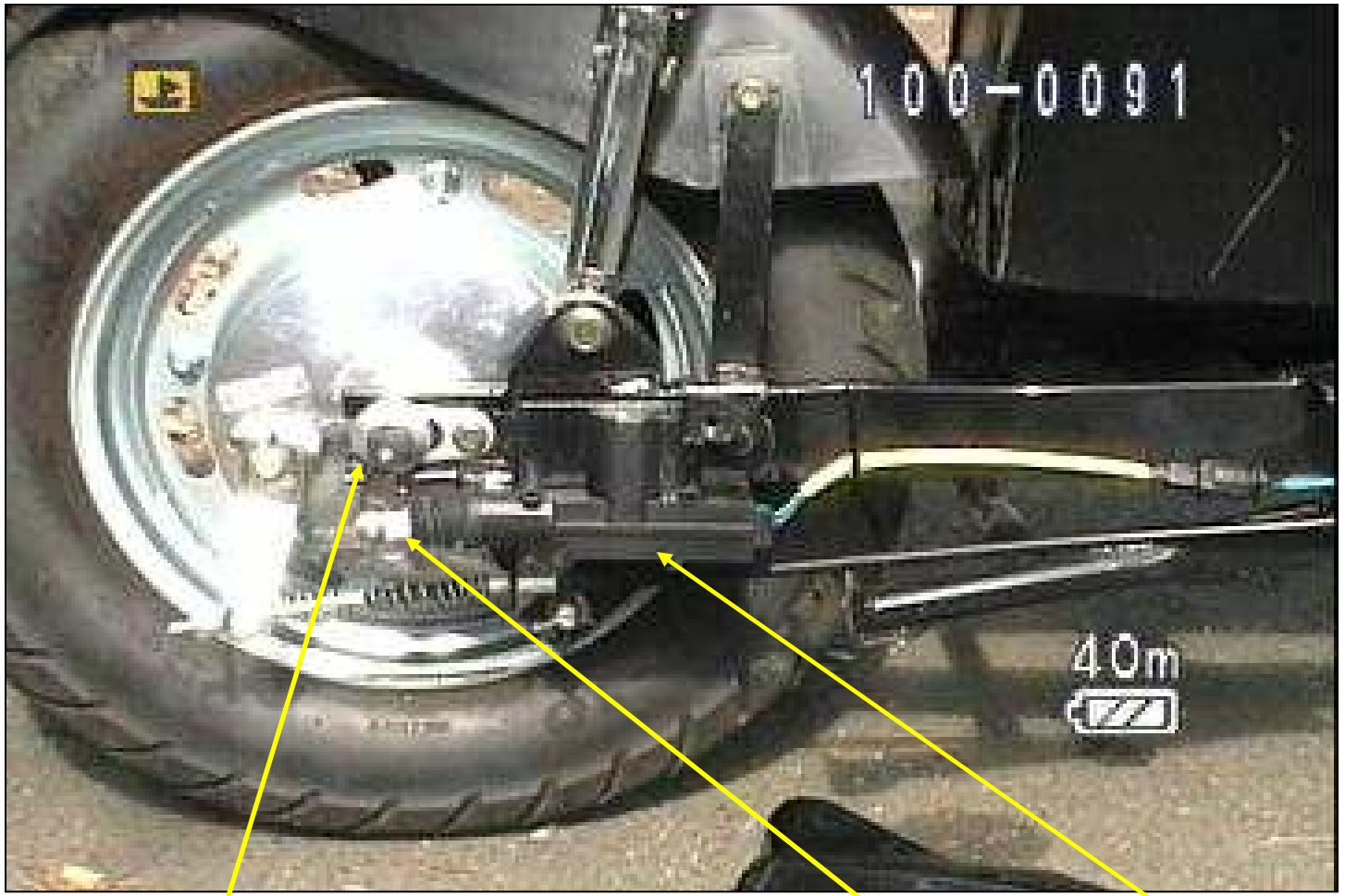
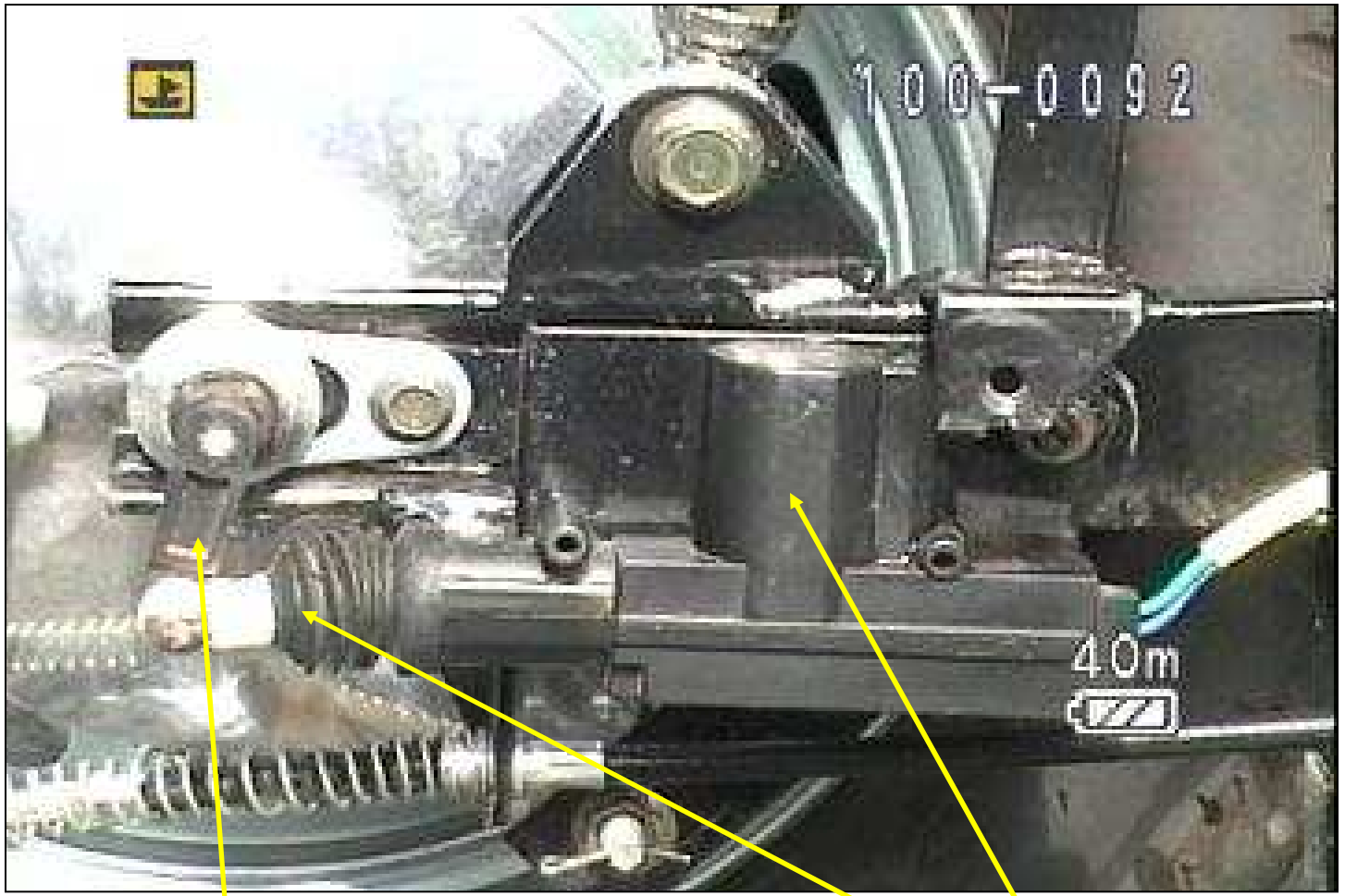
Modifiying the XM-2000 Shift Mechanism (Dealer Prep Series)

