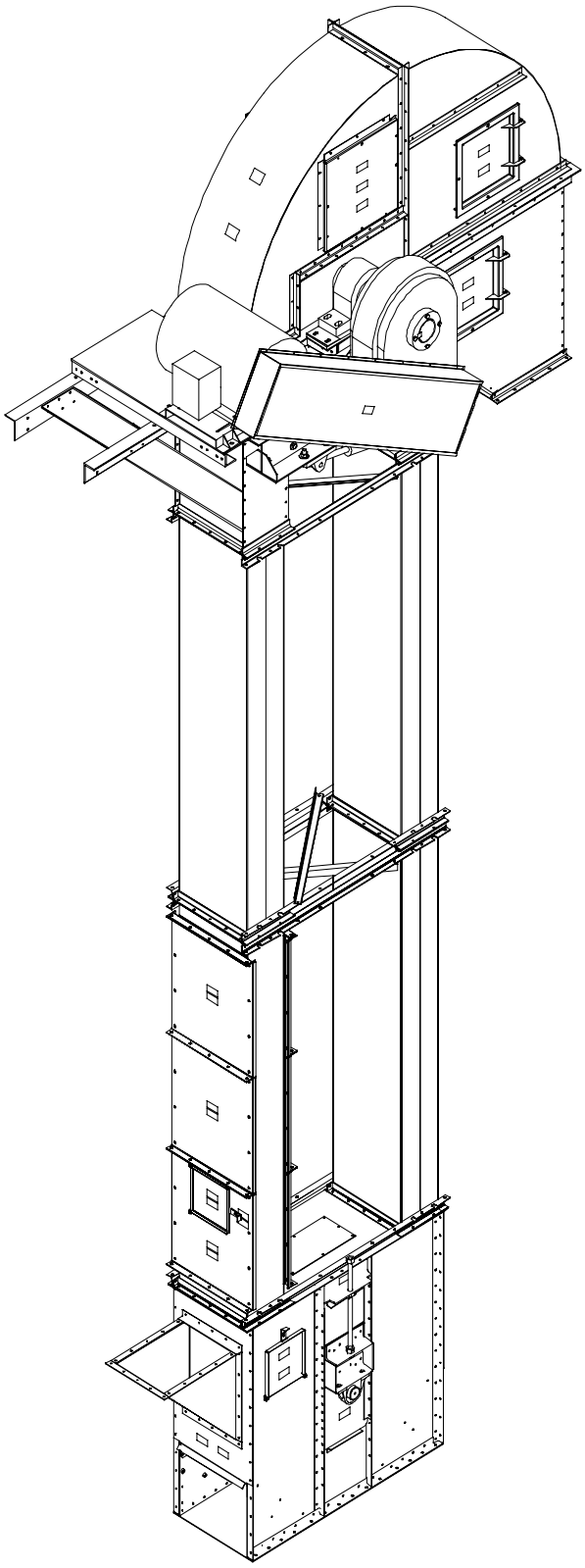
Bucket Elevator
Series 2
Assembly Manual

PNEG-681
Rev: 10-16-06

PNEG-681



Use of the Equipment Information page will help you identify your equipment in the case that you need to notify the company. For this reason, this information should be filled out and kept on record.

Equipment Information

Model Number: _____

Serial Number: _____

RPM: _____

Head Pulley Dia.: _____

Discharge Height: _____

Horsepower: _____

The GSI Group, Inc.
1004 East Illinois Street
P.O. Box 20
Assumption, IL 62510
USA
Phone: 217-226-4421
Fax: 800-800-5329

Date Purchased: _____

Dealer Name
and Phone Number: _____

_____

_____

Table of Contents

SAFETY GUIDELINES

This manual contains information that is important for you, the owner/operator, to know and understand. This information relates to protecting ***personal safety*** and ***preventing equipment problems***. It is the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of these safety guidelines. To help you recognize this information, we use the symbols that are defined below.
Please read the manual and pay attention to these sections. Failure to read this manual and it's safety instructions is a misuse of the equipment and may lead to serious injury or death.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION **CAUTION** used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE **NOTE** indicates information about the equipment that you should pay special attention to.

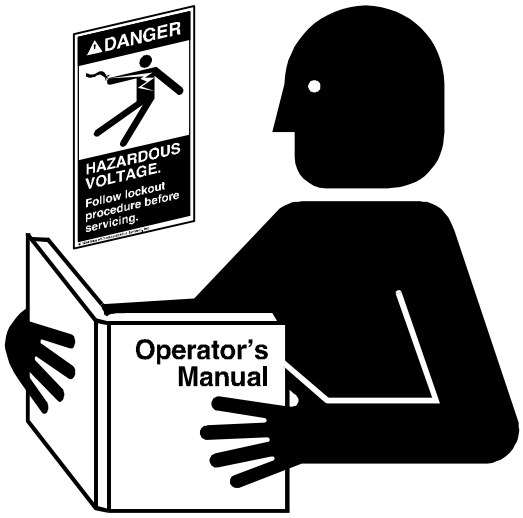
FOLLOW SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and on your machine safety signs. Keep signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from the manufacturer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machinery in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your dealer.

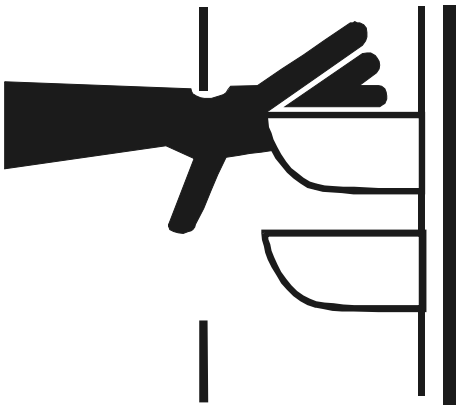


STAY CLEAR OF MOVING BELT

Entanglement in moving belt can cause serious injury or death.

Keep all shields and covers in place at all times.

Wear close fitting clothing. Stop and lock out power source before making adjustments, cleaning, or maintaining equipment.

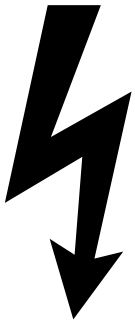


OPERATE MOTOR PROPERLY

Do not operate electric motor equipped units until motors are properly grounded.

Disconnect power on electrical driven units before resetting motor overloads.

Do not repetitively stop and start the drive in order to free a plugged condition. Jogging the drive in this type of condition can damage the elevator and/or drive components.



PRACTICE SAFE MAINTENANCE

Understand service procedures before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is in operation. Keep hands, feet, and clothing from rotating belt and idlers.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any build up grease, oil, or debris.

REMOVE PAINT BEFORE WELDING OR HEATING

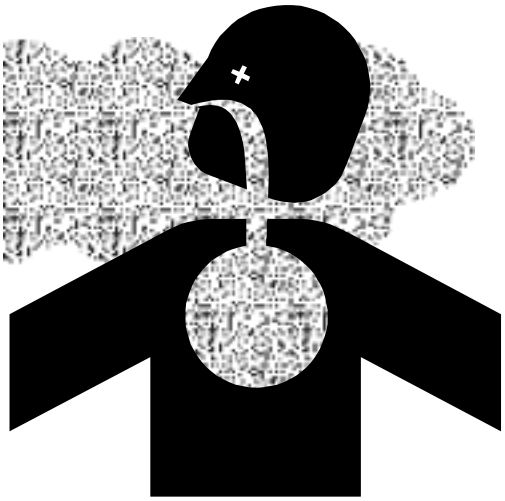
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

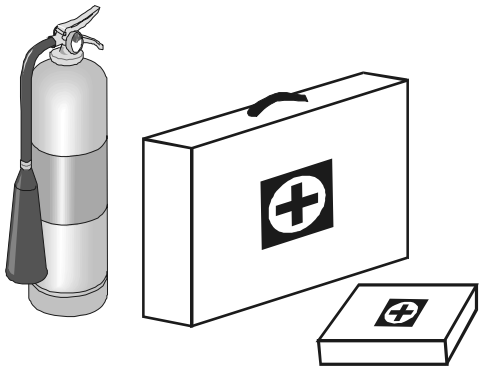


PREPARE FOR EMERGENCIES

Be prepared if fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.

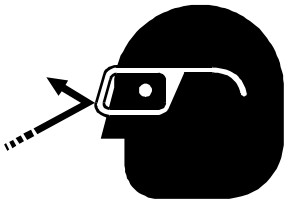
Safety glasses should be worn at all times to protect eyes from debris.

Wear gloves to protect your hands from sharp edges on plastic or steel parts.

A respirator may be needed to help prevent breathing potentially toxic fumes and dust.

Wear hard hat and steel toe boots to help protect your head and toes from falling debris.

Eye Protection



Gloves

Steel Toe Boots

Respirator

Hard Hat

DECALS

Safety decals should be read, and understood, by all people in the grain handling area. Safety decals have been affixed to the equipment to warn of danger to persons and of possible equipment damage. These decals must never be removed, tampered with, painted over or obscured in any way. If labels are damaged or become unreadable, replacement labels are available from the manufacturer.

If a decal is damaged or is missing contact:

The GSI Group, Inc.
Material Handling
1004 East Illinois Street
P.O. Box 20
Assumption, IL 62510
USA
Phone: 217-226-4421
Fax: 800-800-5329

A free replacement decal will be sent to you. (Refer to DC number on the decal).

1 DC-1199

2 DC-1199

3 DC-1377

4 DC-1378

5 DC-995

6 DC-994

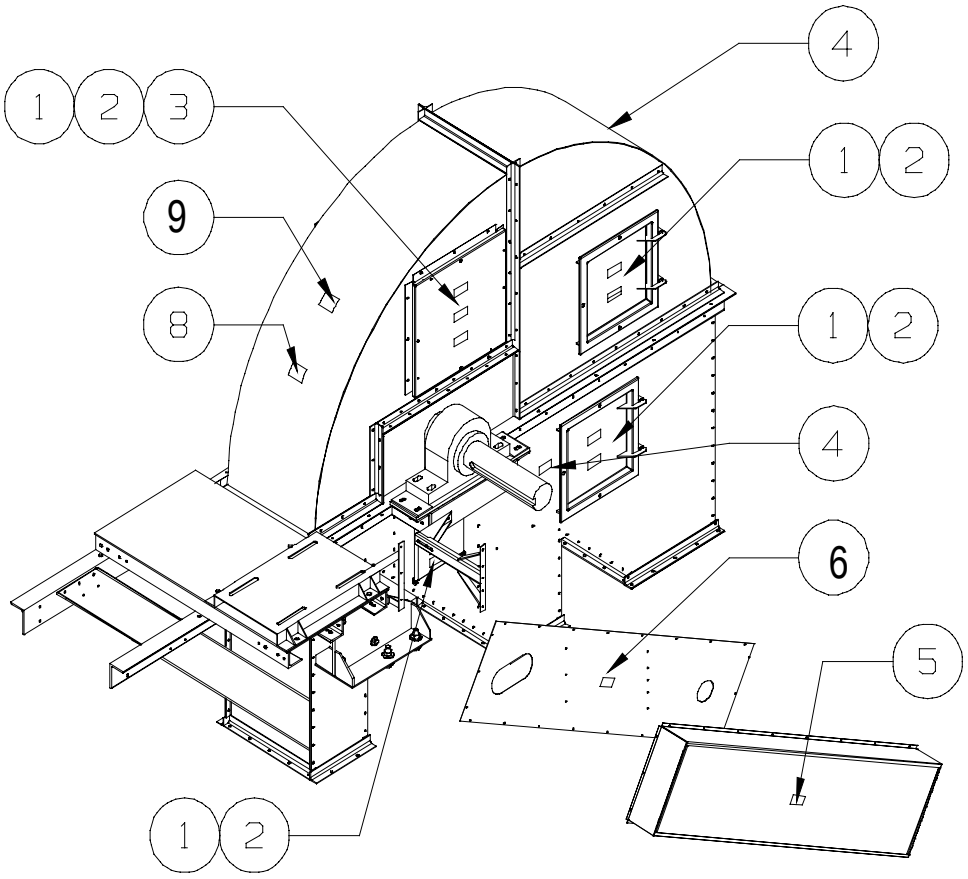
(7) **DC-1248**

(8) **DC-1224**

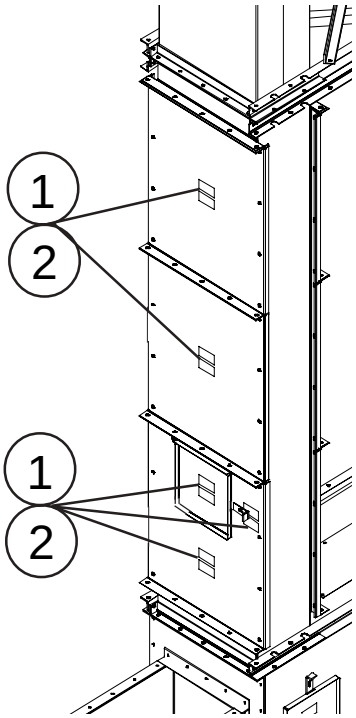
(9) **DC-1601**

DECAL PLACEMENT

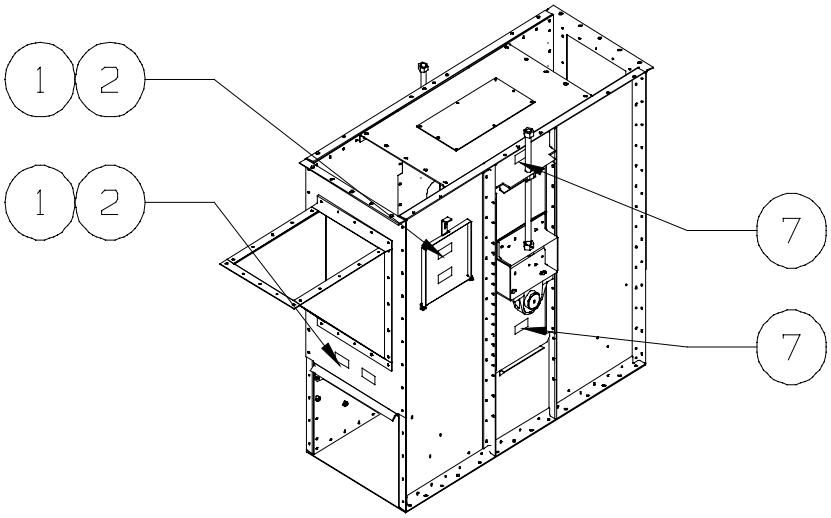
Head Section



Inspection Trunking



Boot Section

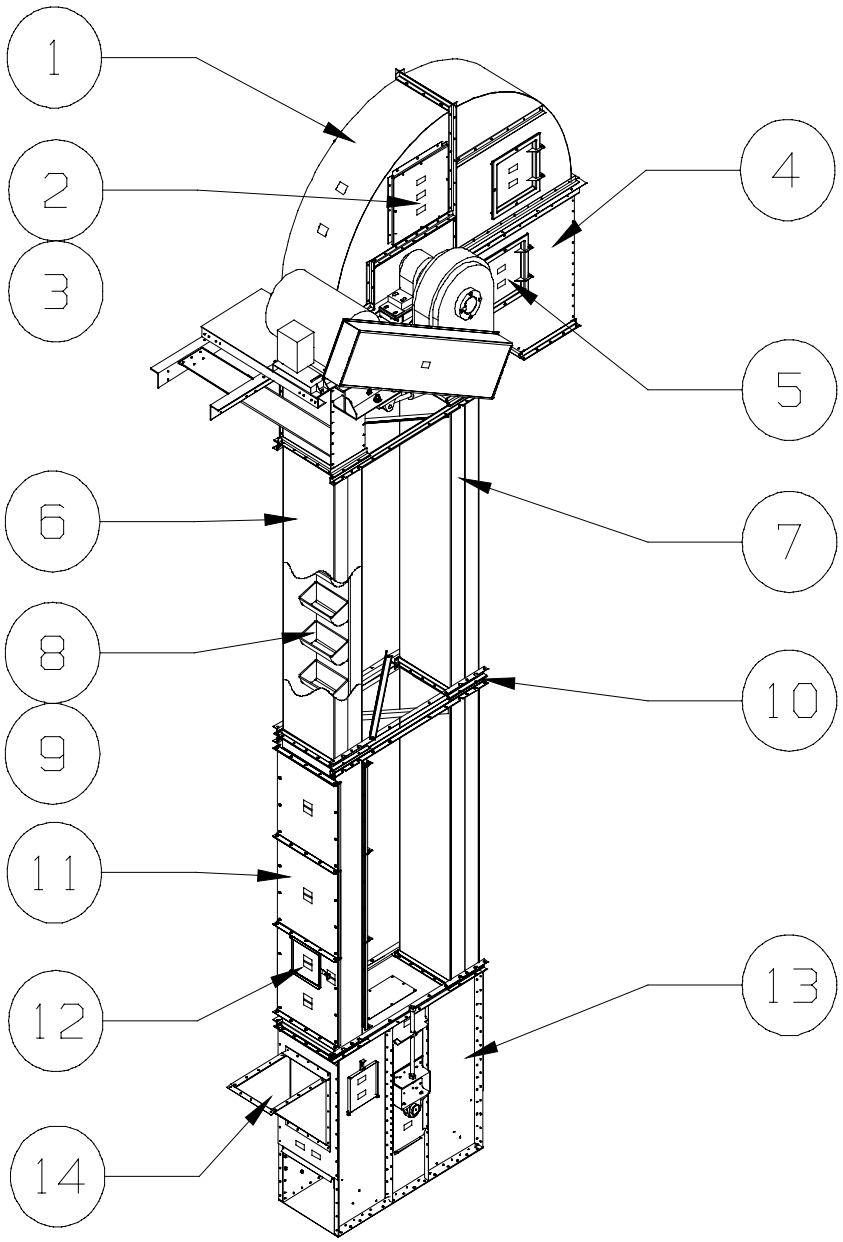


DECAL NUMBERS

1. DC-1198
2. DC-1199
3. DC-1377
4. DC-1378
5. DC-995
6. DC-994
7. DC-1248
8. DC-1224
9. DC-1601

PART IDENTIFICATION

1. Bonnet
2. Pressure Relief Panel (one each side)
3. Head Pulley
4. Lower Head Section
5. Inspection Door
6. Up Leg Trunking
7. Down Leg Trunking
8. Belt
9. Buckets
10. Tie Angles
11. Inspection Section
12. Inspection Door
13. Boot Section
14. Upside Hopper (Downside Hopper optional)



GETTING STARTED

Introduction

Thank you for your choice of our product, which has been designed to give you excellent performance and service for many years.

