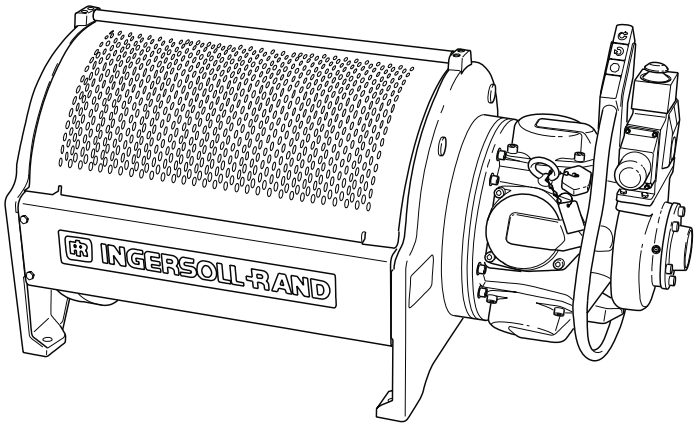
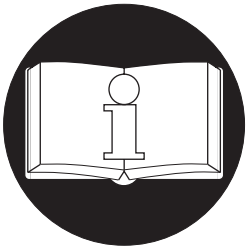
MODEL FA5A AIR WINCH
SUPPLEMENTAL SERVICE AND MAINTENANCE INSTRUCTIONS





This manual contains important service and maintenance information. Make this manual available to all persons responsible for the service and maintenance of these products.

Always operate, inspect and maintain this winch in accordance with American National Standards Institute Safety Code (ASME B30.16) and any other applicable safety codes and regulations.

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

Form MHD56111
Edition 2
March 1997
71296438

INGERSOLL-RAND
MATERIAL HANDLING

INTRODUCTION

The information contained in this manual is supplemental to information contained in the FA5A Winch, Parts, Operation and Maintenance Manual Form number MHD56087.

The information is primarily intended for service and repair personnel who may be involved with the maintenance of **FA5A Winches**. It is recommended that the FA5A Winch Parts, Operation and Maintenance Manual MHD56087 be read prior to performing any service or repair work.

This supplement only contains information on the major subassemblies which are described in separate sections. Refer to the FA5A Manual for all other information.

INDEX

SAFETY INFORMATION

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

Danger, Warning, Caution and Notice

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

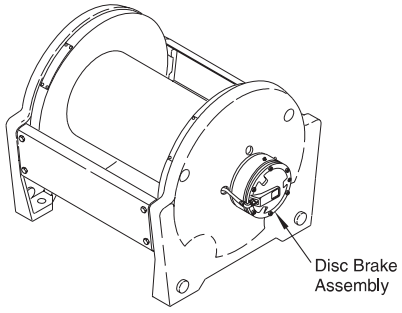
⚠ CAUTION Caution is used to indicate the presence of a hazard which ***will*** or ***can*** cause injury or property damage if the warning is ignored.

NOTICE Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard-related.

DISC BRAKE - GENERAL INFORMATION

Description

The disc brake for the **FA5A** winch bolts to the end of the winch opposite the motor. It has a cylindrical housing approximately twenty centimeters (eight inches) in diameter and ten centimeters (four inches) deep. There are eight socket head bolts located in the end cover. The disc brake has one air line running to it, a drain plug in the bottom, an oil level plug in the side, and a vented filler plug on the top.



(Dwg. MHP1218)

Operation

⚠WARNING

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

When the winch control handle is moved or the pendant control is operated, to haul-in the wire rope, a one-way clutch inside the disc brake allows free rotation of the winch drum without the need to disengage the brake. When the winch control handle is released or returned to the neutral position, or the pendant control button is released, the one-way clutch locks and the disc brake prevents the wire rope from paying-out. When the winch control handle is moved or the pendant control is operated to payout the wire rope, air pressure is directed to the brake. The air pressure releases the brake, and allows the winch drum to rotate.

Components

The disc brake is comprised of two main sections. The first is the housing and end cover plate. Under the cover plate is a diaphragm assembly. The second section is located in the brake housing and consists of a pressure plate, twelve springs, five friction and six separator plates, a one-way clutch with an inner and outer race, and a bearing pressed into a support plate. Refer to the parts drawing MHP0850 for additional information.

Function

The disc brake runs in an oil bath shared with the gearbox. The disc brake housing is bolted to the winch frame. It anchors the disc brake to the winch frame, and holds the oil that lubricates the brake. A flexible diaphragm is positioned between the end cover and the brake housing. When the winch control handle is moved or the pendant button is pushed to payout the wire rope, air pressure is introduced to the brake. The air pressure pushes on the diaphragm, which then presses on a metal diaphragm plate. The diaphragm plate transfers the force through three pins to a pressure plate.

Twelve springs constantly press on the pressure plate. The springs locate in pockets in the support plate. The spring pressure squeezes the friction and separator plates together, engaging the brake. The one-way clutch rides on inner and outer races. The one-way clutch's inner race rotates in a bearing inside the support plate, and connects through the brake shaft to the gearbox and the winch drum. The one-way clutch's outer race engages the friction plates which are located between the separator plates. Three dowel pins align the separator plates and engage them to the disc brake housing. When the plates are compressed together and the brake is engaged, there is a solid connection between the winch drum and the winch frame, and the winch drum cannot turn. Moving the winch control valve forward or pressing the pendant button to payout a load causes air pressure to relieve the spring pressure that compresses the brake discs together. This allows the winch drum to turn, and the wire rope to payout.

NOTICE

The dump valve and orifice release air pressure on the brake at a controlled rate so that the disc brake will engage promptly.

DISC BRAKE TROUBLESHOOTING

⚠WARNING

Prior to troubleshooting the disc brake, remove the wire rope from the winch drum. Failure to remove the wire rope can cause mechanical damage and/or injury.

There are two ways that the disc brake can cause problems:

1. It may fail to release.
2. It may slip or fail to engage properly.

⚠WARNING

If the one way clutch has "rolled over" the winch may have been severely overloaded. If an overload is suspected, the winch drivetrain components and brake components (especially the one way clutch and the inner and outer races) must be closely inspected for damage, and replaced if necessary. Review the FA5A winch operating procedures to be sure that the load does not exceed the rated capacity of the winch.

DISC BRAKE TROUBLESHOOTING

This section provides basic troubleshooting information. 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 disc brake symptoms, probable causes and remedies.

Symptom	Cause	Remedy
Air is not reaching the brake.	The air line is not connected to the brake.	Make sure the air line is connected to the brake.
	The air line is blocked or torn.	Make sure that the air line is not blocked, torn or pinched. Replace the air line if necessary.
The disc brake fails to release.	The diaphragm is leaking.	Remove the cover and diaphragm assembly. Inspect the diaphragm for holes or tears, and replace if necessary.
	The separator plates cannot slide freely on the three pins.	Remove and inspect the three pins for signs of galling, ridges or wear. If any signs are found, replace the pins. Check the separator plates for signs of wear and replace as needed.
	The friction plates are not free to slide on the outer race.	Make sure the plates are free to move on the race. If the plates are sticking, replace the race and/or the plates as needed.
Air pressure is applied to brake at the wrong time.	The brake activation components in the winch control valve are out of adjustment, or the control handle is not returning to neutral.	Refer to the manual for instructions on troubleshooting and adjusting the brake activation components and the winch control valve.
Air pressure is not being released from the brake at the proper time.	The orifice and dump valve assembly are not relieving air pressure from brake.	To check, operate the winch control valve handle or pendant control in the pay-out direction, then feel and listen for air escaping from the dump valve. If no air is detected, replace the orifice and dump valve assembly.
The disc brake is not properly lubricated.	The wrong amount or type of oil is in the disc brake and gearbox.	Remove the disc brake oil level plug. Oil should be just below the level of the oil level hole.
The friction and separator plates are slipping.	The wrong amount or type of oil is in the disc brake and gearbox.	Drain and replace oil from disc brake and gearbox. Refer to inspection in the “MAINTENANCE” section.
The disc brake slips or does not engage properly.	The friction plates are worn.	Inspect the plates for wear. The plates must not be glazed. If the plates are worn or glazed, replace them. Refer to inspection in the “MAINTENANCE” section.
	The pins are sticking in the housing and are not allowing free movement of the friction and separator plates.	Remove and inspect the three pins for signs of galling, ridges or wear. If any of these are found, replace the pins. Inspect the housing and if necessary ream the holes. If reaming does not clean up the holes, replace the housing. Refer to inspection in the “MAINTENANCE” section.
	The springs have collapsed.	Remove and measure the springs. Replace the springs if they are below the minimum measurement. Refer to inspection in the “MAINTENANCE” section.
	The inner race has moved out of position.	Check the retainer ring that holds the inner race in place. If it has failed, the race could move and prevent the diaphragm plate from moving properly. Replace the retainer ring. Refer to inspection in the “MAINTENANCE” section.
	The one-way clutch has "rolled over".	Check the rotation of the one-way clutch. Refer to inspection in the “MAINTENANCE” section. If the clutch has "rolled over" replace the clutch, inner and outer races.
	The brake shaft or inner race is stripped or broken.	Remove and inspect the brake shaft and the inner race. If either the shaft or race is stripped or broken, replace both.
Brake housing is extremely hot.	The brake is not releasing on time.	Adjust brake release valve. Refer to “Section 4”.

DISC BRAKE MAINTENANCE

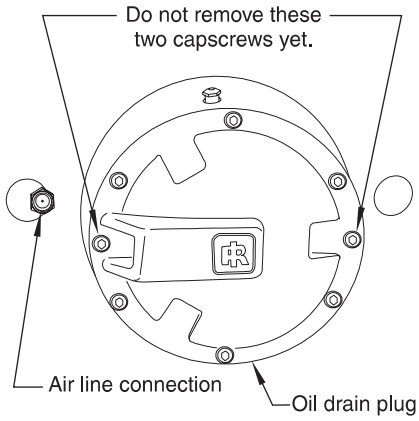
Read these instructions completely before working on the disc brake.

WARNING **Before working on the disc brake, shut off the air to the winch and remove the wire rope from the winch drum. Failure to shut off the air and remove the wire rope can cause mechanical damage and/or injury.**

CAUTION **Before working on the disc brake, lift the vent on top of the disc brake housing to discharge any internal pressure.**

NOTICE **All item numbers shown here refer to the drawing and parts list in parts section.**

Disc Brake Removal and Disassembly

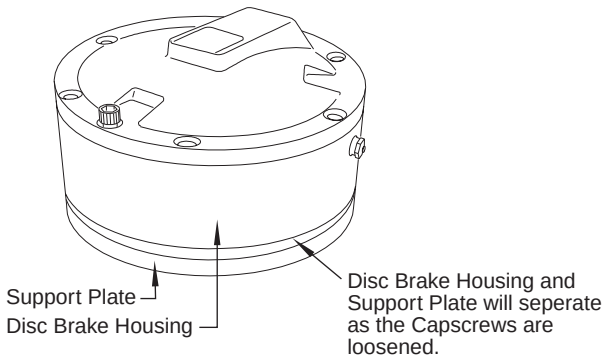


(Dwg. MHP0840)

1. Drain the oil from the brake by removing the drain plug (1) in the bottom of the disc brake housing (7). Be sure to catch the oil in a suitable container and discard it in an environmentally safe manner.

NOTICE **The oil also lubricates the gear box. If the gearbox has not been drained, oil will run out of the upright after the disc brake housing has been removed.**

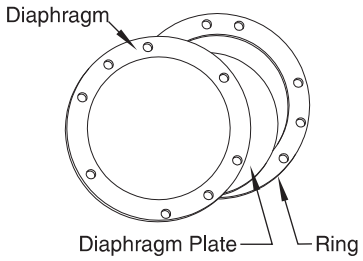
2. While the oil is draining, disconnect the air line and remove the orifice and dump valve assembly from the disc brake housing.
3. Take out the six evenly spaced capscrews (2), but leave the two that line up with the air fitting. These capscrews fasten the disc brake assembly together, and should be left in place until the brake is removed from the winch.
4. Pull the disc brake assembly straight away from the upright and place it in a drain pan. It may be necessary to use a soft hammer to loosen the disc brake housing. The splined brake shaft (34) might come out with the disc brake assembly. If it does, remove it from the brake assembly and set it aside.



(Dwg. MHP0843)

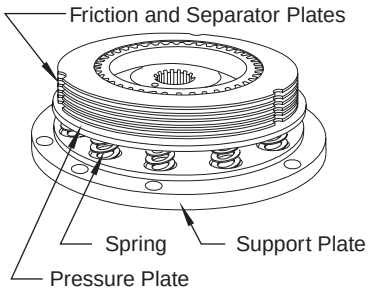
5. Lay the disc brake assembly down with the cover facing up. Loosen the remaining two capscrews by backing them out one turn at a time.

NOTICE **Spring pressure will separate the disc brake housing and the support plate.**



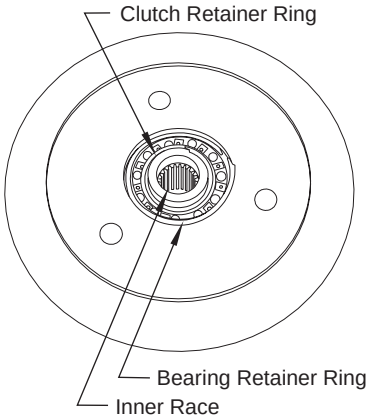
(Dwg. MHP0837)

6. Lift the housing and end cover assembly off the support plate (22), and collect the three dowel pins (8).
7. Separate the housing (7) from the end cover (4) and the diaphragm assembly.
8. Remove and set aside the diaphragm (10), ring (5), and the diaphragm plate (6).



(Dwg. MHP0769)

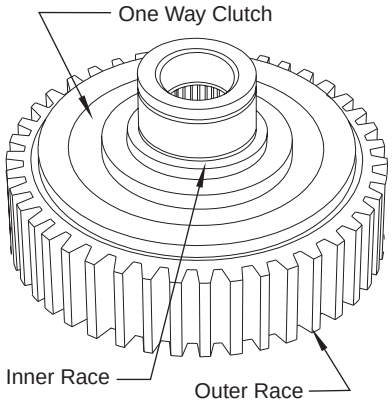
9. Remove the five fiber covered friction plates (13), six steel separator plates (14), pressure plate (12), and the twelve springs (21) from the support plate.



(Dwg. MHP0845)

10. Remove the one-way clutch assembly from its bearing (23) in the support plate by taking off the clutch retainer ring (25). Press the bearing out of the support plate after removing the bearing retainer ring (24).
11. Slide the inner race (16) out of the one-way clutch (11), then slide the one-way clutch (with the wear plates) out of the outer race (17).

Inspection



(Dwg. MHP0848)

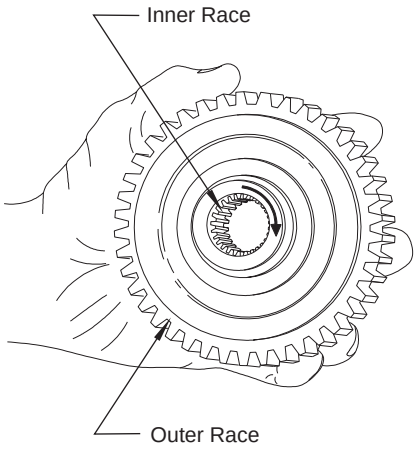
1. Check the support plate bearing for signs of wear. Bearing should rotate freely without sticking or binding. If sticking or binding is present replace bearing.
2. Inspect the one-way clutch and its inner and outer races for signs of slipping, scoring, galling, cracking or discoloration. Replace the one-way clutch and the races if they show any wear or damage.
3. The fiber covered friction plates (13) must be flat, and should not be glazed. The grooves should be sharp and even, and there should be no pieces of fiber missing. The plates should measure 2 mm ±0.1 mm (0.080 ±0.004 inches). Make sure the teeth that engage the one-way clutch are not worn or damaged. Replace any plates that show wear or damage.

NOTICE **Do not wash the friction plates in cleaning solvent. Wipe clean if needed, and replace any plates that have any pieces of debris embedded.**

4. The steel separator plates (14) must be flat, and not scored or discolored. They should measure 1.5 mm ±0.12 mm (0.060 ±0.005 inches). The three notches (on the outside of the separator plates) that engage the pins should not show any deformation. Inspect the housing, and if necessary ream the holes to 7.976 ±0.025 mm (0.314 ±0.001 inches). If reaming does not clean up the holes, replace the housing. Replace any plates or pins that show signs of wear or damage.
5. The free length of springs should measure at least 25.7 mm (1.010 inches). Replace any springs that have collapsed or are bent. Before installing new springs, compress them completely several times. This will preset the springs to the proper initial installation height.
6. Closely examine the diaphragm (10) for holes or tears. If there are any holes or tears, replace the diaphragm. Make sure the radius on the diaphragm plate is smooth and polished, and check the diaphragm cover to make sure there are no sharp edges that might damage the diaphragm.

NOTICE **Before reassembling the brake, make sure that all gasket surfaces as well as the diaphragm and corresponding surfaces of the housing and cover are clean and dry.**

Disc Brake Assembly and Installation



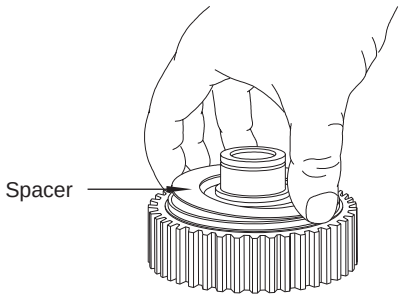
(Dwg. MHP0846)

1. Press the bearing (23) into the support plate (22), and install the retainer ring (24).
2. Holding the outer race on its side, insert the one-way clutch with its wear plates (11) partially into the outer race (17).
3. Place one of the spacers (15) against the inner race's flange before slipping the inner race (16) inside the one-way clutch. Slide the one way clutch all the way into the outer race.

⚠WARNING **Check the direction of rotation of the one-way clutch by holding onto the outer race with the small end of the inner race toward you. The inner race MUST turn clockwise, and immediately lock when turned counterclockwise.**

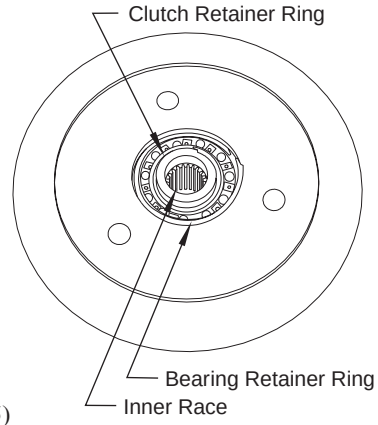
NOTICE **It may be necessary to slightly rotate the one-way clutch to fully insert it into the outer race.**

NOTICE **The direction of rotation shown applies to standard overwind winches.**



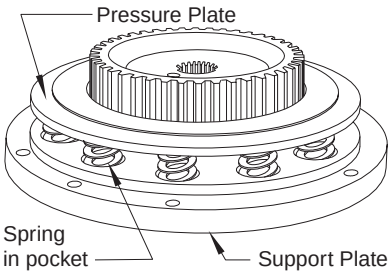
(Dwg. MHP0838)

4. Oil the one-way clutch, install the remaining spacer (15) against the clutch and slip the assembled clutch into the bearing in the support plate.



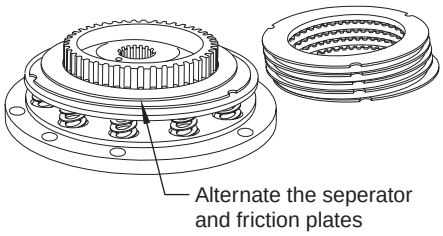
(Dwg. MHP0845)

5. Install the retainer ring (25) that holds the inner race in position.



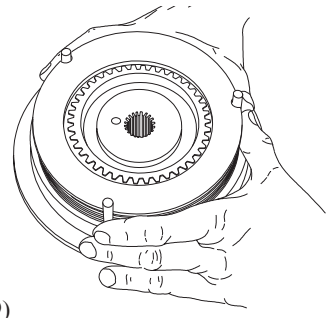
(Dwg. MHP0839)

6. Position the support plate with the spring pockets facing up. Place the springs (21) into the pockets, and rest the pressure plate (12) on top of the springs with the stepped side of the pressure plate facing away from the springs.



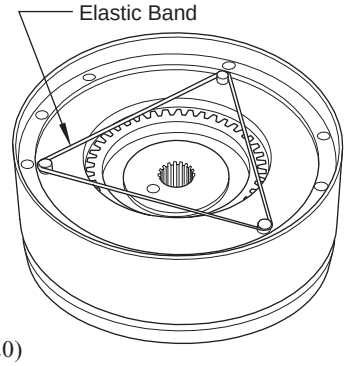
(Dwg. MHP0847)

7. Coat the friction (13) and separator plates (14) with oil. Starting with one of the steel separator plates, alternately place the separator and friction plates over the outer race.



