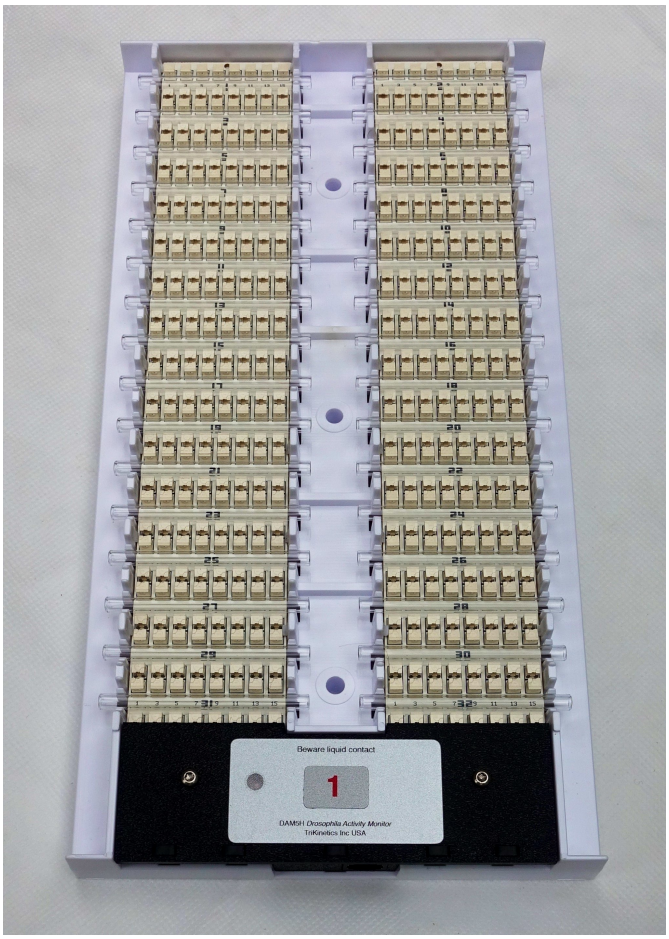
# DAM5H *Drosophila Activity Monitor*

The DAM5H *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 15 infrared beams which bisect each tube, leaving a precise record of when and where it moved.

15 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 5-mm tubes for *d. melanogaster*
- 15 independent beams per tube
- Generates Counts, Moves, Dwell, Rest, Position, Latency 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 for Windows PC or Apple Macintosh
- Compatible with DAM2, LAM25, DEnM, and other TriKinetics monitoring units
- 4-beam option available for reduced cost

## *Specifications*

- Tube diameter: 5mm
- Tube length: 65mm or greater
- Dimensions: 31.0 x 16.0 x 2.6cm, add 1 cm to length for cable entry
- Mass: 0.60 kg without tubes
- Adjacent beam spacing: 3mm
- Active monitoring length: 45mm
- Lateral tube spacing: 16.3mm
- Longitudinal tube spacing: 80mm centers
- Case material: white polycarbonate
- Operating environment: normal laboratory, non-condensing

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## Setup and Operation

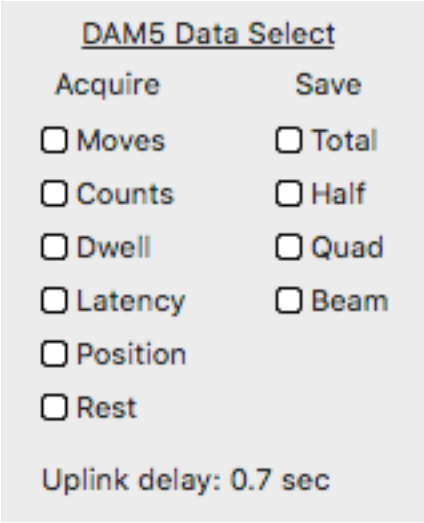
The DAM5H Activity Monitor connects to the DAMSystem3 data collection network and PSIU9 Power Supply Interface Unit using a grey 4-wire telephone cable, and is compatible with the DAM2 and other TriKinetics monitors and cabling.

