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.

Form MHD56298
Edition 2
November 2004
71441844

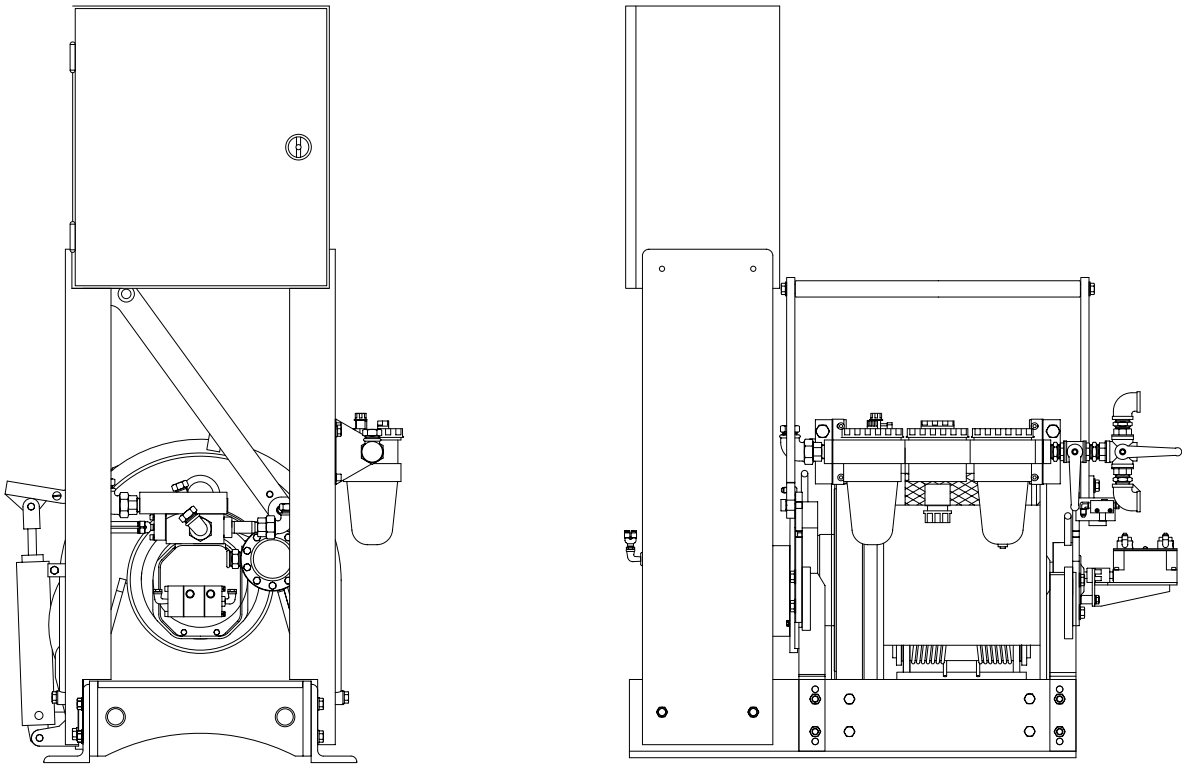
Ingersoll-Rand®

Form MHD56244

PARTS, OPERATION AND MAINTENANCE MANUAL

force5™ WINCHES

MODEL FA150KGMR-RC *MAN RIDER*®



(Dwg. MHP2374)

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-RC 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.

Form MHD56244
Edition 1
December 2001
71396907

Ingersoll-Rand®

CONTENTS

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, **I-R** 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 I-R does not furnish. Additional devices are often required to bring the system up to elevator code standards.

Operating Limitations

Man Rider winches manufactured by **I-R** 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.

OPERATING INSTRUCTIONS

Man Rider Operating Instructions

WARNING

• 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. Always maintain three or more wraps of wire rope on winch drum.
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, etc., clear of 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. Always ensure that you, and all other people, are clear of the path of the load. Do not lift a load over people.
12. Ease slack out of wire rope when starting a lift or pull. Do not jerk the load.
13. Do not swing a suspended load.
14. Do not leave a suspended load unattended.
15. Never operate a winch with twisted, kinked or damaged wire rope.
16. Pay attention to load at all times when operating winch.
17. Never use wire rope as a sling.
18. After use, or when in a non-operational mode, the winch should be secured against unauthorized and unwarranted use.

WARNING LABELS

Each unit is shipped from the factory with warning labels shown. If labels are not attached to your unit, order new labels and install. Refer to parts list for part numbers. 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.

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⚠ WARNING

Failure to follow these warnings can result in severe injury, death or property damage:

- **Do not operate this winch before reading operation and maintenance manual.**

- **Do not lift people except as allowed by maritime regulatory bodies for people lifting applications.**
- **Do not lift loads over people.**
- **Do not lift more than rated load as specified on name plate.**
- **Do not allow less than three wraps of wire rope to remain on drum at all times.**
- **Do not operate a damaged or malfunctioning winch.**
- **Do not remove or obscure warning labels.**

Comply with third party maritime regulations for man-lifting and material handling applications.

P/N 71124887
for Offshore Man Rider™ winches

INGERSOLL-RAND
MATERIAL HANDLING

⚠WARNING

- NEVER ACTIVATE THE BALANCING SYSTEM WHEN THERE IS NO LOAD.

BALANCING POINT ADJUSTMENT PROCEDURE:

select **STANDARD WINCH** mode

(Green indicator will come on to indicate standard winch mode working)

I) PERSON MUST HAVE THE SAFETY HARNESS FITTED.

II) ADJUST PRESSURE REGULATOR KNOB TO APPROX 1 BAR.

III) RAISE MAN 0.5 METER ABOVE FLOOR WITH MAIN CONTROL LEVER

Select Balancing Mode

(Green indicator will come on to indicate balancing mode working)

SLOWLY ADJUST PRESSURE REGULATOR KNOB TO OBTAIN BALANCING POINT.

— CLOCKWISE WILL INCREASE PRESSURE AND TEND TO LOWER MAN.

— ANTICLOCKWISE WILL DECREASE PRESSURE AND THE ABILITY TO LOWER MAN.

(At this point it is recommended than additionnal person is present to increase the load when required for balancing purposes)

USE CONTROL LEVER TO RAISE PERSON TO WORKING POSITION WHEN JOB IS COMPLETED, AND PERSON IS BACK ON THE FLOOR, SELECT STANDARD MODE BEFORE TAKING THE SAFETY HARNESS OFF

IMPORTANT

- THE BALANCING MODE MUST ALWAYS BE SELECTED WHEN LIFTING A PERSON TO WORKING POSITION.

96150447

SPECIFICATIONS

Description

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

Output from the externally mounted gear air motor is transmitted through a disc brake to the planetary reduction gear assembly. The output from the planetary reduction gear assembly is connected to the wire rope drum through the drum carrier. The disc brake is automatically applied when winch is in neutral. The drum band brake operates by applying a friction force between the drum band and winch drum.

Model Code Explanation

Example: FA150KGMR12-RC-60-C-E — **FA 150KG MR 12 - RC - 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** = 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 = 32° F (0° C) or warmer
- **C** = -4° F (-20° C)

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

Air System	Rated Operating Pressure	75 psig (5.8 bar/580 kPa)	
	Air Consumption (at rated pressure and load)	75 scfm	2.1 cu.m/min
Rated Performance (at rated pressure/volume) (1)	Full Drum Line Pull	330 lbs	150 kg
	Full Drum Line Speed	78 fpm	23.8 mpm
Sound Pressure Level (dBA) (2, 3)		89 dBA	
Sound Power Level (dBA) (2)		103 dBA	
Winch Overload Device Setting (4)		610 lbs	276 kg
Winch Net Weight (without wire rope)	12 in. (305 mm) long drum	620 lbs	281 kg
Air Motor Port Inlet Size		3/4 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 (5)		75 lbs	334 N
Drum Barrel Diameter		10.75 in.	273 mm
Drum Flange Diameter		19 in.	483 mm

Notes:

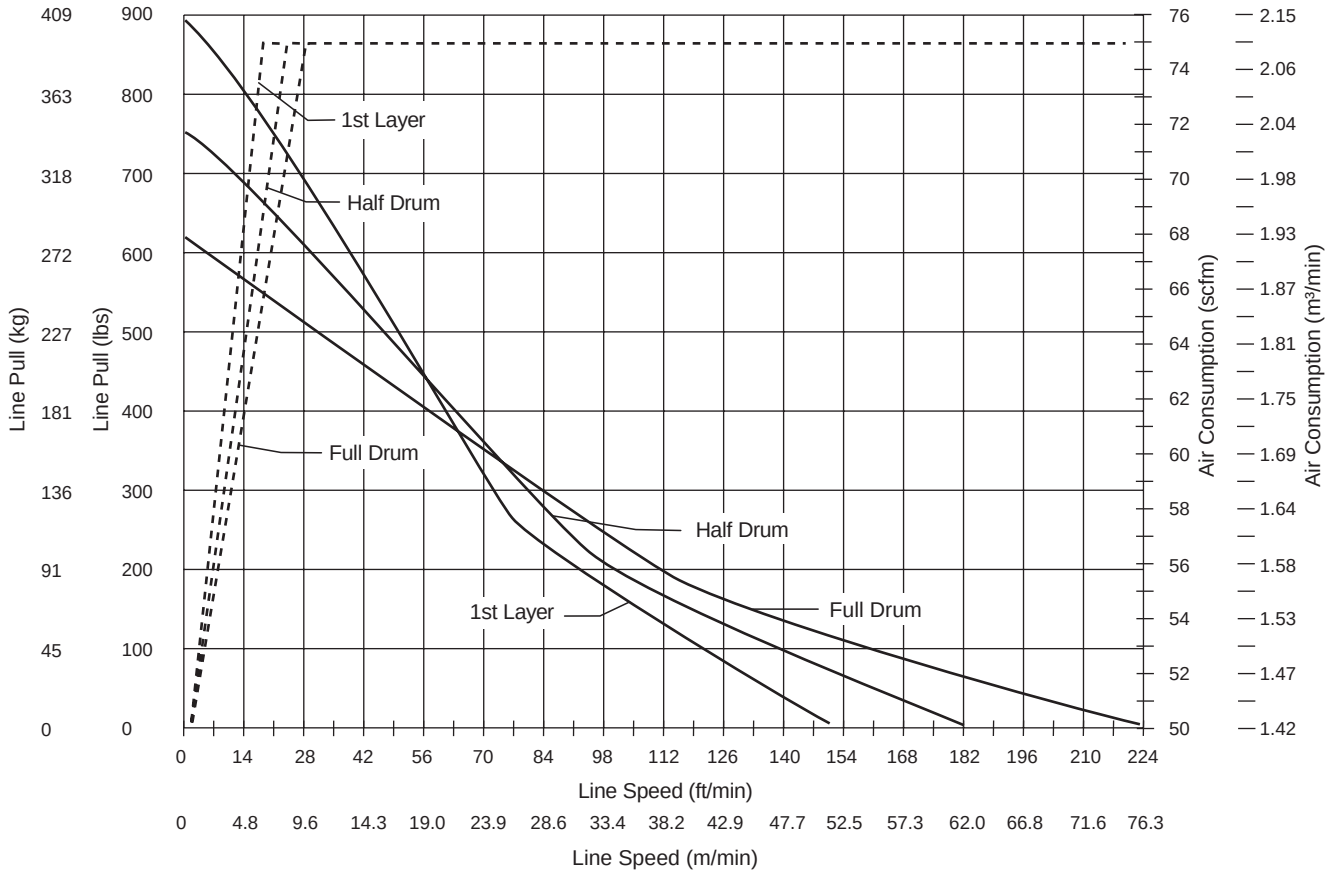
1. Performance based on 84 psig (5.8 bar/580 kPa) operating pressure.
2. Sound measurements have been made in accordance with ISO 11201, ISO 3744-3746 and ISO 4871 test specifications for sound from pneumatic equipment. Readings shown are based on the average noise level of each winch configuration, proportionate to the utilized time in a regular cycle.
3. Lpc (Peak Sound Pressure) does not exceed 130 dB.
4. Winch Overload Device is factory preset at 125% (+/- 10%) of the winch capacity at top layer.
5. 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 @ 330 lb (150 kg) Load**		**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**	**ft**	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**
1	72	21.9	56	17	86	26	116	35	175	53
2	74	22.6	116	35	178	54	239	73	361	110
3	75	22.9	180	55	275	84	370	113	560	171
4	76	23.2	248	76	378	115	509	155	770	235
5	77	23.5	319	97	487	148	655	200	991	302
6	78	23.8	395	120	602	183	810	247	1225	373
7	78	23.8	474	144	723	220	972	296	1470	448
8	78	23.8	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.

Performance Graph



(Dwg. MHP2395)

INSTALLATION

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

Winch gearbox and disc brake are supplied fully lubricated from factory. Refer to “LUBRICATION” section on page 30 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.

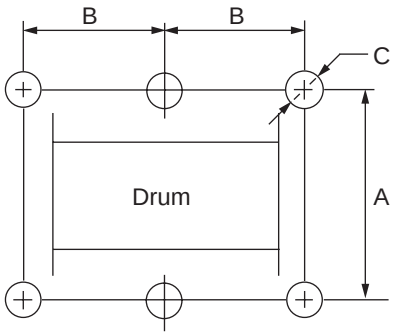
Mounting

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

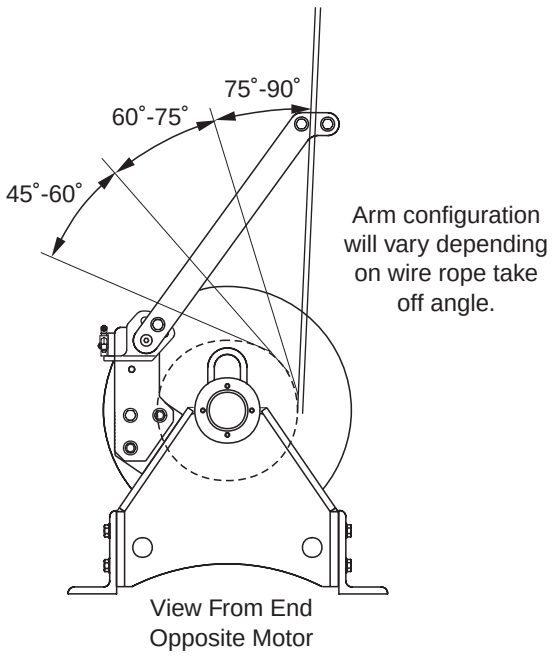
⚠ CAUTION

• 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 11, 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

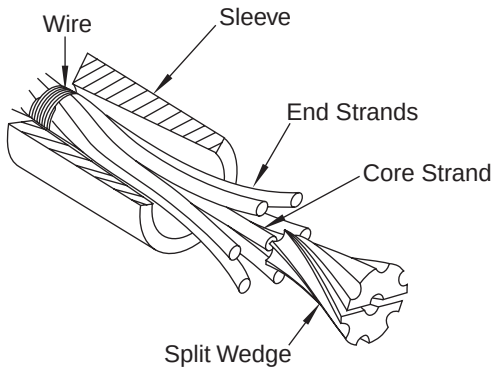
Installing Wire Rope

⚠ CAUTION

• To avoid disc brake damage when installing wire rope pressurize brake with a minimum of 60 psi (4.1 bar) air from an auxiliary source.

Refer to Dwg. MHP0166 on page 11.

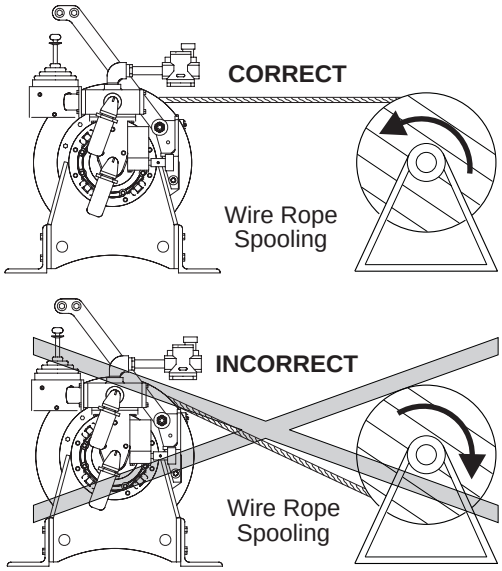
1. Cut wire rope to length in accordance with wire rope manufacturer's instructions.
2. Feed end of wire rope into wire rope anchor hole in drum and pull through approximately 1 ft (305 mm) of wire rope.



(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.

Spooling Wire Rope onto Winch Drum



(Dwg. MHP2294)

⚠ 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 and Dwg. MHP2294 on page 11.

⚠ CAUTION

• Make sure the first wrap of wire rope is tight and lies flush against drum flange.
• Ensure correct wire rope anchor is used.

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.

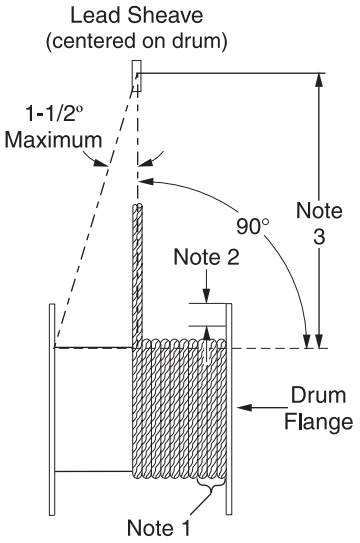
Wire Rope Spooling

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)

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.
3. For correct fleet angle maintain a minimum of 1.6 ft (0.5 m) per inch of drum length. Example: for 12 in. (305 mm) drum length locate lead sheave at least 19.2 ft (6 m) from drum.
   "A" = 1.6 feet (.05 metre) per inch of drum length:
   "A" = 12.8 feet (3.9 metres) for 8 inch long drum.
   "A" = 19.2 feet (5.8 metres) for 12 inch long drum.
   "A" = 26.0 feet (7.9 metres) for 16 inch long drum.
   "A" = 38.4 feet (11.7 metres) for 24 inch long drum.

Installation of the Control Console

There are four holes of 1/2 inch (13 mm) diameter to attach the console.

⚠ WARNING

• The position of the control console is very important for the safety of the person attached to the harness. The operator must be able to see the person at any time.

Connection of the Control Console to the Winch

To connect the supply hoses to the control console, unions are placed so as to avoid any possible reversal during assembly. To connect supply hoses to control box on winch, refer to the marking with color codes (blue, white, no color).
Twelve pipes numbered from 1 to 12 must also be connected to the control box. Refer to Dwg. MHP2355 on page 63.

⚠ WARNING

• Winches and control console are matched components, their identification plates bear the same serial number. Under no circumstances should the console change without having a complete test of the winch-console assembly performed by a certified maintenance person.

