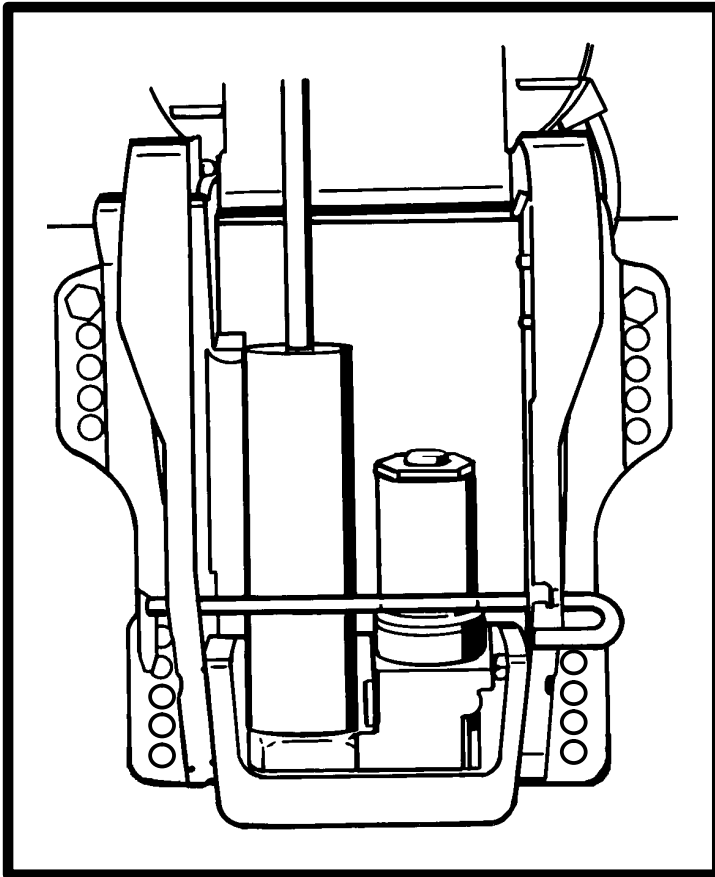




# MID-SECTION



**MANUAL TILT SYSTEM  
(DESIGN I, II, III)**

**5**

**F**



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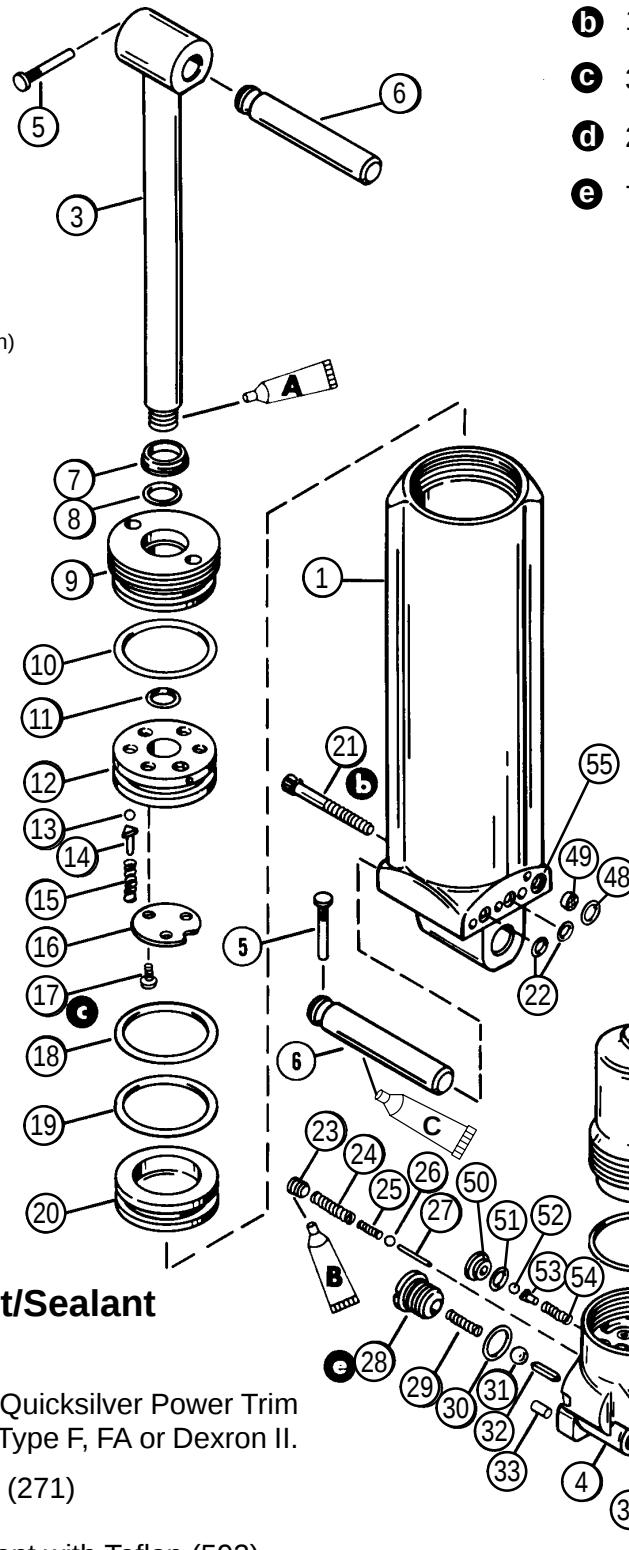


# Manual Tilt System Components (Design One and Two)

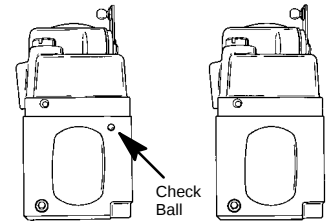
- 1 - Shock Rod Cylinder
  - 2 - Accumulator
  - 3 - Shock Rod
  - 4 - Valve Block
  - 5 - Dowel Pin
  - 6 - Pivot Pin
  - 7 - Rod Wiper
  - 8 - O-ring .671 in. I.D.
  - 9 - Cylinder Cap
  - 10 - O-ring 1.864 in I.D
  - 11 - O-ring .614 in. I.D.
  - 12- Shock Rod Piston
  - 13- Ball (5)
  - 14- Spring Seat (5)
  - 15- Spring (5)
  - 16- Retaining Plate
  - 17- Screw (3)
  - 18- O-ring 1.600 in. I.D. (Shock Piston)
  - 19- O-ring 1.600 in. I.D. (Memory Piston)
  - 20- Memory Piston
  - 21- Screw (2)
  - 22- O-ring .208 in. I.D. (2)
  - 23- Pipe Plug
  - 24- Spring (Large)
  - 25- Spring (Small)
  - 26- Ball
  - 27- Plunger
  - 28- Screw Plug (2)
  - 29- Spring (2)
  - 30- O-ring (2)
  - 31- Ball (2)
  - 32- Push Rod (2)
  - 33- Dowel Pin
  - 34- Spool
  - 35- Spring
  - 36- O-ring .301 in I.D.
  - 37- Screw Plug
  - 38- O-ring .301 in. I.D.
  - 39- Cam Shaft
  - 40- Insulator
  - 41- Retainer Plate
  - 42- Screw
  - 43- O-ring 2.114 in. I.D.
  - 44- Push Rod
  - 45- Ball
  - 46- Flat Spring
  - 47- Screw
- Design One Only**
- 48- O-ring
  - 49- Filter
  - 50- Valve Seat
  - 51- O-ring .364 in. I.D.
  - 52- Ball
  - 53- Spring Guide
  - 54- Spring
  - 55- Hole in Cyliner

## Torque Specification

- a** 35 lb. ft. (47 N·m)
- b** 100 lb. in. (11.2 N·m)
- c** 35 lb. in. (4.0 N·m)
- d** 27 lb. in. (3.0 N·m)
- e** 75 lb. in. (8.5 N·m)



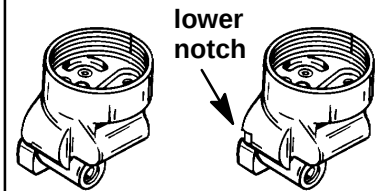
Bottom of Valve Block/Cylinder



DESIGN 1

DESIGN 2

Side of Valve Block

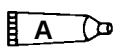


DESIGN 1

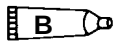
DESIGN 2

## Quicksilver Lubricant/Sealant Application Points

Lubricate ALL O-rings using Quicksilver Power Trim and Steering Fluid or; (ATF) Type F, FA or Dexron II.



Loctite Grade "A" (271)



Loctite Pipe Sealant with Teflon (592)



Special Lubricant 101

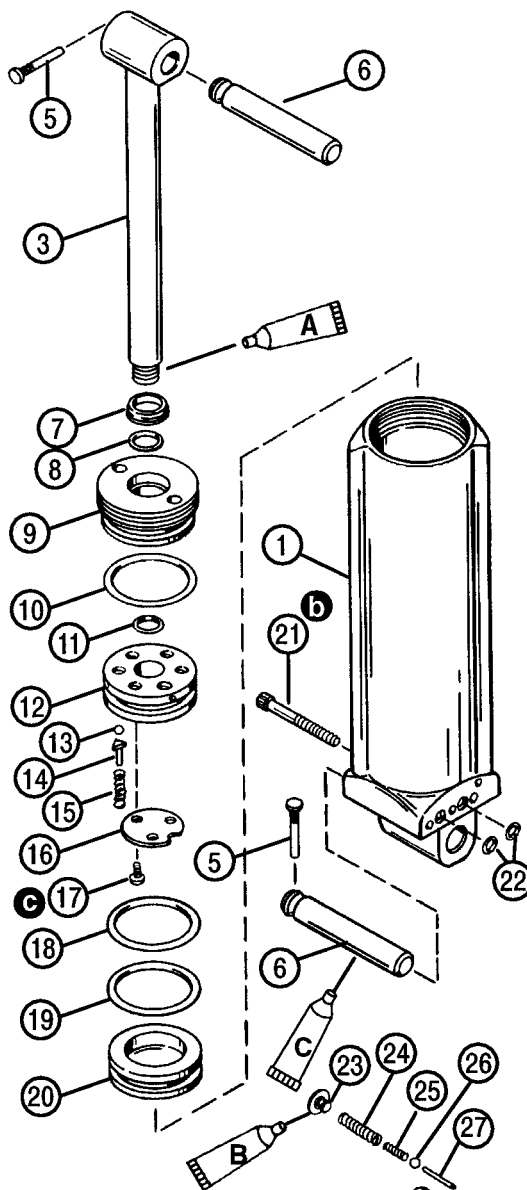
**NOTE:** NOTE: It is recommended that **ALL** O-rings be replaced when servicing tilt system.

26153



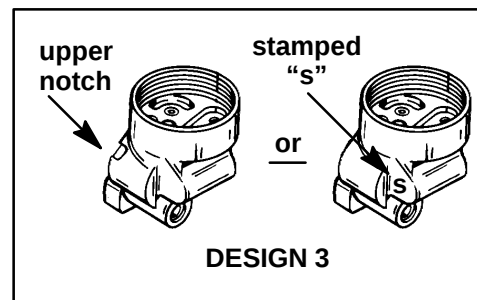
# Manual Tilt System Components (Design Three)

- 1 - Shock Rod Cylinder
- 2 - Accumulator
- 3 - Shock Rod
- 4 - Valve Block
- 5 - Dowel Pin
- 6 - Pivot Pin
- 7 - Rod Wiper
- 8 - O-ring .671 in. I.D.
- 9 - Cylinder Cap
- 10 - O-ring 1.864 in. I.D.
- 11 - O-ring .614 in. I.D.
- 12 - Shock Rod Piston
- 13 - Ball (5)
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- 25 - Spring (Small)
- 26 - Ball
- 27 - Plunger
- 28 - Screw Plug (2)
- 29 - Spring (2)
- 30 - O-ring (2)
- 31 - Ball (2)
- 32 - Push Rod (2)
- 33 - Dowel Pin
- 34 - Spool
- 35 - Spring
- 36 - O-ring .301 in I.D.
- 37 - Screw Plug
- 38 - O-ring .301 in. I.D.
- 39 - Cam Shaft
- 40 - Insulator
- 41 - Retainer Plate
- 42 - Screw
- 43 - O-ring 2.114 in. I.D.
- 44 - Push Rod
- 45 - Ball
- 46 - Flat Spring
- 47 - Screw



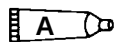
## Torque Specification

- a** 35 lb. ft. (47 N·m)
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- c** 35 lb. in. (4.0 N·m)
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## Quicksilver Lubricant/Sealant Application Points

Lubricate ALL O-rings using Quicksilver Power Trim and Steering Fluid or; (ATF) Type F, FA or Dexron II.



Loctite Grade "A" (271)

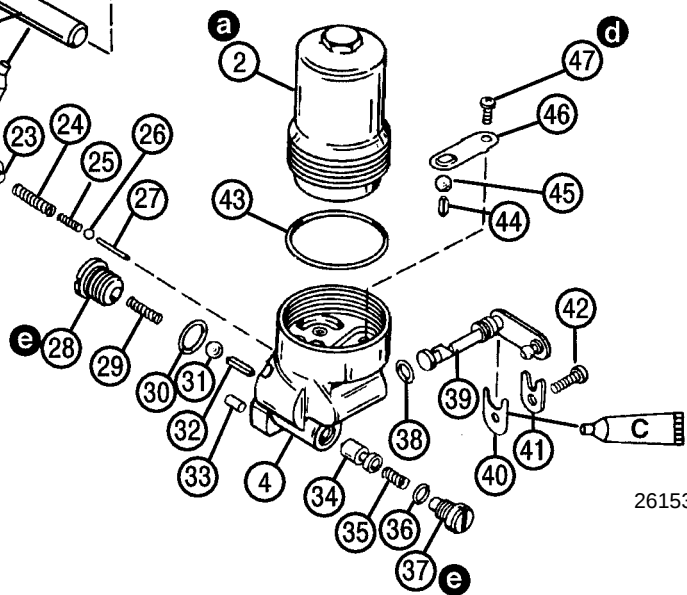


Loctite Pipe Sealant with Teflon (592)



