

IMPORTANT INFORMATION:

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

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

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

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

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

Winch Man Rider™ Supplements:

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

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

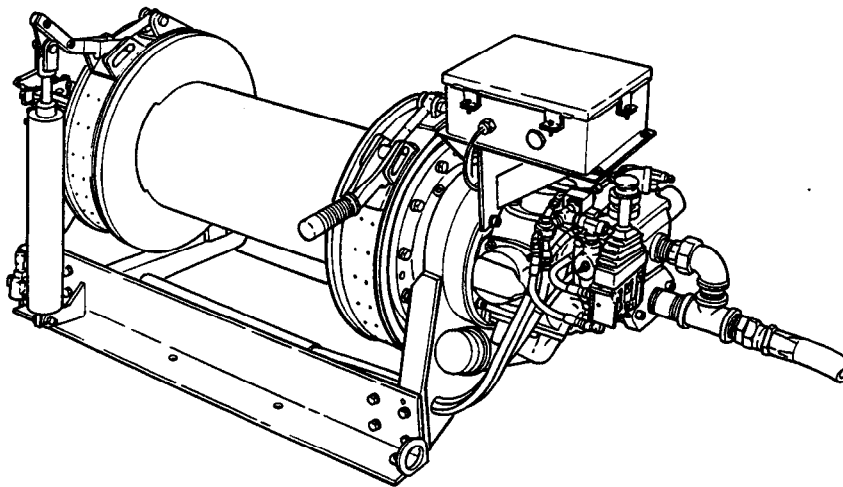
- We strongly recommend that ALL maintenance on **Ingersoll-Rand** equipment be carried out by personnel certified by **Ingersoll-Rand**, or by **Ingersoll-Rand** Authorized Service Centers.
- Contact the Factory if in doubt about installation, operation, inspection and maintenance instructions.
- Use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

PARTS, INSTALLATION AND OPERATION MANUAL

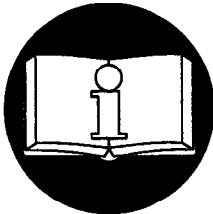
force **5**TM **AIR WINCHES**

MODEL

FA2MRA MANRIDER* WINCH



* 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.



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.

⚠ WARNING

The winch is only part of the Personnel Lifting System. For information defining the Personnel Lifting System requirements read ANSI A10.22 and all associated manufacturers' component literature. A copy of ANSI A10.22-1990 is provided with this product.

Always operate, inspect and maintain this winch in accordance with American National Standards Institute Safety Codes (ANSI A10.22 and ASME B30.7) and all other applicable local, state and federal safety codes and regulations.

Form MHD56082

Edition 4

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INGERSOLL-RAND®
MATERIAL HANDLING

SAFETY INFORMATION

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

Danger, Warning, Caution and Notice

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

- This winch was designed to meet ANSI A10.22-1990 which limits its use as part of a system for personnel lifting. There are other components required to complete the system. It is the users responsibility to supply all other components necessary to properly complete the lifting system in accordance with the regulations that pertain to the lifting application.
- It is the owner's and user's responsibility to check and to conform to 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 for personnel movement.
- 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 Man-Rider® winches are designed and manufactured to meet or exceed standards and specifications established for base mounted drum hoists as defined by ASME B30.7 and for the purpose of personnel handling as defined by ANSI A10.22 - 1990.

In furnishing customers Man-Rider® winches, Ingersoll-Rand does not warrant the suitability of these winches for any particular use. It is the owner's and user's responsibility to determine the suitability of this winch for a particular application.

Ingersoll-Rand Man-Rider® winches manufactured to ANSI A10.22 standards are designed as a component in the Personnel Lifting System. Ingersoll-Rand approval for use of this winch in Man-Rider® applications automatically terminates for any of the following reasons:

1. Winch is not installed in an approved personnel lifting system.
2. Winch is not properly maintained in a safe working condition, with all parts intact and properly adjusted.
3. Winch is used in applications not approved by codes and regulations, or application is inconsistent with manufacturer's operation and maintenance manual.
4. More than one winch is used to attach to a common load.
5. Winch design or functions are altered or changed in any manner from the purchased original without prior approval by Ingersoll-Rand.

This manual has been produced by Ingersoll-Rand to provide company personnel, dealers, mechanics and operators with the information required to install, operate, and maintain 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 common mechanics' 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 can not know of, nor 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 winch in a safe condition and contact supervisors and/or the factory for technical assistance.

WINCH SAFE OPERATING INSTRUCTIONS

The following warnings and operating instructions have been adapted in part from American National (Safety) Standards ASME B30.7 and ANSI A10.22, 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 a 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.

WARNING

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

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. Winch operator must be in vocal contact with personnel being lifted (lowered) from transfer point to landing area.
2. Personnel supervising, operating the winch and personnel being transferred are to be instructed in system operation and safety prior to personnel lifting. Only operate a winch if you are physically fit to do so.
3. Use of a winch to transport personnel (lifting and/or lowering) should only take place when other means of accomplishing this work are not practical.
4. When a "DO NOT OPERATE" sign is placed on the winch, or winch controls, do not operate the winch until the sign has been removed by designated personnel.
5. Never lift a load greater than the rated capacity of the winch. Refer to "SPECIFICATIONS" section for applicable utility and ManRider® capacity ratings.
6. Prior to use, inspect and test the personnel lifting system to the requirements of ANSI A10.22 Section 13 (Inspection and Tests). The winch operator shall be instructed in the operation of this winch and the personnel lifting system per ANSI A10.22 Section 5 (Operation of Hoist).
Winch only: Refer to 'Testing' procedures in the "WINCH INSPECTION" section of this manual for winch information.
7. Installation of the winch must be specially arranged and approved for personnel handling as a component in a Personal Handling System as described and defined in ANSI A10.22. Refer to the "INSTALLATION" section. All bolts and foundations for winch attachment must have a higher load carrying capacity rating than the maximum capacity of the winch.
8. Do not operate a damaged winch.
9. Do not operate a winch that has not been properly maintained or equipped.
10. Do not operate winch with any personnel near the line of force or capable of coming into contact with moving parts.
11. Labels and warning notices must remain permanently posted, and be clearly visible on the winch.
12. Ease the slack out of the wire rope when starting a lift. Do not jerk the load.
13. Never leave a suspended load unattended.
14. Wire rope must spool off drum from the top away from the operator (overwind). The direction of lift is counterclockwise when viewed from the motor end of the winch.
15. Make sure the wire rope is properly anchored to the winch drum. Always maintain a minimum of four tight wraps of wire rope on the drum.
16. Pay attention to the load at all times when operating the winch.
17. Never use the winch wire rope as a sling.
18. Do not leave a load suspended when winch is not in use.
19. Ensure muffler is positioned at the point furthest away from winch operator.
20. Do not use limit switch settings to regulate the winch stopping points. Limit switches are designed as a backup to operator accidental over travel only.
21. Ensure the end of the wire rope is weighted to prevent line run.

WINCH WARNING LABELS

Each unit is shipped from the factory with the warning label shown. If the label is not attached to your unit, order a new label and install. See the parts list for the part number. Label is shown smaller than actual size.



WINCH SPECIFICATIONS

General Specifications		Model			
		FA2-Utility Ratings		FA2-ManRider® Ratings	
Air System	Rated Operating Pressure	90 psig (6.2 bar)			
	Consumption Volume (at rated pressure)	335 scfm	10 cu.m/min	335 scfm	10 cu.m/min
Performance (at rated pressure / volume)	Rated Full Drum Line Pull *	3,500 lbs	1,558 kgs	2,200 lbs	1,000 kgs
	Line Speed - 3rd Layer	65 fpm	20 m/min	75 fpm	23 m/min
	Max Stall Pull - 1st Layer	9,000 lbs	4,082 kgs	9,000 lbs	4,082 kgs
	FA2MRA Net Weight	720 lbs	327 kgs	720 lbs	327 kgs
Air Motor Pipe Inlet Size		1 inch	25 mm	1 inch	25 mm
Minimum Air System Hose Size		1-1/4 inch	32 mm	1-1/4 inch	32 mm
Drum Wire Rope Storage Capacity ** (feet / metres)	Drum Length (inches)	Wire Rope Diameter			
		7/16 inch	11 mm	7/16 inch	11 mm
	24	1,362 ft	415 m	808 ft	246 m

* FA2 Utility rating of 3,500 lbs. (1,558 kg) is based on requirements of ASME B30.7 (5:1 design factor with 7/16 inch (11 mm) wire rope.)

FA2 Manrider® rating of 2,200 lbs. (1,000 kg) is based on requirements of ANSI A10.22 (8:1 design factor with 7/16 inch (11 mm) wire rope.)

** FA2 ManRider® wire rope storage is based on a winch with a 19 inch (483 mm) diameter drum flange and on ANSI A10.22 standards which require the top layer to be at least 2 inches (51 mm) below the drum flange diameter. FA2 Utility wire rope storage is based on a winch with a 19 inch (483 mm) diameter drum flange and on ASME/ANSI B30.7 standards which require the top layer to be at least 1/2 inch (13 mm) below the drum flange diameter. Capacities shown may vary from those published elsewhere.

Model Code Explanation:

Example: FA2MRA24MA1G

FA2 MRA 24 M A 1 G

Series (Capacity):

Model FA2 Personnel Lifting - 1.0 metric tons / 2,200 lbs.
Utility Lifting - 1.6 metric tons / 3500 lbs.

Designation:

* MRA = Man Rider® ANSI A10.22-1990

Drum Length (Distance between drum flanges):

- 8 = 8 inch (203 mm)
- 12 = 12 inch (305 mm)
- 16 = 16 inch (406 mm)
- 24 = 24 inch (610 mm) [Standard]
- 30 = 30 inch (762 mm)

Brake:

- M = Manual Drum Brake [Standard]
- A = Automatic Drum Brake [Standard]
- K = Automatic Disc Brake

Control:

- 1 = Winch mounted lever throttle (Standard)
- 2XX = Remote full flow lever throttle (XX = Specify hose length (feet). Max 20 ft. (6 metres)) **
- 3XX = Remote pilot pendant throttle (XX = Specify hose length (feet). Max 50 ft. (15 metres)) **
- 4XX = Remote pilot lever throttle. (XX = Specify hose length (feet). Max 50 ft. (15 metres)) **

Options:

- Z = Sand blast and Carbozinc primer only
- P = Marine 812 top coat
- G = Drum Guard
- 7 = Drum Grooving (Number = wire rope size in sixteenths, e.g. 7/16 inch)

- * Standard Features:
 - (1) Line Speed Monitor.
 - (2) Adjustable upper and lower rotary limit switches.
 - (3) Piped away exhaust with muffler and 10 feet (3 meters) of exhaust hose.
 - (4) Copy of Operation and Maintenance Manual and ANSI A10.22 Standard supplied in container attached to winch.
 - (5) Dual brakes (manual and automatic drum band brakes).
 - (6) Winch mounted automatic return, pilot air valve throttle lever.

** Remote throttles are provided with 10 feet (3 metres) of hose. Specify hose lengths greater than 10 feet. For lengths greater than 20 ft. (6 metres) with the Remote Full Flow Throttle, or 50 ft. (15 metres) with the Remote Pilot Lever and Remote Pilot Pendant Throttles contact Technical Sales for control acceptability. Metric lengths for reference only, order hose lengths in feet.

Note: FA2MRA winches are shipped with a muffler, 10 feet (3 m) of exhaust hose and the necessary assembly attachments to install the muffler at a distance far enough away from the operator to ensure noise level exposure of less than 90 dBA over an eight hour period (Time Weighted Average (TWA)). The recommended distance is based on noise levels recorded during factory testing. Refer to the "INSTALLATION" section for additional information.

WINCH INSTALLATION

Prior to installing the winch, carefully inspect it for possible shipping damage. Winches are supplied fully lubricated from the factory. Before operation check oil levels and adjust as necessary. Use the proper type of oil as recommended in the "LUBRICATION" section.

⚠ CAUTION

• Owners and users are advised to examine specific, local or other regulations, including ANSI A10.22, ASME B30.7 and/or OSHA Regulations which may apply to a particular type of use of this product before installing or putting winch to use.

Mounting

Care must be taken when moving, positioning or mounting the winch. In most cases, lifting lugs have been provided to assist in handling the winch. If the lug locations are improper for your specific installation, great care should be taken to ensure that the winch, when lifted, will be properly balanced. Determine the weight of your 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.

⚠ CAUTION

• Care must be taken when lifting the winch. Determine winch center of gravity and arrange lifting straps to raise the winch evenly.

• If the winch is mounted to a portable foundation, always attach the lifting straps or cables to the foundation structure when lifting and supporting the winch assembly.

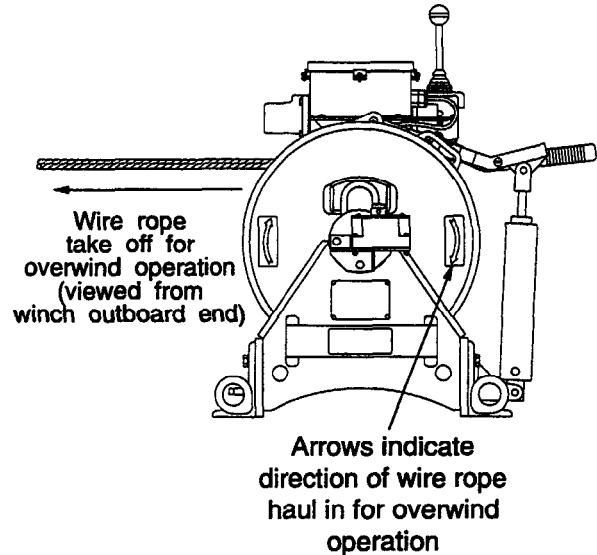
⚠ WARNING

• Install the wire rope to come off the drum for overwind operation ONLY. Failure to correctly spool the wire rope will result in falling load, which can cause severe injury, death and property damage. Refer to Dwg. MHTPA0661.

1. Ensure the winch is positioned in a manner that allows for proper spooling of the wire rope onto the drum. When installed correctly, the direction of lift is counterclockwise as viewed from the motor end of the winch (clockwise from outboard end of winch). Refer to Dwg. MHTPA0661.
2. 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.

3. 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.
 - a. Make sure the mounting surface is flat to within 1/16 inch (2.0 mm). Shim if necessary.

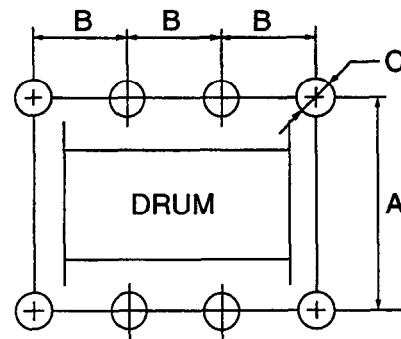
FA MRA Series Winch Wire Rope Take Off Diagram (Overwind Operation Only)



(Dwg. MHTPA0661)

4. Recommended mounting bolts: 5/8 inch (16 mm) Grade 8 or better. Use self-locking nuts or nuts with lockwashers. Refer to Dwg. MHTPA0133 and Table 1 for mounting dimension information. To determine clamping load tensile and shear strength requirements refer to Dwg. MHTPA0606 and Table 2.

Winch Bolt Hole Mounting Dimensions



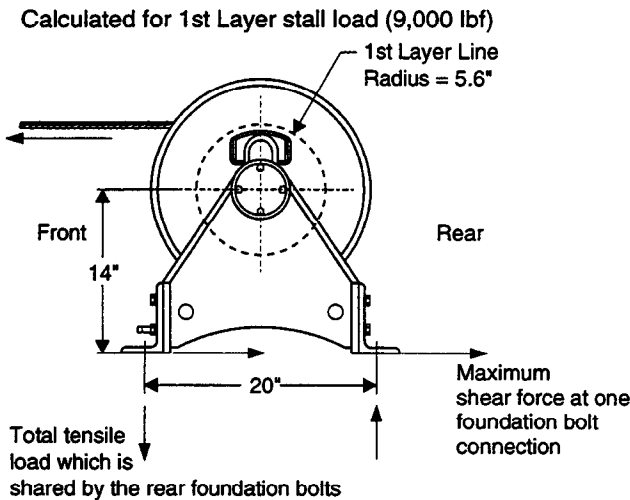
(Dwg. MHTPA0133)

Table 1

Bolt Hole Dimensions

Dimension		Drum Length (inches)	
		24	
"A"	in.	20	
	mm	508	
"B"	in.	11.5	
	mm	292	
"C"	in.	0.6875	
	mm	17.5	

FA Series Winch Foundation Bolt Forces



(Dwg. MHTPA0606)

Table 2

Winch Foundation Bolt Forces

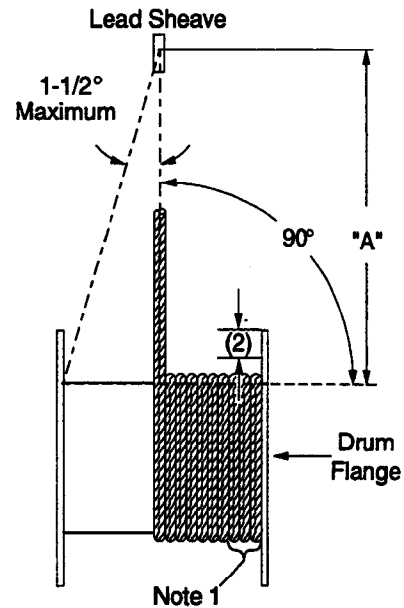
Force Acting on Bolt		Drum Length (inches)	
		24	
Maximum Shear Force at One Foundation Bolt Connection	lbf	2,050	
	N	9,188	
Maximum Tensile Force Shared by Rear Foundation Bolts	lbf	10,270	
	N	46,032	

- If 5/8 inch (16 mm) Grade 8 mounting bolts are used, tighten evenly and torque to 220 ft. lbs. (298 Nm) for dry thread fasteners. If the fasteners are plated, lubricated or a thread locking compound is used, torque to 170 ft. lbs. (230 Nm).
- Maintain a fleet angle between the 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 of drum length, be at least 1.6 feet (0.5 metre) from the drum. Refer to Dwg. MHTPA0487.
- Do not weld to any part of the winch.

