

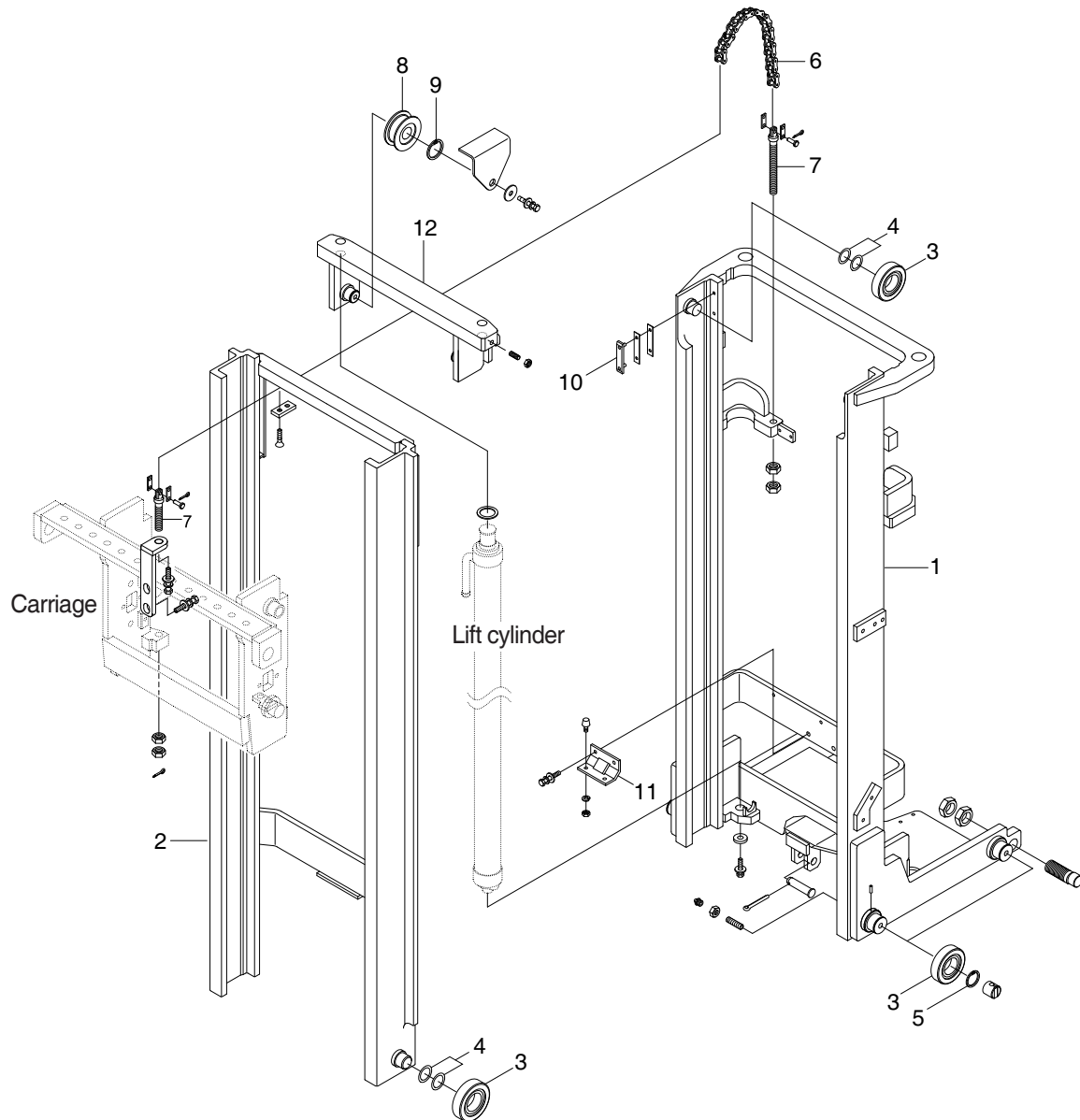
SECTION 8 MAST

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GROUP 1 STRUCTURE

1.2 STAGE MAST (V MAST)

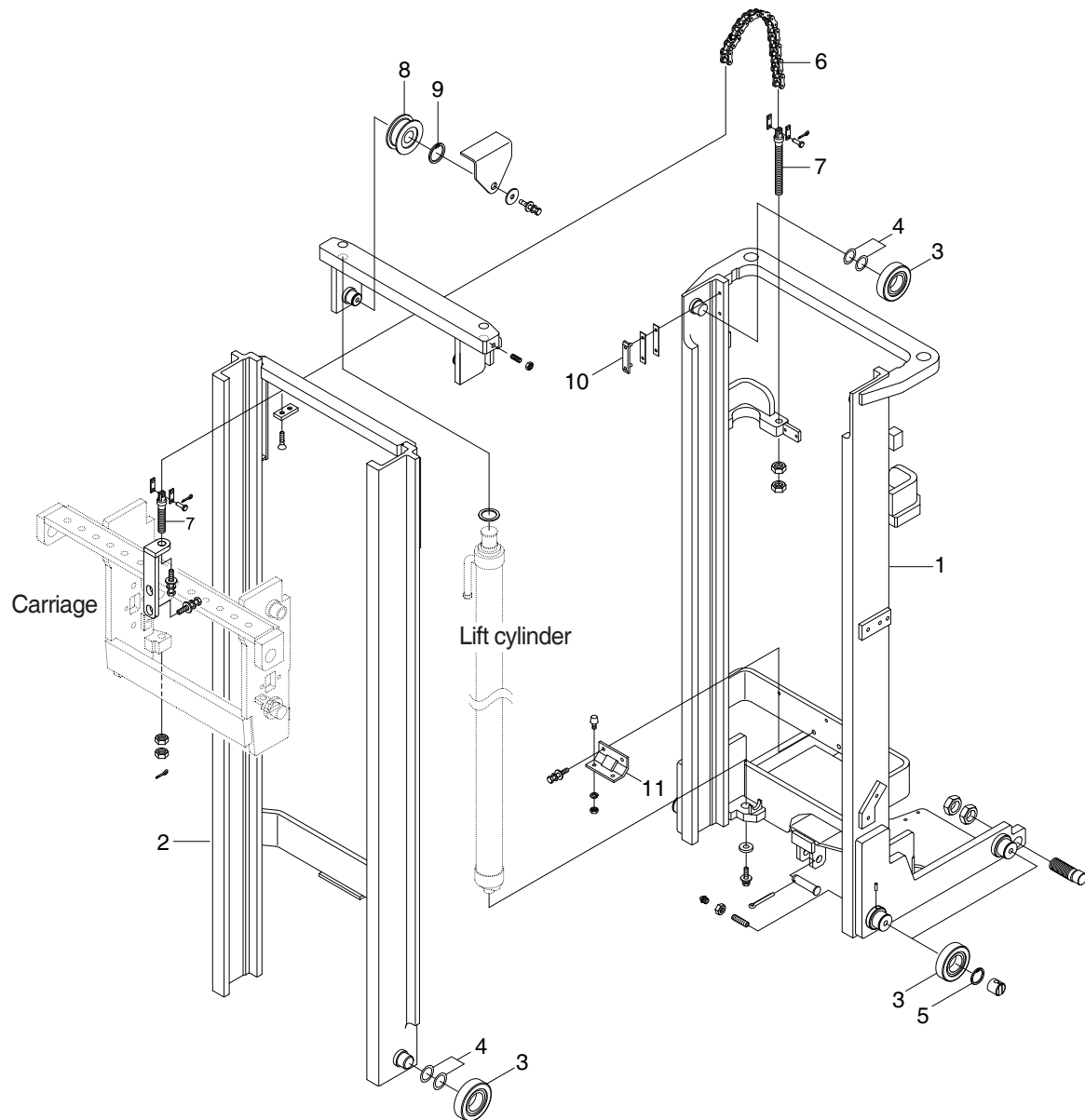
1) 15/18BR-X



15BRXMS01

- | | | | | | |
|---|------------------|---|----------------|----|----------------|
| 1 | Outer mast | 5 | Retaining ring | 9 | Retaining ring |
| 2 | Inner mast | 6 | Lift Chain | 10 | Backup liner |
| 3 | Roller | 7 | Anchor bolt | 11 | Stopper |
| 4 | Shim (0.5, 1.0t) | 8 | Chain sheave | 12 | Pre-lift bar |

