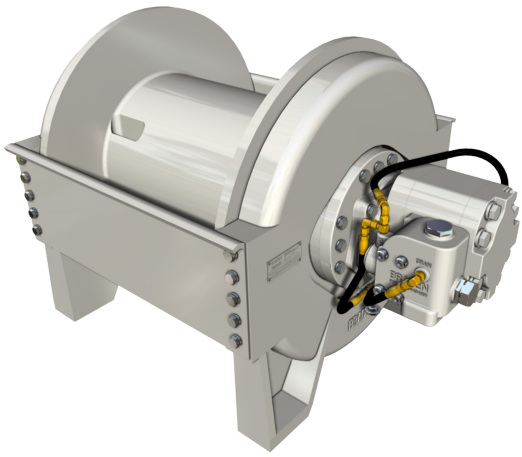
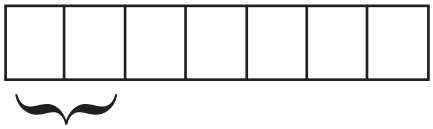
BRADEN
A PACCAR COMPANY

CH210A AND CH280A
HYDRAULIC PLANETARY HOISTS



Record serial number below:



First 2 numbers indicate year of manufacture
(for serial number location, see page 3).

Visit www.arrowheadwinch.com for the most up-to-date product and service information.
Technical publications for most PACCAR Winch products are available for download.

800 East Dallas | Broken Arrow, OK 74012
www.paccarwinch.com | 918.251.8511

MADE IN THE USA

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FOREWARD

The following service instructions have been prepared to provide assembly, disassembly and maintenance information for the BRADEN Model CH Series 3 hoist. It is suggested that before doing any work on these units, all assembly and disassembly instructions should be read and understood.

Some pictures in this manual may show details or attachments that are different from your hoist. Also, some components have been removed for illustrative purposes.

Continuing product improvement may cause changes in your hoist, which are not included in this manual. Whenever a question arises regarding your BRADEN Hoist or this manual, please contact BRADEN Service Department for the latest available information.

Managing Waste

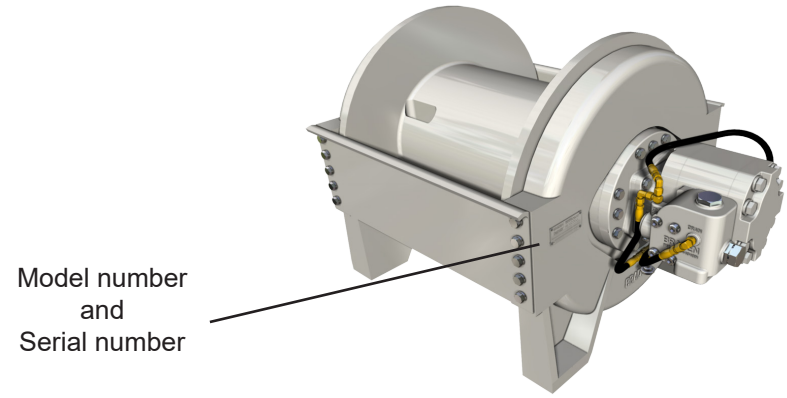
Arrowhead Winch believes in a life-cycle approach to our products. We encourage best practices regarding “Going Green” — making environmentally responsible decisions to “reduce, reuse, and recycle.”

- At the end of the winch’s useful life, it is highly recommended to drain and recycle any oil remaining in the equipment.
- Please use a metal recycler for winch disposal to reduce landfill waste.

The U.S. Environmental Protection Agency has developed required practices, called “management standards,” for businesses that handle used oil and metal wastes. Specific guidelines are available at the EPA and API Web sites as well as your state’s environmental agency Web site:

- https://www.epa.gov/
- http://recycleoil.org/

SERIAL AND MODEL NUMBER LOCATION



MODEL NUMBER AND SERIAL NUMBER

When information on a hoist is needed, always refer to the model number and serial number. Both are located on the top of the motor-side end plate as indicated above.

MODEL NUMBER EXPLANATION

This document provides information on the meaning of the numbers and letters in the BRADEN planetary hoist model nomenclature.

For example:

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
CH	280	A -	AB -	54	P	120 -	01	U -	1

1. **Product Family** – Letters represent product family
2. **Capacity** – Numbers represent maximum rated line pull based on structural capacity
3. **Generation** – Letters represent major design changes in a product family (A, B, etc.)

   *NOTE: Sometimes the “A” will not be included in the model number of the first design generation
4. **Special Features** – Letters represent special unit features (optional)
5. **Gear Ratio** – Numbers represent ratio of the input to the hoist to the drum rotation speed
6. **Motor Code** – Letters represent type of motor (optional)
7. **Motor Size** – Numbers represent displacement of hydraulic motor measured in cubic inches per one rotation (variable displacement numbers are indicated by highest/lowest, such as 128/064)

   *NOTE: 000 indicates the hoist was built without a hydraulic motor
8. **Drum Code** – Numbers represent different drum sizes (drum flange height, barrel diameter, distance between flanges)
9. **Drum Options** – Letters indicate special drum features
10. **Other Options** – May be numbers or letters (optional)

GENERAL SAFETY RECOMMENDATIONS

Safety and informational callouts used in this manual include:

⚠ WARNING ⚠

WARNING – This emblem is used to warn against hazards and unsafe practice which COULD result in severe personal injury or death if proper procedures are not followed.

⚠ CAUTION ⚠

CAUTION – This emblem is used to warn against potential or unsafe practices which COULD result in personal injury and product or property damage if proper procedures are not followed.

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure safety to others as well as yourself. The following recommendations are offered as a general safety guide. Local rules and regulations will also apply.

1. Be certain equipment (boom, sheave blocks, pendants, etc.) is either lowered to the ground or blocked securely before servicing, adjusting, or repairing hoist.
2. Be sure personnel are clear of work area BEFORE operating hoist.
3. Read all warning and caution tag information provided for safe operation and service of hoist.
4. Inspect rigging and hoist at the beginning of each work shift. Defects should be corrected immediately.
5. Keep equipment in good operating condition. Perform scheduled servicing and adjustments listed in the “Preventive Maintenance” section of this manual.
6. An equipment warm-up procedure is recommended for all start-ups and essential at ambient temperatures below +40°F (4°C). Refer to “Warm-up Procedure” listed in the “Preventive Maintenance” section of this manual.
7. Operate hoist line speeds to match job conditions.
8. Leather gloves should be used when handling wire rope.
9. Never attempt to handle wire rope when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and hoist drum.
10. When winding wire rope on the hoist drum, never attempt to maintain tension by allowing wire rope to slip through hands. Always use “Hand-Over-Hand” technique.
11. Never use wire rope with broken strands. Replace wire rope.
12. Do not weld on any part of the hoist.
13. Use recommended hydraulic oil and gear lubricant.
14. Keep hydraulic system clean and free from contamination at all times.
15. Use correct anchor for wire rope and pocket in drum.
16. Do not use knots to secure or attach wire rope.
17. The BRADEN designed wire rope anchors are capable of supporting the rated load when installed properly. For additional safety, ALWAYS maintain a minimum of five (5) wraps of wire rope on the drum.
18. Never attempt to clean, oil or perform any maintenance on a machine with the engine or prime mover running, unless instructed to do so in this manual.
19. Never operate hoist controls unless you are properly positioned at the operators station and you are sure personnel are clear of the work area.
20. Assure personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
21. Ground personnel should stay in view of the operator and clear of hoist drum. Do not allow ground personnel near hoist line under tension. A safe distance of at least 1-1/2 times the length of the cable should be maintained.
22. Do not exceed the maximum pressure, PSI (bar), or flow, GPM (LPM), stated in the hoist specifications.
23. Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the cable is wrapped onto the drum or drawn through guide rollers.
24. “Deadman” controls, which automatically shut off power to the hoist whenever the operator leaves his station, should be installed whenever practicable.
25. Never allow anyone to stand under a suspended load.
26. Avoid sudden “shock” loads or attempting to “jerk” load free. This type of operation may cause heavy loads, in excess of rated capacity, which may result in failure of cable and hoist.

THEORY OF OPERATION

DESCRIPTION OF HOIST

The hoist is made up of the following subassemblies:

1. Hydraulic motor and brake valve
2. Drum, drum closure, ball bearings and oil seals
3. Support end plate and bearing support
4. Motor end plate and motor adapter
5. Tie plates
6. Brake clutch assembly
7. Brake cylinder assembly and multiple-disc brake parts
8. Primary, second stage and output planetary reducer assemblies
9. Ring gear

THEORY OF OPERATION

The primary sun gear is directly coupled to the hydraulic motor by the inner race of the brake clutch assembly. As the motor turns in the hoisting direction, the two planetary assemblies reduce the input speed of the motor and rotate the planetary gearing and the cable drum. The ring gear is held stationary by the brake cylinder and the output planet carrier is coupled directly to the cable drum causing the drum to rotate in the same direction as the motor shaft. In the hoisting direction, the static brake remains applied and the input shaft rotates freely through the brake clutch. When the motor is stopped, the load tries to rotate the hoist gear train in the opposite direction. The brake clutch immediately locks up, allowing the fully applied static brake to hold the load firm. See “Dual Brake System – Operation” for a detailed description of the sequence of operation in the lowering direction.

Dual Brake System – Description

The dual brake system consists of a dynamic brake system and a static brake system.

The dynamic brake system has two operating components:

1. Brake valve assembly
2. Hydraulic motor

The brake valve is basically a counterbalance valve. It contains a check valve to allow free flow of oil to the motor in the hoisting direction and a pilot operated, spring-loaded spool valve that blocks the flow of oil out of the motor when the control valve is placed in neutral. When the control valve is placed in the lowering position, the spool valve remains closed until sufficient pilot pressure is applied to the end of the spool to shift it against spring pressure and open a passage. After the spool valve cracks open, the pilot pressure becomes flow-dependent and modulates the spool valve opening which controls the lowering speed. See Figures 2, 3, and 4.

The static brake system has three operating components:

1. Spring-applied, multiple friction-disc static brake
2. Brake clutch assembly
3. Hydraulic piston and cylinder

Figure 2

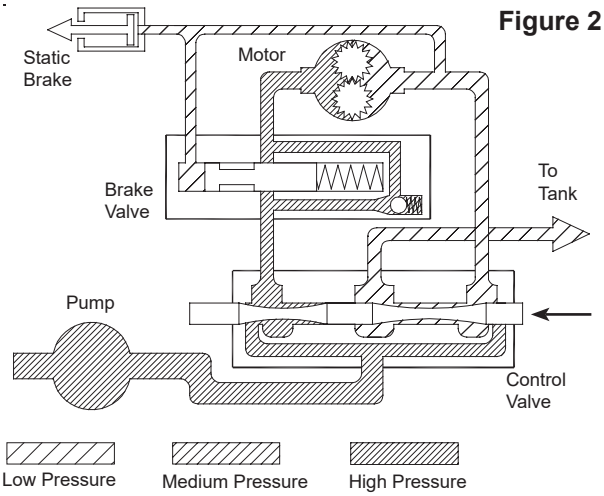


Figure 3

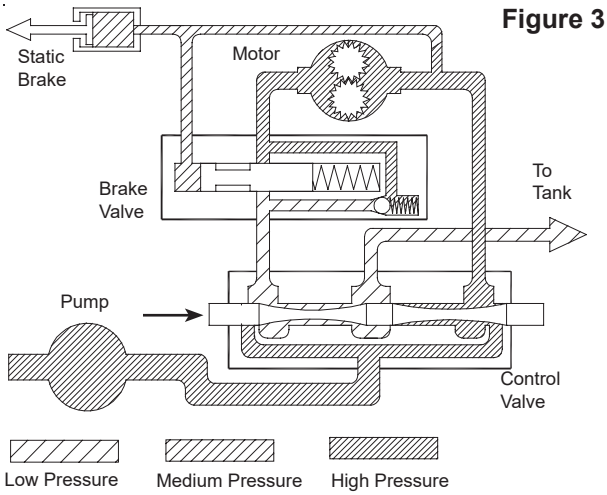
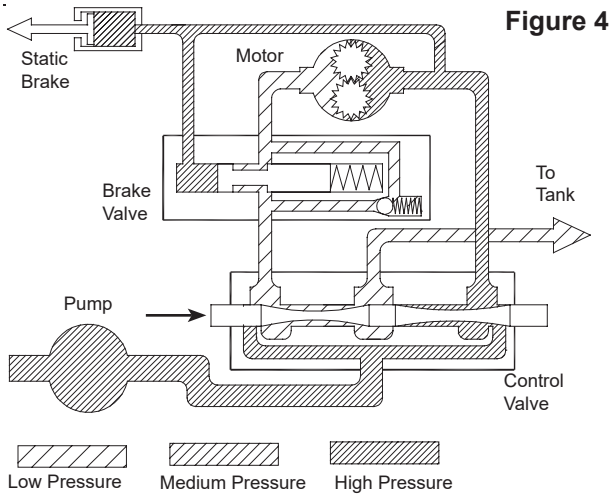


Figure 4



THEORY OF OPERATION

DESCRIPTION OF HOIST

The hoist has four basic component parts:

1. Hoist base
2. Hydraulic motor and brake valve
3. Brake cylinder and motor support
4. Drum assembly

The drum assembly consists of three basic assemblies:

1. Drum with integral ring gear
2. Output planetary gear set
3. Primary planetary gear set

The hydraulic motor is bolted to the motor support which in turn is bolted to the brake cylinder and the base. The motor end of the drum, running on a ball bearing, is supported by the brake cylinder. The other end of the drum runs on a ball bearing on the support bolted to the base. The ring gear for both planetary sets is machined into the drum's inside surface.

HOIST OPERATION

The hydraulic motor drives the sun gear of the primary planetary gear set through the splined inner race of the overrunning brake clutch. When driven by the sun gear, the primary planet gears walk around the ring gear in the drum and drive the primary planet carrier.

The primary planet carrier drives the output planet sun gear which, in turn drives the output planet gears. The output planet carrier is splined to the bearing support and cannot rotate. Therefore, as the output planet gears are driven by the sun gear, they will drive the ring gear/drum.

DUAL BRAKE SYSTEM - DESCRIPTION

The dual brake system consists of a dynamic brake system and a static brake system.

The dynamic brake system has two operating components:

1. Brake valve assembly
2. Hydraulic motor

The brake valve functions as a counterbalance valve, but delivers fine load control by effectively metering flow. It contains a check valve to allow free flow of oil to the motor in the hoisting direction and a pilot operated, spring-loaded spool valve, which blocks the flow of oil out of the motor when the control valve is placed in neutral. When the control valve is placed in the lowering position, the spool valve remains closed until sufficient pilot pressure is applied to the end of the spool to shift it against spring pressure and open a passage. After the spool begins to open at 300-500 psi (20.7-34.5 bar) cracking pressure the pilot pressure becomes flow-dependent and modulates the spool valve opening which controls the lowering speed. Refer to figures 1, 2, and 3.

The static brake system has three operating components:

1. Spring Applied, Multiple Friction Disc Static Brake
2. Overrunning Brake Clutch Assembly
3. Hydraulic Piston and Cylinder

Figure 1
HOISTING

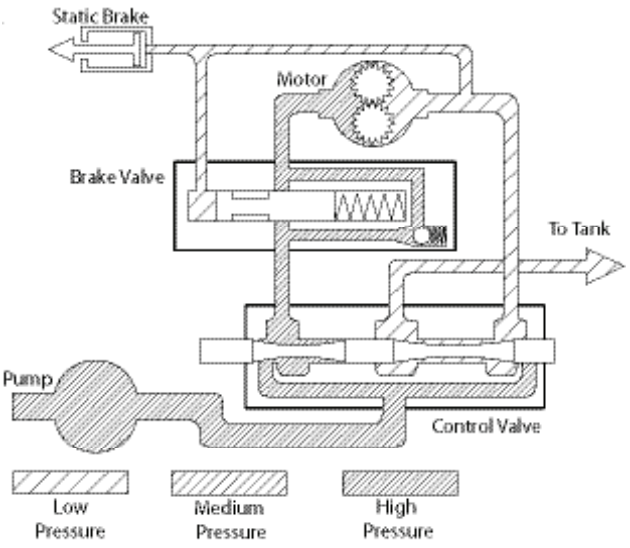
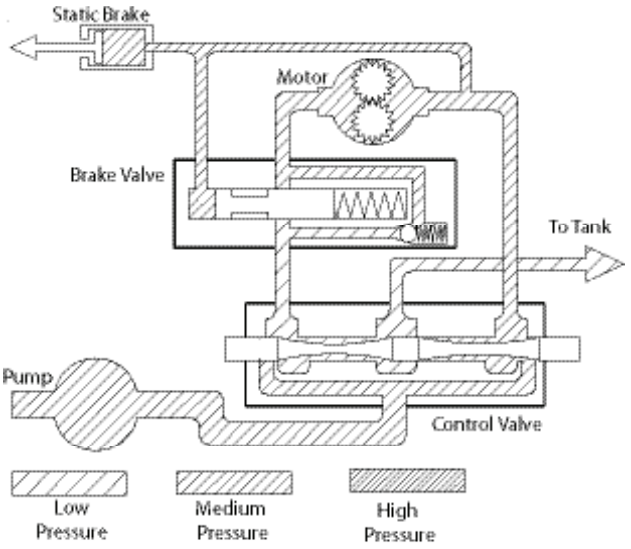


Figure 2
LOWERING 1



The static brake is released by the brake valve pilot pressure at a pressure lower than that required to open the pilot operated spool valve. This sequence assures that dynamic braking takes place in the brake valve and that little, if any, heat is absorbed by the friction brake.

The friction brake is a load holding brake only and has nothing to do with dynamic braking or rate of descent of a load.

The brake clutch is splined to the primary sun gear shaft between the motor and the primary sun gear. It will allow this shaft to turn freely in the direction to raise a load and lock up to force the brake discs to turn with the shaft in the direction to lower a load (Figures 5 and 6).

The hydraulic cylinder, when pressurized, will release the spring pressure on the brake discs, allowing the brake discs to turn freely.

Dual Brake System – Operation

When hoisting a load, the brake clutch which connects the motor shaft to the primary sun gear, allows free rotation. The sprag cams lay over and permit the inner race to turn free of the outer race (Figure 5). The friction brake remains fully engaged. The hoist, in raising a load, is not affected by any braking action (Figure 2).

When the lifting operation is stopped, the load attempts to turn the primary sun gear in the opposite direction. This reversed input causes the sprag cams to instantly roll upward and firmly lock the shaft to the fully engaged friction brake (Figure 6).

When the hoist is powered in reverse, to lower the load, the motor cannot rotate until sufficient pilot pressure is present to open the brake valve (Figures 3 and 4). The friction brake within the hoist will completely release at a pressure lower than that required to open the brake valve. The extent to which the brake valve opens will determine the amount of oil that can flow through it and the speed at which the load will be lowered. Increasing the flow of oil to the hoist motor will cause the pressure to rise and the opening in the brake valve to enlarge, speeding up the descent of the load. Decreasing this flow causes the pressure to lower and the opening in the brake valve to decrease thus slowing the descent of the load.

When the control valve is shifted to neutral, the pressure will drop and the brake valve will close, stopping the load. The friction brake will engage and hold the load after the brake valve has closed.

When lowering a load slowly for precise positioning, no oil flow actually occurs through the hoist motor. The pressure will build up to a point where the brake will release sufficiently to allow the load to rotate the motor through its own internal leakage. This feature results in a slow speed and extremely accurate positioning.

The friction brake receives little wear in the lowering operation. All of the heat generated by the lowering and stopping of a load is absorbed by the hydraulic oil where it can be readily dissipated.

Figure 5 Static Friction Brake Applied

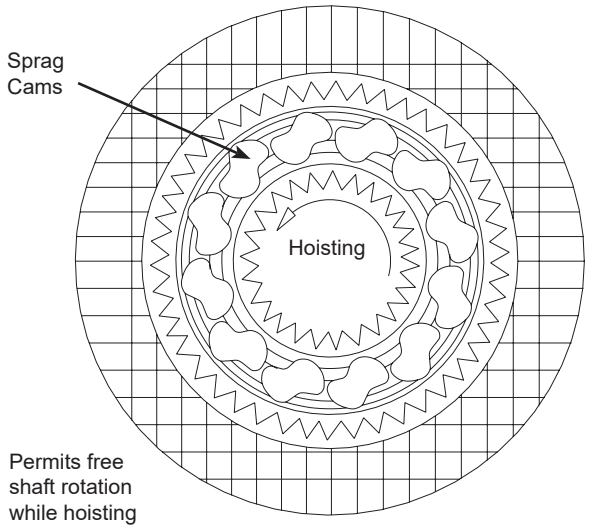
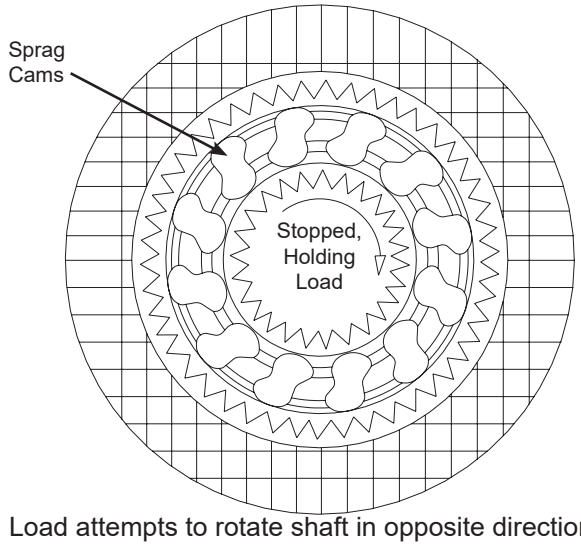


Figure 6 Static Friction Brake Applied



Load attempts to rotate shaft in opposite direction.
Brake clutch locks sun gear shaft to friction brake.

HOIST INSTALLATION

1. The hoist should be mounted with the centerline of the drum in a horizontal position. The mounting plane can be rotated to any position around this centerline.
2. When mounting the CH210A hoist, BRADEN recommends using 4 one-inch Grade 8 bolts and nuts, using both mounting holes in each end plate. The CH280A requires 1-1/4-inch bolts because the side plate hole is 1-3/8 inches.

⚠ WARNING ⚠

DO NOT weld hoist to mounting surface. Welding may not provide adequate structural support for hoist loads. This may cause loss of load control, which could result in property damage, injury, or death. Welding may also damage bearings and seals, resulting in premature failure.

