

Service Manual

M70, M80, M100, M120 Mast Disassembly & Assembly

M70D **A1EC4-60001-79999**

A1EC4-80001-99999

M80D **A1EC4-60001-79999**

A1EC4-80001-99999

M100D **A1EC4-60001-79999**

A1EC5-80001-99999

M120D **A1EC5-60001-79999**

A1EC5-80001-99999

FOREWORD

The instructions are grouped by systems to serve the convenience of your ready reference.

Long productive life of your lift trucks depends to a great extent on correct servicing — the servicing consistent with what you will learn from this service manual. We hope you read the respective sections of this manual carefully and know all the components you will work on before attempting to start a test, repair or rebuild job.

The descriptions, illustrations and specifications contained in this manual were of the trucks of serial numbers in effect at the time it was approved for printing. Caterpillar reserves the right to change specifications or design without notice and without incurring obligation.

SAFETY RELATED SIGNS

The following safety related signs are used in this service manual to emphasize important and critical instructions:



Indicates a specific potential hazard resulting in serious bodily injury or death.



Indicates a specific potential hazard resulting in bodily injury, or damage to, or destruction of the machine.



Indicates a condition that can cause damage to, or shorten service life of the machine.

⚠ WARNING

SAFETY

⚠ WARNING

The proper and safe lubrication and maintenance for this lift truck, recommended by Mitsubishi, are outlined in the **OPERATION & MAINTENANCE MANUAL** for these trucks.

Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the OPERATION & MAINTENANCE MANUAL before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this truck. This makes it important to use caution when performing service work. A knowledge of the system and/or components is important before the removal or disassembly of any component.

Because of the size of some of the truck components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all warning plates and decals on the truck before operating, lubricating or repairing the product.
2. Always wear protective glasses and protective shoes when working around trucks. In particular, wear protective glasses when pounding on any part of the truck or its attachments with a hammer or sledge. Use welders gloves, hood/goggles, apron and other protective clothing appropriate to the welding job being performed. Do not wear loose-fitting or torn clothing. Remove all rings from fingers when working on machinery.
3. Do not work on any truck that is supported only by lift jacks or a hoist. Always use blocks or jack stands to support the truck before performing any disassembly.

⚠ WARNING

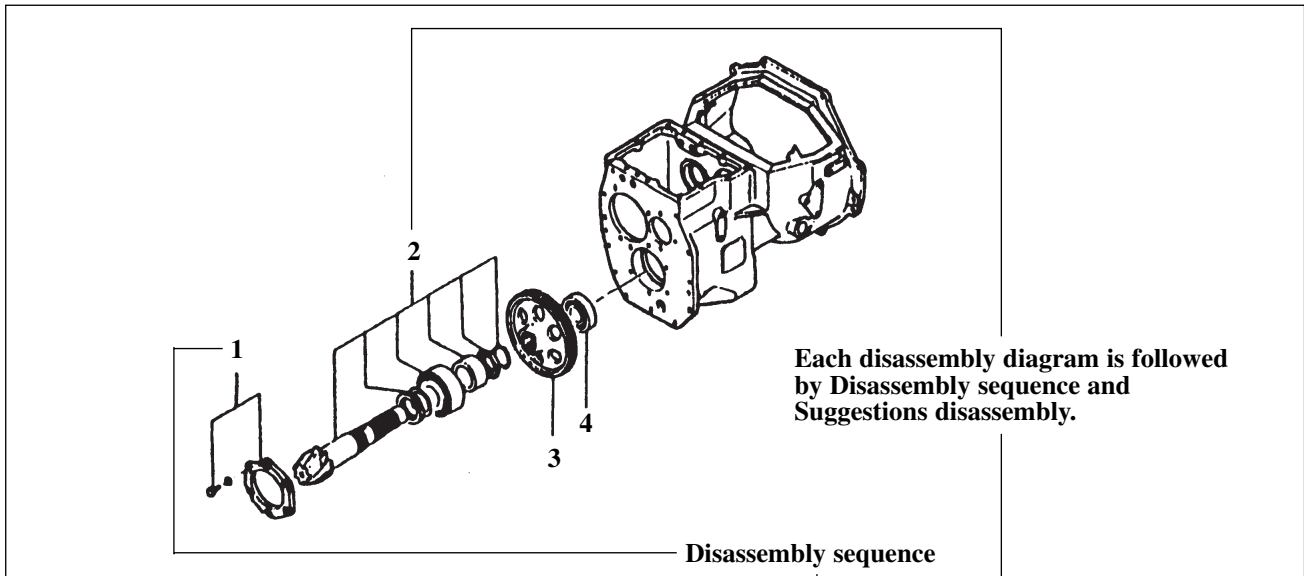
Do not operate this truck unless you have read and understand the instructions in the OPERATION & MAINTENANCE MANUAL. Improper truck operation is dangerous and could result in injury or death.

4. Lower the forks or other implements to the ground before performing any work on the truck. If this cannot be done, make sure the forks or other implements are blocked correctly to prevent them from dropping unexpectedly.
5. Use steps and grab handles (if applicable) when mounting or dismounting a truck. Clean any mud or debris from steps, walkways or work platforms before using. Always face truck when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.
6. To avoid back injury, use a hoist when lifting components which weighs 23 kg (50 lb.) or more. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.
7. To avoid burns, be alert for hot parts on trucks which have just been stopped and hot fluids in lines, tubes and compartments.
8. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.
9. Be careful when removing filler caps, breathers and plugs on the truck. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquid under pressure. The danger is even greater if the truck has just been stopped because fluids can be hot.

