Form MHD56115

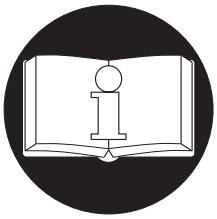
PARTS, OPERATION AND MAINTENANCE MANUAL

THIRD GENERATION

force5™ AIR WINCHES

MODEL FA5A-MR

ManRider®



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 operation, installation and maintenance of these products.

These instructions apply only to winches designed by Ingersoll-Rand that are identified for personnel lifting by a permanent nameplate attached to the winch at the factory.

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

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

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INGERSOLL-RAND
MATERIAL HANDLING

CONTENTS

SAFETY INFORMATION

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

Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in an 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

• 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 Material Handling 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. See 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.

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

Man-Rider winches are type approved and/or certified to meet the requirements of the Offshore Oil Industry by one or more of the following regulatory bodies:
American Bureau of Shipping (ABS), **Lloyd's Register of Shipping** (LRS) or **Det Norske Veritas** (DNV) to comply with the UK Health and Safety Executive (HSE), the Norwegian Maritime Directorate (NMD) or the Norwegian Petroleum Directorate (NPD).

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

⚠WARNING

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

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

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

⚠WARNING

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

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

NOTICE

• Man-Lifting with this winch is STRICTLY LIMITED to off-shore marine applications specifically approved by maritime regulatory bodies. Regulatory bodies, not manufacturer, have determined suitable use. DO NOT USE FOR MAN-LIFTING application not specifically approved by regulatory bodies.

TRACEABILITY

Components with part numbers ending in "CH" are traceable parts. All the processes in the manufacture of these parts are documented to provide traceability. The documentation includes chemical and physical properties of the raw material, heat treating, hardening, tensile and charpy tests as required for the part. Ordering "CH" replacement parts or using the "C" option in the model code will ensure that the unit is provided with or retains certification by the applicable regulatory agency.

SAFE WINCH OPERATING INSTRUCTIONS

Man-Rider Operating Instructions

⚠WARNING

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

1. Winch operator must maintain visual or audio contact with personnel being lifted or lowered from transfer point to landing area.
2. Personnel operating the winch or being transferred are to have sufficient instruction/training concerning that operation before any movement takes place.
3. Hoisting of personnel by means of a winch should only take place when other means of accomplishing this work are not practical.
4. The winch installation must be specially arranged and accepted for personnel handling.
5. Prior to any personnel movement, the entire system should be inspected by the person in charge. It is that individual's responsibility to instruct and appoint the winch operator.
6. The lifting apparatus (basket, etc.) shall be inspected and certified for personnel lifting prior to use.
7. Do not operate without a surveyor's site approval.
8. Do not overload.
9. Do not operate without testing. (Refer to "Inspection and Testing" procedures)
10. Do not operate winch in a damaged condition.
11. Do not operate winch that has not been properly maintained or equipped.
12. Do not attach winch to unsafe foundation. Refer to "INSTALLATION" section for winch mounting instructions.
13. Do not operate winch with any personnel near the line of force or capable of coming into contact with moving parts.
14. All signs and warning notices must be posted permanently on the winch.
15. Always maintain four or more wraps of wire rope on the drum.
16. Never leave a suspended load unattended.
17. Wire rope must spool off drum from the top away from the operator.

General Operating Instructions

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

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

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

1. Only allow people, trained in safety and operation of this product, to operate and maintain this winch.
2. Only operate a winch if you are physically fit to do so.
3. When a "**DO NOT OPERATE**" sign is placed on the winch, or controls, do not operate the winch until the sign has been removed by designated personnel.
4. Before each shift, the operator should inspect the winch for wear and damage. Never use a winch that inspection indicates is worn or damaged.
5. Never lift a load greater than the rated capacity of the winch. See nameplate attached to winch or 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. Ease the slack out of the wire rope when starting a lift or pull. Do not jerk the load.
13. Do not swing a suspended load.
14. Do not leave a suspended load unattended.
15. Never operate a winch with twisted, kinked or damaged wire rope.
16. Pay attention to the load at all times when operating the winch.
17. Never use the wire rope as a sling.
18. After use, or when in a non-operational mode, the winch should be secured against unauthorized and unwarranted use.

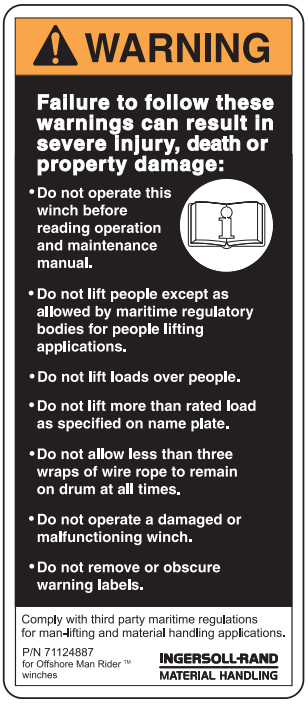
STANDARDS

The standards and/or requirements referred to by Ingersoll-Rand to design or manufacture ***Man-Rider***® winches are as follows:

SPECIFICATION	STANDARD		
	ABS	**LRS**	**DNV**
Wire rope to drum ratio	18:1		
Wire rope design factor at “Man-Rider” rating	Minimum of 8:1		
Winch design factor at “Man-Rider” rating	Minimum of 8:1		
Throttle control	Spring return to neutral		
Brakes (two)	One automatic brake required		
	One manual or second automatic brake required		
Special “Man-Rider” label	Required		
Wire rope fleet angle	Not to exceed 1-1/2° (1-1/2 degrees)		
Drum locking pin	Not Allowed		
Disengaging clutch	Not Allowed		
Drum guard	Required		
Overload protection	Optional, required to meet CE (European Community) directives		
Travel limit switch	Optional (owner responsibility)		
Emergency Lowering	Not Required		Required
Design approval by regulatory or certifying authority	Required		
Witness tests at time of manufacture	Required for some applications		
Minimum clear drum flange	2.5 times wire rope diameter		
Emergency stop device	Optional, required to meet CE (European Community) directives		
Wire rope winding device	Owner Responsibility	Not Required	Owner Responsibility
Data Book	Provided on request		

WARNING LABELS AND TAG

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



SPECIFICATIONS

Description

FA5A *Man-Rider*® winches are air powered, planetary geared units designed for lifting and pulling applications. **FA5A *Man-Rider*®** winches are supplied with an internal automatic disc brake and a manual drum band brake as standard.

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 optional 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.

Model Code Explanation: (Example FA5AMR-LMK1G) **FA 5 A - MR - L M K 1 G**

Series:

FA = Force 5 Air Powered

Capacity: (Based on wire rope at mid drum)

5 = Utility: 10,000 lb (4,536 kg)
Man-Rider: 6,250 lb (2,835 kg)

Generation:

A = Third Generation

Man-Rider:

MR = Man-Rider

MRTD = Man-Rider, Texas Deck **

Drum Length:

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

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

Drum Brake:

A = Automatic Drum Brake

M = Manual Drum Brake (Standard)

Disc Brake:

K = Automatic Disc Brake (Standard)

Control:

1 = Winch mounted lever throttle (Standard)

2 = Remote pilot pendant throttle with standard length 6 foot (1.8 metre) hose

* 2XX = Remote pilot lever throttle (XX = Specify hose length (feet); maximum 60 feet [18.3 m])

3 = Winch mounted full flow lever throttle

4 = Remote full flow lever throttle with standard length 6 foot (1.8 metre) hose

* 4XX = Remote full flow lever throttle (XX = Specify hose length (feet); maximum 20 feet [6 m])

Options:

D = Drum divider flange and additional wire rope anchor **

G = Drum Guard (Standard)

-E = Compliance with European Community Machinery Directive (not rated as a utility winch):
• Muffler • Overload Device • Drum Guard • CE Documentation • Main air supply emergency shutoff

J = Overload Device

K = K6U footprint base ***

L = Limit Switch (upper and lower) ***

P = Emergency Stop Device

7 = Drum grooving (specify rope size in sixteenths: 7 = 7/16 inch wire rope) ***

Type Approval:

A = American Bureau of Shipping (ABS) Type Approval

N = Det Norske Veritas (DNV) Type Approval

R = Lloyd's Register of Shipping (LRS) Type Approval

3rd Party Requirements:

Q = Survey Required

W = Witness Test

Y = DIN 50049-3.1b Third Party Certification

Temperature Requirements (0° C is standard):

C = Minus 20° C (includes Charpy tests)

Material Traceability:

V = DIN 50049-2.2

X = DIN 50049-3.1b (Ingersoll-Rand level 1A or 1B)

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

** Man-Rider, Texas Deck has a four part drum and four wire rope anchors. MRTD not covered in this manual; contact factory for additional information.

*** Option not covered in this manual; contact factory for additional information.

General Specifications

		Utility Rating		Man-Rider Rating	
Air System	Rated Operating Pressure	90 psig (6.3 bar/630 kPa)			
	Air Consumption (at rated pressure and load)	600 scfm	17 cu.m/min	Refer to Performance Curve	
Rated Performance (at rated pressure / volume)	Mid Drum Line Pull	10,000 lbs	4,536 kg	6,250 lbs	2,835 kg
	Mid Drum Line Speed	60 fpm	18.3 m/min	100 fpm	30 m/min
Air Motor Pipe Inlet Size		1.5 inch	38 mm	1.5 inch	38 mm
Minimum Air System Hose Size		1.5 inch	38 mm	1.5 inch	38 mm
Drum Barrel Diameter		12.75 inches	324 mm	12.75 inches	324 mm
Drum Flange Diameter		24.25 inches	616 mm	24.25 inches	616 mm

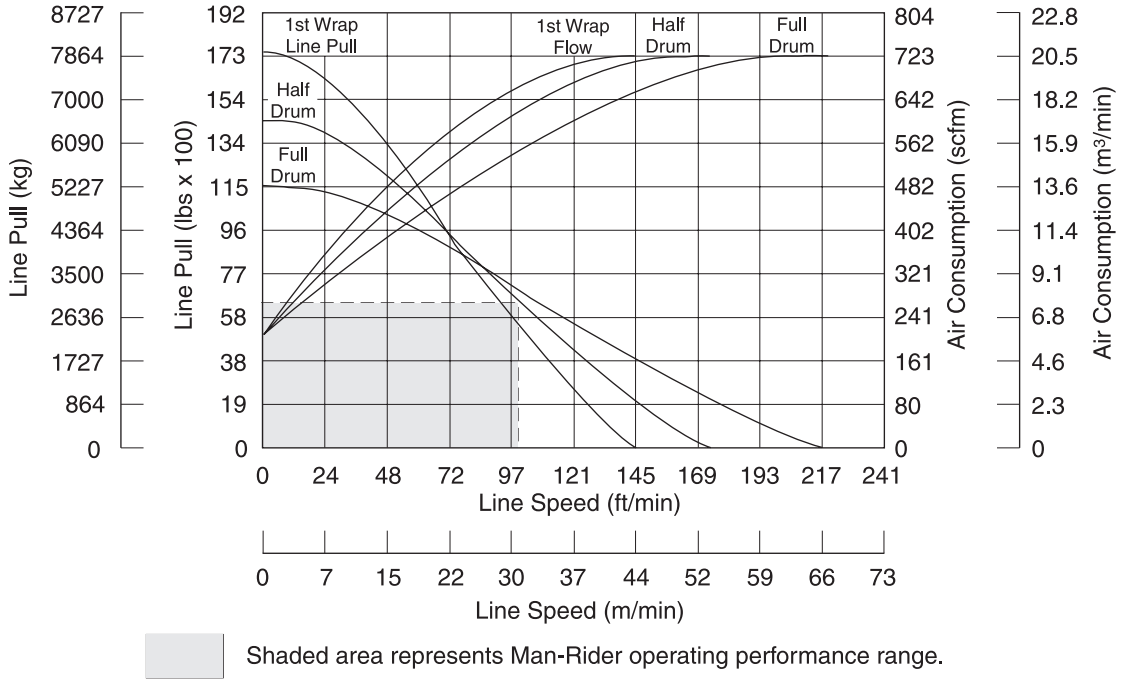
Winch Net Weight (without wire rope)

Model	lbs	kg	Model	lbs	kg
FA5AMR-SMK1	1,170	532	FA5AMR-SMK2	1,145	520
FA5AMR-SAK1	1,175	534	FA5AMR-SAK2	1,175	534
FA5AMR-LMK1	1,363	620	FA5AMR-LMK2	1,380	627
FA5AMR-LAK1	1,390	632	FA5AMR-LAK2	1,390	632

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		feet	metres	feet	metres
12	305	Based on standards which require the top layer to be 2-1/2 times the wire rope diameter below the drum flange.	546	141	321	102
24	610		1,160	290	663	211

FA5AMR Performance Graph



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.

⚠ CAUTION

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

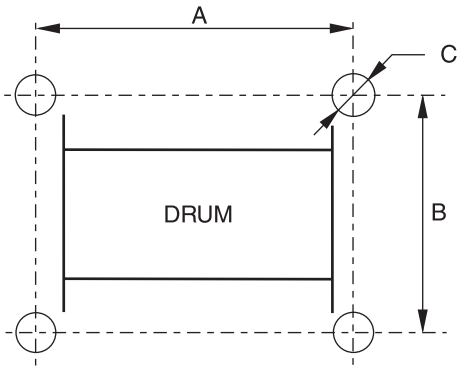
Mounting

Refer to Dwg. MHP0124 and Table 1.
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.

⚠ WARNING

• Winch frame material is not suitable for welding. FA5AMR winches must only be mounted by bolting to a suitable foundation. Do not attempt to mount the winch by welding to a foundation structure.

1. The 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 the 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 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.
6. Do not weld to any part of the winch.



(Dwg. MHP0124)

Table 1: Mounting Bolt Hole Dimensions

Dimension		Drum Length (inches)	
		12	24
"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 4 tight wraps of wire rope on the drum at all times. Refer to Dwg. MHP0498.

Install the winch such that the wire rope, when at the take-off angle limits, shown in Dwg. MHP1404, does not contact the mounting surface.

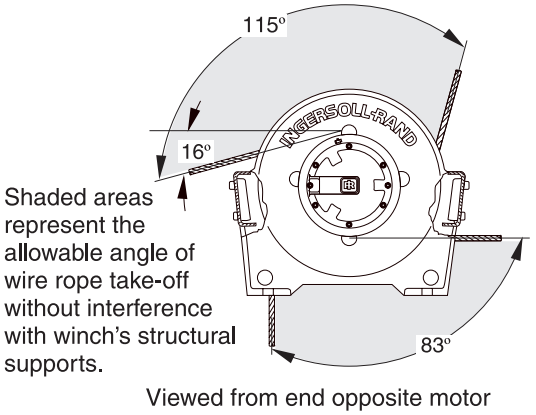
⚠ DANGER

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

☞ 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. For *Man-Riding* operations wire rope construction must be 3/4 inch (18 mm) 6 X 19 IWRC EIPS with a minimum breaking strength of 58,000 lb. (26,672 kg) right lay. Ensure minimum wire rope breaking strength, noted above, is maintained when using wire rope with non-rotating or anti-spin characteristics which is preferred for *Man-Riding* applications. Refer to Table 2 for recommended wire rope sizes.

FA5AMR Standard Wire Rope Take-Off Angle(s):



(Dwg. MHP1404)

Table 2: Wire Rope Minimum and Maximum Recommended Sizes

Wire Rope Anchor Part No.	inch	mm
24258	5/8	16
	3/4	18

Notes:
1. To maintain a utility rating safety factor of 5:1 5/8 inch (16 mm) wire rope must be used.
2. To maintain a Man-Rider 8:1 safety factor ratio 3/4 (18 mm) wire rope must be used.

☞ Installing Wire Rope

Refer to Dwg. MHP1317.
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. MHP1317.
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.

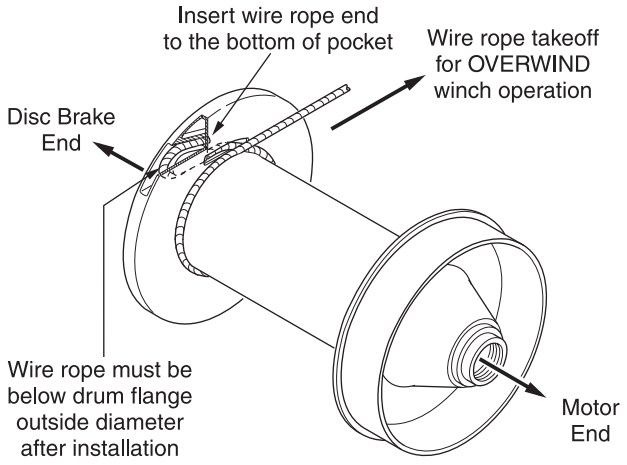
⚠ CAUTION

• Make sure the first wrap of wire rope is tight and lays flush against the drum flange.
• Ensure the correct wire rope anchor is used.
• Install wire rope to come off the drum in an overwind position. Improper installation of wire rope can result in failure of the disc brake to hold load. Refer to Dwg. MHP1317.

☞ Safe Wire Rope Handling Procedures

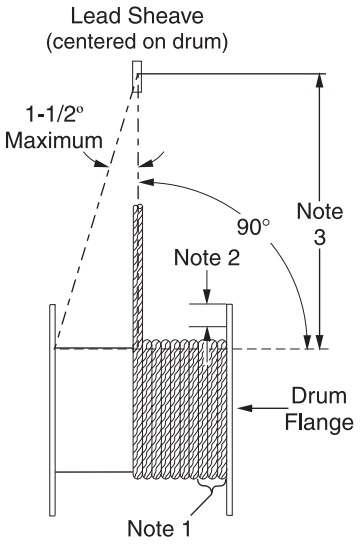
1. Always use gloves when handling wire rope.
2. Never use wire rope which is frayed or kinked.
3. Never use wire rope as a sling.
4. Always ensure wire rope is correctly spooled and the first layer is tight against the drum.
5. Always follow wire rope manufacturer's recommendations on use and maintenance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

Wire Rope Installation Drawing



(Dwg. MHP1317)

Wire Rope and Fleet Angle Installation Drawing



(Dwg. MHP0498)

Notes:

1. Maintain a minimum of 4 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. For correct fleet angle maintain a minimum of 1.6 feet (0.5 metre) per inch of drum length. Example: for 7 inch drum length locate lead sheave at least 11.2 feet (3.5 metres) from drum.

☞ 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.

☞ Rigging

Make sure all wire rope blocks, tackle and fasteners have a sufficient safety margin adequate enough 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.
5. Always maintain at least four 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 600 scfm (17 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 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.
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.

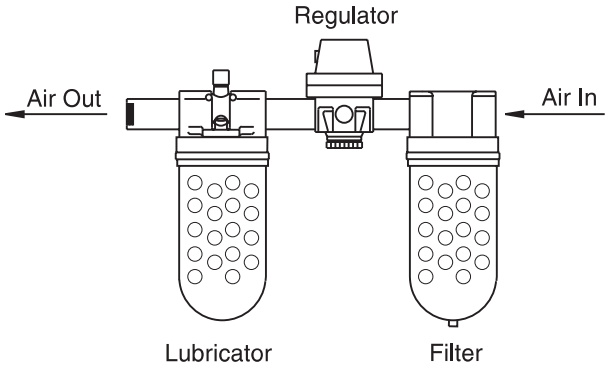
⚠ CAUTION

• 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 (10W) oil.

☞ Air Line Filter

Refer to Dwg. MHP0191.
Place the strainer/filter as close as practical to the motor air inlet port, but upstream from, the lubricator, to prevent dirt from entering the motor. The filter/strainer should provide 20 micron filtration and include a moisture trap. Clean the filter/strainer periodically to maintain its operating efficiency.



(Dwg. MHP0191)

☞ Air Pressure Regulator

Refer to Dwg. MHP0191.
If an air pressure regulator is used, install between the lubricator and filter as shown in Dwg. MHP0191.

☞ 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.

Mufflers

Make sure mufflers are installed in winch motor exhaust and control valve exhaust ports. Check mufflers periodically to ensure they are functioning correctly.

Motor

For utility rated performance and maximum durability of parts, provide a lubricated air supply of 600 scfm (17 cu. m/min) 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 the point of entry to the air motor directional control valve.

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) oil 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

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

The four most important aspects of winch operation are:

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

⚠ CAUTION

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

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 must have a good attitude regarding safety. It is the operator’s responsibility to refuse to operate the winch under unsafe conditions.

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

⚠ WARNING

• Maintain at least 4 wraps of wire rope on the drum at all times.

7. The platform shall be hoisted approximately one foot (30 cm) and inspected to assure that it is secure and properly balanced before personnel are allowed to occupy the platform. Before elevating or lowering personnel, the following conditions shall exist:
   a. Hoist wire rope shall be free of kinks.
   b. Multiple part lines shall not be twisted around each other.
   c. The primary point of wire rope attachment shall be centered over the platform so that the platform will not oscillate when lifted.
   d. If there is a slack wire rope condition, the hoisting mechanisms shall be inspected to assure wire rope is properly seated on drum and in sheaves before resuming winch operation.

8. When personnel are suspended, a signalman must be provided unless voice communication equipment is utilized. Signals must be visible or audible to the operator at all times.
9. Personnel occupying the personnel platform shall wear a body belt with lanyard appropriately attached to the load block or to a structural member of the required strength within the platform.
10. Bridles and associated hardware for the personnel platform shall not be used for any other service.
11. Warning or limiting devices shall be installed to prevent two blocking, unless audible communication has been provided and one of the persons being lifted has been specifically assigned the task of warning of the approach of a two-block condition.

☞ Emergency Lowering

For emergency lowering of personnel it is the customers responsibility to provide an air system containing a small reservoir near the winch that always remains charged.
Air from this reservoir can then be directed to the winch control valve. Size reservoir in accordance with air consumption required to operate winch. Reducing the air consumption will proportionately reduce the line speed.
It may also be possible to lower the load by disconnecting the air inlet hose and moving the throttle to the payout (down) position. Contact the factory for minimum load requirements. Using this method a lowering speed of approximately 3 ft/min (1 m/min) can be accomplished.

