



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
© 2004 Ingersoll-Rand Company

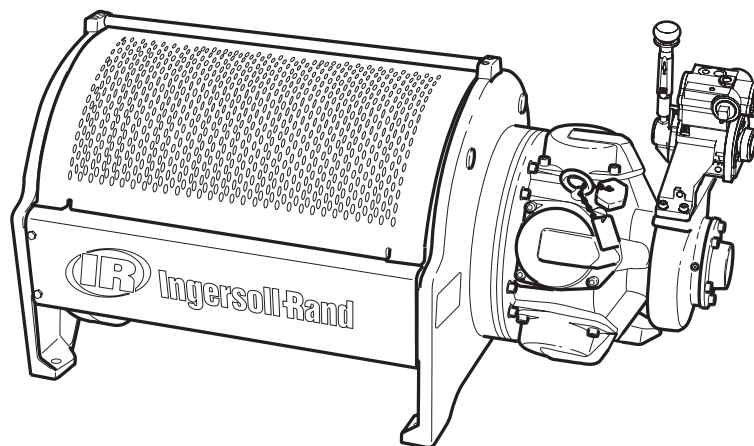


PARTS, OPERATION AND MAINTENANCE MANUAL

THIRD GENERATION

force TM **AIR WINCHES**

MODEL FA5A



(Dwg. MHP2415)



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

WARNING

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

Always operate, inspect and maintain this winch in accordance with American National Standards Institute Safety Code (ASME B30.7) and any other applicable safety codes and regulations.

Form MHD56087

Edition 4

June 2002

71146690

© 2002 Ingersoll-Rand Company



TABLE OF CONTENTS

Description	Page No.
Safety Information	
Danger, Warning, Caution and Notice	3
Safety Summary	3
Safe Operating Instructions	4
Warning Labels and Tag	4
Specifications	
Model Code Explanation	5
General Specifications	6
Winch Weight and Wire Rope Capacities	6
FA5A Performance Curve	7
Description of Operation	7
Traceability	7
Installation	
Mounting	8
Wire Rope	8
Air Supply	10
Motor	11
Emergency Stop and Overload System	11
Initial Winch Operating Checks	11
Operation	
Controls	12
Winch Brakes	15
Constant Tension Manifold (optional feature)	15
Free Spool (optional feature)	15
Inspection	
Records and Reports	16
Frequent Inspection	17
Periodic Inspection	17
Winches Not in Regular Use	18
Inspection and Maintenance Report	19
Troubleshooting	20
Lubrication	
General Lubrication	21
Wire Rope	22
Maintenance	
Maintenance Intervals	23
Adjustments	24
Disassembly	25
Cleaning, Inspection and Repair	29
Assembly	29
Testing	34
Parts Section	
Winch Cross Section Drawing	36
Winch Drawings and Parts Lists Table of Contents	37
Winch Parts Drawings and Parts Lists	38 - 66
Parts Ordering Information	70
Warranty	71
Office Locations	72

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

- Do not use this winch for lifting, supporting, or transporting people or lifting or supporting loads over people.
- The supporting structures and load-attaching devices used in conjunction with this 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 the latest ASME B30.7 standards.

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

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 the information required to install, operate, maintain and repair the products described herein.

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

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

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

SAFE OPERATING INSTRUCTIONS

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

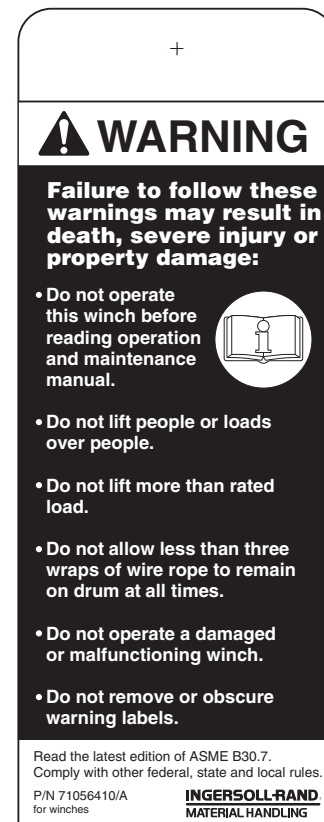
Ingersoll-Rand recognizes that most companies who use winches have a safety program in force at their facility. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

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, inspect 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 "SPECIFICATIONS" section.
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 the 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. Never use the winch for lifting or lowering people, and never allow anyone to stand on a suspended load.
13. Ease the slack out of the wire rope when starting a lift or pull. Do not jerk the load.
14. Do not swing a suspended load.
15. Do not leave a suspended load unattended.
16. Never operate a winch with twisted, kinked or damaged wire rope.
17. Pay attention to the load at all times when operating the winch.
18. Never use the wire rope as a sling.
19. After use, or when in a non-operational mode, the winch should be secured against unauthorized and unwarranted use.

WARNING LABELS AND TAG

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



SPECIFICATIONS

Model Code Explanation: (Example FA5A-LXX1G)

Series

FA = Force 5 Air Powered

Capacity: (Based on wire rope at mid drum)

5 = (5 tons (10,000 lbs [4,536 kg])

Generation:

A = Third Generation

Drum Length:

S = Short without Drum Brake (15 inches [381 mm])

S = Short with Drum Brake (12 inches [305 mm])

L = Long without Drum Brake (27 inches [686 mm])

L = Long with Drum Brake (24 inches [610 mm])

Drum Brake: Note: addition of drum brake reduces the drum length 3 inches [76 mm]

A = Automatic Drum Brake

M = Manual Drum Brake

X = None

Disc Brake:

K = Automatic Disc Brake (Standard)

X = None

Control:

1 = Winch mounted lever throttle (Standard)

* **2** = Remote pilot pendant throttle with standard length (6 ft/1.8 m) hose

** **2XX** = Remote full flow lever throttle (maximum 20 ft/6 m)

** **3XX** = Remote pilot pendant throttle (standard = 6 ft/1.8 m; maximum 66 ft/20 m)

** **4XX** = Remote pilot lever throttle (maximum 66 ft/20 m)

5XX = Remote electric over air throttle †

Options:

7 = Drum grooving (Number = wire rope size in sixteenths, e.g. 7/16 inch) †

C = Low Temperature Components; specify -10° C (14° F) or -20° C (-4° F)

D = Drum divider flange and additional wire rope anchor †

E = Construction Cage

F = Free spool clutch (available only with manual drum brake)

G = Drum Guard

H = Open Front frame for horizontal pulling

K = K6 footprint base

*** **M1** = Material Traceability (typical material results) ††

*** **M2** = Material Traceability (actual material results) ††

*** **M3** = Material Traceability (actual material results for these parts in finished, as-delivered condition) ††

N = Type Approval - Specify:

- American Bureau of Shipping (ABS)
- Det Norske Veritas (DNV)
- Lloyd's Register of Shipping (LRS)

Q = Special Paint

T = Tensioning Manifold

U = Underwound wire rope operation (available only with automatic disc brake)

V = Press Roller †

-E = Compliance with European Community Machinery Directive:

- Main air supply emergency shut off
- Muffler
- Overload Device
- Drum Guard
- CE Documentation

Notes:

* Available only with auto disc brake or with auto drum brake.

** Remote throttles are provided with 6 feet (1.8 metres) of hose. Specify hose lengths greater than 6 feet (1.8 metres). Contact your **Ingersoll-Rand** distributor or the factory for control acceptability for hose lengths greater than 60 feet (18.3 metres). Metric lengths are provided for reference only, order lengths in feet.

*** Documentation, witness testing and material traceability available; must be requested at time of order. Specify options or contact the factory or your nearest **Ingersoll-Rand** distributor for information.

† Not covered in this manual.

†† Refer to 'Traceability' on page 7 for a description of the differences between M1, M2 and M3.

General Specifications

Air System	Rated Operating Pressure	90 psig (6.3 bar/630 kPa)	
	Air Consumption (at rated pressure and load)	700 scfm	20 cu.m/min
Rated Performance (at rated pressure / volume)	Mid Drum Line Pull	10,000 lbs	4,536 kg
	Mid Drum Line Speed	32 fpm	10 m/min
Air Motor Pipe Inlet Size		1.25 inches	32 mm
Minimum Air System Hose Size		1.5 inches	38 mm
Maximum Stall at First Layer		17,000 lbs	7,727 kg
Drum Barrel Diameter		12.75 inches	324 mm
Drum Flange Diameter		24.25 inches	616 mm

Winch Net Weight (without wire rope)

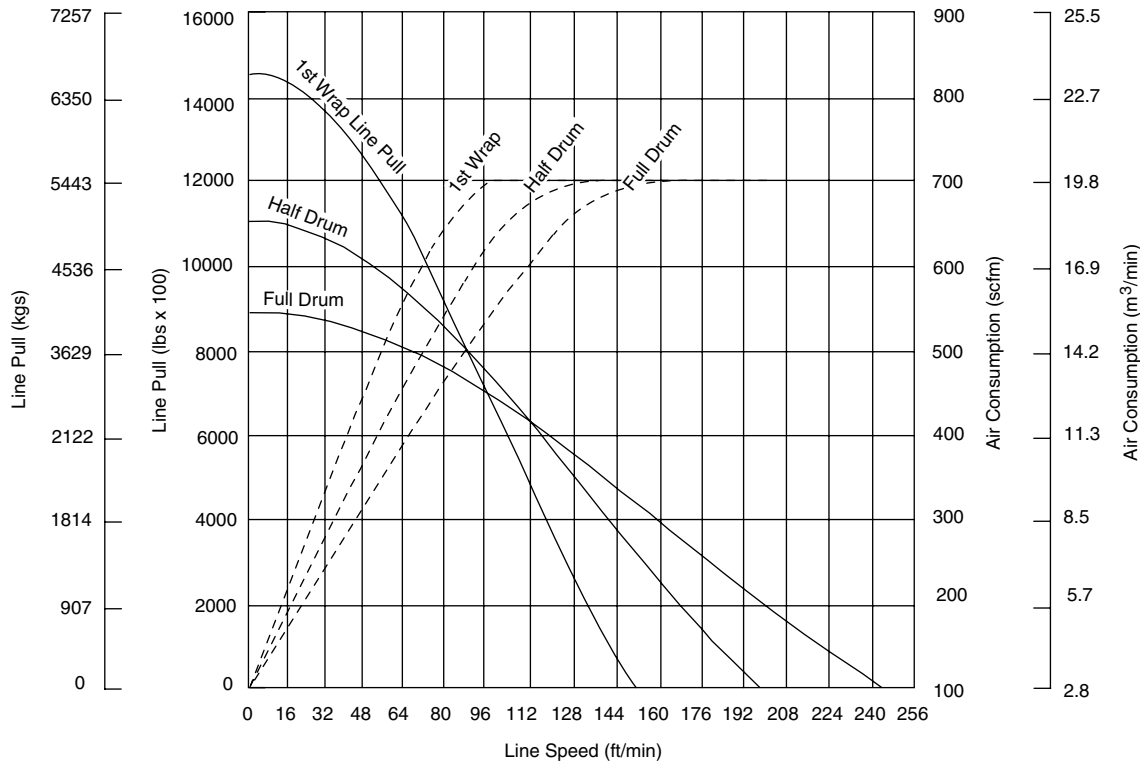
Model	lbs	kg	Model	lbs	kg
FA5A-SXK1	1,048	476	FA5A-SXK2	1,050	477
FA5A-SMK1	1,170	532	FA5A-SMK2	1,145	520
FA5A-SAK1	1,175	534	FA5A-SAK2	1,175	534
FA5A-SMX1	1,120	509	N/A	---	---
FA5A-SAX1	1,165	530	FA5A-SAX2	1,165	530
FA5A-LXK1	1,251	569	FA5A-LXK2	1,263	574
FA5A-LMK1	1,363	620	FA5A-LMK2	1,380	627
FA5A-LAK1	1,390	632	FA5A-LAK2	1,390	632
FA5A-LMX1	1,333	606	N/A	---	---
FA5A-LAX1	1,378	626	FA5A-LAX2	1,378	626

Winch Wire Rope Storage Capacities (feet/metres)

Drum Length		Storage Notes	Wire Rope Diameter			
			5/8 inch	16 mm	3/4 inch	18 mm
inches	mm	Full Drum Storage less 1/2 inch (13 mm) (meets ANSI B30.7) *	feet	metres	feet	metres
12	305		668	202	489	156
15	381		844	256	619	197
24	610		1,373	416	1,010	321
27	686		1,549	469	1,140	362

* Per ASME B30.7 wire rope top layer must be located a minimum of 1/2 inch (13 mm) below drum flange. The wire rope storage capacities listed may vary from figures stated elsewhere.

FA5A Performance Curve



(Dwg. MHP0895)

Description of Operation

FA5A winches are air powered, planetary geared units designed for lifting and pulling applications. **FA5A** winches are supplied with either an internal automatic disc brake, a manual or automatic externally mounted drum band brake, or a combination of both.

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

The output from the planetary reduction gear assembly is connected to the wire rope drum through the output shaft.

The disc brake attaches to the outboard upright opposite the motor end and is connected to the intermediate sun gear through the brake shaft. The disc brake is automatically applied when the winch is in the neutral or operated in the haul-in positions; disengaged when the winch is operated in the payout direction. During winch operation a sprag type clutch in the disc brake allows drum rotation in the haul-in direction with the disc brake engaged. This ensures the brake will respond quickly to hold the load when winch operation stops. Operation of the winch in the payout direction directs pressurized air to the disc brake diaphragm to overcome spring tension and release the brake. When the payout operation is complete the air is vented and the brake is automatically applied.

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

Traceability

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

Units 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.

INSTALLATION

Prior to installing the winch, carefully inspect it for possible shipping damage. Winches are supplied fully lubricated from the factory. Check oil levels and adjust as necessary before operating winch. Refer to “LUBRICATION” section for recommended oils.

⚠ WARNING

• 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. MHP0124 and Table 1 on page 8.

Care must be taken when moving, positioning or mounting the winch. Ensure that the winch, when lifted, will be properly balanced. Determine the weight of the winch by referring to the “SPECIFICATIONS” section. Lift the winch 3 to 4 inches (75 to 100 mm) off the ground. Verify winch is balanced and secure before continuing lift. Mount the winch so the axis of the drum is horizontal and that the motor vent cap is not more than 15° off top vertical center. If the winch is to be mounted in an inverted position, the motor case must be rotated to position the vent cap at the top and adequate clearance must be provided for control valve operation. The breather (8) and drain plug (21) on the disc brake must be swapped.

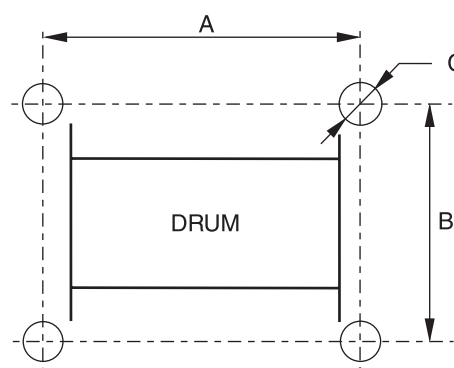


⚠ WARNING

• Winch frame material is not suitable for welding. FA5A winches must only be mounted by bolting to a suitable foundation. Do not attempt to mount winch by welding to a foundation structure. Refer to warning label part number 71270813 on winch.

1. Winch mounting surface must be flat and of sufficient strength to handle the rated load plus the weight of the winch and attached equipment. An inadequate foundation may cause distortion or twisting of winch uprights and side rails resulting in winch damage.
2. Make sure the mounting surface is flat to within 1/32 inch (0.8 mm). Shim if necessary.

3. Mounting bolts must be 3/4 inch-NC (18 mm) Grade 8 or better. Use self-locking nuts or nuts with lockwashers.
4. Tighten 3/4 inch (18 mm) mounting bolts evenly and torque to 380 ft lbs. (515 Nm) for dry thread fasteners. If the fasteners are plated, lubricated or a thread locking compound is used, torque to 280 ft lbs. (380 Nm).
5. Maintain a fleet angle between the lead sheave and winch of no more than 1-1/2°. 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 feet (0.5 metre) from the drum. Refer to Dwg. MHP0498 on page 10.
6. Do not weld to any part of the winch.



(Dwg. MHP0124)

Table 1 - Mounting Bolt Hole Dimensions

Dimension		Drum Length (inches)			
		12	15	24	27
“A”	in.	17.89		29.89	
	mm	455		760	
“B”	in.	22			
	mm	559			
“C”	in.	0.81			
	mm	21			

Wire Rope

⚠ CAUTION

• Maintain at least 3 tight wraps of wire rope on drum at all times. Refer to Dwg. MHP0498 on page 10.

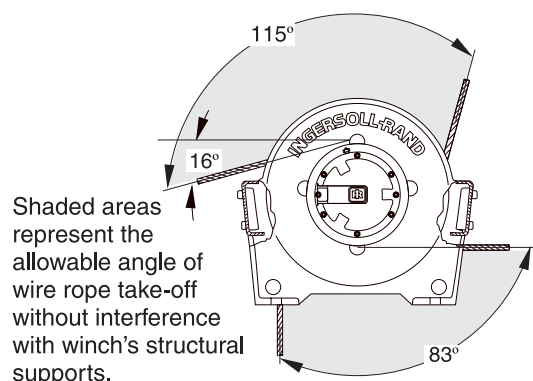
Standard and Open Frame (Face) Winch

Install the winch such that the wire rope, when at the take-off angle limits does not contact the mounting surface. Refer to Dwg. MHP1142 on page 9.

⚠ DANGER

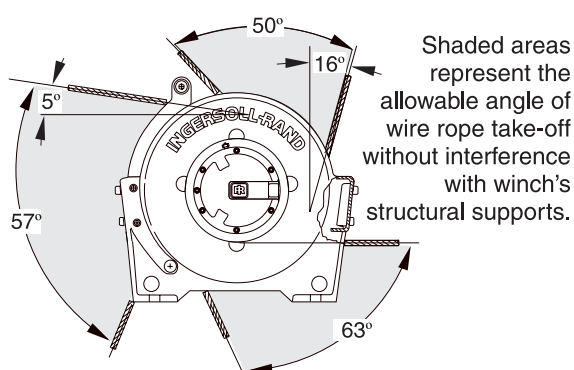
• Exceeding wire rope take-off angles will cause wire rope to come into contact with winch frame supports resulting in damage to wire rope and winch.

FA5A Standard Wire Rope Take-off Angle(s)



Viewed from end opposite motor

FA5A Open Front (Face) Wire Rope Take-Off Angle(s)



Viewed from end opposite motor

(Dwg. MHP1142)

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 which 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 6 X 19 or 6 X 37 Extra Improved IWRC right lay. Refer to Table 2 for minimum and maximum recommended wire rope diameters.

Table 2 - Minimum and Maximum Wire Rope Size

Wire Rope Anchor Part No.	Minimum		Maximum	
	inch	mm	inch	mm
Contact Factory	1/4	8	1/2	13
24258	9/16	14	3/4	18

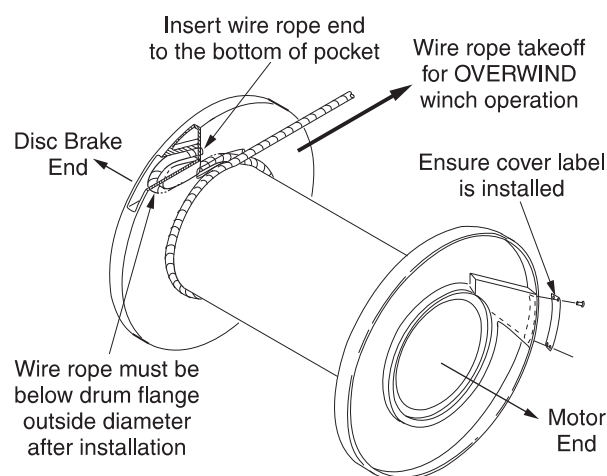
Note: To maintain 5:1 safety factor ratio 9/16 inch (14 mm) wire rope must be used.

Installing Wire Rope

Refer to Dwg. MHP0652 on page 9.

1. Cut wire rope to length and fuse end to prevent fraying of strands in accordance with the wire rope manufacturer's instructions.
2. Feed the end of the wire rope into the wire rope anchor hole in the drum and pull through approximately three feet (1 metre) of wire rope.
3. Forming a large loop with the wire rope, insert the end back into the top of the anchor hole.
4. Place the wire rope wedge into the wire rope anchor pocket in the drum. Install the wedge such that the wire rope will wrap around the wedge as shown in Dwg. MHP0652 on page 9.

Wire Rope Installation



(Dwg. MHP0652)

5. Pull the wire rope into position in the drum anchor pocket. Ensure the wire rope is installed below the edge of the drum flange diameter. Use of a copper drift or similar tool may be required to fully insert wire rope and wedge into the anchor pocket.

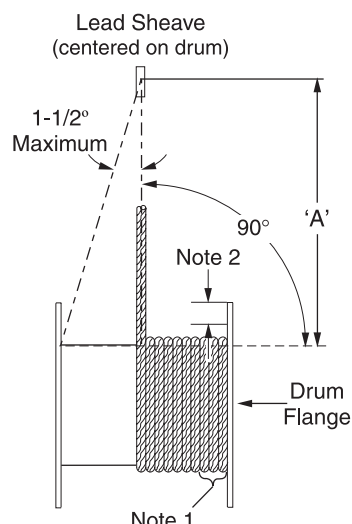
CAUTION

- Make sure first wrap of wire rope is tight and lays flush against drum flange.
- Ensure correct wire rope anchor is used.
- Install wire rope to come off drum in an overwind position. Improper installation of wire rope can result in failure of the disc brake to hold load. Refer to Dwg. MHP0652 on page 9.

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 manufacturers' recommendation on use and maintenance of wire rope.

Wire Rope and Drum Diagram



(Dwg. MHP0498)

'A' = 1.6 feet (0.5 metre) per inch of drum length:

'A' = 19.2 feet (5.85 metres) for 12 inch drum.

'A' = 24.0 feet (7.31 metres) for 15 inch drum.

'A' = 38.4 feet (11.7 metres) for 24 inch drum.

'A' = 43.2 feet (13.2 metres) for 27 inch drum.

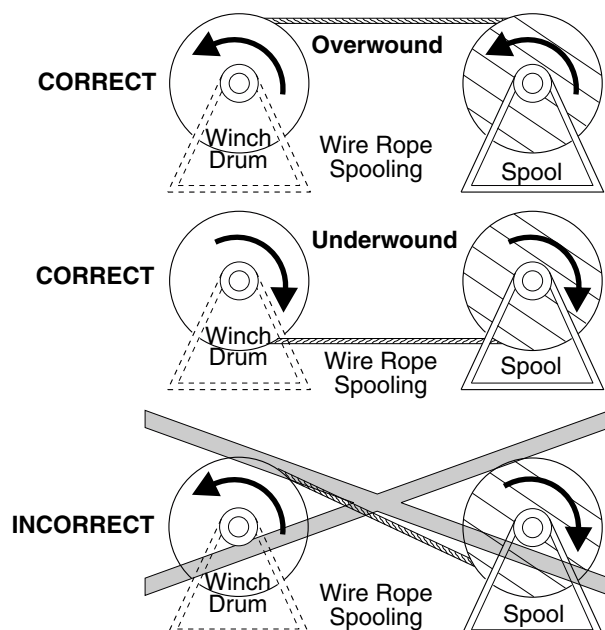
Notes:

1. Maintain a minimum of 3 tight wraps of wire rope on drum at all times.
2. Ensure wire rope does not exceed top layer requirement. Refer to "SPECIFICATIONS" section.
3. If drum is grooved ensure wire rope width is proper size to seat in grooves on last wrap.

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 rewinding apply tension to the end of the wire rope to eliminate line slack. This helps achieve level winding and tight spooling.

Support wire rope spool and have wire rope come off top of spool and over top of winch drum. This will prevent damage to wire rope.



(Dwg. MHP2450)

Rigging

Make sure all wire rope blocks, tackle and fasteners have a sufficient safety margin 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 the 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 10.
5. Always maintain at least three full, tight wraps of wire rope on the drum.

Air Supply

The air supply must be clean, free from moisture and lubricated to ensure optimum motor performance. Foreign particles, moisture and lack of lubrication are the primary causes of premature motor wear and breakdown. Using an air filter, lubricator and moisture separator will improve overall winch performance and reduce unscheduled down time. The air consumption is 700 scfm (20 cu. m/min) at rated operating pressure of 90 psig (6.3 bar/ 630 kPa) at the winch motor inlet. If air supply varies from recommended, then winch performance will change.

Air Lines

The inside diameter of the winch air supply lines must be at least 1-1/2 inch (38 mm). Before 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 air transmission lines and excessive use of fittings, elbows, tees, globe valves etc. cause a reduction in pressure due to restrictions and surface friction in the lines.

Air Line Lubricator

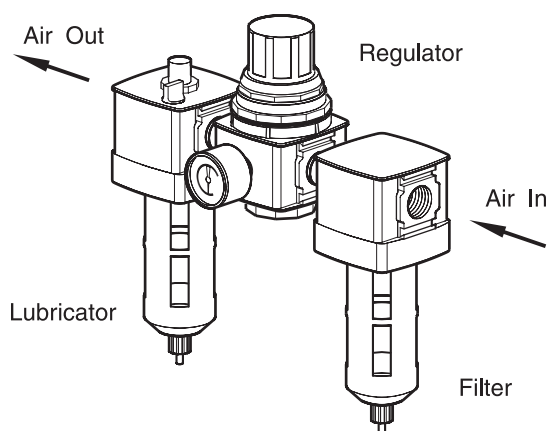
Refer to Dwg. MHP0191 on page 11.

