DAMSystem3 *Data Collection Software*

The DAMSystem3 *Data Collection Software* uploads the output from a set of activity monitors and periodically saves it in disk files on a Macintosh or Windows PC.

At the conclusion of an experiment, which may last for days or weeks, these simple text files are removed from the data folder and taken elsewhere for analysis and permanent archive. They may be processed by any number of existing applications, or input to a spreadsheet or text editor for direct examination.

Preference settings in the program select the USB Serial Port from which the data is to be acquired, the Reading Interval at which the data is to be collected, and the range of monitor numbers to be queried.

An LC4 Light Controller may be programmed to schedule on/off pulses for entrainment, sleep deprivation, etc. on up to 4 independent external devices. These pulse trains are synchronized with the data collection interval, and may be randomized for stimulus application.

An integrated Help system contains setup instructions, troubleshooting tips, and the output file format.

The program displays the real-time status of all connected monitors and light-control channels, and may interrogate any monitor for its status and data on command.

Duplicate copies of the program may be operated concurrently on the same computer to facilitate large systems with multiple PSIU9s and monitor wiring networks.
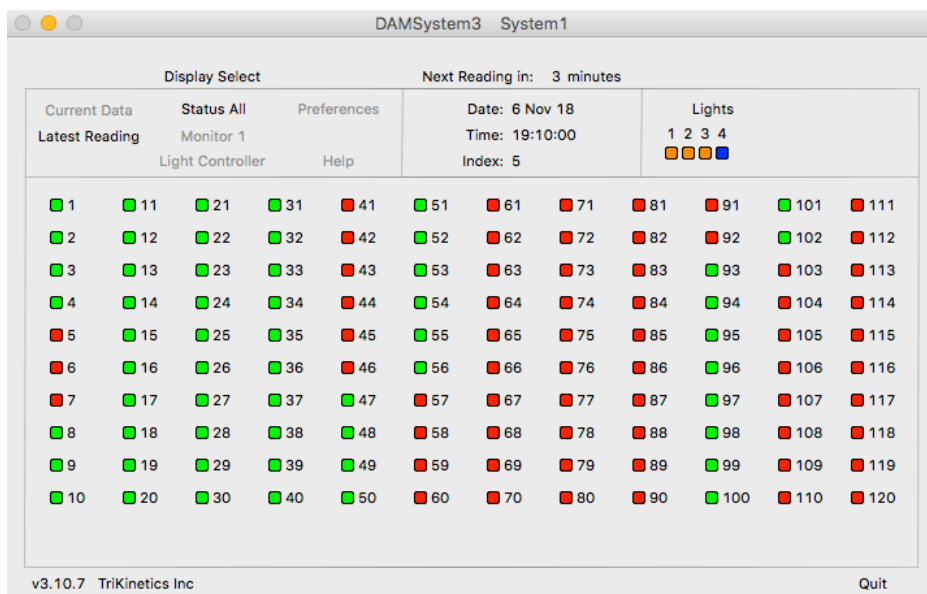
Features

- Data collection from up to 120 monitors per PSIU9 system
- Reading interval from 60 minutes to 1 second (1 monitor only at 1 second)
- LC4 Light Controller programming of complex on/off pulse sequences, including randomization
- Windows PC or Macintosh - any model
- Multiple systems in parallel
- Output data in 42-column text files, 1 file per activity monitor

Specifications

- Windows 7/8/10, 32 or 64-bit, updated to the latest Microsoft Release
- MacOS Lion 10.7 or later, updated to the latest Apple release
- USB port required for connection to TriKinetics PSIU9 monitor interface
- Reading upload rate: 1.5 monitors per second nominal, DAM5M may be slower if multiple data types are used.

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USB Driver

The DAMSystem3 program acquires data from the monitors through the PSIU9 Power Supply Interface Unit and the computer USB port. Before data collection can begin, a software driver for the PSIU9 must be installed.

To install the driver, download the USB driver zip archive from www.trikinetics.com, extract the contents, and follow the Read Me installation steps to completion. This procedure must be successful for data collection through the PSIU9 to occur.

Program Installation

Download the appropriate Macintosh or Windows version of DAMSystem3 from www.trikinetics.com, extract the zip archive, and place the application (along with the Libs folder if Windows) in a separate folder on the desktop. Do not place the application into the 'applications' folder of the computer.