by USATracy

1 – Remove the plastic right cover, held on by two phillips head screws.



2- With the cover removed we can get to the shifter linkage, selenoid and right axle bolt



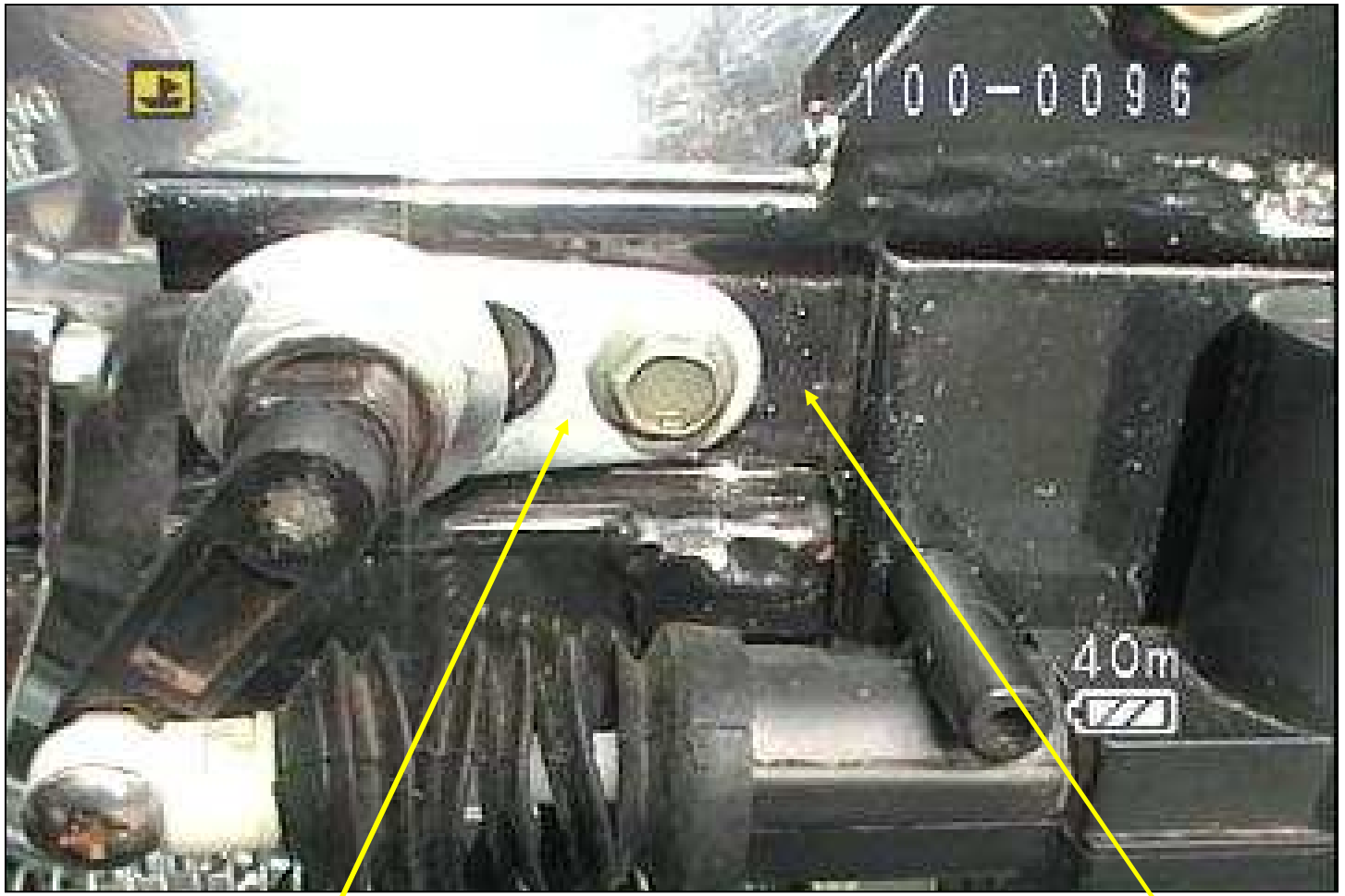
3- Gear shift arm is moved back and forth by the selenoid plunger. Plunger moves in and out of selenoid housing by servo motor.
The gear shift arm pictured is not correct, the selenoid plunger is retracted for low gear, the arm should be just to the right of straight down, or striaght down, it is instead left of straight down.

4- As delivered from the factory, the selenoid plunger is stressed and bent due to poor alignment with the shifter arm. To correct this, we will shim the entire selenoid housing further to the right to remove the stress, the added benefit to this will be you can add an adjustment capability to the selenoid mechanism that does not exist now.

