

Technician Name: \_\_\_\_\_ Date: \_\_\_\_\_

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Customer Name: \_\_\_\_\_ Serial Number: \_\_\_\_\_

## Z-Axis Stall

### Issue Explanation and Background

Each drive motor on the machine (the x, y and z axes motors) has a sensor called an encoder that tracks how many times the motor rotates which in turn tells you how far it has traveled. The on-board computer commands each motor to move a certain distance over a certain interval of time for each operation and then compares the actual distance traveled by the motor (by reading the encoder) to the distance it was commanded to go.

A z-axis stall is caused when the difference between the commanded distance becomes much more than the actual distance over the allotted time interval. An easy example of this would be putting your hand on the cutting truck and preventing it from moving during an operation. The computer is commanding it (and expecting it to move a certain distance in a given time interval) but your hand is preventing it from moving; or stalling the movement. A stall does not have to be a physical obstacle to movement. For instance if a power lead to the motor was broken then the motor would not move when commanded and the computer would record a stall.

### Diagnosis Procedure

**Verify the Firmware Version** – Have the customer read the firmware version directly from card via the Options menu and record \_\_\_\_\_.

Make sure that the memory card is inserted and the machine is ON. Navigate to the Configurations Menu from the *CarveWright Main Menu* by using the **up/down arrows** or pressing the “0” (**Options**) key on the keypad. Scroll down to 2) *Version* and press **ENTER** (or simply press the “2” key on the keypad).

If the version is anything other than the latest release have the customer update the software and retry the project.

**Setup for Troubleshooting** - Turn the machine OFF

**Question 1:** Does the machine have a B-series serial number OR an A-series serial number higher than 500,000?

YES: Proceed to Question 3.

NO: Proceed to Question 2.

**Question 2:** Has the machine had been in for service after September 2007 or has the machine had the 907 package installed? If customer is unsure check their Supertux file.

YES: Proceed to Question 3.

NO: **Send customer the A907 package and installation instructions.** The 907 package is a functional replacement for an electronics suit (and cable) that is no longer produced. Tell customer to install the package, retest and call back if the issue is not resolved.

**Question 3:** Are you running other machinery on the same circuit or running the unit on a very long power cord?

YES: Many times cycling ON other machines (even a refrigerator) can instantaneously draw down the voltage supplied to the machine enough to cause an axis to stall. Have the customer isolate the machine from other machinery and retry the project. If this does not resolve the issue proceed to Question 4.

NO: Proceed to Question 4.

**Question 4:** Does the machine sometimes report an X, Y or Z-axis stall (as opposed to always reporting a z-axis stall)?

YES: Likely causes are: the bit is not spinning during cutting or intermittent voltage from the power supply electronics board. Proceed to the troubleshooting document titled ***Random X, Z and Z Axis Stalls***.

NO: Proceed to Question 5.

**Question 5:** Does the machine reboot or power OFF after a z-axis stall?

YES: Likely cause is intermittent voltage from the power supply electronics board. **Send customer a new power supply board (A2038). Close ticket.**

NO: Proceed to Question 6.

**Question 6:** Turn the machine ON and initiate the same project. Does the z-axis stall happen immediately (right as the z-truck starts to move)?

YES: Likely causes are: the z-truck is physically stuck in place, the z-drive motor is not getting power, or the z-drive motor encoder is not reading. Proceed to Cause 1.

NO: Proceed to Question 7.

**Question 7:** Does the z-axis stall occur before the machine starts carving (during the time when it is making measurements and calibrating the bits)?

YES: Likely cause is that the cover or blow port is limiting the travel of the z-truck, a misplaced sliding plate, or an incorrect bit tip find. Proceed to Cause 5.

NO: Proceed to Question 8.

**Question 8:** Does the z- axis stall happen immediately when the machine starts cutting OR within the first few cutting passes?

YES: Likely cause is an AC cut motor issue where the bit is not spinning fast enough to remove the material. Proceed to Cause 6.

NO: Proceed to Question 9.

**Question 9:** Does the z-axis stall happen at or near the left side of the machine every time it is run?

YES: Likely cause is a short between the FFC cable and the y-motor heatsink. Proceed to Cause 8.

NO: Proceed to Question 10.