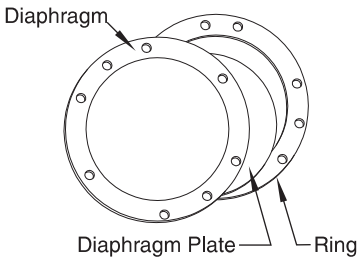
(Dwg. MHP0849)

8. Use the loose dowel pins (8) to help line up the three notches on the steel separator plates.



(Dwg. MHP1120)

9. Place a new gasket (19) on the mating surface of the support plate.
10. Set the disc brake housing (7) on its side, and slip the three dowel pins (8) through the holes provided. Wrap an elastic band around the dowel pins (on the shallow side of the disc brake housing) to hold them in position.
11. Set the disc brake housing down over the plates, shallow side up. Ensure the bolt holes are aligned.

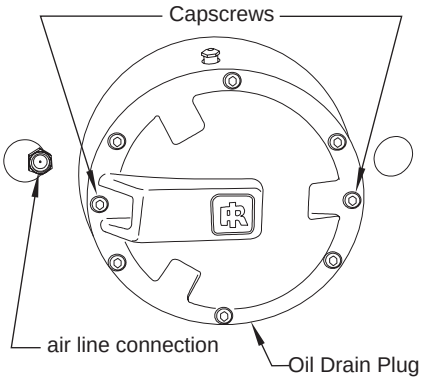


(Dwg. MHP0837)

CAUTION **The dowel pin in the back of the support plate must be between the oil level plug and the oil drain plug.**

12. Remove the elastic band and install ring (5), followed by diaphragm plate (6), diaphragm (10), and cover plate (4).

CAUTION **Ensure the diaphragm plate is positioned with the radius toward the diaphragm. The radius must be smooth and polished.**



(Dwg. MHP1077)

13. Insert two capscrews (2) in the holes lined up with the air inlet, and alternately tighten them one turn at a time until the assembly is snug.
14. Ensure the brake shaft (34) is positioned in the winch with the shouldered end toward the brake. Install a new gasket, and slide the brake assembly into place over the shaft.
15. Line the brake assembly up so that the dowel pin in the upright engages the hole in the back of the support plate.
16. Install the remaining six capscrews (finger tight). Loosen the two capscrews that hold the brake assembly together, and then evenly tighten all eight capscrews. Using a crossing pattern, torque the capscrews to 25 Nm (18 ft. lbs).
17. Reinstall the air fitting and air line, and refill the disc brake with oil until the oil runs out of the oil level plug hole. Refer to "LUBRICATION" section in the FA5A Winch Parts, Operation and Maintenance Manual MHD56087 for suitable oils. To avoid overfilling the disc brake, wait until oil stops flowing out of the oil level hole before replacing the plug.

WARNING **After performing any maintenance on the winch, test winch before returning it to service.**

Adjusting the Disc Brake

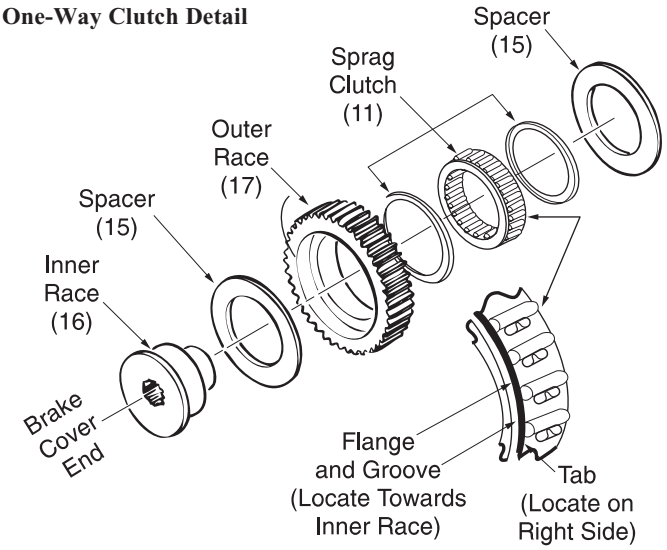
1. No adjustments are required.

Testing the Disc Brake

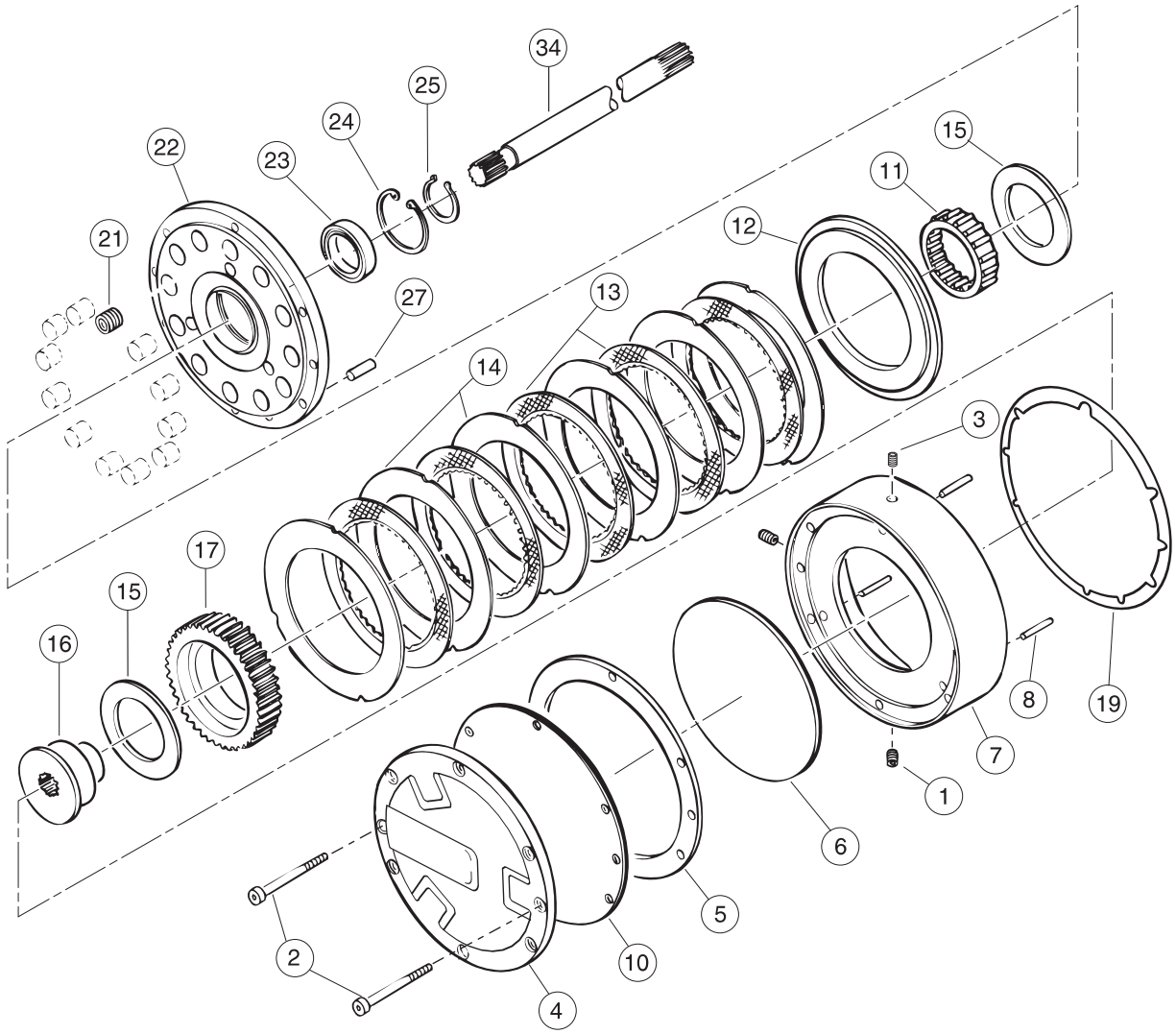
1. Ensure there is no load on the winch.
2. Set the air pressure to 6.3 bar (90 psig) static (while the air motor is not running).
3. Disconnect the air line from the disc brake, and plug the air line to prevent the loss of air pressure. (This will keep the disc brake engaged while the winch is paying out.)
4. Move the winch control valve handle or operate the pendant control in the payout direction. The winch drum should not turn. If it does turn, refer to the "TROUBLESHOOTING" section.

DISC BRAKE PARTS DRAWING

One-Way Clutch Detail



(Dwg. MHP0667)



(Dwg. MHP0630)

DISC BRAKE PARTS LIST

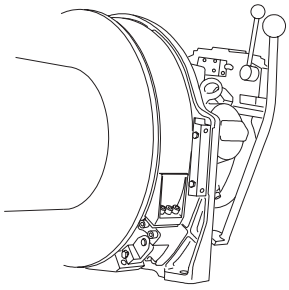
ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
- - -	Disc Brake Assembly*	1	24140
1	Plug	2	71069009
2	Capscrew	8	71264717
3	Vent (25 psi)	1	71271175
4	Cover	1	23605
5	Ring	1	22028
6	Diaphragm Plate	1	22027
7	Housing	1	22026
8	Dowel Pin	3	71126882
• 10	Diaphragm	1	22031
• 11	One-way Clutch	1	71044853
12	Pressure Plate	1	24137
• 13	Friction Plate	5	71126874
14	Separator Plate	6	22033
15	Spacer	2	19007
• 16	Inner Race	1	24038
• 17	Outer Race	1	22032
• 19	Gasket	2	71262257
• 21	Spring	12	71053730
22	Support Plate	1	24138
• 23	Bearing	1	50449
24	Retainer Ring	1	54375
25	Retainer Ring	1	71053748
27	Dowel Pin	1	71126759
34	Brake Shaft	1	24039

• Recommended Spare

* Disc Brake Assembly includes items 1 through 34

Description

The optional manual band brake for the **FA5A** winch is located on the end of the winch drum next to the air motor. It consists of a friction material lined steel band (the brake band) that encircles and grips a brake surface on the winch drum, and a manually operated engagement and release mechanism.



(Dwg. MHP1043)

Operation

The winch operator can engage the brake band at any time, whether the winch drum is turning in the haul-in direction, stationary, or turning in the payout direction. Moving the brake handle towards the winch turns an eccentric shaft which tensions the brake band, causing it to grip the brake surface and prevent the winch drum from turning. The handle will "over-center" and remain in the engaged position until released by the operator.

To release the manual brake, the operator must pull the handle away from the winch to the disengaged position allowing the winch drum to rotate freely. The winch operator needs only to apply light pressure (about 2.3 to 4.5 kg [5 to 10 pounds]) at the brake handle to engage the brake and prevent the winch drum from rotating, and only about 13.6 kg (30 pounds) to move the handle "over-center" in order to lock the brake in the engaged position.

The band brake is designed to work more efficiently in the payout direction than in the haul in direction. Therefore, if the brake is applied when hauling in, it may not completely stop the winch drum from turning.

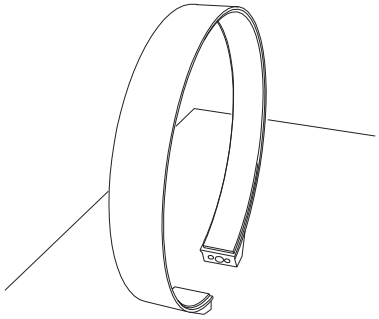
Components

The band brake has two main assemblies. The first assembly consists of a friction material lined steel band that encircles and grips the brake surface at one end of the winch drum. The second assembly is the handle and eccentric assembly that tensions and releases the band when the winch operator moves the brake handle.

Function

Brake band

The brake band is composed of a flat steel strip formed into a circular shape and lined inside with a friction material. Capscrews threaded through brackets welded to the brake band attach one end of the band to the eccentric assembly and fasten the other end to an brake bracket secured to the winch upright.

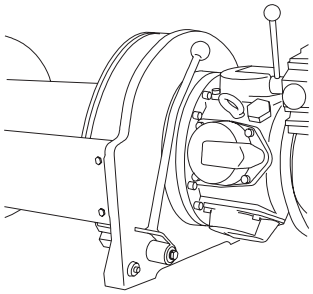


(Dwg. MHP1030)

Handle and eccentric assembly

Refer to Dwg. MHP1037

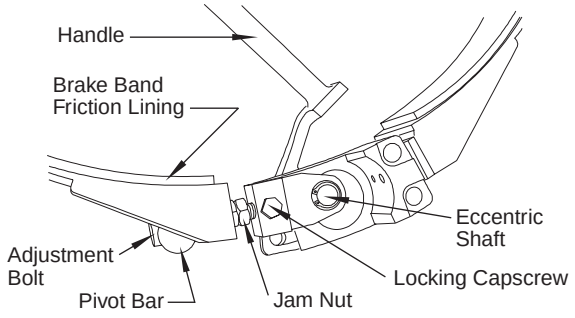
The brake handle has a splined end that engages an eccentric shaft passing through bearings in an brake bracket which bolts to the winch upright. There are two needle bearings pressed into the brake bracket, and are protected from contamination by 'O' rings that act as dirt exclusion seals.



(Dwg. MHP1037)

A cam plate pivots on the end of the eccentric shaft, and this plate is connected to the free end of the brake band by an adjustment bolt. The cam plate contains a self lubricating composite bearing (the sleeve bearing) that allows the cam plate to pivot freely when the brake is being operated. The adjustment bolt passes through a pivot bar, and is retained in the pivot bar by a jam nut that is permanently secured to the bolt. Turning the jamnut (using an open end wrench) adjusts the band brake. A locking capscrew acting on a soft bronze locking pellet prevents the adjustment bolt from turning once the brake is properly adjusted.

The locking pellet prevents the locking capscrew from damaging the adjustment bolt when the locking capscrew is tightened. The pivot bar allows the adjustment bolt to pivot slightly as the brake is tensioned and released.



(Dwg. MHP1035)

MANUAL BAND BRAKE TROUBLESHOOTING

This section provides basic troubleshooting information. 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 manual brake symptoms, probable causes and remedies.

⚠WARNING **Before troubleshooting the band brake, remove the wire rope from the winch drum. Failure to remove the wire rope before working on the winch can cause mechanical damage and/or injury.**

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
---	Brake Assembly	1	21890
101	Capscrew	3	71264808
102	Hardened Washers	3	21899
103	Spacer Tube	3	21891
104	Band Assembly	1	24367
105	Spacer	1	23029
106	Brake Bracket	1	21884
107	Capscrew	2	71264832
112	Capscrew	2	71264824
117	Jam Nut	2	71264790
119	Pivot Bar	1	23755
120	Capscrew	1	71288039
• 129	Locking Pellet	1	23737
130	Capscrew	2	52160
131	Cam Plate	1	21893
132	Retainer Ring	1	71145122
133	Washer	1	71137905
• 134	Sleeve Bearing	1	23749
135	Eccentric Shaft	1	21895
• 137	“O” Ring	1	71138648
• 138	Bearing	1	71138663
• 140	Bearing	1	71138671
• 141	“O” Ring	1	71138697
142	Brake Handle	1	21898
143	Washer	2	71266449
145	Handle Ball	1	71144273

• Recommended Spare

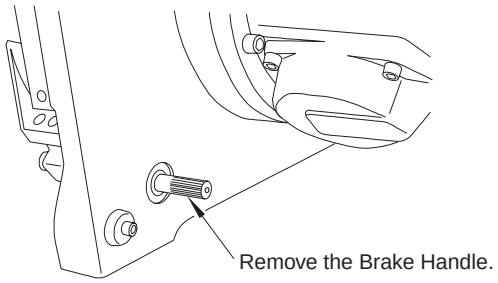
MANUAL BAND BRAKE MAINTENANCE

Read these instructions completely before working on the manual band brake.

⚠WARNING **Before working on the band brake, make sure the wire rope is slack. Releasing the band brake while there is a load on the winch can result in mechanical damage and/or injury.**

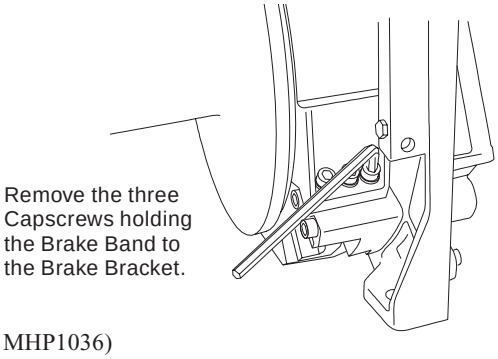
NOTICE **Service is most easily done with the motor end of the winch blocked up approximately 10 cm [4 inches]. Be sure to support the winch securely so that it cannot move while it is being serviced.**

Manual Band Brake Removal and Disassembly



(Dwg. MHP1044)

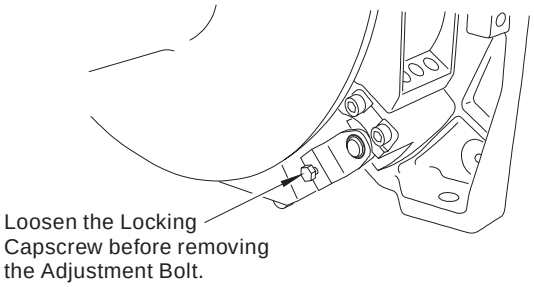
1. Remove the sideframe closest to the brake assembly by taking out the four capscrews that fasten the sideframe to the uprights. This will allow easy access to the band brake assembly.
2. Move the brake handle to the brake release position.
3. Remove the capscrew (130) and washers (143) that hold the band brake handle to the eccentric shaft (135), and pull the handle off the shaft.



(Dwg. MHP1036)

4. Remove the three capscrews (101) that anchor the stationary end of the brake band to the brake bracket (106).

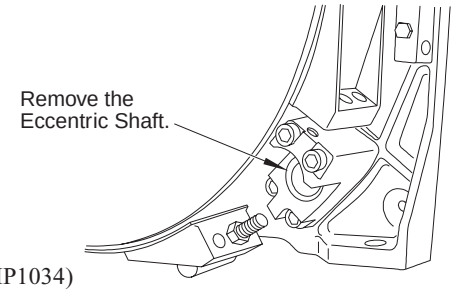
NOTICE **Make sure to remove and set aside the three tubular steel spacers (103) and the rubber spacer (105).**



(Dwg. MHP1041)

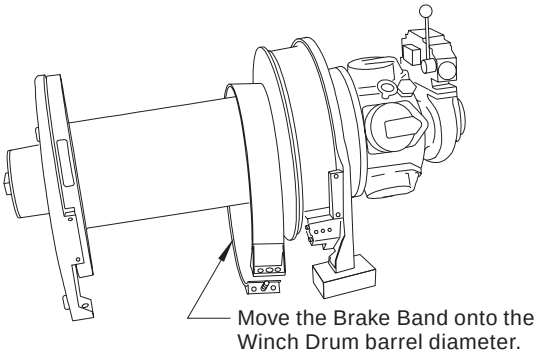
5. Loosen the locking capscrew (130) and then unscrew the adjustment bolt (120) from the cam plate (131). (Note: The locking pellet (129) may fall out if the adjustment bolt is removed. Retain it for reuse.)

⚠CAUTION **The adjustment bolt is a specially treated, high strength fastener permanently attached to the jam nut. Do not remove the adjustment bolt from the end of the band brake unless the threads have been damaged, or if the brake band itself is being replaced.**



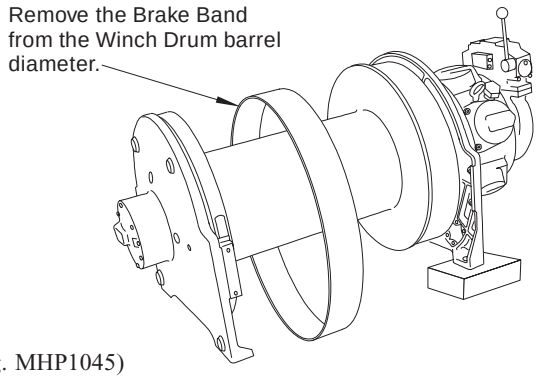
(Dwg. MHP1034)

6. Push the splined end of the eccentric shaft (135) towards the drum and remove it from the brake bracket (106).



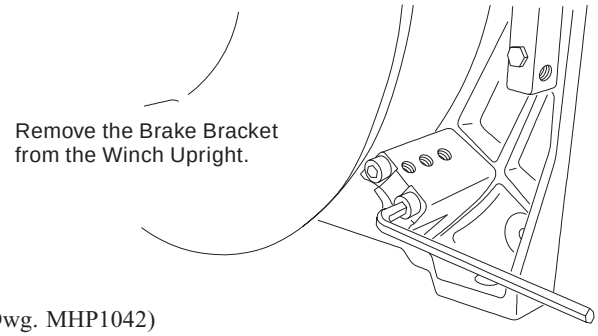
(Dwg. MHP1033)

7. Gently spread the ends of the brake band apart and slide it off the brake drum and onto the winch drum.



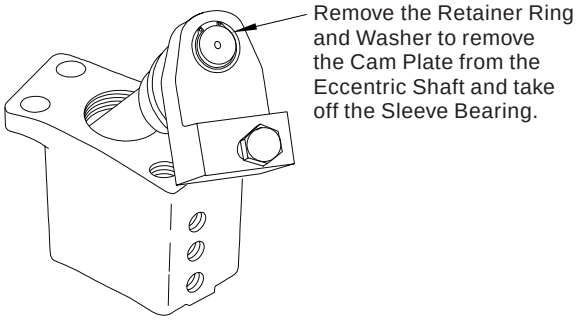
(Dwg. MHP1045)

8. Gently spread the ends of the brake band apart far enough to clear the winch drum barrel diameter and take it off the drum.



