Enclosed Belt Conveyor

Installation and Operation Manual

PNEG-1204

DATE: 4-21-04

PNEG-1204

Introduction

READ THIS MANUAL carefully to learn how to properly use and install equipment. Failure to do so could result in personal injury or equipment damage. This manual and safety signs on your equipment may be available in other languages. (Consult with your dealer to see what is available)

INSPECT the shipment immediately upon arrival. The Customer is responsible for ensuring that all quantities are correct. Report any damage or shortages by recording a detailed description on the Bill of Lading to justify the Customer's claim from the Transport Firm. Our responsibility for damage to the equipment ends with acceptance by the delivering carrier. Save all paperwork and documentation furnished with any of the enclosed belt conveyor components.

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your equipment and should be easily accessible when needed.

WARRANTY is provided as part of the company's support program for customers who use and maintain their equipment as described in the manual. The warranty is explained on the warranty page located on the inside back cover of this manual.

This warranty provides you the assurance that the company will back its products where defects appear within the warranty period. In some circumstances, the company also provides field improvements, often without charge to the customer, even if the product is out of warranty. Should the equipment be abused, or modified to change its performance beyond the factory specifications, the warranty will become void and field improvements may be denied.

Use of the Equipment Information page will help you identify your equipment in the case that you need to call your dealer or installer. This information should be filled out and kept on record.

Equipment Information

Model Number:_____

Serial Number:_____

Date Purchased:_____

Dealer/Distributor Name and Phone Number:

_____

_____

_____

_____

Material Handling
1004 East Illinois Street
Assumption, Illinois 62510 USA
Phone: (217) 226-4421
FAX: (888) 741-3004
e-mail: gsi@grainsystems.com

Table of Contents

NOTES

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.

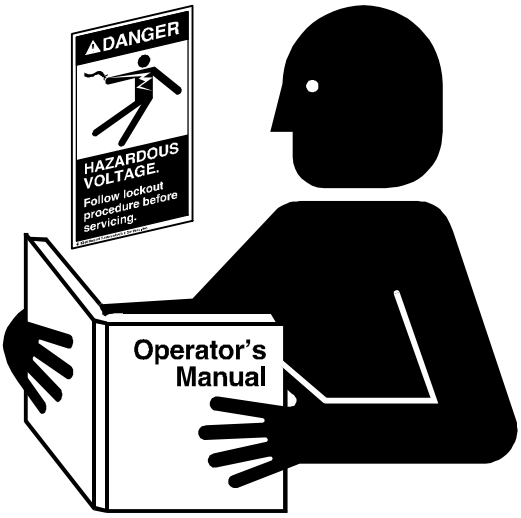
FOLLOW SAFETY INSTRUCTIONS

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.

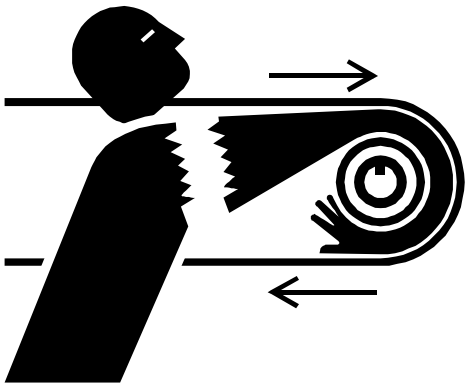


STAY CLEAR OF ROTATING IDLER

Entanglement in rotating idlers 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.

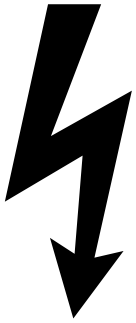


OPERATE MOTOR PROPERLY

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 conveyor 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

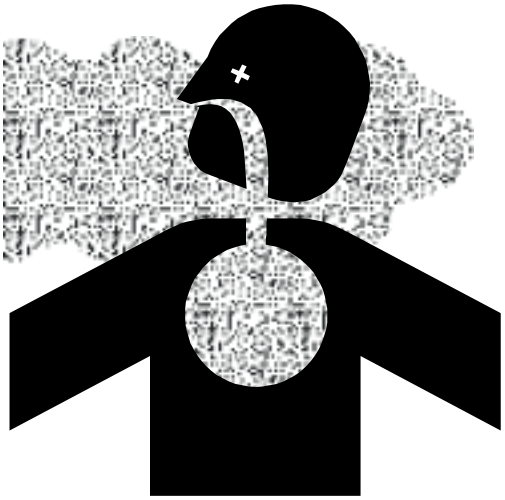
Avoid potentially toxic fumes and dust.

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.

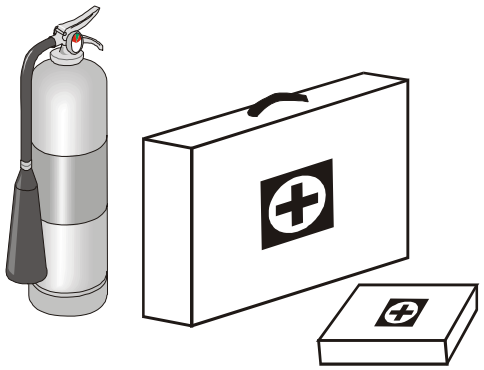


PREPARE FOR EMERGENCIES

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.

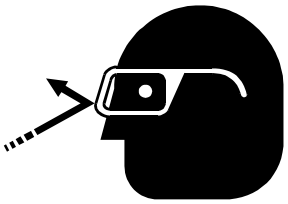
Safety glasses should be worn at all times to protect eyes from debris.

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.

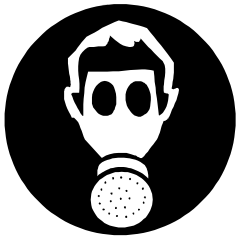
Eye Protection



Gloves

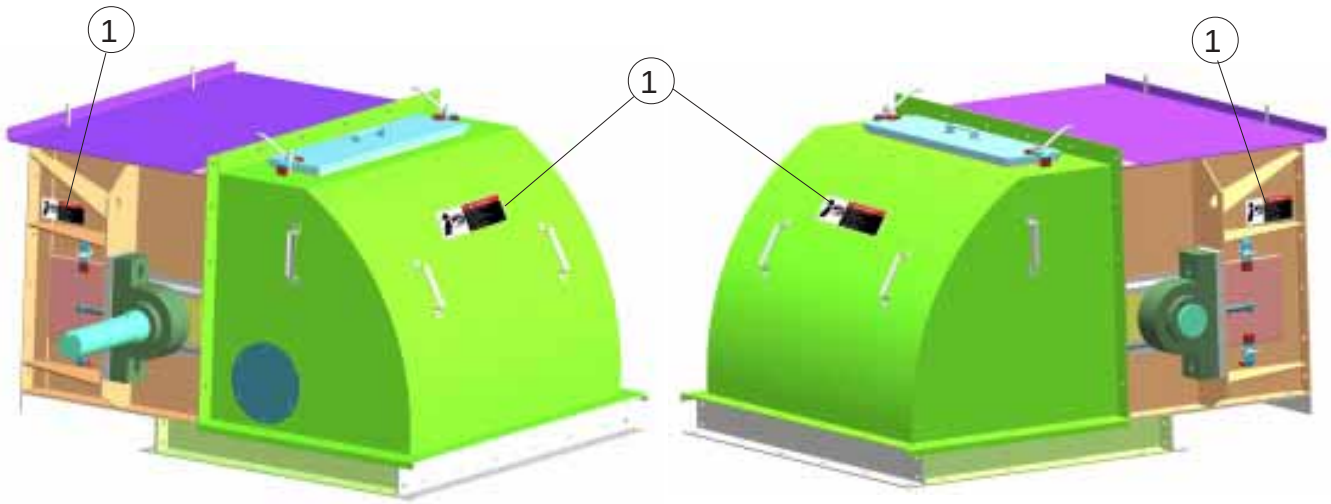
Steel Toe Boots

Respirator

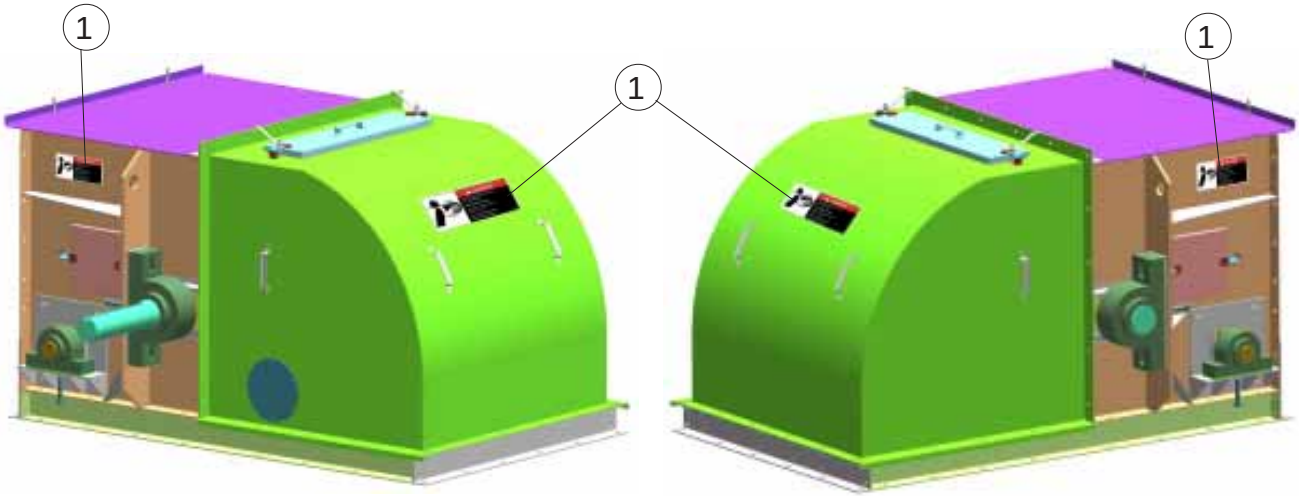


Hard Hat

HEAD SECTION DECAL LOCATIONS



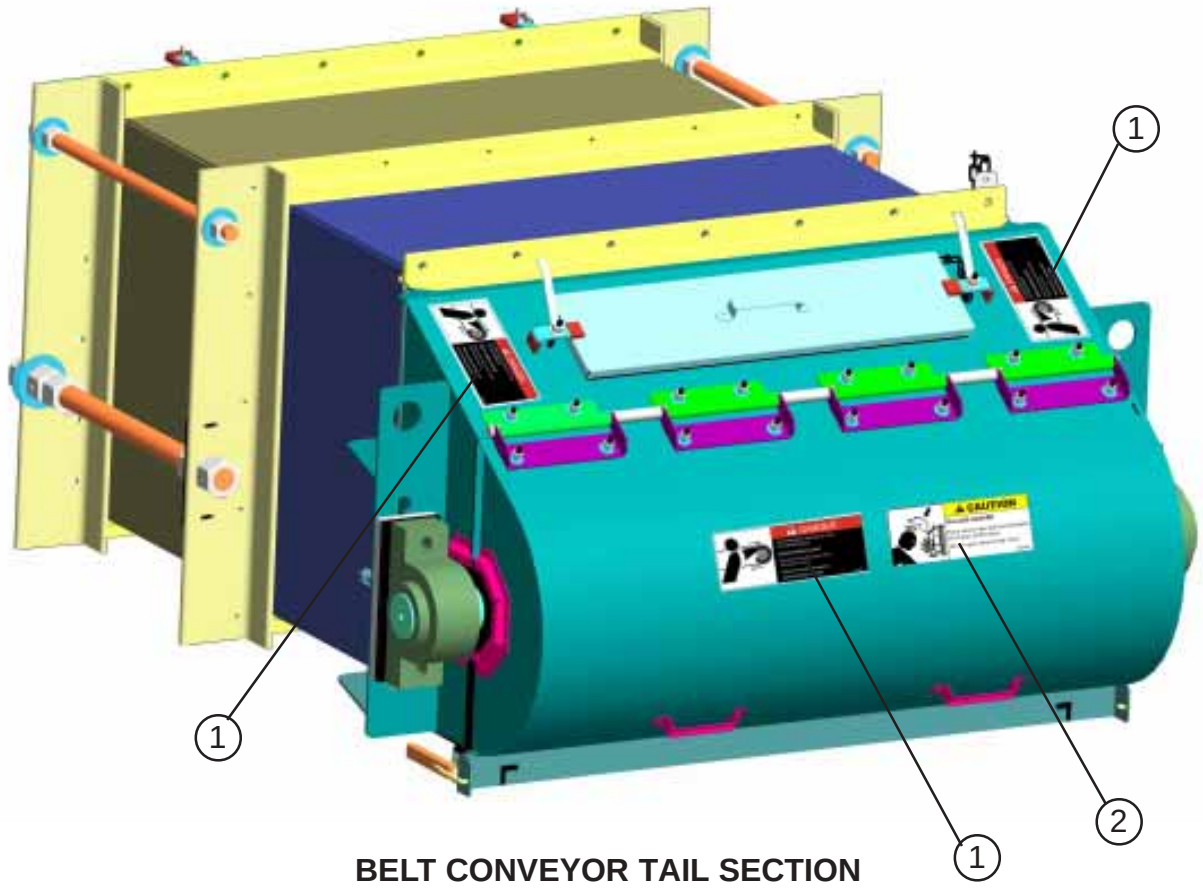
STANDARD HEAD SECTION



SNUB HEAD SECTION

1
DC-1672

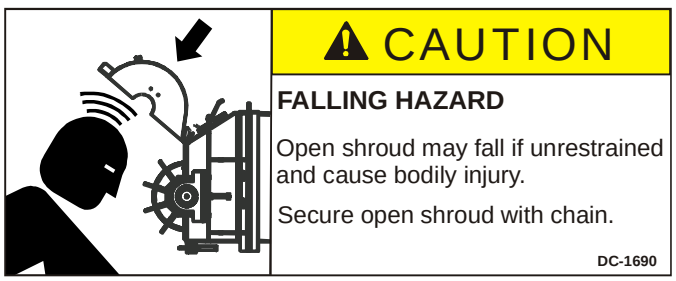
TAIL SECTION DECAL LOCATIONS



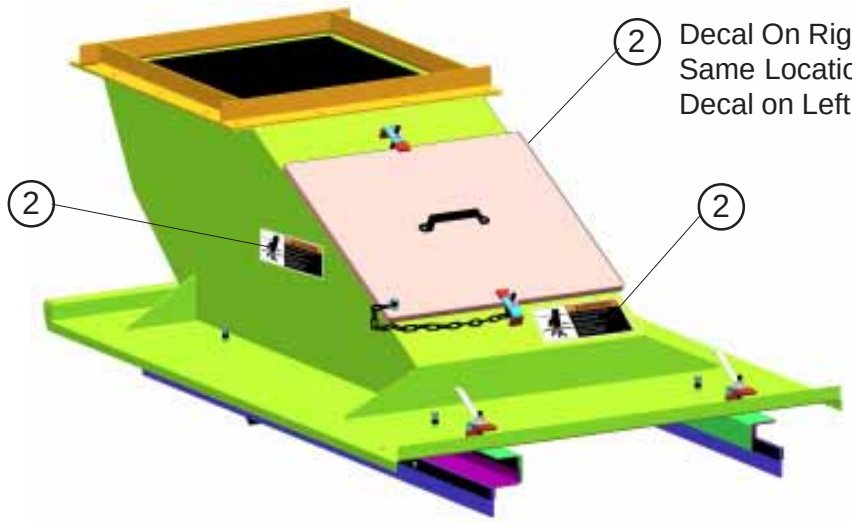
BELT CONVEYOR TAIL SECTION

(1) DC-1672

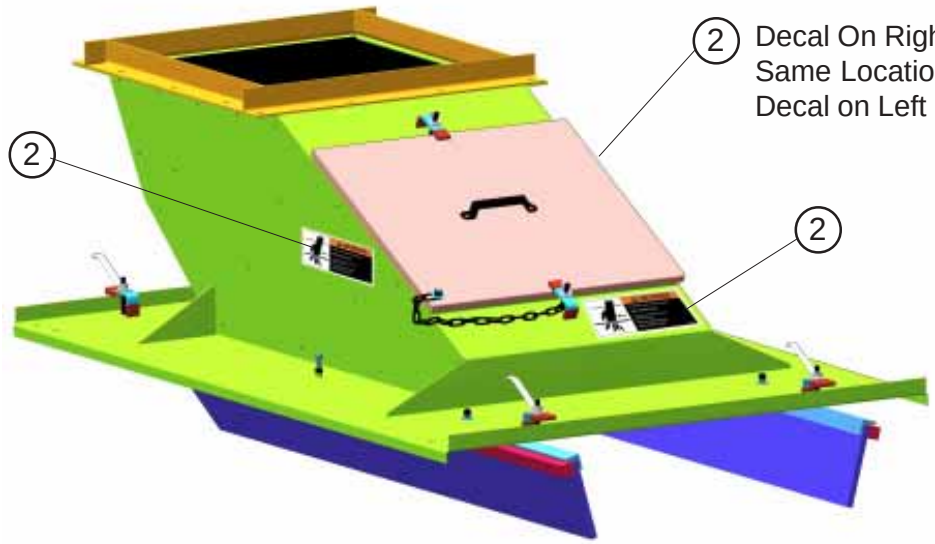
(2) DC-1690



LOADER SECTION DECAL LOCATIONS



FIXED SKIRT LOADER

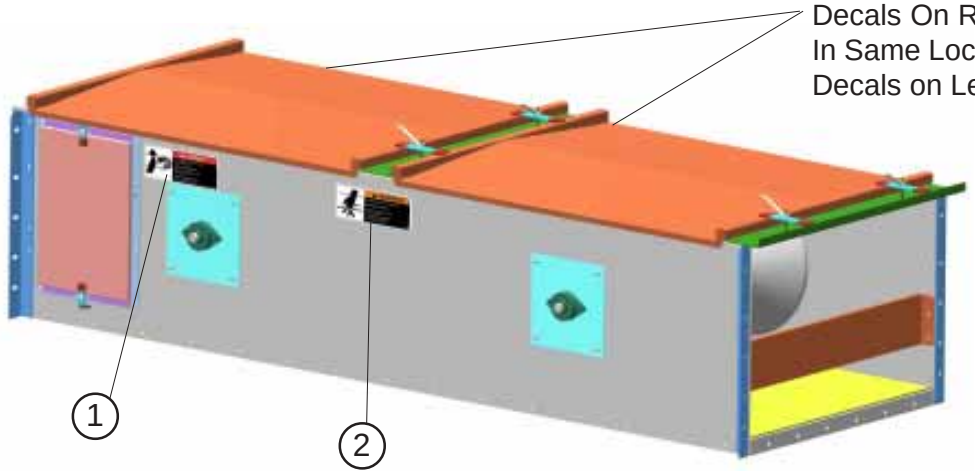


SWING-UP SKIRT LOADER

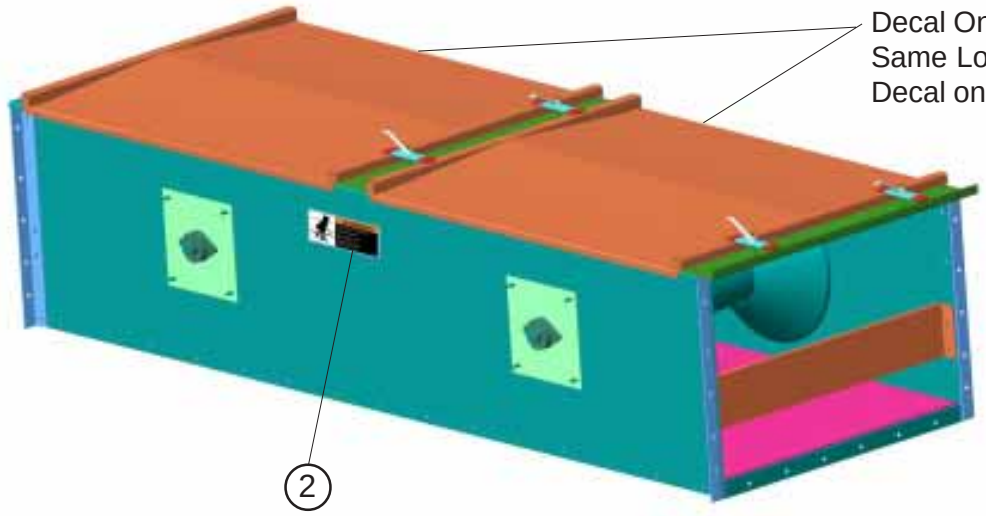
2

DC-1671

INTERMEDIATE SECTION DECAL LOCATIONS



INTERMEDIATE INSPECTION SECTION



STANDARD INTERMEDIATE SECTION

1 DC-1672

2 DC-1671

CONVEYOR ASSEMBLY OVERVIEW

1. Remove any banding and crating material. Arrange all the conveyor components in such a fashion that all are easily accessible.

