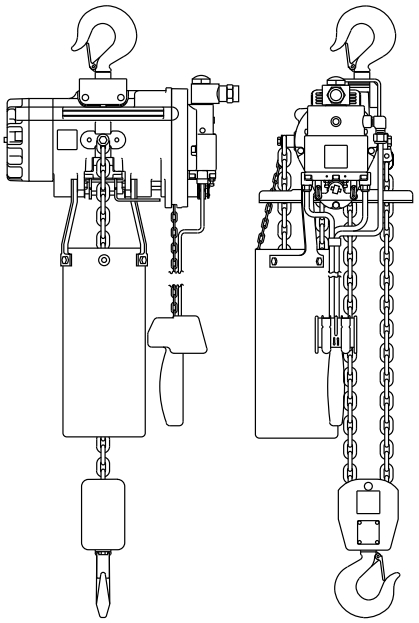
Product Maintenance Information

Air Chain Hoist

MLK Series



(Dwg. MHP0456)

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Ingersoll Rand

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Only allow **Ingersoll Rand** trained technicians to perform maintenance on this product. For additional information contact **Ingersoll Rand** factory or nearest Distributor.

For additional supporting documentation refer to Table 1 'Product Information Manuals' on page 2.
Manuals can be downloaded from http://www.ingersollrandproducts.com.
The use of other than genuine **Ingersoll Rand** replacement parts may result in safety hazards, decreased performance and increased maintenance and will invalidate all warranties.
Original instructions are in English. Other languages are a translation of the original instructions.
Refer all communications to the nearest **Ingersoll Rand** Office or Distributor.

Table 1: Product Information Manuals

Publication	Part/Document Number	Publication	Part/Document Number
Product Safety Information Manual	MHD56295	Product Information Manual	47112677
Product Parts Information Manual	47112669		

OPERATIONAL CONDITIONS, INSPECTION AND REPAIRS

State of Loading

When considering maintenance intervals and operational life it is necessary to consider the conditions of service to which the hoist is subjected. The following factors influence mechanical performance of the hoist, and should be considered in the course of determining service intervals and product life-cycle. These include:

- **Operational Time:** Actual running time (determine by when the chain is actually in motion) of hoist per hour or per work period.

- **Load Distribution:** Actual distribution or proportion of full or partial loads to be handled by equipment.

- **Work Distribution:** Work may be concentrated during a short span, or uniformly distributed over a work period. Work distribution is not a principle factor when determining mechanical wear, but needs to be considered when calculating operational time and periodic maintenance.

- **Environmental Conditions:** When protected from weathering, the hoist is suitable for permanent installation in outdoor locations, although maintenance may be increased. The MLK series hoist is not designed for permanent installation in outdoor marine environments.

Load Factor

Some hoist installations, such as assembly line operation, lifted load is repetitive and easily recorded. Other the load is random and not easily characterized. The Mean Effective Load Factor, also referred to as the Load Spectrum, refers to a theoretical single load value that has the same effect on the hoist as various loads lifted by the hoist during a specified time period. The mean effective load factor, LF, can be expressed as:

Where:

$$LF = \sqrt[3]{W_1^3 P_1 + W_2^3 P_2 + W_2^3 P_3 \ldots + W_n^3 P_n}$$

LF = Mean Effective Load Factor (Load Spectrum): Mean effective load factor is the ratio of mean effective load to rated load.

W = Load Magnitude: Load Magnitude is the ratio of the hoist operating load to the hoist rated capacity. No load operation must be included in this calculation. It is also necessary to take into account the weight of any dead load used to facilitate rigging the load to the hoist hook.

P = Load Probability: Load probability is the ration of running time under each load magnitude to the total hoist running time. The sum of all of load probabilities used in the above equation must equal 1.0

NOTICE

- **Randomly distributed loads - A unit subjected to a random distribution of loading will be assumed to lift load distributed evenly within the rated load of the hoist in decreasing step of 20% of the previous load value. For the purposes of maintenance, such units should be assumed to have a mean effective load factor of 0.65.**

Periodic Inspection

Refer to Table 2 'Inspection Classifications' on page 2 for suggested inspection classifications for Periodic Inspection Intervals. Select conditions most appropriate to application.

Table 2: Inspection Classifications

Conditions	Usage	Load Characterization
Normal	< = 25% duty cycle	Regular
Heavy	> 25% duty cycle	Usually medium loads, frequent max. loads
Severe	Loads normally less than 50% of rated load with running time up to continuous; or, Loads normally above 50% of rated load with running time up to 50% of work period.	

Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection' in the Product Information Manual. Also inspect the following at the suggested intervals recommended in Table 5 "Periodic Maintenance/Inspection Interval"Table 6 'Periodic Maintenance/Inspection Interval' on page 3 .

According to ASME B30.16, frequency of periodic inspection depends on the severity of usage:

Table 3:

NORMAL	HEAVY	SEVERE
Yearly	Semi-Annually	Quarterly

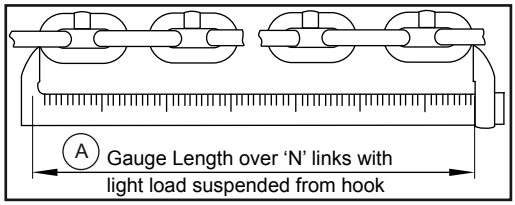
Disassembly may be required for HEAVY or SEVERE usage.

Inspect all the items in "Frequent Inspection" given in the Product Information Manual. Also inspect the following:

1. **FASTENERS.** Check all rivets, split pins, capscrews and nuts. Replace if missing or tighten if loose.
2. **ALL COMPONENTS.** Inspect for wear, damage, distortion, deformation and cleanliness. If external evidence indicates the need, disassemble. Check gears, shafts, bearings, sheaves, chain guides, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
3. **HOOKS**. Inspect hooks carefully for cracks using magnetic particle or other suitable non-destructive method. Inspect hook retaining parts. Tighten or repair, if necessary.
4. **LOAD CHAIN WHEEL.** Check for damage or excessive wear. Replace if necessary. Observe the action of the load chain feeding through the hoist. Do not operate a hoist unless the load chain feeds through the hoist and hook block smoothly and without audible clicking or other evidence of binding or malfunctioning.
5. **MOTOR.** If performance is poor, disassemble the motor and check for wear or damage to bearings and shafts. The parts should be cleaned, lubricated and reassembled. Replace worn or damaged parts.
6. **BRAKE.** Raise a load equal to the rated capacity of the hoist a few inches (cms) off the floor. Verify hoist holds the load without drift. If drift occurs, disassemble. Remove brake discs as described in the "MAINTENANCE" section. Check and clean the brake parts each time the hoist is disassembled. Replace the brake discs if the thickness is less than 0.090 in. (2.29 mm).
7. **SUPPORTING STRUCTURE.** Check for distortion, wear and continued ability to support load.
8. **TROLLEY.** (if equipped) Check that the trolley wheels track the beam properly and clearance between side rollers and beam is correct, 1/16 to 3/16 in. (1.6 to 4.7mm). Check that wheels and rail are not excessively worn and inspect side plates for spreading due to bending. Do not operate the hoist until the problem has been determined and corrected.
9. **LABELS AND TAGS.** Check for presence and legibility. Replace if necessary.
10. **LOAD CHAIN END ANCHORS.** Ensure both ends of load chain are securely attached. Secure if loose, repair if damaged, replace if missing. Check chain stopper is correctly installed and functional.
11. **LOAD CHAIN.** Measure the chain for stretching by suspending a 50 to 100 lbs. (23 to 45 kg) load from the hoist. Measure the load chain over the outside of seven link sections all along the chain paying particular attention to the most frequently reeved links. When any seven links in the working length reaches or exceeds the discard length shown in Table 4 'Load Chain Normal and Discard Length' on page 2, replace the entire chain. Refer to Dwg. MHP0455 on page 3. Always use a genuine Ingersoll Rand replacement chain.

