

# **100 Series Hydraulic Cylinders**


**TECHNICAL MANUAL**  
**100 Series Hydraulic Cylinders**  
**TM-H100A 30NOV01 (ENGLISH)**

# 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.

See machine technical manual for procedure to remove and install cylinders.

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

Cylinder Technical Manuals are concise service guides written as stand-alone manuals, supporting a specific series of hydraulic cylinders.

This Cylinder Technical Manual covers recommended repair procedures for the John Deere 100 Series Hydraulic Cylinder.

CED,OUO1032,1193 -19-04JAN99-1/1

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INDX

*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.*

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# Section 100 Series Hydraulic Cylinders

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### Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 -JUN-23AUG88

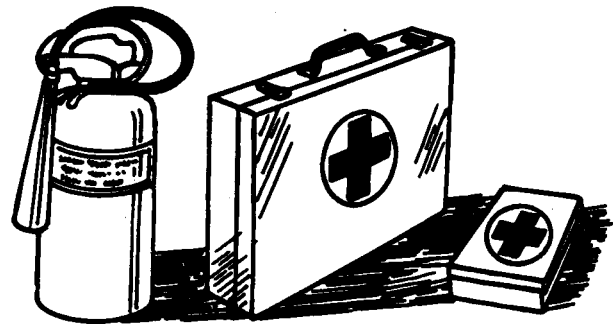
DX,FLAME -19-29SEP98-1/1

### Prepare for Emergencies

Be prepared if 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 -JUN-23AUG88

DX,FIRE2 -19-03MAR93-1/1

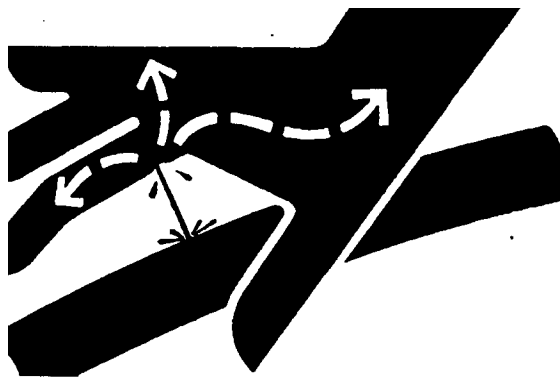
## Avoid High-Pressure Fluids

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 should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



X9811 -UN-23AUG88

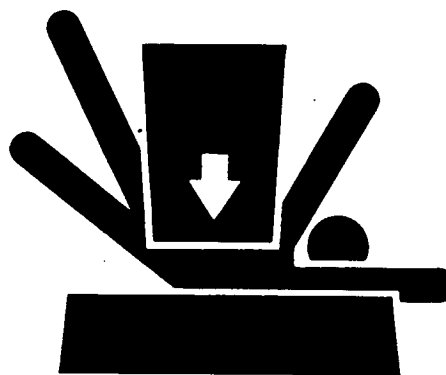
DX,FLUID -19-03MAR93-1/1

## Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If the work requires that the machine or attachment be lifted, provide secure support for them. If left in a raised position, hydraulically supported devices can settle or leak down.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

When implements or attachments are used with a machine, always follow safety precautions listed in the implement or attachment operator's manual.



TS229 -UN-23AUG88

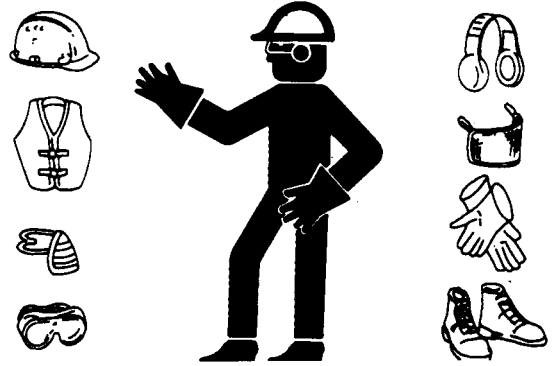
DX,LOWER -19-24FEB00-1/1



### Wear Protective Clothing

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

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



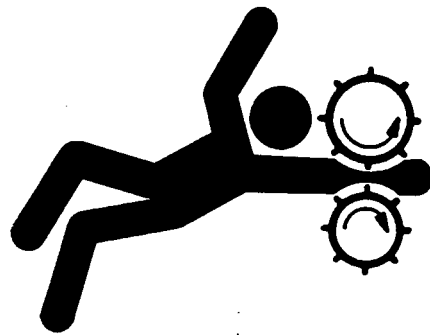
DX,WEAR2 -19-03MAR93-1/1

TS206 -JUN-23AUG88

### Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

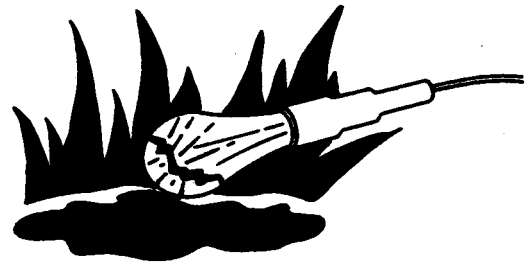


DX,LOOSE -19-04JUN90-1/1

TS228 -JUN-23AUG88

### Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



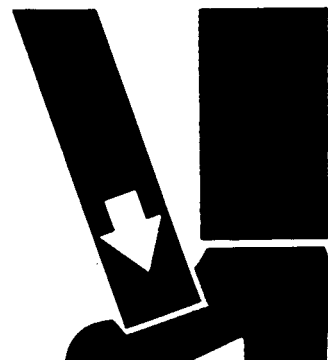
DX,LIGHT -19-04JUN90-1/1

TS223 -JUN-23AUG88

### Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



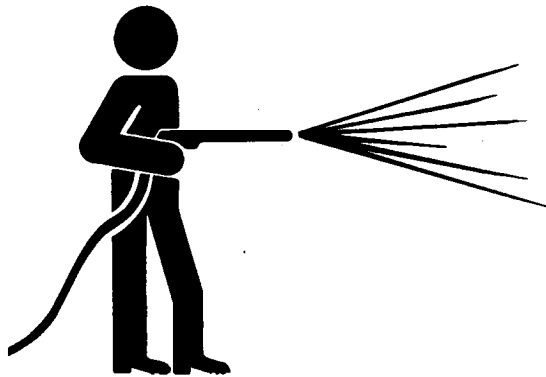
DX,LIFT -19-04JUN90-1/1

TS226 -JUN-23AUG88

## Work In Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



T6642EJ -UN-18OCT88

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

## Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.



TS779 -UN-08NOV89

DX,REPAIR -19-17FEB99-1/1

### Dispose of Waste Properly

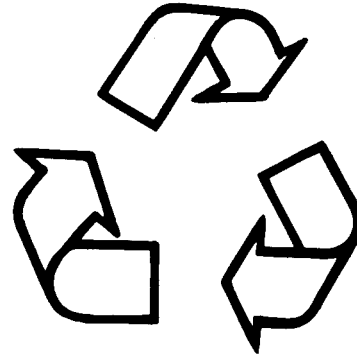
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93-1/1

### Live With Safety

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.



TS231 -19-07OCT88

DX,LIVE -19-25SEP92-1/1



## Hydraulic Cylinder Diagnostics

AG,HX00517,18 -19-06AUG99-1/1

## Hydraulic Cylinder Drift Diagnostics

-- -1/1

<p><b>❶ Cylinder Identification</b></p>	<p>Is the cylinder you are working with a rephasing cylinder?</p>	<p><b>YES: GO TO ❷</b></p> <p><b>NO: GO TO ❸</b></p>
<p>-- -1/1</p>		
<p><b>❷ Preparing Cylinder for Testing</b></p>	<p>Relieve all pressure from the cylinder by either putting the valve, that controls the cylinder, into the float position or by turning off the machine's engine and moving the valve controlling the cylinder(s) from extend to retract positions.</p> <p><i>NOTE: If machine has pilot operated or electro-hydraulic valves see machine manual for instructions on how to relieve all pressure from the cylinder.</i></p> <p>Disconnect the cylinder from the machine by removing the pin at the <b>ROD END</b>.</p> <p><b>RETRACT</b> the cylinder fully and shut off the machine.</p> <p><i>NOTE: To check individual cylinders, disconnect the hoses or lines from the cylinder not being tested and cap off the fittings on the lines for those cylinders to allow you to isolate the cylinder you are testing.</i></p>	<p><b>YES: GO TO ❹</b></p>
<p>-- -1/1</p>		

10  
2

**3 Testing Cylinder for Leaks**

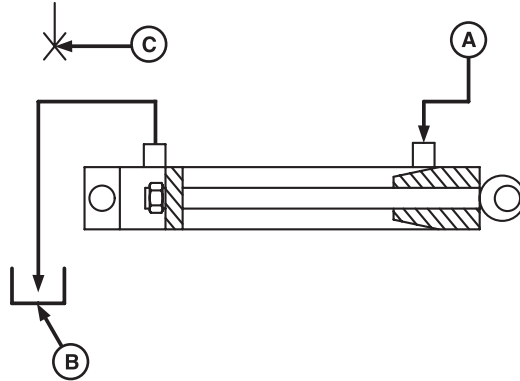
Disconnect the **PISTON END** line from the machine, and remove coupler if necessary, and place the line in a pail or pan.

