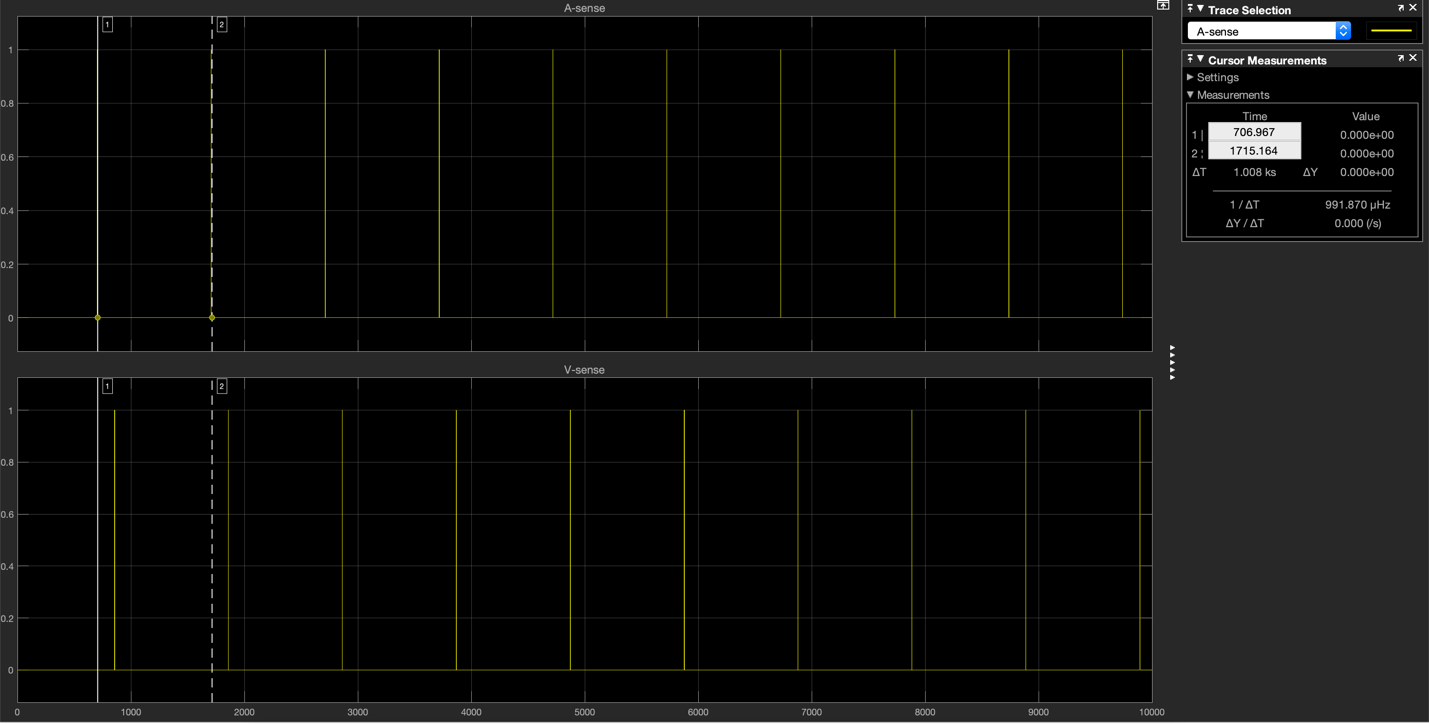
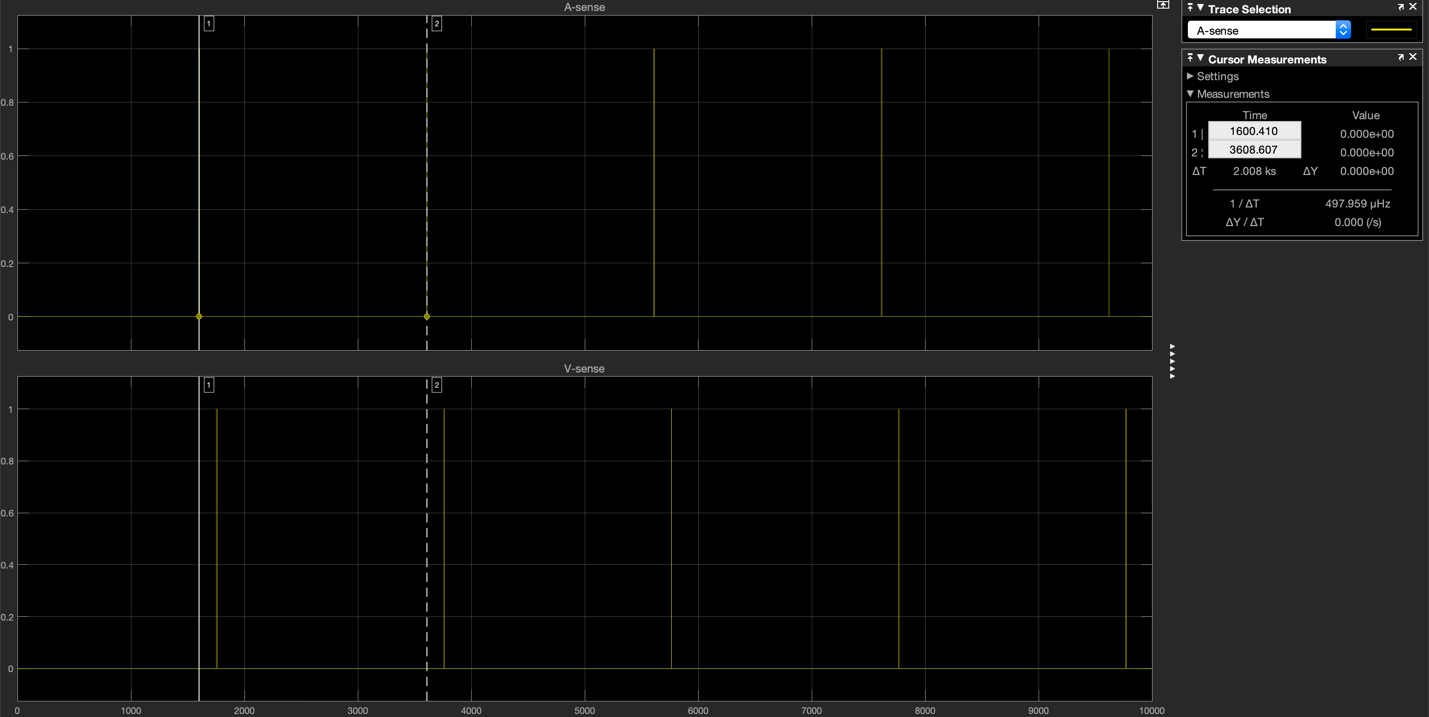