Table 4: Load Chain Normal and Discard Length

Dimensions Of Link - Inches				Number of Links	Discard Length Over N Links, inches
Nominal Wire Diameter	Pitch	Inside Width	Outside width		
1/4	0.767	0.298	0.823	7	5.98



(Dwg. MHP0455)

■ Records and Reports

Inspection records, listing all points requiring periodic inspection should be maintained for all load bearing equipment. Written reports based on severity of service, should be made of the condition of critical parts as a method of documenting periodic inspection. These reports should be dated, signed by the person who performed the inspection, and kept on file where they are readily available for review.

■ Maintenance Schedule

After considering the previous section, regarding loading, it is possible to determine the necessary maintenance intervals. Given that the load spectrum has been determined and the duration of use has been recorded, the following chart is intended to be used to determine service intervals for major overhauls and unit gear box lubrication. Accordingly, the following table is given:

Table 5: Service intervals for major overhauls

Load Spectrum (LF)	Characterization	Time Before Overhaul (hours)	Gear Box Grease Change (*) (hours)
L1 - Light 0 < LF < = 0.50	Hoist is usually subject to very small loads and in exceptional cases only to maximum loads.	3200	200
L2 - Medium (normal) 0.5 < LF < = 0.63	Hoist is usually subject to small loads but rather often to maximum loads.	1600	
L3 - Heavy 0.63 < LF < = 0.80	Hoist is usually subject to medium loads but frequently to maximum loads.	800	
L4 - Heavy 0.80 < LF < = 1.00	Hoist is usually subject to maximum or almost maximum loads.	400	

(*) Operation specifics may warrant modification to these intervals.

■ Periodic Maintenance

While the information in the preceding section is used for major service intervals, many items need to be checked at greater frequency depending on usage. The following information is provided for that purpose, but it is important to note that the information in the preceding section, regarding hours of service, is applicable in all conditions of use. Refer to Table 6 'Periodic Maintenance/Inspection Interval' on page 3.

Table 6: Periodic Maintenance/Inspection Interval

Item	Conditions		
	Normal	Heavy	Severe
Requirements of frequent inspection	Annually	Semiannually	Quarterly
Evidence of loose bolts, nuts, rivets, snap rings	Annually	Semiannually	Quarterly
Evidence of worn corroded, distorted, or cracked parts such as suspension housing, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins, rollers, and locking and clamping devices	Annually	Semiannually	Quarterly
Evidence of damage to hook retaining nuts or collars or pins, used to secure the retaining members	Annually	Semiannually	Quarterly
Evidence of excessive wear, or damage, to load wheels	Annually	Semiannually	Quarterly
Evidence of excessive wear on motor or load brake	Annually	Semiannually	Quarterly
Evidence of damage to supporting structure, and/or trolley, if used	Annually	Semiannually	Quarterly
Product and safety label for legibility	Annually	Semiannually	Quarterly
End connections of load chain	Annually	Semiannually	Quarterly

INSPECTION REPORT

Ingersoll Rand MLK Air Hoist

Model Number:	**Date:**
Serial Number:	**Inspected by:**

Reason for Inspection: (Check Applicable Box)

	1. Scheduled Periodic Inspection (___ Quarterly ___ Semiannually ___ Yearly)	**Operating Environment:** Normal ___ Heavy ___ Severe ___
	2. Discrepancy(s) noted during Frequent Inspection	
	3. Discrepancy(s) noted during maintenance	
	4. Other: _____	

Refer to the Product Information and Parts Information Manual and "INSPECTION" section for the general inspection criteria. Also, refer to appropriate National Standards and Codes of Practice. If in doubt about an existing condition, contact the nearest **Ingersoll Rand** distributor or the factory for technical assistance.

COMPONENT	**CONDITION**		**CORRECTIVE ACTION**		**NOTES**
	Pass	**Fail**	**Repair**	**Replace**	
Fasteners					
Gears					
Shafts					
Bearings			---		
Load Bearing Wheel					
Hook Block/Double-Reeved Pocket Wheel					
Chain Guides					
Springs			---		
Covers, Housings					
Hooks			---		
Top	Actual Hook Throat Width: _____ inches / _____ mm (Refer to Table 4 'Load Chain Normal and Discard Length' on page 2 for minimum/maximum acceptable widths.)				
	Hook Twist		---		(maximum 10%)
	Hook Crack Test Method Used: Dye Penetrant _____ Magnetic Particle _____ Other: _____				
Bottom	Actual Hook Throat Width: _____ inches / _____ mm (Refer to Table 4 'Load Chain Normal and Discard Length' on page 2 for minimum/maximum acceptable widths.)				
	Hook Twist		---		(maximum 10%)
	Hook Crack Test Method Used: Dye Penetrant _____ Magnetic Particle _____ Other: _____				
Hook Latch			---		
Brake (100% Load Test)			---		
Brake (Visual Inspection)					
Tail Pin (End Anchor)					
Load Chain:			---		
Working length(s) maximum wear: _____ inches / _____ mm (Refer to Table 4 'Load Chain Normal and Discard Length' on page 2.)					
Supporting Structure					
Labels and Tags			---		
Other Components (List in NOTES section)					

Testing:	**Pass**	**Fail**	**NOTES**
Operational (No Load)			
Operational (100% Load)			
Operational (Maximum Test Load*)			

* Maximum test load should never exceed 125% of rated capacity.
This form may be photocopied and used as an inspection record.

TROUBLESHOOTING

This section provides basic troubleshooting information. Determination of specific causes to problems are best identified by thorough inspections performed by **Ingersoll Rand** trained technicians. The chart below provides a brief guide to common hoist and trolley symptoms, probable causes and remedies.