10. Always use tools that are in good condition and be sure you understand how to use them before performing any service work.
11. Reinstall all fasteners with same part number. Do not use lesser quality fastener if replacements are necessary. Do not mix metric fastener with standard nuts and bolts.
12. If possible, make all repairs with the truck parked on a level, hard surface. Block truck so it does not roll while working on or under truck.
13. Disconnect battery and discharge any capacitors (electric trucks) before starting to work on truck. Hang "Do not Operate" tag in the Operator's Compartment.
14. Repairs, which require welding, should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of parent metal.
15. Do not damage wiring during removal operation. Reinstall the wiring so it is not damaged nor it will be damaged in operation by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.
16. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution.
17. Always support the mast and carriage to keep carriage or attachments raised when maintenance or repair work is performed, which requires the mast in the raised position.
18. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.
19. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibrations or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure, must be installed correctly.
20. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.
21. Do not operate a truck if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.

HOW TO READ THIS MANUAL

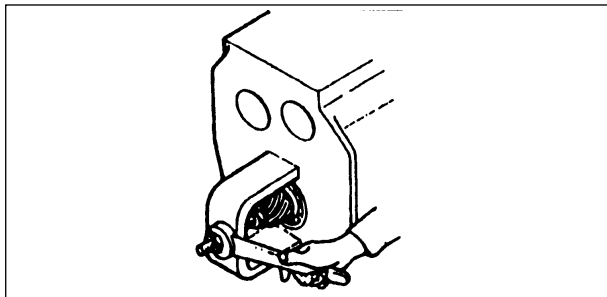
Disassembly diagram (example)



- 1 Cover, Bolt, Washer (part name)
- 2 Output shaft (part name)

Suggestion for disassembly

(1) Output shaft removal



Unit: mm (in.)

Clearance between cylinder and piston	A	0.020 to 0.105 (0.00079 to 0.00413)
	B	0.15 (0.0059)

A: Assembly standard
B: Repair or service limit

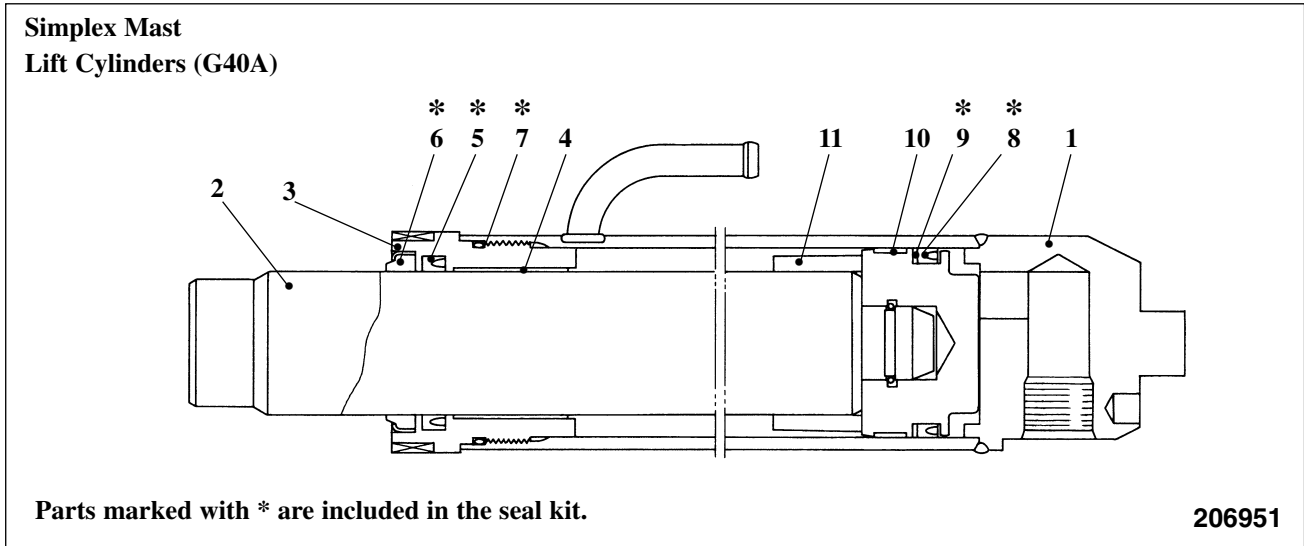
Symbols or abbreviations

- OP.....Option
- R1/4Taper pipe thread (external) 1/4 inch (formerly PT1/4)
- Rc1/8Taper pipe thread (internal) 1/8 inch (formerly PT1/8)
- G1/4A.....Straight pipe thread (external) 1/4 inch (formerly PF1/4-A)
- Rp1/8Straight pipe thread (internal) 1/8 inch (formerly PS1/8)

