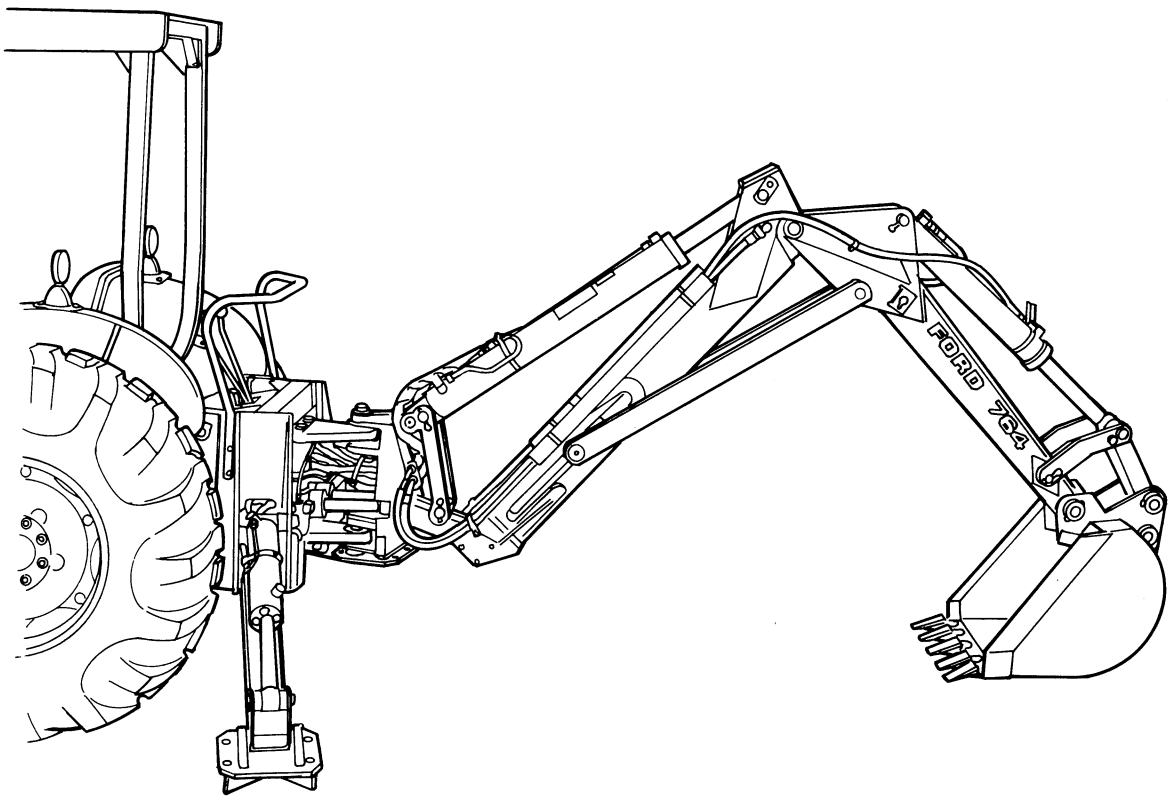
FORD

# Service Manual

FORD
NEW HOLLAND

# Series 764 Backhoe

**Installed on Ford Tractors**
**Models 445, 445A, 545, 545A, 345C, 445C and 545C**




Ford New Holland, Inc
New Holland, PA 17557



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# FOREWORD

This manual contains service procedures for the Ford Series 764 Backhoe. Detailed information is given in description and operation, trouble shooting, tests and adjustments, maintenance, lubrication and specifications.

Installation of the basic backhoe, the attaching kit, and the hydraulic kits are not covered in this publication. Refer to the appropriate operating manual for installation information.

The service procedures in this manual are the most apparent, practical, and efficient methods, however, a procedure may not prove to be the most desirable in all situations. Alternate methods are sometimes required, depending upon the tools and equipment available.

Reference to the direction in the operation and servicing of the backhoe is made as viewed from the seat in the backhoe operating position. When ordering parts, left and right are reversed and referenced as facing in the direction of tractor forward tarvel.

Keep this manual with your service material so that it will be readily available when required.

CONSUMER SERVICES DEPARTMENT
FORD NEW HOLLAND, INC.

# SAFETY PRECAUTIONS

Practically all service work involves the need to drive the tractor. The Operator's Manual, supplied with each tractor, contains detailed safety precautions relating to driving, operating and servicing that tractor. These precautions are as applicable to the service technician as they are to the operator, and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or re-assembly operations, whether within a workshop facility or out "in the field," consideration should be given to factors that may have an effect upon safety, not only upon the mechanic carrying out the work, but also upon bystanders.

## PERSONAL CONSIDERATIONS

- The wrong clothes or carelessness in dress can cause accidents. Check to see that you are suitably clothed.

  Some jobs require special protective equipment.

- **Skin Protection**
  Used engine oil may cause skin cancer. Follow work practices that minimize the amount of skin exposed and the length of time used oil remains on the skin.

- **Eye Protection**
  The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, discing, welding, painting, etc.

- **Breathing Protection**
  Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.

- **Hearing Protection**
  Loud noise may damage your hearing and the greater the exposure the worse the damage. If you feel the noise is excessive, wear ear protection.

- **Hand Protection**
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents such as white spirit, paraffin, etc., may harm the skin.

- **Foot Protection**
  Substantial or protective footwear with reinforced toe-caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.

- **Special Clothing**
  For certain work it may be necessary to wear flame or acid-resistant clothing.

- Avoid injury through incorrect handling of components. Make sure you are capable of lifting the object. If in doubt get help.

## EQUIPMENT CONSIDERATIONS

- **Machine Guards**
  Before using any machine, be sure that the machine guards are in position and serviceable. These guards not only prevent body and clothing from coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.

- **Lifting Appliances**
  Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

  Never stand under a suspended load or a raised implement.

- **Compressed Air**
  The pressure from a compressed air line is often as high as 100 psi (6.9 bar) 7 (kgf/cm²). It is perfectly safe if used correctly. Any misuse may cause injury.

  Never use compressed air to blow dust, filing, dirt, etc., away from your work area unless the correct type of nozzle is fitted.

  Compressed air is not a cleaning agent, it will only move dust, etc., from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears or skin.

- **Hand Tools**
  Many cuts, abrasions and injuries are caused by defective tools. Never use the wrong tool for the job, as this generally leads either to some injury, or to a poor job.

  **Never use**

  — A hammer with a loose head or split handle.
  — Spanners or wrenches with splayed or worn jaws.
  — Spanners or files as hammers; or drills, clevis pins or bolts as punches.

  For removing or replacing hardened pins use a copper or brass drift rather than a hammer.

  For dismantling, overhaul and assembly of major and sub components, always use the Special Service Tools recommended. They will reduce effort, labor and repair cost.

  Always keep tools clean and in good working order.

- **Electricity**
  Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

  Before using any electrical equipment — particularly portable appliances — make a visual check to make sure that the cable is not worn or frayed and that the plugs, sockets, etc., are intact. Make sure you know where the nearest isolating switch for your equipment is located.

## GENERAL CONSIDERATIONS

- **Solvents**
  Use only cleaning fluids and solvents that are known to be safe. Certain types of fluids can cause damage to components such as seals, etc., and can cause skin irritation. Use only solvents that are suitable for the cleaning of components and parts, and that do not affect the personal safety of the user.

- **Housekeeping**
  Many injuries result from tripping or slipping over, or on, objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it — remove it.

  A clean, hazard-free place of work improves the surroundings and daily environment for everybody.

- **Fire**
  Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realized. Everyone must be constantly on guard.

  — Extinguish matches/cigars/cigarettes, etc., before throwing them away.
  — Work cleanly, disposing of waste material into proper containers.
  — Locate the fire extinguishers and find out how to operate them.
  — Do not panic — warn those near and raise the alarm.
  — Do not allow or use an open flame near the tractor fuel tank, battery or component parts.

- **First Aid**
  In the type of work that mechanics are engaged in, dirt, grease, fine dusts, etc., all settle upon the skin and clothing. If a cut, abrasion or burn is disregarded it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become painful and injurious. It only takes a few minutes to have a fresh cut dressed, but it will take longer if you neglect it. Make sure you know where the First Aid box is located.

- **Cleanliness**
  Cleanliness of the tractor hydraulic system is essential for optimum performance. When carrying out service and repairs plug all hose ends and component connections to prevent dirt entry.

  Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high pressure washer or steam cleaner is recommended.

## OPERATIONAL CONSIDERATIONS

- Stop the engine, if at all possible, before performing any service.

- Place a warning sign on tractors which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended.

- Do not attempt to start the engine while standing beside the tractor or attempt to bypass the neutral start switch.

- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.

- Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.

- Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard working surface — concrete for preference.

- If it is found necessary to raise the tractor for ease of servicing or repair, make sure that safe and stable supports are installed beneath axle housings, casings, etc., before commencing work.

- Use footsteps or working platforms when servicing those areas of the backhoe that are not within easy reach.

- Before loosening any hydraulic hoses or tubes be sure the engine is shut off and all residual hydraulic pressure is removed by operating each of the control levers several times.

- Be sure that all of the hydraulic components are resting firmly on solid ground before disconnecting any hoses or tubes.

- Prior to pressure testing, make sure all hoses and tubing connectors are in good condition and tightly sealed. Pressure readings must be taken with the gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment and to eliminate the possibility of personal injury.

- Always lower the backhoe to the ground when leaving the tractor.

- When transporting or driving the tractor and backhoe, be aware of overhead power lines, telephone cables and bridge clearance.

- Do not park or attempt to service a tractor on an incline. If unavoidable, take extra care and block all wheels.

- Escaping hydraulic/diesel fluid under pressure can penetrate the skin causing serious injury. Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Stop the enigne and relieve the pressure before connecting or disconnecting oil lines. Tighten all connections before starting the engine or pressurizing the lines. If fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

- Observe recommended precautions as indicated in this Repair Manual when dismantling the air conditioning system as escaping refrigerant can cause frostbite.

- Prior to removing wheels and tires from a tractor, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.

- When inflating tires beware of over inflation — constantly check the pressure. Overinflation can cause tires to burst and result in personal injury.

- Continuous long term contact with used engine oil may cause skin cancer. Avoid prolonged contact with used engine oil. Wash skin promptly with soap and water.

- Some components on your tractor, such as gaskets and friction surfaces (brake lining, clutch lining, etc.) may contain asbestos. Breathing asbestos dust is dangerous to your health. You are therefore advised to have any maintenance or repair operation on such components carried out by an authorized Ford New Holland Dealer. If, however, service operations are to be undertaken on parts that contain asbestos, the essential precautions are listed below must be observed.

  — Work out of doors or in a well ventilated area.
  — Dust found on tractor or produced during work on the tractor should be dampened, placed in a sealed container and marked to ensure safe disposal.
  — If any cutting, drilling, etc., is attempted on materials containing asbestos, the item should be dampened and only hand tools or low speed power tools used.

Safety precautions are very seldom the figment of someone's imagination. They are the result of sad experience, where most likely someone has paid dearly through personal injury.

Heed these precautions and you will protect yourself accordingly. Disregard them and you may duplicate the sad experience of others.