Always use an air line lubricator with these motors. The lubricator must have an inlet and outlet at least as large as the inlet on the motor directional control valve. Install the air line lubricator as close to the air inlet on the motor as possible.



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

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



(Dwg. MHP0191)

Air Line Filter

Refer to Dwg. MHP0191 on page 11.

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

Air Pressure Regulator

Refer to Dwg. MHP0191 on page 11.

If an air pressure regulator is used, install between the lubricator and filter.

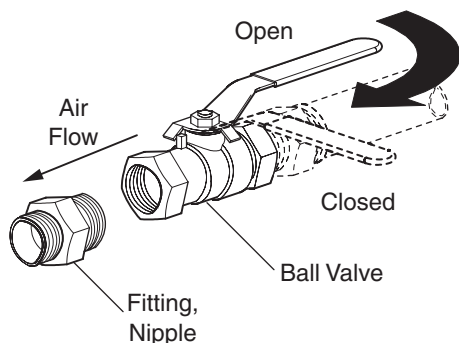
Moisture in Air Lines

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, or an aftercooler at the compressor that cools the air to condense and collect moisture prior to distribution through the supply lines are also helpful.

Ball Valve Shut Off

Refer to Dwg. MHP2459 on page 11.

Install in air supply line upstream of control valve. Ensure ball valve is conveniently located and easily accessible. Advise operators and support personnel of its location and use.



(Dwg. MHP2459)

Description of Part	Part Number
Fitting, Nipple	51704
Ball Valve	71404628

Mufflers (optional feature)

Make sure mufflers are installed in winch exhaust manifold and control valve exhaust ports. An additional muffler is used on winches equipped with an emergency stop and overload device. Check mufflers periodically to ensure they are functioning correctly.

Motor

For optimum performance and maximum durability of parts, provide an air supply of 700 scfm (20 cu. m/m) at 90 psig (6.3 bar/630 kPa). The air motor should be installed as near as possible to the compressor or air receiver. Recommended pressures and volumes are measured at point of entry to air motor directional control valve.

Emergency Stop and Overload System

Refer to Dwg. MHP2434 on page 50.

Air supply line is connected to air control valve. When emergency stop or overload valve is activated, all winch movement will stop.



• If winch continues to move (payout load) after emergency stop activates, brake(s) are not holding load and may require adjustment or repair.

When control valve senses a preset pressure difference between ports, a pilot signal is sent to stop flow of air, all winch movement will stop.

Initial Winch Operating Checks

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

1. When first running the motor inject some light oil into the inlet connection to provide initial lubrication.
2. When first operating the winch it is recommended that the motor be driven slowly in both directions for a few minutes.

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

1. Give the winch an inspection conforming to the requirements of "Winches Not in Regular Use" in the "INSPECTION" section.
2. Pour a small amount of ISO VG 32 (10W) lubricant in the motor inlet port.
3. Operate the 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.

OPERATION

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.

⚠ CAUTION

• To avoid damage to rigging, the structure supporting the rigging and winch, do not “two-block” the end of wire rope.

* Two blocking occurs when the winch wire rope is multi reeved using two separate sheave blocks which are allowed to come into contact with each other during winch operation. When this occurs extreme forces are exerted on the wire rope and sheave blocks which may result in equipment and/or rigging failure.

⚠ WARNING

• The winch is not designed or suitable for lifting, lowering or moving people. Never lift loads over people.

Operators must be physically competent. Operators must have no 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 should have a good attitude regarding safety. It is the operator's responsibility to refuse to operate the winch under unsafe conditions.

Controls

A spring loaded, motor mounted, live air manual throttle control valve is supplied as a standard feature on this winch. Optional remote throttle controls are available. Reference model code on the winch nameplate and compare it to the “SPECIFICATIONS” section on page 5 to determine your configuration. The throttle control provides operator control of the motor speed and direction of drum rotation. Operate winch throttle control using smooth, even movements. Do not slam or jerk throttle controls during operation.

Winch Mounted Control Valve (standard feature)

Refer to Dwg. MHP1809 on page 12.

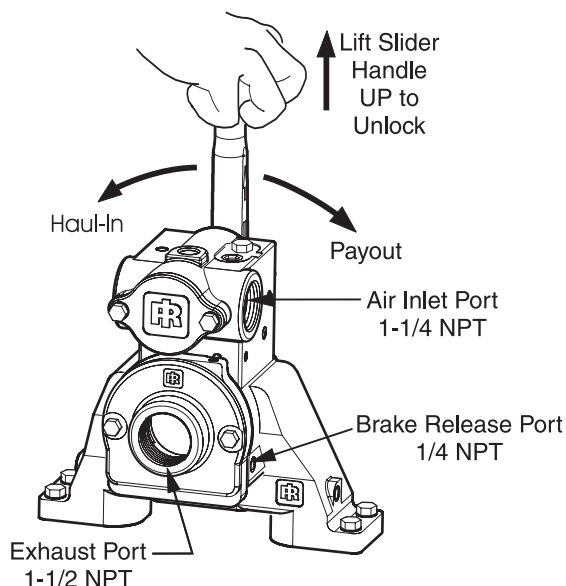
The spring loaded, live air, manual control valve mounts to rotary housing.

To operate control valve, place palm of hand on control knob and wrap fingers around flange of sliding handle. Squeeze fingers, lifting sliding handle up to unlock control lever. Shift control lever in desired direction to payout or haul-in wire rope.

As viewed from air motor end, move control throttle handle to the right (clockwise) to payout wire rope and to the left (counterclockwise) to haul-in wire rope. Avoid sudden movements of control valve to ensure smooth operation of winch.

When released, handle will return to neutral or center position. The sliding handle will drop down to engage and lock control handle in place.

Winch Mounted Throttle Control Valve Operation



(Dwg. MHP1809)

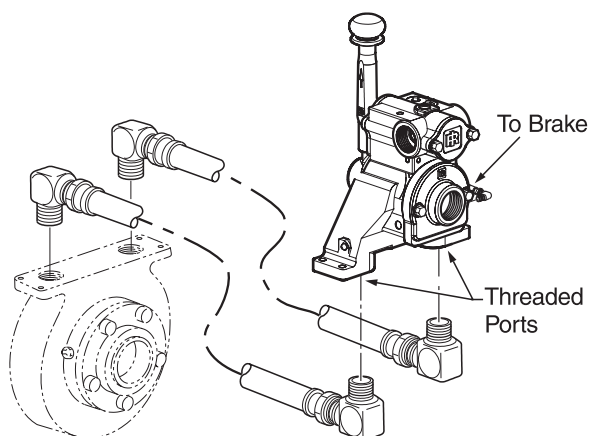
Remote Mounted Control Valve (optional feature)

Refer to Dwg. MHP2043 on page 12.

Provides for remote mounting of winch control at a fixed location at up to 20 feet (6 metres) away from winch motor. Air hoses connect throttle to winch motor to provide winch operation.

Move control throttle handle to the right (clockwise) to payout wire rope and to the left (counterclockwise) to haul-in wire rope. Avoid sudden movements of control valve to ensure smooth operation of winch.

Remote Mounted Control Valve



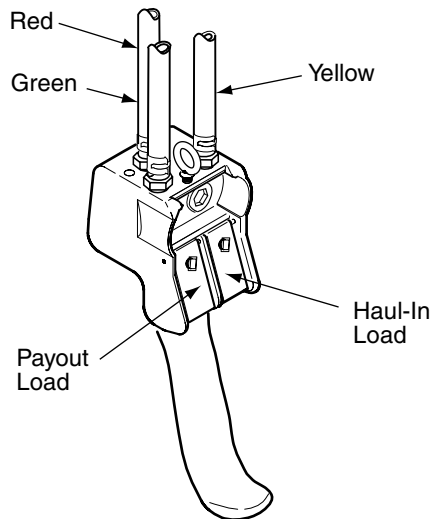
(Dwg. MHP2043)

Remote Pilot Pendant Control (optional feature)

Refer to Dwg. MHP2233 on page 13.

Provides for remote winch control at distances of up to 50* feet (15 metres) away from winch. The pendant pilot control throttle is a two lever movable control station for winch operation. Pilot pressure from pendant pilot control throttle activates winch control valve. The winch control valve, located on winch motor, controls motor speed and direction of drum rotation. Direction of rotation is determined by the pendant lever pressed.

Pendant Hose and Operating Levers



(Dwg. MHP2233)

Press pendant levers using smooth, even movements. To operate winch using pendant:

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

Remote Pilot Lever Throttle (optional feature)

Refer to Dwg. MHP2444, item 358 on page 58.

Provides for remote winch control at distances of up to 50* feet (15 metres) away from winch. The lever pilot control throttle is a fixed mount lever control station for winch operation. Pilot pressure from lever pilot control throttle activates winch control valve. The winch control valve, located on winch motor, controls motor speed and direction of drum rotation. Direction of rotation is determined by direction in which lever is shifted.

* For distances greater than 50 feet (15 metres) contact **Ingersoll-Rand** Technical Support for control suitability.

Underwound Operation (optional feature)

Underwound operation is where wire rope haul-in or payout is off the bottom of drum. This is a special operation and requires a winch specifically designed for this usage.

Underwound operation requires a reverse bias valve installed in the control valve.

Control valve operation will be opposite as shown in Dwg. MHP1809 on page 12. As viewed from air motor end, lift slider handle up to unlock control lever. Move control throttle handle to the left (counterclockwise) to payout, and to the right (clockwise) to haul-in.

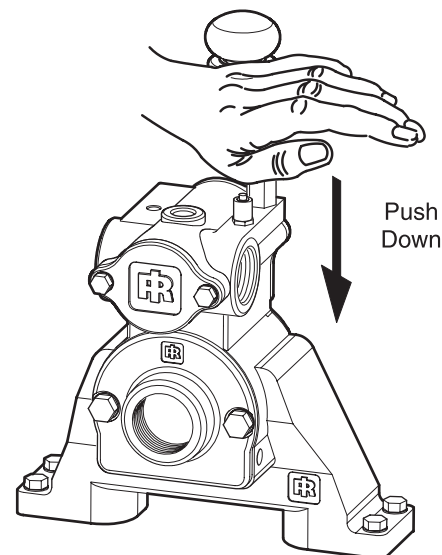
Emergency Stop (optional feature)

Refer to Dwg. MHP2047 on page 13.

Emergency stop device is located on the control valve. When activated, winch drum rotation will immediately cease. To activate emergency stop, conduct the following:

1. Press (push down) red palm valve, located on top of control valve.

Emergency Stop Operation



(Dwg. MHP2047)

NOTICE

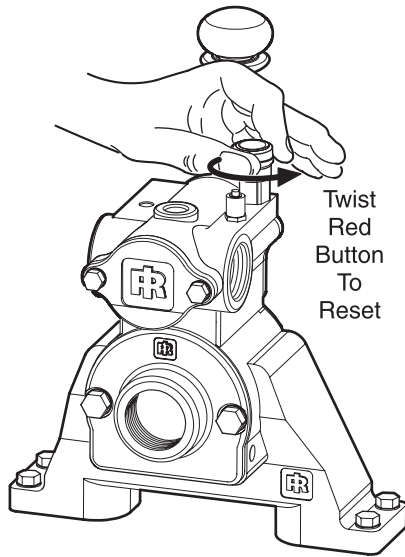
• If winch overload occurs, overload device, if equipped, also stops winch. To operate winch after an overload, reduce load and reset overload.

Emergency Stop Reset

Refer to Dwg. MHP2048 on page 14.

1. Rotate red stop button, in counterclockwise direction until red stop button 'pops' up.
2. Winch is ready to resume operation.

Emergency Stop Reset



(Dwg. MHP2048)

Overload Device (optional feature)

An overload device is available on winches with the emergency shutoff option. Overload device operation is based on differential pressure between air motor inlet and exhaust. The overload device is factory preset to actuate at 150% ($\pm 25\%$) of winch rated capacity. When an overload condition is sensed, the valve poppet closes, to cut off supply air to winch, stopping winch operation. If an overload shutoff occurs, winch load must be reduced. Reset the overload valve and operate winch in payout direction to lower load. Refer to 'Emergency Stop Reset' section on page 13.

Overload Valve Adjustment

Refer to Dwg. MHP2216 on page 14.

5/16 in. or 8 mm open ended wrench required.

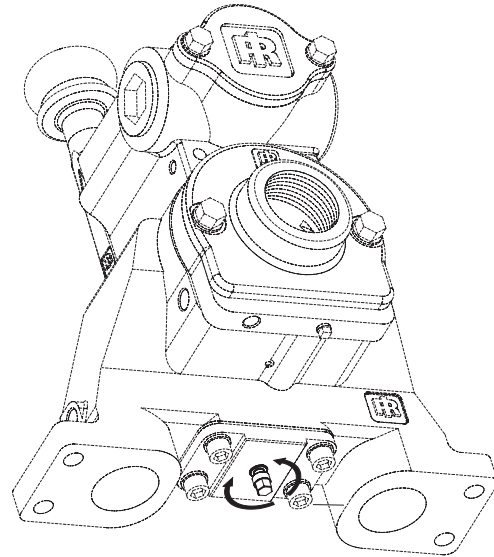
1. Adjust overload valve by turning adjustment screw located at bottom of control valve.
2. Rotating adjustment screw **clockwise will increase** pressure required to activate overload valve.

⚠ WARNING

• This adjustment can cause overload device to **NOT** activate before winch's overload limit is exceeded. This procedure should only be done by personnel trained in testing and servicing this winch.

3. Rotating adjustment screw **counterclockwise will decrease** pressure required to activate overload valve.

Overload Valve Adjustment



(Dwg. MHP2216)

Checking Overload Valve Setting

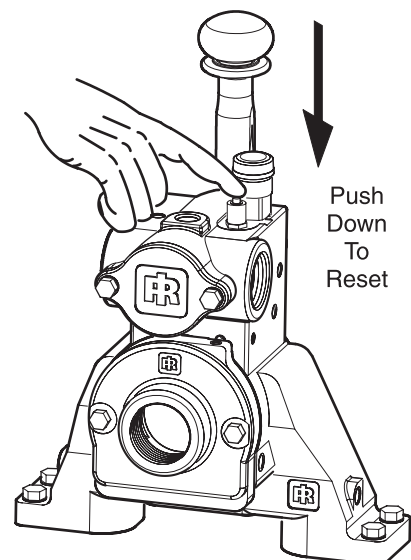
1. Attach load line to a load that is calibrated to maximum load for which winch is rated.
2. Move control lever to haul-in position. If winch does not lift load, adjust the adjustment screw. Refer to 'Overload Valve Adjustment' section on page 14.

Setting the Overload

Attach load line to a load that is calibrated to 150% of winch rated capacity. Shift control lever to haul-in position.

1. If overload valve activates, reset overload valve. Winch is ready for normal operation.
2. If winch lifts load, lower load. Turn adjustment screw counterclockwise in 1/4 turn increments until overload valve activates when control lever is shifted to haul-in position. After each 1/4 turn, retest winch.

Overload Valve Reset



(Dwg. MHP2049)

Winch Brakes

Automatic Disc Brake

The automatic disc brake is spring applied, air released. When the winch is operated in payout direction, air pressure acting on the diaphragm overcomes spring pressure and releases brake. The brake automatically engages when winch operation is returned from payout direction to neutral or when shifted to haul-in direction. When winch is in neutral or haul-in positions the brake air is vented and brake springs apply the brake. The springs, acting on the pressure plate, compress brake friction and separator plates and engage brake to prevent drum rotation in payout direction. The cam type sprag clutch assembly allows drum rotation in haul-in direction with brake plates engaged, but prevents drum from rotating in payout direction.

A minimum air pressure of 25 psi (1.72 bar/172.4 kPa) is required to release brake.

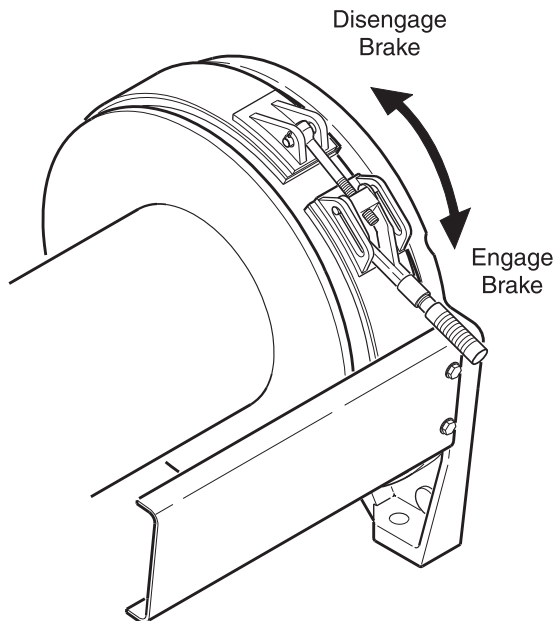
Disc brake adjustment is not required. If disc brake does not operate properly it must be disassembled, inspected and repaired.

Manual Drum Brake (optional feature)

Refer to Dwg. MHP1375 on page 15.

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

Drum Brake Handle Operation



(Dwg. MHP1375)

Automatic Drum Brake (optional feature)

The automatic drum brake is a spring applied, air released, externally mounted brake which uses an air actuated, spring loaded cylinder to automatically disengage the brake when the motor is operated in either the haul-in or payout directions. Air pressure directed to the cylinder overcomes spring pressure 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 automatically 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' in the "MAINTENANCE" section. If brake band cannot be adjusted to hold rated load, the brake must be disassembled, inspected and repaired.

Constant Tension Manifold (optional feature)

Refer to Dwg. MHP2436 on page 52.

With auxiliary valve (744) in the 'NORMAL' position, the winch control valve will provide normal winch operation. With auxiliary valve selector in the 'TENSIONING' position, the winch will automatically haul-in wire rope to maintain tension.

The auxiliary valve provides a preset air pressure to the air motor and disc brake. This allows the brake to be released, and winch to over haul during 'TENSIONING' operations. In this position the winch will maintain a constant tension on the wire rope.

The auxiliary valve comes set at zero from the factory. All adjustments must be made in the field. These adjustments can be changed at any time to accommodate the current load. Refer to 'Adjustments' in the "MAINTENANCE" section for procedures.

Operation

Place auxiliary valve in 'NORMAL' position and use winch control to position the end of load line at the load. Connect load line to the load and use winch control to remove all slack from the load line.

CAUTION

• Ensure slack load line is taken up by operating winch control valve with selector in NORMAL position. If selector lever is placed in TENSION position the winch will immediately attempt to establish line tension causing line to 'snap' resulting in injury or damage to property.

Actuate auxiliary valve to 'TENSIONING' position. Winch will automatically haul-in to maintain tension on load line.

Free Spool (optional feature)

Refer to Dwg. MHP2414 on page 61.

The Free Spool option allows wire rope to be spooled from the drum without operating winch motor.

During normal winch operations the free spool is in non-free spool position. The output shaft connects outboard upright to drum. The free spool handle is in the 'DOWN' position.

⚠ WARNING

• To avoid damage to mounting structure and winch, the winch drum must be stationary and there must be no load on wire rope during Free Spool operation.

Free Spool Position:

1. Engage drum band brake to lock drum in position.
2. Pull handle (512) out.
3. Rotate handle (512) counterclockwise, 180° to the 'UP' position.
4. Release handle. Ensure handle is engaged in slots in detent plate (514).

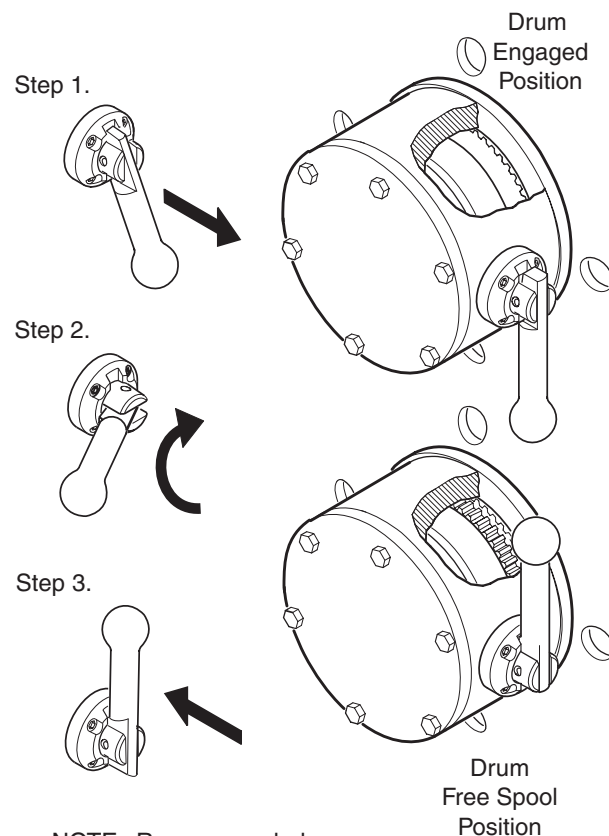
The drum is now in free spool. During free spool operations use drum band brake to control drum speed during wire rope payout.

Non Free Spool Position:

Before operating winch with motor, ensure winch is not in free spool mode.

1. Engage drum band brake.
2. Pull handle (512) out.
3. Rotate handle clockwise, 180° to the 'DOWN' position. This connects winch drum to outboard upright. If required, band brake can be released and drum slowly rotated by hand to assist in lining up output shaft (28) splines with upright.
4. Release handle. Ensure handle is engaged in slot in detent plate (514).

Free Spool Operation



NOTE: Reverse procedure before operating winch.

(Dwg. MHP1322)

INSPECTION

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

⚠ WARNING

• All new, altered or modified 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 the 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 the 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 Reports

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 the 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. 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 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 the 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. **CONTROLS.** During operation of winch, verify response to control is quick and smooth. 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 the drum smoothly.
7. **LUBRICATION.** Refer to "LUBRICATION" section for recommended procedures and lubricants.
8. **PENDANT (optional feature).** Ensure operation of pendant levers is smooth and that winch is responsive to pendant control. Pendant levers must spring return to neutral position when released.
9. **MANUAL THROTTLE LEVER.** Ensure operation of manual throttle lever is smooth and winch is responsive to lever movement. Lever must return to neutral and lock in place when released. If winch responds slowly or controls stick, do not operate winch until all problems have been corrected.
10. **MOTOR.** During operation check motor housing for excess heat build up. Housing should not be hot to touch. Listen for grinding or knocking noises. Ensure lubricated air supply provides 6 to 9 drops per minute of ISO VG 32 (SAE 10W) oil when winch is operated at rated capacity. Operate winch slowly in both directions to verify operation.

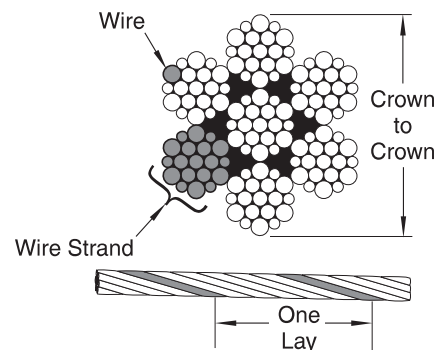
Periodic Inspection

Periodic inspection intervals for winch use under various conditions is 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 the "MAINTENANCE" section. Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection.' Also inspect the following:

1. **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 the diameter of the wire rope from crown-to-crown throughout the life of the wire rope. Recording of the actual diameter should only be done with the wire rope under equivalent loading and in the same operating section as accomplished during previous inspections. If the actual diameter of the wire rope has decreased more than 1/64 inch (0.4 mm) a thorough examination of the wire rope should be conducted by an experienced inspector to determine the suitability of the wire rope to remain in service. Refer to Dwg. MHP0056 on page 17.



(Dwg. MHP0056)

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

6. **BRAKES.** Individually test brakes installed to ensure proper operation. Brakes must hold a **125% rated load** at mid drum without slipping. If indicated by poor operation or visual 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 the "MAINTENANCE" section. If brake band cannot be adjusted to hold rated load, replace the brake band assembly. Adjustments cannot be made to the disc brake. The disc brake must be repaired as described in the "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** (optional feature). Verify fasteners are tight and in good condition. Ensure guard is in good condition.
10. **EMERGENCY STOP VALVE** (optional feature). During winch operation verify the emergency shut-off valve operation. Valve must stop winch operation quickly. Valve must reset properly. Refer to 'Emergency Stop Valve' in the "OPERATION" section for procedures.

11. **OVERLOAD DEVICE** (optional feature). Ensure overload device is properly set to stop the winch when loads exceed 150% (+/- 25%) of winch rated capacity. If winch does not shut down, contact your distributor or the factory for repair information.

