

DAM5M *Drosophila* Activity Monitor

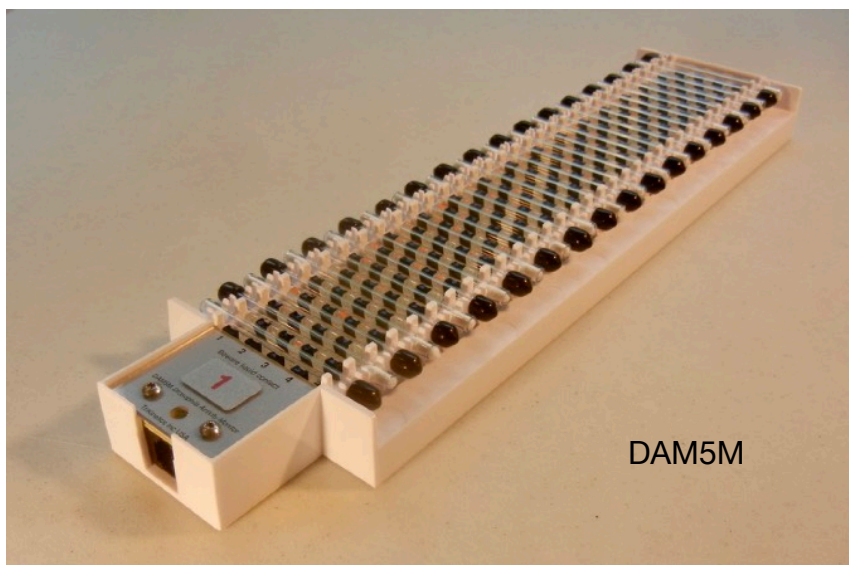
The DAM5M *Drosophila* Activity Monitor measures the locomotor activity of 32 individual flies, each in a 5mm-diameter tube. As a fly walks back and forth, it interrupts 1 of 4 infrared beams which bisect each tube, leaving a record of when and where it moved.

4 independent beams per tube allow the unit to record not only legacy counts, but also beam-to-beam moves, which reject nuisance in-place counting. The dwell time in each beam is also reported, enabling assays of position preference vs food, odor, orientation, light, etc.

Molded clips hold each tube securely in place, allowing the units to be transported easily and operated in any orientation. A wide-open layout opens the tubes to uniform light penetration, without shadow.

Features

- 32 tubes for 32 flies
- 5mm tube diameter for *drosophila melanogaster*
- 4 independent beams per tube
- Generates Counts, Moves, Dwell, Rest, and Position data for each fly
- Built-in tube clips for rapid loading and secure handling
- Stackable for compact storage and transport with tubes
- Consistent operation in bright room light or darkness
- Shadow-free open tube layout
- Connects to legacy PSIU9 power supply, cabling, and DAMSystem3 data collection software
- Compatible with DAM2, LAM25, DEnM, and other TriKinetics monitoring units



Specifications

- Tube diameter: 5mm
- Tube length: 65mm or greater
- Dimensions: 33.0 x 8.3 x 2.6 cm add 1 cm to length for cable entry
- Mass: 0.26 kg without tubes
- Adjacent beam spacing: 9.1mm
- Interconnect: 4 wire, 6 position, RJ-11 modular telephone line jack to DAMSystem network for 9V DC power input and data transmission
- Data collection software: DAMSystem3 on Windows PC or Apple Macintosh
- Data types: Moves, Counts, Dwell, Position, Rest
- Data file format: 42-column DAMSystem text
- Case material: white polycarbonate plastic
- Operating environment: normal laboratory, non-condensing

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Setup and Operation

The DAM5M Activity Monitor connects to the DAMSystem3 data collection network and PSIU9 Power Supply Interface Unit using a grey 4-wire telephone cable, and is compatible with the DAM2 and other TriKinetics monitors and cabling.