2) 20/25BR-X

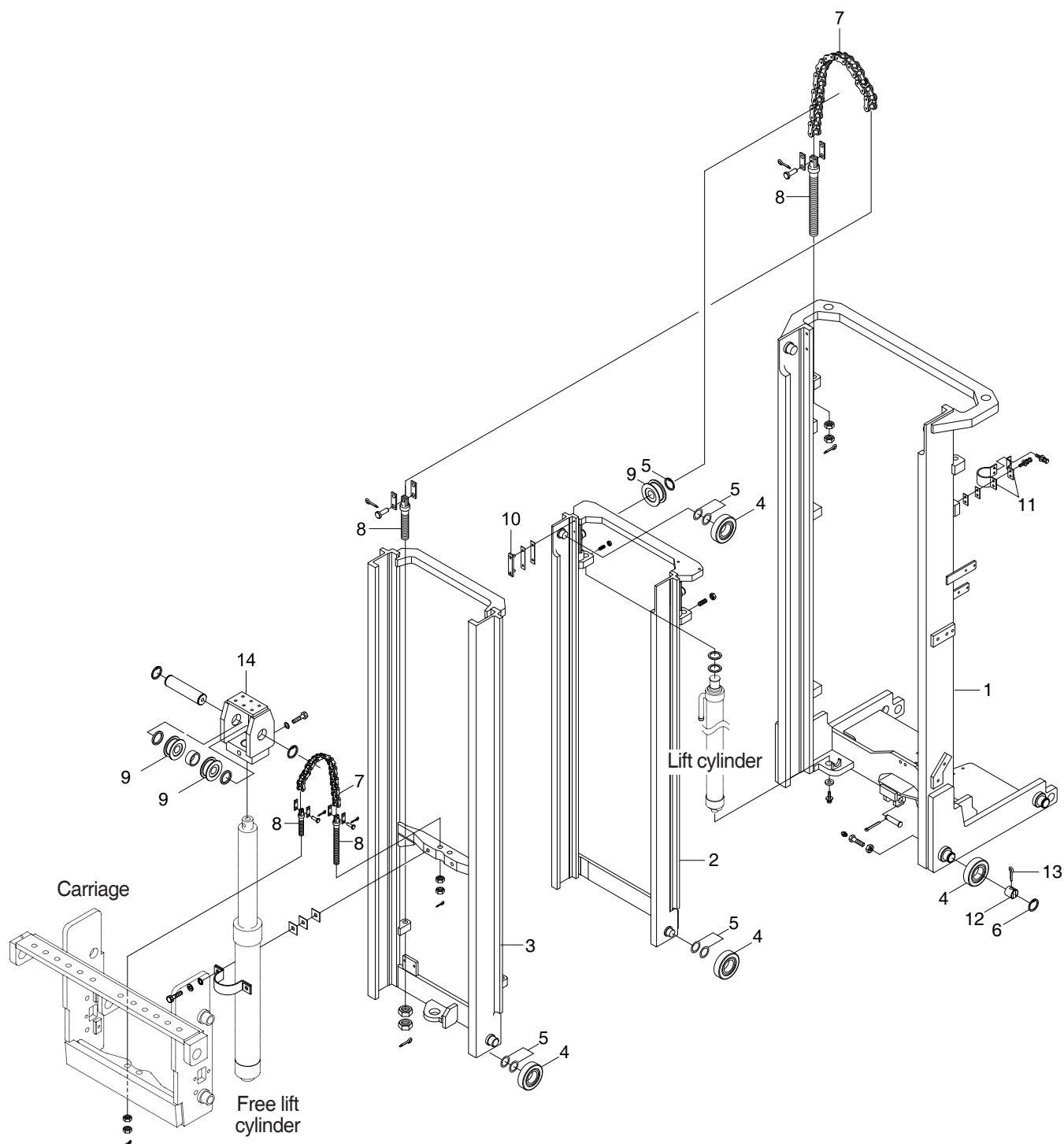


15BRXMS02

- | | | | | | |
|---|------------------|---|----------------|----|----------------|
| 1 | Outer mast | 5 | Retaining ring | 9 | Retaining ring |
| 2 | Inner mast | 6 | Lift Chain | 10 | Backup liner |
| 3 | Roller | 7 | Anchor bolt | 11 | Stopper |
| 4 | Shim (0.5, 1.0t) | 8 | Chain sheave | | |

2.3 STAGE MAST (TF MAST)

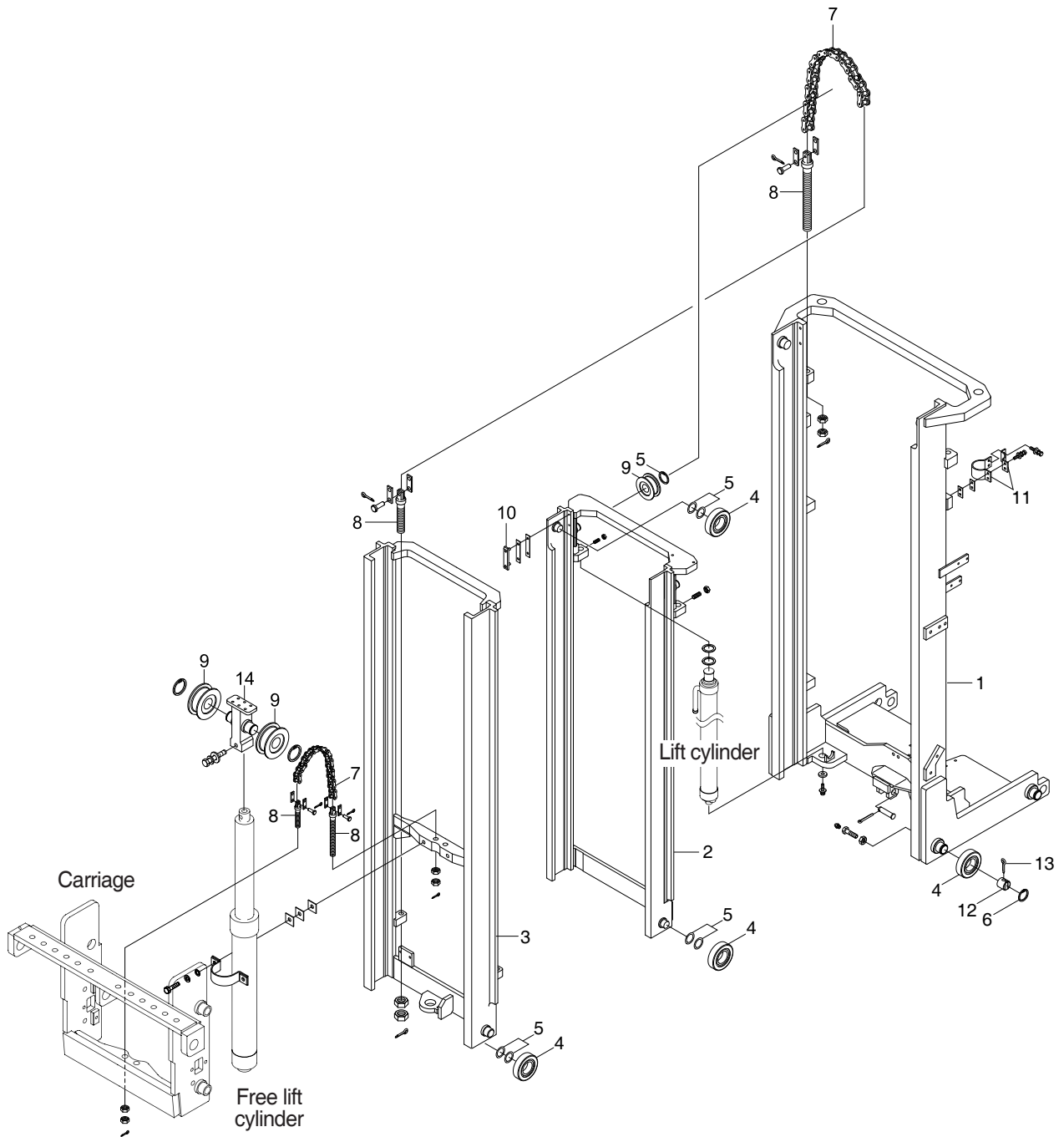
1) 15/18BR-X



15BRXMS03

- | | | | | | |
|---|------------------|----|----------------|----|---------------------|
| 1 | Outer mast | 6 | Retaining ring | 11 | Cylinder clamp |
| 2 | Middle mast | 7 | Lift Chain | 12 | Side roller bearing |
| 3 | Inner mast | 8 | Anchor bolt | 13 | Dowel pin |
| 4 | Roller | 9 | Chain sheave | 14 | Sieve bracket |
| 5 | Shim (0.5, 1.0t) | 10 | Backup liner | | |