2. Locate sturdy items to serve as blocking (i.e. wood blocks, saw horses, etc.). Blocking is used to support the conveyor sections above the ground to help in assembly. Locate and place the conveyor sections on the blocking in order, starting with the head section and concluding with the tail section.

3. A clearance of at least the width of the conveyor is recommended on all sides of the unit. Less clearance may be acceptable however, serious consideration must be given to methods of maintenance, removal and replacement of the conveyor and/or its parts.

4. The standard conveyor is constructed with one discharge located at the drive end. If tripper discharge sections are to be used, the location(s) must be determined before continuing with the conveyor assembly. It may be necessary to position a shorter intermediate section to serve as a spacer in order to accommodate the placement of the tripper discharge(s) where required.

5. Always consult with the approval prints for exact conveyor layout. Maintain adequate clearance for tail extension.

6. During installation of the conveyor, string a chalk line along the conveyor sides to assure that the conveyor is being assembled in a straight line. All hardware should be included with your conveyor. It is recommended that all flanges be caulked to seal the conveyor to keep the dust in and the weather out.

7. After all sections are caulked and bolted, the loader(s) is/are ready to be installed. Loaders must be installed with the grain stream moving in the same direction and same speed as the conveyor belt. (See page 30 for recommended spout loading).

8. After location of the loader(s) (as to spouts, gates, and valves) has been established, the loader(s) are bolted to the conveyor. Do not weld loader(s) to the conveyor. (See page 13 for loader installation).

9. Belt may now be hand fed through the conveyor. Make sure when splicing belt that each cut is clean, square and straight. Detailed belt assembly instructions are listed on pages 20 - 29. These instructions should be followed closely and read thoroughly before starting this step.

10. Check drive belts for tension. Also check the oil level in the speed reducer. ***Reducers are shipped without oil.*** Refer to page 41 for the type and quantity of oil. (DO NOT overfill reducer.)

INTERMEDIATE SECTION INSTALLATION

MAKE SURE TO READ ASSEMBLY OVERVIEW ON PAGE 9 FIRST.

1. Intermediate sections are supplied in standard ten foot (10') lengths. Depending on your application and individual specifications however, shorter sections may be required to accommodate a desired overall length.

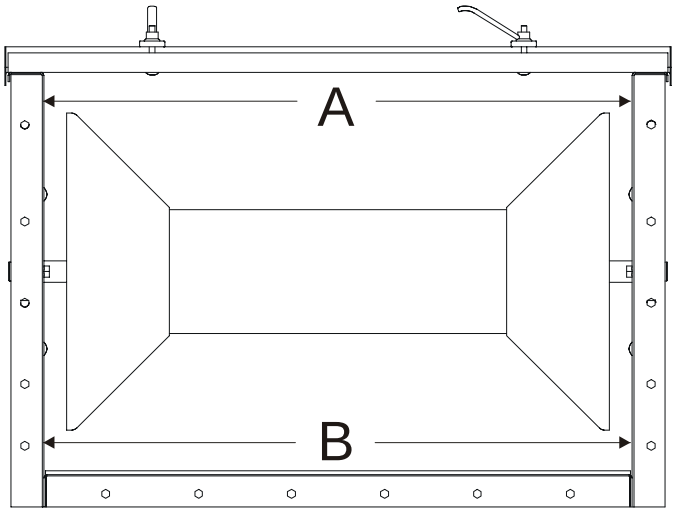
2. After making sure the flanges are aligned, tighten all hardware on the trough section. (It is recommended that the flanges are caulked to insure sealing from dust and outside moisture.)

3. During assembly of the intermediate sections, carefully inspect each flange joint to ensure that the inside bottom and side surfaces of the intermediates are flush. A chalk line is helpful during this phase of the assembly to ensure the proper alignment of the intermediate section surfaces. The maximum run-out in any direction should be +/- 1/4". Make sure the conveyor is level in horizontal applications.

4. Proceed by attaching the head and tail assemblies using the same alignment procedures and precautions noted in the preceding paragraph.

NOTE

It is critical for straitness of the conveyor that the sides and bottom flanges are aligned flush. Also, it is important that the inside dimensions of the box measure equidistant from side-to-side both top and bottom of the intermediate section (Dimension A = Dimension B). See diagram below.



End View of Intermediate Section (Liners not shown for clarity)

INTERMEDIATE SECTION INSTALLATION (CONT.)

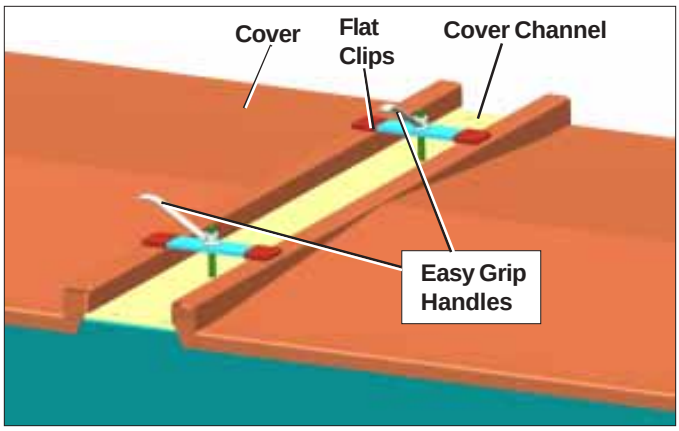
1. Intermediate Sections bolt together along the side and bottom flanges. The covers are fastened to the cover channels by flat clips and easy grip handles.

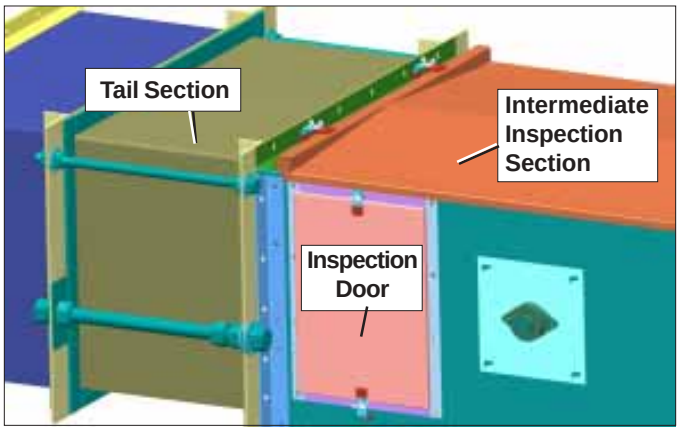
2. Standard intermediate sections do not have a direction in which they bolt to other intermediate sections. The cover channels connect intermediate sections on both ends.

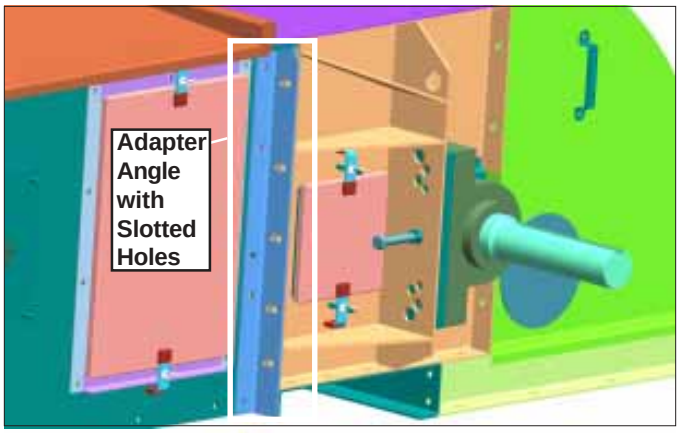
3. Two inspection intermediate sections are included on each installation. They should be assembled at the head and tail. The inspection holes should be oriented closest to the head or tail.

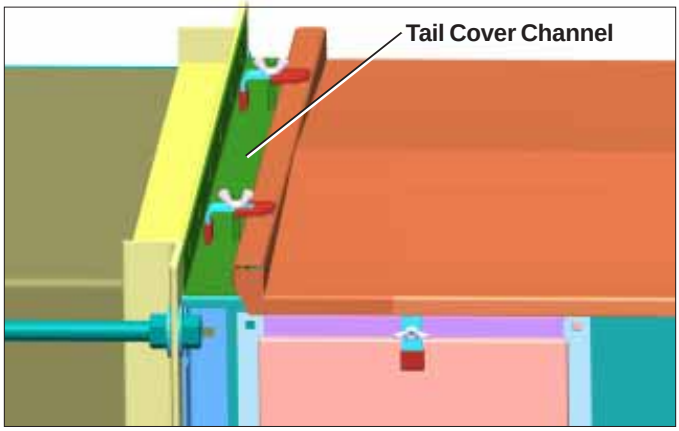
4. The inspection door end of each intermediate section has adapter angles with slotted holes for bolting to head or tail sections.

5. A special cover channel is provided with the tail as shown at right.









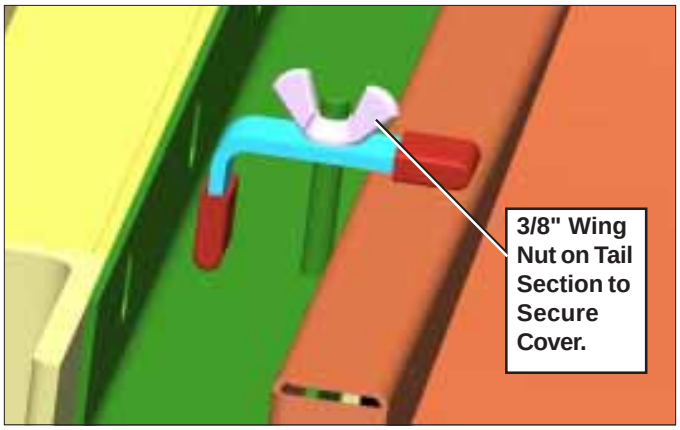
COVER INSTALLATION

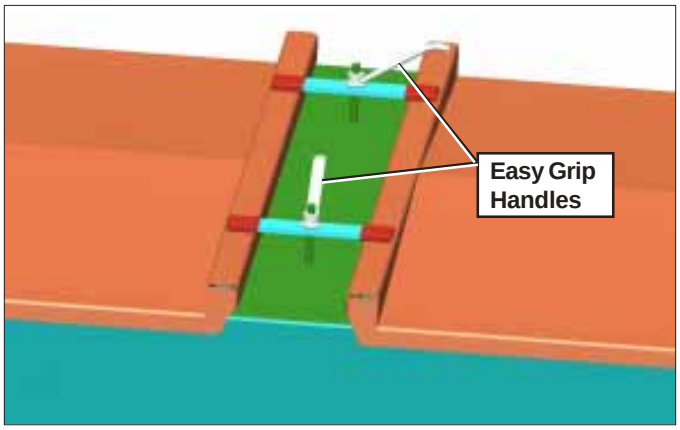
1. Fasten covers to the belt conveyor with the 3/8" easy grip handles provided. Adequately tighten the 3/8" handles so that the covers are in tight contact with conveyor cross channels.

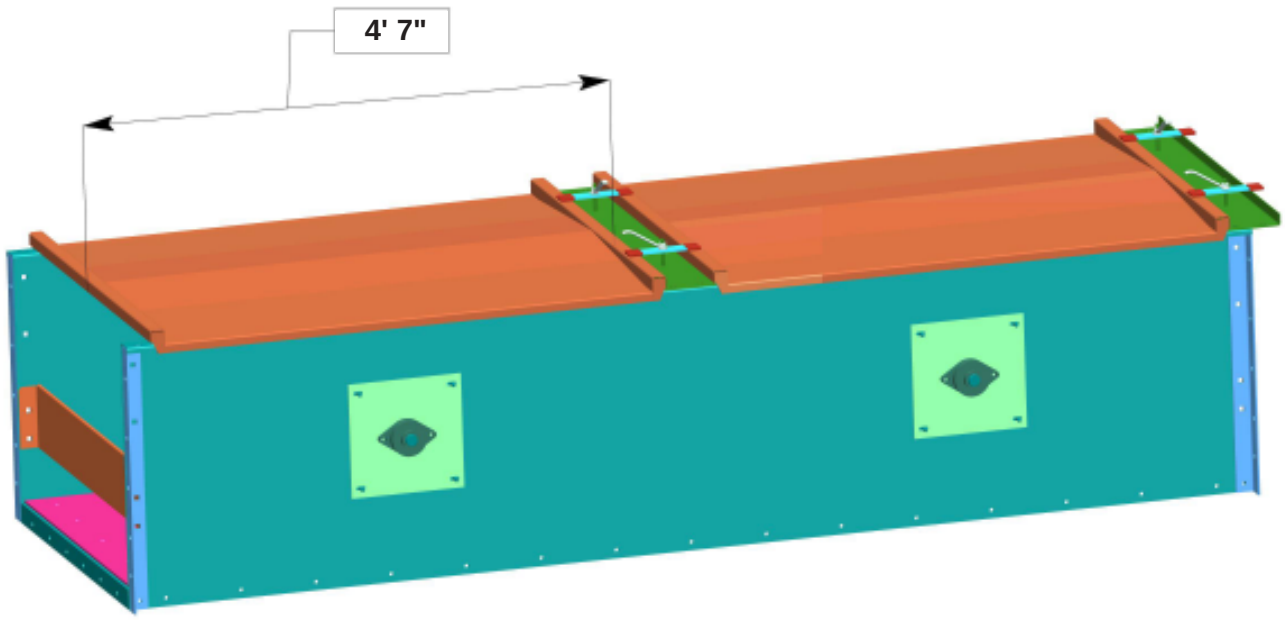
2. When a loader is on the conveyor, the cover section may have to be cut accordingly to accommodate the loader. For installation of a loader, see Loader Installation on page 13.

3. Conveyor covers are made to fit over the entire width and half the length of a conveyor intermediate section. Standard covers measure approximately 4' 7" in length. When a loader is ordered, the cover may be measured and cut to take up the displacement of the loader housing. This depends on the position of the loader.

NOTE **DO NOT** Walk on Conveyor Covers!







Standard Cover Length

LOADER INSTALLATION

Fixed Skirt Loader

1. The fixed skirt loader always attaches at the tail end so no cover modifications should be necessary. The soft rubber skirts are adjustable and can be set to lightly touch the conveyor belt.

Swing-Up Skirt Loader

1. If the loader doesn't line up exactly with an intermediate cover, the intermediate covers will need to be cut to fit. If this is necessary, properly position loader and cut a section from the covers so they will fit between the cover channel bolted to next section and the loader flange. Weld cover back together to achieve required length. Repaint welded area to prevent rusting.

2. The UHMW swing-up skirts should not touch the conveyor belt as they can cause wear to the belt. Use the adjustable set screws to locate the position of the skirts.

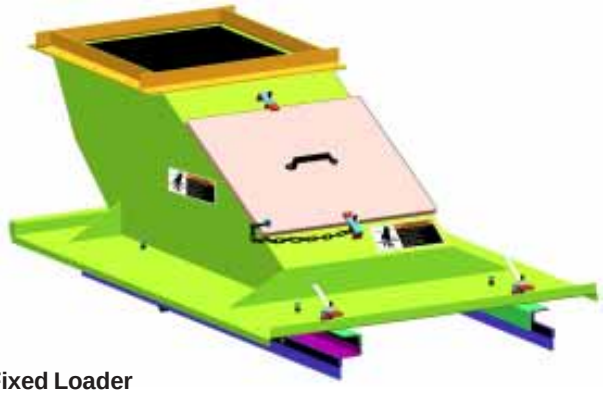
⚠ DANGER

REMOVE PAINT BEFORE WELDING OR CUTTING

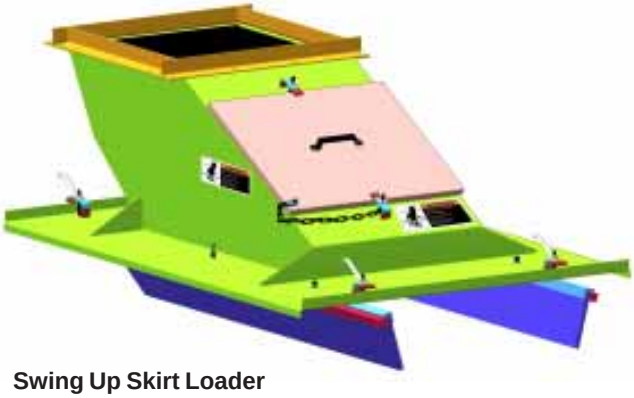
Avoid hazardous fumes that can be generated when paint is heated by welding or torching. Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

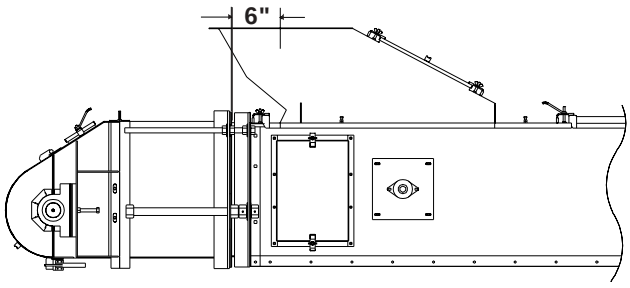
- **If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.**
- **If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or strip per containers and other flammable material from area. Allow fumes to disperse at least 15 minutes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