<h3>Winches Not in Regular Use</h3>

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' 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 the requirements of 'Periodic Inspection' before being placed in service.
3. Standby equipment shall be inspected at least semiannually in accordance with the requirements of 'Frequent Inspection'. In abnormal operating conditions equipment should be inspected at shorter intervals.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand Force 5 Series FA5A Air Winch

Model Number:			Date:		
Serial Number:			Inspected by:		
Reason for Inspection: (Check Applicable Box)					
<input type="checkbox"/>	1. Scheduled Periodic Inspection: (____ Quarterly ____ Semiannually ____ Yearly)	Operating Environment: Normal: ____ Heavy: ____ Severe: ____			
<input type="checkbox"/>	2. Discrepancy(s) noted during Frequent Inspection				
<input type="checkbox"/>	3. Discrepancy(s) noted during maintenance				
<input type="checkbox"/>	4. Other: _____				
Refer to the Parts, Operation and Maintenance Manual "INSPECTION" section for general inspection criteria. Also, refer to appropriate National Standards and Codes of practice. If in doubt about an existing condition, contact the nearest Ingersoll-Rand Distributor or the factory for technical assistance.					
COMPONENT	CONDITION		CORRECTIVE ACTION		NOTES
	Pass	Fail	Repair	Replace	
Uprights and Side Rails					
Drum Band Brake (125% Load Test)					
Disc Brake (125% Load Test)					
Drum Band Brake (Visual Inspection)					
Disc Brake (Visual Inspection)					
Motor					
Controls					
Air System					
Fasteners					
Reduction Gears					
Labels and Tags			---		
Shafts					
Drum Guard					
Wire Rope Wedge			---		
Emergency Stop Valve					
Overload Device			---		
Wire Rope			---		
Other Components (list in NOTES section)					

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

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

This form 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.
	Emergency Stop Valve engaged.	Reset Emergency Shut-off valve.
	Shipping plugs may still be in place.	Remove shipping plugs in valve.
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. Refer to "MAINTENANCE" section on page 24.
	Winch motor controls sticking.	Check pendant/throttle levers spring return to normal (neutral) position when released.
	Winch is overloaded.	Reduce load to within rated capacity.
Winch does not lift/pull load.	Motor may be damaged.	Remove and disassemble motor. Examine all parts and replace any that are worn or damaged.
	Winch is overloaded.	Reduce load to within rated capacity.
	Insufficient air supply.	Verify air supply pressure and volume at winch inlet meets the requirements. Refer to "SPECIFICATIONS" section on page 5. Clean air line filter.
Throttle lever or pendant lever moves but winch does not operate.	Motor may be damaged.	Disassemble and clean the motor and replace any broken or damaged parts.
	Insufficient air supply.	Ensure the air pressure at the winch inlet is at least 90 psig (6.3 bar/630 kPa) at rated volume. Clean air line filter.
	Air leak.	Check hose and fitting connections. Inspect hose(s) for breaks. Tighten fittings and repair or replace hoses as necessary.
	Emergency Stop Valve engaged.	Reset Emergency Shut-off valve.
Motor runs hot or makes excessive noise during operation.	Low oil level.	Check oil levels in the motor. Add oil as required to obtain the proper level.
	Improper lubrication.	Replace oil with type recommended in "LUBRICATION" section on page 21. Set lubricator to provide 6 to 9 drops of oil per minute at maximum winch operating capacity.
	Water in oil.	Drain and refill with recommended oil. Operate winch with no load slowly, in both directions. If noise still exists or motor overheats disassemble and repair motor.
	Damaged or broken piston or connecting rod.	Disassemble and repair motor.
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) not releasing.	Refer to brakes in "MAINTENANCE" section on page 24.
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.
Throttle lever hard to actuate, or lever does not spring return to neutral.	Valve body sticking in bushing.	Lubricate valve through grease fitting with recommended lubricant. Refer to 'Air Throttle' on page 22 in "LUBRICATION" section.

TROUBLESHOOTING (CONTINUED)

Automatic Band Brake:

Brake cylinder will not release.	Band brake out of adjustment.	Adjust band brake to maintain correct cylinder stroke.
	Leaking cylinder seals.	If air is noticed escaping from cinder breather when attempting to release brake, replace or repair cylinder.
	Dirty filter in air supply.	Clean or replace filter.
	Faulty dump valve.	Check dump valve exhaust port. Air should exhaust when control valve handle is neutral. If no air escapes, replace dump valve.

Automatic Disc Brake:

Brake fails to release.	Low air supply pressure.	Ensure air pressure at inlet to disc brake is at least 50 psig (3.4 bar/340 kPa).
	Leaking piston seals.	Inspect brake breather. If air escapes from brake breather when attempting to release brake, replace brake seals.
	No release pressure at brake port.	Check for proper operation of winch controls.
	Sticking brake piston.	Apply 50 psig (3.4 bar/340 kPa) to brake release port and check for brake disc movement. (Brake discs can be viewed through brake breather hole.) If brake discs do not move, disassemble and inspect disc brake as described in "MAINTENANCE" section.

LUBRICATION

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

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 performance of winch. 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 the winch and its associated components.

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

Note: Intervals are based on winch operation in a normal environment as described in "INSPECTION" section. In 'Heavy' or 'Severe' operating conditions adjust lubrication intervals accordingly.

General Lubrication

1. Drain and replace oil in the motor, disc brake and reduction gear after the first 50 hours of initial winch operation. Thereafter, drain and replace oil according to intervals recommended.

2. Always inspect removed oil for evidence of internal damage or contamination (metal shavings, dirt, water, etc.). If indications of damage are noted, investigate and correct before returning winch to service.
3. After winch operation, allow oil to settle before topping off.
4. Always collect lubricants in suitable containers and dispose of in an environmentally safe manner.

Reduction Gear and Disc Brake Lubrication

Refer to Dwg. MHP0501 on page 22.

The reduction gear and disc brake are filled and shipped with oil from the factory. Check oil level before initial winch operation. These components are splash lubricated by the oil in the housing 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 down time for repairs. Oil capacity is approximately 3 quarts (2.8 litres). Oil from the reduction gear assembly also provides lubrication for the disc brake.

On winches equipped with a disc brake, the reduction gear is vented through the disc brake breather plug.

Recommended Lubricant

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

* Units are shipped from factory with ISO VG 100 (SAE 3 EP) lubricant. Reduction Gear capacity is approximately 3 quarts (2.8 litres).

Recommended Grease

Temperature	Type Grease
-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

Reduction Gear and Disc Brake Fill and Drain Procedures

Refer to Dwg. MHP0501 on page 22.

To Fill:

1. Rotate the winch drum to align the reduction gear plugs to the fill position. Fill plug position is at top center.
2. Remove the fill plug on the reduction gear and the level plug on the disc brake housing. Fill slowly until oil flows from the disc brake level plug hole.
3. Reinstall the plugs.

NOTICE

• Depending on ambient temperature it may take several minutes for oil to flow from the disc brake level plug hole. Wait 10 minutes after oil starts to flow from level plug hole before reinstalling plug fittings.

CAUTION

• Do not over fill. 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 Extreme Pressure (EP) rust and oxidation inhibiting lubricant.

To Drain:

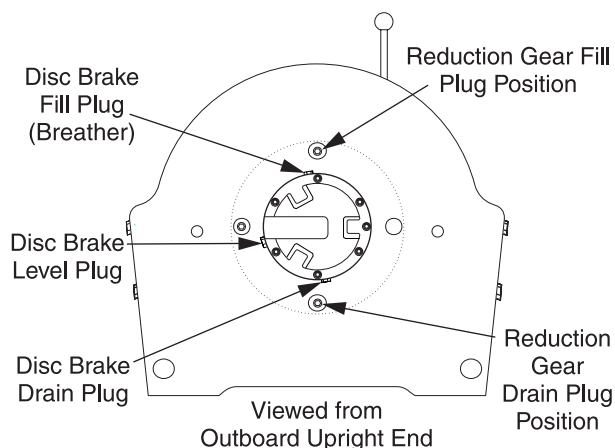
1. Rotate the winch drum to align the reduction gear plugs to the drain position. Drain plug is located at bottom center.
2. Remove the reduction gear drain plug and install long pipe nipple threaded at one end to 3/8-18 NPT. Remove drain vent plug. Remove the disc brake drain plug.

NOTICE

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

3. Collect the drained oil and dispose of properly. If replacing oil, refer to 'To Fill' instructions. Reinstall the reduction gear and disc brake plugs.

Oil Fill and Drain Plug Locations



(Dwg. MHP0501)

Motor

Refer to Dwg. MHP2126 on page 22.

The motor is splash lubricated by oil in the motor housing and has no other means of lubrication. It is therefore important to use only high quality rust and oxidation inhibiting lubricant to ensure maximum performance and minimum downtime for repairs. Refer to 'Recommended Motor Lubricant' table on page 22.

Oil capacity for the winch motor is 3 quarts (2.8 litres). Add oil through the filler opening until oil flows from the level plug hole. Add oil slowly to prevent spilling.

The motor should be level-checked daily or at the start of each shift after any accumulated water has been drained off. When motors are operated in temperatures below freezing, wait long enough at end of shift for water to separate from oil but not long enough for it to freeze. Drain the water then refill to the level plug located on side of motor housing. If desired, all the oil may be drained at the end of the shift and the motor refilled with new oil.

Recommended Motor Lubricant

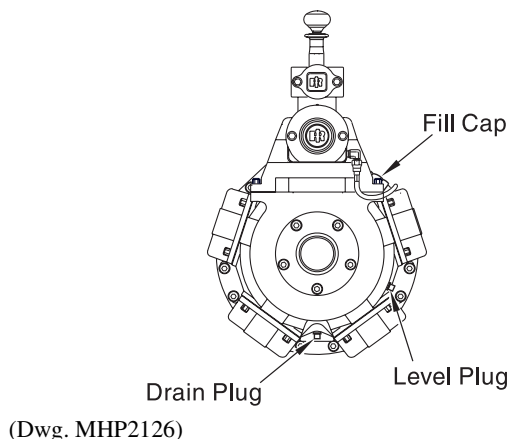
Temperature	Recommended Viscosity
Under 32° F (0° C)	ISO VG 46 (SAE 10W)
32° to 80° F (0° to 27° C)	ISO VG 68 (SAE 20W) *
Above 80° F (27° C)	ISO VG 100 (SAE 30W)

* Units are shipped from factory with ISO VG 68 (SAE 20W) lubricant. Motor oil capacity is approximately 3 quarts (2.8 litres).

NOTICE

• DO NOT use synthetic lubrication in air motor. Synthetic lubricants will cause oil to blow by piston.

Motor Lubrication Locations



Motor Fill and Drain Procedures

Refer to Dwg. MHP2126 on page 22.

To Fill:

1. Remove fill cap and level plug. Fill with oil slowly until oil drains from level plug hole.



• **Do not over fill. 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 motor. Use only high quality rust and oxidation inhibiting lubricant.

To Drain:

1. Remove lower case drain plug in motor housing. Loosen fill cap to vent the motor housing.

Air Throttle Control Valve

The control valve is lubricated through the lubricator filter. It is not necessary to lubricate control valve, maintain proper levels on lubricator.

Wire Rope

Follow the 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 the surface of the wire rope.



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

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

Seals and Bearings

If winch is disassembled, clean all parts thoroughly and coat bearings and seals with clean grease. Refer to the 'Recommended Lubricants' section. Use sufficient grease to provide a good protective coat.

MAINTENANCE

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.)**
- **Shut off air system and depressurize air lines before performing any maintenance.**

Maintenance Intervals

The Maintenance Interval chart is based on intermittent operation of winch eight hours each day, five days per week. If winch operation exceeds eight hours per day, or use is under HEAVY or SEVERE conditions, more frequent maintenance should be performed. Refer to 'Periodic Inspection' on page 17 in "INSPECTION" section for interval guidance.

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

Reduction Gear Assembly

It is recommend that the first oil change be done after approximately 50 hours initial operation. Always inspect removed oil for evidence of internal damage (metal shavings, dirt, water, etc.). Refer to the "LUBRICATION" section for recommended lubricants.

Thermoplastic Coating

Thermoplastic coating is an extremely tough and durable coating designed to take the toughest treatment without chipping or peeling. Special steps must be taken to protect the coating when parts are removed, replaced and if excessive environmental or operational conditions have damaged the coating.

Cleaning Parts

The area to be coated must be clean and free from loose coating. Remove any surface corrosion. To paint thermoplastic coated parts, the parts must be sand blasted in order to 'rough up' the surface for proper paint adhesion. Sand blasting will not remove thermoplastic coating (abrasive material will bounce off).

Loose coating can be removed by cutting with a sharp cutting tool (chisel, putty knife or knife).

Heat Source

WARNING

- **When using an open flame be aware of the materials around the work area. Some solvents, lubricants and materials are extremely flammable.**
- **Drain all components of lubricants, water or any other fluids. Remove, or open all vents and drains. Components will be hot and may discharge hot fluids or gases. Allow sufficient time for components to cool, or cool off components, prior to handling. Gaskets, seals, 'O' rings, and any components that may be damaged should be removed prior to applying coating.**

Thermoplastic coating is heat applied. The surface of the component to which the thermoplastic coating is being applied must be maintained at a temperature of at least 150° F (66° C), but not over 170° F (77° C). Optimum temperature is 300° F (149° C) for best results. A small propane torch (**Ingersoll-Rand** Part No. 71308886) or heat gun (**Ingersoll-Rand** Part No. 71308894) can be used.

NOTICE

- **When using a heat source always keep it moving. Small circles work best. Failure to do so will result in a scorched area at the repair.**

The choice of heat gun or propane torch depends on the size of the area to be coated and the amount of time available to accomplish the task. The propane torch heats the surface faster, but is hard to control and can scorch the coating. The heat gun is slower, easier to control and generally results in a better looking finish.

Repairing Surfaces

For minor repairs to the thermoplastic coating conduct the following:

1. If the under laying surface is not corroded and the scratch is less than 1/16 inch (1.6 mm) wide the surrounding thermoplastic coating can be heated until the material flows together. For clean surfaces with damage greater than 1/16 inch (1.6 mm) heat the area and then apply thermoplastic coating powder (**Ingersoll-Rand** Part No. 71308902 [2 oz. (56.7 g)] to fill the area. Continue heating until coating liquefies and flows together with the existing coating.
2. Corrosion in damaged area must be removed. Sandblast or wire brush the area to remove corrosion. If corrosion exists, ensure the corrosion has not penetrated below the surface of existing thermoplastic coating. This can usually be easily determined by checking to see if the coating is loose around

the corroded area. Cut away coating as necessary to expose corrosion for removal. If the damaged area is less than 1/16 inch (1.6 mm) wide the surrounding thermoplastic coating can be heated until the material flows together. For surfaces with damage greater than 1/16 inch (1.6 mm) heat the area and then apply thermoplastic coating powder (**Ingersoll-Rand** Part No. 71308902 [2 oz. (56.7 g)]) to fill the area. Continue heating until coating liquefies and flows together with the existing coating.

3. Allow the repaired area to cool. Quenching with water is acceptable. Inspect the repair. Rough spots, minor scorching and excess coating deposits can be wet sanded to remove the imperfections. To return the gloss finish, reheat the surface carefully.

For large bare surfaces or new parts:

1. Coating these components can be done more economically and with better end results by using an electrostatic powder application process or flamespray process. Contact **Ingersoll Rand** Technical Assistance for more information.

For specific disassembly and assembly information refer to 'Assembly' or 'Disassembly' in the "MAINTENANCE" section.

Adjustments

Disc Brake

Brake adjustment is **not** required. If the disc brake does not hold rated load, disassemble and repair.

NOTICE

• **Winches are provided with a breather plug located at the top of the disc brake housing. If the brake assembly is removed or repaired ensure the breather is installed and located at the top of the brake housing during reassembly.**

Manual Drum Band Brake (optional feature)

Refer to Dwg. MHP1448 on page 44.

1. Release wire rope tension on the drum.
2. Raise handle (135) to free brake bands (136) and (137).
3. Remove cotter pin (139) and pin (138).
4. Rotate brake link stud (141) clockwise to increase brake torque.
5. Install pin (138) and check adjustment.

NOTICE

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

6. Adjust brake so when brake handle locks (goes over-center), brake will hold rated load.
7. Install cotter pin (139) and bend ends apart when adjustment is complete.

For new Brake Linings:

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

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

CAUTION

• **Observe end of load line. Drum should only complete 3-5 full rotations before stopping.**

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

Automatic Drum Band Brake (optional feature)

Refer to Dwg. MHP2433 on page 45.

For adjustments described in the following text, references to "clockwise" and "counterclockwise" directions refer to directions as viewed from the head end of capscrew (120).

NOTICE

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

1. Loosen jam nut (117) closest to plunger (114).
2. Adjust band assembly using capscrew (120).
 - a. To loosen band brake, turn capscrew (120) in a counterclockwise direction.
 - b. To tighten band brake, turn capscrew (120) in a clockwise direction.

NOTICE

• **If capscrew (120) is not accessible, jam nut (117) [located closest to the head of capscrew (120)] may be used to adjust band brake. Ensure capscrew turns with nut.**

3. When adjustments are complete tighten jam nut (117) closest to plunger (114).

Pilot Air Control Valve Adjustment (optional feature)

Refer to Dwg. MHP2416 on page 48.

If winch operating speeds differ from performance specifications pilot air control valve may require adjustment.

1. Loosen nut (264) and adjust adjusting screw (270), located in valve cap end (268), until drum speed for no-load haul-in equals drum speed for full load payout.
2. Rotate screw (270) 'out' to increase drum speed and 'in' to decrease drum speed. It is suggested that a chalk mark be placed on drum flange so that drum rpm can be accurately counted.

Constant Tension Manifold (optional feature)

Refer to Dwg. MHP2416 on page 48.

The regulator is preset at 0 psig (0 bar/0 kPa), therefore requires adjustment when winch is installed. To adjust for specific load applications, regulator pressure may be adjusted to increase or decrease tension setting.

Regulator gauge and regulator are accessible through cover.

WARNING

• **When adjusting regulator, ensure winch control lever is locked in neutral position and tension selector lever is in the NORMAL position.**

• **Winch supply air is NOT turned off during regulator adjustments. To prevent accidental winch operation, allow only a single person, trained in operation, safety and maintenance of this product, to conduct regulator adjustments.**

Regulator Adjustment Procedure:

Refer to Dwg. MHP2416 on page 48.

1. Attach test load of desired weight to load line, or connect load line to scale.

⚠ WARNING

• **Ensure load line is connected to load and excessive slack is taken up before activating auxiliary valve. When activated, auxiliary valve will automatically engage and winch will operate at full speed to set tension on load line.**

2. With winch control valve remove all slack from load line.

Setting with test load:

1. Actuate auxiliary valve to TENSIONING position. Winch should operate, causing load line to become taut. To increase tension, turn regulator knob clockwise until load begins to rise. Turn regulator knob counterclockwise a minimum of ¼ turn, or until load is balanced (does not raise or lower). Note pressure indicated on gauge for future setting reference.

Setting with scale:

1. Actuate auxiliary valve to TENSIONING position. Winch should operate, causing load line to become taut. To increase tension, turn regulator knob clockwise until scale indicates desired tension. Note pressure indicated on gauge for future setting reference.

Disassembly

General Disassembly Instructions

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

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 the winch any further than is necessary to accomplish the 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 the 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 the work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals and 'O' rings should be discarded once they have been removed. New seals and 'O' rings should be used when assembling the winch.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members, machined surfaces and housings.

7. Do not remove any part which is a press fit in or on a subassembly unless the 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 the bearing with a sleeve slightly smaller than the outside diameter of the bearing. 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.

Thermoplastic Coated Parts Disassembly

Thermoplastic coating on capscrew heads, nuts, housings and other components can be removed as follows:

⚠ CAUTION

• **Separate parts using proper tools. Ensure machined surfaces are not damaged during disassembly.**

1. Fasteners:
 - a. Push tool into or over fastener, forcing coating off of the fastener.
 - b. If coating is too thick, then heat the fastener to soften coating. Socket or wrench will push softened coating off, allowing removal of part.
 - c. For socket head capscrews, setscrews, etc., heat the component until coating is softened. Use a small screwdriver or similar tool to remove coating to allow access for wrench.
2. For housings, plates and other coated mating components use a sharp knife or similar tool to cut through coating around mating area of components.

Drum Guard Disassembly (optional feature)

Refer to Dwg. MHP0658 on page 62.

1. Remove capscrews (592).
2. Remove brackets (591) or (595) by sliding out of drum guard (590).
3. Remove 'O' rings (109) and discard.
4. Carefully remove drum guard (590) from rear (drum brake side) side rail (65). The drum guard attaches to side rail using tabs. The smaller, upper tabs are visible on top of the side rail. The longer, lower tab is located beneath side rail edge. During removal care must be taken not to bend tabs. To correctly remove, at the point where drum guard and side rail meet, push or tap lower portion of drum guard in towards winch drum (62). The direction of force should be directly away from side rail. Do not pull up or down as tabs may become deformed.

Winch Disassembly

Refer to Dwg. MHP0649 on page 38 and MHP0690 on page 40.

1. Remove the wire rope from the drum. Remove wire rope anchor (63) and store for reassembly.
2. Relieve pressure in air lines and winch air components 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 air lines.
4. To drain oil refer to “LUBRICATION” section.
5. Remove capscrews and nuts securing winch to its foundation and move to a suitable work area before beginning disassembly.

WARNING

• **The air motor weighs approximately 260 lbs. (118 kg). Adequately support air motor before removing motor mounting capscrews.**

6. Remove the ten capscrews (197), lockwashers (196), securing the motor assembly to the motor adapter (71). Using a hoist to support the motor, pull the motor straight away from the winch. Refer to the ‘Motor Disassembly’ section if motor disassembly is required.
7. Remove drive shaft (61) and coupling (60).
8. If equipped, disconnect drum band brake as described below.

Manual Drum Brake:

Refer to Dwg. MHP1448 on page 44.

- a. Remove cotter pin (144) and pin (138).
- b. To disassemble further, refer to ‘Manual Band Brake Disassembly’ on page 29.

Automatic Drum Brake:

Refer to Dwg. MHP2433 on page 45.

- a. Remove capscrews (101), spacers (102) and (103).
 - b. Remove and save spacer (105).
 - c. Loosen two nuts (117).
 - d. Remove capscrew (120), pivot bar (119) and nuts (117).
 - e. To disassemble further, refer to ‘Automatic Band Brake Disassembly’ on page 29.
9. Remove drum guard and any other externally mounted winch attachments. Refer to applicable sections for disassembly instructions.

CAUTION

• **There are a total of eight capscrews securing the brake cover to the brake housing. Two of these capscrews (41) hold the brake assembly together, but do not attach to the outboard upright. One capscrew attaching the brake assembly is located directly beneath the brake air line fitting connection; the other is located 180 degrees from the air fitting. The heads of these two capscrews sit deeper into the counterbores of the brake cover. Do not remove these two capscrews (41) until the brake has been separated as an assembly from the winch and the directions in the ‘Disc Brake Disassembly’ section have been reviewed.**

10. Disconnect and remove brake hose (75). Remove six capscrews (1) attaching disc brake assembly to outboard upright (26). Remove disc brake assembly by tapping around housing with a soft hammer or mallet while pulling out and away from upright in a horizontal direction. Remove dowel pin (20) and store until reinstallation. To further disassemble the disc brake assembly, refer to Dwg. MHP1230 on page 42 and the ‘Disc Brake Disassembly’ section.
11. Using a hoist to support the drum, remove side rails (65), one at a time, by removing four capscrews (66) attaching each side rail to uprights (26) and (68).
12. Remove the inboard (motor end) upright (68) by pulling straight away from drum (62) in a horizontal direction. Remove oil seal (29) and bearing (30) from upright. Discard oil seal. Discard bearing if inspection indicate replacement.

13. Remove capscrews (33) and cover (72) from drum if not equipped with a band brake.
14. Outboard upright (26) removal:
 - a. For units **without** disc brake: remove cover (2) by removing six capscrews (1). Pry cover and gasket (18) from upright. Pull upright away from drum (62) in a straight horizontal direction. Remove output shaft (28), oil seal (29) and bearing (30) from upright. Discard oil seal. Discard bearing if inspection indicates replacement. Note the condition of capscrews (27) located in output shaft. Note positions for reinstallation.
 - b. For units **with** a disc brake: pull upright away from drum (62) in a straight horizontal direction. Remove output shaft (28), oil seal (29) and bearing (30) from upright. Discard oil seal. Discard bearing if inspection indicates replacement.

CAUTION

• **Ensure the reduction gear oil is drained before disassembly and that the drain and fill plugs are removed. When using jacking bolts, ensure the cover lifts evenly by turning bolt one full turn and then repeating on the other bolt. If cover jams, remove jacking bolts and gently tap around the cover to reseal it before starting over. Careful prying of the cover along its diameter during jacking, using a soft material wedge, to guide the cover is acceptable. Care must be taken not to scar, gouge or damage the machined finishes on the cover and the reducer housing mating surfaces during parts separation.**

15. Stand drum on end with reduction gear on top. Remove reduction gear assembly from drum (62) by removing six capscrews (33) attaching end cover (34) to drum. Screw two 7/16 - 20 UNF x 1-1/2 inch capscrews into the threaded holes in cover (34). Turn both screws evenly until cover is separated from housing. Remove cover.
16. Screw two 1/2 - 13 UNC x 1-1/2 inch capscrews into the threaded holes in the reducer housing (48). Turn both screws evenly until housing is separated from drum. Attach suitable lifting eyes to the capscrews and remove housing from drum.
17. To further disassemble reduction gear refer to ‘Reduction Gear Disassembly’ section.

K5C2-X Control Valve Disassembly

Refer to Dwg. MHP2427 on page 46.

Handle Removal

If handle is not damaged it is not necessary to disassemble completely.

