MFG: WMI INDUSTRIES LTD
NAME: DRAGON WAGON
TYPE: KIDDIE

WISDOM DRAGON WAGON

PASSENGER CAPACITY: 8 SEATS, 2 PERSONS PER SEAT SPEED: 4.5 RPM
MAXIMUM CAPACITY: 480 PERSONS PER HOUR

DAILY PRE-OPENING INSPECTION

(This inspection shall include but not be limited to the following)

Check the following:

Blocking, Supports	All pins & keys
Track & Jack Stands	Wheels
Chains & Belts	Safety Belts
Condition of Cars	Gates & Fences
Operating Controls	Lighting

OPERATION OF RIDE

1. Open entrance gate and load children assisting them as needed.
2. Secure seat belts.
3. Make sure entrance and exit gates are closed and no one is inside the ride except seated passengers.
4. Depress the operator presence switch, push start button.
5. Ride will stop at the end of timed period.
6. Unlatch seat belts, assist children out of cars and through the exit gate.
7. Close exit gate and proceed to reload the ride.

RIDE OPERATORS POSITION AND FUNCTION

1. Read the operational manual and be aware of proper operation, maintenance, and safety procedures.
2. Before operating ride, a safety check out should be adhered to.
3. Ride operator is to remain at the ride controls and observe riders at all times that the ride is in operation.
4. Occupants on the ride must remain seated at all times that the ride is in motion.
5. Make sure exit and entrance gates are closed to prevent anyone from entering while the ride is in motion.
6. During the operation of the ride, the operator should observe passengers. Check for arms, legs or heads hanging out, for sick or uncomfortable passengers.
7. No food or drinks.
8. Regularly inspect and keep the entire area around the ride free of any obstacles.

GENERAL SAFETY PROCEDURES

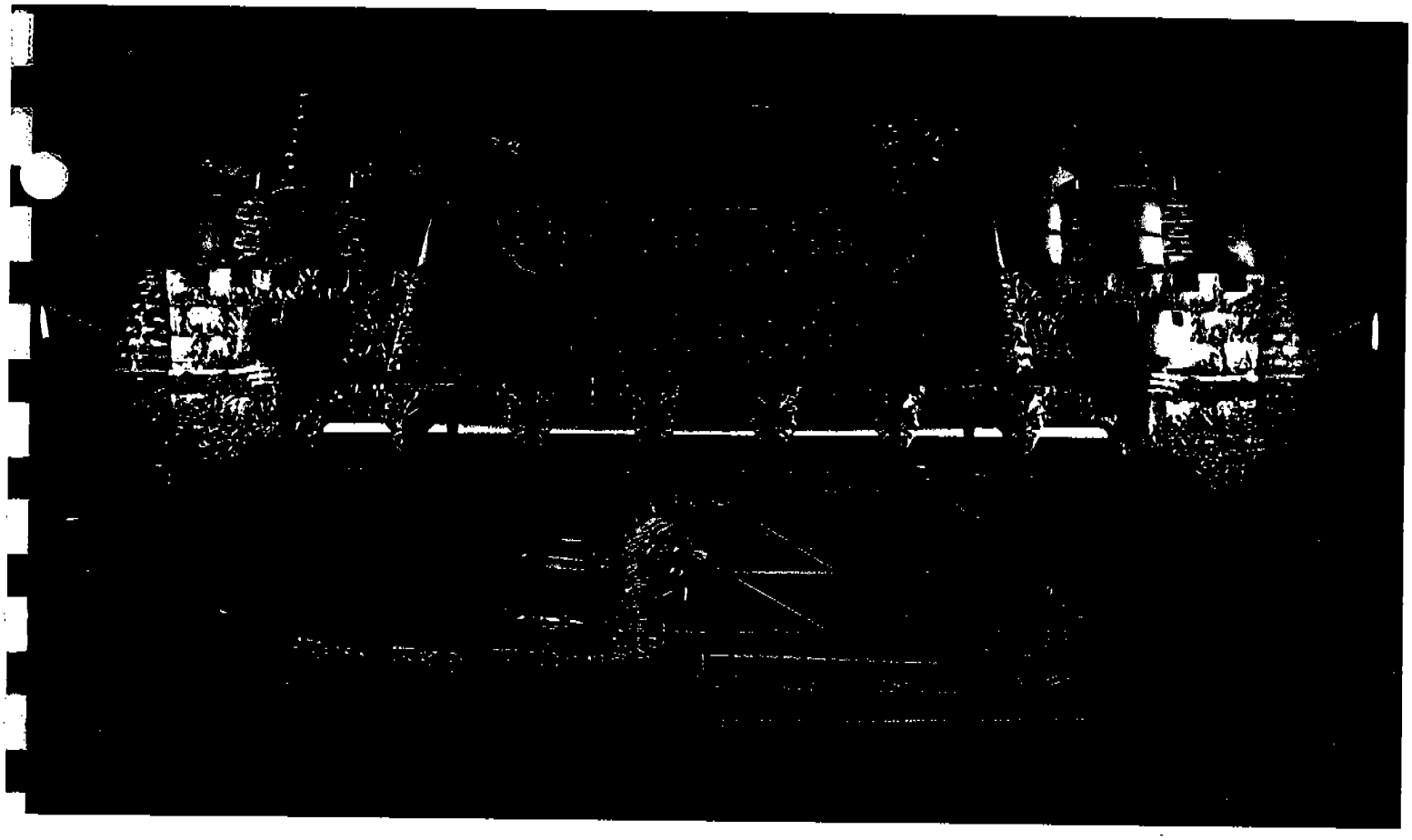
1. Passenger restrictions: 58" or less in height to ride.
2. Turn off before working on moving parts.
3. Do not attempt to repair or replace any components that you are not experienced with. For safety, get help.
4. Ensure that the ride is erected by trained personnel.
5. Regularly inspect the ride and replace any parts found worn or defective.

EMERGENCY PROCEDURES

1. Bring the ride to a complete stop and evacuate passengers as quickly and safely as possible.
2. Notify your supervisor immediately.

PROCEDURE FOR AN INCIDENT

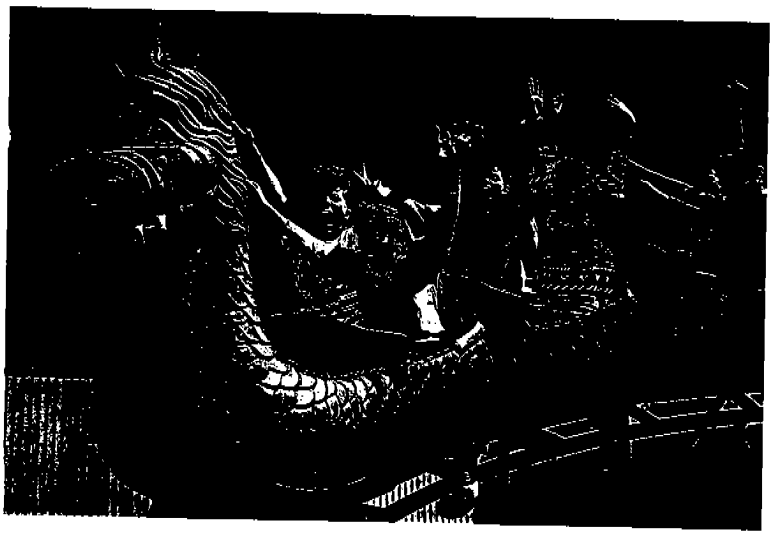
1. Call your supervisor and First Aid or other services if required.
2. DO NOT MOVE THE INJURED PERSON.
3. Assist in crowd control to make way for emergency vehicles.
4. Fill out an accident report while the incident is still fresh in your mind.

