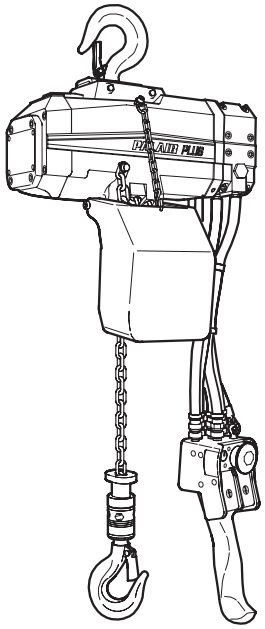
Form MHD56043

PARTS, OPERATION AND MAINTENANCE MANUAL
for
PALAIR PLUS
AIR CHAIN HOIST MODELS
Zinc Plated Load Chain

PAL250K	PAL500K	PAL1000K	PAL1001K	PAL2000K
(0.25 metric tons)	(0.5 metric tons)	(1 metric ton)	(1 metric ton)	(2 metric ton)



(Dwg. MHP2227)

(1 metric ton = 2200 lbs)

READ THIS MANUAL BEFORE USING THESE PRODUCTS. This manual contains important safety, installation, operation and maintenance information. Make this manual available to all persons responsible for the installation, operation and maintenance of these products.

⚠WARNING

Do not use this hoist for lifting, supporting, or transporting people or lifting or supporting loads over people.

Always operate, inspect and maintain this hoist in accordance with American National Standards Institute Safety Code (ASME B30.16), European Security Rules and any other applicable safety codes and regulations.

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Ingersoll-Rand®

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SAFETY INFORMATION

This manual provides important information for all personnel involved with the safe installation, operation and proper maintenance of this product. Even if you feel you are familiar with this or similar equipment, you should read this manual before operating the product.

Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in a hazard. The following signal words are used to identify the level of potential hazard.

⚠ DANGER Danger is used to indicate the presence of a hazard which ***will*** cause ***severe*** injury, death, or substantial property damage if the warning is ignored.

⚠WARNING Warning is used to indicate the presence of a hazard which ***can*** cause ***severe*** injury, death, or substantial property damage if the warning is ignored.

⚠ CAUTION Caution is used to indicate the presence of a hazard which ***will*** or ***can*** cause injury or property damage if the warning is ignored.

NOTICE Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard-related.

Safety Summary

⚠WARNING

• Do not use this hoist or attached equipment for lifting, supporting, or transporting people or lifting or supporting loads over people.
• The supporting structures and load-attaching devices used in conjunction with this hoist must provide an adequate safety factor to handle the rated load, plus the weight of the hoist and attached equipment. This is the customer's responsibility. If in doubt, consult a registered structural engineer.

NOTICE

• Lifting and handling equipment is subject to different regulations in each country. These regulations may not be specified in this manual.

The National Safety Council, Accident Prevention Manual for Industrial Operations, Eighth Edition and other recognized safety sources make a common point: Employees who work near suspended loads or assist in hooking on or arranging a load should be instructed to keep out from under the load. From a safety standpoint, one factor is paramount: conduct all lifting or pulling operations in such a manner that if there were an equipment failure, no personnel would be injured. This means keep out from under a raised load and keep out of the line of force of any load.

Ingersoll-Rand hoists are manufactured in accordance with the latest ASME B30.16 standards.

The Occupational Safety and Health Act of 1970 generally places the burden of compliance with the owner/employer, not the manufacturer. Many OSHA requirements are not concerned or connected with the manufactured product but are, rather, associated with the final installation. It is the owner's and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association, federal, state and local regulations be checked. Read all operating instructions and warnings before operation.

Rigging: It is the responsibility of the operator to exercise caution, use common sense and be familiar with proper rigging techniques. Refer to ASME B30.9 for rigging information, American National Standards Institute, 1430 Broadway, New York, NY 10018.

This manual has been produced by **Ingersoll-Rand** to provide dealers, mechanics, operators and company personnel with information required to install, operate, maintain and repair the products described herein.

It is extremely important that mechanics and operators be familiar with servicing procedures of these products, or like or similar products, and are physically capable of conducting the procedures. These personnel shall have a general working knowledge that includes:

1. Proper and safe use and application of mechanics common hand tools as well as special **Ingersoll-Rand** or recommended tools.
2. Safety procedures, precautions and work habits established by accepted industry standards.

Ingersoll-Rand cannot know of, or provide all the procedures by which product operations or repairs may be conducted and the hazards and/or results of each method. If operation or maintenance procedures not specifically recommended by the manufacturer are conducted, it must be ensured that product safety is not endangered by the actions taken. If unsure of an operation or maintenance procedure or step, personnel should place the product in a safe condition and contact supervisors and/or the factory for technical assistance.

SAFE OPERATING INSTRUCTIONS

The following warnings and operating instructions have been adapted in part from American National (Safety) Standard ASME B30.16 and are intended to avoid unsafe operating practices which might lead to injury or property damage.

Ingersoll-Rand recognizes that most companies who use hoists have a safety program in force in their plants. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

Safe Operating Instructions are provided to make an operator aware of dangerous practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

1. Only allow people trained in safety and operation of this product to operate hoist.
2. Only operate a hoist if you are physically fit to do so.
3. Only allow people trained in safety, maintenance and troubleshooting to perform service on hoists.
4. When a **"DO NOT OPERATE"** sign is placed on the hoist controls, do not operate hoist until sign has been removed by designated personnel.
5. Never use a hoist which inspection indicates is damaged.
6. Do not use hoist if hook latch has been sprung or broken.
7. Check that hook latches are engaged before using.
8. Never splice a hoist chain by inserting a bolt between links.
9. Only lift loads less than or equal to the rated capacity of the hoist. Refer to hoist serial number plate.
10. When using two hoists to suspend one load, select two hoists each having a rated capacity equal to or more than the load. This provides adequate safety in the event of a sudden load shift or failure of one hoist.
11. Never place your hand inside the throat area of a hook.
12. Never use hoist chain as a sling.
13. Only operate a hoist when load chain is centered over the hook. Do not "side pull" or "yard".
14. Never operate hoist with twisted, kinked, "capsized" or damaged load chain.
15. Do not force a chain or hook into place by hammering.
16. Never insert the point of the hook into a chain link.
17. Be certain load is properly seated in saddle of hook.
18. Do not support load on tip of hook.
19. Never run load chain over a sharp edge. Use a sheave.
20. Pay attention to load at all times when operating hoist.
21. Make sure everyone is clear of load path and there are no objects in the way of load. Do not lift a load over people.
22. Never use hoist for lifting or lowering people, and never allow anyone to stand on a suspended load.
23. Ease slack out of chain and sling when starting a lift. Do not jerk the load.
24. Do not swing a suspended load.
25. Never leave a load suspended when hoist is not in use.
26. Never weld or flame cut a load suspended by the hoist.
27. Never use the hoist chain as a welding electrode.
28. Do not operate hoist if chain jumping, excessive noise, jamming, overloading, or binding occurs.
29. Keep the load from hitting the load chain.
30. Do not use the up and down emergency stop limit protection as a normal means of stopping the hoist.
31. Avoid unnecessary jogging of hoist and/or trolley controls.
32. Always rig loads properly and carefully.
33. Shut off air supply before performing any maintenance.
34. Avoid collision or bumping of hoist.
35. After use, or when in a non-operational mode, the unit should be secured against unauthorized and unwarranted use.

WARNING TAG

Each hoist is supplied from the factory with the warning tag shown. If tag is not attached to your hoist, order a new tag and install it. Refer to parts list for part number. Read and obey all warnings and other safety information attached to this hoist. Tag is shown smaller than actual size.

SPECIFICATIONS

General Description

The **Palair Plus** hoist is a lube-free* air powered hoist designed to lift and lower loads. The **Palair Plus** hoist may be hook mounted to the suspension shaft of a trolley or a permanent mounting structure. Using a fixed lug, hoist may also be mounted directly to a trolley. The air supply line can be strung to the hoist using either hose hangers or hose trolleys.

Palair Plus hoists are driven by a lube-free* gear motor connected to a pinion shaft, and planetary reduction gear. Output from the planetary reduction gear drives the load chain sprocket. Pinion shaft is also coupled to the brake discs. The brake is engaged at all times, until the hoist is powered in either the raise or lower direction. System pressure acts on brake piston to release the spring-applied brake during hoist operation.

Hoist top and bottom limit switches are integrated into the hoist body and are activated by buffers attached to the load chain.

Optional overload protection and emergency stop features are designed into the hoist motor assembly. Operation of the emergency stop feature is integrated into the hoist pendant.

* Lube-free means that no lubrication to the supply air is required for these hoists, and therefore no oil mist is exhausted to the atmosphere.

NOTICE

• This edition of the manual incorporates changes covered in supplement MHD56043SUP. Hoists with serial numbers ending in letter E or with serial number 940100 and higher are covered by the information in this manual. The "DESIGN UPDATE SUMMARY" on page 54 is included to allow older hoist versions to be repaired and upgraded.

Model Code Explanation - North American Models

Example: PAL250K-3HD18-6U — **PAL 250 K 3 HD 18 6 U**

Series:

PAL = Palair Chain Hoist

PALP = Palair Premium Chain Hoist

Hoist Capacity:

PAL Models (Zinc plated load chain)

250 = 250 kg (550 lbs)

500 = 500 kg (1100 lbs)

1000 = 1000 kg (2200 lbs)

PALP Models (Nickel Diffused load chain)

250 = 250 kg (550 lbs)

500 = 500 kg (1100 lbs)

1000 = 1000 kg (2200 lbs)

Performance:

K = Standard

Control Pendant:

0 = No Controls

1 = Rope/Chain Control

2 = 1 Motor (hoist only)

3 = 2 Motor (hoist and motorized trolley)

4 = 3 Motor

Suspension:

A = Fixed Lug

B = Bullard Hook

C = Swivel Top Hook

DA = Plain Trolley, rigid mount, 3.25-6.00 inch flange width, tapered or flat

DD = Plain Trolley, rigid mount, 6.01-12.00 inch flange width, tapered or flat

F**A = Geared Trolley, rigid mount, 3.25-6.00 inch flange width, tapered or flat

F**D = Geared Trolley, rigid mount, 6.01-12.00 inch flange width, tapered or flat

HA = Motorized Trolley, rigid mount, 3.25-6.00 inch flange width, tapered or flat

HD = Motorized Trolley, rigid mount, 6.01-12.00 inch flange width, tapered or flat

Hoist Lift:

18 = 18 feet (6 metres)

XX = Specify length in feet

Control Length:

6 = 6 feet (1.8 metres)

XX = Specify length in feet

Options: *

C = Stainless Steel Load Chain

E = Emergency Stop

P = Piped Away Exhaust Kit

R = Copper Plated Corrosion Resistant package

S = Stop Lift (Overload) Protection [must be ordered with option E (Emergency Stop)]

U = Chain Bucket, Canvas

X = Bullard-Burnham Top Hook

Y = Bullard-Burnham Bottom Hook

Z = Self Closing Bottom Hook

Model Code Explanation - European (CE) Models

Example: PAL250K-3HUW3M-2CRX-E — **PAL 250 K – 3 HUW 3M – 7 CR – E**

Series:

PAL = Palair Chain Hoist

Hoist Capacity:

PAL Models (Zinc plated load chain)

250 = 250 kg
500 = 500 kg
1000 = 980 kg**
1001 = 980 kg**
2000 = 2000 kg

Performance:

K = Standard

Control Pendant:

1 = Chain Control (cannot be used on -E Models)
2 = 1 Motor (hoist only)
3 = 2 Motor (hoist and motorized trolley)

Suspension:

A = Fixed Lug
C = Swivel Top Hook
PRU = Plain Trolley, rigid mount, 82-152 mm flange width, universal
PRUW = Plain Trolley, rigid mount, 152-305 mm flange width, universal
GRU = Geared Trolley, rigid mount, 82-152 mm flange width, universal
GRUW = Geared Trolley, rigid mount, 152-305 mm flange width, universal
HU = Motorized Trolley, rigid mount, 82-152 mm flange width, universal
HUW = Motorized Trolley, rigid mount, 152-305 mm flange width, universal

Hoist Lift:

3M = 3 metres (standard)
XX = Specify length in metres

Control Length:

7 = 7 metres (standard)
XX = Specify length in metres

Options:

A = Chain Bucket, 6 metre capacity
B = Chain Bucket, 12 metre capacity
C = Chain Bucket, 24 metre capacity (18 metre capacity for PAL1001K and PAL2000K)
D = Chain Bucket, 36 metre capacity (PAL250K, PAL500K and PAL1000K only)
R = S•COR•E - Spark and Corrosion resistant package (includes: (1) Marine Paint on aluminum area, (2) Zinc plated hooks, attachments and bottom block sprocket (if any), (3) air blows to displace any gas in driving sprocket area, (4) solid bronze wheels and rubber bumpers on trolley)
S = Overload Protection Device
Z = Self Closing Bottom Hook
X = Stainless steel load chain (use of stainless steel derates hoists)
-E = Compliance with European Machinery Directive

PAL1000K and larger units that do not have Option S (overload protection) are derated to 980K; hoists operated above 980K without overload protection do not comply with European Machinery Directive.

* Stainless Steel load chain option is only for derated hoists; standard hoists are provided with zinc plated alloy steel load chain.

** PAL1000K provides SWL 1 ton when ordered with Option S; nominal capacity limited to 980 kg without Option S.

	Model Number					
Specification	**PAL250K**		**PAL500K**		**PAL1000K**	
Load Capacity lb (kg)	550	250	1100	500	2160/2200	980/1000
Falls of load chain	1				2	
Standard length of lift ft (m)	10	3	10	3	10	3
Standard length of pendant ft (m)	6	2	6	2	6	2
Total hoist weight with standard length chain and pendant lb (kg)	33	15	33	15	39.5	18
Weight of chain - 1 ft (0.2 m) of lift lb (kg)	0.36	0.16	0.36	0.16	0.73	0.33

Performance - based on 90 psig (6.3 bar) air pressure

Working pressure: psig (bar)		70-100	5-7	70-100	5-7	70-100	5-7
Min. speed* rated load	Hoisting: ft/min (m/min)	66	20	44	13.5	22	6.8
	Lowering: ft/min (m/min)	75	23	88	27	44	13.5
Max. speed* no load	Hoisting: ft/min (m/min)	98	30	98	30	49	15
	Lowering: ft/min (m/min)	52	16	52	16	26	8
Max. air consumption: scfm (m^3/min)		78	2.2	78	2.2	78	2.2

	Model Number			
Specification	**PAL1001K**		**PAL2000K**	
Load Capacity lb (kg)	2160/2200	980/1000	4400	2000
Falls of load chain	1		2	
Standard length of lift ft (m)	10	3	10	3
Standard length of pendant ft (m)	6	2	6	2
Total hoist weight with standard length chain and pendant lb (kg)	42	19	53	24
Weight of chain - 1 ft (0.2 m) of lift lb (kg)	0.74	0.34	1.49	0.68

Performance - based on 90 psig (6.3 bar) air pressure

Working pressure: psig (bar)		70-100	5-7	70-100	5-7
Min. speed* rated load	Hoisting: ft/min (m/min)	23	7	11	3.5
	Lowering: ft/min (m/min)	43	13	21	6.5
Max. speed* no load	Hoisting: ft/min (m/min)	46	14	23	7
	Lowering: ft/min (m/min)	26	8	13	4
Max. air consumption: scfm (m^3/min)		78	2.2	78	2.2

INSTALLATION

Prior to installing hoist, carefully inspect it for possible shipping damage.
Hoists are supplied from the factory fully lubricated.
Lubricate load chain before operating hoist.

⚠ CAUTION

• Owners and users are advised to examine specific, local or other regulations, including American National Standards Institute and/or OSHA Regulations which may apply to a particular type of use of this product before installing or putting hoist to use.

⚠ WARNING

• A falling load can cause injury or death. Before installing, read "SAFETY INFORMATION".
• The supporting structures and load-attaching devices used in conjunction with this hoist must provide adequate support to handle all hoist operations plus the weight of the hoist and attached equipment. This is the customer's responsibility. If in doubt, consult a registered structural engineer.

Mounting

Ensure hoist is properly installed and personnel are trained in safe operating procedures before placing hoist in service.

Hook Mounted Hoist Installation

Refer to Dwg. MHP0239 on page 9. Place top hook over mounting structure. Ensure hook is large enough to properly fit on structure. Make sure hook latch is engaged. Ensure the supporting member rests completely within the saddle of the hook, and is centered directly above hook shank. Hoist must freely hang from hook without restriction.

⚠ CAUTION

• Supporting member must be positioned on the saddle of the hook. Ensure hoist does not tilt to one side or the other.

Trolley Mounted Hoist Installation

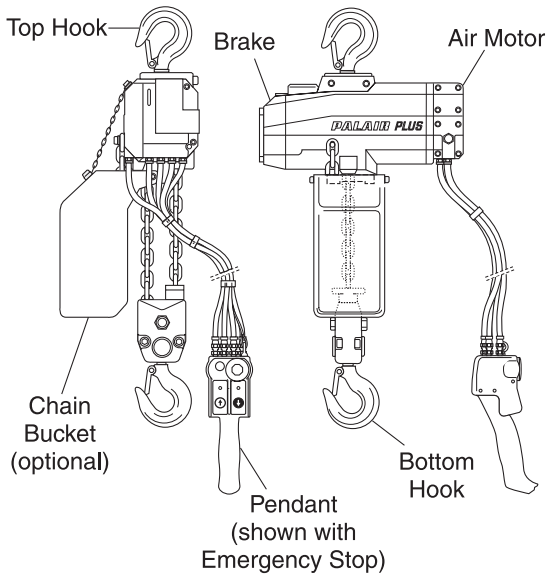
Refer to the trolley manufacturer's installation manual*. Preadjust trolley width for beam flange measurement. Remove rail stop and slide trolley onto end of beam. Reinstall rail stop.

If trolley cannot be installed onto end of beam due to insufficient space or fixed limit stops, trolley may need to be partially disassembled and installed from underneath beam.

*** Trolley Reference Table – Ingersoll-Rand Trolleys**

Trolley Model	Publication Reference
PT	MHD56102
TVP/TVG	MHD56060
TIR	MHD56083
SP/SG	MHD56157

Hoist Components (PAL1000K shown)



(Dwg. MHP0239)

⚠ CAUTION

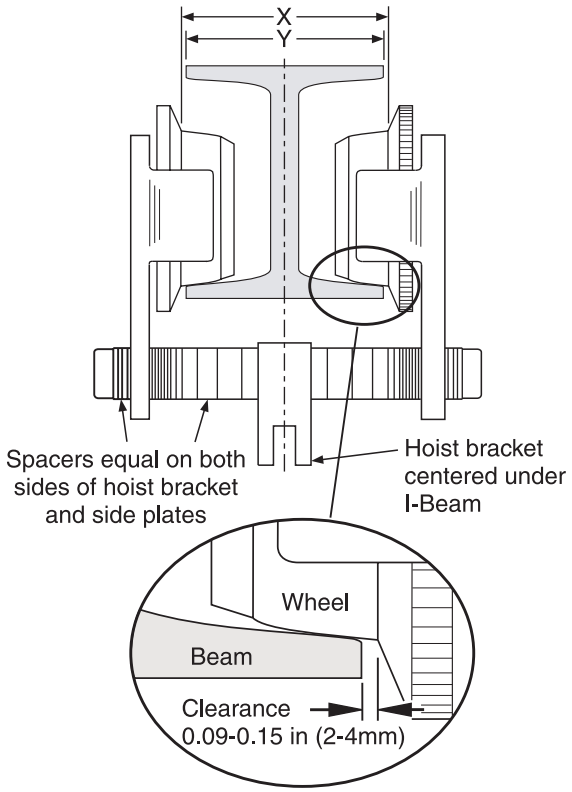
• To avoid an unbalanced load which may damage the trolley, the hoist must be centered under the trolley. Refer to Dwg. MHP1537 on page 10.

NOTICE

• Trolley wheels ride on the top of the lower flange of the beam.

Always follow trolley manufacturer's installation instructions. Typically the total clearance between the beam and trolley wheel flanges is 3/16 to 5/16 in. (4 to 8 mm) when trolley is installed correctly. Refer to Dwg. MHP1537 on page 10. The difference between dimensions 'X' and 'Y' equals the total clearance.

Hoist and Trolley Alignment



(Dwg. MHP1537)

When a trolley is used, check that the trolley side plates are parallel and vertical. Check hoist is centered below trolley. Use equal number of spacers on either side of hoist hanger. Raise a load equal to the rated capacity of the hoist 2-3 in. (50-75 mm) off the floor and operate the trolley along the entire length of the beam.

Ensure beam stops are installed prior to operating trolley.

Air Supply

The air supply must be clean and free from moisture. A minimum of 90 psig (6.3 bar/630 kPa) at the hoist motor inlet is required to provide rated hoist capacity.

