor oil on acrylic or ABS plastic. This oil will deteriorate these materials rapidly. Identify R134a oil containers and measures to eliminate accidental mixing of different oils.

New compressor from parts depot contains new oil. Oil level visible through suction port normally is below drive shaft.

Normal operating oil level of compressor removed from operation cannot be seen through suction port of compressor.

Compressors can be divided into three categories when determining correct oil charge for system.

- New compressor from parts depot
- Used compressor removed from operation
- Compressor internally washed with flushing solvent

Determining amount of system oil charge prior to installation of compressor on machine.

When complete system, lines, and components are flushed add correct amount of oil as described.

### Refrigerant Oil Capacity—Specification

Oil—Volume.....	180 mL (6.09 fl oz)
R134a—Weight.....	950 ± 50 g (2.09 ± 0.1 lb)

If any section of hose is removed and flushed or replaced, measure length of hose and use formula 3 mL per 30 cm (0.1 fl oz per ft) to determine correct amount of oil to be added.

Drain compressor oil into graduated container while rotating compressor shaft and record amount.

If oil drained from compressor removed from operation is very black or amount of oil is less than 6 mL (0.2 fl oz), perform the following and discard oil properly:

- Determine if R134a leakage was detected, remove component and repair or replace component.
- Remove and discard receiver/dryer.
- Flush complete system with TY16134 Air Conditioning Flushing Solvent.

If component is serviceable, pour flushing solvent in ports and internally wash out old oil and discard oil properly.

Install new receiver-dryer. See Receiver-Dryer Repair. (See procedure in this group.)

Install required amount of TY22025 Refrigerant Oil in compressor.

Connect all components. Perform Evacuate R134a System and Perform Charge R134a System. (Group 1830.)

## R134a Refrigerant Recovery/Recycling and Charging Station Installation Procedure

**CAUTION:** Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

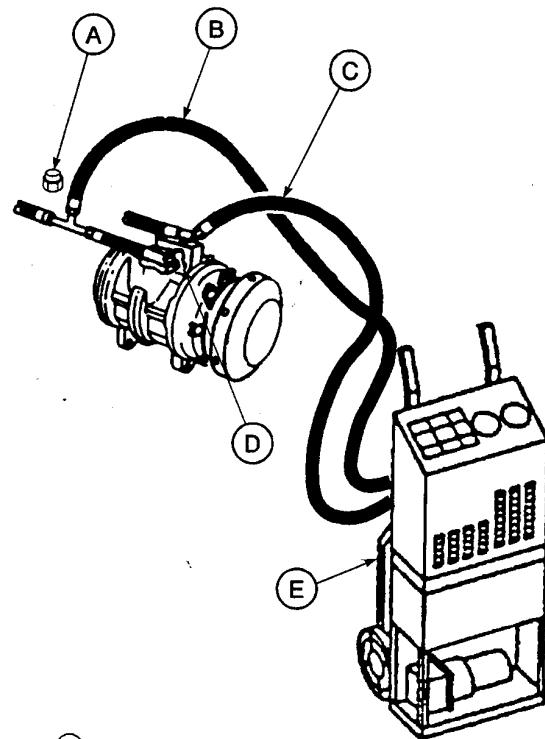
**See Refrigerant Cautions and Proper Handling. (Group 1830.)**

**IMPORTANT:** Use only John Deere approved R134a refrigerant products. Mixing of products not compatible will cause system damage and contaminate recovery, recycling and charging station equipment.

**CAUTION:** Do not remove high pressure relief valve (D). Air conditioning station will discharge rapidly causing possible injury.

**IMPORTANT:** Use only John Deere approved refrigerant recovery/recycling and charging stations. DO NOT mix refrigerant, hoses, fittings, components or refrigerant oils.

1. Follow procedures. **See Refrigerant Cautions and Proper Handling.** (See procedure in this group.)
2. Close both high-side and low-side valves on refrigerant recovery/recycling and charging station (E).
3. Remove cap from low-side charge port.
4. Connect blue hose (C) from refrigerant recovery/recycling and charging station (E) to low-side test port.
5. Remove cap (A) from charge port on high pressure hose and connect red hose (B).
6. Follow the manufacturers' instructions when using refrigerant recovery/recycling and charging station.



T8118AG CV

**A**—High Pressure Hose Charge Port Cap  
**B**—Red Hose  
**C**—Blue Hose  
**D**—High Pressure Relief Valve  
**E**—Refrigerant Recovery/Recycling and Charging Station

TX,9031,DU1693 -19-22APR02-1/1

## Recover R134a Refrigerant

**CAUTION:** Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

**See Refrigerant Cautions and Proper Handling. (Group 1830.)**

**CAUTION:** Do not remove high pressure relief valve. Air conditioning system will discharge rapidly causing possible injury.

**IMPORTANT:** Use correct refrigerant recovery/recycling and charging stations. DO NOT

mix refrigerant, hoses, fittings, components or refrigerant oils.

1. Run air conditioning system for three minutes to help in recovery process. Turn air conditioning system off before proceeding with recovery steps.
2. With engine OFF identify refrigerant type using JT02167A Refrigerant Identification Instrument.
3. Connect refrigerant recovery system. **See R134a Refrigerant Recovery/Recycling and Charging Station Installation Procedure.** (Group 1830.)
4. Follow manufacturers' instructions when using refrigerant recovery/recycling and charging station.

TX,9031,DU1694 -19-22APR02-1/1

## Evacuate R134a System

**⚠ CAUTION:** Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

See Refrigerant Cautions and Proper Handling. (Group 1830.)

**Do not remove high pressure relief valve. Air conditioning system will discharge rapidly causing possible injury.**

1. Connect refrigerant recovery system. See R134a Refrigerant Recovery/Recycling and Charging Station Installation Procedure. (Group 1830.)
2. Open low-side and high-side valves on refrigerant recovery/recycling and charging station.
3. Follow manufacturers' instructions and evacuate system.

**NOTE:** Vacuum specifications listed are for sea level conditions. Subtract 3.4 kPa (34 mbar) (1 in. Hg) from 98 kPa (980 mbar) (29 in. Hg) for each 300 m (1000 ft) elevation above sea level.

**Air Conditioning System—Specification**

Evacuate  
System—Vacuum.....Subtract 3.4 kPa (34 mbar) (1 in. Hg) from 98 kPa (980 mbar) (29 in. Hg) for each 300 m (1000 ft) elevation above sea level

4. Evacuate system until low-side gauge registers 98 kPa (980 mbar) (29 in. Hg) vacuum.

**Air Conditioning System—Specification**

Evacuate  
System—Vacuum.....98 kPa (980 mbar) (29 in. Hg)

If above specification vacuum cannot be obtained in 15 minutes, test the system for leaks. See Refrigerant Leak Test. (Group 9031-25.)

5. When vacuum reaches above specification, close low-side and high-side valves. Turn vacuum pump off.
6. If vacuum decreases more than specification in 5 minutes, there is a leak in system.

**Air Conditioning System—Specification**

Evacuate  
System—Vacuum.....3.4 kPa (34 mbar) (1 in. Hg)

7. Repair leak.
8. Evacuate system for 30 minutes after 98 kPa (980 mbar) (29 in. Hg) vacuum is reached.
9. Close low-side and high-side valves. Stop evacuation.
10. Perform Charge R134a System. (Group 1830.)

OUOE054,0000031 -19-22APR02-1/1

## Charge R134a System

**⚠ CAUTION:** Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

See Refrigerant Cautions and Proper Handling. (Group 1830.)

**IMPORTANT:** Use only John Deere approved refrigerant recovery/recycling and charging stations. DO NOT mix refrigerant, hoses, fittings, components or refrigerant oils.

1. Identify refrigerant type using JT02167A Refrigerant Identification Instrument.
2. Connect R134a Refrigerant Recovery/Recycling and Charging Station. See R134a Refrigerant Recovery/Recycling and Charging Station Installation Procedure. (Group 1830.)
3. Perform Evacuate R134a System. (Group 1830.)

**NOTE:** Before beginning to charge air conditioning system, the following conditions must exist:

*Engine STOPPED, the pump must be capable of pulling at least 28.6 in. Hg vacuum (sea level). Subtract 3.4 kPa (34 mbar) (1 in. Hg) from 98 kPa (980 mbar) (29 in. Hg) for each 300 m (1000 ft) elevation above sea level.*

**Air Conditioning System—Specification**

Evacuate  
System—Vacuum.....Subtract 3.4 kPa (34 mbar) (1 in. Hg) from 98 kPa (980 mbar) (29 in. Hg) for each 300 m (1000 ft) elevation above sea level

4. Follow manufacturer's instructions and charge system.
5. Add refrigerant to system .

**Air Conditioning System—Specification**

Air Conditioning System  
Refrigerant—Refrigerant  
Quantity.....95 kg (2.09 lb)

6. Check air conditioning for proper function. See Diagnose Air Conditioner Malfunctions. (Group 9031-25.)

OUOE054,000002E -19-22APR02-1/1

## Compressor Remove and Install

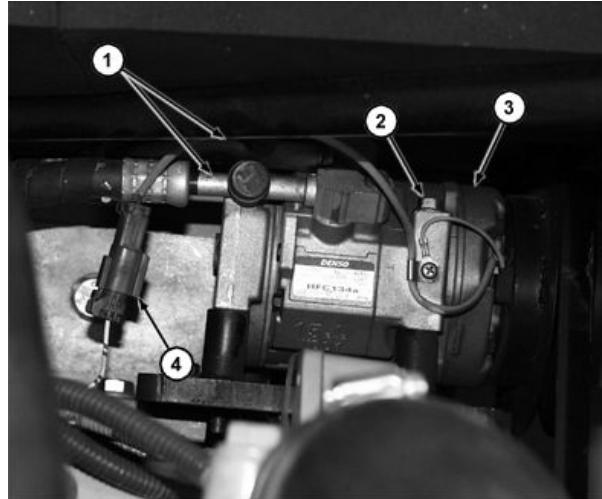
1. Perform Recover R134a Refrigerant. (Group 1830.)
2. Disconnect electrical connector (4).
3. Remove belt.
4. Disconnect high and low pressure lines (1).
5. Remove cap screws, lock washers, and washers (2) and remove compressor (3).
6. Repair or replace parts as necessary.
7. Install compressor (3) and tighten cap screws (2).

### Compressor—Specification

#### Pressure Line Cap

Screw—Torque..... 28 N·m (247 lb-in)

8. Install high and low pressure lines (1).
9. Inspect and adjust compressor belt tension. See Inspect Fan Belt. (Operator's Manual.)
10. Perform Evacuate R134a System and Perform Charge R134a System. (Group 1830.)



T146140B—UN—01FEB02

1—High and Low Pressure Lines  
2—Cap Screw, Lock Washer, and Washer (4 used)

3—Compressor  
4—Electrical Connector

OUOE054,000002F -19-22APR02-1/1

## Receiver-Dryer Remove and Install

1. Perform Recover R134a Refrigerant. (Group 1830.)
2. Remove high pressure input line cap screw (2) and remove input line.
3. Remove high pressure output line (3).
4. Loosen cap screws (5) and remove receiver-dryer (1) from bracket (4).
5. Repair or replace parts as necessary.
6. Install receiver-dryer (1).
7. Tighten high pressure input line cap screw (2).

### Receiver-Dryer—Specification

#### High-Pressure Input Line

Cap Screw—Torque..... 5 N·m (44 lb-in)

8. Tighten high-pressure output line (3).

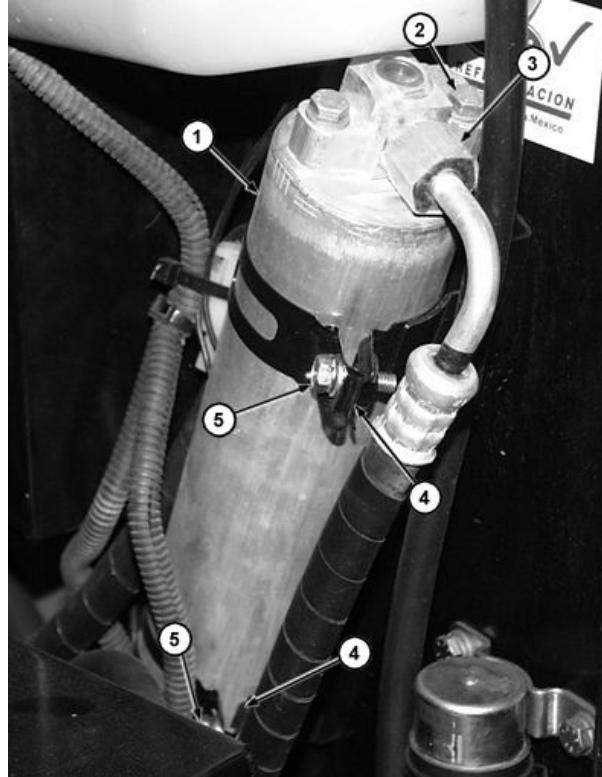
### Receiver-Dryer—Specification

#### High-Pressure Output

Line—Torque..... 14 N·m (124 lb-in)

9. Perform Evacuate R134a System and Perform Charge R134a System. (Group 1830.)

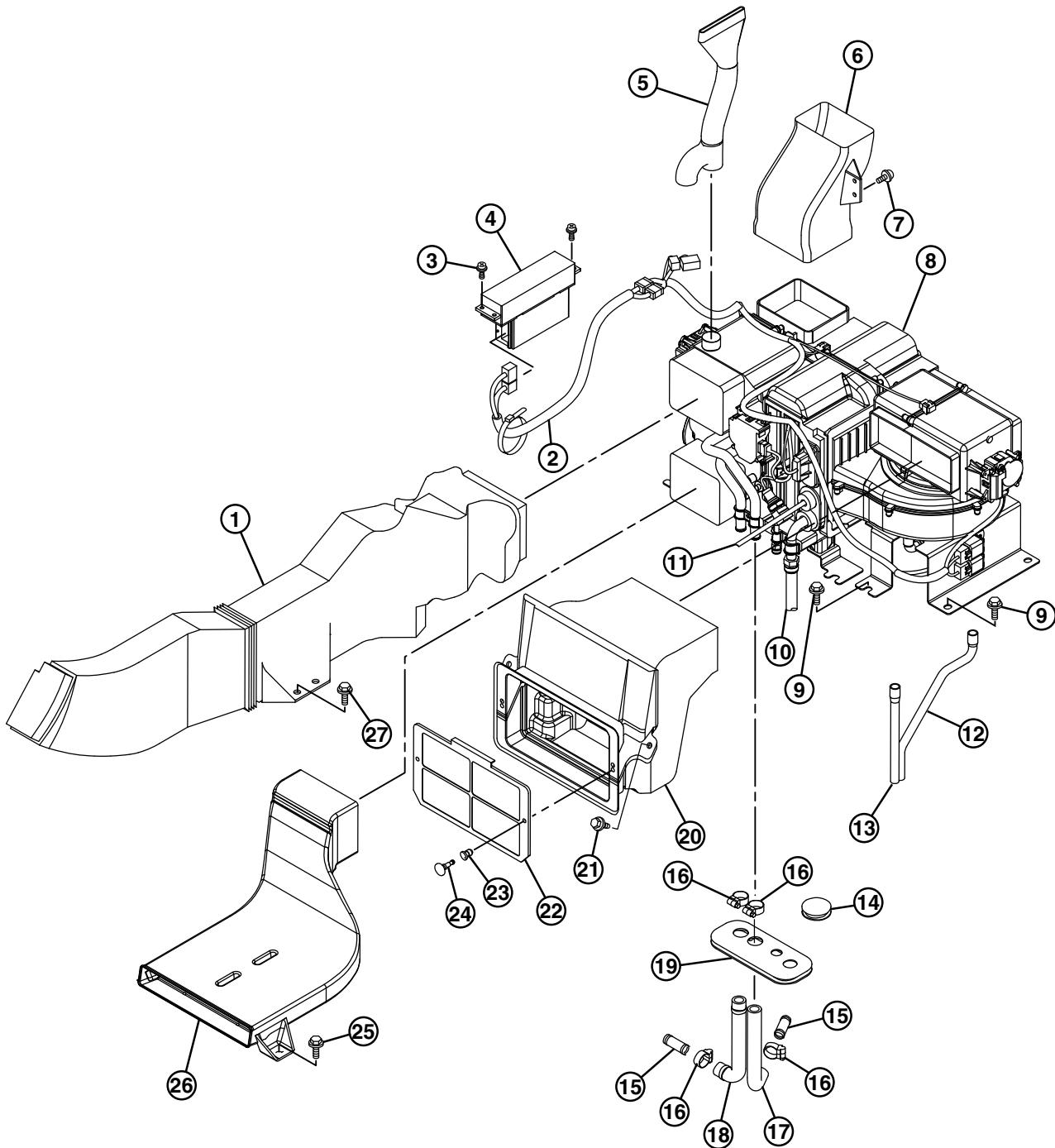
1—Receiver-Dryer      4—Bracket  
2—High Pressure Input Line      5—Cap Screw, Lock Washer, and Washer (2 used)  
3—High Pressure Output Line



T146082B—UN—01FEB02

OUOE054,0000030 -19-30NOV01-1/1

## Air Conditioner and Heater Remove and Install



T148750

T148750 -UN-15JAN13

Continued on next page

TX,SB628 -19-03DEC01-12

1—Duct	8—Air Conditioner and Heater	12—Hose	22—Filter
2—Air Conditioner Harness	9—Cap Screw (6 used)	13—Hose	23—Clip
3—Cap Screw (4 used)	10—Air Conditioner Low Pressure Hose	14—Bushing	24—Clip
4—Air Conditioning Controller	11—Air Conditioner High Pressure Hose	15—Nipple (2 used)	25—Cap Screw (2 used)
5—Duct		16—Hose Clamp (4 used)	26—Duct
6—Duct		17—Hose	27—Cap Screw (2 used)
7—Cap Screw (2 used)		18—Hose	
		19—Gasket	
		20—Duct	
		21—Cap Screw (2 used)	

1. Drain coolant from radiator. Approximate capacity is 26.5 L (7.0 gal).

*NOTE: Evaporator and heater core are integral parts of the air conditioner. If evaporator or heater core need replacement, replace entire air conditioner unit.*

2. Perform Recover R134a Refrigerant. (Group 1830.)

3. Remove air conditioner and heater (8).
4. Replace parts as necessary.
5. Install air conditioner and heater.
6. Perform Evacuate R134a System and Perform Charge R134a System. (Group 1830.)

TX,18,SB628 -19-03DEC01-2/2

## Condenser Remove and Install

1. Perform Recover R134a Refrigerant. (Group 1830.)
2. Remove high pressure liquid output line (3) and high pressure gas input line (4).
3. Remove cap screws, lock washers, washers (1) and condenser (2).
4. Repair or replace condenser as necessary.
5. Install condenser (2).
6. Tighten high pressure liquid output line (3).

### Condenser—Specification

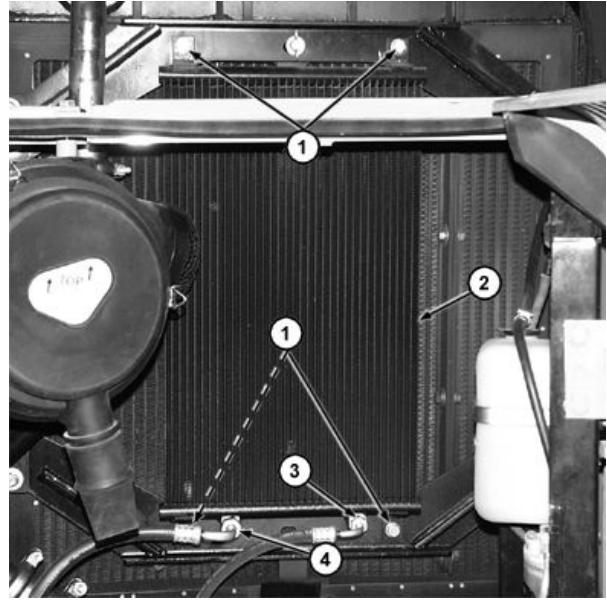
High Pressure Liquid Output Line—Torque..... 39 N·m (29 lb-ft)

7. Tighten high pressure gas input line (4).

### Condenser—Specification

High Pressure Gas Input Line—Torque..... 59 N·m (47 lb-ft)

8. Perform Evacuate R134a System and Perform Charge R134a System. (Group 1830.)



T146081B—UN—01FEB02

1—Cap Screw, Lock Washer, and Washer (4 used)  
2—Condenser  
3—High Pressure Liquid Output Line  
4—High Pressure Gas Input Line

OUOE003,00000E8 -19-03DEC01-1/1

*Heating and Air Conditioning*

## Section 33 Excavator

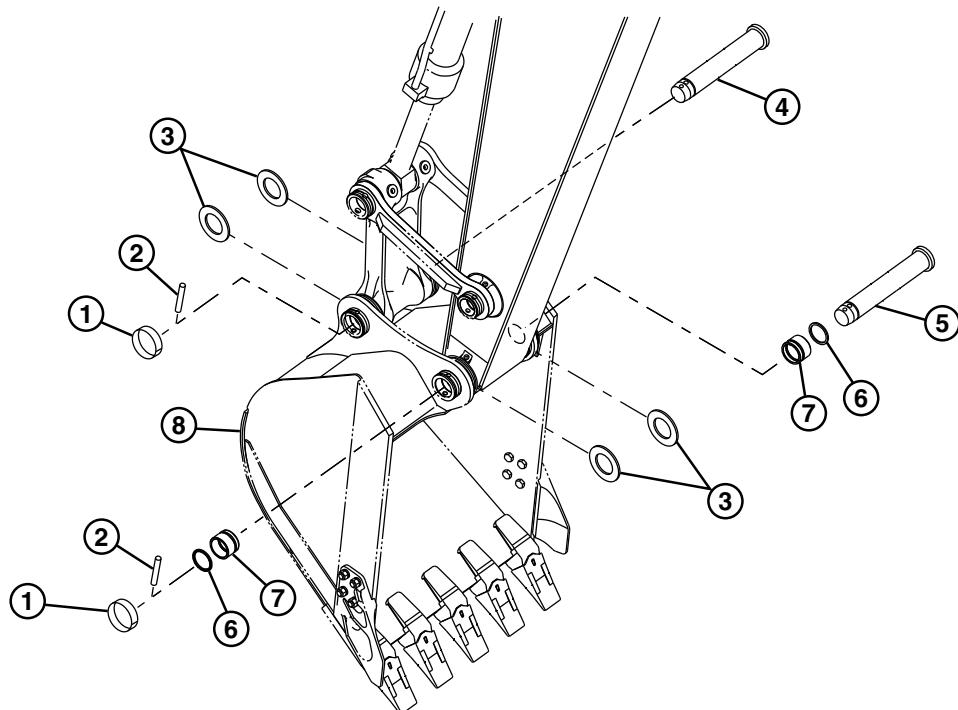
### Contents

	Page
<b>Group 3302—Buckets</b>	
Bucket Repair .....	33-3302-1
Bucket Pin-Up Data .....	33-3302-4
<b>Group 3340—Frames</b>	
Bucket Link Remove and Install .....	33-3340-1
Arm Remove and Install .....	33-3340-3
Boom Remove and Install .....	33-3340-5
Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses .....	33-3340-7
Bushing and Seal Remove and Install .....	33-3340-9
<b>Group 3360—Hydraulic System</b>	
Hydraulic Oil Tank Pressure Release Procedure .....	33-3360-1
Hydraulic Oil Cleanup Procedure Using Portable Filter Caddy .....	33-3360-2
Hydraulic Pump Remove and Install .....	33-3360-3
Hydraulic Pump Disassemble .....	33-3360-6
Hydraulic Pump Assemble .....	33-3360-8
Pilot Pump Disassemble and Assemble .....	33-3360-11
Hydraulic Pump Regulator .....	33-3360-13
Hydraulic Pump Start-Up Procedure .....	33-3360-21
Dampener Drive (Flex Coupling) Remove and Install (S.N. —044369 and S.N. 044416—044439) .....	33-3360-22
Dampener Drive (Flex Coupling) Remove and Install (S.N. 044370—044415 and S.N. 044440—) .....	33-3360-22
Pilot Filter Remove and Install .....	33-3360-24
Attachment Flow Rate and Speed Sense Solenoid Repair .....	33-3360-25
Pilot Pressure Regulating Valve Disassemble and Assemble .....	33-3360-27
Pilot Shut-Off Valve Repair .....	33-3360-28
Propel Speed and Arm Regenerative Solenoid Valve Repair .....	33-3360-30
Pilot Controller Repair .....	33-3360-32
Propel Pilot Controller Repair .....	33-3360-35
Pilot Signal Manifold Repair .....	33-3360-38
Control Valve .....	33-3360-42
Hydraulic Oil Tank Repair .....	33-3360-56
Restriction Valve Remove and Install .....	33-3360-59
Oil Cooler Bypass Valve Remove and Install .....	33-3360-61
Oil Cooler .....	33-3360-62
Boom Cylinder Remove and Install .....	33-3360-62
Arm Cylinder Remove and Install .....	33-3360-64
Bucket Cylinder Remove and Install .....	33-3360-67
Boom, Arm, or Bucket Cylinder Disassemble and Assemble .....	33-3360-69
Hydraulic Cylinder Bleed Procedure .....	33-3360-83

*Contents*

## Bucket Repair

### Remove and Install Bucket



T146019

1—Ring (2 used)  
2—Pin (2 used)

3—Shim (as required)  
4—Pin  
5—Pin

6—Dust Seal (2 used)  
7—Bushing (4 used)

8—Bucket

- CAUTION: Heavy component; use a hoist.**
1. Position bucket (7) on level surface.
  2. Remove parts (2, 4, and 5).
  3. Remove bucket.
  4. Repair or replace parts as necessary.

5. Align pin bores in bucket with pin bores in arm link to prevent damage to dust seals (6) when pins are installed.
6. Adjust bucket pivot end play. See Adjusting Bucket to Arm Joint. (Operator's Manual.)

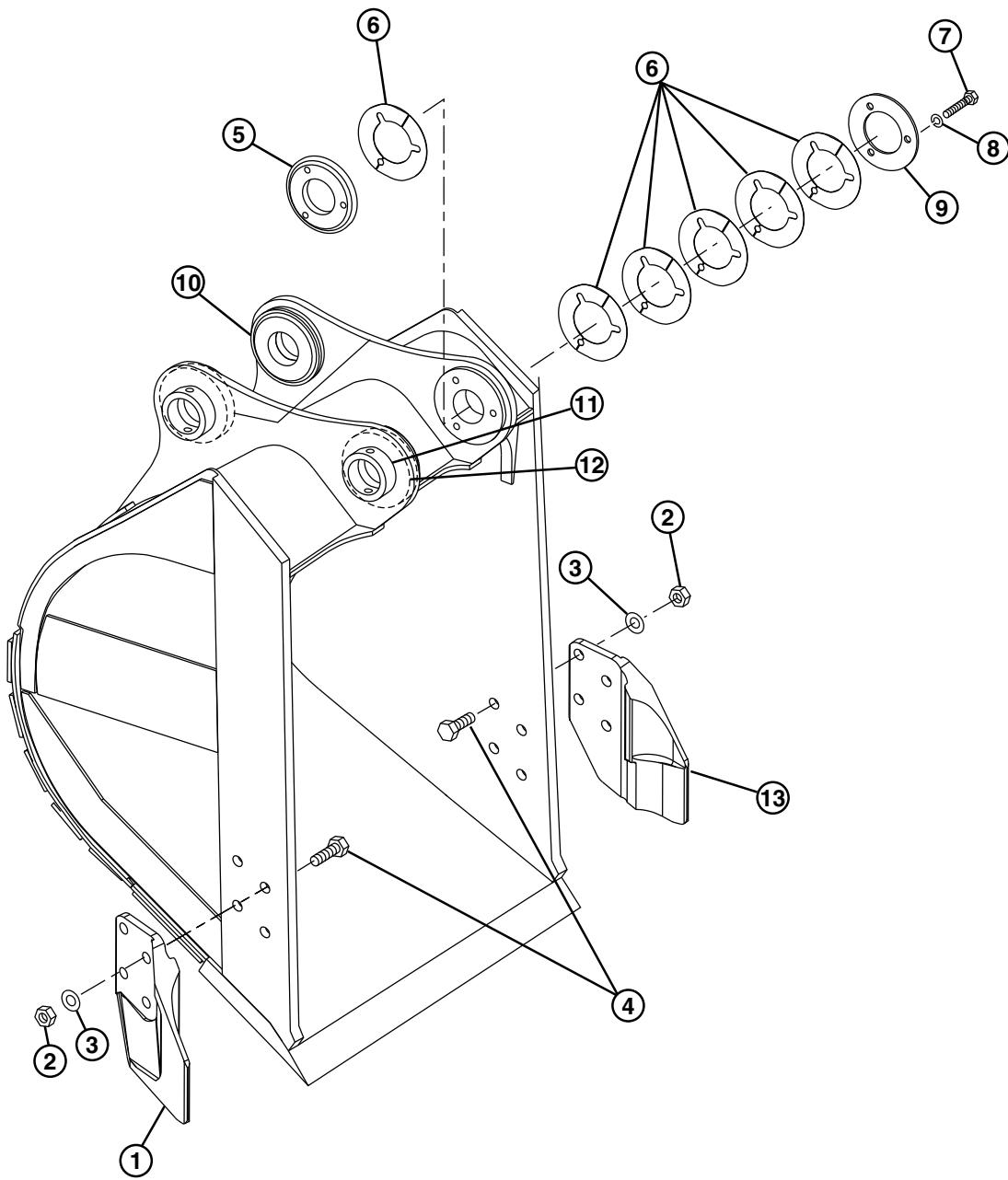
Continued on next page

TX,33,GG2535 -19-22APR02-1/3

T146019—UN—01FEB02

Buckets

Disassemble and Assemble Bucket



T146020

T146020 -UN-01FEB02

Continued on next page

TX,33,GG2535 -19-22APR02-2/3

*Buckets*

1—Side Cutter (2 used)  
2—Nut (12 used)  
3—Washer (12 used)

4—Cap Screw (12 used)  
5—Boss (2 used)  
6—Shims (as required)

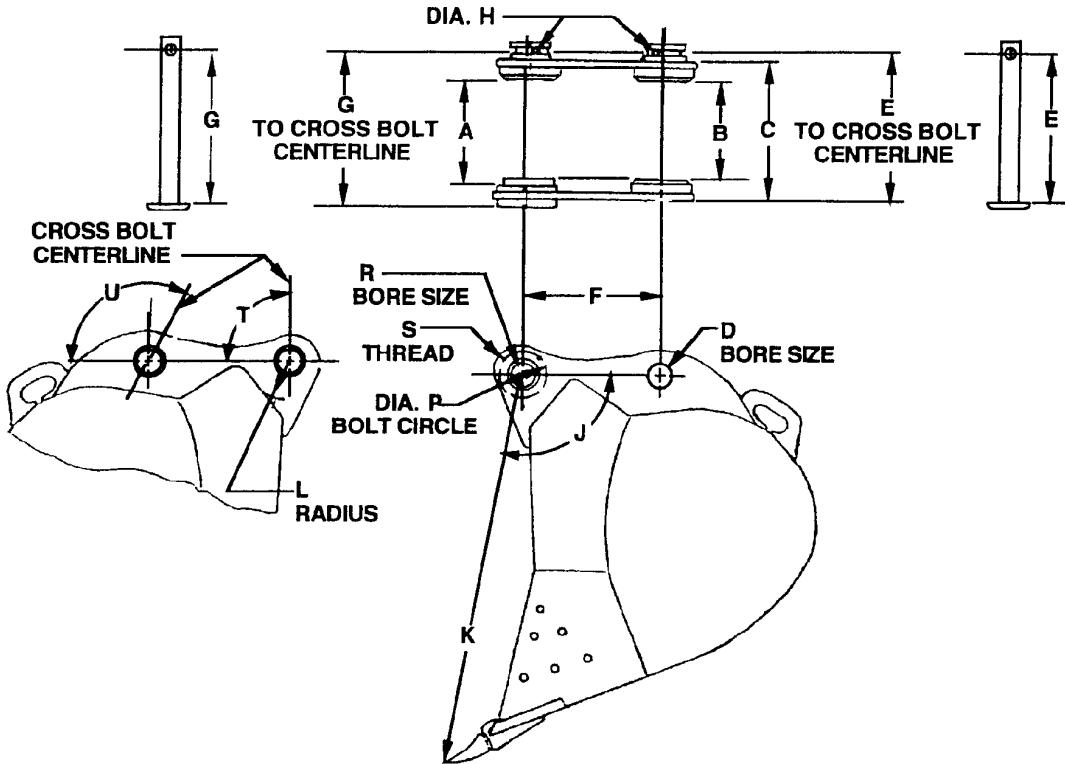
7—Cap Screw (6 used)  
8—Washer (6 used)  
9—Plate (2 used)  
10—Boss (2 used)

11—Stopper (2 used)  
12—Boss (2 used)

TX,33,GG2535 -19-22APR02-3/3

## Bucket Pin-Up Data

## EXCAVATOR BUCKET PIN-UP DATA



MODEL	160CLC 160LC 590D 595D	595	MODEL	160CLC 160LC 590D 595D	595
A	[324] 12.76	[324] 12.76	J (ANGLE)	99°	99°
B	[307] 12.09	[307] 12.09	K	[1463] 57.60	[1463] 57.60
C	[413] 16.26	[413] 16.26	L	[101.6] 4.00	[101.6] 4.00
D	[80] 3.15	[80] 3.15	P	[150] 5.91	[150] 5.91
E	[438] 17.24	[438] 17.24	R	[120] 4.72	[120] 4.72
F	[391] 15.39	[391] 15.39	S (3 HOLES)	M16 X 2	M16 X 2
G	[454] 17.87	[454] 17.87	T (ANGLE)	167°	32°
H	[17] 0.67	[17] 0.67	U (ANGLE)	77°	122°

Company policy limits the use of the enclosed drawings and information to your company and any other usage is expressly prohibited without the written consent of Deere & Company. We regret we cannot keep you informed of subsequent changes in the specifications furnished. You are, therefore, responsible for the risks involved in their use.

It is to be understood that furnishing you with the requested material does not automatically constitute a Deere & Company endorsement of your products on or with any John Deere product.

T160340

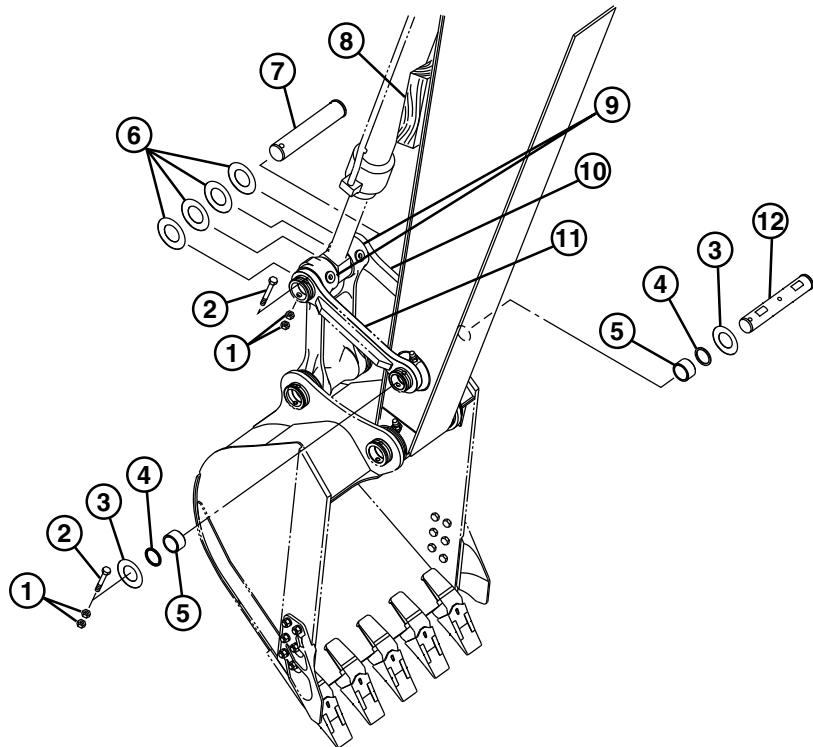
Bucket Pin-Up Data

TX08227,0000252 -19-16OCT02-1/1

T160340 -UN-14OCT02

**Bucket Link Remove and Install**

T146076



T146076—JUN—01FEB02

1—Nut (4 used)  
2—Cap Screw (2 used)  
3—Thrust Plate (2 used)  
4—Dust Seal (2 used)

5—Bushing (2 used)  
6—Thrust Plate (4 used)  
7—Bucket Cylinder Rod  
End-to-Side and Center Links  
Pin

8—Wood Block  
9—Center Link (2 used)  
10—Right Side Link  
11—Left Side Link

12—Side Links-to-Arm Pin

*NOTE: Removal of bucket is not necessary for removal of just bucket links.*

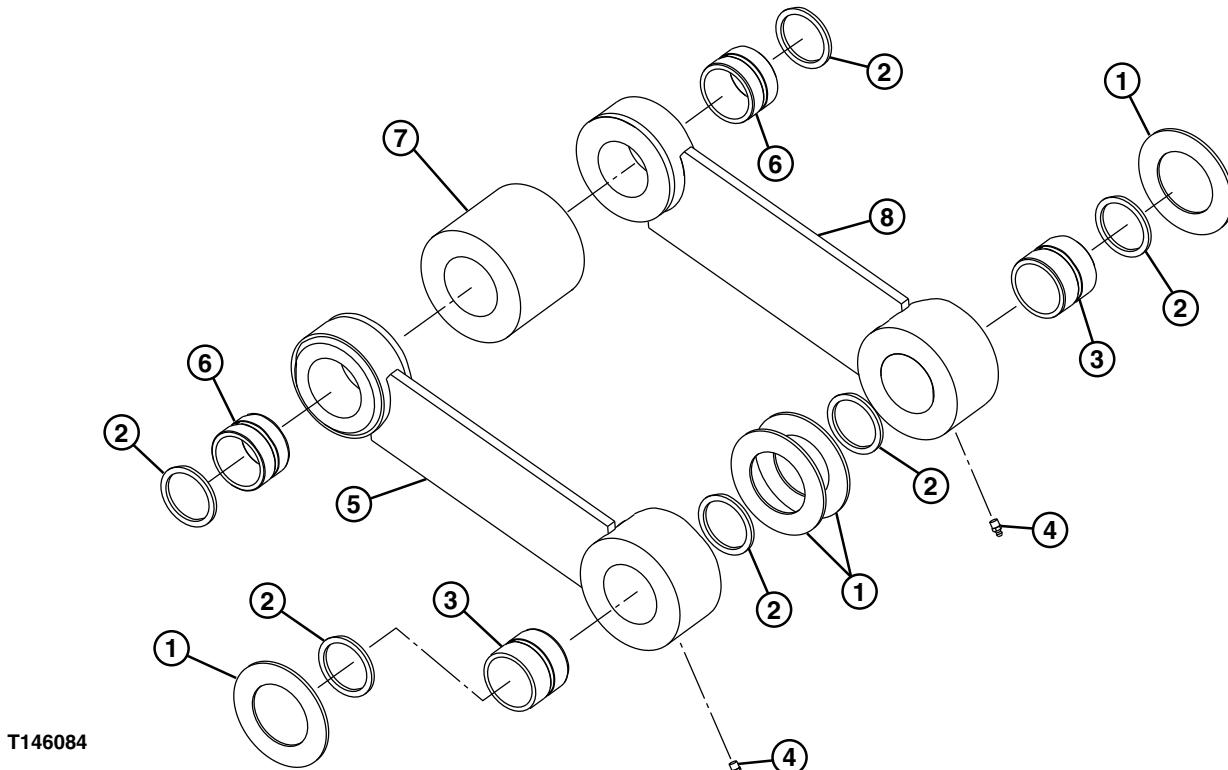
1. Connect hoist to center links (9) using lifting strap. Put wood block (8) between bucket cylinder and arm to hold cylinder up when cylinder pin (7) is removed.

2. Remove parts (1—5).

As cylinder pin (7) is removed, lower links (10 and 11) to ground.

Continued on next page

TX08227,0000253 -19-22APR02-1/2



1—Shim (as required)  
2—Dust Seal (6 used)

3—Bushing (2 used)  
4—Lubrication Fitting (2 used)

5—Left Center Link  
6—Bushing (2 used)  
7—Spacer

8—Right Center Link

3. Inspect bushings (3 and 6) and dust seals (2). See Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses. (Group 3340.)
4. Replace parts as necessary.
5. Before installing pins, align pin bores to prevent damage to dust seal when pins are installed.
6. Tighten nuts (1) against each other allowing cap screws (2) to be free to turn in hole.

#### Specification

Pin-to-Retainer

Nut—Torque..... 550 N·m (405 lb·ft) (tighten nut against nut)

7. Apply multi-purpose grease to all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)

TX08227,0000253 -19-22APR02-2/2

## Arm Remove and Install

1. Remove bucket. [See Bucket Repair.](#) (Group 3302).
2. Retract arm cylinder.
3. Put floor stand under end of boom so load is on boom, not on arm cylinder.

Extend arm cylinder just enough to put end of arm on ground.

**CAUTION:** The hydraulic oil tank is pressurized.  
High pressure release of oil can cause serious burns or penetrating injury.

4. [Perform Hydraulic Oil Tank Pressure Release Procedure.](#) (Group 3360.)
5. Loosen bucket cylinder hydraulic lines to release any residual pressure.

*NOTE: Remove bucket cylinder and linkage only if necessary to repair arm.*

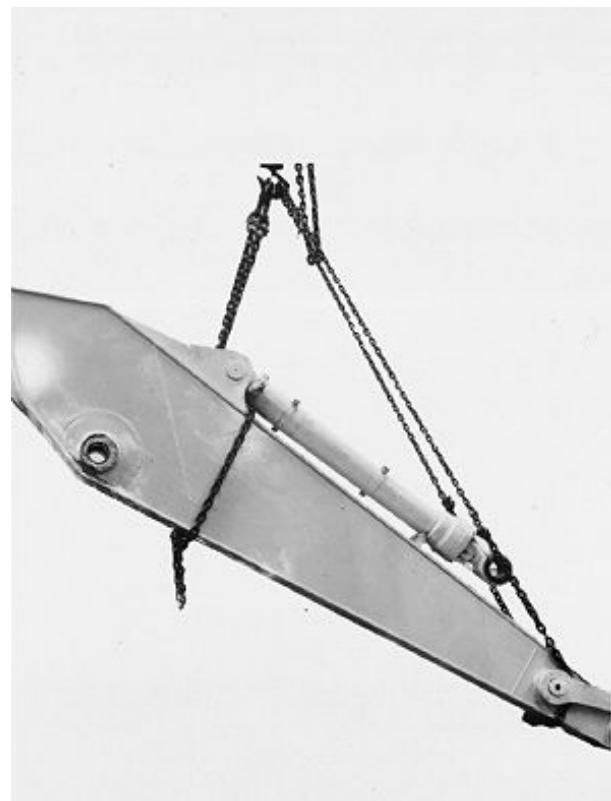
6. Disconnect lines.
7. Remove bucket links and bucket cylinder. [See Bucket Link Remove and Install.](#) (Group 3340.) [See Bucket Cylinder Remove and Install.](#) (Group 3360.)

**CAUTION: Heavy component; use a hoist.**

### Specification

Standard Arm—Weight.....	773 kg (1704 lb) approximate
Long Arm—Weight.....	852 kg (1878 lb) approximate
Bucket Cylinder—Weight.....	125 kg (275 lb) approximate

Attach hoist to arm.



Arm With Bucket Cylinder

Continued on next page

TX08227,0000254 -19-22APR02-1/3

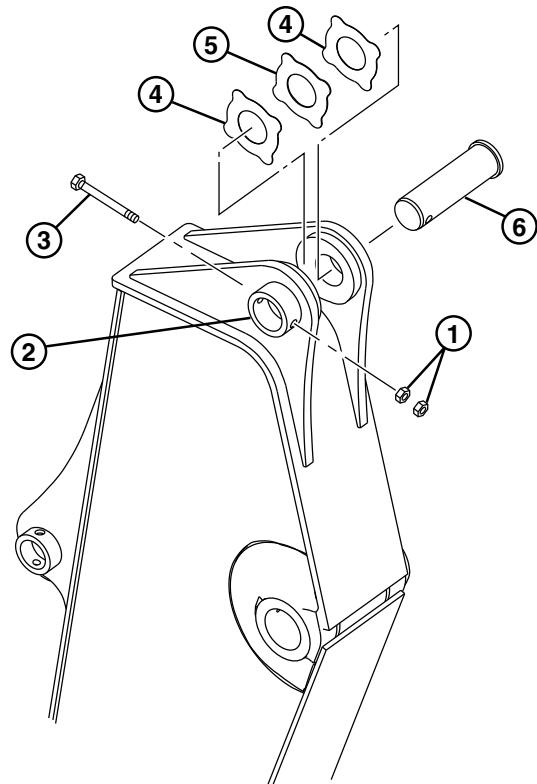
T6626JC—UN-31OCT88

Frames

8. Put wood block between arm cylinder and boom to hold cylinder up when arm cylinder rod end-to-arm pin (6) is removed.
9. Remove parts (1—6).

1—Nut (2 used)  
2—Retainer  
3—Cap Screw

4—Thrust Plate (2 used)  
5—Thrust Plate  
6—Arm Cylinder Rod  
End-to-Arm Pin



T142652 -UN-27SEP01

Continued on next page

TX08227,0000254 -19-22APR02-2/3

10. Remove parts (E—H).
11. Remove arm and lower to floor.
12. Inspect bushings and dust seals. See Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses. (Group 3340.)
13. Repair or replace parts as necessary. See Bushing and Seal Remove and Install. (Group 3340.)
14. Install boom to arm. Tighten nuts (H) against each other allowing cap screw (F) to be free to turn in hole.

**Specification**

Boom-to-Arm Pin

Retainer Nut—Torque..... 550 N·m (405 lb-ft) (tighten nut against nut)

15. Install thrust plates (4) equally on each side of arm to get minimal amount of clearance between boom and arm.

16. Install arm cylinder rod end to arm. Tighten nuts (1) against each other allowing cap screw (3) to be free to turn in hole.

**Specification**

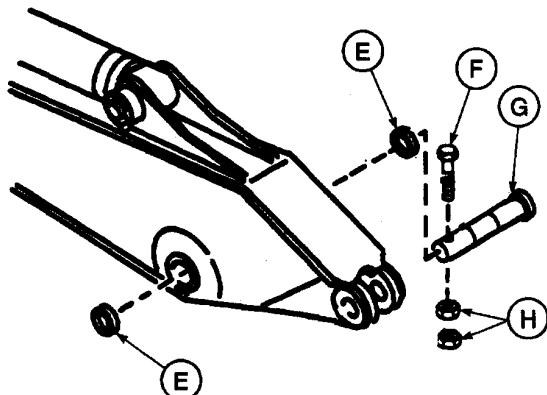
Arm Cylinder Rod

End-to-Arm Pin Retainer

Nut—Torque..... 550 N·m (405 lb-ft) (tighten nut against nut)

17. Connect lines.

18. Apply multi-purpose grease to all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)

E—Seal (2 used)  
F—Cap ScrewG—Boom-to-Arm Pin  
H—Nut (2 used)

TX08227,0000254 -19-22APR02-3/3

**Boom Remove and Install**

1. Remove bucket and arm. See Bucket Repair. (Group 3302.) See Arm Remove and Install. (Group 3340.)
2. Lower boom to ground.

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

3. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
4. Loosen hydraulic lines at frame end of boom to release any residual pressure.

**CAUTION:** To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

5. Disconnect lines.



6. Disconnect wiring harness.
7. Disconnect lubrication lines at rod end of boom cylinders.
8. Remove arm cylinder only if necessary to repair boom. See Arm Cylinder Remove and Install. (Group 3360.)
9. Disconnect boom cylinder rod end. See Boom Cylinder Remove and Install. (Group 3360.)

Continued on next page

TX08227,0000255 -19-22APR02-1/3

X9811—UN—23AUG88

T7966EP—UN—04MAY93

**⚠ CAUTION: Heavy components; use a hoist.**

**Specification**

Boom—Weight..... 1370 kg (3020 lb) approximate  
Arm Cylinder—Weight..... 210 kg (460 lb) approximate

10. Attach hoist to boom. Use protective covering to prevent damage to pin if chain is used.

Arm end of boom is heavy end with arm cylinder installed. Frame end is heavy end when arm cylinder is removed.



T6626JW -UN-31OCT88

TX08227,0000255 -19-22APR02-2/3

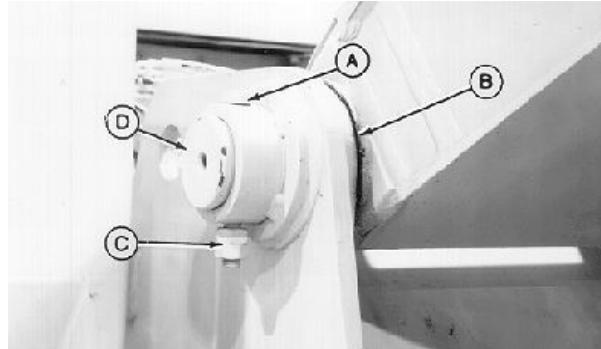
11. Remove nuts (C) and cap screws (A).
12. Remove pin (D) and plates (B).
13. Remove boom.
14. Inspect bushings and dust seals. See Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses. (Group 3340.)
15. Repair or replace parts as necessary. See Bushing and Seal Remove and Install. (Group 3340.)
16. Install plates (B) equally on each side of boom to get minimal amount of clearance between boom and frame.
17. Install boom. Tighten nuts (C) against each other allowing cap screw (A) to be free to turn in hole.

**Specification**

Boom-to-Frame Pin

Retainer Nut—Torque..... 270 N·m (200 lb-ft) (tighten nut against nut)

18. Connect boom cylinder rod end. See Boom Cylinder Remove and Install. (Group 3360.)
19. Connect lines.

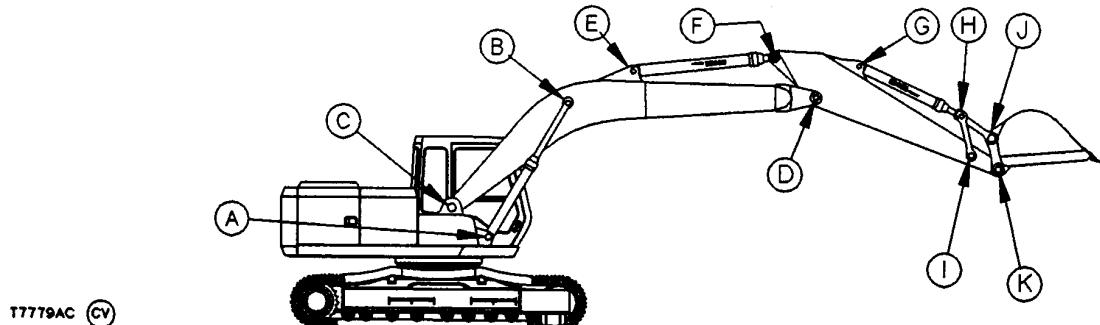


T105736 -UN-17DEC96

- A—Cap Screw (2 used)  
B—Plate (As Required)  
C—Nut (4 used)  
D—Boom-to-Frame Pin
20. Connect wiring harness. See Machine Harness (W2) Component Location. (Group 9015-10)
  21. Connect lubrication lines at rod end of cylinders.
  22. Apply multi-purpose grease to all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)

TX08227,0000255 -19-22APR02-3/3

## Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses



- |  |  |  |  |
|--|--|--|--|
| <b>A</b> —Boom Cylinder Head<br>End-to-Frame Joint | <b>D</b> —Boom-to-Arm Joint                      | <b>G</b> —Bucket Cylinder Head<br>End-to-Arm Joint                     | <b>I</b> —Side Links-to-Arm Joint      |
| <b>B</b> —Boom Cylinder Rod<br>End-to-Boom Joint   | <b>E</b> —Arm Cylinder Head<br>End-to-Boom Joint | <b>H</b> —Bucket Cylinder Rod<br>End-to-Side and Center Links<br>Joint | <b>J</b> —Center Links-to-Bucket Joint |
| <b>C</b> —Boom-to-Frame Joint                      | <b>F</b> —Arm Cylinder Rod End-to-Arm<br>Joint   |  | <b>K</b> —Bucket-to-Arm Joint          |

Item	Measurement	Specification
<b>Boom</b>		
Boom Cylinder Head End-to-Frame Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Boom Cylinder Head End-to-Frame Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
Boom Cylinder Head End-to-Frame Joint Boss	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
Boom Cylinder Rod End-to-Boom Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Boom Cylinder Rod End-to-Boom Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
Boom Cylinder Rod End-to-Boom Joint Boss	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
Boom-to-Frame Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Boom-to-Frame Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
Boom-to-Arm Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Boom-to-Arm Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use

Continued on next page

TX08227,0000256 -19-06MAR02-1/3

T7779AC —UN—11JUN92

*Frames*

<b>Item</b>	<b>Measurement</b>	<b>Specification</b>
Arm		
Arm Cylinder Head End-to-Boom Joint Pin	OD	71.0 mm (2.80 in.) nominal
	OD	70.0 mm (2.76 in.) limit of use
Arm Cylinder Head End-to-Boom Joint Bushing	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Arm Cylinder Head End-to-Boom Joint Boss	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Arm Cylinder Rod End-to-Arm Joint Pin	OD	71.0 mm (2.80 in.) nominal
	OD	70.0 mm (2.76 in.) limit of use
Arm Cylinder Rod End-to-Arm Joint Bushing	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Arm Cylinder Rod End-to-Arm Joint Boss	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Bucket		
Bucket Cylinder Head End-to-Arm Joint Pin	OD	65.0 mm (2.56 in.) nominal
	OD	64.0 mm (2.52 in.) limit of use
Bucket Cylinder Head End-to-Arm Joint Bushing	ID	65.0 mm (2.56 in.) nominal
	ID	66.5 mm (2.62 in.) limit of use
Bucket Cylinder Head End-to-Arm Joint Boss	ID	65.0 mm (2.56 in.) nominal
	ID	66.5 mm (2.62 in.) limit of use
Bucket Cylinder Rod End-to-Side and Center Links Joint Pin	OD	71.0 mm (2.80 in.) nominal
	OD	70.0 mm (2.76 in.) limit of use
Bucket Cylinder Rod End-to-Side and Center Links Joint Bushings	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Side Links-to-Arm Joint Pin	OD	71.0 mm (2.80 in.) nominal
	OD	70.0 mm (2.76 in.) limit of use
Side Links-to-Arm Joint Bushing	ID	71.0 mm (2.80 in.) nominal
	ID	72.5 mm (2.85 in.) limit of use
Center Links-to-Bucket Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Center Links-to-Bucket Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use

Continued on next page

TX08227,0000256 -19-06MAR02-2/3

Item	Measurement	Specification
Bucket-to-Arm Joint Pin	OD	80.0 mm (3.15 in.) nominal
	OD	79.0 mm (3.11 in.) limit of use
Bucket-to-Arm Joint Bushing	ID	80.0 mm (3.15 in.) nominal
	ID	81.5 mm (3.21 in.) limit of use
		TX08227,0000256 -19-06MAR02-3/3

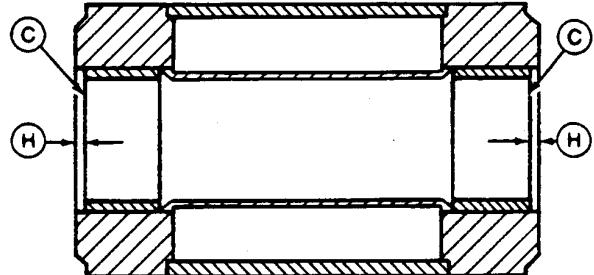
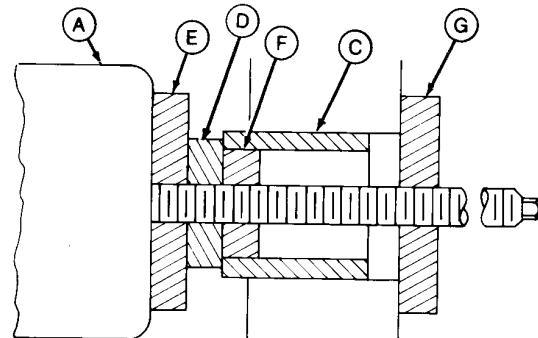
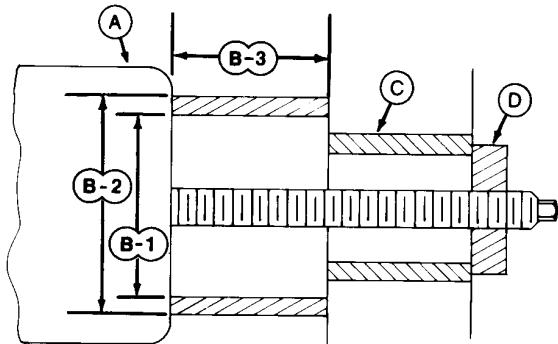
## Bushing and Seal Remove and Install

**IMPORTANT:** Only install bushings using press as shown. Bushings will be damaged if installed with driver.

**NOTE:** Bushing can also be removed by welding three to five weld beads on the inside of bushing. Bushing will shrink enough to permit removal using a hammer.

