

# Dorris. GEAR DRIVES

## 415-700TR Shaft Mounted Gear Drives Installation, Lubrication and Maintenance Instructions

### Assembly of Backstop

When an optional backstop is to be used with the shaft mounted gear drive and has not been factory installed, it should be assembled to the unit prior to mounting the unit on the driven shaft. See Figure 1.

Remove bolts (1), cupped cap (2), shim gasket (3) and spacer ring (4) from the gear housing (5). If the backstop housing (6) contains two snap rings, remove the snap ring (7) only.

**CAUTION: Note direction of rotation indicated by the arrow on the backstop to allow shaft rotation in that direction.**

Install the backstop (8), key not shown, and the snap ring (7) if the snap ring was previously removed, into the backstop housing (6). Place the previously removed shim gasket(s) (3) on the face of the gear drive housing (5). Slide the assembled housing (6) onto the backstop shaft extension. While sliding the backstop housing onto the backstop shaft extension, rotate the backstop housing opposite the direction of the arrow, to allow for ease of installation. Do NOT use excessive force. Bolt the installed housing (6), shim gasket (3), cap gasket (9) and flat cap (10) with bolts (11) treated with a locking adhesive to the gear drive housing (5).

**CAUTION: Do not reinstall bolts (1), cupped cap (2) or spacer ring (4).**

Turn the input shaft by hand to ensure that it locks in the desired direction and rotates freely in the opposite direction without excessive end play. Torque bolts (11) to 25 ft-lbs.

**WARNING: Never use an EP additive oil with a backstop because the enhanced lubrication properties of EP oils may cause the backstop to slip.**

**WARNING: Backstops may not be used for people moving, and have a maximum overrunning speed of 1800 rpm. Indexing, jogging or ratcheting are not permitted.**

**WARNING: Do not attempt to disassemble or service the backstop when it is under power or under load. Remove or block the load so it will not move prior to servicing the unit. Always follow lockout procedures to prevent activation of the prime mover when servicing the unit.**

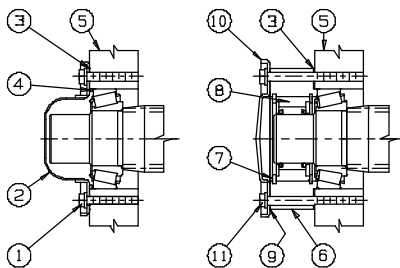


Figure 1 - Backstop Assembly

**WARNING: Failure to comply with these instructions or disassembly of gear drive will void the gear drive warranty.**

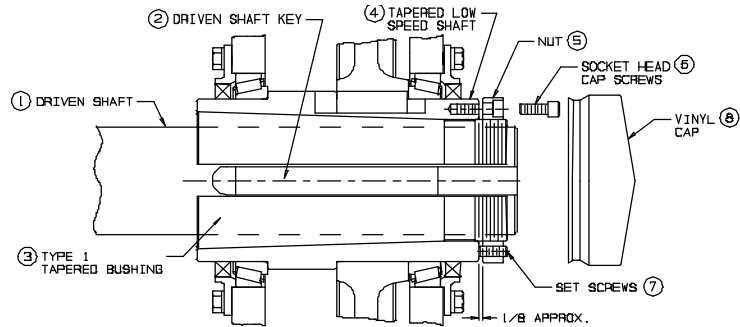


Figure 2 - Type 1 Tapered Bushing Assembly

### Installation & Removal Instructions

All Dorris tapered bushing kits include the bushing, nut, key(s) and fasteners required for installation. See Figure 2.

#### Installation Instructions - Type 1 Bushing

Type 1 tapered bushings are used when the driven shaft diameter is the nominal diameter for that gear drive model. (For example, a 415TR unit has a nominal bore diameter of 4 15/16"). Type 1 tapered bushings have only one key.

De-burr and clean the driven shaft (1) and orient with the keyway up.

Fit and install the key (2) in driven shaft. Stake the keyway to prevent the key from moving. Position the key such that it will be centered lengthwise once the bushing is installed. Note that the key may be square, rectangular or stepped and orient it properly.