Specifications

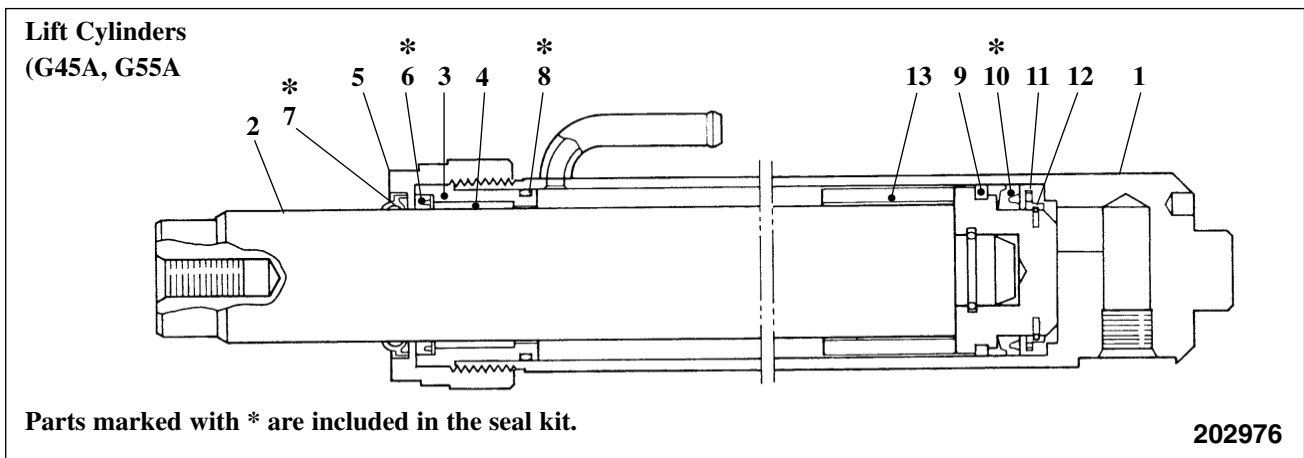
Items		Truck Models		
		M70D M80D	M100D M120D	
Hydraulic system	Flow regulator valve	Type Control flow capacity liter/min (U.S.gal/min)	Adjustable 100 (26.42)	Adjustable 115 (30.38)
	Simplex mast Lift cylinders	Internal diameter mm (in.) Stroke mm (in.)	60 (2.36) 1650 (65)	70 (2.75) 1650 (65)
	Duplex mast First lift cylinders	Internal diameter mm (in.) Stroke mm (in.)	90 (3.54) 820 (32.28)	110 (4.33) 845 (33.27)
	Duplex mast Second lift cylinders	Internal diameter mm (in.) Stroke mm (in.)	55 (2.17) 1590 (62.60)	60 (2.36) 1585 (62.40)
	Triplex mast First lift cylinders	Internal diameter mm (in.) Stroke mm (in.)	90 (3.54) 820 (32.28)	110 (4.33) 845 (33.27)
	Triplex mast Second lift cylinders	Internal diameter mm (in.) Stroke mm (in.)	60 (2.36) 1480 (58.27)	70 (2.75) 1530 (60.24)

Lift Cylinders



- | | | |
|-----------------|--------------|---------------|
| 1 Cylinder tube | 5 U-ring | 9 Backup ring |
| 2 Piston rod | 6 Wiper ring | 10 Bushing |
| 3 Cylinder head | 7 O-ring | 11 Spacer |
| 4 Bushing | 8 U-ring | |

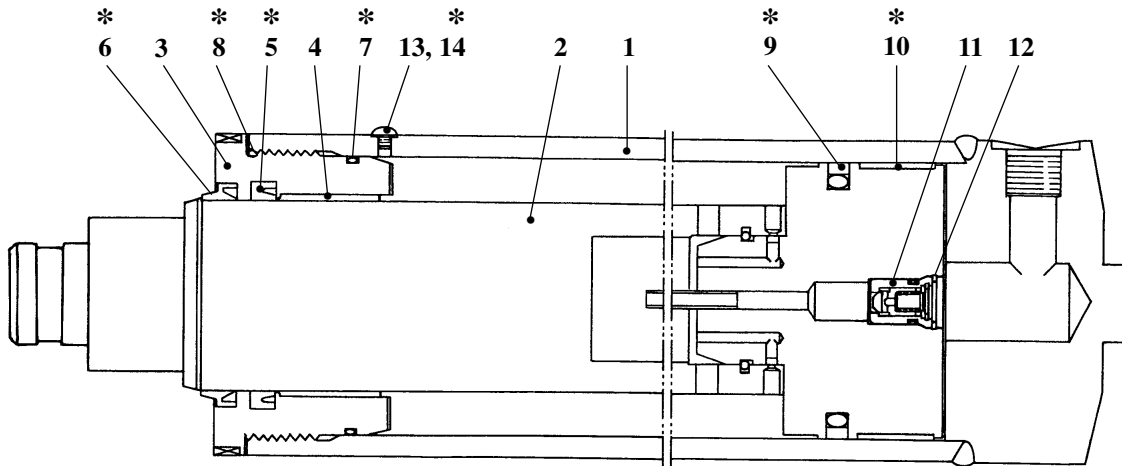
Simplex Mast



- | | | |
|-----------------|--------------------|------------------|
| 1 Cylinder tube | 6 U-ring | 11 U-ring holder |
| 2 Piston rod | 7 Wiper ring | 12 Stopper |
| 3 Cylinder head | 8 O-ring | 13 Spacer |
| 4 Bushing | 9 Piston ring | |
| 5 Holder | 10 U-ring assembly | |

