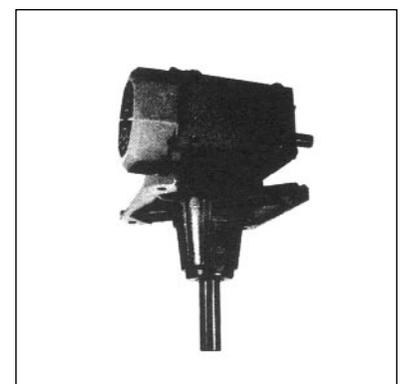
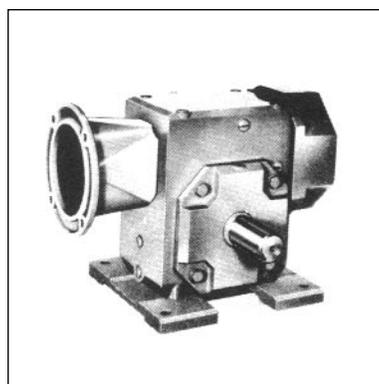
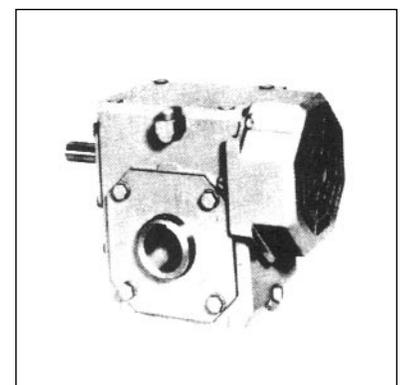
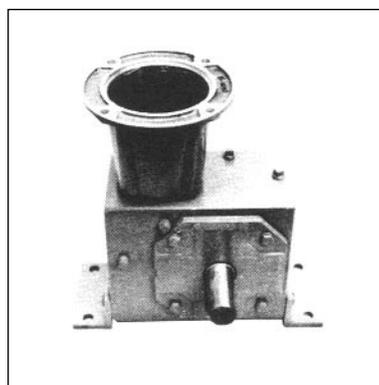
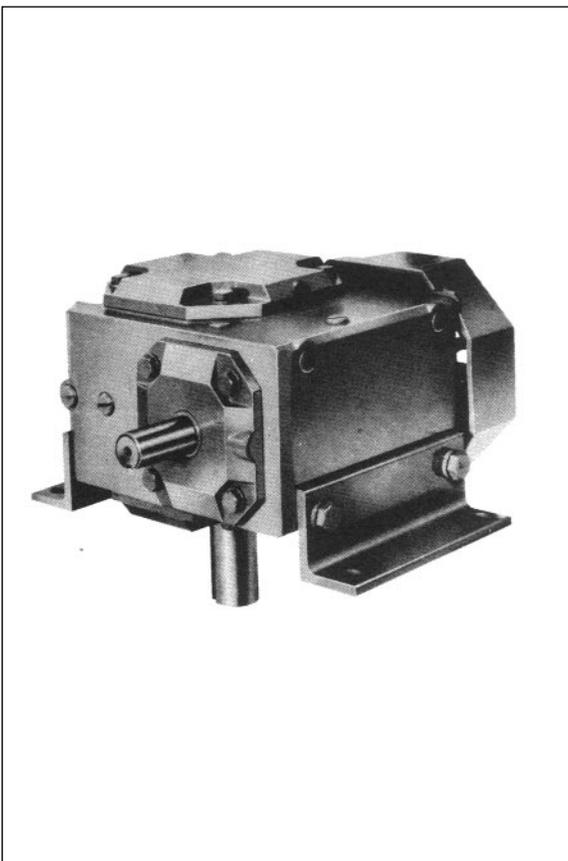


ELECTRA-GEAR[®]

**SM-3 Rev. E
2002**

WORM REDUCER INSTALLATION, MAINTENANCE AND SERVICE MANUAL



ELECTRA-GEAR

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Today, with more than 100,000 square feet, over 100 employees and a world class manufacturing operation, Electra-Gear is a leading producer of mechanical and electrical motion control products serving a broad array of markets.

The Electra-Gear team prides itself on consistent, fast delivery of quality products which meet the customers' specific needs. Our products are *at the heart of what drives your world* and you will find them used in food processing, material handling, chemical process and waste treatment, marine and health equipment.

Electra-Gear holds the distinction in our industry to offer several firsts:

- First to offer reducers, gearmotors and electric motors using aluminum castings
- First to utilize rolled worm technology, a highly automated method of producing a worm
- First to introduce the modifiable worm gear drive providing customers the ultimate in mounting flexibility

What distinguishes Electra-Gear from its many competitors?

- **Aluminum Construction** (*Reducers and Motors*)
 - ◆ No Rust
 - ◆ Light Weight, High Strength
 - ◆ Excellent Heat Dissipation
 - ◆ Non-corrosive
- **Surface Finish** (*Platinum Finish*)
 - ◆ No Paint
 - ◆ Bright, shiny—*aesthetically attractive*
 - ◆ Optional polymer washdown finish (*Platinum Plus*)
- **Short Lead Times**
 - ◆ Guaranteed Same Day/Next Day Service
 - ◆ Aggressive VIP Service for Critical Situations

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I - INSTALLATION

 **WARNING** Improper installation of the gear reducer may cause injury to personnel, gear reducer failure, or damage to driven equipment. Load conditions must be within the published catalog ratings with the recommended A.G.M.A. service factors properly applied.

SAFETY

 **WARNING** Rotating equipment is potentially dangerous and should be properly guarded. The user is responsible for checking all applicable safety codes in his area and providing suitable guards.

A. General

The reducer should be mounted on a flat surface on the machine or foundation, securely bolted down and accurately aligned. Shims under the mounting base should be used when required to provide a level mounting surface.

B. Solid Shaft Mounting

The output shaft can be connected to the load by flexible coupling, sprocket and chain, sheave and V belt, or pinion. Check to insure proper alignment and tension of all components. If sprocket, sheave, or pinion is used, mount as close to gear housing as possible to minimize bearing load and shaft deflection. Overhung load must be checked to make certain it does not exceed published capacity.

When couplings, sheaves, sprockets, or pinions are mounted, it is important that extreme care be used. It is quite easy to damage internal parts by heavy blows used in trying to drive one of these parts on the shaft. It is recommended that a bore be selected to give a light driving fit. If a press fit is required, it is suggested that the external element be heated to assure an easy assembly. Heating beyond 250 degrees F. (121 C.) is not recommended, as heat conducted along the shaft, may damage the shaft seal.

C. Hollow Shaft Mounting

The torque arm of the shaft mounted worm gear reducer must not be mounted too rigidly. If the torque arm is held down without any flexibility, shaft eccentricity, which is usually present, can overload the bearings of the gear reducer. The flexible grommet provided with all torque arms must be retained, or some other suitable means provided to allow the torque arm to be mounted with some flexibility. The torque arm should be mounted in tension (based on direction of rotation).

D. Long Term Storage (6 months and up)

Units should be stored in a protected area (preferably indoors). If stored outdoors, they should be covered to be protected from rain and snow. Wherever stored, units should be filled completely with oil. The input shaft should be rotated so that the output shaft makes at least one revolution per month. The input and output shafts should be covered with grease to protect from corrosion and rust. At start up time, completely drain storage oil and fill to proper oil level with the correct lubricant.

II - LUBRICATION

All Electra-Gear worm reducers and gearmotors are **shipped with oil** unless specified otherwise.

A. Recommended Lubricants

Manufacturer & Lubricant Name	Ambient Temp. Range (F.)	A.G.M.A. Rating
Getty - Veedol Asreslube 98	+100 to +150	8EP
Getty - Veedol Asreslube 95	+50 to +105	7EP
Getty - Veedol Asreslube 90	+40 to +100	6EP
Getty - Veedol Asreslube 86	+25 to +90	5EP
Lubr. Eng. - Almasol 609	+45 to +125	8
Lubr. Eng. - Almasol 608	+32 to +105	7
Lubr. Eng. - Almasol 607	+15 to +70	5
Mobil - Mobil Extra Hecla Super	+50 to +125	8
Mobil - Mobil Cylinder 600W	+32 to +100	7
Shell - Omala J-460	+40 to +115	7EP
Shell - Valvata J-460	+40 to +105	7
Texaco - Meropa 680	+45 to +120	8EP
Texaco - Meropa 460	+32 to +100	7EP
Texaco - Meropa 220	+15 to +75	5EP

—Special Wide Temperature Range Lubricants—

Kendall - Three Star	-10 to +100	7
Mobil - Mobil SHC 634	0 to +135	7EP
Mobil - Mobil SHC 629	-25 to +100	5EP
Mobil - Mobil SHC 626	-40 to +40	3EP

—Special Cold Duty Lubricants—

Conoco - Polar Start 600	-40 to +10	
Lubr. Eng. - Almasol 606	-10 to +40	3EP
Mobil - Mobil SHC 624	-55 to 0	
Shell - Donax A.T.F. T-6	-55 to +5	

Ambient temperature range is based on 1.0 service factor. Lubricants (listed on page 3) are compounded for use in worm gear reducers. Some contain non-corrosive, extreme pressure additives. Do not use lubricants that contain materials that are toxic. Avoid use of such lubes that bring harmful effects. If in doubt, consult your local lubricant supplier. Use only A.G.M.A. rated worm gear lubes.

B. Oil Fill Capacities

Due to the numerous shaft, base, and mounting configurations of Electra-Gear worm reducers, it is impossible to pin-point the exact amount of oil to be used in each unit. Please use the following chart as a guide only for ordering oil.

U.S. Pints		
Frame Size	Continuous Duty	Intermittent Duty
13	.50	.70
17	.90	1.50
21	1.10	2.00
26	1.80	3.40
30	2.80	5.00
35 (or 350)	3.50	7.00
400	4.00	9.25
500	8.00	17.00
600	11.00	26.50

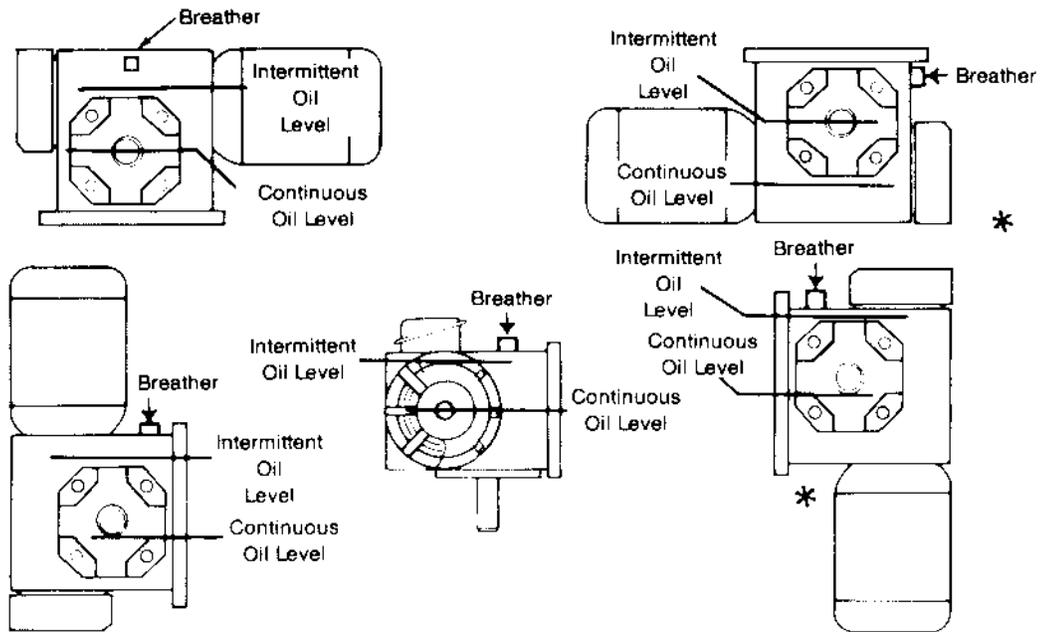
C. Continuous Duty

Continuous duty is defined as running more than 30 minutes in an hour. If the unit is going to be run on a continuous basis (more than half the time), it should be filled to the continuous duty (low) level. See diagram next page.

D. Intermittent Duty

Intermittent Duty is defined as running less than 30 minutes in an hour, or with an input speed of 800 RPM or less. All double reduction worm reducers should have the secondary box filled to the intermittent (high) level.

Oil Level and Mounting Positions for Electra-Gear Worm Reducers

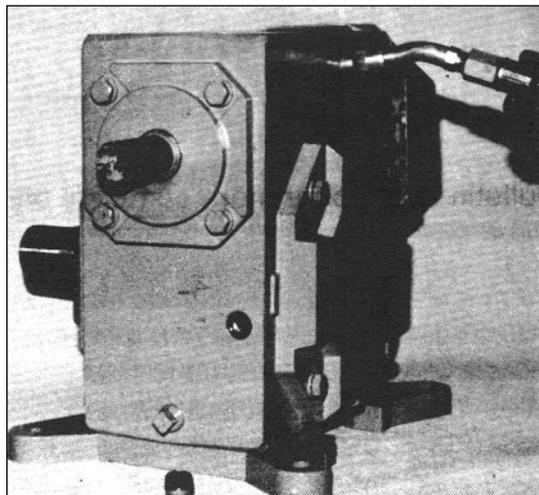


* These positions are not recommended, because the high speed oil seal must support the full head of gearcase oil.