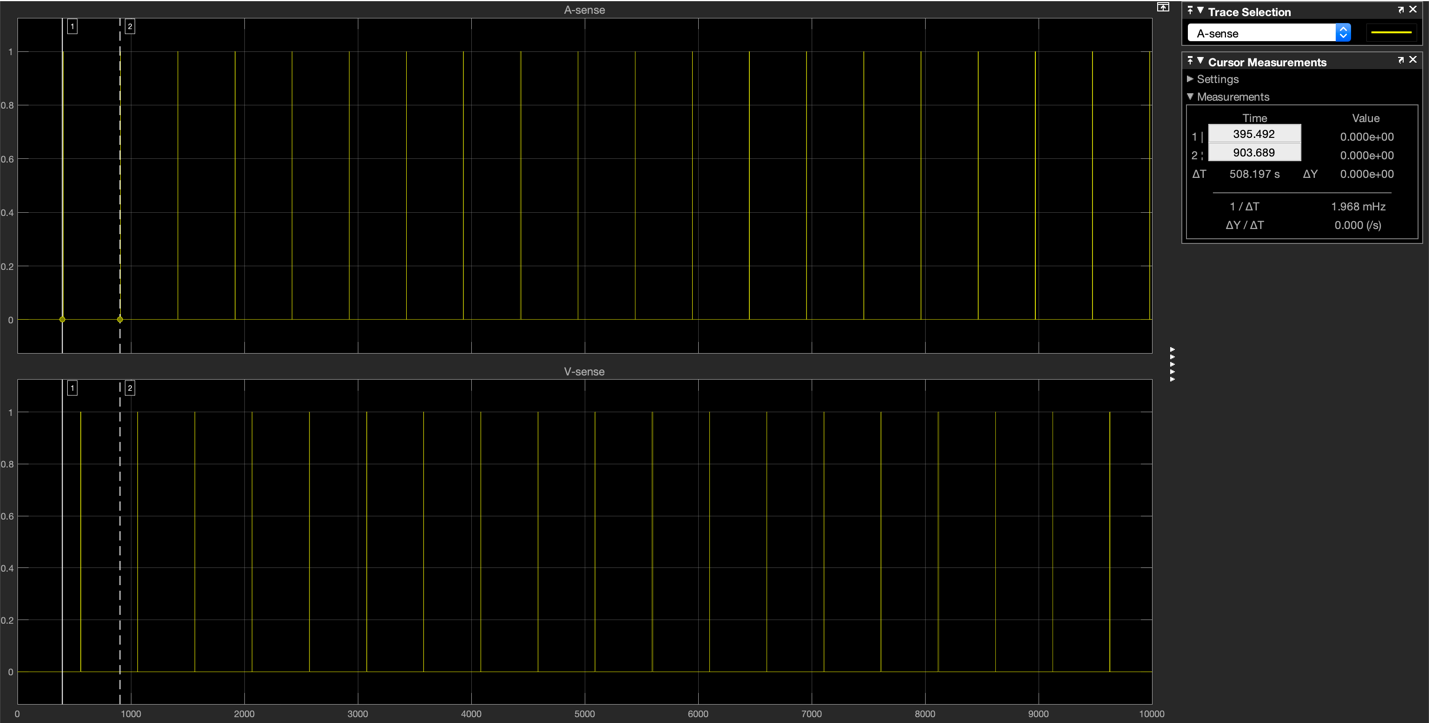
1. Normal Sinus Rhythm (NSR)



