



IMPORTANT INFORMATION:

- A copy of our “Safe Operating Practices” Manuals are always available free of charge either by downloading it from our Technical Publications website @ www.airwinch.com or by contacting the Factory at (800) 866-5457 for North America and (206) 624-0466 for International. The Safe Operating Practices manual must be read prior to anyone operating a **Ingersoll-Rand** winch or hoist. The manual form numbers are as follows:

“Safe Operating Practices Non-Man Rider™ Winches” Manual, Form No. MHD56250

“Safe Operating Practices for Man Rider™ Winches” Manual, Form No. MHD56251

“Safe Operating Practices for Pneumatic, Hydraulic and Electric Hoists” Manual, Form No. MHD56295

- Available winch options may require additional supplements to the basic winch manual.
- For Man Rider™ winches ensure a copy of the Man Rider™ supplement is made available to the operator prior to winch operation.

Winch Man Rider™ Supplements:

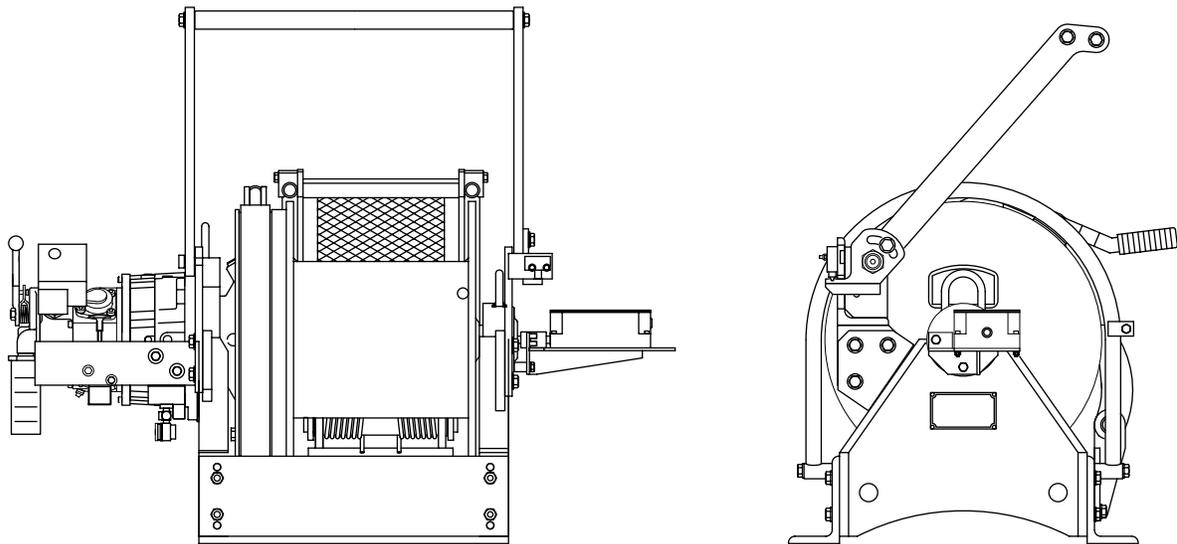
Model:	Publication No.
FA2, FA2.5, FH2, FH2.5	MHD56046
FA5	MHD56042 and MHD56220
FA10	MHD56252
FA2.5A	MHD56236
FA2B and HU40A	MHD56207
FH10MR	MHD56212
Fulcrum Electric	MHD56277
LS500HLP/ LS1000HLP	SAM0004

Model:	Publication No.
LS500RLP	SAM0011
LS1000RLP	SAM0012
LS150RLP	SAM0082
LS150RLP/500/ 1000	SAM0115
LS150RLP and LS150PLP-PH	SAM0120
LS500RLP-E	SAM0122
LS150RLP- DP5M-F	SAM0184
LS150HLP	SAM0222

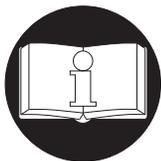
- We strongly recommend that ALL maintenance on **Ingersoll-Rand** equipment be carried out by personnel certified by **Ingersoll-Rand**, or by **Ingersoll-Rand** Authorized Service Centers.
- Contact the Factory if in doubt about installation, operation, inspection and maintenance instructions.
- Use only Genuine **Ingersoll-Rand** parts when maintaining or repairing a winch, hoist or any component of a winch or hoist.
- ANSI / ASME recommends that a winch or hoist (or any components of a winch or hoist) that has been repaired be tested prior to being placed into service:
 - * **Winches** - ANSI / ASME B30.7 (BASE MOUNTED DRUM HOISTS) Refer to section 7.2.2 - Testing.
 - * **Hoists** - ANSI / ASME B30.16 (OVERHEAD HOISTS - UNDERHUNG) Refer to section 16.2.2 - Testing.

PARTS, OPERATION AND MAINTENANCE MANUAL

force **5**TM **WINCHES** **MODEL FA150KGMR MAN RIDER**TM



(Dwg. MHP2254)



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.

This manual applies only to FA150KGMR winches designed by Ingersoll-Rand that are identified for personnel lifting by a permanent nameplate attached to the winch at the factory.

Always operate, inspect and maintain this winch in accordance with European Security Rules and any other applicable safety codes and regulations.

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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 winch.

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

- **Be sure to check all regulations, local, state, federal and country, that may apply to the use of a winch or winch system for lifting and lowering people before using a *Man Riding* winch.**
- **The supporting structures and load-attaching devices used in conjunction with this winch must provide an adequate safety factor to handle the rated load, plus the weight of the winch and attached equipment. This is the customer's responsibility. If in doubt, consult a registered structural engineer.**

Ingersoll-Rand winches are manufactured in accordance with European Security Rules and Regulations.

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 intended path of any load.

The Occupational Safety and Health Act of 1970 generally places the burden of compliance with the user, 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.

GENERAL INFORMATION

Ingersoll-Rand offers, in its winch product line, a limited number of models referred to as *Man Rider* which are designed and manufactured to standards and specifications based on the recommendations of various regulatory bodies for the purpose of lifting people.

Man Rider winches are type-approved and/or certified to meet the requirements of the Offshore Oil Industry by one or more of the following regulatory bodies:

American Bureau of Shipping (ABS), Lloyd's Register of Shipping (LRS) or Det Norske Veritas (DNV) to comply with the UK Health and Safety Executive (HSE), UK Department of Energy (DEn), the Norwegian Maritime Directorate (NMD) or the Norwegian Petroleum Directorate (NPD).

In furnishing customers *Man Rider* winches, **Ingersoll-Rand** does not warrant the suitability of these winches for any particular use. It is the owner's and user's responsibility to determine the suitability of a *Man Rider* winch for a particular application. Further, it is the owner's and user's responsibility to check and satisfy all local, state, federal and country requirements pertaining to lifting and lowering people.

WARNING

• **Many agencies require on winches additional redundant safety devices that Ingersoll-Rand does not furnish. Additional devices are often required to bring the system up to elevator code standards.**

Operating Limitations

Man Rider winches manufactured by **Ingersoll-Rand** to ABS, LRS and/or DNV requirements are furnished with limitations; approval for use in personnel-lifting applications automatically terminates for any of the following reasons:

1. Winch does not meet other applicable codes or standards.
2. Winch is not part of an approved system.
3. Winch is not properly maintained in an "as new" condition with all parts intact and properly adjusted.
4. Winch is used in applications not approved by codes and regulations, or is used in applications inconsistent with manufacturer's operation and maintenance manual.
5. Changes in any of the standards or regulations after **Ingersoll-Rand's** initial shipment of the product.
6. More than one winch is used to attach to a common load.

WARNING

• **Before using a *Man Rider* winch, be sure to check all regulations: local, state, federal and country, that may apply to the use of a winch or winch system for lifting and lowering people.**

7. The personnel platform shall be designed by a registered engineer competent in this area.

NOTICE

• **Lifting personnel with this winch is STRICTLY LIMITED to off-shore marine applications specifically approved by maritime regulatory bodies. Suitable use is determined by regulatory bodies, not the manufacturer. DO NOT USE FOR personnel lifting applications not specifically approved by regulatory bodies.**

Traceability

Load bearing parts are documented to provide traceability. Documentation includes chemical and physical properties of raw material, heat treating, hardening, tensile and charpy tests as required for the part.

Winches with M1, M2 or M3 in the model code have traceable load bearing components.

M1–Material Traceability certificates according to EN 10204 (Ex DIN 50049) 2.2 on load bearing parts. Conformity documents affirm (by the manufacturer) that parts are in compliance with the requirements of the order based on non-specific inspection and testing (i.e., results are typical material properties for these parts).

M2–Material Traceability certificates according to EN 10204 (Ex DIN 50049) 3.1b on load bearing parts. Conformity documents affirm (by a department independent of the manufacturing department) that the actual parts are in compliance with the requirements of the order based on specific inspection and testing (i.e., results are actual material properties for these parts).

M3–Material Traceability certificates according to EN 10204 (Ex DIN 50049) 3.1b on load bearing parts. Conformity documents affirm (by a department independent of the manufacturing department) that the actual parts used in the product are in compliance with the order based on specific inspection and testing (i.e., results are actual material properties for these parts in a finished, as delivered condition).

Components with part numbers ending in CH are charpy parts for use under extreme cold conditions. Traceability requirements must be stated when reordering these parts for continued certification.

WINCH OPERATING INSTRUCTIONS

Man Rider Operating Instructions



• **Failure to follow these instructions may result in termination of all applicable warranties. Ingersoll-Rand assumes no liability for any loss or damage resulting from operation of Man Rider winches if these operating instructions are not followed.**

1. Winch operator must maintain visual or signalmen contact with personnel being lifted or lowered at all times.
2. Personnel operating the winch or being transferred are to have sufficient instruction/training concerning that operation before any movement takes place.
3. Winch installation must be arranged to conform to statutory regulations covering personnel handling.
4. Prior to any personnel movement, winch shall be inspected to ensure safe operation.
5. Lifting apparatus (basket, etc.) shall be inspected and certified for personnel lifting prior to use.
6. Winch shall not be overloaded.
7. Do not operate without testing. Refer to "INSPECTION" and "TESTING" procedures.
8. Do not operate winch in a damaged condition.
9. Do not operate winch in an improperly equipped or maintained condition.
10. Do not attach winch to an unsafe foundation. All bolts and foundations should have a higher load carrying capacity than the wire rope on winch.
11. Do not operate winch if any personnel are near the line of force or where they are likely to come into contact with moving parts.
12. All signs and warning notices must be permanently posted on winch.
13. Keep a minimum of three wraps of wire rope on drum at all times.
14. Never leave an unattended load suspended.
15. Wire rope must spool off drum from the top away from the operator.

General Operating Instructions

The following warnings and operating instructions have been adapted in part from American National (Safety) Standard ASME B30.7 and are intended to avoid unsafe operating practices which might lead to injury or property damage.

Ingersoll-Rand recognizes that most companies who use winches have a safety program in force at their facility. 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 and maintain this winch.
2. Only operate a winch if you are physically fit to do so.
3. When a "DO NOT OPERATE" sign is placed on the winch, or controls, do not operate the winch until the sign has been removed by designated personnel.
4. Before each shift, the operator should inspect the winch for wear and damage. Never use a winch that inspection indicates is worn or damaged.
5. Never lift a load greater than the rated capacity of the winch. Refer to nameplate attached to winch or to "SPECIFICATIONS" section on page 7.
6. Keep hands, clothing, jewelry, etc. away from wire rope, drum and moving parts.
7. Never place your hand in the throat area of a hook or near wire rope spooling onto or off of the winch drum.
8. Always rig loads properly and carefully.
9. Be certain load is properly seated in the saddle of the hook. Do not support the load on the tip of the hook.
10. Do not "side pull" or "yard".
11. Keep everyone clear of load path.
12. Do not lift a load over people.
13. Ease slack out of wire rope when starting a lift or pull. Do not jerk the load.
14. Do not swing a suspended load.
15. Do not leave a suspended load unattended.
16. Never operate a winch with twisted, kinked or damaged wire rope.
17. Be aware of load positions at all times to avoid moving load into hazardous situations.
18. Never use wire rope as a sling.
19. After use, or when in a non-operational mode, the winch should be secured against unauthorized and unwarranted use.

WARNING TAG AND LABELS

Each winch is shipped from the factory with warning tag and labels shown. If tag and labels are not attached to your winch, order new tag and labels and install. Refer to parts list for part numbers. Tag and labels are shown smaller than actual size.

NOTICE

***Man Rider™* AIR WINCH**

Personnel lifting with this winch is **STRICTLY LIMITED** to off-shore marine applications specifically approved by maritime regulatory bodies. Regulatory bodies, not the manufacturer, have determined suitable use. Use for man-lifting **ONLY IN APPLICATIONS SPECIFICALLY APPROVED** by regulatory bodies.

71108856/A

Read the latest edition of ASME B30.7. Comply with other federal, state and local rules.

⚠ WARNING

Failure to follow these warnings may result in death, severe injury or property damage.

BEFORE OPERATING WINCH:

- Do not operate before reading manual(s) supplied with this winch.
- Inspect winch, wire rope and rigging prior to every shift.
- Ensure all winch components and attachments are functioning and properly adjusted.

- Ensure winch anchors and supporting structure are secure and in good condition.
- Ensure winch supply cables and hoses are in good condition and connections are tight.
- Do not operate if malfunctioning or damage is found.
- Use only approved rigging methods.
- Do not make unauthorized modifications.
- Use guards to avoid possible hazards.
- Ensure an accessible shut off valve has been installed in the air supply line and make others aware of its location.
- Use caution when operating in extremely cold temperatures.

READ ADDITIONAL WARNINGS ON OTHER SIDE.

71124887 (manrider winches)

DO NOT REMOVE THIS LABEL.

⚠ WARNING (CONTINUED FROM OTHER SIDE)

WHEN OPERATING WINCH:

- Do not lift loads over people.
- Keep hands, clothing, jewelry, etc. away from wire rope drum and other moving parts.
- Stop winch before touching wire rope.

- Ensure wire rope spools evenly across drum width and each wrap is tight to drum and previous wrap.
- Ensure tension is applied to wire rope when spooling.
- Be aware of load position at all times to avoid moving load into hazardous situations.
- Do not lift or pull load into support structure or winch.
- Do not run wire rope over sharp edges, use approved diameter sheaves.
- Ensure load does not exceed winch, wire rope & rigging ratings.
- Keep everyone clear of load path.
- Keep a minimum of 3 wraps of wire rope on drum at all times. (Minimum of 4 wraps required for ASME A10.22 compliance.)
- Immediately stop operation if load does not respond to winch control.
- Wear hearing and eye protection.
- Ensure brakes hold prior to making complete lift by lifting load a short distance and releasing control.
- Use only in a well ventilated area.
- Keep clear of motor exhaust.
- Do not allow wire rope storage to exceed drum flange diameter.
- Always shut off air or power supply before servicing or leaving winch unattended.
- Do not remove or obscure this or any other warning label.

READ ADDITIONAL WARNINGS ON OTHER SIDE.

71124887 (manrider winches)

SPECIFICATIONS

Air System	Rated Operating Pressure	6.3 bar/630 kPa (90 psig)	
	Air Consumption (at rated pressure and load)	62 scfm	1.75 cu.m/min
Rated Performance (at rated pressure/volume) (1)	Full Drum Line Pull	330 lbs	150 kg
	Full Drum Line Speed	95 fpm	29 mpm
Sound Pressure Level (dBA) (2, 3)		85 dBA	
Sound Power Level (dBA) (2)		96 dBA	
Winch Net Weight (without wire rope)	12 in. (305 mm) long drum	620 lbs	281 kg
Air Motor Port Inlet Size		1/2 in. NPT	
Minimum Air System Hose Size		0.75 in.	19 mm
Wire Rope Size		10 mm	
Maximum Foundation Anchor Shear Force at One Capscrew (4)		75 lbs	334 N
Drum Barrel Diameter		10.75 in.	273 mm
Drum Flange Diameter		19 in.	483 mm

Notes:

- Performance based on 6.3 bar/630 kPa (90 psig) operating pressure.
- Sound measurements have been made in accordance with ISO 11201, ISO 3744-3746 and ISO 4871 test specifications for sound from pneumatic equipment. Readings shown are based on the average noise level of each winch configuration, proportionate to the utilized time in a regular cycle.
- Lpc (Peak Sound Pressure) does not exceed 130 dB.
- Occurs when wire rope take-off from drum equals zero degree angle of inclination. Values based on wire rope at third layer and rated line pull.

Layer	Line Speed @ 150 kg (330 lb) Load		Minimum Load for Emergency Lowering		Wire Rope Storage Capacity							
					8 in. (203 mm) Drum		12 in. (305 mm) Drum		16 in. (406 mm) Drum		24 in. (610 mm) Drum	
	fpm	mpm	lb	kg	ft	m	ft	m	ft	m	ft	m
1	82	25	200	91	56	17	86	26	116	35	175	53
2	85	26	187	85	116	35	178	54	239	73	361	110
3	87	26.5	176	80	180	55	275	84	370	113	560	171
4	89	27	166	75	248	76	378	115	509	155	770	235
5	91	27.7	158	72	319	97	487	148	655	200	991	302
6	93	28.3	150	68	395	120	602	183	810	247	1225	373
7	94	28.6	140	64	474	144	723	220	972	296	1470	448
8	95	29	136	62	556	169	849	259	1142	348	1727	526

* Operate winch at speeds as slow as practical to ensure personnel safety.

** Wire rope storage capacity based on DNV and NMD standards of 2.5 times wire rope diameter below drum flange. Wire rope storage capacities listed may vary from figures stated elsewhere.

Model Code Explanation

Example: FA150KGMR12-1-60-C-E

FA 150KG MR 12 - 1 - 60 - C - E

Series

FA = Force 5 Air Powered

Capacity: (based on wire rope at full drum)

150KG = 330 lb [150 kg] *Man Rider* Rating

Man Rider Designation:

MR = *Man Rider*

Drum Length:

8 = 8 inches (203 mm)

12 = 12 inches (305 mm)

16 = 16 inches (406 mm)

24 = 24 inches (610 mm)

Control:

1 = Winch mounted lever throttle (Standard)

3XX = Remote pilot pendant throttle (XX = Specify hose length (feet). Maximum 50 ft (15 metres)) includes automatic band brake

RC-F = Winch with remote “float” control console includes automatic band brake †

Wire Rope Take-off Range:

Blank = 75° - 90°

60 = 60° - 75°

45 = 45° - 60°

0 = 0° - 45°, where 0° is horizontal

Design Temperature:

Blank = 0° C (32° F) or warmer

C = -20° C (-4° F)

Options:

M1 = Typical Material Certificates (2.2)*

M2 = As-received traceability*

M3 = As-shipped traceability*

N = Type approval (specify ABS or DNV) ††

Q = Special Paint ††

W = Witness Testing ††

X = Testing ††

-E = Compliance with European Machinery Directive (includes emergency stop and overload protection)

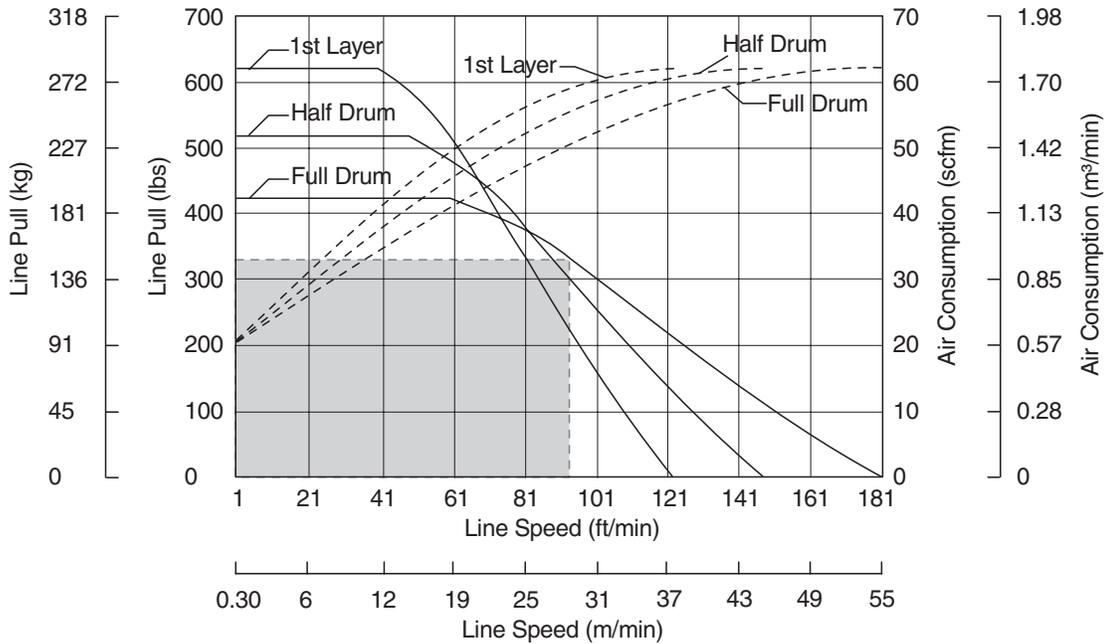
Notes:

* Refer to ‘Traceability’ on page 4 for a description of the differences between M1, M2 and M3.

† Not covered in this manual.

†† If N, Q, W or X are entered, the details must be specified in the text of the sales order.

Performance Graph



(Dwg. MHP2290)

Description

FA150KGMR winches are air powered, planetary geared units designed for transporting personnel. **FA150KGMR** winches are supplied with an internal automatic disc brake and either a manual or automatic drum band brake.

Output from the externally mounted piston air motor is transmitted through a coupling and shaft to the planetary reduction gear assembly.

The output from the planetary reduction gear assembly is connected to the wire rope drum through the output shaft. The disc brake attaches to the inboard upright at motor end and is connected to the input sun gear through brake shaft. The disc brake is automatically applied when winch is in neutral or operated in the haul-in direction; disengaged when winch is operated in the payout direction.

During winch operation a sprag type clutch in the disc brake allows drum rotation in the haul-in direction with disc brake engaged. This ensures brake will respond quickly to hold the load when winch operation stops. Operation of winch in the payout direction directs pressurized air to brake piston to overcome spring force and release brake. When the payout operation is complete air is vented and brake is automatically applied.

The drum band brake operates by applying a friction force between the drum band and winch drum. The manual brake requires an operator to engage and disengage the brake using a handle located on the brake band. The automatic drum band brake operation is similar to the disc brake with the following exception: the automatic drum band brake fully disengages in both the haul-in and payout directions.

INSTALLATION

Prior to installing winch, carefully inspect it for possible shipping damage.

Winch gearbox and disc brake are supplied fully lubricated from factory. Check oil levels and adjust as necessary before operating winch. Refer to "LUBRICATION" section on page 23 for recommended oils.

⚠ 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 winch to use.

Mounting

Refer to Dwg. MHP2288 on page 10 and Table 1 on page 10. Care must be taken when moving, positioning or mounting winch. Winch has lifting eyes welded to both uprights to assist in moving the unit. Attach hooks or a suitable sling to these eyes when moving winch. Refer to "SPECIFICATIONS" section on page 7 to determine winch weight.

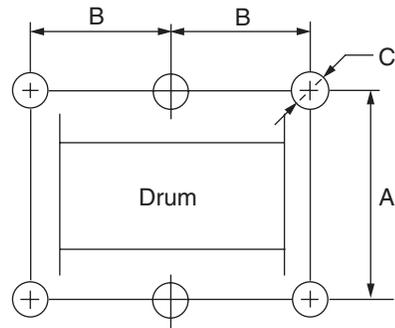
Mount winch so drum axis is horizontal and motor control valve pad is not more than 15 degrees off top vertical center. If winch is to be mounted in an inverted position, the motor case must be rotated to position control valve pad at the top and adequate clearance must be provided for control valve operation.

Position winch to provide unrestricted access to winch control valve.

Do not mount winch in a vertical position, with motor up or down. Reduction gear box lubrication is not designed for this type of installation.

1. Winch mounting surface must be flat and of sufficient strength to handle rated load plus the weight of the winch and attached equipment. An inadequate foundation may cause distortion or twisting of the winch uprights and side rails resulting in winch damage.
2. Make sure mounting surface is flat to within 1/16 in. (1.6 mm). Shim if necessary.
3. Mounting bolts must be 5/8 in. NC (16 mm) Grade 8 or better. Use self-locking nuts or nuts with lockwashers.
4. Tighten mounting bolts evenly and torque to 220 ft lbs (298 Nm) for dry thread fasteners. If fasteners are plated, lubricated or a thread-locking compound is used, torque to 170 ft lbs (231 Nm).
5. Maintain a fleet angle between the lead sheave and winch of no more than 1-1/2 degrees. The lead sheave must be on a center line with the drum and, for every inch (25 mm) of drum length, be at least 1.6 ft (0.5 m) from the drum. Refer to Dwg. MHP0498 on page 12.

Winch Bolt Hole Mounting Dimensions



(Dwg. MHP2288)

Table 1: Mounting Bolt Hole Dimensions

Dimension	Drum Length (inches)				
	8	12	16	24	
"A"	in.	20			
	mm	508			
"B"	in.	7	9	7.5*	10*
	mm	178	229	190*	254*
"C"	in.	0.69			
	mm	18			

* 4 mounting bolt holes in each side.