(Dwg. MHP1042)

9. Using a 10 mm allen wrench, loosen and remove the two long and two short capscrews (107 and 112) that fasten the brake bracket (106) to the winch upright.



(Dwg. MHP1040)

10. If needed, the 'O' rings and bearings can be removed from the brake bracket. The 'O' rings are easily removed with a blunt scribe or a screwdriver, and the small needle bearing (140) can easily be removed by pressing it out. Removal of the larger needle bearing (138) is only required if the bearing housing is cracked or chipped or if the rollers are damaged. Removal in this case can be accomplished using a punch, driven against the bearing outer race.

⚠ CAUTION **This may shatter the race and cause pieces to scatter. Be sure to wear safety glasses.**

11. Remove the retainer ring (132) that holds the cam plate to the eccentric shaft, and remove the washer (133), cam plate (131), and sleeve bearing (134). This completes the disassembly of the manual band brake.

Inspection

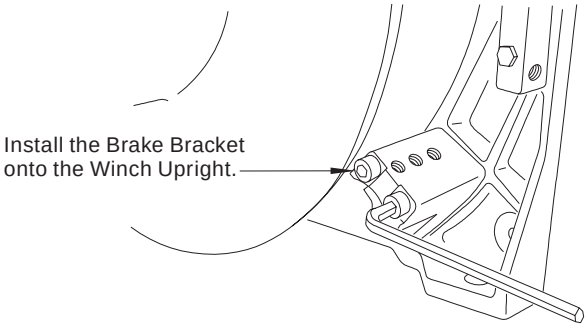
1. Check the sleeve bearing allows free movement of the cam plate. Replace if worn oval by more than 0.76 mm (0.03 inch).
2. Inspect the eccentric shaft bearing surfaces for galling and flat spots.
3. Make sure the two bearings in the brake bracket allow the eccentric shaft to move smoothly and easily. Replace the bearings if any of the needles are damaged or if the outer shells are cracked or chipped.
4. Examine the adjustment bolt threads and the locking pellet for any damage. Replace them if the adjustment bolt is bent or the threads are damaged, or if the pellet is tight in the threaded locking screw hole.
5. Make sure that the rubber spacer between the brake band and the brake bracket is still pliable and has not hardened or cracked.
6. Replace the brake band if the friction surface measures less than 1.5 mm (1/16 inch) thick anywhere on the band.

NOTICE

Do not wash the brake band in cleaning solvent. Wipe clean, or if needed use a commercially available brake cleaner.

7. Check the tubular spacers for signs of collapsing. If any of them are buckling or collapsing, replace them as a set. They should measure 28.3 to 28.8 mm (1.115 to 1.135 inches).
8. Check for any signs of wear on the hardened flat washers that retain the tubular spacers. If they are wearing, replace them as a set.
9. Inspect the 'O' rings (the dirt exclusion seals) for damage. Replace if necessary.

Manual Band Brake Assembly and Installation

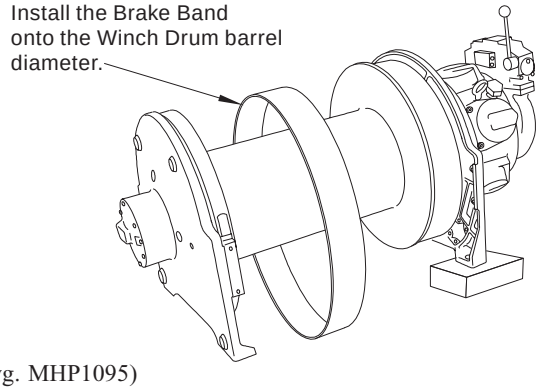


(Dwg. MHP1094)

NOTICE

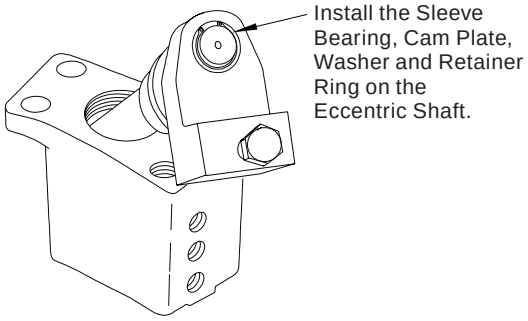
Band brake installation is most easily done with the motor end of the winch blocked up approximately 10 cm [4 inches]. Be sure to support the winch securely so that it cannot move while it is being serviced.

1. If the needle bearings (138 and 140) were removed, press them back into place. Lubricate them by packing with a good quality EP grease, and install and lubricate the 'O' ring dirt exclusion seals with the same grease.
2. Using the two long (107) and two short (112) capscrews, fasten the brake bracket (106) to the winch uprights. Torque the capscrews to 45-50 Nm (33-36 ft. lbs.)



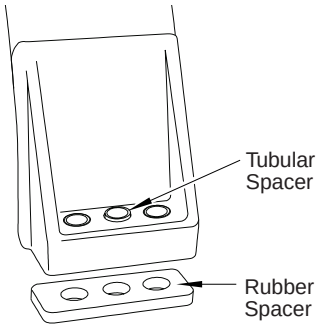
(Dwg. MHP1095)

3. Gently spread the ends of the brake band (104) apart and slip the band over the winch drum barrel diameter.
4. Gently spread the ends of the brake band, and slip it over the flange and onto the brake surface.



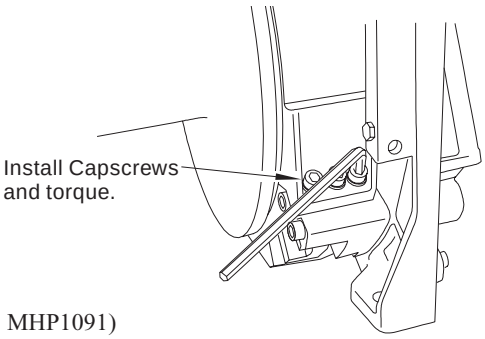
(Dwg. MHP1092)

5. Lubricate the sleeve bearing (134) with EP grease, and install on the eccentric shaft (135) followed by the cam plate (131), the washer (133), and the retainer ring (132).
6. Insert the eccentric shaft into the brake bracket .



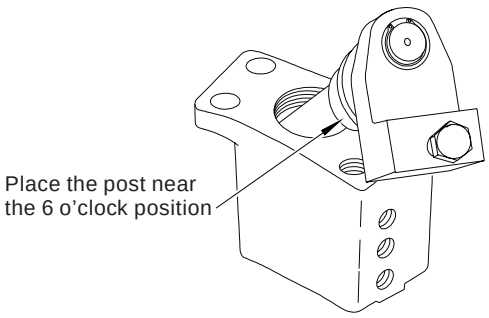
(Dwg. MHP0986)

7. Place the three anchor capscrews (101) through the washers (102), tubular spacers (103), the brake band (104) and the rubber spacer (105).



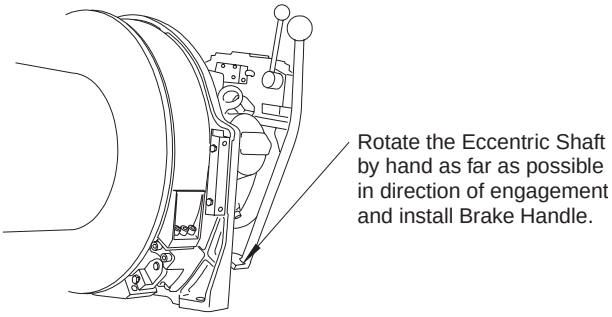
(Dwg. MHP1091)

8. Fasten the end of the brake band to the brake bracket and torque the capscrews to 45-50 Nm (33-36 ft. lbs).



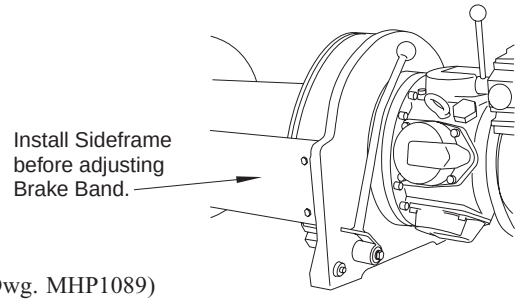
(Dwg. MHP1093)

9. Position the eccentric shaft so that the post on the eccentric shaft is near the "6:00 o'clock" position. If it is necessary to replace the adjustment bolt, procure the proper replacement bolt from an **Ingersoll-Rand** distributor. Remove the protective coating from the threads for a distance of 9.5 mm (3/8 inch) from the shank of the capscrew. Insert the new capscrew through the pivot bar and the brake bracket on the brake band. Apply several drops of Loctite® 242 threadlocking compound onto the bare threads near the shank of the capscrew. Install and tighten a jam nut to hold the adjustment bolt in position. The adjustment bolt should turn freely. Thread the adjustment bolt at least 10 mm (3/8 inch) into the cam plate. This ensures that the locking pellet will contact the adjustment bolt and hold it in place. Insert the locking pellet inside the threaded hole in the side of the cam plate, and hand tighten the locking capscrew into position.



(Dwg. MHP1090)

10. By hand, rotate the eccentric shaft and cam plate in the engaged direction as far as possible. Then, install the brake handle in the released position. The handle should move easily in both directions, and should not fully engage the brake before it is adjusted. If needed, reposition the brake handle before adjusting the brake.



(Dwg. MHP1089)

11. Install the sideframe, and then adjust the band brake.

⚠WARNING **Always adjust and test the band brake after completing repairs or adjustments. Failure to adjust and test the band brake could lead to mechanical damage and/or injury.**

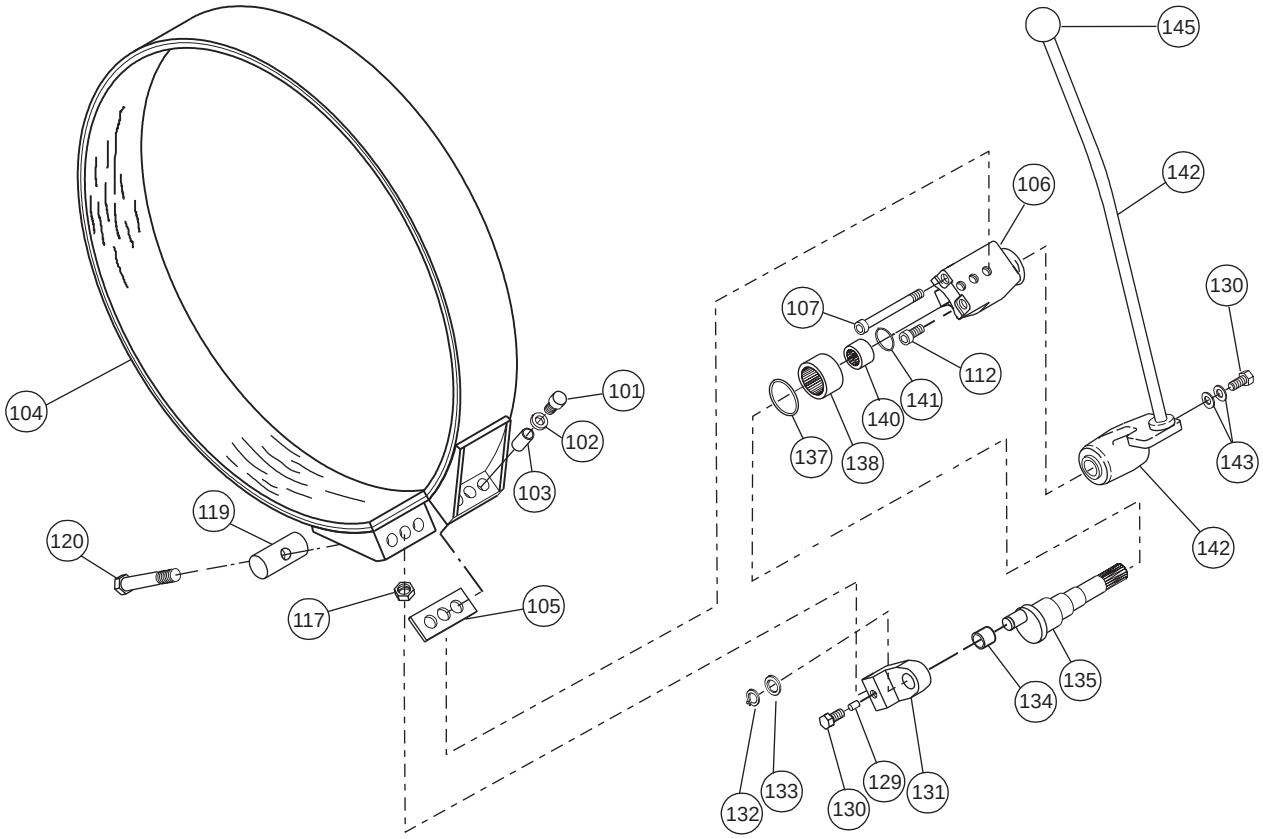
Adjusting the Manual Band Brake

1. Place the band brake handle in a completely released position. Take up some of the slack in the brake band by turning the adjustment bolt, and then tighten the locking capscrew to prevent the adjustment bolt from moving.
2. Move the control handle towards the engaged position. The handle should encounter growing resistance starting at about the last third of its travel. The resistance should not be enough to stop the handle from going "over-center" at the end of its travel. Make sure the handle does not contact the air motor adapter before it goes fully over-center. For maximum load holding capacity, the handle should just "over-center" before it touches the motor adapter. If it "over-centers" too soon, the brake holding capacity will be diminished. If it does over-center too soon, reposition it on the splined eccentric shaft and readjust the brake.
3. The force needed to move the handle "over-center" should be about 13.5 kg (30 lbs). If the handle cannot go "over-center," or if there is excessive resistance, reduce the tension by turning the adjustment bolt in the counterclockwise direction. There must be slack in the band brake when the handle is in the released position. Always test the band brake before use.

Testing the Manual Band Brake

1. Remove any load from the winch, or if possible remove the wire rope. If there is wire rope on the winch, this test may cause it to unspool.
2. Set the inlet air pressure to 6.3 bar (90 psig) static (while the air motor is not running).
3. If the winch is equipped with an automatic disc or band brake, it must be disengaged before testing the band brake. Disconnect the air line from the automatic disc or band brake, and plug it to prevent loss of air pressure. Apply and hold air pressure from an external source 3.5 to 6.3 bar (50 to 90 psig) directly to the air line fitting on the automatic disc or band brake while testing the manual band brake.
4. Move the brake handle towards the winch until it goes fully "over-center."
5. Move the winch control valve handle or operate the pendant control in the payout direction. The winch drum should not turn. If it does turn, review the information on troubleshooting the manual band brake.

MANUAL BAND BRAKE PARTS DRAWING



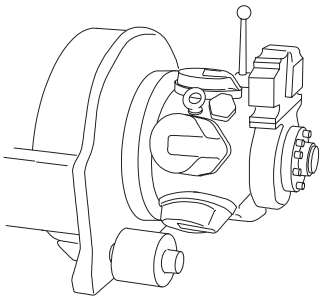
(Dwg. MHP1079)

MANUAL BAND BRAKE PARTS LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
---	Brake Assembly	1	21890
101	Capscrew	3	71264808
102	Hardened Washers	3	21899
103	Spacer Tube	3	21891
104	Band Assembly	1	24367
105	Spacer	1	23029
106	Brake Bracket	1	21884
107	Capscrew	2	71264832
112	Capscrew	2	71264824
117	Jam Nut	2	71264790
119	Pivot Bar	1	23755
120	Capscrew	1	71288039
• 129	Locking Pellet	1	23737
130	Capscrew	2	52160
131	Cam Plate	1	21893
132	Retainer Ring	1	71145122
133	Washer	1	71137905
• 134	Sleeve Bearing	1	23749
135	Eccentric Shaft	1	21895
• 137	“O” Ring	1	71138648
• 138	Bearing	1	71138663
• 140	Bearing	1	71138671
• 141	“O” Ring	1	71138697
142	Brake Handle	1	21898
143	Washer	2	71266449
145	Handle Ball	1	71144273

• Recommended Spare

Description
The optional automatic band brake for the **FA5A** winch is located on the end of the winch drum next to the air motor. It consists of a friction material lined steel band (the brake band) that encircles and grips a brake surface on the winch drum, and a spring loaded pneumatic release assembly.

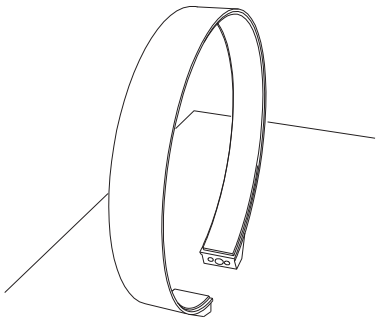


(Dwg. MHP0983)

Operation
The friction material lined steel band remains tensioned, gripping the brake surface until the winch control valve or pendant control is operated to haul-in or payout a load. When the winch is hauling in or paying out a load, air pressure applied to a cylinder assembly releases the band brake and allows the winch drum to rotate freely. When the operator returns the winch control valve handle to the neutral position or stops operating the pendant control, the air pressure is shut off and spring pressure tensions the brake, preventing the winch drum from rotating.

Components
The automatic band brake consists of two main assemblies. The first consists of a brake band that encircles a brake surface on one end of the winch drum. The second is a spring loaded pneumatic release assembly that is activated by air pressure from the winch control valve or pendant control.

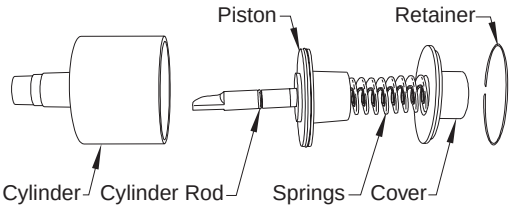
Brake band
The brake band is composed of a flat steel strip formed into a circular shape and lined inside with a friction material. Capscrews threaded through welded brackets anchor one end of the brake band to the winch and fasten the other end of the brake band to the pneumatic release assembly.



Dwg. MHP1030

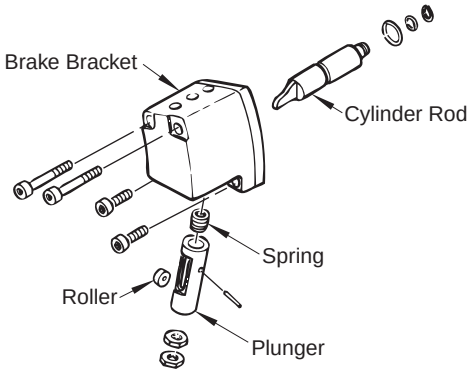
Pneumatic release assembly
The pneumatic release assembly is composed of two parts: (A) the cylinder assembly, and (B) the brake bracket and plunger assembly.

(A) Cylinder assembly
The cylinder assembly consists of a cylinder that houses a cylinder rod, a piston, a nested pair of springs, and a cover that is secured to the cylinder by a retainer ring. The cylinder assembly threads through the side frame of the winch into the brake bracket and plunger assembly.



(Dwg. MHP0984)

(B) Brake bracket and plunger assembly
The brake bracket and plunger assembly is bolted to the drum side of the winch upright (next to the motor). Four capscrews fasten the brake bracket to the upright. Three more capscrews fasten one end of the brake band to the brake bracket. Inside the brake bracket is a plunger that is attached to the other end of the brake band by an adjustment bolt. The adjustment bolt runs through a pivot bar on the band and threads into the plunger. The pivot bar allows the adjustment bolt to pivot slightly as the brake is tensioned and released.



(Dwg. MHP1081)

NOTICE

Additional important parts that allow the band brake to function properly are the dump-valve and the orifice. These parts thread into the side of the cylinder assembly, and release air pressure on the brake at a controlled rate allowing the band brake to engage promptly and without hesitation.

Function
The automatic band brake is spring actuated so that it is always tensioned unless the winch operator moves the winch control valve handle or operates the pendant control to haul-in or payout a load. Springs inside the cylinder assembly push on a piston that is connected to the cylinder rod. The cam shaped end of the cylinder rod engages a plunger inside the band bracket. The plunger is attached to the brake band by an adjustment bolt. While the springs press on the piston, the cylinder rod moves the plunger, pulls on the adjustment bolt, and tensions the brake.

When the operator moves the winch control valve or operates the pendant control, some air pressure is diverted to the brake cylinder. The air pressure acts on the piston to counteract the spring pressure and retract the cylinder rod. When the cylinder rod retracts, it allows the plunger to move the brake band into the released position. When the operator returns the winch control valve handle to neutral or stops actuating the pendant control, air pressure to the brake is shut off, the dump valve releases the air pressure from the cylinder, and the spring pressure pushes on the piston causing the band brake to engage.