E. Oil Filling Procedures

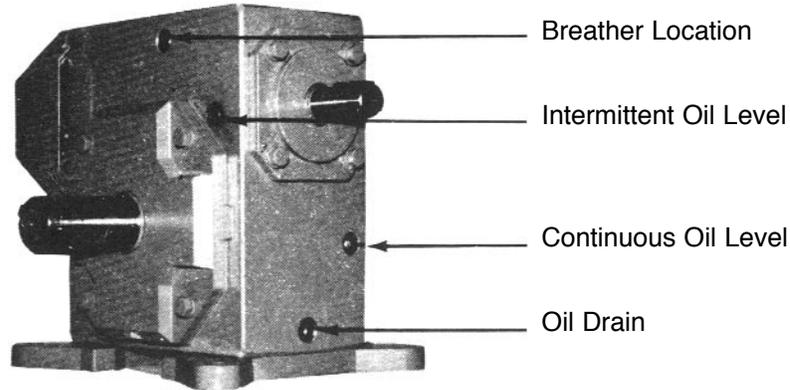
Electra-Gear Worm Gear reducers are easily filled to the proper level by following these steps:

1. Remove pressure relief valve or breather.
2. Remove proper oil plug for oil level desired.
3. Insert lubricant through breather plug hole.
4. Pump oil into unit until oil runs out of hole where oil level plug was.



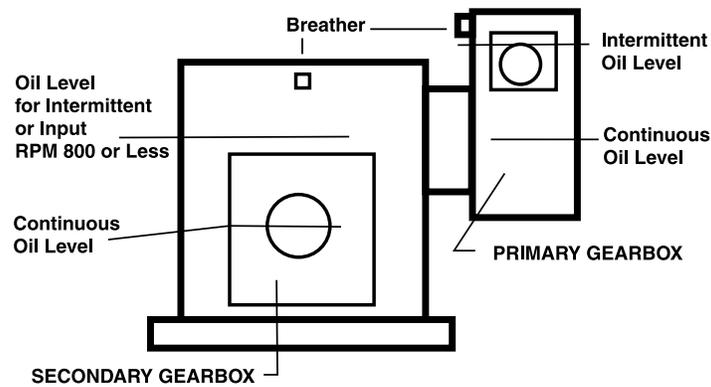
Electra-Gear reducers have many plugs on them designed to be an aid in oil filling and removal and breather location. Your mounting position and duty cycle will have an oil plug that corresponds to it. The breather should be located at the highest position possible.

HORIZONTAL MOUNTING

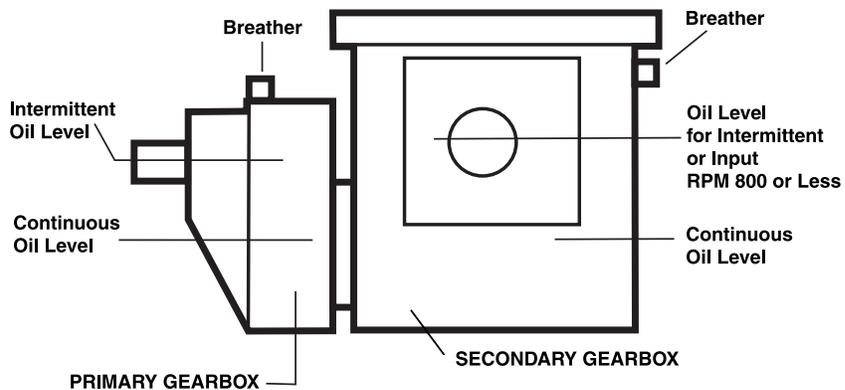


CAUTION Electra-Gear double reduction worm gear reducers have two oil reservoirs. Fill both to proper level before operating. Use preceding page and below as a guide.

DOUBLE WORM REDUCER



HELICAL WORM REDUCER



III - MAINTENANCE

A. Run In Period

The maximum efficiency of Electra-Gear worm gear reducers is obtained after a “run in” period. The length of time required will depend on the load applied and will be 8 to 12 hours at rated load, and considerably longer at light loads.

During “run in”, higher than normal motor currents, lower efficiency, and lower output torque can be expected.

 Overloading will not decrease “run in” time, but may cause severe wear.

B. Oil Change Timetable

1) Standard Mobil 600W Lube

Drain and refill oil after first 100 hours of operation. Under normal conditions, change oil every 2000 hours of operation or 6 months, whichever comes first. Check ambient temperature limits of your oil to make sure it matches ambient conditions.

2) Synthetic Lubricants such as Mobil SHC 600 Series

Under normal conditions, change oil every 4000 hours of operation or every year, whichever comes first.

C. Maintenance Check Points - Trouble Shooting

1) Oil Leaks

There are several possible places for oil to leak out of worm gear reducers:

a) Oil Fill and Drain Plugs - when oil is changed, plug threads should be coated with non-hardening pipe thread sealing compound. Check for tightness on these fittings.

b) If oil is leaking at pressure relief valve or breather:

1. Check location - Is pressure relief valve or breather at highest location?
2. Check oil level - overfilling (to intermittent level in a continuous operation) will cause oil to foam through.
3. Check oil type - the wrong type of oil will foam excessively. Refer to lubrication section.

c) Input Bearing Caps and Output Sideplates - output sideplates and input bearing caps should be tight against reducer housing (check bolts) and should have a bead of silastic around inside machined fit where cap fits to reducer housing. See Final Assembly Procedures for more details. (Page 24)

If sideplate or bearing cap bolts are working loose repeatedly in operation, the whole drive system should be checked over in detail for: overhung load, shock components, faulty drive components, overloading, and be reevaluated accordingly. Consult Electra-Gear Service or Application Engineering Departments for additional help.

Other places to look for oil leaks:

- e. Oil Seals – See seal removal and installation section, page 20.

2. Temperature

Check actual oil bath temperature after running (or during). Oil bath temperature should not be over 200 degrees. Generally the oil bath temperature will rise approximately 100 degrees over ambient temperature (based upon a 1.0 service factor, continuous duty). Excessive oil bath temperature after “run in” period may be a signal of lubricant breakdown, excessive loading, high ambient temperature, or other internal gear reducer problems.

Inspect lubricant and internals of the reducer. Check to see if heat is localized (around a particular bearing or bearings). If so, disassemble and evaluate all parts, change bearings and observe while operating.

3. Vibration/Noise level

If noise level changes:

- a. Check all drive system components. Check for proper alignment and tension. Check for noise coming from components themselves, or somewhere else in the machinery.
- b. If noise is coming from gear reducer, try to identify location and frequency of noise.
 - 1. High frequency (high speed) noises indicate input (worm shaft) problems.
 - A. Check input coupling area (alignment and fit.)
 - B. Listen to input bearings (through stethoscope or screw driver.)
 - 2. Low frequency (low speed noises indicate output (worm gear shaft) problems.
 - A. Check output shaft coupling/sprocket or other load connection area.
 - B. Listen to output bearings.

CAUTION Constant noise at any bearing could be caused by lack of lubrication, lubrication breakdown, bronze filings from worm gear wear, or other contaminants. Disassemble and inspect unit as soon as possible.

WARNING Make certain that the power supply is disconnected before attempting to disassemble and inspect the unit. Lock out the power supply and tag it to prevent unexpected application of power.

Intermittent or repetitive noise could be caused by a high spot on the worm gear (this will usually disappear after running under load). Noise could also be caused by broken particles of internal components resulting from shockload or handling.

Helical worm gear reducers are often “noisy” in the helical (high speed) end. A constant, whirring sound is normal and may disappear after “run in”. If noise is excessive after “run in”, contact Electra-Gear Service Department.

4. Dirt — Contaminant Accumulation

Excessive dirt will hamper effectiveness of reducer cooling fan and pressure relief valve or breather, and may cause excessive pressure or heat in the gear reducer. Be careful not to allow any contaminants to enter the gear reducer or build up on the outside.

5. General

CAUTION Oil should be changed more often if gear reducer is used in a severe environment, i.e. dusty, humid.

Even if no oil leaks are evident, oil levels should be checked frequently. Oil condition should be noted when oil changes are made. Look for foreign particles in oil, and lubricant condition. These could show signs of future troubles, and if suspicious, the gear reducer should be thoroughly inspected at oil change time to prevent future down time.

CAUTION Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

A further insurance against down time is the purchase of a spare unit, or spare parts. The investment is usually quite small when measured against down time costs.

IV - DISASSEMBLY PROCEDURES

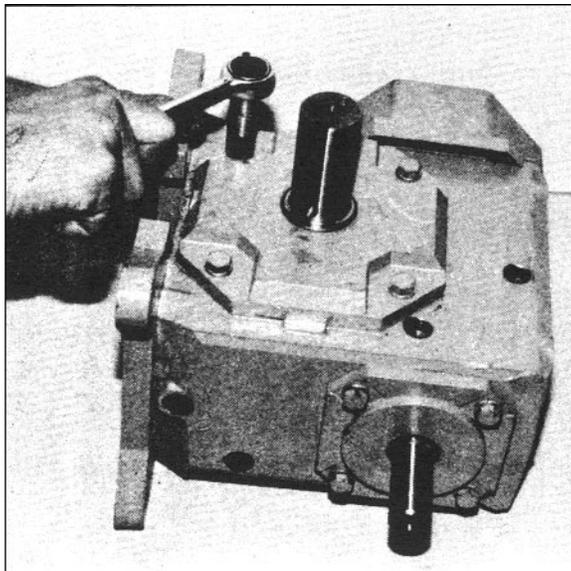
A. Step by Step Procedures

Electra-Gear worm reducers are easily disassembled for inspection of component parts with hand wrenches, a soft hammer, and a screw driver. Units with fans, require an allen wrench for fan set screw.

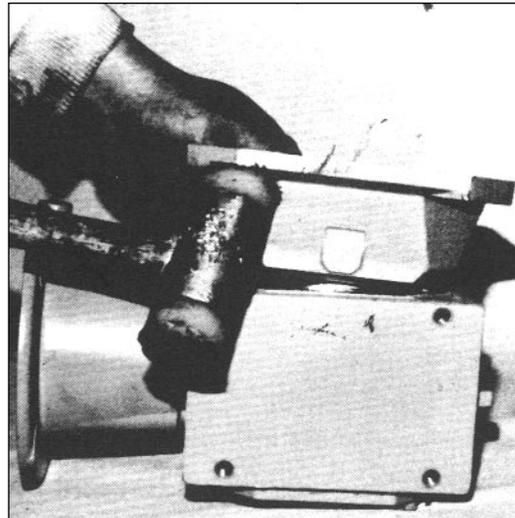
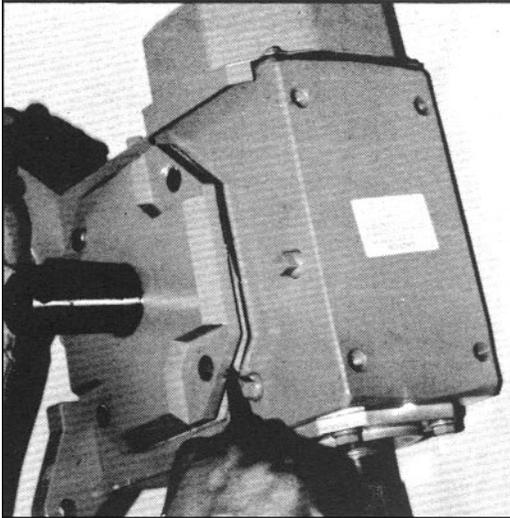
1. Drain unit of oil (when reducer is hot preferably)

WARNING Hot oil or the reducer can cause severe burns. Use extreme caution when removing lubrication plugs and vents.

2. Remove output sideplates
 - a. Loosen and remove bolts holding sideplate to reducer housing.



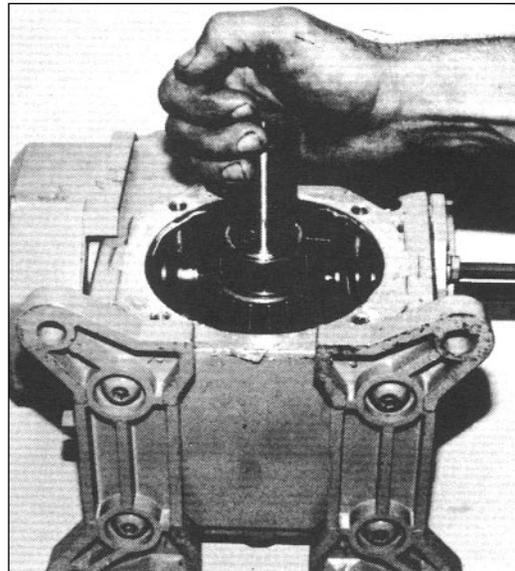
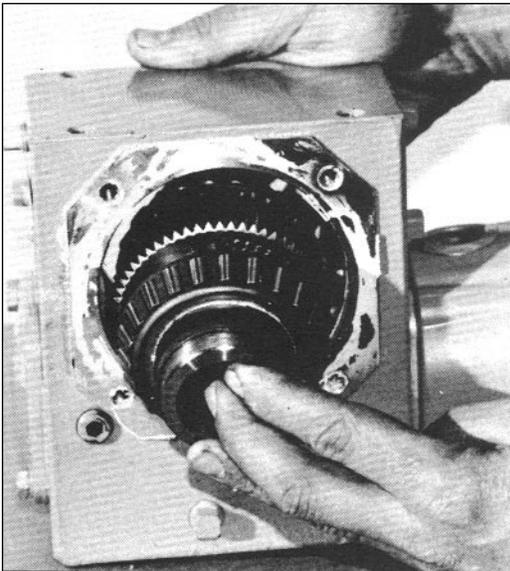
- b. Pry sideplate from reducer housing.