Cap line remaining on machine.

Start the machine and move the valve slowly in the direction to retract the cylinder.

Does oil continue to escape out of the return line as you hold the valve in the retract position?

Note: A small amount of oil may escape from the fitting or line do to oil being trapped in the line when it was disconnected.



HCD1095 -UN-28NOV01

**A—Pressure**  
**B—Pail**  
**C—Cap**

**YES:** Cylinder is leaking around the piston seal or the cylinder bore is scored.

Repair or Replace Cylinder.

GO TO **1**

**NO:** Cylinder is good.

Test the other cylinders in this system with this same procedure.

GO TO **1**

**OR** refer to machine manual to test the valve.

---1/1

**4 Rephasing Cylinder Identification**

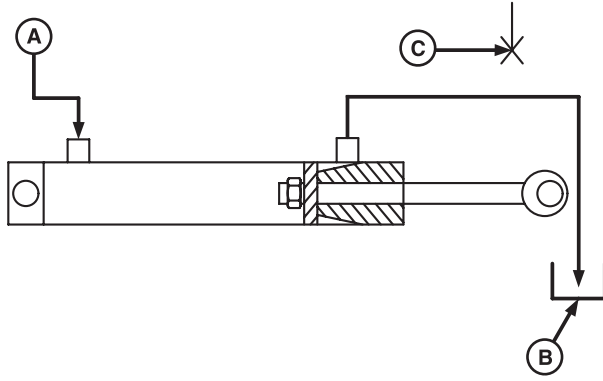
Does this rephasing cylinder rephase in the **RETRACT** position?

**YES:** GO TO **5**

**NO:** GO TO **2**

---1/1

<p><b>5 Preparing Cylinder for Testing</b></p>	<p>Relieve all pressure off of the cylinder by either putting the valve, that controls the cylinder, into the float position or by turning off the machine's engine and moving the valve controlling the cylinder(s) from extend to retract positions.</p> <p>Disconnect the cylinder from the machine by removing the pin at the <b>ROD END</b>.</p> <p><b>CAUTION:</b> Make sure you have room on the machine to fully extend the cylinder with out the rod contacting anything. If there is insufficient room remove the cylinder completely from the machine.</p> <p><b>EXTEND</b> the cylinder fully and shut off the machine.</p> <p><b>CAUTION:</b> If the piston nut is missing off of the rod, the rod could be propelled out of the cylinder.</p> <p><i>NOTE:</i> To check individual cylinders, disconnect the hoses or lines from the cylinder not being tested and cap off the fittings on the lines for those cylinders to allow you to isolate the cylinder you are testing.</p>	<p><b>YES:</b> GO TO <b>6</b></p> <p style="text-align: right;">10 3</p> <p style="text-align: right;">-- -1/1</p>
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<p><b>6 Testing Cylinder for Leaks</b></p>	<p>Disconnect the <b>ROD END</b> line from the machine, and remove coupler if necessary, and place the line in a pail or pan.</p> <p>Cap line remaining on machine.</p> <p>Start the machine and slowly move the valve in the direction to extend the cylinder.</p> <p><b>CAUTION:</b> If the piston nut is missing off of the rod, the rod could be propelled out of the cylinder.</p> <p>Does oil continue to escape out of the <b>ROD END</b> as you hold the valve in the extend position?</p> <p><i>NOTE:</i> A small amount of oil may escape from the fitting or line do to oil being trapped in the line when it was disconnected.</p>  <p>HCD1094 -UN-28NOV01</p> <p><b>A—Pressure</b> <b>B—Pail</b> <b>C—Cap</b></p>	<p><b>YES:</b> Cylinder is leaking around the piston seal or the cylinder bore is scored.</p> <p>Repair or Replace Cylinder.</p> <p><b>GO TO 1</b></p> <p><b>NO:</b> Cylinder is good.</p> <p>Test the other cylinders in this system with this same procedure or refer to machine manual to test the valve.</p> <p><b>GO TO 1</b></p> <p style="text-align: right;">-- -1/1</p>
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## Other Material

Number	Name	Use
T43512 (U.S.) TY9473 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Used to lock threads during assembly

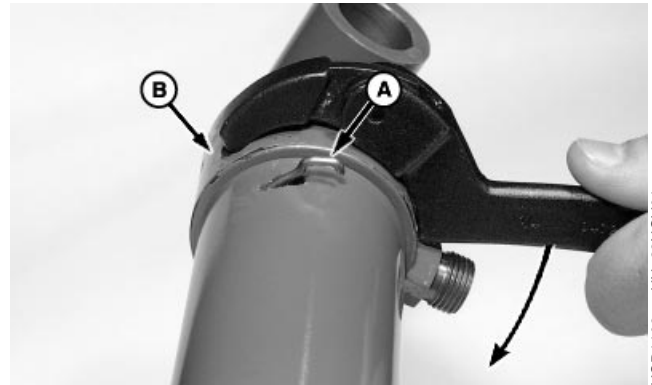
LOCTITE is a trademark of Loctite Corp.

OUO6046,00016B1 -19-08NOV01-1/1

## Disassemble and Assemble Cylinder

**IMPORTANT:** Clamping cylinder in a vise at the middle or rod end of barrel may damage the barrel. Clamp only at the cylinder base end.

Extend rod to remove oil or air between rod piston and rod guide. Excessive amounts of trapped oil or air will expand seals and make disassembly more difficult.



A—Lock Ring  
B—Rod Guide

1. Open both ports and drain all oil from the cylinder.
2. Extend rod fully.
3. Clean outside surface of cylinder with suitable solvent and dry to prevent dirt and debris from entering cylinder barrel.
4. Lift lock ring (A) out of slot using screwdriver.

*NOTE: Spraying penetrating oil in access slot may ease in disassembly.*

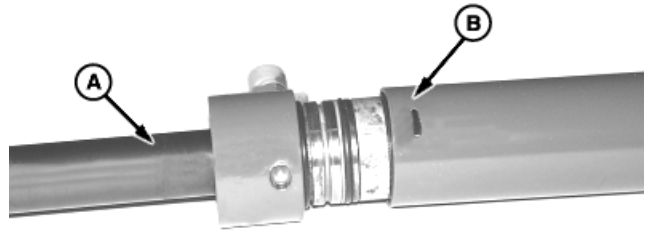
5. Rotate end of rod guide (B) in same direction end of lock ring is pointing, to rotate lock ring out of slot, while pulling on lock ring.