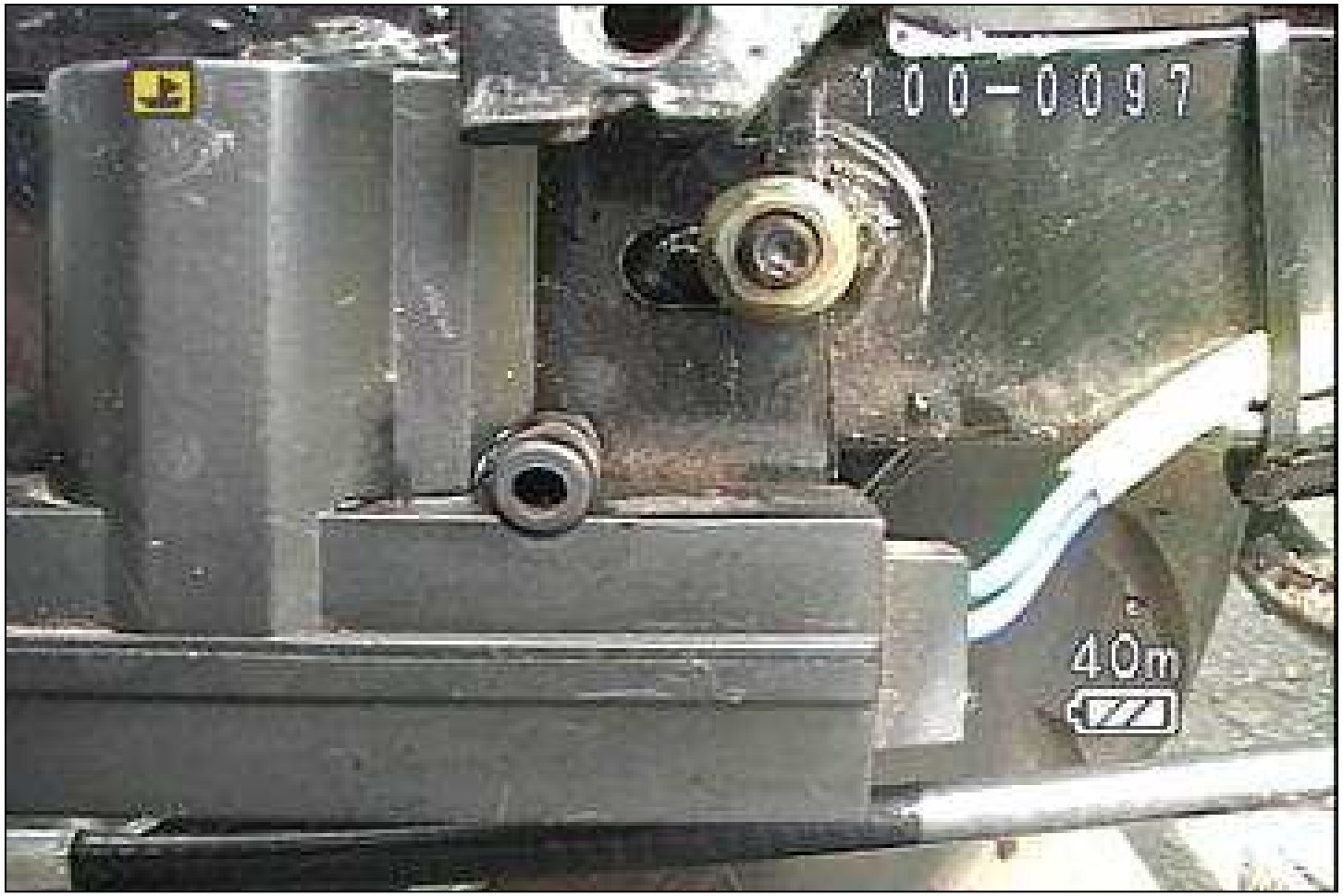
5- The plunger has been fully extended to place the bike in high speed mode. Notice the protective boot has deteriorated in only 6 weeks of exposure to the elements. The boot is very poorly made and not UV resistant. It will be discarded until a replacement solution is sourced.

6- Another angle to show the misalignment between the selenoid plunger and horn. The added stress and friction the plunger must deal with in this configuration will shorten its life and cuase shift problems.

7- The plunger fully extended. Your bike may have the plunger attached to the shift linkage on the inside, or as pictured here, on the outside of the shift lever. When we are done, it will be on the outside as pictured.



8- The rear axle safety retainer, notice that the rear of the selenoid housing mounting bracket is UNDER the right axle safety retainer, this is going to be changed. We are going to slightly loosen but not remove the right axle nut and remove the nut and bolt that hold the selenoid housing on the bike.

