MM6100 - C8 - 12/02
INSTALLATION
LUBRICATION
OPERATION
MAINTENANCE INSTRUCTIONS
PRICE $25.00

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CONCENTRIC SHAFT REDUCER, COUPLED GEARMOTOR, AND GEARMOTOR DRIVES - 800 SERIES

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ATTENTION: Unit should be inspected immediately on receipt of shipment for any indication of rough handling or damage. Any evidence of this should be reported immediately to the carrier and a claim entered. This may show up as scuffed paint, broken or cracked castings, bent shafts, metal deformation or a shift in alignment of components.

⚠CAUTION Do not operate if mounted on the ceiling, on a wall, or on an incline unless the unit has been specifically modified for such an installation. Special lubrication arrangements must be provided when the mounting is other than standard floor mounting on a level, horizontal surface.

INTRODUCTION

IMPORTANT - Read the following instructions carefully and use them as the basis for proper care of your unit. All tags and bulletins wired to the unit should be carefully read and filed for future reference.

STORAGE

NORMAL PREPARATION
Prior to shipment, all gear units are tested with a rust inhibiting oil that covers all interior surfaces. Shaft extensions and external machine surfaces are coated with a drying-film rust-preventive material. These measures constitute the normal preparation for shipment and for temporary delays during installation, and will provide some protection, for some period of time, depending on the ambient conditions. **Outdoor, unprotected storage is not recommended.** The table in the next column shows **approximate** storage periods.

APPROXIMATE STORAGE PERIODS		
Type of Preparation	Outdoor*	Indoor**
Normal	2 Months	6 Months
Long Term	12 Months	24 Months

* Unit stored on blocks and covered with a tarpaulin in a protected area.
** Dry building with reasonably constant temperature.

PREPARATION FOR LONG-TERM STORAGE
If the storage period provided by normal preparation is not adequate, the gear unit must be prepared for long-term storage.

Protection of gear units against corrosion of internal surfaces during long-term storage is best accomplished by submerging the internals in oil and limiting the entry of air into any remaining space over the oil. The major problem in the preparation of the units is to prevent leakage of the oil, which would (1) lower the oil level and leave surfaces exposed and (2) contaminate the storage area. Despite careful preparation by the manufacturer, some oil seepage can be expected. The gear unit should be located in the storage area so as to avoid damage to other equipment and the surroundings.

It is preferable that long-term preparation be done at the factory but, if this is not possible, the following procedure is recommended:

1. Place the gear unit on wooden blocks.

2. Tighten all bolts on the housing and all pipe connections such as plugs, standpipes, dipstick caps, and heaters. Replace the breather with a pressure-relief valve having a 1 PSI setting.

3. Clean the outside diameter surfaces of the bearing covers and the adjacent surfaces of the bearing blocks with solvent. Apply a fillet of adhesive sealant such as General Electric RTV-102 around the junction of these surfaces.

4. All exposed unpainted parts such as shafts should be coated thoroughly with a corrosion preventative compound, solvent cut back type, leaving a firm film. Use Nox Rust No. 369 (Daubert Chemical Co.) or equivalent.

5. Completely fill the gear unit with the type of lubricant specified for operation, and tighten the fill-hole plug.

6. Protect other Buyer's or Seller's vendor-furnished items in accordance with the manufacturer's recommended storage procedures.

7. Cover the gear unit with tarpaulins.

8. It is recommended that the input shaft of every reducer be rotated once a month enough turns to produce one complete turn on the output shaft to prevent Water Etching or False Brinelling of the bearings and seizure of the Elastomeric Seal Lip Material on the shaft.

PROTECTION OF ASSOCIATED EQUIPMENT IN STORAGE

COUPLINGS
Fill with recommended lubricant. Coat the external surfaces with heavy grease. Wrap plastic film around the coupling and tape the plastic to the shaft.

BACKSTOP
Remove the outer half of the backstop guard (A). While rotating the backstop, squirt a rust inhibiting oil such as Mobilarma 523 (Mobil Oil Company) into every open pinhole in the backstop housing (C) in a manner that will saturate every component in the backstop assembly. Replace the backstop guard. Wrap plastic film around the backstop and tape the plastic to the shaft and to the endbell snout.

CHAIN DRIVES
Remove the chain from the drive, roll it up, coat it with grease, and wrap it in plastic film. Coat the sprockets with a firm film of a corrosion-preventative compound such as Mobilarma 633.

BELT DRIVES
Remove the belt from the sheaves and wrap it in plastic film. Coat the sheaves with a firm film of a corrosion preventive compound such as Mobilarma 633.

MOTORS
Refer to instructions on storage protection provided by the motor manufacturer. The bearings are usually prelubricated. Refer to motor manufacturer for relube period. Use protective cover to keep out water.

INSTALLATION

SAFETY
It is the purchaser's responsibility to determine the applicable local and national safety codes related to speed reducers for the specific installation involved. Shaft guarding and noise level requirements particularly should be checked, and any requirements involving the reducer clearly specified.

PREPARING THE GEAR UNIT FOR INSTALLATION

Just prior to installation, remove the protective coatings and touch up any rust spots. If the unit was filled with oil suitable for operation under ambient conditions, it can be drained down to the recommended operating level. If the oil is not suitable for operation, the unit must be drained and refilled to the recommended level with the grade and type of oil shown on the nameplate for the ambient temperature. Reinstall the breather.

Inspect the seal lips carefully. While in storage, they may have deteriorated, the seal will not perform satisfactorily, and must be replaced.

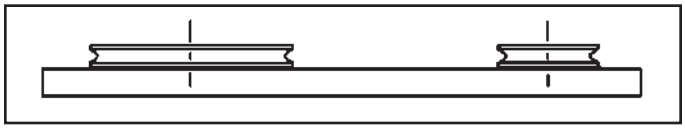
FOUNDATION
The gear unit should be mounted on a rigid foundation such as a reinforced concrete pad, a base plate, or a steel structure. An inadequate foundation will permit misalignment under load which may result in noise or overloading of elements in the drive train.

Install broad, flat metal shims under the feet to level the gear unit and to align it with the motor and the driven equipment. After bolting the gear unit in place, recheck the alignment; it may be necessary to modify the heights to the shim packs to compensate for the effect of torquing the foundation bolts.

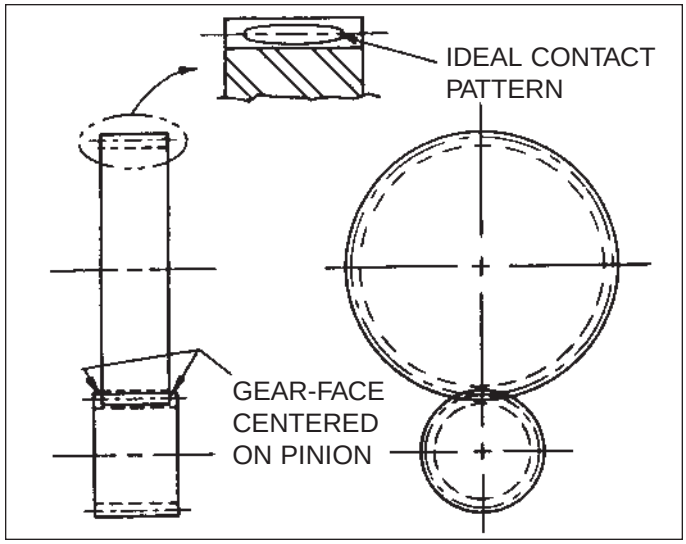
⚠CAUTION Do not mount the gear drive on ceiling, on a wall, or on an incline unless the unit has been specifically modified for such an installation. Special lubrication arrangements must be provided when the mounting is other than standard floor mounting on a level, horizontal surface.

SHAFT CONNECTIONS
WHEN GEARING, BELTS OR CHAINS are used to connect the gear unit to the prime mover or driven equipment, the pinion, sheave, or sprocket should be mounted on the shaft as closely as possible to the bearing cover to minimize shaft deflection and bearing load. Check the overhung loads to be certain that they do not exceed the catalog ratings and that the points of application are not outboard of the bearing cover by more than one shaft diameter. If the overhung load is more than one shaft diameter outboard of the bearing cover, the catalog rating will be reduced. Refer to Catalog PT886, to determine the actual overhung-load rating, or consult the factory.

For satisfactory performance of belt drives and chain drives, sheaves and sprockets must be properly aligned. A straightedge laid across the sides of sheaves and sprockets, as shown below, will facilitate alignment.



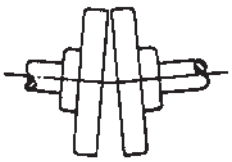
EXTERNAL GEARING must be adjusted for proper backlash, face centering, and alignment. Backlash can best be checked with a feeler gauge. Face centering can be gauged satisfactorily by eye–the wider member (usually the pinion) should extend beyond the narrower member approximately equally on both sides. Alignment can be checked by blueing the teeth, running the drive under load, and noting the contact pattern. Contact should be symmetrical about the center of the gear face; corner contact is unacceptable. Face pattern and contact pattern are illustrated on the next page.



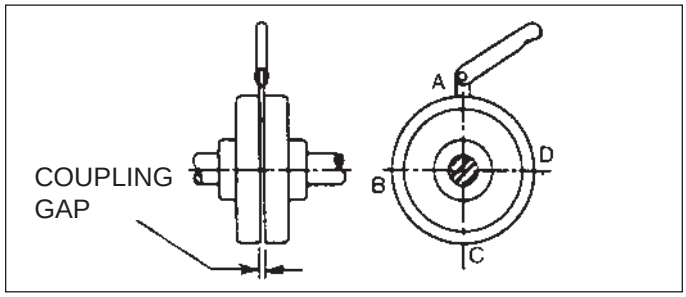
If the gear unit is to be coupling-connected to the prime mover or the driven equipment, or both, flexible couplings must be used. Rigid couplings are not suitable. Flexible couplings can compensate for reasonable amounts of misalignment but it is good practice to maintain good alignment between the gear unit and the connected equipment. It is also necessary to adjust the location of the connected equipment relative to the gear unit to provide the coupling gap (endwise clearance) between shafts that is recommended by the coupling manufacturer.

Coupling alignment errors are of two kinds; angular misalignment and parallel misalignment. Satisfactory alignment of the two shafts is easier to achieve if angular misalignment is corrected first.

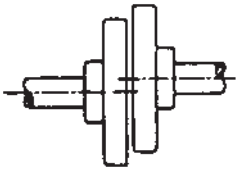
Angular misalignment is illustrated below. It is most easily corrected using a feeler gauge equal in thickness to the recommended coupling gap. When good angular alignment has been obtained, the gap measurement at points A, B, C and D will be all equal.