1. Remove bushings (C) and dust seals using bushing, bearing, and seal driver set.
2. Install bushings with lubrication hole in alignment with lubrication passage in pivot.
3. Install bushing to a depth equal to the thickness of dust seal (H).
4. Install dust seals with lip towards the outside of component.

A—Hydraulic Ram	D—Disks
B1—Pipe-Minimum ID to Clear	E—Bushing Stop (Disk)
Bushing OD	F—Pilot (Disk)
B2—Pipe-Maximum OD	G—Ram Stop (Disk)
B3—Pipe-Length of Bushing	H—Thickness of Dust Seal
C—Bushing	



T95237—UN—01NOV88

T6641CW—UN—31OCT88

TX,33,GG2320 -19-07MAR02-1/1

*Frames*

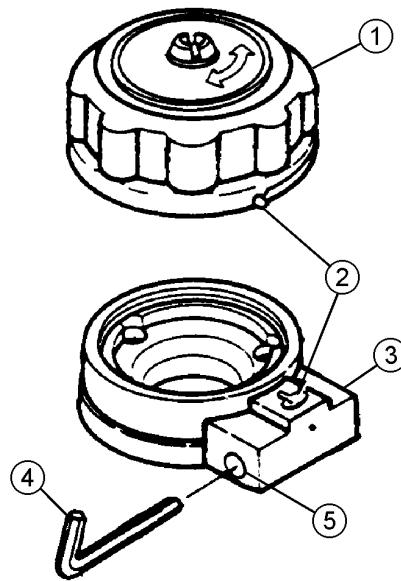
Hydraulic Oil Tank Pressure Release  
Procedure

**CAUTION:** High pressure release of oil from pressurized system can cause serious burns or penetrating injury. Relieve pressure by SLOWLY loosening cap (1).

1. Insert 4 mm hex wrench (4) into hole (5) and turn counterclockwise to release locking pin.
2. Slowly turn cap (1) counterclockwise a few degrees to relieve pressure.
3. Remove cap.

1—Cap  
2—Aligning Marks  
3—Case Assembly

4—4 mm Hex Key Wrench  
5—Hole



T135189—UN—06NOV/00

OUOE054,000000F -19-07OCT02-1/1

## Hydraulic Oil Cleanup Procedure Using Portable Filter Caddy

SPECIFICATIONS	
Hydraulic Oil Tank Capacity	76 L (20 gal)
Hydraulic Oil Tank Filtering Time	7 minutes approximate
Hydraulic System Capacity	170 L (44.9 gal)
Hydraulic System Filtering Time	27 minutes approximate

SERVICE EQUIPMENT AND TOOLS	
Portable Filter Caddy	
Two 3658 mm (12 ft) x 3/4 in. I.D. 100R1 Hoses with 3/4 M NPT Ends	
Quick Disconnect Fittings	
Suction Wand	
Discharge Wand	

1. Install new return filter elements.

*NOTE: For a failure that creates a lot of debris, remove access cover from hydraulic oil tank. Drain the tank. Connect filter caddy suction line to drain port. Add a minimum of 19 L (5 gal) of oil to the tank. Operate filter caddy and wash out the tank.*

**IMPORTANT: The minimum ID for a connector is 1/2 in. to prevent cavitation of filter caddy pump.**

2. Put filter caddy suction and discharge wands into the tank filler hole so ends are as far apart as possible to obtain a thorough cleaning of oil.
3. Start the filter caddy. Check to be sure oil is flowing through the filters.

Operate filter caddy until all oil in the tank has been circulated through the filter a minimum of four times.

### Specification

Hydraulic Oil	
Tank—Capacity.....	76 L (20 gal)
Hydraulic Oil Tank	
Filtering—Time.....	7 minutes approximate

*NOTE: Filtering time for hydraulic oil tank is 0.089 minute x number of liters (0.33 minutes x number of gallons).*

4. Leave filter caddy operating for the next step.
5. Start the engine and run it at fast idle.

**IMPORTANT: For the most effective results, cleaning procedure must start with the smallest capacity circuit then proceed to the next larger capacity circuit.**

6. Starting with the smallest capacity circuit, operate each function through a complete cycle.

Repeat procedure until the total system capacity has circulated through filter caddy seven times. Each function must go through a minimum of three complete cycles for a thorough cleaning of oil.

### Specification

Hydraulic	
System—Capacity.....	170 L (44.9 gal)
Hydraulic System	
Filtering—Time.....	27 minutes approximate

*NOTE: Filtering time for complete hydraulic system is 0.158 minute x number of liters (0.6 minute x number of gallons). Filtering time for machines with auxiliary hydraulic functions must be increased because system capacity is larger.*

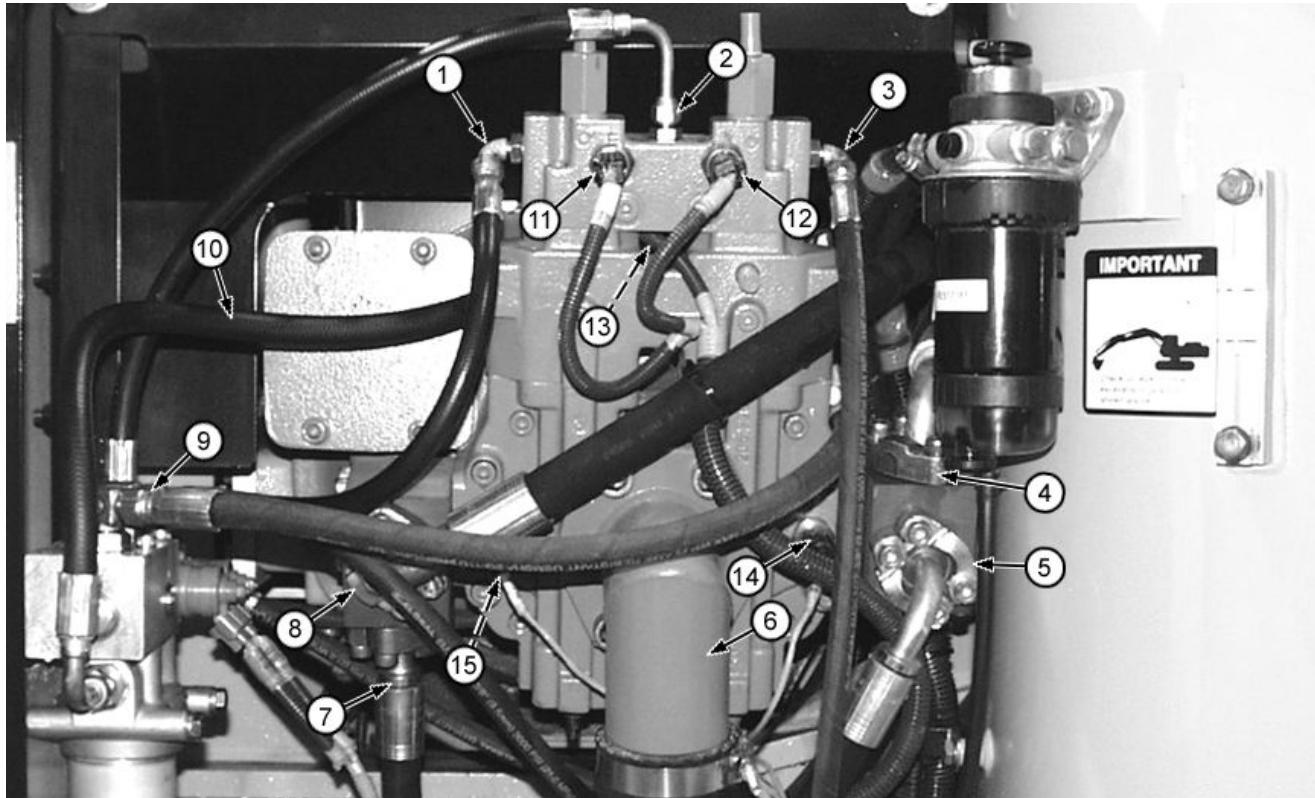
7. Stop the engine. Remove the filter caddy.
8. Install new return filter elements.
9. Check oil level in the tank; add oil if necessary.

TX08227,0000258 -19-07OCT02-1/1

## Hydraulic Pump Remove and Install

- CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.
1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)

2. Drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Remove hood, hood support, covers, and muffler heat shield.
4. Remove muffler and muffler bracket.



T160326B-UN-08OCT02

Hydraulic Pump Line and Connector Identification

1—To Attachment Flow Rate Solenoid Valve Port SB	5—Attenuator Hose	11—Pump 2 (5-Spool) Control Pressure Sensor Connector	14—Pump 1 (4-Spool) Pressure Sensor Connector
2—To Speed Sensing Solenoid Valve Port ST	6—Inlet	12—Pump 1 (4-Spool) Control Pressure Sensor Connector	15—Pump 2 (5-Spool) Pressure Sensor Connector
3—To Pilot Signal Manifold Port SA	7—Attenuator Hose	13—Engine Speed (N) Sensor Connector	
4—To Right Control Valve—4-Spool	8—To Left Control Valve—5-Spool		
	9—To Hydraulic Oil Tank		
	10—Pilot Pump-to-Pilot Filter		

5. Disconnect hydraulic lines (1—10) and disconnect electrical connectors (11—15).

**CAUTION: Heavy component; use a hoist.**

### Hydraulic Pump —Specification

#### Hydraulic Pump

—Weight..... 82 kg (180 lb) approximate

6. Install lifting eyebolt to pump. Connect a hoist to eyebolt using lifting straps.
7. Remove eight hydraulic pump-to-flywheel housing cap screws and remove pump.
8. Repair or replace parts as necessary.
9. Align dampener drive on pump shaft with mating part on engine flywheel.

**IMPORTANT:** The pump adaptor for the flex coupler must be installed correctly. Failure to do so will cause premature failure of flex coupler. See Dampener Drive (Flex Coupling) Remove and Install (S.N. —044369 and S.N. 044416—044439). (Group 3360.) See Dampener Drive (Flex Coupling) Remove and Install (S.N. 044370—044415 and S.N. 044440—). (Group 3360.)

Continued on next page

FR91424.0000028 -19-17AUG06-1/2

Install pump. Tighten eight hydraulic pump-to-flywheel housing cap screws.

**Hydraulic Pump —Specification**

Hydraulic Pump-to-

Flywheel Housing Cap

Screw—Torque..... 50 N·m (37 lb-ft)

10. Connect electrical connectors (11—15). See Pump Harness (W12) Component Location. (Group 9015-10.)

11. Connect hydraulic lines (1—10). See Pump 1 (4-Spool), Pump 2 (5-Spool), and Pilot Pump Line Identification. (Group 9025-15.)

12. Tighten split flange and cap screws.

**Hydraulic Pump —Specification**

Split Flange 8 mm Cap

Screw—Torque..... 50 N·m (37 lb-ft)

13. Tighten pump inlet pipe cap screws.

**Hydraulic Pump —Specification**

Pump Inlet Pipe 14 mm

Cap Screw—Torque..... 210 N·m (155 lb-ft)

14. Install muffler bracket and muffler.

15. Install hood support, covers, muffler heat shield and hood.

16. Fill hydraulic oil tank, see Hydraulic Oil and see 160CLC Drain and Refill Capacities. (Operator's Manual.)

**IMPORTANT:** Hydraulic pump will be damaged if not filled with oil before starting engine. Start-up procedure must be performed whenever a new pump is installed or oil has been drained from the pump or hydraulic oil tank.

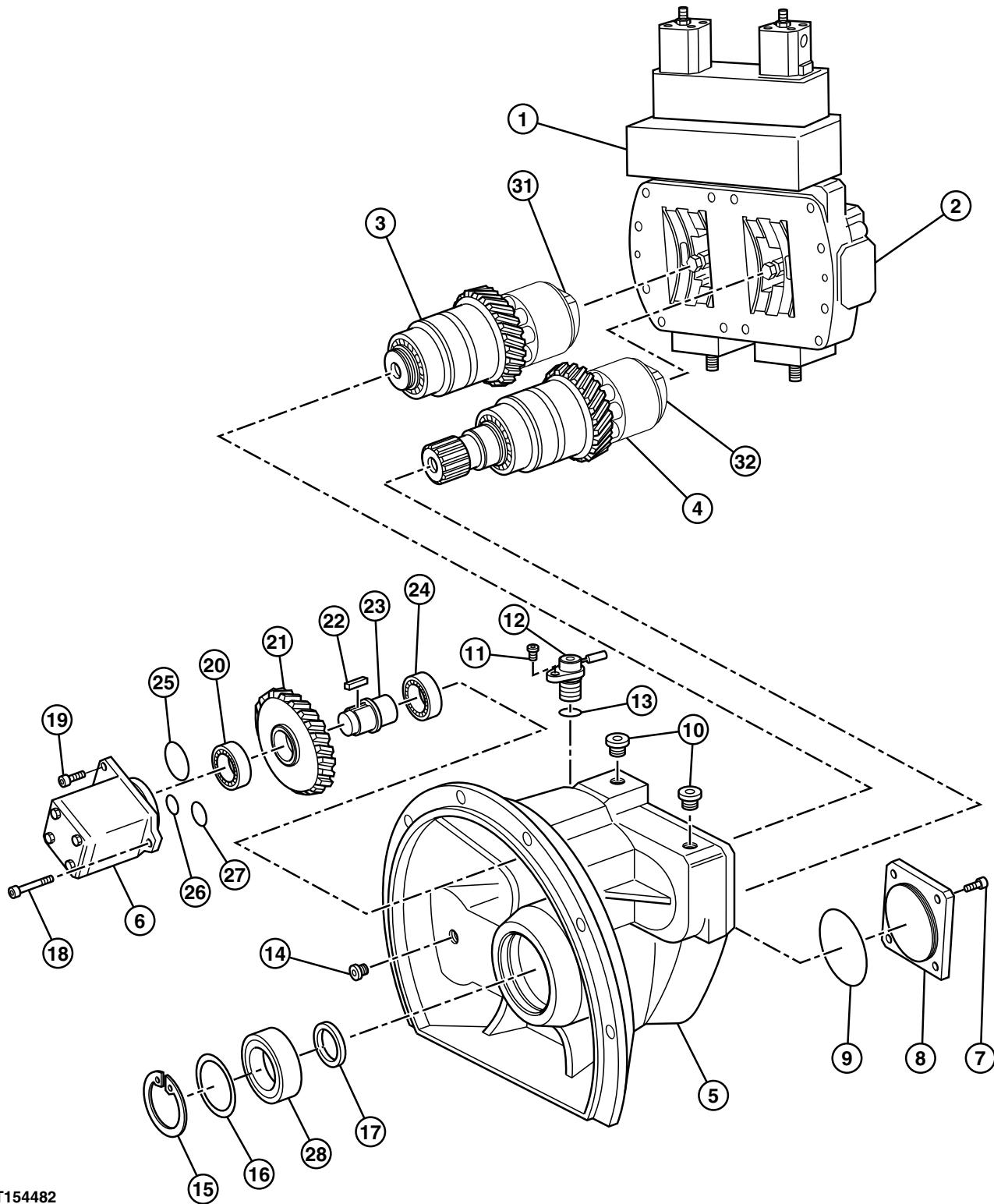
17. Perform Hydraulic Pump Start-Up Procedure. (Group 3360.)

18. Check pump regulator adjustments. For minimum flow, see Hydraulic Pump Regulator Test and Adjustment—Minimum Flow. For maximum flow, see Hydraulic Pump Regulator Test and Adjustment—Maximum Flow. (Group 9025-25.)

FR91424,0000028 -19-17AUG06-2/2

*Hydraulic System*

Hydraulic Pump Disassemble



Continued on next page

TX08227,0000259 -19-08OCT02-1/2

## Hydraulic System

1—Control Housing	7—Cap Screw (4 used)	15—Snap Ring	24—Bearing
2—Valve Head	8—Cover	16—Shim	25—O-Ring
3—Rotary Group Driven Side	9—O-Ring	17—Seal	26—O-Ring
4—Rotary Group Drive Side	10—Plug (2 used)	18—Cap Screw (2 used)	27—O-Ring
5—Pump Housing	11—Cap Screw	19—Cap Screw (2 used)	28—Bearing
6—Pilot Pump	12—Engine Speed Sensor	20—Bearing	31—Valve Plate
	13—O-Ring	21—Gear	32—Valve Plate
	14—Plug	22—Key	
		23—Shaft	

**⚠ CAUTION: Heavy component; use a hoist.**

**Hydraulic Pump—Specification**

Hydraulic  
Pump—Weight..... 82 kg (180 lb) approximate

1. Remove valve head (2) from pump housing (5).

**IMPORTANT: The valve plates and the end of the cylinder blocks are made with highly machined surfaces and can be damaged.**

Remove valve head (2) from pump housing (5).

**IMPORTANT: Valve plates differ from each other and are not interchangeable. Record position before disassembly.**

2. Remove valve plate (31) from rotary group driven side (3) cylinder block.
3. Remove valve plate (32) in rotary group drive side (4) cylinder block.
4. Remove cap screw (11).
5. Remove engine speed sensor (12), and o-ring (13).
6. Remove cap screws (7).

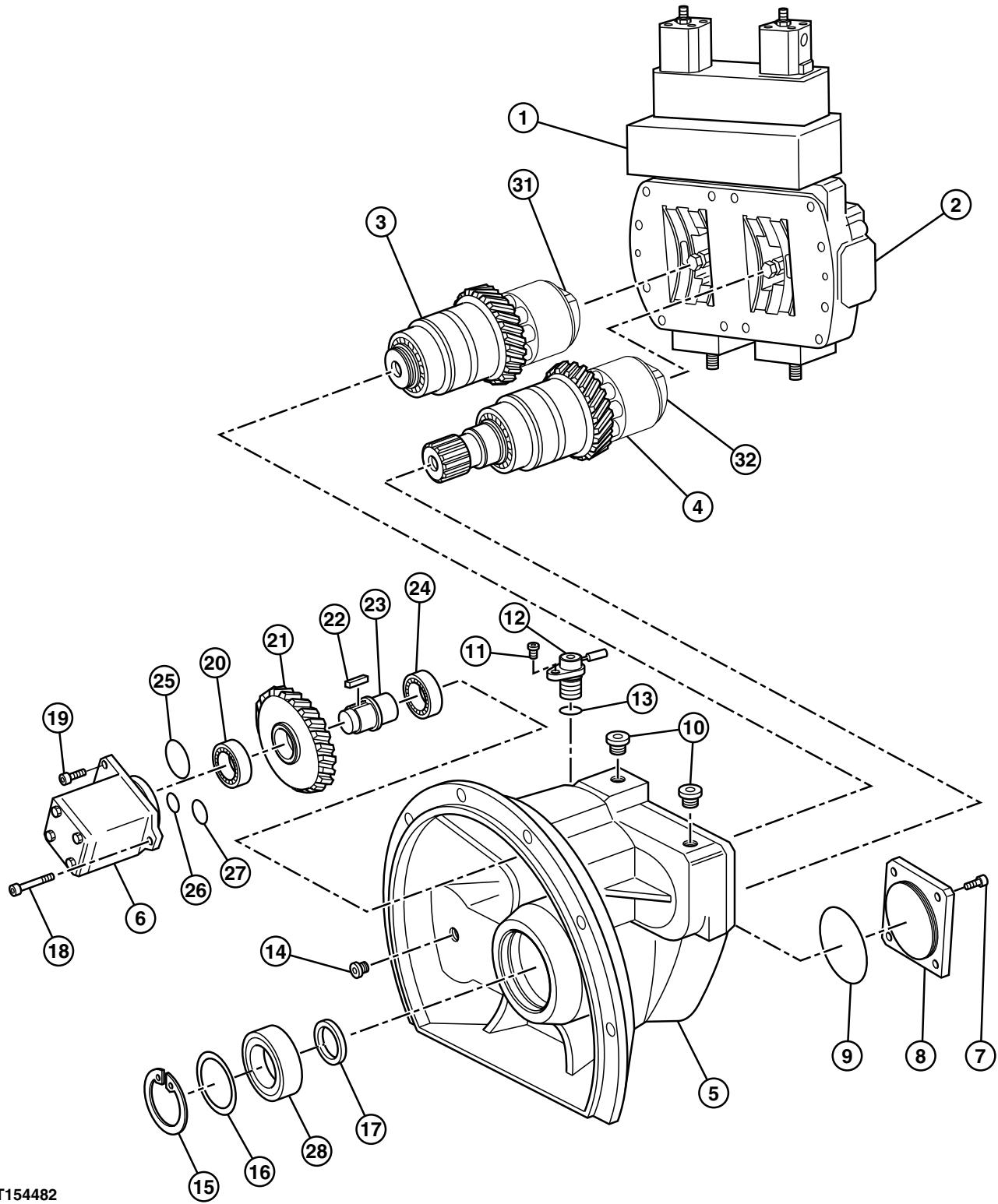
7. Remove cover (8) and o-ring (9).

**IMPORTANT: Cylinder blocks differ from each other and are not interchangeable. Record position before disassembly.**

8. Remove rotary group driven side (3) cylinder block from pump housing.
9. Remove rotary group drive side (4) cylinder block from pump housing.
10. Remove snap ring (15) and shim (16).
11. Remove bearing (28) and seal (17).
12. Remove rotary group drive side (4).
13. Remove plug (14).
14. Remove rotary group driven side (3) by inserting bar in plug hole and driving rotary group from pump housing.
15. Remove cap screws (18 and 19).
16. Remove pilot pump (6).
17. Remove bearing (20), key (22), and shaft (23).
18. Remove gear (21) and bearing (24).

TX08227,0000259 -19-08OCT02-2/2

## Hydraulic Pump Assemble



T154482

Hydraulic Pump

T154482 -UN-01MAY02

Continued on next page

FR91424,0000029 -19-16OCT02-1/3

## Hydraulic System

1—Control Housing	7—Cap Screw (4 used)	15—Snap Ring	24—Bearing
2—Valve Head	8—Cover	16—Shim	25—O-Ring
3—Rotary Group Driven Side	9—O-Ring	17—Seal	26—O-Ring
4—Rotary Group Drive Side	10—Plug (2 used)	18—Cap Screw (2 used)	27—O-Ring
5—Pump Housing	11—Cap Screw	19—Cap Screw (2 used)	28—Bearing
6—Pilot Pump	12—Engine Speed Sensor	20—Bearing	31—Valve Plate
	13—O-Ring	21—Gear	32—Valve Plate
	14—Plug	22—Key	
		23—Shaft	

1. Install bearing (24) into pump housing (5).
2. Assemble gear (21), key (22), and shaft (23).
3. Install gear assembly.
4. Install bearing (20).
5. Install o-rings (25, 26, and 27).
6. Install pilot pump (6).
7. Install cap screws (18 and 19) and tighten.

### Hydraulic Pump—Specification

Pilot Pump-to-Pump	
Housing Cap	
Screw—Torque.....	49 N·m (36 lb·ft)
8. Heat pump housing (5) bores for rotary groups to 80—85°C (176—185°F).	
9. Apply a film of hydraulic oil to rotary groups (3 and 4).	

Continued on next page

FR91424,0000029 -19-16OCT02-2/3

10. Align marks (30) on rotary groups (3 and 4) during installation.
11. Install rotary group driven side (3).
12. Install rotary group drive side (4).
13. Install seal (17) and bearing (28).
14. Install shim (16) and snap ring (15).
15. Install plug (14).

**Hydraulic Pump—Specification**

Pump Housing  
Plug—Torque..... 41 N·m (30 lb-ft)

16. Install o-ring (9) on cover (8).
17. Install cover (8).
18. Install cap screws (7) and tighten.

**Hydraulic Pump—Specification**

Hydraulic Pump Cover  
Cap Screw—Torque..... 88 N·m (65 lb-ft)

19. Install o-ring (13) on engine speed sensor (12).
20. Install engine speed sensor (12).
21. Install cap screw (11).

**Hydraulic Pump—Specification**

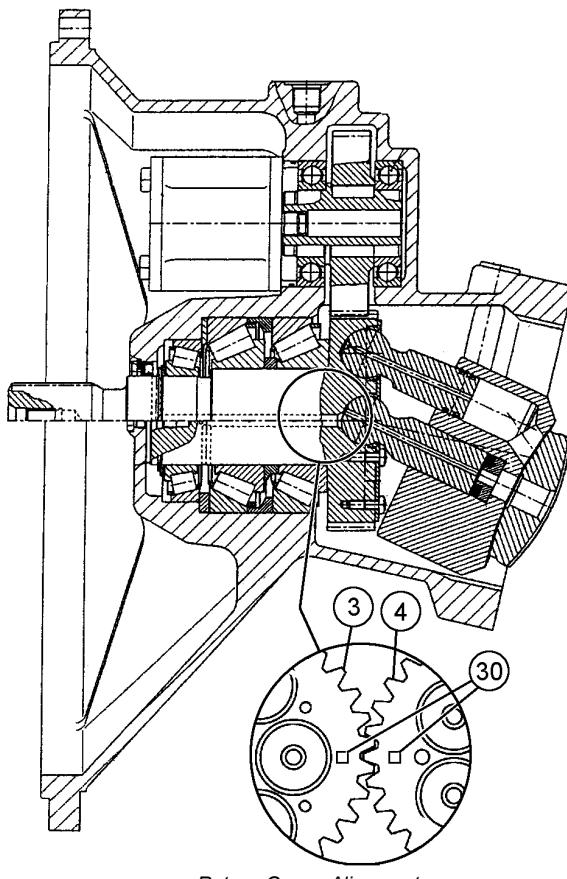
Engine Speed Sensor  
Cap Screw—Torque..... 15 N·m (11 lb-ft)

**IMPORTANT: Cylinder blocks differ from each other and are not interchangeable.**

22. Install rotary group drive side (4) cylinder block in pump housing.
23. Install rotary group driven side (3) cylinder block in pump housing.

**IMPORTANT: Valve plates differ from each other and are not interchangeable.**

24. Install valve plate (32) in rotary group drive side (4) cylinder block.
25. Install valve plate (31) in rotary group driven side (3) cylinder block.



T154475 —UN—02MAY02

3—Rotary Group Driven Side      30—Alignment Mark  
4—Rotary Group Drive Side

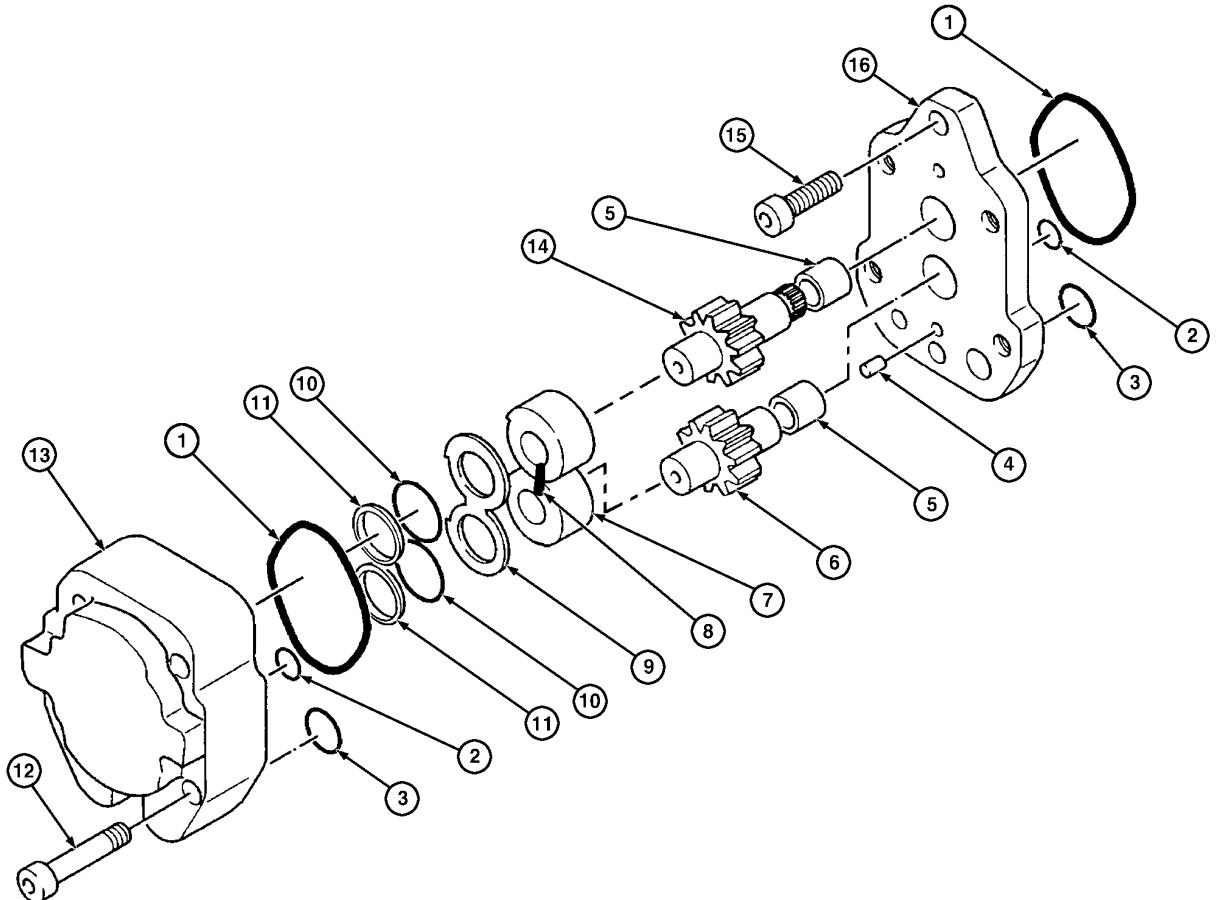
26. Install valve head (2) on pump housing (5).

27. Install cap screws and tighten.

**Hydraulic Pump—Specification**

Valve Head-to-Pump  
Housing Cap  
Screw—Torque..... 69 N·m (51 lb-ft)

FR91424,0000029 -19-16OCT02-3/3

**Pilot Pump Disassemble and Assemble**

T111537

T111537-UN-15OCT97

1—O-Rings (2 used)  
 2—O-Rings (2 used)  
 3—O-Ring (2 used)  
 4—Pins (2 used)

5—Bushing (2 used)  
 6—Driven Gear  
 7—Plate  
 8—Ring  
 9—Plate

10—O-Ring (2 used)  
 11—Guide (2 used)  
 12—Cap Screw (4 used)  
 13—Case

14—Drive Gear  
 15—Cap Screw  
 16—Frame

1. Remove cap screws (12).
2. Remove case (13) from frame (16).
3. Remove O-rings (1—3) from frame (16).
4. Remove plates (7 and 9) and guide (11) from case (13).
5. Remove O-ring (10) from guide (11).
6. Replace parts as necessary.
7. Install O-rings (10) on guides (11).
8. Install guides into case (13).
9. Install plate (9) on guides (11) in case (13).
10. Install plate (7) in case (13).
11. Install O-rings (1—3) in case (13).
12. Install gears (6 and 14).
13. Install O-rings (1—3) in frame (16).
14. Install frame (16) in case (13).

Continued on next page

FR91424,000002A -19-16OCT02-1/2

*Hydraulic System*

15. Install cap screws (12) and tighten.

**Pilot Pump—Specification**

Frame-to-Case Cap  
Screw—Torque..... 49 N·m (36 lb-ft)  
FR91424,000002A -19-16OCT02-2/2

## Hydraulic Pump Regulator Repair

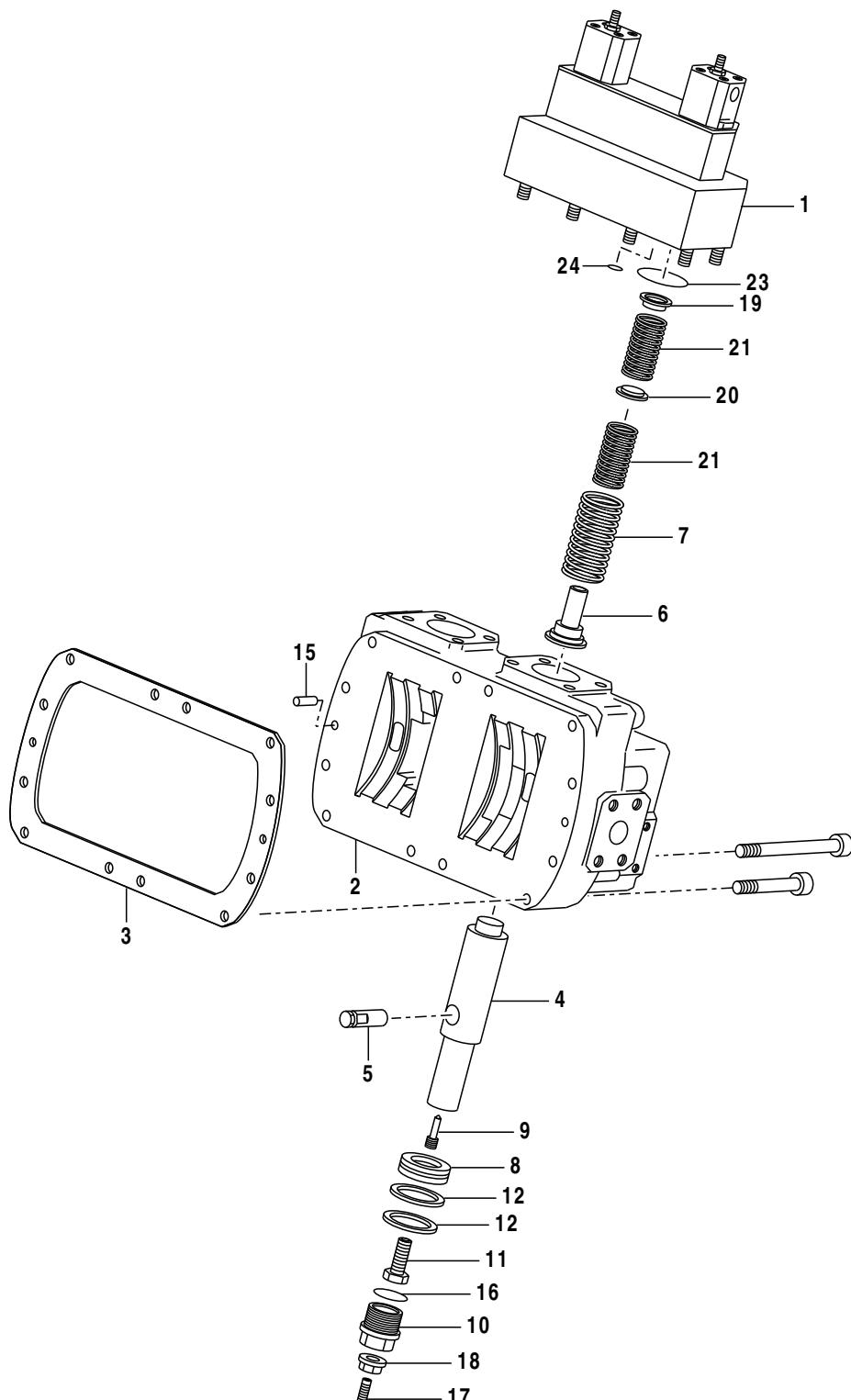
### Disassemble and Assemble Valve Head

*NOTE: Pump 1 (4-spool) and pump 2 (5-spool) regulators  
are similar. Pump 2 (5-spool) regulator is shown.*

Continued on next page

TX08227,000025C -19-16OCT02-1/8

Hydraulic System



T154559

Hydraulic Pump Regulator Valve Head

T154559—UN—03MAY02

Continued on next page

TX08227,000025C -19-16OCT02-2/8

## Hydraulic System

1—Control Housing  
2—Valve Head  
3—Gasket  
4—Servo Piston  
5—Swivel Pin  
6—Spring Guide

7—Spring  
8—Piston  
9—Set Screw  
10—Lock Nut  
11—Cap Screw  
12—Packing (2 used)

15—Pin (2 used)  
16—O-Ring  
17—Adjusting Screw  
18—Lock Nut  
19—Spring Guide  
20—Spring Guide (2 used)

21—Spring (2 used)  
23—O-Ring  
24—O-Ring

1. Remove gasket (3) from valve head (2).
2. Remove pins (15).
3. Remove O-rings (23 and 24).
4. Remove spring guide (19) and spring (7).

**IMPORTANT:** Spring guides (20) are removed with springs (21). Do not remove spring guides from springs.

5. Remove spring assembly (20 and 21).
  6. Remove spring guide (6).
- IMPORTANT:** Removal of adjusting screw (17) from valve head will require adjustment of pump regulator. Only remove adjusting screw if replacement is necessary.

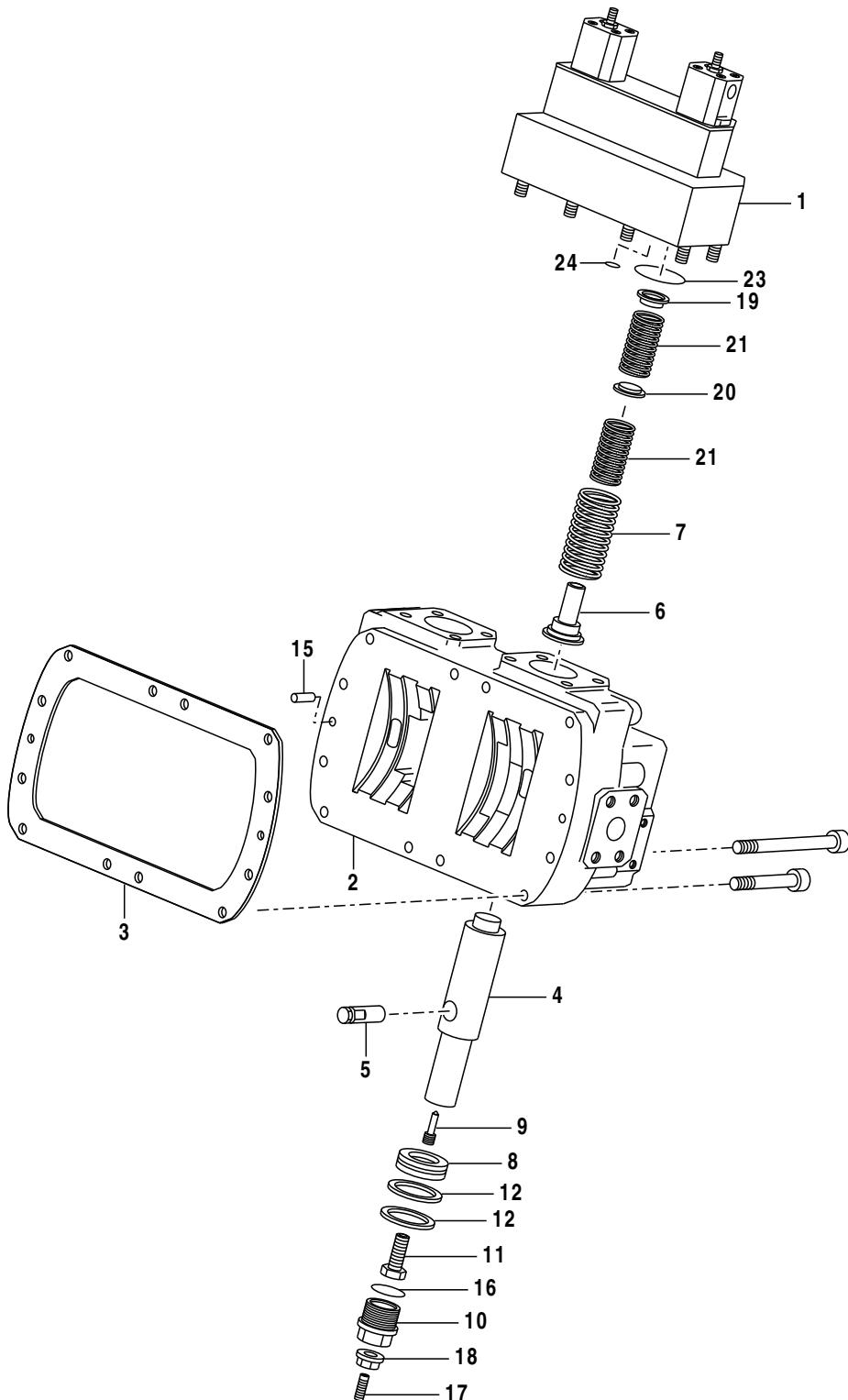
*NOTE: Lock nut assembly (10) includes O-ring (16), lock nut (18) and adjusting screw (17).*

7. Remove lock nut assembly (10).
8. Remove cap screw (11) from servo piston (4).
9. Remove packing (12).
10. Remove piston (8) from servo piston (4).
11. Apply heat to adjusting screw (9) in servo piston (4) to loosen the thread lock and sealer (medium strength).
12. Remove set screw (9).
13. Remove swivel pin (5).
14. Remove servo piston (4).
15. Repair or replace parts as necessary.

Continued on next page

TX08227,000025C -19-16OCT02-3/8

Hydraulic System



T154559

T154559—UN-03MAY02

Hydraulic Pump Regulator Valve Head

Continued on next page

TX08227,000025C -19-16OCT02-4/8

## Hydraulic System

1—Control Housing	7—Spring	15—Pin (2 used)	21—Spring (2 used)
2—Valve Head	8—Piston	16—O-Ring	23—O-Ring
3—Gasket	9—Set Screw	17—Adjusting Screw	24—O-Ring
4—Servo Piston	10—Lock Nut	18—Lock Nut	
5—Swivel Pin	11—Cap Screw	19—Spring Guide	
6—Spring Guide	12—Packing (2 used)	20—Spring Guide (2 used)	

16. Apply a film of hydraulic oil to servo piston (4).
17. Insert servo piston (4) into valve head.
18. Align swivel pin hole.
19. Apply thread lock and sealer (medium strength) to swivel pin (5).
20. Install swivel pin (5) with taper facing set screw.
21. Apply thread lock and sealer (medium strength) to set screw (9).
22. Install set screw (9) and tighten.  
**Hydraulic Pump Regulator—Specification**  
Set Screw—Torque..... 9.8 N·m (7.2 lb-ft)
23. Install packing (12).
24. Install piston (8).
25. Install cap screw (11) and tighten.

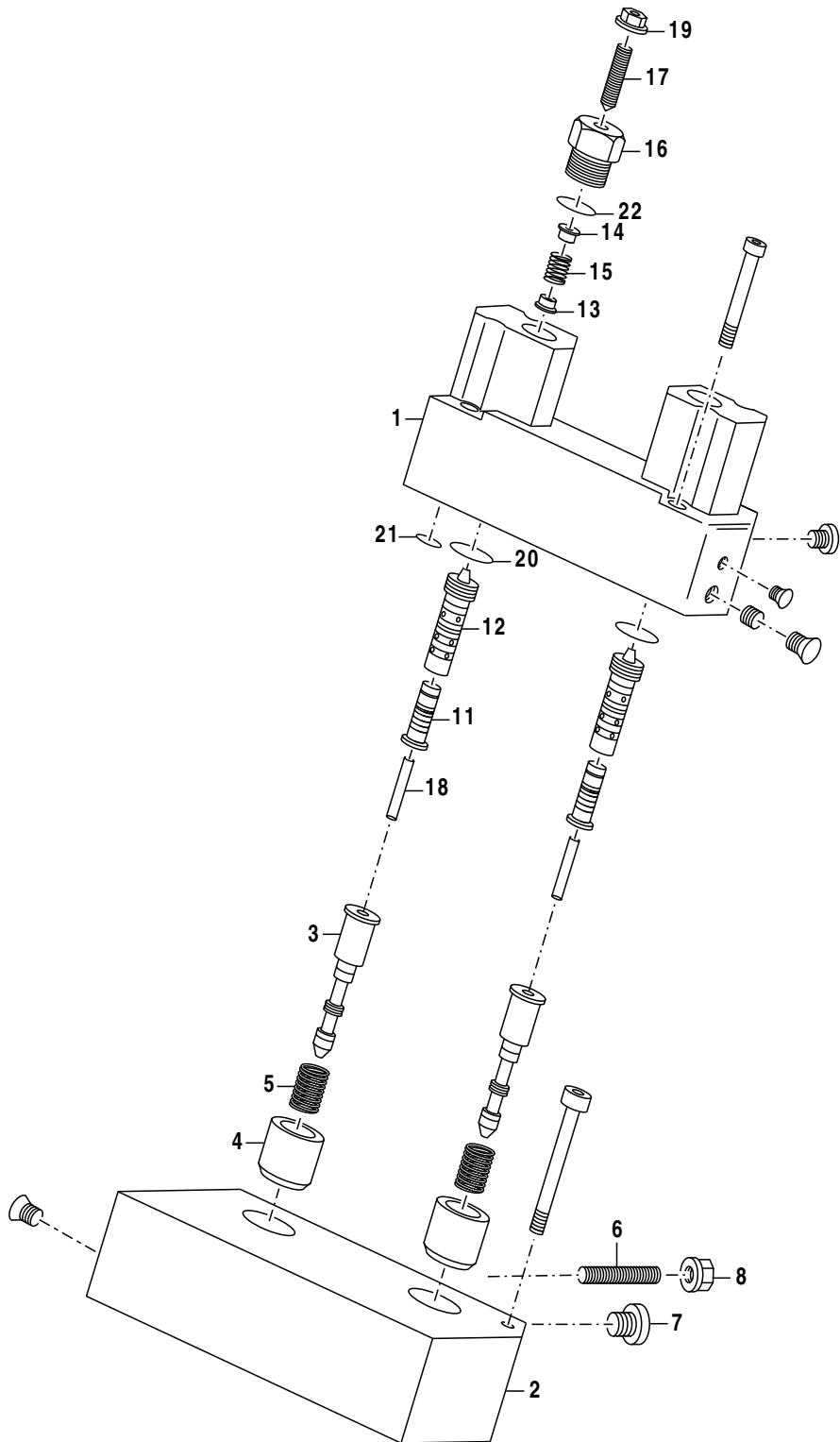
<b>Hydraulic Pump Regulator—Specification</b>	
Servo Piston Cap	
Screw—Torque.....	87 N·m (64 lb-ft)
26. Install lock nut assembly (10) and tighten.	
<b>Hydraulic Pump Regulator—Specification</b>	
Lock Nut	
Assembly—Torque.....	180 N·m (133 lb-ft)

27. Install spring guide (6).
28. Install spring assembly (20 and 21).
29. Install spring (7) and spring guide (19).
30. Install O-rings (23 and 24).
31. Install pins (15).
32. Apply flexible form-in-place gasket to valve head.
33. Install gasket (3).

Continued on next page

TX08227,000025C -19-16OCT02-5/8

Disassemble and Assemble Control Housing



T154560

Hydraulic Pump Regulator Control Housing

T154560 -UN-03MAY02

Continued on next page

TX08227,000025C -19-16OCT02-6/8

## Hydraulic System

1—Cover  
2—Control Housing  
3—Piston  
4—Bushing  
5—Spring  
6—Adjusting Screw

7—Plug  
8—Lock Nut  
11—Piston  
12—Piston  
13—Spring Guide  
14—Spring Guide

15—Spring  
16—Lock Nut  
17—Adjusting Screw  
18—Pin  
19—Lock Nut

20—O-Ring  
21—O-Ring

1.

*NOTE: Pump 1 (4-spool) and pump 2 (5-spool) regulators are similar. Pump 1 (4-spool) regulator is shown.*

- Remove O-ring (20) from control housing (2).
- 2. Remove piston (3), spring (5) and bushing (4).
- 3. Remove plug (7).
- 4. Remove pin (18) and piston (11) from piston (12).

**IMPORTANT: Removal of adjusting screw (17) from control housing will require adjustment of**

**pump regulator. Only remove adjusting screw if replacement is necessary.**

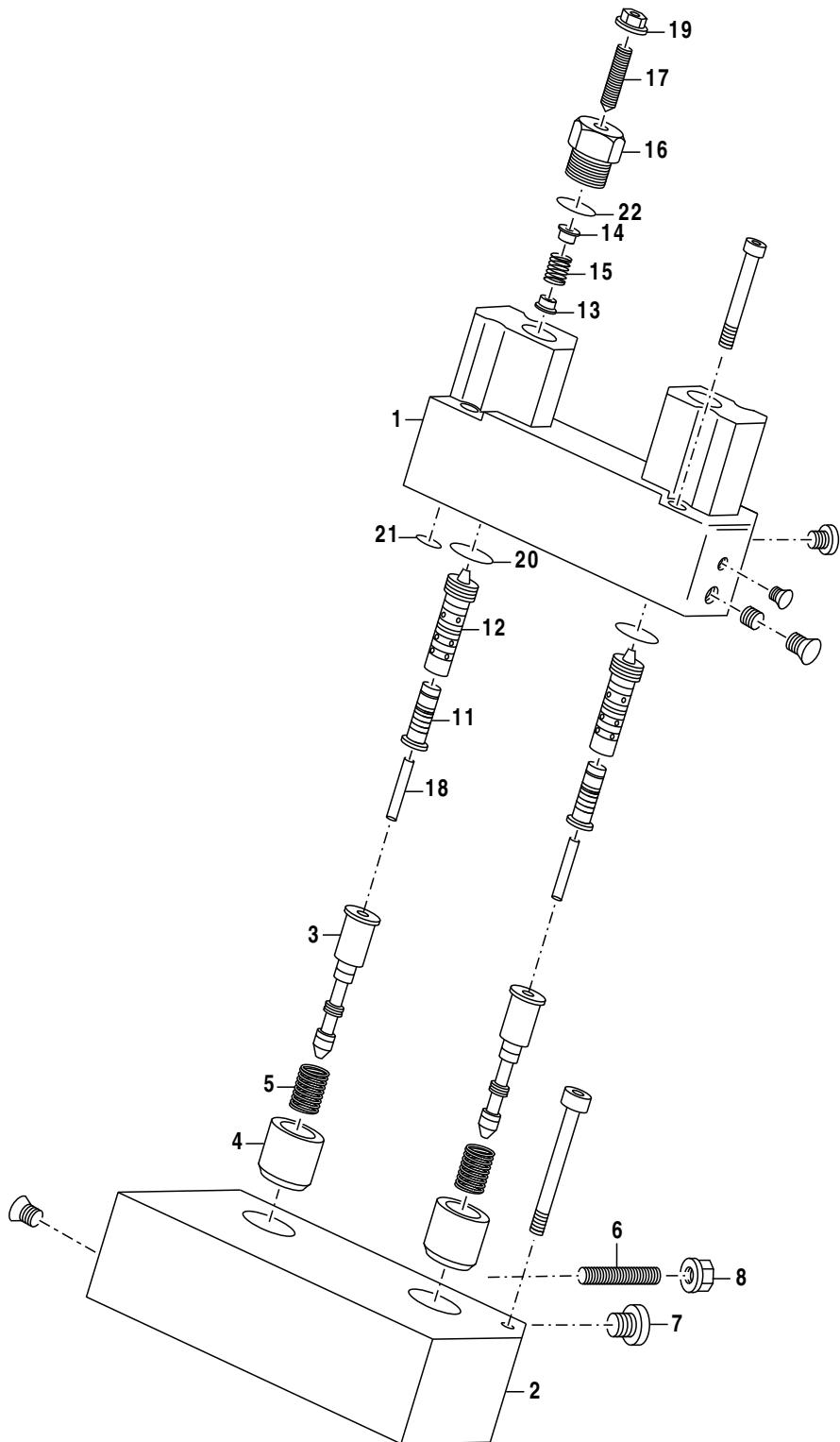
*NOTE: Lock nut assembly (16) includes O-ring (22), lock nut (19) and adjusting screw (17).*

- 5. Remove lock nut assembly (16) from cover (1).
- 6. Remove spring guides (13 and 14) and spring (15).
- 7. Remove piston (12).
- 8. Repair or replace parts as necessary.

