

Equipment Setup:

- IX-RA-834 or IX-RA5S Data Recorder
- Octapolar EP Catheter
- iWire-EP Catheter Interface
- 4 Platinum Needle Electrodes (C-ISO-PN) for surface ECG
- Stimulator Cables (C-HVS-B2)
- 2 Grounding Cables (C-USG-B)
- *Optional:* Complete Small Animal Heater Controller (SA-TCS-6 or SA-TCS-8)



Figure 1: Intracardiac setup.

Overview:

An EP (Electrophysiology) Catheter ECG is a diagnostic procedure used to evaluate the electrical activity of the heart. It is typically done to assess abnormal heart rhythms (arrhythmias) and involves the use of a specialized catheter inserted into the heart to record its electrical signals and to apply electrical stimulation.

Recorder Setup:

1. Place the recorder (IX-RA-834 or IX-RA-5S) on the bench close to the computer.
2. Connect the USB cable to the recorder and the computer. Turn the recorder on using the power switch on the back left of the device.
3. Plug the iWire-EPCath into the iWire port 1 of the IX-RA.



Figure 2: iWire port 1 connection.

4. Plug the C-HVS-B2 cable into the HVS ports of the IX-RA.

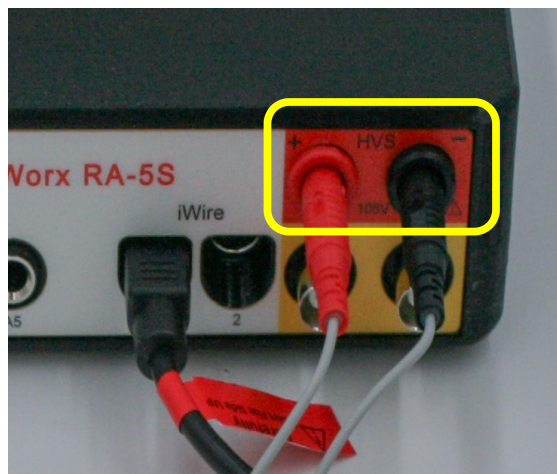


Figure 3: HVS port connection.

5. Plug the C-USG-B grounding cable into the ground connection on the back of the IX-RA.
6. Start **LabScribe**. The **LabScribe** Main window will appear once the program opens.
 - From the Main window, select the **Settings** tab and then click on “**Load Group...**”.
 - Locate the **Research Settings** folder (default location is: **C:\Program Files\iWorx\Labscribe\Research Settings...**), Open the RA-Settings folder which contains the settings group ResearchRA.iwxgrp. Select this group and click Open.
 - Select the **Settings** tab. Below “**Default Setting**” is a list of settings, select the Intracardiac EP menu and then the **2ECG-4EP-S1S2-iWireEPcath** settings file from the list.
 - LabScribe will be configured by the **2ECG-4EP-S1S2-iWireEPcath** settings file, and a pdf setup document will open.

***Note:** if you do not see the Research Settings folder in the LabScribe folder, Reinstall LabScribe, making sure that the Research settings are installed.*

Surface ECG:

1. The mouse is anesthetized with 2% isoflurane in 100% Oxygen at 300mL/min (following induction in a chamber containing 3-5% isoflurane). The temperature may be monitored and maintained within 37-38 deg C using the TCS-100 Temperature control system.
2. Insert the 4 needle electrode into the iWire-EPCath RL, LL, RA and LA connections.

***Note:** The color of the needle electrodes does not matter. As long as the channels correspond to the correct limbs of the rodent, any wire can be used.*

Mouse Prep Video: <https://youtu.be/1hiyj16aT9w>

4. Insert the Needle electrodes subcutaneously into the limbs of the mouse as follows:
 - The needle electrode plugged into LA is inserted into the Left Arm of the mouse/rat.
 - The needle electrode plugged into RA is inserted into the Right Arm of the mouse/rat.
 - The needle electrode plugged into RL is inserted into the Right Leg of the mouse/rat.
 - The needle electrode plugged into LL is inserted into the Left Leg of the mouse/rat.



Figure 4: iWire-EPCath RL, LL, RA, and LA connections.

