

Mighty Blue Glass

on DB

MFG: ALLEN HERSCHELL  
RIDE: SKY WHEEL

03553

00940

Sky Wheel

Skywheel

SKY WHEELS

1960 THROUGH JULY 1968

NOTE: Single axle trailers used prior to 1962

SHEET NO.

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## GENERAL DESCRIPTION

The SKY WHEEL described herein is a mobile, fully self contained amusement ride. The idea of the SKY WHEEL was originally conceived by the Velare Bros., who were the first to build and operate this attractive ride.

In transit, the ride consists of two independent semi-trailer units, with all parts securely stored or attached on the trailers. Drawing No. 16609 shows the assembled unit and indicates the names of the various components.

In operation, the two trailers are placed parallel to each other, approximately 11 feet apart, and after erection the ride operates between the trailers.

The booms are 46 feet long and each end terminates with a bearing arrangement to support a 29 ft. diameter wheel with 8 seats on each wheel. Each seat can carry 450 pounds, so the full capacity of the ride is 32 adults or 48 children.

Each side of the boom is driven with a 5 HP motor through a cable which rotates the 12 ft. diameter bull wheel at approximately 4 RPM. Each one of the main wheels is driven at 4 RPM by two 3 HP gearhead motors driving the rim of the corresponding wheel by friction through an automobile tire.

NOTE: In this Instruction Manual, when reference is made to the "back" of the trailer, it means the end opposite the cab. The right hand (or No. 1 trailer) and the left hand (or No. 2 trailer) are in those respective positions when facing the back of the trailers.

# GENERAL GUIDELINES

## GENERAL GUIDELINES OPERATOR SELECTION AND INSTRUCTION

1. Select competent mature operators, capable of understanding the function and use of amusement rides and their control.

2. Instruct each operator fully in the proper use and function of the ride he is to supervise, including:

- A. Controls and procedures for normal and emergency operation.
- B. Manufacturer's recommended maximum speed and load.
- C. Manufacturer's recommended length of ride time and frequency of repeat rides.
- D. Any foreseeable misuse of the ride as determined by the manufacturer or owner, or by special conditions such as weather, location or crowds.
- E. Each operator must have immediate availability of a manufacturer's operator's manual for the ride he supervises.

3. Require each operator to inspect the ride he supervises, each day of operation.

- A. Determine that no portion of the ride is damaged, omitted, or worn in such a manner that it is unsafe or that may develop into an unsafe condition.
- B. Report any irregularities to superintendent or owner.
- C. Do not operate ride if any irregularities are found until such condition is corrected.

4. Instruct the operator to allow no passenger to ride who is visibly ill, or under the influence of drugs or alcohol.

5. Instruct operators and attendants on the proper methods of securing passengers in the ride. Do not allow a passenger in the ride that cannot be properly secured due to passenger size or malfunction of the securing device.

- A. Stop the ride immediately if any passenger is observed tampering with any restraining device or behaving dangerously, such as standing up.

6. Advise the operator against starting or operating the ride while any person (passenger, spectator, or employee), is in an endangered or unsafe position on the ride or within the ride area.

7. Insist that each operator remain in full control of the operating controls during operation of the ride, and give his full attention to the ride and its passengers.

8. Instruct operator to allow no other person, other than another trained operator, to operate the controls of the ride, excepting portions of the ride that are designed to be controlled by the passenger.

9. Instruct operator and attendants fully as to the proper method of assembly and disassembly of portable rides and supply adequate personnel and equipment to do it safely.

- A. Restrict spectators from the area.

10. Instruct operator to inspect and correct or replace damaged, lost or worn parts that are unsafe or that may develop into unsafe parts simultaneously with assembly or disassembly.

11. Advise operator that factory-installed safety devices are not to be tampered with or removed.

12. Advise operator of owner/supervisor procedure for assisting ill or injured passengers.

13. Instruct operators and attendants that patrons are required to secure all articles, such as keys, change, eye glasses, etc., which may become loose while riding.



# PREVENTATIVE MAINTENANCE

## SAFETY

The following is a list of a few general selected rules which should be adhered to by everyone.

Remember that in the long run the key to a Safe and Successful Operation is to have well-trained and well-supervised employees.

### GENERAL SAFETY GUIDELINES

1. All work must be done by competent qualified mechanics capable of understanding the function of the parts and their proper installation.
  2. Inspect ride, each day of operation, to determine that no portion of the ride is damaged, omitted or worn in such a manner that it is unsafe, or that unsafe conditions may develop.
  3. Perform manufacturers recommended maintenance procedures at intervals and in manner specified by operation and maintenance manual, in the following general areas:
    - A. Lubrication
    - B. Air, Hydraulic and Electrical Systems
    - C. Torquing of Bolts
    - D. Wear of Bolted or Pinned Joints
    - E. Adjustment and Care of Mechanical Components such as Brakes, Clutches, and Air Compressors
    - F. Passenger Securing Devices
    - G. Crowd Control Devices
    - H. Operating and Emergency Controls
    - I. Factory Installed Safety Devices.
  4. Study each job carefully to determine all hazards so that necessary safeguards can be taken.
  5. Examine safety devices, tools, ladders, etc., before they are used to make sure they are in good condition. Ladders should be clean and unpainted.
  6. Use the proper tool or equipment for each job. Ground all hand electric power tools before use.
  7. Wear close-fitting comfortable clothing when working on or close to mechanical apparatus or live electrical circuits. Avoid finger rings, jewelry or other articles which may be caught in moving parts or come in contact with electrical circuits.
  8. Protect your eyes by wearing approved Safety Glasses or Goggles.
  9. Wear hard hats at all times. When working in elevated areas, use a safety belt.
  10. Where work to be performed is hazardous such as live electrical circuits, at least two men shall work together.
  11. If guards must be removed from equipment, make sure they are replaced before leaving the job.
  12. Clean up after each job disposing of surplus materials.
- K90-003/2-78

13. Keep a record of parts replaced and date of replacement. Inform manufacturer of any replacement requirements that are frequent or cause unsafe conditions.

14. Make modifications and additions as outlined in manufacturers service and safety bulletins.

## PREVENTATIVE MAINTENANCE

Preventative maintenance is the best assurance for a successful operation. The ride operator should clean and inspect the ride daily. Lubrication should be performed at recommended intervals.

### MAINTENANCE - FIRST TWO WEEKS OF OPERATION

The ride has been completely serviced and tested before leaving the factory. However, during the first two weeks of operation, the ride operator should be especially observant and watch for possible hydraulic leaks, etc. During the first two weeks, all bolts and nuts should be checked daily for tightness. After the first two weeks, they should be checked at least monthly.

### HYDRAULIC FILTER

There is a hydraulic filter located in the return line going into the hydraulic reservoir. This filter has a replaceable filter element which should be changed at least semi-annually, and whenever the hydraulic fluid becomes contaminated for any reason. "Contamination" refers to any foreign matter such as dirt, sand, water, or other liquid other than the recommended hydraulic fluid.

## WEAR OF JOINTS

### WEARING OF BOLTED OR PINNED JOINTS

Any bolted or pinned joint, whether designed to be stationary or moving, will be subject to stresses causing wear.

Wear will become evident on the fastener, walls of the hole or both. A certain amount of wear is expected and can be considered normal. It is impractical to specify the amount of wear or slop that should be tolerated on every joint. Therefore, the following general guidelines can be used as a guide only.

If in doubt about the condition of a bolt, pin or hole, consult Chance Manufacturing Company.

### NEW RIDES

Some joints will appear to wear rapidly on new rides. This is usually a result of the holes not aligning in the mating parts. When this condition occurs it results in what is termed as "Point Contact". A joint with this condition will generally wear rapidly until the load is distributed evenly over the fastener and the parts.

Once the joint has worn enough to have what is termed "Full Surface Contact" it should wear very slowly and evenly from then on.

If joint continues to wear rapidly, contact Chance Manufacturing Company.

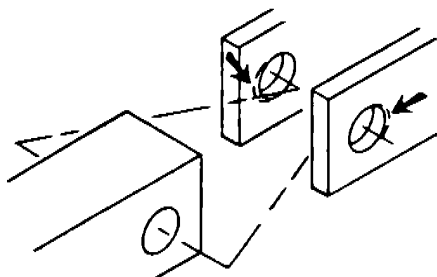
### STATIONARY JOINTS (NO BEARINGS)

Generally encountered with Walkways, Stands, etc.

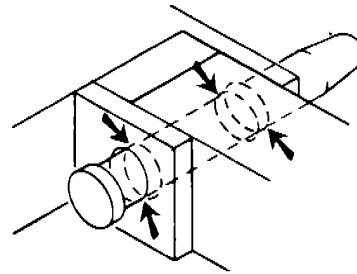
When holes become noticeably egg shaped or sloppy enough to wobble pin around, parts should be align drilled and oversize pins installed.

When using oversize pins, do not jump more than one size.

If in doubt, Consult Factory.



Stationary Joint Wear



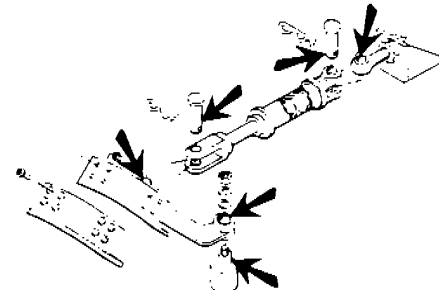
Stationary Joint-Misaligned Holes  
Resulting in Point Contact

### MOVING JOINTS (BEARING OR BUSHING)

Any moving joint that has a bushing or bearing generally is involved with ride action.

Replace any worn parts as soon as detected.

Keep moving joints lubricated.

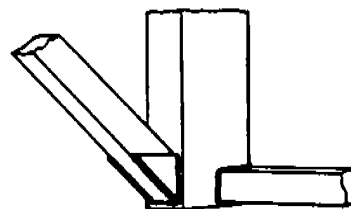


Moving Joints

### WELDED JOINTS

Structural joints should be checked on a regular basis for visual signs of cracking or fatiguing. Joints that have gusset plates should be checked more frequently.

Consult Chance Manufacturing if above conditions are present.



Welded Joints

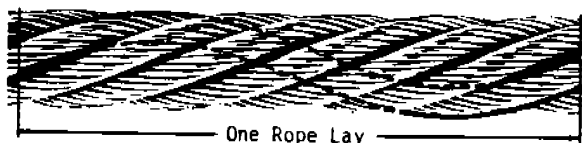
## CABLE INSPECTION

### CABLE REPLACEMENT (NO LONGER SERVICEABLE)

The following guidelines will allow an economical and reasonable service life, while maintaining a high degree of safety as far as preventing damage to the ride or possible injury to the passengers.

Replace cables if any of the following conditions exist. If more than one cable is used, cables must be replaced as a set.

1. General evidence of severe corrosion.
  - A. Rust appearing to stem from interior of cable.
  - B. Cable appears clean at present but previous corrosion is evident from pitted condition of wires.
2. Severe stretching occurring in a short section of cable, indicated by a marked reduction in the diameter of the cable.
3. Severe physical damage such as "kinking", "crushing", or "bird caging".
4. One strand being 75% broken through.
5. A number of wires, equal to the number in a strand, being broken in the length of one rope lay.



"Lay" as a unit of measure



Kinking



Crushing



Bird Caging

RIDE: SKY WHEEL

OPERATION

The Sky Wheel was designed and manufactured with adequate factors of safety to the following specifications:

Wheel Speed . . . . . 4 RPM.  
Boom Speed . . . . . 4 RPM.  
Average Seat Load . . . . . 300 lbs.  
Maximum Seat Load. . . . . 450 lbs.  
Maximum unbalance of Wheel in operation . . . . .  
One seat load.  
Maximum unbalance of Boom in operation . . . . .  
Two seat loads.

In the interests of safety, it is recommended that the towers aux. wind braces be loaded up, by blocking up under the shoes and then driving in shingles under the shoes when operating with winds from the side in excess of 25 miles per hour. Towers are made stable in the direction toward the front of the trailers by the installation of the struts to the trailer house. Stability in the direction away from the trailers is governed by the weight of the trailer and the front aux. wind brace. In addition to possible wind loads from the direction of the trailer front, the inertia load imposed by application of wheel and boom brakes must be considered. If the direction of rotation is such that the top of the boom and the top of the wheels are moving away from the trailers when the boom is vertical, it will be necessary to anchor the front of the trailers.

The trailer houses are equipped with heavy eye bolts; one on the inside front corner of each house. It is recommended to use steel cable to anchor the trailers through these eye bolts. The tractor can be brought near the two houses and the cables attached to the tractor. This anchoring is mandatory to insure the safe operation of the Sky Wheel.

NOTE: Stress Analysis of the Sky Wheel structure is available on request from Allan Herschell Company.

## SKYWHEEL - PORTABLE

### OPERATION OF HYDRAULIC SCREW JACKS

1. The release screw at the bottom of the Pine pump should be left closed tight at all times.
2. Locate pump handle and Webster Valve handles in the storage cabinet.
3. To jack up trailer, pull Webster Valve handle towards you and pump up with Pine pump.
4. When jack has been extended, push valve handle to center or neutral position, with a quick positive movement. This will hold jack until jack collar is run up tight to cylinder.
5. To lower trailers, place handle forward, pump Pine pump until jack collar can be run down to end of screw.
6. Place valve handle in extreme position away from you, this will allow trailer to come down part way under its own weight.
7. Again use Pine pump to complete the lowering of the trailers.

SUBJECT: ERECTION

1. Lay out Ride location and stake the area for positioning the trailers.  
(See Dwg. 16480).
2. Locate trailer #1 (R.H.) as close to stakes as possible and disconnect the tractor.
3. Locate trailer #2 (L.H.) as close to stakes as possible, using one of the horizontal aluminum trailer tie bars as a gage, also check for level across bar. Disconnect the tractor.
4. Assemble two chain hooks to each trailer axle before leveling the trailers.
5. Jack trailer #1 (R.H.) so that the wheels clear the ground and then assemble the platform beam support and check for clearance to ground. (See Dwg. 16432). 52" 433
6. Check the ground level in the area where the platform will be located and then level trailer #1 (R.H.) to a sufficient height to allow the platform to clear the high ground. (See Dwg. 16847).

NOTE: Use sufficient blocking to provide a substantial bearing for the jack foot. The jack screw should not extend more than 4" and the jack collar should be screwed up to a lock position.

