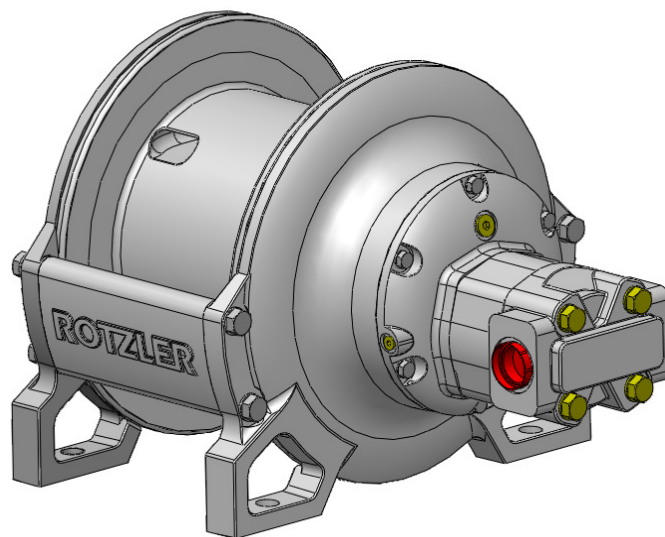




TH4

OWNER'S MANUAL

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR ROTZLER TITAN PLANETARY HYDRAULIC WINCHES



THIS MANUAL CONTAINS IMPORTANT INFORMATION FOR THE SAFE USE OF THIS WINCH.
READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE INSTALLING, OPERATING OR MAINTAINING THIS
WINCH. MAKE THIS MANUAL AVAILABLE TO RESPONSIBLE PERSONNEL.



WARRANTY

WARRANTY - INTRODUCTION

The Identification Label, located on the outside of the winch Final Base, lists important operating specifications for the particular winch. This Label must not be removed, altered or have its technical data obscured. If the data becomes illegible, contact the factory for a replacement Label.

The cable and other load lifting attachments are not part of the winch. Subsequently, Rotzler Inc. cannot be held responsible for any damages resulting from their failure.

WARRANTY

IMPORTANT: ROTZLER TITAN WINCHES ARE NOT DESIGNED NOR INTENDED TO MOVE PERSONNEL. ROTZLER INC. CANNOT BE HELD RESPONSIBLE FOR ACCIDENTS OCCURRING FROM SUCH USE.

- I.) Rotzler Inc. warrants each new Titan winch, assemblies and components thereof, to be free from defects in materials and workmanship for a period of two years from the date of the original purchase by Rotzler Inc.'s original customer, provided the unit is installed, operated and maintained in accordance with the instructions given in the Owner's Manual.
- II.) Wearable or consumable components such as O-rings, Shaft Seals, Brake Discs and Brake Separators are excluded from this warranty unless a material or workmanship defect is detected in these components at the time of the initial winch installation.
- III.) The obligation of Rotzler Inc. under this warranty is exclusively limited. Rotzler Inc. reserves the option of either replacing all components, supplied and manufactured by Rotzler Inc. and found to be defective by reason of faulty material or

workmanship, or furnishing a complete replacement winch. In either case, the replacement components or winch will be supplied freight collect, Free Carrier, the factory.

- IV.) Rotzler Inc. shall not be liable for any consequential damages or expenses of disconnecting or removing a unit or components thereof, nor any cost incurred in diagnosing a failure.
- V.) Rotzler Inc. neither assumes nor authorizes any person to assume on their behalf, any other liabilities in connection with the sale of Rotzler Inc. products.
- VI.) This warranty shall not apply to any units which have been repaired or altered without express written consent from Rotzler Inc.
- VII.) This warranty shall not apply to winches subjected to misuse or neglect or operated or maintained other than in strict accordance with the specifications provided and the instructions given in this Owner's Manual.



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INTRODUCTION

1. INTRODUCTION

WARNING

FAILURE TO FOLLOW RECOMMENDATIONS CONTAINED IN THIS MANUAL COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THIS MANUAL BEFORE INSTALLING, OPERATING OR MAINTAINING THIS WINCH.

Be familiar and comply with all local rules and regulations governing winches, hoisting and pulling units.

Rotzler Inc. Titan winches are not designed, nor intended to lift or move personnel.

Do not hesitate to contact Rotzler Inc. for assistance regarding the installation, operation and maintenance of the winch.

Rotzler Inc. reserves the right to change the design and documentation of the winch without notice and without obligation.

The copyright of this manual and other documentation belongs to Rotzler Inc. The contents are not to be copied in whole or in part, communicated to others or used for competitive purposes.

DESCRIPTION OF WINCH FUNCTION

• **DESCRIPTION OF WINCH FUNCTION - HOISTING**

Hydraulic pressure applied at the Motor hoisting port rotates the primary sun gear. The high speed sun gear rotation is reduced through a two stage planetary gear reduction to provide high torque rotation of the Cable Drum.

The Sprag Clutch allows the Brake Shaft to turn freely in the hoisting direction, independent of the winch brake system.

Hydraulic pressure, proportional to the load that is being lifted, develops at the Motor hoisting port.

Increasing the volume of oil supplied to the Motor increases the hoisting speed. When the oil supply is halted, the winch stops hoisting. The Sprag Clutch then locks the Brake Shaft to the brake system and prevents the load from lowering.

• **DESCRIPTION OF WINCH FUNCTION - LOWERING**

When the winch is not moving, the Sprag Clutch locks the Brake Shaft to the spring applied, pressure released brake system and secures the load.

Some of the hydraulic fluid supplied to the Motor is diverted to the Brake Piston. As the operator increases pressure at the Motor lowering port, pressure also develops at the Brake Piston and partially releases the brake. When the diminished brake is no longer able to sustain the combined torque of the motor and load, the Brake Discs slip and the winch begins to lower the load.

The Motor regulates pressure at the Brake Piston to control the speed of the lowering load. The force of gravity on the lowering load attempts to turn the winch Drum faster than the operator requires. The motor is then forced to turn faster than the hydraulic supply can satisfy and consumes oil, reducing pressure at the Brake Piston. The brake torque then increases and slows the load. In this manner, the Motor continuously regulates the Brake Piston pressure and positively controls the lowering load without using a counter-balance or holding valve.

Increasing the volume of oil supplied to the hydraulic motor increases the lowering speed. When the oil supply is halted, the winch stops lowering and the brake fully applies and secures the load.

When lowering a load, heat is generated as the Brake Discs slip through the Brake Separators. An orifice in the Brake Piston restricts the volume of oil permitted to circulate through the brake plate stack and dissipate this heat.



MODEL CODE

A model code describes the winch configuration as follows:

TH □ . □ . □ □ . □ . □ . □ □ □

SERIES: Rotzler Titan TH Series Winch

SIZE: Nominal Bare Drum Line Pull Capacity (tonnes)

REVISION: Revision level indicates design changes for internal use only

ROTATION: Direction of Cable Drum rotation when hoisting, established by looking at the motor.

CC = Counterclockwise CW = Clockwise

MOTOR: Optional hydraulic Motor displacement.

0 = Standard XX = Other Motor

CABLE DRUM: Configuration of optional Cable Drum.

0 = Standard X = Other Cable Drum

SPECIAL OPTIONS: Used to identify a winch equipped with options not described above.

AVAILABLE OPTIONS

Rotzler Titan TH4 winches are available with the following options:

- CC or CW Cable Drum rotation when hoisting.
- Other motors to suit special hydraulic systems.
- Special paint finish.
- Stainless steel screws for improved corrosion resistance.

AVAILABLE ACCESSORIES

Accessories for use with Rotzler Titan TH4 winches are available as follows:

- External Brake Release Kit allows releasing the brake and lowering a load with an auxiliary hydraulic supply capable of delivering at least 6 USGPM [23 L/min] at 1000 psi [70 bar].

PERFORMANCE DATA

Performance data follows for winches with standard cable and optional motors. When other options are supplied, the particular performance data is inserted as required.

• IDENTIFICATION LABEL

An Identification Label is located on the outside of the Final Base, identifying the specific winch serial number and important technical data critical for the safe operation model configuration, of the winch. An area is provided at the back of this manual to record this data for future reference.

This Label must not be removed, altered or have its technical data obscured. If the data becomes illegible, contact Rotzler Inc. for a replacement label.

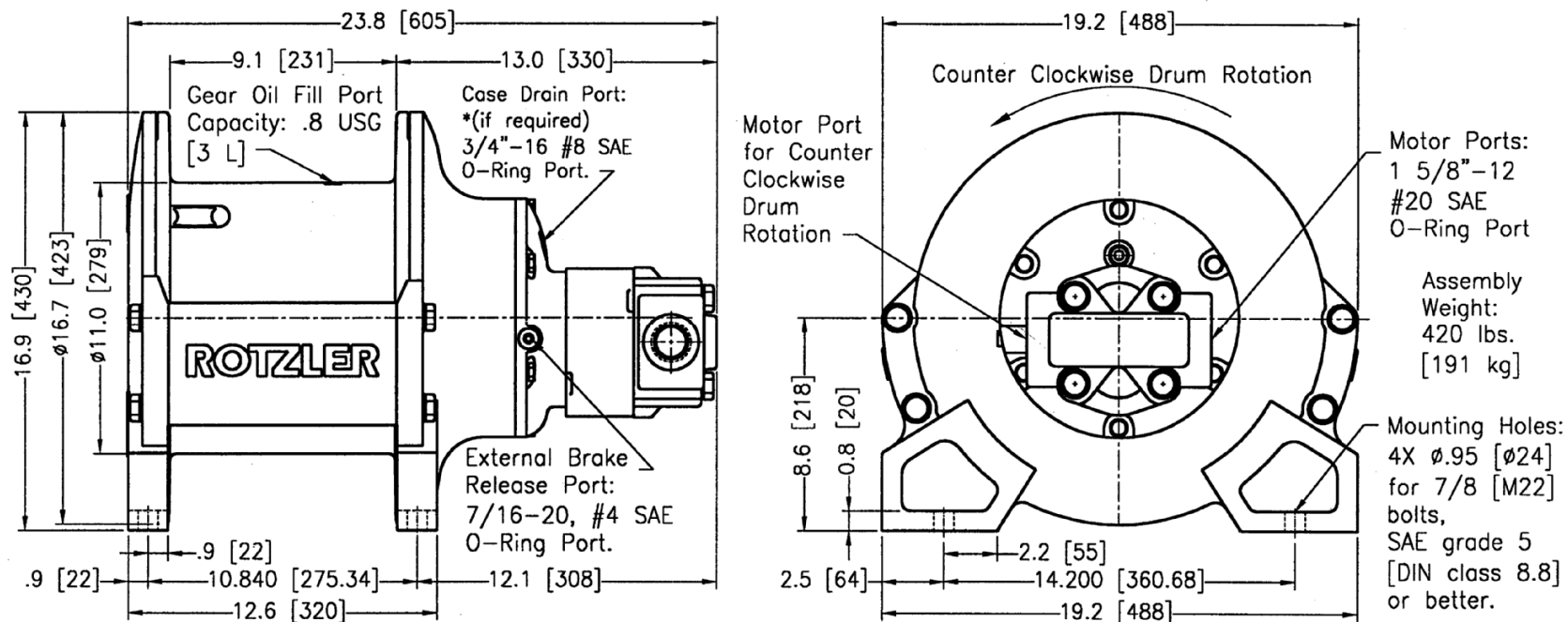


TECHNICAL DATA

2. TECHNICAL DATA – TH4.XX.0.0

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To safely support the load, maintain at least three wraps of rope on the Cable Drum at all times.



* A Case Drain line is recommended when Return Line back pressure exceeds 200 psi [14 bar].

Dimensions are in inches [millimeters]. Cable Wedge accommodates 7/16" to 5/8" [11mm to 16mm] diameter wire rope.

• CABLE DRUM STORAGE CAPACITY

CABLE SIZE	7/16"	1/2"	9/16"	5/8"	11 mm	12 mm	14 mm	15 mm	16 mm
STORAGE CAPACITY	415'	298'	268'	188'	125 m	94 m	83 m	59 m	57 m



• LINE PULL – TH4.XX.0.0

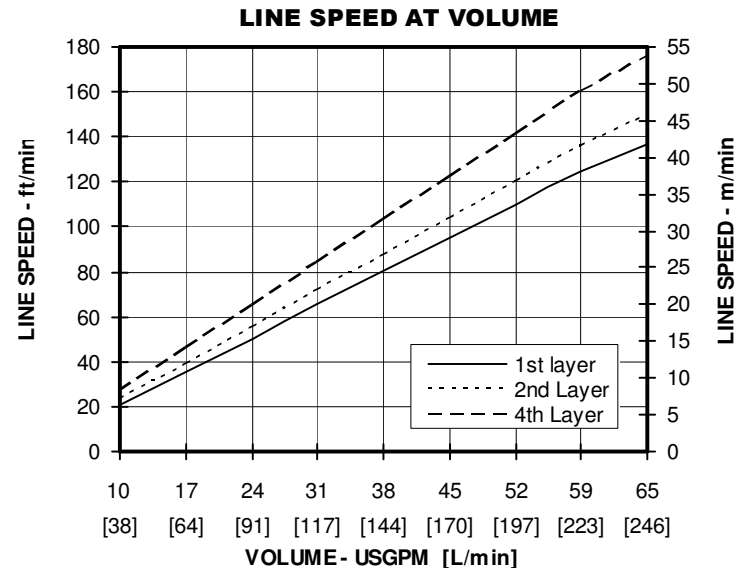
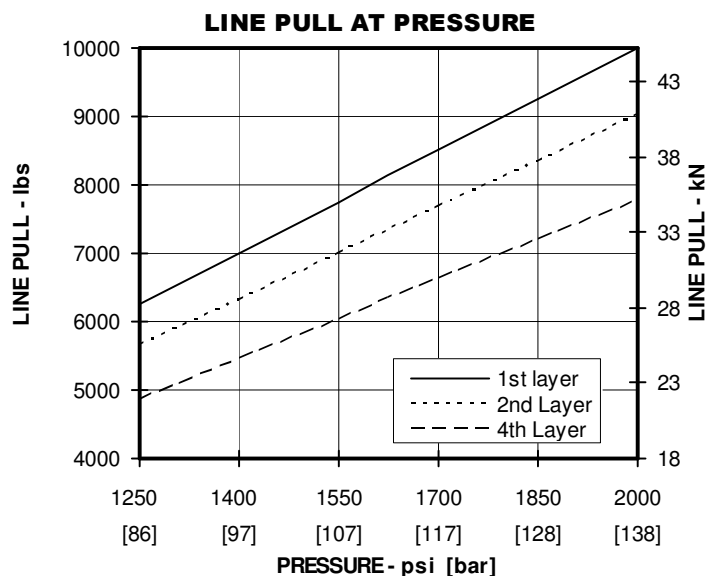
SYSTEM PRESSURE	DRUM TORQUE	LINE PULL AT SYSTEM PRESSURE
Maximum system pressure: 2000 psi [138 bar]	58230 in-lb [6580 N·m]	Bare Drum: 10000 lb [45 kN] Full Drum: 7800 lb [35 kN]
Minimum System Pressure: 1200 psi [83 bar]	34940 in-lb [3950 N·m]	Bare Drum: 6000 lb [27 kN] Full Drum: 4670 lb [21 kN]

• LINE SPEED – TH4.XX.0.0

SYSTEM VOLUME	DRUM SPEED	LINE SPEED AT SYSTEM VOLUME
Maximum System Volume: 65 USGPM [250 L/min]	45 RPM	Bare Drum: 137 ft/min [42 m/min] Full Drum: 176 ft/min [54 m/min]
Minimum System Volume: 10 USGPM [38 L/min]	7 RPM	Bare Drum: 21 ft/min [6 m/min] Full Drum: 27 ft/min [8 m/min]

• PERFORMANCE GRAPHS – TH4.XX.0.0

The following graphs show the winch performance with 5/8" diameter cable on various layers of the Cable Drum.

