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## Optimizing belt fit in the clutch system

*Belt fit must be correct to achieve maximum performance from a snowmobile and to avoid declutching problems. The following report from The Gates Rubber Company focuses on these variables.*

### Problems with belt length

For the snowmobile clutch system to work efficiently, belt and pulley geometry must be correct. If the belt is too long, for example, the extra belt length will cause the belt to ride higher in the primary pulley. The net effect is that the starting gear ratio will be significantly reduced and the sled will feel like it is starting in second gear (see Fig. 1). In the high speed condition, a long belt will not shift to the smallest diameter in the secondary pulley, causing a loss in top

speed. Significant misadjustment can truly be like starting in second gear and loosing overdrive – both at the same time!

A belt that is too long for a drive may result when the belt's construction reaches its maximum tolerance limits. Belts designed by different manufacturers may fit an application differently, but the most likely cause will be a worn belt. A worn belt may have a narrower top width which makes the belt seem longer to the system. A "long" belt may not even be a function of the belt – it can result from an out-of-tolerance center distance adjustment or pulley adjustments made for some other belt.

### 'Short' belt symptoms

The occurrence of a "short" belt is less common than belts that are too long. This condition can result from using an improper belt, from a short tolerance belt or from a long tolerance center distance.

Assuming that the belt is adjusted to permit de-clutching, a short belt can exhibit symptoms very similar to a belt that is too long. A short belt will ride lower in the secondary pulley (see Fig. 1) leading to a lower "gear" ratio and lower acceleration. At high speed, the short belt will ride lower in the primary pulley resulting in speed loss. If pulled too far down in the secondary pulley, one of two problems may occur depending on the design of the secondary pulley:

⇒ On some secondary pulleys, belt travel is limited by a "shelf" at the bottom of the groove (see Fig. 2). If the belt is pulled down on this "shelf" all wedging is lost and the belt will go into drastic slip and perhaps instability.

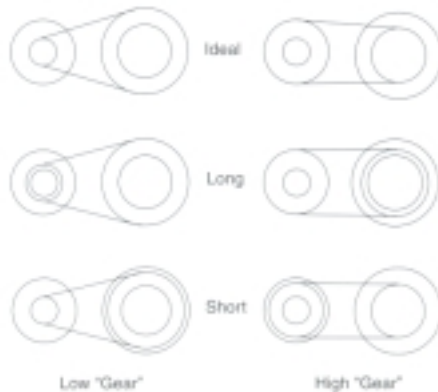


Fig. 1 Effect of belt length on "gear" ratio

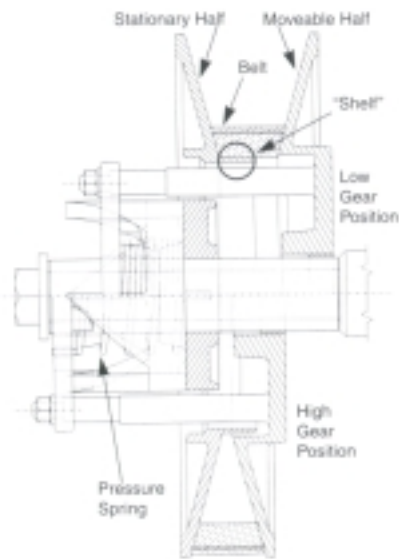


Fig. 2

- ⇒ Some secondary pulley designs feature tapered sidewalls that become verticle at the bottom. If the belt is pulled below the tapered surfaces, significant damage to the undercord material will generally occur.

#### Check for proper fit

The following paragraphs describe the adjustments necessary to obtain maximum performance. The manufacturer's recommended settings should be used, if available. If these values are not available, the values in the following paragraphs are generally accepted for most applications.

- ⇒ The belt deflection adjustment, often referred to as setting the "tension," is done to assure that there is sufficient belt length in the drive to allow the belt to properly de-clutch. For this adjustment, the belt should be easily

deflected 1-1/4 inches (no more than 10 pounds force). Significantly less deflection can cause declutching problems while larger deflections can mean that the belt is too long. This could cause slow acceleration and loss of top speed.

- ⇒ Side clearance between the belt and primary pulley can be measured with feeler gauges inserted between the belt surface of the pulley and the sidewall of the belt (see photo A). Too little clearance will cause excessive rubbing between the belt and the pulley when the drive is declutched, while excessive clearance can cause harsh engagement during the clutching operation. Excessive clearance also can upset the relationship of the clutch weights to the spider in the primary pulley and result in clutching calibration problems. The clearance should be at least .020 inches for proper declutching; values over .060 can cause performance degradation.



Photo A - Side clearance on the primary pulley can be measured with feeler gauges and should be at least .020 inches for proper de-clutching. Values more than .060 inches can cause slow acceleration.

- ⇒ Belt ride in the secondary pulley should be measured with the belt fully seated in the pulley, after the drive has been operated over a part of its speed range and then run in

the declutched position for a few seconds. Most manufacturers recommend that the top of the belt ride close to the outside of the pulley. It should not ride in or out of the pulley more than 1/16 inch when first adjusted (see photo B) and should be readjusted when it reaches 1/8 inch. Too much ride-in will reduce the overall gear ratio and too much ride-out can cause belt damage or belt turnover.



Photo B - Most manufacturers recommend that the top of the belt ride as close to the outside of the pulley. It should not ride in or out of the pulley more than 1/16 inch.

#### Adjusting belt fit

Most clutch systems allow adjustment for belt fit. This is usually accomplished by adjusting the secondary pulley halves spacing — either with shims or mechanical adjustment mechanisms. Center distance adjustment can correct some fit problems but should only be done as a last resort. This can lead to misalignment between the primary and secondary pulleys, drastically reducing belt life. Additionally, center distance adjustments should only be made within the tolerances specified by the sled manufacturer.

Always adjust for the highest ride possible in the secondary pulley to get the best low gear possible, but avoid tightening so much that belt has difficulty de-clutching. This also can cause

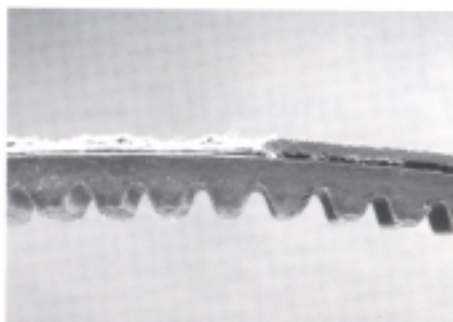


Photo C - As a general rule, a belt that looks "well used" should be replaced—both for maximum drive efficiency and for the security of not having to change a belt out in the snow.

excessive wear on the bottom of the belt.

Many belt fit problems can be traced to a severely worn belt (see photo C). Normally, top-width wear in excess of 1/8 inch is too much.

Additional information on troubleshooting snowmobile belt clutch systems is contained in a \$12.50 video tape entitled "Sled Tech," and in a series of free "Snowmobile TECHTIPS." Send your specific request to: The Gates Rubber Company, c/o EAGLEDIRECT, SnowBelt Tips, 5105 East 41st Avenue, Denver, CO 80216-4420.

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For technical information on snowmobile belts on the Internet, visit the Gates WEB site at <http://www.gates.com>