7. When leveling trailer #1 (R.H.) use the 28" hand level furnished by Allan Herschell Co.

Check for horizontal level by laying the level across the two leveling pads at the front of the trailer, and also by holding the level on the sides of the stub tower tubes.

Check for vertical plumb by holding the level on the face of the stub tower tubes.

8. Check the spacing between trailer #1 and #2, by using the two horizontal trailer tie bars.

Check for longitudinal alignment by using the diagonal tie bar. (See Dwg. 16543).

NOTE: During the erection of the ride it is advisable to have at least two (2) of the trailer tie bars attached to the trailers to maintain alignment.

SUBJECT: ERECTION

9. Trailer #2 (L.H.) will probably have to be moved to align with trailer #1 (R.H.). To accomplish this, assemble the four (4) 10" diameter casters to the landing gear pads and the two caster brackets located at the rear of the opossum bally. (See Dwg. 16566(4)).

10. Place one of the 3/4 x 18 x 24" aluminum ground plates under each of the casters, and then by using the telescoping landing gear and the two 5-ton hand jacks furnished, lower the casters to the aluminum ground plates and jack the trailer up sufficiently to move the trailer to the desired alignment. Pipe sockets are provided on the casters for turning with a bar.

The trailer tie rods should drop on freely.

Double check the alignment by stringing a line cord through the hinge pin holes at the top of the stub towers. Alignment must be within 1/8" (maximum 1/4").

11. When trailer #2 (L.H.) is level and aligned, place sufficient blocking for the jack feet and transfer the load to the four hydraulic trailer jacks. The jack screws should not extend more than 4" and the jack collars should be screwed up to a lock position.
12. Retract the landing gear and remove four 10" diameter casters, at your convenience, and double check the trailers for level.

SUBJECT: ERECTION

13. Connect the main power leads to the trailer junction box located at the front of the trailer #1 (R.H.) on the under side near the king pin. Run the power leads through the insulated bushings provided in the side of the compartment. Connect as per instruction diagram on the compartment cover. Before doing so it is most important to review the control panel electrical dwg. #16809. Improper connection can cause serious damage to the electrical system. If a four wire, 3 phase, 110/208 Volt, 60 cycle, "Y" source is used; connect to the four large connectors indicated, being sure to connect the neutral wire to the proper neutral connector. The handle for the 200 amp., 2 pole, double throw disconnect switch in the van must be in the down position. Ref. Dwg. #16809. This will provide the proper 110 Volt for the lights.

If a 3 wire, 3 phase, 240 Volt, 60 cycle delta source is used, it must be connected to the three large connectors but not to the neutral connector. The handle for the 200 amp., 2 pole, double throw disconnect switch in the van must be in the Up position, or else 240 Volts will be thrown on the lighting circuit causing serious damage to the lights and ballasts. A separate 220/110 Volt, single phase, 3 wire source is necessary in this case, and is connected to the 3 smaller connectors. The neutral lead must be connected to the neutral connector.



SUBJECT: ERECTION

- 14.
15. Remove the bolts anchoring the towers to the top of the vans.
16. Set up Operator's Central Console and check for correct phase.
- 17.
18. ----- Check the spacing between the tower bearing housings by placing the square tubular gage bar over the dowel pin on each bearing housing. If the gage bar indicates the bearing centers are not properly spaced, correct by raising or lowering the front outboard trailer jacks on one trailer, or on both trailers, if so indicated.
19. Remove dowel pins from top side of bearing housings and insert on bottom side of housings. Raise towers to a vertical position.
20. With the towers in a vertical position, have two men climb towers with the gage bar and place on dowel pins to check bearing spacing. If indicated by gage bar, correct bearing spacing by raising or lowering the front outboard jacks only.
21. Remove gage bar and lower the towers on the 4 x 4 wood posts near the end of tower to a horizontal position; recheck the bearing spacing with the gage bar. The towers should have the same spacing in both the horizontal and vertical position, within 1/8". Remove the front trailer tie bar and open the bearing caps on the ends of the towers.
22. Refer to gantry assembly Dwg. #16844. Mount the 3" I beam extensions 12'-6" lg. and assemble the 2" pipe braces as shown. Use 3/4" and 1" pins from the tote boxes. Raise the 6" x 4" I beam on to the tracks and between the vans. Utilizing the 45" lg. aux. wind braces, anchor one gantry carriage to the beam. Now slide the two Lodestar Hoists onto the beam from the other end and then assemble the other gantry carriage.

SUBJECT: ERECTION

23. Place the bull shaft track extensions on opossum belly doors, support opossum belly door with two (2) trench jacks. Roll bull shaft out and hook with both chain hoists. Move bull shaft forward until blue end is under tower bearing housing. Rest blue end on jumper box. Using one hoist on red end, rotate bull shaft 90°.
  24. Looking from rear of trailer to front of trailer, take one drive cable and make a double clockwise loop around the bull shaft on the red bearing end and place it between the two center flanges that mount the boom and bull wheel.
  25. Looking from rear of trailer to front of trailer, take one drive cable and make a double counter-clockwise loop around the bull shaft on the blue bearing end, and place it between the two center flanges that mount the boom and bull wheel.
  26. Using the gantry hoist, raise the bull shaft into the bearing housings and bolt.
- CAUTION: Make sure that the ears located in the center of the shaft are in a vertical position, and the large outlet box in the center faces toward the rear of the trailers.
27. Remove the 8 wind braces from the trailers and place on the ground between the trailers and out of the working area.
  28. Remove #1 red boom from trailer #1 (R.H.) and #2 red boom from trailer #2, (L.H.). Place these booms on blocks in front of their corresponding trailer. Check for broken light tubes and also tape spare tubes in place. Check tires for 12# air pressure.
  29. Roll gantry to the rear and remove #1 blue boom from trailer #1 (R.H.), check for broken glass and tape spares in, also check tire for 12# pressure. Raise into position in the bull shaft and insert the pins and cotter pins. Hook into lightening hole just forward of the wheel and between the boom and motor. Rest the end of the boom on approx. 6" blocks on the ground.
  30. Remove #2 blue boom from trailer #2 (L.H.). Check for broken glass and tape spares in, also check tire for 12# pressure. Raise into position in the bull shaft and insert the pins and cotter pins. Hook the end of each blue boom with the hoists and raise above tower level. Set the platform 4" I beam across the two towers approx. 20 feet from the bull shaft. Lower the booms to rest on this I beam.
  31. Roll gantry forward and hook R.H. red boom (with small end heavy) and raise to bull shaft. Insert spud wrench handle through flange bolt hole on blue boom, and raise red boom enough to engage the spud wrench through the flange, then raise into position and pin and bolt.

SUBJECT: ERECTION

32. Raise #2 red boom into position in the bull shaft and insert pins, cotter pins and bolts through the boom flanges. Plug in the pig tails from the booms to the center outlet box at the center of the bull shaft.
33. Remove the wheel axles from the opossum belly with the gantry hoist and position on blocks or jumper box at the ends of the boom.

NOTE: Place the red axle at the end of the red boom, with the distribution box on the axle toward the electrical outlet plug on the side of the boom.

NOTE: Place the blue axle at the end of the blue boom with the distribution box on the axle toward the electrical outlet plug on the side of the boom.

34. Untie the rope hand lines from trailer and rotate boom and install the red axle. Install the red commutator with the gantry hoists. Rotate boom and install the blue axle. Install the blue commutator. Tie the rope hand lines with the blue axle in a down position.
35. Remove one-half of the red bull wheel from trailer #1 (R.H.) and raise with rope hand line and position between the flanges on the top side of the red end of the bull shaft. Insert pins and cotter pins. Install one tripod assembly.

NOTE: Tripod assemblies are stored in a box in the opossum belly.

36. Remove one-half of the blue bull wheel from trailer #1 (R.H.) and raise with rope hand line and position between the flanges on the top side of the blue end of the bull shaft. Insert pins and cotter pins. Install one tripod assembly. Install the commutator assemblies to the bull shaft.
37. Remove gantry assembly.
38. Rotate the boom by hand 180°, tie the rope lines and assemble the other two halves of the bull wheels and the tripod assemblies.
39. Bolt the hinged brackets between the boom and bull wheel. Thread the drive cables over the idler sheaves and around the bull wheels. Pull small loop of cable over rubber lined idler sheave. (See Dwg. 16532).

40. Install the truss rods (4) on the blue boom, with the turnbuckle end near the blue axle.

NOTE: Turnbuckles on truss rod should be hand tight only.

41. Untie the rope lines, rotate and lower red axle, tie rope lines and install truss rods (4) to the red boom, with the turnbuckle end near the red axle.

NOTE: Turnbuckles on truss rods should be hand tight only.

SUBJECT: ERECTION

42. Install light tubes in the bull wheels and light tubes in the truss rods with the exception of those tubes which go at the very ends of the truss rods near the turnbuckles.
43. Untie hand lines from trailer and rotate boom so it is parallel with the towers and tie to towers with the cable ties provided by Allan Herschell Company. Make sure all pig tails are plugged in.
44. Check for broken glass in the towers and stub tower and tape in spare tubes.
45. Raise the towers sufficiently to remove the knee braces and then raise each of the wind braces and attach the universal end of each to the respective towers. Tie the loose ends of the wind braces together with a rope hand line and have a man guide the braces when raising the towers.
46. Raise the towers simultaneously to a vertical position,  
and insert four (4) hinge pins,  
washers and cotter pins.

CAUTION: When raising towers, do not let one tower lead the other by more than 4", measured at the bull shaft. Correct the individual controls to keep in alignment.

47. With a rope line raise the free end of each wind brace and attach to bracket on top of the van. Check vertical plumb of towers with the hand level and adjust with screw jack. Lengthen or shorten the adjustable eye in the wind brace to line up with the hole in the head rest bracket on the side of the van.
48. Refer to Dwg. 16829 for the auxiliary wind braces. Tie a line to the pear link on the main brace, and then raise it into position and pin to the upper bracket. Assemble and pin the other braces as shown. Block up under the shoes and drive a final shingle to load braces.
49. Park one tractor across the front of the ride (see Dwg. 16480) and attach guy cables provided by Allan Herschell Company from the eyes on the front top corner of each van to the tractor frame.
51. Thread the drive cables around the drive sheaves and install the tensioning idlers. Adjust the tension so that the drive cables are fairly taut.

SUBJECT: ERECTION

52. Check the clearance between the splice plate bolts on the bull wheel and the sides of the tower. It should be approximately  $3/4$ " on each side. If the clearance is not sufficient, correct by adjusting the front outboard trailer jacks only. Recheck for level.
53. Connect the electrical power cables from trailer #1 (R.H.) to trailer #2 (L.H.).
54. Remove the cable ties which tie the booms to the towers.

CONTINUED - NEXT PAGE

SUBJECT: ERECTION

55. With the boom in a vertical position, lay the aluminum gage bar across the face of the boom and towers and check for squareness. Adjust for misalignment by tightening the turnbuckles on thrust rods. Rotate the boom 180° and repeat. All truss rods should be taut and all lock nuts snugged up on the turnbuckle.
56. Park boom in a vertical position and tie to towers with the cable ties.
57. Park a tractor at the rear of the trailers and attach a dead rope line for holding the wheel as the spokes are assembled and also the necessary tackle blocks for rotating the wheel as it is assembled. The winch provided on trailer #2 (L.H.) can be used for rotating the wheel as the spokes are installed.
58. Set up a walk way on each side of the trailer, to be used for assembling the rim rails.
59. Attach a rope tackle block to the chain aling at the center of the rod axle and attach the rope to the spoke hoist bar provided by Allan Herschell Co.
60. Remove one spoke from trailer #1 (R.H.) and lay the tapered end on two saw horses between the trailers. Wipe the tapered ends and the rim rail pins with a thin coat of grease. Attach the spoke hoist bar to cross bar of spoke, and with the use of the winch raise into position in the wheel axle hubs. Insert pins and cotter pins.  
  
CAUTION: Make sure that the ballast in the spokes are on the same side as the distribution box on the wheel axle. Plug in the jumper cord from the distribution box on the wheel axle to the outlet on the spoke.
61. Assemble a total of three (3) spokes and two (2) sets of rim rails to the red wheel. (Start rim assembly with two rims marked "Start", see Dwg. 16574).
- NOTE: When rotating the spokes as they are assembled, use the 2 x 4 spreader and rope bridle.
62. Release the cable ties on the boom and rotate the boom 180°. Tie boom to towers with the cable ties.
63. Assemble a total of six (6) spokes and five (5) sets of rim rails on the blue wheel. (Start rim assembly with two rims marked "Start", see Dwg. #16574.)

SUBJECT: ERECTION

64. Release the cable ties on the boom and rotate the boom 180°. Tie the boom to the towers with the cable ties.
65. Complete the assembly of spokes and rim rails in the red wheel. Make sure all jumper cords are installed in the spokes and from the spokes to the rim rails. (Finish rim assembly with two rims marked "finish", see Dwg. #16574).
66. Release the boom cable ties and rotate the boom 180°. Tie the boom to the towers with the cable ties.
67. Complete assembly of spokes and rim rails in the blue wheel. Make sure all jumper cords are installed in the spokes and from the spokes to the rim rails. (Finish rim assembly with two rims marked "finish", see Dwg. 16574).
68. Install the platform beam support to the hangers at the bottom of the stub towers and then place the platform sections in position. (See Dwg. 16847 and Dwg. 16863).
69. Assemble the tie rods in the spokes. Alternate with two (2) diagonal tie rods and then two (2) straight tie rods. (See Dwg. 16515).
70. Install Gold light tubes in the star of each wheel and GREEN light tubes in the rim rails. Install the Gold light tubes in the ends of the truss rods.
71. Lay the aluminum gage bar across the face of the spoke assembly and the face of the stub towers, and check for squareness. Correct by adjusting the turnbuckles. All tie rods should be taut and the jam nuts locked on the turnbuckles.
72. Remove cable ties from tower and boom. Rotate boom 180° and repeat squaring operation under the previous item (#71).
73. Remove seats from the vans and hang on spokes. Red seat opposite red, etc., etc.
74. Clear area of all tools, blocking, etc., before operating the ride. Make sure all three (3) trailer tie bars are installed. (See Dwg. 16543).

SUBJECT: ERECTION

75. Rotate boom and check brakes; rotate wheels and check adjustment of tires to rim rails.

Check wheel brakes.

Check tensioning on drive cables. 350-360#

Apply Talcum Powder daily to the rubber liners in the double grooved drive sheave (to allow slippage for shock absorption).

