

# DPM *Drosophila* Population Monitor

The *Drosophila* Population Monitor is built around a standard 25 mm diameter plastic or glass *drosophila* vial. A fly-food mixture is cast into the closed end, and a population of flies is then inserted, followed by a cotton plug.

The vial is placed into the monitor, with the closed end protruding through the rear housing, and resting against the end stop. As the flies walk back and forth along the walls of the tube, they interrupt the infrared beam rings which cross in 3 places along its length. These beam interruptions are detected and counted by the onboard electronics, and the totals are reported periodically to the host computer over the DAMSystem wiring network.

The infrared beam rings form narrow planes of invisible light which cross the tube, perpendicular to its long axis. A fly which moves anywhere within the plane of such a beam, either on the wall or in the middle, will be detected and counted as an activity event. Multiple flies which penetrate the beam simultaneously may well be counted only singly, though the likelihood of such an exact coincidence will remain small as long as the number of captive flies is reasonable (<50).

The archival record of the aggregate activity within the vial over an extended period of time may be used to characterize the circadian rhythm of a population of flies, or study the impact of social interaction on such naturally occurring rhythms. The multiple beam rings provide such measurements at 3 different positions relative to the food and tube ends, either for redundancy or more detailed activity analysis.

## Features

- Uses standard 25 x 95 mm *drosophila* shell vials.
- Ring detectors at 3 axial positions provide robust activity measurement.
- Open construction allows light penetration to the vial contents.



- Adjustable end stop provides repeatable axial positioning of the vial
- Horizontal or vertical vial orientation.
- Consistent operation in ambient light levels from bright laboratory to total darkness.
- Accessories included: Glass vial

## Specifications

- Dimensions: 3.90 x 3.38 x 4.38" LWH (99 x 86 x 111 mm)
- Mass: 0.25 kg
- Beam ring separation: 0.94" (24 mm)
- First beam ring registration to end stop: 1.0" (25 mm) adjustable.
- Vial size: 25 mm diameter, plastic or glass
- Case material: ABS plastic
- Operating environment: normal laboratory, non-condensing

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## Data Collection

The 3 rings of infrared emitter/detectors each detect the passage of individual flies through their respective ring, and report the cumulative 'counts' to the host computer as monitor channels 1, 2, and 3 of 32. Channel 1 is derived from the bottom ring, that closest to the stop washer at the vial bottom, channel 2 is in the middle, and channel 3 is at the top, closest to the vial opening. The balance of the 32 channels will always record 0.

Flies are detected as they move through the infrared beam cross section, and thus 2 flies which move simultaneously through the beam ring may be detected as one. Such dropouts will begin to affect counting accuracy as the number of flies in the vial is increased. Also, the detection electronics is tuned for walking flies, and may miss those which quickly jump or fly through the beam ring.

## Mechanical

The monitor may be placed in a horizontal or vertical position for operation. The stop washer may be adjusted in or out with a nut driver or socket wrench to position the vial axially relative to the detector rings. Such a stop provides a registration basis for repeated measurements at a consistent position along the vial axis.

The stop washer may be removed completely if the unit is to be mounted to a long tube, such as would be used for an extended climbing or position preference assay.

## Troubleshooting

To verify that the monitor is operating properly, return to the Monitor tab and show Live or Current data for the single monitor (#nnn) 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 is moved through the vial cavity, the count total for 1 or all of the 3 channels 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 DPM is vulnerable to corrosion damage if water contacts its circuit boards while operating. Beware incubator condensation drips, and if standing water is detected, remove the power and dry the unit immediately in a warm oven.