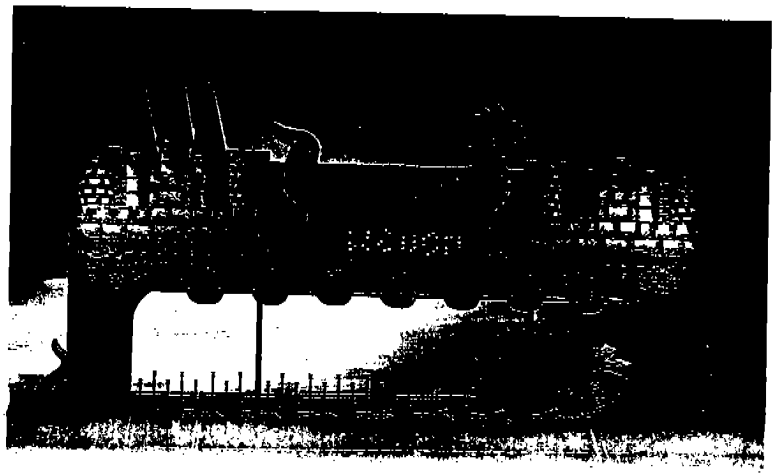


Dragon Wagon

Wisdom

DRAGON WAGON





DRAGON WAGON
SUPER JET - GO-GATOR
CLATTERPILLAR
INSPECTION LIST

1. When the track is set up, all the joints should fit tight with an equal amount of gap above and below the joint.

2. All track pins and wedges must be checked daily for tightness.

3. Point wedges down hill.

4. Point the wedges in the direction the ride is running.

5. Check Jack stands daily for tightness when the ride is not running.

6. Check hitches daily for looseness and wear. 1/8 of an inch up and down movement is correct adjustment.

7. Grease hitches weekly.

8. Check car wheels daily for looseness and wear.

9. Check wheels daily for adjustment so that they do not bind on the corners. (ADJUST WHEELS ON CURVES ONLY.)

10. Seat belts should be used at all times.

11. Keep track clear.

12. Do not allow anyone into the center of the ride while the ride is running.

13. All wedges must have safety pins installed

14. All track braces must be installed

15. All track brace pins must have safety pins

16. Grease wheels weekly.

17. Check gear box grease monthly.

SETTING UP THE SCOOPER JET

Step 1 - [illegible] and trailer to stabilize the Roller Coaster Trailer.

Step 2 - Remove the Center Pole and spread out the three legs and pin the braces to form the base for the center comutator ring.

Step 3 - Place the comutator ring assembly on top of the Center Pole, remove the Center Pole to approximate center of the ride when set up.

Step 4 - Put out the front steps, placing them on the back side of the ride to make it easier for unloading each track section.

Step 5 - Spread out all the jack stands around the ride in their approximate location. Each is numbered, starting with number 1, at the front of the ride going counter clockwise to the rear of the ride.

Step 6 - Remove the first track section (number 1-2) and pin in to the front of the ride and support with that jackstand. At this time install 2 diagonal braces from the jack stand to the track section.

Step 7 - Install second track section, (numbered 2-3) and install the medium high jack stand to stabilize that end. Drive in the track pins and wedges, install 2 braces.

Step 8 - Then roll the coaster car up on the curve so they are out of your way for removing the rest of the track sections.

Step 9 - Starting at the back of the ride, install each track section in order with the jack stand and braces as you proceed around from the back of the ride, clockwise to the front. The last piece of track should be section number 4-5.

Step 10- As you assemble the track, the track can be adjusted so that the joints are smooth all the way around the ride.

Step 11- After all sections are together, use 2 cables from each short stand. These are connected to the center pole, this will center the pole in the middle of the ride. Use the third cable to hold it in position for moving during operation. This cable goes from the center pole to the trailer in the front.

Step 12- Connect the electrical cord from the comutator ring assembly to the main power box using the twist lock plugs.

Step 13- Set out the fence and fence feet around the ride.

Step 14- Move the steps from the back side of the trailer to the front where they pin in for an entrance and install the handrails.

Step 15- Place the fiberglass center pole cover on the center pole.

Step 16- Connect the electrical power cord to 110-220 3 phase power and test the ride. This should operate according to the control switch lettering.

Step 17- Stand up Sign and Pin.

During the operation of the ride, each passenger must wear the seat belt and it should be pulled up snug around them.

After the first half hour of operation check to see that all jack stands and pin wedges are tight and on stable ground. Thereafter the wedges should be checked every two to three hours to make sure that they are locked into the pins securely. Also the jack stands should be checked, at least daily, to make sure they are firmly on the ground.

Car wheels should be checked daily for excessive wear or looseness.

Check gear box grease monthly.

Grease wheels weekly.

Check hitches daily.

OPERATING AMUSEMENT DEVICES - OPERATOR INSTRUCTIONS

The following are the correct loading (balance) procedures for amusement devices:

1. Every amusement ride must always be operated with a balanced load of passengers at all times.

2. The balancing rule is to ensure an even load on the ride's structure and mechanical drive, which in turn will cause less wear and tear and ensure a safer, longer life of the structure with less down time for adjustments and repairs.

3. In practical terms, consider the difference in driving a motor vehicle with balanced wheels as against unbalanced wheels, which causes vibrations and eventually wear and tear. The majority of operators have experienced driving a car with unbalanced wheels and the consequent results. Amusement devices are mostly large wheels and react the same as an automotive wheel when out of balance.

4. Although the out of balance load on some devices cannot be felt by the passengers or operator, it is still essential for the ride to be balanced.

5. On an extremely fast moving ride, it is essential that the ride be accurately balanced at all times.

6. Although it may not be strictly essential to balance slower revolving rides, it is still most desirable to achieve a balanced load, in the interests of the passengers and the owner of the ride, for increased safety and less "wear and tear".

SAFETY REQUIREMENTS

The key to safety is well trained and supervised employees. Make certain that all employees know how the ride operates. The employees should have a good attitude towards safety and common sense.

REMEMBER, SAFETY MUST ALWAYS COME BEFORE REVENUE.

Do not neglect the employees' safety. Before starting the ride, be certain there are no personnel inside the fences or on the ride structure. Be certain all electricity is turned off whenever an employee might come into contact with electrical connections or components. Safety helmets should be worn by all personnel when erecting or disassembling a ride.

GENERAL SAFETY GUIDELINES

The following is a list of a few general 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.

1. All work must be done by competent, qualified mechanics capable of understanding the function of the parts and their proper installation.

2. Inspect the 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 develope.

3. Perform manufacturer's recommended maintenance procedures at intervals and in the manner specified by the Operation and Maintenance Manual, in the following general areas:

   a) Lubrication
   b) Air, Hydraulic, and Electical 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) All parts are present and installed
   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.

6. Use the proper tool or equipment for each job. Ground all hand electric power tools before use unless the manufacturer advises otherwise.

7. Wear close fitting comfortable clothing when working on or close to mechanical appartus or live electrical circuits. Avoid finger rings, jewelery, 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 is to be performed is hazardous, such as live electrical circuits, at least two men should work together.