SYMPTOM	CAUSE	REMEDY
Hoist will not operate.	No air supply to hoist, or too little SCFM or PSIG.	Check PSIG (bar) at valve inlet. Refer to "SPECIFICATIONS" section for correct SCFM (cu.m/min) and PSIG (bar).
	Valve or throttle lever sticking.	Check throttle lever for free movement.
	Pendant malfunction.	Check PSIG (bar) at pendant. Minimum operating pressure in pendant line is 55 psig (3.8 bar).
	Hoist is overloaded.	Reduce load to within rated capacity.
	Motor is damaged.	Repair or replace. See "MAINTENANCE" section.
	Lubricator is low on oil.	Fill lubricator.
	Brake is not releasing.	Check brake release circuit and PSIG (bar) at the brake inlet. (55 PSIG (3.8 bar) minimum).
Load continues to move when hoist is stopped. "UP" direction.	Valve or throttle lever sticking.	Check throttle lever for free movement.
	Dump valves not releasing.	Check pendant hose dump valves.
	Pendant lever sticking.	Check lever and restore free movement.
Load continues to move when hoist is stopped. "DOWN" direction.	Valve or throttle lever sticking.	Check throttle lever for free movement.
	Dump valves not releasing.	Check pendant hose dump valves.
	Brake is slipping.	Check brake springs and brake disc linings for wear. See MAINTENANCE" section.
	Hoist is overloaded.	Reduce load to within rated capacity.
	Pendant lever sticking.	Check lever and restore free movement.
Hoist will not lift rated capacity.	Hoist is overloaded.	Reduce load to within rated capacity.
	No air supply to hoist, or too little SCFM or PSIG.	Check PSIG (bar) at valve inlet. Refer to "SPECIFICATIONS" section for correct SCFM (cu.m/min) and PSIG (bar).
	Main air valve travel is restricted.	Check throttle lever and linkage for free movement.
	Exhaust restricted.	Inspect vents and replace mufflers.
	Motor is damaged.	Check for worn motor bearings, vanes or vane springs.
Reduced speed and/ or capacity.	Old style hoists have filter in inlet nipple which may be plugged restricting air flow.	Install new style inlet nipple with no filter screen.
Hook lowers, but will not raise.	No air supply to hoist, or too little SCFM (cu.m/min).	Check power supply and connections, in power supply line.
	Hoist is overloaded.	Reduce load to within rated capacity.
	Pendant malfunction.	Check PSIG (bar) at air inlet connection on pendant.
Hook can be raised but not lowered.	Brake piston seals leaking.	Install new seals refer to "MAINTENANCE" section.
	Low air pressure.	Check PSIG (bar) at valve inlet. Raise pressure to rated capacity.
	Pendant malfunction.	Check PSIG (bar) at fitting connection on pendant.
Load chain jumps on sheave or is making a snapping sound.	No oil on load chain.	Lubricate load chain. See "LUBRICATION" section.
	Worn or rusted chain.	See "INSPECTION" to determine wear limit. Replace if necessary and lubricate frequently.
	Worn load sheave.	Replace worn parts.
	Capsized Hook.	Correct as described in "MAINTENANCE" section.
	Hoist not in-line with load.	Align hoist with load. Do not "yard" or "side pull".
	Incorrectly reeved load chain.	Check load chain is correctly reeved.
Trolley won't stop or trolley wheels slip.	Damaged beam.	Repair or replace beam.
	Too much oil, grease or paint on track of beam.	Clean off oil, grease or paint.
	Trolley not spaced for beam clearance.	Check trolley spacing. Refer to "INSTALLATION" section.
Air powered trolley does not operate.	Pendant lever sticking.	Check lever and restore free movement.
	No air supply to trolley, or too little SCFM (cu.m/min) or PSIG (bar).	Check PSIG (bar) at trolley valve.
	Control valve is sticking.	See "MAINTENANCE" section.

⚠ WARNING

- **Never perform maintenance on the hoist while it is supporting a load.**

  Before performing maintenance, tag controls:

  WARNING - DO NOT OPERATE EQUIPMENT BEING REPAIRED.
- **Only allow personnel instructed in service and repair of this hoist to perform maintenance.**
- **After performing any maintenance on the hoist, dynamically test hoist to 100% of its rated capacity, in accordance with ASME B30.16 standards, before returning hoist to service. Testing to more than 100% of rated capacity may be required to comply with standards and regulations set forth in areas outside of the USA.**
- **Shut off air system and depressurize air lines before performing any maintenance.**
- **Use of other than genuine Ingersoll Rand replacement parts may result in safety hazards, decreased performance and increased maintenance and may invalidate all warranties.**

NOTICE

- **When reading the instructions, refer to exploded diagrams in Parts Information Manuals when applicable.**

■ Load Chain Care

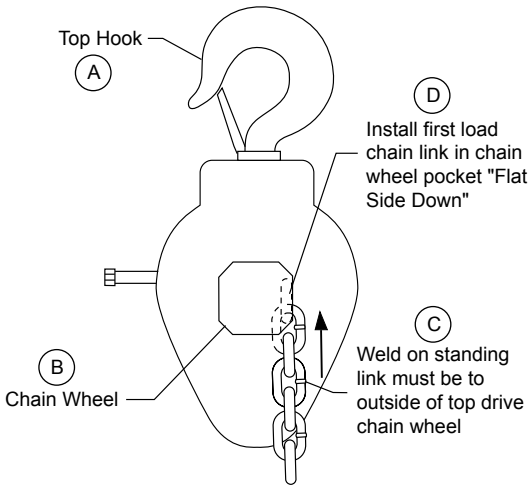
Keep the chain well lubricated as instructed in the "LUBRICATION" section. Never operate a hoist when the load chain does not flow freely and smoothly into and out of the chain wheel, or when it makes noises indicative of binding or other malfunctions.

■ Chain Replacement

Refer to "INSPECTION" section for information on load chain inspection. Excessive chain wear cannot be detected by casual observation. The chain is case hardened to a depth of 0.010 in. to 0.012 in. (0.25 to 0.30 mm) and once this case is worn through, wear will progress rapidly and the strength of the chain will be considerably reduced. Further, the chain will no longer fit the chain wheel properly, greatly increasing the chance of malfunction and chain breakage. One chain wheel will outlast several chains if the chain is replaced as recommended. The use of a worn chain will cause the chain wheel to wear rapidly. If the chain is visibly damaged, examine the chain wheel and chain guard. Install a new chain wheel if the old one is visibly worn. Install a new guard if the old one is broken or distorted.