3. It is important that the hoist be mounted on a surface that will not flex when the hoist is in use, because this could bind the working parts of the hoist. Also, be sure the hoist is mounted on a flat surface. If necessary, use shim stock to ensure proper mounting. The mounting surface should be flat within ±0.020 inch (0.5 mm).

4. Hydraulic lines and components operating the hoist must be of sufficient size to assure minimum back-pressure at the hoist motor ports. The hydraulic back-pressure measured at the motor work ports must not exceed 100 PSI (6.9 bar) at full operating flow. **Back-pressure in excess of 100 PSI (6.9 bar) will shorten motor shaft seal life and partially release the load holding brake.** The standard hoist is supplied with the gear motor internally drained and connected the drain by-pass port on the BRADEN brake valve. If high back-pressures are encountered, the motor should be externally drained directly to the reservoir and the “DRAIN” port on the brake valve capped. All piston motors **MUST** be drained directly to the reservoir. The piston motor case drain port must **NEVER** be exposed to more than 42 PSI (2.9 bar); shaft seal damage will occur.

5. Make certain that the hoist drum is centered behind the first sheave and the fleet angle does not exceed 1.5 degrees. The hoist should also be mounted perpendicular to an imaginary line from the center of the drum to the first sheave to ensure even spooling.

6. The hoist directional control valve must be a three-position, four-way valve with a motor spool such that when the valve is in the center position both work ports are opened directly to tank.

7. The hydraulic oil filter should have a 10-micron nominal rating and be a full-flow type.

8. High-quality hydraulic oil is essential for satisfactory performance and long hydraulic system component life.

   Oil having 150 to 330 SUS viscosity at 100°F (38°C) and viscosity index of 100 or greater will give good results under normal temperature conditions. The use of an oil having a high viscosity index will minimize cold-start trouble and reduce the length of warm-up periods. A high viscosity index will minimize changes in viscosity with corresponding changes in temperature.

   Maximum cold weather start-up viscosity should not exceed 5,000 SUS with a pour point at least 20°F (7°C) lower than the minimum temperature.

   Under continuous operating conditions, the temperature of the oil at any point in the system must not exceed 180°F (82°C). A temperature between 120–140°F (49–60°C) is generally considered optimum.

   In general terms: For continuous operation at ambient temperatures between 50–110°F (10–43°C), use SAE 20W. For continuous operation between 10–90°F (50–32°C), use SAE 10W. For applications colder than 10°F (12°C), contact the BRADEN Service Department. The use of multiviscosity oils is generally not recommended.

WIRE ROPE INSTALLATION

The wedge and anchor pocket must be clean and dry. The end of the wire rope being anchored to the drum must be clean and dry and not frayed. Anything on the end of the wire rope to keep it from fraying (tape or wire) must not be in contact with the wedge when the installation is complete. Consult the wire rope manufacturer on the proper treatment of the dead end of the wire rope. Some rope manufacturers recommend when using rotation-resistant wire rope, that the rope end be seized, welded, or brazed before inserting the wire rope into the wedge socket. This prevents core slippage or loss of rope lay.

Take the free end of the wire rope and insert it through the small opening on the cable drum. Loop the wire rope and push the free end about 3/4 of the way back through the pocket. Install the wedge as shown in Figure 7, then pull the slack out of the wire rope. The dead end of the rope needs to extend slightly beyond the end of the wedge as shown in Figure 8.

Using a hammer and brass drift, drive the wedge as deep into the pocket as possible to ensure it is fully seated and no further movement is detected. Applying a load on the wire rope will also help seat the wedge in the pocket.

Check to ensure the wedge does not protrude from either end of the pocket, causing it to interfere with proper spooling of wire rope onto the drum (Figures 9 and 10). If there is interference or the wedge does not seat firmly, contact the BRADEN Product Support Department at 918-251-8511 to determine the proper wedge size.

It is important that the wire rope have the proper tensioning when it is installed on the drum. When the wire rope is first installed, you should operate the hoist, with light to moderate loads, with reeving that let's you place these loads on the block and the drum with all the rope off the drum except for the last three wraps.

Correct Installation

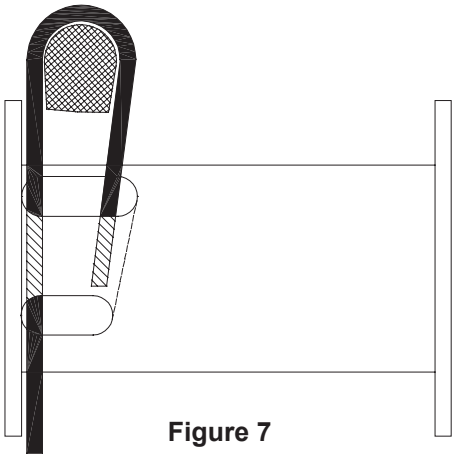


Figure 7

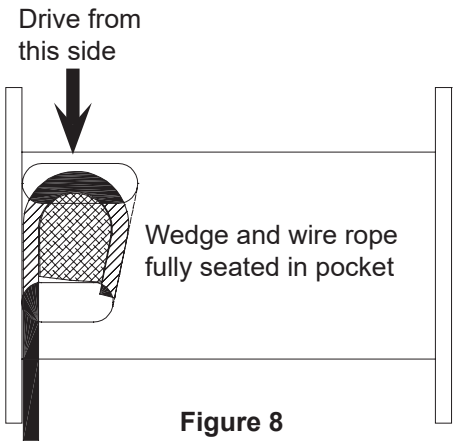


Figure 8

Incorrect Installation

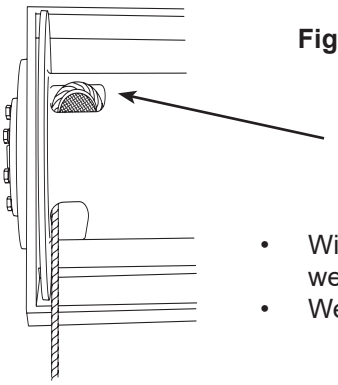


Figure 9

Wedge not
fully seated

- Wire rope not tight against wedge
- Wedge may be too large

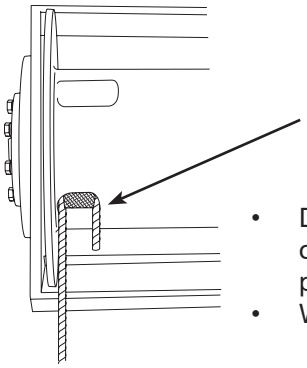


Figure 10

Wedge pulled too far

- Dead end of wire rope and/ or wedge may interfere with proper spooling
- Wedge may be too small

⚠ WARNING ⚠

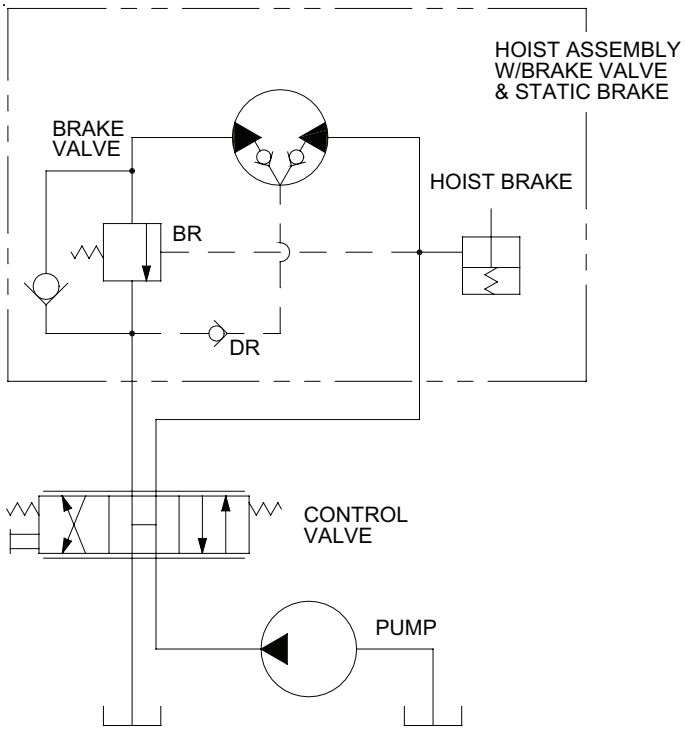
THE CABLE ANCHORS ALONE ON HOISTS ARE NOT DESIGNED TO HOLD RATED LOADS. Hoist loads applied directly to the wire rope anchor may cause the wire rope to pull free and result in the sudden loss of load control and cause property damage, injury, or death. A minimum of 5 wraps of wire rope must be left on the drum barrel to achieve rated load.

HOIST MODEL: WEDGE PART NO.
CH210A: 24493* for 1/2 through 3/4 inch (13–19 mm)
CH280A: 24494* for 7/8 through 1 inch (22–25 mm)
A24493 for 3/4 inch (19 mm)

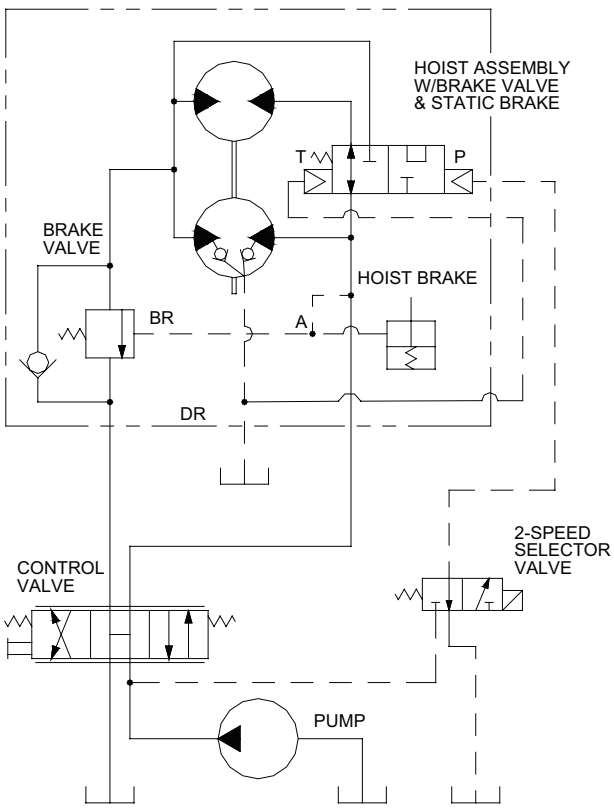
***Standard Anchor**

HYDRAULIC CIRCUIT

SINGLE-SPEED MOTOR CIRCUIT



TWO-SPEED MOTOR CIRCUIT



PREVENTIVE MAINTENANCE

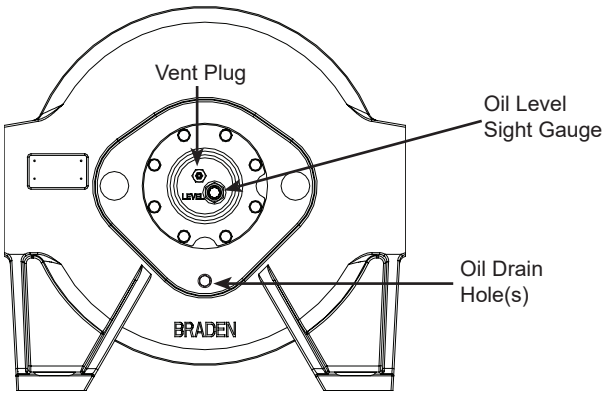
A regular program of preventive maintenance for your planetary hoist is strongly recommended to minimize the need for emergency servicing and promote safe, reliable hoist operation.

Check for external oil leaks and repair as necessary. This is extremely important due to accelerated wear that will result from insufficient lubrication. For hoists with a sight glass, ensure that the sight glass is clear and functional, then visually check oil level daily. For hoists without a sight glass, check oil level monthly if no external oil leaks are detected. Lubricant level must be maintained between the minimum and maximum levels, midway up the sight glass or at the bottom of the level plug port as equipped. Use only the recommended type of lubricant.

Initially, the gear oil should be changed after the first 100 hours of operation. Change the gear oil after the first 100 hours or two months of machine operation, then every 1,000 hours or six months, whichever occurs first. The gear oil should also be changed whenever the ambient temperature changes significantly and an oil from a different temperature range would be more appropriate.

1. Vent Plug and Oil Level
The vent plug and oil level sight gauge are located in the bearing support on the end of the hoist opposite the motor. It is important to keep the vent clean and unobstructed. Whenever gear oil is changed, remove the vent plug and sight gauge, clean in solvent and reinstall.
Do not paint over the vent or replace with a solid plug.

2. Oil Change
Rotate the drum to align the drain plug with the lowest hole in the support bracket. Install a short piece of 1-inch pipe into the threads around the drain plug. Remove the drain plug (5/16-inch hex) and drain the oil into a suitable container. Always dispose of used oil in an environmentally responsible manner. Remove the 1-inch pipe and rotate the drum to align the hole in the drum with the highest hole in the support bracket. Reinstall the pipe and fill the hoist drum with the recommended oil to the center of the sight gauge. Install the drain plug and remove the pipe.



⚠ WARNING ⚠

DO NOT insert fingers through oil drain hole to determine drain hole alignment. Movement of the drum could result in severe injury should appendages be present in the drain hole.

3. Hydraulic System
The original filter element should be replaced after the first 50 hours of operation, then every 500 operating hours or three months, or in accordance with the equipment manufacturer's recommendations.

4. Wire Rope
Inspect entire length of wire rope according to wire rope manufacturer's recommendations.

5. Mounting Bolts
Tighten all hoist base mounting bolts to recommended torque after the first 100 hours of operation, then every 1,000 operating hours or six months, whichever occurs first.

6. Warm-up Procedures
A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below +40°F (4°C).

The prime mover should be run at its lowest recommended RPM with the hydraulic hoist control valve in neutral, allowing sufficient time to warm up the system. The hoist should then be operated at low speeds, forward and reverse, several times to prime all lines with warm hydraulic oil, and to circulate gear lubricant through the planetary gear sets.

⚠ WARNING ⚠

Failure to properly warm up the hoist, particularly under low ambient temperature conditions, may result in temporary brake slippage due to high back pressures attempting to release the brake, which could result in property damage, severe personal injury, or death.

7. Recommended Planetary Gear Oil
Field experience, supported by engineering endurance tests, indicates use of the proper gear oil and a program of regular preventive maintenance will help provide extended gear train life and reliable hoist brake performance.

For simplicity, BRADEN has listed available products in each temperature range that have been tested and found to meet our specifications. This is not to say that other lubricant brands would not perform equally as well.

If the following lubricant brands are not available in your area, make certain your lubricant vendor supplies you with oil equivalent to those products listed.

RECOMMENDED PLANETARY GEAR OIL

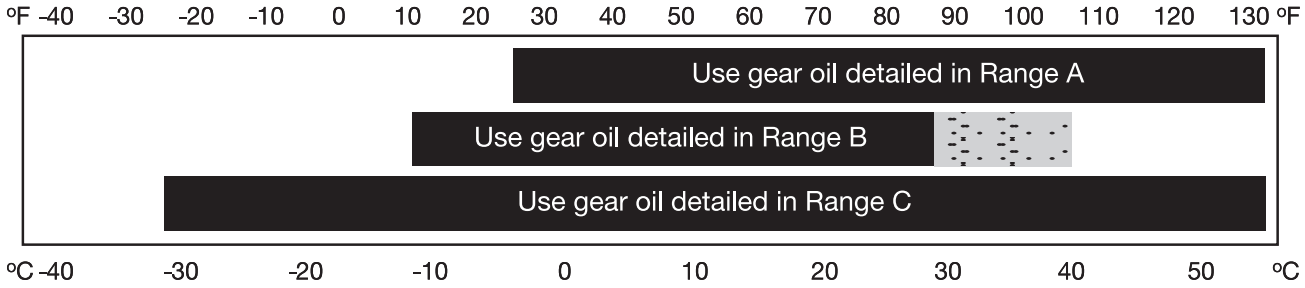
⚠ WARNING ⚠

Failure to use the proper type and viscosity of planetary gear oil may contribute to intermittent brake clutch slippage which could result in property damage, severe personal injury, or death. Some gear lubricants contain large amounts of extreme-pressure (EP) and antifriction additives which may contribute to brake slippage and damage to brake friction discs or seals. Oil viscosity with regard to ambient temperature is also critical to reliable brake operation. Our tests indicate that excessively heavy or thick gear oil may contribute to intermittent brake slippage. Make certain that the gear oil viscosity used in your hoist is correct for your prevailing ambient temperature.

⚠ WARNING ⚠

Oil viscosity is affected by ambient temperature and is critical to reliable brake clutch operation. Tests indicate that excessively heavy or thick gear oil may contribute to intermittent brake clutch slippage. Ensure the gear oil viscosity used in your hoist is appropriate for the prevailing ambient temperature.

PREVAILING AMBIENT TEMPERATURE



Shaded temperature range in the chart above is not recommended for severe applications such as sustained fast duty cycles or frequent winching/hoisting.

NOTE: A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below 40°F (4°C).

	Mobil	Shell	Chevron
Range A	Mobilgear 600 XP 200	Omala S2 GX 220	Gear Compounds EP 220 or Meropa 220
Range B	Mobilgear 600 XP 150	Omala S2 GX 150	Gear Compounds EP 150 or Meropa 150
Range C	Mobilgear SHC 150	Omala S4 GX 150	

PACCAR Winch winches/hoists are factory filled with Mobilgear 600 XP 150 or equivalent. Consult with your oil supplier for equivalent oil options as required.

CH210/CH280 Planetary Hoist Oil Capacity

	Pints	Quarts	Litre
CH210-01 (before 7/2003)	34	17	16.1
CH210-01 (after 7/2003)	23	11.5	10.9
CH210-02	60	30	28.4
CH210-03G	36	18	17
CH210-05G	44	22	20.8
CH280A - 01	50	25	22.7
CH280A - 02	108	54	51

TROUBLESHOOTING

⚠ WARNING ⚠

If a hoist ever exhibits any sign of erratic operation, or load control difficulties (load creeping or chattering) appropriate troubleshooting tests and repairs should be performed immediately. Continued operation in this manner may result in property damage, serious personal injury, or death.

TROUBLE	PROBABLE CAUSE	REMEDY
A The hoist will not lower the load or not lower the load smoothly.	1. The problem could be a plugged or loose pilot orifice. The pilot orifice is a small pipe plug with a hole drilled through it, located behind the pilot port fitting on the brake valve. If it becomes plugged, it will prevent the pilot pressure, from the manifold, from opening the brake valve. If it becomes loose, it will allow an unregulated amount of oil in to operate the brake valve which cause erratic brake valve operation.	Remove the pilot hose and fitting from the brake valve, then use a 5/32-inch Allen wrench to remove the pilot orifice. The diameter of the orifice is approximately .020 inch. Clean and install the pilot orifice tightly in the brake valve.
	2. The friction brake may not be releasing as a result of a defective brake cylinder seal. **NOTE:** If the brake cylinder seal is defective you will usually find oil leaking from the hoist vent plug.	Check brake cylinder seal as follows: A. Disconnect the swivel tee from the brake release port. Connect a hand pump with accurate 0–2,000 PSI gauge and shut-off valve to the –4 JIC fitting in the brake release port. B. Apply 1,000 PSI to the brake. Close shut-off valve and let stand for five minutes. C. If there is any loss of pressure in five minutes, the brake cylinder should be disassembled for inspection of the sealing surfaces and replacement of the seals. Refer to Motor Support-Brake Cylinder Service section of manual.
	3. Friction brake will not release as a result of damaged brake discs.	Disassemble brake to inspect brake discs. Check stack-up height as described in Motor Support-Brake Cylinder Service section.

TROUBLE	PROBABLE CAUSE	REMEDY
B Oil leaks from vent plug	1. Same as A2. 2. Motor seal may be defective as a result of high system back pressure or contaminated oil.	Same as A2. System back pressure must not exceed 150 PSI. Inspect hydraulic system for a restriction in the return line from the control valve to the reservoir. Be sure control valve and plumbing is properly sized to hoist motor. Oil analysis may indicate contamination has worn motor shaft and seal. Thoroughly flush entire hydraulic system and install new filters and oil. Install new motor seal.
C The brake will not hold a load with the control lever in neutral.	1. Excessive system back pressure acting on the brake release port. 2. Friction brake will not hold due to worn or damaged brake discs. 3. Brake clutch is slipping.	The same as Remedy 2 of Trouble B2. Same as Remedy 3 of Trouble A3. Improper planetary gear oil may cause the brake clutch to slip. Drain old gear oil and flush hoist with solvent. Thoroughly drain solvent and refill hoist with recommended planetary gear oil listed in Preventive Maintenance section of manual. Brake clutch may be damaged or worn. Disassemble and inspect brake clutch as described in Brake Clutch Service section.
D The hoist will not raise the rated load.	1. The hoist may be mounted on an uneven or flexible surface which causes distortion of the hoist base and binding of the gear train. Binding in the gear train will absorb horsepower needed to hoist the rated load and cause heat. 2. System relief valve may be set too low. Relief valve needs adjustment or repair.	Reinforce mounting surface. If necessary, use shim stock to level hoist. Refer to Hoist Installation section. First loosen, then evenly retighten all hoist mounting bolts to recommended torque. Check relief pressure as follows: A. Install an accurate 0–4,000 PSI gauge into the inlet port of the brake valve.

TROUBLE	PROBABLE CAUSE	REMEDY
TROUBLE “D” CONTINUED FROM PREVIOUS PAGE The hoist will not raise the rated load.		B. Apply a stall pull load on the hoist while monitoring pressure. C. Compare gauge reading to hoist specifications. Adjust relief valve as required. **NOTE:** If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.
	3. Be certain hydraulic system temperature is not more than 180°F (82°C). Excessive hydraulic oil temperatures increase motor internal leakage and reduce motor performance.	Same as remedies for Trouble D1 and D2. Same as remedies for Trouble E2.
	4. Hoist line pull rating is based on first layer of wire rope.	Refer to hoist performance charts for additional information.
	5. Rigging and sheaves not operating efficiently.	Perform rigging service as recommended by crane manufacturer.
E The hoist runs hot.	1. Same as D1.	Same as remedies for Trouble D1.
	2. Be certain that the hydraulic system temperature is not more than 180°F. Excessive hydraulic oil temperatures may be caused by:	
	A. Plugged heat exchanger.	Thoroughly clean exterior and flush interior.
	B. Too low or too high oil level in hydraulic reservoir.	Fill/drain to proper level.
	C. Same as D2.	Same as remedies for Trouble D2.
	D. Hydraulic pump not operating efficiently.	Prime mover low on horsepower or RPM Tune/adjust prime mover. Check suction line for damage. If pump is belt driven, belts are slipping. Replace/tighten belts. Pump worn. Replace pump.
	3. Excessively worn or damaged internal hoist parts.	Disassemble hoist to inspect/replace worn parts.