CAUTION

Caution - Do not lift assembled wheels by lifting brackets on Bull wheel shaft. These brackets are intended for lifting only the shaft. If it is desired to lift the ride by Crane suitable slings must be used.



## DAILY OPERATING INSTRUCTIONS FOR SKY WHEEL

### PORTABLE

Untie hold-down ropes from booms to towers.

Release hand brakes.

Check cable tension, approximately 350 to 360 lbs. on each cable. It is necessary to maintain this tension so periodic checks should be taken as ride is operating.

Turn on 110 voltage main breaker switch, phase relay breaker and volt meter breaker. Voltage regulator should be set for 30 volts.

Check all lighting after applying light breakers.

Turn on 220 voltage main breaker switch, boom motor breakers and red and blue motor breakers.

Check tires for 12 to 15 lbs. of air and 7-8" flat against rim.

### LOADING

First, load the two blue seats on the blue wheel. Rotate and send to the top.

Then, load four seats on the red wheel. After sending the red wheel to the top, load four more seats on the blue wheel. Send the blue wheel to the top. Finish loading the red wheel. Complete the loading of the blue wheel.

This procedure will keep your ride load in balance. During regular loading and unloading throughout the day, continuous seats should be loaded - even to the point where two seats at a time can be handled with a single stop.

### UNLOADING

In unloading at the finish of the day, follow the first loading procedure - in reverse.

### BRAKING OPERATIONS

To bring the boom in to a stop, the desired boom should be coming over the top to approximately 5° on way down when power on boom handle (white) is pulled to first braking point #9.

Increase braking as boom comes in. Boom should be stopped in a vertical position to the towers with no more than #4 or #5 braking power.

Pull handle all the way down for unloading and loading seats, *ONLY*. This procedure will eliminate rough stopping and will not cause tension on the Falk couplings, thus resulting in less maintenance.

The red and blue wheel brakes should also -

be stopped at #4 or #5 braking point and then pulled all the way down for braking and unloading.

Talcum powder should be used frequently on the main drive wheel to keep the rope cables from sudden gripping.

When closing for the evening, the three top seats on the top wheel should be removed, ropes fastened from booms to towers and hand brakes applied. Turn off all power.

In periodic checks of castings on the spokes, the nuts and bolts should be tightened only as specified in the instruction manual or on the spoke drawing. A torque wrench should be used and set to the required amount of pressure. Tightening with regular wrenches and drawing the nuts up too tight can result in cracked castings.

LUBRICATION INSTRUCTIONS

All grease fittings have been painted red for easy identification.  
A grease gun with flexible outlet is provided in the tool kit.

The following lubrication procedure is recommended:

TOWER OPERATION: BEFORE LOWERING - Check each jack for dirt or sand and wipe clean to prevent damage to jack, Also: Give one shot of grease to fittings on each screw jack as required. Use Mobilplex E.P. #1, or equivalent, in grease gun.

Every Week - Give one shot of grease to fitting on the end of each spoke, wipe off any excess grease on pin.

Every 6 Months -

Lubricate with grease all shaft and motor bearings.  
Use Mobilux Grease No. 1, or equivalent, in grease gun.  
or Mobilplex E.P.O

Every 6 Months -

Drain and refill as per individual instructions each of the following:

Foot Bros. Reducer on tower . . . . . Mobil Compound F-F,  
or equal;

Reuland Motor Fluid Coupling on tower . . . . . Mobil DTE light oil,  
or equal;

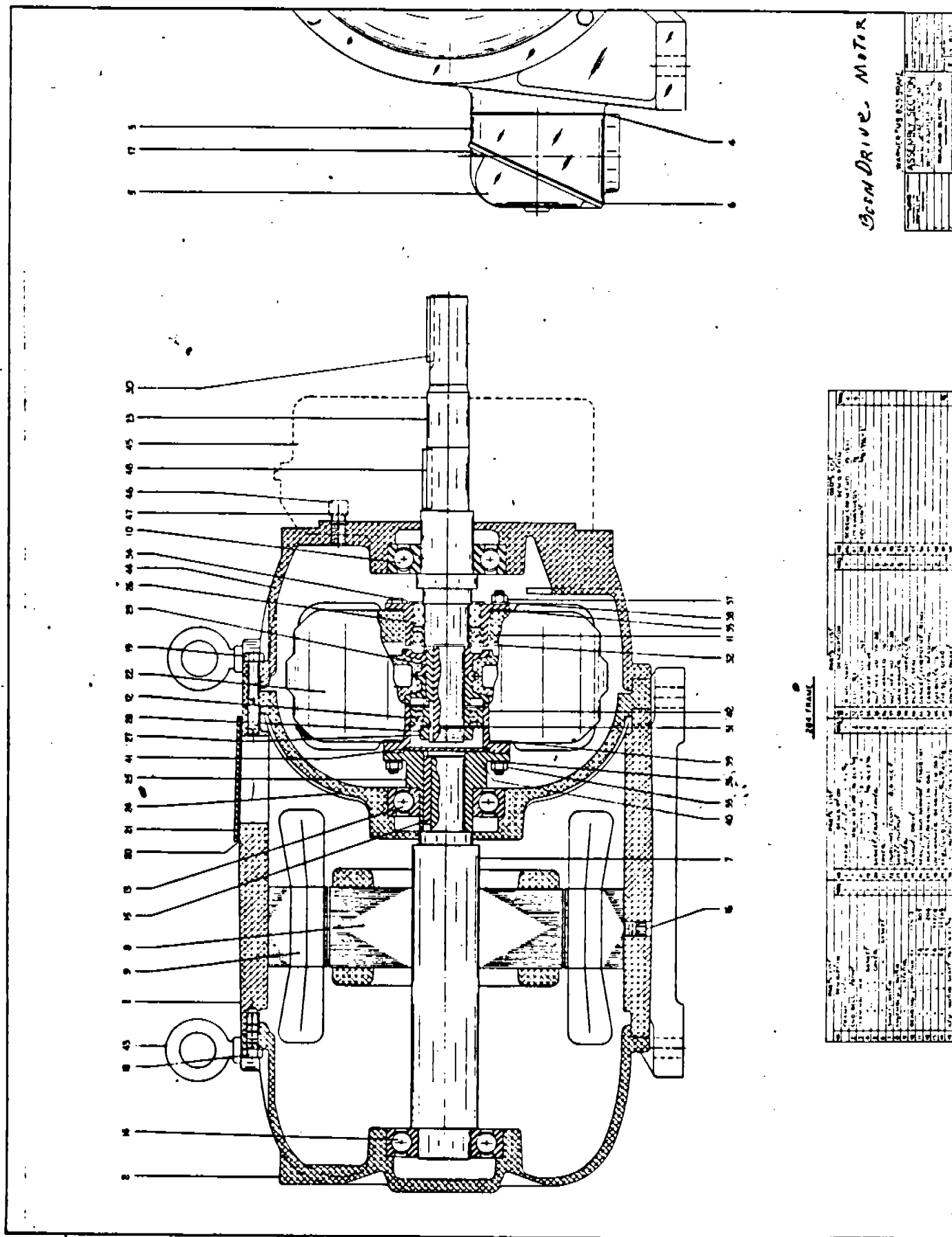
Cone Drive Gear Reducer on Boom . . . . . Mobil Compound F-F,  
or equal;

U. S. Synchrogear Winch . . . . . Mobil Compound F-F,  
or equal.

Rex Wheel Axle Bearings . . . . . Completely fill with  
a high grade, soda base, medium consistency grease having a  
drop point of 300° F or over, such as, Sinclair AF-2, Socony  
BRB Lifetime, Texaco Regal Starfak #2, Shell Alvania #3 or equiv.

Annually - Falk Coupling - service as per individual instructions; base-  
pack with Mobilux Grease No. 1, or equivalent.

The Lubricants noted above are recommended for ambient temperatures  
from 20° F. to 116° F.



# REULAND ELECTRIC CO.

*Emma*

WESTERN DIVISION PLANT  
ALHAMBRA, CALIFORNIA

EASTERN DIVISION PLANT  
HOWELL, MICHIGAN

Supersedes  
Sheet #M-100  
December 4, 1957

Sheet #M-100  
May 11, 1960

*Customer Number*  
*031459 517-546-4400*

## IMPORTANT INSTRUCTIONS

### Installation and Care

Check motor carefully to be sure it has not been damaged in shipment.

Connect motor to line of proper specification as stamped on motor nameplate; check voltage, frequency, phase, etc.

Connection diagram will be found in terminal box or on nameplate except 3 lead polyphase and 2 lead single phase that do not require a diagram.

Provide suitable overload protection based on full load ampere rating shown on nameplate, as recommended by control manufacturer.

Protect wiring circuit with proper size fuses selected according to local code requirements.

The bearings in ball bearing motors have been especially selected according to our policy of precision manufacture. To avoid bearing damage the coupling, pulleys, etc. SHOULD NOT BE DRIVEN ON MOTOR SHAFT. A light press fit or light tap fit is recommended.

Ball bearing motors are shipped with at least six months supply of grease in the housings and need only a small amount of high grade Ball Bearing Grease added every six months. Overgreasing will result in excessive bearing heat. Motors which have no lubrication fittings have sealed bearings that do not require periodic greasing.

If for any reason this motor is taken apart, thoroughly clean the old grease from the bearings and repack the chamber in the end bells behind the bearing full with a good grade of grease. See sheet #M-101 for list of manufacturers of Recommended Ball Bearing Greases.

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# REULAND ELECTRIC CO.

WESTERN DIVISION PLANT  
ALHAMBRA, CALIFORNIA

EASTERN DIVISION PLANT  
HOWELL, MICHIGAN

Supersedes  
Sheet #M-101  
April 4, 1960

Sheet #M-101  
June 9, 1961

## RECOMMENDED BALL BEARING GREASES

The following is a non exclusive list of ball bearing greases suitable for use in our Motors and Motoreducers for Temperatures minus 40° to 20° F.

### TRADE NAME

### MANUFACTURER

RYKON GREASE NO. 1

AMERICAN OIL CO.  
STANDARD OIL DIVISION  
OF AMERICAN OIL COMPANY  
MASTER LUBRICANTS CO.  
STANDARD OIL CO. OF CALIF.  
GULF OIL CORP.  
SHELL OIL CO.  
SINCLAIR REFINING CO.  
THE TEXAS CO.  
TIDEWATER OIL CO. (EASTERN DIV.)  
TIDEWATER OIL CO.

LUBRICO M3 DENSITY  
RPM AVIATION GREASE NO. 1  
GULF PRECISION GREASE NO. 2  
SHELL ALVANIA GREASE #1  
LITHOLINE INDUSTRIAL GR NO. OEP  
REGAL STARFAK #2 or MULTIFAK #2  
TYCOL ALITHO 0  
TYCOL ARMITAGE 10

MOBILUX GREASE NO. 1

GENERAL PETROLEUM CORP.  
SOCONY MOBIL OIL CO., INC.  
MAGNOLIA PETROLEUM CO.

## FOR TEMPERATURES 10° F. to 250° F.

LUBRICO M6 DENSITY  
BALLROLL GREASE NO. 1 or NO. 2  
LITHOLINE INDUSTRIAL GR NO. 2  
RYKON GREASE NO. 2

MASTER LUBRICANTS CO.  
UNION OIL CO. OF CALIF.  
SINCLAIR REFINING CO.  
AMERICAN OIL CO.  
STANDARD OIL DIVISION  
OF AMERICAN OIL COMPANY  
SHELL OIL CO.  
GULF OIL CORP.  
STANDARD OIL CO. OF CALIF.  
THE TEXAS CO.

SHELL ALVANIA GREASE #2  
GULF PRECISION GREASE NO. 2  
CHEVRON INDUSTRIAL GREASE-LIGHT  
REGAL STARFAK #2 or MULTIFAK #2  
TYCOL ARMITAGE 20 or VEEDOL ALL-  
PURPOSE GREASE  
TYCOL ALITHO 20  
PENNS LUBE 704

TIDEWATER OIL CO.  
TIDEWATER OIL CO. (EASTERN DIV.)  
PENNZOIL CO.  
GENERAL PETROLEUM  
SOCONY MOBIL OIL CO., INC.  
MAGNOLIA PETROLEUM CO.

MOBILUX GREASE NO. 1

If you wish to order spare parts or if any part or parts need to be replaced at some later date, please give us the following information and your request will be given prompt attention:

- (1) The serial number of the motor or motoreducer.
- (2) The drawing number of the parts list drawing.
- (3) The number of the particular part and description.

Please send your request to the attention of our Service Department, either 3001 W. Mission Road, Alhambra, California or 4500 E. Grand River Avenue, Howell, Michigan.

# REULAND ELECTRIC CO.

WESTERN DIVISION PLANT

ALHAMBRA, CALIFORNIA

Supersedes  
Sheet #M-102  
Jan. 3, 1958

EASTERN DIVISION PLANT

HOWELL, MICHIGAN

Sheet #M-102  
April 28, 1960

## RECOMMENDED FLUID COUPLING OILS

The following is a non exclusive list of oils suitable for use in Fluid Couplings of our Fluid Shaft Motors and Fluid Shaft Motoreducers. For temperatures minus 40° F. to 20° F.

### TRADE NAME

### MANUFACTURER

VEEDOL AUTOMATIC TRANSMISSION FLUID TYPE A  
TEXAMATIC FLUID or REGAL AZ (R&O)  
GULF AUTOMATIC TRANSMISSION FLUID TYPE A  
RPM TORQUE FLUID NO. 1  
POLAR MACHINE OIL  
DONAX T-6  
AMOCO AUTOMATIC TRANSMISSION FLUID TYPE A  
DURO OIL 160  
UNION AUTOMATIC TRANSMISSION FLUID TYPE A  
TYCOL ANDARIN 46

TIDEWATER OIL CO.  
THE TEXAS CO.  
GULF OIL CORP.  
STANDARD OIL CO. OF CALIF.  
STANDARD OIL CO. (INDIANA)  
SHELL OIL CO.  
AMERICAN OIL CO.  
SINCLAIR REFINING CO.  
UNION OIL CO.  
TIDEWATER OIL CO. (EASTERN DIV.)

MOBIL FLUID 62

GENERAL PETROLEUM CORP.  
SOCONY MOBIL OIL CO., INC.  
MAGNOLIA PETROLEUM CO.