Fixed Loader

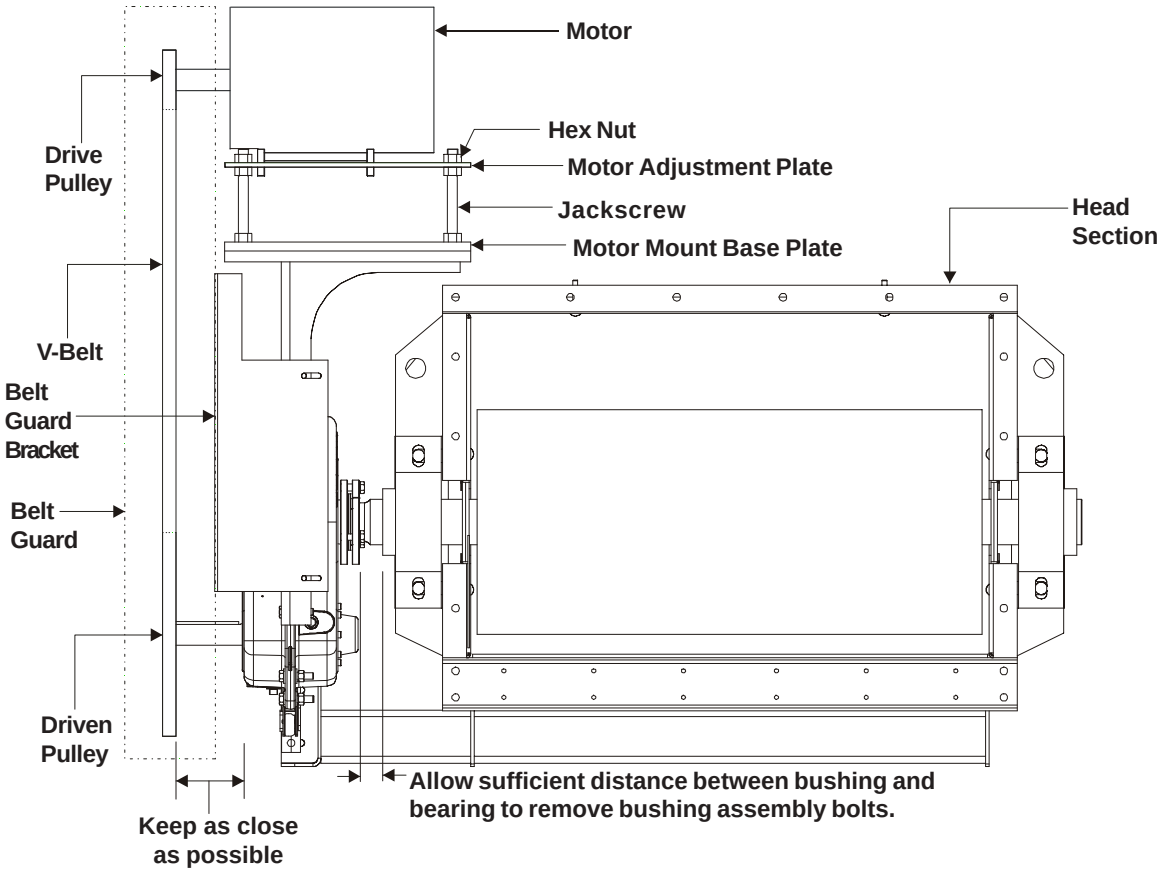


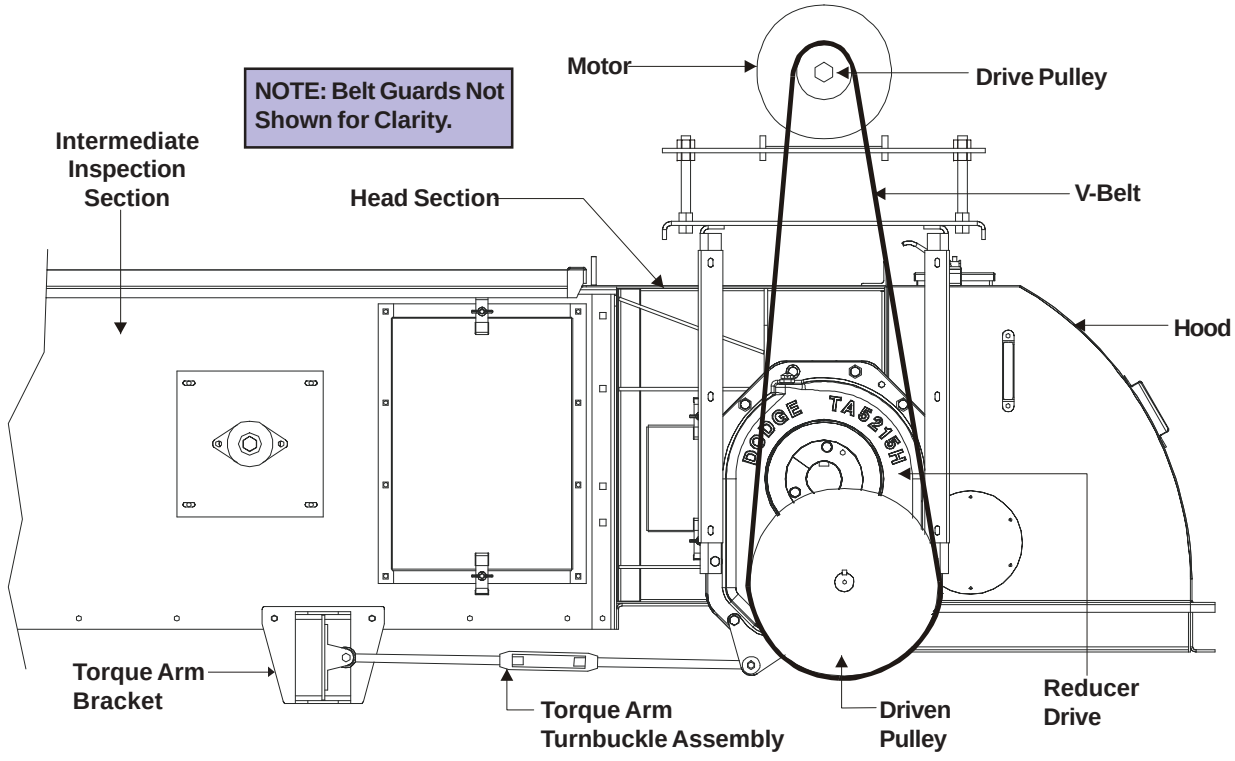
Swing Up Skirt Loader



GSI's recommendation for loader installation includes a minimum distance of no less than 6" between the center of loader inlet and the tail assembly.

MOTOR AND SHAFT TORQUE ARM II INSTALLATION





MOTOR AND TORQUE ARM II REDUCER INSTALLATION

Reducer

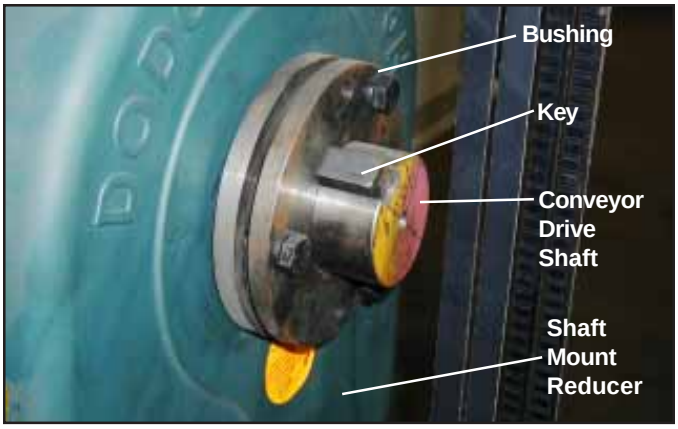
1. To aid in the installation of the reducer onto the shaft, remove any protective coating film from the shaft.

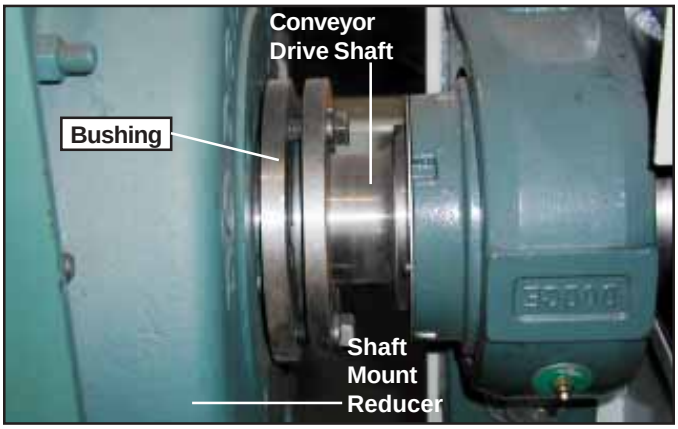
2. Place key in the keyway on the drive shaft.

3. Attach inside bushing to the reducer drive.

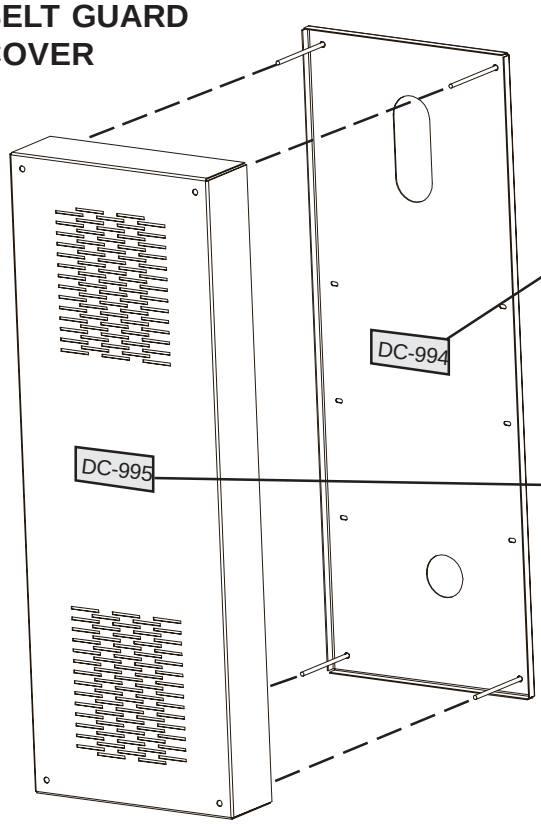
4. Line up the keyway on reducer with key on shaft and slide the reducer drive onto the drive shaft.

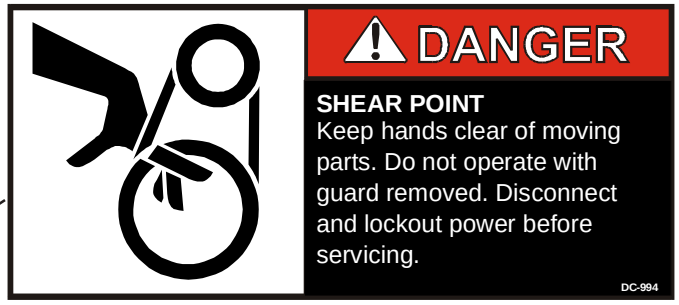
5. Slide outside bushing onto shaft and attach to reducer drive. Once reducer drive is in place, fully tighten both bushings. (See page 38 for more details.)





BELT GUARD COVER





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DC-995

MOTOR AND TORQUE ARM II REDUCER INSTALLATION *(CONT.)*

Torque Arm Turnbuckle Assembly

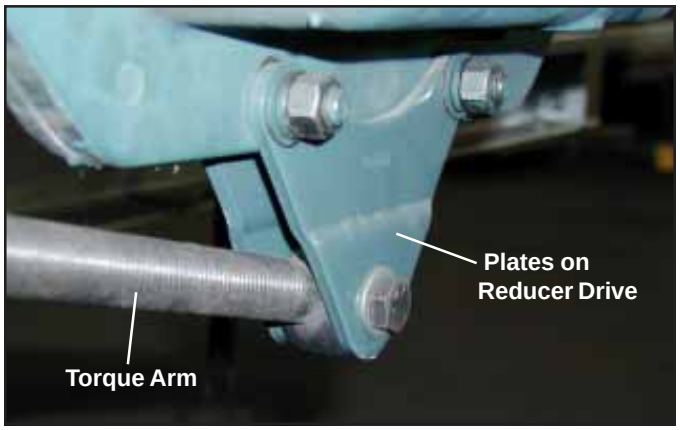
6. Install the torque arm between the 2 plates that are located on the bottom of the reducer drive. Secure using bolt with washer and lock nuts. Attach the other end to the torque arm bracket on the conveyor using two bolts, washers, and locknuts. Tighten the torque arm by turning the turnbuckle. Adjust the position of the reducer. The reducer should be in a vertical position as shown on page 14.

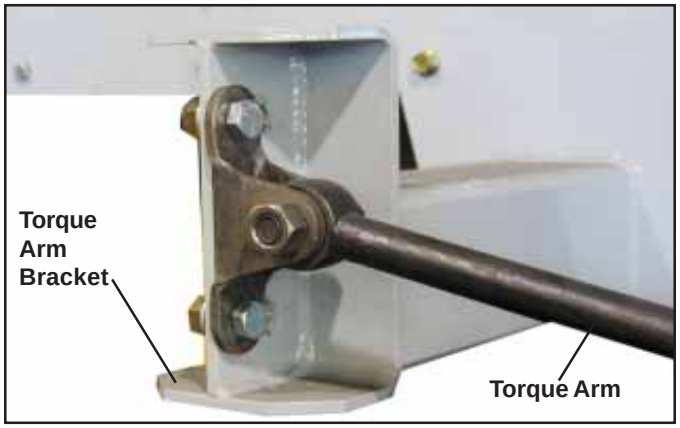
Torque Arm Bracket

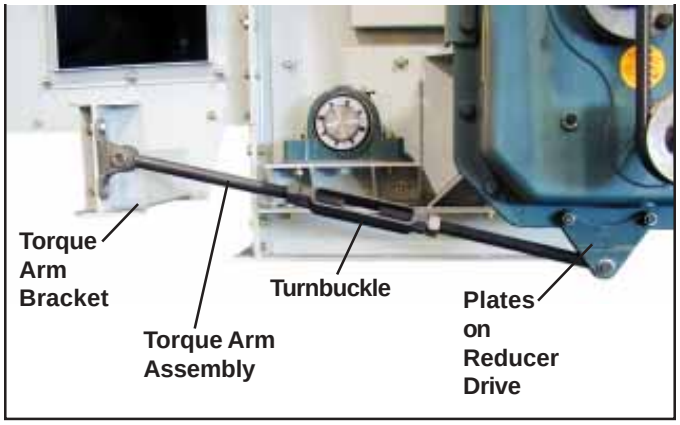
7. The torque arm bracket is mounted under the first intermediate section. Locate bracket by matching an existing set of holes in the intermediate side that allows the turnbuckle assembly to be as short as possible with the reducer in a vertical position.

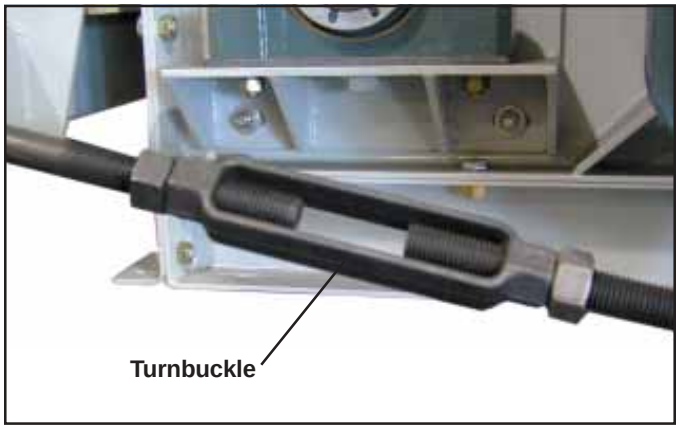
NOTE

The holes in the intermediate side must be drilled out to 9/16" Diameter. Attach with provided hardware.









MOTOR AND TORQUE ARM II REDUCER INSTALLATION *(CONT.)*

Motor Mount Brackets

8. Remove three bolts from each side of the reducer housing. Use a set of holes in the motor mount upright brackets that allows the motor plate to be as close as possible to the top of the conveyor. Check this location by temporarily positioning the belt guard on the reducer with the hole in the guard centered over the reducer input shaft. This will show the correct motor position for the lengths of v-belts provided. Attach by replacing bolts through brackets and housing. Tighten bolts securely.

Motor Mount Adjustment Plates

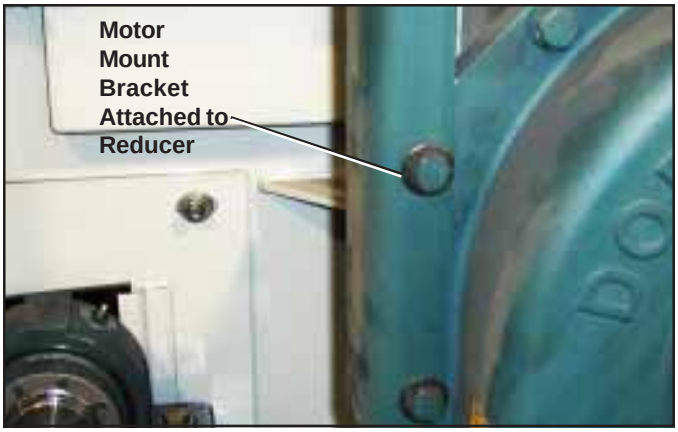
9. Thread nuts onto jackscrews. Place bolt through motor mount bracket and base plate. Thread another nut onto jackscrews to secure. Repeat for 3 remaining jackscrews.

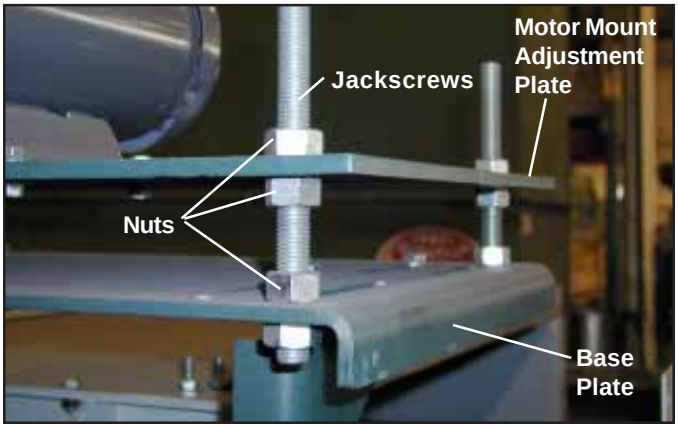
10. Thread another nut onto all four jackscrews. Place adjustment plate onto jackscrews. Thread another nut onto each jackscrew to secure adjustment plate. Use these nuts to adjust the motor height.

11. Attach the motor to the adjustment plate using bolts and locknuts.

Drive Guard Rear Panel

12. Install the rear panel of the drive guard before mounting the sheaves. The rear panel has two (2) mounting brackets with slotted holes. Attach these left-hand and right-hand belt guard mounting brackets to the motor mount frame. Then fasten rear panel of belt guard to the belt guard brackets. After the rear panel is in place, install sheaves onto motor and reducer.





Sheaves and Belts

13. Assemble the V-belt driven sheave to the input shaft of the shaft mount reducer. Insert the bushing into sheave hub. Match holes in bushing and hub (not threads). Put screws into holes that are farthest apart. Slip entire unit with key onto shaft. Align the driver and driven sheaves and tighten the retaining screws. During tightening, it is possible for the sheave to move out of alignment or become out of square. For maximum V-Belt life, the driven sheave should remain both perpendicular to the drive shaft and aligned with the drive sheave. Slip the V-belts over both the driver and driven sheaves.

V-Belt Adjustment

14. Adjustment of V-belt tension is achieved by tightening the hex nuts located on the four (4) jackscrews of the motor base. Adjust motor base equally at all four jackscrews to maintain shaft alignment. Belts are designed to fit loose upon installation. When the V-belt tension is correct, tighten the top nut on the jackscrews to lock the motor base in position. Proper tension is 1/64" of deflection per one (1") inch of sheave centers on one side of belt, centered between sheaves. (See diagram below.)