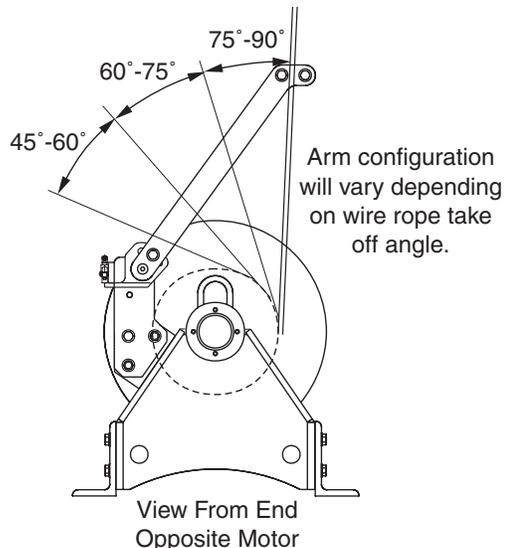
Wire Rope

⚠ CAUTION

• Maintain at least 3 tight wraps of wire rope on drum at all times. Refer to Dwg. MHP0498 on page 12.

Install winch so that wire rope, when at take-off angle limits, shown in Dwg. MHP2269 on page 10, does not contact mounting surface. Install winch with single part wire rope reeving only.

Wire Rope Take-off Angles



(Dwg. MHP2269)

Wire Rope Selection

Consult a reputable wire rope manufacturer or distributor for assistance in selecting the appropriate type and size of wire rope and, where necessary, a protective coating. Use a wire rope that provides an adequate safety factor to handle the actual working load and that meets all applicable industry, trade association, federal, state and local regulations.

When considering wire rope requirements the actual working load must include not only the static or dead load but also loads resulting from acceleration, retardation and shock load. Consideration must also be given to the size of the winch wire rope drum, sheaves and method of reeving. Wire rope construction must be 10 mm EIPS 6 X 19 IWRC with a minimum breaking strength of 15,690 lbs (69.8 kN) right lay to assist spooling. Refer to Table 2.

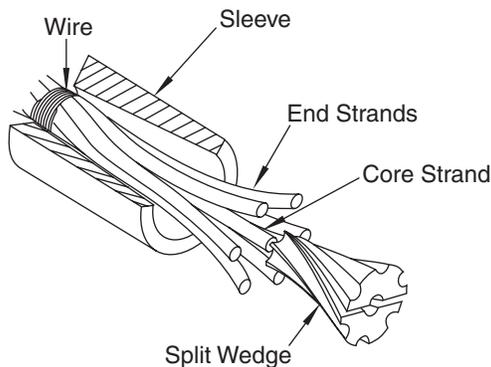
Table 2: Wire Rope Size

Wire Rope Anchor Part No.	Size
71387781	10 mm

Installing Wire Rope

Refer to Dwg. MHP0166 on page 11.

1. Cut wire rope to length in accordance with wire rope manufacturer's instructions.
2. Feed end of wire rope into wire rope anchor hole in drum and pull through approximately 1 ft (305 mm) of wire rope.



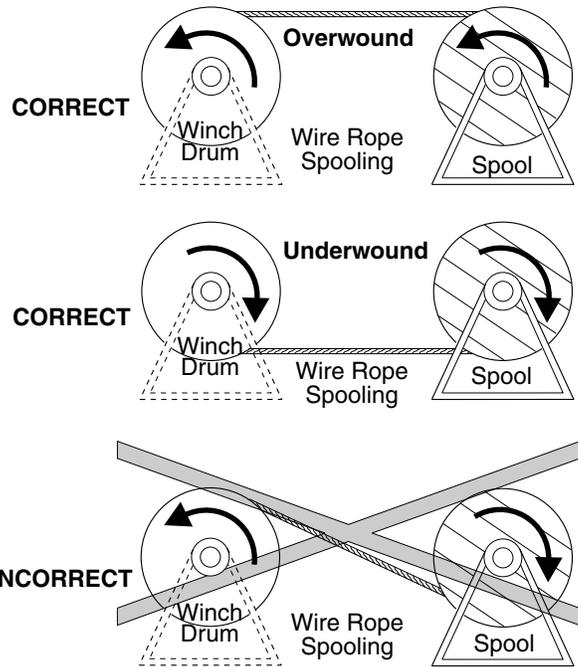
(Dwg. MHP0166)

3. Wrap wire rope with wire a distance from the end 2-5/8 in. (60.3 mm).
4. Slide sleeve over end of wire rope so larger diameter of taper bore is nearest the end of wire rope.
5. Spread end strands of wire rope and insert split wedge until it is below the end of wire rope.
6. Pull sleeve over wire rope end until tight. Check that wire rope strands stay in the slots located on split wedge.
7. Pull wire rope anchor into position in drum anchor pocket.

⚠ WARNING

• **Install wire rope to come off drum in an overwind position. Improper installation of wire rope can result in failure of disc brake to hold load and prevent overload device operation. Refer to Dwg. MHP2269 on page 10 and Dwg. MHP2450 on page 11.**

Spooling Wire Rope onto Winch Drum



(Dwg. MHP2450)

⚠ CAUTION

- **Make sure the first wrap of wire rope is tight and lies flush against drum flange.**
- **Ensure correct wire rope anchor is used.**
- **Do not spool from drum to winch using the slack line detector assembly.**

Safe Wire Rope Handling Procedures

1. Always use gloves when handling wire rope.
2. Never use wire rope which is frayed or kinked.
3. Never use wire rope as a sling.
4. Always ensure wire rope is correctly spooled and the first layer is tight against the drum.
5. Always follow wire rope manufacturer's recommendations on use and maintenance of wire rope.

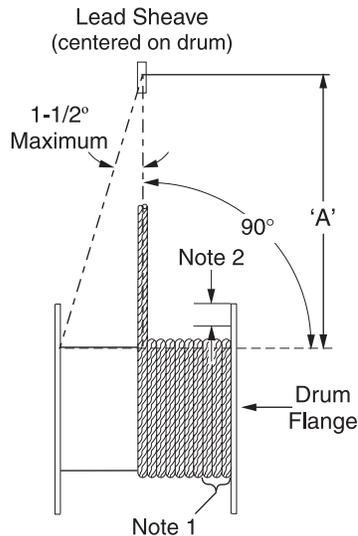
Wire Rope Spooling

To compensate for uneven spooling and the decrease in line pull capacity as the drum fills up, use as short a wire rope as practical. When winding, apply tension to the end of the wire rope to eliminate line slack. This helps achieve level winding and tight spooling.

⚠ CAUTION

• **Do not feed wire rope through slack wire roller for spooling operation. This may cause damage to slack line arm.**

Wire Rope and Fleet Angle Installation Drawing



(Dwg. MHP0498)

- 'A' = 1.6 feet (0.5 metre) per inch of drum length:
- 'A' = 12.8 feet (3.9 metres) for 8 inch drum.
- 'A' = 19.2 feet (5.85 metres) for 12 inch drum.
- 'A' = 25.6 feet (7.8 metres) for 16 inch drum.
- 'A' = 38.4 feet (11.7 metres) for 24 inch drum.

Notes:

1. Maintain a minimum of 3 tight wraps of wire rope on drum at all times.
2. Ensure wire rope does not exceed top layer requirement. Refer to "SPECIFICATIONS" section on page 7.

Slack Line Detector

Refer to Dwg. MHP2266 on page 46.
Before adjusting slack line detector remove one shoulder screw (524) from outboard stop bracket (507). Store in threaded hole on opposite side of winch on the inboard support bracket (508).

NOTICE

• **To avoid damage to limit valve (513), use shoulder screw (524) to lock slack line detector for shipping, maintenance and storage purposes.**

To adjust slack line detector, with wire rope installed on drum:

1. Loosen capscrew (514) on actuator bracket (505).
2. Feed wire rope end between take-off rollers (501), and remove slack from wire rope.
3. Rotate actuator bracket (505) until it contacts the limit switch (481). Tighten capscrew (514).

Limit Switch

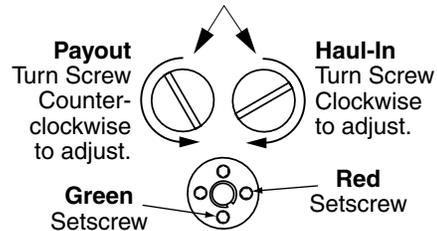
Refer to Dwgs. MHP2471 on page 50 and MHP0607 on page 12. Operate winch in both directions to activate limit switches. Limit switches should engage at established setting +/- 2 ft (0.7 m), and prevent winch operation until reset by shifting winch operating direction.

To set for maximum wire rope payout:

1. Remove cover plate from top of limit switch (462).

2. Loosen green setscrew in center of limit switch, below access cover.
3. Position winch wire rope at desired payout position.
4. Rotate left cam adjustment screw **counterclockwise** until it fully activates cutoff valve, causing system air to vent. 2.75 turns of the cam adjustment screw are required for each full cam revolution.
5. Hold cam adjustment screw in position (venting air) and tighten blue setscrew to lock cam in place.
6. If required, adjust haul-in limit switch. Test winch setpoints by operating winch through three complete cycles to ensure consistent limit switch operation within +/- 2 ft (0.7 m) of setpoints.
7. Install access cover when final adjustments are complete.

Limit Switch Adjustment



(Dwg. MHP0607)

To set for maximum wire rope haul-in:

1. Remove cover plate from top of limit switch assembly (462).
2. Loosen red setscrew in center of limit switch, below access cover.
3. Position winch wire rope at desired haul-in position.
4. Rotate right cam adjustment screw clockwise until it fully activates cutoff valve, causing system air to vent. 2.75 turns of cam adjustment screw are required for each full cam revolution.
5. Hold cam adjustment screw in position (venting air) and tighten red setscrew.
6. If required, adjust payout limit switch. Test winch setpoints by operating winch through three complete cycles to ensure consistent limit switch operation within +/- 2 ft (0.7 m) of setpoints.
7. Install access cover when final adjustments are complete.

Rigging

Make sure all wire rope blocks, tackle and fasteners have a safety margin sufficient to handle the required load under all conditions. Do not allow wire rope to contact sharp edges or make sharp bends which will cause damage to wire rope. Use a sheave. Refer to wire rope manufacturer's handbook for proper sizing, use and care of wire rope.

Safe Installation Procedures

1. Do not use wire rope as a ground (earth) for welding.
2. Do not attach a welding electrode to winch or wire rope.
3. Never run the wire rope over a sharp edge. Use a correctly sized sheave.
4. When a lead sheave is used, it must be aligned with the center of the drum. The diameter of the lead sheave must be at least 18 times the diameter of the wire rope. Refer to Dwg. MHP0498 on page 12.
5. Always maintain at least 3 full, tight wraps of wire rope on the drum.

Air Supply

Air supply must be clean, free from moisture and lubricated to ensure optimum motor performance. Foreign particles, moisture and lack of lubrication are primary causes of premature motor wear and breakdown. Using an air filter, lubricator and moisture separator will improve overall winch performance and reduce unscheduled downtime.

Air consumption is 62 scfm (1.75 cu.m/min.) at rated operating pressure of 90 psig (6.3 bar/630 kPa) at Emergency Stop Valve 1/2 in. NPT inlet. If air supply varies from what is recommended, winch performance will change.

Exceeding 90 psi (6.3 bar/630 kPa) may cause inadvertent activation of the overload device.

Air Lines

The inside diameter of the winch air supply lines must not be less than the size shown in Table 3 on page 13. Prior to making final connections, all air supply lines should be purged with clean, moisture free air or nitrogen before connecting to winch 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.

Table 3

Minimum Allowable Air Supply Line Sizes		
Model	inch	mm
FA150KGMR	3/4	19

Air Line Lubricator

Refer to Dwg. MHP0191 on page 13.
Always use an air line lubricator with these motors. Lubricator must have an inlet and outlet at least as large as the inlet on motor. Install air line lubricator as close to air inlet on motor as possible.

CAUTION

- Lubricator must be located no more than 10 ft (3 m) from the motor.
- Shut off air supply before filling air line lubricator.

Air line lubricator should be replenished daily and set to provide 6 to 9 drops per minute of ISO VG 32 (SAE 10W) oil. A fine mist will be exhausted from the throttle control valve when the air line lubricator is functioning properly.

Air Line Filter

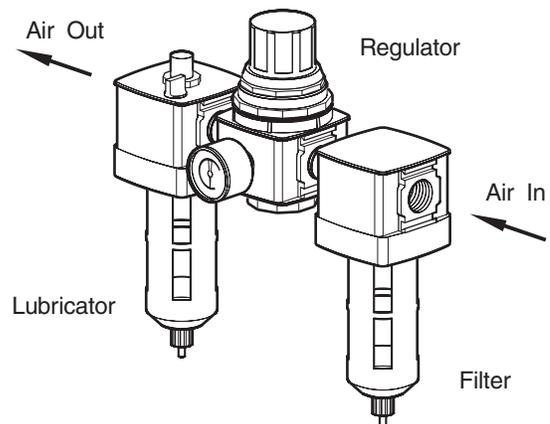
Refer to Dwg. MHP0191 on page 13.
It is recommended that an air line strainer/filter be installed as close as practical to motor air inlet port, but before the lubricator, to prevent dirt from entering motor. Strainer/filter should provide 20 micron filtration and include a moisture trap. Clean strainer/filter periodically to maintain its operating efficiency.

Air Pressure Regulator

Refer to Dwg. MHP0191 on page 13.
If an air pressure regulator is used, install between lubricator and filter as shown. Exceeding rated pressures may cause tripping of overload valve.

Moisture in Air Lines

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



(Dwg. MHP0191)

Motor (full flow and pendant control)

For optimum performance provide an air supply of 90 psig at 62 scfm (6.3 bar/630 kPa at 1.75 cu.m/min) for FA150KGMR winches. Winch should be installed as near as possible to the compressor or air receiver. Recommended pressures and volumes are measured at the point of entry to emergency stop valve.

Mufflers

Refer to Dwg. MHP2277 on page 60.
Ensure mufflers are installed in exhaust ports of control valve and motor. Check mufflers periodically to ensure they are functioning correctly.

Initial Winch Operating Checks

Winches are tested for proper operation prior to leaving factory. Before winch is placed into service the following initial operating checks should be performed.

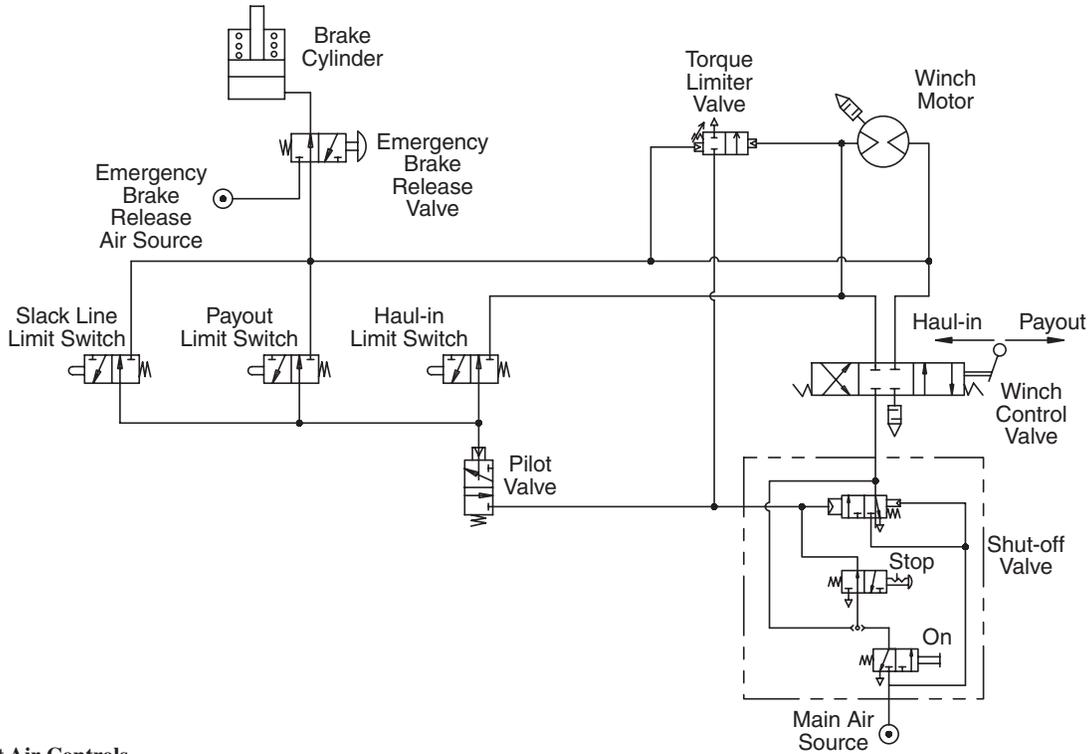
1. When first running motor, inject light oil into inlet connection to provide initial lubrication.
2. When first operating the winch, it is recommended that motor be driven slowly in both directions for a few minutes.
3. Check Emergency Stop operation. Refer to "OPERATION" section on page 16.
4. Check Limit Switch operation. Refer to "OPERATION" section on page 17.

For winches that have been in storage the following start-up procedures are required.

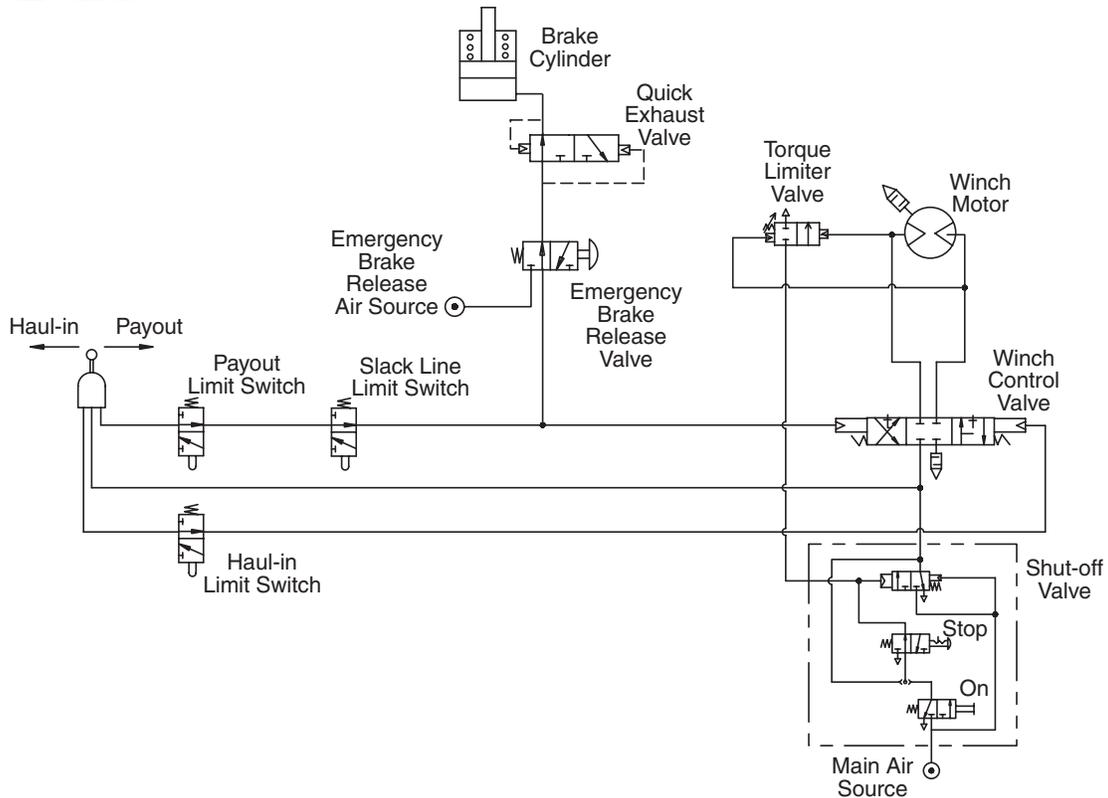
1. Give winch an inspection conforming to the requirements of 'Winches Not in Regular Use' in "INSPECTION" section on page 19.

2. Pour a small amount of ISO VG 32 (SAE 10W) oil in motor inlet port.
3. Operate motor for 10 seconds in both directions to flush out any impurities.
4. Check to ensure oil levels are "full."
5. The winch is now ready for normal use.

Full Flow Controls



Pilot Air Controls



(Dwg. MHP2267)

OPERATION

It is recommended that the user and owner check all appropriate and applicable regulations before placing this product into use.

The four most important aspects of winch operation are:

1. Follow all safety instructions when operating the winch.
2. Allow only people trained in safety and operation of this winch to operate this equipment.
3. Subject each winch to a regular inspection and maintenance procedure.
4. Be aware of winch capacity and weight of load at all times.

WARNING

- Do not lift loads over people.

CAUTION

- Verify limit switch operation to ensure man riding device does not contact sheave.

Operators must be physically competent. Operators must not have a health condition which might affect their ability to act, and they must have good hearing, vision and depth perception. The winch operator must be carefully instructed in his duties and must understand the operation of the winch, including a study of the manufacturer's literature. The operator must thoroughly understand proper methods of hitching loads and must have a good attitude regarding safety. It is the operator's responsibility to refuse to operate the winch under unsafe conditions.

1. Lifting and lowering speeds are operator controlled and should be as slow as practical. **Ingersoll-Rand** recommends that you do not exceed 100 ft (30 m) per minute. Any applicable codes and standards should be followed.
2. Personnel being lifted or lowered must be alert to obstacles and hazards during movement.
3. If a personnel platform is used and is not landed on a solid surface, it shall be tied to the structure before personnel get off or on.
4. Tag lines shall be used where practical.
5. The winch operator shall remain at the controls at all times when handling personnel.
6. Handling of personnel shall be discontinued upon indication of any impending danger.

WARNING

- Maintain at least 3 wraps of wire rope on the drum at all times.

7. The man riding device shall be raised approximately 1 ft (30 cm) and inspected to ensure that it is secure prior to personnel occupancy. Before raising or lowering personnel, the following conditions shall exist:
 - a. Wire rope shall be free of kinks.
 - b. Winch shall be reeved for single part line which avoids obstructions and interference.
 - c. The primary point of wire rope attachment shall be centered over the man riding device to reduce tilting and swinging the suspended person.

8. When personnel are suspended, a signal person must be provided unless operator has line of sight. Signals must be visible to the operator at all times.
9. Rider suspension devices shall be in accordance with all applicable codes and regulations.
10. Bridles and associated hardware for the man riding device shall not be used for any other service.
11. If a slack wire rope condition occurs the hoisting mechanisms shall be inspected to assure wire rope is properly spooled onto drum and through sheaves. When slack wire has been detected, operator must determine and rectify problem prior to resuming operation.

Training

Program

The employer shall provide and implement a training program for all supervisors and employees engaged in the operation of raising, lowering or suspending personnel platforms from a winch load line so that they are familiar with the requirements of the hoisting system and are able to recognize the associated hazards and take appropriate measures. Records of training programs shall be maintained.

Planning Meeting

A meeting attended by the winch operator, signal persons, persons to be lifted and the person in charge of the task to be performed is required to be held to plan and review the procedures to be followed, including procedures for entering and leaving the man riding device, the use of safety equipment, signals, and the lift chart information.

NOTICE

- This meeting shall be held prior to the beginning of personnel hoisting operations at each new work location and thereafter for any new employees assigned to the operation.

Winch Controls

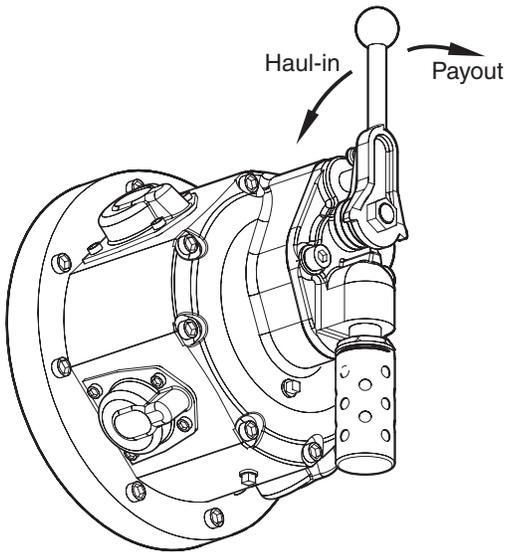
A spring loaded, motor-mounted, manual throttle control valve is supplied as a standard feature on these winches. Optional remote pendant controls are also available. Reference the model code on winch nameplate and compare it to "SPECIFICATIONS" section on page 7 to determine winch configuration. The throttle control provides operator control of motor speed and direction of drum rotation.

Operate winch throttle control using smooth, even movements. Do not slam or jerk throttle controls during operation.

Winch Mounted Air Throttle

Refer to Dwg. MHP2480 on page 16.

The spring loaded, manual control throttle mounts to the air motor. As viewed from the air motor end, move the control throttle handle to the right (clockwise) to payout wire rope and to the left (counterclockwise) to haul-in wire rope. Avoid sudden movements of the control valve to ensure smooth operation of the winch. When released, handle will return to the neutral or center position.



(Dwg. MHP2480)

Remote Pilot Pendant Throttle (optional feature)

Refer to Dwg. MHP1892 and MHP2295 on page 16. Provides for remote winch control at distances up to 50 ft (15 m) away from the winch motor. Contact the factory for distances greater than 50 ft (15 m). Pilot air hoses connect the pendant to the winch motor pilot air valve to provide winch operation. The pendant control is a two lever movable control station which controls payout and haul-in. Direction of winch drum rotation is determined by the pendant lever depressed. Air is directed from the pendant into the pilot valve. The pilot valve spool shifts to direct control air into the winch motor to operate the winch in the desired direction. Winch operation must correspond to the directions indicated by the arrows located on the pendant levers. Press pendant levers using smooth, even movements. To operate the winch using the pendant:

1. To operate in the haul-in direction, press the 'RIGHT' lever.
2. To operate in the payout direction, press the 'LEFT' lever.
3. To throttle operating speed regulate the amount the lever is pressed. Press lever completely for maximum speed; press lever partially for slower speeds.
4. To stop haul-in or payout operation release the lever. Lever will spring return to off and winch motor will stop.