Training Program

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

☞ Planning Meeting

A meeting attended by the winch operator, signalman, persons to be lifted and the person in charge of the task to be performed is required to be held to plan and review the procedures to be followed, including procedures for entering and leaving the personnel platform, the points at which personnel will enter and leave the platform, the use of safety equipment, signals, and the lift chart information.

NOTICE

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

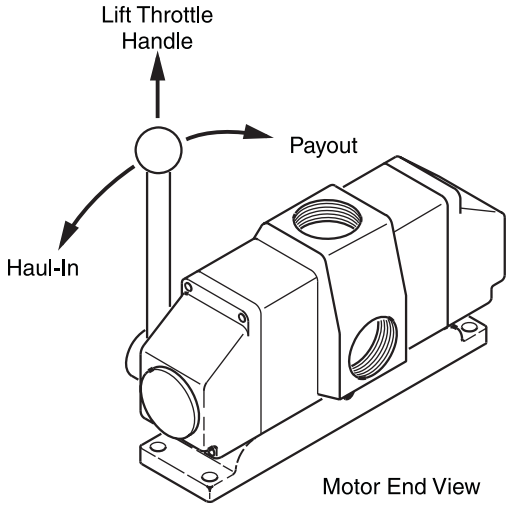
Winch Controls

A spring loaded, motor mounted, manual throttle control valve is supplied as a standard feature on these winches. Optional remote throttle controls are also available. Reference the model code on the winch nameplate and compare it to the "SPECIFICATIONS" section of this manual 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 Air Throttle

Refer to Dwg. MHP0699.
The winch mounted throttle lever prevents accidental operation by locking in the neutral position when released. To operate, the control throttle handle must be lifted up prior to being shifted in the desired direction. To control winch direction move the control throttle handle, as viewed from the motor end, to the right (clockwise) to payout wire rope and to the left (counterclockwise) to haul-in wire rope.
The throttle lever will return to the neutral (off) position when the lever is released.

Winch Mounted Throttle Lever Operation



(Dwg. MHP0699)

☞ Remote Control Pendant

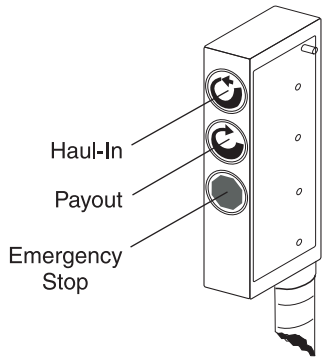
Optional feature. Refer to Dwg. MHP0696.
Provides for remote winch control at distances up to 60* feet (18 metres) away from the winch motor. Pilot air hoses connect the pendant to the winch motor to provide winch operation. The pendant control is a three button movable control station which controls payout, haul-in and is equipped with an emergency shut-off. Direction of winch drum rotation is determined by direction of air flow into the pilot valve. Labels on the pendant buttons indicate winch operation.
Depress pendant buttons using smooth, even movements.

NOTICE

• Pendant haul-in and payout control buttons provide variable speed operation. For low speed operation push appropriate control button slightly; for full speed operation push appropriate control button fully.

***** To ensure accurate winch control when remotely operating the winch at distances greater than 60 feet (18 metres) contact **Ingersoll-Rand** Technical Sales for control suitability.

Remote Pilot Pendant Button Operation

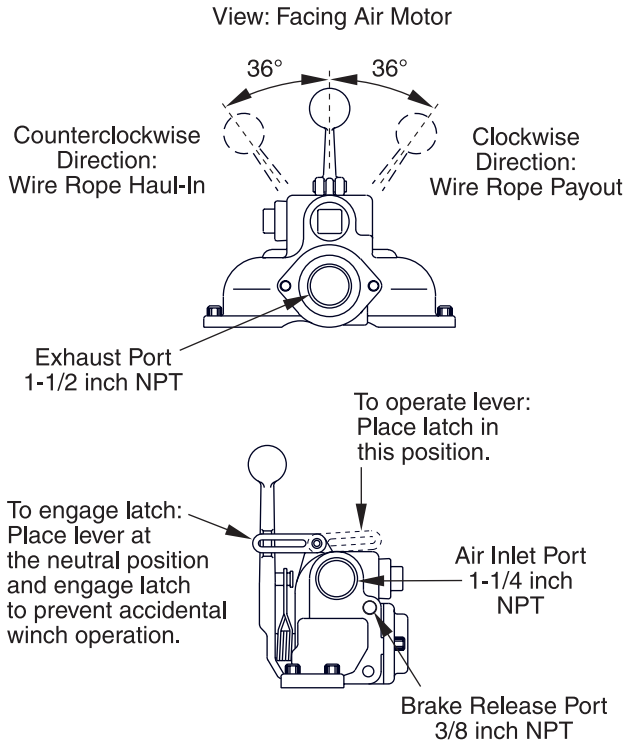


(Dwg. MHP0696)

☞ Winch Mounted Full Flow Throttle Control Valve

Optional feature. Refer to Dwg. MHP0566.
The spring loaded, live air, manual control throttle valve mounts to the air motor.
As viewed from the air motor end, move the control throttle handle to the right (clockwise) to payout wire rope and to the left (counterclockwise) to haul-in wire rope. Avoid sudden movements of the control valve to ensure smooth operation of the winch.
When winch is not in use, engage handle latch to prevent inadvertent movement of the control throttle.

Winch Mounted Full Flow Throttle Control Valve



(Dwg. MHP0566)

☞ Remote Full Flow Throttle

Optional feature. Refer to Dwg. MHP0161.
Provides for the remote mounting of the winch control at a fixed location at up to 20 feet (6 metres) away from the winch motor. Air hoses connect the throttle to the winch motor to provide winch operation.
Move the control throttle handle to the right (clockwise) to pay out wire rope and to the left (counterclockwise) to haul in wire rope. Avoid sudden movements of the control valve to ensure smooth operation of the winch.

☞ Emergency Stop Device

Optional feature. Refer to Dwg. MHP0695.
The emergency stop device, used on 'Winch Mounted Manual Throttle Control' equipped winches, is located at the air inlet of the winch. When activated, winch drum rotation will immediately cease. To activate the emergency stop valve conduct one of the following:

1. Depress (push down) red palm valve.
2. Press emergency stop button on remote control pendant (optional feature).

NOTICE

• The emergency stop is automatically engaged (blocks air supply to winch) when winch air pressure is lost. If winch air supply is lost the emergency stop must be reset, after air supply is provided, before resuming winch operation. Refer to 'To Reset Emergency Stop Valve' section.

If winch overload occurs the overload device, if equipped, also stops the winch by activating the emergency stop device.

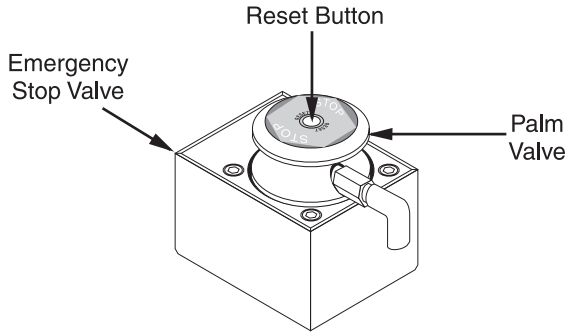
To Reset Emergency Stop Valve:
Refer to Dwg. MHP0695.

1. Ensure air supply is available.
2. Lift (pull up) red palm valve to full travel and hold for 2 seconds.
3. Using a small tip screwdriver or similar tool, carefully depress (push down) reset button to full travel. Reset button is located in the center of the palm valve.

NOTICE

• If the Emergency Stop Valve will not reset inspect the control valve for excessive internal air leakage.

Emergency Stop Valve Operation



(Dwg. MHP0695)

☞ Overload Device

Optional feature. An overload device is available on winches provided with the emergency shut-off valve. Overload device operation is based on the differential pressure between the motor inlet and exhaust. The overload device is factory preset to actuate at 150% (+/- 25%) of rated capacity of the winch. When an overload condition is sensed air is directed to the emergency shut-off valve to isolate air to the winch.
If the overload device is activated the load must be reduced. Reset the Emergency Stop Valve and operate the winch in the payout direction to lower the load.

Winch Brakes

☞ Automatic Disc Brake

The automatic disc brake is a spring applied, air released brake. When the winch is operated in the payout direction air pressure acting on the diaphragm overcomes spring pressure and releases the brake. The brake automatically engages when winch operation is returned from the payout direction to neutral or when shifted to the haul-in direction. When the winch is in the neutral or haul-in positions the brake air is vented and the brake springs apply the brake. The springs, acting on the pressure plate, compress the brake friction and separator plates and engage the brake to prevent drum rotation in the payout direction.
The cam type sprag clutch assembly allows drum rotation in the haul-in direction with the brake plates engaged, but prevents the drum from rotating in the payout direction.
Disc brake adjustment is not required. If the disc brake does not operate properly it must be disassembled, inspected and repaired.

⚠WARNING

• If the brake is disassembled, the friction and separator plates must be correctly installed as described in the "MAINTENANCE" section of this manual. Failure to correctly install the friction and separator plates can cause injury and/or property damage.

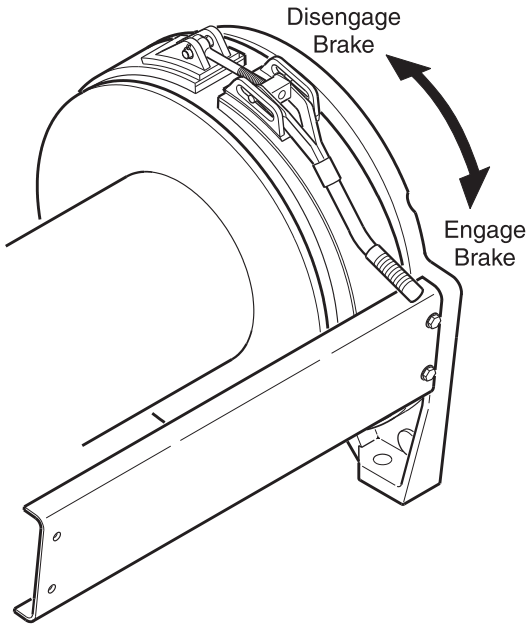
☞ Automatic Drum Brake

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

☞ Manual Drum Brake

Refer to Dwg. MHP1449.
The manual drum brake may be applied by pushing down on the handle (135) 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. MHP1449)

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

An approved test and inspection record should be maintained for each winch, listing all points requiring test and inspection. These reports should be dated, signed by the person who performed the test or inspection, and kept on file where they are readily available to authorized personnel.

1. Winches which are used to raise, lower or suspend personnel platforms shall be inspected by a qualified person, at the beginning of each shift and prior to hoisting employee's on the personnel platform after the winch has been used for any material handling operation.
2. A test lift shall be made for each work location and at the beginning of each shift to insure that all systems and controls are functioning properly.
3. The winch shall not be used for hoisting personnel if the test results in instability or causes permanent deformation of any component.
4. A visual inspection of the winch, personnel platform and rigging shall be conducted immediately after the test lift.

☞ 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, sideframes, 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 the discrepancies have been reviewed and inspected further by personnel knowledgeable on wire rope safety and maintenance procedures.

NOTICE

• The full extent of wire rope wear cannot be determined by visual inspection. At any indication of wear inspect 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. BRAKES. During winch operation test brakes. Brakes must hold load without slipping. Automatic brakes must release when winch motor throttle or pendant is operated. If brakes do not hold load, or do not release properly, the brakes must be adjusted or repaired.
5. WIRE ROPE REEVING. Check reeving and ensure wire rope is properly secured to the drum. Do not operate the winch unless the wire rope feeds onto the drum smoothly.
6. LUBRICATION. Refer to the "LUBRICATION" section for recommended procedures and lubricants.
7. PENDANT (optional feature). Ensure operation of pendant buttons is smooth and that winch is responsive to pendant control. Pendant buttons must spring return to a position flush with the pendant housing when released.
8. 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.

9. MOTOR. Check oil level. Place a suitable container below the motor and carefully open drain plug to remove any accumulated water. Check oil level in motor and add oil as necessary to maintain correct level. Ensure lubricated air supply provides 6 to 9 drops of ISO VG 32 (10W) lubricant. Operate motor slowly in both directions.

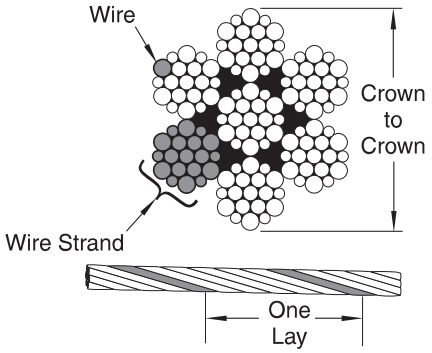
Periodic Inspection

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 the individual components. Disassembly steps are described in the "MAINTENANCE" section. Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection.' Also inspect the following:

1. FRAMES 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.



(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 **100% 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. 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.

Winches Not in Regular Use

1. Equipment which has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming to the requirements of "Frequent Inspection" 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 place 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 FA5A-MR Series Air Winch

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

Reason for Inspection: (Check Applicable Box)

	1. Scheduled Periodic Inspection: ____ Quarterly ____ Semiannually ____ Yearly	Operating Environment:
	2. Discrepancy(s) noted during Frequent Inspection	
	3. Discrepancy(s) noted during maintenance	Normal: ____ Heavy: ____ Severe: ____
	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 Sideframes					
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.

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 Shut-off Valve engaged.	Reset Emergency Shut-off valve.
	Shipping plugs may still be in place.	Remove shipping plugs in control valve.
	Drum brake not released.	Disengage manual drum brake or refer to "Automatic Drum Brake" below.
Load continues to move when winch is stopped.	Brakes slipping.	Check brake band adjustment and brake band lining wear. Disassemble and inspect disc brake.
	Winch motor controls sticking.	Check pendant buttons or throttle levers return to normal (neutral) positions when released.
Winch does not lift load.	Motor may be damaged.	Remove and disassemble motor. Examine all parts and replace any that are worn or damaged.
	Insufficient air supply.	Verify air supply pressure and volume at winch inlet meets the requirements listed in the "SPECIFICATIONS" section. Clean air line filter.
Throttle or pendant button moves but winch does not operate.	Motor may be damaged.	Disassemble and clean the motor and replace any worn or damaged parts.
	Insufficient air supply.	Ensure the air pressure at the winch inlet is at least 90 psig (6.3 bar/630 kPa) at rated volume. Clean air line filter.
	Emergency Stop Valve engaged.	Reset Emergency Stop valve.
	Overload Device engaged.	Reduce load to within rated capacity of winch. If Overload Device cannot be reset, contact factory.
	Air leak.	Check hose connections. Check hose lines for wear or damage. Replace worn or damaged hoses.
Motor runs hot or makes excessive noise during operation.	Improper lubrication.	Check oil level. Set lubricator to provide a minimum of 6 drops per minute.
	Damaged or broken motor internal parts.	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.
	Brakes may not be releasing.	Refer to brake sections below.
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.

Automatic Drum Brake:

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

Automatic Disc Brake:

Brake fails to release.	Low air supply pressure.	Ensure supply air pressure at the brake inlet is at least 50 psig (3.4 bar/340 kPa).
	Leaking diaphragm.	Disassemble brake and replace diaphragm.
	No release pressure at the brake port.	Verify proper operation of winch controls.

LUBRICATION

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

The lubrication intervals recommended in this manual are based on intermittent operation of the winch eight hours each day, five days per week. If the winch is operated almost continuously or more than the eight hours each day, more frequent lubrication will be required. Also, the 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 the performance of the 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/or its associated components.

INTERVAL	LUBRICATION CHECKS
Start of each shift	Check flow and level of air line lubricator (adjust flow to approximately 6 to 9 drops per minute at maximum motor speed.). Check oil level in motor.
Monthly	Inspect and clean or replace air line filter.
	Check reduction gear oil level. On optional lever throttle valve, lubricate grease fitting.
Yearly	Drain and refill winch reduction gear oil.

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

General Lubrication

1. Drain and replace oil in the disc brake and reduction gear after the first 50 hours of initial winch operation. Thereafter, drain and replace oil according to the intervals recommended.
2. Always inspect removed oil for evidence of internal damage or contamination (metal shavings, dirt, water, etc.). If indications of damage are 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.
The reduction gear and disc brake are filled with oil, to the correct level, prior to shipment 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.

☞ Initial Reduction Gear Assembly Oil Change

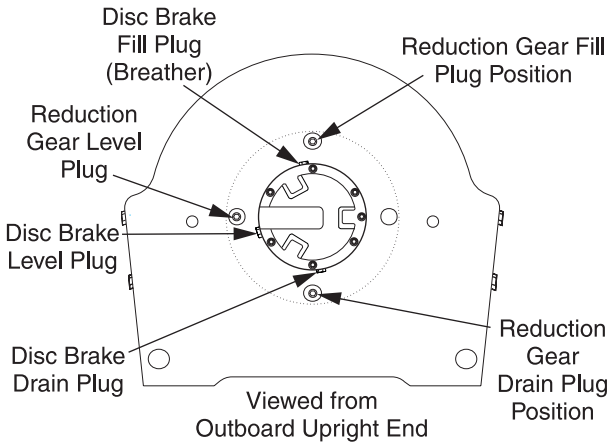
It is recommend that the first oil change be done after approximately 50 hours initial operation. Always inspect removed oil for evidence of internal damage (metal shavings, dirt, water, etc.).

☞ Reduction Gear and Disc Brake Fill and Drain

NOTICE

• There are only 2 plugged holes, located 90º apart, on reduction gear cover (33). To fill or drain reduction gear oil, the winch drum must be rotated to align the plugs for either the fill or drain operation.

Winch Oil Fill and Drain Plug Location Drawing



(Dwg. MHP0501)

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 and drain plugs located on the reduction gear cover (33).
3. **Winch with disc brake:** do not remove the level plug located on the reduction gear cover. Instead, remove the level plug located on the disc brake housing.

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 re-installing plug fittings.

4. Fill slowly until oil flows from the disc brake level plug hole.
5. Re-install the plugs.

⚠ 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 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 a 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. Re-install the reduction gear and disc brake plugs.

Reduction Gear and Disc Brake Recommended Lubricant

Temperature	Recommended Viscosity
Below 32° F (0° C)	ISO VG 68 (20W)
32° to 80° F (0° to 27° C)	ISO VG 100 (30W) *
Above 80° F (27° C)	ISO VG 150 (40W)

* Units are shipped from factory with ISO VG 100 (30W) lubricant. Reduction Gear capacity is approximately 3 quarts (2.8 litres).

☞ Full Flow Lever Control Valve Lubrication

Optional feature. Refer to Dwg. MHP1314.
When changing the reduction gear oil, lubricate the lever control valve at fitting (313). Use the recommended grease to lubricate.

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

Motor Assembly

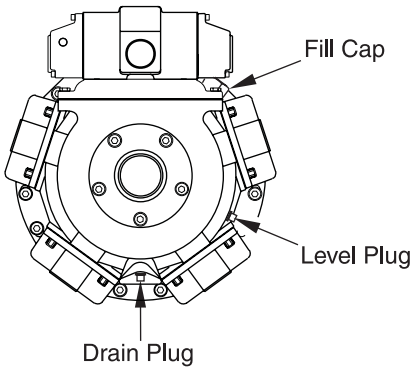
Refer to Dwg. MHP0565.
The motor is splash lubricated by the oil in the motor housing and has no other means of lubrication. It is therefore important to use only high quality rust and oxidation inhibiting lubricant to ensure maximum performance and minimum downtime for repairs. Allow oil to settle before topping off. Pour sufficient oil into the vent cap opening to bring the oil in the motor case to the level of the upper oil plug hole. Add oil slowly to prevent spilling.
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.
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. Failure to drain the water when the winch is to remain idle for an extended period at low temperature may result in the oil splasher freezing fast. Drain the water then refill to the level plug. If desired, all the oil may be drained at the end of the shift and the motor refilled with new oil.

Recommended Motor Lubricant

Temperature	Recommended Viscosity
Below 32° F (0° C)	ISO VG 46
32° to 80° F (0° to 27° C)	ISO VG 68 *
Above 80° F (27° C)	ISO VG 100

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

Motor Lubrication Locations



(Dwg. MHP0565)

Motor Fill and Drain Procedures
Refer to Dwg. MHP0565.
To Fill:

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

⚠ 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 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.

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.

⚠ CAUTION

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

2. Apply a wire rope lubricant, **Ingersoll-Rand** LUBRI-LINK-GREEN or ISO VG 100 (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:
DANGER - DO NOT OPERATE -
EQUIPMENT BEING REPAIRED.
• Only allow personnel trained in safety and service on this winch to perform maintenance.
• After performing any maintenance on the winch, test winch to 125% of its rated line pull at mid drum before returning to service. (Testing to more than 125% of rated line pull may be required to comply with standards and regulations set forth in areas outside the USA.)
• Turn off air system and depressurize air lines before performing any maintenance.

Proper use, inspections and maintenance increase the life and usefulness of your **Ingersoll-Rand** equipment. During assembly lubricate gears, nuts, capscrews and all machined threads with applicable lubricants. Use of antiseize compound and/or thread lubricant on capscrew and nut threaded areas prevents corrosion and allows for easy disassembly of components.

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

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

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 a least 230º F (110º C), but not over 450º F (232º C). Optimum temperature is 300º F (149º 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:
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 100% of rated load at mid drum, 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.

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 the rated load, replace the brake band assembly.

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

☞ Automatic Drum Band Brake

Optional feature. Refer to Dwg. MHP1281.
For adjustments, references to "clockwise" and "counterclockwise" directions, in the text, 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 the counterclockwise direction.
   b. To tighten band brake, turn capscrew (120) in the clockwise direction.

NOTICE

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

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

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, gaskets and 'O' rings should be discarded once they have been removed. New seals, gaskets and 'O' rings should be used when assembling the winch.