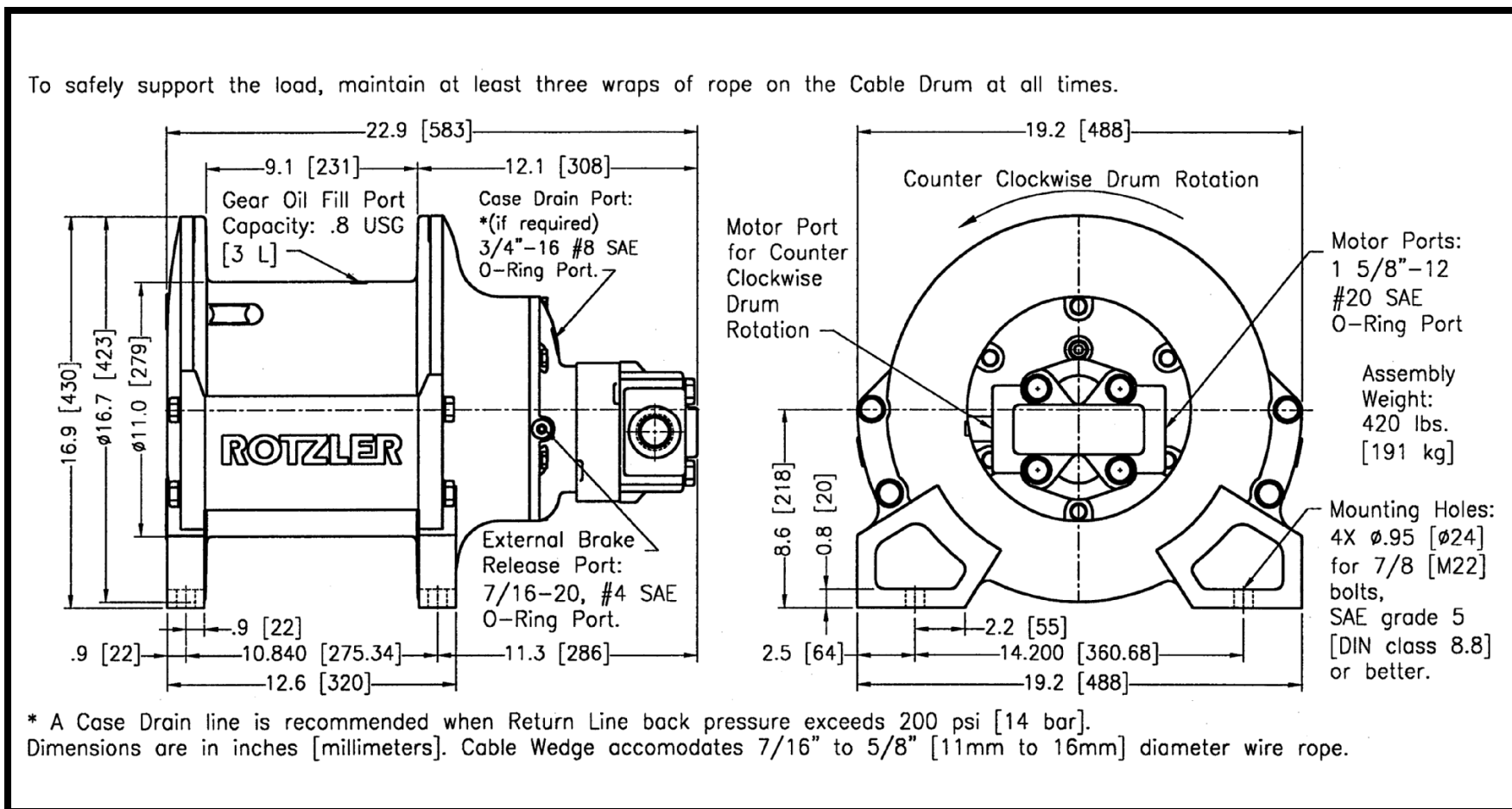




TECHNICAL DATA

TECHNICAL DATA – TH4.XX.59.0

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• CABLE DRUM STORAGE CAPACITY

CABLE SIZE	7/16"	1/2"	9/16"	5/8"	11 mm	12 mm	14 mm	15 mm	16 mm
STORAGE CAPACITY	415'	298'	268'	188'	125 m	94 m	83 m	59 m	57 m



• LINE PULL – TH4.XX.59.0

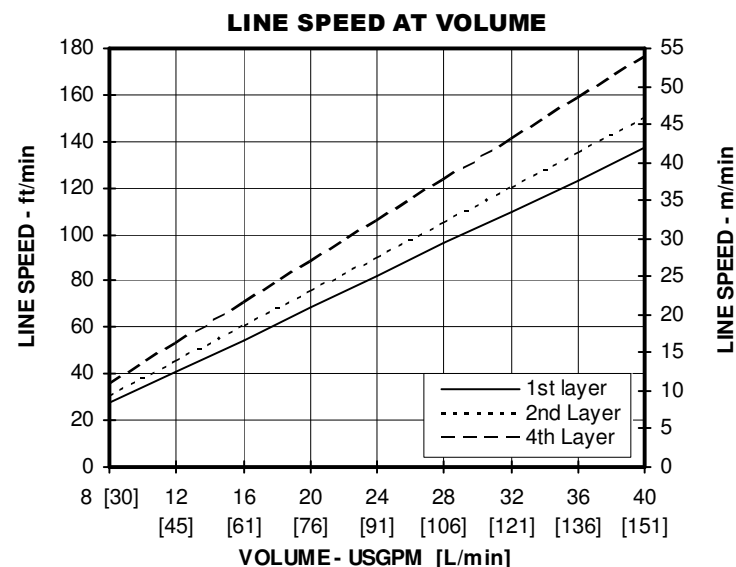
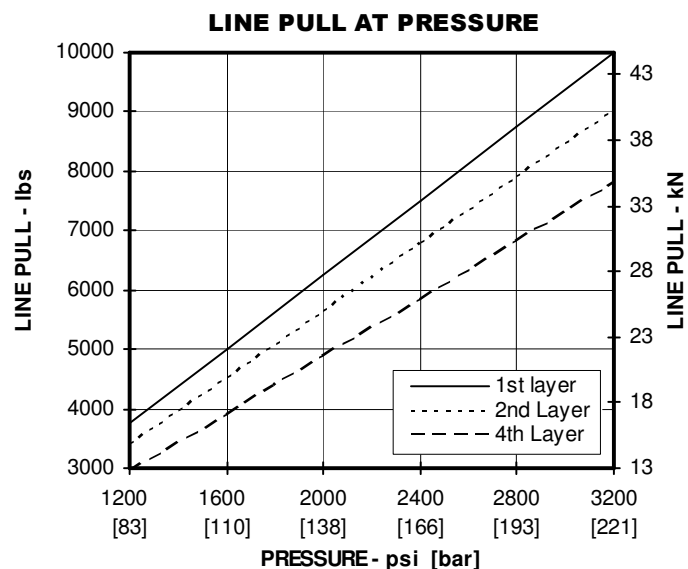
SYSTEM PRESSURE	DRUM TORQUE	LINE PULL AT SYSTEM PRESSURE
Maximum system pressure: 3200 psi [220 bar]	58230 in-lb [6580 N·m]	Bare Drum: 10000 lb [45 kN] Full Drum: 7800 lb [35 kN]
Minimum System Pressure: 1200 psi [83 bar]	34940 in-lb [3950 N·m]	Bare Drum: 3750 lb [17 kN] Full Drum: 2920 lb [13 kN]

• LINE SPEED – TH4.XX.59.0

SYSTEM VOLUME	DRUM SPEED	LINE SPEED AT SYSTEM VOLUME
Maximum System Volume: 40 USGPM [150 L/min]	45 RPM	Bare Drum: 137 ft/min [42 m/min] Full Drum: 176 ft/min [54 m/min]
Minimum System Volume: 8 USGPM [30 L/min]	9 RPM	Bare Drum: 27 ft/min [8 m/min] Full Drum: 35 ft/min [11 m/min]

• PERFORMANCE GRAPHS – TH4.XX.59.0

The following graphs show the winch performance with 5/8" diameter cable on various layers of the Cable Drum.





TECHNICAL DATA

3. HYDRAULIC SYSTEM

To achieve the specified line pull and line speed performance, the hydraulic power unit must be capable of delivering the specified hydraulic pressure and flow.

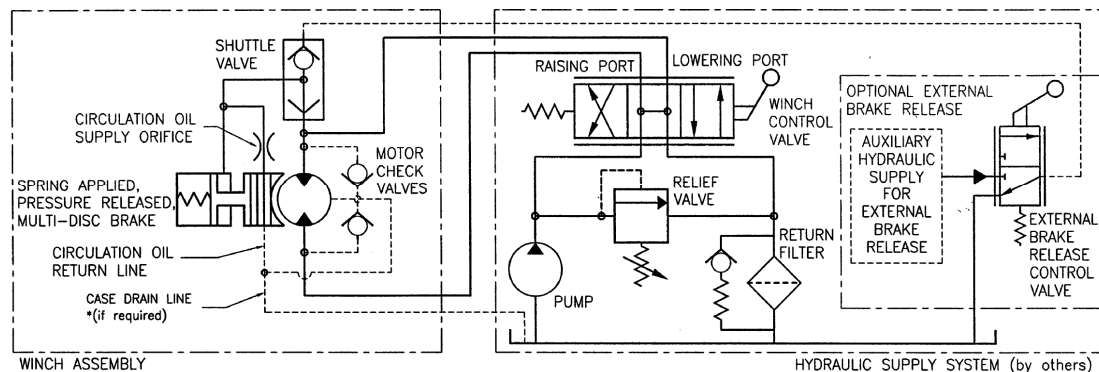
The maximum allowable return line back pressure is 200 psi [14 bar]. If system back pressure cannot be limited to 200 psi [14 bar], remove Motor Plug #293 and connect a hose to drain the excess brake cavity pressure directly to tank. Do not connect to a common return line.

- **HYDRAULIC SYSTEM FLUID** - Use premium grade petroleum based hydraulic fluid. For optimum performance the fluid viscosity should be maintained between 60 and 1400 SUS [10 and 300 cSt]. The operating viscosity in extreme conditions, for short periods of time, should not exceed 45 and 4545 SUS [10 and 1000 cSt]. The recommended operating temperature range of the hydraulic fluid is between 5 and 150 deg F [-15 and 66 deg C].
- **CONTROL VALVE** - A four-way three position, spring centered control valve with motor spool is recommended. For optimum winch performance, work ports should be connected to tank in neutral position. If a control valve with cylinder spool must be used, remove Motor Plug #293 and connect a hose to drain the excess brake cavity pressure directly to tank. Do not connect to a common return line. To provide smooth control at low speeds, a valve with good metering capability is required.

- **RELIEF VALVE** - A pressure relief valve is required to limit the maximum system pressure supplied to the winch and avoid possible over load damage.
- **RESERVOIR** - A well designed and manufactured reservoir is important. Ensuring return lines enter the reservoir below the fluid level and using baffles to divert the oil path reduces air entrapment. To prevent oil contamination, the reservoir must be constructed and maintained in a clean condition. The reservoir must have sufficient surface cooling capacity to dissipate the heat generated in the oil by the brake during lowering.
- **FILTER** - A high quality, well maintained filter is an important component in any hydraulic system. Typically, other system components will dictate the required filtration level. The recommended minimum requirement is a 10 micron filter.
- **HOSES** - Size hydraulic hoses and fittings to accommodate the winch maximum hydraulic pressure and flow. The following minimum recommendation is made for the Rotzler Titan TH4 winch:
 - o Standard Motor pressure hoses: 1 1/2" [38 mm] diameter, 2000 psi [140 bar] operating pressure, grade SAE 100R9 or better. Use larger diameter hoses when extra long lines are required. Refer to factory for hose recommendations when using optional motors.

When rigid tube or pipe is used to plumb the control valve, minimize vibration damage by using short flexible jumper hoses immediately at the winch.

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4. INSTALLATION

Rotzler Titan winches are to be installed by trained and authorized personnel who have read and understand the installation instructions in this manual. This manual is to be kept near the winch and made accessible to installation personnel.

WARNING

FAILURE TO FOLLOW WINCH MOUNTING INSTRUCTIONS COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE INSTALLING THIS WINCH.

IMPORTANT: FOR PROPER LUBRICATION OF THE INTERNAL GEAR COMPONENTS, MOUNT THE WINCH HORIZONTALLY.

