

# 850 G4 Summit



I have an 850 x 154 x 3. I doubt I'll have a kit until 2018 as it will take me a whole season to do competent testing.

As far as getting my hands on an 850 summit clutch, the blessings that been bestowed on me makes me not able to sleep at night regarding the clutch itself and who's helping me test again this season - truly honored for the ones who are helping me.

I started with this in June, but doubt i'll have anything competent until so much testing is done.

First have to get used to the sled and run it through the wringer. Drive the sled everywhere as much as we can and find deficiencies. It is the getting used to the sled and end up finding (I wish I had a little more here) and (I wish I had a little more there) and (I wish it acted different in this situation). These slight deficiencies is where a clutch kit rises to the surface.

The kit solves a bunch of little deficiencies like filling in the gaps where stock settings dont quite hit the mark to an operator that's able to overcome the capacity of the sled.

Now parts go out to my fellow test pilots all over snowmobile land from sea level to Alaska to BC to Colorado and Sweden. Get feedback from all the riders and see what else needs to be done to make a competent tune.

As far as gains, there has to be a search to find gaps in the clutching performance where the sled is by an opinion, deficient. That is my job to find these gaps in the performance of the clutch calibration.

The testing is good old fashioned side-by-side running and sees how much further we can get in track speed and backshift strength.

Breaking trail developing a new clutch kit has its growing pains. I have to talk to the test guys and ask questions that requires them putting forth experience.

I learn a good amount of knowledge, so we get to "smell" and "taste" what the new clutching is like.

Here is the reason why - when we genuinely (iterate) struggle through a problem, we get to understand our product. When one has done that "nail their own stuff down from stock (not a competitor clutch kit)" for years, we get a pretty good grasp of what we can do.

Stock clutching is the highest bar to overcome.

I want to find out all the mistakes, misinterpretations, things off the mark, here before it goes to market, this does take time. Oh and fit that in between all the other things, support current products and eat and sleep and family. (its a non-stop "work in progress" - where is the finish line?)

In the final analysis you will know we built a good clutch kit and we were the ones who actually built it (not bought a competitor helix, have it measured, whip up springs for the kit, then re-label it [ponchos sled shop clutch kit])

We will be able to answer you at multiple levels. If we were not the ones who developed it, we could get stuck on a question. And then you can say to yourself "this person was not really the one who solved the problem"

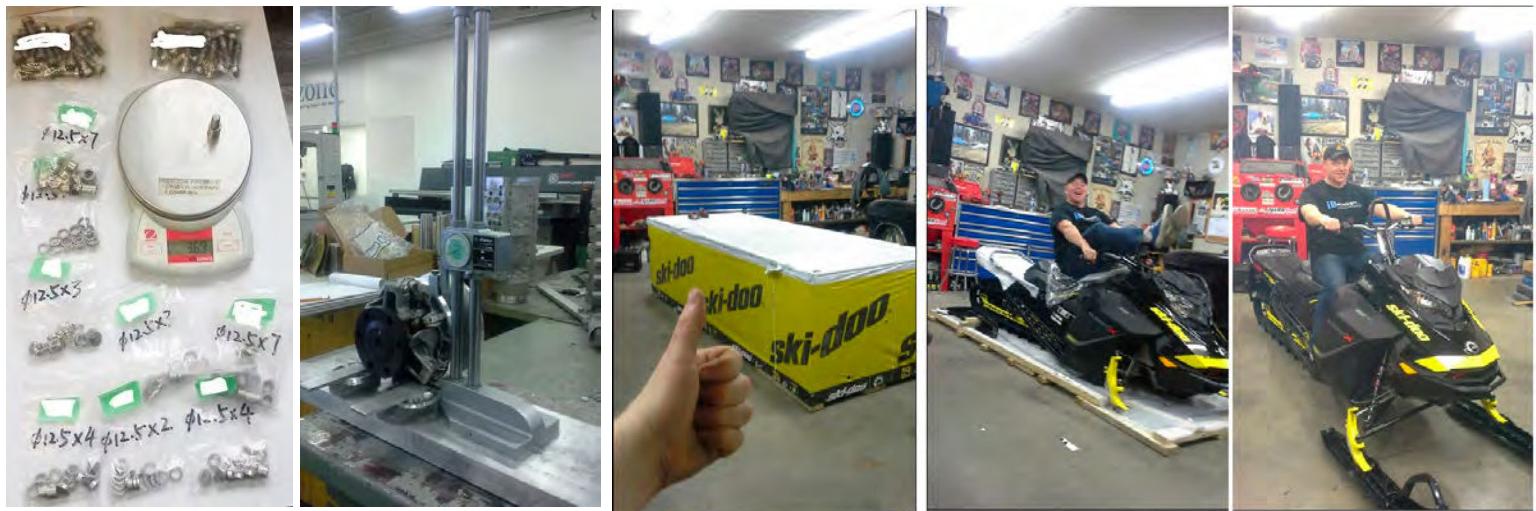
As we roll along in time and I make progress, I will add a picture here or there of what is going on to move forward and have a great clutch kit for 2018

Yes I have pDrive clutch tools (not for sale yet) and (not the ones in the picture below either) - the machine shop is just waiting for me to push the go button.

Happy trackspeed

Joey





## **Hot belts - Blowing Belts**

im working my heart out on lowering temperatures. Up to a little over 450 miles now -  
Im leaving all the factory installed fiber parts on, not modifying any of the clutch guard area. Leaving all felt linings in.

Not running a prefilter grill kit either - I want as much natural under hood heat & moisture to give "from factory" a good go.

Trying to break the system down into its component parts based on track speed.

## **Start of shift**

I been doing slow wrong foot forward, sidehilling across hills, just fast enough to walk and after about 120 feet...."peeeueewee....stinky belt smell" The engagement speed is too high at 3600 for the 967 ramp and im running enough pivot weight with tungsten down here to allow the use of that ramp.

I been trying the 967, 951, 968 ramp with 170 and 185 start forces (getting to try out custom springs)  
Next will be 150, 140 and 120 start forces.

## **Midrange track speeds** (correspondence from a customer)

Some people have to travel long distances from the trailer to the deep

**Mike)** we are out of ID and where were riding have blown belts in 100 miles, this is going to be an expensive winter

**Joe)** Q1] Was there at any time ever on the hardpack to get up to where you both ride the sled, was there any time ever the sled reached a vehicle speed of about 72 to 75mph. Like say some switch back that has a long enough stretch on it to boogie up to over 72mph (yes or no?)  
Q2] Do you two have to run a long distance on roads to get to where you ride to snow, like having to ride a distance at steady part throttle up or back from the snow?

**Mike)** the majority of what we did was breaking our trails into the back country so we maybe had 2 miles of hard pack riding to get to the snow. We did have one ride with search and rescue, 14 miles of trail to get into the stranded sledgers. For most of those 14 miles we would have been in and out of half throttle probably keeping a consistent speed of 50 mph and hitting a top speed of 65 it's very very rare that we would hit a vehicle speed of 75 mph

**Joe)** but you could have hit 75mph even just once, yes? This is all it takes to start to damage a belt with gears that are in the latest summits.

all it takes is one to two times to get there and this happens

[https://www.ibackshift.com/article/g...summit\\_overrev](https://www.ibackshift.com/article/g...summit_overrev)

1] The belt "compression cogs" hits the roller pivot stud and

2] the angle of the secondary clutch where the sheave angles to straight up and down (overdrive portion) &ndash this "ridge" where the angle transitions to perpendicular wants to separate the belt in two - Separating the tension section from the compression section.

### **Belts will cumulative raise heat to overheat by...**

High engine speed at part throttle, heating up the belt from steady running down trails.

OR

Steady part throttle at long trails will raise temperatures of the belt because you are putting the belt on one small area, pulling from the primary clutch. When the belt stays in one area (Within a ½ inch of sheave travel) the temperatures will soar to 180~190 degrees. Eventually so much heat a chord will pop and sentence the belt to death.

### **Death sentence belt temperatures**

[https://www.ibackshift.com/article/b....asp#belt\\_temp](https://www.ibackshift.com/article/b....asp#belt_temp)

Watch your belt sidewall color turn from green to brown to black(185 degrees and no rest)...\*badassing\*...there goes a chord.