## FOR TEMPERATURES 10° F. to 150° F.

RED LINE TURBINE OIL 150 or TRITON 10 W  
DURO OIL 160  
DONAX T-6  
STANOIL INDUSTRIAL OIL NO. 15  
CHEVRON OC TURBINE OIL 9  
GULF HARMONY 44  
HAVOLINE SAE 10  
TYCOL ATURBIO 50 or VEEDOL 10  
3001 PERMA-FLO #15

UNION OIL CO.  
SINCLAIR REFINING CO.  
SHELL OIL CO.  
STANDARD OIL CO. (INDIANA)  
STANDARD OIL CO. OF CALIF.  
GULF OIL CORP.  
THE TEXAS CO.  
TIDEWATER OIL CO.  
AMERICAN OIL CO.

MOBIL DTE OIL LIGHT

GENERAL PETROLEUM CORP.  
SOCONY MOBIL OIL CO., INC.  
MAGNOLIA PETROLEUM CO.





# REULAND ELECTRIC CO.

MAIN OFFICE & FACTORY  
ALHAMBRA, CALIF.

EASTERN OFFICE  
HOWELL, MICHIGAN

## OPERATING INSTRUCTIONS FLUID SHAFT MOTORS AND MOTOREDUCTORS

Sheet #M-111

October 31, 1957

**GENERAL-** This unit has a fluid coupling mounted between output shaft or gear case to obtain special starting characteristics. The fluid coupling has been filled to normal oil level at the factory with a premium grade of SAE 10 W straight mineral oil, for operating in ambient temperature above minus 100° F. For temperatures under minus 100° F., operation will be improved by filling the coupling with a premium grade of SAE 5 W straight mineral oil. This grade of oil may be left in the coupling the year around.

The oil level should be maintained and the coupling will require no attention under normal operating conditions. Check oil level every three months with unit cool. In case a coupling develops a leak at the shaft seal, the equipment should be stopped and the cause of the leak determined and necessary repairs made.

**COUPLING ADJUSTMENT-** When shipped from the factory the fluid coupling will be filled to the normal level as indicated by having the figure 1 cast on the coupling on the vertical centerline. The filler plug then will be at an angle of 36° to give coupling operation suitable for most applications. No further adjustment will be necessary unless special operating conditions exist.

**OPERATION-** When a polyphase fluid coupling motor is started the motor should accelerate to approximately 80% of synchronous speed within 5 to 10 seconds. The output shaft of the coupling may require a longer time, as much as 60 to 90 seconds, to accelerate. Single phase motors should not require more than 3 to 5 seconds to accelerate to a speed above that at which the short circuiter or cut-out switch operates. The load may take many times this interval to come up to rated operating speed. When the coupling does not cushion the starting shock sufficiently, or if a high inertia load is being started and the motor does not come up to speed quickly, reducing the oil level in the coupling will improve the operation. This level should be reduced until the motor starts and comes up to 80% of synchronous speed quickly (not over 10 seconds) while the load accelerates more slowly. When satisfactory performance has been obtained, the new "Top for Filling" mark should be established by painting the fill number or by marking the coupling housing in some manner. Note: (The fill level must not be lower than that obtained with figure 4 fill).

After the load has been accelerated to its normal running speed, the motor speed should agree with that shown on the nameplate. The coupling may not operate continuously at a slip of 15-20% without danger of overheating, even though the motor is operating at rated speed. If this condition does exist increase the oil level unless it is already at the maximum level (No. 1). If the oil is at the maximum level and the slip is still excessive, a larger coupling is indicated.

**MOTOR-** Connect the motor to a power circuit having the same characteristics as those stamped on the nameplate or connection plate.

When writing the factory, always give complete nameplate data, particularly, serial number.

**HEWITT-ROBINS**

INCORPORATED

GEAR PRODUCTS OPERATIONS

A DIVISION OF LITTON INDUSTRIES



**Installation, Operation, Lubrication  
and Maintenance for  
LINE-O-POWER,  
LINE-O-MOTOR, AND  
GEARMOTOR DRIVES**

# FOOTE BROS.

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## 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.

## INSTALLATION

### Foundation

The enclosed gear drive should be supported on a foundation that is rigid and substantial such as a supported concrete bed or a steel structure. After carefully leveling and lining up with the motor and driven equipment, it should be securely bolted in place. An inadequate foundation may result in misalignment or stresses in the gear housing that can cause undue noise and serious overloading of some part of the drive.

In the case of gear units and motors completely assembled and lined up on a base plate, the alignment should be rechecked after bolting down to make sure the base plate did not spring. The use of a base plate does not remove necessity of an adequate foundation. Do not mount any gear drive on the ceiling, wall, or on an incline, or in any position other than horizontal unless the unit has been specially built for this use. Special lubrication arrangements must be provided for such cases. When the unit is to be mounted on an incline, check with the Home Office for special instructions.

### Shaft Connections

An approved type of flexible coupling should be used to connect the prime mover shaft of the input shaft of the gear drive. Rigid type couplings should not be used.

Proper clearance should be allowed between the motor shaft and the gear reducer shaft to permit end float. When the low speed shaft of a reducer is connected to the shaft of the driven equipment by a flexible coupling, an approved type should be used here also. The shaft should be carefully aligned and the coupling properly adjusted for endwise clearance in the same manner as for the motor connection.

Overhung pinions, sprockets, pulleys and sheaves should be mounted as close as possible to the gearing housing to minimize the bearing load and shaft deflection. Overhung loads should be checked to be sure they do not exceed catalog ratings.

Parallel misalignment is illustrated in Figure 2. Where the misalignment is in the vertical plane, it can be corrected by altering the height of either of the shafts. If the misalignment is in the horizontal plane, it usually is easy to correct by moving one of the components transversely until the correct position is obtained. When both halves of a coupling are of the same outside diameter, parallelism can be checked by the use of a straight edge at points 1, 2, 3, and 4 as shown in Figure 4.

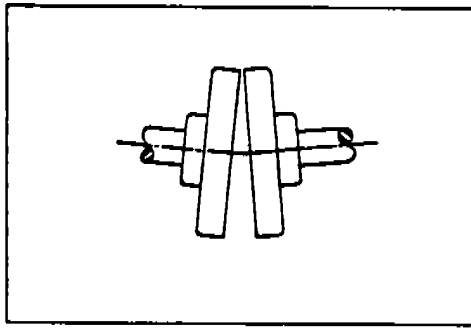


Figure 1

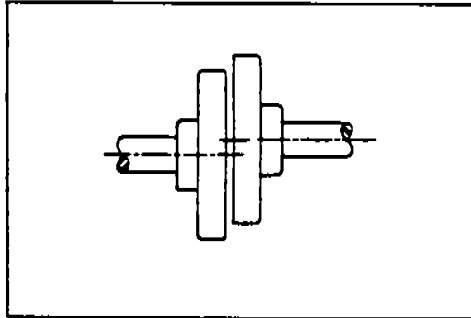


Figure 2

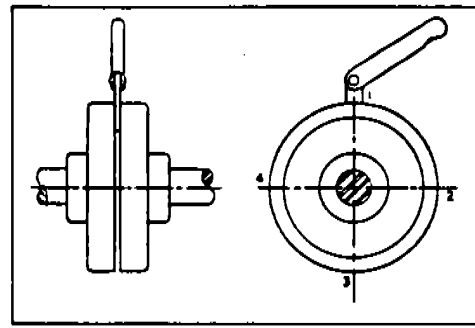


Figure 3

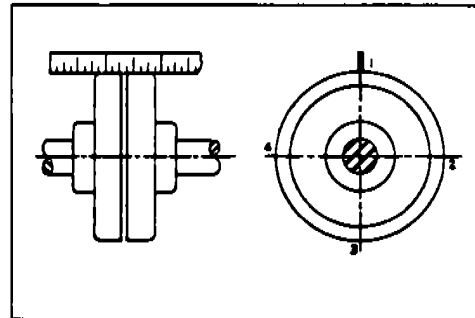


Figure 4

The bores of connections such as couplings, pinions, sheaves, pulleys, sprockets or cranks should be of a size to permit a tapping or light driving fit ( ASA STANDARD ). Never use heavy hammer blows to force a connector on the shaft as it may cause damage to bearings or other internal parts of the drive. Equipment which requires a tight fit should be heated to a suitable temperature and pressed onto the shaft extension.

## START UP

All units are shipped without oil. Care must be taken not to operate the reducer until filled to the center of the oil level indicator with the prescribed grade of oil. Do not overfill as this can cause excess heating or oil leakage. On the other hand, do not allow the oil level to fall more than 1/4" below the center of the oil level indicator to assure adequate lubrication. Make the initial starting operation under no load or light load conditions. Then check for any evidence of localized overheating, and whether there is any vibration due to loose foundation bolts, misalignment of couplings, pulleys, sprockets, etc. If any correction is necessary, it should be made before putting the gear unit into regular service under full load.

## LUBRICATION

Lubricating oils should be high quality petroleum based oils and must not be corrosive to gears or bearings. They must be neutral in reaction, free from grit and abrasives, and have good defoaming properties. For higher temperatures they must have good resistance to oxidation.

Each gear unit comes with a nameplate that shows general lubrication instructions for use within certain ambient temperature ranges. In case the ambient temperature is other than shown, consult the factory for recommendations.

After a short period of initial operation, varying from several days to several weeks, depending on severity of service, it is advisable to draw off the oil in order to flush out any small particles of foreign matter that might have accumulated during the early running of the gear unit. This initial supply of oil can be filtered and used again or replaced with new oil.

Couplings of all metal construction should be heated sufficiently to slip on the shaft easily. The shaft should be coated with white lead in oil and free from grit to minimize scoring. Never use heavy hammer blows to force coupling on to shaft. Heavy blows will be directed against the bearings and can cause brinelling or cracking of the balls, rollers or races and other damage.

Generally, errors of alignment fall into one of three classes:

1. Angular Misalignment (Figure 1)
2. Parallel Misalignment (Figure 2)
3. A Combination of Angular and Parallel Misalignment.

Angular misalignment is illustrated in Figure 1 and should be corrected before attempting to correct for parallel misalignment. To correct proceed as shown in Figure 3, using a leaf gauge or taper gauge. By taking readings at points 1, 2, 3 and 4, it is easy to determine the amount of correction necessary. It is important to check that both shafts are in the closest axial location before taking readings. There will be no angular misalignment if the width of the gap is the same at all points.

## PROTECTION OF REDUCERS FOR STORAGE

**GENERAL:** Gear units which are operated very intermittently should be run briefly at least once every two weeks to protect the gears and bearings by circulating the lubrication. When units are stored for future use, the input shaft should be rotated several turns every two weeks. This is to reduce the possibility of any false brinelling of bearings.

**STORAGE:** This procedure covers the internal and external treatment of gear reducers in storage to inhibit the development of corrosion.

### TREATMENT A

This can be used where the size of the unit is relatively small or where the construction makes it impractical to use Vapor Phase Inhibitor Crystals.

1. Fill the reducer completely with a rust preventative type of oil such as Mobil Kote 503 (Mobil Oil Co.) or it's equivalent.
2. Remove breather at the top of reducer and insert pipe plug. This is to seal the unit against the entrance of moisture or contaminating atmosphere from the outside. Make certain that all oil fill, oil level and oil drain plugs are in place and tight.
3. If the unit is in storage over two years inside or one year outside it is recommended that the original fill be drained out and replenished with fresh new oil of the same type.
4. At the end of the storage period the oil should be drained out and filled to the proper level with the type of Lubricant specified for the operation of the reducer. The breather should be re-mounted at this time.

### TREATMENT B

This is for use where the reducer is large enough to make the use of a complete oil fill too expensive or impractical.

1. Dust the interior of the reducer as completely as possible and practicable with V. P. I. 250 Crystals (Shell Oil Co.) or it's equivalent. As its vapors are heavier than air, it is suggested that the material be applied toward the top of the reducer.
2. About 3 grams per cubic foot of space of V. P. I. material is required (Note 453.6 grams equals 1 pound).
3. Supplemental protection can be offered by hanging a porous cloth bag of the V. P. I. Crystals inside the reducer.
4. Remove the breather at the top of the housing and insert a pipe plug. Make certain that all other plugs in the housing used for oil level, oil drain, and oil fill are in place and tight. For maximum effectiveness of the inhibitor, the reducer should be sealed as far as practical to prevent the escape of the vapors.
5. For optimum protection, after the period of 1 year for outside storage or two years inside storage it is recommended that steps 1, 2 & 3 be repeated.
6. At the end of the storage period the breather should be installed, the separate bag of V. P. I. Crystals should be removed and the reducer filled to the proper level with the oil specified.

### REDUCER EXTERIOR

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.)

# MAINTENANCE

**CAUTION:** Disconnect reducer from driven equipment and turn off power before working on unit.

Care of your unit is important to insure long life. A periodic check will enable the detection of trouble before serious damage is done. Look for any unusual noises, vibration, oil leaks, and excessive heating. Make sure all bolts are tight.

It is necessary that the oil be clean and free from sludge at all times. Make frequent inspection of the static oil level and change oil at regular intervals.

It is desirable to change oil every six months or 2500 hours of operation, whichever occurs first. Where operating conditions are severe, such as rapid rising and falling of temperatures of the gear case with accompanying sweating of the inside walls and resulting formation of sludge, or when operation is in very dusty or moist atmospheres or chemical fumes, it may be necessary to change oil at intervals from one to three months.