Continued on next page

OUO6046,00016AC -19-05NOV01-1/10

6. Pull rod assembly (A) from cylinder barrel (B).

A—Rod  
B—Barrel



HCD1093 -UN-19NOV01

OUO6046,00016AC -19-05NOV01-2/10

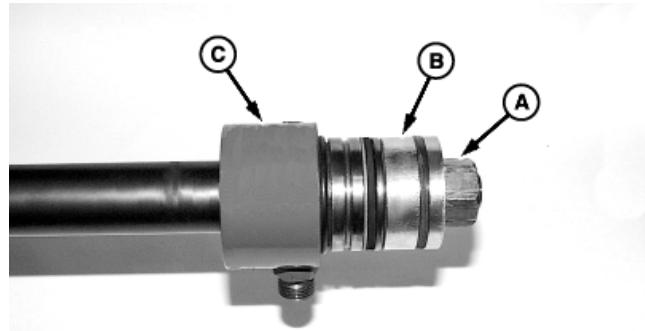
*NOTE: Install rod end in soft-jawed vise in order to remove nut.*

7. Remove nut (A), piston (B) and rod guide (C).

*NOTE: When removing seals from piston and rod guide, do not damage, mark or score any surfaces that contact the seals.*

8. Remove all seals and rings from piston and rod guide.

9. Inspect piston and rod guide for nicks or burrs. Repair or replace as necessary.



HCD1060 -UN-27NOV01

A—Nut  
B—Piston  
C—Rod Guide

OUO6046,00016AC -19-05NOV01-3/10

10. Inspect groove in cylinder barrel. If necessary, clean groove and remove nicks, burrs, or rust from inside of barrel using emery cloth.

11. Clean inside of barrel using a safe solvent and blow dry using compressed air.



HCD1084 -UN-19NOV01

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OUO6046,00016AC -19-05NOV01-4/10

*NOTE: All parts must be clean and dry before assembly.*

12. Install O-ring (B).

*NOTE: The cap seal (A) can be made more pliable by putting the seal in hot water for approximately 5 minutes.*

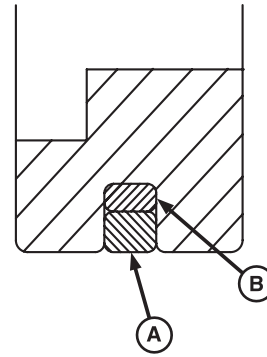
*Install cap seal as quickly as possible once it has been removed from the water and dried to keep the amount of time that seal is stretched to a minimum.*

13. Push seal on end of piston.

14. Install a plastic tie band around cap seal with the smooth side against seal.

15. Pull cap seal across land into position over O-ring using the plastic tie band.

**A—Piston Seal**  
**B—O-Ring**



HCD1096 -UN-27NOV01

HCD1099 -UN-26NOV01

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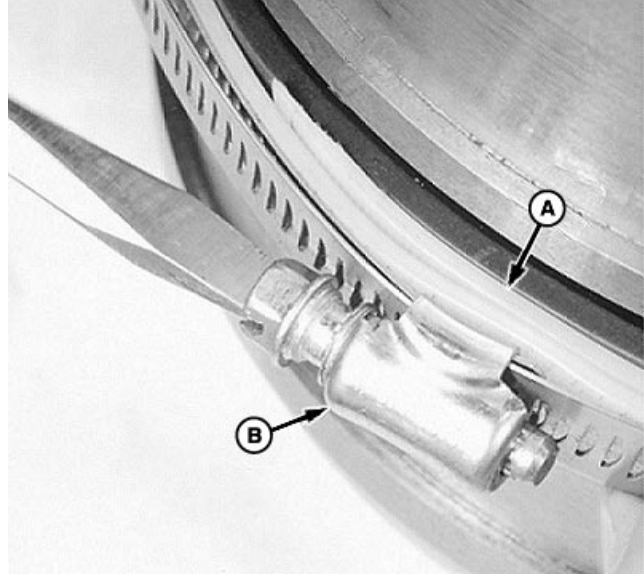
OJ06046,00016AC -19-05NOV01-5/10

16. Check if cap seal is loose; seal must fit tight and not turn. If seal can be turned, it has been stretched too much and can be damaged during assembly into barrel.
17. If necessary, shrink cap seal to its original size using a ring compressor or a hose clamp (B).

Protect by placing shim stock or protective material between seal and clamp when compressing.

Seal will also shrink to its original size if left for a minimum of 8 hours before installing assembly into barrel.

- A—Shim Stock
- B—Hose Clamp



HCD1098 -UN-30NOV01

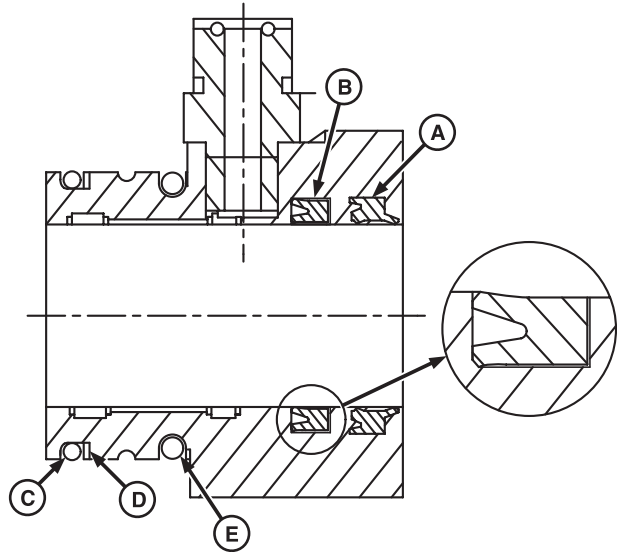
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OOU6046,00016AC -19-05NOV01-6/10

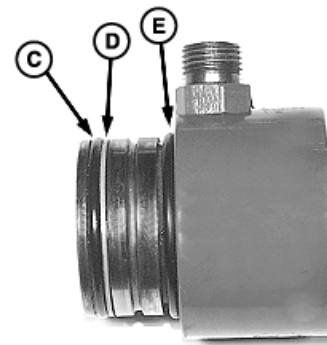
**NOTE:** Seal (B) must be installed with lip facing inside of cylinder as shown.

18. Install seals (A) and (B), O-ring (E), back-up ring (D) and O-ring (C).

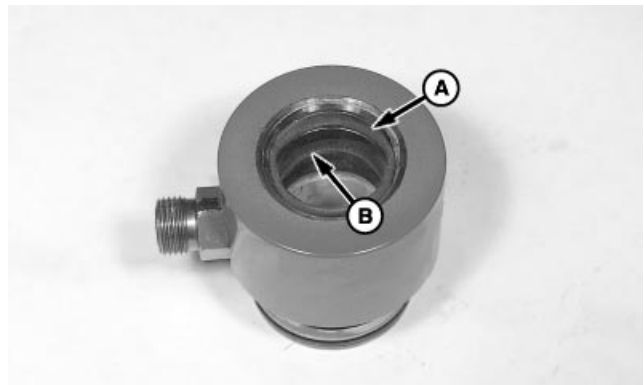
- A—Seal
- B—Seal
- C—O-Ring
- D—Back-up Ring
- E—O-Ring



HCD1063 -UN-28NOV01



HCD1080 -UN-13NOV01



HCD1081 -UN-19NOV01

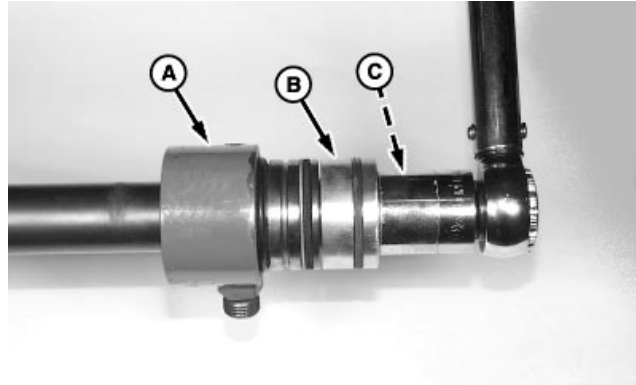
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OOU6046,00016AC -19-05NOV01-7/10

**NOTE:** Install rod end in soft-jawed vise in order to torque nut.

19. Install rod guide (A), piston (B) and nut (C) on rod.
20. Apply light coat of LOCTITE 242 and tighten to torque specified in table:

NUT TORQUE SPECIFICATIONS	
Thread Size	Torque
5/8-18 UNF-2A	130 N•m (96 lb-ft)
3/4-16 UNF-2A	215 N•m (159 lb-ft)



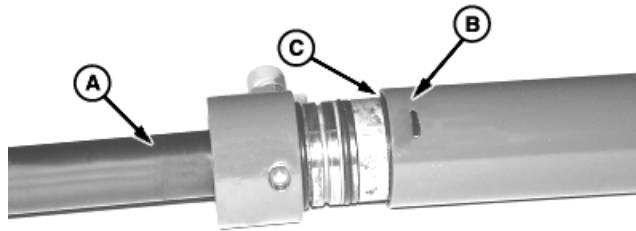
HCD1104 -UN-28NOV01

A—Rod Guide  
B—Piston  
C—Nut

OUC6046,00016AC -19-05NOV01-8/10

21. Apply light film of clean hydraulic oil on all seals and chamfer (C) of barrel.
22. Install rod guide (A) into cylinder barrel (B).

