



# Variable Speed Belt Drives Installation and Maintenance Instructions.

## General Data (See Helpful Hints and Safety on page 7 before proceeding.)

Lovejoy variable speed drive equipment is furnished in two types: ADJUSTABLE CENTER DRIVES and FIXED CENTER DRIVES. The installation data that follows is separated into these two categories.

An ADJUSTABLE CENTER DRIVE consists of a spring loaded variable speed pulley (VSP), a companion sheave (non-adjustable), an adjustable motor base and a V belt. A FIXED CENTER DRIVE, called a COMPOUND DRIVE, consists of one adjustable pulley, a spring loaded pulley and a belt, along with a "torque arm bracket" or some means of preventing rotation of the torque arm on the adjustable pulley.

The spring loaded pulley is the heart of the variable speed belt drive. The springs in the pulley are designed to keep the belt in position without slippage when the drive is operating at its rated torque.

## Installation of Adjustable Center Drives (with adjustable motor bases)

Note: Adjustable motor bases are not intended for use in continuous adjustment.

### 1. GENERAL INSTRUCTIONS:

Unless otherwise approved by Lovejoy or the purchaser, the spring loaded pulley should be mounted on the DRIVER SHAFT. If mounted on the driven shaft, *dangerously high speeds may result*. Consult factory for assistance if needed. (See Safety section, page 7.)

Both shafts must be clean, burr free and full size (not less than .001" under basic size). Lovejoy stock pulleys are bored to basic - .000+.001 (i.e. .875/.876.) Shafts on used equipment should be checked for size and runout (see Photo 1). *Do not hammer pulley on the shaft*. It should be a light push fit. Push the pulley as far onto the shaft as possible.

### 2. MOUNTING THE MOTOR AND THE MOTOR BASE:

Use the largest diameter bolts possible to secure the motor and base. Use lock washers next to all nuts.

**For the vast majority of installations, the motor is the driver and it is mounted on an adjustable base. The following instructions pertain to this type of installation.**

Place the motor, with cap screws finger tightened, on the base. Place the base in its approximate location. Motor rails must be advanced *toward the driven unit* during installation. Place driven sheave on its shaft loosely and check the belt for correct length. Do not install belt in the grooves. To adjust a VSP through its entire speed range, the sliding motor rails must be able to move a distance equal to about one half the outside diameter of the VSP. Check to be sure room has been allowed for on the base for this adjustment. Locate and bolt the end supports of the base to the machine frame.

## Lining Up the Drive

**Good alignment is essential to good belt life and transmission power.**

### Installation Section A

#### V-V drives, Hexadrive Series, Aluminoline and WB Series

Note: The belt must not be in place when aligning.

1. These spring loaded pulleys have two movable flanges and the driven sheave is grooved.
2. When the spring loaded pulley is closed, the width across the flanges is about the same as the width of the flanges of the Lovejoy driven companion sheave. (For other brands allowances may have to be made.)

See diagram for V-V drives (Figure 5 and Photo 2). A straight edge will contact the flanges at four points. Check for both angular and parallel alignment. Refer to COMPANION SHEAVE section for torque on the "QD" bushing screws.

### Adjustable Center Drive

As a rule, the spring loaded pulley in an adjustable center drive is mounted on the DRIVER shaft and the companion sheave on the DRIVEN shaft. With this mounting arrangement the drive is considered a constant torque drive. The horsepower *at the driven shaft* decreases in direct proportion to the speed at the driven shaft.

### Fixed Center Drive

In a compound drive (fixed center), both horsepower and torque are variable at the driven shaft. Refer to the horsepower and torque columns for fixed center drives in the general catalog for ratings if needed.

**Caution: Rim speed of pulley not to exceed 10,500 ft. per minute.**

3. **STOP** - See alignment instructions for V-V drives, V-Flat drives, etc. that follow. Then return to this section. See COMPANION SHEAVE section for torque loads on QD bushings.

4. After aligning, but before installing the belt, tighten all of the motor bolts equally. Check for ease of adjustment of the base when the hand wheel is turned. If it does not adjust easily, one of the motor rails may be cocked or the base is not laying flat. Make adjustments until corrected. Be sure to tighten the set screws on the VSP.

5. Place the belt in the pulley grooves and jog the motor to test setup. Start motor and adjust base until belt is at mid-range and recheck alignment.
6. To limit the travel of the motor and prevent belt from riding out of the VSP or down too far to the bottom of the belt groove, use the stop collars provided on all Lovejoy sliding bases (except size 48/56). Recheck all screws for tightness.

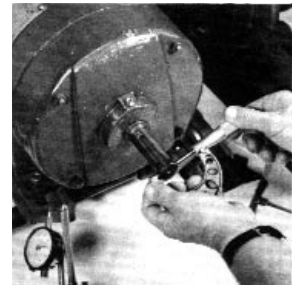


Photo 1 - Check shaft on used motors and other equipment for diameter and runout.

