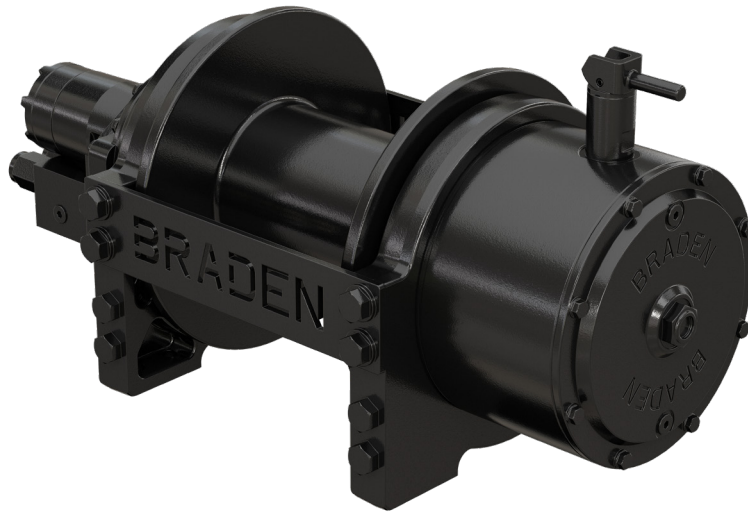


TR12 | TR15 | TR20 | TR25 | TR30 | TR35 Planetary Recovery Winches



Record serial number below:

--	--	--	--	--	--	--

First 2 numbers indicate year of manufacture
(for serial number location, see page 4).

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

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FOREWORD

The following service manual has been prepared to provide installation and maintenance information for BRADEN TR Series Planetary Recovery Winches, for which the intended use is vehicle recovery and pulling of loads.

Some illustrations in this manual may show details or attachments different from your winch. Some components have been removed for illustrative purposes. Drawings in this manual represent a typical unit sold through our distribution channels. Some winches, particularly those sold directly to original equipment manufacturers, may differ in appearance and options.

For inquiries regarding your BRADEN TR Series Recovery Winch or this publication, please contact Arrowhead Winch Technical Support at 918-259-3315, Monday through Friday, 8:00 a.m. to 4:30 p.m. (CST).



Managing Waste

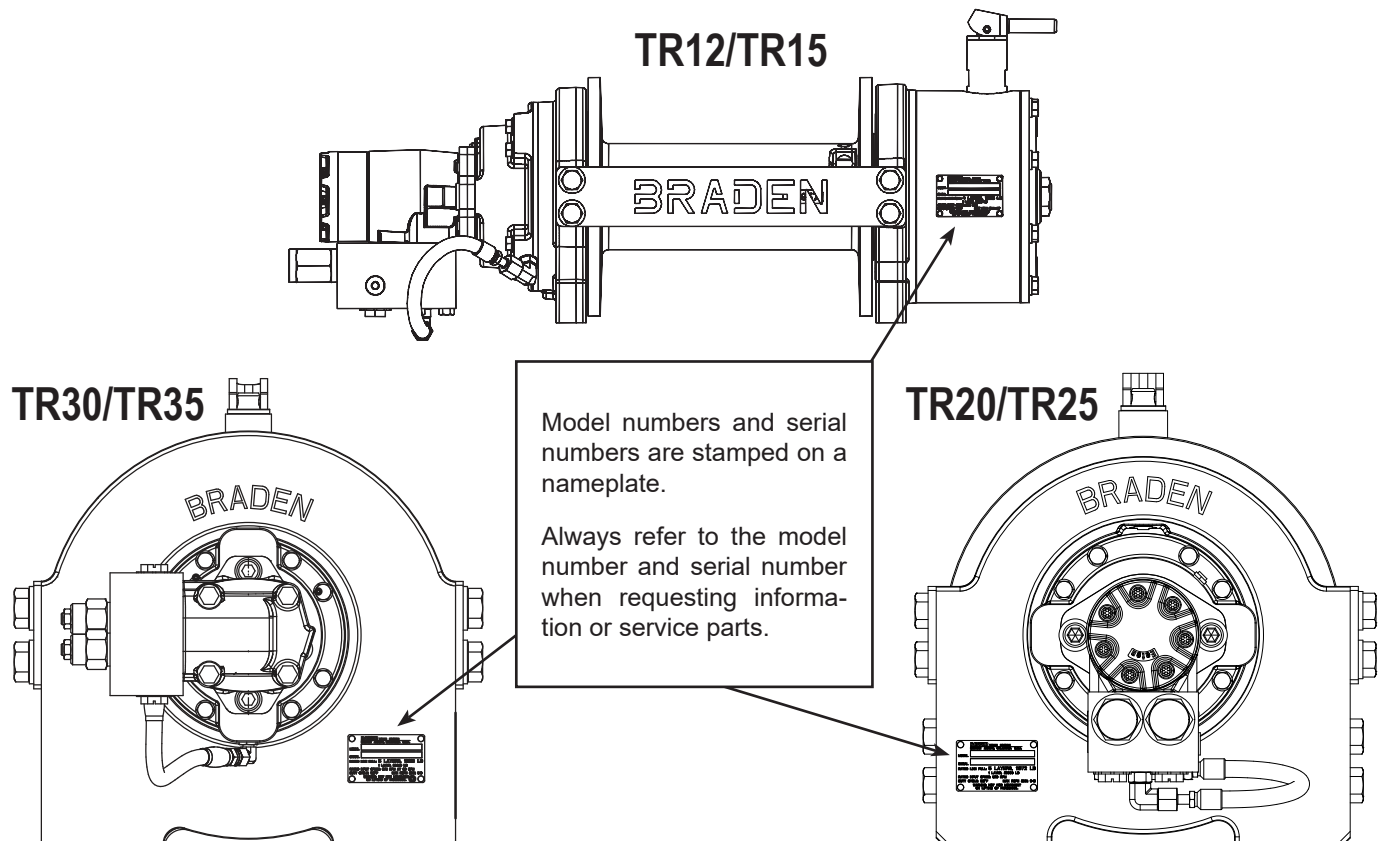
Arrowhead Winch believes in a life-cycle approach to our products. We encourage best practices regarding “Going Green” — making environmentally responsible decisions to “reduce, reuse, and recycle.”

- 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 websites as well as your state’s environmental agency website:

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

MODEL IDENTIFICATION



EXPLANATION OF MODEL NUMBER

TR	20	A	- 29	- 080	- 01	- LA	- LM
PRODUCT FAMILY	CAPACITY	GENERATION	GEAR RATIO	MOTOR SIZE	DRUM CODE	OTHER OPTIONS	OTHER OPTIONS

CAPACITY

12	12,000 lb (5,443 kg)
15	15,000 lb (6,804 kg)
20	20,000 lb (9,072 kg)
25	25,000 lb (11,340 kg)
30	30,000 lb (13,608 kg)
35	35,000 lb (15,876 kg)

GEAR RATIO

13	13:1
26	26:1
29	29:1
30	30:1
36	36:1

MOTOR SIZE

080	8.0 cu in.
096	9.6 cu in.
096/048	9.6/4.8 cu in. two-speed
108/054	10.8/5.4 cu in. two-speed
119	11.9 cu in.
119/059	11.9/5.9 cu in. two-speed

OTHER OPTIONS

AC	Air clutch
EB	Extension shaft

F	Fairlead
LA	Left hand assembly
LM	Low mount
R	Tension roller
T	Tension plate
U	Underwound (rope exits from bottom of drum)
W	3rd wrap indicator

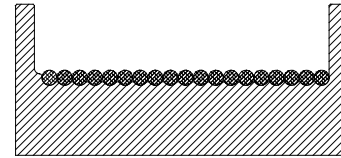
TO ORDER PARTS:

1. List model and serial numbers of the winch.
2. Refer to cross-section drawing (exploded view), select the component(s) needed, and note item number.
3. Find item number on parts list. Show part number, description, and quantity required on your order.

GLOSSARY

Brake Valve — A hydraulic counterbalance valve should be connected to the ports of the hydraulic motor. When oil pressure tries to rotate the motor, the brake valve blocks the flow of oil out of the motor until the internal static brake is released. It controls reel-out speed based on the load and flow of oil to the motor. All the heat generated by controlling the speed of the load is dissipated by the hydraulic system, not by the internal static brake.

Static, Mechanical, or Load-holding Brake — A multidisc, spring-applied, hydraulically released brake that holds a load. This brake is not designed to stop a load being lowered, but holds the load in place when the winch is not in operation.



First-layer Line-pull Rating — The maximum rated line pull (in pounds or kilograms) on the first layer of rope. The maximum rating for any particular winch is based on maintaining an acceptable structural design factor and service life. Certain combinations of drum, gear ratio, motor and hydraulic pressure, may reduce this rating.

First-layer Line-speed Rating — The maximum rated line speed (in feet or meters per minute) on the first layer of cable. Certain combinations of drum, gear ratio, motor, and hydraulic flow may reduce or increase this rating.

D/d Ratio — The ratio of drum barrel diameter (D) to wire/synthetic rope diameter (d). Current SAE standards require a minimum of 8:1.

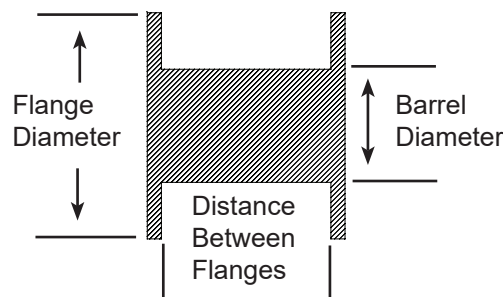
EXAMPLES:

If you know the rope diameter you want to use, multiply it by 8 to get the MINIMUM drum barrel diameter (such as 1/2-inch wire rope $\times 8 = 4$ inches — this is the minimum winch barrel diameter).

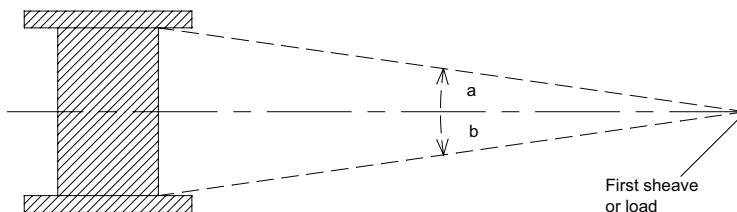
If you know the barrel diameter, divide it by 8 to get the MAXIMUM wire/synthetic rope diameter.

(such as 8-inch barrel diameter $/ 8 = 1$ — this is the maximum wire/synthetic rope diameter)

Drum Dimensions —



Fleet Angle — The angle between the wire/synthetic rope position at the extreme end wrap on a drum, and a line drawn perpendicular to the axis of the drum, through the center of the nearest fixed sheave or load attachment point.



First sheave or load should be centered between the drum flanges, so that angles A and B are equal.

Angles A and B should be a minimum of 1/2 degree and a maximum of 1-1/2 degrees.

Wrap — A single coil of wire/synthetic rope wound on a drum.

Layer — All wraps of wire/synthetic rope on the same level between drum flanges.

Freeboard — Amount of drum flange that is exposed radially past the last layer of wire/synthetic rope. Minimum freeboard varies with the regulatory organization. SAE J706 requires minimum freeboard of $0.7d$, where d is rope diameter.

GENERAL SAFETY RECOMMENDATIONS

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 tension has been removed from the rope and equipment has been blocked securely before servicing, adjusting or repairing winch.
2. Be sure personnel are clear of work area BEFORE operating winch.
3. Read all warning and caution tags provided for safe operation and service of the winch and become familiar with the operation and function of all controls before operating the winch.
4. Inspect rigging and winch at the beginning of each work shift. Defects should be corrected immediately. Do not operate a winch with defects.
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. Do not exceed the maximum pressure (PSI, bar) or flow (GPM, lpm) stated in the winch specifications found in the specific sales brochure.
8. Protective gloves should be worn when handling wire/synthetic rope.
9. Never attempt to handle wire/synthetic rope when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads, sheaves, and winch drum.
10. When winding wire/synthetic rope on the winch drum, never attempt to maintain tension by allowing wire rope to slip through hands. Always use hand-over-hand technique.
11. Never use wire/synthetic rope with broken strands. Replace wire/synthetic rope that is damaged. Refer to wire rope supplier manual.
12. Do not weld on any part of the winch without approval from Arrowhead Winch Engineering.
13. Use recommended hydraulic oil and gear lubricant.
14. Keep hydraulic system clean and free from contamination at all times.
15. Use correct rope anchor for wire/synthetic rope and pocket in drum.
16. Do not use knots to secure or attach wire/synthetic rope.
17. The BRADEN-designed wire/synthetic rope anchors are not intended to support the rated load. ALWAYS maintain a minimum of five wraps of wire rope on the drum or a minimum of eight wraps of synthetic rope on the drum. It is recommended that the last five wraps of wire rope or last eight wraps of synthetic rope be painted bright red to serve as a visual reminder.
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 winch controls unless you are properly positioned at the operators station and you are sure personnel are clear of the work area.
20. Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
21. All personnel should stay in view of the operator and clear of the winch drum. Do not allow personnel near wire/synthetic rope under tension. A safe distance of 1-1/2 times the working length of the rope should be maintained.
22. Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the rope is wrapped onto the drum or drawn through guide rollers or potential pinch points.
23. Install switches or valves that will shut off power to the winch, in locations where they can be reached by anyone entangled in the rope before being drawn into the winch or any pinch point.
24. Deadman controls, which automatically shut off power to the winch whenever the operator leaves his station or releases the winch control lever, should be installed whenever practical.
25. Never allow anyone to position any part of body under a suspended load.
26. Avoid sudden shock loads or attempting to jerk a load free. This type of operation may cause heavy loads, in excess of rated capacity, which may result in failure of rope, winch, or vehicle structure.
27. Whenever possible, install the winch in a location that is not immediately adjacent to a normal operator's station.
28. All winch controls shall be located within easy reach of the operator. The controls shall be installed in such a location that the operator is removed from the electrical path to ground if the load, rigging, or wire/synthetic rope come in contact with or within proximity to an electrically energized conductor.
29. Before operating the winch, be sure ALL safety procedures for the equipment or vehicle the winch is mounted on are properly followed and/or in place.

GENERAL SAFETY RECOMMENDATIONS

Safety informational callouts used in this manual include the following:

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.

- The user shall ensure that the operating personnel are given the necessary training.
- The operator shall always work in compliance with operating instructions.
- A motor spool (open center) directional control valve is required for brake operation.
- Clutch must be fully engaged before starting the winch.
- Do not disengage clutch under load.
- Stay out from under and away from raised loads.
- Stand clear of rope while pulling. Do not try to guide rope.
- Do not use winch to lift, support or otherwise transport personnel.
- Recovery winches are not designed to hold the load during transport. Always strap the load securely to the truck or trailer bed. Do not use winch as a tiedown.

- Avoid conditions where load shifts or jerks occur, as this can shock load the winch. Excessive “inching” shall be avoided.

User’s Responsibilities:

1. Use only a motor spool (open center) control valve per hydraulic system requirements.
2. If a remote-operated winch control valve is used, refer to hydraulic system requirements for emergency stop components to be installed.
3. Adjust system relief pressure per hydraulic system requirements.
4. Install winch per instructions provided.
5. Use wire or synthetic rope specifications, diameters and lengths only as recommended per winch model.
6. Install wire or synthetic rope as instructed using factory approved anchor systems.

THEORY OF OPERATION

DESCRIPTION OF WINCH

The winch consists of four basic assemblies:

1. Hydraulic motor, brake valve block and counterbalance cartridges
2. Static brake assembly
3. Drum assembly
4. Gear train

The hydraulic motor is bolted to the motor adapter which, in turn, is bolted to the brake cylinder end plate of the winch. The drum assembly is supported on each end by an anti-friction ball bearings. The ball bearings are located in the end plates and the end plates are connected by two tie plates. The dual stage planetary reduction multiplies motor torque and delivers it to the drum. The drum features either an anchor hole with two setscrews or a dual anchor pocket with wedge anchor for winding rope onto the drum in either direction.

DESCRIPTION OF DUAL BRAKE SYSTEM

Dynamic Brake

The dynamic brake system consists of two basic

components:

1. Brake valve block and counterbalance cartridges
2. Hydraulic motor

The counterbalance cartridges are installed into a brake valve block which also contains an internal shuttle valve. The shuttle valve directs hydraulic pressure to the brake release port of the winch when the winch is operated in either direction.

Static Brake

The static brake consists of three basic parts groups:

1. Spring-applied, multiple friction disk brake pack
2. Solid brake coupling
3. Hydraulic brake cylinder and spring plate

The brake pack consists of alternately stacked friction and steel brake disks. The steel brake disks are externally splined to the winch and cannot rotate. The friction disks are internally splined to the brake coupling. When the winch is not being operated, spring force compresses the brake pack and locks the brake coupling to the winch, preventing the gear train or drum from rotating in either

THEORY OF OPERATION

direction. The solid brake coupling makes the static brake effective both directions. This means the static brake must be released before the winch can operate in either the reel in or reel out direction.

The static brake is released by pilot pressure applied to the brake cylinder. It releases at a pressure lower than that required to open the pilot-operated counterbalance cartridge. This sequence assures that dynamic braking is accomplished by the counterbalance cartridge and that little heat, if any, is absorbed by the friction brake.

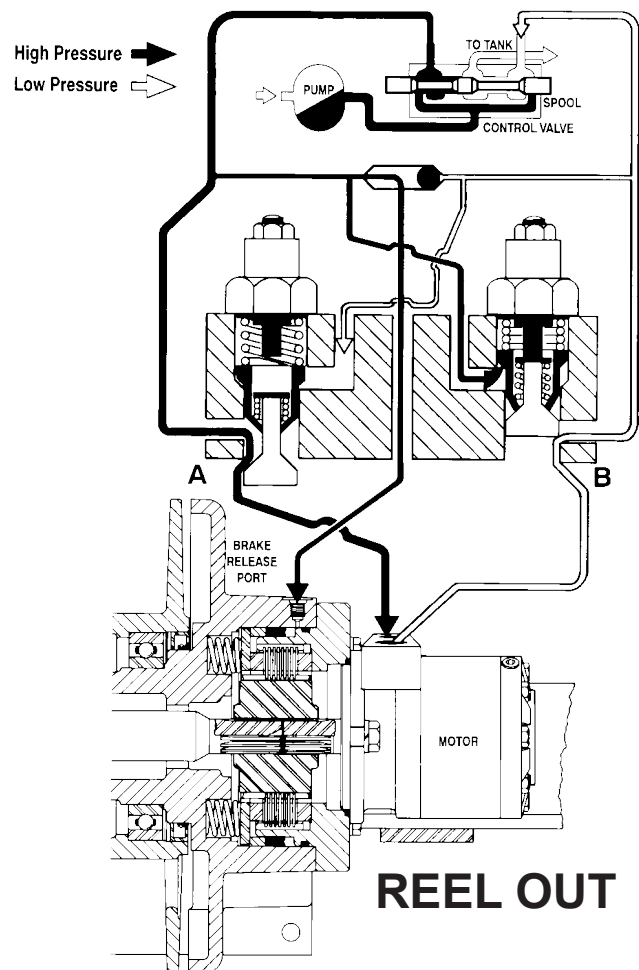
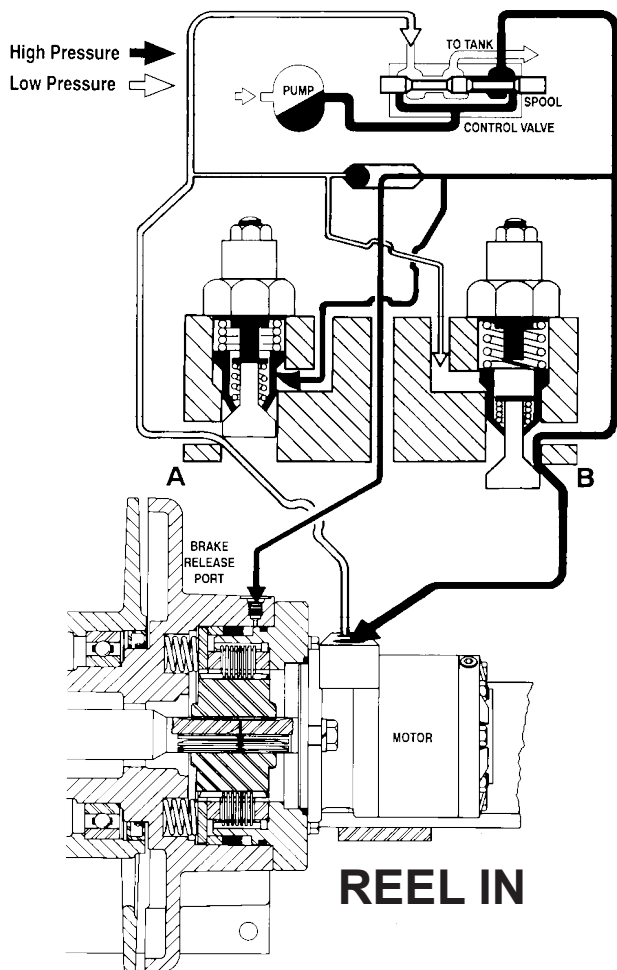
OPERATION OF DUAL BRAKE SYSTEM

Because the static brake on this winch is effective both directions, the brake must be hydraulically released to operate the winch in either the reel in or reel out direction.