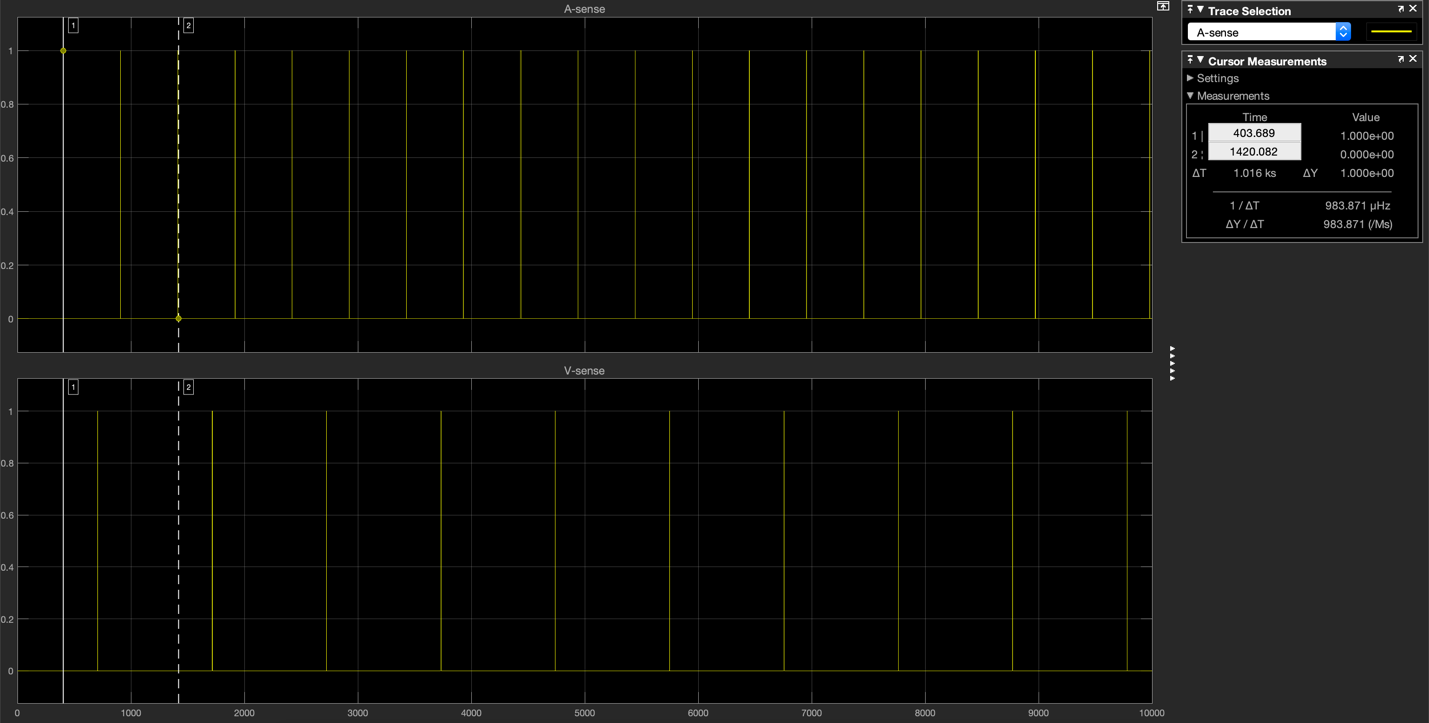
2. Sinus Bradycardia



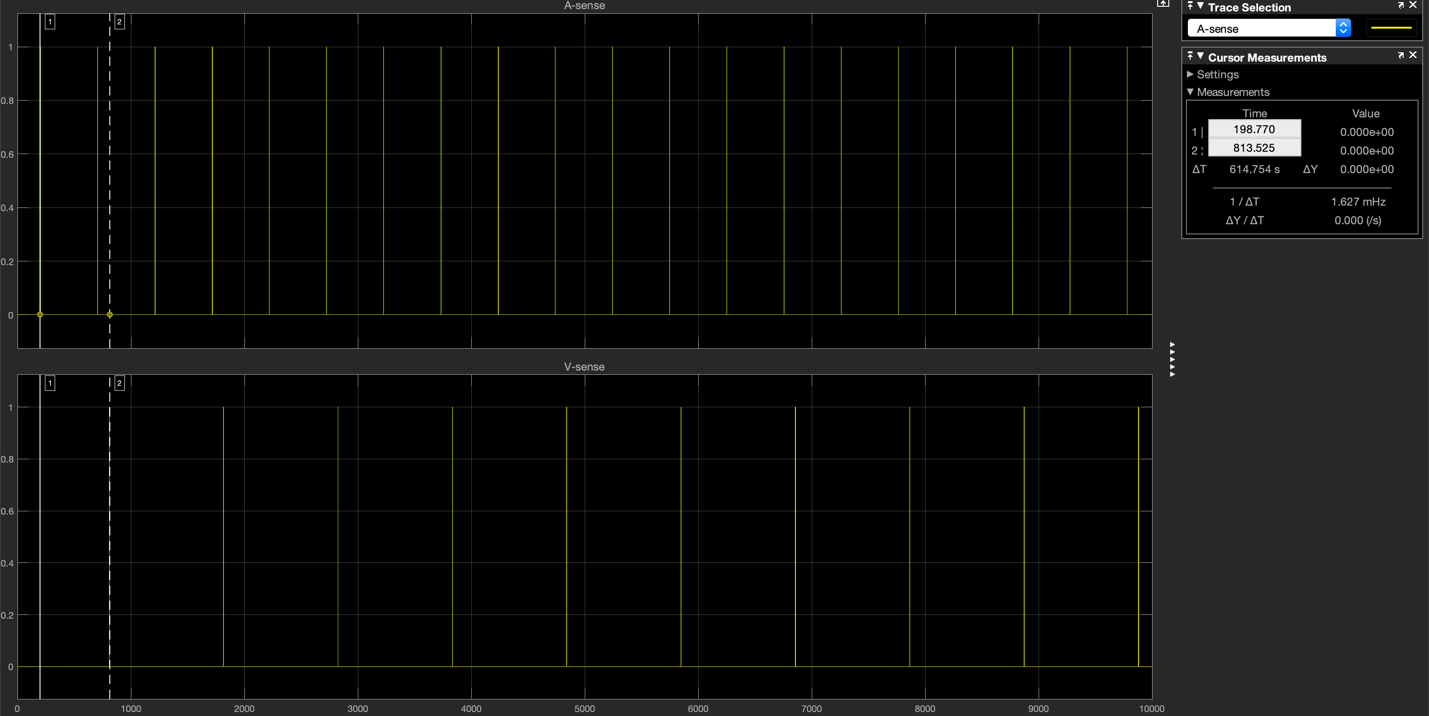
3. Sinus Tachycardia



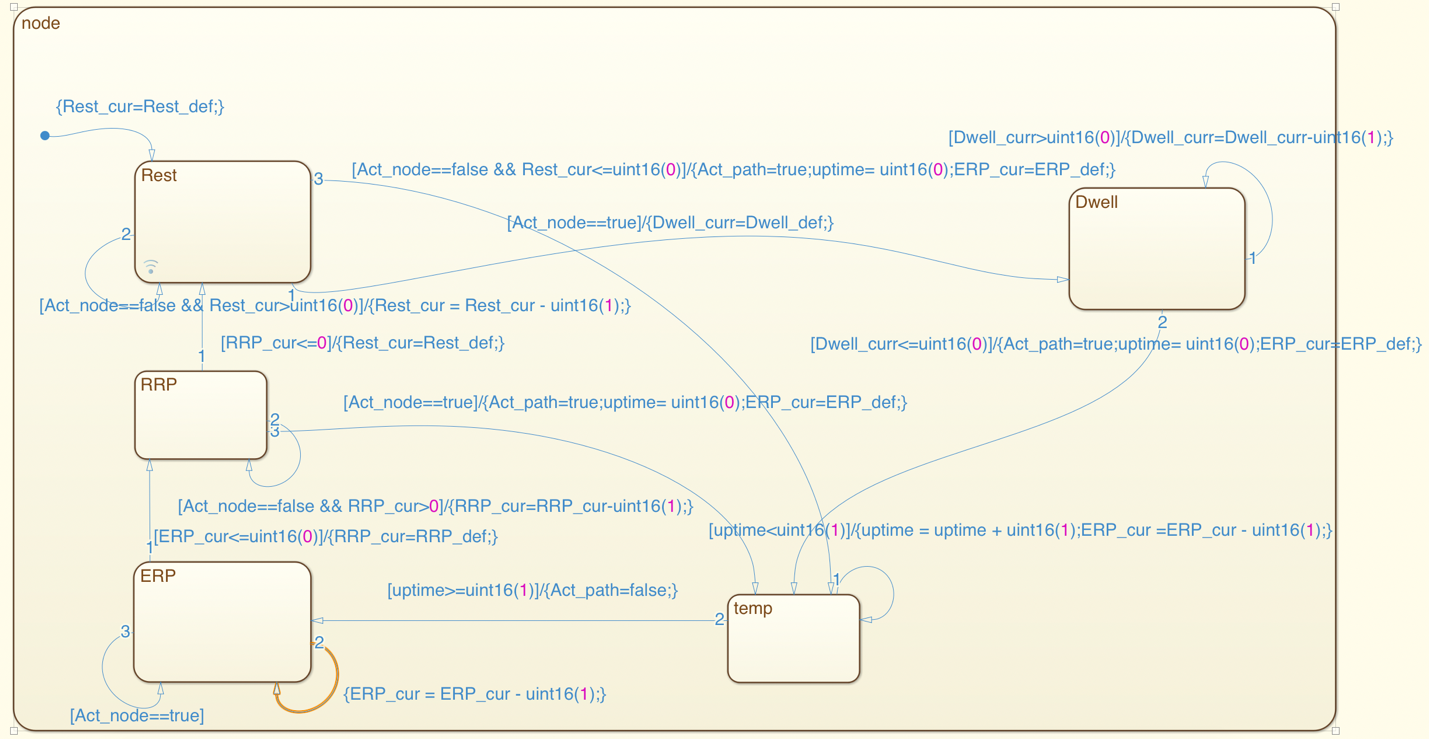
4. AV Block



5. AV delay



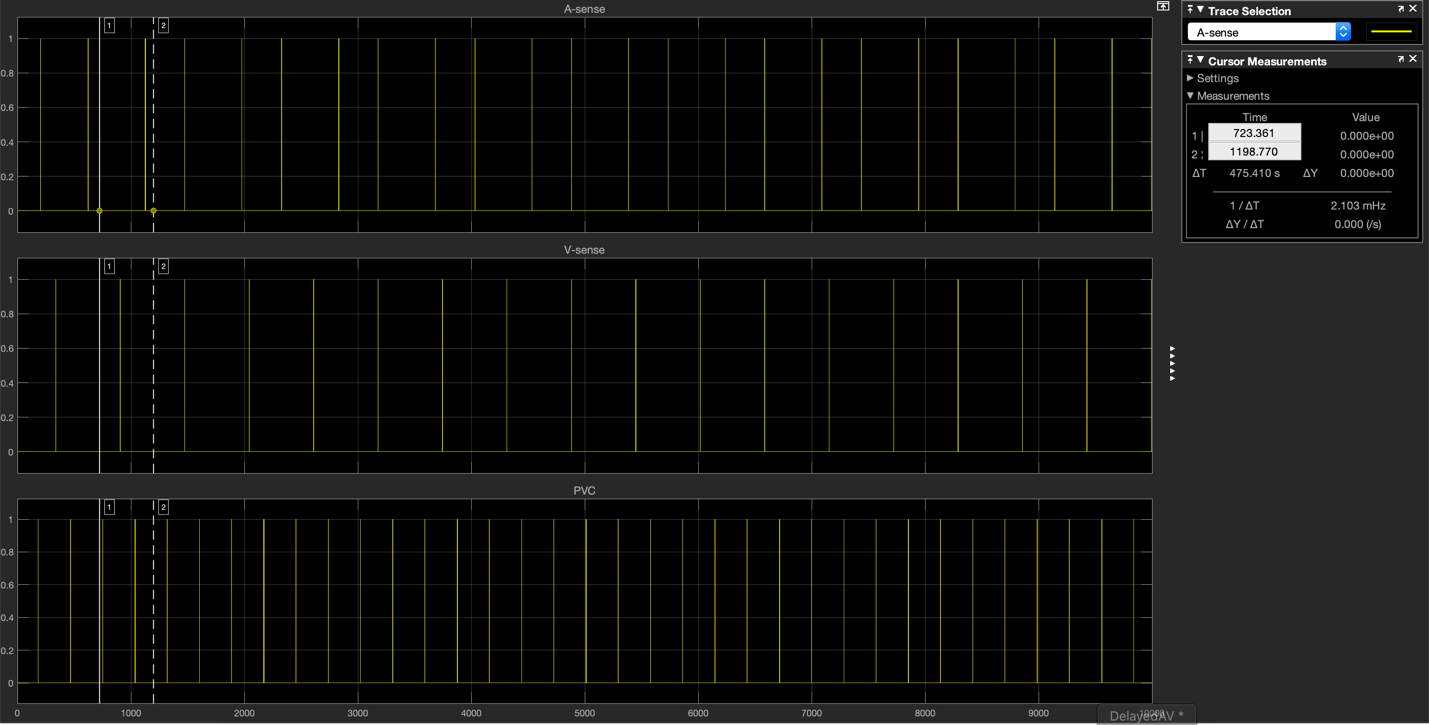
When should the chart enter the Dwell location? When should it move on to location temp?



It should enter the Dwell location when Act\_node is detected. When Dwell\_curr counts down from Dwell\_def to 0, it should move on to location temp.

6. Premature Ventricular Complex

With PVC, we can see the affected A senses. Between channel 1 and channel 2, we can see the A event propagated from the PVC.