11. If guards must be removed from equipment, make sure they are replaced before leaving the job.

12. Clean up each job and dispose of surplus materials.

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

14. Make modifications and additions as outlined in the Manufacturer's Service and Safety Bulletins.

OPERATOR RESPONSIBILITIES

1. HANDICAPPED PERSONS - Persons who are physically handicapped must not be allowed to ride violent or fast moving rides. If the management of the amusement area allow handicapped to ride certain slow rides, the operator must ensure that the handicapped person is under the full control of an adult person who will ride with them and provide supervision during the ride.

2. PROHIBITED PASSENGERS - Operators should not allow a passenger on the ride who cannot be properly secured due to his size or if there is a malfunction to the securing device. Similarly, they must refuse service to a pregnant woman, or a passenger who is visibly ill, or under the influence of alcohol or drugs.

3. CLEARANCE PRECAUTION - Before operating the ride, it is important to ensure that there are no personnel around the ride structure or any exposed electrical components or other areas where there could be a risk of injury.

4. ON-DUTY ATTENTION - Insist that each operator remain in full control of the operating controls during operation of the ride with complete attention to the ride and passengers. Under no circumstances should the operator leave his or her position while the ride is in operation.

   If it does become necessary for the operator to leave his post at the controls, he must turn the ride off completely to ensure it does not accidentally start and injure passengers or staff.

5. INSPECTION/CHECK LIST - Operators must inspect the ride and complete a General Check List before each day's operation.

6. DAILY WARM-UP - The operator must always run the ride through several cycles before the first passengers are loaded. This warm-up without passengers is necessary to make sure the ride is safe and there are no problems mechanically not detected previously,

7. PRECAUTIONS BEFORE AND DURING THE RIDE - Never start the ride unless the operator or assistant is facing the ride and is in a position to observe the whole area because:
   - Patrons have been known to jump fences.
   - Patrons have been known to try to change postions while the ride is running.
   - Patrons have been known to "skylark" causing their own

safety and that of others to be put in jeopardy.
- The operator's assistant may wish to make a last minute adjustment and be put in a dangerous position when the operator puts the ride in motion.

8. SMOKING - Smoking is not allowed on the Sooper Jet. This includes the operator as well as the passengers.

9. LOOSE ITEMS - The area inside the Sooper Jet must be clear of any items that can fly out to the edge of the ride when it gets up to speed.

10. FOOD AND DRINK - It is recommended that no food or drink be allowed onto the ride.

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 Manual for the ride he supervises.

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

   a) Determine that no portion of the ride is damaged, omitted or worn in such a manner that it is unsafe or that it may develope into an unsafe condition.
   b) Report any irregularities to the superintendent or owner.
   c) Do not operate the ride if any irregularities are found until such condition has been corrected.

4. Instruct the operator to allow no passengers to ride who are 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 to board a ride if he cannot be properly secured because of his size or because there is a malfunction of the securing device.

   STOP the ride immediately if any passenger is observed moving from their seat, turning upside down, 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 gives his full attention to the ride and its passengers.

REPLACEMENT OF BOLTS

During normal maintenance practices, it is necessary to replace some bolts. they work loose because they have not been checked periodically, or they become lost when they are removed to repair some component. The points we wish to stress are the following:

Wisdom Mfg. uses only grade 5 bolts or better.

Bolts are identified by markings on the bolt head. Bolts without markings are generally grade 2 or 3 (common hardware store variety) and are not strong enough to be used on amusement rides in high stress areas.

When replacing any bolt, always use an equivalent or stronger bolt. Higher numbers mean stronger bolts.

NOTE: There are some bolts available above grade 8; however, these bolts are not to be used for general purposes. They are extremely brittle and are designed for special applications.

If trouble is encountered with bolts working loose, check the tightness according to the torque chart.

If certain bolts continue to work loose, remove the bolts and inspect the threaded holes. If threads are in good condition, clean the hole out with a non-oil base solvent and blow dry and apply "loctite" to the threads. After doing this, install new washer and bolt and torque as per the chart.

BOLT TENSIONING TORQUE

1. All tensioning pressures are for grade 5 bolts which have a tensile strength of 50 tons per square inch.

2. Bolts that are used continuously for portable ride erection should not be tensioned to maximum torque unless instructed to do so or they are in a high stress area.

3. Bolts tensioned to maximum torque should not be continuously reused and should be replaced with new bolts of equivalent strength.

4. Caution should be exercised in applying torque because in some cases, it may not be possible to utilize all the torque a bolt will stand because of distorting surrounding parts.

5. Lubricate bolts when using with SAE 30 oil or an approved anti-sieze compound.

CAUTION; Torque values are given for steel bolts and steel nuts screwed into threaded holes in steel. Be certain threaded parts are not aluminium, brass, or other soft alloys.

BOLT TORQUE CHART

Bolt Size Grade 5	Max Torque	Recommended Torque Reusable Bolt	Recommended Torque Permanent Bolt
U.N.C.	ft.lbs.	ft.lbs.	ft.lbs
3/8	27	24	26-28
1/2	66	55	60-66
5/8	130	95	125-130
3/4	230	180	220-230
7/8	370	290	360-370
1	560	480	540-560

Maximum torque listed is 65% proof load of bolt

NOTE: It is important to note the necessity of lightly oiling bolt before use as outlined above.

TORQUE METHODS- No torque wrench

Leverage Method:

The average 200-225 lb. mechanic, while standing on his feet, can apply a steady pull with his good arm (right arm if right handed, etc.) of between 100 and 110 lbs. This pull is obtained without bracing his feet or free hand against any solid object such as a work bench or the machinery being worked on.

If a torque of any given value is desired, it becomes a simple matter of leverage. If the mechanic in question is tightening a 7/8" UNC thread bolt wich recommends 520 ft lbs of torque, this value can be reached by using a heavy duty socket wrench and slipping a 5 ft. length of pipe over the handle of the wrench.

Thus, if the mechanic can exert a 100 lb pull, 5 feet times 100 lbs. would equal 500 ft lbs. Any other torque desired can be reached by simply dividing the desired torque value by approximately 110 to determine the length of the pipe or "cheater" bar that is needed.

TURN OF THE NUT METHOD

This method applies only to bolts with UNC threads. If the bolt is shorther than eight times its diameter, tighten the nut until the pieces being joined are snugged up. Put a reference mark on the nut or socket wrench being used and tighten the nut, while preventing the bolt from turning, until the nut has been turned an additional 1/2 of a turn. If the bolt is longer than eight times its diameter, proceed as above but tighten the nut 3/4 of a turn. This will apply a preload to the bolt that will be very close to the same value that would be achieved if a torque wrench had been used.

PNUEMATIC TIRES ON AMUSEMENT DEVICES AND SUPPORT VEHICLES

* It is strongly recommended to carry a quality spare tire and wheel for every type you have in operation, and inflated to pressure.

* Check pressures regularly on all tires in operation and maintain to manufacturer's recommendations.

* Unless unavoidable, it is strongly recommended that repairs or the fitting of new tires to rims be carried out by experts at recognized tire dealers using correct equipment.

***CAUTION

Respect the potential power and explosive force of air under pressure. Serious accidents have resulted from lack of awareness of the explosive potential of compressed air. Respect it as you would DYNAMITE.

The following pages of guidelines, safety precautions and procedures of tire changing are included to make all operators aware of the dangers that can be encountered by neglecting care and safety in handling tires and compressed air.