This also means rope can be wound onto the drum in either direction without any modifications to the winch.

When the winch is powered in either direction, the motor cannot rotate until sufficient pilot pressure is present to open the correct counterbalance cartridge. The friction brake will completely release at a pressure lower than required to open the counterbalance cartridge. The extent to which the cartridge opens will determine the amount of oil that can flow through it and the speed at which the drum will turn. Increasing the flow of oil to the winch motor will cause the pressure to increase and the opening in the cartridge to enlarge, speeding up the cable drum. Decreasing this flow causes the pressure to drop and the opening in the cartridge to decrease, slowing down the cable drum.

When the control valve is returned to the neutral or center position, pressure will rapidly drop and the counterbalance cartridge will close, stopping the load. The friction brake will engage and hold the load after the cartridge is closed.



FREE-SPOOL CLUTCH INSTRUCTIONS

⚠ WARNING ⚠

Visually check that clutch and clutch handle are fully engaged, before operating the winch drum under load. Do not attempt to move the clutch shift handle with a load on the cable.

Do not use “cheaters” to extend the shift handle length or other means to apply undue force on the shift handle. A partially engaged drum clutch may jump out of engagement causing a sudden loss of load control which may result in property damage, severe personal injury, or death.

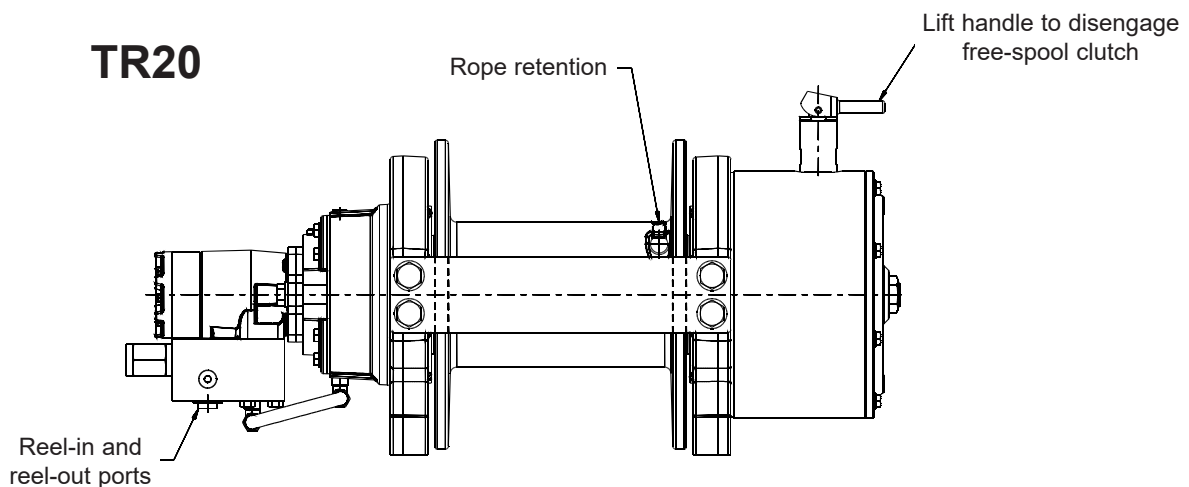
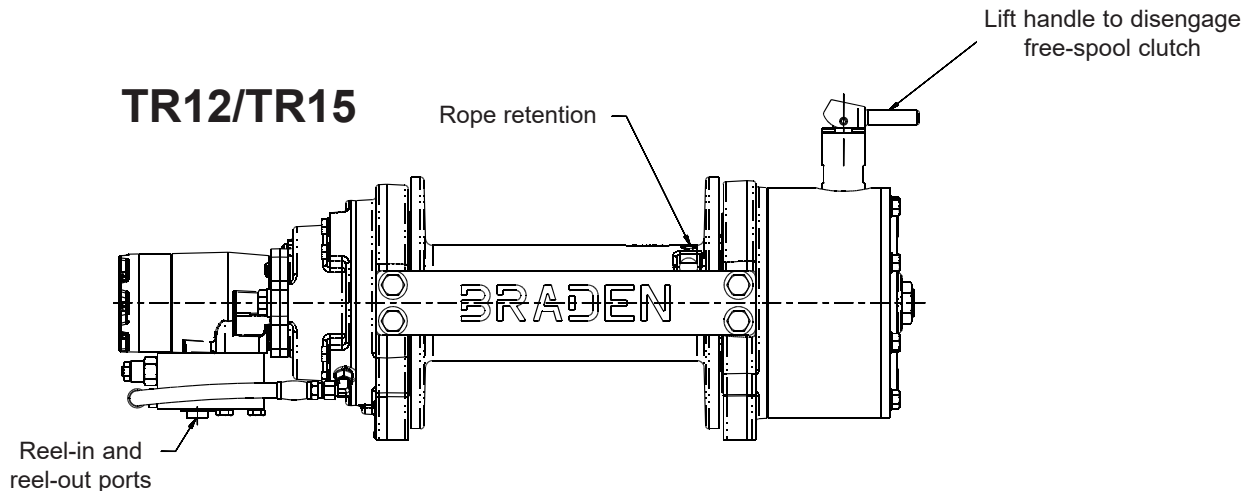
PROCEDURE FOR SHIFTING MANUAL CLUTCH

A. To Disengage Clutch (Activate Free-spool)

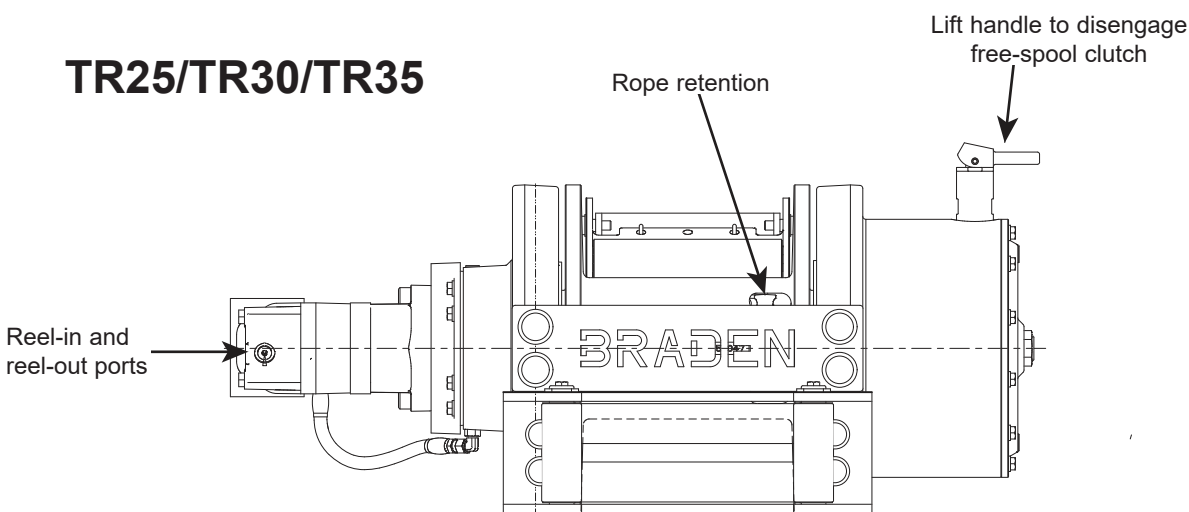
1. Ensure winch motor is not running and the drum is not loaded. The prime mover (hydraulic supply) is stopped in neutral with parking brake set.
2. Lift clutch shift handle to disengage clutch. If shift handle has resistance to shift, drum may be manually rotated in the direction to payout cable relieving the self-energized load and allowing the shift.

B. To Engage Clutch

1. Ensure winch motor is not running and the drum is not loaded. The prime mover is stopped in neutral with parking brake set.
2. Lower shift handle to engage clutch. If shift handle does not lay flat against the shift housing, the clutch is not fully engaged. At this point it may be necessary to rotate the drum slightly in either direction to align clutch.



FREE-SPOOL CLUTCH INSTRUCTIONS



HYDRAULIC SYSTEM REQUIREMENTS

1. Motor spool (open center) control valve.
2. Emergency stop:
 - a. If winch is controlled by a direct-operated manual valve, that valve serves as the E-stop.
 - b. If a remote operated control valve is used, a solenoid-operated hydraulic dump valve, normally open to tank, and an emergency stop switch (to open the dump valve) is required. The E-stop switch is to be normally closed and must be easily accessible to the operator.
3. Relief valve set to no more than 100 psi over maximum operating pressure of the winch.
4. Flow rate should not exceed the maximum rating of the winch.
5. Hydraulic fluid with 150 to 330 SUS viscosity at 100°F (38°C). Maximum operating temperature 180°F (82°C). Cleanliness level of ISO 18/13 should be adequate for motors used on BRADEN products.

WINCH INSTALLATION

1. The winch should be mounted with the centerline of the drum in a horizontal position. The clutch actuator may be indexed at time of order for best fit.
2. Hydraulic lines and components that operate the winch should be of sufficient size to assure minimum back pressure at the winch. The motor manufacturer recommends that back pressure not exceed 100 PSI (6.9 bar) for optimum motor seal life. To limit potential problems arising from high back pressures, the motor should be externally drained directly to tank to improve motor seal life. For back pressures exceeding 150 PSI (10.3 bar), consult Arrowhead Winch Technical Support.
3. 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 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 (11°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). 120°F to 140°F (49°C to 60°C) is generally considered optimum.

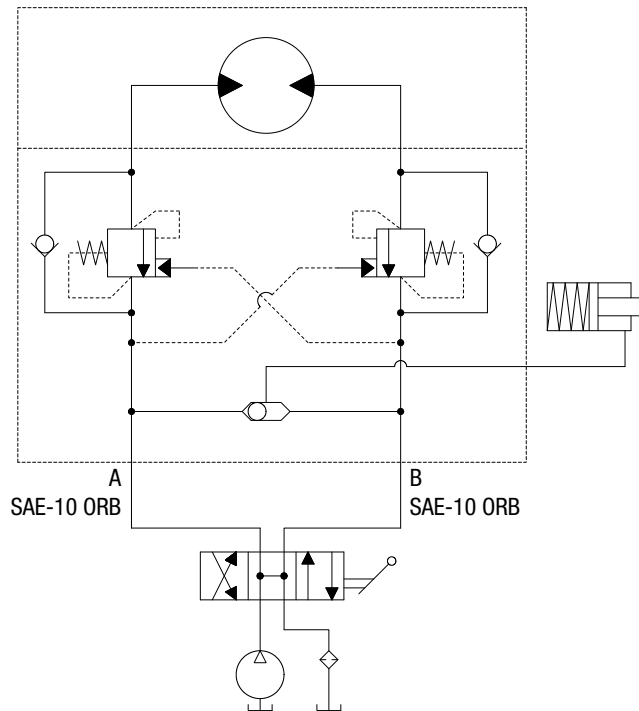
In general terms; for continuous operation at ambient temperatures between 50°F and 110°F (10°C and 43°C), use SAE 20W; for continuous operation between 10°F and 90°F (-12°C and 32°C), use SAE 10W; for applications colder than 10°F (-12°C), contact Arrowhead Winch Technical Support. The use of multiviscosity oils is generally not recommended.

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

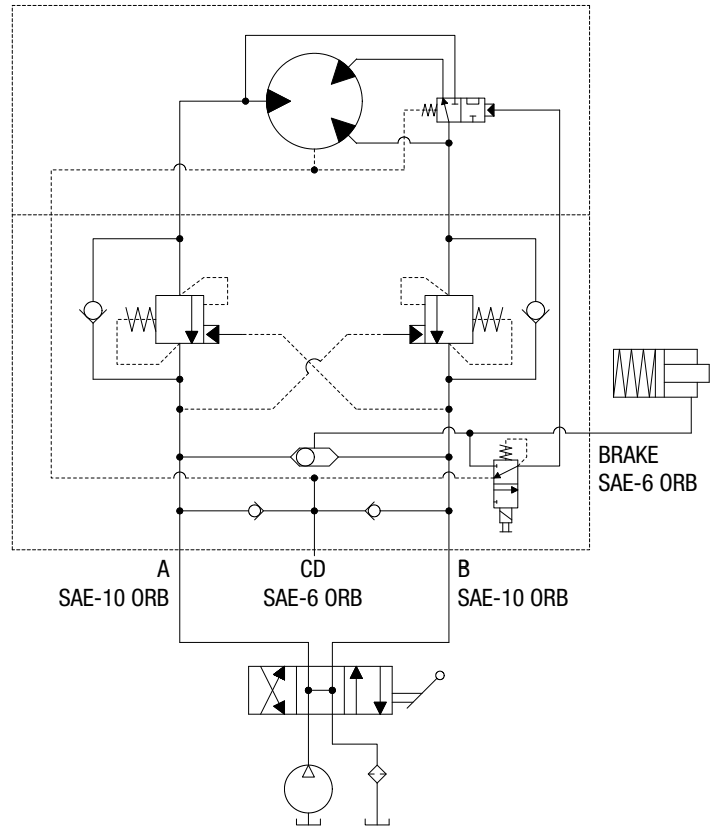
WINCH INSTALLATION

HYDRAULIC CIRCUIT

SINGLE-SPEED MOTOR SCHEMATIC



TWO-SPEED MOTOR SCHEMATIC



WIRE AND SYNTHETIC ROPE INSTALLATION

This document provides instructions on installing wire and synthetic rope using various anchoring methods.

⚠ WARNING ⚠

Wire and synthetic rope anchors alone are not designed to hold rated loads. Loads applied directly to the anchor may cause the rope to pull free and result in the sudden loss of load control, property damage, serious injury or death.

⚠ WARNING ⚠

A minimum number of five wraps of wire rope or eight wraps of synthetic rope must be on the drum to handle full rated load. We suggest that the last five wraps of wire rope or eight wraps of synthetic rope be painted or marked bright red to serve as a visual warning.

SETSCREWS — WIRE ROPE

If the drum is designed with a cast-in, pass-through hole with 2 setscrews, follow these steps:

1. Determine the proper direction to wrap rope onto the drum.
2. Insert rope into the anchor hole until it is even with the other end of the hole.
3. Coat 2 anchor setscrew threads with antiseize compound and then tighten to recommended torque.
4. Wind rope onto the drum.

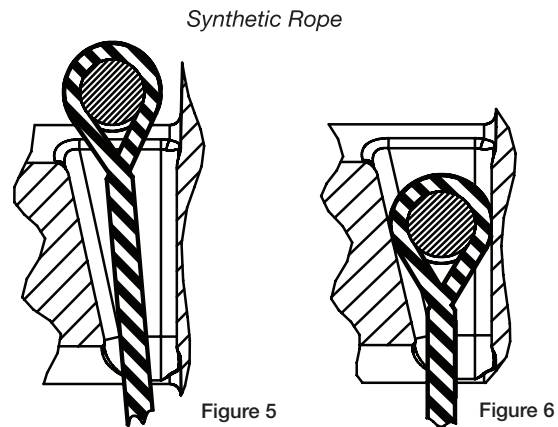
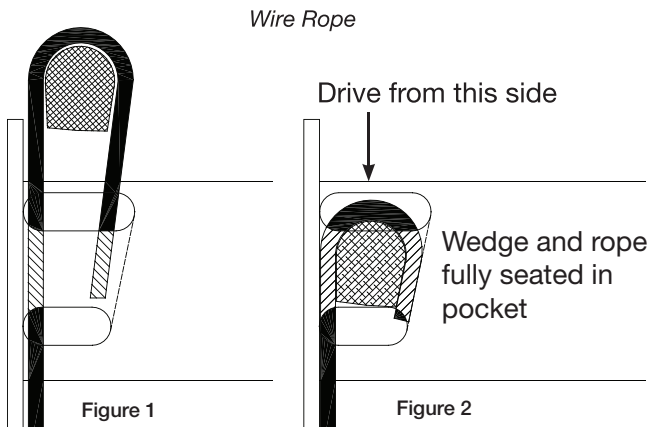
WIRE AND SYNTHETIC ROPE INSTALLATION

WEDGE ANCHOR — WIRE ROPE

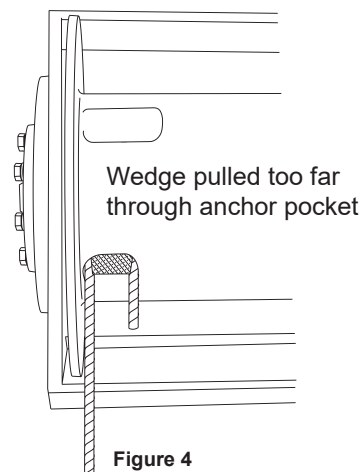
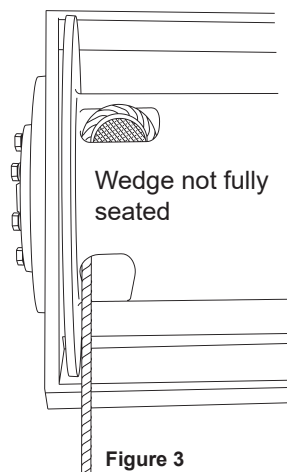
If the drum is designed with an anchor pocket, following these steps:

1. Make sure the anchor pocket and wedge are 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 (i.e. tape or wire) must not be in contact with the wedge when the installation is complete.
2. Take the free end of the wire rope and insert it through the small opening of the anchor pocket.
3. Loop the wire rope and push the free end about 3/4 of the way back through the pocket.
4. Install the wedge as shown in Figure 1 then pull the slack from the cable.
5. The “dead” end of the rope should extend slightly beyond the end of the wedge as shown in Figure 2.
6. Using a hammer and brass drift, drive the wedge as deep into the pocket as possible to ensure it is fully seated.
7. Check to ensure the wedge does not protrude from either end of the pocket, which will cause it to interfere with proper spooling of rope onto the drum (see Figures 3 and 4).

Correct Installations



Incorrect Installations



- Rope not tight against wedge
- Wedge may be too large
- “Dead” end of rope and/or wedge may interfere with proper spooling
- Wedge may be too small

WIRE AND SYNTHETIC ROPE INSTALLATION

WEDGE ANCHOR — SYNTHETIC ROPE

If the drum is designed with an anchor pocket approved for use with synthetic rope, follow these steps:

1. Make sure the anchor pocket and wedge are clean and dry. The end of the synthetic rope being anchored to the drum must be clean and dry and not frayed.
2. Make sure you are using the correct wedge anchor for synthetic rope.
3. Splice an eye at the end of the rope to be inserted into the anchor pocket. It is recommended to wrap the eye with electrical tape to allow the rope to slide into the pocket easily.
4. Insert the eye through the small opening of the anchor pocket.
5. Place the wedge anchor inside the eye of the rope and make sure the rope is seated within the flanges of the anchor as shown in Figure 5.
6. Apply approximately 5% of the load rating to the rope to fully seat the wedge into the anchor pocket as shown in Figure 6.
7. Check to ensure the wedge does not protrude from either end of the pocket, which will cause it to interfere with proper spooling of rope onto the drum (see Figures 3 and 4).

NOTE: For best performance, synthetic rope should not be installed on drums that have previously had wire rope installed.