Air Lines

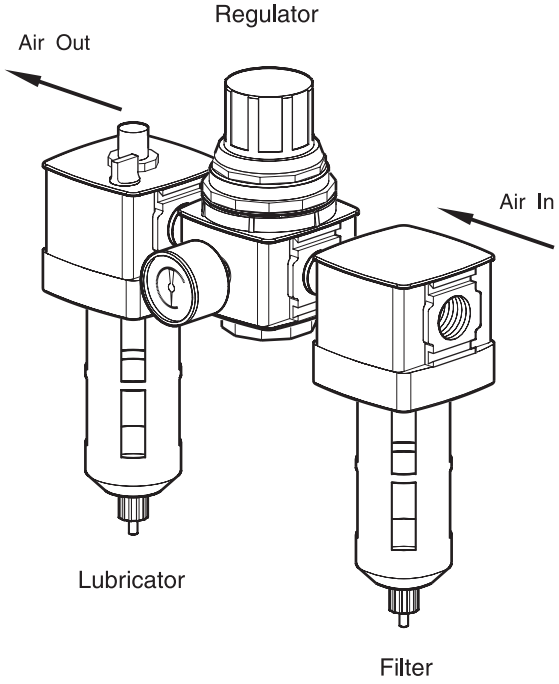
The inside diameter of the hoist air supply lines must not be smaller than 1/2 in. (13 mm) and 7/16 in. (11 mm) for hose fittings. For hoists with motorized trolley, or for supply lengths greater than 30 ft (9 m) the recommended hose diameter is 3/4 in. (18 mm). Before making final connections, all air supply lines should be purged with clean, moisture-free air or nitrogen before connecting to hoist inlet.
Supply lines should be as short and straight as installation conditions will permit. Long transmission lines and excessive use of fittings, elbows, tees, globe valves, etc., cause a reduction in pressure due to restrictions and surface friction in the lines.

Air Line Lubricator (optional)

Refer to Dwg. MHP0191 on page 10. **Palair Plus** lube-free hoists may be operated without lubrication. If a lubricator is used, replenish daily and adjust to provide 3 drops per minute of ISO VG 100 (SAE 30W) oil (minimum viscosity 135 Cst at 104° F (40° C)) at maximum hoist operating speed.

⚠ CAUTION

• Shut off air supply before filling air line lubricator.



(Dwg. MHP0191)

Air Line Filter

Refer to Dwg. MHP0191 on page 10.
It is recommended that an air line strainer/filter be installed within 3 ft (1 m) of the motor to prevent dirt from entering the motor. The strainer/filter should provide 20 micron filtration and include a moisture trap. Clean strainer/filter periodically, as indicated by the operating environment, to maintain its operating efficiency.

Moisture in Air Lines

Moisture that reaches the air motor through the supply lines is the chief factor in determining the length of time between service overhauls. Moisture traps can help to eliminate moisture and other methods, such as an air receiver which collects moisture before it reaches the motor or an aftercooler at the compressor that cools the air prior to distribution through the supply lines, are also helpful.

Motor

For optimum performance and maximum durability of parts, operate air motor within the operating specifications provided in the “SPECIFICATIONS” section. The air motor should be installed as near as possible to the compressor or air receiver.

Overload Device (optional feature)

Overload protection is integrated into the motor body and is standard on -E* versions. The overload system is based on detection of the difference in air pressure between inlet and outlet ports. It consists of a valve which is normally closed. The valve senses pressure at motor inlet and outlet and compares the difference between the two pressures to the index value established by spring adjustment. A difference in pressure greater than index value causes emergency stop to activate, exhausts air to atmosphere and stops hoist. Overload protection is factory pre-set to 120% of the safe working load (SWL).

* 1000K hoists provided in CE countries must be ordered with Overload Protection to maintain hoist rating.Without overload protection, hoists are derated to 980K units. Refer to 'Model Code Explanation' in "SPECIFICATIONS" section on page 5.

Load Chain

Ensure chain is lubricated before operating hoist. Use **Ingersoll-Rand** LUBRI-LINK-GREEN® or ISO VG 220 (50W SAE) oil.

⚠ WARNING

• Failure to maintain clean and well lubricated load chain will affect life of chain resulting in premature wear and can cause chain failure. If visual inspection indicates excessive chain wear inspect load bearings and sheaves. Refer to "INSPECTION" section.

Chain Container

Refer to Dwg. MHP1988 on page 11 and MHP2190 on page 50.

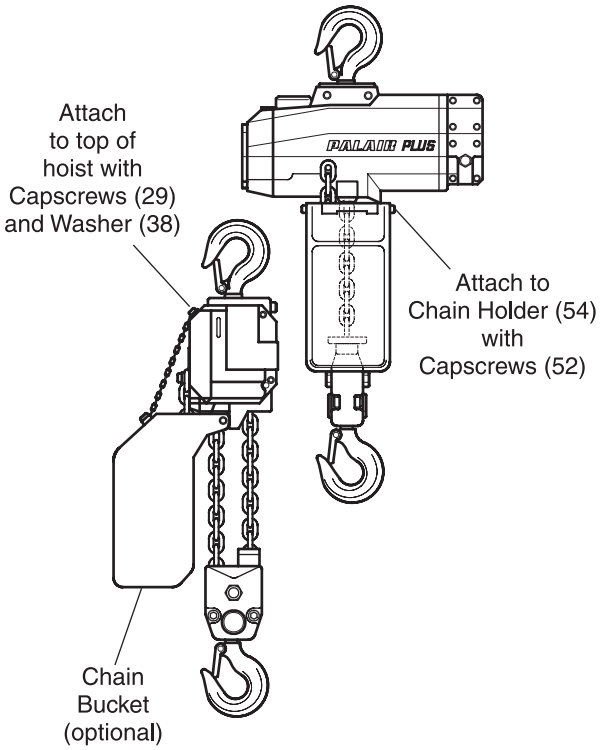
⚠ CAUTION

• Ensure chain container does not contact load chain or hook.
• Do not pile chain carelessly in chain container. Piling chain carelessly into container by hand may lead to kinking or twisting that will jam the hoist.

Run load chain to lowest point, attach chain container to hoist.

1. Check chain bucket label to make sure length of load chain (195) is within capacity of chain bucket. Replace with a larger chain bucket, if required.
2. Attach chain container to chain using capscrew, washer and nut or 'S' hook provided with container. Connect chain to hoist body using capscrew (29) and washer (38).
3. Align holes in container with chain holder (54) and secure with capscrews (52).
4. Run hoist in up direction to feed chain back into container.

Chain Container Installation



(Dwg. MHP1988)

Limit Stop

1. On hoists without a chain bucket, slide buffer and washer onto chain.
2. Install limit stop as described under "Load Chain Replacement" in the "MAINTENANCE" section.
3. Run hoist slowly in the "DOWN" direction to verify limit stop activates cutout.

Pendant

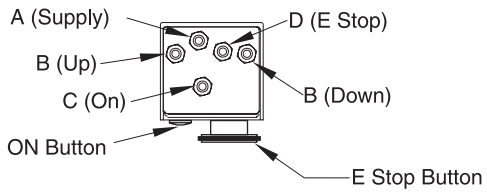
Refer to Dwg. MHP1299 on page 12.

1. Check all hose connections are tight and that hoses are not twisted or crimped. Ensure hoses are correctly installed.

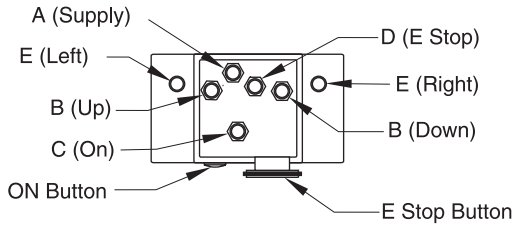
⚠ WARNING

• Disconnect air supply before performng any maintenance.

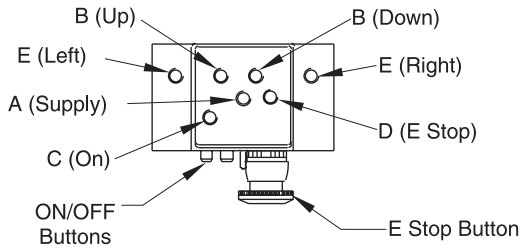
Single Motor Pendant PHS2D(-U) (Top View)
New Style (on hoists supplied after 31 Dec. 1997)



Two Motor Pendant PHS4D(-U) (Top View)
New Style (on hoists supplied after 31 Dec. 1997)



Two Motor Pendant PHS4C(-U) (Top View)
Old Style (on hoists supplied before 31 Dec. 1997)



(Dwg. MHP1299)

2. Check strain relief wire is firmly secured to hoist motor cover (5) and to pendant body with lifting eye (501).

⚠ CAUTION

• To avoid damaging pendant hose, make sure strain relief cable, *not pendant hose*, is supporting weight of the pendant.

Storing the Hoist

1. Always store the hoist in a no load condition.
2. Wipe off all dirt and water.
3. Oil chain, hook pins and hook latch.
4. Place in a dry location.
5. Plug hoist air inlet port.
6. Before returning hoist to service follow instructions for 'Hoists not in Regular Service' in the "INSPECTION" section.

OPERATION

The four most important aspects of hoist operation are:
1. Follow all safety instructions when operating hoist.
2. Allow only people trained in safety and operation on this hoist to operate the hoist.
3. Subject each hoist to a regular inspection and maintenance procedure.
4. Be aware of the hoist capacity and weight of load at all times.

⚠WARNING

• Always operate, inspect and maintain this hoist in accordance with any applicable safety codes and regulations.

Operators must be physically competent. Operators should have no health condition which might affect their ability to react, and they must have good hearing, vision and depth perception. The hoist operator must be carefully instructed in his duties and must understand the operation of the hoist, including a study of the manufacturer's literature. The operator must be aware of proper methods of hitching loads and should have a good attitude regarding safety. It is the operator's responsibility to refuse to operate the hoist under unsafe conditions.

Initial Operating Checks

Hoists are tested for proper operation prior to leaving the factory. Before the hoist is placed into service the following initial operating checks should be performed.
1. After installation of trolley mounted hoists, check to ensure hoist is centered below trolley.
2. Check for air leaks in the supply hose and fittings to pendant, and from pendant to motor.
3. When first running hoist or trolley motors, a small amount of non-detergent, light oil should be injected into inlet connection to allow good lubrication.
4. When first operating hoist and trolley it is recommended that motors be driven slowly in both directions for a few minutes.
5. Operate trolley along the entire length of beam.
6. Check operation of limit devices.
7. Check that trolley (if equipped) and hook movement are same direction as arrows or information on pendant control.
8. Check hoist is securely connected to overhead crane, monorail, trolley or supporting member.
9. Check load is securely inserted in hook, and that hook latch is engaged.
10. Raise and lower a light load to check operation of hoist brake.
11. Check hoist operation by raising and lowering a load equal to the rated capacity of hoist a few inches (centimeters) above floor.
12. Check hoist is directly above load. Do not lift load at an angle (side pull or "yard").
13. Inspect hoist and trolley performance when raising, moving and lowering test load(s). Hoist and trolley must operate smoothly and at rated specifications prior to being placed in service.

⚠WARNING

• Only allow personnel trained in safety and operation of this product to operate hoist and trolley.
• Hoist is not designed or suitable for lifting, lowering or moving persons. Never lift loads over people.
• The hook latch is intended to retain loose slings or devices under slack conditions. Caution must be used to prevent latch from supporting any of the load.

Hoist Controls

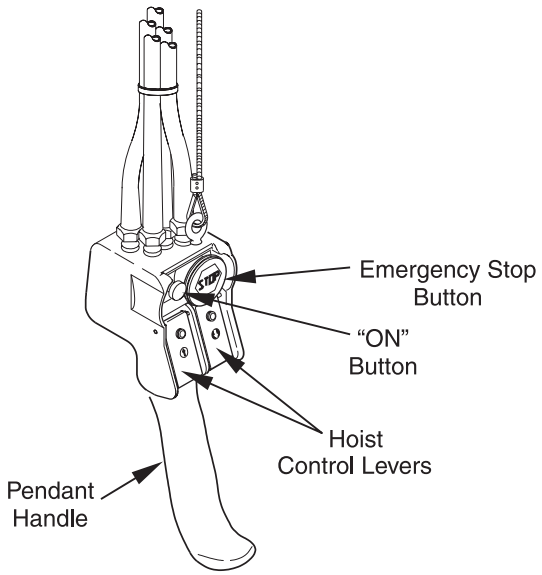
Hoist operation is controlled by either pendant or rope (chain) control. Careful movement of pendant levers or rope (chain) will allow infinitely variable up and down speeds. Hoists supported by a powered trolley require a four lever pendant control.

Pendants

Pendants allow operator to remotely control the positioning of loads from a distance, thereby allowing exact positioning of the load in a controlled and efficient manner.

The two lever pendant is the standard pendant provided with the Palair Plus hoist and is designed to provide hoist operation only. The pendant control throttle uses two separate levers for hoist operation. Direction of hook travel is controlled by whichever lever is depressed. Refer to Dwg. MHP1649 on page 13.
1. To operate hoist, press the "UP" or "DOWN" control lever. Hoist speed is determined by amount lever is depressed. Depress operating lever as necessary to achieve desired operating speed.

2 Lever Pendant (shown with optional Emergency Stop)

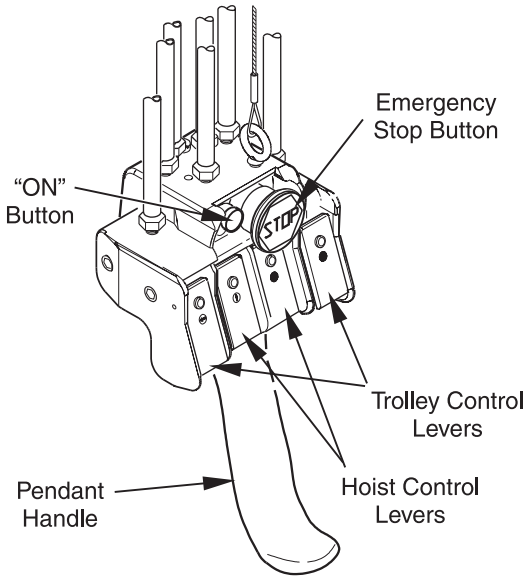


(Dwg. MHP1649)

Four lever pendants provide a single station for operation of hoist and a motor driven trolley.
The pendant control throttle uses the two inside levers for hoist operation and the two outside levers for trolley operation. Direction of travel is controlled by whichever lever is depressed. Refer to Dwg. MHP1547 on page 14.

1. To operate hoist, press the “UP” or “DOWN” control lever. To operate trolley, press the “RIGHT” or “LEFT” control lever. Operating speed is determined by amount lever is depressed. Depress operating lever as necessary to acheive desired operating speed.

4 Lever Pendant (shown with optional Emergency Stop)



(Dwg. MHP1547)

Emergency Stop (optional feature)
The Emergency Stop button, when activated, will immediately stop all hoist and trolley operation.
The Emergency Stop button remains depressed after activation and must be reset to operate hoist or trolley.
To reset pendant Emergency Stop button rotate Emergency Stop button clockwise until button releases and spring returns to original position. Depress ‘ON’ button.

Rope (Chain) Control (optional feature)

The rope (chain) control provides the operator with a local hoist operating station. The following directions are as viewed from motor end of hoist, facing the rope (chain) control.
1. To lift load, pull down on right rope (chain).
2. To lower load, pull down on left rope (chain).
3. Pull rope (chain) to full travel for maximum speed. Pull rope (chain) partially for slower speeds.
4. To stop hoist, release rope (chain).

Hooks

There are three hooks available for use.

Standard Hook

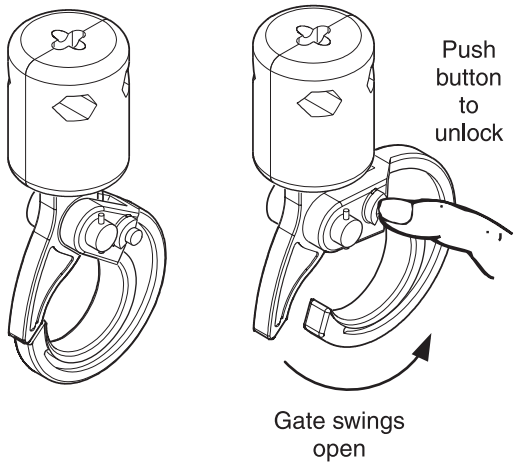
Spring actuated gate latch automatically returns to rest against hook tip when lifting support is seated in hook saddle.

Gate Hook

Refer to Dwg. MHP1736 on page 14.
To lock: close the gate. A recessed pin engages to lock the shank in place when the hook is closed.

To unlock: depress button. Swing hook shank away.

Hook Operation



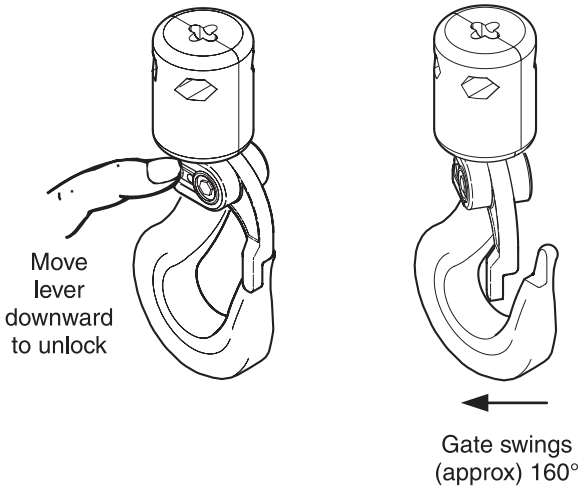
(Dwg. MHP1736)

Bullard Hook

Refer to Dwg. MHP2213 on page 14.
To lock: close the gate; a stainless steel pin is mounted in a horizontal bore which passes through the gate and engages a notch milled in the hook shank.

To unlock: move lever downward a quarter-turn or until it stops; the gate can now swing open 160° (approx).

Hook Operation



(Dwg. MHP2213)

INSPECTION

⚠WARNING

• All new or repaired equipment should be inspected and tested by personnel trained in safety, operation and maintenance of this equipment to ensure safe operation at rated specifications before placing equipment in service.
• Never use a hoist that inspection indicates is damaged.

Frequent and periodic inspection should be performed on equipment in regular service. Frequent inspections are visual examinations performed by personnel trained in safety and operation of this equipment and include observations made during routine equipment operation. Periodic inspections are thorough inspections conducted by personnel trained in safety, operation and maintenance of this equipment. ASME B30.16 states inspection intervals depend upon the nature of the critical components of the equipment and the severity of usage.

Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before the condition results in a hazard.

Deficiencies revealed through inspection, or noted during operation, must be reported to designated personnel trained in safety, operation and maintenance of this equipment. A determination as to whether a condition constitutes a safety hazard must be decided, and the correction of noted safety hazards accomplished and documented by written report before placing the equipment in service.

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 on the condition of critical parts as a method of documenting **periodic** inspections. These reports should be dated, signed by the person who performed the inspection, and kept on file where they are readily available for review.

NOTICE

• During assembly/disassembly visually inspect each component for distortion, wear and damage. Replace items indicating damage, distortion and/or excessive wear. Proper use, inspections and maintenance will increase the life and usefulness of your Ingersoll-Rand equipment.

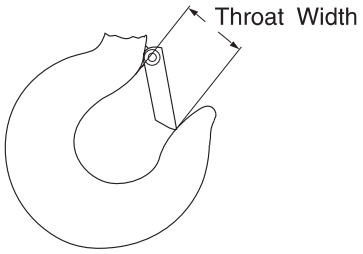
Load Chain Report

Records should be maintained as part of a long-range load chain inspection program. Records should include the condition of load chain removed from service. Accurate records will establish a relationship between visual observations noted during frequent inspections and the actual condition of load chain as determined by periodic inspections.

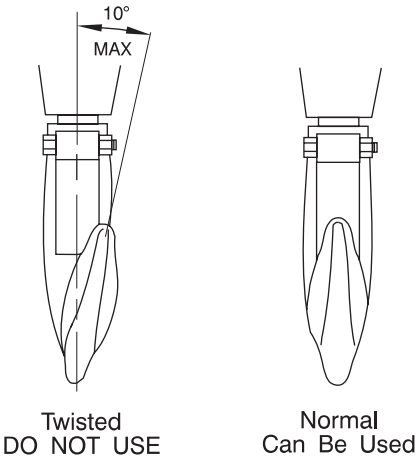
Frequent Inspection

On hoists in continuous service, frequent inspection should be made at the beginning of each shift. In addition, visual inspections should be conducted during regular service for evidence of any damage or malfunction.

1. OPERATION. Check for visual signs or abnormal noises (grinding etc.) which could indicate a problem. Make sure all controls function properly and return to neutral when released. Check chain feed through the hoist and bottom block. If chain binds, jumps, is excessively noisy or “clicks”, clean and lubricate the chain. If problem persists, replace the chain. Do not operate hoist until all problems have been corrected.
2. UPPER AND LOWER LIMIT DEVICE. Test operation with no load. Upward travel must stop when stop buffer on chain contacts hoist limit switch.
3. HOOKS. Check for wear or damage, increased throat width, bent shank or twisting of hook. Replace hooks with 15% increase in throat width. Refer to Dwg. MHP0040 on page 15. Replace hooks with 10° twist. Refer to Dwg. MHP0111 on page 15. If the hook latch snaps past the tip of hook, the hook is sprung and must be replaced. Replace Bullard Burnham hooks if the gate no longer contacts the hook tip. Refer to Dwg. MHP0662 on page 16. Review the latest edition of ASME B30.10 “HOOKS” or additional information. Check hook support bearings for lubrication and indication of wear or damage. Ensure they swivel easily and smoothly.



