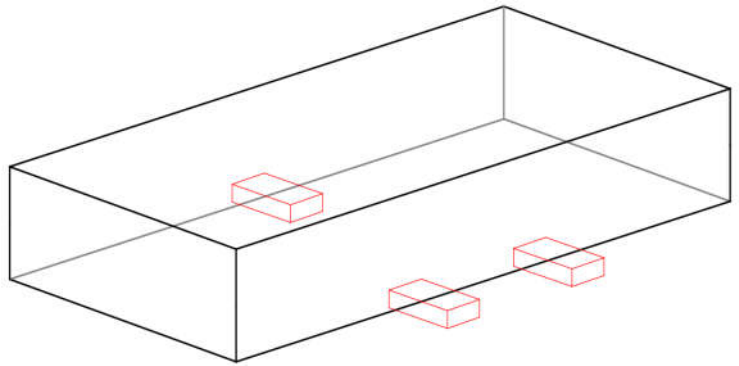


STEPS OF THE VSR PROCESS

STEP 1 : Place workpiece on 3 cushions, shown in red, positioned far from the corners.

This allows the greatest response to vibration. Both bend and torsional resonances can be driven with this arrangement :
See : [Physics of Vibratory Stress Relief](#) on Advanced VSR's website. Very long parts might require 4 cushions. Massive parts, beyond ~ 50 – 60 tons will need more cushions.



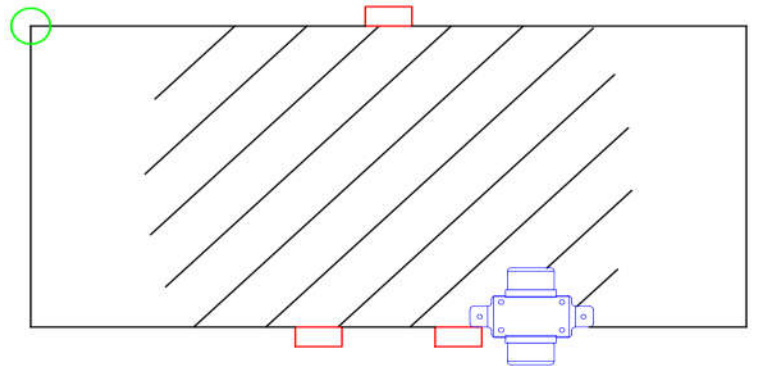
STEP 2 : Place the vibrator in the central portion of the workpiece (shown hatched) . . . near, but not directly above a cushion. Corner placement for massive parts is at times needed.

The vibrator (shown in blue in the image) must be clamped very securely, using heavy-duty bridge clamps. This will assure that the vibrator's clamping quality is secure and will not change during the stress relief.

Avoid placing the clamp bolt points on the aluminum housing, but instead in the hardened steel inserts in the vibrator's mounting feet.



Alternatively, the vibrator can be fastened by bolting the vibrator to the workpiece.



STEP 3 : Mount the accelerometer on one of the corners of the workpiece, like the location marked with a green circle.

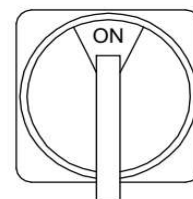
Often the best orientation of this sensor is with its axis vertical, since a workpiece with an overall rectangular-envelope shape, like the one shown, will likely have vertical amplitudes when resonating. Sensor shown mounted vertical on right.

STEP 4 : Unless the correct unbalance setting is known from previous work, adjust it to a low setting, 10 – 20 % of the max available. Time to adjust is only 1 – 2 minutes. See Owner-Operator Manual for details for the specific vibrator being used.

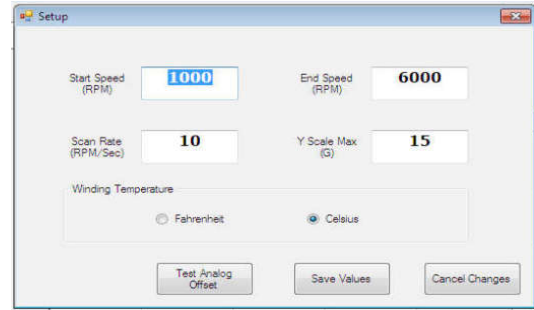
This will allow a trial run ([Quick Scan](#)) to be made, which is a preliminary view of the workpiece's resonance pattern. Later, a [GREEN Pre-Treatment Scan](#) will be made, which will function as a baseline / reference during stress relief.



STEP 5 : Power up the VSR console (190 to 240 VAC, either single or 3 phase), plug in the vibrator & accelerometer cables.