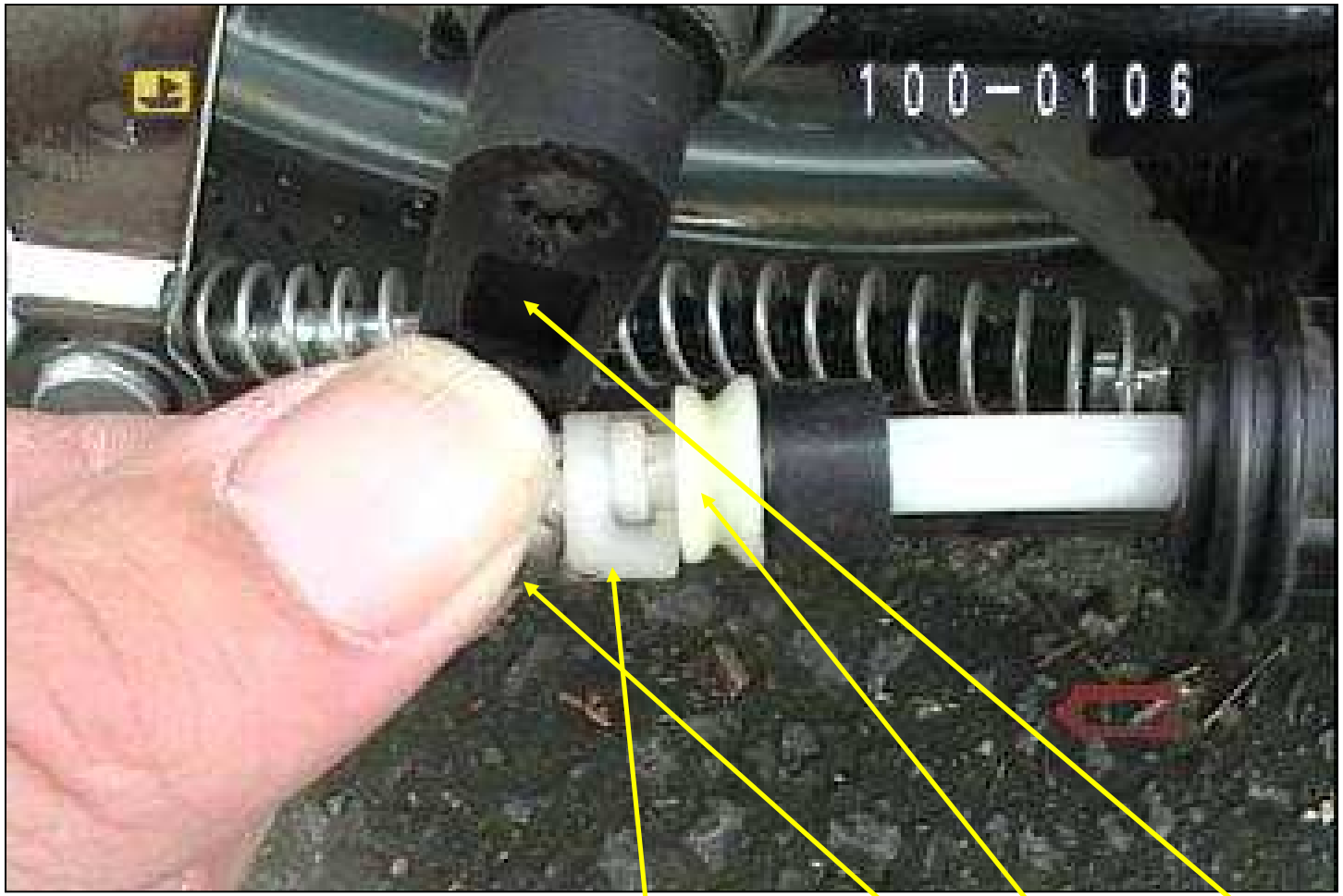


9- The nut on the right side of the selenoid housing, remove this.

10- This special tool is known as a West Virginia Socket Set. Use it to remove the nut and bolt from the selenoid housing.

11- Loosen, but DO NOT REMOVE, the right axle nut, take care no to run it up onto the gear shift lever.

12- This bears repeating, do NOT run the axle nut into the shift arm lever or you may break it. We only need the axle nut a couple of turns loose.



13- Instead of forcibly removing the linkagepivot screw out of the shift lever, disconnect the shift plunger head from the shift plunger.

14- The shift plunger head and the shift plunger just snap together and apart.

15- Once the head is disconnected from the plunger, removing the head from the black shift lever is painless, should just slide out as the screw in the head that goes into the black lever is just slid in and not threaded in as one might think.

16- Closeup of the head and plunger, note the washer your bike will NOT have, as well as the possibly longer screw that your bike may not have. More on this in a moment, but the washer is added as a bearing surface and to prevent binding which WILL OCCUR if you do not add this washer. The washer requires some special fabrication.

17- With the selenoid housing nut and bolt removed and the selenoid plunger removed from the plunger head, slide the axle safety out of the way and remove the selenoid housing out of the way.

18- For now just let it hang.

19- It will help if you know where we are going with all of this, when we remount the selenoid housing, we are going to place it ON TOP of the axle safety instead of under it. This will do two things for us. It will move the selenoid plunger outward inline with the gear lever, and allow for easy back and forth adjustment of the gear shifting mechanism.