(Dwg. MHP0040)



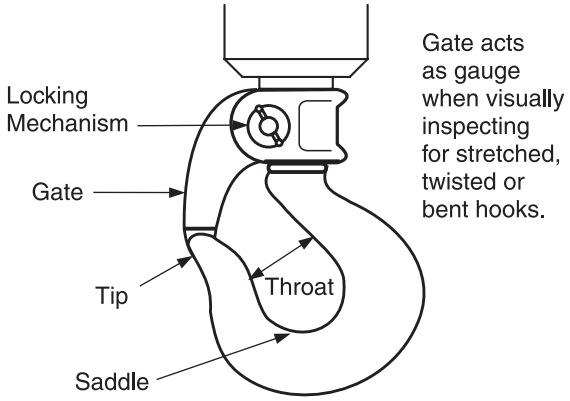
(Dwg. MHP0111)

Table 1

Hoist Capacity	Throat Width *		Discard Width	
	in.	mm	in.	mm
Standard Hooks				
250 kg	1.06	27	1.22	31.05
500 kg				
1000 kg				
1001 kg				
2000 kg	1.26	32	1.45	36.8
Bullard Burnham Hooks				
250 kg	1.25	31.75	1.44	36.5
500 kg				
1000 kg				
1001 kg				
2000 kg	Contact Factory			
Gate Hooks				
250 kg	1.4	35.6	1.61	40.9
500 kg				
1000 kg				
1001 kg				
2000 kg	Contact Factory			

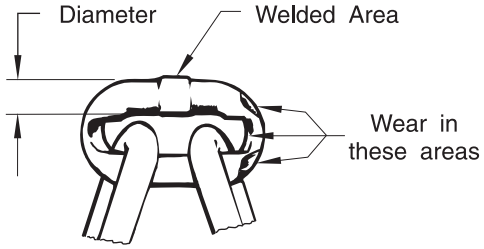
* Dimensions are based on throat width opening with a hook latch or gate in place

Bullard Burnham Hook



(Dwg. MHP0662)

4. CHAIN. Examine each chain link for bending, cracks in weld areas or shoulders, traverse nicks and gouges, weld splatter, corrosion pits, striation (minute parallel lines) and chain wear, including bearing surfaces between chain links. Refer to Dwg. MHP0102 on page 16. Replace a chain that fails any of the inspections. Check chain lubrication and lubricate if necessary. Refer to 'Load Chain' in "LUBRICATION" section.



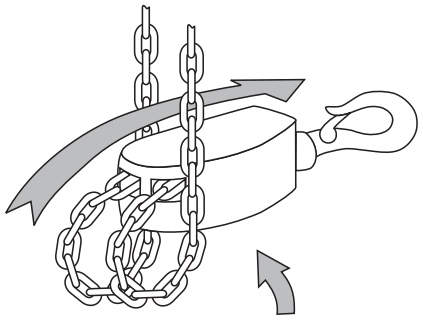
(Dwg. MHP0102)

NOTICE

• Excessive wear or stretching may not be apparent from visual observation. Inspect chain by measuring eleven link sections in accordance with instructions under "Periodic Inspection". A worn load chain may cause load sheaves and sprocket to wear rapidly. Inspect load sheaves and sprocket and replace if damaged or worn.

5. CHAIN REEVING. Ensure welds on standing links are away from load sheave. Reinstall chain if necessary. Make sure chain is not capsized, twisted or kinked. Adjust as required. Refer to Dwg. MHP0043 on page 16.

Capsized Hook



Make certain the bottom block has NOT been flipped through the chain falls

(Dwg. MHP0043)

Periodic Inspection

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

NORMAL	HEAVY	SEVERE
yearly	semiannually	quarterly

Disassembly may be required as a result of frequent inspection findings or in order to properly inspect the individual components. Disassembly steps are described in the "MAINTENANCE" section. Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in "Frequent Inspection." Also inspect the following:

1. FASTENERS. Check retainer rings, rivets, cotter pins, capscrews and nuts on hook, chain bucket and hoist body. Replace if missing or damaged. 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, chain sprockets, 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 SHEAVES AND SPROCKET. Check for damage or excessive wear. Replace if necessary. Observe the action of load chain feeding through hoist. Do not operate a hoist unless load chain feeds through hoist and hook block smoothly and without audible clicking or other evidence of binding or malfunctioning.

5. MOTOR. If performance is poor, disassemble motor and check for worn gearing, bearings and shafts. Parts should be cleaned, lubricated and reassembled. Replace worn or damaged parts.
6. BRAKE. Raise a load equal to the rated capacity of hoist a few inches (centimeters) off floor and check ability of hoist to hold load without excessive drift. If excessive drift occurs, disassemble. Check brake disc lining thickness per 'Disc Brake Inspection and/or Replacement' in "MAINTENANCE" section.

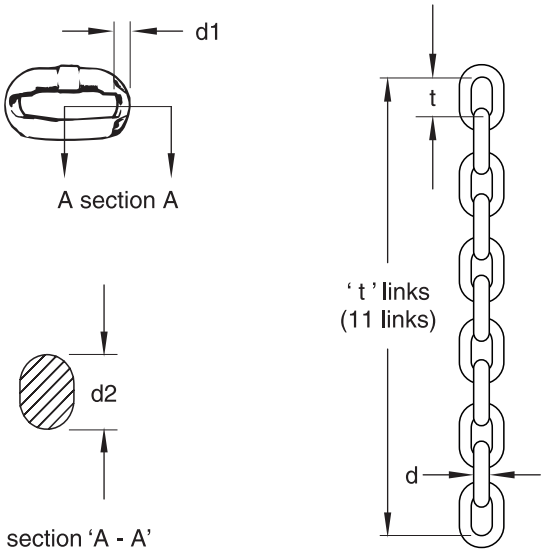
⚠ WARNING

• A falling load can cause injury or death. To keep brake from slipping, do not get lubricant on the brake disc.

7. SUPPORTING STRUCTURE. Check for distortion, wear and continued ability to support load.
8. TROLLEY (if equipped). Check trolley wheels track beam properly and trolley is correctly adjusted in accordance with manufacturer's literature. Check that wheels are not excessively worn and inspect side plates for spreading due to bending. Do not operate hoist until problems have 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 stop buffers are correctly installed and functional.
11. LOAD CHAIN. Measure chain for stretching by measuring across eleven link sections all along chain, paying particular attention to most frequently reeved links. When any eleven links in working length reaches or exceeds discard length, replace entire chain. Refer to Table 2 and Dwg. MHP0802 on page 17. Always use a genuine **Ingersoll-Rand** replacement load chain.

⚠ CAUTION

• The chain must be replaced when measurements exceed those listed in Table 2. Hoist load sheave and chain must be checked for wear at same time, and when necessary, be replaced. Do not weld on or to the chain.



(Dwg. MHP0802)

12. CHAIN CONTAINER. Check for excessive wear and that chain container is securely attached to hoist. Replace if necessary.
13. LIMIT SWITCH. Check limit switches function correctly.

Hoists Not in Regular Use

1. A hoist which has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming with the requirements of "Frequent Inspection" before being placed into service.
2. A hoist which has been idle for a period of over six months shall be given a complete inspection conforming with the requirements of "Periodic Inspection".
3. Standby hoists shall be inspected at least semiannually in accordance with the requirements of "Frequent Inspection". If abnormal operating conditions apply hoists may require a more frequent inspection.

Table 2

Model No.	Chain Size (New)						Discard Length					
	'd'		Single 't' links		11 't' links		Single 't' links		11 't' links		* 'dm'	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
PAL250K	0.197	5	0.591	15	6.50	165	0.597	15.18	6.57	167	0.177	4.5
PAL500K												
PAL1000K												
PAL1001K	0.276	7	0.827	21	9.09	231	0.835	21.21	9.18	168.7	0.248	6.3
PAL2000K												

* Average link diameter wear 'dm'
Measurement of chain link diameter 'dm' = (d1 + d2)/2; ('dm' minimum = 0.9 x 'd')

INSPECTION AND MAINTENANCE REPORT

Ingersoll Rand
Palair Series Air Chain 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 Parts, Operation and Maintenance Manual "INSPECTION" section for 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 Sheave/ Sprocket					
Chain Guides			- - -		
Brake			- - -		
Covers					
Controls					
Limit Switch					
Motor					
Hooks:			- - -		
Top	Actual Hook Throat Width:____inches/____mm (refer to Table 1 on page 16 for minimum/maximum acceptable widths).				
	Hook Twist			- - -		
	Hook Crack Test Method Used: Dye Penetrant ____ Magnetic Particle ____ Other: _____				
Bottom	Actual Hook Throat Width:____inches/____mm (refer to Table 1 on page 16 for minimum/maximum acceptable widths).				
	Hook Twist			- - -		
	Hook Crack Test Method Used: Dye Penetrant ____ Magnetic Particle ____ Other: _____				
Hook Latch				- - -		
Load Chain:				- - -		
	Working length(s) maximum stretch: _____ inches / _____ mm (refer to Table 2 on page 17)				
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 is 125% of rated safe working load (SWL). Testing to more than 125% of rated load may be necessary to test overload device. This page may be photocopied and used by inspectors or maintenance personnel.

LUBRICATION

Lubrication Schedule

To ensure continued satisfactory operation of the hoist, all points requiring lubrication must be serviced with the correct lubricant at the proper time intervals indicated for each assembly. Correct lubrication is one of the most important factors in maintaining efficient operation.
The time intervals recommended in Table 3 are based on hoist intermittent operation of the hoist eight hours each day, five days per week in a normal environment. If the hoist is operated almost continuously, or for more than eight hours each day, or under severe (dirt, chemical fumes, etc.) conditions, more frequent lubrication will be required.

Table 3

Component	Lubrication Frequency by Usage Level		
	Severe	**Heavy**	**Normal**
Geared Trolley Wheels	Monthly	Quarterly	Yearly
Load Chain	Daily	Weekly	When Used
Hook and Hook Latch	Daily	Weekly	When Used
Gear Case	Yearly	Every 3 Years	Unnecessary

Lubricant types and change intervals are based on operation in an environment relatively free of dust, moisture and corrosive fumes. Use only those lubricants recommended. Approval for the use of other lubricants must be obtained from your **Ingersoll-Rand** Technical Support Department or distributor. Failure to observe this precaution may result in damage to the hoist and/or the associated components.
Whenever a hoist is disassembled for overhaul, inspection or replacement of parts, lubricate as follows.

Load Chain

⚠ WARNING

• Failure to maintain clean and well lubricated load chain will result in rapid load chain wear that can lead to chain failure which can cause severe injury, death or substantial property damage. If visual inspection indicates excessive chain wear inspect sprocket and chain wheel. Refer to "INSPECTION" section on page 15.

1. Lubricate each link of load chain weekly. Apply new lubricant over existing layer.
2. In severe applications or corrosive environments, lubricate more frequently than normal.
3. Lubricate hook and hook latch pivot points with same lubricant used on load chain.
4. If required, clean chain with acid free solvent to remove rust or abrasive buildup and lubricate the chain.
5. Use **Ingersoll-Rand** LUBRI-LINK-GREEN® or ISO VG 220 (SAE 50) EP oil.

Gear Case

The gear case is packed with grease on assembly.
Whenever hoist is serviced, remove old grease and replace with new. Use a good quality EP2 grease with a dropping point of 302° F (250° C) with minimum viscosity 1100 SSU at 100° F (38° C).

⚠ CAUTION

• Amount of grease in gear case must not exceed 2 ounces (60 grams).

Air Line Lubricator

If equipped, the air line lubricator should be replenished daily and set to provide 3 drops per minute of ISO VG 100 (SAE 30W) oil with minimum viscosity 135 Cst at 104° F (40° C) at maximum hoist operating speed.

Hook and Hook Latch

1. Lubricate hook and hook latch pivot points. Hook and latch should swivel/pivot freely.
2. Use **Ingersoll-Rand** LUBRI-LINK-GREEN® or ISO VG 220 (SAE 50) EP oil.
3. Lubricate hook bearings by applying several shots of grease from a grease gun to the grease fittings provided on the hook blocks.

Trolley

Optional feature. Refer to manufacturer's literature for lubrication information.
Grease wheel bearings (if not sealed bearings) and wheel drive gear with **Ingersoll-Rand** No. 68 Grease or a standard No. 2

TROUBLESHOOTING

This section provides basic troubleshooting information. Determination of specific causes to problems are best identified by thorough inspections performed by personnel instructed in safety, operation and maintenance of this equipment. The chart below provides a brief guide to common winch symptoms, probable causes and remedies.

SYMPTOM	CAUSE	REMEDY
Hoist will not operate.	No air supply to hoist, or too little PSI (bar/kPa) or CFM (m^3/min).	Check PSI (bar/kPa) at hoist inlet. Refer to "SPECIFICATIONS" section for correct CFM (m^3/min) and PSI (bar/kPa). Check connections; Tighten if necessary.
	Pendant lever sticking.	Check pendant lever and restore free movement.
	Pendant malfunction.	Check air to and from pendant. Minimum operating pressure in pendant line is 60 psig (4 bar/200 kPa).
	Emergency Stop activated.	Reset Emergency Stop. Refer to "OPERATION" section.
	Hoist is overloaded.	Reduce load to within rated capacity.
	Motor is damaged.	Repair or replace. Refer to "MAINTENANCE" section.
	Limit switch sticking.	Check limit switch. Clean and lubricate if required.
	Brake is not releasing.	Remove end cover and inspect brake piston 'O' rings. Check brake release circuit.
Load continues to move when hoist is stopped. 'UP' direction.	Pendant lever sticking.	Check pendant lever and restore free movement.
Load continues to move when hoist is stopped. 'DOWN' direction.	Pendant lever sticking.	Check pendant lever and restore free movement.
	Brake is slipping.	Check brake spring washers and brake disc lining. Refer to "MAINTENANCE" section.
	Hoist is overloaded.	Reduce load to within rated capacity.
Hoist will not lift rated capacity.	Hoist is overloaded.	Reduce load to within rated capacity.
	Motor is damaged.	Check for worn motor bearings.
	Brake is not releasing.	Remove end cover and inspect brake piston 'O' rings. Check brake release circuit.
	No air supply to hoist, or too little PSI (bar/kPa) or CFM (m^3/min).	Check PSI (bar/kPa) at hoist inlet. Refer to "SPECIFICATIONS" section for correct CFM (m^3/min) and PSI (bar/kPa). Check connections; Tighten if necessary.
Hook lowers, but will not raise.	Hoist is overloaded.	Reduce load to within rated capacity.
	No air supply to hoist, or too little PSI (bar/kPa) or CFM (m^3/min).	Check PSI (bar/kPa) at hoist inlet. Refer to "SPECIFICATIONS" section for correct CFM (m^3/min) and LSI (bar/kPa). Check connections; Tighten if necessary.
	Pendant malfunction.	Check air to and from pendant. Minimum operating pressure in pendant line is 60 psig (4 bar/400 kPa)
Load chain jumps on sheave or is making a snapping sound.	Worn or rusted chain.	Refer to "INSPECTION" section to determine wear limit. Replace if necessary.
	Incorrect chain.	Replace with correct chain.
	Worn sprocket, sheave or chain guide.	Replace worn parts.
	Capsized hook.	Refer to 'Hooks' in "INSPECTION" 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.
	No oil on load chain.	Lubricate load chain.

Trolley Trolley will not stop or trolley wheels slip.*	Damaged beam.	Repair or replace beam.
	Too much oil or grease on track of beam.	Clean off oil or grease.

* Refer to manufacturer's literature for additional information on trolley.

⚠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 people trained in safety and maintenance 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 to service. Testing to more than 100% may be necessary to test overload device or 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.

Maintenance Intervals

The Maintenance Interval Chart is based on intermittent operation of equipment for eight hours each day, five days per week. If equipment is in operation for more than eight hours a day or is operated in severe applications or environments, more frequent maintenance should be performed.

INTERVAL	MAINTENANCE CHECKS
Start of each shift	Make a thorough visual inspection of the hoist for damage. Do not operate hoist if damage is found. Check operation of brake.
6 Months	Inspect disc brake friction linings. Clean or replace parts as required. Lubricate brake spring washers.
Annually	Inspect gearing, shafts, and bearings for damage or wear. Check all supporting members, including trolley, if used.

Disc Brake

Adjustment

No brake adjustment is required. If brake fails to hold load or does not function properly replace brake discs.

Brake Friction Disc Replacement

Refer to Dwg. MHP1989 on page 32.
To check or replace brake friction disc (88) use the following procedure.

1. Loosen four capscrews (36) one turn at a time progressively round cover (97) until brake spring load is relaxed. Remove capscrews (36).
2. Remove cover (97), spring washers (96) and brake disc (95).
3. Pull brake friction disc (88) from pinion (75).
4. Inspect brake friction disc (88). Replace if damaged, worn or soaked with oil or grease.
5. Check brake friction disc thickness. Refer to Dwg. MHP0231 on page 21.

NOTICE

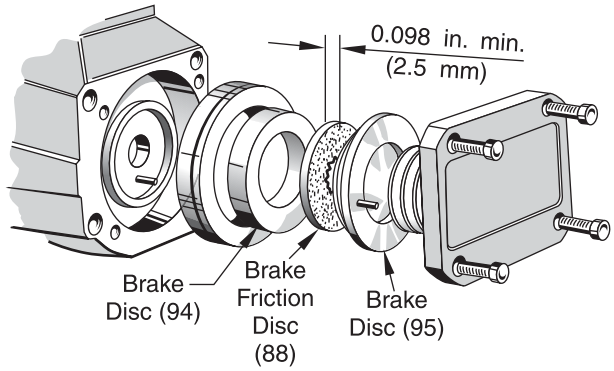
• When any part of brake friction disc thickness measures 0.098 in. (2.5 mm) or less, brake friction disc must be replaced.
• Check brake friction disc for oil or grease contamination. If oil or grease are present replace brake friction disc.

6. Remove brake disc (94) and piston (86). Remove 'O' rings (87) and (93). Discard 'O' rings. Install new 'O' rings (87) and (93). Install piston (86) and brake disc (94).
7. Install brake friction disc (88). Align to locate brake friction disc on pinion (75) splines.
8. Install brake disc (95). Place spring washers (96) on brake disc starting with a dished surface toward brake disc (95). Alternate springs (96) (dished up/dished down). Install cover (97).
9. Align pin (89) in brake disc (95) with hole in cover (97). Secure cover (97) with capscrews (36). Tighten capscrews progressively, in a crossing pattern to evenly compress cover onto housing.

⚠CAUTION

• Brake will not operate properly if there is oil or grease on brake disc.

Brake Friction Disc Thickness



(Dwg. MHP0231)

Overload Device

Refer to Dwg. MHP1302 on page 22 and MHP2192 on page 36.

NOTICE

• Do not change factory settings. If overload requires adjustment as a result of repair, it is recommended that settings be adjusted and certified at an authorized repair facility.

Overload is factory preset at 20% above hoist rated safe working load (SWL). Do not set overload for quantities greater than this setting. The overload spring tension determines pressure at which overload activates to stop hoist operation. Increase spring tension to raise overload setting; decrease to lower overload setting.

To adjust setting use the following procedure:

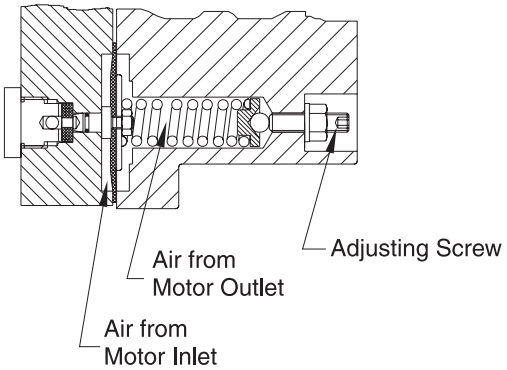
1. Attach a certified test load (not to exceed 20% maximum of the SWL) to hoist. Operate hoist in raise direction. If overload is properly adjusted, load should not raise, hoist should not operate.
2. To adjust, loosen locknut (153) and turn adjusting screw (151) as necessary to increase or decrease the SWL. Turning adjusting screw clockwise increases SWL setting; counterclockwise decreases SWL setting. It is recommended that minor adjustments to setting be made, the locknut be engaged and hoist tested. Repeat adjustments as required.

NOTICE

• When hoist does not shut off, and load raises, the overload SWL has been exceeded. Back adjusting screw (counterclockwise direction) out 1/4 turn and recheck.

3. When completed, ensure locknut is tight and check hoist operation at rated load.

Overload Adjustment



(Dwg. MHP1302)

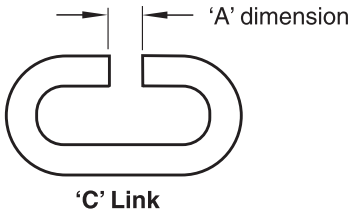
Load Chain

Making a 'C' Link

⚠ CAUTION

• When cutting weld side of a chain link, do not cut or nick opposite side. A damaged link must be replaced to prevent premature failure. A falling chain can cause injury.

1. Using an abrasive wheel or hacksaw, cut a section from weld side of first or last link of chain as shown in Dwg. MHP0817 to the dimension shown in 'C' Link Dimension Table. Use a 'C' link which is the same size as the chain being replaced.



(Dwg. MHP0817)

'C' Link Dimension Table

Hoist Model	Chain Size	'A' Dimension	
	mm	inches	mm
PAL250K	5.0 x 15	0.24	6
PAL500K			
PAL1000K			
PAL1001K	7.0 x 21	0.32	8
PAL2000K			

Load Chain Replacement

Refer to Dwg. MHP0267 or MHP0473 on page 23.

NOTICE

• This procedure replaces load chain on hoist that has not been disassembled for maintenance or repair. To reinstall load chain on hoists that have been reassembled after maintenance or repair refer to 'Load Chain Installation' on page 28.
• On PAL1000K (double fall) hoists the total number of chain links must be an even number to ensure chain is not twisted.
• Prior to installing new load chain, ensure chain is properly lubricated. Refer to "LUBRICATION" section.

⚠ CAUTION

• Welds on load chain can damage hoist sprocket and hook block wheel. Ensure chain welds locate away from hoist sprocket and double fall block wheel. Refer to Dwg. MHP0267 on page 23.