A—Rod Guide  
B—Cylinder Barrel  
C—Chamfer



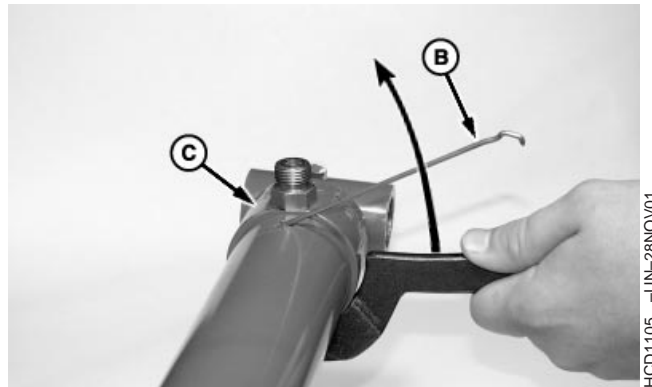
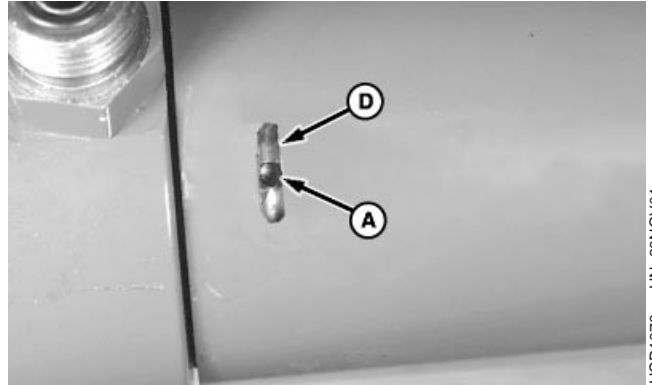
HCD1059 -UN-19NOV01

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OUC6046,00016AC -19-05NOV01-9/10

23. Rotate rod guide (C) until lock ring hole (A) can be seen in access slot (D).
24. Place straight end of lock ring (B) in hole and rotate rod guide in the direction shown until lock ring is seated in access slot.

A—Lock Ring Hole  
B—Lock Ring  
C—Rod Guide  
D—Lock Ring Access Slot



OUC6046,00016AC -19-05NOV01-10/10





**Other Material**

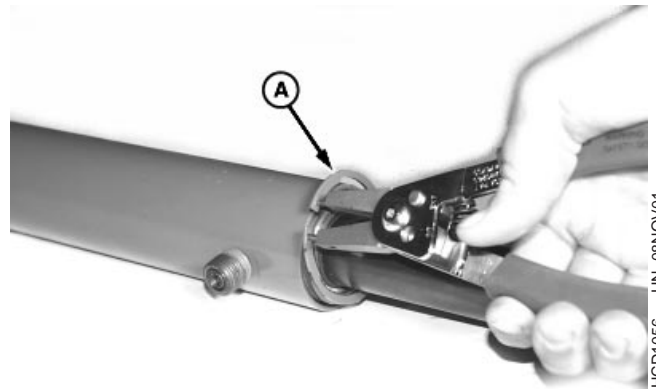
Number	Name	Use
T43512 (U.S.) TY9473 (Canadian) 242 LOCTITE (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Used to lock threads during assembly

OUO6046,00016B1 -19-08NOV01-1/1

**Disassemble and Assemble Cylinder**

**IMPORTANT:** Clamping cylinder in a vise at the middle or rod end of barrel may damage the barrel. Clamp only at the cylinder base end.

**Extend rod to remove oil or air between rod piston and rod guide. Excessive amounts of trapped oil or air will expand seals and make disassembly more difficult.**



HCD1056 -UN-08NOV01

A—Snap Ring

1. Open both ports and drain all oil from the cylinder.
2. Extend rod fully.
3. Clean outside surface of cylinder with suitable solvent and dry to prevent dirt and debris from entering cylinder barrel.
4. Remove external snap ring (A) using snap ring pliers.

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OUO6046,00016B0 -19-07NOV01-1/12

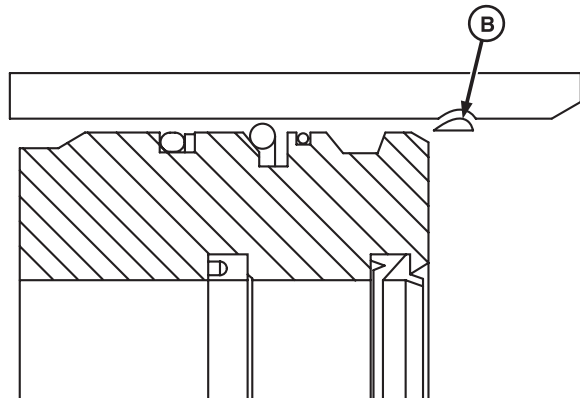
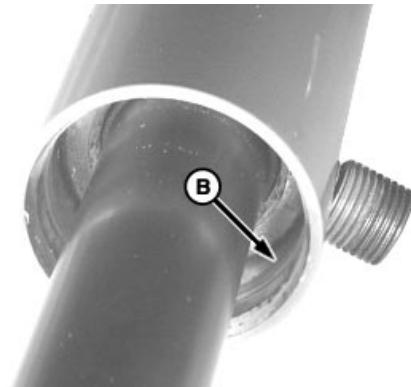
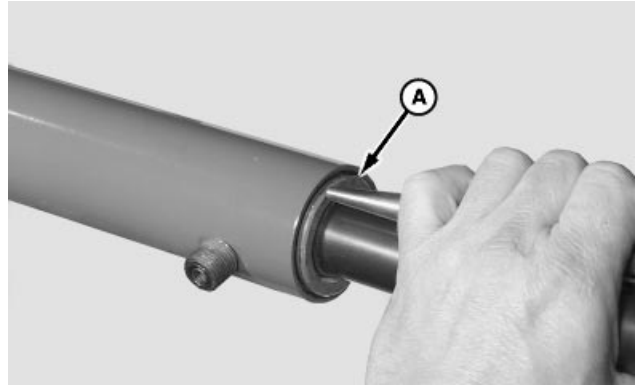
5. Using a wooden dowel or brass drift, drive rod guide (A) into cylinder past barrel snap ring groove.

6. Remove any debris in barrel snap ring groove.

**IMPORTANT: If filler ring (B) is installed backwards, snap ring may not disengage and filler ring could be damaged.**

7. Install filler ring (B), supplied with cylinder seal kit, into barrel snap ring groove in the direction shown to prevent snap ring from engaging in barrel snap ring groove during removal.

A—Rod Guide  
B—Filler Ring



Continued on next page

OUO6046,00016B0 -19-07NOV01-2/12

8. Pull rod assembly (B) with snap ring (A) from cylinder barrel.

*NOTE: Install rod end in soft-jawed vise in order to remove nut.*

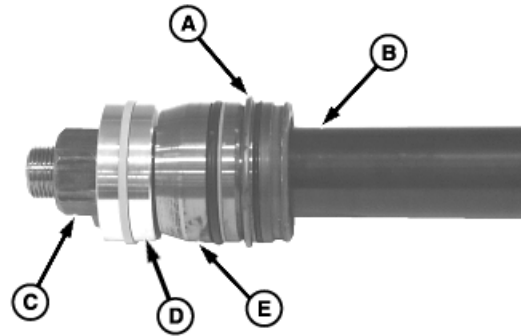
9. Remove nut (C), piston (D) and rod guide (E).

10. Remove groove filler ring from snap ring groove. Do not use for reassembly.

*NOTE: When removing seals from piston and rod guide, do not damage, mark or score any surfaces that contact the seals.*

11. Remove all seals and rings on piston and rod guide.

12. Inspect piston, barrel and rod guide for nicks or burrs. Repair or replace as necessary.



HCD1068 -JUN-08NOV01

- A—Snap Ring
- B—Rod Assembly
- C—Nut
- D—Piston
- E—Rod Guide

OUC6046,00016B0 -19-07NOV01-3/12

13. Inspect groove in cylinder barrel. If necessary, clean groove and remove nicks, burrs, or rust from inside of barrel using emery cloth.