TABLE 1

AGMA LUBRICANT NUMBERS FOR LINE O POWER, LINE O MOTOR, GEARMOTOR & GEARHEADS FOR MECHANICAL VARIABLE SPEED DRIVES

HELICAL GEAR REDUCERS			AGMA LUBRICANT NUMBER BY AMBIENT TEMPERATURE			
TYPE	SL, VSL, VSLE, P, B, K, L, VL, VLE, GM, VGME		15 - 60 DEGREES F		50 - 125 DEGREES F	
			NORMAL SERVICE	HEAVY DUTY	NORMAL SERVICE	HEAVY DUTY
SIZE	310 TO 316 220 TO 227 231 TO 237 243 TO 246		2	2EP	3	3EP
WORM-HELICAL GEAR REDUCERS						
TYPE	WL, VWL, VWLE	WORM SPEED RPM				
SIZE	223 TO 225	ABOVE 700 BELOW 700	7 COMP 7 COMP	7 EP 7 EP	8 COMP 8 COMP	8 EP 8 EP
	226	ABOVE 450 BELOW 450	7 COMP 7 COMP	7 EP 7 EP	7 COMP 8 COMP	7 EP 8 EP

TABLE 2

AGMA Lubricant Number	Viscosity Range S. U. V. Seconds	
	At 100° F	At 210° F
1	180 - 240	
2	280 - 360	
3	490 - 700	
4	700 - 1000	
5		80 - 105
6		105 - 125
7 COMP		125 - 150
8 COMP		150 - 190
8A COMP		190 - 250
AGMA Mild EP Lubricant Nos.		
2 EP	280 - 400	
3 EP	400 - 700	
4 EP	700 - 1000	
5 EP		80 - 105
6 EP		105 - 125
7 EP		125 - 150
8 EP		150 - 190

TABLE 3

APPROXIMATE OIL CAPACITY OF GEAR UNIT BY MODEL AND SIZE						
Size	Gearmotor			Line-O-Power	Line-O-Motor	Line-O-Mount
	Std. Level	L. S. Level	VGM Level	Std. Level	L. S. Level	VSL Level
210-310	1 Pint					
311	1-1/4 Pints					
212-312	1-3/4 Pints					
213-313	3 Pints					
214-314	4 Pints					
215-315	6-1/2 Pints					
216-316	1 Gal					
220	3 Pints	6 Pints	5 Pints	3 Pints	6 Pints	5 Pints
221	4-1/2 Pints	7 Pints	9 Pints	5 Pints	7 Pints	8 Pints
222	7 Pints	9 Pints	10 Pints	7-1/2 Pints	9-1/2 Pints	10 Pints
223	16-1/2 Pints	20 Pints	19 Pints	16-1/2 Pints	20 Pints	19 Pints
224	2.31 Gals	3.31 Gals	4.1 Gals	2.5 Gals	3.5 Gals	4.3 Gals
2245	3.25 Gals	5.37 Gals	—	3.62 Gals	5.75 Gals	—
225	4.1 Gals	6.25 Gals	7.0 Gals	4.5 Gals	6.62 Gals	7.0 Gals
2255	7.12 Gals	10.25 Gals	—	7.41 Gals	10.5 Gals	—
226	9.5 Gals	13.75 Gals	12.0 Gals	9.75 Gals	14.0 Gals	12.0 Gals
227	33.0 Gals	50.0 Gals	19.0 Gals	33.0 Gals	50.0 Gals	19.0 Gals
231	6-1/2 Pints	8.6 Pints	11.0 Pints	7 Pints	10.0 Pints	11.0 Pints
232	7.6 Pints	9.6 Pints	21.5 Pints	8-1/2 Pints	11.0 Pints	21-1/2 Pints
233	2.31 Gals	3.2 Gals	4.75 Gals	2.37 Gals	3.2 Gals	4.75 Gals
234	3.0 Gals	4.75 Gals	12.5 Gals	3 Gals	4.25 Gals	12.5 Gals
2345	3.5 Gals	6.5 Gals	—	3.87 Gals	6.12 Gals	—
235	5.75 Gals	9.25 Gals	16.0 Gals	5.5 Gals	9 Gals	16.0 Gals
2355	8.0 Gals	12.6 Gals	—	8 Gals	13 Gals	—
236	13.0 Gals	18.0 Gals	29.1 Gals	12.75 Gals	18.5 Gals	29.1 Gals
237	53.0 Gals	53.0 Gals	19.0 Gals	53.0 Gals	53.0 Gals	19.0 Gals

NOTE: WITH OUTPUT SHAFT SPEEDS OF 68 RPM OR LESS, THE LOW SPEED LEVEL (HIGH OIL LEVEL) SHOULD BE USED.

### CAUTION

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

## DISASSEMBLY & ASSEMBLY

Standard machine shop practices may be used in assembly and disassembly of the speed reducer. The specially designed high speed type "K" pinion and shaft assembly should be removed and reinstalled as follows:

### Removal -

1. Remove set screws from locking nut.
2. Grip pinion with hard wood or brass clamp to prevent rotation, taking care not to damage gear teeth. When looking at end of pinion, turn locking nut

counterclockwise until shaft and pinion shank threads no longer engage nut threads. Pinion will now be jacked partially out of shaft.

3. Turn nut clockwise onto shaft as far as possible. Do not engage shank threads in the process.

### CAUTION

Alignment between pinion shank and shaft must be maintained while pinion is being removed or assembled.



4. Place spacers, such as open end wrenches or similarly constructed "C" washers, between the inner face of the pinion and the face of the nut, and again turn the nut counterclockwise until the threads disengage. Repeat Nos. 3 and 4 until pinion becomes loose enough to withdraw from shaft.

#### Assembly -

1. Install inner shaft bearing on shaft.
2. Coat shaft bore and pinion shank with Loctite Grade AV.
3. Assemble locking nut two turns onto shaft.
4. Mark starting points of threads on pinion shank and mating threads in nut.
5. With starting points aligned, insert pinion shank through nut and into shaft bore until shank threads bear against mating threads in nut and are in position for engagement.
6. Grip pinion with clamp and turn nut clockwise until approximately two threads are engaged on both the shaft and the pinion shank. The number of threads in engagement on shaft and pinion must be approximately equal. Do not permit the shank splines to rotate inside the shaft bore. If necessary, end of

pinion may be tapped with a soft faced hammer as nut is being turned. Turn nut until shank shoulder bears firmly against end of shaft.

7. Assemble and tighten set screws in locking nut.

#### Bearing Assembly -

1. Ball bearings - Manufacturing tolerances in the reducer housing and shafting permit simple installation with proper fit where this type is used.
2. Tapered roller bearings - This type bearing requires extra care in setting up the correct axial end play. Shim packs are required for proper adjustment, and shims should be added to get the following end play tolerances.

Reducer Size	Bearing Tolerances	
	LS Pinion Shaft	Output Shaft
224, 234, 244	.002 - .004	.003 - .005
2245, 2345, 2445	.002 - .004	.003 - .005
225, 235, 245	.002 - .004	.003 - .005
2255, 2355, 2455	.002 - .004	.003 - .005
226, 236, 246	.002 - .004	.003 - .005
227, 237	.002 - .004	.003 - .005

## PARTS LIST & SPARE PARTS RECOMMENDATIONS

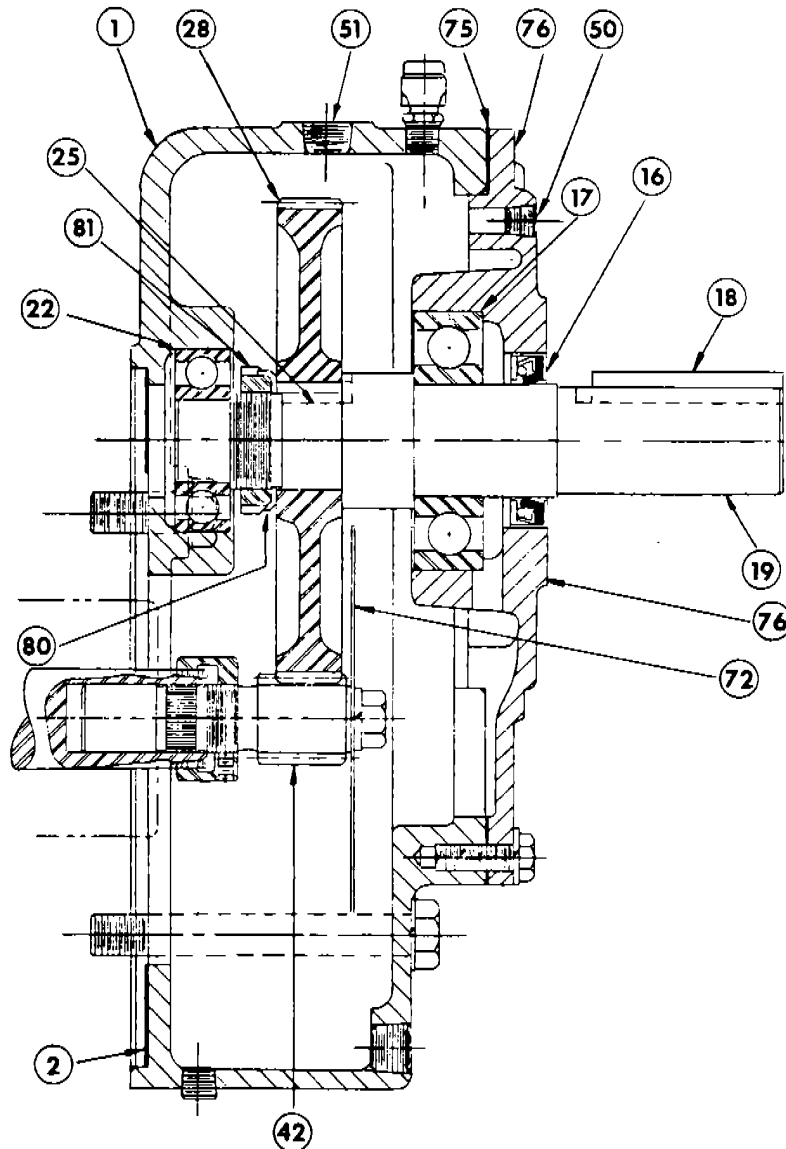
Typical replacement parts are shown on Pages 7 to 14. Bearing and oil seal types may change depending upon model and size of unit. When ordering, specify item number, description, model number, and serial number of reducer.

## ELECTRIC MOTOR

Refer to Operating and Lubrication Bulletins furnished with motor.



# INTEGRAL TYPE GEARMOTOR REDUCERS

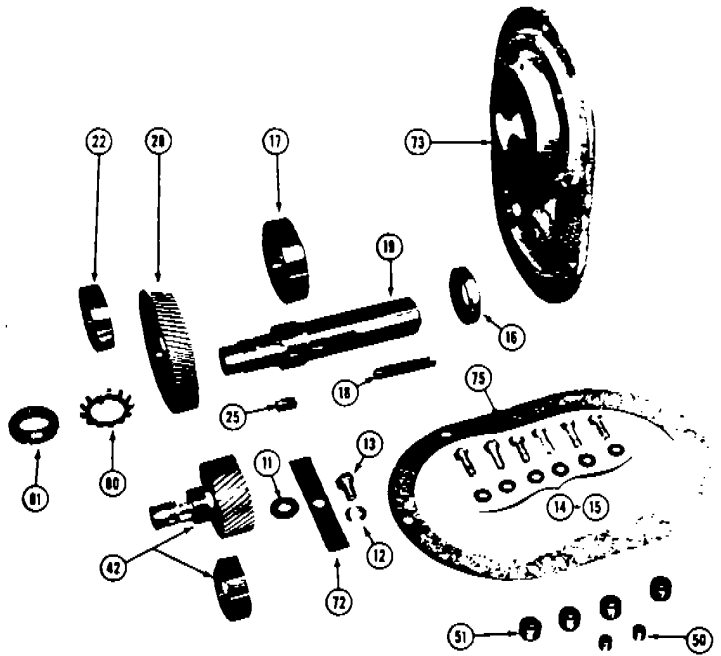


## SINGLE REDUCTION • SIZES 310-311-312-313

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing	18	Key	28	Gear **	72	Oil Splasher
2	Gasket *	19	Output Shaft	42	Pinion, Nut & Nylock Set Screw **	75	Gasket *
16	Oil Seal - Low Speed *	22	Bearing - Low Speed *	50	Pipe Plug	76	Bearing Cap
17	Bearing - Low Speed *	25	Key	51	Pipe Plug	80	Bearing Lockwasher
						81	Bearing Locknut

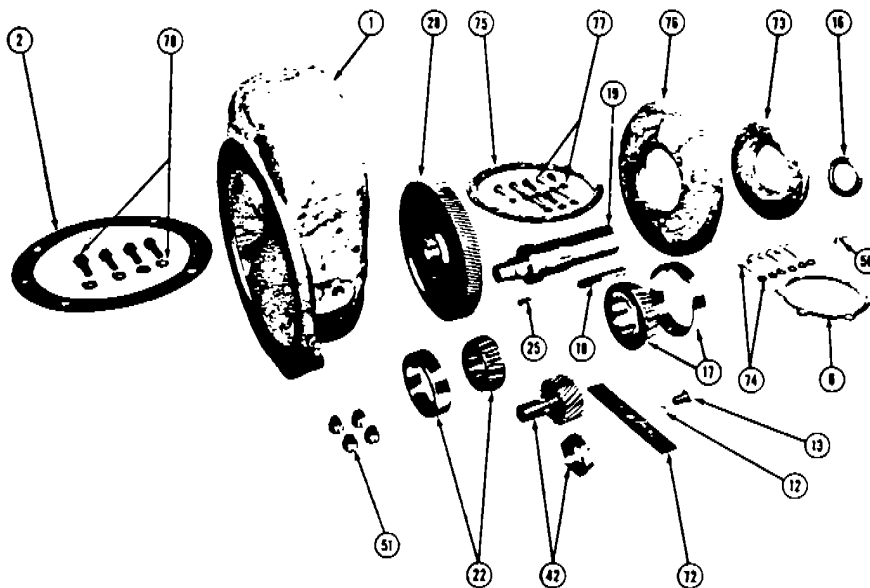
\* Minimum Protection  
 \*\* Maximum Protection

# INTEGRAL TYPE GEARMOTOR REDUCERS



Shims Not Shown

## SINGLE REDUCTION • SIZES 210 - 212 - 213



Shims Not Shown

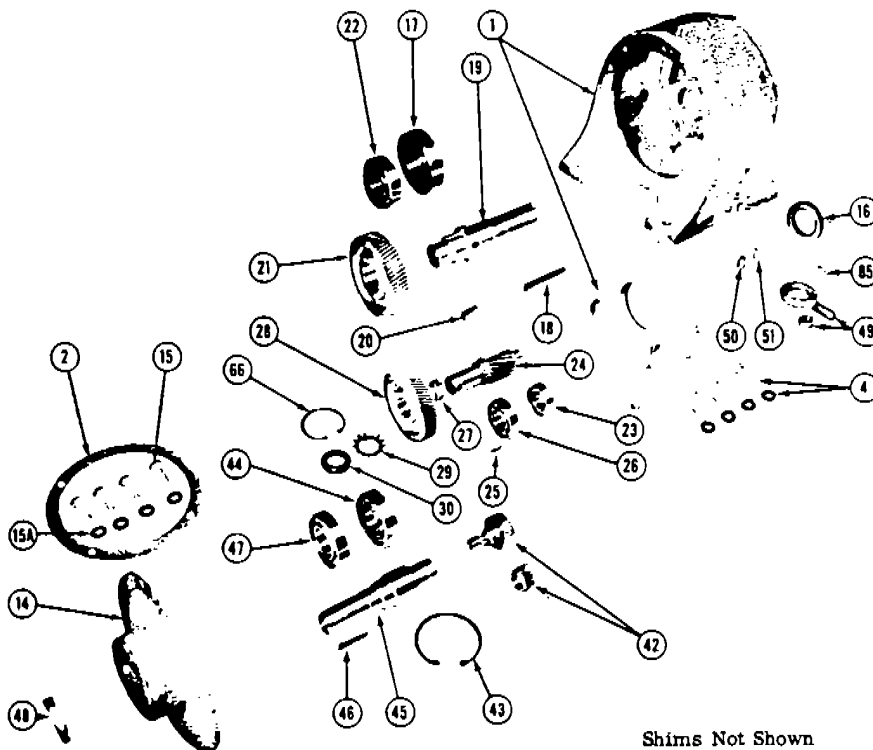
## SINGLE REDUCTION • SIZES 214 - 215 - 216 - 314 - 315 - 316