TIRE SAFETY - MOUNTING/DEMOUNTING

The following guidelines and safety procedures are intended to be used for reference only. Procedures will vary for different tire mounting equipment and different types of rims. If at any time an uncertainty exists about the method of assembly or component parts or use of equipment, consult specific equipment manuals.

The following precautions apply generally for all types of tires. In addition, each section emphasises specific precautions for each particular type of tire.

WARNING

FAILURE TO OBSERVE THE PRECAUTIONS OUTLINED IN THIS SECTION MAY RESULT IN FAULTY POSITIONING OF THE TIRE AND/OR RIM PARTS, CAUSING THE ASSEMBLY TO BURST WITH EXPLOSIVE FORCE SUFFICIENT TO CAUSE SERIOUS PHYSICAL INJURY OR DEATH.

CORRECT PROCEDURES- Do it this way.

1. Make sure that all Rims are in good condition for use - not damaged, dented, or deformed.

2. Remove valve core and exhaust all air from the tire (or tires in the case of a dual assembly) before demounting. Probe the valve stem with a wire as a final check to make sure the valve is not plugged. Do not stand in front of a valve opening as dirt particles may be blown into your eyes.

3. Block vehicle in a positive manner so it cannot roll forward or backward after it is jacked up.

4. Place large hardwood blocks under the jack, regardless of how hard or firm the ground appears.

5. Place safety jacks, or crib up with blocks at an appropriate place under the vehicle, in case the jack slips.

6. Check rim diameter to be sure it exactly matches the rim diameter moulded on the tire. If rim is multiple piece, check component parts to see if they are made by the same manufacturer.

7. Clean and inspect used rim parts thoroughly.

8. Use new tubes and new flaps in new tires.

9. Inspect inside of tire for loose cords, cuts, penetrating objects, or other carcass damage. Scrap tires that are beyond simple repair. Remove dirt, debris, and liquids from the inside of tire before tube is installed.

10. Lubricate with approved rubber lubricant, such as thin vegetable oil soap solution.

11. Use a clip on chuck and extension hose with remote control valve and pressure guage, long enough to allow you to stand to one side, not in front of the assembly, during inflation.

12. Center tire properly on rim before inflating.

13. Secure lock wheel down, or place assembly in safety cage or portable safety device before attempting to inflate tire to seat beads.

14. Check for proper flange and lock ring seating.

15. Adjust air pressure to manufacturer's recommended cold operating pressure, after beads have been seated.

16. Inspect valve cores or proper air retention. Replace damaged or leaky cores.

FAULTY PROCEDURES - Do not do it this way

1. Don't work on tire and rim assemblies until you have reviewed safety practices and procedures.

2. Don't loosen lug nuts on duals until all air is exhausted from both tires. A broken or cracked rim part under pressure could blow apart and seriously injure or kill if lugs are removed before air is exhausted.

3. Don't ever apply heat or do repair work on an inflated tire, rim, and wheel assembly. Heat can increase air pressure to a level sufficient to burst the tire or rim.

4. Don't reinflate a tire that has been run flat or seriously under-inflated without demounting the tire and checking the tire and tube for damage.

5. Don't mix rim parts of different manufacturers unless such use is approved by those manufacturers.

6. Don't attempt, under any circumstances, to rework, weld, heat, or braze rim parts. Replace damaged parts with the same size, type, and make.

7. Don't reuse tubes or flaps that have buckled or creased.

8. Don't use a tube in a tire larger or smaller than that for which the tube was designed.

9. Don't inflate beyond recommended bead seating pressure. Don't stand over tire when inflating.

10. Don't transport fully inflated tires mounted on multi-piece rims. Inflate only enough (10-15 PSI) to keep rim parts in place. Inflate tires to correct operating pressure only after tire and rim assembly have been fastened in place, all lug nuts properly torqued, and rim parts rechecked for proper fit.

11. Do not substitute petroleum based lubricants, silicon or anti-freeze for approved rubber lubricants.

OPERATING INSTRUCTIONS & PARTS MANUAL

RIGHT ANGLE SPEED REDUCER

MODELS 4Z015B THRU 4Z021B & 6Z130

FORM 5S1284 03522

DAYTON ELECTRIC MANUFACTURING CO. CHICAGO 60648

0386/135/1

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE DAYTON RIGHT ANGLE SPEED REDUCER!
RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

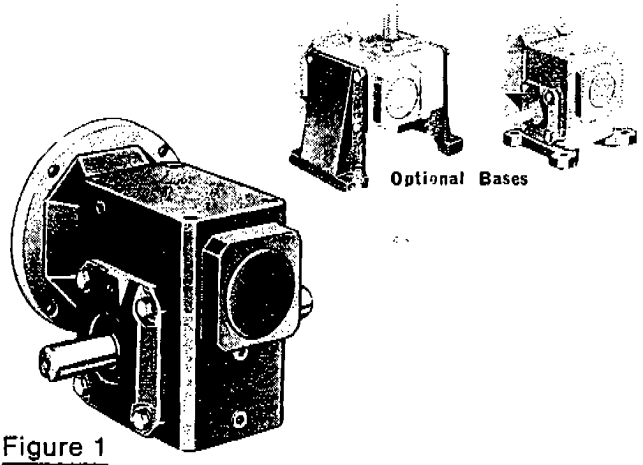


Figure 1

Description

Dayton right angle speed reducers are suitable for continuous, low speed, high torque applications in areas where space is limited. They will accommodate NEMA C-face motors (not included). Each reducer is an assembly consisting of a cast iron housing, steel output shaft with key and plastic cover, tapered roller bearing, steel worm mating gear, and manganese bronze worm gear.

Drilled and tapped holes in the top and bottom of the reducer enable mounting it to flat surfaces. Optional mounting bases 6X501 and 6X504 provide additional mounting positions. (See Figure 1).

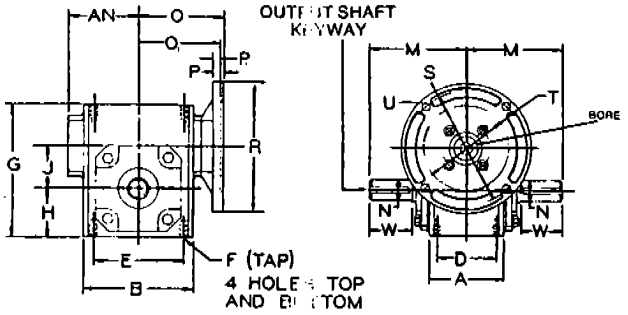
CAUTION: The reducer operates correctly when floor, wall, or ceiling mounted in any position except with the input flange down (motor shaft pointing up).

General Safety Information

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Motor must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means. Refer to NEC Article 250 (Grounding) for additional information.
3. Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out of sight, lock it in the open position and tag it to prevent unexpected application of power. Do not depend on motor control devices, such as motor starters, to prevent unexpected motor starting.
4. Provide guarding around all moving parts.
5. Be careful about touching an operating motor; it may be hot enough to hurt or injure you. Modern-design motors are hot when running at rated voltage and load.
6. Prevent the power cable from touching sharp objects, oil, grease, hot surfaces, or chemicals.
7. Do not kink the power cable.
8. Make certain that the power source conforms to the requirements of your equipment.
9. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.
10. Be sure the output shaft key is fully captive or is removed before running the reducer.