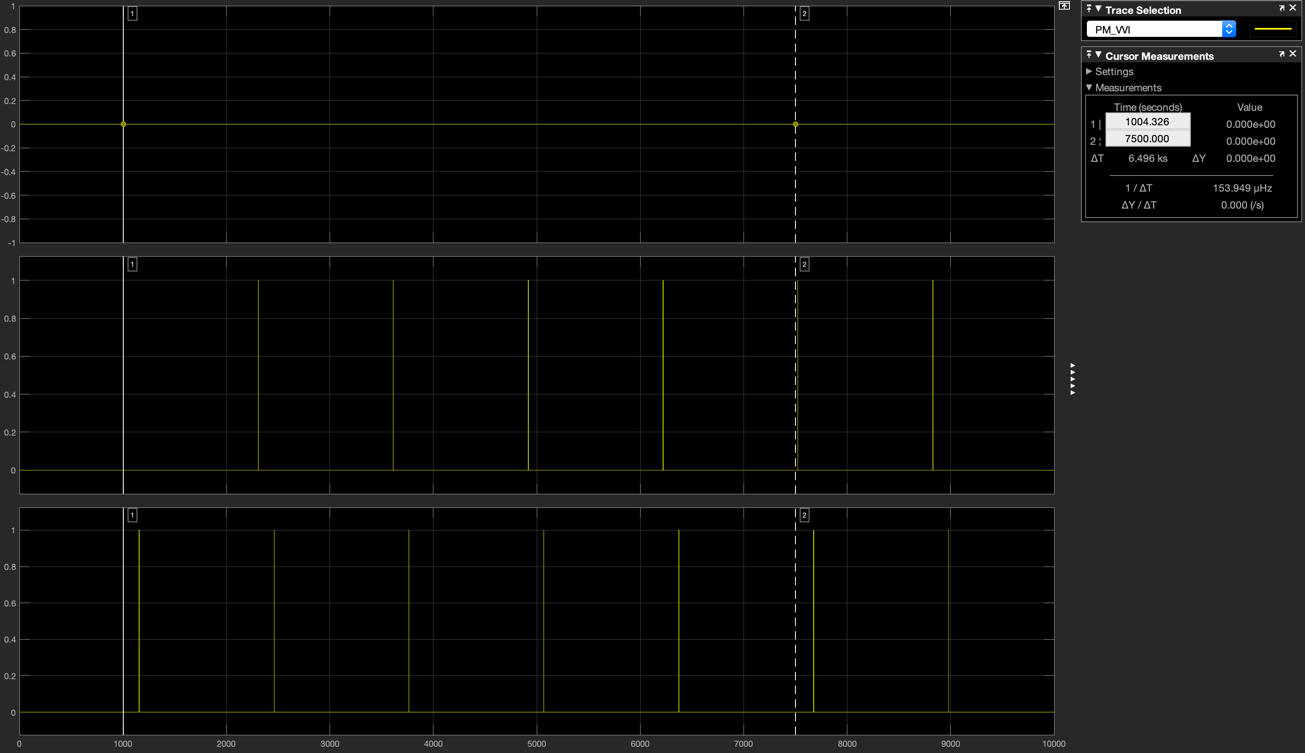


What should the Rest\_def of PVCNode be set to, to guarantee that we observe a V event that propagates back up to the atria?

Rest\_def of PVCNode should be set to a value that let a fire from PCVNode avoid the ERP period of the AVNode and the Atrium node.

1. Observe VVI pacemaker

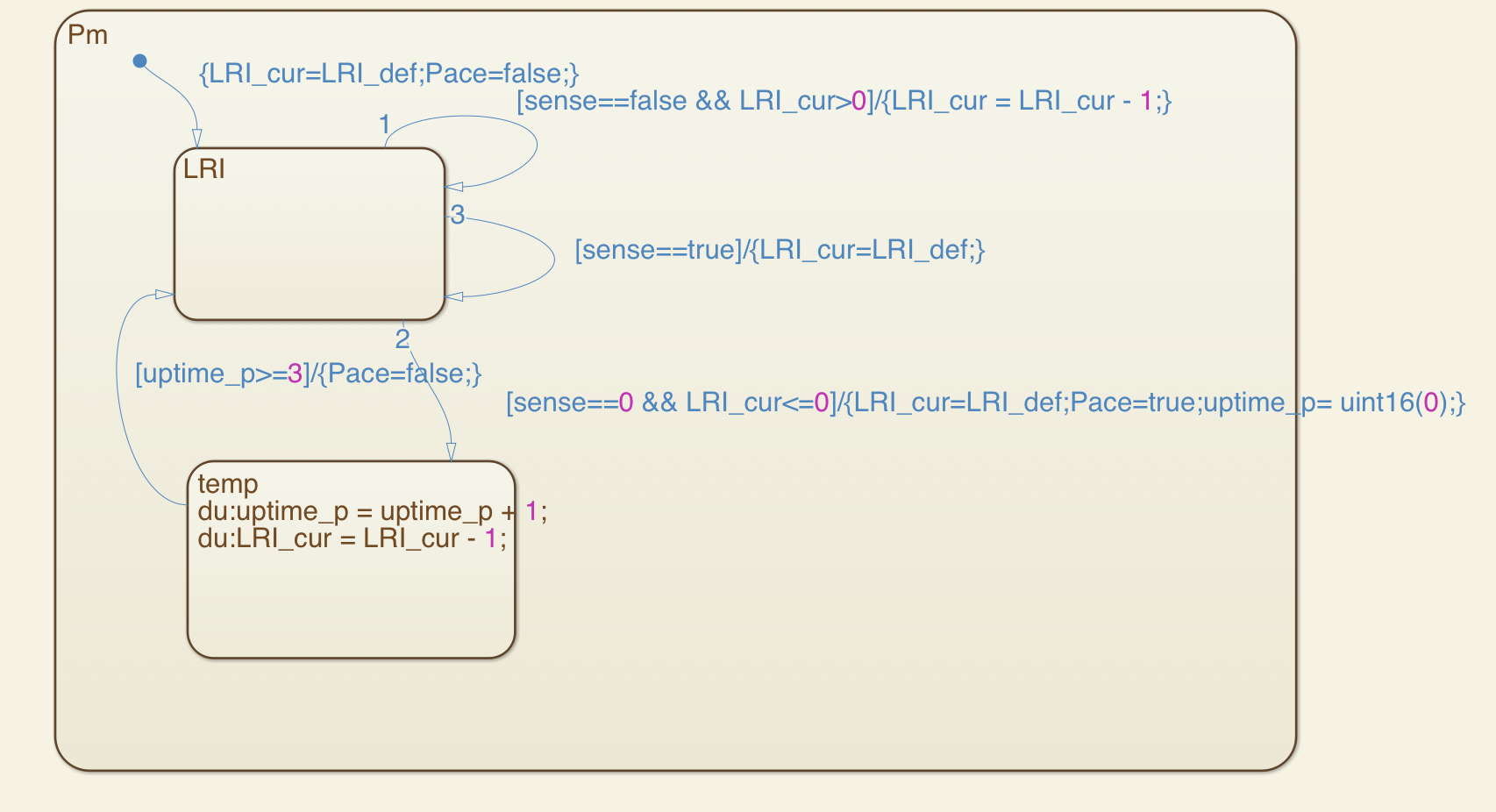
Do you see the PM pacing? Why, or why not?



From the screenshot of the scope, PM is not pacing.