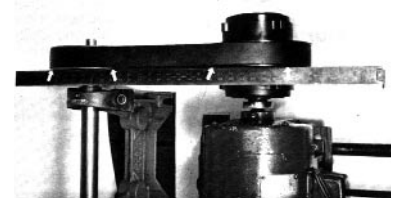
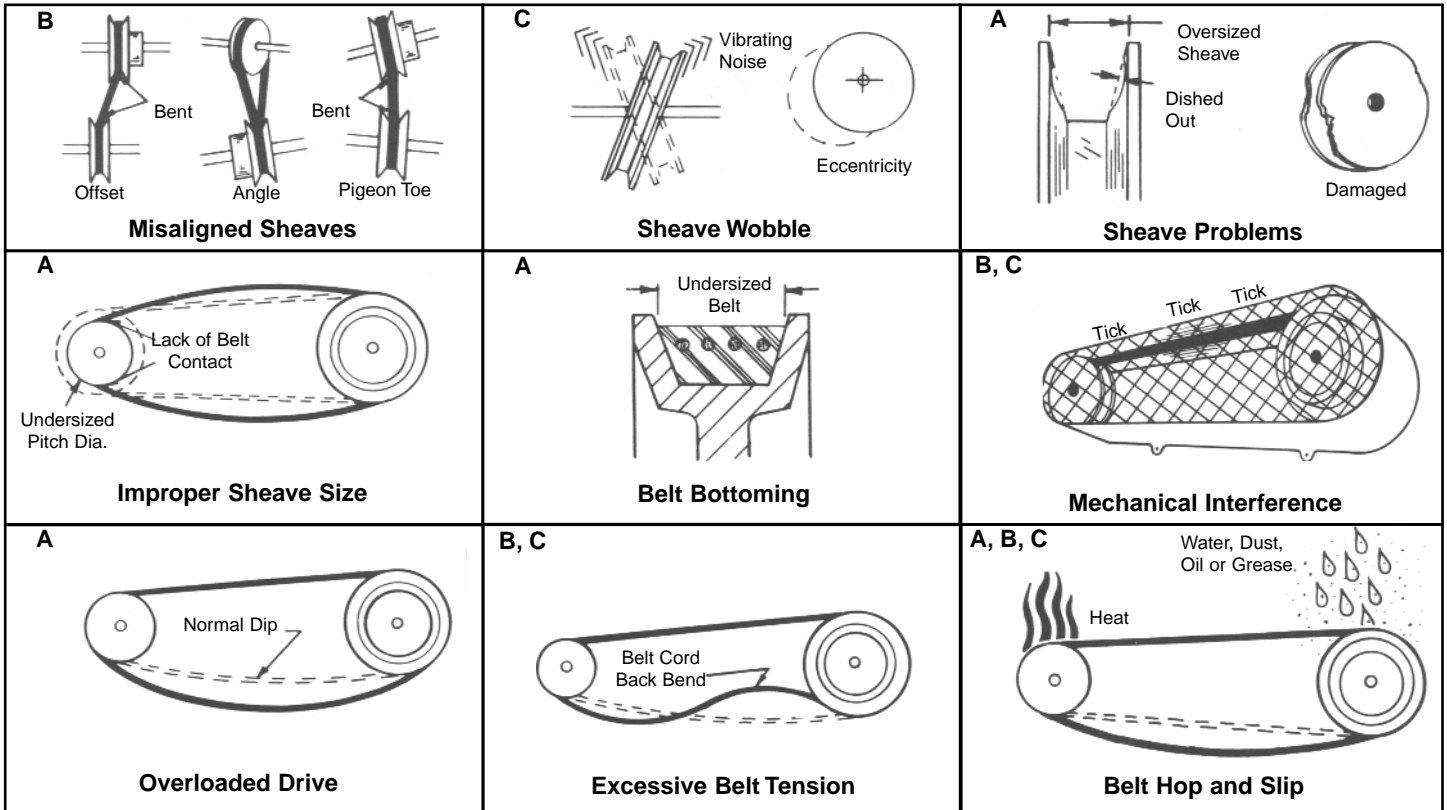


Photo 2 - Straight edge must touch VSP and companion sheave at 4 points.

