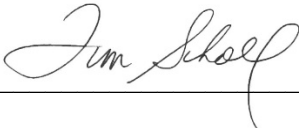


SOP Number:	350.01	
Title:	Monitoring System	
Version Number	Effective Date	Changes
350.01	30 September 2025	

Directors Signature:  Date: 2025/SEP/30

1. SCOPE

- This SOP outlines the steps required to set up the monitoring system.

2. PROCEDURES

a. Location

- The MRI area designated for this procedure is 2245 (Zone 3 and Zone 4).

b. Personnel

- This procedure should only be undertaken by those who are confident. Otherwise, please contact a TIRF facility staff member.

c. Components

- Laptop
 - Used in conjunction with external monitor and adapter – located in 2245.
- Black Box (Fig 1).



Figure 1

- USB to USB-C adaptor to connect the USB cable (next item) to the laptop.
- USB cable to connect the black box to USB to USB-C adapter.
- Frankenstein Power Supply (Fig 2) - 4 power supplies grouped as one.



Figure 2

- Long DB15 Cable
 - Connect the penetration panel to the transducers box (Fig 3).



Figure 3

- Transducer Box
 - The transducer box (Fig 4.1) should be already attached to the animal support bed and the connections for the temperature sensor, the heater, the respiration pillow, and the other end of the long DB15 cable (Fig 4.2)

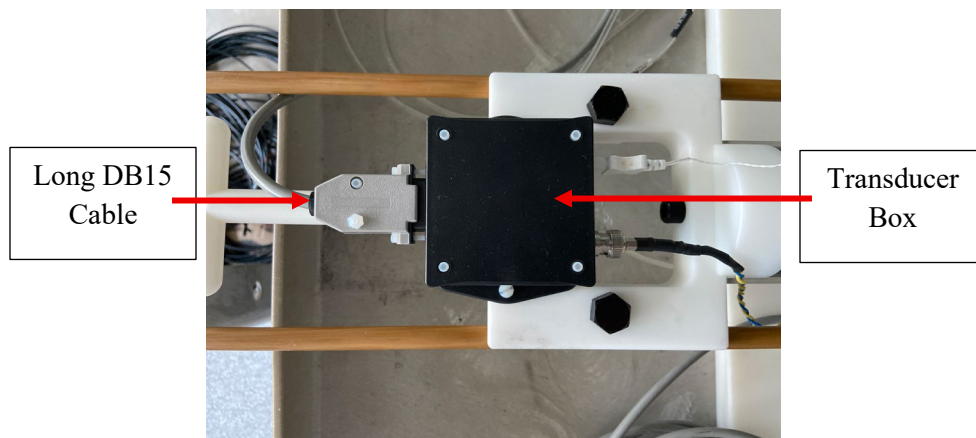


Figure 4.1

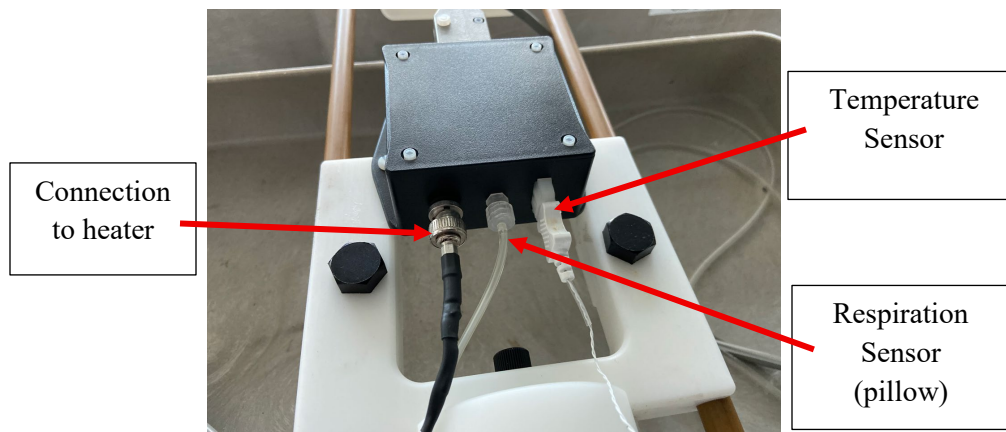


Figure 4.2

d. Connections

- Connect Black Box to the Laptop.
 - Use the USB to USB-C adaptor and the USB cable. (Fig 5).