Test and adjustment procedure
1. Supply compressed air to the system.
2. Make sure the emergency stop button is unlocked.
3. Make sure the standard mode is selected.
4. Press button "ON".
5. Static pressure 80 psi (5.5 0/+0.3 bar) adjust the manometer-relief valve of the filter-regulator -lubricator if necessary, then lock it or seal it. For correct performance, a dynamic pressure of 75 psi (5.2 bar) minimum is necessary.
6. Check the standard mode, set the button mode to the standard position.

Indicators

❍

------- Green ------- -------

Press button "ON",

Indicators

❍

-Green Green ------- -------

Press the emergency stop button

Indicators

❍

------- Green ------- -------

Power shut-off (manometer on left side of console is to 0 + warning device is heard for a brief moment)

Set the Mode button to the "balancing" position
The "failure" indicator comes on
Set the button back to the "standard" mode
The "failure" indicator goes off
The "standard" mode is validated

NOTICE

• If winch fails test, refer to "Troubleshooting" section on page 24.

7. CHECK OF NO LOAD SPEED
   Speed in the lifting direction to 120 ft/min (37 m/min) minimum
   Speed in the lowering direction to 80 ft/min (24 m/min) minimum.

Adjustment in Balancing Mode

This adjustment is done at factory. If adjustments need to be made contact factory.

Slack Line Detector

Refer to Dwg. MHP2266 on page 50.
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.

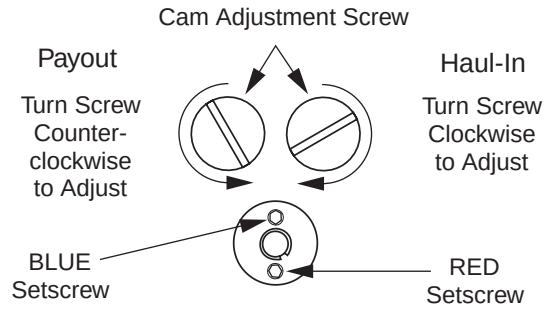
To adjust slack line detector, with wire rope installed on drum:
1. Loosen capscrew (514) on actuator bracket (505).
2. Feed wire rope end between take-off rollers (501), and remove slack from wire rope.
3. Rotate actuator bracket (505) until it contacts the limit switch (481). Tighten capscrew (514).

Limit Switch

Refer to Dwgs. MHP2278 on page 54 and MHP0607 on page 13. 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 (475) from top of limit switch (462).
2. Loosen blue 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 access plate (477) from top of limit switch (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 75 scfm (2.1 cu.m/min) at rated operating pressure of 84 psig (5.8 bar/580 kPa) at the control console gauge. If air supply varies from what is recommended, winch performance will change.

Exceeding 84 psi (5.8 bar/580 kPa) may cause inadvertent activation of the overload device.

NOTICE

• The whole equipment is delivered with 16 ft (5 meters) of hose. Do not modify the length without informing Ingersoll-Rand.

Air Lines

The inside diameter of the winch air supply lines must not be less than the size shown in Table 3 on page 14. 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-RC	3/4	19

Air Line Lubricator

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. The air line lubricator is mounted to the winch frame.

⚠ CAUTION

• Shut off air supply before filling air line lubricator.

Air line lubricator should be replenished daily and set to provide 2 to 3 drops per minute of SAE 10W (ISO VG 32) oil. A fine mist will be exhausted from the throttle control valve when the air line lubricator is functioning properly.

Air Line Filter

The air line strainer/filter is mounted to the winch frame 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

An air pressure regulator is installed between lubricator and filter.

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.

Motor

For optimum performance provide an air supply of 84 psig at 75 scfm (5.8 bar/580 kPa at 2.1 cu.m/min) for FA150KGMR-RC 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

Ensure mufflers are installed in exhaust port of motor. Check mufflers periodically to ensure they are functioning correctly.

Initial Winch Operating Checks

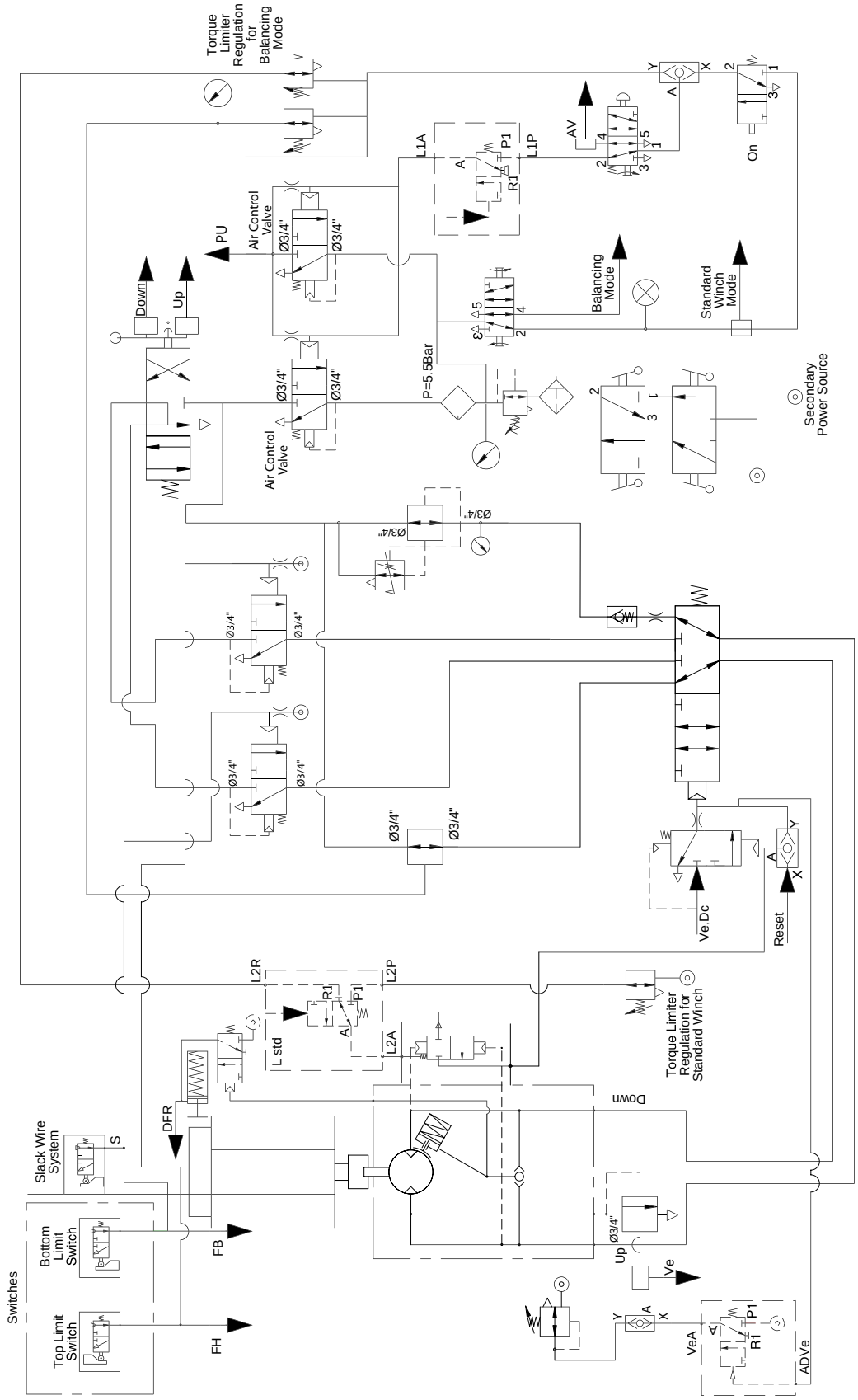
Winches are tested for proper operation prior to leaving factory. Before winch is placed into service the following initial operating checks should be performed.

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 17.
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.

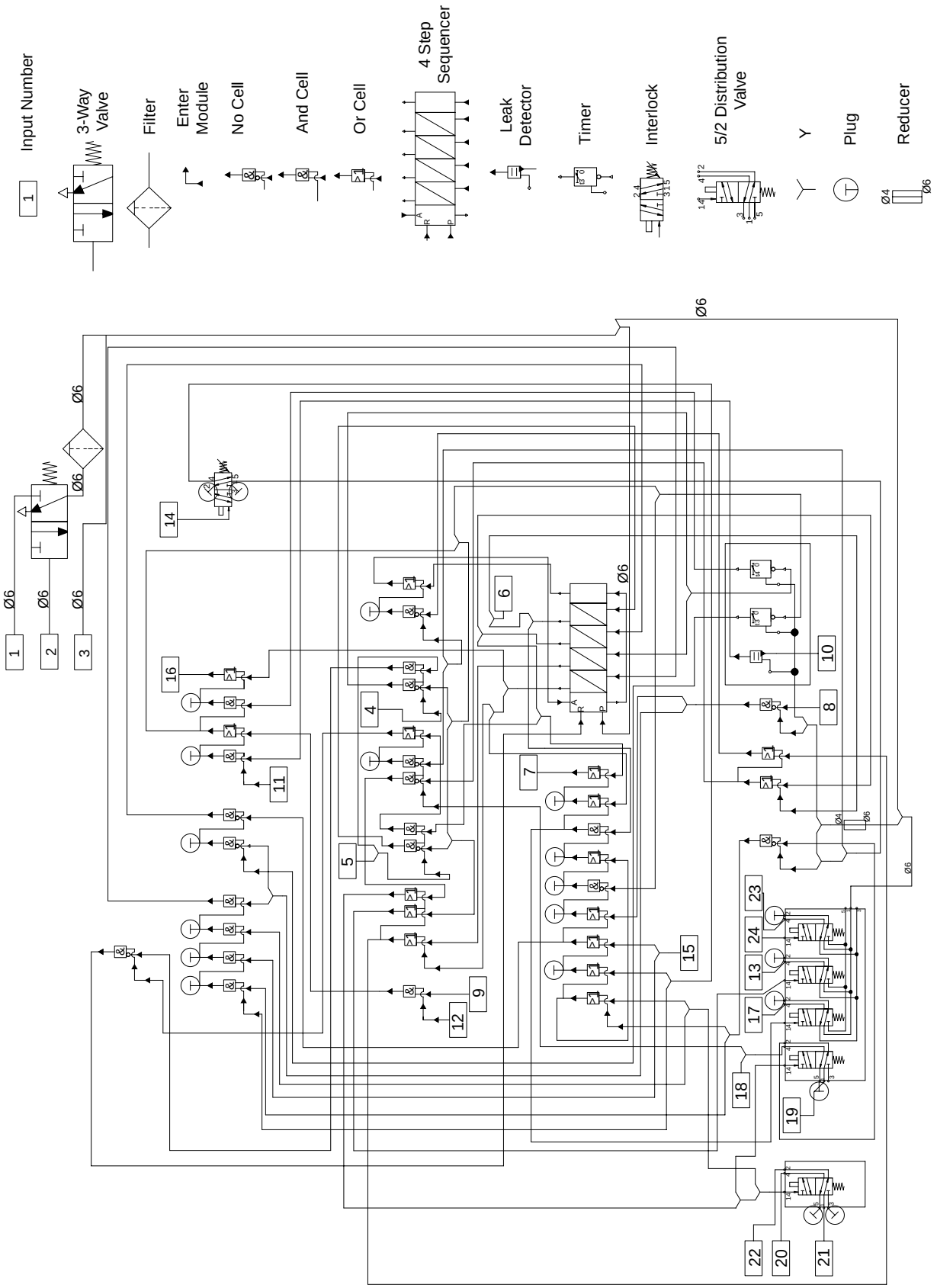
1. Give winch an inspection conforming to the requirements of ‘Winches Not in Regular Use’ in “INSPECTION” section on page 21.
2. Pour a small amount of SAE 10W (ISO VG 32) oil in motor inlet port.
3. Operate motor for 10 seconds in both directions to flush out any impurities.
4. Check to ensure oil levels are “full.”
5. The winch is now ready for normal use.

SYSTEM SCHEMATIC



(Dwg. MHP2353)

SEQUENCER SCHEMATIC



(Dwg. MHP2365)

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 hoisted 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.

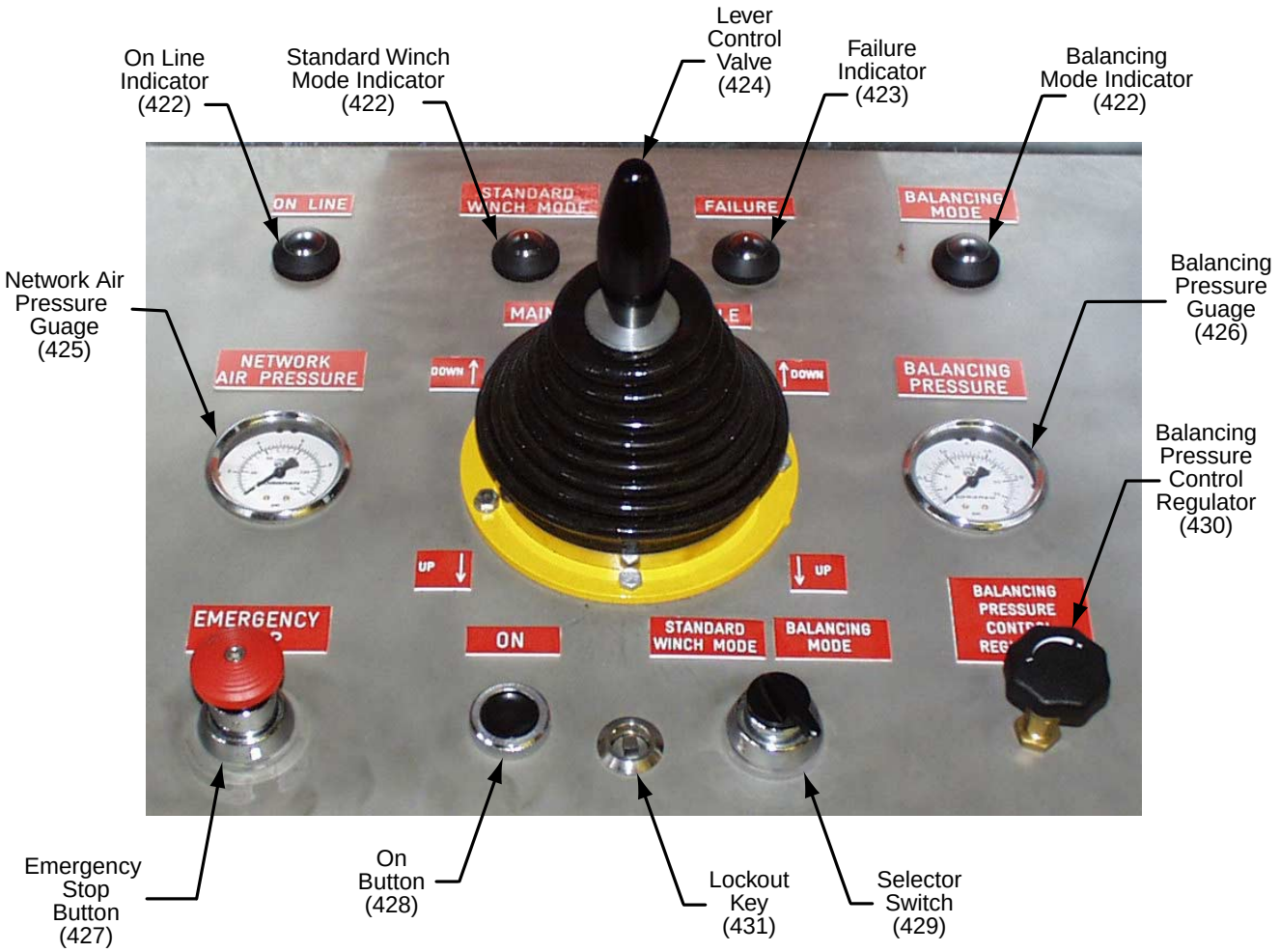
Planning Meeting

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.

Control Console Layout



(Dwg. MHP2354)

Winch Controls

Refer to Dwg. MHP2354 on page 18.

On Line Indicator

This indicator is green when the “ON” button is actuated, compressed air is available, the console is operational.

Network Air Pressure Gauge

- Indicates static pressure preset to 80 psi (5.5 0/+0.3 bar).
- For correct performance, a dynamic pressure of 75 psi (5.2 bar) minimum is necessary.
- Indicates null pressure when the button “ON” is not actuated or when the emergency stop button is actuated.

Emergency Stop Button

If this button is actuated in “standard” mode, the compressed air supply is stopped.
If this button is actuated in “balancing” mode, a warning device is heard.

Standard Winch Mode Indicator

This indicator is green when the “standard” mode is selected.

Lever Control Valve

To spool the wire rope, pull the lever.
To spool out the wire rope, push the lever.
Move the lever slowly and progressively.

On Button

When this button is actuated, air is supplied to the pilot circuit and to the power circuit; the console is thus operational.
This button is disabled in the “balancing” mode; ensure “standard” mode is selected.

Failure Indicator

⚠ DANGER

- **DO NOT use the system when this indicator is red.**
- **Ensure lifted person is safe before repairing the failure.**

When selecting a mode or even permanently, the control box monitors those functions which might be dangerous to the lifted person such as:

a. Brake opening through the band detector.
b. The connection distributor that switches the winch controls either to the “standard” mode or to the “balancing” mode.
c. The safety valve that enables rapid air escape from the motor in case of an overload in “balancing” mode but that must be inactive in “standard” mode.
d. The torque limiter that is calibrated differently according to the selected mode.
e. The emergency stop which must be in the correct position according to the selected mode.

When an anomaly is detected, a red indicator comes on the control box which automatically starts the warning device.

NOTICE

• The indicator also becomes red for a short while when selecting a mode, this is normal and will last only during the time necessary to check the parameters. The same applies in “balancing” mode, when the operator actuates the control lever.

When a failure is detected in “balancing” mode, it is necessary to switch to the “standard” mode, even if the anomaly has been solved.

Selector Switch -Standard Winch Mode or Balancing Mode

Button used for mode selection.

WARNING

• The balancing mode must always be selected when lifting a person to working position.

Balancing Mode Indicator

The indicator is green when the “balancing” mode is selected, even if this mode is validated after testing the control box and after the red indicator “failure” went off.

Balancing Pressure Gauge

It indicates the air pressure supplied in the lowering direction in order to balance the person in the “balancing” mode.

Balancing Pressure Control Regulator

It allows adjustment of the supplied air pressure in the lowering direction in order to balance the person in the “balancing” mode. A pressure of 22 psi (1.5 bar) is necessary to balance an equipped person of approximately 225 lbs (100 daN). 14.5 psi (1 bar) is necessary for 337 lbs (150 daN).

Balancing Point Adjustment Procedure

1. Select Standard Winch mode.
   (Green indicator will come on to indicate standard winch mode working.)
2. Person must have the safety harness fitted.
3. Adjust pressure regulator knob to approximately 14.5 psi (1 bar).
4. Raise person 18 inch (0.5 meter) above floor with main control lever.
5. Select balancing mode.

Green indicator will come on to indicate balancing mode working.

6. Slowly adjust pressure regulator knob to obtain balancing point.
   - Clockwise will increase pressure and tend to lower person.
   - Anticlockwise will decrease pressure and the ability to lower person.