This manual covers general information on the your Bucket Elevator installation. We can not be responsible for the installation of this, or any other, bucket elevator. Due to the large variety of equipment features offered, we can not cover every aspect of installation with this manual. We offer suggested methods for installing bucket elevators. You should rely on your qualified contractor's experience and techniques.

General Safety Statements

The principal concern of the manufacturer is your safety and the safety of others associated with grain handling equipment. We encourage all personnel operating, installing or maintaining this equipment to read thoroughly through this manual before proceeding. It is the responsibility of the buyer to make this manual available to the person or persons involved with this equipment. Guards and safety labels have been installed prior to leaving the manufacturing plant. These devices are not to be removed, altered or defaced in any way. Alterations to the equipment may produce a very dangerous situation and may cause serious injury or death.

We recommend contacting your local power company, and having a representative survey your installation so the wiring is compatible with their system, and adequate power is supplied to your unit.

Use of the Equipment Information page will help you identify your equipment if you need to contact us. Keep this information on record.

Receiving Inspection

Carefully inspect the shipment for damage as soon as it is received. Verify that the quantity of parts or packages actually received corresponds to the quantity shown on the packing slip. Any discrepancies should be clarified immediately. One or more cartons containing the fasteners required for assembly are included with the shipment. Report any damage or shortage to the delivering carrier as soon as possible. The manufacturer's responsibility for damage to the equipment ends with acceptance by the delivering carrier. Refer to the bill of lading. Save all paperwork and documentation furnished with any of the elevator components.

Pre-Installation Preparation

Our Bucket Elevators are designed to be vertically self-supporting when erected but must be supported or guyed against wind loads.

NOTE

The elevator has not been designed to support other equipment such as cleaners, distributors or spouting. Separate structures must be provided for any accessory equipment.

The manufacturer is the vendor of the elevator and certain of its optional accessories only and does not assume responsibility for the installation recommendations contained within this manual. The installation recommendations contained within this manual are for consideration only. The user or installer must consult a civil or structural engineer regarding the design, construction and supervision of the entire installation, including the elevator foundation and the guying cable and/or bracing system.

The MOST IMPORTANT preparations are retaining a licensed engineer to plan the installation and a qualified millwright or contractor to erect the elevator and the accompanying equipment and structures.

BUCKET ELEVATOR FOUNDATION

The bucket elevator foundation must be designed by a qualified civil engineer and installed by a qualified contractor. Consideration should be given to live loads, dead loads, wind loads, and soil bearing loads. Attention should also be given to ensure proper moisture run-off on the top of the base.

BOOT SECTION

Boot Section

Prior to boot installation on the foundation, examine entire boot for any damage or loose hardware. Do not attempt to install if parts are damaged.

Boot sections are pre-assembled at the factory, however Boot Inlet Hoppers are typically shipped separately. Take time now to identify the up and down side of the boot, as proper positioning is critical. The boot inlet section can be installed either as an up-leg or a down-leg inlet. You will note that the up-leg inlet position is approximately six (6") inches higher than the down-leg side. By removing the nuts and inlet blank plates, the boot inlet hopper can be attached.

There are a variety of ways to anchor and level the boot section. It is our recommendation to shim to the perimeter, then secure with hold-downs, and finally grout the base. Whatever technique is used it is important that the boot be level and plumb. Check boot levelness and plumbness periodically throughout the installation process to insure proper elevator erection. After boot is set in place, level in all directions prior to anchoring. Use anchor bolts and mounting brackets (not supplied) to secure boot to foundation.

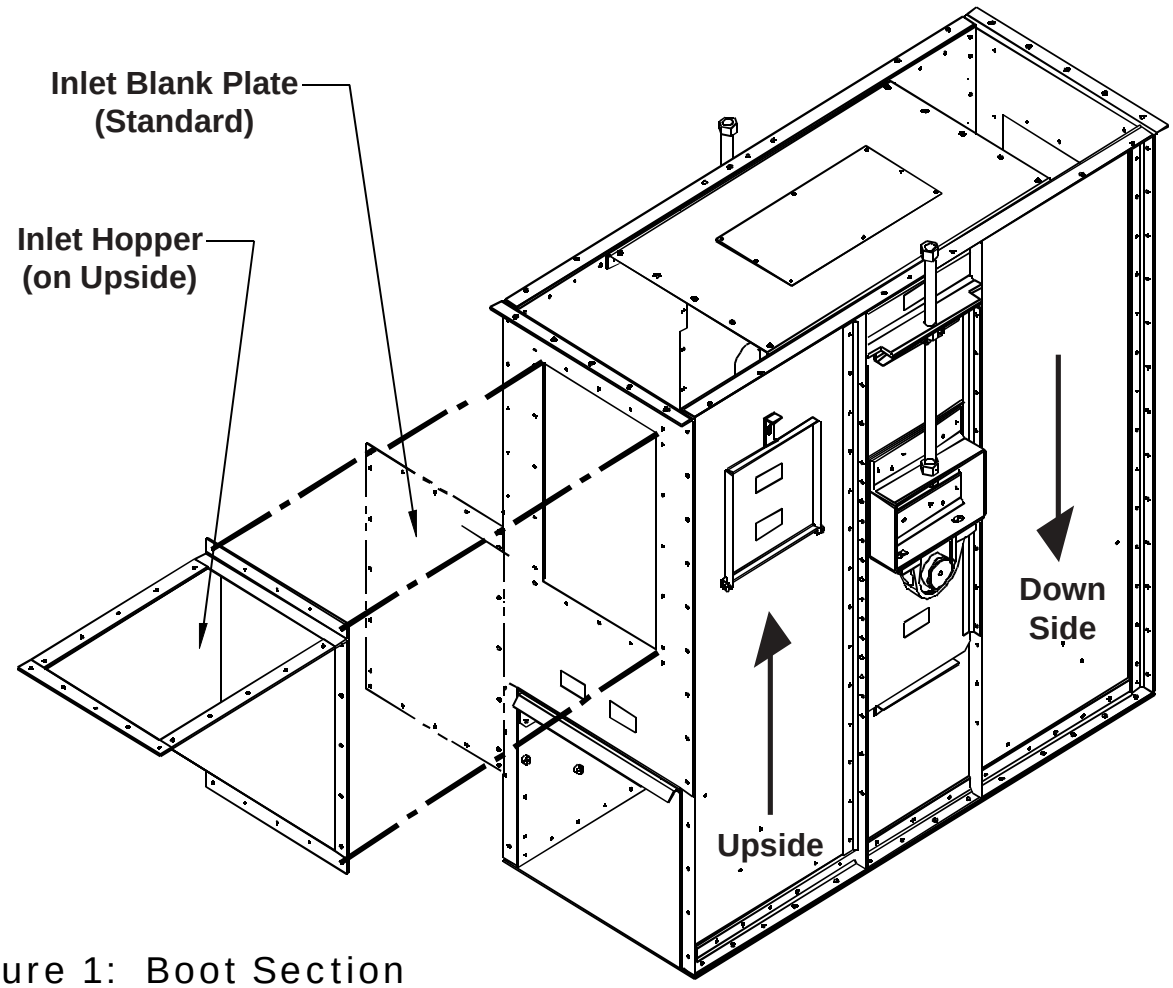


Figure 1: Boot Section

INSPECTION SECTION

The inspection section of your Bucket Elevator has been designed for ease in installation and maintenance. The removable panels are versatile and can be installed in any order. This design allows for the inspection doors to be installed at various positions determined by the installer. Typically, the inspection section is located directly above the boot, on the up-leg side as the first trunking section.

NOTE

This type of installation will vary and will depend on your configuration and application.

Along with the inspection section you will receive installation hardware and two (2) tie-angles. Units containing 42" diameter pulleys and larger, will include a cross tie on the legs, which will be included. (See Figure 2 & 3)

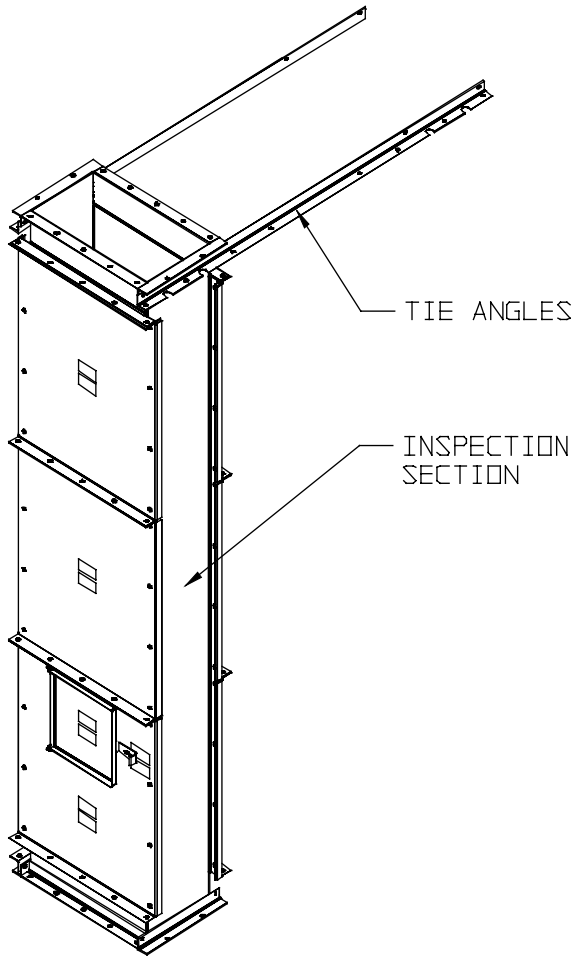


Figure 2: Inspection Section

STANDARD TRUNKING

The standard trunking sections may be fabricated from either painted steel or galvanized steel. The galvanized steel trunking must have the riveted (Huck Bolted) seams located to the inside facing each other on the up leg and the down leg. (See Figure 4.)

The trunking sections come complete with the appropriate hardware and two (2) tie angles. Units containing 42" diameter or larger pulleys, have a cross tie angle included for additional support.

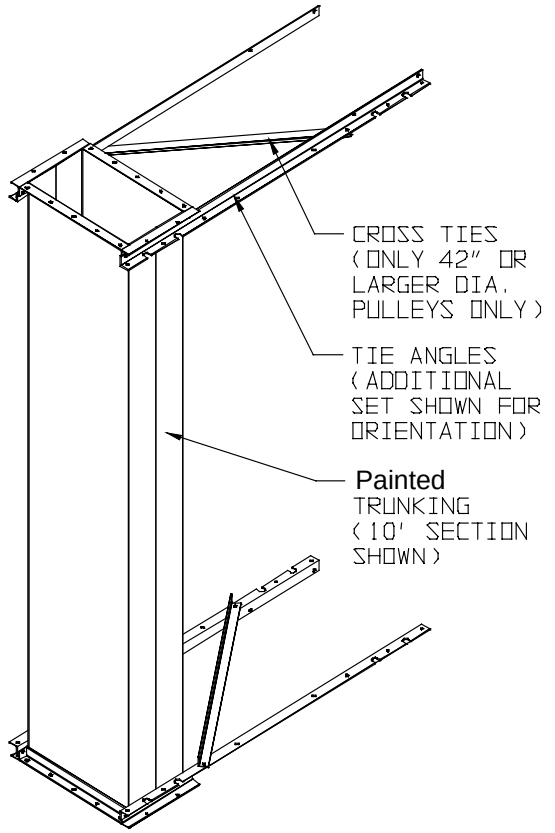


Figure 3: Painted Trunking

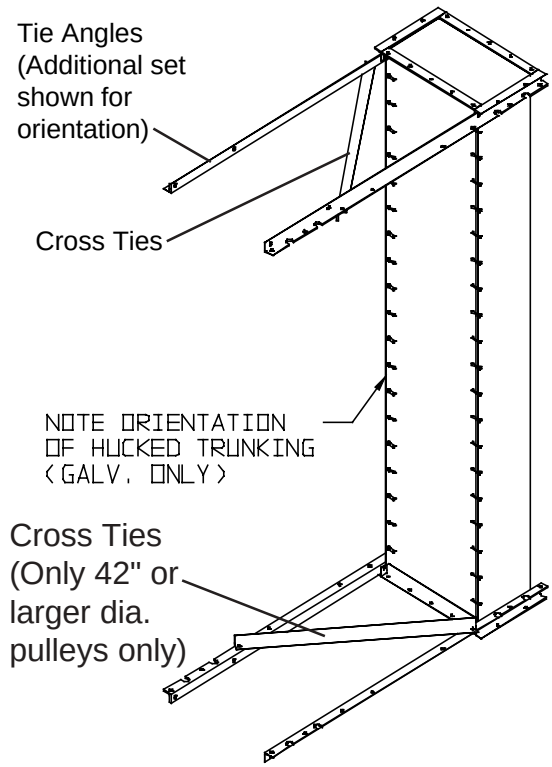


Figure 4: Galvanized Trunking

PRESSURE RELIEF TRUNKING

Pressure Relief Trunking is standard trunking that has been modified to include two panels specifically designed for pressure relief. These panels will be located on the short sides of the trunking directly opposite of each other and centered on ten foot (10') sections of trunking. Included with the mounting hardware will be two (2) tie-angles. As with other systems utilizing 42" diameter and larger pulleys, there will be a cross-tie located on the legs.

⚠WARNING **Removal of all shipping bolts in the Pressure Relief Panels are required before operating any bucket elevator**

NOTE **This unit requires special attention to the relief panel. This area must be inspected for damage to the panel, frame and particularly the hardware.** ***DO NOT INSTALL TRUNKING IF THERE IS ANY APPARENT DAMAGE OR DEFECT.***

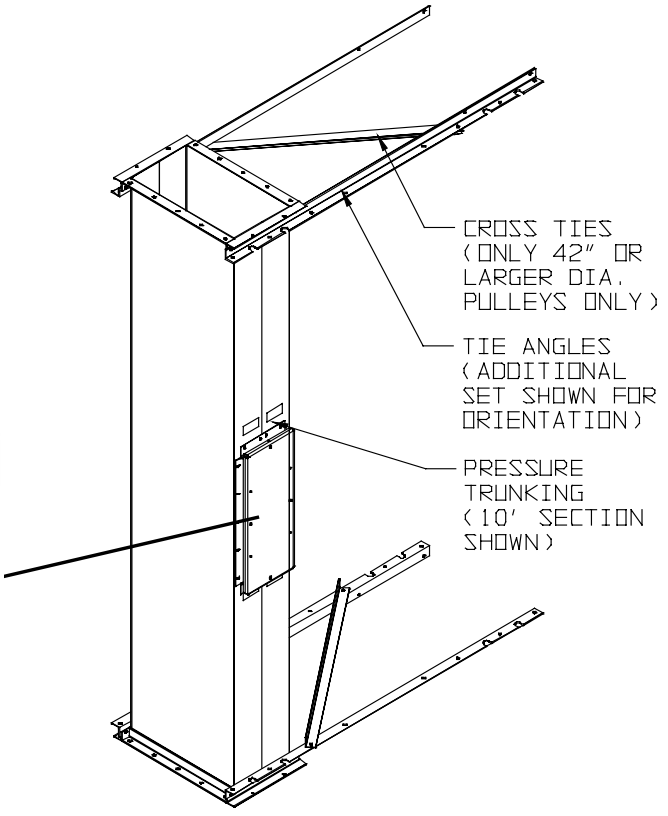


Figure 5: Pressure Relief Trunking

TRUNKING INSTALLATION

Prior to any trunking installation inspect for damage to equipment. Immediately repair or replace defective item(s). It is very important to locate a level surface area in order to correctly assemble the trunking sections.

Section together to make double trunking. Attach tie angle to single trunking as shown. Also if 42" diameter or larger install cross-tie angle. Multiple sections can be ground assembled. Make sure these sections are assembled straight without twist. (We suggests no more than thirty (30) linear feet at any time). Caulk all mating companion angle surfaces to insure water and dust resistance.

It is important to maintain plumb and square trunking in all directions. Guying and plumbing the trunking in all directions is recommended after each section is installed. It is recommended that these levels be checked throughout the legging installation process. It is equally important to insure that all connecting hardware is secure.

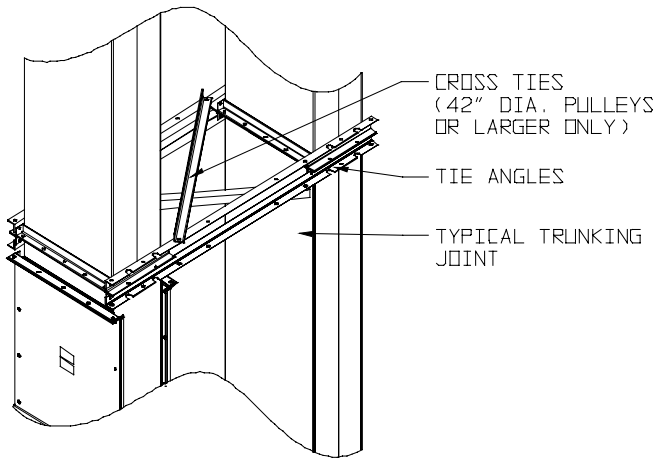


Figure 6: Trunking Joint

NOTE

The attachment bolt holes in the tie angles are intentionally tight for the ½" dia. Bolts. This is to aid for more precise plumbing of the trunking. DO NOT drill out attachment hole. If bolts are hindered going through hole, thread bolts through to reduce chances of damaging threads.