Continued on next page

TX08227,000025C -19-16OCT02-7/8

Hydraulic System



T154560

Hydraulic Pump Regulator Control Housing

TX08227,000025C -19-16OCT02-8/8  
T154560 -UN-03MAY02

1—Cover  
2—Control Housing  
3—Piston  
4—Bushing  
5—Spring  
6—Adjusting Screw

7—Plug  
8—Lock Nut  
11—Piston  
12—Piston  
13—Spring Guide  
14—Spring Guide

15—Spring  
16—Lock Nut  
17—Adjusting Screw  
18—Pin  
19—Lock Nut

20—O-Ring  
21—O-Ring

9. Install piston (12) in cover (1).
  10. Install spring guides (13 and 14) and spring (15).
  11. Install lock nut assembly (16) and tighten.
- Hydraulic Pump Regulator—Specification**
- |                      |                   |
|----------------------|-------------------|
| Lock Nut             | .....             |
| Assembly—Torque..... | 78 N·m (58 lb·ft) |
12. Install piston (11) and pin (18) into piston (12).
  13. Install plug (7) into housing (2).

#### Hydraulic Pump Regulator—Specification

Control Housing	.....
Plug—Torque.....	10 N·m (7.4 lb·ft)

14. Install bushing (4), spring (5), and piston (3).
15. Install O-ring (20).

TX08227,000025C -19-16OCT02-9/8

## Hydraulic Pump Start-Up Procedure

**IMPORTANT:** Hydraulic pump will be damaged if not filled with oil before starting engine. Procedure must be performed whenever a new hydraulic pump is installed or oil has been drained from the pump or hydraulic oil tank.

Procedure is to ensure the pumps are filled with oil and air is bled from suction side of pumps to prevent cavitation.

1. Perform Check Hydraulic Oil Level. (Operator's Manual.)
2. Remove air bleed plug (1) from the top of pump to allow housing to fill with oil from the hydraulic tank and to let air escape.
3. When pump housing is full of oil, install plug.
4. Check oil level in hydraulic tank. Add oil as necessary. Tighten hydraulic tank cap.
5. Start engine and run at slow idle. Slowly raise boom to full height and then lower to pressurize hydraulic oil tank.
6. Purge air from the hydraulic system by slowly operating each function through three cycles. Air in pilot circuits is purged automatically.



Hydraulic Pump Bleed Plug

1—Bleed Plug

T160493B—JUN—15OCT02

TX08227,000025A -19-15OCT02-1/1

## Dampener Drive (Flex Coupling) Remove and Install (S.N. —044369 and S.N. 044416—044439)

1. Remove hydraulic pump. See Hydraulic Pump Remove and Install. (Group 3360.)
- NOTE: Flex coupling may come off with pump or stay on flywheel.
2. Remove parts (A—H).
3. Repair or replace parts as necessary.
4. Install parts (A—H). Apply thread lock and sealer (medium strength) to set screws (B) and to cap screws (D and G).

*NOTE: Spring pin (F) is for alignment of insert (E) to flywheel.*

5. Tighten set screws (B).

### Specification

Coupling-to-Pump Shaft

Set Screw—Torque..... 108 N·m  
(80 lb-ft)

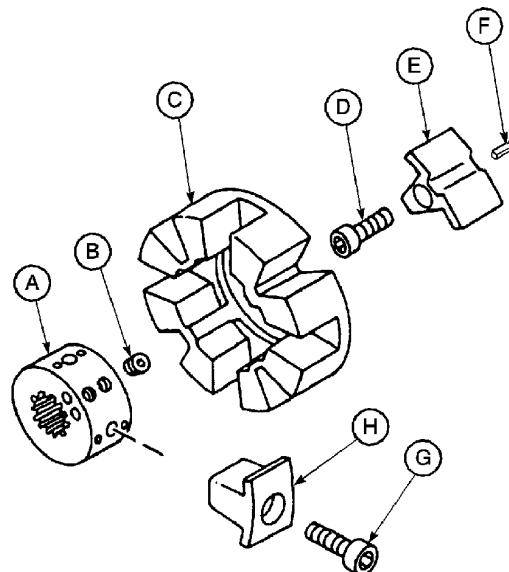
6. Tighten cap screws (D and G).

### Specification

Insert-to-Flywheel  
and Coupling Cap

Screw—Torque..... 215 N·m  
(160 lb-ft)

7. Install hydraulic pump. See Hydraulic Pump Remove and Install. (Group 3360.)



T105285—UN—20NOV96

TX,07,DH5336 -19-26MAR04-1/1

## Dampener Drive (Flex Coupling) Remove and Install (S.N. 044370—044415 and S.N. 044440— )

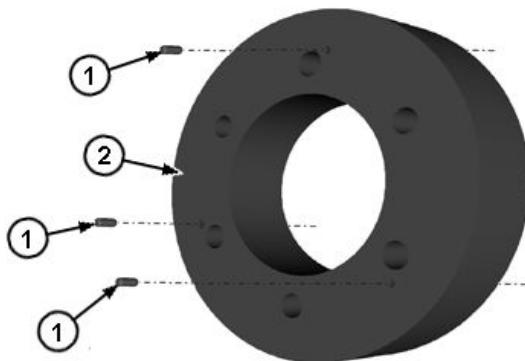
1. Remove hydraulic pump. See Hydraulic Pump Remove and Install. (Group 3360.)

*NOTE: Flex coupling may come off with pump or stay on flywheel.*

2. Remove dampener drive and spacer.
3. Replace parts as necessary.
4. Install guide pins (1) into spacer (2).

1—Guide Pin (4 used)

2—Spacer



T198555—UN—23MAR04

Continued on next page

TX17984,000000F -19-17AUG06-1/4

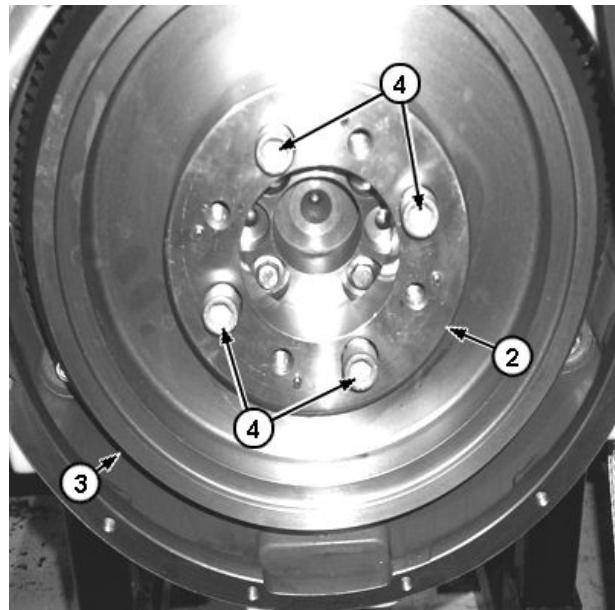
- Attach spacer (2) onto engine flywheel (3) using cap screws (4).

**Specification**

Spacer-to-Engine Flywheel Cap  
Screw—Torque.....137 N·m  
(101 lb-ft)

2—Spacer  
3—Engine Flywheel

4—Cap Screw (4 used)



Spacer Mounted to Engine Flywheel

T198888—UN—02APR04

TX17984,000000F -19-17AUG06-2/4

- Attach flex coupling (5) onto spacer (2) using cap screws (6).

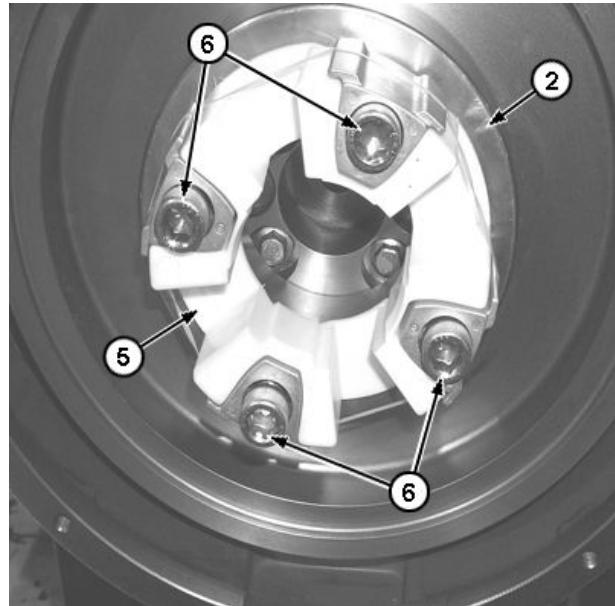
**Specification**

Flex Coupling-to-Spacer  
Cap Screw—Torque.....137 N·m  
(101 lb-ft)

*NOTE: Guide pins (1) are for alignment of the flex coupling (5) onto the spacer (2).*

2—Spacer  
5—Flex Coupling

6—Cap Screw (4 used)



Flex Coupling on Spacer

T198889—UN—02APR04

Continued on next page

TX17984,000000F -19-17AUG06-3/4

- Slide adapter (7) as far as possible onto hydraulic pump spline (11) as shown.

The adapter (7) has a flush side (9) and an offset side (10). The adapter (7) must be installed with the flush side (9) toward the hydraulic pump (8). The hydraulic pump spline (11) will extend slightly past the outside surface of the adapter (7).

- Tighten adapter set screws.

#### Specification

Adapter-to-Pump Shaft

Set Screw—Torque..... 108 N·m  
(80 lb-ft)

- Install hydraulic pump. See Hydraulic Pump Remove and Install. (Group 3360.)

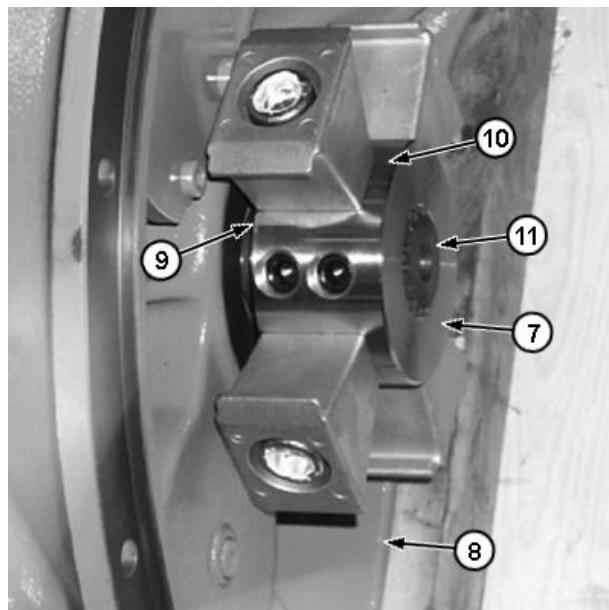
7—Adapter

8—Hydraulic Pump

9—Flush Side of Adapter

10—Offset Side of Adapter

11—Hydraulic Pump Spline



T198560—UN—22MAR04

*Adapter Alignment*

TX17984,000000F -19-17AUG06-4/4

## Pilot Filter Remove and Install

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

- Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
- Disconnect lines (1).
- Remove cap screws (2 and 3) and remove pilot filter (4).
- Repair or replace parts as necessary.
- Replace pilot filter (4) element.

#### Specification

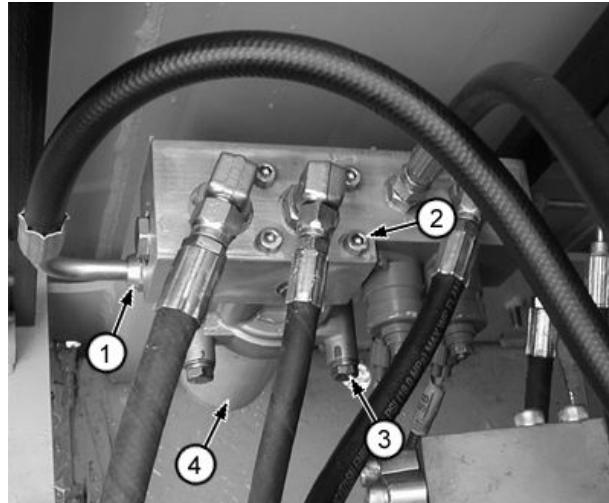
Pilot Filter Element

Housing-to-Filter

Head—Torque..... 25 N·m (220 lb-in.)

- Install cap screws (2 and 3).

- Connect lines.



T160152B—UN—03OCT02

1—Pilot Oil Line  
2—Cap Screw (4 Used)

3—Cap Screw (2 Used)  
4—Pilot Filter

TX08227,000025E -19-24OCT02-1/1

## Attachment Flow Rate and Speed Sense Solenoid Repair

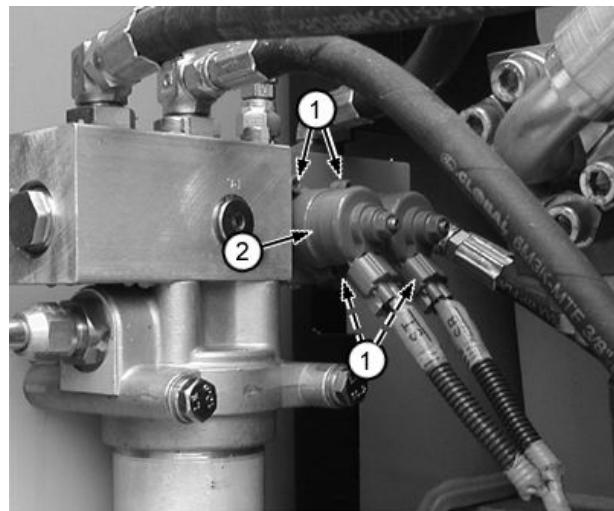
### Remove and Install Attachment Flow Rate and Speed Sense Solenoid

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Disconnect electrical connector.
3. Remove cap screws (1) and remove solenoid valve coil (2). Be careful not to drop spring and O-ring.
4. Keep parts for each individual solenoid valve together.
5. Repair or replace parts as needed.
6. Install solenoid valve coil (2) with O-ring and spring.
7. Tighten cap screws (1).

#### Specification

Solenoid Valve  
Coil-to-Manifold Cap  
Screws—Torque..... 3 N·m (24 lb-in.)



1—Cap Screw (4 Used)

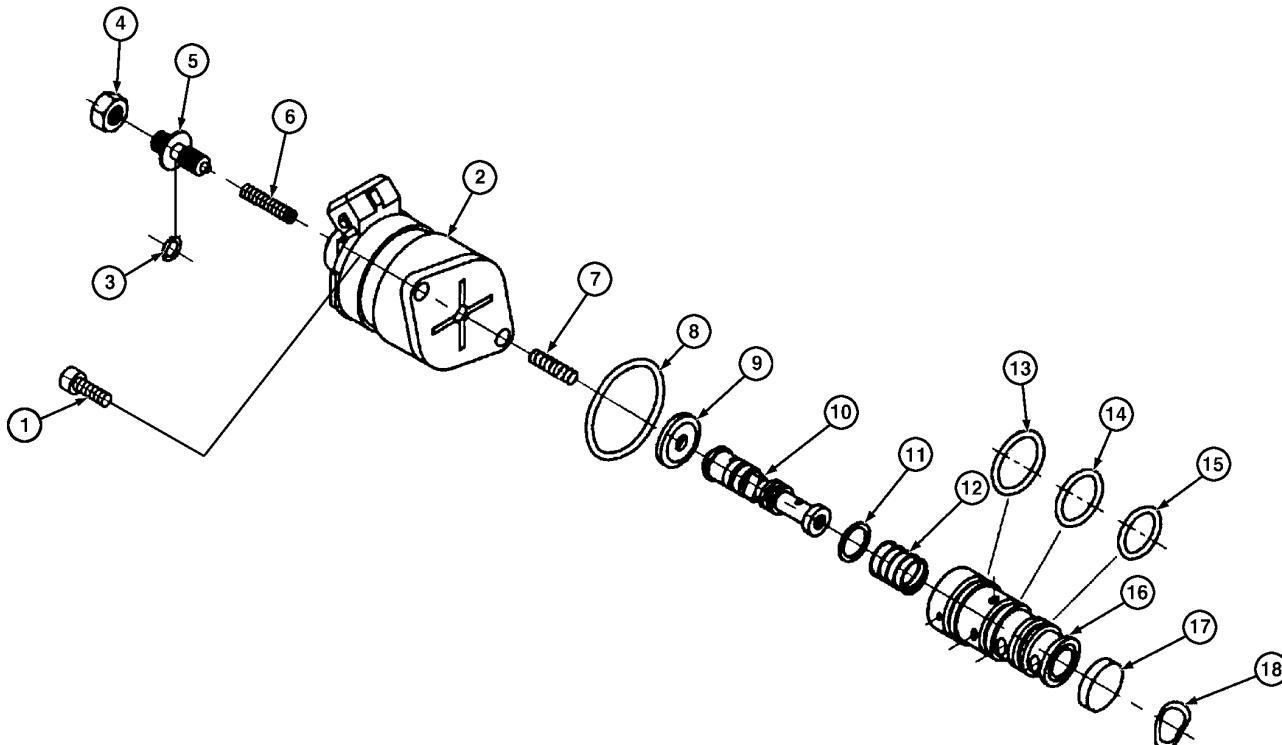
2—Solenoid (2 Used)

8. Connect electrical connectors.
9. Check pressure setting of solenoid valves.

Continued on next page

LD30992,00001AE -19-03OCT02-1/2

T160170B-JUN-08OCT02

**Disassemble and Assemble Attachment Flow Rate and Speed Sense Solenoid**


T143123

T143123-UN-20JUL01

1—Cap Screw (2 used)  
 2—Proportional Solenoid Valve Coil  
 3—O-Ring

4—Lock Nut  
 5—Adjusting Screw  
 6—Spring  
 7—Spring  
 8—O-Ring

9—Diaphragm  
 10—Spool  
 11—Washer  
 12—Spring  
 13—O-Ring  
 14—O-Ring

15—O-Ring  
 16—Sleeve  
 17—Plate  
 18—Washer

1. Remove parts (7—18).

*NOTE: Only remove the lock nut (4) and adjusting screw (5) if replacement of O-ring (3) is necessary. If disassembled, pressure setting of proportional solenoid valve will need to be adjusted.*

2. Repair or replace parts as necessary.
3. Apply clean oil to sleeve (16), O-rings (13, 14 and 15) and spool (10).

After installing spool, push spool against spring to check that spool slides smoothly in sleeve.

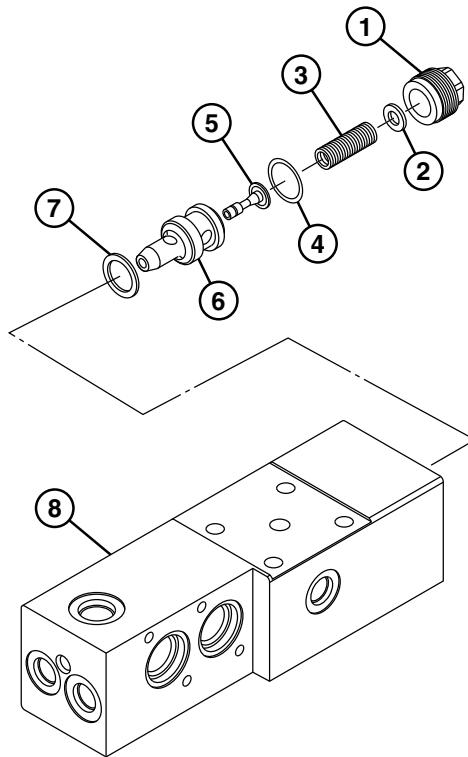
4. Install sleeve (16) so ports align with ports in manifold.
5. Install washer (11) and spring (12) on spool and install spool.
6. Install spring (7), O-ring (8) and diaphragm (9).

LD30992,00001AE -19-03OCT02-2/2

## Pilot Pressure Regulating Valve Disassemble and Assemble

1. Remove plug (1).
2. Remove parts (2—7).
3. Repair or replace parts as necessary.
4. Assemble parts (2—7).
5. Install plug (1).
6. Check pilot pressure. See Pilot Pressure Regulating Valve Test and Adjustment. (Group 9025-25)

1—Plug  
2—Shim  
3—Spring  
4—O-Ring  
5—Poppet Valve  
6—Valve Sleeve  
7—Gasket  
8—Valve Block



T160155—JUN—25OCT02

LD30992,00001AF -19-03OCT02-1/1

## Pilot Shut-Off Valve Repair

### Remove and Install Pilot Shut-Off Valve

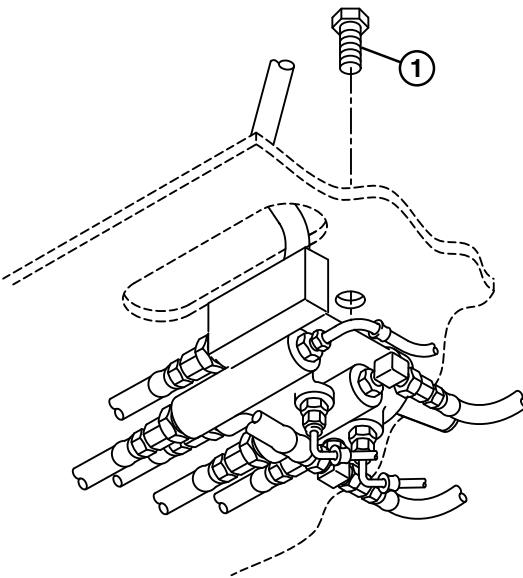
1. Turn upperstructure 90° to tracks.
2. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
3. Disconnect lines.
4. Disconnect spring.
5. Remove cap screws (1) and remove valve with lever attached.
6. Repair or replace parts as necessary.
7. Install valve. Tighten cap screws.

#### Specification

Valve Housing-to-Cab  
Platform Cap  
Screw—Torque..... 49 N·m (36 lb·ft)

1—Cap Screw (2 used)

8. Connect spring.
9. Connect lines. See Pilot Controllers-to-Pilot Signal Manifold Component Location—Excavator Pattern. (Group 9025-15.)

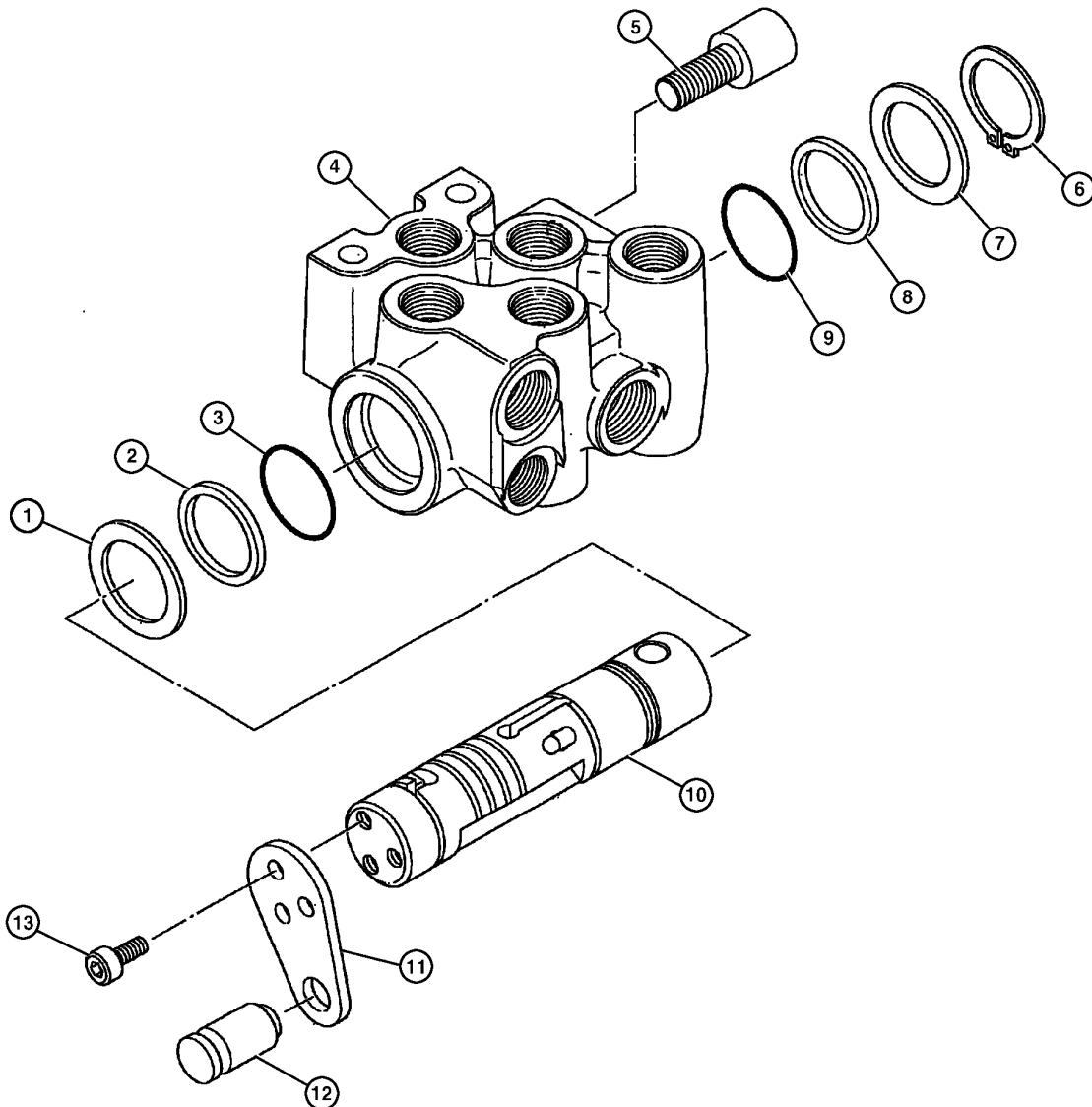


T142504 -UN-20UL01

Continued on next page

TX,33,SB161 -19-24OCT02-1/3

## Disassemble and Assemble Pilot Shut-Off Valve



T143031

1—Washer  
2—Backup Ring  
3—O-Ring  
4—Body

5—Lever Stop Cap Screw  
6—Retaining Ring  
7—Washer

8—Backup Ring  
9—O-Ring  
10—Spool  
11—Bracket

12—Pin  
13—Cap Screw (3 used)

1. Remove spring pin and remove lever from valve.  
*NOTE: Make alignment marks on body (4) and bracket (11) to aid in reassembly.*
2. Remove parts (6—9) and remove spool (10) from body (4).
3. Remove parts (1—3) from body.

4. Remove cap screws (13) and bracket (11) from spool (10).

*NOTE: Remove pin (12) and cap screw (5) only if necessary.*

5. Inspect and replace parts as necessary.

Continued on next page

TX.33.SB161 -19-24OCT02-23

T143031—UN—17JUL01

6. If cap screw (5) has been removed, apply T43512 thread lock and sealer (medium strength) to threads and tighten.
  

Specification	
Lever Stop Cap	
Screw—Torque.....	29.4 N·m (21.5 lb-ft)

  7. Position bracket (11) on spool (10).
  8. Apply T43512 thread lock and seal (medium strength) to threads of cap screws (13) and tighten.

- | Specification        |                     |
|----------------------|---------------------|
| Bracket-to-Spool Cap |                     |
| Screw—Torque.....    | 3.9 N·m (35 lb-in.) |
9. Install parts (1—3) into body (4).
  10. Apply hydraulic oil to spool (10) and install into body (4).
  11. Install parts (7—9) in body (4) and retaining ring (6) to spool (10).
  12. Align marks on bracket (11) with body (4).
  13. Install lever and spring pin to valve.

TX,33,SB161 -19-24OCT02-3/3

## Propel Speed and Arm Regenerative Solenoid Valve Repair

### Remove and Install Propel Speed and Arm Regenerative Solenoid Valve

**⚠ CAUTION: The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.**

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)

2. Disconnect electrical connector.

*NOTE: Keep parts for each individual solenoid valve together.*

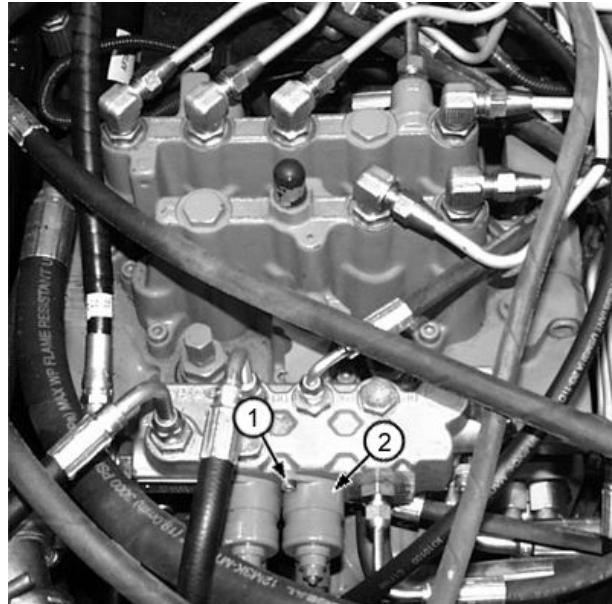
3. Remove cap screws (1) and solenoid valve coil (2). Be careful not to drop spring and O-ring.
4. Install solenoid valve coil (2) with O-ring and spring.
5. Tighten cap screws (1).

#### Specification

Solenoid Valve	
Coil-to-Manifold Cap	
Screws—Torque.....	3 N·m (24 lb-in.)

6. Connect electrical connectors.

7. Check pressure setting of solenoid valves. See Propel Speed Change and Arm Regenerative Solenoid Valve Test and Adjustment. (Group 9025-25.)



Solenoid Valve

1—Cap Screw (4 used)

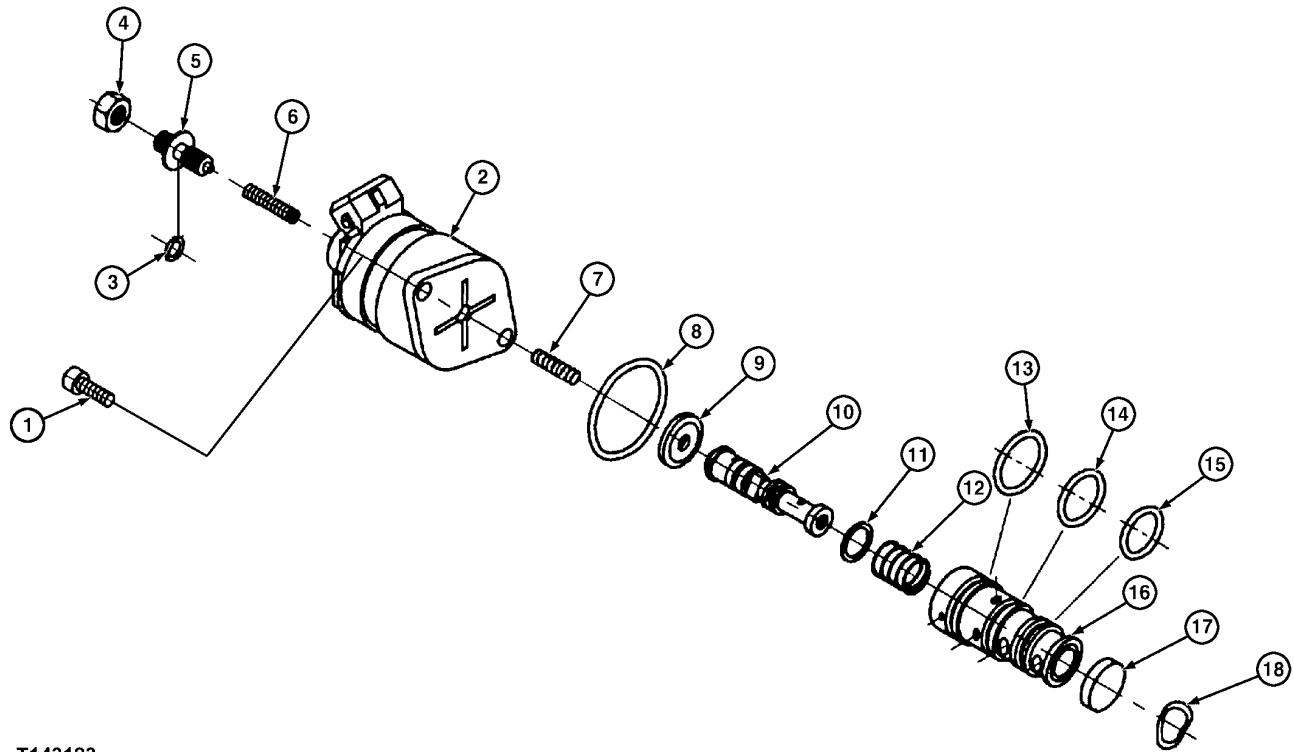
2—Solenoid Valve Coil (2 used)

T160252B—UN—07OCT02

Continued on next page

TX,33,GG2556 -19-23APR02-1/2

**Disassemble and Assemble Propel Speed and Arm Regenerative Solenoid Valve**



T143123

1—Cap Screw (2 used)  
2—Solenoid Valve Coil  
3—O-Ring  
4—Lock Nut

5—Adjusting Screw  
6—Spring  
7—Spring  
8—O-Ring  
9—Diaphragm

10—Spool  
11—Washer  
12—Spring  
13—O-Ring  
14—O-Ring  
15—O-Ring

16—Sleeve  
17—Plate  
18—Washer

1. Remove parts (7—18).

*NOTE: Only remove the lock nut (4) and adjusting screw (5) if replacement of O-ring (3) is necessary. If disassembled, pressure setting of solenoid valve will need to be adjusted. See Propel Speed Change and Arm Regenerative Solenoid Valve Test and Adjustment. (Group 9025-25.)*

2. Repair or replace parts as necessary.
3. Apply clean oil to sleeve (16), O-rings (13, 14 and 15) and spool (10).

After installing spool, push spool against spring to check that spool slides smoothly in sleeve.

4. Install sleeve (16) so ports align with ports in manifold.
5. Install washer (11) and spring (12) on spool and install spool.
6. Install spring (7), O-ring (8) and diaphragm (9).

TX,33,GG2556 -19-23APR02-2/2

T143123—UN—20JUL01

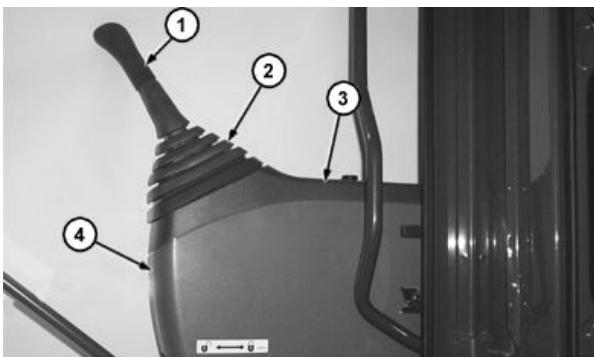
## Pilot Controller Repair

### Remove and Install Pilot Controller

**⚠ CAUTION:** Hydraulic oil tank is pressurized. High pressure release of oil from pressurized system can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Remove knob (1) with wires (6). Remove cap screws (5). Remove boot (2).
3. Remove cap screws (8). Remove cover (3).
4. Remove cap screws (10). Remove cover (4).
5. Pull the seat and consoles as far forward as possible.
6. Remove cap screws (7 and 9) to remove pilot controller from console. Mark location of cap screw with spring pin (7) for later installation.

1—Knob	6—Wires
2—Boot	7—Cap Screw with Spring Pin
3—Cover	8—Cap Screw (3 used)
4—Cover	9—Cap Screw (3 used)
5—Cap Screw (4 used)	10—Cap Screw (6 used)

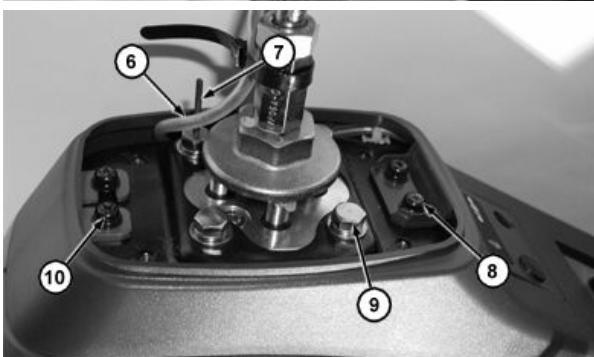


Left Console Shown

T140889B —UN—03MAY01



T140890B —UN—03MAY01



T140891B —UN—03MAY01

Continued on next page

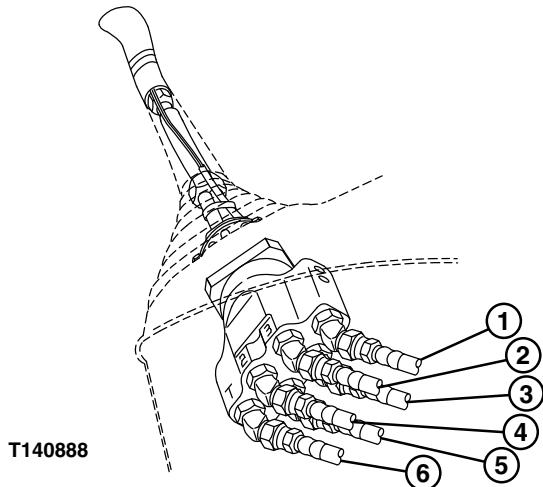
OUOE047,0000041 -19-08MAR02-1/4

Hydraulic System

7. Disconnect lines (1—6) from pilot controller. Identify the hoses by the numbers and letters stamped on the controller housing.  
Install caps and plugs to close all openings.
8. After pilot controller is installed, check the operation of all functions to be sure they operate as shown on the decal on console.

1—Port P Line  
2—Port 3 Line  
3—Port 4 Line

4—Port 2 Line  
5—Port 1 Line  
6—Port T Line



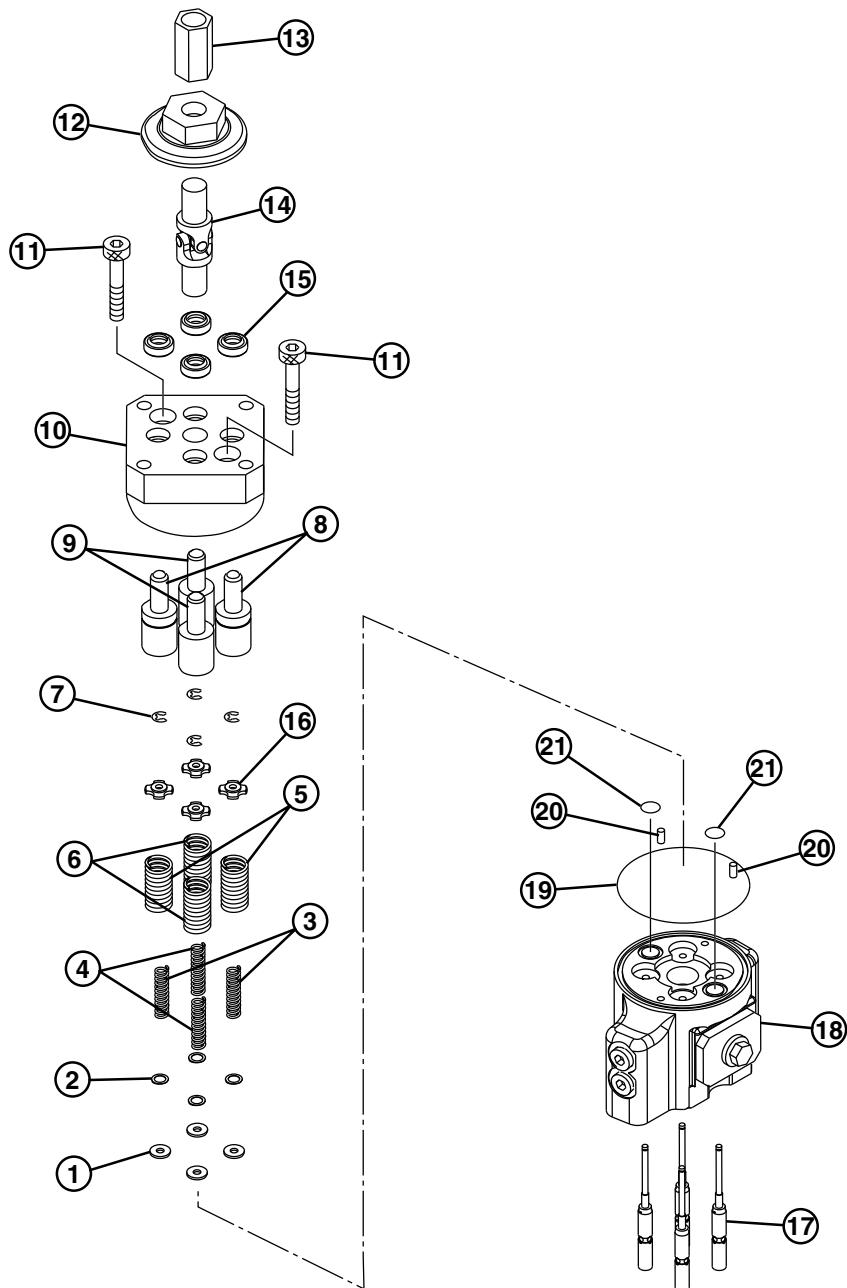
T140888

T140888—UN—30APR01

Continued on next page

OUOE047,0000041 -19-08MAR02-2/4

**Disassemble and Assemble Pilot Controller**



T143186

T143186—UN—17JUL01

- |                             |                            |                          |                       |
|-----------------------------|----------------------------|--------------------------|-----------------------|
| 1—Spacer (4 used)           | 6—Return Spring B (2 used) | 11—Cap Screw (2 used)    | 18—Housing            |
| 2—Shim (as required)        | 7—Retaining Ring (4 used)  | 12—Cam                   | 19—O-Ring             |
| 3—Balance Spring A (2 used) | 8—Pusher A (2 used)        | 13—Coupling              | 20—Dowel Pin (2 used) |
| 4—Balance Spring B (2 used) | 9—Pusher B (2 used)        | 14—U-Joint               | 21—O-Ring (2 used)    |
| 5—Return Spring A (2 used)  | 10—Block                   | 15—Oil Seal (4 used)     |                       |
|                             |                            | 16—Spring Guide (4 used) |                       |
|                             |                            | 17—Spool (4 used)        |                       |

Continued on next page

OUOE047,0000041 -19-08MAR02-3/4

**IMPORTANT: The housing (18) and spools (17) are replaced as an assembly because the spools are select fitted to bores in housing.**

**Some parts from ports 1 and 3 are different than parts from ports 2 and 4. Parts for each port must be kept together and installed into the same port from which it was removed. The port numbers are stamped on the housing.**

**Remove U-joint (14) only if necessary.**

**Note port location and quantity of shims (2) when removing. Same number of shims must be used when installing.**

1. Remove parts from housing. Remember to keep parts removed from each port together. Identify each group of parts by port numbers stamped on housing.
2. Repair or replace parts as necessary.

*NOTE: Install spring guides (16) with protrusion facing up.*

3. Install parts.
4. Apply multi-purpose grease to oil seals.

5. Install pushers (8 and 9). Pushers with grooves go into ports 1 and 3. Pushers without grooves go into ports 2 and 4.

6. Tighten cap screw (11).

**Specification**

Block-to-Housing Cap

Screw—Torque..... 19.6 N·m (174 lb-in.)

7. Apply multi-purpose grease to the end of each pushers (8 and 9) and to the joint of U-joint (14).

8. Install cam (12) on U-joint (14). Adjust clearance between pushers (8 and 9) and cam.

**Specification**

Cam-to-Pushers—Clear-

ance..... 0—0.20 mm (0—0.008 in.)

Hold cam (12) and tighten coupling (13).

**Specification**

Coupling-to-Cam and

U-Joint—Torque..... 88.2 N·m (65 lb-ft)

OUOE047,0000041 -19-08MAR02-4/4

## Propel Pilot Controller Repair

### Remove and Install Propel Pilot Controller

**CAUTION: The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.**

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Disconnect lines.
3. Remove cap screws (3) and remove pedals and levers.
4. Remove cap screws (2) and remove propel pilot controller (1).
5. Repair or replace parts as necessary.
6. Tighten cap screws (2).

**Specification**

Controller-to-Cab

Platform Cap

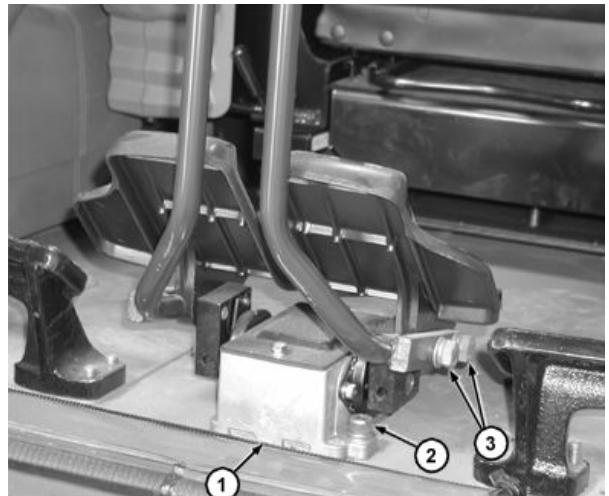
Screw—Torque..... 49 N·m (36 lb-ft)

7. Tighten cap screws (3).

**Specification**

Propel Pedal-to-Lever

Cap Screw—Torque..... 49 N·m (36 lb-ft)



1—Propel Pilot Controller  
2—Cap Screw (2 used)  
3—Cap Screw (4 used)

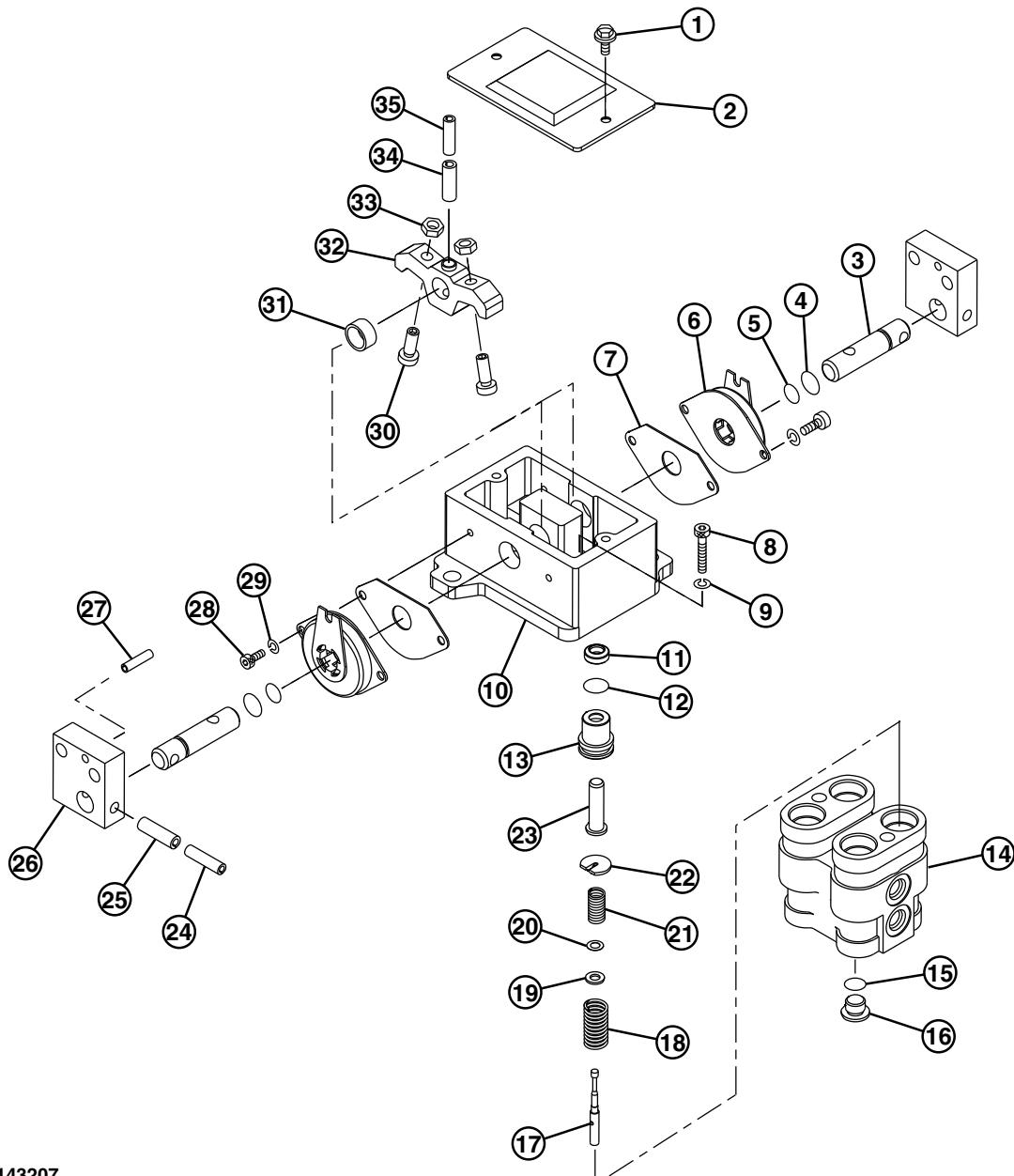
8. Connect lines. See Propel Hydraulic System Line Connection. (Group 9025-15.)
9. After propel pilot controller is installed, check the operation of all functions to be sure they operate correctly.

Continued on next page

TX.33.GG2557 -19-23APR02-1/3

T143206B—UN-20JUL01

**Disassemble and Assemble Propel Pilot Controller**



T143207

T143207—UN—17JUL01

- |                        |                            |                          |                            |
|------------------------|----------------------------|--------------------------|----------------------------|
| 1—Cap Screw (2 used)   | 11—Oil Seal (4 used)       | 22—Spring Guide (4 used) | 30—Adjusting Bolt (4 used) |
| 2—Cover                | 12—O-Ring (4 used)         | 23—Pusher (4 used)       | 31—Bushing (4 used)        |
| 3—Pin (2 used)         | 13—Bushing (4 used)        | 24—Spring Pin (2 used)   | 32—Cam (2 used)            |
| 4—O-Ring (2 used)      | 14—Casing                  | 25—Spring Pin (2 used)   | 33—Lock Nut (4 used)       |
| 5—O-Ring (2 used)      | 15—O-Ring                  | 26—Bracket (2 used)      | 34—Spring Pin (2 used)     |
| 6—Dampener (2 used)    | 16—Plug                    | 27—Spring Pin (2 used)   | 35—Spring Pin (2 used)     |
| 7—Rubber Seat (2 used) | 17—Spool (4 used)          | 28—Cap Screw (4 used)    |                            |
| 8—Cap Screw (2 used)   | 18—Spring (4 used)         | 29—Lock Washer (4 used)  |                            |
| 9—Lock Washer (2 used) | 19—Spacer (4 used)         |                          |                            |
| 10—Holder              | 20—Shim (As required)      |                          |                            |
|                        | 21—Balance Spring (4 used) |                          |                            |

Continued on next page

TX.33.GG2557 -19-23APR02-2/3

**IMPORTANT: The casing (14) and spools (17) are replaced as an assembly because the spools are select fitted to bores in housing.**

**Parts for each port must be kept together and installed into the same port from which it was removed. The port numbers are stamped on the housing.**

**Note port location and quantity of shims (20) when removing. Same number of shims must be used when installing.**

1. Remove parts from casing. Remember to keep parts removed from each port together. Identify each group of parts by port numbers stamped on casing.

**NOTE: Spring pins (24 and 25) are stepped and can only be removed from one direction.**

*Remove spring pin (27) and bushings (31) only if necessary.*

2. Repair or replace parts as necessary.
3. Install spools (17), springs (18), spacers (19), shims (20) and balance springs (21) into casing (14).  
Use number of shims (20) removed.  
Install spring guides (22) with stepped end facing down.
4. Apply multi-purpose grease to the end of each pushers (23) and to oil seals (11).

**IMPORTANT: Note direction of insertion for spring pins (34 and 35).**

5. Assemble cam (32) in holder (10) with spring pins (34 and 35), and pin (3). Install spring pins with slits 90° apart.
6. Lock pins (34 and 35) in position by displacing the bore above spring pin using a punch and hammer.
7. Install holder (10) to casing (14) with cap screws (8), lock washers (9) and tighten.

<b>Specification</b>
Holder-to-Casing Cap
Screw—Torque..... 49 N·m (36 lb-ft)
8. Adjust clearance between cams (32) and pushers (23).
<b>Specification</b>
Cams-to-
Pusher—Clearance..... 0—0.20 mm (0—0.008 in.)
9. Tighten lock nut (33).
<b>Specification</b>
Cam Adjusting Bolt Lock
Nut—Torque..... 9.8 N·m (86 lb-in.)
10. Apply multi-purpose grease to O-rings (4 and 5) and install on pin (3).
11. Position rubber seat (7) and dampener (6) on pin (3) with lever facing upward.
12. Install cap screws (28), lock washers (29) and tighten.
<b>Specification</b>
Dampener-to-Holder Cap
Screw—Torque..... 7 N·m (61 lb-in.)
<b>IMPORTANT: Note direction of insertion for spring pins (24 and 25).</b>
<b>Spring pins must be positioned with slits 90° apart.</b>
<b>Align brackets with marks made during disassembly.</b>
13. Install brackets (26) and spring pins (24 and 25).
14. Lock pins (24 and 25) in position by displacing the bore above spring pin using a punch and hammer.
15. Install cover (2) and cap screws (1) and tighten.
<b>Specification</b>
Cover-to-Holder Cap
Screw—Torque..... 5 N·m (43 lb-in.)
16. Apply multi-purpose grease to spring pin (27).

TX.33,GG2557 -19-23APR02-3/3

## Pilot Signal Manifold Repair

### Remove and Install Pilot Signal Manifold

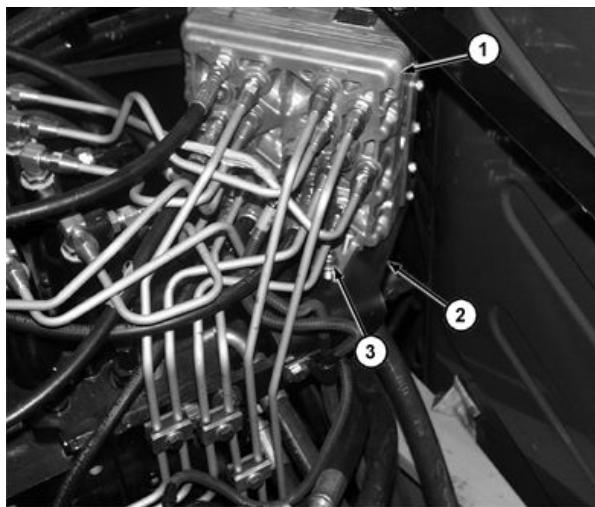
**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull vacuum in hydraulic oil tank using vacuum pump or drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Disconnect lines.
4. Disconnect electrical connectors.
5. Remove cap screws (3).
6. Repair or replace parts as necessary.
7. Position manifold (1) on bracket (2) and apply thread lock and sealer (medium strength) to cap screws (3). Tighten cap screws.