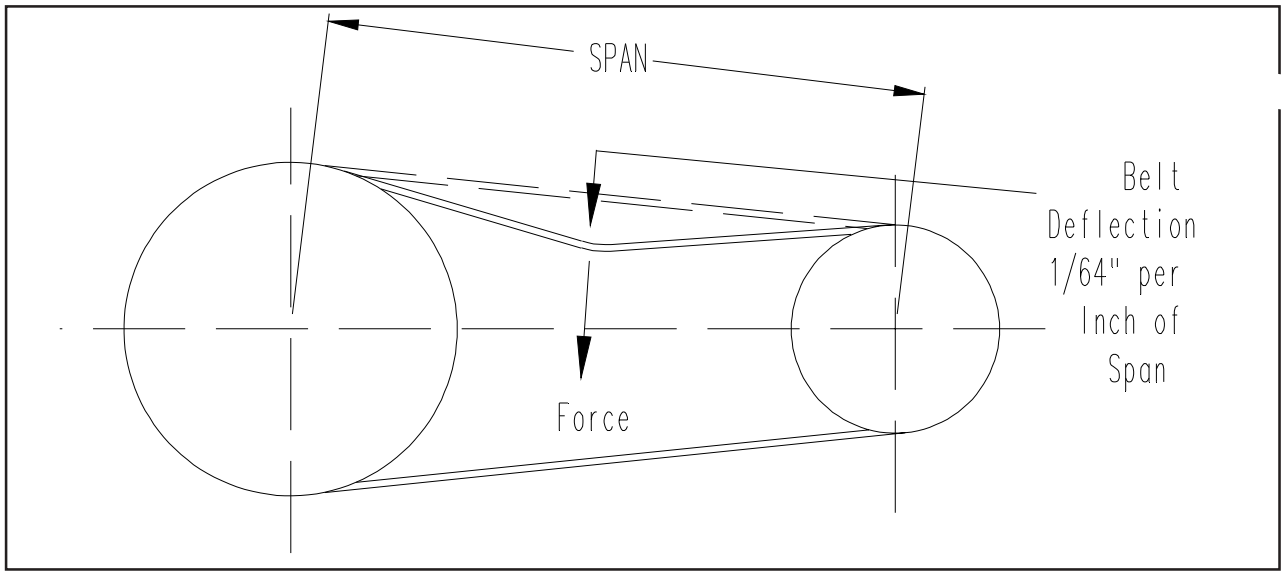
NOTE

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

Sample Deflection Problem:

3-1/2' Span = 21/32" of Deflection (Approximately 11/16")

1. **3-1/2' = 42"**
2. **1/64" = .015625"**
3. **42" x .015625" = .65625"**
4. **.65625" = 21/32" of Deflection**



Front Guard Panel

15. Install the front drive guard panel over the four corner mounting studs. Secure with washers and nuts provided.

Lubricate Reducer Drive

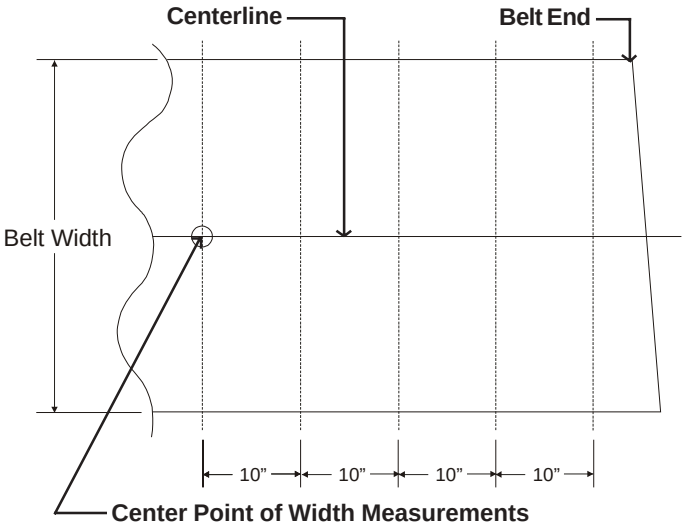
16. Fill the shaft mount reducer with the manufacturer's recommended oil. (See Page 41.)

Lubricate Bearings

17. Grease bearings on head, tail and idlers. Lubricate bearings according to bearing manufacturer's recommendations. (See Page 52.)

FINDING BELT CENTER LINE

1. To find the belt center line, measure the belt width at five points. Starting near the end of the belt, measure the belt width in 10" intervals, marking them as you measure. Each measurement shall then be divided in two and marked. Using a straight edge, draw a center line using the points as a guide. (See diagram at right)

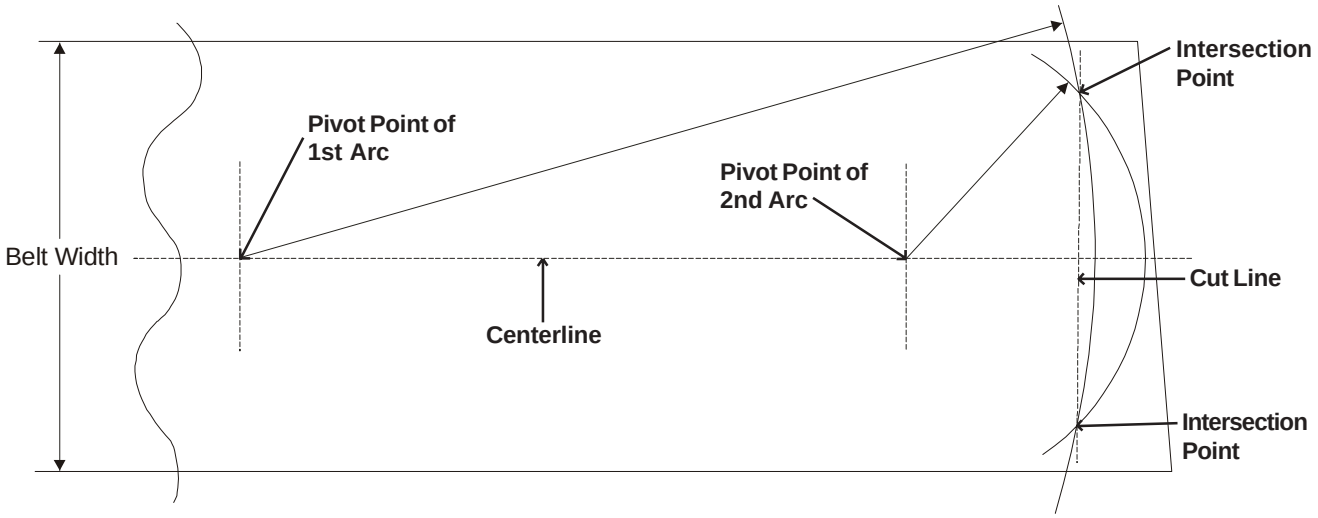


SQUARING THE BELT END

1. A double arc method is used on establishing a cut line on the belt. After a center line has been drawn, pick a point on the center line about two times the belt width. From this point, strike an arc across the width of the belt end. A nail may be used as a pivot point with twine used as the arm of the arc. Tie a marking tool (chalk, for example) to the end of the twine.
2. A second set of arcs is struck with the pivot point of the arc on center line and close to the belt end. Where the two arcs intersect each other are points on which a cut line is drawn.

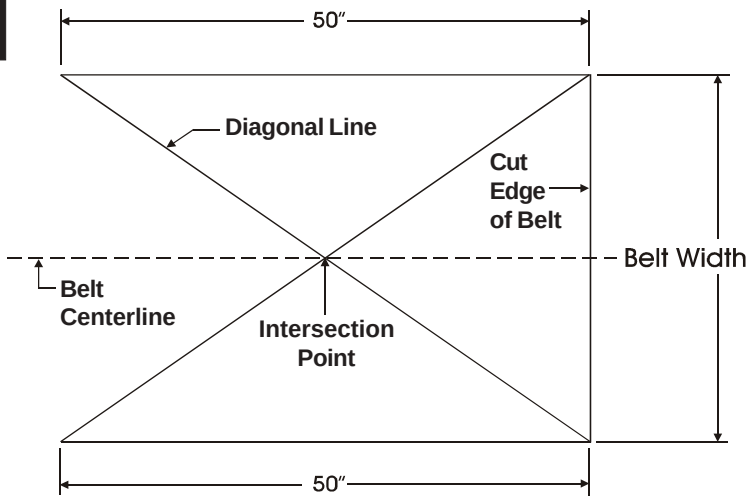
NOTE

The second arc should be slightly less than half of the width of the belt.



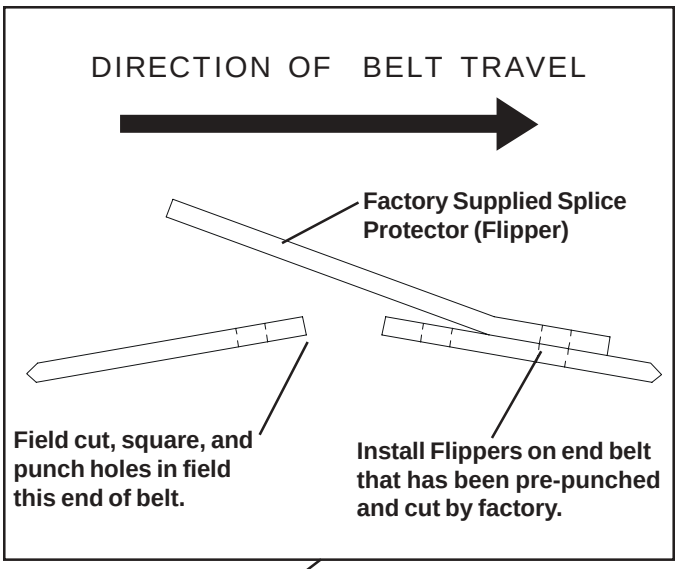
CHECK THE SQUARENESS OF THE BELT CUT

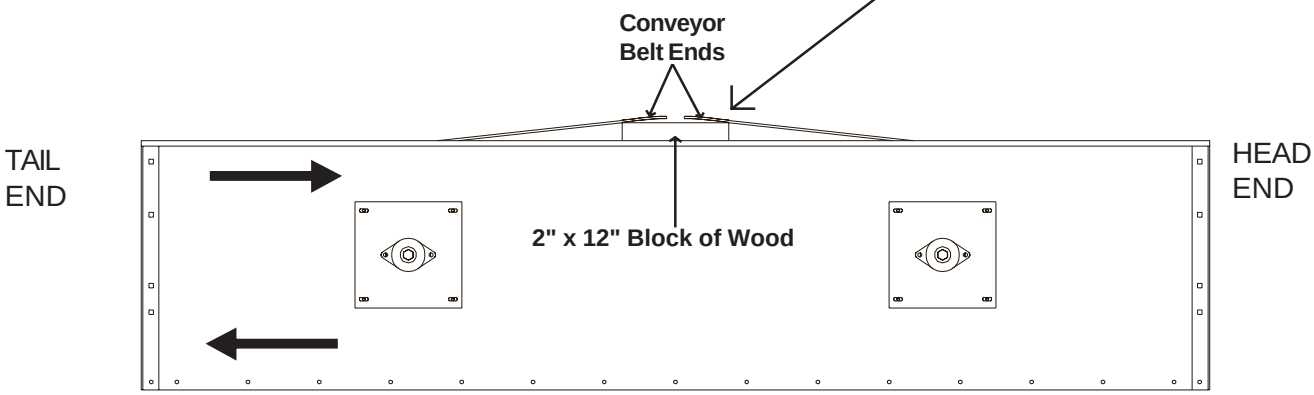
1. To check for the accuracy of the cut made, measure lengthwise 50 inches from each edge of the belt. Using a straight edge, draw a line diagonally across the belt. This should be done from the 50 inch point to the end corner on the opposite side of the belt. Do the same procedure in reverse to form an “x”. The intersection point of the two lines of the “x” should be in line with the center line of the belt.



INSTALLATION OF BELT

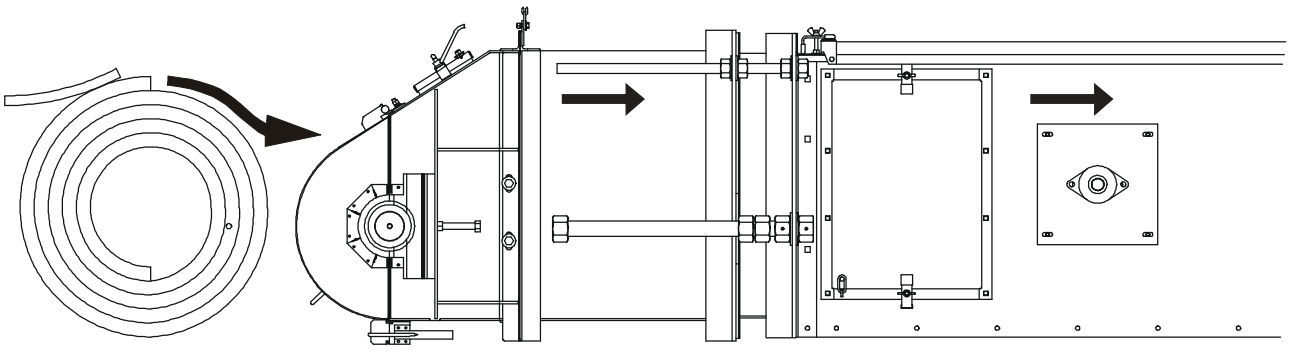
1. Hand thread the belt through the conveyor with the tail section in a retracted position. Attach a tightening device to each end of the belt to prevent damage to the belt. Place a 2" x 12" piece of wood width wise on top of an intermediate section where the belt ends are to be brought together. Bring the belt seam together over the 2" x 12" piece of wood for a working surface to be used for splicing. (See diagram below.) The belt splice can now be installed following step-by-step directions on the following four pages.





Intermediate Section with Covers Removed

Detail installation of belting into conveyor.



Install belting into tail end.

IMPORTANT: Note the direction of the flippers on belt. Flippers are installed to aid in cleanout of tail shroud.

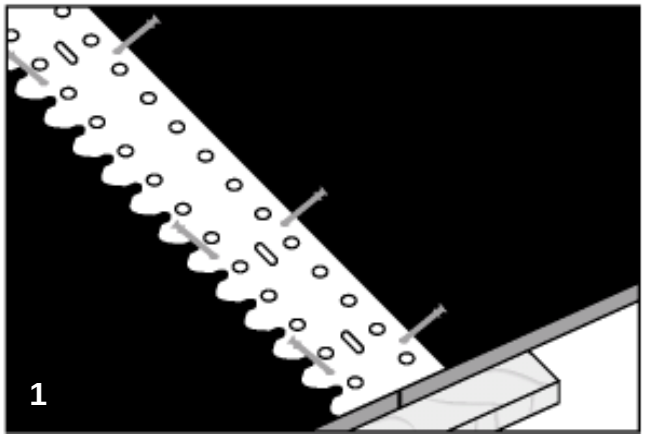
SPLICING THE BELT

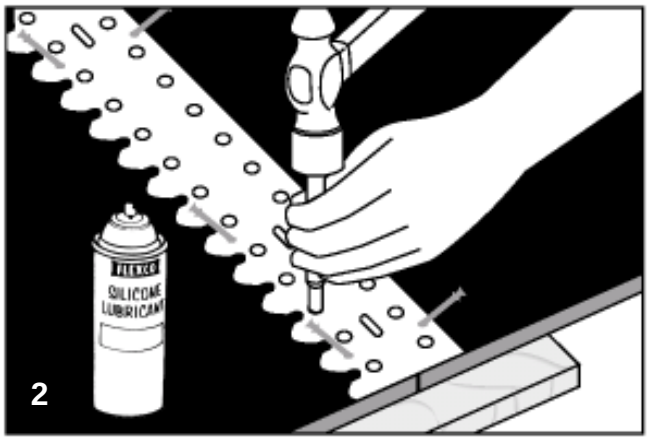
1. Support belt ends with wood plank. Nail Flexco Template in position with belt ends tight against lugs.

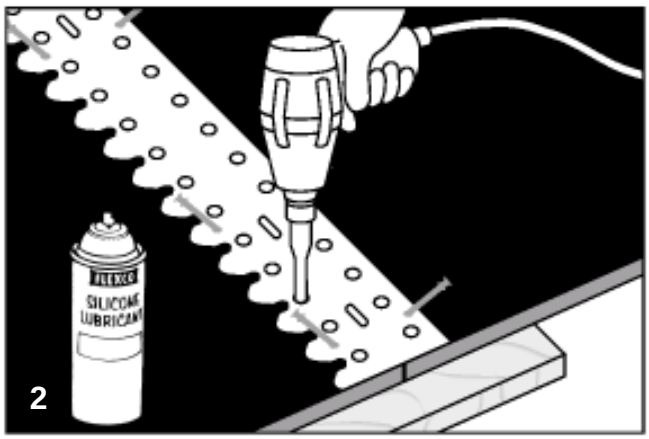
2. Spray template holes with Flexco Silicone Lubricant. Punch or bore bolt holes. Remove template.

NOTE

Splice protector design may vary due to type of conveyor. I.E. - Reversible conveyors and conveyors with low-profile head discharges do not have splice protectors with tails (flippers).







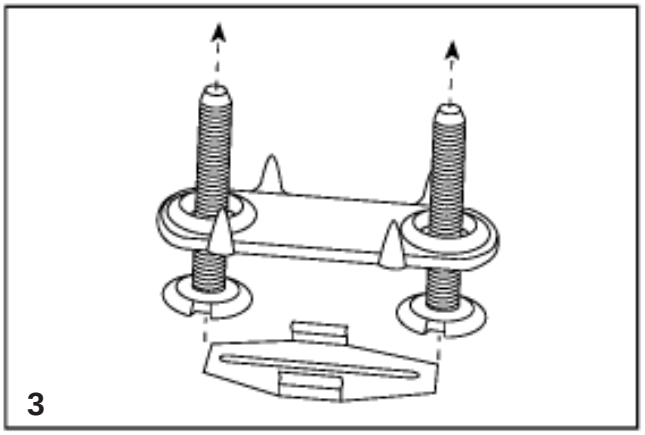
SPLICING THE BELT *(Cont.)*

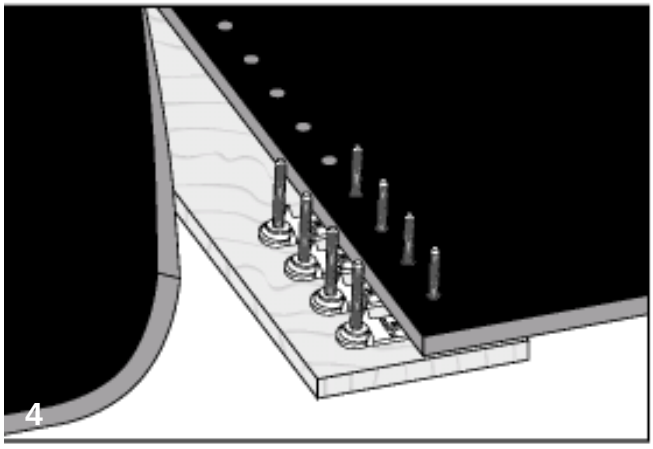
3. To assemble bottom plate insert 2 bolts and attach clip.

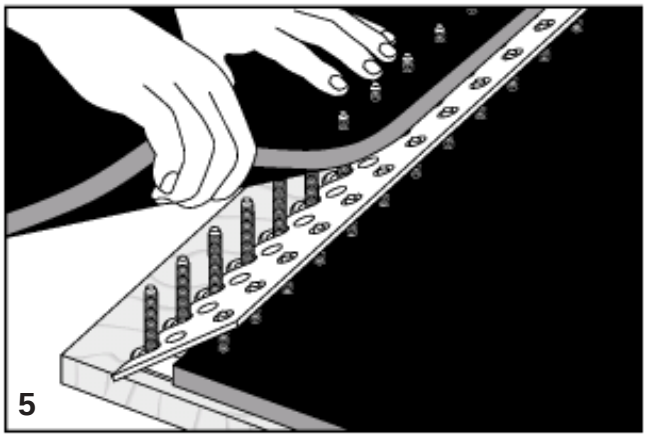
4. Fold one belt end back and insert bolts in one row of holes.

