

Table of Contents

REF: Service Procedures 11C	1
What Causes the 1991-2003 Shifter Detent Plate to Lean	1

[Go To Technical Menu](#)

REF: Service Procedures 11C

What Causes the 1991-2003 Shifter Detent Plate to Lean

The detent plate is a flower shaped piece that has 6 positive stop positions for gear selection (1,N,2,3,4,5).

Each “valley” position corresponds to a specific gear location of the transmission.

In the rear of the detent plate are 4 holes that slip over the four pressed in pins on the shift drum.

The hole spacing in the detent plate matches the pin spacing on the drum.

The pins locate the detent plate (which installs in only one position) and they also posture the detent plate.

It's usually the shift drum pins walking out of their bore that leans the detent plate.



Normally there is a clearance between the detent plate and the clutch basket / starter gear.

And the detent plate roughly sits vertical to the starter ring gear.

Running through the gears with the primary cover off, you should be able to do so without issue and the detent plate should remain vertical.

The detent plates' vertical position is established by the length of the pins on the end of the shift drum. They should all be “home” and protruding the same length out of the drum (installed height .326” - .334”).

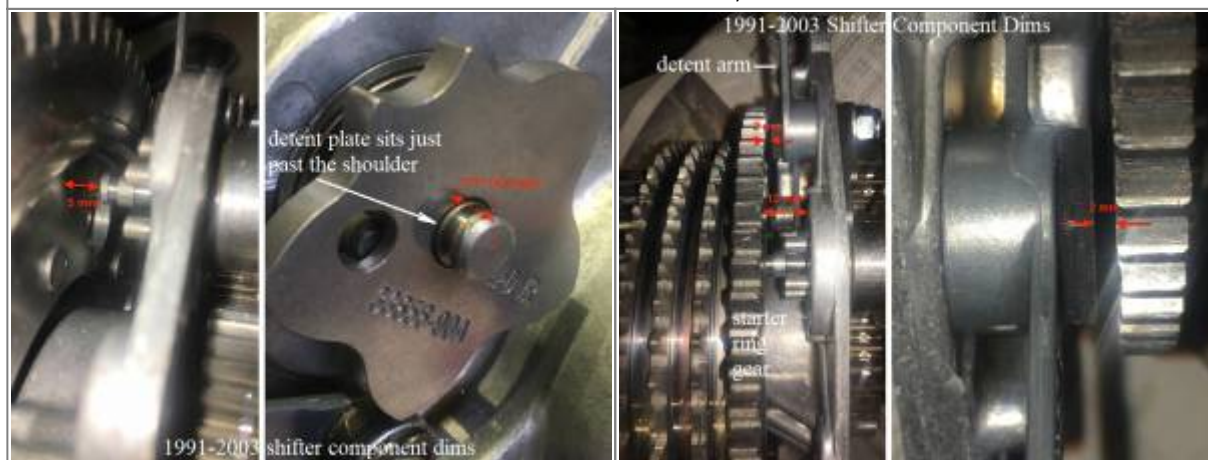
And normal riding / shifting should not lean the detent plate into the starter gear.

The spring clip is built to handle designed side load by pushing back (or reversing the force) on the acting load against it.

However, since the space is so small between the plate and the clutch basket, a skewed detent plate can make contact.

The designed “slop”, adverse conditions and wear can easily make the detent plate “kiss” the back of the clutch basket.

Dims taken from XLForum member, xLoneRiderx ^{2) 3)}



Side loading from shifter construction and rotational forces act against the spring circlip on the end of the shift drum.

THIS IS THE MAIN REASON THE DETENT PLATE LEANS. If the shift arm / shift pawl remains vertical, the detent plate will also remain vertical.

If the pawl doesn't actuate at a 90 degree angle, it can lean into the detent plate putting pressure against the shoulder on just that side of the plate.

That side of the detent plate pushes against the spring clip and the other side pushes in against the shift drum pins.

With the shift drum being the strongest point, the load transfers to the clip which flexes outward.

This “angle” pushing the detent plate can scar up the holes in the back of it where the pins go in. The retainer clip allows the detent to move far enough off the pins to slap the holes when the plate returns.

You may have noticed marring around the those holes (which are not very deep to begin with).

Depending on soft or hard shifting, shifter assembly wear, angle of the bike at the time, heat and vibration, that load can be more or less.

The retainer ring was designed specifically to handle that type of side load and the depth is cut into the end of the drum specifically for that flex clip.

So it's no mistake or cheap engineering that HD put that little flexible clip on the end of the shift drum.

Detent plate pin hole depths ⁴⁾



However, pins in the shift drum can pull out causing the detent plate to lean or skew from it's vertical position:

THIS HAPPENS AS A RESULT OF SHIFTER (SIDE LOADING) AND POOR PRESS FIT OF THE PIN(S).

The flexible detent retainer ring is meant to flex and is not meant to keep the pins from moving.