#### Pilot Signal Manifold—Specification

Pilot Signal  
Manifold-to-Bracket Cap  
Screw—Torque..... 50 N·m (37 lb·ft)

8. Connect electrical connectors. See Machine Harness (W2) Component Location. (Group 9015-10.)



T148070B—UN—01FEB02

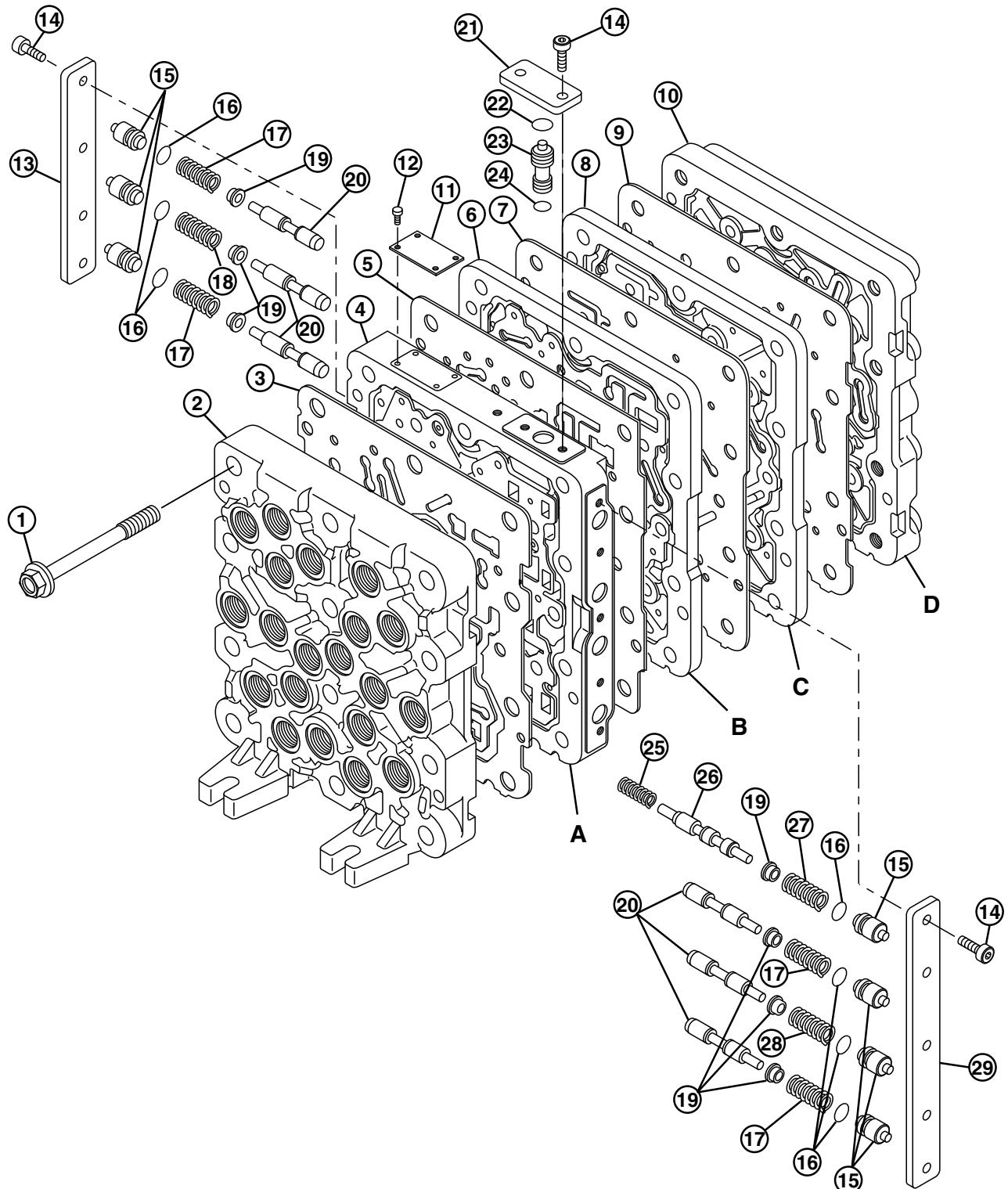
1—Pilot Signal Manifold                    3—Cap Screw (4 used)  
2—Bracket

9. Connect lines. See Pilot Controllers-to-Pilot Signal Manifold Component Location—Excavator Pattern. (Group 9025-15.) See Pilot Signal Manifold-to-Control Valve Line Connection. (Group 9025-15.)

Continued on next page

TX.33.GG2559 -19-23APR02-1/4

**Disassemble and Assemble Pilot Signal Manifold**



T143485

T143485-JN-17JUL01

Continued on next page

TX,33,GG2559 -19-23APR02-2/4

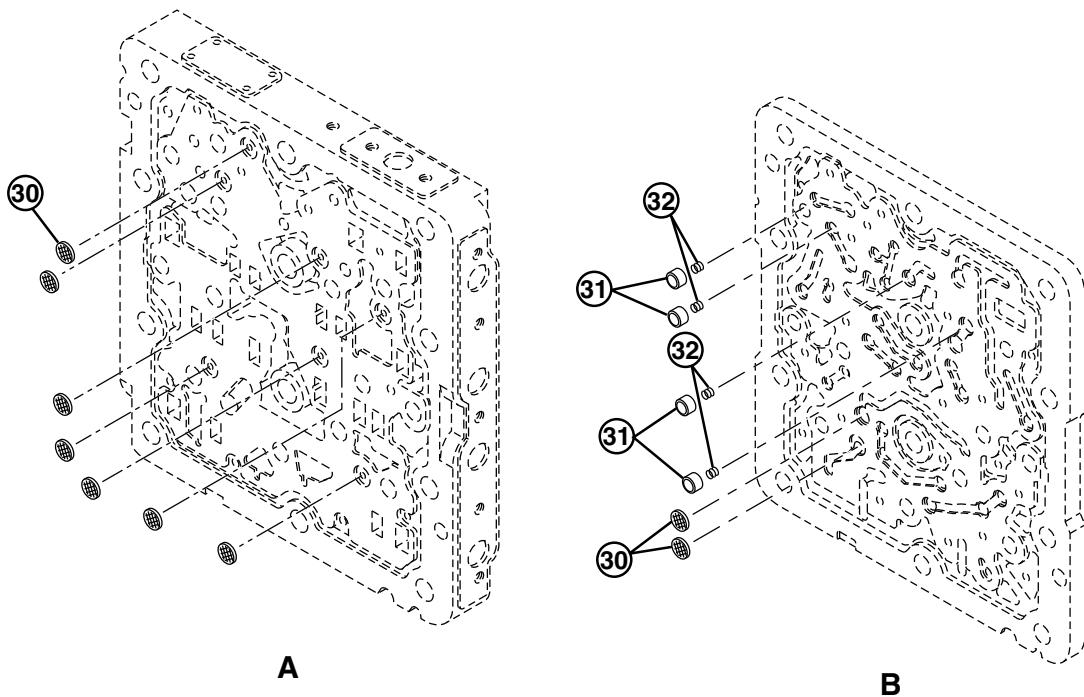
## Hydraulic System

1— Cap Screw (10 used)	10— Body	17— Spring (4 used)	24— O-Ring
2— Body	11— Name Plate	18— Spring	25— Spring
3— Gasket	12— Screw (4 used)	19— Spring Seat (7 used)	26— Spool
4— Body	13— Plate	20— Spool (6 used)	27— Spring
5— Gasket	14— Cap Screw (11 used)	21— Plate	28— Spring
6— Body	15— Plug (7 used)	22— O-Ring	29— Plate
7— Gasket	16— O-Ring (7 used)	23— Valve	
8— Body			
9— Gasket			

Continued on next page

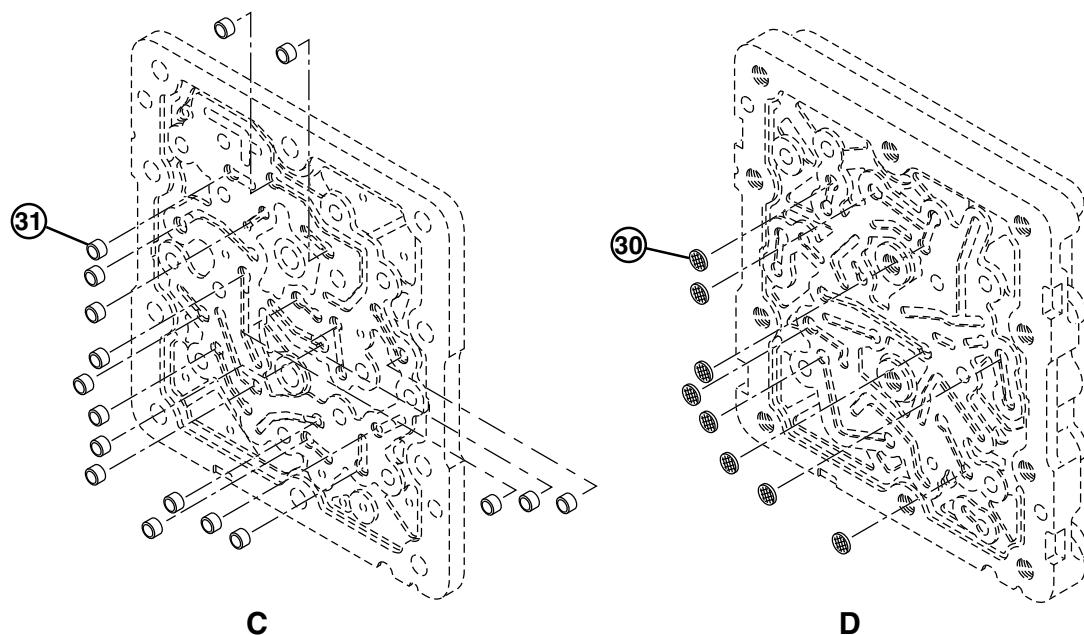
TX.33.GG2559 -19-23APR02-3/4

Hydraulic System



**A**

**B**



**C**

**D**

T143486

30— Filter (17 used)

31— Shuttle Valve (21 used)

32— Spring (4 used)

T143486—JUN—17JUL01

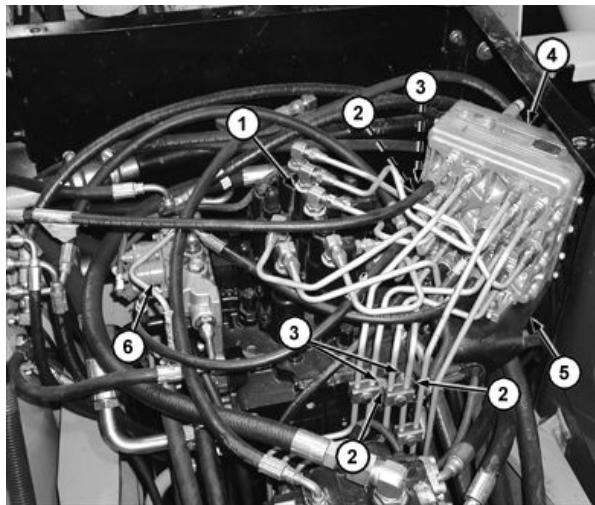
TX,33,GG2559 -19-23APR02-4/4

## Control Valve Repair

### Remove and Install Control Valve

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull vacuum in hydraulic oil tank using vacuum pump or drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Disconnect hydraulic lines.
4. Disconnect electrical connectors (6).
5. Remove cap screws (2) and washers (3). Place pilot signal manifold (4) with bracket (5) to side.



Control Valve

T146655B—UN—01FEB02

1—Control Valve  
2—Cap Screw (3 used)  
3—Washer (3 used)

4—Pilot Signal Manifold  
5—Bracket  
6—Electrical Connector (2 used)

Continued on next page

BS13840,000017D -19-14MAY13-1/14

**CAUTION: Heavy component; use a hoist.**

**Control Valve—Specification**

Control Valve—Weight..... 132 kg (291 lb) approximate

6. Remove cap screws (1 and 6), spacers (3), and washers (2). Remove control valve.
7. Repair or replace parts as necessary.
8. Tighten cap screws (1 and 6).

**Control Valve—Specification**

Mounting Bracket-to-

Control Valve Cap

Screw—Torque..... 140 N·m (103 lb-ft)

9. Install pilot signal manifold with bracket. Tighten cap screws.

**Control Valve—Specification**

Pilot Signal Manifold

Bracket-to-Control Valve

Cap Screw—Torque..... 50 N·m (37 lb-ft)

10. Connect hydraulic lines. See Control Valve and Solenoid Valve Manifold Line Identification. (Group 9025-15.)

11. Tighten split flange cap screws.

**Control Valve—Specification**

Split Flange

Fitting-to-Housing 6 mm

Cap Screw—Torque..... 20 N·m (15 lb-ft)

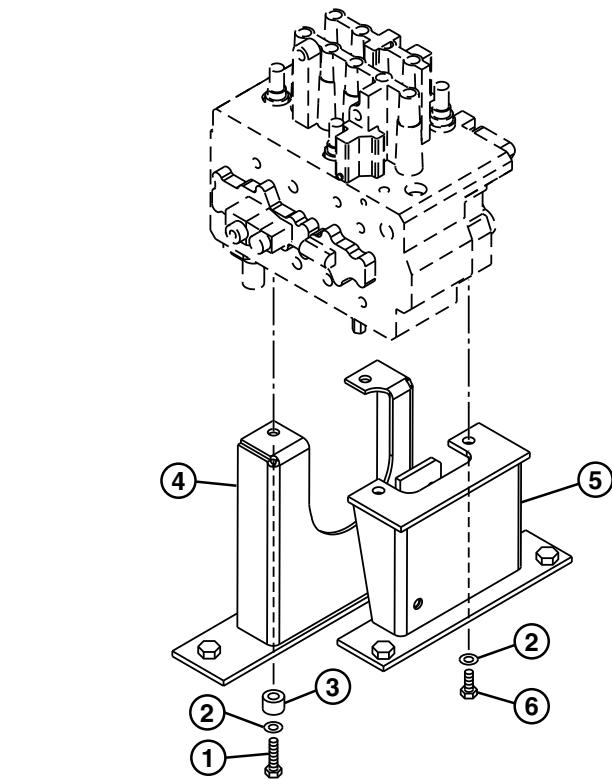
Split Flange

Fitting-to-Housing 8 mm

Cap Screw—Torque..... 50 N·m (37 lb-ft)

12. Connect electrical connectors. See Machine Harness (W2) Component Location. (Group 9015-10.)

13. If hydraulic tank was drained, see 160CLC Drain and Refill Capacities. (Operator's Manual.)



Control Valve Mounting Brackets

1—Cap Screw (2 used)  
2—Washer (4 used)  
3—Spacer (2 used)

4—Front Mounting Bracket  
5—Rear Mounting Bracket  
6—Cap Screw (2 used)

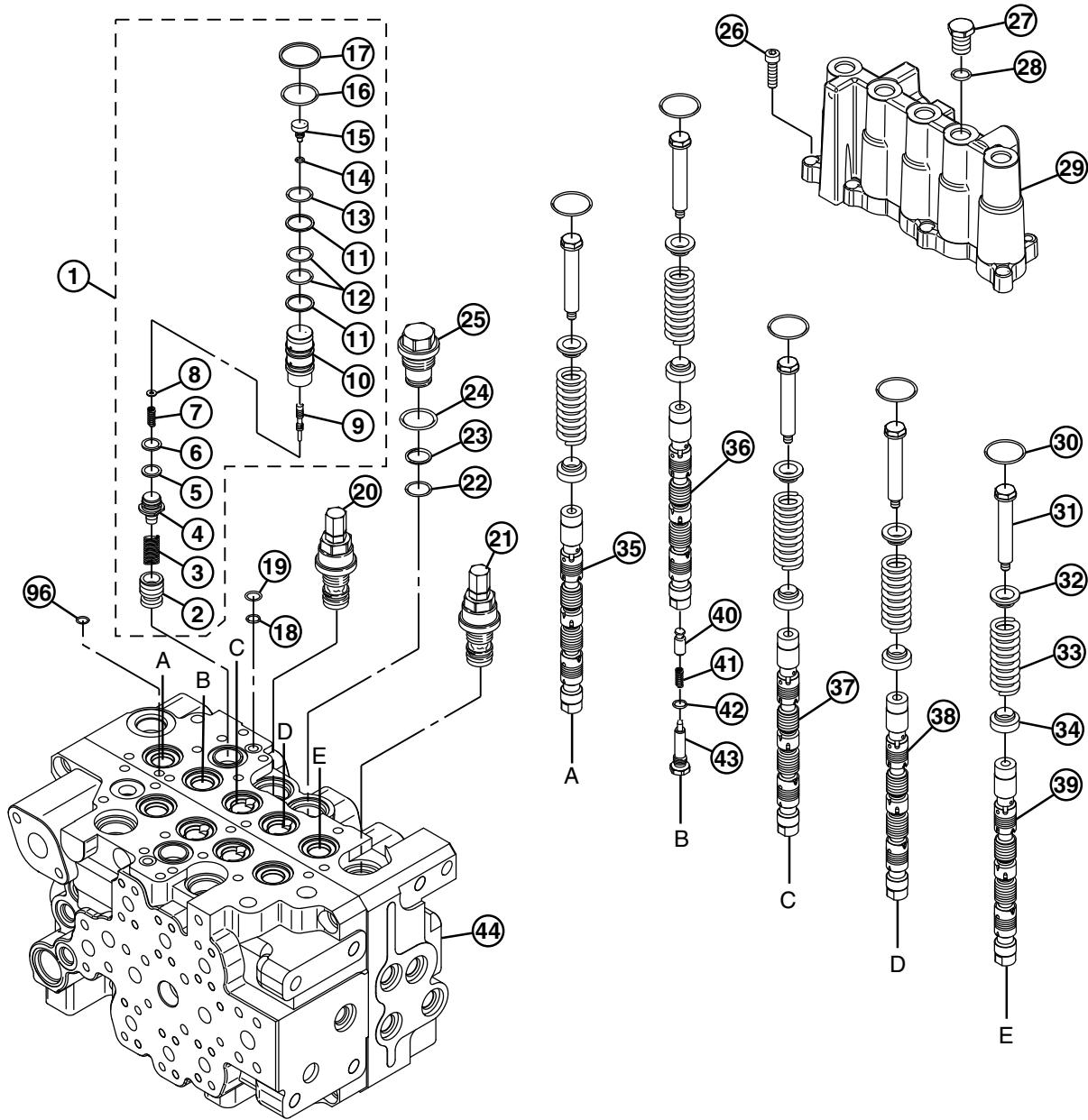
14. Perform Hydraulic Pump Start-Up Procedure. (Group 3360.)

Continued on next page

BS13840,000017D -19-14MAY13-2/14

T146652—UN—01FEB02

**Disassemble and Assemble Control Valve 5-Spool**



TX1135359

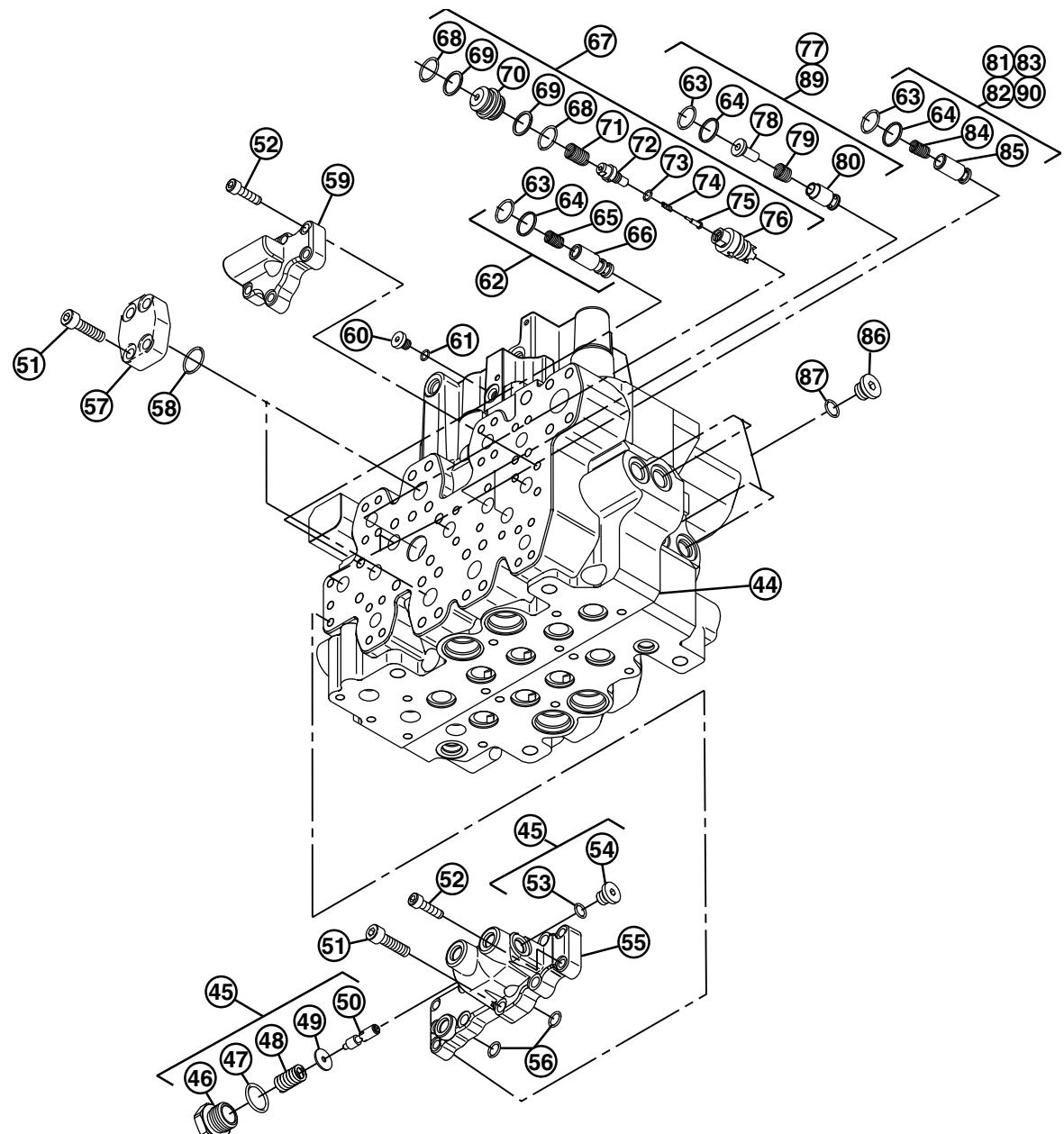
TX1135359 -UN-22APR13

5-Spool—Top Components

Continued on next page

BS13840.000017D -19-14MAY13-3/4

Hydraulic System



TX1132783

5-Spool—Side Components

TX1132783—JUN—22APR13

Continued on next page

BS13840,000017D -19-14MAY13-4/14

1—Arm Reduced Leakage Pilot Valve and Check Valve	28—O-Ring	51—Cap Screw (14 used)	75—Poppet
2—Poppet	29—5-Spool Housing (Pilot Cap)	52—Cap Screw (11 used)	76—Valve Seat
3—Spring	30—O-Ring (5 used)	53—O-Ring	77—Lift Check (Arm I Power Passage)
4—Plug	31—Special Cap Screw (5 used)	54—Plug	78—Plug (2 used)
5—O-Ring	32—Spring Seat (5 used)	55—Cover	79—Spring (2 used)
6—Backup Ring	33—Spring (5 used)	56—O-Ring (2 used)	80—Poppet (2 used)
7—Spring	34—Spring Seat (5 used)	57—Cover (2 used)	81—System Relief Valve Isolation Check Valve—5-Spool
8—Washer	35—Swing Spool	58—O-Ring (2 used)	82—Lift Check (Left Propel Neutral Passage)
9—Spool	36—Arm I Spool	59—Cover	83—Lift Check (Boom II Power Passage)
10—Sleeve	37—Boom II Spool	60—Plug	84—Spring (4 used)
11—Backup Ring (2 used)	38—Auxiliary Spool	61—O-Ring	85—Poppet (4 used)
12—O-Ring (2 used)	39—Left Propel Spool	62—Lift Check and Orifice (Left Propel Power Passage)	86—Plug (4 used)
13—O-Ring	40—Arm Regenerative Valve	63—O-Ring (7 used)	87—O-Ring (4 used)
14—O-Ring	41—Spring	64—Backup Ring (7 used)	88—Lift Check (Arm I Neutral Passage)
15—Plug	42—O-Ring	65—Spring	89—Lift Check (Swing Neutral Passage)
16—O-Ring	43—Plug	66—Poppet	90—Lift Check (Left Propel Neutral Passage)
17—Backup Ring	44—5-Spool Housing	67—Auxiliary Flow Rate Valve (Poppet Valve)	91—O-Ring
18—O-Ring	45—Auxiliary Flow Rate Valve (Selector Valve)	68—O-Ring (2 used)	
19—Backup Ring	46—Plug	69—Backup Ring (2 used)	
20—Boom Up Circuit Relief and Anti-Cavitation Valve	47—O-Ring	70—Bushing	
21—System Relief Valve	48—Spring	71—Spring	
22—O-Ring	49—Washer	72—Plug	
23—Backup Ring	50—Spool	73—O-Ring	
24—O-Ring		74—Spring	
25—Plug			
26—Cap Screw (10 used)			
27—Plug			

1. Remove cap screws (26) and 5-spool housing (pilot cap) (29).

At same time, remove arm reduced leakage pilot valve and check valve (1).

## 2. Arm Reduced Leakage Pilot Valve and Check Valve (1):

- a. Remove parts (2—17).

**IMPORTANT: Spool (9) and sleeve (10) are a matched set. Replace spool and sleeve as an assembly.**

- b. Replace parts as necessary.

- c. Install washer (8) with chamfered side towards spring (7).

## 3. Spool—5 Spool (35—39):

**IMPORTANT: The spools (35—39) are select fitted to bores in housing and are a different design for each function. Spools must be installed into the same bores from which they were removed for proper operation of machine.**

- a. Remove spool (35—39).

**NOTE: The procedures for disassembly and assembly of spools (35—39) are the same except spool (36) has additional parts (40—43).**

- b. Remove parts (30—34).

- c. For spool (36), remove parts (40—43).

- d. Inspect control valve spools for wear and damage. Replace parts as necessary.

- e. For spool (36), install parts (40—43). Tighten plug (43).

### Control Valve—Specification

Arm Regenerative Valve	
Plug-to-Control Valve	
Spool—Torque.....	25 N·m (18 lb-ft)

- f. Assemble parts (31—39). Tighten special cap screw (31).

### Control Valve—Specification

Special Cap	
Screw-to-Control Valve	
Spool—Torque.....	12 N·m (9 lb-ft)

- g. Apply hydraulic oil to parts (31—39) before installation.

- h. Install spool (35—39) into 5-spool housing (44) while rotating spool slowly.

- i. After installing spool (35—39) into 5-spool housing (44), push spool by hand to confirm smoothness.

- j. Install O-ring (30) onto 5-spool housing (44).

- k. Repeat procedure for remaining spools.

## 4. Lift Check and Orifice (Left Propel Power Passage) (62):

- a. Inspect parts (63—66) for wear and damage. Replace parts as necessary.

- b. Install parts (63—66).

## 5. Auxiliary Flow Rate Valve (Poppet Valve) (67):

- a. Replace parts as necessary.

- b. Install parts (68—76).

Continued on next page

BS13840,000017D -19-14MAY13-5/14

6. Lift Check (Arm I Power Passage) (77) and Lift Check (Arm I Neutral Passage) (89):
  - a. Replace parts as necessary.
  - b. Install parts (63, 64, and 78—80).
7. System Relief Valve Isolation Check Valve—5-Spool (81), Lift Check (Left Propel Neutral Passage) (82), Lift Check (Boom II Power Passage) (83), and Lift Check (Swing Neutral Passage) (90):
  - a. Replace parts as necessary.
  - b. Install parts (63, 64, 84, and 85).
8. Auxiliary Flow Rate Valve (Selector Valve) (45):
  - a. Replace parts as necessary.
  - b. Install parts (46—50, 53, and 54). Hand tighten plug (46).

- c. Install O-rings (56) and cover (55). Tighten cap screws (51 and 52).

**Control Valve—Specification**

Cover-to-5-Spool	
Housing 6 mm Cap	
Screw—Torque.....	25 N·m (18 lb-ft)
Cover-to-5-Spool	
Housing 8 mm Cap	
Screw—Torque.....	50 N·m (37 lb-ft)

- d. Tighten plug (46).

**Control Valve—Specification**

Auxiliary Flow Rate	
Valve (Selector Valve)	
Plug—Torque.....	200 N·m (145 lb-ft)

BS13840,000017D -19-14MAY13-6/14

**9. Boom Up Circuit Relief and Anti-Cavitation Valve (20)**

*NOTE: Disassemble valve for cleaning and inspection only. Valve is serviced as assembly.*

*Circuit relief and anti-cavitation valves are also used in the control valve 4-spool top (58 and 61), 4-spool bottom (31 and 32), and the 5-spool bottom (24) sections. Use this procedure and torque value for all these valves.*

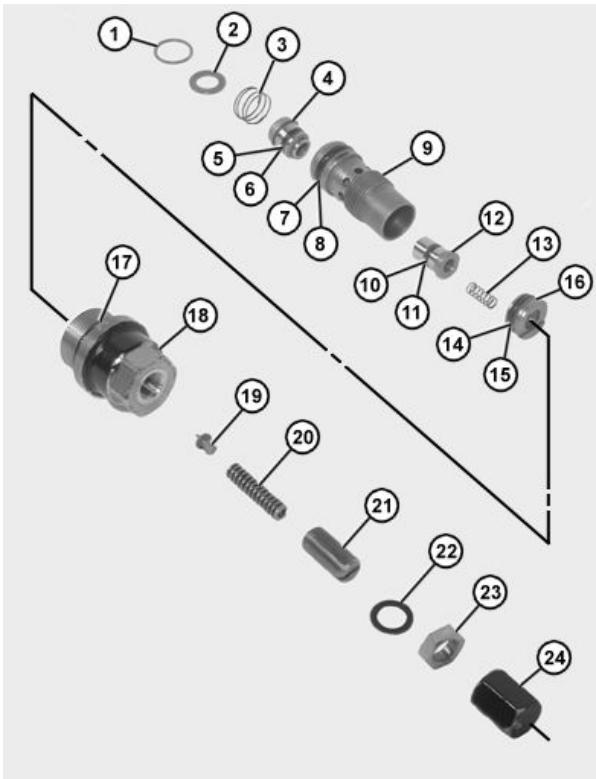
- a. Apply petroleum jelly to circuit relief and anti-cavitation valve O-rings.
- b. Tighten circuit relief and anti-cavitation valve.

**Control Valve—Specification**

Circuit Relief and	
Anti-Cavitation Valve-	
to-Housing—Torque.....	80 N·m (59 lb-ft)

- c. Check and adjust pressure setting. See Circuit Relief Valve Test and Adjustment. (Group 9025-25.)

1—Snap Ring	13—Spring
2—Spring Seat	14—O-Ring
3—Spring	15—Backup Ring
4—Make-Up Valve	16—Seat
5—O-Ring	17—O-Ring
6—Backup Ring	18—Cartridge
7—O-Ring	19—Pilot Poppet
8—Backup Ring	20—Spring
9—Sleeve	21—Adjusting Screw
10—O-Ring	22—Washer
11—Backup Ring	23—Nut
12—Main Poppet	24—Cap



Circuit Relief and Anti-Cavitation Valve Components

T150512B—UN—01FEB02

Continued on next page

BS13840,000017D -19-14MAY13-7/14

## 10. System Relief Valve (21)

*NOTE: Disassemble valve for cleaning and inspection only. Valve is serviced as an assembly.*

- Apply petroleum jelly to system relief valve O-rings.
- Tighten system relief valve (21).

### Control Valve—Specification

System Relief Valve-to-Housing—Torque..... 80 N·m (59 lb-ft)  
Housing—Torque..... 80 N·m (59 lb-ft)

- Check and adjust pressure setting for system relief valve. See System Relief Valve Test and Adjustment. (Group 9025-25.)

## 11. Install O-rings (58) and covers (57). Tighten cap screws (51).

### Control Valve—Specification

Cover-to-5-Spool  
Housing 8 mm Cap  
Screw—Torque..... 50 N·m (37 lb-ft)

## 12. Install cover (59). Tighten cap screws (52).

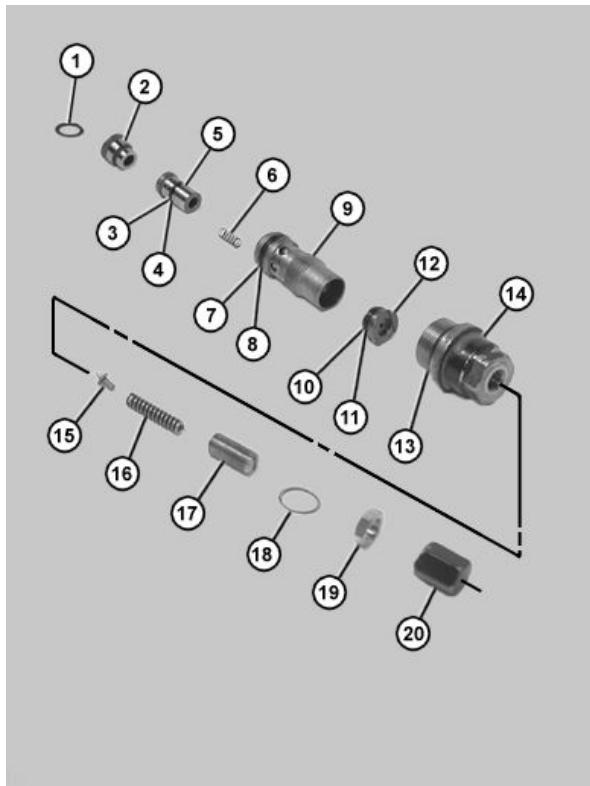
### Control Valve—Specification

Cover-to-5-Spool  
Housing 6 mm Cap  
Screw—Torque..... 25 N·m (18 lb-ft)

## 13. Install 5-spool housing (pilot cap) (29). Tighten cap screws (26).

### Control Valve—Specification

5-Spool Housing (Pilot  
Cap)-to-5-Spool Housing  
Cap Screw—Torque..... 25 N·m (18 lb-ft)



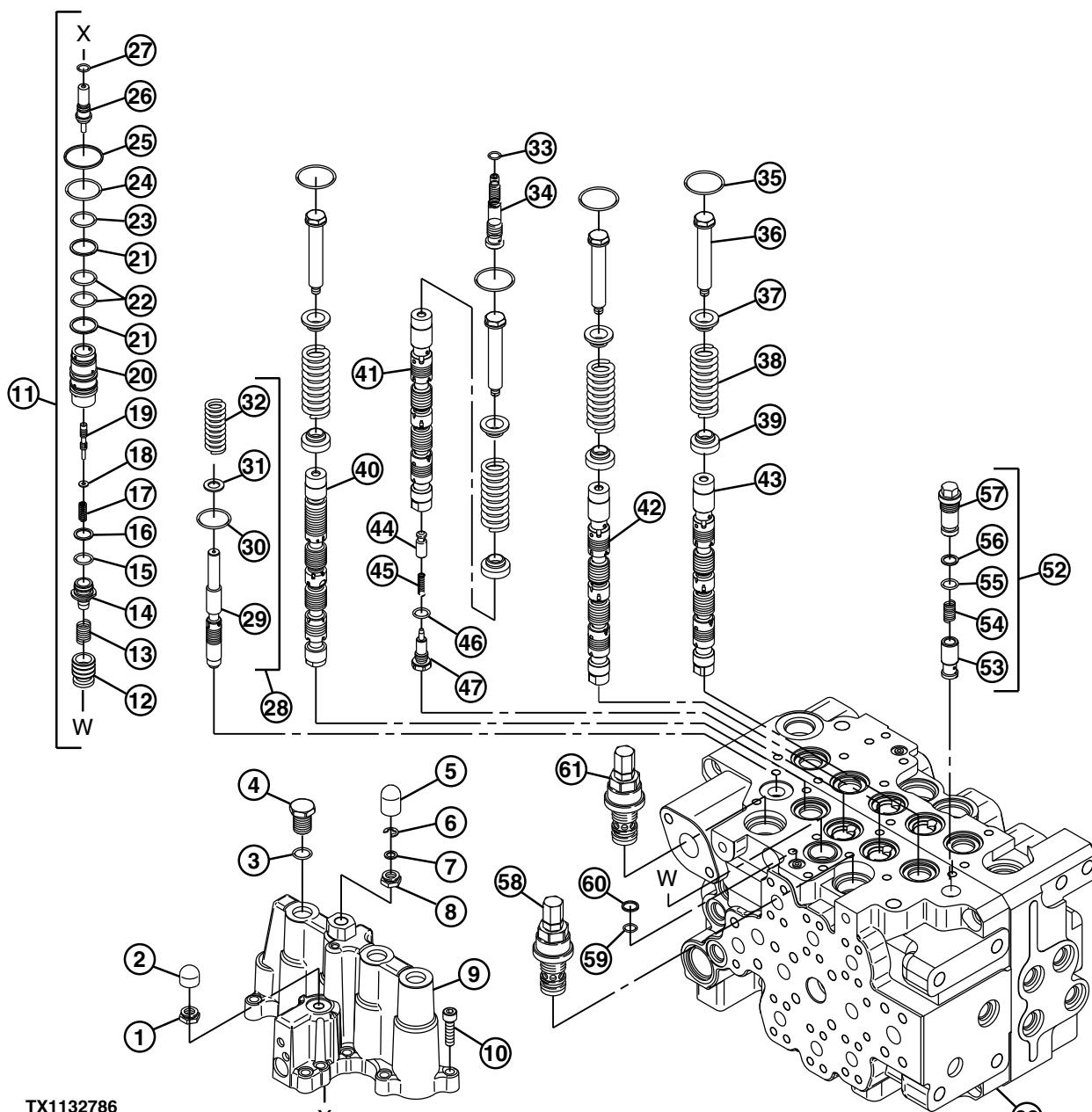
System Relief Valve Components

T150513B-UN-01FEB02

Continued on next page

BS13840,000017D -19-14MAY13-8/14

**Disassemble and Assemble Control Valve 4-Spool**

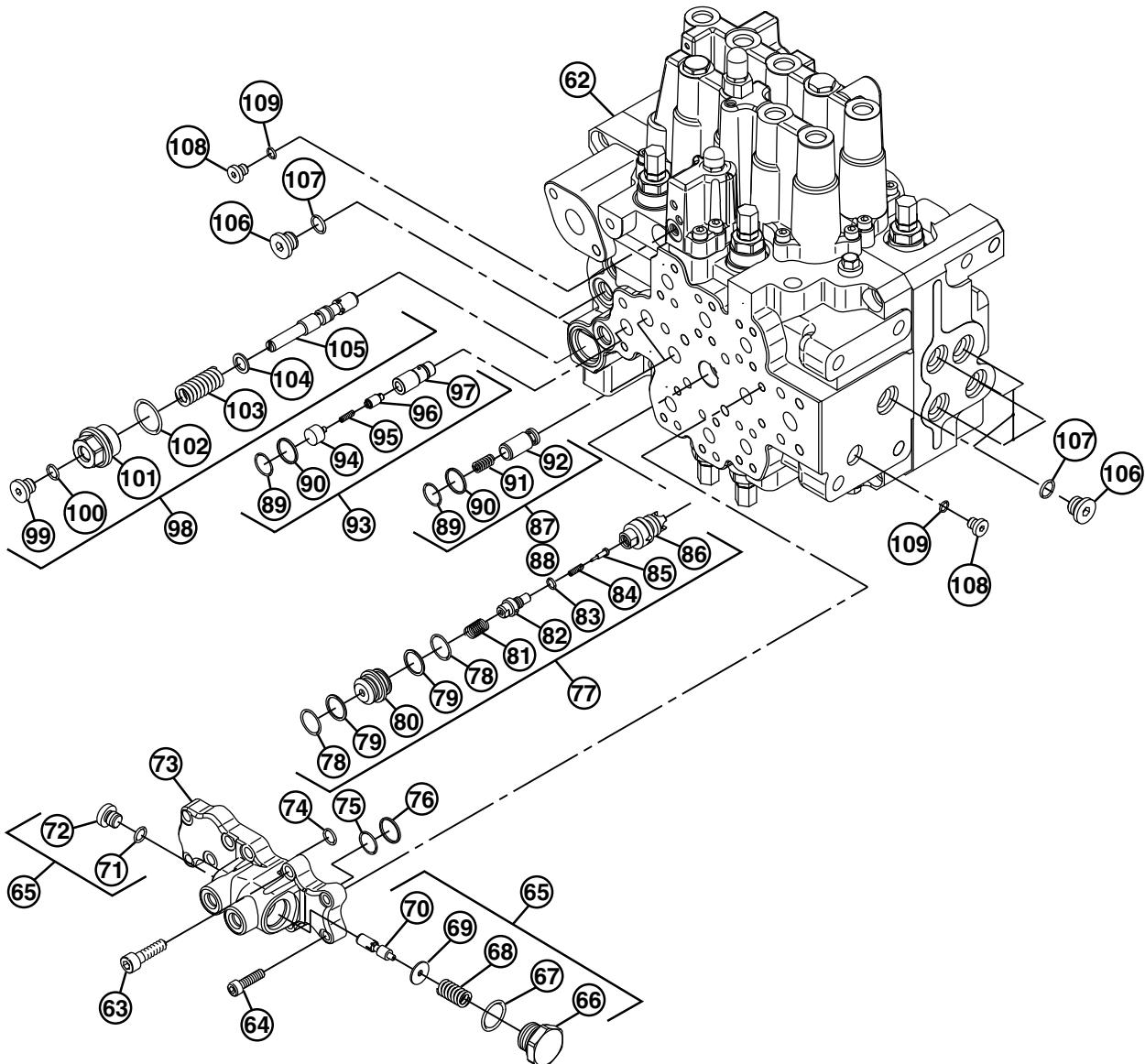


4-Spool—Top Components

TX1132786—JUN—13MAR13

Continued on next page

BS13840,000017D -19-14MAY13-9/14



**TX1132787**

4-Spool—Side Components

TX1132787 —UN-15APR13

Continued on next page

BS13840,000017D -19-14MAY13-10/4

## Hydraulic System

1—Nut	32—Spring	60—Backup Ring	87—Lift Check (Boom I Power Passage)
2—Cap	33—O-Ring	61—Arm Out Circuit Relief and Anti-Cavitation Valve	88—Lift Check (Arm II Neutral Passage)
3—O-Ring	34—Screw	62—4-Spool Housing	89—O-Ring (3 used)
4—Plug	35—O-Ring (4 used)	63—Cap Screw (7 used)	90—Backup Ring (3 used)
5—Cap	36—Special Cap Screw (4 used)	64—Cap Screw (3 used)	91—Spring (2 used)
6—Snap Ring	37—Spring Seat (4 used)	65—Bucket Flow Rate Valve (Selector Valve)	92—Check Valve (2 used)
7—Washer	38—Spring (4 used)	66—Plug	93—Lift Check and Orifice (Arm II Power Passage)
8—Nut	39—Spring Seat (4 used)	67—O-Ring	94—Plug
9—4-Spool Housing (Pilot Cap)	40—Arm II Spool	68—Spring	95—Spring
10—Cap Screw (11 used)	41—Boom I Spool	69—Washer	96—Poppet
11—Boom Reduced Leakage Pilot Valve and Check Valve	42—Bucket Spool	70—Spool	97—Bushing
12—Poppet	43—Right Propel Spool	71—O-Ring	98—Bypass Shut-Off Valve
13—Spring	44—Boom Regenerative Valve	72—Plug	99—Plug
14—Plug	45—Spring	73—Cover	100—O-Ring
15—O-Ring	46—O-Ring	74—O-Ring	101—Plug
16—Backup Ring	47—Plug	75—O-Ring	102—O-Ring
17—Spring	52—System Relief Valve Isolation Check Valve—4-Spool	76—Backup Ring	103—Spring
18—Washer	53—Poppet	77—Bucket Flow Rate Valve (Poppet Valve)	104—Washer
19—Spool	54—Spring	78—O-Ring (2 used)	105—Spool
20—Sleeve	55—O-Ring	79—Backup Ring (2 used)	106—Plug (7 used)
21—Backup Ring (2 used)	56—Backup Ring	80—Bushing	107—O-Ring (7 used)
22—O-Ring (2 used)	57—Plug	81—Spring	108—Plug (2 used)
23—O-Ring	58—Bucket Dump Circuit Relief and Anti-Cavitation Valve	82—Plug	109—O-Ring (2 used)
24—O-Ring	59—O-Ring	83—O-Ring	
25—Backup Ring		84—Spring	
26—Cap Screw		85—Poppet	
27—O-Ring		86—Valve Seat	
28—Arm Regenerative Selector Valve			
29—Spool			
30—O-Ring			
31—Washer			

1. Remove cap screws (10) and 4-spool housing (pilot cap) (9).

### 2. Spool—4 Spool (40—43):

**IMPORTANT:** The spools (40—43) are select fitted to bores in housing and are a different design for each function. Spools must be installed into the same bores from which they were removed for proper operation of machine.

- a. Remove spool (40—43).

*NOTE: The procedures for disassembly and assembly of spools (40—43) are the same except spool (41) has additional parts (44—47).*

- b. Remove parts (35—39).
- c. For spool (41), remove parts (44—47).
- d. Inspect control valve spools for wear and damage. Replace parts as necessary.
- e. For spool (41), install parts (44—47). Tighten plug (47).

#### Control Valve—Specification

Boom Regenerative Valve Plug-to-Control  
Valve Spool—Torque..... 25 N·m (18 lb-ft)

- f. Assemble parts (36—43). Tighten special cap screw (36).

#### Control Valve—Specification

Special Cap  
Screw-to-Control Valve  
Spool—Torque..... 12 N·m (9 lb-ft)

- g. Apply hydraulic oil to parts (36—43) before installation.
- h. Install spool (40—43) into 4-spool housing (62) while rotating spool slowly.
- i. After installing spool (40—43) into 4-spool housing (62), push spool by hand to confirm smoothness.
- j. Install O-ring (35) onto 4-spool housing (62).
- k. Repeat procedure for remaining spools.
3. Install O-ring (33) and screw (34) onto 4-spool housing (pilot cap) (9).
4. Install parts (5—8). Tighten nut (8) onto screw (34).

#### Control Valve—Specification

Nut-to-Screw—Torque..... 20 N·m (15 lb-ft)

### 5. Boom Reduced Leakage Pilot Valve and Check Valve (11):

- a. Remove parts (12—27).

**IMPORTANT:** Spool (19) and sleeve (20) are a matched set. Replace spool and sleeve as an assembly.

- b. Replace parts as necessary.
- c. Install O-ring (27) and cap screw (26) onto 4-spool housing (pilot cap) (9).

Continued on next page

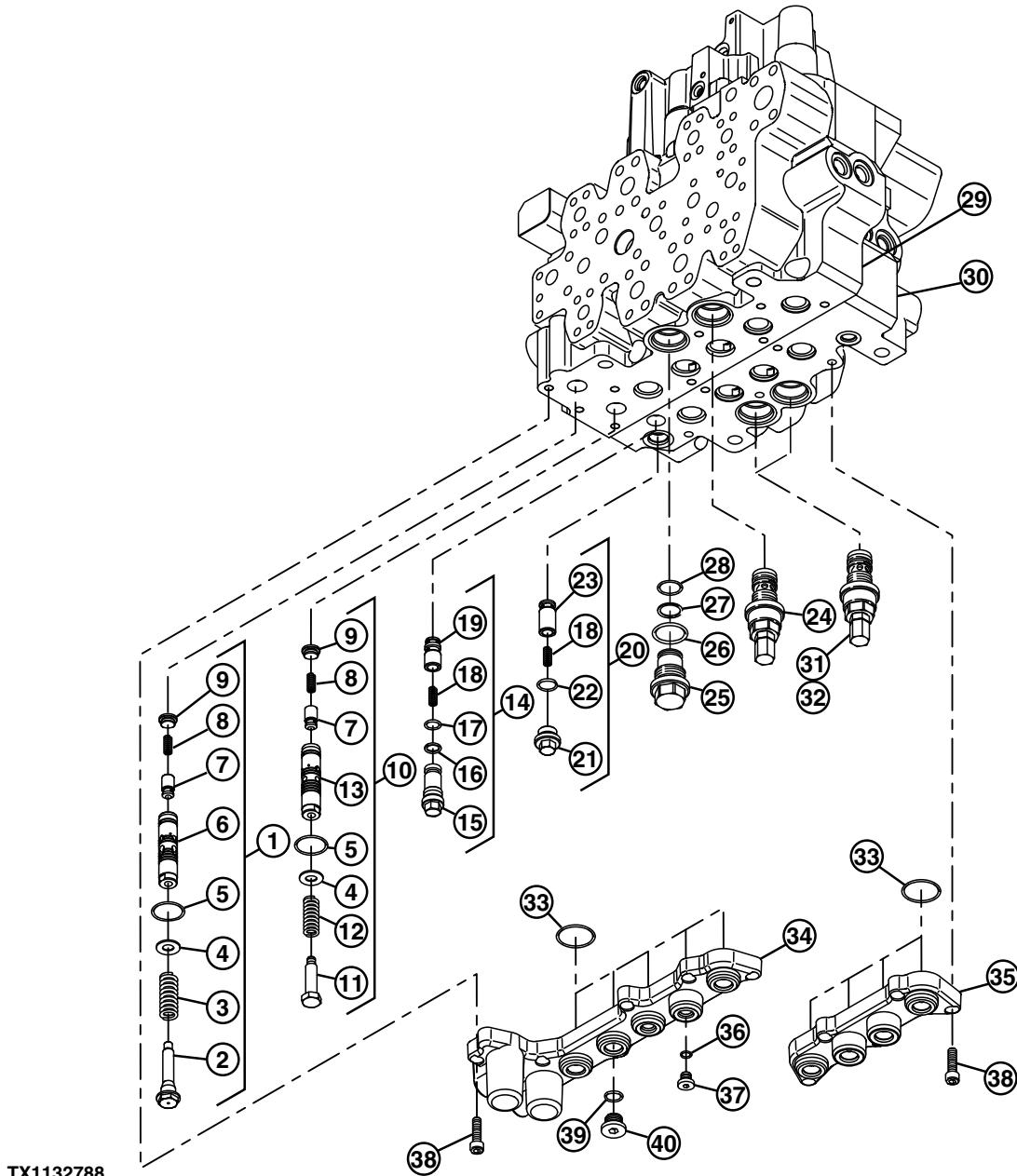
BS13840,000017D -19-14MAY13-11/14

d. Install parts (1 and 2). Tighten nut (1) onto cap screw (26).	Cover-to-4-Spool Housing 8 mm Cap Screw—Torque..... 50 N·m (37 lb·ft)
<b>Control Valve—Specification</b>	
Nut-to-Screw—Torque..... 20 N·m (15 lb·ft)	
e. Install washer (18) with chamfered side towards spring (17).	d. Tighten plug (66).
<b>Control Valve—Specification</b>	
Bucket Flow Rate Valve (Selector Valve) Plug—Torque..... 200 N·m (148 lb·ft)	
<b>6. Arm Regenerative Selector Valve (28):</b>	<b>10. Bucket Flow Rate Valve (Poppet Valve) (77):</b>
a. Inspect spool (29) for wear and damage. Replace parts as necessary.	a. Replace parts as necessary.
b. Install parts (29—32) into 4-spool housing (62) with chamfered side of washer (31) facing towards spring (32).	b. Install parts (78—86).
<b>7. System Relief Valve Isolation Check Valve—4-Spool (52):</b>	<b>11. Lift Check (Boom I Power Passage) (87) and Lift Check (Arm II Neutral Passage) (88):</b>
a. Replace parts as necessary.	a. Replace parts as necessary.
b. Install parts (53—57). Tighten plug (57).	b. Install parts (89—92).
<b>Control Valve—Specification</b>	<b>12. Lift Check and Orifice (Arm II Power Passage) (93):</b>
System Relief Valve Isolation Check Valve-to-4-Spool Housing Plug—Torque..... 130 N·m (96 lb·ft)	a. Replace parts as necessary.
<b>8. Bucket Dump Circuit Relief and Anti-Cavitation Valve (58) and Arm Out Circuit Relief and Anti-Cavitation Valve (61):</b>	b. Install parts (89, 90, 94—97).
See procedure for boom up circuit relief and anti-cavitation valve (20) in the control valve 5-spool top section.	<b>13. Bypass Shut-Off Valve (98):</b>
<b>9. Bucket Flow Rate Valve (Selector Valve) (65):</b>	a. Inspect spool (105) for wear and damage. Replace parts as necessary.
a. Replace parts as necessary.	b. Install washer (104) with chamfered side towards spring (103).
b. Install parts (66—72). Hand tighten plug (66).	c. Install parts (99—105). Tighten plug (101).
c. Install parts (63, 64, 73—76). Tighten cap screws (63 and 64).	<b>Control Valve—Specification</b>
<b>Control Valve—Specification</b>	Bypass Shut-Off Valve-to-4-Spool Housing Plug—Torque..... 182 N·m (134 lb·ft)
Cover-to-4-Spool Housing 6 mm Cap Screw—Torque..... 25 N·m (18 lb·ft)	<b>14. Install 4-spool housing (pilot cap) (9). Tighten cap screws (10).</b>
<b>Control Valve—Specification</b>	<b>Control Valve—Specification</b>
4-Spool Housing (Pilot Cap)-to-4-Spool Housing Cap Screw—Torque..... 25 N·m (18 lb·ft)	

Continued on next page

BS13840,000017D -19-14MAY13-12/14

**Disassemble and Assemble Control Valve  
5-Spool and 4-Spool Bottom**



TX1132788 -JUN-13/MAR13

*5-Spool and 4-Spool—Bottom Components*

1—Auxiliary Flow Combiner Valve and Check Valve	11—Cap Screw	21—Plug	32—Boom Down Circuit Relief and Anti-Cavitation Valve
2—Cap Screw	12—Spring	22—O-Ring	33—O-Ring (9 used)
3—Spring	13—Spool	23—Poppet	34—5-Spool Cover
4—Washer (2 used)	14—Right Propel and Bucket Combined Function Check Valve and Orifice	24—Arm In Circuit Relief and Anti-Cavitation Valve	35—4-Spool Cover
5—O-Ring (2 used)	15—Plug	25—Plug	36—O-Ring
6—Spool	16—Backup Ring	26—O-Ring	37—Plug
7—Poppet (2 used)	17—O-Ring	27—Backup Ring	38—Cap Screw (14 used)
8—Spring (2 used)	18—Spring (2 used)	28—O-Ring	39—O-Ring
9—Plug (2 used)	19—Poppet	29—5-Spool Housing	40—Plug
10—Propel Flow Combiner Valve and Check Valve	20—Flow Combiner Circuit Check Valve	30—4-Spool Housing	
		31—Bucket Curl Circuit Relief and Anti-Cavitation Valve	

Continued on next page

BS13840,000017D -19-14MAY13-13/14

1. Remove parts (33—40).
2. **Auxiliary Flow Combiner Valve and Check Valve (1) and Propel Flow Combiner Valve and Check Valve (10):**

**IMPORTANT:** Plug (9), spring (8), poppet (7), and spool (6 and 13) are a matched set. Replace plug, spring, poppet, and spool as an assembly.