WINCH INSTALLATION

Initial winch mounting is critical for safe operation and optimum performance. Prevent distortion of the winch's centerline by mounting as follows:

- Verify that the winch mounting support structure is adequately designed and constructed to withstand the intended loads with minimal deflection.
- Verify that the mounting surface and the underside of the winch are clean of rust, scale, loose paint, dirt, oil and grease.
- Position the winch on the mounting structure.
- Use hardened steel Structural flat washers between the mounting bolt and the cast Base.
- Inspect each of the four winch feet for contact with the mounting surface. If one of the feet does not contact the mounting surface, correct as follows:

- o Install the recommended mounting bolts (refer to **GENERAL DIMENSIONS** for required size and grade) on the three mounting feet that are in contact with the mounting surface. Lightly tighten until snug.
- o Use shim stock to securely fill the gap beneath the fourth mounting foot.
- o Install the fourth mounting bolt.
- o Fully tighten all four mounting bolts to torque recommended for particular connection design.

ADDING GEAR LUBRICATING OIL

IMPORTANT: THE WINCH IS SHIPPED FROM THE FACTORY WITHOUT GEAR LUBRICATING OIL. TO PREVENT MAJOR WINCH COMPONENT FAILURE, ADD GEAR LUBRICATING OIL PRIOR TO RUNNING THE WINCH.

Add gear lubricating oil as follows:

- Remove the Pipe Plug located on the Cable Drum barrel and the Relief Valve located on the outside of the Final Base.
- Pour high quality SAE 90 gear lubricant oil into the Cable Drum through the Plug port (refer to **GENERAL DIMENSIONS** for required volume). In severe applications, gear tooth wear can be reduced by using a high performance gear lubricant such as Swepco #201 Multi-Purpose Gear Lube.
- Fill the Cable Drum until gear oil appears at the Final Base Relief Valve port. The Cable Drum is now properly half filled with gear oil.
- Install the Relief Valve and Cable Drum Pipe Plug, using Loctite #565 Thread Sealant to seal threads.



INSTALLATION

HYDRAULIC SYSTEM CONNECTION

Recommendations for the selection and arrangement of hydraulic system components are given in the **HYDRAULIC SYSTEM** section of this manual.

Before connecting the winch, verify that the hydraulic system produces the required hydraulic fluid pressure and volume. The Motor hoisting and lowering ports are identified in **GENERAL DIMENSIONS**.

Run the winch without load in both directions using the hydraulic system control valve. Ensure that the brake is effective in the appropriate direction of rotation by verifying that the motor develops significantly higher pressure when lowering than when hoisting.

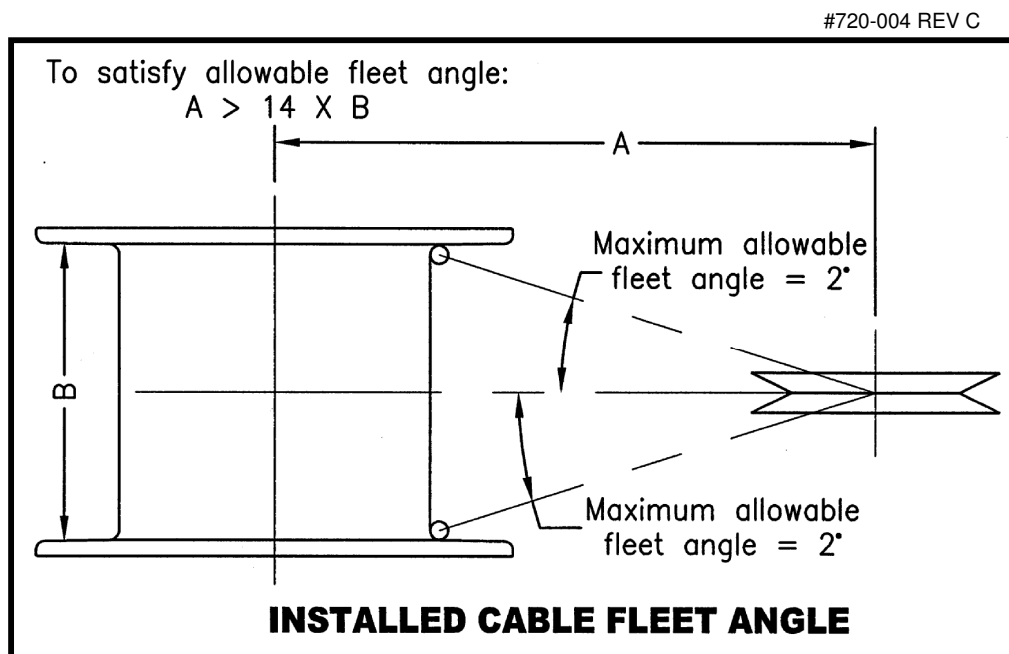
CABLE SELECTION AND INSTALLATION

The cable and other load lifting attachments are not part of the winch and are not covered by this manual. Refer to the manufacturer's recommendations for proper cable selection, handling, inspection and maintenance.

It is the responsibility of the user to identify and follow applicable local regulations governing lifting operations and equipment, including the selection and allowable loading of cable.

• CABLE INSTALLATION - FLEET ANGLE

For proper spooling onto the Cable Drum, the cable angle must not exceed the maximum allowable fleet angle as indicated below. To satisfy this requirement, the distance from the drum to the first sheave must exceed 14 times the distance between the drum flanges.



• CONNECTING THE CABLE

⚠ WARNING

IMPROPER CABLE CONNECTION COULD ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE CONNECTING THE CABLE.

The winch brake can support the load in one direction only. It is therefore critical to ensure that the cable is correctly connected to the Drum.

The Cable Drum has a single pocket which allows the cable to be connected for either counter clockwise or clockwise hoisting. When shipped from the factory, a Rotation Label indicating direction of hoisting and connection instructions is attached to the Cable Drum.

Connect the cable to the Drum as follows (refer to diagram):

- o Identify the appropriate direction of rotation from the Rotation Label.
- o Pass the cable through the cable slot as shown. Bring the loose end around and back into the slot to form a large loop.
- o Push the loose end of the cable through the slot until it is even with the opening. Do not let it protrude from the Drum barrel.
- o Insert the Cable Wedge tapered end first, into the slot at the center of the cable loop. Tighten the cable while maintaining the Wedge in position.
- o As the cable is pulled tight, ensure that the end of the cable stays even with the slot opening as shown.
- o Wind at least three complete wraps of cable onto the Cable Drum before connecting the load.

INSTALLATION INSPECTION

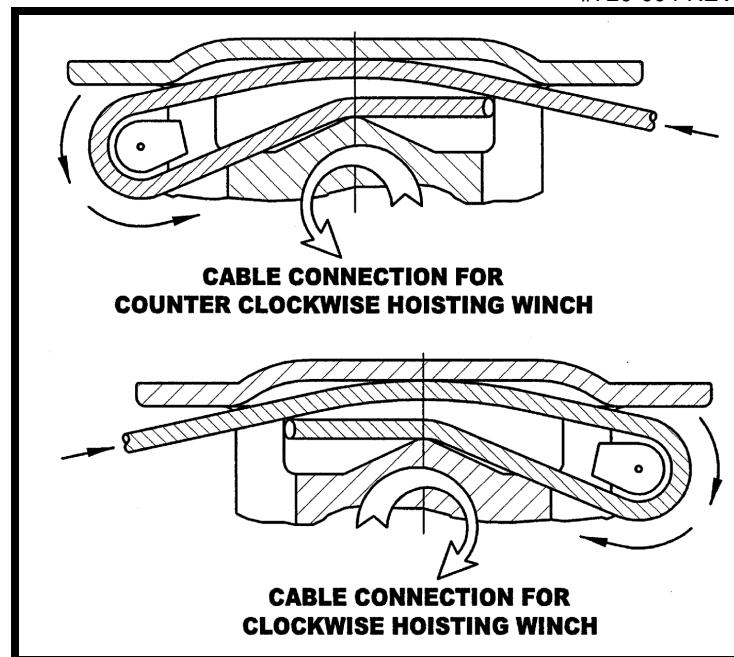
⚠ WARNING

HOISTING THE LOAD WITH AN IMPROPERLY INSTALLED WINCH COULD RESULT IN WINCH FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH.

INSPECT AND TEST WINCH INSTALLATION BEFORE HOISTING HEAVY LOADS TO POTENTIALLY DANGEROUS HEIGHTS.

Verify proper winch installation by slowly lifting and lowering a full test load to a safe height several times before lifting a heavy load to a potentially dangerous height.

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OPERATION

5. OPERATION

SAFETY INSTRUCTIONS

WARNING

IMPROPER WINCH OPERATION COULD ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE OPERATING THIS WINCH.

Rotzler Titan winches are to be operated by trained and authorized personnel who have read and understand the operating instructions in this manual. This manual is to be kept near the winch and made accessible to the operating personnel.

Rotzler Titan winches are not designed, nor intended to lift or move personnel.

Rotzler Titan winches must be installed and operated according to instructions given in this manual.

Operating and safety recommendations made by the manufacturers of other related equipment must also be followed.

It is the operator's responsibility to know and ensure that all local regulations governing hoisting operations are followed.

OPERATING INSTRUCTIONS

The hydraulic control valve controls the direction and speed of the winch. A valve with good metering characteristics will provide good low speed control of the load. Returning the valve to neutral allows the brake to apply and secure the load.

The Cable Wedge pocket is not intended to support the full load. To safely support the load, maintain at least three wraps of rope on the Cable Drum at all times.

The winch must be operated within the load and speed limits stated on the Final Base Identification Label.

When hoisting a load, the operator must maintain visual contact with the load and the immediate operating area. If the operator does not have clear sight of the load, auxiliary personnel or equipment must be used to ensure that the load is lifted safely.

Spooling is improved by maintaining tension on the wire rope.

ALLOWABLE OPERATING TEMPERATURE

Operate the winch only when the hydraulic fluid temperature is within the recommended operating temperature range specified in the **HYDRAULIC SYSTEM** section of this manual.

Operate the winch only when ambient temperature is between 5 and 140 deg F [-15 and 60 deg C].

Contact Rotzler Inc. if it is required to operate the winch in extreme temperatures, vibration, sand, dust or other detrimental environmental conditions.

CABLE HANDLING INSTRUCTIONS

When working with steel cable, always wear gloves. Never use your hands to guide a tight cable.

Do not allow the cable to pass over sharp edges.

Clean and check the cable after every use. Be familiar and comply with all local rules and regulations governing cable inspection and replacement criteria. Replace damaged cable immediately.



SPECIAL INSTRUCTIONS - EXTERNAL BRAKE RELEASE

Refer to the following instructions to release the winch brake and lower a load using an auxiliary hydraulic supply system and the optional External Brake Release Kit #9271804000 (#220-091).

• DESCRIPTION OF EXTERNAL BRAKE RELEASE FUNCTION

The External Brake Release Kit is comprised of a Steel Ball #400000668 (#220-051) and an External Brake Release Fitting #4000006890 (#220-050). These parts are positioned inside the external brake release port of the Motor Shaft End Cover.

The Steel Ball acts as a shuttle valve and prevents auxiliary hydraulic oil supplied at the External Brake Release Fitting from dumping to tank through the Motor. When auxiliary oil is supplied to the Brake Piston, pressure develops and partially releases the Brake. When the diminished brake can no longer hold the load, the Brake Discs slip and the load begins to lower.

Oil passes through the Brake Piston orifice and circulates through the Brake Discs to dissipate heat generated when slipping. This oil then passes through the Motor and back to tank.

WARNING

FAILURE TO VENT THE EXTERNAL BRAKE RELEASE FITTING TO TANK DURING NORMAL WINCH OPERATION COULD TRAP PRESSURE AT THE BRAKE PISTON AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. ENSURE THAT THE EXTERNAL BRAKE RELEASE FITTING IS VENTED TO TANK WHEN NOT IN USE.

• AUXILIARY HYDRAULIC SUPPLY SYSTEM

The auxiliary system must continuously supply at least 6 USGPM [23 L/min] at 1000 psi [70 bar] through a three way, two position, spring returned, control valve to the External Brake Release Fitting.

The valve work port must be connected to tank in the neutral position. A very sensitive control valve is required to control the speed of the lowering load.

The auxiliary system can be permanently plumbed to the External Brake Release Fitting or connected as required. In either case, the Fitting must be vented to tank when not in use and never capped.

• INSTALLATION

When installed at the factory, the External Brake Release Fitting comes installed in the Motor Shaft End Cover port and protected by a Plastic Cap #4000005989 (#220-082).

When installing the External Brake Release Kit into an existing winch, remove the Motor Shaft End Cover Plug #9272214000 (#220-072) and insert the Steel Ball into the Motor Shaft End Cover external brake release port. Then install and tighten the External Brake Release Fitting.

• OPERATION

Supply oil through the auxiliary control valve to the External Brake Release Fitting. Increase the flow of oil to increase pressure and allow the load to drop faster. Return the valve to neutral to reduce the flow of oil and slow or stop the lowering load. A valve with very fine metering capability can be carefully modulated to allow some speed control.

Oil passing through the Brake Piston orifice removes heat from the Brake Discs and must be allowed to vent to tank through the Motor hoses.

IMPORTANT: CIRCULATION OIL MUST BE ALLOWED TO RETURN TO TANK THROUGH THE MOTOR HOSES. ENSURE THAT THE MOTOR PORTS ARE NOT PLUGGED WHEN SUPPLYING AUXILIARY OIL AT THE EXTERNAL BRAKE RELEASE FITTING.



MAINTENANCE

6. MAINTENANCE

WARNING

FAILURE TO PROPERLY MAINTAIN AND SERVICE THE WINCH COULD RESULT IN A MAJOR MECHANICAL FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE MAINTAINING THIS WINCH.

INTRODUCTION

Rotzler Titan winches are to be maintained by trained and authorized personnel who have read and understand the maintenance instructions in this manual. This manual is to be kept near the winch system and made accessible to the maintenance personnel.

Safe operation and optimum performance can only be assured when maintenance intervals are strictly followed. Be familiar and comply with all local rules and regulations governing the maintenance of hoisting equipment.

When maintaining the winch, ensure that the control system is deactivated and appropriate protective lock out devices are in place to prevent inadvertent winch start up during service.

CABLE MAINTENANCE

WARNING

CABLE WEARS OUT. FAILURE TO DETECT CABLE DAMAGE CAN LEAD TO UNEXPECTED CABLE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH.

The cable is supplied independent of the winch and is not covered in this manual. Refer to manufacturer's recommendations for inspection and maintenance instructions.

Be familiar with and adhere to any local or national regulations governing the replacement of wire ropes used in hoisting operations.