14. Clean inside of barrel using a safe solvent and blow dry using compressed air.



HCD1061 -JUN-19NOV01

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OUC6046,00016B0 -19-07NOV01-4/12

**NOTE:** All parts must be clean and dry before assembly.

There are two different piston types. Refer to the steps below which pertain to your piston.

**15. For TYPE I pistons (Four Piece Piston Seal):**

- a. Install seal expander (A).

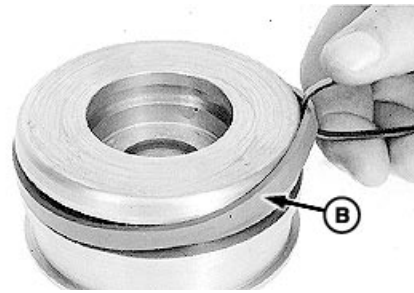
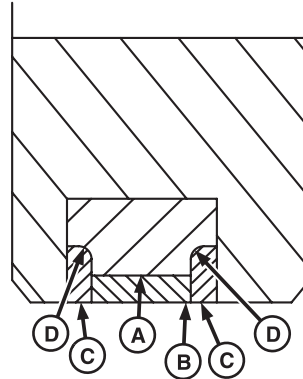
**NOTE:** The cap seal (B) can be made more pliable by putting the seal in hot water for approximately 5 minutes.

Install cap seal as quickly as possible once it has been removed from the water and dried to keep the amount of time that seal is stretched to a minimum.

- b. Push seal on end of piston.
- c. Install a plastic tie band around cap seal with the smooth side against seal.
- d. Pull cap seal across land into position over seal expander using the plastic tie band.

**IMPORTANT:** For proper fit, the backup rings must be installed with the radius toward the seal expander.

- e. Install backup rings (C) with radius (D) toward seal expander (A).



A—Seal  
B—Cap Seal  
C—Backup Ring (2 used)  
D—Radius

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OJ06046,00016B0 -19-07NOV01-5/12

**16. For TYPE II pistons (Two Piece Piston Seal):**

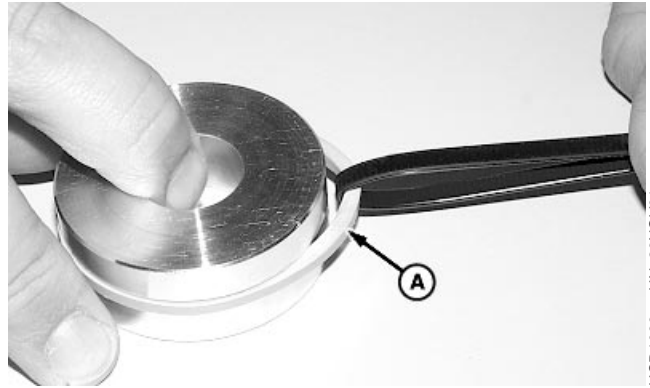
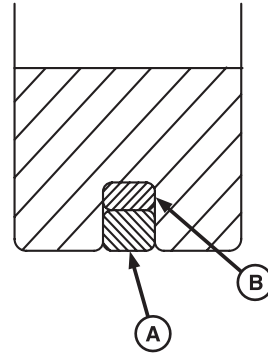
- a. Install O-ring (B).

*NOTE: The cap seal (A) can be made more pliable by putting the seal in hot water for approximately 5 minutes.*

*Install cap seal as quickly as possible once it has been removed from the water and dried to keep the amount of time that seal is stretched to a minimum.*

- b. Push seal (A) on end of piston.  
c. Install a plastic tie band around cap seal with the smooth side against seal.  
d. Pull cap seal across land into position over O-ring using the plastic tie band.

**A—Cap Seal**  
**B—O-Ring**



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OUO6046,00016B0 -19-07NOV01-6/12

**17. For ALL pistons:**

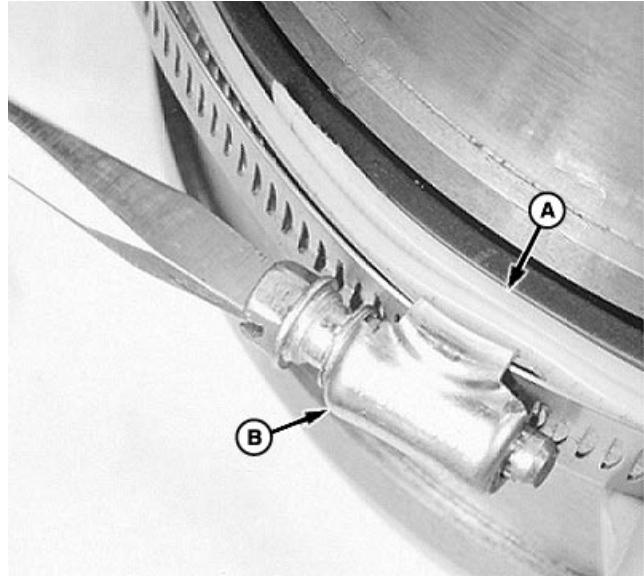
Check if cap seal is loose; seal must fit tight and not turn. If seal can be turned, it has been stretched too much and can be damaged during assembly into barrel.

**18. If necessary, shrink cap seal to its original size using a ring compressor or a hose clamp (B).**

Protect by placing shim stock or protective material between seal and clamp when compressing.

Seal will also shrink to its original size if left for a minimum of 8 hours before installing assembly into barrel.

**A—Shim Stock**  
**B—Hose Clamp**



HCD1098 -UN-30NOV01

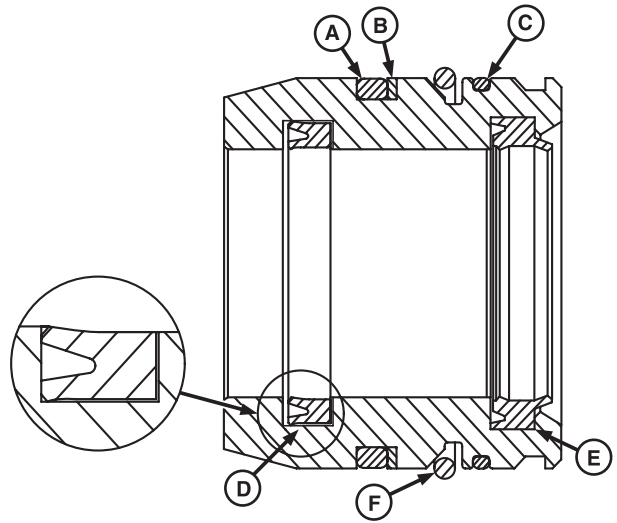
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OUO6046,00016B0 -19-07NOV01-7/12

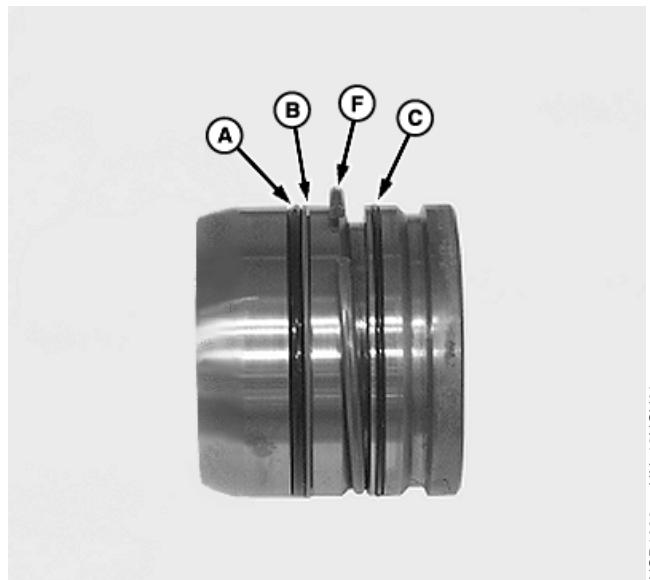
**NOTE:** Seal (D) must be installed with lip facing inside of cylinder as shown.