**Duplex Mast
First Lift Cylinder (H40A)**

**Triplex Mast
First Lift Cylinders (J40A thru J70A)**



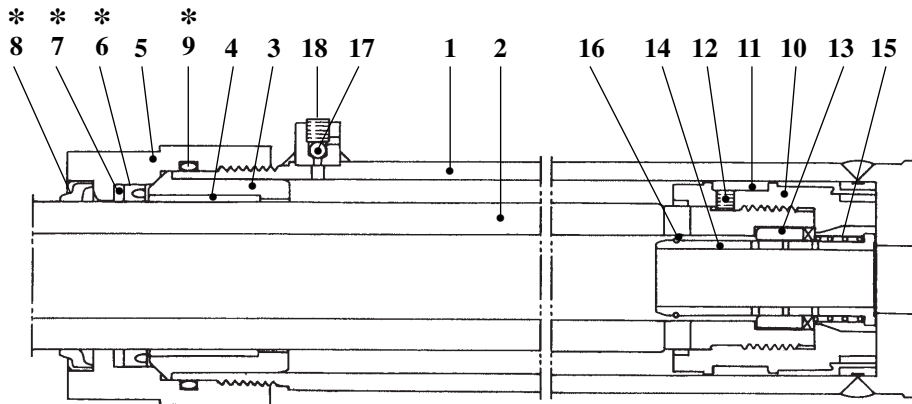
Parts marked with * are included in the seal kit.

206950

- | | | |
|-----------------|----------------------|----------------|
| 1 Cylinder tube | 6 Wiper ring | 11 Check valve |
| 2 Piston rod | 7 O-ring | 12 Snap ring |
| 3 Cylinder head | 8 O-ring | 13 Plug |
| 4 Bushing | 9 Seal ring assembly | 14 Gasket |
| 5 U-ring | 10 Slide ring | |

HYDRAULIC SYSTEM

**Duplex Mast
Second Lift Cylinders (H40A)**

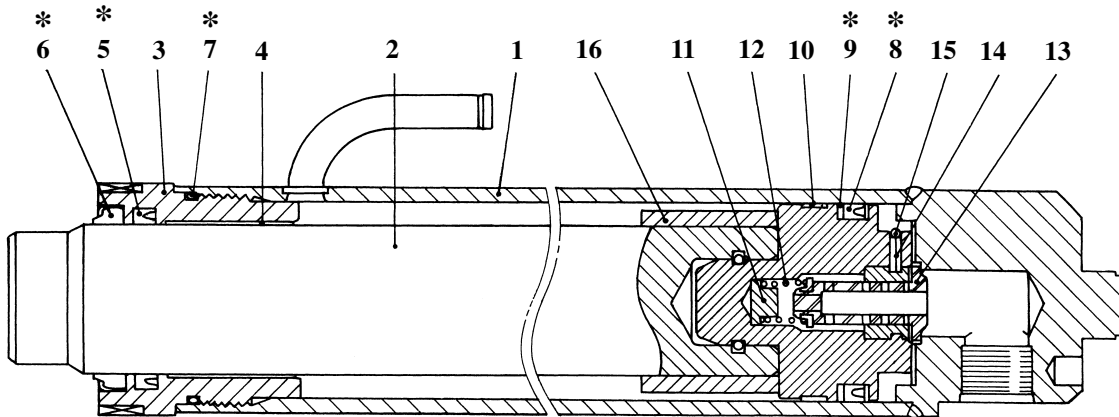


Parts marked with * are included in the seal kit.

206949

- | | | |
|-----------------|---------------|------------------|
| 1 Cylinder tube | 7 Backup ring | 13 Check valve |
| 2 Piston rod | 8 Wiper ring | 14 Cushion spool |
| 3 Cylinder head | 9 O-ring | 15 Spring |
| 4 Bushing | 10 Piston | 16 Snap ring |
| 5 Holder | 11 Slide ring | 17 Steel ball |
| 6 U-ring | 12 Set screw | 18 Set screw |

**Triplex Mast
Second Lift Cylinders (J40A)**

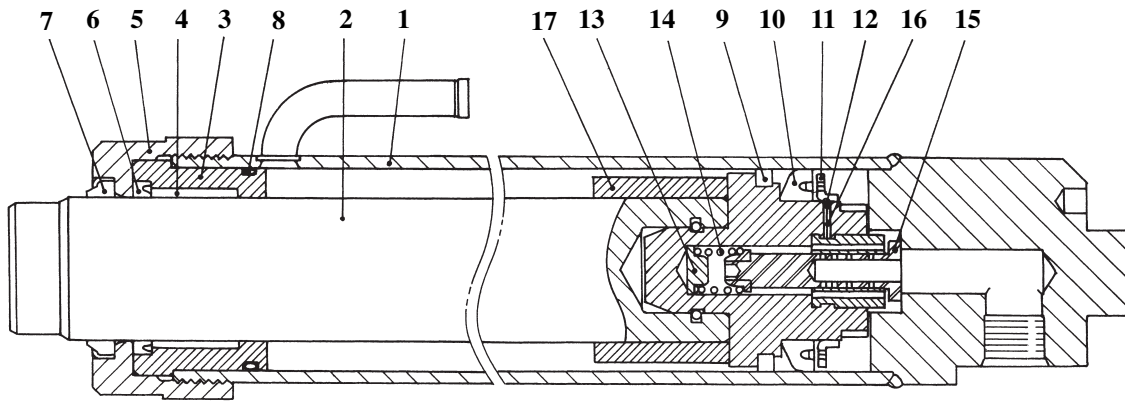


Parts marked with * are included in the seal kit.