• **REPLACING A DAMAGED CABLE**

Replace damaged cable as follows:

- o Spool the cable off of the Drum until only the end secured in the Cable Wedge remains.
- o Rotate the Drum until the Cable Wedge socket is easily accessible.
- o Dislodge the Cable Wedge by pushing the cable rope into the Cable Wedge socket.
- o Remove the Cable Wedge and pull the free end of the cable through the socket.
- o Discard damaged cable and install new cable according to instructions in **CABLE SELECTION AND INSTALLATION**.

PREVENTIVE MAINTENANCE

Perform a basic inspection of the winch daily, monitoring for unusual noise or hydraulic leaks. Clean and check the cable for damage daily. Verify the tension of all mounting bolts weekly.

• **MAINTAINING GEARBOX LUBRICATING OIL**

Inspect the gearbox lubricating oil level through the Final Base Relief Valve port every two months. Maintain the oil level at the half-full point. Repeated loss of lubricating oil indicates a leak and should be investigated.

After the initial 100 hours of operation or two months, whichever comes first, drain the lubricating oil, flush the Cable Drum and add new oil. Subsequently, change the lubricating oil after every 1000 hours of operation or every two years, whichever comes first.



• MAINTAINING HYDRAULIC SYSTEM FLUID

Inspect and maintain the hydraulic system filter and other components according to the manufacturers' recommendations. Once a year, verify the condition of the hydraulic system fluid by having it analyzed for cleanliness, oxidation, color and viscosity. Increase this frequency in severe operating or environmental applications. Clean or replace fluid as required.

• PERIODIC PERFORMANCE VERIFICATION

Verify the performance of the winch every two months. In critical applications, this frequency should be increased. Major service problems are avoided by careful monitoring and early fault detection.

Hoist and lower a full test load at full hydraulic volume. Record the following measurements for evaluation and retain for future reference:

	NO LOAD		FULL LOAD	
	HOIST	LOWER	HOIST	LOWER
Pressure at motor port A				
Pressure at motor port B				
Cable Drum RPM				

Refer to **WINCH TROUBLE SHOOTING** if:

- o Winch does not smoothly hoist and lower the full test load.
- o Any abnormal noises are detected.
- o Test measurements vary from specifications listed in **PERFORMANCE DATA** or from previously recorded measurements
- o Motor does not develop at least 200 psi [14 bar] at the lowering port when lowering full test load at full hydraulic volume.
- o Any hydraulic fluid or gear box lubricating oil leaks are detected.

• PERIODIC OVERHAUL AND INSPECTION

A complete disassembly and internal inspection of the winch should be performed after every 1000 hours of operation or every two years, whichever comes first.

- o Remove winch to a clean, well lit shop area.
- o Disassemble, inspect and service winch as required according to **DISASSEMBLY INSTRUCTIONS**. Discard all O-Rings and Shaft Seals.
- o Thoroughly clean all components.
- o Assemble the winch according to **ASSEMBLY INSTRUCTIONS**, replacing all O-rings and Shaft Seals.
- o Remount and test the winch according to **INSTALLATION INSTRUCTIONS**.

HYDRAULIC SYSTEM TROUBLE SHOOTING

Before trouble shooting an apparent winch fault, ensure that the hydraulic system is delivering the specified hydraulic pressure and volume. Hydraulic system problems are frequently incorrectly diagnosed as winch problems.

An in-line flow meter installed immediately at the winch can be used to confirm adequate hydraulic system supply volume through the winch motor. A faulty hydraulic system pump, relief valve or control valve could divert the hydraulic supply and reduce the winch speed.

Pressure gauges installed immediately at the winch motor ports can be used to confirm adequate hydraulic system supply pressure. A faulty hydraulic system pump, relief valve or control valve could reduce the hydraulic supply pressure and diminish the winch pulling capacity.

If the fault persists and the hydraulic system performance has been verified, refer to **WINCH TROUBLE SHOOTING**.



MAINTENANCE

WINCH TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Winch will not hoist/pull rated load.	a) Inadequate hydraulic system supply pressure.	a) Install gauges at motor ports to verify hydraulic system supply pressure and correct as required.
	b) Damaged winch motor.	b) Replace or repair winch motor.
	c) Winch centerline is distorted due to uneven mounting surface.	c) Refer to INSTALLATION INSTRUCTIONS for proper winch mounting.
	d) Binding load carrying sheaves.	d) Inspect and repair or lubricate sheaves as required.
2. Winch will not turn at rated speed.	a) Inadequate hydraulic system supply volume.	a) Use an in-line flow meter at the motor to verify hydraulic system supply volume and correct as required.
	b) Damaged winch Motor.	b) Replace or repair winch Motor.
	c) Winch centerline is distorted due to uneven mounting surface.	c) Refer to INSTALLATION INSTRUCTIONS for proper winch mounting.
	d) Binding load carrying sheaves.	d) Inspect and repair or lubricate sheaves as required.
3. Winch will not hold the load.	a) Wire rope is wound onto the cable drum in the wrong direction.	a) Install wire rope according to INSTALLATION INSTRUCTIONS .
	b) Hydraulic system is trapping pressure at external brake release port.	b) Vent the external brake release port to tank when in neutral.
	c) Hydraulic system control valve is equipped with the wrong spool and traps pressure at the motor lowering port when returned to the neutral position.	c) Install a control valve spool that connects both work ports to tank in the neutral position.
	d) Clutch assembly is damaged.	d) Disassemble and inspect the Sprag Clutch, Brake Shaft and Brake Hub according to SERVICE INSTRUCTIONS . Replace worn or damaged components.
	e) Brake Friction or Separator Plates are worn or damaged.	e) Disassemble and inspect the Brake Discs and Brake Separators according to SERVICE INSTRUCTIONS . Replace as required.
	f) Hydraulic fluid contamination is causing Brake Piston to bind in Primary Base.	f) Disassemble and inspect the bore of the Primary Base for contamination or abrasion damage according to SERVICE INSTRUCTIONS . Repair or replace as required.

**WINCH TROUBLE SHOOTING (continued)**

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
4. Winch will not turn in the lowering direction.	a) Inadequate hydraulic system supply pressure.	a) Install gauges at motor ports to verify hydraulic system supply pressure. Correct as required.
	b) Brake release pressure does not develop at Brake Piston due to damaged O-Rings.	b) Disassemble and inspect Brake Piston and Brake Conduit O-Rings according to SERVICE INSTRUCTIONS . Replace as required.
	c) Brake release pressure is prevented from reaching Brake Piston due to blocked Brake Conduit.	c) Disassemble and inspect Brake Conduit center bore is clear according to SERVICE INSTRUCTIONS . Repair as required.
	d) Damaged winch Motor.	d) Replace or repair winch Motor.
	e) Winch centerline is distorted due to uneven mounting surface.	e) Refer to INSTALLATION INSTRUCTIONS for proper winch mounting
5. Winch vibrates when lowering the load.	a) Inadequate hydraulic system supply volume.	a) Use an in-line flow meter at the motor port to verify hydraulic system supply volume is greater than the minimum volume specified in PERFORMANCE DATA . Correct as required.
	b) Air in hydraulic fluid.	b) Ensure that the hydraulic fluid is clear. If appearance is milky or cloudy, air is being introduced into the hydraulic system. Diagnose and correct as required.
	c) Cooling oil supply to Brake Discs is blocked by a plugged Brake Piston orifice.	c) Remove Brake Piston and inspect orifice according to SERVICE INSTRUCTIONS . Clear if plugged.
	d) Brake Discs or Separators are damaged or worn.	d) Disassemble and inspect the Brake Discs and Separators according to SERVICE INSTRUCTIONS . Replace as required.
	e) Clutch assembly is damaged.	e) Disassemble and inspect the Sprag Clutch, Brake Shaft and Brake Hub according to SERVICE INSTRUCTIONS . Replace worn or damaged components.



MAINTENANCE

WINCH TROUBLE SHOOTING (continued)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
6. Winch leaks oil.	a) Hydraulic fluid leaks from between the Motor Shaft End Cover and the Primary Base due to a damaged O-ring.	a) Disassemble and inspect the Motor Shaft End Cover O-ring and sealing surfaces according to SERVICE INSTRUCTIONS . Replace or repair as required.
	b) Hydraulic fluid leaks from the Motor Gear Housing due to damaged Motor Housing Seal.	b) Disassemble and inspect the Motor Shaft Seals and sealing surfaces according to SERVICE INSTRUCTIONS . Replace or repair as required.
	c) Gear lubricating oil leaks from between the Final Base and Cable Drum flange due to a damaged final end Cable Drum Seal.	c) Disassemble and inspect the final end Cable Drum Seal according to SERVICE INSTRUCTIONS . Ensure that the sealing surface of the Seal Sleeve is smooth and that the Seal Sleeve connection to the Final Base is intact. Replace seal and repair sealing surface or connection as required.
	d) Gear lubricating oil leaks from the Final Base Relief Valve due to one of the following faults: I) Relief Valve is damaged or blocked open. II) The Brake Shaft Seal is leaking hydraulic fluid into the Cable Drum and relieving through the Relief Valve. Inspect both areas between the Cable Drum flanges and Bases for oil leakage resulting from damaged Cable Drum Seals.	d) I) Remove and inspect Relief Valve. Clear any contamination or replace Valve as required. II) The Cable Drum cavity fills with hydraulic system fluid if the Brake Shaft Seal has failed. If this occurs, disassemble and inspect the Brake Shaft Seal according to SERVICE INSTRUCTIONS . Replace as required. If damaged, replace Cable Drum Seals also.
	e) Gear lubricating oil leaks from between the Primary Base and Cable Drum flange due to a damaged primary end Cable Drum Seal or Bearing Holder O-ring.	e) Disassemble and inspect the primary end Cable Drum Seal and Bearing Holder O-ring according to SERVICE INSTRUCTIONS . Inspect the corresponding sealing surfaces. Ensure that the Seal Sleeve connection to the Primary Base is intact. Replace seal, repair sealing surface or connection as required.

**GENERAL SERVICE INSTRUCTIONS****• INTRODUCTION**

Rotzler Titan winches are designed for easy field repair. If a fault is isolated to one of the three major assemblies, that assembly can be immediately replaced in its entirety and the failed assembly repaired when time permits or returned for factory service.

Perform service of internal components in a clean, well lit, shop area. Discard all O-Rings and Shaft Seals when servicing the winch. Do not attempt to re-use seals.

• SERVICING CRITICAL COMPONENTS

Due to their important function, several internal components are identified as CRITICAL COMPONENTS. CRITICAL COMPONENTS are tracked by the winch Serial Number located on the Final Base Identification Label.

Return Fax forms are provided when CRITICAL COMPONENTS are supplied as spare parts. Return this form to Rotzler Inc. when a CRITICAL COMPONENT is replaced and the manufacturing records for that winch Serial Number will be updated and the component history maintained. This service is offered to protect the end user and participation is left to the discretion of the end user.

• SERVICE RECORDS

Maintain a winch Service Log, identifying Serial Number, service performed, preventive maintenance and service dates.

• ADHESIVE PROCEDURE

Adhesive technology is used throughout Titan winches to structurally secure fasteners and other components. Cleanliness is critical for the successful application of adhesives. Oily contamination from a dirty work area, tools or hands will reduce the strength of adhesive bonds.

SECURING FASTENERS WITH ADHESIVES

1. Use Loctite #262 Threadlocker to secure fasteners.
2. Ensure that fasteners and threaded holes are clean and dry.
3. Apply a bead of Threadlocker axially along the bottom portion of the screw thread that will engage the female thread. Use a single bead approximately 1/8-3/16" [3-5mm] in diameter, depending on screw size.
4. Initially, install screws only finger tight. When a tightening sequence is required, the specified tightening order assumes that the screws are numbered in sequence around the bolt pattern. Screws are then tightened according to the defined order.
5. Wipe away excess Threadlocker.
6. Allow 24 hours for adhesive to cure before applying full service load.
7. Although considered to be a permanent bond, screws can be readily removed using normal hand tools.

SECURING BEARINGS WITH ADHESIVES

1. Use Loctite #648 Retaining Compound to secure bearings as required.
2. Ensure that the bearing and the machined bore are clean and dry.
3. Apply a single bead of Retaining Compound approximately 1/8" [3mm] in diameter around the inside perimeter of the bearing bore. Locate this bead at approximately the same distance from the bottom step as the bearing width.
4. Push bearing into bore until it rests against stop.
5. Wipe away excess compound.
6. Allow 24 hours for adhesive to cure before applying full service load.
7. Although considered to be a permanent bond, bearings can be removed using normal hand tools.



MAINTENANCE

DISASSEMBLY INSTRUCTIONS

REMOVE AND DISASSEMBLE MOTOR ASSEMBLY

- **REMOVE MOTOR ASSEMBLY (Refer to WINCH DRAWING)**

Gradually loosen each of the six Motor Screws #450 to allow the Brake Springs #520 to expand evenly.

Remove the Motor Assembly #001. Leave the Brake Conduit #510 positioned in the Brake Piston #555.

Remove and discard the Motor O-Ring Seal #440.

- **DISASSEMBLE MOTOR (see MOTOR DRAWING)**

If a fault has been isolated to the Motor Assembly, replace the complete Motor Assembly or disassemble and service as follows:

INSPECTION NOTE: Examine the surface finish of the Brake Conduit bore in the Motor Shaft End Cover #272. Repair bore if scratched or damaged.

Before dis-assembling, match mark the Shaft End Cover #272, Gear Housing #250 and Port End Cover #210. Be careful to maintain the orientation of all major components for re-assembly.

Remove the four Motor Assembly Screws #220 and Washers #230. (If it is difficult to hold the Motor Assembly while loosening the Assembly Screws, leave the Motor mounted on the winch while starting to loosen the Screws.) Use the Gear Housing pry slots to disengage the Dowel Pins #270 and remove the Port End Cover. Remove the outboard Thrust Plate #255 complete with End #260 and Side #261 Channel Seals and Backup #265. Discard the Channel Seals and Backup.

Make note of and maintain the orientation of the Gear Set #290 while removing it from the Gear Housing.

Again, use the Gear Housing pry slots to disengage the remaining Dowel Pins #270 and remove the Gear Housing from the Shaft End Cover.

Discard the Channel Seals and Backup from the remaining Thrust Plate.

INSPECTION NOTE: Examine the surface finish of the Thrustblock Bushing sealing area and discard if scratched or damaged.