19. Install seals (E) and (D), snap ring (F), O-ring (C), back-up ring (B) and O-ring (A).

- A—O-Ring
- B—Back-up Ring
- C—O-Ring
- D—Seal
- E—Seal
- F—Snap Ring



HCD1070 -UN-27NOV01



HCD1089 -UN-13NOV01



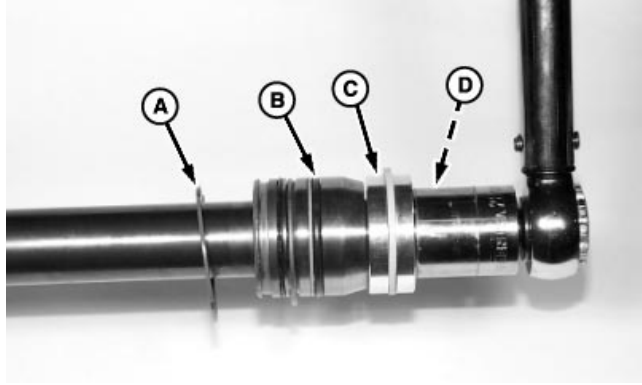
HCD1090 -UN-13NOV01

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OUC6046,00016B0 -19-07NOV01-8/12

**NOTE:** Install rod end in soft-jawed vise in order to torque nut.

20. Install external snap ring (A), rod guide (B), piston (C) and nut (D) on rod.
21. Apply light coat of LOCTITE 242 and tighten to torque specified in table. If torque turn is specified in table go to steps 22—24.



HCD1106 -UN-28NOV01

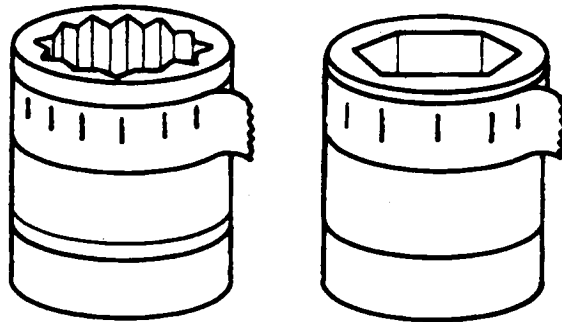
A—External Snap Ring  
B—Rod Guide  
C—Piston  
D—Nut

NUT TORQUE SPECIFICATIONS	
Thread Size	Torque
5/8-18 UNF-2A	130 N•m (96 lb-ft)
3/4-16 UNF-2A	215 N•m (159 lb-ft)
M12 x 1.5	100 N•m (74 lb-ft)

NUT TORQUE SPECIFICATION	
Thread Size	Torque Turn
M16 x 1.5	50 N•m (37 lb-ft) + 45°

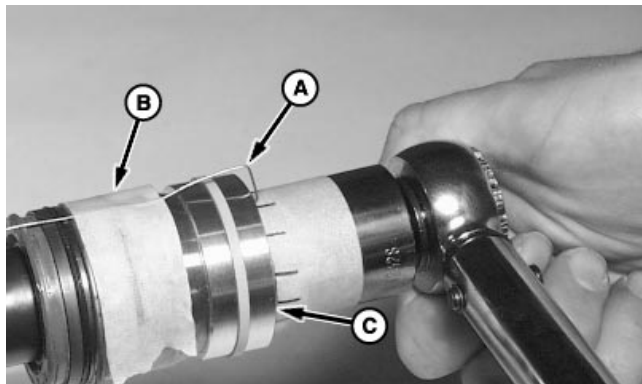
OUC6046.00016B0 -19-07NOV01-9/12

22. Put tape around a socket. Make marks on the tape to divide the socket into 1/12's. The marks will be 30° apart. These will serve as a handy visual reference for determining "Degrees Beyond Snug Torque".
23. Tape a piece of wire (A) on rod guide (B), over piston (C), pointing to one of the marks on the socket.
24. Turn piston nut beyond the snug torque, the number of degrees specified in the table above.



T6149AG -UN-19OCT88

A—Wire  
B—Rod Guide  
C—Piston



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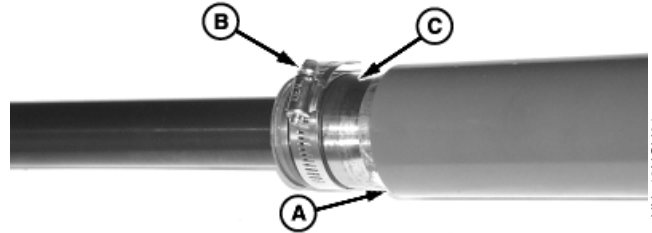
OUC6046.00016B0 -19-07NOV01-10/12



25. Apply light film of clean hydraulic oil on seals and chamfer (A) of barrel.
26. Compress the internal snap ring using a hose clamp (B) until snap ring is seated in groove on rod guide and then loosen a little.

*NOTE: Remove hose clamp once internal snap ring has entered cylinder bore to prevent damage to external O-ring.*

27. Drive rod guide (C) into barrel until snap ring seats in the barrel groove.
28. Pull forward on rod to ensure that it has locked.



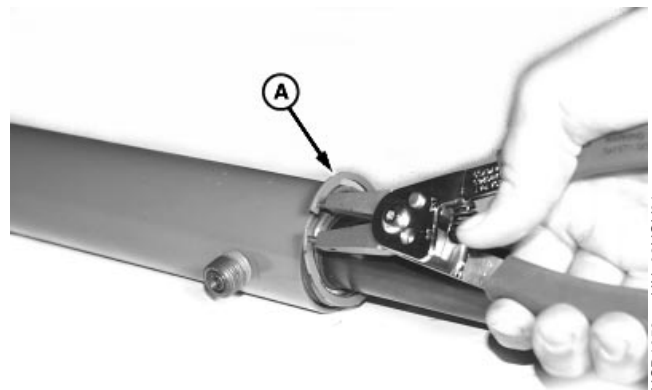
A—Chamfer  
B—Hose clamp  
C—Rod Guide

HCD1071 -UN-19NOV01

OUO6046,00016B0 -19-07NOV01-11/12

29. Install snap ring (A).

A—Snap Ring



HCD1056 -UN-08NOV01

OUO6046,00016B0 -19-07NOV01-12/12



**Other Material**

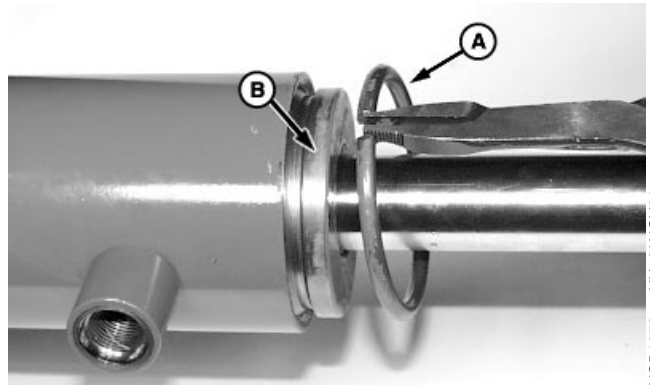
Number	Name	Use
T43512 (U.S.) TY9473 (Canadian) 242 LOCTITE (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Used to lock threads during assembly

OUO6046,00016B1 -19-08NOV01-1/1

**Disassemble and Assemble Cylinder**

**IMPORTANT:** Clamping cylinder in a vise at the middle or rod end of barrel may damage the barrel. Clamp only at the cylinder base end.

Extend rod to remove oil or air between rod piston and rod guide. Excessive amounts of trapped oil or air will expand seals and make disassembly more difficult.



HCD1072 -UN-28NOV01

A—Snap Ring  
B—Rod Guide

1. Open both ports and drain all oil from the cylinder.
2. Extend rod fully.
3. Clean outside surface of cylinder with suitable solvent and dry to prevent dirt and debris from entering cylinder barrel.
4. Remove snap ring (A) from rod guide (B).