  - a. Inspect parts (2—9 and 11—13) for wear and damage. Replace parts as necessary.
  - b. Install washer (4) with chamfered side toward spring (3 and 12).
  - c. Tighten cap screws (2 and 11).

**Control Valve—Specification**

Auxiliary Flow Combiner Valve and Check Valve-to-Housing Cap	Screw—Torque.....	12 N·m (9 lb-ft)
--	-------------------	------------------
3. **Right Propel and Bucket Combined Function Check Valve and Orifice (14):**
  - a. Replace parts as necessary.
  - b. Install parts (15—19). Tighten plug (15).

**Control Valve—Specification**

Right Propel and Bucket Combined Function Check Valve and Orifice-to-Housing	Plug—Torque.....	130 N·m (96 lb-ft)
--	------------------	--------------------
4. **Flow Combiner Circuit Check Valve (20):**
  - a. Replace parts as necessary.
  - b. Install parts (18, 21—23). Tighten plug (21).

**Control Valve—Specification**

Flow Combiner Circuit Check Valve-to-Housing	Plug—Torque.....	130 N·m (96 lb-ft)
--	------------------	--------------------
5. **Arm In Circuit Relief and Anti-Cavitation Valve (24), Bucket Curl Circuit Relief and Anti-Cavitation Valve (31), and Boom Down Circuit Relief and Anti-Cavitation Valve (32):**

See procedure for boom up circuit relief and anti-cavitation valve (20) in the control valve 5-spool top section.

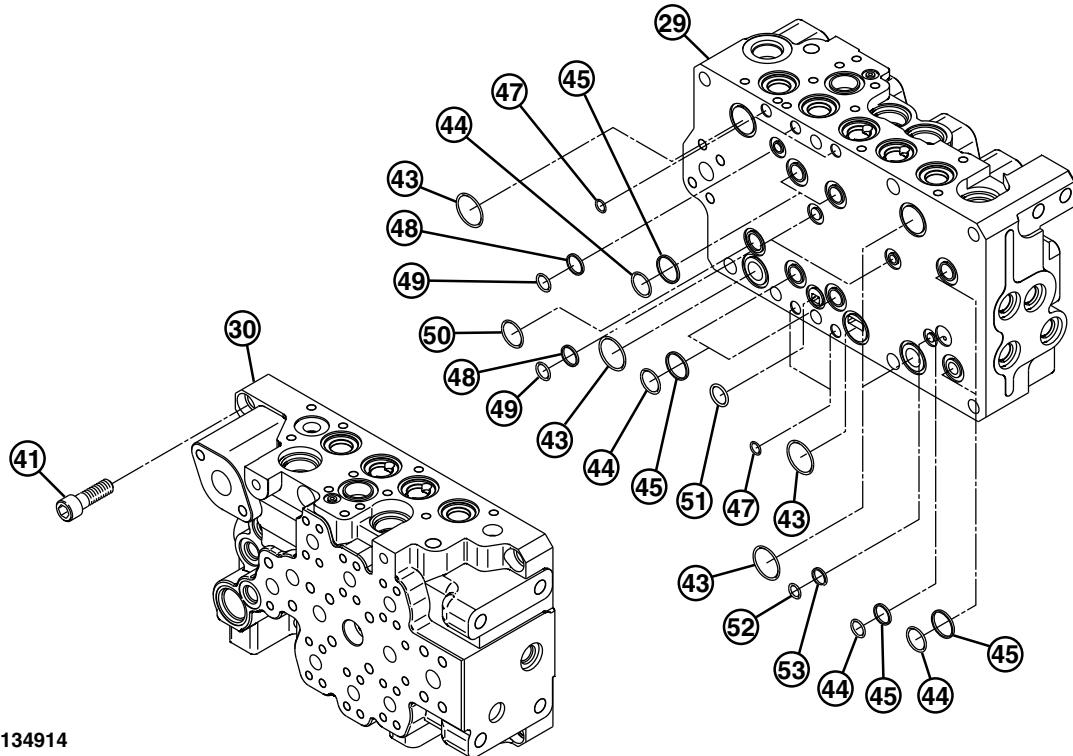
  6. Install O-rings (33), 5-spool cover (34), and 4-spool cover (35). Tighten cap screws (38).

**Control Valve—Specification**

5-Spool Cover-to-Housing Cap	Screw—Torque.....	25 N·m (18 lb-ft)
4-Spool Cover-to-Housing Cap	Screw—Torque.....	25 N·m (18 lb-ft)

BS13840,000017D -19-14MAY13-14/14

**Disassemble and Assemble Control Valve  
5-Spool and 4-Spool Sections**



TX1134914

TX1134914—UN—22APR13

*Disassemble and Assemble 5-Spool and 4-Spool*

29— 5-Spool Housing  
30— 4-Spool Housing  
41— Cap Screw (9 used)

43— O-Ring (5 used)  
44— O-Ring (7 used)  
45— Backup Ring (7 used)

47— O-Ring (5 used)  
48— Backup Ring (3 used)  
49— O-Ring (3 used)

50— O-Ring  
51— O-Ring  
52— O-Ring  
53— Backup Ring

**CAUTION: Heavy component; use a hoist.**

**Control Valve—Specification**

5-Spool Housing—Weight.....50 kg (110 lb) approximate

**Control Valve—Specification**

4-Spool Housing—Weight.....45 kg (99 lb) approximate

1. Remove cap screws (41). Separate 5-spool housing (29) from 4-spool housing (30).

2. Remove O-rings (43—45, 47, 49—52) and backup rings (48 and 53).
3. Replace parts as necessary.
4. Combine 5-spool housing (29) and 4-spool housing (30) and tighten cap screws (41).

**Control Valve—Specification**

5-Spool-to-4-Spool Cap  
Screw—Torque.....113 N·m (83 lb-ft)

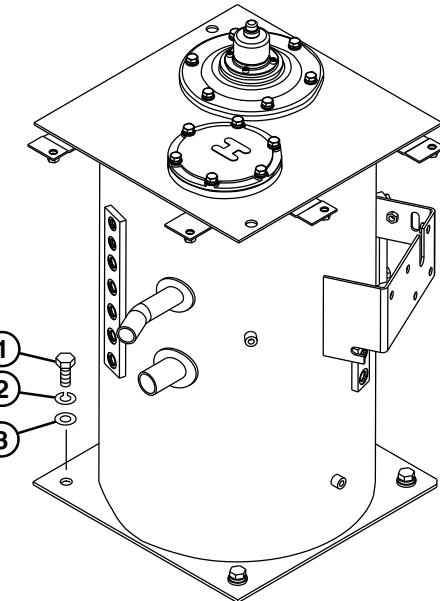
BS13840,000017D -19-14MAY13-15/14

## Hydraulic Oil Tank Repair

### Remove and Install Hydraulic Oil Tank

**⚠ CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Disconnect lines.
4. Disconnect electrical connector on bottom of tank.
5. Remove cap screws (1), lock washers (2) and washers (3).



**⚠ CAUTION:** Avoid possible crushing injury from heavy component. Use appropriate lifting device.

6. Remove hydraulic oil tank using a hoist and lifting straps.
7. Repair or replace parts as necessary.
8. Install hydraulic oil tank.
9. Tighten cap screws (1).

#### Specification

Oil Tank-to-Frame Cap	
Screw—Torque.....	205 N·m 152 lb.-ft.

10. Connect lines.
11. Connect electrical connector on bottom of tank.
12. Fill hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.) See Hydraulic Oil. (Operator's Manual.)

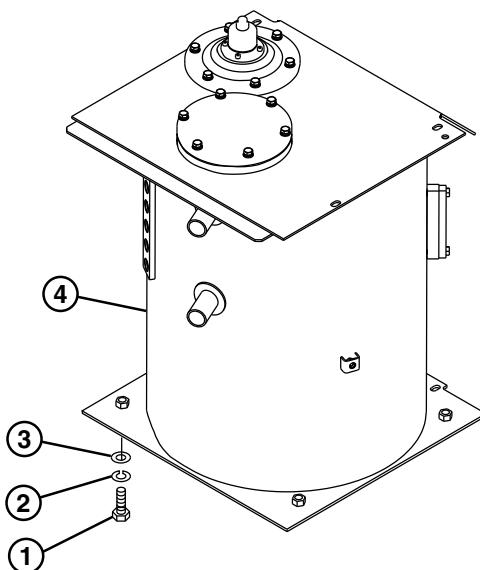
**IMPORTANT:** Hydraulic pump will be damaged if not filled with oil before starting. Procedure must be performed to fill pump housing whenever oil has been drained from the pump or hydraulic oil tank.

13. Perform Hydraulic Pump Start-Up Procedure. (Group 3360.)

1—Cap Screw (4 used)  
2—Lock Washer (4 used)

3—Washer (4 used)

Hydraulic Oil Tank



T150011—UN—01FEB02

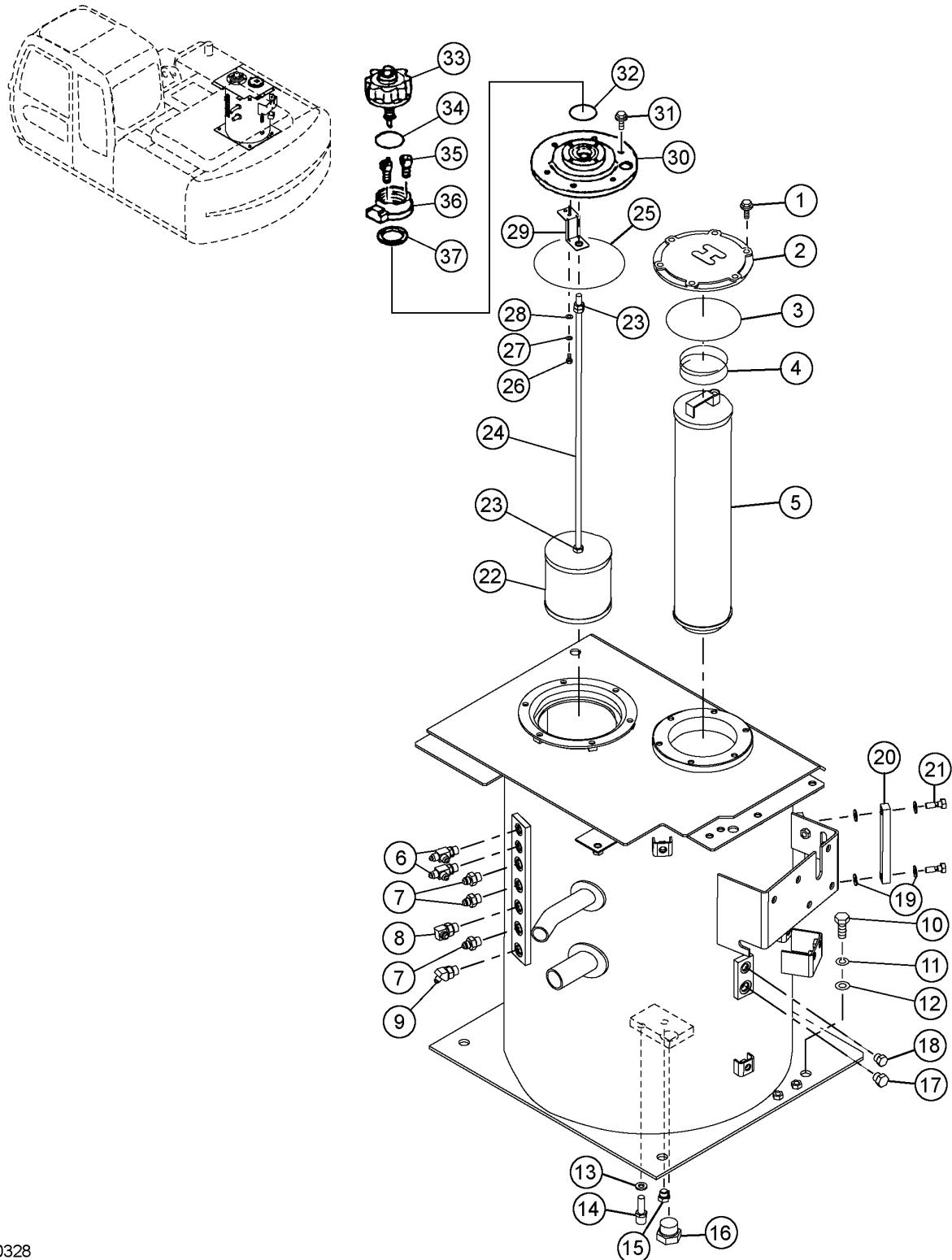
T143359—UN—20JUL01

Continued on next page

TX,33,GG2567 -19-03FEB12-1/4

## Hydraulic System

### Disassemble and Assemble Hydraulic Oil Tank



T160328

*Hydraulic Oil Tank*

T160328 -UN-23OCT02

Continued on next page

TX,33,GG2567 -19-03FEB12-2/4

## Hydraulic System

1—Cap Screw (6 used)	11—Lock Washer (4 used)	21—Cap Screw (2 used)	31—Cap Screw (6 used)
2—Cover	12—Washer (4 used)	22—Suction Screen	32—O-Ring
3—O-Ring	13—Gasket	23—Nut (3 used)	33—Cap
4—Spring	14—Sensor	24—Rod	34—O-Ring
5—Filter Element	15—Plug	25—O-Ring	35—Cap Screw (2 used)
6—Tee (2 used)	16—Plug	26—Cap Screw	36—Housing
7—Adapter (3 used)	17—Plug	27—Lock Washer	37—Gasket
8—Elbow	18—Plug	28—Washer	
9—Elbow	19—Washer (4 used)	29—Bracket	
10—Cap Screw (4 used)	20—Hydraulic Oil Level Gauge	30—Cover	

1. Tighten cap screws (10 and 31).

### Specification

Hydraulic Oil Tank Cover

Cap Screw—Torque.....49 N·m  
36 lb·ft.

**NOTE:** Cap screws and washers used to hold hydraulic oil level gauge are designed specifically for this purpose. Do not use standard cap screws or washers to attach hydraulic oil level gauge.

2. If it was removed, install hydraulic oil level gauge (20). Tighten cap screws (21) to specification.

### Specification

Hydraulic Oil  
Level Gauge Cap  
Screw—Torque.....10—15 N·m  
95—130 lb·in.

TX,33,GG2567 -19-03FEB12-3/4

**IMPORTANT:** To ensure suction screen is held in position against outlet pipe, suction screen rod and suction screen must be adjusted to the correct length.

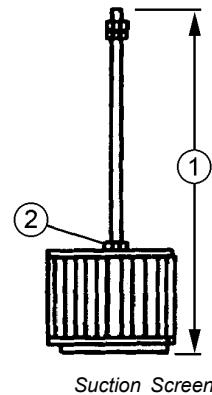
3. Install suction screen with cover. Suction screen must seal against outlet pipe in bottom of tank. If necessary, loosen nut (2) to adjust suction screen rod (1) length.

### Specification

Suction Screen Rod  
(1)—Length.....732 mm  
28.8 in.

Suction Screen Rod  
Nut—Torque.....17 N·m  
150 lb·in.

Hydraulic Cover Cap  
Screw—Torque.....49 N·m  
36 lb·ft.



1—Suction Screen Rod

2—Suction Screen Rod Nut

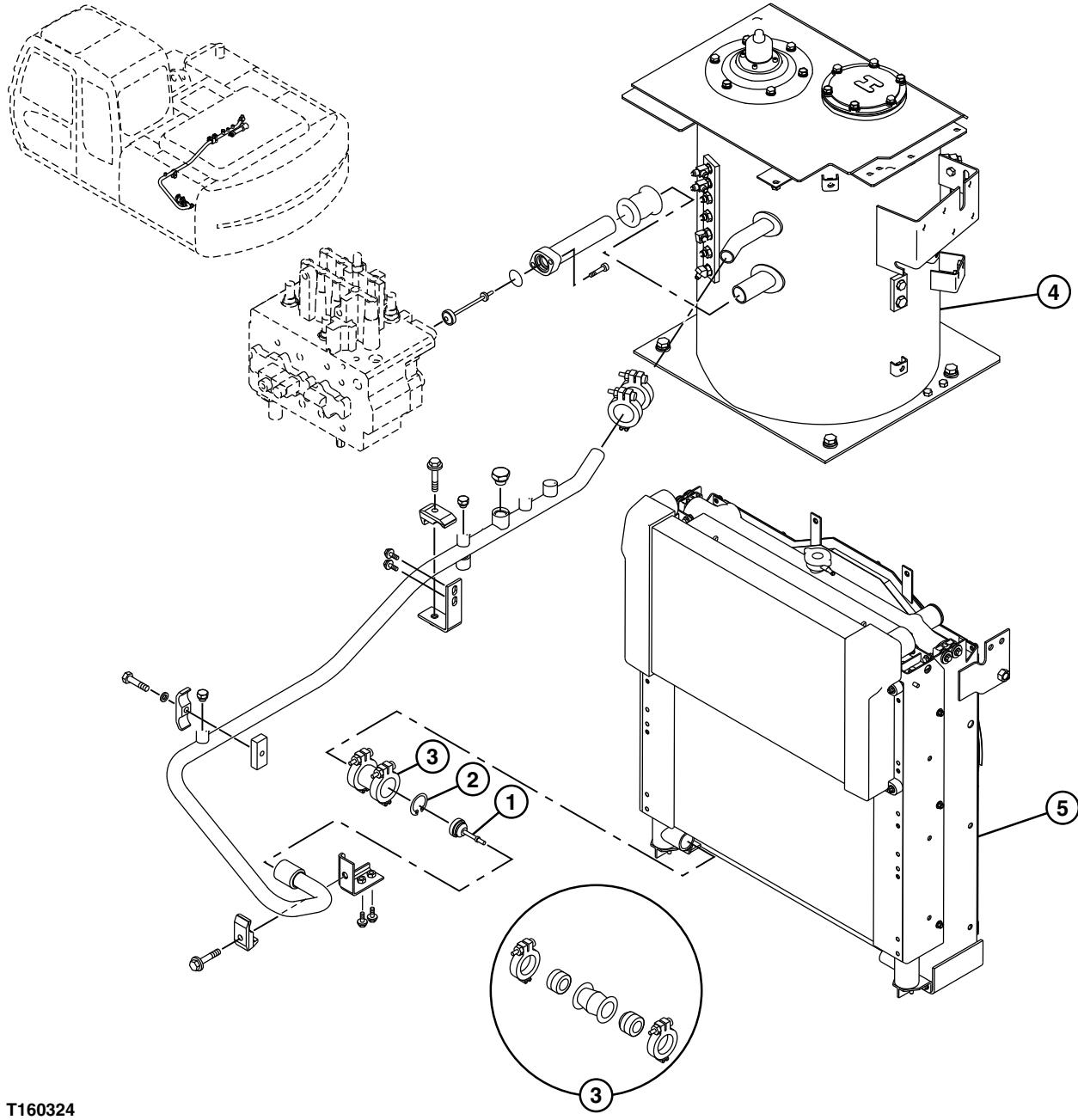
T135193 —UN—06NOV00

TX,33,GG2567 -19-03FEB12-4/4

## Restriction Valve Remove and Install

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull vacuum in hydraulic oil tank using vacuum pump or drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)



T160324

1—Restriction Valve

2—Snap Ring  
3—Coupling

4—Hydraulic Oil Tank

5—Oil Cooler

3. Repair or replace restriction valve (1) and snap ring (2).
4. Tighten nuts on coupling (3).

### Specification

Oil Cooler-to-Hydraulic	
Oil Tank Return Line	
Coupling Nut—Torque.....	4.4 N·m (40 lb-in.)

Continued on next page

TX,33,GG2572 -19-23APR02-1/2

*Hydraulic System*

5. Fill hydraulic oil tank. See Hydraulic Oil. (Operator's Manual.) See 160CLC Drain and Refill Capacities. (Operator's Manual.)

**IMPORTANT:** Hydraulic pump will be damaged if not filled with oil before starting. Procedure must be

performed to fill pump housing whenever oil has been drained from the pump or hydraulic oil tank.

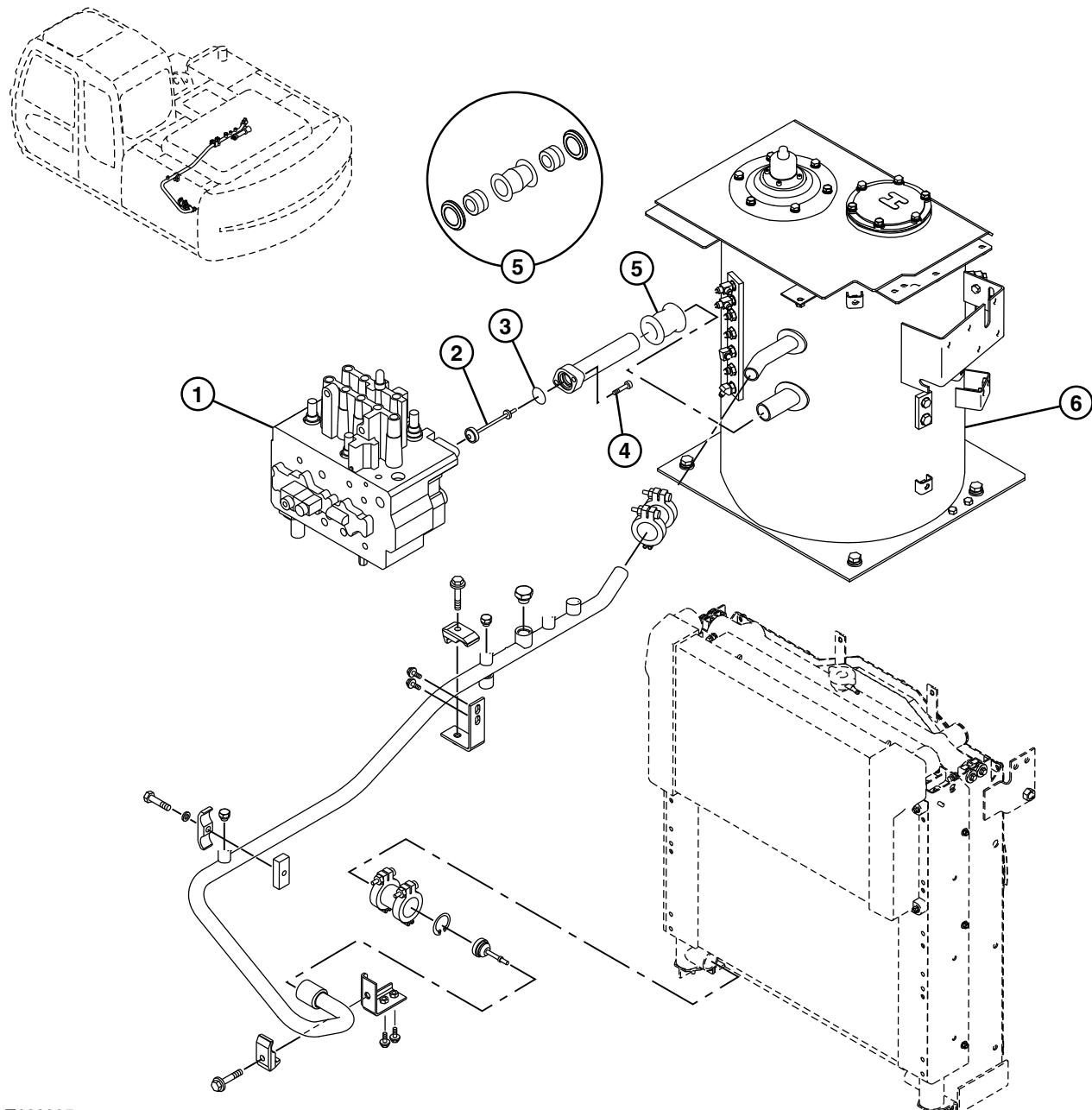
6. Perform Hydraulic Pump Start-Up Procedure. (Group 3360.)

TX,33,GG2572 -19-23APR02-2/2

**Oil Cooler Bypass Valve Remove and Install**

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull vacuum in hydraulic oil tank using vacuum pump or drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)



T160325

1—Control Valve      3—O-Ring  
2—Oil Cooler Bypass Valve      4—Cap Screw (2 used)

5—Coupling  
6—Hydraulic Oil Tank

3. Repair or replace oil cooler bypass valve (2).
4. Tighten nuts on coupling (5).

**Specification**

Control Valve-to-Hydraulic Oil Tank  
Return Line Coupling  
Nut—Torque.....

11.4 N·m (100 lb-in.)  
TX.33.GG2573 -19-23APR02-1/2

Continued on next page

T160325—UN-25OCT02

5. Tighten cap screw (4).

**Specification**

Split Coupling-to- Control Valve Cap
Screw—Torque..... 50 N·m (37 lb·ft)
6. Fill hydraulic oil tank. See <u>Hydraulic Oil</u> . (Operator's Manual.) See <u>160CLC Drain and Refill Capacities</u> . (Operator's Manual.)

**IMPORTANT:** Hydraulic pump will be damaged if not filled with oil before starting. Procedure must be performed to fill pump housing whenever oil has been drained from the pump or hydraulic oil tank.

7. Perform Hydraulic Pump Start-Up Procedure. (Group 3360.)

TX,33,GG2573 -19-23APR02-2/2

**Oil Cooler Remove and Install**

1. Remove radiator. See Cooling Package Remove and Install. (Group 0510.)
2. Remove cap screws.
3. Remove oil cooler.

4. Repair or replace parts as necessary.

5. Install oil cooler.

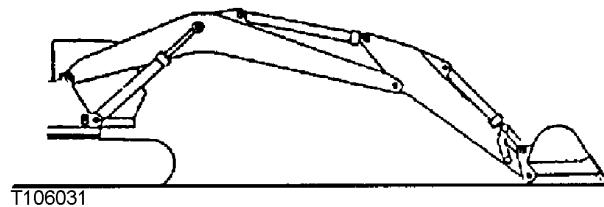
6. Install radiator. See Cooling Package Remove and Install. (Group 0510.)

TX,33,GG2574 -19-24OCT02-1/1

**Boom Cylinder Remove and Install****Remove and Install Boom Cylinder**

*NOTE: Procedure is the same for both boom cylinders.*

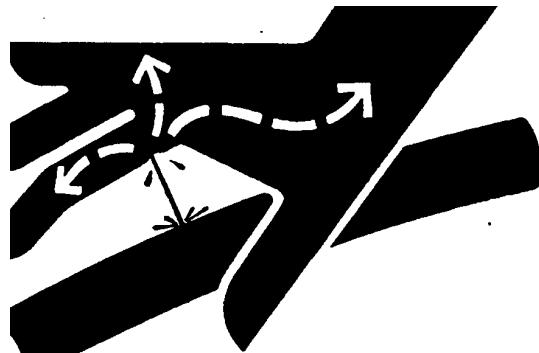
1. Park machine on firm, level surface.  
Retract arm and bucket cylinders and lower bucket to ground.
2. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)



T106031—UN—10JAN97

**CAUTION:** To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

3. Loosen boom cylinder hydraulic lines at frame end of boom to release any residual pressure.
4. Disconnect lines.
5. Disconnect lubricant line at rod end of cylinder.



X9811—UN—23AUG88

Continued on next page

TX,33,GG2576 -19-22APR02-2/5

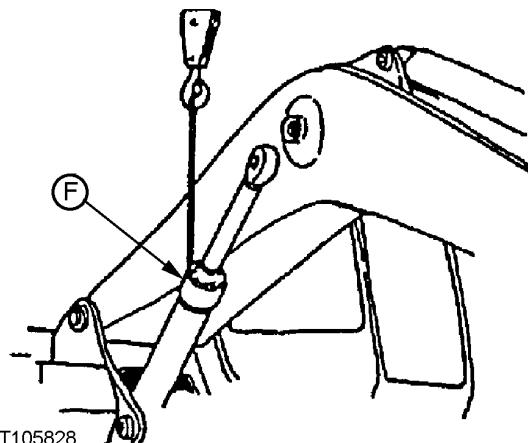
**CAUTION: Heavy component; use a hoist.**

**Specification**

Boom Cylinder—Weight..... 153 kg (337 lb) approximate

6. Attach hoist to boom cylinder (F) using lifting strap.

F—Boom Cylinder



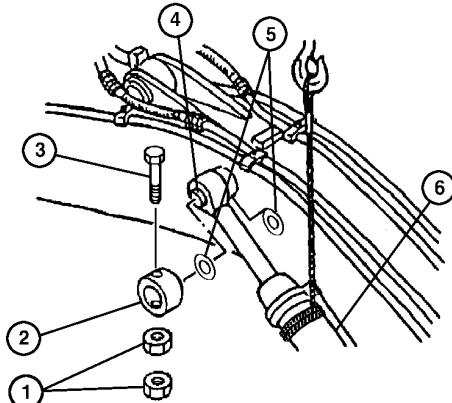
T105828—UN—30DEC96

TX,33,GG2576 -19-22APR02-3/5

7. Remove parts (1—3, and 5).
8. Push boom cylinder rod end-to-boom pin (4) into boom.  
Lower boom cylinder (6) on floor stand.

1—Nut (2 used)  
2—Retainer  
3—Cap Screw

4—Boom Cylinder Rod  
End-to-Boom Pin  
5—Thrust Plate (2 used)  
6—Boom Cylinder



T142979—UN—24JUL01

Continued on next page

TX,33,GG2576 -19-22APR02-4/5

9. Disconnect hydraulic lines (7) from head end of boom cylinder (6).
10. Mark location of thrust plates (8) to aid in assembly.
11. Remove parts (8—11) and remove boom cylinder (6).
12. Repair or replace parts as necessary.
13. Install thrust plates equally on each side of cylinder head end to get the minimum amount of clearance in joint.
14. Align pin bores so thrust plates are not damaged as pin (10) is installed.
15. Connect boom cylinder head end to frame.
16. Tighten nuts (11) against each other allowing cap screws (9) to be free to turn in hole.

**Specification**

Boom Cylinder-to-Frame

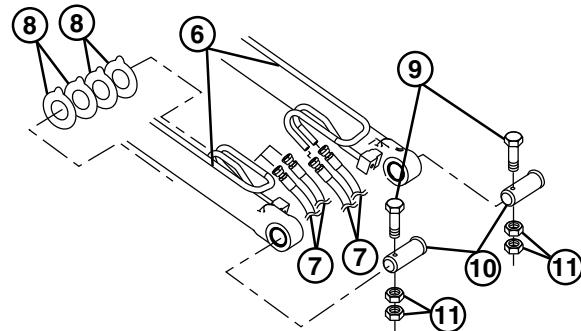
Pin Retainer

Nut—Torque..... 271 N·m (200 lb-ft) (tighten nut against nut)

17. Connect lines.

**IMPORTANT:** Trapped air suddenly compressed in a cylinder is heated and ignites the oil used for assembly causing cap seal and ring damage. Start with cylinder rod retracted and the rod end filled with clean oil. Connect the cylinder head end and lines. Operate function to slowly extend rod. Procedure will eliminate most of the air and reduce the possibility of damage.

18. Start engine.
19. Slowly extend boom cylinder (6) to align pin bores so thrust plates (5) are not damaged as pin (4) is installed.
20. Install thrust plates to get the minimum amount of clearance between boom and boom cylinder rod end.
21. Connect boom cylinder rod end to boom.



T143048 -UN-02AUG01

6—Boom Cylinder	9—Cap Screw (2 used)
7—Rod End-to-Boom Section Bottom Port Line	10—Boom Cylinder-to-Frame Pin (2 used)
Head End-to-Boom Section Top Port Line	11—Nut (4 used)
8—Thrust Plate (As Required)	

22. Tighten nuts (1) against each other allowing cap screw (3) to be free to turn in hole.

**Specification**

Boom Cylinder-to-Frame

Pin Retainer

Nut—Torque..... 270 N·m (200 lb-ft) (tighten nut against nut)

23. Connect lubricant line at rod end of cylinder.

24. Apply grease to all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)

25. Bleed air from cylinder. Perform Hydraulic Cylinder Bleed Procedure. (Group 3360.)

26. Check hydraulic oil level. See Check Hydraulic Oil Tank Level. (Operator's Manual.)

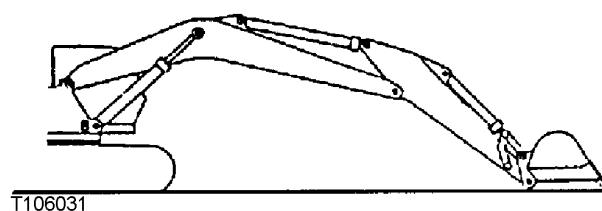
TX,33,GG2576 -19-22APR02-5/5

**Arm Cylinder Remove and Install****Remove and Install Arm Cylinder**

1. Park machine on firm, level surface.
2. Retract arm and bucket cylinders and lower bucket to ground.

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

3. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)



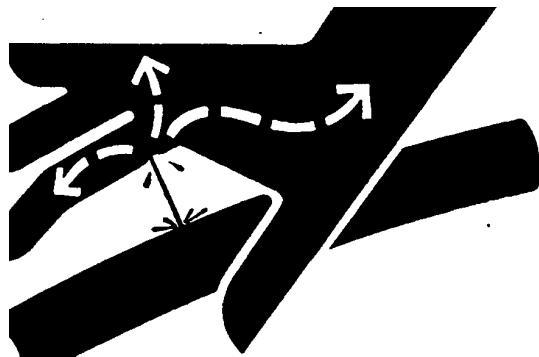
T106031 -UN-10JAN97

Continued on next page

TX,33,GG2577 -19-22APR02-1/5

**CAUTION:** To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

4. Loosen arm cylinder hydraulic lines at frame end of boom to release any residual pressure.
5. Disconnect lines.



X9811—UN—23AUG88

TX,33,GG2577 -19-22APR02-2/5

6. Insert wood block (3) between arm cylinder (1) and boom (2).

**CAUTION: Heavy component; use a hoist.**

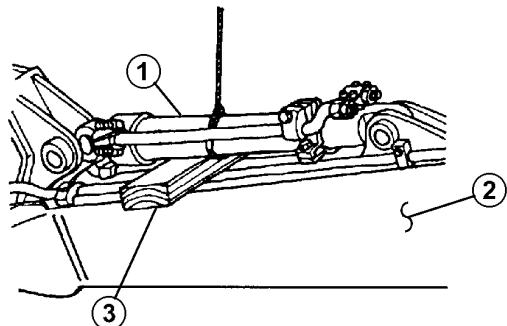
**Specification**

Arm Cylinder—Weight..... 210 kg (460 lb) approximate

7. Attach arm cylinder to hoist using lifting straps.

1—Arm Cylinder  
2—Boom

3—Wood Block



T143063—UN—02AUG01

TX,33,GG2577 -19-22APR02-3/5

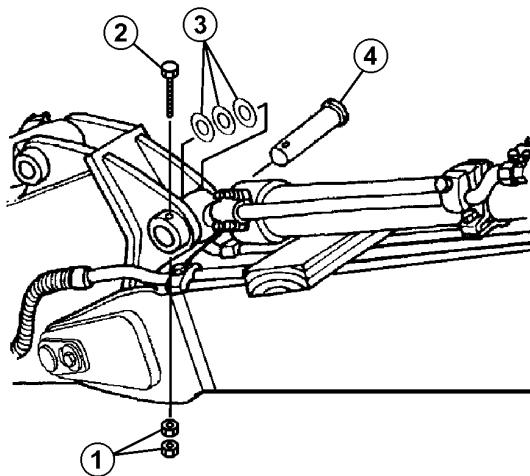
8. Remove parts (1 and 2).

*NOTE: Mark location of thrust plates (3) to aid in assembly.*

9. Push arm cylinder-to-arm pin (4) out and remove thrust plates
10. Disconnect lubricant line.

1—Nuts (2 used)  
2—Cap Screw

3—Thrust Plates (As Required)  
4—Arm Cylinder-to-Arm Pin



T143064—UN—02AUG01

Continued on next page

TX,33,GG2577 -19-22APR02-4/5

11. Remove parts (1 and 2).

*NOTE: Mark location of thrust plates (3) to aid in assembly.*

12. Push arm cylinder-to-boom pin (4) out and remove thrust plates

13. Remove arm cylinder

14. Repair or replace parts as necessary.

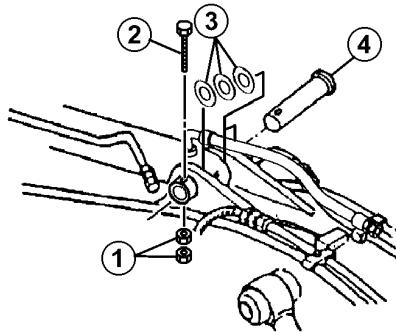
15. Install thrust plates equally on each side of cylinder to get minimum amount of clearance in joints.

16. Align pin bores so thrust washers are not damaged as pin (4) is installed.

17. Connect lubricant line.

18. Connect arm cylinder head end to boom.

19. Tighten nuts (1) against each other allowing cap screw (2) to be free to turn in hole.



T143065 -UN-02AUG01

1—Nut (2 used)  
2—Cap Screw

3—Thrust Plates (As Required)  
4—Arm Cylinder-to-Boom Pin

#### Specification

Arm Cylinder-to-Boom

Pin Retainer

Nut—Torque..... 550 N·m (405 lb-ft) (tighten nut against nut)

**IMPORTANT:** Trapped air suddenly compressed in a cylinder is heated and ignites the oil used for assembly causing cap seal and ring damage. Start with cylinder rod retracted and the rod end filled with clean oil. Connect the cylinder head end and lines. Operate function to slowly extend rod. Procedure will eliminate most of the air and reduce the possibility of damage.

20. Slowly extend arm cylinder to align pin bores so thrust plates are not damaged as pin is installed.

21. Connect arm cylinder rod end to arm.

#### Specification

Arm Cylinder-to-Arm Pin

Retainer Nut—Torque..... 550 N·m (405 lb-ft) (tighten nut against nut)

23. Connect lubricant line.

24. Connect lines.

25. Apply grease to all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)

26. Bleed air from cylinder. Perform Hydraulic Cylinder Bleed Procedure. (Group 3360.)

27. Check hydraulic oil level. See Check Hydraulic Oil Tank Level (Operator's Manual.)

TX,33,GG2577 -19-22APR02-5/5

## Bucket Cylinder Remove and Install

### Remove and Install Bucket Cylinder

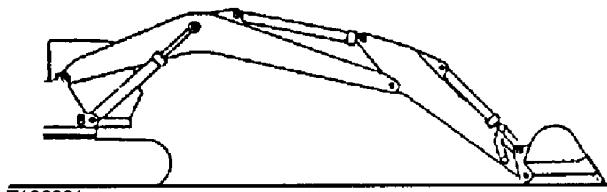
- Park machine on firm, level surface.
- Retract arm cylinder and bucket cylinder (B) and lower bucket to ground. Position end of arm (C) on wood block (D).

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

- Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)

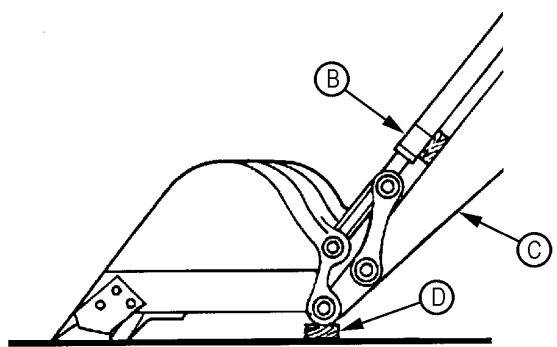
B—Bucket Cylinder  
C—End of Arm

D—Wood Block



T106031—UN—10JAN97

T106031



T106135—UN—09JAN97

TX,33,GG2578 -19-22APR02-1/3

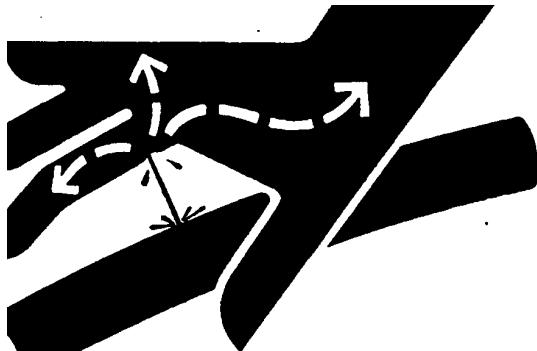
**CAUTION:** To avoid injury from escaping fluid under pressure, stop engine, and relieve the pressure in the system before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

- Disconnect lines.
- Connect center links to hoist using lifting strap.
- Put wood block (5) between bucket cylinder and arm to hold cylinder up when side and center links-to-bucket cylinder pin (1) is removed.
- Remove parts (2 and 6).

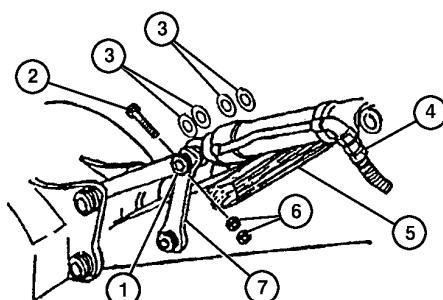
*NOTE: Mark location of thrust plates (3) to aid in assembly.*

- Push side and center links-to-bucket cylinder pin (1) out and remove thrust plates (3).

1—Side and Center Links-to-Bucket Cylinder Pin	5—Wood Block
2—Cap Screw	6—Nut (2 used)
3—Thrust Plates (As Required)	7—Side Link
4—Bucket Cylinder Rod End-to-Bucket Section Top Port Line	



X9811—UN—23AUG88



T143075—UN—02AUG01

Continued on next page

TX,33,GG2578 -19-22APR02-2/3

**CAUTION: Heavy component; use a hoist.**

**Specification**

Bucket Cylinder—Weight..... 125 kg (275 lb) approximate

9. Disconnect bucket cylinder rod end hose (1).
10. Connect bucket cylinder (2) to hoist using lifting strap.
11. Remove parts (3 and 5).

*NOTE: Mark location of thrust plates (4) to aid in assembly.*

12. Push bucket cylinder head end-to-arm pin (6) out and remove thrust plates (4).
13. Remove bucket cylinder.
14. Repair or replace parts as necessary.
15. Install thrust plates equally on each side of bucket cylinder head end to get minimum amount of clearance in joint.
16. Align pin bores so thrust plates are not damaged as pin is installed.
17. Connect bucket cylinder head end to arm.
18. Tighten nuts (3) against each other allowing cap screw (5) to be free to turn in hole.

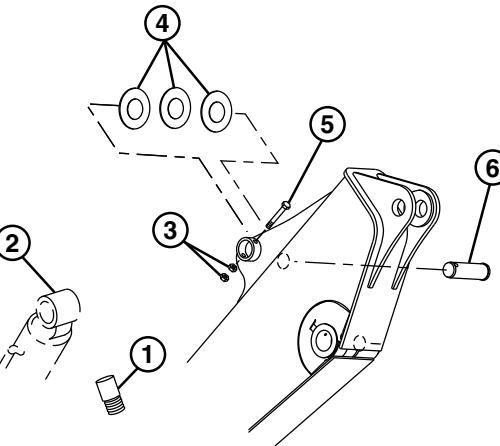
**Specification**

Bucket Cylinder Head  
End-to-Arm Pin Retainer  
Nut—Torque..... 270 N·m (200 lb-ft) (tighten nut against nut)

19. Connect lines.

**IMPORTANT: Trapped air suddenly compressed in a cylinder is heated and ignites the oil used for assembly causing cap seal and ring damage. Start with cylinder rod retracted and the rod end filled with clean oil. Connect the cylinder head end and lines. Operate function to slowly extend rod. Procedure will eliminate most of the air and reduce the possibility of damage.**

20. Start engine.
21. Slowly extend bucket cylinder to align pin bores so thrust plates are not damaged as pin is installed.



T143076 -UN-02AUG01

1—Bucket Cylinder Rod End Hose      4—Thrust Plates (As Required)  
2—Bucket Cylinder      5—Cap Screw  
3—Nut (2 used)      6—Bucket Cylinder Head End-to-Arm Pin

22. Install thrust plates equally on each side of cylinder rod end and side links to get minimum amount of clearance in joint.
23. Connect bucket cylinder rod end to side and center links.
24. Tighten nuts against each other allowing cap screw to be free to turn in hole.

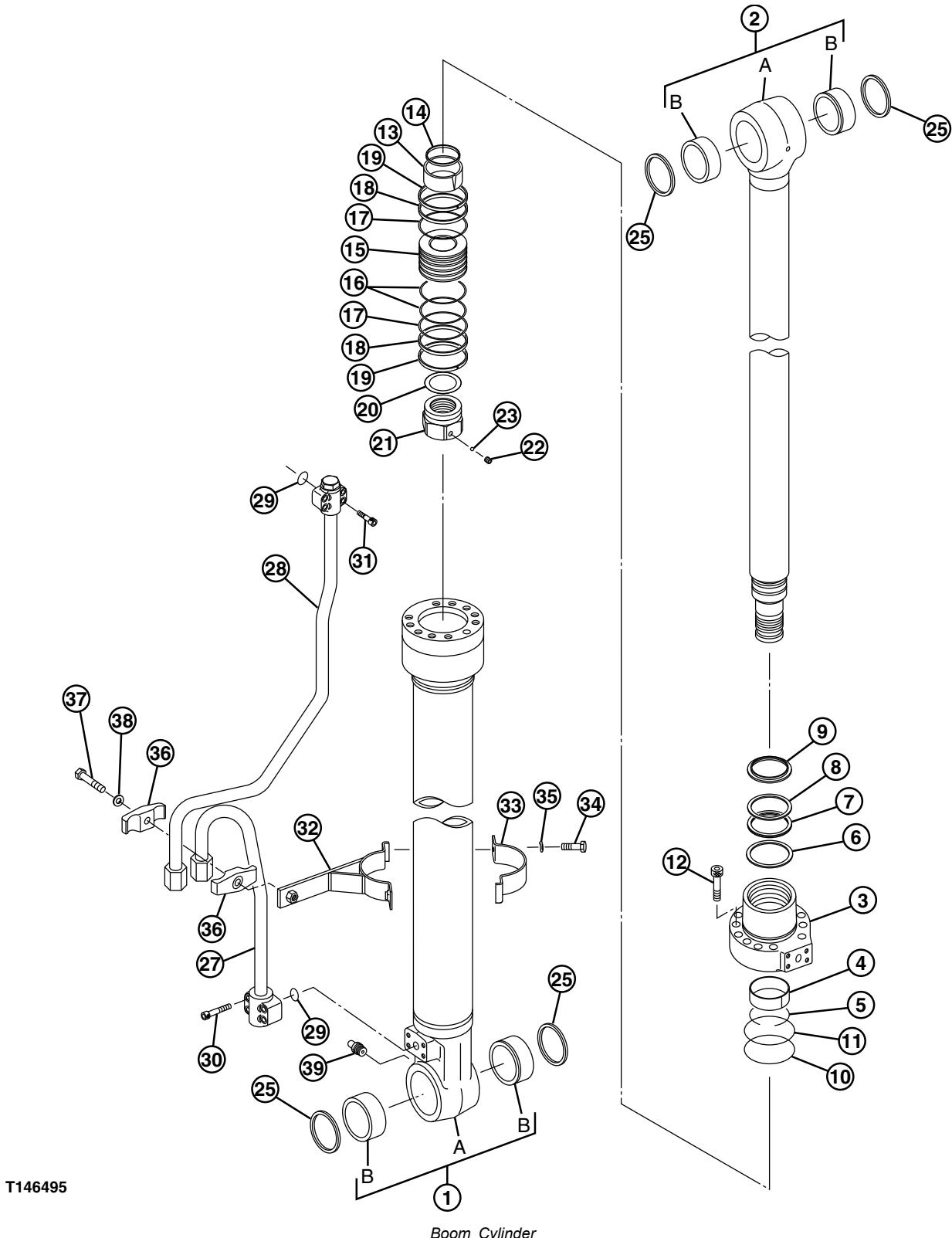
**Specification**

Bucket Cylinder Rod  
End-to-Side and Center  
Links Pin Retainer  
Nut—Torque..... 270 N·m (200 lb-ft) (tighten nut against nut)

25. Lubricate all pivot joints. See Track Adjuster, Working Tool Pivot, Swing Bearing, And Swing Bearing Gear Grease. (Operator's Manual.)
26. Bleed air from cylinder. Perform Hydraulic Cylinder Bleed Procedure. (Group 3360.)
27. Check hydraulic oil level. See Check Hydraulic Oil Tank Level. (Operator's Manual.)