LOWER HEAD SECTION

The Bucket Elevator Lower Head Section is primarily assembled at the factory. The installation hardware used to attach the head section to the trunking system is included. The drive is shipped separately from the Lower Head Section. It is important to inspect all parts for damage and to insure that all hardware is secure.

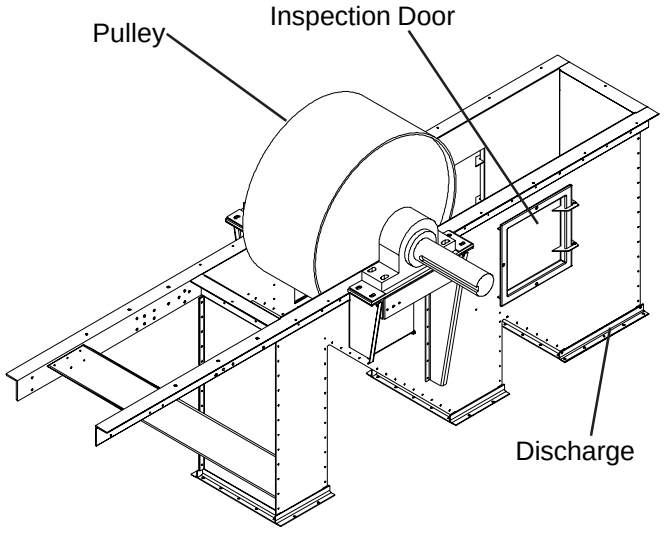


Figure 7: Lower Head Section

PLUMBING

To ensure proper bucket elevator plumbness, set up two transits, one in each direction. Refer to the figure below for proper tolerance in elevator erection.

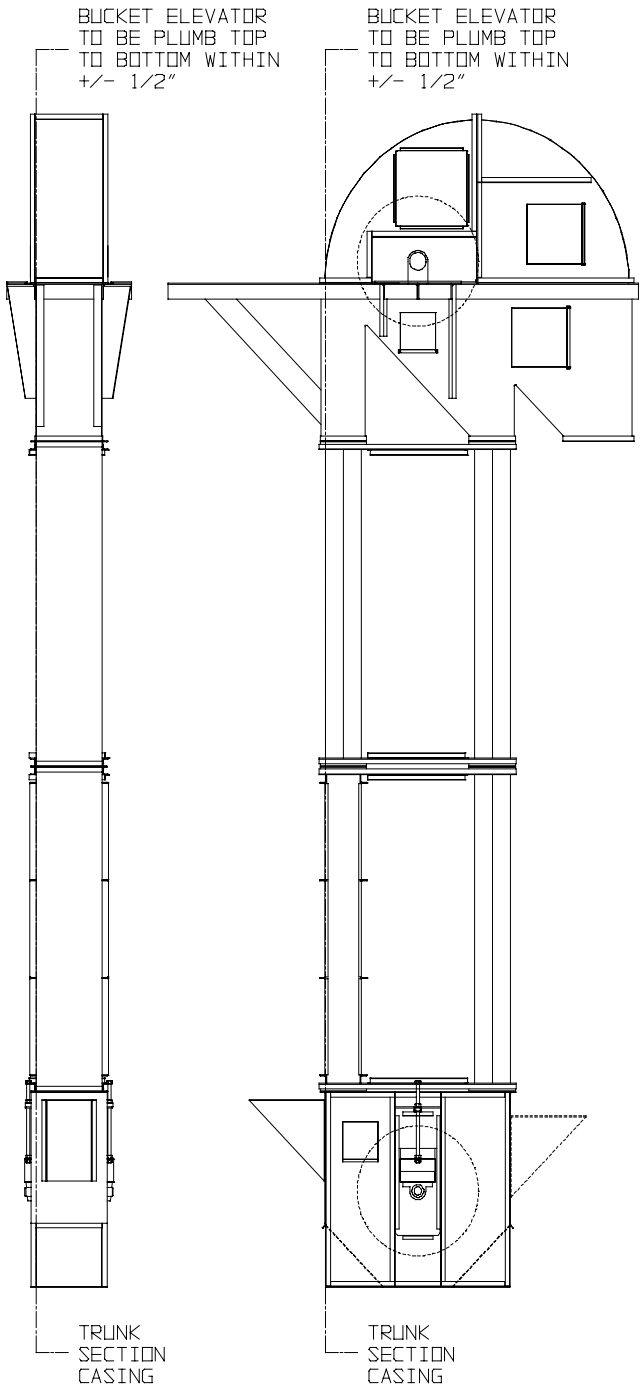


Figure 8: Plumbing Tolerance

HEAD BONNET SECTION

The Bonnet has been designed in two piece construction to allow the front (Discharge) side to slide forward and clamp in place for maintenance to the belt, buckets, pulley, etc. The rear (up-leg) side bonnet included factory installed pressure relief panels. These panels should be carefully inspected for damage including screws and washers. Pressure relief vent door should not be altered in any way except to remove shipping bolts. Motor mount and torque arm will need to be adjusted to fit your drive package per supplied detail. Hardware used to attach bonnet section to head section is included.

⚠WARNING **Bonnet section 'U' lugs are for lifting bonnet section alone only, DO NOT LIFT BONNET AND LOWER HEAD SECTION TOGETHER!**

⚠WARNING **Removal of all shipping bolts in the Pressure Relief Panels are required before operating any bucket elevator**

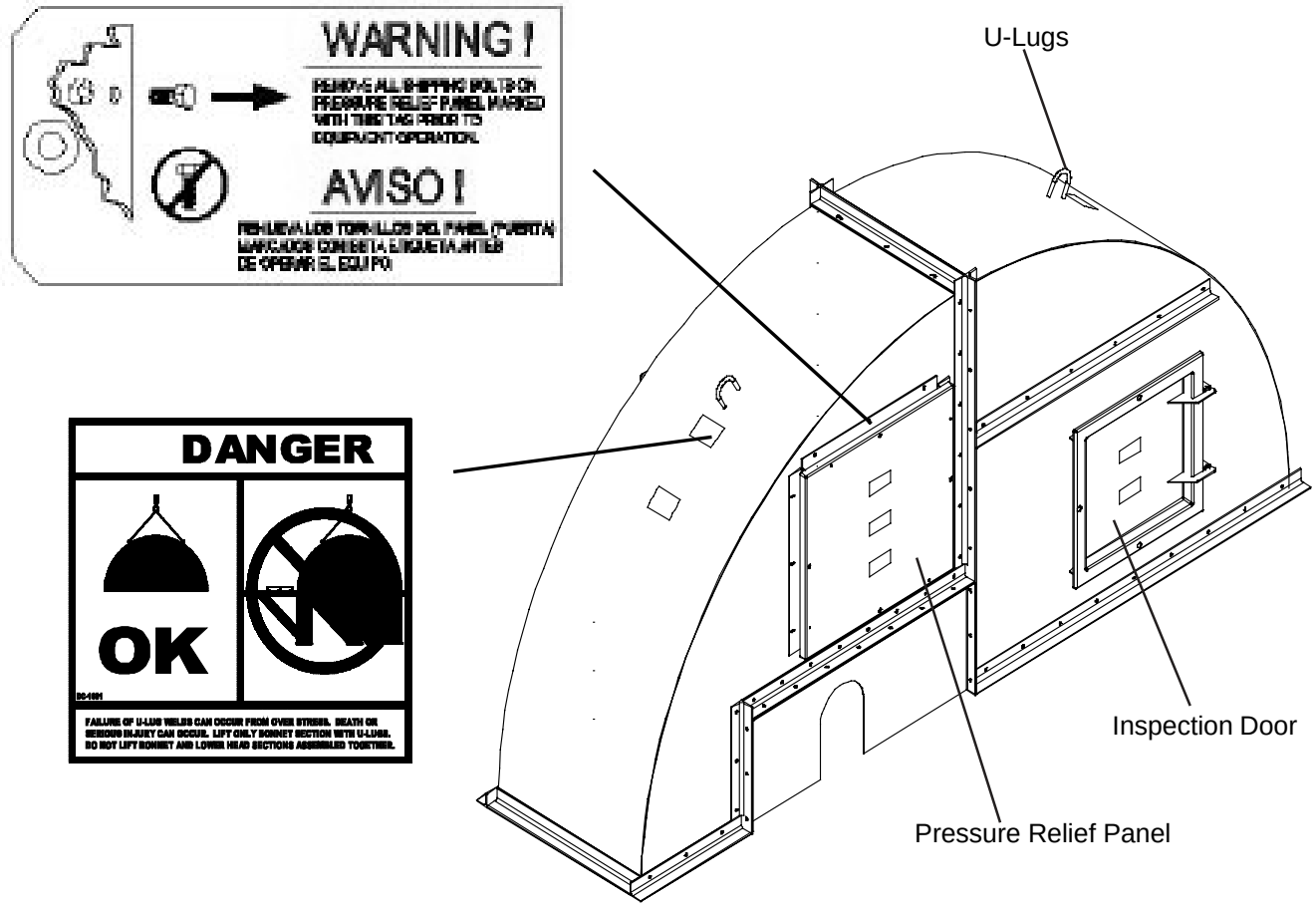


Figure 9: Head Bonnet

BELTING, BUCKETS, AND SPLICING

Belting

The belt for your elevator leg has been specifically chosen based on leg height, grain, weight, pulley diameter, etc. The belt has been pre-punched to accommodate special buckets with specific spacing. The most important criteria when choosing an installation technique is to choose one that is safest for you. Installing the belt can be accomplished several different ways. Prior to installing the belt, the boot pulley should be raised to it's upper most point to allow for proper belt tensioning. On shorter installations, first assembling the buckets to the belt may be less time consuming. However, the additional weight of the buckets and connecting hardware make the belt more difficult to handle.

One of the methods used to install belts is to feed the belt up through the inspection section, over the head pulley, feeding through the Down-Leg, around the boot pulley, and back up to the splice.

⚠CAUTION **To prevent the belt from rolling over the top, anchor the upper end securely.**

Splicing

Upon connecting the ends of the belt together a winching device such as a Come-a-Long may be required. The recommended splice technique is achieved by overlapping the belts or the bar splice. When lap-splicing, draw a 5' minimum of the belt coming up from the bottom of the boot, over belt hanging down from head.

An alternative method, the bar splice (not included) is usually accomplished by turning the ends of the belt out and affixing the manufactured bar splice components per the manufacturer's recommendations. Lacing and other specific types of belt splicing are not recommended. Please consult the factory or your contractor if in question.

Buckets

Buckets are attached to belting using elevator bolts pushed through the belting back side, through the elevator bucket, a flat (fender) washer, a lock washer, and a nut. Secure bucket by tightening nut to slightly indent belt back with bolt head. **Remember to leave buckets around splice area off, if installing buckets prior to belt installation.** (See diagram)

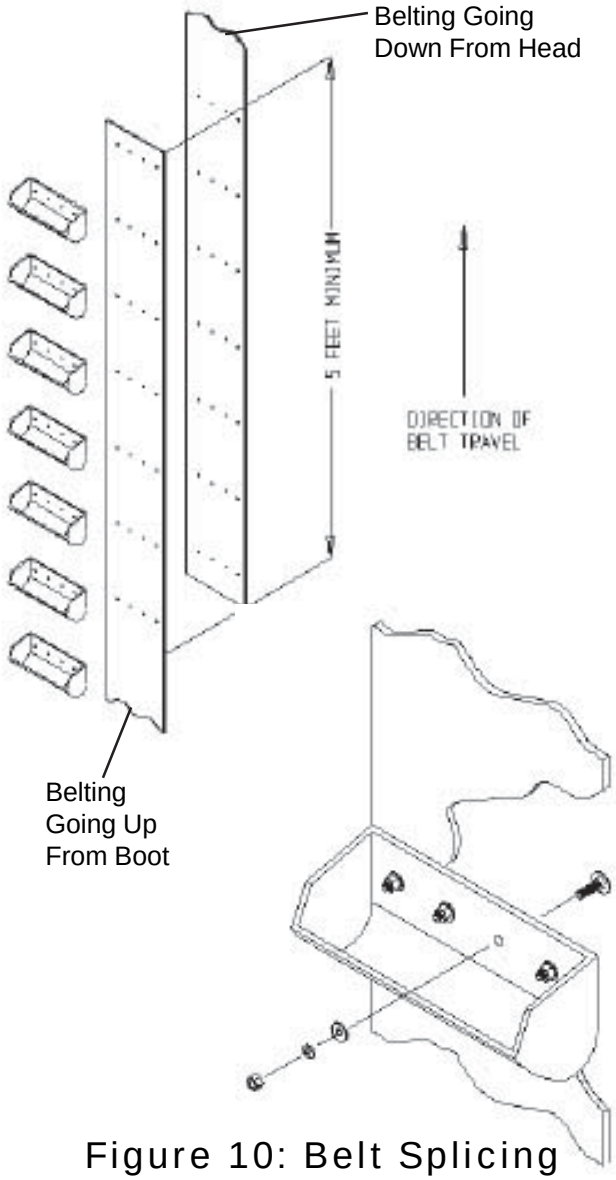


Figure 10: Belt Splicing

CAUTION

DO NOT OVER TIGHTEN BOLTS!
Torque requirements are as follows:
50 inch pounds for 1/4" bolts
96 inch pounds for 5/16" bolts, and
180 inch pounds for 3/8" bolts.
Overtightening can lead to breakage.

***ALWAYS* recheck bolts for correct torque after initial start up and periodically thereafter.**

REMOVING SLACK FROM BELT

Remove any slack in belt after splice connection by lowering boot pulley. It is important that the boot pulley and shaft are checked and maintained to be horizontally level.

Manual Screw Take-Ups

For manual screw take-ups, turning the take-up screws on each side of the boot controls the boot pulley position. After adjustment, be sure to lock each take-up screw in position with the locknut provided.

Gravity Take-Ups

For gravity take-ups, weight provides the tensioning method. In some cases no additional weight in the weight box may be needed because the weight of the belt, cups, weight box assembly and boot pulley assembly may provide adequate tensioning in the belt to eliminate slippage at the head pulley. When adding additional weight (weight not included), use maximum increments of 100 pounds and make sure the weight is equally distributed from side to side for proper belt tracking. The bearing plate adjustment screws are used to level the boot pulley after any needed weight is added. Loosen the bolts attaching the channels of the weight frame assembly to the bearing plate assembly before adjusting the bearing screws. After adjustments have been made, retighten bolts and snug the bearing plate adjustment screw locknuts.

NOTE

Lowering the bearing plate to which the belt is tracking towards on the boot pulley should cause the belt to track back towards the center of the pulley. Inversely, raising the bearing plate to which the belt is tracking away from will achieve belt centering as well.

Do not over tighten belt, as this will decrease the life of the belt.

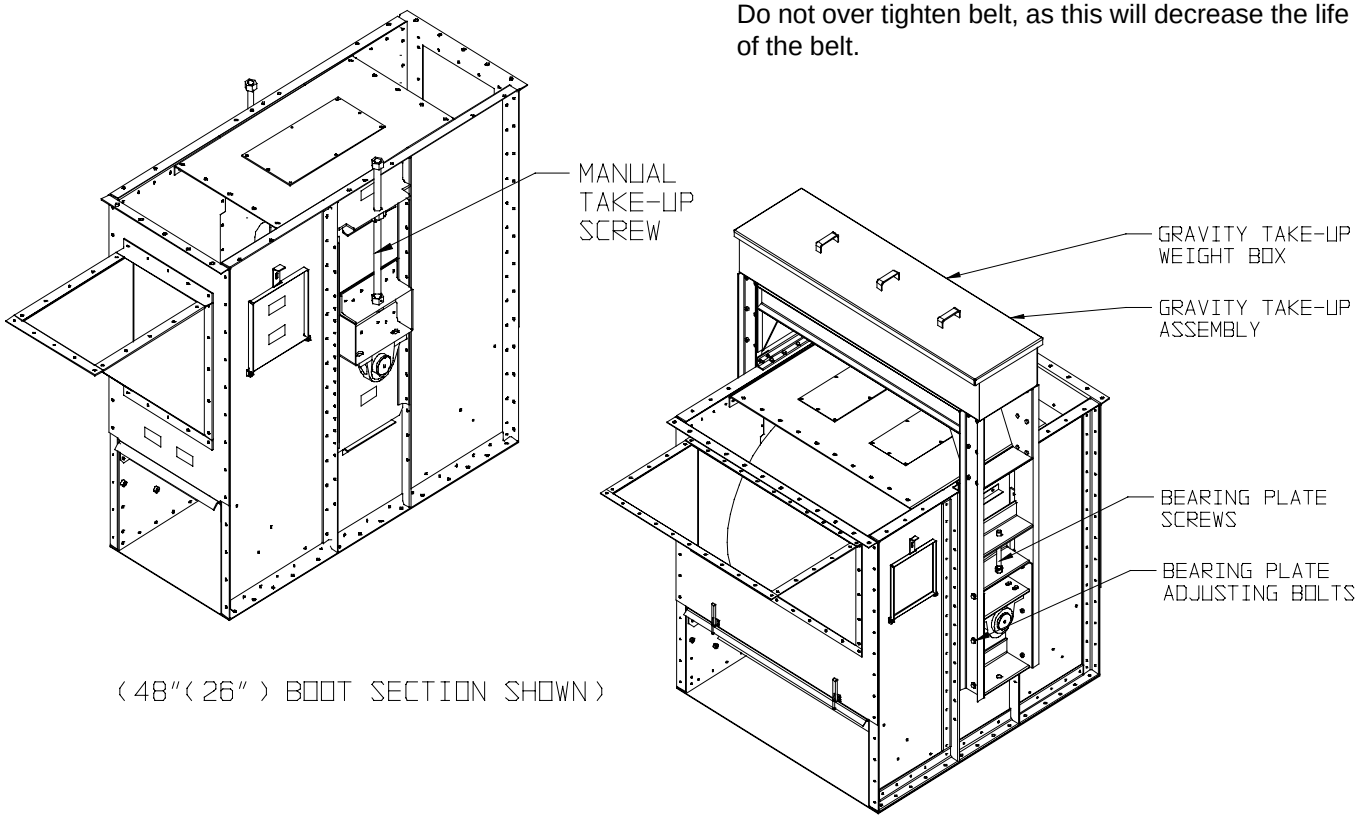


Figure 11: Take-Ups

DRIVE ASSEMBLY

The following assembly instructions are for standard drives as purchased with your elevator from the company. The standard drive is designed using the Dodge Torque Arm II shaft mount reducer and details on the application of this reducer are included in the Torque Arm II Appendix of this manual. If you have purchased a special drive or purchased the drive components from another source, refer to manuals supplied with the vendor components.