Remove the two Section Seals #268 from the Gear Housing and discard.

INSPECTION NOTES:

Examine the surface finish of the Motor Shaft End Cover and Port End Cover face sealing area. Repair or replace as required. Measure Dimension A, the distance from the top of the Brake Shaft Stopper #275 to the top of the Motor Shaft End Cover as indicated in **MOTOR ASSEMBLY DRAWING**. Replace Stopper if damaged or if Dimension A is greater than .045" [1.1 mm].

Examine the surface finish of the Gear Housing bores. Discard if scratched or damaged. Similarly, examine the outer diameter of the Gear Set and discard if damaged.

It is normally not advised to remove Pipe Plugs #245 and # 246, which are positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. Refer to **REVERSING DIRECTION OF ROTATION** instructions if it is necessary to change the direction of hoisting rotation.



REMOVE AND DISASSEMBLE PRIMARY ASSEMBLY

• REMOVE PRIMARY (see WINCH DRAWING)

Position the winch vertically with the Motor end up, resting on the Final Base. Remove the Motor Assembly #001 according to **REMOVE MOTOR ASSEMBLY** instructions.

Remove the four primary end Spacer Bar Screws #430 and Washers #431. Lift the Primary Assembly #002 off of the Final Assembly #003. Support the Primary Assembly on blocks with the Brake Springs facing up.

• DISASSEMBLE PRIMARY (see PRIMARY DRAWING)

If a fault has been isolated to the Primary Assembly, replace the complete Primary Assembly or disassemble and service as follows:

Remove the ten Brake Springs #520.

INSPECTION NOTE: Measure the free length of the Brake Springs and discard if less than 1.25" [32 mm] long.

Remove the Brake Conduit #510. Remove and discard two Brake Conduit O-Rings #513 and two Backup Rings #514.

INSPECTION NOTE: Examine the Brake Conduit bore and clean or replace if plugged.

Use two Motor mounting Screws #450, inserted finger tight into threaded holes provided in the Brake Piston #555 to pry the Piston out of the Primary Base #535. Remove and discard the two Piston O-Rings #530 and #540 and two Backup Rings #531 and #541.

INSPECTION NOTES:

Examine the surface finish of the Primary Base bores where the Piston O-Rings seal and repair if the surface is damaged.

Examine the Brake Piston orifice and clean or replace if plugged.

Pull the Clutch Assembly #500 out of the Primary Base and set it aside. Remove the seven Brake Separators #565 and six Brake Discs #560.

INSPECTION NOTE: Examine the surfaces of the Brake Separators and Discs and replace if worn or damaged.

Remove the Brake Locator #570.

Remove the Brake Shaft Seal Retainer #585. Remove and discard the Brake Shaft Seal #580.

Reverse the Primary Base and lay it flat on the table with the threaded holes down.

INSPECTION NOTES:

Examine the inner bore of the Brake Shaft Bushing #535B that is permanently secured in the Primary Base. If Bushing is excessively worn or damaged, replace complete Primary Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Brake Shaft Bushing.

Examine the outer sealing surface of the Primary Drum Seal Sleeve #535C that is permanently secured to the Primary Base. Repair any minor surface roughness. If Sleeve is worn or damaged beyond repair, replace complete Primary Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Seal Sleeve.



MAINTENANCE

• DISASSEMBLE CLUTCH (See CLUTCH DRAWING)

WARNING

FAILURE TO PROPERLY DETECT AND REPAIR A DAMAGED CLUTCH ASSEMBLY COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. CAREFULLY FOLLOW INSPECTION INSTRUCTIONS AND REPLACE THE COMPONENT OR COMPLETE ASSEMBLY IF UNCERTAIN.

If a fault has been isolated to the Clutch Assembly, replace the complete Clutch Assembly or disassemble and service as follows:

Remove the Bearing Retainer #360. Remove the two Thrust Washers #355 and Roller Bearing #350.

INSPECTION NOTE: Examine the Thrust Washers and Roller Bearing and replace if worn or damaged.

Remove the Motor End Clutch Retainer #320. Clamp the two Clutch Thrust Washers #330 against the Brake Hub and remove the Brake Hub #340, Sprag Clutch Cages #370A and End Bearings #370B together.

INSPECTION NOTE: Examine the Clutch Thrust Washers and replace if worn or damaged.

Remove the two Sprag Clutch Cages #370 and two End Bearings #370B from the Brake Hub.

INSPECTION NOTES:

Examine the surface finish of the Brake Shaft and Brake Hub where the Sprag Clutches engage. The surface finish, size and hardness of these surfaces are critically controlled. Replace the components if any wear or damage is evident.

Examine the Sprag Clutch Cages #370A and End Bearings #370B and replace if worn or damaged.

REMOVE AND DISASSEMBLE FINAL ASSEMBLY

• REMOVE FINAL ASSEMBLY (Refer to WINCH DRAWING)

Leave the Motor Assembly attached and remove the Primary Assembly #002 and Motor Assembly together from the Final Assembly #003 according to **REMOVE PRIMARY ASSEMBLY** instructions.

• DISASSEMBLE FINAL (see FINAL DRAWING)

If a fault has been isolated to the Final Assembly, replace the complete Final Assembly or disassemble and service as follows:

Remove ten Bearing Holder Screws #110. Remove the Bearing Holder #130. Remove and discard the Bearing Holder O-Ring #112. Remove and discard the Bearing Holder Shaft Seal #150.

INSPECTION NOTE: Examine the Holder Ball Bearing #125 and discard if damaged.

Lift the Primary Reduction #101 out of the Cable Drum #115.

INSPECTION NOTES:

Measure the thickness of the Carrier Stopper #155 and discard if damaged or if less than .16" [4 mm] thick.

Measure Dimension B, the distance that the Sun Gear Stopper #851 protrudes from the Final Sun Gear #880 as indicated in **FINAL ASSEMBLY DRAWING**. Discard the Stopper if damaged or if Dimension B is less than .046" [1.2 mm].

Examine the Primary Reduction gear teeth and Planet Gear Needle Bearings. Replace the Primary Reduction Assembly if damaged. Refer to Rotzler Inc. for special instructions if it is essential to repair or rebuild the Primary Reduction.



Lift the Final Reduction #100 out of the Cable Drum.

INSPECTION NOTE: Examine the Final Reduction gear teeth and Planet Gear Needle Bearings. Replace complete Final Reduction Assembly if damaged. Refer to Rotzler Inc. if it is essential to repair or rebuild the Final Reduction.

Lift the Cable Drum off of the Final Base #145. Remove and discard the Cable Drum Shaft Seal #150.

INSPECTION NOTES:

Examine the Cable Drum Ball Bearing #125 and discard if damaged.

Examine the surface finish of the Cable Drum Bearing Holder bore and repair if damaged.

Examine the Cable Drum gear teeth and replace the Cable Drum if teeth are excessively worn or damaged.

Remove the Relief Valve #109 from the back end of the Final Base.

INSPECTION NOTES:

Examine the Relief Valve and clean or replace as required.

Examine the outer sealing surface of the Final Drum Seal Sleeve #145B that is permanently secured to the Final Base. Repair any minor surface damage. If Sleeve is worn or damaged beyond repair, replace complete Final Base. Refer to Rotzler Inc. for special instructions if it is essential to remove and replace the Seal Sleeve.

ASSEMBLY INSTRUCTIONS

Once removed, O-Rings and Shaft Seals should not be used again. It is therefore important that a Motor Seal Kit and a Winch Seal Kit be on hand before beginning any winch service. In addition to O-Rings and Shaft Seals, Service Kits contain the adhesives that might be required during assembly.

Refer to **ORDERING INFORMATION** for Seal and Service Kit component numbers.

After any winch service, always perform a safe test lift as described in **INSTALLATION INSPECTION**.

ASSEMBLE AND INSTALL MOTOR ASSEMBLY

- **ASSEMBLE MOTOR (see MOTOR DRAWING)**

Note that the Motor Gear Set #290 is a matched set of gears and must be maintained in its set. The Gear Set, Gear Housing #250 and Port End Cover #210 should be re-assembled according to the original orientation.

Clean and dry all components, particularly the threaded holes of the Motor Shaft End Cover #272.

It is normally not advised to remove Pipe Plugs #245 and # 246, which are positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. If the Plugs have been removed, determine the correct location for the particular winch being serviced by referring to **MOTOR ASSEMBLY DRAWING**. Install Plug using Loctite #565 Sealant to seal the thread. Refer to **REVERSING DIRECTION OF ROTATION** instructions if it is necessary to change the direction of hoisting rotation.

If required, use Loctite #330 Acrylic Adhesive to secure a new Brake Shaft Stopper #275 in the Motor Shaft End Cover. Ensure that the Stopper is pushed all of the way to the bottom of its counterbore and that the grooves face outward as shown.



MAINTENANCE

Lightly oil the inner bore of the Gear Housing, the Gear Set and all Seals.

Install two new End #260 and Side #261 Channel Seals with new Backups #265 into each of the two Thrust Plates #255.

Install new Section Seals #268 in both ends of the Gear Housing.

Install two Dowel Pins #270 into the Motor Shaft End Cover and two Dowel Pins into the Port End Cover.

Install the Gear Housing onto the Motor Shaft End Cover, carefully engaging the Dowel Pins and maintaining the original orientation. Install a Thrust Plate with Channel Seals and Backups facing down, into the Gear Housing cavity.

Insert the Gear Set into the Gear Housing, maintaining the original orientation.

Place the second Thrust Plate into the Gear Housing with the Seals facing up. Place the Port End Cover #210 onto the Gear Housing.

When originally assembled, the position of Plug #245 was externally indicated by marking one of the four Motor Assembly Screws #220 (see **MOTOR ASSEMBLY DRAWING**). When re-assembling the Motor, be sure to maintain the proper position of this marked screw.

Install and secure the four Motor Assembly Screws using the Threadlocker procedure described in **SECURING FASTENERS WITH ADHESIVES**. Torque screws in 1-3-4-2 sequence to 200 ft-lbs [271 N.m].

- **INSTALL MOTOR ASSEMBLY (See WINCH DRAWING)**

Lightly grease and install a new Motor O-Ring #440.

Remove the Brake Springs and align the Brake Conduit port in the Motor Shaft End Cover with the Brake Conduit #510 located in the Brake Piston #555. Replace the Brake Springs. Carefully engage the Motor spline with the Brake Shaft #310.

Install and secure the six Motor Screws #450 using the Threadlocker procedure described in **SECURING FASTENERS**

WITH ADHESIVES. Gradually tighten each Screw in 1-4-2-5-3-6 sequence to evenly compress the Brake Springs #520.

- **ASSEMBLE CLUTCH ASSEMBLY (Refer to CLUTCH ASSEMBLY DRAWING)**

Thoroughly clean and dry all components.

Install a Clutch Retainer #320 into the middle groove of the Brake Shaft #310. Install a Clutch Thrust Washer #330 with the groove facing into the Clutch as shown.

WARNING

FAILURE TO PROPERLY INSTALL THE SPRAG CLUTCH COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. CONFIRM THE DIRECTION OF ROTATION AND INSTALL CLUTCH ACCORDING TO INSTRUCTIONS.

Proper orientation of the Sprag Clutch Cages #370A and End Bearings #370B in the Brake Hub #340 is critical for reliable brake function. Ensure that the Clutch Cages and End Bearings are properly oriented in the Brake Hub as shown in the **CLUTCH ASSEMBLY DRAWING**. Carefully push the Brake Shaft through the Sprag Clutch using a twisting motion, again referring to **CLUTCH ASSEMBLY DRAWING** for the correct Brake Shaft orientation.

Install the second Clutch Thrust Washer #330 with the groove facing into the Clutch as shown. Secure with the second Clutch Retainer #320.



Verify that the Clutch Assembly is properly assembled as follows:

- Hold the Clutch Assembly by the Brake Hub outer diameter and look at the Brake Shaft male spline from the Motor end. Ensure that the Brake Shaft rotates as follows:
 - Counterclockwise hoisting winch: Brake Shaft rotates free in the clockwise direction and locks in the counterclockwise direction.
 - Clockwise hoisting winch: Brake shaft rotates free in the counterclockwise direction and locks in the clockwise direction.

IMPORTANT: DISCARD THE SPRAG CLUTCH CAGE IF ANY OF THE INTERNAL SPRAGS COME LOOSE WHEN HANDLING. DO NOT ATTEMPT TO RE-ASSEMBLE.

After confirming that the assembly orientation is correct for the required direction of hoisting rotation, complete the Clutch Assembly by installing a Thrust Washer #355, the Thrust Roller Bearing #350 and the second Thrust Washer #355 onto the Reduction End of the Brake Shaft. Secure the bearing assembly by installing the Bearing Retainer #360.

ASSEMBLE AND INSTALL PRIMARY ASSEMBLY

- **ASSEMBLE PRIMARY ASSEMBLY** (Refer to **PRIMARY ASSEMBLY DRAWING**)

⚠ WARNING

FAILURE TO PROPERLY ASSEMBLE THE PRIMARY ASSEMBLY COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE ASSEMBLING THE PRIMARY ASSEMBLY.

Clean and dry all components, particularly the threaded holes of the Primary Base #535. Support the Primary Base on blocks with the threaded holes facing up.

Lightly oil the Primary Base at the Brake Shaft Seal gland. Grease a new Brake Shaft Seal #580 and install it into the Primary Base. Secure Brake Shaft Seal with Retainer #585.

Liberal grease the Reduction End of the Clutch Assembly #500. Use a twisting motion to insert the Clutch Assembly through the Brake Shaft Seal, carefully preventing the sharp Brake Shaft gear teeth from damaging the lip of the seal. Ensure that the Clutch Assembly Bearing is bottomed against the Primary Base.

Install the Brake Locator #570 into the Primary Base.

Lightly oil all Brake Discs #560 and Brake Separators #565. Install the first Brake Separator followed by the first Brake Disc.

Alternately install the remainder of the Brake Separators and Brake Discs, finishing with the last Brake Separator.

MAINTENANCE



IMPORTANT: BACKUP RINGS PREVENT O-RINGS FROM EXTRUDING UNDER HIGH PRESSURE AND MUST BE LOCATED BETWEEN THE O-RING AND EXTRUSION GAP. INSTALL BACKUP RINGS ACCORDING TO INSTRUCTIONS.