DAMSystem3 data collection software versions 3.11 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 DAMSystem3.11+ application.

## Preference Settings




The DAMSystem3.11 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 **ACQUIRE** checkboxes select which data types are collected.

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.

LATENCY measures the time delay between the beginning of each bin and the first count of each beam within the bin. The units of measurement are quarter-seconds, 250 milli-seconds, with a maximum of 255.

POSITION indicates which beam was most recently moved into. The beams are numbered 1-15.

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.

UPLINK DELAY estimates the time required to collect the data from each monitor. As the data transmission speed is relatively slow, the more data types selected for upload, the slower will be the update rate.

The **SAVE** checkboxes choose the resolution at which the acquired DAM5 Move, Count, Dwell, and Latency data types are written to the Monitor.txt file.

TOTAL produces the sum of Moves/Counts for each tube (1 text row per reading.)

HALF produces left/right sums of Moves/Counts/Dwell for each tube (2 rows per reading.) Latency Half generates the crossing times for beams 1 and 15 only.

QUAD divides each tube into 4 adjacent quadrants, and outputs Move/Count/Dwell sums for each (4 rows per reading.) Latency Quad generates the crossing times for beams 1,5,11, and 15.

BEAM outputs 16 rows of data at each reading, with each row containing the individual Move/Count/Latency beam data for 2 adjacent tubes.

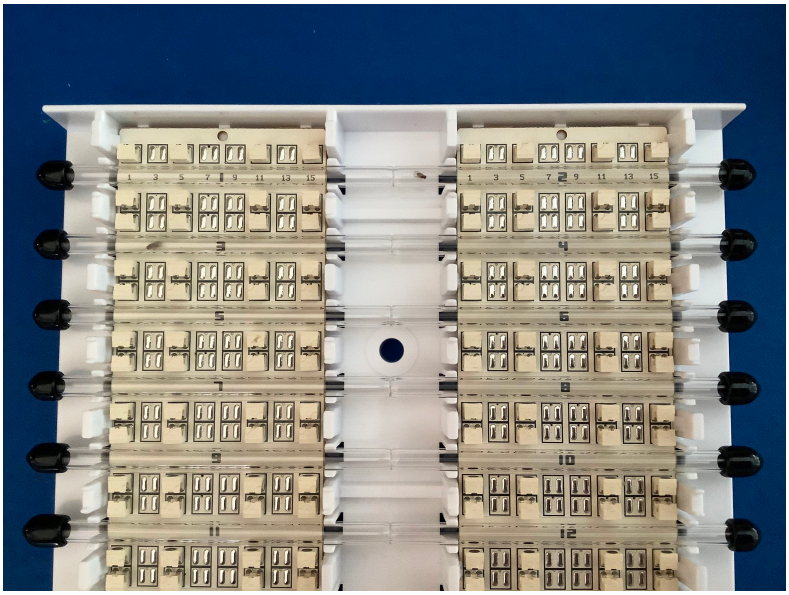
The Rest and Position data types produce only 1 row each, with 32 entries.

Column 8 of each 42-column output row identifies the data type, as shown in the File Format section (MT, M1, C12, D4, MBOE, etc.) These data types may be separated into distinct files using the Filescan application.

## 4-Beam Option

The DAM5H-4 is available at a reduced cost with 4 instead of 15 beams per tube. Note in the adjacent photo that active beams are in positions 1,5,11, and 15, with the other beams unused. All data types are available, just at a reduced position resolution.

The 80mm length tubes as shown are butted end-to-end in the centers of each tube pair, allowing a single fly to walk 2 tube lengths between the end caps. This setup enables enhanced position-preference assays for odor, food, or light using a gap between the butted tube ends as a vent.