# SERVICE TECHNIQUES

## A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

## B. SERVICE TECHNIQUES

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficient working life of a component and lead to costly replacement.

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in overhauled components being more reliable and efficient in operation.

Use cleaning fluids which are known to be safe. Certain types of fluid can cause damage to 'O' rings and cause skin irritation. Use solvents that are suitable for cleaning components and do not risk the personal safety of the user.

Replace 'O' rings, seals or gaskets whenever they are disturbed. Never mix new and old seals or 'O' rings, regardless of condition. Always lubricate new seals and 'O' rings with hydraulic oil before installation.

When replacing component parts use the correct tool for the job.

### HOSES AND TUBES

Always replace hoses and tubes if end connections are damaged.

When installing a new hose loosely connect each end and make sure the hose takes up the designed position before tightening the connection. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing.

The hoses are the arteries of the unit, be sure they are in good condition when carrying out repairs or maintenance, otherwise the machine's output and productivity will be affected.

After replacing a hose on a moving component make sure the hose does not foul by moving the component through its complete range of travel.

Be sure any hose which has been installed is not kinked or twisted.

Hose connections which are damaged, dented, crushed or leaking, restrict oil flow and reduce the productivity of the components being served. Connectors which show signs of movement from the original swaged position have failed, and will ultimately separate completely.

A hose with a chafed outer cover will allow water entry. Concealed corrosion of the wire reinforcement will subsequently occur along the hose length with resultant hose failure.

Ballooning of the hose indicates an internal leakage due to structural failure. This condition rapidly deteriorates and total hose failure soon occurs.

Kinked, crushed, stretched or deformed hoses generally suffer internal structural damage which can result in oil restriction, a reduction in the speed of operation and ultimate hose failure.

Free-moving, unsupported hoses must never be allowed to touch each other or related working surfaces. This causes chafing which reduces hose life.

### BEARINGS

Bearings which are considered suitable for further service should be cleaned in a suitable solvent and immersed in clean lubricating oil until required.

Installation of a bearing can be classified in two ways; press fit on rotating parts such as shafts and gears, and push fit into static locations such as reduction gear housings. Where possible, always install the bearing onto the rotating component first.

Use the correct tools or a press to install a bearing bushing. In the absence of the correct tools or press, heat the bearings and/or casing in hot oil to assist the installation of the bearing.

When bearings or bushings are removed, always carefully check that the bearing is free from discoloration and signs of overheating. Also check for mechanical damage such as excessive clearance, nicks and scuffing. If in doubt replace the bearings or bushings.

Bearings should never be removed unless absolutely necessary. Always use the recommended puller to reduce the risk of bearing or related component damage.

The reliability and durability of a unit depends on the effective operation of the many types of bearings and bushings which are incorporated in the complete assembly.

These bearings and bushings are subjected, in normal operation, to high working loads and adverse conditions.

Be sure, during normal routine servicing, maintenance or repair, that bearings are given the right attention and are installed with care.

## PRESSURE TESTING

Prior to pressure testing be sure all hoses are in good condition and all connections tight. Pressure readings must be taken with gauges of specified pressure ratings.

The correct procedure should be rigidly observed to prevent damage to the system or the equipment and to eliminate the possibility of personal injury.

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## DESCRIPTION AND OPERATION

### GENERAL

The Ford Series 764 Backhoe consists of a mainframe, swing post, cylinders, boom, dipstick, hoses and tubing, control valves and controls, bucket, sub frames and attaching hardware. Refer to Figure 1, for location of the components. Power for the backhoe is supplied by a hydraulic pump mounted on the tractor.

All components of the backhoe are of standard size measurements.

### PUMP

The hydraulic pump is located at the front of the engine and is driven the by the engine crankshaft. Information covering the pump service procedures is explained in the appropriate loader service manual.

### MAINFRAME

The mainframe is of welded construction. Internally it houses the swing cylinders and main control valve. Externally it supports the stabilizers and the swing post. The swing post and stabilizers are secured by means of pins.

The front of the mainframe is open, which allows access to the control valve system relief pressure check port and swing cylinders, Figure 2. The swing cylinders can be removed from the front of the mainframe without removing the unit from the tractor.

Access panels are located on the top of the mainframe to permit access to the control valve, top hoses and circuit relief valves. The main control valve can also be removed from the mainframe by removing the access panels.

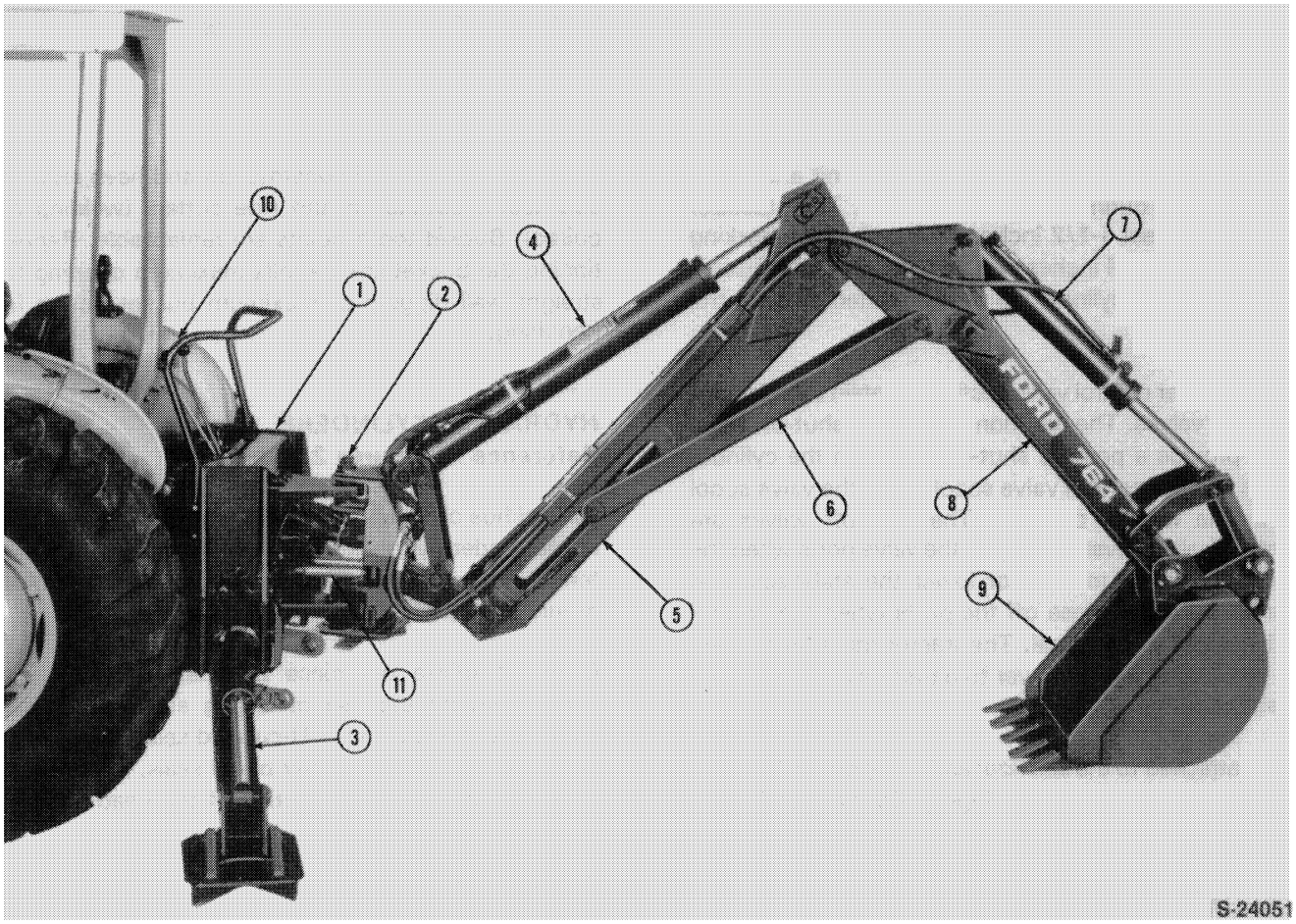



**Figure 1**
**Backhoe Components**

1. Mainframe
2. Swing Post
3. Stabilizer & Cylinder
4. Lift Cylinder
5. Boom
6. Long Bar Link
7. Bucket Cylinder
8. Dipperstick
9. Bucket
10. Control Levers
11. Swing Cylinders

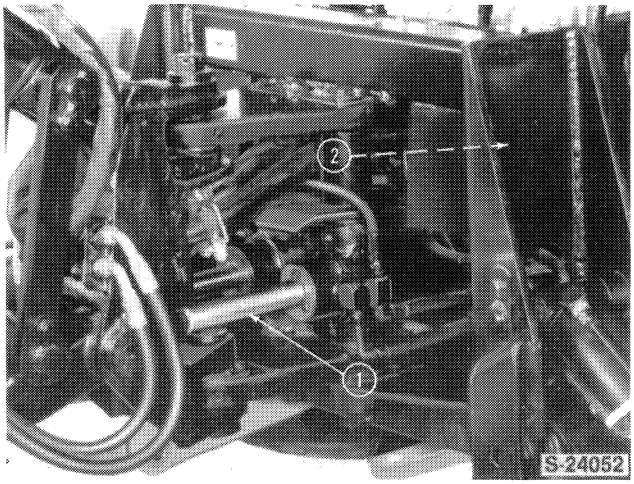



**Figure 2**
**Mainframe**
1. Swing Cylinders 2. Test Port

### STABILIZERS

Stabilizers are attached to the lower right and left side of the backhoe mainframe to level the unit and maintain stability during digging operation. The stabilizer spread is 8 feet 1-1/2 inches (248 cm) while working and 5 feet 10-1/4 inches in transport. Eech stabilizer is controlled by a cylinder which is actuated by a control lever.

The stabilizer control valve sections contain cylinder port shut-off valves. The function of the port shut-off valve is to provide a positive shut-off between the cylinder ports and the control valve spool when the valve spool is in the neutral position. The shut-off valves are hydraulically activated to open the valve ports when the spool is moved to raise or lower the stabilizers and spring loaded to close off the ports when the control valve spool is in neutral. The tractor must be running to provide hydraulic power to either raise or lower the stabilizers.

Pads attached to the stabilizer ends support the backhoe and provide stability while digging. Dirt pads and street pads are available.

### SWING POST

The swing post is a one-piece casting incorporating replaceable bushings at the lift cylinder anchor and boom link attaching pivots. Self-aligning bearings are used at the swing post to mainframe pivots.

The swing cylinder rod ends are attached to the swing post by means of pins.

### BOOM

The boom frame is a reinforced, welded box construction. It supports the hoses for the crowd and bucket cylinders. It also supports the rod end of the lift cylinder and the crowd cylinder is mounted inside the boom assembly. The boom utilizes replaceable bushings at the dipperstick and boom link pivots.

### DIPPERSTICK

The dipperstick is a reinforced, welded, tapered box type construction. It supports the bucket cylinder, idler links, bucket link and bucket. Replaceable bushings are located at the boom-to-dipperstick pivot and at the bucket and bucket idler link pivots.