Align the bushing slot with the shaft key. Slide the tapered bushing (3) onto the driven shaft, threaded end of the bushing out. It is recommended that the tapered bushing be completely supported by the driven shaft. Apply a coat of lithium-based grease or anti-seize compound to the outside of the tapered bushing.

After aligning the key in the bore of the low speed shaft of the gear drive (4), slide the gear drive onto the tapered bushing. Do not lift the gear drive by the high speed shaft; lifting holes are provided in the torque plates.

Thread the nut (5) onto the bushing and snug it up against the low speed shaft of the gear drive hand tight. Back off the nut 1/8" and align the three clearance holes in the nut with the three tapped holes in the low speed shaft.

For alignment only, **LOOSELY** install the three socket head cap screws (6). [Note: These screws must **NOT** be torqued, as they would then prevent the tapered bushing from seating.]

Install the three set screws (7) into the threaded holes in the nut until they contact the gear drive low speed shaft, and torque them evenly to the value shown in Table 1.

**Make sure the 1/8" gap is still present.** If there is no gap, remove the three socket head cap screws, loosen the set screws, and back off the nut another 1/8". Continue this process until you can torque down the set screws while maintaining the 1/8" gap.

Now snug up the three socket head cap screws--handtight only--to prevent them from backing out of the nut. Do not overtighten, and be sure that the set screws (7) are torqued first.

After coating the nut (5) and screws (6 & 7) thoroughly with a lithium based grease, install vinyl cap (8).

#### Installation Instructions - Type 2 Bushing

Type 2 tapered bushings are normally used when the driven shaft diameter is smaller than nominal for that gear drive model. Type 2 tapered bushings have two keys.

The installation procedure for a type 2 bushing is the same as for a type 1 bushing, except that one key is required between the driven shaft and the bushing, while another key is required between the bushing and the gear drive low speed shaft. Fit and install the key in the driven shaft. Stake the keyway to prevent the key from moving. Position the driven shaft key so that it will be centered lengthwise once the bushing is installed. Install the low speed shaft/bushing key until it is seated.

#### Removal Instructions

To remove the gear drive from the tapered bushing (3), remove the vinyl cap (8) and back the three set screws (7) off the gear drive low speed shaft (4) and into the nut (5). Making sure that at least a 1/8" clearance exists between the nut face and the end of the gear drive low speed shaft, alternately tighten the three socket head cap screws (6), that have been installed through the clearance holes in the nut and threaded into the gear drive low speed shaft, until the gear drive releases from the tapered bushing. Then remove the socket head cap screws and the nut from the bushing to allow removal of the gear drive.

Table 1 - Bushing Screw Torque

MODEL	SET SCREW THREAD	MAXIMUM TIGHTENING TORQUE (IN.-LBS.)
415, 507, 608, 700	1/2 - 20	450

## Assembly of Torque Arm

To reduce the loads on the torque rods, keep the torque plates in the factory installed position, away from the driven shaft. Assemble the torque rods and turnbuckle to the torque plates and base angles. Position and secure the base angles so that the torque arm assembly forms a right angle to a line through the point of attachment and the center line of the output shaft. Ensure that the torque arm is in tension when the unit is operating.

Attach the rod ends to the torque plates and base angles with the 1 1/4 (1 1/2 for 608TR and 700TR) diameter pin, two 1 1/4 (1 1/2 for 608TR and 700TR) flat washers and two 7/32 cotter pins.

The base angles must be attached to a sturdy and rigid member of the machinery frame. In locating the base angles, allow for adjustment of the torque arm.

**WARNING: Do not disassemble or service torque arm while unit is in operation, under power or under load. Make certain that unit is securely anchored by some other means (to prevent rotation) prior to servicing torque arm.**

## Assembly of Motor Mount

Read instructions completely before attempting to assemble motor mount. Do not tighten bolts prior to completing the assembly since this may make it difficult to align and install the bolts. All mounting hardware is provided.

The 415TR and 507TR motor mount may be mounted in any one of six positions -- A, B, C, D, E, or F. The 608TR and 700TR motor mounts are designed for specific positions: 6MM for A, B, C & D positions; 6MM-1 for E & F positions. Choose the position which is best suited for ease of installation and desired v-belt center distance. Contact the Dorris Company for v-belt centers for the mounting position and the motor frame chosen.