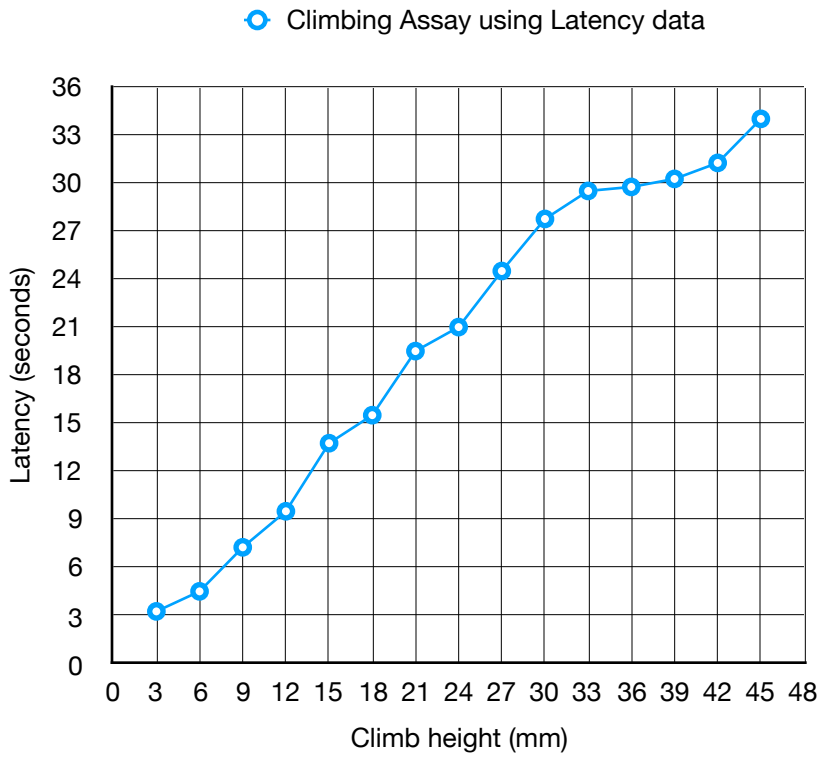
4-beam option with 80mm tubes

## Climbing and Startle Assays

The Latency data type enables the precise measurement of locomotor response to an applied stimulus, such as odor, light, or physical orientation. If the stimulus can be applied immediately prior to a bin start, the latency data will record the elapsed time in quarter-seconds to the crossing of each beam as the fly moves in response to the stimulus.

A climbing assay, for example, will record the time of climb to each beam if the tubes are oriented vertically and the flies are shaken to the tube bottoms immediately prior to a bin start.

A startle response to an applied odor or light stimulus will be immediately measured from the beginning of each bin.




With the fly below the bottom beam at bin start, and the tube vertical, latency measures the time delay to the crossing of each beam as the fly climbs to the top. (Beam spacing = 3mm)

## 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 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 DAM5H 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, M12, M3, MBOE, CT, D3, L34, Pn, Rt, etc)

9 unused

10 Light sensor (1 = On, 0 = Off)

11-42 Data columns

Data types:

MT Moves Total

M## Moves Half 12, 34

M# Moves Quad 1, 2, 3, 4

MBOE Moves Beam Odd Even

CT Counts Total

C## Counts Half 12, 34

C# Counts Quad 1, 2, 3, 4

CBOE Counts Beam Odd Even

D## Dwell Half 12, 34

D# Dwell Quad 1, 2, 3, 4

L## Latency Half 12, 34

L# Latency Quad 1, 2, 3, 4

LBOE Latency Beam Odd Even

Pn Position

Rt Rest

Ct Counts (DAM2/LAM/DEnM)

All rows include 1 number per tube in columns 11-42, with the exception of the MBOE/CBOE/LBOE rows, which produce one number per beam for each of 2 adjacent tubes (11-25 = odd tube, 27-41 = next even tube.)

TOTAL consolidates all beams.

HALF 12, 34 consolidates left-side beams and right-side beams separately.

QUAD 1, 2, 3, 4 consolidates beams into adjacent tube quadrants, left, middle left, middle right, right.