Wire Rope



- Do not use wire rope which is less than 7/16 inch (11 mm) minimum nominal diameter.
- Maintain at least 4 tight wraps of wire rope on the drum at all times. Ensure wire rope top layer is a minimum of 2 inches (50 mm) below drum flange edge. Refer to Dwg. MHTPA0498.
- To prevent wire rope "line run" ensure a weight greater than the total weight of the longest 'wire rope pay out to sheave' length is attached to the end of the wire rope.



Notes:

- Maintain a minimum of 3 tight wraps of wire rope on drum; 4 wraps required on MRA units.
- 0.5 inch (13 mm) minimum allowed distance from top wire rope layer to flange edge; 2 inch (51mm) minimum on MRA units.
- "A" = 1.6 feet (0.5 metre) per inch of drum length; eg., for 12 inch drum length locate lead sheave 19.2 feet (5.9 metres) from drum.

(Dwg. MHTPA0498)

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.

When considering wire rope requirements the actual working load must include not only the static or dead load but also loads resulting from acceleration, retardation and shock load. Consideration must also be given to the size of the winch wire rope drum, sheaves and method of reeving. Wire rope construction must be 6 X 19 or 6 X 37 IWRC right lay to permit correct installation of wire rope anchor. Refer to Table 3 for applicable wire rope sizes.

Table 3

Minimum and Maximum Wire Rope Size

Model	Minimum		Maximum	
	inch	mm	inch	mm
FA2 Utility	7/16	11	5/8	16
FA2 ManRider*	7/16	11	7/16	11

* 7/16 inch (11 mm) wire rope must be used on FA2 winches used for personnel lifting to conform to ANSI A10.22 standards.

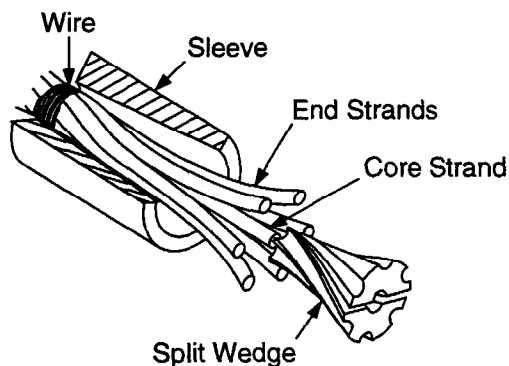
NOTICE

• Use only 7/16 inch (12 mm) wire rope on the FA2MRA winch if used for personnel handling.

Installing Wire Rope

(Refer to Dwg. MHTPA0166)

1. Cut wire rope to length 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 one foot (305 mm) of wire rope.



(Dwg. MHTPA0166)

3. Wrap the wire rope with wire a distance from the end equal to the wedge length plus one inch (25 mm).
4. Slide the sleeve over the end of the wire rope so the larger diameter of the taper bore is nearest the end of the wire rope.
5. Spread the end strands of the wire rope and insert the split wedge until it is below the end of the wire rope.
6. Pull the sleeve over the wire rope end until tight. Check that the wire rope strands stay in the slots located on the split wedge.
7. Pull the wire rope anchor into position in the drum anchor pocket.

CAUTION

• Make sure the first wrap of wire rope is tight and lays flush against the drum flange. Also ensure that each succeeding wrap is tight against the previous one.

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.

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.

NOTICE

• Wire rope must be spooled at least 2 inches (51 mm) below the outer diameter of the drum flange. Refer to Dwg. MHTPA0498.

Rigging

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

Safe Installation Procedures

1. Do not use wire rope as a ground (earth) for welding.
2. Do not attach a welding electrode to winch or wire rope.
3. Never run the wire rope over a sharp edge. Use a correctly sized sheave.
4. When a lead sheave is used, it must be aligned with the center of the drum. The diameter of the lead sheave must be at least 18 times the diameter of the wire rope. Refer to Dwg. MHTPA0498.
5. Always maintain at least four full, tight wraps of wire rope on the drum.

Air Supply

The air supply must be clean and free from moisture.

Air Lines

The inside diameter of the winch air supply lines must not be less than the sizes shown in Table 4. 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.

Table 4

Minimum Allowable Air Supply Line Sizes

Model	inch	mm
FA2	1-1/4	32

Air Line Lubricator

(Refer to Dwg. MHTPA0191)

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. Install the air line lubricator as close to the air inlet on the motor as possible.



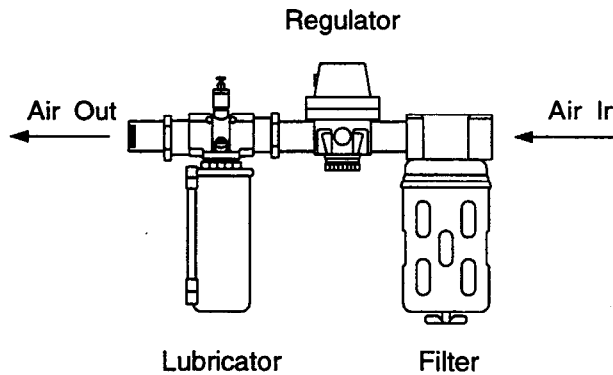
- Lubricator must be located no more than 10 ft. (3 m) from the motor.

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

Air Line Filter

(Refer to Dwg. MHTPA0191)

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



(Dwg. MHTPA0191)

Moisture in Air Lines

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

Motor

For optimum performance and maximum durability of parts, provide an air supply of 90 psig at 335 scfm (6.2 bar/620 kpa at 10 cu.m/m) for FA2 winches. 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.

Electrical Grounding



- The Personnel Lifting System must be properly grounded to conform to ANSI A10.22 standards. Ensure electrical grounding is conducted by licensed electricians in accordance with the latest edition of the National Electric Code (ANSI/NFPA 70) and any applicable local, state and national electric codes and ordinances.

An electrical grounding lug is attached to the winch siderail. Ensure winch is correctly grounded to the Personnel Lifting System before using winch.

Wire Rope Line Speed Monitor

Ensure the indicator sensor is adjusted as described in the "WINCH ADJUSTMENTS" section.

Motor Exhaust and Muffler

(Refer to Dwg. MHTPA0646)



- Operator exposure to noise levels shall not exceed 90 dBA over an 8 hour period (Time Weighted Average (TWA)). Ensure motor and pilot valve air is properly exhausted and muffled.

Winch noise level ratings under factory test conditions:

1. 83 dBA during operation of winch without load in the haul in direction.
2. 87 dBA during operation of winch without load in the pay out direction.

These levels were achieved when the motor and pilot valve air was exhausted through a 10 foot (3 metre) length of hose and attached to a muffler.

Initial 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 for a period of more than one month the following start-up procedure is 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 10W oil in the motor inlet port.
3. Operate the motor for 10 seconds in both directions to flush out any impurities.
4. The winch is now ready for normal use.

WINCH OPERATION

The four most important aspects of winch operation are:

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

WARNING

- Operate this winch **ONLY** if wire rope is installed to come off the drum for overwind operation. Refer to Dwg. MHTPA0564.
- Operation of this winch in a safe manner, as part of a Personnel Lifting System, requires that supervisors, operators, and personnel being transported be thoroughly instructed in the potential dangers involved and the safety procedures established to minimize the risks of accident, injury and property damage.
- Do not transport personnel and materials at the same time. Safe operation, according to established standards, require that personnel and materials are to be transported separately.
- Visual inspections of the winch and entire Personnel Lifting System must be conducted by designated personnel instructed in safety, operation and maintenance of this product before using the winch to transport personnel. Any visual indication of damage must be inspected, repaired and actions documented in accordance with component manufacturers' instructions to ensure the safety of personnel is not compromised.

Personnel Lifting System

Owners are responsible for establishing, implementing and ensuring that supervisors, operators, and personnel being transported are instructed in operation and safety procedures. Refer to 'Training' in the "WINCH OPERATION" section.

1. Supervisors, operators and personnel being lifted should check that winch, wire rope, working platform, lifelines, safety belts (harnesses), etc. are present and functional prior to authorizing personnel lifting.
2. Personnel being transported must be instructed in and adhere to the safety procedures established including, but not limited to, the following list:
 - a. Emergency Escape Procedures in accordance with ANSI A10.22 Section 11.

- b. Use of safety belts (harnesses) and rope grabs (lifelines) in accordance with ANSI A10.22 Sections 11, 12.4 and 12.5.
3. Winch operators must be instructed in and adhere to the procedures established to ensure proper and safe operation of this winch as a component in a Personnel Lifting System.
 - a. Winch operators must remain at the winch controls at all times when handling personnel and materials.
 - b. At any indication of winch, or system, damage or impending danger the winch operator must place the winch in a safe condition and notify designated personnel. Winch and system operation must be suspended until all discrepancies noted have been inspected, repaired and system tested to ensure safe operation.
 - c. Voice communication must be established and maintained between winch operator, personnel being lifted and personnel located at each landing (as applicable).
 - d. Winch operators must maintain at least 4 tight wraps of wire rope on the drum at all times.
 - e. Wire rope shall be weighted on the end to prevent line run when spooling onto the drum.

Initial Winch Operating Checks

NOTICE

- Initial operating checks specific to the entire Personnel Lifting System should be established to ensure system component compatibility.

Winches are tested for proper operation of all features prior to shipping. Before the winch is placed into service the following initial operating checks should be performed.

1. When first running the motor inject a small amount of oil into the inlet connection to provide initial and immediate lubrication.
2. When first operating the winch run the motor slowly in both directions for a few minutes.
3. Verify both drum brakes function as described in 'Winch Testing' in the "WINCH INSPECTION" section. To adjust the brakes refer to 'Winch Adjustments' in the "WINCH MAINTENANCE" section.
4. Adjust and verify limit switch settings. To adjust the limit switch set points refer to 'Winch Adjustments' in the "WINCH MAINTENANCE" section.

5. Verify line speed monitor and overspeed alarm operation as described in 'Winch Testing' in the "WINCH INSPECTION" section.
6. Verify automatic drum brake emergency release system operation as described in 'Winch Testing' in the "WINCH INSPECTION" section.

Winch Component Operation

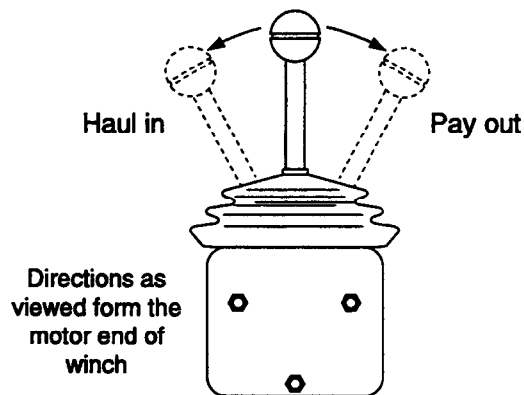
Pilot Air Throttle Control Lever

(Refer to Dwg. MHTPA0608)

Winch control lever directions are described as viewed when facing the winch motor and apply to overwind operation only. To ensure smooth operation of the winch sudden movements of the control valve should be avoided.

1. To payout wire rope, lift up on the winch control lever and move the lever to the right.
2. To haul in wire rope, lift up on the winch control lever and move the winch control lever to the left.

Pilot Air Throttle Control Operation



(Dwg. MHTPA0608)

Manual Drum Brake

The manual drum brake may be applied by pushing down on the brake handle and released by pulling up. If the handle is pushed down fully, it should lock in that position and prevent drum rotation, until released by the operator. The brake must be kept properly adjusted to hold the required load. To adjust the brake refer to 'Winch Adjustments' in the "WINCH MAINTENANCE" section.

Automatic Drum Brake

The automatic drum brake is a spring applied, air released brake. Using an air actuated, spring loaded cylinder the brake automatically disengages when the motor is operated. Air pressure in the cylinder overcomes spring pressure to release the brake. When the pilot air throttle control lever is placed in the neutral position, the air in the cylinder is vented and the spring automatically engages the brake to prevent drum rotation.

The cylinder clevis must be kept properly adjusted to hold the required load. To adjust the brake refer to 'Winch Adjustments' in the "WINCH MAINTENANCE" section.

Limit Switch

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



- Ensure limit switch operates properly and that limits have been set before using winch to transport personnel.

Line Speed Monitor and Overspeed Alarm

The Line Speed Monitor is a battery powered wire rope line speed indicator system which determines line speed by sensing drum rotation.

The Line Speed Monitor provides a visual alarm (flashing red light) and digital readout (in feet) to allow the operator to adjust throttle control to maintain wire rope line speed at 100 feet per minute (30.5 metres per minute) or less. Line Speed Monitors are factory pre-set to match the winch installed on and cannot be adjusted. The overspeed indicator light flashes when drum speed exceeds wire rope line speeds of 100 feet per minute (+/- 10 feet) (30.5 metres per minute; +/- 3 metres) in either direction of drum rotation.

The Line Speed Monitor battery should be recharged every two weeks by connecting the battery charger unit to the monitor and a 110 volt (ac) electrical source.

Winch Emergency Descent Procedure

(Refer to Dwgs. MHTPB0210 and MHTPB0636)



- ANSI A10.22-1990 Section 11 defines the Personnel Lifting System requirements for establishing emergency escape methods and procedures. The following procedure describing the use of the winch to lower personnel or loads when the supply air to the winch has been interrupted should only be used after all other established methods have been exhausted.

The lowering speed of the load using the winch descent procedure is dependent upon the weight of the load, amount of cable on the drum, and position of the load in the lifting system.

To use the winch to lower the load when the air supply has been interrupted conduct the following:

1. Engage the manual band brake.
2. Depress the automatic band brake clevis (107) and remove cotter pin (102) and pin (106) to disconnect cylinder (110) from brake lever (105).
3. Slowly disengage manual band brake using the brake lever (104). Regulate speed of load using manual band brake. If load does not lower engage band brake and then conduct the following step.

4. Remove capscrews (364) from motor adapter valve (468) and remove pilot valve/adapter assembly from winch motor.
5. Using manual band brake to throttle lowering speed (if required) lower the load.

Training

Prior to using the Personnel Lifting System supervisors, operators, service personnel, and personnel being transported must be thoroughly instructed in the potential dangers involved and the safety procedures established to minimize the risks of accident, injury and property damage.

Establishment of safe operating procedures for the Personnel Lifting System should be based on ANSI A10.22 specifications, OSHA regulations, all applicable local, state and national standards, system component manufacturers's recommendations, and system designer recommendations.

Records of training should be maintained and made available to designated personnel for review.

WINCH 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 (approximately 6 to 9 drops per minute required at maximum motor speed).
	Check winch motor oil level.
Monthly	Lubricate components supplied by grease fittings.
	Inspect and clean or replace air line filter.
	Check reduction gear oil level.
Yearly	Drain and refill winch reduction gear oil.
	Drain and refill winch motor oil.

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

Recommended Lubricants

Oil

Temperature	Type Oil
1. Below 32° F (0° C)	SAE 10W
2. 32° to 80° F (0° to 27° C)	SAE 20W
3. Above 80° F (27° C)	SAE 30W

Grease

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

Motor

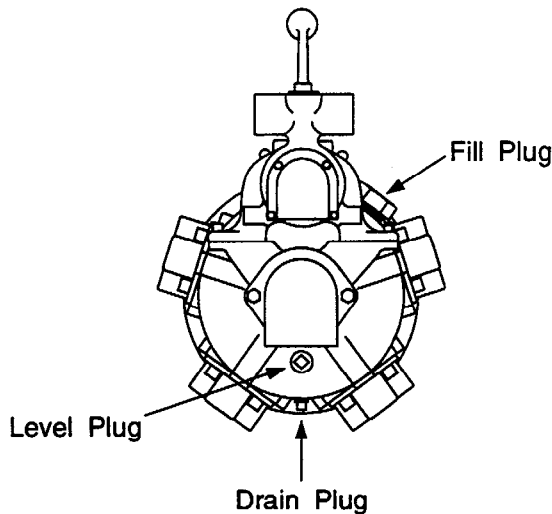
(Refer to Dwg. MHTPA0222)

Correct lubrication is one of the most important factors in maintaining efficient winch operation. The motor is splash lubricated by the oil in the motor housing and has no other means of lubrication. It is therefore important to use only quality, non-detergent motor oil to ensure maximum performance and minimum downtime for repairs. Refer to the 'Recommended Lubricants' section. Allow oil to settle before topping off.

Oil capacity for the FA2 winch motor is 3/8 quart (0.35 litres). Add oil through the fill plug opening until oil flows from the level plug hole. Add oil slowly to prevent spilling.