Bolt one support bracket to each side of the housing using six 5/8" bolts (1" bolts for 608TR and 700TR) with lockwashers. Attach the motor base plate to the brackets using eight 1/2" bolts (5/8" bolts for the 60TR and 700TR), nuts and lockwashers. Assemble the four jack screws to the motor base plate with one nut on the bottom and one nut on the top side of the motor base plate. Thread one more nut on each jack screw to support the motor plate. Motor mounting holes form a vee pattern pointing toward the input shaft extension. Thread remaining nuts onto the jack screws.

## Assembly of Motor & V-belt to Motor Mount

Match the motor mounting holes with the holes in the motor plate. When properly matched, the motor shaft will be aligned with the input shaft. Securely attach the motor to the plate using the proper type and grade of fastener.

Before mounting the sheave on the input shaft extension, apply a thin coat of lithium-based grease or anti-seize compound to the shaft. To minimize the overhung load, mount the sheave as close as possible to the gear drive housing.

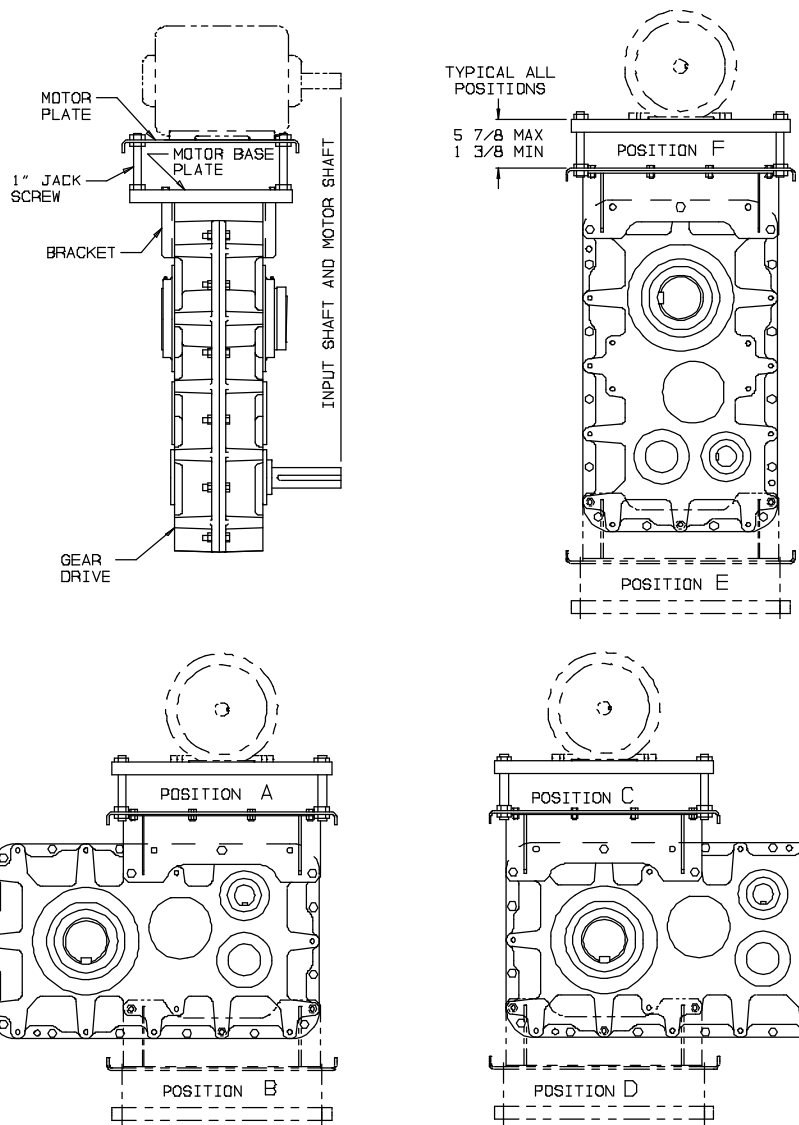


Figure 3 - Motor Mount Dimensions

Before installing the sheave, check that the pitch diameter is greater than the minimum shown in the catalog.