Wire Rope Diameters by Model:

TR12 - 7/16" (11 mm), 1/2" (13 mm)

TR15 - 7/16" (11 mm), 1/2" (13 mm)

TR20 - 1/2" (13 mm), 9/16" (14 mm), 5/8" (16 mm)

TR25 - 1/2" (13 mm), 9/16" (14 mm), 5/8" (16 mm)

TR30 - 5/8" (16 mm)

TR35 - 3/4" (19 mm)

PN113566 1/2" (13 mm) x 170 ft (51.8 m)

PN113656 1/2" (13 mm) x 210 ft (64.0 m)

PN113657 9/16" (14 mm) x 120 ft (36.6 m)

PN113658 9/16" (14 mm) x 150 ft (45.7 m)

PN113567 9/16" (14 mm) x 190 ft (57.9 m)

PN113659 5/8" (16 mm) x 80 ft (24.4 m)

PN113569 5/8" (16 mm) x 110 ft (33.5 m)

PN113660 5/8" (16 mm) x 130 ft (39.6 m)

Synthetic Rope Options by Model:

TR12/TR15*

PN113564 7/16" (11 mm) x 130 ft (39.6 m)

PN113565 1/2" (13 mm) x 90 ft (27.4 m)

TR20/TR25**

PN113565 1/2" (13 mm) x 90 ft (27.4 m)

PN113655 1/2" (13 mm) x 130 ft (39.6 m)

TR30**

PN113659 5/8" (16 mm) x 80 ft (24.4 m)

PN113569 5/8" (16 mm) x 110 ft (33.5 m)

PN113660 5/8" (16 mm) x 130 ft (39.6 m)

PN113568 5/8" (16 mm) x 180 ft (54.9 m)

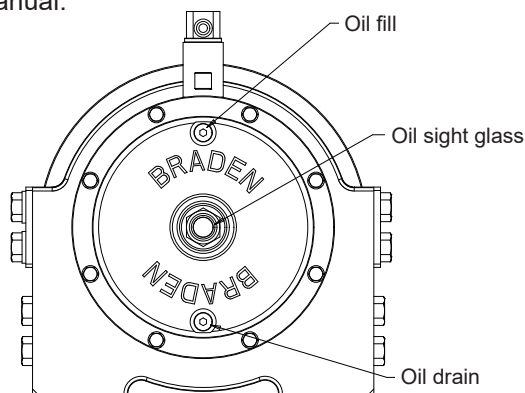
*Synthetic Rope Anchor PN113403 required.

**Synthetic Rope Anchor PN113316 required.

PREVENTIVE MAINTENANCE

1. Oil Level

The gear oil level should be checked weekly. Use sight glass to check oil level. The level should be within the upper and lower limits of the glass. If additional oil is needed, refer to the Preventive Maintenance section of this manual.



2. Oil Change

The gear oil should be changed after the first three months of use, then annually. The gear oil must be changed to remove wear particles that erode bearings, gears and seals.

3. Vent Plug

The vent plug is located at the motor mount area. It is important to keep this vent clean and unobstructed. Whenever gear oil is changed, remove vent plug, clean in solvent and reinstall.

Do not paint over the vent or replace with a solid plug.

4. Mounting Bolts

Retorque winch mounting hardware after the first three months of use, then annually.

PREVENTIVE MAINTENANCE

5. Rope

Inspect entire length of rope according to rope manufacturer's recommendations monthly.

6. Hydraulic Power Supply

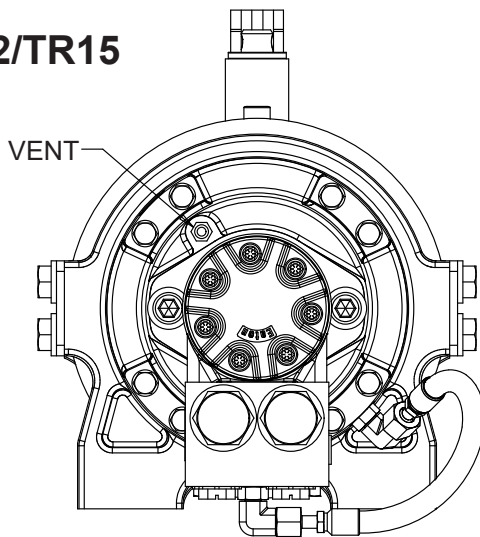
Change hydraulic system filter according to hydraulic pump manufacturer's recommendations.

7. Warm-up Procedure

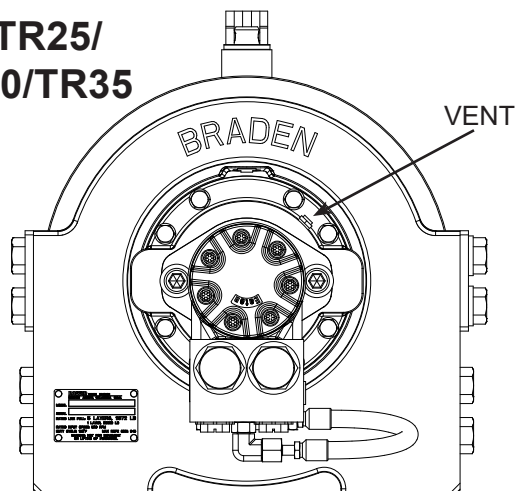
A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below +40°F (4°C).

The hydraulic power supply should be run at its lowest recommended RPM with the hydraulic winch control valve in neutral allowing sufficient time to warm up the system. The winch 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.

TR12/TR15



TR20/TR25/
TR30/TR35



⚠ WARNING ⚠

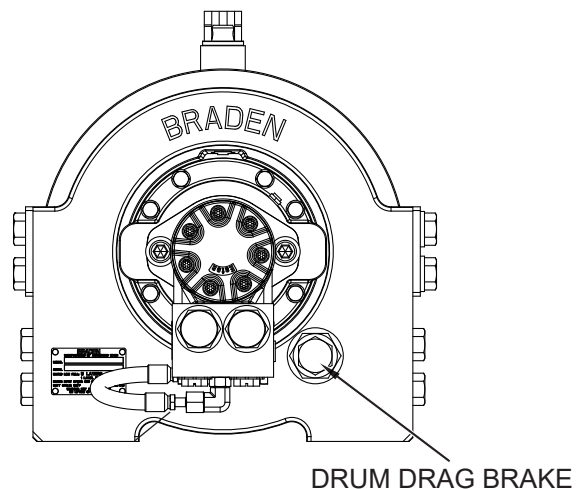
Failure to properly warm up the winch, particularly under low ambient temperature conditions, may result in temporary brake slippage due to high back pressures attempting to release the brake, which could result in property damage, severe personal injury, or death.

8. Drum Drag Brake

Some TR Series winches are equipped with an optional drum drag brake in the end housing to control drum over-spin or "birdnest."

To adjust the drag brake, first disengage the manual clutch (see page 9). Loosen the jam nut and back out the spring housing until the winch drum turns freely. Tighten the spring housing ONLY until the desired amount of drum drag is obtained. Hold the spring housing in place and tighten the jam nut.

Excessive drag will accelerate wear on the brake disc and result in additional force being required to pull cable off the drum by hand. After adjustment, observe the position of the spring housing in relation to the drum flange. If the spring housing is within 1/16 inch (1.6 mm) of the drum flange, the disc is worn beyond its service limit and should be replaced. When replacing the disc, also measure the spring free length. If the spring free length is 1-1/8 inch (28.6 mm) or less, the spring should also be replaced.



⚠ WARNING ⚠

The drum drag brake is NOT intended to hold or control the winch load. Attempting to hold a load with the drag brake may cause a loss of load control, which could result in property damage, injury or death.

PREVENTIVE MAINTENANCE

9. Recommended Planetary Gear Oil

Field experience, supported by engineering endurance tests, indicates that the use of the proper gear oil and a program of regular preventive maintenance will help provide extended gear-train life and reliable winch brake performance. For this reason, Arrowhead Winch has published the following specifications to assist in determining which lubricant is best suited to your application.

For simplicity, Arrowhead Winch 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 below.

RECOMMENDED PLANETARY GEAR OIL

The use of proper gear oil, in conjunction with employing a preventative maintenance program, may extend the life of your BRADEN planetary winch, hoist or drive while ensuring safe and reliable operation.

The gear oils detailed below have been factory tested to meet BRADEN specifications within different ambient temperature ranges. If these products are not available in your area, an equivalent lubricant may perform equally well, although it has not been factory tested to ensure compatibility with BRADEN products.

! WARNING !

Failure to use the proper type and viscosity of planetary gear oil may contribute to intermittent brake clutch slippage, which could result in the sudden loss of load control, property damage, serious injury or death.

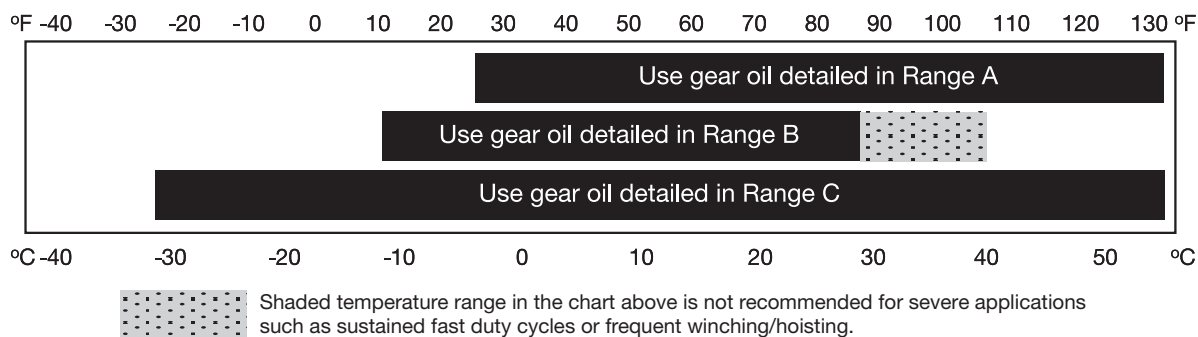
! WARNING !

Some gear lubricants contain large amounts of EP (Extreme Pressure) and anti-friction additives, which may damage brake friction discs or seals. **DO NOT** use oil labeled as meeting "API Service GL-5."

! 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



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	

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

TROUBLESHOOTING

The following troubleshooting section is provided as a general guide. You may also need to contact the original equipment manufacturer (OEM) for additional information.

! WARNING !

If a winch exhibits any sign of:

- Erratic operation such as poor load control, load creep, or chatter
- Unusual noise
- Oil leaks
- A sudden increase in wear particles from oil analysis

Then the winch **MUST** be removed from service until the problem has been corrected. If a winch has been subjected to a sudden heavy load (shock-load) or overload, the winch must be removed from service, disassembled, and all internal components thoroughly inspected for damage. Continued operation with a defect may result in loss of load control, property damage, injury, or death.

TROUBLE	PROBABLE CAUSE	REMEDY
A Winch will not reel out under load or does not reel out 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 causing erratic brake valve operation. NOTE: Some brake valves do not use a separate pilot orifice plug. 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 winch vent plug. 3. Friction brake will not release as a result of damaged brake discs.	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 inches (.5 mm). Clean and install the pilot orifice tightly in the brake valve. Check brake cylinder seal as follows: A. Disconnect the hose from the brake release port. Connect a hand pump with accurate 0–2,000 PSI (0–137.9 bar) gauge and shut-off valve to the fitting in the brake release port. B. Apply 1,000 PSI (68.9 bar) 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 Brake Service section of this manual. Disassemble brake to inspect brake discs. Check stack-up height as described in Brake Service section of this manual.

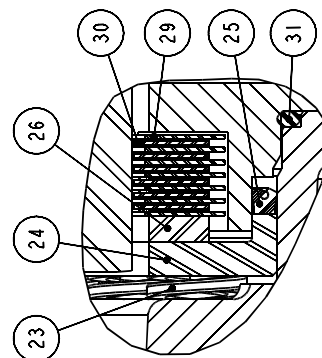
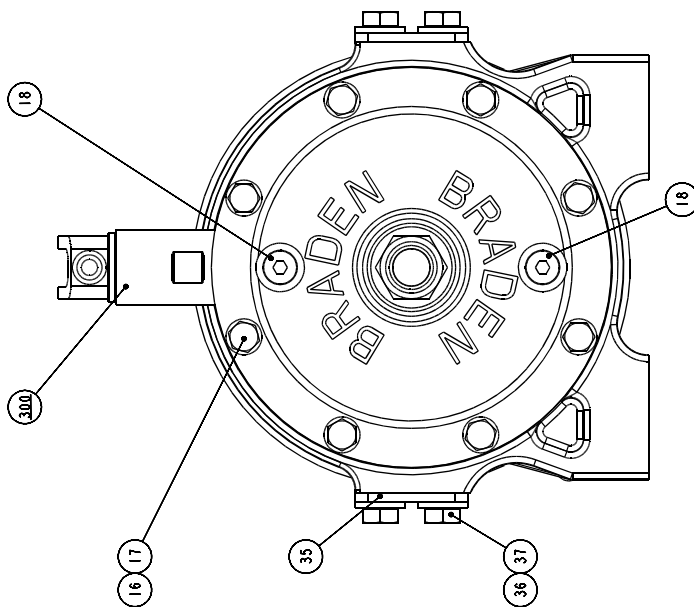
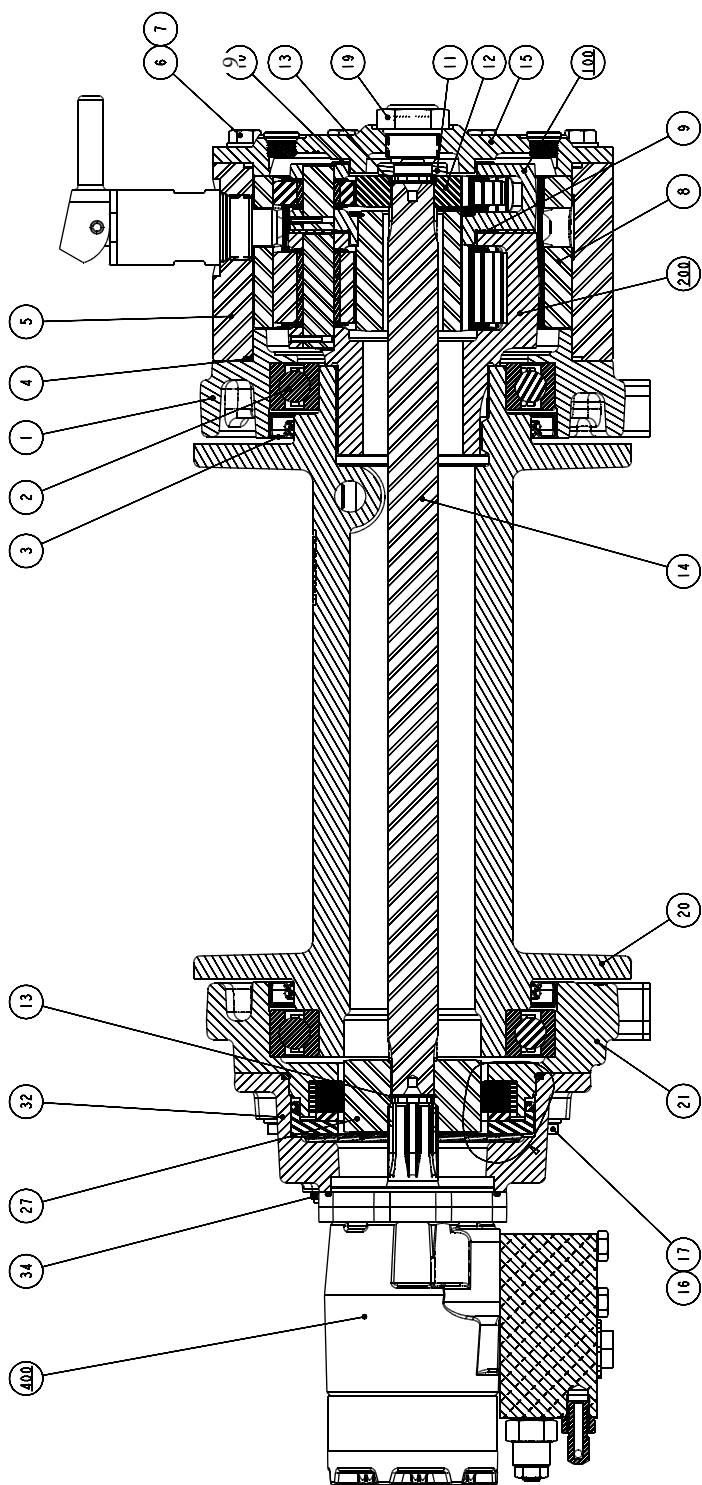
TROUBLE	PROBABLE CAUSE	REMEDY
B Oil leaks from vent plug.	1. Same as A2. 2. Motor seal may be defective as a result of high back pressure in the motor case drain circuit or contaminated oil. Contamination will usually cause the seal to wear a groove in the motor shaft.	Same as A2. Case drain back pressure must not exceed 100 PSI (6.9 bar) for gear motors and 44 PSI (3 bar) for piston motors. Inspect hydraulic power supply for a restriction in the return line to the reservoir. Oil analysis may indicate contamination has worn motor shaft and seal. Thoroughly flush entire hydraulic power supply and install new filters and oil. Install new motor seal.
C 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 discs are slipping.	The pressure at the motor reel-out port is also transmitted to the brake release pilot circuit. Inspect hydraulic circuit for restrictions, plugged filters or control valves not centering. Same as A3. Improper planetary gear oil may cause the brake discs to slip. Drain old gear oil and flush winch with solvent. Thoroughly drain solvent and refill winch with recommended planetary gear oil listed in Preventive Maintenance section of this manual.
D Winch does not reel in the rated load.	1. The winch may be mounted on an uneven or flexible surface which causes distortion of the winch base and binding of the gear train. Binding in the gear train will absorb horsepower needed to winch the rated load and cause heat. 2. Hydraulic power supply relief valve may be set too low. Relief valve needs adjustment or repair.	Reinforce mounting surface. If necessary, use shim stock to level winch. Refer to Winch Installation section of this manual. First loosen, then evenly retighten all winch mounting bolts to recommended torque. Check relief pressure as follows: A. Install an accurate 0–5,000 PSI (0–344.7 bar) gauge into the inlet port of the brake valve. B. Apply a stall pull load on the winch while monitoring pressure. C. Compare gauge reading to winch 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.

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble "D" Continued From Previous Page	3. Be certain hydraulic power supply temperature is not more than 180°F (82°C). Excessive hydraulic oil temperatures increase motor internal leakage and reduces motor performance. 4. Winch line-pull rating is based on first layer of wire/synthetic rope. 5. Rigging and sheaves not operating efficiently.	Same as D1 and D2. Same as remedies for Trouble E2. Refer to winch performance charts for additional information. Perform rigging service as recommended by crane manufacturer.
E Winch runs hot.	1. Same as D1. 2. Be certain that the hydraulic power supply temperature is not more than 180°F (82°C). Excessive hydraulic oil temperatures may be caused by: A. Plugged heat exchanger. B. Too low or too high oil level in hydraulic reservoir. C. Same as D2. D. Hydraulic pump not operating efficiently. E. Hydraulic oil is wrong viscosity for operating conditions. 3. Excessively worn or damaged internal winch parts.	Same as D1. Thoroughly clean exterior and flush interior. Fill/drain to proper level. Same as D2. Engine low on horsepower or RPM Tune/adjust engine. Check suction line for damage. Pump worn. Replace pump Use correct hydraulic oil Disassemble winch to inspect and/or replace worn parts.
F Winch chatters or surges while lifting rated load.	1. Same as D2 2. Hydraulic oil flow to motor may be too low. 3. Controls being operated too quickly.	Same as D2 Same as E2. Conduct operator training as required.

TROUBLE	PROBABLE CAUSE	REMEDY
G Wire/synthetic rope does not spool smoothly on the drum.	1. The winch may be mounted too close to the fairlead, causing the fleet angle to be more than 1-1/2 degrees. 2. Could be using the wrong lay rope. There is a distinct advantage in applying rope of the proper wind or lay. When the load is slacked off, the several wraps 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 winching 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. 3. The winch may have been overloaded, causing permanent set in the wire/synthetic rope.	Check mounting distance and fleet angle. Reposition winch as required to achieve 1/2 to 1-1/2 degree fleet angle. Consult wire/synthetic rope manufacturer for recommendation of wire/synthetic rope that best suits your application. Replace wire/synthetic rope and conduct operator/rigger training as required.