AUTOMATIC BAND BRAKE TROUBLESHOOTING

⚠WARNING **Before troubleshooting the band brake, remove the wire rope from the winch drum. Failure to remove the wire rope before working on the winch can cause mechanical damage and/or injury.**

There are two ways that the band brake can cause problems:
1. It might not release
2. It might not hold the load

If one of the above problems is present check the following before removing any brake components from the winch:

Check the following before removing any brake components from the winch:

Symptom	Cause	Remedy
The brake does not release.	The air line is not connected to the brake.	Make sure the air line is connected to the brake.
	The air line is blocked, pinched, or torn.	Make sure that the air line is not blocked, torn or pinched. Replace the air line if necessary.
	The brake is not adjusted properly.	Adjust the brake.
The band brake does not hold the load.	The brake band (104) has worn past safe limits.	Adjust the brake band (refer to proper section). Replace the band if it measures less than 1.5 mm (1/16 inch) thick anywhere on the band lining, or if it can no longer be adjusted.
	The adjustment bolt (120) is not locked in position.	Check the adjustment bolt lock nuts, and tighten them if needed.
	The three anchor capscrews (101) are loose.	Inspect the anchor capscrews. If necessary, torque them to 45-50 Nm (33-36 ft lbs.)
	The three tubular spacers (103) have collapsed or are worn.	Inspect the tubular spacers. They should measure between 28.3 and 28.8 mm (1.115 and 1.135 inches). If they have collapsed or are worn, replace them.
	The brake activation components in the winch control valve are out of adjustment, or the control handle is not returning to neutral.	Refer to the manual for instructions on troubleshooting and adjusting the brake actuation components in the winch control valve.
	The orifice and dump valve assembly are not relieving air pressure from the brake.	To check, operate the winch control valve handle or pendant control, while feeling and listening for air escaping from the dump valve. If no air is, detected, replace the orifice and dump valve assembly.

If the air pressure is adequate and the brake is properly adjusted, remove the pneumatic release assembly from the winch and continue troubleshooting.

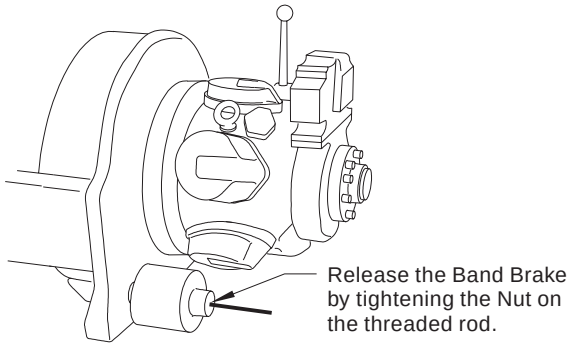
Symptom	Cause	Remedy
The band brake does not release.	Air is leaking past the piston (123) inside the cylinder (121).	Replace the 'O' rings (109, 110, and 122) that prevent air from leaking inside the cylinder.
	The retainer ring (111) that fastens the cylinder rod (108) to the piston (123) has failed.	Replace the retainer ring.
	The cylinder rod (108) is sticking inside the cylinder (121).	Make sure the cylinder rod slides smoothly inside the cylinder.
	The plunger (114) is sticking inside the brake bracket (106).	Make sure the plunger slides smoothly inside the brake bracket.
	The spring (113) has collapsed or is bent.	Replace the spring.
The band brake does not hold the load.	The springs in the pneumatic release assembly have collapsed.	Check the spring length. The springs (124) and (127) should measure 203 mm (8.0 inches). If either spring measures less than this dimension, replace.
	The cylinder rod (108) is sticking in the cylinder (121).	Make sure the cylinder rod is lubricated properly and slides smoothly inside the cylinder.
	The plunger (114) is sticking inside the brake bracket (106).	Make sure that the plunger is lubricated properly and slides smoothly inside the brake bracket.
	The roller (116) or dowel pin (115) is worn or broken.	Inspect the roller and dowel pin for wear. Replace if necessary.

Read these instructions completely before working on the automatic band brake.

⚠WARNING **Before working on the band brake, make sure that the air to the winch is shut off, and the wire rope has been removed. Working on the brake while there is a load on the winch can cause mechanical damage and/or injury.**

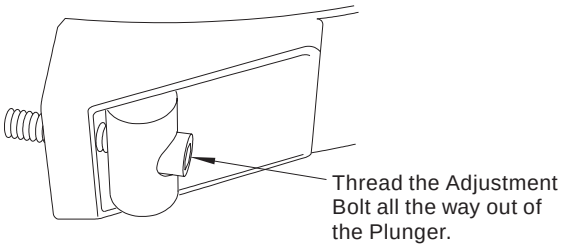
NOTICE **Service is most easily done with the motor end of the winch blocked up approximately 10 cm (4 in.). Be sure to support the winch securely so that it cannot move while being serviced.**

Automatic band brake maintenance



(Dwg. MHP1096)

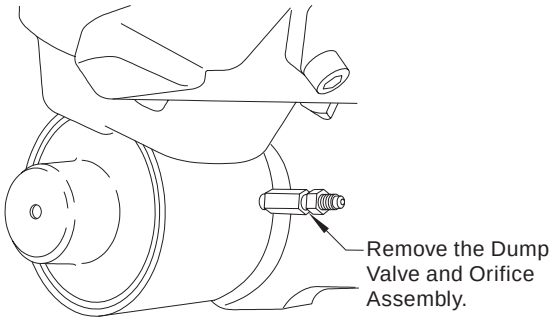
1. Remove the winch sideframe closest to the brake assembly by taking out the four capscrewss fastening it to the corner bars mounted to the uprights. This will allow easy access to the band brake assembly.
2. Thread a piece of 3/8 NC threaded rod approximately 36 cm (14 inches) long fully into the tapped hole in the cylinder rod (inside the cylinder). Make sure the threaded rod is fully tensioned. Slip a flat washer over the threaded rod, and then thread a nut against the cover. Tighten the nut to disengage the brake band.



(Dwg. MHP0976)

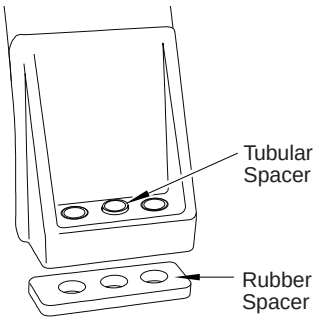
3. While the brake band is in the released position, loosen the adjustment bolt lock nut (117) and thread the adjustment bolt (120) all the way out of the plunger (114).

NOTICE **Do not remove the locknuts from the adjustment bolt unless the bolt is to be replaced.**



(Dwg. MHP0980)

4. Remove the air line and remove the dump valve and orifice assembly from the cylinder.

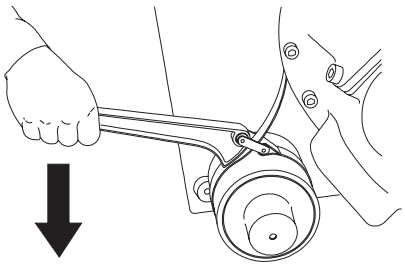


(Dwg. MHP0986)

5. Remove the three capscrews (101) and washers (102) that fasten the stationary end of the brake band to the brake bracket (106).

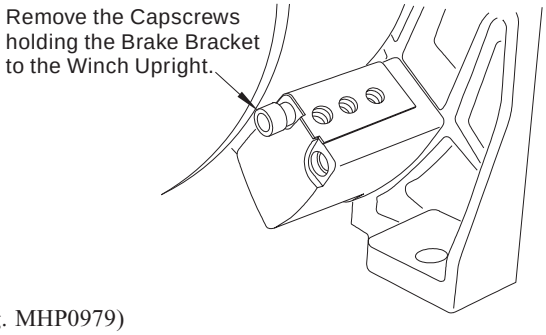
NOTICE

Make sure to remove and retain the three tubular steel spacers (103) and the rubber spacer (105).



(Dwg. MHP0923)

6. Using a cloth strap wrench, turn the cylinder assembly counterclockwise to loosen and remove it from the winch.

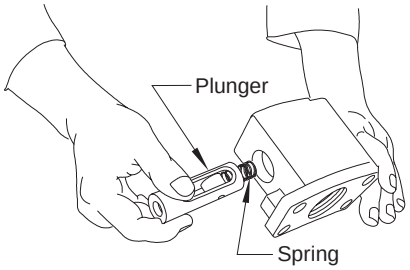


(Dwg. MHP0979)

7. Using a 10 mm allen wrench, loosen and remove the two long and two short capscrews (107 and 112) that fasten the brake bracket to the winch upright. Remove the brake bracket from the side frame.

NOTICE

A 3/8 inch allen wrench may be needed to remove the two socket head capscrews closest to the brake surface. The 3/8 inch allen wrench has enough clearance to turn near the drum flange.

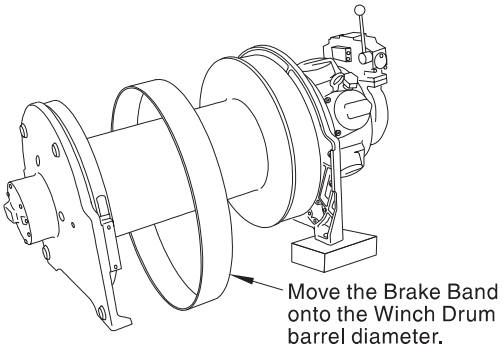


(Dwg. MHP0977)

8. Pull the plunger (114) out of the brake bracket.

NOTICE

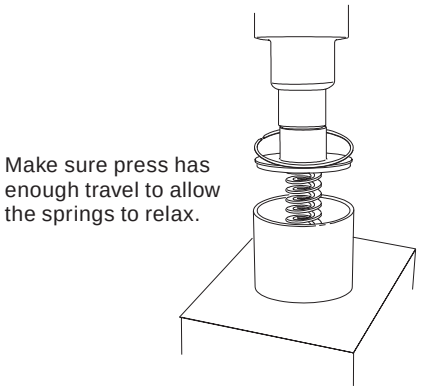
Make sure to remove and retain the small spring (113) that rests behind the plunger.



(Dwg. MHP1097)

9. Carefully spread apart the ends of the brake band and move it off the brake surface and onto the winch drum barrel diameter.
10. Carefully spread the ends of the brake band apart far enough to clear the winch drum barrel diameter, and pull the brake band off the drum. Do not damage the threads of the adjustment bolt by dragging the bolt over the winch drum.

Cylinder Disassembly

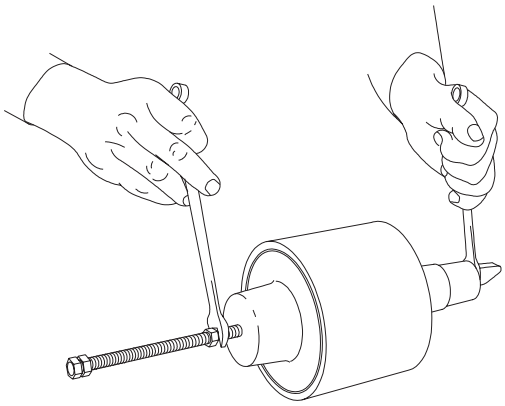


(Dwg. MHP0924)

WARNING **Use care when removing or installing the end cover on the cylinder. Use a sturdy press with at least 13 cm (5 inches) of travel, or use the threaded rod method. Failure to exercise caution can cause mechanical damage and/or injury.**

1. Place the cylinder assembly in a press, and press down on the end cover (125). Using a screwdriver, locate the chamfer on one end of the retainer ring (126), and remove the retainer ring. Slowly release the press allowing the springs to push the cover away from the cylinder.

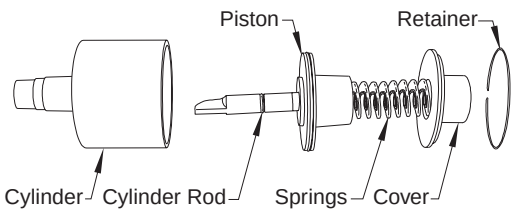
NOTICE **Before pressing down on the end cover, operate the press so that it can retract approximately 13 cm (5 inches) when the springs extend to their uncompressed state.**



(Dwg. MHP0981)

2. If a press is not readily available, there is an alternative method of disassembling the cylinder assembly. Thread a piece of 3/8 NC threaded rod approximately 36 cm (14 inches) long, fully into the tapped hole in the cylinder rod (inside the cylinder). Make sure the threaded rod is fully engaged. Slip a flat washer over the threaded rod, and then thread a nut all the way down to the cover. Tighten the nut until the cover moves far enough to uncover the retainer ring, and remove the ring. Use a 12 mm (approximately 7/16 wrench) to prevent the cylinder rod from turning, and remove the nut from the threaded rod. Spring pressure will push the cover away from the cylinder, allowing complete disassembly.

WARNING **Use care when removing or installing the end cover on the cylinder. Make sure that the threaded rod is fully engaged in the cylinder rod. If the threaded rod starts turning while removing the cover, double nut it or otherwise hold it and prevent it from threading out of the cylinder rod. Failure to exercise caution can cause mechanical damage and/or injury.**



(Dwg. MHP0984)

3. Remove the springs (124 and 127) from the cylinder, and take out the piston (123) and cylinder rod (108).
4. Remove the washer (128) inside the piston, take off the retainer ring that holds the cylinder rod to the piston, and remove the cylinder rod. This completes the disassembly of the band brake and cylinder assembly.

Inspection

1. Examine the ‘O’ rings (109, 110, and 122) on the piston and cylinder rod for signs of cracking or wear. If any of the ‘O’ rings are cracked or worn, replace them.
2. Make sure the cylinder rod (108) moves easily and smoothly inside the cylinder (121), and make sure the plunger (114) moves easily and smoothly inside the brake bracket (106). If the cylinder rod or the plunger sticks or hesitates, clean and polish (or replace) as necessary.
3. Inspect the roller (116) for wear on the inner and outer surfaces, and the cylinder rod (108) for wear on the cam-shaped end. Replace both if any wear is found.
4. Check the pin (115) for wear. Replace the pin and the roller (116) as needed.
5. Examine the springs (124 and 127). They should measure at least 203 mm (8.0 inches) long. Replace them if they have collapsed or become bent.
6. Ensure that the spring (113) has not collapsed or become bent. It should measure at least 203 mm (8.0 inches) long. Replace it if it has collapsed or become bent.
7. Check the tubular spacers for signs of collapsing. If any of them are buckling or collapsing, replace them as a set. They should measure 28.3 to 28.8 mm (1.115 to 1.135 inches)
8. Look for any signs of wear on the washers that retain the tubular spacers. If they are wearing, replace them as a set.
9. Inspect the brake band lining for wear. It should be worn evenly, without high or low spots anywhere around the brake band. Replace the brake band if the friction surface measures less than 1.5 mm (1/16 inch) thick anywhere on the band.

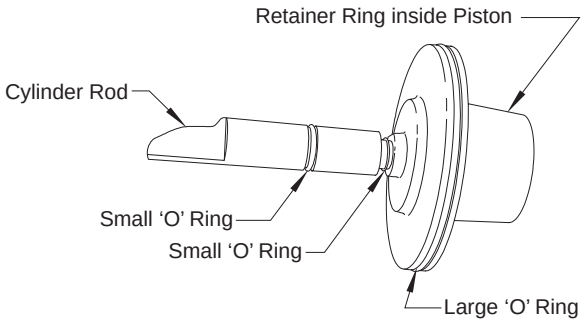
NOTICE

Do not wash the brake band in cleaning solvent. Wipe clean if needed. Use a commercially available brake cleaner.

Automatic Band Brake Assembly and Installation

If assembling from new, or if the air motor and upright have been removed for service, the easiest way to assemble the automatic band brake is to install everything except the cylinder assembly onto the upright and then mount the upright to the winch drum. The cylinder assembly can be installed after the air motor is in place. The assembly and installation of the band brake follows these same basic steps.

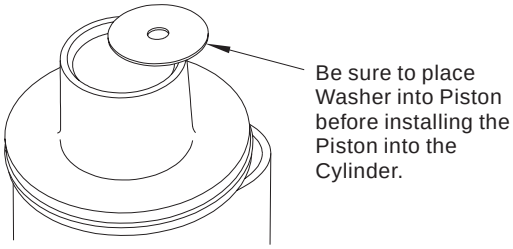
Cylinder Assembly



(Dwg. MHP0982)

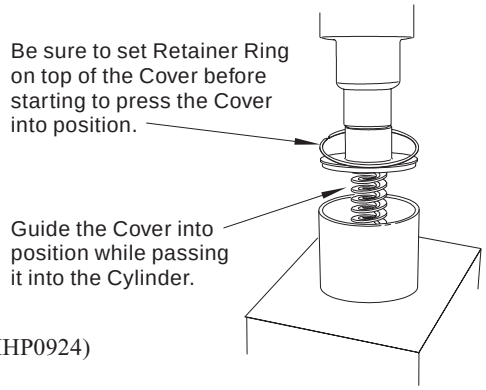
1. Lubricate and install the two small 'O' rings (110 and 109) onto the cylinder rod (108), and insert the cylinder rod into the piston (123).
2. Install the retainer ring (111) that holds the cylinder rod on the piston, and position the large 'O' ring (122) in the groove around the piston.
3. Thoroughly coat the cylinder rod, the 'O' rings, and the inside of the cylinder with Lubriplate Mo-Lith No. 2 (or equivalent) grease.

⚠WARNING **Use care when removing or installing the end cover on the cylinder. Use a sturdy press with at least 13 cm (5 inches) of travel, or use the threaded rod method. Failure to exercise caution can cause mechanical damage and/or injury.**

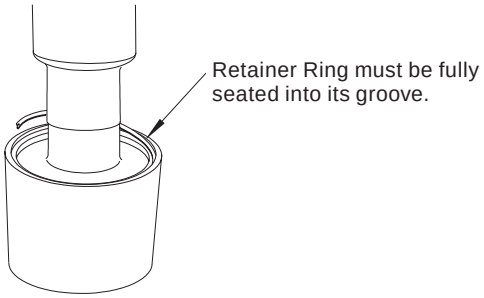


(Dwg. MHP0978)

4. Insert the piston and cylinder rod assembly into the cylinder, and drop the washer (128) into the open end of the piston.



(Dwg. MHP0924)



(Dwg. MHP0925)

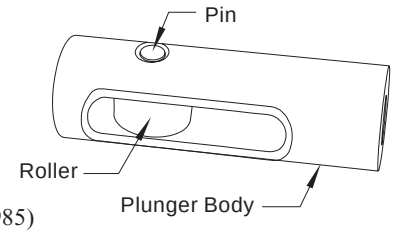
5. Set the cylinder (with the large open end upwards) in a sturdy press. Place the two springs (124 and 127) on top of the washer in the piston, set the large retainer ring (126) over the end cover, and position the end cover over the springs. Carefully press the cover into position on the cylinder.

NOTICE **The threaded rod method can be used in the absence of a press. Refer to cylinder disassembly instructions.**

6. Press the end cover (125) down until the retainer ring groove is exposed, and install the retainer ring (126).

⚠CAUTION **Make sure the retainer ring is fully seated into its groove.**

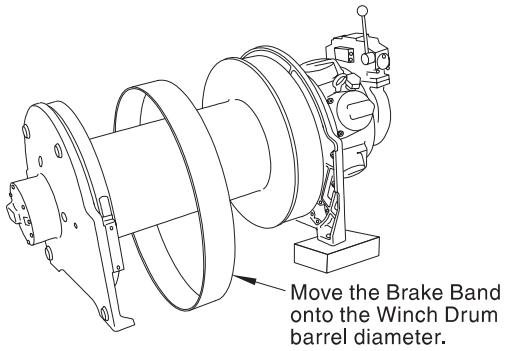
7. Remove the cylinder from the press. The cylinder assembly is complete.



(Dwg. MHP0985)

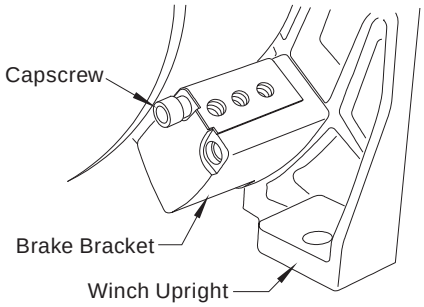
8. To assemble the plunger, place the roller (116) inside the plunger body (114), and then insert the pin (115). Before installing the pin, thoroughly coat the pin, roller, and plunger with Lubriplate Mo-Lith NO. 2 (or equivalent) grease.

Automatic Band Brake Assembly and Installation



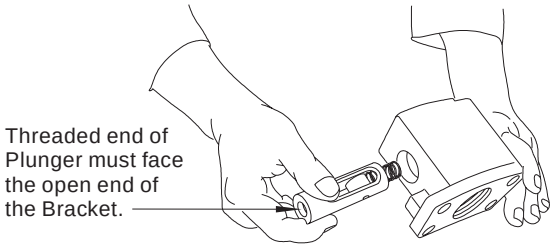
(Dwg. MHP1097)

1. Gently spread the ends of the brake band (104) apart, and slip the band onto the winch drum barrel diameter.



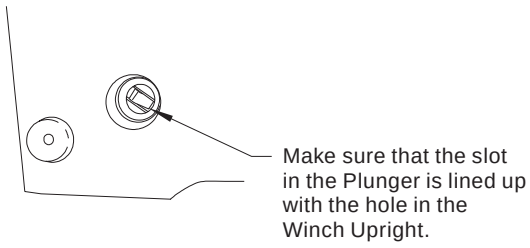
(Dwg. MHP1099)

2. Using the two long (107) and two short (112) capscrews, fasten the brake bracket (106) on to the winch upright. Torque the capscrews to 45-50 Nm (33-36 ft. lbs).
3. Gently spread the ends of the brake band and slip it over the flange and onto the brake surface.