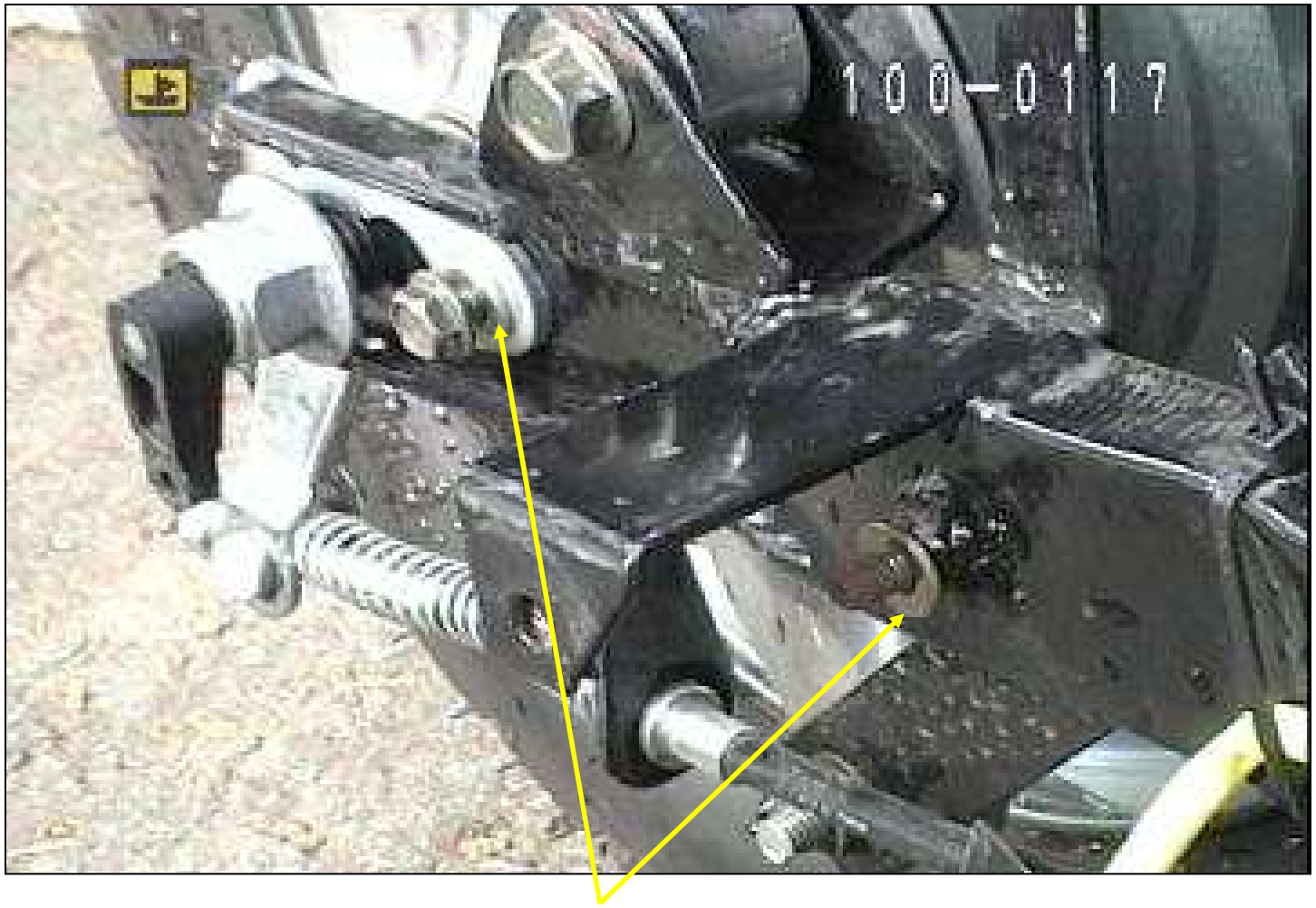
20- Don’t have a vast assortment of washers and spacers ? No problem, nothing special needed really. If you don’t have what you need in the following slides, Lowes or most hardware will.

21- Washers come in thick and thin, each person that modifies their shifter may need one or the other to get it perfect, trail and error goes a long way.

22- Lets review one of our goals, when the selenoid head is removed from the shifter lever and allowed to go where it wants, it is perfectly in line with the lever, which is WRONG, it need to be on one side or the other, for our fix, it MUST be on the outside. But how much to move it ?

23- The shift lever is 3/16 of an inch thick, that is approximately how far the selenoid housing must be moved outward to achieve one of our goals.

24- The axle safety that the housing WAS under, is almost 3/16 of an inch thick, when we move the housing bracket to the top instead of underneath, it will almost allow a near perfect alignment of the plunger head and the shift lever.