TR12/TR15 CROSS-SECTION

Part numbers 09593 and 09717



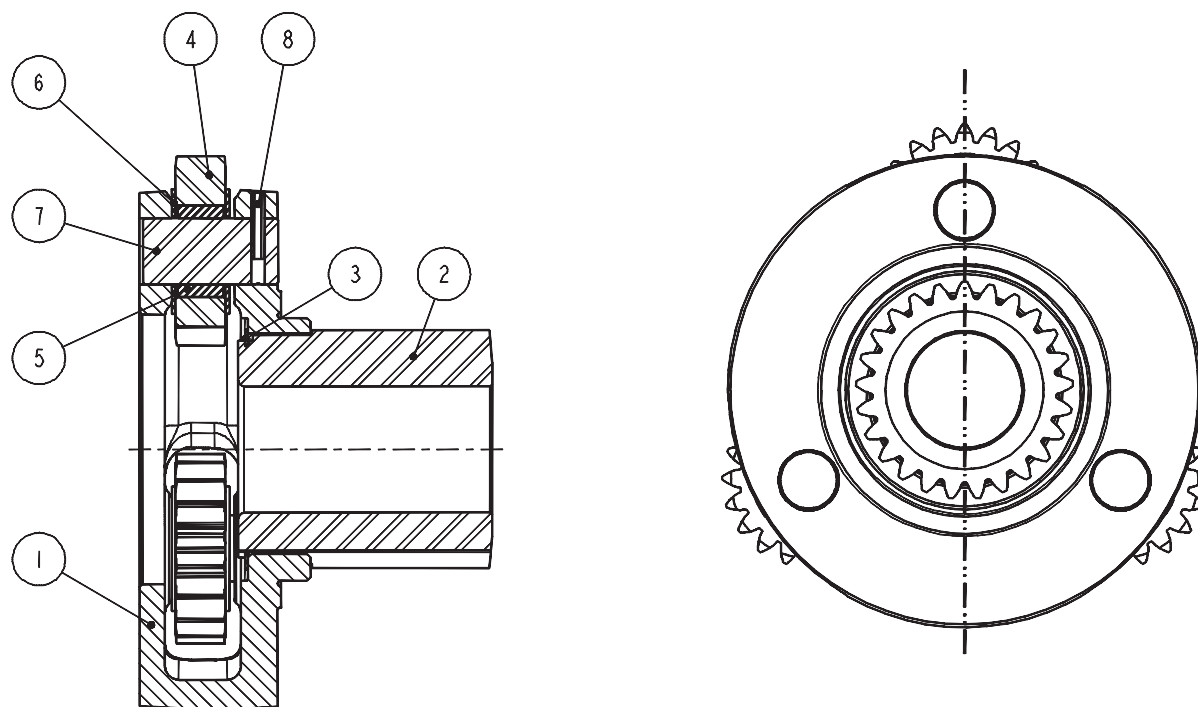
TR12/TR15 COMPONENTS

Part numbers 09593 and 09717

ITEM NO.	DESCRIPTION	PART NO.	QTY.
100	Primary carrier assembly	84763	1
200	Secondary carrier assembly	84764	1
300	Manual clutch assembly	84653	1
400	TR12 hydraulic motor assembly	65253	1
400	TR15 hydraulic motor assembly	65554	1
1	End plate	111915	1
2	Ball bearing	26998	2
3	Oil seal	25918	2
4	O-ring	10450	2
5	Gear housing	111921	1
6	Washer, hard	101440	8
7	Cap screw	104315	8
8	Ring gear	111916	1
9	Thrust washer, 2.50 3.25 .03	111638	2
11	Thrust washer	111926	1
12	Sun, primary	111906	1
13	Snap ring	27535	2
14	Drive, shaft	111904	1
15	Cover, gear housing	111941	1
16	Cap screw	21466	8
17	Washer	100858	8
18	Plug	25665	2
19	16574-0012 Sight gauge	70193	1
20	Drum, TR12A-01	111892	1
21	End plate, brake	111901	1
23	Spring	26094	12
24	Spring plate	25552	1
25	U-cup seal	25594	1
26	Brake plate spacer	25550	1
27	Brake hub	111544	1
29	Brake disc	102314	7
30	Friction disc	25541	6
31	O-ring	70138	1
32	Brake housing	111894	1
34	Relief valve	10074	1
35	Tie plate	111903	2
36	Washer	100859	8
37	Cap screw	104320	8
38	Setscrew (not shown)	24032	2
39	TR12 nameplate (not shown)	111976	1
39	TR15 nameplate (not shown)	112568	1
40	Drive screw (not shown)	11842	4
41	16496-4 Plug (not shown)	69325	1

TR12/TR15 PRIMARY CARRIER ASSEMBLY (100) CROSS-SECTION

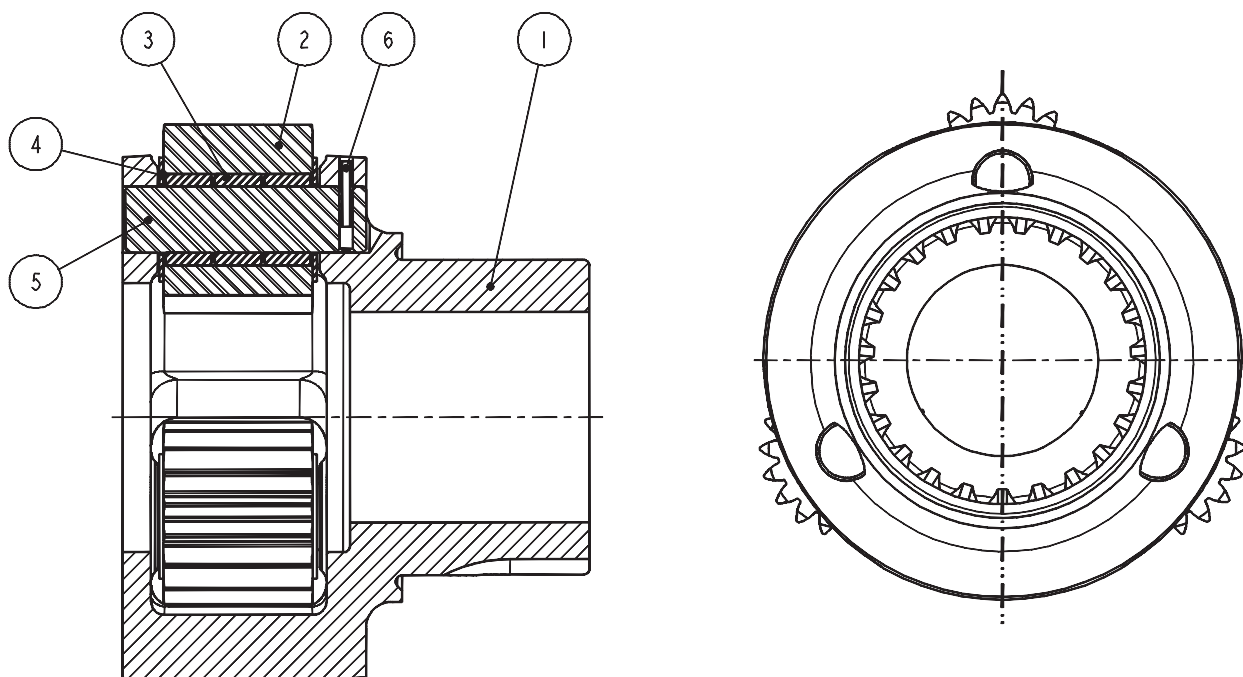
Part number 84763



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Carrier, primary	111927	1
2	Sun gear, secondary	111902	1
3	Retaining ring, external 2.06 .031	111664	1
4	Planet gear, primary	111905	3
5	Bearing roller	24915	3
6	Thrust washer	24914	6
7	Planet gear shaft	25543	3
8	Roll pin	11837	3

TR12/TR15 SECONDARY CARRIER ASSEMBLY (200) CROSS-SECTION

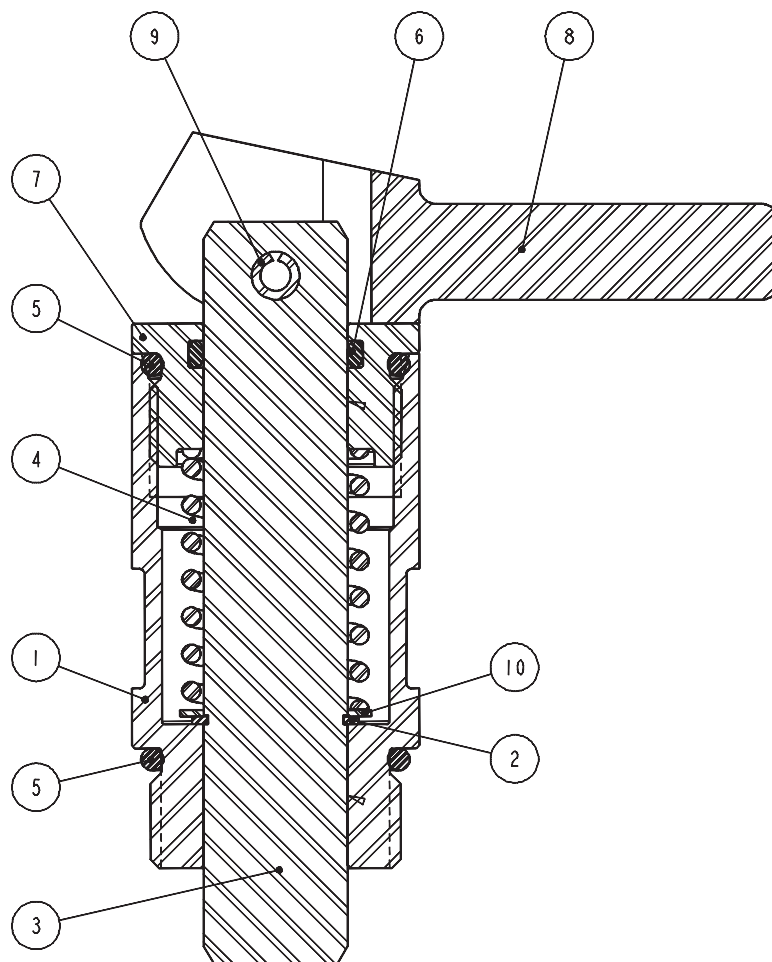
Part number 84764



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Carrier, secondary	111920	1
2	Planet gear, secondary	111907	3
3	Bearing roller	24915	9
4	Thrust washer	24914	6
5	Pin, secondary planet	111908	3
6	Roll pin	11837	3

TR12/TR15/TR20/TR25/TR30/TR35 MANUAL CLUTCH PARTS GROUP (300) CROSS-SECTION

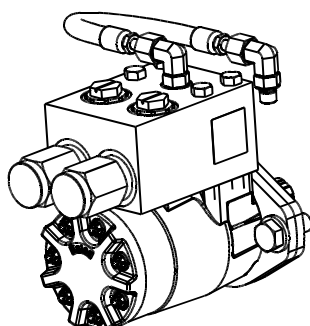
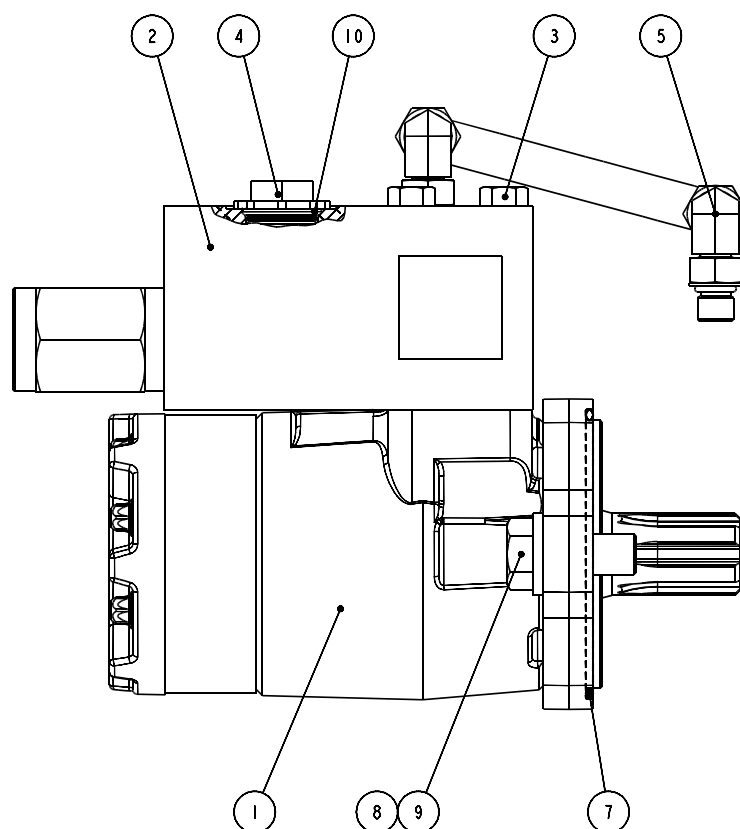
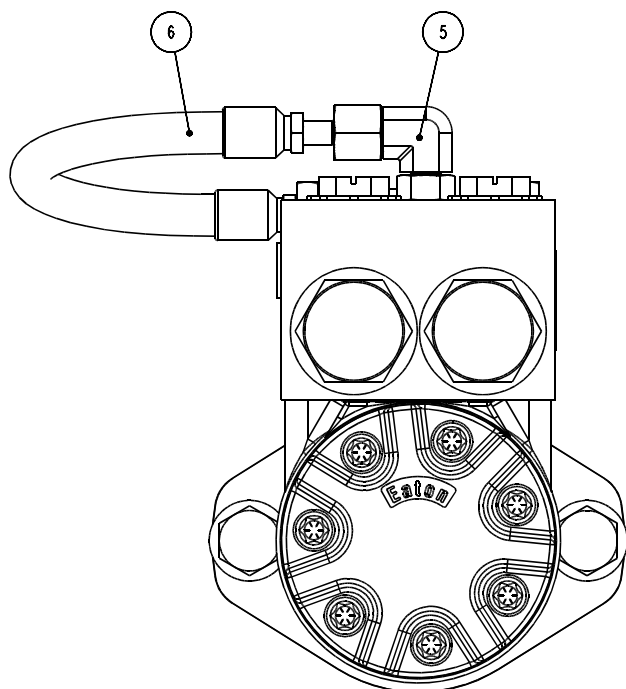
Part number 85143



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Housing, free-spool	111605	1
2	Retaining ring, external .75 .042	111791	1
3	Pin, free-spool	111604 (TR12/TR15/TR20/TR30) 114359 (TR25/TR35)	1
4	Spring .78 .98 .200L 32K	111402	1
5	O-ring	24186	2
6	O-ring	72098	1
7	Free-spool gland	111606	1
8	Cam handle	111607	1
9	Roll pin R25-125 SS	111670	1
10	Thrust washer .75 1.00 .032	112381	1

TR12/TR15 HYDRAULIC MOTOR PARTS GROUP (400) CROSS-SECTION

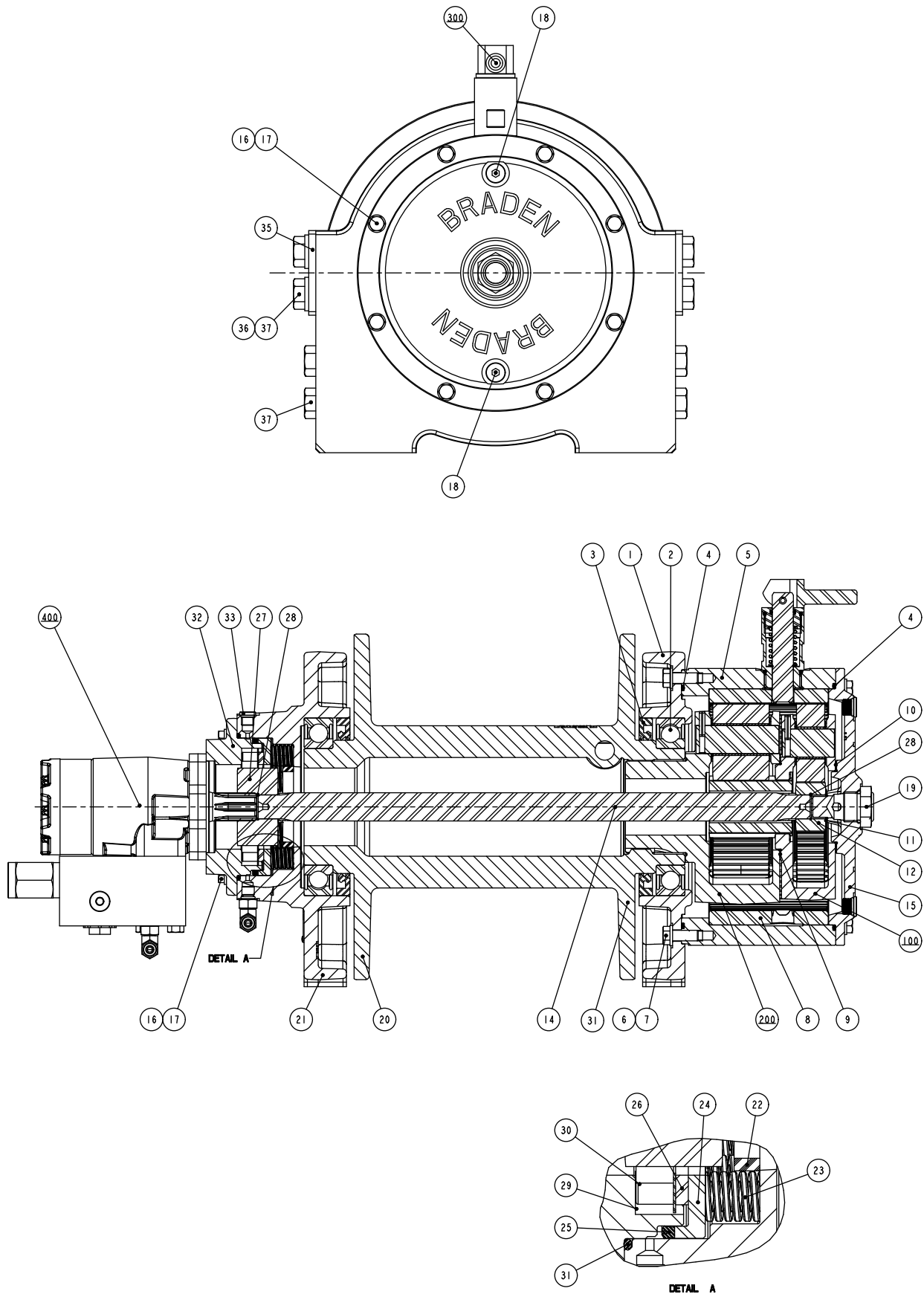
Part numbers 65253 and 65554



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	TR12 Motor, hydraulic	105183	1
1	TR15 Motor, hydraulic, C/L T. 9.6 CID	112567	1
2	Brake valve	108859	1
3	Cap screw	106032	4
4	Shipping plug	29965	2
5	Adapter, 90-degree elbow ORS/ORB	27430	2
6	Hose assembly, -4 ORFS X 10.0 long	104505	1
7	O-ring	29677	1
8	Washer	100859	2
9	Cap screw	103827	2
10	O-ring	24776	2