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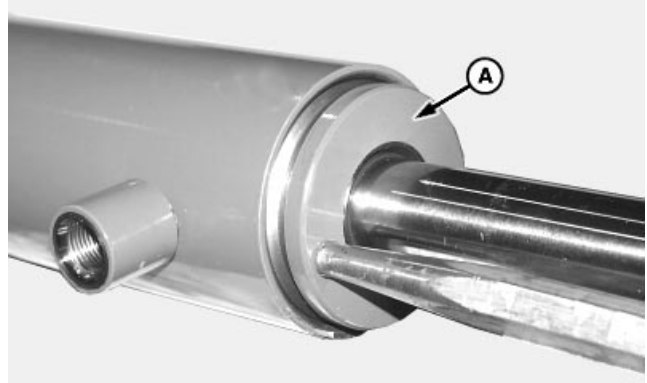
5. Using a wooden dowel or brass drift, drive rod guide (A) into cylinder past barrel snap ring groove.

6. Remove any debris in barrel snap ring groove.

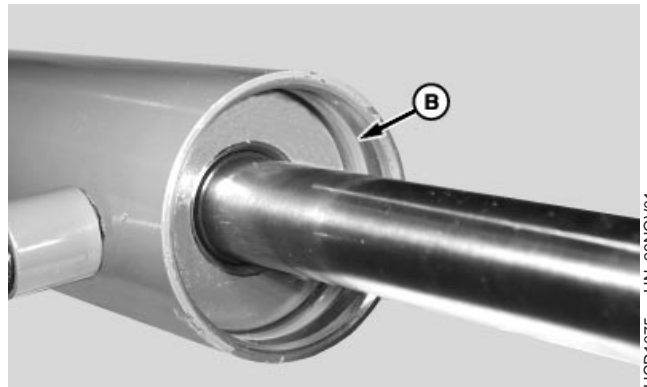
**IMPORTANT: If filler ring (B) is installed backwards, snap ring may not disengage and filler ring could be damaged.**

7. Install filler ring (B), supplied with cylinder seal kit, into barrel snap ring groove in the direction shown to prevent snap ring from engaging in barrel snap ring groove during removal.

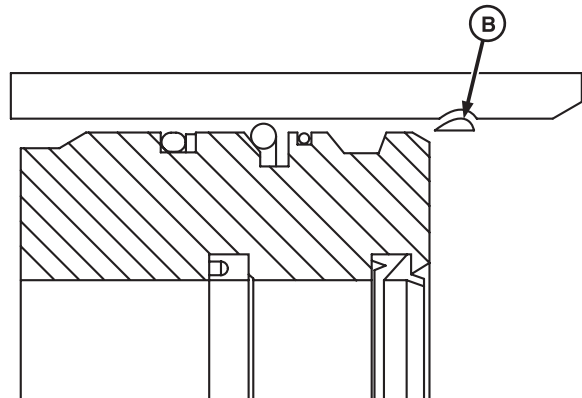
A—Rod Guide  
B—Filler Ring



HCD1073 -UN-13NOV01



HCD1075 -UN-29NOV01



HCD1097 -UN-28NOV01

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OUO6046,00016AF -19-07NOV01-2/10

8. Pull rod assembly (A) from cylinder barrel (B).

*NOTE: Install rod end in soft-jawed vise in order to remove nut.*

9. Remove nut (C), piston (D) and rod guide (E).

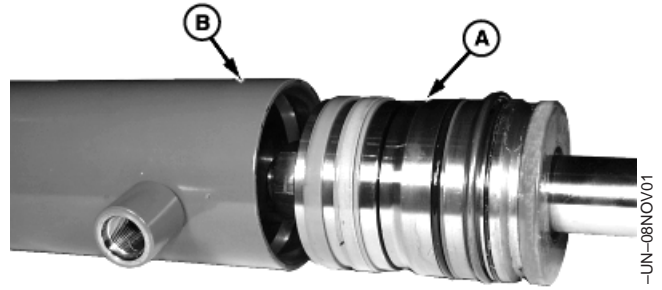
10. Remove groove filler ring from snap ring groove. Do not use for reassembly.

*NOTE: When removing seals from piston and rod guide, do not damage, mark or score any surfaces that contact the seals.*

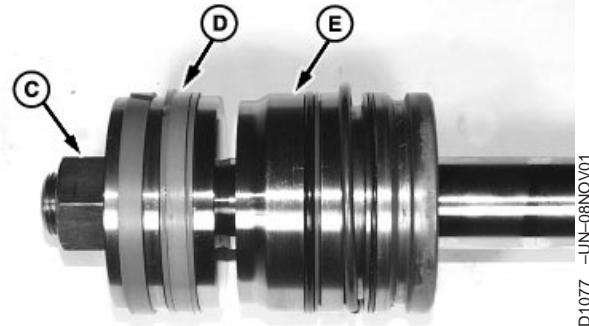
11. Remove all seals and rings on piston and rod guide.

12. Inspect piston, barrel and rod guide for nicks or burrs. Repair or replace as necessary.

- A—Rod Assembly
- B—Cylinder Barrel
- C—Nut
- D—Piston
- E—Rod Guide



HCD1076 -UN-08NOV01



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OOU6046,00016AF -19-07NOV01-3/10

13. Inspect groove in cylinder barrel. If necessary, clean groove and remove nicks, burrs, or rust from inside of barrel using emery cloth.

14. Clean inside of barrel using a safe solvent and blow dry using compressed air.



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**NOTE:** All parts must be cleaned and dry before assembly.

15. Install O-ring (B) and seal (D).

**NOTE:** Cap seal (E) can be made more pliable by putting the seal in hot water for approximately 5 minutes.

Install cap seal as quickly as possible once it has been removed from the water and dried to keep the amount of time that seal is stretched to a minimum.

16. Push cap seal (E) on end of piston.

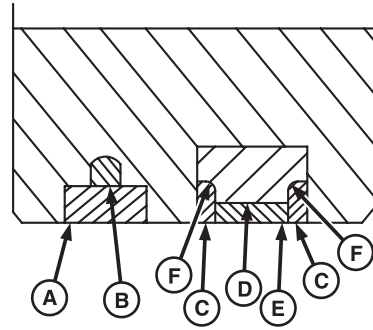
17. Install a plastic tie band around cap seal with the smooth side against seal.

18. Pull cap seal across land into position over seal (D) using the plastic tie band.

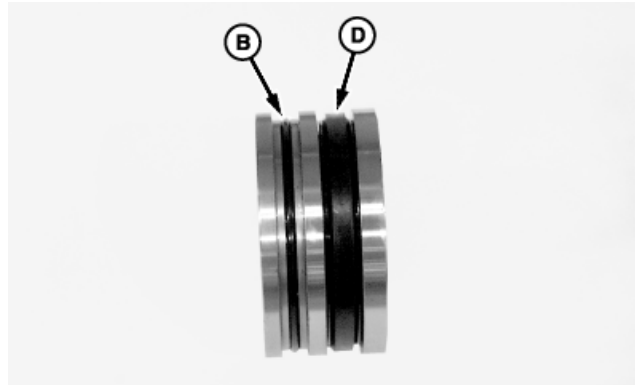
**IMPORTANT:** For proper fit, the back-up rings (C) must be installed with the radius (F) toward cap seal (E).

19. Install ring (A) and back-up rings (C).

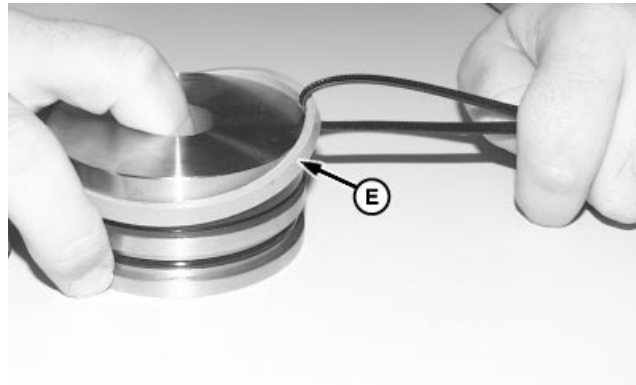
- A—Ring
- B—O-Ring
- C—Back-up Ring (2 used)
- D—Seal
- E—Cap Seal
- F—Radius