Special Lubricant 101

**NOTE:** It is recommended that **ALL** O-rings be replaced when servicing tilt system.



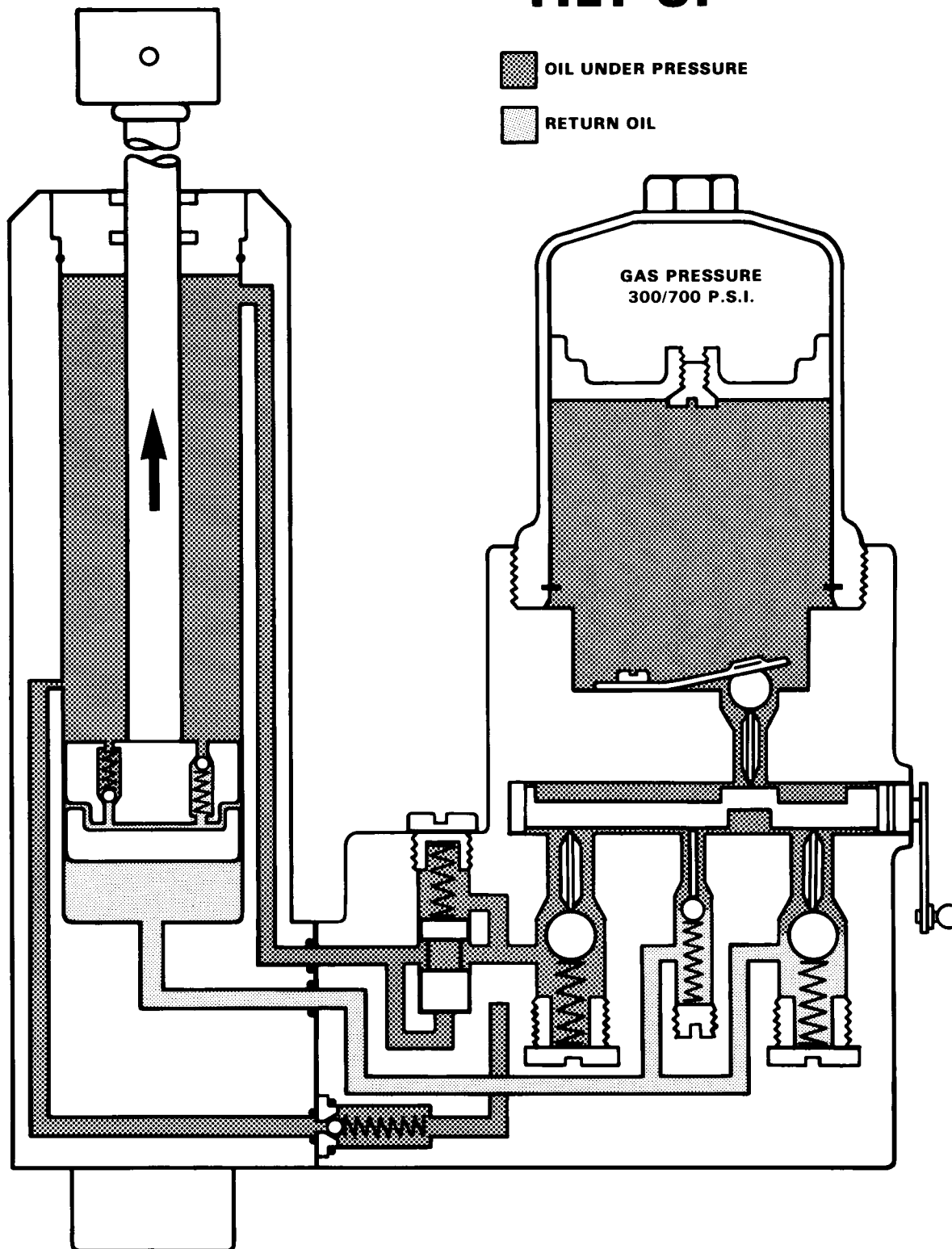
26153



# Manual Tilt Flow Diagrams

## Design 1

### TILT UP

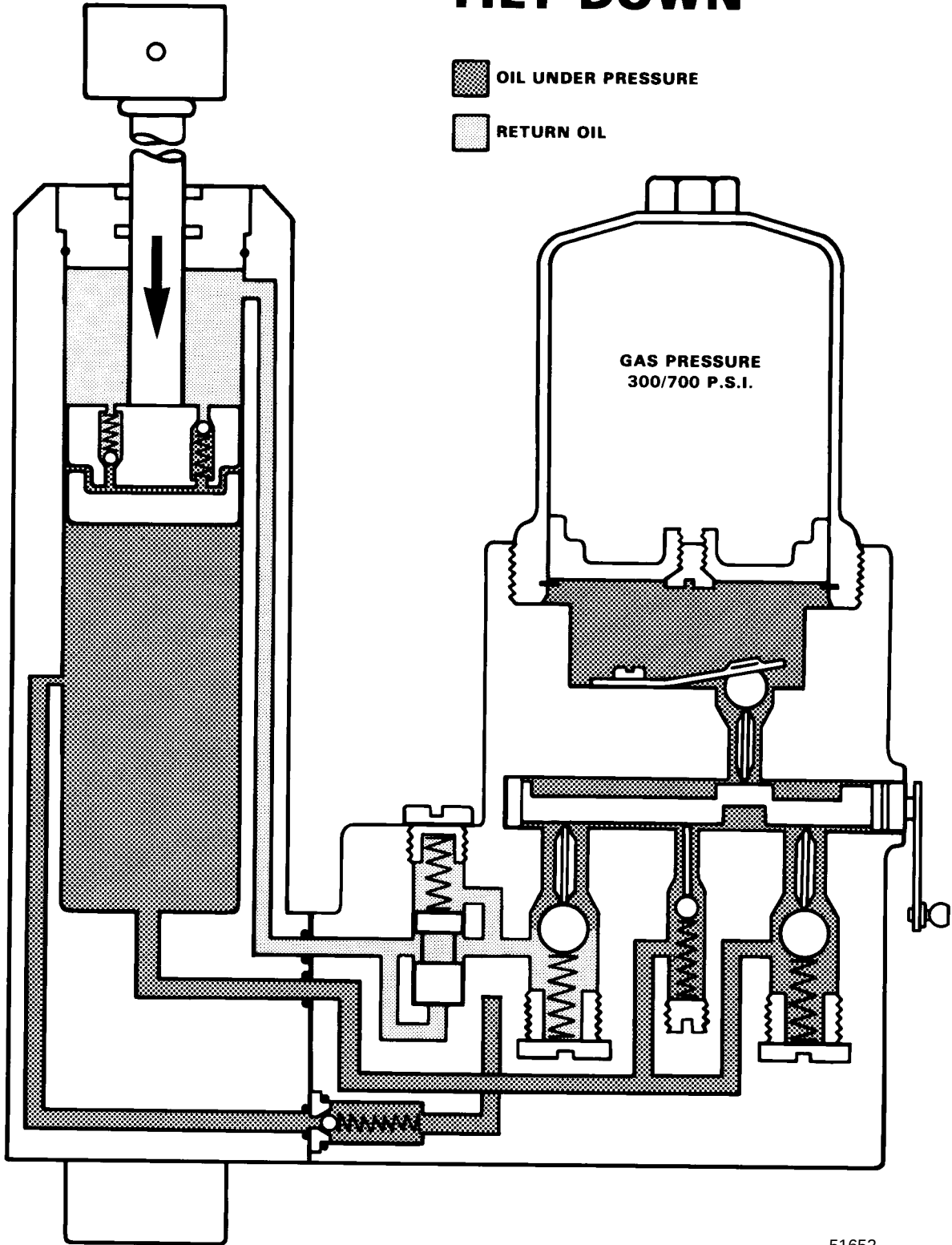


51651



Design 1

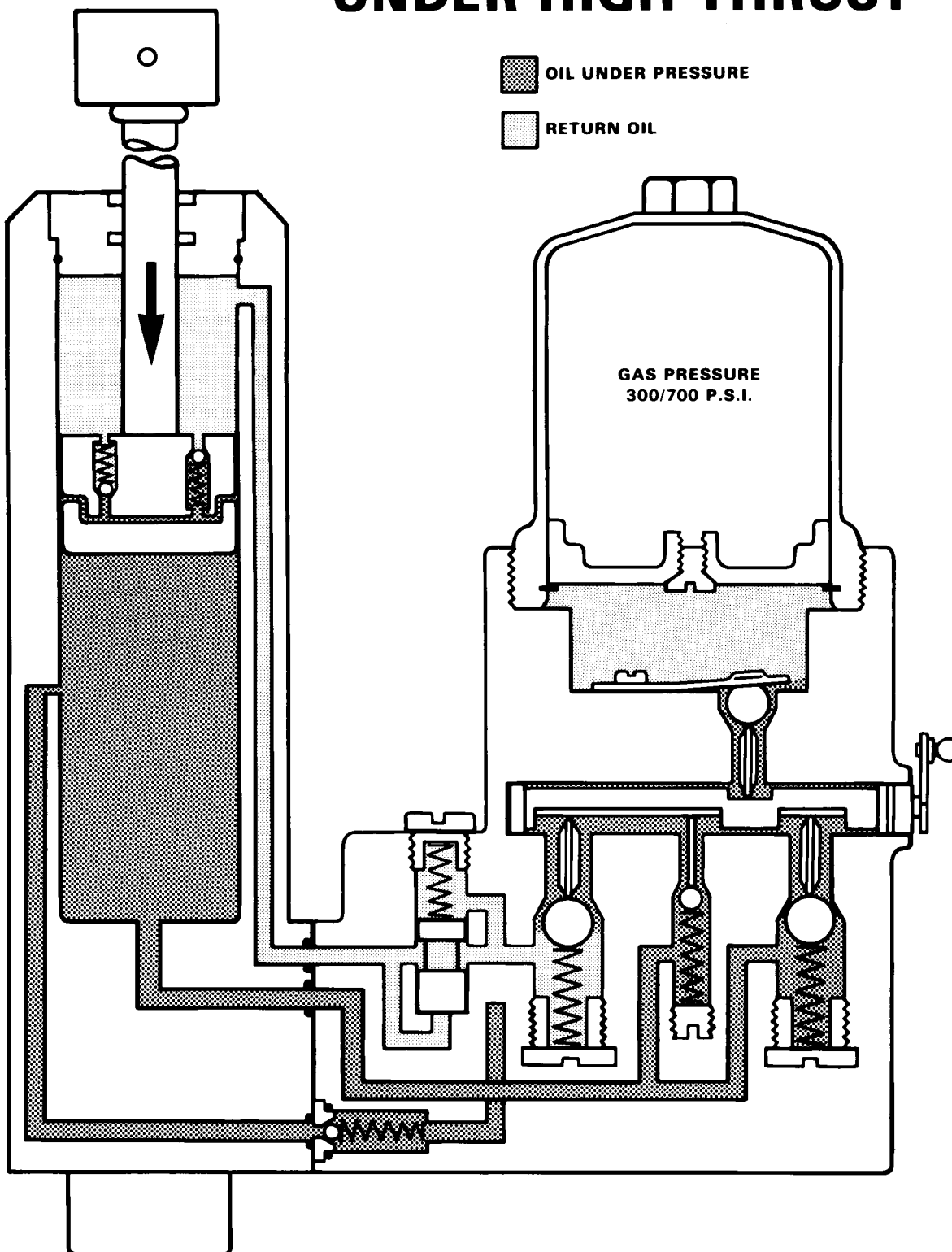
TILT DOWN



51652



## SLOW TILT DOWN UNDER HIGH THRUST

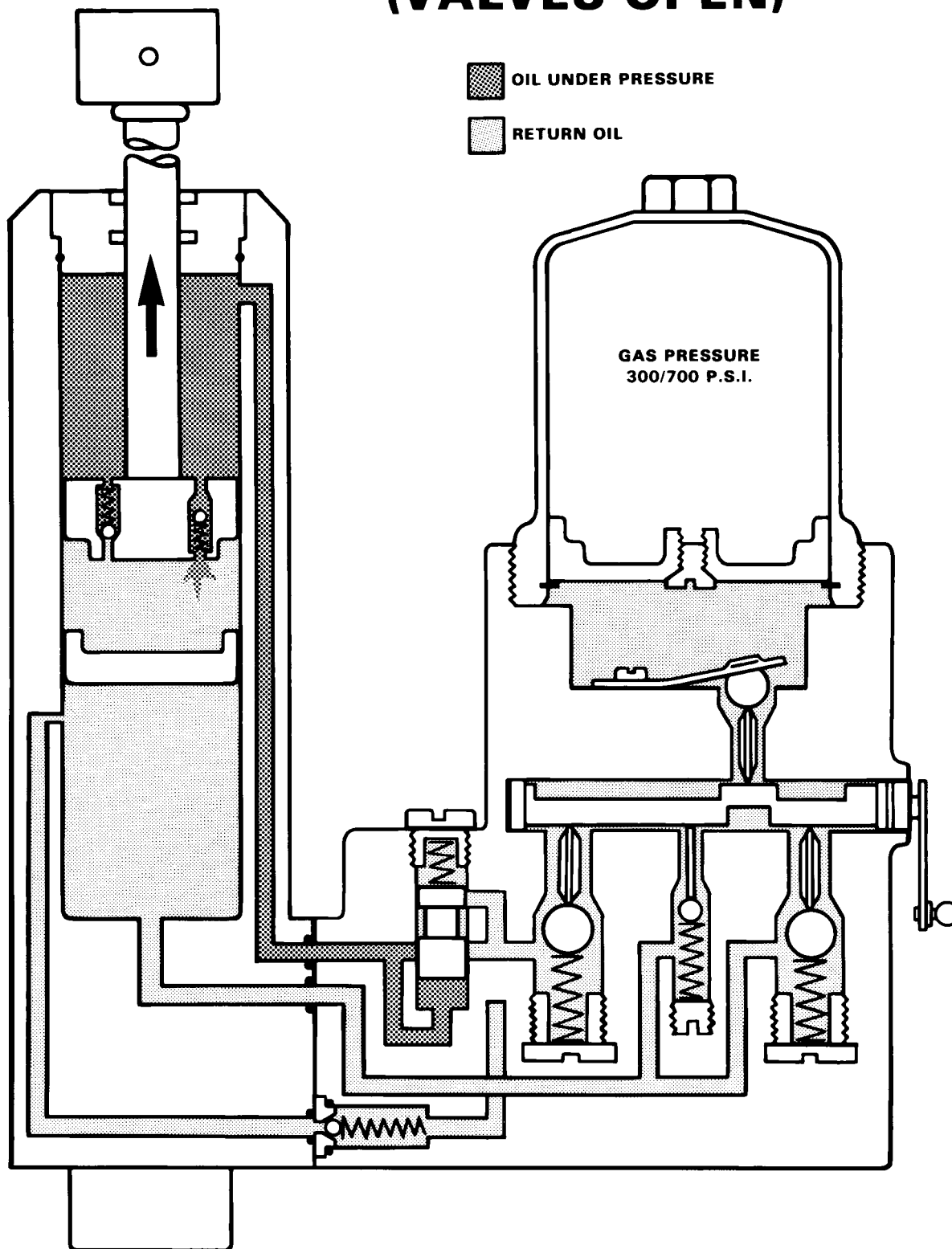


51653



## Design 1

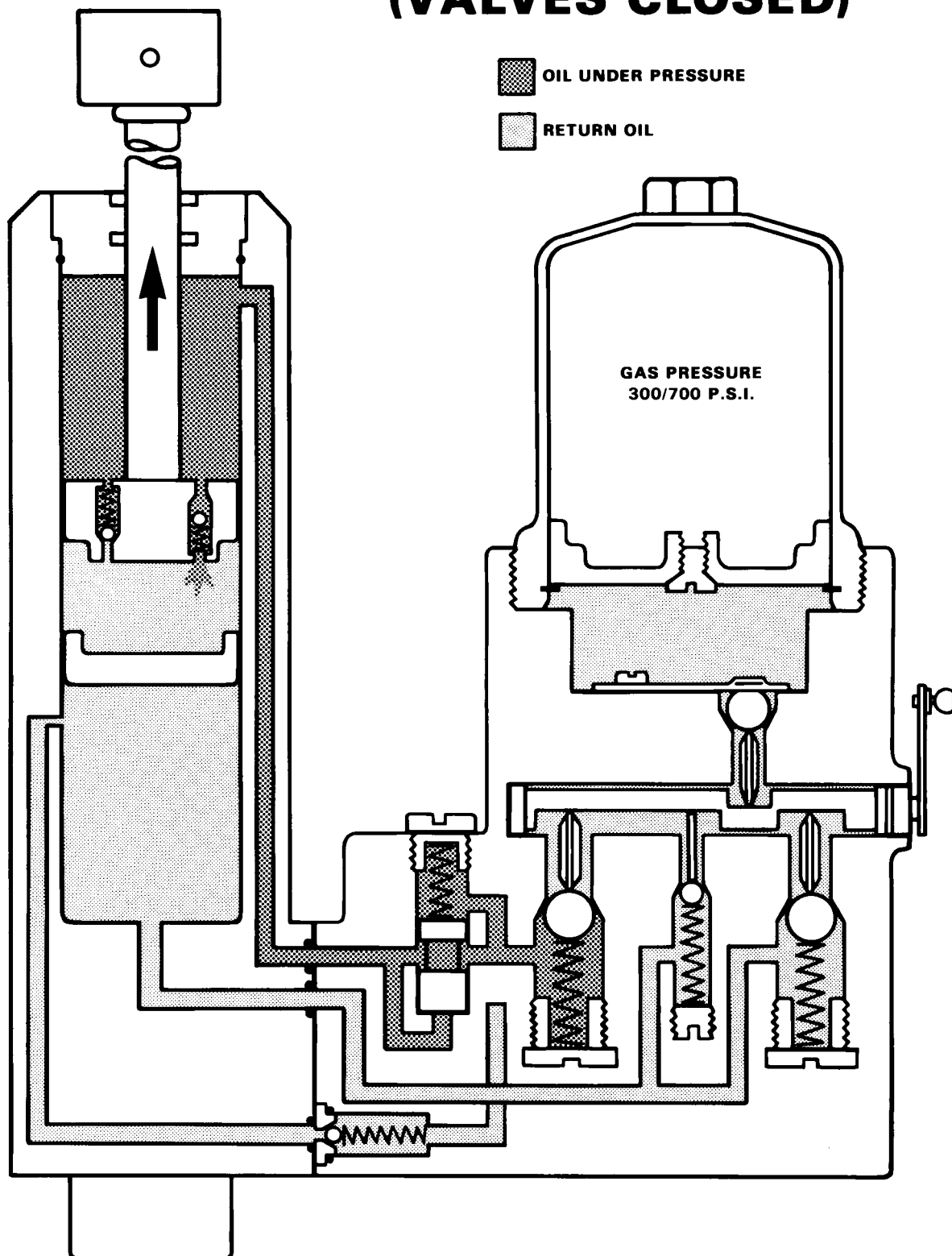
### UNDER WATER STRIKE (VALVES OPEN)



51654



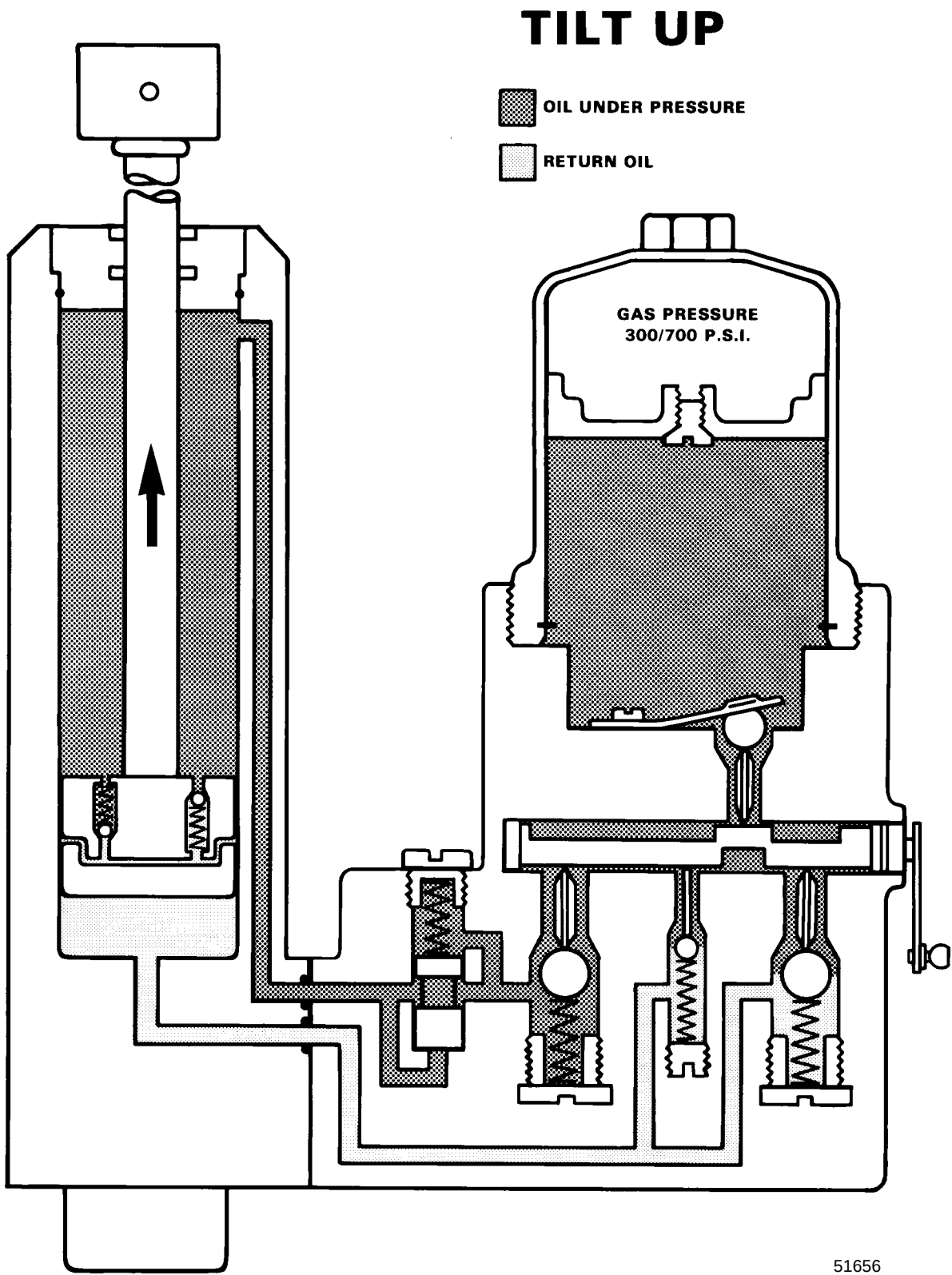
## SHOCK FUNCTION (VALVES CLOSED)