It may not be possible to detect chain wear by casual observation. Chain is case hardened and once the case hardening is worn through, wear will progress rapidly and the strength of the chain will be considerably reduced. Further, the chain will no longer fit correctly in the chain sprocket or block wheel, greatly increasing the chance of malfunction and chain breakage.

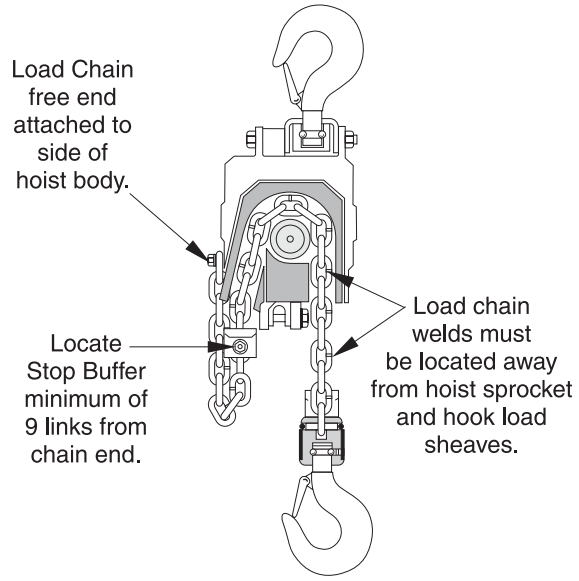
The chain sprocket and block wheel will outlast several load chains if chain is inspected and replaced as recommended. Use of a worn chain will cause sprocket and block wheel to wear rapidly. If chain is visibly damaged, inspect chain sprocket, chain guide and block wheel. Replace worn parts.

1. Hoist must be installed and connected to air supply. Reduce air pressure to 60 psi (414 kPa/4 bar).
2. Remove chain bucket, if used.
3. Remove hook.
   a. On single fall hoists refer to Dwg. MHP1730 on page 40. Remove retainer wire (189), hook ring (188) and hook anchor pin (187).
   b. On double fall hoists refer to Dwg. MHP1989 on page 32. Remove capscrew (59) and washer (57) connecting load chain to bottom of hoist body. Pull chain through hook assembly.
4. Note location of chain buffer (194) assembly (raise/hook end) by counting number of chain links from end of load chain.
5. Remove nut (192), capscrew (191) and buffer ring (193). Slide chain buffer off of chain.
6. Operate hoist in raise direction until load chain free end is approximately 2 feet (60 cm) from hoist.
7. Connect 'C' link to last link of old chain and first link of new chain.

⚠ CAUTION

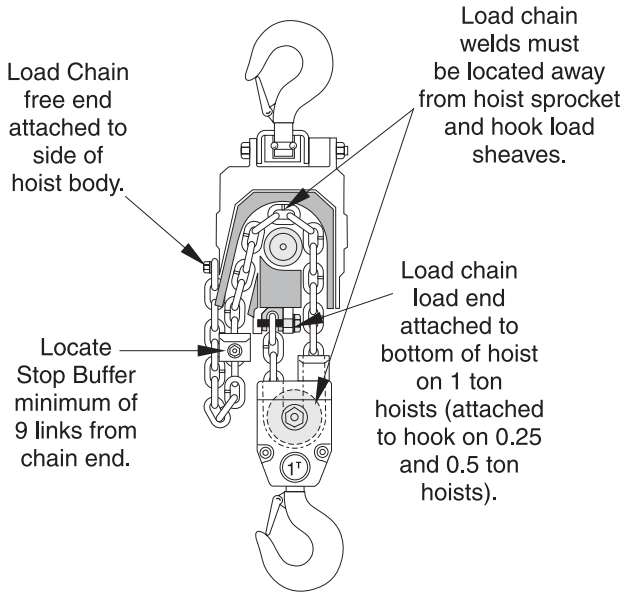
• Verify that old chain is installed with chain link welds located away from hoist sprocket. Refer to Dwg. MHP0267 or MHP0473 on page 23. Attach new chain to 'C' link with welds arranged the same way as on old load chain.

Load Chain Installation Specifications - Single Fall Hoists



(Dwg. MHP0473)

Load Chain Installation Specifications - Double Fall Hoists



(Dwg. MHP0267)

8. Operate hoist slowly in raise direction until 2 to 3 feet (60 to 90 cm) of new chain has passed through hoist. Remove 'C' link.
9. Remove capscrew (36) and washer (45) attaching old load chain to side of hoist body.
10. Note location of chain buffer assembly (raise/hook end) by counting number of chain links from end of load chain. Remove nut (192), capscrew (191) and buffer ring (193). Slide chain buffer off of chain.
11. Install chain buffers on new load chain. Locate as noted during removal from old load chain. Coat capscrew threads with Loctite® 242. Secure with nut (192), capscrew (191) and buffer ring (193).
12. On hook end of load chain, the offset shoulder of buffer (194) must be toward hose connection end of hoist. The buffer actuates the raise limit switch.
    a. On hoist end of load chain, install buffer (194) with offset shoulder of buffer nearest bottom of hoist motor. This buffer activates lower limit switch.

⚠ CAUTION

• Locate chain stopper on hoist end (lower limit switch) at least chain links from end of load chain.

13. On hoist end (lower limit switch) coat capscrew threads with Loctite® 242. Secure end of load chain to hoist body using capscrew (36) and washer (45).
14. On hook end of load chain install hook:
    a. On single fall hoists, install hook support (186), hook anchor pin (187), hook ring (188) and retainer wire (189).
    b. On double fall hoists, feed chain end with a nylon string into the assembled hook block. Ensure chain welds locate away from block wheel (201). Attach end of load chain to bottom of hoist body. Coat capscrew threads with Loctite® 242. Secure end of load chain to hoist body using capscrew (59) and washer (57).
15. Observe chain and hoist while operating hoist in both directions. Hoist should operate smoothly without sticking, binding and without audible clicking noises.

General Disassembly

The following instructions provide the necessary information to disassemble, inspect, repair, and assemble the hoist. Parts drawings of hoist assembly are provided in Parts Section. If a hoist is being completely disassembled for any reason, follow the topic order as presented.
It is recommended that all maintenance work on hoist be performed on a bench in a clean dust free work area. In the process of disassembling hoist, observe the following:

1. Never disassemble hoist any further than is necessary to accomplish needed repair. A good part can be damaged during the course of disassembly.
2. Never use excessive force when removing parts.Tapping gently around perimeter of a cover or housing with a soft hammer, for example, is sufficient to break seal.
3. Do not heat a part with a flame to free it for removal, unless the part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

In general, the hoist is designed to permit easy disassembly and assembly. The use of heat or excessive force should not be required.

4. Keep work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals and 'O' rings should be discarded once they have been removed. New seals and 'O' rings should be used when assembling hoist.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect surface of part and help prevent distortion. This is particularly true of threaded members, machined surfaces and housings.
7. Do not remove any part which is press fit in or on a subassembly unless removal of that part is necessary for repairs or replacement.

Disassembly

NOTICE

• Prior to disassembly, check the serial number of hoist. Hoists with serial numbers prior to 940100 or NOT ending in the letter E may require additional parts to complete repairs and upgrade hoist. Refer to "DESIGN UPDATE SUMMARY" on page 54.

Load Chain Removal

1. Hoist must be installed and connected to air supply. Reduce air pressure to 60 psi (414 kPa/4 bar). Operate hoist in lower direction until 2 to 3 feet (60 to 90 cm) of chain remains.
2. Remove chain bucket, if used.
3. Disconnect hoist end of load chain from side of hoist body by removing capscrew (36) and washer (45).
4. Note location of chain stopper assembly (lower/hoist end) by counting number of chain links from end of load chain. Remove nut (192), capscrew (191) and buffer ring (193). Slide chain buffer (194) off of chain.
5. Operate hoist in lower direction until load chain feeds completely through hoist.

⚠ CAUTION

• When chain is removed, turn off air supply system and disconnect air supply line from hoist before beginning hoist disassembly. It is recommended that hoist be placed in a clean work area before disassembling.

Motor Disassembly

Refer to Dwg. MHP2191 on page 34.

1. Disconnect airlines from fittings (327) located on motor cover (5).
2. Remove capscrews (4) attaching motor cover (5) to gear casing (39).
3. Tap on motor cover to loosen, then gently pry motor cover from gear casing. Take care not to score inside face of motor cover or gear casing. Remove motor as an assembly. Remove coupling (60) from pinion (75).
4. Remove four capscrews (31) from motor flange (26) end of assembly.
5. Tap on motor flange and motor cover to loosen, then gently pry motor flange and motor cover from motor housing (19). Take care not to score mating face of motor flange, motor cover or motor housing. Remove motor flange and gear assembly. Remove and discard 'O' rings (25).
6. Remove motor cover. Separate and collect the two stops (9), four pins (10), two 'O' rings (11), two 'O' rings (12) and two 'O' rings (17). Discard 'O' rings.
7. Place a nonabrasive rod between driving gear (24) and idle gear (23) gear teeth to prevent rotation. Remove nuts (28).
8. Tap on ends of driving gear and idle gear at motor flange (26) end to separate from bearings (27) and motor flange.
9. Separate and collect the two pins (10) and four 'O' rings (25). Discard 'O' rings.
10. Remove bearings (27) from motor flange.
11. On Precision Speed models, remove spacer (113).
12. To separate idle gear assembly parts, remove retainer ring (20). Remove bearing (8).
13. Remove 'O' ring (15), slide valve (16) and spring (18) from housing (19).
14. To separate drive gear assembly parts repeat step 12 on drive gear (24). Drive gear has a splined end on the motor flange side of gear.

Disassemble Emergency Stop: Refer to Dwg. MHP2192 on page 36. Emergency Stop is housed in motor cover (5).

15. Remove capscrews (132) and cover (130). Remove 'O' ring (129) from cover and discard.
16. Remove spring (128).
17. Remove capscrews (119), (120) and (121) securing cover (122) to motor cover (5).
18. Remove diaphragm (134).
19. Secure valve cone (135) to remove capscrew (127).
20. Remove valve cone (126), washer (137) and seal (124) from cover (130) side of assembly.
21. Remove seal (124), washer (137) and spacer (138) from cover (122) side of assembly.

Disassemble Overload: Refer to Dwg. MHP2192 on page 36. Overload is housed in motor cover (5).

22. Remove locknut (153) and washer (152). Turn adjusting screw (151) counterclockwise to loosen and remove. Remove ball (149).

23. If not accomplished in step 17, remove capscrews (119), (120) and (121) securing cover (122) to motor cover (5).
24. Remove 'O' ring (25), clamp (143), diaphragm (144), washer (145) and nut (146) as an assembly. Remove 'O' ring (25) from clamp and discard.
25. Remove spring (147) and spring receiver (148).

Brake Disassembly

Refer to Dwg. MHP1989 on page 32.
1. Loosen four capscrews (36) one turn at a time progressively round cover (97) until brake spring load is relaxed. Remove capscrews (36).
2. Remove cover (97), spring washers (96) and brake disc (95).
3. Pull brake friction disc (88) from pinion (75).
4. Inspect brake friction disc (88). Replace if damaged, worn or soaked with oil or grease.
5. Check brake friction disc thickness. Refer to Dwg. MHP0231 on page 21 and 'Brake Friction Disc Replacement' on page 21.

NOTICE

• When any part of brake friction disc thickness measures 0.098 in. (2.5 mm) or less, brake friction disc must be replaced.
• Check brake friction disc for oil or grease contamination. If oil or grease are present replace brake friction disc.

Hoist Disassembly

Refer to Dwg. MHP1989 on page 32.
1. Remove motor and brake assemblies as previously described.
2. Remove capscrews (29), pull out tubes (32) and screen (33) from gear casing (39). Reposition hoist in a vertical position with motor end down.
3. Remove capscrews (92) and pry brake cover (90) and gasket (77) from gear casing (39). Lift off spring washer (83).
4. Pull piston (86) with 'O' rings (87) and (93) from brake cover (90). Remove pin (85).
5. Pry bearing (78) from planet carrier (67).
6. Set hoist in a horizontal position and from motor end of gear casing (39) carefully tap on the end of pinion (75) to remove planet assembly.
7. Remove retainer ring (82) and tap out pinion (75).
8. If planet assembly requires disassembly slide out planet pins (73) and separate planet gears (69), spacers (72) and bearings (68) from planet carrier (67).
9. Remove ring gear (76) from gear casing.

NOTICE

• Ensure load chain is removed before attempting to remove sprocket (63).

10. Remove retainer ring (40) from motor side and tap on sprocket from brake end of gear casing (39) to drive out sprocket (63), bearing (43) and ring (42).
11. Lift out ring gear (65) and bearing (66).
12. Remove retainer ring (40) from gear casing (39) bore and tap out bearing (43) and ring (42).
13. Loosen capscrews (52) in chain holder (54). Tap out pins (46) and remove chain holder (54) with chain guide stop (53).
14. Remove shafts (34) from gear casing (39) and slide out chain guide (50).

2 Lever Pendant Disassembly

Refer to Dwg. MHP1544 or MHP1558 on page 44.
1. Remove fittings (327) and lifting eye (501).
2. Unscrew plugs (518). Remove springs (517) and balls (516).
3. Tap out pin (502) and remove levers (503).
4. Remove setscrews (515) from pendant handle (514).
5. Remove valve assemblies (506) and (509). Ensure 'O' rings (511) and (505) are removed with valve assemblies. Discard 'O' rings.
6. Remove plug (507) or emergency stop valve (508) from pendant handle (514).
7. Remove retainer ring (512) and exhaust washer (513).

4 Lever Pendant Disassembly

Refer to Dwg. MHP1545 or MHP1577 on page 46.
1. Remove fittings (327) and lifting eye (501).
2. Unscrew plugs (518). Remove springs (517) and balls (516).
3. Remove capscrews (525) and (527) and washers (526) from attachment (left) (523). Remove attachment (left) taking care not to damage pin (529). Separate pin (529), lever (522) and 'O' rings (528) from attachment (left). Discard 'O' rings.
4. Repeat step 3 for attachment (right) (524).
5. Tap out pin (502) and remove levers (503).
6. Remove valve assemblies (506) and (509). Ensure 'O' rings (511) and (505) are removed with valve assemblies. Discard 'O' rings.
7. Remove plug (507) or emergency stop valve (508) from pendant handle (514).
8. Remove retainer ring (512) and exhaust washer (513).

Cleaning, Inspection and Repair

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

Cleaning

⚠ CAUTION

• Bearings that are loose or worn must be replaced. Failure to observe this precaution will result in additional component damage.
• Do not use trichloroethylene to clean parts.

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

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 shaft.
4. Inspect all threaded items and replace those having damaged threads.
5. Inspect brake friction disc for oil. If brake friction disc is oil soaked, replace brake friction disc. If brake friction disc is glazed, sand it lightly using fine emery cloth.
6. Measure thickness of brake friction disc. If brake friction disc (88) is less than 0.098 in. (2.5 mm), replace.
7. Check screen (33), filter (3) and silencer (37) for damage or clogging caused by excessive dirt.

Repair

Actual repairs are limited to the removal of small burrs and other minor surface imperfections from gears and shafts. Use a fine stone or emery cloth for this work.

1. Worn or damaged parts must be replaced. Refer to the applicable Parts Listing for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any part which is in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
3. Smooth out all nicks, burrs, or galled spots on shafts, bores, pins, or bushings.
4. Examine all gear teeth carefully, and remove nicks or burrs.
5. Polish the edges of all shaft shoulders to remove small nicks which may have been caused during handling.
6. Remove all nicks and burrs caused by lockwashers.

Assembly

NOTICE

• Prior to assembly, check serial number of hoist. Hoists with serial numbers prior to 940100 or NOT ending in the letter E may require additional parts to effect repairs and upgrade hoist. Refer to "DESIGN UPDATE SUMMARY" on page 54.

Hoist Assembly

Refer to Dwg. MHP1989 on page 32.

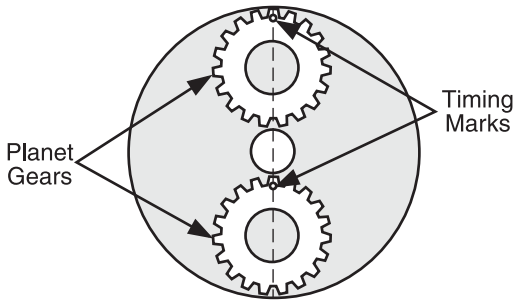
1. Install ring (42) in gear casing (39) so it is positioned just below retainer ring groove on brake side. Install retainer ring (40). Tap bearing (43) into ring (42) from motor side of gear casing (39). Extreme care is required during this operation to ensure bearing (43) remains square and ring (42) is not damaged.
2. Install second ring (42) and bearing (43) on sprocket (63). Slide chain guide (50) into gear casing (39). Tap or press sprocket (63) assembly into gear casing (39) from motor side.
3. Install retainer ring (40) at motor side.
4. Install shafts (34) in gear casing (39). Ensure shafts locate in holes in chain guide (50).
5. Position hoist vertically with motor end down. Lubricate and install 'O' ring (64) in groove on outside of ring gear (65). Install ring gear (65) on spline of sprocket (63).
6. Install bearing (66) on sprocket (63).
7. Install load chain. Refer to 'Load Chain Installation' procedures in the "MAINTENANCE" section on page 28.
8. Assemble chain guide stop (53) to chain holder (54). Apply Loctite® 243 to capscrew (58) threads and secure parts with capscrews (58) and washers (56). Install assembled chain holder in bottom of gear casing (39) with pins (46). Apply Loctite® 243 to capscrew (52) threads and tighten capscrews (52) to secure pins (46).
9. Install pinion (75), bearing (80), and retainer rings (70) and (82) in planet carrier (67).

NOTICE

• Planet gear assembly maintenance should be limited to general cleaning and greasing of planet gears (69) and bearings (68). If planet gear assembly was removed during hoist disassembly it will be necessary to correctly adjust planet gear alignment.

10. Assemble planet assembly so planet gears (69) mesh with pinion (75). Position planet gears (69) so "0" marks engraved on planet gears are in line. Refer to Dwg. MHP0242 on page 27.
11. Install assembled planet assembly with pinion (75) in gear casing (39).
12. Install ring gear (76) with notches outward.
13. Install bearing (78) on planet carrier (67).

Timing Gear Mark Locations



(Dwg. MHP0242)

14. Install gasket (77) on brake cover (90). Place spring washer (83) on bearing (78) with dished side toward bearing. Lubricate gear casing. Refer to "LUBRICATION" section on page 19.
15. Lubricate 'O' rings (79) and (102) and quad ring (84) and install in brake cover (90). Install pin (55) in brake cover (90).
16. Apply thin coat of silicone sealant to gear casing (39) and brake cover (90) mating surfaces. Install new 'O' rings (87) and (93) on piston (86). Install piston (86) and brake disc (94).
17. Install brake friction disc (88). Align to locate brake friction disc on pinion (75) splines.
18. Install brake disc (95). Place spring washers (96) on brake disc starting with a dished surface toward brake disc (95). Alternate springs (96) (dished up/dished down). Install cover (97).
19. Align pin (89) in brake disc (95) with hole in cover (97). Secure cover (97) with capscrews (36). Tighten capscrews progressively, in a crossing pattern to evenly compress cover onto housing.
20. Position hoist vertically with the brake end down. Set screen (33) in motor side of gear casing (39) and loosely secure with capscrews (29). Install tubes (32) through screen (33) until they are fully seated. Tighten capscrews (29). Install coupling (60) on pinion (75).
21. Install motor assembly and secure with capscrews (4).
22. Install silencer (37) in gear casing (39) with capscrew (104).

Motor Assembly

Refer to Dwg. MHP2191 on page 34.

NOTICE

• If motor assembly has been disassembled for inspection or repair it is recommended that it be reassembled using a good quality silicone seal between housing sections. Silicone seal must be allowed to cure for 3 hours before attempting to pressurize motor.

1. Place two pins (10) and 'O' rings (25) on motor flange (26).
2. Press bearings (27) into motor flange (26).
3. Press idle gear (23) into bearing (27) located at top of motor flange.
4. Align splines of idle gear and drive gear (24) and press drive gear into bearing (27) located at bottom of motor flange. Drive gear is splined on end. Place splined end through bearing (toward hoist side).
5. On Precision Units, slide spacer (113) between idle and drive gear and motor flange.
6. Using a nonabrasive tool to prevent drive and idle gear from turning, install nuts (28) to secure gears to bearings.
7. Install (in order) in housing (19). First install 'O' ring (15) on slide valve (22). Then install slide valve (22), spring (18), and slide valve (16).
8. Install bearings (8) on idle and drive gear shafts. Secure with retainer rings (20).
9. Place thin coat of silicone sealant on mating surface of motor housing (19). Slide motor housing over gears, aligning pins (10) with holes in motor housing. Press, or tap housing fully onto motor flange (26).
10. Place stops (9), 'O' rings (12) and pins (10) on motor cover (5). Place 'O' rings (11) and (17) on motor housing.
11. Align pins (10) with holes in motor housing and press, or tap motor cover onto motor housing. Secure assembly using capscrews (31).

Assemble Emergency Stop: Refer to Dwg. MHP2192 on page 36. Emergency Stop is housed in motor cover (5).

12. Place seal (124), washer (137) and valve cone (126) on capscrew (127). Install assembly in motor cover (5) from cover (130) side.
13. Install spacer (138), washer (137) and seal (124) on capscrew (127) from cover (122) side.
14. Screw valve cone (135) on capscrew to clamp components together.
15. Install 'O' ring (129) on cover (130). Install spring (128) and cover (130) on motor cover (5). Secure by evenly tightening capscrews (132).
16. Install diaphragm (134).