This can usually be done by putting a screwdriver against an oil plug, or in the case of a ring base unit, gently tap the base from the housing.

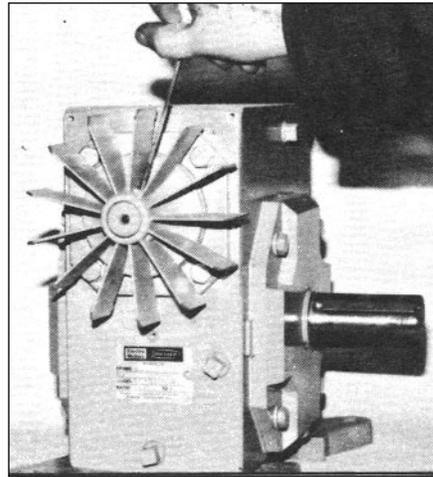
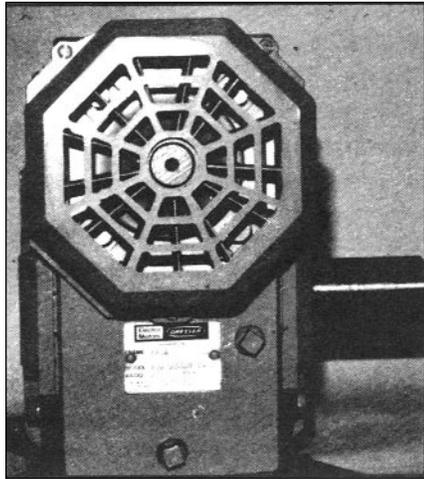
Be careful to leave shims intact with sideplates.

3. Remove output - gear assembly.
 - a. Pry output shaft away from worm (this may have to be tapped with soft hammer).
 - b. Lift output shaft assembly out of reducer.



On units with double extended output shafts, hollow shafts, and 500 and 600 units, it is recommended that both output sideplates be removed before removing worm gear assembly to prevent damage to seals and bearings and to facilitate disassembly.

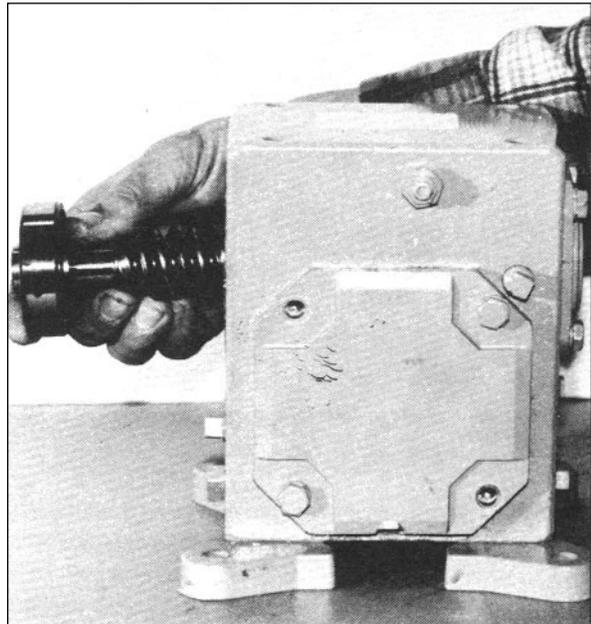
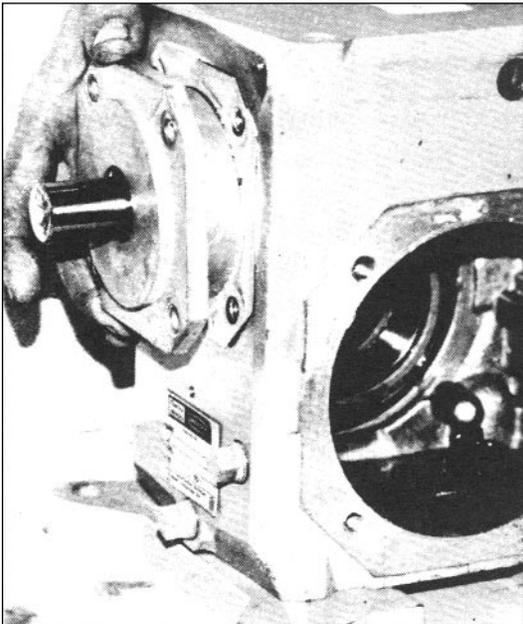
4. Remove fan shield and fan. (If none on unit, proceed to step 5.)
 - a. Remove fan shield
 - b. Remove fan from worm shaft.



5. Remove worm shaft assembly.

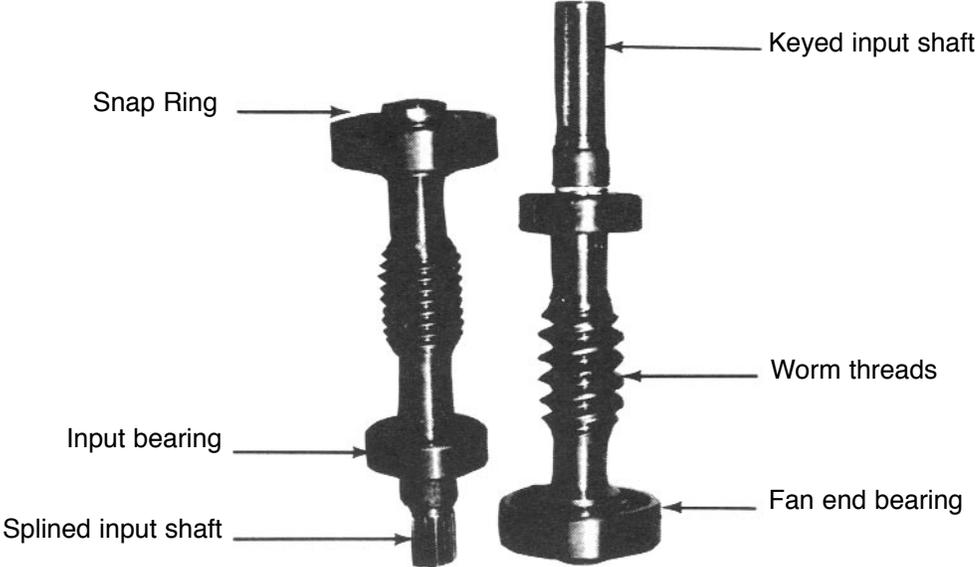
CAUTION Be sure output gear assembly is out of reducer before attempting to remove worm shaft. Serious damage to internal parts will result, and worm shaft will not come out! Remove all keys from input shaft before removing, as these may damage the input seal.

- a. Loosen and remove bolts from fan end bearing cap. (The end opposite input shaft.)
- b. Tap worm shaft on the input shaft end until bearing cap is loose.
- c. Remove fan end bearing cap.
- d. Tap the worm shaft out of reducer housing. (Be sure to keep shims with bearing cap removed.)

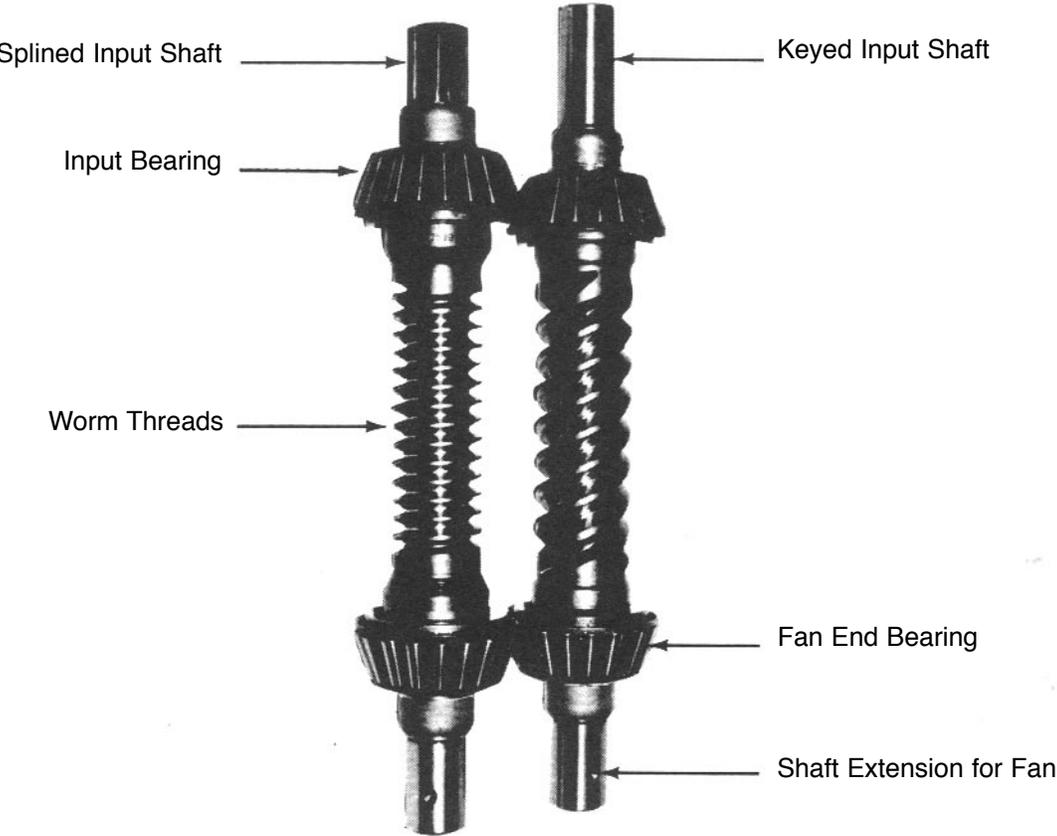


Electra-Gear worm gear reducers have four different worm shaft assembly designs. You will have one of them.

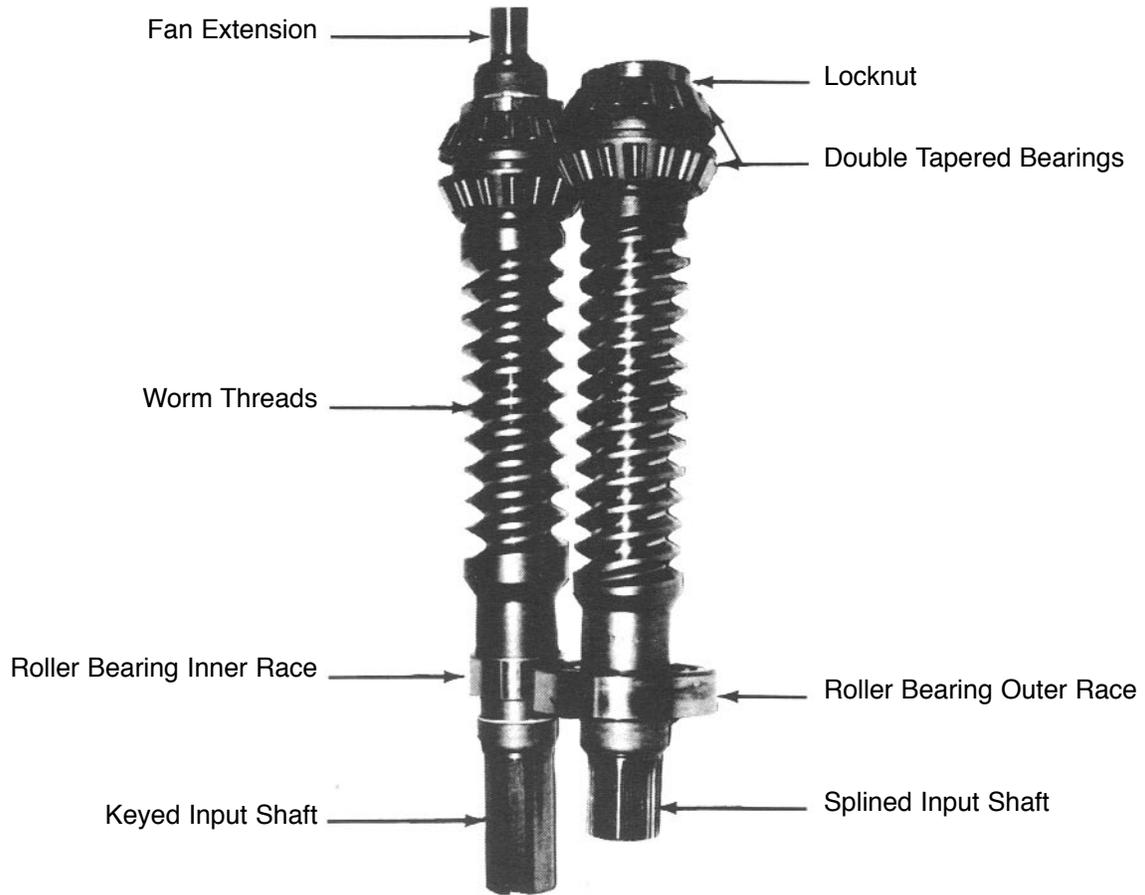
#1 Ball bearing design (Frame Sizes: 13, 17, 21, 26)



#2 Tapered roller bearing design (Frame Sizes: 30, 35, 400)



#3 Double tapered roller bearing design (Frame Sizes: 500 & 600).