### BUCKETS

Buckets are a welded construction and have replaceable teeth, cutting lip and side cutters (welding required). Bucket tooth points are replaceable. Repositioning the bucket link permits maximum opening for straight wall digging or maximum bucket power for trenching.

### HYDRAULIC CYLINDERS
**Reference — Figures 2 and 3**

All backhoe cylinders are double acting and extend and retract under hydraulic pressure. Piston rods are high tensile strength steel. The rods are hardened, turned, ground, polished and chrome plated.

Cylinders utilize one-piece pistons. Sealing is accomplished by the use of O-ring and teflon seals. Cylinder rod heads utilize U-cup rod seals, rod wipers, O-ring with back-up washer barrel seals. All cylinders have threaded or bolt retention of the head caps.

### SWING CYLINDERS

The backhoe boom and digging elements can be moved in an arc of 172° about the mainframe. This movement is obtained by the used of two interconnectd hydraulic cylinders coupled between the mainframe and the swing post, Figure 3. The cylinders act directly on the swing post, without the use of connecting links or bellcranks.

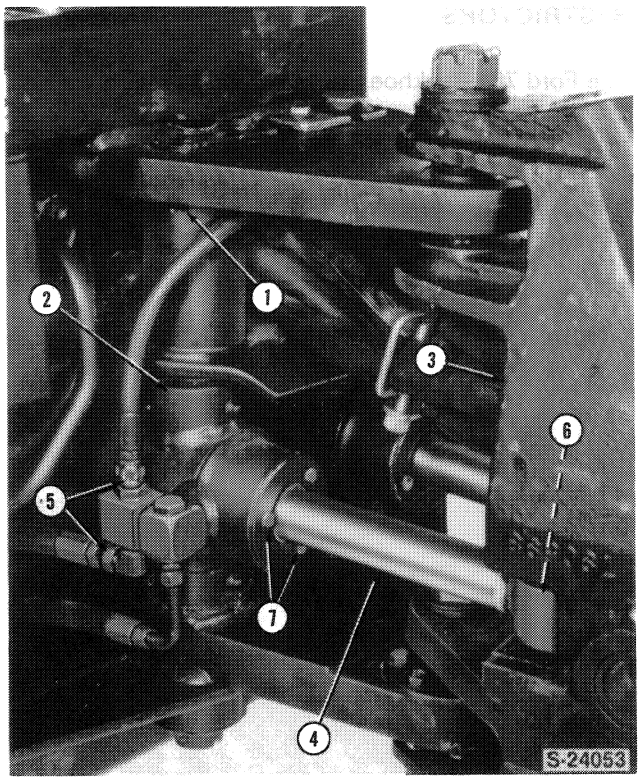



**Figure 3**
**Swing System**

1. Mainframe
2. Trunnion
3. Swing Post
4. Swing Cylinder
5. Hoses
6. Pivot Pin
7. Cap Head Bolts

Each cylinder incorporates a headstock consisting of two large trunnions which pivot in the mainframe, Figure 3. As each cylinder extends or retracts and the swing frame rotates, the cylinders turn in a horizontal plane pivoting on the trunnions within the mainframe.

Each swing cylinder is double acting and each cylinder piston end is connected hydraulically to the rod end of the mating swing cylinder. Consequently, as hydraulic oil is fed to a cylinder to turn the swing frame, one cylinder pushes on one side of the frame while the opposite cylinder pulls on the other side of the frame.

One section of the backhoe multi-section control valve is used to supply oil to the swing cylinders.

## BACKHOE OVERHAUL

### GENERAL

The overhaul section of this repair manual outlines the removal, disassembly, repair and installation of the backhoe components. On overhaul, the following general recommendations should be observed.

Cleanliness is of the utmost importance when servicing the hydraulic components.

Always clean fittings before uncoupling them. Plug all open fittings and ports to prevent entry of foreign matter into the hydraulic system.

Performance of pressure checks and flow tests will improve diagnosis of service problems. Refer to "Trouble Shooting" section for further information.

Certain repairs and adjustments can be performed without complete disassembly of the components. Since the repair procedures describe disassembly, use only those steps applicable to the specific repair to be performed.

Always install new O-rings and seals during assembly as faulty seals lead to circuit problems which are sometimes difficult to trace.

If structural members become cracked or broken, the damage may be repaired by arc welding. Preheat the steel before welding when the temperature is cold to prevent stress cracks in the welded structural member.

**IMPORTANT:** *Be certain that all hydraulic pressure has been relieved and that all structural members have been adequately supported before disassembling any component.*

In the procedures that follow, references are made to the checking of valve springs for purposes of determining if the springs have taken a set. This is best determined by comparing the spring in question with a similar new spring taken from stock. Merely hold the new and used spring side-by-side, and visually compare the spring lengths.

### HYDRAULIC PUMP

The hydraulic pump is a crankshaft driven pump mounted to the front of the tractor. For service procedures, refer to the appropriate loader service manual.

### RESTRICTORS

The Ford 764 Backhoe uses four spring loader restrictors in the control valve.

All of the restrictors are located between the hose adaptor fitting and the spool, however, installation varies from section to section of the control valve, Figure 4.

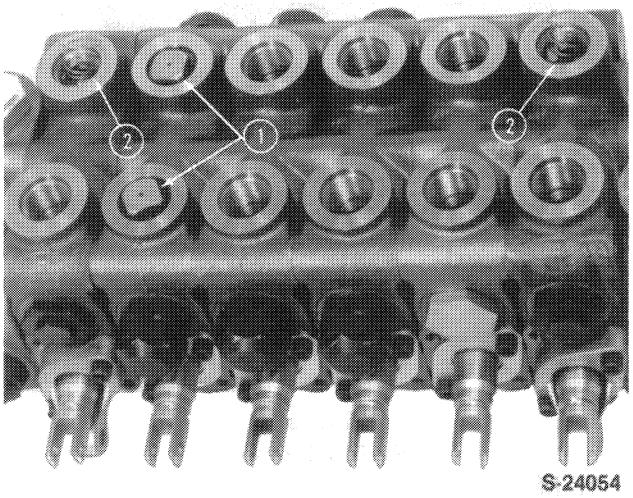



**Figure 4**
**Restrictors**
1. Swing Restrictors 2. Stabilizer Restrictors

The swing circuit uses a restrictor in each control valve port, and they are installed with the flat surface facing outward or toward the hose adaptor fitting. The swing cylinders also use restrictor type adaptor fittings at the cylinder hose ports.

The stabilizer sections each contain one restrictor in the lower ports and are installed with the flat surface facing in or towards the spool.

### CIRCUIT RELIEF VALVES

Circuit relief valves are used in both ends of the lift cylinder valve section, crowd cylinder valve section and the swing cylinder valve section, Figure 5.

The circuit relief valves can be disassembled, cleaned, serviced and adjusted. Refer to "Test Section" for procedures.

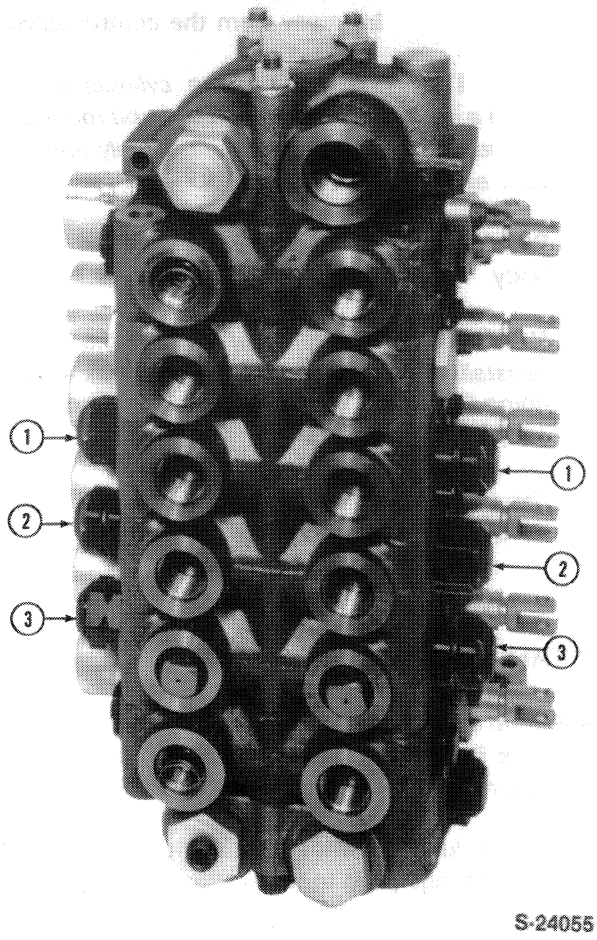



**Figure 5**
**Circuit Relief Valves**

1. Crowd Circuit Relief Valves
2. Lift Circuit Relief Valves
3. Swing Circuit Relief Valves

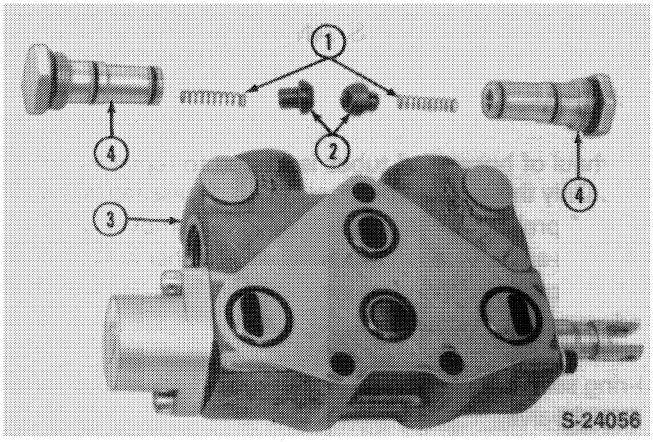



**Figure 6**
**Check Valves**

1. Springs
2. Check Valves
3. Bucket Section
4. Check Valve Body

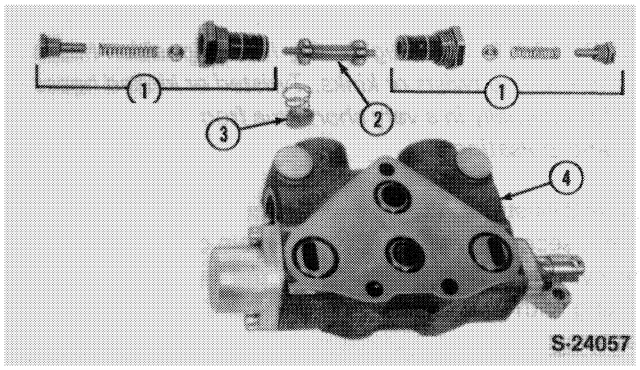



**Figure 7**
**Stabilizer Lock and Load Check Valves**

1. Lock and Load Check Valve Assembly
2. Shuttle Spool
3. Restrictor
4. Stabilizer Section

## CHECK VALVES

Check valves are used in each circuit and any malfunction is the result of foreign material lodging between the seat and the valve. The spring may also be damaged, Figure 6.

The stabilizer valve sections use lock and load check valves and an unlocking shuttle spool. This prevents the stabilizers from moving unless the engine is operating and normal hydraulic pressure is obtained. DO NOT operate the backhoe with these valves removed, damaged or leaking, Figure 7.