If not assembling overload, go to step 17. If overload assembly is required, skip step 17.

17. Install cover (122) and secure with capscrews (119), (120) and (121).

Assemble Overload: Refer to Dwg. MHP2192 on page 36. Overload is housed in motor cover (5).

18. Install 'O' ring (25) on clamp (143). Place diaphragm (144) and washer (145) on clamp (143) and secure with nut (146).
19. Install spring receiver (148), spring (147) and clamp (143) assembly in motor cover (5) from cover (122) side.
20. Install cover (122) and secure with capscrews (119), (120) and (121). Install spacer (141) and plug (140).
21. From opposite side of motor cover (5), install ball (149), adjusting screw (151), washer (152) and locknut (153).

⚠ CAUTION

• Overload requires adjusting to ensure it is set to prevent hoist load lifts greater than 20% of safe working load (SWL). Refer to 'Overload Adjustment' in "MAINTENANCE" section on page 22 prior to placing hoist in service.

22. Place thin coating of silicone sealant on mating surfaces of motor cover and gear housing (39). Lubricate splines of coupling (60) and drive gear (24). Install coupling (60) on pinion (75). Aligning drive gear splines to coupling install motor assembly onto gear housing. Secure in place with capcrews (4).
23. Pendant strain relief cable (557) is attached to motor cover (5) by sliding cable into hole and securing with setscrew (2).

Load Chain Installation

⚠ CAUTION

• Do not attempt to install load chain by powering hoist.
• Ensure welds of load chain links locate away from hoist sprocket. If welds contact sprocket excessive wear will occur and can cause hoist failure resulting in injury and/or property damage.

NOTICE

• Load chain must be installed before assembling brake to hoist. Lubricate load chain before installing.

Refer to Dwg. MHP1989 on page 32, and Dwgs. MHP1730 and MHP1731 on page 40 for part item number reference. The following directions assume hoist is on a work bench with exposed pinion end of brake end of hoist on left hand side. Refer to Dwg. MHP0241 on page 28.

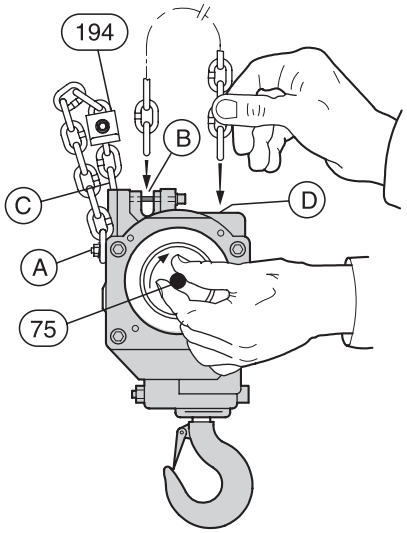
1. Insert first link in chain guide slot 'D' closest to operator such that link is parallel to pinion (75). Ensure welded side of second chain link faces away from sprocket (63).
2. Rotate pinion by hand in clockwise direction to guide chain through hoist until approximately 2 to 3 feet (60 to 90 cm) of chain is through.
3. Install chain buffer (194) with offset shoulder of buffer facing bottom of hoist motor. This buffer activates lower limit switch. Locate as noted during removal from old load chain. Coat capscrew threads with Loctite® 242. Secure using buffer ring (193), capscrew (191) and nut (192).

⚠ CAUTION

• Locate chain stopper on hoist end (lower limit switch) at least 9 chain links from end of load chain.

4. On hoist end (lower limit switch) coat capscrew threads with Loctite® 242. Secure end of load chain to hoist body 'A' using capscrew (36) and washer (45).

Load Chain Installation



(Dwg. MHP0241)

5. Install chain buffer on hook end of load chain so offset shoulder of buffer is facing bottom of hoist motor. Coat capscrew threads with Loctite® 242. On single fall hoists, secure using buffer ring (193), capscrew (191) and nut (192).
6. On hook end of load chain install hook:
   a. On single fall hoists, install hook anchor pin (187), hook ring (188) and retainer wire (189).
   b. On double fall hoists, feed chain end with a nylon string into block flange (202). Ensure chain welds locate away from block wheel (201). Attach end of load chain to bottom of hoist body. Coat capscrew threads with Loctite® 242. Secure end of load chain to hoist body using capscrew (59) and washer (57).

Brake Assembly

Refer to Dwg. MHP1989 on page 32.

1. Lubricate and install 'O' rings (87) and (93) on piston (86). Install piston (86) in brake cover (90).
2. Install brake disc (94) and brake friction disc (88).
3. Place brake disc (95) on brake disc (88). Install springs (96) on brake disc (95) starting with a dished surface toward the brake disc. Alternate springs (96) (dished up/dished down).
4. Align pin (89) in brake disc (95) with hole in cover (97) then install cover (97) and pull down evenly with capscrews (36).
5. Position hoist vertically with the brake end down. Set screen (33) in motor side of gear casing (39) and loosely secure with capscrews (29). Install tubes (32) through screen (33) until they are fully seated. Tighten capscrews (29). Install coupling (60) on pinion (75).
6. Install motor assembly and secure with capscrews (4).
7. Install silencer (37) in gear casing (39) with capscrew (104).

Hook Assemblies

Refer to Dwgs. MHP1730 and MHP1731 on page 40.
If the hook assemblies have been disassembled for inspection or repair attention is required on reassembly to ensure that the correct number of balls (185) are installed and retained with sleeve (186).

2 Lever Pendant Assembly

Refer to Dwg. MHP1544 or MHP1558 on page 44.

1. Assemble protectors (506) and 'O' rings (511) and (505) on valves (509).
2. Insert valve (509) assemblies into pendant handle (514).
3. Install screws (515) in pendant handle.
4. Install balls (516), springs (517) and plugs (518) into pendant handle.
5. Install plug (507) or emergency stop valve (508) into pendant handle.
6. Install fittings (327) and lifting eye (501) into top of pendant handle.
7. Facing pendant handle operation side, place levers (503) such that lever direction indicators show 'UP' on left hand side and 'DOWN' on right hand side. Install pin (502) ensuring pin inserts through levers and locates on opposite side of pendant handle.
8. Install exhaust washer (513) and secure with retainer ring (512).
9. Attach hoses to fittings located on top of pendant handle. Locate hoses to fittings as shown in the "PENDANT HOSE CONNECTION" drawing on page 48.

NOTICE

• Screws (504) are installed in pendant levers allowing adjustment of pendant levers.

4 Lever Pendant Assembly

Refer to Dwg. MHP1545 or MHP1577 on page 46.

1. Assemble protectors (506) and 'O' rings (511) and (505) on valves (509).
2. Insert valve (509) assemblies into pendant handle (514) and attachments (right) (524) and (left) (523).
3. Install screws (515) in pendant handle and attachments (right) and (left).
4. Install balls (516), springs (517) and plugs (518) into pendant handle and attachments (right) and (left).
5. Install plug (507) or emergency stop valve (508) into pendant handle.
6. Install fittings (327) into top of pendant handle and attachments (right) and (left). Install lifting eye (501) into top of pendant handle.
7. Facing pendant handle operation side, place levers (503) such that lever direction indicates 'UP' on left hand side and 'DOWN' on right hand side. Install pin (502) ensuring pin inserts through levers and locates on opposite side of pendant handle.
8. Lubricate and install 'O' rings (528) in recesses on sides of pendant handle (514).
9. Install attachment (right) (524) and (left) (523) to pendant handle (514) and secure with washers (526) and capscrews (525) and (527). Install shorter screws in back, longer screws in front.
10. Facing pendant handle operation side, place levers (522) such that lever direction indicates 'LEFT' on left hand side and 'RIGHT' on right hand side. Install pins (529) ensuring pins insert through levers and locate on side of pendant handle.
11. Install exhaust washer (513) in pendant handle and secure with retainer ring (512).
12. Attach hoses to fittings located on top of pendant handle. Locate hoses to fittings as shown in the "PENDANT HOSE CONNECTION" drawing on page 48.

NOTICE

• Screws (504) are installed in pendant levers allowing adjustment of pendant levers.

Testing

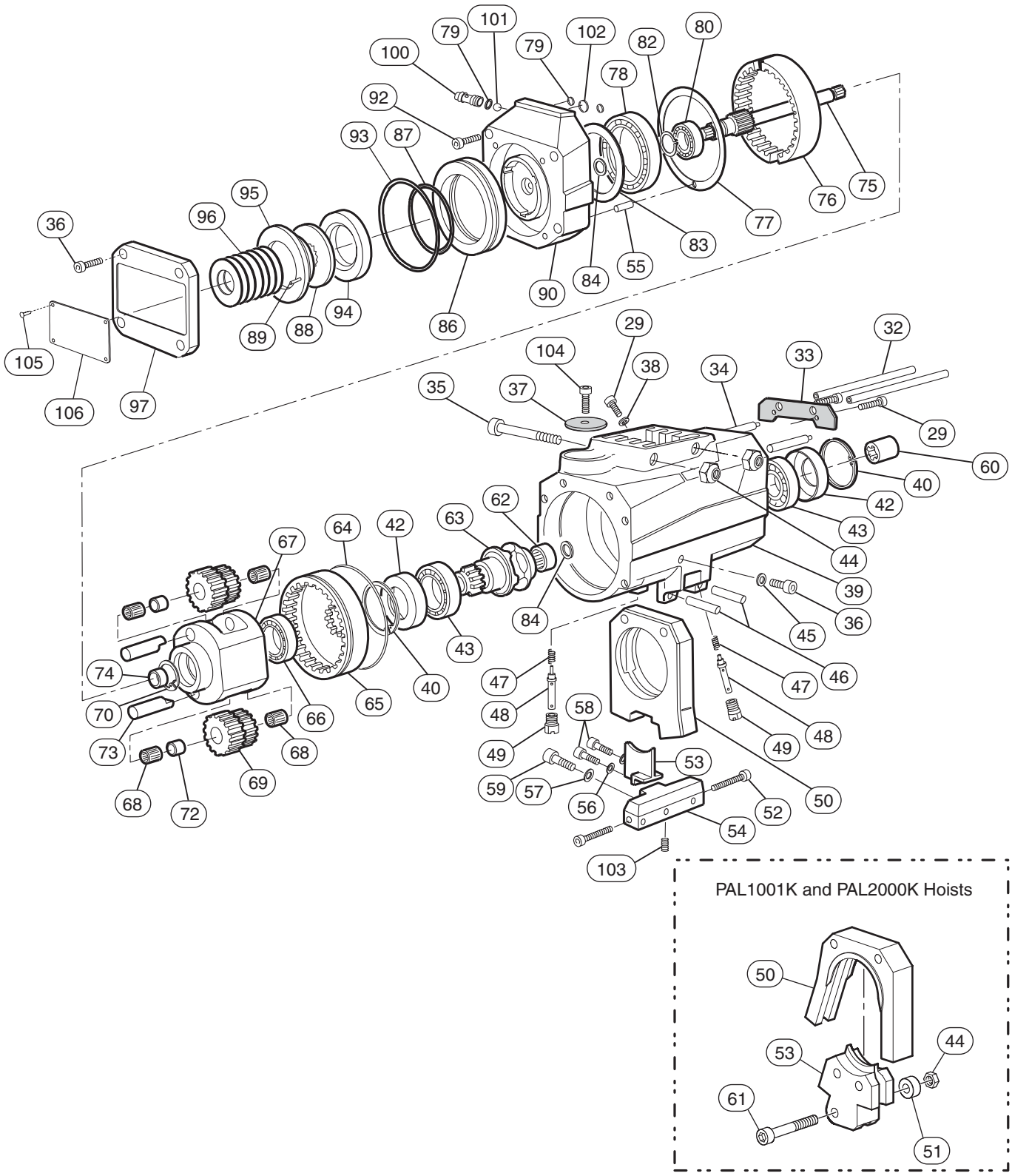
Prior to initial use, all new, extensively repaired, or altered hoists shall be tested by, or under the direction of, personnel instructed in the safe operation and maintenance of this product. A written report should be maintained as a permanent record confirming the satisfactory testing and rating of the hoist.

1. Ensure this product is installed correctly and that it operates properly without a load. Raise and lower hoist fully and operate trolley along the entire length of the beam. There should be no indication of sticking, binding or abnormal noise.
2. Raise a load equal to approximately 10% of rated capacity 2 to 3 inches (50 to 75 mm) off the floor. Test that hoist brake holds load without slipping. Operate trolley along entire length of beam. Raise load to highest position. There should be no indication of sticking, binding or abnormal noise.
3. Dynamically load test to 100% of rated capacity in accordance with applicable standards. Testing to more than 125% may be necessary to comply with standards and regulations set forth in areas outside of the USA.

SERVICE NOTES

ASSEMBLY DRAWINGS AND PART LISTS TABLE OF CONTENTS

HOIST ASSEMBLY PARTS DRAWING



(Dwg. MHP1989)

HOIST ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number	Item No.	Description of Part	Total Qty.	Part Number
13	Spring	3	69165532	65	Ring Gear (250K - 1000K) *	1	96090094
21	Brake Disc	1	94240326		Ring Gear (1001K - 2000K) *		96180044
29	Capscrew	3	41306709	66	Bearing	1	50800005
32	Tube	2	96090055	67	Planet Carrier (250K - 1000K) *	1	96090014
33	Screen (250K - 1000K)	1	96090057		Planet Carrier (1001K - 2000K) *		96180041
	Screen (1001K - 2000K)		96340027	68	Bearing	4	56501513
34	Shaft	2	96090040	69	Planet Gear (250K - 1000K) *	1 set	96090096
35	Capscrew	2	41319606		Planet Gear (1001K - 2000K) *		96180045
36	Capscrew	5	41300206	70	Retainer Ring	1	47703032
37	Silencer	1	96090056	72	Spacer (Standard)	2	96090095
38	Washer	1	45000106	73	Planet Pin	2	96090039
39	Gear Casing (250K - 1000K)	1	96090002	74	Bearing Sleeve	1	56362432
	Gear Casing (1001K - 2000K)		96340005	75	Pinion	1	96090035
40	Retainer Ring	2	47703067	76	Ring Gear, 49t	1	96090038
42	Ring	2	96090076	77	Gasket	1	96090041
43	Bearing	2	50050007	78	Bearing	1	50800009
44	Nut	2/3	43702311	• 79	'O' Ring	3	58212229
45	Washer	1	45001106	80	Bearing	1	50000002
46	Pin	2	96090027	82	Retainer Ring	1	47700015
47	Spring	2	69160332	83	Spring Washer	1	69160432
48	Limit Switch	2	96090051	84	Quad Ring	2	58019830
49	Limit Switch Body	2	96090050	85	Pin	2	46404618
50	Chain Guide (250K - 1000K) *	1	96090019	86	Piston	1	96090113A
	Chain Guide (1001K - 2000K) *		96340023	• 87	'O' Ring	1	58232229
51	Spacer (1001K - 2000K) *	1	96340020	• 88	Brake Friction Disc	1	96090049
52	Capscrew	2	41300406	89	Pin	1	4640-6118A
53	Chain Guide (250K - 1000K) *	1	96090020	90	Brake Cover	1	96090226A
	Chain Guide (1001K - 2000K) *		96340024	92	Capscrew	4	41314906
54	Chain Holder	1	96090013	• 93	'O' Ring	1	PAL250-236
55	Pin	1	46001716	• 94	Brake Disc	1	96090047
56	Washer	2	45201004	• 95	Brake Disc (incl's item 89)	1	96090046
57	Lockwasher	1	45201008	96	Spring Washer	7	69160532
58	Capscrew	2	41313606	97	Cover	1	96090005
59	Capscrew	1	96090098	100	Shuttle Valve Stop	1	96090223
60	Coupling	1	96090034	101	Ball	1	69401625
61	Capscrew	1	41301806	102	'O' Ring	1	58221729
62	Bearing	1	56321512	103	Setscrew	2	42007007
63	Sprocket (250K - 1000K) *	1	96090009	104	Capscrew	1	41300106
	Sprocket (1001K - 2000K) *		96340001	105	Rivet	4	44600821
• 64	'O' Ring	1	58216129	106	Nameplate	1	66709741

• Recommended spare for one hoist, 2 years of normal operation.

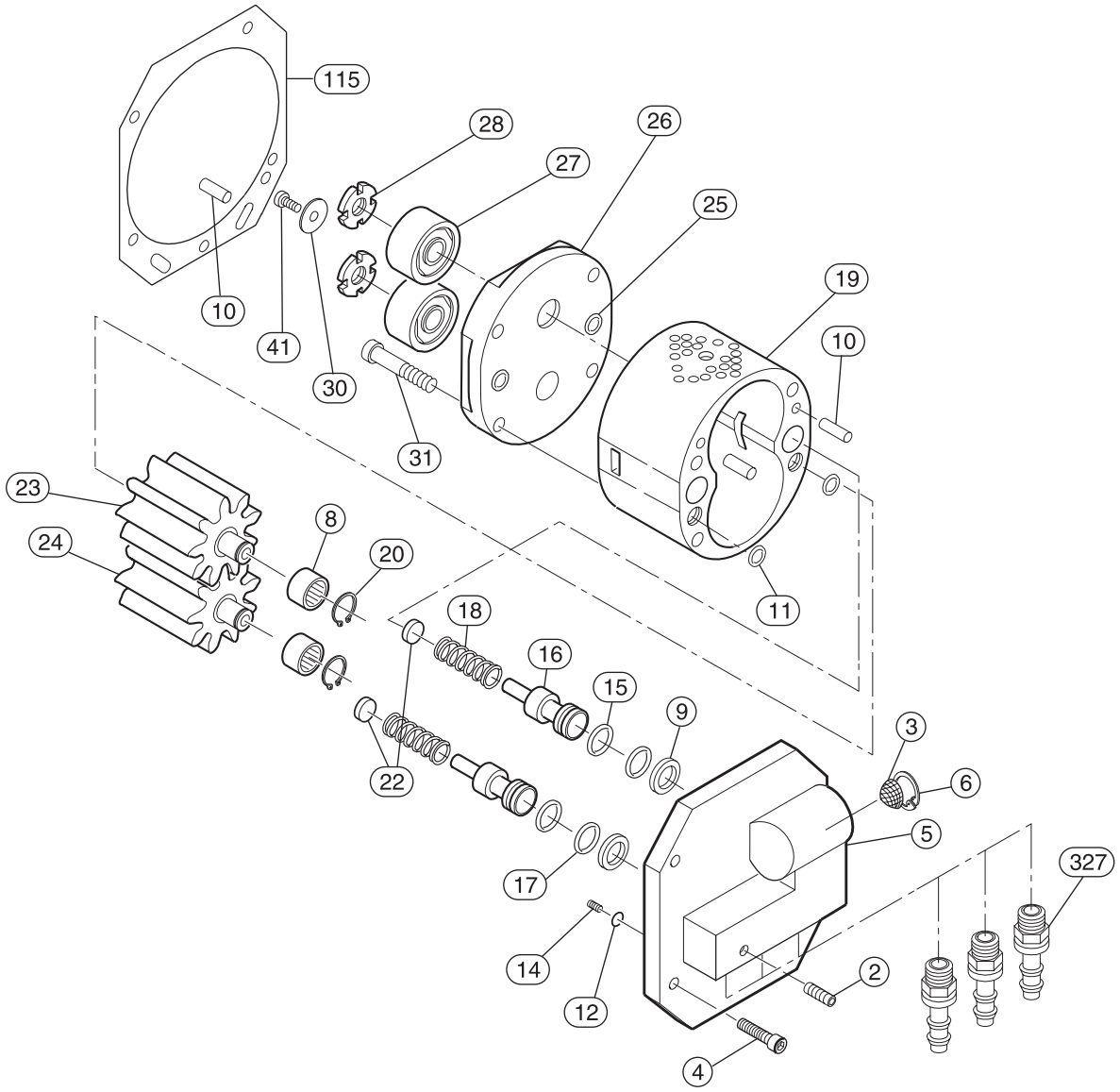
Parts listed below are for S•COR•E (Spark and Corrosion Resistant) Option 'R' hoists

29	Capscrew	3		56	Washer	2	45201004
35	Capscrew	2	41327206	57	Lockwasher	1	45201008
36	Capscrew	5	41322606	58	Capscrew	2	41316506
44	Nut	2	43706511	59	Capscrew	1	96090138 or 41325006
45	Washer	1	45001108				
52	Capscrew	2	41322306	92	Capscrew	4	41327406
54	Chain Holder	1	96090145	104	Capscrew	1	41324306

Brake Assembly Replacement Kit (incl's items 36, 79, 84, 86, 87, 88, 90, 92 to 97 and 102)	1	3609-0007A

* 250K - 1000K = PAL250K, PAL500K, and PAL1000K models; 1001K - 2000K = PAL1001K and PAL2000K.