51655



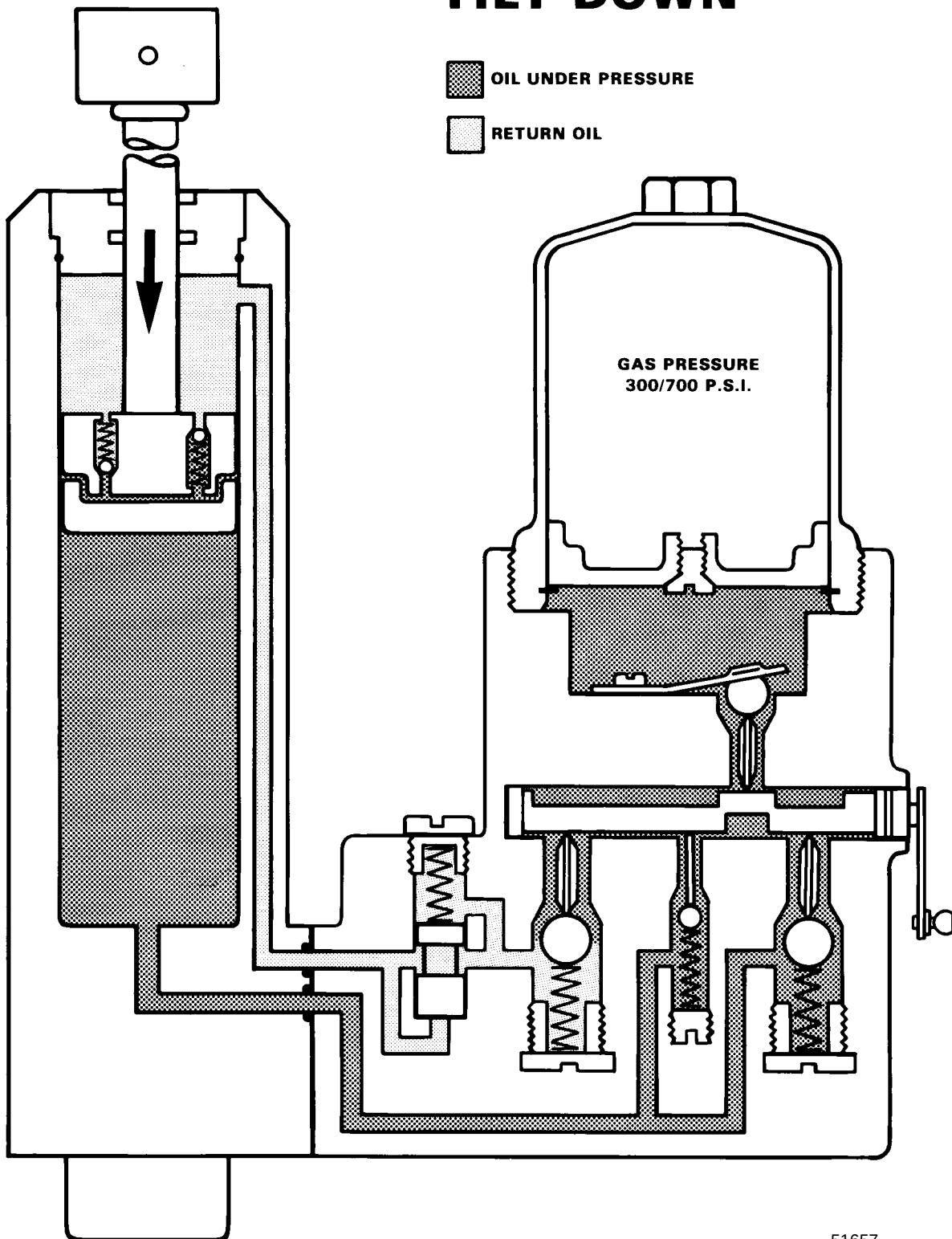
Manual Tilt Flow Diagrams  
Design 2





## Design 2

### TILT DOWN

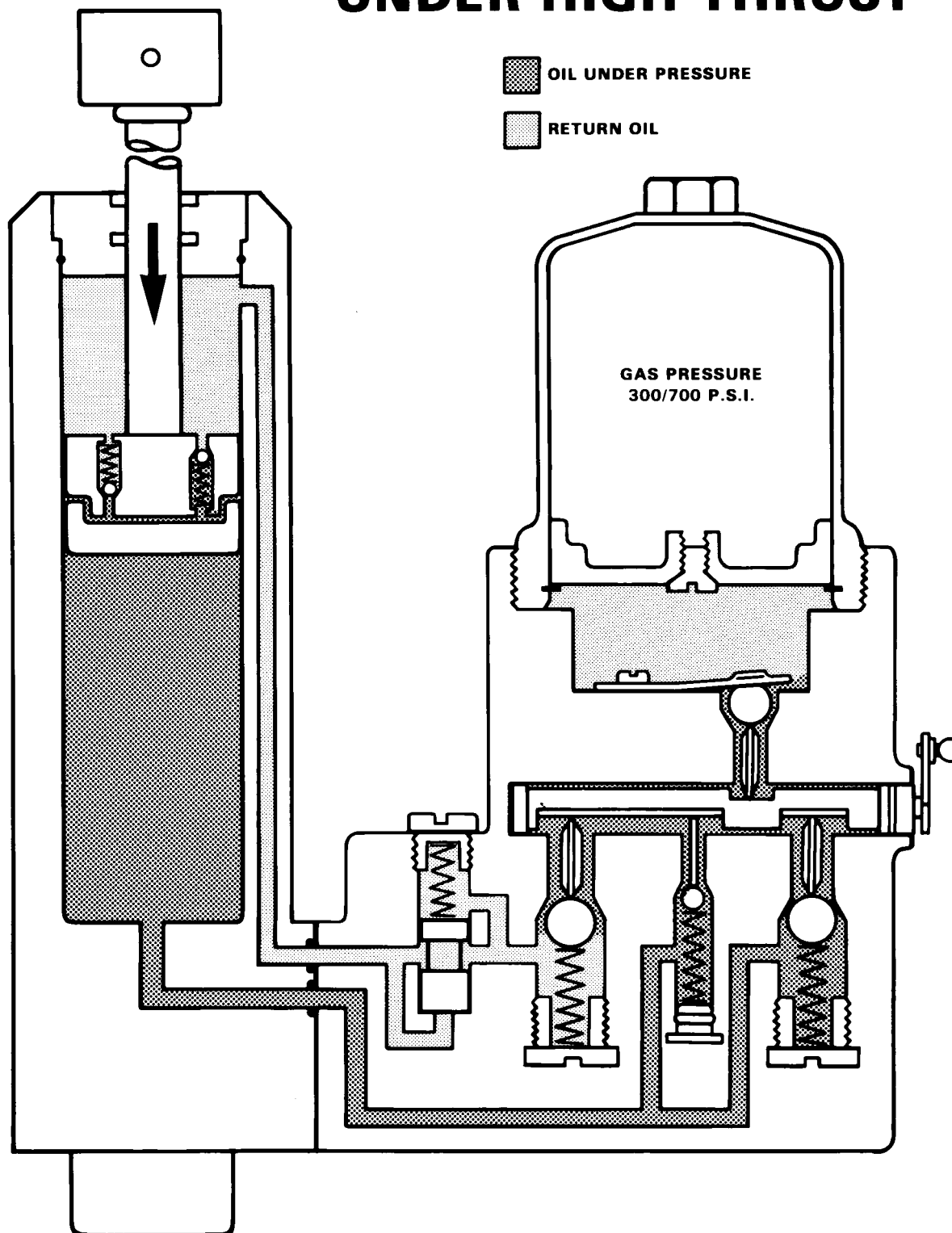


51657



## Design 2

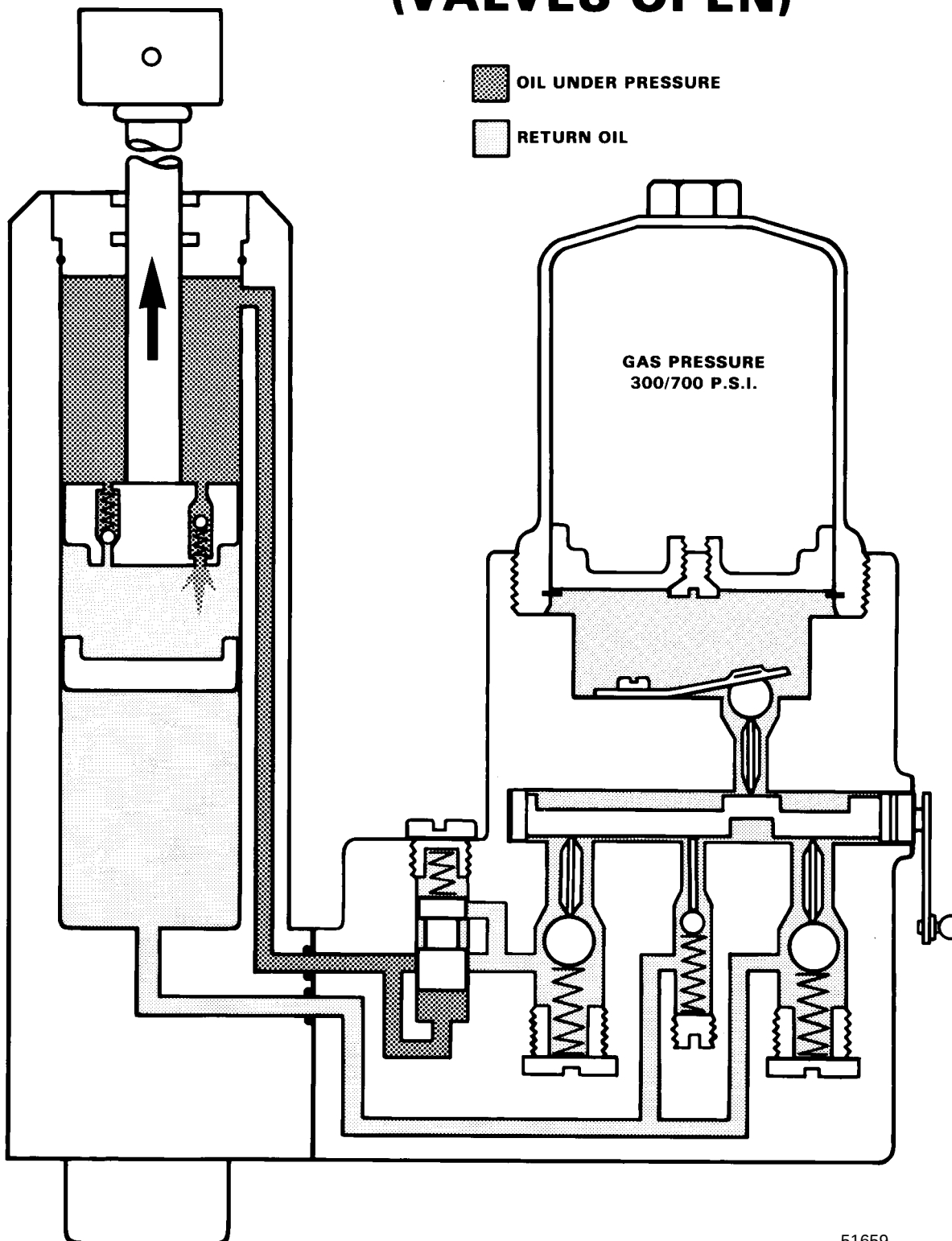
### SLOW TILT DOWN UNDER HIGH THRUST



51658



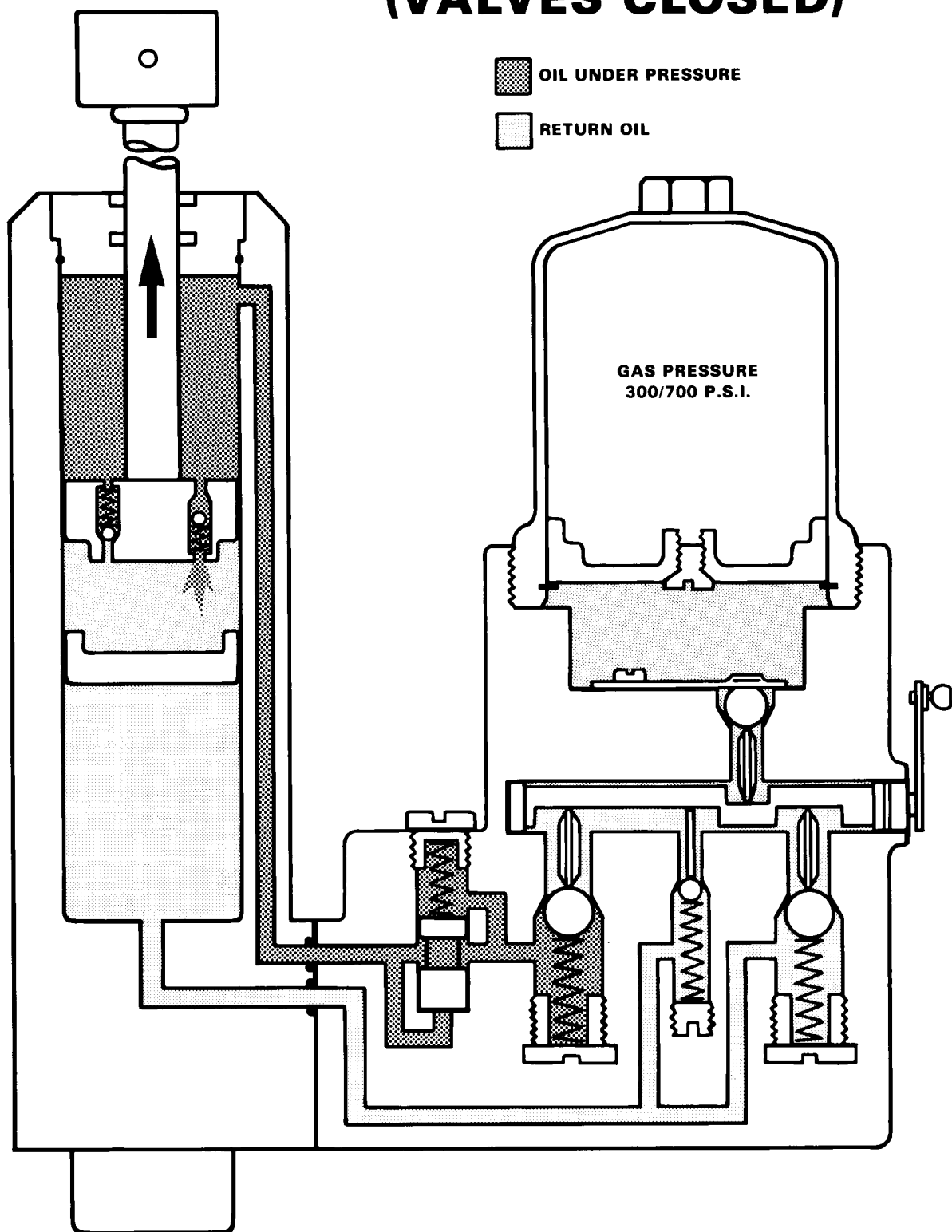
## UNDER WATER STRIKE (VALVES OPEN)