# Lovejoy's Variable Speed Pulley - Belt Drive Troubleshooting Guide

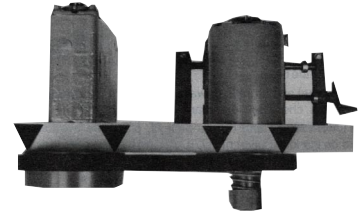


Problem	Probable Cause	Suggested Correction
<p style="text-align: center;"><b>A</b></p> <p style="text-align: center;"><b>Belt Slippage</b></p> <ul style="list-style-type: none"> <li>Rule of thumb very audible belt squeal = 5% or more belt slippage</li> </ul>	<ol style="list-style-type: none"> <li>Overloaded drive</li> <li>Worn sheaves</li> <li>Excessive dust, oil or grease</li> <li>Lack of flange support (weak VSP spring tension or broken spring)</li> <li>Improper companion sheave size</li> <li>Undersized P.D. (belt riding on bottom of sheave)</li> </ol>	<ul style="list-style-type: none"> <li>Check motor ampere load to max. speed range of pulley drive to insure proper size drive package selected.</li> <li>Replace worn sheaves.</li> <li>Provide better shielding.</li> <li>Replace weak or broken spring; Consult factory; Consult catalog for pulley rating.</li> <li>Consult catalog specifications and factory.</li> <li>1/32" min. belt clearance when belt is at pulley's specified minimum pitch diameter.</li> </ul>
<p style="text-align: center;"><b>B</b></p> <p style="text-align: center;"><b>Rapid Belt Wear</b></p> <ul style="list-style-type: none"> <li>Heavy rubber dust deposit</li> <li>Belt side "wear" pattern irregular</li> <li>Heat build-up beyond 160°F max. limit</li> </ul>	<ol style="list-style-type: none"> <li>Misaligned sheaves</li> <li>Loose motorbase supports</li> <li>Damaged or worn sheaves</li> <li>Excessive temperatures</li> <li>Mechanical interference</li> <li>Overloaded drive</li> <li>Broken belt cords (excessive spring tension)</li> <li>Dirt and grit entering drive</li> </ol>	<ul style="list-style-type: none"> <li>Realign sheaves; Remove "bends".</li> <li>Replace undersize screws or broken base.</li> <li>Replace sheaves.</li> <li>Ventilate belt guard; Determine cause.</li> <li>Remove interference; Move pulley over.</li> <li>Increase pitch diameter.</li> <li>Reduce pulley HP rating; Reduce spring tension.</li> <li>Air ventilate belt guard.</li> </ul>
<p style="text-align: center;"><b>C</b></p> <p style="text-align: center;"><b>Vibration</b></p> <ul style="list-style-type: none"> <li>Pulley sheave lacks dynamic smoothness common to belt drive arrangement</li> </ul>	<ol style="list-style-type: none"> <li>Sheave wobble</li> <li>Pulleys or sheaves out of balance</li> <li>Mechanical interference common to belt drive</li> <li>Pulsating loads belt hop</li> <li>Undersized motorshaft</li> <li>Bent shaft</li> <li>Worn / Undersize motorbase</li> <li>Excessive pulley spring tension</li> </ol>	<ul style="list-style-type: none"> <li>Replace distorted sheave rim; Replace worn "QD" bushing.</li> <li>Determine cause; Return to factory for correction.</li> <li>Enlarge belt guard and avoid pulley housing contact.</li> <li>Belt's side surfaces glazed-replace; Remove oil from pulley's flange surfaces.</li> <li>Correct or resize shaft diameter per NEMA specifications.</li> <li>Replace shaft.</li> <li>Replace; Consult catalog for HP rating.</li> <li>Install lighter HP rated pulley; Consult factory.</li> </ul>

## Installation Section B V-Flat Drives

V-Flat Drives are Hexadrive series pulleys with one movable flange. The DRIVEN sheave is flat. (Do not use crowned pulleys.) V-Flat drives are for use with wide variable speed belts only, not for "A" or "B" section type belts.

For correct alignment the edge of the non-movable flange lines up with the edge of the companion sheave and the straight edge will make contact at four places as seen in Photo 3 and Figure 6. Proceed with bolt tightening procedures.



**Photo 3** - Straight edge must touch fixed flange of VSP and edge of flat sheave at 4 points.

## Installation Section C Econoline Drives

Econoline Drives are one flange movable pulleys for use with stock belts "A", "B", etc., and grooved companion sheaves. Follow instructions for mounting the motor base and pulleys. Do not use resilient mount motors (Photo 4).

- Align one edge of the VSP with one edge of the companion sheave, checking for both angular and parallel alignment (Figure 7).
- Snug the screws but do not tighten.
- Place the belt in the grooves and jog the motor while turning the motor base hand wheel until the belt is in the mid-range of the VSP.
- *Re-align the pulleys at this point*, spacing the sheaves equally between the flanges of the VSP (see Figure 7). (This will average and minimize the misalignment of the drive. Some misalignment is characteristic of the Econoline drive.)



**Photo 4** - Final alignment of Econoline Series is made with belt in mid-range of VSP as shown above

## Installation Section D V-V Drive Angle Mounted Motor Bases

V-V Drives are one flange movable pulleys (Hexadrive series) and grooved companion sheaves (wide variable speed belts.) These drives are intended for use when a V-Flat drive will not carry the torque loads. Since only one flange opens on the VSP to maintain alignment, the motor base must be placed at an angle to the path of the belt (see Photo 5 and Figure 1).

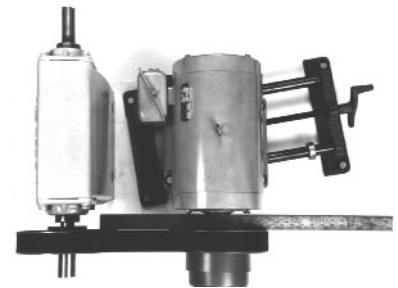
Full scale templates for correct angular mounting position of the motor base are available from the factory. Blueprints for making adapter plates (Figure 2) are also available.

The OFFSET ANGLE for models:

- 11407 and 11401 is 7°
- 11901, 11902 and 11903 is 7 1/2°;
- 12904, 12905, 12907 and 12908 is 9°;
- 13207, 13210, 13220 and 13230 is 9°;
- 14407, 14410, 14420, 14430 and 14433 is 10 1/2°.