## HOSES, TUBES AND FITTINGS

### GENERAL

Overhaul of hoses and tubes is limited to replacement only. Only those hoses or tubes which necessitate some type of preliminary procedure prior to removal or installation are covered in this section. All other hoses are easily accessible, therefore removal and installation procedures are not covered.

O-ring seals are used on fittings at the cylinders and the control valve.

37° flare type fittings are used on all hydraulic tubes and hose connections.

**IMPORTANT:** *Never disconnect a hose or tube that is under pressure. If in doubt actuate the operating levers several times with the engine off prior to disconnecting a hose or tube.*

**IMPORTANT:** *When tightening fittings position hoses so there are no twists or kinks. Twisted or kinked hoses will fail internally in a very short time from repeated flexing and pulsating.*

Figure 8 illustrates the hydraulic circuit routing from the pump, secondary relief valve and main control valve to the cylinders. Also illustrated is the hydraulic circuit routing with the flow divider valve used with 545-545A tractors.

### REMOVAL

1. Before disconnecting any of the hoses or tubing from the main control valve, tag and identify the hose, tube or connector.

2. Note the position of any hoses secured in clamps which will be loosened or removed.

3. Remove any clamps securing the hoses or tubes that are to be removed.

   **NOTE:** *Because of the close proximity of hose connections it may be necessary to remove more than one hose in order to service a particular hose. Loosening the hose at the connection away from the control valve will aid in gaining flexibility and hose movement within the mainframe.*

4. Loosen the hose or hoses to be removed at the connecting point away from the control valve.

   **IMPORTANT:** *On the swing cylinder hoses, make a note of the fitting position and routing of the hoses to assure correct reassembly and prevent early hose failure.*

5. Remove the hose from the connector at the valve body.

   **NOTE:** *Use care in removal of hoses that will be reinstalled. Be careful not to twist or kink a hose, doing so can damage the internal facing causing early hose failure.*

6. Cap all hoses, connectors and ports to prevent entry of dirt into the hydraulic system.

### INSTALLATION

Installation of the hoses and tubes follows the removal procedure in reverse. During installation observe the following requirements:

- Lightly lubricate with hydraulic oil all hose and tube fittings prior to installation.

- Install new O-rings where applicable.

- Install all hoses and tubes in their original positions noted during removal. If the original positions were not noted during removal, position each hose and tube in such a manner so they will not stretch when the boom is lowered or pinch when the boom is raised.

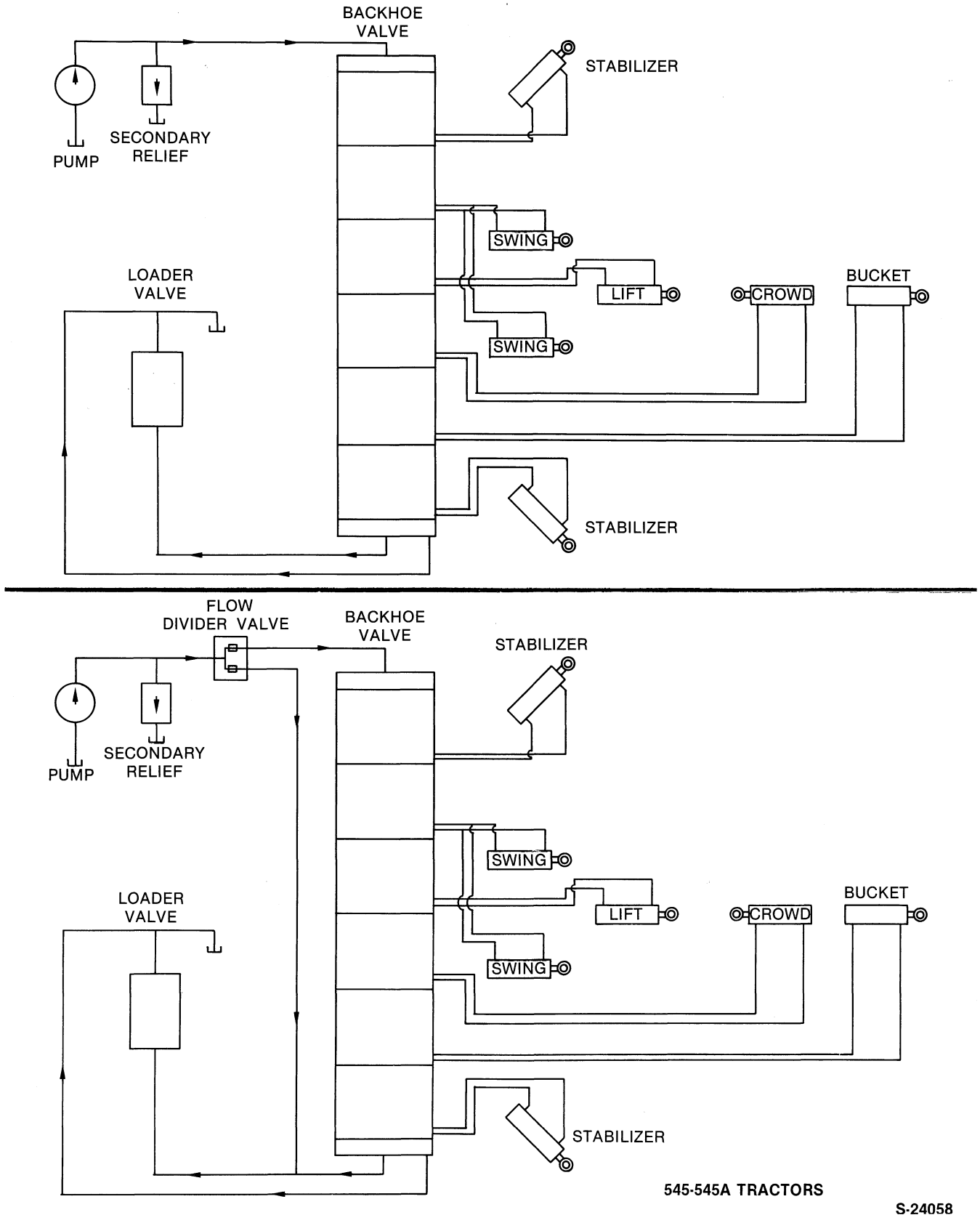



**Figure 8**
**Hydraulic Circuits**

## BACKHOE CYLINDERS

### GENERAL

For cleanliness and ease of handling, all cylinders should be removed from the unit for overhaul except the swing cylinders. It is recommended that the cap on all applicable cylinders be loosened prior to removal.

**IMPORTANT:** *All cylinder caps are locked to the barrels with a setscrew and nylon ball that must be backed out prior to loosening of the cap.*

The head on all of the cylinders slides out with the cylinder rod. The head contains an O-ring and back-up ring to seal against the cylinder barrel. The head also contains a U-cup rod seal and a wiper seal.

The piston assembly is secured to the cylinder rod with a locknut. The piston contains seals and back-up rings that seal against the cylinder barrel walls, Figures 9 and 10.

**IMPORTANT:** *During assembly of all pistons to the cylinder rods, a loctite sealant such as FNH part No. FP-119 must be used between the piston inside diameter and the rod.*

Procedures for removing each cylinder are basically the same, with the exception of the swing and crowd cylinders. Use care in the handling of cylinders during removal and installation to prevent damage to the cylinder rods. Secure the cylinders in a suitable sling as shown in Figure 11, to ensure safe handling.

New seals should be installed when cylinders are disassembled for repair.

### LIFT AND BUCKET CYLINDER REMOVAL

**IMPORTANT:** *DO NOT remove cylinders from the backhoe without first providing ample support and blocking for structural members.*

1. Park the unit on a level, firm surface and place the backhoe elements in a suitable position to best enable removal of a particular cylinder. Support the structural members so that they will be safe to work around.

2. Using hydraulic pressure, relieve any loading on the cylinder pins to aid subsequent pin removal. Stop the engine and relieve all residual oil pressure in the cylinders.

3. Loosen the setscrew securing the cap to the cylinder barrel on applicable cylinders and loosen the cap, Figure 11.

   **NOTE:** *Current lift cylinder assemblies have a threaded cap bearing nut and retaining wire ring to secure the head in the barrel, Figure 12.*

4. Disconnect the hydraulic hoses from the cylinder ports and cap or plug all openings.

5. Position a sling, as shown in Figure 11, around the cylinder to support the weight.

6. Remove the cylinder pivot pin retaining bolts or snap rings as required.

   **NOTE:** *Two pivot pins are used at the lift cylinder barrel end.*

7. Use a brass drift and hammer and drive the pins out of the cylinder pivots.

8. Remove the cylinder, drain the contained oil in the cylinder and recap the ports.

### DISASSEMBLY

### GENERAL

Not all cylinders follow the same disassembly procedures. Obvious differences exist in cylinder barrel diameter, rod size, piston shape and stroke.

1. Position the cylinder in a suitable vise with the ports facing down.

2. Clean the cylinder externally so that the internal parts will not become contaminated.

3. Drain any additional oil left in the cylinder by removing the port caps and slowly pull and push the cylinder rod back and forth until all residual oil is removed.

4. Remove the threaded cap bearing nut, or setscrew, or head cap plate bolts depending on cylinder and remove the head retaining wire lock ring. Pull the rod, head and piston from the barrel, Figure 12.