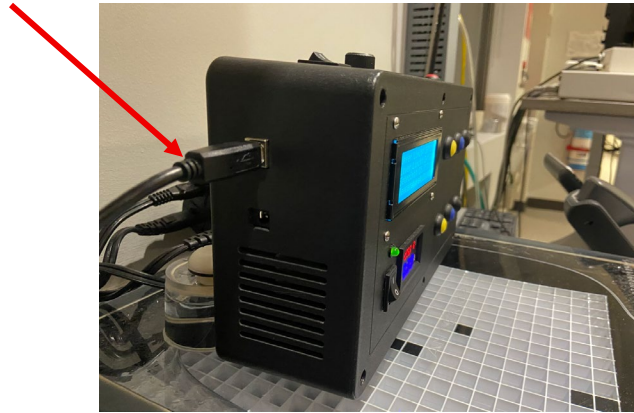


Figure 5

- Connect Frankenstein Power Supply to the Black Box (Fig 6.1)
 - The connector has a specific position, once it is fully connected you can tighten the connector cap. The rotation of the cap should be smooth. DO NOT FORCE IT.
 - With the short DB15 cable, connect the black box to the penetration panel (Fig 6.2)

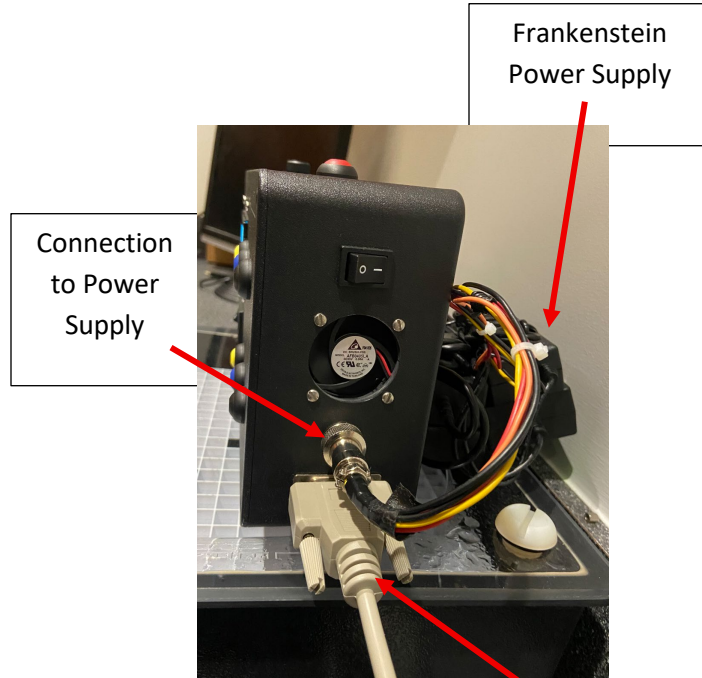


Figure 6.1



Figure 6.2

Short DB15 Cable
from Black Box to
Penetration Panel

- Inside the MRI room (Zone 4), connect the other end of the long DB15 cable from the transducer box to the penetration panel, as indicated by the black arrow (Fig 7).

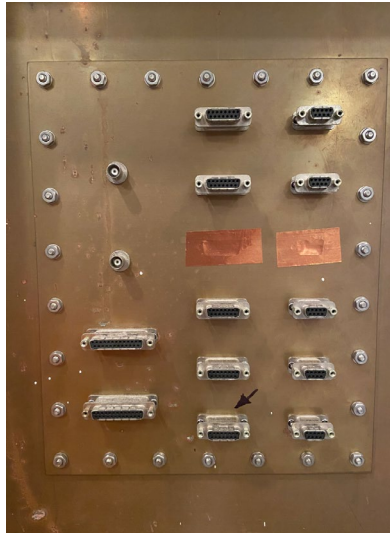


Figure 7

e. Operation

- Turn on the laptop – Password: superluc
- Once the computer is running, double the icon “Animal_Monitoring_Software_MRI_V5” (Fig 8).