1. Carefully pry off plug (935).
2. Remove capscrew (901) and tab lock washer (909).

NOTICE

• **Observe spring (937) connection during disassembly. This spring is under tension and is required to return handle to neutral position.**

3. Carefully pull handle assembly (930) from reverse valve (943). Remove spring (937).

Reverse Valve Removal

1. Remove capscrews (938), (925) and washers (924) from seal bracket (939). Remove seal bracket from housing. Remove and discard 'O' rings (941) and (942).
2. Remove capscrews (901) and washers (902) from exhaust flange (955). Remove flange from housing. Remove and discard 'O' ring (942).
3. Move reverse valve (943) out exhaust flange side of housing until ball (916) is visible on reverse valve. Allow ball (916) to drop out of bushing (944) and remove ball (916).
4. Remove bushing (944) out exhaust flange side of housing.

NOTICE

- **Dowel pin (945) allows the bushing to be removed only from the exhaust flange side of housing. Ball (916) retains reverse valve (943) in bushing (944).**
- **Do not remove reverse valve (943), bushing (944) and ball (916) at the same time, damage may occur to bushing.**
- **Take care to not allow ball (916) to drop in motor. If this occurs it may be necessary to disassemble motor to retrieve ball (916).**

Piston Removal

1. Remove capscrews (901) and washers (902) from piston cover (919). Remove cover and discard gasket (918).
2. Remove capscrews (901) and washers (902) from poppet cover (903). Remove cover and discard gasket (904).
3. Remove the following items from housing poppet bore: spring (905), poppet cap (906) and poppet seal (907).
4. From poppet side, push piston (922) out of housing. Remove 'O' rings (921) and (923) and discard.

Pilot Valve Removal

NOTICE

- **For easier removal it is recommended to use I-R pilot seat tool (920). This must be purchased separately. Operation of this tool (920) is similar to an allen wrench or screw driver.**

If pilot valve is not damaged it is not necessary to disassemble completely.

1. Remove plug (912).
2. Remove pilot valve assembly (910) as an assembly.
3. Discard and replace pilot valve assembly (910) if necessary.

K5C2-EX Control Valve Disassembly

Refer to Dwg. MHP2434 on page 50.

Handle Removal

Follow disassembly instructions for K5C2-X Control Valve.

Reverse Valve Removal

1. Remove capscrews (938), (925) and washers (924) from seal bracket (939). Remove seal bracket from housing. Remove and discard 'O' rings (941) and (942).
2. Remove capscrews (721) and washers (902) from exhaust flange (955) and exhaust adapter (723). Remove and discard 'O' rings (942) and (722).

3. Move reverse valve (943) out exhaust flange side of housing until ball (916) is visible on reverse valve. Allow ball (916) to drop out of bushing (944) and remove ball (916).
4. Remove bushing (944) out exhaust flange side of housing.

NOTICE

- **Dowel pin (945) allows the bushing to be removed only from the exhaust flange side of housing. Ball (916) retains reverse valve (943) in bushing (944).**
- **Do not remove reverse valve (943), bushing (944) and ball (916) at the same time, damage may occur to bushing.**

Piston Removal

Follow disassembly instructions for K5C2-X Control Valve.

Pilot Valve Removal

Follow disassembly instructions for K5C2-X Control Valve.

Emergency Stop Removal

1. Remove adapter (706) and E-Stop button (705).
2. Remove plunger (707). Remove and discard 'O' rings (703).
3. Pull spring (711) out of valve housing and discard.

Overload Valve Removal

1. Remove cap (700). Remove and discard grommet (701).
2. Pull out plunger (702), remove and discard 'O' rings (703).
3. Remove capscrews (901) and washers (902) from cover (719) underneath valve housing.

NOTICE

- **Cover (719) retains spring (718). To remove capscrews (901) and washer (902) unscrew in a crisscross pattern.**
4. Remove adjusting screw (720).
 5. Remove and discard 'O' ring (716), gasket (714) and 'O' ring (713) from piston.
 6. Do not remove seal from piston, if piston appears damaged or worn replace.

Motor Disassembly

Refer to Dwg. MHP0690 on page 40.

1. Remove the five capscrews (255) from the exhaust flange (254).
2. Remove the rotary valve housing (247) by pulling it out of the motor housing (217) as an assembly with the exhaust flange (254).
3. Remove rotary valve (250) by pulling it out from the assembly through the motor end of the rotary valve housing (247).
4. Remove exhaust flange (254) from rotary valve housing (247) by gently tapping edges of flange with a soft hammer until seal is loosened.
5. Remove each cylinder head (201) by removing the four capscrews (200). Remove head gaskets (209) and discard.
6. Remove mounting flange (216) from motor by pulling straight away from motor.
7. Pull the cylinder liner (208) straight out.
8. Position the piston (204) at the top of its stroke. In this position, with the cylinder liner pulled out in step 7, the wrist

pin (203) can be removed. Remove one retainer ring (205) from either side of piston (204). Push the wrist pin (203) out by hand from one side. If the wrist pin is too tight it is acceptable to carefully heat the piston to 200° F (93° C) or less and then push the wrist pin out.

NOTICE

• **If original piston, wrist pin, connecting rod or cylinder liner are to be reassembled, number each set. Also add radial alignment marks for each piston and cylinder liner to the motor housing.**

9. Remove the remaining cylinder liners and pistons as described in steps 7 and 8. To remove the crank assembly, all pistons and cylinder liners must be removed.
10. Crank assembly (231) can now be removed with the oil slinger (230) by pulling straight out from the motor housing (217). Use care while guiding the connecting rods (206) through the inside of the motor housing.

Crankshaft Disassembly

1. Remove cotter pin (236) and the pin nut (237).
2. Remove lock pin (235) by carefully driving it out of its location. Use care not to damage the threads.
3. Pull the crankshaft valve end (231) off the crankshaft.
4. Remove connecting rod rings (234), connecting rod bushing (233), sleeve (232) and connecting rods (206). Record the five connecting rod (206) numbers and foot directions so they can be reinstalled in the same order.
5. Oil slinger (230) does not have to be removed unless damaged. If removal is required, heating of the five screws (229) may be necessary to loosen the Loctite® connection.

Disc Brake Disassembly

Refer to Dwg. MHP1230 on page 42.

NOTICE

• **Prior to disassembly, matchmark the cover (2), housing (6) and support plate (19) to assist in proper alignment of parts during reassembly.**

1. Remove cap screw (1) securing brake to upright (26).
2. Remove brake shaft (25) and retainer ring (23). Place brake assembly on a flat surface with cover (2) on top. Remove elbow fitting (80) and brake valve (79). Alternately and evenly loosen the two cap screws (41) until the brake spring (17) compression has been relaxed. Remove cap screws.
3. Remove cover (2) and diaphragm (3).
4. Using a small tipped screwdriver or similar tool, remove ring (4). Remove diaphragm support (5).
5. Remove housing (6) by lifting straight away from brake parts. Collect the three dowel pins (9) and store until reinstallation. Inspect pins for deformation, wear and damage. Replace if parts fail inspection.
6. Alternately remove the six separator plates (14) and five friction plates (13).
7. Remove the pressure plate (15) and springs (17).
8. Grasp the outer race (12) and remove the sprag clutch as an assembly. Remove the spacer (11) between the sprag clutch assembly and support plate (19).
9. Remove gasket (18) from support plate (19). Discard gasket.

10. To remove the bearing (21) from the support plate (19) first remove the retainer ring (22) and then press the bearing out of the support plate recess.

NOTICE

• **To prevent accidental damage, remove the bearing (21) only if it requires replacement.**

11. Separate the sprag clutch assembly into its component parts. The sprag clutch assembly consists of the inner race (10), two spacers (11), the outer race (12) and the sprag clutch (16). The sprag clutch can be further disassembled into two wearing plates and the sprag cage.

Automatic Drum Band Brake Disassembly

Optional feature. Refer to Dwg. MHP2433 on page 45.

1. Loosen jam nut (117) closest to plunger (114). Turn cap screw (120) counterclockwise until disconnected from plunger.
2. Disconnect air line (76) from exhaust valve (79). Remove exhaust valve from brake cylinder (121). With the aid of a strap wrench, remove brake cylinder (121) and components as an assembly by turning brake cylinder counterclockwise until disconnected from brake bracket (106).
3. Disconnect brake bracket (106) from band assembly by removing three cap screws (101), spacers (102) and spacer tubes (103). Remove spacer plate (105).
4. Disconnect brake bracket from motor end upright (68) by removing two cap screws (107) and two cap screws (112).

⚠ DANGER

• **Springs (124) and (127) exert a considerable force on cover (125). Extreme care must be taken when disassembling the cylinder assembly and removing cover (125).**

5. To disassemble cylinder (121) assembly into its component parts conduct the following:
 - a. Use a press to compress cover (125) enough to remove retainer ring (126). Slowly, and carefully, relax the load exerted on cover (125) by springs (124) and (127). Remove cover and springs.
 - b. Remove washer (128).
 - c. Remove piston (123) assembly.
 - d. Disassemble piston assembly into component parts by removing retainer ring (141) and separating cylinder rod (108) from piston (123). Remove 'O' rings (109), (110) and (122). Discard 'O' rings.
6. Remove plunger (114) assembly and spring (113) from brake bracket (106).

Manual Drum Band Brake Disassembly

Optional feature. Refer to Dwg. MHP1448 on page 44.

The winch does not have to be removed or disassembled to disassemble the manual band brake.

⚠ CAUTION

• **Release wire rope tension on the drum and disconnect main air supply line.**

1. Raise handle (135) to free brake bands (136) and (137).
2. Remove cotter pin (139) and pin (138).

3. Rotate brake link stud (141) counterclockwise until free from brake handle.
4. Remove grip from brake handle (135). Loosen screws in brake handle until handle can be freed from brake band bracket, remove brake handle. Remove pivot nut (134).
5. Remove cotter pin (144) and washer (142).
6. Loosen capscrews (132).
7. Spread brake band (136) and (137) apart slightly and slide out over drum flange. Rotate brake band around drum and remove.
8. Repeat this procedure for other half of brake band (136) and (137).
9. Remove capscrews (132), washers (131), and adapter plate (145).
10. Press bushings (143) out of brake band pivot brackets.

Free Spool Disassembly

Refer to Dwg. MHP2414 on page 61.

1. Relieve pressure in the air lines and winch air components by operating the winch control several times after the air supply has been turned off.

WARNING

- Shut off, bleed down and disconnect the air supply line before performing any disassembly procedures.
- Do not attempt repairs with load on wire rope.

2. To assist in reassembly, place match marks on the housing (502) and outboard upright (26).
3. Remove free spool shifter assembly (507) by pulling it out of housing (502). This assembly is held in place by 'O' ring (501). Remove and discard 'O' ring (501).
4. Pin (508) and handle (512) are held in position by Loctite® applied during assembly. To remove these parts, carefully heat the shifter (515) until parts are removable.
5. Remove capscrew and washers (902). Remove cover (2) and gasket (18). Discard gasket.
6. Remove capscrews (505) and carefully pull housing (502) away from outboard upright (26).
7. Remove output shaft (28) from drum (62).

Reduction Gear Disassembly

NOTICE

- It is not recommended to disassemble reduction gear.

Refer to Dwg. MHP0649 on page 38.

1. Place the reduction gear assembly on a clean work bench such that reducer housing (48) with oil seal (58) is down.
2. Remove capscrews (33) and cover (34) from housing (38).
3. Remove thrust washer (35) and output carrier assembly (36).
4. Remove the input carrier assembly (42) by grasping the intermediate sun gear (39) and removing as an assembly. This also removes the input sun gear (43). Ensure that thrust bearing (45) and thrust washers (44), located on the end of the input sun gear (43), are removed.

NOTICE

- Do not disassemble carrier assemblies (36) and (42). Replace if damaged or worn.

5. Remove the oil seal (58) and discard. Remove the caged needle bearing (46) only if replacing. To remove press bearing out of housing.

Cleaning, Inspection and Repair

Clean all winch component parts in solvent (except the drum brake bands and disc brake friction plates). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the housings, frame and drum. If bushings have been removed it may be necessary to carefully scrape old Loctite® from the bushing bores. Dry each part using low pressure, filtered compressed air. Clean the drum brake band using a wire brush or emery cloth. Do not wash the drum brake band in solvent. If the 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 all gears for worn, cracked, or broken teeth.
2. Inspect all bushings for wear, scoring, or galling.
3. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft.
4. Inspect all threaded items and replace those having damaged threads.
5. Inspect the drum band brake lining for oil, grease and glazing. If the drum band brake lining is oil-soaked, excessively greasy or overly glazed replace the brake band. Remove small glazed areas of band brake lining by sanding lightly with a fine grit emery cloth.
6. Measure the thickness of the drum band brake lining. If the drum brake band lining is less than 0.062 in. (2 mm) thick anywhere along the edges replace the brake band assembly for automatic (104) and manual (136) and (137).

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

Assembly

General Instructions

- Use all new gaskets and seals.
- Replace worn parts.
- Assemble parts using match marks applied during disassembly. Compare replacement parts with originals to identify installation alignments.
- Lubricate all internal parts with rust and oxidation inhibiting lubricant, ISO VG 100 (SAE 30W).

Thermoplastic Coated Parts Assembly

CAUTION

• During application of thermoplastic coating to assemblies use a flame to localize the heat. Do not heat entire assembly. Assemblies contain gaskets, 'O' rings and other components that may be damaged by exposure to excessive heat.

1. When assembling parts already coated, the mating areas can be heated to soften the coating enough to flow together and seal the parts.
2. When installing a new component in an assembly, remove coating from existing parts as necessary to ensure parts mate correctly.
3. Install fasteners and torque as required. Apply coating to bare areas as described in 'Thermoplastic Coating' repairing surfaces instructions in the "MAINTENANCE" section for areas larger than 1/16 inch (1.6 mm).
4. Allow the repaired area to cool. Quenching with water is acceptable. Rough spots, minor scorching and excess coating deposits can be wet sanded to remove the imperfections. To return the gloss finish, reheat the surface carefully.

Motor Assembly

Refer to Dwg. MHP0690 on page 40.

1. Install two seal rings (251) on each end of rotary valve (250). Place bearing (252) onto the rear of rotary valve (250) and press into position. Press only on the bearing inner race. With the rotary valve housing (247) exhaust flange side down, install rotary valve into housing.
2. Install 'O' ring (244) into motor housing (217).
3. Install the rotary valve housing gasket (243) onto rotary valve housing (247). With the exhaust flange down on the bench, install motor housing (217) onto rotary valve housing (247). Check for any evidence of damage to 'O' ring (244) when the rotary valve housing is fully engaged. Install exhaust flange (254) and tighten capscrews (255) to 50 ft lbs (68 Nm).
4. If removed, press crank bearing (228) on crank assembly (231). Press only on the inner race of the bearing.
5. Place crank assembly (231) on a work bench with the oil slinger (230) down and slide the sleeve (232), with tang up, on the crankpin.
6. Slide connecting rod bushing (233) over the sleeve (232) and first connecting rod ring (234) with the chamfer up.
7. Install the connecting rods (206) in the same order as removed, with all feet pointing in the same direction, using the first connecting rod ring (234) to hold one side of the connecting rod feet.
8. Slide the second connecting rod ring (234) over the other side of the connecting rod feet with the chamfer on the ring facing down (toward the stem of the connecting rod).
9. Slide the crank shaft valve end over the crank pin while simultaneously aligning the tang on the sleeve (232) with the slot in the crank shaft.
10. Rotate and position the crank shaft valve end relative to the crank pin to allow installation of the lock pin (235).
11. Tap the lock pin (235) into place and install the pin nut (237). Torque nut to 60 ft lbs (81 Nm).
12. Install cotter pin (236).
13. Install roll pin (240) and bearing (228) into the valve end of the crank shaft.
14. Check that all connecting rods move freely around the crank. Position the crank assembly (231) into the motor housing

(217). Ensure the bearing (228) is seated and connecting rods (206) are centered in the cylinder holes.

NOTICE

• Make certain that the roll pin (240) and the three lugs on the rotary valve (250) line up with the corresponding hole and lugs on the crank shaft.

• Do not allow the rotary valve (250) to slide back in rotary valve housing (247). If the rotary valve slides in too far, the rotary valve and crankshaft will not align properly and will restrict further assembly.

15. Rotate the crank assembly until one connecting rod (206) is at the top of its stroke. Install a piston (204) with its rings (202 and 207) to the connecting rod (206) with wrist pin (203) and retainer rings (205).
16. Install a new cylinder head gasket (209) before installing the cylinder liner (208).
17. Install the cylinder liner (208) over the piston (204) by compressing both piston rings (202) and (207) with a single band ring compressor.
18. Install cylinder head (201) over the cylinder and secure cylinder head to motor housing (217) with four capscrews (200). Torque capscrews to 60 ft lbs (81 Nm).
19. Repeat Steps 15 through 18 with the remaining cylinders.

NOTICE

• When installing the two lowest cylinder heads (201), use seal washers on capscrews (200).

20. Rotate motor by hand. Motor should rotate without binding.
21. Install mounting flange (216) and gasket (226) on the front of the motor housing (217). Make sure notches on both parts are aligned.
22. Lightly lubricate 'O' ring (70) and install in groove on motor adapter (71).
23. Install eye bolts (213), vent cap assembly (210) and pipe plug (218) in the motor housing (217). From the rotary valve housing end of the motor, ensure plug (218) is installed in the left oil fill hole of the motor.
24. Install motor on winch at motor adapter (71) using capscrews (197), lockwashers (196) and washers (198).
25. Ensure oil drain (225) and level plug (225) are installed.

K5C2-X Control Valve Assembly

Refer to Dwg. MHP2427 on page 46.

Reverse Valve Assembly

1. Insert reverse valve (943) into bushing (944) with ball slot oriented UP, approximately 2-1/2 in. (64 mm).
2. Insert bushing (944) and reverse valve (943) into valve housing (917) from exhaust flange side, ensuring that groove in bushing is aligned with pin (945).
3. Insert ball (916) onto reverse valve platform. With finger, push ball (916) in housing until ball hits end of reverse valve.
4. Holding ball (916) in position on reverse valve platform, rotate reverse valve from neutral position to approximately 45 degrees in either direction. Ball will 'walk' up side of reverse valve platform and move in ball hole in bushing.

NOTICE

• **Do not rotate reverse valve past a 90 degree position, it may result in the ball (916) falling in motor.**

5. Slowly push reverse valve, while still in the 45 degree position, the rest of the way in housing until flush with surface. From other side of valve rotate reverse valve back to neutral position, ball should be seated in ball slot at that time.
6. Lubricate 'O' ring (942) and place it in groove in exhaust flange (955).
7. Secure exhaust flange (955) to valve housing with capscrews (901) and washers (902).
8. Insert 'O' ring (941) into seal bracket (939). Lubricate 'O' ring (942) and place into groove in seal bracket.
9. Place seal bracket over end of reverse valve. Using finger pressure, press until seal is seated on reverse valve and seal bracket is seated on valve housing. Secure with washers (924) and capscrews (925) and (938).

Pilot Valve Assembly

NOTICE

• **For easier installation it is recommended to use I-R pilot seat tool (920). This must be purchased separately. Operation of this tool (920) is similar to an allen wrench or screw driver.**

1. Install pilot valve assembly (910).
2. Apply thread sealant Loctite 567® to pilot seat (914), place pilot valve assembly into valve housing. Use a large flat tipped screw driver to engage slots in pilot seat and tighten until pilot assembly is 1/8 in. (3.175 mm) from housing bore.
3. Insert plug (912) and tighten.

Piston Assembly

1. Lubricate and install 'O' rings (921) and (923) on piston (922).
2. Insert assembled piston into valve housing (917) from handle side.
3. Secure with gasket (918), piston cover (919), washers (902) and capscrews (901).
4. Place poppet seal (907) into poppet cap (906). Place this assembly into valve housing and seat on piston (922).
5. Place spring (905) over this assembly.
6. Secure with gasket (904), poppet cover (903), washers (902) and capscrews (901).

Handle Assembly

1. Place spring (937) over reverse valve handle end in seal bracket.

NOTICE

• **Spring (937) will have to be 'Cocked' over stud in seal bracket. This will ensure handle returns to neutral.**

2. Place handle assembly over reverse valve end. Slide handle will have to be lifted slightly to allow pin to fit into slot in seal bracket.

3. Secure handle assembly (930) to reverse valve with tab lock washer (909) and capscrew (901), torque to 15 ft. lbs. (21 Nm). Washer (909) has small tab on side, engage with small hole in handle.
4. Bend tabs of washer (909) over flats of capscrew.
5. Press plug (935) into handle assembly to cover capscrew. Check control handle movement. Correct any discrepancies.

K5C2-EX Control Valve Assembly

Refer to Dwg. MHP2434 on page 50.

Reverse Valve Assembly

1. Insert reverse valve (943) into bushing (944) with ball slot oriented UP. Apply grease to ball (916) and insert into ball slot of reverse valve (943) through bushing (944).
2. Insert bushing (944), reverse valve (943) and ball (916) into valve housing (917) from exhaust flange side, ensuring that groove in bushing is aligned with pin (945).
3. Lubricate 'O' rings (942) and (722), and place in grooves in exhaust adapter (723).
4. Lubricate 'O' rings (942) and place in grooves in exhaust flange (955).
5. Secure exhaust adapter with exhaust flange to valve housing with capscrews (721) and washers (902).
6. Insert 'O' ring (941) into seal bracket (939). Lubricate 'O' ring (942) and place into groove in seal bracket.
7. Place seal bracket over end of reverse valve. Using finger pressure, press until seal is seated on reverse valve and seal bracket is seated on valve housing. Secure with washers (924) and capscrews (925) and (938).

Pilot Valve Assembly

Follow assembly instructions for K5C2-X Control Valve.

Piston Assembly

Follow assembly instructions for K5C2-X Control Valve.

Handle Assembly

Follow assembly instructions for K5C2-X Control Valve.

Emergency Stop Assembly

1. Insert spring (711) into valve housing (917).
2. Place 'O' rings (703) on plunger (707).
3. Insert plunger into valve housing.
4. Screw adapter (706) and E-Stop button (705) into valve housing.
5. Tighten adapter until snug, do not over tighten.

Overload Valve Assembly

1. Replace 'O' rings (703) on plunger (702).
2. Insert plunger (702) with 'O' rings in valve housing (917).
3. Replace grommet (701) in cap (700).
4. Install and tighten cap (700) flush to valve housing.
5. Replace piston (712) if appears damaged or worn.
6. Insert 'O' ring (713) on piston (712).
7. Replace gasket (714).

NOTICE

• **Cover (719) retains springs (718), adjustment nut (717) and plate (715). Insert capscrews (902) and washers (901) in a crisscross pattern until tightened evenly.**

8. Insert adjusting screw (720), refer to 'OPERATION' section for overload valve adjustment.

Freespool Assembly

Refer to Dwg. MHP2414 on page 61.

1. Assemble shaft support (503) to output shaft (28) and secure with socket capscrews (504). Torque capscrews to 18 ft lb (25 Nm).
2. Apply Loctite® 609 to handle (512) and press into free spool shifter (515).
3. Apply Loctite® 242 to threads of plunger (511) and screw into detent plate (514).
4. Place new 'O' ring (501) into groove in housing (502). Lubricate with a mixture of half ISO VG 68 (SAE 20W) lubricant and half molybdenum disulfide lubricant compound.
5. Lubricate free spool shifter assembly (507) with above compound, place into housing (502).
6. Slide shaft support (503) and output shaft (28) as an assembly into housing (502) until groove in shaft support aligns with pin (516) in free spool shifter assembly (507). Tap into place with suitable soft headed hammer.
7. Insert this assembly into winch drum (62), twisting slightly to align gears and until housing (502) fits tightly against outboard upright (26). Align marks made in 'Disassembly' step 2.
8. Install capscrews (505) into housing (502) tighten and torque to 18 ft lb (25 Nm).
9. Apply light coat of EP grease to face of housing (502), place gasket (18) on housing face and align bolt holes.
10. Using capscrews (1) and washers (902) install cover (2) onto housing (502).
11. Operate free spool several times to ensure smooth operation.

Reduction Gear Assembly

Refer to Dwg. MHP0649 on page 38.

1. Install oil seal (58) in housing (48).
2. Install needle bearing (46) if removed during disassembly.
3. Install thrust washers (44) on input sun gear (43).
4. Install input sun gear assembly (43) in housing (48).
5. Install (40) on either side of input gear carrier (42).
6. Install input gear carrier (42) on input sun gear (43).
7. Align intermediate sun gear (39) with input gear carrier (42) and install in gear carrier (42). Take care not to damage teeth on either part while installing.
8. Install thrust washer (35) and output gear carrier (36) in housing (48). Align with intermediate sun gear (39). Take care not to damage teeth on either part while installing.
9. Align holes in cover (34) with housing (48) and secure with capscrews (33). Torque to 60 ft lbs (81 Nm).
10. With drum standing on end, place reduction gear assembly into drum. Place Loctite® 515 on mating surfaces of housing (87) and end cover. Align the 3/8 inch NPT holes in the end cover with counterbore marks on the housing mating flange. Secure in place by evenly installing sixteen capscrews (33). Torque capscrews to 60 ft lbs. (81 Nm).

11. Cover the reduction gear to prevent dirt and contaminants from entering assembly and place in a safe place until ready for assembly to winch uprights.

Winch Assembly

Refer to Dwg. MHP0649 on page 38.