Run the sled hard as you normally do, but stop every once in a while to check the color of the belt. Monitor the clutch temps and when you start to see the belt glaze from that point on it will start to turn brown. You'll end up knowing how long you can run the sled for whatever you do and that "timer" will be going off in your mind giving you a conscience "im at the point of ...or...im almost at the point of - giving the belt a rest. Pop the side panel off, clutch guard off and take a drink of water or whatnot to give the belt and clutches an "open air" break.

When running down hardpack, then vary the engine speed while driving, speed up, slow down, speed up, slow down. Imagine you are able to watch your belt move across the sheave face. Changing speed will move the belt across the sheave face and draw away more heat from the belt. Staying fairly one vehicle speed traveling will have heat localized on one area of the sheave faces and heat can not be drawn away from the belt.

Trail sleds can get away with long distances of steady part throttle because of their higher gearing, lower track loads and much lower engine speed at part throttle. Example an 800 trail sled can poke along at 60mph at 5500~6000 rpms to where I see on my own 850 x 154 x 3" running at 6900~7200 rpms at 50mph depending on load.

## GEARING summit 850, MY 2017 and Top track speed

### Track speed sentence belt to death

orange box maximum safe track speed

red box....starts damage and engine will take off into overspeed.

850 x 154 summit		850 x 165 summit	
Top Gear	19	Top Gear	21
Bottom Gear	45	Bottom Gear	51
Engine RPM	7950	Engine RPM	7950
Gear Ratio	2.368421052631	Gear Ratio	2.428571428571
Constant	50.3	Constant	50.3
Belt Safe 1:1 ratio	Caution 1/2 o.d.	Danger Full o.d.	Belt Safe 1:1 ratio
MPH 66.70	74.11	80.36	MPH 65.10
KMH 107.34	119.27	129.33	KMH 104.77
			116.41
			126.23

### Clutch Pivot Pin testing



## Helix Testing



Primary clutch pivot pin and spacer testing

Jan 8th / 17



The 2017 Skidoo 850 models come with the P-Drive primary clutch. We have the following options available for this primary clutch:

The following springs are load tested as a "Assembly with guides\* @79.4mm and @45mm"

As an example, BRP list one of the 850 stock primary springs (417224168) as 150/350\*\* in this method and list it as BL/PL (Blue/Purple).

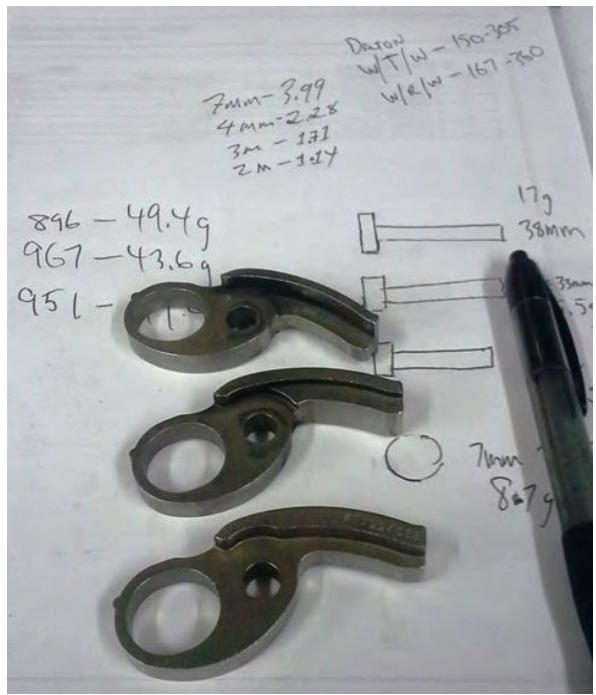
Dalton White/Tan/White	(DPDS- W/T/W)	150 lbs	305 lbs.
Dalton White/Red/White	(DPDS- W/R/W)	167 lbs	360 lbs.
Dalton White/Yellow/White	(DPDS- W/Y/W)	210 lbs	340 lbs.



967 Ramp 92mm Tungsten  
 $43.6g + 15.5g + 8.7 = 67.8g \text{ @ } 1000 \text{ ft}$

Clicker #2 too heavy on bottom end  
 Needs to be more aggressive  
 Need to go to click #1

$4500' - 63.8$	$9000' - 67.8 - 8g = 59.8$
$67.8g - 9000' = 63.8$	$59.8 - 43.6 = 16.2$
$967 + 33\text{mm} + 9\text{mm} + 9\text{mm} = 63.7$	$967 + 33\text{mm} + 2\text{mm} = 59.8g$
CLICK 1	CLICK 1



SW 3 - 67.8 (68) need 70gmm? Dalton  
 Sunday Lodger garage

967 @ 38mm @ 7mm @ 3mm = 71gamm

27.4
43.6
71.0

Sunday past...(Jan 8th-17)

967 ramp + 32mm (15.5 gram) + 7mm tungsten (8.7g) = 67.8  
 Dalton primary spring W/T/W (150/305)

Still not happy with it. Acts like a 417 ramp in a 800e. I mean it rips (you can tell im frustrated) but fer cryin out loud, I make some changes and I still have to go down to clicker #1 and it just dont do what I can get a TRA clutch to do when I make a substantial change.

This is what I stuffed in tonight for next ride

967 ramp

+ 38mm pivot bolt (16.7g) + 7mm tungsten (8.7g) + 3mm BRP spacer = 27.4 grams of composites

TOTAL = 71 grams

I clickered up to #2

Trying to break this bitch and make it...Groan

My own ramps will be more aggressive than this 967 and the rest of the BRP ramps to draw some meat out of this 850 and make it work harder.

## **Line upon line...**

In position 1 and 2 the engine will reach its peak power rpm very quickly with some overshoot. This means that the drive clutch will apply less pressure on the belt in its transition between engagement speed and peak rpms.

Position 3 represents a good all-around position where there is only minimal rpm overshoot.

In position 4 and 5 the clutch will clamp the belt very early after engagement, slowing down the climb in rpm.

**end....**

## **Latest flyweight grams for 967 @ 600~1750 feet.**

Jan 29th - 16

Feedback im getting from Colorado, WA, BC im too light on my flyweight gram calculation by 2.5 grams. This is getting interesting. Waitng for feedback from AK, BC(2), NB and Norway.

38mm bolt

+ tungsten 3mm (grey color) 4.1 gram

+ tungsten 7mm (grey color) 9.7 gram

+ steel 3mm (yellow color) 1.7 gram

= 31.5 grams -was still running at 8000 rpms, clicker #3. holy cow. haha

Setup for Feb 12th

38mm bolt

+ tungsten 4mm (grey color) 5.3 gram

+ tungsten 7mm (grey color) 9.7 gram

+ steel 3mm (yellow color) 1.7 gram

= 32.7 grams, clicker #3 (gona break this som-bitches back)

## **Engine speed drifting low - FINALLY, woo hoo! :)**

Holy Cow...**Setup for Feb 26th**

38mm bolt (17 grams)

+ tungsten 4mm (grey color) 5.3 gram

+ tungsten 7mm (grey color) 9.7 gram

+ steel 4mm (yellow color) 2.37 gram

+ steel 2mm (yellow color) 1.1 gram

= 35.4 grams, clicker #3

.....and still 8000 rpms full throttle. Hmm,

This is the order they have to go on **ALWAYS TUNGSTEN LAST.**

**ALWAYS PUT THE YELLOW STEEL SPACERS ON FIRST, TUNGSTEN ON LAST. TUNGSTEN TOUCHES THE WEIGHT PIVOT ALUMINUM CLAMP.**

**ONLY USE THE BELT CHANGE TOOL TO PREVENT OVERTIGHTEN OF THE PIVOT BOLT ALUMINUM RAMP CLAMP.**

I do this test of running down a hill, full throttle about 50mph, reduce throttle and back full throttle. Full throttle 7700 rpms. YAY!...this is what i've been waiting for to make engine speed not recover. Turn around, go back to start about 1/8 miles and change clicker to #4.

Again, full throttle about 50mph or so let off throttle, back on throttle and 7900 and up to 8000 again. But I dont want clicker #4, I just want to prove something about the clicker and what its going to do for me.