HCD1062 -UN-28NOV01



HCD1088 -UN-13NOV01



HCD1100 -UN-26NOV01



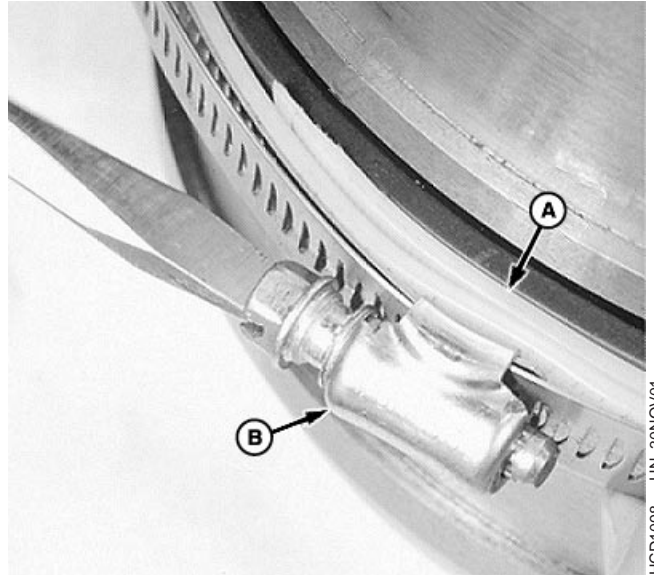
HCD1087 -UN-28NOV01

20. Check if cap seal is loose; seal must fit tight against seal expander and not turn. If seal can be turned, it has been stretched too much and can be damaged during assembly into barrel.
21. If necessary, shrink cap seal to its original size using a ring compressor or hose clamp (B).

Protect by placing shim stock or protective material between seal and clamp when compressing.

Seal will also shrink to its original size if left for a minimum of 8 hours before installing assembly into barrel.

- A—Shim Stock
- B—Hose Clamp



HCD1098 -UN-30NOV01

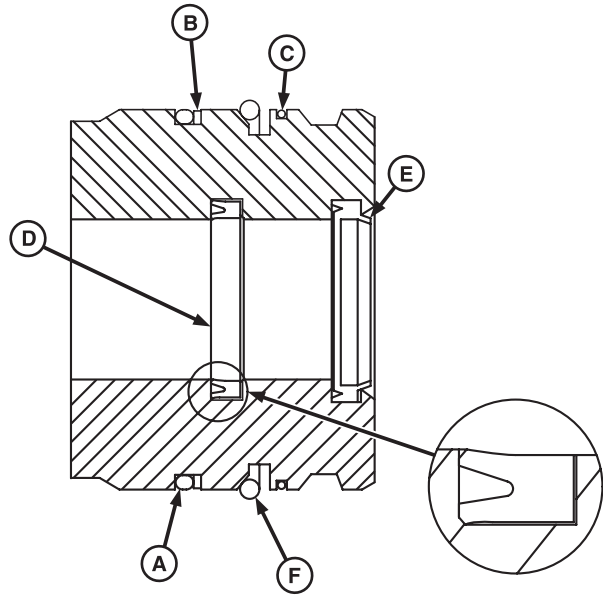
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OUC6046,00016AF -19-07NOV01-6/10

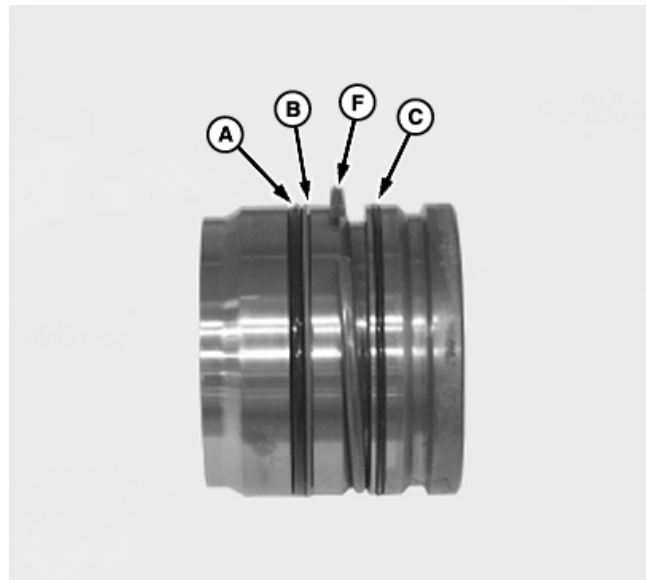
**NOTE:** Seal (D) must be installed with lip facing inside of cylinder as shown.

22. Install seals (E) and (D), snap ring (F), O-ring (C), back-up ring (B) and O-ring (A).

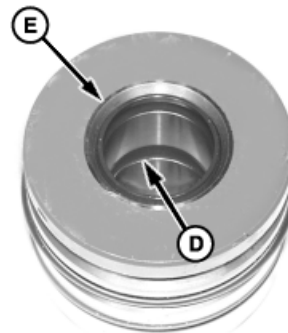
- A—O-Ring
- B—Back-up Ring
- C—O-Ring
- D—Seal
- E—Seal
- F—Snap Ring



HCD1064 -UN-27NOV01



HCD1085 -UN-13NOV01



HCD1091 -UN-13NOV01

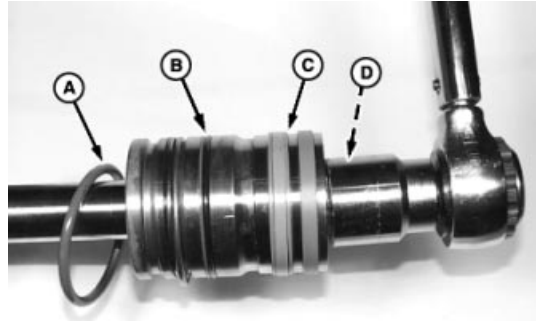
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**NOTE:** Install rod end in soft-jawed vise in order to torque nut.

23. Install external snap ring (A), rod guide (B), piston (C) and nut (D) on rod.
24. Apply light coat of LOCTITE 242 and tighten to torque specified in table:



A—External Snap Ring  
B—Rod Guide  
C—Piston  
D—Nut

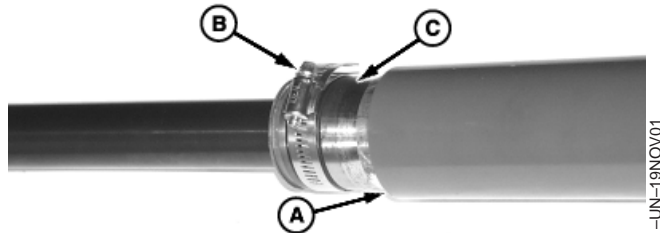
NUT TORQUE SPECIFICATIONS	
Thread Size	Torque
3/4-16 UNF-2A	210 N•m (155 lb-ft)
7/8-14 UNF-2A	320 N•m (236 lb-ft)
1-12 UNF-2A	463 N•m (341 lb-ft)
1 1/8-12 UNF-2A	492 N•m (363 lb-ft)
1 1/4-12 UNF-2A	965 N•m (712 lb-ft)

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25. Apply light film of clean hydraulic oil on seals and chamfer (A) of barrel.
26. Compress the internal snap ring using a hose clamp (B) until snap ring is seated in groove on rod guide and then loosen a little.

**NOTE:** Remove hose clamp once internal snap ring has entered cylinder bore to prevent damage to external O-ring.

27. Drive rod guide (C) into barrel until snap ring seats in the barrel groove.
28. Pull forward on rod to ensure that it has locked.



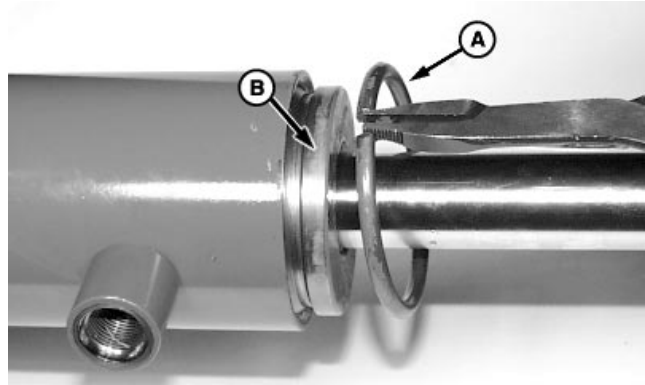
A—Chamfer  
B—Hose clamp  
C—Rod Guide

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29. Install snap ring (A) in rod guide (B).

A—Snap Ring  
B—Rod Guide



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