ITEM NO.	DESCRIPTION
1	Housing
2	Gasket
6	Shim
11	Plain Flatwasher (not shown)
12	Std. Split Lockwasher
13	Hex. Hd. Cap Screw
14	Hex. Hd. Cap Screws
15	Std. Split Lockwashers
16	Oil Seal - Low Speed*
17	Bearing - Low Speed*
18	Key
19	Shaft - Output
22	Bearing - Low Speed*
25	Key
28	Gear**
42	Pinion, Nut and Nylock Set Screw**
50	Pipe Plug
51	Pipe Plug
69	Adapter (not shown)
70	Gasket, Adapter (not shown)
72	Oil Splasher
73	Bearing Plate
74	Screw, Hex. Hd. Cap & Lockwasher
75	Gasket*
76	Bearing Cap
77	Screw, Hex. Hd. Cap & Lockwasher
78	Screw, Hex. Hd. Cap & Lockwasher or Stud, Nut & Lockwasher
80	Bearing Lockwasher
81	Bearing Locknut

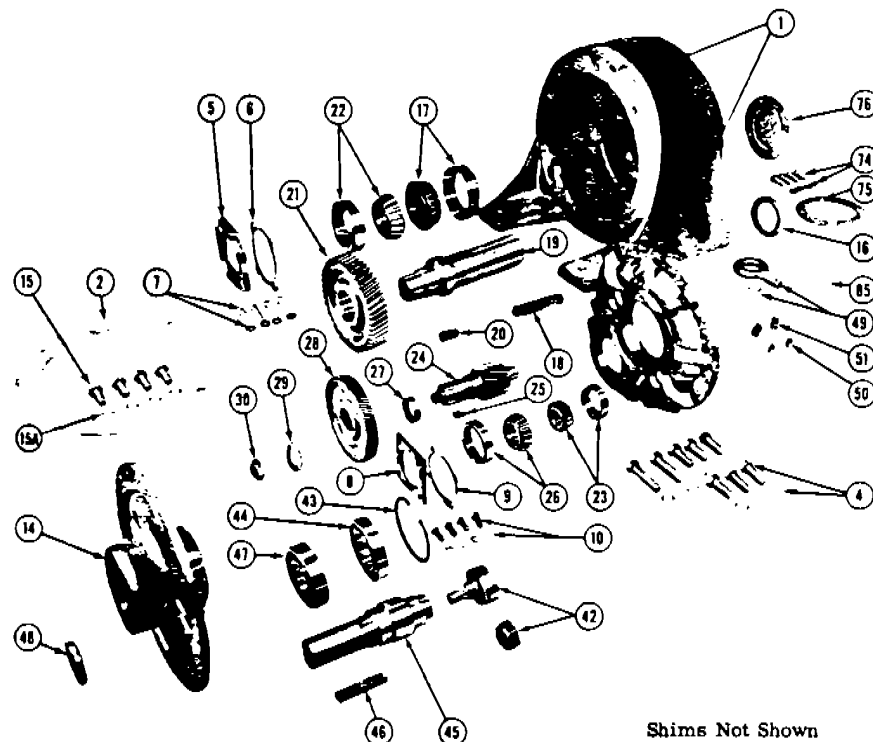
\*Minimum Protection

\*\*Maximum Protection

# LINE-O-POWER AND LINE-O-MOTOR REDUCERS



DOUBLE REDUCTION • SIZES 220 - 221 - 222 - 223



DOUBLE REDUCTION • SIZES 224 - 2245 - 225 - 2255 - 226

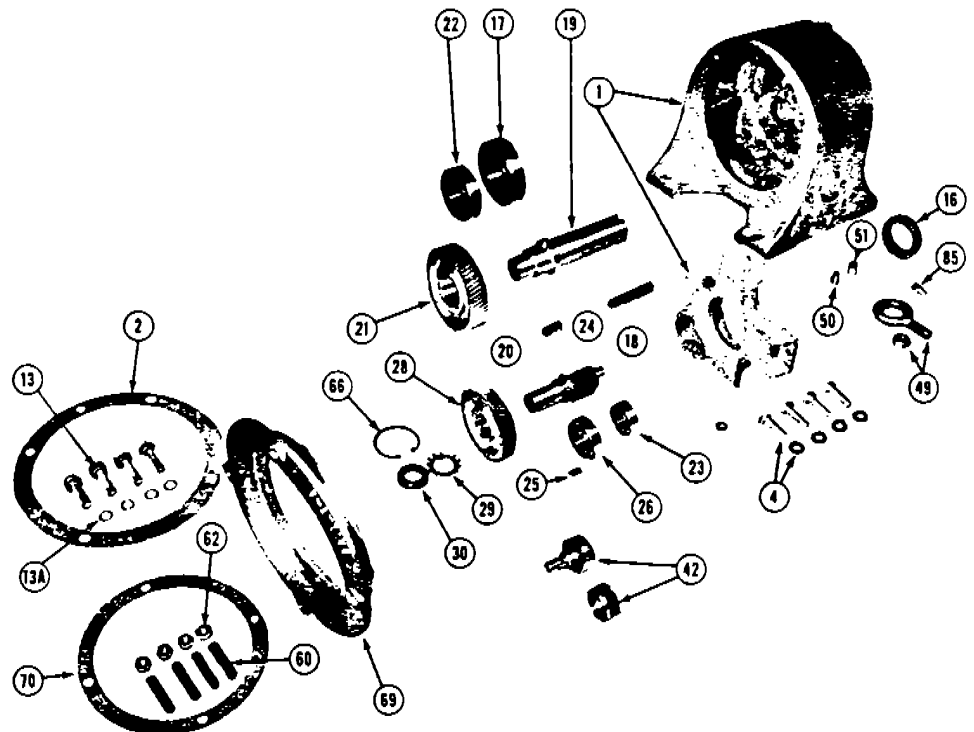
ITEM NO.	DESCRIPTION
1	Housing & Center Plate
2	Gasket*
4	Screw, Hex. Hd. Cap & Lockwashers
5	Bearing Retainer
6	Shim Set
7	Hex. Hd. Cap Screw & Lockwashers
8	Bearing Retainer
9	Shim Set
10	Hex. Hd. Cap Screw & Lockwashers
14	End Bell
15	Hex. Hd. Cap Screw
15A	Gasket Copper (set)
16	Oil Seal, Output Shaft*
17	Bearing, Output Shaft*
18	Key, Output Shaft
19	Shaft, Output
20	Key, Low Speed Gear
21	Gear, Low Speed**
22	Bearing, Output Shaft*
23	Bearing, Low Speed Pinion*
24	Low Speed Pinion**
25	Key, High Speed Gear
26	Bearing, Low Speed Pinion
27	Spacer, High Speed Gear (not shown)
28	Gear, High Speed**
29	Bearing Lockwasher
30	Bearing Locknut
42	Pinion, High Speed, Nut & Set Screw**
43	Snap Ring
44	Bearing, Input Shaft*
45	Shaft, Input
46	Key, Input
47	Bearing, Input Shaft*
48	Oil Seal, Input Shaft*
49	Eye Bolt & Jam Nut
50	Pipe Plug - Oil Level
51	Pipe Plug - Oil Drain
66	Snap Ring
74	Hex. Hd. Cap Screw & Lockwasher
75	Bearing Cap Gasket
76	Bearing Cap
85	Breather
90	Split Ring (not shown)
91	Split Ring Retainer (not shown)

\*Minimum Protection  
\*\*Maximum Protection

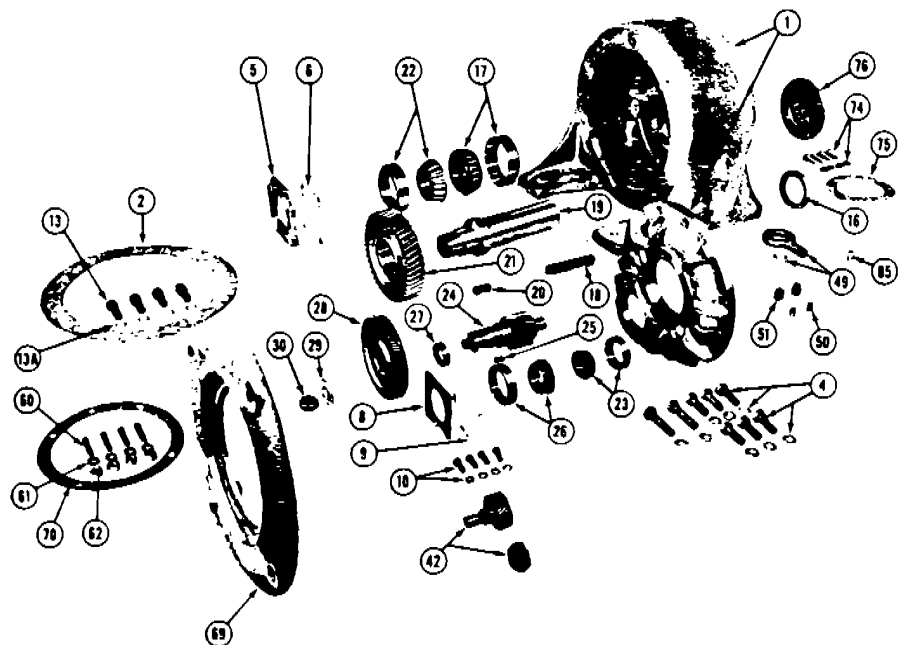
# INTEGRAL TYPE GEARMOTOR REDUCERS

ITEM NO.	DESCRIPTION
1	Housing & Center Plate
2	Gasket*
4	Screw, Hex. Hd. Cap & Lockwasher
5	Bearing Retainer
6	Shim
8	Bearing Retainer
9	Shim Set
13	Screw, Socket Head Cap
13A	Copper Gasket Set
16	Oil Seal - Low Speed*
17	Bearing - Low Speed*
18	Key
19	Shaft - Output
20	Key
21	Gear - Low Speed**
22	Bearing - Low Speed*
23	Bearing - Low Speed Pinion*
24	Low Speed Pinion**
25	Key
26	Bearing - Low Speed Pinion*
27	Spacer
28	Gear - High Speed**
29	Bearing Lockwasher
30	Bearing Locknut
42	High Speed Pinion, Nut and Nylock Set Screw**
49	Eye Bolt and Nut
50	Pipe Plug - Oil Level
51	Pipe Plug - Oil Drain
60	Stud
61	Washer, Lock
62	Nut, Hex
66	Snap Ring
69	Adapter
70	Adapter Gasket
74	Hex. Hd. Cap Screw & Lockwasher
75	Bearing Cap Gasket
76	Bearing Cap
85	Breather
90	Split Ring (not shown)
91	Retainer - Split Ring (not shown)