That test ive done several times this season but never got to make the engine labor by drifting rpms until recently. The upside is most of the test guys have got these results earlier in the season - to get the engine to labor in deep snow and solve the engine-speed-drifting with a different primary spring.

The downside of adding weight to the 967 ramps in the amount i've added is as the pivot bolt weight has increased, so has the engagement speed. It went from 3200 to 3700 rpms. Adding pivot weight in this amount causes the center of gravity on the ramp to move towards the tip; acting as-if it has more tip weight.

What ive found is the engagement speed is slight high and makes it more difficult to do wrong foot forward because the clutching wants to "surge" and ever so slightly pull the handlebars away from your hands. Talk about concentrating super hard on maintaining throttle control. I have Bret Ras-mussen voice repeating itself over and over as I practice wrong foot forward. The higher engagment speed is making me tired and Im in good physical shape.



At about 80 feet I can smell the drive belt. The rider behind me can smell the belt. If I let Gino go first to do a wrong foot forward and then I follow his track, the load is lighter for me and I still smell drive belt. Buddy has a MTNTK Blow hole on his 850 x 154 summit and all he smells is burning belt in his face all the time - YUK! But man that Blow Hole works like a shot for moving air from the clutch guard.

Taking a break to go over Rasmussen technique; wrong foot forward



## New primary spring - Finally

What a great supplier. Earlier on in the winter I give Dale at Dalton a rundown of the data I been pulling in from the test guys. The springs used, elevations, snow depth, engine speeds and comments. This spring here I stuck my neck out for a suggestion to have Dale make. I wanted 140 start and the best he could do is 150 start. Ok, for me that's still better than 170 start.

I'm hangin my hat on a handful of springs and this is the latest one. Took Dale 7 weeks to get this one made. Normally its 6 weeks but man, the waiting for this has been pure agony for me.

Joe) Dale, is it ready yet?

Dale) no

Joe) Dale...any news yet?

Dale) No

....haha, Sorry Dale buddy but you know me, my anxiety can only be quenched with the spring itself and / or.....red wine! haha

Part of the anxiety too is, the Fedex charges to get more than 6 but less than 10 of these springs out on 2 day air is like \$540. Truly you'd have a shit if you knew the total cost (less my own sled) of receiving parts, cost of the parts, sending out parts to test pilots all over God's creation.



## Flyweight legend (temporary)

- 1) 38mm pivot + T7 +T4 + 4mm = 33.2
- 2) 38mm pivot + T7 + T4 + 3mm = 32.8
- 3) 38mm pivot + T7 +T3 + 3mm = 31.5
- 4) 38mm pivot + T7 + T4 = 30.9
- 5) 33mm pivot + T7 + T4 = 30.5
- 6) 38mm pivot + T7 +7mm = 29.7
- 7) 38mm pivot + T7 +4mm + 2mm = 29.1
- 8) 33mm pivot + 3mm +2mm = 28.8
- 9) 38mm pivot + T7 + 3mm + 2mm +2mm = 28.7
- 10) 38mm pivot + T7 +3mm = 28.1 gram
- 11) 38mm pivot + T7mm + 2mm = 27.6 gram
- 12) 33mm pivot + T7 + 2mm = 27.5 gram
- 13) 33mm pivot + T7mm = 26.4 gram
- 14) 33mm pivot + T7mm + 2mm = 26.0 gram
- 15) 38mm pivot + T4mm +3mm +2mm = 25.1 gram
- 16) 38mm pivot + T4mm +4mm = 24.6 gram
- 17) 38mm pivot + 7mm + 3mm + 2mm = 23.9 gram
- 18) 38mm pivot + 7mm + 4mm = 23.3 gram
- 19) 38mm pivot + 4mm + 4mm+ 2mm = 22.8-gram
- 20) 38mm pivot + 4mm + 3mm + 2mm = 21.7 gram
- 21) 38mm pivot + 3mm + 2mm + 2mm = 21.1 gram
- 22) 38mm pivot + 3mm + 2mm = 19.4 gram
- 23) 38mm pivot + 3mm = 18.3grams
- 24) 26mm pivot + 7mm = 16.9 gram
- 25) 26mm pivot + 3mm + 2mm = 15.6gram

### Flyweight package

BRP# 486017028 Tungsten 7mm @ 9.7 grams -  
Qty 3

Joe's Tungsten T7mm 8.7 grams

T4mm @ 5.2 grams - Qty 6

T3mm @ 4.1 grams - Qty 3

BRP# 486016043 7mm - @ 4.0 grams - Qty 3

BRP# 486016042 4mm - @ 2.3 grams - Qty 6

BRP# 486016041 3mm - @ 1.7 grams - Qty 3

BRP# 486016040 2mm - @ 1.1 grams - Qty 6

38mm pivot @ 17 grams - Qty 3

33mm pivot @ 15.5 grams - Qty 3

26mm pivot @ 13.3 grams - Qty 3

### These are two average questions I been getting over the 2016~17 winter and spring.

**Q)** Joe how come I dont see you have any custom ramps?

**A)** I've made custom ramps in Sept 2016 so Im ahead of the game. Im not offering anything until I believe i've exhausted testing the stock BRP ramps applied to the the custom springs I've had made for me.

**Q)** Will you have adjustable ramps?

**A)** At this point, the adjustablility of my ramps will be like the BRP ramps with the single pivot hole and clicker adjustment. I will be tuning old fashioned like Aaen says to with flyweight grams and spring force changes.

I have other things for the pDrive primary clutch up my sleeve im working on.

## **June 15th 2017 Latest specs for model year (MY) 2018**

New ramps - 990 low elevation. 965 High elevation (146 to 175)

New helix - 42/38 (146" only)

Gearing - 21:49 (146), 21:49 (154 Hc Europe), 21:51 (154) 21:53 (165, 175)

I can't wait to stuff the 175 gearing in my 154 and test out the 990 and 965 ramps...woo!

## **PDrive pivot pin kit done finally Oct 18 2017**

I got the weights done for my G4 summit clutch kit pDiddy pivot bolt kit and does not matter what ramp the owner uses. They can use the 990, 965, 967, 951, 968. I have the weights done for every ramp and can go to at least 100 grams on the total overall ramp. Not ready to send out a kit yet, just saying I have all the configurations done. I have a few more loose ends to tie up.

For the iB 850 summit clutch kit, the elevations are laid out as a starting point. An owner of this kit can tune it for correct engine speed in about an hour of riding. Simple; use the belt change tool on the clutch guard to remove a pivot bolt and adjust the spacer size and/or pivot bolt size to correct engine speed at full throttle.

Pivot bolts require the tightness allowed by the original BRP belt change tool - the OEM belt change tool applies the correct amount of torque for the bolt every time when the tuner cranks it down, hand tight.

t=Tungsten, s=Steel, Ti=Titanium

Example: t7mm = tungsten 7mm spacer. s3mm = steel 3mm spacer. Ti35 = Titanium 35mm socket cap screw



## Belt heat, belt life, gear change, clicker position

**Jackson**) how's the 850 kit going to help the belt life? I know skidoo has warrantied the motor mount shims a new belt and gearing for the 17s. What are your thoughts on the new gearing offered on the G4 summits? Should I leave it or put the new in? And the clicker does what on this pDrive?

**Joey**) Core Value - The #1 way to keep clutch heat to its lowest is to have correct engine speed when full throttle - 7900. Lower or higher than 7900 the temperatures soar. Both over or underrev, the belt ceases to move across the face of the primary clutch face.

Core Value - Lower heat by lowering part throttle engine speed. So when (example) poking along at 40mph on the hardpack, from this snow area to that snow area, lower heat will be at 6200 rpms instead of 6700 rpms.

Subjective Value - Gearing lower is up to you. Me, I bet less than 5% of my total riding is on any hardpack. Im 90%+ in the trees or swamps or out back where its technical. Usually the only trail I drive on is the trail I made riding in - If I can help it. And by that time, im p00ped to drive hard. Haha. I choose lower gearing because I want the track to "roast" whenever I can and put my 154 x 3" up on its tail. Some gear higher by 1 tooth on a G4 sled because they have a lot more riding on hardpack percentage and sometimes outright trail ride, even with a 3" paddle.  
Gearing lower is up to you what you do with your sled.

