



## Replacing the Speed Control Quadrant Roll Pin with a Bolt, 2 Star washers and a Nylock Nut

*Originally Written by Bill Mayo (See June 13 2016 Update from Bill at the end)*

I find about 50% of the headstocks I rebuild need the quadrant replaced. I have spent a lot of time trying various fixes/modifications/solutions for this problem. [The major problem is that owners do not lubricate the Control Sheave causing it to slightly bind/stick on the Idler Shaft.](#)

I ask customers how quickly they turn the Speed Control Handle from FAST to SLOW.

[Most customers turn the handle too fast which causes the Speed Control leg to deform/bend allowing the worn gear to operate on the side of quadrant teeth slowly destroying the teeth.](#)

Only going from FAST to SLOW at about 1/4 to 1/2 the speed of going from SLOW to FAST really help. You are squeezing the motor belt forcing the motor sheaves apart against the motor spring when going from FAST to SLOW.

This problem results from the quadrant slowly bending the Speed Control bracket leg which causes the quadrant roll pin to wear the holes bigger in the legs of the speed control bracket.

This causes the quadrant to tilt and is no longer centered on the control sheave bearing button. This causes the side of the quadrant teeth to wear quickly as they are no longer centered on the steel worm control gear of the Speed Control Assy.

If you are changing the speed quite often, then the teeth on the new quadrant will again wear more on one side than the other side. This may slowly destroy the teeth and make changing speed quite hard or impossible again.

I believe taking your time when going from FAST to SLOW will prevent most of this type of damage to the



original Speed Control Assembly along with frequent lubrication.

Of course, I developed a solution for this problem a few years ago.

Since the quadrant roll pin wears the holes and the leg bends which causes the quadrant teeth to wear only on the teeth edges, it may jam or make changing the speed quite hard.

I have converted all the Speed Control Assemblies I use 6 1/2 years ago when I find the problem being repeated on each headstock I rebuilt.

The one leg is bending on the speed control bracket.

I quickly found that allen head 10 32 X 2 1/2" bolt fits in the quadrant and legs without any drilling or shimming required.

I put a little wheel bearing grease in the quadrant hole and use an allen wrench to thread the bolt through the legs and quadrant.

The star washers was added on the outside of the legs after a year as I found the bolt would start turning in the legs when I want all the rotation to be the quadrant on the bolt.

Later, I started using red LocTite on the star washers. I tighten the nylock nut until I cannot move the quadrant to seat the star washers into the legs and the bolt head & nut. Then I back off the nut until I can move the quadrant.

I have been using these modified Speed Control Assemblies for seven years for myself and customers with no new problems and the quadrant teeth look new each time I lubricate my headstocks.



Headstocks with a small speed control assembly horizontal hole will need a small slot filed for the allen bolt head to clear when installing.



This picture shows the removed Speed Control Assembly on the right side and a rebuilt Speed Control Assembly on the left side.



The left side one shows the remaining threads on the bolt was [hack sawed off](#).

I file the end of the bolt to remove any sharp points after hack sawing the bolt.



Note that the worm control shaft is in the **center** of quadrant teeth.

One of my secrets is I actually use a hammer and punch with the bracket in a metal vise and tap/hit the bent leg **(no quadrant installed)** toward the center.

Most times I have to do both legs to center the quadrant.

I just check that it will still fit between the legs when doing this task until the legs allow the quadrant teeth to be centered in the worm gear.

**The legs bend quite easily**, so it does not take much to realign the legs so the quadrant tracks in the center of the worm gear.

I have cracked a few legs while doing this task and had to discard the bracket so a little force a few times is better than one big hit.

I have done close to a hundred of these roll pin to bolt changes.

I have been doing this modification to all the headstocks I rebuild. Since I never gotten a headstock back that I rebuilt, I can only check my personal headstocks which shows no shifting of the quadrant teeth on the worm gear.





## **Adjusting the High Speed Screw and Speed Control Dial**

I set the speed control assembly to the FAST position. I rotate the worm gear until the quadrant contacts the high speed adjustment screw. I check where the indent in the worm gear shaft for the speed control handle is at this time.

I want the indent to be at the 11:30 position.



If you have the thin locking nut of the high speed adjustment screw, I want the screw head to be extending about the width of the nut pass the nut to start.



