



AVL LOOMS

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AVL Tech Bulletin: **Positive Dobby Troubleshooting**

Topic: **Troubleshooting Harness Lift and Dobby Issues on the Positive Dobby**

Date: **9/30/2021**

Overview

This document covers issues of miss lifting with any AVL positive dobby loom. That includes: mechanical dobby, Compu-Dobby® I, Compu-Dobby II, Compu-Dobby IV Positive, Compu-Dobby 4.5 Positive and Compu-Dobby 5 Positive equipped looms. This document does not address the negative countermarch dobbies, however, many of the same troubleshooting techniques apply.

Issues Covered

The primary issue this document reviews is incorrect harness lifts with either harnesses failing to lift and/or lifting when they shouldn't. The causes of this problem can be broken into three areas:

- Weaving techniques
- Harness float
- Mechanical causes

This document focuses on these causes and how to resolve them. It is crucial to address harness float first, before dealing as its existence tends to mask mechanical causes. The primary exception to this problem is where specific mechanical issues are visibly obvious, such as with dobby cables not in alignment with their dobby fingers or the dobby arm insert.

This document does not focus on issues of loom miss assembly or threading errors. Before using this document, it is prudent to verify that the harnesses are connected the correct harness cable loops and spring lever chains. It is also a good idea to make sure that no warp ends are miss threaded into heddles on different harnesses.

Harness Float

Harness float is a condition that is possible on the AVL rising shed looms due to the alignment of at-rest harnesses below the warp center line. When the warp tension overcomes the weight of the harnesses and the harness spring force, the harnesses floats up. Another cause of harness float is where the rising warp ends threaded into adjacent harnesses pulls up on the floating harness. This second cause typically coincides with a tight warp sett, dense patterning and/or sticky yarns. In any case of harness float the primary cause of miss lifts is the slack created in the cables, harness and dobby, as they extend down through the dobby head.

Diagnosing Harness Float

The test for harness float is straight forward:

1. If there is a warp on the loom, eliminate the warp tension and make the warp visibly slack. This step removes any influence of the warp on the dobby lifts.
2. Make the harness spring-chains under each harness visibly slack. This step eliminates this adjustment from influencing the dobby lifts.
3. Treadle through your weaving pattern. If the miss lifts are eliminated, or reduced, then we can conclude that your loom, or more accurately, your warp has a harness float problem. If the issues remain, we can conclude they are being caused by mechanical issues.

Fixing Harness Float



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Harness float can be fixed by one or more of 3 choices. The choices are arranged in the order of priority you should consider:

- **Increase the harness spring tension for the harnesses that are miss lifting.** Jim Ahrens designed the spring lever system with this capability in mind. It is a simple, yet very effective approach to countering the pulling up of a floating harness with more force pulling down. The downside to this option is that if too much harness spring force is added, treading the right treadle will require more effort. The process for the fix is incremental trial and error, where the spring force is increased a small amount and then the tested. The fix is done by shortening up on the chain one or two links at a time where it hooks into the spring lever. Testing should be done with warp tension ON. *Please note: Because this problem is a warp-related issue, the fix is only for that specific warp. The harness spring-chains for all harnesses should be set back to slack with the next warp.*
- **Decrease warp tension.** Given that too much warp tension is one of the causes of harness float, it follows that reducing warp tension may fix harness float. From experience it has been observed that higher-than-necessary warp tension is often a result of habit. Many weavers were taught early in their weaving careers to overcome inconsistent end to end warp tension variation by increasing warp tension. Jim Ahrens's approach was instead to focus on more consistent warping through better tools so that the damaging effects of over tensioning the warp could be avoided. The key focus on setting warp tension should be at the shed. The shed needs to open cleanly, but any additional warp tension beyond creating a clean shed may cause issues. That stated, some warp conditions do not allow for reducing warp tension enough to avoid harness float and still allow for a clean shed.
- **Reduce density and/or reduce warp stickiness.** This is a catch all fix for a number of related conditions. Generally speaking, thicker warp yarn, tighter warp sett, denser patterning and stickier warp all make rising warp ends want to grab and pull up on the ends that are intended to stay down on a particular pick. Changing most of these factors is a design consideration that cannot easily happen with an existing warp. Hence, it is wise to sample designs before committing to a full warp. The one exception to this rule is the use of sizing on the warp. Sizing is a term for conditioning the warp to reduce its hairiness/stickiness. In situ, a spray starch is one method of sizing a warp.