■ *Single Line (fall) Hoists, Method 1*

1. Remove the brake spring and piston housing, brake discs and brake plates to expose the brake driver.
2. At the side of the chain wheel opposite the chain anchor bolt, engage the first link of chain in a pocket of the chain wheel FLAT SIDE DOWN (Refer Dwg. MHP3255 on page 6). The weld on the second link must face away from the powered chain wheel. Refer Dwg. MHP0472 on page 7).
3. Rotate the brake driver by hand to thread the chain through the hoist.
4. Keep the chain straight and do not twist it. Attach the free end of the chain using the chain anchor bolt, washers and spacer (Dwg. MHP3256). Clean the brake parts and inspect them for excessive wear before assembling.



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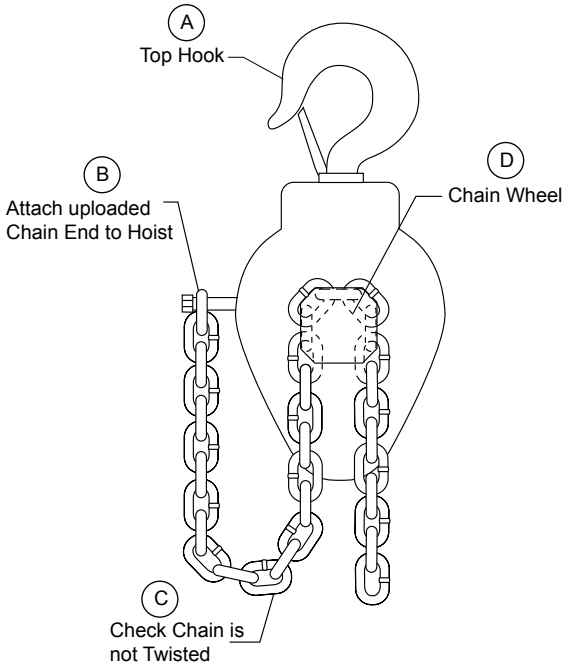

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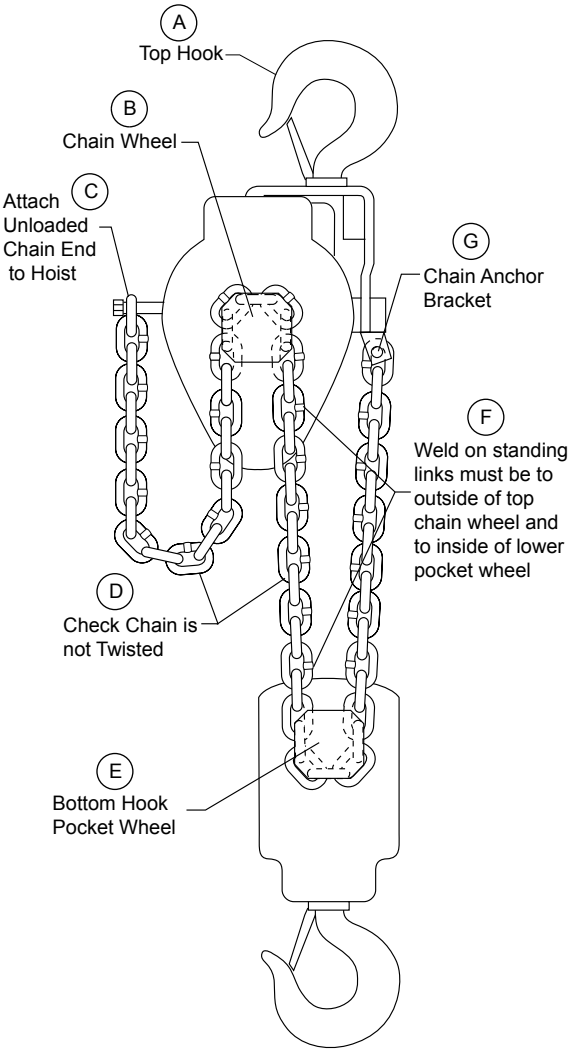

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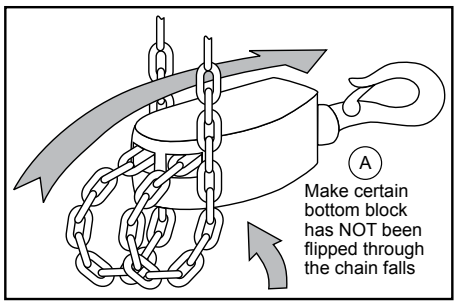
Double Line (fall) Hoists, Method 1

WARNING

- **The replacement chain for a series MLK double line hoist must have an EVEN number of links.**

1. Install the chain through the chain wheel as in steps 1 through 4 of the instructions for single line Hoist, and attach the end of the chain to the Hoist using the anchor bolt and fasteners. Keep the chain straight.
2. Make certain the chain is straight and feed the end through the bottom hook pocket wheel with the first link ON EDGE WITH THE WELD TO THE INSIDE OF THE IDLER SHEAVE WHEEL.
3. Keep the chain straight and attach the free end to the chain anchor bracket.

Capsized Hook



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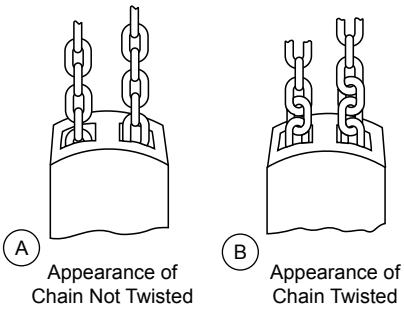


(Dwg. MHP0020)

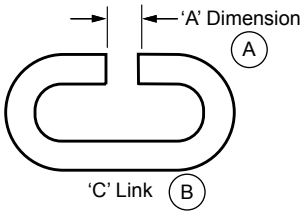
A. Appearance of Chain Not Twisted; **B.** Appearance of Chain Twisted.

Single or Double Line (fall) Hoists, Method 2

1. On ML250K and ML500K single line Hoists, disconnect the load end of the chain from the bottom hook block. On ML500KR and ML1000K double line Hoists, disconnect the load end of the chain from the chain anchor bracket and withdraw it from the bottom hook sheave block. Do not remove the chain from the Hoist.
2. Using an abrasive wheel, cut a section from the last standing link as shown in Dwg. MHP0471.

CAUTION

- **Do not distort the link in any manner. It must be able to pass over the chain wheel without binding. The last complete link of old chain must be a flat link unless two cut links are used to make the first link of the new chain a flat link.**



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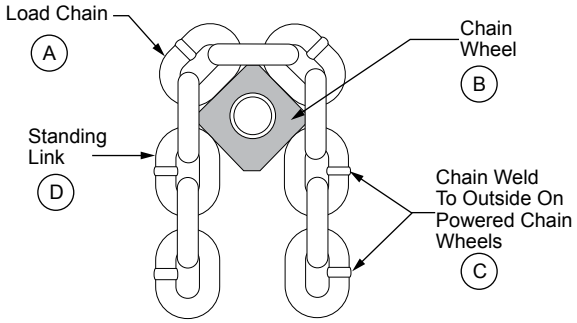


(Dwg. MHP0472)

3. Connect old chain by hooking the end of the new chain onto the cutaway link. Make certain the welds on the standing links (links that are perpendicular to the chain wheel) face away from the powered chain wheel.
4. Slowly run the Hoist in the raise direction, running off the old chain and reeving the new chain over the chain wheel. The first link of new chain over the chain wheel must be a flat link.
5. After the new chain is installed, secure the unloaded end of the chain to the side of the Hoist. Make certain there is no twist in the unloaded end of the chain between the chain wheel and the end link.