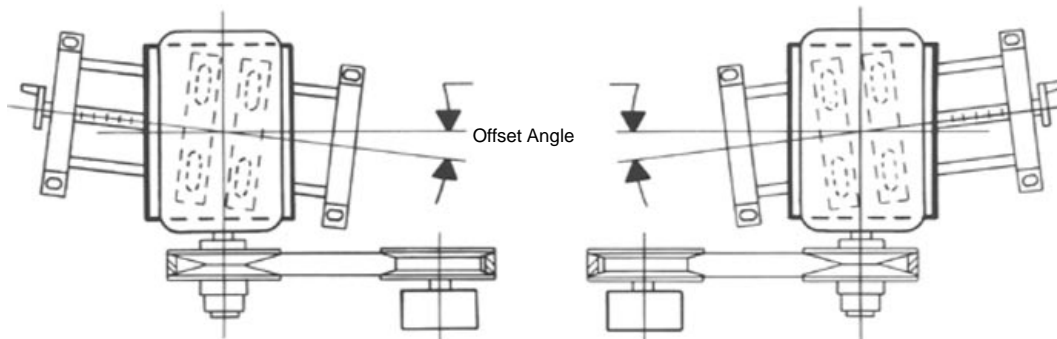
If the driven sheave horizontal center line is more the 3" above or below the centerline of the DRIVE pulley, the angle of offset given does not apply. Write to the factory for instructions.

Once the base is set at the correct angle, mount the adapter plate and then the motor on to the motor base. Position the motor towards the driven unit. See paragraphs 2 thru 7 preceding for further instructions.

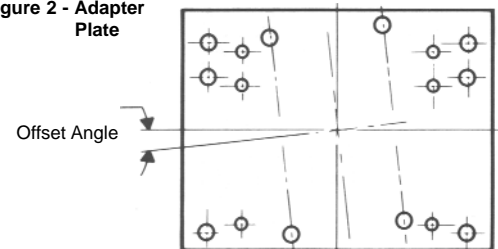


**Photo 5** - Angle mounted motor base

**Figure 1**



**Figure 2 - Adapter Plate**



## Installation Section E

### Special Instructions for use of Model 200 "Tilting" Motor Base

Motor rails may be put on pivot pins in any convenient position (see Photo 6). For ease of adjustment and load distribution, the motor should be centered over the base.

Turn handwheel. Tilt rails forward, away from handwheel. With VSP on motor shaft, check belt length and align pulleys.

**IMPORTANT:** After lining up the pulleys, place the two lock washers supplied on the lower pivotpin ( $\frac{7}{8}$ " dia.) This prevents the motor rails from drifting off the pins (Photo 6).

## Installation Section F

### Optional Mounting and Controls

When the drive is installed so that the line of the DRIVEN sheave is at an angle (up or down) to the driver pulley, greater adjustment of the base may be required in order to run the VSP through its entire speed range. Longer motor base guide rods may be necessary. Consult the Lovejoy engineering department for your special requirements.

#### Motor base control options include:

1. An electric remote control using a gearhead motor coupled to the adjusting screw or gearhead motor and chain drive.  
*Note: Bases are not intended for continuous adjustment, only intermittent.*
2. Replace the handwheel control with a sprocket and chain.
3. Use a universal joint and rod to extend the adjusting screw outside of the machine housing.
4. A dial indicator handwheel for use in determining the approximate RPM. It is used for positioning the motors on the base. The user must calibrate the handwheel reading to relate to RPM, feet per minute, etc.

## Installation Section G

### Installation of Lovejoy Companion Sheaves and "QD" Bushings

*For other brands follow instructions accompanying the product.*

1. Be sure the tapered surface of the bushing and the inside of the hub are clean and burr free.
2. Place bushing in sheave loosely. Slide sheave to desired position on shaft. Be sure the heads of the cap screws are on the outside.
3. Align sheaves. Tighten screws alternately and progressively until they are pulled tight. (See Wrench Torque Chart, Figure 3.) Do not allow sheave to be drawn in contact with flange of bushing. There should be a  $\frac{1}{8}$ " to  $\frac{1}{4}$ " gap (see Photo 7).

#### Removal

1. Loosen and remove cap screws.
2. Insert cap screws in other set of tapped holes.
3. Progressively tighten inserted screws until sheave is loose.

## Installation Section H

### Alignment Drawings of Adjustable Center Drives

Figure 5: V-V Drive Two Side Movable VSP.

Figure 6: V-Flat Drive One Side Moveable VSP.

*Straight edge must contact the flanges of the pulleys at 4 points.*

Figure 7: Final alignment of Econoline pulley drives.

*Align belt in midrange. Be sure companion sheave is centered when the belt is at midrange of the VSP.*