2) 20/25BR-X

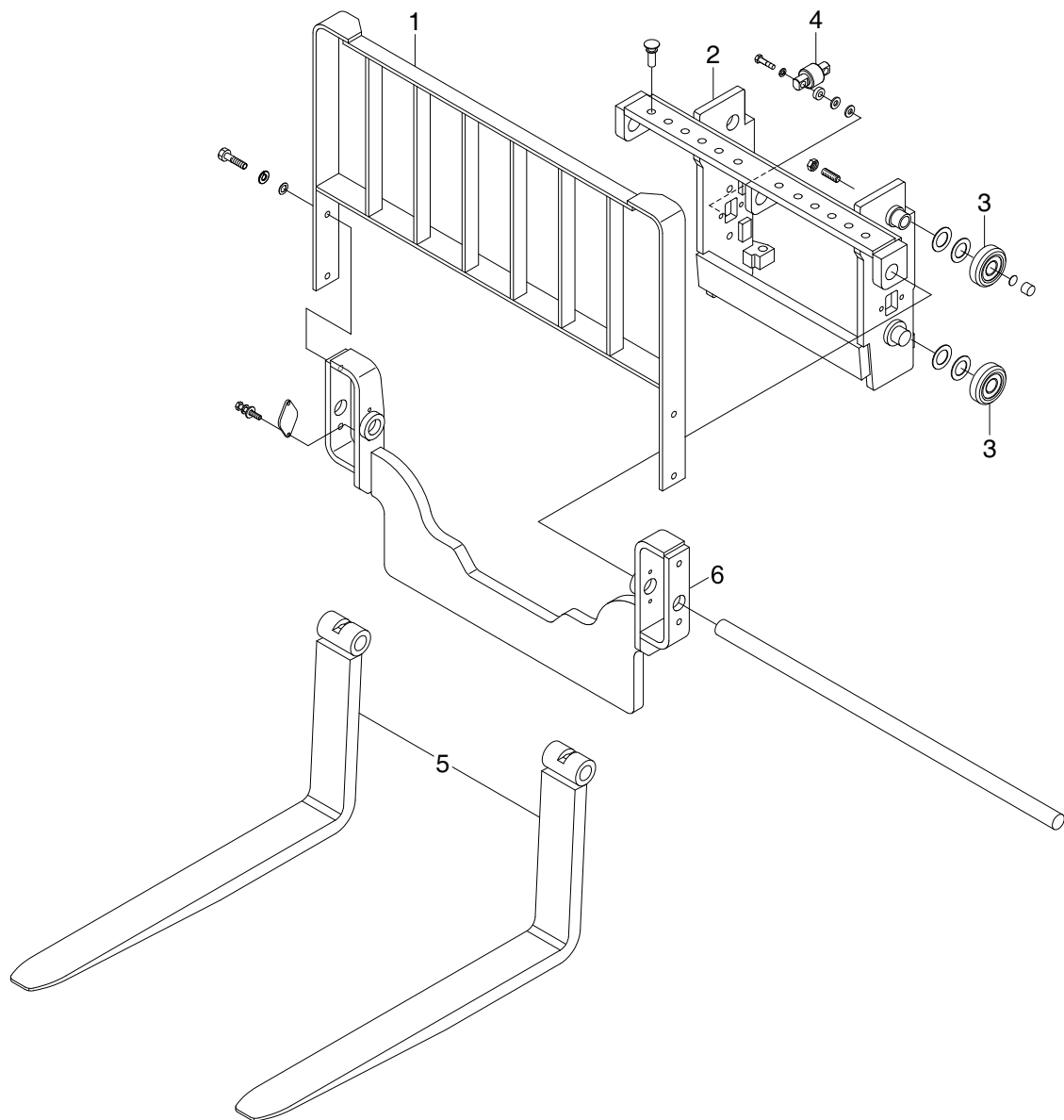


15BRXMS04

- | | | | | | |
|---|------------------|----|----------------|----|---------------------|
| 1 | Outer mast | 6 | Retaining ring | 11 | Cylinder clamp |
| 2 | Middle mast | 7 | Lift Chain | 12 | Side roller bearing |
| 3 | Inner mast | 8 | Anchor bolt | 13 | Dowel pin |
| 4 | Roller | 9 | Chain sheave | 14 | Sieve bracket |
| 5 | Shim (0.5, 1.0t) | 10 | Backup liner | | |

3. CARRIAGE, BACKREST AND FORK

1) 15/18BR-X (Shaft Type)

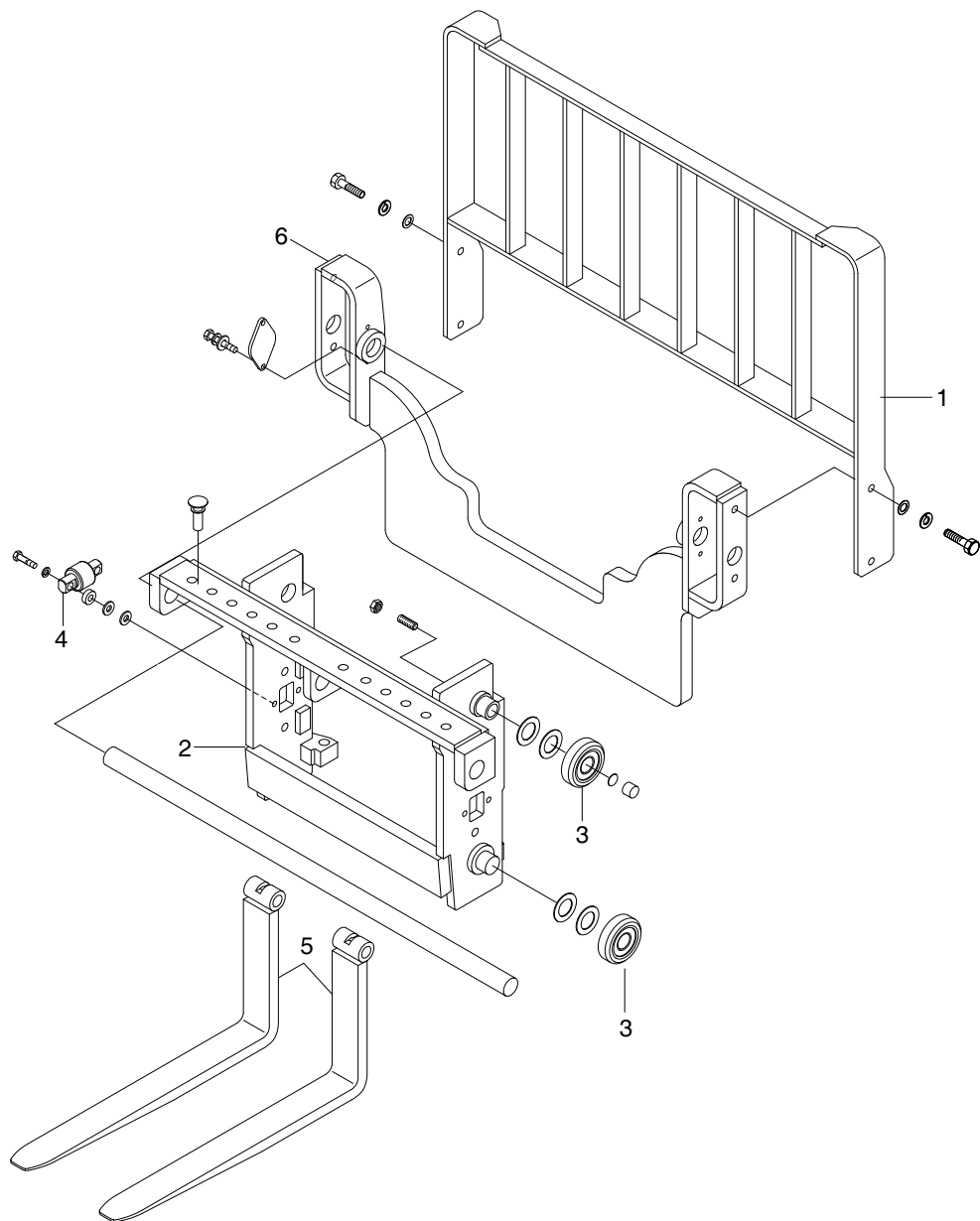


15BRXMS05

- 1 Backrest
- 2 Carriage
- 3 Load roller

- 4 Sider roller
- 5 Fork assembly
- 6 Finger bar

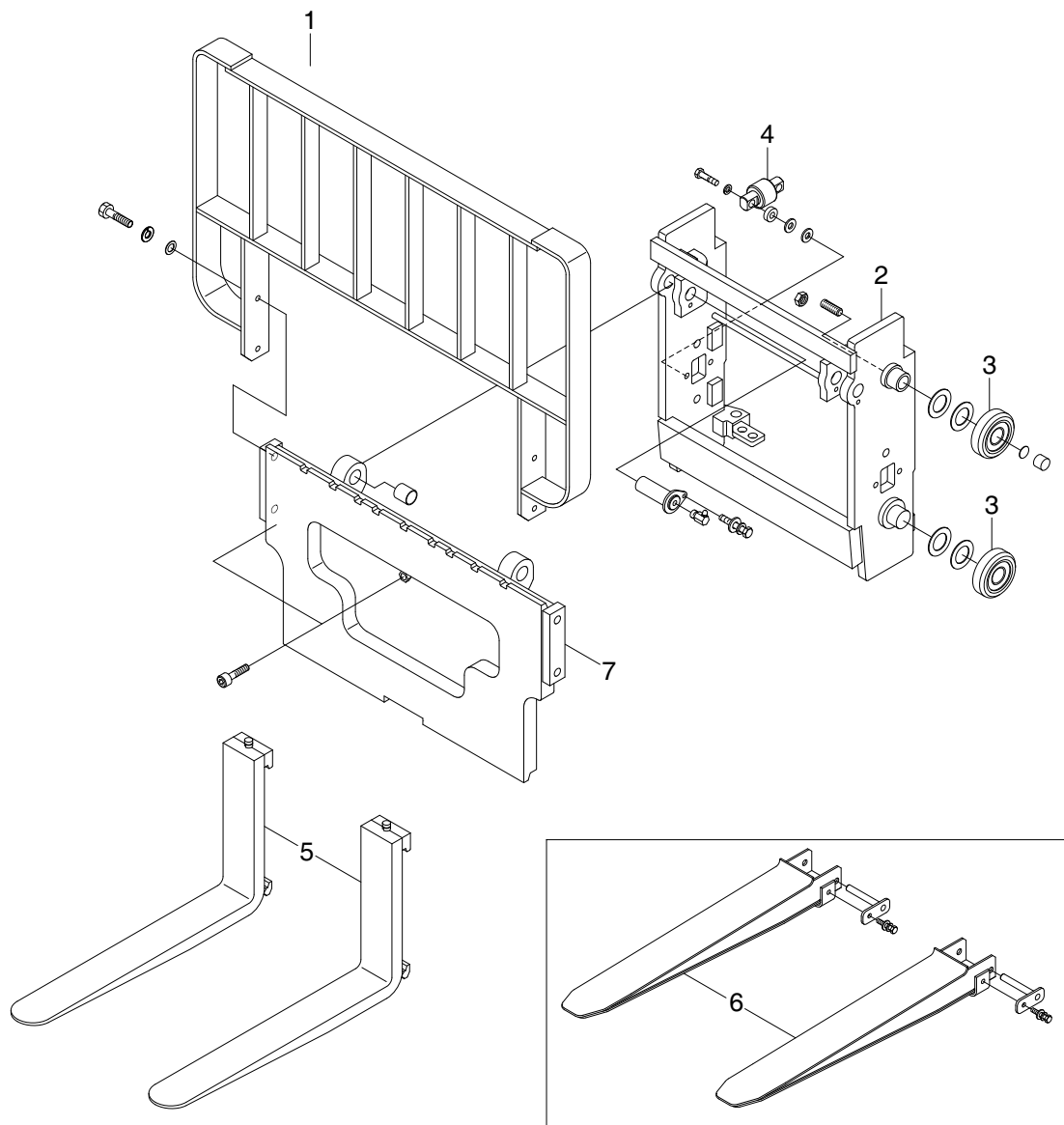
2) 20/25BR-X (SHAFT TYPE)