**Question 10:** Turn the machine ON and initiate the same project. Does the z-axis stall happen at the same position or spot in the carving every time it is run?

YES: Likely cause is a physical obstruction that is limiting the travel of the z-truck. Proceed to Cause 9.

NO: Proceed to Question 11.

**Question 11:** Does the depth of the carving shift in as the project proceeds?

YES: Likely cause is that the z-motor is losing track of its position. Proceed to Cause 10.

NO: **Elevate this issue ticket to the next level of Technical Support.**

## Z - Axis Stall Causes

**Cause 1:** The z-drive motor does not perform the commanded motion.

A. The z-truck is stuck in position. Reach into the machine and attempt to move the z-truck up and down (with the power OFF). Is the z-truck seized in place?

YES: Likely cause is that there is a mechanical problem that is preventing the z-truck from moving freely. Proceed to Cause 2.

NO: Proceed to Cause 1/B.

B. The z-truck moves, but moves very roughly. Reach into the machine and attempt to move the z-truck up and down (with the power OFF). Does the z-truck move but in a very rough way?

YES: Likely cause is a stripped gear in the z-motor pack. **Proceed to Cause 2**

NO: Proceed to Cause 1/C.

C. The z-motor is not getting power. Move the z-truck up and down across its range of motion several times with the power OFF. Notice the amount of force needed to move the z-truck up and down. Turn the machine ON (with the memory card inserted and the machine plugged in) and again notice the force needed for movement. Is the force more when the machine is ON than when it is OFF?

YES: The z-drive motor is getting power. Proceed to Cause 1/D.

NO: The z-drive motor is NOT getting power. Proceed to Cause 3.

D. The z-motor encoder is not reading. Enter the sensor check menu through the keypad and scroll down to Z Position item. Move the z-truck up and down and observe the values shown on the LCD screen. Does the value shown change as the z-truck moves?

YES: **Elevate this issue ticket to the next level of Technical Support.**

NO: Proceed to Cause 4.

**Cause 2:** There is a mechanical problem that prevents the z-truck from moving freely.

A. The z-belt tensioner pulley is bound with dust. First, we want to clean and lubricate the lower z-truck pulley with compressed air and WD-40. At the same time clean and lubricate the vertical z-rails. Look into the machine see if the z-belt pulley (at the bottom of the z-belt) moves at all when you try to move the z-truck. Is the pulley now free to rotate?

YES: Cause is dust in the pulley bushing. If the lubricant frees the z-truck move it up and down several times while applying more WD-40 to purge the dust. Make sure to check that the blow deflector is there and has been assembled correctly.  
**Close ticket.**

NO: Proceed to Cause 2/B.

B. There are screws scrapping on the y-truck. To continue this diagnosis, we will want to remove the top cover and remove the z-drive motor pack. Removing the z-motor pack releases all tension on the belt. Send the customer the document describing the removal of the head cover and z-drive motor pack along with the document on further diagnosing this issue. Have them call back if the steps provided do not resolve the issue. Once the z-drive pack is removed, thoroughly clean the z-rails. Again attempt to move the z-truck up and down. Check that all 4 of the plastic wipers that keep dust from accumulating on the z-rails are in place and not binding the rollers. Is the z-truck still stuck in place?

YES: Likely cause is screws dragging on the y-truck. Remove Z-truck and tighten screws. Reassemble and retest. If the z-truck is still stuck, **elevate this issue ticket to the next level of Technical Support.**

NO: Proceed to Cause 2/C.

C. The z-motor pack gears are stripped, worn or out of adjustment. Turn the pulley protruding from the loose z-drive motor pack. Does the z-pulley rotate freely?

YES: **Elevate this issue ticket to the next level of Technical Support.**

NO: Cause is a stripped gear in the z-motor pack. **Send customer a new z-drive motor pack (A2017). Close ticket.**

**Cause 3:** No voltage to the z-motor.

A. The power supply is not providing 24V to the motors. Check to see that the y-motor pack is getting power. Move the y-truck back and forth across the machine several times with the power OFF. Notice the amount of force needed to move the y-truck back and forth. Turn the machine ON (with the memory card inserted and the machine plugged in) and again notice the force needed for movement. Is the force more when the machine is ON than when it is OFF?