TX,33,GG2578 -19-22APR02-3/3

**Boom, Arm, or Bucket Cylinder Disassemble and Assemble**  
**Disassemble Boom, Arm, or Bucket Cylinder**



T146495 -JN-01 FEB02

Continued on next page

LD30992,00001AD -19-02OCT02-1/21

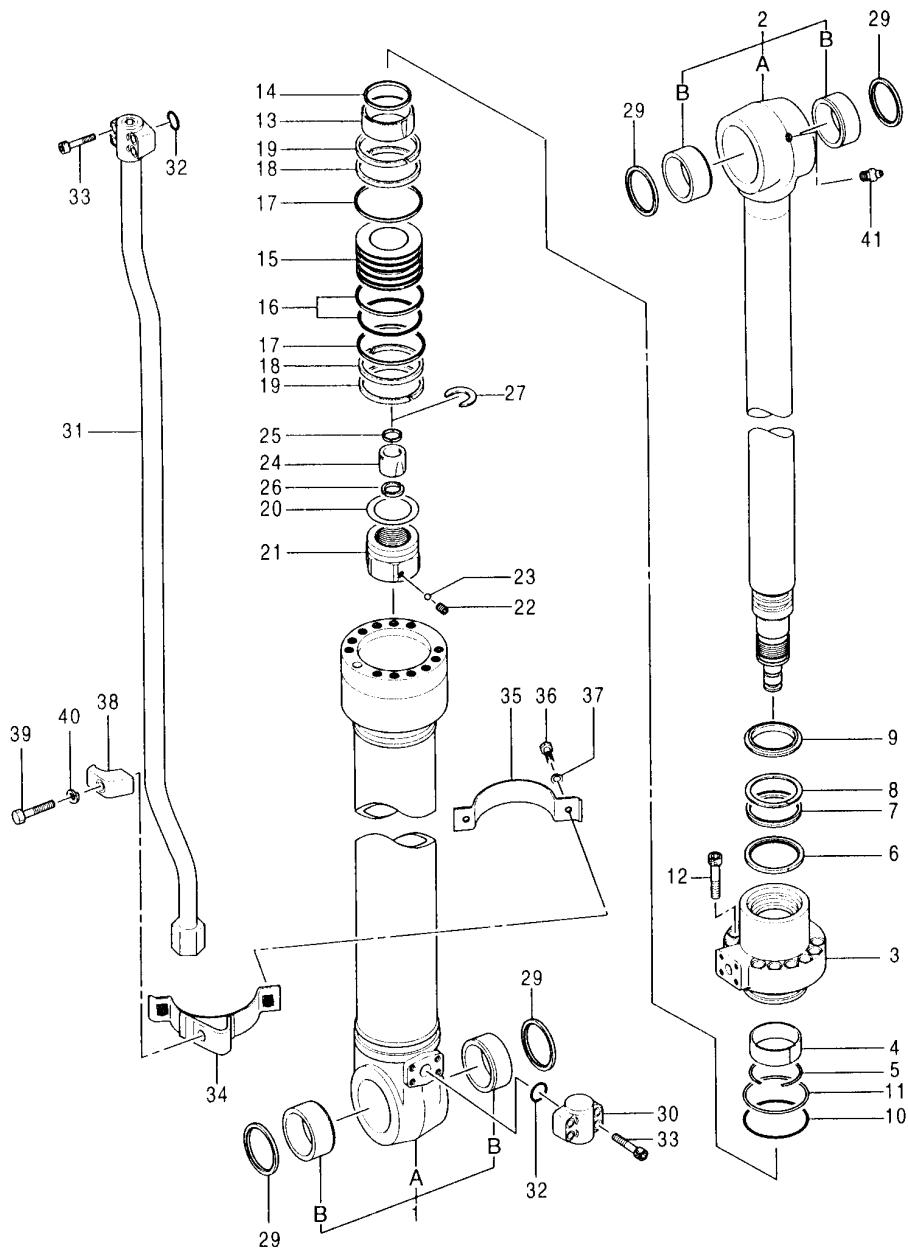
## Hydraulic System

1—Cylinder Barrel and Bushing	8—Backup Ring	19—Wear Ring	32—Clamp
1A—Cylinder Barrel	9—Wiper Seal	20—Shim	33—Clamp
1B—Bushing (2 used)	10—O-Ring	21—Nut	34—Cap Screw (2 used)
2—Rod and Bushing	11—Backup Ring	22—Set Screw	35—Lock Washer (2 used)
2A—Rod	12—Cap Screw (12 used)	23—Steel Ball	36—Half Clamp (2 used)
2B—Bushing (2 used)	13—Cushion	25—Dust Seal (4 used)	37—Cap Screw
3—Rod Guide	14—Cushion Seal	27—Head End Line	38—Lock Washer
4—Wear Ring	15—Piston	28—Rod End Line	39—Lubrication Fitting
5—Snap Ring	16—Cap Seal and O-Ring	29—O-Ring (2 used)	
6—Buffer Ring Seal	17—Backup Ring (2 used)	30—Cap Screw (4 used)	
7—U-Cup Seal	18—Buffer Seal (2 used)	31—Cap Screw (4 used)	

Continued on next page

LD30992,00001AD -19-02OCT02-2/21

*Hydraulic System*



**TP48028**

*Arm Cylinder*

TP48028—UN—30MAY96

Continued on next page

LD30992,00001AD -19-02OCT02-3/21

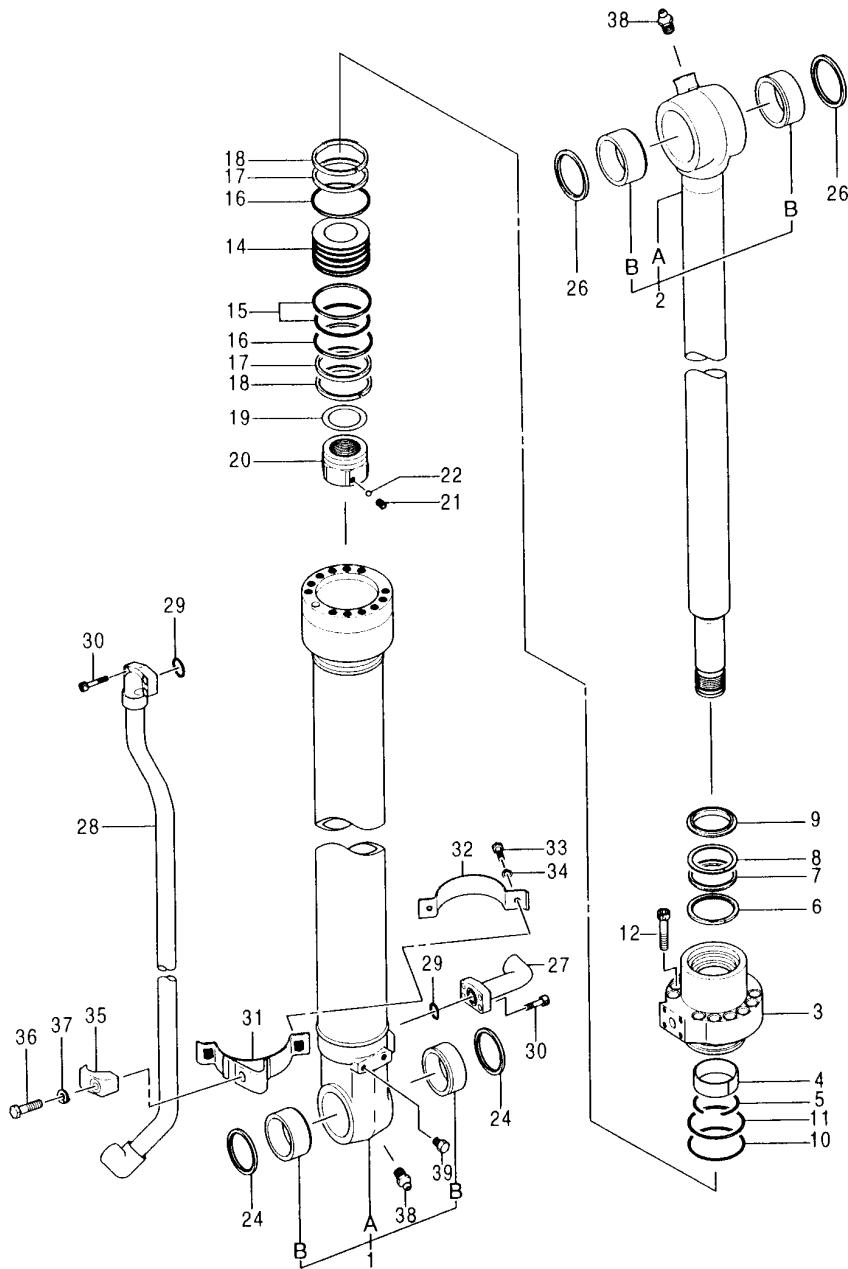
## Hydraulic System

1—Cylinder Barrel and Bushing	8—Backup Ring	19—Wear Ring	33—Cap Screw (8 used)
1A—Cylinder Barrel	9—Wiper Seal	20—Shim	34—Clamp
1B—Bushing (2 used)	10—O-Ring	21—Nut	35—Clamp
2—Rod and Bushing	11—Backup Ring	22—Set Screw	36—Cap Screw (2 used)
2A—Rod	12—Cap Screw (10 used)	23—Steel Ball	37—Lock Washer (2 used)
2B—Bushing (2 used)	13—Cushion	24—Cushion	38—Clamp
3—Rod Guide	14—Cushion Seal	25—Cushion Seal	39—Cap Screw
4—Wear Ring	15—Piston	26—Retainer Ring	40—Lock Washer
5—Snap Ring	16—Cap Seal and O-Ring	27—Ring	41—Lubrication Fitting
6—Buffer Ring Seal	17—Backup Ring (2 used)	29—Dust Seal (4 used)	
7—U-Cup Seal	18—Buffer Seal (2 used)	30—Head End Adapter	
		31—Rod End Line	
		32—O-Ring (2 used)	

Continued on next page

LD30992,00001AD -19-02OCT02-4/21

## Hydraulic System



T108520

***Bucket Cylinder***

1—Cylinder Barrel and Bushing	7—U-Cup Seal	18—Wear Ring	31—Clamp
1A—Cylinder Barrel	8—Backup Ring	19—Shim	32—Clamp
1B—Bushung (2 used)	9—Wiper Seal	20—Nut	33—Cap Screw (2 used)
2—Rod and Bushing	10—O-Ring	21—Set Screw	34—Lock Washer (2 used)
2A—Rod	11—Backup Ring	22—Steel Ball	35—Clamp
2B—Bushung (2 used)	12—Cap Screw (12 used)	24—Dust Seal (2 used)	36—Cap Screw
3—Rod Guide	14—Piston	26—Dust Seal (2 used)	37—Lock Washer
4—Wear Ring	15—Cap Seal and O-Ring	27—Elbow Fitting	38—Lubrication Fitting
5—Snap Ring	16—Backup Ring (2 used)	28—Rod End Line	
6—Buffer Ring Seal	17—Buffer Seal (2 used)	29—O-Ring (2 used)	
		30—Cap Screw (8 used)	

Continued on next page

LD30992,00001AD -19-02OCT02-5/21

T108520-JUN-24MAR97

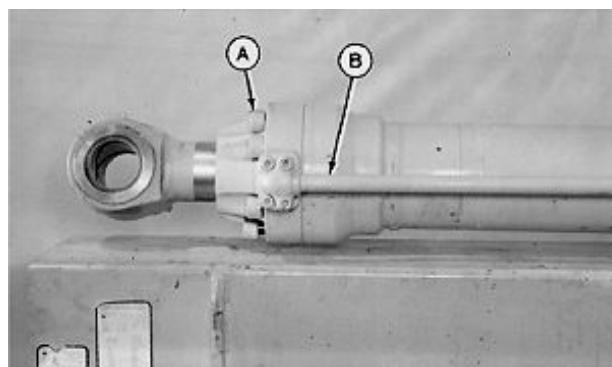
**CAUTION: Heavy components; use a hoist.**

**Specification**

Boom Cylinder—Weight (approximate).....	153 kg (337 lb)
Arm Cylinder—Weight (approximate).....	210 kg (460 lb)
Bucket Cylinder—Weight (approximate).....	125 kg (275 lb)

*NOTE: Disassemble procedure is the same for all cylinders except as noted. Disassemble of cylinder is shown using the JT30043 Cylinder Service Stand.*

1. Fasten head end of cylinder to JT30043 cylinder service stand or equivalent.
2. Remove line (B).
3. Pull rod out so piston is against rod guide.
4. Connect rod to hoist using lifting strap.
5. Remove cap screws (A).



A—Cap Screw (12 used)      B—Line

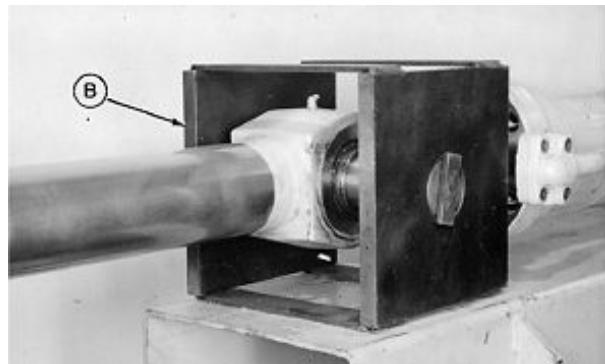
**CAUTION: Use care when removing cylinder rod to avoid damage to sliding surfaces.**

6. Pull rod, rod guide, and piston from barrel.

LD30992,00001AD -19-02OCT02-6/21

7. Install rod eye in sliding housing (B). Install housing in cylinder service stand.

B—Sliding Housing



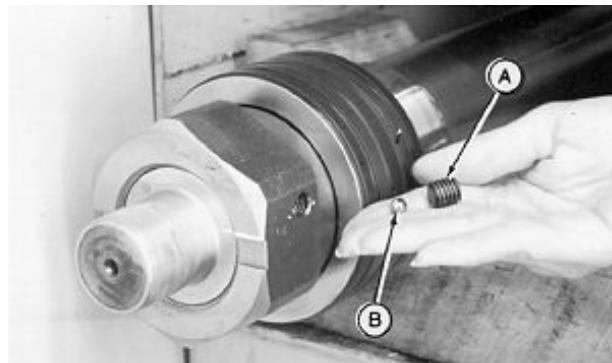
T6557HK—UN—27OCT88

LD30992,00001AD -19-02OCT02-7/21

8. Remove staked material from set screw (A) hole using small air grinder or drill and bit.
9. Remove set screw (A). Remove steel ball (B).

A—Set Screw

B—Steel Ball



T6585X1—UN—27OCT88

Continued on next page

LD30992,00001AD -19-02OCT02-8/21

**IMPORTANT:** To avoid damaging the tapped hole for set screw, the cap screw in the JT30043-30 Hex Piston Nut Wrench must be tightened against a side of the nut without the tapped hole.

To avoid gouging side of nut, install a piece of steel flat stock between nut and cap screw.

10. Install JT30043-30 Hex Piston Nut Wrench so cap screw is tighten against side of nut (B) without tapped hole.

Install 38 x 51 x 6.4 mm (1.5 x 2.0 x 0.25 in.) piece of steel flat stock between nut and cap screw. Tighten cap screw.

11. Loosen nut (B).

B—Nut



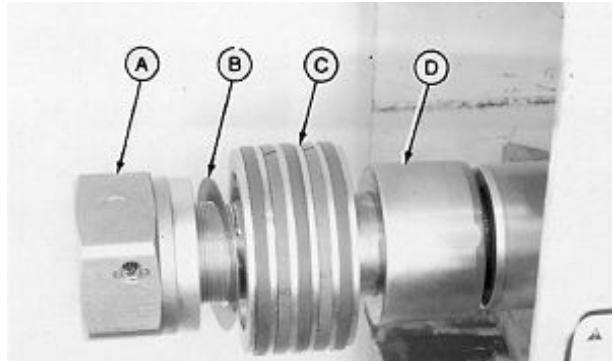
T7768AG—JUN—22MAY92

LD30992,00001AD -19-02OCT02-9/21

12. Remove parts (A—D).

A—Nut  
B—Shim

C—Piston  
D—Cushion



T6585XK—JUN—27OCT88

Continued on next page

LD30992,00001AD -19-02OCT02-10/21

13. For arm cylinder, remove ring (A) using punch and hammer.

Push cushion (C) against shoulder.

Remove retainer ring (B). Remove cushion.

Take notice of direction of flat face on cushion and notches in cushion seal to aid in assembly.

Remove cushion seal (D).

14. Remove rod guide.

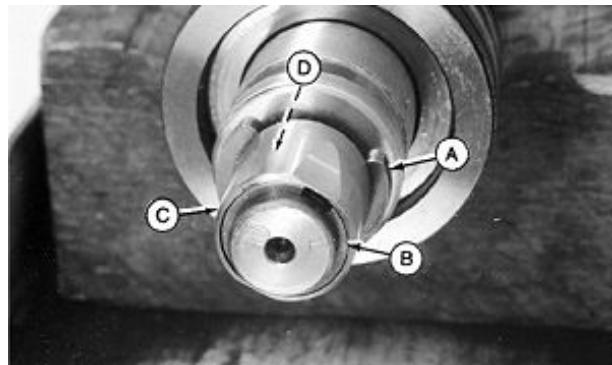
Remove parts from rod guide and piston.

A—Ring

B—Retainer Ring

C—Cushion

D—Cushion Seal

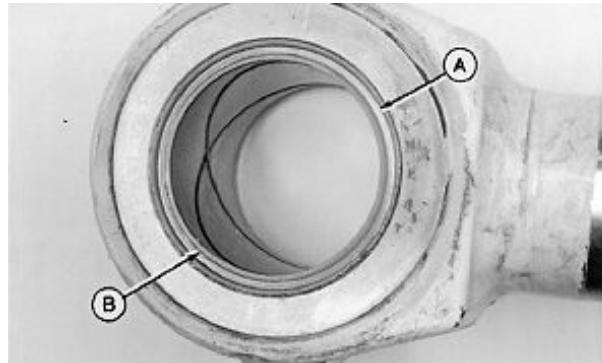


T7778AU—UN—19JUN92

15. Remove rod end and head end dust seals (A) and bushing (B) for wear or damage, replace as necessary.

A—Dust Seal (2 used)

B—Bushing



T6557HR—UN—27OCT88

Continued on next page

LD30992,00001AD -19-02OCT02-12/21

**Inspect Boom, Arm, or Bucket Cylinder**

1. Inspect piston, inside rod guide and barrel for wear, scratches and nicks that may cut or damage seal or wear ring.
2. Inspect rod end and head end dust seals and bushing for wear or damage, replace as necessary. See Bushing and Seal Remove and Install. See Inspect Boom, Arm, and Bucket Pins, Bushings and Bosses. (Group 3340.)
3. Check for rod curvature.

Put rod on V-blocks. Measure for rod curvature using dial indicator.

4. Check for rod curvature on V-blocks using dial indicator.

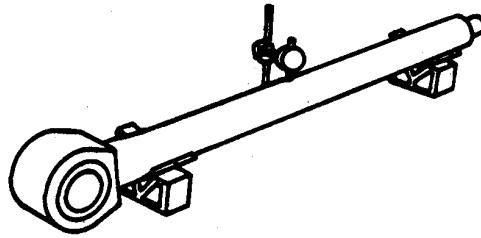
**Specification**

Boom Rod—Curvature..... 0.5 mm per 1 m (0.020 in. per 3.25 ft)  
 Arm Rod—Curvature..... 0.5 mm per 1 m (0.020 in. per 3.25 ft)  
 Bucket Rod—Curvature..... 0.5 mm per 1 m (0.020 in. per 3.25 ft)

5. Inspect rod surface for scratches or wear.

**Specification**

Boom Rod Allowable  
 Scratch—Depth..... 0.1 mm (0.004 in.)  
 (enough to detect by a fingernail)



Boom Rod—OD.....	$80 \pm 0.03$ mm ( $3.15 \pm 0.001$ in.)
Arm Rod Allowable	
Scratch—Depth.....	0.1 mm (0.004 in.) (enough to detect by a fingernail)
Arm Rod—OD.....	$90 \pm 0.03$ mm ( $3.54 \pm 0.001$ in.)
Bucket Rod Allowable	
Scratch—Depth.....	0.1 mm (0.004 in.) (enough to detect by a fingernail)
Bucket Rod—OD.....	$75 \pm 0.03$ mm ( $2.95 \pm 0.001$ in.)

LD30992,00001AD -19-02OCT02-13/21

T6585XG—UN—27OCT88

**Assemble Boom, Arm, or Bucket Cylinder**

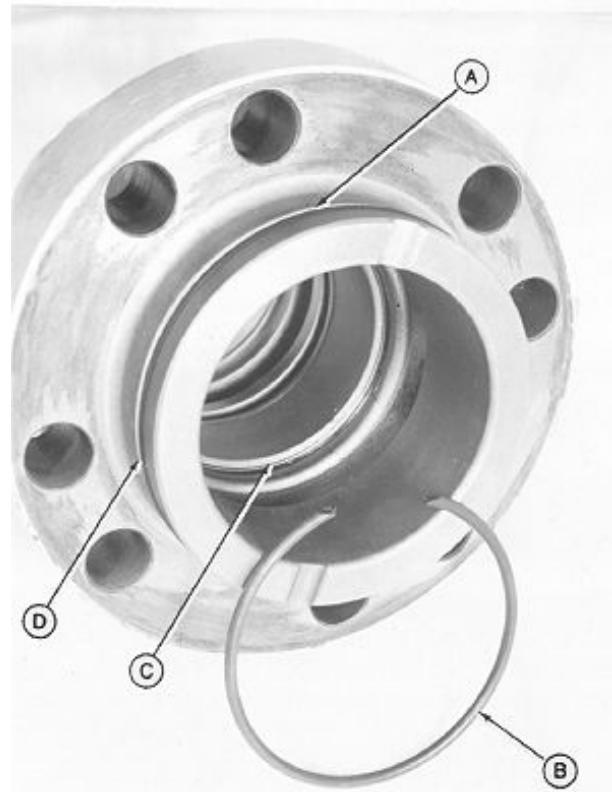
**NOTE:** Use a cylinder repair kit when assembling a rebuildable cylinder.

The left and right boom cylinders are the same except for the head end (27) and rod end (28) lines, and clamps (32 and 33).

1. Install bushing (1B and 2B) to depth equal to thickness of dust seals.
2. Install dust seals (25) tight against bushing with seal lip outward. See Bushing and Seal Remove and Install. (Group 3340.)
3. Push wear ring (C) to bottom of bore using driver disk and press.
4. Install parts (A, B, and D).

A—Backup Ring  
 B—Snap Ring

C—Wear Ring  
 D—O-Ring



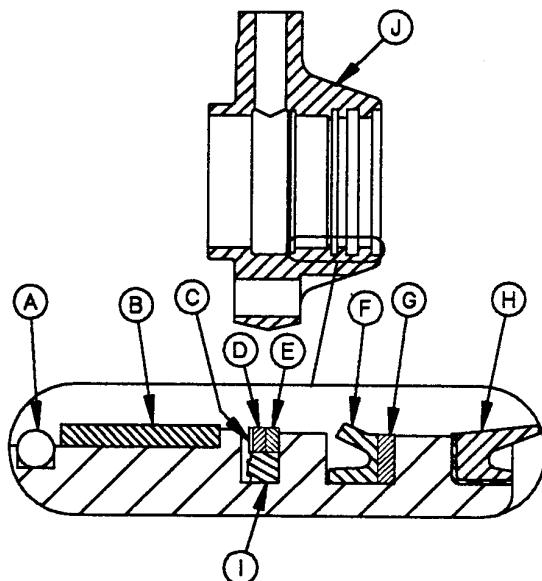
T6585XN—UN—27OCT88

Continued on next page

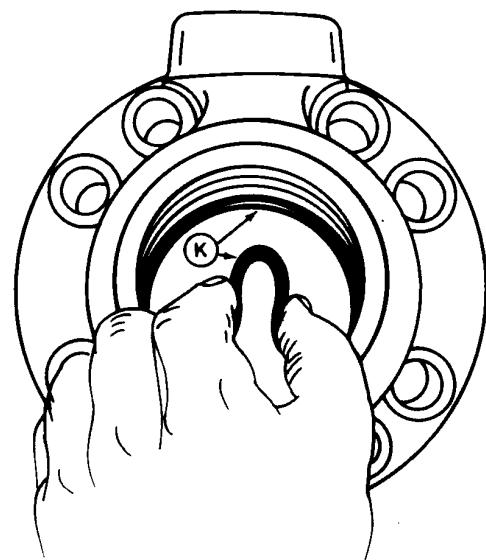
LD30992,00001AD -19-02OCT02-14/21

5. Install buffer ring seal (I) with notched side towards wear ring (B)
- Install black buffer ring (D) with notched side (C) towards wear ring.
- Install green buffer ring (E).
6. Install U-cup seal (F) with lip towards wear ring (B) using bending method (K)
- Install backup ring (G).
7. Install wiper seal (H) so lip is towards outside of cylinder.
8. Install rod guide (J) on rod.

A—Snap Ring	G—Backup Ring
B—Wear Ring	H—Wiper Seal
C—Notched Side	I—Buffer Ring Seal
D—Black Buffer Ring	J—Rod Guide
E—Green Buffer Ring	K—Bending Method Seal Installation
F—U-Cup Seal	



T7623AF -UN-22OCT91



T7963AK—UN—01APR93

T7963AK

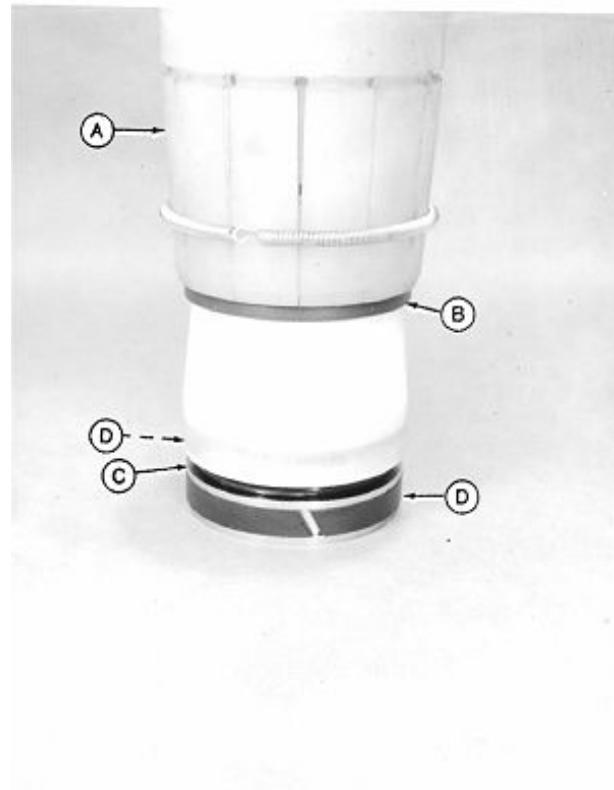
Continued on next page

LD30992,00001AD -19-02OCT02-15/21

9. Install O-ring (C) into middle groove of piston.
10. Install buffer seals (D). Buffer seal in groove above helps support thin section of installer. Buffer seal below keeps cap seal from going into that groove if pushed too far.
11. Mount correct installer on boom, arm or bucket piston. Apply clean oil to installer.
12. Push cap seal (B) down installer and into middle groove over O-ring (C) using correct size pusher (A).

A—JDG840-6 and JDG842-2  
Pusher  
— JDG918 Installer For Boom  
— JDG917 Installer For Bucket  
— JDG843-1 Installer For Arm

B—Cap Seal  
C—O-Ring  
D—Buffer Seal



Continued on next page

LD30992,00001AD -19-02OCT02-16/21

T7964AQ — JUN — 18MAR93

13. Check cap seal, seal must fit tight against O-ring and not turn. If seal can be turned, it has been stretched too much and can be damaged during assembly into cylinder barrel.
14. For cap seal that has been stretched too much, shrink it to its original size using ring compressor or plastic tie band and hose clamp.

When using ring compressor, put piece of shim stock between cap seal and compressor at joint so it does not damage seal.

When using plastic tie band and hose clamp, grind taper on one end of tie band. Install tie band with taper against cap seal. Before tightening hose clamp, check to be sure tie band is under hose clamp all around piston.



T6396AC -UN-27OCT88

LD30992,00001AD -19-02OCT02-17/21

15. Install backup ring (C) on each side of cap seal.
16. Install buffer seals (B) and wear rings (A).

Turn seals and rings so slits are 180° from each other

A—Wear Ring  
B—Buffer Seal

C—Backup Ring



T657HV -UN-27OCT88

Continued on next page

LD30992,00001AD -19-02OCT02-18/21

17. For boom cylinder, install cushion seal (G) so notches (F) are towards piston and threaded section of rod.

For arm cylinder, install cushion seals (A and C) so notches (B) are towards piston and threaded section of rod.

18. Install cushion (D) so wide end of flat face (E) is towards rod guide and narrow end is towards piston.

19. For arm cylinder, install cushion so wide end of flat face is towards end of rod and narrow end is towards piston.

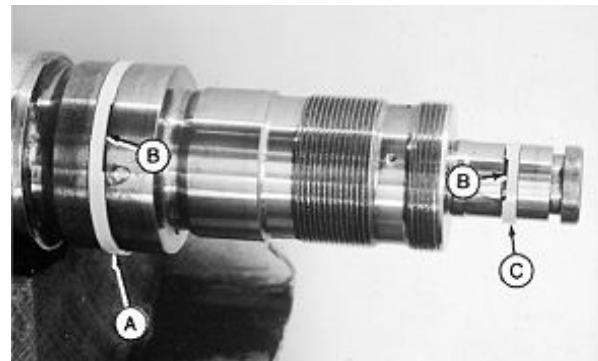
Install retainer ring in groove.

Pull cushion out against retainer ring.

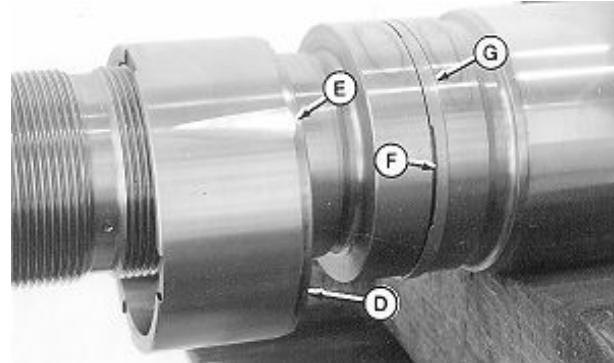
Install ring.

A—Cushion Seal  
B—Notch  
C—Cushion Seal  
D—Cushion

E—Flat Face  
F—Notch  
G—Cushion Seal



Arm Cylinder Rod



Boom Cylinder Rod

T7778AV—UN—10JUN92

T8286BL—UN—16JUL94

T6585XK—UN—27OCT88

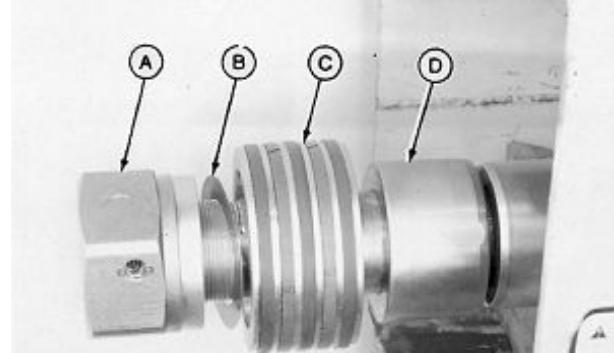
20. Install piston (C) so flat side is against cushion (D).

21. Install shim (B).

22. Install nut (A).

A—Nut  
B—Shim

C—Piston  
D—Cushion



Continued on next page

LD30992,00001AD -19-02OCT02-20/21

**IMPORTANT: To avoid damaging the tapped hole for set screw, the cap screw in the JT30043-30 Hex Piston Nut Wrench must be tightened against a side of the nut without the tapped hole.**

**To avoid gouging side of nut, install a piece of steel flat stock between nut and cap screw.**

23. Tighten nut using JT30043-30 Hex Piston Nut Wrench. Install wrench so cap screw is tighten against side of nut (B) without tapped hole.

Install 38 x 51 x 6.4 mm (1.5 x 2.0 x 0.25 in.) piece of steel flat stock between nut and cap screw. Tighten cap screw.

#### Specification

Piston-to-Rod

Nut—Boom—Torque..... 3800 N·m (2800 lb-ft)

Piston-to-Rod

Nut—Arm—Torque..... 7230 N·m (5330 lb-ft)

Piston-to-Rod

Nut—Bucket—Torque..... 4780 N·m (3530 lb-ft)

24. Install rod nut steel ball.

If indentation for steel ball in rod is not aligned with tapped hole, make new indentation using drill and 10 mm bit or by striking steel ball using hammer and punch.

25. Tighten rod nut set screw.

#### Specification

Rod Nut Set

Screw—Boom—Torque..... 57 N·m (42 lb-ft)

Rod Nut Set

Screw—Arm—Torque..... 57 N·m (42 lb-ft)

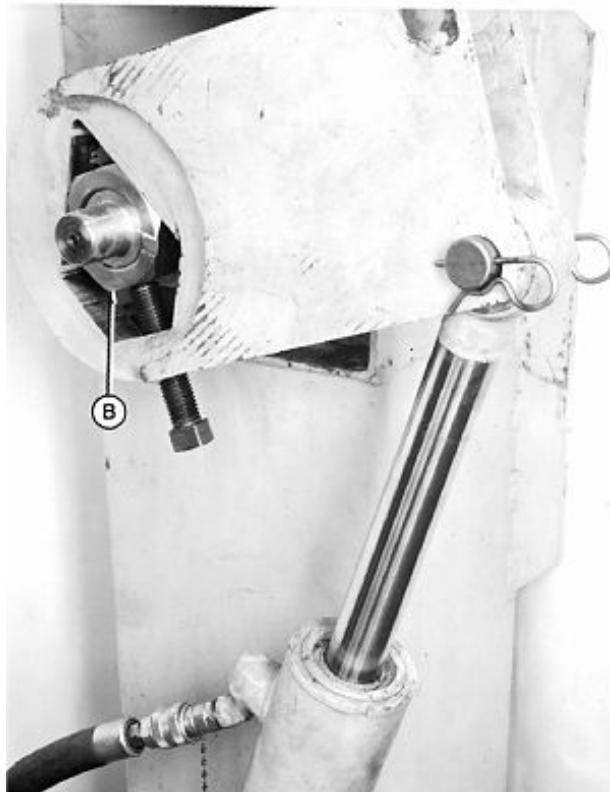
Rod Nut Set Screw—Bu-

cket—Torque..... 57 N·m (42 lb-ft)

26. Stake rod nut set screw in two places 90° from previous stake marks.

**CAUTION: Use care when installing cylinder rod to avoid damage to sliding surfaces.**

27. Apply clean oil to piston and seals. Attach hoist to rod using lifting strap. Carefully install piston, rod and rod guide into barrel.



T776AH—UN—22MAY92

#### B—Nut

28. Tighten rod guide cap screws.

#### Specification

Rod Guide-to Barrel Cap

Screw—Boom—Torque..... 171 N·m (126 lb-ft)

Rod Guide-to Barrel Cap

Screw—Arm—Torque..... 271 N·m (200 lb-ft)

Rod Guide-to Barrel Cap

Screw—Bucket—Tor-

que..... 171 N·m (126 lb-ft)

29. Install lines.

LD30992,00001AD -19-02OCT02-21/21

### Hydraulic Cylinder Bleed Procedure

**IMPORTANT:** This procedure must be performed whenever boom, arm, or bucket cylinders are purged of oil. Bleed air at initial start-up, whenever major repairs or maintenance (oil change) is done on hydraulic system, or when machine has been in storage for a period of time. Failure to do so will result in internal damage to components. The following procedure is recommended to purge all air from system.

1. Position cylinder with cylinder rod retracted and the rod end filled with clean oil.
2. Connect the cylinder head end and lines.
3. Run engine at slow idle.
4. Slowly operate function to move cylinder to the most horizontal position possible.
5. Slowly extend and retract cylinder several times to approximately 100 mm (4 in.) from end of stroke.
6. Operate cylinder several times to full stroke.
7. Check hydraulic oil. See 160CLC Drain and Refill Capacities. (Operator's Manual.) See Hydraulic Oil. (Operator's Manual.)

TX,33,GG2374 -19-24APR02-1/1

*Hydraulic System*

## Section 43 Swing or Pivoting System

### Contents

	Page
<b>Group 4350—Mechanical Drive Elements</b>	
Swing Gearbox .....	43-4350-1
Swing Gearbox Disassemble and	
Assemble.....	43-4350-4
Start-Up Procedure .....	43-4350-7
Upperstructure Remove And	
Install .....	43-4350-8
Swing Bearing .....	43-4350-15
<b>Group 4360—Hydraulic System</b>	
Swing Motor and Park Brake.....	43-4360-1
Crossover Relief Valve and Make-Up Valve .....	43-
4360-6	
Swing Motor	
Start-Up Procedure .....	43-4360-7

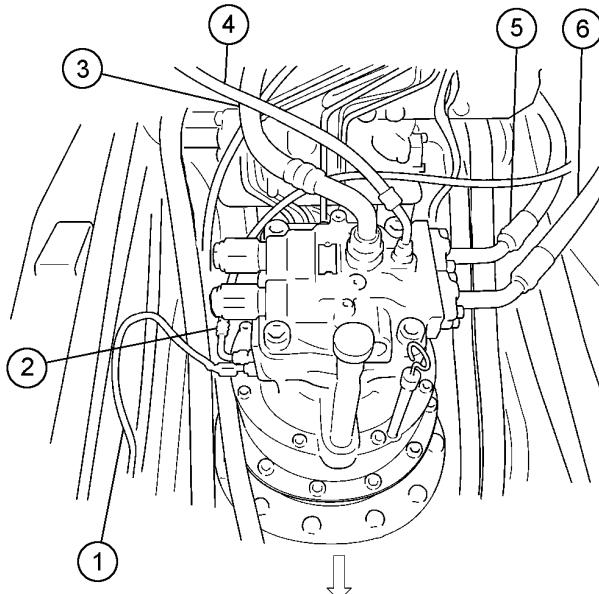
*Contents*

### Swing Gearbox Remove and Install

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Pull vacuum in hydraulic oil tank using vacuum pump or drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Disconnect wiring harness (1) and lines (2—6).

1—Wiring Harness	4—Line
2—Line	5—Line
3—Line	6—Line



T160330-UN-24OCT02

TX08227,000025F -19-17OCT02-1/3

**CAUTION:** Heavy component; use a hoist.

*NOTE: Swing motor may be removed by itself or with swing gearbox. To remove swing motor. See Swing Motor and Park Brake Repair. (Group 4360.)*

*Mark swing gearbox housing to machine upperstructure to aid in installation.*

4. Install JT01748 Lifting Brackets and connect to hoist.

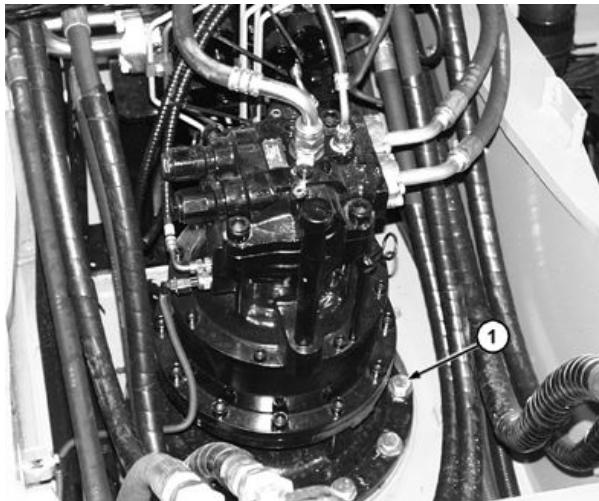
#### Swing Gearbox—Specification

Swing Motor, Brake, and Gearbox—Weight..... 220 kg (485 lb) approximate

5. Remove cap screws and washers (1).
6. Remove swing gearbox.
7. Repair or replace parts as necessary.
8. Apply rigid-form-in place gasket to mating surfaces of swing gearbox housing and upperstructure.
9. Install swing gearbox.
10. Tighten cap screws (1).

#### Swing Gearbox—Specification

Swing Gearbox-to-Upperstructure Cap Screw—Torque..... 500 N·m (370 lb-ft)



Swing Gearbox

1—Cap Screw and Washer (12 used)

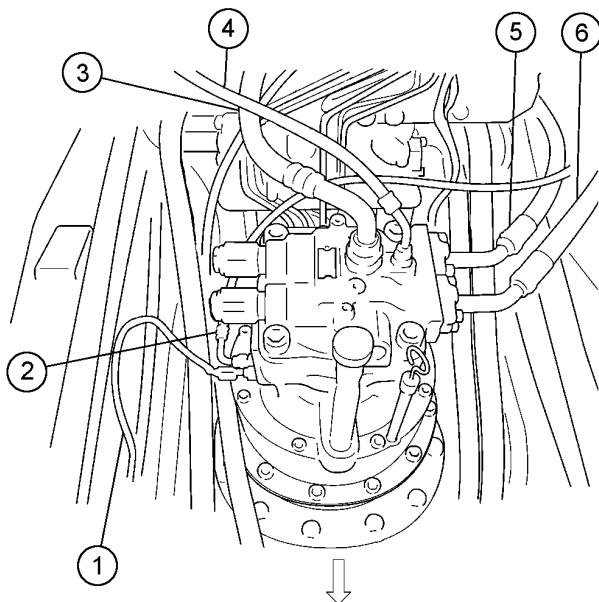
T143498B-UN-02AUG01

Continued on next page

TX08227,000025F -19-17OCT02-2/3

11. Connect wiring harness (1) and lines (2-6).
12. If hydraulic oil tank was drained, fill hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
13. Perform Swing Gearbox Start-Up Procedure. (Group 4350.) Perform Swing Motor and Park Brake Start-Up Procedure. (Group 4360.)

1—Wiring Harness      4—Line  
2—Line      5—Line  
3—Line      6—Line

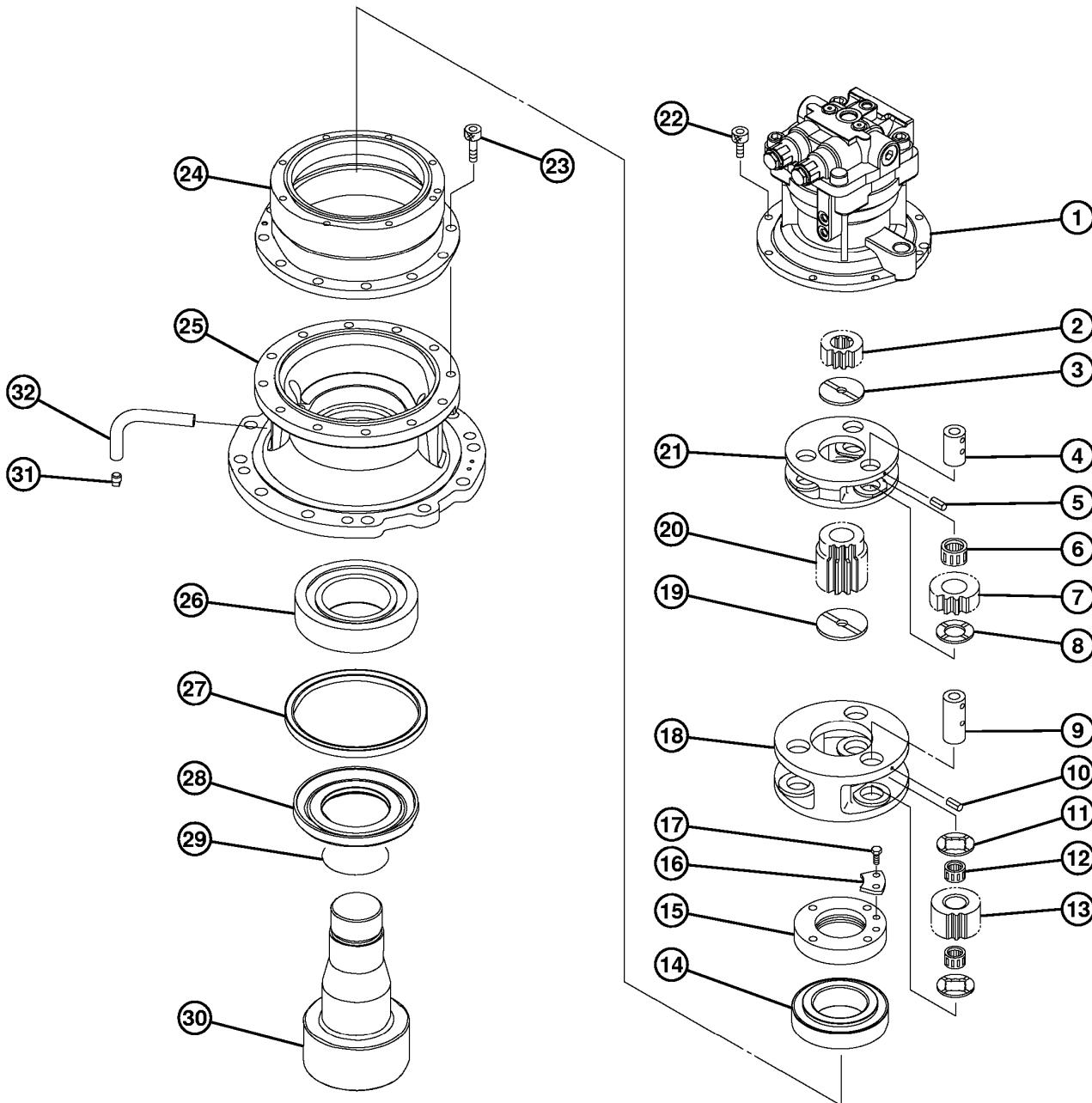


T160330—UN—24OCT02

TX08227,000025F -19-17OCT02-3/3

*Mechanical Drive Elements*

## Swing Gearbox Disassemble and Assemble



T160388

T160388 -UN-24OCT02

Continued on next page

JP51892,000000D -19-17OCT02-1/6

1—Swing Motor	9—Pin (3 used)	17—Cap Screw (2 used)	24—Ring Gear
2—First Stage Sun Gear	10—Spring Pin (3 used)	18—Second Stage Carrier	25—Housing
3—Thrust Plate	11—Thrust Plate (6 used)	19—Thrust Plate	26—Roller Bearing
4—Pin (3 used)	12—Bearing (6 used)	20—Second Stage Sun Gear	27—Oil Seal
5—Spring Pin (3 used)	13—Planetary Gear (3 used)	21—First Stage Carrier	28—Sleeve
6—Bearing (3 used)	14—Roller Bearing	22—Cap Screw (8 used)	29—O-Ring
7—Planetary Gear (3 used)	15—Bearing Nut	23—Cap Screw (12 used)	30—Shaft
8—Thrust Plate (3 used)	16—Lock Plate		31—Pipe Plug

32—Pipe

1. Make alignment marks between swing motor (1), ring gears (24), and between ring gear (24) and housing (25) to aid in assembly.

**⚠ CAUTION: Heavy component; use a hoist.**

**Swing Gearbox—Specification**

Swing Motor—Weight..... 47 kg (104 lb) approximate

2. Remove cap screws (22) and swing motor (1) from swing gearbox.
3. Remove first stage carrier (21) from ring gear (24).

*NOTE: First stage sun gear may be removed separately or along with carrier.*

**⚠ CAUTION: Heavy component; use a hoist.**

**Swing Gearbox—Specification**

Ring Gear—Weight..... 23 kg (50 lb) approximate

4. Remove cap screws (23) and ring gear (24).
5. Remove second stage carrier (18).

*NOTE: Second stage sun gear may be removed separately or with carrier.*

*NOTE: Procedure for disassembly of first and second stage carriers is the same.*

6. Disassemble first stage carrier (21) assembly, remove first stage sun gear (2).

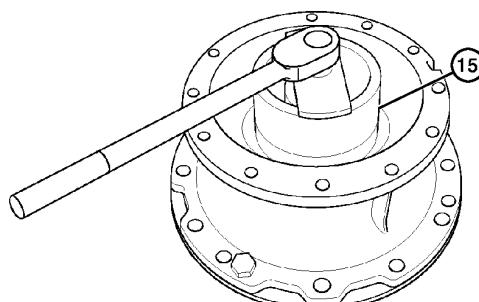
**IMPORTANT: The hole for the spring pin located in the first stage carrier does not continue through. Pay attention to the tapping-in distance when tapping the spring pin in.**

7. Tap spring pin (5) into pin (4).
8. Remove pin (4), planetary gear (7), needle bearing (6), and thrust plate (8) from first stage carrier (21).
9. Inspect needle bearing for wear.
10. Remove thrust plate (3) from carrier.
11. Using wood blocks, clamp pin (4) in vise. Tap spring pin (5) out.
12. Remove cap screws (17) and lock plate (16).

JP51892,000000D -19-17OCT02-2/6

13. Remove bearing nut (15) from shaft (30) using swing gearbox nut spanner wrench. See DFT1220 Swing Gearbox Nut Spanner Wrench. (Group 9900.)

**15—Bearing Nut**



T142064

T142064—JUN—14MAY01

Continued on next page

JP51892,000000D -19-17OCT02-3/6

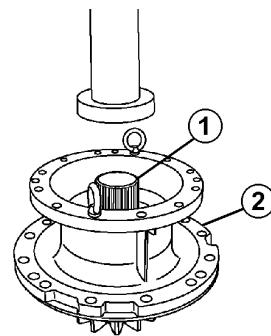
**CAUTION: Heavy component; use a hoist.**

**Swing Gearbox—Specification**

Housing Assembly—Weight.....110 kg (240 lb) approximate

*NOTE: Bearing and sleeve are pressed onto shaft.*

14. Using press, push upper end of shaft (1) and remove from housing (2). Inner race of roller bearing (26) and sleeve (28) are removed with shaft (30).
15. Remove and discard oil seal (27).
16. Remove outer race from housing by inserting bar through oil passage in housing, and tap it out.



1—Shaft

2—Housing

T146941 –UN–19NOV01

JP51892,000000D -19-17OCT02-4/6

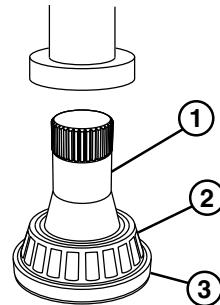
17. Inspect shaft (1), roller bearing (2), and sleeve (3).
18. If disassembly is necessary, use press to push upper end of shaft to remove roller bearing and sleeve.
19. Repair or replace parts as necessary.
20. Apply rigid form-in-place gasket to OD of new oil seal (27).
21. Install oil seal so lip (spring side) is toward bottom of bore. Push seal to bottom of bore.
22. Apply thin layer of multi-purpose grease to O-ring (29) and lip of oil seal.

23. Apply hydraulic oil to all internal parts.
24. Apply film of grease on threaded surface of bearing nut (15). Install bearing nut on shaft (30) with stepped side of bearing nut towards roller bearing (14).
25. Tighten bearing nut with swing gearbox nut spanner wrench so splines of lock plate (16) and shaft (30) are aligned. See DFT1220 Swing Gearbox Nut Spanner Wrench. (Group 9900.)

**Swing Gearbox—Specification**

Bearing Nut—Torque.....353 N·m (260 lb-ft)

*NOTE: Procedure for assembly of first and second stage carriers is the same.*



1—Shaft  
2—Roller Bearing

3—Sleeve

T146899 –UN–19NOV01

26. To assemble second stage carrier install bearing (12) into planetary gear (13).
27. Install planetary gear (13) with thrust plates (11) into second stage carrier (18).
28. Align spring pin hole in pin (9) to face out.

Continued on next page

JP51892,000000D -19-17OCT02-5/6

29. Install spring pins (5 and 10) with slit towards end of pin.
30. Install thrust plate (19) with oil grooves towards second stage sun gear (20).
31. Install second stage carrier (18) so notch is aligned with lock plate (16).
32. Install second stage sun gear (20) into second stage carrier (18) assembly with small diameter part of second stage sun gear up.
33. Install first stage sun gear (2) into first stage carrier (21) assembly with stepped side of sun gear down.
34. Apply rigid form-in-place gasket to ring gear (24), housing (25) and swing motor (1) mating surfaces.

**CAUTION: Heavy component; use a hoist.**

**Swing Gearbox—Specification**

Swing Motor—Weight..... 47 kg (104 lb) approximate

35. Align marks on swing motor and ring gear.

36. Install swing motor.

37. Apply thread lock and sealer (medium strength) to cap screws (22 and 23). Tighten cap screws.



1—Slit

**Swing Gearbox—Specification**

Ring Gear-to-Housing  
Cap Screw—Torque..... 205 N·m (151 lb-ft)

**Swing Gearbox—Specification**

Swing Motor-to-  
Ring Gear Cap  
Screw—Torque..... 88 N·m (65 lb-ft)

JP51892,000000D -19-17OCT02-6/6

T142429-UN-22JUN01

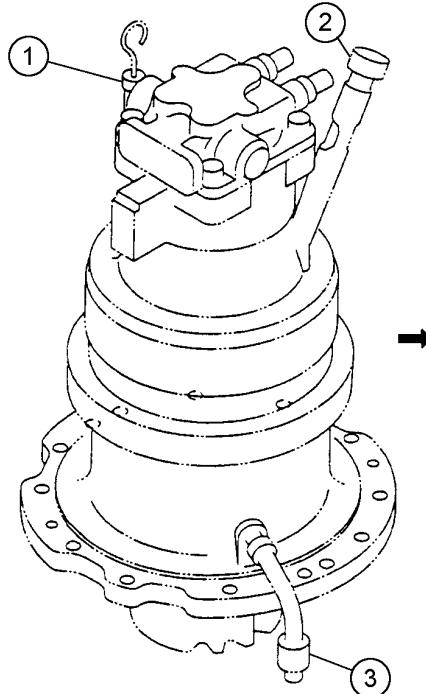
### Swing Gearbox Start-Up Procedure

**IMPORTANT: Swing gearbox will be damaged if not filled with oil before operating swing function. Procedure must be performed whenever a new swing gearbox is installed or oil has been drained from the gearbox.**

1. Check that drain line plug (3) is installed.
2. Remove fill cap (2) and add oil. See Swing Gearbox and Propel Gearbox Oils. (Operator's Manual.)
3. Install fill cap (2). Check oil level on dipstick (1).

1—Dipstick  
2—Fill Cap

3—Drain Line Plug



T160439-UN-24OCT02

TX,25,GG2228 -19-17OCT02-1/1

## Upperstructure Remove And Install

### Remove Upperstructure

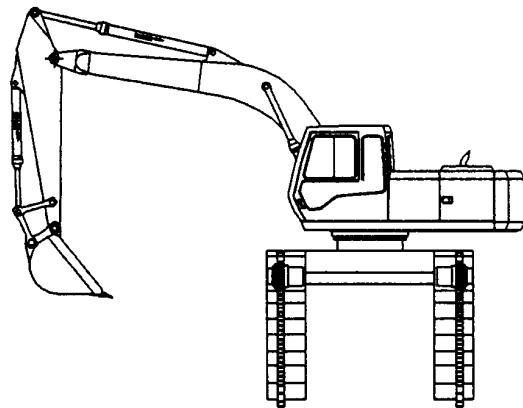
**NOTE:** Procedure requires two technicians. The cement floor must be a minimum of 102 mm (4 in.) thick. Area must be large enough so the upperstructure can be turned 180° with the angle between boom and arm at 90—100° and the tracks laid out flat on the floor.

1. Clean machine thoroughly.

**CAUTION:** Keep the angle between boom and arm at 90—100° to prevent machine from sliding backwards.

2. Park machine with boom to left side (cab side toward sprocket) of undercarriage.
3. Disconnect tracks and lay out flat on floor to sprocket end of undercarriage. See Track Chain Repair. (Group 0130.)

**NOTE:** To make removal of main frame-to-swing bearing cap screws easier after machine is raised into position, loosen the cap screws one turn at this time.



T7712AG -UN-24FEB92

T7712AG CV

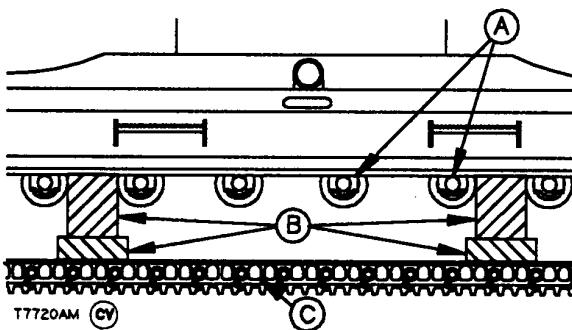
4. Turn upperstructure and raise right side of machine, using boom down function.

TX08227,000026E -19-17OCT02-1/11

5. Put hardwood blocks (B), approximately 254 mm (10 in.) between lower track rollers (A) and track chain (C).
6. Turn upperstructure back to left side so it is 90° to track.

A—Track Rollers  
B—Hardwood Blocks

C—Track Chain



T7720AM -UN-07MAY92

Continued on next page

TX08227,000026E -19-17OCT02-2/11

**⚠ CAUTION: Heavy component; use a hoist.**

**Upperstructure—Specification**

Machine-Without

Tracks—Weight..... 9300 kg (20,500 lb) approximate

7. Put two DFT1089 Barrel Supports under counterweight (D). See DFT1089 Barrel Support. (Group 9900.)

To provide enough clearance, use bridge planks (E) and hardwood blocks (F) to raise height of supports and planks to 1.12 m (44 in.). Height is approximate clearance needed to clear bottom of rotary manifold. Do not put blocks under cap screw heads. Keep height below the maximum.