Lightly grease new Brake Piston large O-Ring #530 and small O-Ring #540. Install the O-Rings into the appropriate glands of the Brake Piston #555 with the large O-Ring at the gland nearest the Brake Spring side.

Slide both O-rings to the inside of their glands, towards the middle of the Piston. Install the large Backup Ring #531 and small Backup Ring #541 into the appropriate glands on the outside of the O-Rings. Refer to the **PRIMARY ASSEMBLY DRAWING** to ensure that the Backup Rings are in the correct position relative to the O-Rings.

Lightly oil the Primary Base where the two Piston O-Rings seat. Position the Brake Piston on the Primary Base, oriented so that the Brake Conduit port will align with the corresponding port on the Motor Assembly. Carefully and evenly, push the Piston all the way into the Primary Base until the Piston bottoms against the last Brake Separator. Verify the Piston orientation by temporarily installing a Motor Assembly with Brake Conduit onto the Primary Base. If not properly aligned, the Motor Assembly Brake Conduit can be used to spin the Piston until the Motor Cover bolt holes align with the Primary Base threaded holes.

Install two new Backup Rings #514 into the Brake Conduit #510 glands. Slide both Backup Rings to the inside of their glands, towards the middle of the Conduit. Lightly grease two new Brake Conduit O-Rings #513 and install in the glands on the outside of the Backup Rings. Refer to the **PRIMARY ASSEMBLY DRAWING** to ensure that the Backup Rings are in the correct position relative to the O-Rings.

Gently push the Brake Conduit into the Piston port.

Install ten Brake Springs #520 into the Brake Piston Spring cavities.

- **INSTALL PRIMARY ASSEMBLY (Refer to WINCH DRAWING)**

Position the Final Assembly #003 vertically, resting on its Final Base with the Bearing Holder facing up. Lower the Primary Assembly #002 into the Holder Bearing. Temporarily install four Spacer Bar Screws #430 and Washers #431. Do not secure screws with Threadlocker at this time.

Install Motor Assembly onto the Primary Base according to **INSTALL MOTOR ASSEMBLY**.

To ensure that the winch centerline is not distorted, position the Winch horizontally on a smooth, flat, clean surface. Secure the four Spacer Bar Screws #430 using the Threadlocker procedure described in **SECURING FASTENERS WITH ADHESIVES**. Tighten Screws in 1-3-2-4 sequence.

ASSEMBLE AND INSTALL FINAL ASSEMBLY

- **ASSEMBLE FINAL ASSEMBLY (Refer to FINAL ASSEMBLY DRAWING)**

Thoroughly clean and dry all components, particularly the threaded holes of the Spacer Bars #140.

Install the Relief Valve #109 into the outside of the Final Base #145 using Loctite #565 Sealant to seal the thread.

Position the Final Base flat with the male spline facing up.

If required, install a new Ball Bearing #125 into the Cable Drum #115 using the procedure described in **SECURING BEARINGS WITH ADHESIVES**. Ensure that the Bearing is fully pushed to the bottom of its seat. Lightly grease the bearing bore and press a new Shaft Seal #150 into the Cable Drum until the outside of the Seal case is flush with the Drum surface.

Carefully guide the Cable Drum onto the Final Base, engaging the Drum Bearing with the Final Base bearing pilot.



Install the Final Reduction #100 into the Cable Drum, ensuring that the female spline of the Final Carrier fully engages the male spline of the Final Base.

If required, install a new Sun Gear Stopper #850 into the Final Sun Gear #880 using Loctite #330 Acrylic to secure. If required, press a new Carrier Stopper #155 onto the Primary Reduction #101.

Install the Primary Reduction #101 into the Cable Drum, ensuring that the Final Sun Gear fully engages the Final Reduction.

If required, install a new Ball Bearing #125 into the Bearing Holder #130 using the procedure described in **SECURING BEARINGS WITH ADHESIVES**. Ensure that the Bearing is fully pushed to the bottom of its seat. Lightly grease the bearing bore and press a new Shaft Seal #150 into the Bearing Holder until the outside of the Seal case is flush with the Holder surface.

Lightly grease and install a new Holder O-Ring #112. Install the Bearing Holder into the Cable Drum. Install and secure the ten Bearing Holder Screws #110 using the procedure described in **SECURING FASTENERS WITH ADHESIVES**.

- **INSTALL FINAL ASSEMBLY (REFER TO WINCH DRAWING)**

Install Primary Assembly #002 onto the Final Assembly, #003 according to **INSTALL PRIMARY ASSEMBLY** instructions.

Inspect the Identification Label #410 and replace if damaged or difficult to read.

RE-MOUNT AND TEST WINCH

Re-mount the winch according to **INSTALLATION INSTRUCTIONS**. Always perform the safe test lift described in **INSTALLATION INSPECTION** after any winch service or maintenance.

SPECIAL INSTRUCTIONS - REVERSING DIRECTION OF ROTATION

- **GENERAL INFORMATION**

⚠ WARNING

FAILURE TO PROPERLY INSTALL THE SPRAG CLUTCH COULD RESULT IN A WINCH BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE CHANGING THE DIRECTION OF HOISTING ROTATION OF ANY WINCH.

Refer to the following instructions to change a winch's direction of Cable Drum rotation when hoisting. For clarity, some information found elsewhere in this Manual is repeated below.

- **DESCRIPTION OF BRAKE FUNCTION**

The direction of Cable Drum rotation when hoisting is established by looking at the motor end of the winch. The standard counterclockwise hoisting winch is designated CC and the Cable Drum rotates in a counterclockwise direction when hoisting as viewed from the motor end of the winch (refer to **GENERAL DIMENSIONS**). A clockwise hoisting winch is designated CW and rotates in the opposite direction.

The Brake Sprag Clutch Cage allows the Brake Shaft to turn freely in the hoisting direction, independent of the winch brake system. In the lowering direction, the Clutch Cage locks the Brake Shaft to the winch brake system and holds the load.

When lowering the load, the operator supplies hydraulic fluid to the Motor lowering port. Some of the hydraulic fluid is diverted to the Brake Piston to release the brake and allow the winch to drive in the lowering direction.



MAINTENANCE

Two assemblies control the direction of rotation when hoisting and must be modified when reversing the winch's rotation:

o **MOTOR ASSEMBLY (see MOTOR DRAWING)**

The Motor Shaft End Cover #272 is internally ported to supply hydraulic fluid to the Brake Piston when lowering and block hydraulic fluid when hoisting. A Pipe Plug #245 is positioned in the Motor Shaft End Cover depending on the required direction of rotation when hoisting. A specially marked Motor Assembly Screw #220 indicates the Motor's hoisting direction when viewed from the outside. Refer to **MOTOR ASSEMBLY DRAWING** to determine the correct Pipe Plug location and Motor Assembly Screw marking for the desired direction of rotation.

o **CLUTCH ASSEMBLY (see CLUTCH DRAWING)**

The Clutch Assembly contains two Clutch Cages #370A positioned between two Clutch End Bearings #370B. The Clutch allows the Brake Shaft #310 to turn independent of the Brake Hub #340 when hoisting and locks the Shaft to the Hub when lowering. The Clutch Cages and End Bearings are oriented on the Brake Shaft depending on the required direction of rotation when hoisting. Refer to **CLUTCH ASSEMBLY DRAWING** to determine the correct Clutch orientation for the desired direction of rotation.

• **PROCEDURE FOR REVERSING DIRECTION OF ROTATION**

If attention is paid to cleanliness, the following procedure can be performed in the field without removing the winch from its mounting. If desirable to perform this service in the field, reduce spillage by draining half of the gear lubricating oil out of the Cable Drum before starting. Once completed, be sure to replenish the lubricating oil level according to **ADDING GEAR LUBRICATING OIL**.

It is always preferable to perform any winch service work in a clean, well lit, shop area.

1. REVERSE MOTOR PIPE PLUG (See MOTOR DRAWING)

Remove the Motor Assembly #001 according to **DISASSEMBLY INSTRUCTIONS - REMOVE MOTOR ASSEMBLY**. If practical, this is easier done with the winch positioned on end with the Motor facing up.

Place the Motor Assembly resting on the Port End Cover #210. Remove both Pipe Plugs #246.

Remove the Pipe Plug #245 from its current location and install it in the opposite location. If uncertain, refer to **MOTOR ASSEMBLY DRAWING** to verify the correct location of Pipe Plug #245. Replace Pipe Plugs #246. Use Loctite #565 Sealant to seal all Pipe Plug threads.

To visually identify the new motor rotation, use a permanent scribe to place an "X" over the existing identification mark on the head of the existing specially marked Motor Assembly Screw #220. Place a new mark on the opposite screw.

2. REVERSE SPRAG CLUTCH (See CLUTCH DRAWING)

Remove the Brake Springs #520 and Brake Conduit #510. Remove Brake Piston #555, Clutch Assembly #500, Brake Separators #565 and Brake Discs #560 according to **DISASSEMBLE PRIMARY ASSEMBLY** instructions.

Take the Clutch Assembly and remove the Motor End Clutch Retainer #320. Clamp the two Clutch Thrust Washers #330 against the Brake Hub #340 and remove the Brake Hub #340, Sprag Clutch Cages #370A and End Bearings #370B together.

The Clutch Assembly direction of rotation is reversed by turning the Sprag Clutch Cages and End Bearings around end for end inside the Brake Hub. Refer to **ASSEMBLE CLUTCH ASSEMBLY** for warnings and instructions. If uncertain, verify the correct Clutch Cage and End Bearing orientation for the desired direction of rotation before proceeding. Replace the Clutch Thrust Washers with the grooves facing into the Clutch as shown.



Carefully push the Brake Shaft through the Sprag Clutch Cages, End Bearings and Thrust Washers using a twisting motion. Secure with the Motor End Retainer.

Clean and dry all components, particularly the threaded holes of the Primary Base. Replace the Clutch Assembly, Brake Separators, Brake Discs and Brake Piston according to **ASSEMBLE PRIMARY ASSEMBLY** warnings and instructions. Replace the Brake Conduit and Brake Springs.

3. INSTALL MOTOR ASSEMBLY

Install the Motor Assembly onto the winch according to **INSTALL MOTOR ASSEMBLY** instructions.

4. REPLACE IDENTIFICATION LABEL (see WINCH DRAWING)

The Identification Label #410 is located on the winch Final Base, but must not be altered outside of our factory. The Model Code identifies the direction of hoisting rotation. When changing a winch's rotation, contact Rotzler Inc. for a replacement Identification Label.

• RE-MOUNT AND TEST WINCH

Re-mount the winch according to **INSTALLATION INSTRUCTIONS**. Always perform the safe test lift described in **INSTALLATION INSPECTION** after any winch service or maintenance.

SPECIAL INSTRUCTIONS - STAINLESS STEEL SCREWS

• GENERAL INFORMATION

Standard Rotzler Titan TH series winches are equipped with plated alloy steel screws. Stainless steel screws are optionally available for use in highly corrosive environments. The stainless screw option consists of replacement Stainless Steel Screws for the winch as indicated in the **ASSEMBLY DRAWINGS**. Stainless Steel screws are identified with "A4" on the head of the screw.

7. ORDERING

TECHNICAL INFORMATION

An Identification Label is located on the outside of the Final Base and identifies the winch model and serial numbers. Record the numbers below and retain for future reference:

MODEL: _____
SERIAL NUMBER: _____

The Identification Label must not be removed, altered or have its technical data obscured. If the data becomes difficult to read, contact Rotzler Inc. for a replacement Label.

SEAL AND SERVICE KITS

It is recommended that Winch and Motor Seal (or Service) Kits be available before beginning service as follows:

- **#9262277000 (230-093), TH3/4 WINCH SEAL KIT** (contains seals as indicated in **ASSEMBLY DRAWINGS**)
- **#4000006240 (230-086), TH3/4 WINCH SERVICE KIT** (contains Loctite adhesives in addition to the seals contained in the Seal Kit)
- **#4000006326 (240-094), M350 MOTOR SEAL KIT** (contains seals as indicated in **MOTOR ASSEMBLY DRAWINGS**)
- **#4000006324 (240-080), M350 MOTOR SERVICE KIT** (contains Loctite adhesives in addition to the seals contained in the Seal Kit)

ORDERING REPLACEMENT COMPONENTS

When ordering replacement components for the winch or when making technical inquiries, refer to the Model and Serial Number listed on the winch Identification Label.

The winch model number does not distinguish what types of screws are installed on the winch. When ordering parts, it is therefore important to specify what type of screws is required.

WINCH DRAWING

This technical drawing is an exploded view of a Rotzler industrial machine, likely a centrifugal pump or a similar rotating equipment. The main body of the machine is labeled 'ROTZLER'. The assembly includes a motor or drive unit on the right, a central rotating assembly with a large impeller or wheel, and a base. Various components are numbered for identification:

- 001**: Motor or drive unit.
- 002**: Central rotating assembly.
- 003**: Impeller or wheel.
- 415**: Small rectangular plate or gasket.
- 416**: Small rectangular plate or gasket.
- 420**: Small rectangular plate or gasket.
- 430** and **431**: Small rectangular plate or gasket.
- 440**: Small rectangular plate or gasket.
- 450** and **451**: Small rectangular plate or gasket.

The diagram shows the relative positions and assembly sequence of these components, with dashed lines indicating the alignment of parts.



WINCH COMPONENT LIST

#EW.TH4 REV B

REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #	STAINLESS STEEL SCREW OPTION	
001	See table 1	1	Assembly, Motor, M350-XX, XX	See table 1		
002	See table 1	1	Assembly, Primary, TH4.XX	See table 1		
003	N/A	1	Assembly, Final, TH4	F.TH4		
004	N/A	1	Assembly, Hardware, TH3. Includes:	H.TH3		
410	400 000 0701	1	Label, Identification	220-065		
415	400 000 0702	1	Label, Number	220-077		
416	400 000 0703	1	Label, Rotation, CC - counter clockwise hoisting	220-078		
	400 000 0704	1	Label, Rotation, CW - clockwise hoisting	220-079		
420	926 043 4000	1	Cable Wedge, 0.75"	230-067		
430	001 580 0000	8	Screw, Hex-Hd Cap, M16-2.00x50mm, DIN 933, Gr.8.8, Plated	230-062	012 240 0020	230-098
431	012 973 0000	8	Washer, M16, DIN 433, Plated	230-022	400 000 3361	230-099
* 440	012 859 0000	1	Seal, O-ring, #2-163	220-044		
450	001 553 0020	6	Screw, Hex-Hd Cap, M10-1.50x25mm, DIN 933, SS Gr. A4	220-100		
451	001 773 0020	6	Washer, M10, DIN 433, SS Gr. A4	220-101		

* TH3 Winch Seal Kit #9262277000 (230-093), and TH3 Winch Service Kit #4000006240 (230-086) include item #440.