Specifications and Performance

MODEL	WORM CENTER DISTANCE	NOM. GEAR RATIO	OUTPUT SHAFT END THRUST (LBS)	OUTPUT SHAFT OVERHUNG LOAD (LBS)	NOMINAL OUTPUT @ 1725 RPM INPUT	NEMA FRAME SIZE	CONTINUOUS DUTY OUTPUT TORQUE (IN-LBS) @ INPUT OF 1725 RPM AND GIVEN HP (1.0 SERVICE FACTOR)						
							3/4 HP	1 HP	1½ HP	2 HP	3 HP	5 HP	7½ HP
4Z015B	3.25	60:1	3,945	2,857	29 RPM	56C	994	132[illegible]	—	—	—	—	—
6Z130	3.25	50:1	3,670	2,857	34 RPM	56C	904	120[illegible]	1810	—	—	—	—
4Z016B	3.25	40:1	3,398	2,857	43 RPM	56C	799	106[illegible]	1599	—	—	—	—
4Z017B	3.25	30:1	3,021	2,857	58 RPM	56C	—	82[illegible]	1244	1659	—	—	—
4Z018B	3.25	20:1	2,534	2,857	86 RPM	182TC	—	—	—	—	1911	—	—
4Z019B	3.25	15:1	2,171	2,857	115 RPM	182TC	—	—	—	—	1368	—	—
4Z020B	3.25	10:1	1,698	2,857	173 RPM	182TC or 184TC	—	—	—	—	937	1563	—
4Z021B	3.25	5:1	1,306	2,110	345 RPM	213TC	—	—	—	—	—	—	1201



A	B	D	E	F	G	H	J	AN
5	8½	4	7½	7/16-14	9⅜	3½	3¼	5⁷⁄₁₆

OUTPUT SHAFT				56C	182TC 184TC	213TC 215TC
M	N	W	KEYWAY	O	O1	O1
7¹⁄₁₆	1½	3⁵⁄₁₆	3/8 × 3/16	5¹¹⁄₁₆	6¼	6¼

FRAME NO.	P	P1	R	S	T	U	INPUT BORE	INPUT KEYWAY
56C	1/2	—	6½	5⅞	4½	13/32	.625	3/16 × 3/32
182TC-184TC	—	9/16	9	7¼	8½	17/32	1.125	1/4 × 1/8
213TC	—	9/16	9	7¼	8½	17/32	1.375	5/16 × 5/32

Figure 2 — Right Angle Speed Reducer Dimensions

A	B	C	D	D1	D2	F	G	G1	H	H1
13⅜	8½	13/16	11⅞	7⅛	3⁹⁄₁₆	17/32	8¼	9¹³⁄₁₆	4¹¹⁄₁₆	6¼

J	AN	OUTPUT SHAFT M	N	W	KEYWAY	56C O	182TC 184TC O1	213TC O1
3¼	5⁷⁄₁₆	7¹⁄₁₆	1½	3⁵⁄₁₆	3/16	5¹¹⁄₁₆	6¼	6¼

FRAME NO.	P	P1	R	S	T	U	INPUT BORE	INPUT KEYWAY
56C	1/2	—	6½	5⅞	4½	13/32	.625	3/16 × 3/32
182TC-184TC	—	9/16	9	7¼	8½	17/32	1.125	1/4 × 1/8
213TC	—	9/16	9	7¼	8½	17/32	1.375	5/16 × 5/32

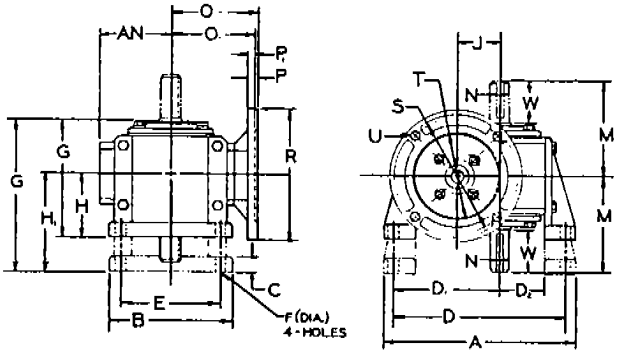
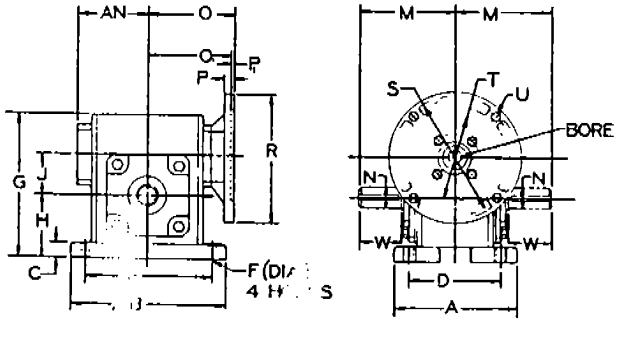


Figure 3 — Dimensions of Reducer with Optional 6X504 Vertical Mounting Base



A	B	C	D	E	F	G	H	J	AN
7¾	11⅛	7/8	6⅛	9½	17/32	10¼	4⅜	3¼	5⁷⁄₁₆

OUTPUT SHAFT				56C	182TC 184TC	213TC
M	N	W	KEYWAY	O	O1	O1
7¹⁄₁₆	1½	3⁵⁄₁₆	3/8 × 3/16	5¹¹⁄₁₆	6¼	6¼

FRAME NO.	P	P1	R	S	T	U	INPUT BORE	INPUT KEYWAY
56C	1/2	—	6½	5⅞	4½	13/32	.625	3/16 × 3/32
182TC-184TC	—	9/16	9	7¼	8½	17/32	1.125	1/4 × 1/8
213TC	—	9/16	9	7¼	8½	17/32	1.375	5/16 × 5/32

Figure 4 — Dimensions of Reducer with Optional 6X501 Horizontal Mounting Base

WARNING: WHEN AN INSTALLATION INVOLVES A HOLDING OR OVERHAULING APPLICATION (SUCH AS A HOIST OR CONVEYOR), A SEPARATE MAGNETIC BRAKE OR OTHER LOCKING DEVICE SHOULD BE USED. DO NOT DEPEND ON GEAR FRICTION TO HOLD THE LOAD.

1. Locate the speed reducer in a clean and dry area with access to adequate motor cooling air supply. If installation is outdoors, make certain that the reducer is protected from the weather.

2. Using 7/16-14 bolts, mount the reducer directly to a rigid surface (preferably metallic), or, if necessary, install one of the optional mounting bases on the reducer with 7/16-14 bolts, then mount the base to the rigid surface with 1/2" hardware.
   CAUTION: Horizontal or vertical mounting surfaces (i.e. floor, ceiling, or wall) are suitable for the reducer, which may be mounted in any position on the surface except with the input flange down (motor shaft pointing up).

3. There are 6 pipe plugs and 1 vent plug on the reducer. (See Figure 6, Ref. Nos. 8, 9 & 10.) Check the positions of the vent plug and pipe plugs after the reducer is installed. The vent plug should be the uppermost (highest) of the group. If it is not, interchange the vent plug with the pipe plug which is in the uppermost position. (See Figure 5.)