**Upperstructure—Specification**

Floor-to-Bottom  
of Main Frame

Clearance—Height..... 1.12 m (44 in.) minimum

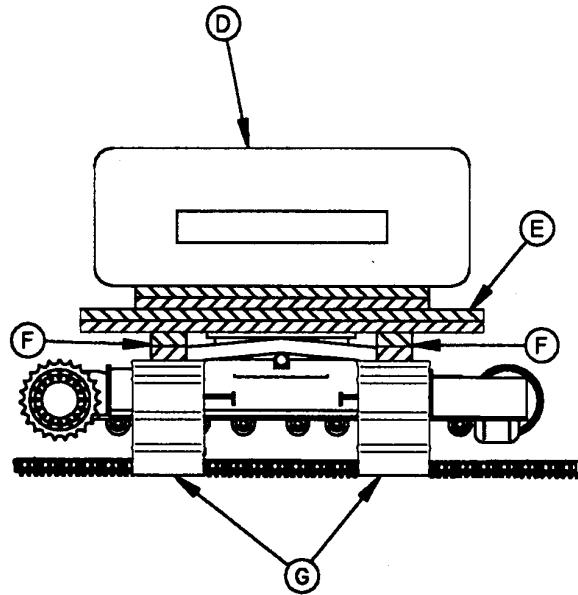
Height ..... 1.17 m (46 in.) maximum

**D—Counterweight**

**E—Bridge Plank (As Required)**

**F—Hardwood Block (As  
Required)**

**G—DFT1089 Barrel Support (4  
used)**

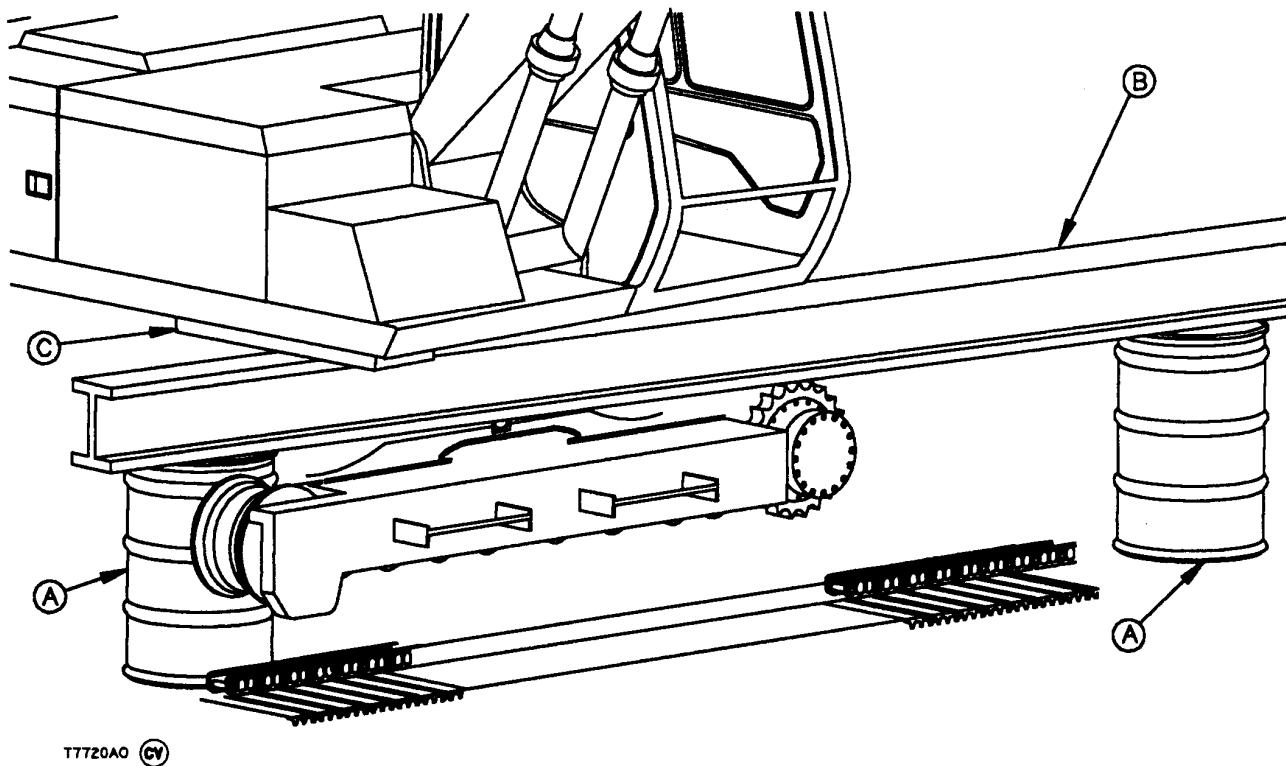


T7720AS

Continued on next page

TX08227,000026E -19-17OCT02-3/11

T7720AS —JUN—07MAY92



T7720AO

T7720AO - UN - 07MAY92

A—DFT1089 Barrel Support (4 used)      B—3.7 m (12 ft) Length of W8 x 28 lb Wide Flange Beam (2 used)      C—Hardwood Block (Use as Required)

8. Slowly raise left side, using boom down function, until machine is level.
9. Place barrel supports and 3.7 m (12 ft) length of W8 x 28 lb Wide Flange Beam (B) under main frame at right boom cylinder and right corner of cab. See DFT1089 Barrel Support

For maximum support, barrel supports must be positioned so beam is under main frame and corner of cab as far as possible.

Install hardwood blocks (C) as needed to make up for any unevenness.

10. Lower machine so main frame and corner of cab are on beam.

Check that bottom of main frame is 1.12 m (44 in.) off floor and level. Keep height to maximum of 1.17 m (46 in.).

Continued on next page

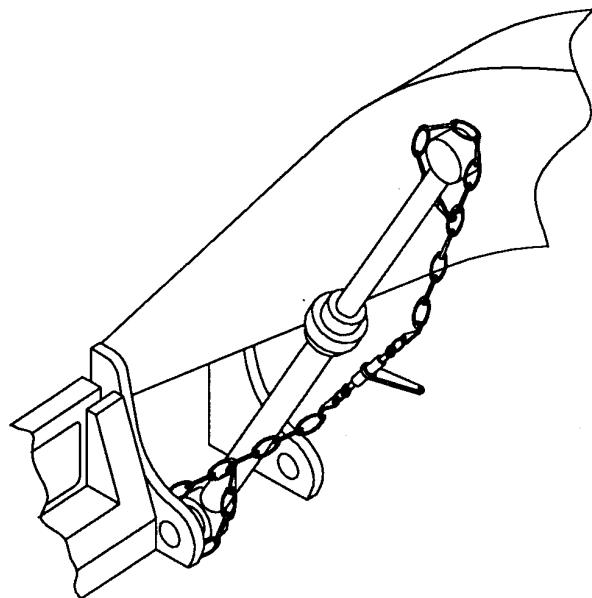
TX08227,000026E -19-17OCT02-4/11

11. Install 13 mm (1/2 in.) chain around boom cylinder head end boss on frame and rod end boss on boom. Tighten chain just enough to remove slack using chain binder.

12. Disconnect negative battery cables.

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

13. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)



T7149AJ CV

T7149AJ—UN—05OCT89

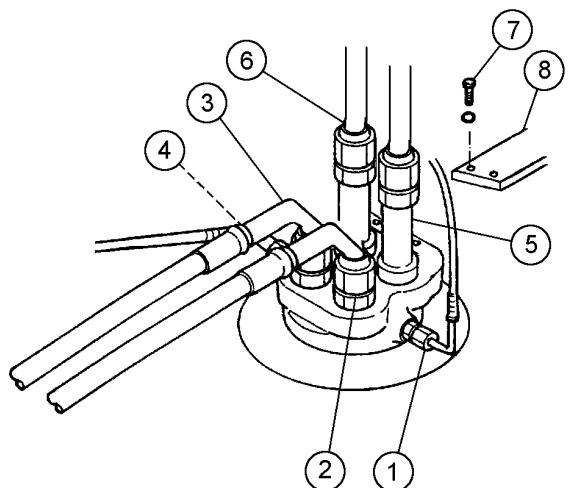
TX08227,000026E -19-17OCT02-5/11

14. Disconnect lines (1—6) and fittings from top of rotary manifold.

15. Remove cap screw (7) and bracket (8) on rotary manifold.

16. Put matching marks on upperstructure and outer race of swing bearing.

1—Line	5—Line
2—Line	6—Line
3—Line	7—Cap Screw
4—Line	8—Bracket



T160302—UN—24OCT02

Rotary Manifold

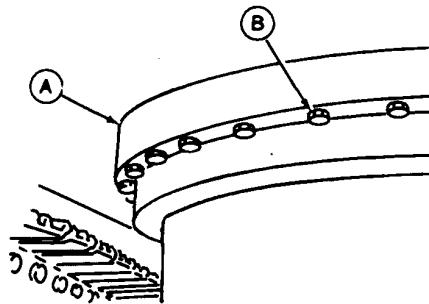
Continued on next page

TX08227,000026E -19-17OCT02-6/11

**CAUTION: Heavy component; use a hoist.****Upperstructure—Specification**

Undercarriage—Weight ..... 6245 kg (13,770 lb) approximate

17. Put 18-t (20-ton) service jack under each end of undercarriage. Use hardwood blocks as necessary.
18. Remove cap screws (B) from swing bearing (A).
19. Slowly lower undercarriage onto track chain.
20. Lift sprocket end of undercarriage so sprocket clears track chain.
21. Pull undercarriage out from under upperstructure.
22. Repair or replace parts as necessary.



A

B

A—Swing Bearing  
B—Cap Screw (31 used)

T6626JK—UN—06DEC88

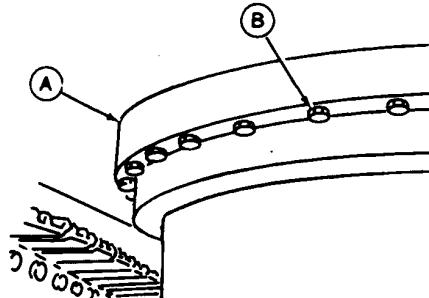
TX08227,000026E -19-17OCT02-7/11

**Install Upperstructure****CAUTION: Heavy component; use a hoist.**

1. Push undercarriage under upperstructure.
2. Align matching mark on outer race of swing bearing with mark on upperstructure.
3. Install DFT1113 Guide Pins to help align holes in swing bearing (A) with holes in main frame. See DFT1113 Guide Pin. (Group 9900.)
4. Raise undercarriage into position using two 18-t (20-ton) service jacks. It may be necessary to turn swing bearing inner race to align teeth on swing motor pinion shaft.
5. Install cap screws (B) and tighten.

**Upperstructure—Specification**

Swing Bearing-to-  
Upperstructure Cap  
Screw—Torque..... 510 N·m (380 lb-ft)



A

B

A—Swing Bearing  
B—Cap Screw (31 used)

T6626JK—UN—06DEC88

If all cap screws are not accessible, tighten them after machine has been lowered and supports have been removed.

Continued on next page

TX08227,000026E -19-17OCT02-8/11

6. Connect lines (1-6) and fittings to top of rotary manifold.
7. Install cap screws (7) and bracket (8) on rotary manifold.

**Upperstructure—Specification**

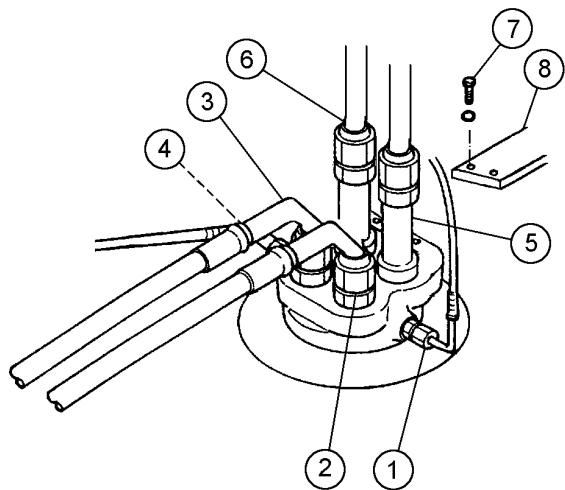
Rotary Manifold Cap

Screw—Torque..... 140 N·m (103 lb·ft)

8. Connect negative battery cable.

9. Remove chain.

1—Line	5—Line
2—Line	6—Line
3—Line	7—Cap Screw (2 used)
4—Line	8—Bracket



T160302—UN—24OCT02

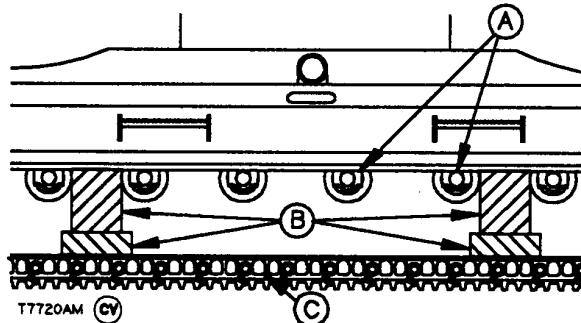
*Rotary Manifold*

TX08227,000026E -19-17OCT02-9/11

10. Put hardwood blocks (B) between lower track rollers (A) and track chain (C) on counterweight side.

A—Track Rollers  
B—Wooden Blocks

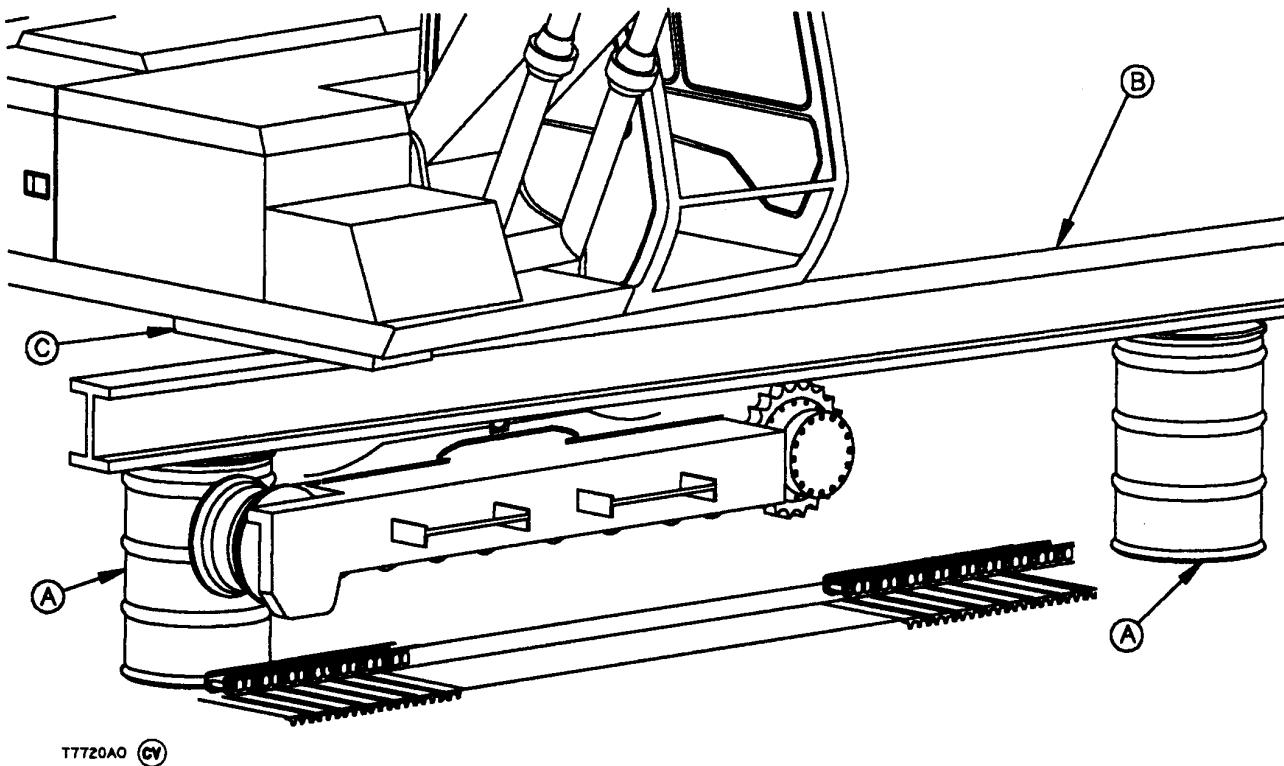
C—Track Chain



T7720AM —UN—07MAY92

Continued on next page

TX08227,000026E -19-17OCT02-10/11



T7720AO

T7720AO - UN - 07MAY92

A—DFT1089 Barrel Support (4 used)      B—3.7 m (12 ft) Length of W8 x 28 lb Wide Flange Beam (2 used)      C—Hardwood Block (use as required)

11. Raise machine just enough to remove hardwood blocks (C), wide flange beam (B), and barrel supports (A).
12. Lower machine so lower track rollers and front idler are on track chain.
13. Turn upperstructure and raise machine and remove bridge planks and barrel supports from other side.
14. Remove hardwood blocks between roller and track chain.
15. Lower machine so lower track rollers and front idler are on track chain.
16. Tighten any remaining swing bearing-to-main frame cap screws.

#### Upperstructure—Specification

Swing Bearing-to-Upperstructure Cap  
Screw—Torque..... 510 N·m (380 lb·ft)

17. Install track chains. See Track Chain Repair. (Group 0130.)
18. Perform Check and Adjust Track Sag. (Operator's Manual.)

TX08227,000026E -19-17OCT02-11/11

## Swing Bearing Repair

### Remove and Install Swing Bearing

1. Remove upperstructure. See Upperstructure Remove And Install. (Group 4350.)



**CAUTION: Heavy component; use a hoist.**

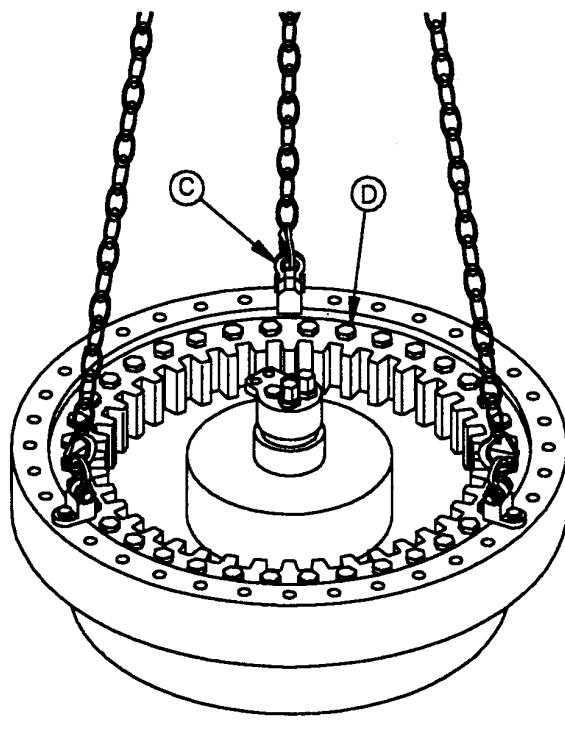
#### Swing Bearing—Specification

Swing Bearing—Weight..... 220 kg (490 lb) approximate

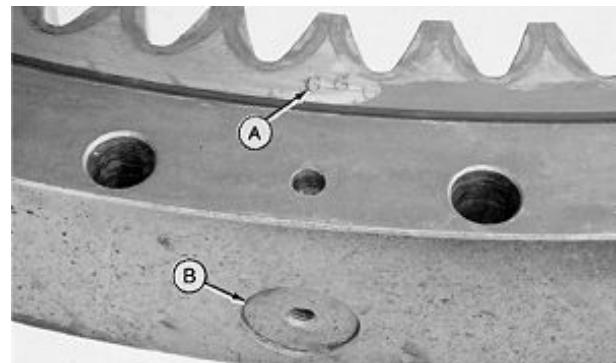
2. Connect swing bearing to hoist using lifting brackets (C) such as JT01748 Lifting Brackets.
3. Remove cap screws (D). Remove swing bearing.

A—Tooth  
B—Loading Plug

C—Lifting Bracket (3 used)  
D—Cap Screw (36 used)



T7720AR (5)



Continued on next page

TX08227,000026F -19-17OCT02-1/8

T7720AR—UN—07MAY92

T5925AA—UN—11APR90

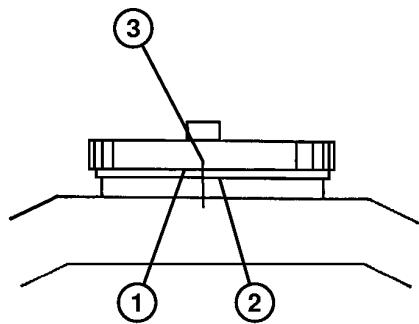
4. Put alignment marks on swing bearing inner race (1) and track frame (2).
5. Check and replace swing bearing upper and lower seals if necessary. See procedure in this group.
6. Replace steel balls and spacers as necessary.
7. Repair or replace parts as necessary.
8. Clean mating surfaces of swing bearing, upperstructure, and undercarriage.
9. Apply cure primer to mating surface on undercarriage and swing bearing. Apply rigid form-in-place gasket.
10. Align marks on frame and swing bearing.

**IMPORTANT:** The tooth marked with the letter "G" or "S" or equivalent is the starting and stopping point for the hardening process. The tooth and the bearing loading plug must be installed on the right side of the machine so the use of that part of the swing bearing is minimized.

11. Install swing bearing on undercarriage so tooth (A) marked "G" or "S" or equivalent and bearing loading plug (B) is to right side of machine.
12. Install cap screws (D) and tighten.

#### Swing Bearing—Specification

Undercarriage-to-Swing  
Bearing Cap  
Screw—Torque..... 490 N·m (360 lb-ft)



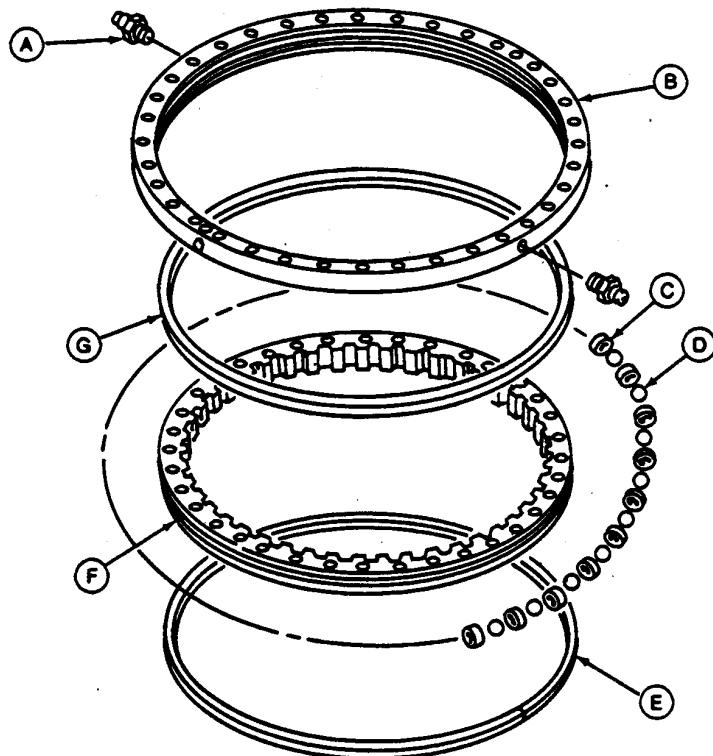
T160378-UN-24OCT02

- 1—Swing Bearing
- 2—Track Frame
- 3—Alignment Mark
13. Apply multi-purpose grease to swing bearing teeth and pinion shaft. See Track Adjuster, Working Tool Pivot, Swing Bearing, and Swing Bearing Gear Grease. (Operator's Manual.)
14. Install upperstructure. See Upperstructure Remove And Install. (Group 4350.)

Continued on next page

TX08227,000026F -19-17OCT02-2/8

## Disassemble and Assemble Swing Bearing



A—Lubrication Fitting (2 used)  
B—Outer Race

C—Spacer (121 used)  
D—Steel Ball (121 used)

E—Lower Seal  
F—Inner Race  
G—Upper Seal

1. Check and replace swing bearing upper seal (G) and lower seal (E) if necessary. See procedure in this group.

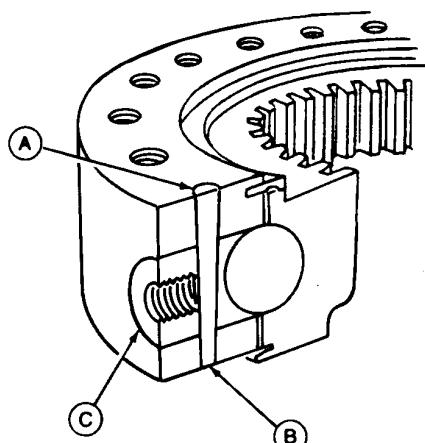
TX08227,000026F -19-17OCT02-3/8

T6626IP—UN—07NOV88

2. Grind tack weld (A) off top of taper pin (B).
3. Drive taper pin out from bottom side of bearing.
4. Remove loading plug (C) using an M10-1.50 cap screw.

A—Tack Weld  
B—Taper Pin

C—Loading Plug



T6876FI—UN—07MAY92

Continued on next page

TX08227,000026F -19-17OCT02-4/8

5. Remove steel balls (A) and spacers (B).
6. Turn inner race to remove remaining steel balls and spacers.

**⚠ CAUTION: Heavy component; use a hoist.**

**Swing Bearing—Specification**

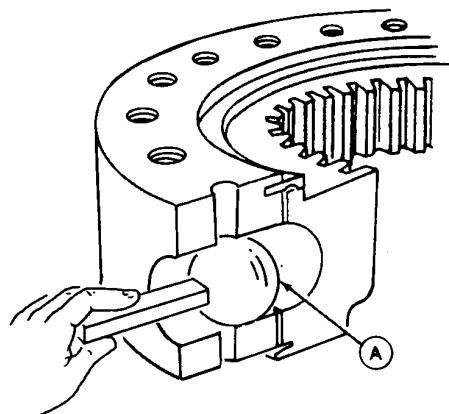
Swing Bearing Outer

Race—Weight..... 90 kg (200 lb)

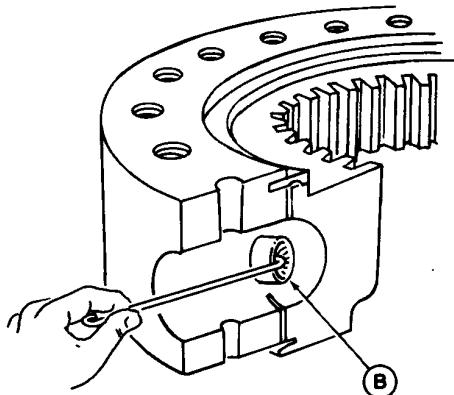
7. Lift outer race off inner race.
8. Replace parts as necessary.
9. Apply grease to spacers and steel balls.
10. Install spacers (B) and steel balls (A). Turn inner race as needed to install spacers and steel balls.

A—Steel Ball (121 used)

B—Spacer (121 used)



T6876FK—UN—07MAY92



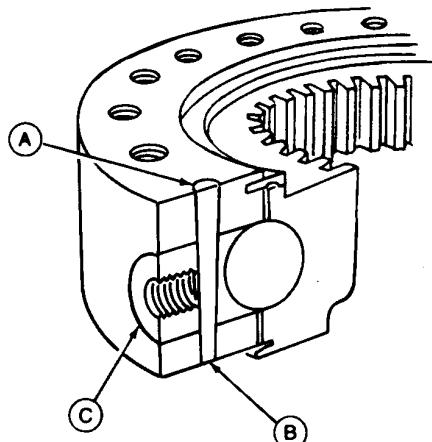
T7763AB—UN—07MAY92

TX08227,000026F -19-17OCT02-5/8

11. Install loading plug (C).
12. Install taper pin (B) even with top of swing bearing.
13. Tack weld pin (A) to swing bearing.
14. Add multi-purpose grease to swing bearing through lubrication fittings. See Track Adjuster, Working Tool Pivot, Swing Bearing, and Swing Bearing Gear Grease. (Operator's Manual.)

A—Tack Weld  
B—Taper Pin

C—Loading Plug



T6876FI—UN—07MAY92

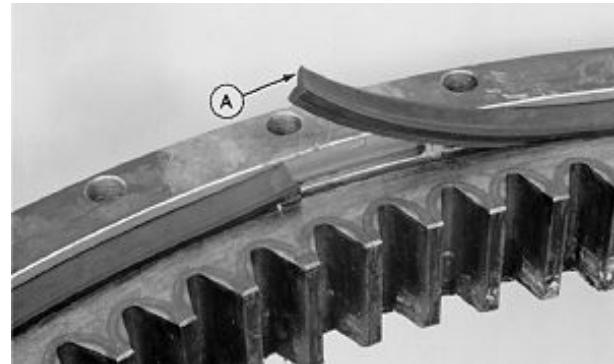
Continued on next page

TX08227,000026F -19-17OCT02-6/8

**Install Swing Bearing Upper Seal**

1. Remove old seal (A).
2. Remove old adhesive from seal groove. Thoroughly clean seal groove and new seal using cure primer.
3. Apply instant gel adhesive sparingly to seal groove.
4. Install seal with lip against outer bearing race.
5. Start 76 mm (3 in.) from end of seal using a blunt instrument to force seal into groove. Push seal in direction of portion already installed to avoid stretching seal.
6. Before bringing ends of seal together, cut off excess length.
7. Apply instant gel adhesive to both ends of seal. Push ends into seal groove making sure they come together.

**IMPORTANT: To avoid pulling seal out of groove,  
adhesive must cure for at least 24 hours  
before using swing function**



T5925AM -UN-11APR90

A—Seal

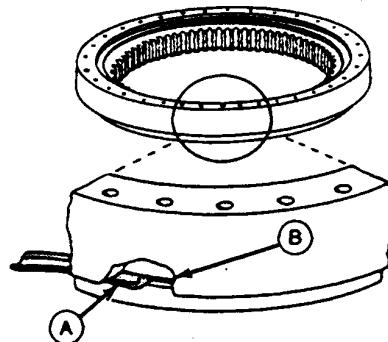
8. Let adhesive cure for at least 24 hours before using swing function.

TX08227,000026F -19-17OCT02-7/8

**Install Swing Bearing Lower Seal**

*NOTE: Part of swing bearing shown cut away to show lower seal in groove.*

1. Remove old seal (A).
2. Remove old adhesive from seal groove (B). Thoroughly clean seal groove and new seal using cure primer.
3. Apply instant gel adhesive sparingly to seal groove.
4. Install seal with seal lip against outer race.
5. Start 76 mm (3 in.) from end of seal using blunt instrument to force seal into groove. Push seal in direction of portion already installed to avoid stretching seal.
6. Before bringing ends of seal together, cut off excess length.
7. Apply adhesive to both ends of seal. Push ends into seal groove making sure they come together.



T5936BA -UN-17MAY89

A—Seal

B—Seal Groove

8. Let adhesive cure for at least 24 hours before using swing function.

TX08227,000026F -19-17OCT02-8/8

**IMPORTANT: To avoid pulling seal out of groove,  
adhesive must cure for at least 24 hours  
before using swing function**

*Mechanical Drive Elements*

# Group 4360 Hydraulic System

## Swing Motor and Park Brake Repair

### Remove and Install Swing Motor and Park Brake

**CAUTION:** The hydraulic oil tank is pressurized. High pressure release of oil can cause serious burns or penetrating injury.

1. Perform Hydraulic Oil Tank Pressure Release Procedure. (Group 3360.)
2. Drain hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
3. Disconnect wiring harness (1) and lines (2-6).

**CAUTION: Heavy Component; use a hoist.**

#### Swing Motor and Park Brake—Specification

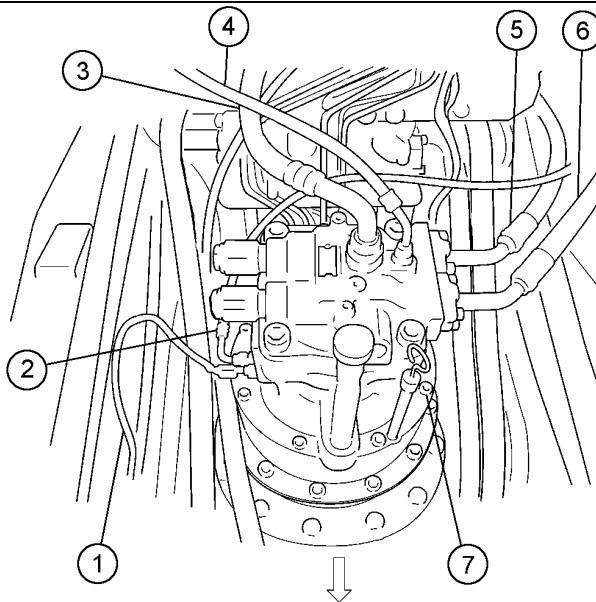
Swing Motor and Park  
Brake—Weight..... 47 kg (104 lb) approximate

4. Remove cap screws (7) and remove swing motor and park brake.
5. Repair or replace parts as necessary.
6. Install swing motor and brake.
7. Tighten cap screws (7).

#### Swing Motor and Park Brake—Specification

Swing Motor-to-  
Ring Gear Cap  
Screw—Torque..... 88 N·m (65 lb-ft)

8. Connect wiring harness (1) and lines (2-6).



1—Wiring Harness  
2—Line  
3—Line  
4—Line

5—Line  
6—Line  
7—Cap Screw

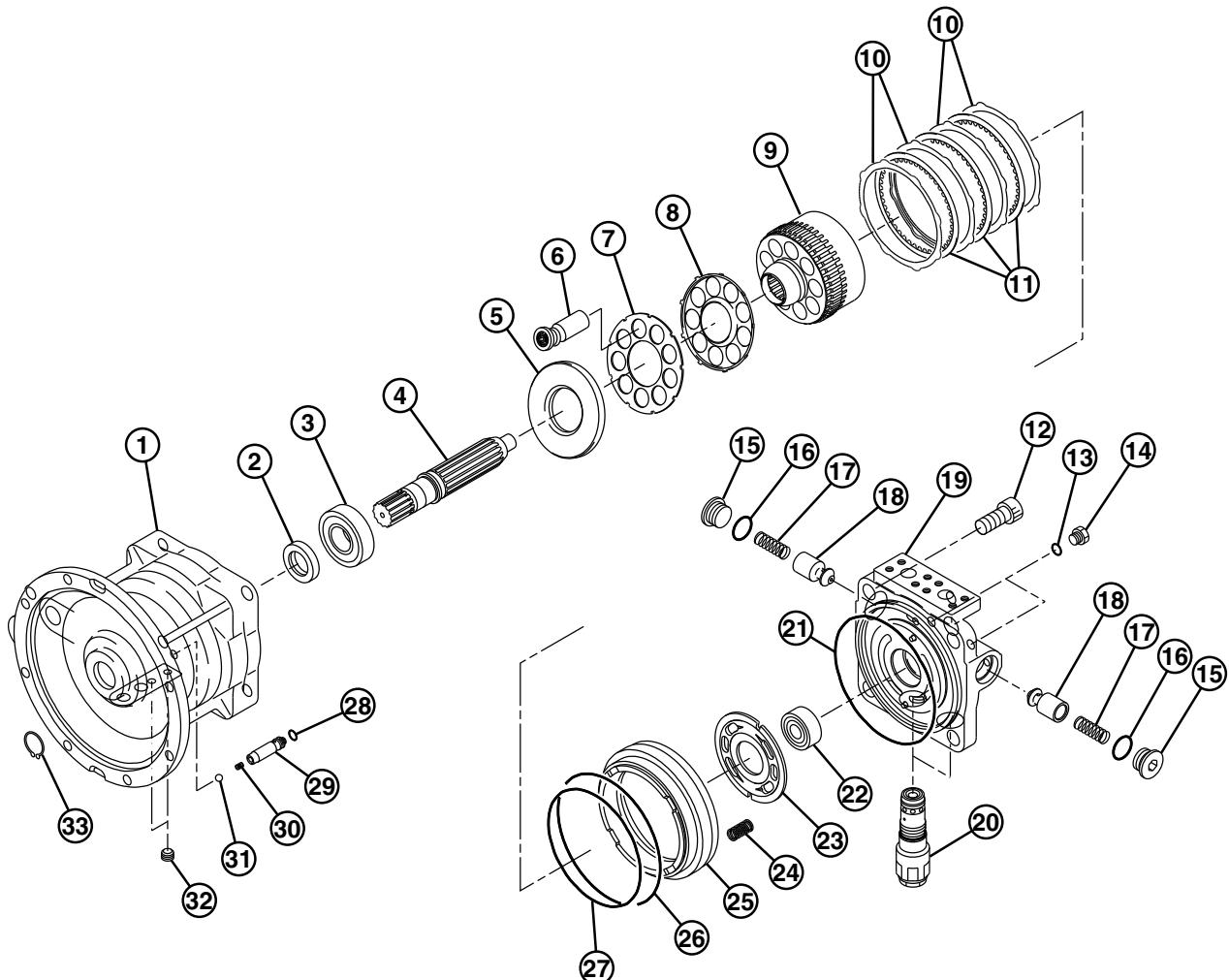
9. Fill hydraulic oil tank. See 160CLC Drain and Refill Capacities. (Operator's Manual.)
10. Perform Swing Motor and Park Brake Start-Up Procedure. (Group 4360.)

Continued on next page

TX08227,0000261 -19-03JAN13-1/6

T160467—UN-24OCT02

**Disassemble Swing Motor and Park Brake**



T142065

T142065 -UN-22JUN01

Continued on next page

TX08227,0000261 -19-03JAN13-2/6

## Hydraulic System

1—Housing	11—Friction Plate (3 used)	18—Poppet (2 used)	25—Brake Piston
2—Oil Seal	12—Cap Screw (4 used)	19—Valve Housing	26—O-Ring
3—Bearing	13—O-Ring (2 used)	20—Crossover Relief Valve (2 used)	27—O-Ring
4—Shaft	14—Plug (2 used)	21—O-Ring	28—O-Ring
5—Trust Plate	15—Plug (2 used)	22—Bearing	29—Piston
6—Piston (9 used)	16—O-Ring (2 used)	23—Valve Plate	30—Spring
7—Plate	17—Spring (2 used)	24—Spring (24 used)	31—Ball
8—Retainer			32—Plug (2 used)
9—Cylinder Block			33—Snap Ring
10—Plate (4 used)			

1. Drain oil. Approximate capacity is 0.8 L (0.8 qt).

**CAUTION: Heavy component; use a hoist.**

**Swing Motor and Park Brake—Specification**

Swing Motor and Park

Brake—Weight..... 55 kg (120 lb) approximate

**CAUTION: Swing motor valve housing and cover is under spring pressure. Remove cap screws evenly to release spring force.**

2. Mark alignment of swing motor housing and valve housing assembly. Loosen cap screws (12).

**IMPORTANT: Valve plate has a polished surface. Valve plate may remain on valve housing or stay with cylinder block. Valve plate may be damaged if dropped. Hold valve plate during disassembly.**

3. Remove valve plate (23) and springs (24).

4. Remove brake piston (25).

5. Remove parts (6—9) from shaft (4).

6. Remove snap ring (33) and shaft (4).

7. Push out oil seal (2) and remove outer race of bearing (3).

8. Remove inner race of bearing from shaft.

**NOTE: Filter and orifice are mounted inside of piston (29). Unless clogged or deformed, do not disassemble. Do so only when absolutely needed. If internal parts need to be replaced, replace piston as an assembly.**

9. Replace parts as necessary.

TX08227,0000261 -19-03JAN13-3/6

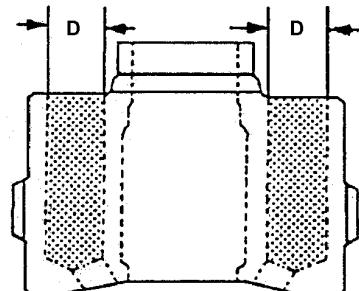
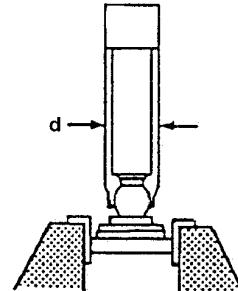
### Inspect Swing Motor and Park Brake

1. Measure clearance between outer diameter of piston and inner bore of cylinder.

**Swing Motor and Park Brake—Specification**

Piston-to-

Cylinder—Clearance..... 0.027 mm (0.0011 in.) new  
0.052 mm (0.0020 in.) maximum used



T142067

T142067 -JUN-22 JUN01

Continued on next page

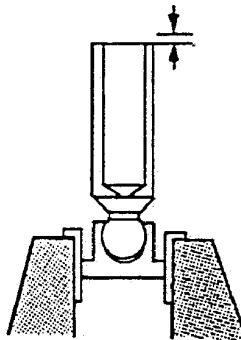
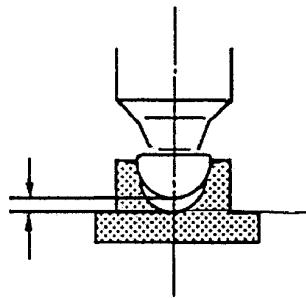
TX08227,0000261 -19-03JAN13-4/6

2. Measure clearance between piston and slipper at caulked position.

**Swing Motor and Park Brake—Specification**

Piston-to-

Slipper—Clearance..... 0.0 mm (0.0 in.) new  
0.3 mm (0.0118 in.) maximum used



T142069

T142069—UN-22JUN01

Continued on next page

TX08227,0000261 -19-03JAN13-5/6

3. Measure thickness of slipper.

**Swing Motor and Park Brake—Specification**

Slipper—Thickness.....	5.5 mm (0.22 in.) new
	5.3 mm (0.21 in.) minimum

4. Measure thickness of friction plate.

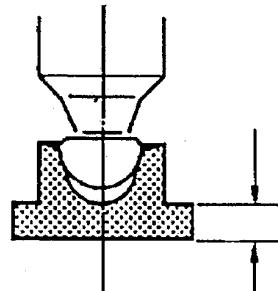
**Swing Motor and Park Brake—Specification**

Friction Plate—Thickness.....	2.0 mm (0.08 in.) new
	1.8 mm (0.07 in.) minimum

**Assemble Swing Motor and Park Brake**

1. Align spline teeth of friction plates (11) with cylinder block (9) and outer tabs of plates (10) with housing (1).
2. Apply petroleum jelly to valve plate (23).
3. Install thrust plate (5) with chamfered edge towards housing (1).

T142072



Slipper Thickness

**CAUTION: Heavy component; use a hoist.**

**Swing Motor and Park Brake—Specification**

Swing Motor and Park Brake—Weight.....	55 kg (120 lb) approximate
---	----------------------------

4. Align mating marks on valve housing (19) and housing (1) and tighten cap screws (12).

**Swing Motor and Park Brake—Specification**

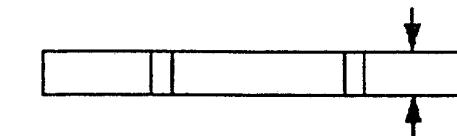
Valve Housing Cap Screw —Torque.....	430 N·m (320 lb-ft)
---	---------------------

5. Install poppet (18) and spring (17). Tighten plug (15) with O-ring (16) attached.

**Swing Motor and Park Brake—Specification**

Poppet Plug—Torque.....	330 N·m (245 lb-ft)
-------------------------	---------------------

6. Install crossover relief valves (20) into valve housing (19).



Friction Plate Thickness

**Swing Motor and Park Brake—Specification**

Crossover Relief Valve—Torque.....	175 N·m (130 lb-ft)
---------------------------------------	---------------------

T142073

T142072—UN—22JUN01

T142073—UN—22JUN01

TX08227,0000261 -19-03JAN13-6/6

## Swing Motor Crossover Relief Valve and Make-Up Valve Repair

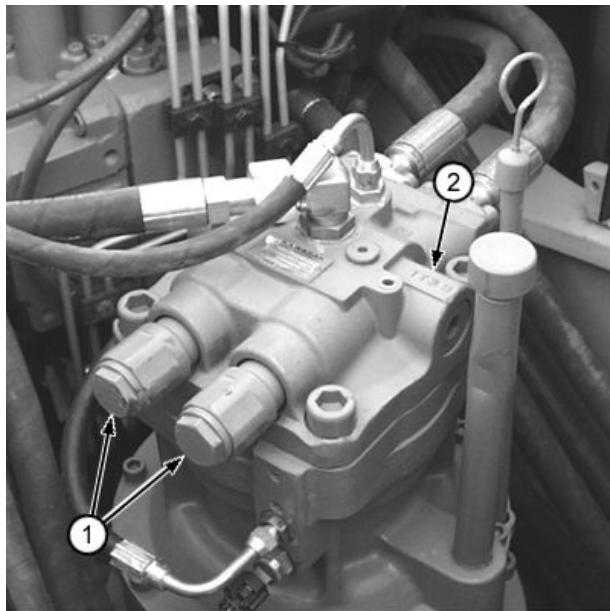
### Remove and Install Crossover Relief Valve

1. Tighten crossover relief valves (1).

**Crossover Relief and Make-Up Valves—Specification**  
 Crossover Relief  
 Valve—Torque..... 175 N·m (130 lb-ft)

2. Check crossover relief valve pressure setting.  
Perform Swing Motor Crossover Relief Valve Test and Adjustment. (Group 9025-25.)

1—Crossover Relief Valve (2      2—Make-Up Valve (2 used)  
 used)



T160491C -UN-19OCT02

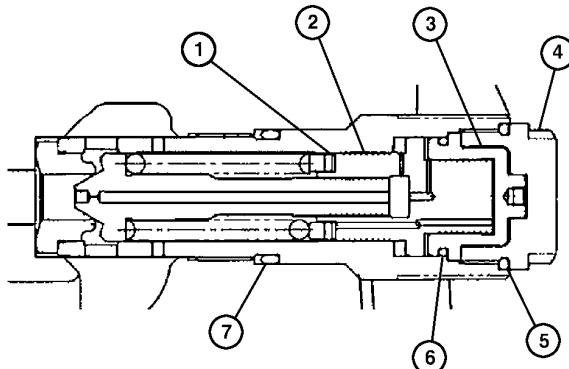
TX08227,0000262 -19-17OCT02-1/3

### Disassemble and Assemble Crossover Relief Valve

1. Tighten plug (4).

**Crossover Relief and Make-Up Valves—Specification**  
 Crossover Relief Valve  
 Plug—Torque..... 118 N·m (88 lb-ft)

1—Shim  
 2—Piston  
 3—Sleeve  
 4—Plug  
 5—O-Ring  
 6—O-Ring  
 7—O-Ring



T142068 -UN-22JUN01

T142068

Continued on next page

TX08227,0000262 -19-17OCT02-2/3

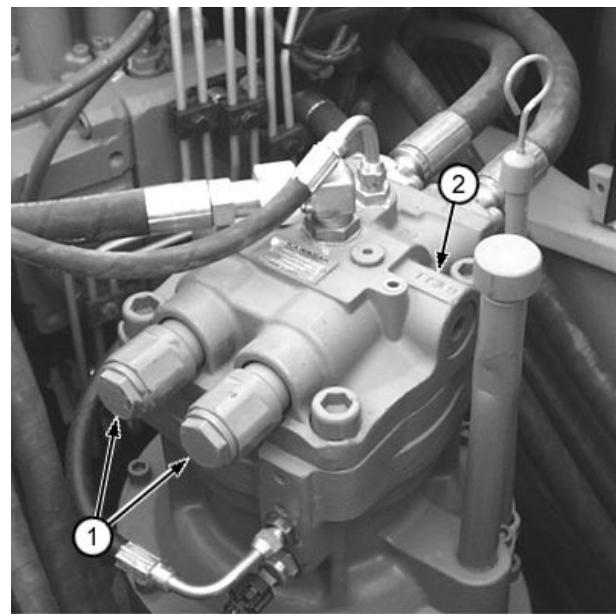
**Remove and Install Make-Up Valve**

Tighten make-up valve (1).

**Crossover Relief and Make-Up Valves—Specification**

Make-Up  
Valve—Torque..... 332 N·m (245 lb·ft)

**1—Crossover Relief Valve (2      2—Make-Up Valve (2 used)  
used)**



T160491C—UN—19OCT02

TX08227,0000262 -19-17OCT02-3/3

**Swing Motor and Park Brake Start-Up Procedure**

**IMPORTANT:** Swing motor will be damaged if not filled with oil before operating swing function. Start-up procedure must be performed whenever a new swing motor is installed or oil has been drained from motor.

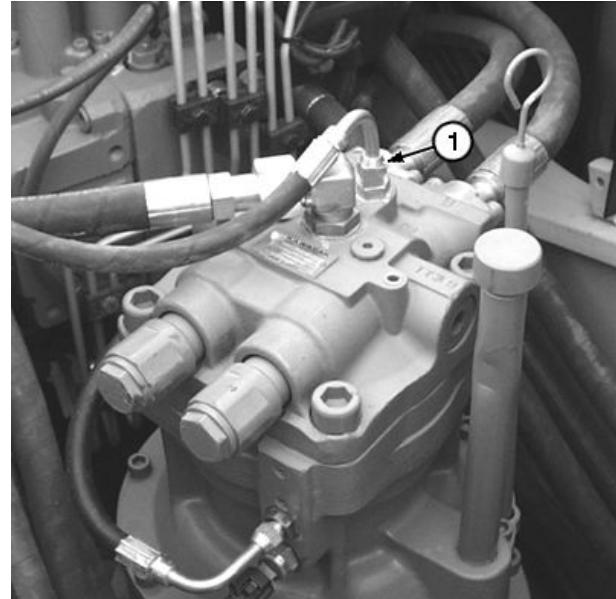
Procedure is to ensure swing motor is filled with oil.

1. Disconnect swing motor drain line (1).

*NOTE: Air must be allowed to escape from swing motor while filling.*

2. Fill motor with oil through port until oil reaches level of port. Allow air to escape from swing motor while filling. See Hydraulic Oil. (Operator's Manual.)
3. Connect swing motor drain line.

**1—Swing Motor Drain Line**



Swing Motor Drain Line

TX1126047A—UN—16NOV12

TX08227,0000263 -19-21NOV12-1/1

*Hydraulic System*

## Section 99 Dealer Fabricated Tools

### Contents

	Page
<b>Group 9900—Dealer Fabricated Tools</b>	
ST4920 Track Recoil Spring Disassembly and Assembly Tool .....	99-9900-1
DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool .....	99-9900-5
DFT1112 Spacer .....	99-9900-6
DFT1155 Propel Gearbox Bearing Nut Wrench .....	99-9900-7
DFT1109 Holding Bar .....	99-9900-8
Rotary Manifold Lifting Tool .....	99-9900-9
DFT1089 Barrel Support .....	99-9900-9
DFT1113 Guide Pin .....	99-9900-10
DFT1119 Pump Support .....	99-9900-10
DFT1220 Swing Gearbox Nut Spanner Wrench .....	99-9900-12

*Contents*

Group 9900  
Dealer Fabricated Tools

**ST4920 Track Recoil Spring Disassembly and Assembly Tool**

*NOTE: It is recommended that DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool be used with track recoil spring disassembly and assembly tool.*

*Dimensions given are metric.*

Tool is the same as used on other machines except the holder (C). For each track adjuster use the holder with the correct size hole for the nut on that track adjuster.

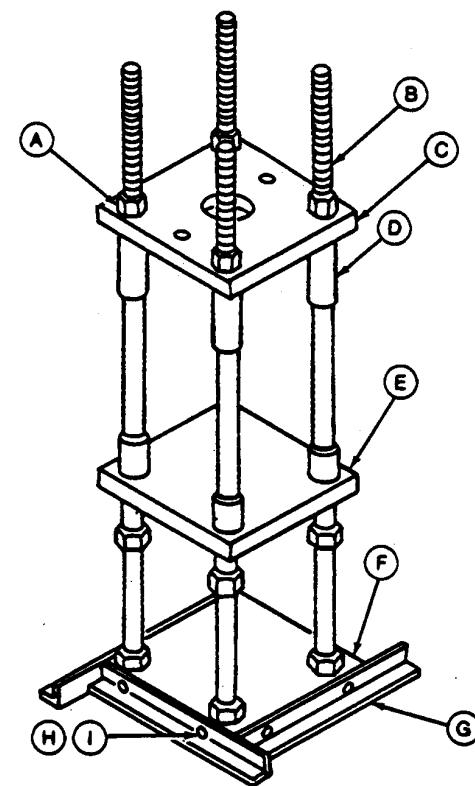
Track Recoil Spring Disassembly and Assembly Tool (compression tool) is used with hydraulic jack to compress recoil spring in track adjuster repair.

Material required:

- 1020 HR Steel for Holder (C), Supporting Plate (E), Base Plate (F), and Base (G).
- "D" Grade (SAE Grade 5) for Eyebolts (D), Nuts (A), and Cap Screws (H).
- "F" Grade (SAE Grade 8) for Studs (B).