207778A

- | | | |
|-----------------|-----------------|------------------|
| 1 Cylinder tube | 7 O-ring | 13 Cushion spool |
| 2 Piston rod | 8 U-ring | 14 Pin |
| 3 Cylinder head | 9 Backup ring | 15 Snap ring |
| 4 Bushing | 10 Bushing | 16 Spacer |
| 5 U-ring | 11 Spring guide | |
| 6 Wiper ring | 12 Spring | |

**Triplex Mast
Second Lift Cylinders (J45A, J55A)**

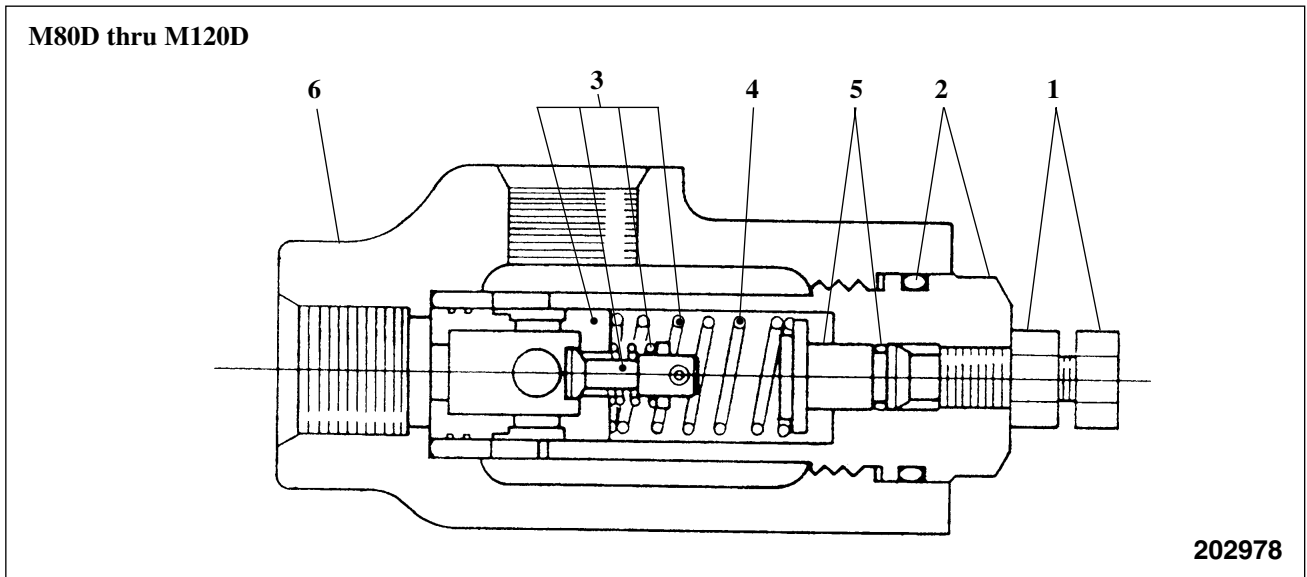


Parts marked with * are included in the seal kit.