## Design 2

### SHOCK FUNCTION (VALVES CLOSED)



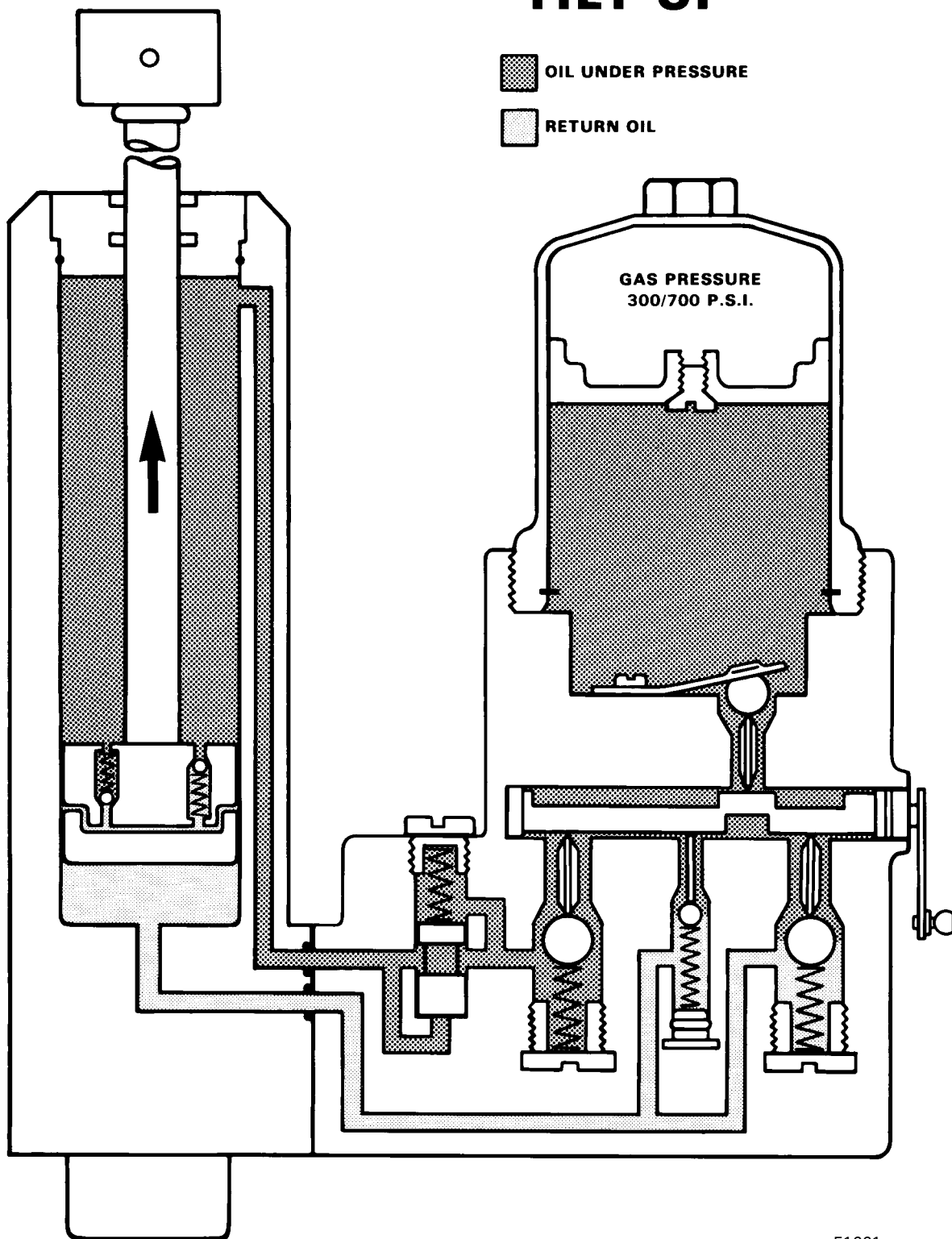
51660



# Manual Tilt Flow Diagrams

## Design 3

### TILT UP

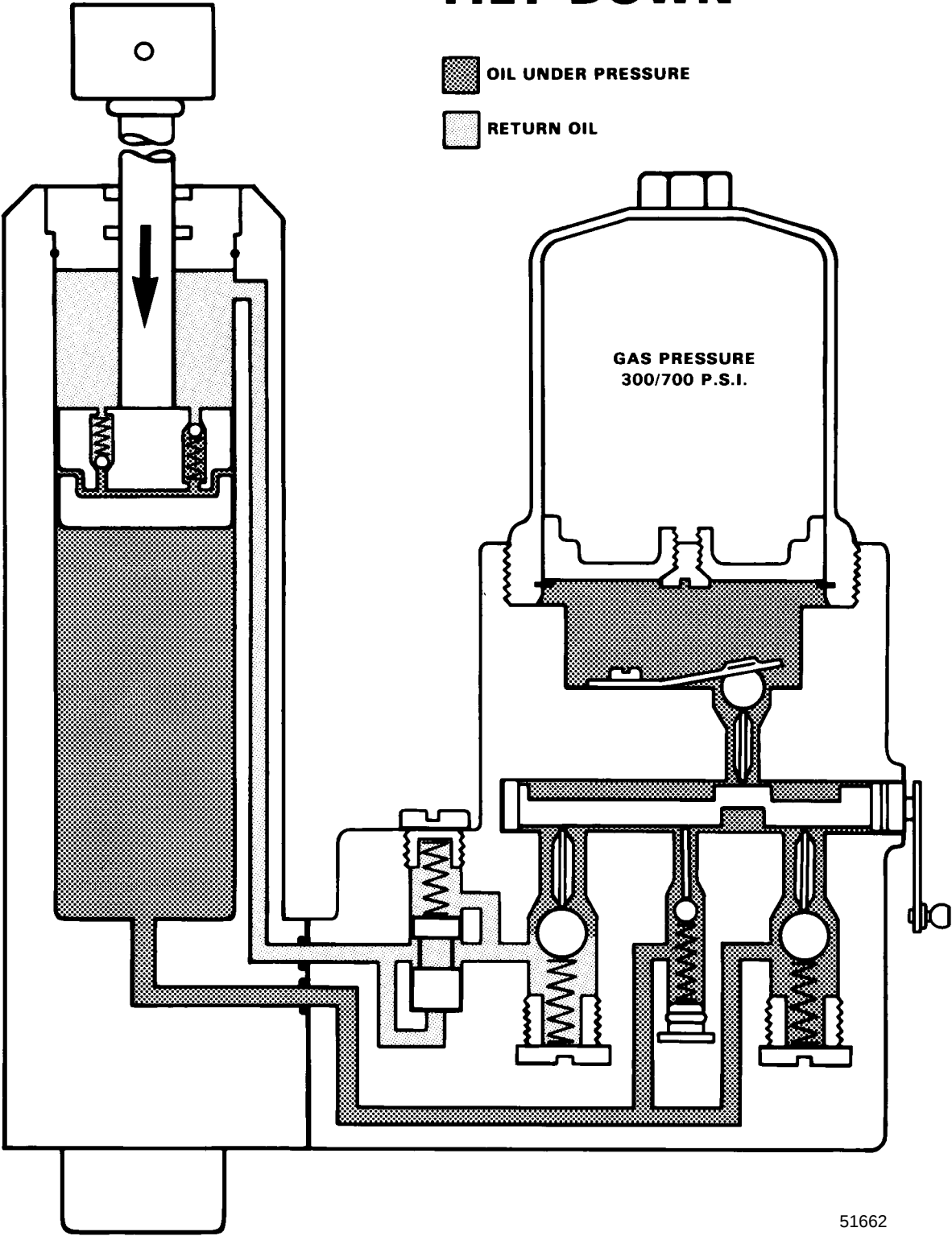


51661



# Design 3

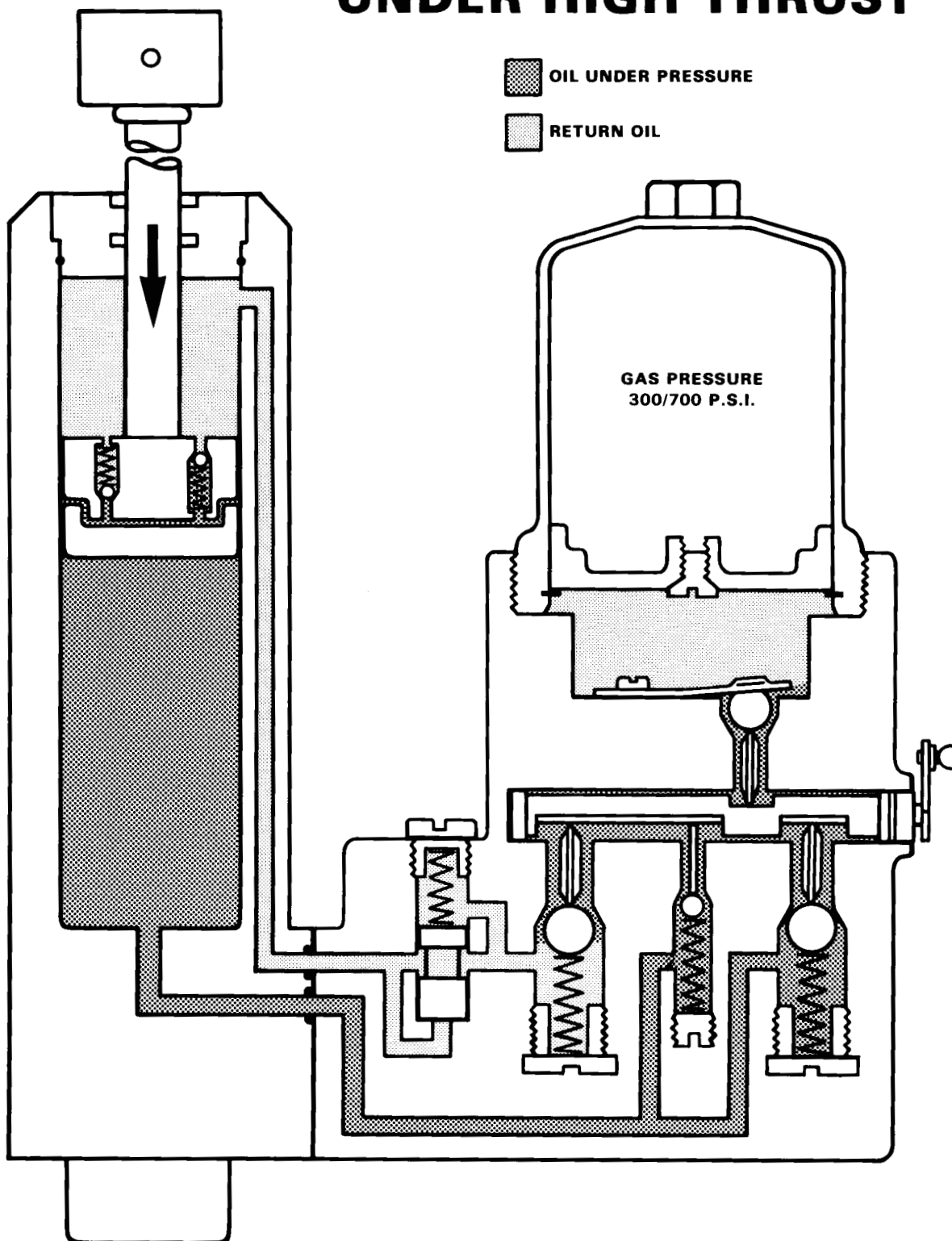
## TILT DOWN





## Design 3

### SLOW TILT DOWN UNDER HIGH THRUST

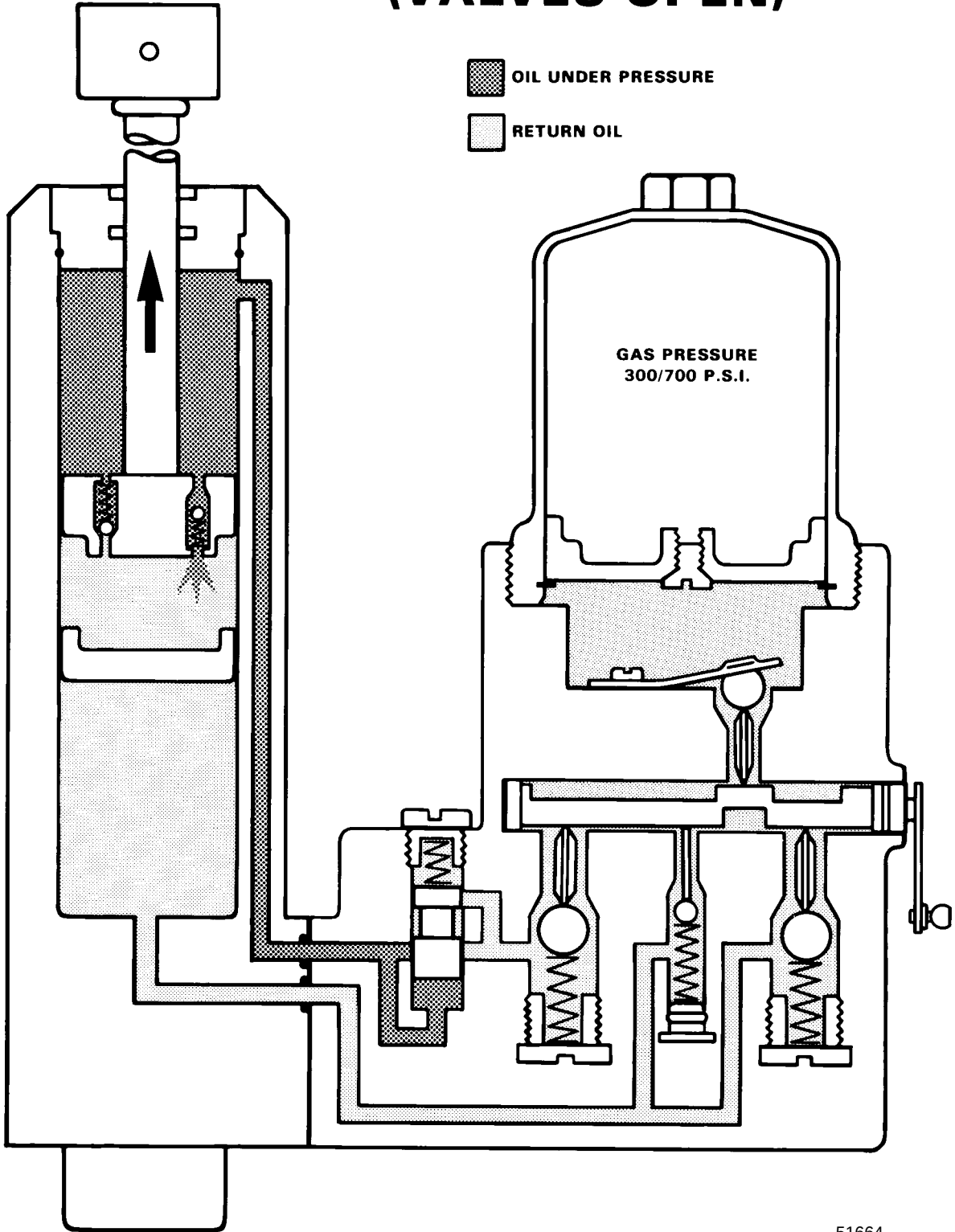


51663



Design 3

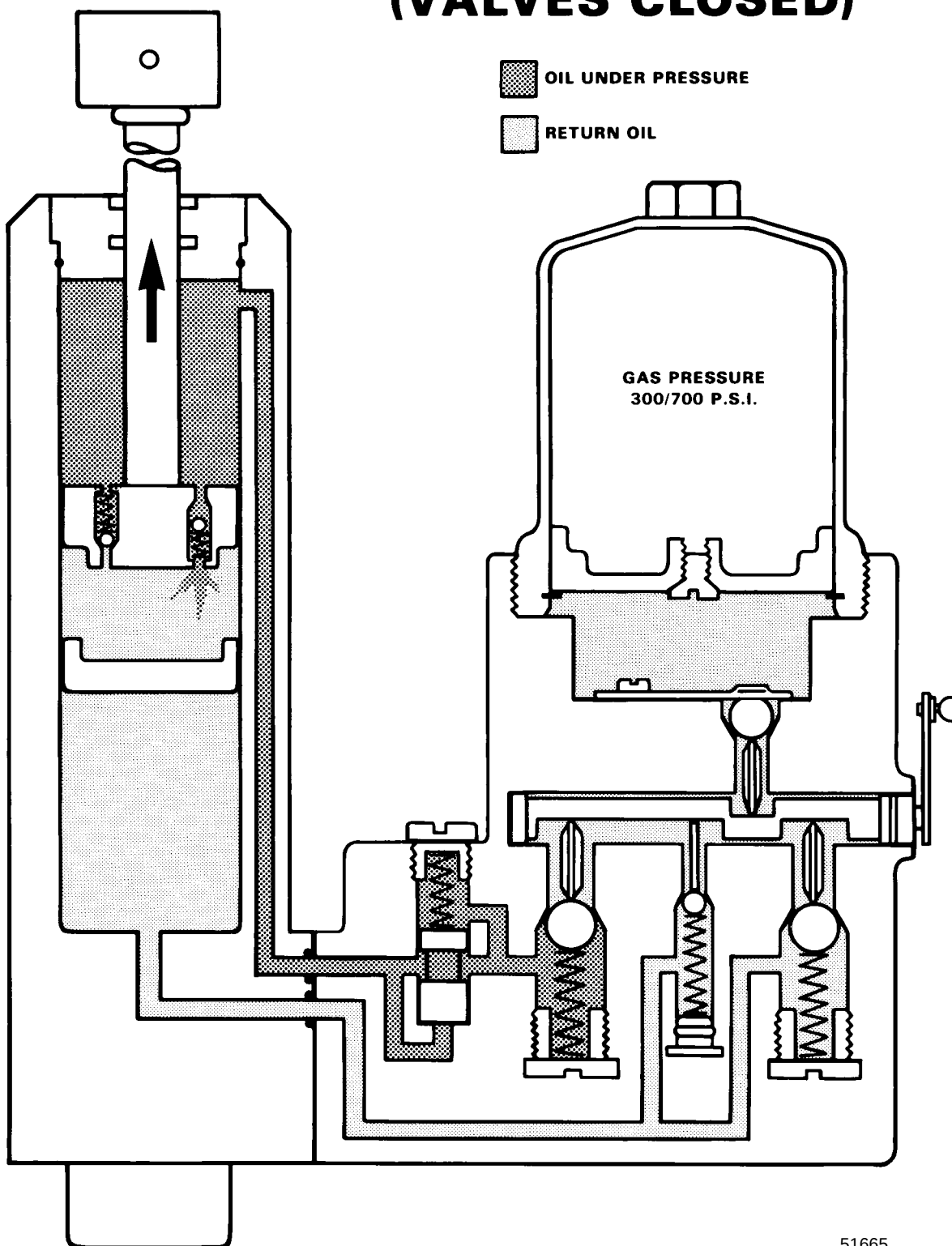
**UNDER WATER STRIKE  
(VALVES OPEN)**



51664



## SHOCK FUNCTION (VALVES CLOSED)



51665



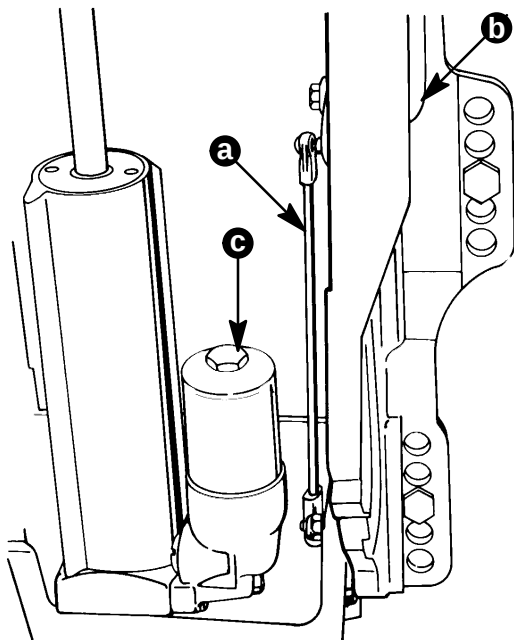
# Hydraulic System Troubleshooting

Refer to disassembly/reassembly instructions (following) if disassembly is required when servicing.

**IMPORTANT:** After debris or failed components have been found (during troubleshooting procedure) it is recommended that unit be disassembled completely and ALL O-rings be replaced. Check ball components and castings must be cleaned using engine cleaner and compressed air or replaced prior to reassembly.

Support outboard with tilt lock lever when servicing manual tilt system.

1. Check manual release cam adjustment. Cam must open and close freely. Adjust cam link rod as necessary.



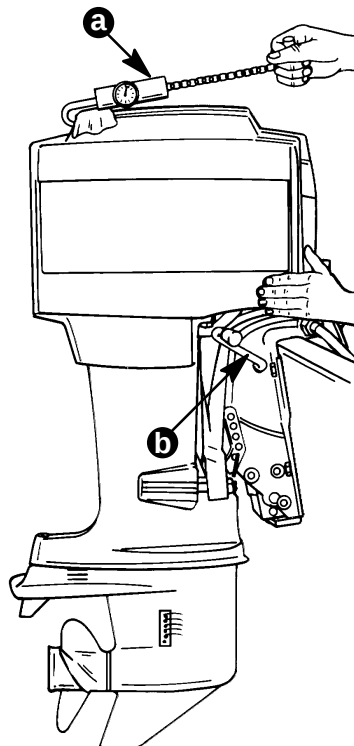
51143

- a - Link Rod
- b - Manual Release Lever
- c - Accumulator

2. Check for external leaks in the manual tilt system. Replace defective part(s) if leak is found.

**IMPORTANT:** If cut or damaged O-rings are found, inspect machined surfaces for scoring, burrs or debris.

3. Check for discharged accumulator. 35 to 50 lb. ft. (47-68 N·m) of pulling force must be attained when tilting outboard from full “down” to full “up” position. If more than 50 lb. ft. (68 N·m) of force is required, replace accumulator.