\*Minimum Protection  
\*\*Maximum Protection



DOUBLE REDUCTION • SIZES 220 - 221 - 222 - 223



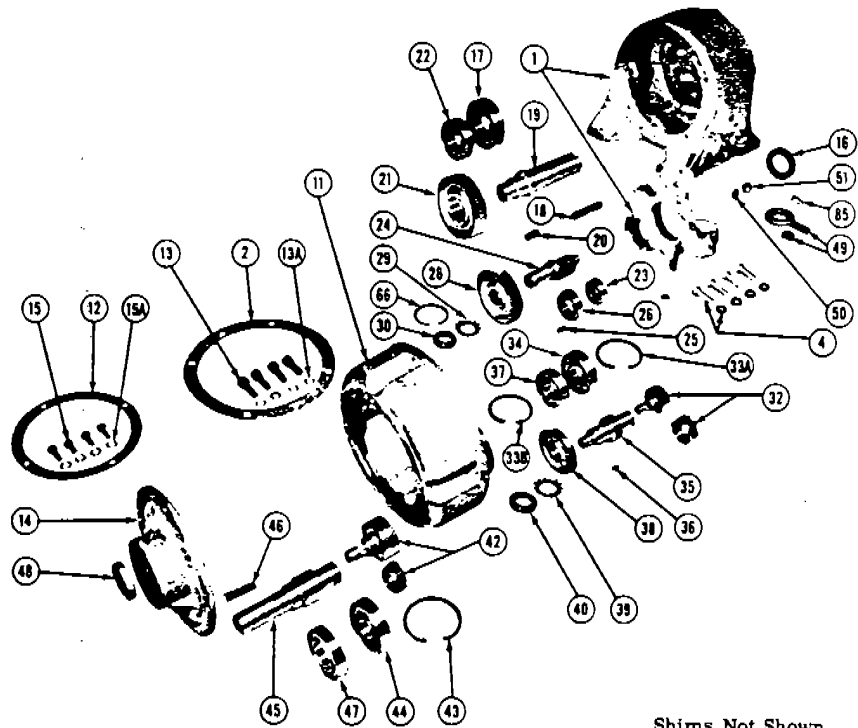
Shims Not Shown

DOUBLE REDUCTION • SIZES 224 - 2245 - 225 - 2255 - 226

# LINE-O-POWER AND LINE-O-MOTOR REDUCERS

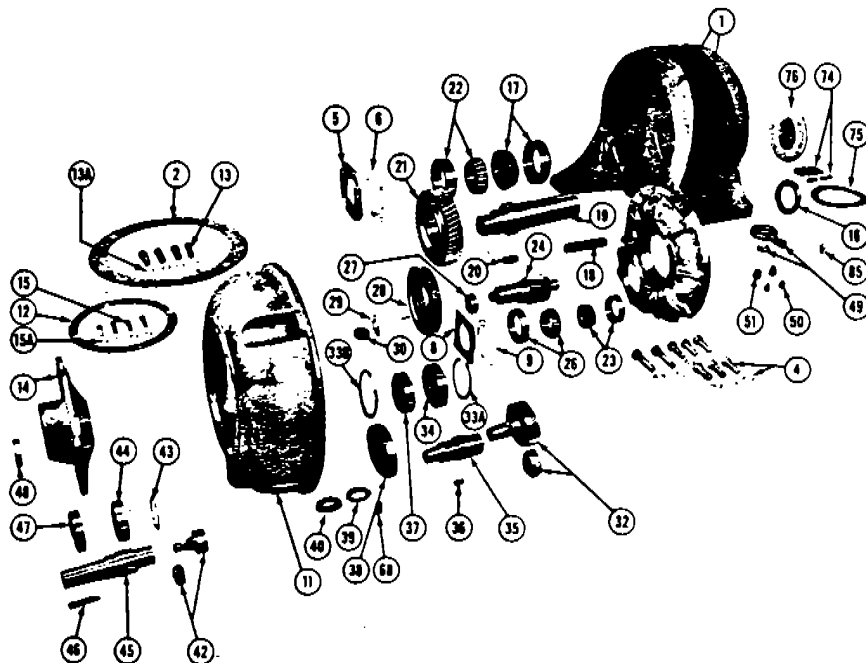
ITEM NO.	DESCRIPTION
1	Housing & Center Plate
2	Gasket*
4	Screw, Hex. Hd. Cap & Lockwasher
5	Bearing Retainer
6	Shim Set
8	Bearing Retainer
9	Shim Set
11	Bracket Reduction
12	Bracket Gasket
13	Screw, Socket Head
13A	Bearing Retainer Copper Gasket
14	End Bell
15	Screw, Hex. Head
15A	End Bell Copper Gasket
16	Oil Seal, Output Shaft*
17	Bearing, Output Shaft*
18	Key, Output Shaft
19	Output Shaft
20	Key, Low Speed Gear
21	Gear, Low Speed**
22	Bearing, Output Shaft*
23	Bearing, Low Speed Pinion*
24	Low Speed Pinion**
25	Key
26	Bearing, Low Speed Pinion*
27	Spacer (not shown)
28	Gear, Intermediate**
29	Bearing Lockwasher
30	Bearing Locknut
32	Pinion, Intermediate, Nut & Set Screw**
33A	Snap Ring Intermediate Bearing
33B	Snap Ring, Intermediate Bearing, Intermediate*
34	Bearing, Intermediate*
35	Shaft, Intermediate
36	Key, High Speed Gear
37	Bearing, Intermediate*
38	Gear, High Speed**
39	Bearing Lockwasher
40	Bearing Locknut
42	Pinion, High Speed, Nut & Set Screw**
43	Snap Ring
44	Bearing, Input Shaft*
45	Shaft, Input
46	Key, Input
47	Bearing, Input*
48	Oil Seal Input*
49	Eyebolt and Jam Nut
50	Pipe Plug - Oil Level
51	Pipe Plug - Oil Drain
66	Snap Ring
74	Hex. Hd. Cap Screw & Lockwasher
75	Bearing, Cap Gasket
76	Bearing Cap
85	Breather
90	Split Ring (not shown)
91	Split Ring Retainer (not shown)

\*Minimum Protection  
\*\*Maximum Protection



Shims Not Shown

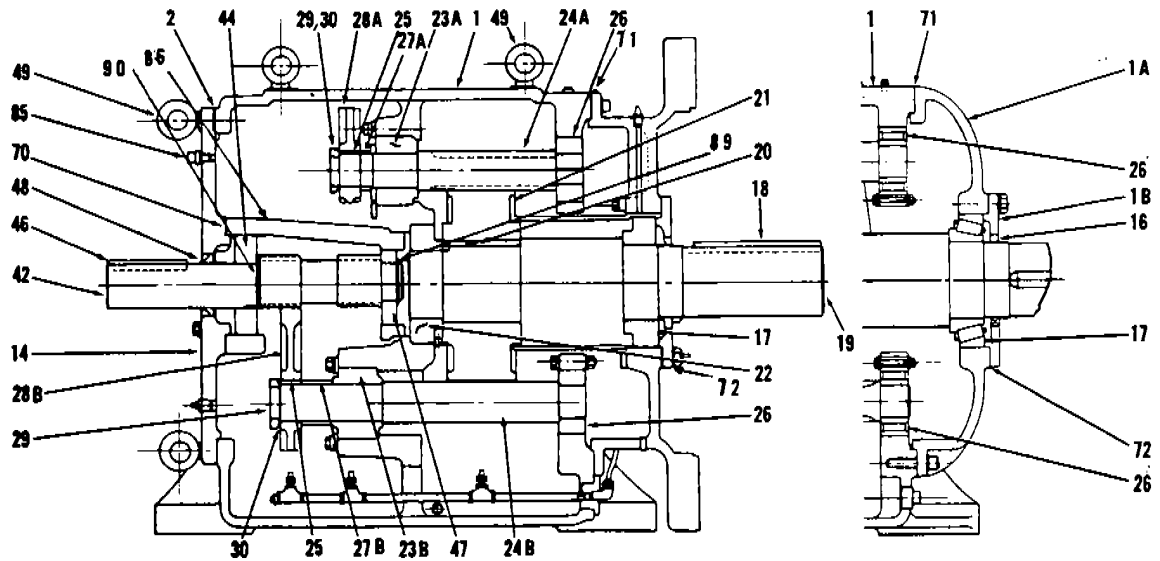
## TRIPLE REDUCTION • SIZES 231 - 232 - 233



Shims Not Shown

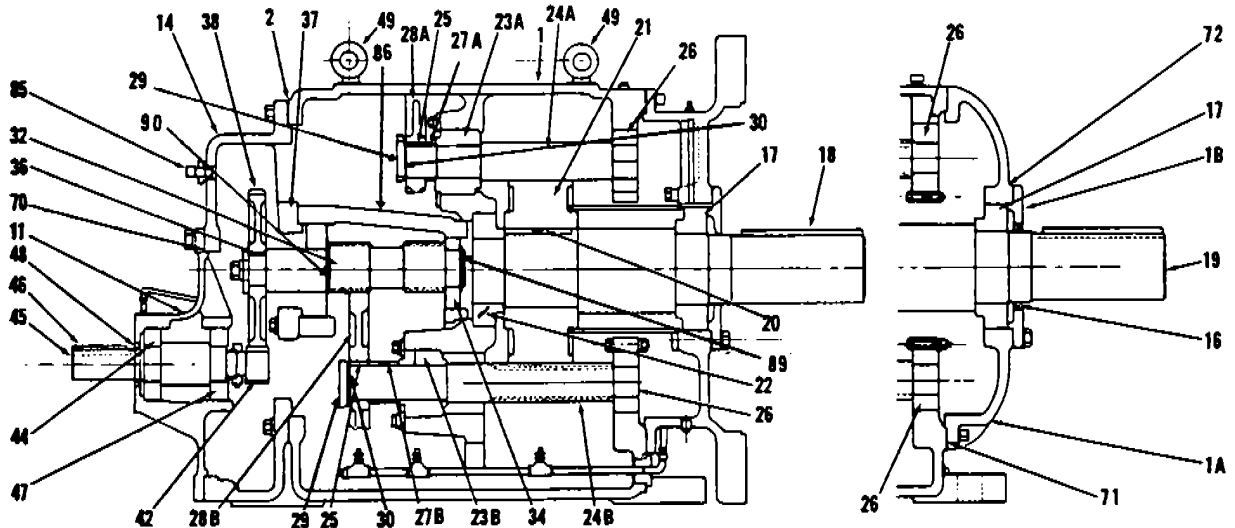
## TRIPLE REDUCTION • SIZES 234 - 2345 - 235 - 2355 - 236

**SIZE 227 - VERTICAL LINE-O-POWER TYPE VSL  
SIZE 227 - HORIZONTAL LINE-O-POWER TYPE SL**



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	HOUSING	21	GEAR, L. S. **	28A	GEAR, H. S. (LEFT) **	70	GASKET, CARRIER *
1A	END BELL	22	BEARING, L. S. *	288	GEAR, H. S. (RIGHT) **	71	GASKET, L. S. HOUSING *
18	COVER, L. S.	23A	BEARING L. S. PINION (LEFT) *	29	LOCKNUT (L&R)	72	GASKET, L. S. COVER *
2	GASKET, H. S. COVER	238	BEARING L. S. PINION (RIGHT) *	30	LOCKWASHER (L&R)	85	BREATHER
14	COVER, H. S.	24A	PINION SHAFT, L. S. (LEFT) **	42	PINION & SHAFT H. S. **	86	BEARING CARRIER
16	OIL SEAL, L. S. *	248	PINION SHAFT L. S. (RIGHT) *	44	BEARING H. S. *	89	SNAP RING
17	BEARING L. S. *	25	KEY, H. S. GEAR (L&R)	46	KEY, H. S. SHAFT	90	SNAP RING
18	KEY, OUTPUT SHAFT	26	BEARING, L. S. PINION (L&R) *	47	BEARING, H. S. *		
19	SHAFT, OUTPUT	27A	SPACER, H. S. GEAR (LEFT)	48	OIL SEAL, H. S. *		
20	KEY, L.S. GEAR	27B	SPACER, H. S. GEAR (RIGHT)	49	EYE BOLT		

**SIZE 237 - VERTICAL LINE-O- POWER TYPE VSL  
SIZE 237 - HORIZONTAL LINE-O-POWER - TYPE SL**



ITEM	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	HOUSING	21	GEAR, L. S. **	28A	GEAR, INT. (L) **	45	SHAFT, INPUT
1A	ENDBELL, L.S.	22	BEARING, L. S. *	288	GEAR, INT. (R) **	46	KEY, INPUT SHAFT
18	COVER, L.S.	23A	BEARING, L. S. PINION (LEFT) *	29	LOCKNUT (L&R)	47	BEARING, H. S. *
2	GASKET, BRACKET	238	BEARING, L. S. PINION (RIGHT) *	30	LOCK WASHER (L&R)	48	OIL SEAL, H. S. *
11	END BELL, H.S.	24A	PINION SHAFT, L. S. (LEFT) **	32	PINION & SHAFT (INT) **	49	EYE BOLT
14	BRACKET, REDUCTION	248	PINION SHAFT, L. S. (RIGHT) **	34	BEARING, INT. PINION *	70	GASKET, INPUT END BELL *
16	OIL SEAL, L. S. *	25	KEY, INT. GEAR (L&R)	36	KEY, H. S. GEAR	71	GASKET, L. S. HOUSING *
17	BEARING, L. S. *	26	BEARING, L. S. PINION (L&R) *	37	BEARING, INT. PINION *	72	GASKET, L. S. COVER *
18	KEY, OUTPUT SHAFT	27A	SPACER, INT. GEAR (L)	38	GEAR, H. S. **	85	BREATHER
19	SHAFT, OUTPUT	27B	SPACER, INT. GEAR (R)	42	PINION NUT & SET **	86	BEARING CARRIER
20	KEY, L.S. GEAR			44	SCREW, H. S.	89	SNAP RING
						90	SNAP RING

\* MINIMUM PROTECTION  
\*\* MAXIMUM PROTECTION

37A

**VERTICAL LINE-O-POWER - TYPE VSL - SIZES 220 TO 226**  
**VERTICAL LINE-O-POWER - TYPE VSLE - SIZES 220 TO 226**

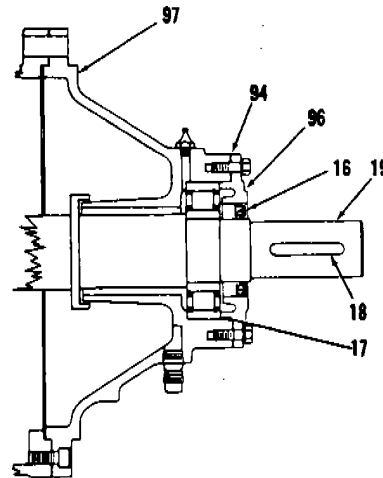
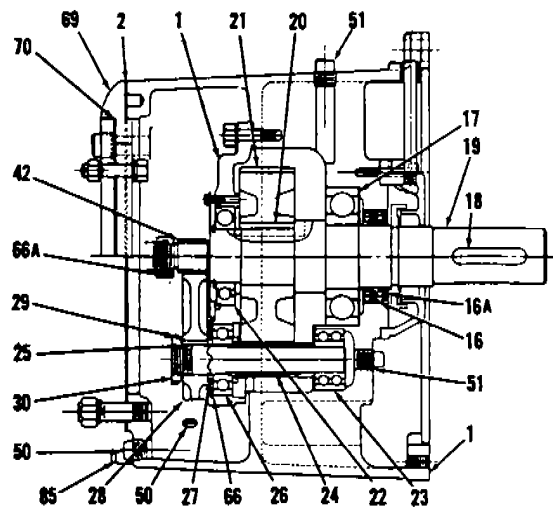
ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing & Center Plate	22	Bearing, L. S. Upper*	42	Pinion, H. S. Nut & SS**	51A	Pipe Plug
2	Gasket*	23	Bearing, L. S. Pinion*	43	Snap Ring	66	Snap Ring
14	End Bell	24	Pinion, L. S. **	44	Bearing, H. S. *	85	Breather
16	Oil Seal*	25	Key, H. S. Gear	45	Input Shaft	92	Grease Fitting
16A	Oil Seals, Output Shaft*	26	Bearing, L. S. Pinion*	46	Key, Input Shaft	93	"O" Ring
17	Bearing, L. S. Lower*	27	Spacer	47	Bearing, H. S. *	94	Gasket, L. S. Housing*
18	Key, Output Shaft	28	Gear, H. S. **	48	Oil Seal, Input Shaft*	95	Gasket, L. S. Cover*
19	Shaft, Output	29	Lockwasher	49	Lifting Hook	96	Lower Seal Plate
20	Key, L. S. Gear	30	Locknut	51	Pipe Plug	97	Extended Housing
21	Gear, L. S. **						