TROUBLE	PROBABLE CAUSE	REMEDY
F Hoist chatters while raising rated load.	1. Same as D2. 2. Hydraulic oil flow to motor may be too low. 3. Controls being operated too quickly.	Same as remedies for Trouble D2. Same as remedies for Trouble E2. Conduct operator training as required.
G The wire rope does not spool smoothly on the drum.	1. The hoist may be mounted too close to the main sheave, causing the fleet angle to be more than 1.5 degrees. 2. The hoist may not be mounted perpendicular to an imaginary line between the center of the cable drum and the first sheave. 3. Could possibly be using the wrong lay rope. There is a distinct advantage in applying rope of the proper direction of lay. When the load is slacked off, the several coils on the drum will stay closer together and maintain an even layer. If rope of improper lay is used, the coils will spread apart each time the load is removed. Then, when winding is resumed, the rope has a tendency to crisscross and overlap on the drum. The result is apt to be a flattened and crushed rope. 4. The hoist may have been overloaded, causing permanent set in the wire rope.	Check mounting distance and fleet angle. Reposition hoist as required. Refer to Hoist Installation section of manual. Consult wire rope manufacturer for recommendation of wire rope that best suits your application. Replace wire rope and conduct operator/rigger training as required.

CH210A HOIST SERVICE KITS

63592 - SEAL KIT WITH V-RING
63370 - SEAL KIT W/O V-RING

PART NO.	DESCRIPTION	QTY.
100589	O-RING	1
107297	OIL SEAL	1
70167	OIL SEAL	1
103441	SEAL, U-CUP	1
22357	O-RING	1
77278	BACK-UP WASHER	1
13017	O-RING	1
25366	O-RING	1
10330	O-RING	1
13542	O-RING	1
21150	O-RING	1
24773	O-RING	1
106203	O-RING	1
10052	O-RING	1
13838	O-RING	1
25591	O-RING (in 63370 kit only)	1
103393	V-RING SEAL (in 63592 kit only)	1
103380	V-RING SEAL (in 63592 kit only)	1

BRAKE DISC PACK
64576 - 36:1, 64575 - 50:1

		QTY	
PART NO	DESCRIPTION	36:1	50:1
102954	BRAKE DISC	8	11
103167	FRICTION DISC	7	6
24108	BRAKE SPRING	18	15

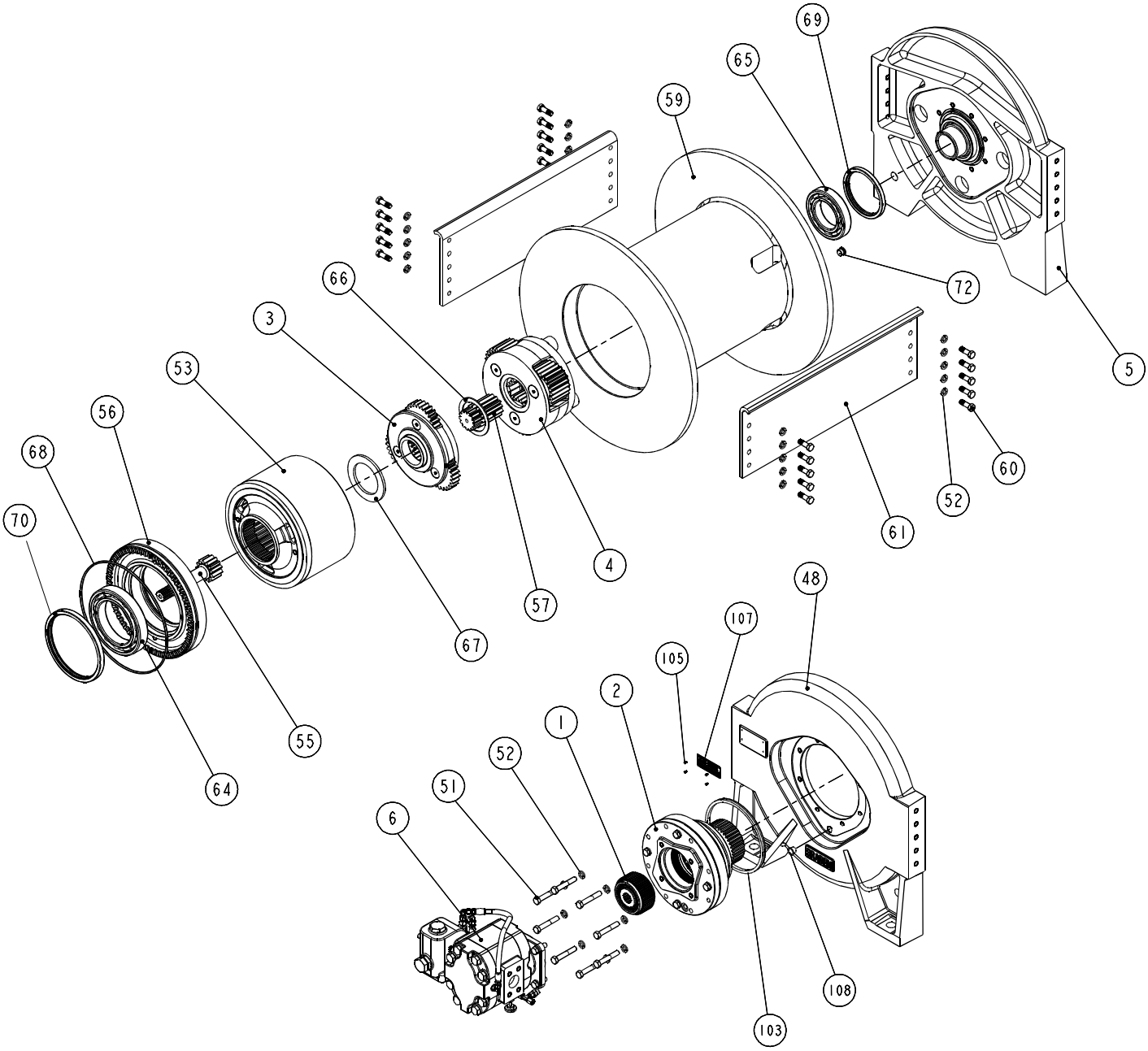
64573 BEARING KIT 50:1

PART NO.	DESCRIPTION	QTY
24486	BALL BEARING	1
24487	BALL BEARING	1
29512	THRUST WASHER	1
103239	THRUST WASHER	1
24306	THRUST WASHER	6
26120	ROLLER BEARING	3
24113	SPIROL PIN	3
103447	PRIMARY PLANET SHAFT	3
103138	OUTPUT PLANET SHAFT	3
103681	THRUST WASHER	6
103683	ROLLER	132
24582	SPIROL PIN	3
103682	BEARING SPACER	3

64574 BEARING KIT 36:1

PART NO	DESCRIPTION	QTY
24486	BALL BEARING	1
24487	BALL BEARING	1
29512	THRUST WASHER	1
103239	THRUST WASHER	1
24309	OIL SEAL	6
25292	ROLLER BEARING	3
24113	SPIROL PIN	3
104113	PRIMARY PLANET GEAR SHAFT	3
103138	OUTPUT PLANET SHAFT	3
103681	THRUST WASHER	6
103683	ROLLER	132
24582	SPIROL PIN	3
103682	BEARING SPACER	3

CH210A MAIN HOIST ASSEMBLY



ITEM	DESCRIPTION	PART NUMBER	QTY.
1	Over-running Clutch Assembly (14T "C" Input)	82908	1
	Over-running Clutch Assembly (13T "D" Input)	82907	1
2	Brake Cylinder Assembly ("C" Motor Mount)	82930	1
	Brake Cylinder Assembly ("D" Motor Mount)	83120	1
3	Primary Planet Carrier Assembly (Current Production)	83117	1
	Primary Planet Carrier Assembly (S/N's Prior to 0201100)	82931	1
4	Output Planet Carrier Assembly	82932	1
5	Drum Support Asssembly (w/o Auxiliary Brake)	82933	1
6	Motor Asssembly	82934	1
48	Motor Endplate	103155	1

CH210A MAIN HOIST ASSEMBLY

ITEM	DESCRIPTION	PART NUMBER	QTY.
51	Capscrew (1/2 - NC X 3 G8)	102347	8
52	Lockwasher (1/2)	11026	28
53	Ring Gear (36:1 gear ratio) *	104110	1
	Ring Gear (50:1 gear ratio) *	104111	1
55	Primary Sun Gear (with 82908 SAE C Clutch and 36:1 ratio)	103242	1
	Primary Sun Gear (with 82907 SAE D Clutch and 36:1 ratio)	103243	
	Primary Sun Gear (with 82908 SAE C Clutch and 50:1 ratio)	103600	
	Primary Sun Gear (with 82907 SAE D Clutch and 50:1 ratio)	103241	
56	Drum Closure	103041	1
57	Output Sun Gear	103244	1
59	Cable Drum (01)	103170	1
	Cable Drum (02)	83047	1
	Cable Drum (01 with Ratchet & Pawl)	103870	1
	Cable Drum (01 with Auxiliary Brake)	104902	1
60	Capscrew (1/2 - NC X 1-1/2 G8 Special -01 Drum)	103314	20
	Capscrew (1/2 - NC X 2 G8 Special -02 Drum)	29855	20
61	Tie Plate, 26-3/4 in. long (01 drum)	103211	2
	Tie Plate, 38-3/4 in. long (02 drum)	103815	2
64	Ball Bearing	24487	1
65	Ball Bearing	24486	1
66	Thrust Washer	103239	1
67	Thrust Washer	29512	1
68	O-Ring	100589	1
69	Seal	107297	1
70	Seal	70167	1
71	Cable Wedge - Not Shown	24493	1
72	Plug, O-Ring Flush	32411	2
103	V-Ring Seal	103393	1
105	Drive Screw	11842	4
107	Nameplate	76381	1
108	Closure (#8 Caplug)	70686	1
109	Tie Plate Spacer-Not Shown (02 Drum ONLY)	104108	4

* Replaces previous design two piece ring gear with spiral rings

CH210A PRIMARY PLANETARY ASSEMBLY

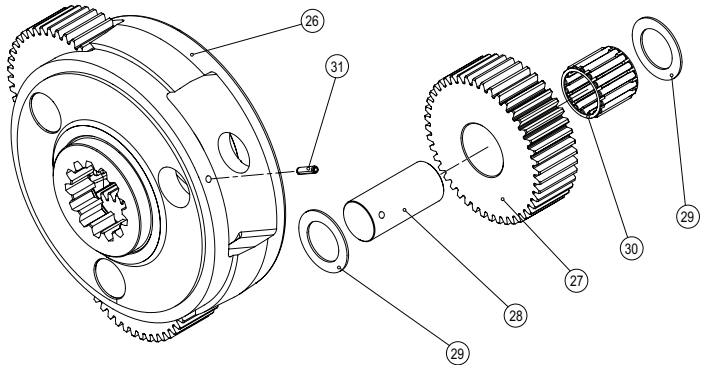
PRIMARY PLANET CARRIER ASSEMBLY

P/N 83117 (CURRENT PRODUCTION)

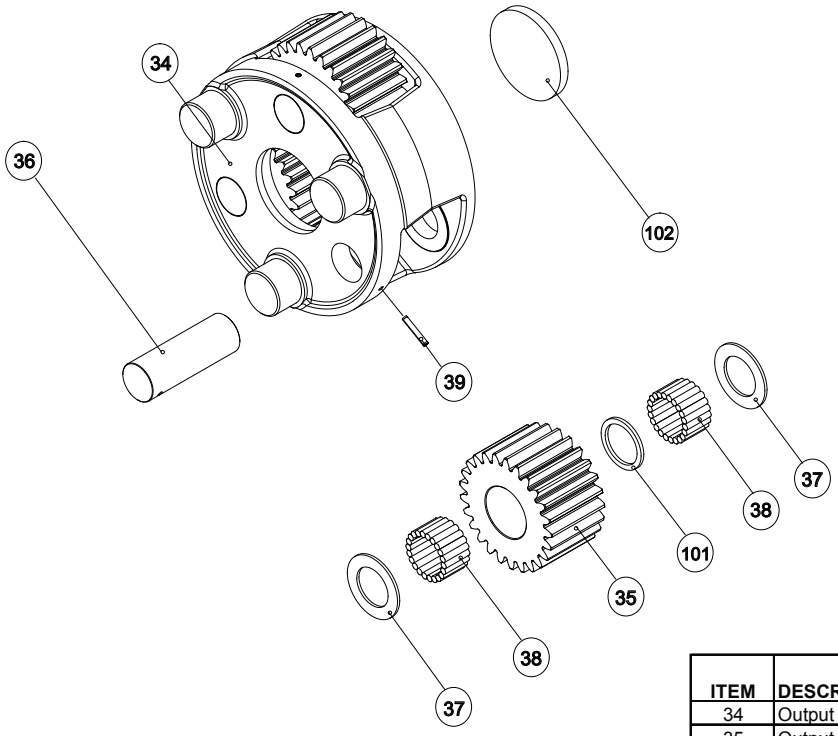
ITEM	DESCRIPTION	PART NUMBER		QTY.
		36:1	50:1	
26	Primary Planet Carrier	104112	103056	1
27	Primary Planet Gear	104114	103237	3
28	Primary Planet Gear Shaft	104113	103447	3
29	Thrust Washer	24306	24306	6
30	Roller Bearing	25292	26120	3
31	Spirol Pin	24113	24113	3

P/N 82931 (S/N'S PRIOR TO 0201100)

ITEM	DESCRIPTION	PART NUMBER		QTY.
		36:1	50:1	
26	Primary Planet Carrier	103055	103056	1
27	Primary Planet Gear	103238	103237	3
28	Primary Planet Gear Shaft	26295	103447	3
29	Thrust Washer	25631	24306	6
30	Roller Bearing	24579	26120	3
31	Spirol Pin	24113	24113	3

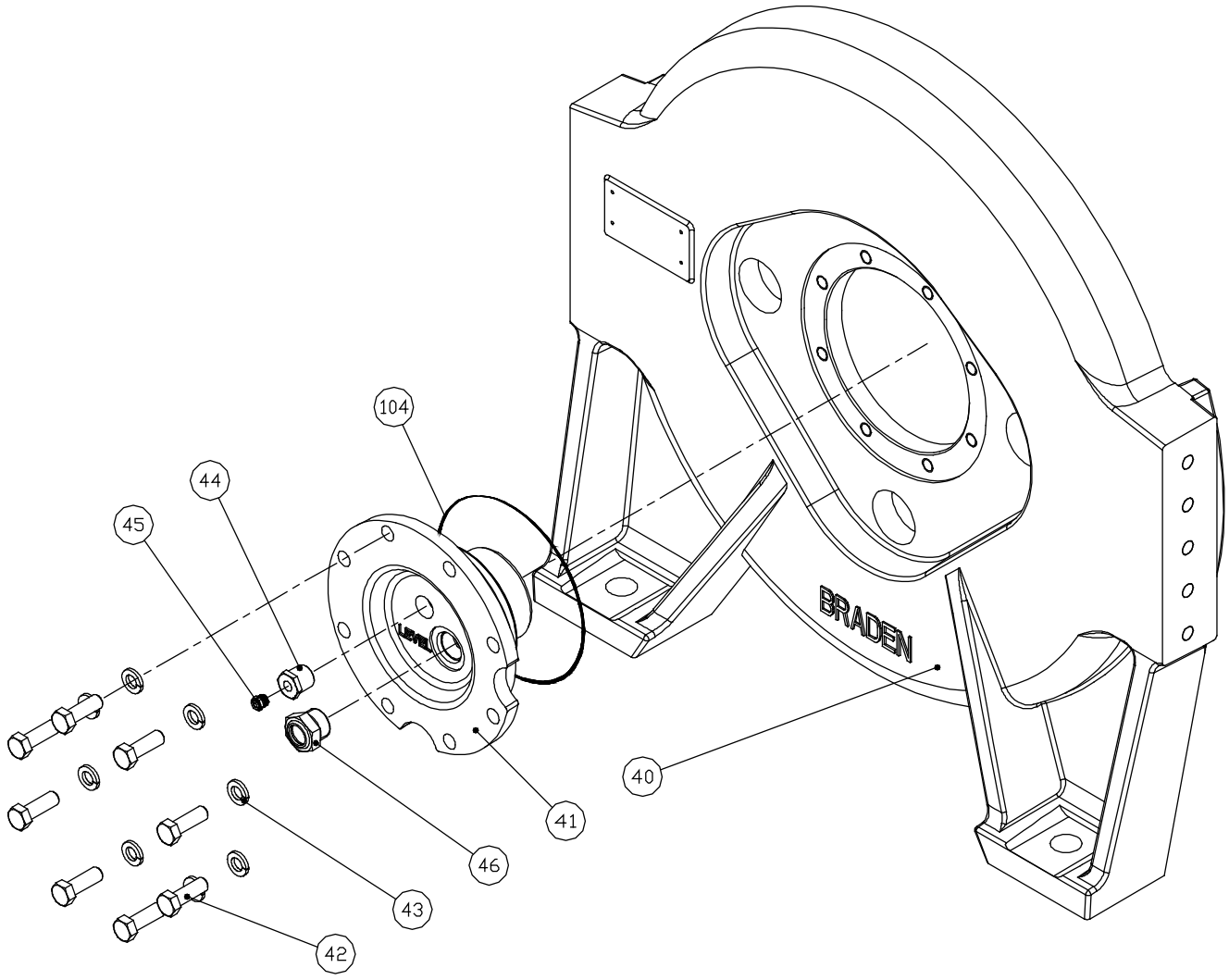


CH210A OUTPUT PLANETARY ASSEMBLY



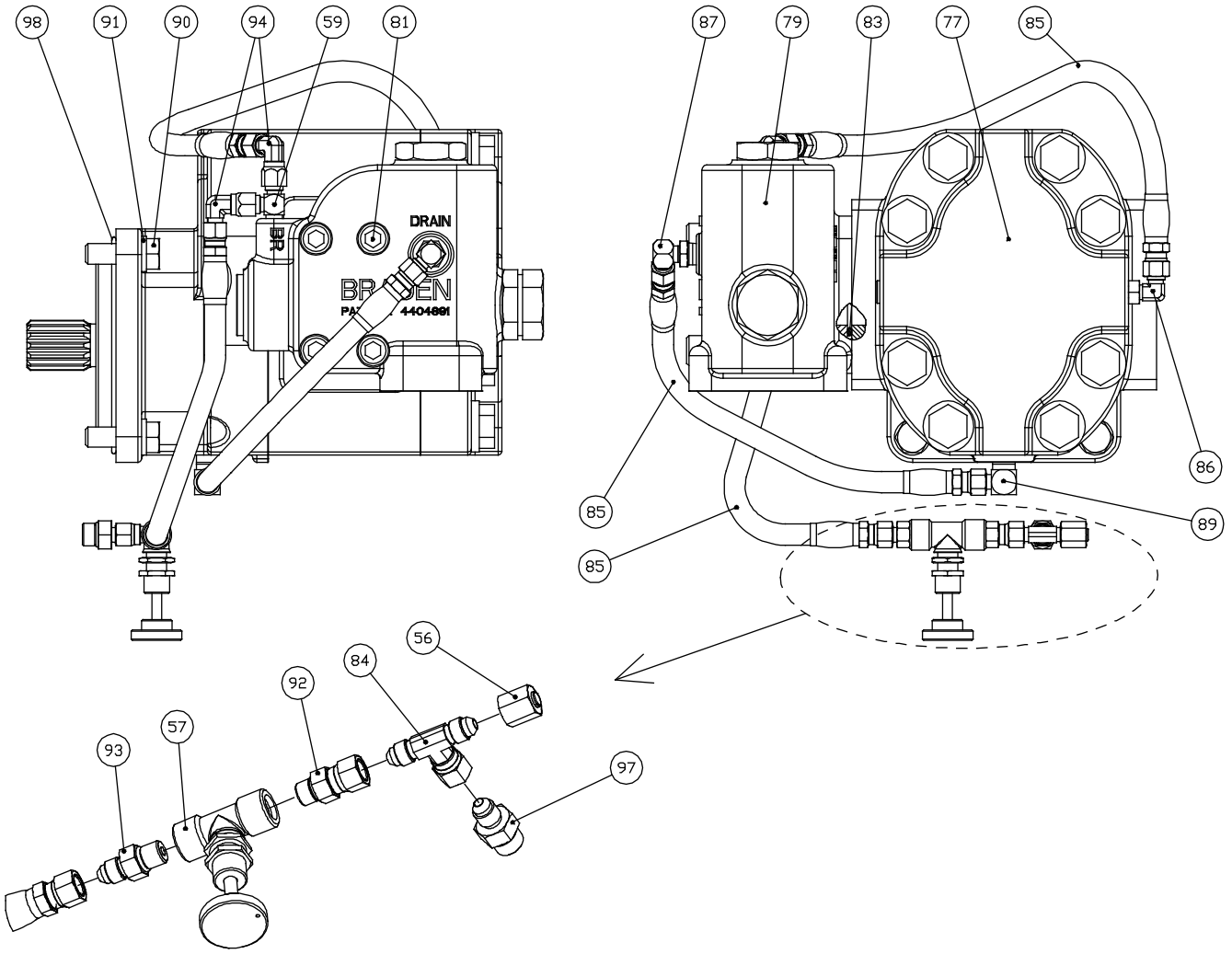
ITEM	DESCRIPTION	PART NUMBER	QTY.
34	Output Planet Carrier	103060	1
35	Output Planet Gear	103236	3
36	Output Planet Gear Shaft	103138	3
37	Thrust Washer	103681	6
38	Loose Rollers	103683	132
39	Spirol Pin	24582	3
101	Bearing Spacer	103682	3
102	Thrust Plate	103279	1