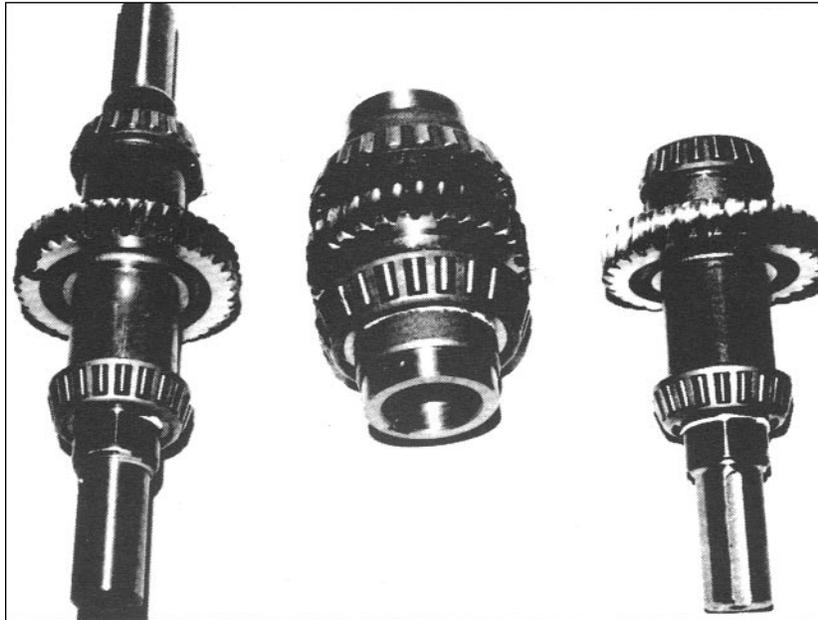


#4 Swallow shaft design (available on Frame Sizes: 13, 17, 21, 26, 30, 35, 400).



When replacing a swallow shaft worm, the worm/coupling assembly has to be ordered as a unit.

Typical output shaft assemblies:
Double Extended, Hollow Shaft, Single Extended



B. Internal Parts Evaluation and Determination

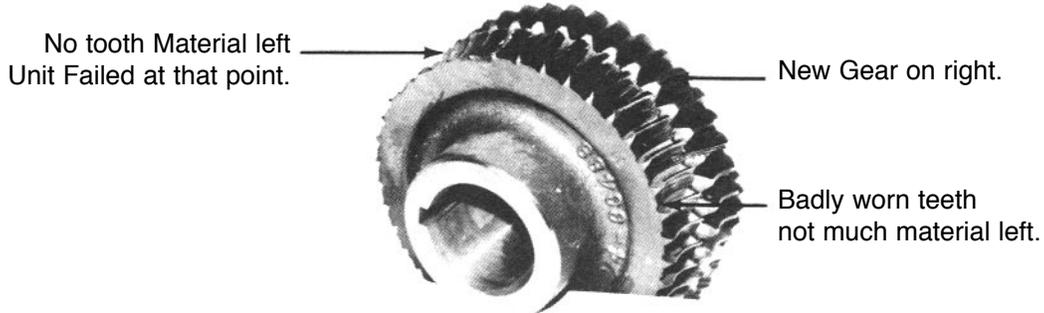
NOTE: All worms and gears are available as a set only (both worm **and** gear.)



After removing worm shaft and gear shaft assemblies, clean all parts with non-flammable solvent, including tapered bearing cups pressed in bearing caps.

1. Inspect worm gear.

The nature of the material and application usually make the worm gear the “fuse” of the unit.



A good gear will have a nice even polish across the tooth face all around, and have plenty of tooth material left.

Look for even wear across the face of the gear teeth. Uneven wear may be the result of improper centering (offset shimming) of the gear. Look for lines in teeth surface, signs of heat, or stress. Pitting or broken teeth is evidence of shockload. Pitting can indicate extreme loads and/or lubrication breakdown. More wear in one area of the gear than others is indication of a heavy cyclic load that occurs on each output shaft rotation.

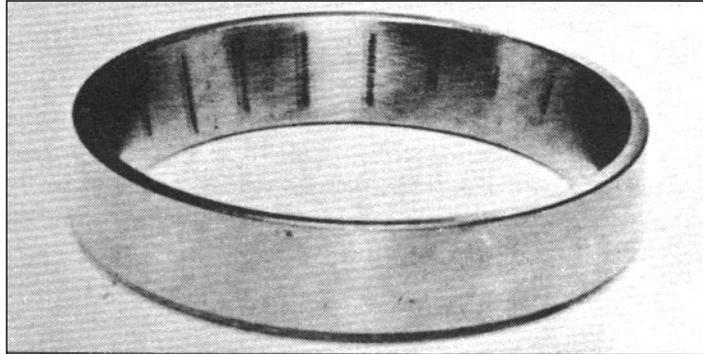
2. Inspect worm shaft.



Check smoothness of worm threads. A good worm will have smooth threads. Discoloration should be noted also. Bluish tint or burnt oil indicate excessive heat, loading, incorrect lubricant, or lubrication breakdown.

3. Inspect worm bearings

Check for noise, feel of rotation. They should spin smoothly. Check bearing cups for signs of distress, brinelling, fretting, overhung load, uneven wear, etc.



4. Inspect output bearings - as above.

5. Inspect seals.

Are springs intact? Is seal lip cut? Show signs of wear?

After the inspection of all parts, determine which parts need replacing. If worm or gear show that they need replacing, both should be replaced. As was noted earlier, worms and gears are available as a set only. Undetectable wear on one member of the set will shorten the service life of the replaced part. If gearset is replaced, it is a good idea to replace bearings and seals as well.

V - BEARING REMOVAL AND INSTALLATION

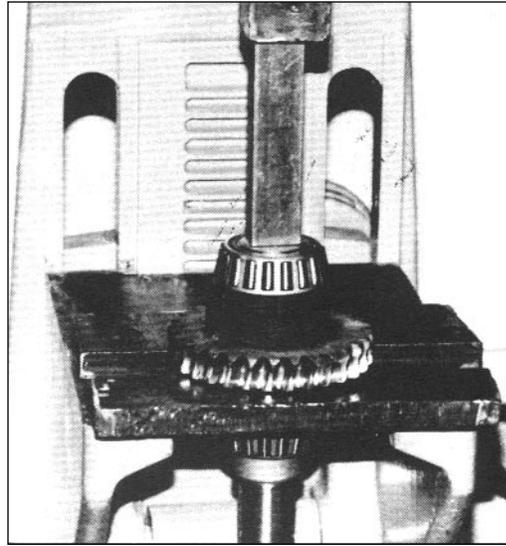
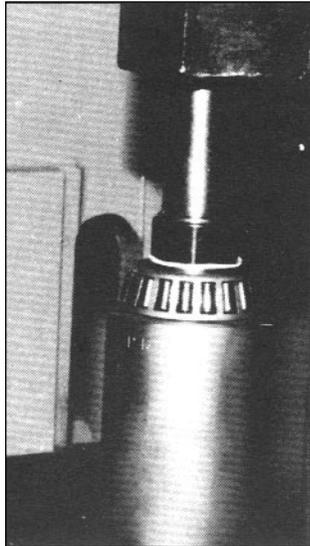
A. Ball Bearings and Bearing Cones

All ball bearings and bearing cones are a press fit on worm and gear shafts. Bearings may be removed by press, puller, or heat.

1. Removal Guidelines

- a. Be careful to remove snap rings or locknuts on worm shafts before removal of bearings.
- b. Be careful to get good contact with **inner** race when pressing or pulling bearing cones as the cages will quickly deform if pressed or pulled against.

- c. When removing output shaft bearings with press, it is easier to remove gear and press gear back on than to attempt to grab inner race of bearing on gear side (opposite shaft shoulder).



2. Installation Guidelines

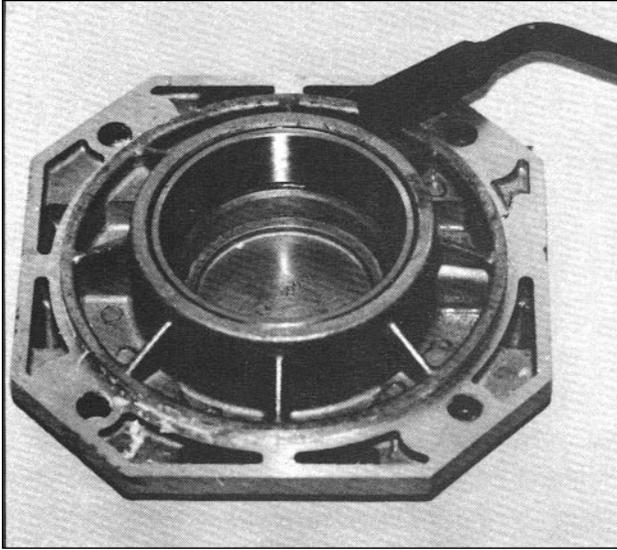
A press should be used when installing bearing cones or ball bearings. In extreme cases, heat may be used to facilitate, but should be used with extreme care so as not to damage new bearings.

- a. Always press on the inner race only.
- b. Use a length of steel tubing (with squared ends) which is large enough in I.D. to fit over the shaft and small enough in O.D. to fit the inner race.
- c. Press bearings squarely, all the way to shaft shoulder, gear, or snap ring. Failure to do this can result in improper adjustment of endplay when unit is assembled causing bearing or worm gear failure.

B. Bearing Cups

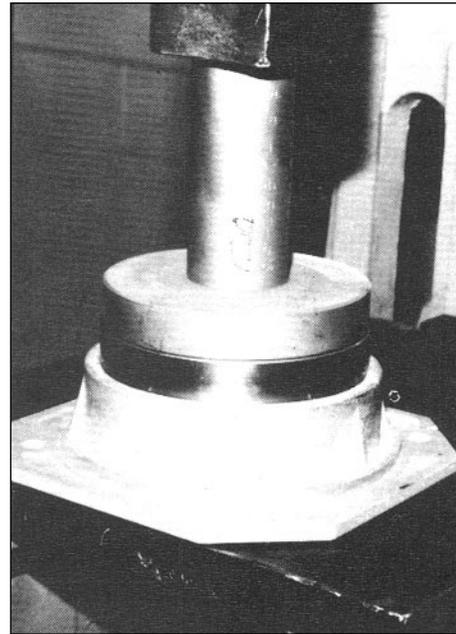
With the exception of the 500 and 600 worm assemblies, all bearing cups in Electra-Gear worm reducers are pressed into bearing caps (input) or sideplates (output). 500 and 600 have one bearing cup loose at fan end.

To remove (see next page):



1. Heat area around bearing cup. (Don't overheat)
2. Tap sideplate or bearing cap on table until cup falls out.
3. Repeat step #1 until step #2 is accomplished.

⚠ WARNING Handle with care, severe burns can occur. Heat resistant gloves are recommended.



4. The new bearing cup is easily installed while bearing cap or sideplate is hot. Drop bearing cup into hot sideplate. Make sure cup bottoms out in sideplate.
5. Alternate to step #4; Press bearing cup into bearing cap / sideplate. Be careful not to brinnell cup's wearing surface.

See chart next page for Electra-Gear and Manufacturers bearing part numbers.

**BEARINGS
CROSS REFERENCE CHART
STANDARD REDUCERS OR GEARENDS**

C. Bearing Part Numbers and Mfg. Part Numbers

Gear Size	Input F.E. Bearing PL-1 = 4b	Input P.E. Bearing PL-1 = 4a	Brg. Mfg. ID	Output Solid Bearing PL-1 = 17	Output Hollow Bearing	Brg. Mfg. ID
13	56-30330-30 6203NR Brg. Sz. = 203	56-32220-12 6203 N/A Brg. Sz. = 203	EGO NTN	56-32220-12 6203	56-30221-02 56-31221-02 L44610 L44643	EGO T
17	56-32220-18 6304 Brg. Sz. = 304	56-32220-18 6304 Brg. Sz. = 304	EGO NTN	56-30221-02* 56-31221-02* L44610 L44643	56-30221-12* 56-31221-12* LM29710 LM29749	EGO T
21	56-32220-20 6305 Brg. Sz. = 305	56-32220-47 6204 Brg. Sz. = 204	EGO NTN	56-30221-05* 56-31221-05* LM67010 LM67048	56-30221-11* 56-31221-11* LM806610 LM806649	EGO T
26	56-32220-21 6306 Brg. Sz. = 306	56-32220-85 6205 Brg. Sz. = 205	EGO NTN	56-30221-06* 56-31221-06* LM48510 LM48548	56-30221-09* 56-31221-09* 382 3874	EGO T
30	56-30221-45 56-31221-45 M86610 M86644	56-30221-45 56-31221-45 M86610 M86644	EGO T	56-30221-46 56-31221-46 LM102910 LM102949	56-30221-10* 56-31221-10* 34478 34306	EGO T
35	56-30221-45 56-31221-45 M86610 M86610	56-30221-45 56-31221-45 M86610 M86610	EGO T	56-30221-46 56-31221-46 LM102910 LM102949	56-30221-10* 56-31221-10* 34478 34306	EGO T
400	56-30221-07* 56-31221-07* HM8941 HM89443	56-30221-28* 56-31221-28* HM8941 HM89443	EGO T	56-30221-27* 56-31221-27* 3720 3775	56-30221-29* 56-31221-29* HM218210 2789	EGO T
500	56-30221-20* 56-31221-20* 44348 44162	56-34338-01 NU308 N/A Brg. Sz. = 308	EGO NTN T	56-30221-33* 56-31221-33* 3920 3982	56-30221-35* 56-31221-35* 42584 42381	EGO T
600	56-30221-36* 56-31221-36* 903210 HM903247	56-34338-02 NU309 N/A Brg. Sz. = 309	EGO NTN T	56-30221-34* 56-31221-34* JM612910 JM612949	56-30221-35* 56-31221-35* 42584 42381	EGO T

* All tapered bearings are sold as a cup and cone set only. Both part numbers must be used.