**VERTICAL LINE-O-POWER - TYPE VSL - SIZES 230 TO 236**  
**VERTICAL LINE-O-POWER - TYPE VSLE SIZES 230 TO 236**

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing & Center Plate	22	Bearing, L. S. Upper*	37	Bearing, Int. *	51	Plug, Pipe
2	Gasket*	23	Bearing, L. S. Pinion*	38	Gear, H. S. **	51A	Plug, Pipe
11	Bracket Reduction	24	Pinion, L. S. **	39	Lockwasher	66	Snap Ring
12	Gasket	25	Key, Int. Gear	40	Locknut	85	Breather
14	End Bell	26	Bearing, L. S. Pinion*	42	Pinion, H. S. & Nut**	92	Grease Fitting
16	Oil Seal, L. S. *	28	Gear, Int. **	43	Snap Ring	94	Gasket*
16A	Oil Seal, L. S. *	32	Pinion, Int. Speed & Nut**	44	Bearing, Input*	95	Gasket, L. S. Cover*
17	Bearing, L. S. Lower	32A	Snap Ring	45	Input Shaft	96	Lower Seal Plate
18	Key, Output Shaft	32B	Snap Ring	46	Key, Input	97	Extended Housing
19	Shaft, Output	34	Bearing, Int. *	47	Bearing, Input*	98	"O" Ring
20	Key, L. S. Gear	35	Shaft, Int.	48	Oil Seal, Input*	99	"O" Ring
21	Gear, L. S. **	36	Key, H. S. Gear	49	Lifting Hook		

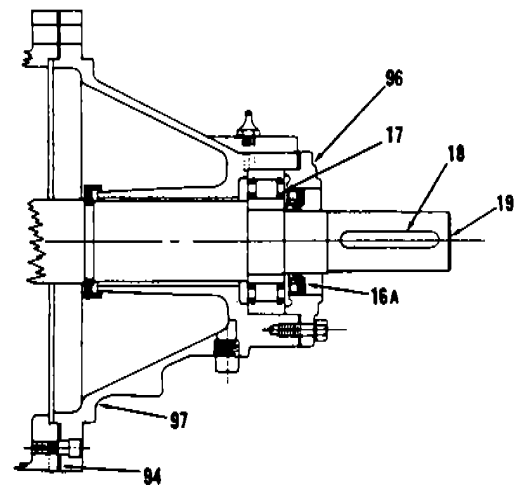
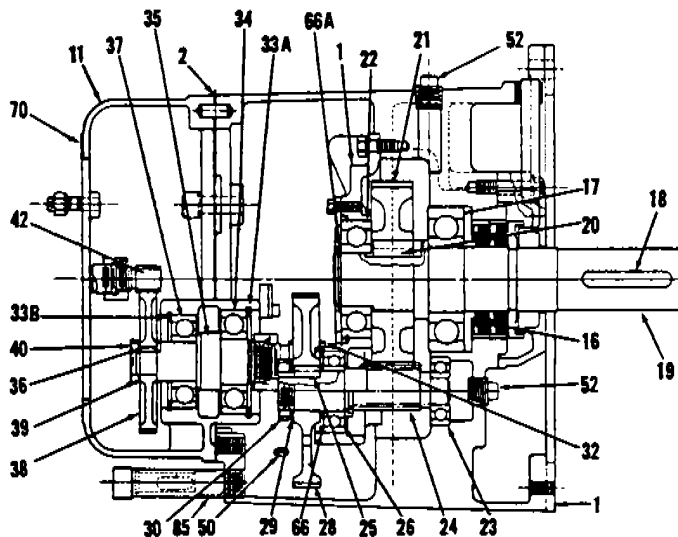
\*Minimum Protection  
 \*\*Maximum Protection

**VERTICAL GEARMOTOR - TYPE VGM - SIZES 220 TO 226**  
**VERTICAL GEARMOTOR - TYPE VGME - SIZES 220 TO 226**



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing & Center Plate	21	Gear, L.S.**	29	Lockwasher	66A	Snap Ring
2	Gasket*	22	Bearing, L.S.*	30	Locknut	69	Adapter
16	Oil Seal, L.S.*	23	Bearing, L.S. Pinion*	42	Pinion, H.S. & Nut**	70	Gasket*
16A	Oil Seal, L.S.*	24	Pinion, L.S.**	49	Lifting Hooks	85	Breather
17	Bearing, L.S.*	25	Key, H.S. Gear	50	Pipe Plugs	94	Gasket*
18	Key, L.S. Shaft	26	Bearing, L.S. Pinion*	51	Pipe Plugs	96	Lower Seal Plate
19	Shaft, Output	27	Spacer, H.S. Gear	66	Snap Ring	97	Extended Housing
20	Key, L.S. Gear	28	Gear, H.S.**				

**VERTICAL GEARMOTOR - TYPE VGM - SIZES 230 TO 236**  
**VERTICAL GEARMOTOR - TYPE VGME - SIZES 230 TO 236**



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing & Center Plate	22	Bearing, L.S.*	33B	Snap Ring	50	Pipe Plug
2	Gasket*	23	Bearing, L.S. Pinion*	34	Bearing, Int.*	52	Pipe Plug
11	Reduction Bracket	24	Pinion, L.S.**	35	Shaft, Int.	66	Snap Ring
16	Oil Seal, L.S.*	25	Key, Int. Gear	36	Key, H.S. Gear	66A	Snap Ring
16A	Oil Seal, L.S.*	26	Bearing, L.S. Pinion*	37	Bearing, Int.*	70	Gasket*
17	Bearing, L.S.*	28	Gear, Int. Speed**	38	Gear, H.S.**	85	Breather
18	Key, L.S. Shaft	29	Lockwasher	39	Lockwasher	94	Gasket*
19	Shaft, Output	30	Locknut	40	Locknut	96	Lower Seal Plate
20	Key, L.S. Gear	32	Pinion, Int. Speed & Nut**	42	Pinion, H.S. & Nut**	97	Extended Housing
21	Gear, L.S.**	33A	Snap Ring	49	Lifting Hook		

\*Minimum Protection  
\*\*Maximum Protection





## products and services

### conveyor equipment

apron conveyors  
apron feeders  
automated systems  
belt conveyors  
belt conveyor idlers  
conveyor chain  
materials handling  
overhead conveyors  
pallet loaders & unloaders  
pilew blocks  
portable conveyors  
sectional belt conveyors  
unit handling  
roller conveyors  
trippers  
wire rope conveyors  
woven wire conveyor belt

### Industrial rubber products

belting: conveyor, elevator, transmission  
expansion joints  
tires: industrial & petroleum  
molded goods  
sheet packing

### power transmission equipment

couplings  
drives  
electric motors  
engineering class chain  
gearmotors  
roller chain  
speed reducers  
sprockets

### processing equipment

blending systems  
crushing plants: stationary  
portable  
crushers  
feeders  
perforated plate  
pulverizers  
screen cloth  
shelbouts: car & foundry  
vibrating conveyors  
vibrating screens  
washers: industrial  
centrifugal  
wash plants: stationary  
portable

### engineering services

design, engineering, installation:  
belt conveyor systems  
self-unloader boat systems  
shiploading facilities  
storage and reclaiming systems  
unit handling systems

## district sales offices

- ALABAMA**  
\* 35233, Birmingham, 1631 First Avenue South, 205 322-8765
- CALIFORNIA**  
\* 90022, Los Angeles, 2604 S. Malt Ave., 213 685-7840  
\* 94545, Hayward, 27451 Industrial Blvd., 415 783-4400
- CANADA**  
Montreal 9, Quebec, 750 LeBeau Blvd., 514 332-1280  
Toronto, Ontario, 212 King St. W., Room 501, 416 362-3791  
Burnaby, B.C., 1410 Ingleton Ave., 604 291-2304
- ILLINOIS**  
\* 60160, Melrose Park, 17th & Bloomingdale, 312 345-5330
- INDIANA**  
46224, Indianapolis, 5610 Crawfordsville Road, 317 243-6638
- MASSACHUSETTS**  
\* 02026, Dedham, 68 Walnut St., 617 329-1330
- MICHIGAN**  
48220, Ferndale, 1840 Milton Road, 313 547-1770
- MISSOURI**  
63045, Maryland Heights, 8 Progress Parkway, 314 432-3656
- NEW YORK**  
\* 14240, Buffalo, 144 Kensington Ave., 716 833-7700  
\* 10962, Orangeburg, 100 Hunt Road, 914 359-5900
- NORTH CAROLINA**  
\* 28204, Charlotte, 1624 Tol Street, 704 377-2571
- OHIO**  
44129, Cleveland, 9701 Brookpark Road, 216 749-7203
- PENNSYLVANIA**  
\* 19034, Ft. Washington, Ft. Washington Industrial Park, 215 646-3900  
15216, Pittsburgh, 1231 Banksville Road, 412 563-7200
- TEXAS**  
\* 75247, Dallas, 636 Regal Row, 214 631-4260  
\* 77011, Houston, 5711 Navigation Boulevard, 713 926-3193
- UTAH**  
84116, Salt Lake City, 555 South 3rd East, 801 322-1144
- WASHINGTON**  
\* 98108, Seattle, 6140 Maynard Avenue South, 206 762-4220
- WEST VIRGINIA**  
26302, Charleston, 521 Central Avenue, 304 344-8081
- WISCONSIN**  
53216, Milwaukee, 6416 W. Capitol Drive, 414 464-0450
- EXPORT DEPARTMENT**  
10962, New York, Orangeburg, 100 Hunt Road, 914 359-5900

Contact above for the H-R sales office or distributor nearest you.

- \* Hewitt-Robins District Warehouse

## Hewitt-Robins operations

### Industrial rubber products

**HEWITT RUBBER OPERATIONS**  
New York 14240, Buffalo, 240 Kensington Avenue

### conveyor & processing equipment

**BULK HANDLING OPERATIONS**  
New Jersey 07055, Passaic, 270 Passaic Avenue  
Wisconsin, 53214, Milwaukee, 4603 West Mitchell Street

**CHAINVEYOR OPERATIONS**  
California 90022, Los Angeles, 2041 Dorte Avenue

**MATERIALS MANAGEMENT SYSTEMS**  
Maryland 21701, Frederick, 922 East Street

**ROBINS ENGINEERS and CONSTRUCTORS**  
New Jersey 07511, Totowa, 711 Union Blvd.  
California 90670, Santa Fe Springs, 8415 Secure Way

**UNIT HANDLING OPERATIONS**  
Kentucky 41042, Florence, 7100 Industrial Road

**VON GAL OPERATIONS**  
Alabama 36102, Montgomery, 3101 Old Hayneville Rd.

**WIRE PRODUCTS OPERATIONS**  
Pennsylvania 19406, King of Prussia, 101 Queens Drive

### power transmission equipment

**ELECTRA MOTORS OPERATIONS**  
California 92803, Anaheim, 1110 North Lamon Street

**GEAR PRODUCTS OPERATIONS**  
Illinois 60609, Chicago, 4545 South Western Boulevard  
Illinois 60609, Chicago, 5301 South Western Boulevard  
Illinois 60624, Chicago, 4401 West Roosevelt Road  
Illinois 60515, Downers Grove, 555 Rogers Street

**UNION CHAIN OPERATIONS**  
Ohio 44870, Sandusky, West Monroe Street

**WHITNEY CHAIN OPERATIONS**  
Connecticut 06102, Hartford, 237 Hamilton Street

## Hewitt-Robins International

**Brazil**, Sao Paulo, Equipamentos Industriais Robins, S.A.  
Rua Marconi, 23-4-0 Ander

**England**, London W. 1, Hewitt-Robins (Great Britain) Ltd.  
8 Cavendish Place

**France**, Paris 8e, Hewitt-Robins (France) SARL  
120 Avenue des Champs Elysees

**Holland**, Amsterdam N, Hewitt-Robins Europa, N.V.  
Schaeferstraat 18-20

**Holland**, Amsterdam 11, Hewitt-Robins (Holland) N.V.  
Arent-Janszoon Ernststraat 797

**India**, Calcutta, Hewitt-Robins, Inc.  
#5A Lord Sinha Road

**India**, Jamshedpur 7, Tata-Robins-Fraser, Ltd.  
11 Station Road, Burma Mines

**Italy**, Milan, Hewitt-Robins (Italia) S.p.A.  
Via Borromei 5

**South Africa**, Johannesburg, Hewitt-Robins (S.A.) (Pty.) Ltd.  
260 Market Street

EXECUTIVE OFFICES • STAMFORD, CONNECTICUT 06906

RIDE: SKY WHEEL

SUBJECT: BOOM & WHEEL BRAKES  
OPERATION & ADJUSTMENT

The brakes provided on the Sky Wheel are of the normally disengaged type, and require the application of a D.C. electrical current to energize them. This current is supplied by means of full wave bridge rectifiers. There is provided one rectifier for each two brakes, three rectifiers in all, and they are mounted near the main control panel in the van. The D.C. voltage is varied, by means of lever operated autotransformers, mounted in the operator's console, which vary the A.C. input voltage to the rectifiers. Because the 115 V. A.C. supply to the brake controls may vary, an additional A.C. autotransformer is provided to maintain a preset A.C. voltage supply. (1) This main autotransformer should be set to not over 30 volts, as indicated by the meter on the console.

The brake control lever on the console also actuates a micro switch in its first 5 degrees of travel, interrupting the power supply to the respective motor. Further actuation of this control lever gradually increases the D.C. voltage applied to the brakes, and proportionally increases the brake torque. At the end of its travel this lever automatically locks. A thumb operated latch is provided to unlock the lever, so the brake may be released and the motor restarted.

NOTE: It is important that the application of the brakes must be done gradually, so as not to repeatedly impose the maximum inertia load on the drive. While maximum braking torque is available for emergency use, the drive components are not designed to withstand this load at every stop. It is advisable to adjust the drive cable tension and the wheel drive units so that there is some slippage at these points, to help absorb the inertia of a fully loaded wheel.

The brakes are adjusted at the factory to zero gap on the friction plates; this adjustment results in the best brake feel and maximum control. If, due to wear, this gap becomes excessive, it must be reset. A quick check on the gap may be made by connecting a D.C. voltmeter of 100 V., or larger capacity, to the lines feeding the brake field coil. With the meter connected, the brake control lever for that respective brake is gradually pulled back until a click, indicating the brake is energized, is heard. A more positive indication is possible if the four bolts retaining the brake cover are removed and the brake cover slid back. Then the brake gap is visible and it is simple to see this gap close as the brake is energized. If the voltage required to close the gap is 10 volts, or less, the gap setting is satisfactory. If more than 10 Volts is required, then the gap should be reset. See Warner Electric Motor Brake Service Manual.

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(1) Revised-date 4/18/61.