CH210A DRUM SUPPORT ASSEMBLY



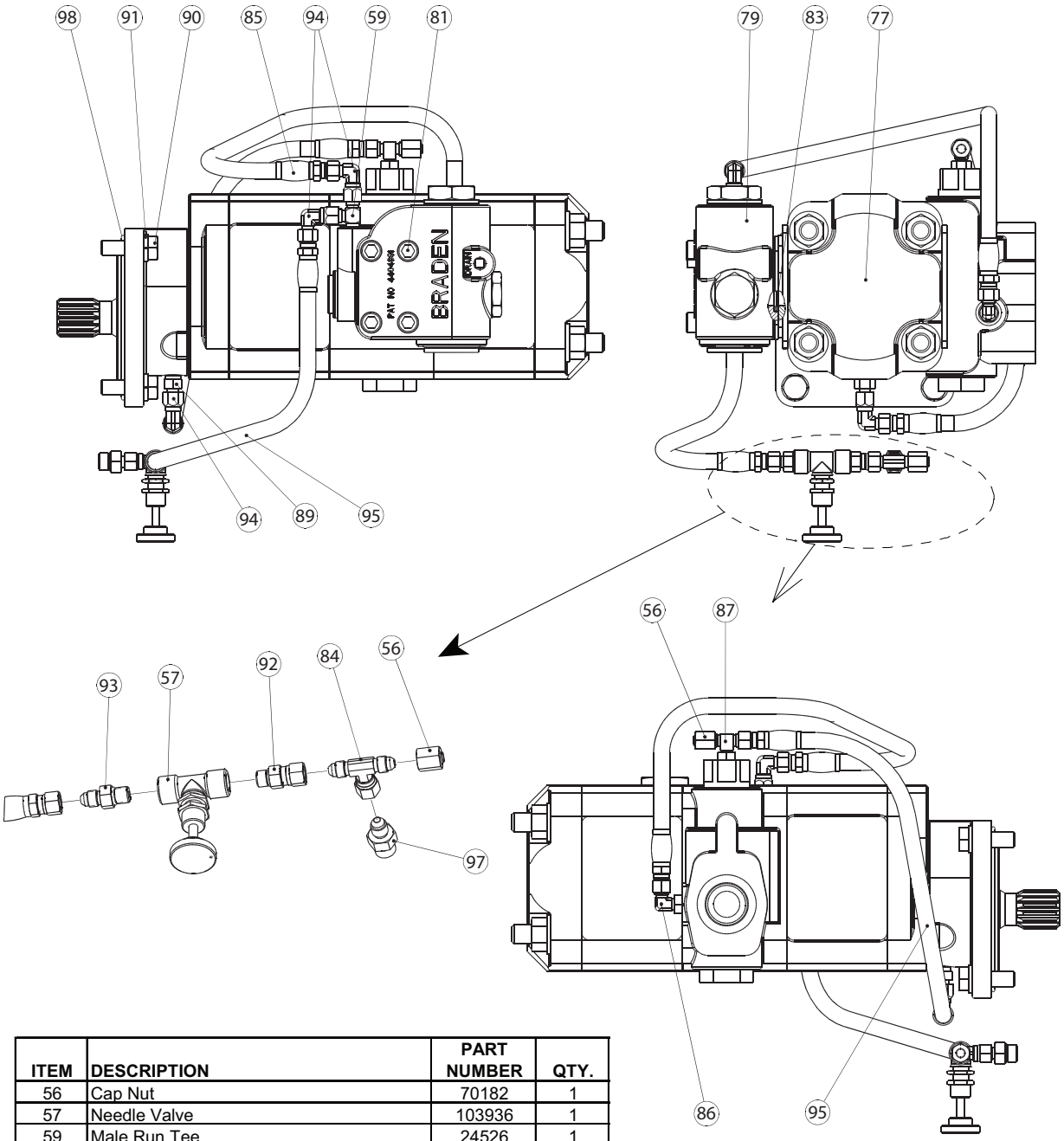
ITEM	DESCRIPTION	PART NUMBER	QTY.
40	Support Endplate	103156	1
41	Bearing Support	24453	1
42	Capscrew (1/2 NC X 1-1/2 G5)	13413	8
43	Lockwasher (1/2)	11026	8
44	Reducer Bushing	18066	1
45	Vent Plug	18062	1
46	Sight Gauge	70193	1
104	V-Ring Seal	103380	1
105	Drive Screw (not shown)	11842	4
106	Approval Plate (not shown)	103501	1

CH210A SINGLE SPEED HYDRAULIC MOTOR ASSEMBLY



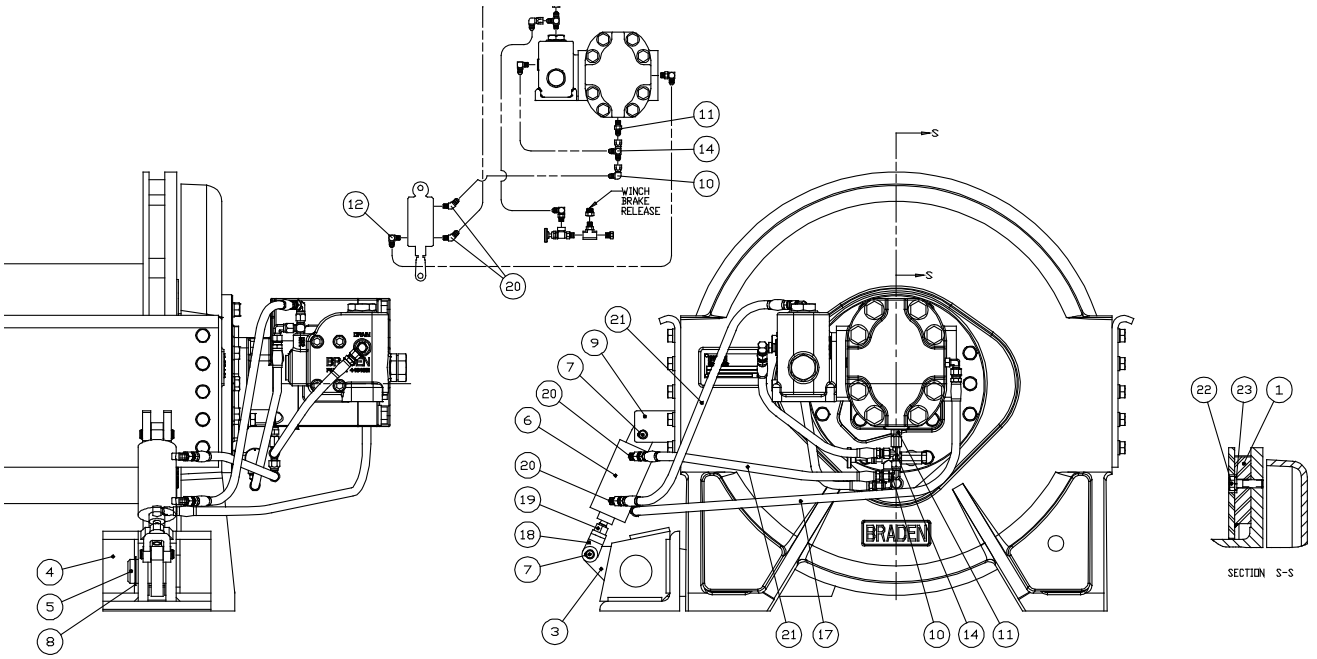
ITEM	DESCRIPTION	PART NUMBER	QTY.
56	Cap Nut	70182	1
57	Needle Valve	103936	1
59	Male Run Tee	24526	1
77	Hydraulic Motor (code 090)	25272	1
	Hydraulic Motor (code 110)	25273	1
	Hydraulic Motor (code 120)	25274	1
79	Brake Valve	81609	1
81	Capscrew (1/2 - 13 x 4-1/2 G8 Sock Hd)	23690	4
83	O-Ring	13542	1
84	Swivel Tee Fitting	25748	1
85	Hose Assembly (2 each w/ratchet & pawl)	25935	3
86	Elbow Fitting	25302	1
87	Elbow Fitting	21163	1
89	Elbow Fitting (not used w/ratchet & pawl)	31341	1
90	Capscrew (1/2 - NC x 1-1/2 G8 Z)	104322	4
91	Lockwasher (1/2)	11026	4
92	Adapter	103947	1
93	Adapter	25864	1
94	Swivel Nut Elbow, 90 degree	26140	2
97	Adapter	31284	1
98	O-Ring	10330	1
	Warning Tag (not shown)	25257	1

CH210A TWO SPEED HYDRUALIC MOTOR ASSEMBLY



ITEM	DESCRIPTION	PART NUMBER	QTY.
56	Cap Nut	70182	1
57	Needle Valve	103936	1
59	Male Run Tee	24526	1
77	Hydraulic Motor (code 128/064)	25337	1
79	Brake Valve	81586	1
81	Capscrew (7/16 NC x 3 G8 Sock Hd)	21134	4
83	O-Ring	21150	1
84	Swivel Tee Fitting	25748	1
85	Hose Assembly	25750	1
86	Elbow Fitting	25302	1
87	Tee, -4 ORB	29078	1
89	Adapter	26001	1
90	Capscrew (1/2 - NC x 1-1/2 G8 Z)	104322	4
91	Lockwasher (1/2)	11026	4
92	Adapter	103947	1
93	Adapter	25864	1
94	Swivel Nut Elbow, 90 degree	26140	3
95	Hose Assembly	25935	2
97	Adapter	31284	1
98	O-Ring	10330	1
	Warning Tag (not shown)	25257	1

CH210A RATCHET AND PAWL ASSEMBLY



RATCHET & PAWL ASSEMBLY

ITEM	DESCRIPTION	PART NUMBER	QTY.
1	Ratchet Half	83074	2
3	Pawl Assembly	81651	1
4	Pivot Base	24871	1
5	Pin	24876	1
6	Cylinder Assembly	81663	1
7	Pivot Pin	24881	2
8	Retaining Ring	12035	1
9	Mounting Plate	52495	2
10	Swivel Nut Elbow, 90 degree	26140	3
11	Adapter	26001	1
12	Elbow Fitting	21163	1
14	Swivel Tee	26002	2
17	Hose Assembly	34197	1
18	Clevis	24882	1
19	Jam Nut	18004	1
20	Elbow Fitting	21165	2
21	Hose Assembly	25749	2
22	Capscrew (1/2 NC x 1-3/4 G8 Z)	104323	12
23	Lockwasher (1/2)	11026	12

CH280A HOIST SERVICE KITS

64292 - CH280A SEAL KIT

PART NO.	DESCRIPTION	QTY.
103441	SEAL, U-CUP	1
22357	O-RING	1
108968	BACK-UP RING	1
13017	O-RING	1
103393	V-RING SEAL	2
70167	16342-26 SEAL	1
10427	SEAL	1
103317	O-RING	1
13542	O-RING	1
10330	O-RING	1

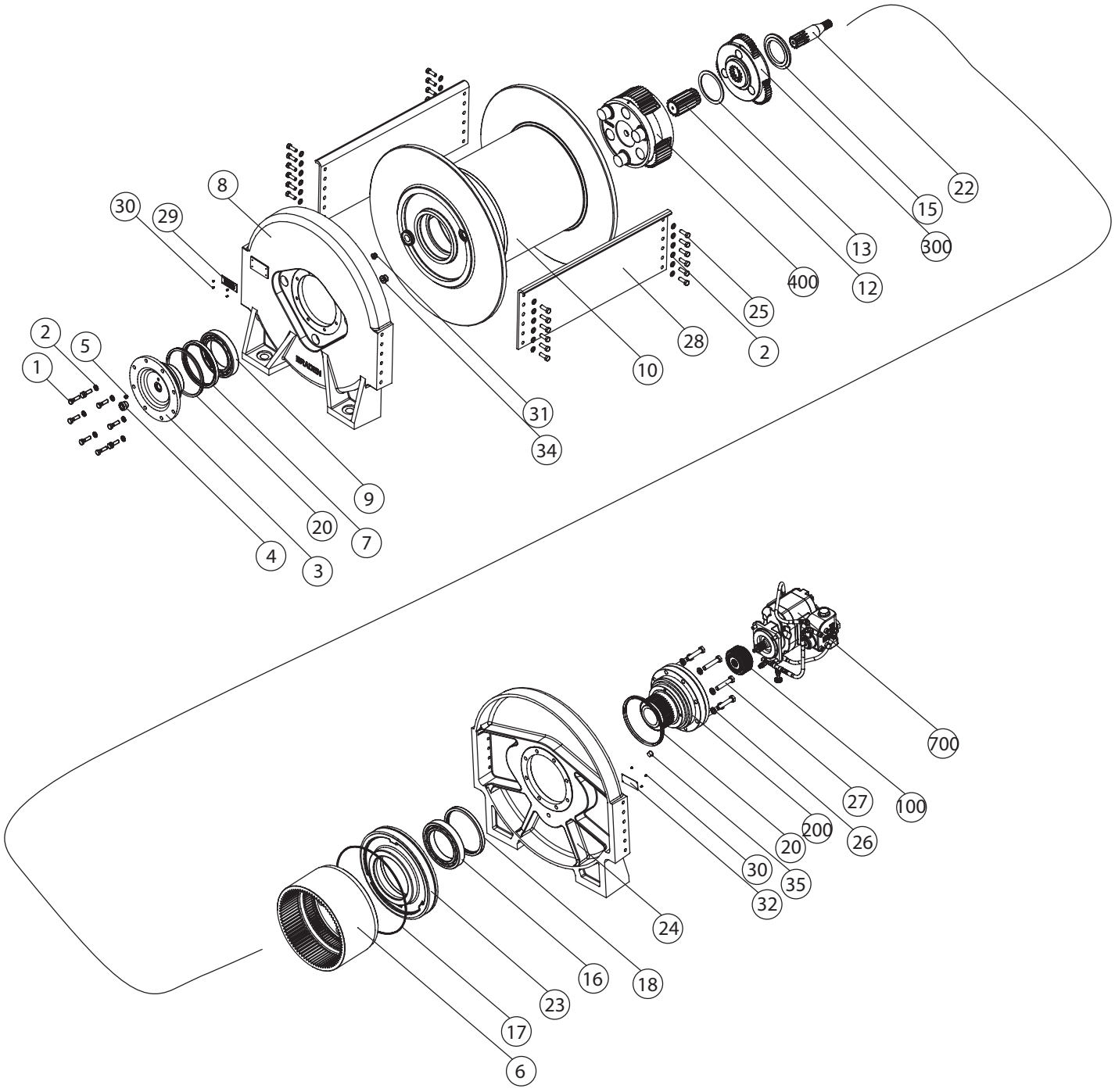
65844 - CH280 BRAKE REBUILD KIT

PART NO.	DESCRIPTION	QTY.
102954	BRAKE DISC	9
103167	FRICTION DISC	8
24108	BRAKE SPRING	16
32411	O-RING	1
22450	PLUG	1

64329 - CH280A RATCHET AND PAWL CONVERSTION KIT - 01 DRUM ONLY

PART NO.	DESCRIPTION	QTY.
40155	PAWL ASSY	1
24871	PIVOT BASE	1
24876	PIN	1
81663	CYLINDER ASSEMBLY	1
104153	PIVOT PIN	2
12035	SNAP RING	1
52495	MOUNTING PLATE	2
21163	2685008 ELBOW TBG FTG	1
25749	HOSE ASSY	1
34197	HOSE ASSY	1
24882	CLEVIS	1
18004	NUT-JAM	1
21165	2685010 ELBOW TBG FTG	2
40242	HOSE ASSY	1
101082	EXTERNAL RETAINING RING	4
18047	GREASE FITTING	1
26001	ADAPTER	1
26002	SWIVEL TEE	1
26140	SWIVEL NUT 90 DEG. ELBOW	1
106933	RATCHET WHEEL HALF	2
106934	RATCHET COVER HALF	2
68052	DOC RATCHET & PAWL INSTALL	1

CH280A MAIN HOIST ASSEMBLY

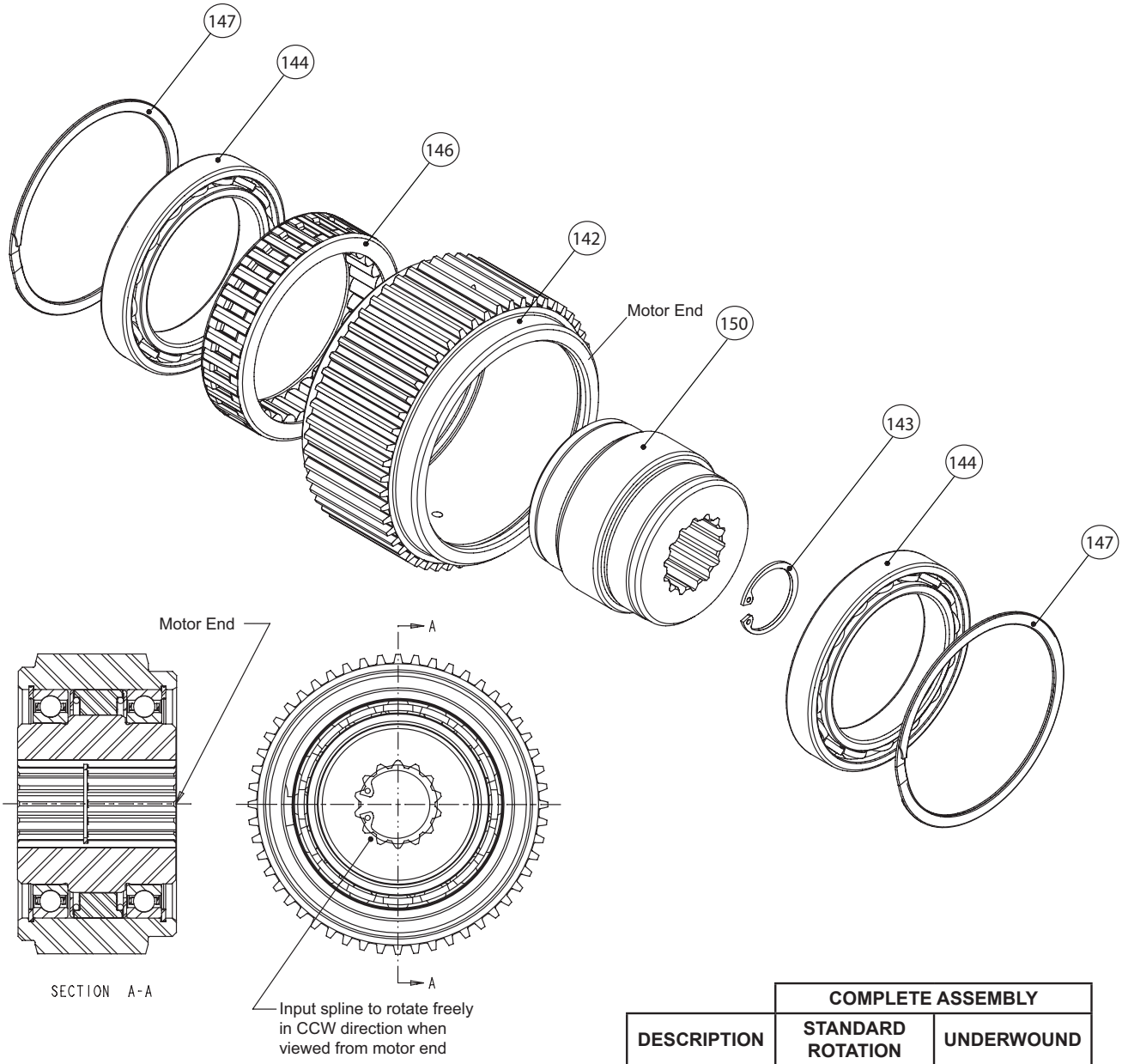


CH280A MAIN HOIST ASSEMBLY

ITEM	PART	DESCRIPTION	QTY.
1	104323	Capscrew, HEX (1/2-13 x 1 3/4 GD8)	8
2	11026	Lockwasher (1/2-inch)	32
3	106597	Bearing Support	1
4	70193	Sight Gauge	1
5	18062	Relief Valve	1
6	106641	Ring Gear	1
7	10427	Seal	1
8	106671	End Plate, Support	1
9	24487	Ball Bearing	1
10	106682	Cable Drum (-01)	1
	83539	Cable Drum (-01P)	
	83536	Cable Drum (-02)	
12	106621	Output Sun Gear	1
13	104365	Thrust Washer	1
15	106670	Thrust Washer	1
16	106673	Ball Bearing	1
17	103317	O'Ring	1
18	70167	Seal	1
20	103393	V-Ring Seal	2
22	106626	Primary Sun Gear SAE C	1
	107983	Primary Sun Gear SAE D	
23	106625	Drum Closure	1
24	106642	End Plate, Motor	1
25	103314	Capscrew, Special	24
26	102423	Lockwasher, 5/8-inch	8
27	23578	Capscrew, Hex 5/8-18 x 3 1/4 GD8	8
28	106911	Tie Plate (-02)	2
	106647	Tie Plate (-01/ -01P)	2
29	NSS	Approval Plate	1
30	11842	Drive Screw	8
31	32411	Plug, O'Ring Flush	1
32	NSS	Nameplate	1
33	24494	Cable Wedge (NS)	1
34	22450	Plug	1
35	70686	Closure	1
100	-	Overrunning Clutch Assembly - see page 8	1
200	-	Brake Cylinder Assembly- see page 9	1
300	83483	Primary Planet Carrier Assembly- see page10	1
400	83484	Output Planet Carrier Assembly- see page 11	1
700	-	Hydraulic Motor Assembly- see pages 12-15	1