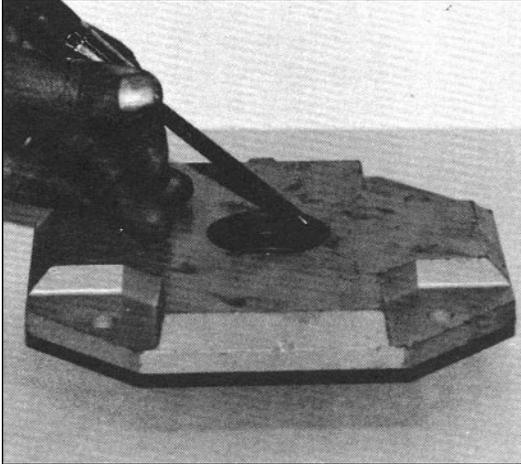
Refer to Parts List number PL-1 for item number and information.

EGO = Electra-Gear Operations Part Number
T = Timken
NTN = NTN

VI - GEAR REMOVAL AND INSTALLATION

Gears should be pressed off output shafts as shown in bearing section (pages 16 & 17). Be careful not to lose the key. Press gear squarely against shaft shoulder.

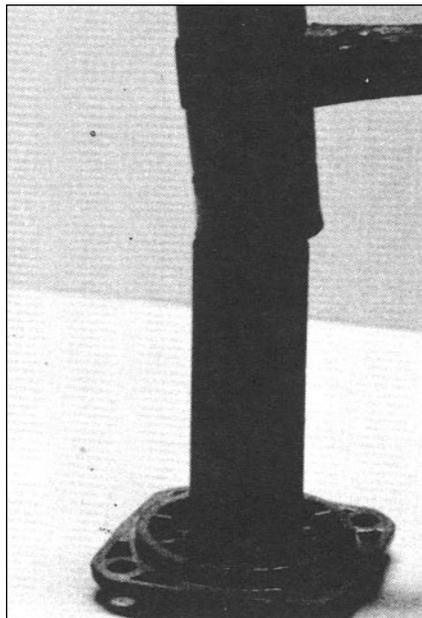
VII - SEAL REMOVAL AND INSTALLATION



A. Step by Step Procedures

1. Pry seal out of bearing cap or sideplate with screwdriver.
2. Clean all silastic out of seal housing cavity.
3. Apply small bead (1/32") of silastic in the seal bore.
4. Press or gently tap seal in seal bore, using a squared off piece of tubing with O.D. smaller than O.D. of seal.

CAUTION Be careful to press seal squarely into cavity. Lack of silastic or improper pressing will cause oil leak around back of seal.



**SEALS
CROSS REFERENCE CHART
STANDARD PRODUCT REDUCERS OR GEARENDS**

GEAR SIZE	INPUT		OUTPUT		ELECTRA PART NO. MANUFACTURER'S NO. DIMENSIONS
	MOTOR OR PULLEY END	FAN OR BLIND END	SOLID SHAFT	HOLLOW SHAFT	
	SLEEVELESS DESIGN	SLEEVELESS DESIGN	SLEEVELESS DESIGN	SLEEVELESS DESIGN	
13	57-35150-60 CR# 6580 .656 X 1.575 X .250	N/A	57-35150-65 AD 0723-FO .667 X 1.379 X 2.55	N/A	
17	57-35150-27 NOK 79Y-7100R .785 X 1-3/8 X 1/4	N/A	57-35150-26 NOK 79Y-7101R 7/8 X 1-1/2 X 5/16	57-35150-58 NAT 473438 1-15/32 X 2-3/8 X 3/8	
21	57-35150-27 NOK 79Y-7100R .785 X 1-3/8 X 1/4	N/A	57-35150-25 NOK 79Y-7094R 1-1/8 X 1-3/4 X 1/4	57-38296-49 NAT 472924 2 X 2-7/8 X 1/2	
26	57-30223-02 NAT 471267 7/8 X 1-3/8 X 5/16	N/A	57-38292-84 NAT 470774 1-3/8 X 2-1/16 X 7/16	57-30223-09 NAT 471272 2-1/8 X 3 X 3/8	
30	57-30223-98 NAT 252277 1 X 1-3/8 X 1/4	57-30223-98 NAT 252277 1 X 1-3/8 X 1/4	57-35150-33 NOK AD7796-EO 1-3/4 X 2-5/8 X 5/16	57-35150-38 NOK AD3664-EO 3 X 4 X 7/16	
35	57-30223-98 NAT 252277 1 X 1-3/8 X 1/4	57-30223-98 NAT 252277 1 X 1-3/8 X 1/4	57-35150-33 NOK AD7796-EO 1-3/4 X 2-5/8 X 5/16	57-35150-38 NOK AD3664-EO 3 X 4 X 7/16	
400	* * 57-35150-25 NOK 79Y-7094R 1-1/8 X 1-3/4 X 1/4	57-35150-25 NOK 79Y-7094R 1-1/8 X 1-3/4 X 1/4	57-35150-34 NOK AD7799-EO 1-7/8 X 2-3/4 X 5/16	57-35150-37 NOK AD7943-EO 3-1/2 X 4-5/8 X 1/2	
500	57-35150-81 CR# 15542 1-9/16 X 2-3/8 X 5/16	57-35150-07 CR # 13739 NAT 473215 1-3/8 X 2-3/8 X 5/16	57-30223-85 CR# 24954 NAT 470605 2-1/2 X 3-3/8 X 3/8	* * * * 57-35150-56 NOK AD4020-EO 3-3/4 X 5 X 1/2	
600	57-35150-81 CR# 15542 1-9/16 X 2-3/8 X 5/16	57-35150-07 CR # 13739 NAT 473215 1-3/8 X 2-3/8 X 5/16	57-30223-90 CR# 27269 NAT 416664 2-3/4 X 3-1/2 X 3/8	* * * * 57-35150-56 NOK AD4020-EO 3-3/4 X 5 X 1/2	

* * FOR KEYED INPUT SHAFT REDUCER USE 57-35150-07, NAT P/N 473215, DIM. 1-3/8 X 2-3/8 X 5/16.

* * * * FOR 3 INCH AND ABOVE BORE SIZE USE 57-35150-55, NOK AD7856-EO, DIM. 4-1/4 X 5-1/2 X 1/2.

NOTE: WHEN ORDERING PARTS YOU MUST GIVE THE PARTS LIST NUMBER, ITEM NUMBER, PART DESCRIPTION, H.P., PHASE, HERTZ, VOLTS, R.P.M. AND THE COMPLETE FRAME AND MODEL NUMBER. THIS WILL INSURE THAT THE CORRECT PART IS ORDERED. All dimensions, designs, prices and specifications are subject to change without notice.

VIII - ASSEMBLY PROCEDURES

These procedures are to be followed when you have complete worm shaft and gear shaft sub-assemblies ready to go into gear reducer.

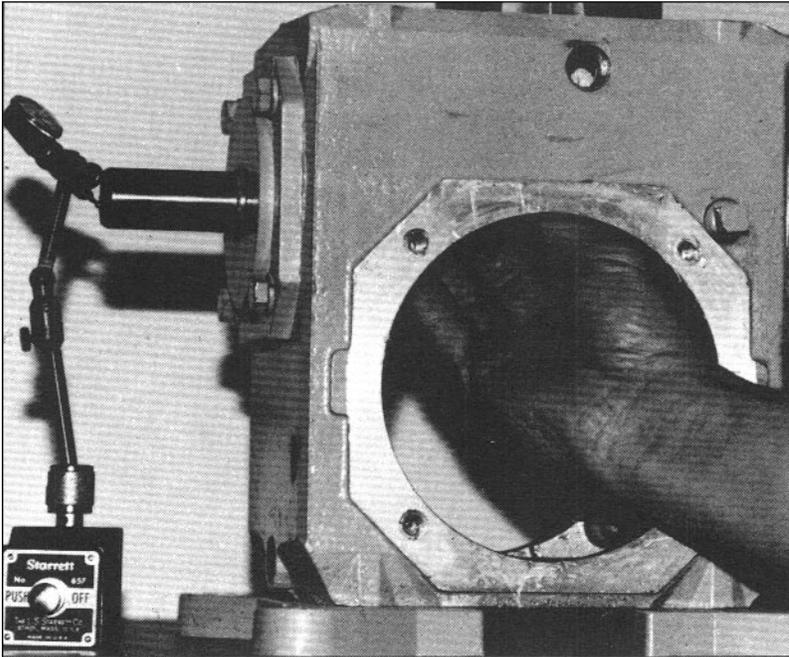
A. Shimming Required

These instructions should be followed when any bearings, worm shaft, or gear have been replaced. If either assembly has had no parts changes, the shim packs can remain and the assemblies can be installed as under the procedures in "B".

Proper operation of the gear reducer requires accurate adjustment of the worm shaft and gear shaft end play. Excessive end play results in noisy operation, while insufficient end play will pre-load the bearings and result in premature failure or overload to the motor.

1. Worm Shaft Installation

NOTE: Size 13, 17, 21, 26 worm shafts (ball bearing design) cannot be adjusted for end play. One bearing is clamped, one is floating. Install shims as they were when originally disassembled. For taper bearings designs:



Shims	
<u>Color</u>	<u>Thickness</u>
Red	.002"
Green	.003"
Blue	.005"
Brown	.010"
Yellow	.020"

- Install approximately (.020") shims under each bearing cap.
- Clamp gear reducer and measure end play with dial indicator.
- Adjust end play by addition or removal of shims supplied with gear set.
- See Table next page for allowable end play.

GEAR HEAD SIZE	WORM SHAFT END PLAY		OUTPUT SHAFT PRELOAD	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
13, 17, 21 & 26	BALL BEARINGS UTILIZED. NO AXIAL ADJUSTMENT REQUIRED. BEARING OPPOSITE WORM INPUT END IS SHIMMED TO "LOCK" INTO HOUSING. OTHER BEARING (IF USED) "FLOATS".		.000"	.002"
30, 35, 400	.001"	.002"	.000"	.002"
500 - 600	.001"	.002"	.000"	.002"

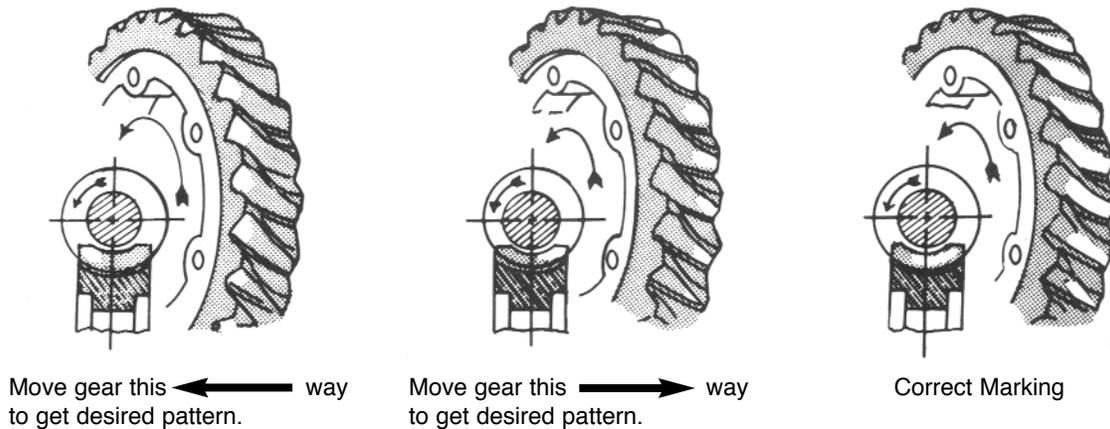
NOTE: The allowable end play is for normal (+32° to +125°F) ambient temperature only. Call Electra-Gear service department for proper end play for other operating temperatures or conditions.

2. Output Shaft Assembly

- a. To properly adjust output shaft end play and center the gear with worm, apply bluing to gear teeth. Install approximately (.020") shims with each sideplate. Bolt sideplates securely. Check axial end play. Adjust to limits shown in table by removal or addition of shims.
- b. Run the unit without oil in both directions for several output shaft revolutions. Apply slight holding pressure to output shaft to assist the marking of the gear.