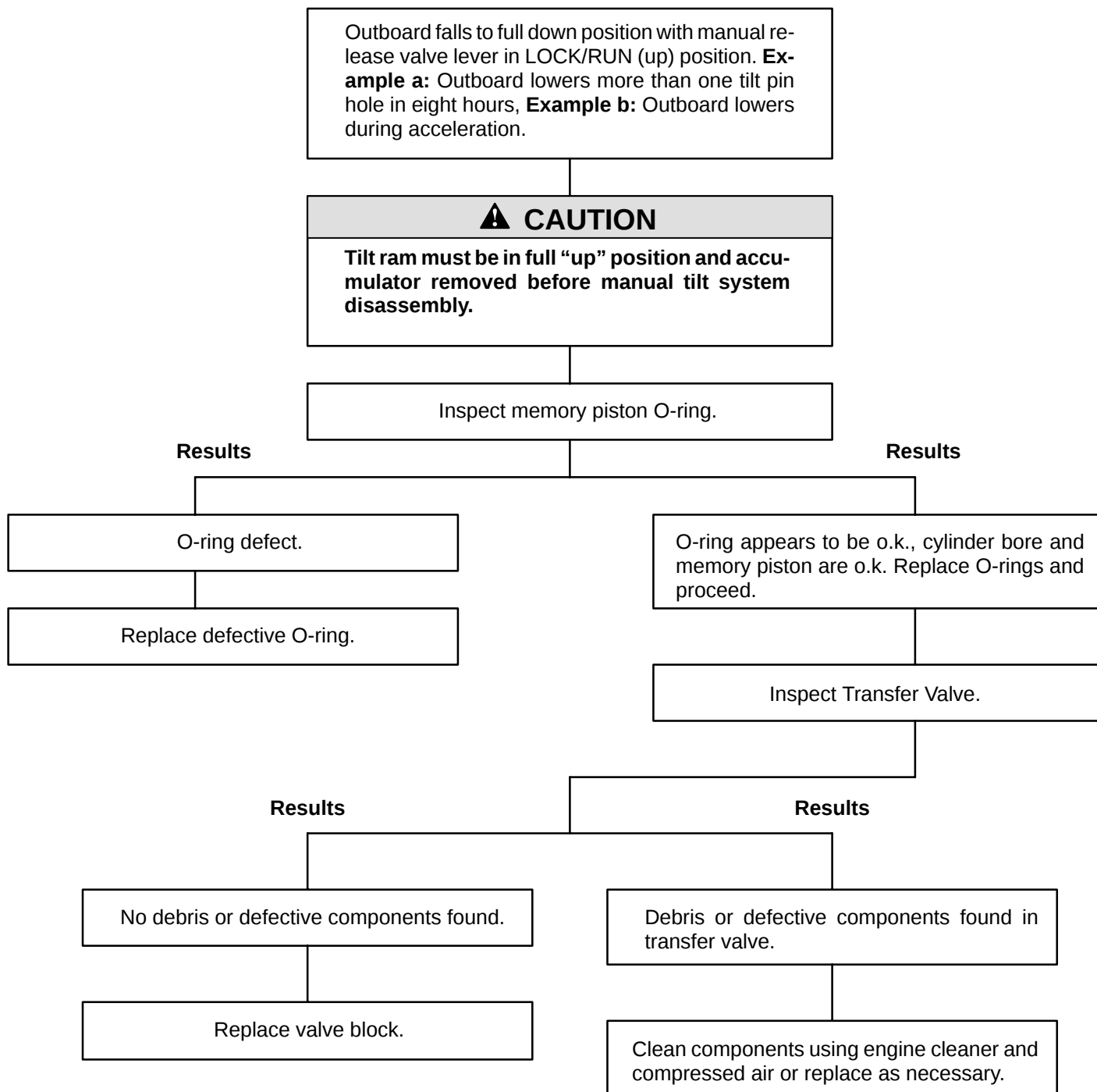


50431

- a - Weight Scale
- b - Valve Lever (open position)

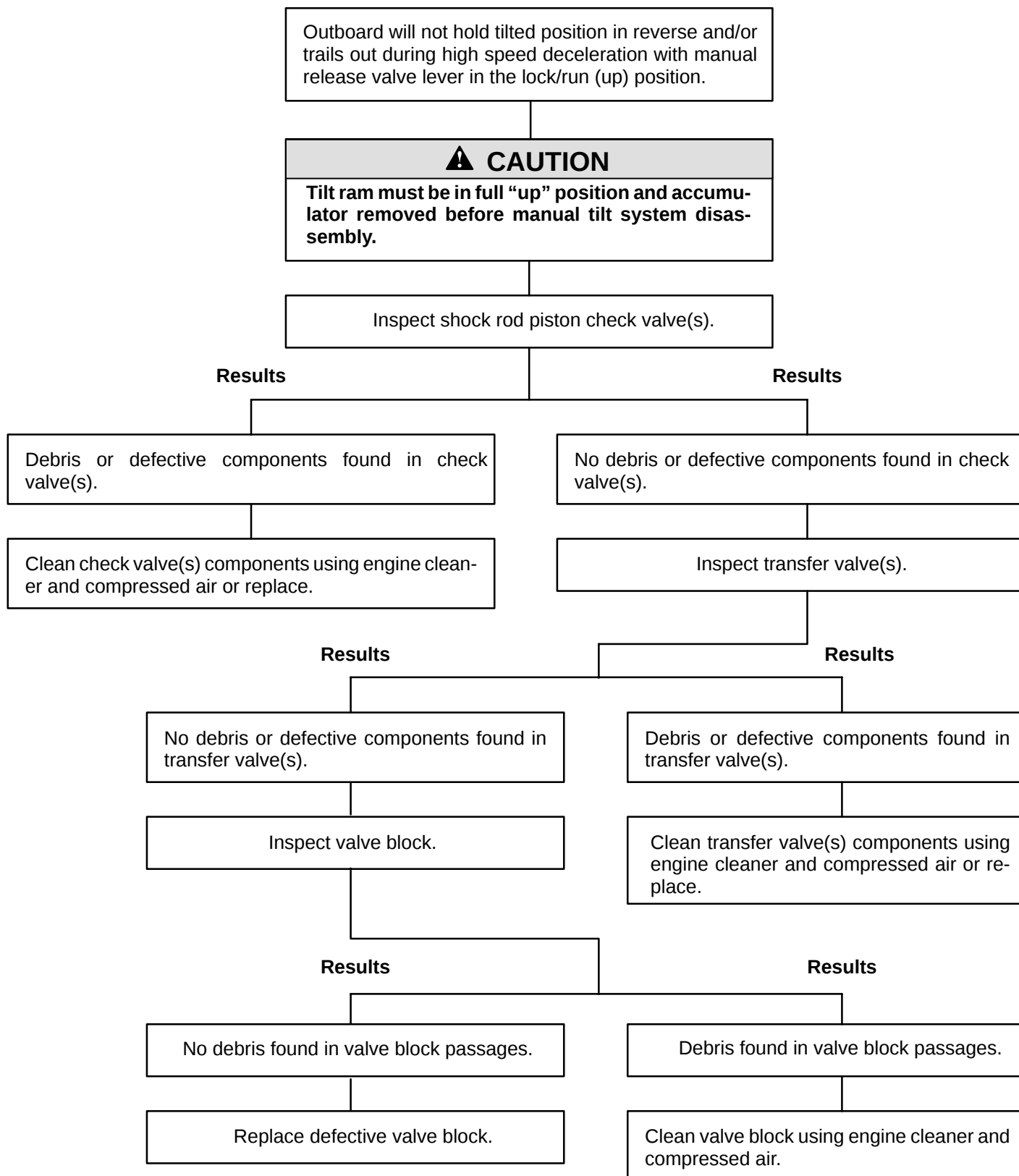


# Troubleshooting Flow Chart





# Troubleshooting Flow Chart (Continued)





## Manual Tilt System Removal

### ⚠ CAUTION

Remove cowling and remove all spark plug leads from spark plugs to prevent accidental starting while servicing outboard.

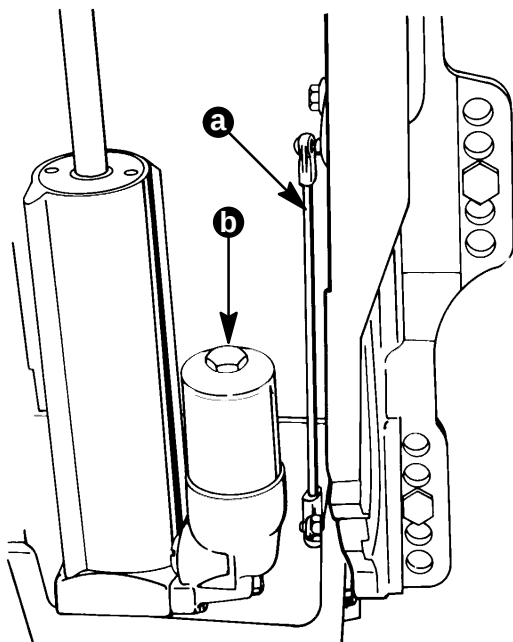
### ⚠ WARNING

Service or installation of the tilt system may result in loss of pressure in the shock cylinder. If the outboard is not in the full down position, such loss of pressure will cause the engine to fall to the full down position with a potential for damaging engine or causing personal injury. To avoid such injury support outboard in the up position using tilt lock lever.

### ⚠ WARNING

Manual tilt system is pressurized. Accumulator must be removed when shock rod is in the full up position, prior to servicing, otherwise oil spray-back may occur.

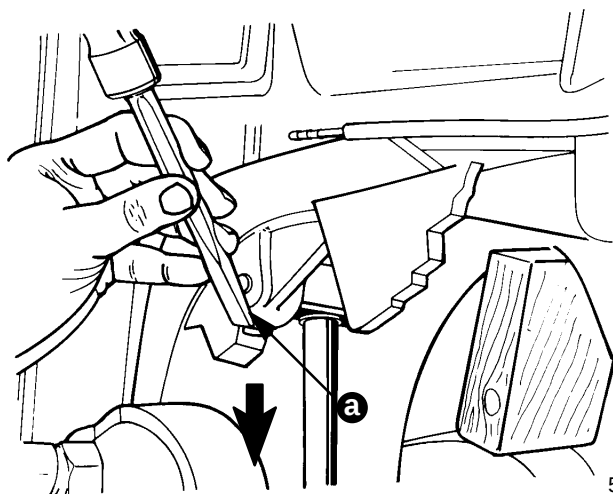
1. Support outboard in the up position using tilt lock lever.
2. Remove link rod.



51143

- a - Link Rod  
b - Accumulator

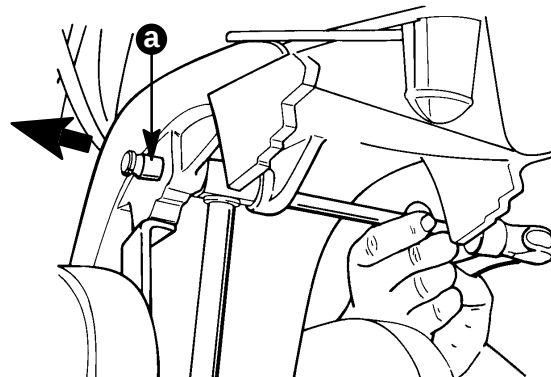
3. Use suitable punch to remove (DRIVE DOWN) upper dowel pin. Retain dowel pin.



51144

- a - Dowel Pin

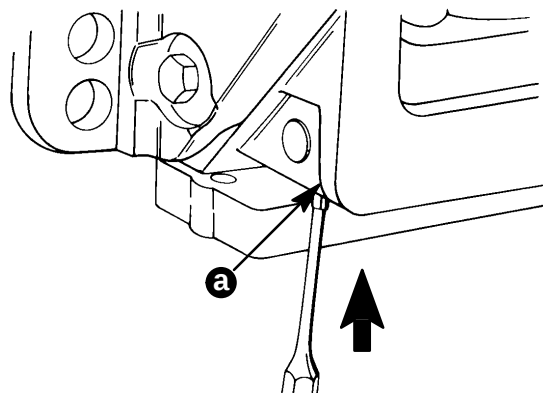
4. Use suitable punch to drive out upper pivot pin.



51144

- a - Pivot Pin

5. Use punch to remove (DRIVE UP) lower dowel pin. Retain dowel pin.

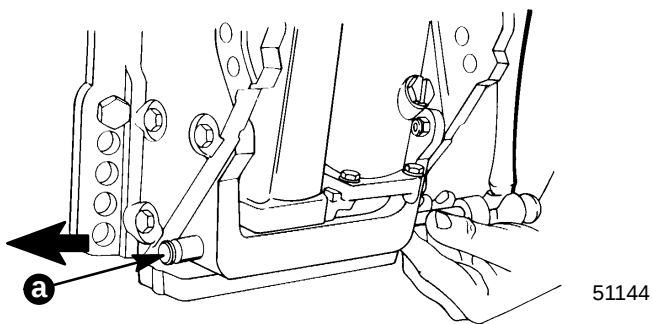


51144

- a - Dowel Pin

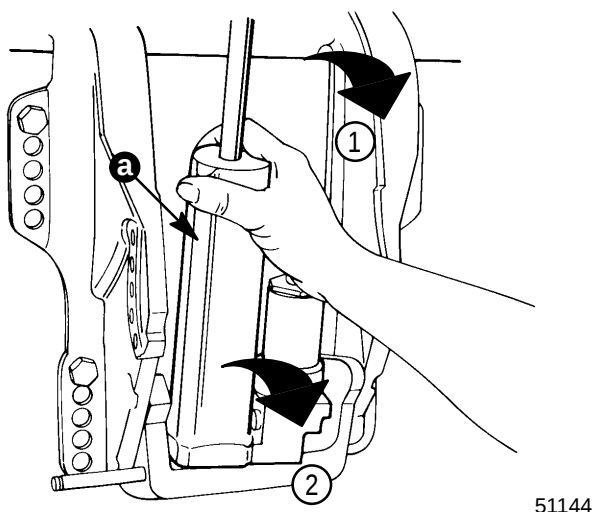


6. Use suitable punch to drive out lower pivot pin.



a - Pivot Pin

7. Tilt shock absorber assembly (TOP FIRST) out from clamp bracket and remove assembly.



a - Manual Tilt System

## Manual Tilt System Disassembly

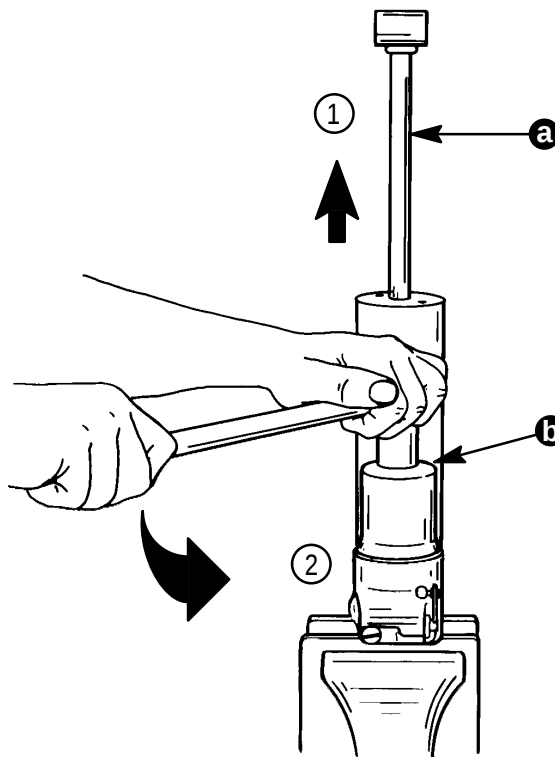
**NOTE:** Accumulator contains a high pressure nitrogen charge and is NOT SERVICEABLE. Replace if necessary.

### ⚠ WARNING

This tilt system is pressurized. Remove accumulator only when shock rod is in full up position.