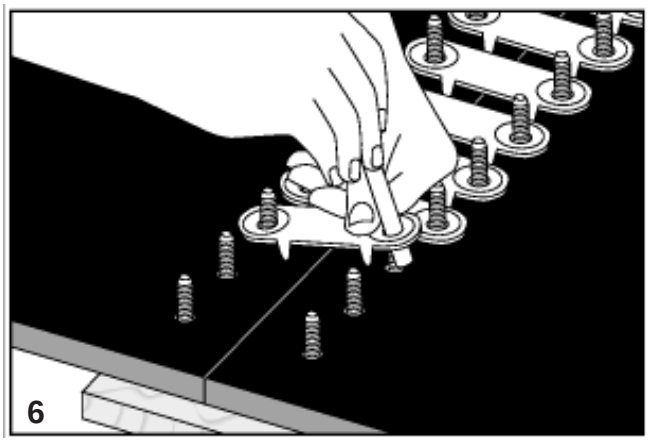
5. Align bolts with template teeth and place the other belt end over bolts. Remove template.

6. Place top plates over bolts using bolt horn.









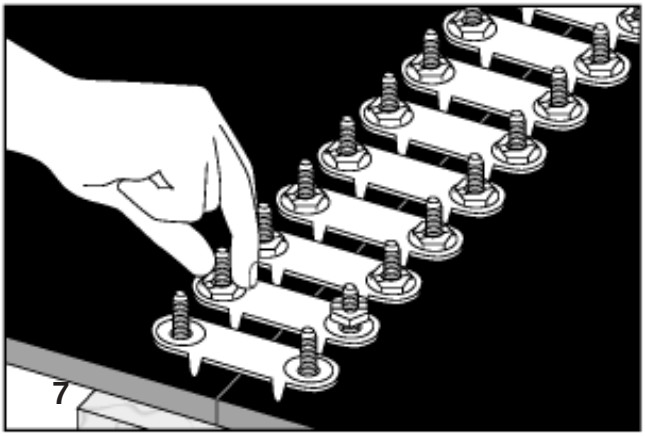
SPLICING THE BELT *(Cont.)*

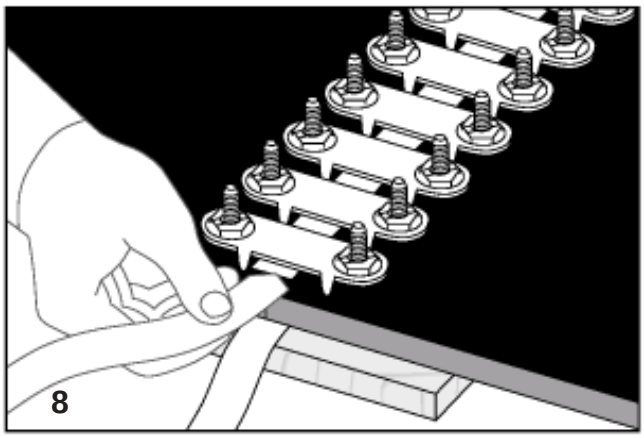
7. Start nuts on bolts by hand.

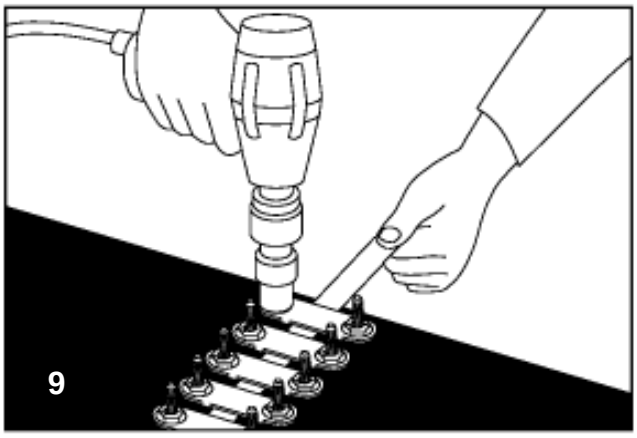
8. Cut Flexco-Lok Tape 3-1/2 times the belt width and feed tape under top plates, under the bottom plates, then back under top plates.

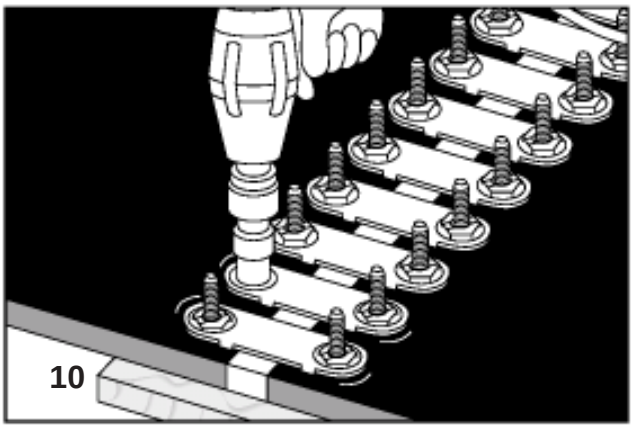
9. Pull tape tight and hold in position by tightening a fastener at each end. Then tighten all other plates.

10. Tighten all nuts uniformly. **NOTE**: A flexco Power Wrench used with an impact tool will speed this step considerably.









SPLICING THE BELT *(Cont.)*

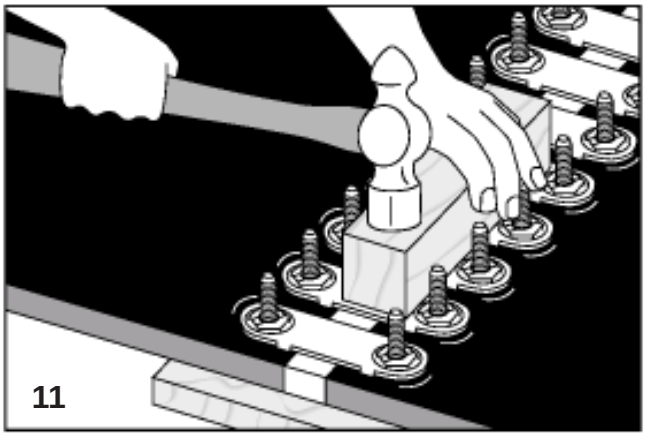
11. Hammer plates in belt with wood block. Retighten nuts.

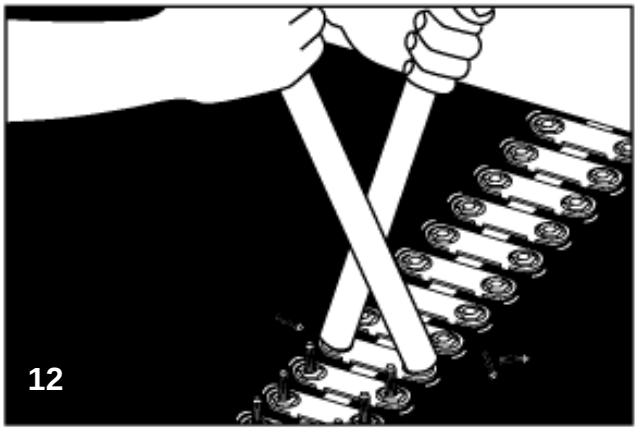
12. Break off excess bolt ends using two bolt breakers. Peen or grind bolts to finish.

13. Place flippers on belt. The flipper should be located so the tail of the flipper covers the splice. **Note direction of belt travel.** The flippers are evenly spaced across the belt with a 1/4" gap between them. There will be a larger gap between the outside flipper and the edge of the belt.

14. Punch or bore holes. Attach flippers using same connectors as splice. Repeat steps 10-12.

15. Finished splice.





BELT TENSION

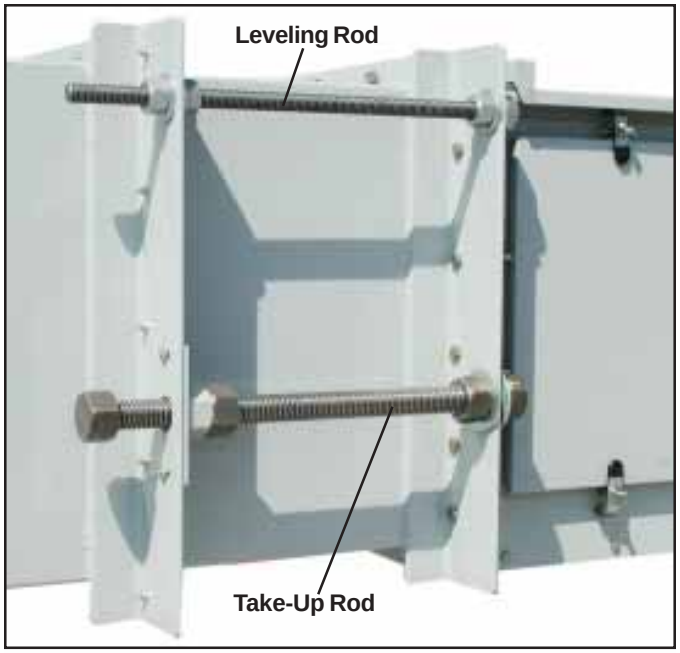
1. **IMPORTANT: The belt tension should be checked every day of use for the first few days.** Conveyor belts stretch when new and must be checked at regular intervals. After approximately two weeks of usage, checks of belt tension may be done at less frequent intervals.
2. After splice has been installed and 2" x 12" piece of wood is removed, belt is ready to be tightened.
3. The belt is tightened by turning the take-up rods located on the tail section. Make sure that they are adjusted equally to prevent misalignment. The conveyor belt should be tightened enough to prevent the belt from slipping on the drive pulley. When done adjusting take-up rods, tighten nuts against flanges to lock in place.

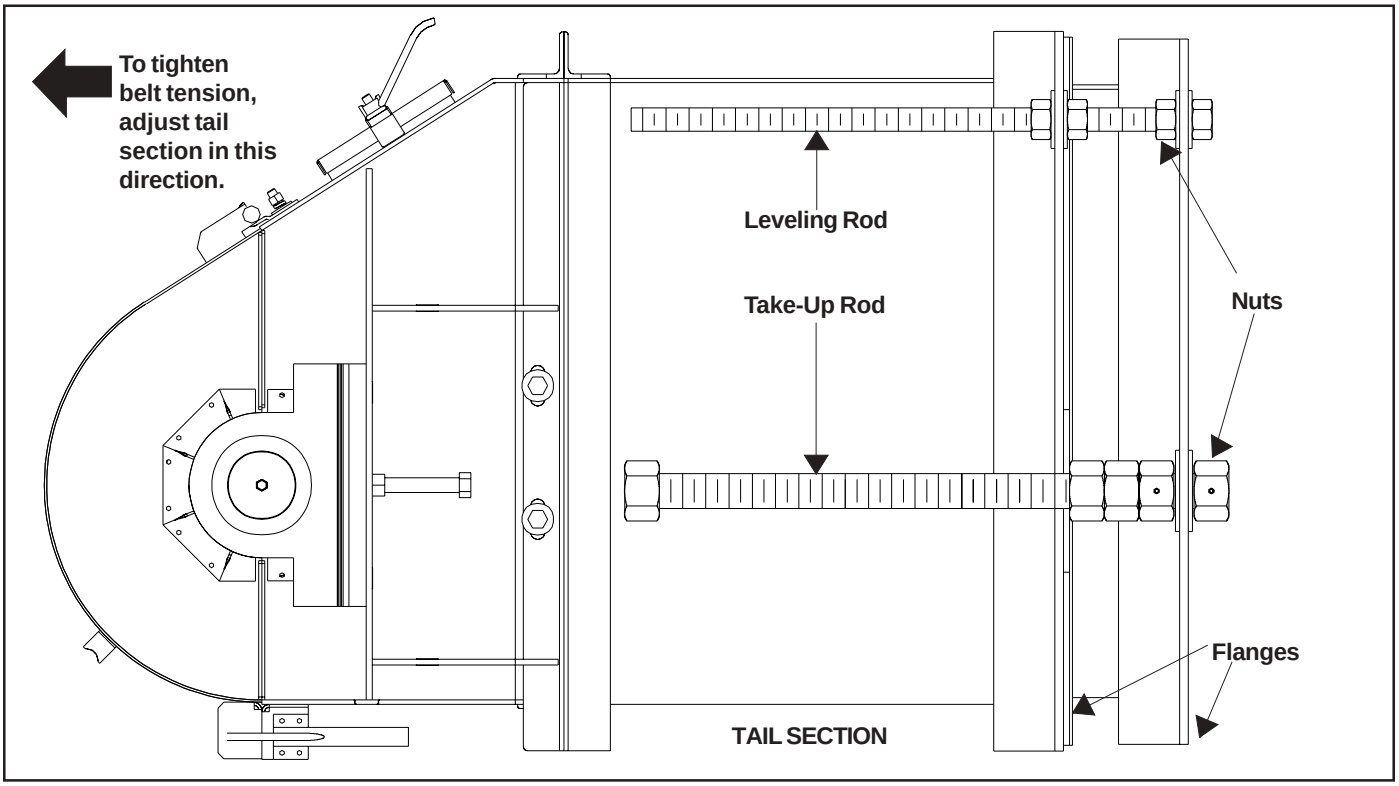
NOTE

Do Not over tighten belt. Over tightening can cause premature wear of bearings and shafts.

NOTE

After an hour of running, the belt should be retightened and thereafter checked at regular intervals. **Take-Up Rods are for tightening belt only.** They are not to be used to adjust belt tracking.





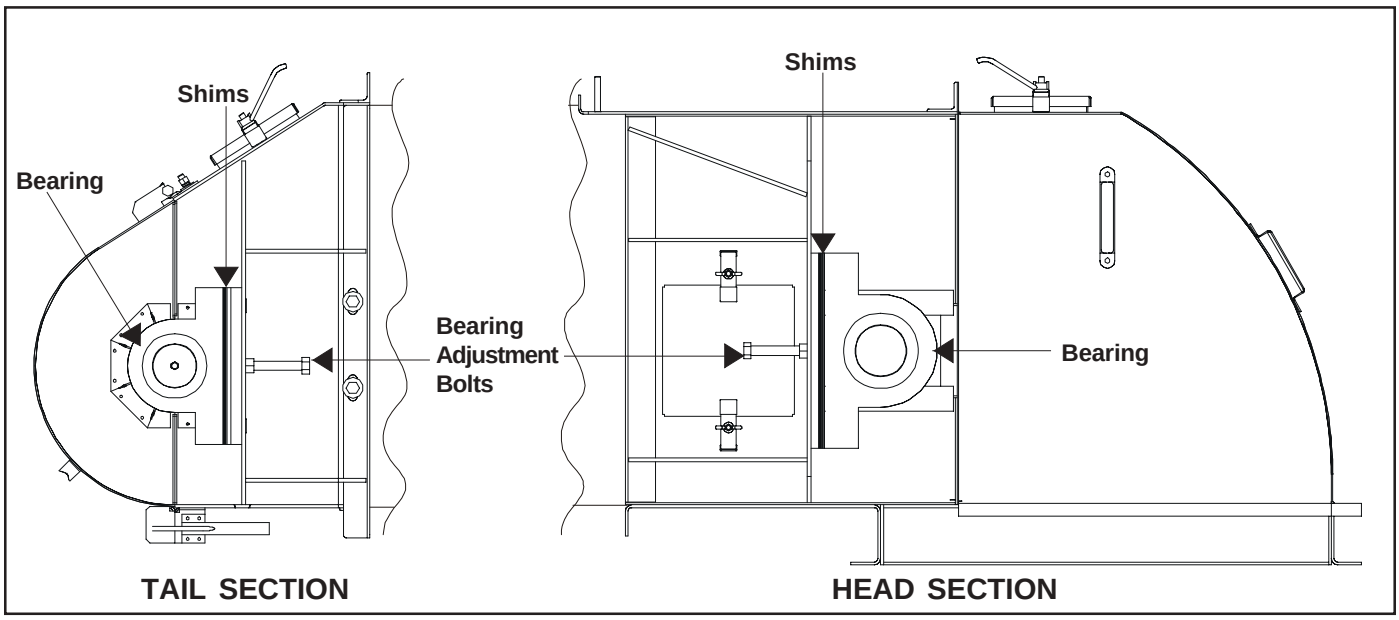
BELT TRACKING

Squareness of the Conveyor

1. Before tracking procedure is begun, each section should be square and straight so there is no unequal weight distribution. Check conveyor intermediate sections for any extensive damage such as cave-in sides, etc. Idlers should be checked for looseness. If idlers are loose, re-center and tighten set screws on bearing lock collar.

2. After intermediate sections are bolted together, a chalk line should be strung along the sides of the conveyor, making sure that it is in a straight line. Loosening bolts on the intermediate frames will permit slight adjustment of the intermediate sections.

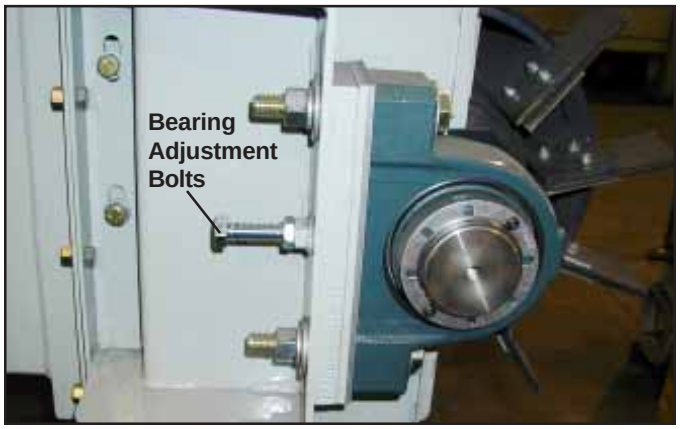
3. After conveyor has been installed, check to see if the unit is level (width wise). The conveyor must be level for proper belt tracking.

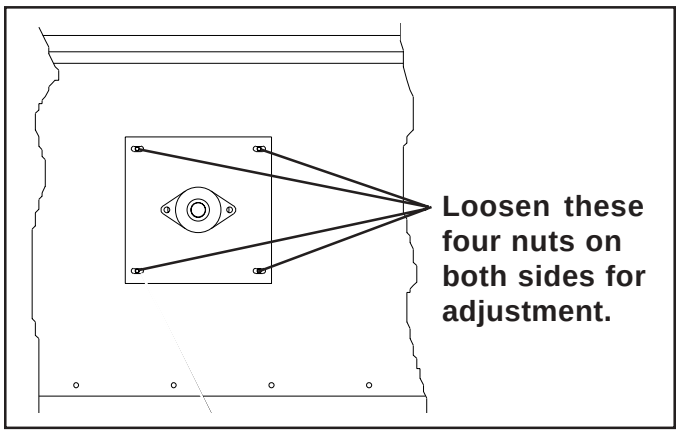


Tracking Adjustment

4. Belt tracking adjustment is initiated by moving the bearing adjustment bolts. These are located on both sides of the head and tail sections. Belt tracking adjustments are made by adding or removing shims under bearing as necessary. **DO NOT** use take-up rods to correct belt tracking.

5. Adjustment of the idlers is done by loosening eight bolts. These bolts hold the bearings in place and are located on both sides of the conveyor sections (four on each side). After loosening these bolts, the end of the idler can shift either forward or backward.





General Tracking/Training Procedures

6. Tracking the belt is a process of adjusting idlers, pulleys, and loading conditions in a manner that will correct any tendencies of the belt to run other than true.

7. A normal sequence of training is to start with the top pulleys in the direction of belt travel. Start with the belt empty. After tracking is completed, run the belt with a full load and recheck tracking.

8. Tracking adjustment is done while the belt is running and should be spread over some length of the conveyor preceding the region of trouble. The adjustment may not be immediately apparent, so permit the belt to run for several minutes and at least three full belt revolutions after each idler adjustment to determine if additional "tracking" is required.

9. After adjustment, if the belt has overcorrected, it should be restored by moving back the same idler, and not by shifting additional idlers or rollers.