NSS= Not Serviced Separately

CH210A & CH280A OVERRUNNING CLUTCH ASSEMBLY

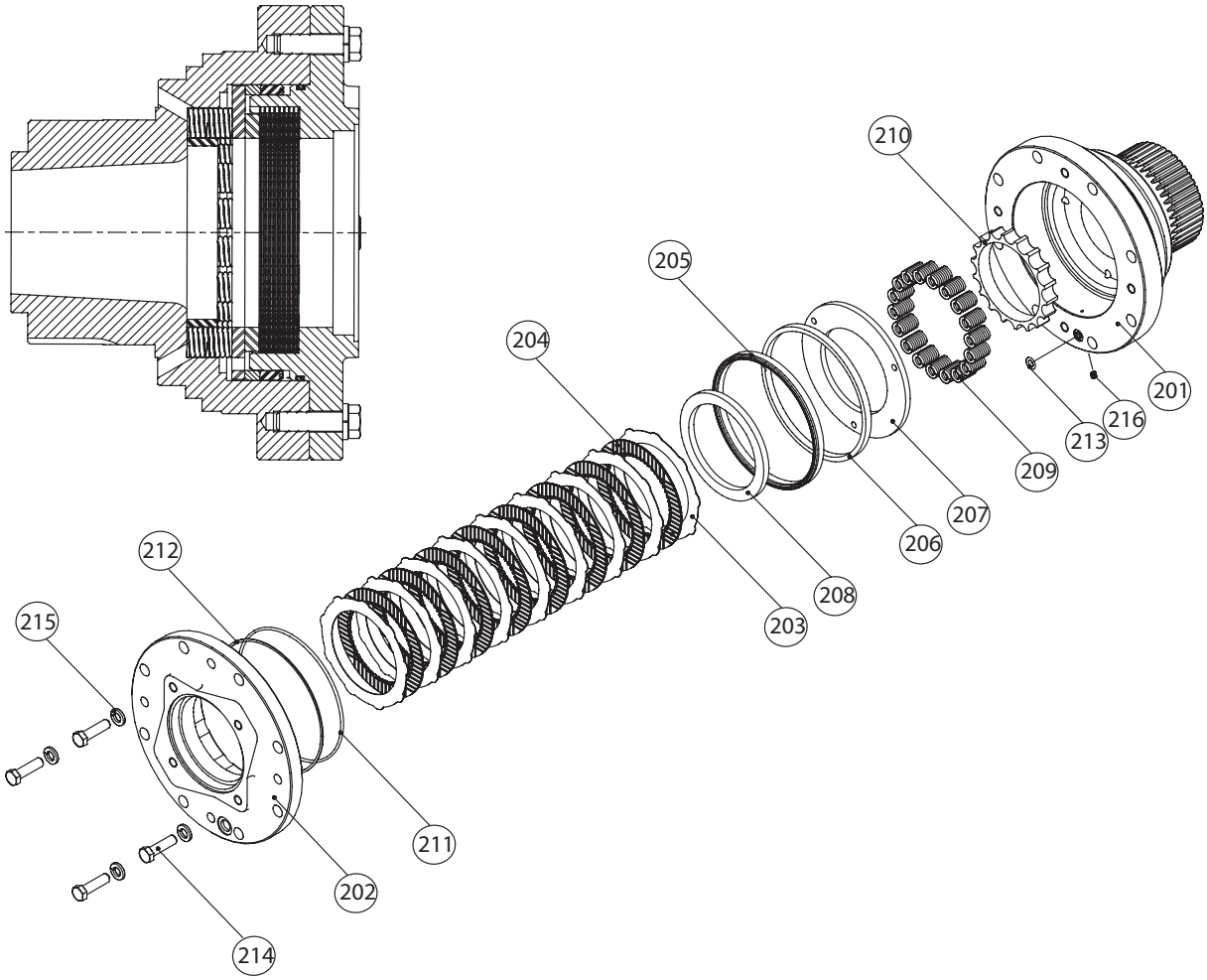


	COMPLETE ASSEMBLY	
DESCRIPTION	**STANDARD ROTATION**	**UNDERWOUND**
SAE “C”	82908	83148
SAE “D”	82907	83170

ITEM	PART NO	DESCRIPTION	QTY
142	NSS	Outer Race	1
143	24506	Retaining Ring (Assembly 82908) SAE “C”	1
	28734	Retaining Ring (Assembly 82907) SAE “D”	
144	103104	Ball Bearing	1
146	NSS	Over-running Clutch	1
147	103110	Retaining Ring	2
150	NSS	Inner Race	1

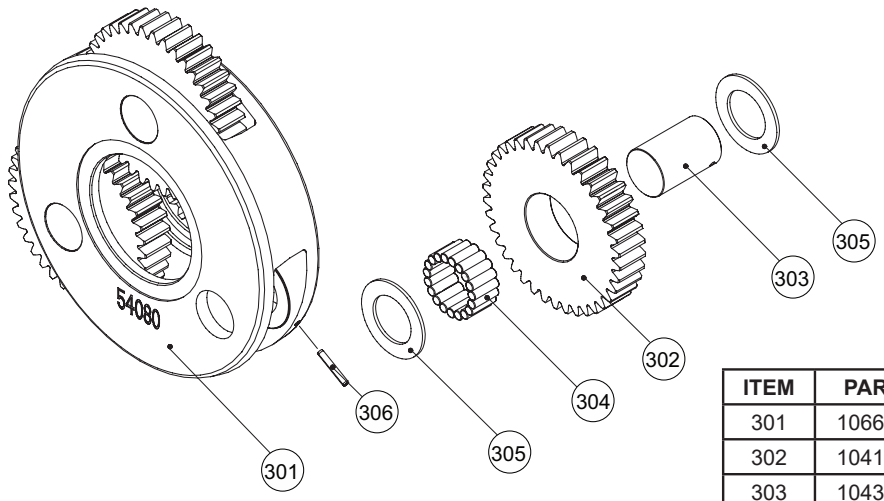
NSS - Not Serviced Separately

CH210A & CH280A BRAKE CYLINDER ASSEMBLY



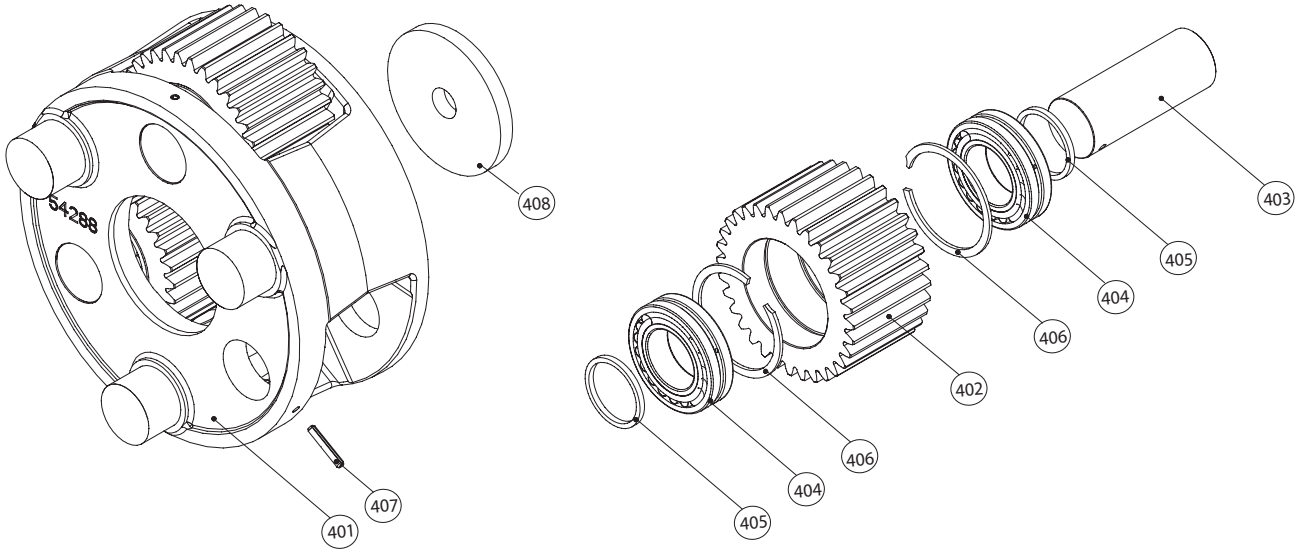
ITEM	PART NUMBER		DESCRIPTION	QTY.		
	CH210A	CH280A		CH210A 36:1 Ratio	CH210A 50:1 Ratio	CH280A
201	102979	106599	Brake Cylinder	1		
202	103035	106652	Motor Adapter - SAE C	1		
	103045	107954	Motor Adapter - SAE D	1		
203	102954		Brake Disc	8	11	9
204	103167		Friction Disc	7	6	8
205	103441		Seal, U-Cup	1		
206	25746		Piston Back-Up Ring	1		
207	103168		Pressure Plate	1		
208	103169		Brake Plate Spacer	1		
209	24108		Brake Spring	18	15	18
210	103147		Spring Spacer	1		
211	22357		O-Ring	1		
212	108968		Back-Up Washer	1		
213	13017		O'Ring	1		
214	104323		Capscrew, Hex 1/2-13 x 1 3/4-inch GD8	4		
215	11026		Lockwasher, 1/2-inch hardened	4		
216	103379		Expansion Plug	1		

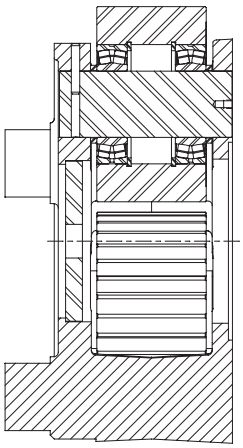
CH280A PRIMARY PLANET CARRIER ASSEMBLY



ITEM	PART	DESCRIPTION	QTY.
301	106648	Primary Planet Carrier	1
302	104151	Primary Planet Gear	3
303	104355	Primary Planet Shaft	3
304	11104	Roller	57
305	103681	Thrust Washer	6
306	24582	Spirol Pin	3

CH280A OUTPUT PLANET CARRIER ASSEMBLY

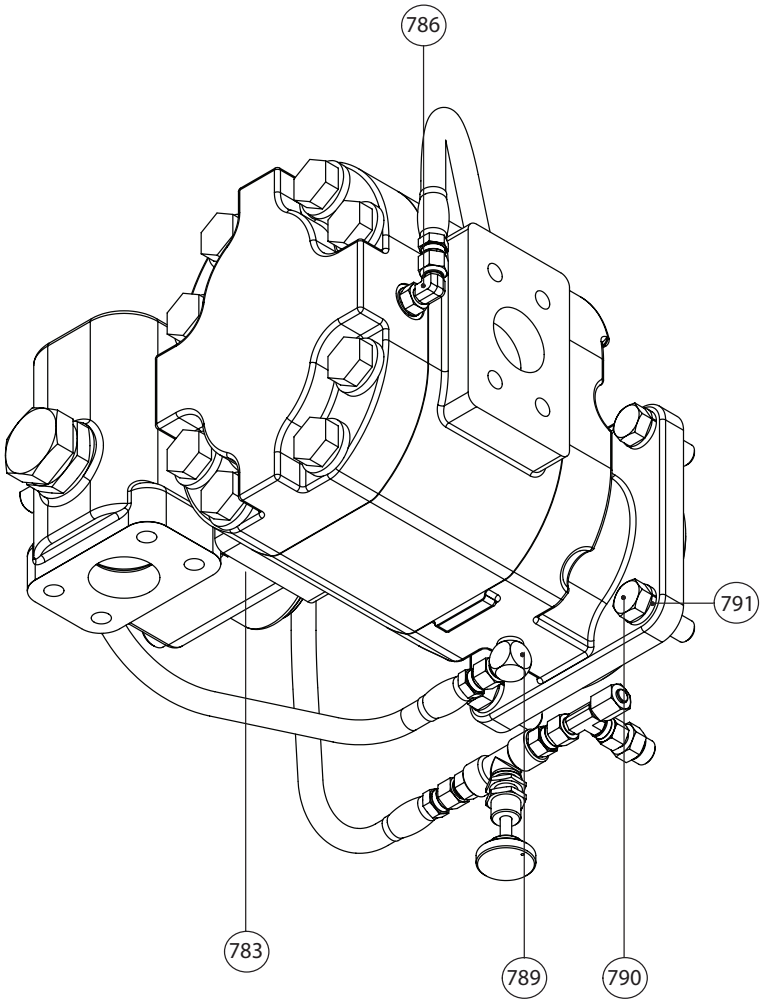


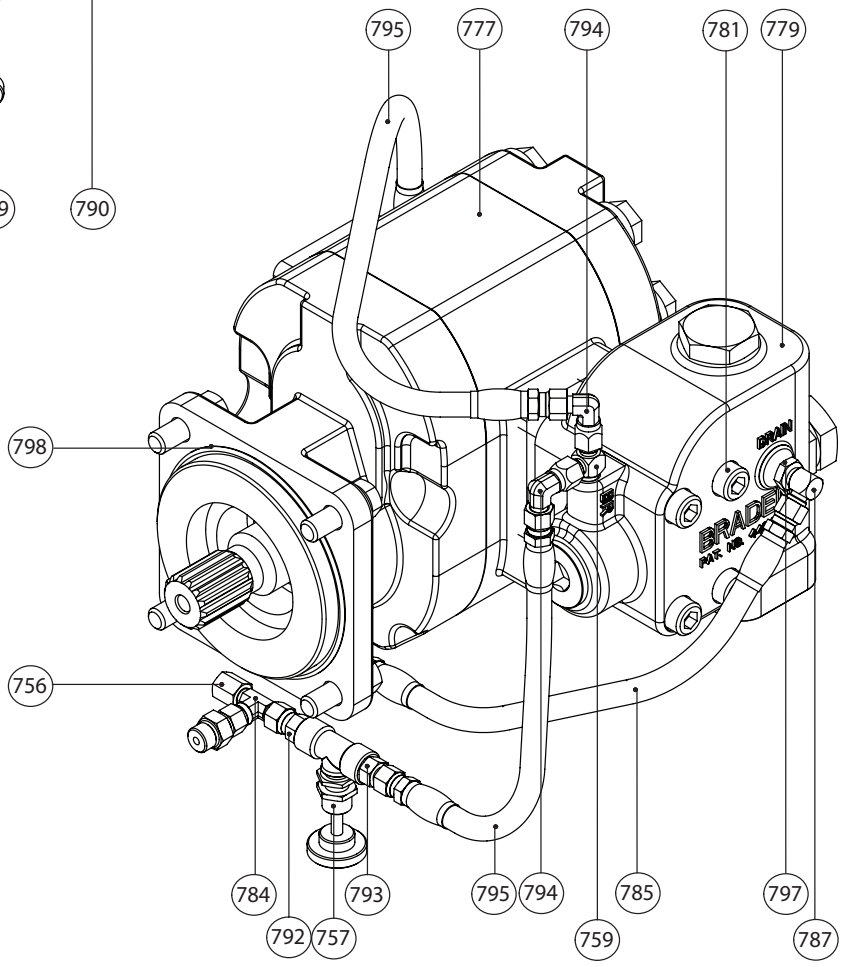


ITEM	PART	DESCRIPTION	QTY.
401	106634	Output Planet Carrier	1
402	106620	Output Planet Gear	3
403	106643	Output Planet Shaft	3
404	107715	Bearing	6
405	107713	Spacer	6
406	107716	Retaining Ring	6
407	18055	Rollpin	3
408	106649	Output Thrust Plate	1

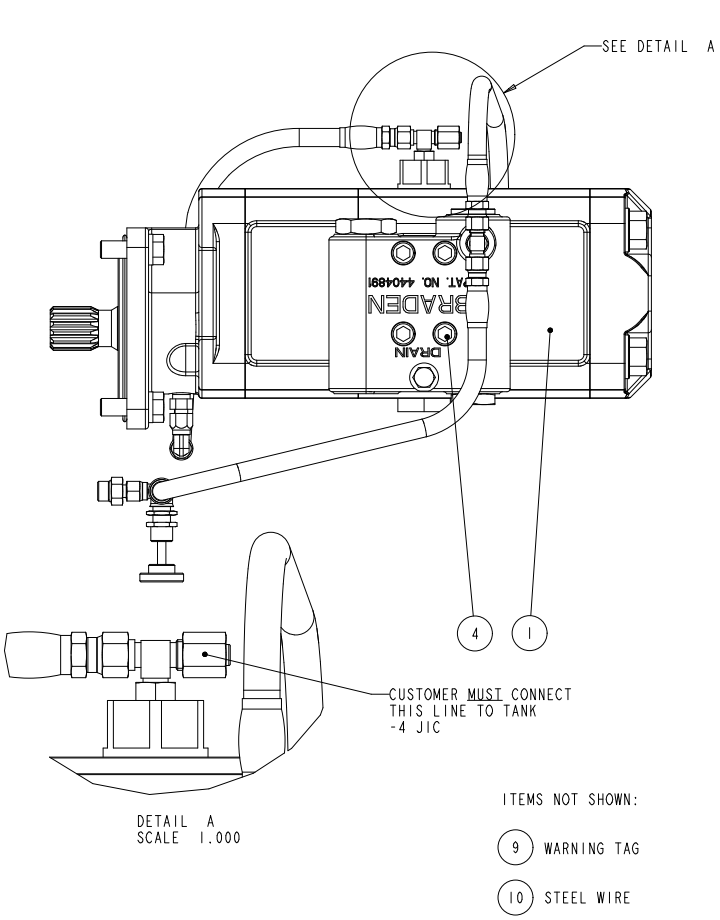
CH280A SINGLE SPEED HYDRAULIC MOTOR ASSEMBLY

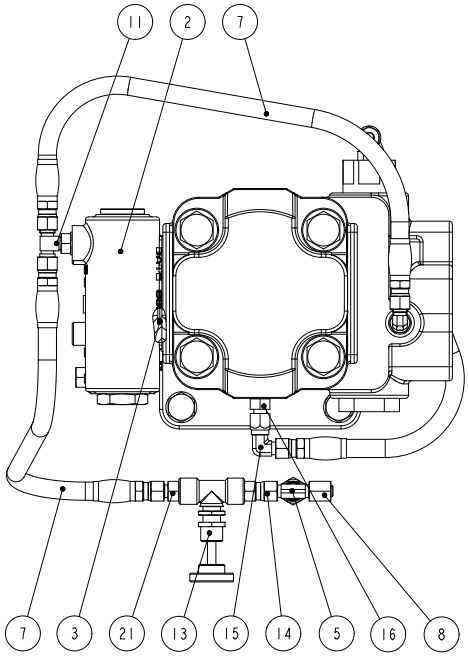
ITEM	PART	DESCRIPTION	QTY.
756	70182	Cap Nut	1
757	103936	Needle Valve	1
759	24526	Tee	1
777	25274	Hydraulic Motor (12.0 CID)	1
	25273	Hydraulic Motor (11.0 CID)	1
	25272	Hydraulic Motor (9.0 CID)	1
779	81609	Brake Valve Assembly	1
781	23690	Capscrew, Hex 1/2-13 x 4 1/2-inch	4
783	13542	O'Ring	1
784	25748	Swivel Tee	1
785	25935	Hose Assembly	2
786	25302	Elbow Fitting	1
787	21163	Elbow Fitting	1
789	31341	Elbow	1
790	104322	Capscrew, Hex head 1/2-13 x 1 1/2-inch	4
791	11026	Lockwasher, 1/2-inch	4
792	103947	Adapter	1
793	25864	Adapter	1
794	26140	Elbow	2
795	25750	Hose Assembly	1
797	31284	Adapter	1
798	10330	O'Ring	1





CH280A TWO SPEED HYDRAULIC MOTOR ASSEMBLY

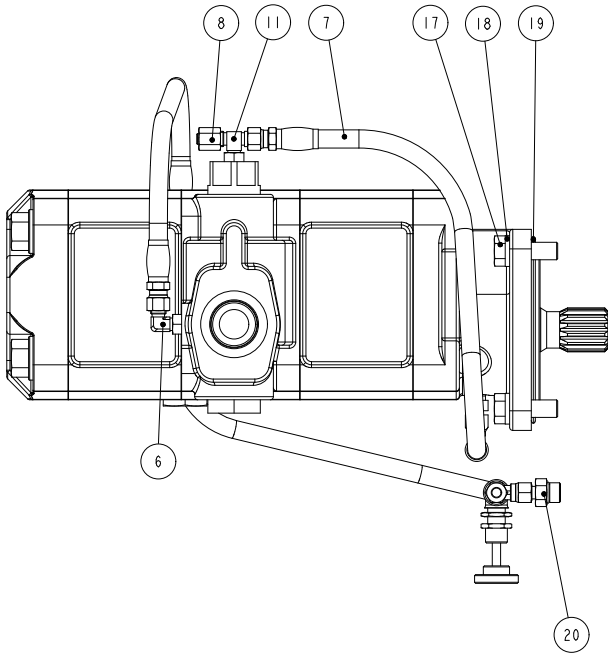




ITEMS NOT SHOWN:

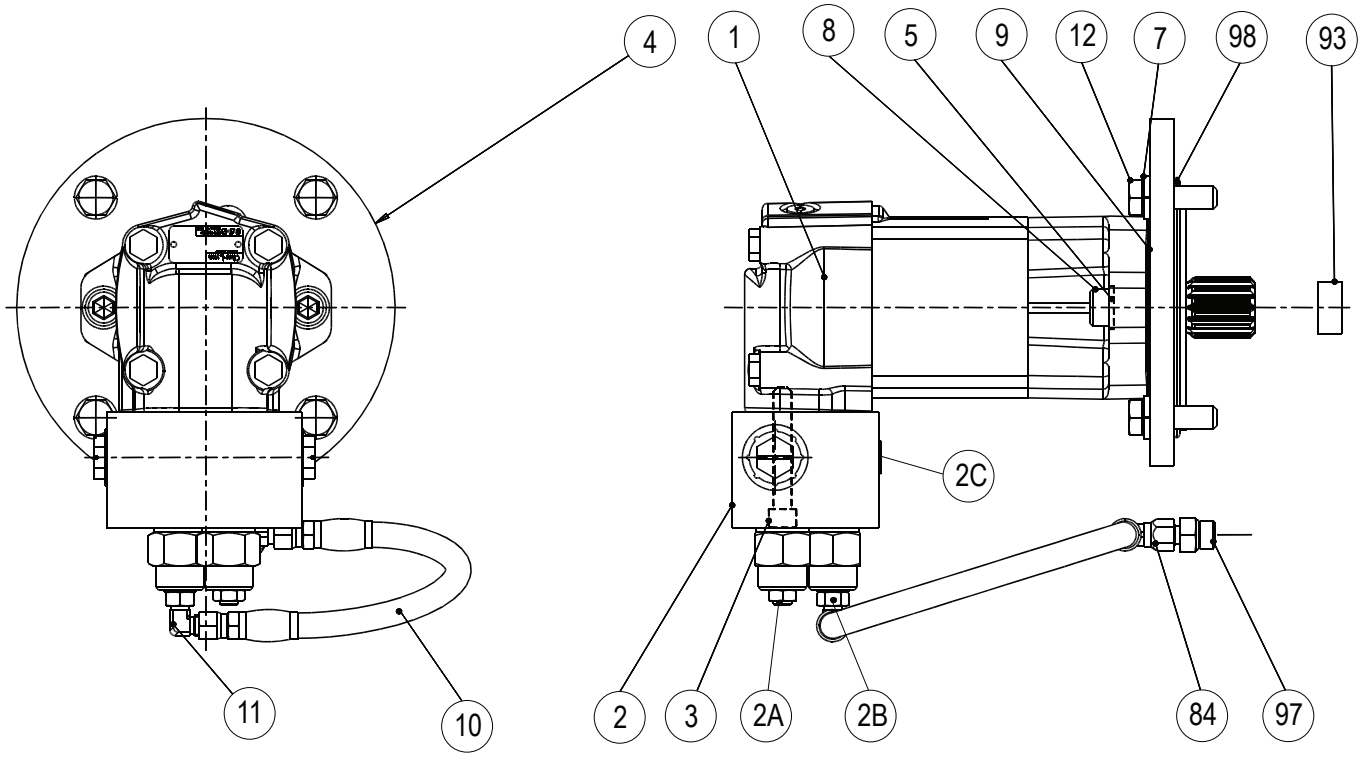
9 WARNING TAG

10 STEEL WIRE



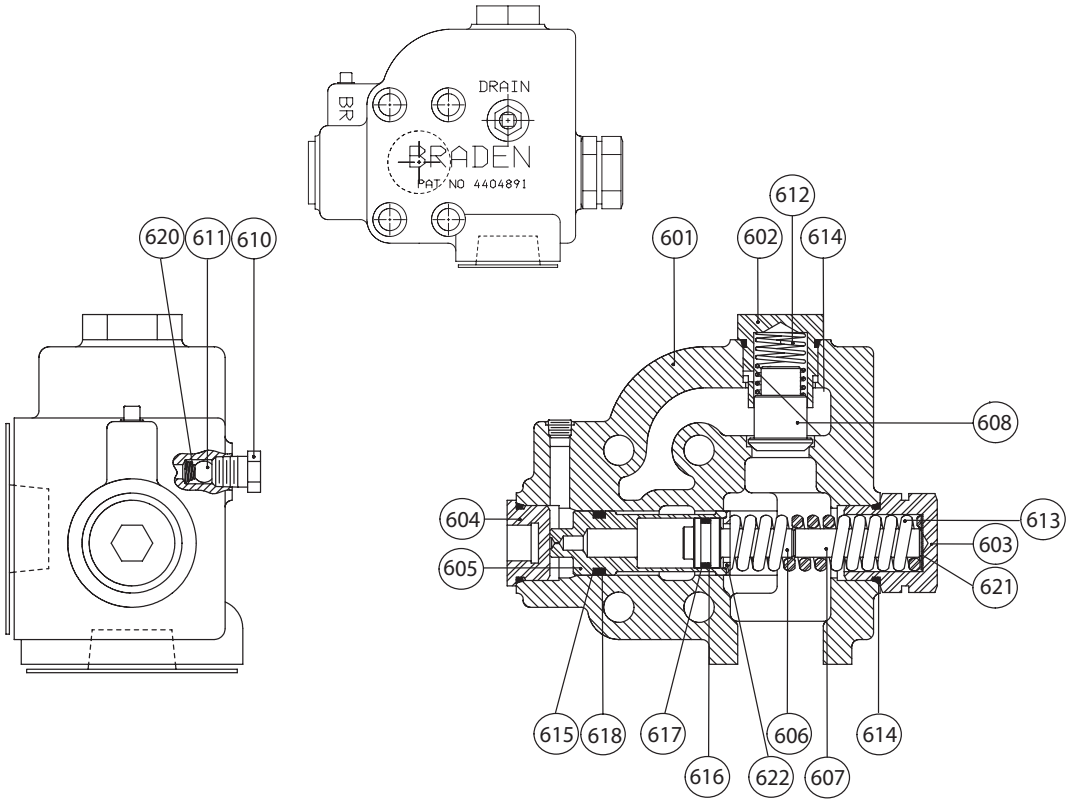
ITEM	PART NO.	DESCRIPTION	QTY
1	25337	HYD MOTOR 2 SPEED (PARKER)	1
2	81984	BRAKE VALVE ASSY - 1.25-61	1
3	13838	O-RING	1
4	21134	CAPSCREW	4
5	25748	SWIVEL TEE	1
6	25302	ELBOW FITTING	1
7	25750	HOSE ASSY	3
8	70182	CAP NUT	2
9	25257	WARNING TAG	1
10	94058	.035 SOFT STEEL WIRE	1
11	29078	TEE, -4 ORB	2
12	29080	WARNING TAG	1
13	103936	NEEDLE VALVE	1
14	103947	ADAPTER - 40RB/-4JIC SWIVEL	1
15	26140	SWIVEL NUT 90 DEG. ELBOW	1
16	26001	ADAPTER	1
17	104322	CAPSCREW	4
18	11026	LOCKWASHER	4
19	10330	O-RING	1
20	31284	ADAPTER	1
21	25864	ADAPTER	1

CH280A LSHT HYDRAULIC MOTOR ASSEMBLY



ITEM	PART NO.	DESCRIPTION	QTY
1	B688P	Gerotor Motor, LSHT 14.9 CID (Low Speed High Torque)	1
2	82473	Brake Valve Assembly	1
2A	27258	Counterbalance Cartridge	1
2B	27259	Cavity Plug	1
2C	25665	Plug	1
3	25130	Capscrew, Socket Head 3/8 - 18 X 2-1/2 GD8	3
4	25076	Motor Adapter 4B-C To 2B-A	1
5	72144	Washer, Sealing 1/2	2
7	11026	Lockwasher, 1/2	4
8	103827	Capscrew, Socket Head 1/2 - 13 X 1-1/4 GD8 Z	2
9	23108	Gasket - Motor 2B A Mount	1
10	25935	Hose Assembly, 4 X 14	1
11	25302	Elbow Fitting, -4 ORB -4 JIC	1
12	104322	Capscrew, Hex Head 1/2 - 13 X 1-1/2 GD8 Z	4
84	106271	Elbow, JIC Swivel -4/-4	1
93	26350	Spacer	1
97	31284	Adapter, -4 JIC -6 ORB	1
98	10330	O-Ring	1

CH210A & CH280A BRAKE VALVE ASSEMBLY

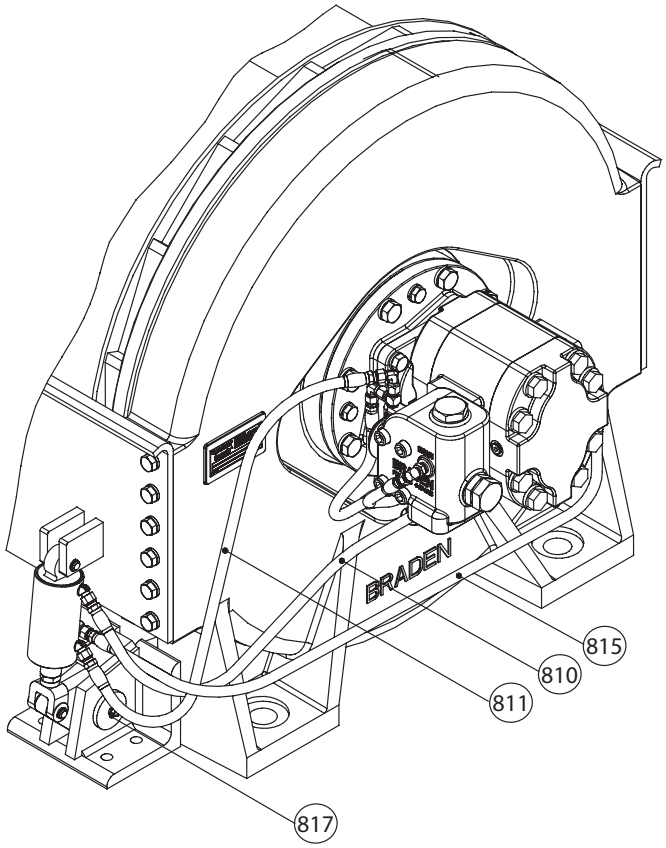


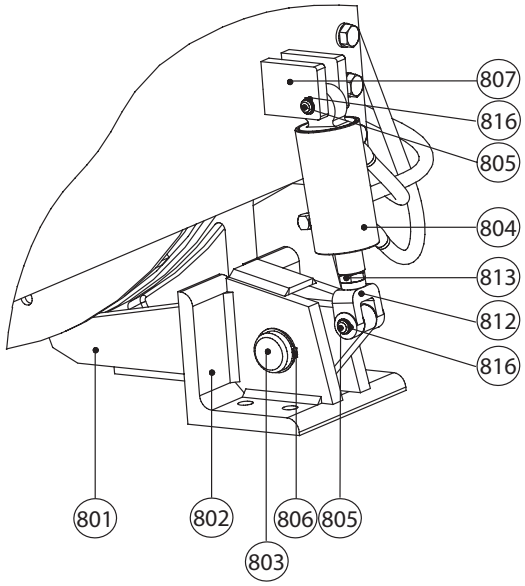
ITEM	PART	DESCRIPTION	QTY.
N/A	81609	Brake Valve Assemby (includes all times below)	
601	NSS	Brake Valve Housing	1
602	24424	Valve Spring Retainer	1
603	101016	Spring Retainer	1
604	24420	Plug	1
605	24419	Brake Valve Piston	1
606	24425	Damper Piston	1
607	101017	Damper Piston Extension	1
608	24423	Check Valve Poppet	1
610	24436	Reducer	1
611	24428	Ball, Steel	1
612	24190	Check Valve Spring	1
613	24434	Main Piston Spring	1
614	24186	O'Ring	2
615	24778	Back-Up Ring	1
616	24776	O'Ring	1
617	24777	Back-Up Ring	1
618	21123	O'Ring	1
620	25373	Check Spring	1
621	25662	Shim, Valve Spring	AR
622	101015	Spring Seat	1

BRAKE VALVE SEAL KIT #61616

PART	DESCRIPTION	QTY
24776	O-RING	1
21123	O-RING	1
24186	O-RING	3
24777	BACK-UP RING	1
24778	BACK-UP RING	1
13542	O-RING	1

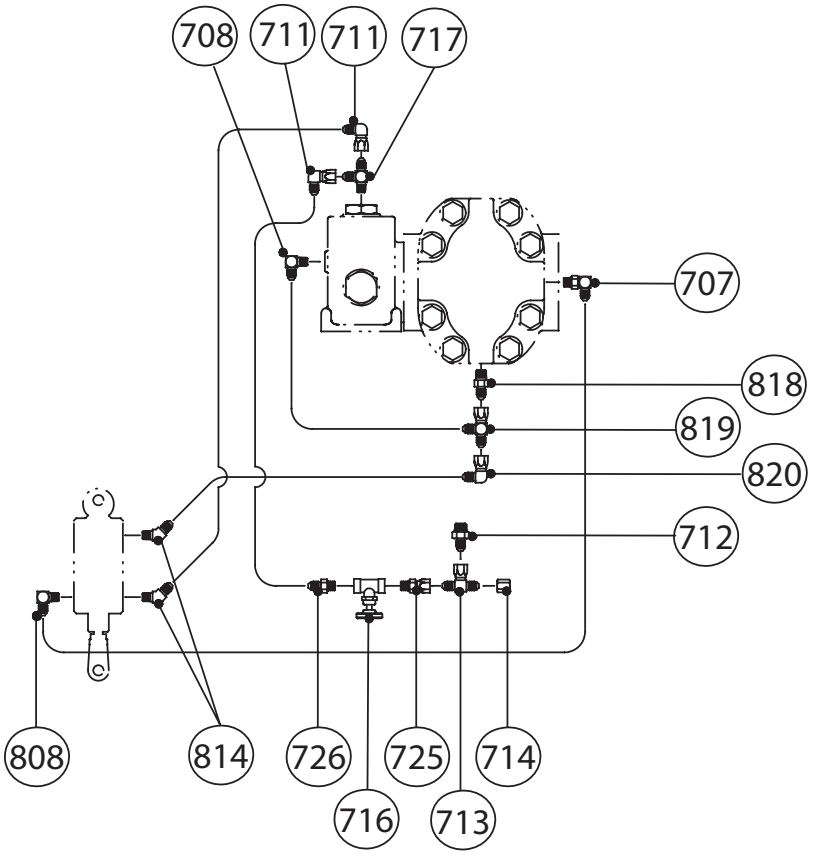
CH280A RATCHET & PAWL ASSEMBLY





CH280A RATCHET & PAWL ASSEMBLY

ITEM	PART NO.	DESCRIPTION	QTY.
801	40155	Pawl Assembly	1
802	24871	Pivot Base	1
803	24876	Pin	1
804	81663	Cylinder Assembly	1
805	104153	Pivot Pin	2
806	12035	Snap Ring	1
807	52495	Mounting Plate	2
808	21163	Elbow	1
810	25749	Hose Assembly	1
811	34197	Hose Assembly	1
812	24882	Clevis	1
813	18004	Jam Nut 1/2-inch	1
814	21165	Elbow	2
815	40242	Hose Assembly	1
816	101082	Retaining Ring	4
817	18047	Grease Fitting	1
818	26001	Adapter	1
819	26002	Tee	1
820	26140	Elbow	1



HOIST DISASSEMBLY

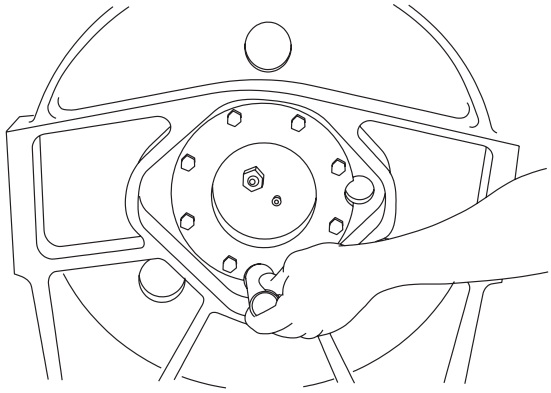
SERVICE PRECAUTIONS

- Before any part is removed from the hoist, all service instructions should be read and understood.
- Work in a clean, dust free area as cleanliness is of utmost importance when servicing hydraulic equipment.
- Inspect all replacement parts, prior to installation, to detect any damage which might have occurred in shipment.
- Use only genuine BRADEN replacement parts. Never reuse expendable parts such as oil seals and O-rings.
- Replace bent or deformed hoist structural components such as side plates or base. Do not attempt to straighten.
- Inspect all machined surfaces for excessive wear or damage . . . before reassembly operations are begun.
- Lubricate all O-rings and oil seals with gear oil prior to installation.
- Remove wire rope prior to removing hoist from crane.
- Use a sealing compound on the outside surface of oil seals and a light coat of thread sealing compound on pipe threads. Avoid getting thread compound inside parts or passages which conduct oil.
- Thoroughly clean all parts in a good grade of non-flammable safety solvent. Wear protective clothing as required.

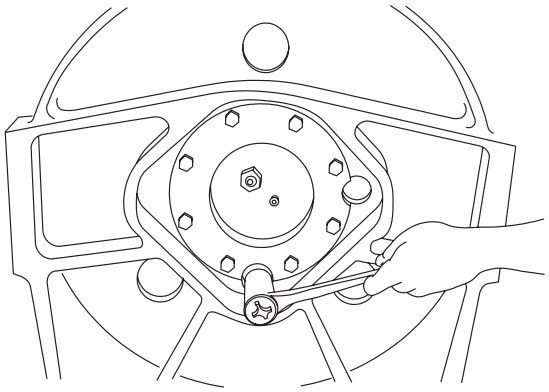
After troubleshooting the hoist and its hydraulic system as covered in the “Troubleshooting” section, and the problem is determined to be in the hoist, use the following procedure to disassemble the hoist.

1. Remove the wire rope from the hoist drum and align the drain plug in the drum with the lowest hole in the support end plate before removing the hoses and mounting bolts. After the hoist is removed from its mounting, clean the outside surfaces.

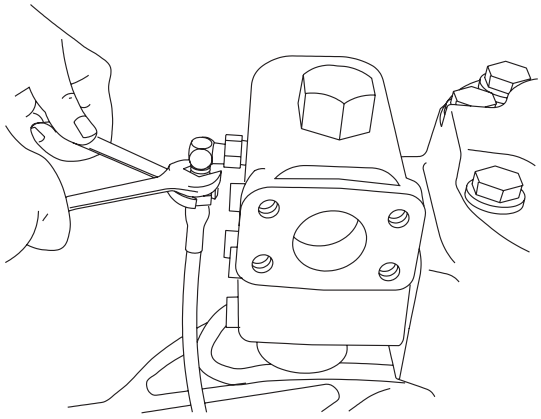
2. To drain the oil, screw a short piece of 1-inch pipe into the larger threads of the drain hole.



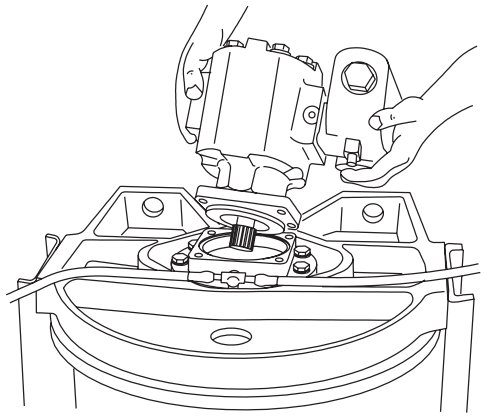
3. Use a 5/16-inch Allen hex to remove the drain plug through the pipe. If the drain holes were not aligned before the hoist was removed from its mounting, the oil can be drained by removing the vent plug and sight gauge in the bearing support and turning the hoist upward on the bearing support end.



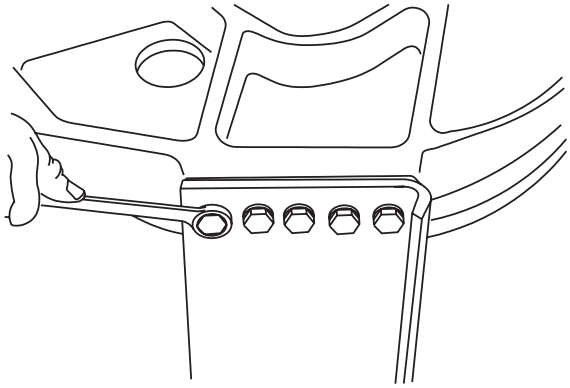
4. Begin the disassembly by standing the hoist on the end opposite the motor. Tag and remove the hydraulic hoses that connect the brake valve and the motor (manifold in the case of a two-speed motor) to the brake release port.



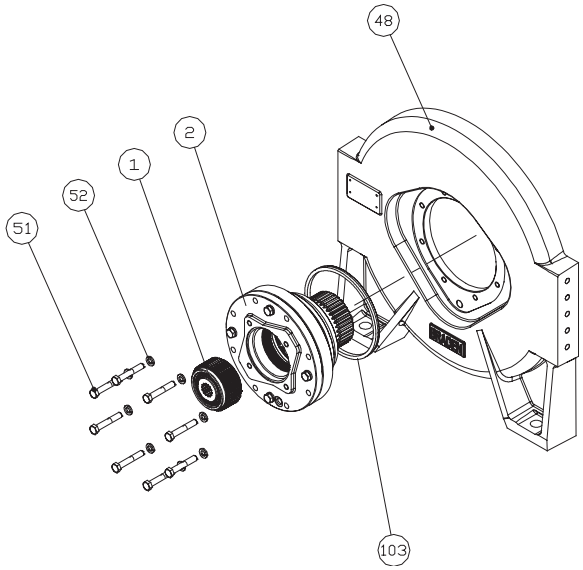
5. Remove the four capscrews and lockwashers securing the motor and lift the motor off the hoist. Remove and discard the O-ring installed on the outside of the motor pilot.



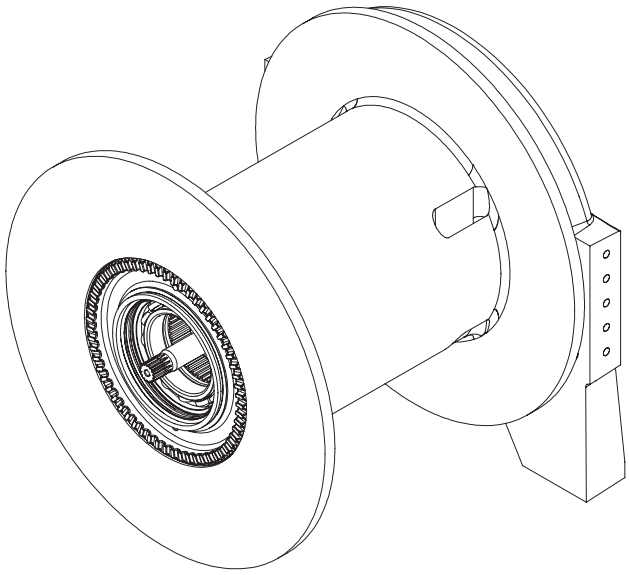
6. Remove the 20 capscrews and lockwashers from the two tie plates, and remove the plates.



7. Remove the overrunning clutch assembly (Item 1) from the center of the brake cylinder assembly. Refer to Overrunning Clutch Assembly Service section in this manual for additional information. Remove the eight capscrews (Item 51) and lockwashers (Item 52) from the motor adapter, and remove the brake cylinder assembly. Remove and discard the V-ring seal (Item 103) that was under the brake cylinder. Do not remove the four capscrews holding the motor adapter to the brake cylinder at this time. Refer to Brake Cylinder Service section of manual.



8. Remove the motor end plate (Item 48) from the drum.



9. There are two 1/2-inch NC tapped holes in the drum closure (Item 56). Install two capscrews or threaded eyebolts to aid in removing the closure from the cable drum. Remove and discard the O-ring (Item 68) from the OD of the drum closure.

10. Install two eyebolts into top end of ring gear. Lift ring gear out of drum. Remove planet gear sets from drum.

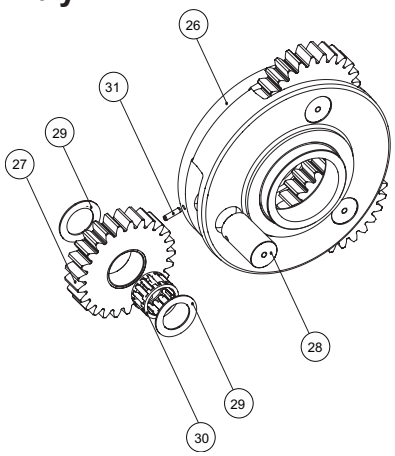
11. Lift the cable drum (Item 59) off of the drum support assembly (Item 5).