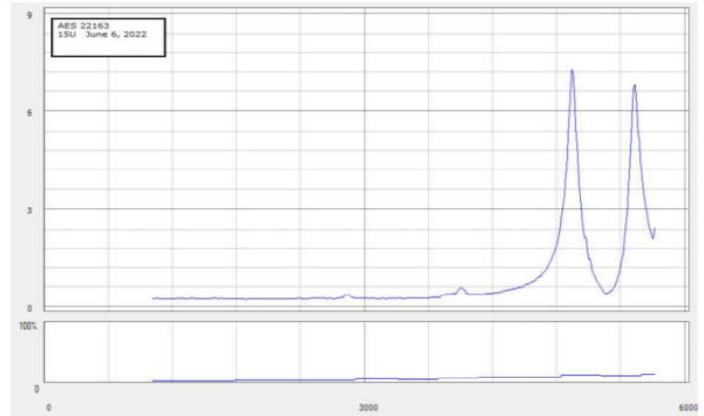


STEP 6 : Open the Advanced VSR app on the 15" touchscreen PC's desktop, and then open the SETUP window. Any of the 4 parameters shown in the white boxes can be changed by touching them (a keypad will open allowing a new value to be entered). Adjust the settings to the ones shown, then push SAVE VALUES.



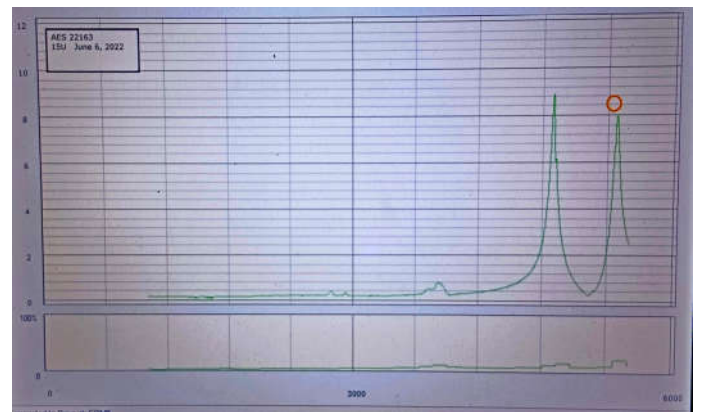
STEP 7 : Start the vibrator by pushing the green push-button. It will start and idle at the START SPEED shown in the setup window : 1000 RPM.

STEP 8 : Push the **blue** push-button (marked AUTO) and select **QUICK SCAN**, which is a preliminary view of the initial workpiece resonance pattern.



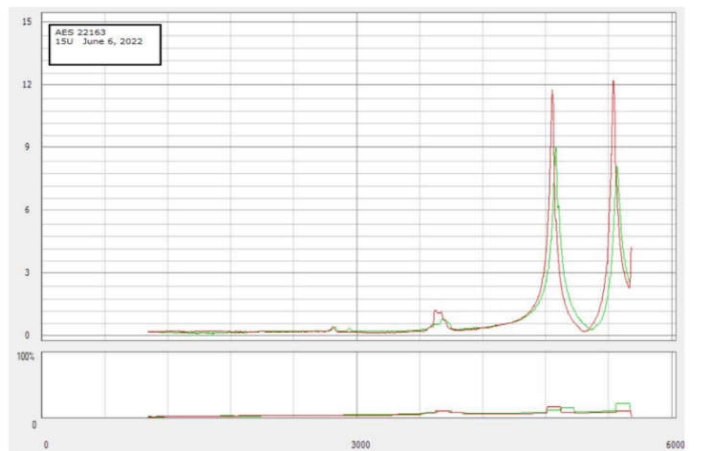
STEP 9 : Push the INCREASE push-button, which has an arrow pointing to the right. ➔ The system will generate a plot of the workpiece's response to vibration. What is needed is a plot showing one or more resonances, which will appear as peaks in the upper plot area. Expand to higher RPM and redo if needed.

The lower plot area is vibrator input power. If the vibrator is at a poor location, has excessive unbalance, or both, a peak in the power plot will be present. This **QUICK SCAN** looks good, showing two distinct peaks (upper plot) and a smooth power plot.



STEP 10 : Then push the button marked **QUICK SCAN**, which will then turn green and read **PRETREATMENT SCAN**. Scan again, making a **green**, more detailed plot, which functions as a **baseline**. (If the peaks are too short, increase unbalance, and redo.)

STEP 11 : Push the MANUAL button, start the vibrator again, and tune the speed so that the real-time cursor (**red circle**) is on top of one of the peaks. Either peak will work, but both will be tuned upon and held during treatment. Effective treatment will make the circle move higher and to the left. This might require a few touches of the DECREASE or INCREASE buttons, to stay on top of the peak as it shifts leftwards. Changes are faster in the beginning, but become smaller and slower, as stresses are relieved. When this peak is stable, tune to the other peak(s), and treat likewise. It will likely take typically 5 – 15 minutes for a peak to stabilize, although for massive structures, it often takes longer. Push STOP when the peaks are stable. Peaks grew from ~ 8 to ~ 12 g's on this workpiece.



STEP 12 : Push the **PRE-SCAN** button, changing it **RED** and reading **POST-SCAN**. Start the vibrator again, and push INCREASE to make a **RED** scan on top of the **GREEN** one, documenting the changes : Peak growth and slight shifting.

Completed VSR Chart shown on right, documenting stress relief. If a great amount of material is removed during rough machining, another treatment would be prudent, to maximize stability.

STABILITY OF THE RESONANCE PATTERN = STABILITY OF THE WORKPIECE