### Clicker

<https://www.ibackshift.com/article/850-g4-summit-196.asp#clickerposition>

lower number makes more "revvy"

Higher number makes engine lug harder.

My kit is designed to run in clicker #3 and then adjust the clicker to how revvy you want it or how much lugging you want the engine to be loaded. To change the pivot weight and correct engine speed, it will be a 5 minute adjustment anywhere you want to stop and change the pivot weight. Simply take the belt change tool off the clutch guard and remove the pivot bolt to change the bolt itself and/or the spacers to adjust the flyweight grams.

Say right now you are in clicker #3 and the pivot weight makes 7900 rpms. Because of today's conditions you want the engine to feel more revvy off the bottom end to midrange - no problem. Take the clicker and move it to #2 or #1. Lowering the clicker will make the engine be more revvy. The 7900 will stay about the same because the pinweight controls engine speed at full throttle. Next example - Because of this different day conditions, I want the engine to be, and feel more loaded. I want to do a bit of long hardpack riding to get to the deep snow location. No problem, clicker up to #4 or #5 and the engine will have a more loaded feel. Engine speed at part throttle on hardpack will be a few hundred rpms lower.

Thanks, Joey.

**Kevin**) Hi Joe, I changed gearing on my G4x154 from 19:45 to 21:45 because the stock gearing was too low for me. I mostly just boondock around here with short climbs of no more than 1000' vertical. That and most boondocking areas are connected by groomed trails and lakes so having a top speed of 130 km/h (80mph) is good so I don't have to hold the sled to the bar when I'm travelling between powder stashes.

So if your full clutch kit with springs and helix would work with my gearing I will probably get that. If not, I'll get your your pivot weight kit instead and run the stock springs and helix.

**Joe)** Hi Kevin. Oh that 21 top gear will be just fine. I kept my 19 top gear and the guys I ride with having older sleds thought my sled "rips" across the lakes and hardpack trail. Sometimes I have to run a bit of hardpack to get to the powder stashes, I drive not so fast to conserve fuel. I try my best to run out a tank of gas and tap into my LinQ gas can.

Yes the clutch kit will work with your 21 gear and you'll be able to do 130kmh(80mph) without damaging the belt. In fact after you been poking along the flat parts at 75mph with ease, when "you stop" and people with regular sleds "catch-up-then-rest beside you", they are going to say "what-in-the-heck is in that sled?" HAHAHA.

You can set the clicker in 3 or 4. Remember the clickers do the opposite of what the old TRA does. The pDrive is higher lumber, load engine harder

## **Flyweight - pDrive flyweight ramp differences (lazy or crisp)**

Article, click on link above

## **I AM LOSING MY MIND....Arrgh....but i'll find it. haha**

two details. I've already sent 60+ kits out since I said "2nd week of November release" but after the Nov 17th release I run into some turbulence with a supplier for the pivot spacers.

**1]** The supplier cancellation. The supplier I had for making the spacers called me up telling me they can't sell spacers to me anymore because I bought more spacers off of them than they sell in a year. Since their shop is doing other batch work, I can't get spacers from them until February. Ok, i've parted ways with that supplier because I can't have that category of supplier who's relying on a 3rd party to make the spacers. This summer past, I did research on how to make these spacers and found some companies with capabilities to make them. Woo Hoo. Ok this took a bunch of time to get solved. Now do quality control of checking the...

**spacer weight - chamfer - outer diamer - inner diameter - corrosion protection - sealing - and finally "Crush test" on every size.** I put them in a vise and crank it to see if I can distort them and nope, they maintain their shape.

The test pieces from that shop are all good. Super happy with the product. Ok so now Im getting a huge batch of pivot spacers made and its first party, I can talk to the guy directly on phone or text him for correspondence. Very happy.

**2]** This weekend past, I broke another tungsten spacer.

The tungsten is good. They are an exact copy of BRP tungsten weight 486017028 x 7mm spacer. Many of them are BRP tungsten I've sent out, regardless. It's better to have 2 suppliers than one.

There were 5 guys in the garage and we were talking laughing and videos playing, working on 2 sleds and plumber working on the heated floor system.

I was talking and tightening up and; **crack**. Dammit! I dint realize I had my hand on the long side of the allen wrench – having a good time. This is what a mechanic said to me last season when he broke a tungsten tightening up for his customer.

I'm not taking a chance of even one damaged tungsten spacer happening. I don't even have a beer to contribute to this event. haha.

Scenario; Ok, So now a customer accidentally breaks (in Sweden/USA/anywhere...) and has to wait for new tungsten? Nope, that is not good! Bad for both of us.

Prior to this knowledge I did not know we had a Fastenal dealer in the city here so I did not have good access to bolts. Found out there was one and I went over to plow thru their selection with my gram scale. Found a 45mm bolt that weighed good. These "hardware store" bolts are just as good as the BRP pivot bolts as I did a hardness test on them and they are grade 5 - these new black bolts I have are equal strength to the BRP pivot bolts.

Brought the new bolt to the shop, stripped the primary apart to cycle the ramp with no spring using the bolt and skidoo (gold) spacers and everything cleared.

Sat down and spent 6 hours going through each ramp model (961, 967, 965, 990, 968) weighing out every spacer and bolt to come up with new setting sheets.

There will be inexperienced tuners and worse off, experienced tuners that will crack one by improper installation and now I've eliminated that with the addition of a bolt. And now I'm 100% happy this will be foolproof - the end! Haha

Conclusion for today - the machine shop is making more pivot bolt spacers as I type this and will get more clutch kits out. Today Thursday the 14th I can send another 25 clutch kits out.

Apology - Sorry for the delay. I'm not a victim, rather with these problems have to look for the opportunity that's buried inside a problem. This is just getting better and better, the kit is getting more tighter and will be able to serve quickly after I have all the supplier problems dialled in.

The wait will be worth it.

OH and I have the 990 ramps engaging on my 154 summit at 2800~2900 rpms. So much fun for wrong foot forward on sidehilling. Working on being able to change engagement speed with variation of 500 rpms up and down and so far, everything is working out good. Just have to solve production problems. I can't do everything at once.

thanks for the patience.

Joey



## **Truly frustrating - Pivot pin kit hurdles**

Acc....Dec 30th. No more Tungsten WOO HOO!. I am happy as heck. I've deleted the tungsten from the pivot pin kit. Finally I can make weight with pivot bolts. I tested on a diamond rockwell hardness tester the BRP bolts and some black oxide pivot bolts and nearly the same. The tech guy told me "About grade 5 Joe". Great. Now with a little change, the tungsten spacers are gone and pure steel spacers. 2mm, 3mm, 4mm, 7mm steel spacers and an assortment of black oxide pivot bolts and titanium bolts for up to 13000 feet with the kit.

Spacers; The guy making the spacers for me, I do trust completely. Super good guy to deal with. He's trying to improve the quality of the spacer design at his shop so I have to do less work in my shop. Then I can spend less time on them, but I check every spacer on a pivot bolt myself.

Imagine sitting there with a pivot bolt in your left hand and then taking one by one, 900 spacers to test and put on the bolt to make sure they have no burrs on them. Figuring out a QC process to overcome the "time spent" doing the QC so I can get more bang for the \$-Buck-\$. Every spacer must be checked because you dont want a spacer stuck on a pivot bolt out in the cold and can't remove it from the pivot bolt. Heh, this is another job for my big sister Jackie (kit packer/helper/inventory control/shipping).

Yep, i've had to take a bunch of them and drill them out by hand to ensure they fit nicely on the pivot before I do corrosion coating. Reader, I can't tell you how much stress this is of getting the chain of supply going with a flow to give me comfort of getting parts in ahead of time and complete the QC. Its like juggling chainsaws and knives. HAHA...not used to having many hurdles tipped up in front of me.

Don't worry, im getting my s#!t together. The surprise of a problem is the economy of the exchange of information to learn to overcome. I figure it will be a month of continuing non-stop arranging and testing out suppliers to make the parts and get them into a cohesive whole into my shop, having smooth flowing parts coming in and going out.