YES: The y-drive motor is getting power. Proceed to Cause 3/B.

NO: Likely cause is intermittent voltage from the power supply electronics board.  
**Send customer a new power supply board (A2038). Close ticket.**

B. The cable from the z-drive motor pack is disconnected. Verify that the power to the machine is OFF. Locate, unplug, and reseat the 8-pin z-drive motor pack connector at the z-motor pack electronics board (make sure that the connector is orientated correctly before re-plugging). Move the z-truck up and down across its range of motion several times with the power OFF. Notice the amount of force needed to move the z-truck up and down. Turn the machine ON (with the memory card inserted and the machine plugged in) and again notice the force needed for movement. Is the force more when the machine is ON than when it is OFF?

YES: Cause is a loose connector. **Close ticket.**

NO: Proceed to Cause 3/C.

C. The data and power connections to the z-drive motor pack are interrupted. Enter the sensor check menu on the side of the machine and scroll down to Z position item. Move the z-truck up and down across its range and watch the values displayed on the LCD screen. Do the values shown for Z Position change?

YES: Proceed to 3/D.

NO: Likely cause is that the 14-pin FFC cable is unplugged. Reseat FFC cable and retest.

D. The FFC cable is unplugged. Enter the sensor check menu on the side of the machine and scroll down to Brd Tracking item. Reach in and rotate the small brass wheel on the far left of the machine between the sandpaper belts. Watch the values displayed on the LCD screen. Do the values shown for Brd Tracking change?

YES: Proceed to 3/E.

NO: Likely cause is that the 14-pin FFC cable is unplugged. Reseat FFC cable and retest.

E. FFC cable is damaged. Has the FFC cable ever been unplugged?

YES: Verify that the power to the machine is OFF. Remove the FFC from the z-truck electronics board. Inspect the conductor “fingers” for damage. If the “fingers”

are damaged **send customer new FFC cable (C1028)**. If the fingers do not appear damaged, **send customer a new head termination electronics board (A2060)**.

NO: Proceed to 3/F.

F. Broken z-drive power connection in the z-motor pack. We will want to remove the top cover and remove the z-drive motor pack to perform this diagnosis. Verify that the power to the machine is OFF. Unplug the 8-pin connector from the y-motor pack (only disconnect the cable, DO NOT remove the y-motor pack). Now plug the loose z-motor pack into the y-motor pack connector (make sure that the connector is orientated correctly before re-plugging). Rotate the pulley on the loose z-motor pack with your fingers with the power OFF. Notice the amount of force needed to rotate the pulley. Turn the machine ON (with the memory card inserted and the machine plugged in) and again notice the force needed to rotate the pulley. Is the force more when the machine is ON than when it is OFF?

YES: Likely cause is a bad head termination electronics board. **Send customer a new head termination electronics board (A2060). Close ticket.**

NO: Likely cause is a bad z-drive motor pack. **Send customer a new z-drive motor pack (A2017). Close ticket.**

**Cause 4:** The z-drive motor encoder is getting NO reading.

A. The cable from the z-drive motor pack is disconnected. Verify that the power to the machine is OFF. Locate, unplug, and reseat the 8-pin z-drive motor pack connector at the back of the z-motor pack. Enter the sensor check menu through the keypad and scroll down to Z Position item. Move the z-truck up and down and observe the values shown on the LCD screen. Does the value shown change as the z-truck moves?

YES: Cause is a loose connector. **Close ticket.**

NO: Proceed to Cause 4/B.

B. A cable is not plugged in correctly. Check to see that the y-motor pack is getting an encoder reading. Enter the sensor check menu on the side of the machine and scroll down to Y Position item. Move the y-truck back and forth and watch the values displayed on the LCD screen. Do the values shown for Y Position change?

YES: The y-encoder is getting a reading. Proceed to Cause 4/D.

NO: The y-encoder is NOT getting a reading. Proceed to Cause 4/C.

C. The controller is bad. Check to see that the board position sensor encoder is getting a reading. Enter the sensor check menu on the side of the machine and scroll down to Brd Tracking item. Reach in and rotate the small brass wheel on the far left of the machine between the sandpaper belts. Watch the values displayed on the LCD screen. Do the values shown for Brd Tracking change?