15BRXMS06

- | | | | |
|---|-------------|---|---------------|
| 1 | Backrest | 4 | Sider roller |
| 2 | Carriage | 5 | Fork assembly |
| 3 | Load roller | 6 | Finger bar |

3) 15/18BR-X (HOOK TYPE)

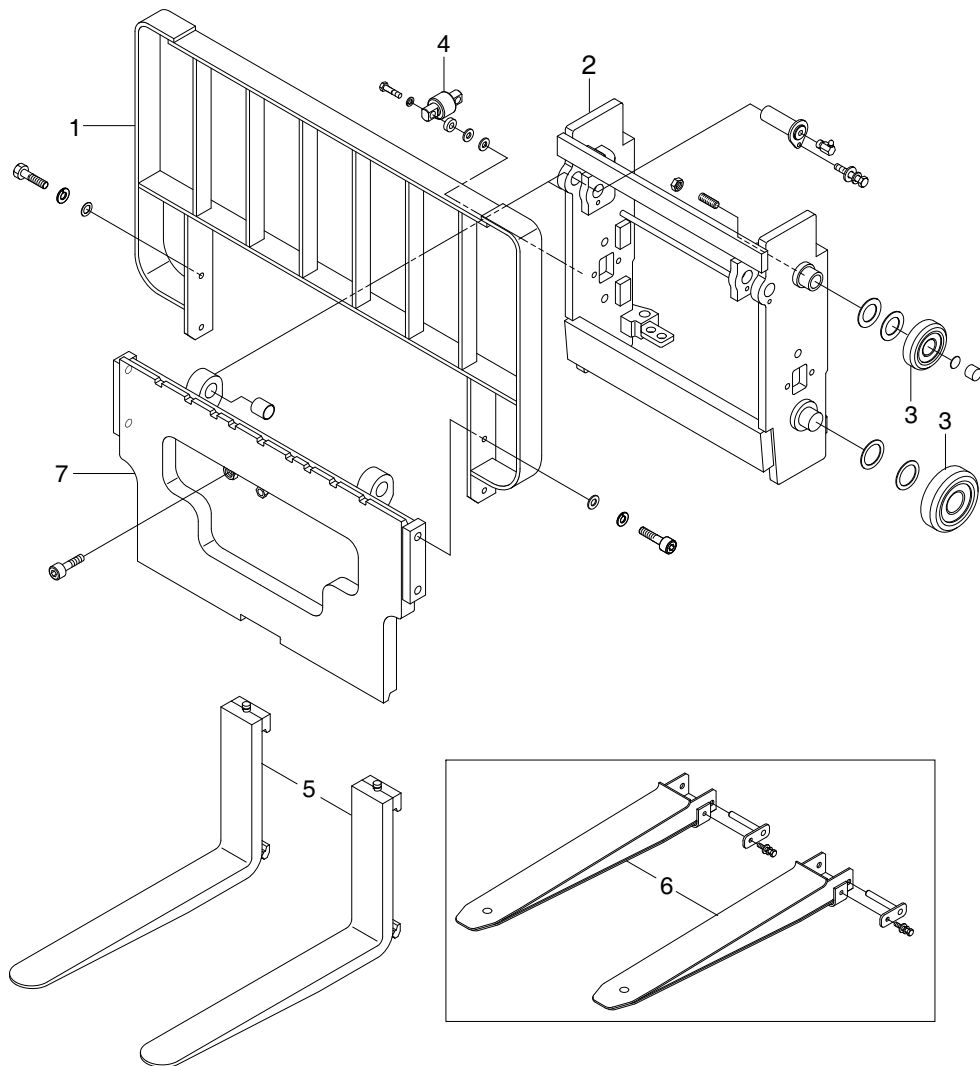


15BRXMS07

- 1 Backrest
- 2 Carriage
- 3 Load roller
- 4 Sider roller

- 5 Fork assembly
- 6 Extension fork
- 7 Finger bar

4) 20/25BR-X (HOOK TYPE)



15BRXMS08

- 1 Backrest
- 2 Carriage
- 3 Load roller
- 4 Sider roller

- 5 Fork assembly
- 6 Extension fork
- 7 Finger bar

GROUP 2 OPERATION INSPECTION, FAILURE DIAGNOSIS AND TROUBLESHOOTING

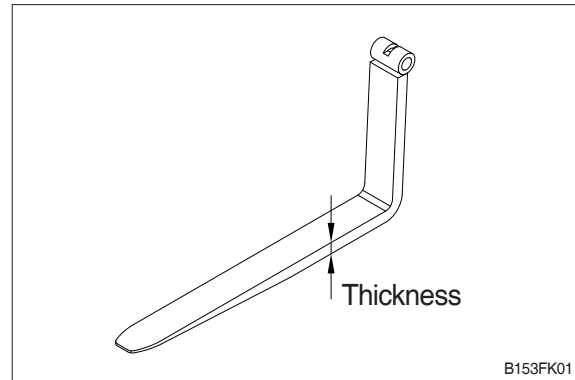
1. OPERATION INSPECTION

1) FORKS

- (1) Measure the thickness of the fork starting point to check whether the measurement value deviates from the reference value.

mm

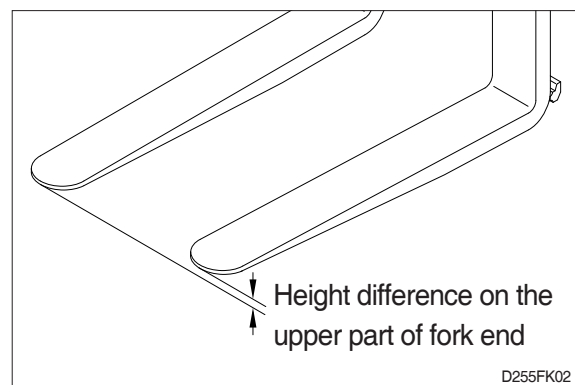
STD Fork	Applicable model	Standard	Limit
64FY-11030	15/18BR-X	35	32
64HN-11030	20/25BR-X	45	40



- (2) Set forks in middle and measure the height difference from the top from the upper part of the fork end.

mm

Model	Fork length	Height difference
15/18/20/25BR-X	Equal or below 1500	3
	Above 1500	4



- (3) Most of the force is focused on the fork starting part and on the hook, so crack inspection method is used when checking the crack.

2. MAST

- 1) Check for cracks at mast stay, tilt cylinder bracket, guide bar, fork carriage and roller shaft weld. Use visual inspection or crack inspection method and cracks must be repaired.
- 2) Set mast vertical, raise forks about 10 cm from ground and check front/rear clearance and left/right clearance between the inner mast and fork carriage, and between the outer mast and inner mast. Use the following value to check the clearance between the roller and the rail.
 - Front/Rear Clearance : Within 2.0 mm
 - Left/Right Clearance : Within 2.5 mm
- 3) Check that there is an oil groove in bushing at mast support.
- 4) Lift the fork 10 cm from the ground to enable the mast to be vertical, and push the middle of the lift chain with the finger to check the difference in tension. Adjust the chain stopper bolt when there is difference in tension.
- 5) Perform visual inspection for any abnormal screw thread on the chain anchor bolt, and check the condition of the chain wheel and chain contact surface. Turn the chain wheel manually with the hand to check the clearance of the bearing.

2. FAILURE DIAGNOSIS AND TROUBLESHOOTING

1) MAST

Nature of Trouble	Cause	Remedy
Forks fail to lower.	· Deformed mast or carriage.	· Disassemble, repair or replace
Forks fail to elevate.	· Faulty hydraulic system. · Mast deformation	· Refer to Section 6 Hydraulic System Also, refer to Section 6 Failure Diagnosis of the Cylinder on the Hydraulic Equipment · Disassemble the mast for partial replacement of the problem or replace the overall mast
Lift speed is slow and lacks processing capacity	· Faulty hydraulic system. · Mast deformation	· Refer to Section 6 Hydraulic System Also, refer to Section 6 Failure Diagnosis of the Cylinder on the Hydraulic Equipment · Disassemble the mast for partial replacement of the problem or replace the overall mast Partial replacement of the problem or replace the overall mast
Mast not moving upwards smoothly	· Deformed mast or carriage. · Faulty hydraulic system. · Damaged load roller and side rollers · Different tension on the left/right chain · Different tilt angle on the left/right mast (Mast is twisted when tilted)	· Disassemble, repair or replace · Refer to Section 6 Hydraulic System Cylinder, Pump and Control Valve SECTION 6 HYDRAULIC SYSTEM · Replace · Adjust chains · Adjust tilt cylinder rods
Noise occurred when the mast is operating upwards/downwards	· Broken load roller bearings · Broken sider roller bearings · Deformed masts · Bent lift cylinder rod · Deformed carriage · Broken sieve bearing	· Replace · Replace · Disassemble, repair or replace · Replace · Replace · Replace
Noise occurred on tilting	· Insufficient lubrication on the anchor pin bushing or pin abrasion · Bent tilt cylinder rod	· Fill or replace lubricant · Replace