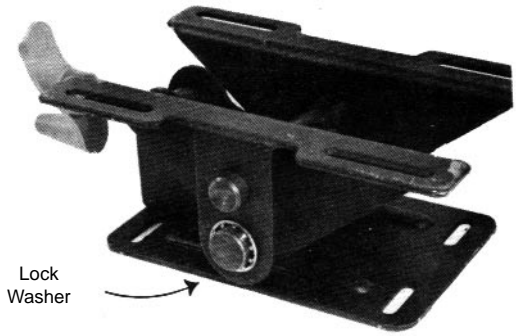
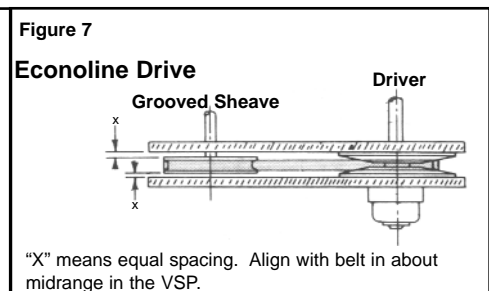
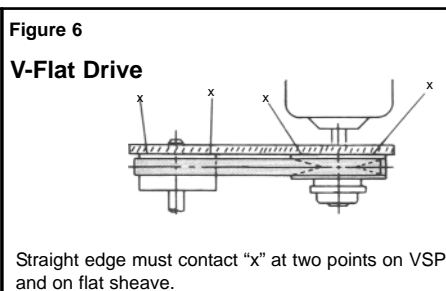
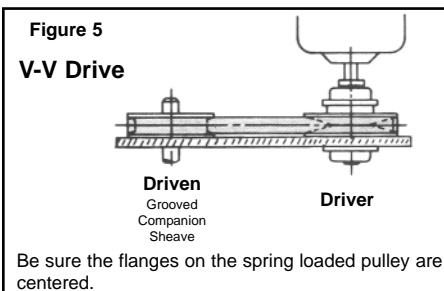


Photo 6 - Tilting Motor Base - install lockwashers after aligning pulleys.

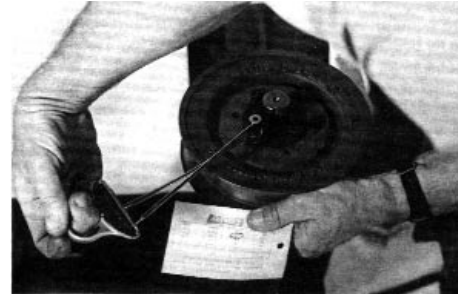
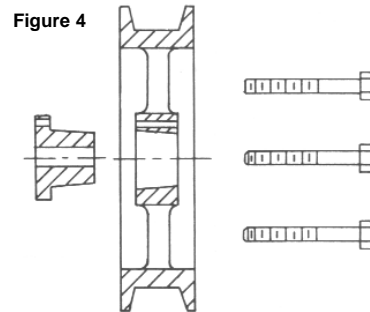


Photo 7 - If possible, use torque wrench to tighten screws in companion sheave bushings.

Figure 3  
Wrench Torque Values for Tightening Bushings

Bushing Size	Torque (in-lbs.)	Wrench Length	Wrench (Pull-lbs.)
JA	60	4 inch	15 lb.
QH	72	5 inch	18 lb.
SH	108	6 inch	18 lb.
SDS	108	6 inch	18 lb.
SD	108	6 inch	18 lb.
SK	180	6 inch	30 lb.
SF	360	10 inch	36 lb.
E	720	12 inch	60 lb.

Caution: Do not exceed these values.



## Installation Section I

### Installation of Fixed Center of Compound Drives

The RPM at the DRIVEN pulley is changed by turning the handwheel on the manually adjustable pulley. Or, in the case of HEXact or GLA series adjustable pulleys, the speed is changed from a remote location. Make adjustment in speed only when drive is rotating.

Depending on how they were purchased, fixed center drives may be mounted in either a "C" or "Z" configuration (see Figure 8). The adjustable pulley is the same for either mounting. The spring loaded pulley is different. It is necessary that the correct mounting configuration be followed. *Do not adjust pulley unless drive is running. Damage to the pulley bearing will occur.*

#### Instructions:

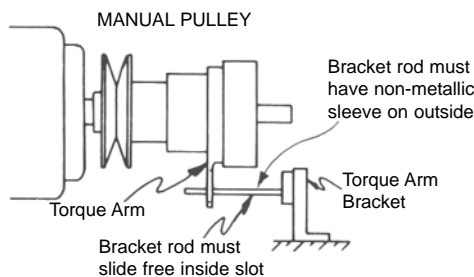
Unless otherwise authorized, the adjustable pulley must be mounted on the DRIVER shaft.

*Caution: Do not lift the adjustable pulley by the torque arm. Do not hammer the pulley on the shafts.*

For good performance and safety, both pulleys must be mounted as far up on its shaft as possible (see Figure 9).

1. Open the adjustable pulley to its full open position. Try the belt in the groove; it should be within  $\frac{1}{8}$ " of the bottom of the groove. It must not touch the bottom of the groove. (In the case of HEX pulleys,  $\frac{1}{8}$ " to the hex point.) If the belt touches the bottom of the groove, severe vibration will result.
2. Recheck the center to center distance for the belt and pulley set being installed (see Figure 18). The catalog speed range can only be attained if the correct belt length is used for the specified center distance.
3. If possible, prior to mounting, place the belt in the grooves of both the DRIVER and DRIVEN pulleys. Install both pulleys in this manner. This will prevent having to wedge the belt over the spring loaded flanges later, a process that can damage belts by stretching the cord members. *Using a pry bar to get the belt over the flanges must be avoided.*
4. With the pulley roughly aligned, check to be sure the belt is now resting near the bottom of the adjustable pulley and is tight in the groove at the O.D. of the spring loaded pulley. The belt should be taut. If it is not, or if the belt is down into the spring loaded pulley and not flush with the O.D., the minimum speed listed in the catalog will not be attainable. If the minimum speed listed is not important, proceed with alignment, otherwise some adjustment will have to be made to the center to center distance.
5. In order to prevent the torque arm from rotating, a TORQUE ARM BRACKET must be used. (Bracket NO. 501 (Figure 11) may be ordered through Lovejoy.) The bracket rod must slide freely in the slot of the torque arm (see Figure 10). Use plastic sheathing on extension rod per sketch.
6. To align the drive, push the adjustable pulley as far on to the DRIVER shaft as it will go. With the belt at the top of the spring loaded pulley and at the minimum pitch diameter of the adjustable pulley, place a straight edge along one flange of the adjustable pulley. Move the DRIVEN pulley on to the shaft until it looks to be about centered with regard to the driver pulley flanges. Place the straight edge along the opposite flange and make adjustments to the DRIVEN pulley until its flanges are centered equally between the flanges of the DRIVER pulley.