NOTICE

• **Pendant haul-in and payout levers provide variable speed operation. For low speed operation push appropriate lever slightly; for full speed operation push appropriate lever fully.**

Pendant

Check that all hose connections are tight and that hoses are not twisted or crimped. Refer to Dwg. MHP2295 on page 16 for hose connections. Pendant lengths up to 50 ft (15 m) are available. Contact the factory for pendant lengths greater than 50 ft (15 m).

CAUTION

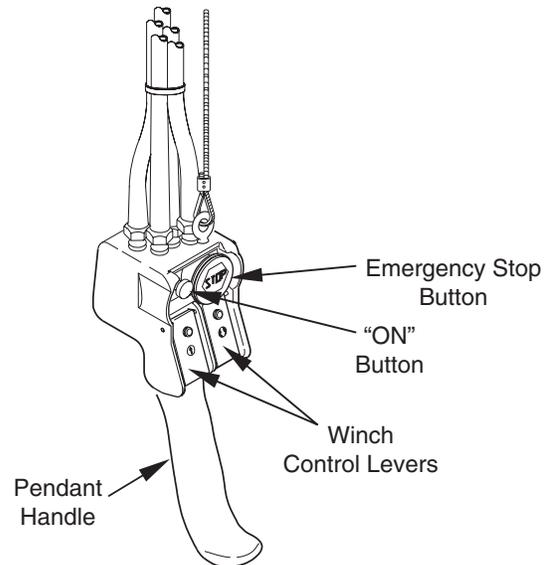
• **To avoid damaging the pendant hose, make sure the strain relief cable is slightly shorter than hose lengths to ensure hoses are not stretched.**

Emergency Stop

The Emergency Stop button, when activated, will immediately stop all winch operations. The Emergency Stop button will remain depressed after activation. To reset Emergency Stop button, twist (rotate) Emergency Stop button clockwise until button releases and spring returns to its original position. Press "ON" button.

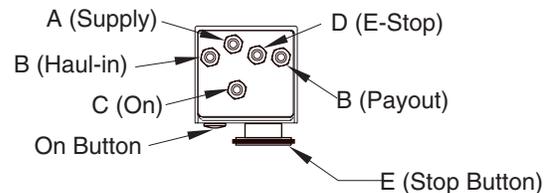
For winches equipped with pendant, an Emergency Stop button is mounted both on winch and pendant. Activation of either button will stop the winch. After resetting Emergency Stop button winch can only be turned on by pressing "ON" button at the pendant.

Pendant Operation



(Dwg. MHP1892)

Hose Connection Ports



(Dwg. MHP2295)

Winch Brakes

Automatic Disc Brake

The automatic disc brake is spring applied, air released. When the winch is operated in payout direction, air pressure acting on the piston overcomes spring force and releases brake. The brake automatically engages when winch operation is returned from payout direction to neutral. When winch is in neutral or haul-in positions the brake air is vented and brake springs apply the brake. The springs, acting on the brake piston, compress brake friction and separator plates and engage brake to prevent drum rotation in payout direction.

The cam type sprag clutch assembly allows drum rotation in haul-in direction with brake plates engaged, but prevents drum from rotating in payout direction.

A minimum air pressure of 60 psi (410 kPa/4.1 bar) is required to release brake.

Disc brake adjustment is not required. If disc brake does not operate properly it must be disassembled, inspected and repaired.

Manual Drum Brake (winch mounted throttle)

Refer to Dwg. MHP2265 on page 44.

The manual drum brake may be applied by pushing down on the handle and released by pulling up. By pushing the handle down fully, it will go over-center and lock in that position, preventing drum rotation. The drum brake must be kept properly adjusted to hold the required load. Refer to 'Adjustments' on page 25, in the "MAINTENANCE" section. If brake band cannot be adjusted to hold the rated load, the brake must be disassembled, inspected and repaired.

Automatic Drum Brake (remote control)

Refer to Dwg. MHP2265 on page 44.

The automatic drum brake is a spring applied, air released, externally mounted brake which uses an air actuated, spring loaded cylinder to disengage the brake when the motor is operated in either the haul-in or payout directions. Air pressure directed to the cylinder overcomes spring force to release brake and allow drum to rotate.

When the control valve is placed in the neutral position, air in the cylinder is vented which allows the cylinder spring to engage brake and prevent drum rotation.

Adjustments to the cylinder clevis can be made to compensate for normal brake lining wear. The drum brake must be kept properly adjusted to hold the required load. Refer to 'Adjustments' on page 25, in the "MAINTENANCE" section. If brake band cannot be adjusted to hold rated load, the brake must be disassembled, inspected and repaired.

Winch Motor

Draining Motor Housing

Refer to Dwgs. MHP2481 on page 40 and MHP2258 on page 56. During normal operation moisture can collect in the motor housing. This accumulation should be drained regularly. Excess moisture in the housing will decrease bearing life. In addition, freezing moisture can damage motor components.

To drain, locate and remove oil level, pipe plug (121) in bottom of motor housing (118). Any fluid drained should be disposed of in an environmentally safe manner.

Slack Line Detector



- **Slack line detector and limit switch functions are not operable when emergency release valve is activated.**

Refer to Dwg. MHP2266 on page 46.

If slack line exists between winch and sheave, slack line detector limit switch valve stops wire rope payout. When slack wire has been detected, operator must determine and rectify problem prior to resuming operation.

Slack Line Detector arms may vary in design depending on required take-off angle. Ensure correct arms are used for desired take-off angle.



- **Operator and signal persons must watch for any conditions that allow slack wire rope to exist between sheave and lifted person which may not be sensed by the slack wire detector. If slack wire condition is noticed, all winch operations must cease until problem is rectified.**

Press Roller

Refer to Dwg. MHP2268 on page 48.

The press roller, positioned between drum flanges, assists proper spooling of wire rope onto the drum and maintains tight wraps when winch is not in operation. Ensure wire rope is always trapped between press roller and drum barrel. Press roller adjustments are not required.

Limit Switches

Pre-set limit switch settings prevent winch wire rope payout and haul-in by stopping air flow to the winch motor when a set point has been reached. It is the owner's and operator's responsibility to adjust winch operating limits prior to using the winch to transport personnel. To adjust the limit switch set points refer to the "INSTALLATION" section on page 12.

Emergency Lowering

The following information is provided to allow for emergency lowering of a person if air supply is lost to the winch. These procedures should be used if no other method of safely lowering personnel is available.

Winch Brake Configuration

Man Rider winches are supplied with a manual or automatic drum brake and a disc brake.

If your winch has a manual drum brake, it can be used to regulate the descent of the person when one of the options listed below is used.

When air supply is lost, winch disc brake and automatic drum brake are engaged.

Emergency Lowering Precautions

1. Emergency lowering operations must be performed by a minimum of two personnel trained in the operation of the winch.
2. Communication must be established between lifted person and winch operators. Operators should be able to visually monitor lifted person until landed.
3. If line of sight between operators and lifted person is not possible, signals must be conveyed to the operators.
4. The winch must be isolated from the supply air system during emergency lowering operations.

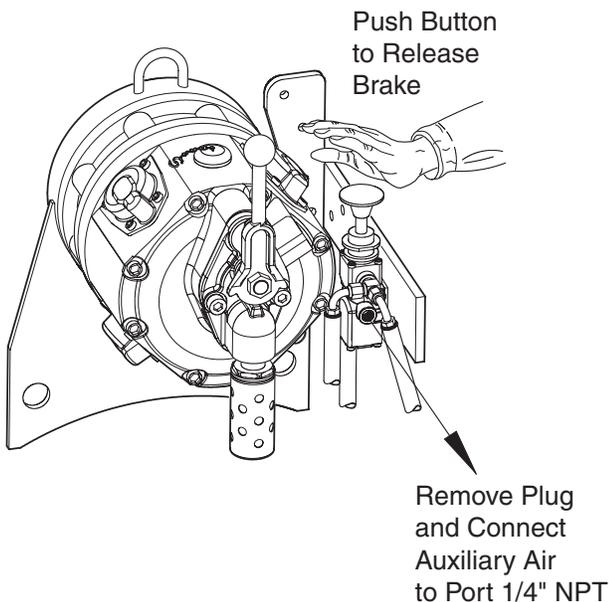
Emergency Lowering Procedure

Use the following options for lowering in an emergency.

Manual Band Brake and Disc Brake

Have one operator stationed at the manual drum brake to slowly release and apply the manual drum brake when the air disc brake is released by the Emergency Lowering Device.

1. The winch is equipped with an Emergency Lowering Device. To activate the Emergency Lowering Device, remove pipe plug from valve body and connect an air or nitrogen line of 60 psi (410 kPa/4.1 bar). Ensure the Emergency Stop button is in the off position (not activated). With one operator in control of the manual drum brake, the other operator presses and holds the Emergency Release valve button to begin lowering. With maximum rated load, lowering speed can reach 10 feet per minute (3 metres per minute). Speed may be improved by moving throttle lever in payout direction. Release of valve button stops emergency lowering and sets the disc brake.
2. If there is insufficient weight for Emergency Lowering Device to work refer to 'Alternative Measures.'



(Dwg. MHP2289)

Automatic Band Brake and Disc Brake

Have one operator stationed at the Emergency Lowering Device with second operator visually monitoring suspended person. Refer to steps 1 and 2 under 'Manual Band Brake and Disc Brake' Instructions.

Alternative Measures

If the air brake release methods listed above do not allow the person to lower, there may not be enough weight to overcome the natural mechanical resistance of the winch gearbox and motor. The minimum load for emergency lowering is 200 lbs (91 kg) on the first layer.*

* Refer to "SPECIFICATIONS" section for minimum load at different layers.

1. If the motor will not backdrive, attach a line to the man riding device and carefully pull down suspended person.

⚠ WARNING

• The line used to pull down the Man Riding device must be attached in such a manner as to NOT pull on the suspended person or tip the Man Riding device.

2. Alternatively, send additional weight to the suspended person using another line. This weight must be secure and evenly distributed. Never exceed the capacity of the winch or man riding device.

⚠ CAUTION

• Any additional weight should be sent in small, easily handled bundles and only enough to cause person to lower. When lowering person in this manner the brake(s) can be used to control lowering by releasing air pressure or applying the band brake.

INSPECTION

Inspection information is based in part on American National Standards Institute Safety Codes (ASME B30.7).

WARNING

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

Frequent and periodic inspections should be performed on equipment in regular service. Frequent inspections are visual examinations performed by operators or 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 the safety, operation and maintenance of this equipment.

ASME B30.7 states inspection intervals depend upon the nature of the critical components of the equipment and the severity of usage. The inspection intervals recommended in this manual are based on intermittent operation of the winch eight hours each day, five days per week, in an environment relatively free of dust, moisture, and corrosive fumes. If the winch is operated almost continuously or more than eight hours each day, more frequent inspections will be required.

Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before condition becomes dangerous. Deficiencies revealed through inspection, or noted during operation, must be reported to designated personnel instructed 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 authorized review.

Wire Rope Report

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

Frequent Inspection

On equipment in continuous service, frequent inspection should be made by operators at the beginning of each shift. In addition,

visual inspections should be conducted during regular operation for indications of damage or evidence of malfunction (such as abnormal noises).

1. **WINCH.** Prior to operation, visually inspect winch housings, controls, brakes, side rails, uprights and drum for indications of damage. Do not operate unless the wire rope feeds onto the drum smoothly. Any discrepancies noted must be reviewed and inspected further by authorized personnel instructed in the operation, safety and maintenance of this winch.
2. **WIRE ROPE.** Visually inspect all wire rope which can be expected to be in use during the day's operations. Inspect for wear and damage indicated by distortion of wire rope such as kinking, "birdcaging," core protrusion, main strand displacement, corrosion, broken or cut strands. If damage is evident, do not operate winch until the discrepancies have been reviewed and inspected further by personnel knowledgeable on wire rope safety and maintenance procedures.

NOTICE

• **The full extent of wire rope wear cannot be determined by visual inspection. At any indication of wear inspect wire rope in accordance with instructions in 'Periodic Inspection.'**

3. **AIR SYSTEM.** Visually inspect all connections, fittings, hoses and components for indication of air leaks. Repair any leaks or damage.
4. **PENDANT (optional feature).** Ensure operation of pendant levers is smooth and winch is responsive to pendant control. Pendant levers must spring return to the neutral position when released.
5. **MANUAL THROTTLE LEVER.** Ensure operation of manual throttle lever is smooth and winch is responsive to lever movement. Lever must return to neutral and lock in place when released. If winch responds slowly or controls stick, do not operate winch until all problems have been corrected.
6. **BRAKES.** During winch operation test brakes. Brakes must hold load without slipping. Automatic brakes must release when winch motor throttle is operated. If brakes do not hold load, or do not release properly, brakes must be adjusted or repaired.
7. **WIRE ROPE REEVING.** Check reeving and ensure wire rope is properly secured to the drum. Do not operate winch unless wire rope feeds onto drum smoothly.
8. **LUBRICATION.** Refer to "LUBRICATION" section on page 23 for recommended procedures and lubricants.
9. **LIMIT SWITCHES.** Ensure limit switches engage and prevent operation at the required set point and with drum rotating in correct direction. Ensure limit switch properly resets.
10. **MOTOR.** During operation check motor housing for excess heat build up. Housing should not be hot to touch. Listen for grinding or knocking noises. Ensure lubricated air supply provides 6 to 9 drops per minute of ISO VG 46 (SAE 10W) oil when winch is operated at rated capacity. Operate winch slowly in both directions to verify operation.

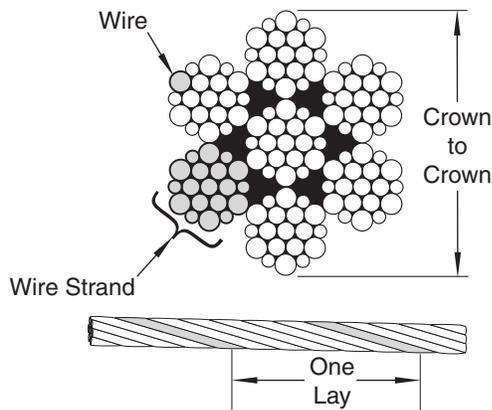
Periodic Inspection

Winch periodic inspection intervals vary depending on the conditions listed below:

NORMAL	HEAVY	SEVERE
yearly	semiannually	quarterly

Disassembly may be required as a result of frequent inspection findings or in order to properly inspect individual components. Disassembly steps are described in "MAINTENANCE" section. Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection' on page 19. Also inspect the following:

1. **SIDE RAILS and UPRIGHTS.** Check for deformed, cracked or corroded main components. Replace damaged parts.
2. **FASTENERS.** Check retainer rings, split pins, capscrews, nuts and other fasteners on winch, including mounting bolts. Replace if missing or damaged and tighten if loose.
3. **DRUM and SHEAVES.** Check for cracks, wear or damage. Replace if necessary.
4. **WIRE ROPE.** In addition to "Frequent Inspection" requirements, also inspect for the following:
 - a. Buildup of dirt and corrosion. Clean with steam or a stiff wire brush to remove dirt and corrosion if necessary.
 - b. Loose or damaged end connection. Replace if loose or damaged.
 - c. Check wire rope anchor is secure in drum.
 - d. Verify wire rope diameter. Measure diameter of wire rope from crown-to-crown throughout the life of wire rope. Recording of actual diameter should only be done with wire rope under equivalent loading and in the same operating section as accomplished during previous inspections. If actual diameter of wire rope has decreased more than 1/64 in. (0.4 mm) a thorough examination of wire rope should be conducted by an experienced inspector to determine the suitability of wire rope to remain in service. Refer to Dwg. MHP0056 on page 20.



(Dwg. MHP0056)

5. **ALL COMPONENTS.** Inspect for wear, damage, distortion, deformation and cleanliness. If external evidence indicates damage, disassemble as required to conduct a detailed inspection. Inspect gears, shafts, bearings, sheaves, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.

6. **BRAKES.** Individually test brakes installed to ensure proper operation. Brakes must hold a **125% rated load** at mid-drum without slipping. If indicated by poor operation or visible damage, disassemble and repair brake(s). Check all brake surfaces for wear, deformation or foreign deposits. Clean and replace components as necessary. Adjustments can be made to the drum band brake to compensate for normal brake lining wear. Refer to 'Adjustments' in "MAINTENANCE" section on page 25. If brake band cannot be adjusted to hold rated load, replace brake band assembly. Adjustments cannot be made to disc brake. The disc brake must be repaired as described in "MAINTENANCE" section.
7. **FOUNDATION or SUPPORTING STRUCTURE.** Check for distortion, wear and continued ability to support winch and rated load. Ensure winch is firmly mounted and that fasteners are in good condition and tight.
8. **LABELS and TAGS.** Check for presence and legibility of labels. Replace if damaged or missing.
9. **DRUM GUARD.** Verify fasteners are tight and in good condition. Ensure guard is in good condition.
10. **LIMIT SWITCH.** Operate winch in both directions to activate limit switch. Limit switch must activate (stop winch operation) at established settings (+/- 2 ft [+/- 0.6 m]). Reset limit switch by operating winch in opposite direction. Refer to 'Limit Switch' in "INSTALLATION" section on page 12 for adjustment procedures.
11. **EMERGENCY STOP VALVE.** During winch operation verify emergency shut-off valve operation. Valve must stop winch operation quickly. Valve must reset properly. For procedures, refer to 'Emergency Stop Valve' in the "OPERATION" section on page 16.
12. **OVERLOAD DEVICE.** Ensure overload device is properly set to stop winch in an overload condition. During operation apply band brake, overload will set and winch will cease to operate. If winch does not shut down, contact your distributor or factory for repair information.
13. **PRESS ROLLER.** Inspect rollers for wear and grooves. Ensure rollers freely rotate. Replace rollers if worn or grooved. Replace bearings if rotation is rough or stiff.
14. **SLACK LINE DETECTOR.** Inspect rollers for wear and grooves. Ensure rollers freely rotate. Replace worn or grooved rollers.

Winches Not in Regular Use

1. Equipment which has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming to the requirements of 'Frequent Inspection' on page 19 before being placed in service.
2. Equipment which has been idle for a period of over six months shall be given a complete inspection conforming with requirements of 'Periodic Inspection' on page 20 before being placed in service.
3. Standby equipment shall be inspected at least semiannually in accordance with requirements of 'Frequent Inspection' on page 19. In abnormal operating conditions equipment should be inspected at shorter intervals.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand FA150KGMR Winch

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. Discrepancies noted during Frequent Inspection	
	3. Discrepancies noted during Maintenance	
	4. Other: _____	

Refer to 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	
Uprights and Side Rails					
Drum Band Brake (125% Load Test)					
Automatic Disc Brake (125% Load Test)					
Drum Band Brake (Visual Inspection)					
Disc Brake (Visual Inspection)					
Motor					
Hoses, Controls and Valves					
Fasteners			---		
Shafts and Gears			---		
Labels and Tags			---		
Slack Line Detector					
Guard					
Wire Rope and Anchor			---		
Press Roller					

TESTING	Pass	Fail	NOTES
Operational (No Load)			
Operational (10%)			
Operational (Maximum Test Load *)			

* Maximum test load is 125% of rated line pull at full drum.

This page may be copied and used as an Inspection/Maintenance Record.

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
Winch will not operate.	No air supply to winch.	Check air supply line connections and hoses.
	Winch is overloaded.	Reduce load to within rated capacity. Verify overload settings.
	Shipping plugs may still be in place.	Remove shipping plugs in control valve.
	Drum brake not released.	Disengage manual drum brake or refer to 'Automatic Drum Brake' below.
Load continues to move when winch is stopped.	Brake(s) slipping.	Check brake band adjustment and brake band lining wear. Disassemble and inspect disc brake.
	Winch motor controls sticking.	Check pendant/throttle levers return to normal (neutral) positions when released. Disassemble, inspect and repair the pilot air control valve. Verify spool adjustment.
Winch does not lift load.	Motor may be damaged.	Remove and disassemble motor. Examine all parts and replace any that are worn or damaged.
	Insufficient air supply.	Verify air supply pressure and volume at winch inlet meets requirements. Refer to "SPECIFICATIONS" section on page 7. Clean air line filter.
	Upper limit switch activated.	Lower load and check limit switch settings.
Winch hauls in but does not payout.	Lower limit switch activated.	Raise load and check limit switch settings.
	Slack line detector activated.	Determine cause of slack line and rectify problem.
Throttle moves but winch does not operate.	Motor may be damaged.	Disassemble and clean the motor and replace any worn or damaged parts.
	Insufficient air supply.	Ensure air pressure at the winch inlet is at least 90 psig (6.3 bar/630 kPa) at rated volume. Clean air line filter.
	Air leak.	Check hose connections. Check hose lines for wear or damage. Replace worn or damaged hoses and fittings.
Winch runs slow.	Improper hose or fitting sizes.	Check fittings, connections and hoses for correct size and length. Replace parts that may cause restricted air flow. Inspect air line filter.
	Motor may be damaged.	Remove and disassemble motor. Inspect all parts and replace all worn or damaged parts.
	Brake(s) may not be releasing.	Refer to brake sections below.
	Ice in exhaust ports and/or air lines.	Check aftercoolers and traps. Add airline antifreeze to air supply.
	Motor piston ring wear.	Inspect piston rings and replace if worn.
	Excessive water in motor.	Drain water in motor. Refer to 'Draining Motor Housing' in "OPERATION" section on page 17.
Air lines freeze.	Water in air supply.	Install or drain air system moisture traps, moisture collecting air receivers and compressor aftercoolers. After corrective action has been taken, disconnect lines at winch inlet and purge with clean, dry air or nitrogen.

Air Motor:

Motor runs hot or makes excessive noise during operation.	Damaged or broken motor internal parts.	Disassemble and repair motor.
	Moisture in motor housing.	Drain motor housing. Refill to correct level. Refer to "LUBRICATION" section on page 23.

Automatic Drum Brake:

Brake will not release.	Damaged or leaking cylinder seals.	If air is noticed escaping from around the cylinder cover when attempting to release the brake disassemble and inspect cylinder. Replace all seals and repair or replace worn or damaged parts.
	Dirty filter in air supply.	Clean or replace filter.
Brake does not set when controls are released.	Hole in exhaust valve restricted or exhaust valve damaged.	Remove and inspect exhaust valve. Clean hole or replace damaged exhaust valve.

SYMPTOM	CAUSE	REMEDY
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Automatic Disc Brake:

Brake will not release.	Low air supply pressure.	Ensure supply air pressure at the brake inlet is at least 60 psig (410 kPa/4.1 bar).
	Leaking brake piston seals.	Disassemble brake and replace seals.
	No release pressure at brake port.	Verify proper operation of winch controls.

LUBRICATION

To ensure continued satisfactory operation of winch, all points requiring lubrication must be serviced with the correct lubricant at the proper time interval as indicated for each assembly.

The lubrication intervals recommended in this manual are based on intermittent operation of winch eight hours each day, five days per week. If winch is operated almost continuously or more than eight hours each day, more frequent lubrication will be required. Also, 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. Other lubricants may affect winch performance. Approval for the use of other lubricants must be obtained from your **Ingersoll-Rand** distributor. Failure to observe this precaution may result in damage to winch and/or its associated components.

INTERVAL	LUBRICATION CHECKS
Start of each shift	Check flow and level of air line lubricator (approximately 6 to 9 drops per minute required at maximum motor speed).
	Check winch motor oil level.
Monthly	Lubricate components supplied by grease fittings
	Inspect and clean or replace air line filter.
	Check reduction gear oil level.
Yearly	Drain and refill winch reduction gear oil.
	Drain and refill winch motor oil.

Note: Intervals are based on winch operation in a normal environment as described in the “INSPECTION” section on page 19. In ‘Heavy’ or ‘Severe’ operating conditions adjust lubrication intervals accordingly.

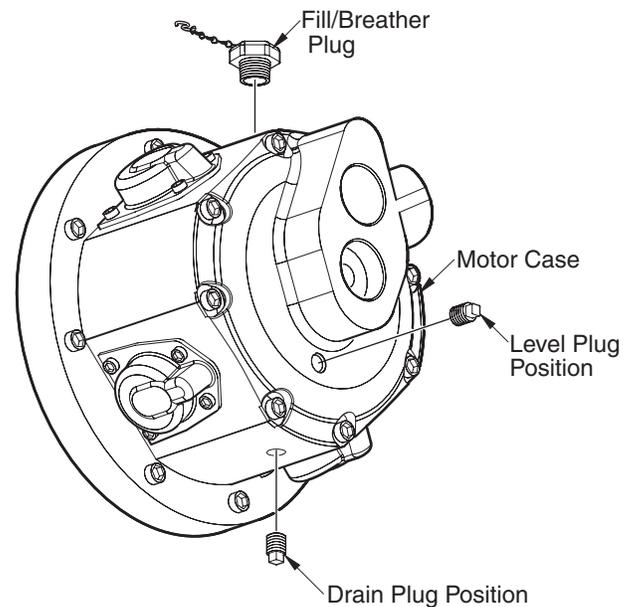
Motor

Correct lubrication is one of the most important factors in maintaining efficient winch operation. The motor is splash lubricated by the oil in the motor housing and has no other means of lubrication. It is therefore important to use only high quality, Extreme Pressure (EP) rust and oxidation inhibiting gear oils or non-detergent motor oils to ensure maximum performance and minimum downtime for repairs. Refer to Table 4 for recommended oil types. Allow oil to settle before topping off. Oil capacity for the winch motor is 1/2 pt (0.24 ltr). Pour sufficient oil into the vent cap opening to bring the oil in the motor case to the level of the upper oil plug hole. Add oil slowly to prevent spilling.