## Assembly of Scoop Mount

Scoop mounts are designed to fit on gear drives in the 6 o'clock orientation only.

Install the gear drive to the driven shaft as discussed on page 1, and attach the torque arm as discussed on page 2 so that the drive is oriented as close to vertical as possible. Bolt the scoop mount to the face of the gear drive using bolts and lockwashers provided and securely tighten the bolts (115 ft-lb. for 415 & 507, 450 ft-lb. for 608 & 700).

Next, install the spring support kits (see fig. 4). **The spring support kits must be in place according to these instructions before the motor is mounted.** Verify that one spring locator (3) is bolted to each spring support plate (1) with the supplied hex head bolts (5). If necessary assemble using a thread-locking

compound. Thread one jam nut (2) completely up each threaded rod of the spring support plates (1). Align the threaded rods of the spring support plates (1) with the clearance holes of the customer supplied support plate (7) and drop into position. Loosely thread another jam nut on the bottom of each threaded rod.

If there are **greater than** twelve inches between the top of the spring support plate (1) and the bottom surface of the scoop mount (6), bolt locator plugs (3) to the bottom of the scoop mount. If there are **less than** twelve inches between the top of the spring support plate (1) and the bottom surface of the scoop mount (6), place the spring (8) on each spring support plate (1) before bolting the upper locator plugs (3) to the scoop mount. Use the flat head screws (4) with a thread-locking compound and tighten to 200 ft-lb. Raise the spring support plates by adjusting the jam nuts (2) until the spring touches the bottom of the scoop mount.

### Assembly of Scoop Mount (cont'd.)

Compress each spring (8) using the eight jam nuts on the top of the customer supplied support plate (7). Set the spring support plate (1) approximately at the final set dimension given in Table 2. Assure that the spring support plates (1) are level and that the springs are compressed evenly.

At this point, the motor may be mounted on the scoop mount. Use the supplied bolts to maneuver the motor for proper shaft alignment (see coupling literature for proper alignment requirements). Once the motor is aligned, shim under the motor and remove the vertical adjustment bolts. Bolt the motor securely and verify shaft alignment.

Finally, verify that each spring is set to the final set dimension given in Table 2, this time using a thread-locking compound. Torque all jam nuts (2) to 210 ft-lb. securely against the customer supplied support plate (7). Once again assure that the springs are compressed evenly. Note that in some cases a 1 1/2" "crows foot" socket (like Armstrong 12-867 1 1/2) may be needed.

### Lubrication

**CAUTION: All Dorris gear drives are shipped without oil. Do not assume that this unit has been properly lubricated. Prior to start-up, be sure that the proper type, grade and amount of oil has been installed into the gear drive.**

Lubricate the gear drive by filling the unit to the proper level, per these instructions. Select the proper type and grade of oil based on the ambient air temperature range around the gear drive. Choose an oil that meets the requirements of Table 3. Table 5 lists some oil brand names that meet the requirements in Table 3. Other oil companies may have equivalent oils to those listed.

Make sure that the coolest ambient temperature is at least 10°F greater than the pour point of the oil chosen.

Synthetic, hydrocarbon-type (polyalphaolefin base) gear oils without EP additives are recommended for ambient temperatures as low as -20°F or as high as 170°F. However, consult Dorris for proper oil selection for applications where the ambient temperature is greater than 100°F.

The oil capacity of the unit is dependent on its mounting position. See Table 4 and Figure 5. The oil capacities are based upon the mounting position shown, assume a double or triple reduction (15:1 through 250:1) ratio and an output speed of the gear drive being 40 rpm or more. For speeds less than 40 rpm, inclined or vertical mounting, or other arrangements not shown, consult the Dorris Company.

This unit is supplied with grease purge seals. Use an NLGI #2 grease (such as Shell Alvania Grease 2 or Texaco Premium RB Grease, for example).

When the gear drive is used in the food processing industry, ensure that the lubrication is approved for the application.