**Feedback** - A lot of clutch kits out there now. Feedback is uplifting. The neat thing about sending out kits all over God's creation is there is a percentage owners who report back to me with a problem to overcome. This is one of the greatest opportunites ever. I can't tell you how much its scary as heck to hear/read of a problem. I start to think waAay too far into the future and get ahead of myself and then think - Ok back off about 20% there Joe. Pump the brakes there Joe. haha.

Solving a problem for a customer is nothing less than a joy after being able to overcome it. Problems are where the opportunities are. I swear its the feedback from customers telling me good results and also reporting on problems, that is why these clutch kits do well. Its not just me. Its the test guys who get to see environments/conditions I can't see here. Also the customers reporting a problem, then overcoming it.

That's it for now I guess. Later on I will start to explain why I have replaced the aluminum left arm with a steel arm. It has to do with overall ramp weight (composite of the ramp itself/clicker left arm/right arm - as a whole unit) and engagement speed control.

I have the 951 arm engaging at 2500 rpms with pivot weight for 1000 feet. This is what the 951 and 990 engage like with pivot weight at 1000 feet>>>2500 rpms the sheave starts to move towards the belt. 2600 rpms the sheave tugs on the belt. I can slowly crawl around in the trees between 2800 to 3400 rpms before the sled wants to take off. Oh man, the clutch heat is miiiiiiiiint. Talk about superb throttle control doing wrong foot forward at a brisk walking speed. I mean like a walking speed of you walking down a set of stairs. Then when done, full throttle for a victory wheelie up the bank.



Wait till you see the turbo arm I made last year. Getting it ready for production now.

So this one guy says to me "o0oh, I see what you are doing now". I said back to him "Fine...why dint you think of it then, huh?"

...rubbing it in that I did it first.

Thanks for reading the blog, keep checking back every week or two.

We'll see you later and stay.....**"Tuned"!**

Joey

### **BANG BANG BANG....that is my face hitting on the table**

sigh....Holy cow man. November I get cut off from a spacer supplier. Then have to find suppliers to make spacers. That was going back and forth to make sure they are perfect. That took up a shit-pile of time.

Now having trouble with the steel arm (in the picture above) supplier as he's going away to Las Vegas to a machinist convention for 10 days. The local machine shop making the first two batches for me, the one operator is recovering from a hip operation. 43 yrs old and Tyler had a hip operation. He has nobody to run that specific machine to make steel arms for me. I can't win. Holidays I swear are an interruption in the stream of commerce and i've had enough of this bullshit. I have steel arms on the way from a 2nd shop but only enough for 33 clutch kits as he only had time to do 100pcs. So, yesterday and today i've send out drawings and samples to 5 different machine shops and I'm going to end up having 3 suppliers for this. I'm working to have 3 spacer suppliers and 3 steel arm suppliers. F\*&()ng had enough of this grief.

Sorry for saying "Sorry" so damn much. I think God's teaching me a lesson. haha

The wait will be worth it- more feedback today.

#### **Gen 4 kit**

Sean <sean

You replied to this message on 1/3/2018 2:01 PM.

Sent: Wed 1/3/2018 1:32 PM

To: info@backshift.com

Man Joey you once again hit it out of the park! Perfect spot on 7900 rpm every time. Engagement is so smooth to. The engine braking is how it should come from the factory! Let me know when you have those boondocking ramps done or ready for testing. I'd love to try a set!

Sean

I dont have any boondocking ramps, rather I'm working on 2 different versions of steel arms and a new primary clutch spring cover.

We'll see you later and stay.....**"Tuned"!**



### **Finally some relief. A lot of spacers, mwaa ha ha haaaa...**

Friday past, received 6 bags of spacers. There is 3 times this amount in the picture. This was 2 bags.

Machine shop said another 6 bags on the way too.

Sorted and QC all of them today. Only 2 had burrs on them which were easily cleaned up with a deburr tool.

We'll see you later and stay....."Tuned"!

### **Another setback - left steel arms bad batch**

Sigh Give me a break man. (insert crazy laugh) bwaHAHAHAaa...

300 pcs of the left arm come in and I could only use 4 of them. Had to send them back. This set me behind another week. Received good ones yesterday Wed jan 31st. So am now sending kits out again.

The problem was the CNC machine made too thin of a cut so the top of the arm would impact in the 951 ramp when the clicker is on #5. When the ramp is on clicker #5 this is where the ramp is pivoted up on the tip, the thick roller surface of the ramp is tipped down and almost touches the arm. These ones the 951's were touching the arms and could not get more than clicker 4.

New "corrected" Left arm clears 951 now. Every arm has to be checked on a test ramp.

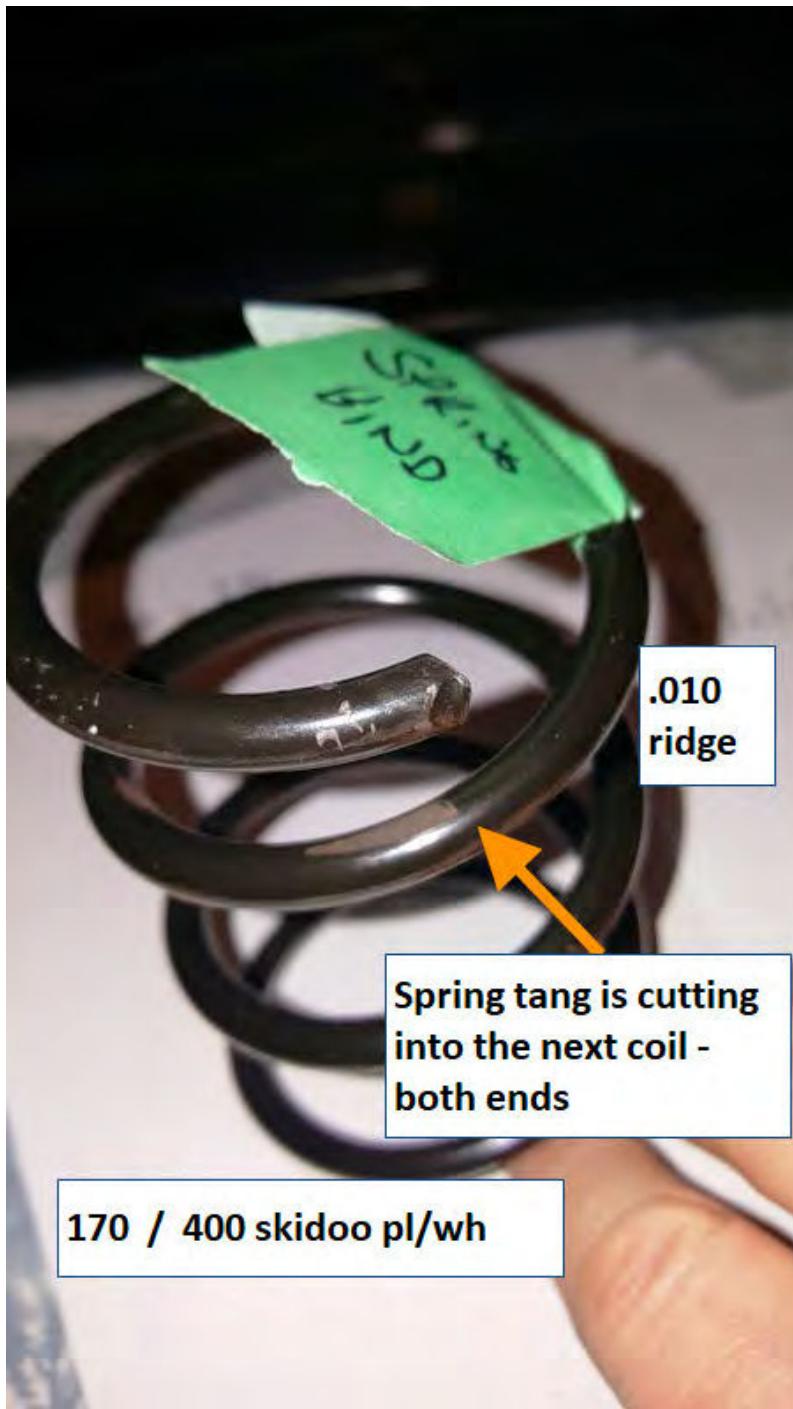


We'll see you later and stay....."Tuned"!