TABLE 1	REF.	VARIANCE	NEW PART #	DESCRIPTION	OLD PART #
	001	Counter Clockwise hoisting, standard motor	400 000 6405	Assembly, Motor, M335-96, CC	M.TH4.CC.96
		Clockwise hoisting, standard motor	400 000 6407	Assembly, Motor, M350-96, CW	M.TH4.CW.96
		Counter Clockwise hoisting, -59 motor	400 000 6403	Assembly, Motor, M350-59, CC	M.TH4.CC.59
		Clockwise hoisting, -59 motor	400 000 6406	Assembly, Motor, M350-59, CW	M.TH4.CW.59
	002	Counter Clockwise hoisting	400 000 6417	Assembly, Primary, TH4, CC	P.TH4.CC
		Clockwise hoisting	400 000 6418	Assembly, Primary, TH4, CW	P.TH4.CW

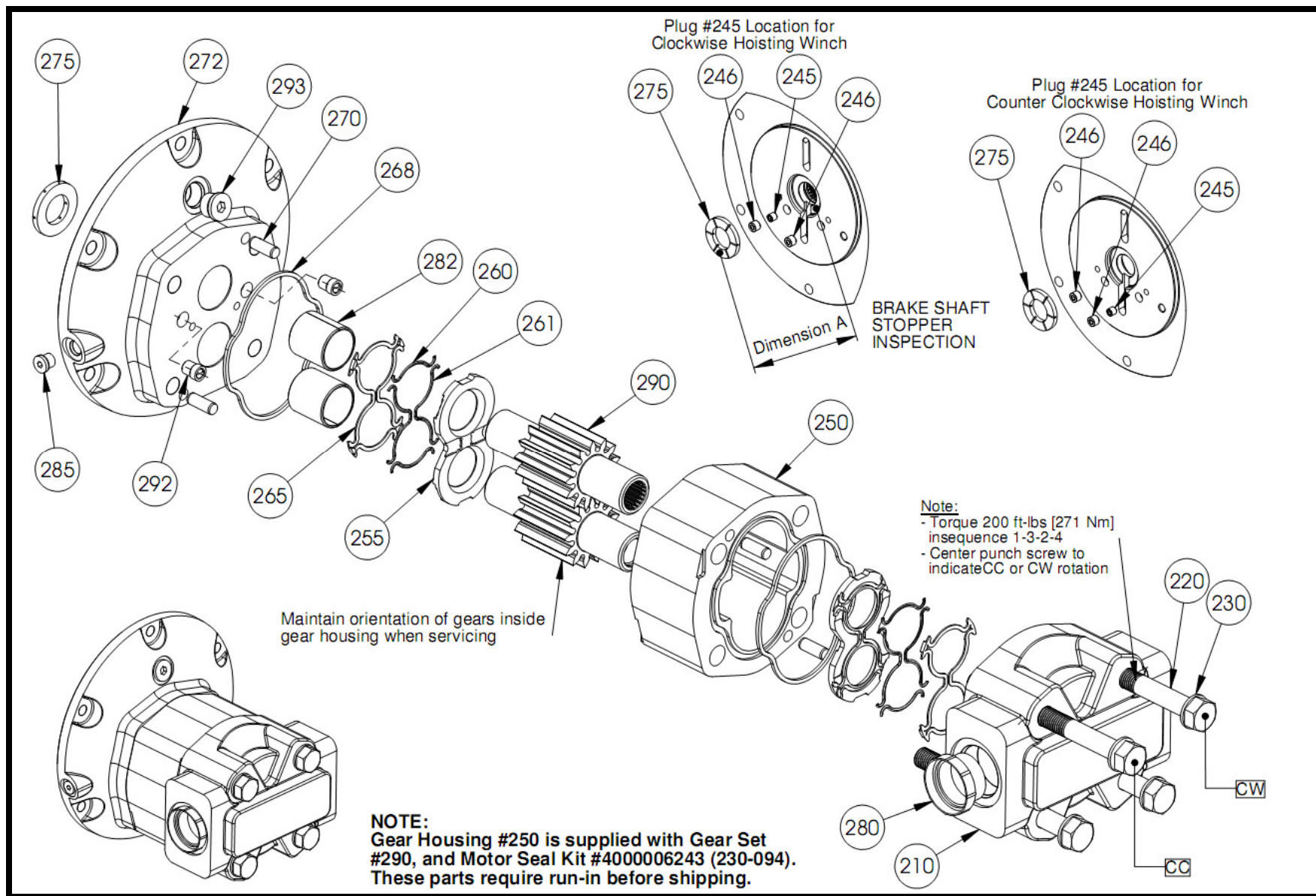
NOTE: The winch model number is located on the Identification label #410 and identifies rotation code (CC, CW) and motor code (96, 59, etc.)



DRAWINGS

M330 + 350 STANDARD & OPTIONAL MOTOR ASSEMBLY DRAWING

#EM.TH3, 4, 5 REV C





M330 + 350 STANDARD & OPTIONAL MOTOR COMPONENT LIST

#EM.TH3, 4, 5 REV C

REF	QTY	OPTION	NEW PART #	DESCRIPTION	OLD PART #
210	1	-32, -48, -57	400 000 6206	Motor Cover, Port End, M330	230-019M
220	4	-32	400 000 6254	Screw, Hex Hd Cap, M16-2.00x100mm, DIN 931, Gr. 8.8, Plated	230-110
	4	-48	400 000 6260	Screw, Hex Hd Cap, M16-2.00x110mm, DIN 931, Gr. 8.8, Plated	230-118
	4	-57	400 000 6215	Screw, Hex Hd Cap, M16-2.00x120mm, DIN 931, Gr. 8.8, Plated	230-028
230	4		012 973 0000	Washer, M16, DIN 433, Plated	230-022
245	1		926 377 4000	Fitting, Plug, Pipe, 1/16, Airway #5409-1	220-057
246	2		400 000 6055	Fitting, Plug, Pipe, 1/8, Airway #5409-2	220-135
250	1	-32	400 000 6251	Motor Housing, Gear, M/C, M330-32, CI# 324 8210 100	230-108M
	1	-48	400 000 6258	Motor Housing, Gear, M/C, M330-48, CI #324 8215 100	230-116M
	1	-57	400 000 6203	Motor Housing, Gear, M/C, M330-57, CI #324 8217 100	230-018M
* 255	2	-32, -48, -57	400 000 6208	Motor Thrust Plate, M330, CI# 391 2185 065	230-020
* 260	4	-32, -48, -57	926 375 4000	Motor Seal, Channel, End, M330, CI# 391 2881 930	230-128
* 261	4	-32, -48, -57	926 376 4000	Motor Seal, Channel, Side, M330, CI# 391 2881 931	230-129
* 265	2	-32, -48, -57	926 378 4000	Motor Seal, Backup, M330, CI# 391 2881 929	230-055
* 268	2	-32, -48, -57	926 372 4000	Motor Seal, Section, M330, CI# 391 2884 076	230-056
270	2		400 000 2945	Motor Dowel Pin, 511, PH #391 2080 078	230-054
272	1	-32, -48, -57	400 000 6200	Motor Cover, Shaft End, M/C, M330	230-017M
	1	-32, -48, -57	400 000 1304	Motor Cover, Shaft End, M/C, M330B (TH5)	N/A
275	1		400 000 5990	Stopper, Brake Shaft	220-084
280	2		400 000 6232	Fitting, Cap, Plastic, SAE #20, Caplug #PDO-120	230-071
282	2	-32, -48, -57	400 000 6265	Motor Bushing, M330, CI# 391 0482 306	230-127
285	1		927 221 4000	Fitting, Plug, SAE #4, AW #6409-4, CI #391 2281 010	220-072
290	1	-32	400 000 6253	Motor Gear Set, M330-32, CI# 324 2810 007	230-109
	1	-48	400 000 6259	Motor Gear Set, M330-48, CI #324 2815 007	230-117
	1	-57	400 000 6209	Motor Gear Set, M330-57, CI# 324 2817 007	230-021
292	2		927 220 4000	Motor Check Valve, M330, CI #391 3681 001	230-126
293	1		400 000 6233	Fitting, Plug, SAE #8, Airway #6409-8	230-072

* Motor Seal Kit #400 000 6243 (230-094) and Service Kit #400 000 6238 (230-080) include:
 #255 (x2), #260 (x4), #261 (x4), #265 (x2), #268 (x2)

DRAWINGS



M330 + 350 STANDARD & OPTIONAL MOTOR COMPONENT LIST

#EM.TH3, 4, 5 REV C

REF	QTY	OPTION	NEW PART #	DESCRIPTION	OLD PART #
210	1	-59, -96, -107	400 000 6311	Motor Cover, Port End, M350	240-019M
220	4	-59	400 000 6333	Screw, Hex Hd Cap, M16-2.00x150mm, DIN 931, Gr. 8.8, Plated	240-110
	4	-96, -107	400 000 6315	Screw, Hex Hd Cap, M16-2.00x170mm, DIN 931, Gr.8.8, Plated	240-028
230	4		012 973 0000	Washer, M16, DIN 433, Plated	230-022
245	1		926 377 4000	Fitting, Plug, Pipe, 1/16, Airway #5409-1	220-057
246	2		400 000 6055	Fitting, Plug, Pipe, 1/8, Airway #5409-2	220-135
250	1	-59	400 000 6331	Motor Housing, Gear, M/C, M350-59, CI #323 8213 100	240-108M
	1	-96	400 000 6309	Motor Housing, Gear, M/C, M350-96, CI #323 8222 100	240-018M
	1	-107	400 000 1602	Motor Housing, Gear, M/C, M350-107, PH #323 8225 100	N/A
* 255	2	-59, -96, -107	400 000 6312	Motor Thrust Plate, M350, CI #391 2185 068	240-020
* 260	4	-59, -96, -107	400 000 6336	Motor Seal, Channel, End, M350, CI #391 2885 074	240-128
* 261	4	-59, -96, -107	400 000 6337	Motor Seal, Channel, Side, M350, CI #391 2885 073	240-129
* 265	2	-59, -96, -107	400 000 6316	Motor Seal, Backup, M350, CI #391 2885 075	240-055
* 268	2	-59, -96, -107	400 000 6317	Motor Seal, Section, M350, CI #391 2884 021	240-056
270	4		400 000 2945	Motor Dowel Pin, M330, CI# 391 2082 032	230-054
272	1	-59, -96, -107	400 000 6307	Motor Cover, Shaft End, M/C, M350	240-017M
	1	-59, -96, -107	400 000 1303	Motor Cover, Shaft End, M/C, M350B (TH5)	N/A
275	1		400 000 5990	Stopper, Brake Shaft	220-084
280	2		400 000 6232	Fitting, Cap, Plastic, SAE #20, Caplug #PDO-120	230-071
282	2	-59, -96, -107	400 000 6335	Motor Bushing, M350, CI #391 0482 308	240-127
285	1		927 221 4000	Fitting, Plug, SAE #4, AW #6409-4, CI #391 2281 010	220-072
290	1	-59	400 000 6332	Motor Gear Set, M350-59, CI #323 2813 008	240-109
	1	-96	400 000 6313	Motor Gear Set, M350-96, CI #323 2822 008	240-021
	1	-107	400 000 1601	Motor Gear Set, M350-107, CI #323 2825 008	N/A
292	2		927 220 4000	Motor Check Valve, M330, CI #391 3681 001	230-126
293	1		400 000 6233	Fitting, Plug, SAE #8, Airway #6409-8	230-072

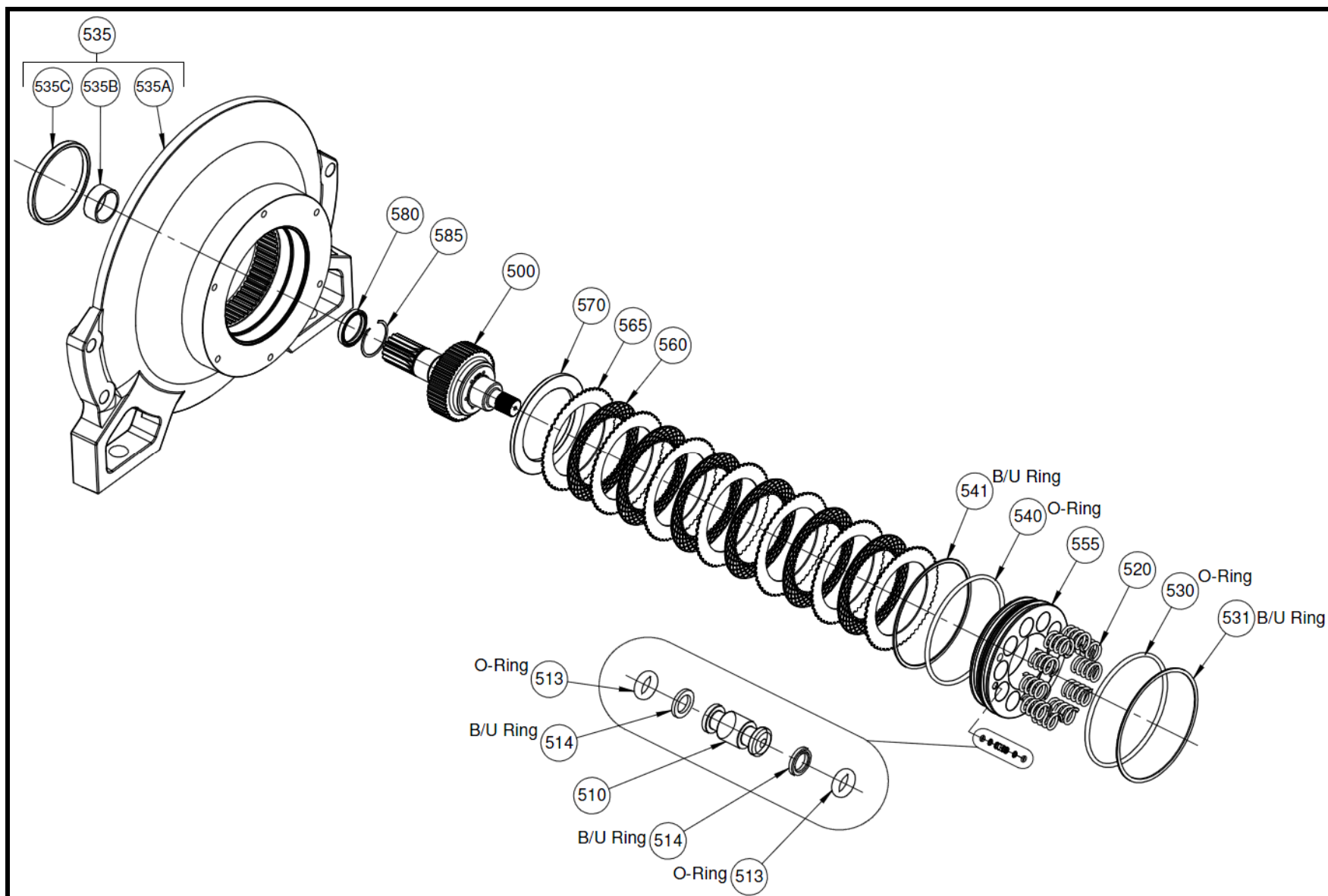
* Motor Seal Kit #400 000 6326 (240-094) and Service Kit #400 000 6324 (240-080) include:
 #255 (x2), #260 (x4), #261 (x4), #265 (x2), #268 (x2)