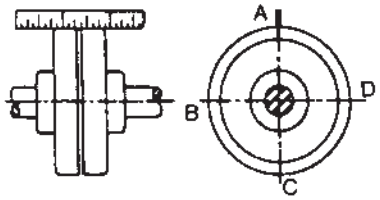
ANGULAR
MISALIGNMENT



Parallel misalignment is illustrated below. It is corrected in the horizontal direction by shifting one of the two connected units sideways and in the vertical direction by shimming. When good parallel alignment has been obtained, a straight edge at points A, B, C and D will simultaneously contact the outer surfaces of both coupling hubs.



PARALLEL
MISALIGNMENT



After parallel misalignment has been corrected, it is recommended that the angular alignment be rechecked and readjusted as indicated.

The fit of a coupling hub, pinion, sprocket, or sheave on a gear-unit shaft will range from loose to heavy interference. Heavy hammer blows must never be used to mount any of these components on the shaft because the bearings in the gear unit may be damaged. If the component at the ambient temperature cannot be mounted with light tapping, it must be expanded by heating until it can. Heating will also facilitate the removal of these components, reducing the likelihood of damaging the gear unit.

CAUTION When mounting heated components on a gear-unit shaft, take care to protect the oil seal from heat damage. Use wet rags or an air hose to cool the shaft.

LUBRICATION

CAUTION **Gear units are shipped without oil.**

Before startup, fill the unit to the indicated level with the grade and type of oil shown on the nameplate for the ambient temperature range.

Suitable oils are listed on Page 4 in this manual. If the unit will be operated at ambient temperatures outside the range shown on the nameplate, consult the factory for recommendations.

CAUTION Do not overfill; a high oil level will generate heat through churning. To ensure proper lubrication of all moving parts, do not underfill or let the oil level drop more than 1/4 inch below the indicated level.

The initial oil fill should be changed after two weeks of operation. Thereafter, the oil should be changed every six months under normal operating conditions.

TABLE 1
AGMA LUBRICANT NUMBERS FOR
CONCENTRIC SHAFT REDUCER, COUPLED GEARMOTOR & GEARMOTOR

HELICAL GEAR REDUCERS		AGMA LUBRICANT NUMBER BY AMBIENT TEMPERATURE			
		15 - 60 DEGREES F		50 - 125 DEGREES F	
TYPE	SL, VSL, P, K, L, VL, GM, CVC	NORMAL SERVICE	HEAVY DUTY	NORMAL SERVICE	HEAVY DUTY
SIZE	820 - 827 831 - 837 843 - 847	4	4 EP	5	5 EP

Where the lubricant contains lead naphthenate (an EP additive) the reducer oil sump temperature should not exceed 160°F (70°C).

TABLE 3

APPROXIMATE OIL CAPACITY (GALLONS)						
UNIT SIZE	GEARMOTOR			REDUCER AND COUPLED GEARMOTOR		
	STD. LEVEL	L.S. LEVEL	VGM LEVEL	STD. LEVEL	L.S. LEVEL	VSL LEVEL
821	.8	1.0	1.9	.8	1.0	1.9
822	1.1	1.3	2.0	1.1	1.3	2.0
823	2.1	2.5	4.5	2.1	2.5	4.5
824	2.8	3.8	7.5	2.8	3.8	7.5
8245	3.7	5.9	7.5	3.7	5.9	7.5
825	5.5	7.8	16.3	5.5	7.8	16.3
8255	8.4	12.0	18.5	8.4	12.0	18.5
826	11.0	16.0	25.0	11.0	16.0	25.0
8265	–	–	–	30.0	40.0	–
827	–	–	–	40.0	50.0	–
831	–	1.4	1.9	–	1.4	1.9
832	–	1.6	2.0	–	1.6	2.0
833	–	3.2	4.5	–	3.2	4.5
834	–	4.6	7.5	–	4.6	7.5
8345	–	6.3	9.7	–	6.3	9.7
835	–	10.2	16.3	–	10.2	16.3
8355	–	14.5	18.5	–	14.5	18.5
836	–	20.5	25.0	–	20.5	25.0
8365	–	26.0	–	–	26.0	–
837	–	35.0	–	–	35.0	–
843	–	3.6	4.5	–	3.6	4.5
844	–	5.1	7.5	–	5.1	7.5
8445	–	7.5	9.7	–	7.5	9.7
845	–	11.0	16.3	–	11.0	16.3
8455	–	15.3	18.5	–	15.3	18.5
846	–	21.0	25.0	–	21.0	25.0
8465	–	47.0	–	–	47.0	–
847	–	59.0	–	–	59.0	–

NOTE: WITH OUTPUT SHAFT SPEED OF 68 RPM OR LESS, THE LOW SPEED LEVEL (HIGH OIL LEVEL) SHOULD BE USED, DATA APPLIES TO HORIZONTAL FLOOR MOUNTED GEARMOTORS AND REDUCER MODELS.

* FOR VERTICAL UNITS (LOW SPEED DOWN), USE THE HIGH OIL LEVEL PLUG.

⚠ CAUTION These are approximate amounts. Always fill your speed reducer to the oil level indicator for proper lubrication.

The vertical flange mounted drive has a grease fitting at the bottom of the housing at the output shaft. Re-grease with NLFI No. 2 consistency Lithium Base grease at three month intervals.

The seals at the shaft extensions should be purged periodically with NLGI No. 2 Lithium Base grease. Using a hand gun, pump grease into the fitting until the grease forced out around the shaft is clean. Pump slowly to avoid forcing grease past the lip seal and into the gear unit.

OPERATION

PRE-STARTUP

After the installation has been completed, but before the initial startup, the following checks should be made:

1. Check the foundation bolts and the bolts on the gear-unit housing for tightness. Recommended torque values are shown on Page 13.

2. Check to ensure that the unit has been filled to the indicated level with the proper grade and type of oil.

3. Check the motor for correct direction of rotation.

4. Check the alignment of the couplings, sheaves, sprockets, and open gearing. Check the tension in the belts and chains and the backlash in the gearing.

5. Check the nameplate rating on the gear unit to be certain it exceeds the motor rating.

⚠WARNING For safety, purchaser or user should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The user is responsiblefor checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.

INITIAL STARTUP

After the pre-startup checks have been made and corrections completed, the gear unit may be put into operation. It is advisable to job the motor through a few revolutions while observing the system. After it has been determined that there are no problems, and vibration and noise levels appear to be normal, the drive can be operated continuously at full speed. During the first few hours of operation, the housing should be checked frequently for overheating. Depending upon the ratio, speed, and load, the oil-sump temperature may rise to as much as 100°F (56°C) above ambient.

⚠CAUTION Under no circumstances should the oil-sump temperature exceed 200°F (95°C). If this should occur, notify the factory.

The housing in the vicinity of the high-speed oil seal may reach a temperature significantly above 200°F. This will diminish as the seal and shaft wear in.

MAINTENANCE

⚠WARNING Before starting to work on the gear unit, turn off the power and disconnect the reducer from the connected equipment.

Good maintenance will prolong the life of the gear unit, help to detect trouble before serious damage can occur, and provide a safer working environment for operating personnel. It is recommended that the drive be inspected at intervals as follows:

DAILY CHECK (First Week Only)

Check for oil leaks. Check the oil level. Check for changes in temperature, sound level, and vibration. At the end of the first week of operation, check to ensure that the torques on the foundation bolts and the external housing bolts conform to the values shown on Page 13.

WEEKLY CHECK

Check the oil level. Check for oil leaks. Check for changes in temperature, sound level, and vibration. Check the connections to the driver and driven units: adjust belt tension, lubricate chains and couplings, etc. If the environment is extremely dirty, purge the seals at the shaft extensions in accordance with the instructions on Page 4.

MONTHLY CHECK

Check to ensure that the torques on the foundation bolts conform to the values shown on Page 13. Purge the seals at the shaft extensions in accordance with the instruction on Page 4. If the drive has not been operated within the past month, it should be run for a few minutes to recoat the internal surfaces with lubricant.

SEMI-ANNUAL CHECK

Drain and replace the lubricant with a grade and type appropriate for the ambient conditions. Check for gear-tooth wear.

CONCENTRIC-SHAFT REDUCER CONFIGURATION

Exploded-view drawings of these gear units in double, triple and quadruple reduction are shown elsewhere in this manual. The numbers shown in the descriptions below are the item numbers in the parts lists on the exploded-view drawings. Refer to the appropriate drawing as an aid in understanding the assembly of your unit.

The primary housing (1A) is a footed casting or weldment. The housing carriers the low-speed shaft (2) with mounted low-speed gear (3) and the low-speed pinion (4). The bearings for these two shafts are carried at the right end by bores in the primary housing and at the left end by bores in the center-plate (1B). The center-plate is bolted to the housing and located accurately by means of a pilot diameter and a dowel pin. The high-speed gear (5) is mounted outside the center-plate on an extension of the low-speed pinion (4). At both the low-speed shaft and the high-speed shaft, a lip seal prevents oil leakage. When furnished, a grease-purged seal prevents the entrance of contamination.

The number of reductions in a unit is determined by the attachments mounted upon the primary housing as follows:

For DOUBLE REDUCTION, an endbell (13) carrying the high-speed shaft (12) with integral high-speed pinion is bolted to the primary housing (1A). The high-speed pinion meshes with the high-speed gear (5).

For TRIPLE REDUCTION, a reduction-bracket (6) carrying the countershaft (7) with integral reduction-bracket pinion is bolted to the primary housing (1A) and located accurately by means of pilot diameter and dowel pin. The high-speed gear (8) is mounted on an extension of the countershaft (7). The reduction-bracket pinion meshes with the intermediate gear (5). An endbell (13) carrying the high-speed shaft (12) with integral high-speed pinion is bolted to the reduction-bracket (6) and located accurately by means of a pilot diameter. The high-speed pinion meshes with the high-speed gear (8).

For QUADRUPLE REDUCTION, a first reduction-bracket (9) carrying the first intermediate countershaft (10) with integral pinion is bolted to the second reduction-bracket (6) and located accurately by means of a pilot diameter and dowel pin. The high-speed gear (11) is mounted on an extension of the first intermediate countershaft (10). The first intermediate pinion meshes with the first intermediate gear (8). An endbell (13) carrying the high-speed shaft (12) with integral high-speed pinion is bolted to the first reduction-bracket and located accurately by means of a pilot diameter. The high-speed pinion meshes with the high-speed gear (11).

VERTICAL CONCENTRIC SHAFT REDUCERS are standard units except that the end surface of the primary housing (1A) has been machined to provide a mounting surface for a plate that will permit vertical installation of the unit. A motor-driven lube pump is always furnished with vertical units to supply lubricant to bearings and gearing located above the oil in the primary housing.