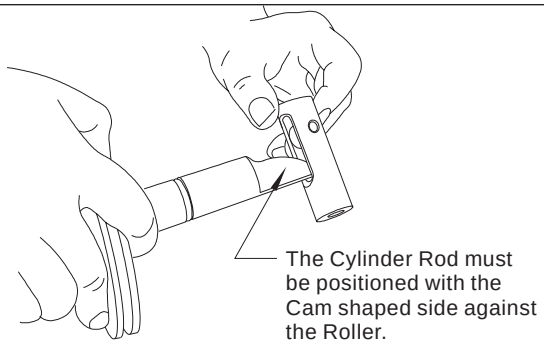
(Dwg. MHP1250)

4. Place the small spring (113) in the end of the plunger, and slip the plunger (114) into the brake bracket (106) bolted onto the frame. Make sure that the threaded end of the plunger faces the open end of the bracket. (Brake bracket pictured unmounted.)



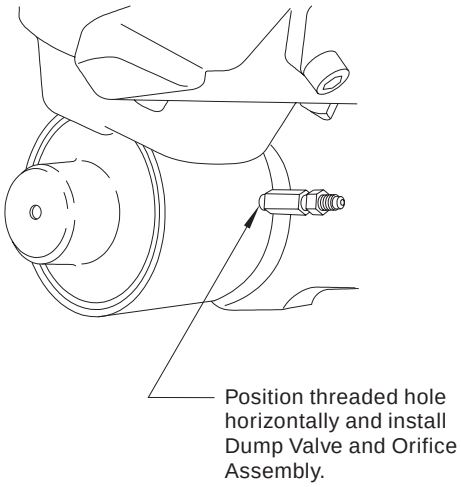
(Dwg. MHP1032)

5. Look through the hole in the upright and position the plunger so that the slot in the plunger is aligned with the hole.



(Dwg. MHP1039)

6. Position the cylinder rod (inside the plunger) with the cam shaped side against the roller, and then screw the threaded end of the cylinder assembly through the hole in the sideframe into the bracket. (Cylinder rod and plunger are shown disassembled for clarity.)

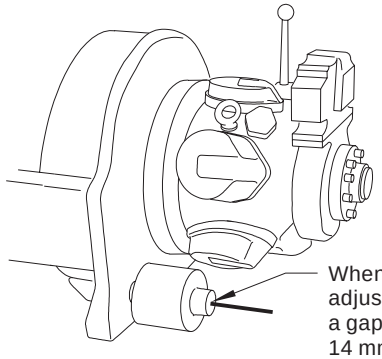


(Dwg. MHP1251)

7. Thread the cylinder fully (until snug) into the side frame, and then back off until the threaded hole in the side of the cylinder is pointed towards the air motor and is positioned horizontally.
8. Install the dump valve and orifice assembly on the cylinder, and connect the air line.
9. If the adjustment bolt lock nuts have been removed, apply some thread-locking compound (Loctite® 680 or equivalent) to the threads of the adjustment bolt close to the shank (near the brake band). Thread one of the lock nuts onto the adjustment bolt so that it holds the adjustment bolt on the brake band with very little slack.
10. Loosely thread the adjustment bolt into the plunger.
11. Install the rubber spacer (105) between the brake band and the brake bracket.
12. Fasten the stationary end of the brake band to the brake bracket using the three capscrews (101), washers (102) and spacer (103). Torque the capscrews to 45-50 Nm (33-36 ft lbs).
13. Fasten the corner bar to the winch upright, and torque the two capscrews to 45-50 Nm (33-36 ft lbs). Install the sideframe and torque the four capscrews to 72-78 Nm (52-57 ft lbs).

⚠ CAUTION **Always adjust and test the band brake after completing repairs or adjustments. Failure to adjust and test the band brake can lead to mechanical damage and/or injury.**

Adjusting the Automatic Band Brake



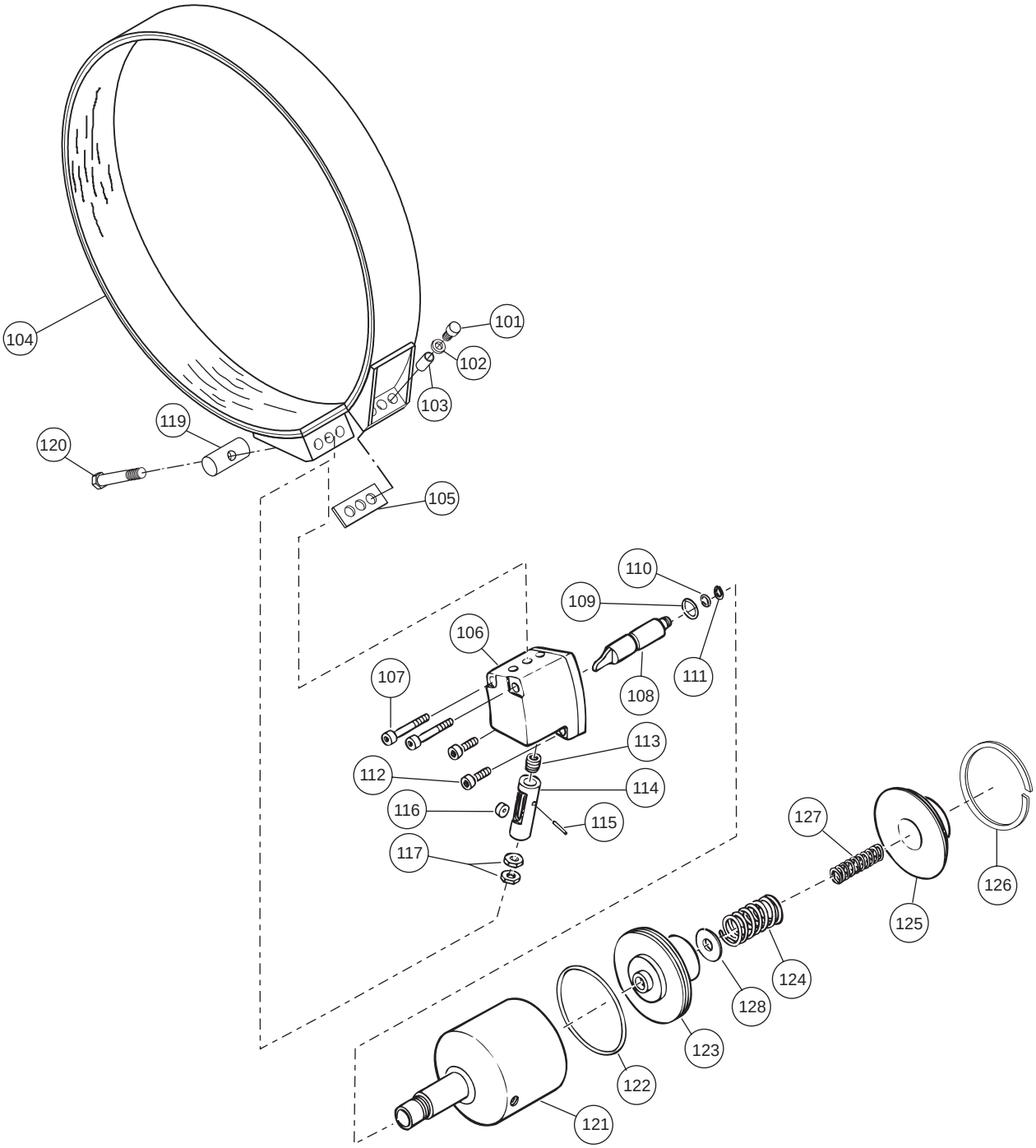
(Dwg. MHP0983)

1. Thread a piece of 3/8 NC rod all the way into the cylinder rod. With the brake band slack and no air applied to the band brake, push the end of the threaded rod to position the plunger all the way inside the bracket. Turn a nut down the threaded rod until it is even with or just touching the cylinder cover. Apply air pressure to the band brake cylinder from an outside air source. When air pressure is applied to the cylinder, the nut on the threaded rod should move about 25 mm (1 inch) away from the cover. Tighten the adjustment nut to remove slack from the brake, and remove the air pressure from the cylinder. When you remove the air pressure, the nut should move closer to the cylinder end cover and then stop.
2. Repeat the process of applying air, adjusting, and removing air until the nut stops (when there is no air applied to the brake) at approximately 14 mm (9/16 inch) from the cylinder cover. Tighten the jam nuts closest to the plunger to fasten the adjustment bolt in position. Finally, remove the 3/8 NC threaded rod from the cylinder rod.

Testing the Automatic Band Brake

1. Remove or pay out the wire rope until there is no load on the winch.
2. Set the inlet air pressure to 6.3 bar (90 psig) static (while the air motor is not running).
3. Disconnect the air line from the automatic band brake, and plug the air line to prevent the loss of air pressure. (This will keep the band brake tensioned during testing.)
4. If the winch is equipped with an automatic disc brake, it must be released before testing the band brake. Release the disc brake by applying air at 3.5 to 6.3 bar (50-90 psig) directly to the air line fitting on the disc brake housing.
5. Move the winch control valve handle or operate the pendant control in the payout direction. The winch drum should not turn. If it does turn, review the information on troubleshooting the band brake.

AUTOMATIC BAND BRAKE PARTS DRAWING



(Dwg. MHP1080)

AUTOMATIC BAND BRAKE PARTS LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
---	Brake Assembly	1	23890
101	Capscrew	3	71264808
102	Hardened Washers	3	21899
103	Spacer Tube	3	21891
104	Band Assembly	1	24367
105	Spacer	1	23029
106	Brake Bracket	1	22984
107	Capscrew	2	71264832
108	Cylinder Rod	1	23885
• 109	'O' Ring	1	71049423
• 110	'O' Ring	1	52662
111	Retainer Ring	1	54136
112	Capscrew	2	71264824
113	Spring	1	71126643
114	Plunger	1	23886
115	Dowel Pin	1	71144968
116	Roller	1	23883
117	Jam Nut	2	71267413
119	Pivot Bar	1	23755
120	Adjustment Bolt	1	71267405
121	Cylinder	1	23889
• 122	'O' Ring	1	52536
123	Piston	1	23884
124	Spring	1	71144943
125	Cover	1	23887
126	Retainer Ring	1	71126668
127	Spring	1	71144935
128	Washer	1	71145080

• Recommended Spare

Description

The air winch is controlled by a poppet type directional control valve that is either lever operated at the winch or pendant operated from a remote location. The winch operator can control the winch drum direction and speed by moving a lever on the winch control valve or by pressing a button on the remote pendant. Materials used in the construction of the valve include cast iron for the body, with corrosion resistant stainless steel and bronze for the internal parts.

The poppets are designed for zero air leakage when the valve is in the neutral position, and precise control of the air flow when the valve is operated. Inlet air pressure provides a balancing force on each inlet poppet to enhance control and reduce the lever force on manually operated valves.

Incorporated in the directional control valve are an exhaust air restrictor and a brake release valve for winches that are equipped with a disc brake. The exhaust air restrictor allows the winch operator to control the winch payout speed with the air motor instead of using the brake. The brake release valve causes the disc brake to release when the directional control valve lever is moved or the pendant button is pressed to run the winch in the payout direction.

When a winch is equipped with an automatic band brake, two brake release valves are installed in the control valve. One valve releases the band brake when the lever moves to the haul-in position and one releases the band brake when the handle moves to the payout position.

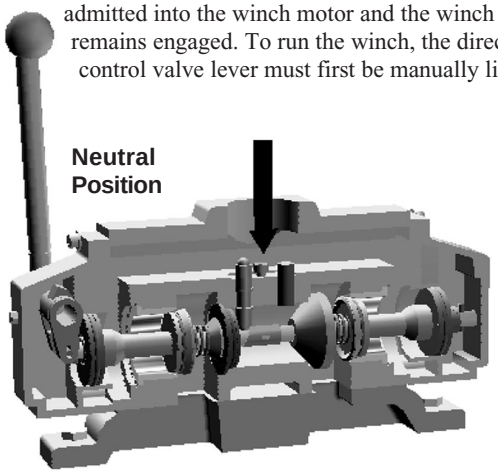
A shuttle valve, mounted on a block on the directional control valve body, causes the brake release valve to release both the band and disc brake in the payout direction, and causes only the band brake to release in the haul-in direction.

Operation

The manual control lever pivots on a cross shaft running through an end cap bolted to the valve body. The lever is spring loaded so that the control valve returns and automatically locks into the neutral position. A clevis attached to the cross shaft engages a control shaft that runs lengthwise in the valve body.

Neutral

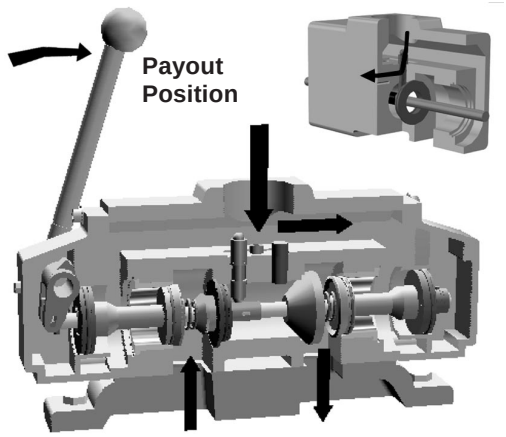
When the manual control lever is in the neutral position, no air is admitted into the winch motor and the winch brake(s) remains engaged. To run the winch, the directional control valve lever must first be manually lifted and then moved towards or away from the operator. This action causes the control shaft to open the appropriate poppets and admit air to the winch motor.



(Dwg. MHP1184)

Payout

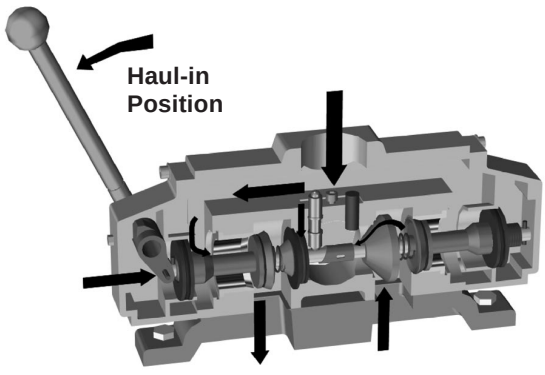
When the winch operator manually moves the directional control valve lever to the right (when viewed from the motor end), the control shaft slides to the left and causes the right hand inlet poppet and the left hand exhaust poppet to open at the same time. Refer to drawing MHP1186. The inlet poppet admits high pressure air into the motor, and the exhaust restrictor poppet controls the air leaving the motor through the secondary exhaust port. This restriction regulates the payout speed of the winch, reducing brake use and increasing operator control of descending loads. If the winch is equipped with an automatic disc and/or band brake, a sleeve on the valve shaft activates a brake release valve(s) that release the brake(s).



(Dwg. MHP1186)

Haul-in

When the winch operator moves the manual control lever to the left (when viewed from the motor end), the valve shaft slides to the right and causes the left hand inlet poppet valve and the right hand exhaust restrictor poppet to open at the same time. Refer to drawing MHP1185. The inlet poppet admits high pressure air into the motor, and the exhaust poppet allows air to leave the motor through the secondary exhaust port. If the winch is equipped with an automatic band brake only, a sleeve on the valve shaft activates a brake release valve.



(Dwg. MHP1185)

Components
The directional control valve consists of an external handle, a valve body which contains the valve spool, and two valve end cap assemblies.

Function
The directional control valve regulates the direction and speed of winch drum rotation. The control valve also acts to supply air to the brake(s) depending on winch options and function selected.

DIRECTIONAL CONTROL VALVE TROUBLE SHOOTING

This section provides basic troubleshooting information. 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 direction control valve symptoms, probable causes and remedies.

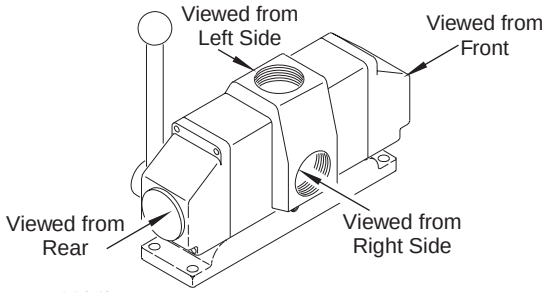
Symptom	Cause	Remedy
No drum movement when control valve actuated in Payout direction.	No air supply.	Check air lines for rips or tears. Remove shipping plugs.
No drum movement when control valve actuated in Haul-in direction.	Winch is overloaded.	Reduce load.
Air escaping valve while in neutral position.	Worn 'O' ring(s).	Disassemble valve and replace 'O' ring(s).
Moving control handle in either direction very hard.	Binding poppet.	Disassemble valve and inspect.
Control handle in neutral position but drum still rotating.	Poppet valve stuck open.	Disassemble valve and inspect.
Control handle moves very easy in both directions but no drum movement.	Clevis pin sheared.	Disassemble end cap and repair.
Unable to obtain rated line speed.	Valve incorrectly adjusted.	Adjust washers to provide correct clearance.

DIRECTIONAL CONTROL VALVE MAINTENANCE

Read these instructions completely before working on the Directional Control Valve.

NOTICE **The directional control valve is comprised of components that have very close tolerances. The valve components should only be disassembled to make a repair. Disassembly of good components can cause additional damage.**

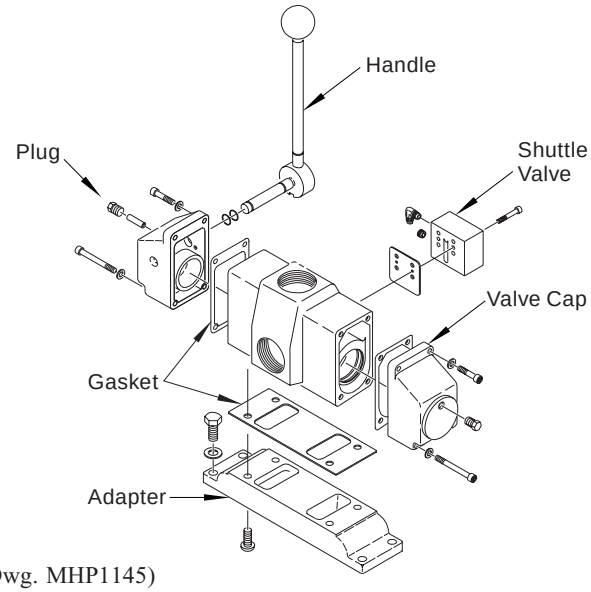
Removing Control Valve from Winch



(Dwg. MHP1121)

1. Remove brake air line.
2. Remove muffler or exhaust hose.
3. Disconnect inlet air line.
4. Using a pipe wrench, remove inlet hose adapter.
5. Loosen capscrews (442) and flatwashers (434). Take valve assembly to clean work bench. Capscrews (442) cannot be removed until end caps or adapter are removed.

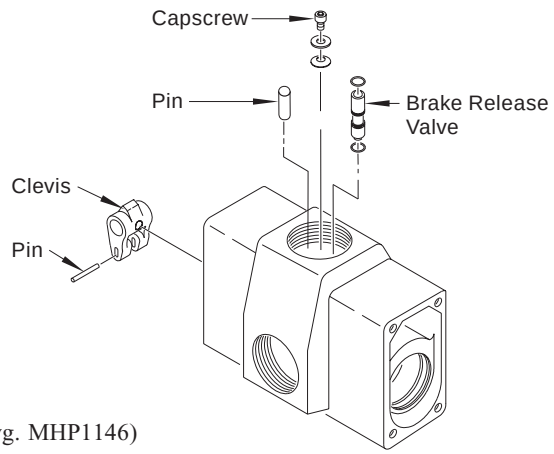
Separation of Components



(Dwg. MHP1145)

1. Remove capscrews (441) and separate valve adapter (440) from valve body (410), discard gasket (424). Remove capscrews (442) and flatwashers (434).
2. Remove capcrews (439 and 437) and washers (433) from valve cap (438). Using a soft face hammer remove valve cap (438) and discard gasket (411).
3. Remove the plug (447) from valve cap (450). Pin (445) has internal threads. Install an 8-32 x 2 inch screw into pin. Pull out pin (445).
4. Lift up valve handle assembly slightly, to remove pressure on pin (463). Press handle assembly out of valve cap (450).
5. Remove capcrews (439 and 437) and washers (433) from valve cap (450). Using a soft face hammer remove valve cap (450).
6. Remove capscrews (418) from shuttle valve body (479) and remove shuttle valve.
7. Remove fittings (this depends on the winch options).
8. Remove gasket (419) and discard.