TR20 CROSS-SECTION

Part number 09613



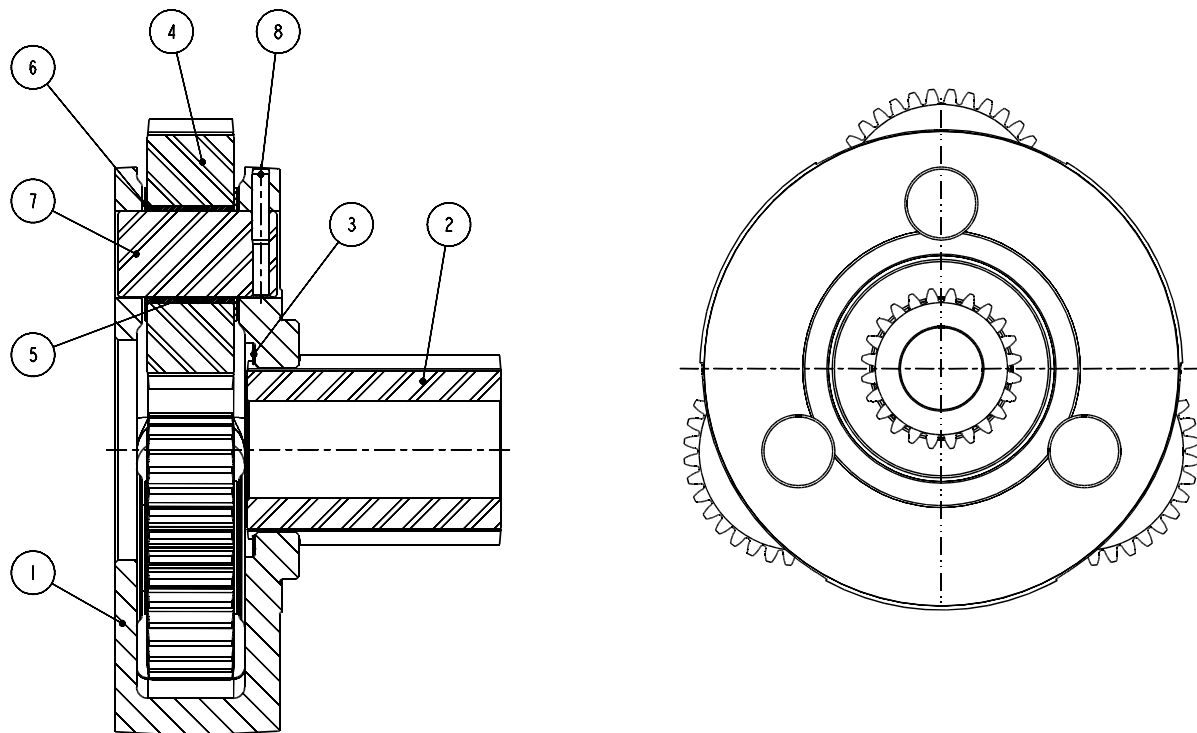
TR20 COMPONENTS

Part number 09613

ITEM NO.	DESCRIPTION	PART NO.	QTY.
100	Primary carrier assembly	84654	1
200	Secondary carrier assembly	84656	1
300	Manual clutch assembly (see page 24)	84653	1
400	Hydraulic motor assembly	65253	1
1	Endplate	111417	1
2	Ball bearing	29142	2
3	Seal, 4.72 6.30 .47	111497	2
4	O-ring	21033	2
5	Ring gear housing	111406	1
6	Washer, hard	101440	8
7	Capscrew	104309	8
8	Ring gear	111404	1
9	Thrust washer, 3.00 3.75 .03	111450	1
10	Thrust washer, 2.50 3.25 .03	111638	1
11	Thrust race	27718	1
12	Sun, primary	111422	1
13	Snap ring	27535	2
14	Drive shaft	111420	1
15	Housing cover	111414	1
16	Washer	100858	16
17	Capscrew	11766	16
18	Plug	25665	2
19	Sight gauge	70193	1
20	Drum, TR20A-01	111418	1
21	Brake endplate	112521	1
22	Spring locator	100136	1
23	Spring	26094	12
24	Spring plate	25552	1
25	U-cup seal	25594	1
26	Brake plate spacer	25550	1
27	Brake hub	111544	1
29	Brake disc	102314	7
30	Friction disc	25541	6
31	O-ring	70138	1
32	Motor adapter, SAE A2	112121	1
33	Plug -4	69325	1
34	Relief valve 1-5 PSI	10074	1
35	Tie plate	111419	2
36	Washer	100860	8
37	Capscrew	25119	8
38	Setscrew (not shown)	24032	2
39	TR20 nameplate (not shown)	111776	1
40	Drive screw (not shown)	11842	4

TR20 PRIMARY CARRIER ASSEMBLY (100) CROSS-SECTION

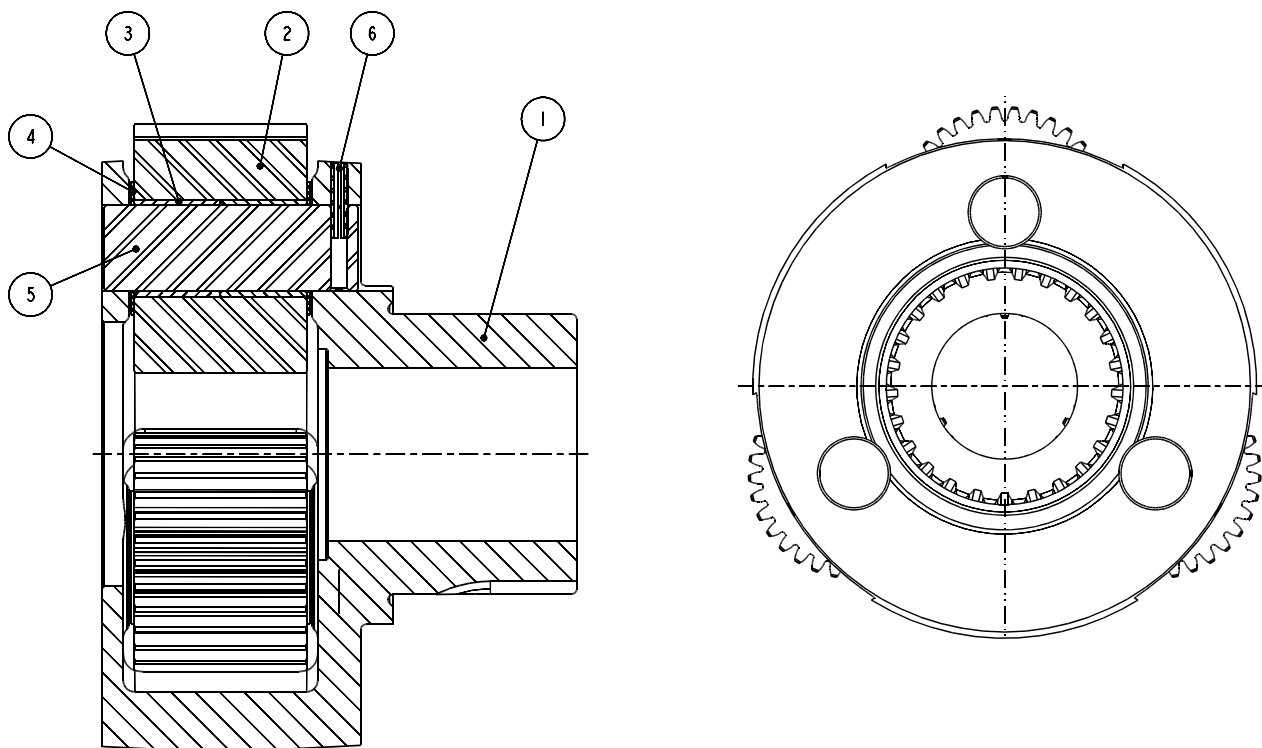
Part number 84654



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Primary planet gear carrier	111405	1
2	Sun gear, secondary	111413	1
3	Retaining ring, external 2.06 .031	111664	1
4	Primary planet gear	111408	3
5	Bushing, 1.00 1.13 1.00	111412	3
6	Thrust bearing	24167	6
7	Primary planet gear pin	111410	3
8	Rollpin	12005	3

TR20 SECONDARY CARRIER ASSEMBLY (200) CROSS-SECTION

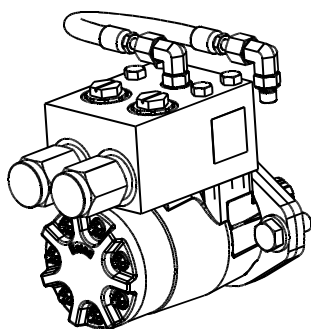
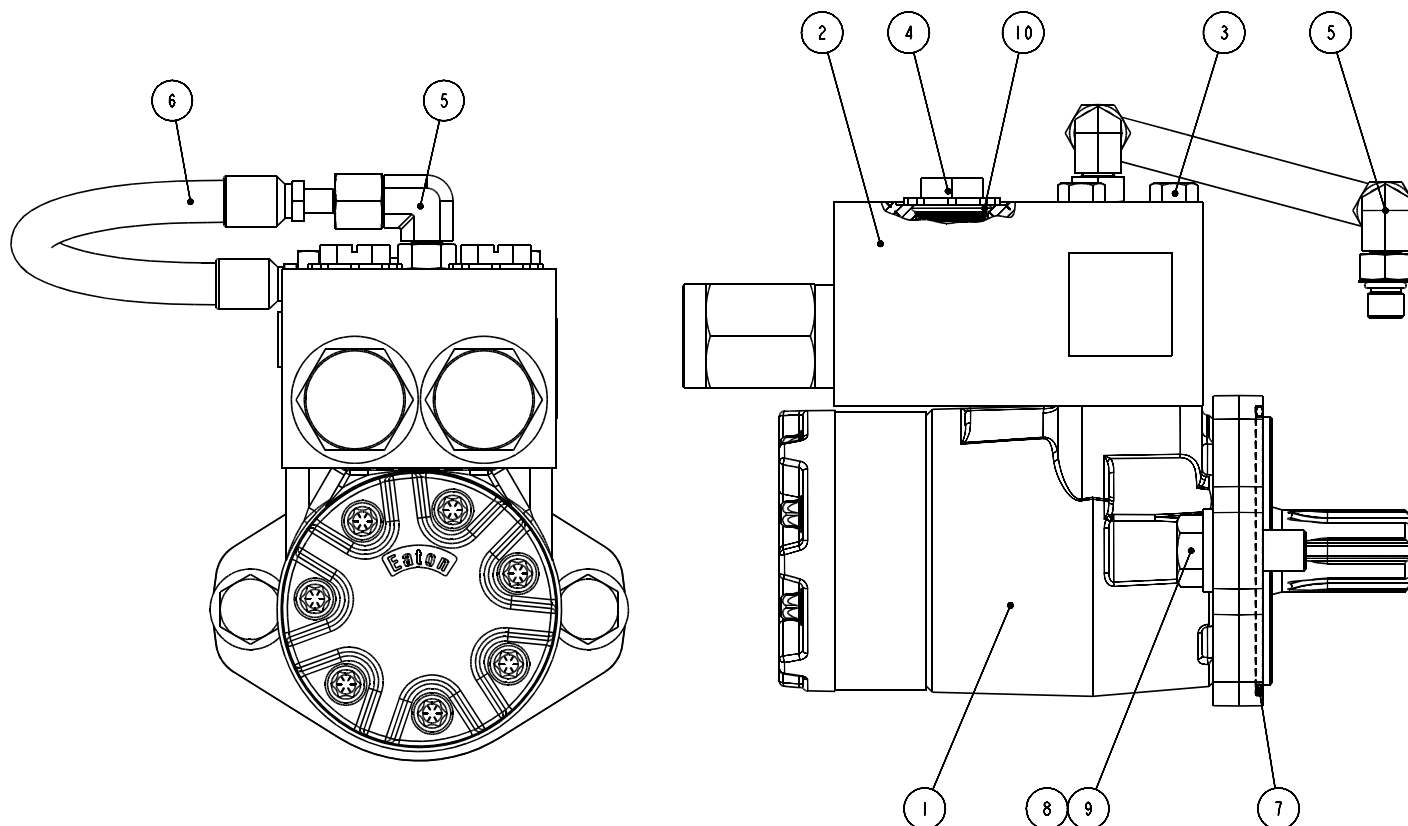
Part number 84656



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Secondary planet gear carrier	111407	1
2	Secondary planet gear	111409	3
3	Bushing, 1.00 1.13 1.00	111412	6
4	Thrust bearing	24167	6
5	Secondary planet gear pin	111411	3
6	Rollpin	12005	3

TR20 HYDRAULIC MOTOR PARTS GROUP (400) CROSS-SECTION

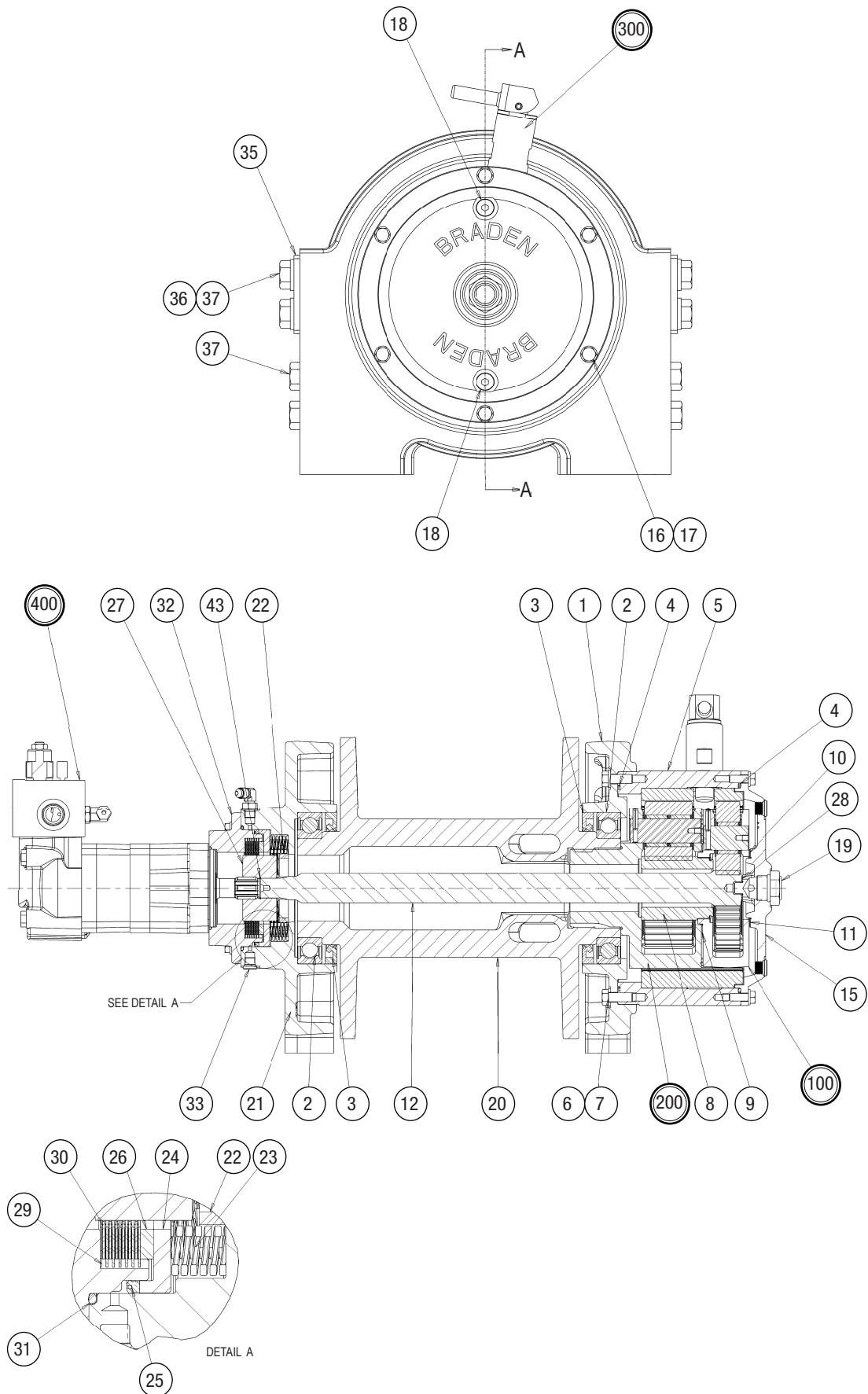
Part number 65253



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Hydraulic motor	105183	1
2	Brake valve	108859	1
3	Capscrew	106032	4
4	Shipping plug	29965	2
5	Adapter, 90 elbow ORS/ORB	27430	2
6	Hose assembly, -4 ORFS x 10.0 long	104505	1
7	O-ring	29677	1
8	Washer	100859	2
9	Capscrew	103827	2
10	O-ring	24766	2

TR25 CROSS-SECTION

Part number 010109



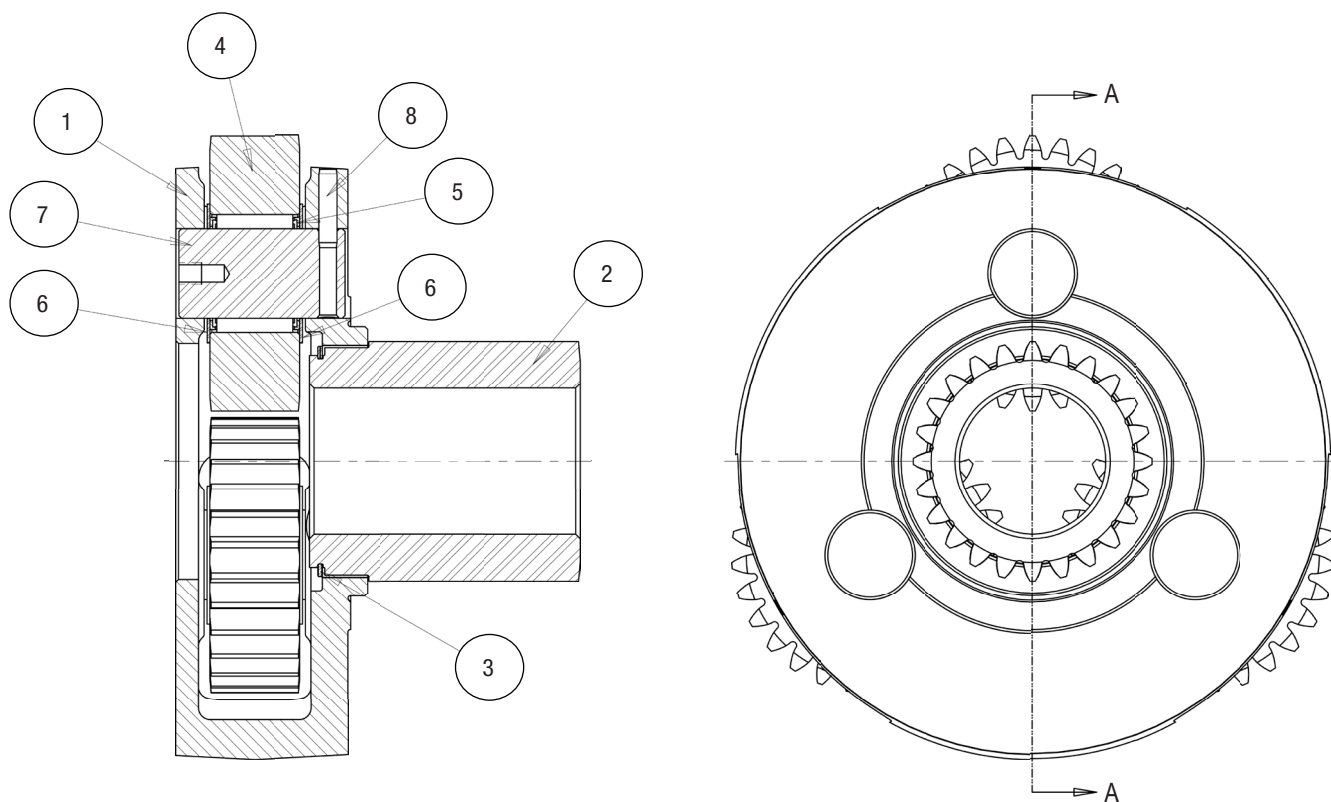
TR25 COMPONENTS

Part number 010109

ITEM NO.	DESCRIPTION	PART NO.	QTY.
100	Primary carrier assembly	85089	1
200	Secondary carrier assembly	85088	1
300	Manual clutch assembly (see page XX)	85143	1
400	Hydraulic motor assembly	65659	1
1	Endplate	113981	1
2	Ball bearing	29142	2
3	Seal, 4.72 6.30 .47	111497	2
4	O-ring	21033	2
5	Ring gear housing	114016	1
6	Washer, hard	101440	12
7	Capscrew	104309	12
8	Ring gear	114044	1
9	Thrust washer, 3.00 3.75 .03	111450	1
10	Thrust washer, 2.50 3.25 .03	111638	1
11	Thrust race	24308	1
12	Drive shaft	114365	1
15	Housing cover	114043	1
16	Washer	100858	14
17	Capscrew	11766	14
18	Plug	25665	2
19	Sight gauge	70193	1
20	Drum, TR20A-03	113249	1
21	Brake endplate	113980	1
22	Spring locator	100136	1
23	Spring	26094	12
24	Spring plate	25552	1
25	U-cup seal	25594	1
26	Brake plate spacer	25550	1
27	Brake hub	111544	1
28	Thrust race	24308	1
29	Tire Plate	114364	2
30	Capscrew	25119	16
31	Washer	100860	8
32	Roller	111766	1
33	Drive screw	11842	4
34	O-ring	70138	1
35	Brake Disc	102314	7
36	Friction Disc	25541	6
37	Motor Adapter, SAE-A2	112232	1
38	16496-4 plug	69325	1