NOTICE

• **Unless otherwise stated capscrew torque values listed are for lubricated or plated threads. This assembly uses "blue bolts" in numerous locations. These are plated and should not be lubricated.**

1. Using a hoist, support the drum.
2. Install bearing (30) in inboard (motor end) upright (68). With oil seal (29) lip facing towards drum, install oil seal in inboard upright.
3. Install output shaft (28), bearing (30) and oil seal (29) in outboard upright (26). Install the outboard upright onto drum by aligning splines of output shaft to reduction gear output carrier assembly splines.
 - a. For units **with** disc brake, refer to the 'Disc Brake Assembly' section.
 - b. For units **without** disc brake, ensure three capscrews (27) are installed in the output shaft. Apply Loctite® 515 on mating surfaces of outboard upright (26) and end cover (2). Install gasket (18). Install six capscrews (1) and secure end cover to upright. Torque capscrews to 18 ft lbs (24 Nm).
4. If unit is equipped with drum band brake, install the drum band brake bracket and piston assemblies. Do not attach the brake band assembly (147) or (130). Refer to the applicable 'Drum Band Brake' section for instructions.
5. Install coupling (60) on shaft (61) and install on end of the input sun gear (43), located in the reduction gear assembly.
6. If unit is equipped with drum band brake, place brake band assembly (147) or (130) onto drum brake flange. Place inboard (motor end) upright (68) on drum.
7. Loosely attach the side rails (65) to the uprights (26) and (68) using four capscrews (66) for each sideframe. Tighten capscrews and torque to 75 ft lbs (102 Nm) for dry threads, or 55 ft lbs (75 Nm) if thread lubrication is used.
8. Align holes in motor adapter (71) and install on upright. Secure with six capscrews (73). Torque capscrews to 125 ft lbs (170 Nm) for dry threads, or 95 ft lbs (129 Nm) if thread lubrication is used.
9. If equipped with drum band brake, attach band brake assembly (147) or (130). Refer to applicable assembly sections.

Manual Drum Band Brake Assembly

Optional feature. Refer to Dwg. MHP1448 on page 44.

1. Press bushings (143) into brake band pivot brackets. Bushing flanges must be to motor upright side.
2. Attach adapter plate (145) to motor side upright (68) loosely with capscrews (132) (apply Loctite® 242 to threads) and washers (131).
3. Place brake band (136) and (137) onto drum and rotate around drum (close to mounting position). Spread brake band halves (136) and (137) apart slightly and slide in over drum flange. Place brake band pivot bracket over pin in adapter plate (145).
4. Repeat this procedure for other brake band halves (136) and (137).

5. Place washer (142) over pin in adapter plate (145) and secure with cotter pin (144). Bend cotter pin ends apart.
6. Insert pivot nut (134) into brake handle (135).
7. Place brake handle (135) into bracket in brake band halves (136) and (137) and tighten screws in handle. Slide grip over brake handle.
8. Place brake link stud (141) into pivot nut (134) and rotate clockwise until approximately 1 inch (25 mm) of threads are exposed.

NOTICE

• **Refer to ‘Adjustment’ section for instructions on adjusting brake.**

9. Lift up brake handle (135) until hole in brake link stud (141) and bracket in brake band halves (136) and (137) are aligned. Insert pin (138) and secure with cotter pin (139). Bend cotter pin ends apart.
10. Push brake handle (135) down to the lock position.
11. Torque capscrews (132) to 50 ft lbs (68 Nm).

Automatic Drum Band Brake Assembly

Optional feature. Refer to Dwg. MHP2433 on page 45.

For ease of assembly install bracket (106), cylinder (121) assembly and brake handle stop to motor end upright (68) prior to assembling upright to drum.

1. Assemble brake cylinder (121) as follows:
 - a. Install ‘O’ ring (122) on piston (123).
 - b. Heavily coat piston and cylinder rod with “LubriPlate” MO-LITH No. 2 or equivalent lubricant. Install ‘O’ rings (109) and (110) on cylinder rod (108). Place cylinder rod (108) into piston (123) and secure in place using retainer ring (111).
 - c. Install piston assembly in brake cylinder (121).
 - d. Install washer (128) and springs (124) and (127).

! DANGER

• **Springs (124) and (127) exert a considerable force on cover (125) when assembled. Extreme care must be taken when assembling and installing cover (125) and retainer ring (126).**

- e. Using a press, slowly compress cover (125) and springs until retainer ring groove is accessible. Install retainer ring (126). To ensure that retainer ring is properly installed, tap end of retainer ring with a punch until entire retainer ring rotates in brake cylinder groove. Slowly release press and ensure retainer ring securely holds cover in place.
2. If not accomplished during ‘Winch Assembly’ steps, install bracket (106) to inside of motor end upright (68) and secure in place using capscrews (107) and (112). Torque capscrews to 35 ft lbs (48 Nm).
3. Assemble roller (116) in plunger (114) and secure using dowel pin (115). Heavily coat plunger assembly with “LubriPlate” MO-LITH No. 2 or equivalent lubricant. Install spring (113) and plunger assembly in brake bracket (106). Align groove in plunger towards hole in motor end (68) upright.
4. Align cylinder rod roller surface to groove in plunger. Turn cylinder (121) clockwise until snug. Adjust cylinder (121) such that air hose connection port is horizontal and towards the motor.

Conduct the following when winch is assembled, but prior to mounting to foundation. The motor end of winch should be raised enough to allow access to brake components located on the inside surface of inboard (motor end) upright (68).

5. Place spacer (105) between upper brake band flange and bracket. Attach band assembly (104) to bracket (106) using three capscrews (101), spacers (102) and spacer tubes (103). Torque capscrews to 35 ft lbs (48 Nm).
6. Install pivot bar (119) and capscrew (120) through lower flange of brake band assembly (104). At lowest point of threads, place a bead of Loctite® 680 and install jam nut (117) fully. Jam nut threads must become coated with sealant. Install second jam nut (117) to approximate middle of thread length. Thread capscrew (120) into bottom of plunger (114) a minimum of five thread lengths. Lock in place, against plunger, using jam nut (117). Adjust brake as described in ‘Drum Band Brake Adjustment’ section.

Adjusting Automatic Drum Band Brake

Optional feature. Refer to Dwg. MHP2433 on page 45.

! CAUTION

• **This adjustment is done after a rebuild. It is only a rough adjustment intended to remove major slack prior to adjusting with a load.**

This procedure can be done at a work bench using a 50 psig (3.44 bar/344 kPa) air supply applied to the brake cylinder. After completion of this procedure the brake must further be adjusted using the recommended air supply and a test load.

1. Insert a length of 3/8 inch NC threaded rod, fully into the cylinder rod (108). With brake band slack and no air supplied to brake, push end of threaded rod to position plunger all the way inside brake bracket (106). Place a nut on threaded rod, and locate nut until it is just touching cover (126). Apply air to brake. Threaded rod should move out from cylinder approximately 1 inch (25 mm).
2. Tighten capscrew (120) in plunger (114) to remove slack from band brake. Release air pressure. Nut should move closer to end cover (125) and stop.
3. Repeat step 1 until nut stops at approximately 9/16 inch (14 mm) from cover (125).
4. Refer to further adjusting in ‘Automatic Drum Brake Adjustment’.

Disc Brake Assembly

Refer to Dwg. MHP1230 on page 42.

1. Install bearing (21) into support plate (19) and secure with retainer ring (22).
2. In this order, place spacer (11), sprag clutch (16), outer race (12) and spacer (11) on inner race (10). Test sprag clutch operation. Refer to Dwg. MHP1197 on page 35.

NOTICE

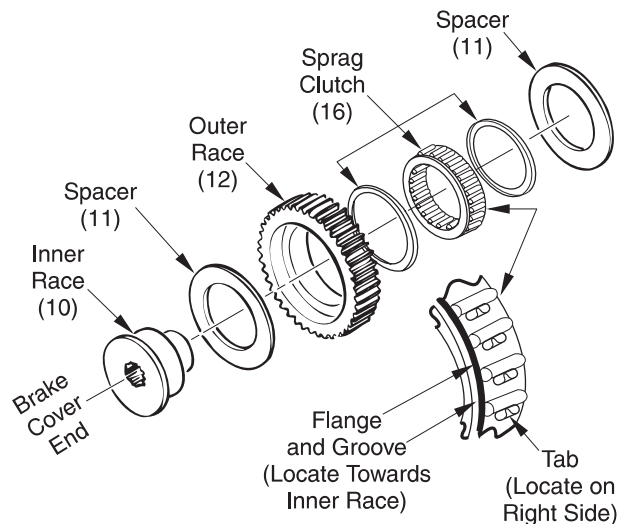
• **Correct sprag clutch installation prevents clockwise rotation (brake engages) and allows counterclockwise rotation when viewed from the cover (2) end of the brake assembly.**

⚠ WARNING

• **Incorrect assembly of the sprag clutch will adversely affect winch operation. In haul-in operation, sprag clutch will be engaged resulting in restricted winch operation. In neutral and payout positions, the sprag clutch can rotate resulting in brake not holding load. Ensure the sprag clutch is correctly installed.**

3. Install assembly on support plate (19).
4. Install twelve springs (17) in holes on inside of support plate (19).
5. Install gasket (18) and pressure plate (15).
6. Determine correct alignment of cover (2), housing (6) and support plate (19) by checking matchmarks placed during disassembly, or by placing housing on support plate and matching capscrew holes.
7. Correctly align with dowel slots on the housing (6) and alternately install six separator plates (14) and five friction plates (13), beginning with a separator plate. Align the outer three indentations on plates to form a single groove.
8. Install the three dowel pins (9) in housing (6). Apply Loctite® 515 sealant on mating surfaces of housing and end cover (2). Install housing by aligning dowel pins with separator (13) and friction plate (14) grooves and, also aligning capscrew holes in housing with holes in end cover.

Sprag Clutch Assembly



(Dwg. MHP1197)

9. Install ring (4), and diaphragm support plate (5). Support plate radius must be next to diaphragm (3).
10. Install diaphragm (3) and cover (2).
11. Locate as shown on Dwg. MHP1230 on page 42, and install two capscrews (41). Evenly and alternately tighten capscrews to compress springs. Torque capscrews to 18 ft lbs (24 Nm).
12. Install brake shaft (25) and place assembly on outboard (opposite motor end) upright (26).
13. Align capscrew holes such that the breather (8) is slightly off top dead center. Install six capscrews (1). Torque capscrews to 18 ft lbs (24 Nm).
14. Install capscrews (1) securing brake to upright (26).
15. Install exhaust valve (79), elbow fitting (80) and connect air hose (75) to elbow fitting.
16. Winch drum **must** rotate freely in the haul-in direction and **must not** rotate in the payout direction, unless air is applied to the brake, when assembled properly.

Drum Guard Assembly (optional feature)

Refer to Dwg. MHP0658 on page 62.

1. Place drum guard (590) on rear side rails (65) with longer inside tab located under side rails edge and smaller outside tabs located on top of side rails edge.
2. Place 'O' rings (109) on brackets (591) or bracket shaft (596). Install 'O' rings in quantities required to remove any 'play' or gap between drum guard and brackets.
3. Align brackets (591) or (595) on mounting holes in uprights (26) and (68). Secure in place with capscrews (592).

Testing

Operational Test

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

1. Check oil level in motor, reduction gear assembly and disc brake are correct. Top off levels as required before operation as described in the "LUBRICATION" section.
2. To initially 'break in' new or overhauled motors, operate winch without load, in both directions, for 15 minutes at 100 - 200 RPM.
3. Check operation of brakes. Adjust if necessary as described in the "MAINTENANCE" section.
4. Check operation of limit switches, locking mechanisms and all safety devices when equipped.
5. Check foundation mounting fasteners are secure.
6. Install drum guard when provided.

Load Test

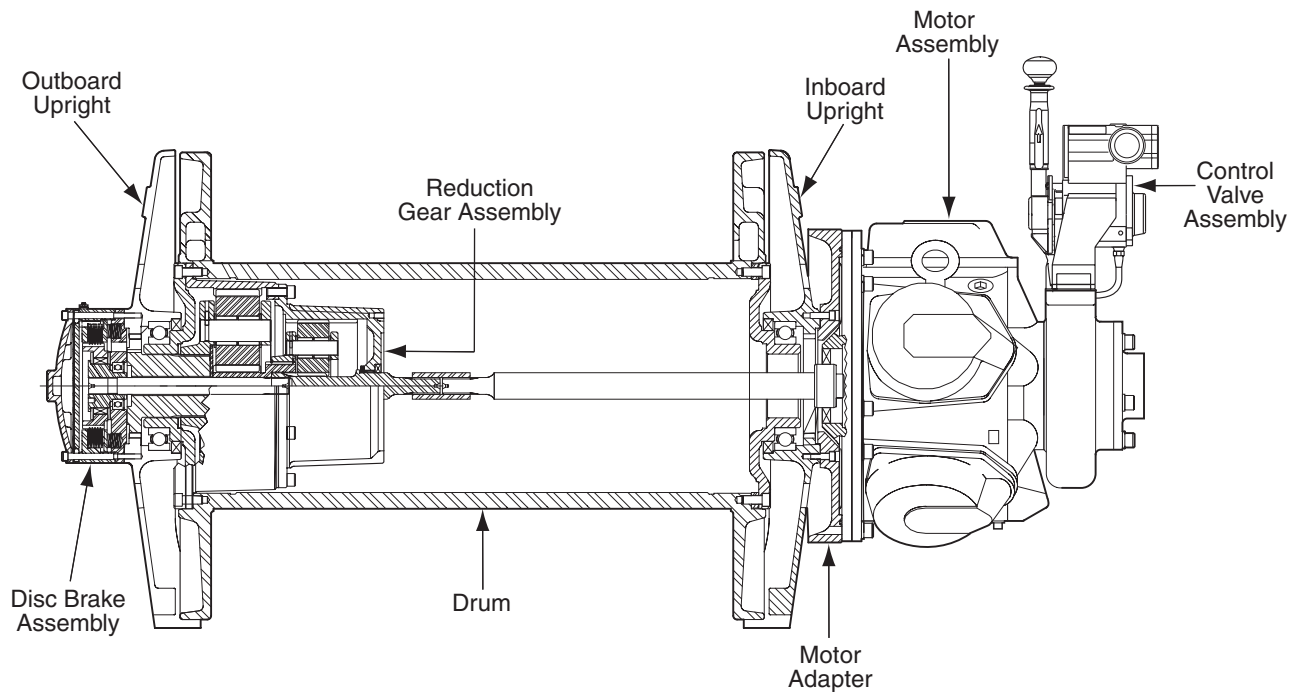
Prior to initial use, all new, extensively repaired, or altered winches shall be load tested by or under the direction of a person trained in safety and operation of this winch and a written report furnished confirming the rating of the winch. Test loads shall not be less than **100%** of rated line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

FA5A Winch 125% Test Load 12,500 lb. (9,058 kg)

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.**

WINCH CROSS SECTION DRAWING

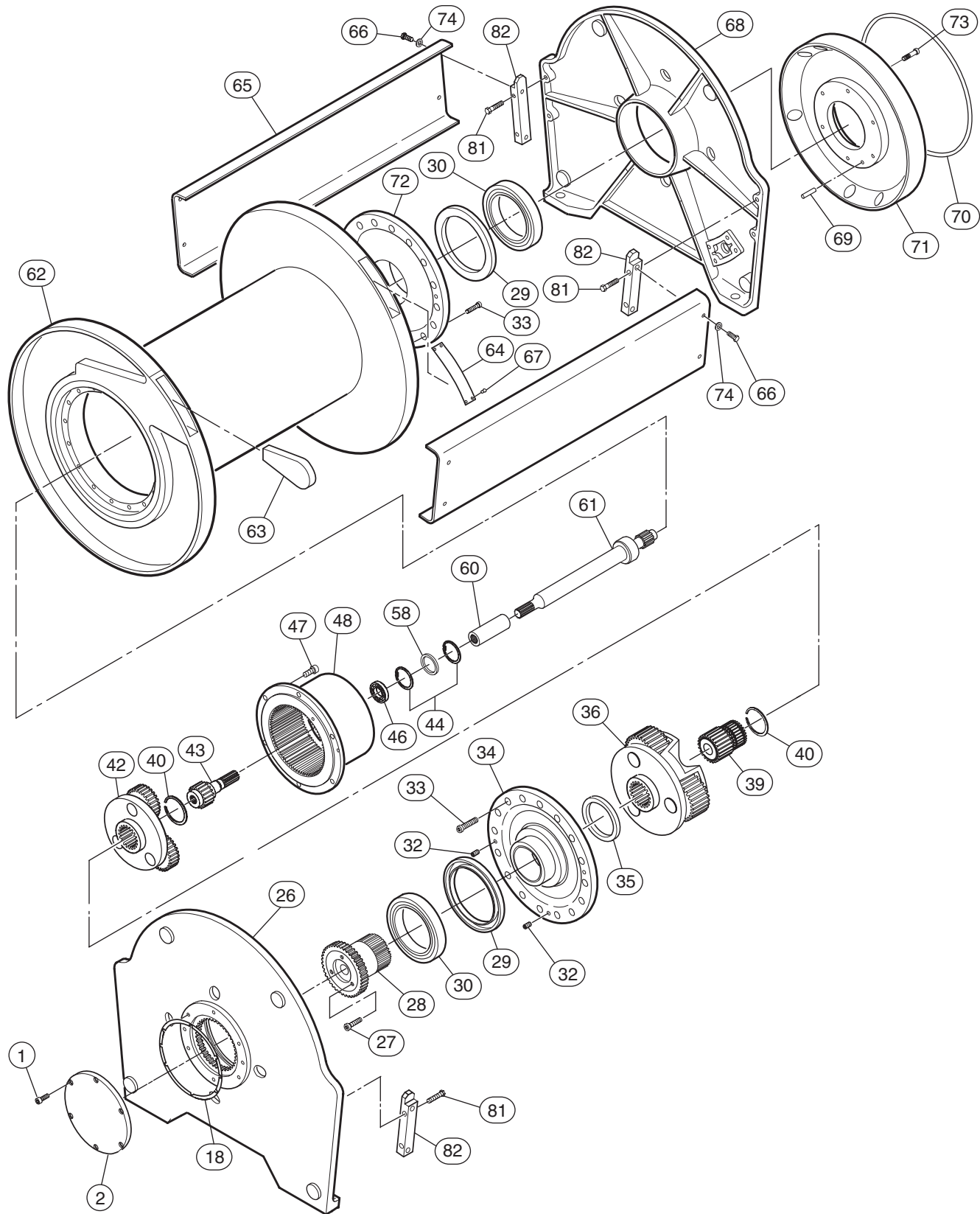


(Dwg. MHP1224)

WINCH DRAWINGS AND PARTS LISTS TABLE OF CONTENTS

	Page
Winch Cross Section Drawing (MHP1224)	36
Drum, Base and Reduction Gear Parts Drawing (MHP0649)	37
Drum, Base and Reduction Gear Parts List	39
Motor Assembly Drawing (MHP0690)	40
Motor Assembly Parts List	41
Disc Brake Assembly Drawing (MHP1230).....	42
Disc Brake Assembly Parts List	43
Manual Drum Brake Assembly Drawing (MHP1448) and Parts List.....	44
Automatic Drum Brake Assembly Drawing (MHP2433) and Parts List.....	45
K5C2-X Control Valve Assembly Drawing (MHP2427)	46
K5C2-X Control Valve Assembly Parts List	47
Pilot Air Control Valve (Optional) Assembly Drawing (MHP2416) and Parts List.....	48
Full Flow Remote Control Valve Assembly Drawing (MHP2432) and Parts List	49
Emergency Stop and Overload K5C2-EX Valve Assembly Drawing (MHP2434)	50
Emergency Stop and Overload K5C2-EX Valve Assembly Parts List	51
Tensioning Manifold Assembly Drawing (MHP2436)	52
Tensioning Manifold Assembly Parts List.....	53
Remote Pendant Assembly Drawings (MHP2346) and (MHP1677)	54
Remote Pendant Assembly Parts List	55
Open Frame (Face) Winch Assembly Drawing (MHP1231).....	56
Open Frame (Face) Winch Assembly Parts List.....	57
Remote Pilot Air Control (Optional) Parts Drawing (MHP2444)	58
Remote Pilot Air Control (Optional) Parts List	59
Muffler Assembly Drawing (MHP1189) and Parts List	60
Free Spool Assembly Drawing (MHP2414) and Parts List	61
Drum Guard Assembly Drawing (MHP0658) and Parts List	62
Air Preparation Assembly Drawing (MHP0223) and Parts List.....	63
Winch Label/Tag Location Parts Drawing (MHP1229).....	64
Winch Label/Tag Location Parts List	65
Construction Cage Assembly Drawing (MHP2438) and Parts List.....	66

DRUM, BASE AND REDUCTION GEAR PARTS DRAWING



(Dwg. MHP0649)

DRUM, BASE AND REDUCTION GEAR PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
1	Capscrew (1)	6	71266613	61	Drive Shaft - Long Drum (24 and 27 inch)	1	23902
2	End Cover (1)	1	21732				
• 18	Gasket	1	71262257				
26	Upright, Outboard †	1	25566				
27	Capscrew (1)	3	71266936	62	Drum, 12 in (305 mm) with Band Brake** (3) †	1	23750
28	Output Shaft †	1	21019		Drum, 15 in (381 mm) (3) †		24046
• 29	Oil Seal	2	71053862		Drum, 24 in (610 mm) with Band Brake** (3) †		21729
30	Bearing	2	71053854		Drum, 27 in (686 mm) (3) †		24048
31	Reduction Gear Assembly (2) (incl's items 32, 34-48 and 58)	1	26985	63	Wire Rope Anchor (4)	1	24258
32	Plug	2	71408439	64	Label, Wire Rope Cover	1	71148282
33	Capscrew (5)	32 (16)	71113161				
34	Cover †	1	71408371	65	Side Rail - Short Drum (12 and 15 inch)	2	24674-P
35	Thrust Washer	1	71408397		Side Rail - Long Drum (24 and 27 inch)	2	24675-P
36	Planetary Assembly	1	71408322	66	Capscrew	8	7126461
39	Intermediate Sun Gear	1	71408330	67	Rivet	4	50915
40	Retainer Ring	2	71408405	68	Upright, Inboard †	1	25567
42	Planetary Assembly	1	71408348	69	Dowel Pin	1	71136923
43	Input Sun Gear	1	71408355	• 70	'O' Ring	1	51459
44	Retainer Ring	2	71408421	71	Motor Adapter	1	22034
46	Bearing	1	71408413	72	Cover (5) †	1	24440
47	Capscrew	2	71408447	73	Capscrew	6	71311674
48	Reducer Housing	1	Order Item 31	74	Washer	8	71274807
• 58	Oil Seal	1	71408363	81	Capscrew	8	71264709
60	Coupling	1	50775	82	Corner Bar	4	21882
61	Drive Shaft - Short Drum (12 and 15 inch)	1	24035				

** Item 62, size 12 and 24 inch drum with band brake is not illustrated.

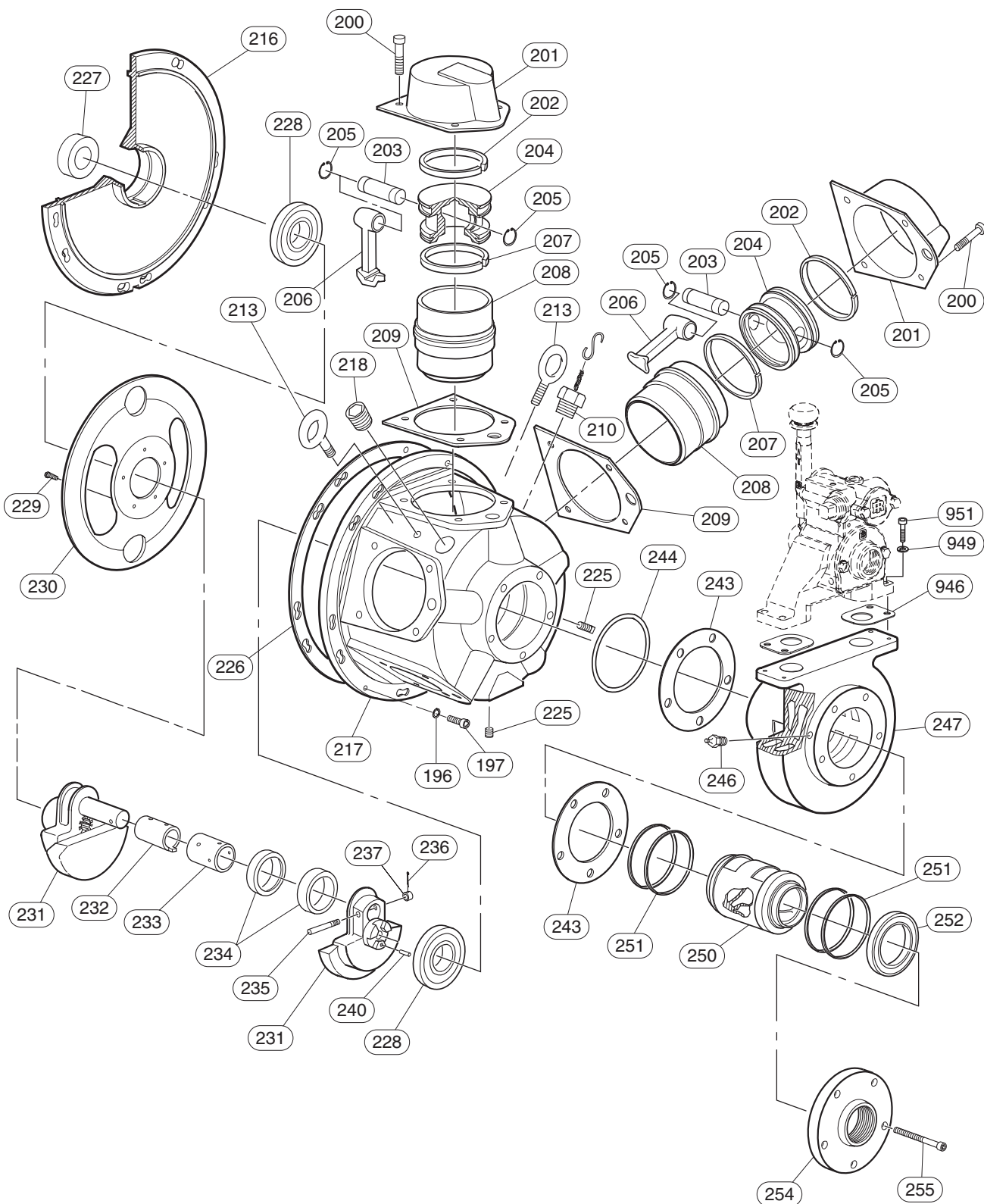
† These parts also come in a cold weather version. For winches with a -C in the model code, adding CH (DNV) or CHA (ABS) to the end of these part numbers is required to retain winch certification. Example: Order Drum (15 in. long) (item 62) part number 24046 as part number 24046CH or 24046CHA.