Disassembly of Valve Body

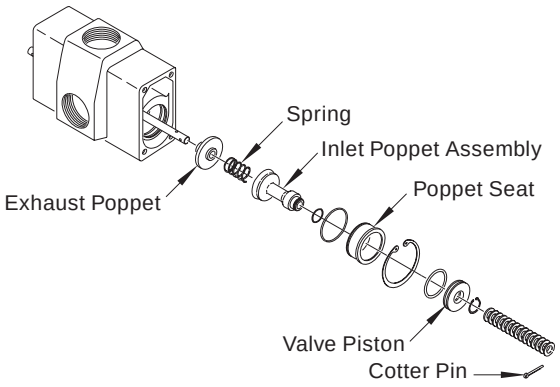


(Dwg. MHP1146)

1. Press out pin (409) from clevis (446) and slide clevis off shaft (401).

Entering from air inlet.

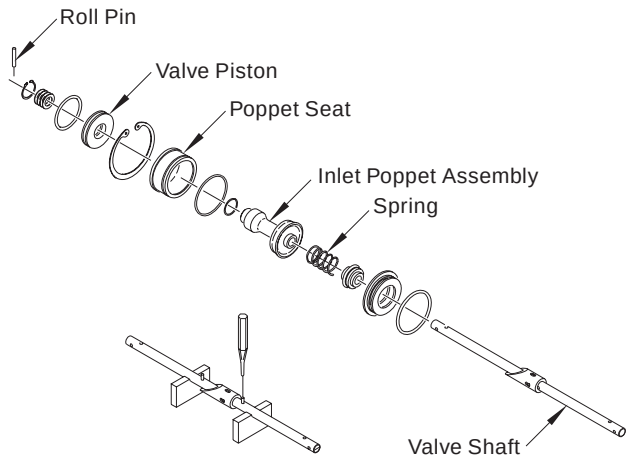
2. Remove capscrew (465), washer (417) and spring clip (416).
3. Lift out brake release valve assembly (413) or pin (412) depending on winch options.



(Dwg. MHP1147)

Starting at front of the valve body.

4. Remove cotter pin (414) from shaft (401) and take off washers (434).
5. Remove retainer ring (429).
6. Pull poppet subassembly out of valve body.
7. Remove retainer (432) and seperate piston valve (431) from inlet poppet, remove 'O' ring (430) from outside of valve piston and 'O' ring (426) from inside of valve piston.
8. Seperate poppet seat (428) from inlet poppet and remove 'O' ring (427).
19. Remove spring (422).
10. Remove exhaust poppet (420).

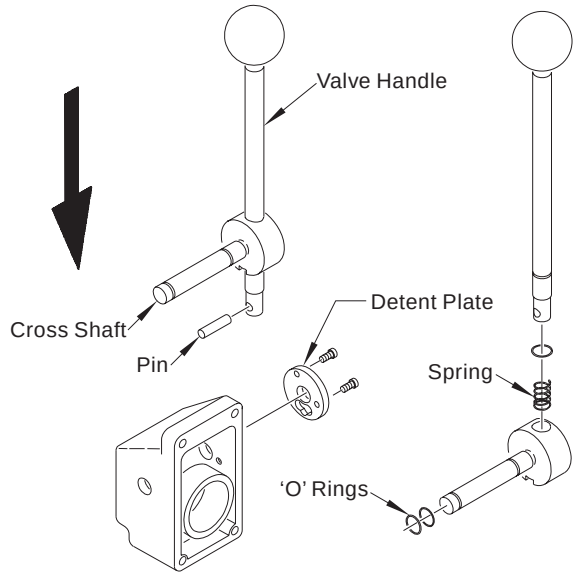


(Dwg. MHP1148)

Turn the valve around and finish disassembly.

11. Remove roll pin (406) and shims (444).
12. Remove retainer ring (429). Remove shaft (401) with the rest of the valve assembly. This step might require shaft (401) being tapped from front end of valve body. The 'O' ring in the restrictor seat (403) might create a tight fit.
13. Pull poppet subassembly out ot valve body.
14. Remove retainer (432) and seperate piston valve (431) from inlet poppet, remove 'O' ring (430) from outside of valve piston and 'O' ring (426) from inside of valve piston.
15. Seperate poppet seat (428) from inlet poppet and remove 'O' ring (427).
16. Separate inlet poppet assembly (423) from shaft (401).
17. Slide spring (422) off of shaft (401).
18. Slide restrictor poppet (402) off shaft (401).
19. Slide restrictor seat (403) off of shaft (401), remove 'O' ring (404) and discard.
20. Using a suitable punch, tap out roll pins (405).
21. Back off setscrew (407) and slide sleeve (408) off shaft (401).

Handle Disassembly



(Dwg. MHP1149)

1. Push pin (463) out of valve handle (449).
2. Catch spring (462).
3. Remove 'O' ring (460).
4. Unscrew handle ball (469).
5. Remove 'O' rings (448) from cross shaft (461).
6. Remove capscrews (465) and then detent plate (464).

Inspection

1. Inspect the bores in the valve body and end caps, for pitting, scratches or other signs of abnormal wear. Clean and lightly hone.
2. Replace 'O' rings in all components disassembled. Replace any steel components (not the valve body) that are showing sign of corrosion.
3. Inspect springs, looking for signs of cracks, bulging, or corrosion.
4. Set springs on a flat surface, springs should stand straight up. If springs have any abnormal appearance, replace.
5. Ensure that valve components are kept clean during repair. Dirt or other contaminates can cause damage to new parts.

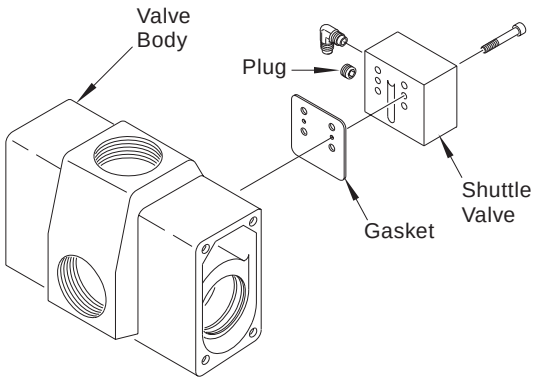
Directional Control Valve Assembly and Installation

During control valve assembly lubricate all 'O' rings with DOW CORNING #111 lubricant.

NOTICE **DOW CORNING #111 lubricant is the ONLY factory authorized lubricant for this valve. Use of other lubricants may cause valve malfunctions.**

NOTICE **When installing new end caps, valve body or valve adapter, clean all threaded holes with a tap (to remove any burrs or debris). Also remove any coating from machined surfaces to ensure a proper fit.**

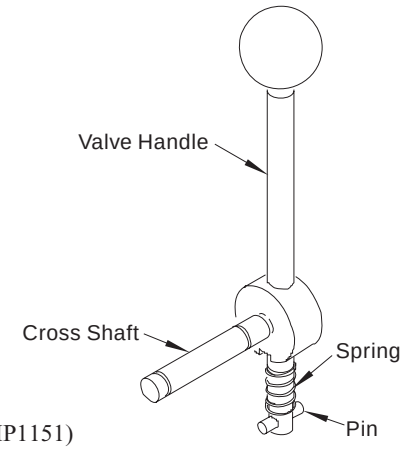
Shuttle Valve Assembly



(Dwg. MHP1150)

1. Place a bead of pipe sealant around threads of fittings installed in lower port on shuttle valve body (479) and tighten.
2. Place capscrews (418) into shuttle valve body(479) and slide gasket (419) onto the capscrews. Match capscrews to mounting holes in valve body (410) insert and tighten to 24 to 30 inch lb. (8.9 - 3.0 Nm).

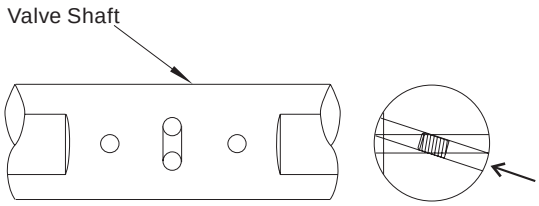
Handle Assembly



(Dwg. MHP1151)

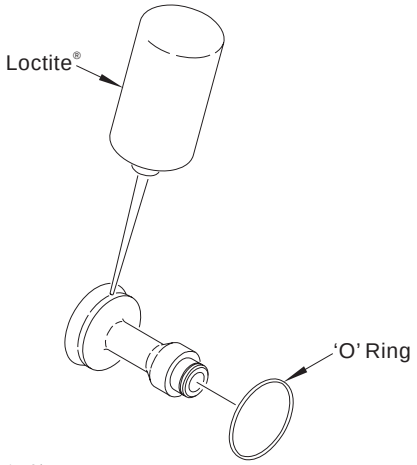
1. Apply Loctite® 242 on threads of valve handle (449). Screw handle ball (469) onto valve handle (449) and tighten.
2. Slide 'O' ring (460) onto valve handle (449) and lubricate. Insert this assembly into cross shaft (461).
3. Slide spring (462) onto lower portion of valve handle (449).
4. Press pin (463) into valve handle. Pin should protrude about 1/16 inch (1.6 mm) from one side. Long side of pin should fit into slot in the cross shaft and not bind when moved up and down.

Valve Body Assembly



(Dwg. MHP1022)

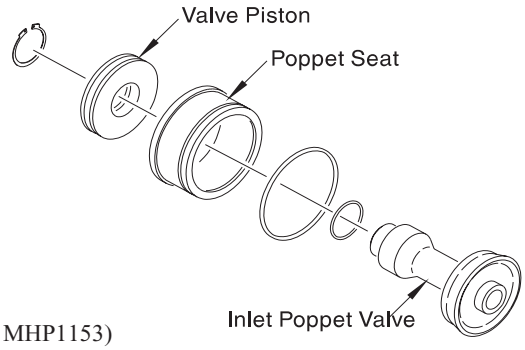
1. Insert setscrew (407) into the center hole in shaft (401) from bottom position. Center threaded hole is offset 18° (degrees) from the two other holes and flats on shaft.
2. With the flats on shaft (401) facing you, slide sleeve (408) onto shaft (401). The flat part of the sleeve should be on the right with the 45º (degrees) on the left.
3. Press roll pins (405) into shaft (401) until pins are exposed equally on both sides of the shaft.



(Dwg. MHP1152)

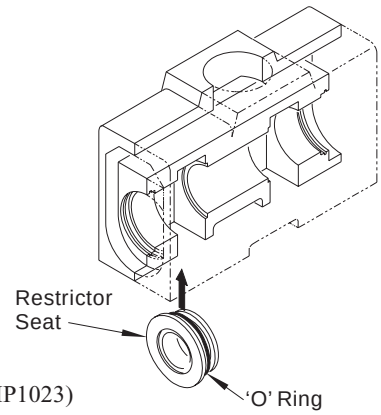
4. Ensure that inlet poppet is at room temperature 70° F (21° C).
5. Clean both inlet poppet (423) and 'O' ring with a non-residue cleaner. Electrical contact cleaner works well, blow dry with clean, dry compressed air.
6. Apply a continuous bead of Loctite® 4212 to the groove in the inlet poppet.
7. Slide 'O' ring over inlet poppet and into the groove. Press 'O' ring into groove all around and wipe excess Loctite® 4212 from poppet surface. Allow Loctite® 4212 to cure.

⚠ CAUTION **Wear rubber gloves while installing 'O' rings. The cleaner can cause skin irritation. Loctite® 4212 is very sticky and hard to clean off skin.**



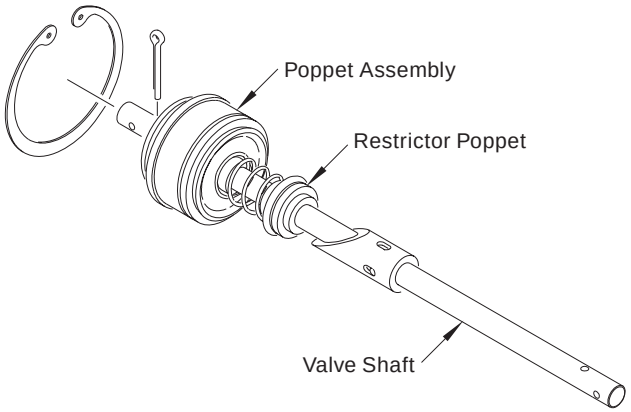
(Dwg. MHP1153)

8. Assemble both poppet valves.
   a. Lubricate the 'O' ring on the inlet poppet valve (423).
   b. Lubricate 'O' ring (427) and place it on poppet seat (428). Place this assembly on poppet valve (423).
   c. Lubricate 'O' ring (426) and place on poppet valve (423).
   d. Install valve piston (431) on poppet valve and secure with retainer (432).



(Dwg. MHP1023)

9. Place 'O' ring (404) onto restrictor seat (403) and lubricate.
10. Insert restrictor seat (403) up through bottom of valve body and into inner bore position. Press restrictor seat into valve body until seated.

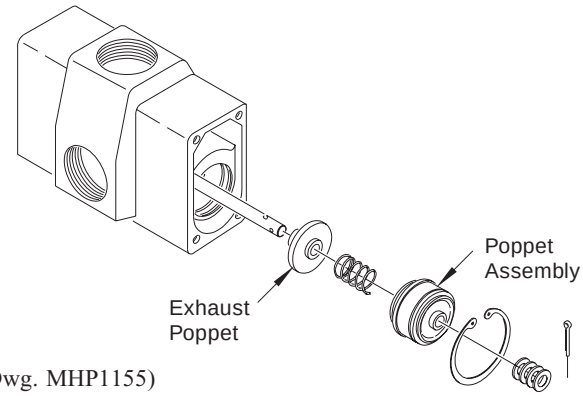


(Dwg. MHP1154)

Assemble valve components onto shaft (401) in the following order.

11. With the 45° degree side of sleeve (408) facing left, slide restrictor poppet (402) onto the left side with the bevel portion of poppet facing the sleeve.
12. Slide spring (422) on next followed by poppet assembly with large end towards sleeve. Insert pin (414) into shaft (401) to retain components (do not bend).
13. From the back of the valve body, carefully slide this assembly into valve body. Use fingers to press poppet seat into valve body.
14. Insert retainer ring (429) into valve body.

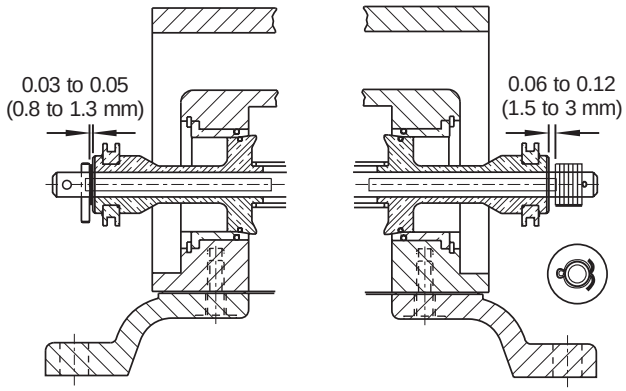
NOTICE **The flats on shaft (401) must be facing the left (or pilot valve) side of the valve body.**



(Dwg. MHP1155)

Move to the front of the valve body

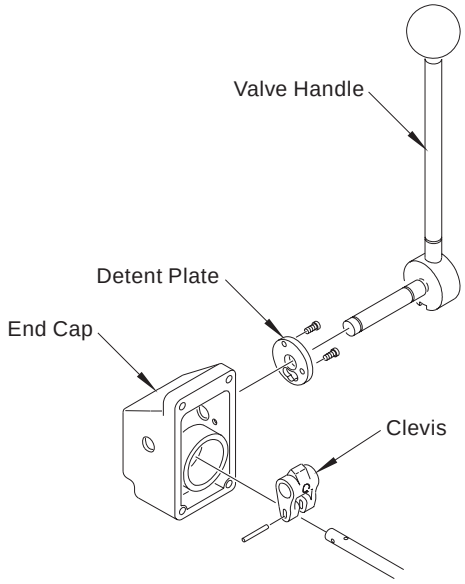
15. Slide exhaust poppet (420) over shaft (401), from the front of the valve body. Push into valve body, followed by spring (422).
16. Slide poppet assembly on to shaft (401). Use fingers to press poppet seat into valve body.
17. Install retainer ring (429) into valve body.



(Dwg. MHP1181)

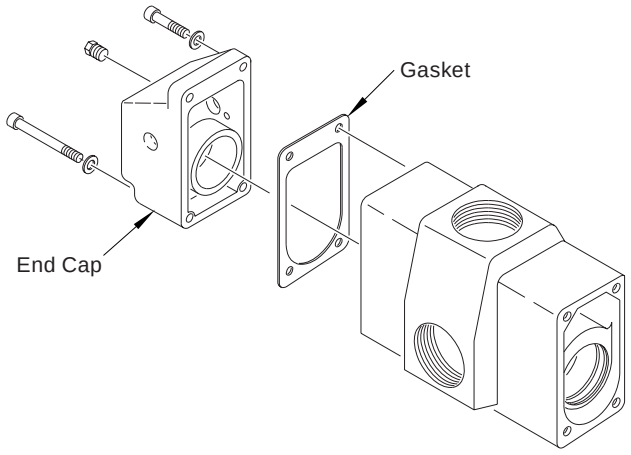
18. At the rear of the valve, use washers (434) as required to establish a clearance between pin (406) and inlet poppet (423), of 0.03 to 0.05 inches (0.8 to 1.3 mm). Then press pin into shaft (401) until pin is level with top of washer(s).
19. At the front of the valve, use washers (434) as required to establish a clearance between the washers and inlet poppet (423) of 0.06 to 0.12 inches (1.5 to 3 mm). Then insert cotter pin (414) into shaft and bend ends over.
20. Place ‘O’ rings (430) into grooves on both piston valves (431) and lubricate.

Control Handle End Cap Assembly



(Dwg. MHP1156)

1. Place the split portion of valve clevis (446) over shaft (401), with large portion on top of shaft and rounded portion of valve clevis facing valve body. Apply Loctite® 609 on roll pin (409). Tap roll pin (409) through valve clevis and shaft until centered in clevis.
2. Apply Loctite® 680 on threads of capscrews (465) and insert into detent plate (464). Insert cross shaft (461) without 'O' rings into end cap (450). Place detent plate on cross shaft and align with mounting holes in end cap (450). Insert capscrews (465) and tighten to 42 to 45 in. lbs. (15.5 to 16.7 Nm). Ensure that cross shaft rotates freely and then remove.



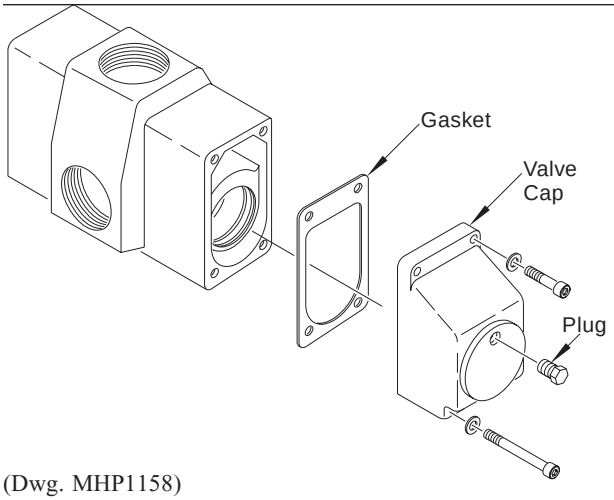
(Dwg. MHP1157)

3. Place valve body (410) on its side with the clevis end over the edge of the workbench.
4. Place gasket (411) on valve cap (450) and slide assembly over clevis. Lubricate threads and loosely install capscrews (437) and (439) and washers (433).
5. From the bottom hole in valve cap use a punch, or similar tool, to align the cross shaft holes in valve cap with the hole in the clevis. Use tool to maintain position and tighten capscrews to 54 to 60 inch lbs (20 to 22 Nm).

NOTICE

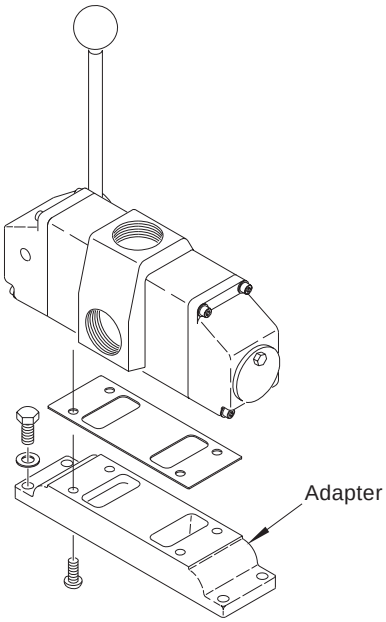
The slotted pin grooves in the clevis (where clevis and shaft (401) are joined) make alignment of the cross shaft and clevis difficult. To prevent binding of cross shaft during installation, ensure the cross shaft holes (located in valve cap) and the clevis hhole are aligned before installing cross shaft.