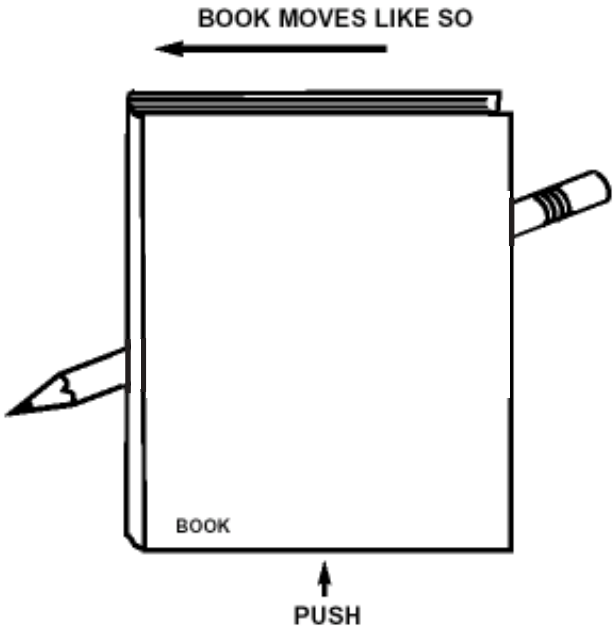
10. If the belt runs to one side at a particular point or points on the conveyor structure, the cause will probably be due to the alignment, or leveling of the structure, or to the idlers and pulleys immediately preceding that particular area, or a combination of these factors.

11. If a section or sections of the belt run off at all points along the conveyor, the cause is possibly in the belt itself, in the belt not being joined squarely, or in the loading of the belt. With regard to the belt, this will be due to camber. Its condition should improve after it is operated under full load tension. It is a rare occasion when a cambered belt (less than 1/2%) needs to be replaced.

12. When replacing a used belt, go through the system and square and level all rollers, idlers, pulleys and bed before training a new belt.

13. The basic and primary rule which must be kept in mind when tracking a conveyor belt is simple, **"THE BELT MOVES TOWARD THAT END OF THE ROLL/IDLER IT CONTACTS FIRST."**

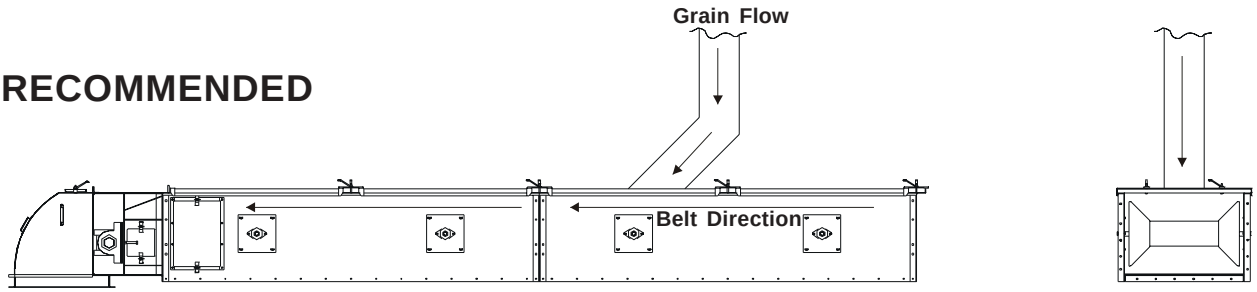
14. The reader can demonstrate this for himself very simply by laying a small dowel rod or round pencil on a flat surface in a skewed orientation. If a book is now laid across the dowel rod and gently pushed by one's finger in a line directly away from the experimenter, the book will tend to shift to the left or right depending upon which end of that dowel rod the moving book contacts first.



SPOUTING

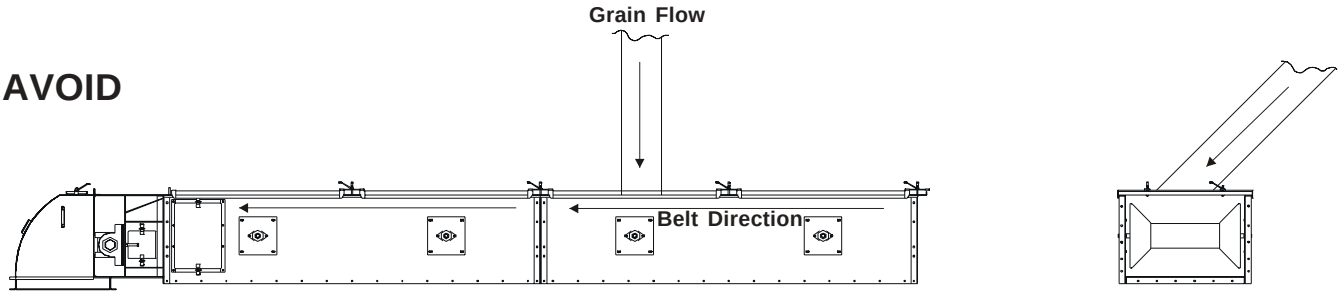
1. Below are the recommended and incorrect ways to attach spouting to load the conveyor. Contact the GSI Material Handling Department if there are any questions about loading conditions.

RECOMMENDED



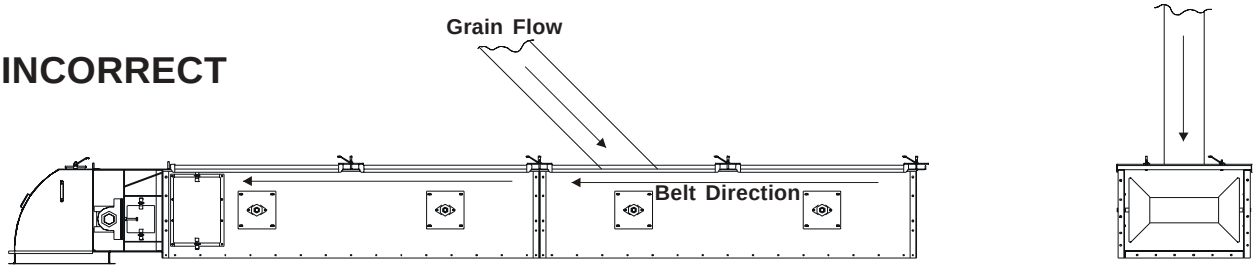
Grain stream centered on the belt. Grain moving in the same direction and at the same speed as the belt.

AVOID



This causes excessive wear of belting and off center loading on belt which causes spillage. This method of loading results in grain tumbling on belt.

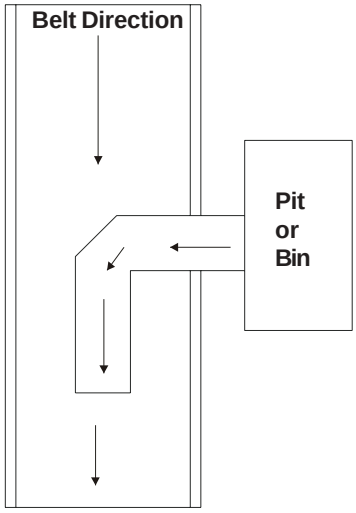
INCORRECT



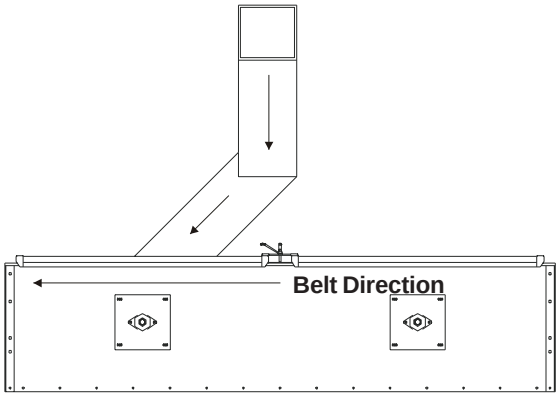
Grain should be loaded in the same direction of belt travel and at the same speed.

SPOUTING LOCATION

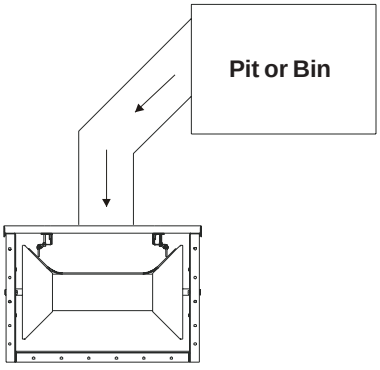
1. Grain should come out from storage and make a 90° turn by use of baffles and load straight into the conveyor at approximately a 45° angle.



TOP VIEW



SIDE VIEW



END VIEW

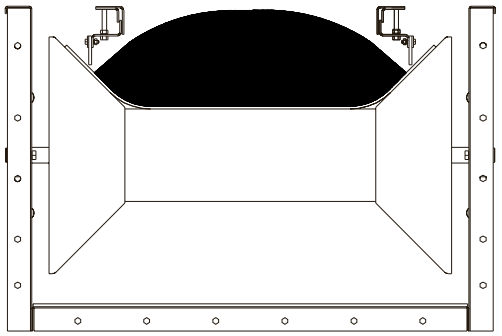
BELT CONVEYOR LOADING

1. Start with a light load and gradually work up to the load that the conveyor was designed to handle. Check chutes to see that the material is being directed onto the center of the belt. Off-center load will affect belt alignment in that the belt will run off center. A central load will maintain belt alignment.

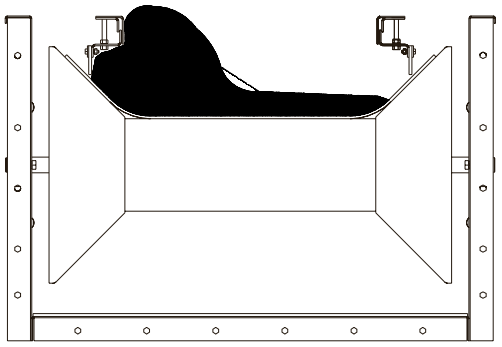
2. The loading point of a belt conveyor is the critical point. Here the conveyor receives its major abrasion and practically all of its impact. The ideal condition is to have the material flow onto the belt at the same speed and direction of travel as the belt, with a minimum amount of impact, and to load the belt on center.

3. Adjust the skirts to prevent side spillage of material and to keep the load central on the belt. The maximum distance between skirtboards customarily is two thirds the width of a trough belt.

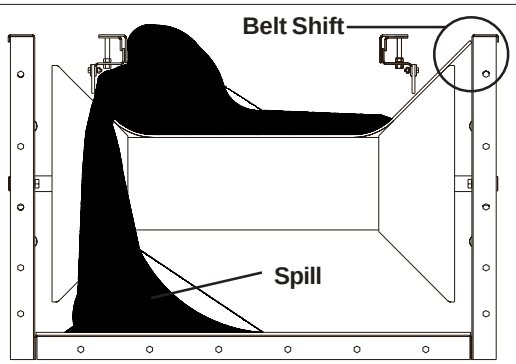
4. The skirt lengths are designed to stop side spillage. The material should also be at rest on the belt before it reaches the end of the skirt. If the material is still tumbling as it passes the skirt end, the skirts should be lengthened.



CORRECT - Evenly Loaded



INCORRECT - Loaded to One Side



EFFECT OF IMPROPER LOADING

MOTION SENSOR OPTION

WHIRLIGIG - WG1-4B
Installation Instructions

⚠WARNING

ALWAYS OBSERVE LOCKOUT AND TAG-OUT PROCEDURES BEFORE, DURING AND AFTER INSTALLATION.

DO NOT REMOVE THE WHIRLIGIG COVER. THE ROTATING COMPONENTS UNDER THE COVER COULD CAUSE SERIOUS INJURY.

1. Shaft ends are predrilled and tapped from the factory.

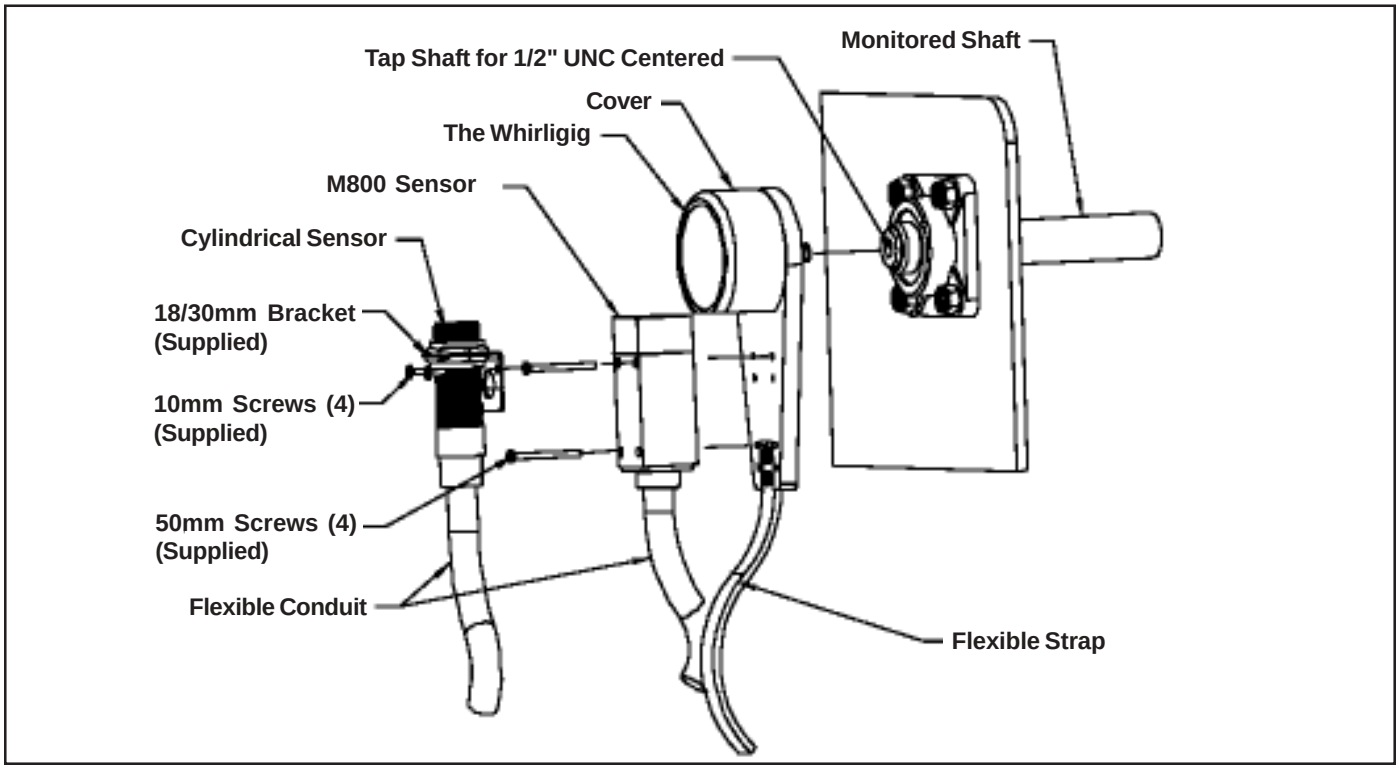
2. Thread the WHIRLIGIG onto the machine shaft using 5/8" open ended wrench and suitable thread locking adhesive (Loctite or similar).

3. Install the sensor to the WHIRLIGIG base-plate. Two sets of predrilled holes are provided for M800 sensor. Fit the sensor to leave an approximate 2mm gap between sensor face and cover.
   A universal bracket (WGB18/30) is supplied for fitting 18mm or 30mm sensors.

4. Connect the sensor in accordance with manufacturer's instructions and observe all relevant electrical & OSHA regulations.

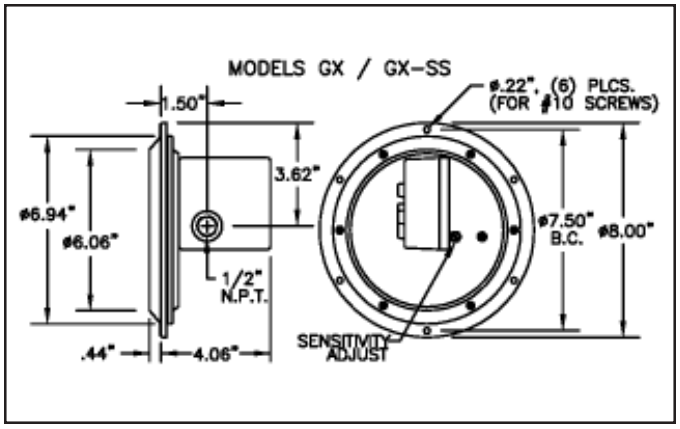
5. Fix the flexible strap securely to the static structure. (If required).

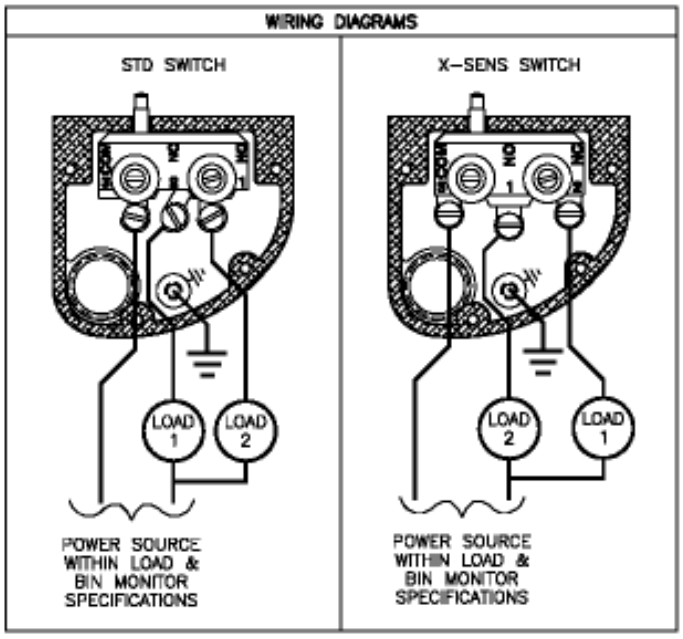
   TIP: *The M800 speedswitch and system function can be tested by placing a thin metal plate between the sensor and the cover of the WHIRLIGIG. When installing other industry standard sensors, leave a small gap between the sensor & the WHIRLIGIG cover for this purpose.*



PRESSURE PLUG SWITCH OPTION

Monitor MODEL GX, Part No.7-8150 - Neoprene diaphragm, standard switch





ELECTRICAL INSTALLATION

1. **Hazardous Location Precautions**
   Observe the regulations listed in the National Electrical Code regarding equipment in hazardous locations. In particular, insure power is disconnected whenever the cover is removed, insure the cover and case mating surfaces are not damaged, and upon completion, ensure cover screws are secure and that no gaskets or sealer has been used between the cover and case surfaces.

2. **Output Contacts**
   Route wires through the 1/2" NPT conduit entrance. No power is required to operate the diaphragm bin monitors. All electrical installation is done directly to the terminals of the output switch. The switch terminals are designated with “3” (COM-common), “2” (N.C.-normally closed), and “1” (N.O.-normally open). When the diaphragm is not sensing material, the switch is in the normal condition (i.e. N.C. contact is closed to COM, and N.O. contact is open to COM). However, when the diaphragm senses material, the switch is opposite from normal condition (i.e.N.C. contact is open to COM, and N.O. contact is closed to COM). Be sure to comply with all electrical specifications listed within this bulletin.