2) FORK

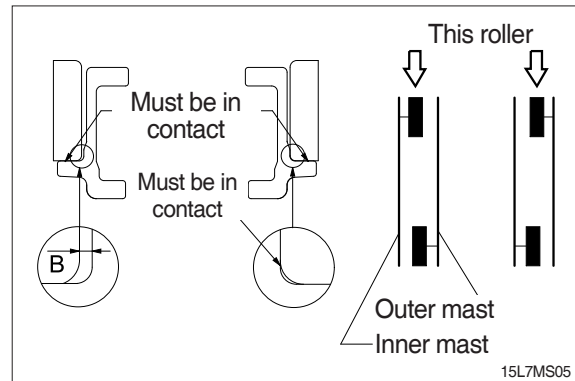
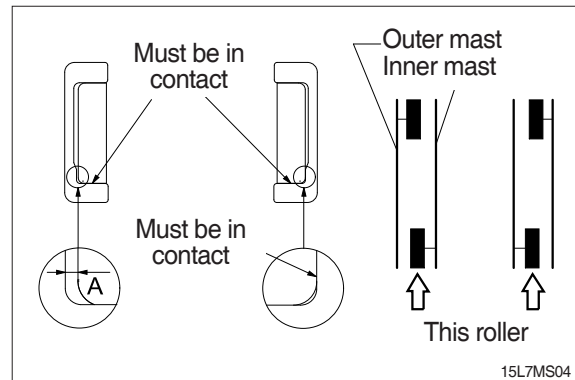
Out of Service	Cause	Remedy						
Abrasion	Fork is worn out to be reduced in thickness from long work Thickness must be checked · Wear limit : Must be 90% or more of the fork thickness	Replace fork when worn out more than the abrasion limit						
Distortion	The shape of the fork is bent from various reasons such as when hitting the wall or the object suddenly, and when lifting the cargo unevenly. · Difference in fork end height <table border="1"><tr><th>Fork length (mm)</th><th>Height difference (mm)</th></tr><tr><td>Equal or below 1500</td><td>3</td></tr><tr><td>Above 1500</td><td>4</td></tr></table>	Fork length (mm)	Height difference (mm)	Equal or below 1500	3	Above 1500	4	If the measured value exceeds the allowance, replace fork.
Fork length (mm)	Height difference (mm)							
Equal or below 1500	3							
Above 1500	4							
Fatigue	Fatigue failure may occur from fatigue crack even when loaded under the defined strength of the fork. Therefore, daily inspection is required. · Crack on the fork heel · Crack on the fork weldments	Repair by the expert Replace fork when twisted severely						

GROUP 3 ADJUSTMENT

1. MAST LOAD ROLLER (V Mast)

1) INNER/OUTER MAST ROLLER CLEARANCE ADJUSTMENT

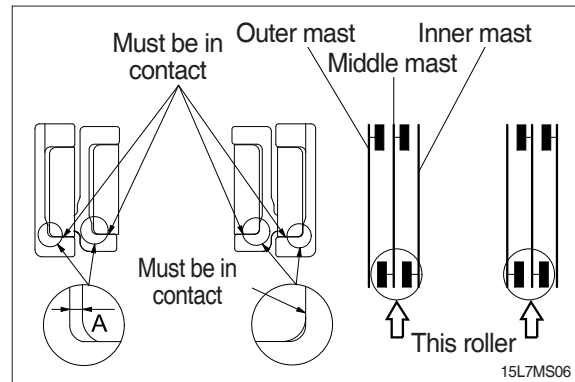
- (1) Measure the clearance with the mast overlap at near 480 mm.
- (2) Move the inner mast to one side to enable the roller to be in contact with the outer mast, and insert the inner/outer mast roller in the nearest point on the side facing each other on the roller side and mast to adjust the clearance to be in the following value.
 - Standard clearance A, B = 0.3~0.6 mm
 - Shim thickness 0.5, 1.0 mm
- (3) Allocate to have equal thickness on the shim of the left/right roller. Refer to mast load roller and back up liner removal and installation.
- (4) After adjustment, check whether the inner mast moves smoothly inside the outer mast.



2. MAST ROD ROLLER (TF MAST)

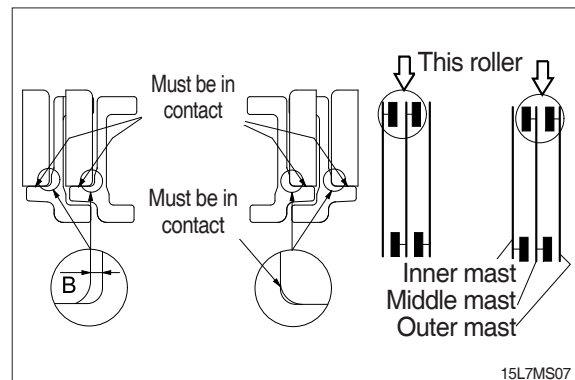
1) INNER AND MIDDLE MAST ROLLER CLEARANCE ADJUSTMENT

- (1) Measure the clearance with the mast overlap at near 480 mm.
- (2) Move the inner mast to one side to enable the roller to be in contact with the outer and middle mast, and insert the inner and middle mast roller shim each in the nearest point on the side facing each other on the roller side and mast to adjust the clearance to be in the following value.
 - Standard clearance A, B = 0.3~0.6 mm
 - Shim thickness 0.5, 1.0 mm
- (3) Allocate to have equal thickness on the shim of the left/right roller. Refer to mast load roller and back up liner removal and installation.
- (4) After adjustment, check whether the inner mast moves smoothly inside the middle mast. Also, check whether the middle mast moves smoothly inside the outer mast.



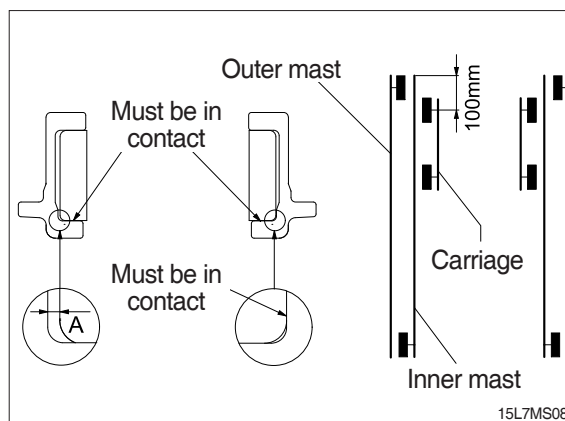
2) OUTER AND MIDDLE MAST TOP ROLLER CLEARANCE ADJUSTMENT

- (1) Measure the clearance with the mast overlap at near 480 mm.
- (2) Move the middle mast to one side to enable the roller to be in contact with the middle and inner mast, and insert the outer and middle mast roller shim each in the nearest point on the side facing each other on the roller side and mast to adjust the clearance to be in the following value.
 - Standard clearance A, B = 0.3~0.6 mm
 - Shim thickness 0.5, 1.0 mm
- (3) Allocate to have equal thickness on the shim of the left/right roller. Refer to mast load roller and back up liner removal and installation.
- (4) After adjustment, check whether the inner mast moves smoothly inside the middle mast. Also, check whether the middle mast moves smoothly inside the outer mast.



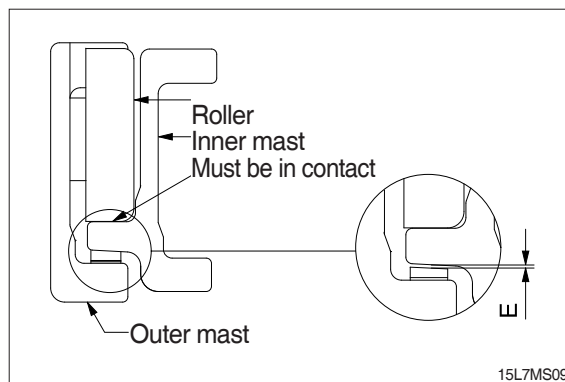
3) CARRIAGE LOAD ROLLER

- (1) Measure the clearance when the center of the carriage upper roller is 100 mm from the top of the inner mast.
- (2) Loosen the adjusting screw from the side roller to measure the clearance from the top and bottom roller. Move the inner mast to one side to enable the roller to be in contact with the inner mast, and insert the carriage roller shim in the nearest point on the side facing each other on the roller side and mast to adjust the clearance to be in the following value.
 - Standard clearance C = 0.3 ~ 0.6 mm
 - Shim thickness 0.5, 1.0 mm
- (3) Allocate to have equal thickness on the shim of the left/right roller. Refer to carriage assembly removal and installation.
- (4) After the adjustment, the carriage should move smoothly along the overall mast length.



4) MAST BACKUP LINER

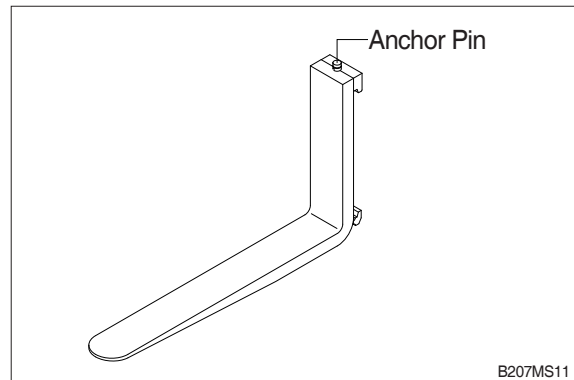
- (1) Position the inner mast towards the floor to measure the clearance.
- (2) Enable the inner mast to be in contact with the outer mast to insert the backup liner shim between the mast backup liner and the inner mast, and adjust the clearance to be in the following value.
 - Standard Clearance E = 0.5~1.0 mm
 - Shim Thickness 0.5, 1.0 mm
- (3) After the adjustment, the mast backup liner should move smoothly.