Certification Type	Example Part Number To Order	
ABS	---	24046CHA
DNV	24046CH	---

- Recommended spare for one winch, 2 years of normal operation

Notes: (1) Winches with disc brakes will use items 1, 2 and 18 shown in drawing MHP1230 on page 42.
 (2) It is not recommended to disassemble reduction gear assembly unless necessary.
 (2) Sizes 12 and 24 inch refer to drums equipped with band brake. Sizes 25 and 27 inch refer to drums without band brake.
 (3) Wire rope anchor for 9/16 to 3/4 inch (14 to 18 mm) wire rope only.
 (4) Winches with drum brakes will not use item 72, cover and only require a quantity of (16) for item 33, capscrew.

MOTOR ASSEMBLY DRAWING



(Dwg. MHP0690)

MOTOR ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
190	Motor Assembly **	1	K5B-546LP	229	Button Head Screw	5	*
196	Lockwasher	10	71268213	230	Oil Slinger	1	*
197	Capscrew	10	71268205	231	Crank Assembly	1	*
200	Capscrew	20	52317	232	Sleeve	1	K5B-519
201	Cylinder Head	5	K5B-H505	233	Bushing	1	K5B-511
202	Compression Ring	1 Set	K5B546-KRING	234	Connecting Rod Ring	2	K5B-510
203	Wrist Pin	5	HU-514A	235	Lock Pin	1	*
204	Piston	5	*	236	Cotter Pin	1	*
205	Retainer Ring	10	902A45-632	237	Pin Nut	1	*
206	Connecting Rod	5	K5B-509	240	Roll Pin	1	54257
207	Oil Ring	5	Order Item 202	243	Gasket	2	K5B-928
208	Cylinder Liner	5	K5B-L505-47	244	'O' Ring	1	20A11CM248
209	Head Gasket	1 Set	K5B-507-5	246	Grease Fitting	1	53095
210	Vent Cap Assembly	1	26604	247	Rotary Valve Housing	1	K5B-546
213	Eye Bolt	2	KU-888	250	Rotary Valve Assembly	1	K5B-526EQ-RS
216	Mounting Flange	1	K5B-502A	251	Seal Ring ***	1 Set	K5B-607A
217	Motor Housing	1	K5B-501A	252	Bearing	1	50138
218	Pipe Plug	1	71263297	254	Exhaust Flange	1	KK5B-276M
225	Pipe Plug	2	54912	255	Capscrew	5	51471
226	Gasket	1	K5B-592	946	Gasket	1 set	27115
227	Oil Seal	1	K5B-270	949	Washer	4	71376370
228	Crank Bearing	2	51066	951	Capscrew	4	71369276

* Parts not sold separately, Refer to the "Motor Assembly Kit List."

** Motor Assembly (190) includes items 200 through 255.

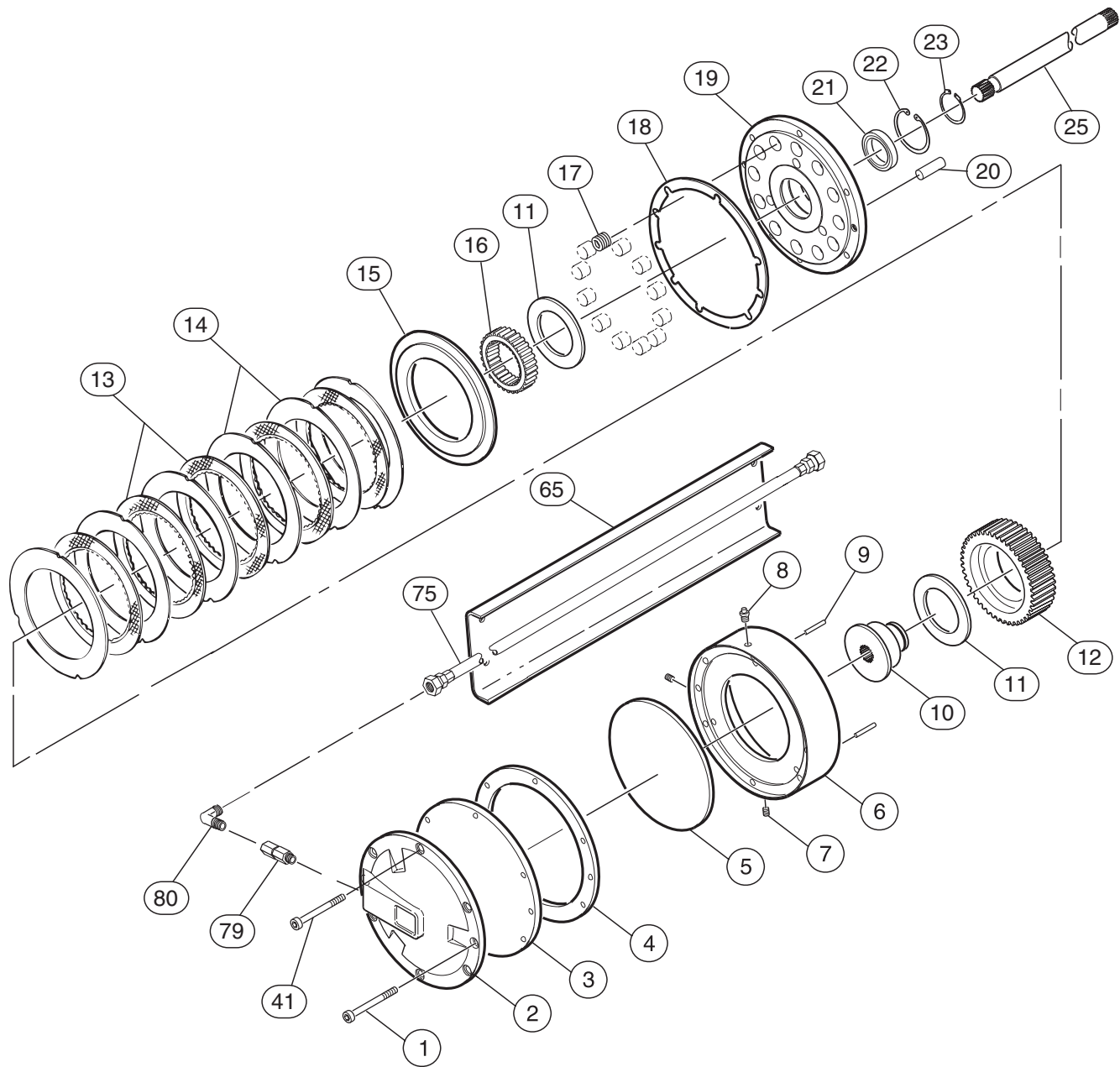
*** Seal Ring, item 251, set = quantity of 4.

Motor Assembly Kit List:

Item No.	Description of Part	Total Qty	Part Number
231	Crank Assembly (includes items 229, 230 and 235 through 237)	1	K5B-A516
261	Piston Assembly (includes items 202 through 205 and item 207)	1	K5B-A513-47
---	Motor Gasket Kit (includes items 209, 226, 243, 244 and 248)	1	26823
• ---	Motor Service Kit (includes items 196, 197, 200, 202, 207-209, 226, 243, 244 and 251)	1	71390181

- Recommended spare for one winch, 2 years of normal operation

DISC BRAKE ASSEMBLY DRAWING



(Dwg. MHP1230)

DISC BRAKE ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
320	Disc Brake Assembly *	1	24140	15	Pressure Plate	1	24137
1	Capscrew	6	71264717	16	Sprag Clutch Kit ***	1	27724
2	End Cover **	1	23605	17	Spring	12	71053730
3	Diaphragm	1	22031	18	Gasket	1	71262257
4	Ring	1	22028	19	Support Plate	1	24138
5	Diaphragm Support	1	22027	20	Dowel Pin	1	71126759
6	Housing	1	22026	21	Bearing	1	50449
7	Plug	2	71069009	22	Retainer Ring	1	54375
8	Breather	1	71271175	23	Retainer Ring	1	71053748
9	Dowel Pin	3	71126882	25	Brake Shaft †	1	24039
10	Inner Race †	1	***	41	Capscrew	2	71354146
11	Spacer	2	19007	50	Label ††	1	71306518
12	Outer Race †	1	***	79	Valve Exhaust	1	71047898
13	Friction Plate	5	71126874	80	Elbow Fitting	1	24141
14	Separator Plate	6	22033				

Side Rails				Brake Hose			
65	Short Drum (15 in.)	1	24674	75	Short Drum (15 in.)	1	23230-63
	Long Drum (27 in.)		24675		Long Drum (27 in.)		23230-75

- Recommended spare for one winch, 2 years of normal operation

* Disc Brake Assembly includes items 1 through 25, 41 and 50.

** As viewed from the brake end, the air line attaches to the brake cover on the left hand side on standard winches and on the right hand side on winches supplied with the optional Open Frame (Face) configuration. On winches with the optional Open Frame (Face) configuration, install the end cover (item 2) rotated 180° from view shown.

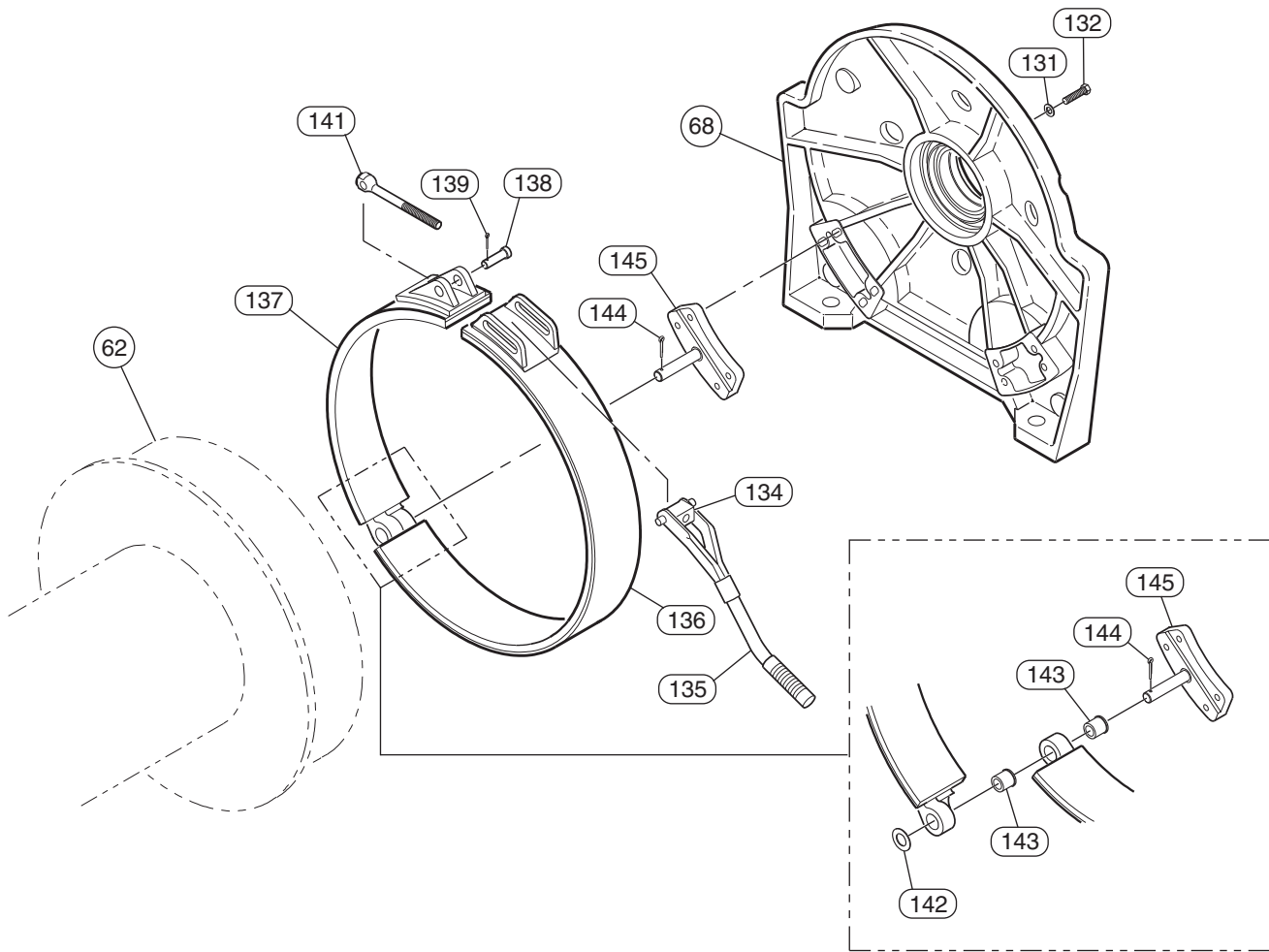
*** Sprag Clutch Kit (16) includes Inner Race (10) and Outer Race (12).

† 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 (15 in. long) (item 62) part number 24046 as part number 24046CH or 24046CHA.

Certification Type	Example Part Number To Order	
ABS	---	24046CHA
DNV	24046CH	---

†† Item not illustrated

MANUAL DRUM BRAKE ASSEMBLY DRAWING AND PARTS LIST



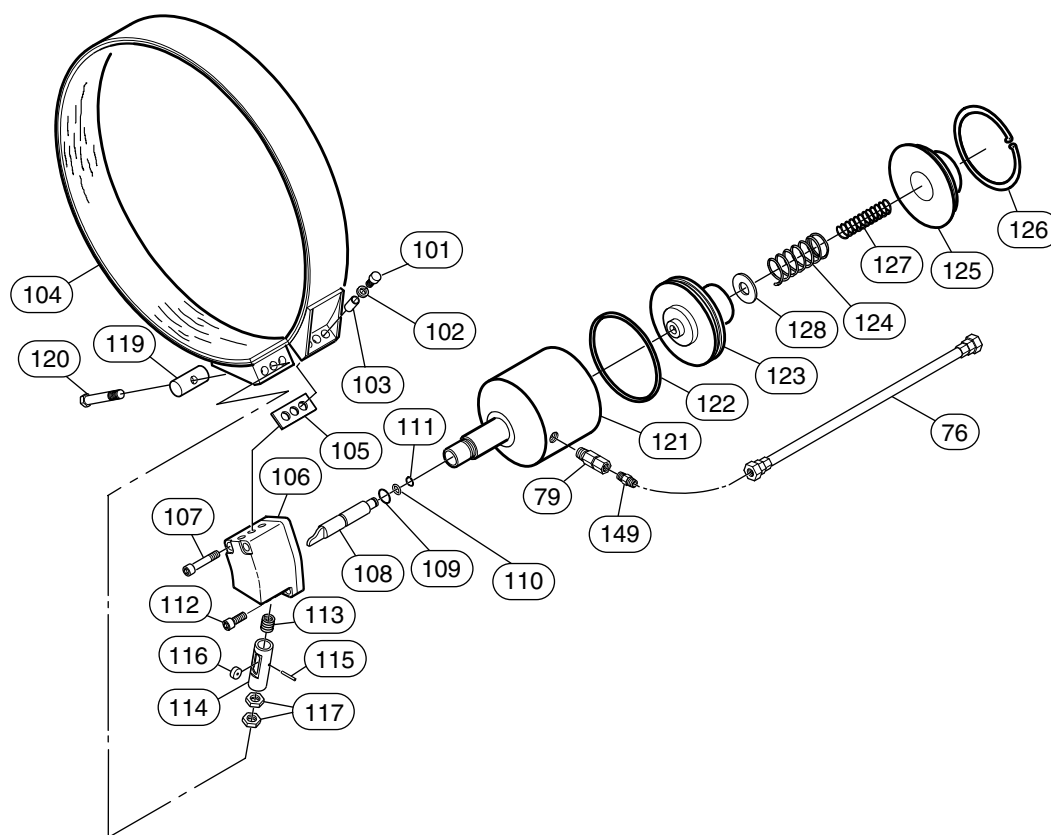
(Dwg. MHP1448)

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
147	Brake Assembly (includes items 131 through 145)	1	26377	137	Front Brake Band Assembly (only available as a set) †	1	26641
62	Drum, Short (12 inch (305 mm))	1	23750	138	Pin †	1	4308-S
	Drum, Long (24 inch (610 mm))		21729	139	Cotter Pin	1	51996
68	Upright, Motor End	1	25567	141	Brake Link Stud †	1	4115
131	Washer	4	71334411	142	Washer	1	71334379
132	Capscrew	4	71335459	143	Bushing	2	71334403
134	Pivot Nut	1	2445	144	Cotter Pin	1	50965
135	Brake Handle	1	26388	145	Adapter Plate	1	26350
136	Rear Brake Band Assembly (only available as a set) †	1	26641	---	Brake Lining Kit (includes brake lining and rivets)	1	26642

† 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 (15 in. long) (item 62) part number 24046 as part number 24046CH or 24046CHA.

Certification Type	Example Part Number To Order	
ABS	---	24046CHA
DNV	24046CH	---

AUTOMATIC DRUM BRAKE ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2433)

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
130	Brake Assembly *	1	23890	114	Plunger †	1	23886
76	Hose Assembly	1	24403-39	115	Dowel Pin	1	71144968
79	Valve, Exhaust	1	71047898	116	Roller †	1	23883
101	Capscrew	3	71264808	117	Jam Nut	2	71267413
102	Spacer	3	21899	119	Pivot Bar	1	23755
103	Spacer Tube	3	21891	120	Capscrew	1	71267405
• 104	Band Assembly †	1	24367	121	Cylinder	1	23889
105	Spacer	1	23029	• 122	'O' Ring	1	52536
106	Brake Bracket †	1	22984	123	Piston	1	23884
107	Capscrew	2	71264832	124	Spring	1	71144943
108	Cylinder Rod	1	23885	125	Cover	1	23887
• 109	'O' Ring	1	71049423	126	Retainer Ring	1	71126668
• 110	'O' Ring	1	52662	127	Spring	1	71144935
111	Retainer Ring	1	54136	128	Washer	1	71145080
112	Capscrew	2	71264824	149	Fitting, Nipple	1	52092
113	Spring	1	71126643				

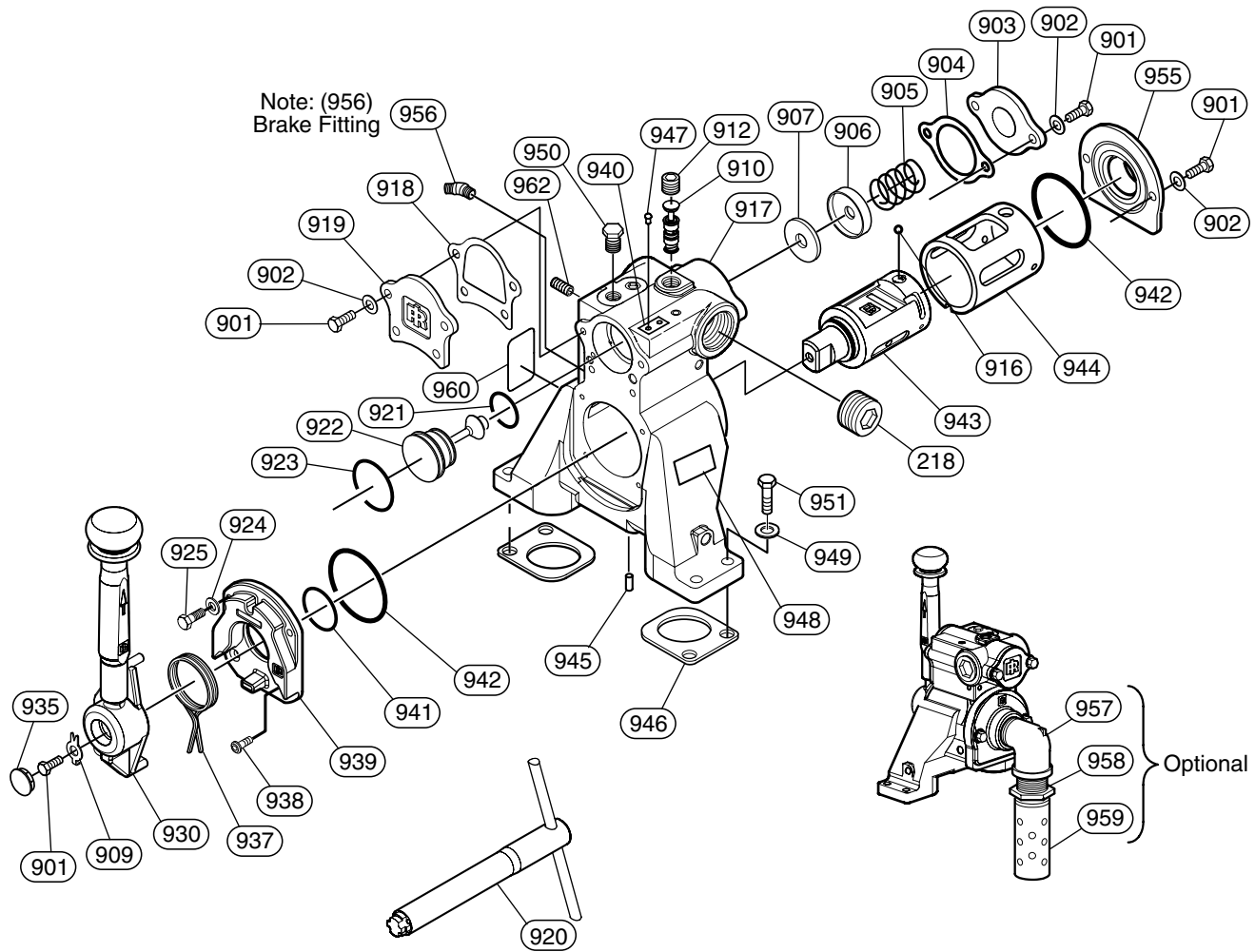
* Automatic Drum Brake Assembly (130), includes items 101-128.

• Recommended spare for one winch, 2 years of 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 (15 in. long) (item 62) part number 24046 as part number 24046CH or 24046CHA.

Note: See certification type cold weather chart on page 44 for example of part number to order.

K5C2-X CONTROL VALVE ASSEMBLY DRAWING



K5C2-X CONTROL VALVE ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
900	Control Valve Assembly	1	K5C2-X	938	Buttonhead Screw	2	71394407
218	Plug	1	71263297	939	Seal Bracket (Note 2)	1	28733-S
901	Capscrew	9	71342034	940	Tag, No FA2B	1	71392757
902	Washer	8	71303408	941	'O' Ring	1	71357198
903	Cover, Poppet	1	26997	942	'O' Ring	2	51651
904	Gasket, Poppet	1	27064	943	Reverse Valve Kit (Normal)**	1	27925-SX
905	Spring, Poppet	1	71351068		Reverse Valve (Reverse Bias)**		28002
906	Cap, Poppet	1	28734		Reverse Valve (Unbiased)		****
907	Seal, Poppet	1	26991	944	Bushing (Normal)***	1	26686
909	Washer, Tab Lock	1	71398051		Bushing (Reverse Bias)***		27450
910	Pilot Valve Assembly	1	28696		Bushing (Unbiased)		****
912	Plug	1	71267561	945	Pin	1	71146674
916	Ball	1	D10-280	946	Gasket	1 set	27115
917	Valve Housing	1	*	947	Rivet	2	71028849
918	Gasket, Cover	1	26999	948	Label, Throttle Direction	1	71352777
919	Cover, Piston	1	26998	949	Washer	4	71376370
920	I-R Pilot Valve Tool	1	28690	950	Plug	1	71366348
921	'O' Ring	1	52537	951	Capscrew	4	71369276
922	Piston (Note 1)	1	28735-S	955	Exhaust Flange	1	26691
923	'O' Ring	1	71355796	956	Fitting	1	71367932
924	Washer	2	71271985	957	Fitting, Elbow	1	71273676
925	Capscrew	2	71348338	958	Fitting, Nipple	1	71057483
930	Handle Assembly	1	27239-1	959	Muffler	1	52472
935	Plug	1	71348965	960	Label, Warning	1	71373229
937	Spring	1	26966	962	Breather	1	51559

* Item 917 not sold separately, order item 900.

** Reverse Valve (Normal) for Standard Overwound operation. Reverse Valve (Reverse Bias) for Optional Underwound operation.


*** Ensure Bushing matches Reverse Valve (Reverse Valve (Normal) and Bushing (Normal)). Mixing these components can result in erratic winch operation.