Table 4

Temperature	Oil Type
Below 32° F (0° C)	ISO VG 46 (SAE 10W)
30° to 80° F (0° TO 26° C)	ISO VG 68 (SAE 20W)*
Above 80° F (26° C)	ISO VG 100 (SAE 30W)

* Winches are shipped from factory with ISO VG 68 (SAE 20W) lubricant.



(Dwg. MHP2271)

The oil level in the motor should be checked daily or at the start of each shift after accumulated water has been drained off. When motors are operated in temperatures below freezing, wait long enough at end of shift for water to separate from oil but not long enough for it to freeze. Failure to drain the water when the winch is to remain idle for a protracted period at low temperatures may result in the oil splasher freezing fast. Drain the water then refill to the level plug. If desired, all the oil may be drained at the end of the shift and the motor refilled with new oil.

Reduction Gear and Disc Brake Lubrication

Refer to Dwg. MHP2297 on page 24.

The reduction gear and disc brake are filled with oil from the factory. Check oil level before initial winch operation.

Reduction gear and disc brake components are splash lubricated by oil in the housings and have no other means of lubrication. It is therefore important to use high quality, Extreme Pressure (EP) rust and oxidation inhibited gear oils to ensure maximum performance and minimum downtime for repairs. Refer to Table 5 for recommended oil types.

Table 5

Temperature	Oil Type
Below 32° F (0° C)	ISO VG 68 (SAE 2 EP)
32° to 80° F (0° to 27° C)	ISO VG 100 (SAE 3 EP) *
Above 80° F (27° C)	ISO VG 150 (SAE 4 EP)

* Winches are shipped from factory with ISO VG 100 (SAE 3 EP) lubricant. Reduction Gear capacity is approximately 1 qt (1 ltr). Disc brake capacity is approximately 0.2 gal (0.76 ltr).

Initial Reduction Gear Assembly Oil Change

1. Drain and replace oil in the motor and reduction gear after the first 50 hours of initial winch operation. Thereafter, drain and replace oil according to the intervals recommended.
2. Always inspect removed oil for evidence of internal damage or contamination (metal shavings, dirt, water, etc.). If indications of damage are noticed, investigate and correct before returning winch to service.
3. After winch operation, allow oil to settle before topping off.
4. Always collect lubricants in suitable containers and dispose of in an environmentally safe manner.

Reduction Gear Fill/Drain Procedures

Refer to Dwg. MHP2297 on page 24 and MHP2260 on page 38.

NOTICE

• **There are two plugged holes, located 180 degrees apart, on reduction gear carrier (23). To fill or drain reduction gear oil, winch drum must be rotated to align plugs for fill and drain operations.**

To Drain:

1. Rotate winch drum to align reduction gear carrier plugs to the drain position. Drain plug is located at bottom center.
2. Remove reduction gear carrier drain and fill plugs (24).

NOTICE

• **Always drain oil into a suitable container and inspect drained oil for evidence of damage, metal shavings, dirt, water, etc. Dispose of oil in an environmentally safe manner.**

3. Collect drained oil and dispose of properly. Reinstall the reduction gear carrier plugs.

To Fill:

1. Rotate winch drum to align reduction gear plugs to the fill position. Fill plug position is at top center.
2. Remove fill plug (24) located on gear carrier (23).
3. Fill slowly with 1 qt (1 ltr) of recommended oil.
4. Reinstall plug.

CAUTION

• **Do not overfill. Excess oil will reduce operating efficiency and increase oil temperature.**
 • **The use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage to the gears. Use only high quality rust and oxidation inhibiting lubricant.**

Disc Brake Fill/Drain Procedures

Refer to Dwg. MHP2259 on page 42.

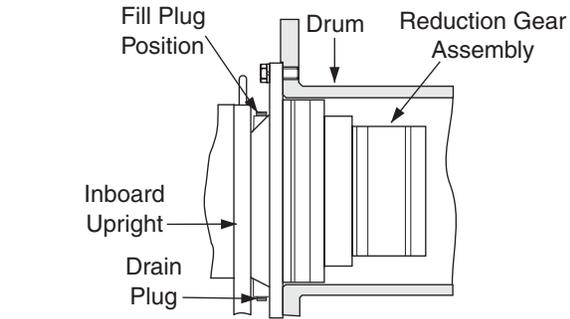
Disc Brake Drain:

1. Remove drain and level plugs (177).
2. Collect drained oil and dispose of properly.

Disc Brake Fill:

1. Install drain plug (177).
2. Remove level plug (177).
3. Add oil slowly until oil is level with level plug port.
4. Install level plug.

Reduction Gear Level and Fill Plug Locations



(Dwg. MHP2297)

Air Line Lubricator

An air line lubricator should be installed in air supply line as close as possible to motor inlet, but no more than 10 ft (3 m) away. Use ISO VG 46 (SAE 10W) oil in lubricator. Adjust lubricator to provide 6 to 9 drops per minute at maximum motor speed.

Wire Rope

Follow wire rope manufacturer's instructions. At a minimum, observe the following guidelines.

1. Clean with a brush or steam to remove dirt, rock dust or other foreign material on wire rope surface.

CAUTION

• **Do not use an acid-based solvent. Only use cleaning fluids specified by the wire rope manufacturer.**

2. Apply a wire rope lubricant, **Ingersoll-Rand LUBRI-LINK-GREEN** or ISO VG 100 (SAE 30W) lubricant.
3. Brush, drip or spray lubricant weekly, or more frequently, depending on severity of service.

Seals and Bearings

If winch is disassembled, clean all parts thoroughly and coat bearings and seals with clean grease. Refer to 'Recommended Grease' table on page 24. Use sufficient grease to provide a good protective coat.

Recommended Grease

Temperature	Grease Type
-20° to 50° F (-30° to 10° C)	EP 1 multipurpose lithium based grease
30° to 120° F (-1° to 49° C)	EP 2 multipurpose lithium based grease

⚠ WARNING

- Never perform maintenance on the winch while it is supporting a load.
- Before performing maintenance, tag controls:
WARNING - DO NOT OPERATE - EQUIPMENT BEING REPAIRED.
- Only allow personnel trained in safety and service on this winch to perform maintenance.
- After performing any maintenance on the winch, test winch to 125% of its rated line pull at mid drum before returning to service. (Testing to more than 125% of rated line pull may be required to comply with standards and regulations set forth in areas outside the USA.)
- Turn off air system and depressurize air lines before performing any maintenance.

INTERVAL	MAINTENANCE CHECK
Start of each shift (Operator or Maintenance Personnel)	Make a thorough visual inspection of the winch for damage. Do not operate the winch if damaged.
	Operate the winch at low RPM in both directions. Winch must operate smoothly without sticking, binding or abnormal noises. Check the operation of the brake(s).
3 Months (Maintenance Personnel)	Inspect drum brake friction linings. Clean or replace parts as required. Adjust drum brake as necessary.
Yearly (Maintenance Personnel)	Inspect winch gearing, shafts and bearings for wear and damage. Repair or replace as necessary.
	Check all supporting members, including the foundation, fasteners, nuts, sheaves and rigging, etc. for indications of damage or wear. Repair or replace as required.

Adjustments

Refer to “INSTALLATION” section for Slack Wire Rope Detector and Limit Switch Adjustments.

Disc Brake

Refer to Dwg. MHP2259 on page 42.
Brake adjustment is **not** required. If disc brake does not hold 125% of rated load at mid drum, disassemble and repair.

Manual Drum Band Brake

Refer to Dwg. MHP2265 on page 44.

1. Release wire rope tension on the drum.
2. Raise handle (354) to free brake band (384).
3. Remove cotter pin (352) and pin (351).
4. Rotate brake link stud (353) clockwise to increase brake torque.
5. Install pin (351) and check adjustment.

NOTICE

- If brake band cannot be adjusted to hold rated load, replace brake band assembly.

6. Adjust brake so when brake handle locks (goes over-center), brake will hold rated load.
7. Install cotter pin (352) and bend ends apart when adjustment is complete.

⚠ CAUTION

- When any part of the brake lining measures 0.062 in. (2 mm) or less, brake bands (384) must be replaced.

For new Brake Linings:

Run-in new brake linings to remove loose material and allow new lining to conform to brake drum.

1. Operate winch while applying increasing pressure to brake band handle until drum stops.

⚠ CAUTION

- Observe end of load line. Drum should only complete three to five full rotations before stopping.

2. Repeat step 1 twice while operating winch in both directions (payout and haul-in). The brake link stud may require tightening to stop drum rotation.
3. Adjust brake as described in steps 1 through 7 above.

Automatic Drum Band Brake (optional feature)

Refer to Dwg. MHP2265 on page 44.

NOTICE

- If brake band cannot be adjusted to hold rated load, replace the brake band assembly.

1. Remove cotter pin (352) and washer (385) at adjustment clevis (358).
2. Apply air to the brake cylinder (362) and remove pin (357) to disconnect clevis from brake lever (355).
3. Turn adjustment clevis (358) clockwise to increase cylinder rod extension. Turn clevis counterclockwise to decrease cylinder rod extension.
4. Assemble clevis (358) to brake lever (355) using pin (357). Release air to brake cylinder (362).
5. Brake should hold rated load (refer to “INSPECTION” section on page 19) when cylinder (362) is retracted. Brake band should not drag on drum when cylinder is extended.
6. Install cotter pin (352) and washer (385) to secure clevis to brake lever when adjustment is complete.

Pilot Air Control Valve Adjustment (optional feature)

Refer to Dwg. MHP2275 on page 57.

If winch operating speeds differ from performance specifications pilot air control valve may require adjustment. Loosen nut (219) and adjust adjusting setscrew (218), located in valve end cap (209), until drum speed for no-load haul-in equals drum speed for full load payout. Adjust screw ‘OUT’ (counterclockwise turn) to increase speed; adjust screw ‘IN’ (clockwise turn) to decrease speed. It is suggested that a chalk mark be placed on drum flange so that drum rpm can be accurately counted. Tighten nut (219) when adjustment is complete.

Disassembly

General Disassembly Instructions

The following instructions provide the necessary information to disassemble, inspect, repair, and assemble the winch. Parts drawings are provided in the Parts Section on page 37.

If a winch is being completely disassembled for any reason, follow the order of the topics as they are presented.

It is recommended that all maintenance work on the winch be performed in a clean, dust-free work area.

In the process of disassembling the winch, observe the following:

1. Never disassemble winch 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 the perimeter of a cover or housing with a soft hammer, for example, is sufficient to break the seal.
3. Do not heat a part with a flame to free it for removal, unless part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

In general, the winch 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, gaskets and 'O' rings should be discarded once they have been removed. New seals, gaskets and 'O' rings should be used when assembling the winch.
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 a press fit in or on a subassembly unless removal of that part is necessary for repairs or replacement.
8. When removing ball bearings from shafts, it is best to use a bearing puller. When removing bearings from housings, drive out bearing with a sleeve slightly smaller than the outside bearing diameter. The end of the sleeve or pipe which contacts the bearing must be square. Protect bearings from dirt by keeping them wrapped in clean cloths.

Winch Disassembly

Refer to Dwg. MHP2259 on page 42 and MHP2260 on page 38.

1. Remove wire rope from drum.
2. Operate winch to position reduction gear drain plug at its lowest position.
3. Relieve pressure in air lines by operating winch control several times after air supply has been turned off.



• **Shut off, bleed down and disconnect air supply line before performing any disassembly procedures.**

4. Disconnect and tag air lines.
5. Remove winch from its mounting and take to a suitable work area before beginning disassembly.
6. Remove lower drain plug (121) on motor housing (118) and allow oil to drain into a suitable container. Loosen fill cap (117) to vent motor housing.

7. Drain oil from reduction gear assembly by removing plug (35) when positioned at its lowest point, and similar plug (35) from its highest point to vent. Refer to Dwg. MHP2271 on page 23 in "LUBRICATION" section. If winch is equipped with a drum band brake elevate winch outboard end (opposite from motor end) to prevent draining oil from contaminating brake band lining.
8. Remove pipe plug (177) in disc brake housing (4) to drain brake oil.
9. Remove drum band brake, drum guard and any other externally mounted winch components. Refer to appropriate disassembly text.



• **The air motor weighs approximately 45 lbs (21 kg). Adequately support air motor before removing motor mounting capscrews.**

10. Remove capscrews (119) and lockwashers (113) securing motor assembly to motor adapter (4). Using a hoist to support motor, pull motor straight away from winch. Reference the applicable 'Motor Disassembly' section if motor disassembly is required.
11. Remove capscrews (3) and separate brake assembly. If brake assembly sticks, tap brake housing with a soft faced hammer until parts separate. Note position of all brake parts for reassembly.
12. Support drum (60) and remove capscrews (13) from drum shaft (15). Pry drum shaft (15) from inboard upright (17).
13. Remove capscrews (65) and lockwashers (22) which secure side rails (62) and (63) to inboard upright (17). Drive out dowel pins (19).
14. Remove inboard upright (17).
15. Remove limit switch assembly, end cover (74), capscrews (70) and (77) and lockwashers (5) from outboard upright (64).
16. Remove capscrews (13) and shaft retainer (72) from drum (60).
17. Remove drum and reduction gear assembly.
18. Remove remaining capscrews (65) and lockwashers (22) which attach side rails (62) and (63) to outboard upright (64). Drive out dowel pins (19).
19. Remove bearing (71) and seal (69) from outboard upright (64).
20. Remove capscrews (21) and lockwashers (22) securing gear carrier (23) to drum (60).
21. Install two 1/2 in. - 13 NC x 3 in. long capscrews into threaded holes in outer bolt pattern ring of gear carrier (23). Use these capscrews to break seal. Remove reduction gear/gear carrier assembly from drum (60).

To disassemble reduction gear assembly refer to Reduction Gear Disassembly section.

Control Valve Removal

1. Unscrew the two valve chest cover capscrews (245) and remove cover (247) with assembled parts from motor case (118).
2. Remove gasket (103).
3. Remove reverse valve nut (241) from reverse valve (251).
4. Pull throttle lever (242) and spring (243) from reverse valve.
5. Remove reverse valve (251), 'O' ring (249) and 'O' ring (248) from valve chest cover.
6. Remove thrust washer (105).

Motor Disassembly (full flow)

Refer to Dwg. MHP2481 on page 40.

1. Remove control valve as described in "Control Valve Removal".
2. Using a 7/16 in. -14 thread bolt, remove rotary valve (107) from rotary valve bushing (106).
3. Unscrew eight motor case capscrews (119) and remove motor case (118) containing assembled motor from motor adapter (139).
4. Unscrew four cylinder capscrews (112) from any one of the four cylinder heads (114) and remove the cylinder head, cylinder sleeve (111) and gasket (115).
5. Crank assembly (135) until piston (108) is at top dead center. Push piston wrist pin (109) out of piston, freeing piston from connecting rod (134). Repeat until all four cylinders and pistons have been removed freeing the crank assembly (135) and assembled parts.
6. Using two screw drivers, pry crank pin sleeve (131) from crank and remove connecting rod rings (133), connecting rods (134) and connecting rod bushing (132).
7. Remove crank bearing (138) (only if replacement is necessary) by supporting inner ring of bearing and pressing on face of motor pinion.
8. If pinion on crankshaft (135) is damaged or worn, it will be necessary to replace entire crankshaft.
9. Unscrew four oil wall buttonhead screws (129) and remove oil wall (127). Removal of the oil wall is seldom necessary unless reverse valve bushing (252) is to be removed.
10. Rotary valve bushing (106) and reverse valve bushing (252) are press fits in the motor case and should never be removed unless replacement is necessary. To remove, heat bushings to 450° F (232° C) to loosen Loctite®. Support the face of the motor case that contacts the valve chest cover, and, with a suitable arbor inserted into motor case and against the face of the bushing, press bushing out while it is hot.

CAUTION

- Use an arbor that will clear the bushing keys (120) that project into each bushing bore in motor case. Pressing bushings out in the opposite direction or using an arbor that will not clear the bushing keys will result in the keys being sheared off.

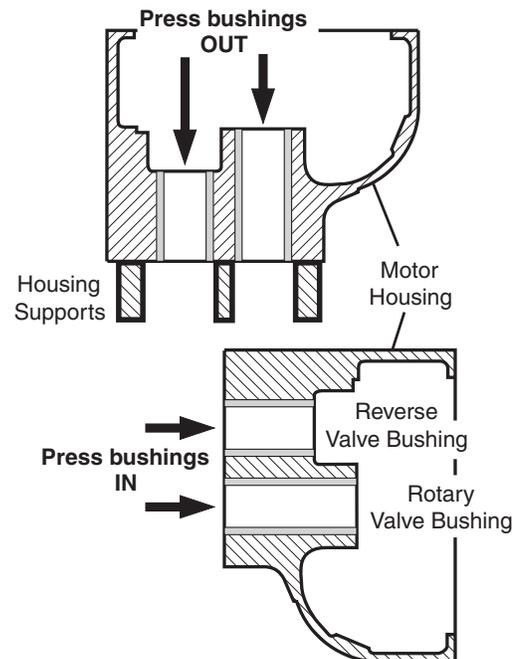
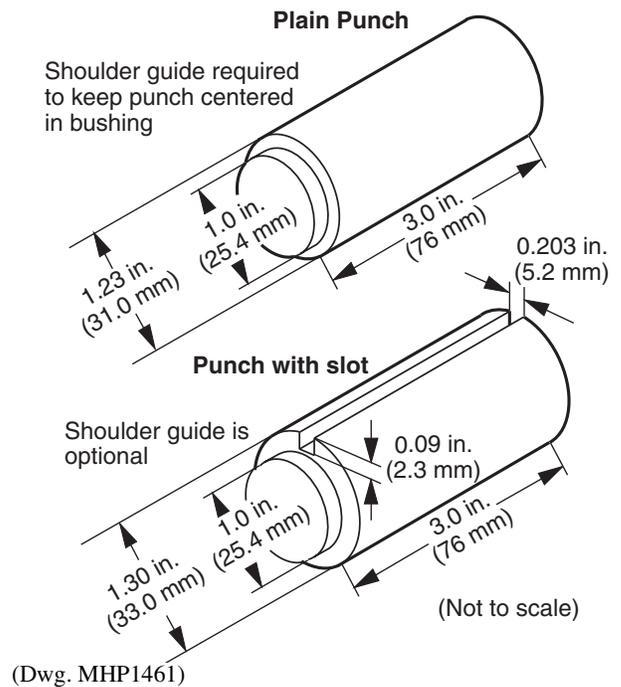
Rotary Valve Bushing Removal

Refer to Dwg. MHP1463 on page 27.

1. Fabricate one of the two punches shown in Dwg. MHP1461 on page 27, the first punch will clear the bushing key (120), the second one has a slot to clear the bushing key. Press old rotary valve bushing (106) out of motor housing (118).
2. Measure motor housing bore, if greater than 1.313 in. (33.35 mm) replace housing.

CAUTION

- Press rotary valve bushing out from inside motor housing only. Bushing has a groove to clear bushing key (120).
- Support motor housing to prevent damage during pressing.



(Dwg. MHP1463)

Motor Disassembly (pendant control)

Refer to Dwg. MHP2258 on page 56.

1. Remove capscrews (102) and motor manifold (101) from motor housing (118).
2. Using a 7/16 in. -14 thread bolt, remove the rotary valve (107) from the rotary valve bushing (106).
3. Unscrew the eight motor case capscrews (119) and remove motor housing (118) containing assembled motor from disc brake assembly.
4. Unscrew four cylinder capscrews (112) from any one of the four cylinder heads (114) and remove the cylinder head, cylinder sleeve (111) and gasket (115).

5. Rotate the crankshaft assembly (135) until the piston (108) is at top dead center. Push pin (109) out of piston, freeing piston from connecting rod (134). Repeat until all four cylinders and pistons have been removed freeing the crankshaft (135) and assembled parts.
6. Using two screw drivers, pry sleeve crankshaft (131) from the crankshaft assembly and remove retainer rings (133), connecting rods (134) and connecting rod bushing (132).
7. Remove bearing (138) (only if replacement is necessary) by supporting the inner ring of bearing and pressing on face of motor pinion.
8. If pinion on crankshaft (135) is damaged or worn, it will be necessary to replace the entire crankshaft.
9. Unscrew four oil wall screws (129) and remove oil wall (127). Removal of oil wall is seldom necessary unless rotary valve bushing (12) is to be removed.
10. The rotary valve bushing (106) and reverse valve are press fits in the motor case and should never be removed unless replacement is necessary. To remove, heat bushings to 450° F (232° C) to loosen Loctite®. Support the face of the motor case that contacts the valve chest cover, and, with a suitable arbor inserted into the motor case and against the face of the bushing, press the bushing out while it is hot.

CAUTION

• Use an arbor that will clear the bushing keys (120) that project into each bushing bore in motor case. Pressing bushings out in the opposite direction or using an arbor that will not clear the bushing keys will result in the keys being sheared off.

Reverse Valve Bushing Removal

Refer to Dwg. MHP1463 on page 27.

1. Fabricate one of the two punches shown in Dwg. MHP1461, on page 27 the first punch will clear the bushing key (120), the second one has a slot to clear the bushing key. Press old reverse valve bushing (252) out of motor housing (118).
NOTE: This bushing is only 2 inches (51 mm) long.

CAUTION

• Press reverse valve bushing out from inside motor housing only. Bushing has a groove to clear bushing key (120).
• Support motor housing to prevent damage during pressing.

Disc Brake Disassembly

Refer to Dwg. MHP2259 on page 42.

1. Carefully loosen capscrews (151) 4 or 5 turns each progressively around motor adapter (139) until brake spring compression is relaxed. Do not allow adapter to become cocked during removal.
2. When brake spring compression is relaxed remove capscrews (151), adapter (139) and springs (154).
3. Remove cylinder (164) and brake piston (157) as an assembly from brake housing (4).
4. Tap brake piston (157) out of cylinder (164) and remove seals (155) and (158).

NOTICE

• When any part of friction disc thickness measures 0.072 in. (1.83 mm) or less, or if oil groove pattern is not clearly visible, friction discs must be replaced.

5. Remove brake hub assembly, brake discs (173) and friction discs (172).
6. If brake hub must be disassembled for inspection or repair remove retainer ring (12), bearing (174) and spacer (152) from shaft (8). Carefully tap or press bushing (168) out of back side. Take sprag clutch (169) out of brake hub (171).

Reduction Gear Disassembly

Refer to Dwg. MHP2260 on page 38.

1. Remove capscrews (21) and lockwashers (22) from gear carrier (23), separating it and the reduction gear assembly (30) from drum (60).
2. Unfasten capscrews (24) and locknuts (25) from reduction gear assembly, separating it from gear carrier (23).
3. Remove capscrews (36), retaining ring (31), and seal (32). Pry off output housing (33).
4. Remove retainer ring (37), bearing (38), and retainer ring (40) from end of planetary assembly (41). Separate planetary assembly (41) and ring gear (43) from spacer (48).
5. Unfasten retainer ring (47) from sun gear (46) and remove sun gear from planetary assembly (49).
6. Separate spacer (48), ring gear (43), and planetary assembly (49).
7. Unfasten retainer ring (47) from sun gear (46) and remove sun gear from planetary assembly (49).
8. Separate spacer (48), ring gear (43), and planetary assembly (49). Remove pinion (44) from planetary assembly (49).

Manual or Automatic Drum Brake

Refer to Dwg. MHP2265 on page 44.

Actuator Disassembly:

1. Automatic Brake
 - a. Disconnect and remove hose, fittings and dump valve (364) from the cylinder (362).
 - b. Remove cotter pin (352), washer (385) and pin (351) from the link stud (353) and brake band (384).
 - c. Remove cotter pin (352), washer (385) and pin (357). Separate the clevis (358) from brake lever (355).
 - d. Remove cylinder (362) from bracket (372).
2. Manual Brake:
Remove cotter pin (352) and pin (351) from handle (354), then remove handle (354) from brake band (384).

Brake Disassembly:

1. Remove capscrews (21) and (383), lockwashers (22) and (374) and stop plate (382).
2. Use a hoist to raise the winch approximately 6 in. (15 cm). Separate the brake band (384) halves and rotate the brake band assembly slowly until it can be removed from the drum (60).
3. Remove cotter pins (352) and pins (375) so brake band halves (384) can be removed from the arm (379). Lower winch when brake band assembly has been removed.

Press Roller Disassembly

Refer to Dwg. MHP2268 on page 48.

1. Compress the ends of the springs (409) and (411) and remove shoulder screw (413) from arms (412).
2. Unfasten capscrews (418) and washers (419), and remove base (421) from side rail (63).
3. Remove retainer ring (417) and washer (406) from either end of pivot shaft (414) and slide shaft out of arm (412) base holes (421). Remove arms (412) from base (421).

4. Remove bushing (415) from end of spacer (416), remove spacer and springs (409) and (411) from base.
5. From both ends of roller shaft (403), remove retainer ring (405) and (404). Pull bearing (407) from both ends of shaft, and remove short rollers (401) and spacers (408).
6. Slide arms (412) off ends of roller shaft. Remove spacers (408) and bearings (407) from ends of shaft, then slide long press roller (402) off roller shaft (403).

Delta 'P' Overload Valve and Brake Release Valve Removal

Refer to Dwg. MHP2464 on page 52.

1. Remove capscrew (422), nut (436) and lockwasher (435) securing Delta 'P' overload valve (549) to bracket (508).
2. Remove and store Delta 'P' overload valve (549), in a clean, dry area until ready to reassemble winch.
3. Remove capscrew (433), washer (399) and nut (434) securing brake release valve (432) to bracket (508).
4. Remove and store brake release valve (432) in a clean, dry area until ready to reassemble winch.

NOTICE

• **It is not recommended to disassemble brake release valve (432). If disassembly of Delta 'P' overload valve is necessary refer to Dwg. MHP2293 on page 55.**

Slack Line Detector Disassembly

Refer to Dwg. MHP2266 on page 46.