⚠ WARNING To prevent cuts from the keyway or key, hold output shaft with cloth.

Remove assembly and align the gear with the worm by moving shims from one side to the other to get desired pattern.

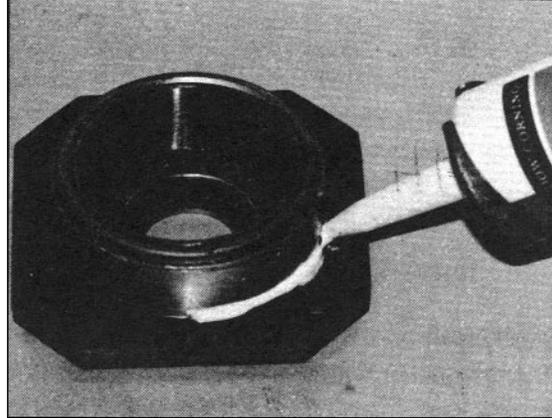
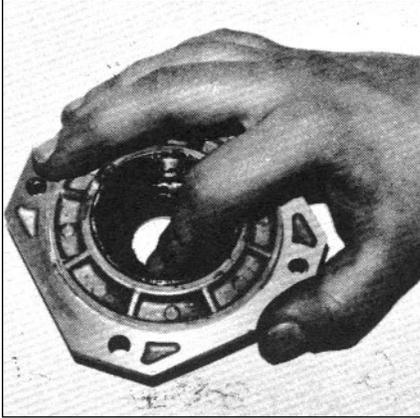


Refer to next section before putting unit into service.

B. No Shimming Required / Shimming Complete - Final Assembly

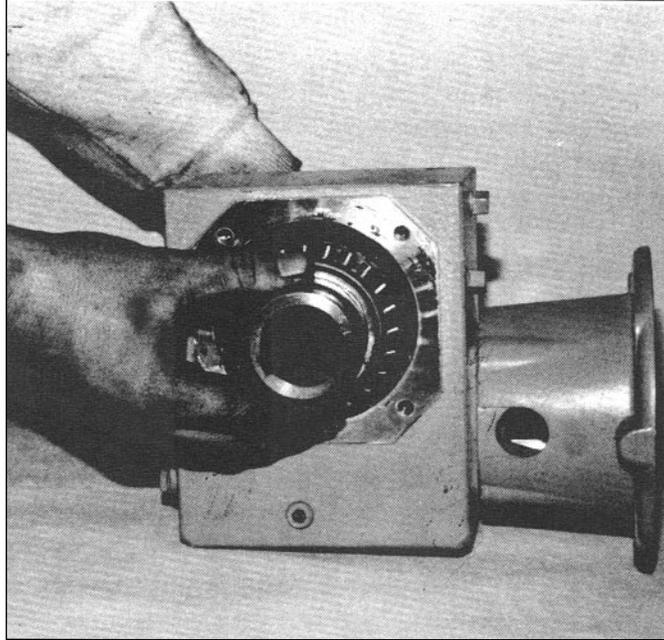
If **no parts** have been changed, or just seals, the reducer will not have to be re-shimmed. Careful disassembly should have left shim packs with the bearing caps and sideplates as originally assembled. Follow these steps when assembling without shimming, or when shimming is complete.

1. Clean off excess silastic around bearing caps, sideplates, shims and reducer housing.
2. Take (remove) input shaft end bearing cap first and follow these steps:



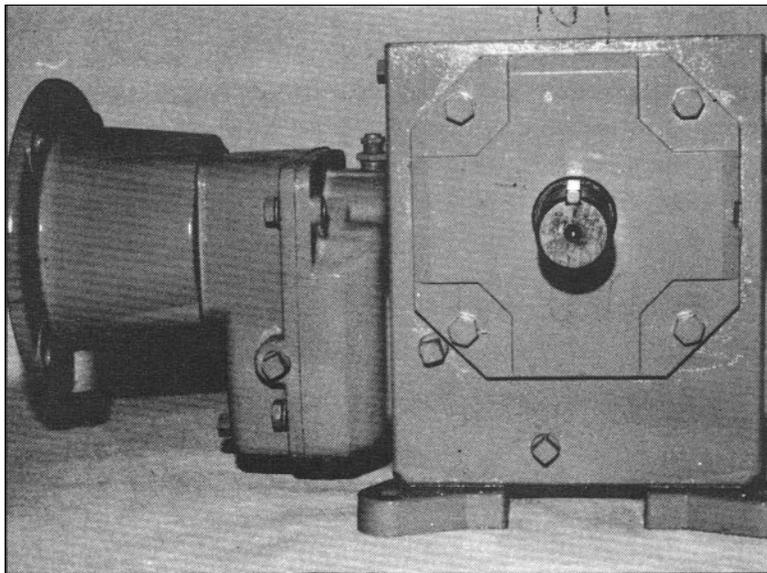
- a. Grease lip of seal generously with Chevron SRI Grease #2 or equivalent. The cavity between lips on seal and where spring is should be full of grease.
 - b. Apply a small bead of silastic approximately 1/16" diameter on inside edge of shims (on the edge where the cap fits up to housing).
3. Slide worm shaft assembly into housing and through input bearing cap.
 4. Repeat steps in #2 for fan end bearing cap.
 5. Repeat steps in #2 for blank output sideplate.

NOTE: This step is for single output shaft extensions on size 400 and below. For hollow shaft, double extended shaft, 500 and 600, proceed to step #6.
 6. Insert output gear / shaft assembly into gear reducer. Align with worm.
 7. Repeat steps in #2 for open sideplates.
 8. Tighten all input bearing cap bolts and all output sideplate bolts. Refer to page 30 for proper bolt/nut torques.
 9. Refer to installation and lubrication instructions before (pages 1 - 6) putting unit into service.

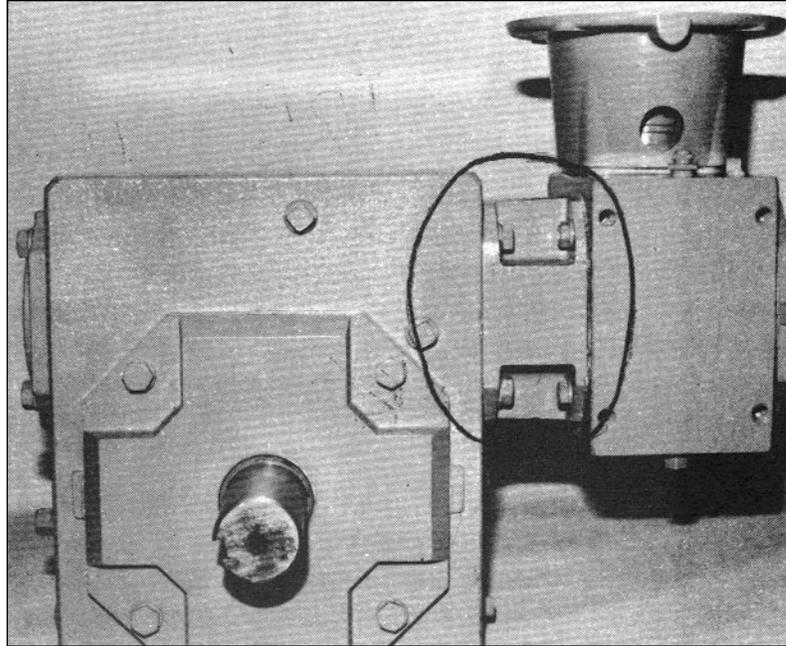


IX - SERVICE TIPS — MULTIPLE REDUCTION UNITS AND GEARMOTORS

Electra-Gear multiple reduction reducers are as easy to service as single reduction units. Helical worm, double worm, and worm planetary are two gear reducers connected.

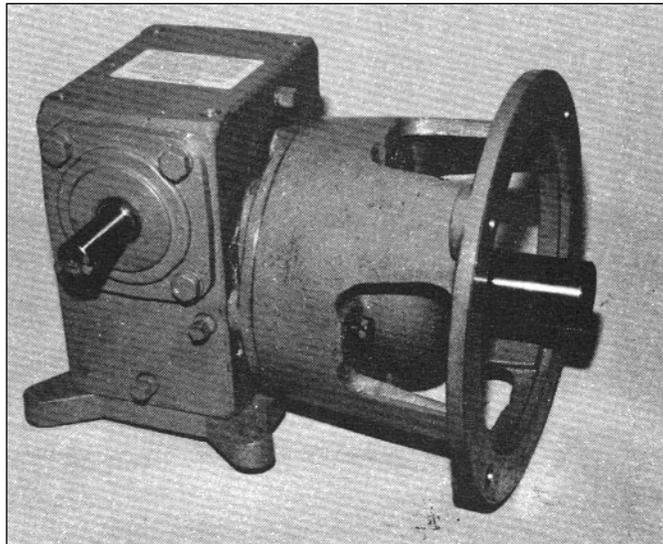


- A. Helical worm reducers are built so that the back end of the helical gearcase becomes the input bearing cap for the secondary worm reducer. This part should be treated as such for shimming procedures, etc. The helical gearcase itself is serviced as the worm gear reducer is, with bearing end play, tolerances, etc., all important.



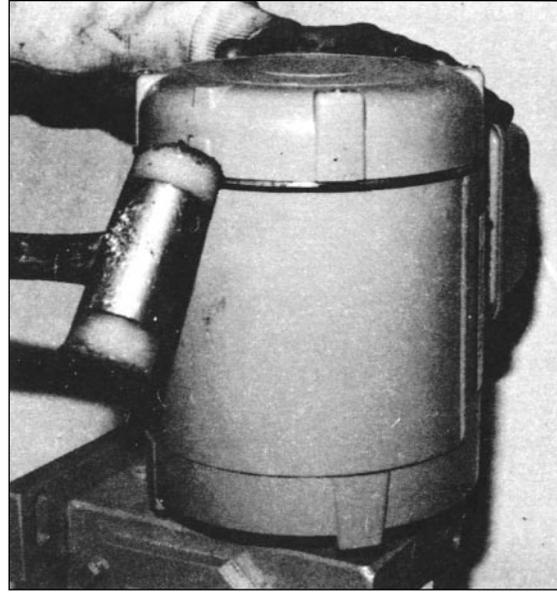
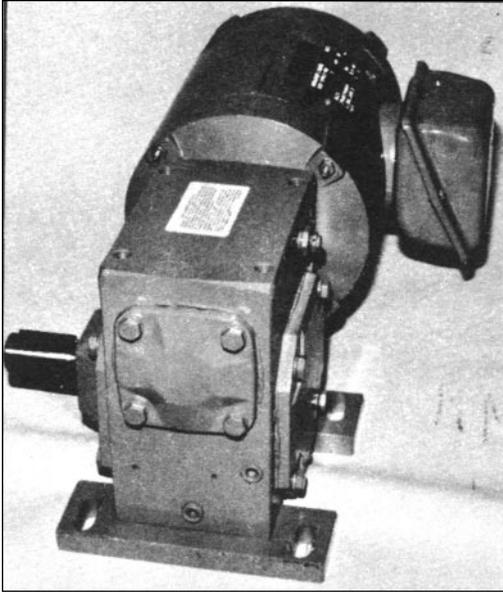
- B. Double worm reducers are built so that the adapter (circled) is the output side-plate for the primary unit, and the input bearing cap for the secondary unit. If reshimming the unit use this piece and shim units separately **before** final assembly.

The output shaft of the primary is connected to the input shaft of the secondary by means of a splined coupling. Heat, puller, or press may be needed to disassemble or assemble.

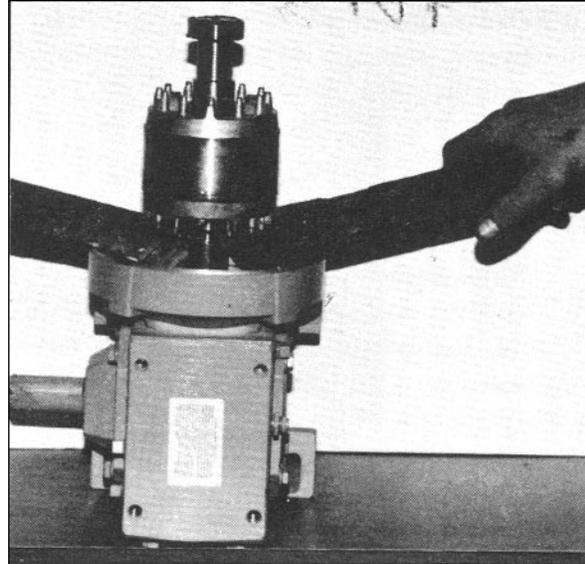
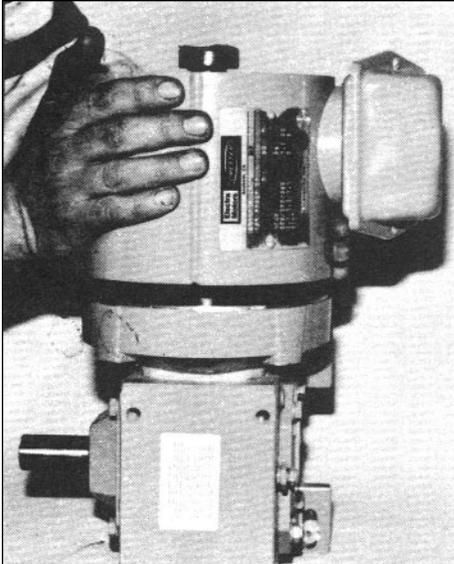


- C. Worm planetary units (WP17A, WP177A, R etc.)