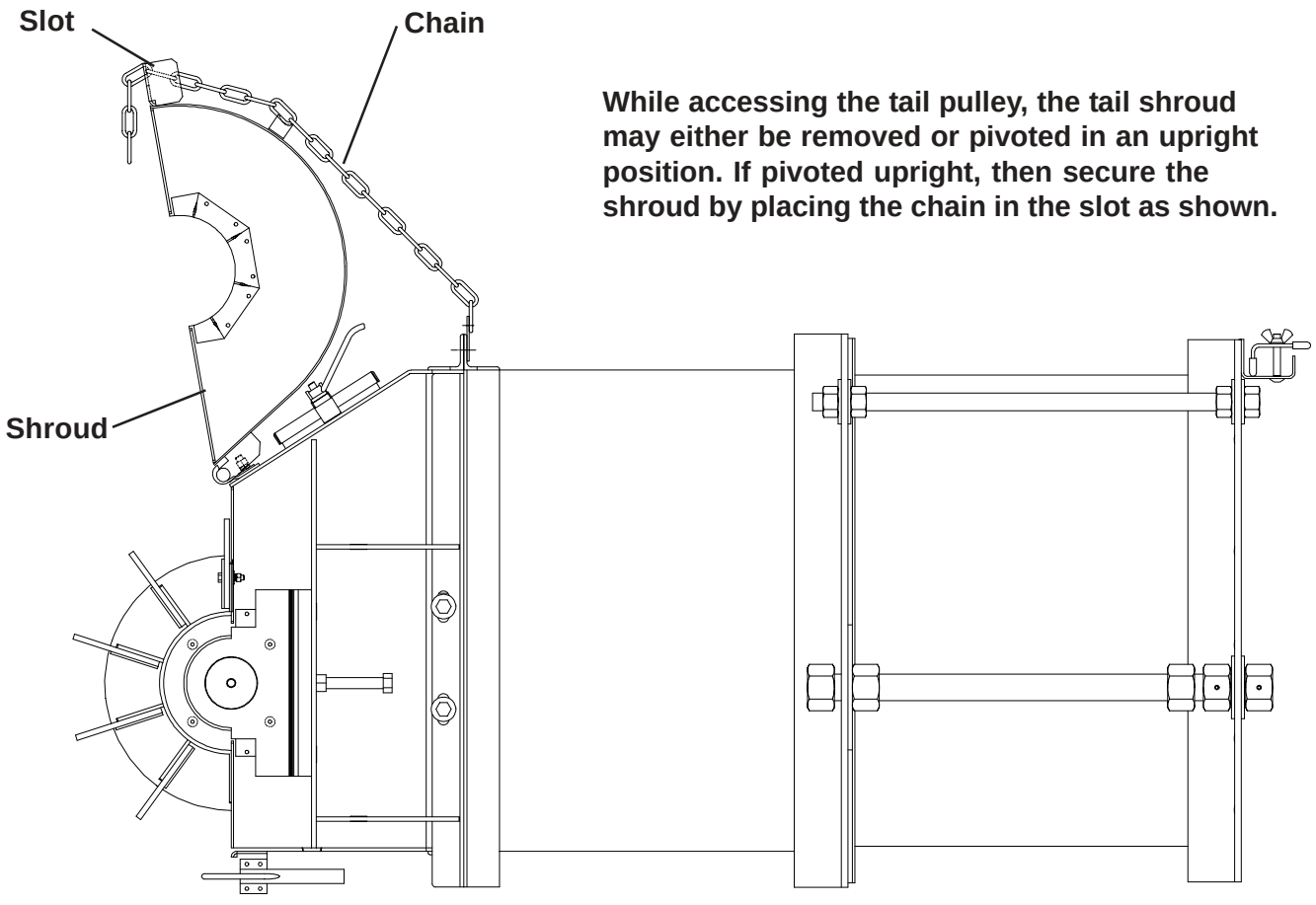
STARTING CONVEYOR

1. Check for and remove any tools or debris that may have been left in the conveyor during installation.

2. Tighten the take-up rods on the tail section equally. The belt should be tightened sufficiently to prevent slippage between the drive pulley and belt and to conform to the crown on the crowned head pulley.

3. Install covers after belt has been trained.

SECURE SHROUD DURING MAINTENANCE



While accessing the tail pulley, the tail shroud may either be removed or pivoted in an upright position. If pivoted upright, then secure the shroud by placing the chain in the slot as shown.

CARE & MAINTENANCE

⚠WARNING

Before any maintenance is performed to the conveyor, power must be shut off and locked out to prevent accidental start up!

The care and maintenance section is provided with the intention of helping to extend the useful life of the unit. Like all equipment, the useful life of the conveyor is greatly reduced if not used wisely and well maintained.

Please follow the next few simple steps to insure the safety and longevity of your equipment.

- Check all bearings and moving parts daily during use.
- Lubricate bearings according to bearing manufacturer's recommendations. (See page 52.)
- Follow manufacturer's recommendations for gear reducer lubrication and maintenance. (See page 41.)
- Inspect the V-belts periodically for proper tension and wear. V-belts should be replaced as necessary. If replacement or tension adjustment is required, please refer to the Shaft Mount Reducer Assembly Section on page 15.
- The belting and belt idlers should be checked periodically for wear and damage. Should replacement of these components be required, contact the manufacturer.

Bearings

Lubricate bearings at regular intervals. If one bearing is re-lubricated, all other bearings should also be lubricated. Do not over lubricate as this will destroy bearing seals.

Welding

Welding on or to the conveyor may cause damage to both the conveyor and its electrical system. If welding is necessary, precautions should be taken to protect the conveyor. Should it be necessary to fasten anything to the conveyor permanently, careful consideration should be given to methods of maintenance, removal and replacement of the conveyor and/or its parts.

Motor

Connect the conveyor motor to a power source according to the motor manufacturer's instructions and recommendations. To avoid injury it is recommended that a certified electrician perform the motor wiring. A shut off switch should be placed near the motor so that the system may easily be shut down to help prevent accidents during maintenance. It is important to check proper motor shaft rotation before installing drive belts

Support

Include adequate support for the conveyor assembly to be installed at intervals no greater than 10 feet. It is recommended that supports be installed at vertical portions of flanges leaving bottoms of intermediate sections clear. By attaching supports in this manner, the removable bottoms are unobstructed for ease of replacement. Support legs are available as an option.

STORAGE

If the unit is to be inactive for an extended period, the following procedures are recommended.

- Thoroughly clean the unit.
- Loosen the V-belt tension. Doing so relieves the stress placed on the bearings and shafts of the drive and tail sections.
- Lubricate shafts and drive chain components with a good grade of light machine oil.

TROUBLESHOOTING

SYMPTOM	PROBLEM	SOLUTION	PAGE
Conveying belt drifts sideways.	Belt not properly tracked.	Track belt over pulleys.	27, 28, 29
	Belt splice not square.	Check splice squareness, re-splice.	21
	Material not placed on center of belt.	Direct material through loader and spouting.	30, 31, 32
	Machine is not straight.	Check machine alignment with chalk line or string.	9, 10, 27
	Machine not level.	Check and level sections.	27
	Material buildup on pulleys.	Clean pulleys, retrack belt.	--
Material buildup on idler pulley, drive pulley or between sections and belt.	Material getting under belt.	Remove buildup from pulleys and sections.	--
		Track conveying belt.	27,28, 29
		Check machine alignment and levelness.	9, 10, 27
		Eliminate point(s) where material may be entering under belt.	--
	Loader not being used.	Use loader to position material on center of belt. All material must be directed through hopper.	--
Lack of capacity.	Conveying belt slippage.	Tighten so belt conforms to crowned pulleys.	35

TORQUE ARM II REDUCER INSTALLATION

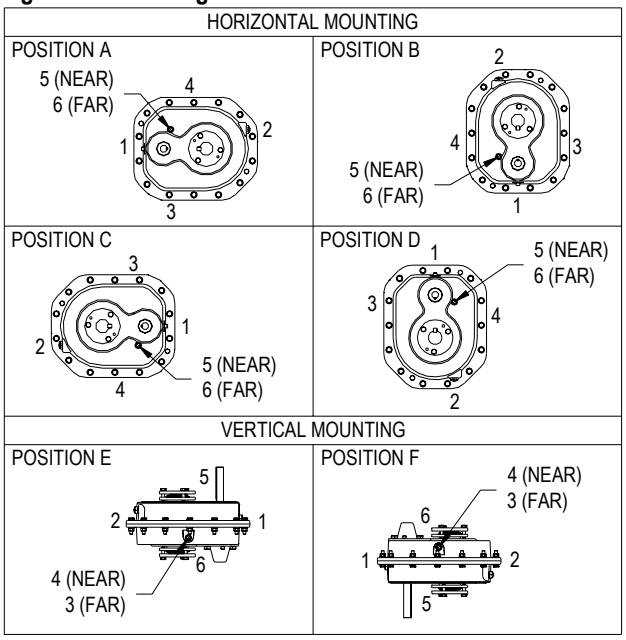
1. Use lifting bracket to lift reducer.

2. Determine the running positions of the reducer. (See Fig. 1) Note that the reducer is supplied with 6 plugs; 4 around the sides for horizontal installations and 1 on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

Horizontal Installations - Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filter/ventilation plug in shipment and install plug in topmost hole. Of the 2 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

Vertical Installations - Install the filter/ventilation plug in the hole provided in the upper face of the reducer housing as installed. If space is restricted on the upper face, install the vent in the highest hole on the side of the reducer per Figure 1. Install a plug in the hole in the bottom face of the reducer. Do not use this hole for the magnetic drain plug. Of the remaining holes on the sides of the reducer, use the plug in the upper housing half for the minimum oil level plug.

Figure 1 – Mounting Positions



Output Speeds Above 15 RPM						
Mounting Position	Vent and Plug Locations					
	1	2	3	4	5	6
Position A	Level	Plug	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Level	Plug	Plug	Plug
Position C	Plug	Level	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

Output Speeds 15 RPM and Below +						
Mounting Position	Vent and Plug Locations					
	1	2	3	4	5	6
Position A	Plug	Level	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Plug	Level	Plug	Plug
Position C	Level	Plug	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

+ 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.

The running position of the reducer in a horizontal application is not limited to the four positions shown in Fig. 1. However, if running position is over 20° in position "B" & "D" or 5° in position "A" & "C", either way from sketches, the oil level plug cannot be used safely to check the oil level, unless during the checking, the torque arm is disconnected and the reducer is swung to within 20° for position "A" & "C" or 5° for position "B" & "D" of the positions shown in Fig. 1. Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication filling holes furnished along with other standard pipe fittings, stand pipes and oil level gauges as required.

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.

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.

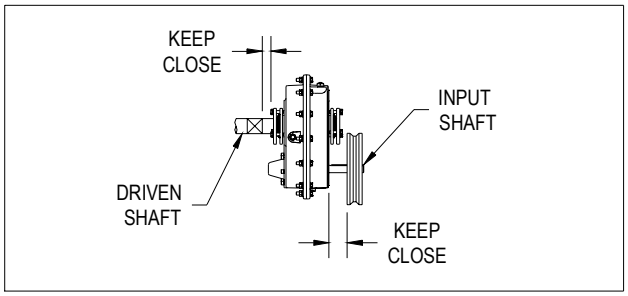


Figure 2 – Reducer and Sheave Installation

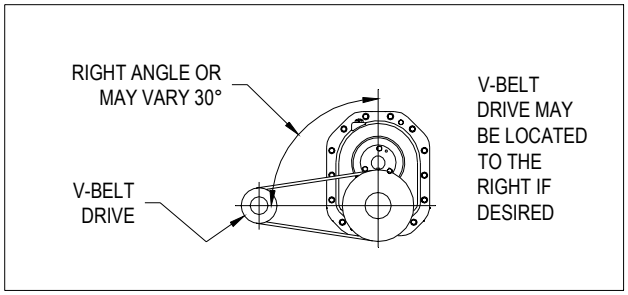


Figure 3 – Angle of V-Drive

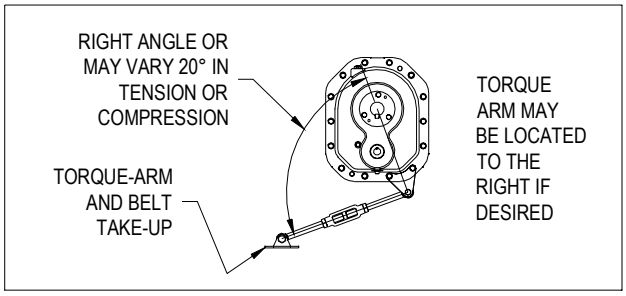


Figure 4 – Angle of Torque-Arm

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.

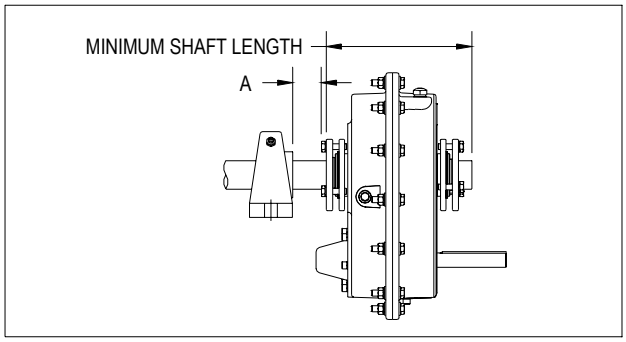


Figure 5 – Minimum Recommended Dimensions

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.

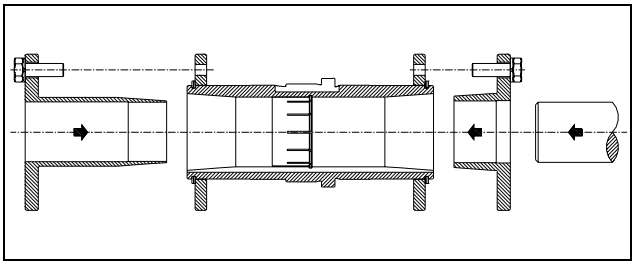


Figure 6 – Short Shaft Bushing and Output Hub Assembly

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.

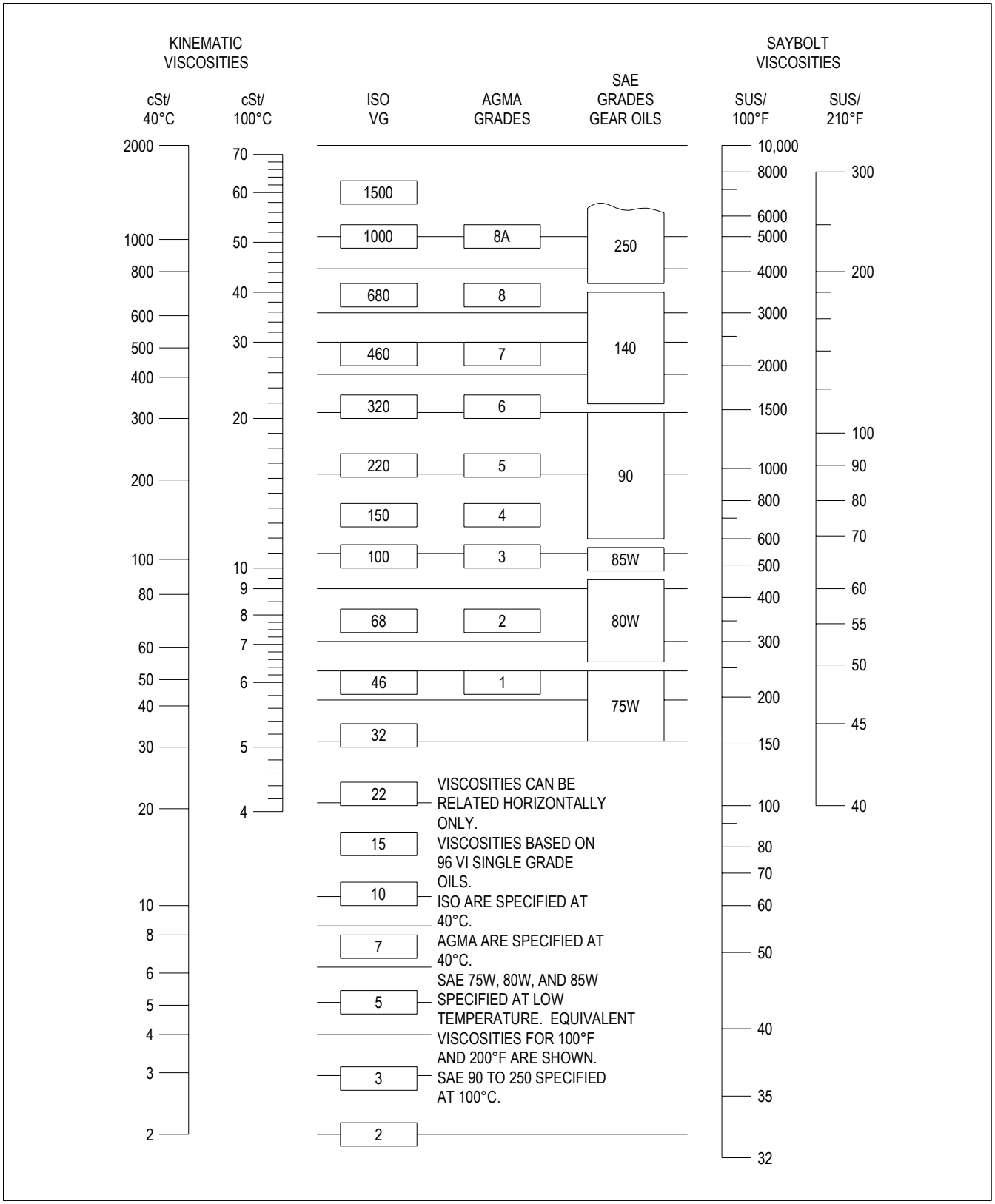
Follow the installation instructions provided in this manual.