6. Lubricate 'O' rings (448) and locate in grooves on cross shaft (461). Insert cross shaft through detent plate side of valve cap assembly. To complete, raise handle assembly up and insert pin (463) into detent plate while pushing on cross shaft.
7. Align the hole in the cross shaft with the hole in the end of the clevis. Apply a bead of Loctite® 242 to pin (445). Using a 8-32 x 2 inch screw attached to the threaded end of pin, install pin by tapping into position. Ensure pin is inserted fully into clevis.
8. Operate the lever in both directions. There should be no indication of sticking or binding. When released, the lever must return to the neutral position and lock in place (handle must be lifted before shifting in either direction).
9. Place pipe thread sealant on the threads of plug (447), insert it into end cap (450) and tighten.



(Dwg. MHP1158)

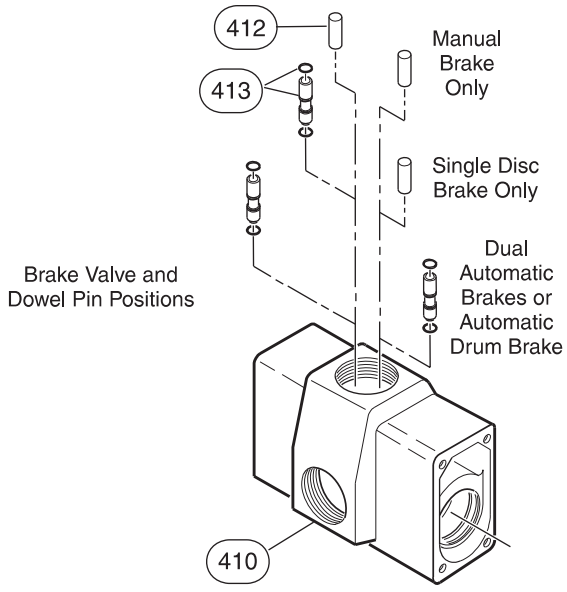
10. Insert capscrews (437) and washers (433) through top mounting holes in valve cap (438). Place gasket (411) on capscrews, insert these into valve body and loosely tighten.
11. Insert capscrews (439) and washers (433) through bottom mounting holes. Tighten capscrews (437 and 439) to 54 to 60 inch lbs. (20 to 22 Nm).
12. Place pipe thread sealent on the threads of plug (436), insert into valve cap (438) and tighten.



(Dwg. MHP1159)

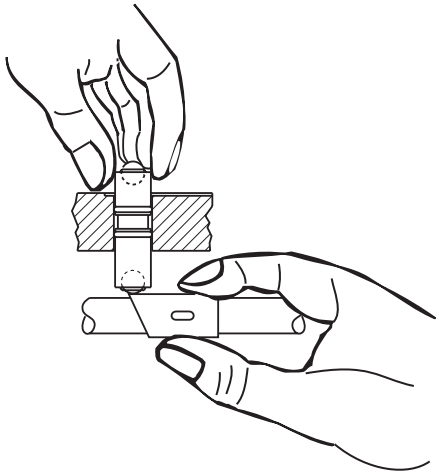
13. Insert capscrews (442) and flatwashers (434) into adapter (440). These capscrews cannot be removed without:
    a. Removing end caps or,
    b. Removing adapter from valve body.
14. Apply Loctite® 242 on threads of capscrews (441). Install capscrews through adapter (440) and gasket (424). Insert these into mounting holes in valve body and tighten to 13 to 17 ft lbs (58 to 76 Nm).

Brake Release Valve Installation and Adjustment



(Dwg. MHP1227)

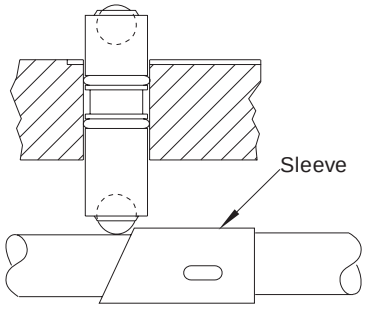
1. Press brake valve (413) into valve body. Brake valve has one end that is longer. This end should be down (in the valve body).



(Dwg. MHP1024)

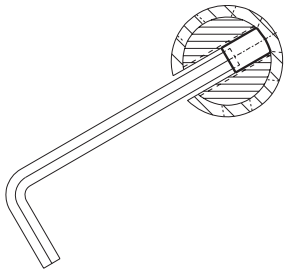
2. Rotate sleeve (408) 180º (degrees) or until long portion of sleeve is on top.
3. Using fingers on the brass body, press brake valve (413) into the valve body until steel ball is in firm contact with sleeve (408).
4. Rotate sleeve (408) 180º (degrees) or until the long portion of sleeve is on the bottom.
5. Apply Loctite® 609 to pin (412) and push into valve body (through air inlet) until 0.16 to 0.25 inch (4 to 6.5 mm) is exposed above surface.

NOTICE **Avoid using excessive Loctite® 609. Loctite can drip onto shaft (401) causing shaft to stick in poppet seat, resulting in erratic winch operation.**



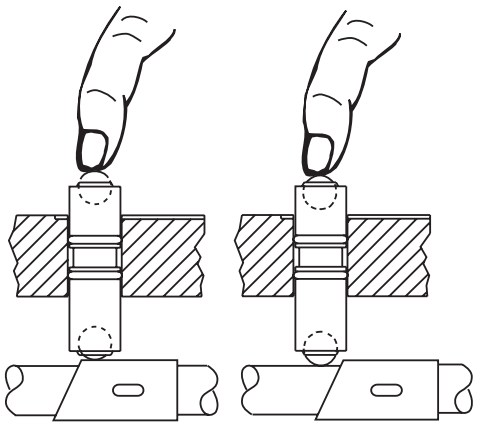
(Dwg. MHP1027)

6. Insert capscrew (465) through flatwasher (417) and spring retainer (416) into valve body and tighten.
7. Adjusting brake valve (413). Ensure that long portion of sleeve (408) is on the bottom of shaft (401) and align a slot in sleeve with center threaded hole in shaft.
8. Slide sleeve fully up to steel ball in brake valve.



(Dwg. MHP1025)

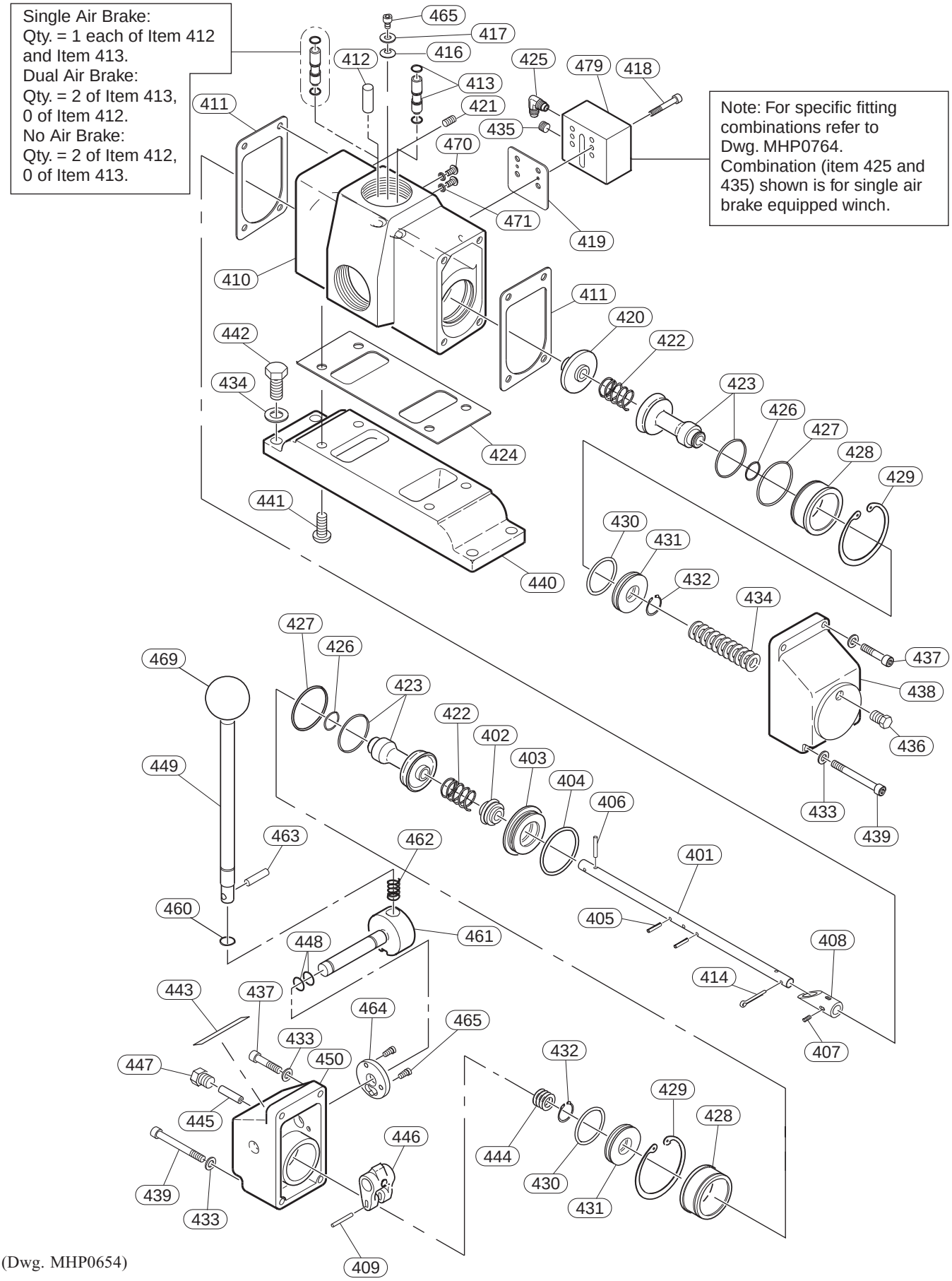
9. Insert allen wrench through slot in sleeve and tighten setscrew (407) against far side of sleeve. Locking sleeve into position.



(Dwg. MHP1026)

10. Check operation of brake valve. Press control lever assembly to the front (haul-in) position at the same time using your finger to feel the top steel ball. The ball should rise immediately. When the control handle is returned to neutral, the ball should drop.

DIRECTIONAL CONTROL VALVE PARTS DRAWING



(Dwg. MHP0654)

DIRECTIONAL CONTROL VALVE PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
400	Valve Assembly *	1	- - -
	Single Air Brake		24801
	Single Air Brake - CE *		25451
	Dual Air Brakes		24803
	Dual Air Brakes - CE *		25442
	Without Air Brakes		24804
	Without Air Brakes - CE *		25443
401	Valve Shaft	1	23522
402	Restrictor, Poppet	1	23523
403	Restrictor, Seat	1	23524
• 404	'O' Ring	1	71137988
405	Pin	2	71293179
406	Pin	1	71293161
407	Setscrew	1	71138093
408	Sleeve	1	23606
409	Pin	1	71149157
410	Valve Body	1	24795
• 411	Gasket	2	23592
412	Pin	**	71146195
• 413	Valve Assembly	**	23594
	'O' Ring (each assembly)	2	
414	Pin, Cotter	1	71287478
• 416	Spring Clip	1	24793
417	Washer	1	50899
418	Capscrew	2	71261747
• 419	Gasket	1	23744
420	Exhaust Poppet	1	23516
421	Plug	1	51897
422	Spring	2	71138028
• 423	Inlet Poppet Assembly	2	24139
• 424	Gasket	1	71264725
425	Fitting, Elbow	‡	71262299
• 426	'O' Ring	2	52662
• 427	'O' Ring	2	51768
428	Poppet Seat	2	23518
429	Retainer Ring	2	53833
• 430	'O' Ring	2	52573
431	Valve Piston	2	23519
432	Retainer Ring	2	71138010
433	Washer	8	71271985
434	Washer	†	53881
435	Plug	‡	71069009
436	Plug	1	71303689
437	Capscrew	4	71138069
438	Valve Cap	1	23520
439	Capscrew	4	71138077
440	Adapter, Standard	1	23514
	Adapter, CE		24373
441	Capscrew	4	71138085
442	Capscrew	4	53890
443	Label, Standard	1	71148290
	Label, CE		96180102
444	Shim	†	71138119
445	Pin	1	71145379
446	Clevis	1	23589
447	Plug	1	25498
• 448	'O' Ring	2	71137962
449	Handle	1	23747
450	Valve Cap	1	23607
• 460	'O' Ring	1	71146963
461	Cross Shaft	1	23746
462	Spring	1	71146948
463	Pin	1	71146955
464	Detent Plate	1	23748
465	Capscrew	3	53807
469	Knob	1	71138051
470	Capscrew	2	71303671
• 471	Seal Washer	2	71303838
479	Shuttle Valve Body	1	23739

• Recommended spare.

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

** Refer to the following to determine Pin (Item 412) and Valve Assembly (Item 413) configuration requirements:
1. Winches without disc or automatic drum band brake (Valve Assemblies 24804 or 25443) use quantity of 2 Pins (Item 412).
2. Winches with a single automatic brake (disc or drum band) (Valve Assemblies 24801 or 25451) use quantity of 1 Pin (Item 412) and quantity of 1 Valve Assembly (Item 413).
3. Winches with disc and automatic drum bank brakes (Valve Assemblies 24803 or 25442) use quantity of 2 Valve Assemblies (Item 413).

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

‡ Refer to Dwg. MHP0764 to determine Shuttle Valve (Item 479) configuration.

REDUCTION GEAR - GENERAL INFORMATION

Description

The reduction assembly is a planetary gear type design. There are two planetary stages used in this reduction gear to achieve a 43:1 reduction. The air motor provides input to the first stage sun gear which turns the planet gears. The first stage planet gears are connected to the planet carrier which is connected to the sun gear of the second stage. The sun gear in the second stage drives the planet gears, in the second stage, which are connected to the planet carrier. The planet carrier in the second stage is connected to the outboard upright through the output shaft. This prevents planet carrier rotation. Rotation of the second stage planet gears causes the reduction gearbox housing to rotate. The housing is connected to the drum by the cover and capscrews.

Operation

Depending on which direction (clockwise or counterclockwise) the input shaft is turning will determine the direction of drum rotation. The speed of drum rotation is dependent on the speed of the input shaft. This allows the operator to vary the drum speed by controlling air motor speed. Planetary gears are not inherently self locking (as are some other types of gearing) it is therefore important that the braking systems work properly.

REDUCTION GEAR TROUBLESHOOTING

This section provides basic troubleshooting information. 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 reduction gear symptoms, probable causes and remedies.

Symptom	Cause	Remedy
Grinding noise or excessive vibration when rotating.	Worn bearings or thrust washers.	Disassemble, inspect and repair.
No drum rotation	Broken gear teeth.	Disassemble, inspect and repair.

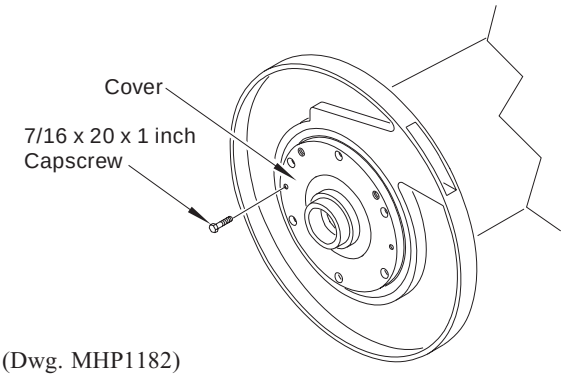
Reduction Gearbox Removal

1. Rotate gearbox until drain plug is in lowest position (refer to "LUBRICATION" Section).
2. Drain lubricant into a clean container and observe for particles or metal shavings which might indicate a problem and help to identify the cause.

⚠WARNING **Shutoff, bleed down and disconnect the air supply line before performing any disassembly procedures.**

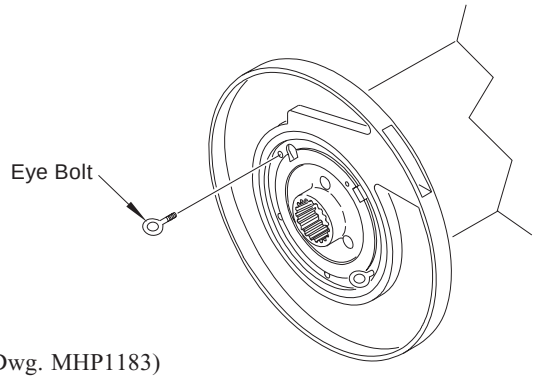
3. Remove disc brake.
4. Remove cover (4) and gasket (19) from outboard upright (26).
5. Remove output shaft (28).
6. Remove capscrews (86) from sideframes (78) at outboard upright (26). Loosen capscrews (86) at the motor upright (27).
7. Support drum (77). Attach lifting/pulling device to outboard upright (26) and remove winch mounting bolts. Pull outboard upright free from drum.

⚠ CAUTION **There will be lubricant seepage in area, use appropriate material to absorb lubricant.**



(Dwg. MHP1182)

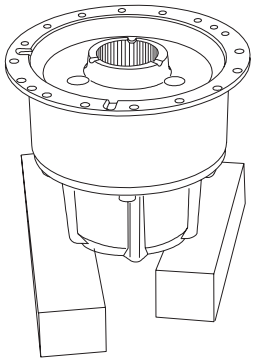
8. Use two 7/16 - 20 x 1 inch capscrews and thread them into the two threaded holes in the end cover (33).
9. Tighten both capscrews evenly until seal between the cover (33) and drum (27) is broken, remove cover (33) and thrust washer (36).



(Dwg. MHP1183)

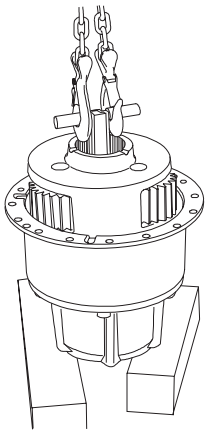
10. Use two 1/2 - 13 x 1 inch eye bolts and thread them into the two threaded holes in housing (44).
11. Tighten both eyebolts evenly until seal between housing and drum is broken.
12. Attach a suitable lifting device to the eye bolts and carefully pull reduction gear assembly out of drum. Move to a clean sturdy workbench.

Reduction Gearbox Disassembly



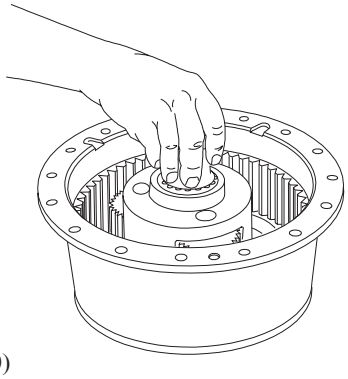
(Dwg. MHP1167)

1. Support the housing assembly on two blocks.



(Dwg. MHP1168)

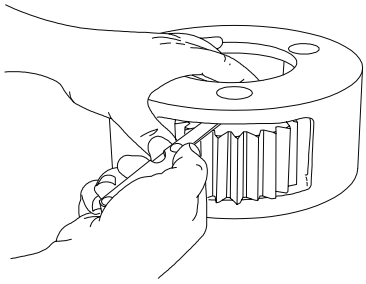
2. Insert a suitable lifting jig into the output carrier assembly (3) and lift assembly out of housing.



(Dwg. MHP1160)

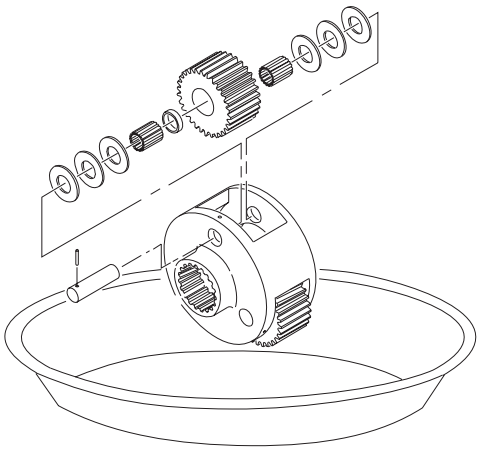
3. Grip output sun gear (45) and pull out intermediate carrier assembly (4).
4. Remove retainer ring (53) from output sun gear (45) and push out of carrier.
5. Remove intermediate sun gear (54). Remove thrust washers (63 and 65) and bearing (67) from sun gear.
6. Remove oil seal (71) and bearing (67) from back side of housing (69)
7. Remove capscrews (68) and separated housings (44 and 69).

Output Carrier Disassembly



(Dwg. MHP1169)

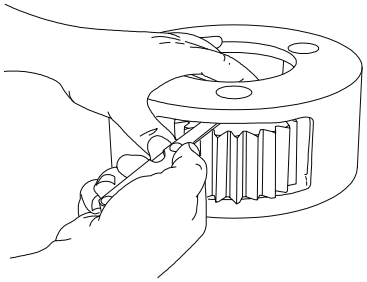
Prior to disassembly check planet gear side clearance, 0.005 to 0.032 inches (0.13 to 0.81 mm). Spin gears, gears should rotate freely. If gears are tight or clearance is incorrect, disassemble planet assembly.