Your drive assembly is designed so that the same components fit in either a left hand or right hand drive application. If facing the head side, the reducer is between you and the head, and the head discharge is on the right hand side of you, then you have a right hand drive application. Conversely, if the head discharge is on the left side of you, then you have a left hand drive application. The figures shown below are for a right hand application.

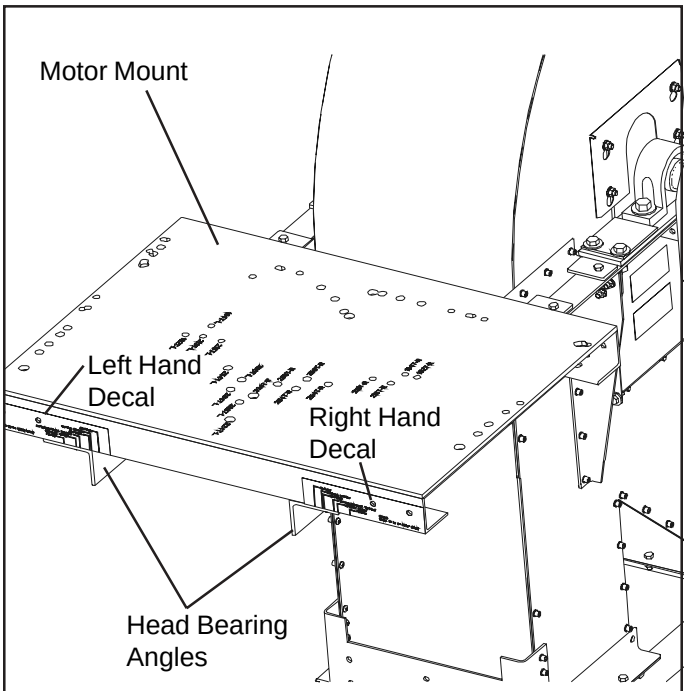


Figure 12: Motor Mount Plate

MOTOR MOUNT ASSEMBLY

Motor Mount

To determine the correct placement of your motor mount assembly, do as follows:

1.) Find the side of the motor mount which has two decals affixed. (See Fig 12.) One decal will have “LH” for left hand and one will have “RH” for right hand.

2.) Place the motor mount such that the decals face away from the pulley towards the end of the head bearing angles.

3.) Find your horsepower, class rating and drive application side on the decals. Follow the indication line next to those numbers to where it points down to the bottom of the motor mount.

4.) Slide the motor mount in or out while keeping the correct decal mark lined up with the outside toe of the head bearing angle. (See Fig. 13) This will align the holes in the head bearing angles to the proper holes in the motor mount assembly.

5.) Using the proper hardware, bolt the motor mount down to the head bearing angles.

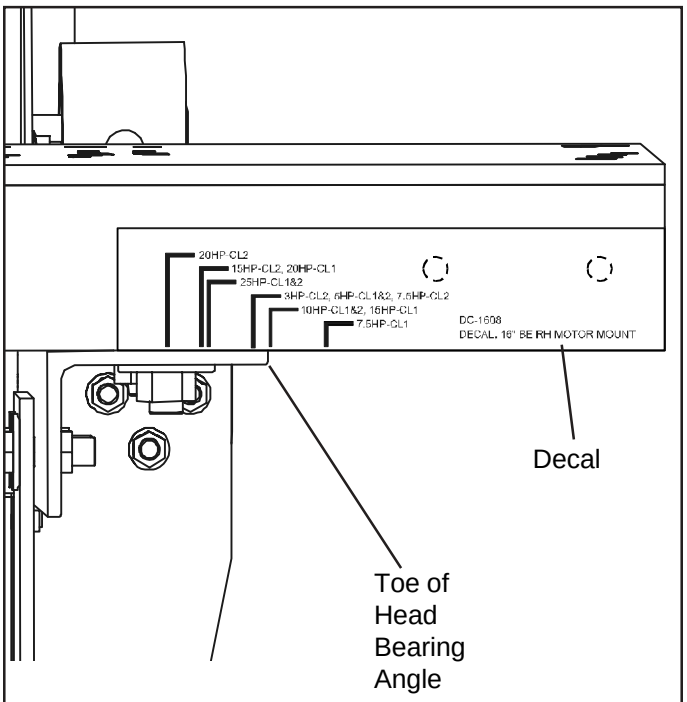


Figure 13: Right Hand Motor Placement Decals

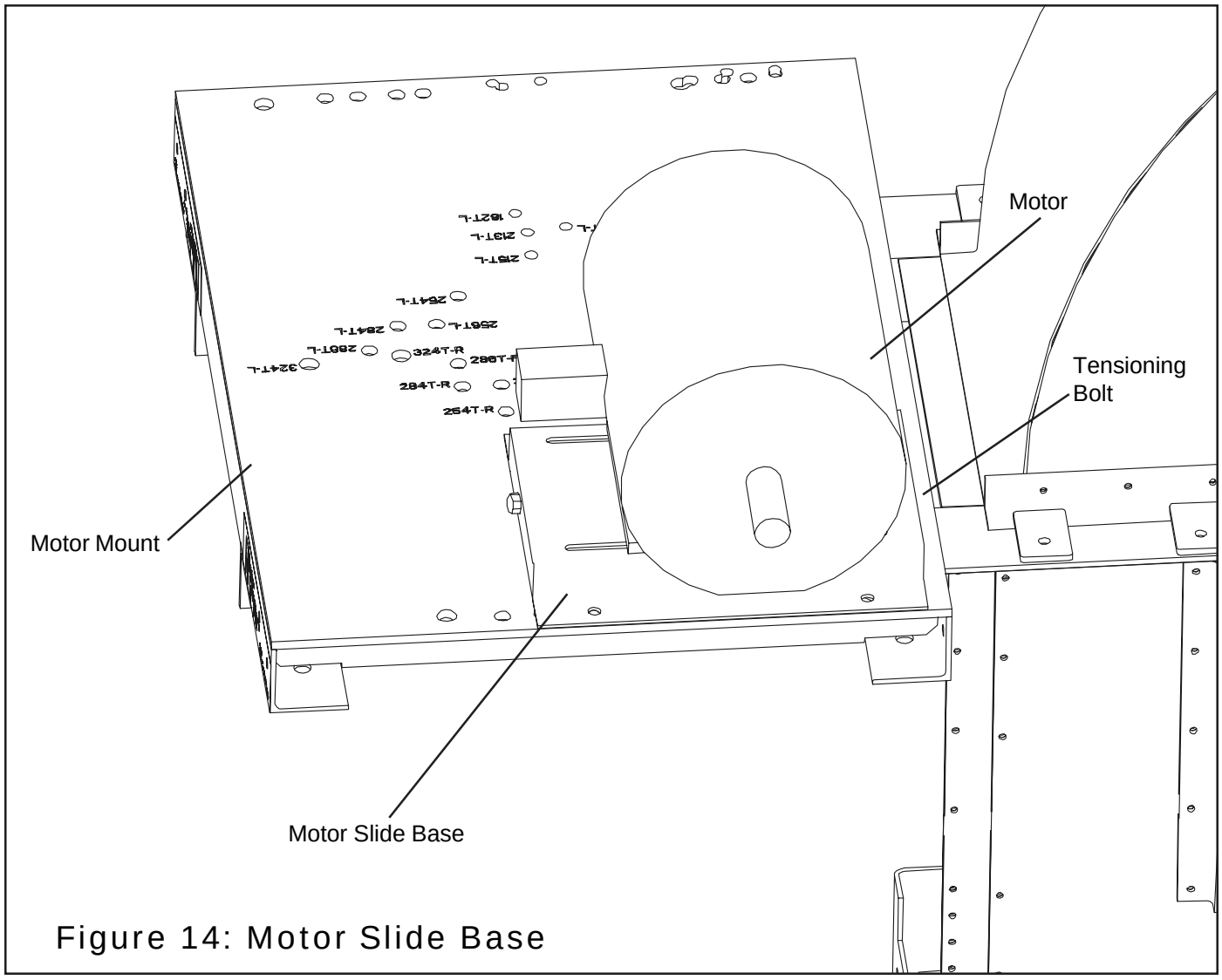


Figure 14: Motor Slide Base

Slide Base

Place the motor slide base upon top of the motor mount, respectively to the drive application side. The slide base will fit in only one set of holes. (See Fig 14.) Make sure that the tensioning bolt is positioned so that tightening will pull the motor away from the pulley. Using the proper hardware, bolt the slide base to the motor mount.

Place the motor onto the motor slide base and position the motor as close as possible toward the pulley. Using the proper hardware, bolt into position.

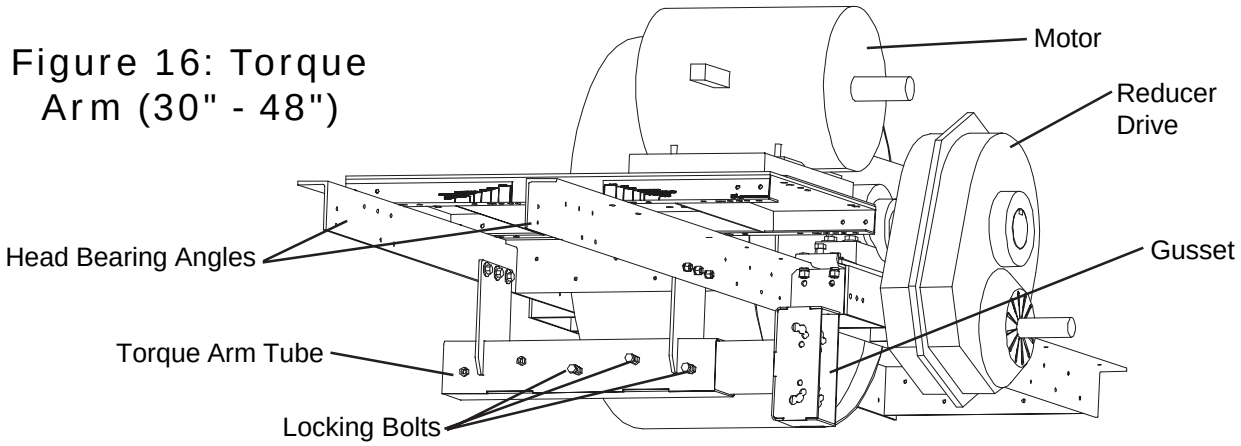
TORQUE ARM

Place the torque arm Tube assembly to the head section by sliding the two gussets of the torque arm assembly between the head bearing angles, making sure the locking bolts face away from the head section, attach with the proper hardware. (See Fig 3) On 16” & 24” Elevators, the torque arm tube will slide in and out freely with the motor’s torque causing a positive lock situation. In 30” & up Elevators, loosen the three locking bolts and place the torque arm foot mounting tube in the torque arm assembly such that the foot mounting bracket is to the side in which the reducer will be mounted. Wait until the reducer is set on the shaft to retighten the locking bolts.

SHAFT MOUNT REDUCER

For reducer assembly, see page 30 of the Torque Arm II Reducer Installation Appendix. This appendix has detailed installation instructions of the reducer bushing mounting along with instructions for options such as cooling fans and backstops. Once the reducer is assembled, attach the torque arm turnbuckle assembly to the reducer, and the torque arm foot to the foot mounting bracket of the torque arm tube using the proper hardware.

Figure 16: Torque Arm (30" - 48")



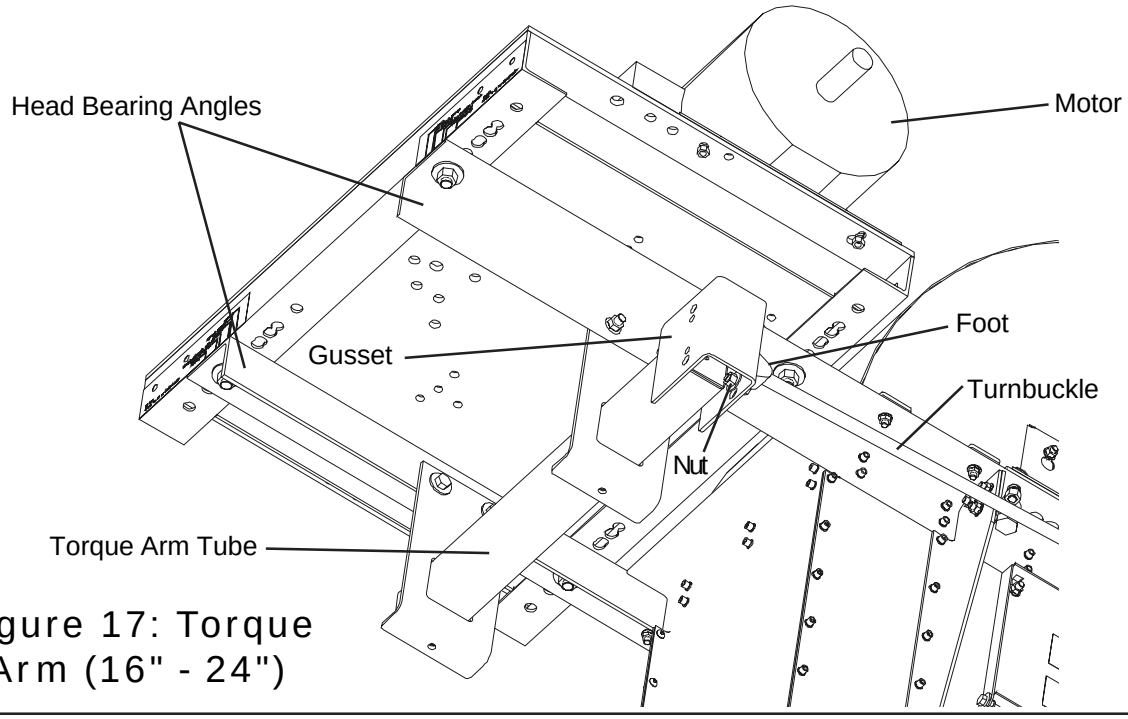


Figure 17: Torque Arm (16" - 24")

DRIVE GUARD

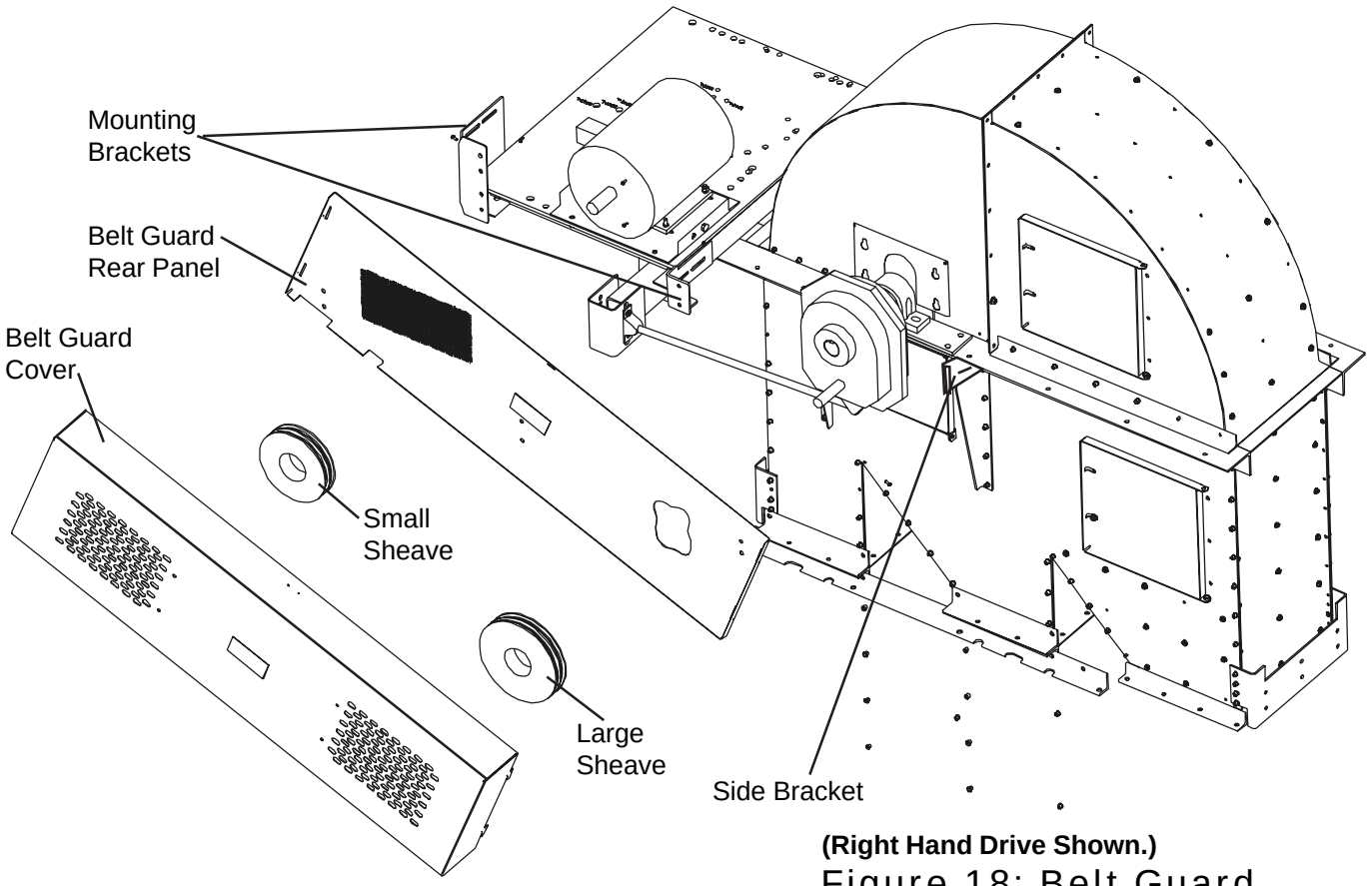
Attach the drive guard brackets to the motor mount assembly. (See Fig 4) The shorter broken legs of the brackets will point towards the pulley. Align the guard rear panel of the guard to the brackets. Note, in a right hand drive application as shown in Fig. 4, the flanges of the guard rear panel will face away from the head section, but in a left hand application, the flanges will point towards the head section. The wider, larger, hole in the guard rear panel is intended to accept the motor output shaft. The guard rear panel will only attach in one orientation. Once rear panel is bolted on, attach the drive guard struts to the bearing support of the head section and to the rear panel. Using hardware, bolt the two struts together. All brackets are designed to be adjustable.