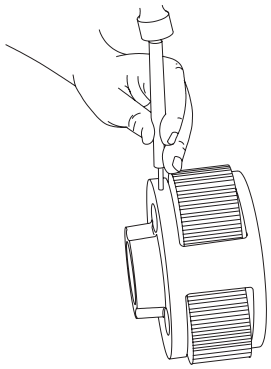
12. Thoroughly clean and inspect all disassembled components at this time. Inspect bearings in the drum closure and cable drum (Items 64 and 65), and replace as required. Inspect sealing surfaces on the drum support and brake cylinder and repair any damaged areas if possible, or replace components as required. During a complete hoist teardown, drum seals (Items 69 and 70) and V-ring seals (Items 103 and 104) should always be replaced. Inspect thrust washers (Items 66 and 67) for signs of excessive wear, heat damage or metal transfer and replace as necessary. Inspect the ring gear teeth for nicks, spalling, or excessive wear. Replace if wear in contact areas is greater than 0.015 inch (0.4 mm) when compared to unworn area of teeth.

PLANET CARRIER SERVICE

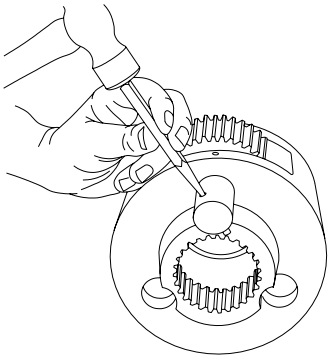
PRIMARY PLANET CARRIER CH210 ONLY

Disassembly





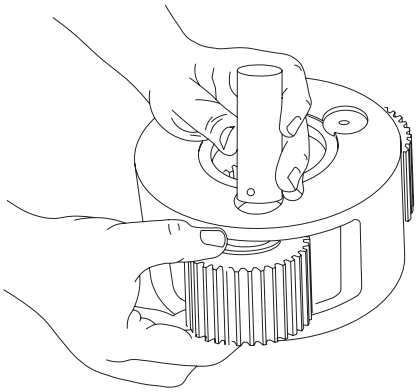
1. Remove the planet gears by first driving the roll pins (Item 31) into the center of the planet gear shafts (Item 28).



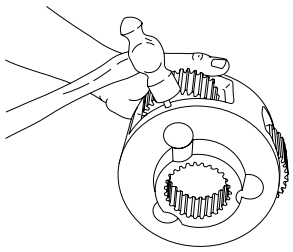
2. Use a punch to drive the roll pins from the planet gear shafts. **DO NOT** reuse the roll pins.

3. Now you can remove the planet shafts, bearings, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, the bearing should be replaced. Likewise, the cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage that will impair the cage's ability to separate, retain and guide the rollers properly, the bearing should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary

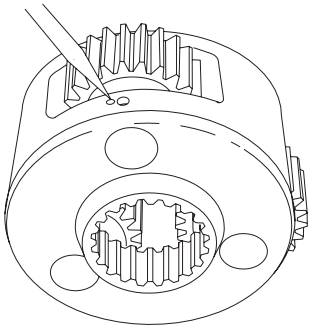
Assembly



1. Install a bearing into a planet gear and place a thrust washer on each side of the gear. Position this assembly into an opening in the carrier. Slide a planet gear shaft through the carrier, thrust washer, bearing and remaining thrust washer.



2. Carefully align the pin hole in the carrier with the hole in the shaft and drive a new roll pin into place. **ALWAYS** use **NEW** roll pins. When properly positioned, 50% of the roll pin will engage the planet gear shaft and 50% will remain in the carrier.

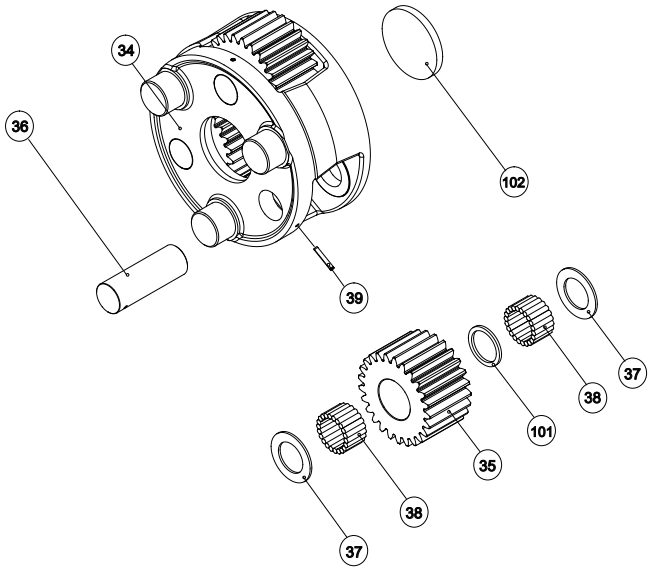


3. Note that the roll pin is slightly recessed into the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole and prevent the pin from backing out in operation. Repeat these steps for each of the three planet gears.

OUTPUT PLANET CARRIER CH210 ONLY

Disassembly

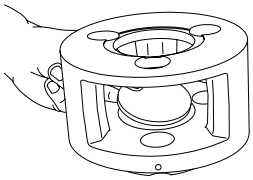
1. Follow steps 1 and 2 of the Primary Planet Carrier disassembly procedure to remove the roll pins from the planet gear shafts.



2. Now you can remove the planet shafts, bearings, spacers, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, they should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. Inspect gears and shafts for abnormal wear or pitting and replace if necessary.

Assembly

1. Place the output carrier on a clean work surface with the drive pins down. Install the output thrust plate (Item 102) into the center of the carrier.



2. Apply a liberal coat of oil soluble grease to a thrust washer and center it on one side of a planet gear. Place the planet gear on a clean work surface with the thrust washer down. Apply a liberal coat of oil soluble grease to the bore of the gear. Stack a row of loose roller bearings into the planet gear, using the grease to hold them in position. There are 22 rollers in each row. Install a bearing spacer. Stack a second row of loose roller bearings on top of the bearing spacer. Place a second thrust washer on the planet gear. Carefully slide the planet gear, bearings and thrust washers into the carrier. Install a planet gear shaft into the carrier and through the planet gear bearings.

3. Follow steps 2 and 3 of the Primary Planet Carrier assembly procedure to install and stake a **NEW** roll pin in the carrier.

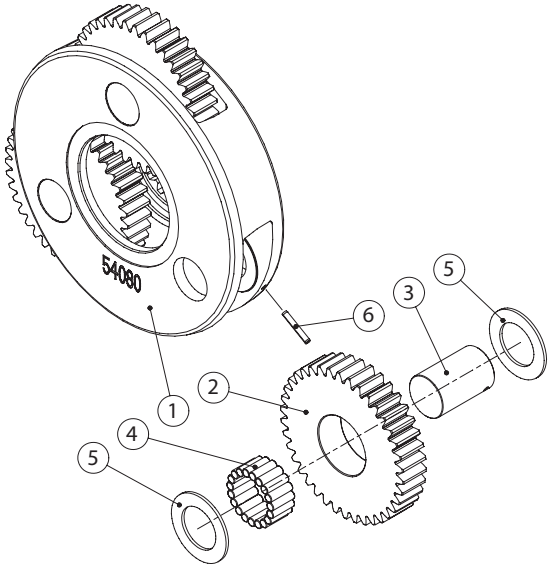
Repeat this procedure for each of the planet gears.

PLANET CARRIER SERVICE

PRIMARY PLANET CARRIER
CH280 ONLY

Disassembly

1. Remove the planet gears using a punch and driving the roll pins (Item 6) into the center of the planet gear



   shafts (Item 3). Slide the planet shafts out of the planet carrier.

2. Use a punch to drive the roll pins out or the planet gear shafts. **DO NOT** reuse the roll pins.

3. Remove the planet shafts, bearings, spacers, thrust washers and gears. The bearing rollers are loose in the planet gear, so take precautions to ensure they are contained when the planet gear is removed from the planet carrier. Holding the thrust washers against the gear as it is removed from the planet carrier will help keep them in place.

4. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, they should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

Assembly

1. Place the planet carrier on a clean work surface with the roll pin side down.

2. Place a planet gear (Item 2) on a clean work surface resting on the gear teeth. Apply grease to the loose rollers (Item 4) and set in the lower half of the planet gear. Apply grease to one of the thrust washers (Item 5) and push onto the planet gear letting the grease hold in place. Slide the planet shaft (Item 3) into the planet gear and through the thrust washer. Grease and install the remaining rollers around the planet shaft. There are 19 rollers in each planet gear. Grease and install the remaining thrust washer (Item 3) onto the planet gear shaft and against the planet gear. Rotate the planet gear so it is positioned for installation into the planet carrier resting on the table. Remove the planet shaft while holding the thrust washers against the gear to keep the loose rollers in place.

3. Carefully slide the planet gear, bearings, and thrust washers into the planet carrier. The thrust washers must be held against the gear to keep the loose rollers positioned in the planet gear. Slide the planet gear shaft into the carrier and through the planet gear bearings.

4. Carefully align the pin hole in the planet carrier with the hole in the planet shaft and drive a new roll pin into place – **ALWAYS USE NEW ROLL PINS**. Ensure that the new roll pin is slightly recessed into the planet carrier. With a center punch, stake the planet carrier next to the pin hole. This will distort the hole and prevent the pin from backing out during operation.

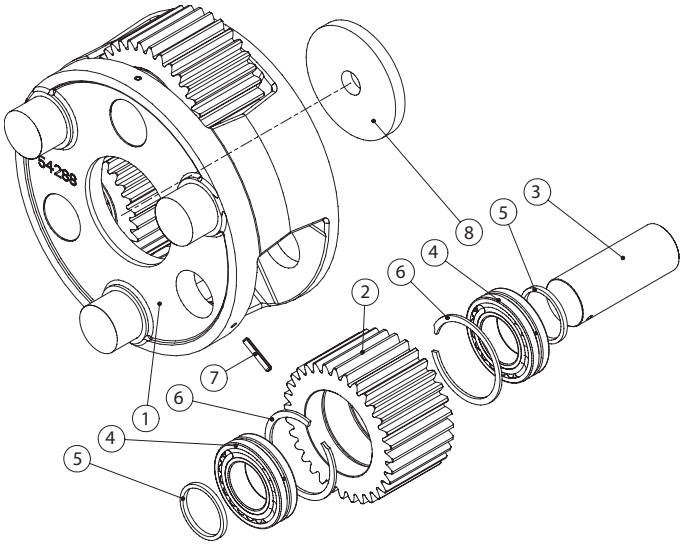
5. Repeat the above steps for each of the three planet gears.

PLANET CARRIER SERVICE

OUTPUT PLANET CARRIER
CH280 ONLY

Disassembly

1. Remove the planet gears using a punch and driving the roll pins (Item 6) into the center of the planet gear



   shafts

2. Slide the planet shafts out of the planet carrier and remove bearings, spacers, thrust washers and gears from the planet carrier.

3. Thoroughly clean all parts and inspect for damage and wear. The bearings should not exhibit any irregularities. If the bearings show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, they should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

Assembly

1. Place the output carrier on a clean work surface with the drive pins down. Install the output thrust plate (Item 8) into the center of the carrier.

2. Install the retaining rings (Item 6) into the planet gear (Item 2) bore and ensure they are seated in the groove. Use a hydraulic press to press the bearings (Item 4)

⚠ WARNING ⚠

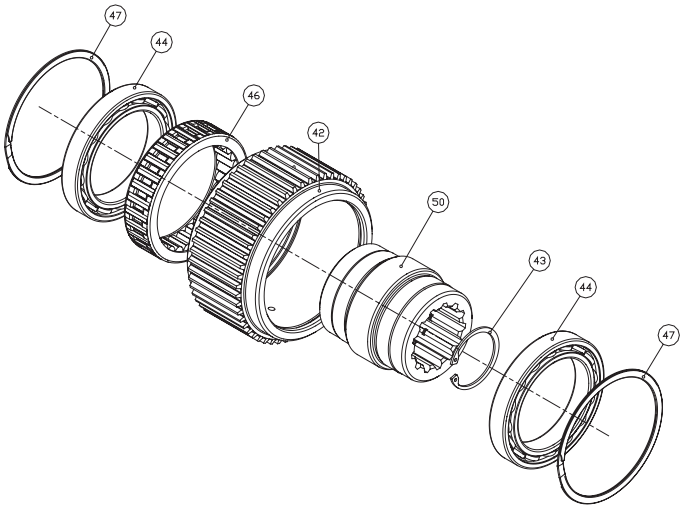
Follow safety procedures and wear safety glasses when operating a hydraulic press. Failure to follow procedures may result in death or personal injury.

   into the gear until the bearing is seated against the retaining ring. Press the second bearing into the opposite side of the gear. Apply a light coat of grease to the bearing races and the spacers (Item 5) and set the spacers on top of the bearing on each side of the gear. Carefully slide the planet gear, bearings and spacers into the carrier. Install a planet gear shaft (Item 3) into the carrier and through the planet gear bearings.

3. Follow step 4 of the Primary Planet Carrier assembly procedure to install and stake a **NEW** roll pin in the carrier.

4. Repeat this procedure for each of the planet gears.

BRAKE CLUTCH SERVICE



NOTE: Outer race (Item 42), Inner race (Item 50) and Overrunning clutch (Item 46) are NOT SOLD individually as replacement parts. If any of these parts require replacement, the entire overrunning clutch assembly must be replaced. Carefully note the relative orientation between the inner and outer races, and the direction of free rotation of the inner race. The clutch MUST be reassembled correctly for proper hoist operation.

⚠ WARNING ⚠

The polished surfaces of the inner and outer race and the overrunning cams must be perfectly smooth to ensure positive engagement of the clutch. The slightest defect may reduce clutch effectiveness, which may lead to loss of load control and result in property damage, injury, or death. It is generally recommended to replace the entire clutch assembly if any component is defective. For these reasons, the overrunning clutch assembly should be disassembled for inspection only if the hoist has exhibited any unusual operation that would point toward a clutch malfunction, or the overrunning clutch assembly shows external signs of mechanical damage.

Disassembly

1. Remove one of the retaining rings (Item 47) from the outer race (Item 42). Push the inner race (Item 50), bearings (Item 44) and overrunning clutch (Item 46) through the outer race.

2. Use a small punch and hammer to tap one of the bearings (Item 44) off of the inner race. The overrunning clutch can now be removed from the inner race. Closely inspect the overrunning clutch and the polished surfaces of the inner and outer race for wear, cracks, pitting, corrosion or mechanical damage. Closely inspect the bearings for any signs of damage, wear, corrosion, pitting or heat discoloration.

Assembly

⚠ WARNING ⚠

Failure to assemble the overrunning clutch assembly with all parts oriented correctly may result in reduced brake effectiveness, which may lead to loss of load control and result in property damage, injury, or death.

1. If both bearings (Item 44) have been removed from the inner race, install one of them now.

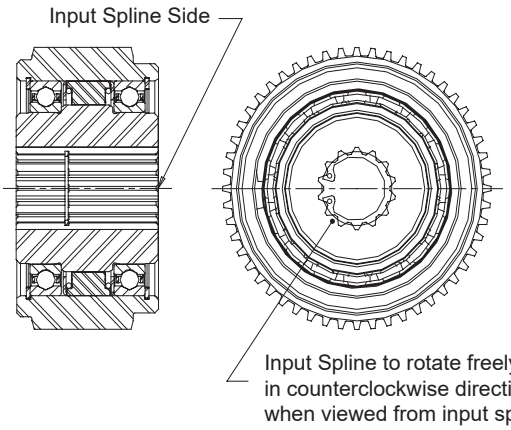
2. Install the overrunning clutch onto the inner race. Rotate the inner race slightly to get the clutch started onto the inner race.

3. Install the other bearing onto the inner race.

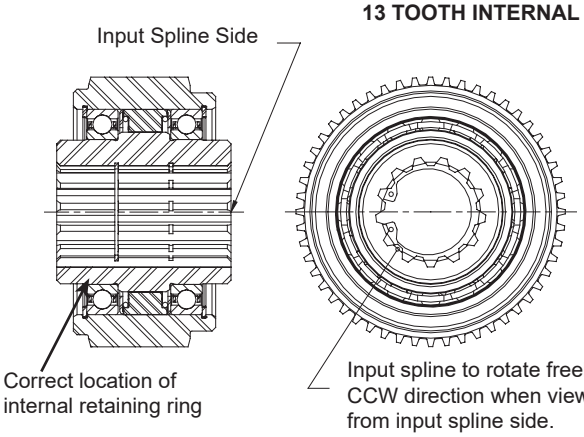
4. The outer race should have one retaining ring (Item 47) installed in one end. Carefully slide the inner race, with bearings and clutch, into the outer race. Install the other retaining ring into the outer race.

Shown below are the two types of clutch assemblies used in CH210 hoists. The drawings show each type properly assembled.

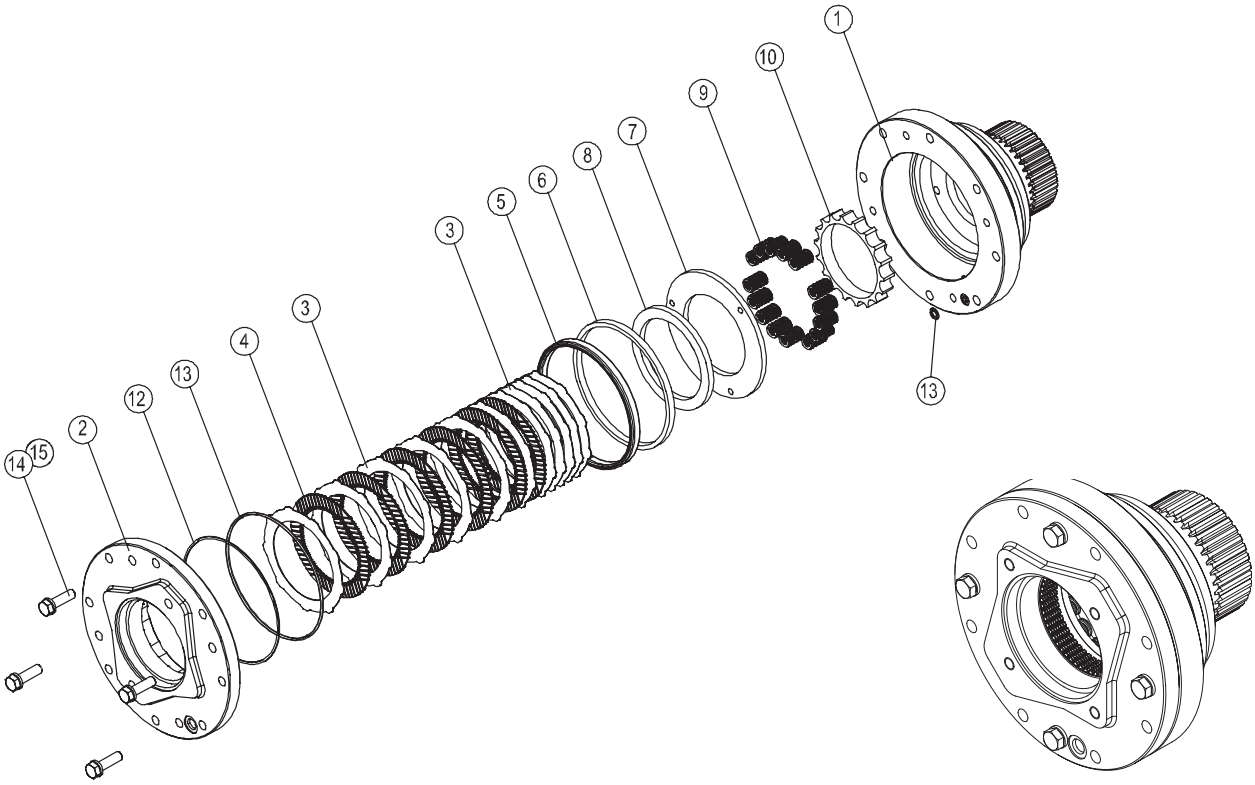
14 TOOTH INTERNAL SPLINE



13 TOOTH INTERNAL SPLINE



BRAKE CYLINDER SERVICE



Disassembly

⚠ CAUTION ⚠

The motor adapter is under spring tension from the brake springs. Loosen each of the capscrews one turn at a time until spring tension is released.

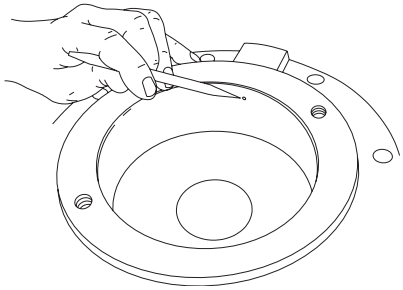
1. Stand the brake assembly on the splined end, with the motor adapter upward. Remove the four capscrews (Item 14) and lockwashers (Item 15). Use a crisscross pattern and loosen each capscrew one turn at a time until spring tension is released.

2. Remove the motor adapter (Item 2). Lift out all the brake discs (Item 3), friction discs (Item 40) and the spacer (Item 8).

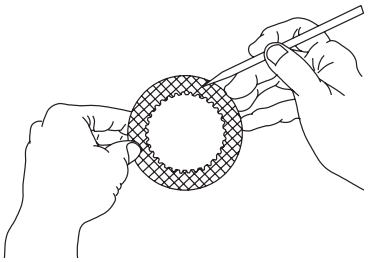
3. Remove and discard the O-ring and backup ring (Items 11 and 12) from the motor adapter. Remove and discard the seal (Item 5) from the brake cylinder. Remove the steel backup ring (Item 6).

4. Remove the pressure plate (Item 7) and the springs and spacer (Items 9 and 10) from the brake cylinder.

Clean and Inspect

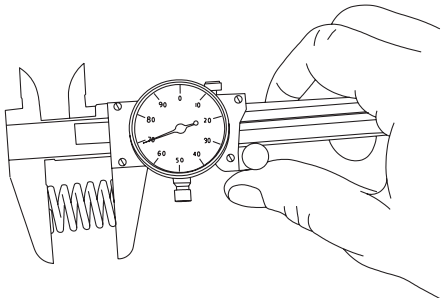


1. Thoroughly clean and inspect all parts at this time. Check sealing surfaces on both the motor adapter and brake cylinder. Be sure the brake release port is open and free of contamination.



2. Place friction brake disc on flat surface and check for distortion with a straight edge. Friction material should appear even across entire surface with groove pattern visible. Replace friction disc if splines are worn to a point, disc is distorted, friction material is burned or worn unevenly, or groove depth is less than 0.003 inch (0.08 mm).