WARNING

- **A twisted chain can jam as it passes over the chain wheel, which can result in damage to the Hoist or even breaking the chain causing severe injury, death or substantial property damage.**

6. On single line Hoists, install the stop ring (115) and spring (114) and then attach the bottom hook block assembly.
7. On double line Hoists, reeve the load end of the new chain around the pocket wheel in the sheave block assembly, making certain the chain is not twisted between the hoist and sheave block.

NOTICE

- **The new chain must have an EVEN number of links when the hoist has two chain falls and uses a bottom sheave block.**

8. Keeping the load end of the chain straight, attach the end link to the chain anchor bracket.
9. Lubricate the chain as instructed in the "LUBRICATION" section.
10. Run the hook up and down several times under power with no load to make certain the chain is running smoothly over the chain wheel. There must be no apparent binding or evidence of malfunctioning.

Servicing the Filter and Strainer

1. Disconnect the air supply from the Hoist.
2. Unscrew the air hose from the inlet strainer (42) .
3. Unscrew the inlet strainer from the inlet body (38).
4. Wash the screen inside the inlet strainer clean with a quality, non-toxic, non-flammable commercial solvent in a well ventilated area. If the screen is damaged or cannot be cleaned, replace the inlet strainer.
5. Unscrew the inlet nipple (39) from the valve chest and remove the inlet nipple and inlet body from the valve chest.
6. Push the inlet nipple out of the inlet body.
7. Remove the two swivel inlet seals (40) from the inlet nipple.
8. If the swivel inlet gasket (41) is damaged, replace it.
9. Moisten the new swivel inlet seals with O-ring lubricant and install them in the grooves around the body of the inlet nipple.
10. Push the inlet nipple into the inlet body until the hex of the nipple is flush against the face of the inlet body.
11. Keep the threaded hole of the inlet body facing away from the Hoist and screw the inlet nipple into the valve chest.
12. Screw the inlet strainer into the inlet body.
13. Screw the air hose into the inlet strainer.
14. Reconnect the air supply to the Hoist.

Disassembly

WARNING

- **Disconnect the air supply hose before performing any maintenance or repairs on this Hoist.**

General Instructions

1. The MLK Hoist is constructed of various modules, and during the process of disassembly it is not always necessary to disassemble a particular module just because it is removed from the Hoist. For example, it is necessary to remove the valve chest assembly in order to disassemble the motor. However, the valve chest need not be disassembled unless parts within the valve chest require replacement. Do not disassemble the Hoist any further than necessary to replace or repair damaged parts.
2. Whenever grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
3. Do not remove any part which is a press fit in or on a sub-assembly unless the removal of that part is necessary to complete the repair or replacement of the part.

4. Do not disassemble this Hoist unless you have a complete set of new gaskets, O-rings and seals on hand for replacement. These are available in Overhaul Gasket Kit
5. Do not attempt to wash sealed bearings.

Disassembly of Valve Chest

Refer to Dwgs. MHP3238, MHP3241, and MHP3245.
1. If the Hoist has a pendant control, disconnect the three pendant hoses (211) from the elbow and adapters (221 and 222) by loosening the swivel fitting (212).
2. Remove the pendant links (223).
3. Unscrew the valve chest screws (44 and 45) and remove the valve chest (14) and valve chest gaskets (43).
4. Unscrew and remove the swivel inlet assembly. Push the inlet nipple (39) out of the inlet body (38) to expose the swivel inlet seals (40).
5. Unscrew the valve chest cover screws (37) and remove the valve chest cover (33) and valve chest cover gasket (31).
6. Remove the piston and piston shaft assemblies (26 and 28) and piston springs (25).
7. Remove the valve seat lock screws (23).
8. While exerting pressure against the valve seats (20), use retaining ring pliers to remove the valve seat retainers (24).
9. Using a hooked tool, pull the valve seats from the valve chest or tap the bottom of the valve chest on a block of wood.
10. Remove the two valve assemblies (15 and 17) and valve springs (19) from the valve chest.
11. If the piston shaft seals (29) require replacement, press the piston retaining pins (30) from each piston and shaft and slide the pistons off the shafts.

Disassembly of the Brake Mechanism

Refer to Dwg. MHP3243.
1. Unscrew the four shoulder bolts (105) and remove the assembled spring and piston housing (96).
2. If you are going to disassemble the spring and piston housing, proceed as follows:
   a. Remove the plate screws (104) and the plate (103).
   b. Place the assembly, pressure plate (98) downward, on an arbor press or place the assembly vertically in a vise.
   c. While holding the housing against the compression of the springs (97), hold the pressure plate screw (98A) with a wrench and unscrew the piston nut (98B).
   d. Ease up on the arbor press slowly and carefully.
3. Pull off the pressure plate and push the piston (99) from the housing.
4. Withdraw the brake plates (94) and brake discs (95).

Disassembly of the Motor

Refer to Dwg. MHP3240.
1. Remove the entire brake mechanism. Refer to disassembly of the brake mechanism.
2. Remove the brake driver retainer (93) and withdraw the brake driver (92).
3. Remove the assembled valve chest (14). Refer to disassembly of the valve chest.
4. Remove the limit actuator retaining pin (52) and withdraw the limit actuator (51).
5. Unscrew the valve chest plate screws (48) and remove the valve chest plate (46).
6. Grasp the rear end plate (67) and pull the entire assembled motor from the Hoist. If the motor is a little "sticky", tap on the brake end of the motor shaft (64) with a soft drift.

NOTICE

- **If the cylinder dowel (71) separates from the assembled motor, insert a long pin in the dowel pin hole to align the front end plate (72) during removal.**

7. Grasp the motor shaft vertically in copper-covered vise jaws.
8. Remove the motor shaft rear retaining ring (65).
9. Lift off the rear end plate (67) and bearing (66), cylinder (70) cylinder dowel (71), vanes (69), springs (69A), rotor (68), front end plate (72) and bearing (73).