DAMSystem3 data collection software versions 3.10 and beyond contain preference settings to select which output data types are produced by the monitor, and these checkboxes must be set prior to operation. Earlier versions of the program will record the default Total Moves for each tube.

Standard 5x65mm glass or plastic tubes should be used, filled with food and a cap on one end, and cotton on the other to allow air exchange for the fly inside. Tubes are loaded into the monitor by simply snapping them down into the clips at each tube position, and must be fully seated to insure that the infrared beams bisect the tubes at their centerline.

Additional information is available in the Help section of the DAMSystem3.10 application.

Preference Settings

The DAMSystem3.10 Preferences pane contains 2 columns of checkboxes to select which data is uploaded by the monitor, and how it is saved to the data file.

The **DATA** checkboxes select which data types are collected, and as the data transmission speed from the monitor is relatively slow, the more data types selected for upload, the slower will be the update rate.

MOVES are registered only when a fly enters one beam after exiting another. Activity which occurs within or around the beam after entry will be ignored.

COUNTS are registered by each beam when a fly enters it. If a fly moves in and sits, only a single count will be recorded, but if a fly moves around within the beam, or out and back in, multiple counts may well be accumulated.

DWELL measures the percentage of the bin period (0-100) that each beam contains the fly. The total dwell for each tube is always 100, and the fractions indicate position preference among the beams.

REST increments continuously for each tube, and is reset to 0 only when a move occurs. Its value in seconds may grow across many bins to measure the duration of a long quiescent period. The resolution is 4 seconds.

POSITION indicates which beam was most recently crossed. The beams are numbered 1-4 as shown on the label, unless Flip Odd is selected.

0:15 MAX limits each move and count channel to a maximum of 15 if checked; otherwise the limit is 63. Selecting 0:15 speeds up data collection if counts and moves fall within this range.

FLIP ODD places position 1 on the opposite end for tubes numbered 1, 3, 5 ... 31. Counts, moves, dwell, and position data will be reversed for these tubes, so that beam #1 is the same distance from the unit edge for all tubes.

The **SAVE** checkboxes choose which of the 4 beam channels for the Moves, Counts, and Dwell data types are written to the Monitor file. For example, if Moves, Dwell, and Ch 1 are

<u>Data</u>	DAM5M	<u>Save</u>
<input type="checkbox"/> Moves		<input type="checkbox"/> Total
<input type="checkbox"/> Counts		<input type="checkbox"/> Ch 1
<input type="checkbox"/> Dwell		<input type="checkbox"/> Ch 2
<input type="checkbox"/> Rest		<input type="checkbox"/> Ch 3
<input type="checkbox"/> Position		<input type="checkbox"/> Ch 4
		<input type="checkbox"/> Ch 1+2
<input type="checkbox"/> 0:15 max		<input type="checkbox"/> Percent
<input type="checkbox"/> Flip odd		<input type="checkbox"/> Tube all

selected, 2 rows will be written to the file at each reading, tagged as M1 and D1. These rows will contain the number of moves and the dwell percentage for beam 1 of each tube.

TOTAL will produce the sum of the 4 channels, and 1+2 will produce the sum of channels 1 and 2 - useful for left/right position preference assays.

PERCENT converts each Move and Count output to a fraction of its total, 0:100. The totals themselves are not converted.

TUBE ALL consolidates the data for each tube into a separate row, producing 32 output rows at each reading.

The Rest and Position data types produce only 1 row each, with 32 entries.