TR25 PRIMARY CARRIER ASSEMBLY (100) CROSS-SECTION

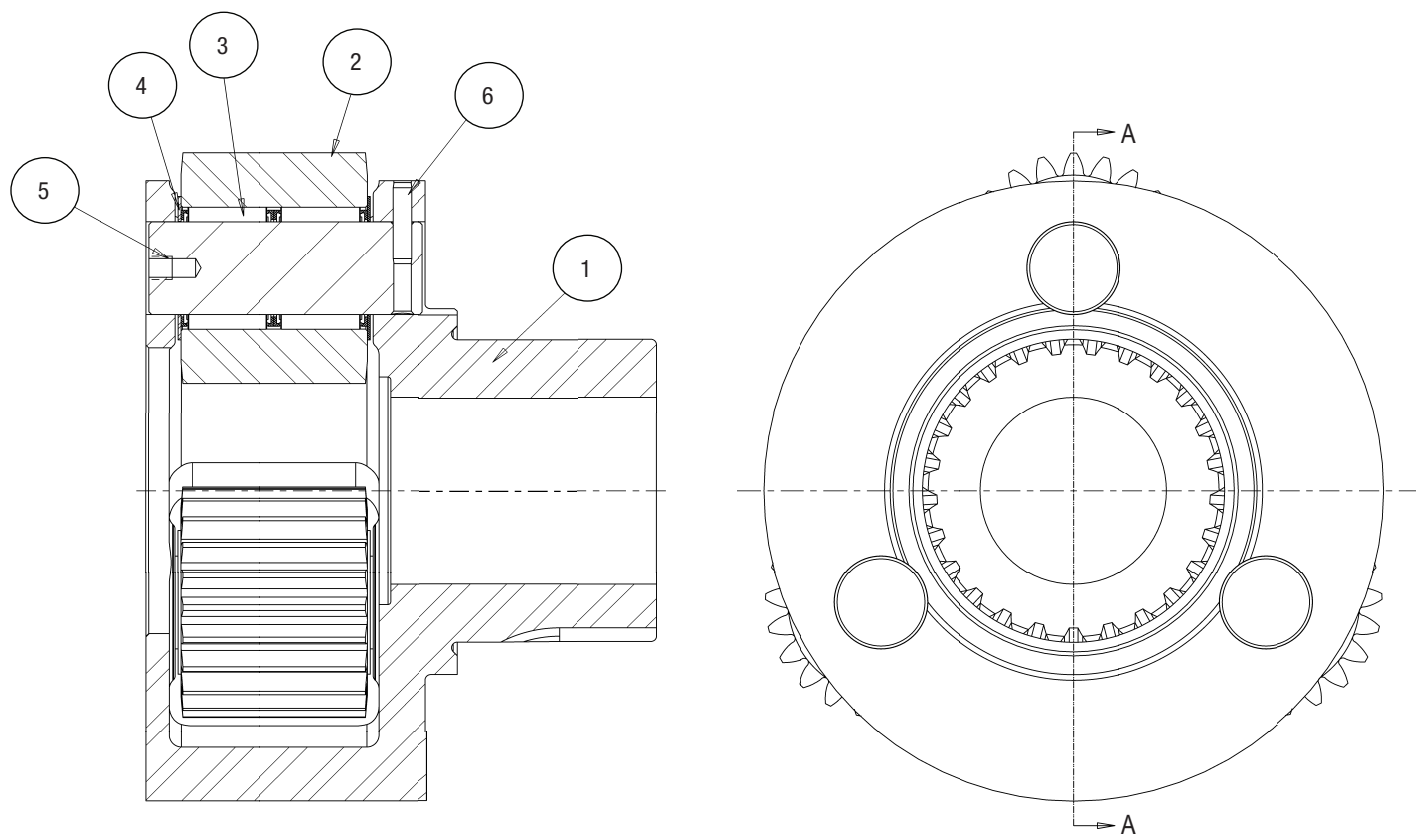
Part number 85089



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Primary planet gear carrier	114021	1
2	Sun gear, secondary	114023	1
3	Retaining ring, external 2.06 .031	108564	1
4	Primary planet gear	114022	3
5	Rollar bearing	24579	3
6	Thrust bearing	24167	6
7	Input pin	114038	3
8	Rollpin	12005	3

TR25 SECONDARY CARRIER ASSEMBLY (200) CROSS-SECTION

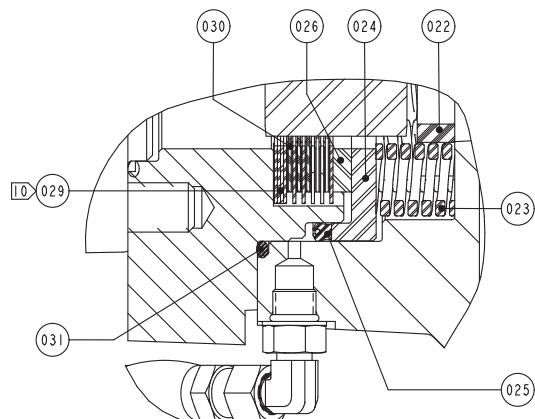
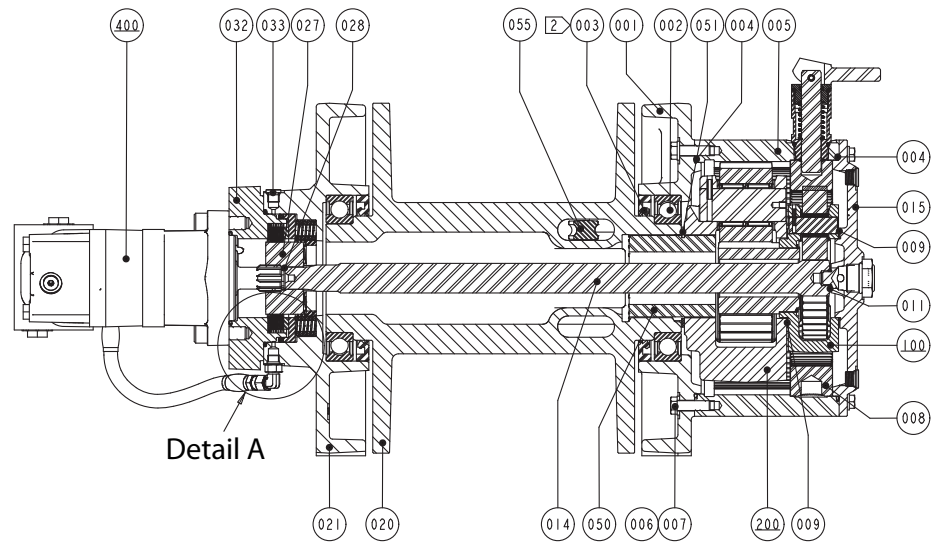
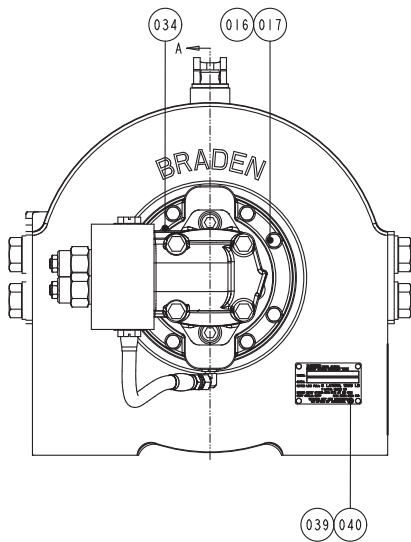
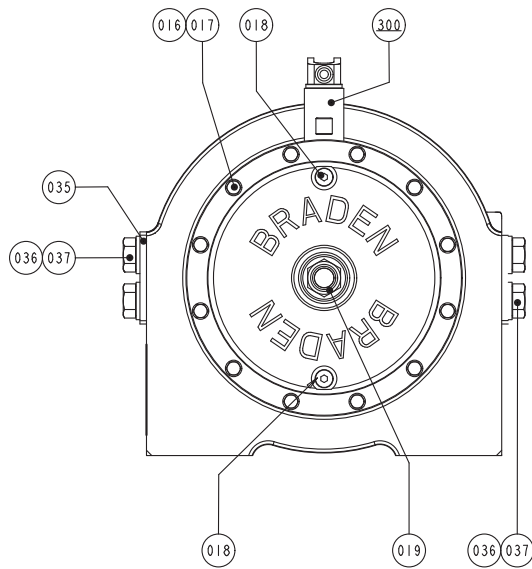
Part number 85088



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	Secondary planet gear carrier	114068	1
2	Secondary planet gear	114020	3
3	Roller bearing	24579	6
4	Thrust bearing	24167	6
5	Secondary planet gear pin	114037	3
6	Rollpin	12005	3

TR30 CROSS-SECTION

Part number 09801



Detail A

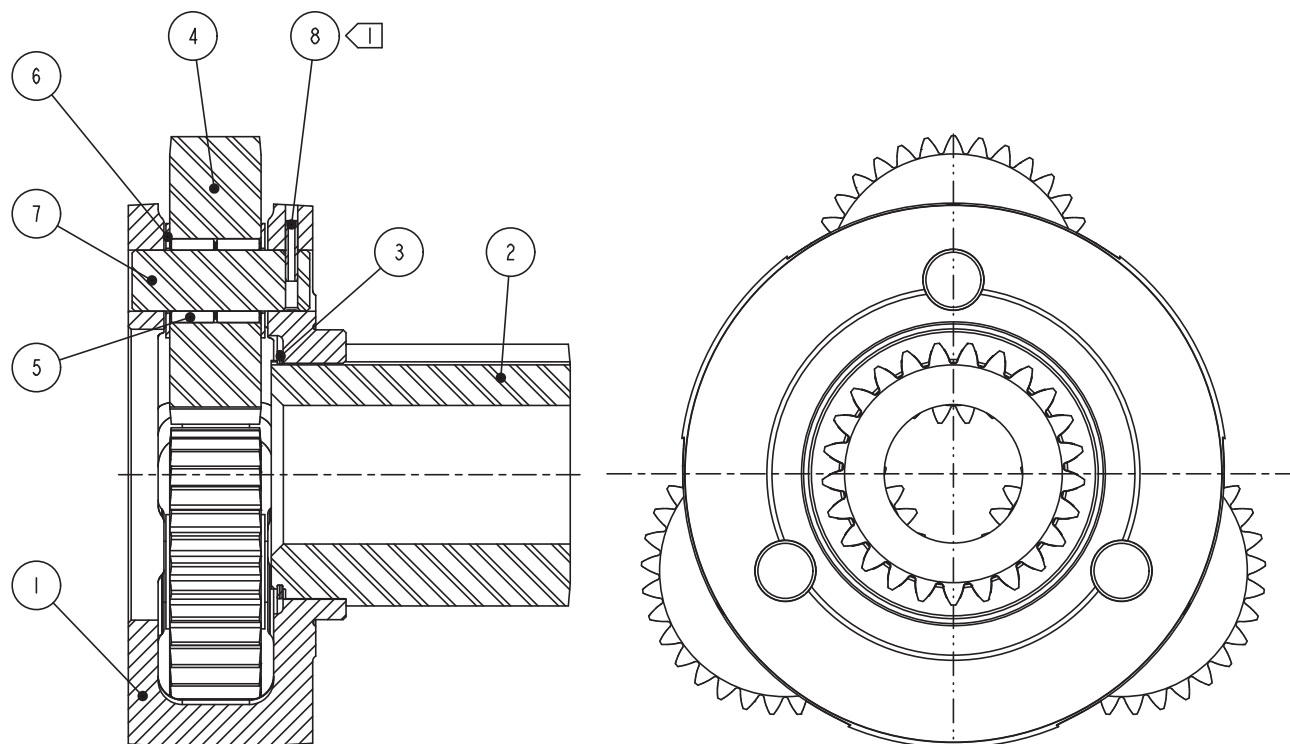
TR30 COMPONENTS

Part number 09801

ITEM NO.	DESCRIPTION	PART NO.	QTY.
100	PRIMARY CARRIER ASSEMBLY	84905	1
200	SECONDARY CARRIER ASSEMBLY	84906	1
300	MANUAL CLUTCH ASSEMBLY (see page 24)	84653	1
400	HYDRAULIC MOTOR ASSEMBLY	65659	1
1	ENDPLATE	112883	1
2	BALL BEARING	29142	2
3	SEAL 4.72 6.30 .47	111497	2
4	O-RING	25108	1
5	OUTPUT RING GEAR	112895	1
6	HARD WASHER	101440	12
7	CAPSCREW	104132	12
8	INPUT RING GEAR	112896	1
9	THRUST WASHER, 3.00 3.75 .03	111450	1
11	THRUST RACE	24308	1
14	DRIVE, SHAFT	112878	1
15	HOUSING COVER	112879	1
16	WASHER	100858	20
17	CAPSCREW	11766	20
18	PLUG	25665	2
19	SIGHT GAUGE	70193	1
20	DRUM, TR30A-01	112888	1
21	ENDPLATE	112889	1
22	SPRING LOCATOR	100136	1
23	SPRING	26094	12
24	SPRING PLATE	25552	1
25	U-CUP SEAL	25594	1
26	BRAKE PLATE SPACER	25550	1
27	BRAKE HUB	111544	1
28	SNAP RING	27535	1
29	BRAKE DISC	102314	7
30	FRICTION DISC	25541	6
31	O-RING	70138	1
32	MOTOR ADAPTER, SAE-A2	112232	1
33	PLUG	69325	1
34	RELIEF VALVE 1-5 PSI	10074	1
35	TIE PLATE	112893	2*
36	WASHER	100856	8
37	CAPSCREW	102008	8
50	OUTPUT COUPLING	112897	1
51	RETAINING RING	32093	1
52	THRUST WASHER, 3.34 4.33 .04	113184	1
55	CABLE WEDGE	26095	1

TR30 PRIMARY CARRIER ASSEMBLY (100) CROSS-SECTION

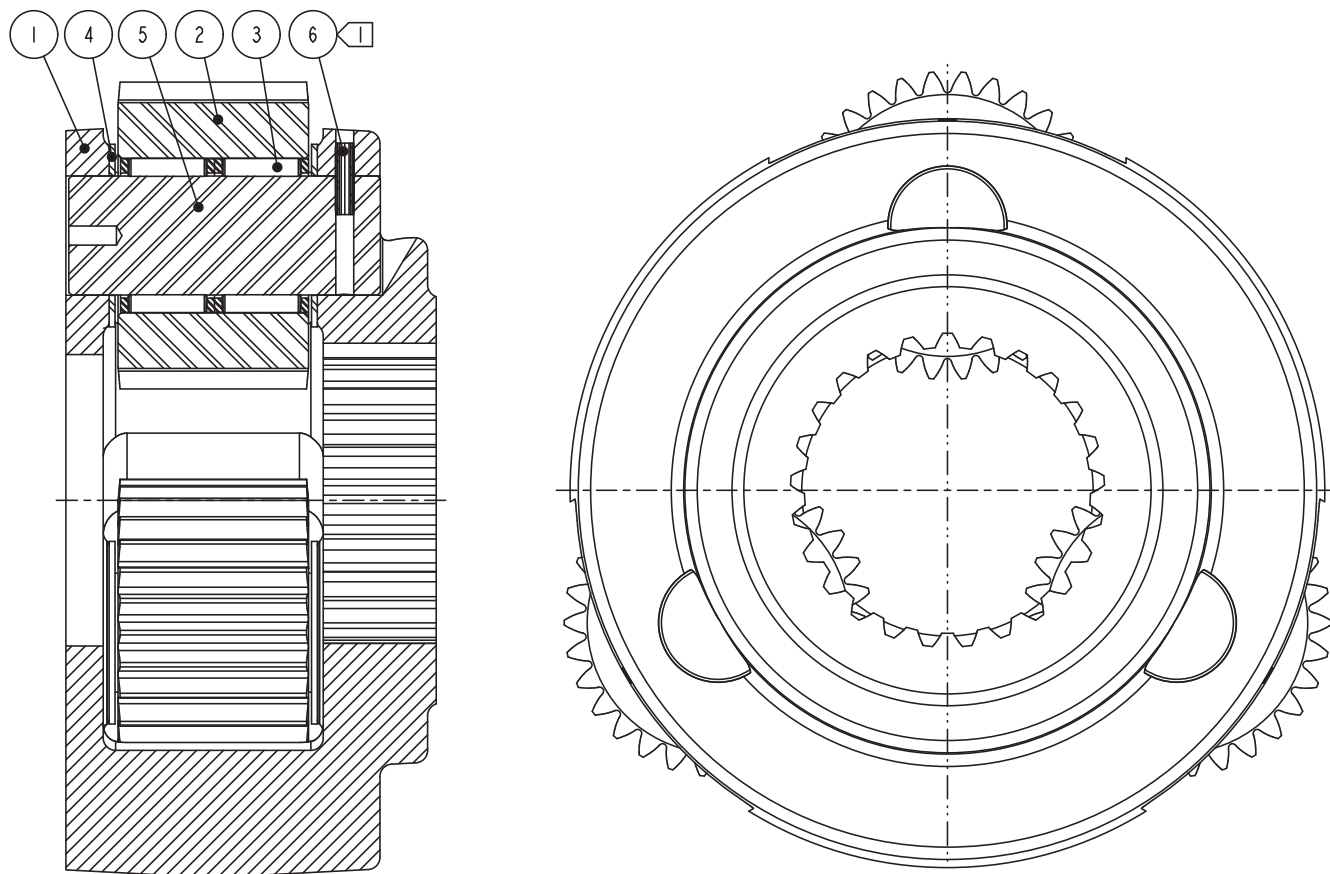
Part number 84905



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	PRIMARY PLANET CARRIER	112884	1
2	OUTPUT SUN GEAR	112885	1
3	EXTERNAL RETAINING RING	108564	1
4	PLANET GEAR	112886	3
5	BEARING ROLLER	24915	6
6	THRUST WASHER	24914	6
7	PRIMARY PLANET PIN	112887	3
8	ROLLPIN	11837	3

TR30 SECONDARY CARRIER ASSEMBLY (200) CROSS-SECTION

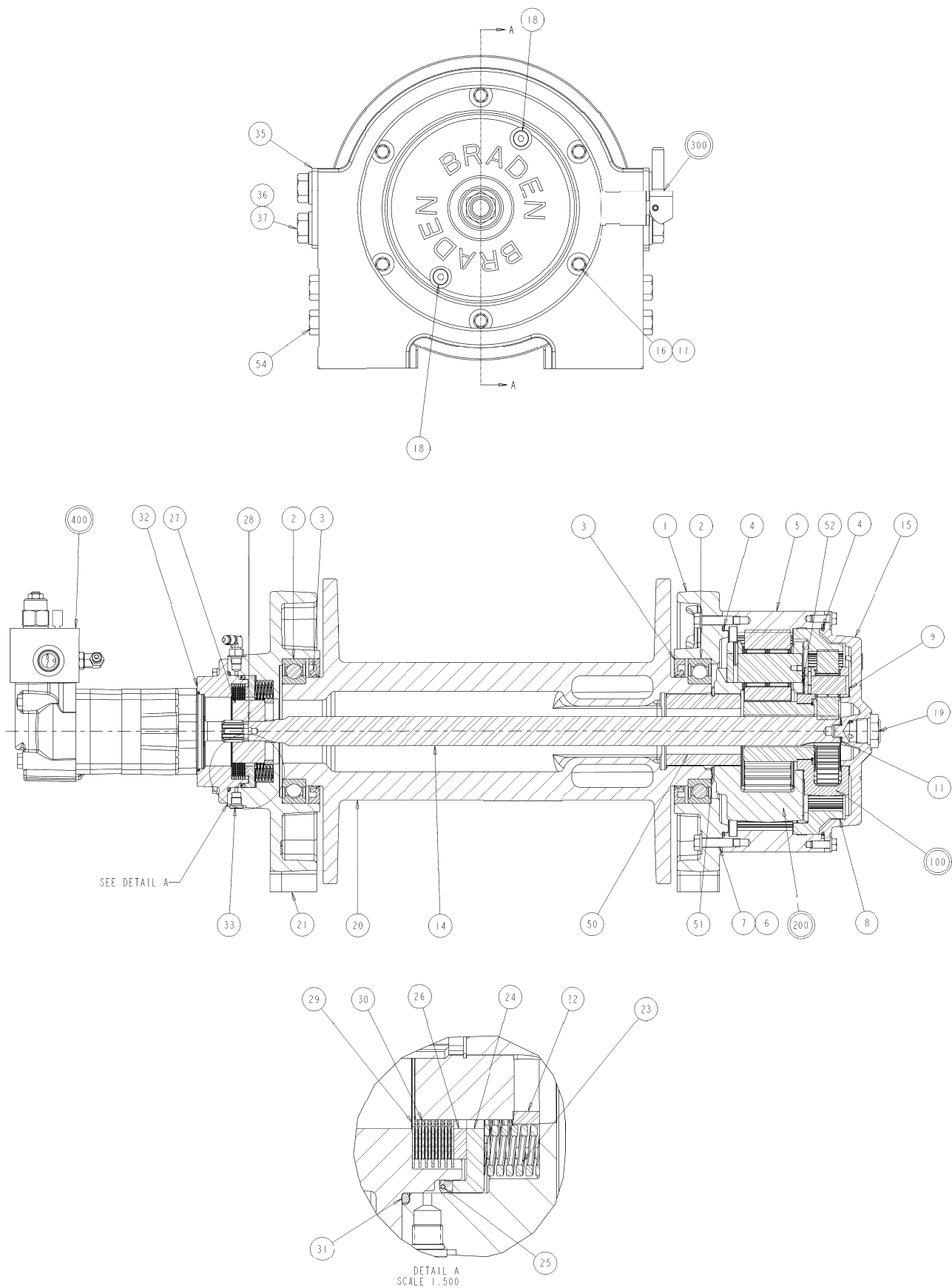
Part number 84906



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	SECONDARY PLANET CARRIER	112890	1
2	SECONDARY PLANET GEAR	112891	3
3	ROLLER BEARING	25292	6
4	THRUST WASHER	24306	6
5	SECONDARY PLANET PIN	112892	3
6	SPIROL PIN	23584	3