Planetary units are on the output end of our 17 worm reducers or helical gear cases. The output sideplate of the 17 is the adapter between the two gear units.



The majority of Electra-Gear worm reducers are used with motors as an integral design. To disassemble for servicing the gear reducer:

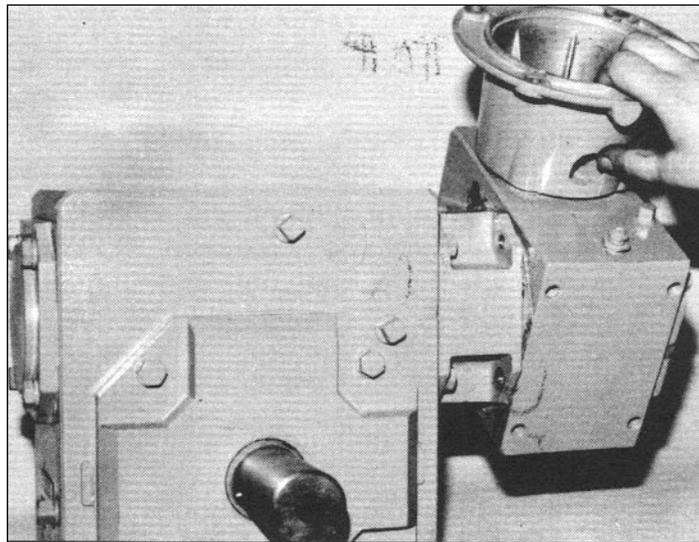


1. Remove motor, brake, fan guard, and fan if present.
2. Remove long through bolts.
3. Tap end cap with soft hammer to loosen and remove.
4. Tap gear housing while holding stator-housing assembly and remove.
5. Pry rotor-shaft assembly loose from splined coupling. Use wood blocks and be careful not to break adapter.

X - ASSEMBLY AND MOUNTING CHANGES

Assembly positions are easily changed on Electra-Gear worm gear speed reducers.

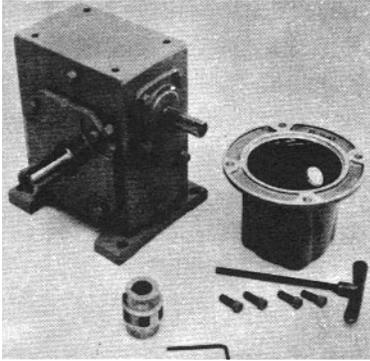
- A. Changing output shaft protrusion. (Right to left or Left to right)
1. Remove sideplate being careful to leave all shims with sideplate.
 2. Remove output shaft/gear assembly. (You will have to remove both sideplates on 500 and 600 units.)
 3. Remove opposite sideplate; keep shims with it.
 4. Clean excess silastic off housing and sideplates.
 5. Apply silastic to both sideplates before reassembling.
 6. Reassemble in reverse order (and reverse position) of disassembly. Make sure shims stay with the sideplate they came off with; this will maintain centering of the gear.
 7. Change breather location, if necessary.
- B. Base change
Reducer feet, angle brackets, etc. may be moved from one side to another using tapped holes in housing. Ring bases should be changed as described in Output Shaft section above. In both cases be sure to change breather to proper location.
- C. Double Worm Reducers



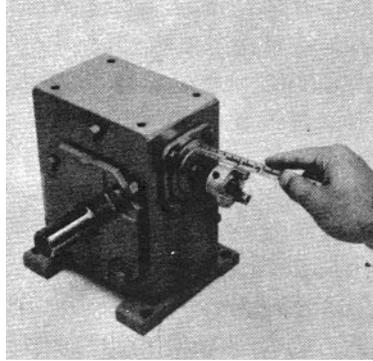
There are many possible configurations for these units. The primary may be rotated in 90 degree increments in relation to the secondary unit. This is done by simply loosening the adapter bolts and rotating the unit to the position desired. Study the assembly position you want carefully. Most changes, however complicated they appear, are usually accomplished by one or two simple procedures.

D. Convertible

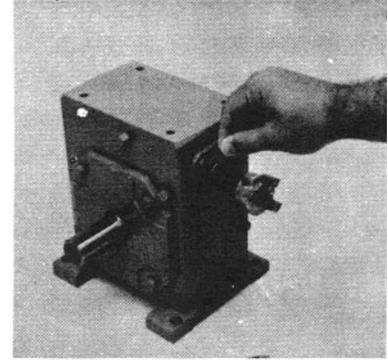
MAKING THE CONVERSION



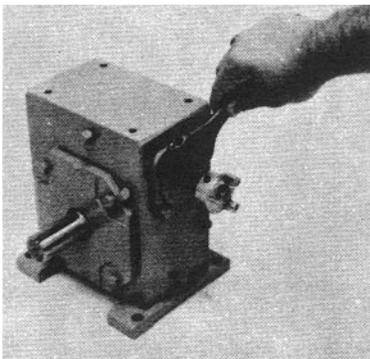
1. An Electro-Gear Convertible Worm Reducer can be quickly and easily converted from a standard configuration reducer to a NEMA "C" reducer by



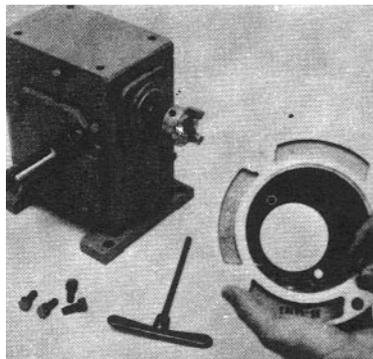
2. Slipping the reducer coupling half onto the input shaft and locate on the shaft according to the dimensions on the dimension sheets, then



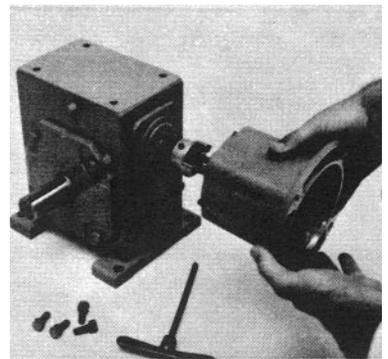
3. Tighten the set screw. The next step is to



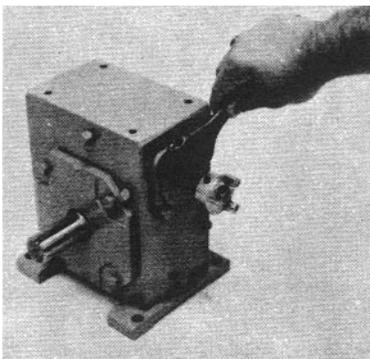
4. Remove the four bolts holding the bearing cap in place without removing the bearing cap. The four bolts removed are



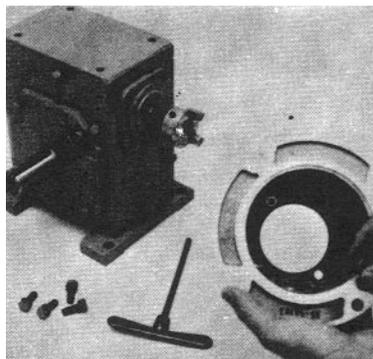
5. Replaced by longer bolts which are included in the Convertible Kit.



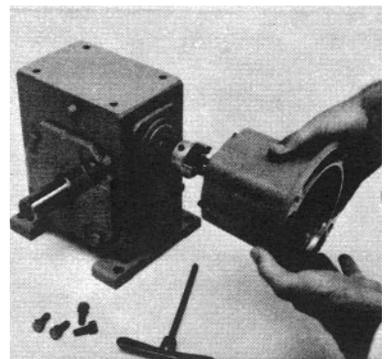
6. Slip the NEMA "C" flange adapter into place and



7. Tighten the bolts. This completes the conversion which allows



8. The mounting of a NEMA "C" face motor. In just these few minutes



9. A worm gearmotor has been assembled.

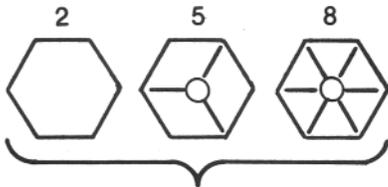
XI - BOLT / NUT TORQUE SPECS

Thread Size	Grade of Bolt / Nut			
	2	5	8	8+
	Ft. - Lbs. of Torque			
10-24	2	3	4	5
1/4-20	7	10	14	16
5/16-18	14	21	30	33
3/8-16	24	37	52	59
7/16-14	39	60	84	95
1/2-13	59	90	128	145

Oil Fill / Drain Plugs		
Thread Size	Square Head	Socket Head
1/8 Pipe	6	5
1/4 Pipe	10	9
3/8 Pipe	20	15
1/2 Pipe	25	20

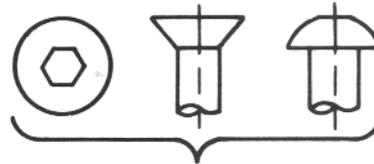
Note: 1) Above torque specs are in ft.-lbs.
 2) Assemble all bolts / nuts and pipe plugs with an anti-seize compound.