6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect 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

Refer to Dwg. MHP1450.
1. Separate capscrew (597), washer (74) and nut (598).
2. Pull bracket (595) straight away from drum guard (590). Note how many washers (593) there are for assembly.
3. Pull drum guard (590) away from bracket (592). By design the drum guard attaches to the sideframe by tabs. The smaller, upper tabs are visible on the top of the sideframe. The longer, lower tab is located under the sideframe. During removal take care not to bend the tabs. Push the drum guard away from the sideframe, towards the drum. Do not pull 'up' or 'down' as the tabs may become deformed.
4. Note how many washers (593) there are on bracket (592) for assembly.

NOTICE

• Washers should be distributed equally on both sides of drum guard (590).

☞ Winch Disassembly

Refer to Dwg. MHP1410.
1. Remove the wire rope from the drum. Remove wire rope anchor (63) and store for reassembly.
2. 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.

3. Disconnect and tag the air lines.
4. To drain oil refer to "LUBRICATION" section.
5. Remove the 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 the air motor before removing the motor mounting capscrews.

6. Remove the ten capscrews (197), lockwashers (196) and washer (198) 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. Disconnect the drum band brake.
   Manual Drum Brake:
   Refer to Dwg. MHP1448.
   a. Remove cotter pin (139) and pin (138).
   b. To disassemble further, refer to 'Manual Band Brake Disassembly' and Dwg. MHP1448.
   Automatic Drum Brake:
   Refer to Dwg. MHP1281.
   a. Remove capscrews (101), spacers (102) and (103).
   b. Remove and save spacer (105).
   c. Loosen nut (117) that is locking plunger (114).
   d. Rotate capscrew (120) until free from plunger (114).

NOTICE

• Lower nut (117) is bonded to capscrew (120) and should not be removed.

9. Remove drum guard and any other externally mounted winch attachments.

⚠ CAUTION

• There are a total of eight capscrews securing the brake cover to the brake housing. Two of these capscrews 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 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 and the 'Disc Brake Disassembly' section.

11. Using a hoist to support the drum, remove sideframes (65), one at a time, by removing four capscrews (66) and washers (74) attaching each sideframe 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 indicates replacement.
13. Remove the drum band brake assembly (104) by sliding over the end of the drum (62) flange.
14. To remove outboard upright (26) 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 reseat 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.

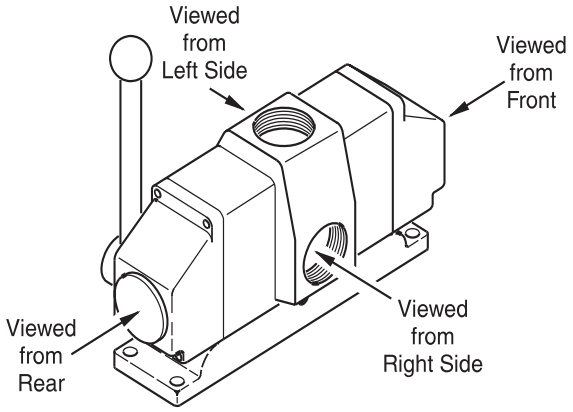
15. Stand drum on end with reduction gear on top. Remove reduction gear assembly from drum (62) by removing six capscrews (32) attaching end cover (33) to drum. Screw two 7/16 - 20 UNF x 1-1/2 inch capscrews into the threaded holes in cover (33). Turn both screws evenly until cover is separated from housing. Remove cover.
16. Screw two 1/2 - 13 UNC x 1-1/2 inch capscrews into the threaded holes in the reducer housing (59). 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.

☞ Lever Operated Control Valve

Refer to Dwg. MHP1407.
It is recommended that the valve be separated from the winch and moved to a clean work area before disassembly of valve.

1. Disconnect the air line fittings at the shuttle valve body (479).
2. Disconnect the air inlet line at the valve inlet. On units equipped with an emergency stop valve, disconnect air inlet at the valve.
3. To separate valve from motor, alternately loosen capscrews (442) on adapter (440). Capscrews and washers (434) cannot be removed until adapter is separated from valve body (410). Separate valve as an assembly from winch motor rotary valve housing (247).
4. Remove capscrews (441) and separate adapter (440) from valve body. Remove and discard gasket (424).

Control Valve Assembly View References



(Dwg. MHP1121)

NOTICE

• Procedure references to left, right, front and rear are in accordance with the positions shown on Dwg. MHP1121.

To remove valve cap (438) on control valve end opposite the handle (449):

1. Remove capscrews (437) and (439), and washers (433) and separate valve cap (438) from valve body (410). Remove gasket (411) and discard.

To disassemble the handle end of the lever operated control valve:

1. If equipped with an emergency stop valve, disconnect tubing at fittings and remove four capscrews (528). Separate emergency stop valve as an assembly from valve body (410).
2. Remove plug (447). Pin (445) has internal threads. Install an 8-32 x 2 inch screw into pin. Pull out pin (445).
3. Slide handle (449) and cross shaft (461) out of valve cap (450) as an assembly.
4. To remove valve cap (450), remove capscrews (437) and (439) and washers (433). Separate valve cap assembly (450) from body (410). Remove gasket (411) and discard.
5. Drive out pin (409) from valve shaft (401) to remove clevis (446).
6. To disassemble rear poppet assembly:
   a. Remove pin (406) and shims (444) from valve shaft (401).
   b. Remove retainer ring (429). Pull poppet assembly (423) along with poppet seat (428) and valve piston (431) from valve body (410).
   c. Reach into valve body and remove spring (422) and poppet restrictor (402).
   d. Remove retainer ring (432) and separate valve piston (431) and poppet seat (428).
   e. Remove and discard 'O' rings (426), (427) and (430).
7. To disassemble the front poppet assembly:
   a. Remove cotter pin (414) and washers (434). Note quantity of washers installed. These washers are used to establish a 0.06 to 0.12 inch (1.5 to 3.0 mm) gap between washers and inlet poppet assembly (423).
   b. Remove retainer ring (429). Pull poppet assembly (423) along with poppet seat (428) and valve piston (431) from valve body (410).
   c. Reach into valve body and remove spring (422) and exhaust poppet (420).

d. Remove retainer ring (432) and separate valve piston (431) and poppet seat (428).
e. Remove and discard 'O' rings (426), (427) and (430).
f. Push shaft (401) to the front of valve body to cause pin (405) to push seat restrictor (403) out of valve body. Remove and discard 'O' ring (404).
g. Support shaft (401) on both sides of pins (405) and push pins out.
h. Insert allen wrench into open hole in sleeve (408) and back out setscrew (407) a couple of turns to loosen sleeve on shaft (401). Remove sleeve.

8. To remove valve assemblies (413) or pins (412) remove capscrew (465), washer (417) and spring washer (416). From the exhaust port, using a soft material probe, push the valve assembly or pin up through the top of the valve body until it can be grasped from the top. Pull out valve assembly or pin.

☞ Pendant Operated Pilot Control Valve Disassembly

Optional feature. Refer to Dwg. MHP1408.
It is recommended that the valve be separated from the winch and moved to a clean work area before disassembly of valve.

1. Disconnect the air line fittings at the shuttle valve body (479).
2. Disconnect the air inlet line at the valve inlet. On units equipped with an emergency stop valve, disconnect air inlet at the valve.
3. To separate valve from motor, alternately loosen capscrews (442) on adapter (440). Capscrews and washers (434) cannot be removed until adapter is separated from valve body (410). Separate valve as an assembly from winch motor rotary valve housing (247).
4. Remove capscrews (441) and separate adapter (440) from valve body. Remove and discard gasket (424).

To disassemble the end caps of the pendant operated control valve:

1. Disconnect the air line from the elbow fitting (482) located on the cylinder (451).
2. Disconnect tubing at fittings and remove capscrews (528). Separate emergency stop valve as an assembly from valve body (410).
3. Remove capscrews (437) and (439) and washers (433). Separate valve cap assembly (450) from valve body (410).

⚠ CAUTION

• Do not disassemble valve cap assembly further unless necessary to conduct a repair. Valve cylinder (451) and valve cap (438) are press fit together. Close fit tolerances cannot be maintained if disassembled. If repair is required, replace these parts to ensure secure fit.

4. To separate the valve cap assembly into component parts, place the valve cap in a vise. Using a strap wrench, or similar tool, remove cylinder.
5. Remove seal cup (456). Remove and discard 'O' ring (457).
6. Pull piston (454) from cylinder. Remove and discard 'O' ring (453).
7. Remove capscrew (465), retainer spring (459) and spring (452).
8. To further disassembly valve body refer to 'Lever Operated Control Valve' section and conduct steps 6 through 8 with the following exceptions:
   a. Step 6a. applies to both ends of the valve shaft, therefore, remove pins (406) and shims (444) from both ends of valve shaft (401).
   b. Step 7a. does not apply to the Pendant Operated Pilot Control Valve. Skip this step and proceed to step 7b.

☞ Live Air Throttle Valve Disassembly

Optional feature. Refer to Dwg. MHP1380.

NOTICE

• Match mark throttle valve parts to ensure proper re-assembly.

1. Remove the two capscrews (302) and lockwashers (304) that hold the valve body retainer (305).
2. Mark the square end on the valve body (316) and the handle (300) to ensure correct orientation during re-assembly.
3. Drive out pin (301) and remove handle (300).
4. Make note on how the spring (303) is positioned before removing it. Pull valve body (316) out of the valve bushing (314) while disconnecting the spring (303).
5. Remove seal rings (315) from valve body (316).
6. Check parts for score marks or wear.
7. Measure clearance between the valve bushing (314) and valve body (316). Clearance between valve bushing and valve body should not exceed 0.002 inch (0.05 mm) or excessive air leakage will occur.

☞ Motor Disassembly

Refer to Dwg. MHP0690.

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.

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 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 capscrews (1) until the brake spring (17) compression has been relaxed. Remove capscrews.
2. Remove cover (2) and diaphragm (3).
3. Using a small tipped screwdriver or similar tool, remove ring (4). Remove diaphragm support (5).
4. 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.
5. Alternately remove the six separator plates (14) and five friction plates (13).
6. Remove the pressure plate (15) and springs (17).
7. 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).
8. Remove gasket (18) from support plate (19). Discard gasket.
9. 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.

10. 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. MHP1281.

1. Loosen jam nut (117) closest to plunger (114). Turn capscrew (120) counterclockwise until disconnected from plunger.
2. Disconnect air line 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 capscrews (101), spacers (102) and spacer tubes (103). Remove spacer plate (105).
4. Disconnect brake bracket from motor end upright (68) by removing two capscrews (107) and two capscrews (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 the cylinder (121) assembly into its component parts conduct the following:
   a. Use a press to compress the cover (125) enough to remove retainer ring (126). Slowly, and carefully, relax the load exerted on cover (125) by the 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 (111) and separating cylinder rod (108) from piston (123). Remove 'O' rings (122), (109) and (110). 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.
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) counter-clockwise 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 (112).
7. Spread brake band (137) apart slightly and slide out over drum flange. Rotate brake band around drum and remove.
8. Repeat this procedure for brake band (136).
9. Remove capscrews (112), washers (131), and adapter plate (145).
10. Press bushings (143) out of brake band pivot brackets.

☞ Reduction Gear

Refer to Dwg. MHP1410.

1. Place the reduction gear assembly on a clean work bench such that reducer housing (59) with oil seal (58) is down.
2. Remove thrust washer (34) and output carrier assembly (52).
3. Remove the input carrier assembly (67) by grasping the intermediate sun gear (45) and removing as an assembly. This also removes the input sun gear (54). Ensure that thrust bearing (56) and thrust washers (55), located on the end of the input sun gear (54) are removed.

NOTICE

• Do not disassemble planetary assemblies further than necessary to complete repairs. If planet gears (43) or (51) are disassembled, note the position of all spacers, roller bearings and shims to ensure correct reassembly.

4. To disassemble an output planet gear (43) from the output carrier (35) conduct the following:
   a. Before disassembly verify each gear (43) has a 0.005 to 0.032 inch (0.1 to 0.8 mm) end clearance.
   b. Using a small punch, drive roll pin (37) fully into output planet pin (36).
   c. Gently tap and slowly remove output planet pin (36) from output carrier (35). Using a punch, remove roll pin (37) from planet pin and discard.
   d. Remove output planet gear (43) assembly. Take care to prevent internal roller bearings (41) in each gear from falling out during removal.
   e. Note the position and quantity of the washers (38), (39) and (40) in each gear assembly. Keeping the washers separated, by assembly, will assist in reinstallation.

NOTICE

• If gear clearance is not within specification (0.005 to 0.032 inch [0.1 to 0.8 mm]) as determined in Step 4a., correct location/quantity of washers (38), (39) and (40) must be determined at assembly.

   f. Unless the roller bearings (41) or spacer (42) must be replaced it is not recommended that these parts be separated or removed from the output planet gear assembly. Care must be taken to maintain the roller bearing position. The output planet pin (36) can be carefully reinserted into the gear to maintain bearing position until reassembly.
   g. When planet gears are removed the thrust washer (44) may be removed from the inside of the output carrier (35).
5. To disassemble an input planet gear (51) from the input carrier (47) conduct the following:
   a. Before disassembly verify each gear (51) has a 0.005 to 0.032 inch (0.1 to 0.8 mm) end clearance.
   b. Using a small punch, drive roll pin (83) fully into input planet pin (49).
   c. Gently tap and slowly remove input planet pin (49) from input carrier (47). Using a punch, remove roll pin (83) from planet pin and discard.
   d. Remove input planet gear (51) assembly. Take care to prevent internal roller bearings (50) in each gear from falling out during removal.
   e. Note the position and quantity of the washers (84), (85) and (86) in each gear assembly. Keeping the washers separated, by assembly, will assist in reinstallation.

NOTICE

• If gear clearance is not within specification (0.005 to 0.032 inch [0.1 to 0.8 mm]) as determined in Step 4a., correct location/quantity of washers (84), (85) and (86) must be determined at assembly.

   f. Unless the roller bearings (50) or spacer (53) must be replaced it is not recommended that these parts be separated or removed from the output planet gear assembly. Care must be taken to maintain the roller bearing position. The input planet pin (49) can be carefully reinserted into the gear to maintain bearing position until reassembly.
6. Remove the oil seal (58) and discard. Remove the caged needle bearing (57) only if replacing. To remove press bearing out of housing.

Cleaning, Inspection and Repair

☞ Cleaning

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 remove 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 (104).

☞ 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 (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.

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.

☞ Control Valve Assembly

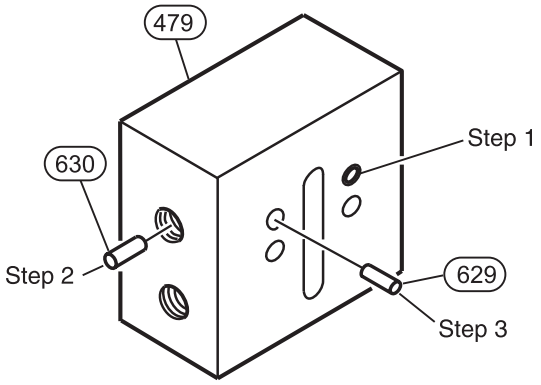
NOTICE

• Lubricate all 'O' rings with DOW CORNING #111 lubricant. Failure to use lubricant or the use of other lubricants can cause valve malfunction. Contact the factory if recommended lubricant is not available.
• Use a correctly sized tap and die to clean threaded holes and fastener threads prior to assembly. Ensure machined surfaces are clean and free from damage which could prevent a proper fit.

☞ Shuttle Valve Assembly

Refer to Dwgs. MHP1407, MHP1408, MHP1409 and MHP1228.
For winches equipped with dual automatic brakes or with an automatic drum brake follow the next steps. For all other winch configurations, complete steps 5 and 6 only.

1. Press one pin (629) into far hole until pin is flush with shuttle valve body (479).
2. Insert pin (630) into fitting port and shake down to pin (629).
3. Press pin (629) into near hole until pin is flush with shuttle valve body (479).
4. Check that pin (630) moves freely between two pins (629) in body (479) by shaking body. Pin (630) should be heard hitting pins (629).



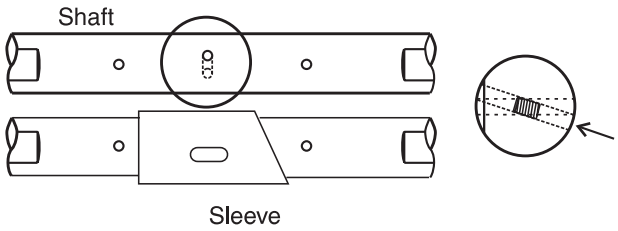
(Dwg. MHP1228)

5. Refer to Dwg. MHP1409 to determine brake fitting requirements on shuttle valve body (479). Before installing brake fittings, coat fitting threads with a bead of pipe sealant. Install fittings in valve body ports and tighten.
6. Place capscrews (418) into shuttle valve body (479) and locate gasket (419) on capscrews. Match capscrews to mounting holes in control valve body (410) and attach shuttle valve to control valve body. Tighten capscrews to 24-30 inch lbs (9-11 Nm).

☞ Valve Body Assembly

Refer to Dwg. MHP1408 (Pendant Pilot Operated Valve) and MHP1407 (Lever Operated Valve)

1. Facing the flats of the valve shaft (401), slide sleeve (408) onto shaft with the flat end of sleeve on the left and the angled (45°) end of sleeve on the right. Center sleeve on shaft.
2. Align the center hole in sleeve with offset hole (18° below centerline) in shaft and install setscrew (407) to attach sleeve to shaft. Refer to Dwg. MHP1022.



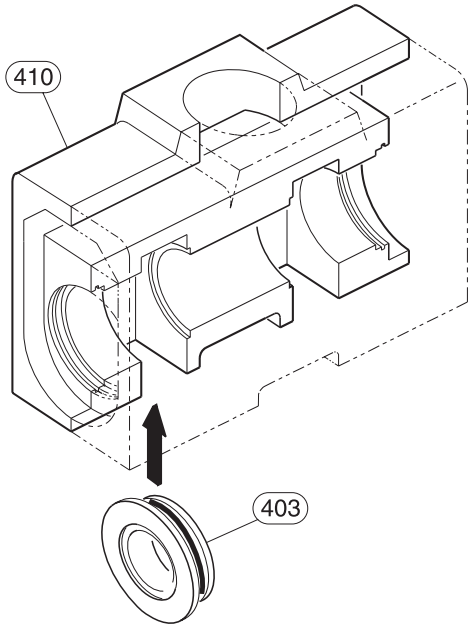
(Dwg. MHP1022)

3. Support shaft (401) and press pins (405) into shaft on both sides of sleeve until equally exposed on both sides of shaft.
4. Facing shaft (401) flats, conduct the following from the right side.
5. Slide restrictor poppet (402) onto shaft.
6. Install spring (422).
7. To assemble the poppet valves (423):
   a. Lubricate 'O' ring (427) and place it on poppet seat (428). Place this assembly on poppet valve (423).
   b. Lubricate 'O' ring (426) and place it on poppet valve (423).
   c. Put valve piston (431) on poppet valve and secure with retainer ring (432).
   d. Place 'O' ring (430) in groove in valve piston and lubricate.
8. Slide poppet assembly onto shaft (401) and insert cotter pin (414) in end of shaft to hold components. Do not bend cotter pin ends at this time.

NOTICE

• Pendant Pilot Valves do not use cotter pin (414). For these units, use a suitable cotter pin to *temporarily* contain components on the shaft. The pin will be removed in a following step.

9. Lubricate 'O' ring (404), place on restrictor seat (403) and insert assembly from the bottom of valve body and into position. Refer to Dwg. MHP1023. Press restrictor seat into groove in valve body until seated.
10. Install shaft (401) assembly in valve body (410) from side with installed restrictor seat (403). Carefully install to prevent sleeve (408) or pins (405) from damaging seat as they pass through.
11. Align poppet seat with valve body and, using fingers, press poppet seat into valve body.



(Dwg. MHP1023)

12. Secure in place using retainer ring (429). Remove cotter pin installed in step 8.

NOTICE

• The flats on shaft (401) must be facing the left (or valve) side of the valve body (410).

13. On opposite side of valve body, slide exhaust poppet (420) onto shaft (401). Press into valve body.
14. Install spring (422).
15. Slide poppet assembly (423) onto shaft (401).

NOTICE

• Pendant Pilot Valves do not use cotter pin (414). For these units, use a suitable cotter pin to *temporarily* contain components on the shaft. The pin will be removed in a following step.

16. Align poppet seat with valve body and, using fingers, press poppet seat into valve body.
17. Secure in place using retainer ring (429).

NOTICE

• Install pin (406) in step 18 only enough to determine clearance requirements of step 19. Do not fully install pin until directed.

18. On lever operated control valves install pin (406) in shaft (401) on the handle end of valve. This is the side of the valve that the restrictor poppet (402) and restrictor seat (403) are located. On pendant operated control valves pin (406) will be installed on both ends of shaft (401).
19. Measure clearance between end of poppet assembly (423) and pin (406). Using shims (444) attain a clearance of 0.03-0.05 inch (0.8-1.3 mm) between poppet assembly and pin.
20. When clearance is established, press pin down until pin protrudes below shaft 0.380 (+/- 0.01) inch (9.7 [+/- 0.3] mm).

☞ Brake Release Valve Installation and Adjustment

Refer to Dwgs. MHP1408 (Pendant Pilot Operated Valve) or MHP1407 (Lever Operated Valve) and MHP1411.

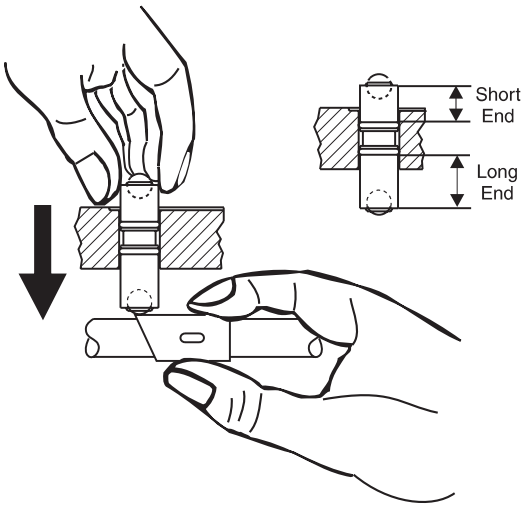
NOTICE

• Valve assembly (413) shaft body is longer on one side of middle groove than the other. Correct placement of valve assembly is with the longer shaft section located towards the bottom of the valve body (410). The shorter section will protrude up, through the valve body.
• To adjust brake release valve ensure sleeve (408) is loose on shaft (401). If not loose, back off (turn counterclockwise) setscrew (407).