   **NOTE:** *Be sure the rod surface is not damaged during removal.*

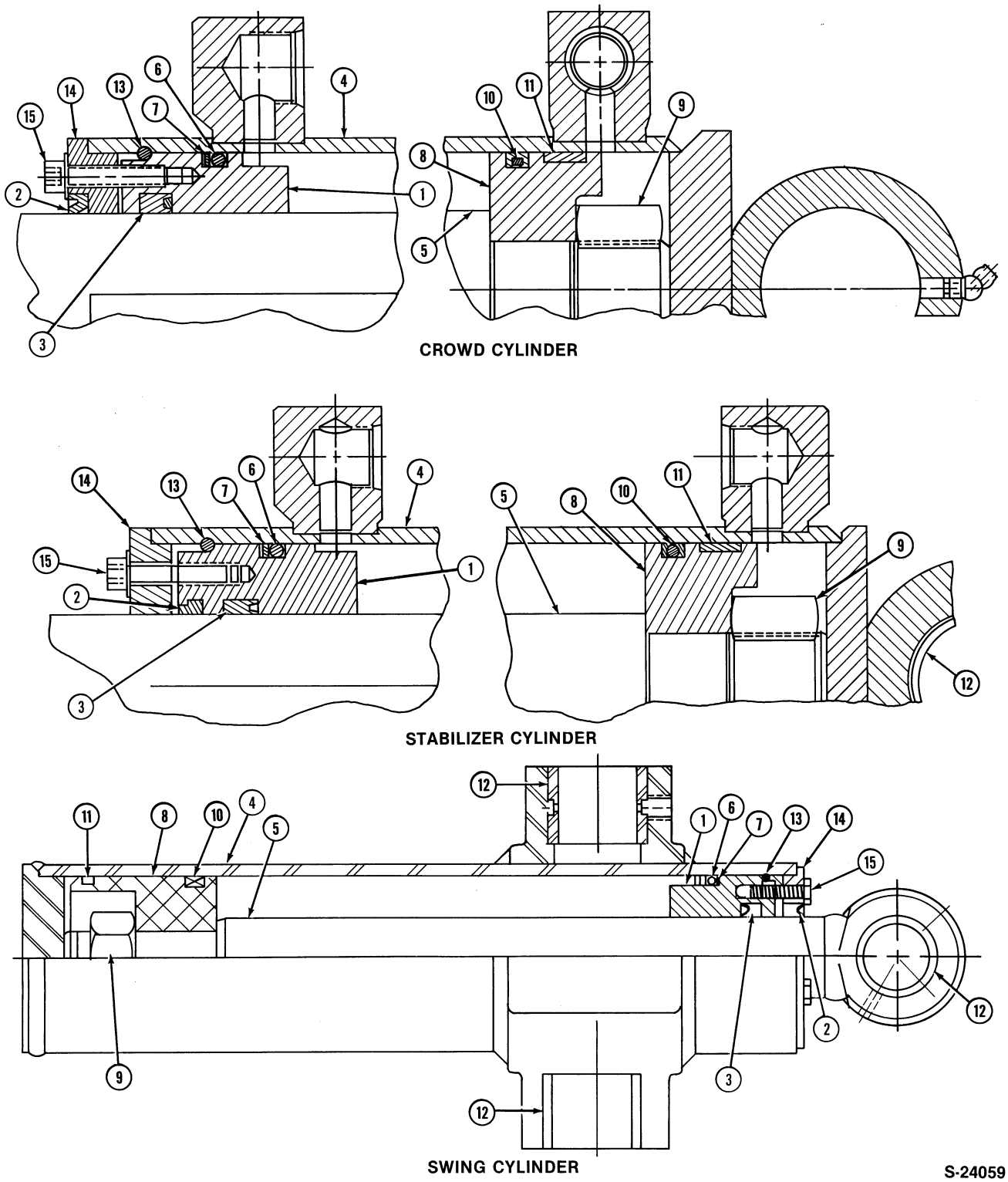
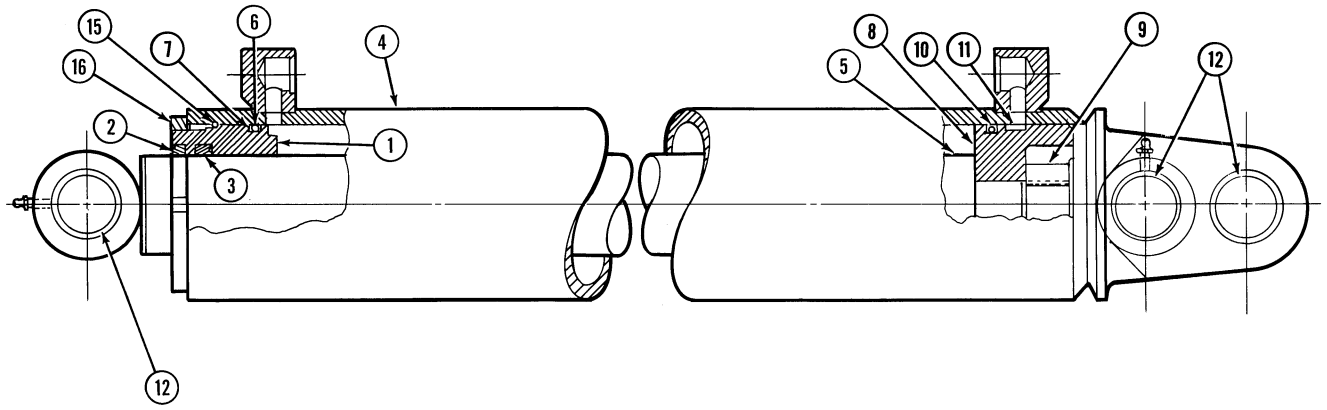


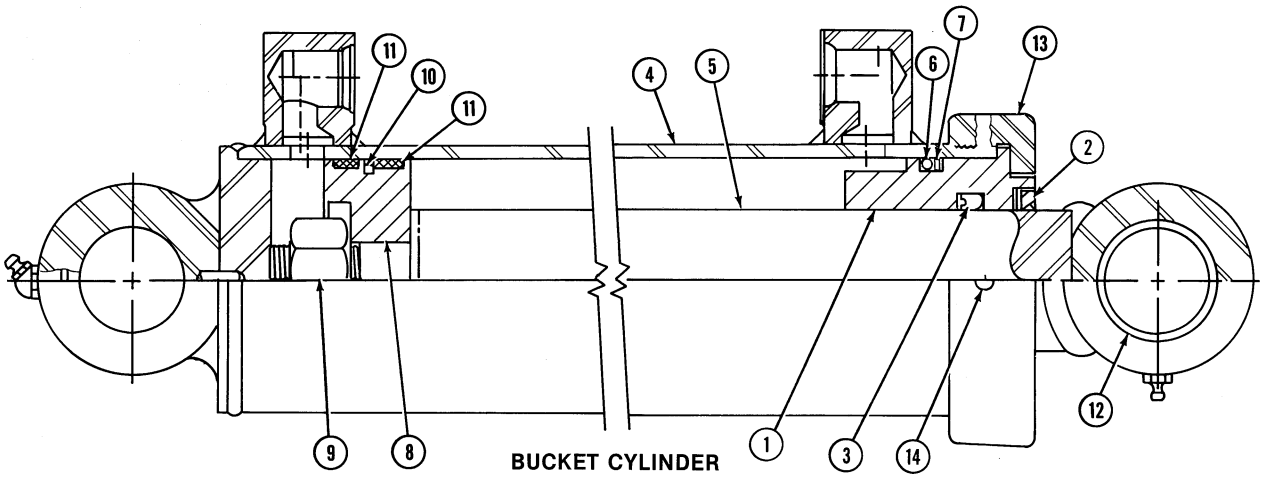

**Figure 9**
**Cylinder Assemblies**

1. Head
2. Wiper Seal
3. Head Seal
4. Cylinder Barrel
5. Cylinder Rod
6. Head O-Ring
7. Head Back-Up Ring
8. Piston
9. Piston Nut
10. Piston Seal
11. Wear Ring
12. Bushing
13. Wire Lock Ring
14. Head Cap
15. Cap Screw

# BACKHOE CYLINDERS




LIFT CYLINDER




BUCKET CYLINDER

S-24060

**Figure 10**
**Cylinder Assemblies**

1. Head
2. Wiper Seal
3. Head Seal
4. Cylinder Barrel
5. Cylinder Rod
6. Head O-Ring
7. Head Back-Up Ring
8. Piston
9. Piston Nut
10. Piston Seal
11. Wear Ring
12. Bushing
13. Head Cap
14. Setscrew
15. Wire Lock Ring
16. Cap Bearing Nut

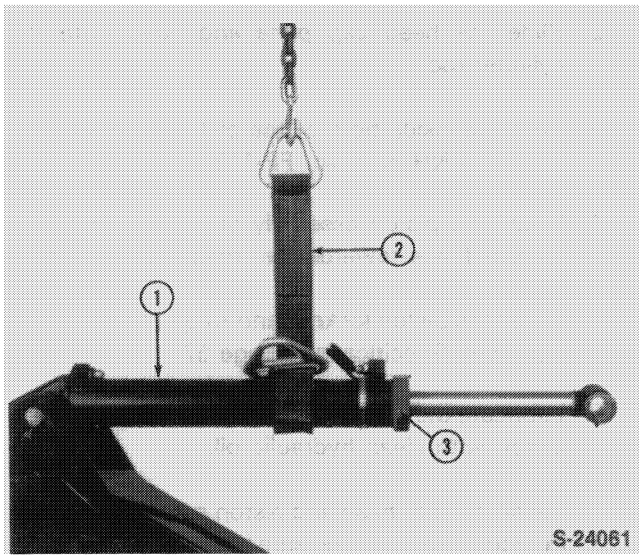



**Figure 11**
**Cylinder Removal**

1. Bucket Cylinder
2. Sling
3. Setscrew

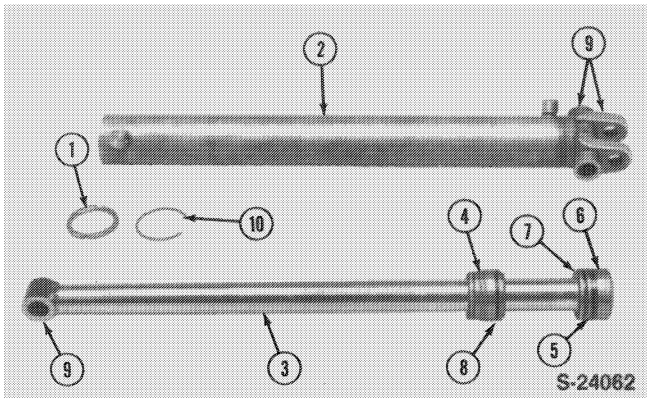



**Figure 12**
**Cylinder Disassembly**

1. Cap Bearing Nut
2. Cylinder Barrel
3. Cylinder Rod
4. Head Assembly
5. Wear Ring
6. Piston
7. Seal
8. O-Ring and Back-Up Ring
9. Bushings
10. Wire Lock Ring

5. Secure the cylinder rod trunnion in a vise, or preferably secure to an anchor point on the backhoe using an attaching pin. Remove the piston retaining locknut using a quality socket and drive system. Considerable torque may be required to loosen the locknut, Figure 13.

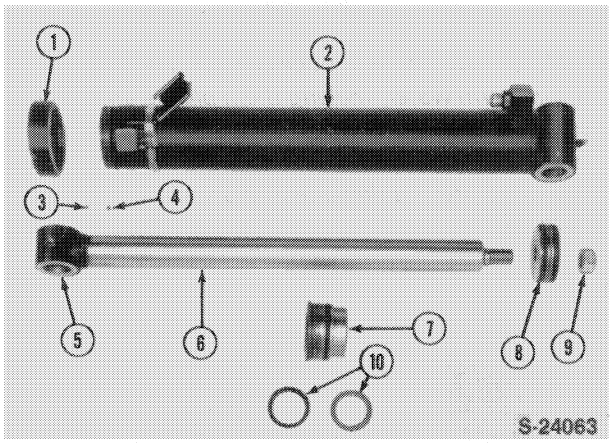



**Figure 13**
**Piston and Head Removal**

1. Cap
2. Barrel
3. Nylon Ball
4. Setscrew
5. Bushing
6. Rod
7. Head
8. Piston
9. Locknut
10. Wiper and U-Cup Seal

6. Remove the piston assembly from the cylinder rod.

7. Remove the head and cap from the cylinder rod, Figure 13.

8. Remove the O-ring and back-up ring from the outer diameter of the head.

9. Remove the internal U-cup seal and the wiper seal from the head. Discard all the old seals.

10. Remove and discard the O-rings, back-up rings and teflon rings from the piston.

**NOTE:** *The lift cylinder piston contains one cast iron ring at the locknut end, Figure 12.*

## INSPECTION AND REPAIR

1. Clean all the components thoroughly with a suitable solvent, and air dry using compressed air.

2. Inspect all parts for damage and replace parts as necessary.

3. Install new seals and O-rings on the cylinder head assembly.

4. Install new rings and seals on the cylinder piston.

**NOTE:** *It may become necessary to warm the teflon rings in warm water, making them pliable and easier to install. Re-shape the rings by installing a ring compressor around the piston and allowing the seals to cool. Use care to prevent damage to the surface of the rings, Figure 14.*


**Figure 14**
**Re-Sizing Piston Seal**

1. Compressor Tool
2. Piston
3. Wear Ring Seal

5. Inspect the cylinder rod and barrel for burrs, scratches or other damage. Damaged rods or barrels will cut the new seals causing premature leakage.