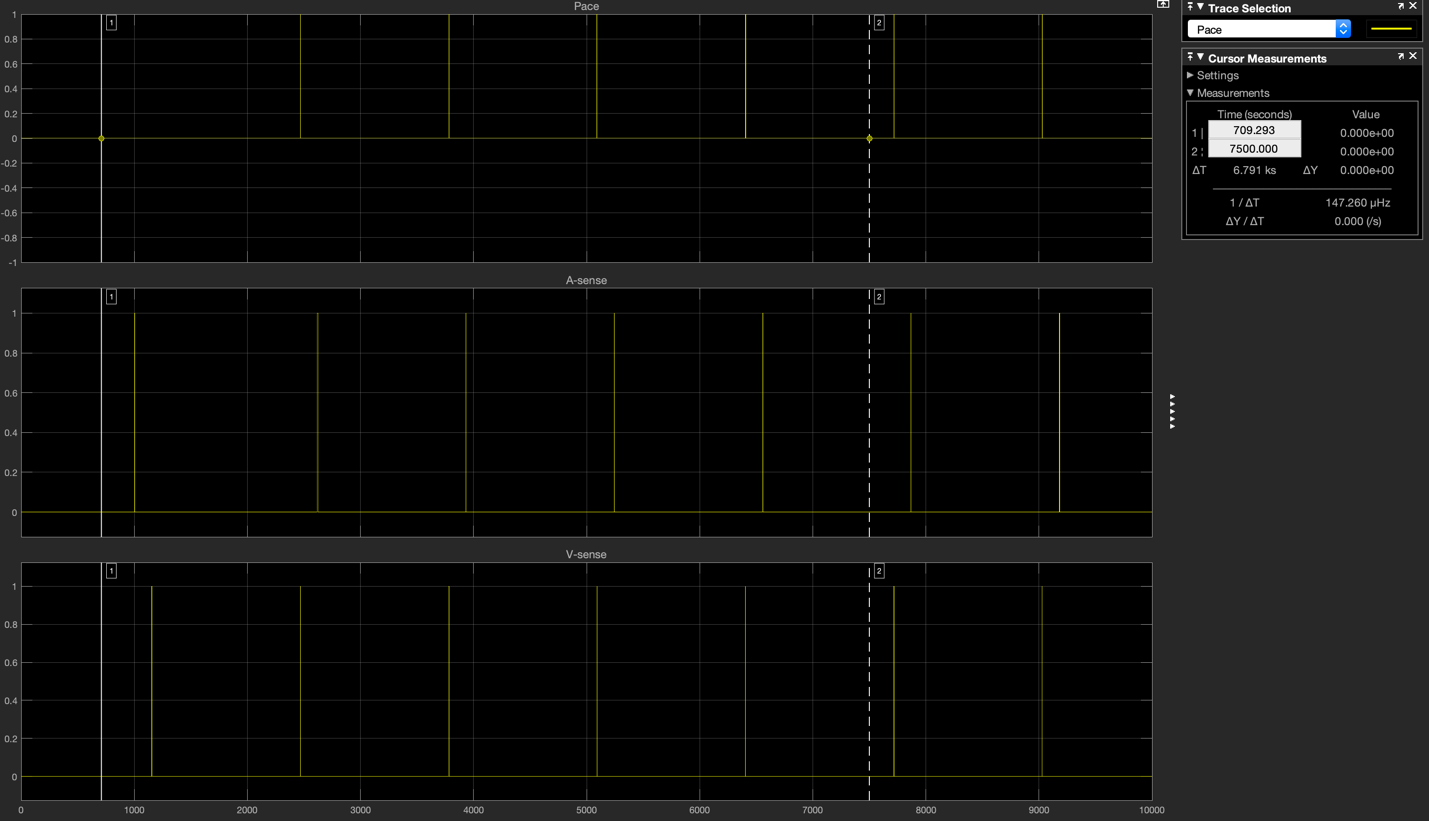
The uppermost scope view represents PM pacing. It is constantly 0. So, PM is not pacing.

Explain how the LRI\_def value of 1300 prevents any pacing.



For PM to pace, LRI\_def should be smaller than the V-sense period. Or LRI\_cur will always be set to the default LRI\_def value when it counts down because it will receive a V even while it’s counting down. Since V sense period is the same as the atrium period, and 1300 is the same as the atrium period, so it will not pace.

2. Debugging the VVI



The PM will pace because 1310ms is shorter than 1800ms. The period for V sense is 1800ms.The PM will pace when it doesn’t receive a V event after 1310 count-down.

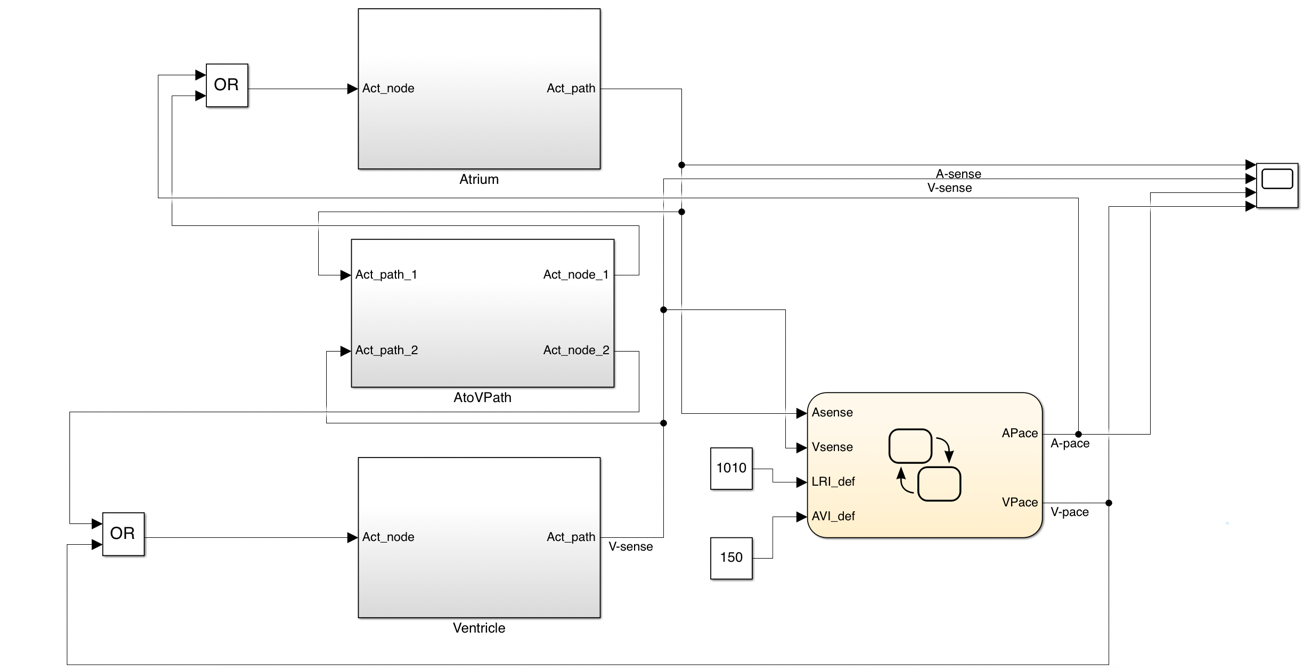
We need to set LRI\_def to be larger than 1800 to make the PM not pace. The screen shot below is for LRI\_def equal to 1810.