At this point it is recommended that an additional person is present to increase the load when required for balancing purposes.

7. Use control lever to raise person to working position.
8. When job is completed, and person is back on the floor, select standard mode before taking the safety harness off.

WARNING

• Never activate the balancing system when there is no load.

Overload Device

An overload device is required on all ***Man Rider*** winches.

The overload device is integrated into the winch air motor and prevents the winch from lifting a load greater than the overload value listed in the specifications chart. If an overload is detected, the winch automatically switches to the “balancing” mode whatever the operating mode, “standard” or “balancing”.

CAUTION

• To avoid damage to the rigging, the structure supporting the rigging and the winch, do not use the wire rope with multi reeving arrangement.

Winch Brakes

Automatic Disc Brake

The automatic disc brake is a spring applied, air released brake. When the winch is in the neutral position the brake air is vented and the brake springs apply the brake. The springs, acting on the pressure plate, compress the brake’s friction and steel discs and engage the brake to prevent drum rotation.

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

Automatic Drum Brake (Remote Control)

Refer to Dwg. MHP2265 on page 46.
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 31, in the "MAINTENANCE" section. If brake band cannot be adjusted to hold rated load, the brake must be disassembled, inspected and repaired.

Slack Line Detector

CAUTION

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

Refer to Dwg. MHP2266 on page 50.
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.

WARNING

• 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 52.
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 13.

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.

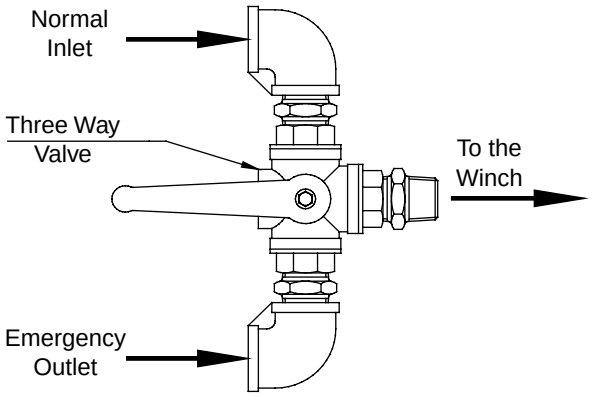
1. In the event of supply failure, operate the three way valve from normal air supply to the emergency inlet Open the emergency power source. Ensure that downstream pressure is 72 to 101 psi (5 to 7 bar). Operate the winch slowly to open the brakes to lower the person the shortest way to safety.

WARNING

• After each use of emergency lowering device, return the three valve to the main air inlet and check the secondary power source is in proper working condition and able to fulfill its task.

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.
5. In the event of supply failure, operate the three way valve from normal air supply to the emergency inlet.
6. Open the emergency power source. Ensure that downstream pressure is 72 to 101 psi (5 to 7 bar).
7. Operate the winch slowly to open the brakes and lower the person the shortest way to safety.



(Dwg. MHP2372)

NOTICE

• For the emergency power source, 13 gallon (50 litre) nitrogen bottles can be used.

WARNING

• After each use of emergency lowering device, return the three-way valve to the main air inlet and check the secondary power source is in proper working condition and able to fulfill its task.

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. MANUAL THROTTLE LEVER. Ensure operation of manual throttle lever is smooth and winch is responsive to lever movement. Lever must return to neutral. If winch responds slowly or controls stick, do not operate winch until all problems have been corrected.
5. 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.
6. 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.
7. LUBRICATION. Refer to "LUBRICATION" section on page 30 for recommended procedures and lubricants.
8. 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.
9. 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 2 to 3 drops per minute of SAE 10W (ISO VG 46) oil when winch is operated at rated capacity. Operate winch slowly in both directions to verify operation.

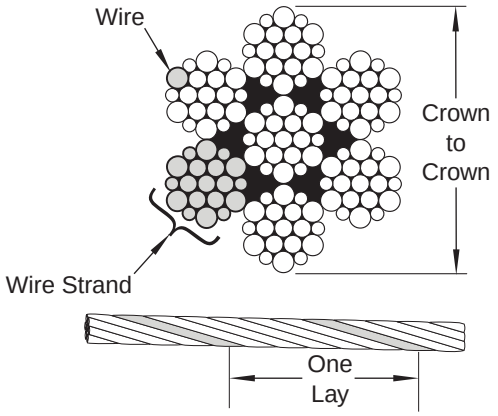
Periodic Inspection

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 21. 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 22.



(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. 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 31. 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 10 for adjustment procedures.
11. EMERGENCY STOP BUTTON. 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 Button' in the "OPERATION" section on page 18.
12. OVERLOAD DEVICE. The overload device is an intrical part of the motor. Ensure overload device is properly set to stop winch when load exceeds 125% (+/-10%) of winch rated capacity. 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 21 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 22 before being placed in service.
3. Standby equipment shall be inspected at least semiannually in accordance with requirements of 'Frequent Inspection'on page 21. In abnormal operating conditions equipment should be inspected at shorter intervals.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand FA150KGMR-RC 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.	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 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 84 psig (5.8 bar/580 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.
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.

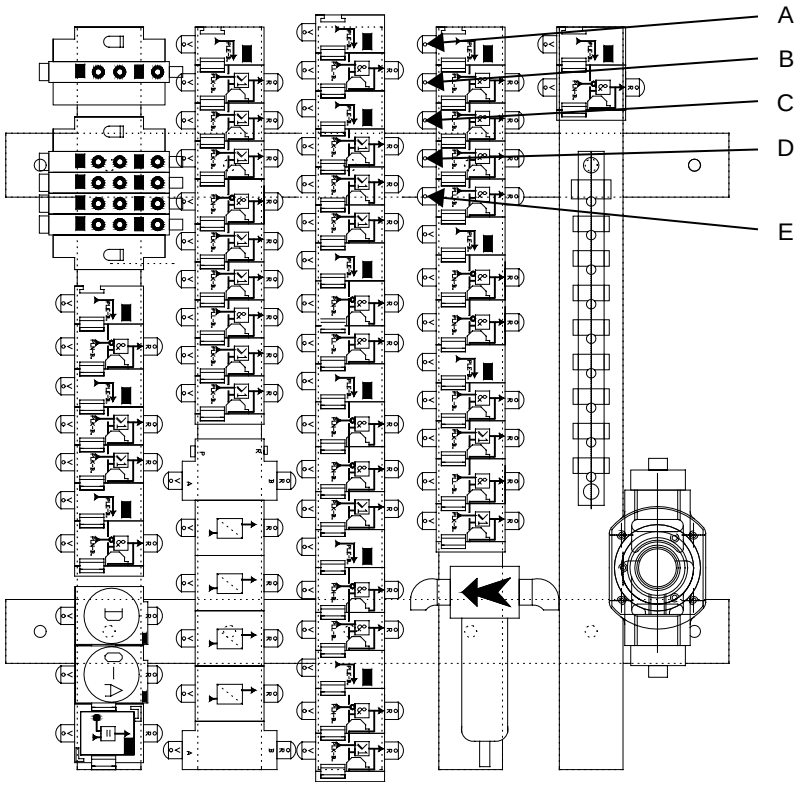
Automatic Band Brake:

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 cylinders. 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
Control Box:			
Indicator's Status		**Start up Failure:** Refer to Dwg. MHP2367 on page 27.	Check the on information at input 18, if not present check hoses between input 18 and on button.
On Line	Off		
Standard winch mode	On		Check the on information at output 19, if not present exchange command block.
Failure	Off		
Balancing mode	Off		
Indicator's Status		**Standard Mode Failure:**	Check test points A, B, C, D and E.
On Line	On		
Standard winch mode	On		A, B, C, D and E points must be high level.
Failure	On		
Balancing mode	Off		
		Point A at a low level:	Check input 14, high level required.
			If the level is high, use the interlock adjustment procedure, if the adjustment does not correct the problem exchange the command block, contact **Ingersoll-Rand** customer service.
			If the input 14 is at a low-level, check output 23, a high level is required.
			If the level is high, check the hoses between output 23 and exhaust valve.
			If the level is low, check the input 24, high level is required.
			If the level is high, exchange the command block.
			If the level is low, check the output 13, a high level is required.
			If the level is high, check the hoses between output 13, input 24 and exhaust valve.
			If the level is low, exchange the command block.
		Point B at a low level:	Exchange the command block.
		Point C at a low level:	Check the input 15, high level required.
			If the level is high, exchange the command block.
			If the level is low, check the hose between the brake detector and input 15, check the detector.
		Point D at a low level:	Exchange the command block.
		Point E at a low level:	Check the input 8, low level required.
			If the level is high, check the hose between the brake detector and input 15, check the detector.
			If the level is low, exchange the command block.
Indicator's Status		**Standard Mode Problems Without Failure Signal:** Refer to Dwg. MHP2368 on page 27.	Check the output signal 16, each time you move the main control handle you have a pulse of about 1 second.
On Line	On		
Standard Winch Mode	On		
Failure	Off		
Balancing Mode	Off		
		No pulse:	Check limit switches: slack and bottom input 12 (high) top input 10 (high).
			Check up 11 and down 12 inputs, high when moved.
			If these inputs are right, verify setting of the temporisation A, set between the 0 and A.
			If right, exchange command block.
Indicator's Status		**Floating Mode Failure** Refer to Dwg. MHP2369 on page 28.	Check test points A, B, C, D, E and F.
On Line	Off		Check points A, B, C, D and F must be at a low level.
Standard Winch Mode	Off		Check point E must be at a high level for 10 seconds after switching to the floating mode. After this time it will be at a low level.
Failure	On		
Balancing Mode	Off		

SYMPTOM	CAUSE	REMEDY
	Point A at a high level:	Check input 19, high level required.
		If the level is high, exchange the command block.
		If input 19 is at a low level, check the hose between input 19 and the emergency stop.
	Point B at a high level:	Exchange the command block.
	Point C at a high level:	Check input 14, a level of about 29 psi (2 bar) is required.
		If the level is 29 psi (2 bar) use the interlock adjustment procedure; if the adjustment does not correct the problem exchange the command block.
		If input 14 is at a high level, check output 23, a low level is required.
		If the level is low, check the hoses between output 23 and exhaust valve.
		If the level is high, check input 24, low level is required.
		If the level is low, exchange the command block.
		If the level is high, check output 13, a low level is required.
		If the level is low, check the hose between plug 13, 24 and exhaust valve.
		If the level is high, exchange the command block.
	Point D at a high level: Refer to View Two of Dwg. MHP2370 on page 28.	Check input 15, low level required.
		If the level is low, exchange the command block.
		If the level is high, check output 13, a low level is required.
		If the level is low, check the hoses between output 13 and connection distributor.
		If the level is high, exchange the command block.
	When switching to balancing mode you must have a high level at point E during 10 second if wrong:	Verify setting of the temporisation B, set to D. If right exchange the command block.
	Point F at a high level:	Check input 8, high level is required.
		If the level is low, check the hose between the brake detector and input 15, check the detector.
		If the level is high, exchange the command block.
	No Switching Between the Two Modes.	Check input 11 and 12, low level is required.
		If high level, check hoses between inputs 11 and 12 and main control detectors, check detectors.
		If low level, check inputs 4 and 5: In standard mode 4 is low 5 is high In floating mode 4 is high 5 is low
		If right, exchange command block.

Standard Mode Failure



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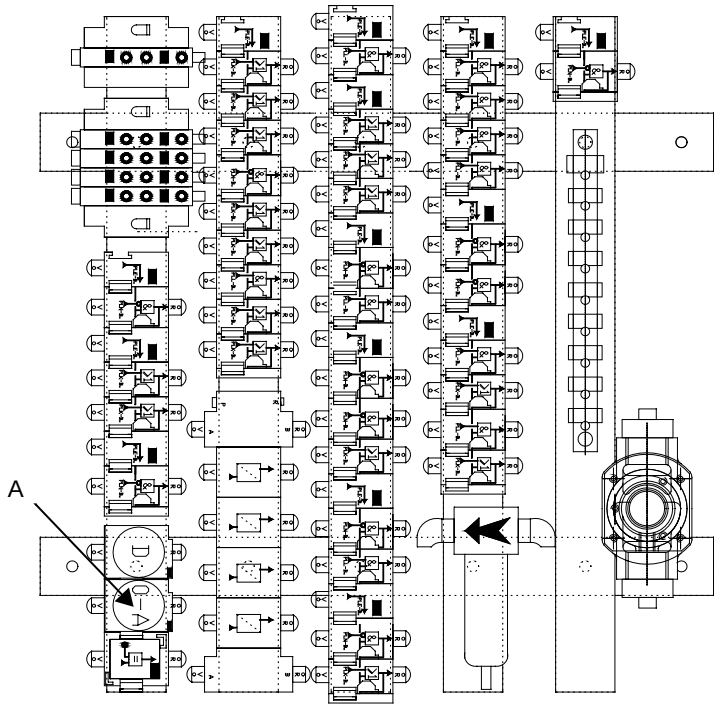
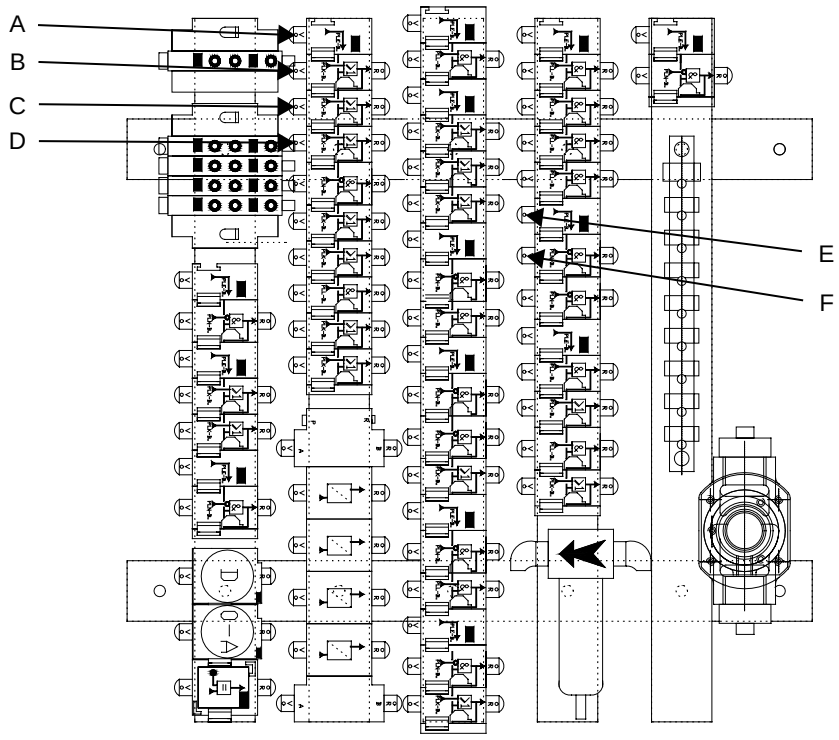
Standard Mode Problems Without Failure Signal



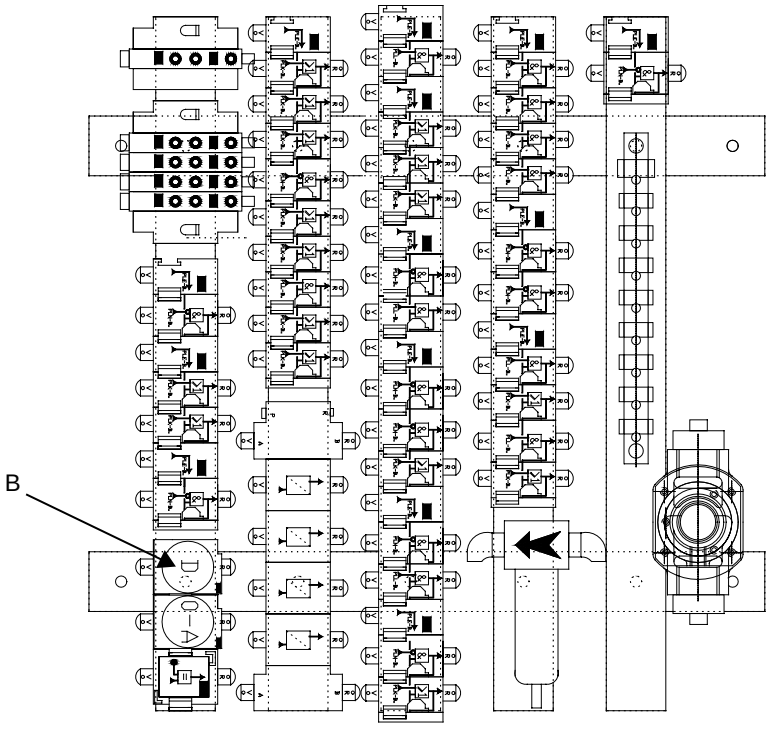
(Dwg. MHP2368)

Floating Mode Failure: View One



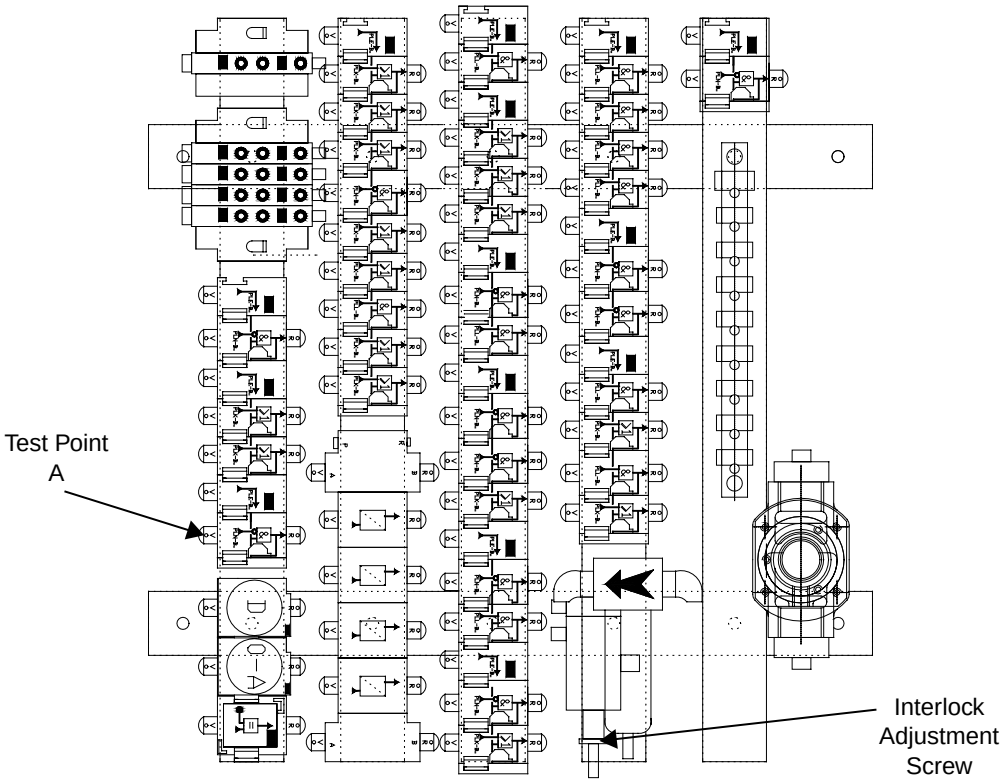
(Dwg. MHP2369)

Floating Mode Failure: View Two



(Dwg. MHP2370)

Interlock Adjustment Procedure



(Dwg. MHP2371)

1. Disconnect input 14, close the hose coming from the winch; connect an adjustable regulator to the input.
2. Supply air to the winch.
3. Adjust the pressure to 44 psi (3 bar).
4. Unscrew the nut on the interlock and then unscrew the screw until you have a low level on test point A.
5. Then adjust the screw until you have a high level on test point A, secure the screw with the locknut.
6. Set the pressure to 29 psi (2 bar). You must have a low level on test point A.
7. Set the pressure to at least 72 psi (5 bar). You must have a high level on test point.
8. Shut-off the air, reconnect hose and test the winch.