## Accumulator Removal

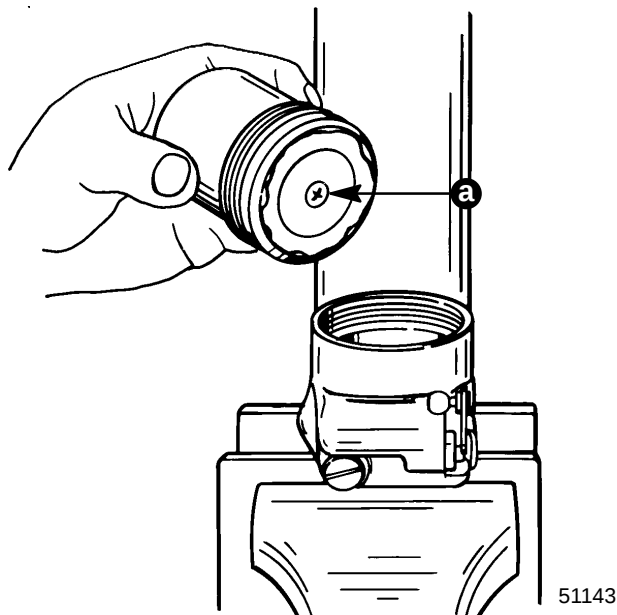
1. Place manual tilt system in soft jawed vise.
2. Position shock rod to full up position.
3. Remove accumulator.



a - Shock Rod  
b - Accumulator

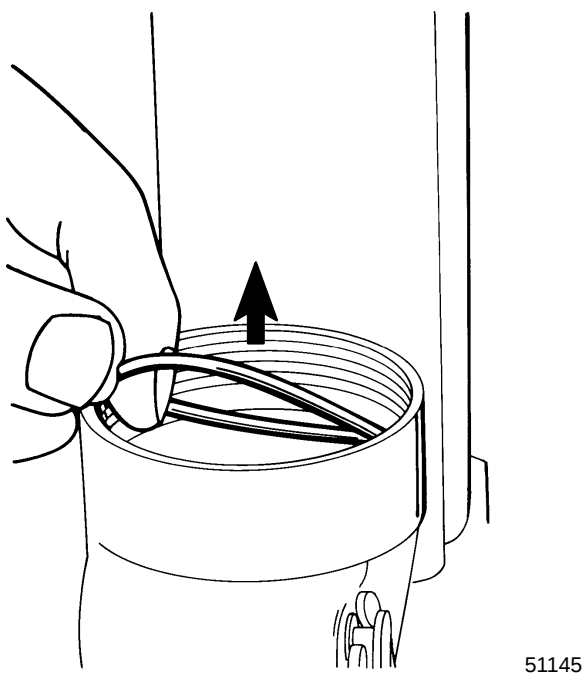


4. If plunger can be compressed into accumulator by hand, accumulator is defective. Replace accumulator.



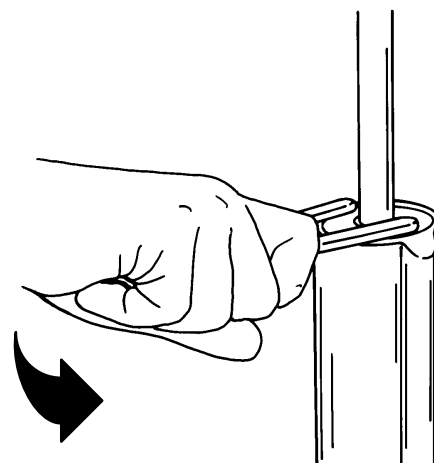
a - Plunger

5. Remove O-ring.

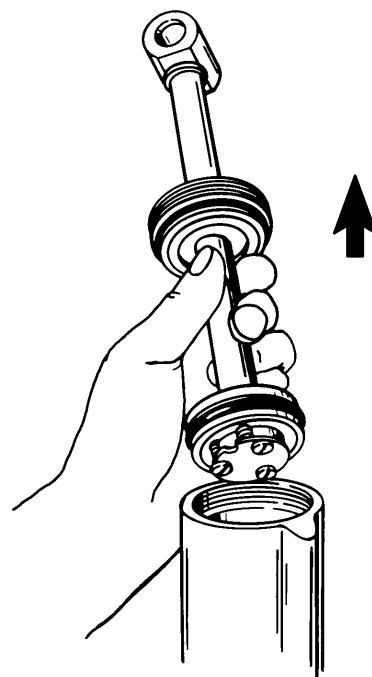


## Shock Rod Removal

1. Remove cylinder end cap assembly using spanner wrench [1/4 in. x 5/16 in. long pegs].

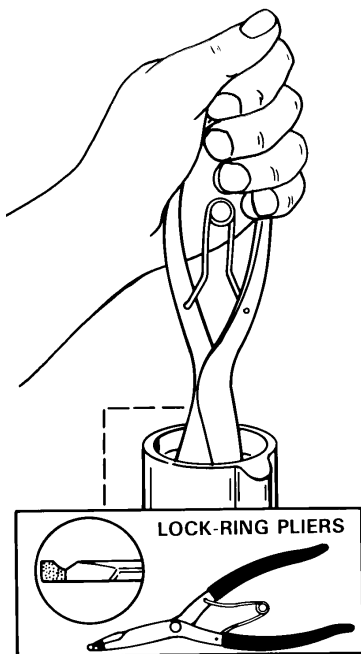


2. Remove shock rod assembly.



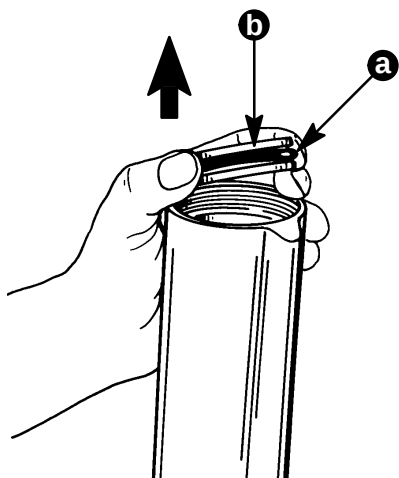


3. Remove memory piston from cylinder using lock ring pliers (Craftsman P/N 4735) or suitable tool.



51144

4. Remove O-ring from memory piston.



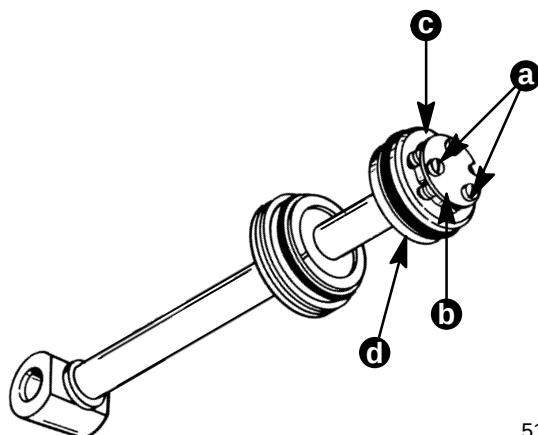
51144

- a - O-ring  
b - Memory Piston

5. Remove tilt system from vise and empty fluid into appropriate container.

## Shock Rod Disassembly

1. Place shock rod assembly on clean work surface.
2. Remove plate and O-ring.
3. Remove check ball components from shock rod piston.



51143

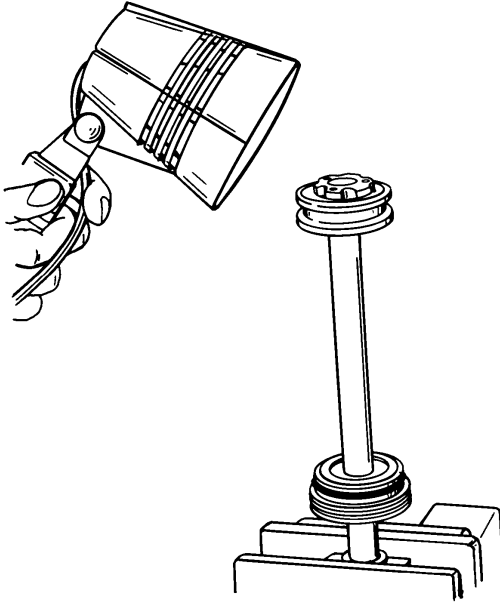
- a - Screw (3)  
b - Plate  
c - O-ring  
d - Shock Rod Piston

### ⚠ CAUTION

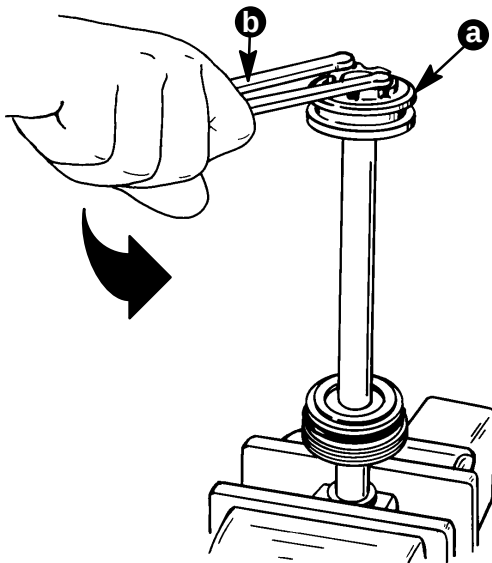
When removing shock piston, spanner wrench must have 1/4 in. x 5/16 in. long pegs to avoid damage to shock piston.



4. Place shock rod into soft jawed vise and apply heat to loosen piston using torch lamp (P/N 91-63209).
5. Loosen shock rod piston using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].
6. Allow shock rod piston to cool. Remove from shock rod.



51146



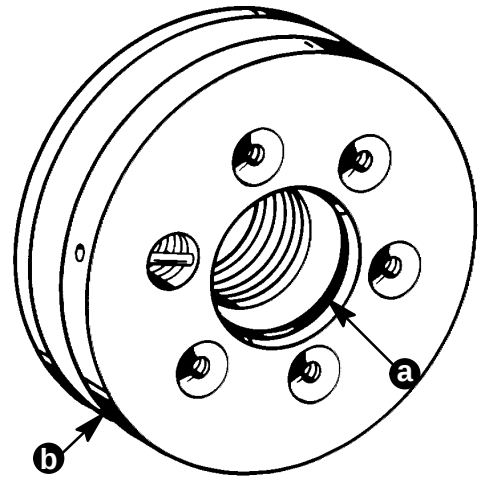
51146

a - Shock Rod Piston  
b - Spanner Wrench

## ⚠ CAUTION

**Do not remove check ball components from shock rod piston. Removal and reinstallation of check valve could result in improper operating pressure and possible manual tilt system damage.**

7. Inspect check valve for debris; clean debris from check valve if found. If debris cannot be cleaned from check valve, replace shock piston as an assembly.
8. Clean shock and components with compressed air.
9. Remove inner O-ring.



51199

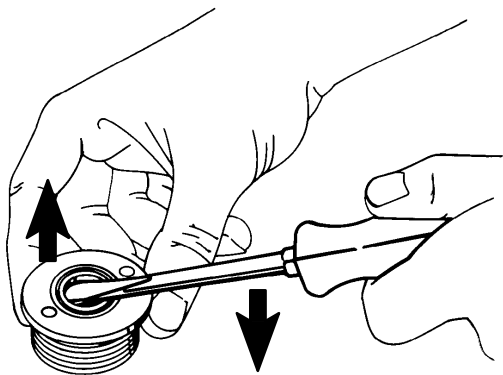
a - O-ring  
b - Shock Piston

10. Remove cylinder end cap assembly from shock rod.
11. Inspect shock. If wiper (located in cap) has failed to keep rod clean, replace wiper.

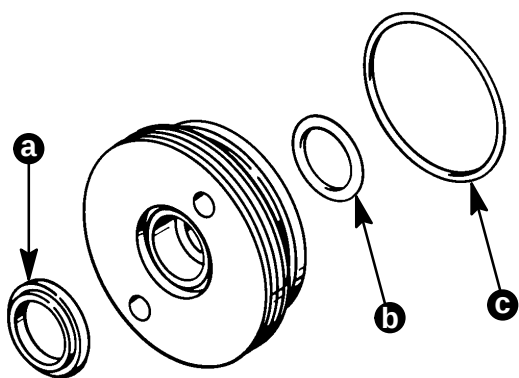


12. Place end cap on clean work surface.

13. Remove rod wiper, inner O-ring, and outer O-ring.



51147

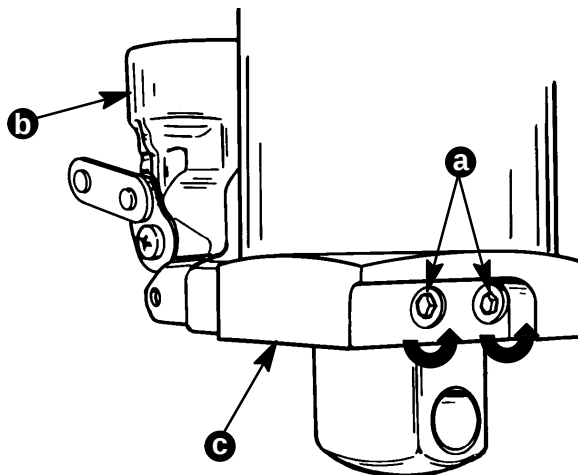


51145

- a - Rod Wiper
- b - Inner O-ring
- c - Outer O-ring

## Valve Block Removal

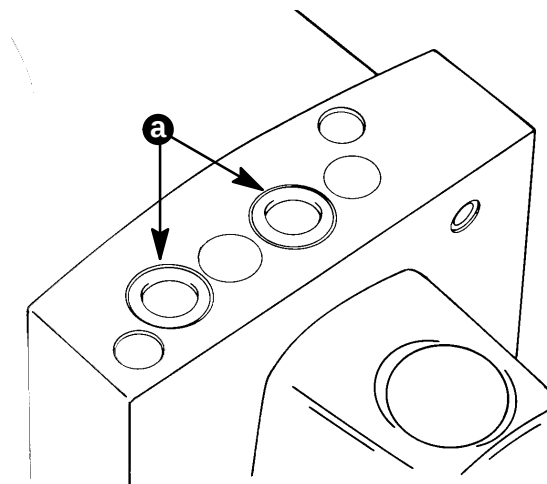
1. Remove valve block from shock rod cylinder.



51146

- a - Screws (2)
- b - Valve Block
- c - Shock Rod Cylinder

2. Remove O-rings.



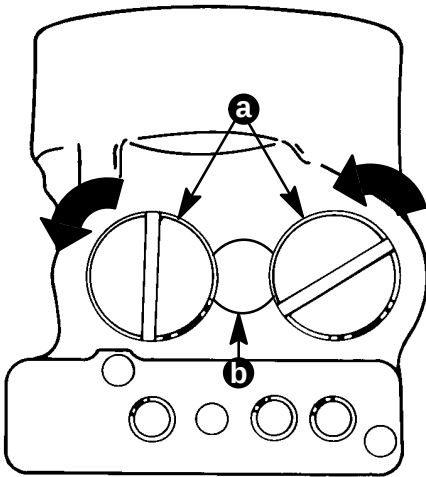
51148

- a - O-rings (2)



## Valve Block Disassembly

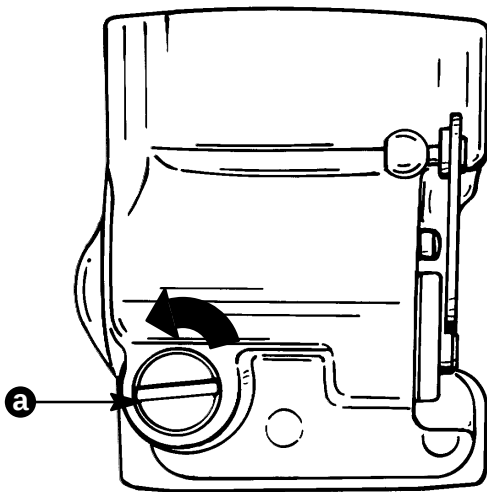
1. Remove slow trim valve assembly.
2. Remove hydraulic oil transfer valve components.



51143

- a - Transfer Valves (2)
- b - Slow trim Valve Assembly (Plug or Screw Plug)

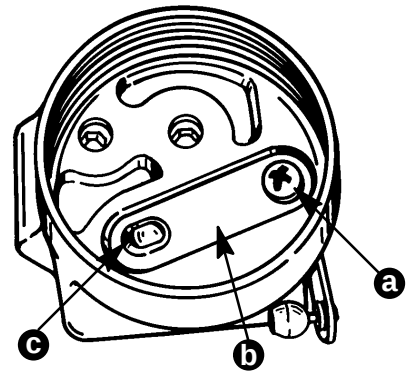
3. Remove surge valve assembly.



51145

- a - Surge Valve

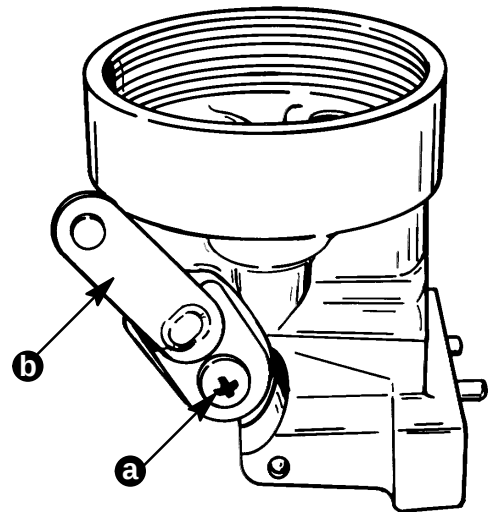
4. Remove reservoir assembly.



51142

- a - Screw
- b - Flat Spring
- c - Ball

5. Remove cam assembly.



51145

- a - Screw
- b - Cam Assembly



## Manual Tilt System Cleaning and Inspection

1. It is recommended that all O-rings exposed during disassembly be replaced.
2. Clean components, filter, and check valve seats using engine cleaner and compressed air. Do not use cloth rags.
3. Inspect all machined surfaces for burrs or scoring to assure O-ring longevity.
4. Inspect shock rod. If wiper (located in cap) has failed to keep rod clean, replace wiper.

## Manual Tilt System Reassembly

**IMPORTANT:** Components must be dirt and lint free. Slightest amount of debris in tilt system could cause system to malfunction.

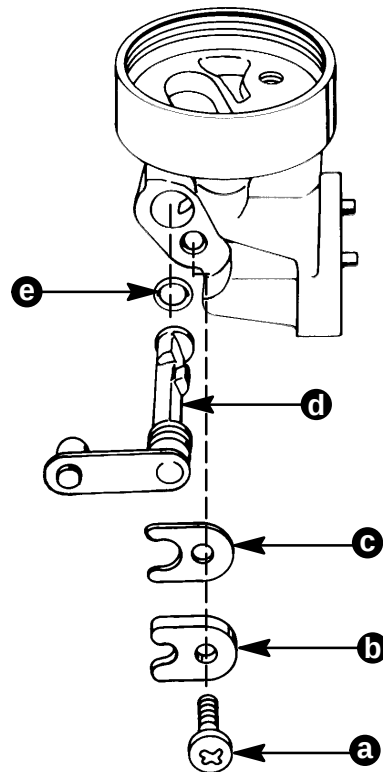
Apply Quicksilver Power Trim and Steering Fluid or, (ATF) Type F, FA or Dexron II on all O-rings during reassembly.

**NOTE:** Refer to "Manual Tilt System Components" for proper O-ring sizes.

## Valve Block Reassembly

**IMPORTANT:** Cam shaft O-ring must be lubricated using Special Lubricant 101 prior to installation.

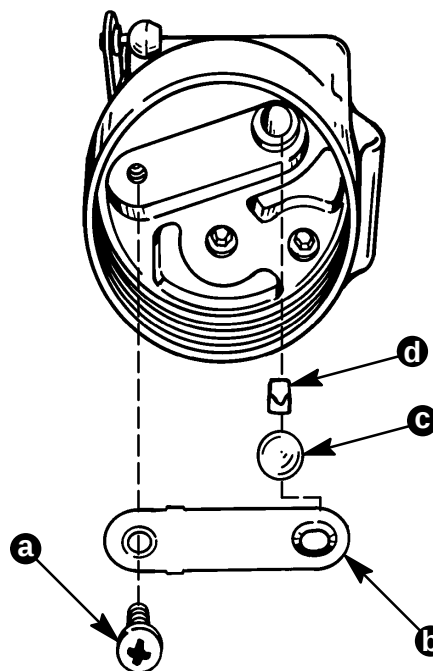
1. Install lubricated O-ring to cam shaft.
2. Install cam shaft in valve block.
3. Secure cam shaft in place using insulator, retain-er plate, and screw. Tighten screw securely.