1. Slide rollers (501) off shafts (502). Remove capscrews (509) and washers (385) from shafts (502) and inboard arm (503).
2. Remove capscrew (514) and washer (519) from threaded hole in outboard arm (503) and the actuator bracket's (505) slot.
3. Remove shoulder screw (517), bushing (521), and bushing (515), and detach actuator bracket (505) from outboard arm (503). Remove outboard arm from stop bracket (507).
4. Remove capscrews (522) and washers (520) and detach limit valve (481) from stop bracket (507).
5. Remove elbow fittings (482) and breather (460) from limit valve (481).
6. Remove shoulder screw (523) and bushing (515). Detach inboard arm (503) from support bracket (508).
7. Remove capscrews (21) and washers (519) from stop bracket (507). Detach stop bracket from outboard upright (64).
8. Remove capscrews (21) and washers (519) from support bracket (508). Detach support bracket from inboard upright (17).

Drum Guard Disassembly

Refer to Dwg. MHP2281 on page 62.

1. Remove capscrews (701), nuts (707), lockwashers (705) and clamps (702) from drum guard.
2. Lift drum guard (704) from between the two supports (703).
3. Remove capscrews (708) and washers (709).
4. Remove supports (703) from winch side rails.

Two Lever Pendant Disassembly

Refer to Dwg. MHP2296 on page 58.

1. Remove fittings (738) and lifting eye (722).
2. Unscrew plugs (726). Remove springs (727) and balls (728).
3. Tap out pin (729) and remove levers (736).
4. Remove setscrews (732) from pendant handle (737).
5. Remove valve assemblies (735). Remove 'O' rings (725) and (731) and protector (733) from valve assemblies. Discard 'O' rings.
6. Remove emergency stop valve (723) from pendant handle (737).
7. Remove retainer ring (741) and exhaust washer (740).

Cleaning, Inspection and Repair

Cleaning

Clean all winch component parts in solvent (except drum brake bands and disc brake friction plates). The use of a stiff bristle brush will facilitate removal of accumulated dirt and sediments on housings, frame and drum. If bushings have been removed it may be necessary to carefully remove old Loctite® from bushing bores. Dry each part using low pressure, filtered compressed air. Clean drum brake band using a wire brush or emery cloth. Do not wash drum brake band in solvent. If drum brake band lining 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: Inspect **gears** for

- worn, cracked or broken teeth. Replace if necessary.

Inspect **bushings** for

- wear, scoring or galling. Replace if necessary.

Inspect **shafts** for

- ridges caused by wear. Replace if necessary.
- scoring or galling.

Inspect **all threaded items** for

- damaged threads. Replace if necessary.

Inspect **drum band brake lining** for

- oil, grease and glazing. If drum band brake lining is oil-soaked, excessively greasy or overly glazed replace brake band. Remove small glazed areas of band brake lining by sanding lightly with a fine grit emery cloth.
- thickness of drum band brake lining. If drum brake band lining is less than 0.062 in. (2 mm) thick anywhere along the edges replace brake band assembly.

Inspect **motor cylinder bores** for

- wear. Cylinders can be lightly honed. For any large scratches or wear patterns, replace cylinder assembly.

Inspect **motor rotary valve (107) and rotary bushing (106)** for

- clearance between valve and bushing. Nominal gap is 0.00125-0.00225 inch (0.0318-0.0572 mm) per side for a total of 0.0025-0.0045 inch (0.0635-0.1143 mm). If gap is greater than 0.0025 inch (0.064 mm) per side, or greater than 0.005 inch (0.127 mm) total replace rotary bushing.
- rotary valve and bushing should not come into contact. If contacting, bushing may be honed to eliminate the interference. Bearings on end of rotary valve may be cause of contact; check bearings (138) for excessive play and proper press fit. Replace bearings if required.
- any time bushing or valve is replaced, replace bearings.

NOTICE

• **Applying Loctite® 609 to both surfaces is necessary to ensure an airtight seal between rotary valve bushing and motor housing.**

Inspect **piston/connecting rod assembly** for

- wear, scoring. Replace if either condition exists.
- connecting rod should operate smoothly without binding and without excessive side to side play.

Inspect **bearings** for

- all motor bearings are factory lubricated and sealed. Inspect for loss of grease and evidence of grit, dirt or other contaminants. If dry or contaminated, replace the bearing.
- Inspect crankshaft roller bearings (needle). At any indication of damage, or contamination replace bearings.

Inspect **disc brake** for

- wear. Replace brake discs if grooving pattern is no longer visible or if discs are cracked or chipped.

Repair

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

1. Worn or damaged parts must be replaced. Refer to 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 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

General instructions

- use new gaskets and seals.
- replace worn parts.
- assemble parts using match marks applied during disassembly. Compare replacement parts with originals to identify installation alignments.

Motor Assembly (full flow)

Refer to Dwg. MHP2481 on page 40.

1. Place motor case (118) on a flat table with open side facing up.
2. Clean bushing bore in motor housing with Loctite® 790 cleaner. Ensure that entire bore is clean then dry using low pressure, filtered compressed air.
3. Apply a thin even coat of Loctite® 609 to entire outside surface of new rotary valve bushing (106).
4. Using a swab, apply a thin even coat of Loctite® 609 to entire inner bore of motor housing.
5. Align keyway in rotary valve bushing with bushing key in bore of motor case. Start bushing squarely in bore and gently press it (by hand) flush with the top face of the case. Once bushing has been installed allow Loctite® to cure for 10 minutes. Full cure requires 24 hours.
6. Clean reverse valve bushing bore in motor housing with Loctite® 790 cleaner. Ensure that entire bore is clean then dry using low pressure, filtered compressed air.
7. Apply a thin even coat of Loctite® 609 to entire outside surface of new reverse valve bushing (252).
8. Using a swab, apply a thin even coat of Loctite® 609 to entire inner bore of motor housing.
9. Align groove in reverse valve bushing (252) with bushing key (120) in motor housing. Press rotary valve bushing into motor housing until reverse valve bushing is flush with motor housing.
10. Check fit of rotary valve (107) in bushing. It must be a good running fit. Lap if necessary using a mild, fine grain, lapping compound. If bushing has closed in sufficiently to make lapping impossible, ream to 1.000 in. (25.4 mm) diameter.
11. Check fit of the reverse valve (251) in its bushing. If it is tight, ream bushing to 1.000 in. (25.4 mm) diameter.
12. Place oil wall (127) in motor case and retain with four oil wall screws (129) and lockwashers (128).
13. Support inner ring of shielded side of crank bearing (78) and press crank (135) into bearing until shoulder on crank contacts inner ring. Ensure crank bearing (78) is installed with unshielded side nearest the flanged end of crank (135).
14. Place motor case assembly on bench with open side up and inlet bushing (123) to the left.
15. Lubricate rotary valve bushing (106) and rotary valve (107).
16. Insert rotary valve into rotary valve bushing. The raised tang on rotary valve should be pointing toward the inlet bushing.
17. Lubricate the inside and outside of crank pin sleeve (131) and place on rotary valve tang, all the way to the left.
18. Slide crank pin sleeve to the right, until it falls onto the rotary valve tang.
19. Lubricate bushing (132) and place bushing over crank pin sleeve.
20. Place one connecting rod ring (133) over bushing.
21. Place feet of four connecting rods (134) into the space between bushing and ring.
22. Place second connecting rod ring over the connecting rod ends, beveled face first. Apply oil to this assembly.
23. Insert crankshaft assembly into crank pin sleeve. Ensure that the slot in crankshaft end and tang on rotary valve are aligned.
24. When crankshaft is seated, move assembly to the left. There should be a slight drop as assembly seats onto the rotary valve.
25. Install piston rings (110) into grooves in pistons (108). Ensure that the piston ring face marked with a dot is toward the top (closed) end of the piston (108). Do not expand piston rings more than is necessary to slip rings over pistons. Expand and slide the **Ingersoll-Rand** ring tool D01-933 over piston ring on piston. Ensure upper and lower piston ring ends are offset from each other.
26. Insert a wrist pin (109) partially into piston.
27. Place this assembly onto the connecting rod and push wrist pin fully into piston.
28. Place cylinder gasket (115) onto cylinder sleeve (111).
29. Using fingers, compress top piston ring and press the cylinder sleeve down over the piston. Sleeve will push **Ingersoll-Rand** ring tool D01-933 off piston. Remove ring tool.
30. Place a copper washer (113) into capscrew (112). Ensure that the flat side of copper washer faces cylinder head.
31. Align gasket and motor case capscrew holes. Insert capscrew and washer through cylinder head (114) and loosely secure it to motor case. Repeat for the other three capscrews.
32. Holding motor case still, rotate crankshaft 90°. This will bring the next connecting rod to its highest position.
33. Repeat steps 25 to 32 above for the other three pistons.

34. Snug up the four capscrews. DO NOT final tighten.
35. Snug up the capscrews on opposite cylinder head.
36. Repeat this procedure for the other two cylinder heads.
37. Repeat these steps until ALL cylinder heads are final tightened. Hold the crankshaft FIRMLY and in a vertical position. Spin the motor case 4 to 8 complete revolutions. Assembly should rotate freely without any signs of binding or knocking.
38. Apply a thin coat of grease to gasket surface of motor mounting bracket (79).
39. Match hole pattern in gasket (125) and motor mounting bracket. Press gasket into position.
40. Place motor mounting bracket onto motor case.

NOTICE

- Ensure that the inlet bushing (123) is pointing to the left and motor mounting bracket feet and oil drain plug are pointing towards the assembler.

41. Slide motor assembly to the edge of the bench. Insert capscrew (119) through lockwasher (244) and secure mounting bracket to motor case. DO NOT Final Tighten.
42. Rotate assembly 180° and install one more capscrew and washer.
43. Install motor pinion bearing (63) in counterbored end of drum shaft (62).
44. Place drum shaft (62) onto crankshaft. Lower and align setscrew holes.
45. Insert two setscrews (77), final tighten both setscrews in equal steps to keep drum shaft centered.
46. Tip assembly over WHILE inserting fingers under the rotary valve (107).

NOTICE

- Ensure that rotary valve does NOT slide out of rotary bushing. If rotary valve slides out, motor will have to be disassembled to line up rotary valve and crankshaft.

47. Lay assembly on its side with motor to the left.
48. Insert capscrew (69) through lockwasher (71). Place capscrew and lockwasher through base (87) and into motor case. Repeat 3 times. Tighten capscrews to 110 ft/lbs. (15.2 kg/m).
49. Tip motor assembly onto its base.
50. Note that an arrow is stamped on the face of the valve chest cover (247) and that a line is scribed on the shank of the reverse valve (251). Turn reverse valve until line and arrow are in alignment and slide stem of valve into valve chest cover, entering square shank in square hole in control arm. Ensure main port in reverse valve is installed facing down. Apply reverse valve nut (241) to threaded end of reverse valve.

Control Valve Assembly

1. Insert six capscrews (119) and lockwashers (244) into motor case (118). Hand tighten. DO NOT final tighten.
2. Attach the vent cap assembly (117) to one of the left side capscrews on motor housing and final tighten all capscrews to 10 ft/lbs. (1.4 kg/m).
3. Install and tighten stop pin (246) into valve chest cover (247) if it was removed.
4. Insert thrust washer (105) into valve chest cover.
5. Slide 'O' rings (248) and (249) onto reverse valve (251). Lubricate with oil.

6. Insert the reverse valve into valve chest housing. Ensure that 'O' ring is not cut upon installation.
7. Place gasket (102) onto valve chest cover.
8. Insert throttle lever (242) onto outside of reverse valve.
9. Install valve chest cover assembly. Ensuring that throttle lever and main (large) ports in reverse valve are face UP.
10. Secure valve chest cover with capscrews (245) and lockwashers (244), tighten to 10 ft/lbs. (1.4 kg/m). Remove throttle lever.
11. Place spring (243) onto throttle lever, on right side of stud.
12. Use bench to hold free end of spring. Then, twist throttle lever so that the stud goes past the free end of spring.
13. Continue twisting the throttle lever while pushing free end of spring over stud.

⚠ CAUTION

- The spring can SNAP off throttle lever. KEEP the throttle lever pointed away from your body.

14. Align the square hole in throttle lever with the reverse valve and press onto the reverse valve.
15. Rotate throttle lever slightly to the left and right to allow spring to 'pop' over stop pin.
16. Use nut (241) to secure throttle lever to reverse valve and final tighten.
17. Check lever rotates freely in both directions and spring returns to neutral when released.

Motor Assembly (pendant control)

Refer to Dwg. MHP2258 on page 56.

1. Place motor housing (118) on a flat table surface with face of motor perpendicular with the table.
2. Clean bushing bore in motor housing with Loctite® 790 cleaner. Ensure that entire bore is clean then dry using low pressure, filtered compressed air.
3. Apply a thin even coat of Loctite® 609 to entire outside surface of new rotary valve bushing (106).
4. Using a swab, apply a thin even coat of Loctite® 609 to entire inner bore of motor housing.
5. Align the keyway in the rotary valve bushing with the bushing key in the bore of the motor case. Start the bushing squarely in the bore and gently press it (by hand) flush with the top face of the case. Once the bushing has been installed allow the Loctite® to cure for 10 minutes. Full cure requires 24 hours.
6. Clean reverse valve bushing bore in motor housing with Loctite® 790 cleaner. Ensure that entire bore is clean then dry using low pressure, filtered compressed air.
7. Using a swab, apply a thin even coat of Loctite® 609 to the entire inner bore of the motor housing.
8. Check fit of rotary valve (107) in bushing. It must be a good running fit. Lap if necessary using a mild, fine grain, lapping compound. If bushing has closed in sufficiently to make lapping impossible, ream to 1.000 in. (25.4 mm) diameter.
9. Place the oil wall (127) in the motor case and retain with the four oil wall screws (129) and lockwashers (128).
10. Support the inner ring of the shielded side of the crank bearing (138) and press crankshaft assembly (135) into bearing until shoulder on crank contacts inner ring. Ensure bearing (138) is installed with the unshielded side nearest the flanged end of crankshaft assembly (135).

11. Slide the connecting rod bushing (132) onto the sleeve (131). Place one connecting rod ring (133), straight face first, over connecting rod bushing until it contacts the flange on the crank pin sleeve. Enter the feet of the four connecting rods (134) into the space between bushing and ring. Slide the second ring, beveled face first over feet of rods.
12. Ensure that the three oil holes, visible in the bore of the crank pin sleeve, are aligned with the oil groove running lengthwise in the crank pin. Slide the crank pin sleeve, small end first, along with the parts assembled on it, onto the crank pin. Tap sleeve onto crank pin until it seats, making sure to maintain the alignment between the notch in the sleeve flange and this groove on the end of the crank pin.

NOTICE

• **Ensure the sleeve remains in position on the crank pin until it is locked in place by the tang on the rotary valve on final assembly.**

13. Install the piston rings (110) so that the face marked with a dot is toward the top (closed) end of the piston (108). Do not expand the ring more than is necessary to slip it over the piston.
14. Insert the crank assembly into the motor case, centralizing it as well as possible and positioning the connecting rods so that one leads to each cylinder hole in case. Rotate crank until one rod protrudes far enough to allow installation of piston (108) and piston wrist pin (109).
15. Place piston rings (110) into grooves in piston (108). Compress lower ring with **Ingersoll-Rand** tool D01-933.
16. Slide cylinder sleeve (111) over piston and place this assembly over the connecting rod (134). Align holes in piston with connecting rod and insert wrist pin (109).
17. Push sleeve down over piston until fully seated into motor case. Sleeve will push **Ingersoll-Rand** tool D01-933 off piston.
18. Place gasket (115) over sleeve, aligning holes.
19. Insert capscrews (112) and washers (113) through cylinder head (114). Place this assembly over the cylinder assembly and tighten. Repeat until all cylinders have been installed.
20. Examine the end of the crank pin and sleeve crankshaft (131) by looking through the bore of the rotary valve bushing (106). Position the rotary valve (107) so that the tang will enter both the groove in the end of the crank pin and the notch in the flange on the sleeve and insert the rotary valve into the rotary valve bushing. Positioning the rotary valve before inserting is important, as it is possible to install it incorrectly with the tang contacting the edge of the sleeve flange.
21. Install a new motor case gasket (125) on the shoulder of the motor mounting bracket (79). Enter pinion end of crank in bore of drum shaft (15) and slide motor into position on shoulder of motor mounting bracket, entering the crank bearing (138) in its bore in the bracket. Rotate motor slightly, if necessary, to mesh pinion with intermediate gear. Retain with motor case capscrews.

Reduction Gear Assembly

Refer to Dwg. MHP2260 on page 38.

1. Lubricate and install 'O' rings (42) on ring gear (43). Assemble ring gear (43) and spacer (48). Check capscrew holes are aligned.

2. Install pinion (44) into planetary assembly (49), and planetary assembly (49) into ring gear (43). Position assembled parts vertically with end cover (51) down. Check capscrew holes are aligned.
3. Press thrust bearing (45) into sun gear (46) and install sun gear (46) into planetary assembly (49) with retainer ring (47).
4. Lubricate and install 'O' rings (42) on ring gear (43). Assemble ring gear (43) and spacer (48). Check capscrew holes are aligned.
5. Install planetary assembly (49) on sun gear (46). Install ring gear (43) and spacer (48) over planetary assembly. Check capscrew holes are aligned.
6. Press thrust bearing (45) into sun gear (46) and install sun gear into planetary assembly (49) with retainer ring (47).
7. Install planetary assembly (41) in ring gear (43). Position ring gear so capscrew holes are aligned with spacer (48).
8. Install retainer ring (40), bearing (38) and retainer ring (37) on planetary assembly (41).
9. Install output housing (33) over end of planetary assembly (41). Align capscrew holes. Install capscrews (36) with Loctite® 242 and torque to 32 ft lbs (43.4 Nm).
10. Install steel plug assembly (35) on output housing (33).
11. Install seal (32) and retainer ring (31).

Drum Brake Assembly

Refer to Dwg. MHP2265 on page 44.

1. Install pivot bracket (377) on the end of arm (379) with pin (375), washer (378) and cotter pin (352). Recessed side of the threaded hole must be toward the band side.
2. Install connecting link (381) on the arm (379) and secure in position with pin (375), washer (378) and cotter pin (375). Assemble connecting link (381) so curved surface matches contour of the brake band.
3. Install halves of brake band (384) to the connecting link (381) and secure with pins (375) and cotter pins (352).
4. Lift the winch assembly, with a suitable hoist, approximately 6 in. (15 cm) off the floor or work bench.
5. Position the brake band sub-assembly around the brake diameter on the drum (60) so the arm (379) lays at the bottom. When positioned, lower the winch.
6. Mount pivot bracket (372) on the inside surface of the side rail (62) and secure in position with capscrews (65) and lockwashers (22).
7. Screw link stud into handle and install the handle (354) in the lug on the end of the brake band (384). Lubricate the pivot points being careful not to get grease on the brake band lining.
8. Pull the halves of the brake band together and install pin (351) through the lug on brake band (384) and the link stud (353) of the handle assembly.
9. Install stop plate (382) on the inside of the side rail (63) with capscrews (21) and washers (22). Install adjusting screw (383) and locknut (374) through the side rail (63) and stop plate (384) until it contacts the arm (379).
10. Adjust brake as described at the start of the "MAINTENANCE" section on page 25.

Automatic Drum Brake Assembly

Refer to Dwg. MHP2265 on page 44.

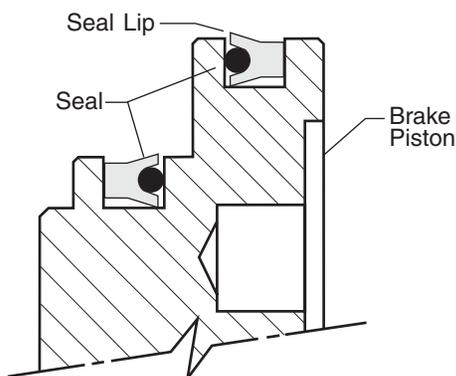
1. Install bracket (372) on side rail (62) with capscrews (65) and lockwashers (22).
2. Screw nut (359) and clevis (358) onto cylinder rod.
3. Attach brake lever (355) to brake band (384).

- Install cylinder (362) so it connects with bracket (372) and brake lever (355). Use pins (357), washers (385) and cotter pins (352) to secure in position.
- Install dump valve (364) fittings and hose (368) to the cylinder (362).
- Adjust automatic brake as described at the start of the "MAINTENANCE" section on page 25.

Disc Brake Assembly

Refer to Dwg. MHP2259 on page 42.

- Install pipe plug (177) in brake housing (4).
- Press one bushing (168) into brake hub (171). Install shaft (8) into assembly. Slide sprag clutch (169) onto shaft (8) and into brake hub (171). Press in second bushing (168). Ensure sprags are assembled all in the same direction and springs are not twisted or out of location. Sprag clutch must be installed so that the end with the stamped arrow is farthest from the motor adapter (139). Check that shaft rotates freely clockwise when looking at the non splined end of brake hub (171) and locks up instantly in the counterclockwise direction. Check rotation of shaft in free sprag clutch direction is smooth. If tightness or rough rotation exists disassemble and inspect.
- Install spacer (152) and bearing (174) on shaft (8). Secure parts with retainer ring (12).
- Starting with a friction disc (172) and alternating with brake discs (173), install friction discs (172) and brake discs (173) in brake housing (4).
- Install assembled shaft and brake hub assembly through brake. Remove pipe plug (177) in brake housing (4) to check that brake hub is properly engaged with each friction disc (172). Use of artificial light will aid inspection. Line up plates and tap gently on shaft if bearing (174) is tight in brake housing (4).
- Install capscrews (161) in two locations in brake cylinder (164). Use Loctite® 242 on capscrew threads.
- Lubricate and install seals (155) and (158) on brake piston (157). Seal lips must face each other. Refer to Dwg. MHP0139 on page 33. Lubricate and install 'O' rings (165) and (167) in recessed grooves in brake cylinder (164).



(Dwg. MHP0139)

- Apply a light film of grease to bore of brake cylinder (164) and install brake piston (157).
- Install assembled brake piston and cylinder on brake housing (4) so brake port hole is positioned on the right hand side and machined pad is at the bottom.
- Set brake springs (154) into holes provided in the brake piston (157).
- Lubricate and install 'O' ring (153) in recessed groove in motor adapter (139).

- Install motor adapter (139) on brake cylinder (164) so the threaded hole, which is located dead center between the counterbored mounting bolt holes, is located at the bottom (6 o'clock position.)
- Secure motor adapter (139) with capscrews (151) and washers (2). Apply Loctite® 242 to capscrews and torque to 35 ft lbs (45 Nm). Pull motor adapter down evenly to compress the brake springs (154). Tighten capscrews 4 to 5 turns each progressively around the motor adapter (139). Do not allow motor adapter (139) to become cocked.
- Install connector fitting (181) and dump valve (178) in brake cylinder.

Winch Assembly

Refer to Dwg. MHP2260 on page 38 and Dwg. MHP2259 on page 42.

- Assemble reduction gear assembly (30) using reduction gear assembly text in "MAINTENANCE" section.
- Assemble drum (60), uprights (17) and (64), and side rails (62) and (63) using drum assembly text in "MAINTENANCE" section.
- Install oil seal (2) in drum shaft (15) with lip.
- Assemble brake assembly using brake assembly text in "MAINTENANCE" section.
- Lubricate and position 'O' ring (1) on drum shaft.
- Carefully install disc brake assembly on drum shaft to avoid damaging 'O' ring (1). Secure in position with capscrews (3). Apply Loctite® 242 to capscrew threads and torque to 85 ft lbs (115 Nm).
- Install motor assembly (100) to motor adapter (139) using washers (113) and capscrews (119). Apply Loctite® to capscrew threads and torque to 20 ft lbs (27 Nm).

Drum Assembly

Refer to Dwg. MHP2260 on page 38.

- Assemble reduction gear assembly (30) using reduction gear assembly text in "MAINTENANCE" section.
- Stand drum (60) in a vertical position with large bore up.
- Install gear carrier (23) onto reduction gear assembly (30), align capscrew holes and secure using capscrews (24) and locknuts (25).
- Clean surfaces of the drum (60) and gear carrier (23). Apply Loctite® 515 gasket sealant to drum mating surface. Lower reduction gear assembly (30) into drum (60). Take care to align mounting holes.
- Install capscrews (21) and lockwashers (22) with Loctite® 242 and torque to 65 ft lbs (88 Nm).
- Install drum shaft (15) in inboard upright (17) and secure with capscrews (13). Torque to 44 to 49 ft lbs (60 to 66 Nm). Lubricate and install 'O' ring (14) on drum shaft. Carefully lower inboard upright assembly into the drum, making sure splines on drum shaft (15) mesh in the reduction gear assembly.
- Using a 'C' clamp, fasten the inboard flange assembly to the drum flange and place complete assembly in horizontal position.
- Clean seal surface and install oil seal (69) in outboard upright (64) with lip toward the bearing.
- Pack bearing (71) with grease and install in outboard upright (64).
- Install outboard upright (64) on drum end. Ensure assembly is kept centered during this step to avoid seal or bearing damage.
- Install shaft retainer (72) using capscrews (13) with Loctite® 242. Torque to 35 ft lbs (41 Nm).

12. Install oil seal (454) in end cover with lip toward the bearing.
13. Apply a light coat of Loctite® 515 to the mating surface of outboard upright (64) and install end cover (74) using capscrews (70) and lockwashers (5). Apply a small amount of Loctite® 242 to capscrew (70) threads and torque to 25 ft lbs (34 Nm).
14. Install side rails to uprights and loosely secure using capscrews (65) and lockwashers (22). Remove ‘C’ clamp.
15. Apply Loctite® 242 to capscrews (65) and torque to 65 ft lbs (88 Nm).
16. Install dowel pins (19).