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 2 to 3 drops per minute required at maximum motor speed).
	Check mufflers for damage. Clean or replace if necessary.
Monthly	Lubricate components supplied by grease fittings
	Inspect and clean or replace air line filter.
Half Yearly	Replace mufflers.
Yearly	Disassemble winch and refill winch reduction gear oil.
	Inspect disc brake. Clean or replace as necessary.

Note: Intervals are based on winch operation in a normal environment as described in the “INSPECTION” section on page 21. In ‘Heavy’ or ‘Severe’ operating conditions adjust lubrication intervals accordingly.

Reduction Gear and Disc Brake Lubrication

The reduction gear is filled with oil from the factory.
Reduction gear 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.

Initial Reduction Gear Assembly Oil Change

1. 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.
2. After winch operation, allow oil to settle before topping off.
3. Always collect lubricants in suitable containers and dispose of in an environmentally safe manner.

Reduction Gear Fill/Drain Procedures

Refer to Dwg. MHP2358 on page 44.
Disassemble reduction gear to replace oil.

Replace the oil in the reduction housing every year. If the winch is used at a normal frequency, the oil in the reduction housing is suitable for one years operation without changing. However, when the winch is used at a high frequency, the oil may need to be changed on a more frequent basis.
To ensure correct performance, highest efficiency and long life, it is essential that the lubricating oil be maintained at the correct level. The recommended grade of oil must be used at all times since the use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage of the gears

The reduction gear assembly is filled and shipped with oil from the factory. Oil capacity is approximately 0.25 pt (0.12 ltr). Use only high quality lubricants in the reduction gear assembly. Recommended lubricant: SYNTHETIC OIL MOBIL SHC 626.

⚠ 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.

Air Line Lubricator

An air line lubricator is mounted to the winch frame. Use SAE 10W (ISO VG 46) oil in lubricator. Adjust lubricator to provide 2 to 3 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 30W SAE (ISO VG 100) 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 30. 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 44.
Brake adjustment is **not** required. If disc brake does not hold 125% of rated load at mid drum, disassemble and repair.

Automatic Drum Band Brake

Refer to Dwg. MHP2265 on page 46.

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 21) 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.

Directional Air Control Valve

Refer to Dwg. MHP2275 on page 54.
Directional control valve adjustment is **not** required. If control valve is not functioning properly contact factory.

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 Sectionon page 38.
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. MHP2376 on page 40 and MHP2375 on page 42.
1. Remove wire rope from drum (31).
2. Relieve pressure in air lines by operating winch control several times after air supply has been turned off.

WARNING

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

3. Disconnect and tag all air lines.
4. Remove winch from its mounting and take to a suitable work area before beginning disassembly.
5. Remove capscrews (45), washers (46) and locknuts (47) from control box assembly (44). It is not recommended to disassembly control box assembly (44).
6. Remove capscrews (49), washers (50) and locknuts (51) that secure brackets (48) to side rails (32) and (33).
7. Disconnect and remove lubricator assembly and brackets from slack arm assembly (500).
8. Remove slack arm assembly (500) from winch, refer to slack arm disassembly section.
9. Remove press roller assembly (400) from side rail (32) as an assembly. Refer to press roller disassembly section to further disassemble component.
10. Remove capscrews (10) that secure motor and brake assembly to inboard upright (17).

WARNING

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

11. Refer to motor and brake disassembly sections for any further disassembly of these components.
12. Support drum (31), and remove capscrews (36), lockwashers (25) and dowel pins (37) that secure side rails (32) and (33) to inboard upright (17).
13. Carefully pry inboard upright from drum carrier assembly (23).
14. Remove capscrews (24) and lockwashers (25) that secure drum carrier assembly (23) to drum (31).
15. Remove drum carrier assembly (23).
16. It is not necessary to disassemble drum carrier assembly (23), unless worn or damaged.
17. Remove capscrews (41) and lockwashers (40) from end cover (74).
18. Remove capscrews (13) from retainer (72).
19. Remove bearing (71) and seals (69) and (454) from outboard upright. Replace if necessary.
20. Remove capscrews (36), lockwashers (25) and dowel pins (37) that secure side rails (32) and (33) to outboard upright (34).

Motor Disassembly

Refer to. Dwg. MHP2357 on page 42.
1. Remove the capscrews (144) and lockwashers (143) to remove the motor assembly from the motor housing (140).
2. Remove the 'O' ring (137).
3. Remove capscrews (150).
4. Remove the motor cover (142) and gasket (152). If necessary, remove bearings (145, 148), spool front stop (147) and pins (138).
5. Immobilize the motor rotors with a bar between the teeth and remove nuts (131 and 136).
6. Remove the drive gear (135), the idle gear (149), the retainer ring (146) and internal ring.

CAUTION

• Take all necessary precautions to avoid damaging the rotors. Use a mallet to disengage the rotors

7. Remove the screw (133) and washer (132).
8. Remove ball bearings (130 and 134).
9. Remove the selector stop (153), ball (154) and 'O' ring (155).

Disc Brake and Reduction Gear Disassembly

Refer to Dwg. MHP2358 on page 44.
Refer to Winch Disassembly section to begin brake gear disassembly.
1. Stand reduction gear assembly in a vertical position so output shaft (85) is down.
2. Remove 'O' ring (108).
3. Remove capscrews (107).
4. Remove flange (112), 'O' ring (110) and springs (103).
5. Remove washer (102) and the brake discs (97 and 98).
6. Remove coupling sleeve (104).
7. Supply compressed air through the supply hole in the housing of the brake piston (100) so as to remove it.
8. Remove 'O' rings (99 and 101).
9. Remove retainer ring (84).
10. Put a drain pan under the assembly to collect oil from the reducer.
11. Hold reducer by the casing (91) and knock on the output shaft with a mallet to separate gear housing (91) from brake body (111).
12. Remove planet pinion cage assembly and input shaft.
13. After removing the axles from the planet gears (92), remove the planet gears (92), the needle roller cage (89) and the spacer (90).
14. Remove the retainer ring (106) and remove the input shaft (116).
15. Remove the sun gear (113) and the bearing (115).
16. Remove ring gear (93), gasket (114), pins (95), bearing (94) and oil seal (105).
17. Remove outer retainer ring (86) and then remove bearing (87) and the output gear (80).
18. Remove bearings (81), (83) and the oil seal (82).

Automatic Drum Brake

Refer to Dwg. MHP2373 on page 46.

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).

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.

Torque Limiter Assembly Disassembly

Refer to Dwg. MHP2386 on page 48.
1. Disconnect hoses.
2. Remove capscrews (179) with seal washer (181) to remove torque limiter assembly from motor.
3. Remove 'O' rings (180 and 178) if necessary.
4. Remove screw (176) and joint (177).
5. Remove 4 capscrews (161) to remove cover (162).
6. Remove valve (165) and 'O' ring (163).
7. Remove spacing piece (170), washer (167) and diaphragm (166).
8. Remove 4 capscrews (161) to remove cover (175).
9. Remove valve (174), 'O' ring (173) and spring (171).
10. Remove nut (172) and washer (167) to remove diaphragm (166).

Directional Control Valve Disassembly

Refer to Dwg. MHP2361on page 57.
After disconnecting the hoses and pipes and after removing the capscrews (197), remove the connection distributor.
1. Remove cover (205) and plug (202).
2. Remove capscrew (192), washer (193), and cover (190).
3. Remove plug (202), joint (199), and spring (200).
4. Insert a drift punch in the hole of the piston (196) to prevent its rotation and release the capscrew (191).
5. Remove washer (194) and diaphragm (195).
6. Remove piston (196).
7. Remove screw (203).
8. Remove spacing piece (201).
9. If necessary, remove joint (199).

Lever Control Valve Disassembly

Refer to Dwg. MHP2362 on page 58.
1. Disconnect all air hoses.
2. Remove capscrews (625) with lockwashers (626).
3. Remove valve assembly and base plate (632) from support (622).
4. Remove capscrews (634) with lockwashers (610).
5. Remove angle bracket (614) and directional valves (606) from base plate (632).
6. Remove 'O' ring (630).
7. Remove screw (628).
8. Carefully slide out the rotary valve (629) with stop (619), spring (637) and control lever (618) (check position of this rotary valve).
9. Tap out pin (636) and extract control lever (618).
10. Remove stop (619), spring (637) and 'O' ring (627).

Press Roller Disassembly

Refer to Dwg. MHP2268 on page 52.
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) 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).

Slack Line Detector Disassembly

Refer to Dwg. MHP2266 on page 50.
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. MHP2281on page 66.
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.

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:
1. Inspect **gears** for:
   a. worn, cracked or broken teeth. Replace if necessary.
2. Inspect **bushings** for:
   a. wear, scoring or galling. Replace if necessary.
3. Inspect **shafts** for:
   a. ridges caused by wear. Replace if necessary.
   b. scoring or galling.

4. Inspect all threaded items for:
   a. damaged threads. Replace if necessary.
5. Inspect drum band brake lining for:
   a. 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.
   b. 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.
6. Inspect motor housing bores for:
   a. wear. Bores can be lightly honed. For any large scratches or wear patterns, replace motor housing.
7. Inspect bearings for:
   a. free smooth rotation. Inspect for evidence of grit, dirt or other contaminants. If dry or contaminated, replace the bearing.
   b. inspect roller bearings (needle). At any indication of damage, or contamination replace bearings.
8. Inspect the brake steel discs and friction discs for oil. If the friction discs have become oil-soaked, replace them. If the steel discs have become glazed, sand them lightly using fine emery cloth and a flat surface as backing. Inspect the remaining brake parts for warpage or other damage, and replace damaged parts as necessary. Replace the input pinion shaft oil seal

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

Refer to Dwg. MHP2357 on page 42.

1. Install the selector stop (153), ball (154) and ‘O’ ring (155) in the motor housing (141).
2. Lubricate ball bearings (130 and 134) with grade 2 grease and install in motor housing (141).
3. Install screw (133) with washer (132).
4. Install internal ring of bearing and retainer ring (146) on drive gear (135).
5. Install rotors in motor housing (141).
6. Immobilize the motor rotors with an bar between the teeth and install nuts (131 and 136) secured with Loctite® 243.
7. Install bearings (145 and 148), stops (147) and pins (138) in motor cover (142).
8. Install motor cover (142) on motor housing. Ensure pins (138) are fully aligned and engaged. Install capscrew (150) secured with Loctite® 243.
9. Check that ‘O’ ring (137) is correctly installing in motor housing (140).
10. Install motor assembly with gasket (152) in motor housing and secure with capscrews (144) and lockwashers (143).
11. Check to ensure drive gear turns smoothly in both directions.

Automatic Drum Brake Assembly

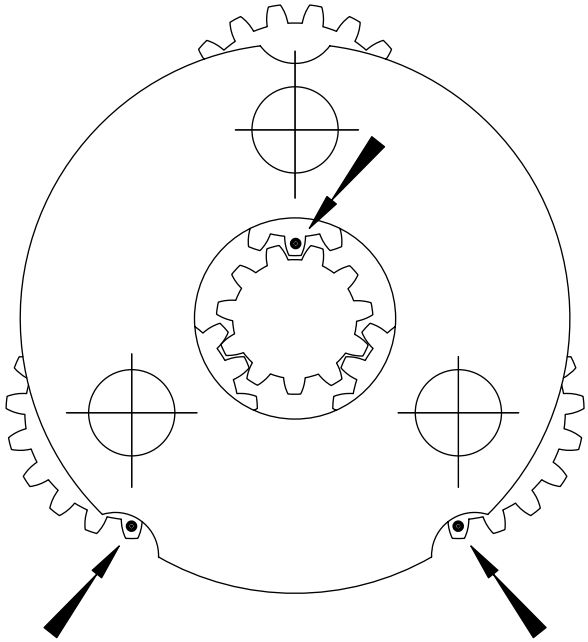
Refer to Dwg. MHP2265 on page 46.

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).
4. 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.
5. Install dump valve (364) fittings and hose (368) to the cylinder (362).
6. Adjust automatic brake as described at the start of the “MAINTENANCE” section on page 31.

Disc Brake and Reduction Gear Assembly

Refer to Dwg. MHP2358 on page 44.

1. Install oil seal (82) in the bore of gear housing (91) so seal lip is toward the planet assembly side.
2. Press bearings (81 and 83) into gear housing (91).
3. Install retainer ring (84) on output shaft (85) and press output shaft into gear housing.
4. Install ring gear (80) and bearing (87) on output shaft and secure in position with retainer ring (86).
5. Press bearing (115) onto sun gear (116) and locate with retainer ring (113). Install sun gear (116) with bearing (115) in the planet support (117) and secure with retainer ring (106).
6. Install two bearings (89) with a spacer (90) between in the bore of each planetary gear (92).
7. Position each assembled planetary gear in the planet support (117) with timing marks correctly positioned and carefully install planet axles (88). Refer to drawing Dwg. MHP2364 on page 35.



(Dwg. MHP2364)

CAUTION

• For assembly of planet gears, each planet gear must be positioned with the timing mark as shown on drawing MHP2364 on page 35.

8. Install planetary gear assembly and ring gear (93) in gear housing (91).
9. Install ball bearing (94) on the planet support (117).
10. Place the reduction gear assembly in a vertical position with the planetary gear end up.

Fill the gear assembly with clean oil SYNTHETIC OIL MOBIL SHC 626.

NOTICE

• Capacity of gear box: 1 qt (0.94 Litres).

11. Install oil seal (105) and pins (95) in the brake body (111) (so seal lip is toward planetary gear side).
12. Install brake piston (100) with 'O' rings (99 and 101).
13. Install the friction discs (97), steel discs (98) and coupling sleeve (104). Alternate discs placement, friction disc first then steel disc, ending with friction disc. Ensure steel disc between each pair of friction discs.
14. Install washer (102) on the brake piston (100). Supply compressed air through the supply hole of the housing of the brake piston (100) to ensure that the piston moves correctly (do the operation several times).
15. Install oil seal (105) (seal lip is toward air gear motor side) and retainer ring (106) in the flange (112).
16. Install pins (96), 'O' ring (110) (hold seal in its housing by applying a small quantity of grease) and the springs (103) (hold the springs in their housings by applying a small quantity of grease) on the flange (112).
17. Install flange (112) on the brake body. Install capscrews (107) secure with Loctite® 243
18. Install 'O' ring (108).

CAUTION

• When installing the motor on reducer-brake, be careful not to damage the lip of the oil seal (105). Refer to Dwg. MHP2358 on page 44.

Torque Limiter Assembly

Refer to Dwg. MHP2386 on page 48.

1. Install diaphragm (166), washer (167) and nut (172).
2. Install spring (171), 'O' ring (173) and valve (174).
3. Install cover (175) and 4 capscrews (161).
4. Install diaphragm (166), washer (167) and spacing piece (170).
5. Install 'O' ring (163) and valve (165).
6. Install cover (162) and the 4 screws (161).
7. Install joint (177) and screw (176).
8. Install 'O' rings (180 and 178).
9. Install torque limiter assembly with seal rings (181) and 2 capscrews (179).
10. Reconnect hoses.

Lever Control Valve Assembly

Refer to Dwg. MHP2362 on page 58.

1. Lubricate and install 'O' ring (627) on rotary valve (629).
2. Lubricate and carefully install rotary valve in valve housing (620).
3. Lubricate and install spring (637) on rotary valve. Ensure pin (638) is installed in valve housing (620).
4. Install bracket stop (619). Apply a small amount of LOCTITE® 243 to threads of screws (628) and install.
5. Install control lever (618) on rotary valve and align pin hole. Install pin (638) to secure control lever.
6. Lubricate and install 'O' rings (630) on base plate (632).
7. Install angle bracket (614) with capscrews (634) and lockwashers (610).
8. Install the directional valve (606) on the angle bracket with the capscrews (611) and lockwashers (612).
9. Install control valve and base plate on console with capscews (625) and lockwasher (626).
10. Install lever and bellows (641).

Winch Assembly

Refer to Dwg. MHP2376 on page 40 and Dwg. MHP2358 on page 44.

1. Assemble disc brake and reduction gear assembly using assembly text in "MAINTENANCE" section.
2. Install motor assembly (20) to flange (112) using capscrews (151). Apply small amount of Loctite® and torque to 20 ft lbs (27 Nm).
3. Stand drum (30) in a vertical position with large bore up.
4. Clean surface of drum and install drum carrier assembly (23) with hub side of carrier in drum and secure using capscrews (24) and washers (25). Apply small amount of Loctite® 242 and torque to 57 ft lbs (81 Nm).
5. Clean surface and install oil seal (69) in outboard upright (34) with lip toward the bearing (71).
6. Pack bearing (71) with grease and install in outboard upright (34).
7. Support drum (30) in a horizontal position and install outboard upright (34) to drum (30). Ensure assembly is kept centered during this step to avoid seal or bearing damage
8. Install shaft retainer (72) using capscrews (13) with Loctite® 242. Torque to 35 ft lbs (41 Nm).

9. Install oil seal (454) in end cover with lip toward the bearing.
10. 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).
11. Install side rails to uprights and loosely secure using capscrews (65) and lockwashers (22).
12. Apply Loctite® 242 to capscrews (65) and torque to 65 ft lbs (88 Nm).
13. Install dowel pins (19).
14. Install disc brake, reduction gear and motor assembly on inboard upright. Apply Loctite® 243 to capscrew threads, secure with capscrews (10) torque to approximately 49-56 ft lbs (70-80 Ng).

Slack Line Detector Assembly

Refer to Dwg. MHP2366 on page 50.
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) though 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).

Press Roller Assembly

Refer to Dwg. MHP2268 on page 52.
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 66.
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.