GROUP 4 REMOVAL AND INSTALLATION

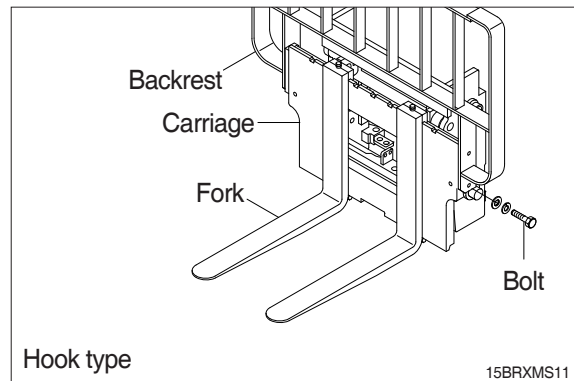
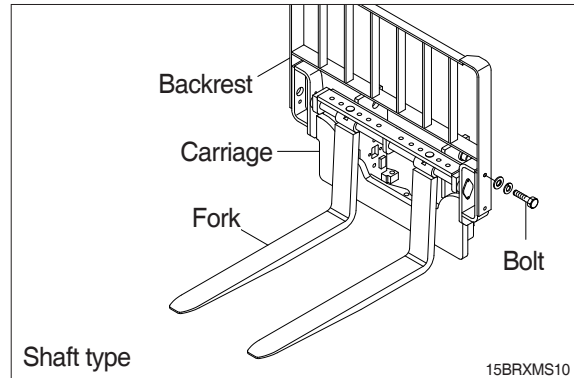
1. FORK

- 1) Lower the fork carriage until the forks are approximately 25mm from the floor.
- 2) Release the fork anchor pin and push one fork at a time toward the center of the carriage where a notch has been cut in the bottom plate for easy removal.
- 3) Remove carefully one by one. On larger fork, it may be necessary to use a wooden block.
- 4) Reverse the above procedure to reinstall.



2. BACKREST

- 1) Remove bolts mounting the backrest to fork carriage. Raise the backrest straight up to remove from the carriage.
- 2) Raise the backrest above the carriage to lower, and fasten the bolt for installation.



3. CARRIAGE ASSEMBLY

1) CARRIAGE

- (1) With the mast vertical, raise the carriage high enough to place blocks under the carriage. This is done to create slack in the load chains when the carriage is lowered. Lower the carriage all the way down to the floor. Make sure the carriage is level, this will prevent any binding when the mast is raised.
- (2) While supporting lift chains, remove the split pin and chain anchor pins from the chain anchor.
- (3) Remove the chain from the sieve to hang in front of the carrier.
- (4) Slowly raise upright until mast is located on the top of the fork carriage. Move carriage to work area and lower the mast.

▲ Make sure that carriage remains on floor and does not bind while mast is being raised.

- (5) Inspect all parts for wear or damage. Replace all worn or damaged parts. Replace all worn or damaged parts.
- (6) Reverse the above procedure to reinstall.

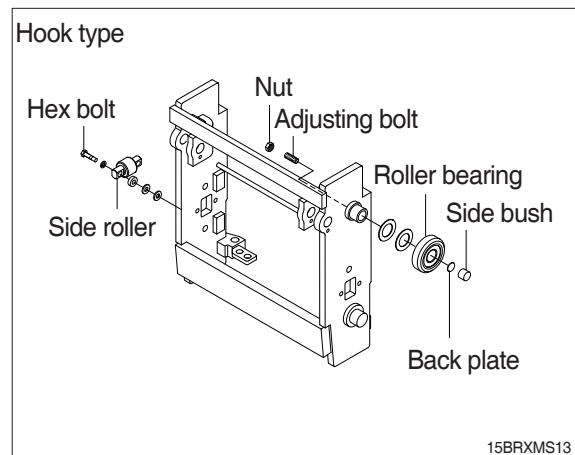
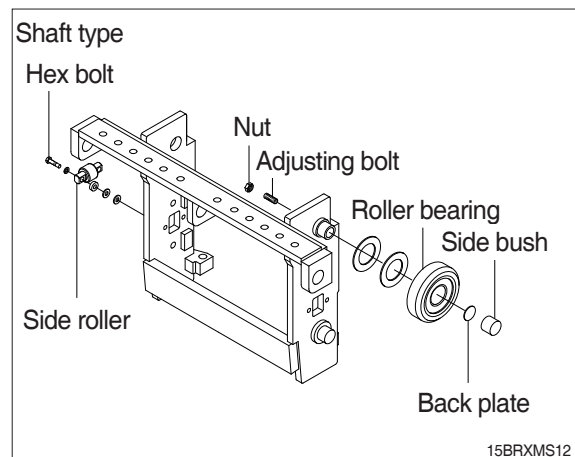
▲ Replace the split pin of chain anchor with new one

2) SIDE ROLLER

- (1) Remove the carriage as outlined in the carriage assembly removal procedure.
- (2) Loosen the hexagon bolt and side roller to remove from the carriage side plate.
- (3) Thoroughly clean, inspect and replace all worn or damaged parts.
- (4) Reverse the above procedure to reinstall.

※ Adjustment

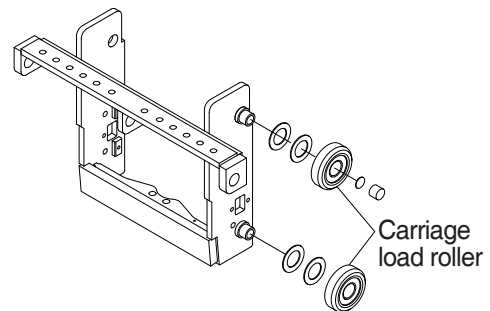
- When the carriage is installed appropriately, loosen the hexagon bolt if required to position the carriage on the middle of the inner mast.
- Fasten the hexagon bolt and adjust until the side roller is in contact with the mast.
- Fasten the adjusting bolt and adjust until the side bush is in contact with the mast.
- Move up and down to check whether the carriage is moving freely without being fixed. Also, check whether the chain is adjusted appropriately according to the chain adjustment method. Refer to the chain adjustment method. If required, adjust the carriage and re-inspect the operating state.



3) CARRIAGE LOAD ROLLER

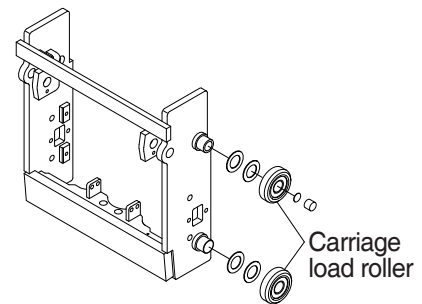
- (1) Remove the carriage as outlined in the carriage assembly removal procedure.
- (2) Remove the bolt and washer from the top load roller bracket.
- (3) Using a plier, remove load rollers from load roller bracket.
- (4) Reverse the above procedure to reinstall. Refer to the mast roller adjustment method.