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

**Motor Lubrication Locations
(FA2 Shown)**



(Dwg. MHTPA0222)

Wire Rope

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

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



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

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

Reduction Gear Assembly

(Refer to Dwg. MHTPA0140)

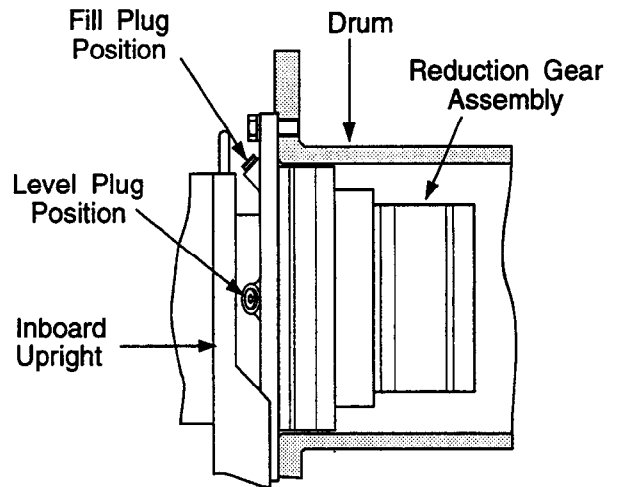
The reduction gear assembly is filled and shipped with oil from the factory. Check oil level before initial winch operation. If the winch is used at a normal frequency replace the oil in the reduction housing once every year. To ensure correct performance, highest efficiency and long life, it is essential that the lubricating oil be maintained at the correct level. Rotate the drum until the fill plug is located at top dead center then add oil up to the level plug hole. Oil capacity for the reduction gear assembly is 1-1/2 quarts (1.4 litres).



• Do not over fill. Excess oil will reduce operating efficiency and increase oil temperature.

The recommended grade of oil must be used at all times since the use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage to the gears. Refer to the 'Recommended Lubricants' section. Use only high quality lubricants in the reduction gear assembly such as motor oil, high grade EP type hydraulic oil or their equivalents.

Reduction Gear Lubrication Plug Locations



(Dwg. MHTPA0140)

Drum Brakes

Lubricate pivot points, pins and shafts with recommended grease to prevent corrosion of parts.



• Do not allow grease or oil to come into contact with drum band brake linings.

Disc Brake (optional feature)

Oil from the reduction gear assembly also provides lubrication for the disc brake. After an oil change or winch overhaul remove the breather plug and pour 6 to 8 ounces (0.2 litres) through the breather hole in the brake housing to initially lubricate the brake discs. Refer to the 'Recommended Lubricants' section. Reinstall the breather plug before operation of winch or brakes.

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. Lubricate grease fittings monthly with 2 or 3 pumps of a grease gun.

Air Line Lubricator

Replenish lubricator **daily** and set to provide 6 to 9 drops of oil per minute. Refer to the 'Recommended Lubricants' section for recommended oil.

Wire Rope Line Speed Monitor

Does not require lubrication.

Limit Switch

Does not require lubrication.

WINCH INSPECTION

Inspection information is based in part on American National Standards Institute Safety Codes (A10.22 and B30.7).

Records and Reports

Personnel Lifting System

Owners are responsible for establishing and implementing operation and safety procedure training for all personnel involved in the use and operation of a Personnel Lifting System.

1. **PERSONNEL TRAINING.** Records of training provided to supervisors, operators, service personnel and personnel being transported should be maintained and made available to designated personnel for review.
2. **SYSTEM MAINTENANCE.** Records of all service, maintenance and testing performed on the Personnel Lifting System should be maintained and made available to designated personnel for review.

Winch Records and Reports

Inspection records, listing all points requiring inspection, should be maintained for all load bearing equipment. Written reports, based on **Initial, Weekly and Quarterly** inspections, should be made on the condition of critical parts as a method of documenting inspections. These reports should be dated, signed by the person who supervised the performance of the inspection, and kept on file where they are readily available for review. A sample winch 'Inspection and Maintenance Report' has been provided at the end of this section.

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.

Personnel Lifting System wire rope records should be maintained and made available to designated personnel for review.

System Inspections and Tests

WARNING

• Information provided by Ingersoll-Rand is applicable only to the winch to assist in determining the condition of the winch components described. References to other Personnel Lifting System components are made with respect to their relationship to the winch. For specific information on system components other than the winch, reference the manufacturers' literature and ANSI A10.22.

Personnel Lifting System inspections and tests of installed components, functions and safety devices should be established based on procedures derived from ANSI A10.22 specifications, OSHA regulations, manufacturers' literature and recommendations, system designer recommendations and all applicable local, state and national standards.

1. **SYSTEM.** Frequency of inspections:
 - a. Initial system inspection.
 - b. Daily checks and Weekly inspections.
 - c. Quarterly inspections.

System Initial and Quarterly Inspections

In addition to established Daily and Weekly inspections conduct the following:

NOTICE

• The static drop test is only required for guided cage systems.

1. **INITIAL INSPECTION.** With the cage at **rated load, on a guided cage system**, using dead weights, conduct a static drop test. This test is designed to ensure the cage safety clamps engage and stop the cage from falling. Perform requirements of the weekly inspection.
2. **QUARTERLY INSPECTION.** With the cage **empty, on a guided cage system**, conduct a static drop test. This test is designed to ensure the cage safety clamps engage and stop the cage from falling. Perform requirements of the weekly inspection.

System Testing

Personnel Lifting System testing should be conducted in accordance with the system specific instructional manual and component manufacturers' recommendations. A system specific instruction manual must be compiled to conform to the requirements of ANSI A10.22, and detail the operation, maintenance and safety requirements of the various components comprising the personnel lifting system.

Winch Inspections

The following listed inspections apply only to the winch. These inspections should be conducted when scheduled, when indicated by winch performance and when the winch is disassembled for repair.

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.

Damage 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 made, and the correction of noted safety hazards accomplished and documented by written report before placing the equipment in service.

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.
- Prior to using the winch to lift personnel, an initial inspection should be conducted after assembly, major repairs or alteration, and when the system has been idle for periods of longer than one month.

Daily checks, weekly and quarterly inspections should be performed on equipment in regular use.

1. **Daily checks** are visual examinations performed by operators or personnel instructed in safety and operation of this equipment and include observations made during routine equipment operation.
2. **Weekly inspections** are thorough inspections conducted by personnel instructed in safety, operation and maintenance of this equipment. Weekly inspections are also required prior to personnel lifting if the system has been idle for periods in excess of one week, but less than one month.
3. **Quarterly inspections** are a combination of weekly inspection requirements and the performance of a static drop test **on guided cage systems only** to verify operation of the cage's safety clamp.

Winch Daily Checks and Weekly Inspections

On equipment in continuous service, weekly inspections are required. Maintain written records of weekly inspections to provide an accumulative basis for continuing evaluation. Disassembly may be required as a result of inspection findings.

In addition, daily checks, or visual inspections should be conducted by operators during regular operation for damage or evidence of malfunction.

1. **WINCH (DAILY)**. At the beginning of the shift, prior to operation, visually inspect winch housings, controls, brakes, siderails and drum for indications of damage. Do not operate the winch until all discrepancies noted have been reviewed, inspected further and corrected by personnel instructed in the operation, safety and maintenance of this winch.
WINCH (WEEKLY). Inspect the following:
 - a. **SIDE RAILS AND END UPRIGHTS**. Check for deformed, cracked or corroded main components. Replace damaged parts.
 - b. **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.
 - c. **DRUM AND SHEAVES**. Check for cracks, wear or damage. Replace damaged parts.
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 an experienced wire rope inspector.

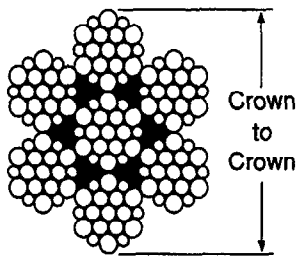
NOTICE

- 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 the following instructions.

In addition to daily check requirements, also inspect for the following weekly:

- a. Ensure wire rope is spooled onto the drum for overwind operation only and that a minimum of 2 inches (50 mm) clearance is maintained between the outside edge of the drum flange and the outermost layer of wire rope.
- b. Buildup of dirt and corrosion. Clean with steam or a stiff wire brush to remove dirt and corrosion if necessary.
- c. Loose, frayed or damaged end connection. Replace if loose, frayed or damaged. Ensure ends will not catch on personnel.
- d. Ensure the wire rope is securely anchored in the winch drum.

- e. 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. MHTPA0056).



(Dwg. MHTPA0056)

3. **AIR SYSTEM (WEEKLY).** Visually inspect all connections, fittings, hoses and components for indication of air leaks. Repair any leaks and replace damaged components.
4. **CONTROLS (DAILY AND WEEKLY).** During operation of winch, verify response to control is quick and smooth. If winch responds slowly or movement is unsatisfactory, do not operate winch until all problems have been corrected.
5. **BRAKES (WEEKLY).** Ensure proper operation. Verify each brake system will hold a 150% rated load with full drum (as applicable to normal use) 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. If drum brake lining thickness is 0.062 inch (2 mm) or less anywhere along its edge replace brake bands or linings. Clean and replace components as necessary. Test each brake system independently.
6. **LIMIT SWITCHES (WEEKLY).** Verify winch limit switches operate at the set limits. When actuated, limit switches interrupt air flow to the motor in the direction of winch operation only. Adjust limit settings or repair to correct all noted discrepancies.
7. **ALL COMPONENTS (WEEKLY).** 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, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.

8. **SUPPORTING STRUCTURE (WEEKLY).** Check for distortion, wear and continued ability to support winch. Ensure winch is firmly mounted and that fasteners are in good condition and tight.
9. **LABELS AND TAGS (WEEKLY).** Check for presence and legibility of labels. Replace if damaged or missing.
10. **WIRE ROPE LINE SPEED MONITOR.** Verify Line Speed Monitor displays line speed and overspeed alarm lights at 100 feet per minute (+/- 10 feet) (30.5 metres per minute; +/- 3 metres). If battery charge light is on, charge battery.
11. **WINCH EXHAUST AND MUFFLER.** Visually inspect exhaust hoses, connections and muffler for damage. Ensure piping and muffler are correctly installed and direct exhaust away from winch operator. Operator noise levels must not exceed 90 dBA over an 8 hour period (Time Weighted Average (TWA)).
12. Ensure electrical ground (earth) is firmly connected and that wire is in good condition. Replace wire if corroded or damaged.

Winch Initial and Quarterly Inspections

Disassembly may be required as a result of inspection findings or in order to properly inspect the individual components. Maintain written records of initial and quarterly inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in "Weekly Inspection." Also conduct the following:

1. **INITIAL INSPECTION.** Conduct all requirements of 'Winch Daily and Weekly Inspection' and 'Winch Testing'.
2. **QUARTERLY INSPECTION.** Conduct all requirements of 'Winch Daily and Weekly Inspection' and 'Winch Testing'.

Winches Not in Regular Service

1. Equipment which has been idle for a period of one week or more, but less than one month, shall be given an inspection conforming to the requirements of "Daily and Weekly Inspections" before being placed in service.
2. Equipment which has been idle for a period of over one month shall be given a complete inspection conforming with the requirements of "Initial and Quarterly Inspections" before being placed in service.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand Force 5 Series Ansi Manrider® Air Winch

Model Number:	Date:
Serial Number:	Inspected by:
Reason for Inspection: (Check Applicable Box)	
<input type="checkbox"/> 1. Scheduled Inspection (___ Weekly ___ Quarterly ___ Initial) <input type="checkbox"/> 2. Discrepancy(s) noted during Daily Inspection <input type="checkbox"/> 3. Discrepancy(s) noted during maintenance <input type="checkbox"/> 4. Other: _____	Operating Environment: Normal ___ Heavy ___ Severe ___

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	
Side Rails and End Uprights					
Manual Drum Band Brake (150% Load Test)					
Automatic Drum Band Brake (150% Load Test)					
Drum Band Brakes (Visual Inspection)					
Motor					
Limit Switches					
Controls					
Air System					
Fasteners					
Reduction Gears					
Labels and Tags			---		
Shafts					
Wire Rope Anchor Wedge			---		
Line Speed Monitor and Overspeed Alarm			---		
Other Components (list in NOTES section)					

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

* Maximum winch operational test load is 125% of rated line pull.
 Maximum brake test load is 150% of rated line pull; perform by raising the test load approximately 4 to 6 inches (100 to 150 mm).

WINCH 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 problems, probable causes and solutions.

PROBLEM	CAUSE	SOLUTION
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.
	Automatic drum band brake does not release.	Pressurize brake release port and check for leakage. Replace brake piston seals if leakage is found.
	Limit switch engaged.	Shift pilot valve throttle lever in opposite direction. If winch operates, adjust limit switch settings.
	Shipping plugs may still be in place.	Remove shipping plugs in valve and motor exhaust ports.
Load continues to move when winch is stopped.	Automatic drum band brake is slipping.	Check brake band adjustment and brake band lining wear.
	Winch is overloaded.	Reduce load to within rated capacity.
	Pilot air throttle control valve sticking.	Disassemble, inspect and repair the pilot air control throttle valve.
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.
	Automatic drum band brake or optional disc brake do not release.	Disassemble, inspect and repair the automatic drum band and/or optional disc brake.
Throttle lever moves but winch does not operate.	Motor may be damaged.	Disassemble and clean the motor and replace any broken or damaged parts.
	Insufficient air supply.	Ensure the air pressure at the winch inlet is at least 90 psig (6.2 bar) at rated volume. Clean air line filter.
	Limit switch engaged.	Shift pilot valve throttle lever in opposite direction. If winch operates, adjust limit switch settings.
Motor runs hot or makes excessive noise during operation.	Low oil level.	Check oil level in the motor. Add oil as required to obtain the proper level.
	Improper lubrication.	Replace oil with type recommended in the "LUBRICATION" section.
	Water in oil.	Drain and refill with recommended oil. Operate winch with no load slowly, in both directions. If noise still exists or motor overheats disassemble and repair motor.
	Damaged or broken piston or connecting rod.	Disassemble and repair motor.
Winch runs slow.	Improper hose or fitting sizes.	Check fittings, connections and hoses for correct size and length. Replace parts that may cause restricted air flow. Inspect air line filter.
	Motor may be damaged.	Remove and disassemble motor as described in the "MAINTENANCE" section. Inspect all parts and replace all worn or damaged parts.

PROBLEM	CAUSE	SOLUTION
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 cylinder will not release.	Drum brake out of adjustment.	Adjust drum brake to maintain correct cylinder stroke.
	Damaged or leaking cylinder seals.	If air is noticed escaping from the cylinder breather when attempting to release the brake replace or repair cylinder.
	Dirty filter in air supply.	Clean or replace filter.
	Faulty dump valve.	Check dump valve exhaust port. Air should exhaust when control valve handle is in neutral. If no air escapes, replace dump valve.

Limit Switch

Winch does not operate in one direction.	Limit switch engaged	Operate winch in opposite direction. Adjust limit switch settings to required travel limits.
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Line Speed Monitor and Overspeed Alarm

Line Speed Monitor does not show feet per minute indication.	Low battery.	Charge battery.
	Sensor may be damaged or obstructed.	Clean capscrew heads and sensor. Verify 0.2 inches (+/- 0.1 inches) [5 mm (+/- 2.5 mm)] clearance between sensor and capscrew heads.

WINCH LABEL AND TAG PARTS LIST

ITEM NO.	DESCRIPTION OF LABEL	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF LABEL	QTY TOTAL	PART NUMBER
• 601	Warning	1	71124895	612	IR Logo (small)	2	71106322
• 602	Caution Tag	1	71107148	• 613	Notice	1	71150023
• 603	Overwind	2	71109516	• 614	Owner's Manual	1	71149454
604	IR Siderail Logo	1	71106272	• 615	Limit Switch Adjust	1	71149454
605	Product	1	71111785	616	To Sensor Input	1	71149439
• 606	Nameplate	1	71108849	617	Battery Charger Input	1	71149421
607	Nameplate Rivet	4	71028849	618	Ground Connection	1	71149447
608	Exhaust	1	71042196	619	Line Speed Monitor	1	71149405
609	Oil	1	71043616	620	Battery Charger	1	71149413
610	Air Supply	1	71046395				

• At a minimum, and to ensure the winch attached safety labels are in place, replace these labels if they are lost or damaged.

WINCH 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 service personnel trained in safety and maintenance on this winch to perform maintenance.

Reduction Gear Assembly

It is recommended 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.).

Check the oil in the reduction housing as recommended in the "LUBRICATION" section. If low, replenish. The oil should be changed at least once every year.

Refer to the "LUBRICATION" section for recommended oil.

INTERVAL	MAINTENANCE CHECK
Start of each shift (Operator or Maintenance Personnel)	<p>Make a thorough visual inspection of the winch for damage. Do not operate the winch if damaged.</p> <p>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).</p>
3 Months (Maintenance Personnel)	Inspect the drum brake friction linings. Clean or replace parts as required. Adjust drum brake as necessary.
Yearly (Maintenance Personnel)	<p>Inspect the winch gearing, shafts and bearings for wear and damage. Repair or replace as necessary.</p> <p>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.</p>

Winch Adjustments

Disc Brake (optional feature) Adjustment

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

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 Brake Adjustment

1. Release wire rope tension on the drum.
2. Raise handle to free brake bands.
3. Remove cotter pin and pin.
4. Rotate link stud clockwise to increase brake torque.
5. Install pin and check adjustment.
6. Brake should be adjusted until brake lever over center position can be attained with 50 to 100 lb. (23 to 45 kg) force on the handle.
7. Install cotter pin when adjustment is completed.

⚠ CAUTION

- When any part of the brake lining measures 0.062 inch (2 mm) or less, brake bands (128) or linings must be replaced.