## **Springs breaking**

I have a cut apart pDrive primary clutch. The clutch strokes 1.3 inches to sheaves touching. At about 1/3 of the sheave stroke in, the spring tang touches the next coil and starts to wear in to the next coil. This is happening at both ends of the spring.

I wish BRP would have just used the better, more easy to make coil springs with the ends wound and ground flat. This would open up the aftermarket to make more spring force variations. With this design, its difficult for the spring manufacturers to make a spring with varying forces because of the design limitations with this spring. Piss poor choice if you ask me. Limits the tuning ability with springs. I forsee the future will not have much springs available in the aftermarket with varying forces. There will be about a dozen springs and each aftermarket shop will just have the same spring and the consumer will buy based on price - who's lowest. This primary clutch spring design **SUCKS!**



## **Tyler and the recordable tach story.**

### **PROBLEM – RECORDABLE TACHOMETER USE**

Joe, I started with the weights for 3000 feet.. 40mm bolt, no spacers. Went for a ride and when I stopped to check the tach, it showed 8100 rpm recorded. Turned around and driving back, seen 8300 on the recorded tach.

Added a 3mm spacer. Went again. Around 8000, driving in fresh, 2 feet of decent snow. Changed more pivot weight – removed 3mm, added 4mm on.

Put sled on the trailer and travelled north to 4000 feet and deeper snow. I am still seeing 8100 of high rpm recordings. Why is the pivot weight not changing the recordable rpms?

At 4000 feet, I add the 3mm spacer on top of the 4mm spacer and go in knee deep powder. All I saw was 7900 to 8000. The recorded rpm confirms. Finally!! After a couple km of playing in similar snow, on and off the throttle, probably not even wot, I look down and see 8200+ rpm recorded again. Ugh.

So now I'm going over this clutch, making sure all rollers are free and spraying them down. Am i over-reacting to the max rpm recordings? Seems like I've ended up heavier pinweight than I should need, but I understand that every sled could be different.

## **SOLUTION – STOP USING THE RECORDABLE TACHOMETER.**

Hi Tyler.

The recordable tach only shows a spike in engine speed

The recordable tach only shows a spike in engine speed

The recordable tach only shows a spike in engine speed

**AAEN writes)** Ideally the shift out point should be at the power peak (7900~7950) of the engine and the shift curve should be straight from there through to the maximum track speed. In practice it may sometimes end up a little different.

The shift out over-rev is of short duration and highly individual depending on the combination of machine weight, engine power and primary clutch ramp angle.

## **3 questions**

At 70kmh (42mph) track speed did the tachometer say 8200, yes or no? The answer required is Yes, no, or I don't know.

At 70kmh (42mph) track speed did the tachometer say 7800, yes or no? The answer required is Yes, no, or I don't know.

At 70kmh (42mph) track speed did the tachometer say 8100, yes or no? The answer required is Yes, no, or I don't know.

**AAEN writes)** By watching your tach, you can determine how the transmission is actually performing. You watch the tach move and change speed. You have two reference points to tune a transmission, you have to compare engine speed and track speed.

if you only rely on the recordable tachometer to tell you what engine speed is happening then you only know the engine speed spike and dont know what rpms you had when the track speed topped out.

## **Tuning**

The 965, 967, 951 ramps "flash" high engine speed right away when you press the throttle.

Say you are going in 1 to 2 foot unbroken snow and doing about 20kmh. You crack the throttle, the engine is going to flash to 8100 8200 and then pull down to 7900~8000.

Overspeed rpms at the start is also from the track spinning until the vehicle speed catches up with the track speed, and the engine speed will lower.

But your tachometer is only going to read you 8200. You press the button and voila...."8200"

And now you think its 8200 rpms for as long as you are pressing full throttle but the tach only recorded a "bump" of engine speed for a fraction of a second. Meanwhile you are going full throttle and the engine is taching at 8000 but you rarely look at the tach or don't look at the tach until you stopped. You are supposed to look at the tach while you are driving.

I wish BRP did not put that feature on because it takes tuners away from what they should be doing and that is

looking at the tach while they press full throttle in a pull.

You go across something or go up something and go full throttle, you have to look at the tachometer.

Full throttle, look at the tach – what does it say? That's how you calibrate the flyweight. My recommendation to you is to stop looking at the "recordable tach" as it is taking you away from doing "how" you are supposed to tune the flyweight.

Stop looking at the recorded rpms because its not the correct feature for calibrating the primary clutch. You look at the tach in-action as you are driving.

### **Stop using the recorded tach feature, pretend it does not exist.**

We'll see you later and stay....."Tuned"!

### **Spacers dont fit - burr or too tight**

**Gerry)** Hi Joe here is photo of 45 mm bolts and weights the collars do not slide to the head of bolts. If I jam them up, not sure if I can get them off. Tried spinning them a bit to see if I can get them to move freely, can't. Not sure if I should take emery cloth and try polish the bolt shank a bit . They fit on the 40mm bolts no problem so I going to try the 98.1 total gram weight so I can get this back together please advise on fix

**Joey)** Hi Gerry. Hmm...must have been a spacer or two I missed.

I check every one by hand myself, takes hours to do 1000 spacers.

You can take a spacer and put it in a vise, give it a squeeze and then drill it out with a 5/16 drill bit.

It will be bang on diameter then.

When I check the spacers, I put them on a cut off bolt that is slight oversize shank. Ones that don't go on, I set aside and then drill them all out after im done the big part of the QC.

Just drill out with a 5/16 and there will be some shearing of metal off - sometimes it's the "seam" inside the spacer that might be too thick.

The spacer started life out as an extruded tube and sometimes inside the pipe will have a burr from the extrusion die. So some of them have a burr and have to be drilled.

Sorry I must have missed the two you have there.

Let me know, Thanks, joey

\*\*\*

We'll see you later and stay....."Tuned"!

### **Overrevving by "X" rpms (add pivot weight then)**

**Mike)** What ramps would i need to drop 300 RPM ? Sled has low elevation ramps. Pivot bolt is 38 mm ,so should be right. Sled has always over revved from new ,now have 2600 km. Clutching stock, except one spacer 1.8 gram. Added weight did nothing to lower RPM. Not using max read out.

**Joey)** Aaen Pg 29) **IF** need less engine speed, **THEN** add more mass to the ramp.

Rule of thumb

Estimated 1 gram = approximate 200 rpms

BRP Parts available

26mm pivot @ 13.1g

33mm pivot @ 15.2g

38mm pivot @ 16.7g

Steel spacer 7mm @ 4.0g

Steel spacer 4mm @ 2.2g

Steel spacer 3mm @ 1.7g

Steel spacer 2mm @ 1.1g

Tuning

**IF** have a 16.7g pivot bolt and need 300 rpms less, **THEN** add 1.5 grams to the pivot bolt = 18.2 grams

on 16.7g pivot bolt, add 1.5 grams by 1x 3mm spacer to make "estimated" 18.4 grams or use 15.2 pivot bolt and add 1x 4mm (2.2g) + 1x 2mm (1.1g) to make estimated 18.5 grams or use 15.2 pivot bolt and add 1x 3mm (1.7g) + 1x 2mm (1.1g) to make estimated 18.0 grams.

Aaen pg 46 & 76 - Testing

Follow the same procedures every time and only change one variable at a time.

Test 1] **IF** after running "estimated" 18.2 grams setting and still need 100 rpms less, **THEN** add another 0.5 grams (write your tuning notes)

Test 2] **IF** after running "estimated" 18.7 grams setting and still need 100 rpms less, **THEN** add another 0.5 grams (write your tuning notes)

Keep adding pivot bolt mass until you are not happy with the performance of the latest setting; then revert back to the previous setting.

No being tossed to and fro, carried about with every wind of doctrine, cunning craftiness, or word sorcery...just Aaen

Now i'll add my own words. If you had one of my pivot pin/spacer kits (which im working on packaging up), you could get 7800~7900 rpms in about one hour of bombin' around in your favorite area. Once you get the engine to labour at 7900 then the clickers will respond, making a traditional engine speed change(s). You'll be able to get the engine to tach the way you want at 7900~7950 rpms. Wet/heavy day/power down, rpms down; no problem, clicker up one #, bam...7900 again.

We'll see you later and stay....."Tuned"!