1. Rotate sleeve (408) to place the longer edge on top. Refer to Dwg. MHP1024.
2. Using gentle hand pressure to prevent damage to the valve assembly (413), press valve assembly down until ball is in firm contact with sleeve (408).

⚠ CAUTION

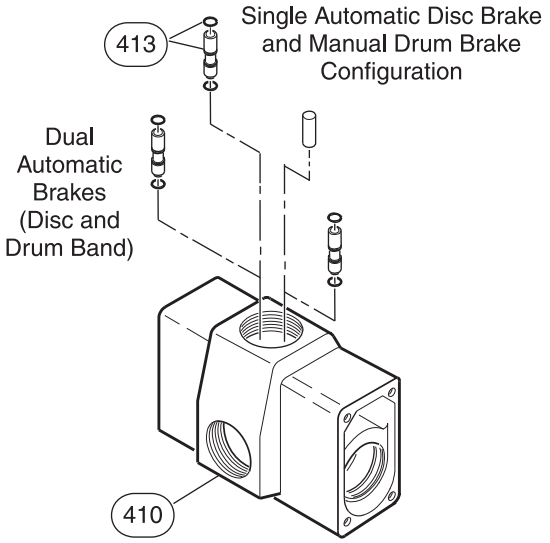
• When using sealants care must be taken to use only enough to effectively do the job. Excess sealant can drip onto internal components and harden resulting in erratic winch operation or control problems.



(Dwg. MHP1024)

3. For units with dual air brakes, repeat step 2 for second valve assembly (413). On units with a single brake, apply Loctite® 609 to pin (412) and press into valve body (410) [through the air inlet]. Leave 0.16-0.25 inch (4-6.4 mm) exposed at the top.
4. Rotate sleeve (408) until long section of sleeve is on the bottom (180°).
5. Place washer (417) and spring washer (416) on capscrew (465) and install in hole located between brake valve assembly ports in valve body (410). Tighten capscrew and ensure spring washer locks brake assembly(s) (413) and/or pin(s) (412) in place.

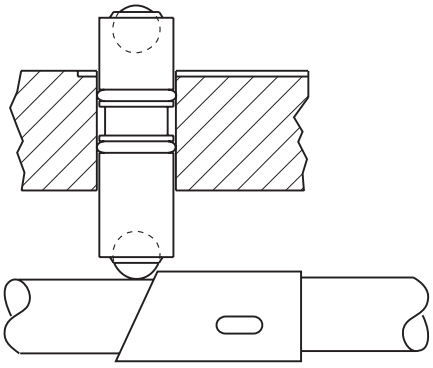
Brake Valve and Dowel Pin Positions



(Dwg. MHP1411)

To adjust the brake valve (413) conduct the following:

1. Ensure long section of sleeve (408) is positioned at the bottom of shaft (401). Align slot in sleeve with center (angled) hole in shaft.
2. Slide sleeve up to steel ball as shown in Dwg. MHP1027.



(Dwg. MHP1027)

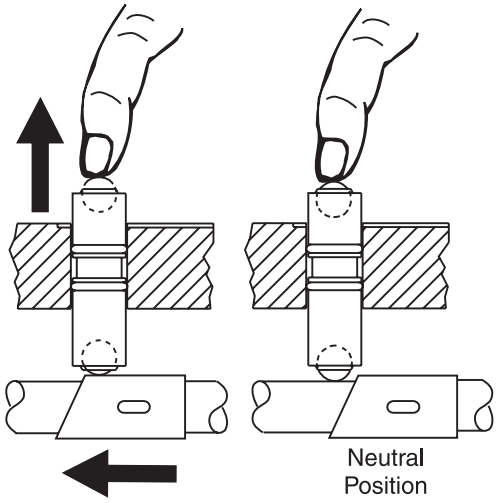
3. With an allen wrench inserted through sleeve (408) slot, tighten setscrew (407) until secure against the far wall of sleeve. This locks the sleeve in position.

To check brake valve operation:
Refer to Dwg. MHP1026.

1. Press shaft (401) in the direction causing the sleeve to shift and engage the lower ball. This will cause the top ball in valve assembly (413) to immediately rise as the lower ball is pushed up. When released, the ball must return to its neutral position.

NOTICE

• If the lever throttle handle is installed, shifting the lever in the haul-in direction will accomplish the same result. Pendant operated valves would require air be supplied for pendant operation. This is not a recommended procedure.



(Dwg. MHP1026)

☞ Valve Cap Assembly (Handle End)

Refer to Dwg. MHP1407.
The following describes the assembly of the valve cap assembly on the lever control handle end of valve.

1. Install washers (434) place on shaft (401) to establish a 0.06 -0.12 inch (1.5-3.0 mm) clearance between the interior washer face and the poppet assembly (423) end face. Secure in place with cotter pin (414) with ends bent back to hold in place.
2. Press pin (463) into handle (449) until one end protrudes approximately 1/16 inch (1.6 mm).
3. Slide 'O' ring (460) down handle into groove and lubricate.
4. Slide spring (462) over handle and onto pin.
5. Insert this assembly up through the bottom of cross shaft (461). 'The bottom' is the side with the groove for locating pin (463).
6. Apply a drop of Loctite® 242 to threads on handle. Install knob (469) and tighten.
7. Install detent plate (464) on valve cap (450) with cutout portion of plate located at bottom. Coat threads with Loctite® 680, install and tighten capscrews (465) to 42-45 inch lbs (15-17 Nm). Install cross shaft (461) **without** 'O' rings. Ensure cross shaft rotates freely. Remove cross shaft.
8. Place split section of clevis (446) on shaft (401). Ensure rounded section of clevis is towards the valve body (410) and is located on top. Coat pin (409) with Loctite® 609 and press into lower slot (perpendicular to shaft), through shaft and into lower slot located on opposite of clevis. Center pin in clevis.
9. Place valve body (410) on its side with the clevis end over the edge of the workbench.
10. Place gasket (411) on valve cap (450) and slide assembly over clevis. Lubricate threads and loosely install capscrews (437) and (439) and washers (433).
11. From the bottom hole in valve cap use a punch, or similar tool, to align the cross shaft holes in valve cap with the hole in the clevis. Use tool to maintain position and tighten capscrews to 54-60 inch lbs (20-22 Nm).

NOTICE

• The slotted pin grooves in the clevis (where clevis and shaft (401) are joined) make alignment of the cross shaft and clevis difficult. To prevent binding of cross shaft during installation, ensure the cross shaft holes (located in valve cap) and the clevis hole are aligned before installing cross shaft.

12. Lubricate 'O' rings (448) and locate in grooves on cross shaft (461). Insert cross shaft through detent plate side of valve cap assembly. To complete, raise handle assembly up and insert pin (463) into detent plate while pushing on cross shaft.
13. Align the hole in the cross shaft with the hole in the end of the clevis. Apply a bead of Loctite® 242 to pin (445). Using an 8-32 x 2 inch screw attached to the threaded end of pin, install pin by tapping into position. Ensure pin is inserted fully into clevis.
14. Operate the lever in both directions. There should be no indication of sticking or binding. When released, the lever must return to the neutral position and lock in place (handle must be lifted before shifting in either direction).
15. Coat threads of plug (447) with pipe sealant and install in valve cap end.

☞ Valve Cap Assembly

Refer to Dwg. MHP1407.
The following describes the assembly of the valve cap assembly located on the end opposite the lever control handle.

1. Install washers (434) on shaft (401). Place enough on shaft to establish an 0.06-0.12 inch (1.5-3.0 mm) clearance between the interior washer face and the poppet assembly (423) end face. Secure in place with cotter pin (414) with ends bent back to hold in place.
2. Lubricate threads and install capscrews (437) and (439), washers (433), gasket (411) and valve cap (438) to valve body (410). Tighten capscrews to 54-60 inch lbs (20-22 Nm).

☞ Pendant Operated Valve End Cap Assembly

Refer to Dwg. MHP1408.

1. Slide spring retainer (459) into spring (452). Insert capscrew (465) through spring end and into retainer. Install this assembly into piston (454) and tighten.

NOTICE

• Prior to installing a new spring (452), fully compress the spring 10 to 12 times. This 'sets' the spring and maintains the correct preload on the piston (454).

2. Lubricate 'O' ring (453) and install in external groove on piston (454).
3. Install setscrew (458) into piston until flush. This setscrew will be used to complete valve adjustments later in this section.
4. Lubricate 'O' ring (455) and install in internal groove in seal cup (456). Slide seal cup onto piston shaft taking care not to dislodge 'O' ring.
5. Lubricate 'O' ring (457) and install in seal cup face groove.

NOTICE

• The slot in the seal cup (viewed from valve cap cover end) must be located at the bottom when installed correctly. This is required to provide clearance for the shaft (401) pins (406).

6. Coat external mating sleeve surface of cylinder (451) with Loctite® 609 and press into valve cap (438).

⚠ CAUTION

• Ensure cylinder (451) is pressed into valve cap (438) evenly and with the threaded port located at the exact bottom of the cylinder. These are machined parts with a press fit. Care must be taken to ensure they are not damaged during assembly. If damaged they must be replaced.

☞ Pendant Valve Adjustment

To adjust the valve conduct the following:

1. Lubricate threads and install capscrews (437) and (439), lockwashers (433), gasket (411) and valve cap (438) assembly to valve body (410). Tighten capscrew, but do not torque.
2. Reaching into the exhaust port on the valve body (410) grasp the shaft (401) and check for movement in either direction. Any movement requires adjustment.
3. If there is shaft movement, remove the valve caps and back out the setscrews (458) in pistons (454) 1/4 turn. Repeat until there is no movement.
4. When adjustment is complete tighten capscrews (437) and (439) to 54-60 inch lbs (20-22 Nm).

☞ Adapter Installation

Refer to Dwgs. MHP1407 and MHP1408.

1. Place washers (434) and capscrews (442) in holes in adapter (440).

NOTICE

• Failure to install washers (434) and capscrews (442) at this time will require adapter (440) or valve cap assembly removal to provide access to these holes.

2. Place gasket (424) on mating face of adapter (440) and align holes with valve body (410). Coat threads with Loctite® 242 and, from the bottom side of adapter, install capscrews (441) into valve body. Tighten to 13-17 ft lbs (58-76 Nm).

☞ Live Air Throttle Valve Assembly

Optional feature. Refer to Dwg. MHP1380.

NOTICE

• During assembly align parts using match marks made during disassembly.

1. Install seal rings (315) on each end of valve body (316).
2. Install valve body (316) into valve bushing (314).
3. Insert valve bushing (314) into valve housing (311). Ensure ports in bushing and flat cutout in valve body are properly aligned with housing ports as shown in Dwg. MHP1380.
4. Install valve body retainer (305) with two capscrews (302) and lockwashers (304). Torque capscrews to 25 ft. lbs. (34 Nm).
5. If removed, re-install spring retaining stud (306) and torque to 25 ft. lbs. (34 Nm).
6. Install spring (303) and handle (300) on square shaft of valve body (316). The spring (303) ends must straddle the spring retaining stud (306) on throttle handle (300). Install roll pin (301).

7. Check throttle handle moves fully left and right without sticking or binding. Throttle handle should center, by spring force, automatically when released.

☞ Reduction Gear Assembly

Refer to Dwg. MHP1410.

1. Install oil seal (58) in housing (59). Install caged needle bearings (57) in housing.
2. To install planet gear assemblies to carriers conduct the following:
   a. Locate a pin. Approximate size for the input planet gear (51) is 0.75 inches (19 mm) in diameter and 1-5/8 inches (41 mm) long. Approximate size for the output planet gear (43) is 1-1/8 inches (28 mm) in diameter and 2-1/4 inches (57 mm) long.
   b. Using the configuration information noted during disassembly and Dwg. MHP1410 assemble the planet gears, spacers, bearings and washers on the pins located in step 3.a.

NOTICE

• Shim output carrier (35) and input carrier (47) planet gears for 0.005 to 0.032 inch (0.1 to 0.8 mm) end clearance.

3. Input Carrier Assembly (67):
   a. Install the intermediate sun gear (45) in input carrier (47) and secure by installing retainer rings (53) on each side of gear. Install input sun gear (54).
   b. Place an input planet gear (51) assembly into the intermediate carrier (47). Verify end clearance. Align the hole in input planet pin (49) in line with the hole in the input carrier (47). Carefully insert the pin and tap to install the planet pin (49) while driving out the locator pin. When installed and with the holes lined up in the carrier and in the pin, install roll pin (83) to secure in place. Verify end clearance. Repeat for the remaining planet gear assemblies.
4. Output Carrier Assembly (52):
   a. Place thrust washer (44) into recess in output carrier assembly.
   b. Place an output planet gear (43) assembly into the output carrier (35). Verify end clearance. Align the hole in output planet pin (36) in line with the hole in the intermediate carrier (35). Carefully insert the pin and tap to install the planet pin (36) while driving out the locator pin. When installed and with the holes lined up in the carrier and in the pin, install roll pin (37) to secure in place. Verify end clearance. Repeat for the remaining planet gear assemblies.
5. Place thrust washers (55) and thrust bearing (56) on input sun gear (54). Install input carrier assembly (67) into housing (59).
6. Place output carrier assembly (52) into housing (87). Place housing (87) onto housing (59). Align planetary gears of output carrier assembly with intermediate sun gear (45).
7. Apply Loctite® 515 to mating surfaces of housing (87) and housing (59). Align capscrew holes and install six capscrews (80). Torque capscrews to 60 ft lbs. (81 Nm).
8. With drum standing on end, place reduction gear assembly into drum. Place Loctite® 515 on mating surfaces of housing (87) and end cover (33). 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 (32). Torque capscrews to 60 ft lbs. (81 Nm).
9. 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. MHP1410.

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. For units **with** disc brake, refer to the 'Disc Brake Assembly' section.
4. Install the drum band brake bracket and piston assemblies. Do not attach the brake band assembly (104). Refer to the 'Drum Band Brake' section for instructions.
5. Install coupling (60) on shaft (61) and install on end of the input sun gear (54), located in the reduction gear assembly.
6. If unit is equipped with drum band brake, place brake band assembly (104) onto drum brake flange. Place inboard (motor end) upright (68) on drum.
7. Loosely attach the sideframes (65) to the uprights (26) and (68) using four capscrews (66) and washers (74) 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 (104) as described in the 'Drum Band Brake Assembly' section.

☞ Manual Drum Band Brake Assembly

Optional feature. Refer to Dwg. MHP1448.

1. Press bushings (143) into brake band pivot brackets. Bushing flanges must be to the motor upright side.
2. Attach adapter plate (145) to upright (68) loosely with capscrews (112) (apply Loctite® 242 to threads) and washers (131).
3. Place brake band (136) onto drum and rotate around drum (close to mounting position). Spread brake band (136) apart slightly and slide in over drum flange. Place brake band pivot bracket over pin in adapter plate (145).
4. Repeat this procedure for brake band (137).
5. Place washer (142) over pin in adapter plate (145) and secure with cotter pin (144).
6. Insert pivot nut (134) into brake handle (135).
7. Place brake handle (135) into bracket in brake band (136) 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 in. (25 mm) of threads are exposed.

NOTICE

• Refer to 'ADJUSTMENT' section for adjusting brake.

9. Lift up brake handle (135) until hole in brake link stud (141) and bracket in brake band (137) are aligned. Insert pin (138) and secure with cotter pin (139).
10. Push brake handle (135) down to the lock position.
11. Tighten capscrews (112).

☞ Automatic Drum Band Brake Assembly

Optional feature. Refer to Dwg. MHP1281.
For ease of assembly install bracket (106), cylinder (121) assembly to motor end upright (68) prior to assembling upright to drum.

1. Assemble the brake cylinder (121) as follows:
   a. Install 'O' ring (122) on piston (123).
   b. Heavily coat the 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 the retainer ring groove is accessible. Install retainer ring (126). To ensure that retainer ring is properly installed, tap the end of the retainer ring with a punch until the 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 85 ft lbs (115 Nm).
3. Assemble roller (116) in plunger (114) and secure using dowel pin (115). Heavily coat the 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 the air hose connection port is horizontal and towards the motor.

Conduct the following when the winch is assembled, but prior to mounting to the foundation. The motor end of the winch should be raised enough to allow access to the brake components located on the inside surface of the 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 55 ft lbs (75 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 approximately the middle of the 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 the 'Drum Band Brake Adjustment' section.

☞ Adjusting Automatic Drum Band Brake

Optional Feature. Refer to Dwg. MHP1281.

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

☞ Disc Brake Assembly

Refer to Dwg. MHP1230.

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.

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.

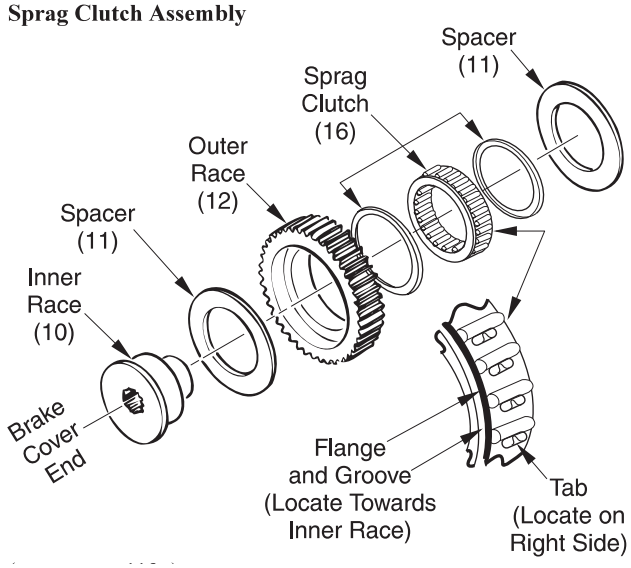
⚠WARNING

• 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.
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 and install two capscrews (1). 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). 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). Install exhaust valve (79), elbow fitting (80) and connect air hose (75) to elbow fitting.
13. 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.

Sprag Clutch Assembly



(Dwg. MHP1197)

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 2 hours 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:

Utility Winch:
FA5AMR Winch 125% Test Load 12,500 lb. (5,670 kg)

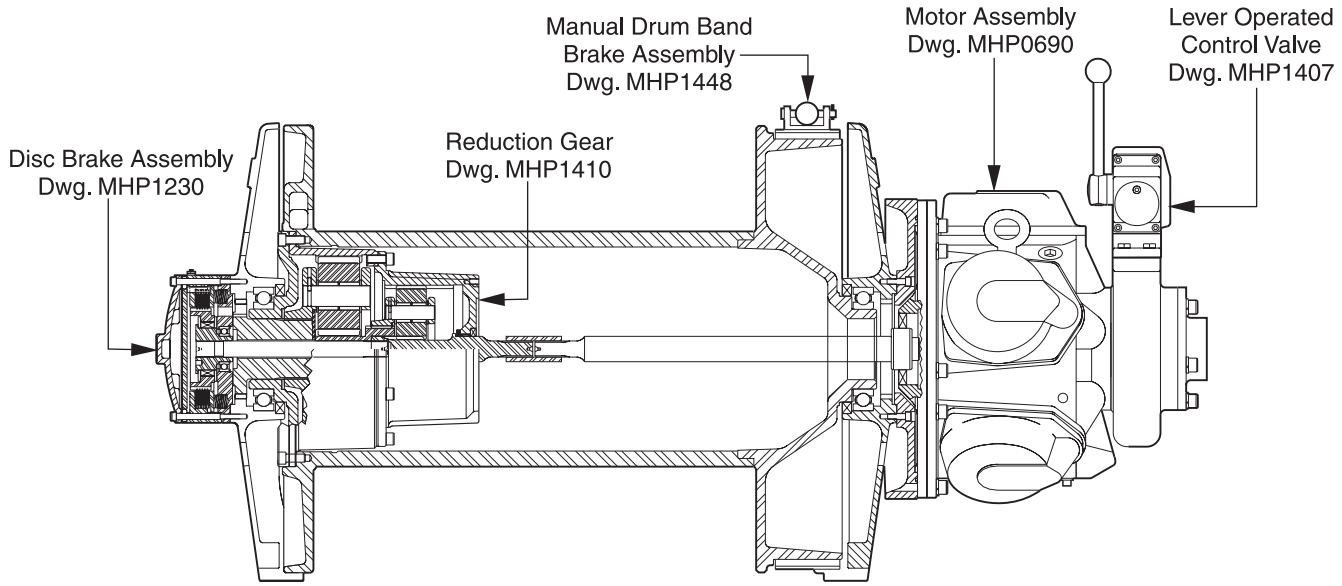
***Man-Rider*® Winch:**
FA5AMR Winch 125% Test Load 7,812 lb. (3,543 kg)

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.