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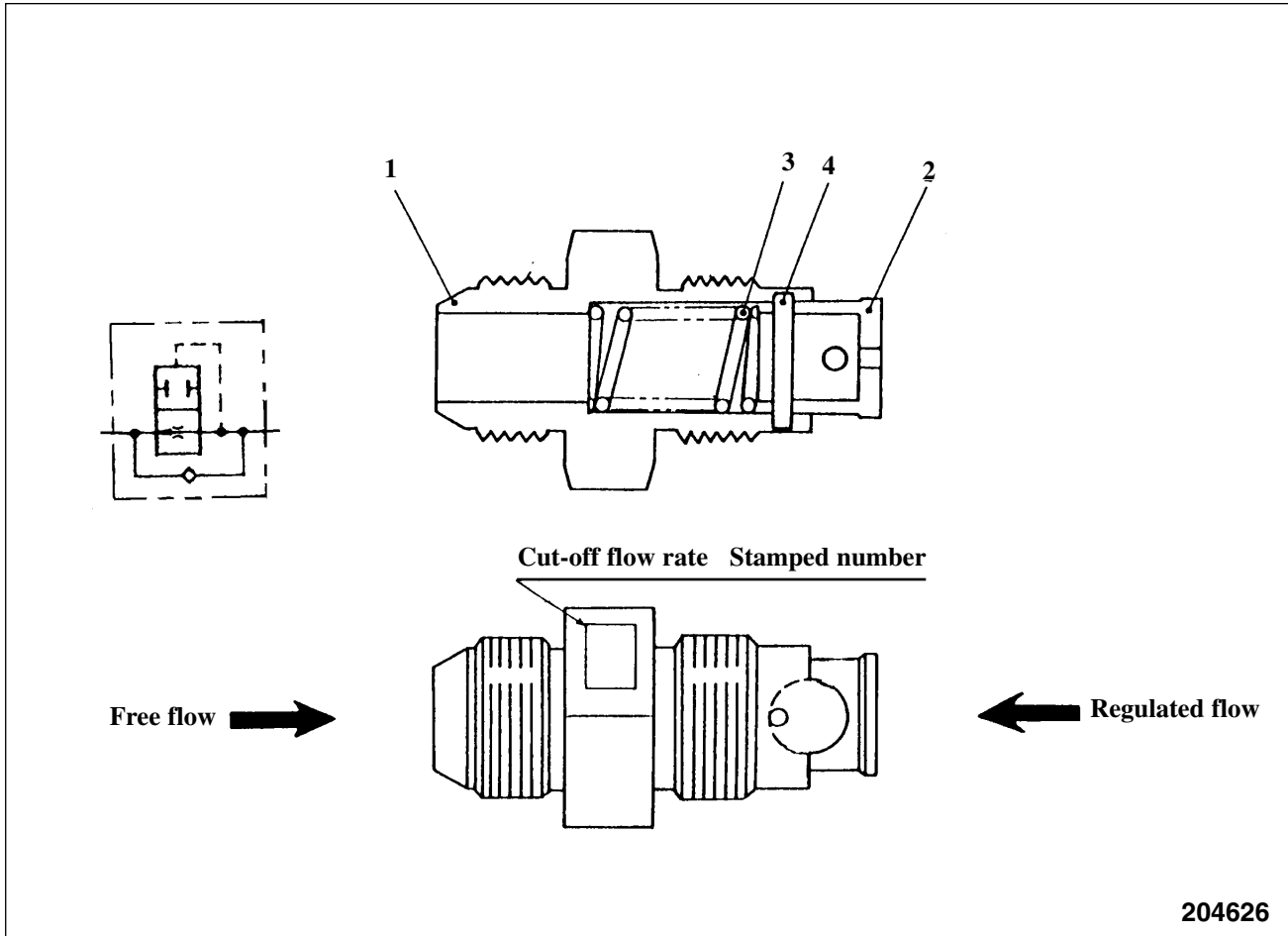
- | | | | | | |
|---|---------------|----|-----------------|----|--------------|
| 1 | Cylinder tube | 6 | U-ring | 11 | Holder |
| 2 | Piston rod | 7 | Wiper ring | 12 | Stopper |
| 3 | Cylinder head | 8 | O-ring | 13 | Spring guide |
| 4 | Bushing | 9 | Piston ring | 14 | Spring |
| 5 | Holder | 10 | U-ring assembly | 15 | Cushion rod |
| | | | | 16 | Spring pin |
| | | | | 17 | Spacer |

Flow Regulator Valve



- | | |
|--|------------------------|
| 1 Set bolt, Lock nut | 4 Spring |
| 2 Sleeve, O-ring | 5 Spring guide, O-ring |
| 3 Piston, Spring pin, Washer spring, Valve | 6 Valve body |

Down Safety Valve



- 1 Connector
- 2 Valve

- 3 Spring
- 4 Spring pin

The down safety valve is located at the bottom side of right-hand lift cylinder.

This valve provides a means of preventing the load from lowering, unsafely, rapidly, when a hose bursts.