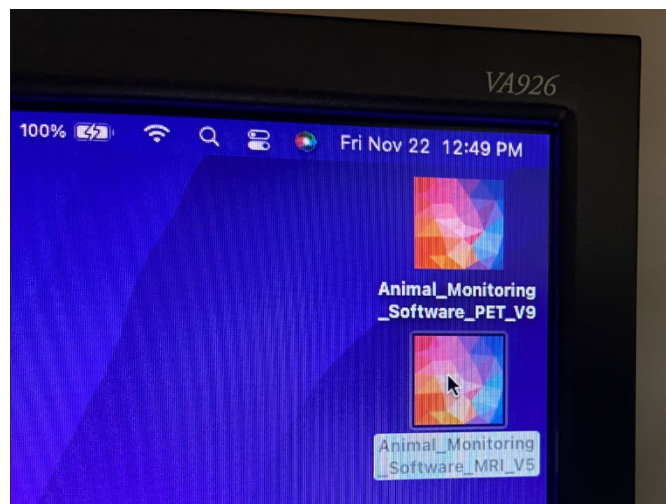


Figure 8

- Once the application launches, select the pull-down menu “Port” and select any of the “...usbmodem...” options. In this example “dev/cu.usbmodem14401” (Fig 9).

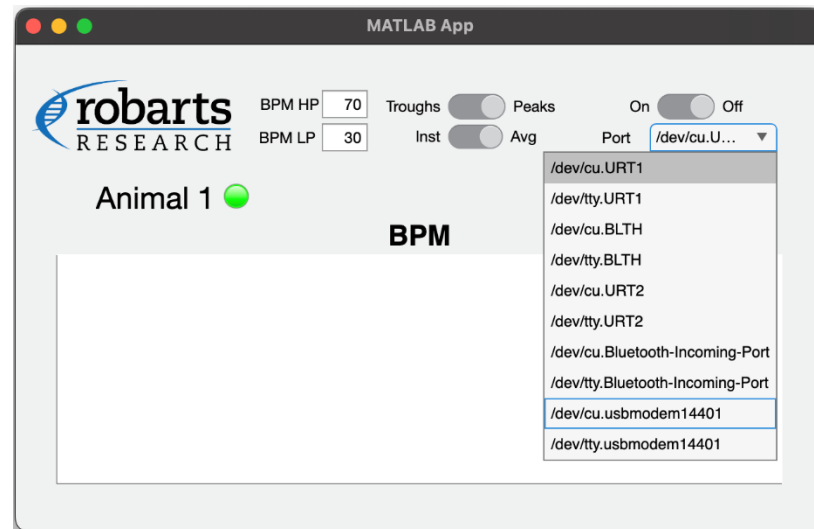


Figure 9

- The following message indicates a successful connection, “Arduino found at /dev/cu.usbmodem14401” (or the other “/dev/tty.usbmodem14401” if it was selected), as shown in the figure 10.
- Then, select the following options: “On” (A), “Troughs” (B), and “Inst” (C), as shown in the previous figure. Once you select the “On” position, you should start acquiring a waveform representing the respiration. “Inst” means “Instantaneous” and it reports the instantaneous Breaths per Minute (BPM). The other option is “Avg” (Average) corresponding to a 10 second average (the length of the recording displayed) but that option is not recommended. Depending on the position of the respiration pillow, sometimes the “Peaks” are better defined than the “Troughs”. If that is the case, select the “Peaks” position.