**** Reverse Valve (Unbiased) and Bushing (Unbiased) contact factory for application.

Note 1: Item 922 not sold separately, includes items (6) each of 901 and 902, items 904-907, 918, 921 and 923.

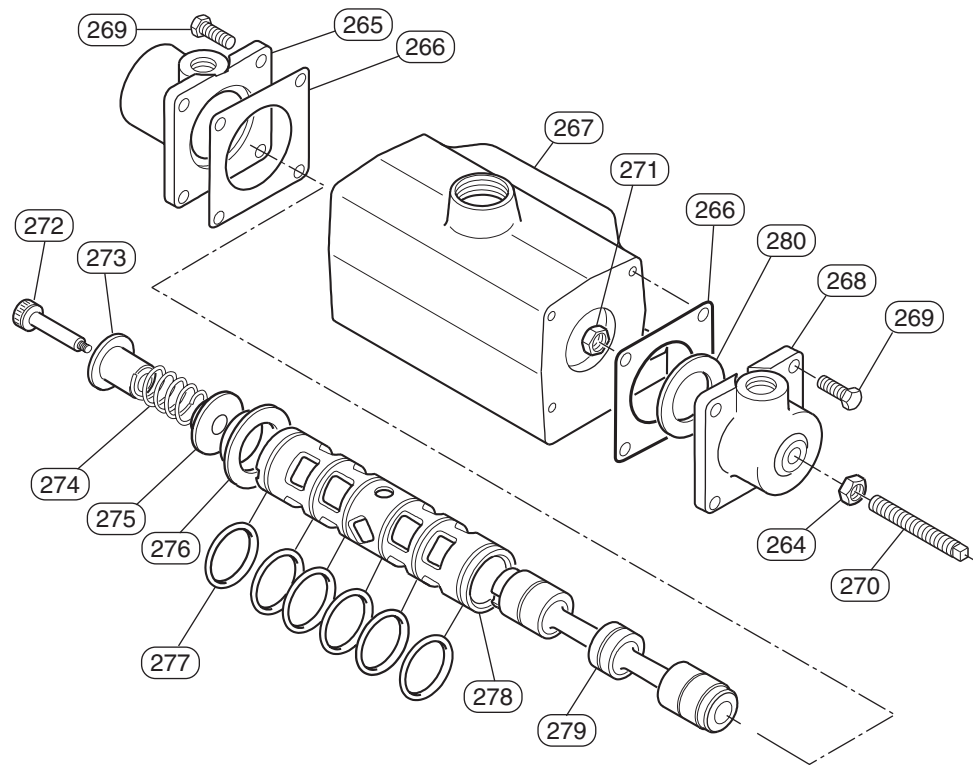
Note 2: Item 939 not sold separately, includes items (1) each of 901 and 909, items 924, 925, 935, 937, 938, 941 and 942.

Item No.	Kit Description	Total Qty	Part Number
• 780	Control Valve Service Kit Standard (includes items 901, 902, 904, 905, 907, 909, 916, 918, 921, 923-925, 935, 937, 938, 941, 942, 946, 949 and 951) (K5C2-X only)	1	27240
784	Reverse Valve Kit (includes items 940, 943 and 947) (All other winch models)	1	27925-SX
• 786	Overload Valve Service Kit (includes items 701, 703, 712 through 714, 716, 722 and 942)	1	27995
• 788	Emergency Stop Service Kit (includes items 703 and 711)	1	27994
789	Emergency Stop Kit (Optional Feature)*	1	28026
930	Handle Assembly Kit (includes items 901, 909, 930 and 935)	1	27239-1

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

* Kits can be installed to K5C2-X control valve for emergency stop option.

PILOT AIR CONTROL VALVE (OPTIONAL) ASSEMBLY DRAWING AND PARTS LIST



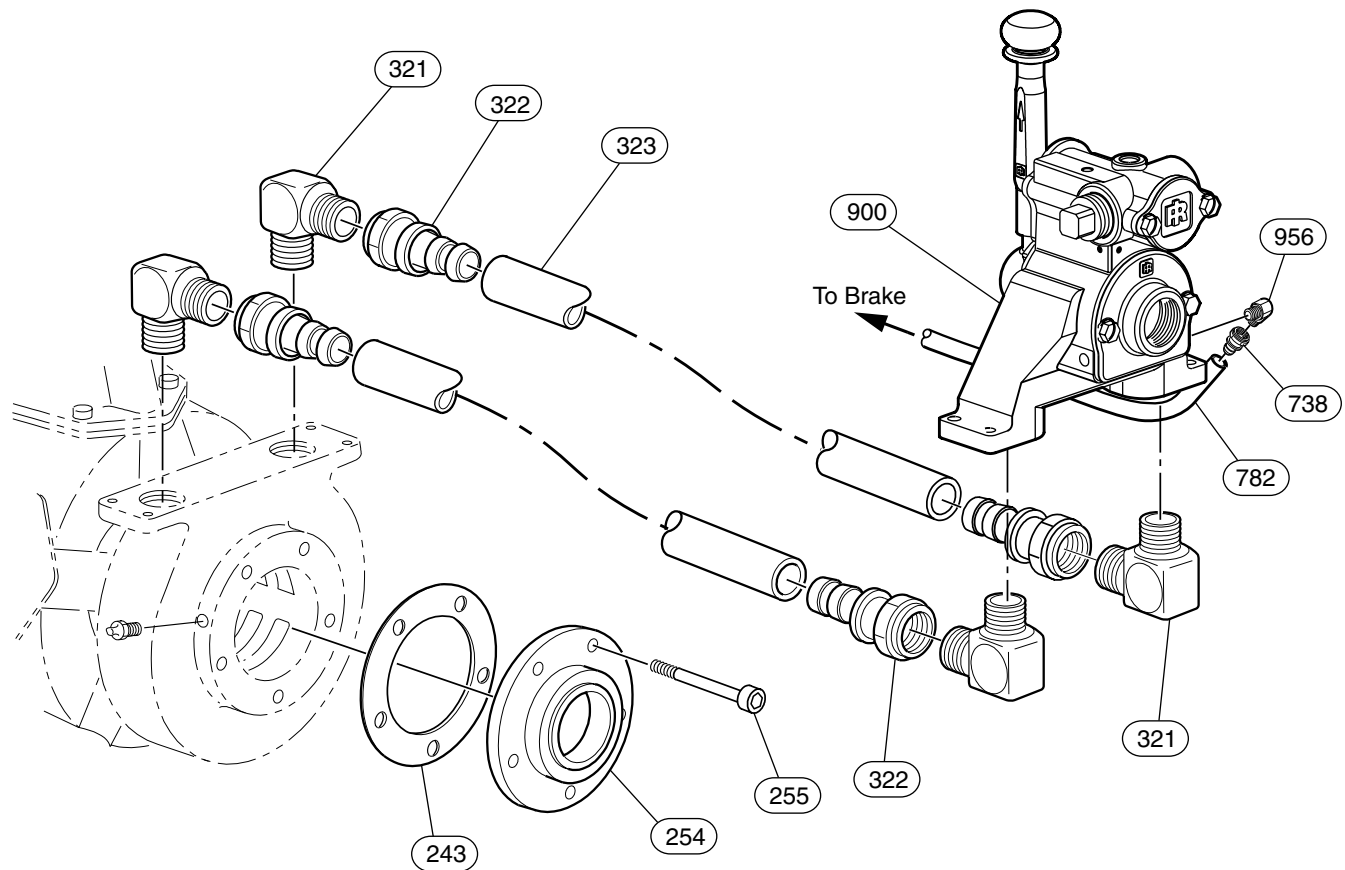
(Dwg. MHP2416)

Item No.	Description of Part	Total Qty	Part Number
			510 size
355	Valve Assembly (includes items 265 through 280)	1	20993-P
264	Locknut	1	71069132
265	End Cap	1	71136725
266	Gasket	2	71136733
267	Valve Body	1	Not sold separately, order item 355
268	End Cap Assembly (includes items 270 and 271)	1	25591
269	Capscrew	8	71030118
270	Adjusting Screw	1	53545
271	Nut	2	50176
272	Shoulder Screw	1	54710
273	Guide	1	71136741
274	Spring	1	71136758
275	Washer	1	71136774
276	Spacer	1	71136766
277	'O' Ring (only available in Pilot Air Control Valve Service Kit)	1	Order Kit
278	Valve Sleeve	1	Not sold separately, order item 355
279	Valve Spool	1	
280	Washer	1	71332324

Service Kit	Part Number
• Pilot Air Control Valve Service Kit (includes items 266 (qty 2) and 277 (qty 6))	71356406

- Recommended spare for one winch, 2 years of normal operation

FULL FLOW REMOTE CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

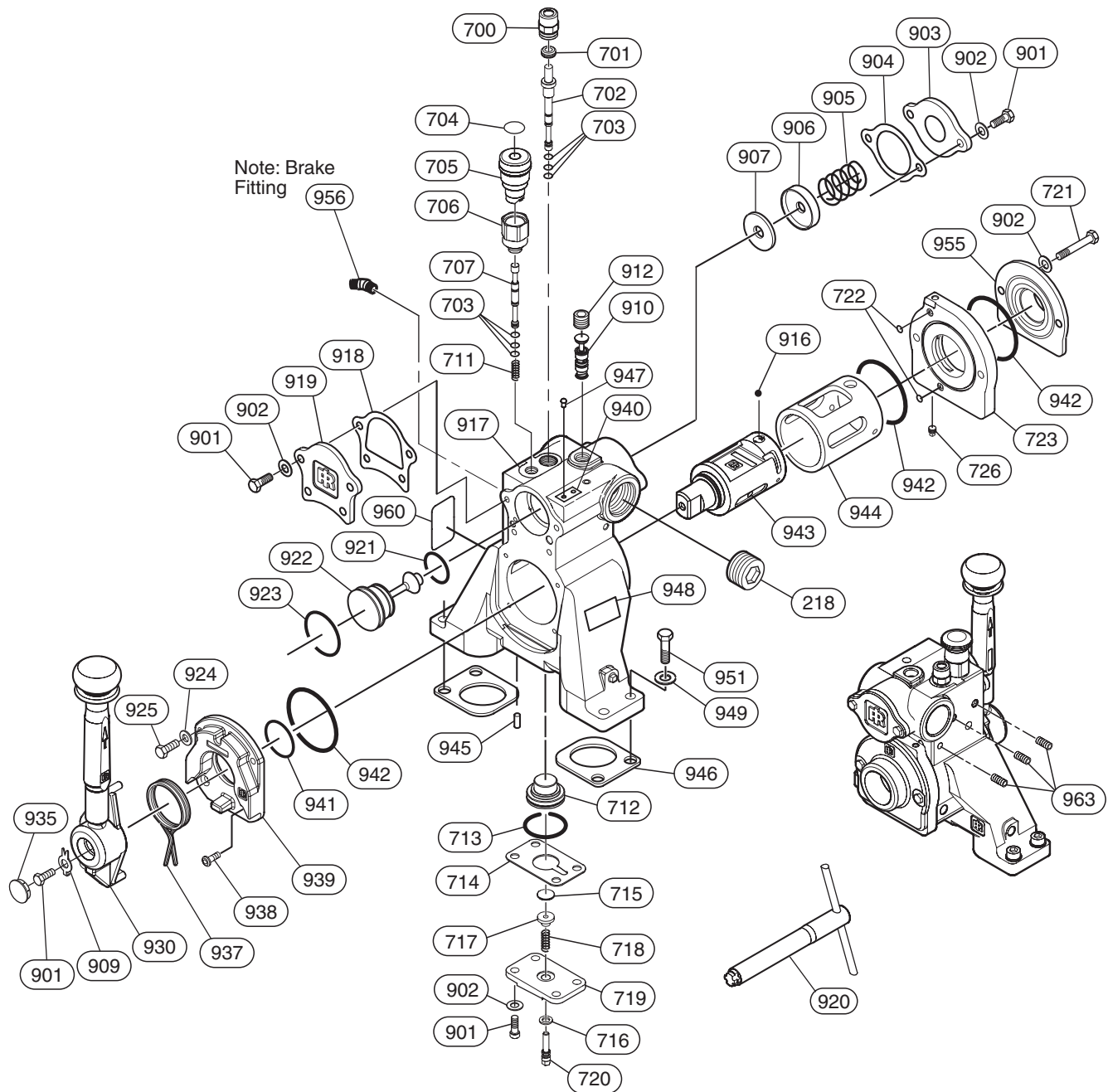


(Dwg. MHP2432)

Item No.	Description of Part	Total Qty	Part Number
243	Gasket	1	K5B-928
254	Exhaust Cover	1	KK5B-276M
255	Capscrew	5	51471
321	Fitting, Elbow	4	54270
322	Fitting Hose End	4	54738
323	Hose (bulk)	As Req'd	54737
738	Hose End	2	51029
782	Hose (bulk)	As Req'd	50923
900	Control Valve Assembly	1	K5C2-SBK-X
956	Fitting, Elbow	1	71367932

Note: To convert live air control to remote live air control contact factory for kit part numbers.

EMERGENCY STOP AND OVERLOAD K5C2-EX VALVE ASSEMBLY DRAWING



(Dwg. MHP2434)

EMERGENCY STOP AND OVERLOAD K5C2-EX VALVE PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
• 908	Control Valve Assembly	1	K5C2-EX	919	Cover, Piston	1	26998
218	Plug	1	71263297	920	I-R Pilot Valve Tool	1	28690
700	Cap	1	27491	921	'O' Ring	1	52537
701	Grommet	1	71365779	922	Piston (Note 1)	1	28735-S
702	Plunger	1	27490	923	'O' Ring	1	71355796
703	'O' Ring	6	71127039	924	Washer	2	71271985
704	Label, Stop	1	95790099	925	Capscrew	2	71348338
705	Button, E-Stop	1	71372601	930	Handle Assembly	1	27239-1
706	Adapter	1	27488	935	Plug	1	71348965
707	Plunger	1	27489	937	Spring	1	26966
711	Spring	1	71365787	938	Buttonhead Screw	2	71394407
712	Piston	1	27964	939	Seal Bracket (Note 2)	1	28733-S
713	'O' Ring	1	51768	940	Tag, No FA2B	1	71392757
714	Gasket	1	27493	941	'O' Ring	1	71357198
715	Plate	1	27624	942	'O' Ring	3	51651
716	'O' Ring	1	71365795	943	Reverse Valve Kit (Normal)**	1	27925-SX
717	Adjustment Nut	1	24374		Reverse Valve (Reverse Bias)**		28002
718	Spring	1	71053730		Reverse Valve (Unbiased)		****
719	Cover	1	27494	944	Bushing (Normal)***	1	26686
720	Screw, Adjusting	1	27571		Bushing (Reverse Bias)***		27450
721	Capscrew	2	71365811		Bushing (Unbiased)		****
722	'O' Ring	2	71138135	945	Pin	1	71146674
723	Adapter, Exhaust	1	27540	946	Gasket	1 set	27115
726	Plug	1	27945	947	Rivet	2	71028849
901	Capscrew	11	71342034	948	Label, Throttle Direction	1	71352777
902	Washer	12	71303408	949	Washer	4	71376370
903	Cover, Poppet	1	26997	951	Capscrew	4	71369276
904	Gasket, Poppet	1	27064	955	Exhaust Flange	1	26691
905	Spring, Poppet	1	71351068	956	Fitting	1	71367932
906	Cap, Poppet	1	28734	957	Fitting, Elbow (refer to Dwg. MHP2427)	1	71273676
907	Seal, Poppet	1	26991				
909	Washer, Tab Lock	1	71398051	958	Fitting, Nipple (refer to Dwg. MHP2427)	1	71057483
910	Pilot Valve Assembly	1	28696				
912	Plug	1	71267561	959	Muffler (refer to Dwg. MHP2427)	1	52472
916	Ball	1	D10-280				
917	Valve Housing	1	*	960	Label, Warning	1	71373229
918	Gasket, Cover	1	26999	963	Plug	3	28628

* Item 917 not sold separately, order item 908.

** Reverse Valve (Normal) for Standard Overwound operation. Reverse Valve (Reverse Bias) for Optional Underwound operation.

*** Ensure Bushing matches Reverse Valve (Reverse Valve (Normal) and Bushing (Normal)). Mixing these components can result in erratic winch operation.

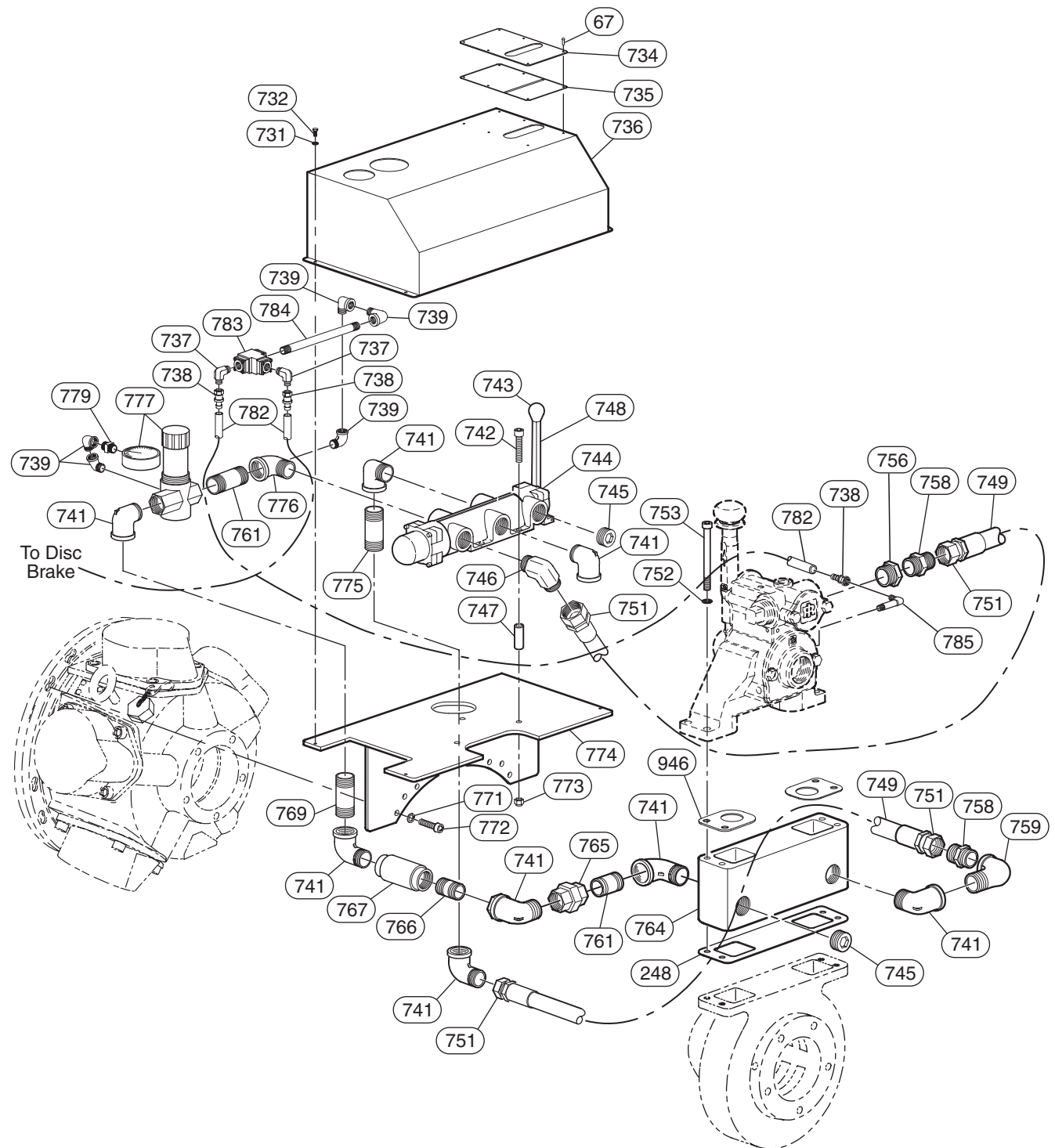
**** Reverse Valve (Unbiased) and Bushing (Unbiased) contact factory for application.

Note 1: Item 922 not sold separately, includes items (6) each of 901 and 902, items 904-907, 918, 921 and 923.

Note 2: Item 939 not sold separately, includes items (1) each of 901 and 909, items 924, 925, 935, 937, 938 and 940.

Note 3: Refer to page 45 for kits and spare part kits.

TENSIONING MANIFOLD ASSEMBLY DRAWING



(Dwg. MHP2436)

TENSIONING MANIFOLD ASSEMBLY PARTS LIST

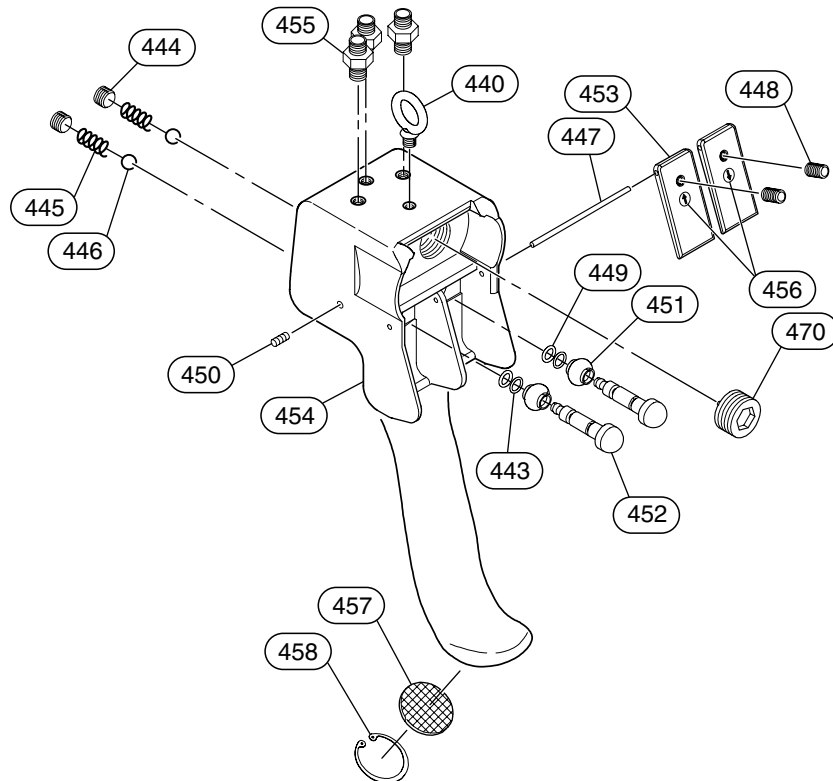
Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
67	Rivet	6	50915	756	Fitting, Bushing	1	50934
248	Gasket	1	K5B-547	758	Fitting, Nipple	2	71308258
731	Washer	4	71320964	759	Fitting, Elbow	1	50928
732	Capscrew	4	71127054	761	Fitting, Nipple	2	50933
734	Label, Tensioning Manifold	1	26217	764	Manifold, Control Valve	1	25874
735	Gasket	1	26216	765	Union	1	71328330
736	Cover	1	26215	766	Fitting, Nipple	1	71328314
737	Fitting, Elbow	2	54869	767	Check Valve	1	71320915
738	Fitting, Hose End	3	51029	769	Fitting, Nipple	1	71328249
739	Fitting, Elbow	5	52803	771	Washer	4	71320956
741	Fitting, Elbow	8	54243	772	Capscrew	4	71320949
742	Capscrew	3	71319073	773	Nut	3	71069132
743	Handle Ball	1	71138051	774	Bracket	1	26095
744	Valve	1	71316434	775	Fitting, Nipple	1	71320907
745	Plug	2	71069017	776	Fitting, Elbow	1	26057
746	Fitting, Elbow	1	51001	777	Regulator and Gauge*	1	71325047
747	Spacer	3	14998-8B	779	Fitting, Connector	1	54943
748	Handle	1	26149	782	Hose**	As Req'd	50923
749	Hose**	As Req'd	51003	783	Shuttle Valve	1	50277
751	Fitting, Hose End	4	51002	784	Fitting, Tube Extension	1	71325591
752	Washer	4	51581	785	Fitting, Elbow	1	71149975
753	Capscrew	4	71328199	946	Gasket	1 set	27115

* Items not sold separately

** Order in even foot increments, i.e. 51003-02 = 2 feet (0.6 metres)

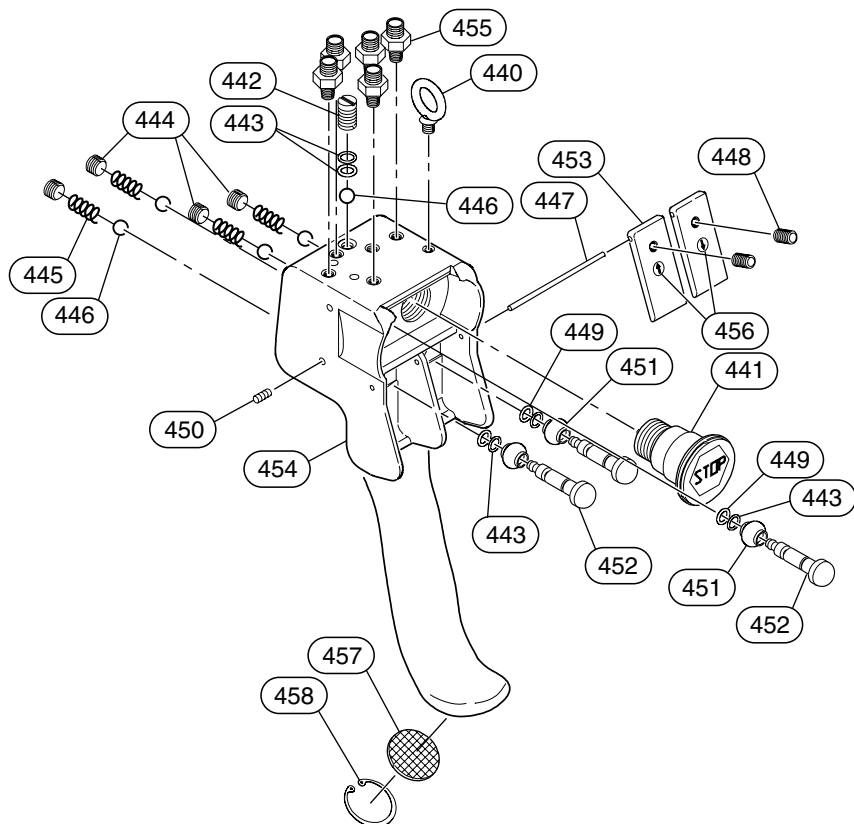
REMOTE PENDANT ASSEMBLY DRAWINGS

Pendant without Emergency Stop



(Dwg. MHP2346)