Figure 4 - Spring Support Assembly

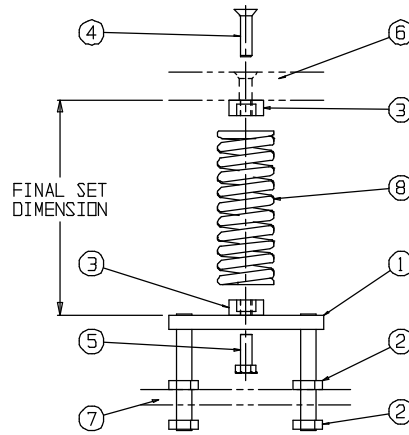


Table 2 - Spring Support Set Dimensions

Motor Weight	Final Set Dimension
1000 - 1300 lbs.	9.00
1400 - 1600 lbs.	8.75
1700 - 1950 lbs.	8.50
2000 - 2300 lbs.	8.25

Table 3 - Oil Selection

AMBIENT TEMP RANGE (°F)	R & O (RUST & OXIDATION INHIBITED) GEAR OIL FOR UNITS WITH OR WITHOUT A BACKSTOP		VISCOSITY RANGE	
	AGMA R & O LUBE NUMBER	ISO VG R & O GRADE	cSt (mm <sup>2</sup> /s) @ 40°C (104°F)	SUS @ 100°F
15 - 75	3	100	90 - 110	417 - 510
32 - 100	4	150	135 - 165	626 - 765
50 - 125	5	220	198 - 242	918 - 1122

Table 4 - Oil Capacity for Double and Triple Reduction Ratios (Quarts)

MODEL	6 O'CLOCK MOUNT	3 O'CLOCK MOUNT	12 O'CLOCK MOUNT	9 O'CLOCK MOUNT	VERTICAL MOUNT
415TR	25	40	38	24	43
507TR	25	40	38	24	43
608TR	52	56	63	54	93
700TR	52	56	63	54	93