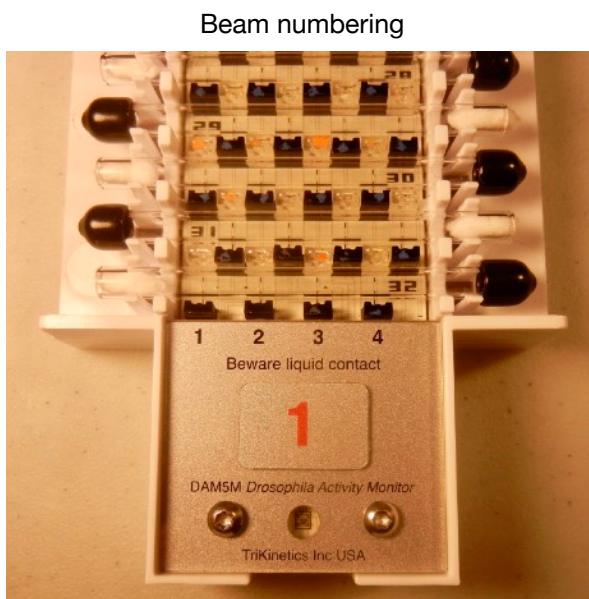
Column 8 of each 42-column output row identifies the data type, as shown in the File Format section (MT, M1, C12P, D4F, TA, etc.) These data types may be separated into distinct files using the Filescan application.

Beam Numbering

The 4 beams for each tube are numbered 1-4 by default, as shown on the monitor label.

The beams for the odd-numbered rows, however, are displaced to the right - note the positions of the black beam detectors in the photo. This offset means that if the tubes are loaded with equal amounts of food, and placed into the monitor with the food on the left, the distance between the end of the food and beam #1 will be different between the even and odd tubes.

To correct for this, the even-numbered tubes may be displaced to the left to make the distance the same. Or, the Flip Odd preference box may be checked to reverse the beam numbering of the odd tubes. This will place #1 on the right side and #4 on the left, so that the distance from the unit edge to the first beam will be the same for all tubes. In this case, the tubes will be alternately installed as shown, and the beams will be numbered 1-4 for the even tubes and 4-1 for the odd.



Precautions

The flexible clips which hold the tubes in place are strong, but not infinitely so. Do not force the tubes into place, or distort the clips themselves, lest they break.

The exposed beam detectors (black) are vulnerable to incident infrared energy from external sources, especially incandescent lighting. LED lights produce no infrared energy, fluorescent lights produce some, and hot incandescent bulbs produce much. If empty-tube ghost counts are being produced, shield the external source or change its type to LED.

The DAM5M is vulnerable to corrosion damage if water sits on its circuit board while operating. Beware incubator condensation drips, and if standing water is detected, dry the unit immediately in a warm oven.

Monitor Data File Format

TriKinetics MonitorNN.txt data files are tab-delimited text files, organized into 42 columns per row, as follows:

- 1 Index (Incremented with each reading, 1 at program launch)
- 2 Date (DD MMM YY)
- 3 Time (HH:MM:SS)
- 4 Monitor status (1 = valid data, 51 = no data received)
- 5 Extras (Number of extra readings consolidated by Filescan)
- 6 Monitor number (1-120)
- 7 Tube number (1-32, 0 if monitor row)
- 8 Data type (MT, M1F, CT, C12FP, D3, Pn, Rt, TA, etc)
- 9 unused
- 10 Light sensor (1 = On, 0 = Off, not present in all units)
- 11-42 Data columns (1 per tube if monitor row)

Data types:

- MT Moves Total
- M# Moves 1,2,3,4,12 (1+2), P percent, F flip odd
- CT Counts Total
- C# Counts 1,2,3,4,12 (1+2), P percent, F flip odd
- D# Dwell 1,2,3,4,12 (1+2), P percent, F flip odd
- Pn Position, F flip odd
- Rt Rest
- Ax Auxiliary
- TA Tube All, P percent, F flip odd

DAM5M tube row columns, if selected:

- | | |
|--------------------|-------------------|
| 11 Total moves | 27-30 Dwell (1-4) |
| 12-15 Moves (1-4) | 31 Dwell 1+2 |
| 16 Moves 1+2 | 32,33 0 |
| 17,18 0 | 34 Position |
| 19 Total counts | 35 Rest |
| 20-23 Counts (1-4) | 36 0 |
| 24 Counts 1+2 | 37 Aux |
| 25,26 0 | 38-42 unused |