Testing

Operational Test

Prior to initial use, all new or repaired winches shall be tested to ensure proper operation.
1. To initially 'break in' new or overhauled motors, operate winch without load, in both directions, for 5 minutes at 100-200 RPM.
2. Check operation of brakes. Adjust if necessary as described in "MAINTENANCE" section on page 31.
3. Check foundation mounting fasteners are secure.
4. Check drum guard is installed.
5. 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-RC 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

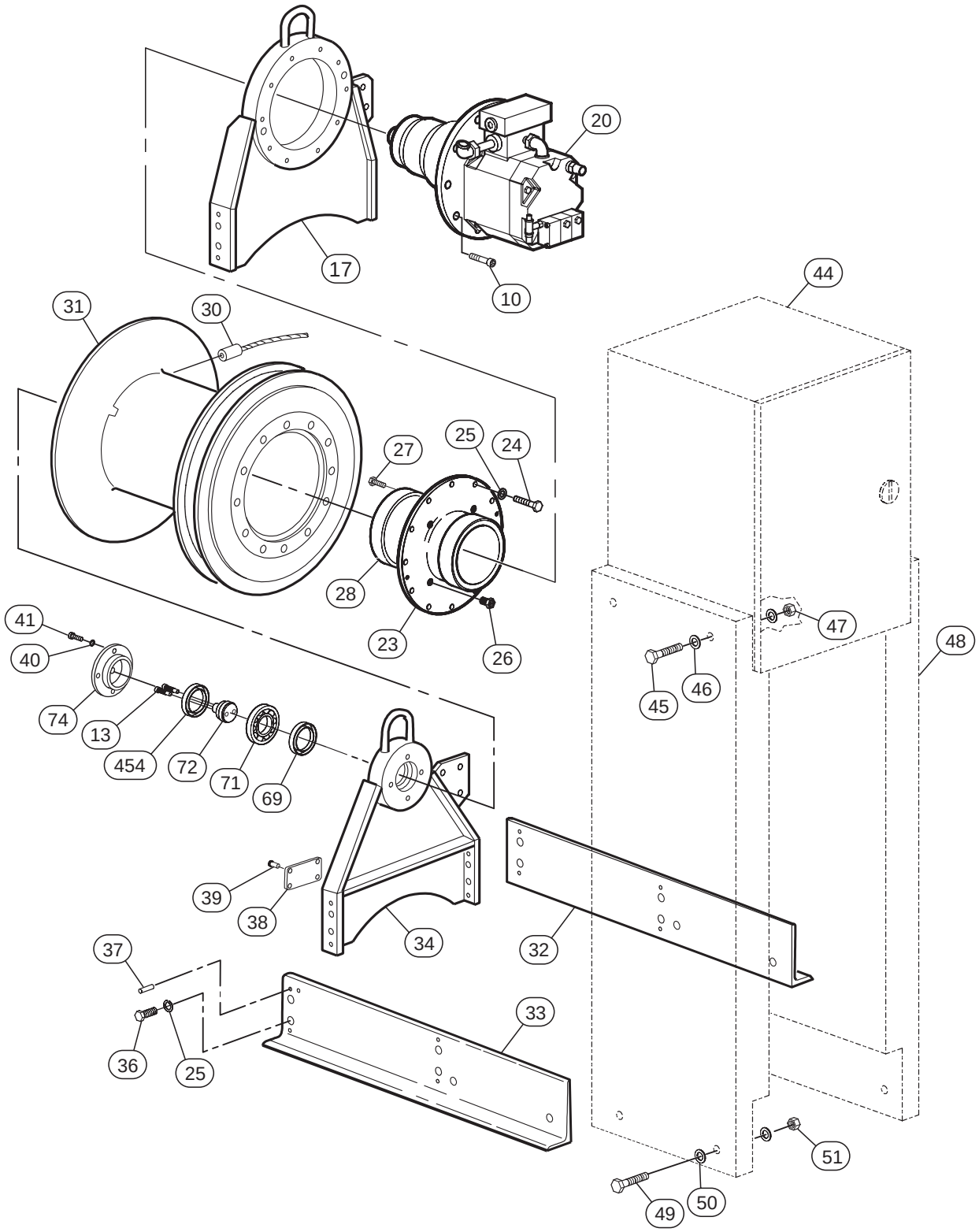
Operate winch through three complete cycles to ensure consistent limit switch operation within +/- 2 ft (+/- 0.6 m) of setpoints. Refer to ‘Limit Switch’ on page 13 in “INSTALLATION” section to establish setpoints.

PARTS DRAWINGS AND PARTS LISTS TABLE OF CONTENTS

Description **Page**

SERVICE NOTES

DRUM AND BASE ASSEMBLY DRAWING



(Dwg. MHP2376)

DRUM AND BASE ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
10	Capscrew	10	54133
13	Capscrew	2	51766
17	Inboard Upright	1	28300
20	Motor Assembly	1	76157549
23	Drum Carrier Assembly (incl's items 27 and 28)	1	28917
24	Capscrew	12	50973
25	Lockwasher	20	50181
26	Breather	4	51892
27	Capscrew	8	Order item 23
28	Hub	1	Order item 23
30	Wire Rope Anchor*	1	71387781
31	Drum 8 in. long (203 mm)	1	Contact factory
	Drum 12 in. long (305 mm)		11354-2
	Drum 16 in. long (406 mm)		Contact factory
	Drum 24 in. long (610 mm)		Contact factory
32	Side Rail (8 in. long drum)	1	Contact factory
	Side Rail (12 in. long drum)		28837-2
	Side Rail (16 in. long drum)		Contact factory
	Side Rail (24 in. long drum)		Contact factory
33	Side Rail (8 in. long drum)	1	Contact factory
	Side Rail (12 in. long drum)		28852-2
	Side Rail (16 in. long drum)		Contact factory
	Side Rail (24 in. long drum)		Contact factory

Item No.	Description of Part	Qty. Total	Part Number
34	Outboard Upright	1	28310
36	Capscrew	8	50183
37	Dowel Pin	8	52334
38	Nameplate	1	71106967-R
39	Rivet	4	71028849
40	Lockwasher	4	50200
41	Capscrew	4	51780
44	Control Box Assembly	1	76150491
45	Capscrew	4	51712
46	Washer	8	50177
47	Locknut	4	50170
48	Bracket	2	28836
49	Capscrew	4	71324743
50	Washer	8	71064844
51	Locknut	4	51750
69	Seal	1	51474
71	Bearing	1	51797
72	Retainer	1	19232
74	End Cover	1	19233
454	Seal	1	71054688

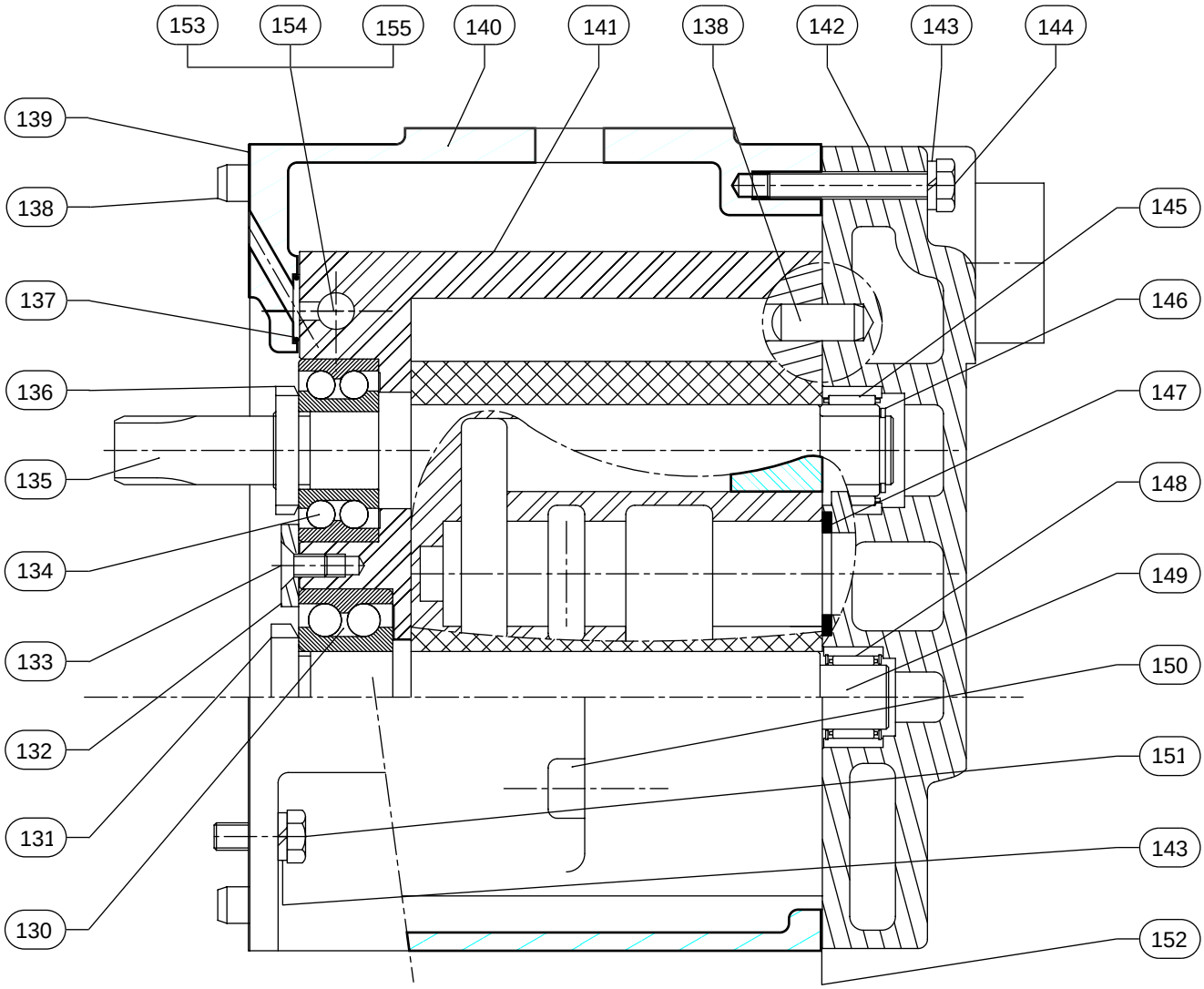
• Recommended Spare for one winch, 2 years at normal operation.

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

† 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 AND PARTS LIST



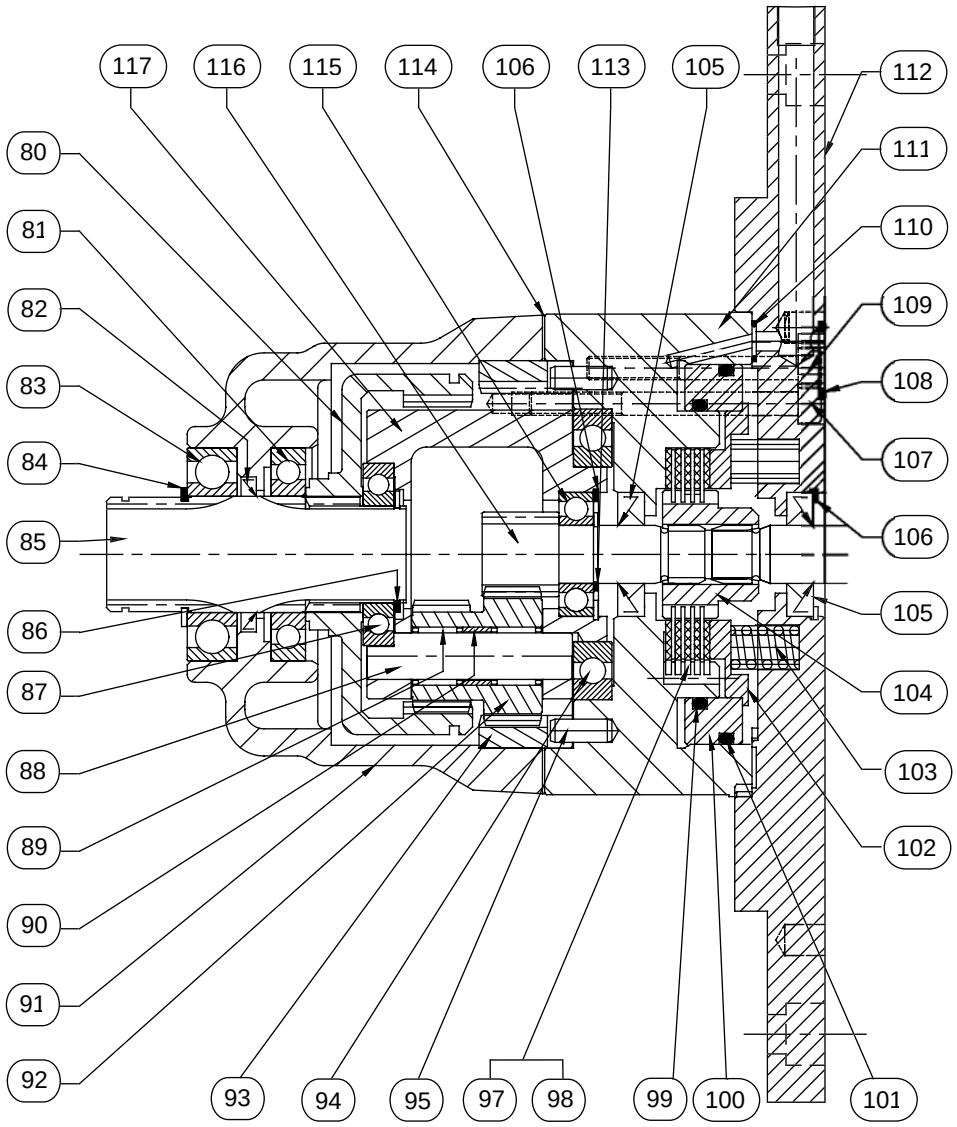
(Dwg. MHP2357)

Item No.	Description of Part	Qty. Total	Part Number	Item No.	Description of Part	Qty. Total	Part Number
129	Motor Assembly	1	Contact factory	143	Lockwasher	9	4520-1006
130	Ball Bearing	1	50600004	144	Capscrew	5	41019001
131	Slotted Nut	1	57000004	145	Needle Bearing	1	56462813
132	Washer	1	96310054	• 146	Retainer Ring	1	47836732
133	Screw	1	41103403	• 147	Spool Front Stop	2	96200069
134	Ball Bearing	1	50600003	148	Needle Bearing	1	56492213
135	Drive Gear	1	96200094	149	Idle Gear	1	96200095
136	Slotted Nut	1	57000003	150	Capscrew	4	41321506
• 137	'O' Ring	1	58221729	151	Screw	4	41020301
• 138	Pin	6	46000416	• 152	Gasket	1	96310118
• 139	Gasket	1	96310045	153	Selector Stop	1	96090223
140	Motor Housing	1	96310078	154	Ball	1	69401625
141	Motor Housing	1	96150361	• 155	'O' Ring	1	58212229
142	Motor Cover	1	96150344	581	Fitting, Pipe	2	51281

• Recommended Spare for one winch, 2 years at normal service.

SERVICE NOTES

DISC BRAKE AND REDUCTION GEAR ASSEMBLY DRAWING



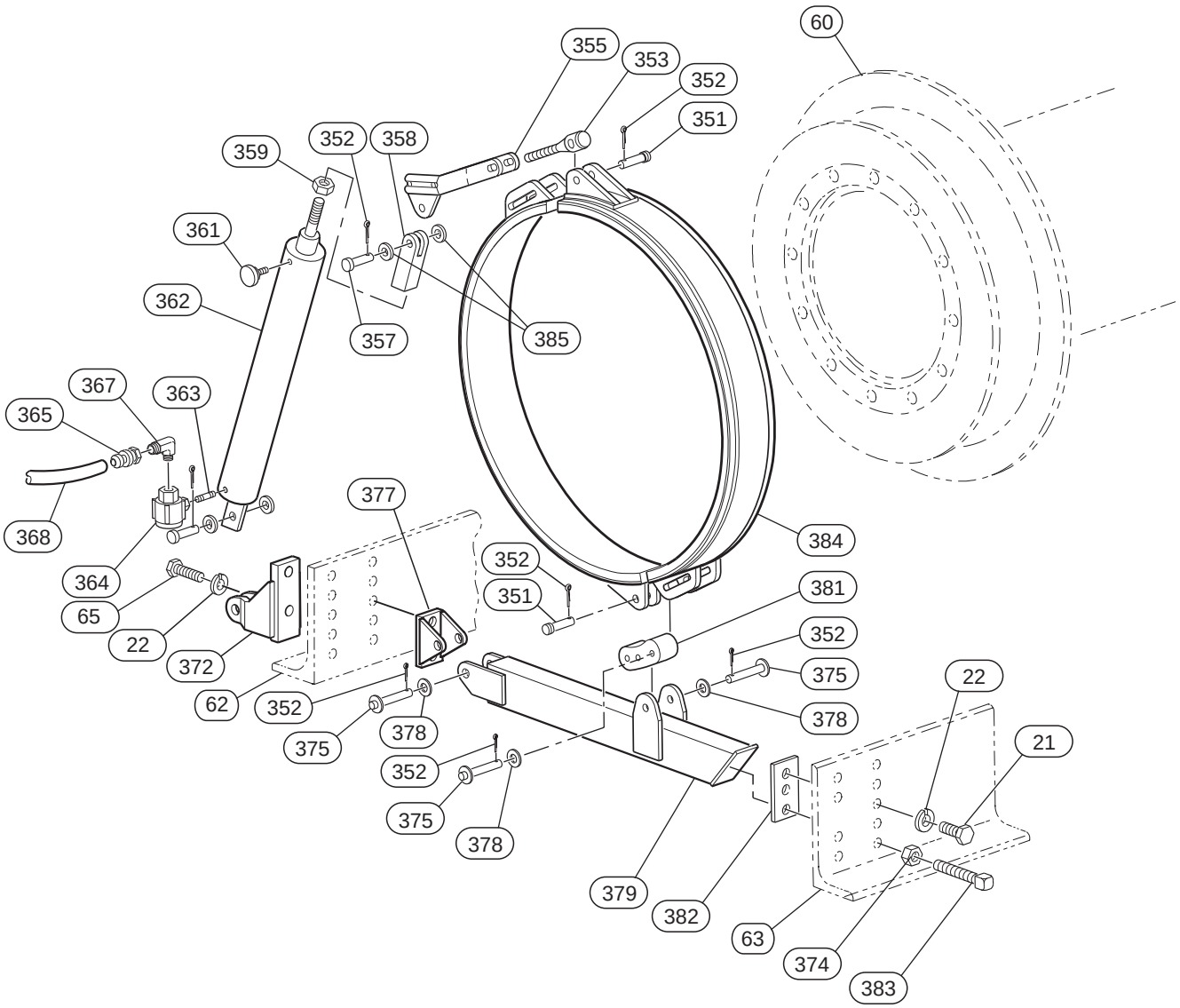
(Dwg. MHP2358)

DISC BRAKE AND REDUCTION GEAR ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
80	Ouput Ring Gear	1	96090094
81	Ball Bearing	1	50800006
• 82	Oil Seal	1	58017530
83	Ball Bearing	1	50050006
• 84	Retainer Ring for Shaft	1	47700029
85	Output Shaft	1	96187061
• 86	Retainer Ring	1	47802139
87	Ball Bearing	1	50800005
88	Planet Axle	3	96090039
89	Needle Bearing	6	56501513
90	Spacer	3	96090095
91	Gear Housing	1	96180005
92	Planet Gear	3	96090096
93	Ring Gear	1	96090038
94	Ball Bearing	1	50800009
95	Pin	2	46001116
• 97	Friction Disc	5	63028241
• 98	Steel Disc	4	63028341
• 99	'O' Ring	1	58235129
100	Brake Piston	1	96180126
• 101	'O' Ring	1	58235229
102	Washer	1	96150479
103	Spring	4	69165532
104	Coupling Sleeve	1	96180128
• 105	Oil Seal	2	58020330
• 106	Retainer Ring for Bore	2	47703032
107	Capscrew	4	41331306
• 108	'O' Ring	1	58218129
• 109	Capscrew	4	41322506
• 110	'O' Ring	1	58212529
111	Brake Body	1	96150359
112	Flange	1	96150550
113	Retainer Ring for Sun Gear	1	47700015
• 114	Gasket	1	96180042
115	Ball Bearing	1	50000002
116	Sun Gear	1	96157360
117	Planet Support	1	96180041

• Recommended Spare for one winch, 2 years at normal operation.