PINIONS

LOW-SPEED PINIONS

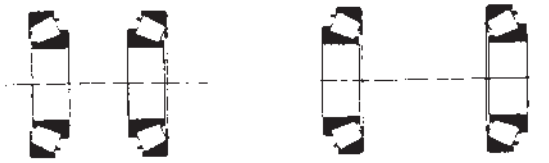
Low-speed pinions are cut integrally onto the countershaft (4).

REDUCTION-BRACKET PINIONS

Reduction-bracket pinions are permanently mounted on their shafts (7)(10). For the replacement of either of these two parts, an assembly must be ordered.

HIGH-SPEED PINIONS

There are two types of bearing arrangement for high-speed pinions in Concentric Shaft Reducers. In the smaller endbells, direct-mounted bearing are used; in the larger endbells, indirect mounted bearings are used.



DIRECT MOUNT INDIRECT MOUNT

HIGH-SPEED PINIONS WITH DIRECT-MOUNTED BEARINGS

The sizes that use this configuration in the endbell are as follows: 820, 821, 831, 832, 833, 843, 844, 8445, and 845.

Depending upon the ratio of the high-speed gearset, the pinion may be larger than the bore of the inboard bearing. In this case, the inboard bearing cone must be mounted on the shaft before the pinion is permanently mounted. For the replacement of any of these parts, an assembly of the shaft, bearings, and pinion must be ordered.

HIGH-SPEED PINIONS WITH INDIRECT-MOUNTED BEARINGS

The sizes that use this configuration in the endbell are as follows: 822, 823, 824, 8245, 825, 8255, 826, 8265, 827, 834, 8345, 835, 8355, 836, 8365, 837, 8455, 846, 8465, and 847.

These high-speed pinions are permanently mounted on their shafts. For the replacement of either of these two parts, an assembly must be ordered. Bearings can be installed or removed in the field from these assemblies.

DISASSEMBLY AND REASSEMBLY

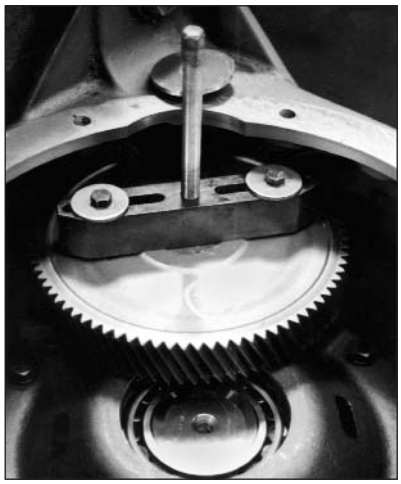
Standard machine shop practices should be used in the disassembly and reassembly of these gear units. Work should be done in a clean, dry area where the likelihood of dirt or other contamination entering the open housing or adhering to the exposed components is nil. When components are removed from the gear unit, they should be carefully cleaned and then placed on clean wooden boards or pallets and covered with paper or plastic sheets.

PRIMARY HOUSING DISASSEMBLY REASSEMBLY

Disassembly and reassembly will be greatly facilitated by positioning the housing (1A) vertically on blocks spread apart to clear the low-speed shaft extension (2).

1. Remove the grease-purge cover (26), where applicable, from the end of the housing.

2. Remove the bolt, washer and retainer plate (40)(41)(42). Heat the hub of the high-speed gear (5) to about 300°F (150°C) to soften the Loctite. Pull the high-speed gear off the low-speed pinion (4) with a suitable puller.



3. Remove the bolts and lift out the center-plate (1B).

4. Using eyebolts screwed into the ends of the shafts, gently raise the shaft assemblies starting with the low-speed shaft. Take care not to strike components together.

5. Remove the bearing cones from the low-speed pinion and the low-speed gear and bearing cones from the low-speed shaft.

6. Remove the low-speed shaft bearing-plate (21) and the low-speed pinion bearing-plate (35) from the center-plate.

7. Remove the bearing cups from the bores in the housing and center-plate.

8. Remove the oil seal.

PRIMARY HOUSING REASSEMBLY
LOW-SPEED SHAFT

1. Heat the low-speed gear (3) to about 250°F (120°C) to expand the bore.

2. Insert the key (15) into the keyway on the low-speed shaft (2). Place the hot gear on the shaft. Before it can shrink, position the gear firmly against the shaft shoulder. If when cool, a gap remains between the gear and the shoulder, place the assembly in a press and close the gap.

⚠WARNING Handle the hot gear with insulated gloves.

3. Install the spacer (18) on the low-speed shaft behind the gear.

   NOTE: This spacer is not used on the following sizes: 820, 821, 824, 831, 834, and 844.

4. Heat the bearing cones (16)(19) to about 250°F (120°C) to expand the bores. Heating can be done with a heat lamp, oil bath, or oven.

⚠CAUTION Heat uniformly; do not place the bearing in an area of localized high temperature. Do not exceed 250°F to avoid drawing back the bearing hardness.

5. Place the hot bearing cones on the shaft with the wider shoulder inward. Before they can shrink, position each cone firmly and squarely against the shaft shoulder, spacer, or gear hub as the case may be. If when cool, a gap remains between the bearing and the shoulder, place the assembly in a press and close the gap.

⚠WARNING Handle the hot bearings with insulated gloves.

LOW-SPEED PINION

1. Determine the number and location of low-speed pinion spacers (32) to be used from the table below. Units with combinations of size and number of teeth not appearing in the table do not use low-speed pinion spacers.

SIZE	NUMBER OF TEETH IN COUNTERSHAFT PINION	SPACER USED ON SHAFT EXTENSION END	SPACER USED ON BLIND END
821, 831	16	YES	NO
8255, 8355, 8455	17	YES	NO
826, 836, 846	17	YES	NO
8265, 8365, 8465	17	YES	NO

2. Heat the bearing cones (30)(33) to about 250°F (120°C) to expand the bore. Heating can be done with a heat lamp, oil bath, or oven.

⚠CAUTION Heat uniformly; do not place the bearing in an area of localized high temperature. Do not exceed 250°F to avoid drawing back the bearing hardness.

3. Place the hot bearing cones on the low-speed pinion (4) with the wider shoulders inward. Before they can shrink, position each cone firmly and squarely against the shaft shoulder or spacer. If when cool, a gap remains between the bearing and the shoulder, place the assembly in a press and close the gap.

⚠WARNING Handle the hot bearings with insulated gloves.

PRIMARY HOUSING

1. Place the bearing cups (17)(20) in the bearing bores in the primary housing (1A) with the wider shoulder contacting the housing shoulders. Tap the cups with a piece of hard wood to seat them firmly.

2. Using eyebolts screwed into the ends of the shafts, lower the two shaft assemblies into place starting with the low-speed pinion (4). Gently guide the teeth in the low-speed pinion into mesh with the low-speed gear (3).

3. Lower the center-plate (1B) into position slightly above the primary housing. Guiding it to avoid bumping the bearings as they are enveloped by the bearing bores, continue to lower the center-plate until the pilot diameter and dowel pin are properly engaged with the housing.

4. Install the bolts and lockwashers on the center-plate and torque them to the value shown in the table on Page 13.

5. Install the bearing cups (17)(31) in the center-plate and adjust the bearing endplay following Instruction I in the Bearing Adjustment section on Pages 11 and 12.

6. Heat the high-speed gear (5) to about 250°F (120°C) to expand the bore. Clean then coat the spline on the low-speed pinion with Loctite Retaining Compound RC-609.

CAUTION Do not exceed 250°F because the high temperature will have a detrimental effect on the Loctite.

7. After installing the spacer (39) on the shaft, align the splines and slip the hot gear onto countershaft. Before the gear can shrink, install the bolt (41), lockwasher (42), and retainer plate (40) in the end of the countershaft and torque the bolt to the value shown in the table on Page 13. If when cool, a gap remains between the bearing and the shoulder, place the assembly in a press and close the gap.

WARNING Handle the hot gear with insulated gloves.

8. Install the oil seal (25), following the instructions on Pages 12 and 13 and the grease-purge cover (26).

PINION AND SHAFT DISASSEMBLY

Pinions are permanently mounted into the shafts. When replacing one member, both members must be replaced.

PINION AND SHAFT ASSEMBLY

1. Clean the surface of the pinion shank and the shaft bore thoroughly with an oil-free cleaner.

2. Apply Loctite Primer 7649 to the pinion shank and allow to cure for approximately 5 minutes.

3. Apply Loctite Maximum Strength Retaining Compound RC/635 to the pinion shank.

4. Hand insert the pinion shank into the bore of the shaft.

5. Using a hydraulic press, press the pinion completely into the shaft bore until the shoulder on the pinion bottoms out on the end of the shaft.

CAUTION Alignment between the pinion shank and the shaft must be maintained while the pinion is being pressed into the shaft.

CAUTION No heat is required during the installation of the pinion.

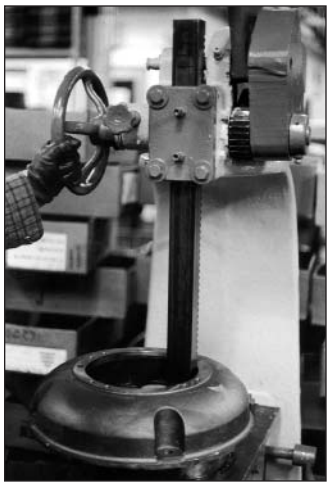
REDUCTION-BRACKET AND SECOND REDUCTION-BRACKET DISASSEMBLY

The construction and the disassembly and reassembly procedures are identical for the reduction-bracket and the second-reduction-bracket. Therefore, the item numbers used below will refer to the reduction-bracket. When working on the second-reduction-bracket, item numbers corresponding to those below can be determined from the exploded-view drawing for the quadruple reduction unit.

1. Remove the bolt and retainer plate (55)(54). Heat the hub of the first intermediate gear (8) to about 300°F (150°C) to soften Loctite. Pull gear off the shaft (7) with a suitable puller.

2. Place the reduction-bracket in a hydraulic press and free the shaft by pressing it out of the left-hand bearing cone (50).

CAUTION Do not support the reduction-bracket on its flange surface. Take the thrust directly on the bearing-carrier hub.



3. Remove the right-hand bearing cone (52) from the shaft using a bearing puller or a hydraulic press.

4. Remove the bearing cups (51)(53) from the bearing-carrier hub in the reduction-bracket.

REDUCTION-BRACKET AND SECOND-REDUCTION-BRACKET REASSEMBLY

Reassembly will be greatly facilitated by blocking up the reduction-bracket (6) so that the second intermediate countershaft (7) is horizontal.

NOTE: If the shaft was removed from the reduction-bracket, it is recommended that new bearings be used in the reassembly.

1. Place the bearing cups (51)(53) in the bearing bores in the reduction-bracket with the wider shoulders contacting the bracket shoulders. Tap the cups with a piece of hard wood to seat them firmly.

2. Heat the two bearing cones (50)(52) to 250°F (120°C). Heating can be done with a heat lamp, oil bath, or oven.

CAUTION Heat uniformly; do not place the bearing in an area of localized high temperature. Do not exceed 250°F to avoid drawing back the hardness.

