

DAM2 *Drosophila* Activity Monitor

The DAM2 *Drosophila* Activity Monitor measures the locomotor activity of 32 individual flies, each in a separate tube. As a fly walks back and forth within its tube, it interrupts an infrared beam that crosses the tube at its midpoint, and this interruption, detected by the onboard electronics, is added to the tube's activity count as a measure of fly activity.

In a typical experiment, an agar/sucrose food mixture is placed into one end of each tube, followed by the fly, and followed by a cotton plug in the open end. The 32 tubes are inserted into holes in the monitor case, and centered.

Over the course of the experiment, which may last for days or weeks, the counting circuits continuously monitor the activity in all 32 tubes, and at periodic intervals upload their count totals to the host computer for storage and later analysis. This daily record provides a good measure of both the intensity of locomotor activity and the relative periods of rest.

The DAM2 is fabricated from a transparent polycarbonate plastic, allowing light penetration to all points along the tube. It is compact, light in weight, and when used within an incubator, allows plentiful air circulation around the tubes. The through-hole design accommodates tubes of arbitrary length.

An on/off visible light sensor is built into each unit to provide a simple record of the ambient light state over time. This record accompanies the activity count data as it is acquired and stored, and is useful in analyzing circadian rhythms and adaptations of the flies to external light stimuli.

An optional gas distribution manifold is available to facilitate the controlled exchange of air within the tubes, as would be needed for hypoxia studies.



DAM2

Features

- 32 tubes for 32 flies
- 5mm tube diameter for *drosophila melanogaster*, 7mm for *d. virilis*
- Consistent operation in bright room light or darkness
- Ambient light sensor provides on/off record of entrainment cycles, stimulation pulses, and inadvertent light exposure.

Specifications

- Tube diameter: 5mm or 7mm
- Tube length: 65mm nominal, transparent glass or plastic
- Dimensions: 127 x 48 x 87 mm LWH
- Mass: 0.17 kg without tubes
- Ambient Light Sensor threshold: 10 lux nominal, photopic response curve
- Interconnect: 4 wire, 6 position, RJ-11 modular telephone line jack to PSIU9 DAMSystem network for 9V DC power input and data transmission
- Operating environment: normal laboratory, non-condensing

TRIKINETICS

Tubes

We supply tubes in Corning Pyrex glass (5 or 7mm diameter by 65mm length) and polycarbonate plastic (5mm diameter by 65mm length.) Both materials are transparent, and may be washed and autoclaved for cleanliness and sterility.

Fly Food

A food mixture must be placed into one end of each tube to sustain the fly over the course of a multi-day experiment. Many recipes are reported in the literature, but a simple one which works is as follows:

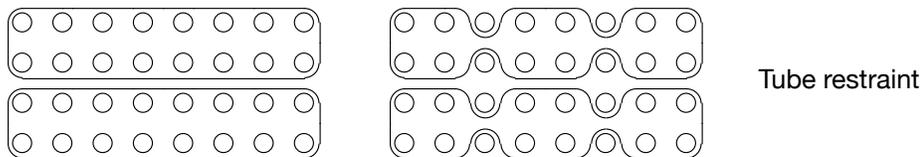
- 100 ml water
- 5g sucrose crystals
- 2g agar powder

Combine the ingredients in a glass beaker, and bring carefully to a boil using a hot plate or microwave oven. When the solids are completely dissolved, pour the solution slowly down the side of another glass beaker containing the glass tubes standing on end, to a level of about 15mm deep. Allow the mixture to cool and solidify. Carefully remove the tubes from the agar matrix, sealing the tops with a finger to retain the food, and wipe them clean. Then seal the food end of each tube with either a quick dip in melted paraffin wax or a plastic cap to prevent desiccation. The flies may now be loaded, one into the open end of each tube, and the tubes then plugged with cotton.

Monitor Setup

Tubes containing flies must be the proper diameter, and may have a wax coating or plastic cap on one end to seal the fly food. Insert the tubes through the 32 holes in the monitor, and leave them centered so that the detection beam will bisect the tube.