Shaft type



15BRXMS14

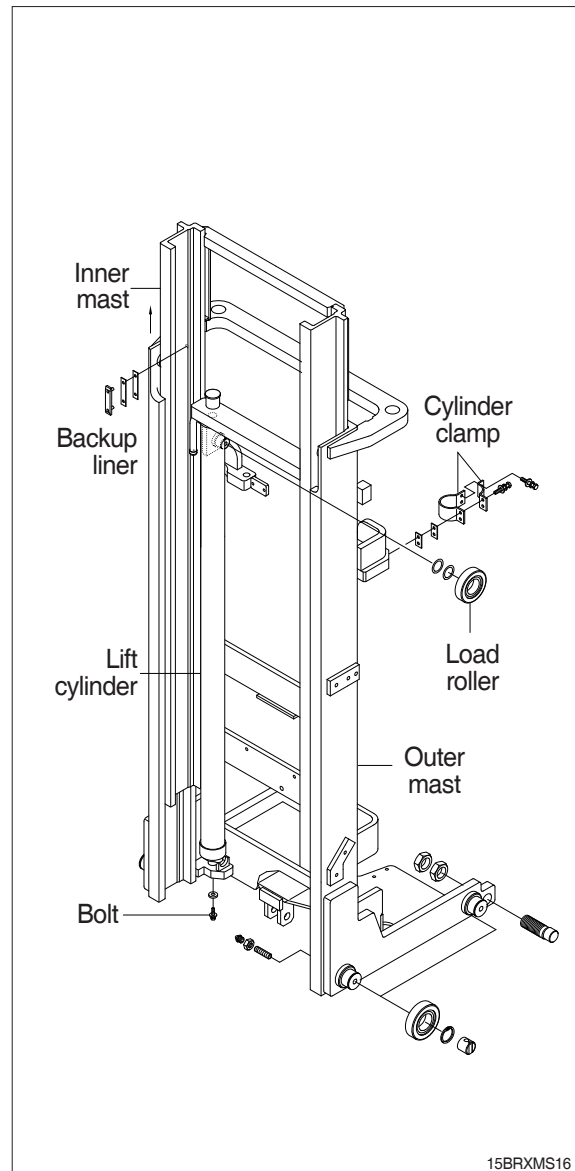
Hook type



15BRXMS15

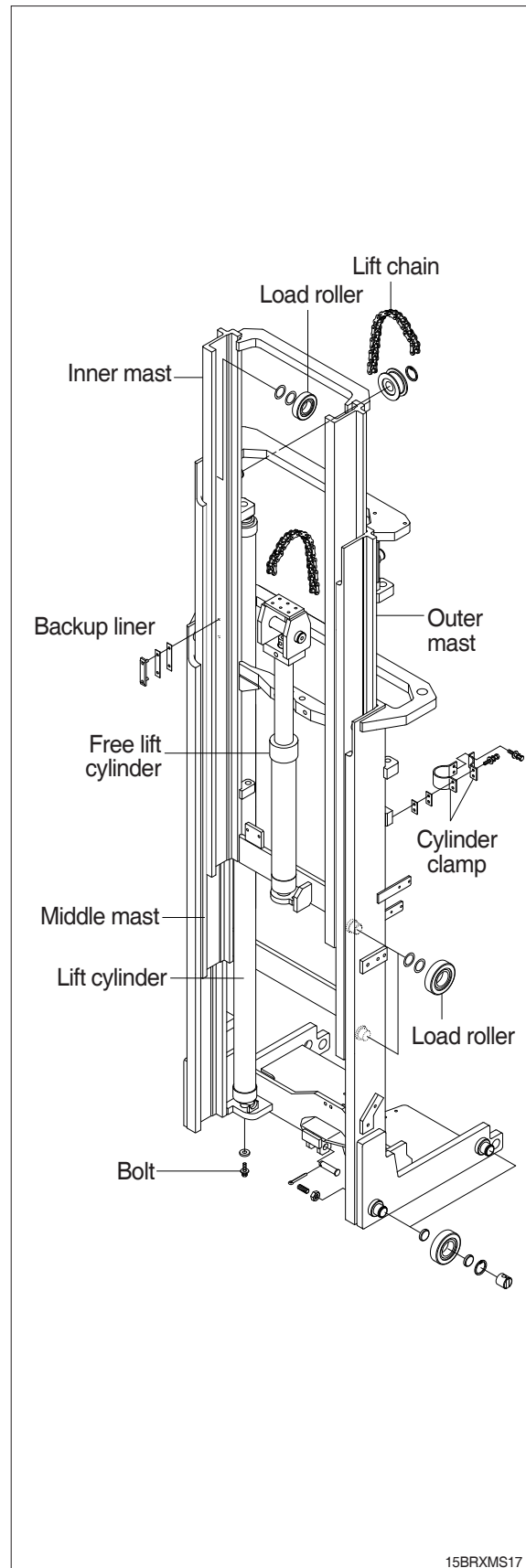
4) MAST LOAD ROLLER AND BACKUP LINER (1) 2 STAGE MAST (V MAST)

- ① Remove the carriage assembly and move it to one side.
- ② Loosen and remove hexagon bolts and washers securing lift cylinders to the outer mast.
- ③ Loosen and remove hexagon bolts and nut securing lift cylinders to the pre-lift bar.
- ④ Remove the pre-lift bar and cylinder clamp.
- ⑤ Fix the chain to the mast section at the top cross member. Using an overhead hoist, slowly raise the inner mast high enough to clear lift cylinder
- ⑥ After lowering the lift cylinder rods, and disconnecting lift cylinder hose, tilt the lift cylinders LH and RH and tie them with ropes to the outer mast.
- ⑦ Using the overhead hoist, lower inner mast until top and bottom rollers and back up liners are exposed.
- ⑧ Using a plier, remove load rollers from load roller bracket. Remove back up liners and shims.
- ⑨ Thoroughly clean, inspect and replace all worn or damaged parts.
- ⑩ Reverse the above procedure to reinstall. Refer to MAST LOAD ROLLER ADJUSTMENT paragraph.



(2) 3 STAGE MAST (TF MAST)

- ① Remove the carriage assembly and move it to one side.
- ② Remove the hexagon bolt fixing the cylinder bottom from the outer mast.
- ③ Remove the bolts and special washer fixing the lift cylinder to the middle mast.
- ④ As shown in the figure, tie the chain on the inner and middle mast on the top cross member. Using a crane, slowly raise sufficiently to prevent interference on the lift cylinder.
- ⑤ After lowering the lift cylinder rods, and disconnecting lift cylinder hose, tilt the lift cylinders LH and RH and tie them with ropes to the outer mast.
- ⑥ Using the crane, raise the inner and middle masts. Place a wooden block of approximately 100 mm below the pre-lift cylinder bracket of the inner mast, and lower the mast part (This will loosen the chain).
- ⑦ Remove the retaining ring for fixing the chain sieve. Remove the chain sieve and hang the chain. The top outer/bottom middle mast roller and backup liner are exposed.
- ⑧ Use a plier to remove the load roller from the load bracket. Remove back up liners and shims.
- ⑨ Fix the chain to the middle mast section at the top cross member. Use a crane to slowly raise the middle mast to expose the top/bottom roller.
- ⑩ Use a plier to remove the load roller from the load roller bracket.
- ⑪ Thoroughly clean, inspect and replace all worn or damaged parts.
- ⑫ Reverse the above procedure to reinstall. Refer to MAST LOAD ROLLER ADJUSTMENT paragraph.



5) RISING MAST

(1) INNER MAST (V MAST)

- ① After completing all necessary steps for load rollers and back up liner removal use an overhead hoist to remove chain around upper cross member of the inner mast section.
- ② Raise the inner mast straightly to take out from the outer mast.
- ③ After replacement, install in the reverse order of the removal procedure. Perform all necessary measurements and adjustments.

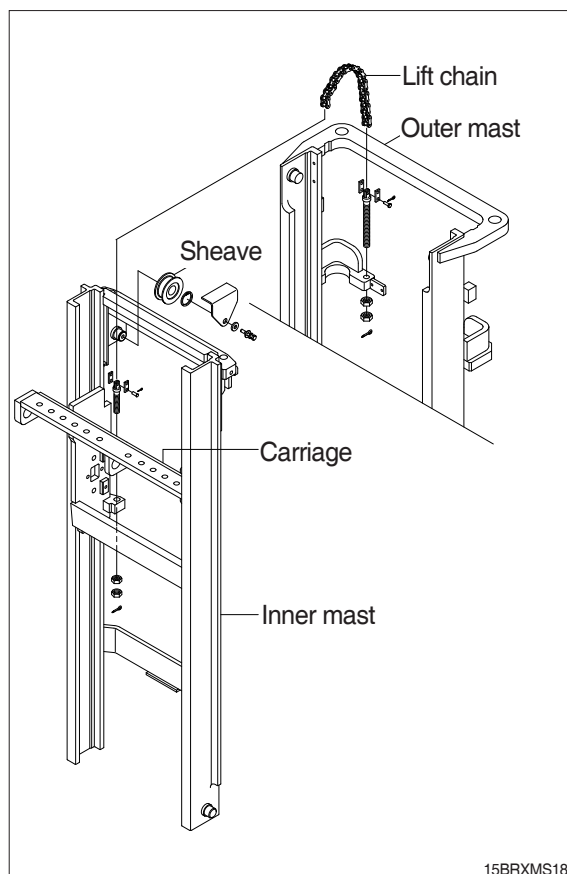
(2) INNER AND MIDDLE MAST (TF MAST)

- ① If required, remove the rear chain and sieve support after completing all work procedures required for removing the load roller and the backup liner.
- ② Remove the lift cylinder hose. Put the hose into an appropriate container to discharge the hydraulic fluid.
- ③ While supporting the pre-lift cylinder, remove bolts and washers securing the cylinder to mast cross member.
- ④ Wind a rope on the pre-lift cylinder to tie on the crane. Raise slowly to put the cylinder on one side.
- ⑤ Fix the chain to the mast section at the top cross member. Use a crane to raise straightly to separate the inner mast from the middle mast.
- ⑥ Fix the chain to the middle mast section at the top cross member. Use a crane to raise straightly to separate the middle mast from the outer mast.
- ⑦ After replacement, install in the reverse order of the removal procedure. Perform all necessary measurements and adjustments.

6) CHAIN

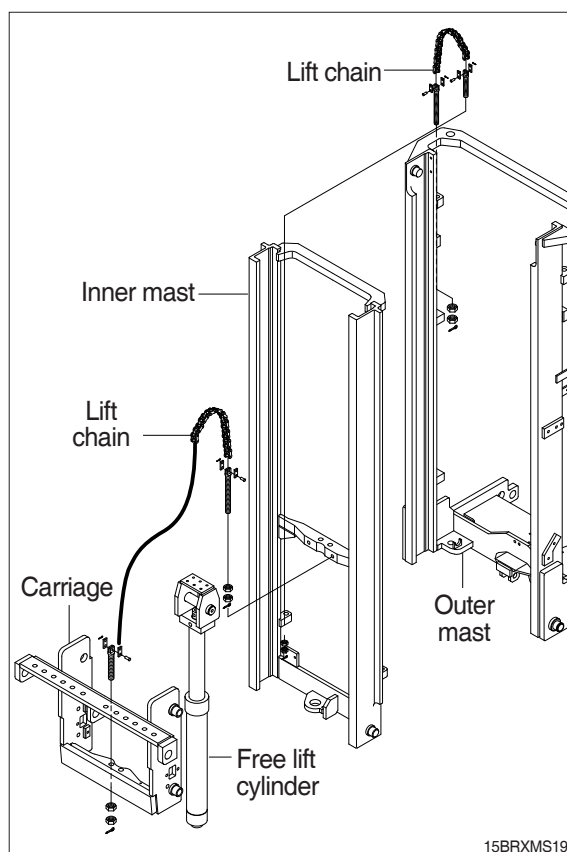
(1) Chain Sieve (V Mast)

- ① Wind the rope on the carriage to tie on the crane. Raise the carriage sufficiently to prop the carriage, and enable the tension on the chain to be reduced. Place the wooden block below the carriage to lower the carriage.
- ② Remove the split pin securing the chain anchor pins and discard. Remove the chain anchor pin while supporting the chain, and place the chain on top of the carriage.
- ③ Remove the retaining ring for fixing the sieve. Remove sheaves and bearings.
- ④ Remove the bearing retaining ring from the sheave and press the bearings from the sheave.
- ⑤ Thoroughly clean, inspect and replace all worn or damaged parts.
- ⑥ Reverse the above procedure to reinstall. Use the new split pin on the chain anchor pin.