6. Inspect the cylinder pivot bushings for wear, and replace as necessary. Replace bushings using a suitable step plate in a press, Figure 15.

7. Check the threads on all applicable parts for damage. They must be in good condition because of the high torque requirements.

## CYLINDER ASSEMBLY

1. Coat the cylinder rod with a light film of clean hydraulic oil.

2. Slide the head cap plate and head onto the cylinder rod.

3. Coat the inside bore of the piston with a loctite sealant, FNH part No. FP-119.

4. Install the piston assembly on the rod with the recessed side towards the threads on the rod.

5. Install the piston locknut and torque to specification. See Specifications page 57.

6. Lubricate the inside of the cylinder barrel and the piston with clean hydraulic oil.

7. Install the rod, head and piston assembly into the cylinder barrel, making sure the head is fully in the barrel.

8. Install the head wire lock ring inside the barrel. Pull the rod and piston assembly out unitl the head is up against the retaining ring.

9. Install the head cap plate using the bolts removed. Torque the bolts to 11-12 lbs. ft. (15-16 Nm).

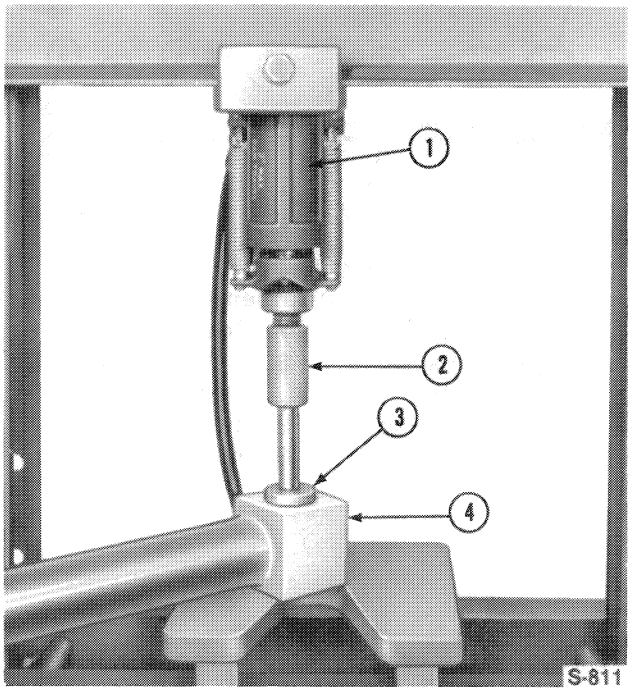



**Figure 15**
**Bushing Replacement**

1. Press
2. Adaptor
3. Step Plate
4. Trunnion

## INSTALLATION

Installation of a cylinder generally follows the removal procedure in reverse, however, the following points should be observed.

1. Lubricate the attaching pins and bushings prior to installation.

2. Use a sling and hoist to install the cylinder.

3. Attach the cylinder hoses an tighten securely. Be sure there are no twists in the hoses and check for proper routing. Twists and kinks will short hose life.

4. Replenish oil in the reservoir that was lost during cylinder removal. Operate the unit at idle speed and cycle the cylinders to purge air from the system.

5. Recheck the oil level and add oil as required. See specifications for correct oil grade.

**IMPORTANT: Recheck the cap plate head bolts, torque to 11-12 lbs. ft. (15-16 Nm) after the cylinder had been installed and cycled several times.**

## CROWD CYLINDER

### GENERAL

The crowd cylinder is mounted inside the boom and requires different procedures for removal and installation. The cylinder overhaul is basically the same as the lift and bucket cylinders except for the cap and head area. The cap is retained to the head with four bolts. The head is retained in the barrel with a large retaining ring.

The crowd cylinder rod end trunnion pin is mounted through two guide blocks, one on each side of the rod trunnion. The guide blocks are also mounted inside the boom, Figure 16.

### CROWD CYLINDER REMOVAL

1. The crowd cylinder is mounted inside of the boom. The barrel end pivot pin is also used as the dipperstick to boom pivot pin, so it will be necessary to remove the dipperstick first as outlined in component removal covered on page 32.

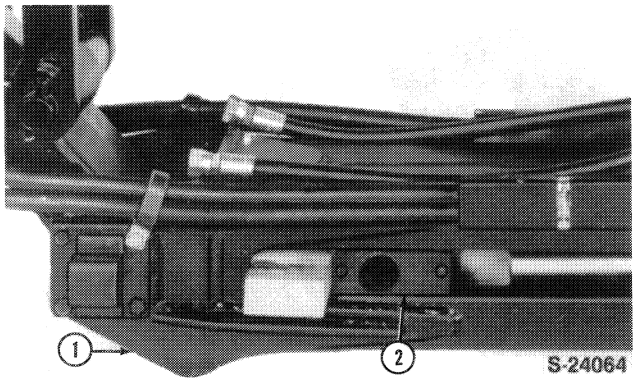



**Figure 16**
**Crowd Cylinder Guide Blocks**
1. Boom 2. Guide Block

**NOTE:** *Shims are used at the barrel end pivot pin. It wil be necessary to keep track of the amount and location to aid in assembly.*

2. Remove the snap rings securing the long bar links at the rod end of the crowd cylinder pin.

**NOTE:** *The pivot pin has a woodruff key on one side of the pin.*

3. Remove the long bar links and the crowd cylinder rod pin.

4. Use the lift cylinder (without the engine running), and lower the boot to a horizontal position with the floor.

5. Remove the crowd cylinder hoses and barrel elbows, Figure 17.

6. Remove the crowd cylinder out of the boom, Figure 18.

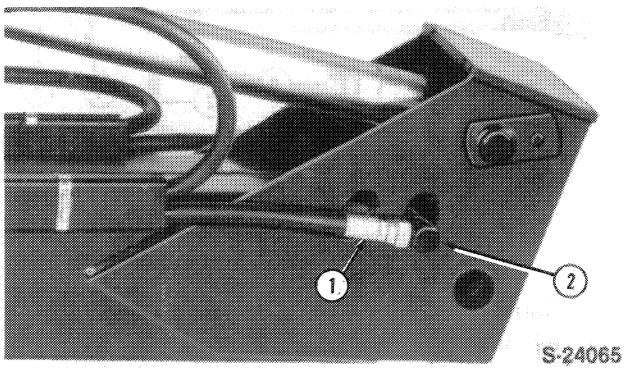



**Figure 17**
**Crowd Cylinder Hose and Elbow**
1. Hose 2. Elbow

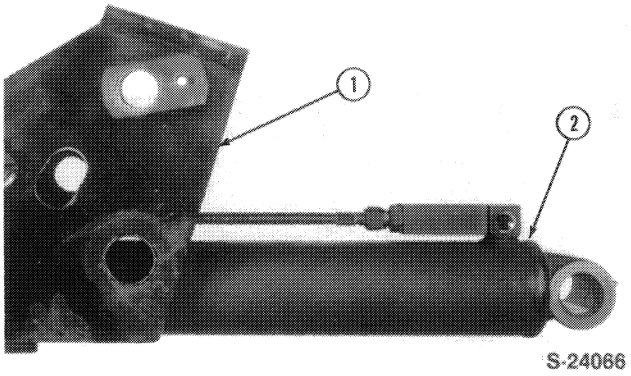



**Figure 18**
**Crowd Cylinder Removal**

1. Boom
2. Crowd Cylinder

## CROWD CYLINDER DISASSEMBLY

The procedures to overhaul the crowd cylinder are the same as the lift and bucket cylinders. The only difference is in the way the cap plate is secured to the head and the head retained in the barrel, Figure 19.

1. Remove the four bolts securing the cap plate to the head.
2. Use a brass drift and hammer, and drive the head into the barrel far enough to expose the internal retaining ring. Remove the ring from the barrel.
3. Remove the rod, head and piston assembly from the barrel.

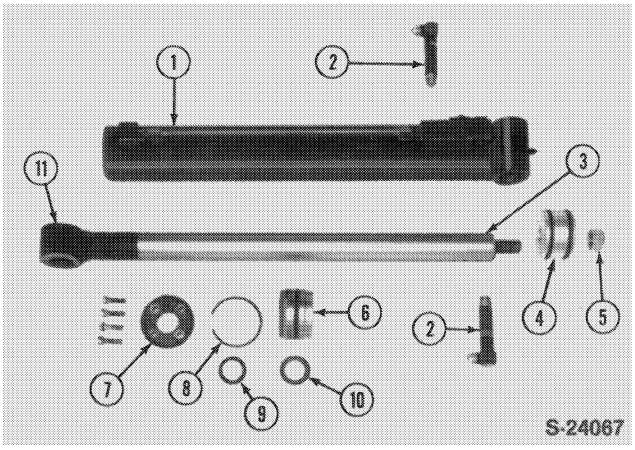



**Figure 19**
**Crowd Cylinder Disassembly**

1. Barrel
2. Elbows
3. Rod
4. Piston Assembly
5. Locknut
6. Head Assembly
7. Head Cap Plate
8. Retaining Ring
9. Wiper Seal
10. U-Cup Seal
11. Bushing

## INSPECTION AND REPAIR

The procedures to inspect and repair the cylinder are the same as the lift and bucket cylinders.

## CROWD CYLINDER ASSEMBLY

Assembly procedures generally follows the disassembly procedures in reverse, however the following must be observed.

1. Lubricate all seals prior to assembly.
2. Recheck the oil level in the reservoir. Add oil as required. See specifications for correct grade.

**IMPORTANT:** *Recheck the cap plate head bolt torque, 11-12 lbs. ft. (15-16 Nm) after the cylinder has been installed and cycled several times.*

## STABILIZER CYLINDER REMOVAL

### GENERAL

The engines must be running to move the stabilizer up or down. Lock out valves in the main control valve hold them in position.

1. To remove the stabilizer cylinder, start the engine and lower the stabilizer arm to the floor.
2. Remove the hoses at the cylinder ports and install caps and plugs on all openings.
3. Remove the upper and lower pivot pins and remove the cylinder, Figure 20.

### DISASSEMBLY

1. Remove the four bolts securing the cap plate to the head, Figure 21.
2. Use a brass drift and hammer, and drive the head into the barrel just far enough to expose the retaining ring. Remove the ring.
3. Remove the cylinder rod, head and piston assembly from the barrel.