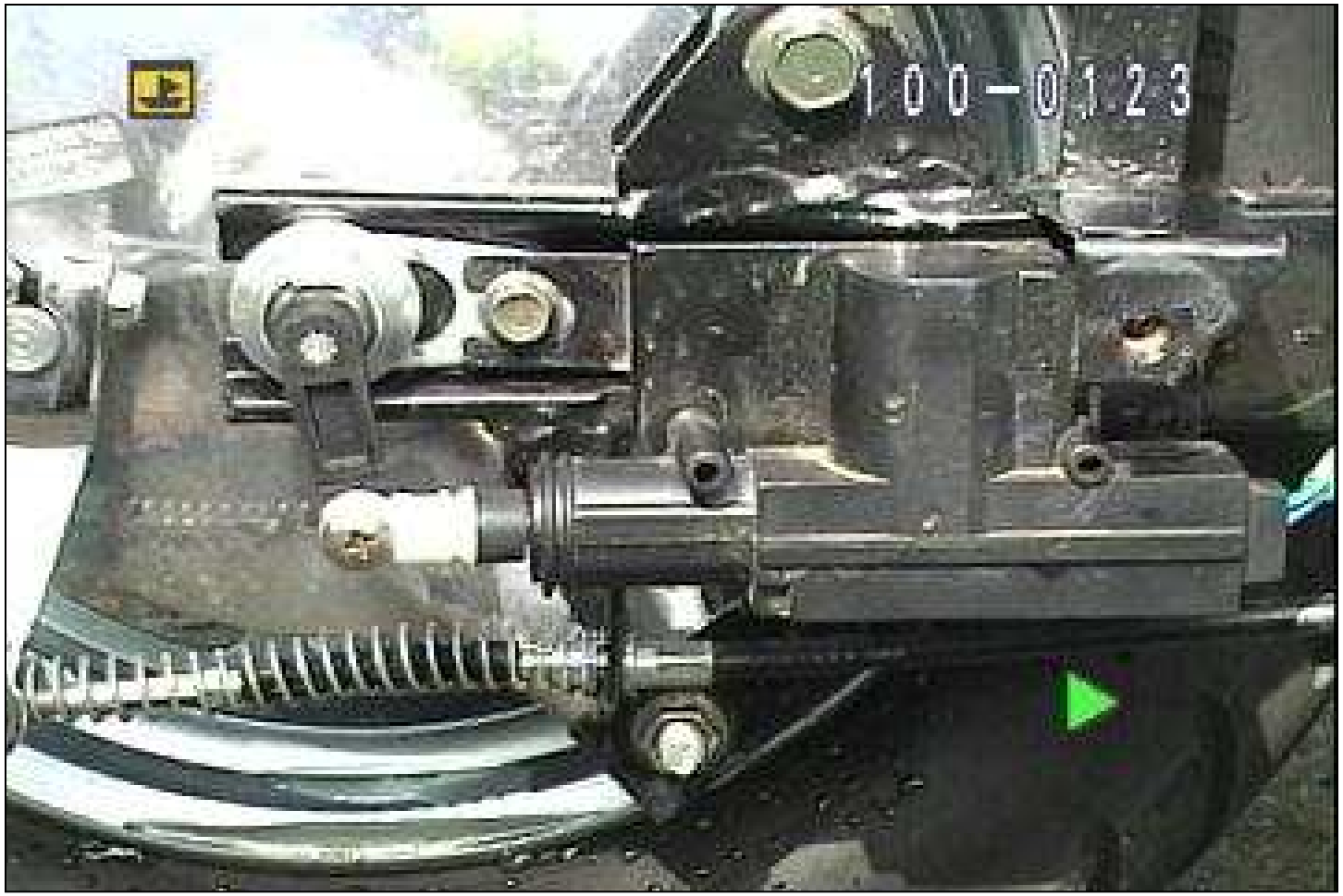
25- Add two washers to the bolt and nut for the housing, I used thin on the rear (bolt) and thick on the front (nut). When the housing in reinstalled, it will sit ON TOP OFF these washers.

26- Test fit and examine the linkage, this one is not even touching the lever, so I went for a thinner washer on