For your notes:

DRAWINGS**PRIMARY ASSEMBLY DRAWING**

#EP.TH4 REV B





PRIMARY ASSEMBLY COMPONENT LIST

#EP.TH4 REV B

PRIMARY COMPONENT LIST				EP.TH4
REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #
500	See table 1	1	Assembly, Clutch, TH4.XX	See table 1
510	400 000 0714	1	Brake Conduit, TH2	220-045
* 513	400 000 0715	2	Seal, O-ring, #2-008	220-047
* 514	400 000 0716	2	Seal, Backup Ring, #8-008	220-048
520	400 000 5895	10	Spring, TH2	220-016
* 530	926 387 4000	1	Seal, O-ring, #2-357	220-043
* 531	926 388 4000	1	Seal, Backup Ring, #8-357	220-042
535	400 000 6237	1	Base, Primary, Assembled, TH4. Includes:	240-076
535A	400 000 6297	1	Base, Primary, TH4	240-002G
535B	926 391 4000	1	Bearing, Sleeve, Symmco #SS-4856-12	230-066
535C	926 399 4000	1	Sleeve, Rotary Shaft Seal, TH3	230-058
* 540	926 384 4000	1	Seal, O-ring, #2-356	220-041
* 541	926 383 4000	1	Seal, Backup Ring, #8-356	220-040
555	400 000 6303	1	Brake Piston, TH4	240-011
560	926 382 4000	6	Brake Disc, TH2	220-039
565	926 381 4000	7	Brake Separator, TH2	220-038
570	926 380 4000	1	Brake Locator, TH2	220-015
* 580	926 392 4000	1	Seal, Brake Shaft, TH3	230-035
585	400 000 6239	1	Retainer, Spirolox, #UR-187	230-081

When sold separately, Primary Assembly is supplied with:

- 4000006347 (#801-002) (x1) Shipping Plate
- 0015530000 (#220-032) (x2) screw
- 4000000707 (220-068) (x2) washer

NOTE: The winch model number is located on the Final Base Identification label and identifies rotation code (CC, CW).

TABLE 1

REF.	VARIANCE	NEW PART #	DESCRIPTION	OLD PART #
500	Counter Clockwise hoisting	400 000 6357	Assembly, Clutch, TH4, CC	C.TH4.CC
	Clockwise hoisting	400 000 6358	Assembly, Clutch, TH4, CW	C.TH4.CW

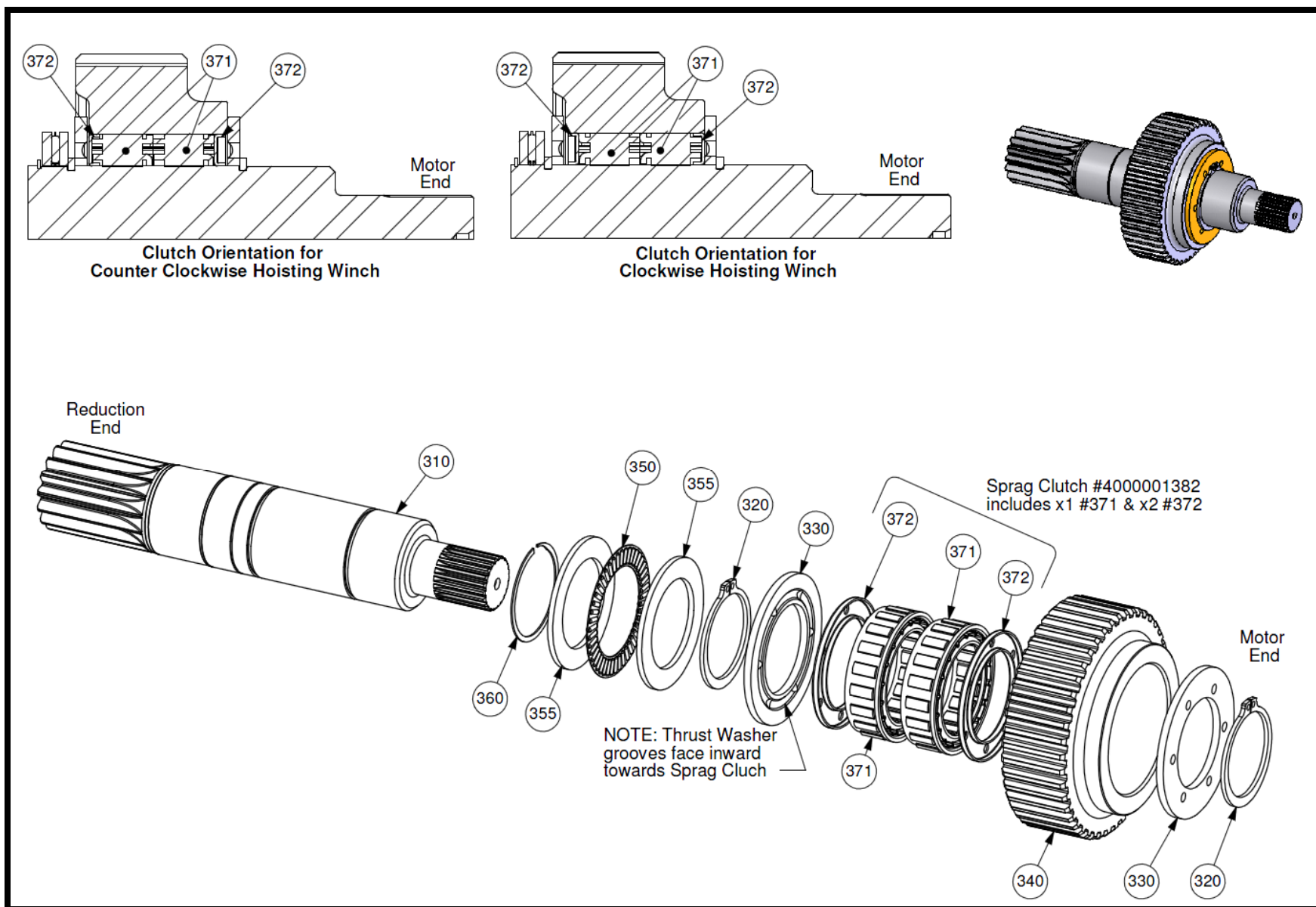
* TH3 Winch Seal Kit #9262277000 (#230-093) includes #513 (x2), #514 (x2), #530, #531, #540, #541, and #580.

DRAWINGS



CLUTCH ASSEMBLY DRAWING

#EC.TH4 REV C





CLUTCH ASSEMBLY COMPONENT LIST

#EC.TH4 REV C

New Part # for C.TH4.CC is 400 000 6357 New Part # for C.TH4.CW is 400 000 6358				WEIGHT: 6.40 lbs
REF.	NEW PART #	QTY.	DESCRIPTION	OLD PART #
* 310	400 000 6304	1	Brake Shaft, TH4	240-014
320	400 000 5932	2	Retainer, DIN 471 American Ring #471-0380	220-037
330	400 000 0709	2	Brake Clutch Thrust Washer	220-036
* 340	400 000 0682	1	Brake Hub, TH4	240-010
350	400 000 5929	1	Bearing, Thrust Roller, INA #TC 2435	220-034
355	400 000 6221	2	Bearing, Thrust Washer, Torrington #TRC-2435	230-049
360	400 000 0708	1	Retainer, Spirolox #US-150	220-046
* 371	400 000 0711	2	Brake Sprag Clutch Cage	220-124
372	400 000 0712	2	Brake Sprag Clutch End Bearing	220-125

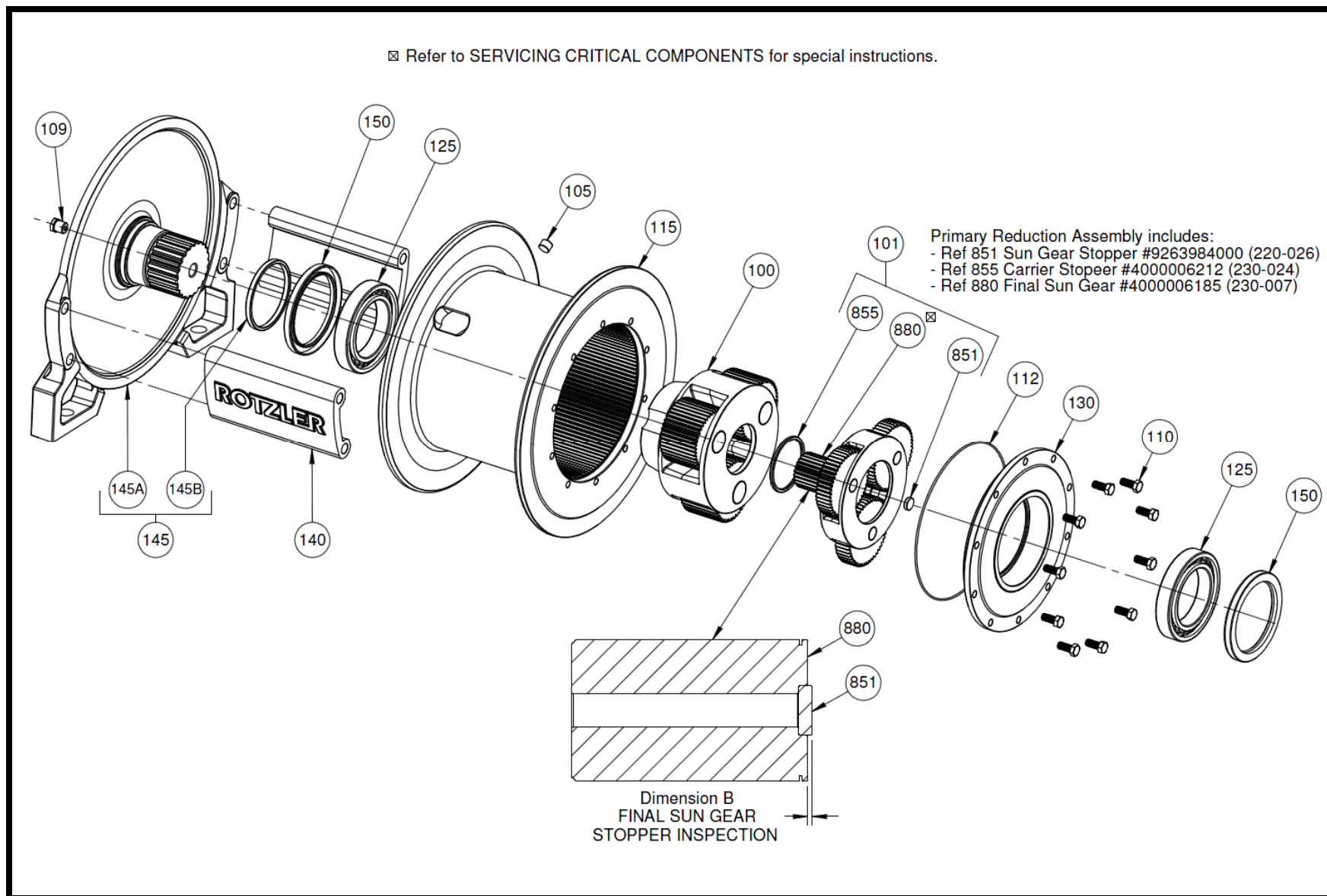
* Refer to SERVICING CRITICAL COMPONENTS for special instructions.



DRAWINGS

FINAL ASSEMBLY DRAWING

#EF.TH4 REV C





FINAL ASSEMBLY COMPONENT LIST

#EF.TH4 REV C

FINAL ASSEMBLY COMPONENT LIST				EF.TH4
REF.	NEW PART #	QTY	DESCRIPTION	OLD PART #
100	926 097 3000	1	Assembly, Reduction, Final, TH3	RF.TH3
101	926 096 3000	1	Assembly, Reduction, Primary, TH3	RP.TH3
105	926 064 4000	1	Fitting, Plug, Pipe, 3/8, SS 316, Seaway #D432	220-134
109	926 063 4000	1	Valve, Relief	220-063
110	001 553 0020	10	Screw, Hex Hd Cap, M10-1.50x25mm, DIN 933, SS Gr. A4	220-100
* 112	400 000 6227	1	Seal, O-ring, #2-177	230-064
115	926 098 1000	1	Cable Drum, TH3	230-013G
125	400 000 6224	2	Bearing, Ball, SKF #6018	230-059
130	926 099 2000	1	Holder, Bearing, TH3	230-012M
140	926 104 3001	2	Spacer Bar, TH3	230-030M
145	400 000 6321	1	Base, Final, Assembled, TH4. Includes:	240-074
145A	926 954 1000	1	Base, Final, TH4	240-001G
145B	926 399 4000	1	Sleeve, Rotary Shaft Seal, TH3	230-058
* 150	400 000 6225	2	Seal, Rotary Shaft, DIN3760, WA Style, 110X140X12 mm	230-060

* TH3 Winch Seal Kit #9262277000 (230-093), and TH3 Winch Service Kit #4000006240 (230-086) include item #112 and #150 (x2).



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