DRUM BRAKE ASSEMBLY DRAWING



(Dwg. MHP2373)

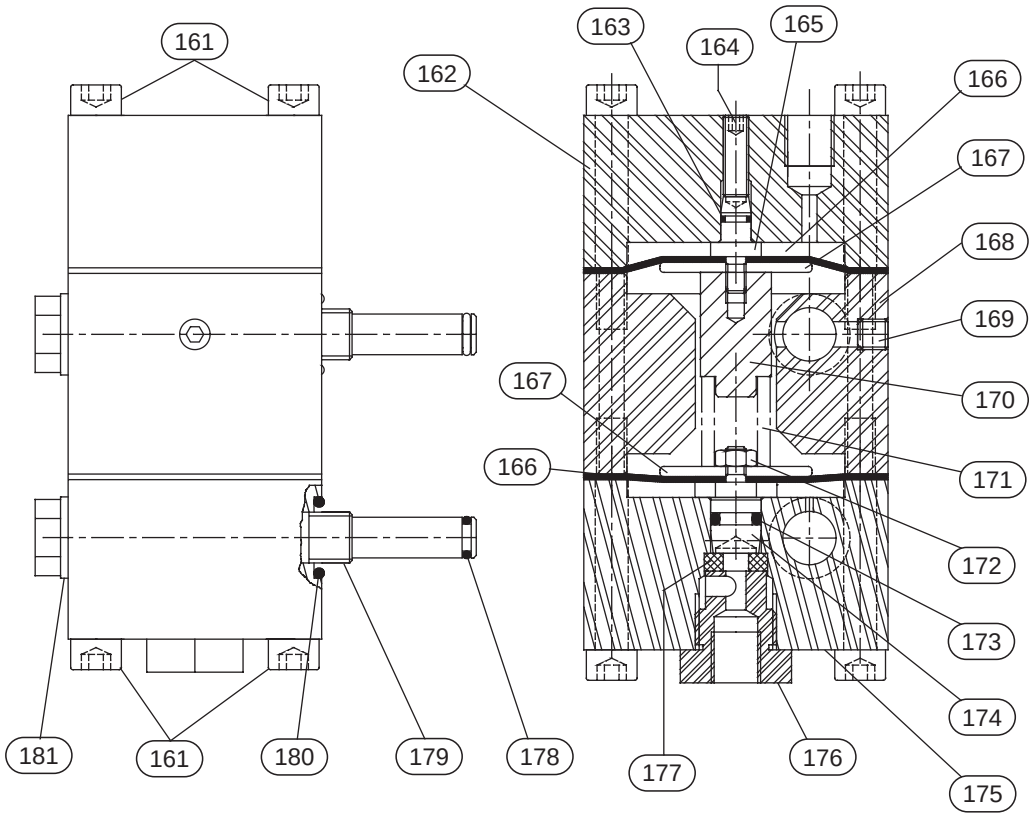
DRUM BRAKE ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
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)†		
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	Contact factory
	Side Rail (12 in. [305 mm] long drum)†		28332-2
	Side Rail (16 in. [406 mm] long drum)†		Contact factory
	Side Rail (24 in. [610 mm] long drum)†		
65	Capscrew	2	50183
351	Pin	2	4303-S
352	Cotter Pin	7	51937 (7)
353	Link Stud	1	2448
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	2	50171 (2)
375	Pin	3	3704-S
377	Pivot Bracket†	1	11146
378	Washer	As Req'd	50890
379	Arm	1	11147
381	Connecting Link†	1	11144
382	Stop Plate	1	11145
383	Setscrew	1	52226
•384	Brake Band†	1 Set	28570-SET
	Brake Band Lining Kit	1 Kit	28570-BLK
385	Washer	4	52914
•	Recommended Spare for one winch, 2 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	---

TORQUE LIMITER ASSEMBLY DRAWING AND PARTS LIST



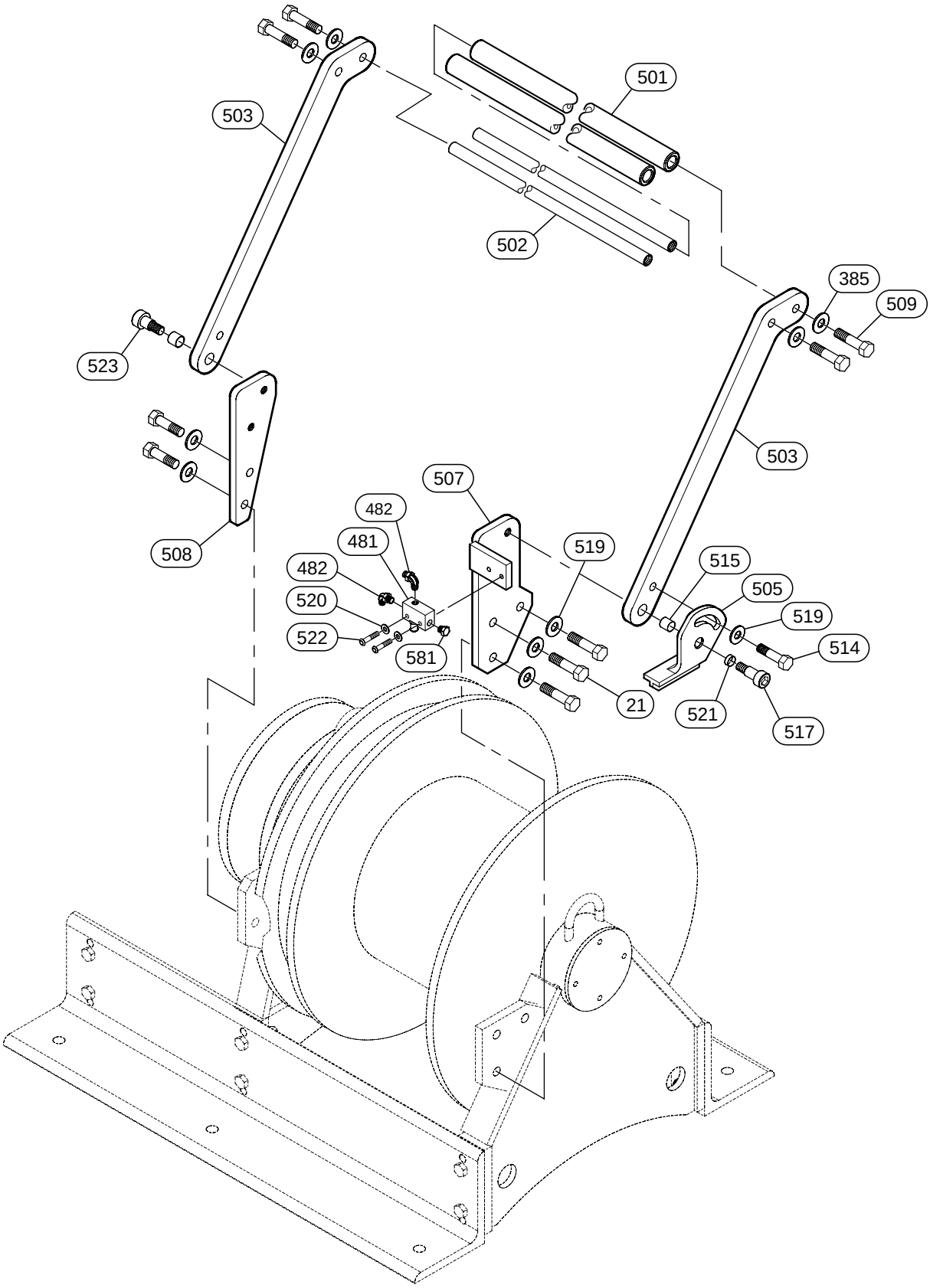
(Dwg. MHP2386)

Item No.	Description of Part	Qty. Total	Part Number
160	Torque Limiter Assembly (Includes items 161 through 181)	- - -	76360045
161	Capscrew	8	41327406
162	Cover	1	96360041
•163	'O' Ring	1	58222329
164	Screw	1	42007307
165	Valve	1	96360017
•166	Diaphragm	2	96360020
167	Washer	2	96360019
168	Body	1	96360038
169	Screw	1	42007807
170	Spacing Piece	1	96360044
171	Compression Spring	1	69154541
172	Nut	1	43001111
•173	'O' Ring	1	58214029
174	Valve	1	96360040
175	Cover	1	96360039
176	Screw	1	96360018
•177	Joint	1	96360042
•178	'O' Ring	2	58209229
179	Capscrew	2	96360022
•180	'O' Ring	2	58210729
•181	Seal Washer	2	58409731

• Recommended Spare for one winch, 2 years at normal operation.

SERVICE NOTES

SLACK LINE DETECTOR ASSEMBLY DRAWING



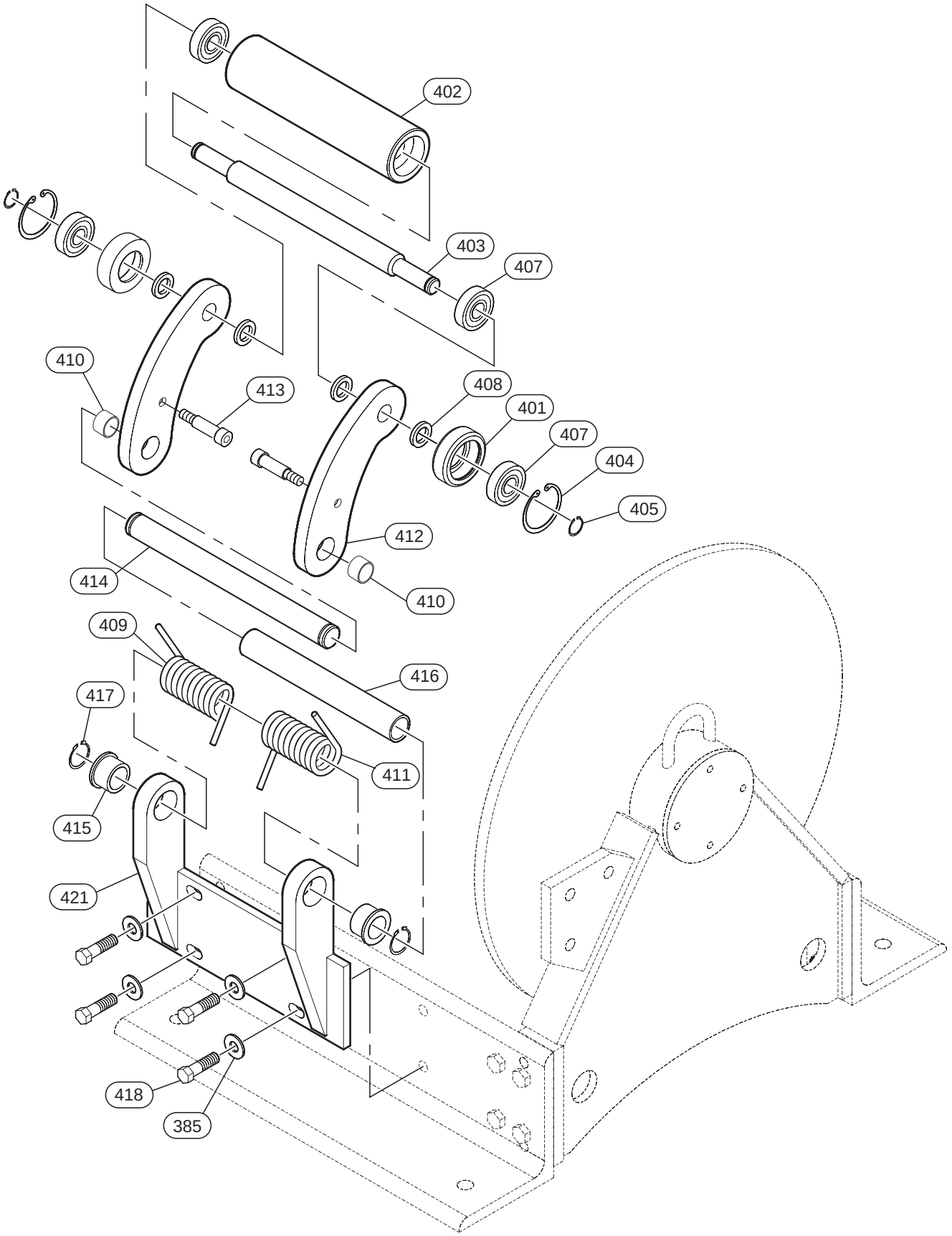
(Dwg. MHP2366)

SLACK LINE DETECTOR ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
500	Slack Line Detector Assembly (Incl's items 21, 385, 460, 481, 482, and 501-523)	1	28281
21	Capscrew	5	50973
385	Washer	4	52914
460	Breather	1	51559
481	Limit Valve	1	71356430
482	Fitting, Plug	2	54292
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		
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		
503	Arm (75°-90°)	2	28294
	Arm (60°-75°)		Contact factory
	Arm (45°-60°)		
505	Actuator Bracket	1	28431
507	Stop Bracket, Outboard	1	28292
508	Support Bracket, Inboard	1	28289
509	Capscrew	4	71387278
514	Capscrew	1	51086
515	Bushing	2	71386577
517	Shoulder Screw	1	71386650
519	Washer	6	71064844
520	Washer	2	71352462
521	Bushing	1	71386569
522	Capscrew	2	71386585
523	Shoulder Screw	1	71386643
524	Shoulder Screw*	1	71383368

* Item not illustrated, required for transportation and storage

PRESS ROLLER ASSEMBLY DRAWING

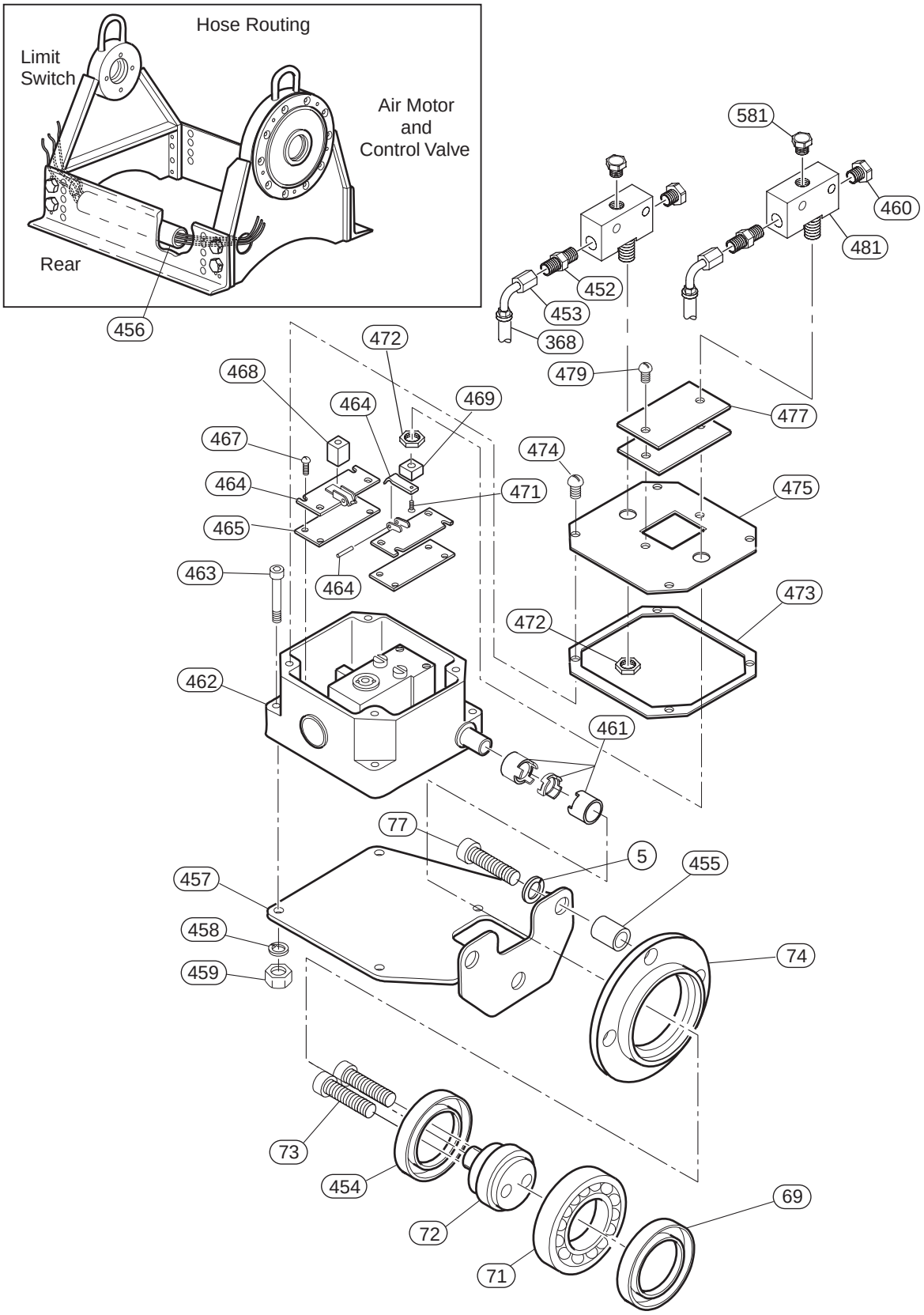


(Dwg. MHP2268)

PRESS ROLLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
400	Press Roller Assembly (Incl's 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
407	Bearing	4	71053649
408	Spacer	4	71383798
409	Spring	1	71383657
410	Bushing	2	Order item 412
411	Spring	1	71383665
412	Arm Assembly (Incl's item 410)	2	71383723
413	Shoulder Screw	2	71061634
414	Pivot Shaft	1	71383749
415	Bushing	2	71337091
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		