4. Attaching (coupling) the load:
   NOTE: To determine output torque capacity for operating conditions other than a normal eight hour day and shock-free operation, multiply the rated output torque (see Specifications) by the applicable load factor listed (see Load Factor Chart). Avoid shock loads.

   a. When connecting a load to the speed reducer output shaft, be careful to avoid excessive tension if using either belt or chains with chain sprockets. Overhung load should not exceed limits shown in Specifications and Performance at 1½" from the shaft shoulder. See Detailed Overhung Load Calculations for additional information.

DETAILED OVERHUNG LOAD CALCULATIONS

$$\frac{\text{Full Load Torque of Speed Reducer} \times 2}{\text{Pitch Diameter of Gear, Pulley, or Sprocket}} = \text{Pounds of Load on Center of Speed Reducer Output Shaft}$$

Multiply pounds of load (obtained from above formula) by the correct factor listed below to determine actual overhung load in "pounds" on center of speed reducer output shaft.

DRIVE FACTORS

Sprocket	1.0
Pulley	1.5
Gear	1.25

Locate the sprocket, pulley or gear as close to the shaft shoulder as practical to minimize overhung load and increase bearing life.

If the center line of the sprocket, pulley or gear is located more than 1½" away from the shoulder, consult Dayton Electric Mfg. Co. to help determine the amount of overhung load.

   b. On direct-coupled installations, carefully check shaft and coupling alignment as unit is being bolted down. Shim as required. Do not depend on a flexible coupling to compensate for misalignment.
   c. End Thrust Capacity (see Specifications and Performance):
   CAUTION: The thrust ratings given in the chart are calculated at full output torque for the reducer, at 1725 RPM and maximum horsepower input. The thrust ratings are in addition to the full overhung load rating, assuming all the worst conditions of loading.

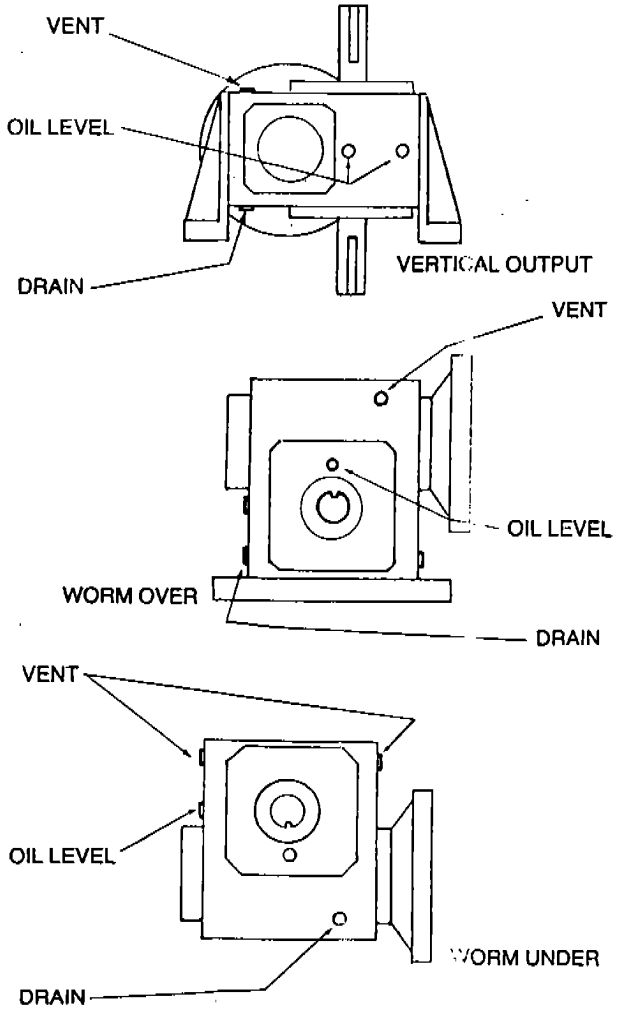


Figure 5 — Location of Vent, Oil Level, and Drain Plugs for Each Reducer Mounting Position

LOAD FACTOR CHART

TYPE OF LOAD	LOAD FACTOR
8-10 Hour Day Service with Moderate Shock Load	0.8
24 Hour Day Service Without Shock Loads	0.8
24 Hour Day Service with Moderate Shock Loads	0.6
Combined Load Conditions Such as Lifting with Moderate Shock Loads	0.6

5. Attaching motor to speed reducer:

CAUTION: Do not exceed motor horsepower or torque loads indicated on nameplate or in specifications. Maximum motor momentary or starting torque is not to exceed 300% of maximum motor running torque. Unit is not recommended for more than ten starts per hour.

a. Speed reducer is to be used with appropriate NEMA C-face, 1725 RPM motor, without mounting base. See Gearing Chart for correct motor frame size. For performance specifications at input motor speeds other than 1725 RPM, write to Dayton Electric Mfg. Co. Make sure motor shaft is clean and free of dirt.
Wipe shaft with light oil.

b. Lubricate input shaft bore with heavy grease or anti-seize compound provided with reducer. Install key in motor shaft keyway.

c. Line up key in motor shaft with keyway in input shaft bore. Carefully insert motor shaft.

d. Carefully insert motor shaft into reducer input bore, then move motor toward reducer until motor C-face meets reducer input flange. Rotate the motor housing to line up the tapped holes in the motor C-face with the holes in the reducer input flange.

e. Four screws with lock washers to fit tapped holes in motor face are provided. Insert two screws in two upper holes of motor face.
NOTE: Do not tighten screws completely.

f. Insert lower two screws finger-tight, and then back them off ¾ turn.

g. Tighten upper two screws and lower two screws.

IMPORTANT: RUN MOTOR MOMENTARILY AND THEN TURN OFF POWER. MOTOR SHOULD COAST FREELY WITHOUT BINDING, INDICATING THAT MOTOR SHAFT ALIGNMENT IS CORRECT.

h. Before running a new reducer for the first time after it has been installed, check it for vent plug location and proper oil level. Figure 5 illustrates the correct vent, oil level, and drain plug locations for the three reducer mounting positions. Interchange positions of plugs on reducer, if necessary. The oil level in the reducer should be at oil level plug height. Add or drain off oil if necessary.
NOTE: Reducer has been filled at the factory with enough oil for the "worm over" mounting position.

CAUTION: Do not operate the reducer the first time without making sure it contains the correct amount of oil. Doing so can damage the reducer. See "Lubrication" in Maintenance section for details.

i. Run the motor which drives the reducer, and check the direction of reducer output rotation. If you want to reverse the reducer output direction, do so by reversing the motor leads.

Trouble Shooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Unit fails to operate	1. Blown fuse or open circuit breaker	1. Replace fuse or reset circuit breaker.
	2. No power	2. Contact power company.
	3. Defective motor	3. Repair or replace.
Unit operational, but no output	Defective gear(s)	Check and replace if necessary.
Intermittent rotation of output shaft	Damaged gear assembly possibly caused by shock load	Replace gear, and, if possible, avoid shock load.
Excessive noise	1. Bearings worn	1. Replace bearings.
	2. Belt or chain too tight	2. Adjust belt tension.
	3. Overhung Load, exceeds rating and causes bearing wear	3. Correct and/or replace bearing.

WARNING: MAKE SURE THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY REDUCER COMPONENTS! IF THE POWER DISCONNECT POINT IS OUT OF SIGHT, LOCK IT IN THE OPEN POSITION AND TAG IT TO PREVENT UNEXPECTED APPLICATION OF POWER.