Weaving Techniques

There are a lot of ways to successfully warp and weave. However, there is only one way to treadle a positive dobbie. During weaving the weaver must keep a foot on each treadle and move the left and right treadles in unison. When using only one foot to treadle, the tension on the other treadle cable is loose resulting in two possible problems. The first is that the treadle cable might come off the pulley immediately above. When this happens and the weaver continues weaving, the cable will break due to the small radius of the pulley axle on which it is now riding. The second issue, which is more directly related to this document is that failing to depress the left treadle fully will result in the dobbie arm not ascending high enough to release all the dobbie cable balls from the dobbie arm insert. Some dobbie cables might not be able to catch under the dobbie arm insert in this scenario, as well.

Mechanical Issues

Mechanical issues range from worn out parts to misadjusted areas of the loom. Review for worn parts first.

Worn or Failed Parts



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The following are parts that should be reviewed for excessive wear:

- **Dobby cable balls.** These should be round on top. If misshapen, the dobbie cable must be replaced. Misshapen dobbie cable balls will more easily slip out from under the dobbie arm insert as the pick is lifting.
- **Dobby arm insert.** The slots on the dobbie arm insert should have clean edges with little to no evidence of rounding or flaring on the leading edges. Replace if rounding or flaring of the slot edges is evident. Worn dobbie arm insert slots will more easily allow the dobbie cable balls to slip out from under the dobbie arm insert as the pick is lifting.
- **Dobby pegs (for the mechanical dobbie).** Make sure that all of your dobbie pegs are the same length above the base. Do not mix dobbie pegs of different lengths in the same pattern repeat.
- **Dobby arm wobble.** The dobbie arm should exhibit minimal wobble or twist on its pivot point. Replace the dobbie arm, hanging arm and/or pivot bushing if 10 degrees or more of twist is evident.
- **Dobby arm to cam-cylinder cable.** If the turnbuckle in this cable cannot be adjusted to ensure that the dobbie arm touches the bumper at the top of the right side dobbie head slot, the cable has become over stretched and must be replaced.
- **Dobby finger slots.** The dobbie cables are aligned and slide up and down in slots on the back sides of the dobbie fingers. If the front of the slot wears unevenly between the dobbie fingers, some dobbie fingers may sit back significantly farther than the others. When this happens, the dobbie cables behind these worn fingers do not press into the dobbie arm insert as far as the other dobbie cables, which may cause the dobbie cable ball not to be caught under the dobbie arm insert. If the dobbie finger positions vary by more than 3/32 inch, replace the odd dobbie finger.
- **Compu-Dobbie solenoid.** If a solenoid on the Compu-Dobbie doesn't extend when activated, or is always activated, it must be replaced. Also, if after completing the Compu-Dobbie alignment procedure it is found that solenoids are not fully extending when selected, either the Compu-Dobbie is adjusted too far in towards the fingers, or the solenoid has become too weak to fully extend against the dobbie finger. In this latter case, the solenoid must be replaced.

Misadjustments

- **Dobby finger slot to dobbie cable alignment.** Each dobbie cable must be in the slot behind it dobbie finger. Correct pulling out the finger, aligning it with the cable and pushing the finger back into place.
- **Dobby arm height.** When the left treadle is down, the dobbie arm must be touching the rubber bumper at the top of the right slot in the dobbie head. Adjust the turnbuckle in the dobbie arm to cam-cylinder cable to address this problem. When making this adjustment, it is helpful to also make sure that the treadle paths are kept so that the treadles do not hit the floor or the pulley above.
- **Dobby arm insert to dobbie cables alignment.** When the dobbie arm is up touching the bumper in the right slot, the dobbie cables should align directly in front of the dobbie arm insert slots. If pushed into the slot, the dobbie cables should not touch the side wall of the slot. If not aligned properly, the dobbie arm insert and dobbie cable balls will wear prematurely. To fix the problem, loosen the hanging arm bolts that secure it to the loom side frame, and then adjust the dobbie arm to match the dobbie arm insert slots to the dobbie cables.
- **Dobby cylinder alignment (mechanical dobbie only).** The dobbie cylinder rides in a left and right pillow block bearing (herein referred to as a pillow block). A spring backs each pillow



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block pushing it out. The pillow blocks are retained by aluminum brackets at the front, where the retainers have long Allen head set screws that are used for adjusting the pillow blocks in opposition to the springs. The jam nut on the Allen head set screw is used to lock down the position. To adjust the dobbie cylinder position use the following procedure:

1. If there is a warp on the loom, make it slack (zero warp tension, warp hanging loose).
 2. Make sure that your harness spring-chains are also slack (hanging with some curve, not straight across).
 3. Create a set of dobbie bars that lift a first pick of the first 2, middle 2 and last 2 harnesses, and the remain bars should be an alternating odds/evens tabby. On a 16 harness loom, the first pick will be 1, 2, 9, 10, 15, 16 holes are pegged.
 4. Weigh down the left treadle so that the dobbie arm is up against the bumper at the top of the slot on the right side of the dobbie head.
 5. Adjust the dobbie cylinder so that the dobbie pegs push the dobbie cables approximately half way into the dobbie arm insert slots. *Note: If the dobbie cables are pushed up against the back of the dobbie arm insert slots, the dobbie cables will wear prematurely. Also note: The dobbie cylinder adjustments are generally made equally on the right and left sides. However, variation and wear may dictate adjusting the sides independently to ensure optimal operation.*
 6. Treadle and ensure the correct 6 harnesses lift. Treadle through the tabby verifying the correct harnesses lift. If some harnesses are not lifting when selected, adjust inward the set screw closest to the offending harness by ½ turn increments with testing in between adjustments until the correct harnesses lift every pick. If during treadling, harnesses are lifting that should not, either the dobbie cylinder is adjusted in too far and the dobbie cables are being pressed hard against the back of the dobbie arm insert, or one of the other issues noted in this document is the cause.
- **Compu-Dobby alignment.** As with the dobbie cylinder alignment, the purpose of is to ensure that the dobbie cable is pushed into the dobbie arm insert slot half way to avoid premature wear. With the Compu-Dobby alignment there is a second reason for only going half way into the dobbie arm insert slots, which is to avoid limiting the Compu-Dobby solenoid plunger travel. Solenoid strength is strongest at full extension getting progressively weaker the closer it gets to full retraction. Thus, limiting the solenoid plunger travel makes the solenoid weaker, and may cause it to be too weak to properly push the dobbie cable. There are two mounting systems for Compu-Dobbys on the positive dobbie head:
 - *Compu-Dobby I style brackets.* The Compu-Dobby I style brackets mount to the outside of the left and right sides of the dobbie head. The Compu-Dobby is held in place by way of one Allen head socket head cap screw per side. To adjust the Compu-Dobby position with this style bracket, loosen each screw and slide the Compu-Dobby in the bracket slots.
 - *Pillow blocks.* As with the dobbie cylinder, the pillow blocks used on the Compu-Dobby use the same backing spring and retainer hardware as with the dobbie cylinder. The pillow blocks are adjusted by tightening or loosening the Allen head set screws. Again, the jam nut on the Allen head set screw is used to lock down the position.

To adjust the Compu-Dobby position use the following procedure:

1. If there is a warp on the loom, make it slack (zero warp tension, warp hanging loose).
2. Make sure that your harness spring-chains are also slack (hanging with some curve, not straight across).



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3. Adjust the Compu-Dobby out away from the doobby fingers so that extended solenoids just touch the doobby fingers.
4. Create a weaving file of
 - Pick 1: first 2, middle 2 and last 2 harnesses to be raised. On a 16 harness loom, this means that 1, 2, 9, 10, 15, 16 are all activated.
 - Pick 2: first 2, middle 2 and last 2 harnesses to be raised
 - Pick 3: Odds pick of tabby
 - Pick 4: Evens pick of tabby
5. Weigh down the left treadle so that the doobby arm is up against the bumper at the top of the slot on the right side of the doobby head.
6. Enter weaving mode in your weaving software activating the first pick. The solenoid tips should now be extended for the 6 selected harnesses and lightly touching the doobby fingers.
7. Adjust the Compu-Dobby towards the fingers now. As you are making this adjustment watch from underneath the Compu-Dobby as the doobby cables for the activated solenoids are pushed towards the doobby arm insert. Stop adjusting when the doobby cables for the 6 activated solenoids are halfway into the doobby arm insert slots. *Note: If the doobby cables are pushed up against the back of the doobby arm insert slots, this may induce more harness selection errors and prematurely wear the doobby cables. Also note: The Compu-Dobby position adjustments are generally made equally on the right and left sides. However, variation and wear may dictate adjusting the sides independently to ensure optimal operation.*
8. Treadle the pick and then the tabby watching for the correct harnesses lifting. From here you might need to make small adjustments to the Compu-Dobby position until it reliably lifts the correct harnesses every time. If some harnesses are not lifting when selected, adjust inward the set screw closest to the offending harness by ½ turn increments with testing in between adjustments until the correct harnesses lift every pick. If during treadling, harnesses are lifting that should not, one of the other issues noted in this document is the cause.