Print Numbers:

- ST4050 Nut (A)
- ST4045 Bolt (B)
- ST4035 Holder (Plate) (C)
- ST4036 Holder (Plate) (C)
- ST4037 Holder (Plate) (C)
- ST4047 Eyebolt (D)
- ST4040 Supporting Base (E)
- ST4042 Base Plate (F)
- ST4041 Base (G)
- ST4046 Cap Screw (H)
- ST4049 Lock Washer (I)



A—Nut (12 used)  
B—Stud (4 used)  
C—Holder  
D—Eyebolt (4 used)  
E—Supporting Plate

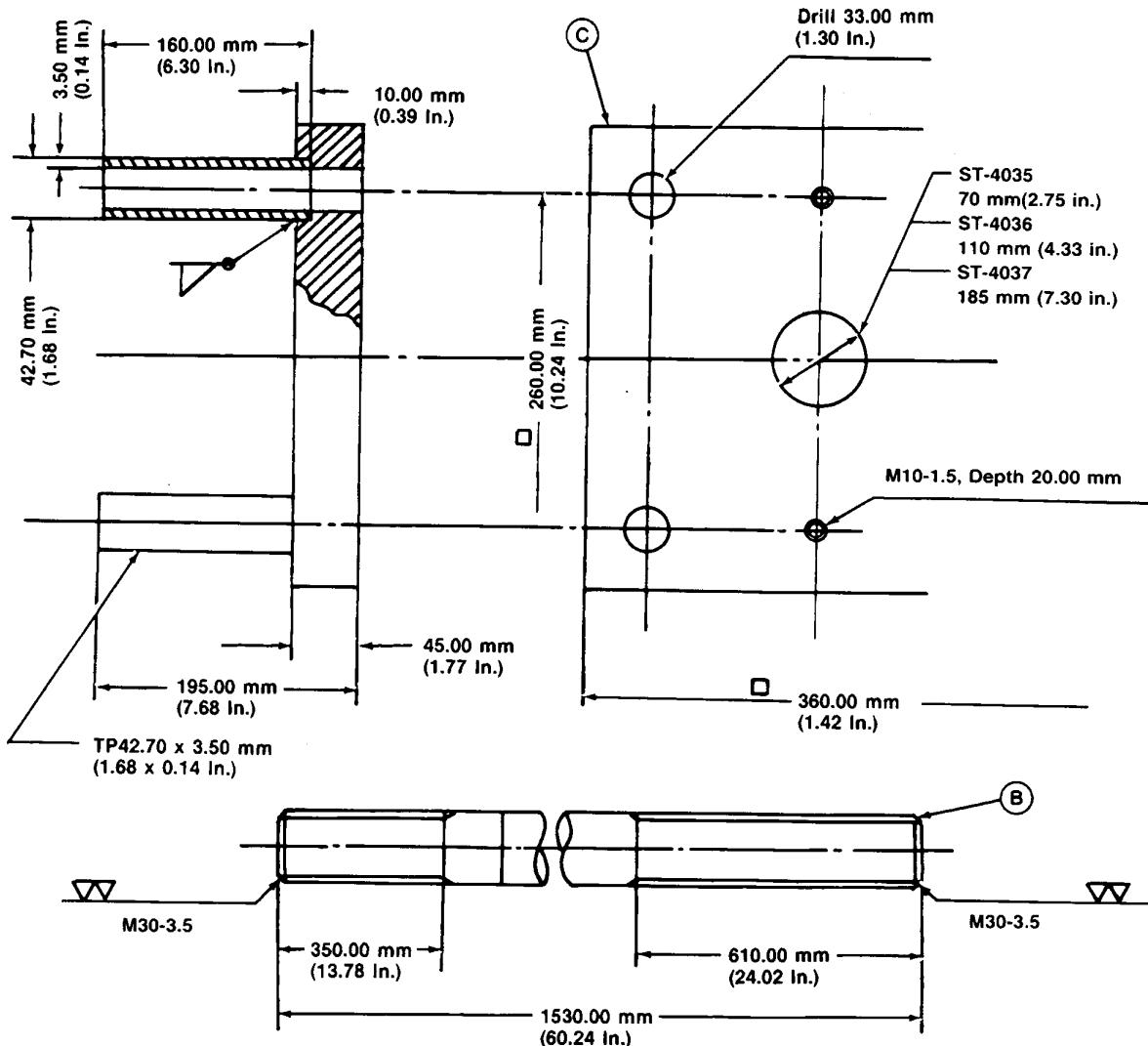
F—Base Plate  
G—Base (4 used)  
H—Cap Screw (8 used)  
I—Lock Washer (8 used)

Continued on next page

TX.99.GG2585 -19-29MAR97-1/4

T6585UY—UN—24MAR98

*Dealer Fabricated Tools*

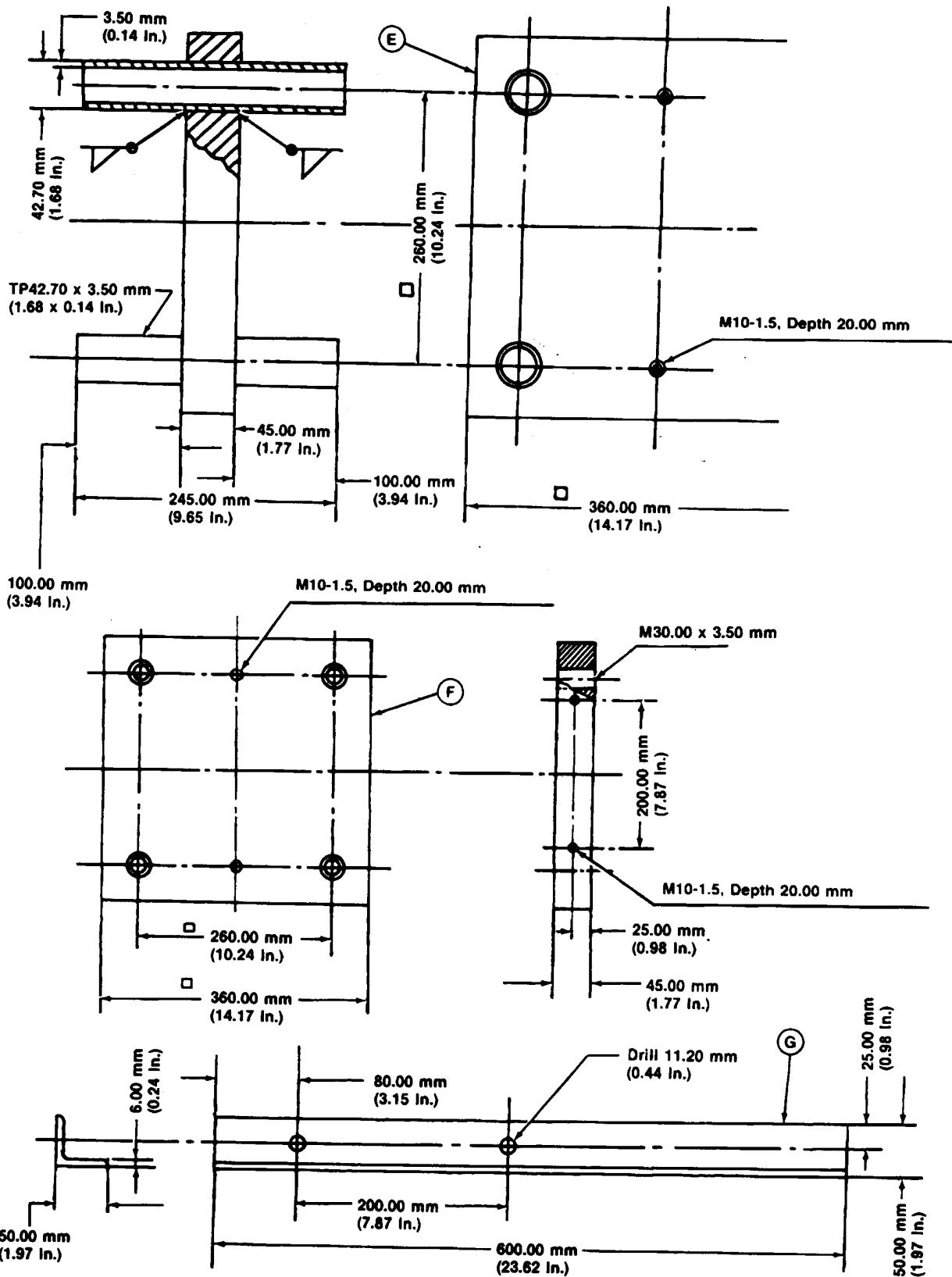


Continued on next page

TX,99,GG2585 -19-29MAR97-2/4

T7029CI—UN—06JUL89

Dealer Fabricated Tools

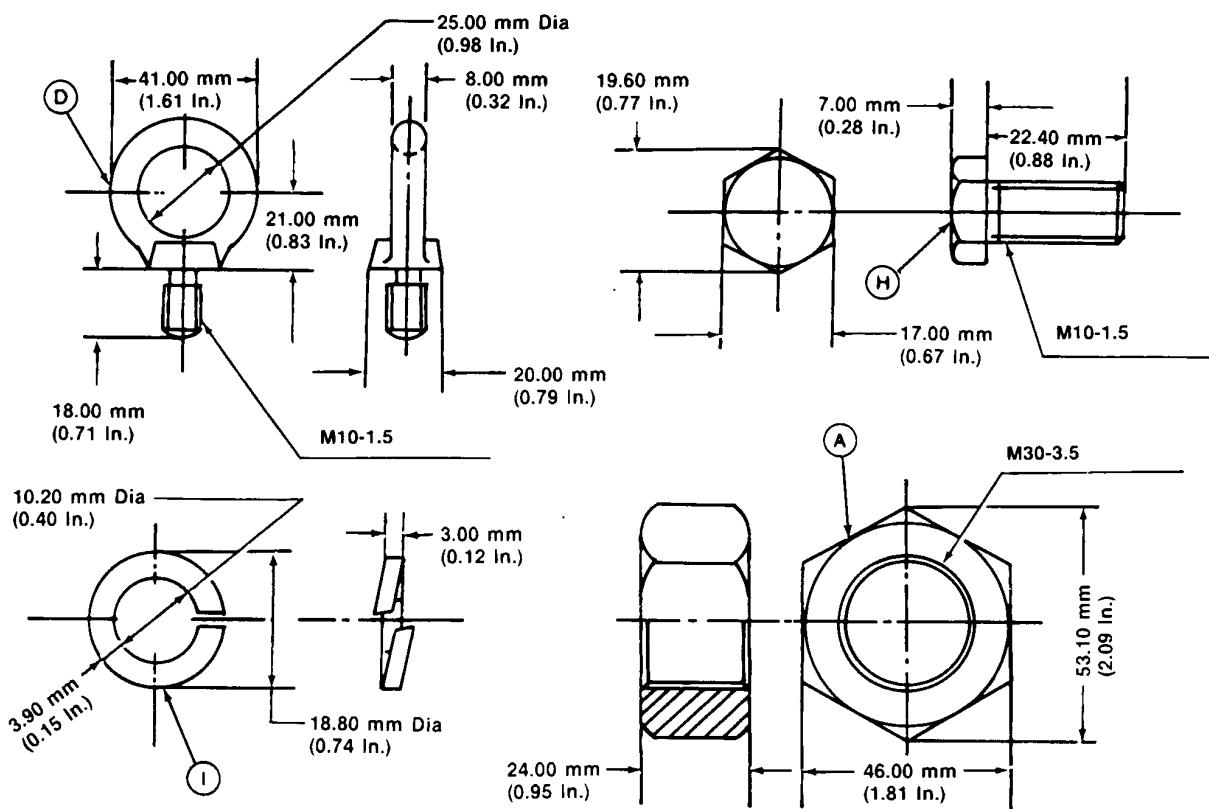


Continued on next page

TX,99,GG2585 -19-29MAR97-3/4

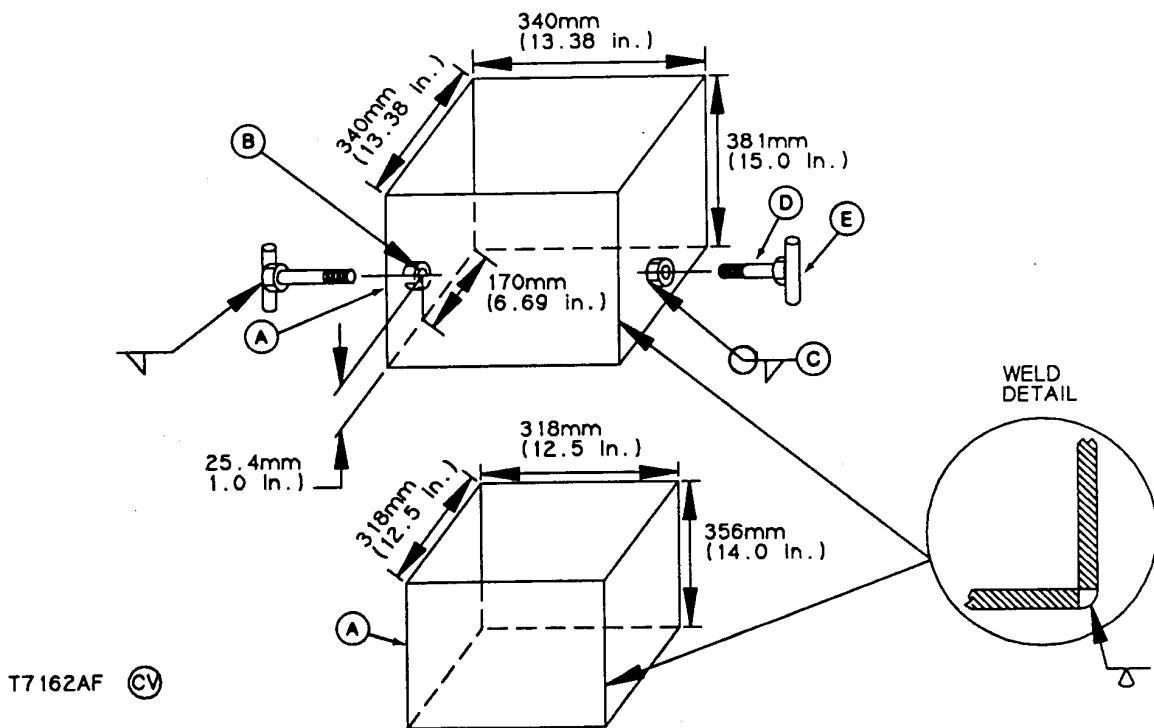
T7029CH -JUN-06JUL89

*Dealer Fabricated Tools*



T7029CG -UN-06JUL89

TX,99,GG2585 -19-29MAR97-4/4

**DFT1087 Track Recoil Spring Disassembly and Assembly Guard Tool**

A—3/16 in. 1020 CR Steel Plate  
B—9/16 in. Hole (2 places)

C—1/2 in. Nut (2 used)  
D—1/2 x 2 in. Cap Screw (2 used)

E—1/2 x 3 in. Steel Round Stock  
(2 used)

Track Disassembly and Assembly Guard Tool is used with  
ST4920 Track Recoil Spring Disassembly and Assembly  
Tool.

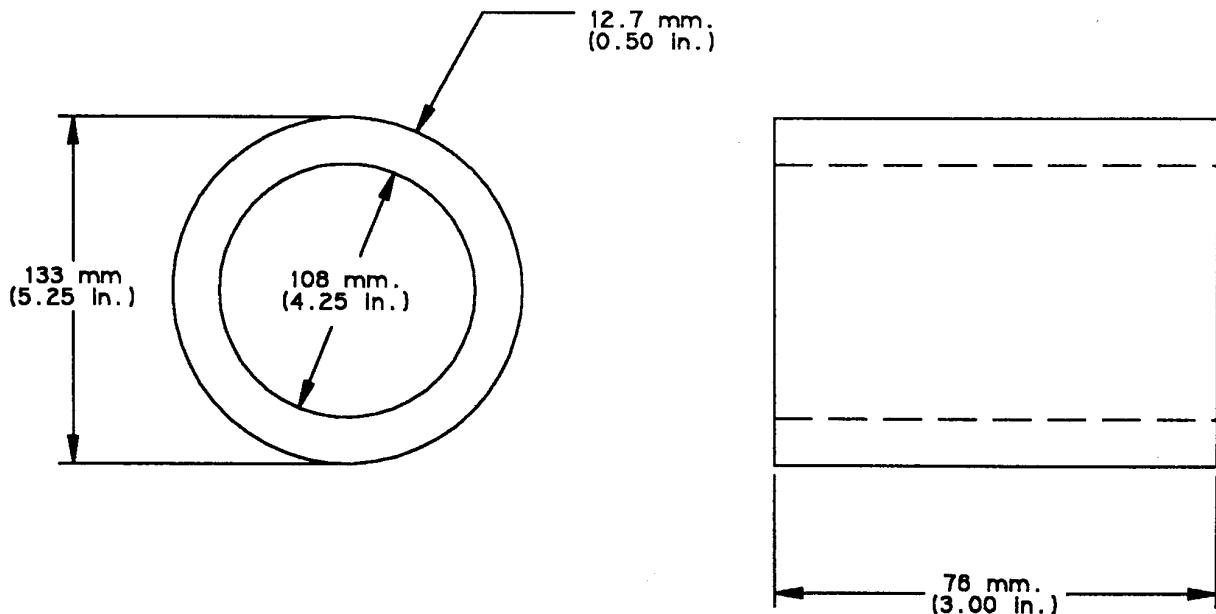
Material required:

- 3/16 in. 1020 CR Steel Plate (A)
- 1/2 in. Nut (C) (2 used)
- 1/2 x 2 in. Cap Screw (D) (2 used)
- 1/2 x 3 in. Steel Round Stock (E) (2 used)

TX,99,GG2586 -19-29MAR97-1/1

T7162AF—UN—17OCT89

## DFT1112 Spacer



T7720AL

Spacer is used with ST4920 Track Recoil Spring Disassembly and Assembly Tool. Spacer is installed on the bottom plate so force is applied to spring flange on cylinder and not to the piston.

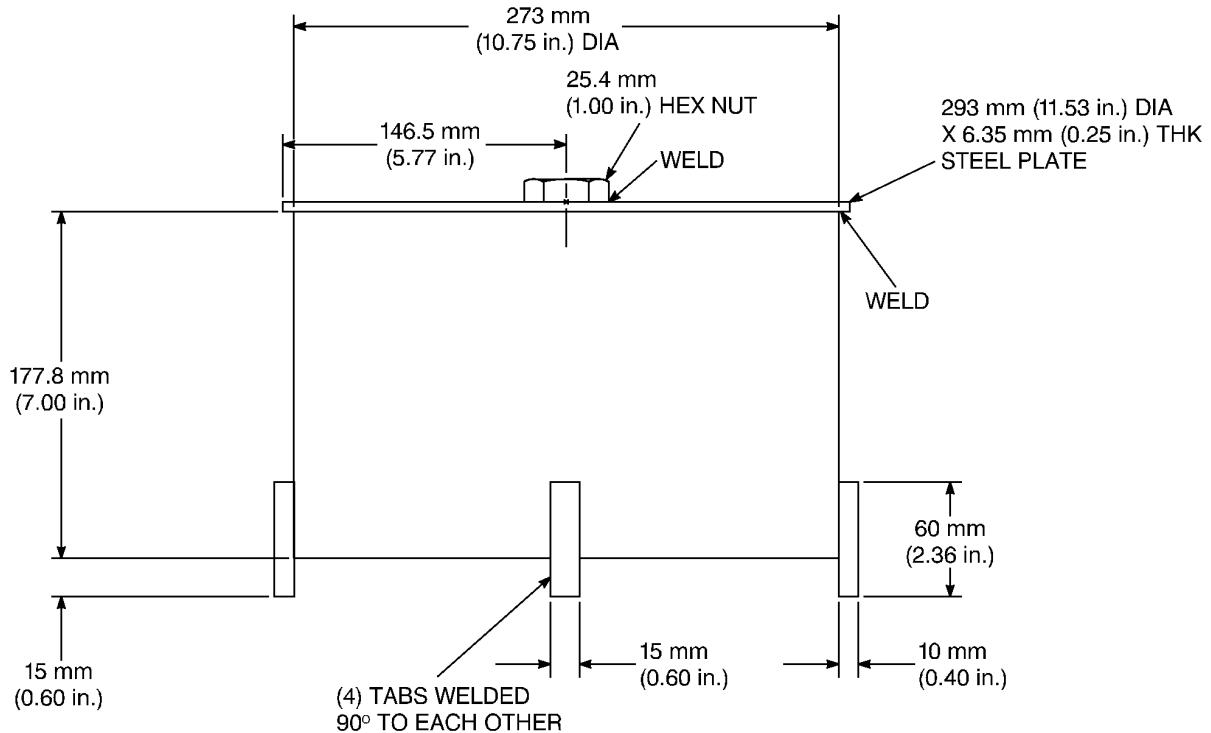
Cut the ends of spacer so they are parallel to each other.

Material Required:

133 x 108 x 76 mm (5.25 x 4.25 x 3.00 in.) Heavy Wall Steel Pipe

TX,99,GG2587 -19-29MAR97-1/1

T7720AL-UN-28APR92

**DFT1155 Propel Gearbox Bearing Nut Wrench**

T111916

Propel Gearbox Bearing Nut Wrench is used to remove and install the gearbox bearing nut.

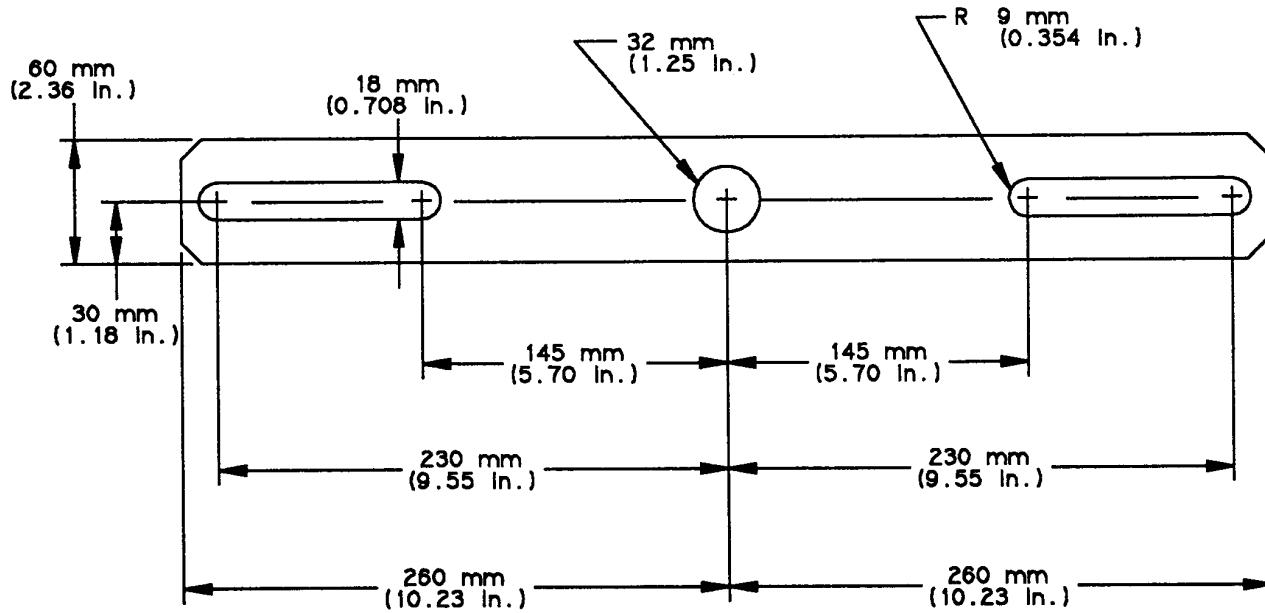
Material required:

- 10.75 in. OD Pipe

- 11.53 in. Dia. x 0.25 in. Steel Plate
- 0.40 in. x 0.60 in. x 2.36 in. Steel Bar (4 pcs)
- 1.00 in. Hex Nut

T111916-19-29OCT97

TX,99,GG2588 -19-24OCT02-1/1

**DFT1109 Holding Bar**T7690AA 

Holding Bar is used with the DF1036A Propel Gearbox Nut Wrench as a guide when loosening the hub-to-housing nut in the propel gearbox.

Material required:

- 16 mm (5/8 in.) flat bar stock

TX,99,GG2589 -19-29MAR97-1/1

T7690AA -UN-27FEB92

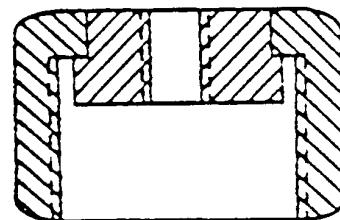
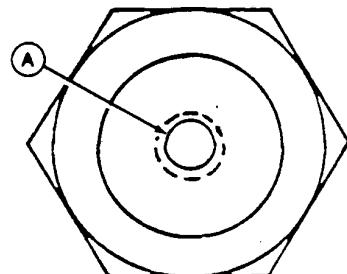
## Rotary Manifold Lifting Tool

Tool is used to remove and install rotary manifold.

Drill and tap disk in fitting cap to M8-1.25 mm threads (A).

Material required:

- 38H1416 Cap (—12)
- JT05548 8 mm Metric Lifting Eyebolt



T6641DO -UN-24OCT88

TX,99,GG2590 -19-29MAR97-1/1

## DFT1089 Barrel Support

Barrel supports are used to support the upperstructure when removing the undercarriage.

**CAUTION: Cutting tops off barrels that contained flammable or explosive material can cause serious injury or death.**

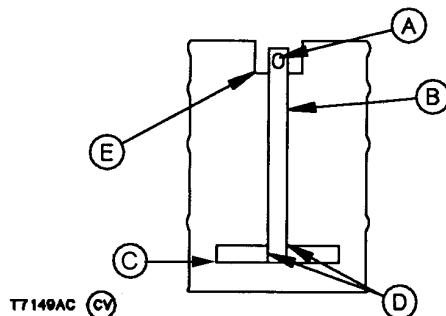
Material Required:

- Clean metal 55 gal barrels of equal height with lids removed. (Must be 34.5—35.5 in. height x 24 in. wide.)
- 1/2 x 4 x 24 in. 1020 CR Plate
- 1/2 x 4 x 12 in. 1020 CR Plate
- One empty 3 lb coffee can or equivalent
- Highway Cement (9 bag mix). Mix extra dry to aid curing time.

Insert hook assembly into barrel before cement is set. Hold assembly in position, using a steel plate or wire, until cement begins to cure.

Level off cement with top of barrels.

Cement must cure for a minimum of ten days.



- A—2 x 4 in. Slotted Hole,  
Recessed  
B—1/2 x 4 x 24 in. 1020 CR  
Plate  
C—1/2 x 4 x 12 in. 1020 CR  
Plate  
D—1/4 in. Fillet Weld  
E—One empty 3 lb coffee can  
or equivalent

The approximate weight of each barrel support is 545 kg (1 200 lb). The approximate support capacity of each barrel support is 385 560 kg (850,000 lb).

TX,99,GG2591 -19-29MAR97-1/1

T7149AC -UN-09JAN97

**DFT1113 Guide Pin**

Guide pin is used to align cap screw holes in swing bearing and upperstructure.

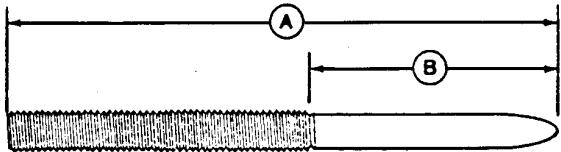
Remove threads for a distance (B) and then grind a taper on same end.

Material Required:

- M18-2.5 x 150 mm (6 in.) Threaded Rod

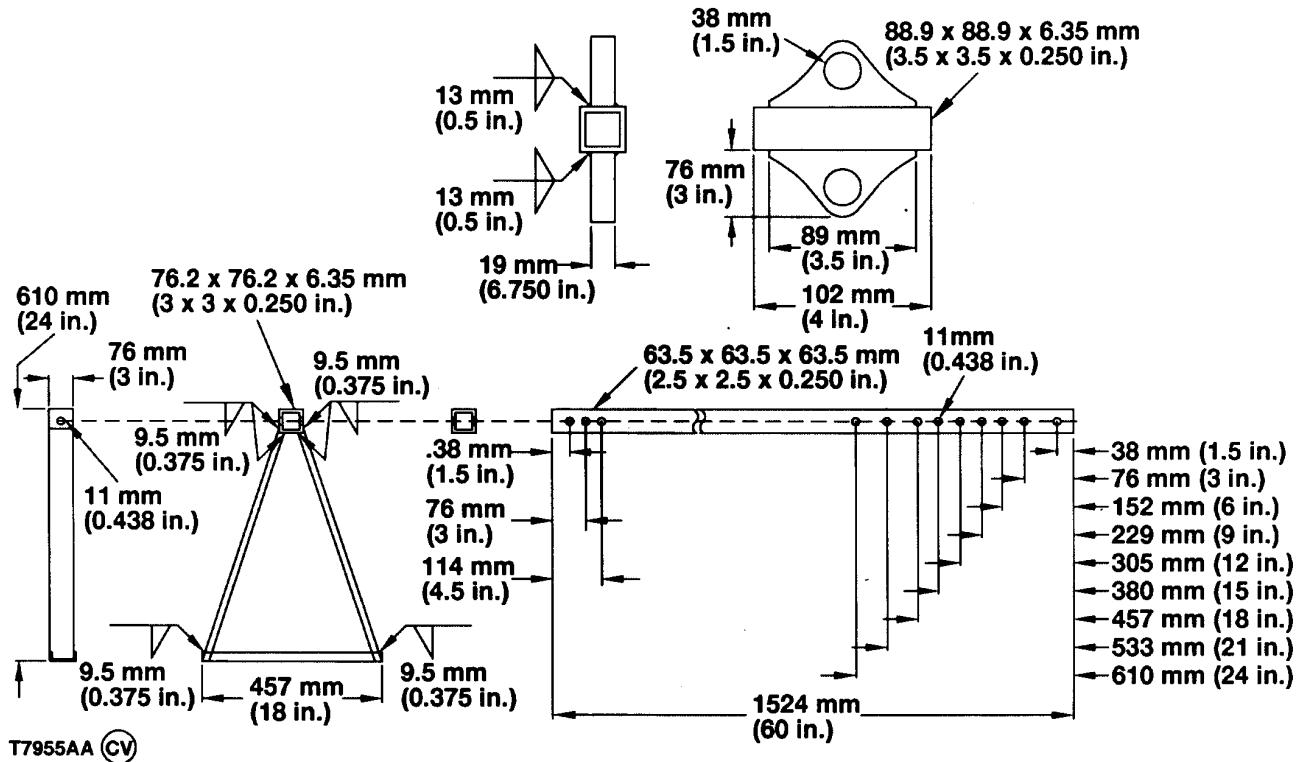
A—150 mm (6 in.)

B—100 mm (4 in.)



T6641EK -UN-24OCT88

TX,99,GG2592 -19-29MAR97-1/1

**DFT1119 Pump Support**

T7955AA -UN-23APR93

Pump support is used with a hand hoist to support a pump(s) when an engine is removed.

Two end stands are needed.

Drill the holes through the square steel tubing so they are centered.

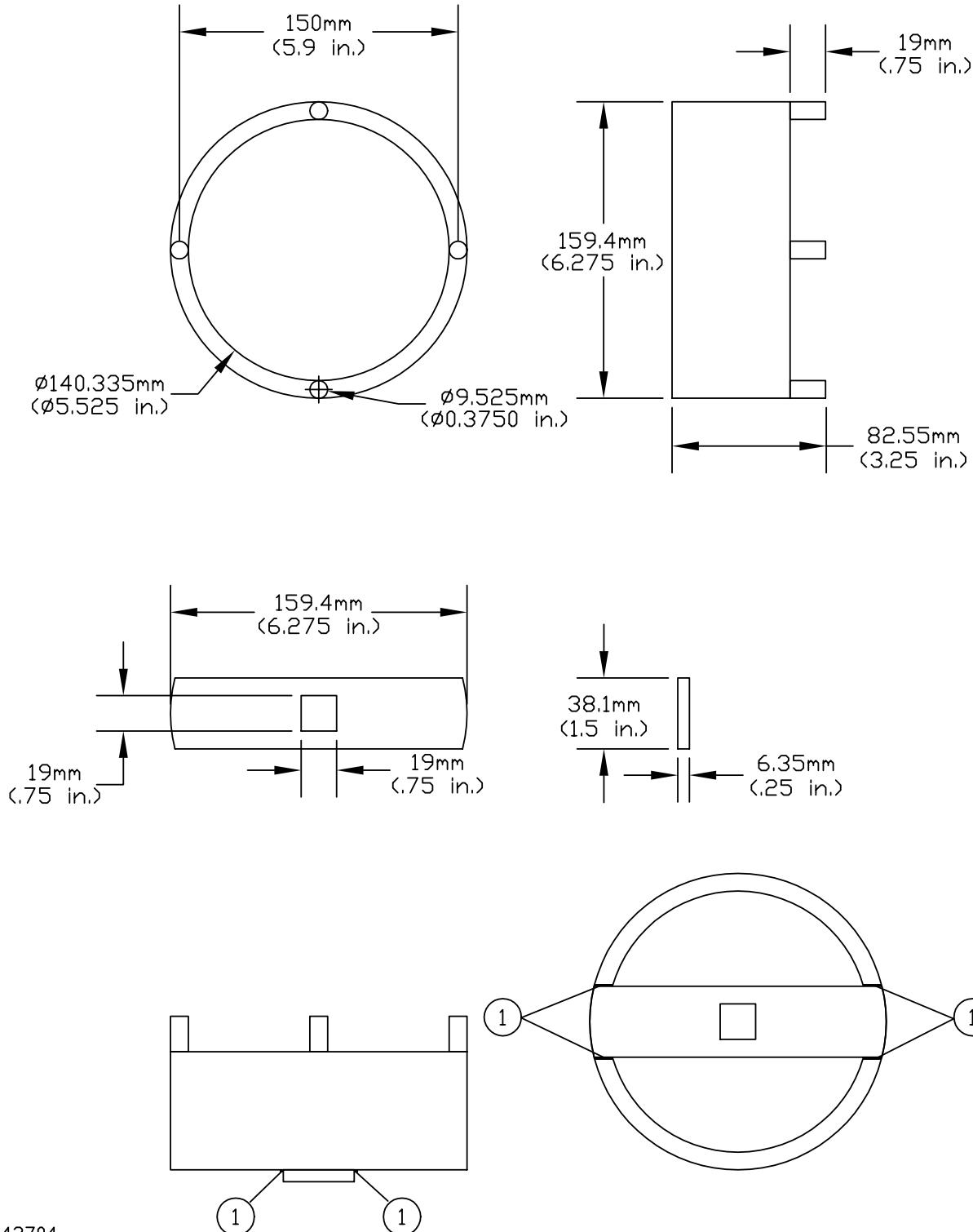
Material required:

- C3 x 5 Steel Channel
- 88.9 x 88.9 x 6.35 mm (3.5 x 3.5 x 0.250 in.) Square Steel Tubing

- 76.2 x 76.2 x 6.35 mm (3 x 3 x 0.250 in.) Square Steel Tubing
- 63.5 x 63.5 x 6.35 mm (2.5 x 2.5 x 0.250 in.) Square Steel Tubing
- 19 mm (3/4 in.) flat bar stock
- M10 x 89 mm or 3/8 x 3-1/2 in. D Grade (SAE Grade 5) Cap Screw (2 used)
- M10 or 3/8 in. D Grade (SAE Grade 5) Nut (2 used)

TX,99,GG2592 -19-29MAR97-1/1

*Dealer Fabricated Tools*

**DFT1220 Swing Gearbox Nut Spanner Wrench**

T143704

1—Weld (4 Places)

Material required:

• 159.4 x 82.5 mm (6.275 x 3.25 in.) Steel Tubing

Continued on next page

OUOE047,000000E -19-19NOV01-1/2

T143704 —UN—03MAR10

*Dealer Fabricated Tools*

- 159.4 x 38.1 x 6.35 mm (6.65 x 1.5 x .25 in.)

OUOE047,000000E -19-19NOV01-2/2

*Dealer Fabricated Tools*

# Index

	Page		Page
<b>A</b>			
Adjuster, track		Bearing	
Disassemble and assemble .....	01-0130-17	Swing, disassemble and assemble .....	43-4350-17
Remove and install .....	01-0130-16	Swing, install lower seal .....	43-4350-19
Air conditioner		Swing, install upper seal .....	43-4350-19
Compressor, remove and install .....	18-1830-7	Swing, remove and install .....	43-4350-15
Condenser, remove and install .....	18-1830-9	Belt, fan	
Receiver-dryer, remove and install .....	18-1830-7	Remove and install .....	05-0510-3
Remove and install .....	18-1830-8	Belt, seat	
Air conditioner and heater		Remove and install .....	18-1821-8
Remove and install .....	18-1830-8	Bleed procedure	
Air conditioner system		Hydraulic cylinder .....	33-3360-83
Flush and purge .....	18-1830-2	Bolt and screw torque values	
Refrigerant cautions and proper handling .....	18-1830-1	Metric .....	00-0003-2
Air conditioning		Unified inch .....	00-0003-1
Charge R134a system .....	18-1830-6	Bonded windowpane	
Evacuate R134a system .....	18-1830-6	Remove and install .....	18-1810-3
R134a refrigerant oil information .....	18-1830-4	Boom	
R134a station installation .....	18-1830-5	Remove and install .....	33-3340-5
Recover R134a refrigerant .....	18-1830-5	Boom cylinder	
Air test		Assemble .....	33-3360-77
Rotary manifold .....	02-0260-23	Bleed procedure .....	33-3360-83
Arm		Disassemble .....	33-3360-69
Remove and install .....	33-3340-3	Inspect .....	33-3360-77
Arm cylinder		Inspect pins and bushings .....	33-3340-7
Assemble .....	33-3360-77	Remove and install .....	33-3360-62
Bleed procedure .....	33-3360-83	Boom pins and bushings	
Disassemble .....	33-3360-69	Inspect .....	33-3340-7
Inspect .....	33-3360-77	Boom, arm, and bucket bushings and bosses	
Inspect pins and bushings .....	33-3340-7	Inspect .....	33-3340-7
Remove and install .....	33-3360-64	Boom, arm, and bucket pins	
Arm pins and bushings		Inspect .....	33-3340-7
Inspect .....	33-3340-7	Bucket	
Arm regenerative solenoid valve		Disassemble and assemble .....	33-3302-2
Disassemble and assemble .....	33-3360-31	Links, remove and install .....	33-3340-1
Remove and install .....	33-3360-30	Pin-up data .....	33-3302-4
Attachment flow rate and speed sense solenoid		Remove and install .....	33-3302-1
Disassemble and assemble .....	33-3360-26	Bucket cylinder	
Remove and install .....	33-3360-25	Assemble .....	33-3360-77
Repair .....	33-3360-25	Bleed procedure .....	33-3360-83
Attachment flow rate solenoid		Disassemble .....	33-3360-69
Disassmeble and assemble .....	33-3360-26	Inspect .....	33-3360-77
Remove and install .....	33-3360-25	Inspect pins and bushings .....	33-3340-7
Repair .....	33-3360-25	Remove and install .....	33-3360-67
Attachments		Bucket pins	
Adding safely .....	00-0001-8	Inspect .....	33-3340-7
Operating safely .....	00-0001-8	Bushings and seals	
		Remove and install .....	33-3340-9
<b>B</b>			
Backover accidents		Cab	
Avoiding .....	00-0001-7	Remove and install .....	18-1800-1
Battery explosions		Cab guarding	
Prevent .....	00-0001-4	00-0001-2	
Carrier roller, track			
Disassemble and assemble .....	01-0130-5		
Remove and install .....	01-0130-3		
C			
Cab			
Remove and install .....			
Cab guarding .....			
Carrier roller, track			
Disassemble and assemble .....			
Remove and install .....			

Continued on next page

Page	Page
Chain sprocket, track Remove and install ..... 01-0130-12	Lift check and orifice (arm II power passage) ..... 33-3360-49
Chain, track Disassemble and assemble ..... 01-0130-10	Lift check and orifice (left propel power passage) ..... 33-3360-44
Disassemble and assemble to replace broken part ..... 01-0130-11	Propel flow combiner valve and check valve ..... 33-3360-53
Remove and install ..... 01-0130-8	Remove and install ..... 33-3360-42
Charge R134a system ..... 18-1830-6	Right propel and bucket combined function check valve and orifice ..... 33-3360-53
Chemical products Safe handling ..... 00-0001-4	Spool (4 spool) ..... 33-3360-49
Compressor Remove and install ..... 18-1830-7	Spool (5 spool) ..... 33-3360-44
Condenser, air conditioner Remove and install ..... 18-1830-9	System relief valve ..... 33-3360-44
Control housing, hydraulic pump regulator Disassemble and assemble ..... 33-3360-18	System relief valve isolation check valve (4-spool) ..... 33-3360-49
Control valve Arm in circuit relief and anti-cavitation valve ..... 33-3360-53	System relief valve isolation check valve (5-spool) ..... 33-3360-44
Arm out circuit relief and anti-cavitation valve ..... 33-3360-49	Controller, pilot
Arm reduced leakage pilot valve and check valve ..... 33-3360-44	Disassemble and assemble ..... 33-3360-34
Arm regenerative selector valve ..... 33-3360-49	Remove and install ..... 33-3360-32
Arm regenerative valve ..... 33-3360-44	Controller, propel pilot
Auxiliary flow combiner valve and check valve ..... 33-3360-53	Disassemble and assemble ..... 33-3360-36
Auxiliary flow rate valve (poppet valve) ..... 33-3360-44	Remove and install ..... 33-3360-35
Auxiliary flow rate valve (selector valve) ..... 33-3360-44	Cooler, oil
Boom down circuit relief and anti-cavitation valve ..... 33-3360-53	Remove and install ..... 33-3360-62
Boom reduced leakage pilot valve and check valve ..... 33-3360-49	Cooling package
Boom regenerative valve ..... 33-3360-49	Remove and install ..... 05-0510-1
Boom up circuit relief and anti-cavitation valve ..... 33-3360-44	Counterbalance valve
Bucket curl circuit relief and anti-cavitation valve ..... 33-3360-53	Disassemble and assemble ..... 02-0260-19
Bucket dump circuit relief and anti-cavitation valve ..... 33-3360-49	Counterweight
Bucket flow rate valve (poppet valve) ..... 33-3360-49	Remove and install ..... 17-1749-1
Bucket flow rate valve (selector valve) ..... 33-3360-49	Coupling, flex (dampener drive)
Bypass shut-off valve ..... 33-3360-49	Remove and install ..... 33-3360-22
Circuit relief and anti-cavitation valves ..... 33-3360-44	Crossover relief valve
Flow combiner circuit check valve ..... 33-3360-53	Disassemble and assemble ... 02-0260-17, 43-4360-6
Lift check (arm I neutral passage) ..... 33-3360-44	Remove and install ..... 43-4360-6
Lift check (arm I power passage) ..... 33-3360-44	Cylinder
Lift check (arm II neutral passage) ..... 33-3360-49	Assemble boom, arm, or bucket ..... 33-3360-77
Lift check (boom I power passage) ..... 33-3360-49	Bleed procedure, hydraulic ..... 33-3360-83
Lift check (boom II power passage) ..... 33-3360-44	Bushings and seals, remove and install ..... 33-3340-9
Lift check (left propel neutral passage) ..... 33-3360-44	Disassemble boom, arm, or bucket ..... 33-3360-69
Lift check (swing neutral passage) ..... 33-3360-44	Inspect boom, arm, or bucket ..... 33-3360-77

**D**

Dampener drive	
Remove and install ..... 33-3360-22	
Dealer fabricated tool	
DFT1087 track recoil spring guard ..... 99-9900-5	
DFT1089 barrel support ..... 99-9900-9	
DFT1109 holding bar ..... 99-9900-8	
DFT1112 spacer ..... 99-9900-6	
DFT1113 guide pin ..... 99-9900-10	
DFT1119 pump support ..... 99-9900-10	
DFT1155 propel gearbox bearing nut wrench ..... 99-9900-7	
Rotary manifold lifting ..... 99-9900-9	

Continued on next page

Page	Page
ST4920 track recoil spring assembly ..... 99-9900-1	Handling chemicals ..... 00-0001-4
Dealer fabricated tools	Hardware torque values
DFT1220 swing gearbox nut spanner wrench ..... 99-9900-12	Metric ..... 00-0003-2
Disassemble and assemble	Unified inch ..... 00-0003-1
Pilot shut-off valve ..... 33-3360-29	Hazards
Drive, dampener (flex coupling)	Avoiding ..... 00-0001-6
Remove and install ..... 33-3360-22	Heater
Driving metal pins ..... 00-0001-10	Remove and install ..... 18-1830-8
 <b>E</b>	High-pressure oils
Emergency preparation ..... 00-0001-5	Avoid ..... 00-0001-3
Engine	Hydraulic
install ..... 04-0400-4	Fittings, 30° cone seat ..... 00-0003-7
remove ..... 04-0400-1	Fittings, 37° flare ..... 00-0003-7
repair ..... 04-0400-5	Hydraulic cylinder
Evacuate R134a system ..... 18-1830-6	Bleed procedure ..... 33-3360-83
Exhaust fumes ..... 00-0001-3	Hydraulic fitting
Explosion	Flared connections ..... 00-0003-8
Battery ..... 00-0001-4	Hydraulic oil
 <b>F</b>	Cleanup procedure using portable filter caddy ..... 33-3360-2
Fan	Hydraulic oil tank
Remove and install ..... 05-0510-2	Disassemble and assemble ..... 33-3360-57
Fan belt	Remove and install ..... 33-3360-56
Remove and install ..... 05-0510-3	Hydraulic pump
Fan guard	Disassemble ..... 33-3360-6
Remove and install ..... 05-0510-2	Remove and install ..... 33-3360-3
Fan shroud	Start-up procedure ..... 33-3360-21
Remove and install ..... 05-0510-2	Hydraulic pump regulator, control housing
Filter, pilot	Disassemble and assemble ..... 33-3360-18
Remove and install ..... 33-3360-24	Hydraulic pump regulator, valve head
Fire prevention ..... 00-0001-4	Disassemble and assemble ..... 33-3360-13
Flex coupling	Hydraulic pump
Remove and install ..... 33-3360-22	Assemble ..... 33-3360-8
Flush air conditioner system ..... 18-1830-2	 <b>I</b>
Front idler	Idler, front
Disassemble and assemble ..... 01-0130-14	Disassemble and assemble ..... 01-0130-14
Remove and install ..... 01-0130-13	Remove and install ..... 01-0130-13
Test for oil leakage ..... 01-0130-15	Test for oil leakage ..... 01-0130-15
Fuel tank	Inspect machine ..... 00-0001-2
Remove and install ..... 05-0560-1	 <b>L</b>
 <b>G</b>	Leakage test, oil
Gearbox, propel	Front idler ..... 01-0130-15
Assemble ..... 02-0250-9	Track roller ..... 01-0130-3
Disassemble ..... 02-0250-3	Lifting objects
Remove and install ..... 02-0250-1	Special care ..... 00-0001-8
Gearbox, swing	Links
Remove and install ..... 43-4350-1	Bucket, remove and install ..... 33-3340-1
 <b>H</b>	 <b>M</b>
Handhold use ..... 00-0001-5	Machine inspection ..... 00-0001-2
	Machine movement
	Unintended ..... 00-0001-6

Continued on next page

Page	Page
Machine tip over	
Avoiding .....	00-0001-8
Manifold, pilot signal	
Disassemble and assemble .....	33-3360-39
Remove and install .....	33-3360-38
Manifold, rotary	
Air test.....	02-0260-23
Disassemble and assemble .....	02-0260-22
Remove and install .....	02-0260-21
Metal face seal	
Inspect .....	01-0130-6
Metal pins	00-0001-10
Metric bolt and screw torque values	00-0003-2
Molding, one piece and windowpane	
Remove and install .....	18-1810-2
Molding, two piece and windowpane	
Remove and install .....	18-1810-1
Motor, propel	
Disassemble and assemble .....	02-0260-1
Remove and install .....	02-0260-1
Moving parts	
Safety.....	00-0001-3
Servicing .....	00-0001-3
<b>O</b>	
O-ring boss fittings.....	00-0003-4
Oil	
Lines and fittings.....	00-0003-4
Oil cooler	
Remove and install .....	33-3360-62
Oil cooler bypass valve	
Remove and install .....	33-3360-61
Oil information	
R134a refrigerant .....	18-1830-4
Oil leakage test	
Front idler.....	01-0130-15
Oil lines and fittings .....	00-0003-4
Oil tank, hydraulic	
Disassemble and assemble .....	33-3360-57
Remove and install .....	33-3360-56
Operation qualification.....	00-0001-1
<b>P</b>	
Pilot control shutoff lever .....	00-0001-6
Pilot controller	
Disassemble and assemble .....	33-3360-34
Remove and install .....	33-3360-32
Pilot controller, propel	
Disassemble and assemble .....	33-3360-36
Remove and install .....	33-3360-35
Pilot filter	
Remove and install .....	33-3360-24
Pilot pressure regulating valve	
Disassemble and assemble .....	33-3360-27
Pilot pump	
Disassemble and assemble .....	33-3360-11
Install.....	33-3360-8
Remove.....	33-3360-6
Pilot shut-off valve	
Disassemble and assemble .....	33-3360-29
Remove and install .....	33-3360-28
Pilot signal manifold	
Disassemble and assemble .....	33-3360-39
Remove and install .....	33-3360-38
Pin-up data	
Bucket .....	33-3302-4
Portable filter caddy	
Hydraulic oil cleanup procedure.....	33-3360-2
Propel gearbox	
Assemble .....	02-0250-9
Disassemble .....	02-0250-3
Remove and install .....	02-0250-1
Propel motor	
Disassemble and assemble .....	02-0260-1
Remove and install .....	02-0260-1
Start-up procedure .....	02-0260-20
Propel motor cover	
Disassemble and assemble .....	02-0260-16
Propel pilot controller	
Disassemble and assemble .....	33-3360-36
Remove and install .....	33-3360-35
Propel speed change valve	
Disassemble and assemble .....	02-0260-20
Propel speed solenoid valve	
Disassemble and assemble .....	33-3360-31
Remove and install .....	33-3360-30
Protective equipment.....	00-0001-2
Pump	
Start-up procedure .....	33-3360-21
Pump, hydraulic	
Assemble .....	33-3360-8
Disassemble .....	33-3360-6
Remove and install .....	33-3360-3
Pump, pilot	
Disassemble and assemble .....	33-3360-11
Install.....	33-3360-8
Remove.....	33-3360-6
Purge air conditioner system.....	18-1830-2
<b>R</b>	
R134a refrigerant recovery .....	18-1830-5
R134a refrigerant recovery and charging station	
Installation procedure.....	18-1830-5
R134a system charge.....	18-1830-6
R134a system evacuate .....	18-1830-6
Radiator	
Remove and install .....	05-0510-1
Receiver-dryer	
Remove and install .....	18-1830-7

Continued on next page

Page	Page
Recoil spring, track	
Disassemble and assemble .....	01-0130-17
Remove and install .....	01-0130-16
Recover R134a refrigerant .....	18-1830-5
Refrigerant	
Cautions and proper handling .....	18-1830-1
Recover R134a, air conditioning .....	18-1830-5
Refrigerant oil information	
R134a .....	18-1830-4
Refrigerant recovery/recycling and charging	
Charging station installation	
procedure .....	18-1830-5
Remove and install	
Arm Cylinder .....	33-3360-64
Bucket cylinder .....	33-3360-67
Pilot shut-off valve .....	33-3360-28
Restriction valve	
Remove and install .....	33-3360-59
Riding machine .....	00-0001-7
Roller, track	
Disassemble and assemble .....	01-0130-2
Oil leakage test .....	01-0130-3
Remove and install .....	01-0130-1
Roller, track carrier	
Disassemble and assemble .....	01-0130-5
Rotary manifold	
Air test .....	02-0260-23
Disassemble and assemble .....	02-0260-22
Remove and install .....	02-0260-21
<b>S</b>	
Safety	
Operator's seat .....	00-0001-5
Safety equipment .....	00-0001-2
Safety information	
Recognizing .....	00-0001-1
Safety instructions .....	00-0001-1
Safety symbols .....	00-0001-1
Seal	
Swing bearing lower, install .....	43-4350-19
Swing bearing upper, install .....	43-4350-19
Seal, metal face	
Inspect .....	01-0130-6
Seat	
Check adjustment .....	18-1821-1
Remove and install .....	18-1821-2
Seat belt	
Remove and install .....	18-1821-8
Use and maintenance .....	00-0001-6
Servicing machine safely .....	00-0001-9
Shoe, track	
Remove and install .....	01-0130-7
Signal manifold, pilot	
Disassemble and assemble .....	33-3360-39
Remove and install .....	33-3360-38
Sliding window	
Remove and install .....	18-1810-3
Speed sense solenoid	
Disassemble and assemble .....	33-3360-26
Remove and install .....	33-3360-25
Repair .....	33-3360-25
Spring, track recoil	
Disassemble and assemble .....	01-0130-17
Remove and install .....	01-0130-16
Sprocket	
Remove and install .....	01-0130-12
Start-up procedure	
Hydraulic pump .....	33-3360-21
Propel motor .....	02-0260-20
Swing gearbox .....	43-4350-7
Swing motor .....	43-4360-7
Steps use .....	00-0001-5
Swing bearing	
Disassemble and assemble .....	43-4350-17
Install lower seal .....	43-4350-19
Install upper seal .....	43-4350-19
Remove and install .....	43-4350-15
Swing gearbox	
Remove and install .....	43-4350-1
Start-up procedure .....	43-4350-7
Swing motor	
Start-up procedure .....	43-4360-7
Swing motor and park brake	
Disassemble .....	43-4360-2
Inspect .....	43-4360-3
Remove and install .....	43-4360-1
Swing motor make-up valve	
Remove and install .....	43-4360-7
<b>T</b>	
Tank, fuel	
Remove and install .....	05-0560-1
Tank, hydraulic oil	
Disassemble and assemble .....	33-3360-57
Remove and install .....	33-3360-56
Tip over	
Avoiding .....	00-0001-8
Tool, dealer fabricated	
DFT1087 track recoil spring guard .....	99-9900-5
DFT1089 barrel support .....	99-9900-9
DFT1109 holding bar .....	99-9900-8
DFT1112 spacer .....	99-9900-6
DFT1113 guide pin .....	99-9900-10
DFT1119 pump support .....	99-9900-10
DFT1155 propel gearbox bearing nut wrench .....	99-9900-7
Rotary manifold lifting .....	99-9900-9
ST4920 track recoil spring assembly .....	99-9900-1
Torque charts	
Metric .....	00-0003-2
Unified inch .....	00-0003-1
Torque value	
30° cone seat hydraulic fittings .....	00-0003-7
37° flare hydraulic fittings .....	00-0003-7

Continued on next page

	Page	Page
Flared connections.....	00-0003-8	
Flat face O-ring seal fitting .....	00-0003-6	
Inch SAE four bolt flange fitting.....	00-0003-9	
Metric cap screw .....	00-0003-3	
Metric four bolt flange fitting.....	00-0003-10	
O-Ring boss fitting .....	00-0003-4	
<b>Track adjuster</b>		
Disassemble and assemble .....	01-0130-17	
Remove and install .....	01-0130-16	
<b>Track adjuster cylinder</b>		
Disassemble and assemble .....	01-0130-21	
<b>Track carrier roller</b>		
Disassemble and assemble .....	01-0130-5	
Remove and install .....	01-0130-3	
<b>Track chain</b>		
Disassemble and assemble .....	01-0130-10	
Disassemble and assemble to replace broken part.....	01-0130-11	
Remove and install .....	01-0130-8	
<b>Track chain sprocket</b>		
Remove and install .....	01-0130-12	
<b>Track roller</b>		
Disassemble and assemble .....	01-0130-2	
Remove and install .....	01-0130-1	
Test for oil leakage .....	01-0130-3	
<b>Track shoe</b>		
Remove and install .....	01-0130-7	
<b>U</b>		
Unified inch bolt and screw torque values .....	00-0003-1	
<b>Upperstructure</b>		
Install.....	43-4350-12	
Remove.....	43-4350-8	
<b>V</b>		
<b>Valve</b>		
Control, remove and install .....	33-3360-42	
Pilot shut-off, disassemble and assemble.....	33-3360-29	
Pilot shut-off, remove and install.....	33-3360-28	
<b>Valve head, hydraulic pump regulator</b>		
Disassemble and assemble .....	33-3360-13	
<b>Valve, crossover relief</b>		
Disassemble and assemble .....	43-4360-6	
Remove and install .....	43-4360-6	
<b>Valve, make-up, swing motor</b>		
Remove and install .....	43-4360-7	
<b>Valve, oil cooler bypass</b>		
Remove and install .....	33-3360-61	
<b>Valve, restriction</b>		
Remove and install .....	33-3360-59	
<b>W</b>		
<b>Waste disposal</b>		00-0001-5
<b>Welding on machine</b>		17-1740-1
<b>Welding or heating</b>		
Paint removal .....	00-0001-9	
<b>Welding repairs</b>		00-0001-10
<b>Window, sliding</b>		
Remove and install .....	18-1810-3	
<b>Windowpane, bonded</b>		
Remove and install .....	18-1810-3	
<b>Windowpane, one piece molding</b>		
Remove and install .....	18-1810-2	
<b>Windowpane, two piece molding</b>		
Remove and install .....	18-1810-1	
<b>Work site hazards</b>		
Avoid .....	00-0001-6	

*Index*