LIMIT SWITCH ASSEMBLY DRAWING

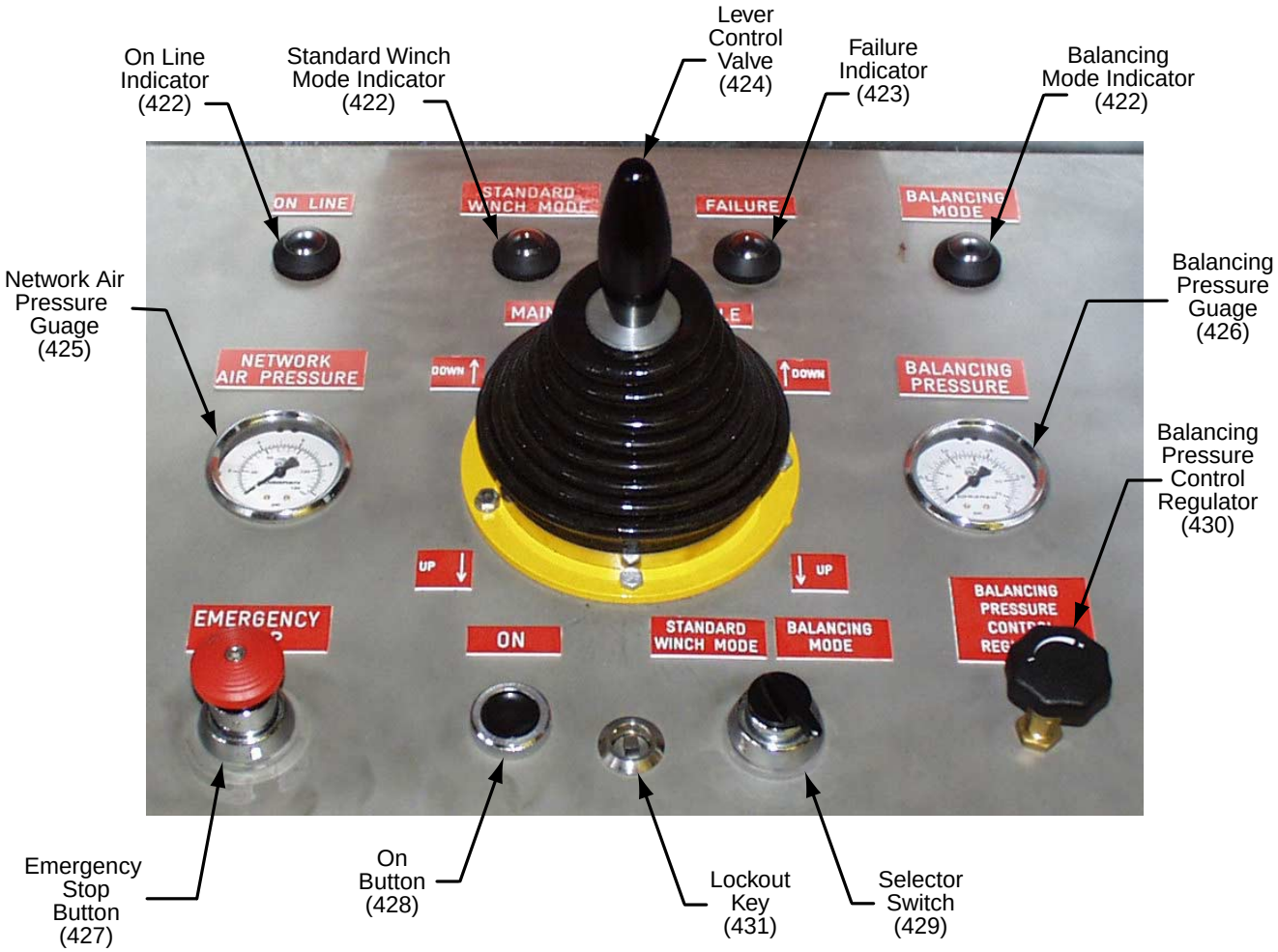


(Dwg. MHP2375)

LIMIT SWITCH ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
50	Limit Switch Assembly (Incl's items 5, 13, 71-72, 74, 77, 452-469, 471-479, 481, and 482)	1	27306-1
5	Lockwasher	3	50200
69	Seal	1	51474
71	Bearing	1	51797
72	Retainer	1	19232
73	Capscrew	2	71030787
74	End Cover	1	19233
77	Capscrew	3	51769
368	Hose, Bulk	Specify Length in Feet	50923
452	Fitting, Tee	1	53940
453	Fitting, Hose End	7	52179
454	Seal	1	71054688
455	Spacer	3	14998-7
456	Hose Sleeve	1	28449
457	Bracket, Limit Switch	1	11501
458	Lockwasher	4	52909
459	Nut	4	54142
460	Breather	2	51559
461	Coupling Assembly	1	52381
462	Limit Switch	1	19578-1
463	Capscrew	4	54493
464	Lever Assembly	2	Order item 462
465	Plate	2	
467	Screw	8	
468	Block, Tall	1	
469	Block, Short	1	
471	Screw	2	
472	Locking Ring	2	
473	Gasket	1	
474	Screw	4	
475	Cover Plate	1	
477	Access Plate	1	
478	Lockwasher	2	
479	Screw	2	
481	Valve	2	71356430
482	Fitting, Plug	4	51281

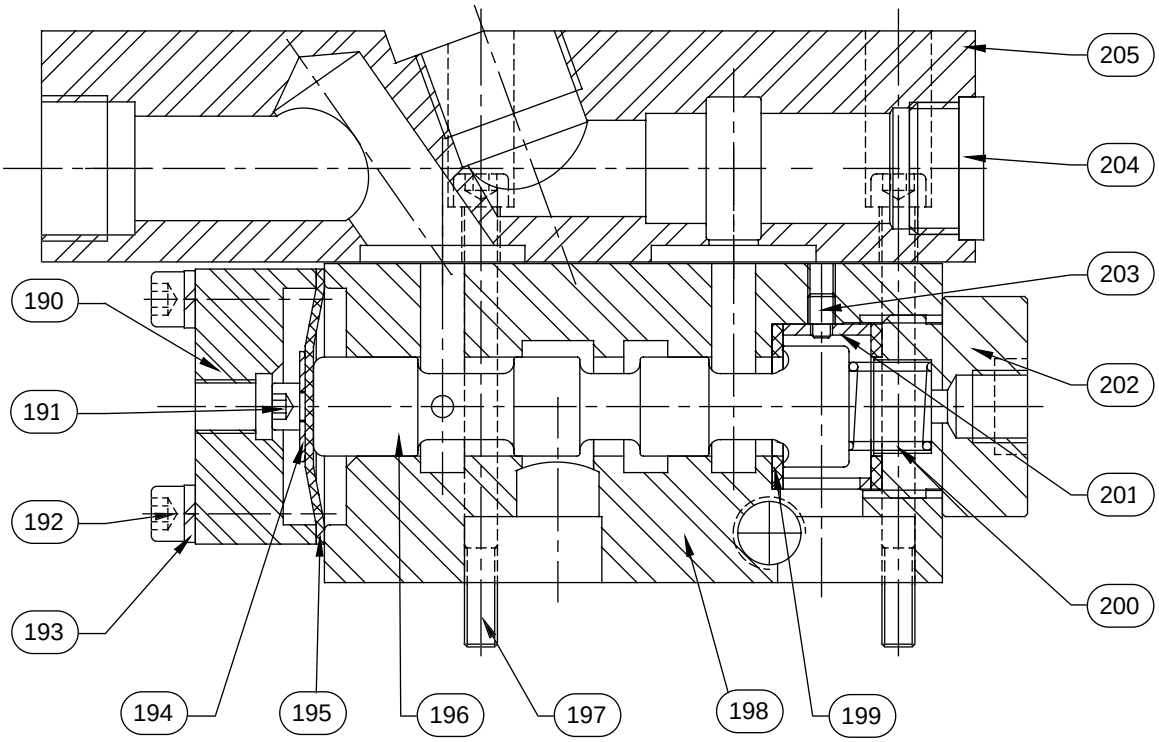
CONTROL CONSOLE VIEW AND PARTS LIST



(Dwg. MHP2354)

Item No.	Description of Part	Qty. Total	Part Number
422	Pneumatic Green Indicator	3	60932841
423	Pneumatic Red Indicator	1	60932941
424	Lever Control Valve Assembly	1	76150489
425	Pressure Gauge (0-10 bar)	1	67750241
426	Pressure Gauge (0-2.5 bar)	1	67750341
427	Directional Valve	1	68531241
428	Directional Valve	1	68531441
429	Directional Valve	1	68550041
430	Pressure Regulator	2	67780141
431	Lockout Key	1	Contact factory

DIRECTIONAL CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

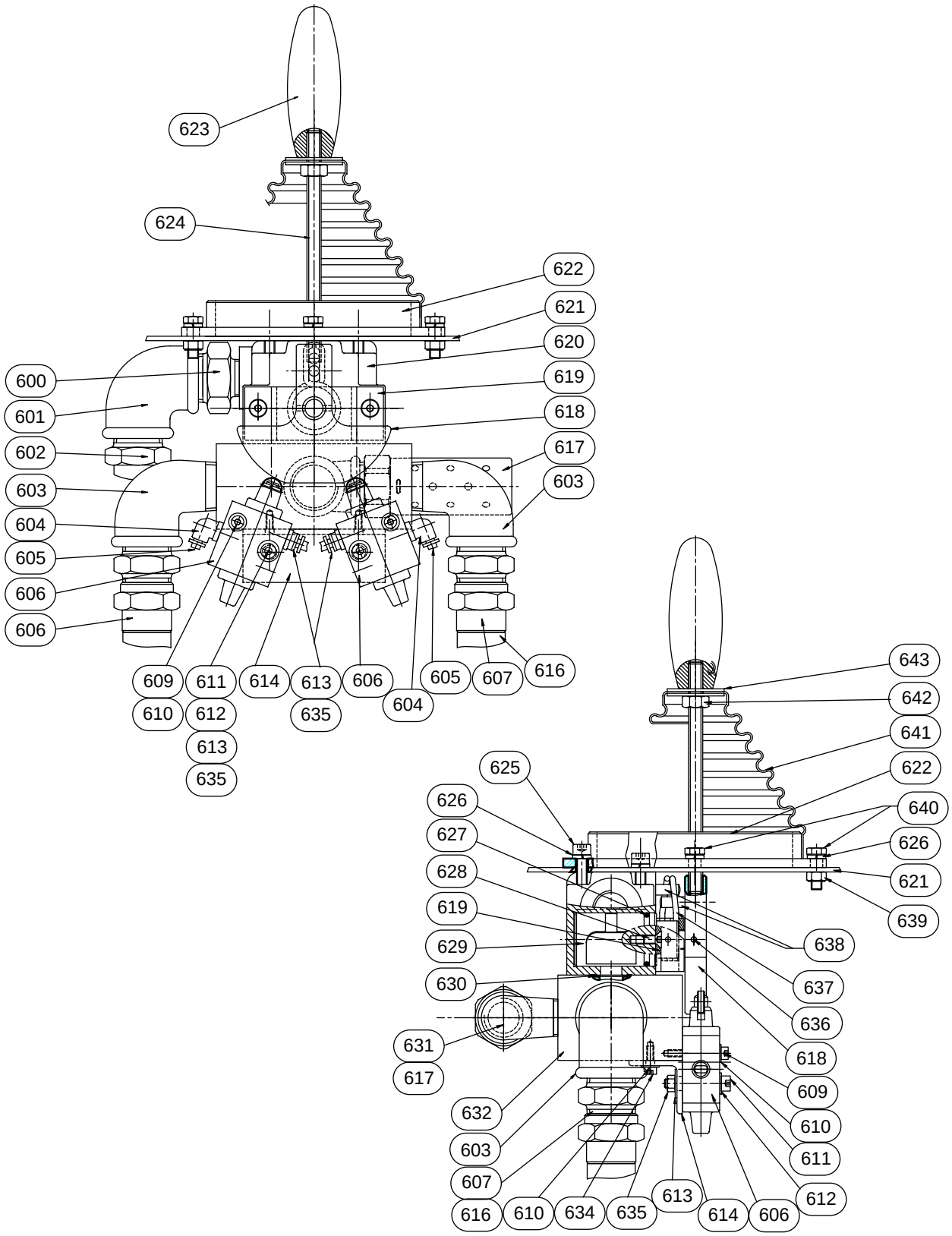


(Dwg. MHP2361)

Item No.	Description of Part	Qty. Total	Part Number
606	Directional Control Valve Assembly (Refer to Dwg. MHP2362 on page 58)	2	68553441
190	Cover	1	96150378
191	Capscrew	1	41326306
192	Capscrew	4	41322306
193	Lockwasher	4	45201006
194	Washer	1	45700005
• 195	Diaphragm	1	96360020
196	Piston	1	96150376
197	Capscrew	4	41331306
198	Directional Control Valve Body	1	96150377
• 199	Joint	2	96150383
200	Spring	1	69158732
201	Spacing Piece	1	96150382
202	Plug	1	96150375
203	Screw	1	42008307
204	Plug	1	65160932
205	Cover	1	96150374

• Recommended Spare for one winch, 2 years at normal operation.

LEVER CONTROL VALVE ASSEMBLY DRAWING



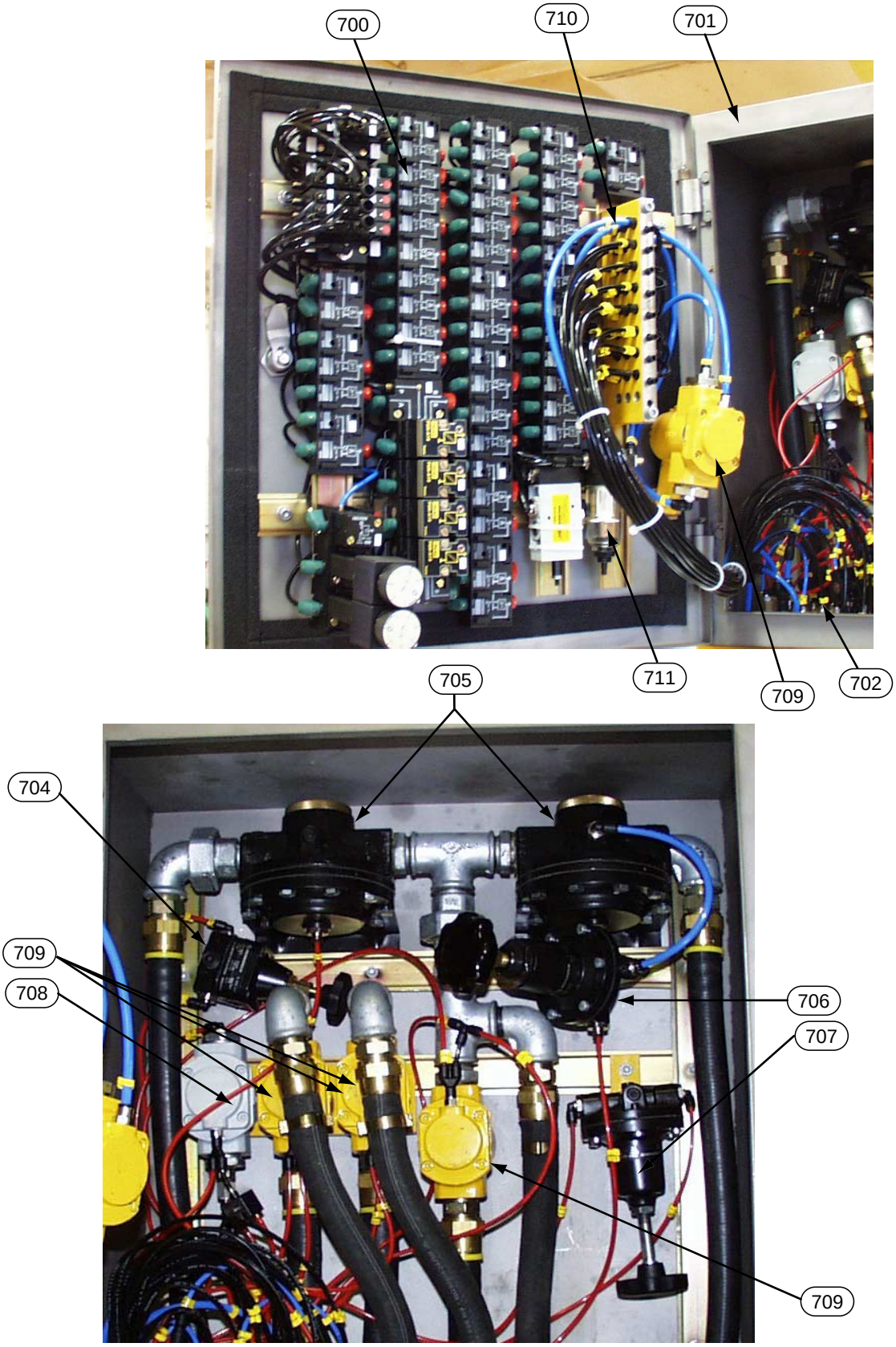
(Dwg. MHP2362)

LEVER CONTROL VALVE PARTS LIST

Item No.	Description of Part	Qty. Total	Part Number
600	Fitting, Nipple 1/2-3/4 in	1	61331032
601	Female, Elbow 3/4 in	1	61331232
602	Fitting, 3/4 in	1	61645232
603	Fitting, Elbow 3/4 in	2	61330932
604	Elbow 1/8 in	2	68143628
605	Pipe	2 m	68045428
606	Directional Control Valve Assembly	2	68553441
607	Sleeve	2	61045128
609	Capscrew	2	41311006
610	Lockwasher	4	45000104
611	Capscrew	2	41322106
612	Washer	2	45000105
613	Washer	2	45700005
614	Angle Bracket	1	96150423
615	Fitting	3	68246128
616	Hose	5m	16810656
617	Muffler	1	68497432
618	Control Lever	1	96150406
619	Stop	1	96180034
620	Valve Housing	1	96180145
621	Console	1	96150416
622	Lever Control Valve Support	1	96150368
623	Handle	1	57426232
624	Axle	1	96150394
625	Capscrew	4	41322506
626	Lockwasher	7	45201006
•627	‘O’ Ring	1	58217629
628	Screw	2	41105103
629	Rotary Valve	1	96180146
•630	‘O’ Ring	3	58220929
631	Elbow 1/2 in	1	61330832
632	Base Plate	1	96180110
633	Pipe	2 m	102U0401
634	Capscrew	2	41313606
635	Stop Nut	2	43707211
•636	Pin	1	46507220
637	Spring	1	96180035
•638	Straight Pin	2	46001216
639	Stop Nut	3	43707611
640	Screw	3	41020301
641	Bellows with Clamping Collar	1	68952341
642	Nut	1	43003511
643	Washer	2	45701008

• Recommended Spare one winch, 2 years at normal operation.