If a regular nut, I set the screw even with the outside of the nut to start.

Then I will adjust the screw CW (nut loose) until I can get the indent to stop at the 11:30 position and tighten the nut. It should never take more than a one turn of the screw to do this. I leave the belt off when installing the speed control assembly.

I place the speed control dial to FAST when installing the assembly.

I make sure the anti-vibration spring is installed and then screw in the 3 screws to hold the assembly.

I then install the speed control handle and make sure the dial is at FAST when the quadrant is stopped by the high speed screw.

I make sure the handle can be rotated from FAST to SLOW and back to FAST without any problem. Then leave at FAST.

Then I install the motor drive belt and hook the control sheave retaining loop onto the quadrant.

I then install the motor with the switch and wires over the headstock lock rod. I pull the floating sheave and rotate the motor belt over the floating sheave after the motor pan (5 screws) is secured to the headstock.

I will be happy to mail you allen head bolt, 2 star washers and a nylock nut if you send me your address. If any other Shopsmith wants, needs, questions, comments or concerns, please let me know. *Now he sells them at a very modest cost to cover expenses.*

Bill Mayo

----- Additional Information - current as of Oct 2015 -----

Bill developed these techniques as he stated in the text above, "6 ½ Years Ago" as referenced in the Shopsmith Wiki article, which clearly was written some years back.

Indeed he now states that "The combination of this hardware has greatly improved the reliability of the headstocks that I have rebuilt in the past 12 years without having any returns during that time.", and I don't know when he started providing that updated timeline reference, but rest assured, it is now over 12 years.

Additionally, with regard to cutting off the bolt in the Speed Control described above, he now offers the following suggestion: *The longer bolt can be left sticking upward and the ON/OFF switch wires routed behind the bolt and/or a nylon clamp can be installed on the bolt to hold these wires to replace the nylon clamp (which gets lost most times).*

Bill has for some time provided through his eBay account, a Shopsmith Headstock Improvement kit that now includes not only the bolt, nut and washers for the Speed Control, *as well as an additional bolt kit and retaining washer for the Eccentric Bushing retaining washer for B and C series Headstocks, shown below.*



10-24 x 2 ½" allen head screw, 2 star washers and a nylock nut for the speed control upgrade, coupled with a #10 X 3/4" body washer & #10 star washer, to better retain the eccentric (12 o'clock in left photo), and a 5/16" X 2" allen head bolt with lock washer and square nut. This replaces the eccentric bushing bolt. *He notes that in 'A' series headstocks, you will have to drill a larger access hole in the side of the "A" (earliest) headstock casing to insert the bolt. B and C headstocks came standard with a larger hole.*

**Word of caution here:** it is possible to over tighten either the existing or the replacement bolt and break off one of the aluminum ears casted in the headstock just below the eccentric. Use caution. By the time you have compressed the lock washer in Bill's kit to where it is flat, it's likely tight enough.

Needless to say, aside from retaining Bill to do repairs personally for some folks through the years, we are all indebted to Bill Mayo for his innovation, his creative problem solving, and his willingness to share what he has learned here in the forums. – Everett –

## Update from Bill

**Sent:** 13 Jun 2016 07:14

**From:** [billmayo](#)

**Recipient:** [everettdavis](#)

Thank you for all the kind words and for including my speed control bolt kit. This was my most improved update for the headstock. I also believe the set screw I use in the eccentric bushing is another major improvement I have used for years. This is what I list in the Ebay listing:

¼" X 5/16"-18 Knurl-Grip Cup Point Set Screw. Replaces the eccentric bushing cone point set screw (103A). The cone point set screw only has a tiny point to hold the Idler Shaft bearing. Over time, this set screw has loosened many times. If the cone point set screw is even slightly over tighten when installing idler shaft bearing in the eccentric bushing, it can distort the Idler Shaft outer bearing casing resulting in either a ticking noise, over heating or failure of the Idler Shaft bearing. This set screw allows the idler shaft to be positioned at different locations within the eccentric bushing to get the proper Gilmer or Poly-V belt alignment with the Drive Sleeve pulley. You position the eccentric bushing against the retaining washer and move the idler shaft inward for proper belt alignment before tightening the set screw.

If you could add this to the existing material, I would greatly appreciate it. Thanks.

Bill