Figure 10



Torque arm bracket fixed to a vertical machine member or horizontal member.

*continued...*

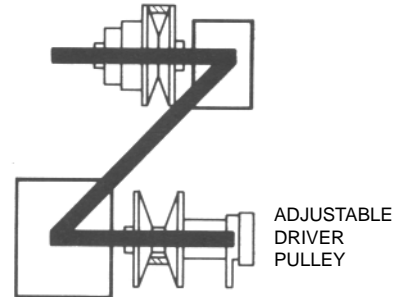
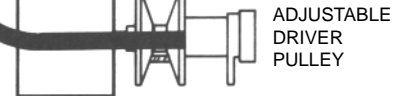
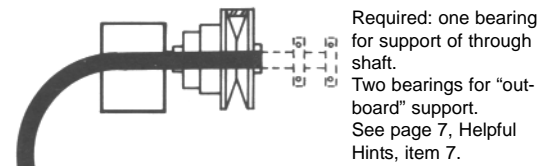


Figure 8

Figure 9

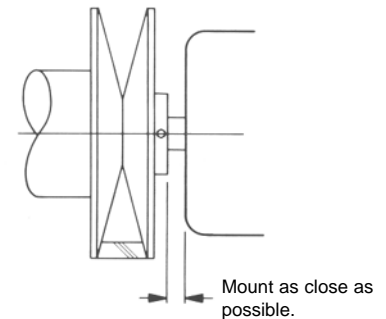
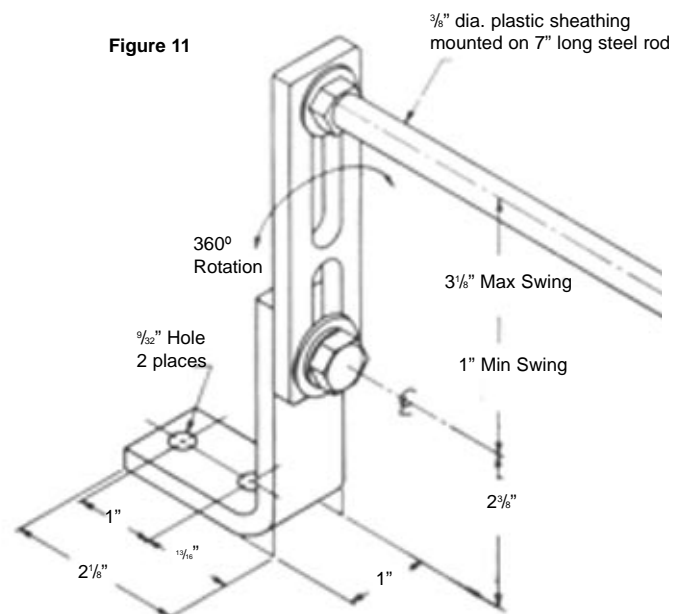
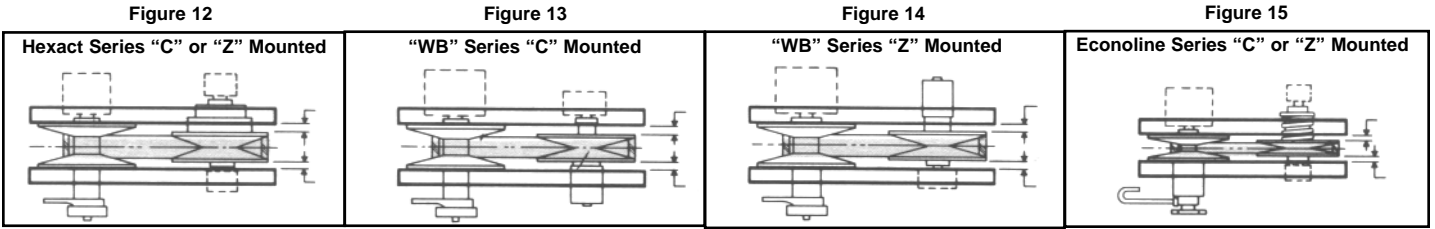


Figure 11



step 6 continued...

Check for both parallel and angular misalignment. See Figures 12 through 15 below for alignment of your drive.



When the drive is aligned, the motor should be started and the pulleys adjusted to run through the speed range desired. *It is important to note the maximum speed rating for each drive. Do not exceed these speeds. See speed chart in Figure 18.* If the adjustable pulley is installed as the DRIVEN pulley, it will be necessary to *jog the motor until the belt is out at the maximum P.D. of the adjustable pulley.* Turn the handwheel *only when the motor is turning.* Never adjust the pulley closed without the motor running.