CONTROL BOX AND SEQUENCER VIEWS

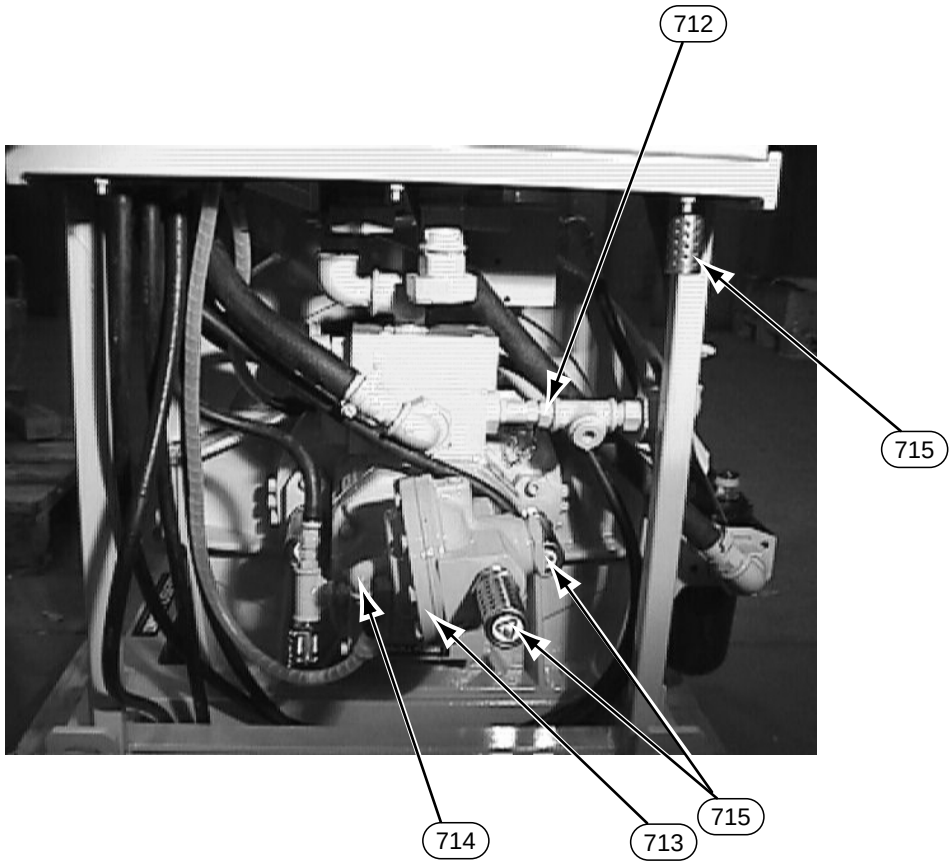


(Dwg. MHP2359)

CONTROL BOX AND SEQUENCER PARTS LIST

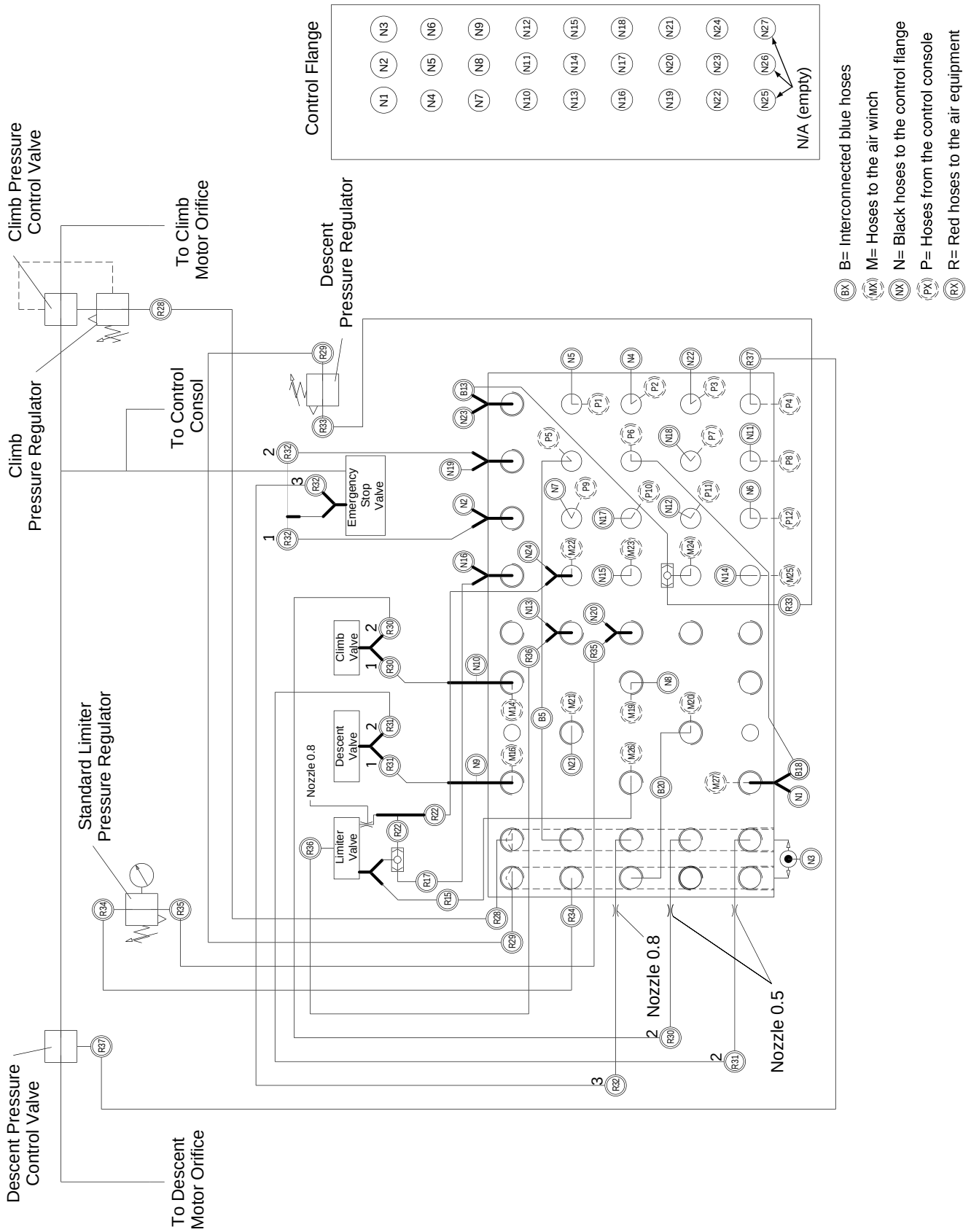
Item No.	Description of Part	Qty. Total	Part Number
700	Sequencer Assembly	1	76150490
701	Control Box Assembly	1	76150491
702	Connecting Flange	1	96150408
704	High Precision Pressure Regulator	1	67750141
705	Regulator 3/4 in	2	67730541
706	Servo Pressure Regulator 1/4 in	1	67730741
707	Pressure Regulator 1/4 in	1	67730841
708	Shut-Off Valve 3/4 in	1	76170123
709	Shut-Off Valve 3/4 in	4	76170122
710	Control Flange	1	96150411
711	Air Filter	1	68551941
712	Check Valve	1	63801741
713	Outlet Valve	1	67730441
714	Fitting, ‘Y’ 1/8 in	2	68245928
715	Muffler	3	68497432

SEQUENCER AND WINCH ASSEMBLY VIEW



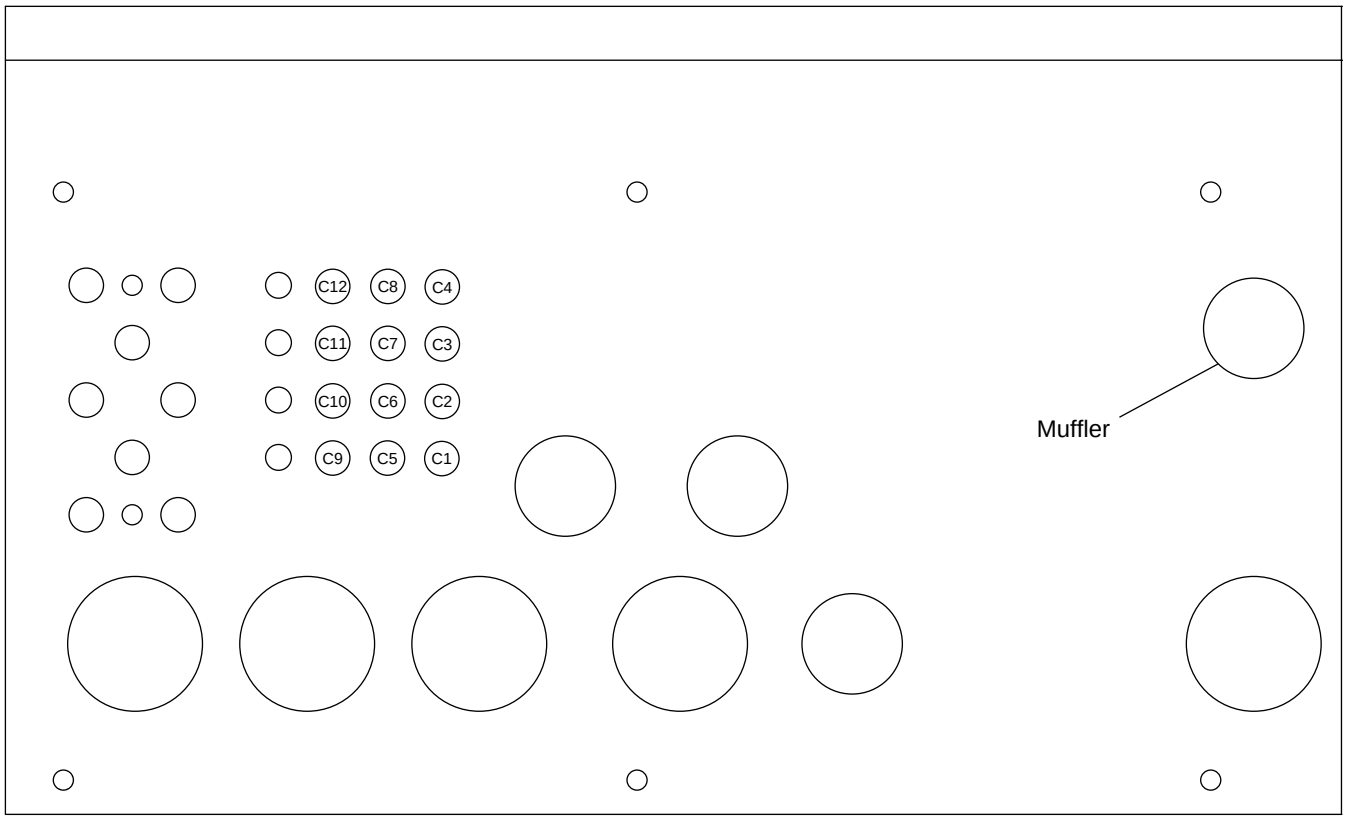
(Dwg. MHP2360)

CONNECTING FLANGE PIPING AND HOSES LEGEND



(Dwg. MHP2363)

CONNECTING FLANGE PIPING AND HOSES LEGEND



C = Hoses from the Control Console
Viewed from beneath Control Box

(Dwg. MHP2355)

CONNECTING FLANGE LEGEND

B13	VeA: Port A of Exhaust Valve
B18	Piloting Pressure
M14	FH: Top Limit Switch
M16	FB + S: Bottom Limit Switch + Slack
M19	DFR: Brake Detection
M20-B20	ADFR: Brake Detection Supply
M21	L2a: Port A of Torque Limiter Control Valve Floating
M22-R22	Dc: Signal to Directional Control Valve
M23	E Dc: Directional Control Valve Inlet
M24	Ve: Signal to Exhaust Valve
M25	EVe: Exhaust Valve Inlet
M26	Torque Limiter Exhaust
M27	Piloting Pressure
P1	Standard Mode Information
P2	Balancing Mode Information
P3	L2r: Signal to Floating Torque Limiter (Port R)
P4	Signal to Lowering Pressure Valve
P5-B5	Downstream Connection to Emergency Valve
P6	Upstream Connection to Emergency Valve
P7	Connection to Pilot Pressure of Emergency Stop Valve
P8	UP
P9	Failure Indicator
P10	Warning Buzzer
P11	DOWN
P12	Floating Indicator
R15	Ve, Dc: Exhaust Valve, Directional Valve
R17	RESET
R28	Signal to Pressure Regulator Lifting Side
R29	Signal to Exhaust Valve Pressure Regulator
R30	Signal to Lifting Valve
R31	Signal to Lowering Valve
R32	Signal to Main Air Shut Off Valve
R33	Lowering Regulator
R34	Standard Limiter Regulating Inlet
R35	Standard Limiter Regulating Outlet
R36	Torque Limiter Supply
R37	Lowering Pressure Regulating Valve

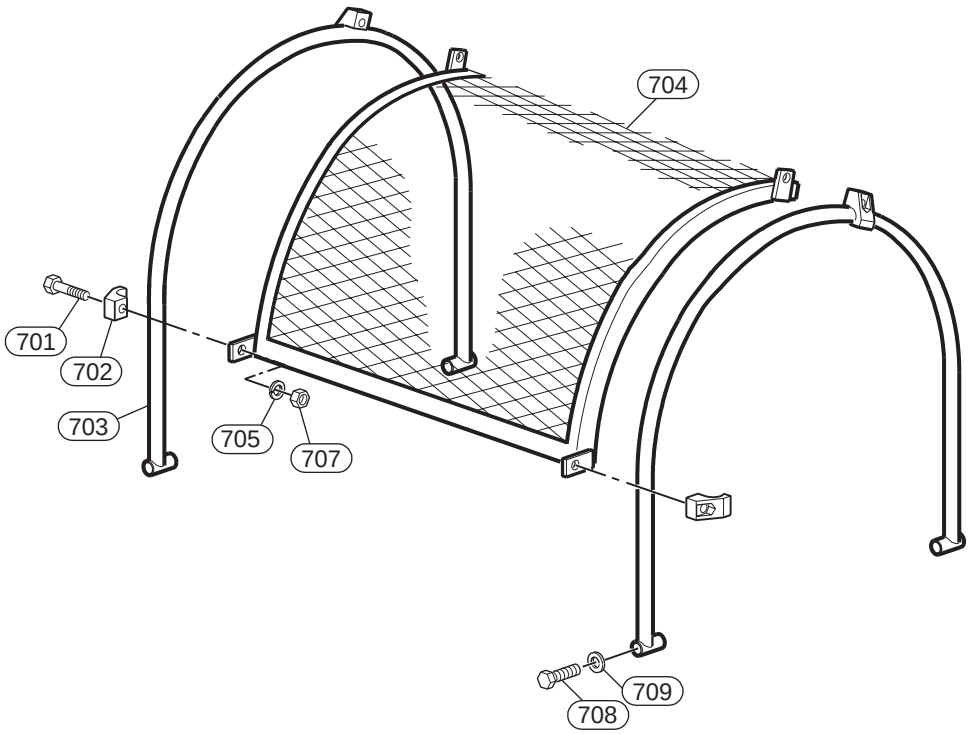
B	Interconnected Blue Hoses
M	Hoses to the Air Winch
P	Hoses from the Control Console
R	Red Hoses to Air Equipment

CONTROL FLANGE LEGEND

N1	PA: Inlet Pressure
N2	PP: Piloting Pressure
N3	PU: Working Pressure
N4	FLT: Floating Mode
N5	STD: Standard Mode
N6	VF: Floating Indicator
N7	VA: Failure Indicator
N8	DFR: Brake Detector
N9	FB: Bottom Limit Switch
N10	FH: Top Limit Switch
N11	UP: Lifting
N12	DW: Lowering
N13	OUTLET Ve, Dc: Exhaust Valve Outlet, Directional Valve Outlet
N14	INLET Ve: Exhaust Valve Inlet
N15	INLET Dc: Directional Valve Inlet
N16	RESET
N17	AV: Warning Buzzer
N18	INLET L1p: Emergency Stop Valve Inlet (Port P)
N19	OUTLET L1a: Emergency Stop Valve Outlet (Port A)
N20	INLET L2p: Floating Torque Limiter Inlet (Port P)
N21	OUTLET L2a: Floating Torque Limiter Outlet (Port A)
N22	INLET L2r: Floating Torque Limiter Inlet (Port R)
N23	OUTLET VeA: Exhaust Valve Outlet (Port A)
N24	ADVe: Exhaust Valve Supply
N25	empty
N26	empty
N27	empty

Refer to Dwg. MHP2363 on page 62.

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

Item No.	Description of Part	Qty. Total	Part Number
67	Nameplate	1	Contact factory
68	Rivet	8	71028849
902	Notice, ***Man Rider*** (Refer to Label on page 6)	1	71108856
903	Label, Throttle Direction	1	96180102
904	Label, Warning (Refer to Label on page 6)	1	71124887
905	Label, Overwind Cable	2	96180103
906	Label, Limit Switch	1	71149454
908	Label, **Ingersoll-Rand** Logo	2	71106256
909	Label, Product	1	71111793
910	Label Sheet	1	71295240
911	Label, Open Book	1	96180098
912	Label, CE	1	96180096
914	Warning	1	96150447

Contact factory for label locations.

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, which services will be for your account and form your basis for claim against the carrier.

United States Office Locations

For Order Entry and Order Status

Technical Support

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

Ingersoll-Rand
Distribution Center
P.O. Box 618
510 Hester Drive
White House, TN 37188 USA
Phone: (615) 672-0321
Fax: (615) 672-0801

Web Site:
www.irco.com

Regional Sales Offices

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

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

Houston, TX
450 Gears Road
Suite 210
Houston, TX 77067-4516
Phone: (281) 872-6800
Fax: (281) 872-6807

Los Angeles, CA
13107 Lakeland Road
Santa Fe Springs, CA
90670-0525
Phone: (562) 777-0808
Fax: (562) 777-0818

International Office Locations

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

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

Regional Sales Offices
Edmonton, Alberta
5608 - 94 A Street
Edmonton, Alberta
T6E 3E4
Phone: (780) 438-5039
Fax: (780) 430-4500

Montreal, Quebec
3501 St. Charles Blvd.,
Suite 104
Kirkland, Quebec
H9H 4S3
Phone: (514) 695-9040
Fax: (514) 695-0963

British Columbia
1200 Cliveden Avenue
Delta, B. C.
V3M 6G4
Phone: (604) 523-0803
Fax: (604) 523-0801

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

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

Asia Pacific Operations
Ingersoll-Rand
23/F., 625 King's Road
North Point, Hong Kong
Phone: (852) 2527 0183
Fax: (852) 2529 5976

Russia
Ingersoll-Rand
Kuznetsky Most 21/5
Entrance 3
Moscow 103895
Russia
Phone: (7) 501 923 9134
Fax: (7) 501 924 4625

Australia
Ingersoll-Rand Aust
1 Hartnett Drive
Seaford, Vic 3198
Australia
Phone: 61 3 95541642
Fax: 61 3 95541607

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