WARNING Handle the hot bearings with insulated gloves.

3. Assemble the hot right-hand bearing cone (52) on the second intermediate countershaft (7), seating the wider shoulder firmly against the shaft shoulder.

4. From pipe or tubing with inside diameter a little larger than the splined portion of the shaft, cut a temporary spacer a little longer than the width of the first intermediate gear (8).

5. Insert the shaft/bearing assembly into the bearing-carrier hub and slip the hot left-hand bearing cone (50) onto its end of the shaft leaving about .010 inches endplay in the bearings.

CAUTION Do not seat the cone so as to remove all endplay.

6. Quickly slip the temporary spacer onto the splined shaft extension and thread the bolt (55) and retainer plate (54) assembly into the end of the shaft.

7. While the bearing cone is still hot, tighten the bolt to adjust the bearing endplay following Instruction II in the Bearing Adjustment section on Page 11.

8. After the endplay has been properly established and the bearing has cooled down, remove the bolt, retaining plate, and temporary spacer.

9. Heat the first intermediate gear to 250°F (120°C) to expand the bore.

CAUTION Do not exceed 250°F because the high temperature will have a detrimental effect on the Loctite.

10. Clean, then coat the splined surfaces in the gear bore and on the shaft with Loctite Retaining Compound RC-609. Align the splines, slip the hot gear onto the shaft and position it snugly against the bearing cone.

WARNING Handle the hot gear with insulated gloves.

11. Slip the bolt into the retainer plate, coat the threads with Loctite Threadlock 242, and screw the bolt into the end of the shaft. Torque the bolt to the value shown in the table on Page 13.

CAUTION Do not overtorque the bolt because this could affect the bearing endplay.

ENDBELL DISASSEMBLY

The disassembly will be greatly facilitated by clamping the flange in a vise so that the shaft is in a horizontal position.

ENDBELLS WITH DIRECT-MOUNTED BEARINGS

This instruction applies to endbells for the following sizes: 820, 821, 831, 832, 833, 843, 844, 8445, and 845.

1. After removing the key (80) from the high-speed shaft (12), remove the bearing cone (14).

2. Pull the high-speed shaft with integral pinion and mounted bearings (70)(71) out of the endbell (13). Remove the cup of the right-hand bearing from the bore.

3. Remove the oil seal (75) from the bearing cover.

4. Remove the snap ring (72) from the bearing carrier hub in the endbell.

ENDBELLS WITH INDIRECT-MOUNTED BEARINGS

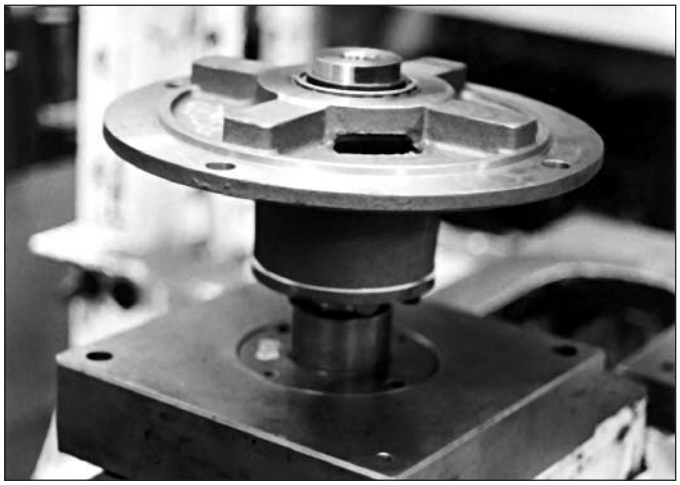
This instruction applies to endbells for the following sizes: 822, 823, 824, 8245, 825, 8255, 826, 8265, 827, 834, 8345, 835, 8355, 836, 8365, 837, 8455, 846, 8465, and 847.

1. After removing the key (80) from the high-speed shaft (12), remove the bearing cover (14).

2. Bend up the locking tang on the bearing lockwasher (84) and remove the bearing locknut (83) and lockwasher (84).

3. Place the endbell in a hydraulic press and free the shaft by pressing it out of the left-hand bearing cone (81).

CAUTION Do not support the endbell on its flange surface. Take the thrust directly on the bearing-carrier hub.



4. Remove the right-hand bearing cone (81) from the shaft. Remove the bearing cups (82) from the bearing-carrier hub in the endbell.

5. Remove the oil seal (87) from the bearing cover.

ENDBELL REASSEMBLY

The reassembly will be greatly facilitated by clamping the flange in a vise so that the shaft is in a horizontal position.

ENDBELLS WITH DIRECT-MOUNTED BEARINGS

This instruction applies to endbells for the following sizes: 820, 821, 831, 832, 833, 843, 844, 8445, and 845.

1. Install the snap ring (72) in the bearing-carrier hub of the endbell (13). Install the right-hand bearing cup (71) in the bearing bore with the wider shoulder contacting the snap ring. Tap the cup with a piece of hard wood to seat it firmly.

2. Insert the assembly consisting of high-speed shaft (12), pinion, and bearing cones (70) into the endbell. Install the left-hand bearing cup (71) in the bearing bore with the wider shoulder outward. Tap the cup with a piece of hard wood to seat it firmly.

3. Adjust the bearing endplay following Instruction III in the Bearing Adjustment section on Page 12.

4. Remove the bearing cover (14). Install the oil seal (75) in the bearing cover following the instructions in the Oil Seal section on Pages 12 and 13.

5. Coat the shimpack on both sides with a very thin film of General Electric RTV-102. Before the sealant begins to set, bolt the assembly together, torquing the bolts to the value shown in the table on Page 13.

CAUTION Take care to align the slot in the bearing-cover hub with the cored oil-drain hole in the endbell and to keep sealant from preventing drain-back of the oil.

ENDBELLS WITH INDIRECT-MOUNTED BEARINGS

This instruction applies to endbells for the following sizes: 822, 823, 824, 8245, 825, 8255, 826, 8265, 827, 834, 8345, 835, 8355, 836, 8365, 837, 8455, 846, 4865, and 847.

If the high-speed shaft was removed from the endbell, it is recommended that new bearings be used in the reassembly.

1. Place the bearing cups (82) in the bearing bores in the endbell with the wider shoulders contacting the endbell shoulders. Tap the cups with a piece of hard wood to seat them firmly.

2. Heat the two bearing cones (81) to 250°F (120°C). Heating can be done with a heat lamp, oil bath, or oven.

CAUTION Heat uniformly; do not place the bearing in an area of localized high temperature. Do not exceed 250°F to avoid drawing back the hardness.

3. Assemble the hot right-hand bearing cone onto the high-speed shaft (12), seating the wider shoulder firmly against the shaft shoulder. If, when cool, a gap remains between the bearing and the shoulder, place the assembly in a press and close the gap.

WARNING Handle the hot bearings with insulated gloves.

4. Insert the shaft/bearing assembly into the bearing-carrier hub and slip the hot left-hand bearing cone onto its end of the shaft leaving about .010 inches endplay in the bearings.

CAUTION Do not seat the cone so as to remove all endplay.

5. Quickly install the bearing locknut (83) onto the threaded shaft extension.

6. While the bearing cone is still hot, tighten the locknut to adjust the bearing endplay following Instruction IV in the Bearing Adjustment section in the next column.

7. After the correct bearing endplay has been achieved, remove the bearing locknut (83).

8. Apply Loctite Primer 7649 to the threaded portion of the input shaft and allow the primer to cure for approximately 5 minutes.

9. Apply Loctite Maximum Strength Retaining Compound RC/635 to the threaded portion of the input shaft.

10. Install bearing lockwasher (84) and locknut (83) onto the threaded shaft extension.

CAUTION Do not overtighten bearing locknut. Locknut should only be snugged against the bearing cone.

11. Bend the appropriate lockwasher tang to lock the locknut.

12. Tighten the bearing locknut setscrew. NOTE: Not all locknuts are equipped with setscrews.

13. Install the oil seal (87) in the bearing cover (14) following the instruction in the Oil Seal section on Pages 12 and 13.

14. Apply a small bead of General Electric RTV-102 to the flange surface of the bearing cover, circling each bolt hole.

CAUTION Do not permit sealant to block the drain-back slot of hole.

15. Install the bearing cover on the endbell, torquing the bolts to the value shown in the table on Page 13.

CAUTION If the bearing cover has a slot in the hub, align it with the cored drain-back hole in the endbell.

REJOINING THE REASSEMBLED MODULES

Gear-unit modules are joined to each other with gaskets (46)(56)(66) at the mating surfaces. All interfaces use pilot diameters to maintain concentricity between the modules. Reduction-brackets also use dowel pins (59) to (69) establish the correct radial relationship with the modules to which they are

joined. Bolts must be torqued to the values shown in the table on Page 13.

Endbells are constructed with a heavy lug at one point between the hub and the flange. This lug carries an oil drain-back hole.

CAUTION For proper lubrication of the high-speed bearings, the endbell must be mounted on the gear unit in its original position (with the lug down).

On vertical concentric-shaft reducers, any location of the lug is acceptable. On integral gearmotors or vertical integral motors, the motor may be mounted to obtain the best location for the conduit box.

RETURNING THE GEAR-UNIT TO SERVICE

After the reassembly has been completed, turn the input shaft by hand. Rotation should be smooth with no noise or indications of binding or scraping.

When reinstalling the unit, follow the instructions in the sections on Installation, Pages 2 and 3, and Operation, Page 5.

BEARING ADJUSTMENT

All bearings in Foote-Jones/Illinois Gear Series 800 concentric-shaft reducers are single-row tapered-roller bearings. These bearings must be adjusted at assembly to obtain the proper axial clearance or endplay. The three methods used for adjusting endplay are:

SHIM ADJUSTMENT
BOLT ADJUSTMENT
LOCKNUT ADJUSTMENT

For each type of shaft, the method of adjustment, the amount of bearing endplay required and the designation of the applicable instruction are given in the table below.

SHAFT	METHOD OF ADJUSTMENT	BEARING ENDPLAY	INSTRUCTION
Low-Speed Shaft Sizes: All	Shim	.001” - .003”	I
Low-Speed Pinion Sizes: All	Shim	.001” - .003”	I
Reduction-Bracket Countershaft Sizes: All	Bolt	.002” - .004”	II
High-Speed Shaft (Direct Mounted) Sizes: 820, 821, 831, 832, 833, 843, 844, 8445, 845	Shim	.003” - .005”	III
High-Speed Shaft (Indirect Mounted) Sizes: 822, 823, 824, 8245, 825, 8255,826, 8265, 827, 834, 8345, 835, 8355, 836, 8365, 837, 8455, 846, 8465, 847	Locknut	.002” - .004”	IV

INSTRUCTION I
(Low-Speed Shaft and Low-Speed Pinion)

1. Place bearing cups on the appropriate bearing cones.

2. Assemble centerplate over these cups (slip fit) to inside of housing, use all the fasteners to secure centerplate to housing. See page 13 for the appropriate bolt tightening torques.