Automatic Drum Brake Adjustment

1. Remove cotter pin and washer at adjustment clevis.
2. Apply air to the brake cylinder and remove pin and second washer to disconnect clevis from brake lever.
3. Clevis adjustments:
 - a. To decrease brake torque, turn adjustment clevis clockwise to increase cylinder rod extension.
 - b. To increase brake torque, turn clevis counterclockwise to decrease cylinder rod extension.
4. Assemble clevis to brake lever with washer and pin. Release air to brake cylinder.
5. Test brake as described in 'Winch Testing' in the "MAINTENANCE" section. Readjust if necessary.
6. Install cotter pin and second washer to secure clevis to brake lever when adjustments are complete.

Pilot Air Control Valve Adjustment

If winch operating speeds differ from performance specifications the pilot air control valve may require adjustment. Loosen nut and adjust adjusting screw, located in the valve end cap, until drum speed for no-load haul in equals the drum speed for full load pay out.

Limit Switch Adjustment

(Refer to Dwg. MHTPA0607)

⚠ CAUTION

- Maintain at least 4 tight wraps of wire rope on the drum at all times. Ensure wire rope top layer is a minimum of 2 inches (50 mm) below drum flange edge. Refer to Dwg. MHTPA0498.

The FA2MRA air lines and connections are color coded to assist in assembly. Refer to the following table in determining air connections by color coding.

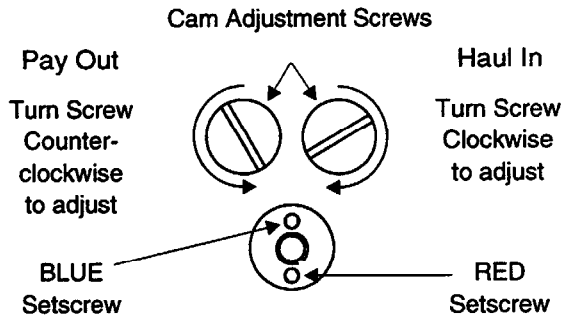
Adjustments described as viewed when facing the limit switch assembly from the automatic brake cylinder side of the winch.

Winch Air System Color Code

Winch Direction	Limit Switch Connections	Pilot Air Valve Manifold to Throttle
Haul In	Yellow	Brown
Pay Out	Green	Blue

Winch Direction	Supply Air	Limit Switch Setscrews
Haul In	Red	Red
Pay Out		Blue

Limit Switch Adjustment



(Dwg. MHTPA0607)

To set winch maximum wire rope pay out limit switch:

1. Remove access plate from top of limit switch.
2. Loosen the blue setscrew in the center of the limit switch, below the access cover.
3. Position winch wire rope at desired pay out position.
4. Rotate the left cam adjustment screw counterclockwise until it fully activates the cutoff valve, causing system air to vent. 2-3/4 turns of the cam adjustment screw are required for each full cam revolution.
5. Hold the cam adjustment screw in position (venting air) and tighten the blue setscrew.
6. Adjust haul in limit switch. Test winch setpoints by operating the winch through three complete cycles to ensure constant limit switch operation within +/- 2 feet (2/3 m) of setpoints.
7. Install access cover when final adjustments are complete.

To set winch maximum wire rope haul in limit switch:

1. Remove access plate from top of limit switch.
2. Loosen the red setscrew in the center of the limit switch, below the access cover.
3. Position winch wire rope at desired pay out position.
4. Rotate the right cam adjustment screw clockwise until it fully activates the cutoff valve, causing system air to vent. 2-3/4 turns of the cam adjustment screw are required for each full cam revolution.
5. Hold the cam adjustment screw in position (venting air) and tighten the blue setscrew.
6. Adjust haul in limit switch. Test winch setpoints by operating the winch through three complete cycles to ensure constant limit switch operation within +/- 2 feet (2/3 m) feet of setpoints.

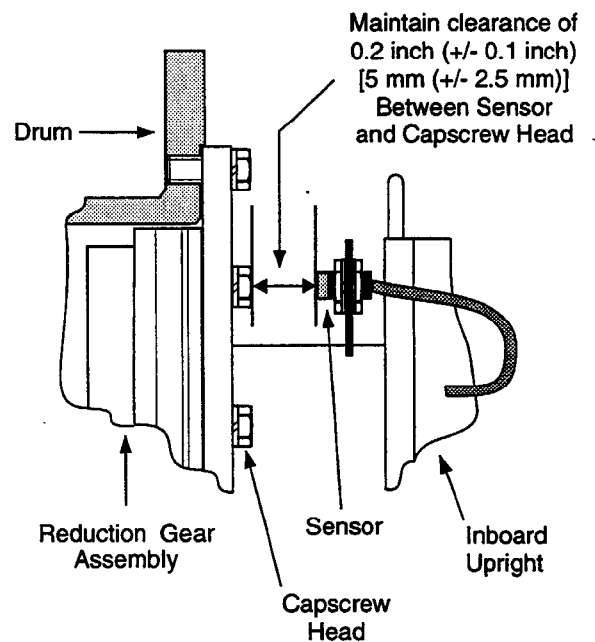
7. Install access cover when final adjustments are complete.

Wire Rope Line Speed Monitor and Overspeed Alarm Adjustment

Line speed monitor adjustments are limited to the placement of the sensor. Adjustments to the indicator set points established at the factory should not be attempted. To change line speed monitor set points contact your nearest **Ingersoll-Rand** distributor or the factory.

1. The sensor attaches to the assembly bracket and faces the drum reduction gear mounting capscrews.
2. Install the sensor and adjust to ensure a clearance of 0.2 inch (+/- 0.1 inch) [5 mm (+/- 2.5 mm)] between the sensor and the drum reduction gear mounting capscrew heads. Refer to Dwg. MHTPA0602.

Overspeed Indicator Sensor Clearance



(Dwg. MHTPA0602)

Disassembly

General Disassembly Instructions

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

If a winch is being completely disassembled for any reason, follow the order of the topics as they are presented. It is recommended that all maintenance work on the winch be performed in a clean dust free work area.

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

1. Never disassemble the winch any further than is necessary to accomplish the needed repair. A good part can be damaged during the course of disassembly.
2. Never use excessive force when removing parts. Tapping gently around the perimeter of a cover or housing with a soft hammer, for example, is sufficient to break the seal.

3. Do not heat a part with a flame to free it for removal, unless the part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

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

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

Winch Disassembly

(Refer to Dwg. MHTPC0635)

1. Remove the wire rope from the drum.
2. Operate the winch to position reduction gear drain plug at its lowest position.
3. Relieve pressure in the air lines 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.

4. Disconnect and tag the air lines.
5. Remove the winch from its mounting and take to a suitable work area before beginning disassembly.
6. Remove lower case drain plug (464) in motor housing (463) and allow the oil to drain into a suitable container. Loosen fill cap (462) to vent the motor housing.
7. Drain oil from the gear reduction assembly by removing pipe plug (48) when positioned at its lowest point.
8. For winches with an optional disc brake remove pipe plug (24) in brake housing (21) to drain brake oil. The winch outboard end (opposite the motor end) must be elevated to prevent draining oil from contaminating the drum brake band lining.

⚠ WARNING

• The FA2MRA air motor weighs approximately 117 lbs. (53 kg). Adequately support the air motor before removing the motor mounting capscrews.

9. Remove drum band brakes, drum guard, limit switch and any other externally mounted winch attachments.
10. Remove the capscrews and lockwashers securing the motor assembly to the motor adapter. Using a hoist to support the motor, pull the motor straight away from the winch. Reference the applicable **Motor Disassembly** section if motor disassembly is required.

Instructions 11 through 17 apply only to winches with an optional disc brake.

11. Alternately and evenly loosen capscrews (4) until the brake spring tension has been released. Remove capscrews and motor adapter (6).
12. Remove the brake housing (21). If the brake housing sticks, tap it with a brass hammer until the pieces separate. Note the position of all brake pieces for reassembly.
13. Remove friction plates (16) and drive plates (17).
14. Remove springs (9) from brake piston (10).
15. Remove brake piston (10) from brake housing (21). Tap lightly with a plastic mallet to separate parts if necessary.
16. Remove seals (11) and (12) from brake piston (10).
17. Remove splined hub (19) from shaft (35) followed by retainer ring (32).
18. Remove retainer ring (36) from the bore of the drum shaft (41).
19. Pull shaft and bearing assembly from the drum shaft (41).
20. Support the drum (80) and remove capscrews (39) from the drum shaft (41). Pry drum shaft (41) from the inboard upright (42).
21. Remove capscrews (85) and lockwashers (46) which secure the side rails (82 and 83) to the inboard upright (42). Drive out dowel pins (87).
22. Remove inboard upright (42).
23. Disconnect limit switch hoses (354, 355 and 359) from fittings (526). Hoses and fittings should be plugged or taped shut to maintain air system cleanliness. Disconnect coupling (507).
24. Remove capscrews (97), lockwashers (96), limit switch with bracket (504), spacers (503) and end cover (95) from the outboard upright (84). Place limit switch assembly in a safe place.
25. Remove capscrews (93) and bearing retainer (92) from the drum (80).
26. Remove drum and reduction gear assembly.
27. Remove the remaining capscrews (85) and lockwashers (46) which attach the side rails (82) and (83) to the outboard upright (84). Drive out dowel pins (87).
28. Remove bearing (86) and seal (99) from outboard upright (84).

29. Remove capscrews (45) and lockwashers (46) from the gear carrier (47). Lift reduction gear assembly from the drum (80). To disassemble reduction gear refer to the 'Reduction Gear Disassembly' section.

Manual and Automatic Drum Brake

(Refer to Dwg. MHTPB0636)

Actuator Disassembly:

1. Automatic Brake
 - a. Disconnect and remove hose, fittings and dump valve (112) from the cylinder (110).
 - b. Remove cotter pin (102), washer (129) and pin (101) from the link stud (103) and brake band (128).
 - c. Remove cotter pin (102), washer (129) and pin (106). Separate the clevis (107) from brake lever (105).
 - d. Remove cylinder (110) from bracket (118).
2. Manual Brake:
 - a. Remove cotter pin (102) and pin (101) from handle (104) then remove handle (104) from brake band (128).

Brake Band Disassembly:

3. Remove capscrews (119), lockwashers (117) and stop plate (126).
4. Use a hoist to raise the winch approximately 6 inches (15 cm). Separate the brake band (128) halves and rotate the brake band assembly slowly until it can be removed from the drum (80).
5. Remove cotter pins (102) and pins (121) so brake band halves (128) can be removed from the arm (124). Lower winch when brake band assembly has been removed.

Reduction Gear Disassembly

(Refer to Dwg. MHTPC0635)

1. Place the reduction gear assembly on a clean work bench such that the end containing seal (43) is down.
2. Remove capscrews (75) and pry off cover (73).
3. Remove ring gear (72), sun gear (69) and planet assembly (67).
4. Gear Removal:
 - a. Remove capscrews (60) from the input housing (59).
 - b. Lift off input housing (59) followed by ring gear (63) and sun gear (66).
 - c. Remove planet assembly (58) and sun gear (56).
 - d. Remove spacer (71), planet assembly (54) and ring gear (53).
 - e. Remove retainer ring (50) from gear carrier (47) and press out bearing (49).

FA2 Motor Disassembly

(Refer to Dwg. MHTPB0210.)

1. Remove capscrews (364), lockwashers (363) and exhaust cover (469). Pull out rotary valve (467) and rotary valve bushing (466). Remove adapter valve (468).
2. Remove the capscrews (451), lockwashers (452) and cylinders (453) from the motor housing (463).

3. Rotate the crankshaft assembly (473) to bring each wrist pin (457) above the motor housing (463), then push out the wrist pin (457) and remove piston (455). Plugs (456) pressed into ends of wrist pins (457) should not be removed. To avoid breakage use extreme care when removing compression rings (454).
4. Pull the crankshaft assembly (473) with attached connecting rods (459) out of the motor housing (463) by shifting the connecting rods (459) to clear the cylinder holes. The connecting rods (459) are joined through a common journal on the crankshaft and are held in place by connecting rod rings (474) on each side of the main rib.
5. To remove the connecting rods (459) from the crankshaft (473), take out setscrew (478) and drive out the taper pin (479) securing the counterbalance to the crankshaft.
6. Loosen the capscrew (480), remove counterbalance, then pull off connecting rod rings (474), connecting rods (459), bushing (476) and sleeve (475).

Cleaning, Inspection and Repair

Clean all winch component parts in solvent (except the drum brake bands and disc brake friction plates). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the housings, frame and drum. If bushings have been removed it may be necessary to carefully 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 liquid. 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 replace the brake bands as a set. Remove 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 linings are less than 0.062 inch (2 mm) thick anywhere along the edges replace the brake bands (128) as a set.

Repair

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

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

Winch Assembly

General instructions

- use all new gaskets and seals.
- replace worn parts.
- assemble parts using match marks attached during disassembly. Compare replacement parts with originals to identify installation alignments.
- lubricate all internal parts with a mixture of half SAE 20W oil and half molybdenum disulfide lubricant compound (eg. STP).

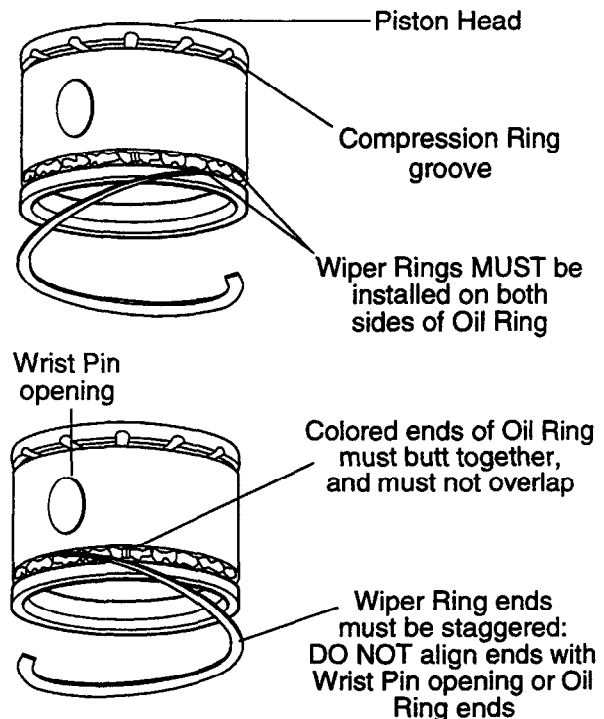
FA2 Motor Assembly

(Refer to Dwg. MHTPB0210)

1. Press bearing (465) onto crankshaft counterbalance. Place the connecting rods (459) on the bushing (476) and hold them in place with the two connecting rod rings (474). Install connecting rod rings (474) so the chamfered side is next to the connecting rod (459).
2. Place the sleeve (475) on the crankshaft (473), then install the connecting rod (459) assembly on the crankshaft (473).
3. Secure the crankshaft counterbalance to the crankshaft with the taper pin (479) and tighten capscrew (480).
4. Attach the rotary valve housing and valve cover to the motor housing (463) with at least two capscrews. This is necessary to correctly locate bearing (465) when installing the crankshaft in the motor housing (463), shifting it as necessary so each connecting rod (459) end will project through a cylinder hole.
5. Align bearing (465) in the bore of the motor housing (463) and tap crankshaft assembly in place until bearing (465) bottoms on the rotary valve bushing.
6. Check the fit of each compression and oil ring by placing one ring at a time in the cylinder, making sure that it is not canted or tilted in relation to the cylinder wall. With a feeler gauge, measure the ring gap.
7. Make sure that compression rings, oil rings, and pistons are absolutely clean. Carefully place oil rings (458) and compression rings (454) in their respective grooves on the pistons (455).

NOTICE

- Do not interchange the compression and oil rings. The plain compression ring (454) must be placed nearest the head of the piston (455). The oil ring (458) (identified by several oil channel grooves) must be placed nearest the skirt of the piston (455).
8. Compression and oil ring joints (gaps) should be staggered and positioned so that joints (gaps) do not coincide with wrist pin (457) openings. (Ref. Dwg. MHTPA0224).



(Dwg. MHTPA0224)

9. Rotate the crankshaft so each connecting rod (459) in succession will project enough beyond the motor housing (463) to permit inserting the wrist pin (457) through the piston (455) and connecting rod (459).
10. After each piston (455) is assembled to its connecting rod (459), install a gasket (460) and cylinder (453).
11. Slide each cylinder (453) over the piston (455), guiding it carefully over the compression and oil rings. Note that the cylinder has four tapered ears around the skirt of the piston which serve as ring compressors to aid in installation. The cylinder should go into place by tapping lightly. If force is required, there may be an alignment problem which must be corrected before continuing.
12. Secure cylinders (453) to the motor housing (463) by uniformly tightening capscrews (451) and lockwashers (452).

13. Remove exhaust cap (469). Install rotary bushing (466) and rotary valve (467) in adapter valve (468). Align the drive pins on the rotary valve (467) with the end of the crank shaft (473). The three drive pins on the crank shaft end of the rotary valve should fit in the holes in the crank shaft without appreciable play. If the holes in the crank shaft are elongated, the crank shaft should be replaced. The drive pins are located so that the rotary valve will always be returned to the correct position.
14. Replace the exhaust cap (469) and secure in position with capscrews (364) and lockwashers (363).