TR35 CROSS-SECTION

Part number 010110



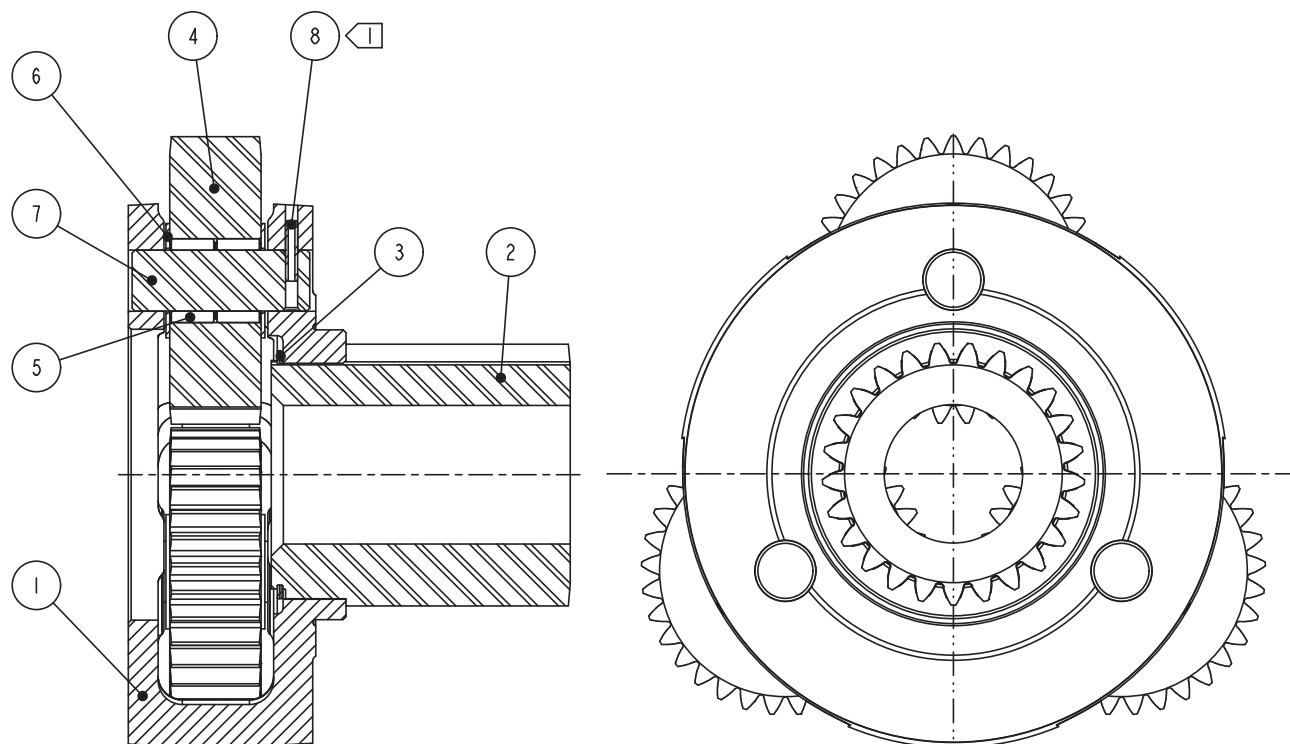
TR35 COMPONENTS

Part number 010110

ITEM NO.	DESCRIPTION	PART NO.	QTY.
100	TR35 INPUT CARRIER ASM	85091	1.00
200	TR35 OUTPUT CARRIER ASM	85090	1.00
300	PRTS GRP, MANUAL CLUTCH	85143	1.00
400	PRTS GRP, HYD MTR	65659	1.00
1	ENDPLATE	113983	1.00
2	BEARING, BALL	29142	2.00
3	SEAL 4.72 6.30 .47	111497	2.00
4	O-RING	25108	2.00
5	TR35 RING GEAR OUTPUT	114031	1.00
6	WASHER, HARD	101440	12.00
7	CAPSCREW	104313	12.00
8	TR35 FREESPOOL RING GEAR	114034	1.00
9	THRUST WASHER, 3.00 3.75 .03	111450	1.00
11	THRUST RACE	24308	1.00
14	DRIVE SHAFT, TR35A	114366	1.00
15	COVER, HSG	113998	1.00
16	WASHER	100858	18.00
17	CAPSCREW	11766	18.00
18	PLUG	25665	2.00
19	16574-0012 SIGHT GAUGE	70193	1.00
20	DRUM TR35A-06	114001	1.00
21	ENDPLATE, BRAKE	113982	1.00
22	SPRING LOCATOR	100136	1.00
23	SPRING	26094	12.00
24	SPRING PLATE	25552	1.00
25	U-CUP SEAL	25594	1.00
26	BRAKE PLATE SPACER	25550	1.00
27	BRAKE HUB	111544	1.00
28	SNAP RING	27535	1.00
29	BRAKE DISC	102314	7.00
30	FRICTION DISC	25541	6.00
31	O-RING	70138	1.00
32	MTR ADAPTER, SAE-A2	112232	1.00
33	16496-4 PLUG	69325	1.00
34	RELIEF VALVE 1-5 PSI	10074	1.00
35	TR35 TIE PLATE	114033	2.00
36	WASHER	100856	8.00
37	CAPSCREW	102008	8.00
39	NAMEPLATE, TR30A J706	112894	1.00
40	DRIVE SCREW	11842	4.00
50	OUTPUT COUPLING	112897	1.00
52	THRUST WASHER, 3.34 4.33 .04	113184	1.00
53	RETAINING RING	108018	1.00
54	CAPSCREW	25119	8.00
55	16313-325 RETAINING RING	32093	1.00
56	CABLE WEDGE	26095	1.00

TR35 PRIMARY CARRIER ASSEMBLY (100) CROSS-SECTION

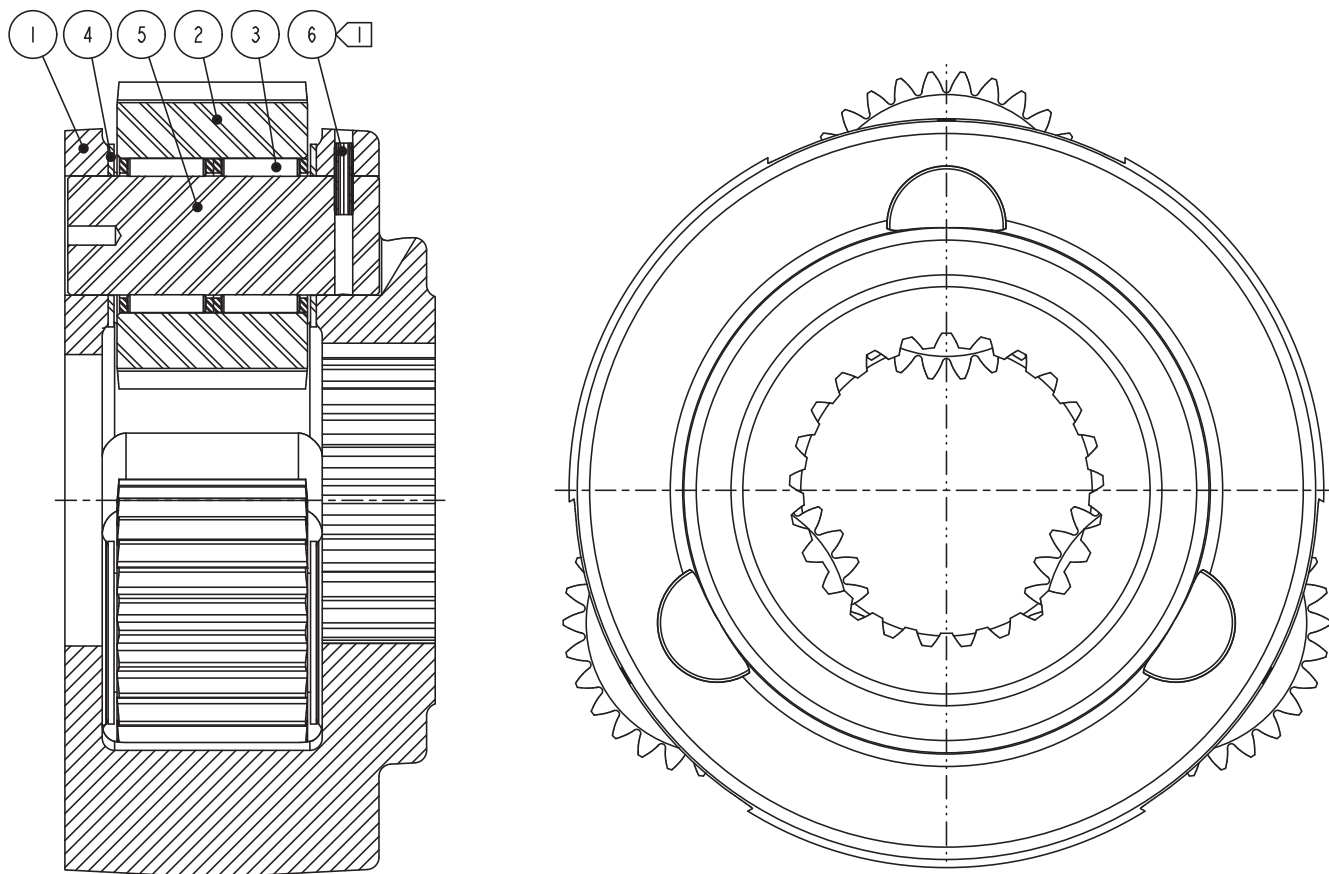
Part number 85091



ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	PRIMARY PLANET CARRIER	112884	1
2	OUTPUT SUN GEAR	112885	1
3	EXTERNAL RETAINING RING	108564	1
4	PLANET GEAR	112886	3
5	BEARING ROLLER	24915	6
6	THRUST WASHER	24914	6
7	PRIMARY PLANET PIN	112887	3
8	ROLLPIN	11837	3

TR35 SECONDARY CARRIER ASSEMBLY (200) CROSS-SECTION

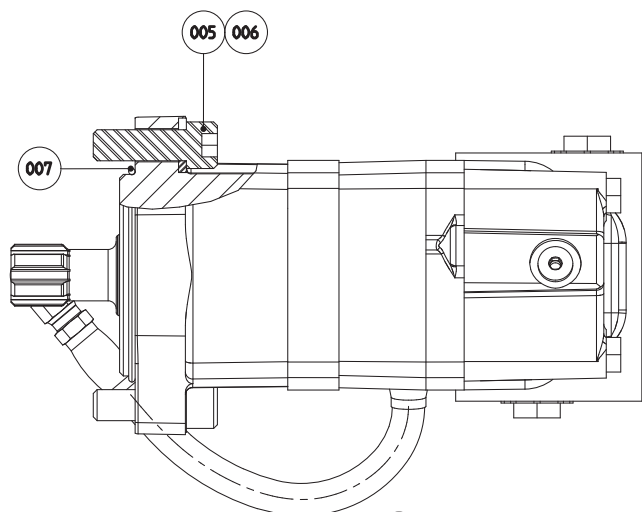
Part number 85090



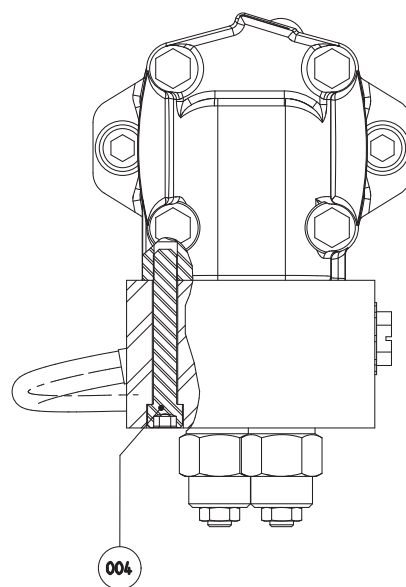
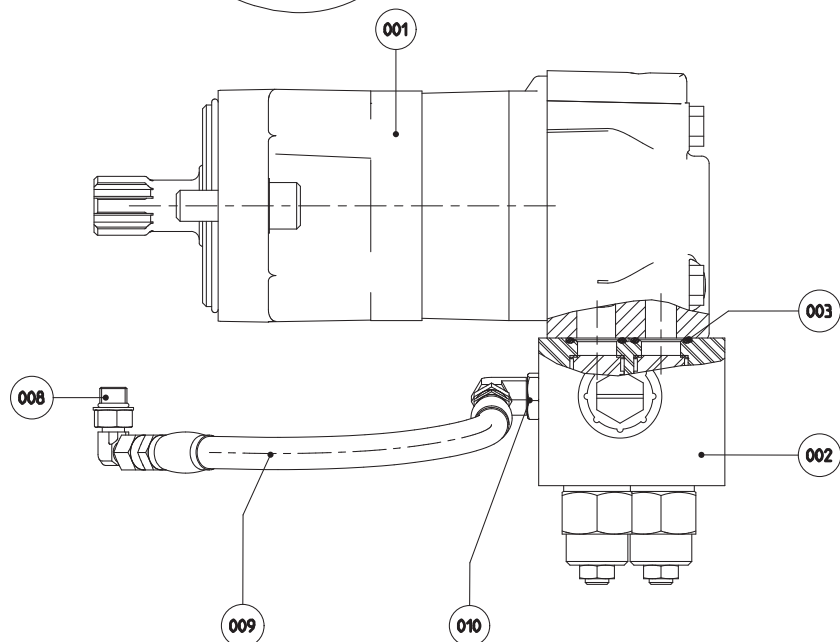
ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	SECONDARY PLANET CARRIER	112890	1
2	SECONDARY PLANET GEAR	112891	3
3	ROLLER BEARING	25292	6
4	THRUST WASHER	24306	6
5	SECONDARY PLANET PIN	112892	3
6	SPIROL PIN	23584	3

TR25/TR30/TR35 HYDRAULIC MOTOR PARTS GROUP (400) CROSS-SECTION

Part number 65659

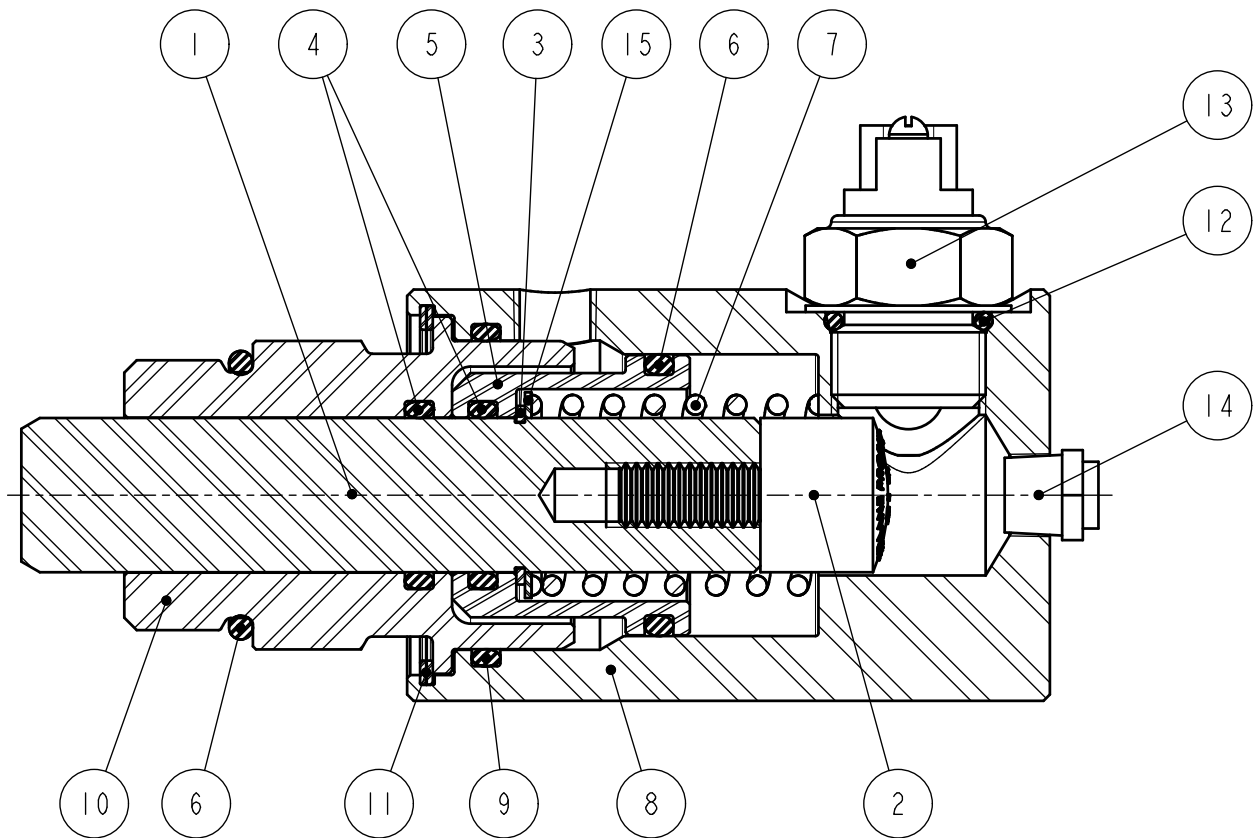


ITEM NO.	DESCRIPTION	PART NO.	QTY.
1	HYDRAULIC MOTOR	112904	1
2	BRAKE VALVE ASSY	25351	1
3	O-RING	24776	2
4	CAPSCREW	25130	3
5	LOCKWASHER	11026	2
6	CAPSCREW	25818	2
7	O-RING	29677	1
8	ELBOW FITTING	25302	1
9	HOSE ASSY	25936	1
10	ELBOW/O-RING	25131	1



OPTIONAL AIR CLUTCH PARTS GROUP

Part number 85126



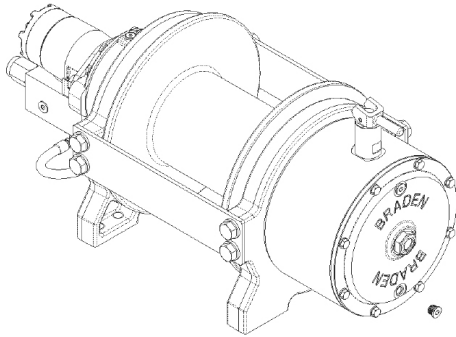
ITEM NO.	DESCRIPTION	PART NO.
1	PIN, FREESPOOL	114358
2	BUMPER, .75 URETHANE	111944
3	RET RING EXT .75 .042	111791
4	O-RING	72098
5	PISTON, AIR CLUTCH	111753
6	O-RING	24186
7	SPRING .78 .98 .200L 32K	111402
8	HOUSING, AIR CLUTCH	111779
9	O-RING	69813
10	PLUG, AIR CLUTCH	111752
11	RET RING INT 1.75 .062	111755
12	O-RING	23950
13	BALL SWITCH, SAE-8 N/C	111780
14	RELIEF VALVE 1-5 PSI	10074
15	THRUST WASHER .75 1.00 .032	112381

OPTIONAL TR SERIES ACCESSORIES

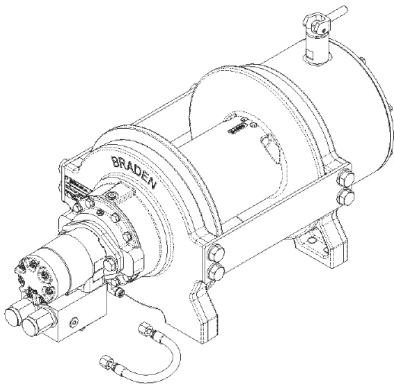
Model	Drum	Clutch Options			Tension Options		Fairlead	
		Manual Clutch	Air Clutch	Blocked Clutch	Tension Roller	Tension Plate	Fairlead	Overwound Fairlead
TR12	-01	85143	85126	114492	65384	65385	84839	NA
	-02	85143	85126	114492	65384	65385	84839	NA
	-03	85143	85126	114492	NA	NA	85070	NA
TR15	-01	85143	85126	114492	65384	65385	84839	NA
	-02	85143	85126	114492	65384	65385	84839	NA
	-03	85143	85126	114492	NA	NA	85070	NA
TR20	-01	85143	85126	114492	66027	66138	84839	65631
	-03	85143	85126	114492	66139	NA	84839	65631
	-04	85143	85126	114492	65999	NA	85070	NA
TR25	-01	85143	85126	114492	NA	NA	84839	NA
	-03	85143	85126	114492	NA	NA	84839	NA
	-04	85143	85126	114492	66033	NA	85070	NA
TR30	-01	85143	85126	114492	66028	65236	84839	NA
	-05	85143	85126	114492	65998	NA	85070	NA
TR35	-06	85143	85126	114492	66034	NA	85070	NA

WINCH DISASSEMBLY

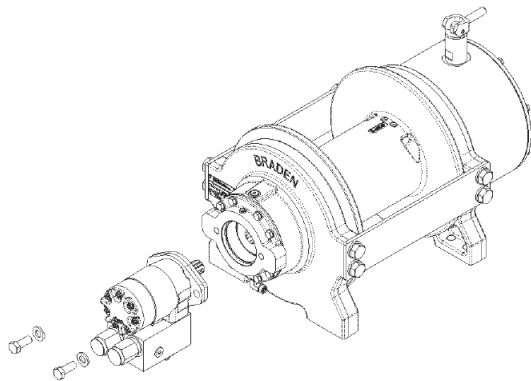
1. Remove plug and drain oil.