HOIST MOTOR ASSEMBLY PARTS DRAWING



(Dwg. MHP2191)

HOIST MOTOR ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number	Item No.	Description of Part	Total Qty.	Part Number
110	Motor Assembly (includes items 2 through 115)	1	76090206	18	Spring	2	94240224
				19	Housing	1	96090007
2	Setscrew	1	42007707	20	Retainer Ring	2	47801339
3	Filter	1	61909028	22	Slide Valve	2	94120030
4	Capscrew	4	41312206	23	Idle Gear *	1 Set	96090030
5	Motor Cover	1	96090079	24	Driving Gear *		96090031
6	Retainer Ring	1	47703018	• 25	'O' Ring **	2	58222329
8	Needle Bearing	2	56461912	26	Motor Flange	1	96090008
9	Stop	2	96090042	27	Bearing	2	50600002
10	Pin	6	46000416	28	Locknut	2	57000002
• 11	'O' Ring	2	58205029	30	Washer	1	96090032
• 12	'O' Ring	2	58212229	31	Capscrew	4	41300806
14	Setscrew	2	42007407	41	Screw	1	41306706
• 15	Quad-ring	2	58231229	• 115	Gasket	1	96180066
16	Slide Valve	2	94240212	327	Fitting	3 ***	61652632
• 17	Quad-ring	2	58228929				

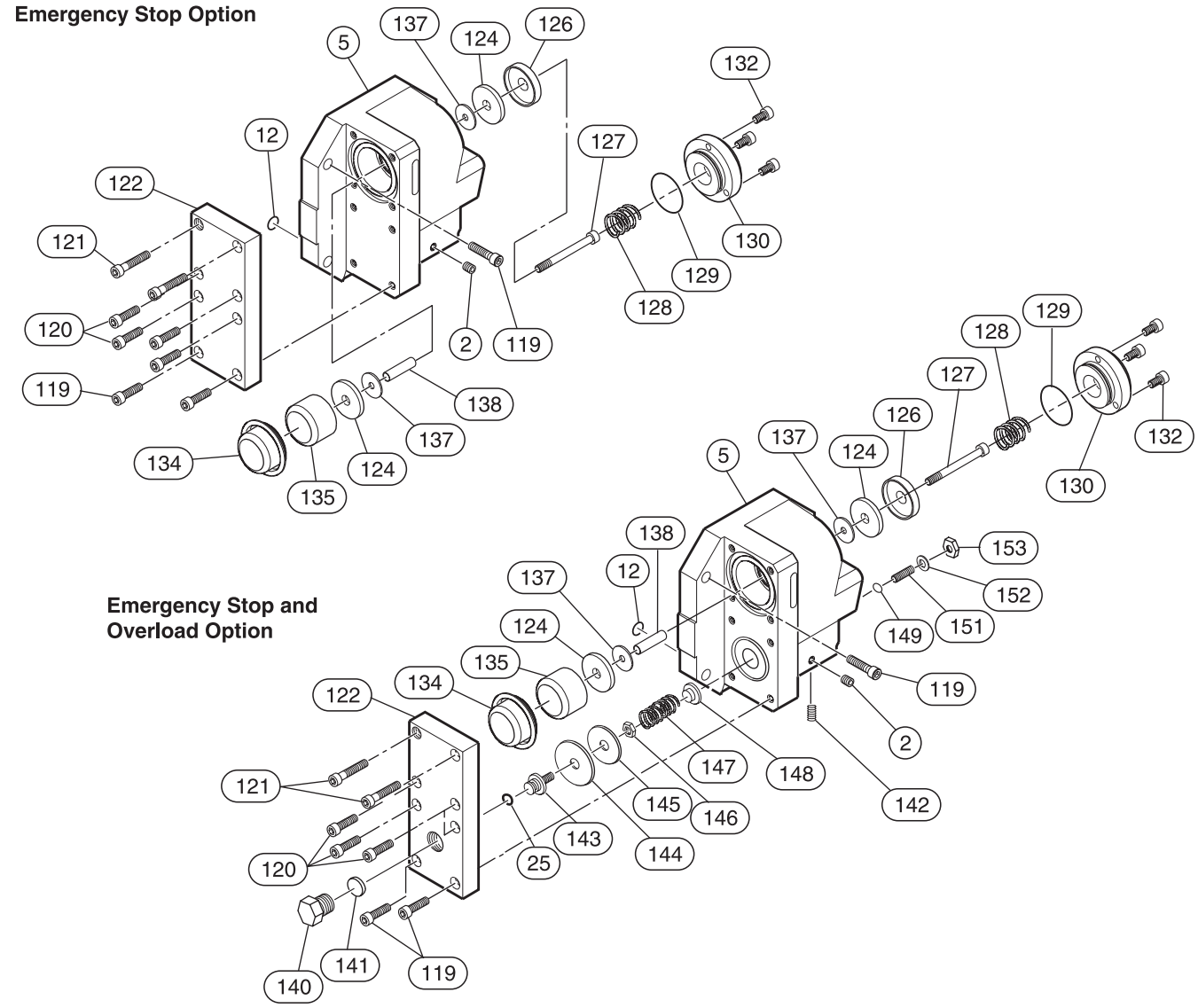
• Recommended spare for one hoist, 2 years of operation.

* Idle Gear (item 23), Driving Gear (item 24) are sold only as a set.

** 'O' ring (item 25) quantity is 3 with E-Stop and Overload Motor options.

*** Fitting (item 327) quantity is 5 with E-Stop option.

MOTOR EMERGENCY STOP AND OVERLOAD VALVE ASSEMBLY PARTS DRAWING



(Dwg. MHP2192)

MOTOR EMERGENCY STOP AND OVERLOAD VALVE ASSEMBLY PARTS LIST

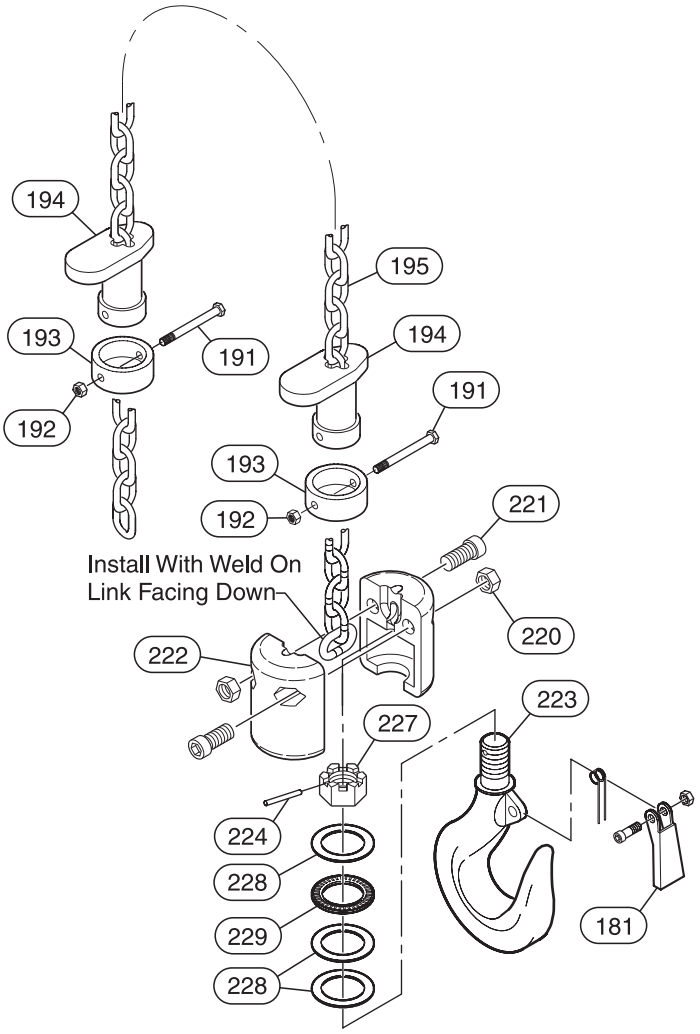
Item No.	Description of Part	Total Qty.	Part Number	
			With Emergency Stop	With Emergency Stop and Overload
110	Motor Assembly *	1	76090430	76090429
2	Setscrew	1	42008307	
5	Motor Cover	1	96090270	96090266
• 12	'O' Ring	2	58212229	
25	'O' Ring	1	---	58222329
119	Capscrew	6	41322206	
120	Capscrew	4	41322306	
121	Capscrew	2	41324306	
122	Cover	1	96090271	96090267
• 124	Seal	2	96170056	
126	Valve Cone	1	96170053	
127	Capscrew	1	41308206	
128	Spring	1	69158732	
• 129	'O' Ring	1	58214829	
130	Cover	1	96170059	
132	Capscrew	3	41326306	
• 134	Diaphragm	1	67716341	
135	Valve Cone	1	96170054	
137	Washer	2	45700005	
138	Spacer	1	96170055	
140	Screw, Plug	1	---	96090269
• 141	Spacer	1	---	96360021
142	Orifice Plug	1	---	96170071
143	Clamp	1	---	96360017
144	Diaphragm	1	---	96360020
145	Washer	1	---	96360019
146	Nut	1	---	43001111
147	Spring	1	---	69159432
148	Spring Receiver	1	---	96360023
149	Ball	1	---	69400125
151	Screw	1	---	42007107
152	Washer	1	---	58404531
153	Locknut	1	---	43707611

• Recommended spare for one hoist, 2 years of operation.

* Includes parts shown on Dwg. MHP2191 on page 34.

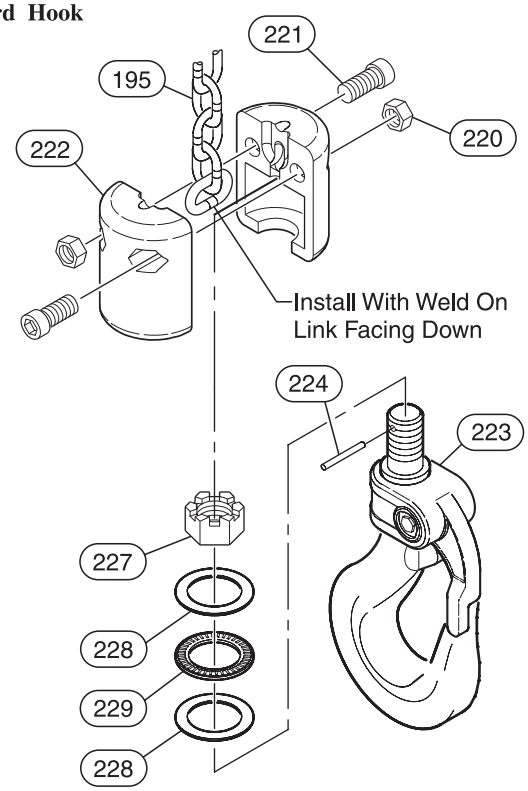
HOOK ASSEMBLY PARTS DRAWING

Standard Hook



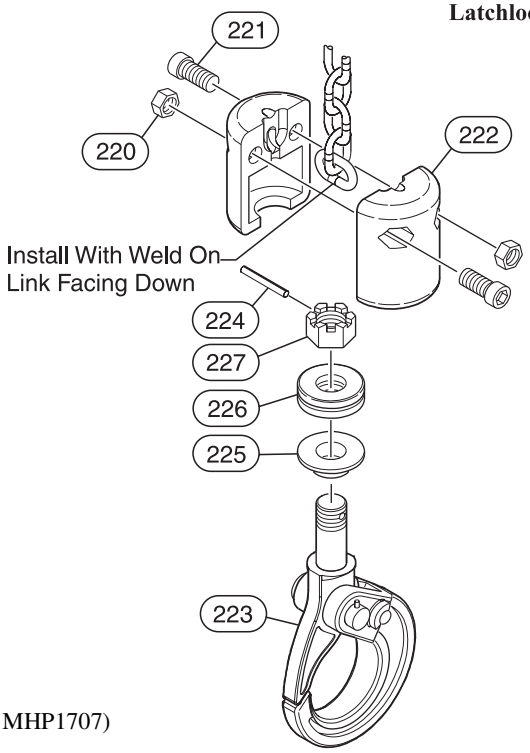
(Dwg. MHP2212)

Bullard Hook



(Dwg. MHP2219)

Latchlock Hook



(Dwg. MHP1707)

HOOK ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number				
			Standard Hook		Latchlock Hook		Bullard Hook
			Non Nickel	Nickel Plated	Non Nickel	Nickel Plated	
181	Hook Latch Kit	1	96090086	Contact Factory	---		
191	Capscrew	1	41308106	41326006	41308106	41326006	41308106
192	Nut	1	43705011	43707211	43705011	43707211	43705011
193	Buffer Ring	2	96090207	96090221	96090207	96090221	96090207
194	Buffer	2	96090121				
195	Load Chain Zinc Plate (Standard)	*	LC515-G8AC				
	Load Chain Stainless Steel **		6909-8032				
220	Nut	2	04615027	10548485-NC	04615027	10548485-NC	04615027
221	Capscrew	2	04615035	10548428-NC	04615035	10548428-NC	04615035
222	Bottom Block	2	04560926	10548436-NC	04560926	10548436-NC	04560926
223	Hook	1	04615514	10548576-NC	04615480	10548378-NC	04687208
224	Pin	1	04565396	10548451-SS	04565396	10548451-SS	04565396
225	Spacer	1	---		04658746		---
226	Bearing	1	---		04658720	10548444	---
227	Nut, Slotted	1	04615019	10548634-NC	04658753	10548402-NC	Included w/ hook
228	Race, Thrust	3/2	04615043	10548600-NC	---	10548493-SS	45373
229	Bearing, Thrust	1	04615050	10548626	---		42089
230	Bottom Hook Assembly	1	04565255	10548584-NC	04565263	10548410-NC	04662516

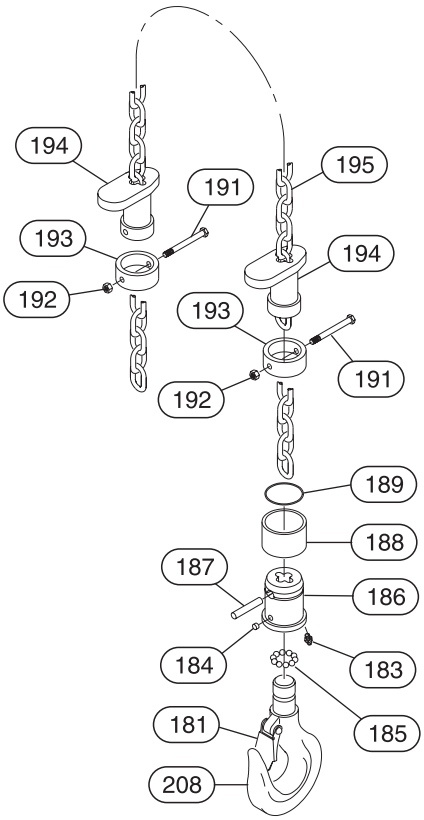
Notes:

* Order load chain in feet.

** Use of Stainless Steel Load Chain derates 500 kg hoist to 310 kg capacity and 980/1000 kg hoist to 630 kg. Use only on Stainless Steel designated hoists.

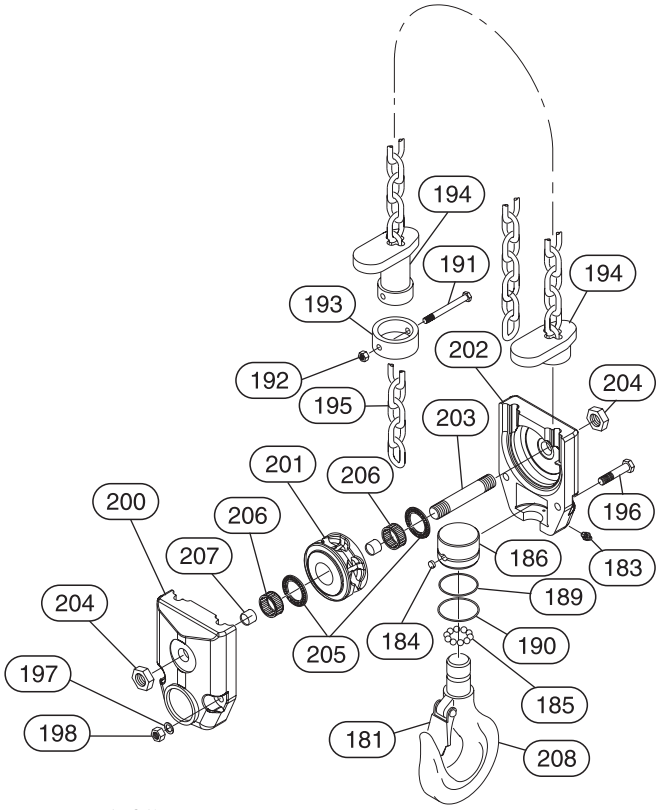
BOTTOM HOOK ASSEMBLY PARTS DRAWINGS

1/4 and 1/2 ton Hook Assembly
Old Style



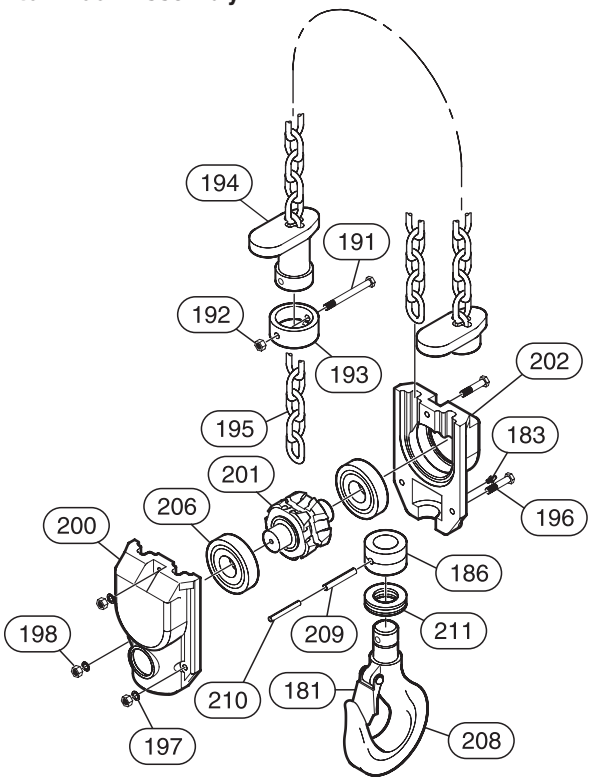
(Dwg. MHP1730)

1 ton Hook Assembly



(Dwg. MHP1731)

2 ton Hook Assembly



(Dwg. MHP1732)

BOTTOM HOOK ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number					
			Standard			Corrosion Resistant		
			PAL250K	PAL500K	PAL1000K	PAL250K	PAL500K	PAL1000K
182	Bottom Hook Assembly *	1	36090284		36090285	36090213		36090212
183	Grease Fitting	1	67102627					
184	Plug	1	96090060		96090024	96090060		96090024
185	Ball (quantity of 10 per set)	1 set	69401125					
186	Hook Support	1	96090011		96090012	96090143		96090012
187	Pin	1	46001616		---	46001616		---
188	Hook Ring	1	96090025		---	96090146		---
189	Retainer Wire	1	47901239		96090148	47901239		96090148
190	'O' Ring	1	---		58216029	---		58216029
191	Capscrew	( )	41308106 (2)		41308106 (1)	41306006 (2)		41326006 (1)
192	Nut	( )	43705011 (2)		43705011 (1)	43707211 (2)		43707211 (1)
193	Buffer Ring	( )	96090207 (2)		96090207 (1)	96090222 (2)		96090222 (1)
194	Buffer	( )	96090121 (2)		96090121 (1)	96090121 (2)		96090121 (1)
	Buffer (1 ton hoist raise limit switch)	1	---		96090018	---		96090018
195	Load Chain Zinc Plate (Standard)	**	LC515-G8AC					
	Load Chain Stainless Steel ***		6909-8032					
196	Screw	2	---		41300406	---		41322306
197	Lockwasher	2			45200006			45201006
198	Nut	2			41300406			43006211
200	Block Flange	1			96090006			96090006
201	Block Wheel	1			96090010			96090142
202	Block Flange	1			96090276			96090276
203	Wheel Axle	1			96090052			96090125
204	Locknut	2			43200112			43202212
205	Thrust Washer	2			57308632			57308632
206	Bearing	2			56322115			56322115
207	Inner Ring	2			56362432			56362432
208	Bottom Hook w/Latch	1	96090083		96090139	96090139		
	Bottom Hook - Bullard		71265938			Contact Factory		

Notes:

* Top Hook Assembly (175) includes items 176 through 180. Bottom Hook Assembly (182) includes items 182 through 208.

** Order load chain in feet.

*** Use of Stainless Steel Load Chain derates 500 kg hoist to 310 kg capacity and 980/1000 kg hoist to 630 kg. Use only on Stainless Steel designated hoists.

**** Latch Kit includes spring, latch, capscrew and nut.

BOTTOM HOOK ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number			
			Standard		Corrosion Resistant	
			PAL1001K	PAL2000K	PAL1001K	PAL2000K
182	Bottom Hook Assembly *	1	36340013	36340015	36340032	36340027
183	Grease Fitting	1	67102627			
184	Plug	1	96090060	---	96090060	---
185	Ball (quantity of 10 per set)	1 set	69401125		69401125	
186	Hook Support	1	96340012	96340009	96340058	96340009
187	Pin	1	46000516	---	46000516	---
188	Hook Ring	1	96090025		96090146	
189	Retainer Wire	1	47901239		96090148	
190	'O' Ring	1	58215829	---	58215829	---
191	Capscrew	( )	41300506	41321706	41300506	41321706
192	Nut	( )	43703411	43707611	43703411	43707611
194	Buffer	( )	96340022			
195	Load Chain (bulk) Zinc Plate (Standard)	**	LC721-G8-CZP			
	Load Chain (bulk) Stainless Steel ***		LC721-G41			
196	Screw	3	---	41300406	---	41322306
197	Lockwasher	3		45200006		45201006
198	Nut	3		43000711		43006211
200	Block Flange	1	---	96340068	---	96340068
201	Block Wheel	1		96340010		96340050
202	Block Flange	1		96340007		96340007
206	Bearing	2	56322115	50050007	56322115	50050007
208	Bottom Hook w/Latch	1	96090083	96340008	96090139	96340051
	Bottom Hook - Bullard		---		---	
209	Pin	1	---	46508020	---	46508020
210	Pin	1		46508120		46508120
211	Thrust Bearing	1		54000005		54000007

Notes:

* Bottom Hook Assembly (182) includes items 182 through 208

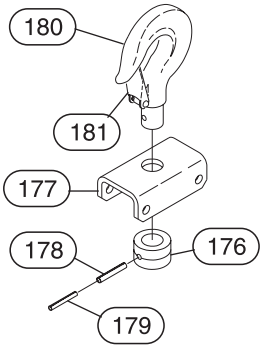
** Order load chain in feet.