Slack Line Detector Assembly

Refer to Dwg. MHP2266 on page 46.

1. Install support bracket (508) to outside of inboard upright (17) with capscrews (21) and washers (519).
2. Install stop bracket (507) to outside of outboard upright (64) with capscrews (21) and washers (519).
3. Attach inboard arm (503) to support bracket (508) with shoulder screw (523) and bushing (515).
4. Slip washers (510) over capscrews (509). Push capscrews (509) through holes at other end of inboard arm (503). Attach shafts (502) to inboard arm (503) with capscrews (509). Slide rollers (501) over shafts (502).
5. Attach elbow fittings (482) and breather (460) to limit valve (481).
6. Bolt limit valve to stop bracket (507) with capscrews (522) and washers (520).
7. With shoulder screw (517), bushing (521), and bushing (515), attach actuator bracket (505) to lower end of outboard arm (503), and outboard arm to stop bracket (507).
8. Attach outboard ends of shafts (502) and rollers (501) to outboard arm (503) with capscrews (509) and washers (385).
9. Insert capscrew (514) with washer (519) in the actuator bracket’s (505) slot, and thread into hole in outboard arm (503). For arm tension adjustment, refer to instructions in the “INSTALLATION” section on page 10.

NOTICE

• **Shoulder screw (524) fits in threaded hole in the stop bracket (507) and is used during shipping and storage to lock and protect the roller arm assembly. When not in use, this screw is stored in threaded hole in support bracket (508).**

Delta ‘P’ Overload and Brake Release Valve Installation

Refer to Dwg. MHP2464 on page 52.

1. Install Delta ‘P’ overload valve (549) to bracket (508) and secure using capscrews (422), lockwashers (435) and nuts (436).
2. Install brake release valve (432) to bracket (508) and secure using capscrews (433), washers (399) and nuts (434).

Press Roller Assembly

Refer to Dwg. MHP2268 on page 48.

1. Slide long press roller (402) onto roller shaft (403), and install bearings (407) inside roller on both ends of shaft.
2. Slip spacers (408) over both ends of roller shaft (403) and insert one end of shaft through small hole in arm (412). Over shaft end, slip spacer (408), short press roller (401), and bearing (407). Install internal retainer ring (404) to hold bearing (407) to roller, then install external retainer ring (405) to hold bearing (407) to roller shaft (403).

3. Over opposite end of roller shaft (403), slip small hole of other arm (412), then spacer (408), short press roller (401), and bearing (407). Install internal retainer ring (404) to hold bearing to roller, then install external retainer ring (405) to hold bearing to roller shaft (403).
4. Push spacer (416) through one of the holes in base (421), and slide springs (409) and (411) onto spacer.

NOTICE

• **Long ends of springs (409 and 411) should be side by side in center of spacer, and in front of base (421).**

5. Push spacer through other hole in base (421). Install bushings (415) to ends of spacer.
6. Fit arms (412) over base (421) and line up holes. Slide pivot shaft (414) through holes in arms and base, then install retainer ring (417) to either end of pivot shaft.
7. Bolt base (421) to side rail (63) with capscrews (418) and washers (419).
8. Compress short ends of springs (409) and (411) and install shoulder screw (413) in arms (412) behind them. Short ends of springs (409) and (411) should press against the insides of the screws.

Drum Guard Assembly

Refer to Dwg. MHP2281 on page 62.

1. Place supports (703) over winch drum assembly and loosely secure to side rails with washers (709) and capscrews (708).
2. Position drum guard (704) between supports (703).
3. Secure drum guard to supports with clamps (702), capscrews (701), lockwashers (705) and nuts (707).
4. Tighten all fasteners and check drum guard is secure. Ensure wire rope does not interfere with drum guard during winch operation.

Two Lever Pendant Assembly

Refer to Dwg. MHP2295 on page 16 or MHP2296 on page 58.

1. Assemble protectors (733) and ‘O’ rings (725) and (731) on valve (735).
2. Insert valve (735) assemblies into pendant handle (737).
3. Install setscrews (723) in pendant handle.
4. Install balls (728), springs (727) and plugs (726) into pendant handle.
5. Install emergency stop valve (723) into pendant handle.
6. Install fittings (738) and lifting eye (722) into top of pendant handle.
7. Facing pendant handle operation side, place levers (736) such that lever direction indicators show ‘Payout’ on left hand side and ‘Haul-in’ on right hand side. Install pin (729) ensuring pin inserts through levers and locates on opposite side of pendant handle.
8. Install exhaust washer (740) and secure with retainer ring (741).
9. Attach hoses to fittings located on top of pendant handle. Locate hoses to fittings as shown in the “INSTALLATION” section.

Testing

Operational Test

Prior to initial use, all new or repaired winches shall be tested to ensure proper operation.

1. Check oil level in reduction gear assembly and disc brake is correct. Top off levels as required before operation as described in "LUBRICATION" section on page 23.
2. To initially 'break in' new or overhauled motors, operate winch without load, in both directions, for 15 minutes at 100-200 RPM.
3. Check operation of brakes. Adjust if necessary as described in "MAINTENANCE" section on page 25.
4. Check foundation mounting fasteners are secure.
5. Install drum guard.
6. Check limit switches and slack line detector are correctly adjusted. Refer to "INSTALLATION" section on page 10.

Load Test

Prior to initial use, all new, extensively repaired, or altered winches shall be load tested by or under the direction of a person trained in safety and operation of this winch and a written report furnished confirming the rating of the winch. Test loads shall not be less than **100%** of rated line pull at mid drum and should not exceed **125%** of the rated line pull at mid drum.

To test the winch at **125%** of the rated load at mid drum apply the following load:

**FA150KGMR Winch 125% Test Load 412 lb (187 kg)
mid-drum**

NOTICE

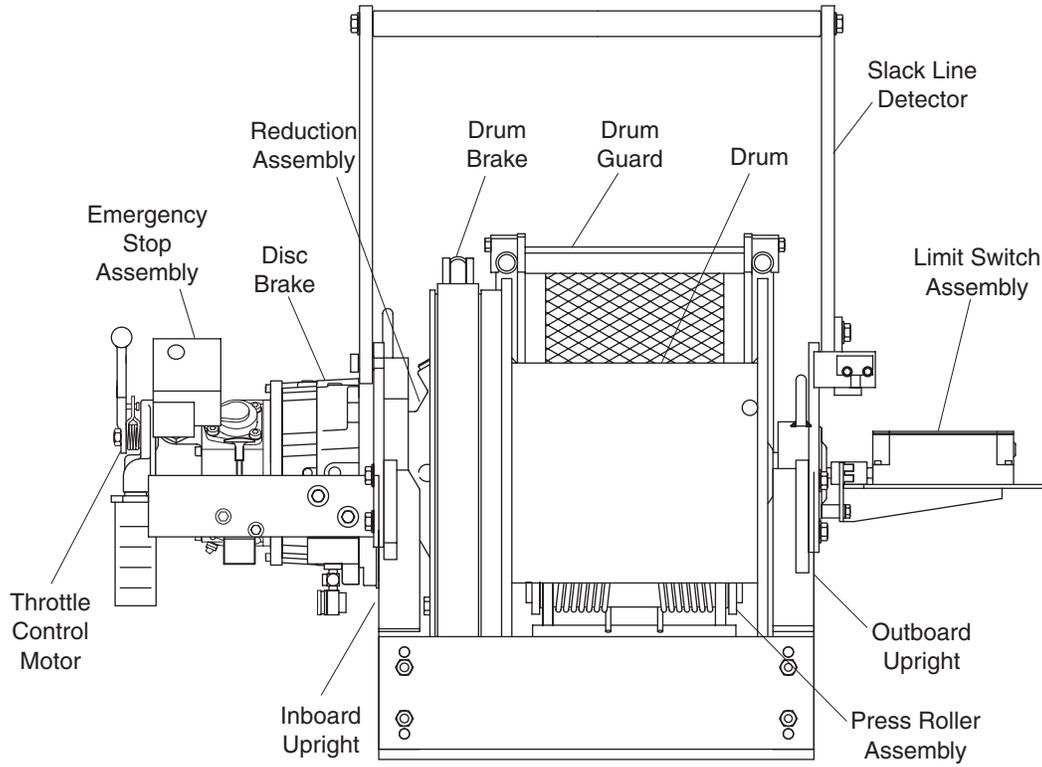
• **Testing to more than 125% of rated line pull may be required to comply with standards and regulations set forth in areas outside the USA.**

Limit Switch

Operate winch through three complete cycles to ensure consistent limit switch operation within +/- 2 ft (+/- 0.6 m) of setpoints.

Refer to 'Limit Switch' on page 12 in "INSTALLATION" section to establish setpoints.

WINCH ASSEMBLY DRAWING

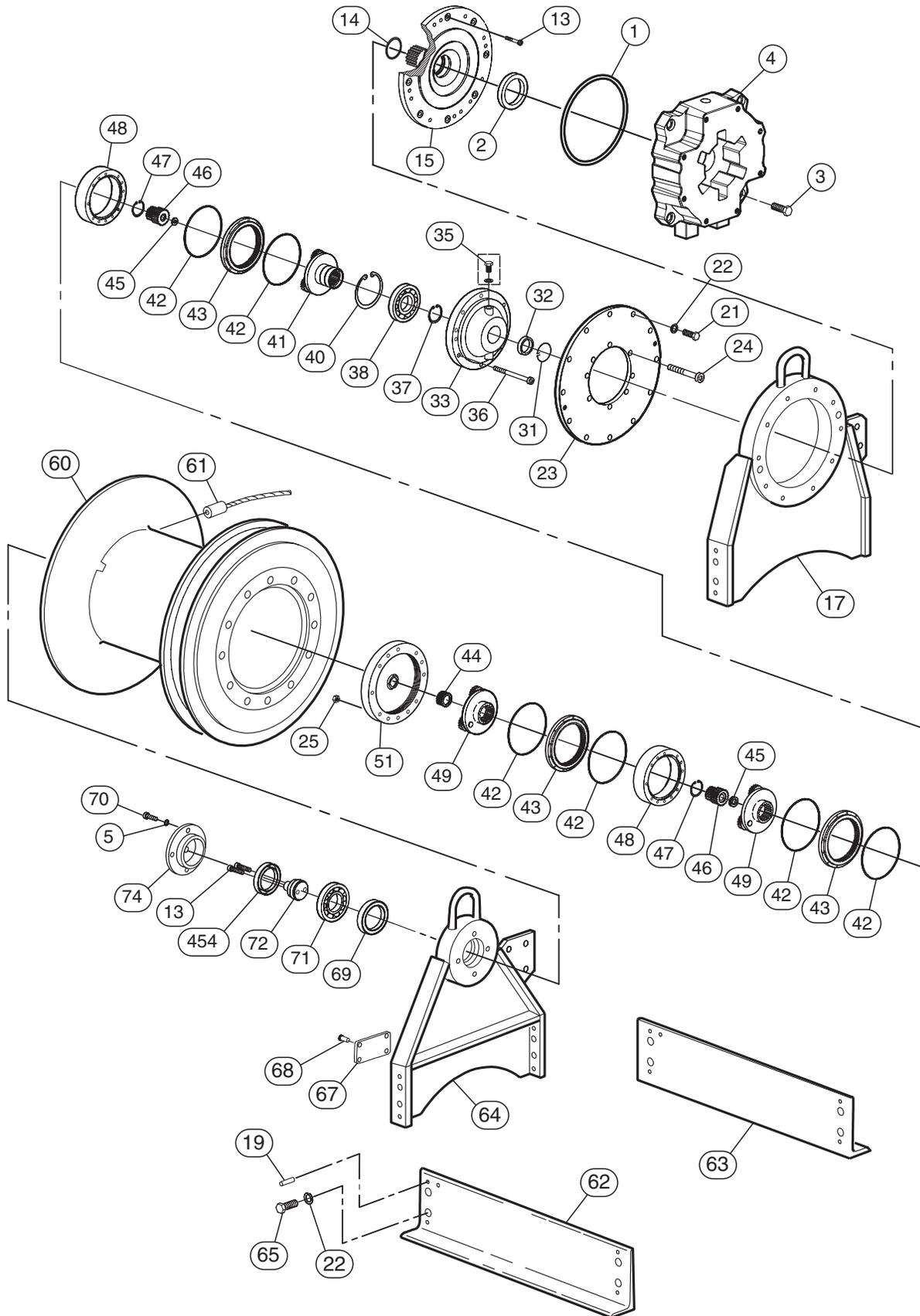


(Dwg. MHP2291)

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DRUM, BASE AND REDUCTION GEAR ASSEMBLY DRAWING



(Dwg. MHP2260)

DRUM, BASE AND REDUCTION GEAR ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
• 1	'O' Ring	1	52670	45	Thrust Bearing	2	71413561
• 2	Oil Seal	1	71350656	46	Sun Gear	2	**
3	Capscrew	4	52380	47	Retainer Ring	2	71413579
4	Brake Housing †	1	11953	48	Spacer	2	**
5	Lockwasher	1	50200	49	Planetary Assembly	2	
13	Capscrew	12	51766	51	End Cover	1	
• 14	'O' Ring	1	50373	60	Drum (8 in. long) †	1	
15	Drum Shaft	1	28311		Drum (12 in. long) †		11354-2
17	Inboard Upright †	1	28300		Drum (16 in. long) †		Contact factory
19	Dowel Pin	8	52334		Drum (24 in. long) †		
21	Capscrew	12	50973	61	Wire Rope Anchor *	1	71387781
22	Lockwasher	20	50181	62	Side Rail (8 in. long drum) †	1	Contact factory
23	Gear Carrier †	1	28426		Side Rail (12 in. long drum) †		28347-2
24	Capscrew	8	53981		Side Rail (16 in. long drum) †		Contact factory
25	Locknut	8	51682		Side Rail (24 in. long drum) †		
30	Reduction Gear Assembly (includes items 31 – 49 and 51)	1	71386494	63	Side Rail (8 in. long drum) †	1	Contact factory
31	Retainer Ring	1	71413538		Side Rail (12 in. long drum) †		28332-2
32	Seal	1	71413520		Side Rail (16 in. long drum) †		Contact factory
33	Housing	1	**		Side Rail (24 in. long drum) †		
35	Plug Assembly (Steel)	2		64	Outboard Upright †	1	28310
36	Capscrew	2		65	Capscrew	8	50183
37	Retainer Ring	1	71413546	67	Nameplate	1	Contact factory
38	Bearing	1	71413512	68	Rivet	4	71028849
40	Retainer Ring	1	71413553	• 69	Seal	1	51474
41	Planetary Assembly	1	**	70	Capscrew	1	51780
42	'O' Ring	6	71413504	• 71	Bearing	1	51797
43	Ring Gear	3	**	72	Retainer	1	19232
44	Pinion †	1	10498	74	End Cover	1	19233
				• 454	Seal	1	71054688

• Recommended spare for one winch, 5 years at normal operation.

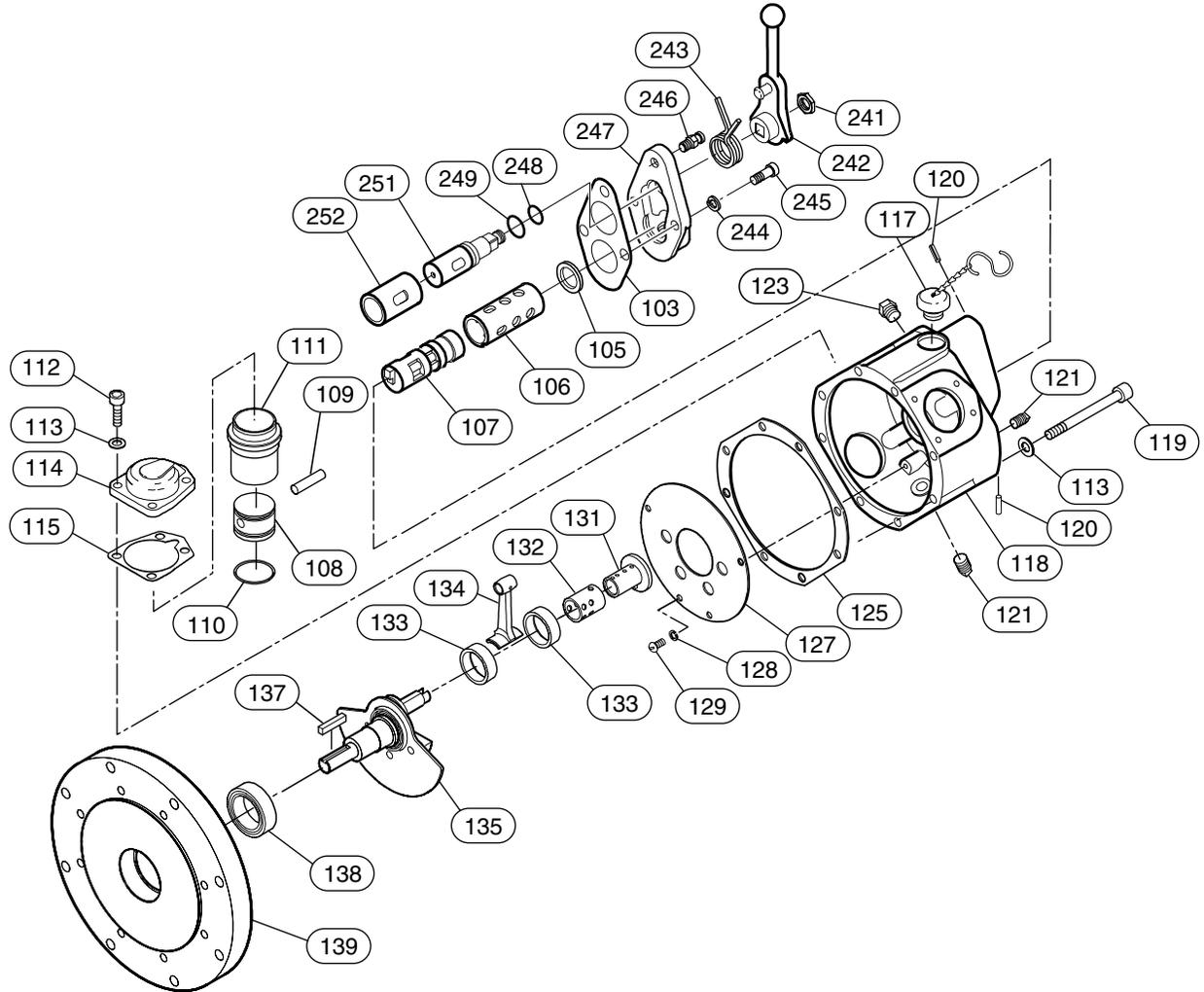
* Wire rope anchors are for use with 6 X 19 or 6 X 37 IWRC right lay construction wire rope only.

** Order item 30, reduction gear assembly.

† These parts also come in a cold weather version. For winches with a -C in the model code, adding CH (DNV) or CHA (ABS) to the end of these part numbers is required to retain winch certification. Example: Order Drum (12 in. long) (item 60) part number 11354-2 as part number 11354-2CH or 11354-2CHA.

Certification Type	Example Part Number To Order	
ABS	---	11354-2CHA
DNV	11354-2CH	---

MOTOR ASSEMBLY DRAWING (FULL FLOW)



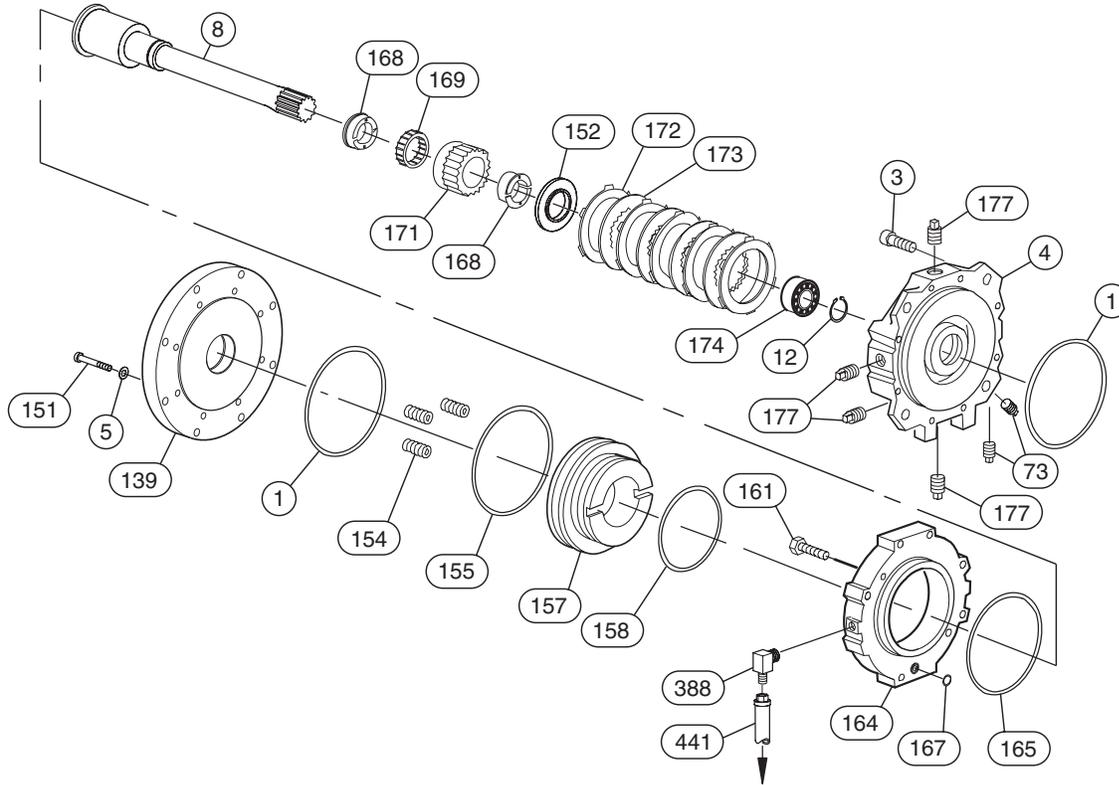
(Dwg. MHP2481)

MOTOR ASSEMBLY PARTS LIST (FULL FLOW)

Item No.	Description Of Part	Qty Total	Part Number
103	Gasket	1	26603
105	Thrust Washer	1	BU-552A
• 106	Rotary Valve Bushing Kit (includes Loctite® 609)	1	BU7A-K525
107	Rotary Valve	1	29228
108	Piston Assembly (includes item 110)	4	D01-A513B
109	Wrist Pin	4	TC-389B
110	Piston Ring Pack	8	D01-337-8
111	Cylinder Sleeve	4	D01-L505A
112	Capscrew	16	50156
113	Washer (copper)	24	D01-504
114	Cylinder Head	4	D01-H505A
115	Gasket	4	D01-507
117	Vent Cap Assembly	1	DLC-303
118	Motor Case Assembly (includes items 106, 120, 121, 123 and 252)	1	BU-X501A
119	Capscrew	8	71126908
120	Bushing Key	2	N00-15
121	Oil Plug	2	50822
123	Inlet Bushing	1	71386262
125	Gasket	1	BU-592
127	Oil Wall	1	BU-500
128	Lockwasher	4	F-58
129	Buttonhead Screw	4	J-376
131	Sleeve	1	BU-519
132	Bushing	1	D01-511A
133	Connecting Rod Ring	2	D01-510
134	Connecting Rod	4	D01-509A
135	Crankshaft Assembly	1	28326
137	Key	1	71383095
138	Bearing	1	58-96
139	Motor Adapter	1	28314
241	Reverse Valve Nut	1	23A4C5
242	Throttle Lever	1	BU-555/556A
243	Throttle Lever Spring	1	BU-412
244	Lockwasher (pack)	10 (order 2 packs)	T11-58-5
245	Capscrew	2	52333
246	Throttle Spring Stop Pin	1	BU-553
247	Valve Chest Cover (includes items 103, 105 and 246)	1	BU-K546A
248	'O' Ring	1	410-283
249	'O' Ring	1	BU-948
251	Reverse Valve Assembly (includes items 241, 248 and 249)	1	BU-K944A
252	Reverse Valve Bushing Kit (includes Loctite® 609)	1	BU7A-K945
• ---	Motor Service Kit (includes items 110, 115, 125, 242, 248 and 249)	1	71407712

• Recommended spare for one winch, 5 years at normal operation.

DISC BRAKE ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2259)

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
78	Disc Brake Assembly *	1	28313	• 158	Seal	1	71107718
• 1	'O' Ring	2	52670	161	Capscrew	2	71056493
3	Capscrew	4	52380	164	Cylinder	1	11951
4	Brake Housing †	1	11953	• 165	'O' Ring	1	52730
5	Lockwasher	8	50200	• 167	'O' Ring	1	52662
8	Shaft †	1	28312-S	168	Bushing	2	12011
12	Retainer Ring	1	52227	169	Sprag Clutch	1	52666
73	Pipe Plug	1	54246	171	Brake Hub †	1	12010
139	Motor Adapter	1	28314	• 172	Friction Disc	5	12013
151	Capscrew	8	71070924	• 173	Brake Disc	4	12012
152	Spacer	1	19633	• 174	Bearing	1	52665
154	Spring	3	50751	177	Pipe Plug	4	54912
• 155	Seal	1	71107726	388	Fitting, Elbow	1	71098552
157	Brake Piston	1	22177	441	Hose Assembly **	1	29227-5

• Recommended spare for one winch, 5 years at normal operation.

* Includes all items in list except 5 and 151.