Place sheaves onto the output shaft of the motor and the input shaft of the reducer. Place belts upon the sheaves.

Note that the reducer may need to be rotated, clockwise or counterclockwise, in conjunction with slide base adjustments, to achieve correct center distance for the drive belts. Move the location of the reducer torque arm turnbuckle to achieve this rotation, as needed. The belts are designed specifically per application. Once the drive belts are tensioned, and the reducer is rotated (if necessary), tighten all bolts. For installing the safety screen around the motor output shaft, approximate the hole location to the screen, and snip clearance hole in screen. (See Fig 5) Attach using proper hardware. Attach belt guard cover, latch and bolt.

NOTE

Shaft mount reducers are shipped without lubricant! Do not operate the elevator until the gear reducer has been filled with an approved lubricant as noted in the Torque Arm II Appendix of this manual. With the reducer in vertical position, fill with lubricant until oil runs out of oil level plug. See the Appendix for volume of oil per reducer size.



(Right Hand Drive Shown.)

Figure 18: Belt Guard

DRIVE GUARD

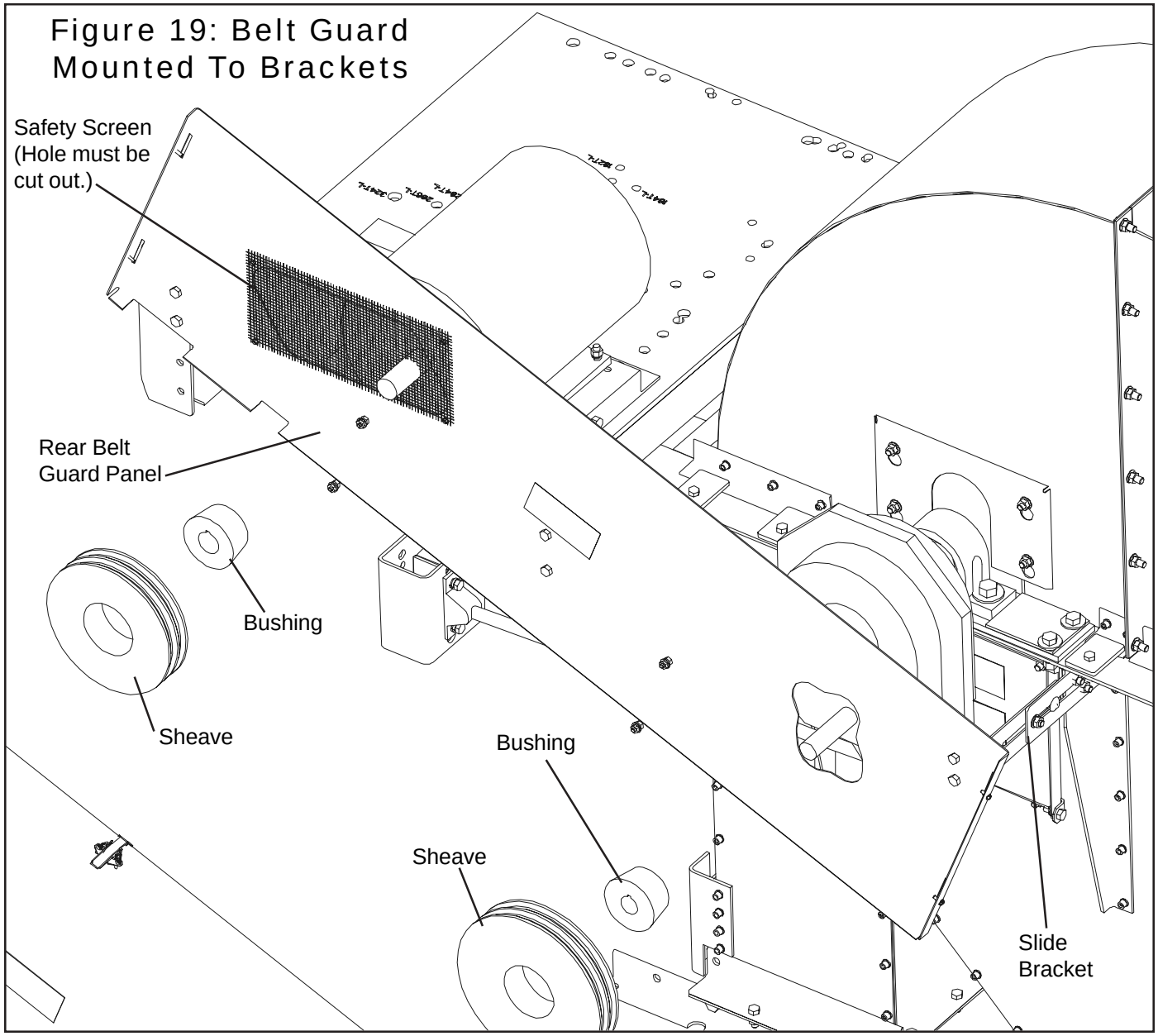


Figure 19: Belt Guard Mounted To Brackets

DRIVE GUARD

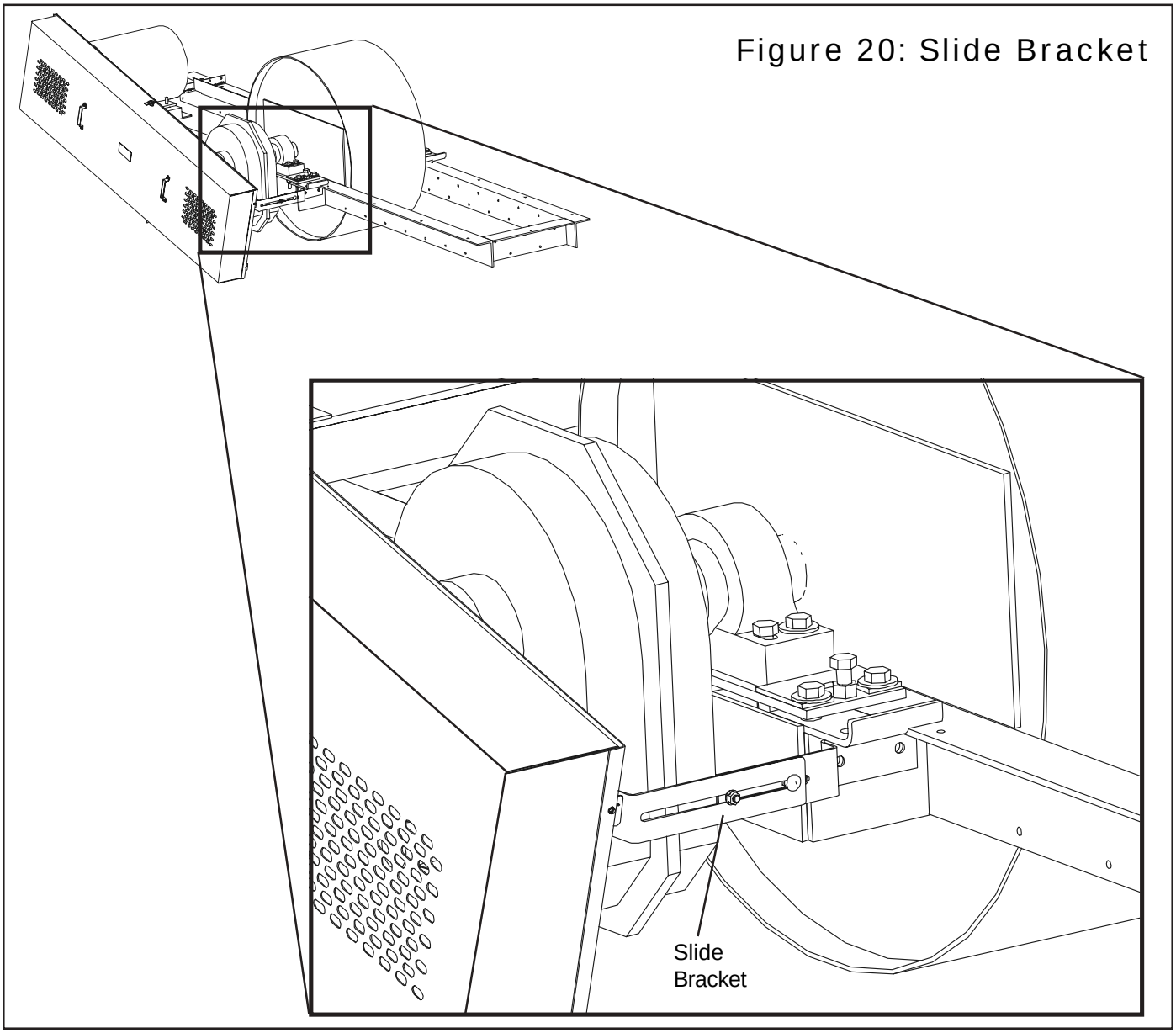


Figure 20: Slide Bracket

DRIVE BELTS

Belts are designed to fit loose upon installation. Tensioning of belts to an acceptable level is accomplished through the Motor Mount Adjustable Slide Base. Proper tension is 1/64" of deflection per, 1" of sheave centers on one side of belt, centered between sheaves.

NOTE *Too much tension shortens belt life. Check belt tension frequently during the first 24-48 hours of operation.*

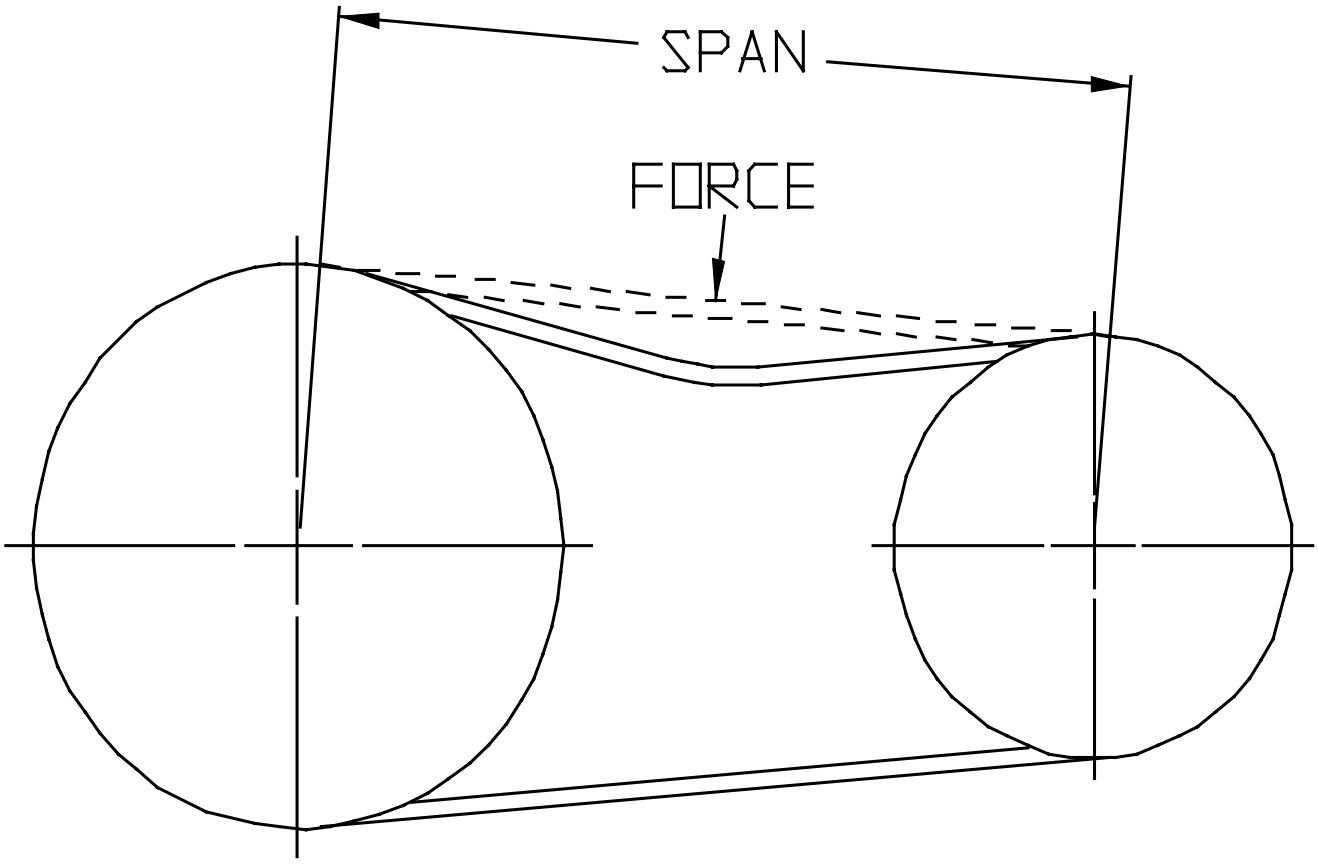


Figure 21: Drive Belt

FINAL CHECKS & START-UP

Final Checks and Start-up

Adjust the throat plate in the head discharge so there is about 1/4” clearance between it and edge of the buckets on the lap splice.

⚠CAUTION

1. Check clearance at the lap splice.

2. Do a final check of all parts to be sure all hardware is tight and no foreign objects or tools are left inside elevator.

3. Check all guards, inspection doors, and removable plates to be sure they are in place and secure.

4. Tighten the take-up screws on the boot evenly to tighten the belt on the pulley, keeping bottom pulley level, and work from side to side in small amounts until belt is tight.

5. Rotate by hand or carefully jog drive to check for proper rotation, clearance and operation of entire unit. Make any adjustments necessary. Jog minimum of one complete revolution of belt. If no problems exist, carefully run elevator while checking all aspects of operation of the unit.

Tracking

Tracking of the belt is very important for optimum results. To correct any tracking problems first adjust the boot bearing plates. Adjust the take up screws downward on the side that the belt is tracking toward. If this does not correct the problem or if the belt is tracking properly on the boot pulley but not the head pulley, further adjustments to the head pulley may be required.

The bearing side that the belt is tracking toward may need to be shimmed to compensate. After loosening the head bearing bolts that go thru the head angle, use the jacking screws to raise the bearing. A full shim is placed under the bearing base, jack screws are backed off and the bearing mounting bolts are retightened. Use thin shims to make small adjustments until the belt tracks properly.

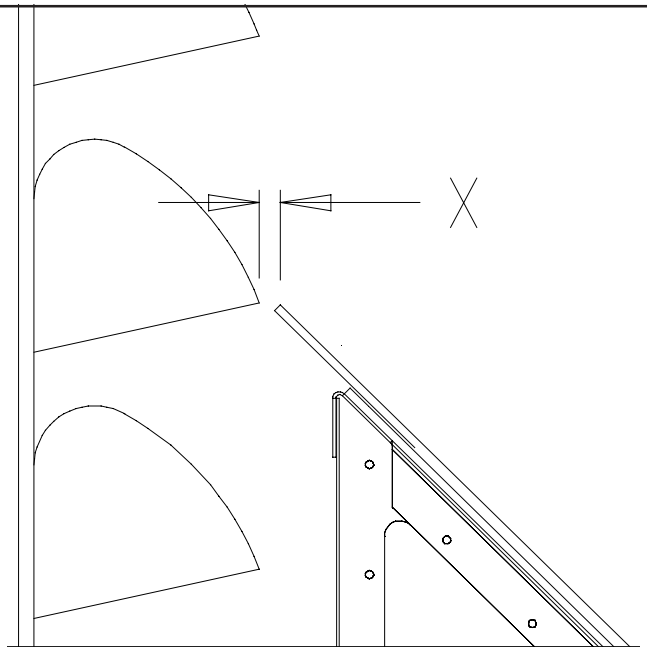


Figure 22: Throat Plate

Start-Up

Once you are sure everything is complete and all adjustments are made and proper lubrication is done, run the elevator for an initial break-in WITHOUT load for several hours. Look and listen for any irregularities before running any material through the unit. Recheck all moving parts and adjust as needed. The final tension of the belt is done under load.