If captivation of the tubes is necessary to prevent sliding, use rubber bands, stretched first over the 4 corner tubes of 2 adjacent rows, and pressed up against the monitor surface. Then remove the tubes from columns 3 and 6, and reinsert them from above and below the bands as shown to place them into frictional contact.



With the tubes installed, the monitor may be plugged into the DAMSystem network.

Ambient Light Sensor

Each unit contains an ambient light sensor, which may be seen adjacent to the hole for tube #1. This sensor is set to discriminate light from dark at a nominal threshold of 10 lux, and will report its output with the count data at each collection bin. With the Monitor tab set to Live or Current and #nnn, the sensor output will be displayed in real time, and may be used for diagnostic purposes. When File data is retrieved from the monitor at the end of each bin, the light sensor will report dark(0) only if dark for the entire preceding bin. If the sensor measures light above its threshold at any point during the bin, it will report light(1) for the bin, serving to detect door openings or other lights-on transients.

The sensor output is reported in column 10 of the MonitorNNN file.

Data Collection

To verify that the monitor is operating properly, click Current Data and Monitor NN in the Display Selector of DAMSystem3, and then click NN up or down to choose the monitor number in question. The status box should be green (status 1), and the 32 channels of real-time count activity should be displayed. If a thin object such as a pencil point is moved through one of the tube cavities, the count total for that channel should increment.

The monitor will accumulate activity counts for as long as it has operating power, and will uplink its accumulated counts (and then reset to 0) whenever commanded to do so by the host computer. Counts will be accumulated as the flies are active in both total darkness and bright ambient light.

Precautions

The light detectors used in the counting beams are sensitive to ambient light in the infrared band, as would be emitted from a hot incandescent bulb. Such external light will normally not prevent the counting circuits from detecting fly movement, but may cause false counts if the level of such light changes rapidly (as when the light turns on or off, or is shadowed.) Fluorescent or LED lights, emitting principally in the visible band, will not cause such transient counts.

The DAM2 is vulnerable to corrosion damage if water penetrates its case while operating. Beware incubator condensation drips, and if standing water is detected, dry the unit immediately in a warm oven.

MAN2 Gas Distribution Manifold

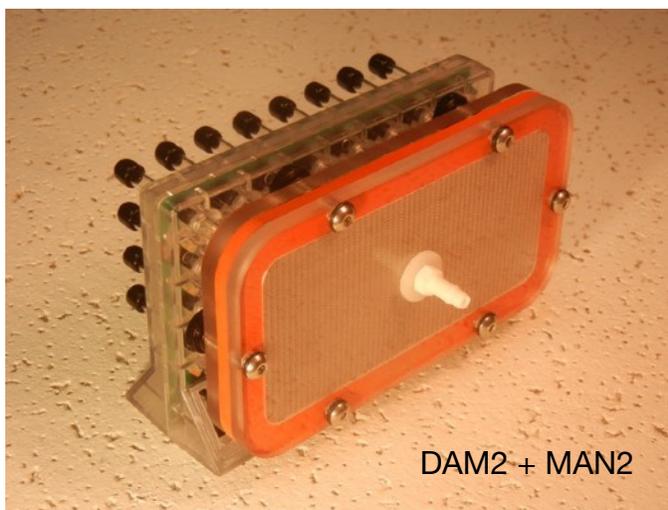
This accessory for the DAM2 provides controlled gas flow to the flies, allowing studies of drug and alcohol interaction and hypoxia. A common inlet port and manifold cavity distributes the gas to each tube, and small exit holes near their far end allow gases to escape, but not the flies.

A silicone rubber gasket seals each tube exit, and stainless-steel mesh prevents flies from exiting into the manifold cavity.

The manifold body is PVC plastic, making it robust to chemical attack, and the entire unit may be disassembled for cleaning.

Two manifolds, one on either end of the tubes, would provide a sealed system, preventing gas escape to the environment.

The inlet tube fitting accepts 3/16" ID flexible tubing.



DAM2 + MAN2