## **P-Drive design has something to do with the belt heat?**

I have no data to back up anything I say. You could say my conduct is almost scandalous; i only have an average amount of information gathered from people i've asked about what engine characters make high vibration and then me parakeet it.

**1] (inherent engine vibration)** A powerful engine with a long crankshaft stroke. A strong power pulse creates a strong vertical vibration the same frequency as crank rotation. The engine itself makes a high amplitude vibration and a large vibratory peak to peak motion.

**2] (damping)** A vibration control mechanism that generates heat; the primary clutch possibly has too much runout in it. 23 could be too much (fine on paper) but I'd like to try "Please BRP let **me** try one " anywhere from 14 to 16 runout. Im not saying get rid of it, rather do "field tuning". Is 23 too much?

**3] (misalignment)** The engine torques out of alignment under full throttle and preloads one side of the belt more than another, causing a non-linear pull on the belt skewing it. It is impossible to get away from skew in a CVT system. With this chassis, the clutch c2c are close together so the vertex angle of the skew as the belt touches the pulley(s) is more angle than a clutch with longer c2c. Bigger belt skewing angle = more heat.

Gear selection becomes even more important to "dial in" to put the belt in the best possible position in "both" clutches for your own personal use & style; not just broad brush "gear up a tooth" - sorry, that is just error.

**4] (Belt toughness)** With the cocktail of details going on under the hood, I think the belt needs to be more tough to be able to deform without fracturing; to have a balance of strength and deformation - not hardness, less work hardening (blowing the top layer off) I do have good feedback of the **XS-821** to which is a softer compound belt. The 531 belt, hoo boy, its a hard belt. I've been starting to consider (harder compound) is going the wrong way with belt durometer on this combination of short of c2c and sheave runout measurement.

Sorry i dont have a coles notes short answer.

We'll see you later and stay....."Tuned"!

## **Joe, are you measuring belt temps on the 850 summit?**

XP/XM

I did and got tired of doing it. The latest 391 belts in the last season (prior to the discontinuation of it) were not changing color on the sidewall anymore when belt temps repeatedly got past 185~190 degrees. I did routine belt temp testing for years and also get my clutch kit test guys to note a common denominator - the 391 belt temps could get to around 190 on the high side. Heating up to that several times, the sidewall color would change from green to brown and if go over 200 a handful of times...black. Chord 90% pop-out after running belt extended period at 190 deg.

On my 13 sled I've been able to learn a combination of what to do to get the belt temperatures lower. I ride with a closed group of guys & will go ride with other groups, mostly 154 XM's and run the combination of a checklist I made to which the belt temperatures can stay less than 190 degrees when running hard. Best alignment while under full throttle is at the top of the list.

G4

What i've been able to do on the XM's at this point have not been able to duplicate on my own G4 summit.

Last season while the 391 was still going, I could heat the belt up to 260 and it starts to "stink" after that temperature. I'd get the belt hot enough the guy riding behind me (We're doing wrong foot forward, crossing a hill) could smell the drive belt on my sled.

I've got 305 degrees on my 531. The record from a test buddy with a 175 got 330 degrees. Look at the side of my belt and Pat's belt...."green" color.

This winter I was going through average 2 foot fresh and belt started to smell; fawkit - im breaking trail till something happens. I've no idea how hot the belt got but it blew into chunks smaller than 1/2 inch and just a ball of yarn around the primary clutch which took 20 minutes to "snip" off with small handle wire snippers.

On this website in the "technical" (belt section), i have to delete most of my belt temperature information because its old and out of date. A modern belt does not give off the "signs" a 2017~older gives whilst you look at it to tell you to back off. Now the skidoo belts act like aftermarket belts. Hardly ever hear of a driver noticing a chord popping out. Rather, just, \*BOOM\*, right in the middle of a good pull (and you either slam your chest into the handlebars or sail over them when the sled stops dead..HAHA)

We'll see you later and stay....."Tuned"!

## **Joe; do i need a clutch kit?**

**Shawn writes)** I have a 2018 ski doo G4 850 summit X 165. I'm 5'10" and weight is about 225lbs. I mountain ride between 8- 10k only. My rpms are 8k. Sled actually runs really good compared to some. I've got 425miles on sled and original belt. I'm wondering for the money if I would gain much with the clutch kit, or if I even need it. Or have other suggestions? Your kit was awesome on my 05 rev 800.

Thanks, Shawn.

Hi Shawn, thanks for asking; here we go...

**Need;** require, be necessary, solves a problem, under obligation, a supply for something lacking, a state that requires relief.

**Want:** to wish for, desire, gain higher status, lusting

It's just like every year. A sled has "X" amount of capacity built in. Driver gets the sled home and stands there in awe of his or her new baby- without even hearing it run says "how can it get better than this?" Then gets riding it and says "how can it get better than this"

The first day on my 850 x 154 x 3.0 summit, I was impressed with how the sled went. For several weekends I was wondering if I'm going to be able to make a clutch kit worthy for sale. Nervous about how good the sled went in varying conditions, I would keep on riding as much as I can to get better at skills to work over my sled.

I found from running many hours and many tanks of gas in different locations and snow types; collecting input from other riders - lots and lots of rider input – you start to find "I wish it was better here". "I wish it was better there". It is where these small shortages add up and a clutch kit floats to the surface.

Some people have the ability to match and / or overcome the capacity that's built into the sled from factory. Some people's ability will not rise (running the sled enough) up to the capacity of the sled. Some people ride in areas / locations that have the kind of snow, taxing the sled enough to reveal a weakness.

...the owner gets his sea legs with it

...the owner starts to get used to what the sled can do

...the owner sometimes wishes there was a little more here and a little more there

...And then eventually for that percentage of owners ability exceeds the capacity of the sled.

Nobody "needs" a clutch kit. I don't need a clutch kit. I just want one because I want to excite and raise my emotions where they were lower at times when I could make my sled do something where I wish it had more of. Now I have a bit more track speed, more pleasant throttle control, engine braking, ski lifting. I was happy with stock but now im really happy with the clutch kit and gearing mods I've done to satisfy my own needs – and that's what I sell.

I doubt you need a clutch kit because it seems your sled's capacity is high enough that carries into effect the question you raised about "need".

thanks

Joey

We'll see you later and stay....."Tuned"!

## **2018~2019 season**

### **Hmm...966 ramps**

A new ramp for low elevation - primarily in Europe/Scandinavia from what I know so far.

966 @ 51 grams.

I'll put them up to the other ramps after to compare.



Similar to the 951, but the mass is distributed a little differently. I think it will have more bottom end and lower engagement speed. I'll test this out over the winter and have other test guys run it too. Im going to make a guess that it will be less resistant to rpms sucking down at higher track speeds. Like say when you are doing a wheelie on a trail (to get from this snow stash to that snow stash) and wheelie over a hill at 40~45mph, the ramp will be more resistant to not having the engine drift rpms lower when the skis land on the ground; less rpm drift at mid to higher track speeds can be reduced by less mass on the end of the ramp.

Last season I was able to get 2700~2800 engagement with 990 and 951's. I'll check this 966 ramp for engagement speed right away.

I got a spring tested last season 155/370 so was able to get the engagement speed down even more with the kit (as an option); so i'll try that out and complete a chart and put on the blog here.

The BRP techs who design these ramps are the smarty of the smart smarts! I hope to meet some one day to learn more how they go about developing tuning objectives.

We'll see you later and stay....."Tuned"!

## **Q] Whats the difference between the 951 and 965 in a kit for my 17 x 850 x 2.5?**

...Plus at the end of the season im turning 7350 rpms unless I hold it wide open for a long time

**A]**The 967 and 951 ramps have the same profile. The difference of them is the mass. The 951 is heavier than the 967.

The "total" mass of the ramp which includes the clicker assembly and left arm and pivot bolt determines the engine speed.

I know my kit needs around 96 to 97 "total" grams to run at 7950 rpms at 1000 feet.

With the 967 ramps I have to add more pivot weight than the 951 to achieve around 96~97 grams.

967 ramps using 45mm pivot plus a 7mm spacer on the pivot plus a 3mm spacer on the pivot = 96.9 grams to make 7950 rpms.