Change the Windows or MacOS System Settings or Preferences to inhibit sleep of the CPU. This will allow long-term data collection without interruption.

Launch DAMSystem3, click Preferences, and click Serial Port.

Plug the PS9-1 power supply into a wall outlet using a line cord, and plug the round connector into the PSIU9. Verify that the green light is on. Plug the USB cable into the PSIU9 on one end and the computer on the other.

Click Serial Port again in Preferences and watch for a new entry - this is the port for the PSIU9. Click this entry and it should turn from gray to black indicating successful selection.

Click Current Data and verify that the yellow light on the PSIU9 is flashing. If it is, installation is complete and the system is ready to collect data.
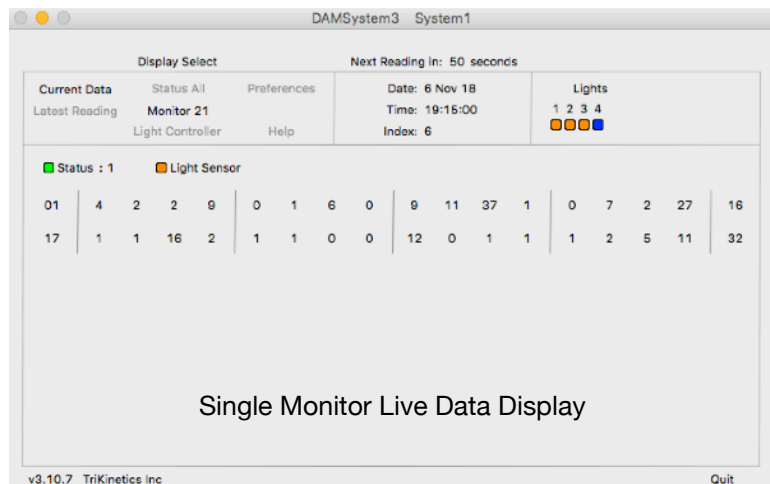
Monitor Installation and Checkout

Select the Monitor Range and Reading Interval in Preferences.

Connect the activity monitors to the PSIU9 via phone cables, using 5-way splitters to expand the network as necessary. Use a single long cable and coupler to connect the PSIU9 to the inside of each incubator; then connect one or more splitters in series to the coupler, and short cables from them to the monitors.

Select Current Data and Status All and verify that as the monitors are connected, the status boxes turn from red to green. If at any time the boxes turn black, a cable is defective or has been misconnected; find it by unplugging cables one by one until the red/green status boxes return.

To check a single monitor, select Current Data and Monitor. Click the monitor number in its upper/lower half to select the unit. Poke a small object through one of the beam channels and verify that the corresponding count increments on the screen. After a reading has been taken, Monitor and Latest Reading will show the counts written to the file, and Current Data will show 0 to begin the next reading.

DAMSystem3 System1																	
Display Select			**Next Reading in: 50 seconds**														
Current Data	Status All	Preferences	Date: 6 Nov 18					Lights									
Latest Reading	Monitor 21		Time: 19:15:00					1 2 3 4									
	Light Controller	Help	Index: 6														

☐ Status : 1		☐ Light Sensor															
01	4	2	2	9	0	1	6	0	9	11	37	1	0	7	2	27	16
17	1	1	16	2	1	1	0	0	12	0	1	1	1	2	5	11	32

Single Monitor Live Data Display

v3.10.7 TriKinetics Inc   Quit

Preference Settings

Preferences must be set prior to data collection, especially the Serial Port, Monitor Range, and Reading Interval.

The Eclosion Monitor Tap Count should be set to 0 unless this unit is in use.