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

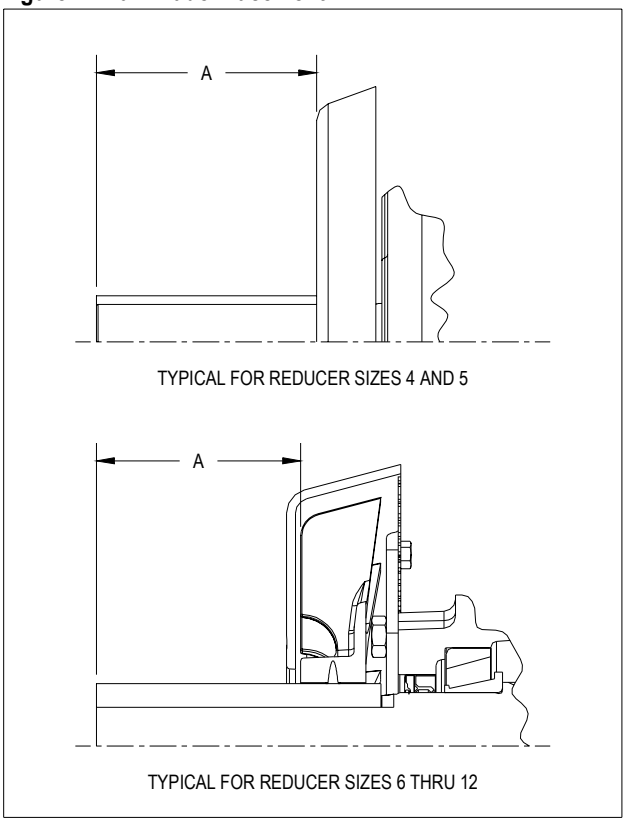
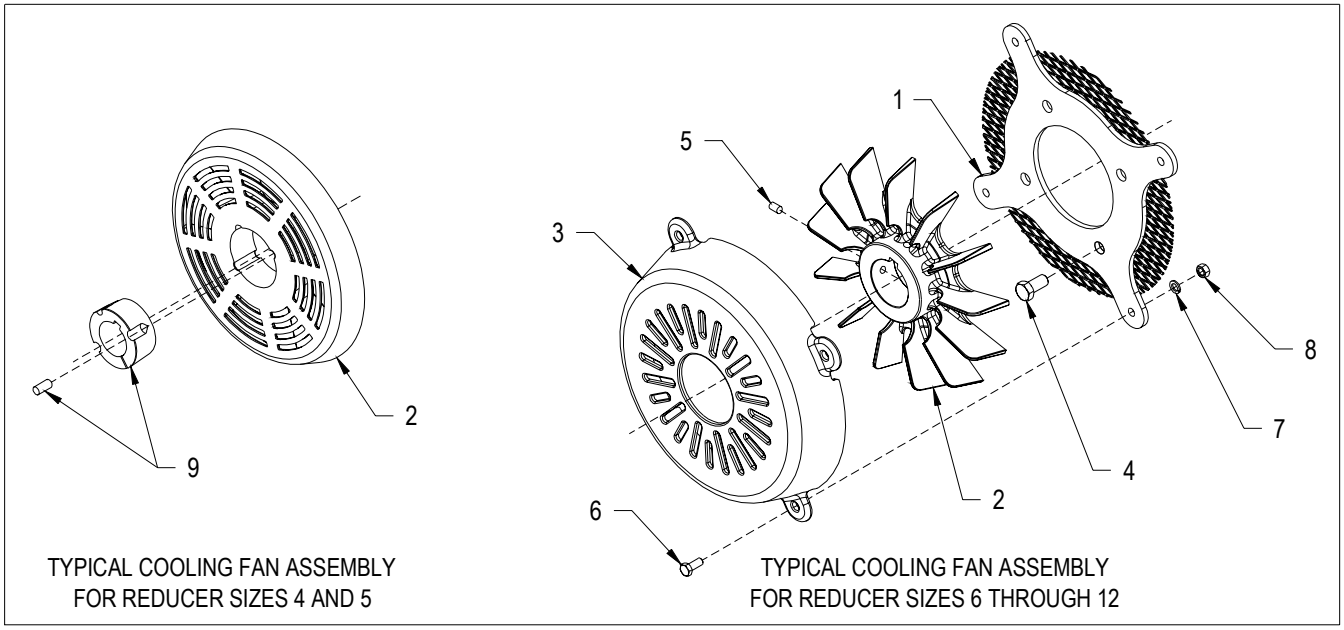


Figure 2 – Parts Identification



TYPICAL COOLING FAN ASSEMBLY FOR REDUCER SIZES 4 AND 5

TYPICAL COOLING FAN ASSEMBLY FOR REDUCER SIZES 6 THROUGH 12

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

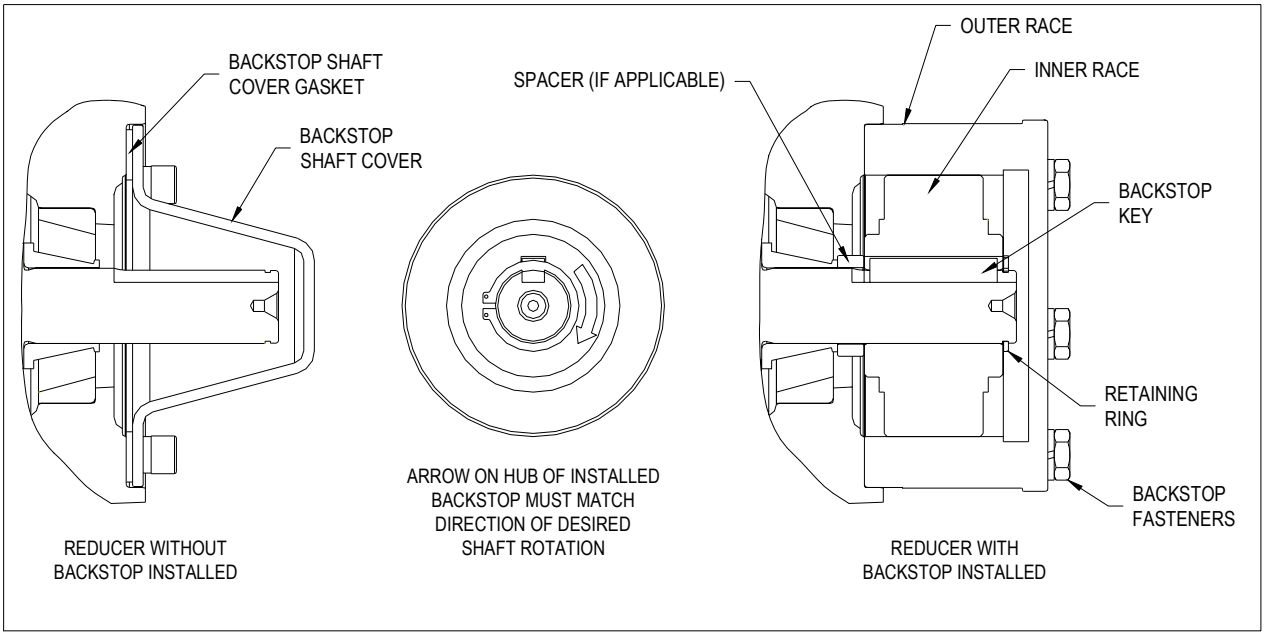


Figure 7 – Backstop Assembly

Instruction Manual
For
IMPERIAL® Adapter Mounted DODGE® ISAF Pillow Blocks and IP Unitized Spherical Roller Bearing Pillow Blocks, Flanges, Piloted Flanges & Take-Ups

GENERAL INFORMATION

DODGE ISAF and IP Spherical Roller Bearing mounted units incorporate a unique way of mounting and dismounting the units to and from the shaft. The patented IMPERIAL system (Pat. #5,489,156) pulls the bearing on the adapter based upon a predetermined clockwise rotation of the locknut. Dismounting is accomplished via counterclockwise rotation of the locknut. Keep in mind that the thread on the locknut as well as on the adapter is a left-hand thread.

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.

INSPECTION

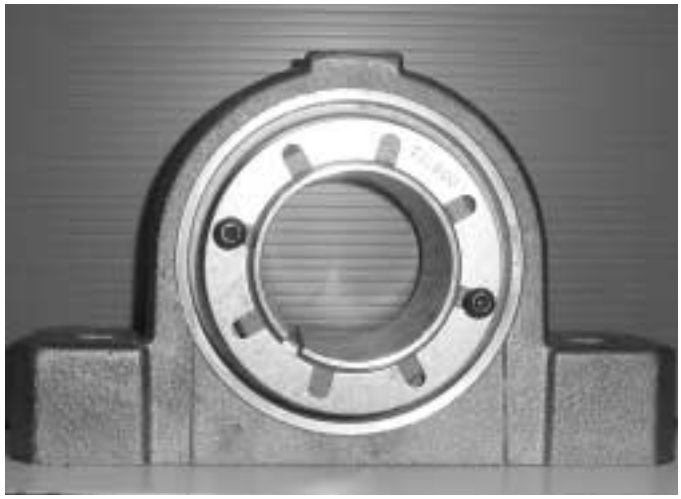
Inspect shaft. Ensure that the shaft is smooth, straight, clean, and within commercial tolerance. Inspect unit. Do not allow unit to be exposed to any dirt or moisture.

MOUNTING

Install the non-expansion unit first.

1. Apply a coating of light oil or other rust inhibitor to the adapter area of the shaft.
2. Before mounting bearing to shaft, remove lockplate from bearing and turn locknut counterclockwise one to two turns to allow adapter to expand fully. The unit is now shaft ready. Slide the bearing to the desired position on the shaft.

Keep weight off bearing during mounting via a sling or jacks.



Picture 1

3. Proper locking of this unit to the shaft is based on turning the locknut clockwise a predetermined number of degrees shown for each bore size on Table 1.

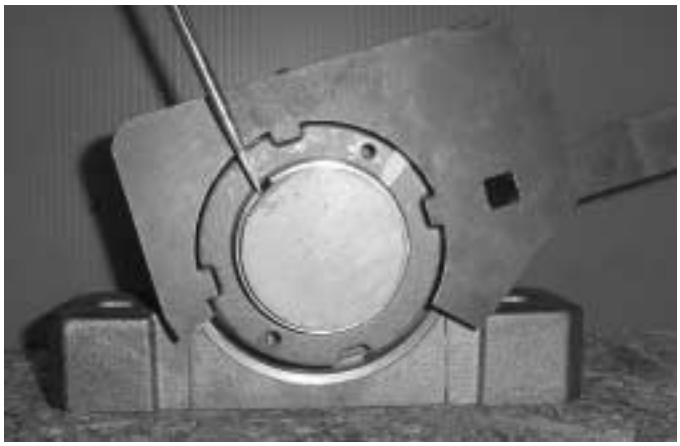
WARNING: Because of the possible danger to persons(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, 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.

The turning of the locknut must start from a “zero reference point.” This “zero reference point” is defined as the point when the clearance between adapter sleeve, shaft and bearing bore has been removed, and all surfaces are in metal to metal contact. To reach the “zero reference point,” rotate locknut clockwise, using both hands, as tight as possible. From this point use a spanner or drift and hammer and rotate the locknut an additional 1/8 of a turn. This is your “zero reference point.” This all needs to be done with weight off bearing.

4. Once “zero reference point” is reached, scribe a line through both locknut face and adapter face (Picture 2).

Picture 2

Then continue to tighten the locknut (Picture 3) by turning it clockwise using hammer and drift or spanner by the appropriate rotation angle shown on Table 1.



Picture 3

Proper mounting has been achieved when the scribed line on the locknut has rotated from the scribed line on the adapter face by the angle shown on Table 1. To reach the full rotation of the locknut, the use of hammer blows onto spanner or drift may be needed for proper mounting. In high vibration or impact loading applications, maximum nut rotation is required.

Table 1
Locknut Angle of Rotation From
“Zero Reference Point”

SHAFT SIZE	BASIC BRG. NO.	LOCKNUT ROTATION	
		DEGREES	TURNS
1 1/8 - 1 1/2	22208K	235 +/– 25	5/8 to 3/4 turns
1 5/8 - 1 3/4	22209K	285 +/– 25	3/4 to 7/8 turns
1 7/8 - 2	22210K	285 +/– 25	3/4 to 7/8 turns
2 3/16 - 2 1/4	22211K	360 +/– 40	7/8 to 1 1/8 turns
2 3/8 - 2 1/2	22213K	360 +/– 40	7/8 to 1 1/8 turns
2 11/16 - 3	22215K	360 +/– 40	7/8 to 1 1/8 turns
3 3/16 - 3 1/2	22218K	450 +/– 40	1 1/8 to 1 3/8 turns
3 11/16 - 4	22220K	450 +/– 40	1 1/8 to 1 3/8 turns
4 7/16 - 4 1/2	22222K	405 +/– 40	1 to 1 1/4 turns
4 15/16 - 5	22226K	495 +/– 40	1 1/4 to 1 1/2 turns
5 7/16 - 5 1/2	22228K	495 +/– 40	1 1/4 to 1 1/2 turns
5 15/16 - 6	22232K	360 +/– 40	7/8 to 1 1/8 turns
6 7/16 - 7	22236K	405 +/– 40	1 to 1 1/4 turns

5. a) Slide lockplate over shaft and align tang of lockplate with slot in adapter sleeve.

   b) Find a locknut hole that aligns with a lockplate hole. If the closest locknut hole is beyond a lockplate hole, then tighten, not loosen, the locknut to meet a lockplate hole.

   c) Insert lockwasher and tighten button head screws to lock assembly. (Ref. Picture 4)

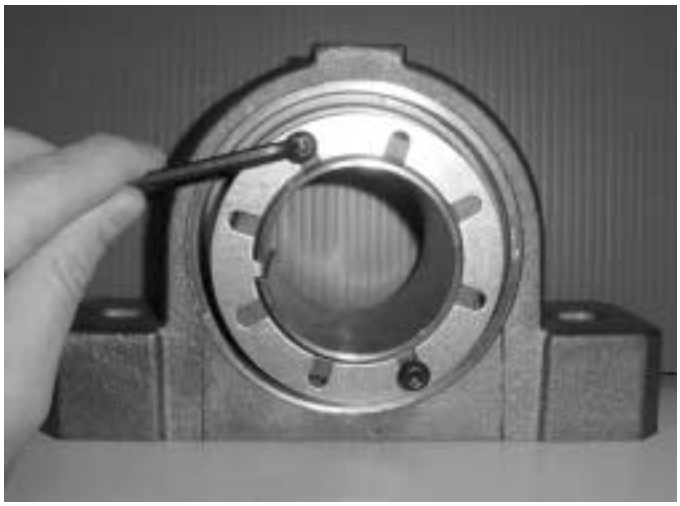
6. Bolt down pillow block or flange unit to the structure.

7. Repeat steps 1 through 6 for the expansion bearing except immediately after Step 2 do the following:

EXPANSION

Pillow Blocks (Locknut facing outboard)

Align pillow block housing mounting holes with substructure mounting holes. Push insert as far as possible in the direction of the fixed bearing. If bearing locknut is facing toward fixed bearing, position float bearing insert in center of housing. (NOTE: This is necessary because in the process of mounting, bearing is being drawn toward locknut. **Also remember to keep weight off of bearing.**) (NOTE: When pillow block is subjected to heavy cap loads, use hardened washers and properly torqued bolts to obtain sufficient clamp force between the bearing block and the mounting structure.)



Picture 4

Flange and Piloted Flange Units (Locknut facing outboard)

Slide flange unit against mounting plate. Snug mounting bolts. With a sling or by other means keep weight off bearing. Push insert as far as possible in the direction of the fixed bearing. If bearing locknut is facing toward fixed bearing, position float bearing insert in center of housing. (NOTE: This is necessary because in the process of mounting, bearing is being drawn toward locknut. **Also remember to keep weight off bearing.**)

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

All non-expansion bearing sizes can be re-oped to become expansion bearings. To re-op a non-expansion to an expansion bearing follow these steps:

IP:

To re-op a non-expansion to an expansion bearing (1) Move the snap ring, opposite from the collar side of bearing, to the outermost snap ring groove. (2) Install bearing per Expansion Bearing instructions. Note: Bearing nameplate has a non-expansion Part Number. When bearing is re-oped the bearing should be marked as expansion for future reference.

ISAF:

For 2-Bolt and 4-Bolt Pillow Blocks: 1) Remove bearing cap; 2) Remove stabilizing ring; 3) Re-assemble cap on base; 4) Torque cap bolts to recommended torque values. (Table 3)

DISMOUNTING

1. Remove weight off bearing via a sling or jacks.
2. Remove mounting bolts from bearing.
3. Remove button head screws and lockplate from the adapter nut.
4. Using a spanner wrench turn the locknut counterclockwise until the bearing unit is pushed off the adapter sleeve sufficiently to permit the release of the adapter sleeve from the shaft.

MAINTENANCE

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.

GREASE LUBRICATION

DODGE IP and ISAF Unitized Spherical roller bearings are prepacked with a NLGI #2 lithium 12-Hydroxystearate grease. For relubrication select a grease that is compatible with #2 lithium 12-Hydroxystearate. Relubricate in accordance with the recommendation of Table 2.

OPERATION 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 top 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.

Table 2
Regreasing Intervals (Months) (Based on 12 hours per day, 150 degrees F. Max)

SHAFT SIZE	RPM								
	250	500	750	1000	1250	1500	2000	2500	>3000
1 7/16	4	3	2	2	1	0.5	0.25	0.25	0.25
1 11/16	4	3	2	2	1	0.5	0.25	0.25	0.25
1 15/16, 2 SM	4	3	2	2	1	0.5	0.25	0.25	0.25
2 LG, 2 3/16	3.5	2.5	1.5	1	0.5	0.5	0.25	0.25	0.25
2 3/8, 2 7/16	3	2	1.5	1	0.5	0.25	0.25	0.25	—
2 11/16, 2 3/4, 2 15/16	3	2	1.5	1	0.5	0.25	0.25	0.25	—
3 7/16	2.5	1.5	1	0.5	0.25	0.25	0.25	—	—
3 15/16	2	1.5	1	0.5	0.25	0.25	—	—	—
4 7/16	2	1.5	1	0.5	0.25	—	—	—	—
4 15/16	1.5	1	0.5	0.25	—	—	—	—	—
5 7/16 - 5 1/2	1.5	1	0.5	0.25	—	—	—	—	—
5 15/16 - 7	1	0.5	0.5	0.25	—	—	—	—	—

STORAGE OR SPECIAL SHUT DOWN

If equipment will be idle for some time, before shutting down, add compatible 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.

EXPANSION BEARING

Bore Size	Total Expansion (in.)	
	IP	ISAF
1 1/8 - 1 1/2	3/16	7/32
1 5/8 - 1 7/8	1/4	7/32
1 15/16 - 2	1/4	17/64
2 13/16	1/4	7/32
2 1/4 - 2 7/16	1/4	5/16
2 1/2 - 3 3/16	1/4	15/64
3 1/4 - 3 1/2	1/4	3/8
3 11/16 - 4	5/16	3/8
4 7/16 - 5	3/8	3/8
5 7/16 - 7	N/A	3/8

TABLE 3 – Cap Bolt Torque for ISAF Pillow Blocks
(Non-Expansion & Expansion) (Grade 5 Bolts)

Bore Size (In.)	2 Bolt Base		4 Bolt Base	
	Bolt Size	Torque Ft.-Lbs.	Torque Bolt Size	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 7/16-5 1/2	–	–	1-8	512-640
5 15/16-6	–	–	1-8	512-640
6 7/16-6 1/2	–	–	1-8	512-640
6 15/16-7	–	–	1-8	512-640

WARRANTY

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

EXCEPT FOR THE ABOVE EXPRESS LIMITED WARRANTIES, THE COMPANY MAKES NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH (i) PRODUCT MANUFACTURED OR SOLD BY THE COMPANY OR (ii) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF THE COMPANY REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCT OR PRODUCTS.

IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR BENEFITS. PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE LIMITED TO THAT STATED ABOVE, WHICH SHALL NOT EXCEED THE AMOUNT PAID FOR THE PRODUCT PURCHASED. THIS WARRANTY IS NOT TRANSFERABLE AND APPLIES ONLY TO THE ORIGINAL PURCHASER. WE SHALL HAVE NO OBLIGATION OR RESPONSIBILITY FOR ANY REPRESENTATIVE OR WARRANTIES MADE BY OR ON BEHALF OF ANY DEALER, AGENT OR DISTRIBUTOR OF THE COMPANY.

THE COMPANY ASSUMES NO RESPONSIBILITY FOR FIELD MODIFICATIONS. MODIFICATIONS TO THE PRODUCT NOT SPECIFICALLY COVERED BY THE CONTENTS OF THIS MANUAL WILL NULLIFY ANY PRODUCT WARRANTY THAT MIGHT HAVE BEEN OTHERWISE AVAILABLE. THE USE OF OUR EQUIPMENT TO HANDLE MATERIALS OTHER THAN FREE FLOWING, NONABRASIVE AND DRY MATERIALS, AS INTENDED, WILL RESULT IN THE VOIDING OF THIS LIMITED WARRANTY.

THE FOREGOING WARRANTY SHALL NOT COVER PRODUCTS OR PARTS WHICH HAVE BEEN DAMAGED BY NEGLIGENT USE, MISUSE, ALTERATION, OR ACCIDENT. ANY NEGLIGENT USE, MISUSE, ALTERATION, OR DAMAGE DUE TO ACCIDENT, AS DETERMINED BY A COMPANY REPRESENTATIVE, MAY VOID THE WARRANTY. THIS WARRANTY COVERS ONLY PRODUCTS MANUFACTURED BY THE COMPANY. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. WE RESERVES THE RIGHT TO MAKE DESIGN OR SPECIFICATION CHANGES AT ANY TIME, BEARING NO RESPONSIBILITY TO MAKE SIMILAR DESIGN OR SPECIFICATION CHANGES ON PREVIOUSLY SOLD MERCHANDISE.

PRIOR TO INSTALLATION, PURCHASER HAS THE RESPONSIBILITY TO RESEARCH AND COMPLY WITH ALL FEDERAL, STATE, AND LOCAL CODES WHICH MAY APPLY TO THE LOCATION AND INSTALLATION.

07/21/98

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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