Maintenance

The belt will stretch after installation and may need further adjustment. Expect some stretching during the first few weeks of operation. On manual take-up boots, belt tension should be maintained by turning the boot take up screws slowly and evenly to maintain proper tracking. When the screw adjustment is completely used, the belt will have to be re-spliced. Good belt tension is critical for proper traction on the pulley and optimum performance.
Regularly scheduled maintenance will ensure long life and safe operation of the unit.

Routine maintenance checks may include general wear, loose nuts and bolts, electrical wiring, contacts, switches, misalignment, guy wire inspection, bearing seals and lubrication and oil content for gearbox.

Torque Arm II Reducer Installation

1. Use lifting bracket to lift reducer.

2. The running position of the reducer is shown in Figure 1. The reducer is supplied with 6 plugs. Install the magnetic drain plug in the hole closest to the bottom of the reducer. Discard the tape that covers the vent plug in shipment and install this plug in the topmost hole. Of the two remaining plugs on the sides of the reducer, the lowest one is the minimum level plug.

The running position of the reducer can vary from the vertical position shown in Figure 1. In certain sizes of elevator drives, the reducer is swung by shortening or lengthening the turnbuckle. This is to obtain the correct center distance for drive belt from the motor. If the reducer is located to a postion of over 20° from the vertical position shown, the oil level plug cannot be used safely to check the oil level. Disconnect the turnbuckle torque arm and swing to within 5° of vertical position to check the oil level.

3. Mount reducer on driven shaft as follows:

> **WARNING:** To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

For Taper Bushed Reducer: Mount reducer on driven shaft per instruction in Torque-Arm II Bushing Installation section of this manual.

4. Install sheave on input shaft as close to reducer as practical. (See Fig. 2)

5. If not using a Dodge Torque-Arm II motor mount, install motor and V-belt drive so belt will approximately be at right angles to the centerline between driven and input shaft. (See Fig. 3) This will permit tightening the V-belt with the torque arm.

6. Install torque arm and adapter plates reusing the reducer bolts. The adapter plates will fit in any position around the input end reducer.

7. Install torque arm fulcrum on a flat and rigid support so that the torque arm will be approximately at right angles to the centerline through the driven shaft and the torque arm anchor screw. (See Fig. 4) Make sure that there is sufficient take-up in the turnbuckle for belt tension adjustment when using V-belt drive.

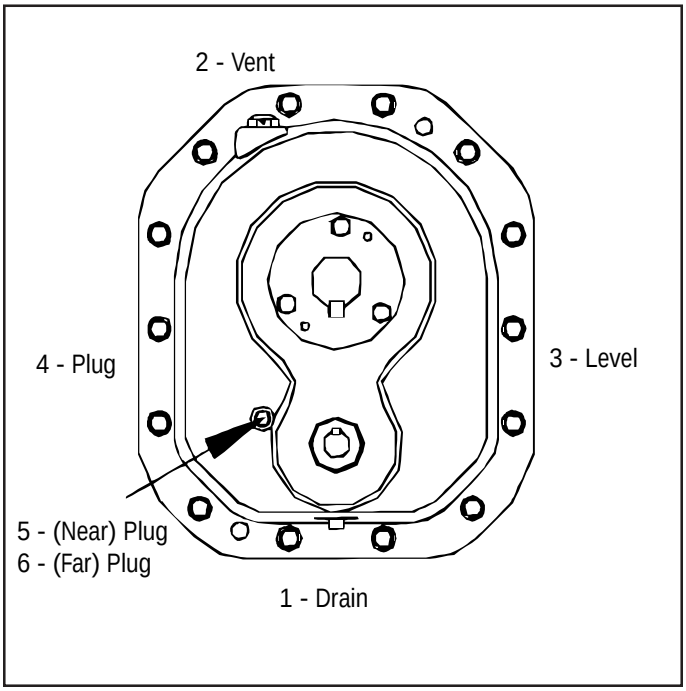


Figure 1 - Mounting Position

CAUTION: Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe this precaution could result in damage to or destruction of the equipment

8. Fill gear reducer with recommended lubricant. See Table 2.

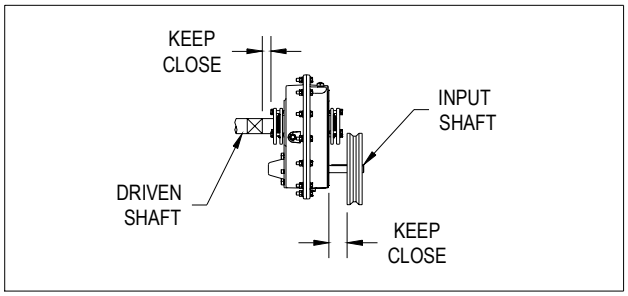


Figure 2 – Reducer and Sheave Installation

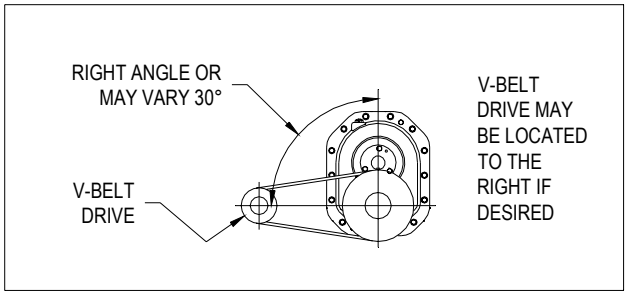


Figure 3 – Angle of V-Drive

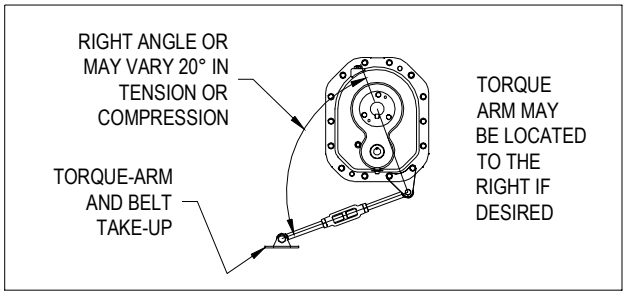


Figure 4 – Angle of Torque-Arm

TORQUE-ARM II BUSHING INSTALLATION

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

The Dodge Torque-Arm II Reducer is designed to fit both standard and short length driven shafts. The Standard Taper Bushings series is designed where shaft length is not a concern. The Short Shaft Bushing series is to be used where the driven shaft does not extend through the reducer.

Standard Taper Bushings:

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of two tapered bushings, bushing screws and washers, two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft must extend through the full length of the reducer. If the driven shaft does not extend through the reducer do not use the standard tapered bushings; instead use the short shaft bushings as described in the Short Shaft Bushings section that follows. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (see Figure 5), is given in Table 1.

2. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.

3. Place one bushing, flange end first, onto the driven shaft and position per dimension “A”, as shown in Table 1. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.

4. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

5. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance “A” from the shaft bearing.

6. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension “A”, place the screws with washers installed, in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least 1/8” between the screw heads and the bearing.

7. Place the second tapered bushing in position on the shaft and align the bushing keyway with the shaft key. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.

8. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 1. Repeat procedure on outer bushing.

Short Shaft Bushings:

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of one long tapered bushing, one short tapered bushing, one tapered bushing wedge, bushing screws and washers, two bushing backup

plates and retaining rings, and necessary shaft key or keys. The driven shaft does not need to extend through the reducer for the short shaft bushing to operate properly. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (see Figure 5), is given in Table 1.

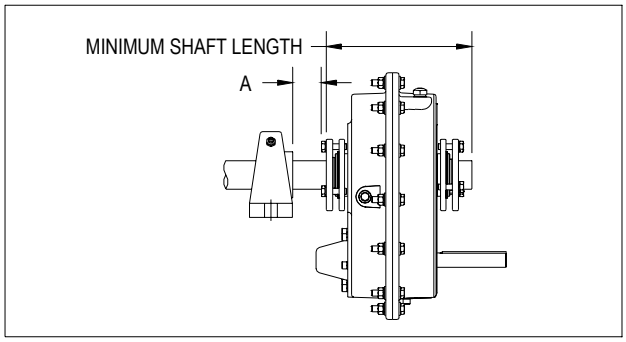


Figure 5 – Minimum Recommended Dimensions

Table 1 – Minimum Mounting Dimensions and Bolt Torques

Minimum Required Shaft Length		
Reducer Size	Standard Taper Bushing	Short Shaft Bushing
TA0107L	6.83	4.32
TA1107H	6.95	4.43
TA2115H	7.80	4.80
TA3203H	8.55	5.46
TA4207H	8.94	5.66
TA5215H	10.33	6.35
TA6307H	10.82	6.72
TA7315H	11.87	7.62
TA8407H	12.82	8.10
TA9415H	13.74	8.56
TA10507H	15.46	9.67
TA12608H	18.32	11.60

Bushing Screw Information and Minimum Clearance for Removal			
Reducer Size	Fastener Size	Torque in Ft.-Lbs.	A
TA0107L	5/16-18	20 – 17	1.08
TA1107H	5/16-18	20 – 17	1.20
TA2115H	3/8-16	20 – 17	1.20
TA3203H	3/8-16	20 – 17	1.20
TA4207H	3/8-16	26 – 23	1.48
TA5215H	1/2-13	77 – 67	1.81
TA6307H	1/2-13	77 – 67	1.81
TA7315H	1/2-13	77 – 67	2.06
TA8407H	1/2-13	77 – 67	2.06
TA9415H	5/8-11	86 – 75	2.39
TA10507H	5/8-11	86 – 75	2.39
TA12608H	5/8-11	86 – 75	2.39

2. The long bushing is designed to be installed from the side of the reducer opposite the driven equipment as shown in Figure 6. The long bushing when properly installed is designed to capture the end of the customer shaft that does not extend through the reducer. Normally the reducer would be mounted such that the input shaft extends from the side of the reducer opposite the driven equipment however the reducer design allows installation of the reducer to be mounted in the opposite direction.

3. Install the tapered bushing wedge into the hollow bore of the reducer from the same side as the long bushing will be installed. When installing the tapered bushing wedge into the reducer hub, install the flange end first so that the thin taper is pointing outwards towards the long bushing as shown in Figure 6. The wedge is properly installed when it snaps into place in the reducer hub.

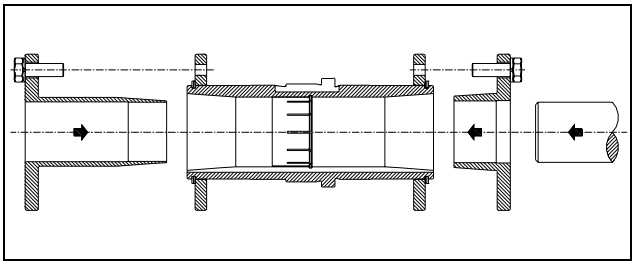


Figure 6 – Short Shaft Bushing and Output Hub Assembly

4. Align the tapered bushing wedge keyway with the reducer hub keyway. The keyway in the wedge is slightly wider than the keyway in the reducer hub allowing for easier installation.

5. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.

6. Install the short bushing; flange first, on the driven shaft and position per dimension “A”, as shown in Table 1. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.

7. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

8. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance “A” from the shaft bearing.

9. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension “A”, place the screws with washers installed, in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least 1/8” between the screw heads and the bearing.

10. Place the long bushing in position on the shaft and align the bushing keyway with the shaft key. Use care to locate the long bushing with the tapered bushing wedge installed earlier. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.

11. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 1. Repeat procedure on outer bushing.

Bushing Removal for Standard Taper or Short Shaft Bushings:

1. Remove bushing screws.

2. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws make sure screw threads and threaded holes in the bushing flanges are clean. If the reducer was positioned closer than the recommended minimum distance "A" as shown in Table 1, loosen the inboard bushing screws until they are clear of the bushing flange by 1/8". Locate two (2) wedges at 180 degrees between the bushing flange and the bushing backup plate. Drive the wedges alternately and evenly until the bushing is free on the shaft.

3. Remove the outside bushing, the reducer, and then the inboard bushing.

LUBRICATION

IMPORTANT: Because reducer is shipped without oil, it is necessary to add the proper amount of oil before operating reducer. Use a high-grade petroleum base rust and oxidation inhibited (R&O) gear oil - see tables. Follow instructions on reducer warning tags, and in the installation manual.

Under average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

CAUTION: Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe this precaution could result in bodily injury.

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months, depending on severity of conditions.

Table 2 – Oil Volumes

Reducer Size		Approximate Volume of Oil to Fill Reducer to Oil Level Plug ● ⏚											
		† Position A		† Position B		† Position C		† Position D		† Position E		† Position F	
		▲ Qt	L	▲ Qt	L	▲ Qt	L	▲ Qt	L	▲ Qt	L	▲ Qt	L
TA0107L	Single	0.7	0.6	0.5	0.5	0.7	0.6	1.4	1.3	1.3	1.2	1.5	1.4
	Double	0.7	0.6	0.5	0.5	0.6	0.6	1.3	1.3	1.2	1.2	1.4	1.3
TA1107H	Single	1.3	1.3	0.7	0.7	0.7	0.6	1.7	1.6	1.5	1.4	1.9	1.8
	Double	1.3	1.3	0.7	0.7	0.6	0.6	1.7	1.6	1.5	1.4	1.9	1.8
TA2115H	Single	2.1	2.0	1.2	1.2	1.1	1.0	2.7	2.5	2.3	2.2	3.1	2.8
	Double	2.1	2.0	1.1	1.1	1.0	1.0	2.6	2.5	2.4	2.3	3.0	2.9
TA3203H	Single	2.8	2.7	1.6	1.6	1.8	1.7	4.1	3.9	3.3	3.1	4.4	4.2
	Double	2.8	2.7	1.5	1.4	1.7	1.6	4.0	3.8	3.4	3.3	4.2	4.0
TA4207H	Single	4.4	4.2	2.6	2.5	2.9	2.8	7.4	7.0	6.3	6.0	7.8	7.3
	Double	4.4	4.2	2.5	2.4	2.8	2.6	7.3	6.9	6.4	6.0	7.5	7.1
TA5215H	Single	7.4	7.0	4.9	4.7	5.8	5.5	13.2	12.5	11.6	11.0	13.1	12.4
	Double	7.4	7.0	4.7	4.4	5.5	5.2	12.9	12.2	11.4	10.8	12.6	11.9
TA6307H	Single	8.8	8.4	5.8	5.5	6.6	6.2	16.1	15.3	13.2	12.5	16.1	15.3
	Double	8.8	8.4	5.5	5.2	6.2	5.9	15.8	15.0	13.9	13.1	15.3	14.5
TA7315H	Single	8.4	8.0	11.8	11.1	13.9	13.2	22.5	21.3	22.1	20.9	25.1	23.7
	Double	8.4	8.0	10.8	10.3	13.2	12.5	22.0	20.9	22.4	21.2	23.1	21.8
TA8407H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	7.7	7.3	11.7	11.1	13.7	12.9	25.1	23.8	24.0	22.7	25.8	24.4
TA9415H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	17.0	16.1	16.8	15.9	18.1	17.1	33.2	31.4	33.2	31.4	38.6	36.5
TA10507H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	38.0	36.0	27.6	26.1	25.8	24.4	53.5	50.6	53.8	50.9	56.1	53.0
TA12608H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	53.0	50.2	41.5	39.3	37.1	35.1	70.7	66.9	72.2	68.3	80.4	76.1

● Oil quantity is approximate. Service with lubricant until oil runs out of oil level hole.
† Refer to Figure 1 for mounting positions.
▲ US measure: 1 quart = 32 fluid ounces = .94646 liters.
⏚ Below 15 RPM output speed, oil level must be adjusted to reach the highest oil level plug. If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Dodge.

Table 3 – Oil Recommendations

ISO Grades For Ambient Temperatures of 50˚F to 125˚F												
Output RPM	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301 – 400	320	320	320	220	220	220	220	220	220	220	220	220
201 – 300	320	320	320	220	220	220	220	220	220	220	220	220
151 – 200	320	320	320	220	220	220	220	220	220	220	220	220
126 – 150	320	320	320	220	220	220	220	220	220	220	220	220
101 – 125	320	320	320	320	220	220	220	220	220	220	220	220
81 – 100	320	320	320	320	320	220	220	220	220	220	220	220
41 – 80	320	320	320	320	320	220	220	220	220	220	220	220
11 – 40	320	320	320	320	320	320	320	320	320	320	220	220
1 – 10	320	320	320	320	320	320	320	320	320	320	320	320

ISO Grades For Ambient Temperatures of 15˚F to 60˚F												
Output RPM	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301 – 400	220	220	220	150	150	150	150	150	150	150	150	150
201 – 300	220	220	220	150	150	150	150	150	150	150	150	150
151 – 200	220	220	220	150	150	150	150	150	150	150	150	150
126 – 150	220	220	220	150	150	150	150	150	150	150	150	150
101 – 125	220	220	220	220	150	150	150	150	150	150	150	150
81 – 100	220	220	220	220	220	150	150	150	150	150	150	150
41 – 80	220	220	220	220	220	150	150	150	150	150	150	150
11 – 40	220	220	220	220	220	220	220	220	220	220	150	150
1 – 10	220	220	220	220	220	220	220	220	220	220	220	220

Notes:

1. Assumes auxiliary cooling where recommended in the catalog.

2. Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.

3. Extreme pressure (EP) lubricants are not necessary for average operating conditions. When properly selected for specific applications, TORQUE-ARM II backstops are suitable for use with EP lubricants.

4. Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer's representative for his recommendations.