Disassembly of the Gearing

Refer to Dwgs. MHP3242, and MHP3259.
1. Remove the entire brake mechanism. Refer to disassembly of the brake mechanism.
2. Remove the brake driver retainer (93) and withdraw the brake driver (92).
3. Withdraw the brake tube (57).
4. Grasp the brake housing (90) and pull it away from the housing (1) just far enough to expose the two cutout areas at the rear of the housing. Rotate the brake housing until the large diameter of each planet gear (82) is aligned with a cutout area. Withdraw the brake housing, ring gear (88) and planet gear frame assembly as a unit.
5. Remove the ring gear gasket (89).
6. Pull the brake housing (90) from the gear frame bearing (86). If it is a little "sticky", lightly tap on the rear of the planet gear frame (81) with a plastic hammer to loosen it.
7. Pull the ring gear (88) from the brake housing, if required.
8. Using a bearing puller, remove the gear frame bearing (86).
9. Remove the planet gear shafts (85) by pressing them toward the short hub end of the planet gear frame (81).
10. Do not remove the needle bearings (83 or 87) from the planet gears (82) or planet gear Frame unless you have new bearings on hand for installation. A needle bearing is always damaged during the removal process.

Disassembly of the Throttle Lever and Chain Guide

Refer to Dwgs. MHP3238, and MHP3259.
1. Drive out the limit actuator retaining pin (52) and remove the limit actuator (51).
2. Drive out the throttle lever retaining pin (54).
3. Grasp the square end of the throttle shaft (50) and withdraw it from the Hoist.
4. Unscrew the chain guide screws (11) and remove the chain guide (10).

Disassembly of the Chain Wheel and Chain Guard

Refer to Dwgs. MHP3239, and MHP3259.
1. Remove the brake mechanism. Refer to disassembly of the brake mechanism.
2. Remove the valve chest. Refer to disassembly of the valve chest.
3. Remove the motor. Refer to disassembly of the motor.
4. Remove the gearing. Refer to disassembly of the gearing.
5. Remove the throttle lever and chain guide. Refer to disassembly of the throttle lever and chain guide.
6. Using a soft drift, lightly tap the motor end of the chain wheel (76) to drive it out through the brake end of the Housing.
7. Use a bearing puller to remove the chain wheel bearings (77 and 79).
8. Remove the chain guard retaining screws (13A) and remove the chain guard (13).

Cleaning, Inspection and Repair

Use the following procedures to clean, inspect, and repair the components of the hoist.

Cleaning

⚠ CAUTION

- **Bearings that are loose, worn or rotate in the housing must be replaced. Failure to observe this precaution will result in additional component damage. Do not use tri-chloroethylene to clean parts.**

Clean all hoist component parts in solvent (except for the brake discs). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the gears and frames. If bushings have been removed it may be necessary to carefully scrape old Loctite® from the bearing bores. Dry each part using low pressure, filtered compressed air.

Inspection

All disassembled parts should be inspected to determine their fitness for continued use. Pay particular attention to the following:

1. Inspect all gears for worn, cracked, or broken teeth.
2. Inspect all bushings for wear, scoring, or galling.
3. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft.
4. Inspect all threaded items and replace those having damaged threads.
5. Measure the thickness of the brake discs (95). If the brake discs are less than 0.090 in. (2.29 mm) replace the brake discs (95).
6. Check mufflers (49) for damage or excessive dirt.
7. Check bearings for freeness of rotation and wear. Replace bearings if rotation is rough or bearings are excessively worn.
8. Inspect brake driver bearing wear area on brake driver (92) and in planet gear frame (81) for ridges or galling. If either condition exists replace parts.

Assembly

General Instructions

1. The MLK Hoist is constructed of various modules. The following instructions will first describe how to assemble the individual modules and finally, how to assemble a complete hoist from the assembled modules.
2. Always press on the inner ring of a ball-type bearing when installing the bearing on a shaft.
3. Always press on the outer ring of a ball-type bearing when pressing the bearing in a bearing recess.
4. Always press against the stamped end of a needle-type bearing when installing the bearing in a bearing recess.
5. Whenever grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
6. Always clean and wipe every part (except the brake parts) with a thin film of oil before installation.
7. Never wash sealed bearings in solvent or any other cleaner.

Assembly of the Chain Wheel and Chain Guard

Refer to Dwgs. MHP3239, and MHP3259.
1. Place the Chain Guard (13) in position, and install the two chain guard screws (13A) and lockwashers (13B) at 9.5 - 10.8 Nm (7-8 ft-lbs) torque.
2. Place the chain wheel plain end washer (78) on the plain or short hub of the chain wheel (76).
3. Press the chain wheel plain end bearing (77) on the plain or short hub of the chain wheel until it contacts the chain wheel plain end washer.
4. Slide the chain wheel splined end washer (80) over the splined hub of the chain wheel.
5. Press the chain wheel splined end bearing (79) on the splined hub of the chain wheel until it contacts the washer.

Assembly of the Planet Gear Frame

Refer to Dwgs. MHP3242, and MHP3259.
1. Press a new planet gear bearing (83) into each end of the planet gears (82). Seat each bearing 1/64 in. (0.5 mm) below the face of the gear.
2. Work a liberal amount of **Ingersoll Rand** No. 11 Grease into the bore of the planet gear bearings, making certain that each of the individual needles or rollers are covered.
3. Stand the planet gear frame (81) on the table of an arbor press with its short hub upward.

4. Wipe a thin film of **Ingersoll Rand** No. 11 Grease on both faces of one of the planet gears, and place a planet gear thrust washer (84) against each face. The grease will retain it in position.
5. Slide the planet gear, large diameter upward, and thrust washers into one side of the planet gear frame and press in a planet gear shaft (85).

NOTICE

- **The direction of press is important. The holes in the web of the gear frame are slightly tapered to retain the planet gear shaft. Make certain you press the shafts in from the short hub end of the gear frame.**

6. Install the second Planet Gear with its Thrust Washers.
7. Stand the planet gear frame on its short hub and press the gear frame bearing (86), retainer ring first, onto the long hub.
8. Press the brake driver bearing (87) into the bore of the Planet Gear Frame.
9. Work a liberal amount of **Ingersoll Rand** No. 11 Grease into the bore of the brake driver bearing, making certain that each individual needle or roller is covered.

Assembly of the Motor

Refer to Dwg. MHP3240.
1. Install the motor shaft front retaining ring (75) in the annular groove near the center of the motor shaft (64).
2. Press the front end plate bearing (73) into the front end plate (72), and the rear end plate bearing (66) into the rear end plate (67).
3. Slide the front end plate and bearing, bearing side first, down over the motor shaft until it seats against the motor shaft front retaining ring.
4. Slide the rotor (68) counterbored end first down over the motor shaft until it contacts the front end plate.
5. Place a vane (69) and vane spring (69A) in each vane slot in the rotor.
6. Set the cylinder (70) down over the rotor, aligning the dowel hole in the cylinder with the dowel hole in the front end plate.
7. Slide the rear end plate and bearing, flat side first, onto the hub of the motor shaft until it contacts the cylinder. Align the dowel hole in the rear end plate with the dowel hole in the cylinder.
8. Install the motor shaft rear retaining ring (65) in the annular groove on the end of the motor shaft.
9. Insert a 1/8 in. (3 mm) steel guide rod about 3 in. (76 mm) long through the dowel holes in the end plates and cylinder to maintain alignment of parts, and remove the assembly from the vise.