** Hose assembly (8 in. [203 mm]).

† These parts also come in a cold weather version. For winches with a -C in the model code, adding CH (DNV) or CHA (ABS) to the end of these part numbers is required to retain winch certification. Example: Order Drum (12 in. long) (item 60) part number 11354-2 as part number 11354-2CH or 11354-2CHA.

Certification Type	Example Part Number To Order	
ABS	---	11354-2CHA
DNV	11354-2CH	---

SERVICE NOTES

DRUM BRAKE ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number	
			Manual Brake	Automatic Brake
21	Capscrew	1	50973	
22	Lockwasher	3	50181	
60	Drum (8 in. [203 mm] long) †	1	Contact factory	
	Drum (12 in. [305 mm] long) †		11354-2	
	Drum (16 in. [406 mm] long) †		Contact factory	
	Drum (24 in. [610 mm] long) †		Contact factory	
62	Side Rail (8 in. [203 mm] long drum) †	1	Contact factory	
	Side Rail (12 in. [305 mm] long drum) †		28347-2	
	Side Rail (16 in. [406 mm] long drum) †		Contact factory	
	Side Rail (24 in. [610 mm] long drum) †			
63	Side Rail (8 in. [203 mm] long drum) †	1	28332-2	
	Side Rail (12 in. [305 mm] long drum) †		Contact factory	
	Side Rail (16 in. [406 mm] long drum) †			
	Side Rail (24 in. [610 mm] long drum) †			
65	Capscrew	2	---	50183
• 351	Pin	2	4303-S	
352	Cotter Pin	See ()	D02-330 (5)	51937 (7)
353	Link Stud	1	2448	
354	Handle	1	2329	
355	Brake Lever	1	---	11498
357	Pin	2		8609
358	Clevis	1		6237-2
359	Nut	1		50159
• 361	Breather	1		52384
362	Cylinder	1		4575-1
363	Fitting, Nipple	1		52006
• 364	Dump Valve	1		51954
365	Fitting, Hose End	2		52385
367	Fitting, Elbow	1		52182
368	Hose, Bulk	1		50923
372	Bracket †	1		11493
374	Locknut	See ()		50171 (1)
375	Pin	3	3704-S	
• 376	Band Brake (includes items 380 and 384)	1 set	29301	
377	Pivot Bracket †	1	11146	
378	Washer	As Req'd	50890	
379	Arm	1	11147	
380	Brake Band (rear) †	1	Order item 376	
381	Connecting Link †	1	11144	
382	Stop Plate	1	11145	
383	Setscrew	1	52226	
384	Brake Band (front) †	1	Order item 376	
385	Washer	4	---	52914

• Recommended spare for one winch, 5 years at normal operation.

† These parts also come in a cold weather version. For winches with a -C in the model code, adding CH (DNV) or CHA (ABS) to the end of these part numbers is required to retain winch certification. Example: Order Drum (12 in. long) (item 60) part number 11354-2 as part number 11354-2CH or 11354-2CHA.

Certification Type	Example Part Number To Order	
ABS	---	11354-2CHA
DNV	11354-2CH	---

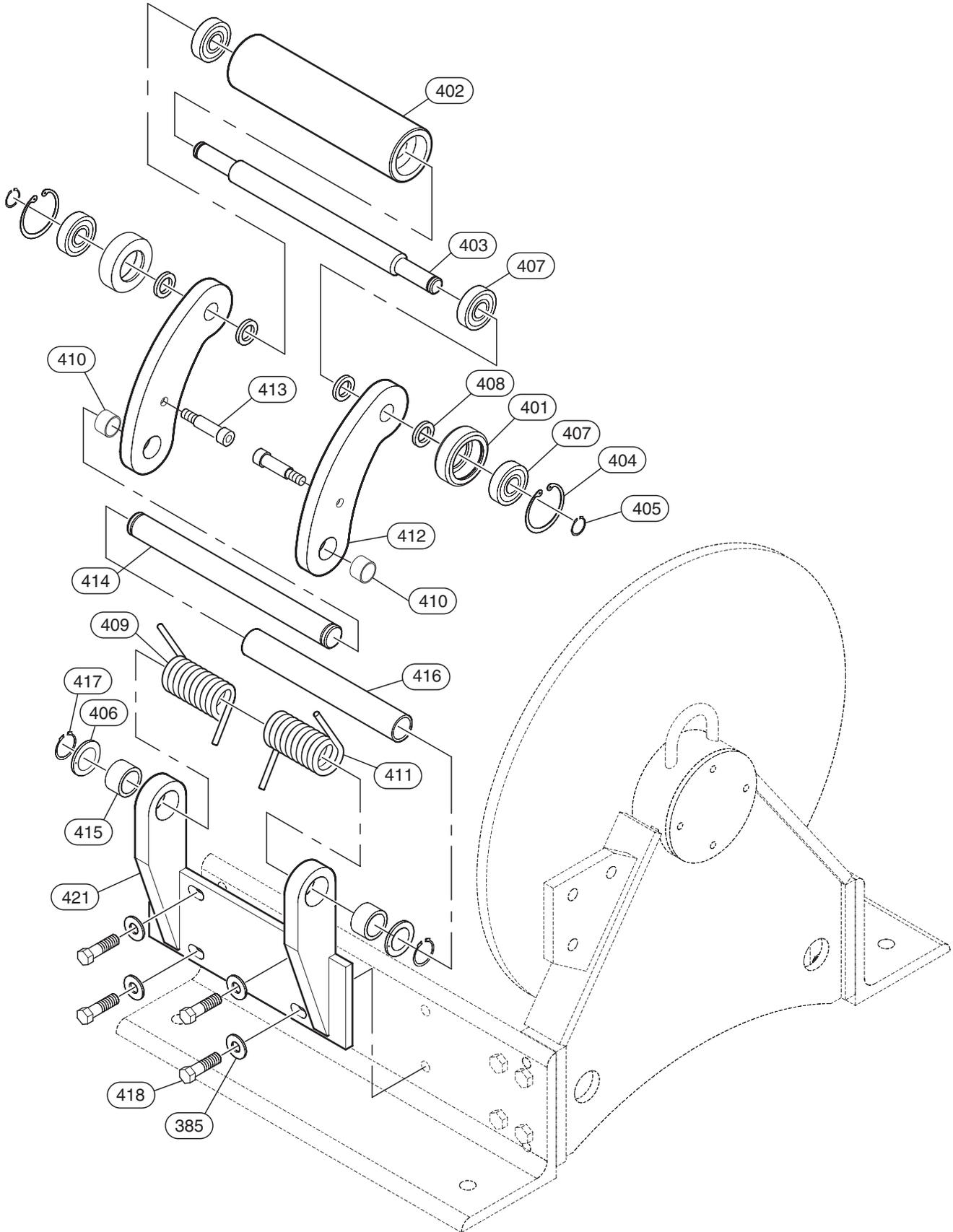
SLACK LINE DETECTOR ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
500	Slack Line Detector Assembly (includes items 21, 385, 460, 481, 482, and 501-523)	1	28281
21	Capscrew	5	50973
385	Washer	4	52914
389	Fitting, Pipe	1	71048268
444	Hose Assembly (39.5 in. [1003 mm])	1	29227-12
448	Hose Assembly (21 in. [533 mm])	1	29227-7
450	Hose Assembly (14 in. [355.6 mm])	1	29227-9
451	Hose Assembly (11 in. [279 mm])	1	29227-10
452	Fitting, Tee	1	53940
460	Pipe Plug	1	71386992
481	Limit Valve	1	213-C
482	Fitting, Elbow	2	51281
• 501	Roller (8 in. [203 mm] long drum)	2	Contact factory
	Roller (12 in. [305 mm] long drum)		28301
	Roller (16 in. [406 mm] long drum)		Contact factory
	Roller (24 in. [610 mm] long drum)		Contact factory
• 502	Shaft (8 in. [203 mm] long drum)	2	Contact factory
	Shaft (12 in. [305 mm] long drum)		28299
	Shaft (16 in. [406 mm] long drum)		Contact factory
	Shaft (24 in. [610 mm] long drum)		Contact factory
503	Arm (75°-90°)	2	28294
	Arm (60°-75°)		Contact factory
	Arm (45°-60°)		Contact factory
505	Actuator Bracket	1	28431
507	Stop Bracket, Outboard	1	28693
508	Support Bracket, Inboard	1	28289
509	Capscrew	4	71387278
514	Capscrew	1	51086
515	Bushing	2	71386577
517	Shoulder Screw	1	71404594
519	Washer	6	71064844
520	Washer	2	71352462
521	Bushing	1	71386569
522	Capscrew	2	71406730
523	Shoulder Screw	1	71404586
524	Shoulder Screw *	1	71383368

• Recommended spare for one winch, 5 years at normal operation.

* Item not illustrated, required for transportation and storage.

PRESS ROLLER ASSEMBLY DRAWING



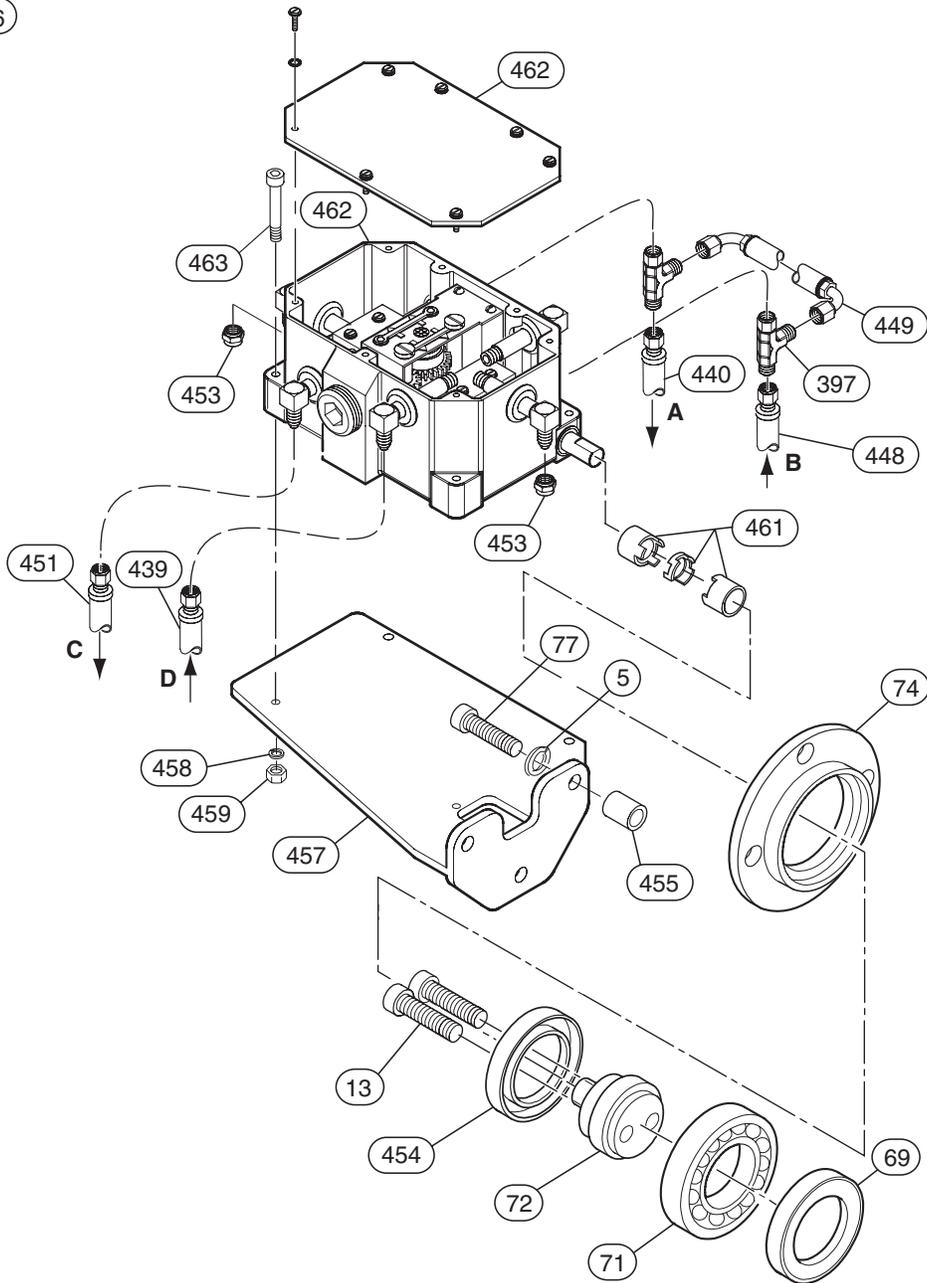
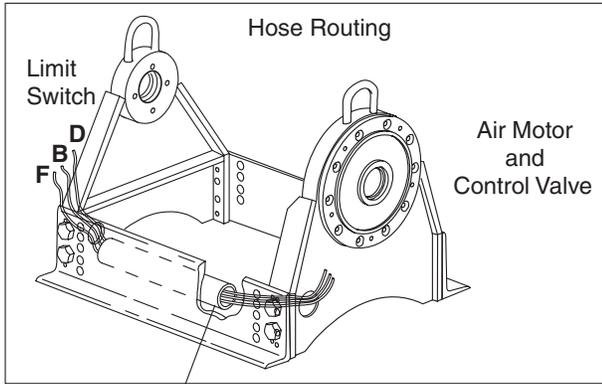
(Dwg. MHP2268)

PRESS ROLLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
400	Press Roller Assembly (includes items 385 and 401-421)	1	71383780
385	Washer	4	52914
• 401	Press Roller, Short	2	71383764
• 402	Press Roller (8 in. [203 mm] long drum)	1	Contact factory
	Press Roller (12 in. [305 mm] long drum)		71383772
	Press Roller (16 in. [406 mm] long drum)		Contact factory
	Press Roller (24 in. [610 mm] long drum)		
• 403	Roller Shaft (8 in. [203 mm] long drum)	1	Contact factory
	Roller Shaft (12 in. [305 mm] long drum)		71383756
	Roller Shaft (16 in. [406 mm] long drum)		Contact factory
	Roller Shaft (24 in. [610 mm] long drum)		
• 404	Retainer Ring	2	71069322
• 405	Retainer Ring	2	53050
406	Washer	2	71390272
• 407	Bearing	4	71053649
• 408	Spacer	4	71383798
• 409	Spring	1	71383657
• 410	Bushing	2	71388508
• 411	Spring	1	71383665
412	Arm Assembly	2	71383723
413	Shoulder Screw	2	71061634
414	Pivot Shaft	1	71383749
• 415	Bushing	2	71390264
416	Spacer	1	28416
• 417	Retainer Ring	2	71053581
418	Capscrew	4	71371652
421	Base (8 in. [203 mm] long drum)	1	Contact factory
	Base (12 in. [305 mm] long drum)		71383715
	Base (16 in. [406 mm] long drum)		Contact factory
	Base (24 in. [610 mm] long drum)		

• Recommended spare for one winch, 5 years at normal operation.

LIMIT SWITCH ASSEMBLY DRAWING



(Dwg. MHP2471)

LIMIT SWITCH ASSEMBLY PARTS LIST

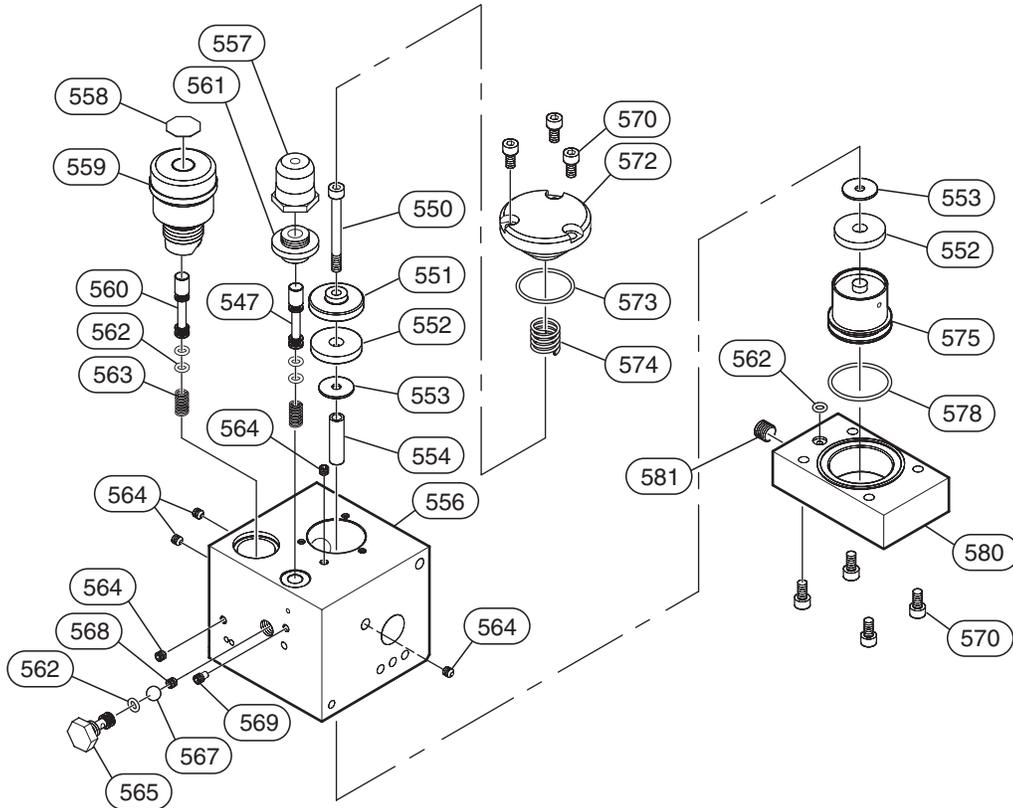
Item No.	Description of Part	Qty. Total	Part Number
5	Lockwasher	3	50200
13	Capscrew	2	51766
69	Seal	1	51474
71	Bearing	1	51797
72	Retainer	1	19232
74	End Cover	1	19233
77	Capscrew	3	51769
397	Fitting, Tee (swivel)	2	71067789
439	Hose Assembly (40 in. [1016 mm])	1	29227-11
440	Hose Assembly (48 in. [1219 mm])	1	29227-6
448	Hose Assembly (21 in. [533 mm])	1	29227-7
449	Hose Assembly (11.5 in. [292 mm])	1	29227-8
451	Hose Assembly (11 in. [279 mm])	1	29227-10
453	Cap	2	71111975
454	Seal	1	71054688
455	Spacer	3	14998-7
456	Hose Sleeve	1	28449
457	Bracket	1	29089
458	Lockwasher	4	52909
459	Nut	4	53548
461	Coupling Assembly	1	52381
462	Limit Switch	1	71402119
463	Capscrew	4	54493
906	Label, Limit Switch *	1	71149454

* Item not illustrated.

EMERGENCY STOP/OVERLOAD PARTS LIST (FULL FLOW)

Item No.	Description of Part	Qty. Total	Part Number
388	Fitting, Elbow	2	71098552
389	Fitting, Pipe	3	71048268
390	Fitting	1	71306990
393	Muffler	1	52104
397	Fitting, Tee (swivel)	2	71067789
399	Washer	2	71271985
422	Capscrew	2	71059901
423	Fitting, Tee	1	71406714
425	Dump Valve	1	71406656
426	Fitting	1	71406631
427	Fitting, Elbow (vented)	1	29246
428	Fitting, Tee	1	71406706
429	Pipe Plug	1	51467
430	Fitting	1	52181
431	Pipe Plug	1	51897
432	Brake Release Valve	1	71405823
433	Capscrew	2	71138069
434	Locknut	2	50852
435	Washer	2	71406722
436	Locknut	2	71069132
437	Hose Assembly (9 in. [228.6 mm])	1	29227-4
438	Hose Assembly (13.5 in. [342.9 mm])	1	29227-2
439	Hose Assembly (40 in. [1016 mm])	1	29227-11
440	Hose Assembly (48 in. [1219 mm])	1	29227-6
441	Hose Assembly (8 in. [203 mm])	1	29227-5
442	Hose Assembly (18.5 in. [469.9 mm])	1	29227-1
443	Hose Assembly (6.5 in. [165.1 mm])	1	29227-3
444	Hose Assembly (39.5 in. [1003 mm])	1	29227-12
482	Fitting, Elbow	3	51281
508	Support Bracket, Inboard	1	28289
548	Emergency Stop Valve Assembly	1	29218
549	Delta 'P' Valve (overload valve)	1	28446

EMERGENCY STOP ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2292)

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
548	Emergency Stop Assembly *	1	29218	• 563	Spring	2	71365787
547	Plunger	1	**	564	Setscrew	5	71386221
550	Capscrew	1	71386205	565	Plug	1	28394
551	Cap	1	28401	• 567	Ball	1	71386171
• 552	Seal	2	28399	568	Setscrew, Orifice	1	28417
• 553	Washer	2	71386197	569	Setscrew	1	**
554	Spacer	1	28400	570	Capscrew	7	71386213
556	Valve Block	1	***	572	Cap	1	28397
557	Boot	1	**	• 573	'O' Ring	1	71137970
558	Label	1	95790099	• 574	Spring	1	71386189
559	Button	1	71372601	575	Piston	1	28398
560	Plunger	1	28395	• 578	'O' Ring	1	71137988
561	Insert	1	**	580	Cover	1	28396
• 562	'O' Ring	6	71127039	581	Fitting, Pipe	1	54292

• Recommended spare for one winch, 5 years at normal operation.

* Includes items 550-581.

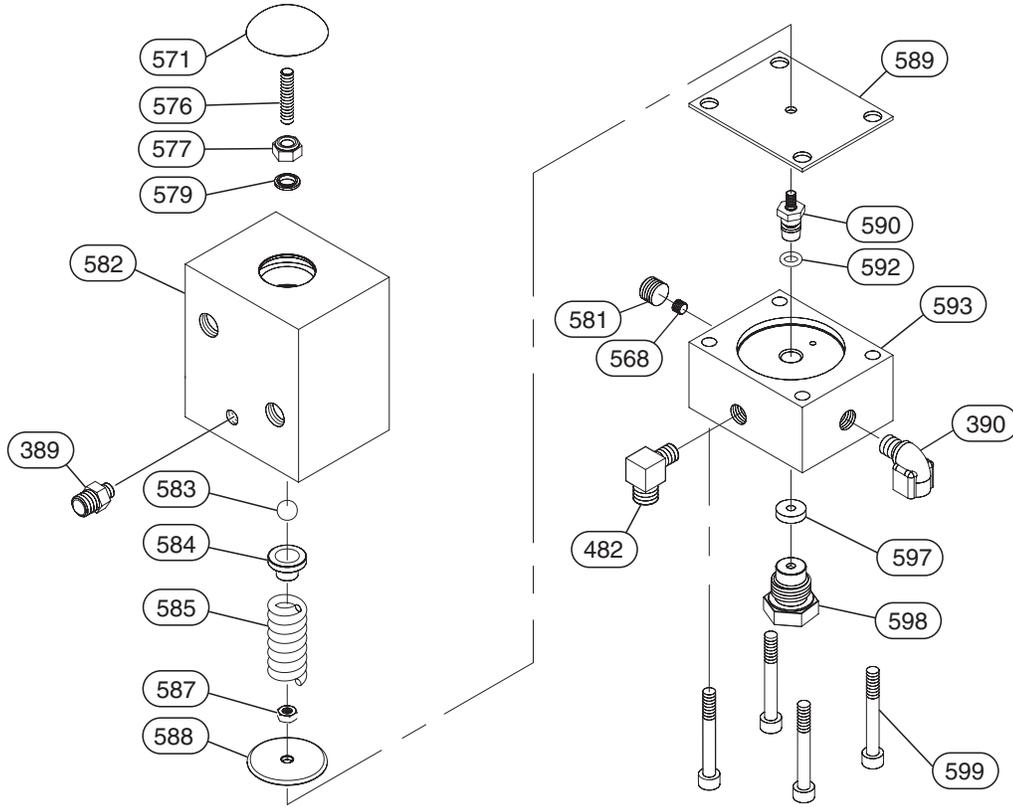
** Not sold separately order Kit 29215.