5. For reducers operating in ambient temperatures between -22°F (-30°C) and 20°F (–6.6°C) use a synthetic hydrocarbon lubricant, 100 ISO grade or AGMA 3 grade (for example, Mobil SHC627). Above 125°F (51°C), consult DODGE Gear Application Engineering (864) 288-9050 for lubrication recommendation.

6. Mobil SHC630 Series oil is recommended for high ambient temperatures.

GUIDELINES FOR TORQUE-ARM II REDUCER LONG-TERM STORAGE

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

Preparation:

1. Drain oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 4.

2. Seal the unit airtight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.

3. Cover all unpainted exterior parts with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co. or equivalent)

4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside, or cover the unit with a durable waterproof cover which can keep moisture away.

5. Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.

6. In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

When placing the reducer into service:

1. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.

2. Clean the shaft extensions with petroleum solvents.

3. Assemble the vent plug into the proper hole.

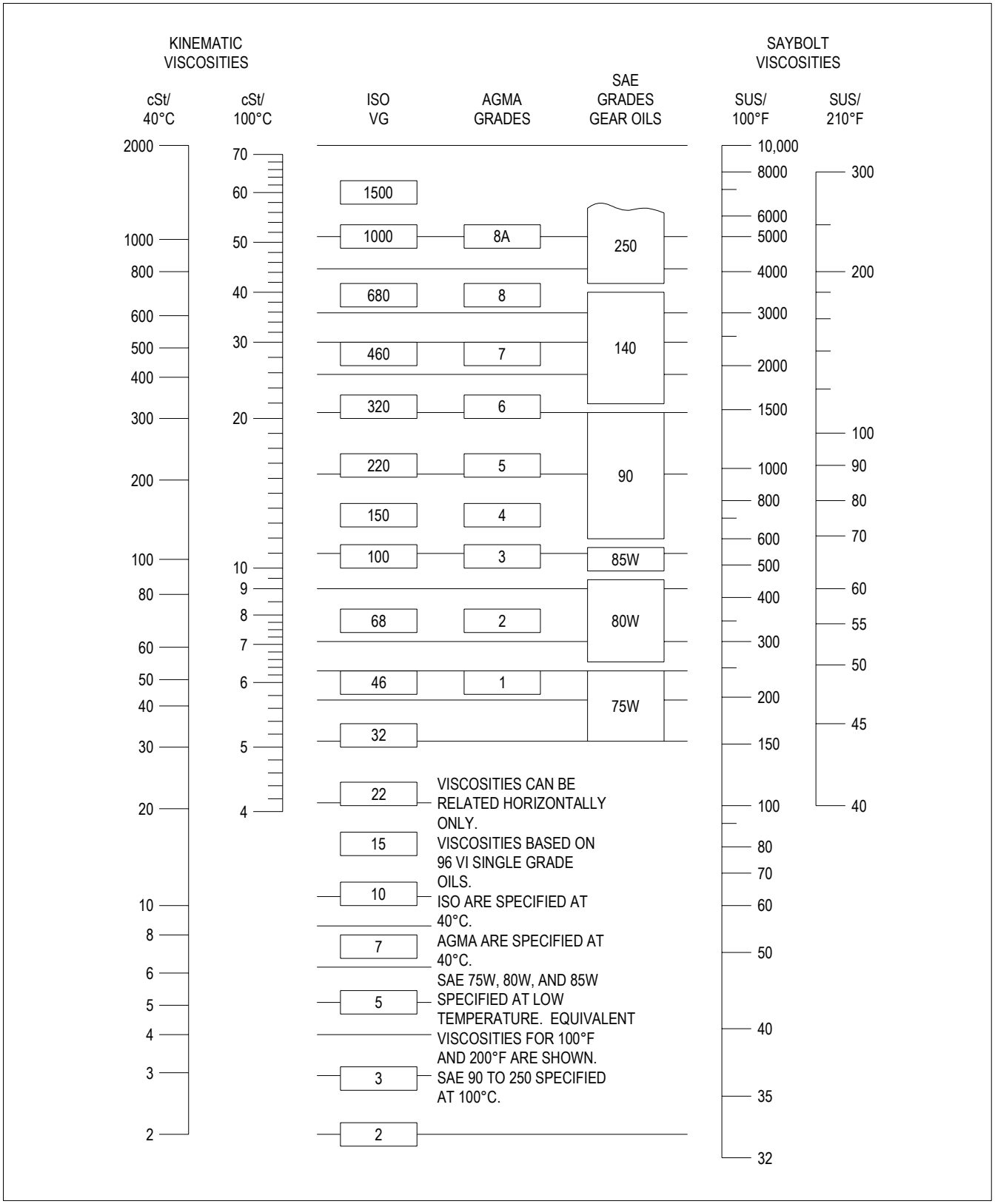
Follow the installation instructions provided in this manual.

Table 4 – Quantities of VCI #105 Oil

Reducer Size	Quantity (Ounces / Milliliter)
TA0107L	1 / 30
TA1107H	1 / 30
TA2115H	1 / 30
TA3203H	1 / 30
TA4207H	1 / 30
TA5215H	2 / 59
TA6307H	2 / 59
TA7315H	3 / 89
TA8407H	3 / 89
TA9415H	4 / 118
TA10507H	6 / 177
TA12608H	8 / 237

VCI #105 and #10 are interchangeable.
VCI #105 is more readily available.

OIL VISCOSITY EQUIVALENCY CHART



COOLING FAN INSTALLATION

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

Unpack all components and inspect for shipping damage. Do not use any component that has been damaged or modified. Make sure all components are clean and free of any foreign material prior to assembly. Cooling fan assembly is designed to fit onto the input shaft before placement of sheeves or belt guard assembly.

Installation for TA4207CF and TA5215CF:

1. Referring to Figure 2, install tapered bushing (9) into bore of fan blade assembly (2) and loosely install the three set screws provided with fan. Snug set screws but do not tighten at this time.

2. Slide fan assembly onto input shaft and install input shaft key. Note: Key is supplied with the TAII reducer. Locate fan blade edge distance "A" (Figure 1) from end of shaft per Table 1. Make sure fan assembly rotates without interference when input shaft is rotated.

3. Alternately tighten the set screws until fan assembly is securely installed on the input shaft.

4. Recheck fan assembly for proper location and clearance. Loosen set screws and repeat steps 2 and 3 above if not properly located.

Installation for TA6307CF through TA12608CF:

1. Referring to Figure 2, install fan guard back plate assembly (1) using the four bolts (4) provided. Note that the screen is mounted towards the reducer. Tighten to recommended torque in Table 1.

CAUTION: Fan guard screen has sharp edges. Use caution when installing to avoid lacerations.

2. Slide fan blade assembly (2) onto input shaft and install key and set screws (5). Note: Key is supplied with the TAII reducer. Position fan blade edge distance "A" (Figure 1) from end of shaft per Table 1. Make sure fan assembly rotates without interference when input shaft is rotated. Tighten the two fan blade set screws (5) securely.

3. Install fan guard cover (3) with four bolts (6), lockwashers (7), and hex nuts (8). Tighten securely.

4. Verify fan blade rotates freely and does not interfere with fan guard back plate (1) or fan guard cover (3). Adjust fan blade if necessary.

Table 1 - Dimensions and Bolt Torque

Reducer Size	Dim."A" mm	Torque (Ft.-Lbs.)
TA4207H	3-3/4	-----
TA5215H	4-5/8	-----
TA6307H	4-1/4	33 - 30
TA7315H	4-3/8	33 - 30
TA8407H	5-1/16	33 - 30
TA9415H	6-1/4	33 - 30
TA10507H	6-7/16	33 - 30
TA12608H	6-7/16	33 - 30

Figure 1 - Fan Blade Placement

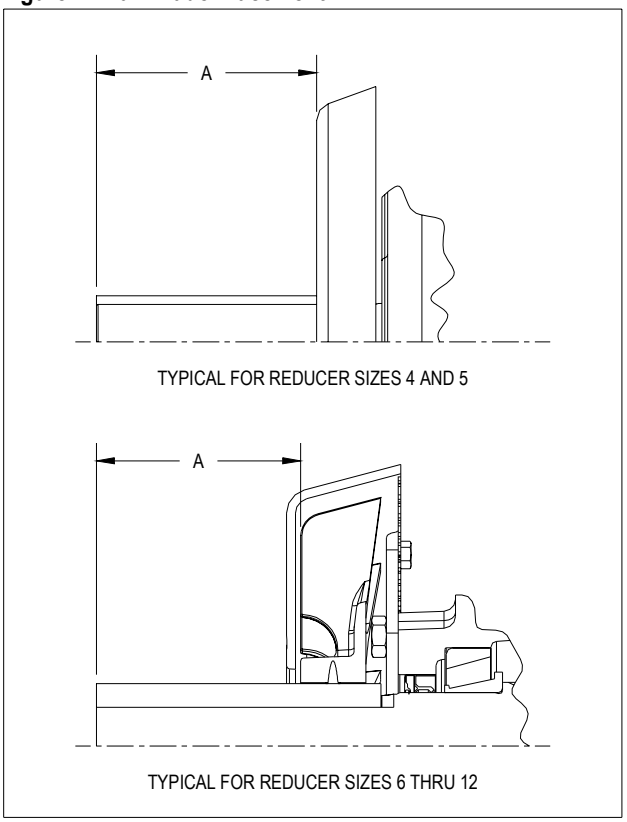


Figure 2 – Parts Identification

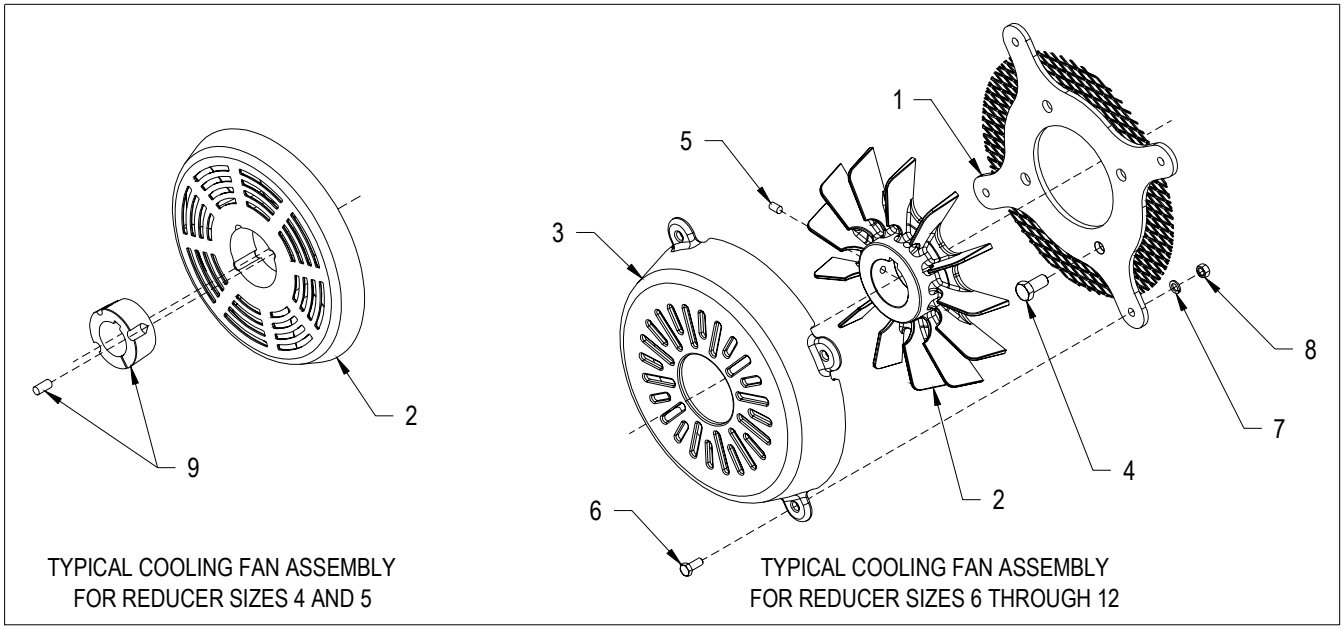


Table 2 – Cooling Fan Part Numbers

Description	Ref. Number	Quantity	TA4207	TA5215	TA6307	TA7315	TA8407	TA9415	TA10507	TA12608
Cooling Fan Assembly	-----	1	904106	905106	906106	907106	907106	909106	910106	912106
Fan Guard Plate Assy.	1	1	-----	-----	906519	906519	906519	909519	909519	912519
Fan Blade	2	1	904517	905517	906517	907517	907517	909517	910517	910517
Fan Guard Cover	3	1	-----	-----	906521	906521	906521	909521	909521	909521
Mounting Bolt	4	4	-----	-----	411294	411294	411294	411294	411294	411294
Fan Set Screw	5	2	-----	-----	400086	400086	400086	400086	400086	400086
Cover Bolt	6	4	-----	-----	411390	411390	411390	411390	411390	411390
Lockwasher	7	4	-----	-----	419010	419010	419010	419010	419010	419010
Hex Nut	8	4	-----	-----	407085	407085	407085	407085	407085	407085
Taper Bushing Assy.	9	1	117162	117092	-----	-----	-----	-----	-----	-----

Assembly includes parts listed below marked

Set screws are included with taper bushing assembly.

BACKSTOPS

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

1. Remove backstop shaft cover and gasket, shown in Figure 7. These parts will not be reused. This cover is directly opposite the extended end of the input shaft.

2. Clean the face of the gearbox to remove any gasket material or contamination from the cover mounting surface. It is important that contamination not get into the gearbox or the backstop during the backstop installation/servicing process.

3. Face reducer looking at the side from which the cover was removed. Determine carefully the desired direction of free rotation. It is important that the direction be correctly determined because to reverse the direction after the backstop is installed, it is necessary to remove the backstop, turn it end-for-end and then reinstall it.

4. Match the arrow on the backstop inner race to the direction of free rotation for the desired shaft. Note that reversing the backstop end-for end changes the direction of the arrow. The shaft will rotate in the same direction as the arrow on the backstop.

5. If the backstop kit has a spacer ring included, install it onto the shaft first, adjacent to the bearing inner ring.

6. Install the backstop inner race and sprag cage assembly onto the shaft. DO NOT remove the cage from the inner race or the shipping strap from the sprag set at this time. Insert the key into the inner race and mating shaft keyway. These parts should slip onto the shaft easily, a light coating of oil may assist in assembly. Do not use a hammer to force the installation, damage can occur to the shaft and/or the backstop. Slide the race against the spacer or the shaft shoulder and install the retaining ring into the groove in the shaft. Only use the supplied key, as it is specifically designed for each backstop.

7. Apply a thin coating of RTV silicone onto the gearbox mating surface for the outer race (same as the cover area). It is important to apply the sealant around the fastener holes to prevent leakage. Do not allow excessive amounts of silicone to enter the gearbox or to be applied to other parts.

8. Install the outer race by gently rotating it opposite the shaft rotation while pressing lightly inwards. Do not force the outer race into position as backstop damage may occur. Once the outer race is well piloted onto the sprag set, remove the shipping strap from the sprag set by cutting it, being careful not to let the outer race back off the sprags. The outer race should slide easily into position with a slight turning motion. A light coating of oil on the race inner diameter may ease installation.

9. Align the fastener holes in the outer race with the mating holes in the gearbox. Use the supplied grade 5 fasteners and lock washers only. Torque the fasteners in an alternating pattern per Table 5.

Table 5 – Backstop Fastener Torque Values

Reducer Size	Fastener Size	Torque in Ft.-Lbs.
TA0107L	1/4-20	8 – 7
TA1107H	1/4-20	8 – 7
TA2115H	1/4-20	8 – 7
TA3203H	1/4-20	8 – 7
TA4207H	1/4-20	8 – 7
TA5215H	5/16-18	17 – 15
TA6307H	5/16-18	17 – 15
TA7315H	3/8-16	30 – 27
TA8407H	5/16-18	17 – 15
TA9415H	3/8-16	30 – 27
TA10507H	3/8-16	30 – 27
TA12608H	3/8-16	30 – 27

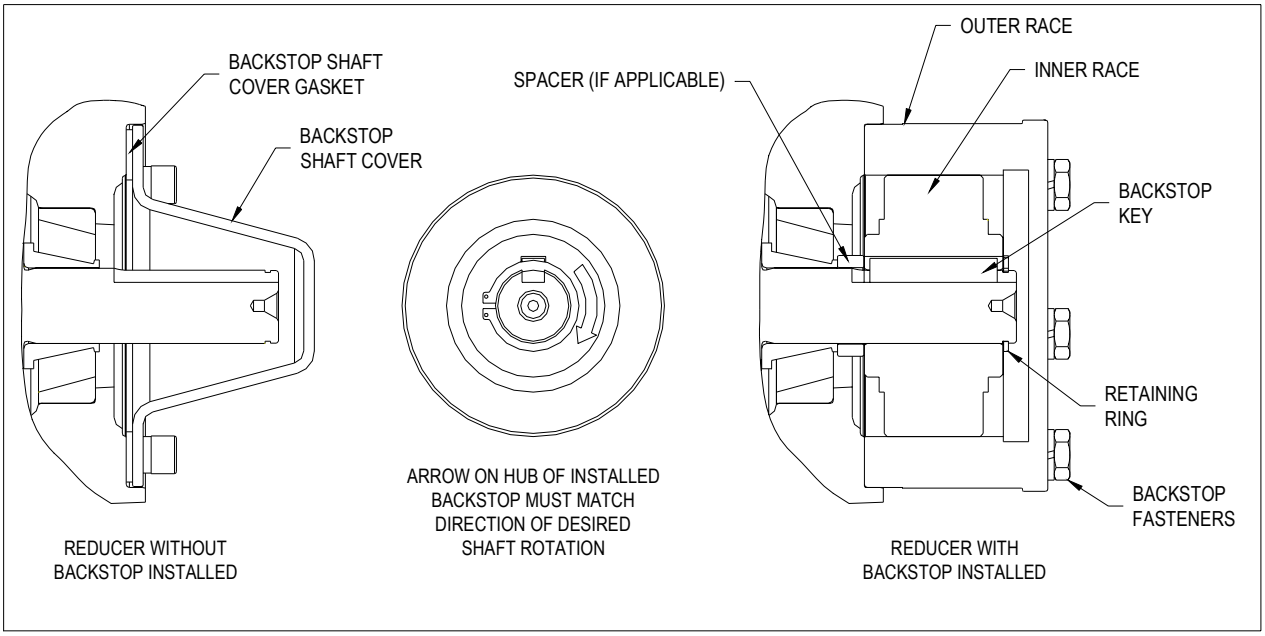


Figure 7 – Backstop Assembly

INSTRUCTION MANUAL FOR
DODGE® S-2000 SPHERICAL ROLLER BEARINGS

INSTALLATION INSTRUCTIONS

NON-EXPANSION BEARING

WARNING

TO ENSURE THAT DRIVE IS NOT UNEXPECTEDLY STARTED, TURN OFF AND LOCK OUT OR TAG POWER SOURCE BEFORE PROCEEDING. FAILURE TO OBSERVE THESE PRECAUTIONS MAY RESULT IN BODILY INJURY.