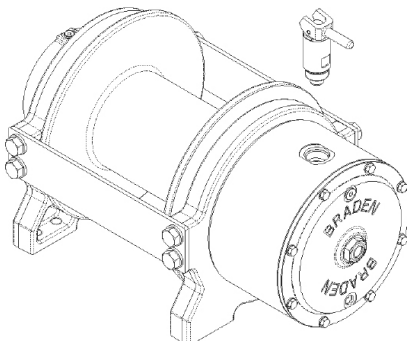
2. Remove brake hose from brake valve and brake cylinder housing.



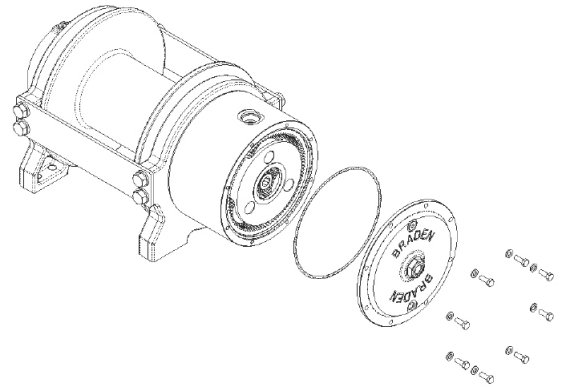
3. Remove motor assembly from motor support by removing two bolts and two washers. Remove brake coupling.



4. Remove the free-spool clutch assembly.

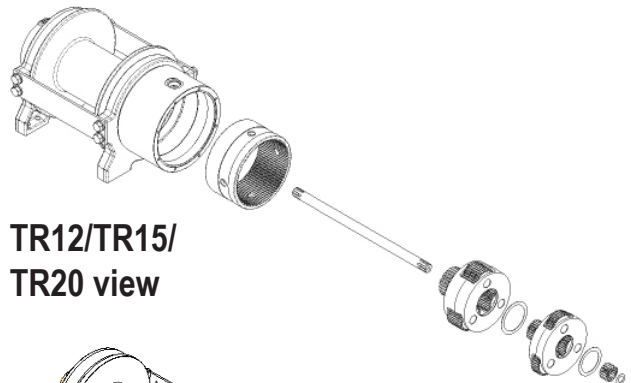


5. Remove the gear housing cover by removing eight screws and eight washers. Remove O-ring.

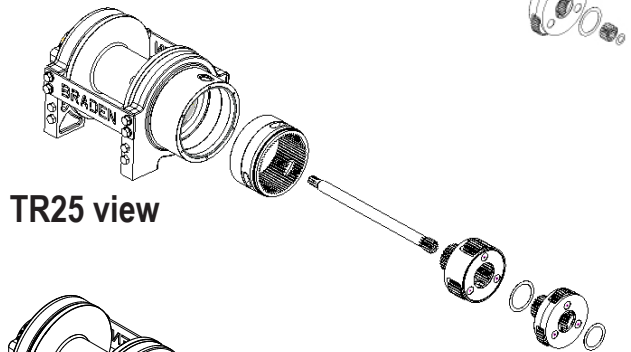


6. Remove thrust washer, primary sun gear, primary carrier spacer, primary carrier assembly, output carrier spacer, output carrier assembly, input shaft, and ring gear. (TR12 and TR15 also have gear housing and O-ring.)

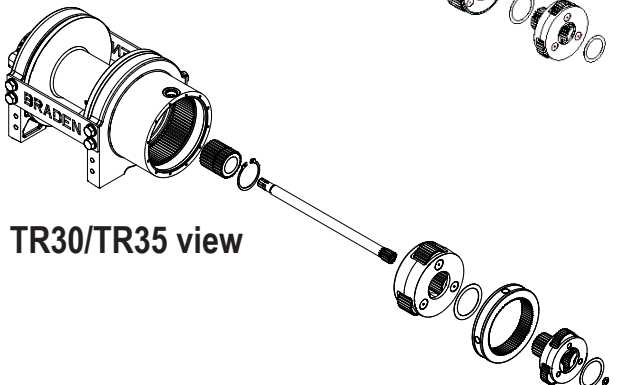
NOTE: The primary sun gear of the TR12 and TR15 has a snap ring which is offset rather than centered. When reassembling, ensure the primary sun gear is oriented with the snap ring toward the cover of the gear housing.



TR12/TR15/
TR20 view



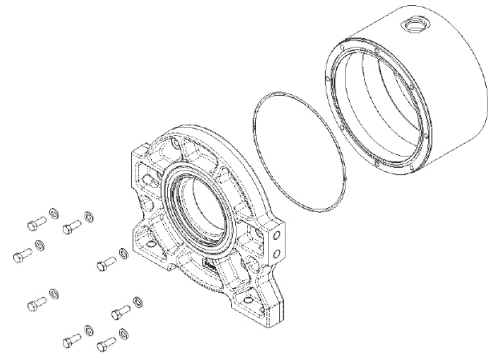
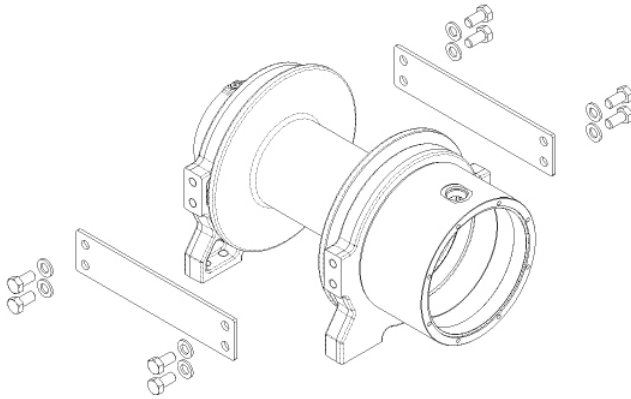
TR25 view



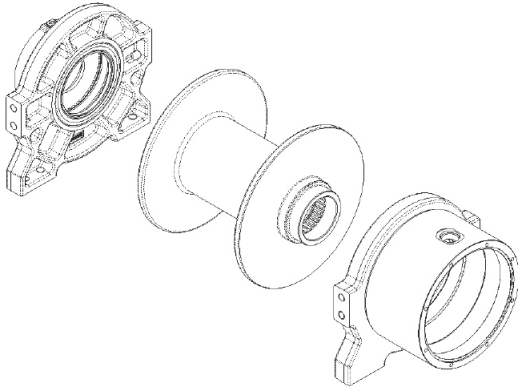
TR30/TR35 view

WINCH DISASSEMBLY

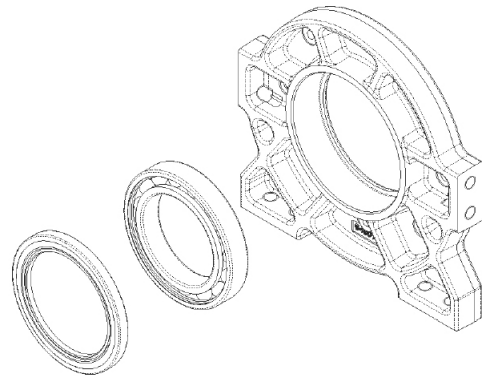
1. Remove tie plates by removing eight screws and eight washers.
3. Separate gear housing from drum support by removing eight screws and eight washers. (TR20 and TR30 only.)



2. Separate drum supports from drum.



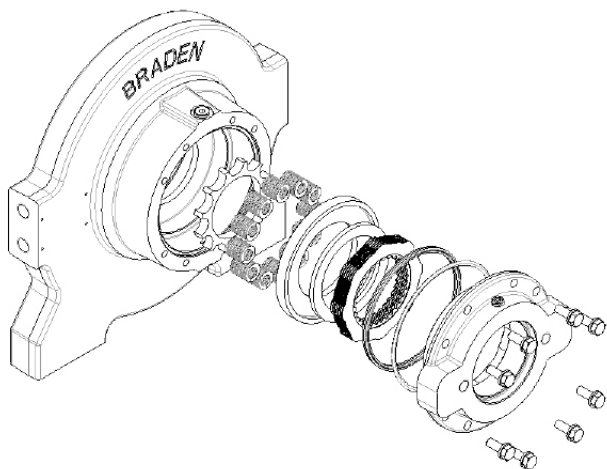
4. Remove seal and bearing from each drum support.



BRAKE SERVICE

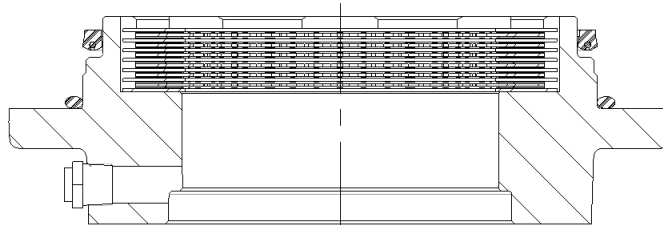
Disassembly

1. Remove motor support by progressively loosening eight capscrews, relieving the brake pack's spring load. Spring load will be relieved before capscrews disengage motor support. Remove O-ring, U-cup seal, brake pack (friction and steel discs), spacer and pressure plates, brake springs, and spring spacer.

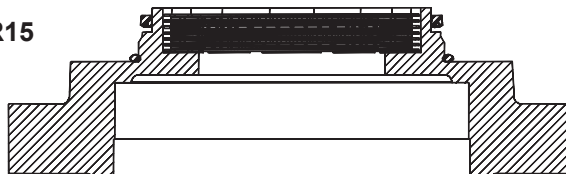


2. Lubricate the new O-ring with oil and install onto the motor support. Lubricate the new U-cup seal and install so that the O-ring side of the seal is facing the winch motor. This allows the seal to expand when pressurized.
3. Soak friction discs in oil. This will keep the discs from sticking together after spring pressure is applied.
4. Insert a steel disc into the bore of the motor support, followed by a friction disc. Alternate steel and friction discs until all are installed. The stack should finish with a steel disc on top.

TR20/TR25/TR30/TR35



TR12/TR15

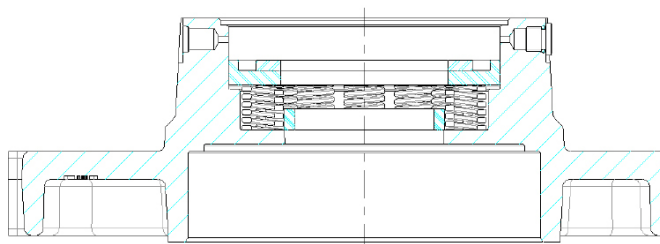


Inspection

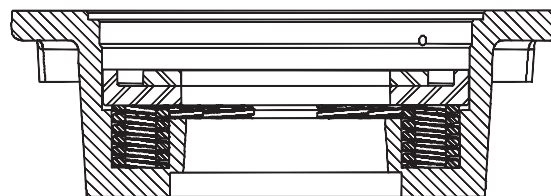
1. Inspect sealing surfaces of motor support and brake cylinder for wear and dings. Make sure the brake release port is open and free of contamination.
2. Measure friction disc thickness with a caliper. Minimum reusable thickness is .055 inch (1.40 mm). Measure flatness of both friction and steel discs. These should be flat within .005 inch (0.13 mm). Look for signs of overheating. Replace steel discs that show heat discoloring. Examine friction facing for missing material, cracks, or other damage. Replace as necessary. Inspect friction splines for wear and replace if worn to a point.
3. Check spring free length with a caliper. Minimum length is 0.938 inch (23.8 mm). Inspect springs for bending or other damage. If any spring is suspect, replace all springs as a set. Mixing old and new springs can cause uneven pressure which contributes to poor brake application, uneven friction disc wear, and possible spring failure.

5. Place the brake housing end plate on a bench with cylinder bore facing upward.
6. Install the spring spacer, followed by the brake springs, pressure and spacer plates.

TR20/TR25/TR30/ TR35



TR12/TR15



Reassembly

1. Begin reassembly by placing the motor support facedown on a workbench.

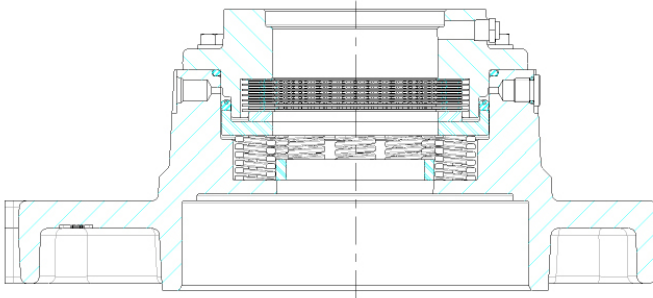
BRAKE SERVICE

7. Next, assemble the motor adapter to the end plate. To do this, lift the motor adapter up, then reach in through the motor adapter bore and hold the brake plates in position using your fingers. Flip the assembly over, and carefully install into the bore of the brake cylinder until the brake disc stack is flush against the spacer plate.
8. Check all components for alignment and proper position.
9. Install eight washers and screws finger-tight. Next, equally tighten the screws in a crisscross pattern, compressing the brake springs evenly. Final tighten screws per torque chart.

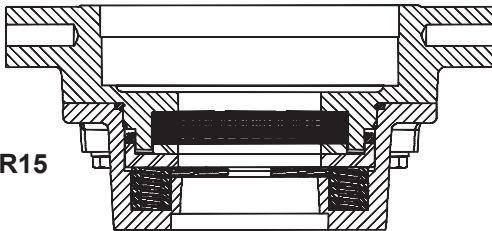
Testing Brake Seals

1. Connect a hand pump with an accurate 0-2,000 PSI (0-137.9 bar) gauge. Apply 1,000 PSI (68.9 bar) to the brake cylinder port. Close the shut-off valve and let stand for five minutes. If there is any loss of pressure in five minutes, disassemble the brake and inspect the sealing surfaces and seals for damage.
2. Use the brake coupling to align the friction disc teeth before releasing port pressure. The teeth must be aligned before the winch can be fully assembled.

TR20/TR25/TR30/TR35



TR12/TR15



PLANET GEAR CARRIER SERVICE

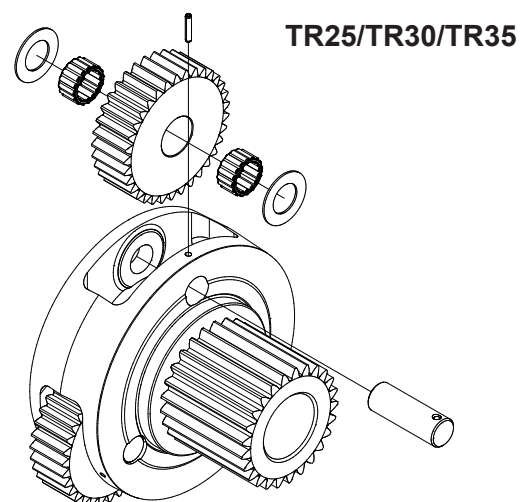
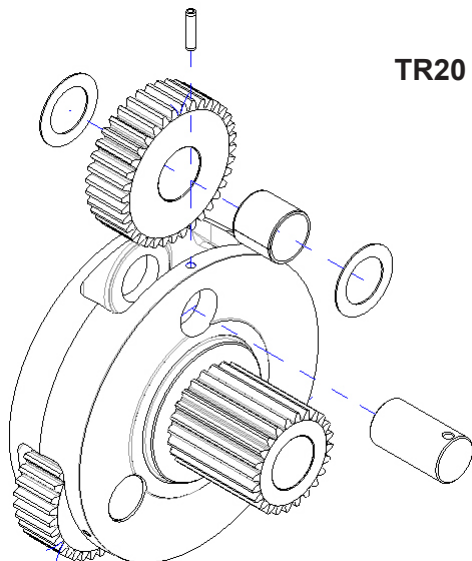
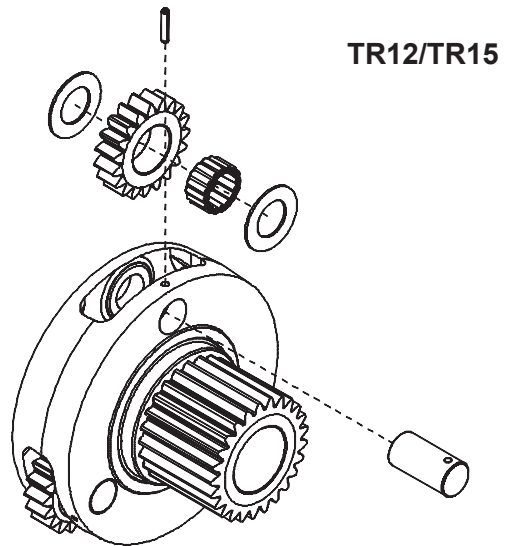
The primary and secondary carriers both use the same service procedures described here.

Disassembly

1. Use a 1/8" drift for TR12/TR15 or 3/16" drift for TR20/TR30 to drive the roll pins into the center of the planet shafts. Drive the shafts out of the carrier, freeing the planet gears and thrust washers.
2. Use the 1/8" drift for TR12/TR15 or 3/16" drift for TR20/TR30 to finish driving the roll pins from the planet shafts.
3. Press out the planet gear bushings and discard the bushings (bearings are used for TR12, TR15 and TR30).
4. Clean all parts and inspect for damage and wear. Planet shafts are to be free of scoring. Thrust washers are to be free of surface irregularities and heat discoloring. Planet teeth should be free of abnormal wear and pitting. Always replace roll pins and shaft bushings/bearings with new.

Reassembly

1. Press new planet bushings/bearings into the gears, then apply oil to the inside of the bushings/bearings.
2. Lay the planet carrier on the workbench; insert a thrust washer, planet and another washer into the planet window. Install a shaft through the carrier and gear arrangement, and then secure with a new roll pin. Repeat process for remaining gears.
3. Recess each roll pin slightly into the carrier. To prevent the pins from backing out, use a punch to stake each pinhole.



WINCH ASSEMBLY

Reassemble the winch in reverse order of the steps described in Winch Disassembly section of this manual. Take care to apply oil to O-rings and seal lips, and properly torque fasteners per the torque chart also in this manual.

RECOMMENDED FASTENER TORQUE

The general-purpose torque shown in the chart applies to SAE grade 5 and 8 bolts, studs, and standard steel full, thick, and high nuts. 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 30W engine oil applied to threads and face of bolt or nut.

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

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

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

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