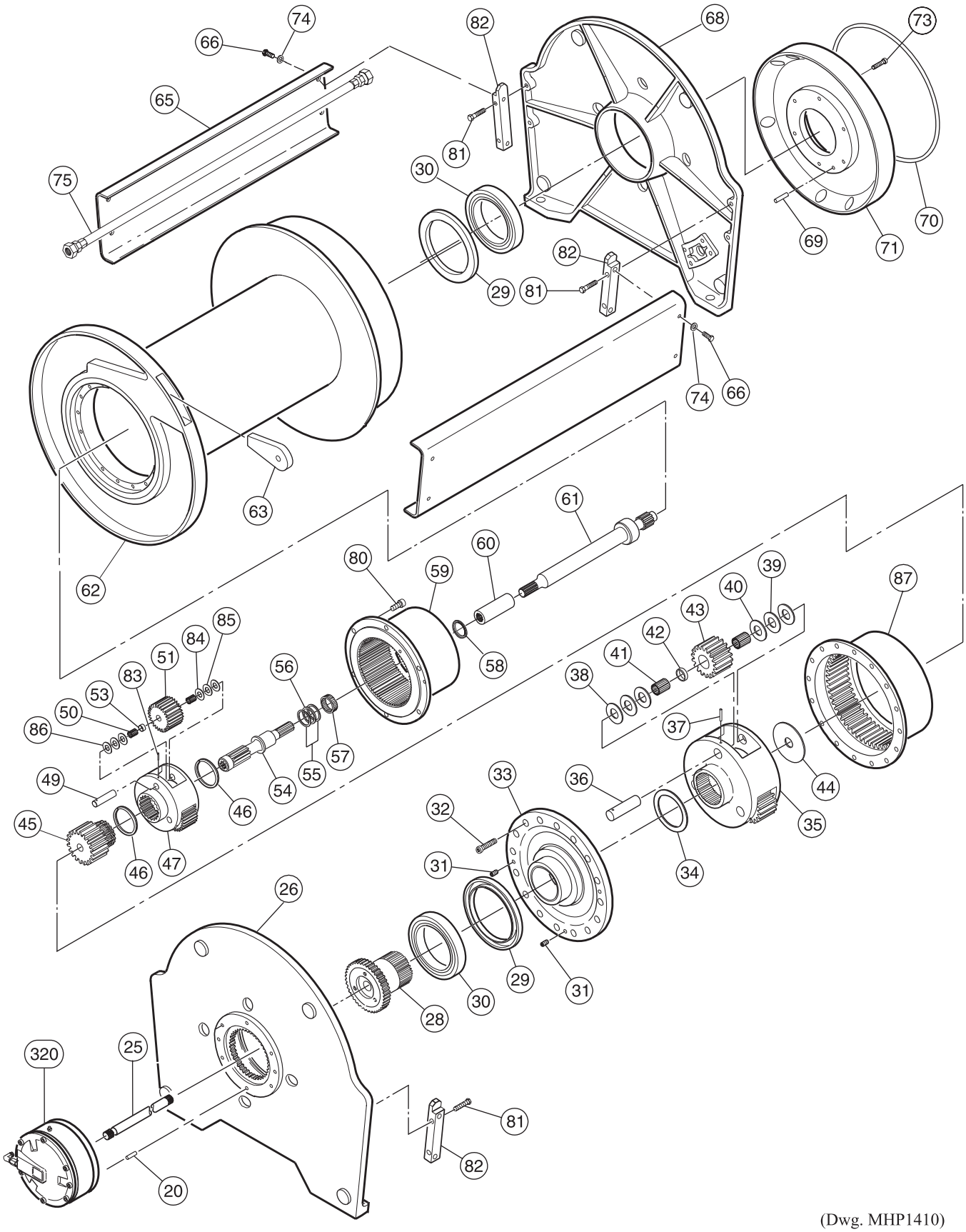
WINCH DRAWINGS AND PARTS LISTS TABLE OF CONTENTS

WINCH CROSS SECTION DRAWING



(Dwg. MHP1459)

WINCH ASSEMBLY PARTS DRAWING



(Dwg. MHP1410)

WINCH ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
1	Capscrew (1)	6	71266613	53	Spacer	3	20389
2	End Cover (1)	1	24381	54	Input Sun Gear	1	23896
• 18	Gasket (1)	1	71262257	55	Thrust Washer	2	71113203
20	Dowel Pin	1	71126759	56	Thrust Bearing	1	71113195
25	Brake Shaft	1	24039	57	Bearing	1	71113187
26	Upright, Outboard End	1	25566	• 58	Oil Seal	1	71113179
27	Capscrew (1)	3	71266936	59	Reducer Housing	1	20672
28	Output Shaft	1	21019	60	Shaft Coupling	1	50775
• 29	Oil Seal	2	71053862	61	Drive Shaft - Short Drum	1	24035
• 30	Bearing	2	71053854		Drive Shaft - Long Drum		23902
48	Reduction Gear Assembly (1)	1	23900	62	Drum - 12 inch	1	23750
31	Plug	2	71267561		Drum - 24 inch		21729
32	Capscrew	16	71264683	63	Wire Rope Anchor (2)	1	24258
33	Cover	1	20393-1	65	Sideframe - Short Drum	2	24674
34	Thrust Washer	1	23738		Sideframe - Long Drum		24675
52	Carrier Assembly (1)	1	23891	66	Capscrew	8	71264691
35	Carrier	1	23892	68	Upright, Motor End	1	25567
36	Pin, Planet	3	20394	69	Dowel Pin	1	71136923
• 37	Pin, Roll	3	71113302	• 70	'O' Ring	1	51459
38	Washer (0.123 thickness)	Refer to Note (3)	71146815	71	Motor Adapter - K5B	1	22034
39	Washer (0.092 thickness)		50533	73	Capscrew	6	71311674
40	Washer (0.06 thickness)		71126478	74	Washer	8	71274807
41	Bearings, Roller	126	71113286	75	Hose Assembly - Short Drum	1	23230-63
42	Spacer	3	20388		Hose Assembly - Long Drum		23230-75
43	Gear, Planet	3	23893	80	Capscrew	6	71113161
44	Thrust Washer	1	20406	81	Capscrew	8	71264709
67	Input Carrier Assembly (1)	1	23897	82	Corner Bar	4	21882
45	Intermediate Sun Gear	1	23894	83	Roll Pin	3	71267793
46	Retainer Ring	2	71113278	84	Washer (0.123 thickness)	Refer to Note (3)	71146807
47	Carrier, Planet	1	23898	85	Washer (0.06 thickness)		71113229
49	Pin, Planet	3	20386	86	Washer (0.092 thickness)		71113260
50	Bearing, Roller	108	71113252	87	Output Carrier Housing	1	20377
51	Gear, Input Planet	3	23899				

Model Driver Option 'C' (minus 20° C Temperature/Charpy Tested Parts):

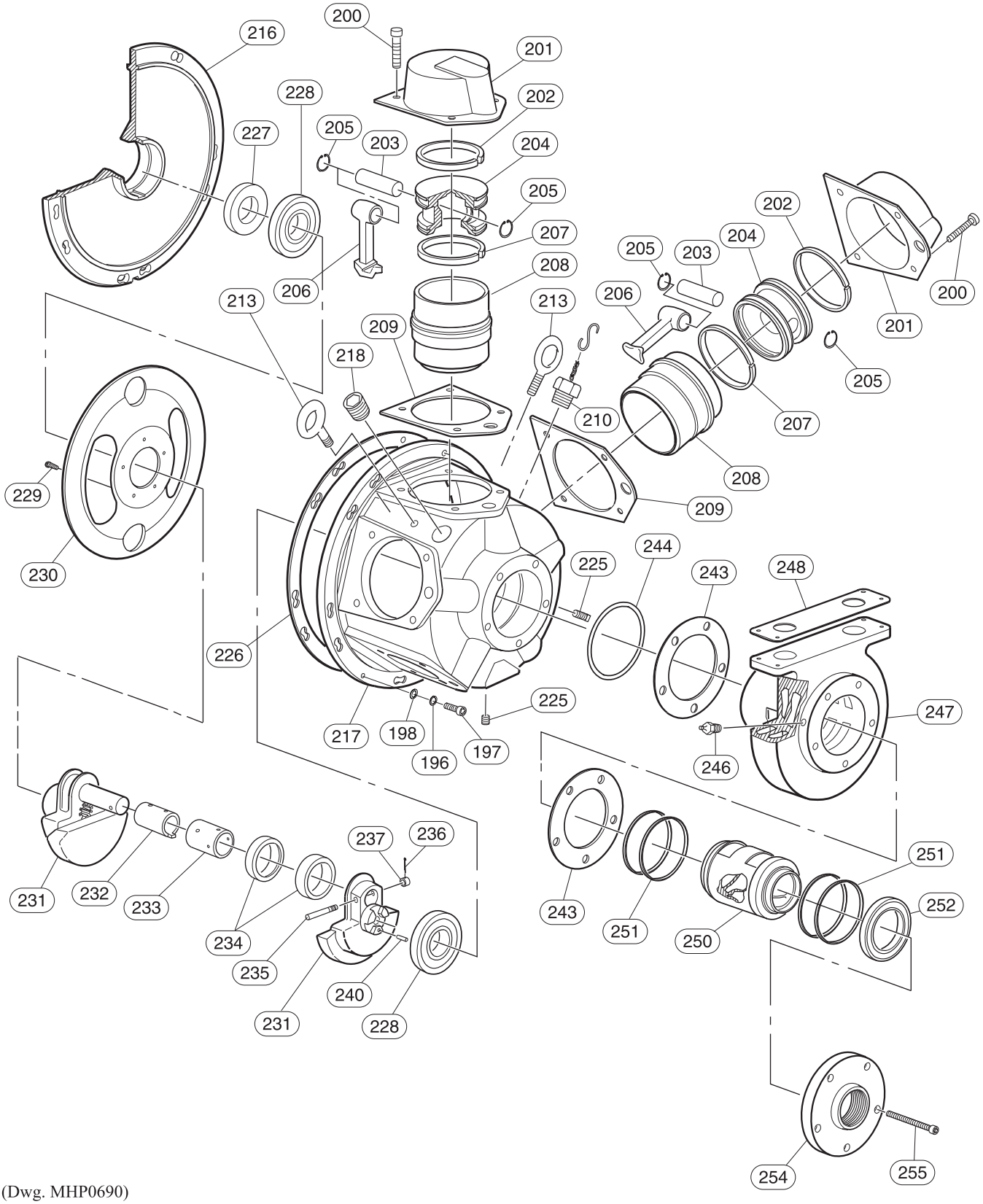
26	Upright, Outboard End	1	25566CH	45	Intermediate Sun Gear	1	23894CH
28	Output Shaft	1	21019CH	47	Carrier, Planet	1	23898CH
48	Reduction Gear Assembly (1)	1	23900CH	49	Pin, Planet	3	20386CH
33	Cover	1	20393-1CH	51	Gear, Input Planet	3	23899CH
52	Carrier Assembly (1)	1	23891CH	54	Input Sun Gear	1	23896CH
35	Carrier	1	23892CH	59	Reducer Housing	1	20672CH
36	Pin, Planet	3	20394CH	62	Drum - 12 inch	1	23750CH
43	Gear, Planet	3	23893CH		Drum - 24 inch		21729CH
67	Input Carrier Assembly (1)	1	23897CH	68	Upright, Motor End	1	25567CH
•	Recommended spare.			87	Output Carrier Housing	1	20377CH

Notes: (1) Winch Reduction Gear Assembly includes items 33, 34, the Output Carrier Assembly (items 35 through 44), the Input Carrier Assembly (item 39 [quantity 6], items 45 through 53, items 83 through 86), and items 51 through 59.

(2) Wire rope anchor for 9/16 to 3/4 inch (14 to 18 mm) wire rope only.

(3) Washers (items 38 through 40 and items 84 through 86) must be installed in quantities necessary to establish end clearances noted in the "MAINTENANCE" section.

MOTOR ASSEMBLY PARTS DRAWING



(Dwg. MHP0690)

MOTOR ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
196	Lockwasher	10	71268213
197	Capscrew	10	71268205
198	Washer	10	71274815
199	Motor Assembly **	1	K5B-546LP
200	Capscrew	20	52317
201	Cylinder Head	5	K5B-H505
• 202	Compression Ring	1 Set	K5B546-KRING
203	Wrist Pin	5	HU-514A
204	Piston *	5	*
205	Retainer Ring	10	902A45-632
206	Connecting Rod	5	K5B-509
• 207	Oil Ring	5	Order Item 202
208	Cylinder Liner	5	K5B-L505-47
• 209	Head Gasket	1 Set	26228
210	Vent Cap Assembly	1	K5B-A303
213	Eye Bolt	2	KU-888
216	Mounting Flange	1	K5B-502
217	Motor Housing	1	K5B-501A
218	Pipe Plug	1	71263297
225	Pipe Plug	2	54912
• 226	Gasket	1	K5B-592
• 227	Oil Seal	1	51873
228	Crank Bearing	2	51066
229	Button Head Screw *	5	*
230	Oil Slinger *	1	*
231	Crank Assembly	1	K5B-A516
232	Sleeve	1	K5B-519
233	Bushing	1	K5B-511
234	Connecting Rod Ring	2	K5B-510
235	Lock Pin	1	HU-520
236	Cotter Pin	1	53456
237	Pin Nut	1	D02-394
240	Roll Pin	1	54257
• 243	Gasket	2	K5B-928
• 244	'O' Ring	1	20A11CM248
246	Grease Fitting	1	53095
247	Rotary Valve Housing	1	K5B-545
• 248	Gasket	1	K5B-547
250	Rotary Valve	1	K5B-526EQ-R
• 251	Seal Ring ***	1 Set	K5B-607A
• 252	Bearing	1	50138
254	Exhaust Flange	1	KK5B-276M
255	Capscrew	5	51471

• Recommended spare.

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

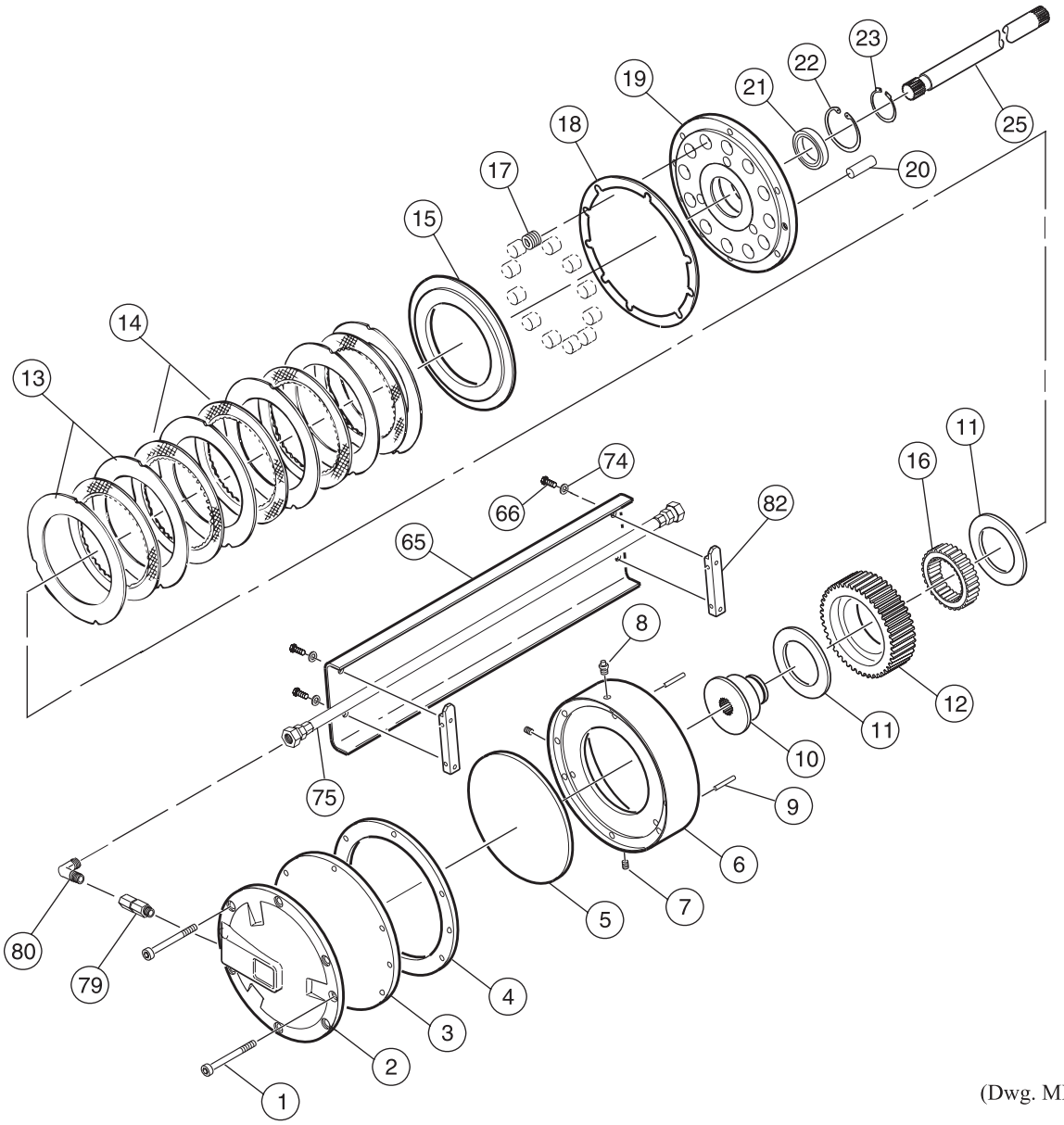
** Motor Assembly includes items 200 through 255.

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

Motor Assembly Kit List:

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
231	Crank Assembly (Includes items 206 and 228 through 240)	1	K5B-A516
261	Piston Assembly (Includes items 202 through 205 and item 207)	1	K5B-A513-47
262	Cylinder Assembly (Includes items 201 and 208)	1	K5B-A505-47

DISC BRAKE ASSEMBLY PARTS DRAWING



(Dwg. MHP1230)

DISC BRAKE ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
320	Disc Brake Assembly *	1	24140	15	Pressure Plate	1	24137
1	Capscrew	8	71264717	• 16	Sprag Clutch ***	1	71044853
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	24038	66	Capscrew	8	71264691
11	Spacer	2	19007	74	Washer	8	71274807
• 12	Outer Race ***	1	22032	79	Valve Exhaust	1	71047898
• 13	Friction Plate	5	71126874	80	Elbow Fitting	1	24141
14	Separator Plate	6	22033	82	Corner Bar	2	21882

Sideframe				**Brake Hose**			
65	Short Drum - 12 inch	1	24674	75	Short Drum - 12 inch (hose length - 63 inches)	1	23230-63
	Long Drum - 24 inch		24675		Long Drum - 24 inch (hose length - 75 inches)		23230-75

Model Driver Option 'C' (Minus 20° C Temperature/Charpy Tested Parts):

320	Disc Brake Assembly *	1	24140CH	• 12	Outer Race ***	1	22032CH
• 10	Inner Race ***	1	24038CH	25	Brake Shaft	1	24039CH

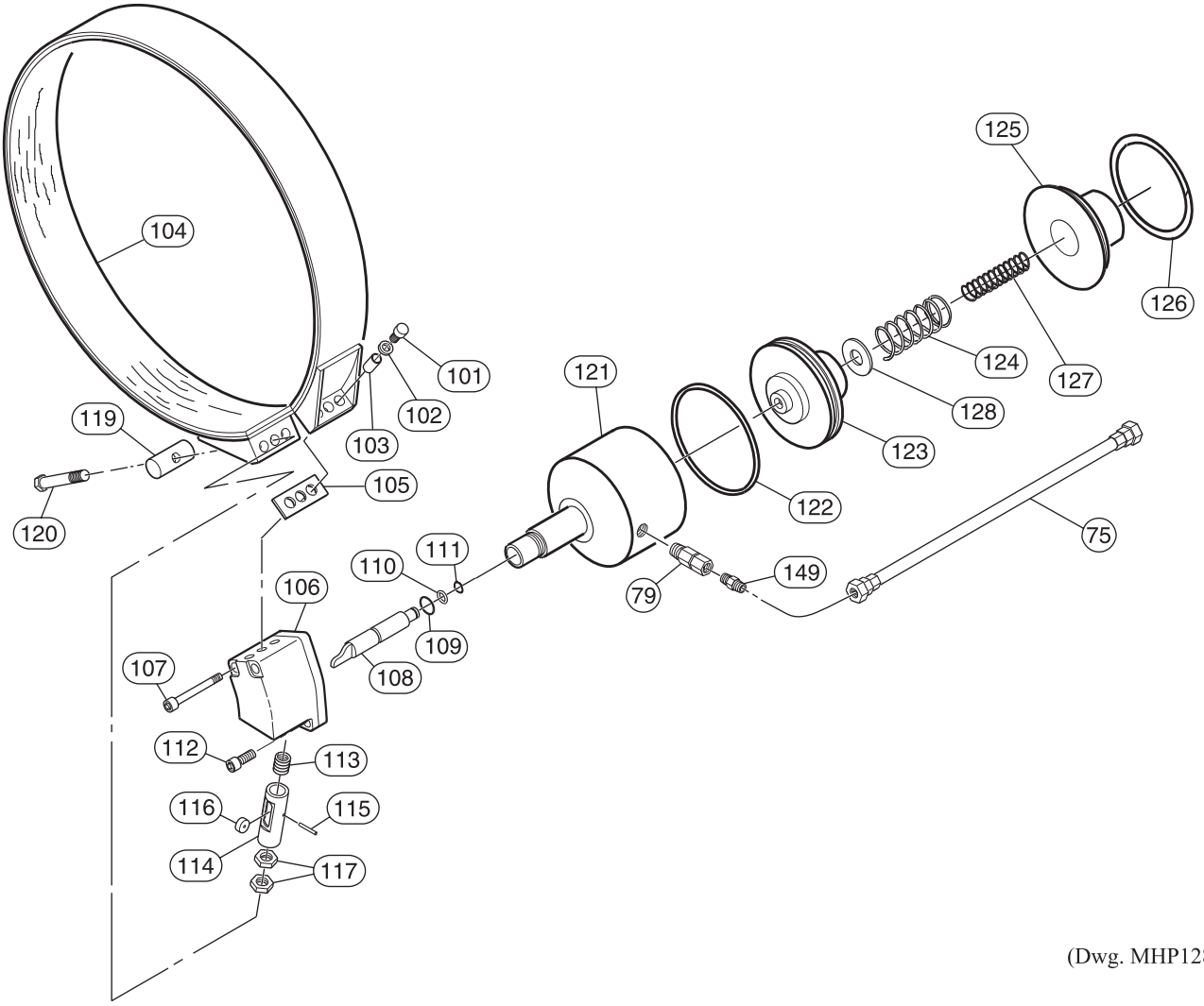
• Recommended spare.

* Disc Brake Assembly includes items 1 through 25.