7. The installation and alignment for HEXACT AND LINEARLY ACTUATED PULLEYS are the same as for manually adjusted pulleys. The spring loaded pulleys are the same for any type of drive. Since the pulley drive is controlled from a remote location, suitable safety and operating interlocks are required.

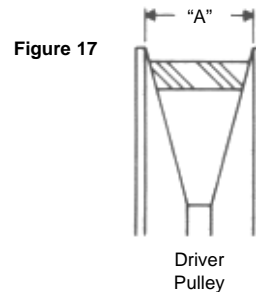
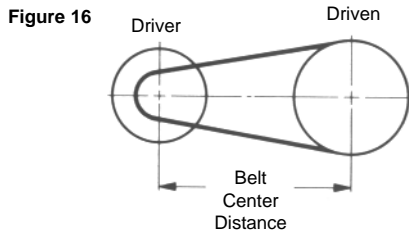
For operating interlocks, it is suggested that the remote increase/decrease speed functions be operable only when the belt drive is operating. The exception is during set up when it is necessary to open the adjustable pulley flanges. For safety, observe the *maximum speed permitted* and provide stops for the adjustable pulley. A

tachometer off the driven pulley is an excellent way to provide visual limits. Limit switches may be used along the torque arm bracket extension rod. Or limit switches with rotating contactors can be used to sense the limit of movement of the movable flange of the driven pulley. This would be in series with the increase/decrease control function along with a red indicator light, which will require the operator to back the speed off until the light goes off.

8. Figure 18 is a chart showing the maximum permissible speed at the DRIVEN shaft for Lovejoy "WB" and HEXact drives. *Observe these speeds and do not exceed.*

Consult Lovejoy about an optional stop device which will restrict adjustment and control the maximum speed of the driven pulley. The device can be included as part of the adjustable pulley.

Dimension "A" is the distance between flanges of DRIVER pulley when maximum RPM is attained at DRIVEN pulley.



HP@ 1750 RPM	Driver Pulley	Driven Pulley	Type Mounting	Belt Top Width	Minimum Speed Position Belt Center to Center Distance*					Driver Pulley "A"	Max RPM @Driven Pulley
3/4	M-007	260	C or Z	7/8	1422V300 8.69	1422V880 11.75	1422V420 14.75	1422V480 17.78	1422V540 20.81	7/8	4950
1.1-1/2	M-1	301C 301D	C Z	1 3/16	1922V321 8.06	1922V363 10.19	1922V426 13.41	1922V484 16.34	1922V544 19.36	1 1/4	4650
2,3	M-3	3030C 3030D	C Z	1 7/16	2322V364 9.19	2322V421 12.09	2322V481 15.13	2322V541 18.16	2322V601 21.19	1 1/2	4650

HP@ 1750 RPM	Driver Pulley	Driven Pulley	Type Mounting	Belt Top Width	Minimum Speed Position Belt Center to Center Distance*					Driver Pulley "A"	Max RPM @Driven Pulley
1/2,3/4	M-007	21407	C or Z	7/8	1422V300 8.7	142V360 11.74	142V420 14.77	142V480 17.79	142V540 20.81	1 3/16	4350
1-3	HM-3	31901 11901 31902 11902	C Z C Z	1 3/16	1922V363 9.34	1922V403 11.38	1922V443 13.41	1922V484 15.47	1922V604 21.53	1 1/4	4725
5-7 1/2	HM-7	32904 12904 32905 12905 32907 12907	C Z C Z C Z	1 13/16	2926V426 10.67	2926V486 13.72	2926V546 16.75	2926V606 19.78	2926V666 22.81	1 31/32	4005
10-30	HM-30	34407 14407 34410 14410 34420 14420 34430 14430	C Z C Z C Z C Z	2 3/4	4430V555 14.25	4430V610 17.03	4430V660 19.56	4430V690 21.09	4430V730 23.13	3	3300

\*NOTE: Center to center distances are based on installation with the belt in the min. P.D. position of the DRIVER pulley and at the max. P.D. of the DRIVEN pulley. "A" dimension is the distance between the flanges of the DRIVER pulley when max. RPM is reached at the driven pulley. *Do not exceed max. RPM.*

## Lubrication and Maintenance

Variable speed pulleys requiring lubrication should be run through at least part of their speed range after greasing and at least once every two weeks. Following a definite schedule will help to insure proper functioning of the parts when the speed is adjusted. Opening and closing the pulley flanges distributes the grease and helps to prevent galling and seizing on the sliding surfaces.

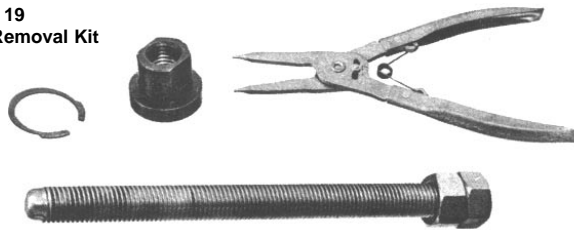
Lovejoy pulleys are packed with ARCO Caldron EP 2 grease of equivalent (Texaco Multifak EP2, Mobil Mobilux EP 2 or ARCO Litholene HEP 2). Avoid using automotive chassis and other non-interchangeable lubricants.