- YES: The board tracking sensor encoder is getting a reading. Likely cause is a bad cable. **Elevate the ticket to the next level of Technical Support.**
- NO: The y-encoder is NOT getting a reading. Cause is a bad controller. **Send customer a new controller box (A2037). Close ticket.**

D. FFC cable is damaged. Has the FFC cable ever been unplugged?

- YES: We will want to remove the top cover and remove the z-drive motor pack to perform this diagnosis Remove the FFC from the z-truck electronics board. Inspect the conductor “fingers” on the exposed side of the cable for damage. If the “fingers” are damaged or the cable appears to be kinked **send customer new FFC cable (C1028).** If the fingers do not appear damaged, **send customer a new head termination electronics board (A2060).**
- NO: Likely cause is short in the head termination board. Proceed to Cause 4/E.

E. Bad solder joint on the head termination electronics board. Verify that the power to the machine is OFF. Unplug the 8-pin connector from the y-motor pack (only disconnect the cable, DO NOT remove the y-motor pack). Now plug the loose z-motor pack into the y-motor pack connector (make sure that the connector is orientated correctly before re-plugging). Enter the sensor check menu on the side of the machine and scroll down to Y Position item. Rotate the pulley protruding from the loose z-motor pack and watch the values displayed on the LCD screen. Do the values shown for Y Position change?

- YES: There is now a z-encoder signal. **Send customer a new head termination electronics board (A2060).**
- NO: Cause is a bad z-drive motor pack. **Send customer a new z-drive motor pack (A2017). Close ticket.**

**Cause 5:** The z-axis is stalling during homing.

A. The z-truck is hitting the blow port. The second part of the homing routine moves the z-trucks to the far left of the machine and has it go to the far bottom of its travel. Does the z-axis stall happen when the z-truck is all the way to the left of the machine (The LCD will say *Homing*)?

- YES: Likely cause is that the blow port is improperly assembled and that the z-truck is hitting it on its initial homing pass. Adjust the blow port and retry.
- NO: Proceed to Cause 5/B.

B. The z-axis is stalling during when finding the board surface. Another part of the machine auto-calibration is finding the surface of the loaded board. It does this by touching the surface with a bit. Does the z-axis stall happen when the machine is finding the board surface (The LCD will say *Finding Surface*)?

- YES: Likely cause is that the bit touch plate is not swinging out far enough and the bit is hitting it on the edge. Proceed to the document titled ***Bit Not Touching the Bit Plate.***
- NO: **Elevate this issue ticket to the next level of Technical Support.**

**Cause 6:** The cutting spindle not spinning fast enough to cut wood.

A. The cutting motor does not turn ON prior to cutting. The cutting motor will come ON just prior to the first cutting pass. Set up and start a project. Does the motor turn ON before the bit touches the wood on the first cutting pass?

YES: Proceed to Cause 6/B.

NO: Likely cause is a problem with the AC safety switch, the control electronics or the AC motor. Proceed to Cause 7.

B. The cutting bit does not spin when it is supposed to be cutting. When the machine begins its carving, does the bit begin spinning before it touches the wood?

YES: Proceed to Cause 6/C.

NO: Proceed to Cause 6/D.

C. The flexshaft is damaged. Disconnect the flexshaft sheath from the z-truck and remove the flexshaft core. Is there visible damage to, or metal shavings on, any part of the flexshaft?

YES: Likely cause is a damaged flexshaft. **Send customer a flexshaft core (P1044).** Also check for damage to the square in the spindle shaft. If there are shavings or visible damage the z-truck (A2015) will also need to be replaced.

NO: **Elevate this issue ticket to the next level of Technical Support.**

D. The flexshaft core is broken. Disconnect the flexshaft sheath from the z-truck and remove the flexshaft core. Is the core broken?

YES: Cause is a broken flexshaft. **Send customer a flexshaft core (P1044).** Check along the length of the flexshaft sheath and make sure that it has not been damaged. Many times the sheath will be damaged by excessive heating.

NO: Proceed to Cause 6/E.

E. The flexshaft core is disengaged. Make sure to correctly reseal the flexshaft core on both the cut motor and the spindle shaft sides. Does the z-axis stall still occur after reseating the flexshaft?

YES: Proceed to Cause 6/F.