3. Rotate both shafts to check for free movement, install a magnetic base dial indicator to the machined surface of the housing with the point of the dial indicator contacting the end of the low speed shaft. Pull or push on the low speed shaft and read and record the total indicator movement, then move the dial indicator to the low speed pinion shaft end and, pull and push on the low speed pinion shaft, read and record the total indicator movement. Remove centerplate ie. say the low speed shaft value is .016 and low speed pinion shaft value is .020, the recommended end play is .002” - .004” for both the low speed shaft and low speed pinion shaft. Then you would put .014 shims in low speed shaft bore of the centerplate, and put .018 shims in the low speed pinion shaft bore of the centerplate. Then re-install the center in the housing with **ALL** the fasteners. See page 13 for the appropriate bolt tightening torques. Re-install dial indicator and recheck the end plays to see if they are within the specifications, if not then add or subtract the appropriate shims to be within the recommendation of .002” - .004” end play.

INSTRUCTION II
(Reduction-Bracket Countershaft)

1. Attach a dial indicator to the reduction-bracket with the point contacting the end face of the pinion.

2. While holding the pinion to prevent rotation, tighten the bolt in steps of a few degrees of rotation. While rotationally oscillating the shaft to seat the rollers, check the bearing endplay frequently. The steps should become smaller and smaller as the endplay approaches the recommended upper value of .004”. Continue tightening until the endplay is within the range of .002” - .004”.

3. If the bolt is tightened too far (the endplay is found to be less than .002”), quickly, while the bearing cone is still hot, loosen the bolt one turn and strike the bolt head with a rawhide mallet to move the cone and increase the endplay. Then repeat the above procedure until the proper endplay is obtained.

INSTRUCTION III
(High-Speed Shaft in Sizes: 820, 821, 831, 832, 833, 843, 844, 8445, and 845)

1. Mount the bearing cover (14) on the endbell (13) with two bolts (77) 180° apart. While rotationally oscillating the shaft (12) to seat the bearing rollers, uniformly tighten the bolts to about 10 foot-pounds torque.

2. With a feeler gauge or taper gauge, measure the gap between the bearing cover and the endbell at four places about 90° apart.

3. Assemble a shimpack (76) equal in thickness to the average of the gap reading plus. 004".

4. Install the shimpack between the bearing cover and the endbell. Install the full complement of bolts and torque them to the value shown in the table on Page 13.

5. Check the resulting bearing endplay with a dial indicator. If it is not .003" - .005", modify the thickness of the shimpack as indicated and repeat the checking procedure.

INSTRUCTION IV
(High-Speed Shaft in Sizes: 822, 823, 824, 8245, 825, 8255, 826, 8265, 827, 834, 8345, 835, 8355, 836, 8365, 837, 8455, 846, 8465, and 847).

1. Attach a dial indicator to the endbell (13) with the point contacting the end face of the pinion.

2. While holding the pinion to prevent rotation, tighten the bearing locknut (83) in steps of a few degrees of rotation. While rotationally oscillating the shaft (12) to seat the bearing rollers, check the bearing endplay frequently. The steps should become smaller and smaller as the endplay approaches the recommended upper value of .004". Continue tightening until the endplay is within the range of .002" - .004".

3. If the locknut is tightened too far (the endplay is found to be less than .002"), quickly, while the bearing cone is still hot, loosen the locknut one turn and strike the end of the shaft with a rawhide mallet to move the cone and increase the endplay. Then repeat the tightening procedure until the proper endplay is obtained.

BOLT TORQUES

To prevent loosening under operating conditions, all bolts must be tightened, unless otherwise specified, to the torque values given in table.

SHAFT SEALS

LIP SEALS
The oil seals used in these units have lips of synthetic-elastomer materials. They are constructed with a spring behind the inner lip which exerts constant pressure to keep the lip in contact with the shaft.

In any disassembly of the gear unit that involves withdrawing a shaft from an oil seal, it is recommended that oil seal be replaced. If a groove has been worn in the shaft where it contacts the seal lip, it may be possible to shift the seal axially in the seal bore to avoid the groove. If not, the area should be carefully polished or plunged ground (.003" deep maximum) to remove the imperfection, or a seal wear-sleeve may be installed.

RECOMMENDED BOLT TIGHTENING TORQUES* (lb-ft)

BOLT SIZE	GRADES III & V	GRADE VIII, STUDS, & SOC. HD. SCREWS
1/4	9	13
5/16	18	28
3/8	31	46
7/16	50	75
1/2	75	115
9/16	110	165
5/8	150	225
3/4	250	370
7/8	380	590
1	585	895
1-1/8	780	1410
1-1/4	1100	1960
1-3/8	1460	2630
1-1/2	1750	3150
1-5/8	2390	4310
1-3/4	3110	5610
1-7/8	4190	7550
2	4500	8100
2-1/4	6500	11,700
2-1/2	7140	16,200

*Maximum torque values are shown. Use 90% to 100% of these values.

Before installing a new seal, carefully examine it for imperfections. The lips should have smooth, uninterrupted edges free of molding flash. The shell O.D. should be free of dents, scratches, and burrs.

1. Clean the seal bore in the bearing cover (14) or primary housing (1A) and apply a thin coating of sealant to the seal bore.

2. Mount the seal in the seal bore with the spring side inboard. Use a piece of hard wood to drive the seal flush with the surface.

3. Wipe a liberal amount of NLGI No. 2 Lithium Base grease into the seal and onto the lips and shaft as an aid in installation and for lubrication at startup.

CAUTION Care must be taken to prevent damaging the seal lip on the edges of the keyway or on shaft shoulders. Plastic electrical tape wrapped around the shaft starting at the seal area and working toward the end of the shaft will protect the lips during installation.

V-RING SEALS

A dual-seal arrangement is used on the low-speed shaft in vertical gear-units. The second seal is a V-ring. It is slipped onto the low-speed shaft outboard of the bearing cone, and its lip contacts the shell of the standard lip seal.

GREASE-PURGED SEALS

Where applicable, these seals are furnished for both shaft extensions. The exceptions are the high-speed shaft on integral gearmotors and the low-speed shaft on vertical gear-units.

RATCHET-TYPE BACKSTOP

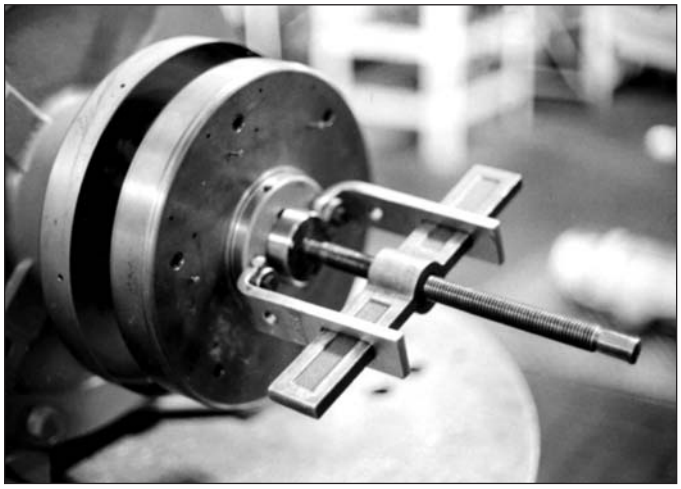
Pawls are carried in a rotating housing mounted on the high-speed shaft. These pawls engage a ratchet wheel, preventing rotation in one direction. The backstop can be assembled to permit free rotation of the high-speed shaft in either direction.

At a rotational speed of about 600 RPM, centrifugal force lifts the pawls off the ratchet wheel. When rotation drops below this speed, springs on the pawls force the pawls into contact with the ratchet wheel. The exploded-view drawing of this device shown elsewhere in this manual can be used as an aid in understanding the disassembly and reassembly instructions below.

BACKSTOP DISASSEMBLY

If the purpose of the disassembly is to reverse the direction of rotation, perform only steps 1 through 4 below.

1. Remove the outer half of the dust cover (A).



2. Loosen the set screw in the housing (C) and pull the housing off the shaft (12). Lay the housing, open-side up, on a table.

3. Drive out the roll pins (B) upon which the pawls pivot and the stop pins (K).

4. Remove the socket-head screws (L) from the ratchet wheel (E), and remove the ratchet wheel.

5. Remove the inner half of the dust cover and the key (D).

   NOTES: If the backstop will not be remounted, fasten the bearing cover to the endbell with hex-head bolts of proper size and length.

BACKSTOP REASSEMBLY

1. Coat all surfaces of the pawl (F) assemblies lightly with grease. With the housing (C) laying on a table, open-side up, lay the pawls in the housing, orienting them properly for the desired direction of rotation.

2. Align the holes in the pawls with the holes of the same size in the housing. Drive roll pins (B) through the pawl and both sides of the housing.

3. Coat the ratchet wheel (E) lightly with grease. Mount the ratchet wheel and the inner half of the dust cover (A) on the bearing cover (14), orienting the ratchet wheel to permit high-speed shaft (12) rotation in the desired direction. Torque the socket-head screws (L) to the value shown in the table on Page 13.

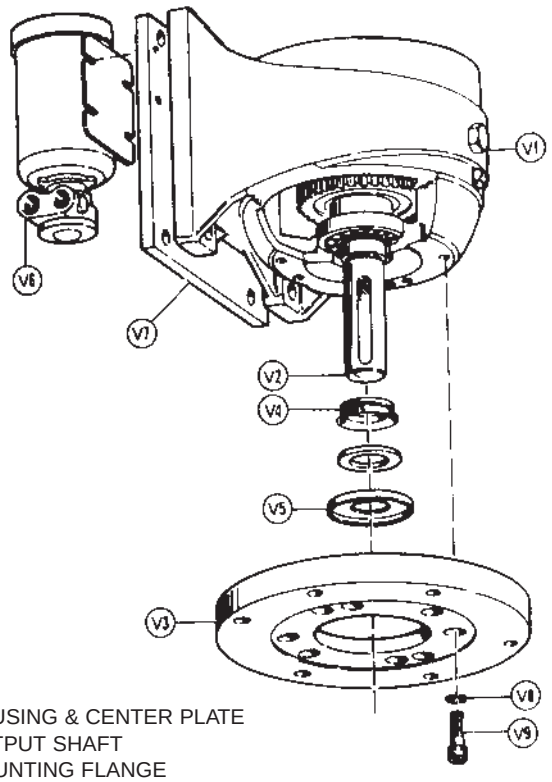
4. Move each pawl outward against its stop. Insert a small dowel pin or nail into the appropriate hole in the housing under the pawl to hold the pawl clear of the ratchet wheel during assembly.