### Maintenance on Econoline Adjustable Pulleys (M34, M50, M60, M70) and M007 Adjustable Pulley:

To prevent speed drift, a nylon plug contacts the adjusting screw. To increase drag on the adjusting screw, tighten the set screw over the plug that is located opposite the torque arm, just in front of the handwheel. *Special Note:* M007 Pulleys must be greased about every two weeks. Grease fitting is on the hub near the outer belt flange.

Light oil on the adjusting screw and motor base guide rods will make adjustment easier and help prevent corrosion.

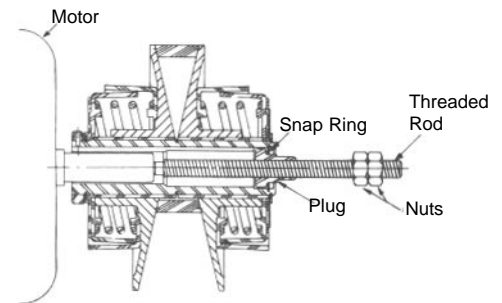
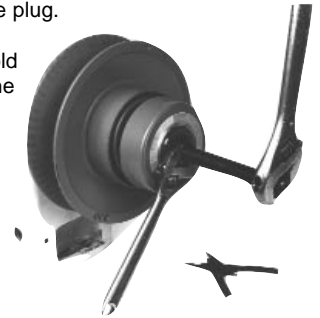
Figure 19  
Easy Removal Kit



### EASY REMOVAL KIT

Remove a Hexadrive pulley easily, without damage to the pulley assembly, or motor shaft.

1. Insert plug into bore with the shoulder leading.
2. Insert snap ring in groove next to the plug.
3. Insert the threaded rod into plug. Hold plug flat with one wrench and turn the screw with another.
4. Back the pulley off the shaft.
5. Consult catalog for Easy Removal Kit.



## Helpful Hints

1. Check alignment of the drive at speeds other than "set-up" speed. Misalignment will cause the belt to overheat and wear rapidly.
2. Observe pulley face runout. A good rule of thumb of .001" per inch of diameter is acceptable.
3. Watch for overload conditions. If the belt loops out or squeals, the drive is overloaded. This condition will frequently exist during startup, but should not continue for more than a few seconds. When starting up, particularly if starting several times a day, try to start slowly by jogging the machine to bring the speed up gradually. Observe the torque rating in the catalog for the rating of the drive at the DRIVEN pulley.
4. Excessive vibration will cause damage to all of the equipment in the drive system. If any doubt exists as to the safe levels of vibration a qualified person should be called in to examine the drive.
5. Lubricated pulleys will stick or freeze if not lubricated properly. The most frequent cause is failure to run the drive through part of its range at the time it is lubricated. The pulley must be lubricated at least once every two weeks and pulley adjusted opened and closed to distribute the grease inside. Small amounts of grease will do. Wipe excess off of belt faces.
6. Where necessary, use Loctite on set screws to prevent screws from backing out due to vibration in the machine.
7. When belt drive is subjected to cyclic loading, numerous starts and stops or will be running at high speed continuously (over 1800 RPM) an outboard bearing support (see Figure 8 on page 5) is recommended. Thru bore pulley assemblies are available. Consult catalog.
8. Belt drive guards must permit adequate ventilation of the drive components. A non-ventilated drive can retain heat. Any heat "build-up" contributes to component and belt deterioration.

## Safety

The user of variable speed belt drives should be aware of the hazards through misuse of the product or failure to protect against contact with moving parts.

Spring-loaded pulleys should never be disassembled without first receiving instructions from factory.

Variable speed pulley rim speeds must never exceed 10,500 feet per minute. Companion pulley speeds beyond catalog ratings are not recommended.

Shafting must be of adequate diameter to prevent failure due to fatigue or torsional shear. Heavy rotating parts may cause fatigue failure due to bending in the shaft. Rapid accelerations or braking, or shock loading, may cause a shaft to fracture due to torsional twist beyond its capacity.

When vibration that is deemed beyond acceptable limits exists in a drive shaft, failures may result. A qualified person should determine if the structure is adequately supported and if the shafts are large enough to transmit

the power. All mounting screws on the pulleys must be kept tight.

Even though each pulley is individually balanced at the factory the system in which the pulleys operate may resonate, particularly at high RPM's over 1800. Sometimes a new belt will reduce vibration levels in a system, or the structure may need stiffening. Also, small pulley diameters and long shaft center, coupled with the weight of a long belt, may generate vibration.

The user must protect all who have exposure to the drive with adequate guards. Guards must protect against a person placing limbs in contact with moving parts, as well as protect against the hazards due to failure of any of the rotating part. When maintenance is required in the area of the equipment *necessitating removal of the guarding*, the prime mover should be turned off and "locked out."

Reference should be made to OSHA standards for Guards for Power Transmission Apparatus, the American Society of Mechanical Engineering standard B15.1 and local safety codes.

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- *Curved Jaw Couplings*
- *Disc Couplings*
- *Torsional Couplings*
- *Gear Couplings*
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- *Motion Control Couplings*
- *Deltaflex Couplings*
- *Saga Couplings*
- *Variable Speed Pulleys*
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- *Uniflex Couplings*

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