Reduction Gear Assembly

(Refer to Dwg. MHTPC0635)

1. Lubricate and install 'O' rings (62) on ring gear (72). Assemble ring gear (72), cover (73) and spacer (71). Check dowel and capscrew holes are aligned.
2. Drive dowels (74) into assembly so they are flush with the cover (73).
3. Position assembled parts vertically with the cover (73) down. Install planet assembly (67) and gear (69) into ring gear (72).
4. Press bushing (55) into sun gear (66) and install sun gear (66) into planet assembly (67).
5. Lubricate and install 'O' rings (62) on ring gear (63). Install ring gear on spacer (71) being careful not to damage the 'O' ring. Align dowel and capscrew holes.
6. Tap dowels (70) into ring gear (63) and spacer (71). Leave approximately 0.37 inch (9 mm) exposed for engagement with input housing (59).
7. Install planet assembly (58) so planet gear teeth mesh in the ring gear (63) and with the sun gear (66).
8. Carefully install input housing (59) so it locates on dowels (70). Tilt assembly on the work bench and install capscrews (75) with Loctite® 242 and torque to 32 ft. lbs. (43 Nm).
9. Return assembly to the vertical position. Install bushing (55) and retainer ring (57) on sun gear (56) and install sun gear (56) in planet assembly (58).
10. Lubricate and install 'O' ring (51) on ring gear (53). Line up dowel and capscrew holes and install ring gear (53) on input housing (59) being careful not to damage 'O' ring (51).
11. Install planet assembly (54) so planet gear teeth mesh with ring gear and sun gear.
12. Lubricate and install 'O' ring (51) on ring gear (53).
13. Install oil plugs (61) in input housing (59).
14. Press bearing (49) into bore of gear carrier (47). Install retainer ring (50).
15. Install gear carrier (47) on ring gear (53) being careful not to damage 'O' ring (51). Check capscrew and dowel holes are lined up. Install capscrews (60) with Loctite® 242. Torque capscrews (60) to 94 ft. lbs. (127 Nm).
16. Tap dowels (52) through ring gear (53), input housing (59) and gear carrier (47) until they are just below the flange surface of the gear carrier (47).

Manual and Automatic Drum Brake Assembly

(Ref. Dwg. MHTPB0636)

1. Install pivot bracket (122) on the end of arm (124) with pin (121), washer (123) and cotter pin (102). Recessed side of the threaded hole must be toward the band side.
2. Install connecting link (125) on the arm (124) and secure in position with pin (121), washer (123) and cotter pin (121). Assemble connecting link (125) so curved surface matches contour of the brake band.
3. Install halves of brake band (128) to the connecting link (125) and secure with pins (101), (121) and cotter pins (102).
4. Lift the winch assembly, with a suitable hoist, approximately 6 inches (15 cm) off the floor or work bench.
5. Position the brake band sub-assembly around the brake diameter on the drum (80) so the arm (124) lays at the bottom. When positioned, lower the winch.
6. Mount pivot bracket (122) on the inside surface of the side rail (130) and secure in position with capscrews (116) and lockwashers (117).
7. Screw link stud into handle and install the handle (104) in the lug on the end of the brake band (128). Lubricate the pivot points being careful not to get grease on the brake band lining.
8. Pull the halves of the brake band together and install pin (101) through the lug on band (128) and the adjusting screw (103) of the handle assembly.
9. Install stop plate (126) on the inside of the side rail (131) with capscrews (119) and washers (117). Install adjusting screw (127) and locknut (120) through the side rail (131) and stop plate (126) until it contacts the arm (124).
10. To adjust brake refer to 'Winch Adjustments' in the "MAINTENANCE" section.

Automatic Drum Brake Actuator Assembly:

11. Install bracket (118) on side rail (130) with capscrews (116) and lockwashers (117).
12. Screw nut (108) and clevis (107) onto cylinder rod.
13. Attach brake lever (105) to brake band (128).
14. Install cylinder (110) so it connects with bracket (118) and brake lever (105). Use pins (106), washers (129) and cotter pins (102) to secure in position.
15. Install dump valve (112) fittings and hose (115) to the cylinder (110).
16. To adjust brake refer to 'Winch Adjustments' in the "MAINTENANCE" section.

Winch Assembly

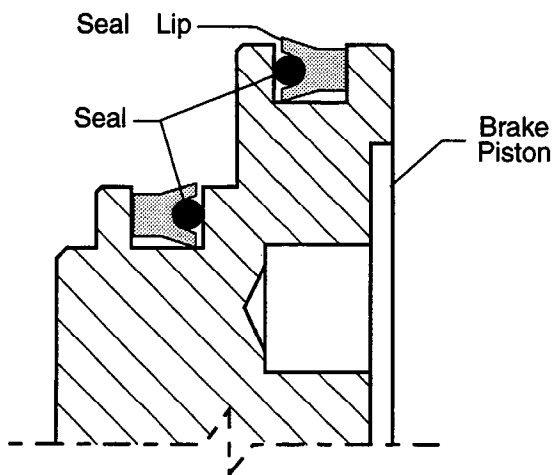
(Refer to Dwg. MHTPC0635)

1. Clean both mating surfaces on the inboard upright (42) and install drum shaft (41) through the bore aligning the dowel pin holes.
2. Install dowel pins (40) flush or slightly below the surface of the drum shaft (41).
3. Install capscrews (39) with Loctite® 242 and torque to 44 ft. lb. (60 Nm).
4. Press bearing (37) onto the shaft (35) using Loctite® 609. Install retainer ring (38).

5. Install shaft and bearing into the drum shaft (41) so smaller splined end enters first.

Instructions 6 through 16 cover winches with an optional disc brake. For winches without a disc brake skip to instruction 17.

6. Install retainer ring (32) and splined hub (19) on shaft (35) so splined side of outside diameter goes on first. Seat splined hub (19) against retainer ring (32).
7. Lubricate and install 'O' ring (33) on hub of drum shaft.
8. Install brake housing (21) on drum shaft (41) being careful not to damage 'O' ring (33).
9. Position brake housing (21) so brake port is in the 2 o'clock position (as viewed from the motor end). Install drain plug (24) in brake housing (21) at the 6 o'clock position.
10. Install fitting (22) and breather (23) in the top of the brake housing (21).
11. Lubricate friction plates (16) with a light SAE 10W motor oil and install friction plates (16) and drive plates (17) in brake housing (21). Begin with a friction plate (16) then alternate between drive plates (17) and friction plates (16). Ensure the splined teeth mesh. Do not use force.
12. Lubricate and install seals (11) and (12) in brake piston (10) grooves so seal lips face each other. Do not overstretch seals during this procedure. Refer to Dwg. MHTPA0139.
13. Install brake piston assembly in brake housing (21) so stepped side enters first. Gently tap into position using a soft mallet until seated.
14. Install one brake spring (9) in each of the brake spring holes.
15. Lubricate and install 'O' ring (20) on motor adapter (6).
16. On winches with a disc brake install capscrews evenly to compress brake springs. Do not allow plate to become cocked. Evenly hand tighten all capscrews before applying final torque.



(Dwg. MHTPA0139)

17. On disc brake equipped winches install shaft extender (7) on end of shaft (35).

18. Lubricate and install 'O' ring (5) in groove on the motor adapter (6).
19. Ensure oil seal (2) is installed in the bore of the motor assembly. Seal lip must face into the motor assembly.

⚠ WARNING

• The FA2MRA air motor weighs approximately 117 lbs. (53 kg). Adequately support the air motor while installing the motor mounting capscrews.

20. Mount motor assembly to motor adapter (6) with capscrews (97) and lockwashers (96). Torque capscrews (97) to 30 ft. lbs. (41 Nm).
21. On winches with a disc brake install fitting (31) in dump valve (30) and screw into the brake release port. Install vented fitting (29) in dump valve (30). Install fitting (25) in valve assembly (260) with elbow (26). Install steel tube (27) between fitting on the dump valve (30) and elbow (26).

Drum Assembly

1. Lay gear carrier (47) on the work bench and install bearing (49), retainer ring (50) and 'O' ring (51).
2. Align the dowel pins (52) and install reduction gear assembly to gear carrier (47).
3. Install capscrews (60) and torque to 60 ft. lbs. (81 Nm).
4. Clean surfaces of the drum (80) and gear carrier (47). Apply Loctite® 515 gasket sealant to drum mating surface. Lower reduction gear assembly into drum (80).
5. Install capscrews (45) and lockwashers (46) with Loctite® 242 and torque to 70 ft. lbs. (95 Nm).
6. Install fill/drain plugs (48) in gear carrier (47).
7. Apply a thin coat of Loctite® 609 to the outside of seal (43) and install in gear carrier (47).
8. Place drum in an upright position. Carefully lower inboard assembly into the drum (80) making sure splines on shaft (35) and drum shaft (41) mesh in the drum and reduction gear assembly.
9. Using a 'C' clamp, clamp the inboard flange assembly to the drum flange and place complete assembly in a horizontal position.
10. Clean seal surface and install oil seal (99) in outboard upright (84) with lip toward the drum.
11. Pack bearing (86) with grease and install in outboard upright (84).
12. Install outboard upright (84) on the drum end. Ensure assembly is kept centered on seal and journal during this step.
13. Install shaft retainer (501) using capscrews (93) with Loctite® 242. Torque to 30 ft. lbs. (41 Nm).
14. Apply a light coat of Loctite® 515 sealant to the mating surface of the outboard upright (84) and install end cover (95), spacers (503) and bracket (504) using capscrews (97) and lockwashers (96). Apply a small amount of Loctite® 242 to capscrew (97) threads and torque to 30 ft. lbs. (41 Nm).
15. Install side rails to uprights and loosely secure using capscrews (85) and lockwashers (46).

16. Tap dowel pins (87) into position so they are flush with the side rails.
17. Apply Loctite® 242 to capscrews (85) and lockwashers (46) and torque to 70 ft lbs (95 Nm).

Limit Switch Assembly

(Refer to Dwg. MHTPB0633)

1. Install coupling (507) half on shaft retainer (501) shaft. Apply a small amount of Loctite® 242 to setscrew threads and install. Install rubber dampener.
2. Install coupling (507) half on limit switch (508) shaft. Apply a small amount of Loctite® 242 to setscrew threads and install.
3. Align limit switch (508) foundation holes with bracket (504) holes and install capscrews (509), lockwashers (505) and nuts (506).

Line Speed Monitor and Overspeed Alarm Installation

(Refer to Dwg. MHTPA0643)

1. The assembly bracket (613) attaches to the motor mounting flange and is secured with two capscrews (97).
2. Mount the line speed monitor (612) to the bracket and secure using capscrews (610) and nuts (611).
3. Install the sensor to the bracket assembly (613) and secure with lock nuts.

Winch Testing

Prior to initial use, all new, altered or repaired winches shall be tested to ensure proper operation at rated capacity. Testing loads should be based on the utility rating of the winch. The FA2-MRA with 7/16 inch (11 mm) wire rope is rated for a maximum 3,500 lbs. (1,558 kg) rated line pull.

1. OPERATIONAL TEST. Prior to initial use, all new, altered or repaired winches shall be tested to ensure proper operation.
 - a. Check oil level in motor, reduction gear assembly and disc brake are correct.
 - b. To initially 'break in' new or overhauled motors operate without load, in both directions, for 2 hours at 100 - 200 RPM.
 - c. New Drum Brake Band Lining Run-in Procedure: All new drum brake band linings require a 'run-in' period. Operate the winch without load in the payout direction while gradually applying the brake. Allow the brake to slip for approximately one minute. Winch motor may stall as drum brake band lining fully engages. Do not allow brake to overheat.

- d. Check operation of brakes. Adjust if necessary as described in the "MAINTENANCE" section.
 - e. Check operation of limit switches, locking devices and all safety devices when equipped.
 - f. Check foundation mounting fasteners are secure.
 - g. Install drum guard when provided.
2. 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 the operation and safety of this winch and a written report furnished confirming the rating of the winch. Load winch to **at least 100%, but not more than 125%** of the rated utility line pull and operationally test winch. Operate winch in both directions. Winch must operate smoothly, without indication of binding or malfunction.
 - a. To test the winch at 125% of the rated utility load of 3,500 lbs. (1,558 kg) apply the following load with the wire rope on the first layer of the drum:

FA2MRA Winch	4,375 lb. (1,985 kg)
---------------------	-----------------------------

3. LINESPEED INDICATOR AND OVERSPEED ALARM. During operational and load tests, observe winch line speed. Maximum allowed line speed, when used as a ManRider®, should not exceed 100 ft./min (30.5 m/min). The visual overspeed alarm must activate when line speed reaches 100 ft./min (+/- 10 ft) (30.5 m/min (+/- 3 m)).
4. BRAKES. Test the drum automatic and manual band brakes independently. Each brake shall hold 150% of rated load without slipping. Automatic drum band brake must stop and hold test load when the winch throttle lever is placed in the neutral position. Manual drum band brake must be able to stop and hold test load when the winch throttle lever is placed in the neutral position and brake is applied.
5. LIMIT SWITCHES. Operate winch in both directions to activate limit switches. Limit switches should engage at established settings (+/- 2 feet (2/3 m)), and prevent winch operation must reset after reversing winch operating direction and allowing drum to turn approximately three full revolutions.

SERVICE NOTES

WINCH ASSEMBLY DRAWINGS AND PARTS LISTS TABLE OF CONTENTS

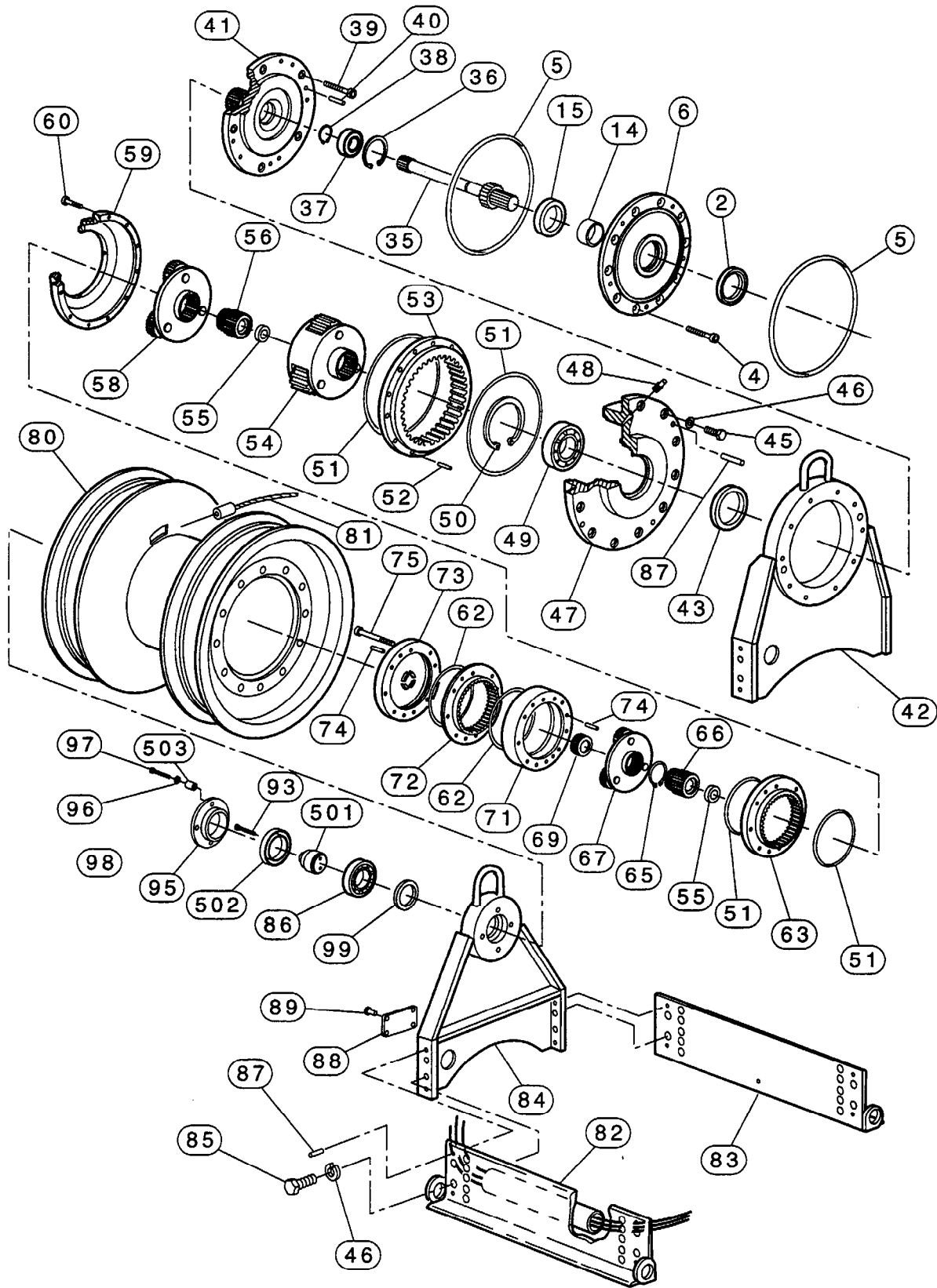
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WINCH LABEL AND TAG PARTS LIST

ITEM NO.	DESCRIPTION OF LABEL	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF LABEL	QTY TOTAL	PART NUMBER
• 601	Warning	1	71124895	612	IR Logo (small)	2	71106322
• 602	Caution Tag	1	71107148	• 613	Notice	1	71150023
• 603	Overwind	2	71109516	• 614	Owner's Manual	1	71149454
604	IR Siderail Logo	1	71106272	• 615	Limit Switch Adjust	1	71149454
605	Product	1	71111785	616	To Sensor Input	1	71149439
• 606	Nameplate	1	71108849	617	Battery Charger Input	1	71149421
607	Nameplate Rivet	4	71028849	618	Ground Connection	1	71149447
608	Exhaust	1	71042196	619	Line Speed Monitor	1	71149405
609	Oil	1	71043616	620	Battery Charger	1	71149413
610	Air Supply	1	71046395				

• At a minimum, and to ensure the winch attached safety labels are in place, replace these labels if they are lost or damaged.