51142

- a - Screw
- b - Retainer Plate
- c - Insulator
- d - Cam Shaft
- e - O-ring

4. Install push rod, ball, flat spring and screw in valve block.
5. Torque screw to 27 lb. in. (3.0 N·m).

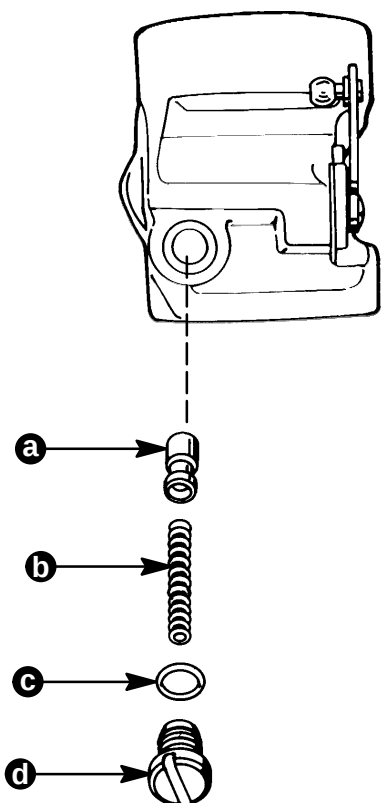


51145

- a - Screw
- b - Flat Spring
- c - Ball
- d - Push Rod



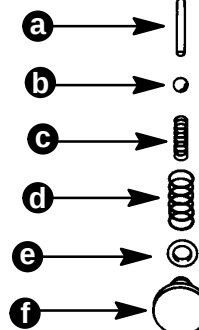
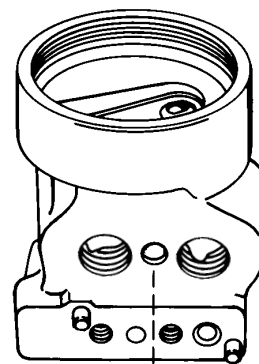
6. Install spool, spring, lubricated O-ring and screw plug (surge valve assembly) into valve block.
7. Torque screw plug to 75 lb. in. (8.5 N·m).



- a - Spool
- b - Spring
- c - O-ring
- d - Screw Plug

8. Install push rod, ball, spring, lubricated O-rings and screw plug (transfer valve components) in valve block.
9. Install plunger, ball, spring (small), spring (large) in valve block (Slow Trim Valve Assembly).
10. Apply Loctite Pipe Sealant with Teflon 592 to threads of pipe plug (design one and two style valve block).
11. Install pipe plug or plug into valve block. Tighten pipe plug (if equipped) securely.

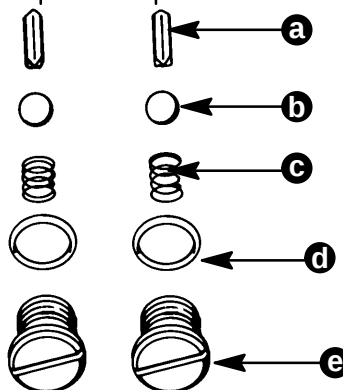
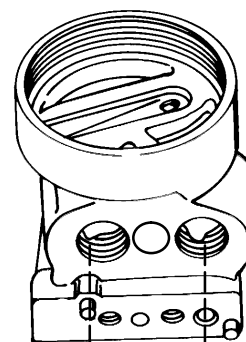
51142



- a - Plunger
- b - Ball
- c - Spring (Small)
- d - Spring (Large)
- e - O-ring
- f - Plug (Design 3)

51142

12. Torque screw plug to 75 lb. in. (8.5 N·m).



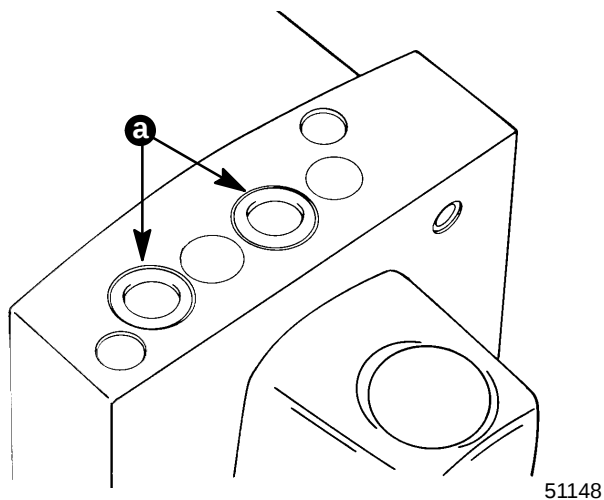
- a - Push Rod (2)
- b - Ball (2)
- c - Spring (2)
- d - O-ring (2)
- e - screw Plug (2)

51142



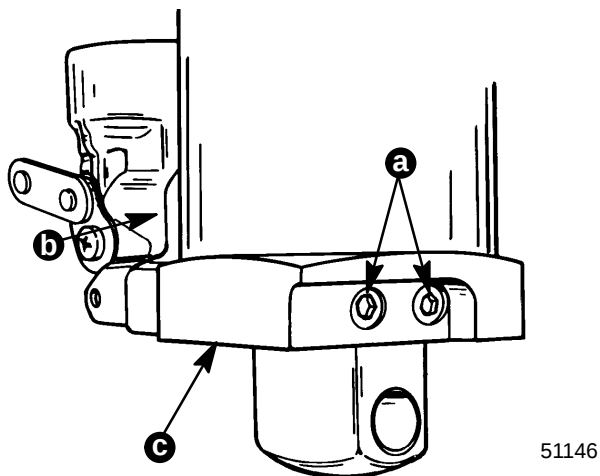
## Valve Block Installation

1. Install lubricated O-rings.



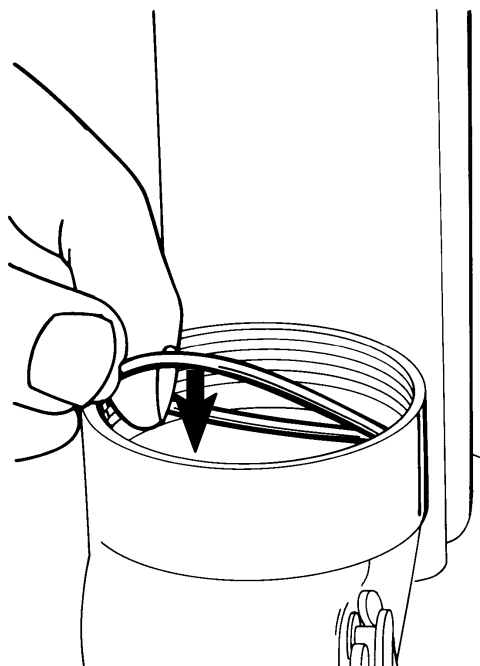
a - O-rings (2)

2. Install valve block to shock rod cylinder. Torque screws to 100 lb. in. (11.2 N·m).



a - Screw (2)  
b - Valve Block  
c - Shock Rod Cylinder

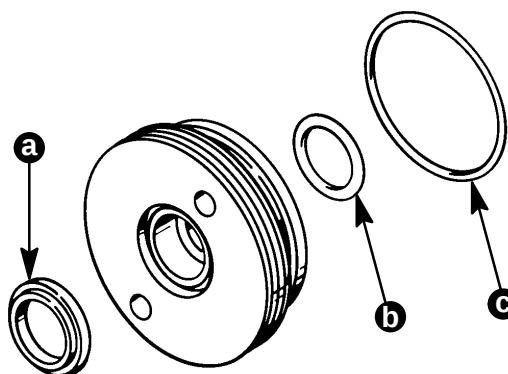
3. Install lubricated O-ring.



51145

## Shock Rod Reassembly

1. Install lubricated O-rings.
2. Install rod wiper.

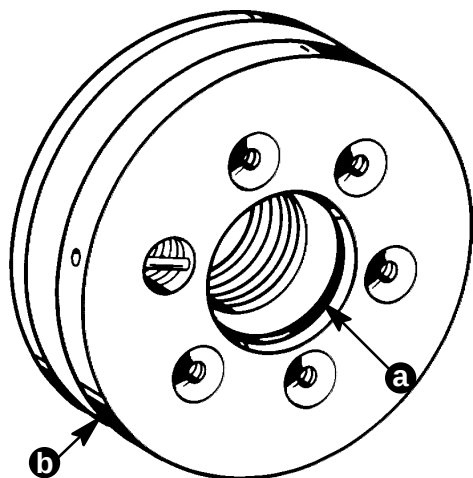


51145

a - Rod Wiper  
b - Inner O-ring  
c - Outer O-ring



3. Install lubricated O-ring.



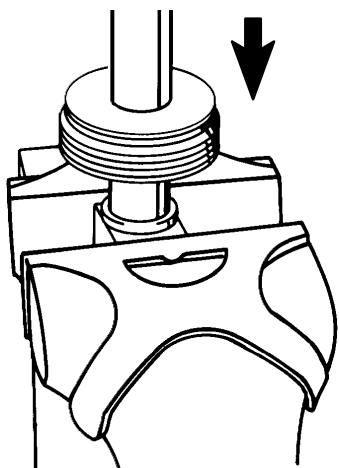
51199

a - O-ring

b - Shock Piston

4. Clamp shock rod in soft jawed vise.

5. Position cylinder end cap onto rod as shown.



51146

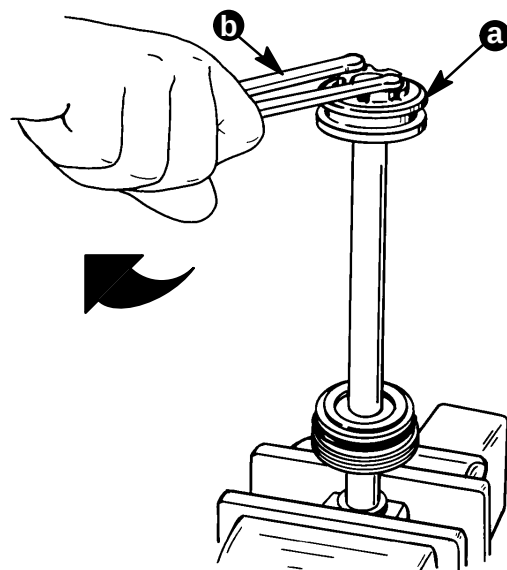
### CAUTION

When installing shock rod piston, spanner wrench must have 1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs to avoid damage to shock rod piston.

6. Apply Loctite Grade "A" (271) to threads on shock rod.

7. Install shock rod piston.

8. Tighten shock rod piston securely using spanner wrench (1/4 in. x 5/16 in. long pegs).



51146

a - Shock Rod Piston

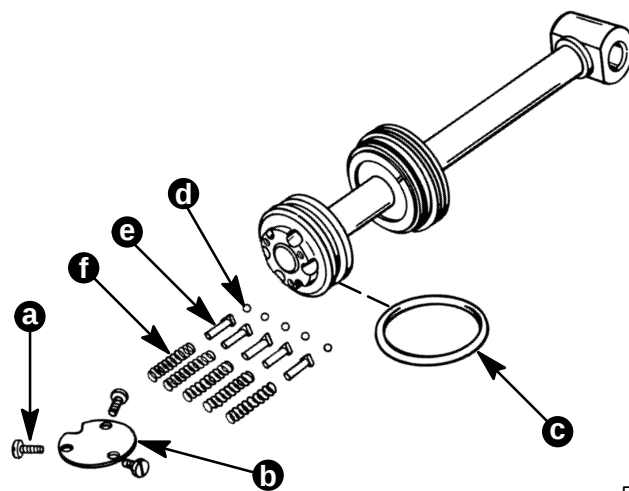
b - Spanner Wrench

9. Remove shock rod assembly from vise.

10. Install lubricated O-ring to shock rod piston.

11. Install ball, seat, and spring (five sets) to shock rod piston.

12. Secure components with plate. Torque screws to 35 lb. in. (4.0 N·m).



51147

a - Screw (3)

b - Plate

c - O-ring

d - Ball (5)

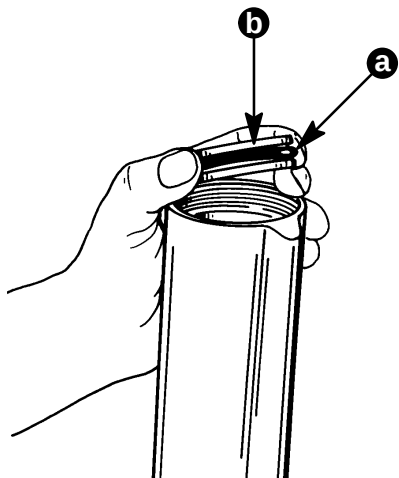
e - Seat (5)

f - Spring (5)



## Shock Rod Installation

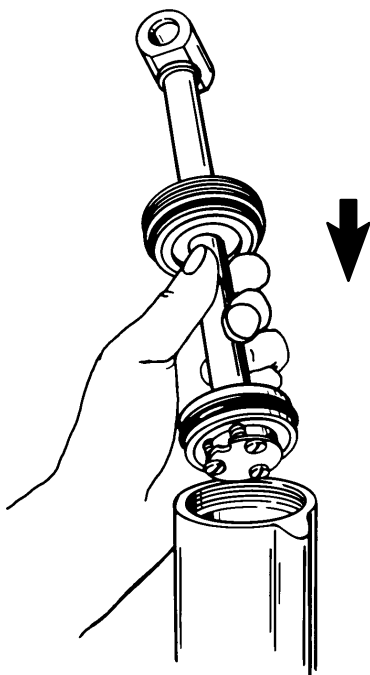
1. Place cylinder/manifold assembly into soft jawed vise.
2. Fill cylinder to top using Quicksilver Power Trim and Steering Fluid or; (ATF) Type F, FA of Dexron II.
3. Place cam shaft lever in the open position (lever facing down).
4. Install lubricated O-ring to memory piston and install piston into cylinder three inches (76mm) from top.



51144

- a - O-ring  
b - Memory Piston

5. Refill cylinder to top and install shock rod assembly into cylinder.



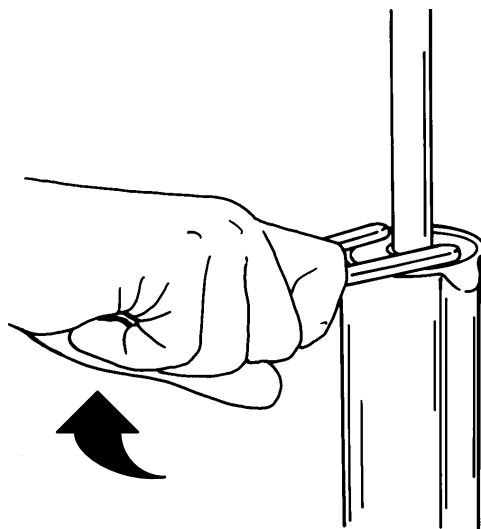
51143

6. Refill cylinder to top.

### CAUTION

**End cap must not make contact with shock rod piston when tightening. Shock rod piston must be positioned in cylinder deep enough to avoid contact.**

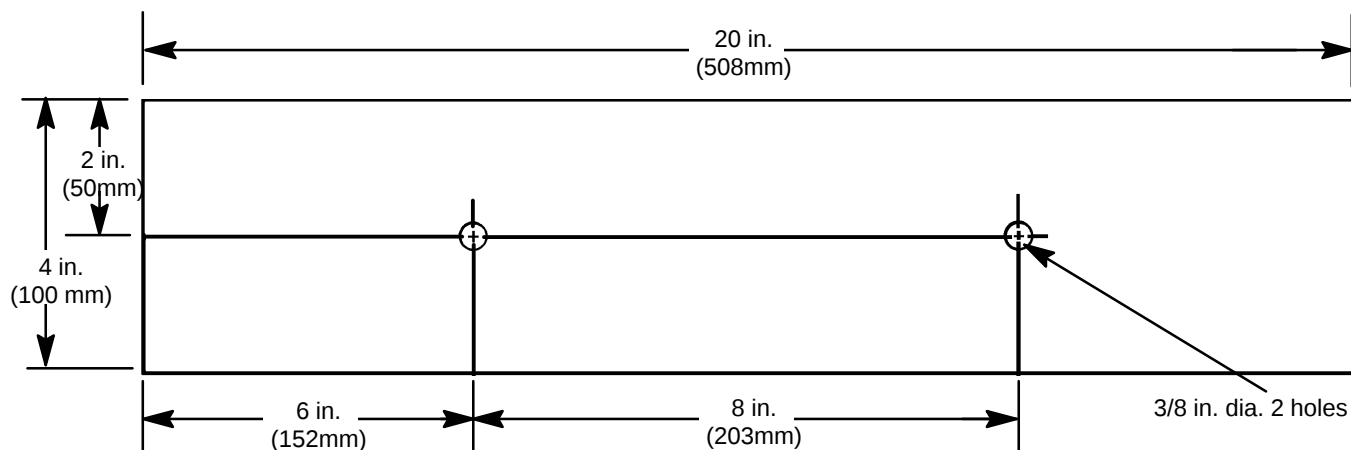
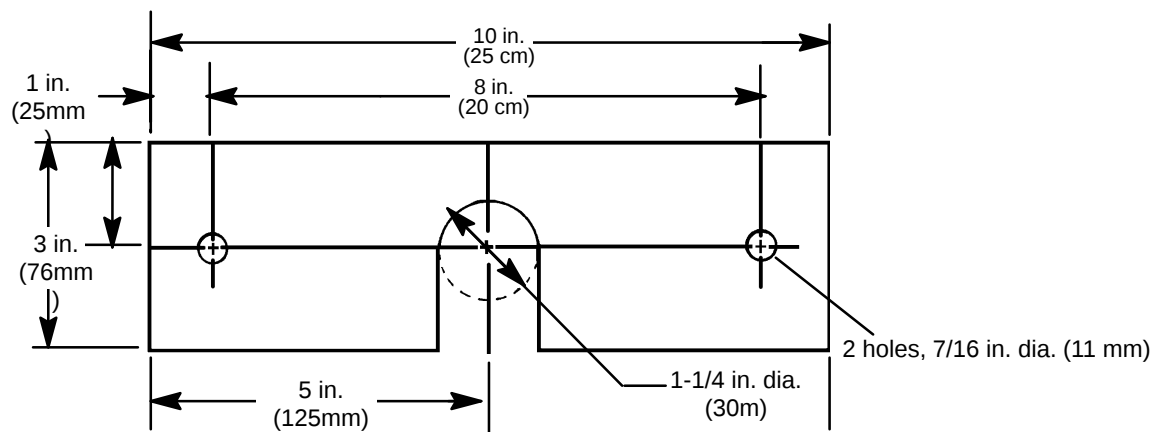
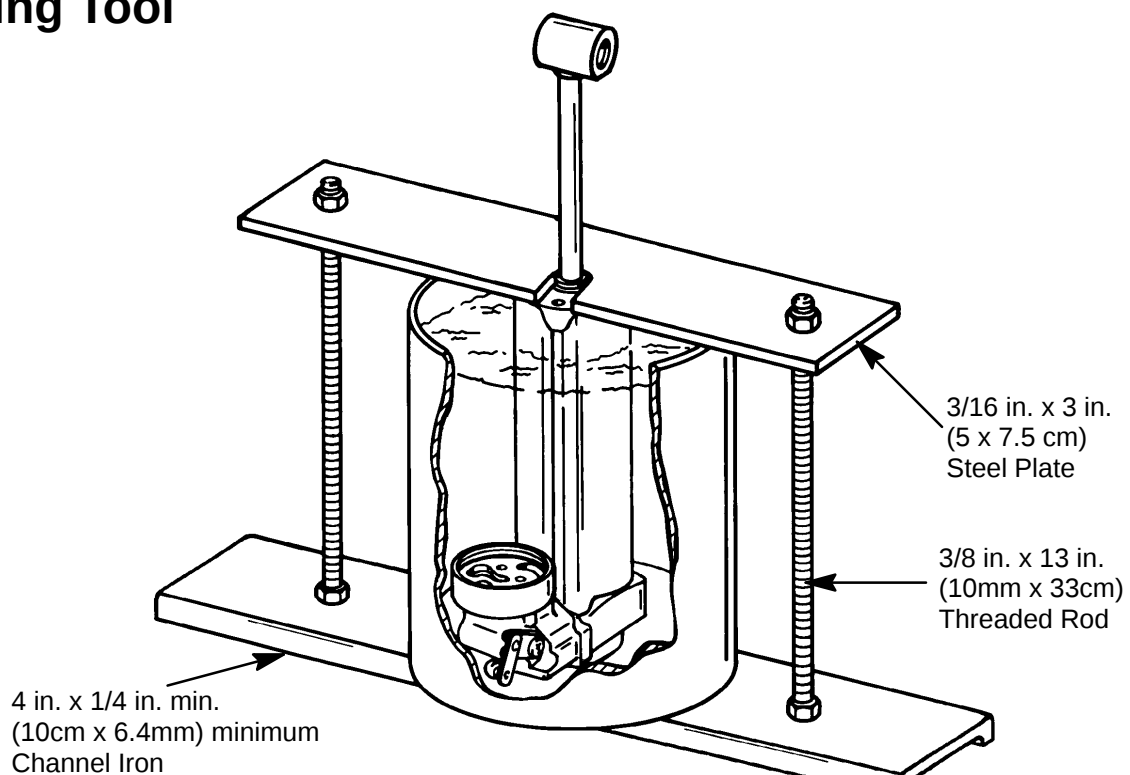
7. Tighten end cap securely using spanner wrench [1/4 in. x 5/16 in. (6.4mm x 8mm) long pegs].