5. Heat the housing/pawl assembly in an oven to about 250°F (120°C). After placing the key (D) in the keyway in the shaft, slide the hot housing assembly onto the shaft. Position the housing with about .06" between its hub and the end-surface of the bearing cover (14). In this position, the pawls should fully engage the ratchet wheel and there should be no other contact between moving and stationary parts.

6. When it has been determined that the housing is positioned correctly, tighten the set screw in the housing hub.

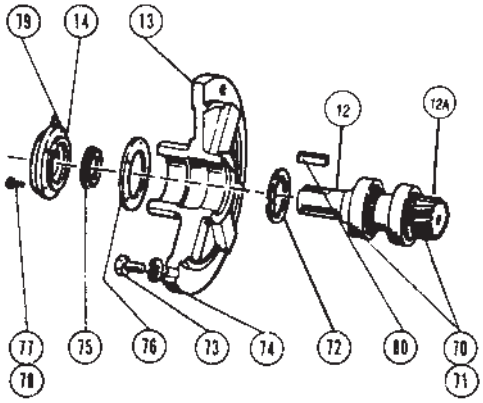
7. Remove the pins or nails from the housing to permit the pawls to drop into operating positions.

8. Install the outer half of the dust cover, taking care to provide adequate clearance between it and the housing. Fasten the two cover pieces together with sheet-metal screws.



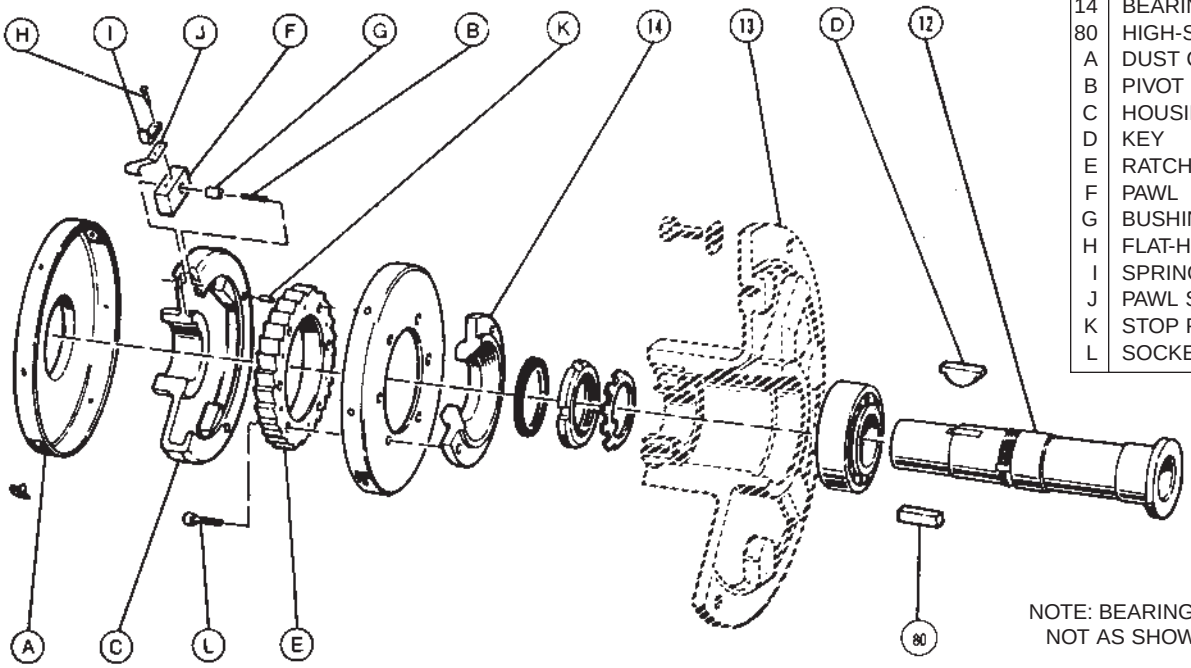
V1 HOUSING & CENTER PLATE
V2 OUTPUT SHAFT
V3 MOUNTING FLANGE
V4 V RING SEAL
V5 SLINGER
V6 MOTORIZED PUMP
V7 PUMP MOUNTING PLATE
V8 MOUNTING FLANGE LOCKWASHER
V9 MOUNTING FLANGE BOLT

For other reducer parts See pages 16, 17, or 18



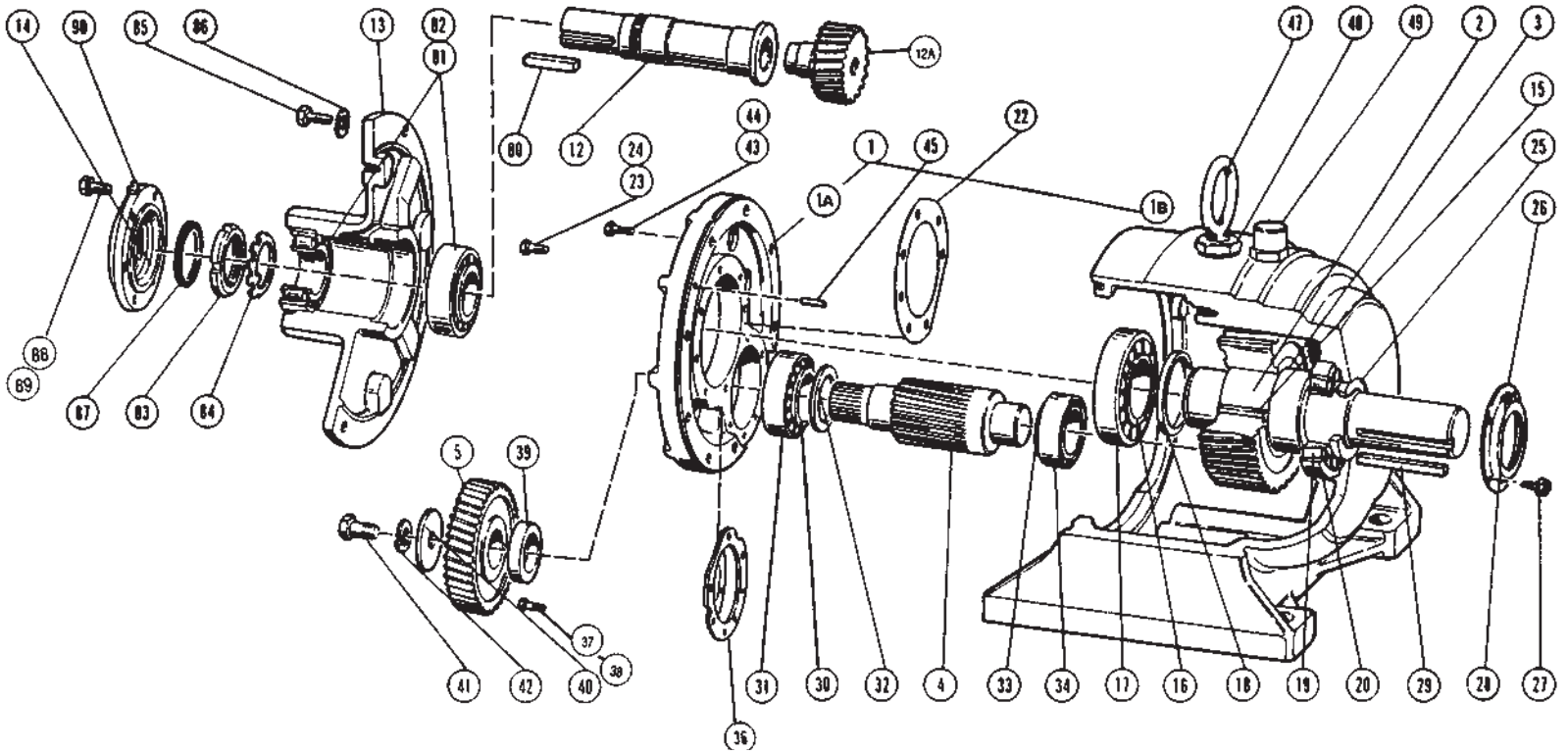
12 HIGH-SPEED SHAFT / 12A PINION
13 ENDBELL
14 BEARING COVER
70 HIGH-SPEED BEARING – LEFT AND RIGHT
71 HIGH-SPEED BEARING – LEFT AND RIGHT
72 HIGH-SPEED BEARING SNAP RING
73 ENDBELL MOUNTING BOLT
74 ENDBELL MOUNTING LOCKWASHER
75 HIGH-SPEED LIP SEAL
76 GASKET
77 BEARING-COVER BOLT
78 BEARING-COVER LOCKWASHER
79 HIGH-SPEED GREASE-PURGE FITTING
80 HIGH-SPEED SHAFT KEY

High-Speed Shaft (Direct Mounted)
Sizes: 820, 821, 831, 832, 833
843, 844, 8445, 845



PARTS LIST BACKSTOP LOCKING OPTION	
12	HIGH-SPEED SHAFT
13	ENDBELL
14	BEARING COVER
80	HIGH-SPEED SHAFT KEY
A	DUST COVER
B	PIVOT PIN
C	HOUSING
D	KEY
E	RATCHET WHEEL
F	PAWL
G	BUSHING
H	FLAT-HEAD RIVET
I	SPRING STIFFENER
J	PAWL SPRING
K	STOP PIN
L	SOCKET-HEAD SCREW