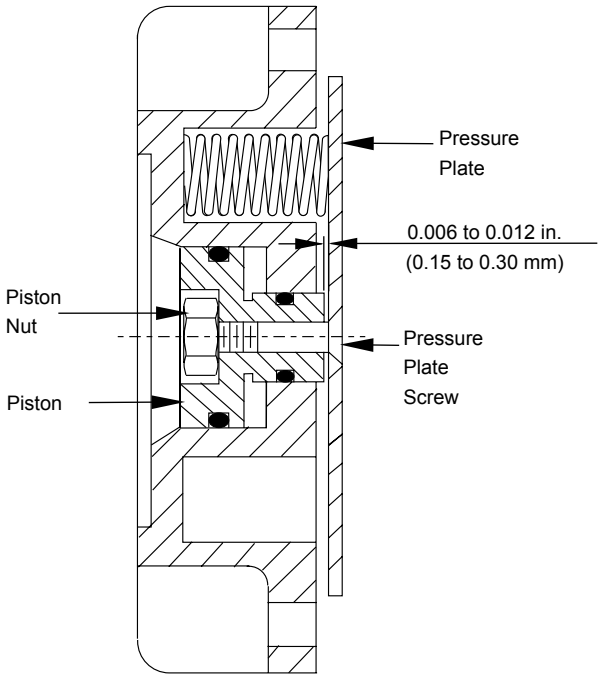
Assembly of the Brake Mechanism

Refer to Dwg. MHP3243.
1. Lightly coat the piston seals (100 and 101) with O-ring lubricant, and install them in their respective grooves on the brake piston (99).
2. Taking care not to cut the seals, slide the piston into the brake spring and piston housing (96).
3. Place the spring and piston housing on the workbench so that the three spring cavities are upward.
4. Place a spring (97) in each cavity.
5. Install the pressure plate screw (98A) so that the screw head enters the counterbore in the pressure plate (98). Place the pressure plate and screw over the springs so that the screw enters the hole in the brake piston.
6. Using a vise, carefully compress the pressure plate against the brake spring and piston housing until the screw or stud protrudes through the piston. Start the piston nut (98B) onto the screw or stud.
7. Remove the assembly from the vise.
8. Tighten the pressure plate screw and piston nut until a 0.006 to 0.012 in. (0.15 to 0.30 mm) gap exists between the pressure plate and piston. See Dwg. MHP0488.

NOTICE

- **Make certain the Piston extends completely through the Spring and Piston Housing and contacts the Pressure Plate.**

9. Place the plate (103) in the recess of the spring and piston housing, and install the plate screws (104) at 2.8 - 3.4 Nm (25- 30 in. lbs) torque.



(Dwg. MHP0488)

Assembly of Valve Chest

Refer to Dwgs. MHP3238, MHP3241, and MHP3245.
1. If the valve chest cover pins (32) were removed, install them in the bottom of the valve chest (14).
2. Apply a thin film of O-ring lubricant to the valve seals (16 and 18) and install them on the valves (15 and 17).

⚠ CAUTION

- **Do not substitute any other O-rings for these Seals.**

3. Install a Valve Spring (19) on the non-tapered end of each Valve and insert the Valves, Valve Spring first, into the openings at the bottom of the Valve Chest. Valves are marked UP or DOWN, to indicate function. The opening in the Valve Chest is marked, either or ↑ ; or↓ UP VALVE or DOWN VALVE. Make certain the proper valve is inserted into the correct opening.
4. Apply a thin film of O-ring lubricant to the valve seat shaft seals (22) and install one seal in each valve seat (20).
5. Apply a thin film of O-ring lubricant to the valve seat seals (21) and install two seals on each valve seat.
6. Align the smaller diameter cross-hole of the valve seat with the threaded hole in the side of the valve chest for the valve seat lock screw (23). With the hub end trailing, install the valve seats in the valve chest.
7. Screw the valve seat lock screws (23) into the valve chest. Make certain they enter the valve seats and torque the screws (23) to 2.7 - 3.1 Nm (24 - 27 in-lb).
8. Using retaining ring pliers and applying pressure to the hub of the valve seat, Install the valve seat retainers (24). Make certain the retainers seat in the grooves of the valve chest
9. If the pistons (26) were separated from the piston shafts (28), apply a thin film of O-ring lubricant to each piston shaft seal (29) and install them in the grooves of the piston shafts.
10. Slide the pistons onto the piston shafts with the small hub of the piston toward the smallest diameter of the shaft. align the cross-hole in each piston with the crosshole in each shaft and install the piston retaining pins (30).
11. Apply a thin film of O-ring lubricant to the piston seals (27) and install one on each piston.
12. Apply a thin coat of O-ring lubricant on the piston cylinder walls and insert the Piston springs (25) into the valve chest against the valve seat retainers.
13. Install the assembled pistons and shafts in the valve chest.
14. Apply a thin coat of O-ring lubricant to the valve chest cover seals (34) and install them in the valve chest cover (33).
15. Align the valve chest cover gasket (31) with the valve chest cover pins and place the gasket against the valve chest.
16. Align the valve cover with the valve chest cover pins and piston shafts and place the cover against the valve chest.
17. Install the six valve chest cover screws (37) and torque them evenly to 9.5- 10.8 Nm (7-8 ft-lbs).
18. Thread the adjustment screw locknuts (36) onto the bleed adjustment screws (35) and install the screws in the valve chest cover.

NOTICE

- **These Screws will require adjustment on Hoists having a pendant control. Refer to adjustment of bleed screws on pendant control models in "INSTALLATION" section of Product Information Manual.**

19. Manually work the piston shafts up and down to ensure there is no binding of parts.

Assembly of Hoist

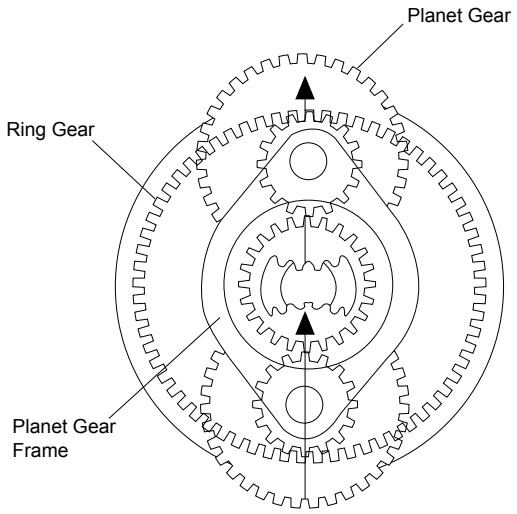
1. Place the chain guard (13) in position in the housing (1), and install the two chain guard screws (13A) and lockwashers (13B) at 9.5 - 10.8 Nm (7-8 ft-lbs) torque.