The pins were not designed to move so there was no designed retaining ring (or keeper) for them.

In operation while changing gears, sometimes the pins in the shift drum will pull out a little and change the vertical position of the detent plate.

There is also a result of side loading and pins that won't stay put during the side load event.

All of the pins may not come out, maybe just one or two or sometimes all (not necessarily at the time or temperature).

But any of the pins are subject to move out a little based off heat level and pressure applied on them outward by the shift pawl.

There is a side load applied to the shift arm from (designed) loose shifter assembly clearances as well as a varying level of force from foot action.

The shift arm can "twist" slightly outward causing the pawl to twist as well.

If a pin gets hot enough, it can move with force acting on it (speed of shift / force applied to the pins, vibration and over heated pins = "perfect storm").

That force to the pins ends at the shift pawl.

The detent plate will lean at an angle as far as the clip is able to hold it. The plate is then out of it's perch and interferes with the big clutch gear.

This produces a metal scraping noise and metal shavings into the primary.

Then if the clips breaks from this, the detent plate comes off and plays a tennis match with the clutch gear and into the primary and / or tranny gears.

The shift drum has end play as well.

The detent plate installs on the end of the shift drum.

With the drum itself able to shift axially (app .007"), the distance between the detent plate and the clutch basket will be variable within that range.

So a leaning plate may have a touch / not touch situation if the space falls within that end play.

Shift drum end play ⁵⁾



Shift drum pins walking out the drum have been responsible for breaking the flexible clip that holds the detent plate.

When a pin (or pins) walk out of the drum, they stay hard in the position they land. And when the drum turns them in different positions during normal shifting, natural forces can be exerted on opposite ends of the detent plate simultaneously.

Example: (spitball figures)

One pin pulls out enough to make the detent plate lean at a 10° angle. Maybe the plate leans toward the starter gear at the top (touching or not doesn't matter here).

Now you shift into a couple more gears, turning the lean of the detent plate on the bottom.


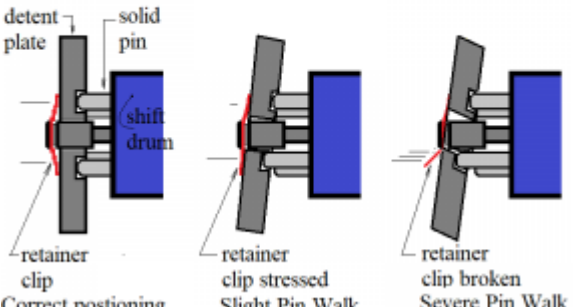
You shift hard and the side force against the flex clip is from the top.

In this instance, the flex clip is being pushed backwards in circumference (like turning a sock inside out). And this will cause the clip to break sending it into the primary to chew and get chewed by tranny gears. The flex clip is made from spring steel and is meant to soften and return axial full body force (as in the detent plate pushing against it in a vertical position)

However, it is very brittle with forces trying to cup opposite ends and push them in reverse while holding the center still.

Likewise, if the detent plate is forced too far out on one side, that could also break the clip.

In reality, there is very little clearance between the end of the shift drum and the starter gear.

Broken detent plate retainer ring ⁶⁾	Retainer clip stresses ⁷⁾
<p>Shifter Detent Plate Retaining Ring (11019)</p>  <p>it's common to find these broken</p>	<p>1991-2003 shift drum pin(s) are subject to 'walking out' of the drum, leaning the detent plate and breaking the retainer clip. The retainer clip was designed to handle full shoulder side load. A pin walking out shifts the load on the retainer clip.</p>  <p>retainer clip Correct positioning</p> <p>retainer clip stressed Slight Pin Walk</p> <p>retainer clip broken Severe Pin Walk</p>

The spring clip (detent plate retainer ring) is not designed to push the pins back into the drum.

Opposite force made by the spring effect of the bowed retainer clip isn't enough to correct the pins. Each pin is pressed into the drum and tends to conserve it's position once it starts pulling out and re-sets it's position.

If you measure the drum pins and they all protrude at different lengths, you can't just push them in. If you try to extract them, they are extremely hard to remove without heating them with a propane torch. The drum was specifically designed for that clip. In fact, it's difficult to find a replacement for it. And it is suggested to replace it every time you remove it.

When reinstalling an old one compared to installing a new clip, you'll find the old one is already sprung somewhat and goes on much easier than a new one.

Therefore it can come off easier than a new one will.

It's difficult to find another type circlip (and spacer required in place of the original) for that shaft.

Go To Technical Menu

1)

photos by xLoneRiderx of the XLFORUM

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2)

<http://xlforum.net/forums/showthread.php?t=2078814&highlight=detent&page=19>

3)

<http://xlforum.net/forums/showthread.php?t=2078814&highlight=detent&page=18>

4) , 5)

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Last update: **2021/08/26 04:26**