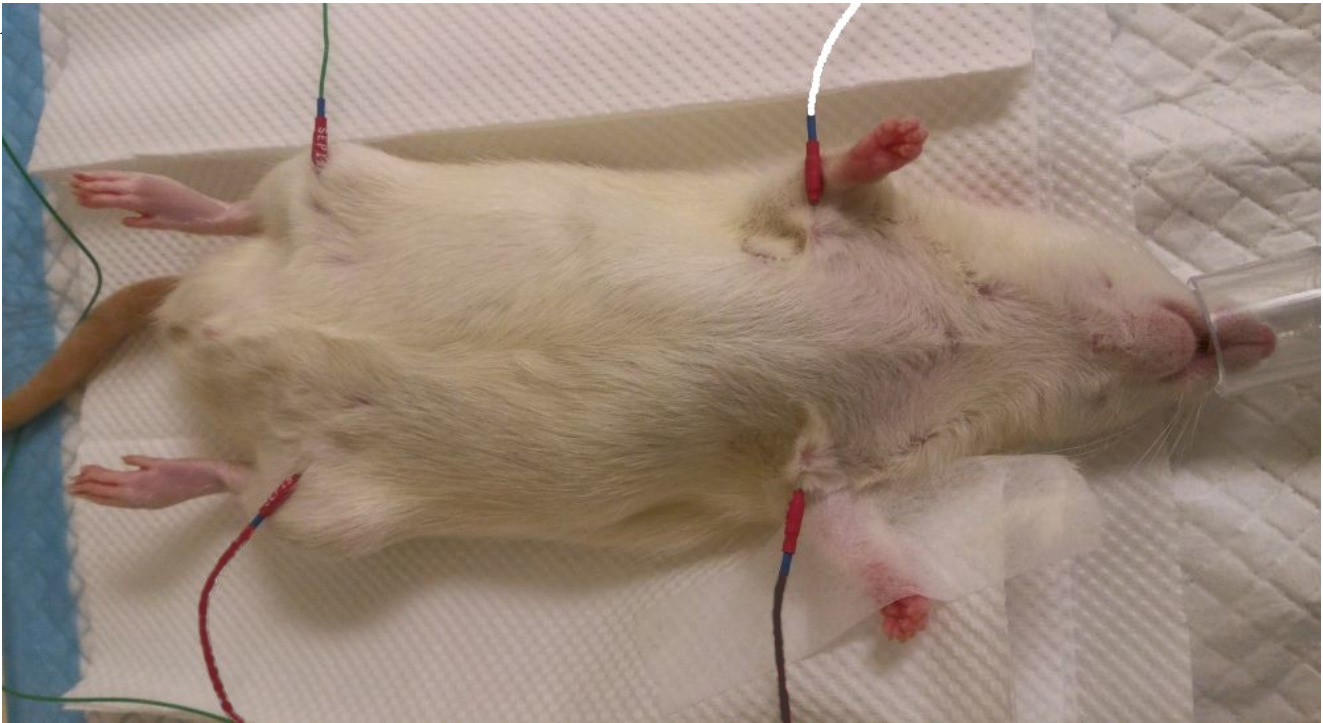


Figure 5: Mouse experiment setup. LA (Left Arm), RA (Right Arm), RL (Right Leg), and LL (Left Leg) needle electrodes.

Intracardiac ECG:

The Intracardiac EP Catheter has 8 segments.

- Two segments are typically used for stimulation. The particular segments used for stimulation depends on the protocol being followed.
 - High Voltage constant current stimulator (use C-HVS-B2)
 - Low Voltage constant voltage stimulator (use C-BNC-B2)
- Six segments can be used for recording ECG.

1. Plug the EP Catheter into the catheter input of the iWire-EPCath.
2. Plug the Red and Black connectors of the C-HVS-B2 into the Stim + and Stim - inputs of the iWire-EPCath.
3. Set the Stimulation switch to either Off setting.

Note: *There is no difference in either Off setting on the stimulation dial.*



Figure 6: EP Catheter input, Stim +, and Stim - inputs.

Mouse Surgery and Catheter Insertion:

Video: <https://youtu.be/9GbLNZUC1iE>

Stimulation:

Information on Stimulation can be found in our LabScribe manual by navigating to:

- In the LabScribe toolbar Select: Help → Help (Manual)
- Section 5: The Stimulator



Recording with LabScribe:

1. Initiate recording by pressing the red icon labeled “**REC**”. The icon will now change to black and be labeled “**STOP**”.
2. It may take up to 30 seconds for the ECG signal to level out.
3. Select the ‘AutoScale all Channels’ button at the top of the toolbar.The icon for the 'AutoScale all Channels' button, showing a red and blue waveform with a double-headed vertical arrow.
- This button can be pressed as many times as necessary throughout recording, or the recording can be continually AutoScaled in real time by selecting: View --> Display --> and Online AutoOffset. This will use the mean values of your data to adjust the trace view so you don't need to keep clicking Autoscale.
4. The HVS stimulator can be fired by clicking on the Fire button on the Stimulator toolbar.
5. When the recording is finished Click the “**STOP**” icon.

Reducing Noise:

- Make sure that the heater used for maintaining the animal is a shielded low noise heater.
 - The iWorx SA-TCS-6 system which includes the TCS-100 is designed to minimize the noise from the heater.
- The heated bed may generate noise in the system. To minimize this, the electrode wires can be wrapped in tinfoil.
- Reduce the wire length and braid the electrode wires, to reduce any power supply noise pickup.
- A second grounding cable can be utilized if necessary.
 - Try grounding the IX-RA and/or the animal to the earth ground.
 - Try grounding the iWire-EPCath to ground using the C-USG-B cable.

Troubleshooting:

- Using the IX-RA-834 only: If the segments in the EP catheter become polarized, to depolarize them, connect the segments together.
 - For example: If segments 1 and 2 were used for stimulation and you want to record from them, connect segments 1 and 2 to each other before attaching the recording leads.