3. Maintaining the minimum heart rate

Where should you connect Asense and Vsenseports?  
Where should you connect Apace and Vpace ports, and how?

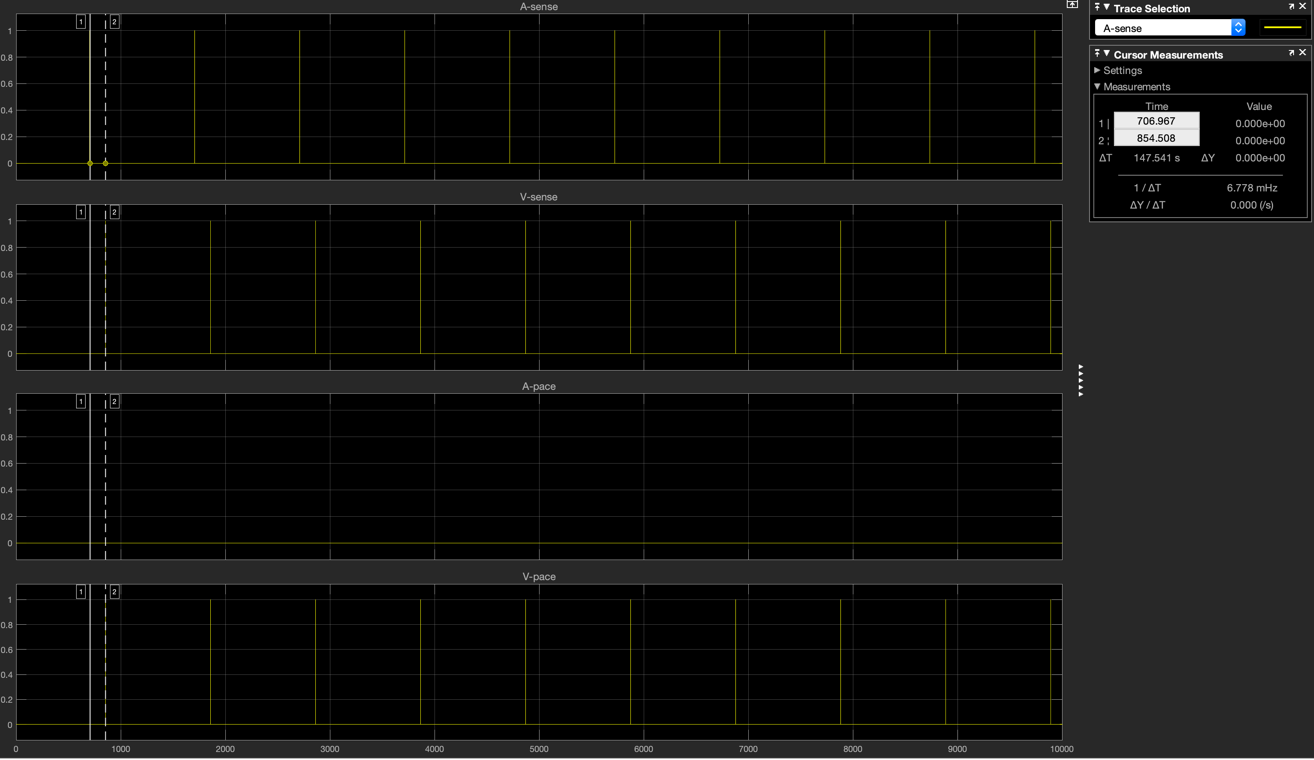
As below.

  
What should you set the LRI\_def to so a heart rate of about 60bpm is maintained?

Set LRI\_def to be larger than 1000ms which is the period of Asense to make sure there is not Apace.  
What should you set AVI\_def to?

Set AVI\_def to 150 to ensure a 150ms delay instead of 500ms. So AVI\_def should be set to be the maximum delay between A event and V event to avoid excessive delay.