*** Use of Stainless Steel Load Chain derates 1001 kg hoist to 800 kg capacity and 2000 kg hoist to 1600 kg. Use only on Stainless Steel designated hoists.

*** Latch Kit includes spring, latch, capscrew and nut.

TOP HOOK ASSEMBLY DRAWING AND PARTS LIST

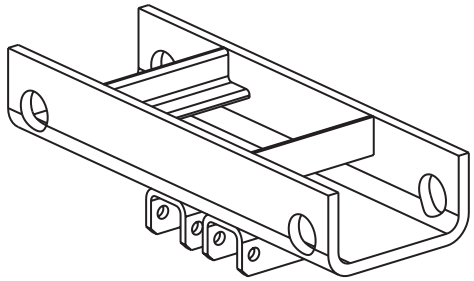
Top Hook Assembly (175)



Note: When installing pins (178) and (179), ensure gaps are rotated 180°

(Dwg. MHP1732)

Trolley Mounting Bracket



(Dwg. MHP2484)

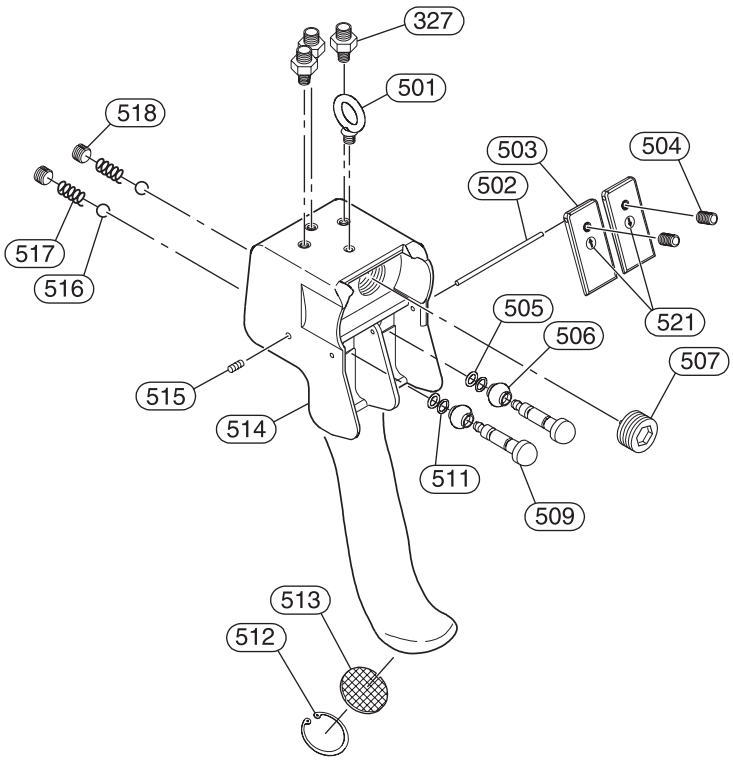
Item No.	Description of Part	Total Qty.	Part Number					
			Standard			Corrosion Resistant		
			PAL250K	PAL500K	PAL1000K	PAL250K	PAL500K	PAL1000K
174	Suspension Assembly		36340001			36340033		
175	Top Hook Assembly *	1	76340005			36340033		
176	Hook Ring	1	96340003			96340060		
177	Support Plate	1	96090022			96090141		
178	Pin	1	46501020					
179	Pin	1	46507720					
180	Top Hook w/Latch	1	96340002			96340059		
	Top Hook - Bullard		04662515			Contact Factory		
181	Latch Kit **	1	96090086					
---	Trolley Mounting Bracket	1	04685566					

Item No.	Description of Part	Total Qty.	Part Number			
			Standard		Corrosion Resistant	
			PAL1001K	PAL2000K	PAL1001K	PAL2000K
174	Suspension Assembly		Contact Factory		Contact Factory	
175	Top Hook Assembly *	1	76340005	76340035	76340033	76340034
176	Hook Ring	1	96340003	96340015	96340060	96340053
177	Support Plate	1	96090022	96340016	96090141	96340054
178	Pin	1	46507720	46507920	46507720	46507920
179	Pin	1	46501020	46507820	46501020	46507820
180	Top Hook w/Latch	1	96340002	96340014	96340059	96340052
	Top Hook - Bullard		Contact Factory	---	Contact Factory	---
181	Latch Kit **	1	96090086			
---	Trolley Mounting Bracket	1	04685566			

Notes:
* Top Hook Assembly (175) includes items 176 through 180.
** Latch Kit includes spring, latch, capscrew and nut.

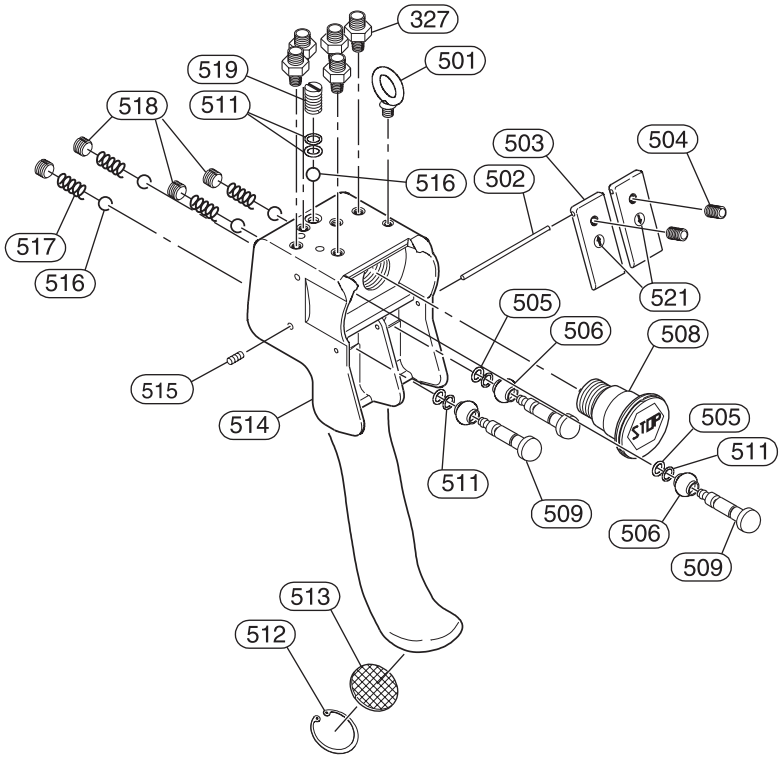
2 LEVER PENDANT ASSEMBLY PARTS DRAWING

2 Lever Pendant without Emergency Stop



(Dwg. MHP1558)

2 Lever Pendant with Emergency Stop



(Dwg. MHP1544)

2 LEVER PENDANT ASSEMBLY PARTS LIST

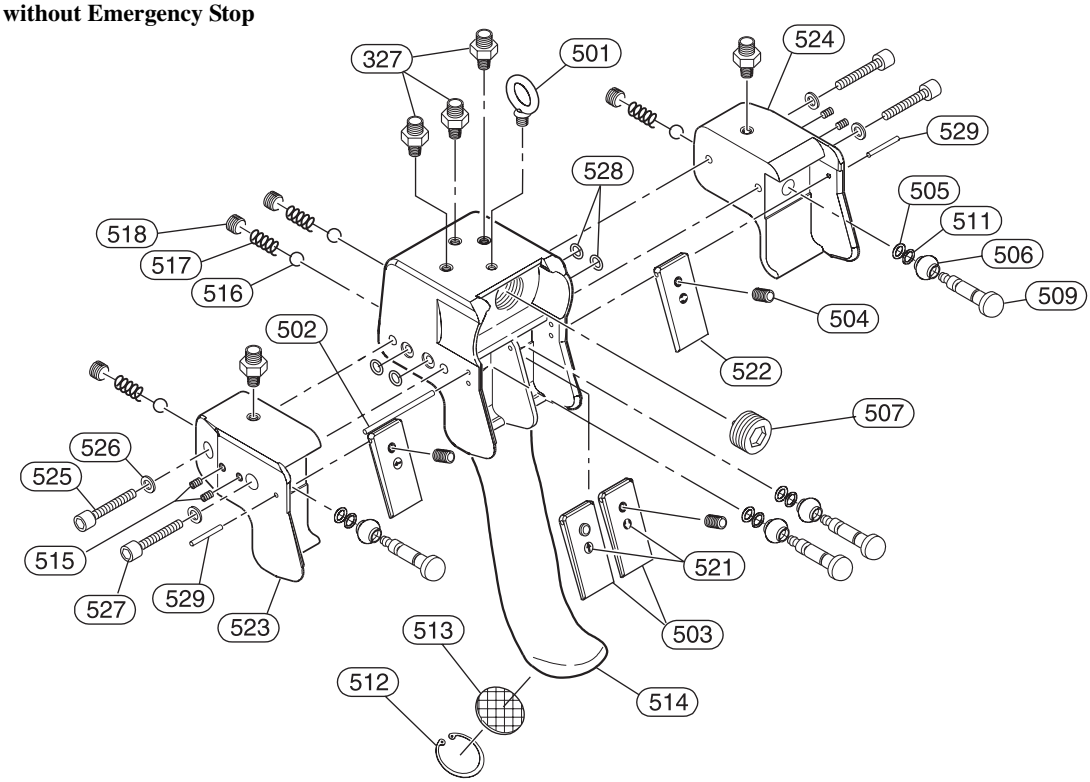
Item No.	Description of Part	Total Qty.	Part Number				
			Without Emergency Stop			With Emergency Stop	
327	Fitting	3 (5)	71078158				
500	Pendant Assembly	1	PHS2E	PHS2E-R	PHS2E-F	PHS2E-U	PHS2E-RU
501	Lifting Eye	1	64222332				
502	Pin	1	95790040				
503	Lever-Hoist	2	95790122				
504	Screw	2	42008607				
• 505	'O' Ring	2 (3)	58235329				
506	Protector	2 (3)	95790107				
507	Plug	1	65129541			---	
508	Emergency Stop Valve	1	---			95790108	
509	Valve	2 (3)	95790104				
• 511	'O' Ring	2 (5)	58209229				
512	Retainer Ring	1	47713030				
513	Exhaust Washer	1	67600303				
514	Pendant Handle	1	Not sold separately; order Pendant Assembly item 500				
515	Setscrew	2 (3)	42008307				
• 516	Ball	2 (5)	69401625				
517	Spring	2 (4)	69128541				
518	Plug	2 (4)	65107741				
519	Plug	1	---			95790106	
521	Label Kit	1	95790111				

• Recommended spare for one hoist, 2 years of operation.

( ) Quantity required for pendants with emergency stop feature.
-R = S•COR•E
-F = Food Grade
-U = With Emergency Stop
-RU = Emergency Stop and S•COR•E

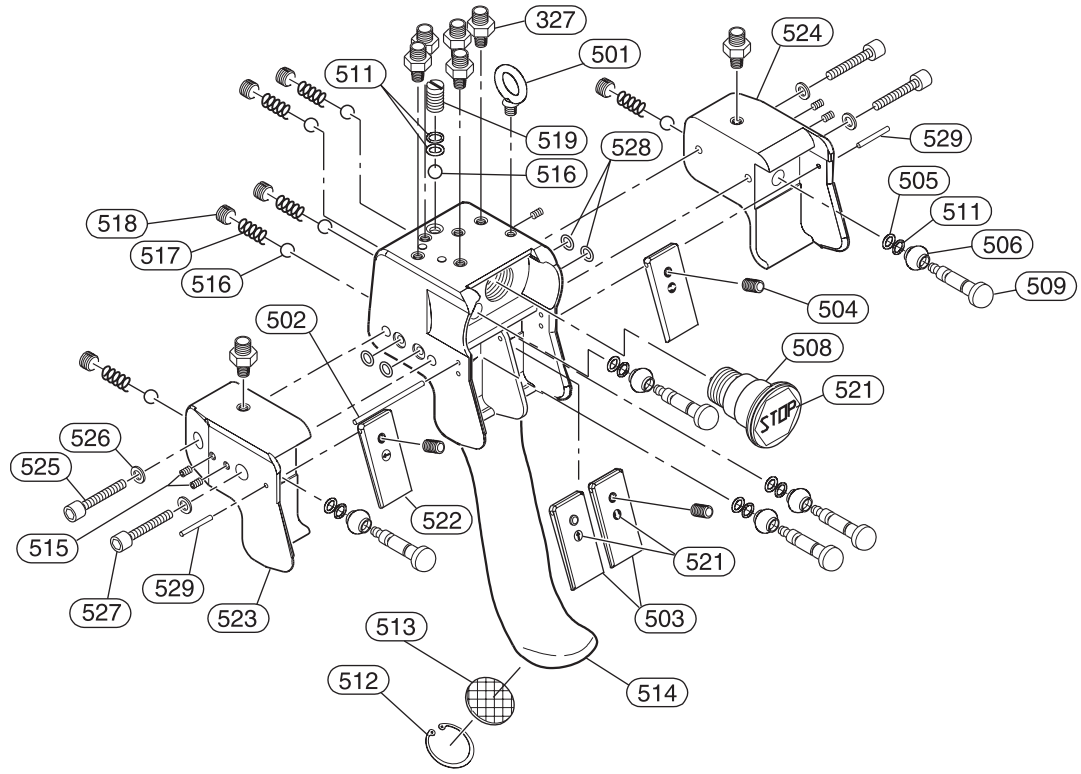
4 LEVER PENDANT ASSEMBLY PARTS DRAWING

4 Lever Pendant without Emergency Stop



(Dwg. MHP1577)

4 Lever Pendant with Emergency Stop



(Dwg. MHP1545)

4 LEVER PENDANT ASSEMBLY PARTS LIST

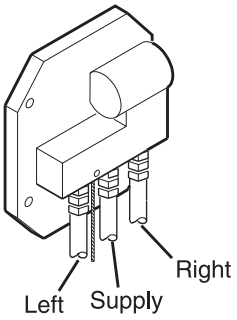
Item No.	Description of Part	Total Qty.	Part Number	
			Without Emergency Stop	With Emergency Stop
327	Fitting	5 (7)	71078158	
500	Pendant Assembly	1	PHS4E	PHS4E-U
501	Lifting Eye	1	64222332	
502	Pin	1	95790040	
503	Lever-Hoist	2	95790122	
504	Screw	4	42008607	
• 505	'O' Ring	4 (5)	58235329	
506	Protector	4 (5)	95790107	
507	Plug	1	65129541	---
508	Emergency Stop Valve	1	---	95790108
509	Valve	4 (5)	95790104	
• 511	'O' Ring	4 (7)	58209229	
512	Retainer Ring	1	47713030	
513	Exhaust Washer	1	67600303	
514	Pendant Handle	1	Not sold separately; order Pendant Assembly item 500	
515	Screw	4 (5)	42008307	
• 516	Ball	4 (7)	69401625	
517	Spring	4 (6)	69128541	
518	Plug	4 (6)	65107741	
519	Plug	1	---	95790106
521	Label Kit	1	95790111	
522	Lever-Trolley	2	95790128	
523	Attachment (Left)	1	95790125	
524	Attachment (Right	1	95790126	
525	Capscrew	2	41330506	
526	Washer	4	45201005	
527	Capscrew	2	41322106	
• 528	'O' Ring	4	58218229	
529	Pin	2	95790127	

• Recommended spare for one hoist, 2 years of operation.

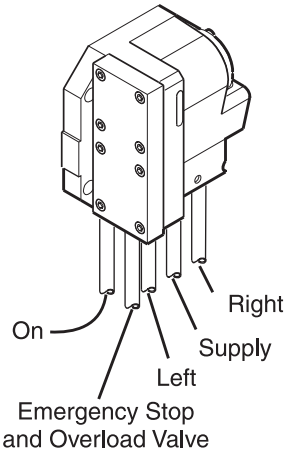
( ) Quantity required for pendants with emergency stop feature.

PENDANT HOSE CONNECTIONS AND HOSE ASSEMBLY PARTS DRAWING

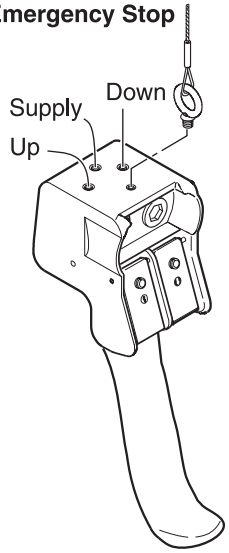
Motor Connections
Hoist without Emergency Stop



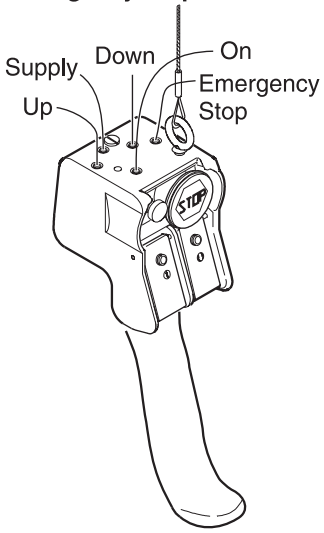
Motor Connections
Hoist with Emergency Stop
and Overload Valve



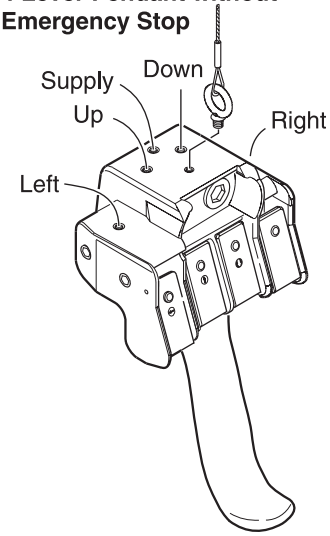
2 Lever Pendant without
Emergency Stop



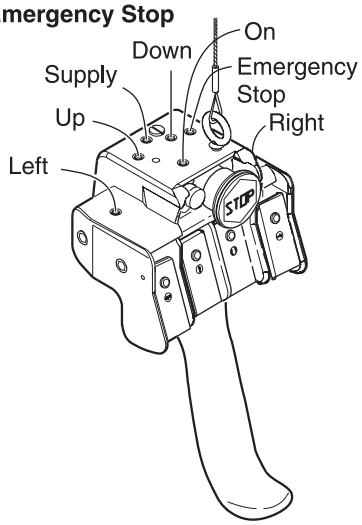
2 Lever Pendant with
Emergency Stop



4 Lever Pendant without
Emergency Stop

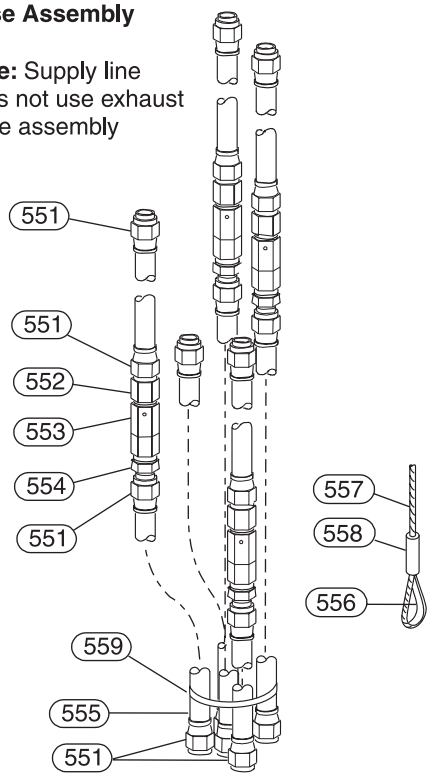


4 Lever Pendant with
Emergency Stop



Hose Assembly

Note: Supply line does not use exhaust valve assembly



(Dwg. MHP2194)

PENDANT HOSE CONNECTIONS AND HOSE ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty.	Part Number
551	Fitting, Hose End	As Req'd	51029
552	Fitting, Connector	As Req'd	71048284
553	Valve, Exhaust *	As Req'd	20417
554	Fitting, Connector	As Req'd	71048268
555	Hose (bulk)	As Req'd	50923
556	Clamping Thimble	1	MLK-602
557	Strain Relief Cable (bulk) **	As Req'd	71073506
558	Clamping Sleeve	1	MKL-521
559	Cable Tie	As Req'd	61125132

Notes:

* One exhaust assembly required every 20 ft (6 m). Includes items 551 (quantity 1), 552 and 554.