(2) Rear Chain Sieve (TF Mast)

- ① Raise the carriage and inner mast to support firmly.
- ② Remove the split pin securing the chain anchor pins and discard. Remove the chain anchor pin from the outer mast while supporting the chain, and remove the chain.
- ③ Remove the retaining ring fixing the sieve to also remove the sieve and the bearing.
- ④ Remove the bearing retaining ring from the sheave and press the bearings from the sheave.
- ⑤ Thoroughly clean, inspect and replace all worn or damaged parts.
- ⑥ Reverse the above procedure to reinstall.
- ⑦ Use the new split pin on the chain anchor pin.



(3) Chain Wheel Bearing Support (TF Mast)

- ① Remove the carriage assembly and move it to one side.
- ② Remove the bolt fixing the chain wheel bearing support to the pre-lift cylinder, and wind the rope to the chain wheel bearing support assembly.
- ③ Hand the rope on the chain wheel bearing support and use the crane to raise the support straightly for separating from the pre-lift cylinder. Move the support to the workplace.
- ④ On the chain wheel bearing, remove the retaining ring fixed on the chain wheel bearing support.
- ⑤ Remove the bearing retaining ring from the chain wheel bearing, and press the bearing from the chain wheel bearing.
- ⑥ Thoroughly clean, inspect and replace all worn or damaged parts.
Reverse the above procedure to reinstall.

(4) Rear Chain (TF Mast)

- ① Remove the carriage assembly and move it to one side. Refer to the details on carriage installation and removal.
- ② Raise about 150 mm from the group to fix the lift truck firmly.
- ③ Use the rope or chain to tie on the crane, and raise the inner mast slowly to loosen the chain sufficiently for removal. Fix the inner mast section with a block.
- ④ Remove the split pin and chain anchor pin fixing the chain to the chain anchor of the inner mast.
- ⑤ While supporting the chain, remove the split pin and chain anchor pin fixing the chain on the chain anchor of the outer mast.
- ⑥ Remove chains.
- ⑦ Reverse the above procedure to reinstall. Use the new split pin on the chain anchor pin. Refer to this section for load chain lubrication and adjustment.

(5) Carriage chain

- ① Place the rope near the carriage front plate to tie on the crane. Raise the carriage sufficiently to remove the split and chain anchor pins easily above the carriage. Remove the chain anchor pin from the carriage to hang the chain above the carriage.
- ② Place the wooden block below the carriage to lower the carriage on top of the block.
- ③ Remove the split pin and chain anchor pin from the chain anchor when supporting the chain.
- ④ Remove the chain to clean with a solvent. Refer to this section for load chain and maintenance and inspection.
- ⑤ Reverse the above procedure to reinstall. Use the new split pin on the chain anchor pin.
Refer to this section for load chain lubrication and adjustment.

(6) Load chain inspection and maintenance

The lift chain must be inspected and lubricated as shown below after operating for 200 hours.

① Abrasion

The joint of the chain is gradually worn out from movement across the sieve. This is mostly shown as the abrasion of the pin outer diameter and pitch hole inner diameter materials of the internal plate.

The abrasion state of the chain can be measured with an abrasion-resistant ruler or the metal tape. Replace when the chain is loosened approximately 2%. The chain section operating above the sieve must be measured clearly when checking the chain abrasion state. Repair shall not be performed in the method of cutting the worn out chain to overlap for connection with the new part. The entire chain must be replaced on the lift truck when the chain is partially worn out.

② Rust and corrosion

Chains used on lift trucks are highly stressed precision components. Therefore, the maximum strength and fatigue strength must be maintained constantly while the chain is used. Corrosion is the main cause of reducing the cargo delivery capability of the lift chain or the roller chain, and crack is occurred on the side plate due to corrosion.

③ Plate Crack

Plate crack is mostly caused by fatigue, and fatigue is the phenomenon having impact to most of the metals and plastics. Plate is cracked due to the repeated big load, and chain is eventually broken. Crack due to fatigue is discovered on the pitch line through the vertical section of the pitch hole at all times. This is different from the irregular crack from stress corrosion. When crack is discovered, all chains of the lift truck shall be replaced. Noise on the chain specifies that crack will occur on the plate, and it is recommended to replace the chain before the crack is occurred.

④ Tight joints

All lift chains must be moved smoothly. Tight joints intrude with curve and increase the internal friction to enhance the chain tension. Increase in tension accelerates the chain abrasion and fatigue.

The causes of joint constraint on the lift chain are as shown below.

- Bent pins or plates.
- Rusty joints.
- Damaged plate edges

Lubricate the rusty chains, and chains with the curved or damaged parts shall be replaced.

⑤ Protruding or turned pins

Heavily loaded chains in operation generate tremendous friction between pins and plates. In extreme cases, the frictional torque in the joint can actually turn pins to outside plates. If chain is allowed to operate in this condition, the pins slowly work out of the chain causing chain failure. Turned pins are instantly damaged as the flats on the V heads are no longer in line. Chains with turned or protruding pins should be replaced immediately. Do not attempt to repair the chain by driving pins back into the chain.

⑥ Chain side wear

Abrasion form on the pin head and outer plate specifies alignment fault, and this state results in damage of the chain and sieve to increase the internal friction on the chain system.

⑦ Chain anchor and chain sieve

Detailed check is required on the chain anchor and chain sieve for the inspection on the chain system. Inspect the abrasion, crack and alignment state of the chain anchor.

Replace the chain anchor that with abrasion or damaged finger, and the chain anchor must be aligned to prevent alignment defect or twisting of the chain. Load will not be distributed appropriately between the plates when there is defective alignment of the chain. There can be permanent problem due to the fatigue when the working hours are extended. Chain sieve that is severely worn out on the flange and outer diameter must be replaced, and serious abrasion on the flange refers to defective alignment.

⑧ Chain Abrasion Measuring Point

Chain abrasion or extended state can be checked through the chain abrasion measurement point. Stretching of a chain is due to the elongation of the pitch holes and wearing of the pin O.D. Most of the stretching is occurred on the sieve contact section, and this part is checked with the measurement point during the inspection. The method of using the abrasion scale is on the side of the measurement point, and it is as shown below.

- The length of the chain pitch is determined by using the 6-inch ruler on one side of the abrasion-resistant ruler.
- If the pitch is 1/2 (12.7 mm), 3/4 (19.05 mm), 1 (25.4 mm), 1-1/2 (38.1 mm) and 2 (50.8 mm), A section of the ruler is used.
- If the pitch is 5/8 (15.875 mm), 1-1/4 (31.75 mm) or 2 (50.8 mm), B section is used.

A and B points of the ruler are aligned in the middle of the pin, and position on the opposite side of A or B is recorded.

If other point is placed side by side with the pin, the chain is worn out, and it must be replaced.

When the point is aligned on top (plate crack, pin deformation, stretching, etc., the chain must be replaced with one pair of complete assembly. Chain with the accurate length, pitch and material can be received only when the chain is ordered with the item number.

(7) Load chain lubrication and adjustment

① Lubrication

The most important consideration in field maintenance of lift chains is lubrication. Hard working, heavily loaded chains cannot be expected to give satisfactory wear life without scheduled periodic re-lubrication. Like all bearing surfaces, the precision manufactured, hardened steel, joint-wearing surfaces require a film of oil between mating parts to prevent rapid wear. Oil must penetrate the chain joint to prevent wear. Applying oil to external surfaces will prevent rust, but oil must flow into the live bearing surfaces for maximum wear life. Lubrication cycle is different according to the operating condition and environment, but the optimum cycle is 200 hours each, and more frequent lubrication is required when the lift truck is parked in the external space or operated in harsh conditions.

- Remove the existing oil with a clean cloth, and use compressed air to blow away the residue.

▲ Wearing protective glasses

- Use a clean brush to apply the EP-140 lubricant or heavy motor oil (40W).

② Replacement

Chain shall be replaced in one pair. It will be virtually impossible to maintain uniform loading between the strands if a new chain is put into service opposite an old chain. Joint on the old chain will be larger than the joint on the new chain, and it is very difficult to maintain the uniform chain tension on both sides. The new chain is worn out more slowly to be better on tolerating most of the load that causes defects due to permanent abrasion and fatigue. Do not clean the chain with steam or reduce the new chain for use.

Genuine grease is effective on preventing abrasion and corrosion. When the lubricant applied in the factor is dry or wiped off, place the new chain in the engine oil for about 30 minutes before installation. Remove the old chain from the mast, and check the chain anchor and sieve. Replace the damaged, cracked or worn out anchor with a new anchor pin and split pin. Do not apply paint after installing the new chain.

③ **Adjustment**

Chain adjustments are important for the following reasons.

- To maintain uniform load on the chain
- Proper sequencing of mast
- Prevent over-stretching of chains.
- Prevent the chain from breaking away from the chain sieve due to loosening

④ **Sequence of Adjustment**

- With mast in its fully collapsed and vertical position, lower the fork to the floor.
- Adjust the chain length by loosening or tightening the nut on the chain anchor.
Fasten the nut after the adjustment is completed on top of the mast.