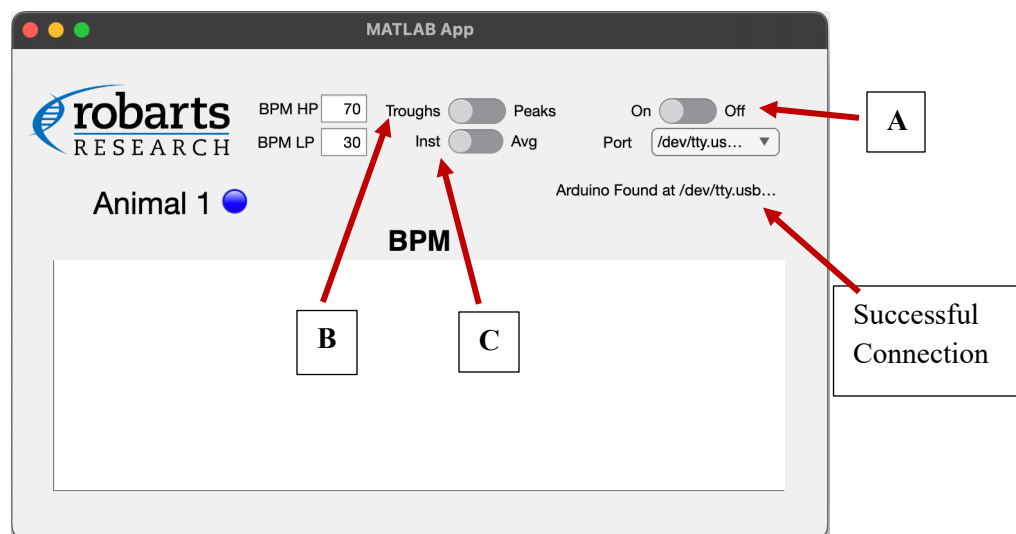


Figure 10

- The black box has several ON/OFF switches. For an automatic temperature control, select the following switch positions.
 - Switch at the front (left of the Voltage/Current display), should be “ON” (Fig 11).

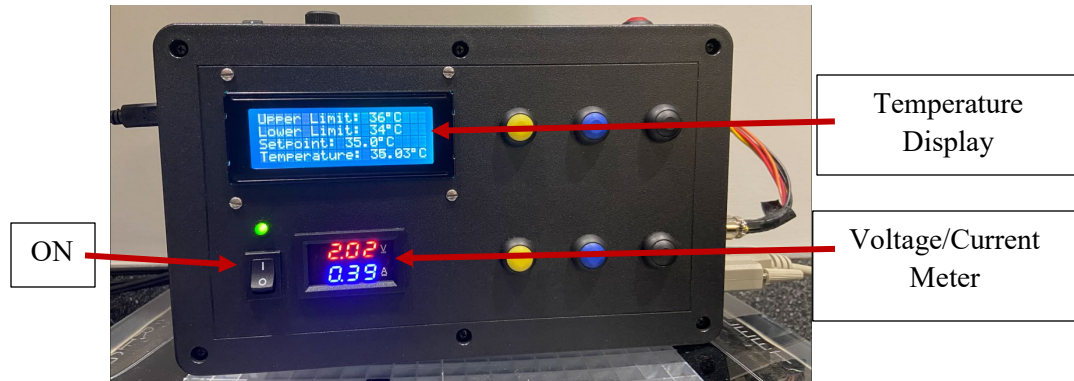


Figure 11

- Switch at the right side of the black box should be “ON” (Fig 12.1).
- Switch at the top of the black box should be “OFF” (Fig 12.2).

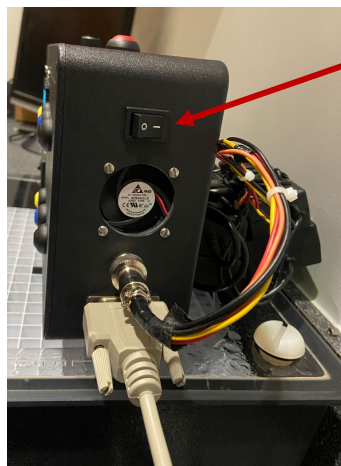


Figure 12.1



Figure 12.2

- The Set Point is adjusted using the black push buttons in 0.5 °C increments, typically set to 38 °C.
- The Upper Limit is set with the yellow buttons in 1 °C steps, usually 2 °C above the set point (e.g., 40 °C). If the measured temperature exceeds this limit, the display turns red.
- The Lower Limit is set with the blue buttons in 1 °C steps, typically 2 °C below the set point (e.g., 36 °C). If the temperature drops below this limit, the display turns blue.
- When the temperature is within limits, the display remains green.