the rear housing (bolt) so it would sit a tad closer to the lever and be more inline.

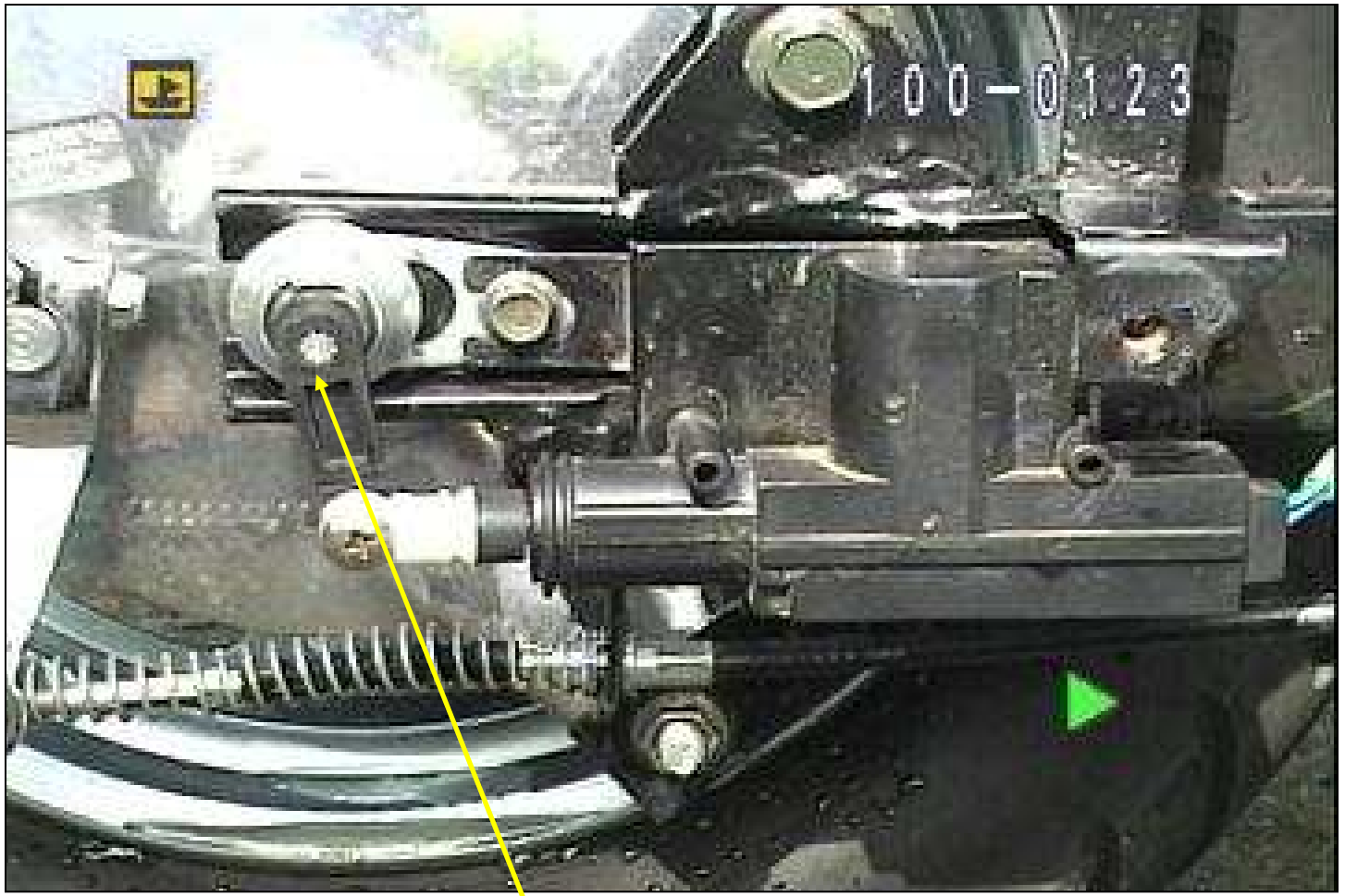
27- OK, this is where we should be now, things are back together loosely and you like the way things line up, the screw is not necessarily in the shift lever yet, because we have something left to do there as well.