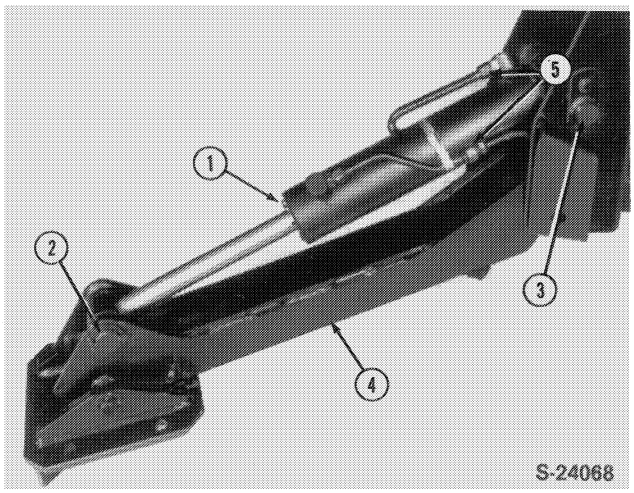



**Figure 20**
**Stabilizer Cylinder Removal**

1. Stabilizer Cylinder
2. Lower Pivot Pin
3. Upper Pivot Pin
4. Stabilizer Arm
5. Hoses and Tubes

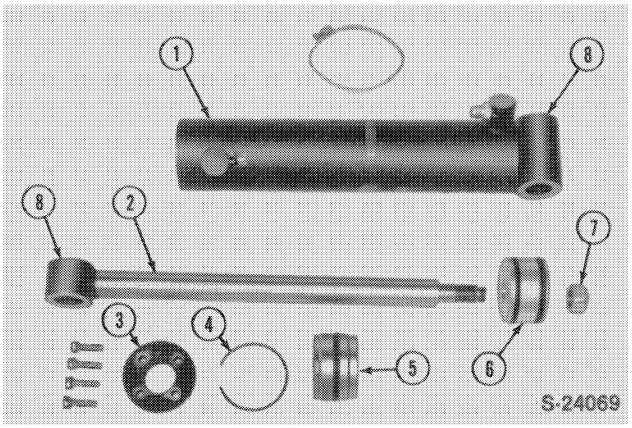



**Figure 21**
**Stabilizer Disassembly**

1. Barrel
2. Rod
3. Head Cap Plate
4. Retaining Ring
5. Head Assembly
6. Piston Assembly
7. Locknut
8. Bushings

## INSPECTION AND REPAIR

The inspection and repair of the stabilizer cylinders are the same as the lift and bucket cylinder procedures.

## ASSEMBLY

The assembly procedure generally follows the disassembly procedures in reverse, however the following must be observed.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

2. Check the hydraulic reservoir and replenish the oil as required. See specifications for correct grade of oil.

   **IMPORTANT:** *Recheck the cap plate head bolt torque, 11-12 lbs. ft. (15-16 Nm) after the cylinder has been installed and cycled several times.*

## SWING CYLINDER REPAIR

### GENERAL

The swing cylinders do not have to be removed from the mainframe to repair the piston or head seals. The cylinder will have to be removed if the barrel is damaged. Refer to component removal procedures, page 16, to remove the cylinders.

Position the backhoe straight behind the mainframe. Lower the bucket until it just clears the floor by 2-3 inches. This will allow the digging component to be moved by hand to the right of left off center. This hand movement will allow the swing cylinder rod trunnion to clear the swing post anchor after the pivot pin is removed.

## SWING CYLINDER OVERHAUL

1. Clean the outside of the cylinder.

2. Remove the three cap plate head bolts from the cylinder, Figure 22.

3. Remove the swing cylinder rod trunnion pivot pin to swing post, Figure 22.

4. Remove the hoses from the swing cylinder, Figure 22.

5. Swing the backhoe digging components by hand so the swing cylinder rod clears the swing post anchor.

   **NOTE:** *Keep the swing cylinder cross over hose over an oil pan to catch the exhaust oil from the opposite swing cylinder when the digging components are moved by hand.*

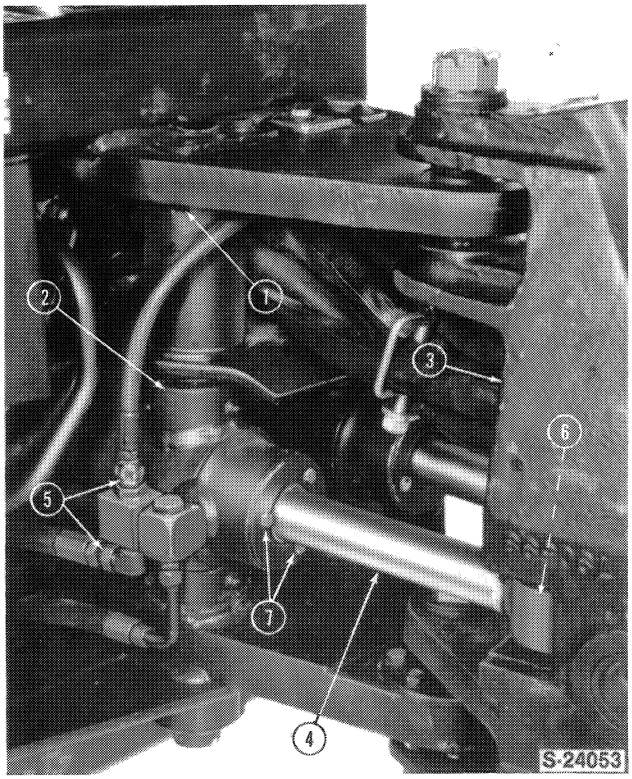



**Figure 22**
**Swing Cylinder Disassembly**

1. Mainframe
2. Trunnion
3. Swing Post
4. Swing Cylinder
5. Hoses
6. Pivot Pin
7. Cap Head Bolts

6. Use a brass drift and hammer and drive the swing cylinder head into the barrel far enough to gain access to the head to barrel retaining ring. Remove the ring.

7. Place an oil pan under the front of the swing cylinder and slowly remove the rod, head and piston assembly.

8. Secure the swing cylinder rod trunnion end in a vise and remove the locknut.

9. Remove the piston, head, lock ring and cap plate from the cylinder rod, Figure 23.

## INSPECTION AND REPAIR

1. Inspect the cylinder rod, barrel and components in the same manner as the lift and bucket cylinders.

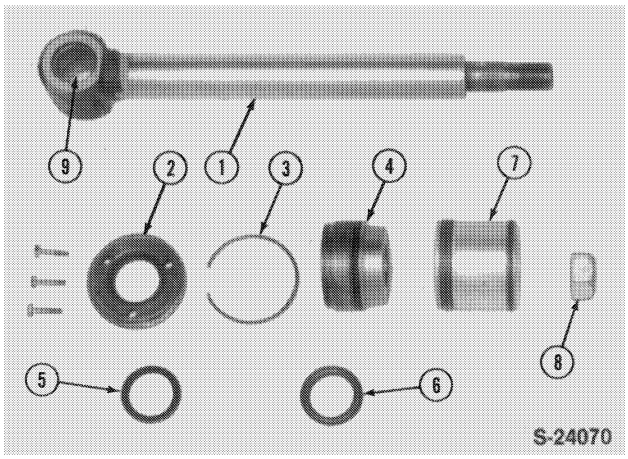



**Figure 23**
**Swing Cylinder Disassembly**

1. Rod
2. Head Cap Plate
3. Retaining Ring
4. Head Assembly
5. Wiper Sal
6. U-Cup Seal
7. Piston Assembly
8. Locknut
9. Bushing

2. Install new O-rings, seals and back-up rings on the head and piston.

## ASSEMBLY

The assembly procedure generally follows the disassembly procedures in reverse, however the following must be observed.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

2. Check the hydraulic reservoir and replenish the oil as required. See specifications for correct grade of oil.

   **IMPORTANT:** *Recheck the cap plate head bolt torque, 9 lbs. ft. (12 Nm) after the cylinder has been installed and cycled several times.*

## SWING CYLINDER ASSEMBLY REMOVAL

### GENERAL

Removal of the swing cylinder for repair should not be necessary unless the cylinder barrel is damaged and must be replaced.

# BACKHOE CYLINDERS

Because of the high torque applied to the swing cylinders, the upper and lower swing cylinder pivot pins are a tight fit and require working the pins out of the pivot hole to release the cylinder.

If it becomes necessary to remove a swing cylinder, the following procedures may be used.

## REMOVAL

1. Remove the retaining bolt securing the upper pivot pin on top of the mainframe, Figure 24.
2. Use a brass hammer and drive a small gradual tapered chisel between the pin retainer and the mainframe, Figure 24. Drive the chisel in until the pin starts to move upward.
3. Apply a coat of penetrating oil around the pin and continue wedging the pin upwards approximately two inches. Use shim plates on top of the mainframe to aid in pin removal.

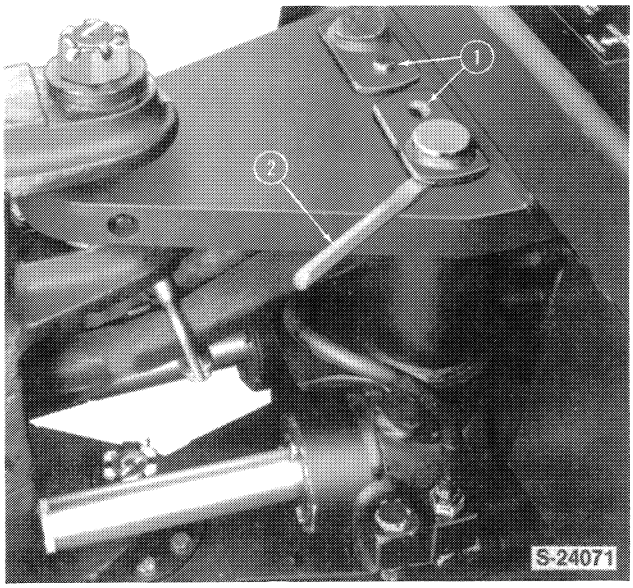



**Figure 24**
**Swing Cylinder Removal — Upper Pin**
1. Retaining Bolt
2. Chisel

4. Remove the nut and bolt securing the lower pin to the mainframe, Figure 25.
5. Install a correct size used bolt in the exposed hole of the lower pin.

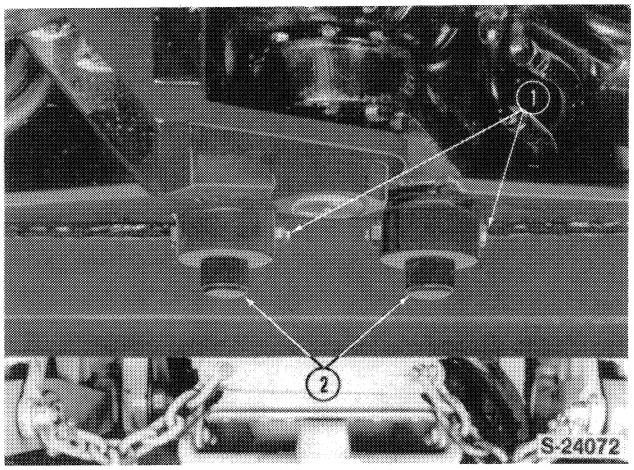



**Figure 25**
**Swing Cylinder Removal — Lower Pin**
1. Bolt and Nut
2. Lower Pin

6. Use a pipe wrench and rotate the pin so that a large chisel can be wedged between the used bolt and the mainframe. Apply penetrating oil and continue removal of the pin. Use shim plates to aid in removal.
7. Draw the lower pin out approximately 2-1/2 inches or until the swing cylinder pivot trunnion is free of the pin, Figure 26.
8. Remove the three hydraulic hoses from the cylinder and cap the hoses and ports.
9. Remove the swing cylinder to swing post pivot pin and remove the cylinder.