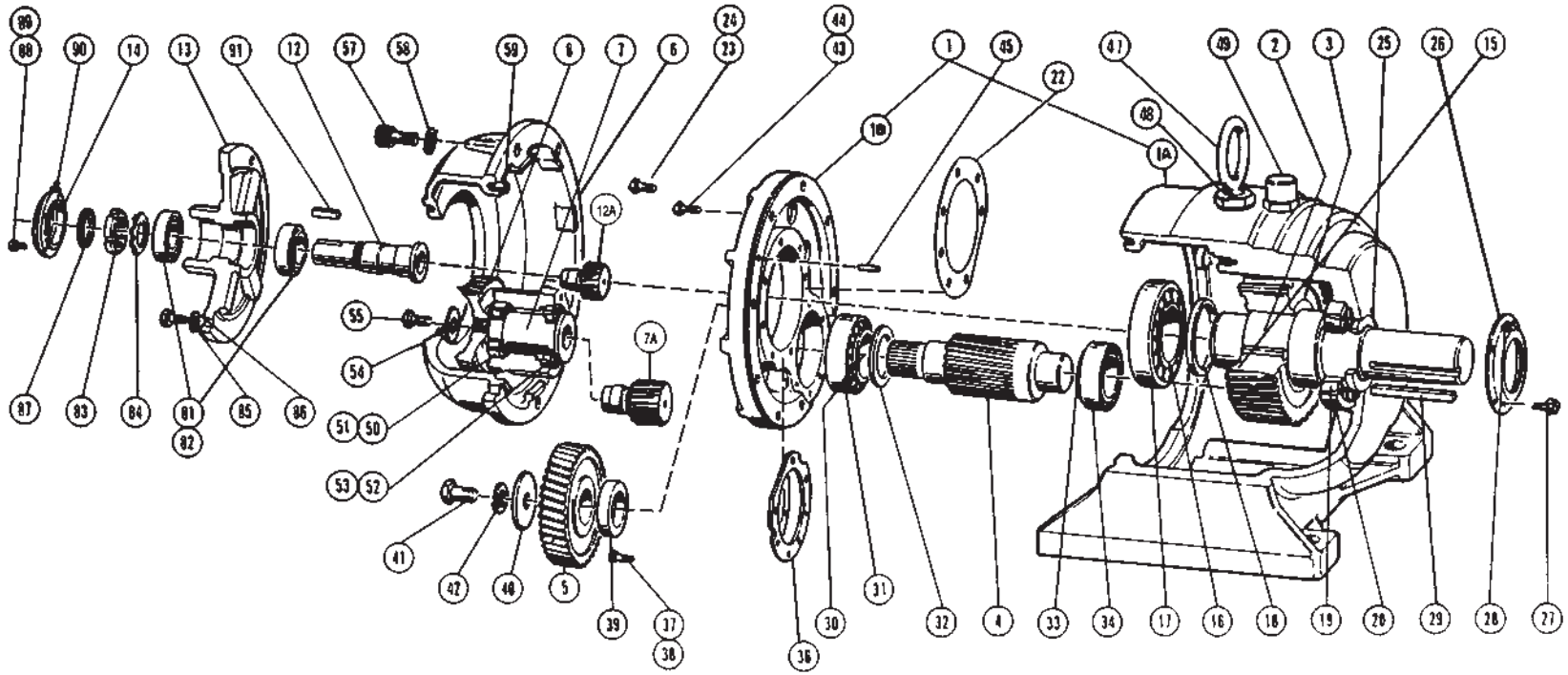
NOTE: BEARING ARRANGEMENT IS NOT AS SHOWN FOR ALL SIZES



DOUBLE REDUCTION

1. HOUSING (1A) AND CENTERPLATE (1B)
2. LOW-SPEED SHAFT
3. LOW-SPEED GEAR
4. LOW-SPEED PINION
5. HIGH-SPEED GEAR
12. HIGH-SPEED SHAFT / 12A PINION
13. ENDBELL
14. BEARING COVER
15. LOW-SPEED GEAR KEY
16. LOW-SPEED BEARING–CONE, LEFT
17. LOW-SPEED BEARING–CUP, LEFT
18. LOW-SPEED BEARING SPACER
19. LOW-SPEED BEARING–CONE, RIGHT
20. LOW-SPEED BEARING–CUP, RIGHT
22. LOW-SPEED BEARING SHIMPACK
23. LOW-SPEED BEARING PLATE BOLT
24. LOW-SPEED BEARING PLATE LOCKWASHER
25. LOW-SPEED SHAFT LIP SEAL
26. LOW-SPEED GREASE PURGE COVER
27. LOW-SPEED GREASE PURGE COVER SCREW
28. LOW-SPEED GREASE PURGE FITTING
29. LOW-SPEED SHAFT KEY
30. LOW-SPEED PINION BEARING–CONE, LEFT
31. LOW-SPEED PINION BEARING–CUP, LEFT
32. LOW-SPEED PINION BEARING–SPACER
33. LOW-SPEED PINION BEARING–CONE, RIGHT
34. LOW-SPEED PINION BEARING–CUP, RIGHT
36. LOW-SPEED PINION BEARING SHIMPACK
37. LOW-SPEED PINION BEARING PLATE BOLT
38. LOW-SPEED PINION BEARING PLATE LOCKWASHER
39. HIGH-SPEED GEAR SPACER
40. HIGH-SPEED GEAR RETAINER PLATE
41. HIGH-SPEED GEAR RETAINER PLATE BOLT
42. HIGH-SPEED GEAR RETAINER PLATE LOCKWASHER
43. CENTERPLATE MOUNTING BOLT
44. CENTERPLATE MOUNTING LOCKWASHER
45. CENTERPLATE DOWEL PIN
46. RTV
47. EYEBOLT
48. DYNA-SEAL WASHER
49. BREATHER
80. HIGH-SPEED SHAFT KEY
81. HIGH-SPEED CONE, LEFT AND RIGHT
82. HIGH-SPEED BEARING CUP, LEFT AND RIGHT
83. HIGH-SPEED BEARING LOCKNUT
84. HIGH-SPEED BEARING LOCKWASHER
85. ENDBELL MOUNTING BOLT
86. ENDBELL MOUNTING LOCKWASHER
87. HIGH-SPEED LIP SEAL
88. BEARING COVER MOUNTING BOLT
89. BEARING COVER MOUNTING LOCKWASHER
90. HIGH-SPEED GREASE-PURGE FITTING

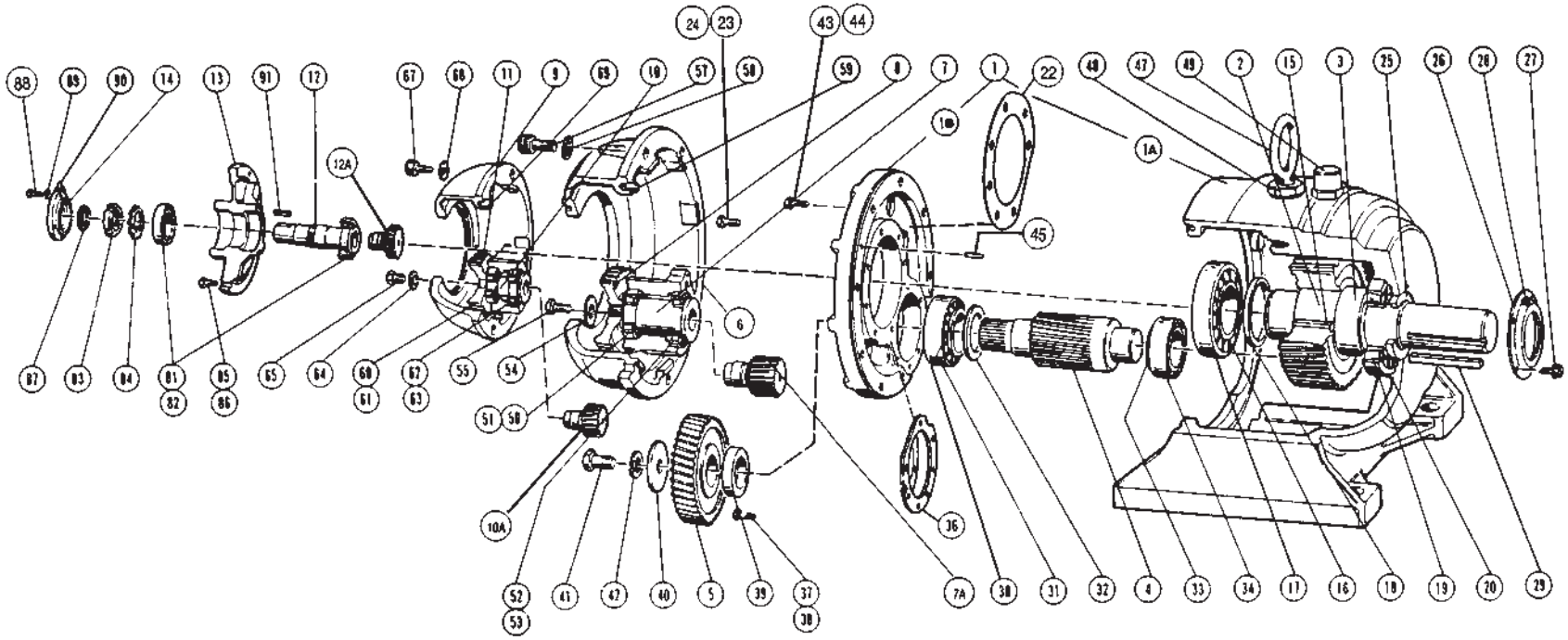
⚠WARNING Use a bead of adhesive sealant such as General Electric RTV-102 on part #13 before final assembly to part #1, otherwise the gear reducer will leak hot oil.



TRIPLE REDUCTION

1. HOUSING (1A) AND CENTERPLATE (1B)
2. LOW-SPEED SHAFT
3. LOW-SPEED GEAR
4. LOW-SPEED PINION
5. INTERMEDIATE GEAR
6. REDUCTION BRACKET
7. COUNTERSHAFT / 7A PINION
8. HIGH-SPEED GEAR
12. HIGH-SPEED SHAFT / 12A PINION
13. ENDBELL
14. BEARING COVER
15. LOW-SPEED GEAR KEY
16. LOW-SPEED BEARING–CONE, LEFT
17. LOW-SPEED BEARING–CUP, LEFT
18. LOW-SPEED BEARING SPACER
19. LOW-SPEED BEARING–CONE, RIGHT
20. LOW-SPEED BEARING–CUP, RIGHT
22. LOW-SPEED BEARING SHIMPACK
23. LOW-SPEED BEARING PLATE BOLT
24. LOW-SPEED BEARING PLATE LOCKWASHER
25. LOW-SPEED SHAFT LIP SEAL
26. LOW-SPEED GREASE PURGE COVER
27. LOW-SPEED GREASE PURGE COVER SCREW
28. LOW-SPEED GREASE PURGE FITTING
29. LOW-SPEED SHAFT KEY
30. LOW-SPEED PINION BEARING–CONE, LEFT
31. LOW-SPEED PINION BEARING–CUP, LEFT
32. LOW-SPEED PINION BEARING–SPACER
33. LOW-SPEED PINION BEARING–CONE, RIGHT
34. LOW-SPEED PINION BEARING–CUP, RIGHT
36. LOW-SPEED PINION BEARING SHIMPACK
37. LOW-SPEED PINION BEARING PLATE BOLT
38. LOW-SPEED PINION BEARING PLATE LOCKWASHER
39. INTERMEDIATE GEAR SPACER
40. INTERMEDIATE GEAR RETAINER PLATE
41. INTERMEDIATE GEAR RETAINER PLATE BOLT
42. INTERMEDIATE GEAR RETAINER PLATE LOCKWASHER
43. CENTERPLATE MOUNTING BOLT
44. CENTERPLATE MOUNTING LOCKWASHER
45. CENTERPLATE DOWEL PIN
46. RTV
47. EYEBOLT
48. DYNA-SEAL WASHER
49. BREATHER
50. COUNTERSHAFT BEARING–CONE, LEFT
51. COUNTERSHAFT BEARING–CUP, LEFT
52. COUNTERSHAFT BEARING–CONE, RIGHT
53. COUNTERSHAFT BEARING–CUP, RIGHT
54. HIGH-SPEED GEAR RETAINER–PLATE
55. HIGH-SPEED GEAR RETAINER–PLATE BOLT
56. RTV
57. REDUCTION-BRACKET MOUNTING BOLT
58. REDUCTION-BRACKET MOUNTING LOCKWASHER
59. REDUCTION-BRACKET DOWEL PIN
81. HIGH-SPEED BEARING CONE
82. HIGH-SPEED BEARING CUP
83. HIGH-SPEED BEARING LOCKNUT
84. HIGH-SPEED BEARING LOCKWASHER
85. ENDBELL MOUNTING BOLT
86. ENDBELL MOUNTING LOCKWASHER
87. HIGH-SPEED LIP SEAL
88. BEARING COVER MOUNTING BOLT
89. BEARING COVER MOUNTING LOCKWASHER
90. HIGH-SPEED GREASE-PURGE FITTING

⚠WARNING Use a bead of adhesive sealant such as General Electric RTV-102 on parts #6, 13 & 14 before final assembly to part #1, otherwise the gear reducer will leak hot oil.