(Dwg. MHP1222)

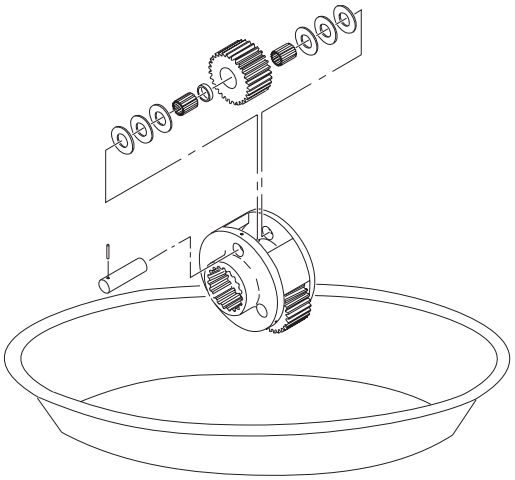
1. Tap roll pin (38) completely into output planet pin (35).
2. Place carrier in a wide shallow container or on a clean shop towel. Each gear contains 42 needle bearings (41) that may fall out as the output carrier is disassembled.
3. Push out output planet pin (35). Remove thrust washers (34, 40, and 42), needle bearings (41), and spacer (59). Thrust washers (34, 40, and 42) are used in combination to achieve clearance, all three might not be present or quantities may vary.
4. Tap roll pin (38) out of output planet pin (35).

Intermediate Carrier Disassembly



(Dwg. MHP1169)

rior to disassembly check planet gear side clearance, 0.005 to 0.032 inches (0.13 to 0.81 mm). Spin gears, gears should rotate freely. If gears are tight or clearance is incorrect, disassemble planet assembly.



(Dwg. MHP1187)

1. Tap roll pin (50) completely into intermediate planet pin (46).
2. Place carrier in a wide shallow container or on a clean shop towel. Each gear contains 36 needle bearings (48) that may fall out as the intermediate carrier is disassembled.
3. Tap out intermediate planet pin (46). Remove thrust washers (52, 55, and 64), needle bearings (48), and spacer (49). Thrust washers (52, 55, and 64) are used in combination to achieve clearance, all three might not be present or quantities may vary.
4. Tap roll pin (50) out of intermediate planet pin (46).

Inspection

1. Check all gear teeth for signs of galling, chipping, or uneven wear pattern.

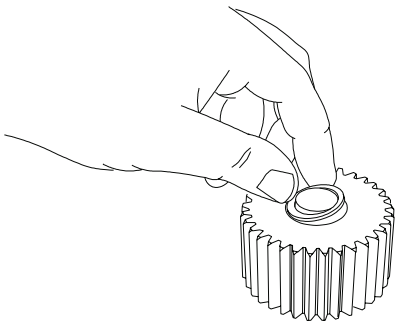
Intermediate Carrier Assembly

Cut two pieces of cardboard 3 inches (76 mm) square.

Make a intermediate planet pin tool as follows:

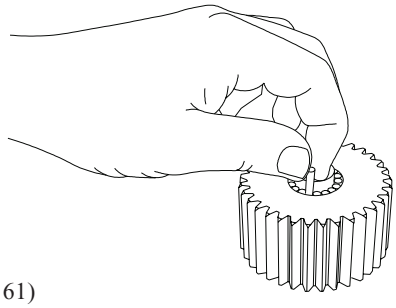
a. Cut an old pin to the same width as the gear, or

b. Make a pin that is the same diameter as intermediate planet pin (46) and as long as the gear is wide.



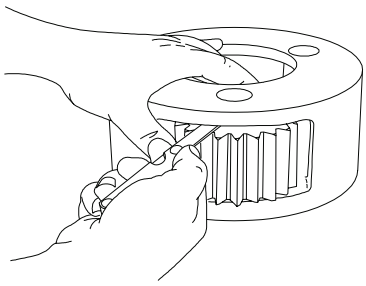
(Dwg. MHP1164)

1. Place planet gear (51) on the cardboard square and insert pin tool.
2. Insert 5 to 7 needle bearings (48) into gear around pin tool, ensure first few needle bearings do not tip over.
3. Insert spacer (49) followed by all 18 needle bearings.



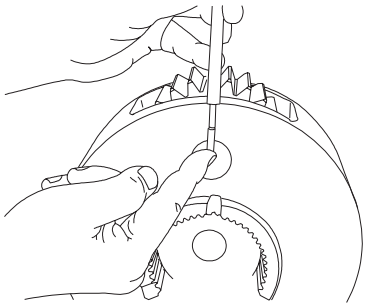
(Dwg. MHP1161)

4. Place a thrust washer (either 52,55,or 64) on top of this followed by the other cardboard square.
5. Pinching both cardboard squares, flip assembly over. Finish inserting the remaining needle bearings.
6. Place another thrust washer on top of assembly. Carefully slide assembly off the cardboard, pinching the thrust washers as they come free. Slide this assembly right into the intermediate carrier (47).



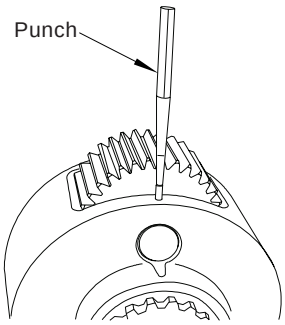
(Dwg. MHP1169)

7. Align the bores and push out the pin tool using the intermediate planet pin (46). Measure the side clearance and adjust the thrust washers (52, 55, or 64) to provide 0.005 - 0.032 inches (0.13 - 0.81 mm). Spin gears, gears should rotate freely.



(Dwg. MHP1165)

8. Measure the distance that roll pin (50) must be tapped into carrier so that the roll pin is half in the carrier and half in the pin, and mark the punch.



(Dwg. MHP1166)

9. Tap roll pin (50) into intermediate carrier (47) to the mark on the punch.

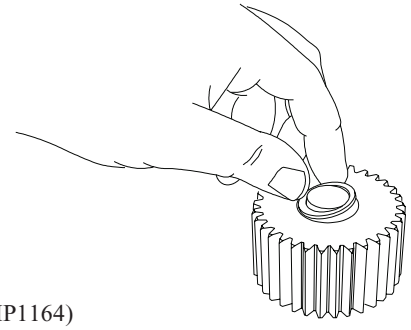
Output Carrier Assembly

Cut two pieces of cardboard 3 inches (76 mm) square.

Make an output planet pin tool as follows:

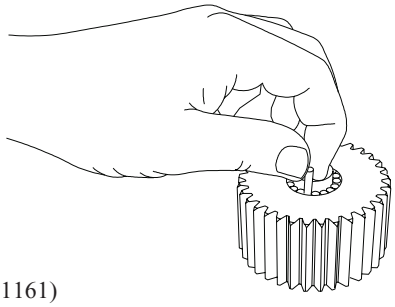
a. Cut an old pin to the same width as the gear, or

b. Make a pin that is the same diameter as output planet pin (35) and as long as the gear is wide.



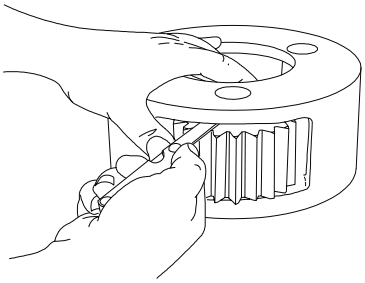
(Dwg. MHP1164)

1. Place planet gear (39) on the cardboard square and insert pin tool.
2. Insert 5 to 7 needle bearings (41) into gear around pin tool, ensure first few needle bearings do not tip over.
3. Insert spacer (59) followed by all 24 needle bearings.



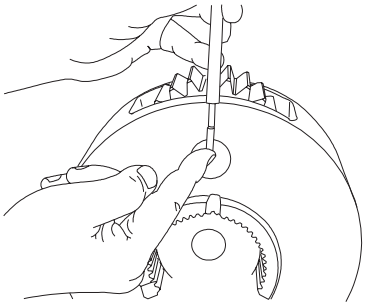
(Dwg. MHP1161)

4. Place a thrush washer (either 34,40 or 42) on top of this followed by another cardboard square.
5. Pinching both cardboard squares, flip assembly over. Finish inserting the remaining needle bearings.
6. Place another thrust washer on top of assembly. Carefully slide assembly right into the output carrier (37).



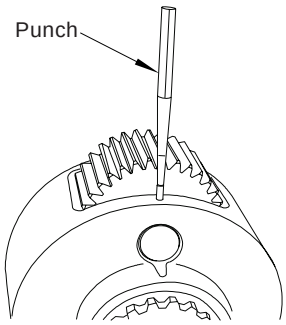
(Dwg. MHP1169)

7. Align the bores and push out the pin tool using the output planet pin (35). Measure the side clearance and adjust the thrust washers (34, 40, or 42) to provide 0.005 - 0.032 inches (0.13 - 0.81 mm). Spin gears, gears should rotate freely.



(Dwg. MHP1165)

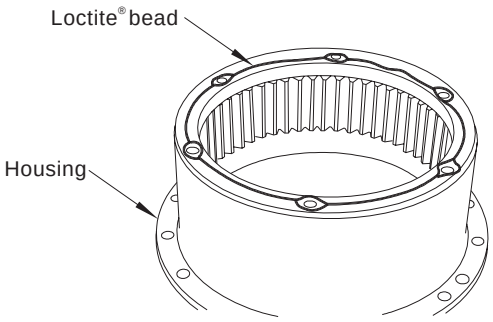
8. Measure the distance that roll pin (38) must be tapped into carrier so that the roll pin is half in the carrier and half in the pin, and mark the punch.



(Dwg. MHP1166)

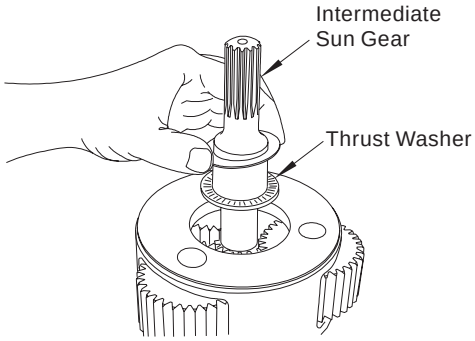
9. Tap roll pin (38) into output carrier (37) to the mark on the punch.

Reduction Gearbox Assembly



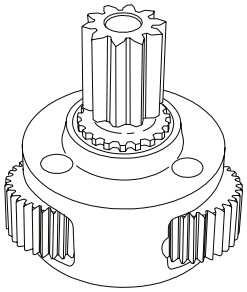
(Dwg. MHP1162)

1. Apply a bead of Loctite® 515 to the back mating surface of housing (44).
2. Insert capscrews (68) through housing (69) and into housing (44). Tighten capscrews to 60 ft lb (81 Nm).
3. Press bearing (67) into housing (69) followed by oil seal (71).



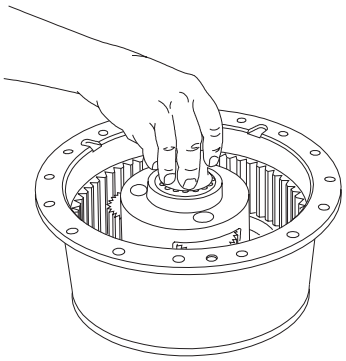
(Dwg. MHP1163)

4. Slide one thrust washer (65) onto input end of intermediate sun gear (54) followed by thrust washer (63) and then next thrust washer (65).



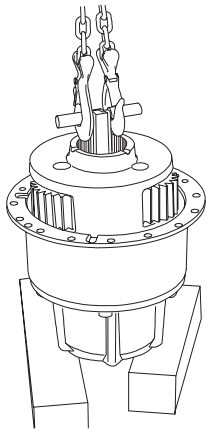
(Dwg. MHP1170)

5. Place retainer ring (53) on end of output sun gear (45). Slide this assembly into intermediate carrier assembly and fasten with retainer ring (53).



(Dwg. MHP1160)

6. Insert intermediate sun gear assembly into intermediate carrier assembly, twisting until fully seated.
7. Lower this assembly into the housing assembly, twisting sun gear or carrier assembly until assembly is fully seated.



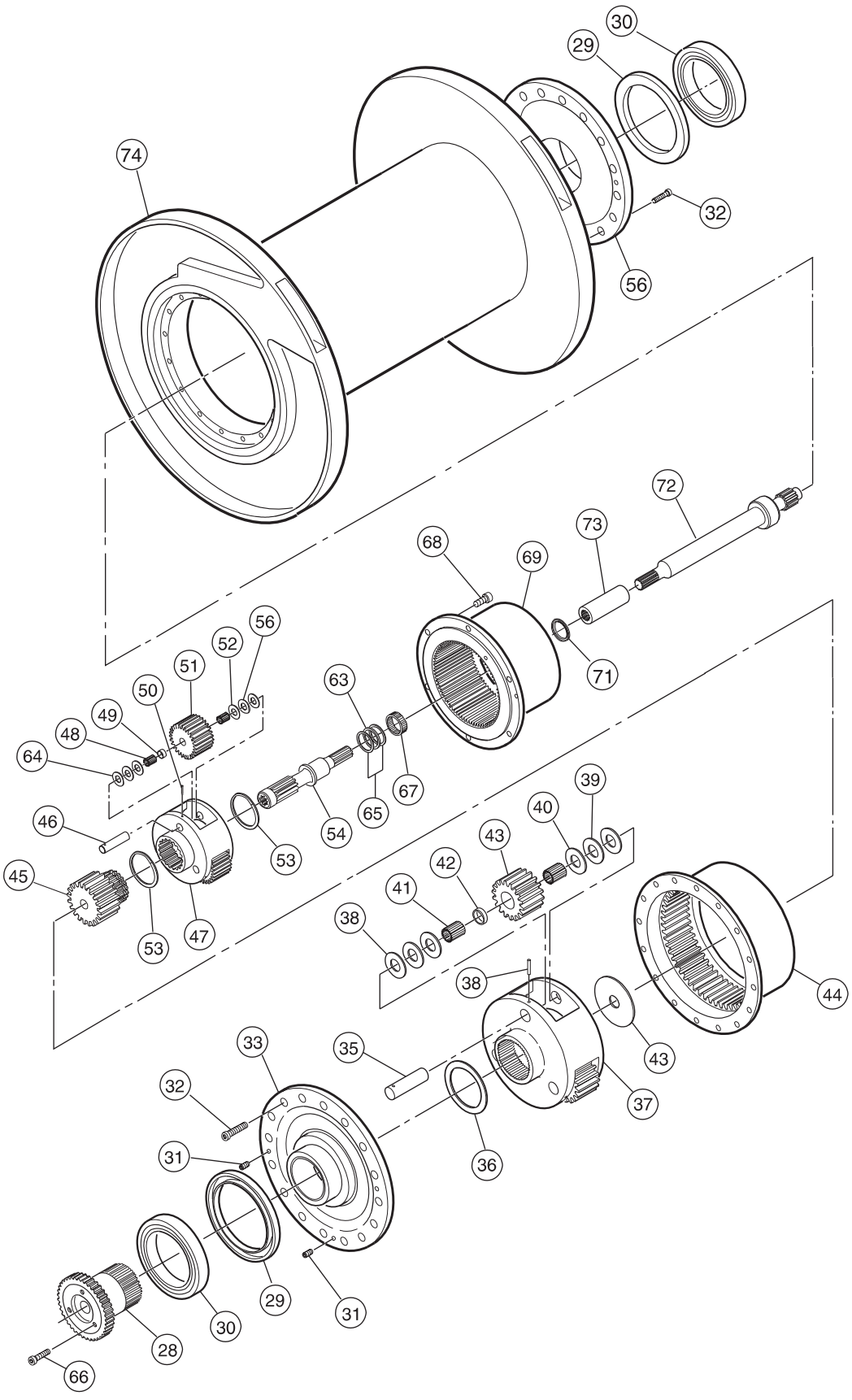
(Dwg. MHP11688)

8. Apply EP grease to the end of output sun gear (45). Set thrust washer (43) in the grease and apply more to the top of the thrust washer.
9. Lower intermediate carrier assembly into the housing assembly, twisting carrier until carrier is fully seated.
10. Apply a bead of Loctite® 515 to the mating surface of the drum.
11. Install two 1/2 - 13 x 1 inch eye bolts into housing assembly. Lift and insert reduction gear assembly into drum. Reduction gearbox assembly might have to be rotated to allow intermediate sun gear to align with and slide into coupling (73). Remove eye bolts.
12. Apply a bead of Loctite® 515 to the mating surface of housing (44).
13. Place thrust washer (36) inside of cover (33), use some EP grease to hold in place.
14. Align the two threaded holes in cover (33) with the grooves in housing (44).
15. Insert capscrews (32) through cover and into housing, tighten to 60 ft lb (81 Nm).

Winch Assembly

1. Press bearing (30) and oil seal (29) into outboard upright (26).
2. Slide upright onto cover (33).
3. Insert output shaft (28) through upright and into reduction assembly. Upright might have to be rotated to allow output shaft to align with splines in reduction gearbox and teeth in upright.
4. Insert capscrews (86) through sideframe (78), into corner bar (20) and tighten to 75 ft lb (102 Nm).
5. For units with disc brake refer to **Disc Brake Section**.
6. Insert capscrew (2) through cover (4) and gasket (19). Install this assembly on upright and tighten to 18 ft lb (24 Nm).
7. Install mounting bolts.
8. Fill reduction gearbox with lubricant.

REDUCTION GEAR ASSEMBLY PARTS DRAWING



(Dwg. MHP1221)

REDUCTION GEAR ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER	ITEM NO.	DESCRIPTION OF PART	QTY TOTAL	PART NUMBER
28	Output Shaft	1	21019	50	Pin. Roll	3	71267793
- - -	Gearbox Assembly (1)	1	23900	51	Gear, Intermediate Planet	3	23899
• 29	Oil Seal	2	71053862	52	Thrust Washer	6	71113260
• 30	Bearing	2	71053854	53	Retainer Ring	2	71113278
31	Plug, Drain	2	71267561	54	Intermediate Sun Gear	1	23896
32	Capscrew	16	71264683	55	Thrust Washer	6	71113229
33	End Cover	1	20393-1	56	End Cover	1	24440
- - -	Output Carrier Assembly (2)	1	23891	59	Spacer	3	20388
34	Thrust Washer	6	71146815	• 63	Bearing, Thrust	1	71113195
35	Pin, Output Planet	3	20394	64	Thrust Washer	6	71146807
36	Thrust Washer	1	23738	65	Thrust Washer	2	71113203
37	Output Carrier	1	23892	66	Capscrew	3	71266936
38	Pin, Roll	3	71113302	• 67	Bearing, Needle	1	71113187
39	Gear Output Planet	3	23893	68	Capscrew	6	71113161
40	Thrust Washer	6	71126478	69	Housing	1	20672
• 41	Bearing, Roller	126	71113286	• 71	Oil Seal	1	71113179
42	Thrust Washer	6	50533	72	Drive Shaft (12 inch)	1	24035
43	Thrust Washer	1	20406		Drive Shaft (15 inch)		
44	Housing	1	20377		Drive Shaft (24 inch)		23902
- - -	Intermediate Carrier Assembly (3)	1	23897		Drive Shaft (27 inches)		
45	Output Sun Gear	1	23894	73	Coupling	1	50775
46	Pin, Intermediate Planet	3	20386	74	Drum Assembly (12 inch)	1	23750
47	Intermediate Carrier	1	23898		Drum Assembly (15 inch)		24033
• 48	Bearing, Needle	108	71113252		Drum Assembly (24 inch)		21729
49	Spacer	3	20389		Drum Assembly (27 inch)		24030

• Recommended spare.

(1) Gearbox Assembly includes items 31, 33, 36, 44, 63, 65, 67 through 69, 71, Output Carrier Assembly and Intermediate Carrier Assembly.

(2) Output Carrier Assembly includes items 34, 35, and 37 through 43 and 59.

(3) Intermediate Carrier Assembly includes items 45 through 55 and 64.

PARTS ORDERING INFORMATION

The use of replacement parts other than **Ingersoll-Rand** Material Handling may invalidate the Company's warranty. For prompt service and genuine **Ingersoll-Rand** Material Handling parts, provide your nearest Distributor with the following:

1. Complete winch model number as it appears on the nameplate.
2. Part number and part description as shown in the service manual.
3. Quantity required.

Return Goods Policy

If it becomes necessary to return the complete winch or certain parts to the factory, contact the Distributor from whom you purchased the winch, or the nearest **Ingersoll-Rand** Distributor in your locality.

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.

NOTICE

Continuing improvement and advancement of design may cause changes to this winch 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.

Disposal

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

For additional information contact:

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

or

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

SERVICE NOTES

SERVICE NOTES

United States Office Locations

For Order Entry, Order Status and Technical Support

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

Regional Sales Offices

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

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

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

International Office Locations

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

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

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

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 USA
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) 3-27-93-08-08
Fax: (33) 3-27-93-08-00

Asia Pacific Operations
Ingersoll-Rand (Japan) Ltd.
Shin-Yokohama Square Bldg.
(5th Floor)
2-3-12 Shin-Yokohama,
Kouhoku-Ku,
Yokohama-shi, Kanagawa
Pref. 222 Japan
Phone: 81-45-476-7800
Fax: 81-45-476-7806

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

Printed in USA