

## How the AWS operates at low respiratory rate settings with software update v357

It was recently brought to our attention that our Anesthesia WorkStation (AWS) was not very patient friendly at very low respiratory rates. This is because the I:E ratio has been held fixed at 1:2 for simplicity of operation. Given a respiratory rate (RR) of 4 breaths per minute (bpm), the current minimum, the period of each breath would be 15 seconds. With an I:E = 1:2 the inspiratory phase is unreasonably long at 5 seconds. (With this new software it will be 1.5 seconds)

What we have done to keep the inspiratory phase closer to what it should be is to keep the I:E fixed at 1:2 from the highest rate setting of 80 bpm down till the fixed I:E yielded a Itime of 1.5 seconds. That turns out to be 13.3 bpm. From there on, down to the minimum RR the Itime stays fixed at 1.5 seconds and the I:E increases as defined by that math. The lowest RR has been changed from 4 bpm to 2 bpm with reptiles in mind.

While testing the new software it seemed that when the period of a breath gets very long one starts to wonder if the machine is still working. To help relieve this anxiety we have switched the display to a count down timer indicating the seconds until the next inspiration. This counting down occurs when the RR is set to 5 bpm or less, a period of 12 seconds or longer. The one display is used to display both the RR and the count down timer as described below.

Say, the RR is set to 2.2. The period is then 27.3 seconds. As the breath starts the RR of 2.2 is displayed for 2 second then the display changes to the count down timer which is at 25.3 by that time, the display shows 25, 24, 23, 22, 21 when it gets to an even factor of 10 seconds instead of continuing to count down 20, 19, 18, 17... the AWS emits a short beep and the display switches back to show the current RR for 2 second then continues the count down. The whole sequence would look like this:

**Beep 2.2(inspiration)** 25, 24, 23, 22, 21, **beep 2.2**, 18, 17, 16, 15, 14, 13, 12, 11, **beep 2.2**,  
8, 7, 6, 5, 4, 3, 2, 1, **beep 2.2(inspiration)**, 25, 24, 23...

When you want to know what the RR is set to look at the display when you hear the beep. You will see the RR setting and the change over to however many seconds are left until the next inspiration.

This is difficult to describe so after all that click on this link to see it in action:

[http://www.hallowell.com/index.php?pr=Video Presentations&doc=0](http://www.hallowell.com/index.php?pr=Video%20Presentations&doc=0)

Should you have any questions, please do not hesitate to call or write me.

Let me know how it works for you,  
Stetson Hallowell