Behavior & Physiology

Combining Running Wheels & Light Sensor with DSI Telemetry

Background

The rodent Running Wheel represents a very simple and clever way to register animal physical activity in its home cage environment. The use of this high throughput tool is particularly relevant for research involving circadian rhythms, phenotyping and drug testing. Typically, the time and distance run on a voluntary running wheel are monitored over several days or weeks to determine whether a particular substance or experimental manipulation has an effect on exercise behavior. Running wheel events may be acquired by DSI's Ponemah software via the Signal Interface solution for synchronized recording with physiological signals, such as activity/sleeping events, body temperature, heart rate, etc. Simply add a light sensor to correlate circadian rhythm with day/night light cycles.

Software Setup

The following instructions provide details on setting up the Signal Interface channels to correctly measure running wheel activity and ambient light.

Connect a Signal Interface and enable desired channels

1. Connect the Signal Interface to the MX2 using its USB cable.
   For more details please see the Signal Interface section of the Ponemah v6.x user manual.

2. Connect running wheels to the Signal Interface Digital Channels 5-12 using the D-sub to 8x BNC splitter cable supplied by DSI (see appendix).
3. Connect the Light Sensor to one of the Analog Channels 1-4 on the front of the Signal Interface using the BNC to BNC cable supplied by DSI (see appendix).
4. From a Ponemah Experiment, select **Hardware | Edit PhysioTel HD/MX2 Configuration**.
5. Verify the Signal Interface is recognized with the MX2 it is connected to - its icon should be green.
6. Select the Signal Interface from the list on the left and enable the channels corresponding to your connected devices.
7. Configure all implants to the RPC receivers.
8. Select **Save & Exit**.

Example: An Experiment using a light sensor in the room to monitor light level along with one running wheel would have two channels enabled as pictured (Ch1 – Light Sensor and Ch5 – Running Wheel).

Assign Signal Interface Channels to Subjects

1. Navigate to the **Setup menu | Subject Setup**.
2. Select the **Signal Interface Setup** button at the bottom of the dialog.
3. Select which subject each input channel will be associated with using the dropdown menu.
    a. Running Wheel – Assign individual Subjects to their associated Running Wheel
    b. Light Sensor – Assign all Subjects to the Light Sensor.
4. Ensure the Analysis module assign to the running wheel and light sensor is set to **RAW**.
5. Give each channel an appropriate label to identify the running wheel. If using multiple running wheels, it can help to number them for easier identification.
6. The Units column should be set appropriately
    a. Running Wheel can be set to 'Counts' or 'Revolutions'.
    b. Light Sensor does not have units and can be left as 'RAW' or blank.
7. Once Signal Interface Channels are configured select **OK** to close the dialog.

NOTE: You will notice checkboxes in the Subject Setup for the Signal Interface channels. This is an alternate form of assigning channels to subjects. After data collected has been started the checkboxes will disappear because the channel association can no longer be adjusted.

Setting up the RAW channel for a running wheel to count running wheel activity

1. Select the **Attributes icon** for a running wheel channel, either from the Subject details or from the Channel Details page.

2. Verify the correct channel is selected at the top of the RAW Analysis Attributes window.
   a. Example shows a single running wheel was labeled as 'Wheel'.
3. Configure settings in the **Std Attrib tab** as in the example and then select OK.
   a. Threshold - .5
   b. Dead Time - 100
   c. Area Baseline – 0
   d. Area Units – Counts sec
   e. Trigger Direction – Rising
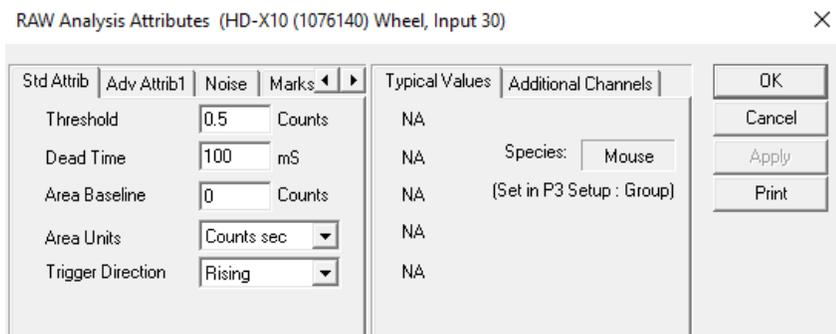
4. Repeat the settings for each running wheel channel.

Appendix

DSI D-sub to 8x BNC splitter cable with inputs labeled Ch 5-12
DSI part number: 274-0033-001
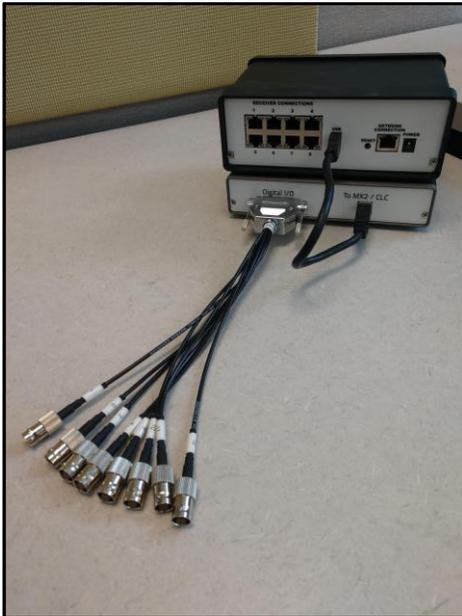
DSI Light Sensor
DSI part number: 275-0060-001