Grade I.D. System



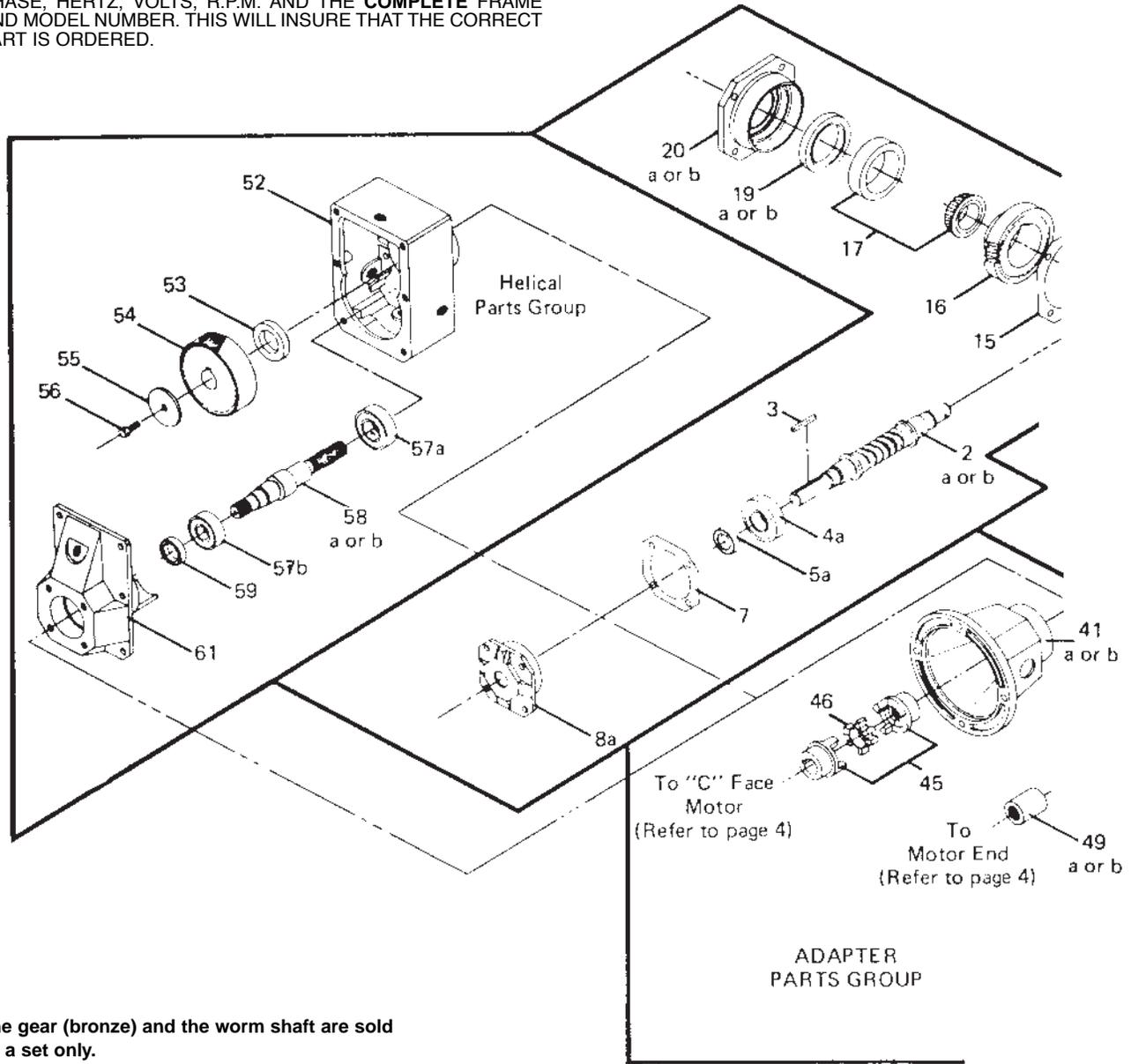
Hex Head Bolts

Grade 8+



Socket, flat, and button head cap screws

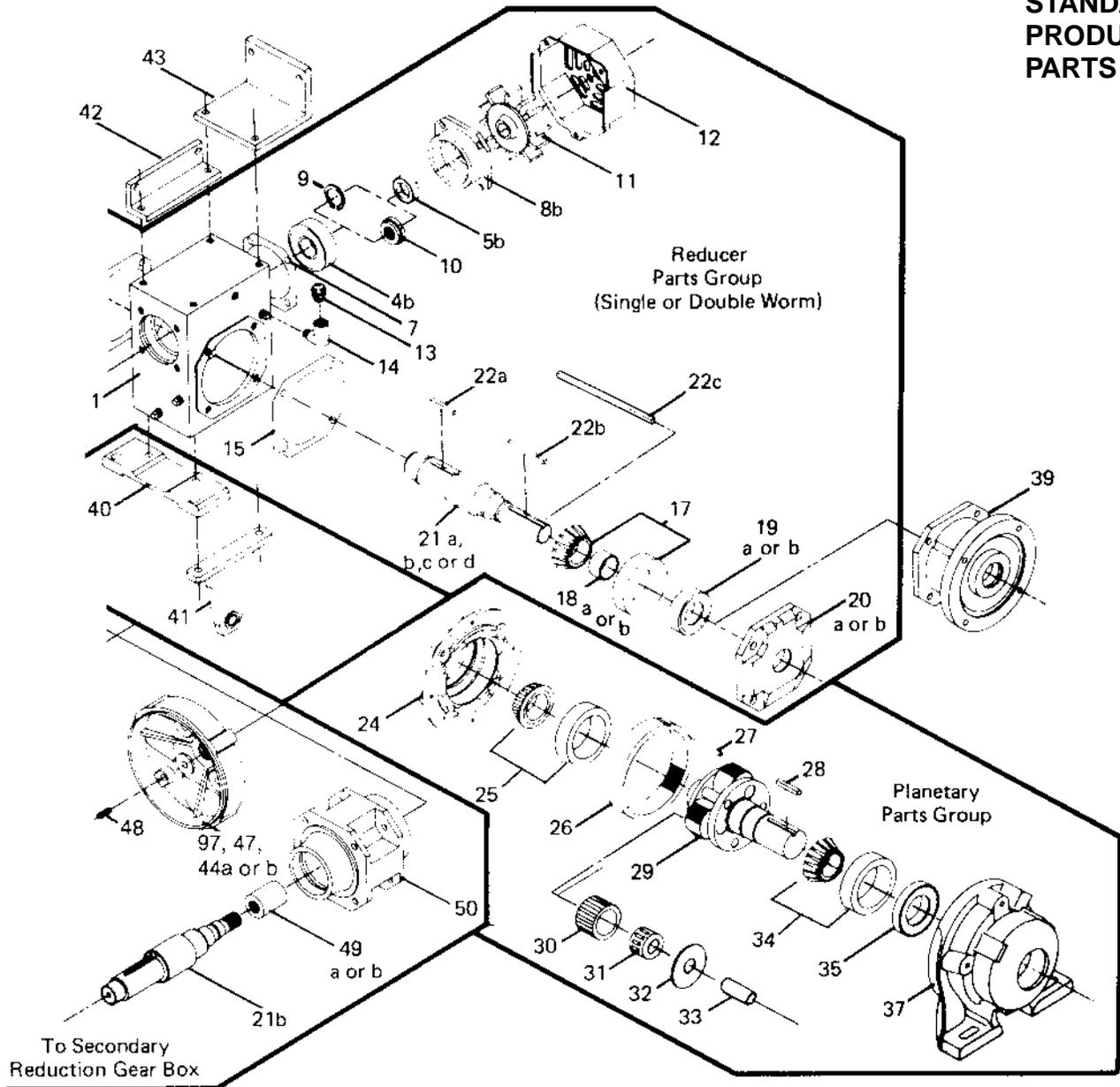
NOTE: WHEN ORDERING PARTS PLEASE PROVIDE THE PARTS LIST NUMBER, ITEM NUMBER, PART DESCRIPTION, H.P., PHASE, HERTZ, VOLTS, R.P.M. AND THE **COMPLETE** FRAME AND MODEL NUMBER. THIS WILL INSURE THAT THE CORRECT PART IS ORDERED.



The gear (bronze) and the worm shaft are sold as a set only.

Worm Reducer (or gear end for gearmotor) Parts Group (single or double worm)	
1	Gear housing
2a	Worm shaft, keyed for reducer only
2b	Worm shaft, splined for gearmotor only (gear end)
3	Key, input, worm shaft
4a	Bearing, input, specify as to ball, taper or roller
4b	Bearing, input, fan end, specify as to ball, taper or roller
5a	Seal, input
5b	Seal, input, fan end
7	Shim set, input
8a	Bearing cap, input
8b	Bearing cap, input, fan end
9	Snap ring
10	Lock nut, 500 and 600 only
11	Fan
12	Fan shield
13	Pressure relief valve
14	Elbow or bushing
15	Shim set, output
16	Gear, bronze, specify gear ratio
17	Bearing, output, cup and cone set
19a	Seal, output - solid
19b	Seal, output - hollow
20a	Side plate, open
20b	Side plate, closed
21a	Output shaft, single end, keyed
21b	Output shaft, single end, splined for planetary or double worm, specify
21c	Output shaft, standard double end, keyed
21d	Output shaft, hollow, specify as to bore diameter
22a	Key, gear
22b	Key, output
22c	Key, inside hollow shaft

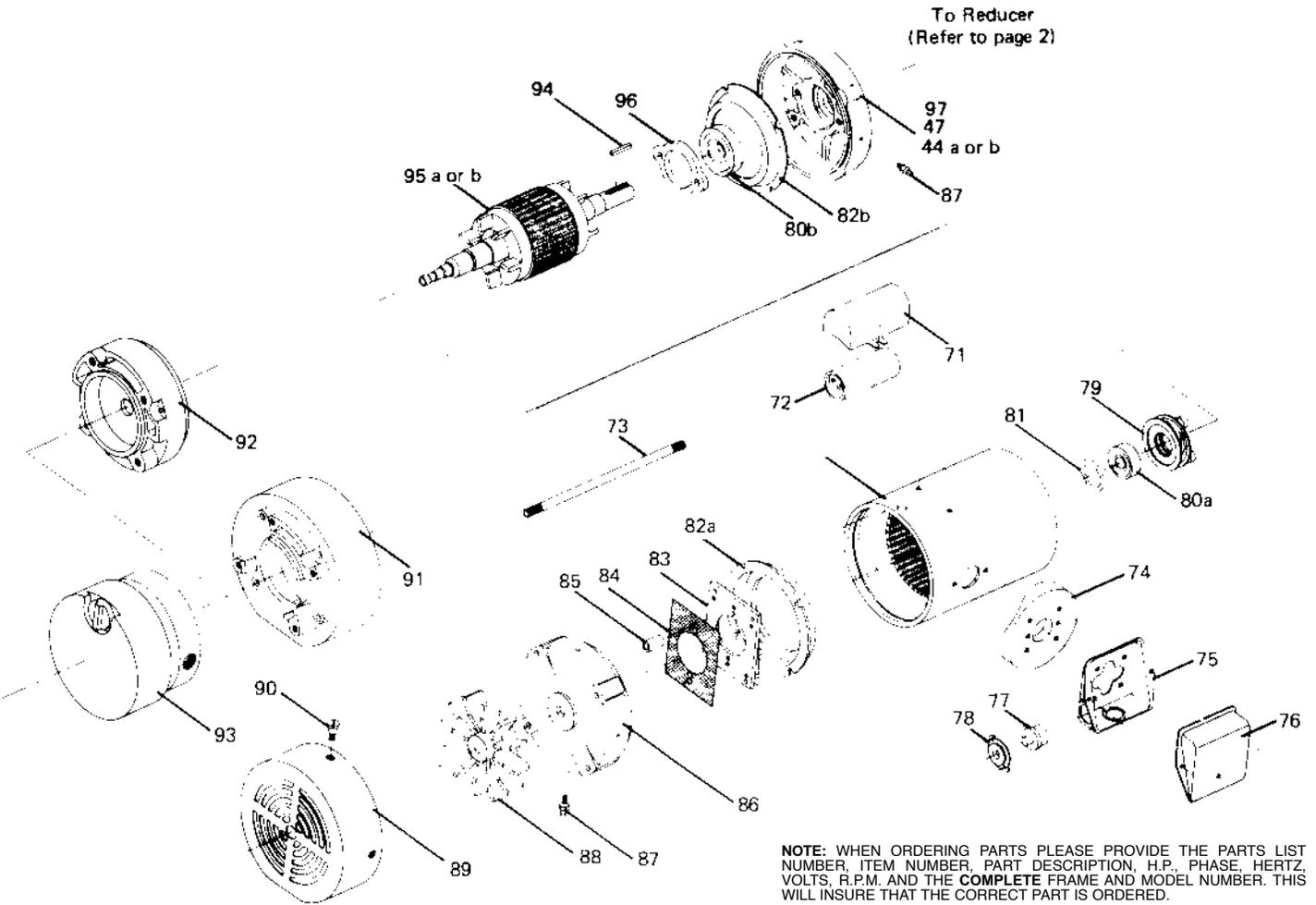
STANDARD PRODUCT PARTS LIST



Worm Planetary Parts Group	Gear Case Mounting Parts Group	Helical Gear Case Parts Group
24 Planetary adapter	39 Ring mount	52 Gear housing
25 Bearing, cup and cone set	40 Adaptable base, 2 required	53 Spacer washer
26 Ring gear	41 Torque arm	54 Helical gear, specify gear ratio
27 Dowel pin, ring gear	42 "B" bracket	55 Retain in washer
28 Key, output shaft	43 "JB" bracket	56 Retain in bolt
29 Planetary gear shaft assembly		57a Bearing, input
30 Gear, 3 required	Adapter Parts Group	57b Bearing, input
31 Needle bearing, 3 required	44a NEMA "C" flange, specify as to motor frame size	58a Input shaft, pinion gear, keyed
32 Thrust washer, 6 required	44b NEMA "D" flange, specify as to motor frame size	58b Input shaft, pinion gear, splined
33 Pin, 3 required	45 Flexible coupling assembly	59 Seal, input
34 Bearing, output, cup and cone set	46 Rubber insert flex coupling	61 End plate, helical
35 Seal, output	47 Motor adapter, specify as to motor frame size	
37 Planetary gear housing	48 Roll pin	
	49a Solid coupling, 17 tooth	
	49b Solid coupling, 19 tooth	
	50 Double worm adapter to secondary gear box. Double worm reducers or gearmotors use the same basic parts in the primary or secondary reduction unit.	

All dimensions, designs, prices and specifications are subject to change without notice.

MOTOR PARTS LIST



All dimensions, designs, prices, and specifications are subject to change without notice.

MOTOR PARTS LIST FOR FOOT MOUNTED, FACE MOUNTED OR 3/4 MOTOR END (GEARMOTOR) (SINGLE PHASE OR THREE PHASE)

70	Wound stator assembly (specify as to with or without feet)	85	Spacer, stationary switch
71	Cover, capacitor	86	End cap, fan end, opposite drive end
72	Capacitor	87	Grease fitting (not std., only spl. units)
73	Stud, motor	88	Fan
74	Mounting pad, terminal box	89	Fan shroud
75	Terminal box	90	Shoulder screw
76	Terminal box cover	91	Brake mount for T.E.F.C.
77	Klixon T.M.	92	Brake mount of T.E.N.V.
78	Klixon retainer	93	Brake, specify as to torque, NEMA design, Volts, hz.
79	Rotary switch	94	Key, rotor
80a	Bearing, fan end	95a	Rotor, Shaft assembly, keyed output
80b	Bearing, output end	95b	Rotor, Shaft assembly, splined output
81	Spring washer	96	Bearing retainer
82a	Air baffle, fan end	97, or 47 or 44a or 44b:	End Cap, output end, must specify as to type and size, etc.
82b	Air baffle, output end		
83	Stationary switch		
84	Insulation, stationary switch		

IMPORTANT INFORMATION



Please Read Carefully



The following  and  information is supplied to you for your protection and to provide you with many years of trouble free and safe operation of your Electra-Gear product.

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



- Written authorization from Electra-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.



- 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 Electra-Gear.

ELECTRA-GEAR

WARRANTY PROCEDURE:

Units returned under warranty must be accompanied by a "Return Goods Authorization", or **RGA number** and should be shipped freight prepaid to Electra-Gear or an authorized service center. Valid warranty items will be repaired or replaced at Electra-Gear's option on a no-charge basis and shipped back to customer freight allowed.

Warranty is limited to parts and labor involved in our product only. Charge-backs for customers to perform warranty work will not be accepted.

Warranty will not be extended by virtue of having been repaired during warranty period.

RETURNS:

Annual Restocking—Distributors are entitled to one annual return in an unlimited amount. No restocking charge will be assessed if an order of equal value is placed to offset credit. Returned products must be unused, less than eighteen (18) months old and current saleable merchandise.

Restocking—Minimum charge is 35% of price on all products except annual restocking and prototype returns. Rush service charges, freight and all other charges are not subject to credit.

All returns must be accompanied by an **RGA number** and shipped back to Electra-Gear freight prepaid.

Old line parts, units and accessories are **not returnable**.

ELECTRA-GEAR

A REGAL-BELOIT Company

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AND ELECTRIC MOTORS...**

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