NO: Cause is an improperly seated flexshaft. **Close ticket.**

F. The flexshaft sheath is separated from its end termination. In some rare cases the flexshaft sheath can separate from its plastic terminations. Follow the flexshaft sheath with your hand to make sure that it is unbroken. Is the flexshaft sheath separated at either end from its terminations?

YES: Cause is a broken flexshaft sheath. **Send customer a flexshaft assembly (A2045). Close ticket.**

NO: Proceed to Cause 6/G.

G. The flexshaft sheath on the AC cut motor side is disengaged. In some rare cases the flexshaft sheath can separate from its connection to the AC motor or the spindle. Follow the flexshaft sheath with your hand to make sure that it is securely fastened into the AC cut motor. Is the flexshaft disconnected from the AC cut motor?

- YES: Cause is a disconnected flexshaft assembly. **Send customer directions to reassembly flexshaft assembly. Close ticket.**
- NO: **Elevate this issue ticket to the next level of Technical Support.**

**Cause 7:** The AC cut motor is not getting power through the AC motor safety switch. The machine has two safety switches on the front cover that are mounted underneath the front lip of the black plastic head cover. These switches are triggered when the clear front cover is lifted. Facing the machine, the switch to the left is the controller safety switch and the switch to the right is the AC motor safety switch (which we are concerned about in the following diagnosis). **Before initiating this diagnosis please have the customer UNPLUG the machine.**

A. Service has been done on the machine recently and something is disconnected.

Has the top cover or bottom panel been removed recently for service?

- YES: Likely cause is a disconnected cable to one of the serviced components. Have the customer check and reseat all of the serviced connections. Focus on the connectors at the back end of the AC cut motor if the top cover has been removed and the connectors on the X-termination board if the bottom panel has been removed. If checking and reseating all of the affected connectors does not resolve the error proceed to Cause 7/B.
- NO: Proceed to Cause 7/B.

B. The AC motor safety switch is not being depressed far enough. The AC motor safety switch cuts power to the AC cut motor when the clear cover is lifted. Open and close the front clear safety cover. You should hear two distinct clicks from the switches but we are only concerned with the right switch here. Can you hear the right switch click as the cover comes down?

- YES: Proceed to Cause 7/E.
- NO: Proceed to Cause 7/C.

C. The AC motor safety switch is bad. Open the clear safety cover and using a small flathead screwdriver, depress the switch button. Can you hear the switch click as you depress the button with the screwdriver?

- YES: Likely cause is that the cover is not depressing the switch button far enough. Proceed to Cause 7/D.
- NO: Cause is a bad AC switch. **Send the customer a new AC switch (P007-00007). Close ticket.**

D. The front cover is loose or out of position. Open the clear safety cover and do the following:

- Use compressed air to clean around the switch button.
- Wiggle to clear cover to see if there is any slop at the corner pivots. Tighten if there is.
- Loosen the top cover screws and push the black cover toward the front of the machine before retightening.
- Add a small piece(s) of tape to the end of the “finger” on the clear cover to make it longer.

Do these suggestions allow the cover to “click” the switch when the cover is down?

YES: Cause was that the cover is not depressing the switch button far enough. **Close Ticket.**

NO: **Elevate this issue ticket to the next level of Technical Support.**

E. Does the customer have access to a Voltmeter?

YES: Proceed to Cause 7/F.

NO: Proceed to Cause 7/G.

F. Checking the switch with a voltmeter. Verify that the machine is unplugged. Drop the AC safety switch by removing the two small screws securing the plastic guard over the switch. Place the probe tips on each of the switch terminals and check for continuity between them when the switch is depressed. Is there continuity between the terminals?

YES: Likely cause is a bad X-termination electronics board. **Send customer an X-termination electronics board (A2074).**

NO: Cause is a bad AC switch. **Send the customer a new AC switch (P007-00007).**

G. The switch is damaged. Verify that the machine is unplugged. Drop the AC safety switch by removing the two small screws securing the plastic guard over the switch. Does the switch or cable near the switch appear to be damaged or have a “burnt” smell?