3. Place steel disc on flat surface and check for distortion with a straight edge. Check surface for signs of material transfer or excessive heat. Replace steel disc if distorted, heat discolored, or mechanically damaged.



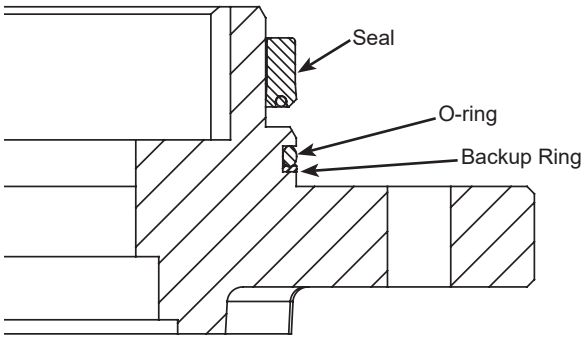
4. Check brake spring free length. Minimum free length is 1-7/16 inch (36.5 mm). Check springs for any signs of cracking or failure. If a brake spring must be replaced for any reason, then **ALL** brake springs must be replaced.

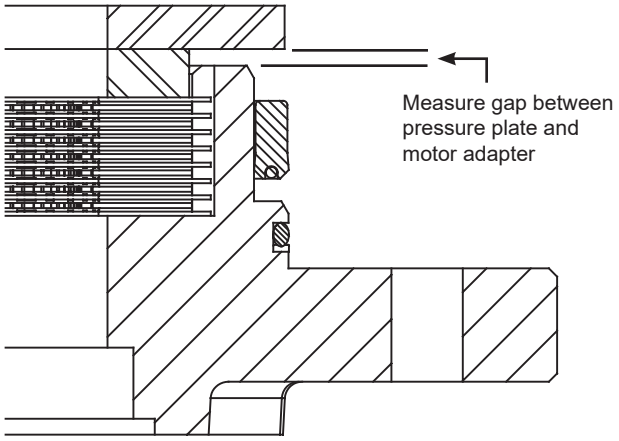
⚠ CAUTION ⚠

Failure to replace brake springs as a set may result in uneven brake application pressure and repeated brake spring failure.

Assembly

NOTE: See Page 22 for the quantity of brake discs, friction discs, and brake springs for each hoist model.





1. Place the motor adapter on a clean work surface with the motor-mounting surface down. Apply a light coat of oil to a new backup ring (Item 12) and O-ring (Item 11) and install them into the groove on the motor adapter. Backup rings are always placed on the low pressure side of the O-ring. In this case, the backup ring is toward the motor-mounting surface. Lightly oil the brake cylinder seal (Item 5) and install it onto the motor adapter with the seal lip down.

2. Install a steel brake disc (Item 3) into the motor adapter, followed by a friction disc (Item 4). Continue to alternately install steel and friction discs. A steel disc will be on top.

3. Install the brake plate spacer (Item 8) on top of the last steel disc.

4. To check brake stack height, place pressure plate (Item 7) on top of brake spacer. Hold pressure plate down firmly by hand and measure gap (in three places) between motor adapter and pressure plate. Average gap must measure between 0.080 inch (2.0 mm) minimum and 0.160 inch (4 mm) maximum. If the gap exceeds the maximum limit, there may be too many discs in the stack-up or the discs are distorted. If the gap is less than the minimum, there may be too few discs or the discs are worn beyond their serviceable limit and should be replaced. When the gap is within the minimum and maximum values, remove the pressure plate and all brake discs. Lubricate all friction discs with the same oil to be used in the hoist. Install all brake discs and brake plate spacer as described in steps 2 and 3.

5. Place the brake cylinder on a clean work surface with the splined end down. Install the spring spacer (Item 10), then the springs (Item 9).

⚠ WARNING ⚠

Always use the molded spring spacer to properly position the springs in the brake cylinder. Failure to install the spring spacer may allow the springs to contact each other and become damaged. This could result in loss of load control, property damage, injury, or death.

6. Install the pressure plate (Item 7) into the brake cylinder. Be careful that none of the springs fall over. Install the steel backup ring (Item 6). Apply petroleum jelly or an oil soluble grease to a new O-ring (Item 13) and install it in the brake cylinder.

   NOTE: The close fitting backup ring may be depressed slightly to one side to lodge it in the brake cylinder bore and temporarily hold the pressure plate and springs in place while the brake cylinder is inverted and lowered over the motor adapter.

   As an alternate, the motor adapter and brake plates can be turned over and installed into the brake cylinder, holding the brake plates and spacer in place through the center opening. Be careful to not pinch your fingers between the spacer plate and the pressure plate.

7. Apply petroleum jelly or an oil soluble grease to the sealing surface of the brake cylinder and the piston seal. Turn the brake cylinder over and lower it onto the motor adapter, being careful not to damage the piston seal or O-ring on the adapter. Be careful the O-ring (Item 13) does not fall out of place, and the oil passages are aligned. The alternate assembly method above could also be used.

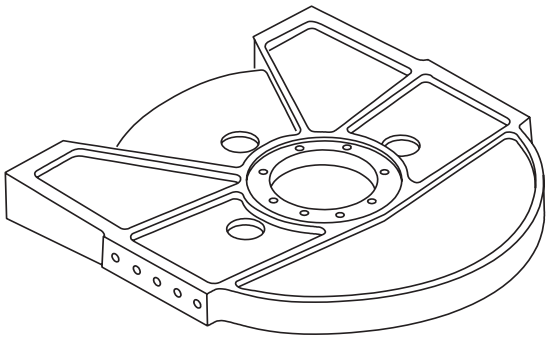
8. Turn the entire assembly over and install the four capscrews and lockwashers. After the capscrews make contact with the motor adapter, evenly tighten them one turn at a time until the motor adapter is drawn tight against the brake cylinder, then torque to the recommended value.

BRAKE CYLINDER PRESSURE TEST

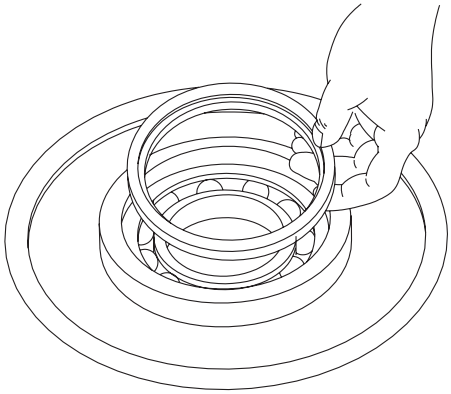
1. Install a -6 ORB fitting into the brake release port on the motor adapter. Connect a hand pump with an accurate 0–2,000 PSI (0–138 bar) gauge and shut-off valve to this fitting. Apply 1,000 PSI (69 bar) to the brake and close the shut-off valve. Let the unit stand for five minutes. If there is any loss of pressure, the brake cylinder should be disassembled for inspection of the sealing surfaces, seal and O-ring. When the source of the pressure leak has been determined and corrected, reassemble the brake cylinder and repeat the test.

2. WHILE PRESSURE IS APPLIED AND THE BRAKE IS RELEASED, install the overrunning clutch assembly into the brake pack. Turn the clutch back and forth to align the splines on all the friction discs. Release the pressure on the brake cylinder and remove the clutch assembly. The brake cylinder is now complete and ready to be installed in the hoist.

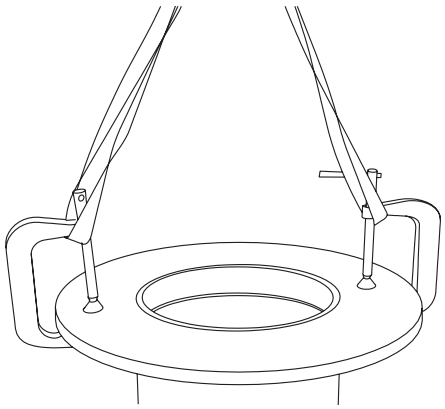
HOIST ASSEMBLY



1. Place the drum support assembly on a clean work surface with the bearing support facing up. Lubricate the bearing and sealing surfaces on the bearing support. Install a new V-ring seal onto the bearing support.



2. Install a new bearing in the drum if replacement is necessary, making certain to press it against the shoulder in the bottom of the bearing bore. Coat the outside diameter of a new seal with a good grade of sealant. Turn the spring side of the seal toward the bearing, and press the seal into the seal bore, leaving it flush with the surface of the drum bore.



3. Turn the drum over, and set it down on the bearing support. Be careful not to damage the seal when lowering the drum onto the bearing support.

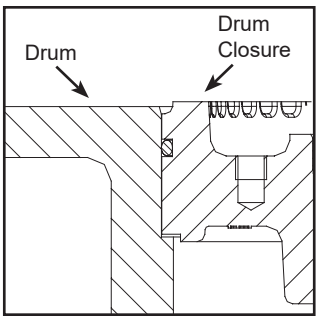
4. Lower the output planet carrier assembly into the cable drum and engage the three lugs on the carrier into the three holes in the drum. Be sure the carrier is firmly seated against the web in the drum.

5. Install the thrust washer (Item 66) into the recess in the output planet carrier, then install the output sun gear (Item 57) into the center of the output planet gears.

6. Install the primary planet carrier assembly on top of the output planet carrier, engaging the splines in the primary carrier with the output sun gear. Install the thrust washer (Item 67) onto the primary carrier.

7. Install the ring gear into the drum. Rotate the ring gear back and forth to engage the internal splines with the primary and output planet gears. When correctly installed, the bottom of the ring gear adapter will be resting on the thrust washer (Item 67), which is on the primary planet carrier. Note some ring gears on early hoists are two separate parts connected with a spiral snap ring.

8. Install a new bearing in the drum closure if replacement is necessary, making certain to press it against the shoulder in the bottom of the bearing bore. Coat the outside diameter of a new seal with a good grade of sealant. Turn the spring side of the seal toward the bearing, and press the seal into the seal bore, leaving it flush with the surface of the drum closure. Lubricate a new O-ring (Item 68) and install it into the groove on the outside diameter of the closure. Lubricate the outside diameter of the closure and install it into the drum. When correctly installed, the drum closure will be approximately 0.034 inch (0.9 mm) above the drum flange. If the drum closure cannot be installed as shown, one or more components may be out of position or not properly seated. The most common causes of this problem are the thrust washers being out of position, or the output planet carrier not fully seated into drum. **DO NOT** proceed with assembly until the source of the problem has been identified and corrected.



9. Place the motor end plate on the cable drum, aligning it approximately with the support end plate, and centering it on the drum. Lubricate and install a new V-ring (Item 103) onto the brake cylinder. Lubricate the sealing surface of the brake cylinder and carefully install the brake cylinder assembly through the end plate into the drum. Position the brake release port in the same location as removed. Rotate the brake cylinder back and forth to align the splines with those on the ring gear adapter. Install the input sun gear (Item 55) through the center of the brake

cylinder, engaging the teeth on the three input planet gears.

10. Install the eight capscrews and lockwashers (Items 51 and 52) through the brake cylinder into the motor end plate. Loosely tighten all capscrews until they are snug against the motor adapter. Continue to tighten the capscrews in a crisscross pattern onto turn at a time until the motor end plate is drawn up tightly against the brake cylinder. **Torque capscrews 110 LB-FT (149 Nm).**

11. Install the two tie plates (Item 61) between the two end plates of the hoist, using all 20 BRADEN SPECIAL capscrews and lockwashers (Items 60 and 52). Be sure the curved sides of the tie plates are toward the top of the hoist. Torque all capscrews to their correct value.

12. Install the overrunning clutch assembly into the center of the brake pack. Refer to Page 26 for correct orientation. Input spline side, shown on Page 26, is the end of the clutch facing outward, toward the motor. It may be necessary to rotate the drum slightly in either direction to align the clutch splines with the input sun gear. The internal retaining ring in the clutch should be seated against the input sun gear when correctly installed.

13. Lubricate and install a new O-ring onto the hydraulic motor pilot. Engage the motor shaft with the inner race of the overrunning clutch and lower the motor into place. Install motor capscrews and lockwashers and torque to correct value.

14. Install all hydraulic lines disconnected during disassembly, then tighten all connections.

15. After the hoist assembly is complete, check all capscrews and fittings to make certain they have been properly installed and tightened correctly. Refill the hoist with the recommended oil listed in Recommended Gear Oil section of manual.

16. Before returning the hoist to full service, a light load should be lifted and held a few feet off the ground to be sure the static brake is functioning properly. The hoist should also be able to slowly lower the load in a smooth and controlled manner. If the hoist does not perform either of these functions correctly, refer to Troubleshooting section for additional information.

RECOMMENDED BOLT TORQUE

Higher or lower torques for special applications will be specified such as the use of spanner nuts, nuts on shaft ends, jam nuts and where distortion of parts or gaskets is critical.

Lubricated torque values based on use of SAE 30-wt engine oil applied to threads and face of bolt or nut.

Avoid using thread lubricants as the applied torque may vary by 10 - 40%, depending upon the product used.

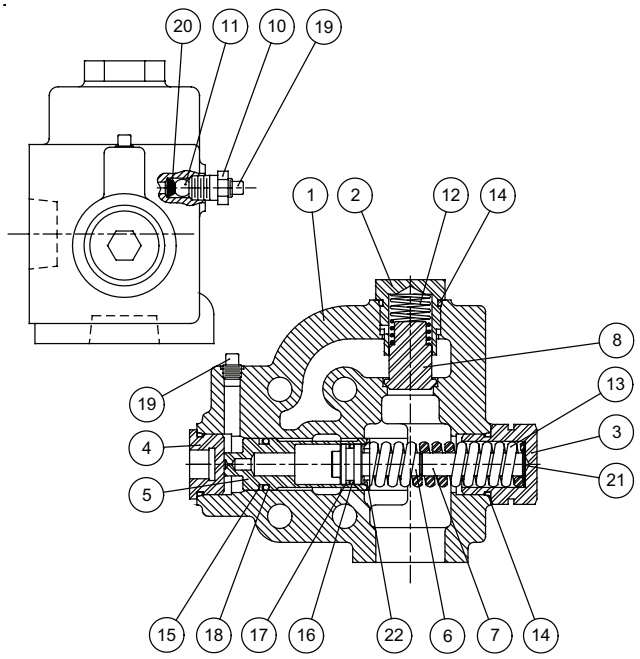
Bolt Diam. Inches	Thread per inch	Torque LB-FT (N.m)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
1/4	20 28	8 (11)	6 (8)	12 (16)	9 (12)
5/16	18 24	17 (23)	13 (17)	24 (33)	18 (24)
3/8	16 24	31 (42)	23 (31)	45 (61)	35 (47)
7/16	14 20	50 (68)	35 (47)	70 (95)	50 (68)
1/2	13 20	75 (102)	55 (75)	110 (149)	80 (108)
9/16	12 18	110 (149)	80 (108)	150 (203)	110 (149)
5/8	11 18	150 (203)	115 (156)	210 (285)	160 (217)

Bolt Diam. Inches	Thread per inch	Torque LB-FT (N.m)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
3/4	10 16	265 (359)	200 (271)	380 (515)	280 (380)
7/8	9 14	420 (569)	325 (441)	600 (813)	450 (610)
1	8 14	640 (868)	485 (658)	910 (1234)	680 (922)
1 1/8	7 12	790 (1071)	590 (800)	1290 (1749)	970 (1315)
1 1/4	7 12	1120 (1518)	835 (1132)	1820 (2468)	1360 (1817)
1 3/8	6 12	1460 (1979)	1095 (1485)	2385 (3234)	1790 (2427)
1 1/2	6 12	1940 (2360)	1460 (1979)	3160 (4284)	.2370 (3214)

To convert LB-FT to Kg-m, multiply LB-FT value by 0.1383

8-2008

BRAKE VALVE SERVICE



ITEM	DESCRIPTION	QTY.
1	Valve Housing	1
2	Check Valve Retainer	1
3	Spring Retainer	1
4	Plug	1
5	Main Piston	1
6	Damper Piston	1
7	Damper Piston Extension	1
8	Check Valve Poppet	1
10	Reducer	1
11	Check Ball	1
12	Check Valve Spring	1
13	Main Piston Spring	1
14	O-ring	1
15	Backup Ring	1
16	O-ring	1
17	Backup Ring	1
18	O-ring	1
19	Pipe Plug	1
20	Check Spring	1
21	Shim	1
22	Spring Seat	1

Most CH Series hoists are supplied with our BRADEN 1.5-inch brake valve. It is a reliable hydraulic valve with internal components manufactured to close tolerances. Due to these close tolerances, several individual parts are not available as replacement parts and are noted in the following parts lists as not serviced separately (NSS).

Before disassembling the brake valve, be sure you have conducted all applicable troubleshooting operations and are certain the brake valve is causing the malfunction.

Thoroughly clean the outside surfaces of the valve and work in a clean dust-free area, as cleanliness is of utmost importance when servicing hydraulic components.

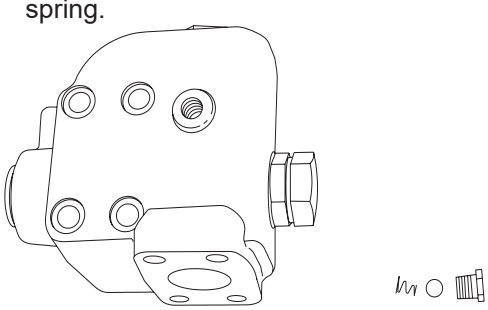
1.5-inch brake valves built after mid-March 1997 contain a spring seat (Item 22) between the spool spring and the spool. This provides a slightly larger, more uniform area for the spring to seat against the spool. The result is increased spring service life and improved repeatability of pressure/flow modulation over the full compression range of the spring.

The spring retainer has been modified to allow for the additional thickness of the spring seat and a groove machined into the hex end cap serves as a visual indication that the valve contains the new spring seat. The spring seat improvement may be added to earlier brake valves by installing kit, Part Number 62805. Items 3, 7, 13, 14 and 22 are included in the kit. We recommend that this kit be installed whenever the brake valve is removed for inspection or service.

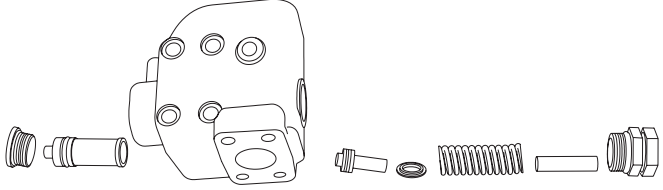
It is always a good practice to check the initial opening or cracking pressure of the brake valve whenever the hoist is serviced or inspected. Refer to BRADEN Service Bulletin 527 for complete brake valve test and adjustment procedures.

DISASSEMBLY

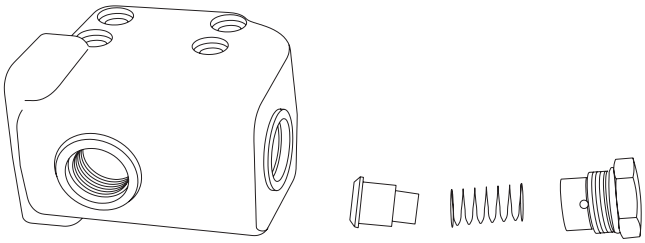
1. Remove the fitting, motor drain check ball and spring.



2. Remove the spool spring retainer and spool spring. Remove the spool plug and carefully remove the spool assembly. Remove the damper piston from the spool. The piston will come out of the spool slowly, because of a partial vacuum formed between the two. Use extreme care to avoid damaging the polished surfaces of either piece



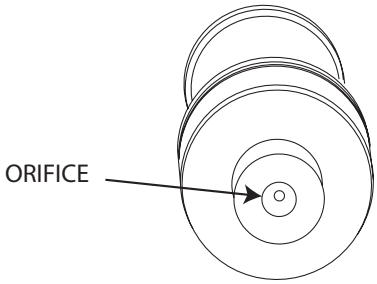
3. Remove the check valve spring retainer, spring and check valve poppet.



CLEAN AND INSPECT

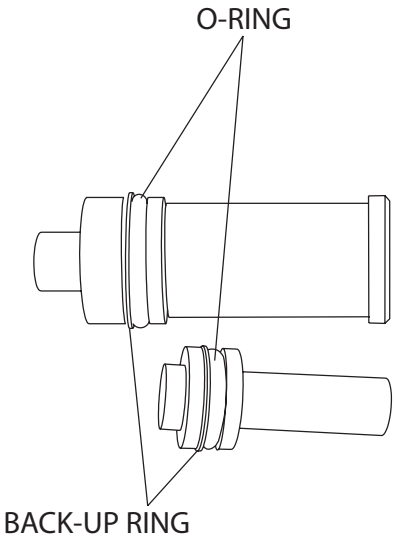
1. Discard all O-rings and backup rings. Clean all parts in solvent and blow dry. Inspect polished surfaces of spool and damper piston for damage that may cause binding or leakage. Inspect spool bore in valve housing for damage or scoring. Inspect check valve seat in valve housing and check valve poppet. If the spools, bores or valves are damaged, the entire brake valve must be replaced. Check the free length of main piston spring. Replace if less than 3-7/16 inch (87.3 mm) long. Check the free length of the check valve spring. Replace if less than 1-1/2 inch (38.1 mm) long.

2. Inspect the 0.020–inch (0.5 mm) orifice in the end of the spool to be certain it is open.



ASSEMBLY

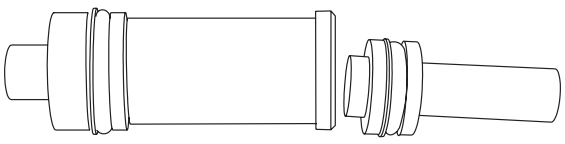
1. Install new O-rings and backup rings on spool and damper pistons as shown. It is important that each backup ring is on the correct side of its O-ring. Take care not to cut the O-rings during assembly. Let the spool and piston set for 10 minutes before installing them into the brake valve housing. This allows O-rings to return to their original size after being stretched.



2. Install new O-rings on the plug and spool retainers.

3. Lubricate the spool and damper piston O-rings with hydraulic oil. Carefully install the damper piston into the spool. Carefully install the spool into the valve housing. Always install the spool into the valve body from the plug end, so the O-ring enters the bore first. Install the spring seat, spool spring, damper piston extension and spring retainer.

4. Install the check valve poppet, spring and check valve retainer.



5. Install the motor drain check ball, spring and fitting.

6. The brake valve is now completely assembled and ready to be installed on the hoist motor.

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