** As viewed from the brake end, the air line attaches to the brake cover on the left hand side on standard winches.

*** When replacing Sprag Clutch (item 16) also replace Inner Race (item 10) and Outer Race (item 12).

AUTOMATIC DRUM BAND BRAKE ASSEMBLY DRAWING AND PARTS LIST



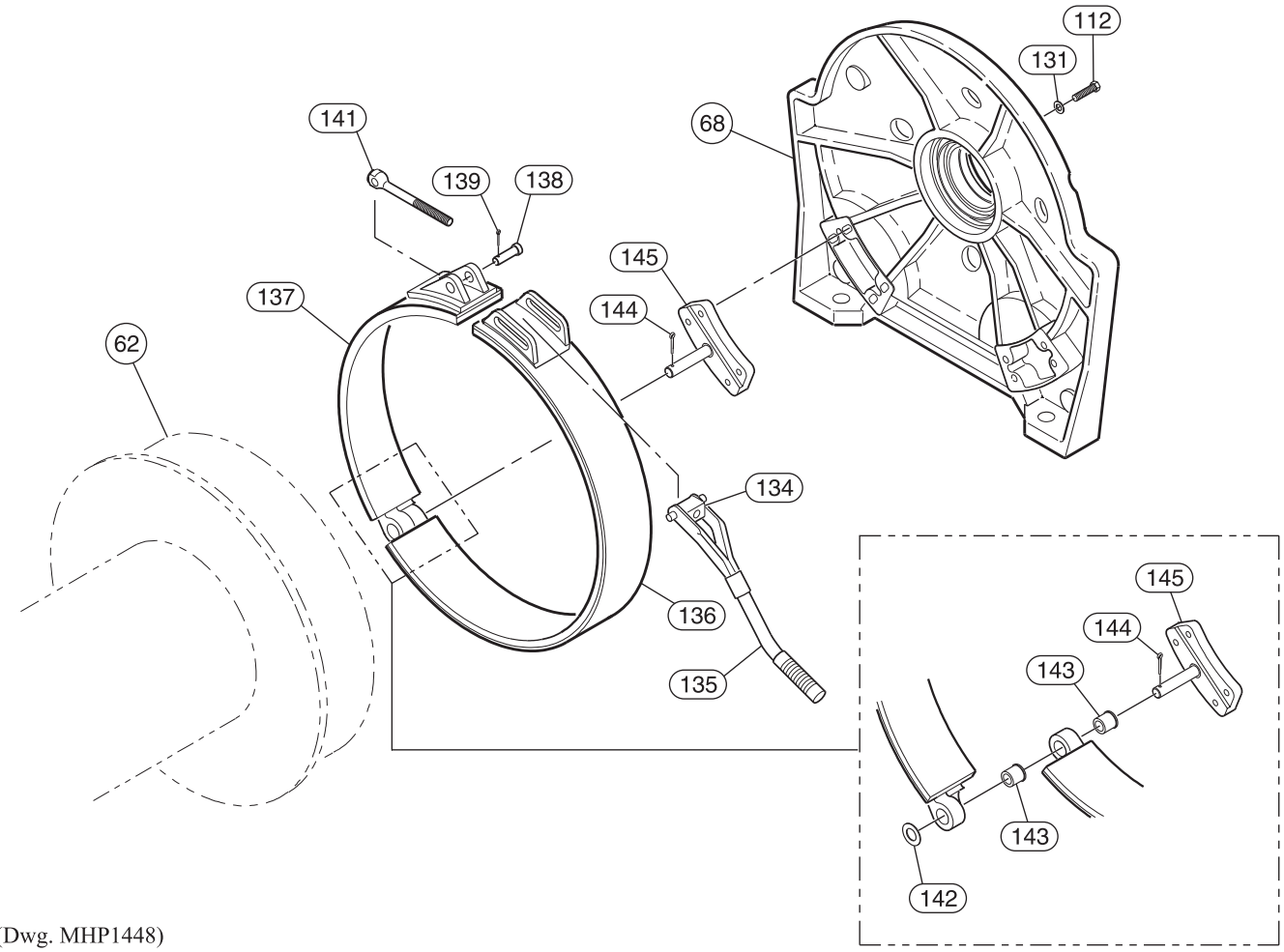
(Dwg. MHP1281)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
75	Hose Assembly	1	24403-39	114	Plunger	1	23886
79	Valve, Exhaust	1	71047898	115	Pin, Dowel	1	71144968
100	Brake Assembly *	1	25155	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	71326805
104	Band Assembly	1	25144	121	Cylinder	1	26138
105	Spacer	1	23029	• 122	'O' Ring	1	52536
106	Brake Bracket	1	22984	123	Piston	1	25534
107	Capscrew	2	71298921	124	Spring	1	71299721
108	Cylinder Rod	1	23885	125	Cover	1	25392
• 109	'O' Ring	1	71049423	126	Retainer Ring	1	71126668
• 110	'O' Ring	1	52662	127	Spring	1	71299713
111	Retainer Ring	1	54136	128	Washer	1	71145080
112	Capscrew	2	71298939	149	Fitting, Nipple	1	52092
113	Spring	1	71126643				

• Recommended spare. * Brake assembly (100) consists of items 101 through 128.

Note: For Charpy Item part numbers contact the factory.

MANUAL DRUM BAND BRAKE ASSEMBLY DRAWING AND PARTS LIST

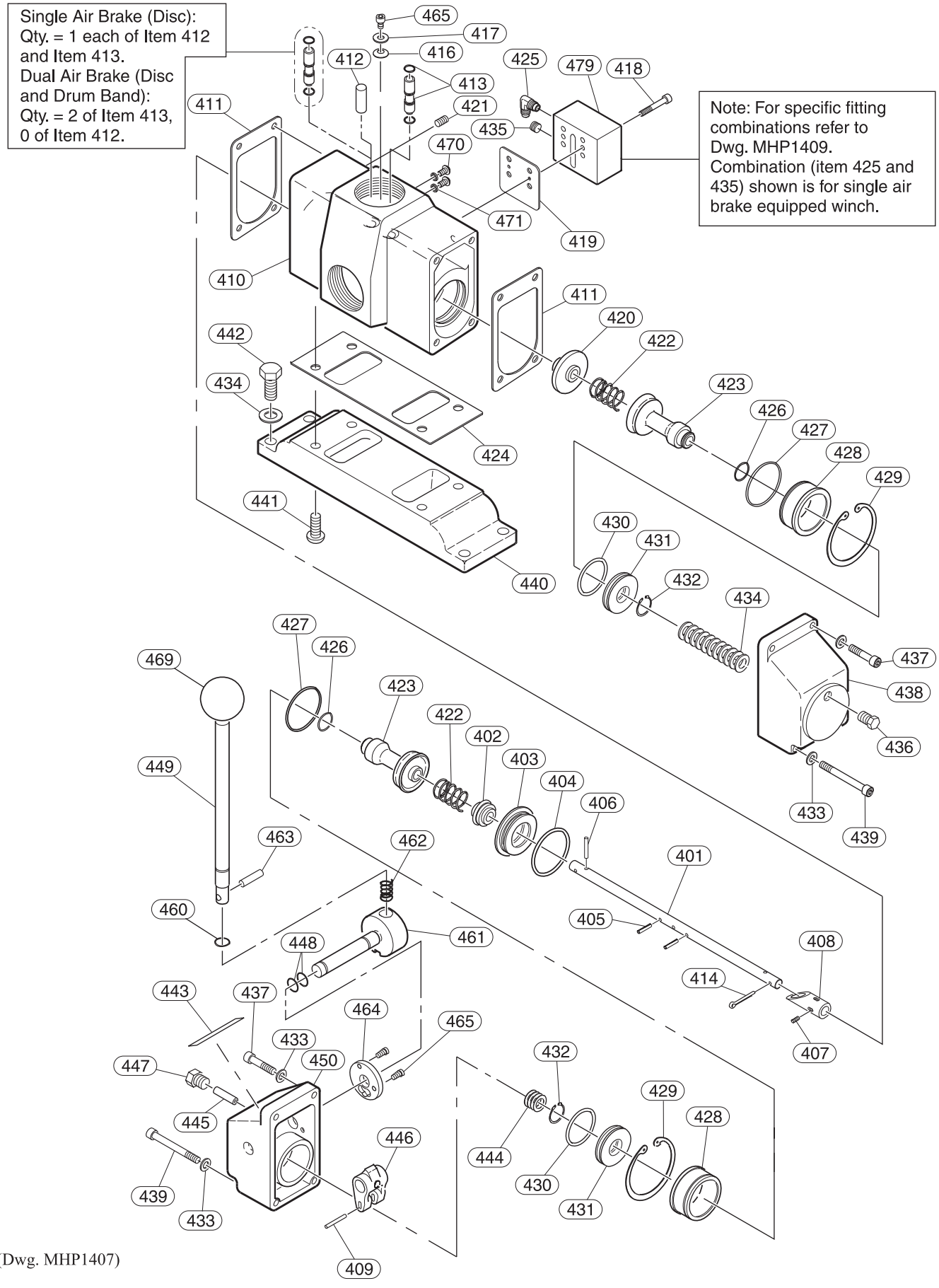


(Dwg. MHP1448)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	
			Standard	Charpy
62	Drum (with Band Brake) Short Drum (12 inch)	1	23750	23750CH
	Drum (with Band Brake) Long Drum (24 inch)		21729	21729CH
68	Upright, Motor End	1	25567	25567CH
112	Capscrew	4	71335459	- - -
131	Washer	4	71334411	- - -
134	Pivot Nut	1	2445	2445CH
135	Brake Handle	1	26388	26388CH
136	Rear Brake Band Assembly	1	26345	26345CH
137	Front Brake Band Assembly	1	26342	26342CH
138	Pin	1	4303-S	4303-SCH
139	Cotter Pin	1	51996	- - -
141	Brake Link Stud	1	4115	4115CH
142	Washer	1	71334379	- - -
143	Bushing	2	71334403	- - -
144	Cotter Pin	1	50965	- - -
145	Adapter Plate	1	26350	26350CH

• Recommended spare.

LEVER OPERATED CONTROL VALVE ASSEMBLY PARTS DRAWING



(Dwg. MHP1407)

LEVER OPERATED CONTROL VALVE ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
400	Valve Assembly *	1	- - -
	Single Air Brake		24801
	Single Air Brake -E *		25451
	Dual Air Brakes		24803
	Dual Air Brakes -E *		25442
401	Valve Shaft	1	23522
402	Restrictor, Poppet	1	23523
403	Restrictor, Seat	1	23524
• 404	'O' Ring	1	71137988
405	Pin	2	71293179
406	Pin	1	71293161
407	Setscrew	1	71138093
408	Sleeve	1	23606
409	Pin	1	71149157
410	Valve Body	1	24795
• 411	Gasket	2	23592
412	Pin	**	71146195
• 413	Valve Assembly	**	23594
	'O' Ring (each assembly)	2	
414	Pin, Cotter	1	71287478
• 416	Spring Clip	1	24793
417	Washer	1	50899
418	Capscrew	2	71261747
• 419	Gasket	1	23744
420	Exhaust Poppet	1	23516
421	Plug	1	51897
422	Spring	2	71138028
• 423	Inlet Poppet Assembly	2	24139
• 424	Gasket	1	71264725
425	Fitting, Elbow	‡	71262299
• 426	'O' Ring	2	52662
• 427	'O' Ring	2	51768
428	Poppet Seat	2	23518
429	Retainer Ring	2	53833
• 430	'O' Ring	2	52573
431	Valve Piston	2	23519
432	Retainer Ring	2	71138010
433	Washer	8	71271985
434	Washer	†	53881
435	Plug	‡	71069009
436	Plug	1	71303689
437	Capscrew	4	71138069
438	Valve Cap	1	23520
439	Capscrew	4	71138077
440	Adapter, Standard	1	23514
	Adapter, -E		24373
441	Capscrew	4	71138085
442	Capscrew	4	53890
443	Label, Standard	1	71148290
	Label, -E		96180102
444	Shim	†	71138119
445	Pin	1	71145379
446	Clevis	1	23589
447	Plug	1	25498
• 448	'O' Ring	2	71137962
449	Handle	1	23747
450	Valve Cap	1	23607
• 460	'O' Ring	1	71146963
461	Cross Shaft	1	23746
462	Spring	1	71146948
463	Pin	1	71146955
464	Detent Plate	1	23748
465	Capscrew	3	53807
469	Knob	1	71138051
470	Capscrew	2	71303671
• 471	Seal Washer	2	71303838
479	Shuttle Valve Body	1	23739

• Recommended spare.

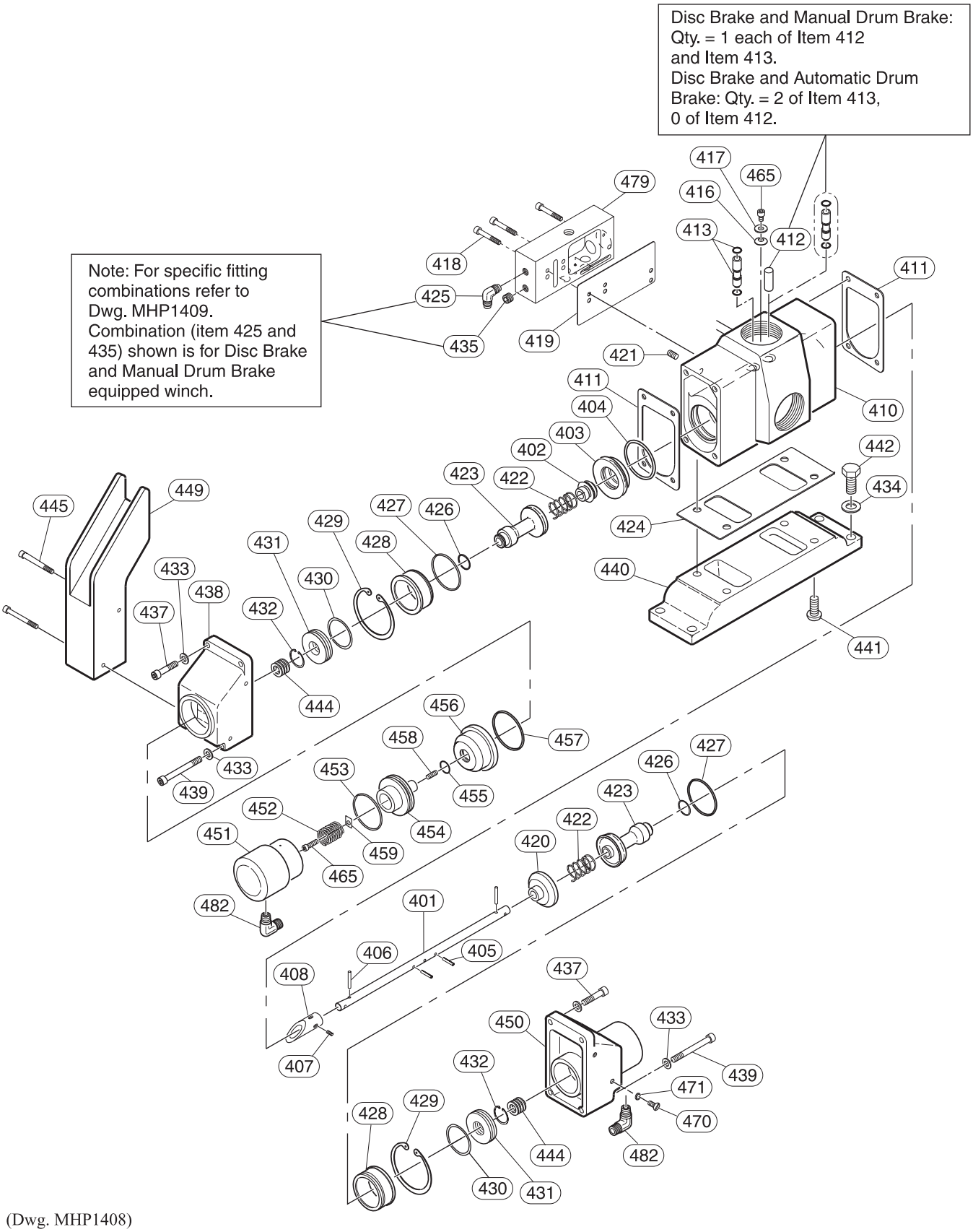
* Valve Assembly (Item 400) consists of Items 401 through 417, 420 through 424, 426 through 434 and 436 through 471.

** Refer to the following to determine Pin (Item 412) and Valve Assembly (Item 413) configuration requirements:
1. Winches with a disc brake and manual drum band brake (Valve Assemblies 24801 or 25451) use quantity of 1 Pin (Item 412) and quantity of 1 Valve Assembly (Item 413).
2. Winches with disc and automatic drum band brakes (Valve Assemblies 24803 or 25442) use quantity of 2 Valve Assemblies (Item 413).

† Quantity of 4 Washers (Item 434) required to mount Adapter (Item 440). Additional Washer (Item 434) and Shim (Item 444) quantities = 'As Required' to establish clearance tolerances described in "MAINTENANCE" section.

‡ Refer to Dwg. MHP1409 to determine Shuttle Valve (Item 479) configuration.

PENDANT OPERATED PILOT CONTROL VALVE ASSEMBLY PARTS DRAWING



(Dwg. MHP1408)

PENDANT OPERATED PILOT CONTROL VALVE ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
400	Valve Assembly: *	1	- - -
	Single Air Brake		25440
	Single Air Brake -E *		25439
	Dual Air Brakes		25441
	Dual air brakes -E *		25468
401	Valve Shaft	1	23522
402	Restrictor, Poppet	1	23523
403	Restrictor, Seat	1	23524
• 404	'O' Ring	1	71137988
405	Pin	2	71293179
406	Pin	2	71293161
407	Setscrew	1	71138093
408	Sleeve	1	23606
410	Valve Body	1	24795
• 411	Gasket	2	23592
412	Pin	**	71146195
• 413	Valve Assembly	**	23594
	'O' Ring (each assembly)	2	
• 416	Spring Clip	1	24793
417	Washer	1	50899
418	Capscrew	3	71261747
• 419	Gasket	1	71303861
420	Exhaust Poppet	1	23516
421	Plug	1	51897
422	Spring	2	71138028
• 423	Inlet Poppet Assembly	2	24139
• 424	Gasket	1	71264725
425	Fitting, Elbow	‡	71262299
• 426	'O' Ring	2	52662
• 427	'O' Ring	2	51768
428	Poppet Seat	2	23518
429	Retainer Ring	2	53833
• 430	'O' Ring	2	52573
431	Valve Piston	2	23519
432	Retainer Ring	2	71138010
433	Washer	8	71271985
434	Washer	4	53881
435	Plug	‡	71069009
437	Capscrew	4	71138069
438	Valve Cap	2	23598
439	Capscrew	4	71138077
440	Adapter, Standard	1	23514
	Adapter, -E		24373
441	Capscrew	4	71138085
442	Capscrew	4	53890
444	Shims	***	71138119
445	Capscrew	2	71261713
449	Pendant Bracket	1	24442
450	Valve Cap Assembly †	2	25505
451	Cylinder	2	23595
452	Spring	2	71053730
• 453	'O' Ring	2	51554
454	Piston	2	23596
• 455	'O' Ring	2	71145650
456	Seal Cup	2	23597
• 457	'O' Ring	2	71138234
458	Setscrew	2	71148779
459	Retainer, Spring	2	24041
465	Capscrew	3	53807
470	Capscrew	2	71303671
• 471	Seal Washer	2	71303838
479	Shuttle Valve Body ‡	1	24146
482	Elbow Fitting	2	71262091

• Recommended spare.

* Valve Assembly, Item 400 consists of items 401 through 417, 420 through 424, 426 through 433, and 437 through 471 and 482.

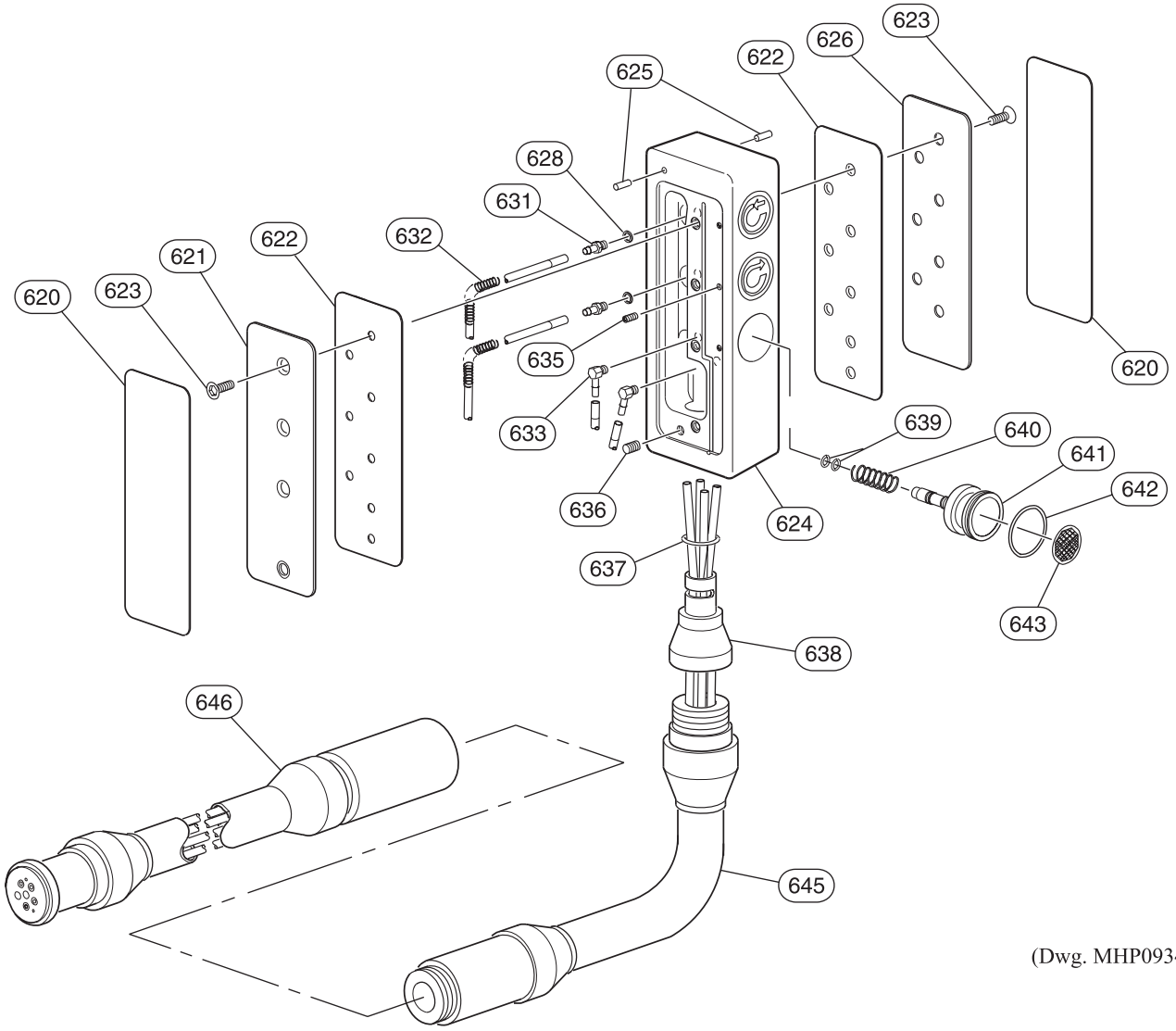
** Refer to the following to determine Pin (Item 412) and Valve Assembly (Item 413) configuration requirements:
1. Winches with a disc brake and manual band brake (Valve Assembly 25439 or 25440) use quantity of 1 Pin (Item 412) and quantity of 1 Valve Assembly (Item 413).
2. Winches with disc and automatic drum band brakes (Valve Assemblies 25441 or 25468) use quantity of 2 Valve Assemblies (Item 413).