YES: Cause is a bad AC switch. **Send the customer a new AC switch (P007-00007). Close ticket.**

NO: **Elevate this issue ticket to the next level of Technical Support.**

**Cause 8:** There is a short in the FFC.

A. The FFC cable is shorting to the y-motor heatsink. Open the clear cover and move y-truck from the middle of travel slowly to the left. Watch and see if the white FFC cable emerging from the back of the y-truck ever touches the finned heatsink on the back of the y-motor mounted to the far left of the head. It is possible that this rubbing can cause a short. Slightly lift and bend the FFC cable up at the loop on

the left so that it does not rub on the heatsink. Place a piece of electrical tape over the rightmost fin to isolate it. Is the issue resolved?

YES: Cause is a short between the FFC cable and the y-motor heatsink. **Close Ticket.**

NO: Proceed to Cause 9.

**Cause 9:** There is a physical impediment to the z-truck moving up and down.

A. The z-truck is dragging or hitting something on its rails. Move y-truck to the middle of the machine and move the z-truck up and down across its full range of motion several times. Look for obstacles to free and smooth movement. Were any physical obstacles encountered?

YES: **Identify and remove the obstacle. Close ticket.**

NO: Proceed to Cause 9/B.

B. The z-truck is dragging or catching on the cover. Move z-truck up and down while moving the y-truck back and forth across its full range several times. Look for interference and dragging between the top cover and flexshaft assembly. Were any areas of interference discovered?

YES: Likely cause is the flexshaft dragging on the top cover. **Reseat top cover to clear interference and test again. Close ticket.**

NO: Proceed to Cause 9/C.

C. The gears in the z-drive motor pack are full of dust or they are damaged. Move the z-truck up and down across the full range of motion. "Feel" for sticky spots, rough spots or in the motion. Were any rough spots that were spaced evenly along the length of travel?

YES: Likely cause is a bad z-drive motor pack. Proceed to Cause 2.

NO: Proceed to Cause 9/D.

D. The carving depth makes it difficult for the cut. In some cases the depth of cut, the material hardness, and condition of the bit combine to stall the motor because material cannot be removed fast enough. Inspect the sharpness and condition of the bit. Also look at the depth of the carving where the machine stalls. What is the depth of the project as shown in the Designer software \_\_\_\_\_? Also record depth of the cut at the point where the machine stalls\_\_\_\_\_. Replace dull bits and lessen the depth of the carving. Have these suggestions cleared the z-axis stall?

YES: Cause was a dull bit or deep carving. **Make adjustments in the design and dispose of damaged or dull bits. Close ticket.**

NO: **Elevate this issue ticket to the next level of Technical Support.**

**Cause 10:** The z-encoder is losing track of its position.

A. The z-motor encoder is reading intermittently. Move the z-truck to very top of its travel. Turn the machine ON, enter the sensor check menu through the keypad and scroll down to Z Position item. Move the z-truck from the very top to the very bottom of travel and record the values on the LCD screen. The encoder reading should start at 0.0 and read between 2.8 and 3.0 inches all the way to the bottom. Repeat this up and down exercise several times. The reading should return to 0.0 at the top (within a tolerance of +/- .005). If encoder reading is less than the specified values at the bottom of travel, OR does not return to 0.0 (with a tolerance of +/- .005) at the left side then the encoder is not reading correctly. Remove the head cover and remove the plastic cap covering the back end of the z-motor. Check for and remove sawdust in the encoder sensor. Does the z-encoder now read within specifications?

YES: **Reassemble the machine making sure that the seal on the z-encoder is in place. Close ticket.**

NO: Proceed to Cause 10/B.

B. The Z-Belt is loose. If the z-belt retaining clamp comes loose it is possible that the belt will slip teeth and cause the machine to lose track of the z-truck position. Many times a loose belt will announce itself with a ratcheting sound as the belt skips teeth under load. Move the z-truck to the top of its travel and reach in and grab the bottom of the exposed z-belt. Try to move the z-truck down while preventing the z-belt from moving. Can you get the z-truck to move down the belt without the belt moving?

YES: Cause is a loose z-belt. **Remove z-truck and tighten screws on clamp. Make sure that the screws have thread cement on them. Close ticket.**

NO: Proceed to Cause 10/C.

C. The quick change mechanism is loose. Is the Quick Change loose?

YES: Cause is a loose QC. **Send customer tightening instructions. Close ticket.**

NO: **Elevate this issue ticket to the next level of Technical Support.**