** Specify length in feet. Attach free end of cable to motor cover and secure with setscrew (2).

Description of Part	Part Number
Exhaust Valve Kit (Incl's items 175, 176 and 177)	20417
Hose Kit (One motor)	PHB2PP-XX
Hose Kit (Two motor)	PHB4PP-XX

XX = Specify Hose Length

Hose Bundle Assembly with Strain Relief

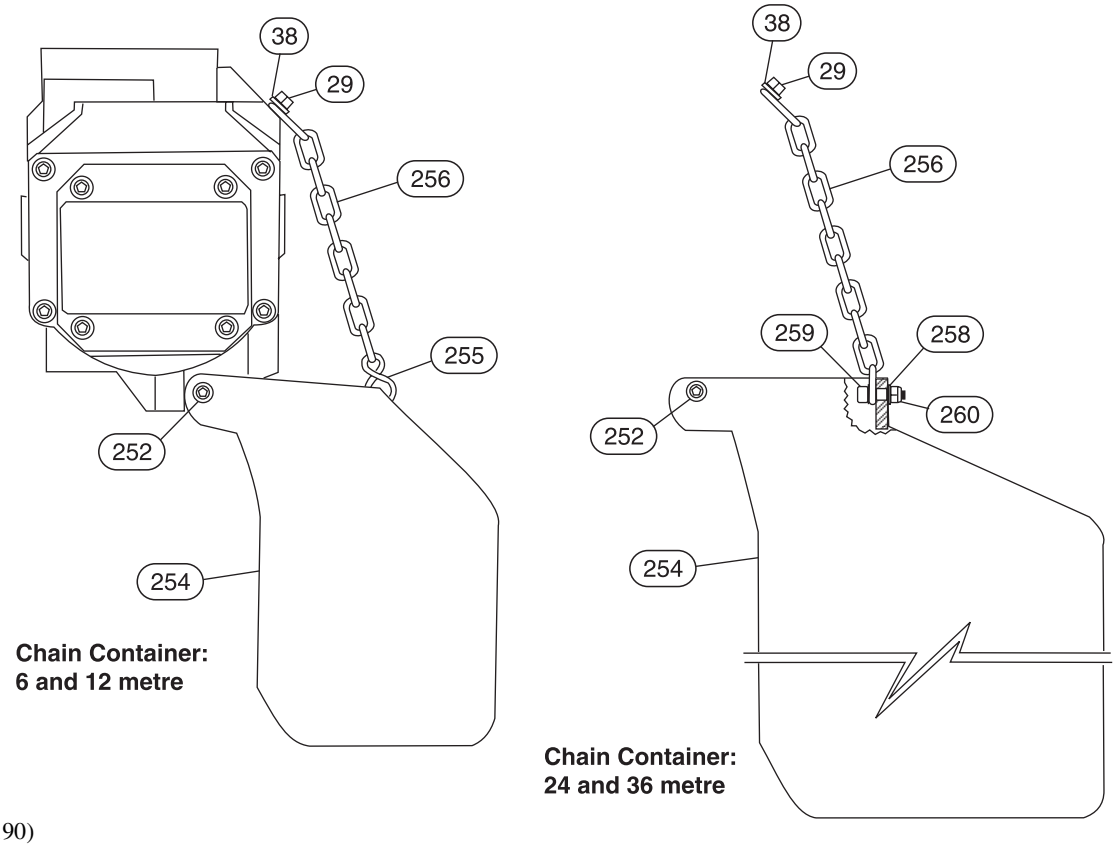
Length		without Emergency Stop			with Emergency Stop		
		2 Button	4 Button	6 Button	2 Button	4 Button	6 Button
ft	m	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
10	3	21653-10	21654-10	21655-10	21656-10	21657-10	21658-10
15	4.5	21653-15	21654-15	21655-15	21656-15	21657-15	21658-15
20	6	21653-20	21654-20	21655-20	21656-20	21657-20	21658-20
25	7.6	21653-25	21654-25	21655-25	21656-25	21657-25	21658-25
30	9	21653-30	21654-30	21655-30	21656-30	21657-30	21658-30
35	10.7	21653-35	21654-35	21655-35	21656-35	21657-35	21658-35
40	12	21653-40	21654-40	21655-40	21656-40	21657-40	21658-40
45	13.7	21653-45	21654-45	21655-45	21656-45	21657-45	21658-45
50	15.25	21653-50	21654-50	21655-50	21656-50	21657-50	21658-50

Notes: 1. 1/4 in. hose with working pressure of 250 psi (17.2 bar).

2. Dump valves included on lengths of 10 ft (3 m) and longer to provide quick exhaust and improve control response.

3. For hose bundle lengths over 50 ft (15.25 m) contact Technical Support for control acceptability.

CHAIN CONTAINER ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2190)

Item No.	Description of Part	Total Qty.	Part Number			
			Standard Container		Corrosion Resistant Container	
			6 and 12 metre	24 and 36 metre	6 and 12 metre	24 and 36 metre
29	Capscrew	1	41306709		41322606	
38	Washer, Flat	1	45000105		45001105	
252	Capscrew	2	41300406		41322306	
255	S-Hook	2	94120206			
256	Balance Chain 6 and 12 metre	0.117 m	69033232			
	Balance Chain 24 and 36 metre	0.16 m				
258	Washer, Flat	2	45001105			
259	Capscrew	1	41322906			
260	Locknut	1	43707211			

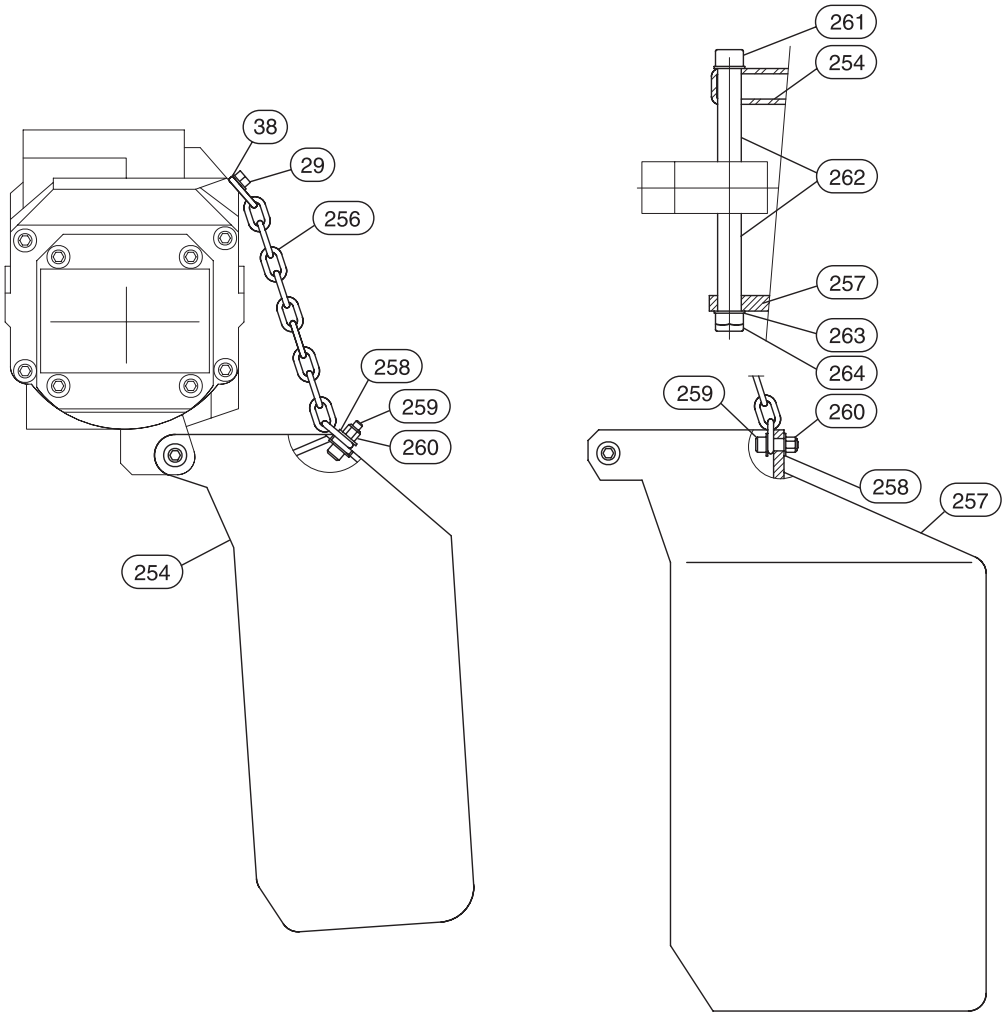
Chain Containers:

254	Plastic for 6 metres of Chain	1	96090016
	Plastic for 12 metres of Chain		96090017
	Metal for 24 metres of Chain		96090164
	Metal for 36 metres of Chain		96090116

Chain Container Kits:

253	CB250/1000-6M (includes items 254, 255 and 256)	1	36090280
	CB250/1000-12M (includes items 254, 255 and 256)		36090281
	CB250/1000-24M (includes items 256 through 260)		76090239
	CB250/1000-36M (includes items 256 through 260)		76090142

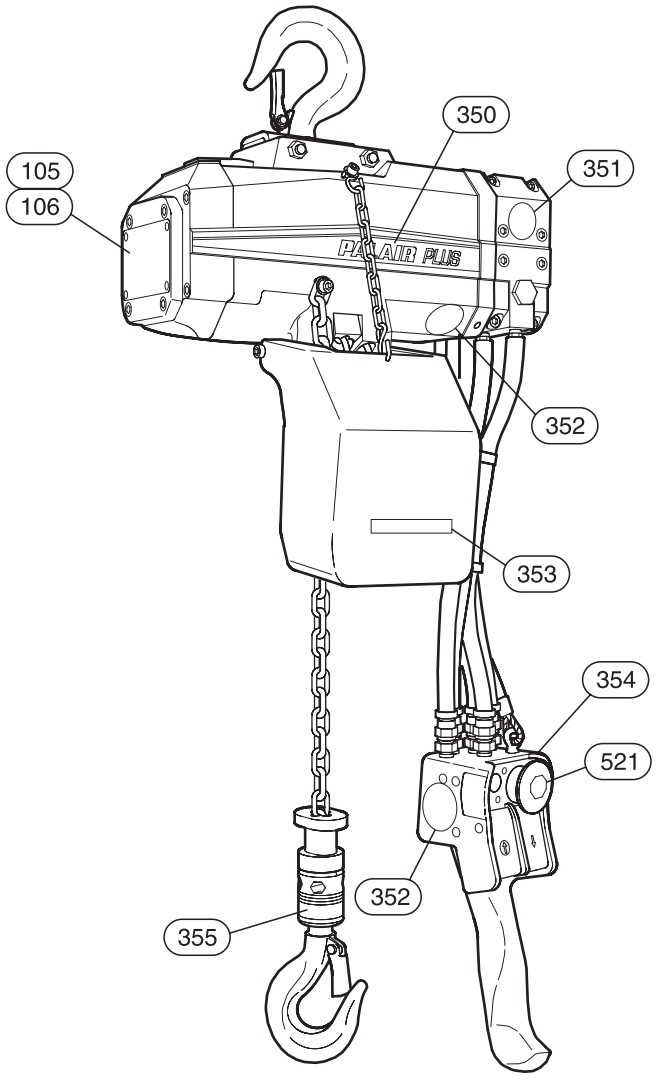
PAL1001K/2000K CHAIN CONTAINER ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2507)

Item No.	Description of Part	Total Qty.	Part Number	
			Standard	Option "R"
29	Screw	1	41306706	41322606
38	Washer, Flat	1	45000105	45001105
254	Chain Container for 6 metres of Chain	1	96340017	
256	Balance Chain	0.16 m	69033232	
257	Chain Container for 12 metres of Chain	1	96340028	
	Chain Container for 18 metres of Chain		96340047	
258	Washer, Flat	2	45001105	
259	Screw	1	41322906	
260	Locknut	1	43707211	
261	Screw	1	41329706	
262	Spacer	2	96340018	
263	Washer, Flat	2	45001108	
264	Locknut	1	43707011	
265	CB2000-6M (incl's items 212 through 220)	1	76340025	
	CB2000-12M (incl's items 212 through 219 and 221)		76340026	
	CB2000-18M (incl's items 212 through 219 and 221)		76340027	

LABEL LOCATION DRAWING AND PARTS LIST



(Dwg. MHP2228)

Item No.	Description of Part	Total Qty.	Part Number	Item No.	Description of Part	Total Qty.	Part Number
105	Rivet	4	44600821	355	Capacity Label (PAL250K)	1	36090213
106	Nameplate	1	66709741		Capacity Label (PAL250K)		96090280-A
350	Palair Plus	1	96090279		Capacity Label (PAL500K)		96090280-B
351	CE Label	1	96180097		Capacity Label (PAL980K)		96090258
352	Read Manual Label	1	96180098		Capacity Label (PAL1000K)		96090259
353	I-R Logo	1	96180101		Capacity Label (PAL1001K)		96090280-C
354	Warning (Do not lift)	1	96180100		Capacity Label (PAL2000K)		96340065
356	Made in England	1	92109529				
521	Label Kit	1	95790111				

ACCESSORIES AND OPTIONS

Description of Part	Part Number
Chain Containers: refer to Chain Installation Drawing on page 11	
Chain Container Assembly max. lift 20 ft. (6 m) PAL250K, PAL310K, PAL500K; max. lift 10 ft. (3 m) PAL1000K	36090280
Chain Container Assembly max. lift 40 ft. (12 m) PAL250K, PAL310K, PAL500K; max. lift 20 ft. (6 m) PAL1000K	36090281
Chain Container Assembly max. lift 80 ft. (24 m) PAL250K, PAL310K, PAL500K; max. lift 40 ft. (12 m) PAL1000K	36090239
Chain Container Assembly max. lift 120 ft. (36 m) PAL250K, PAL310K, PAL500K; max. lift 60 ft. (18 m) PAL1000K	76090142
Chain Container Assembly max. lift 20 ft. (6 m) PAL800K, PAL1001; max lift 10 ft. (3 m) PAL1600K, PAL2000K	76340025
Chain Container Assembly max. lift 40 ft. (12 m) PAL800K, PAL1001K, max lift 20 ft. (6 m) PAL1600K, PAL2000K	76340026
Chain Container Assembly max. lift 60 ft. (18 m) PAL800K, PAL1001K; max lift 30 ft. (9 m) PAL1600K, PAL2000K	76340027

Canvas Chain Buckets ('U' Option)

Used With	Max Lift (ft)	Max Lift (m)	Part Number	Used With	Max Lift (ft)	Max Lift (m)	Part Number
PAL/P250/315/500K	20	6	3609-0280	PAL/P630/1000K	10	3	3609-0280
PAL/P250/315/500K	40	12	3609-0281	PAL/P630/1000K	20	6	3609-0281
PAL/P250/315/500K	80	24	3609-0239	PAL/P630/1000K	40	12	3609-0239

Description of Part	Part Number
Lubricator 1/2 in.	L20-04-LK00-28
Filter 1/2 in.	F20-04-000
Regulator 1/2 in	R20-06-G00
Liquidator	8826-W2-000
Air Inlet Swivel	71079339
Exhaust Valve Kit (Incl's items 175, 176 and 177)	20417
Hose Kit (One motor)	PHB2PP-XX
Hose Kit (Two motor)	PHB4PP-XX
Lubricant	LUBRI-LINK-GREEN
Silica Gel	92155183
Piped Away Exhaust Kit	PAL-K8

XX = Specify Length

Piped Away Exhaust ('P' option)

426	Kit (incl's items 427 through 430)	1	PAL-K8
427	Elbow	1	PAL-8
428	Screw	1	PAL-638
429	'O' Ring	1	5821-2229
430	'O' Ring	1	5821-5129

PARTS ORDERING INFORMATION

Use of replacement parts other than **Ingersoll-Rand** may result in decreased hoist performance, and may, at the Company's option, invalidate the warranty.

For prompt service and genuine **Ingersoll-Rand** parts, provide your nearest Distributor with the following:

1. Complete hoist model number and serial number as it appears on the nameplate.
2. Part number and part description as shown in this manual.
3. Quantity required.

The model and serial number label is located on the brake end housing.

For your convenience and future reference it is recommended that the following information be recorded.

Hoist Model Number _____

Hoist Serial Number_____

Date Purchased _____

Return Goods Policy

Ingersoll-Rand will not accept any returned goods for warranty or service work unless prior arrangements have been made and written authorization has been provided from the location where the goods were purchased.

Hoists returned with opened, bent or twisted hooks, or without chain and hooks, will not be repaired or replaced under warranty.

NOTICE

• Continuing improvement and advancement of design may cause changes to this hoist which are not included in this manual. Manuals are periodically revised to incorporate changes. Always check the manual edition number on the front cover for the latest issue.

Disposal

When the life of the hoist has expired, it is recommended that the hoist be disassembled, degreased and parts separated as to materials so that they may be recycled.

NOTICE

• Mineral based oils are recyclable, however, some oils such as glycols may be extremely toxic and must be identified and disposed of at an approved waste or disposal site in accordance with all local, state and federal laws and regulations.

For additional information contact:
Ingersoll-Rand
P. O. Box 618
510 Hester Drive
White House, TN 37188
Phone: (615) 672-0321
Fax: (615) 672-0801

or

Ingersoll-Rand
Douai Operations
111, avenue Roger Salengro
59450 Sin Le Noble, France
Phone: (33) 03-27-93-08-08
Fax: (33) 03-27-93-08-00

DESIGN UPDATE SUMMARY

This edition of the manual incorporates changes covered in supplement MHD56043SUP. Hoists with serial numbers ending in letter E or with serial number 940100 and higher are covered by the information in this manual. The following parts must be installed together to complete the parts upgrade. Upgrading parts on hoists with serial numbers not ending in E, or with numbers less than 940100 is required to repair the hoist as old part versions are not available as replacement parts.

Item No.	Description of Part	Part Number	Design Change Information
62	Bearing	56321512	Replaces bearing part number 56322115.
63	Sprocket	96090009	Modified to accommodate new 'U' Cup seal (84) and bearing (62).
79	Shuttle Spool 'O" Ring	58212229	New item. Requires new brake cover (90), designed to accommodate shuttle spool.
84	'U' Cup Seal	58019830	Large 'U' Cup seal.
90	Brake Cover	96090004	Modified to accommodate new 'U' Cup seal (84) and shuttle spool components (79), (100) and (101).
100	Shuttle Spool	96090223	New items. Requires new brake cover (90), designed to accommodate shuttle spool.
101	Shuttle Ball	69401625	
102	'O' Ring	58221729	Seal port to shuttle spool.

LIMITED WARRANTY

Ingersoll-Rand Company (I-R) warrants to the original user its Products to be free of defects in material and workmanship for a period of one year from the date of purchase. **I-R** will repair, without cost, any Product found to be defective, including parts and labor charges, or at its option, will replace such Products or refund the purchase price less a reasonable allowance for depreciation, in exchange for the Product. Repairs or replacements are warranted for the remainder of the original warranty period.

If any Product proves defective within its original one year warranty period, it should be returned to any Authorized Hoist and Winch Service Distributor, transportation prepaid with proof of purchase or warranty card.

This warranty does not apply to Products which **I-R** has determined to have been misused or abused, improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine **I-R** parts.

I-R makes no other warranty, and all implied warranties including any warranty of merchantability or fitness for a particular purpose are limited to the duration of the expressed warranty period as set forth above. I-R's maximum liability is limited to the purchase price of the Product and in no event shall I-R be liable for any consequential, indirect, incidental, or special damages of any nature rising from the sale or use of the Product, whether based on contract, tort, or otherwise.

Note: Some states do not allow limitations on incidental or consequential damages or how long an implied warranty lasts so that the above limitations may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

IMPORTANT NOTICE

It is our policy to promote safe delivery of all orders. This shipment has been thoroughly checked, packed and inspected before leaving our plant and receipt for it in good condition has been received from the carrier. Any loss or damage which occurs to this shipment while en route is not due to any action or conduct of the manufacturer.

Visible Loss or Damage
If any of the goods called for on the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt.

Concealed Loss or Damage
When a shipment has been delivered to you in apparent good condition, but upon opening the crate or container, loss or damage has taken place while in transit, notify the carrier's agent immediately.

Damage Claims
You must file claims for damage with the carrier. It is the transportation company's responsibility to reimburse you for repair or replacement of goods damaged in shipment. Claims for loss or damage in shipment must not be deducted from the **Ingersoll-Rand** invoice, nor should payment of **Ingersoll-Rand** invoice be withheld awaiting adjustment of such claims as the carrier guarantees safe delivery.
You may return products damaged in shipment to us for repair, which services will be for your account and form your basis for claim against the carrier.

United States Office Locations

For Order Entry and Order Status

Technical Support

Ingersoll-Rand
P.O. Box 970
1467 Route 31 South
Annandale, NJ 08801
Phone: (908) 238-7000
Fax: (908) 238-7048

Ingersoll-Rand
Global Logistics
P.O. Box 618
510 Hester Drive
White House, TN 37188
Phone: (615) 474-8665
Fax: (615) 672-0854

Web Site:
www.irco.com

Regional Sales Offices

Annandale, NJ
P.O. Box 970
1467 Route 31 South
Annandale, NJ 08801
Phone: (908) 238-7000
Fax: (908) 238-7048

Detroit, MI
1872 Enterprise Drive
Rochester, MI 48309
Phone: (248) 293-5700
Fax: (248) 293-5800

International Office Locations

Offices and distributors in principal cities throughout the world. Contact the nearest **Ingersoll-Rand** office for the name and address of the distributor in your country or write/fax to:

Canada
National Sales Office
Regional Warehouse
Toronto, Ontario
51 Worcester Road
Rexdale, Ontario
M9W 4K2
Phone: (416) 213-4500
Fax: (416) 213-4510
Order Desk
Fax: (416) 213-4506

Latin America Operations
Ingersoll-Rand
Production Equipment Group
730 N.W. 107 Avenue
Suite 300, Miami, FL, USA
33172-3107
Phone: (305) 559-0500
Fax: (305) 222-0864

Europe, Middle East and Africa
Ingersoll-Rand
Douai Operations
111, avenue Roger Salengro
59450 Sin Le Noble, France
Phone: (33) 3-27-93-08-08
Fax: (33) 3-27-93-08-00

Asia Pacific Operations
Ingersoll-Rand
42 Benoi Road
Jurong, Singapore
629903
Phone: 65-861- 1555
Fax: 65-861- 0317

Russia
Ingersoll-Rand
Presnensky Val
19, Moscow 123557
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Fax: (7) 095-737-01-48

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