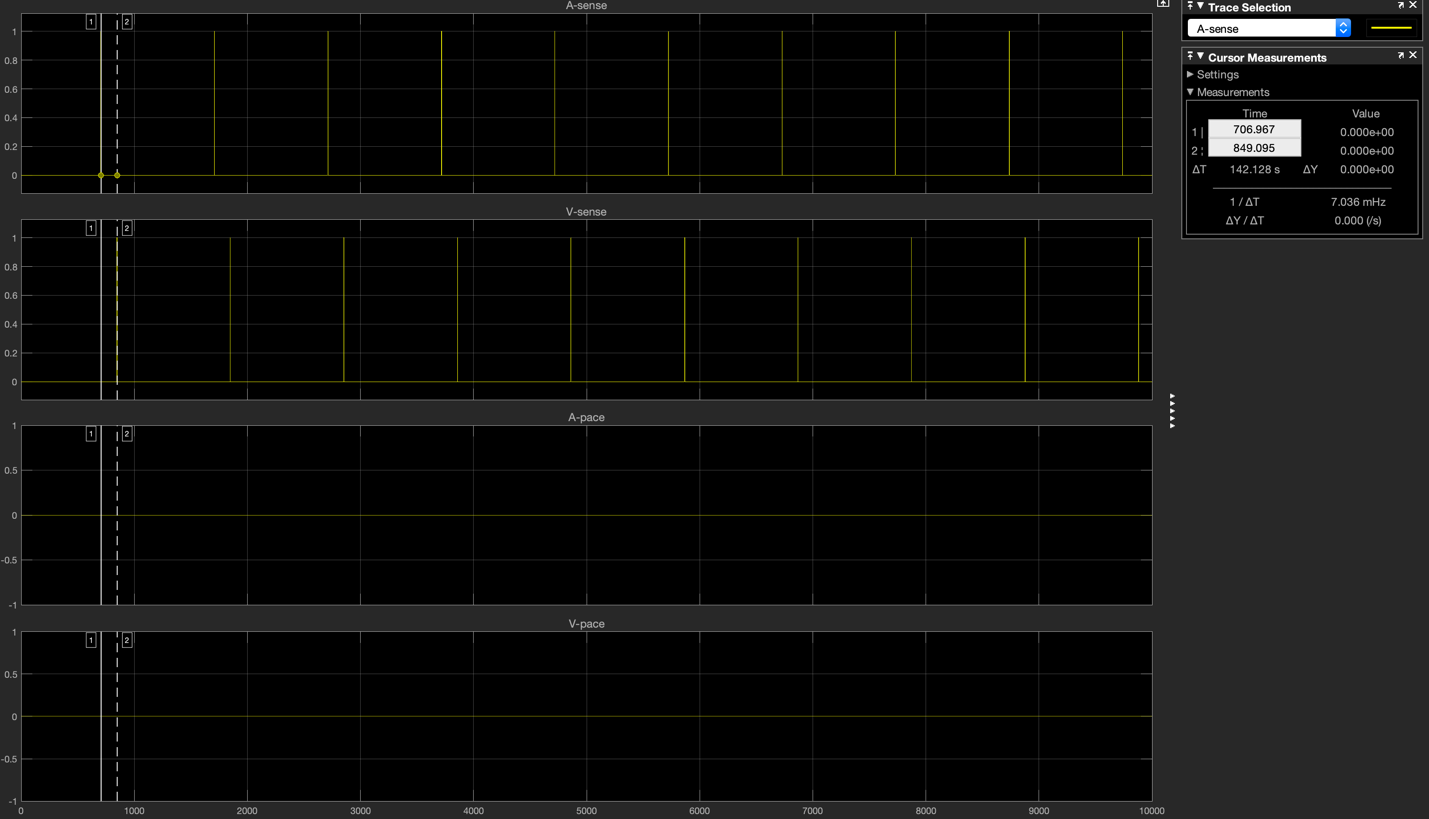
The scope result is as below.



4. Getting familiar with the pacemaker

a. Adjust the heart model parameters

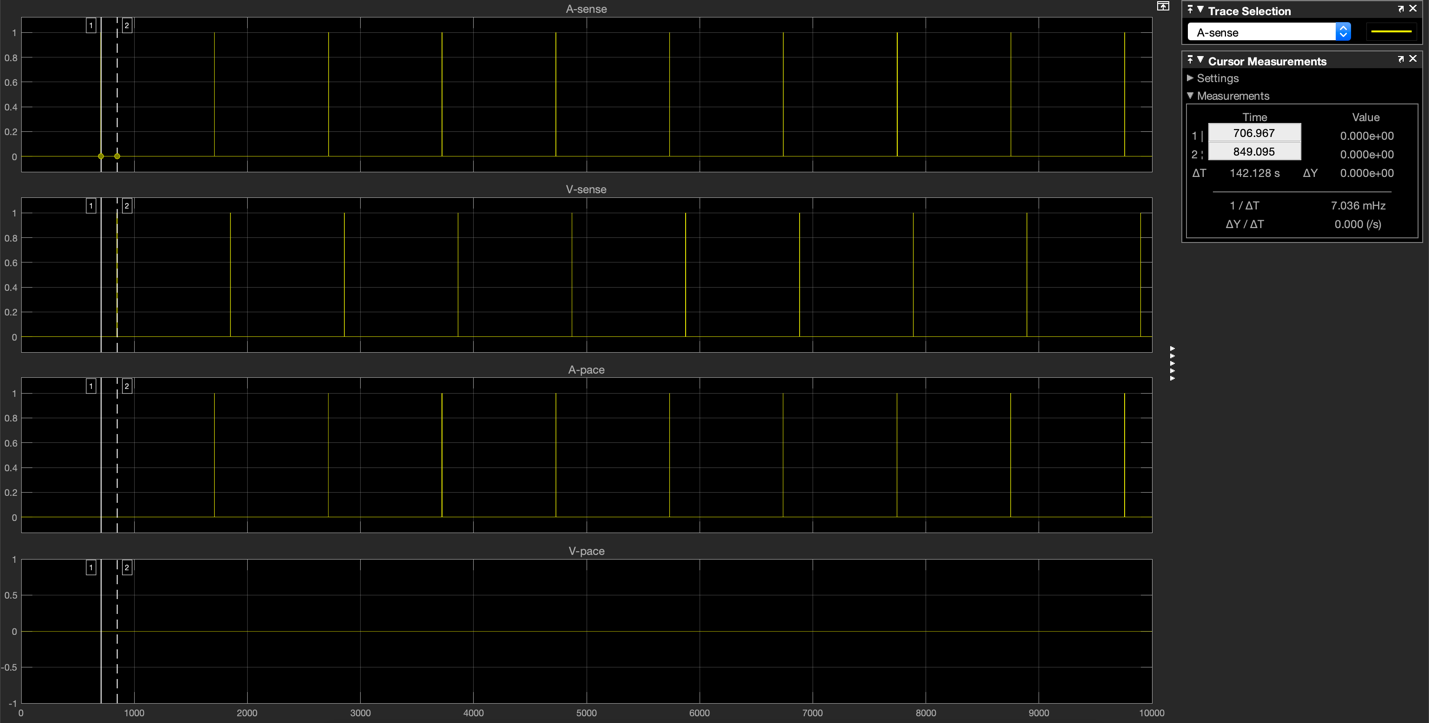
i. I changed the conduction delay from 500ms to 140ms.



ii. I changed the conduction delay to 160ms.



iii. I changed the conduction delay to 140ms and the ERP\_def for the atrium to 400ms. The Rest\_def for the atrium stays 700ms.



iv. I changed the conduction delay from 500ms to 160ms and the ERP\_def for the atrium to 400ms. The Rest\_def for the atrium stays 700ms.



b. They correspond to (1) normal sinus rhythm, (2) excessive AVNode delay, (3) bradycardia, (4) both brady cardia and excessive AVNode dealy respectively.

5. What is the set of values of LRI\_def and AV\_def that produces each of the above observations?

Let Atrium’s rest period be Ar, Atrium’s ERP period be Ae, conduction delay be cd

(1) LRI\_def > Ar + Ae AV\_def > cd

(2) LRI\_def > Ar + Ae AV\_def < cd

(3) LRI\_def < Ar AV\_def > cd

(4) LRI\_def < Ar AV\_def < cd