*** Item 556 is not sold separately order item 548.

Kits

---	Emergency Stop Boot Kit (includes items 547, 557, 561, 562 and 569)	1	29215
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DELTA 'P' OVERLOAD VALVE ASSEMBLY DRAWING AND PARTS LIST

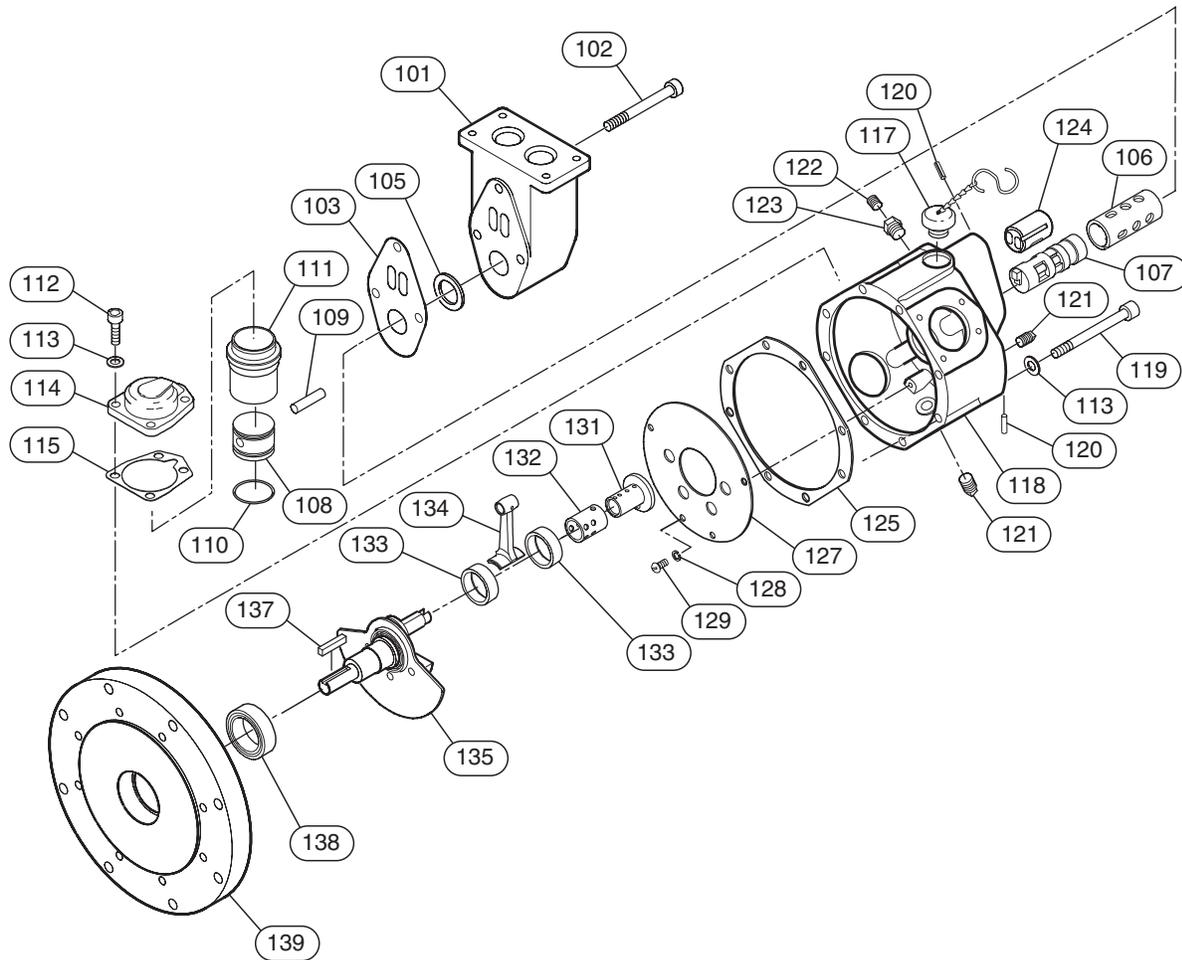


(Dwg. MHP2293)

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
549	Delta 'P' Overload Valve Assembly (includes items 460 and 568-599)	1	28446	• 583	Ball	1	G601-65
389	Fitting, Pipe	1	71048268	584	Guide	1	28441
390	Fitting	1	71306990	• 585	Spring	1	71386775
482	Fitting, Elbow	1	51281	587	Nut	1	71386783
568	Setscrew, Orifice	1	28417	588	Washer	1	28442
• 571	Plug	1	71387211	• 589	Diaphragm	1	28443
576	Screw	1	71386809	• 590	Poppet	1	28439
577	Nut	1	71386817	• 592	'O' Ring	1	71138135
• 579	Seal	1	71303838	593	Block, Upper	1	28437
581	Fitting, Pipe	1	54292	• 597	Seal	1	28444
582	Block, Lower	1	28438	598	Fitting, Pilot	1	28440
				599	Capscrew	4	71386791

• Recommended spare for one winch, 5 years at normal operation.

MOTOR ASSEMBLY DRAWING AND PARTS LIST (PENDANT CONTROL)



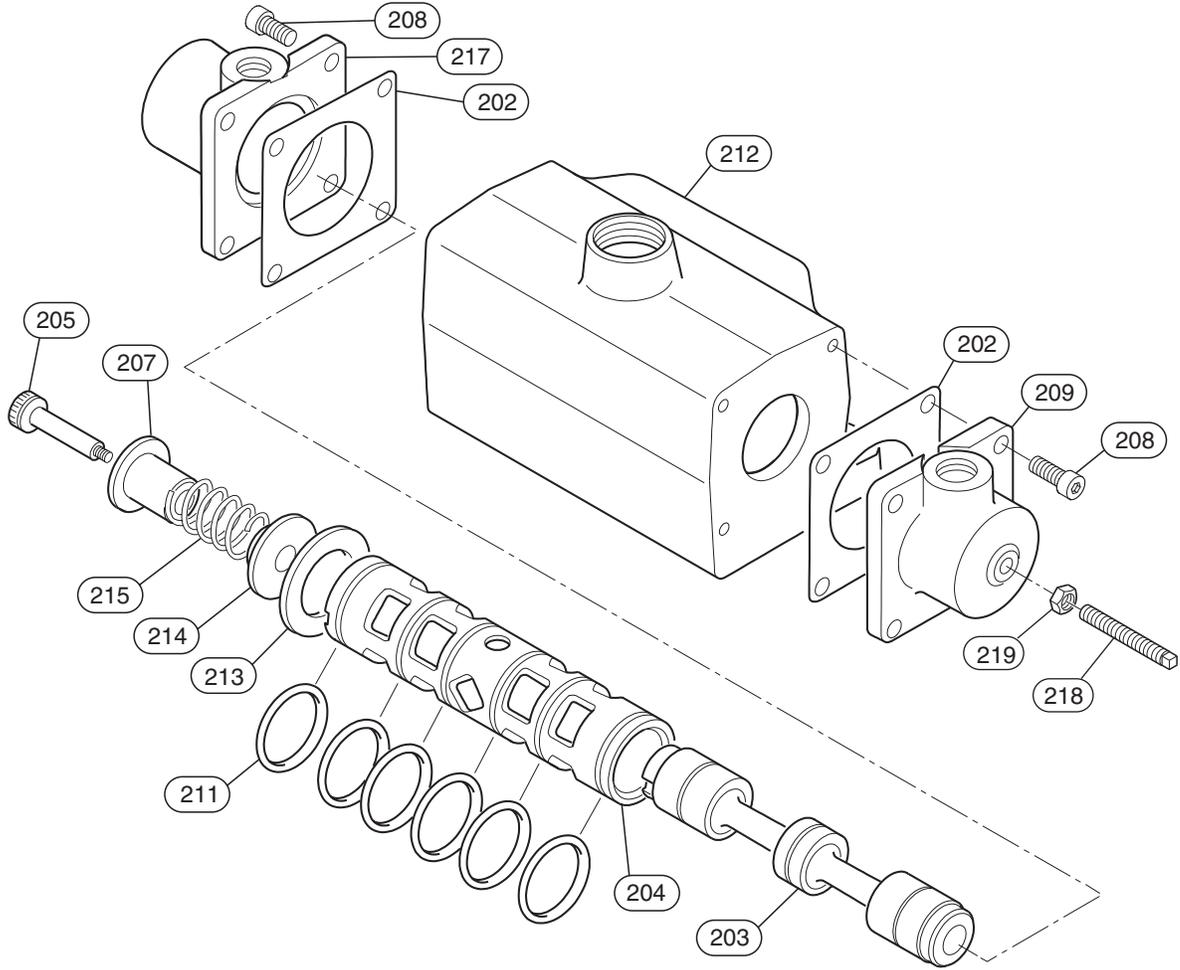
(Dwg. MHP2258)

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
100	Motor Assembly *	1	28316	120	Bushing Key	2	N00-15
101	Motor Manifold	1	71382808	121	Pipe Plug	2	D02-402
102	Capscrew	3	54090	122	Pipe Plug	1	C6H20A-79
• 103	Gasket	1	BU7A-547	123	Inlet Bushing	1	BU-38
105	Thrust Washer	1	BU-552A	124	Reverse Valve Bushing	1	BU7ARC-945
106	Rotary Valve Bushing	1	BU7A-K525	• 125	Gasket	1	BU-592
107	Rotary Valve	1	BU-526	127	Oil Wall	1	BU-500
108	Piston (includes item 110)	4	D01-A513B	128	Lockwasher	4	F-58
109	Wrist Pin	4	TC-389B	129	Buttonhead Screw	4	J-376
• 110	Piston Ring	8	D01-337-8	131	Sleeve	1	BU-519
111	Cylinder Sleeve	4	D01-L505A	132	Bushing	1	D01-511A
112	Capscrew	16	50156	133	Connecting Rod Ring	2	D01-510
113	Washer (copper)	24	D01-504	134	Connecting Rod	4	D01-509A
114	Cylinder Head	4	D01-H505A	135	Crankshaft Assembly	1	28326
• 115	Gasket	4	D01-507	137	Key	1	71383095
117	Vent Cap Assembly	1	DLC-303	138	Bearing	1	58-96
118	Motor Case	1	BU7ARC-501	139	Motor Adapter	1	28314
119	Capscrew	8	71126908				

• Recommended spare for one winch, 5 years at normal operation.

* Includes items 101, 103, 105-129 and 131-138.

PILOT AIR CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

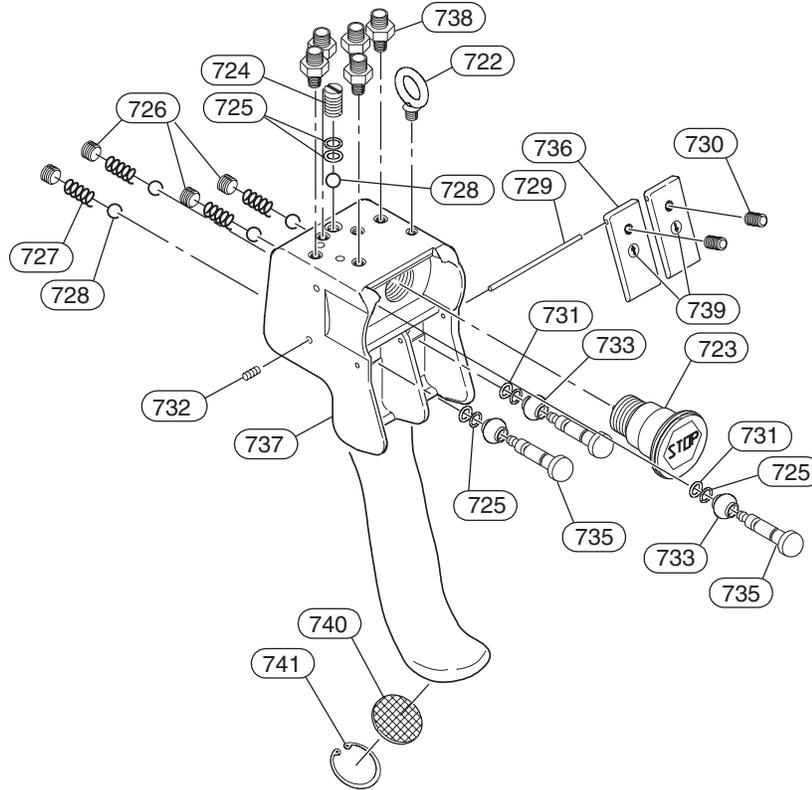


(Dwg. MHP2275)

Item No.	Description of Part	Qty. Total	Part Number
201	Valve Assembly (includes items 202-217)	1	28447
202	End Cap Gasket	2	51978
203	Valve Spool	1	Order item 201
204	Valve Sleeve	1	
205	Shoulder Screw	1	9640-4
207	Centering Shaft Guide	1	9640-5
208	Capscrew	8	9640-6
209	End Cap	1	9640-7
211	'O' Ring	6	Order item 9750-13
212	Valve Body	1	Order item 201
213	Space	1	9640-10
214	Washer	1	9640-11
215	Spring	1	54925
217	End Cap	1	9640-13
218	Setscrew	1	53545
219	Nut	1	50176
•	Valve Service Kit (includes items 202 and 211)	1	9750-13

• Recommended spare for one winch, 5 years at normal operation.

TWO LEVER PENDANT ASSEMBLY DRAWING AND PARTS LIST



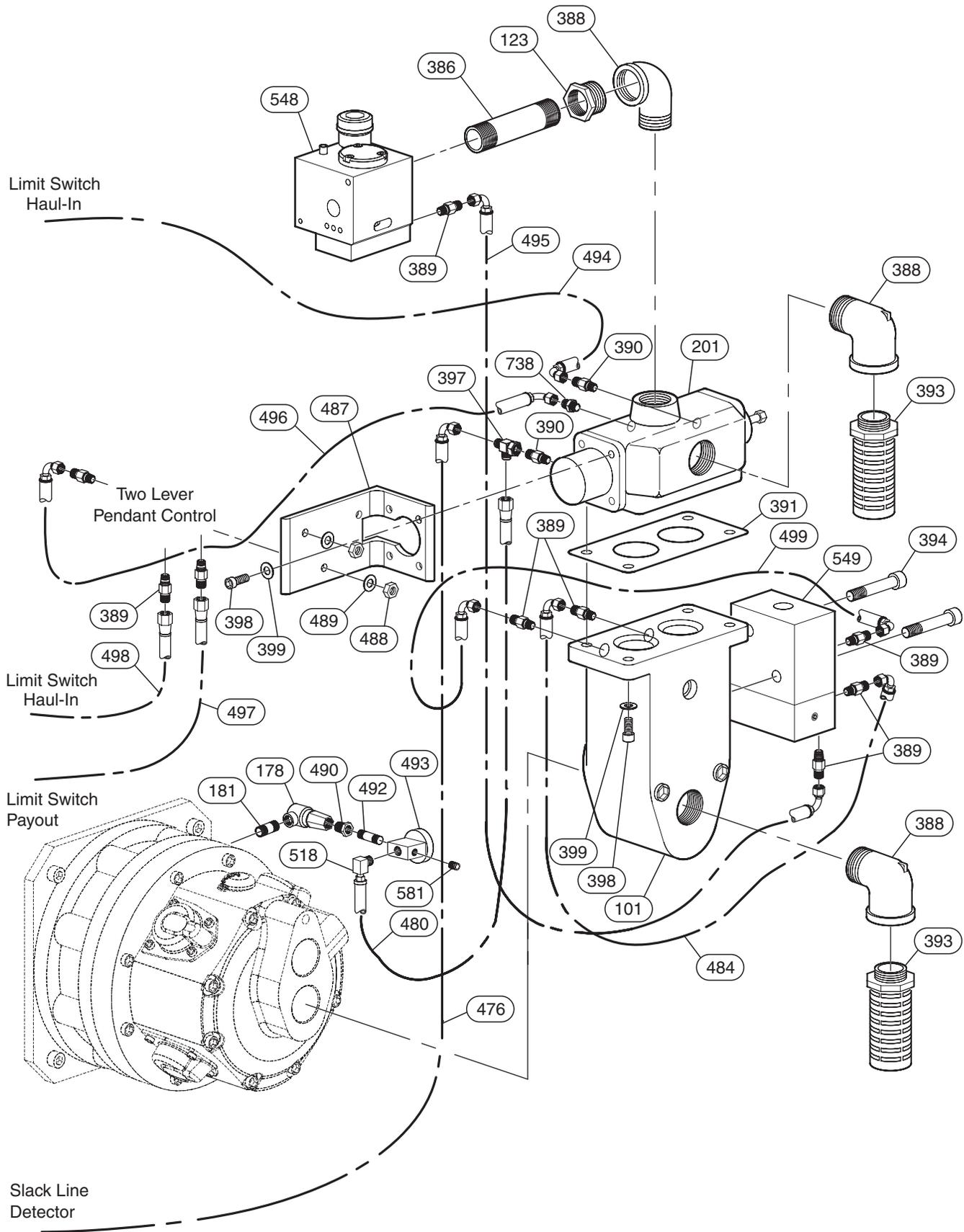
(Dwg. MHP2296)

Item No.	Description of Part	Qty. Total	Part Number
720	Pendant Assembly (includes items 722-741)	1	PHS2E-U
722	Lifting Eye	1	64222332
723	Emergency Stop Valve	1	95790108
724	Plug	1	95790106
• 725	'O' Ring	5	58209229
• 726	Plug	4	65107741
• 727	Spring	4	69128541
• 728	Ball	5	69401625
• 729	Pin	1	95790040
• 730	Setscrew	2	42008607
• 731	'O' Ring	3	58235329
732	Setscrew	3	42008307
• 733	Protector	3	95790107
735	Valve	3	95790104
736	Lever	2	95790122
737	Pendant Handle (Not sold separately)	1	Order item 720
738	Fitting, Hose	5	71078158
739	Label Kit	1	95790111
• 740	Exhaust Washer	1	95790114
• 741	Retainer Ring	1	47713030

• Recommended spare for one winch, 5 years at normal operation.

SERVICE NOTES

E-STOP/OVERLOAD CONNECTION ASSEMBLY DRAWING (PENDANT CONTROL)

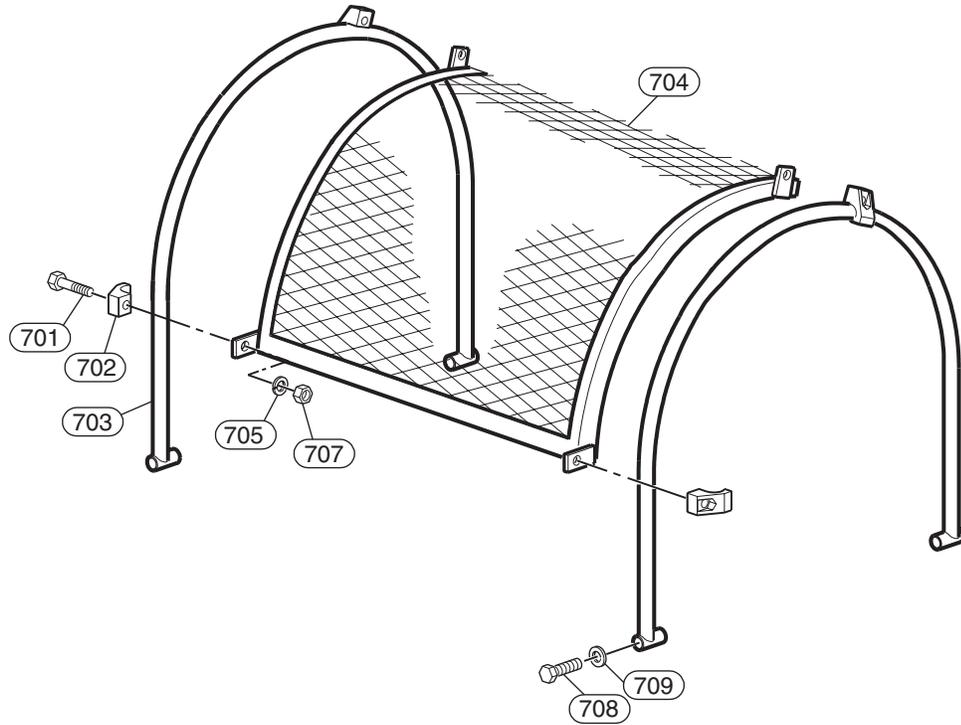


(Dwg. MHP2277)

E-STOP/OVERLOAD CONNECTION ASSEMBLY PARTS LIST (PENDANT CONTROL)

Item No.	Description of Part	Qty. Total	Part Number
101	Motor Manifold	1	71382808
123	Inlet Bushing	1	71386262
178	Dump Valve	1	50276
181	Fitting, Nipple	1	54274
201	Valve Assembly	1	28447
386	Fitting, Nipple	1	71387161
388	Fitting, Elbow	3	52190
389	Fitting, Pipe	9	71048268
390	Fitting, Hose	2	71387021
391	Gasket	1	71018386
393	Muffler	2	52104
394	Capscrew	2	71387039
397	Fitting, Tee (swivel)	1	71067789
398	Capscrew	8	71030084
399	Washer	8	71271985
476	Hose Assembly (69.5 in. [1765 mm] long)	1	28372-6
480	Hose Assembly (21 in. [533 mm] long)	1	28372-10
483	Control Throttle	1	71386064
484	Hose Assembly (13 in. [330 mm] long)	1	28372-8
485	Capscrew	2	71386965
486	Capscrew	1	71386957
487	Bracket	1	71382816
488	Nut	3	71386981
489	Washer	3	71386973
490	Bushing	1	54688
492	Fitting, Nipple	1	51804
493	Valve	1	71386999
494	Hose Assembly (61.5 in. [1562 mm] long)	1	28372-4
495	Hose Assembly (17 in. [432 mm] long)	1	28372-9
496	Hose Assembly (26.5 in. [673 mm] long)	1	28372-1
497	Hose Assembly (61.5 in. [1562 mm] long)	1	28372-3
498	Hose Assembly (57 in. [1448 mm] long)	1	28372-2
499	Hose Assembly (19 in. [483 mm] long)	1	28372-7
518	Fitting, Elbow	1	51281
548	Emergency Stop Assembly	1	29218
549	Delta 'P' Valve Assembly (overload valve)	1	28446
581	Fitting, Pipe	3	54292
738	Fitting, Hose	1	71078158

DRUM GUARD ASSEMBLY DRAWING AND PARTS LIST

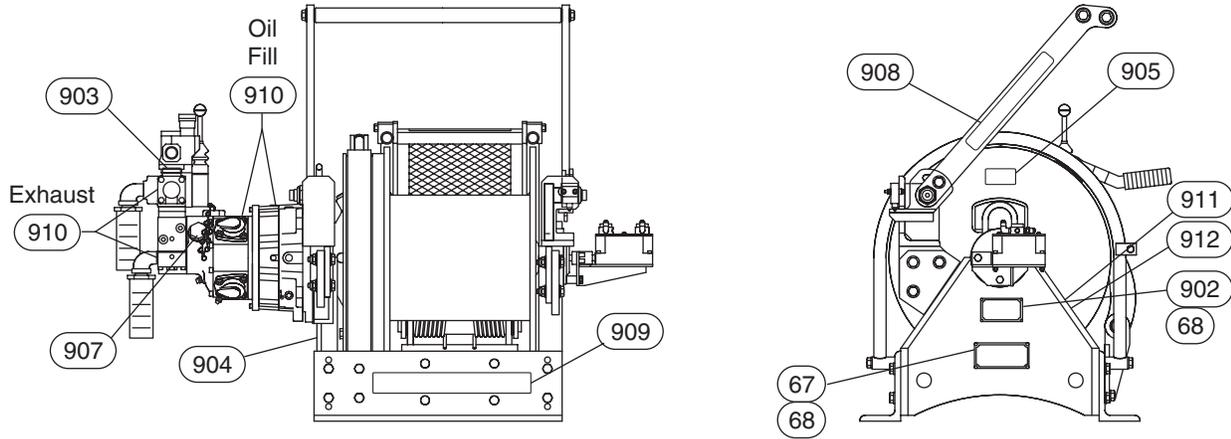


(Dwg. MHP2281)

Item No.	Description of Part	Qty. Total	Part Number
700	Drum Guard Assembly * (8 in. [203 mm] long drum)	1	Contact factory
	Drum Guard Assembly * (12 in. [305 mm] long drum)		11283-2
	Drum Guard Assembly * (16 in. [406 mm] long drum)		Contact factory
	Drum Guard Assembly * (24 in. [610 mm] long drum)		
701	Capscrew	4	71126742
702	Clamp	4	10399
703	Support	2	10400
704	Drum Guard (8 in. [203 mm] long drum)	1	Contact factory
	Drum Guard (12 in. [305 mm] long drum)		11259-2
	Drum Guard (16 in. [406 mm] long drum)		Contact factory
	Drum Guard (24 in. [610 mm] long drum)		
705	Lockwasher	4	51581
707	Nut	4	51440
708	Capscrew	4	71324743
709	Washer	4	50182

* Drum Guard Assemblies include items 701–709.

WINCH LABEL/TAG LOCATION DRAWING AND PARTS LIST



(Dwg. MHP2270)

Item No.	Description of Part	Qty. Total	Part Number
67	Nameplate	1	Contact factory
68	Rivet	8	71028849
902	Notice, <i>Man Rider</i> (Reference Page 6 for Label)	1	71108856
903	Label, Throttle Direction	1	96180102
904	Label, Warning (Reference Page 6 for Label)	1	71124887
905	Label, Overwind Cable	2	96180103
906	Label, Limit Switch *	1	71149454
907	Tag, Check Oil Level Notice	1	71107148
908	Label, Ingersoll-Rand Logo	2	71106256
909	Label, Product	1	71111793
910	Label Kit **	1	71295240
911	Label, Open Book	1	96180098
912	Label, CE	1	96180096

* Item Not Illustrated.

** Item 910, includes air supply, oil drain/fill/level and exhaust labels.

ACCESSORIES

Description of Accessory	Part Number
Muffler (quantity of 2 required for 'E' Option winches)	52104
Lubricant (16 fluid ounces)	LUBRI-LINK-GREEN
Filter 3/4 inch NPT	F30-06-00
Regulator 3/4 inch NPT (w/ gauge)	R28-06-F0G0-28
Lubricator 3/4 inch NPT	L30-06-00
Liquidator 2 inch FNPT (not shown on drawing)	8834-WI-000
Pipeline Strainer 3/4 FNPT (not shown on drawing)	EU-A267

SERVICE NOTES

SERVICE NOTES

PARTS ORDERING INFORMATION

The use of other than **Ingersoll-Rand** replacement parts may adversely affect the safe operation and performance of this product.

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

Model Number _____

Serial Number _____

Date Purchased _____

When ordering replacement parts, please specify the following:

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

The nameplate is located on the winch outboard upright.

NOTICE

- **Continuing improvement and advancement of design may cause changes to this equipment 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.**
- **Sections of this manual may not apply to your winch.**

Refer all communications to the nearest **Ingersoll-Rand** Office or Distributor.

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.

Winches that have been modified without **Ingersoll-Rand** approval, mishandled or overloaded will not be repaired or replaced under warranty. A printed copy of the warranty which applies to this winch is provided inside the back cover of this manual.

Disposal

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

For additional information contact:

Ingersoll-Rand
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046 USA
Phone: (206) 624-0466
Fax: (206) 624-6265

or

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

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,

United States Office Locations

For Order Entry and Order Status

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

Technical Support

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Web Site:

www.irco.com

Regional Sales Offices

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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

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