*** Shim (Item 444) quantity = 'As Required' to establish clearances described in "MAINTENANCE" section.

‡ Refer to Dwg. MHP1409 to determine Shuttle Valve (Item 479) configuration.

† Valve Cap Assembly (Item 450) includes one each of Items 438, 451 through 459 and 465.

REMOTE PENDANT ASSEMBLY PARTS DRAWING



(Dwg. MHP0934)

REMOTE PENDANT ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
627	Pendant Assembly *	1	24445	635	Setscrew	3	71273122
620	Label	2	71273106	636	Setscrew	1	71274724
621	Cover	1	24447	• 637	'O' Ring	1	52662
• 622	Gasket	2	24444	638	Swivel	1	24433
623	Capscrew	11	71273130	• 639	'O' Ring	6	71126825
624	Body	1	24441	640	Spring (Haul-In and Payout)	2	71271142
625	Pin, Dowel	2	71261341		Spring (Emergency Stop)	1	71261390
626	Cover	1	24443	641	Button	3	24155
• 628	Gasket	2	71044960	• 642	'O' Ring	3	50557
631	Fitting	2	71044937	643	Label	1 Set	71261309
632	Spring	2	71263081	645	Pendant Hose (length - 6 ft)	1	26028
633	Fitting	2	71273114	646	Pendant Extension Assembly **	1	24259-XX

• Recommended spare.

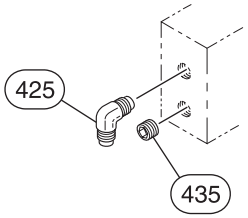
* Pendant Assembly includes items 620 through 645.

** Pendant Extension Assembly (item 646) must be ordered in feet. Example: 15 feet = Part Number 24259-15. Lengths available up to 54 feet. Contact your distributor or the nearest Ingersoll-Rand office for assistance on lengths greater than 54 feet.

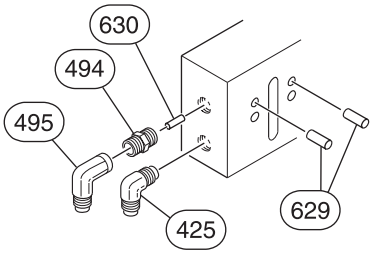
SHUTTLE VALVE ASSEMBLY PARTS DRAWING

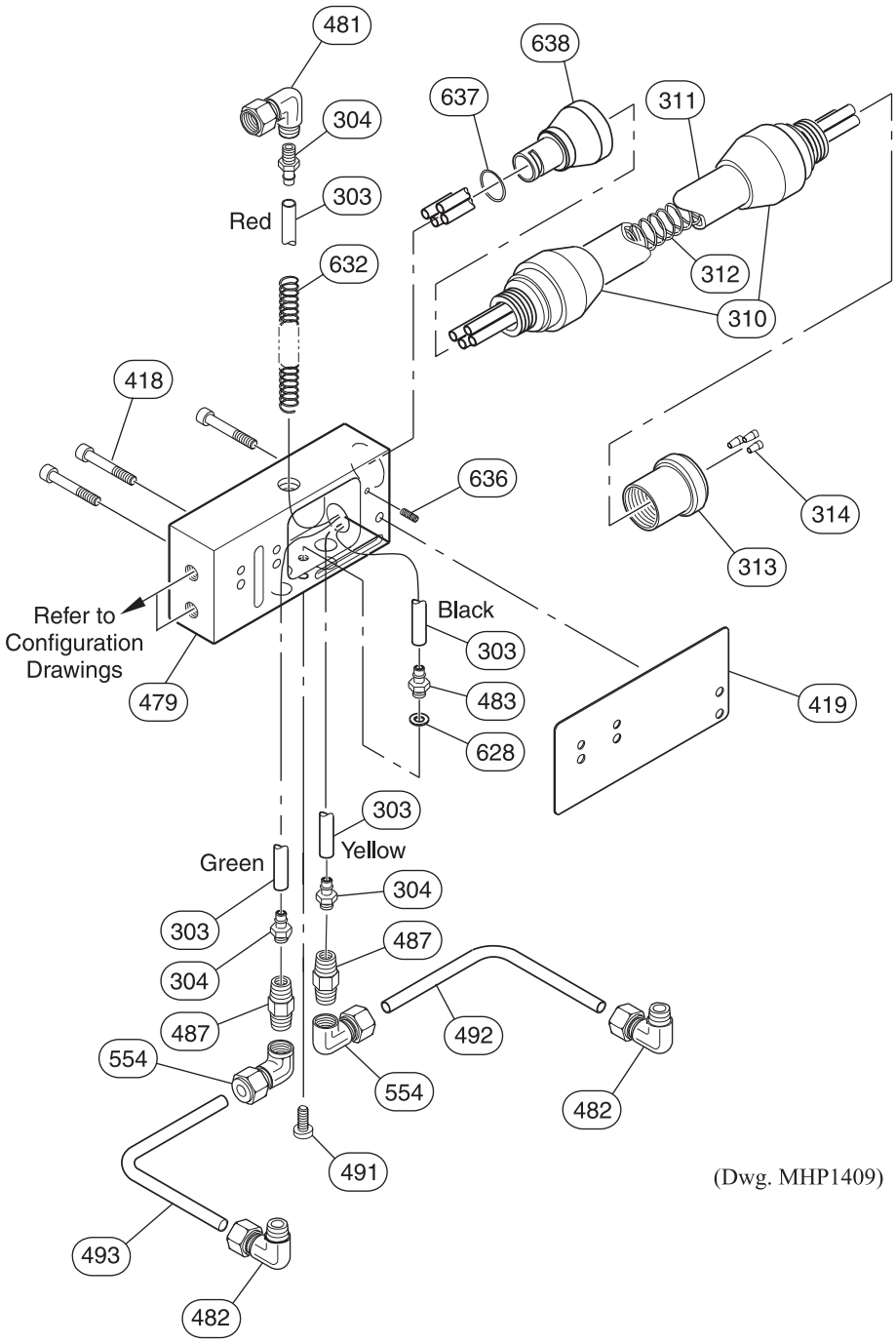
Brake Port Configurations:

Winch with single air actuated disc brake



Winch with single air actuated automatic drum brake, or drum and disc brake





(Dwg. MHP1409)

SHUTTLE VALVE ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
Pendant Operated Pilot Air Valve:							
303	Tubing (Hose) *	As required	71261374	487	Nipple Fitting	2	24242
304	Tubing Fitting	3	71262083	491	Plug	1	71262141
310	Fitting	2	71268536	492	Short Tubing	1	24241-1
311	Hose	1	71261366	493	Long Tubing	1	24241-2
312	Spring	1	71263107	494	Nipple Fitting	**	71262117
313	Coupling	1	24434	495	Elbow Fitting		71267173
314	Ferrule	4	24249	554	Elbow Fitting	2	71262109
418	Capscrew	3	71261747	• 628	Gasket	1	71044960
• 419	Gasket	1	71303861	629	Roll Pin	2	71039374
425	Elbow Fitting	**	71262299	630	Pin	1	71146674
435	Plug		71069009	632	Spring	1	71263081
479	Valve Body, Shuttle	1	24146	636	Setscrew	1	71274724
481	Elbow Fitting	1	24244	• 637	'O' Ring	1	52662
482	Elbow Fitting	2	71262091	638	Swivel	1	24433
483	Tube Fitting	1	71044937				

Lever Operated Air Valve:

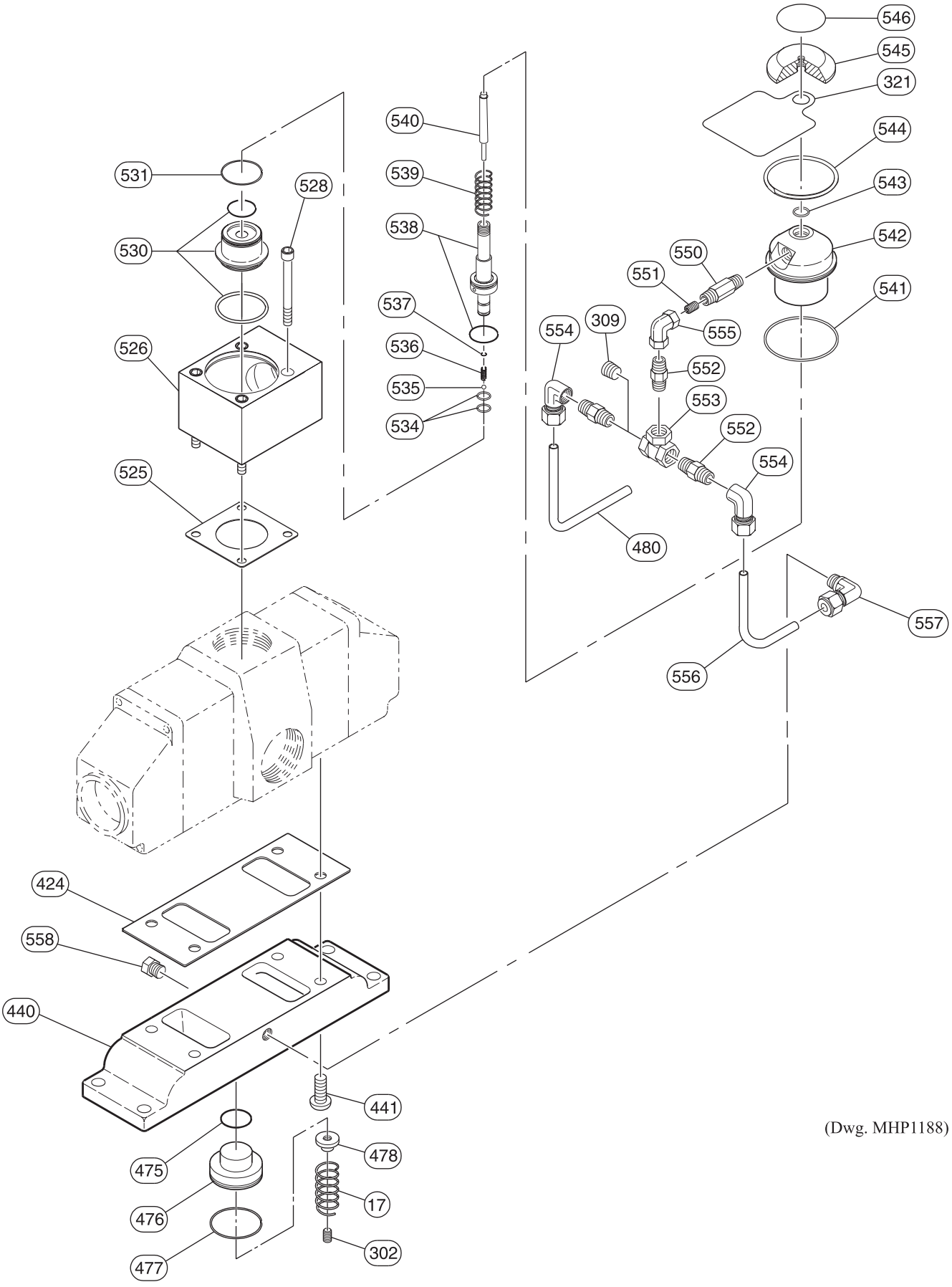
479	Shuttle Valve Body	1	23739	494	Nipple Fitting	**	71262117
418	Capscrew	2	71261747	495	Elbow Fitting		71267173
• 419	Gasket	1	23744	629	Roll Pin	2	71039374
425	Elbow Fitting	**	71262299	630	Pin	1	71146674
435	Plug		71069009				

• Recommended spare.

* Tubing colors noted on Dwg. MHP0764 are for reference only. Originally supplied units are marked with the colors noted to assist in assembly. Replacement tubing does not have color designation. Prior to removal of existing tubing, note the connections at each end to assist in determining correct assembly.

** Item 425: Qty. = 1 on dual (disc and drum) air brake equipped winches; Qty. = 1 on single (disc) air brake equipped winches
Item 435: Qty. = 0 on dual (disc and drum) air brake equipped winches; Qty. = 1 on single (disc) air brake equipped winches.
Items 494 and 495: Qty. = 1 each on dual (disc and drum) air brake equipped winches; Qty. = 0 on single (disc) air brake equipped winches.

EMERGENCY STOP AND OVERLOAD ASSEMBLY PARTS DRAWING



(Dwg. MHP1188)

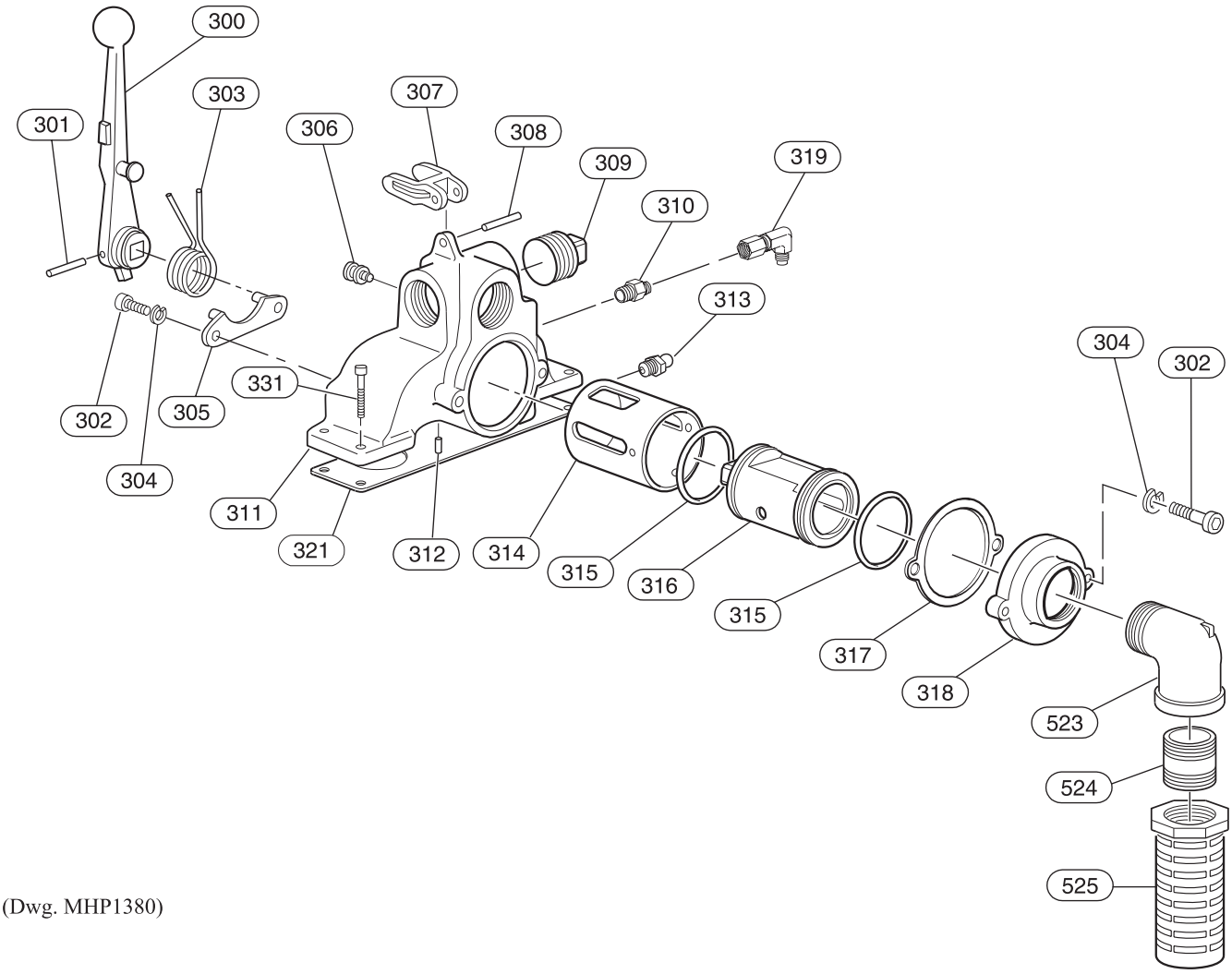
EMERGENCY STOP AND OVERLOAD ASSEMBLY PARTS LIST

ITEM NUMBER	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER		
			Manual Lever with Overload Device	Pendant with Emergency Stop	Pendant with Emergency Stop and Overload Device
17	Spring	1	71053730		
302	Setscrew	1	71266589		
309	Plug	1	23745	- - -	- - -
321	Label, E-Stop Instructions	1	71320279		
• 424	Gasket	1	71264725		
440	Adapter	1	24373	23514	24373
441	Capscrew	4	71138085		
• 475	'O' Ring	1	50557		
476	Piston	1	24372		
• 477	'O' Ring	1	51768		
478	Adjustment Nut	1	24374		
480	E-Stop Tube	1	- - -	24240	24378
524	Emergency Stop Valve Assembly *	1	24252		
• 525	Gasket	1	24204		
526	Body	1	24200		
528	Capscrew	4	71138077		
530	Poppet Assembly	1	25837		
• 531	'O' Ring	1	71137970		
• 534	'O' Ring	2	50846		
535	Ball	1	71126833		
536	Spring	1	71263875		
• 537	'O' Ring	1	71126825		
538	Poppet Rod Assembly	1	25838		
539	Spring	1	71261945		
540	Rod, Emergency Stop	1	24255		
• 541	'O' Ring	1	71303978		
542	Poppet Guide	1	24256		
• 543	'O' Ring	1	71137962		
544	Retainer Ring	1	71157507		
545	Palm Valve, Knob	1	24257		
546	Label	1	71266688		
550	Fitting	1	24243		
551	Setscrew, Orifice	1	24245		
552	Fitting	( )	71266522 (2)	- - -	71266522 (3)
553	Valve, Shuttle	1	71266514	- - -	71266514
554	Fitting, Elbow	( )	71262109 (1)	- - -	71262109 (2)
555	Fitting, Elbow	( )	71266530 (1)	71272109 (1)	71266530 (2)
556	Overload Tubing	1	24379	- - -	24379
557	Fitting, Elbow	1	71262091	- - -	71262091
558	Plug	1	24439	- - -	24439

• Recommended spare.

* Valve Assembly includes items 525 through 546.

CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP1380)

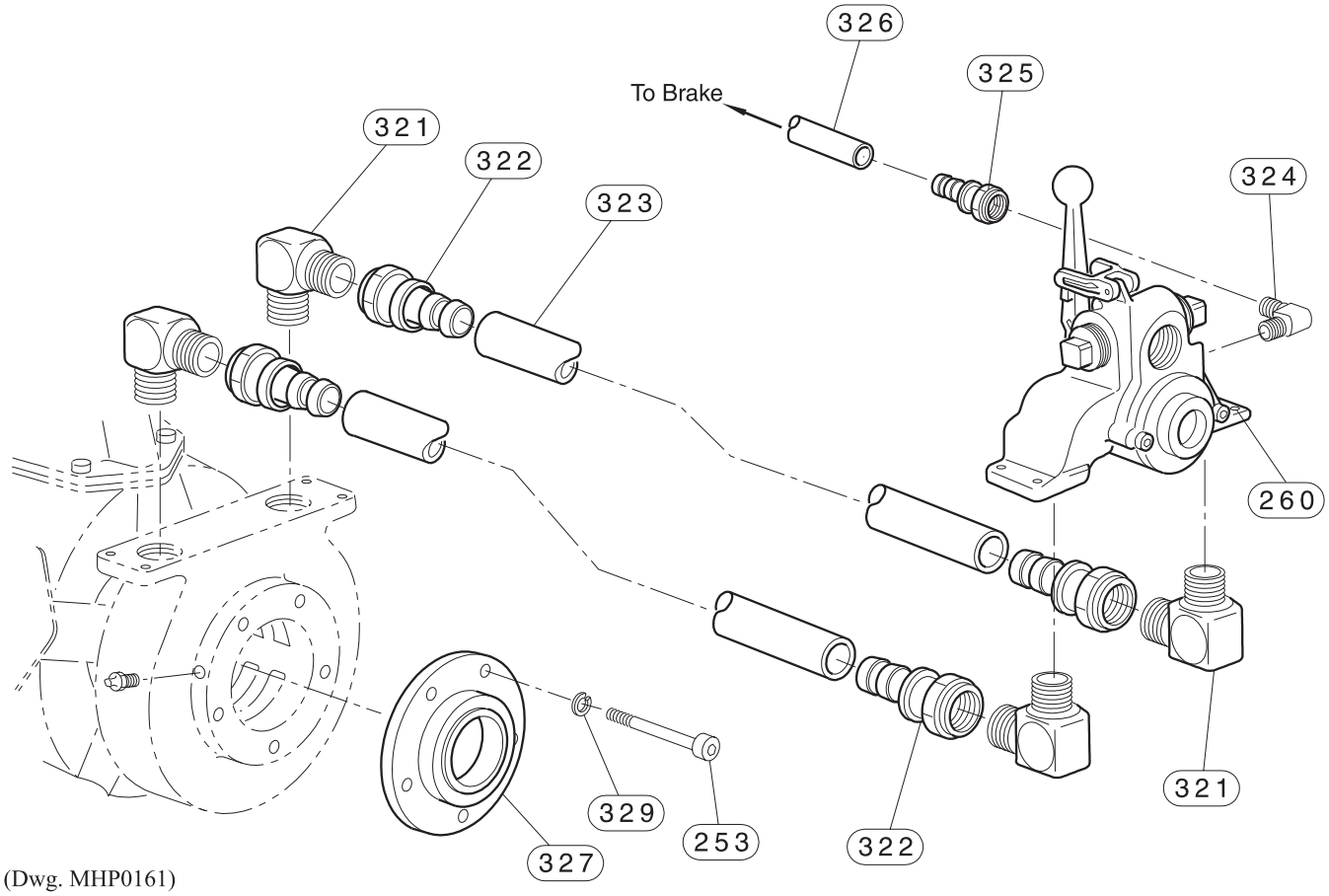
ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
260	Valve Assembly *	1	K5B-REMOTEP
300	Handle	1	K5B-556P
301	Roll Pin	1	K5B-1115
302	Capscrew	4	71292064
• 303	Spring	1	K5B-412
304	Lockwasher	2	51581
305	Valve Body Retainer	1	K5B-1110AP
306	Spring Retaining Stud	1	K5B-553
307	Latch	1	K5B-869AP
308	Roll Pin	1	HLK-20
309	Pipe Plug	2	71263297
310	Fitting, Bushing	1	51814
311	Valve Housing **	1	K5B-1101P
•	Recommended spare.		