An alternate method to remove the upper and lower swing pins can be accomplished by welding a large nut on the ends of the pins so a puller can be attached.

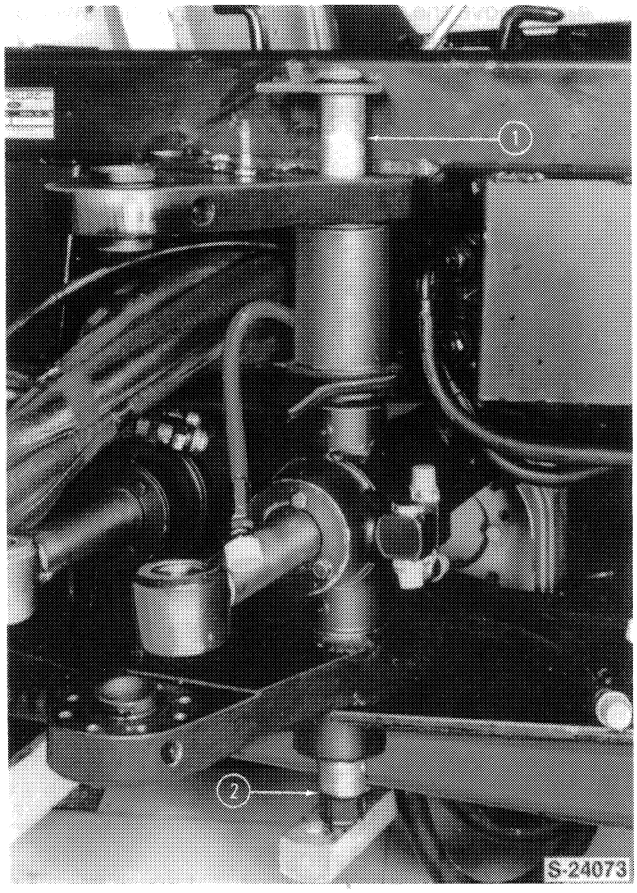



**Figure 26**
**Swing Cylinder Removal**

1. Upper Pin
2. Lower Pin

**NOTE:** *The swing cylinder barrel uses restrictor type adaptors, Figure 27. These adaptors are sealed with O-rings and can be serviced. Install the adaptors in their correct locations since they function with the main control valve restrictors to cushion the swing action.*

For cylinder repair procedures, refer to page 15.

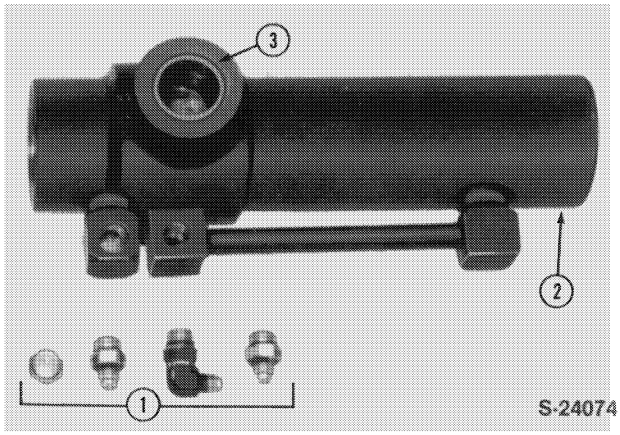



**Figure 27**
**Swing Cylinder Adaptors**

1. Adaptors
2. Barrel
3. Bushing

## CROWD CYLINDER GUIDE BLOCKS

### GENERAL

The crowd cylinder guide blocks can be removed, repaired and installed without removing the cylinder. Position the backhoe so the dipperstick is extended halfway to full reach. This will retract the crowd cylinder halfway up the inside of the boom slot and allow enough room to remove the slide blocks, after the pin is removed.

**IMPORTANT:** *Rest the bucket on the floor. DO NOT apply down pressure. This will prevent pressure from being applied against the long bar links.*

### REMOVAL

1. Remove the snap rings from the pins securing the long bar links at the dipperstick and crowd cylinder rod trunnion, and remove the long bars.

   **NOTE:** *The long bar links are keyed to the dipperstick pin and the crowd cylinder rod end pin. The pins must be installed with the keys on opposite sides (dipperstick pin left side and crowd pin right side).*

2. Remove the step pin from the guide blocks and crowd cylinder rod end, Figure 28.

3. Slide the blocks down the inside of the boom and remove the blocks through the slots in the side of the boom, Figure 29.

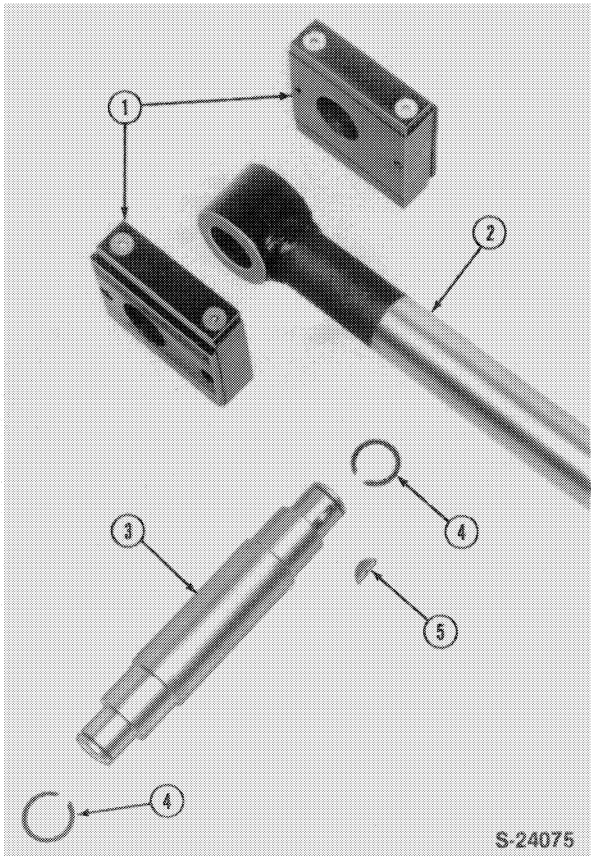



**Figure 28**
**Crowd Cylinder Guide Block Removal**

1. Guide Blocks
2. Cylinder Rod
3. Step Pin
4. Snap Ring
5. Key

### INSPECTION AND REPAIR

1. Clean the guide blocks with a suitable solvent and air dry with compressed air.

2. Inspect the bushings in the blocks for wear. Replace as required using a step plate and driver to remove and install the bushings, Figure 30.

3. Inspect the side plates for wear. Replace as required.

4. Check the wear plates on the top and bottom of the guide blocks for wear. If worn, remove and discard both plates. Do not discard the shims.

5. Install new wear plates, less shims, on the top and bottom of the block assembly.

6. Install the blocks into the boom channels, and with a feeler gauge measure the clearance between the block wear plate and the boom channel. The clearance must not exceed .030. If shimming is required, install the same thickness of shims on the top and bottom of the block assembly. Recheck the clearance and add or subtract shims as necessary to maintain specified clearance, Figure 31.

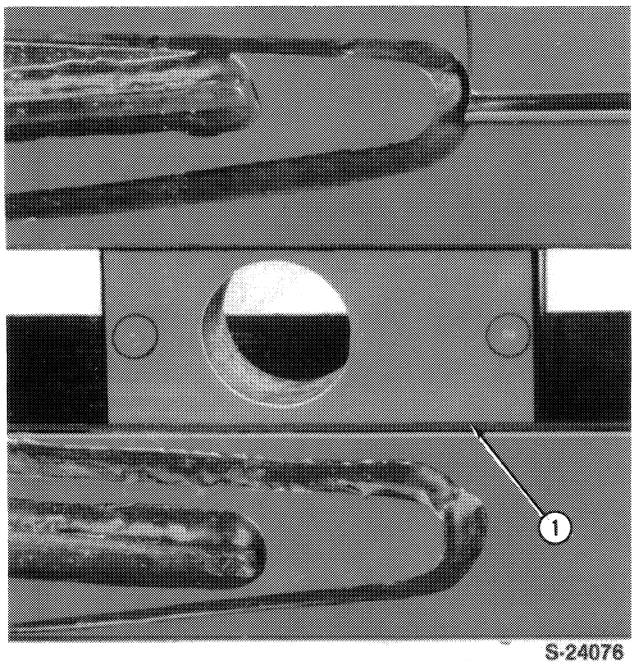



**Figure 29**
**Guide Block Removal**
1. Guide Block

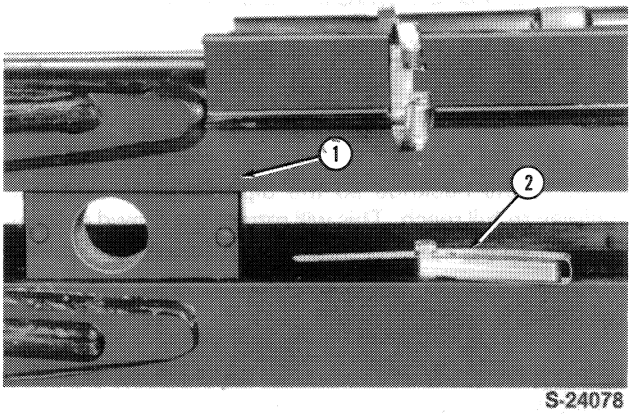



**Figure 31**
**Guide Block Adjustment**
1. Guide Block
2. Feeler Gauge .030

## INSTALLATION

The installation procedure is in reverse of the removal procedure.

Lubricate the slide blocks and the crowd cylinder rod pin with the correct lubricant. See specifications.

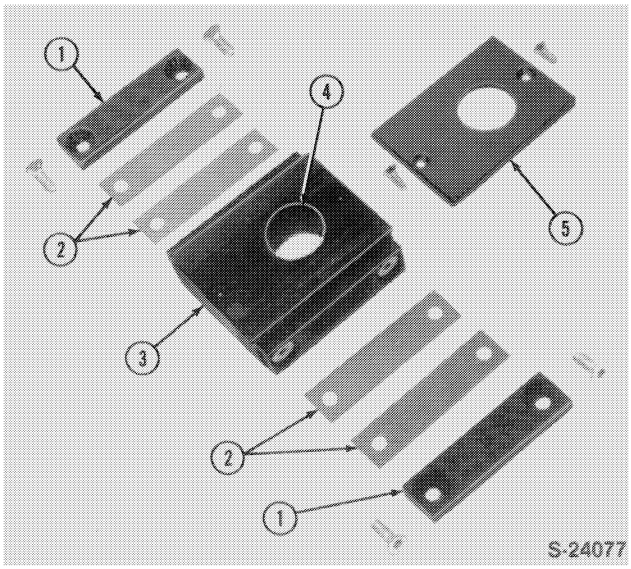



**Figure 30**
**Guide Block Repair**
1. Upper and Lower Wear Plates
2. Shims
3. Guide Block
4. Bushing
5. Side Wear Plate