WINCH ASSEMBLY DRAWING



(Dwg. MHTPC0635)

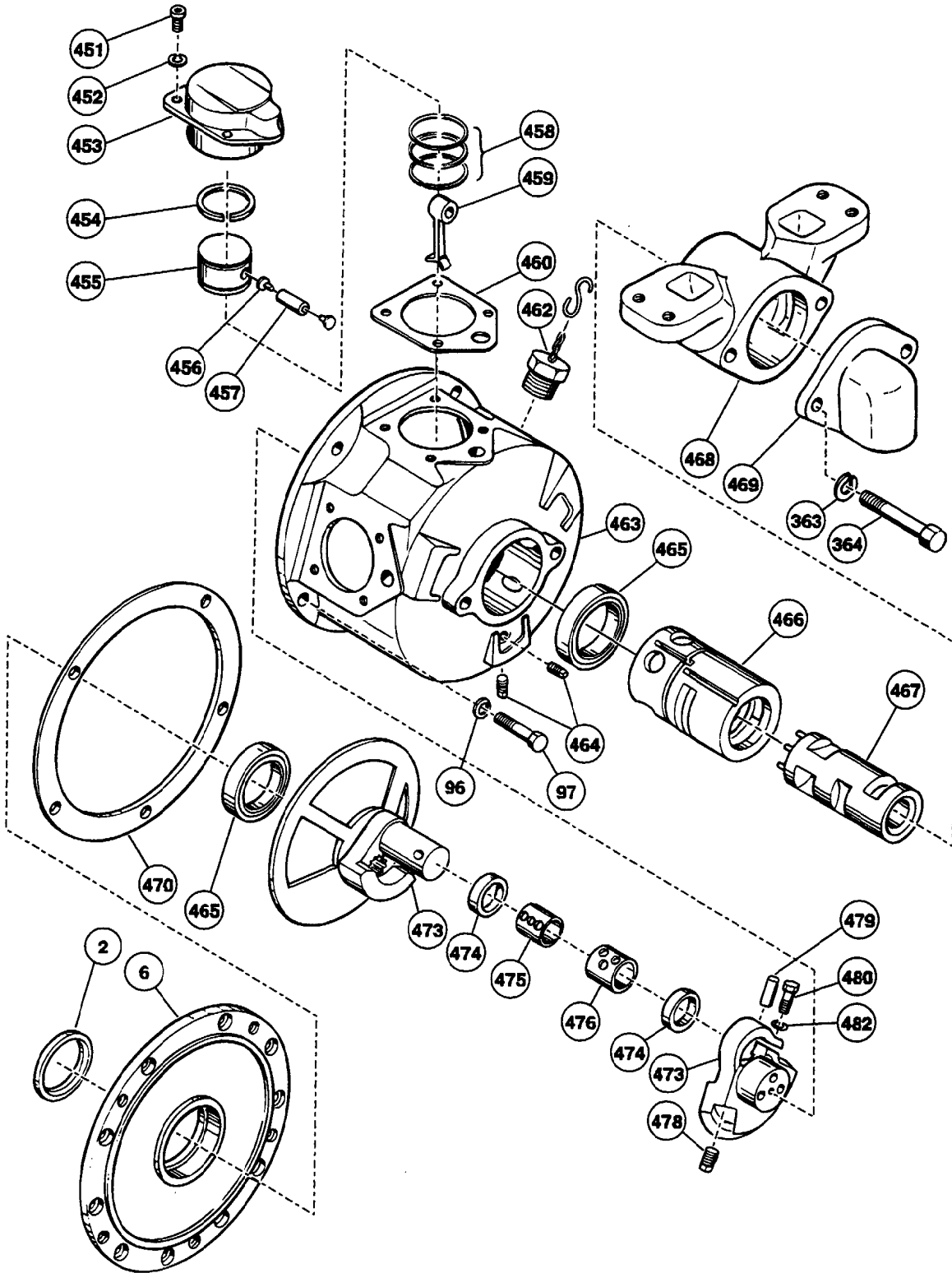
WINCH ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
* 2	Oil Seal	1	52223	71	Spacer	1	71068522
4	Capscrew	5	51931	72	Ring Gear	1	71107437
* 5	'O' Ring	2	51484	73	Cover	1	71107486
6	Motor Adapter	1	10361	74	Dowel Pin	4	
14	Seal Ring	1	11107	75	Capscrew	8	71107445
35	Shaft	1	11095	80	Drum (8 inch long)	1	20655
* 37	Bearing	1	52229		Drum (12 inch long)		23759
39	Capscrew	5	51766		Drum (16 inch long)		
40	Pin	2	52683		Drum (24 inch long)		23706
41	Drum Shaft	1	14021		Drum (30 inch long)		24029
42	Inboard Upright	1	10342	* 81	Wire Rope Anchor	1	52001
* 43	Seal	1	51475	82	Side Rail (8 in. drum)	1	20656
45	Capscrew	20	50973		Side Rail (12 in. drum)		19799
46	Lockwasher	20	50181		Side Rail (16 in. drum)		
47	Gear Carrier	1	15451		Side Rail (24 in. drum)		23726
48	Pipe Plug	2	51467		Side Rail (30 in. drum)		24026
49	Bearing	1	51473	83	Side Rail (8 in. drum)	1	20655
50	Retainer Ring	1	51479		Side Rail (12 in. drum)		19718
---	Reduction Gear Assy	1	51783		Side Rail (16 in. drum)		
* 51	'O' Ring	4	52149		Side Rail (24 in. drum)		23725
52	Dowel Pin	4	71068472		Side Rail (30 in. drum)		24027
53	Ring Gear	1	71068548	84	Outboard Upright	1	10268
54	Planet Assembly	1	71068555	85	Capscrew	8	50973
55	Thrust Bearing	2	71068647	* 86	Bearing	1	51797
56	Sun Gear	1	71068530	87	Dowel Pin	10	50984
58	Planet Assembly	1	71068498	88	Name Plate	1	71108849-R
59	Input Housing	1	71107429	89	Drive Screw	4	50915
60	Capscrew	8	71106736	93	Capscrew	2	51485
62	'O' Ring	2	52273	95	End Cover	1	10266
63	Ring Gear	1	71068514	96	Washer	4	50200
65	Retainer Ring	1		97	Capscrew	4	50829
66	Sun Gear	1	71107460	* 99	Seal	1	51474
67	Planet Assembly	1	71107452	501	Retainer	1	19232
69	Sun Gear	1	10498	502	Seal	1	71054688
				503	Spacer	1	14998-7

* Recommended spare.

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

MOTOR ASSEMBLY DRAWING



(Dwg. MHTPB0210)

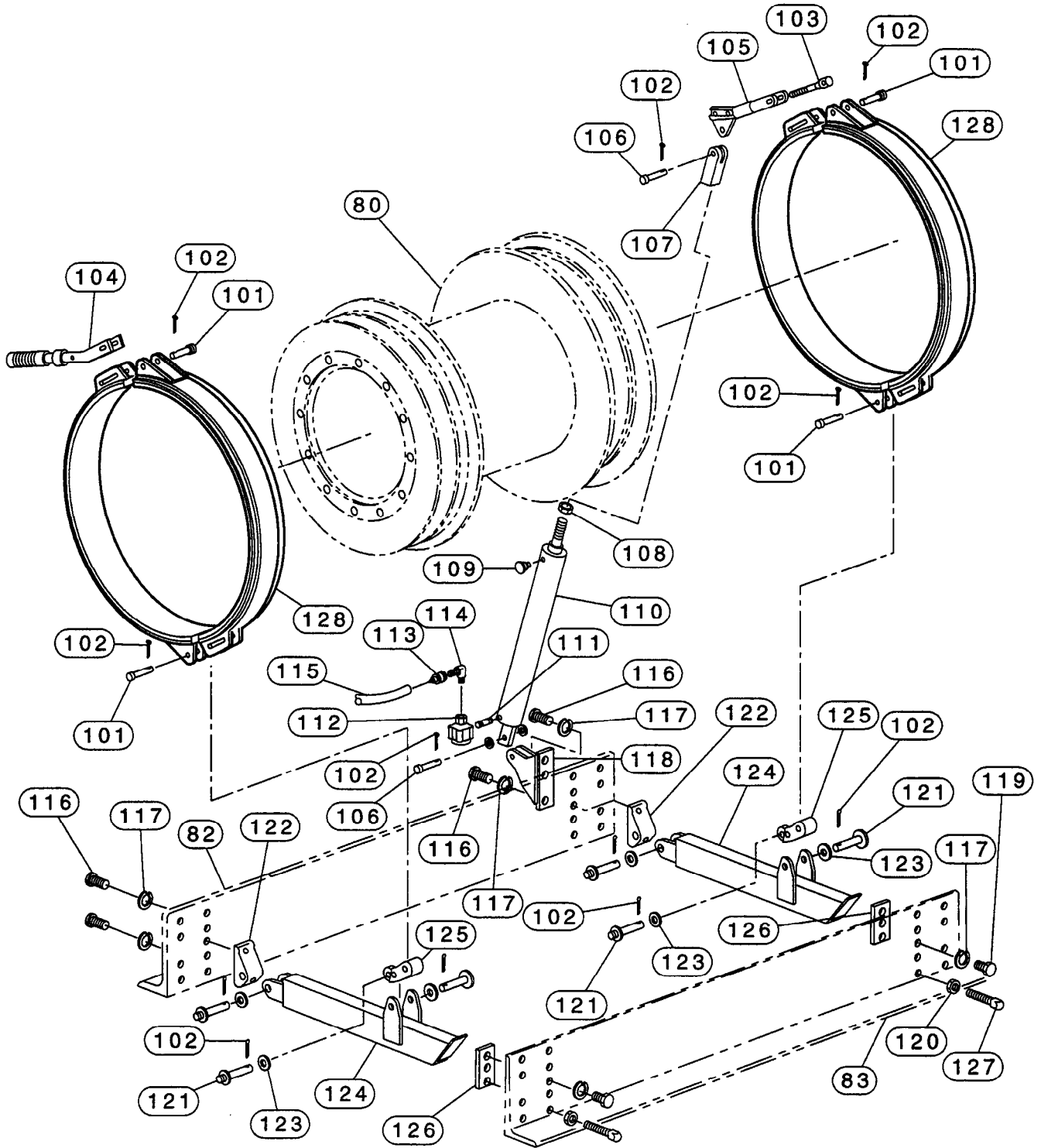
MOTOR ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
*	Motor Assembly	1	50259-1
• 2	Oil Seal	1	52223
6	Motor Adapter	1	10361
96	Lockwasher	5	50200
97	Capscrew	5	50829
363	Lockwasher	2	51486
364	Capscrew	2	54840
451	Capscrew	20	50871
• 452	Copper Washer	1 Set	94-027-20
453	Cylinder	5	94-024
• 454	Compression Ring	5	Order Kit 94-RS
455	Piston Assy (Incl's items 454, 457, & 458)	5	94-010A
456	Plug	10	Order 94-011-1A (Item 457)
457	Wrist Pin Assembly (Incl's item 456)	5	94-011-1A
• 458	Oil Ring	5	Order Kit 94-RS
459	Connecting Rod	5	94-009
• 460	Gasket	1 Set	94-025-5
462	Vent Cap Assembly	1	94-018
463	Motor Housing	1	94-014
464	Pipe Plug	2	94-015
465	Bearing	2	50944
• 466	Rotary Bushing	1	10986
• 467	Rotary Valve	1	94-019
468	Adapter Valve	1	10987
469	Exhaust Cap	1	21-1
• 470	Gasket	1	94-029
473	Crank Shaft Assembly	1	94-001
474	Connecting Rod Ring	2	94-008
475	Sleeve	1	94-007
476	Bushing	1	94-006
478	Setscrew	1	94-005
479	Pin	1	94-004
480	Capscrew	1	51712
482	Lockwasher	1	50200

• Recommended spare.

* Motor Assembly includes items listed above.

DRUM BRAKE ASSEMBLY DRAWING



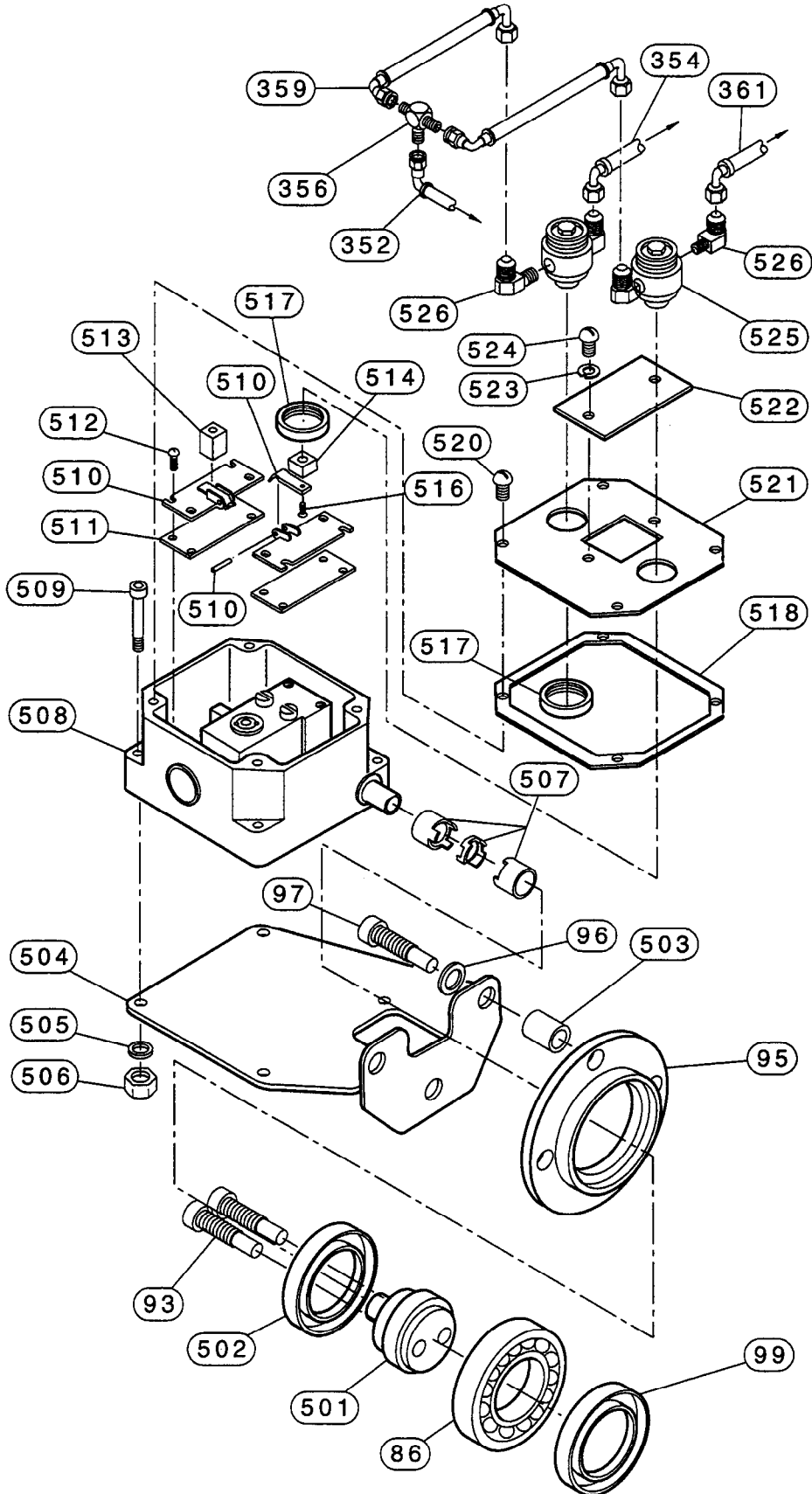
(Dwg. MHTPB0636)

DRUM BRAKE ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER	
			MANUAL BRAKE	AUTOMATIC BRAKE
80	Drum	1	Refer to Winch Assembly Drawing and Parts List	
82	Side Rail	1		
83	Side Rail	1		
101	Pin	4	4303-S	
102	Cotter Pin	See ()	51937 (5)	51937 (7)
103	Link Stud	2	2448	
104	Handle	1	2329	---
105	Brake Lever	1	---	11498
106	Pin	2	---	8609
107	Clevis	1	---	6237-2
108	Nut	1	---	50159
109	Breather	1	---	52384
110	Cylinder	1	---	4575-1
111	Fitting	1	---	52006
• 112	Dump Valve	1	---	51954
113	Fitting	2	---	52385
114	Elbow	1	---	52330
115	Hose	1	---	50923
116	Capscrew	3	---	50873
117	Lockwasher	6	50181	
118	Bracket	1	---	11493
119	Capscrew	3	50973	
120	Nut	2	50171	
121	Pin	6	3704-S	
122	Pivot Bracket	2	11146	
123	Washer	As Req'd	50890	
124	Arm	2	11147	
125	Connecting Link	2	11144	
126	Stop Plate	2	11145	
127	Screw	2	52226	
• 128	Brake Band	2 Sets	10724 (Set)	
	Brake Band Lining Kit	2 Kits	10724-BLK	

• Recommended spare.