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
312	Roll Pin	1	71326102
313	Grease Fitting	1	53095
314	Valve Bushing **	1	K5B-1101P
• 315	Seal Ring	2	K5B-606
316	Valve Body	1	K5B-944
317	Gasket	1	K5B-275
318	Flange	1	KK5B-276SP
319	Fitting, Elbow Swivel	1	71328561
• 321	Gasket	1	K5B-547
331	Capscrew	4	71325039
523	Fitting, Elbow	1	71273676
524	Fitting, Nipple	1	71057483
525	Muffler	1	52465

* Valve Assembly (260) includes items 300-309 and 311-318.

** Valve housing (311) and Valve Bushing (314) are matched set. Replace both at same time.

REMOTE FULL FLOW CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

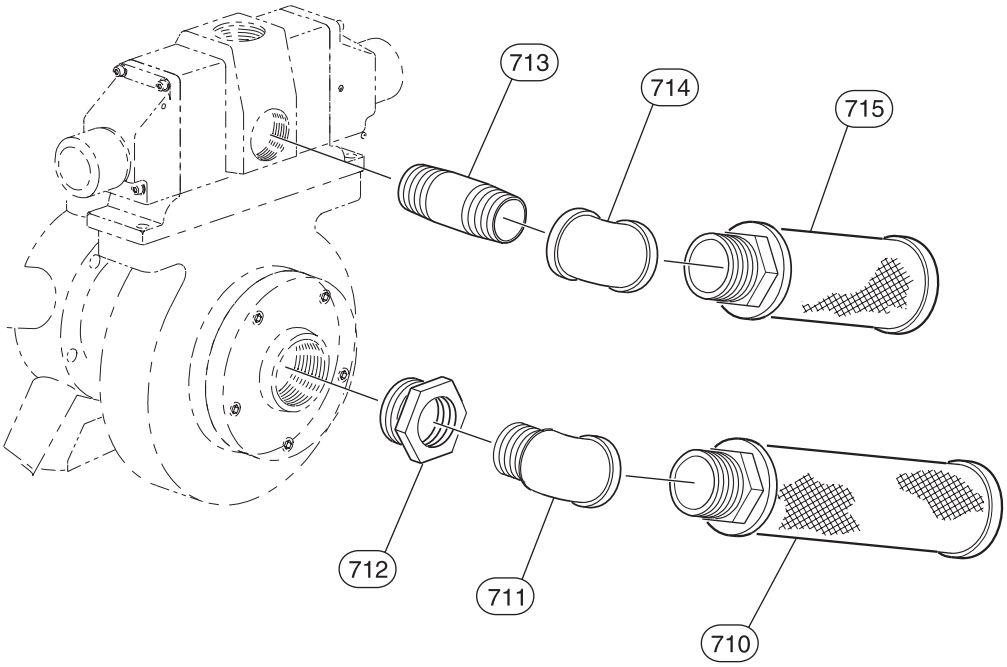


(Dwg. MHP0161)

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
260	Control Valve Assembly	1	K5B-REMOTE
253	Capscrew	5	119A2A267
321	Elbow Fitting	4	71015457
322	Hose End	4	54738
323	Hose	2	54737-*
324	Elbow Fitting	1	52182
325	Hose End	2	51029
326	Hose	1	50923-*
327	Exhaust Cover	1	251P2559A
329	Lockwasher	5	50181

* Add hose length (feet/metres). Maximum length = 20 feet (6 metres). Contact Ingersoll-Rand for information on control suitability for lengths greater than 20 feet (6 metres). Metres are for reference only; order quantities in feet.

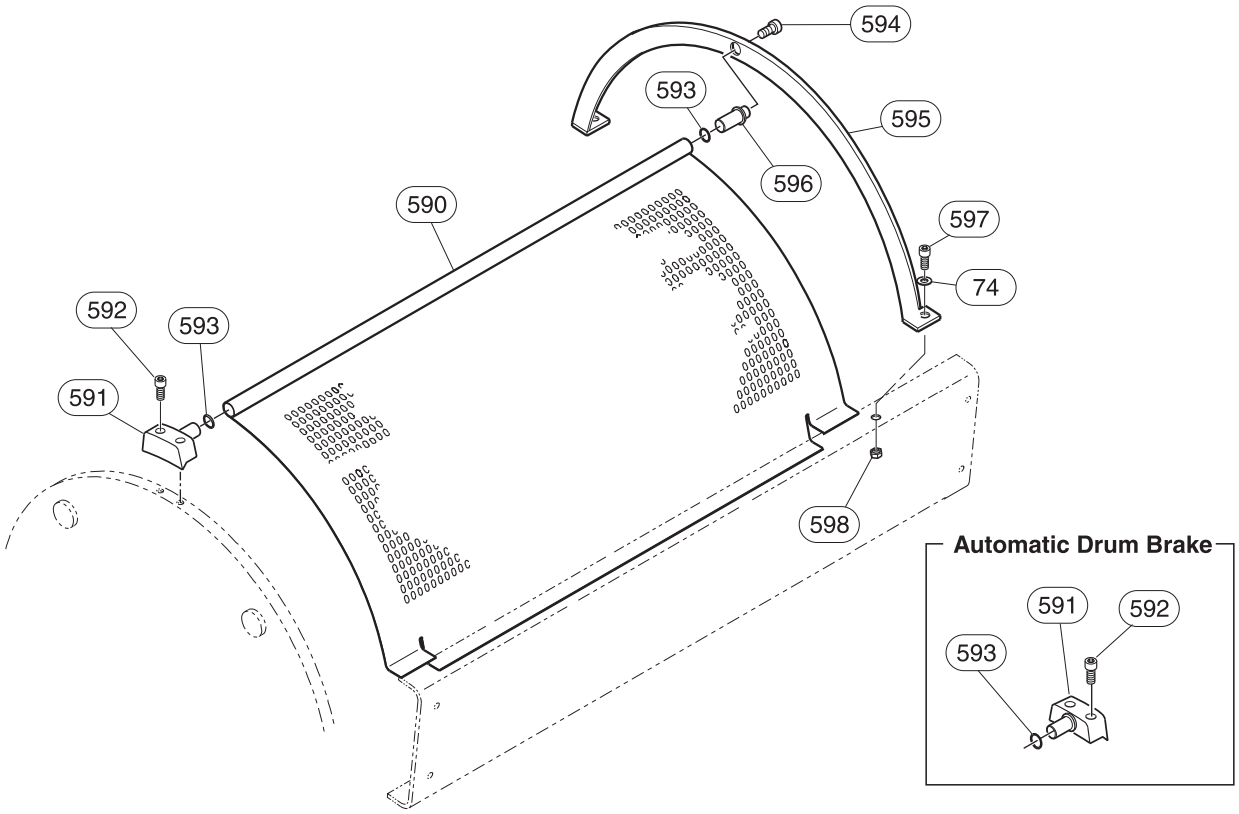
MUFFLER ASSEMBLY PARTS DRAWING AND PARTS LIST



(Dwg. MHP1189)

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	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

DRUM GUARD ASSEMBLY PARTS DRAWING AND PARTS LIST



(Dwg. MHP1450)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	
			Manual Band Brake	Automatic Band Brake
74	Washer	2	71274807	- - -
590	Drum Guard - Short Drum (12 in)	1	23836-1P	23836
	Drum Guard - Long Drum (24 in)		23506-1P	23506
591	Bracket	See ( )	23608 (1)	23608 (2)
592	Capscrew	See ( )	71261739 (2)	71261739 (4)
593	Washer	As required	71296800	
594	Capscrew	1	71306443	- - -
595	Bracket	1	26367	- - -
596	Pin	1	26376	- - -
597	Capscrew	2	71306435	- - -
598	Nut	2	71335616	- - -

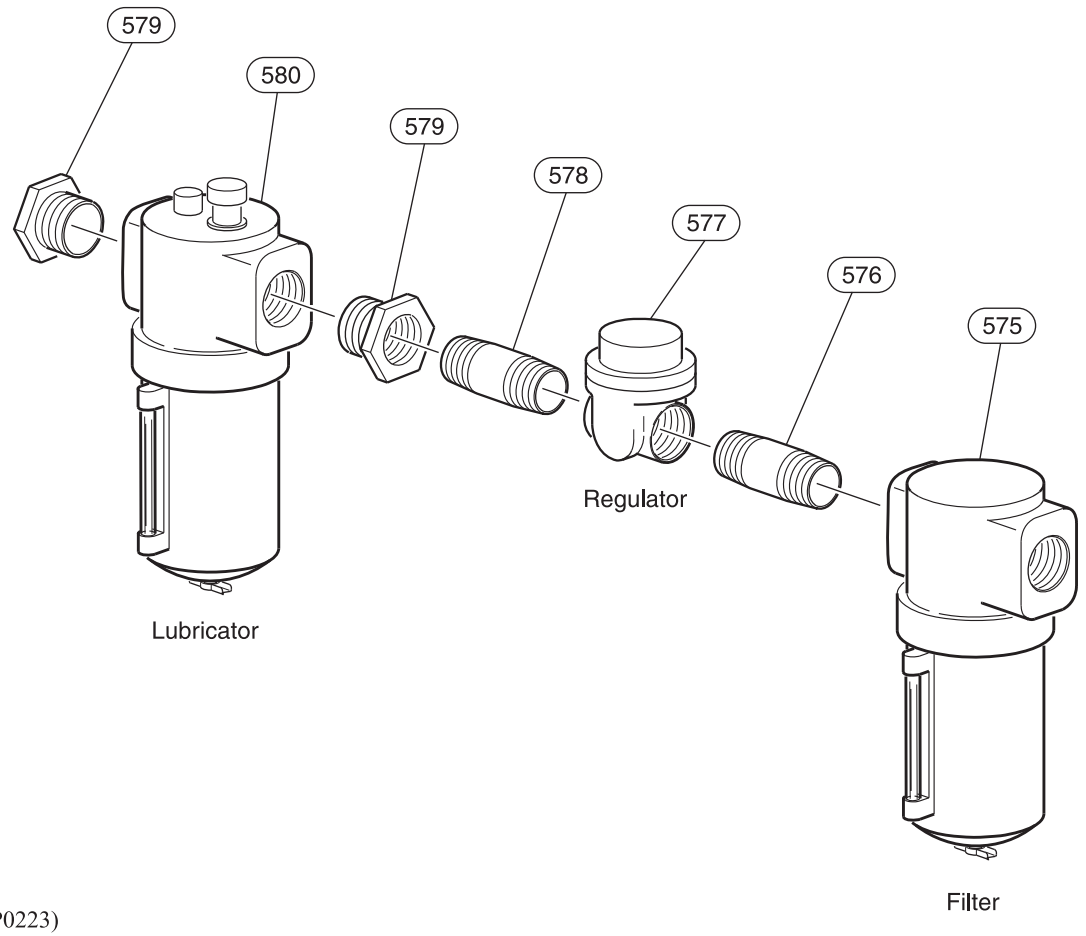
Drum Guard Assemblies on Winches with Manual Drum Band Brake (includes Items 74 and 590 through 598)

Manual Band Brake Short Drum (12 inch)	1	26392	- - -
Manual Band Brake Long Drum (24 inch)		26393	- - -

Drum Guard Assemblies on Winches with Automatic Drum Band Brake (includes Items 590-593)

Automatic Band Brake Short Drum (12 inch)	1	- - -	23835
Automatic Band Brake Long Drum (24 inch)		- - -	23507

AIR PREPARATION ASSEMBLY PARTS DRAWING AND PARTS LIST



(Dwg. MHP0223)

ITEM NUMBER	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
575	Filter	1	F42-0B-000
576	Pipe Nipple	1	51670
577	Regulator	1	R30-0B-G00
578	Pipe Nipple	3	51704
579	Pipe Bushing	2	Contact factory
580	Lubricator	1	L40-0B-G00

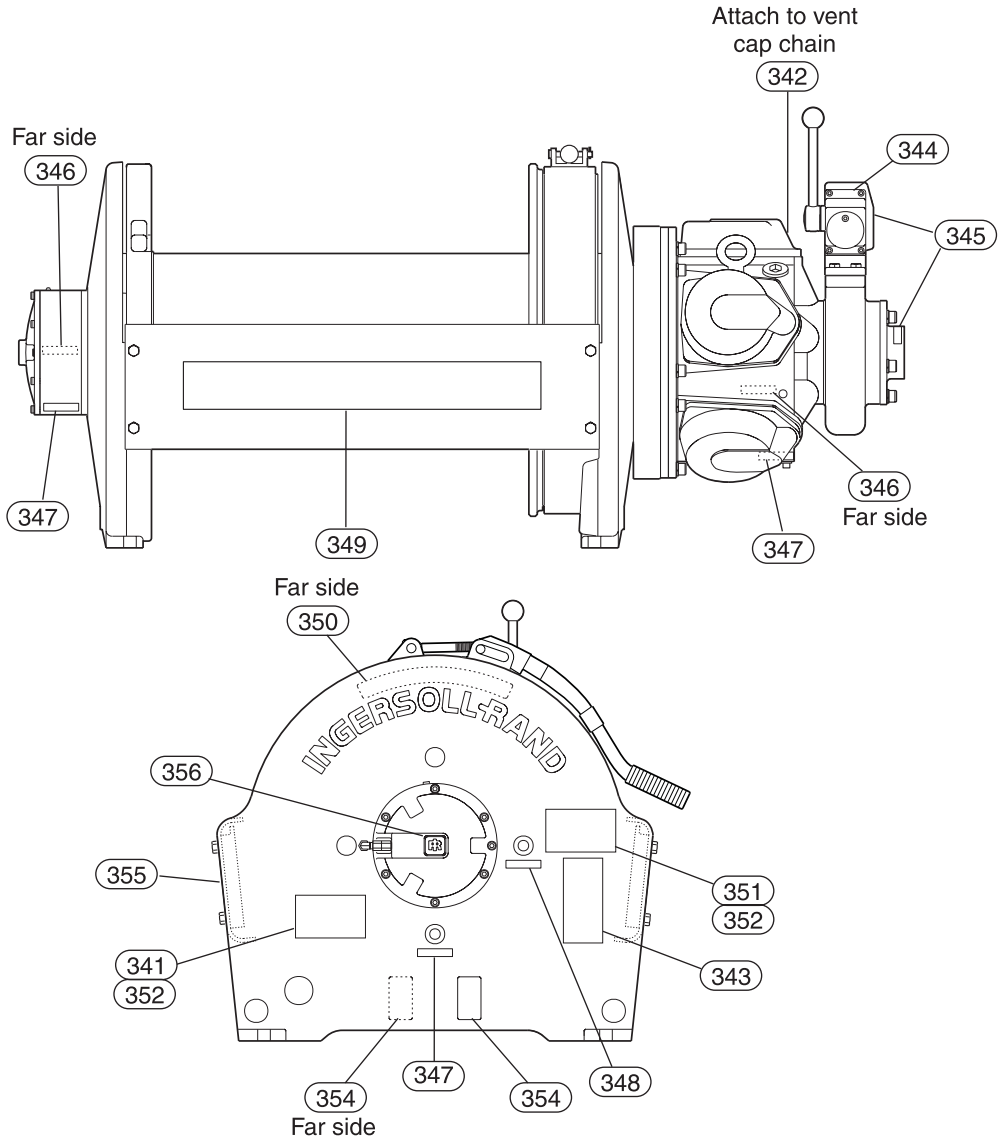
* Air preparation components for 1-1/2 inch NPT system. Items 578 and 579 depend on required size for customer application.

ACCESSORIES AND KITS

DESCRIPTION OF ACCESSORY	QTY TOTAL	PART NUMBER	DESCRIPTION OF ACCESSORY	QTY TOTAL	PART NUMBER
Thermoplastic Powder	2 ounce	71308902	Yellow Touch-Up Paint	1 can	FAP-237Y
Propane Torch	1 each	71308886	Lubricant	16 fl. oz.	LUBRI-LINK-GREEN
Heat Gun	1 each	71308894	Infra-red Thermometer	1	71308878

DESCRIPTION OF KIT	QTY TOTAL	PART NUMBER	DESCRIPTION OF KIT	QTY TOTAL	PART NUMBER
Adapter Rail Kit for FA5A Short Drum to K6U Foot Print	1	24333	Adapter Rail Kit for FA5A Long Drum to K6U Foot Print	1	24332

WINCH LABEL/TAG LOCATION AND PART NUMBER REFERENCE DRAWING



(Dwg. MHP1460)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
341	ManRider Label	1	71108856	350	Drum Direction Label	1	71126585
342	Check Oil Level Notice	1	71107148	351	Nameplate	1	71108849
343	Warning Label	1	71124887	352	Drive Screws	8	50915
344	Air Supply Label	1 sheet	71295240	354	Do Not Weld Label	2	71270813
345	Exhaust Label			355	IR Logo Label - 12 inch Drum	1	71106272
346	Oil Level Label						
347	Oil Drain Label				IR Logo Label - 24 inch Drum		71109102
348	Oil Fill Label						
349	Product Label - 12 inch	1	71111785	356	IR Monogram Label	1	71137780
	Product Label - 24 inch		71116438				

SERVICE NOTES

SERVICE NOTES

PARTS ORDERING INFORMATION

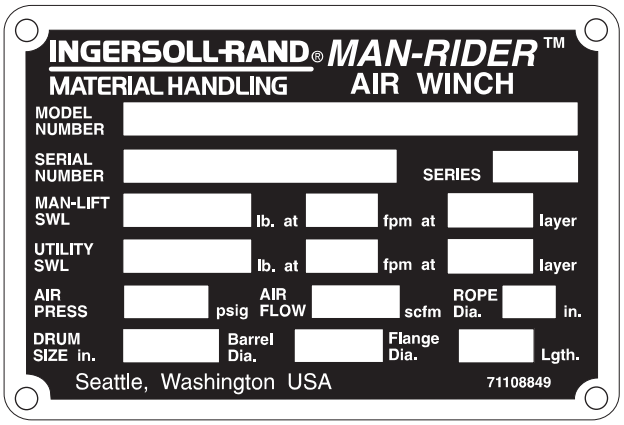
The use of other than **Ingersoll-Rand** Material Handling replacement parts may adversely affect the safe operation and performance of this product.
For your convenience and future reference it is recommended that the following information be recorded.

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. Nameplate may be shown smaller than actual size.

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.

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

Return Goods Policy

Ingersoll-Rand will not accept any returned goods for warranty or service work unless prior arrangements have been made and written authorization has been provided from the location where the goods were purchased.
Winches 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 Material Handling
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046 USA
Phone: (206) 624-0466
Fax: (206) 624-6265

or

Ingersoll-Rand Material Handling
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

HOIST AND WINCH 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, Order Status and Technical Support

Ingersoll-Rand
Material Handling
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046
Phone: (206) 624-0466
Fax: (206) 624-6265
Web Site: www.irhoist.com

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

Regional Sales Offices

Chicago
888 Industrial Drive
Elmhurst, IL 60126
Phone: (630) 530-3800
Fax: (630) 530-3891

Detroit, MI
23192 Commerce Drive
Farmington Hills, MI 48335
Phone: (248) 476-6677
Fax: (248) 476-6670

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

Los Angeles, CA
11909 E. Telegraph Road
Santa Fe Springs, CA 90670
Phone: (562) 948-4189
Fax: (562) 948-1828

Philadelphia, PA
P.O. Box 425
900 E. 8th Ave., Suite 103
King of Prussia, PA 19406
Phone: (610) 337-5930
Fax: (610) 337-5912

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:

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

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) 213-4605

Regional Sales Offices

Calgary, Alberta
44 Harley Road S.E.
Calgary, Alberta
T2V 3K3
Phone: (403) 252-4180
Fax: (403) 252-4462

Edmonton, Alberta
1430 Weber Center
5555 Calgary Trail N.W.
Edmonton, Alberta
T6H 5G8
Phone: (403) 438-5039
Fax: (403) 437-3145

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

British Columbia
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Richmond, B. C.
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Material Handling
Douai Operations
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Fax: (33) 3-27-93-08-00

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2-3-12 Shin-Yokohama,
Kouhoku-Ku, Yokohama-shi,
Kanagawa Pref. 222 Japan
Phone: 81-45-476-7800
Fax: 81-45-476-7806

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Ingersoll-Rand Company
Kuznetsky Most 21/5
Moscow 103895 Russia
Phone: 7-501-921-53-21
7-501-923-91-34
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