WARNING: GEAR BACKLASH SHOULD BE CHECKED AT INSTALLATION AND AGAIN AT REGULAR INTERVALS TO PREVENT INJURY OR DAMAGE THAT MIGHT BE CAUSED BY GEAR TOOTH FAILURE. THIS SHOULD BE DONE BY MEASURING THE ROTARY MOVEMENT OF THE OUTPUT SHAFT (ROTATING ALTERNATELY CW AND CCW) AT A SUITABLE RADIUS WHILE HOLDING THE INPUT SHAFT STATIONARY. GEARS SHOULD BE REPLACED WHEN THE BACKLASH EQUALS FOUR TIMES THE MEASUREMENT TAKEN AT INSTALLATION.

CLEANING

Properly selected and installed speed reducers are capable of operating for long periods of time with minimal maintenance. Periodically clean dirt accumulations from open type motors, especially in and around vent openings, preferably by vacuuming. (Vacuuming avoids embedding dirt in windings.)

LUBRICATION

The speed reducer was filled with AGMA #8 gear lube oil at the factory. Check the oil level after installing the reducer, making sure it is correct for the reducer mounting position before running the reducer. (See Figure 5, on page 3. The oil level should be at oil level plug height.) If the level is low, drain the remaining oil, then refill the reducer to the correct level — do not mix brands of oil.

CAUTION: If oil level is too low, reducer bearings and gears will not get enough lubrication. Too much oil in the reducer may cause oil to leak from the air vent, or may cause the oil to churn and foam, which may cause overheating. Either too much or too little oil can cause reducer bearing and gear damage.

For new reducers, change the oil 120 hours after the reducer starts operating (based on 8 hours per day operating). After the first change, change oil every 2,000 operating hours, or every six months, whichever occurs first.

Use Dayton worm gear lubricant, Stock No. 2W576 (AGMA #7) for ambient operating temperatures between 15° and 60°F, Stock No. 2W577 (AGMA #8) for ambient operating temperatures between 25° and 125°F, or Stock No. 5W061 (synthetic AGMA #7 EP) for ambient operating temperatures between −40° and 150°F.

OIL SEAL REPLACEMENT

CAUTION: A new seal will leak if the seal lips and/or the seal rubbing surface on the shaft have been altered or roughed up. Protect the seal lips at all times. Clean the shaft, but do not use any abrasives on the part of the shaft rubbed by the seal.

To prevent seal damage and gear misalignment when replacing the oil seal, proceed as follows (see Figure 6):

1. Disassembly:
   a. Remove sprockets, pulleys, etc. that are mounted on the shaft where the seal is to be replaced.
   b. Use punch to pierce two or more holes in steel casing of seal. (Casing may be rubber coated.)
      CAUTION: Do not drill holes in seal casing because metal chips may get inside reducer, damaging it.
   c. Insert sheet metal screws, leaving the heads sufficiently exposed so they can be pried or grasped with pliers.
   d. Work seal loose. Be careful to keep all metal or dirt particles from entering reducer.
   e. Remove old sealing compound from seal seat, if present.
   f. Remove burrs and sharp edges from shaft.
   g. Clean shaft with solvent-soaked rag.
      WARNING: DO NOT USE ABRASIVE MATERIAL ON SHAFT SEAL CONTACTING SURFACES.

2. Reassembly:

   CAUTION: Protect seal lips when handling seal. Leakage will result if lips are damaged. If a seal with rubber coating on the outside diameter (O.D.) is used, no sealant is necessary. If no rubber coating is on seal O.D., coat cage with Permatex No. 3 or equivalent sealing compound. Coat seal lips with ball bearing grease and carefully work seal into position. Protect seal lips from shaft keyway edges by wrapping shaft with thin, strong paper coated with oil.

   a. Place seal, open side (with garter spring) facing reducer, on shaft or in recess in input flange.

   b. Place the face of a pipe or tube (face must be flat, smooth, and square to the length of the pipe or tube) against the seal and drive or press seal until seated in the same position as the seal that was removed.

      CAUTION: Do not strike seal directly.