Cut-off flow rate

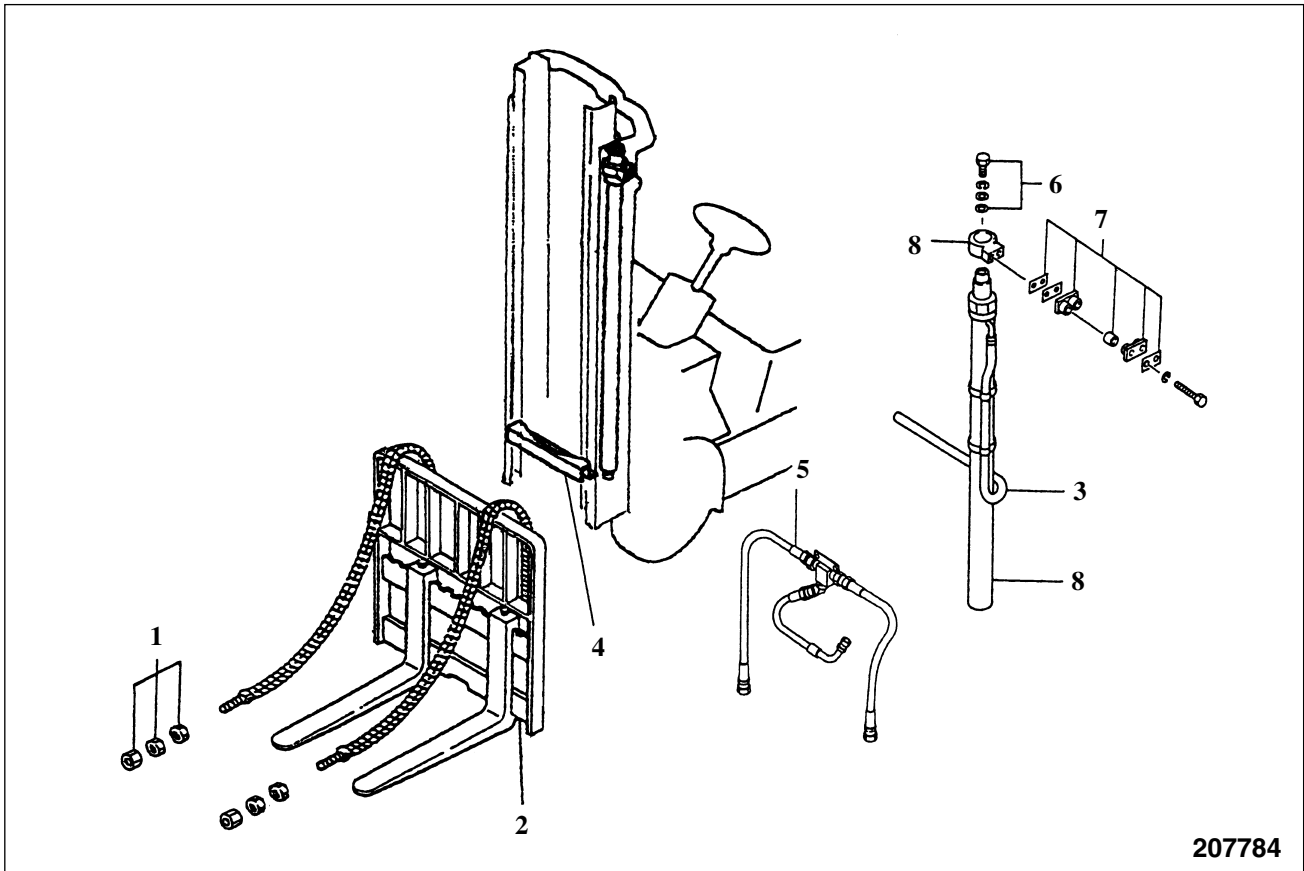
Mast model	Simplex	G40A	G45A, G55A
	Duplex	H40A	—
	Triplex	J40A	J45A, J55A
Cut-off flow rate liter (U.S.gal)/min		90 ⁰ ₋₁₅ (23.8 ⁰ ₋₄)	120 ⁺⁵ ₋₁₀ (31.7 ^{+1.3} _{-2.6})

⚠ WARNING

Do not reuse down safety valve after a lift line hose failure.

Lift Cylinders

Dual-stage Panoramic Mast (Simplex Mast)



207784

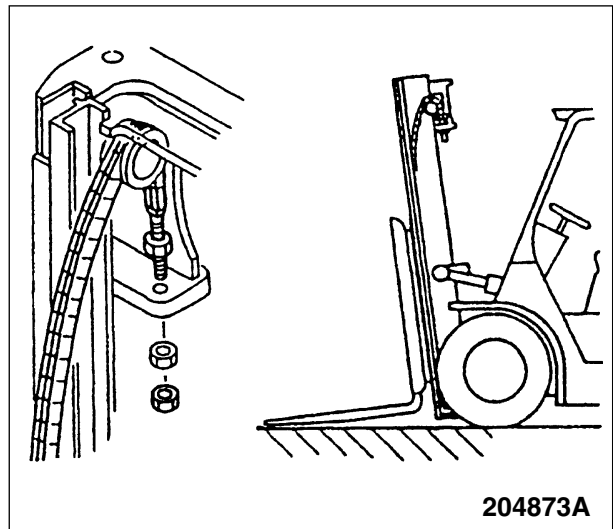
Sequence

- | | | |
|------------------------------|----------------------|----------------------------|
| 1 Nuts | 4 Hose guard | 7 Cylinder clamp, Cushion, |
| 2 Fork, Lift bracket | 5 High-pressure hose | Collar, Shims |
| 3 Return (low-pressure) hose | 6 Set bolt, Shims | 8 Lift cylinder, Bracket |

Suggestions

1. Lift bracket removal

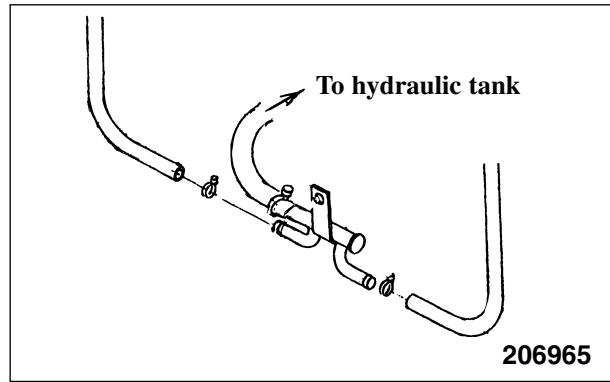
- (1) Tilt the mast forward, and lower the inner mast to the bottom. Slacken the lift chains, and remove the nuts from the anchor bolts.
- (2) Tilt the mast back to vertical position. Raise the inner mast until the lift bracket becomes free. Then, back the truck away from the lift bracket and fork assembly.