51145



# Instructions for Making Retaining Tool



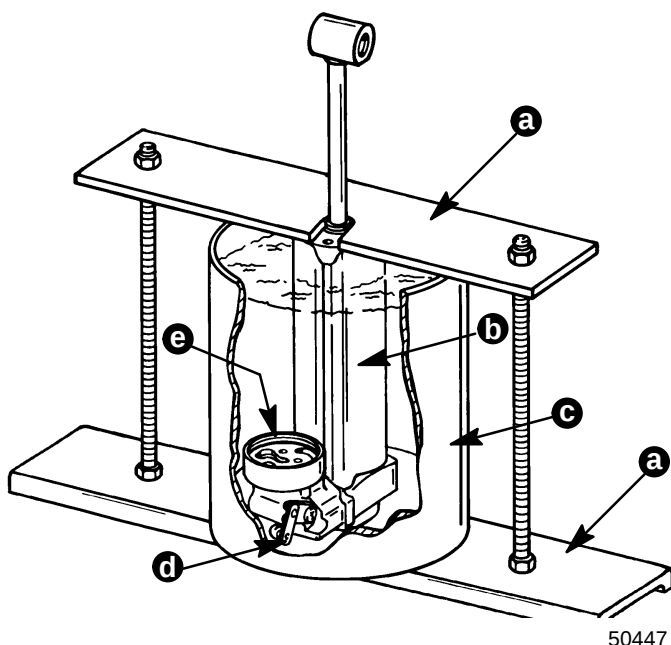


## Bleeding Manual Tilt System

**IMPORTANT:** While bleeding tilt system, time must be allowed between each stroke to allow air bubbles to dissipate.

1. With shock rod in the full up position and manifold cam lever open (facing down), secure tilt system to retaining tool and container. (A No. 10 can or 3 lb. coffee can can be used).
2. Fill container to near full level using Quicksilver Power Trim and Steering Fluid or; (ATF) Type F, FA or Dexron II.

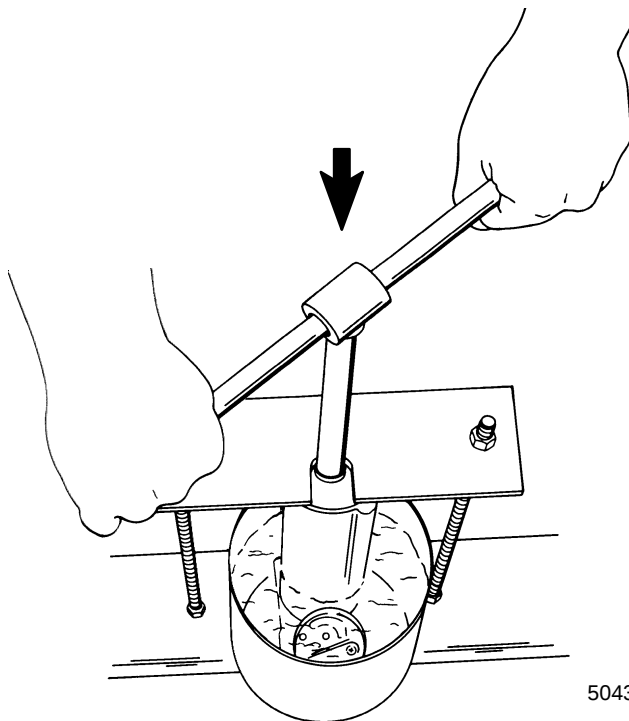
**IMPORTANT:** Fluid level must remain above accumulator opening during bleeding process.



- a - Retaining Tool
- b - Tilt System
- c - Container
- d - Cam Lever
- e - Accumulator Opening

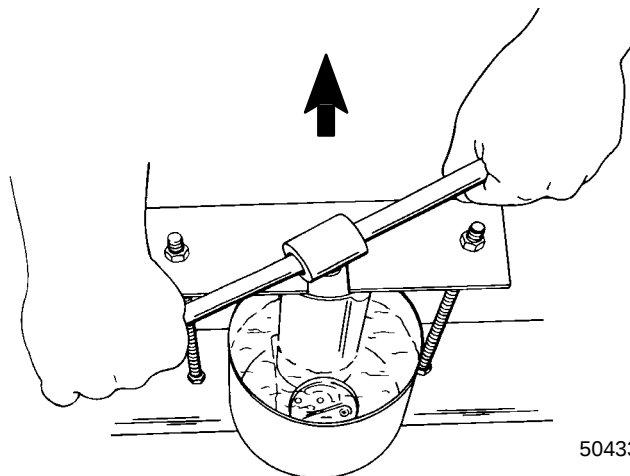
50447

3. Bleed unit by pushing rod down slowly (18-20 seconds per stroke) until stopped at base. Wait until all air bubbles exit accumulator base.



50432

4. During up stroke, pull up on rod slowly 3 in. (76mm) from base.
5. Wait until all air bubbles exit accumulator base.

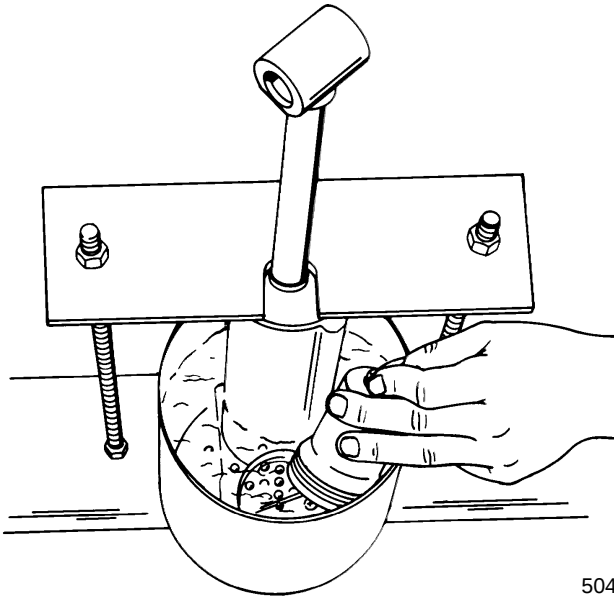


50433

6. Slowly cycle unit 5-8 times (round trip per cycle) using short strokes 3 in. (76mm) from base allowing bubbles to disappear during each stroke.

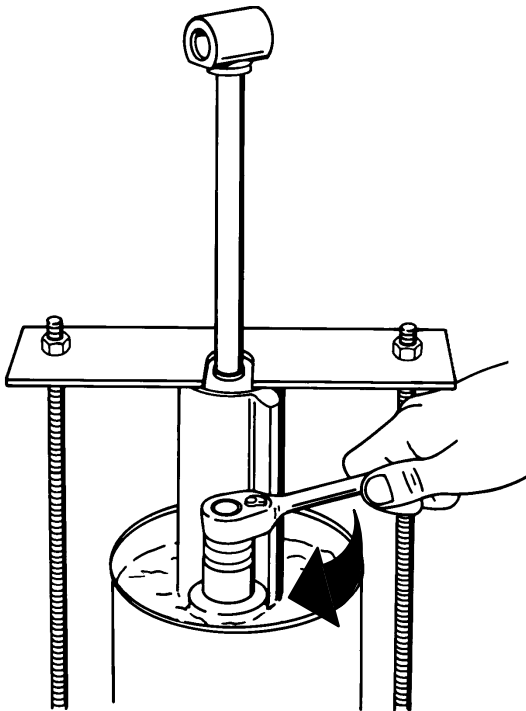


7. Allow unit to stand five minutes then proceed to cycle unit 2-3 more times using short strokes. No air bubbles should appear from accumulator port at this time.
8. With oil level well above accumulator port, slowly pull rod to full up position.
9. Install accumulator making sure air bubbles do not enter system.



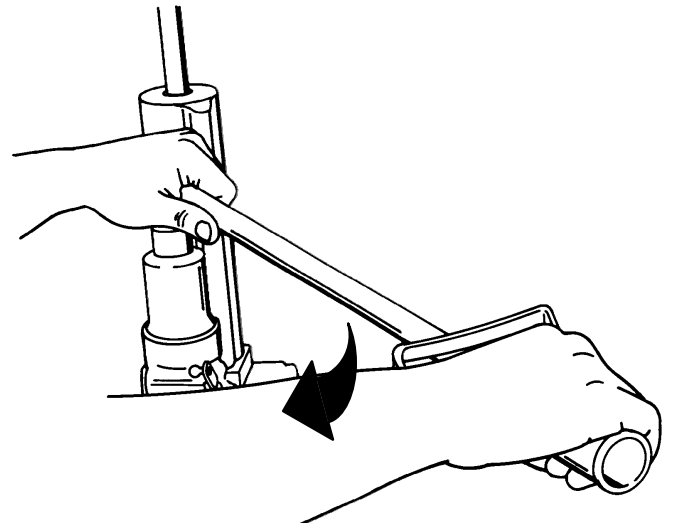
50432

10. Tighten accumulator snugly at this time.



50432

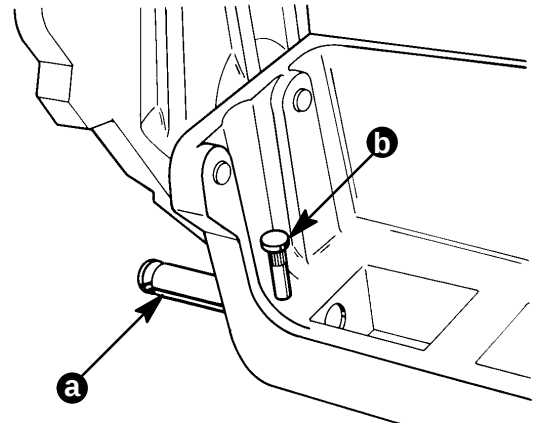
11. With cam lever remaining open (facing down), remove tilt assembly from oil and secure in soft jawed vise. Torque accumulator to 35 lb. ft. (47 N·m).



50433

## Manual Tilt System Installation

1. Apply Special Lubricant 101 to lower pivot pin hole and pivot pin surface.
2. Start lower pivot pin into pivot pin hole and position lower dowel pin (retained) in its hole.

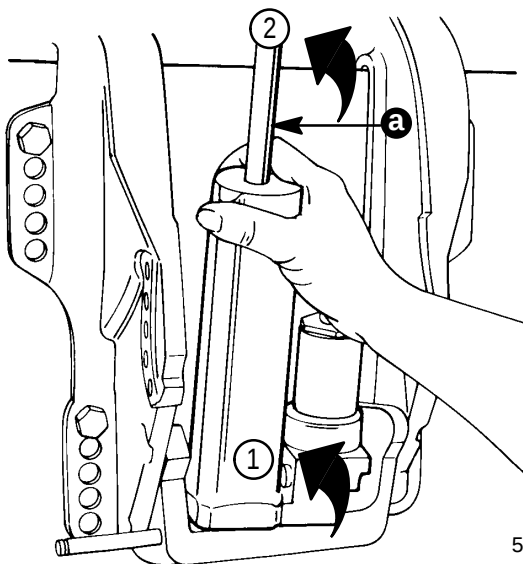


51148

- a - Lower Pivot Pin  
b - Lower Dowel Pin



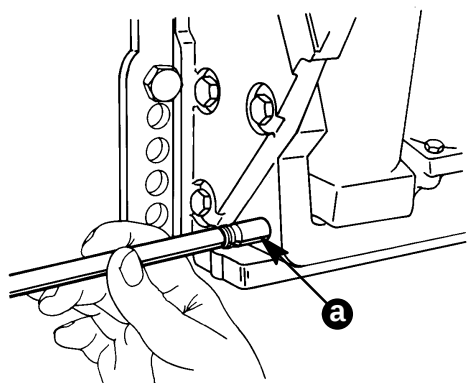
3. Reinstall manual tilt system. Reconnect release valve link rod.



51144

a - Manual Tilt System

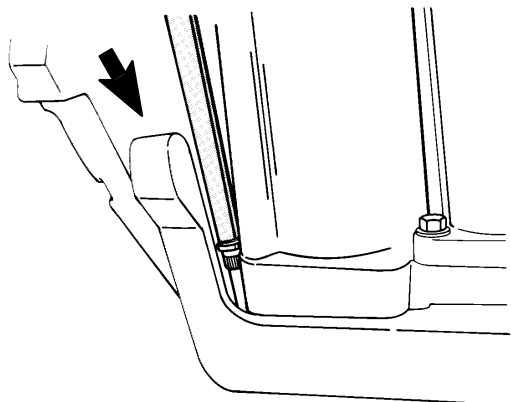
4. Using a suitable punch, drive lower pivot pin into clamp bracket and trim cylinder assembly until pivot pin is flush with outside surface.



51147

a - Lower Pivot Pin

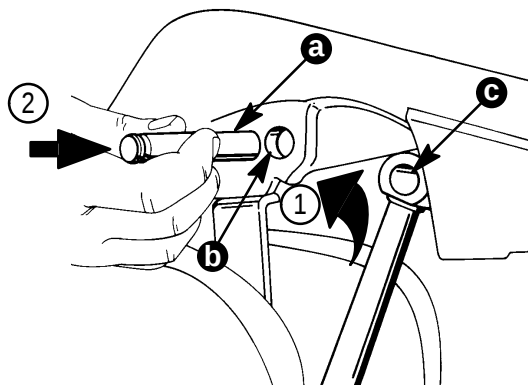
5. Using a punch, drive lower dowel pin in until seated.



51148

a - Lower Dowel Pin

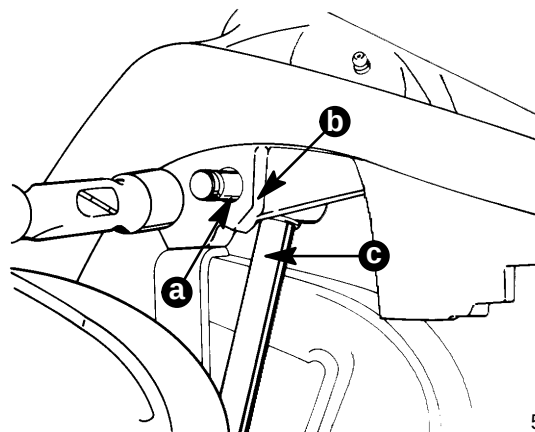
6. Apply 2-4-C Marine Lubricant (92-90018A12) to surface of upper pivot pin, pivot pin hole and shock rod hole.



51148

- a - Pivot Pin  
b - Pivot Pin Bore  
c - Shock Rod Bore

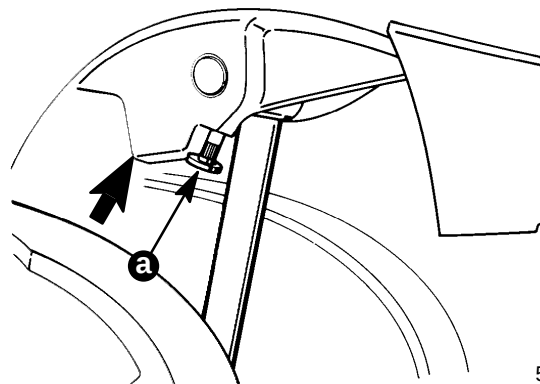
7. Using a mallet, drive upper pivot pin into swivel bracket and through shock rod until pivot pin is flush with swivel bracket.



51148

- a - Pivot Pin  
b - Swivel Bracket  
c - Shock Rod

8. Drive upper dowel pin (a) into its hole until seated.



51147

a - Dowel Pin

9. Check manual release cam adjustment. Cam must open and close freely. Adjust link rod as necessary.