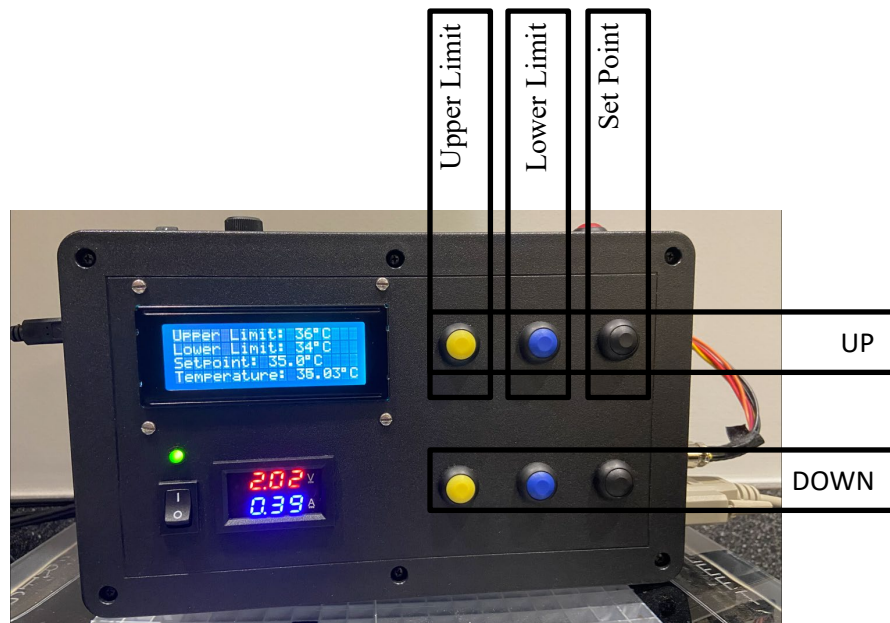


Figure 13

- When no current is flowing, the indicator will read 0.00 A. If the temperature is low and current reads zero, verify all connections.
- The Black Box delivers a maximum of ~5.0 V and 1 A to the animal heater. Adjusting these limits requires internal hardware modifications.
- A brief temperature overshoot is normal when changing the mouse. The system will automatically adjust the current to stabilize at the set point.
- Maximize the app window on your computer for better visibility of the respiration trend from a distance (Fig 14). A respiration rate below 20 BPM may indicate the animal is in distress, while a rate above 90 BPM suggests the animal may regain consciousness and move within the scanner.

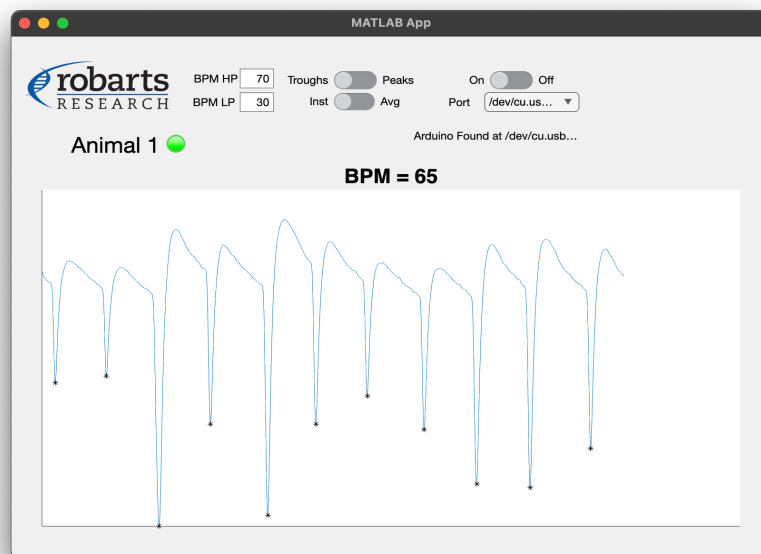


Figure 14