951 ramps being heavier use less pivot weight, therefore; 951 ramps using 40mm pivot bolt = 97.1 grams to make 7950 rpms. There is only 0.2 grams difference between the two to make 7950 rpms at full throttle.

The clutch kit should be around 33~3400 with either ramp and its very smooth engagement. I concentrated a lot on removing the "surging" out of the engagement speed so the handlebars don't feel like they're always wanting to tug out of your hands every time the engine speed goes to engagement speed.

Re 7350 rpms; for the last 10% of the season when there is warm/wet/heavy days and you lose engine speed, this is the opportunity to raise the clicker 1 or 2 numbers to get the rpms back to 79~7950 rpms.

We'll see you later and stay....."Tuned"!

## Belt chart for 2019

DRIVE BELT APPLICATION CHART					
2019 Drive Belt Specifications					
PART NUMBER	COMPOUND	THICKNESS	WIDTH	LENGTH	DEGREES
<b>Regular Fiber</b>					
417 300 197	medium (no top cog)	14.5 mm	37.6 mm	1106 mm	26
417 300 127	hard (top cog)	16.4 mm	36.3 mm	1118 mm	25
417 300 383	hard (top cog)	16.4 mm	38.5 mm	1118 mm	26
<b>High Performance Fiber</b>					
417 300 297	soft (top cog)	16.7 mm	38.2 mm	1112 mm	26
417 300 288	medium (top cog)	16.7 mm	37.7 mm	1117 mm	26
417 300 534	hard (top cog)	16.7 mm	37.7 mm	1117 mm	26
417 300 531	hard (top cog)	16.7 mm	38.3 mm	1117 mm	26
417 300 571	Hard top cog	17.6 mm	38.3 mm	1124 mm	26
417 300 572	Hard top cog	17.6 mm	37.7 mm	1124 mm	26
Note: These measurements are OEM specifications, depending on how and where you measure the belt, results may vary.					

## 2019~2020 season

### 300 sets of Popeye arms

Got in the first batch of the season. Enough pDrive Popeye arms for 300 clutch kits to get iBackshift started. About 2/3's into this lot, i'll order enough for the whole season in one order.

Every piece has to be put on a test ramp to make sure the hole sizes are correct. What a tedious job, but have music cranking in the background to help pass the time.





## iBackshift G4 spindles

Something I been working on for 3 seasons. \*sigh\* I take a long time to execute work, im old and slow. We tested the shit out of these last season. Bent two pairs hitting birch trees and some rocks. Learned a lot of how they work and bend. Man, I've got a competent CAD guy who understands "machine design" and "statics & materials" who's helping me make them stronger and lighter.

I've studied suspension tuning since the mid 90's from when I was taught by Al Shimpa at the Cat factory, "Suspension tuning must be known" when I was tuning for a Cat factory racer. An example; we're taught what ride height (set in) does to get top speeds. Having the proper amount of "set in" was the difference in a 440 going 104 to 106mph; and we could repeat before/after, make the sled go 104 this time, then 106, then 104, then 106mph. Its what ride height "does" in the overall suspension to give it the means to extract highest speeds. Anyway, I dont say much about suspensions and/or tuning them; I keep that under my hat as ive got enough questions on my plate about clutch tuning.

This is a product coming down the pipe. Running them last season was one of the joy's of my life. They will be another addition to my product line, in-due-time.

## Dalton 900ACE adjustable weights (DPT-900 and 901-T)

**If you dont know history, then you dont know anything. Like a leaf that does not know its part of the branch.**

**If you dont know history, then you are doomed only to know who fabricates the future.**

The adjustable cam arm with the weight through the elongation of it. Back in the 1960's a gentleman named Tim Dole (78yrs today) and a co-engineer invented these cam arms for Mr. Salisbury (Salisbury/McCulloch industries) who were the first inventors of the modern CVT primary clutch as we know today, even before the Aan/Omc venture of the late 60's. I talked with Tim Dole on the phone early spring 2019 and what an interesting hour long conversation that was of how they were first making "Flyweights" out of plate steel, machined to shape, drilled and tapped, making an "internal cavity"; every clutch weight done by hand - a work of the engineering artist. Tim was the guy who also invented the two arm / one roller, if you remember skidoo having the "orange bell" clutches with the Salisbury type of cam arm and phenolic resin roller, nick named "the bamboo roller".

As the 70's moved along, Yamaha experimented with that type type of cam arm, but ended up going with the style of adding rivets to the side of the arm, because the only way to do the composites(screws) through the elongation method (internal cavity) was to make billet cam arms; this cost too much. Powder metallurgy (compressed steel powder) was the most economical route to go with adding metal rivet weights into the holes to achieve the desired shift curves. Yamaha used this method of having an adjustable weight to today. In the picture below there is a plastic package with a set of **1975** cam arm for a 440 oval track sled, still in the original package (i have). The other yamaha cam arm is form a 90's consumer snowmobile, something common.

A little time goes by and John Hooper in 1994 starts to design his own cam arm with the setscrew going through the elongation of the arm (internal cavity style) which he patented on Jan 22, 1996.



"PRODUCING WHAT OTHERS JUST PROMISE"

Hooper Racing  
402 Washington Rd.  
Goshen, NH 03752  
SHOP (603)863-0049 FAX (603)863-2161

006792

Here is John's patent. <https://patents.justia.com/patent/5795255>

Now, to honor John Hooper, Dale Cutler (CPC Performance) got a licence agreement from John Hooper for CPC to manufacture their own style of internal cavity cam arms.

Dale Toole (Dalton Industries) ended up buying the patent off of John Hooper and kept up the patent maintenance yearly. The machine shop out east there who's copied the Dalton arms into skidoo pdrive form came about 2 inches away from getting his ass sued by Dalton over a patent infringement.

Top is Dalton 900Ace turbo ramp with internal cavity adjustment. Bottom is the Dalton 902 x 850 pDrive arm with side fastener adjustment.



I'm going to be trying these 900ACE arms in my 850 pDrive right away, on the second ride of the season. We'll see how they work out, they've got quite the aggressive curve to the top of them.

## Dalton 850 adjustable pDrive weights (DPT 902)



## 2020.5 season

2020.5 x 850 turbo

I was privy about this sled for quite some time and was drooling to buy one with the details I was told. Sitting at the dealer with a \$grand\$ in hand I watched the pre-release video and by the time it got to mention "165hp" I could not believe what I was seeing. Errm....165? I had money on 180hp. I walked out of the dealer. Not buying one because thinking it over for a 1/2 hour sitting there deciding what im going to do; its not a return on investment for me for using higher than 4000 ft once/year. I have expriences with a Jawz pipe, a degree of timing and seeing my kit with that engine combination, it pulls like 2.5~3.0 grams more weight than my stock engine and clutch kit. So say for \$1100.00 CDN I can have the turbo power down here at 900 feet where I ride.

I walk out the door of the dealer and my ol' riding buddy James walks in and buys it. Great, now I can test his sled and develop a clutch kit for it. I have a few years under my belt dealing with aftermarket turbo brands and clutch tuning them. Last year I kinda knew what i was going to start off with as a base.

Testing day; James arrived, unloaded the sled and was excited to get started. **James)** "This turbo sled goes real good Joe" Joe ok, if you think so. We'll see about that. I know they go but after you run your sled then drive Corey's sled, you may re-evaluate your conclusion.

## Ski-Doo 850 Turbo testing (starting a clutch kit)

We spent an hour driving up and down the race course, trading sleds, running side by side. Wanted James to get the feel of the conduct of the turbo vs. Corey's new Xpert (both 165 x 3.0). Checking engagement speed, Corey's Xpert @ 3000 w/kit. James turbo stock clutching 4000 engagement speed. After an hour of trading the sleds back and forth, and then doing a little drag racing to finish off; James said "Make my sled go like Corey's"



<https://youtu.be/V7Pg3tcM1-g>

Now I have guys with test kits in Washington, Colorado, Alberta, BC, Finland and here at home.

### Pat testing the Ski-Doo 850 Turbo clutch kit in Washington



<https://youtu.be/yimohyWvu2c>

### Ski-Doo 850 Turbo clutch kit 2700 engagement speed



[https://youtu.be/uRKSIV\\_Vyo](https://youtu.be/uRKSIV_Vyo)