QUADRUPLE REDUCTION

1. HOUSING (1A) AND CENTERPLATE (1B)
2. LOW-SPEED SHAFT
3. LOW-SPEED GEAR
4. LOW-SPEED PINION
5. SECOND INTERMEDIATE GEAR
6. SECOND REDUCTION BRACKET
7. SECOND INTERMEDIATE COUNTERSHAFT / 7A PINION
8. FIRST INTERMEDIATE GEAR
9. FIRST REDUCTION BRACKET
10. FIRST INTERMEDIATE COUNTERSHAFT / 10A PINION
11. HIGH-SPEED GEAR
12. HIGH-SPEED SHAFT / 12A PINION
13. ENDBELL
14. BEARING COVER
15. LOW-SPEED GEAR KEY
16. LOW-SPEED BEARING–CONE, LEFT
17. LOW-SPEED BEARING–CUP, LEFT
18. LOW-SPEED BEARING SPACER
19. LOW-SPEED BEARING–CONE, RIGHT
20. LOW-SPEED BEARING–CUP, RIGHT
22. LOW-SPEED BEARING SHIMPACK
23. LOW-SPEED BEARING PLATE BOLT
24. LOW-SPEED BEARING PLATE LOCKWASHER
25. LOW-SPEED SHAFT LIP SEAL
26. LOW-SPEED GREASE PURGE COVER
27. LOW-SPEED GREASE PURGE COVER SCREW
28. LOW-SPEED GREASE PURGE FITTING
29. LOW-SPEED SHAFT KEY
30. LOW-SPEED PINION BEARING–CONE, LEFT
31. LOW-SPEED PINION BEARING–CUP, LEFT
32. LOW-SPEED PINION BEARING–SPACER
33. LOW-SPEED PINION BEARING–CONE, RIGHT
34. LOW-SPEED PINION BEARING–CUP, RIGHT
36. LOW-SPEED PINION BEARING SHIMPACK
37. LOW-SPEED PINION BEARING PLATE BOLT
38. LOW-SPEED PINION BEARING PLATE LOCKWASHER
39. SECOND INTERMEDIATE GEAR SPACER
40. SECOND INTERMEDIATE GEAR RETAINER PLATE
41. SECOND INTERMEDIATE GEAR RETAINER PLATE BOLT
42. SECOND INTERMEDIATE GEAR RETAINER PLATE LOCK-WASHER
43. CENTERPLATE MOUNTING BOLT
44. CENTERPLATE MOUNTING LOCKWASHER
45. CENTERPLATE DOWEL PIN
46. RTV
47. EYEBOLT
48. DYNA-SEAL WASHER
49. BREATHER
50. SECOND COUNTERSHAFT BEARING–CONE, LEFT
51. SECOND COUNTERSHAFT BEARING–CUP, LEFT
52. SECOND COUNTERSHAFT BEARING–CONE, RIGHT
53. SECOND COUNTERSHAFT BEARING–CUP, RIGHT
54. FIRST INTERMEDIATE GEAR RETAINER–PLATE
55. FIRST INTERMEDIATE GEAR RETAINER–PLATE BOLT
56. RTV
57. REDUCTION-BRACKET MOUNTING BOLT
58. REDUCTION-BRACKET MOUNTING LOCKWASHER
59. REDUCTION-BRACKET DOWEL PIN
60. FIRST INTERMEDIATE BEARING–CONE, LEFT
61. FIRST INTERMEDIATE BEARING–CUP, LEFT
62. FIRST INTERMEDIATE BEARING–CONE, RIGHT
63. FIRST INTERMEDIATE BEARING–CUP, RIGHT
64. HIGH-SPEED GEAR RETAINER PLATE
65. HIGH-SPEED GEAR RETAINER PLATE BOLT
66. RTV
67. REDUCTION-BRACKET MOUNTING BOLT
68. REDUCTION-BRACKET MOUNTING LOCKWASHER
69. REDUCTION-BRACKET DOWEL PIN
81. HIGH-SPEED BEARING CONE
82. HIGH-SPEED BEARING CUP
83. HIGH-SPEED BEARING LOCKNUT
84. HIGH-SPEED BEARING LOCKWASHER
85. ENDBELL MOUNTING BOLT
86. ENDBELL MOUNTING LOCKWASHER
87. HIGH-SPEED LIP SEAL
88. BEARING COVER MOUNTING BOLT
89. BEARING COVER MOUNTING LOCKWASHER
90. HIGH-SPEED GREASE-PURGE FITTING

⚠WARNING Use a bead of adhesive sealant such as General Electric RTV-102 on parts #6, 9, 13 & 14 before final assembly to part #1, otherwise the gear reducer will leak hot oil.

MECHANICAL WARNINGS AND CAUTIONS

⚠WARNING **IMPORTANT INFORMATION** **⚠CAUTION**

PLEASE READ CAREFULLY

The following ⚠WARNING and ⚠CAUTION information is supplied to you for your protection and to provide you with many years of trouble free and safe operation of your Foote-Jones/Illinois Gear product:

Read **ALL** instructions prior to operating reducer. Injury to personnel or reducer failure may be caused by improper installation, maintenance or operation.

⚠WARNING

- Written authorization from Foote-Jones/Illinois Gear is required to operate or use reducers in man lift or people moving devices.
- Check to make certain application does not exceed the allowable load capacities published in the current catalog.
- Buyer shall be solely responsible for determining the adequacy of the product for any and all uses to which Buyer shall apply the product. The application by Buyer shall not be subject to any implied warranty of fitness for a particular purpose.
- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.
- Hot oil and reducers can cause severe burns. Use extreme care when removing lubrication plugs and vents.
- Make certain that the power supply is disconnected before attempting to service or remove any components. Lock out the power supply and tag it to prevent unexpected application of power.
- Reducers are not to be considered fail safe or self-locking devices. If these features are required, a properly sized, independent holding device should be utilized. Reducers should not be used as a brake.
- Any brakes that are used in conjunction with a reducer must be sized or positioned in such a way so as to not subject the reducer to loads beyond the catalog rating.
- Lifting supports including eyebolts are to be used for vertically lifting the gearbox only and no other associated attachments or motors.
- Use of an oil with an EP additive on units with backstops may prevent proper operation of the backstop. Injury to personnel, damage to the reducer or other equipment may result.
- Overhung loads subject shaft bearings and shafts to stress which may cause premature bearing failure and/or shaft breakage from bending fatigue, if not sized properly.

⚠CAUTION

- Test run unit to verify operation. If the unit tested is a prototype, that unit must be of current production.
- If the speed reducer cannot be located in a clear and dry area with access to adequate cooling air supply, then precautions must be taken to avoid the ingestion of contaminants such as water and the reduction in cooling ability due to exterior contaminants.
- Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

> The manufacturer makes no warranties or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.

Resellers/Buyers agree to also include this entire document including the warnings and cautions above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This information should be read together with all other printed information supplied by Foote-Jones.

ELECTRICAL WARNINGS AND CAUTIONS

WARNING

IMPORTANT INFORMATION
PLEASE READ CAREFULLY

CAUTION

Appropriate Foote-Jones/Illinois Gear instructions provided with the motor and precautions attached to the motor should be read carefully prior to installation, operation and/or maintenance of the equipment. Injury to personnel or motor failure may be caused by improper installation, maintenance or operation.

The following WARNING and CAUTION information is supplied to you for your protection and to provide you with many years of trouble free and safe operation of your Foote-Jones product:

WARNING

- Disconnect power and lock out driven equipment before working on a motor.
- Always keep hands and clothing away from moving parts.
- The lifting support on the motor is not to be used to lift the entire machine. Only the motor attached directly to the support may be safely lifted by the support.
- Install and ground per local and national codes.
- Discharge all capacitors before servicing a single phase motor.
- Misapplication of a motor in hazardous environment can cause fire or an explosion and result in serious injury. Only the end user, local authority having jurisdiction, and/or insurance underwriter are qualified to identify the appropriate class(es), group(s), division and temperature code Foote-Jones/Illinois Gear personnel cannot evaluate or recommend what motors may be suitable for use in hazardous environments. If a motor is name plated for hazardous locations, do not operate the motor without all of the grease and drain plugs installed.
- Never attempt to measure the temperature rise of a motor by touch. Temperature rise must be measured by thermometer, resistance, resistance, imbedded detector or thermocouple.
- Motors with automatic reset thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic reset thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.
- Motors with manual reset thermal protectors may start unexpectedly after the protector trips when the surrounding air is at +20˚ Fahrenheit or lower. If the manual reset protector trips, disconnect motor from its power supply. After the protector cools (five minutes or more), it can be reset and power may be applied to the motor.
- Connect all protective device leads, marked P1, P2, etc., per instructions supplied with the motor.
- Operation of a motor at other than its nameplate rating may result in fire, damage to equipment or serious injury to personnel.
- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.

CAUTION

- Consult qualified personnel with questions and all electrical repairs must be performed by trained and qualified personnel only.
- For motors nameplated as “belted duty only”, do not operate the motor without belts properly installed.
- Motors and/or driven equipment should not be operated faster than their rated speed.
- For inverter applications, follow the inverter manufacturer’s installation guidelines.
- Make sure the motor is properly secured and aligned before operation.

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

> The manufacturer makes no warranty or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.

Resellers/Buyers agree to also include this entire document including the warnings and cautions above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This information should be read together with all other printed information supplied by Foote-Jones.

For more information contact: **Foote-Jones**, *A REGAL-BELOIT Company*, 2914 Industrial Avenue, Aberdeen, SD 57402-1089
Phone: 605-225-0360 • Fax: 605-225-0567

NOTES

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Power Transmission Distributors Association

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