2. Install the assembled chain wheel (76), small bearing end first, into the brake end of the housing (1). Tap the chain wheel lightly on its trailing end to make certain the plain end bearing (77) is fully seated.
3. Install a brake housing bolt seal (90A) into each of the four bolt holes in the brake housing (90) so that the tapered end of each Seal faces the shoulder side of the brake housing.
4. Align the bolt holes in the flange of the ring gear (88) with the bolt holes in the brake housing, and press the ring gear, flange side first, onto the shoulder of the brake housing.

⚠ CAUTION

- **It is very important that the planet gears (82) and ring gear be aligned when the gear frame assembly is inserted into the ring gear.**

5. Align the gearing as follows:
   a. Stand the ring gear and brake housing upright.
   b. Align the arrows and scribe lines on the faces of the planet gears in a straight line as shown in Dwg. MHP3299.
   c. While maintaining this alignment, insert the gear frame assembly, bearing end first, into the ring gear seating the gear frame bearing (86) in the brake housing.



(Dwg. MHP3299)

6. Apply a thin film of grease on the ring gear gasket (89) and place the gasket on the face of the ring gear.
7. While holding the entire assembly so that the planet gears (82) are aligned with the cutout areas in the housing (1), install the assembly in the housing so that the splined hub of the gear frame engages the splined hub on the chain wheel.
8. Place the motor retaining washer (63) dished (concave) side first, against the front end plate and engage the dowel hole in the washer with the guide rod.
9. While aligning the guide rod with the dowel hole in the bottom of the housing bore, slide the assembled motor into the housing so that the motor shaft (64) passes through the chain wheel and meshes with the planet gears.
10. Withdraw the guide rod from the motor and install the cylinder dowel (71) so tapered end enters first.
11. Insert the Mufflers (49) into the recess in the valve chest plate (46).
12. Place the housing gasket (9) onto the motor end of the housing and install the valve chest plate with the valve chest plate screws (48) at 9.5 - 10.8 Nm (7-8 ft-lbs) torque.
13. Slide the brake driver (92) on the splined end of the motor shaft and install the brake driver retainer (93).
14. Manually, rotate the brake driver several revolutions to make certain the planet gears are properly aligned and properly meshed with the motor shaft and the motor rotates freely.
15. Insert the brake tube (57) in the hole in the boss at the upper right-hand corner of the brake housing and install a brake tube seal (58) on each end of the brake tube.
16. Place a brake plate (94) followed by a brake disc (95), brake plate, brake disc and two brake plates over the brake driver, aligning the notches in the brake plates with the bolt holes in the brake housing and main housing.

NOTICE

- **Brake discs and brake plates must be free from oil and grease. This may cause the brake to slip.**

17. Insert the brake tube housing seal (59) into the hole in the boss of the brake spring and piston housing (96). Install the assembled brake spring and piston housing, making certain that the brake tube enters the hole in the base on the housing. Align the bolt holes in the brake spring and piston housing with those in the brake housing and install the four shoulder bolts (105) and lockwashers (106). Torque to 23 - 27 Nm (17 - 20 ft-lbs).
18. Stand the Hoist upright on the brake end. Place the valve chest gasket (43) on the valve chest plate, making certain that the small flapper is properly positioned in the recess between the two ports.

⚠ CAUTION

- **If the valve chest gasket is flipped over, the flapper will not be in the recess between the two ports, and the brake will not release.**

19. Center the two round rubber discs in corresponding recesses in the valve chest plate.
20. Place the assembled valve chest (14) on the valve chest gasket, and install the valve chest screws (44 and 45) at 9.5 - 10.8 Nm (7-8 ft-lbs) torque.
21. Position the chain guide (10) underneath the chain wheel, and install the chain guide screws (11) at 2.9 - 3.6 Nm (26 - 32 in. lb) torque.
22. Place the throttle shaft spring (56) over one hub of the throttle lever (53) so that the bent leg of the spring is toward the inside of the throttle lever.
23. Hold the throttle lever in the housing recess beneath the chain wheel so that the throttle shaft spring is toward the valve chest end of the Hoist and the legs of the spring engage a rib on the bottom of the chain guide. Place a throttle lever thrust washer (55) at each end of the throttle lever bore, and insert the throttle shaft (50) round end first, through the valve chest plate, housing and throttle lever. Install the throttle lever retaining pin (54). throttle shaft (50) has two cross holes. On MLK hoists ensure throttle lever retaining pin (54) locates in the hole nearest the stepped end of the throttle shaft (50).
24. Place the limit actuator (51) on the square end of the throttle shaft, and install the limit actuator retaining pin (52).
25. Install the two pendant links (223) between the limit actuator and the valve shafts.
26. Apply a thin film of O-ring lubricant to the two swivel inlet seals (40) and install them in the grooves of the inlet nipple (39).
27. Being careful to prevent cutting the seals, push the inlet nipple into the inlet body (38).
28. Apply a thin film of O-ring lubricant to the swivel inlet seal (41) and install the seal on the nipple.
29. Thread the inlet assembly into the top of the valve chest and tighten it at 5.6 - 6.8 Nm (50 - 60 in. lb) torque.
30. Thread the inlet strainer (42) into the inlet body and tighten it.

■ Load Chain Anchoring

1. Chain Anchor Bolt (107) should be torqued to 9.5 - 10.8 Nm (7 - 8 ft-lbs)

■ *Pendant Installation*

⚠ WARNING

- **Disconnect the hoist from the air supply before installing this pendant control kit.**

When installing pendant assembly on an MLK Hoist, a crimping tool or compatible grooving tool must be used to install the clamping sleeve (216) on the either end of the strain relief cable (215).

The strain relief cable (215) must be long enough to allow the pendant hose to hang nearly straight yet short enough to absorb the pendant weight and forces.

When the control hoses are cut to length, the hose at the rear of the handle should extend 6 in. (150 mm) beyond the top clamping thimble. With an MLK-A545A valve chest, the two hoses at the front of the handle should extend 2 in. (51 mm) beyond the top clamping thimble (217).

Install one hose tie (218) above the pendant handle (200) and one hose tie below the clamping thimble (217). Install the remaining hose ties every 2-1/2 feet (0.76 m) between the hose ties at the handle and thimble.

When installing the warning plate (219), ensure the plate can be read from the lever side of the pendant handle.

■ Load Test

Prior to initial use, all new, extensively repaired, or altered hoists shall be load tested by or under the direction of a qualified person, and a written report furnished confirming the rating of the hoist. Dynamically load test hoist to 100% of its rated capacity in accordance with ASME B30.16 standards. Testing to more than 100% may be necessary to comply with standards and regulations set forth in areas outside of the USA.

SERVICE NOTES

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