LIMIT SWITCH ASSEMBLY DRAWING



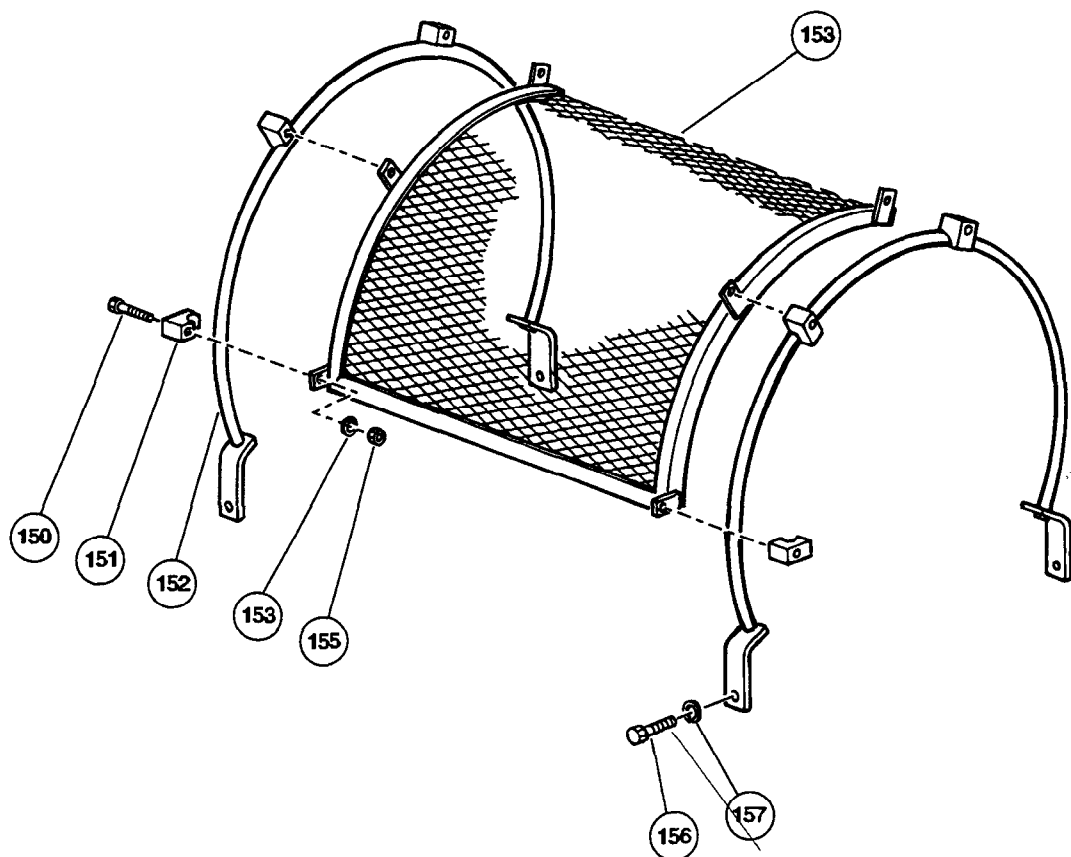
(Dwg. MHTPB0633)

LIMIT SWITCH ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER	
86	Bearing	2	51797	
93	Capscrews	2	71030787	
95	End Cover	1	19233	
96	Lockwasher	3	50200	
97	Capscrew	3	51769	
99	Seal	2	51474	
352	Hose Assembly	Specify Length in Feet	50923	
354	Hose Assembly			
356	Fitting, Tee	1		
359	Hose Assembly	Specify Length in Feet	50923	
361	Hose Assembly			
501	Retainer	1	19232	
502	Seal	1	71054688	
503	Spacer	3	14998-7	
504	Bracket, Limit Switch	1	11501	
505	Lockwasher	4	52909	
506	Nut	4	54142	
507	Coupling Assembly	1	52381	
508	Limit Switch Assembly	1	19578-1	
509	Capscrew	4	54493	
510	Lever Assembly	2	Order Item 508 Limit Switch Assembly	
511	Plate	2		
512	Capscrew	8		
513	Block, Tall	1		
514	Block, Short	1		
516	Capscrew	2		
517	Locking Ring	2		
518	Gasket	1		
520	Capscrew	4		
521	Cover Plate	1		
522	Access Plate	1		
523	Lockwasher	2		
524	Capscrew	2		
525	Valve	4		51756
526	Fitting, 90	8		51281

• Recommended spare.

DRUM GUARD ASSEMBLY DRAWING AND PARTS LIST (OPTIONAL)

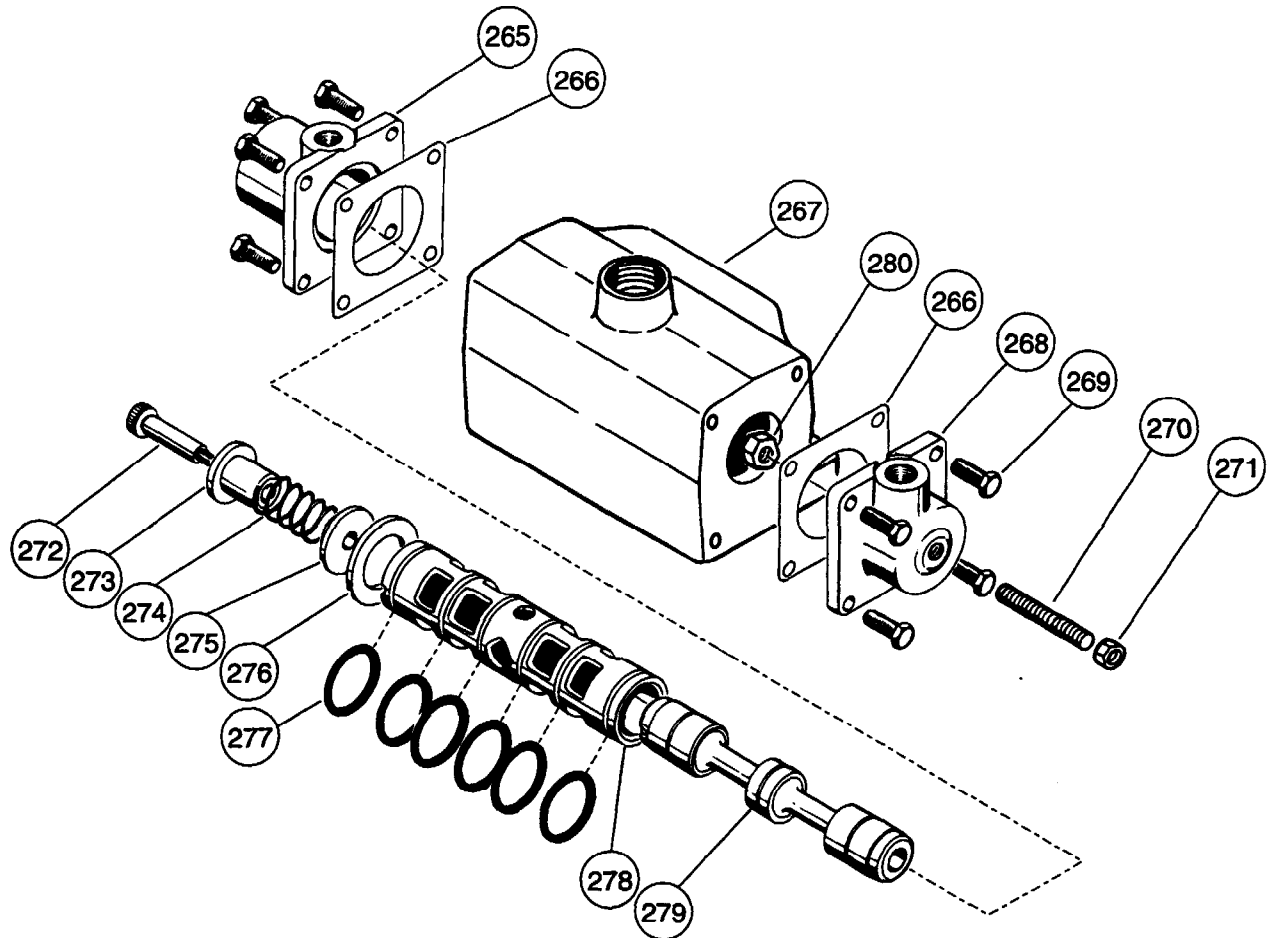


(Dwg. MHTPA0205)

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
*	Drum Guard Assembly (8 inch long drum)	1	11283-1
	Drum Guard Assembly (12 inch long drum)		11283-2
	Drum Guard Assembly (16 inch long drum)		11283-3
	Drum Guard Assembly (24 inch long drum)		11283-5
150	Capscrew	4	71072243
151	Clamp	4	10399
152	Support	2	10400
153	Drum Guard (8 inch long drum)	1	11259-1
	Drum Guard (12 inch long drum)		11259-2
	Drum Guard (16 inch long drum)		11259-3
	Drum Guard (24 inch long drum)		11259-5
154	Lockwasher	4	51580
155	Nut	4	71061584
156	Capscrew	4	53391
157	Washer	4	50182

* Drum Guard Assemblies include items 150 through 157.

PILOT AIR CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST



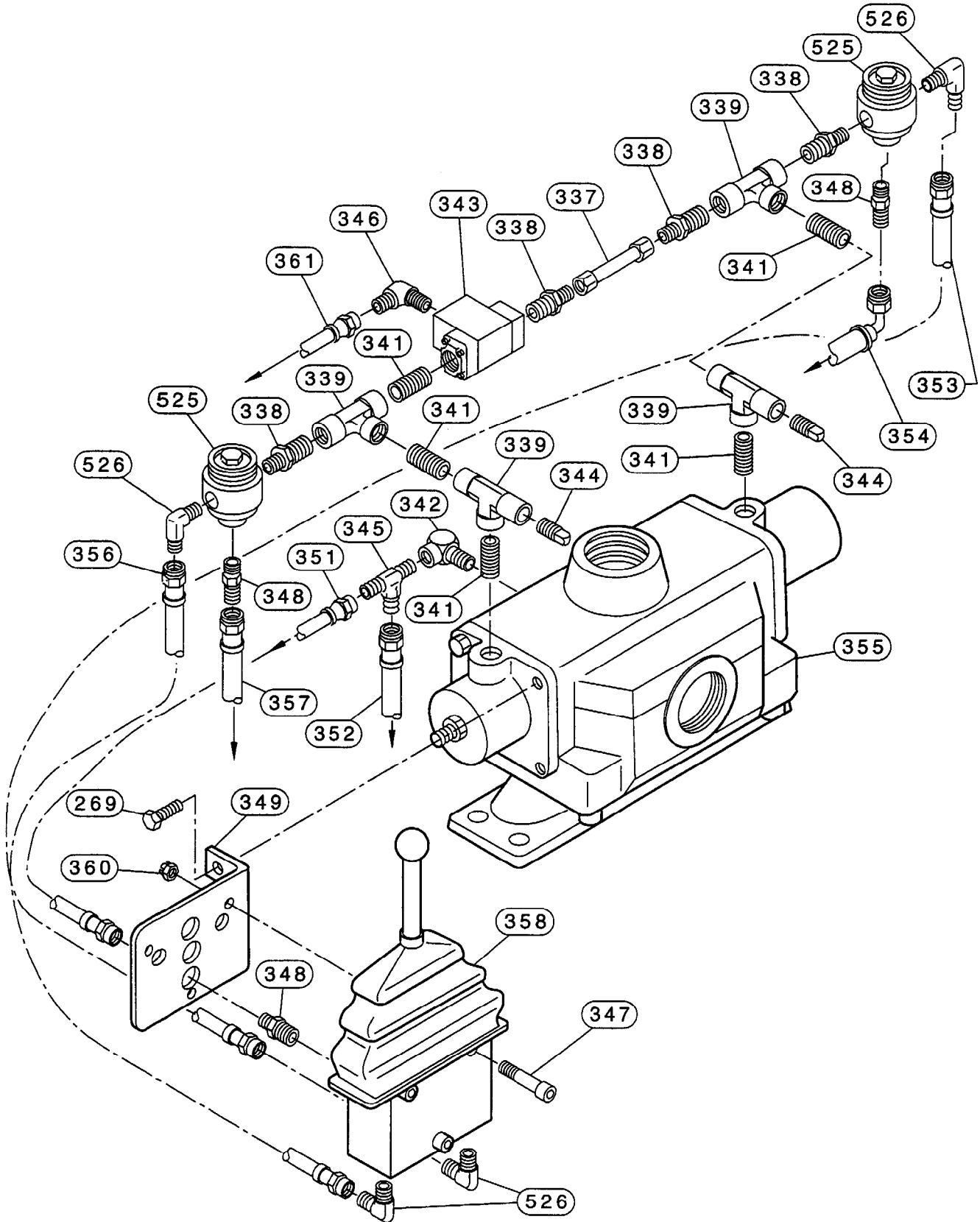
(Dwg. MHTPA0141)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
* 355	Valve Assembly	1	20991
265	End Cap	1	52241
• 266	Gasket	2	52457
267	Valve Body	1	Not sold separately, order item 355
268	End Cap (Inlet Side)	1	11778
269	Capscrew	8	52234
270	Adjusting Screw	1	71083968
271	Nut	1	52265
272	Shoulder Screw	1	817-002
273	Guide	1	52233
274	Spring	1	52240
275	Washer	1	52239
276	Spacer	1	52238
• 277	O' Ring	6	51632
278	Valve Sleeve	1	Not sold separately, order item 355
279	Valve Spool	1	Not sold separately, order item 355
280	Stop	1	11777

• Recommended spare.

* Includes items 265 through 280.

PILOT AIR VALVE PLUMBING ASSEMBLY DRAWING

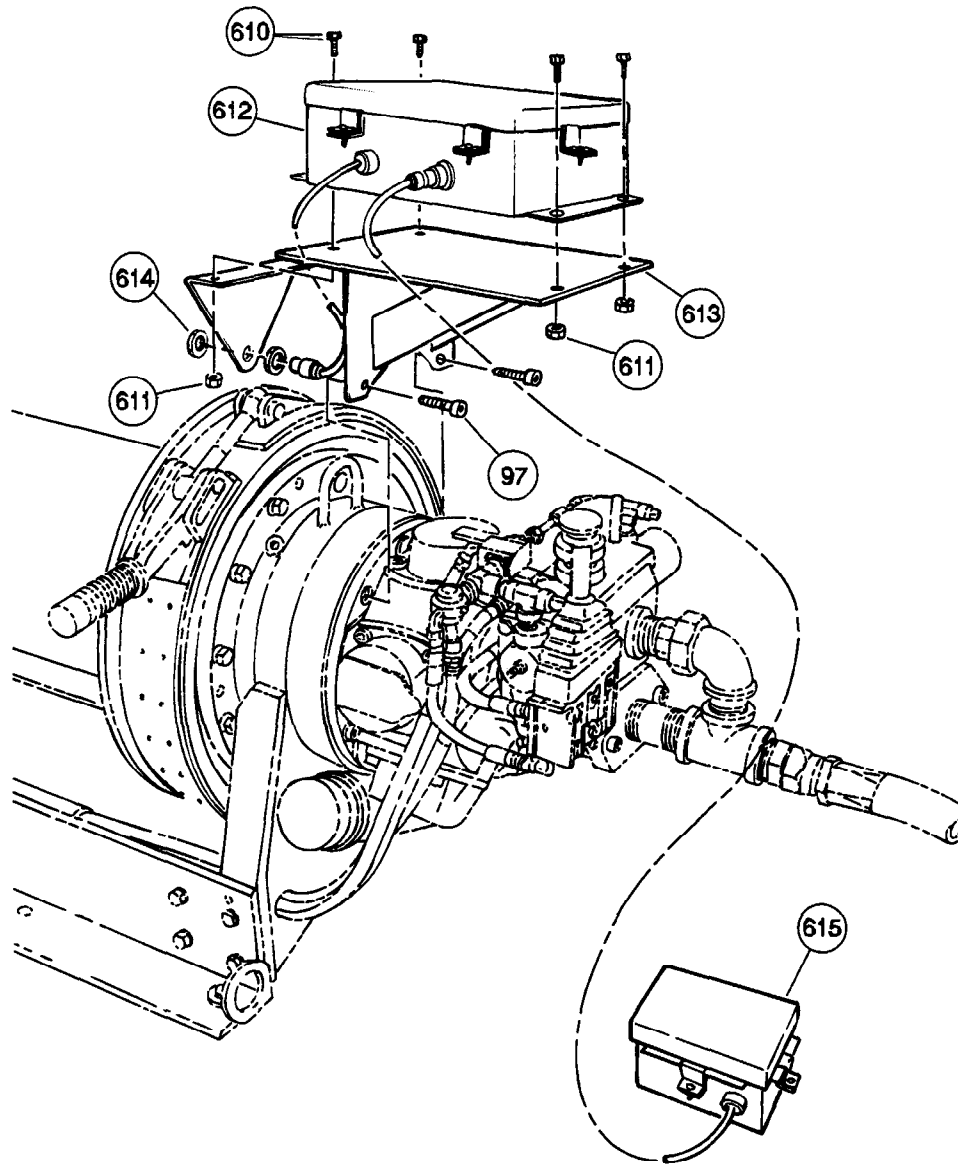


(Dwg. MHTPB0632)