Table 5 - Selective Oil Brand Names

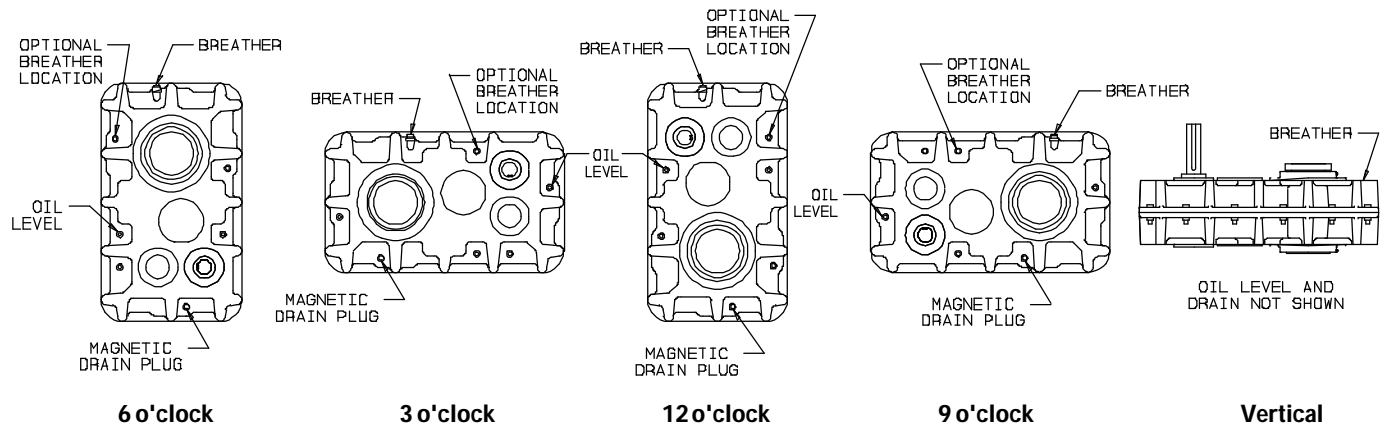
#### R & O Gear Oils

COMPANY	ISO VISCOSITY GRADE		
	100 (AGMA 3)	150 (AGMA 4)	220 (AGMA 5)
AMOCO	American Ind'l Oil 100	American Ind'l Oil 150	American Ind'l Oil 220
CHEVRON	Machine Oil R&O ISO 100	Machine Oil R&O ISO 150	RPM Gear Oil SAE 90 (ISO 220)
CITGO	Pacemaker Oil 100	Pacemaker Oil 150	Pacemaker Oil 220
CONOCO	Dectol R&O Oil 100	Dectol R&O Oil 150	Dectol R&O Oil 220
EXXON	Teresstic 100	Teresstic 150	Teresstic 220
MOBIL	DTE Heavy	DTE Extra Heavy	DTE BB
PHILLIPS	Magnus Oil ISO VG 100	Magnus Oil ISO VG 150	Magnus Oil ISO VG 220
SHELL	Morlina Oil 100	Morlina Oil 150	Morlina Oil 220
SUN	Sunvis 9100	Sunvis 9150	Sunvis 9220
TEXACO	Regal Oil R&O 100	Regal Oil R&O 150	Regal Oil R&O 220

#### Synthetic Hydrocarbon Type Gear Oils

COMPANY	LOW TEMP (0° TO 60°F) *	NORMAL TEMP (50° TO 125°F)	HIGH TEMP (100° TO 170°F)
MOBIL	SHC 626	SHC 630	Consult Factory
TEXACO	Pinnacle 68	Pinnacle 220	Consult Factory
AMSOIL	RCJ 68	RCM 220	Consult Factory

\* -20°F possible if no backstop installed.



**Figure 5 - Gear Drive Orientations, Double and Triple Reduction (15:1 thru 250:1) Ratios**

### Maintenance

Change the oil after an initial period of 500 hours of operation or one month, whichever occurs first.

Thereafter, for a petroleum-based gear oil, change the oil every 2500 hours of operation or every six months, whichever occurs first. If a synthetic, hydrocarbon-type gear oil is used, the recommended oil change interval is doubled to 5000 hours or 12 months, whichever occurs first.

In cases of severe service applications, such as extreme exposure to water, high humidity, dirty or dusty environment or chemicals in the air, which react with lubrication oil, the oil change interval must be shortened depending on the severity of the conditions.

Purge the seal cavities with recommended grease at every oil change.

For better drainage, drain the oil when the unit is warm. Remove and examine the magnetic drain plug for metal chips and fines. An excessive amount of metal fines signals internal problems. Consult the Dorris Company if you think the amount is excessive. Small amounts of metal fines are normal and should simply be cleaned off prior to reinstallation. After draining, thoroughly flush the inside of the unit with clean oil. Remove and clean the breather plug to ensure that the air passage is clear. Reinstall the drain plug and breather plug after using a thread sealant.

For units that see a significant seasonal swing in ambient temperature, you should change the grade of oil as needed (lighter oil in the winter, heavier oil in the summer).

Do not allow the gear drive to become covered with dirt, dust or other debris. The insulating properties of these coverings could cause the unit to overheat. This will lead to a breakdown of the lubrication, causing premature failure of the gear drive components.

### Storage

If the unit is not going to be operated for an extended period of time (greater than two months), you have two options. Either fill the unit completely with the proper oil for long term storage or fill it to the operating level and run it for a minimum of half an hour per week to coat the internal parts with oil. Either procedure will help prevent internal oxidation of the critical parts. Before resuming use, ensure that the oil is of the proper type and at the proper level. Operation of the unit when full of oil causes overheating and leakage through the oil seals and the breather plug.

Store the gear drive in a dry location where the temperature remains relatively constant, not passing through the dew point. Do not store the unit outdoors. If the temperature passes through the dew point, moisture will condense on the inside of the unit, reducing the life of the gear drive.

In environments where a buildup of unwanted surface coverings is expected, clean the outer surfaces of the gear drive often. Ensure that the breather is clear after cleaning.

Check the unit for oil leakage and the source of that leakage. The most common leak points are pipe plugs and oil seals. Operation of the unit when full of oil causes overheating and leakage through the oil seals and the breather plug. Rather than waiting for parts during unscheduled down time, you may wish to order replacement parts when the leaks are minor.

Occasionally, the breather plug is not properly located at the highest point on the unit. Relocate the breather plug, if required, especially if the lubricant is foaming out of the breather. Many leaks are caused by overfilling the unit with oil. Check for the proper level. Do not let any leak go unattended as the loss of oil will eventually cause a failure.