1. Clean shaft and bore of bearing. The shaft should be straight, free of burrs and nicks, and correct size (see shaft tolerance table). If used shafting is utilized, then the bearing should be mounted on unworn section of shafting.
2. Lubricate shaft and bearing bore with grease or oil to facilitate assembly. Slip bearing into position. When light press fit is required, press against the end of the inner ring of bearing. Do not strike or exert pressure on the housing or seals.
3. Bolt bearing to support, using shims where necessary to align bearing so inner ring does not rub on seal carrier. Use full shims which extend across the entire housing base.
4. Determine final shaft position and tighten setscrews in the locking collar(s) of non-expansion bearing to recommended torque while the other bearings remain free. Rotate the shaft slowly under load, if possible, to properly center the rolling elements with respect to the raceways. Then tighten setscrews into the locking collar of the remaining bearings to the recommended torque.

4a. For normal thrust loads, shock loads, or vibration, the shaft should be spot drilled to provide additional holding power. Under heavy thrust load applications it is advisable to use auxiliary thrust carrying devices such as shaft shoulder, snap rings, or a thrust collar.

5. Check rotation. If there is any strain, irregular rotational torque or vibration, it could be due to incorrect alignment, bent shaft or bent supports. Installation should be rechecked and correction made where necessary.

EXPANSION BEARING

Steps (1, 2, 3) Same as Non-Expansion Bearing.

4. Position expansion bearing in the housing. For normal expansion conditions, the bearing insert should be positioned in the center of the housing. To center bearing insert in housing, move bearing insert to extreme position and mark shaft. Then using bearing maximum total expansion table, move bearing insert in opposite direction one-half the total expansion to center bearing in the housing. If maximum expansion is required, move bearing insert to the extreme position in the housing to permit full movement in direction of expansion. After expansion bearing has been positioned in the housing, tighten the setscrews in the locking collar to the recommended torque.

5. Same as Non-Expansion Bearing.

FIELD CONVERSION (RE-OP) OF A NON-EXPANSION BEARING INTO AN EXPANSION BEARING

In bearing sizes $1\frac{1}{8}$ thru $3\frac{1}{2}$ the non-expansion bearing can be re-oped to become an expansion bearing. Sizes $3\frac{11}{16}$ thru 5 cannot be re-oped. To re-op a non-expansion to an expansion bearing (1) remove bearing collar. (2) Remove snap ring from collar side of bearing and also remove the non-expansion spacer. (3) Re-install snap ring. (4) Press, not hammer, on inner ring end opposite the collar until seal carrier bottoms against snap ring. (5) Re-install collar and install bearing per Expansion Bearing instruction. Note: Bearing name plate has a non-expansion Part Number. When bearing is re-oped the bearing should be marked as expansion for future reference.

BEARING MAXIMUM TOTAL EXPANSION TABLE

SHAFT SIZE		TOTAL EXPANSION
In.	MM	In.
$1\frac{1}{8}$ - $1\frac{1}{2}$	—	$\frac{1}{8}$
$1\frac{5}{8}$ - $3\frac{1}{2}$	40-90	$\frac{1}{4}$
$3\frac{11}{16}$ - 4	—	$\frac{5}{16}$
$4\frac{7}{16}$ - 5	—	$\frac{3}{8}$

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Rockwell Automation nor are the responsibility of Rockwell Automation. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

LUBRICATION INSTRUCTIONS

OPERATION IN PRESENCE OF DUST, WATER OR CORROSION VAPORS

This bearing is factory lubricated with No. 2 consistency lithium base grease which is suitable for most applications. However, extra protection is necessary if bearing is subjected to excessive moisture, dust, or corrosive vapor. In these cases, bearing should contain as much grease as speed will permit (a full bearing with consequent slight leakage through the seal is the best protection against contaminant entry).

In extremely dirty environments, the bearing should be purged daily to flush out contaminants. For added protection, it is advisable to shroud the bearing from falling material.

HIGH SPEED OPERATION

At higher operating speeds, too much grease may cause overheating. In these cases, the amount of lubrication can only be determined by experience. If excess grease causes overheating, remove grease fittings and run for ten minutes. This will allow excess grease to escape. Then wipe off excess grease and replace grease fittings.

In higher speed applications, a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals. However, the proper volume and interval of lubrication can best be determined by experience.

AVERAGE OPERATIONS

The following table is a general guide for normal operating conditions. However, some situations may require a change in lubricating periods as dictated by experience. If the bearing is exposed to unusual operating conditions, consult a reputable grease manufacturer.

Lubrication Guide

Read Preceding Paragraphs Before Establishing Lubrication Schedule

Suggested Lubrication Period in Weeks								
Hours run per day	1 to 250 rpm	251 to 500 rpm	501 to 750 rpm	751 to 1000 rpm	1001 to 1500 rpm	1501 to 2000 rpm	2001 to 2500 rpm	2501 to 3000 rpm
8	12	12	10	7	5	4	3	2
16	12	7	5	4	2	2	2	1
24	10	5	3	2	1	1	1	1

OPERATING TEMPERATURES

Abnormal bearing temperatures may indicate insufficient lubrication. If the housing is too hot to touch for more than a few seconds, check the temperature by applying a thermometer at the top of the pillow block with the thermometer tip surrounded by putty.

Because the thermometer reading will be approximately 10°F lower than the actual bearing temperature, add ten degrees to the reading and compare to the temperature rating of your grease. If the bearing temperature reading is consistent and operating within the recommended limits of your grease, the bearing is operating satisfactorily.

The recommended maximum operating temperature for No. 2 lithium base grease is 200°F.

STORAGE OR SPECIAL SHUT DOWN

If equipment will be idle for some time, before shutting down, add grease to the bearing until grease purges from the seals. This will ensure protection of the bearing, particularly when exposed to severe environmental conditions. After storage or idle period, add fresh grease to the bearing before starting.

SET SCREW TORQUE TABLE

Shaft Size	Socket Set Screw Size	Tightening Torque
1 1/8 - 1 3/4 Inches	5/16 Inches	165 Inch Pounds
1 7/8 - 2 1/2 Inches	3/8 Inches	290 Inch Pounds
2 11/16 - 3 1/2 Inches	1/2 Inches	620 Inch Pounds
3 11/16 - 5 Inches	5/8 Inches	1325 Inch Pounds
40-45mm	M8	17.8 Newton-meters
50-65mm	M10	35 Newton-meters
70-90mm	M12	57 Newton-meters

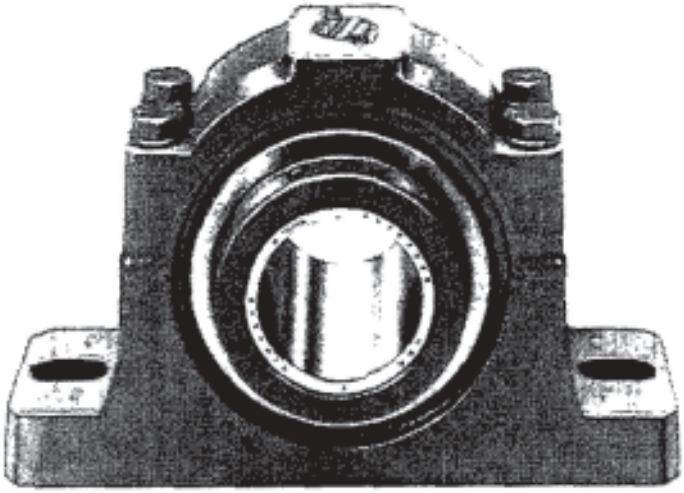
RECOMMENDED SHAFT TOLERANCE TABLE

Nominal Shaft Size	Low to Normal Equivalent Loads and Catalog Speed*	
Up to 1 1/2 Inches	+.000 Inches	-.0005 Inches
Over 1 1/2 to 2 1/2 Inches	+.000 Inches	- .001 Inches
Over 2 1/2 to 4 Inches	+.000 Inches	- .001 Inches
Over 4 to 5 Inches	+.000 Inches	-.0015 Inches
40-90 mm	+.000 mm	- .025 mm

On severe applications and where dynamic balance and minimum runout are important, a snug to light press fit may be required to obtain optimum bearing performance. Consult factory.

*Normal equivalent load .08C to .18C.

DODGE® INSTRUCTION MANUAL
for
TAF Pillow Blocks & S-1 Units



FITTING OR REPLACING A UNIT IN A PILLOW BLOCK

WARNING

To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

1. Up to 5" bore, match marks have been stamped on the mating faces of the cap and base of each outer housing. Over 5" bore match mark cap and base of each outer housing before removing cap. When reassembling pillow block make sure match marks on cap and base match. At this time do not remove shims found between the cap and base.
2. Lubricate bearing seat on the cap and on the base of the outer housing with an anti-seize compound.
3. Fit each unit to its outer housing before carrying out step 7. Place the unit in the pillow block base and install cap. Tighten cap bolts to specified torque in Table 1.

Table 1 – Cap Bolt Torque (Non-Expansion & Expansion)

Bore Size (In.)	2 Bolt Base Bolt Size	2 Bolt Base Torque Ft.-Lbs.	4 Bolt Base Torque Bolt Size	4 Bolt Base Ft.-Lbs.
$1^{7}/_{16}$-$1^{11}/_{16}$	$^{3}/_{8}$-16	24-30	—	—
$1^{15}/_{16}$-$2^{3}/_{16}$	$^{7}/_{16}$-14	40-50	—	—
$2^{7}/_{16}$-$2^{1}/_{2}$	$^{1}/_{2}$-13	60-75	$^{1}/_{2}$-13	60-75
$2^{11}/_{16}$-3	$^{5}/_{8}$-11	120-150	$^{5}/_{8}$-11	120-150
$3^{7}/_{16}$-$3^{1}/_{2}$	$^{3}/_{4}$-10	208-260	$^{3}/_{4}$-10	208-260
$3^{15}/_{16}$-4	—	—	$^{3}/_{4}$-10	208-260
$4^{7}/_{16}$-$4^{1}/_{2}$	—	—	$^{7}/_{8}$-9	344-430
$4^{15}/_{16}$-5	—	—	1-8	512-640
$5^{7}/_{16}$-6	—	—	1-8	250
$6^{7}/_{16}$-7	—	—	$1^{1}/_{8}$-7	350

4. Add or remove shims between cap and base as required to obtain "snug" fit of unit in outer housing with cap bolts tightened to specified torque in Table 1.

WARNING: Because of the possible danger to persons(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Rockwell Automation nor are the responsibility of Rockwell Automation. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

5. Check fit by prying against lubrication stud in unit through the lubrication hole in housing cap with a screwdriver or small pinch bar depending upon the size of the pillow blocks.
6. The "snug" fit becomes a matter of judgment. A "loose or sloppy" fit may allow a unit mount to move in its outer housing thus wearing the mating surfaces. Too "tight" a fit will not allow the unit to move and compensate for misalignment and for shaft deflection caused by belt pull and dead weight.
7. Install bearings per installation instruction on following pages.

TABLE 2

Set Screw Torque	
Size	**In.-Lbs.**
5/16	165
3/8	290
1/2	620
5/8	1325
3/4	2150
7/8	5130

INSTALLATION INSTRUCTIONS (Medium Speed, Normal & Heavy Load)*

WARNING

To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

1. Clean shaft and bore of bearing. Lubricate with light oil.
2. Slip bearing in position noting step 3.
3. **Expansion Bearing:** Loosen cap bolts in outer housing a little so inner unit is free to align in outer housing. Outer housing shims provide a proper fit and must not be removed. Bolt outer housing to support. For heavy loads, use grade 8 base bolts.* Expansion type outer housings should be located so inner unit can move freely in either direction.

   Non-Expansion Bearings: Loosen cap bolts in outer housing a little so inner unit is free to align in outer housing. The hold-down bolts should be loose in the bolt holes. If the bolts are tight in bolt holes, the unit should be moved slightly on the shaft to provide looseness. This will help prevent preloading or inducing an initial thrust on bearings. Tighten nuts on hold-down bolts. For heavy loads, use grade 8 base bolts.*
4. Tighten set screws to the torque values shown on Table 2.
5. Turn shaft several revolutions, or run shaft, if feasible and safe, to allow alignment of inserts in their respective housings. Retighten cap bolts of both the expansion and the non-expansion outer housing to recommended torque in Table 1. Outer housing shims provide a proper fit and must not be removed.
6. **The effort required to turn the shaft should be the same before and after bolting bearings to the support.**

LUBRICATION INSTRUCTIONS

Storage or Special Shutdown — If exposed to wet or dusty conditions or to corrosive vapors, extra protection is necessary. Add grease until it shows at the seals; rotate the bearing to distribute grease; cover the bearing. After storage or idle period, add a little fresh grease before running. During long idle periods, rotate shaft at least once a month.

High Speed Operation — In the higher speed ranges too much grease will cause overheating. The amount of grease that the bearing will take for a particular high speed application can only be determined by experience — see "Operating Temperature" below. If excess grease in the bearing causes overheating, it will be necessary to remove grease fitting (also drain plug when furnished) to permit excess grease to escape. The bearing has been greased at the factory and is ready to run. When establishing a relubrication schedule, note that a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals.

Operation in Presence of Dust, Water or Corrosive Vapors — Under these conditions the bearing should contain as much grease as speed will permit, since a full bearing with consequent slight leakage is the best protection against entrance of foreign material. In the higher speed ranges too much grease will cause overheating — see "High Speed Operation" above. In the lower speed ranges it is advisable to add extra grease to a new bearing before putting into operation. Bearings should be greased as often as necessary (daily if required) to maintain a slight leakage at the seals.

Average Operation — This bearing has been greased at the factory and is ready to run. The following table is a general guide for relubrication. However, certain conditions may require a change of lubricating periods as dictated by experience. See "High Speed Operation" and "Operation in Presence of Dust, Water or Corrosive Vapors" above.

Operating Temperature — Abnormal bearing temperature may indicate faulty lubrication. Normal temperature may range from "cool to warm to the touch" up to a point "too hot to touch for more than a few seconds," depending on bearing size and speed, and surrounding conditions. Unusually high temperature accompanied by excessive leakage of grease indicates too much grease. High temperature with no grease showing at the seals, particularly if the bearing seems noisy, usually indicates too little grease. Normal temperature and slight showing of grease at the seals indicate proper lubrication.

Lubrication Guide
Read Preceding Paragraphs Before Establishing Lubrication Schedule.

Hours Run per Day	Suggested Lubrication Period In Weeks				
	1 to 250 RPM	251 to 500 RPM	501 to 750 RPM	751 to 1000 RPM	1001 to 1500 RPM
8	12	12	10	7	5
16	12	7	5	4	2
24	10	5	3	2	1

Kind of Grease — Many ordinary cup greases will disintegrate at speeds far below those at which DODGE bearings will operate successfully if proper grease is used. DODGE bearings have been lubricated at the factory with No. 2 consistency lithium-base grease which is suitable for normal operating conditions. Relubricate with lithium-base grease or a grease which is compatible with original lubricant and suitable for roller bearing service. In unusual or doubtful cases the recommendation of a reputable grease manufacturer should be secured.

Special Operating Conditions — Refer acid, chemical, extreme or other special operating conditions to Rockwell Automation Power Systems, Greenville, SC 29602.

NOTES

The GSI Group, Inc. Warranty

THE GSI GROUP, INC. ("GSI") WARRANTS ALL PRODUCTS WHICH IT MANUFACTURES TO BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USAGE AND CONDITIONS FOR A PERIOD OF 12 MONTHS AFTER RETAIL SALE TO THE ORIGINAL END USER. THE PURCHASER'S SOLE REMEDY AND GSI'S ONLY OBLIGATION SHALL BE TO REPAIR OR REPLACE, AT GSI'S OPTION AND EXPENSE, PRODUCTS THAT, IN GSI'S SOLE JUDGMENT, CONTAIN A MATERIAL DEFECT DUE TO MATERIALS OR WORKMANSHIP. ALL DELIVERY AND SHIPMENT CHARGES TO AND FROM GSI'S FACTORY WILL BE PURCHASER'S RESPONSIBILITY. EXPENSES INCURRED BY OR ON BEHALF OF THE PURCHASER WITHOUT PRIOR WRITTEN AUTHORIZATION FROM AN AUTHORIZED EMPLOYEE OF GSI SHALL BE THE SOLE RESPONSIBILITY OF THE PURCHASER.

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This Equipment shall be installed in accordance with the current installation codes and applicable regulations which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installation occurs.

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