Pendant with Emergency Stop



(Dwg. MHP1677)

REMOTE PENDANT ASSEMBLY PARTS LIST

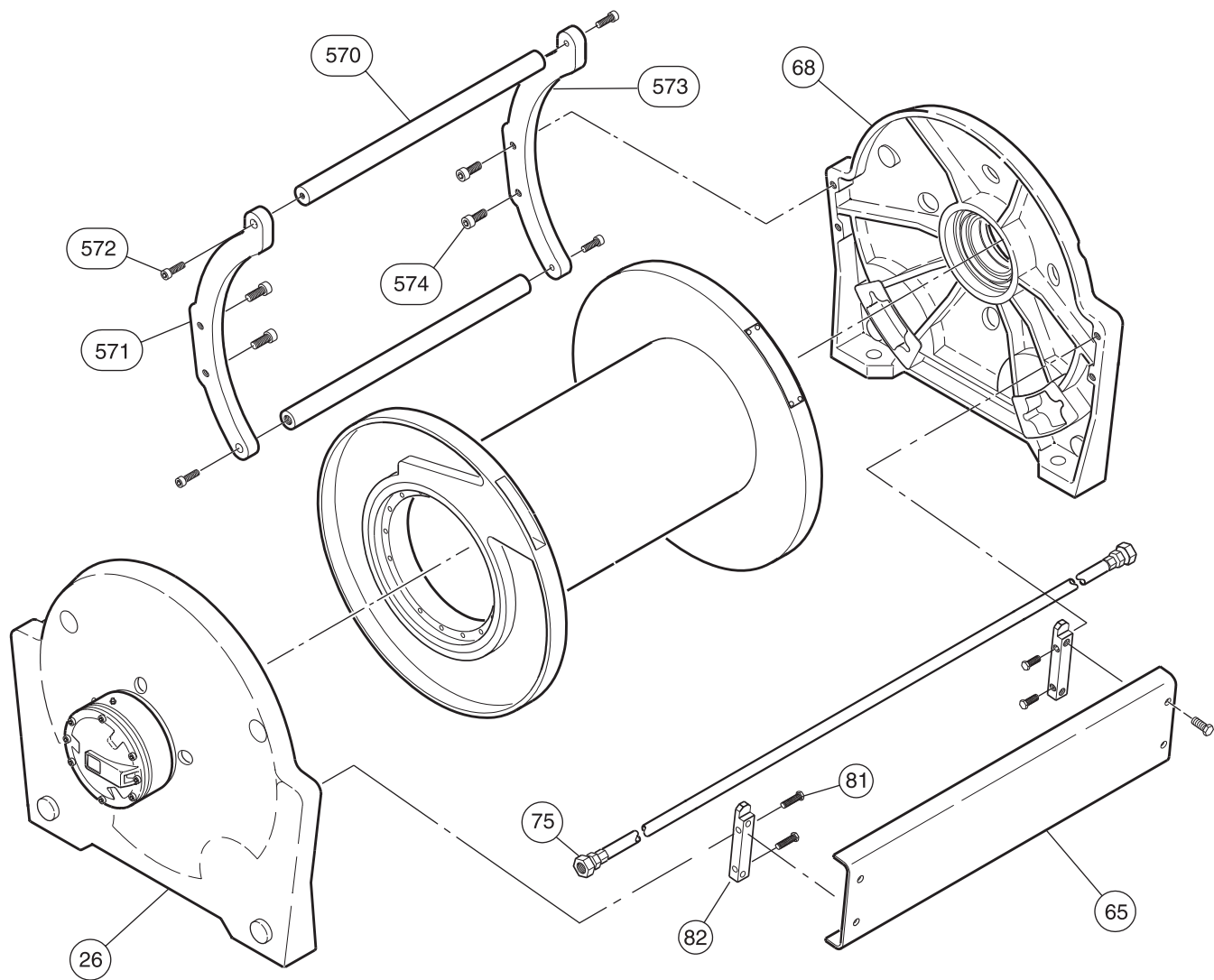
Item No.	Description of Part	Total Qty	Part Number	
			Without E-Stop	With E-Stop
353	Pendant Assembly*	1	PHS2E	PHS2E-U
440	Lifting Eye	1	64222332	
441	Emergency Stop Valve	1	---	95790108
442	Plug	1		95790106
• 443	'O' Ring	2(5)	58209229	
444	Plug	2(4)	54292	
445	Spring	2(4)	69128541	
446	Ball	2(5)	69401625	
447	Pin	1	95790040	
448	Setscrew	2	42008607	
• 449	'O' Ring	2(3)	58235329	
450	Setscrew	2(3)	42008307	
451	Protector	2(3)	95790107	
452	Valve	2(3)	95790104	
453	Lever	2	95790122	
454	Pendant Handle	1	order item 353	
455	Fitting	3(5)	71078158	
456	Label Kit	1	95790111	
457	Exhaust Washer	1	95790114	
458	Retainer Ring	1	47713030	
470	Plug	1	65129541	---

* Pendant assembly without E-Stop includes items 440, 443-449 and 451-458 and 470.

** Pendant assembly with E-Stop includes 440-449 and 451-458.

- Recommended spare for one winch, 2 years of normal operation.

OPEN FRAME (FACE) WINCH ASSEMBLY DRAWING



(Dwg. MHP1231)

OPEN FRAME (FACE) WINCH ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
26	Upright, Outboard End	1	25566	571	Sideframe, Outboard End	1	25548
68	Upright, Motor End	1	25567	572	Capscrew	4	71306450
81	Capscrew	4	71264709	573	Sideframe, Motor End	1	25549
82	Corner Bar	2	21882	574	Capscrew	4	71306443

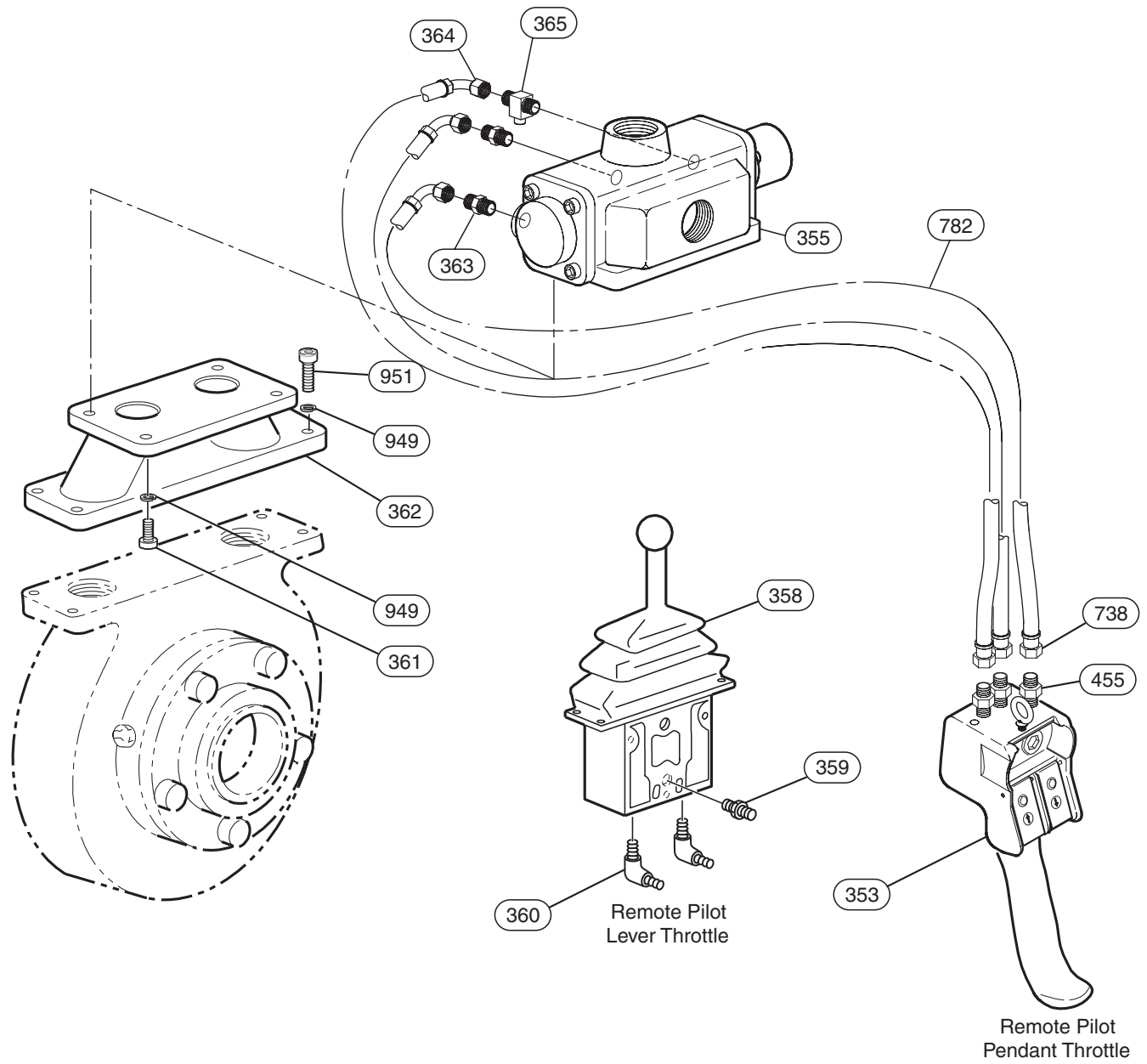
65	Side Rail:			570	Bar:		
	Short Drum	1	24674		Short Drum	2	*
	Long Drum		24675		Long Drum		25550
75	Brake Hose:						
	Short Drum	1	23230-63				
	Long Drum		23230-75				

Open Frame (Face) Kit Assembly (includes Items 570 through 574):

Short Drum	1	*	Long Drum	1	25546
------------	---	---	-----------	---	-------

* Contact factory.

REMOTE PILOT AIR CONTROL (OPTIONAL) PARTS DRAWING



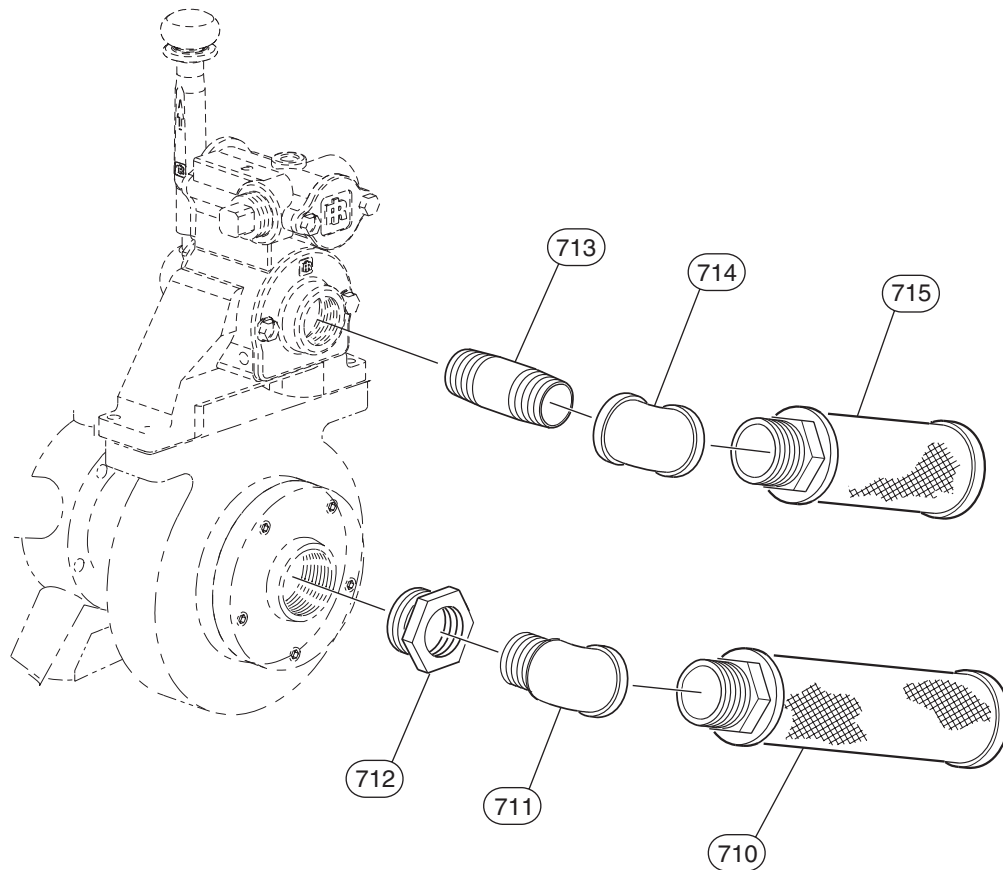
(Dwg. MHP2444)

REMOTE PILOT AIR CONTROL (OPTIONAL) PARTS LIST

Item No.	Description of Part	Total Qty	Part Number
353	Remote Pilot Pendant	1	PHS2E
355	Valve Assembly	1	20993-P
358	Remote Pilot Lever Throttle	1	71386064
359	Fitting, Nipple	1	71048268
360	Fitting, Elbow	2	51281
361	Capscrew	4	71355895
362	Manifold	1	13881-P
363	Fitting, Nipple	2	53939
364	Fitting, Hose	3	52179
365	Fitting, Tee	1	52181
455	Fitting, Nipple	3	71078158
738	Fitting, Hose	3	51029
782	Hose (bulk) †	As Req'd	50923
949	Washer	8	71376370
951	Capscrew	4	71369276

† Hose lengths exceeding 50 ft (16 m), contact factory.

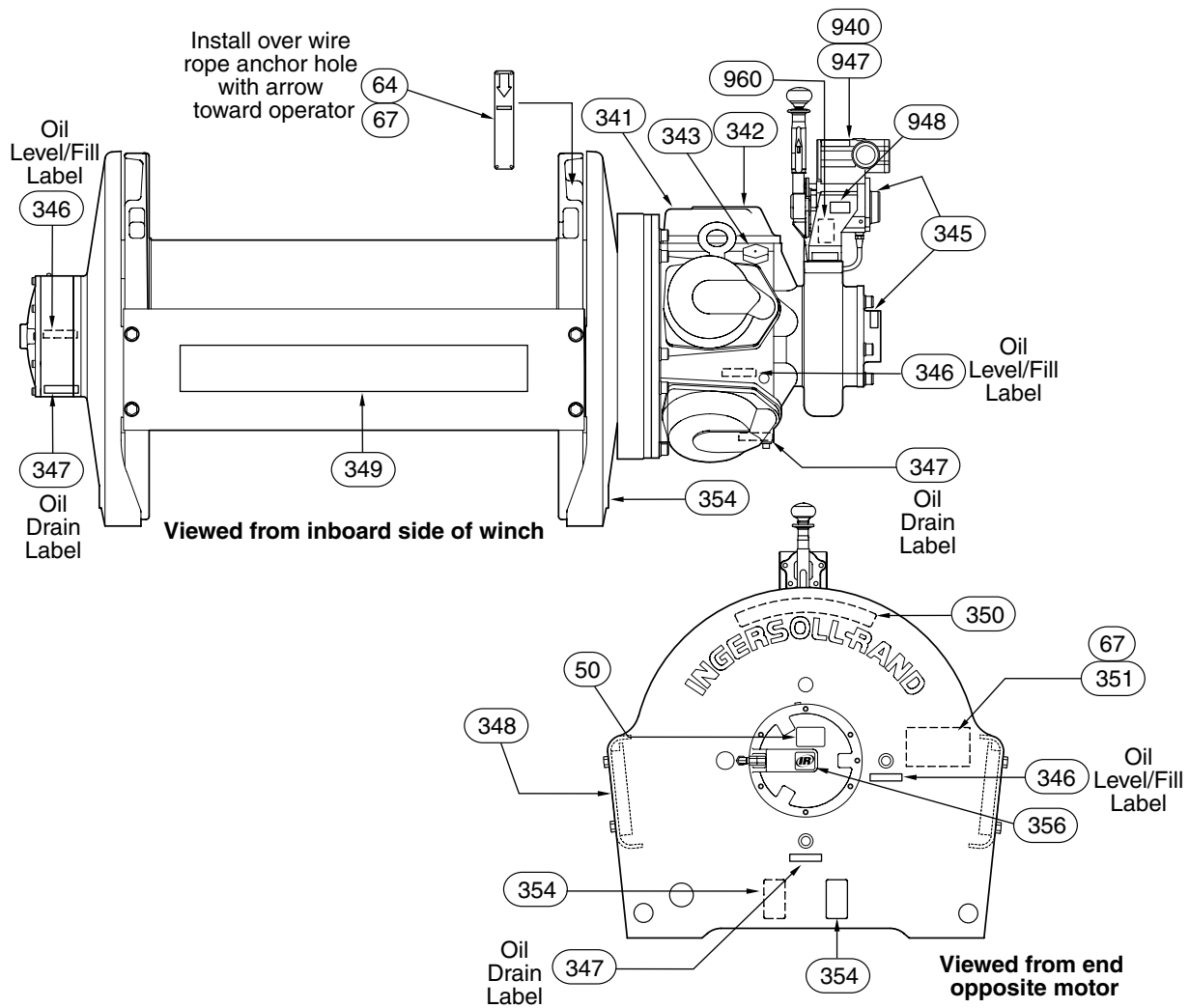
MUFFLER ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP1189)

Item No.	Description of Part	Total Qty	Part Number
Motor Muffler and Fittings:			
710	Muffler	1	50594
711	Elbow Fitting	1	71106439
712	Reducer	1	71057459
Control Valve Muffler and Fittings:			
713	Nipple Fitting	1	71311260
714	Elbow Fitting	1	54299
715	Muffler	1	71264360

WINCH LABEL/TAG LOCATION PARTS DRAWING



(Dwg. MHP1229)

WINCH LABEL/TAG LOCATION PARTS LIST

Item No.	Description of Part	Total Qty	Part Number
300	Label Kit (Short)**	1	23510-1-S
	Label Kit (Long)***		23510-2-S
50	Label, Disc Instructions	1	71306518
64	Label, Wire Rope Cover	1	71148282
67	Rivet	8	50915
341	Label, Warning	1	04306445
342	Tag, Warning	1	71056410
343	Tag, Notice Check Oil Level	1	71107148
345	Label, Exhaust	1 set	71295240
346	Label, Oil Level/Fill		
347	Label, Oil Drain		
348	Product Label (Short)	1	71111777
	Product Label (Long)		71109508
349	I-R Logo (Short)	1	71106272
	I-R Logo (Long)		71109102
350	Label, Throttle Direction	1	71126585
351	Nameplate	1	Contact Factory
354	Label, Warning	2	71270813
356	Label, I-R Monogram	1	71137780
940	Tag, No FA2B	1	71392757
947	Rivet	2	71028849
948	Label, Throttle Direction	1	71352777
960	Label, Warning	1	71373229

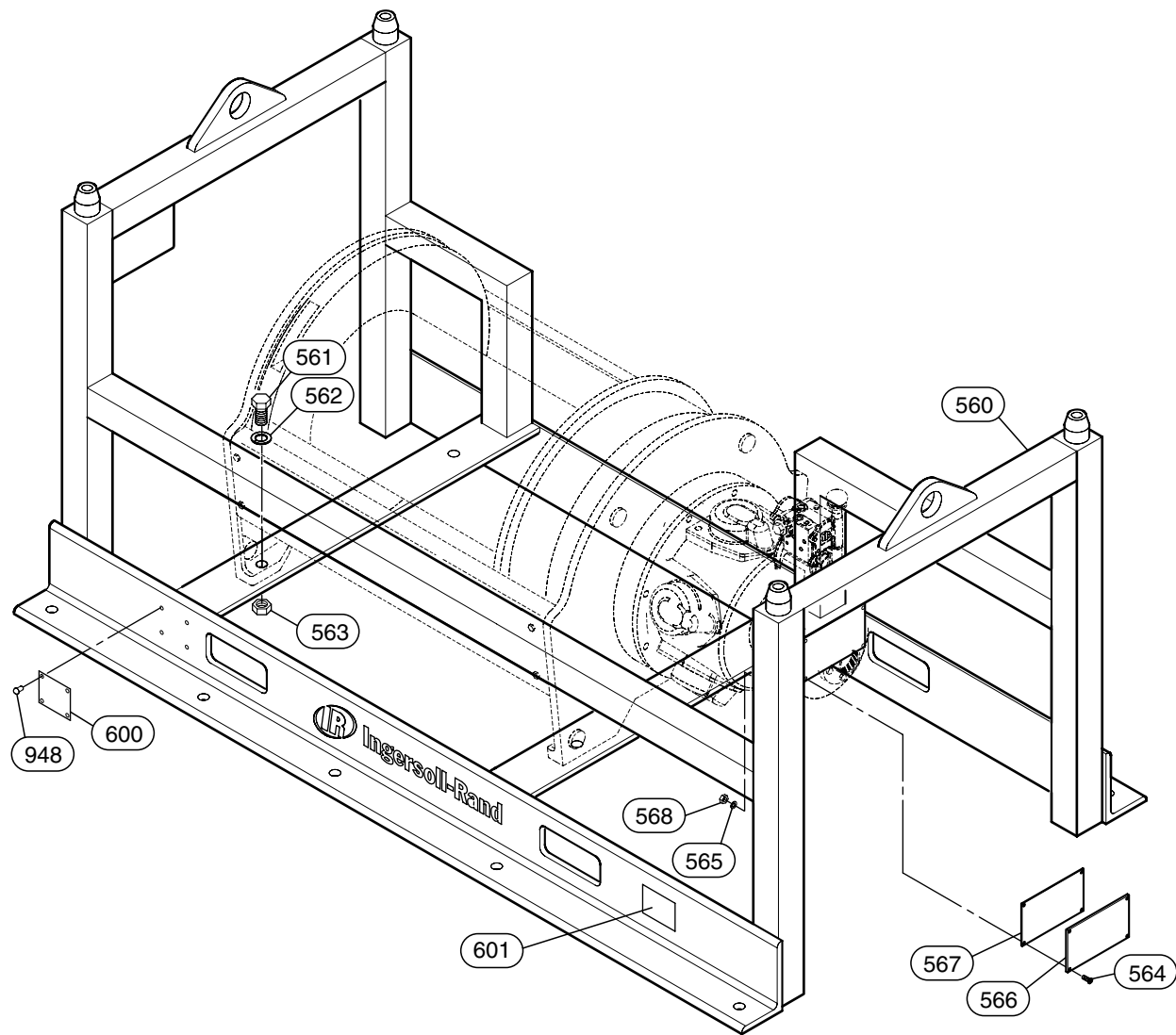
Contact factory with winch serial number for new nameplate orders.

** 23510-1-S (includes items 341-343, 345-347, 349, 350 and 354-356)

*** 23510-2-S (includes items 341-343, 345-347, 349, 350 and 354-356)

Note: Contact factory for (CE) European label information.

CONSTRUCTION CAGE ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2438)

Item No.	Description of Part	Total Qty	Part Number
560	Construction Cage (Short)	1	CC-FA5A-SM
	Construction Cage (Long)		CC-FA5A-LM
561	Capscrews	4	71355838
562	Lockwasher	4	71316830
563	Locknut	4	71355846
564	Buttonhead Screw	4	71359129
565	Washer	4	51831
566	Cover, Label	1	27426
567	Label, Specification	1	71359137
568	Nut	4	50852
600	Nameplate	1	Contact Factory
601	Label, Warning	1	71359384
948	Rivet	4	71028849

SERVICE NOTES

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.

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 which 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 unit has expired, it is recommended that it 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

WARRANTY

LIMITED WARRANTY

Ingersoll-Rand Company (I-R) warrants to the original user its Hoists and Winches (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 enroute 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

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

For Technical Support

Ingersoll-Rand
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046
Phone: (206) 624-0466 or
(866) 273-FAST (3278)
Fax: (206) 624-6265

Web Site:

www.airwinch.com

Regional Sales Offices

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

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

International Office Locations

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

Canada

National Sales Office Regional Warehouse Toronto, Ontario

51 Worcester Road
Rexdale, Ontario
M9W 4K2
Phone: (416) 213-4500
Fax: (416) 213-4510
Order Desk
Fax: (416) 213-4506

Latin America Operations

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

Europe, Middle East and Africa

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

Asia Pacific Operations

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

Russia

Ingersoll-Rand
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: 613 95541642
Fax: 613 95541607