PILOT AIR VALVE PLUMBING ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
269	Capscrew	8	52234
337	Tube Assembly	1	
338	Fitting	4	51814
339	Fitting, Tee	4	54678
341	Fitting	5	51034
342	Fitting, Elbow	1	71034714
343	Valve	1	50277
344	Fitting, Plug	2	50822
345	Fitting, Tee	1	71063374
346	Fitting, Elbow	1	52182
347	Capscrew	3	71053763
348	Fitting	3	52092
349	Bracket	1	20231
351	Hose Assembly	Specify Length in Feet	50923
352	Hose Assembly		
353	Hose Assembly		
354	Hose Assembly		
355	Valve Assembly	1	20991
356	Hose Assembly	Specify Length (Feet)	50923
357	Hose Assembly		
358	Throttle Valve Assembly	1	71149389
360	Nut	3	54171
525	Valve	4	51756
526	Fitting, Elbow	8	51281

LINE SPEED MONITOR ASSEMBLY DRAWING AND PARTS LIST

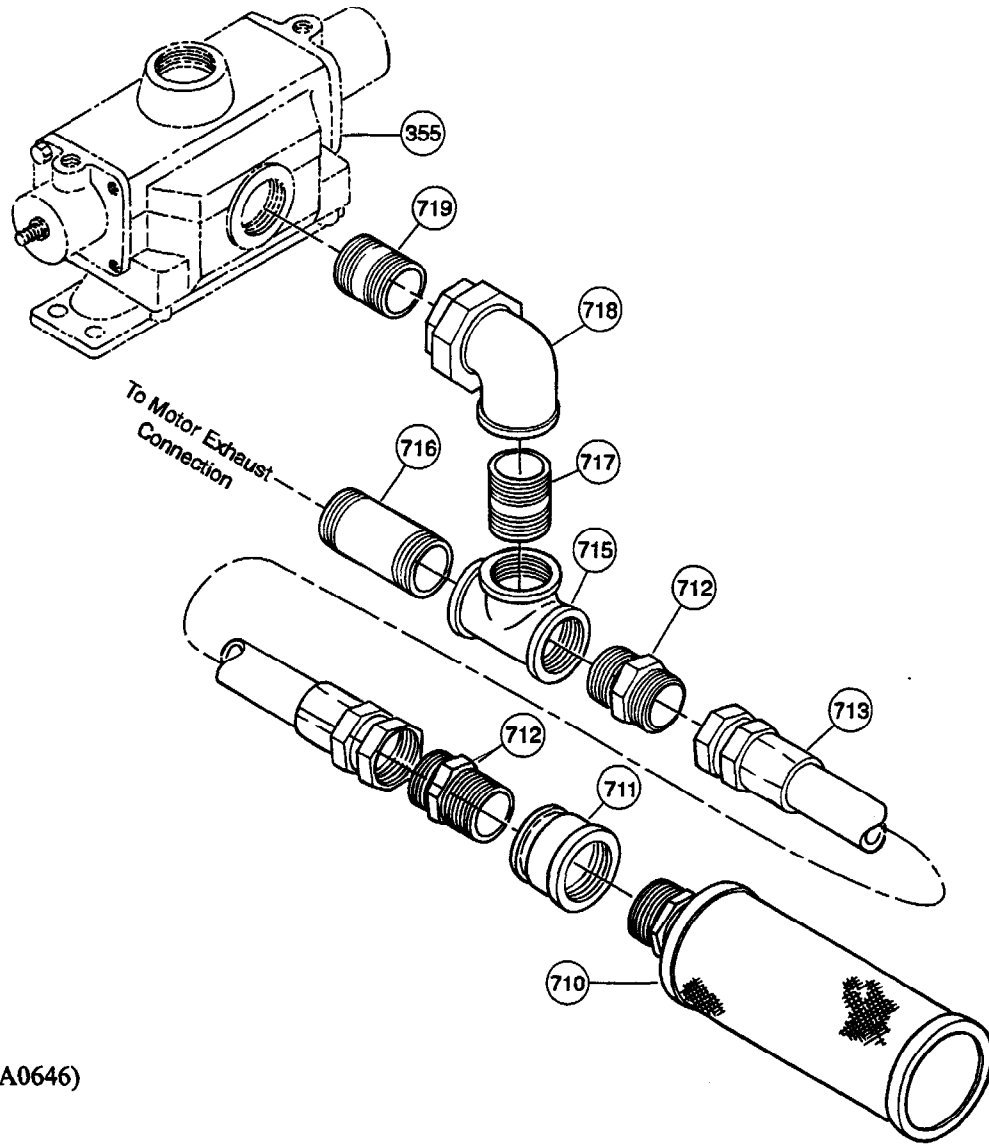


(Dwg. MHTPA0643)

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
97	Capscrew	5	50829
610	Capscrew	4	53374
611	Nut	4	53390
612	Line Speed Monitor	1	LSM1
613	Bracket, Monitor	1	23768
614	Lock Nut	2	Refer to Item 612, provided with sensor
615	Monitor Battery Charger	1	BC01
616	Bracket, Sensor	1	23823

• Recommended spare.

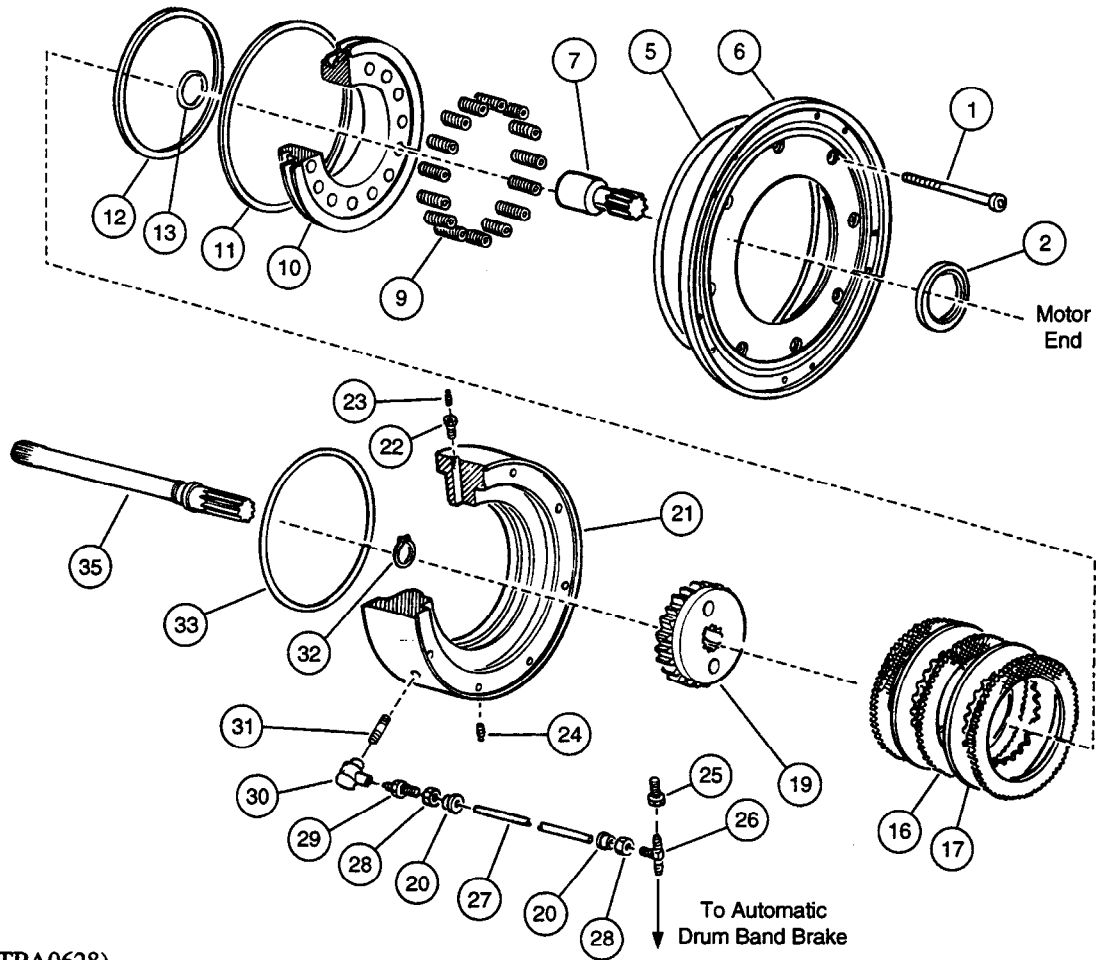
MUFFLER ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHTPA0646)

ITEM NO.	DESCRIPTION OF PART	QUANTITY TOTAL	PART NUMBER
355	Valve Assembly	1	20991
710	Muffer	1	50594
711	Fitting, Pipe	1	71144976
712	Fitting	2	52076
713	Hose Assembly	10 feet	Contact factory
714	Fitting, Pipe	1	71144984
715	Fitting, Pipe	1	71068860
716	Fitting, Pipe	1	71145056
717	Fitting, Pipe	1	71144992
719	Fitting, Pipe	1	50933

DISC BRAKE ASSEMBLY DRAWING AND PARTS LIST (OPTIONAL FEATURE)

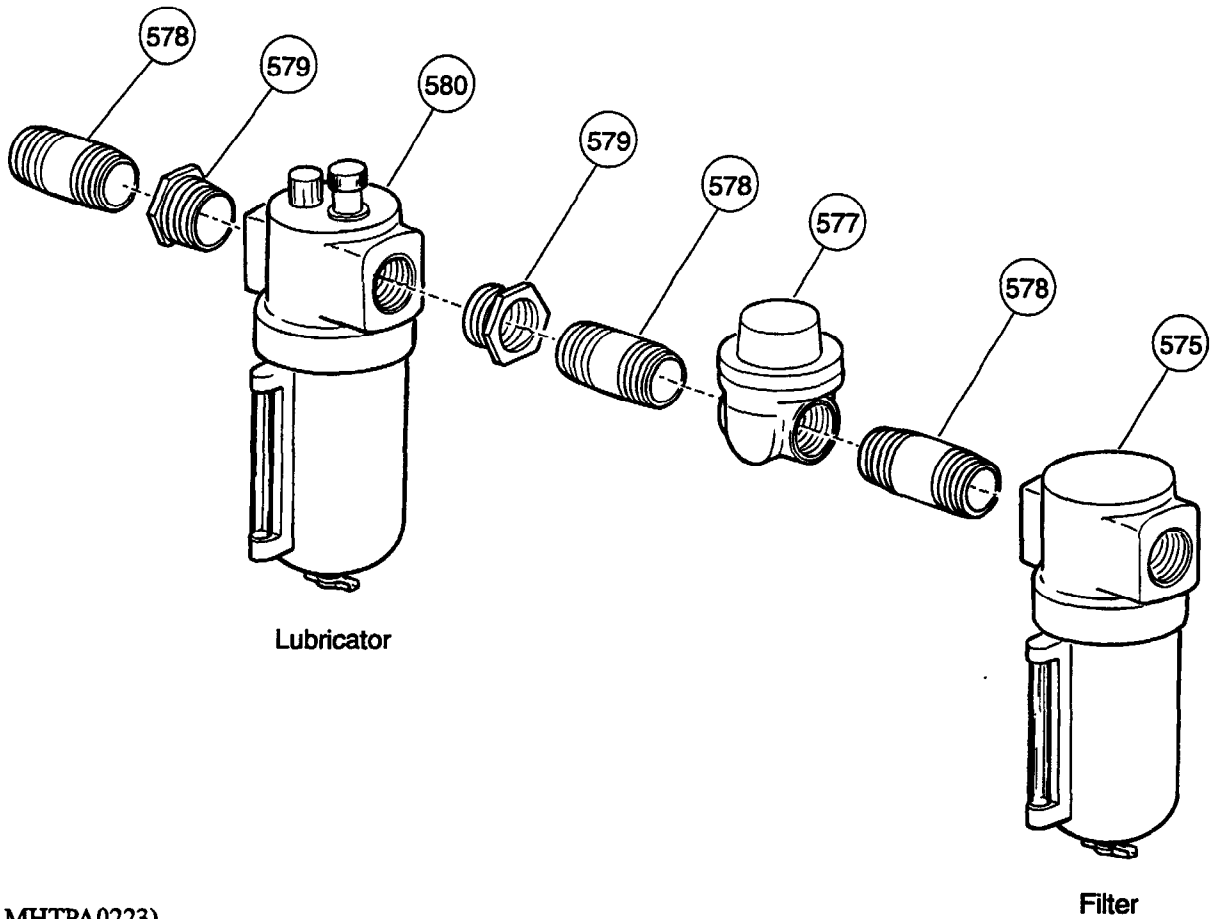


(Dwg. MHTPA0628)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
1	Capscrew	5	51448	21	Brake Housing	1	11324
• 2	Oil Seal	1	52223	22	Fitting	1	51803
• 5	O' Ring	1	51484	• 23	Breather	1	51857
6	Motor Adapter	1	10361	24	Pipe Plug	1	50801
7	Shaft Extender	1	11104	25	Fitting	1	52182
• 9	Spring	12	50751	26	Tee Fitting	1	52181
10	Brake Piston	1	15453	27	Tubing	1	52520
• 11	Seal	1	51483	28	Nut, Fitting	2	55013
• 12	Seal	1	51482	29	Vented Fitting	1	51814
15	Seal Adapter	1	---	• 30	Dump Valve	1	50276
• 16	Friction Plate	2	51481	31	Fitting	1	51034
• 17	Drive Plate	1	51480	32	Retainer Ring	1	52227
19	Splined Hub	1	11136	• 33	O' Ring	1	51460
20	Sleeve, Fitting	2	55014	35	Shaft	1	11095

• Recommended spare.

AIR PREPARATION ASSEMBLY DRAWING AND PARTS LIST (OPTIONAL)



(Dwg. MHTPA0223)

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
575	Filter	1	F42-0A-000
577	Regulator	1	R30-0A-G00
578	Pipe Nipple	3	51704
579	Pipe Bushing	2	51706
580	Lubricator	1	L40-0A-G00

* Air preparation components for 1-1/4 inch NPT system.

ACCESSORIES PARTS LIST

DESCRIPTION OF ACCESSORY	ACCESSORY PART NUMBER
Lubricant	LUBRI-LINK-GREEN
Touch-up Paint	FAP-237Y

PARTS ORDERING INFORMATION

The use of other than Ingersoll-Rand Material Handling replacement parts may invalidate the Company's warranty.

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.

INGERSOLL-RAND		MAN-RIDER™	
MATERIAL HANDLING		AIR WINCH	
MODEL NUMBER	_____		
SERIAL NUMBER	_____	SERIES	_____
MAN-LIFT SWL	_____ lb. at _____ fpm at _____ layer		
UTILITY SWL	_____ lb. at _____ fpm at _____ layer		
AIR PRESS	_____ psig	AIR FLOW	_____ scfm
DRUM SIZE	_____ Barrel Dia.	_____ Flange Dia.	_____ Lgth.
Seattle, Washington USA		71108849	

NOTICE

- Continuing improvement and advancement of design may cause changes to this equipment which are not included in this manual. Manuals are periodically revised to incorporate changes. Always check the manual edition number on the front cover for the latest issue.
- Sections of this manual may not apply to your winch.
- Using other than genuine Ingersoll-Rand Material Handling parts may adversely affect the safe operation of this product.

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.

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
Telex: 786573

or

Ingersoll-Rand Material Handling
Douai Operations
111, avenue Roger Salengro
59450 Sin Le Noble, France
Phone: (33) 27-93-08-08
Fax: (33) 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 and Order Status

**Ingersoll-Rand
Distribution Center**
P.O. Box 618
510 Hester Drive
White House, TN 37188
Phone: (615) 672-0321
Telex: 786573
Fax: (615) 672-0801

For Technical Support

**Ingersoll-Rand
Material Handling**
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046
Phone: (206) 624-0466
Telex: 786573
Fax: (206) 624-6265

Regional Sales Offices

Atlanta, GA
111 Ingersoll-Rand Drive
Chamblee, GA 30341
Phone: (404) 936-6230
Fax: (404) 936-6204

Detroit, MI
23192 Commerce Drive
Farmington Hills, MI 48335
Phone: (810) 476-6677
Fax: (810) 476-6670

Houston, TX
Suite 150
2500 East T.C. Jester
Houston, TX 77008
Phone: (713) 864-3700
Fax: (713) 864-2244

Los Angeles, CA
11909 E. Telegraph Road
Santa Fe Springs, CA 90670
Phone: (310) 948-4189
Fax: (310) 948-1828

Milwaukee, WI
12311 W. Silver Spring Dr.
Milwaukee, WI 53225
Phone: (414) 461-0973
Fax: (414) 461-3639

Philadelphia, PA
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
Telex: 786573
Fax: (206) 624-6265

**Canada
National Sales Office
Regional Warehouse
Toronto, Ontario**
51 Worcester Road
Rexdale, Ontario
M9W 4K2
Phone: (416) 675-5611
Fax: (416) 675-6920
Order Desk
Fax: (416) 674-6549

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
201-6351 Westminster Hwy
Richmond, B. C.
V7C 5C7
Phone: (604) 278-0459
Fax: (604) 278-1254

**Latin America Operations
Ingersoll-Rand
Production Equipment
Group**
730 N.W. 107 Avenue
Suite 300, Miami, FL
33172-3107
Phone: (305) 559-0500
Fax: (305) 559-7505

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

**Asia Pacific Operations
Ingersoll-Rand (Japan) Ltd.**
Kawa Bldg. No. 17
2-7 Nishi-Azabu 1-chrome
Minato-ku, Tokyo 106 Japan
Phone: (03) 3403-0641/7
Fax: 81 3 3401-2409

**Russia
Ingersoll-Rand Company**
World Trade Center
Office 1101
Krasnopresnenskaya Nab. 12
Moscow, Russia 123610