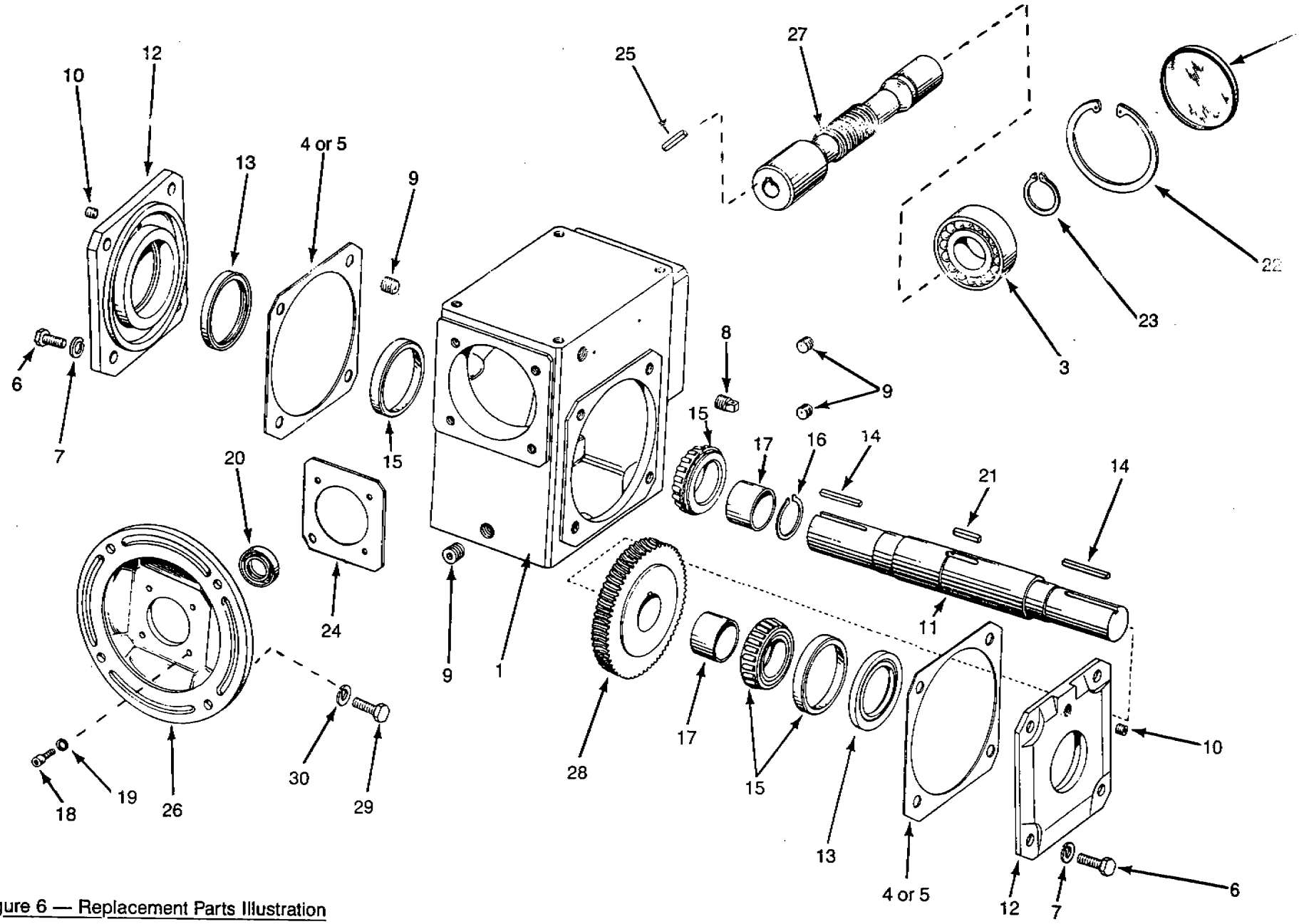


Figure 6 — Replacement Parts Illustration

REF. NO.	DESCRIPTION	PART NO.	QTY.
1	Housing	93D401076001	1
2	End cover	93A113391001	1
3	Bearing	93A120314004	1
4	Shim, 0.007 thick	29A125920001	4
5	Shim, 0.019 thick	29A125930001	6
6	Capscrew, GR5, 3/8-16 x 1"	*	8
7	Lockwasher, 3/8"	*	8
8	Vent plug	93A115462001	1
9	Pipe plug	93A113412003	4
10	Pipe plug	93A113412002	2
11	Output shaft	06B062860001	1
12	Seal case	93C304974001	2
13	Oil seal	40A021874400	2
14	Key	23A027415900	2
15	Bearing	04A122920700	2
16	Lock ring	24A092852800	1
17	Spacer	28A125940001	2
18	Hex soc. screw, 5/16-18 x 1"	*	4
19	High collar lockwasher, 5/16"	93A113442005	4
20	Oil seal, 4Z021B	40A021874500	1
	Oil seal, 4Z015B-4Z019B & 6Z130	40A021877300	1
	Oil seal, 4Z020B	40A021874400	1
21	Key	23A027417100	1
22	Lock ring	24A092841400	1
23	Lock ring	24A092854100	1
24	Gasket	93A115454001	1
25	Input key, 4Z015B-4Z017B & 6Z130	23A027410600	1
	Input key, 4Z018B-4Z020B	23A027417700	1
	Input key, 4Z021B	23A027412900	1
△	Anti-seize compound	93A122208001	1

△Not shown.
*Standard hardware item; available locally.

GEARING TABLE						SPECIFIC PARTS FOR EACH MODEL FOR MOUNTING MOTOR			
						• REF. NO. 29 HEX HD. CAPSCREW (4)		• REF. NO. 30 LOCKWASHER (4)	
MODEL	RATIO	MOTOR FRAME	REF. NO. 26 MOTOR FLANGE	REF. NO. 27 WORM	REF. NO. 28 GEAR	3/8-16 x 1"	1/2-13 x 1¼"	3/8"	1/2"
4Z015B	60:1	56C	93C304581001	93B208538001	35A125750001	*	—	*	—
6Z130	50:1	56C	93C304581001	93B208418001	35A125720001	*	—	*	—
4Z016B	40:1	56C	93C304581001	93B208536001	35A125660001	*	—	*	—
4Z017B	30:1	56C	93C304581001	93B208535001	35A125600001	*	—	*	—
4Z018B	20:1	182TC	08D006490001	93B208534003	35A125540001	—	*	—	*
4Z019B	15:1	182TC	08D006490001	93B208533003	35A125510001	—	*	—	*
4Z020B	10:1	182TC	08D006490001	93B208532003	35A125450001	—	*	—	*
4Z021B	5:1	213TC	08D006490001	93B208629001	93A118021001	—	*	—	*

*Standard hardware item; available locally.

1-800-323-0620

Gear Box – Dayton 4Z019B (Grainger)

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. Right angle speed reducers, Models 4Z015B thru 4Z021B & 6Z130, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

LIMITATION OF LIABILITY. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

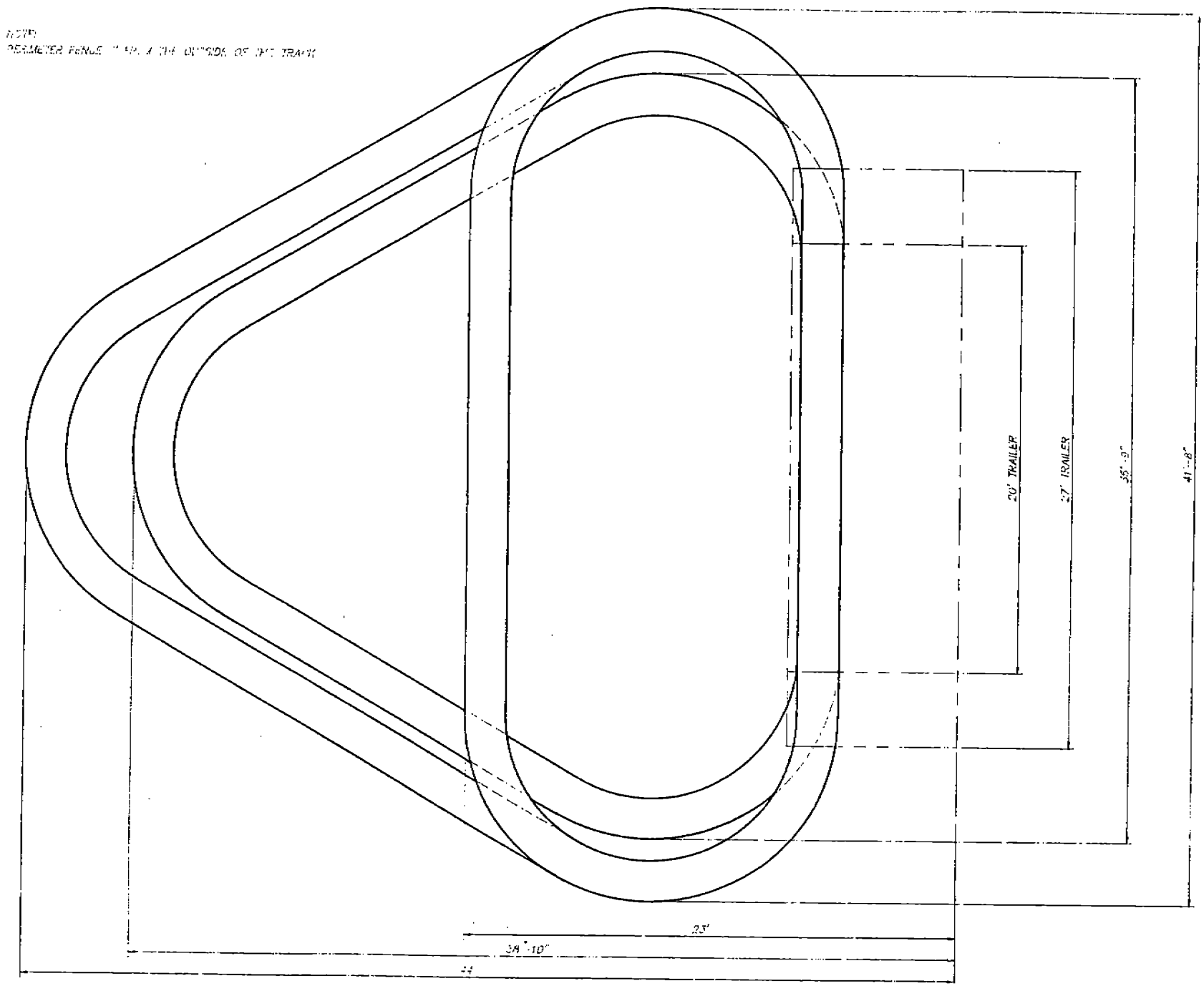
Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648



TRACK / TRAILER OPTIONS