204873A

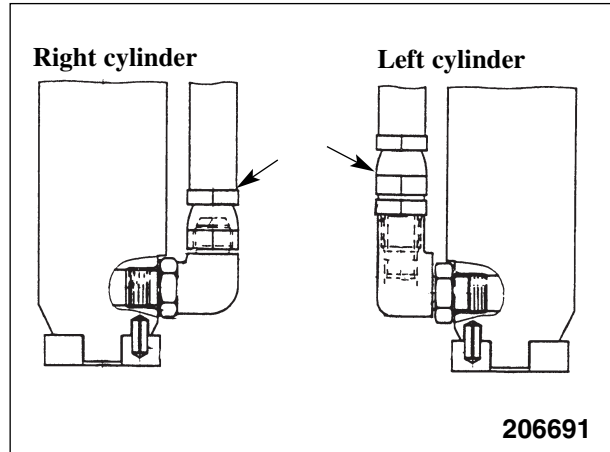
2. Removing return hose

Lift the mast to the maximum lift position, and turn the key switch off. Disconnect the return hose from the right and left lift cylinders at the connectors.



3. Disconnecting high-pressure hoses

Slowly push the lift lever forward to lower the lift bracket to the ground. Disconnect the high-pressure hoses at the joints indicated by arrows. Use a container to catch oil flowing out of the hoses.

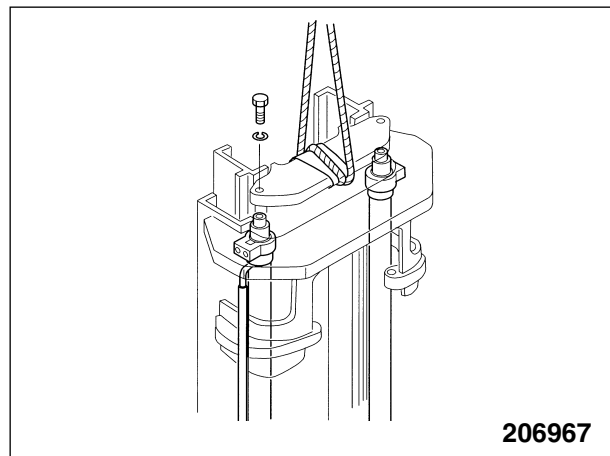


4. Removing set bolts

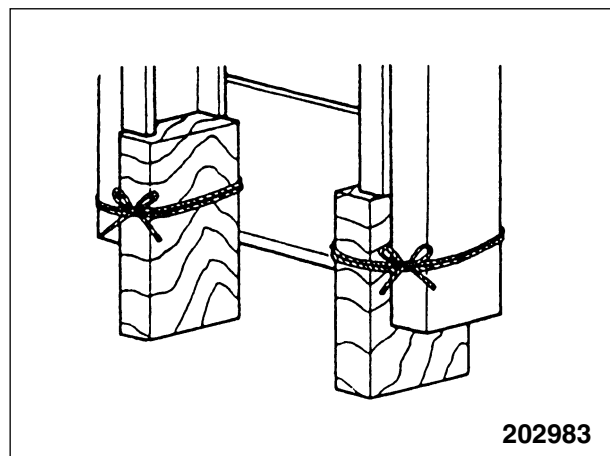
- (1) Remove the set bolt at the top of each lift cylinder. Lift the inner mast to separate the cylinder rod ends. To lift the inner mast, hitch a sling around the mast with protective rag.

NOTE

The rod end of either lift cylinder is shim adjusted to eliminate the difference in stroke between the cylinders. Before removing the set bolts, make a record of the amount of shims and cylinders to which the shims are fitted.



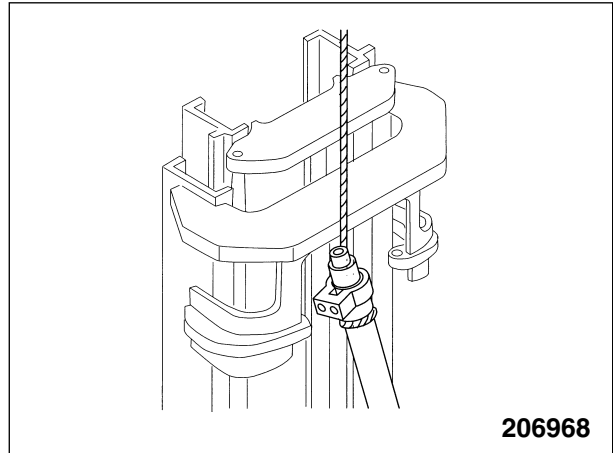
- (2) Tie wood blocks under the inner mast and detach the sling. Make sure the right and left wood blocks are the same in height.



HYDRAULIC SYSTEM

5. Removing lift cylinders

Hitch a sling to the lift cylinder from the rear side of the mast, and remove the cylinder. Hitch the sling before removing the cylinder clamp.



Installation

To install, follow the reverse of removal sequence, and do the following steps once completed:

1. Extend and retract the lift cylinders several times under no load condition to bleed air out of the cylinder circuits and to make sure that the cylinders move smoothly.
2. Check the oil level in the hydraulic tank with an oil level gauge. (Make reference to Hydraulic Tank section.)
3. Check to make sure that the lift height is correct.
4. After the lift cylinders or piston rods have been replaced, check for difference in stroke between the two cylinders. (Make reference to Group 11 MAST AND FORKS.)

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