28- Now, see the silver washer between the white selenoid head and the black shift lever ? Pretend it’s not there, because on your bike, it’s not. Look at the lever just to the top of the washer, see that ridge that jumps out in the black plastic, if you do not add a shim here, the shifting will not work right. But you can’t just add the washer, it will not fit, it needs a little work.

29- Go find a 1/16 washer (thick) and grind a small flat edge on one side, once you test fit it things will become apparent. If you do not have a grinder, hold the washer in a wrench and slide the edge on a concrete sidewalk and it will grind down just right, that’s how we made shivs in elementary school during recess, remember ?.



30- Reassemble, note the shift plunger is retracted (low), the shift lever is just to the right of straight down, or straight down. It should NOT be anymore to the right of straight down than pictured. Also the selenoid housing is now adjustable from right to left by loosening the housing bolts, make sure you start with the housing centered, THEN adjust the lever so it is right of down or down. Then adjust the housing for good shifter movement.



31- If you can’t get the shift lever right of down or down without radically sliding the house, pull the shift lever off the spline and flip it over and try again, it is slightly offset when flipped over.

32- You will want to add a small locknut or a thin nut with some locktite on it to hold the selenoid head screw in. Don’t tighten the nut or the shifter will bind, just enough to secure the screw is all that is needed.

33- Tightening your axle nutis a good idea too.

I would add one more thing, on step 26 where you are using washers to get the right line on the plunger head and the shift lever, you may want to consider trimming it inward towards the wheel a little bit, back in the direction it was originally, just a little, this will place some tension against the black lever arm to keep it from working off the spur gear, or working part way off which may lead to excessive wear of the gear levers plastic teeth on the metal spur.

This was the reason I noted in 26 that I went to a smaller washer because, although it looked nice and straight, I wanted just a tad of tension into the wheel as opposed to perfectly straight so that over time the lever would not work off the shaft.

This is the other mod that needs to be done, nothing but the friction of plastic on metal holds the black shift lever on the spur gear, that and the overtension that was created by the factory installed selenoid housing which forced it to stay on the spur gear.

I have two bikes, on one the lever is very tight, on the other, it is a lot looser, repeated removal and reinstallation of the lever will cause wear and it will loosen up a little.

On the selenoid housing, removing the rear washer, or using a thinner one, or by adding more washers to the front, you can tilt the selenoid head into the lever to place some tension on it to ensure it will stay in place.

What is needs it for a groove to be machined into the spur so a C-Clip can be used to secure the lever, but that may be difficult for most to do.

Alternatively, since the spur gear shaft is hollow, you may be able to force thread a small machine screw into the shaft and use that with a small washer to secure the lever to the shaft, then tilting the housing will not be necessary.

Also not noted in the above slides, the axle can be moved forward and backwards quite a bit. So this also must be taken into consideration when changing a flat and such, after reinstalling a rear wheel, you have to go over all of the selenoid adjustments to ensure good shifting. If the wheel is too far forward or back then it may be outside the limits of adjusting the shifter.

34- Any Questions ?