The DAM5M Data and Save checkboxes should be left unchecked unless DAM5M monitors are in use. The DAM5M Data Sheet contains instructions for their selection.
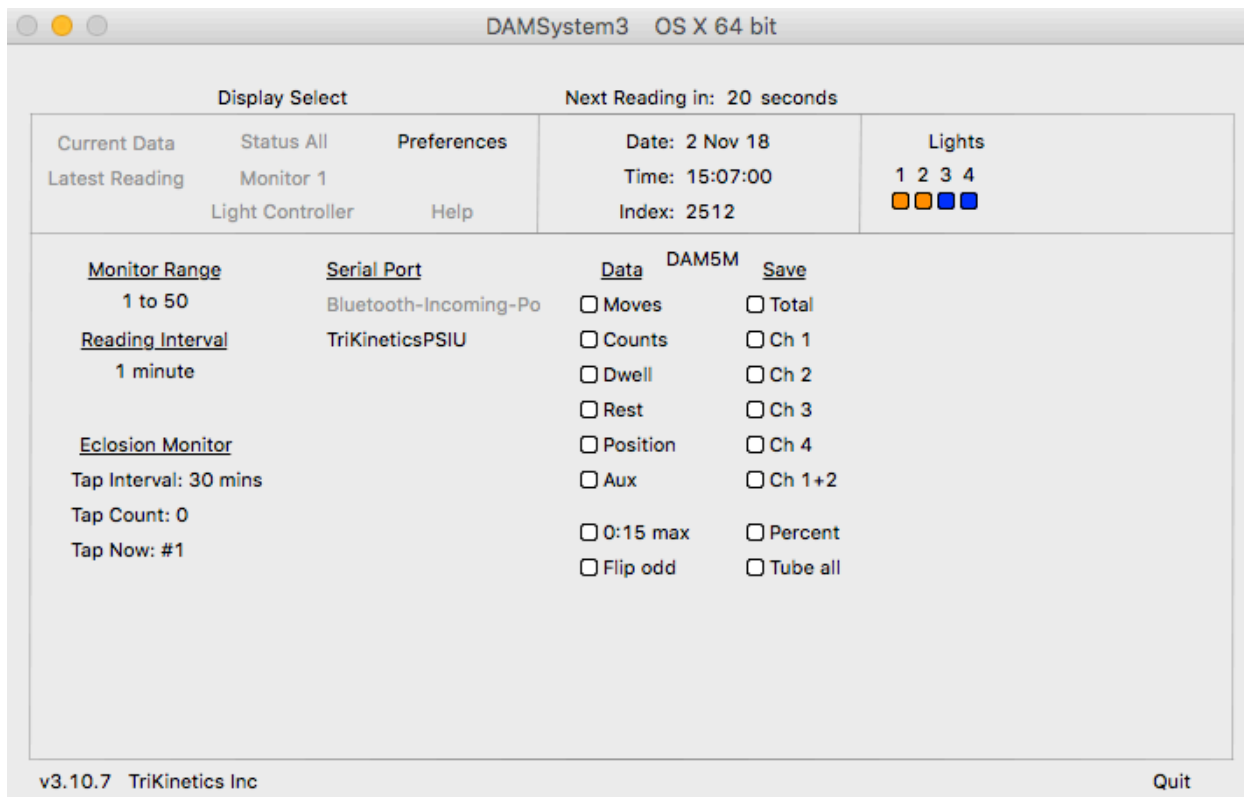
DAMSystem3 Preference Settings

Monitor Range

The Monitor Range specifies which monitor numbers are to be polled for data at each reading. Only monitors with red number labels within the selected range will have their data collected.

A system which includes just a single monitor (#1) should have its range set for '1 to 1'. A system which for example includes monitors 10-19 should have a range of only '10 to 19' so that time is not wasted looking for absent units. Monitors within the selected range which are not present will simply be recorded in the data folder with a reading status code of 51 and data values of 0.

To increase a number, click on the upper half. To decrease, click the lower half.

Reading Interval

Activity data is collected from the monitors periodically, according to the reading Interval. A 10-minute setting will produce collections at 0, 10, 20, 30, 40, and 50 minutes past each hour, generating 6 x 24 = 144 readings per day for each connected monitor.

Short reading intervals increase the time resolution of the acquired data, but at the expense of the larger data file necessary to store the extra readings.

To increase the reading interval, click on the upper half in Preferences. To decrease, click the lower half.

Note that the reading upload rate is a nominal 1.5 monitors per second, so the number of monitors which can be polled successfully is reduced as the reading interval is shortened. A reading which does not complete in time will force the next reading to begin late, eventually resulting in a skipped reading. No monitor data will be lost, but the monitor files will contain a gap in the reading sequence (fixable with FileScan.) To be safe, plan on a reading interval no shorter in seconds than the number of connected monitors. If necessary, use multiple PSIU9 systems in parallel to provide the desired collection rate.

Serial Port

The Serial Port must be selected to enable communication with the PSIU9 and activity monitors. The proper port will be labeled TriKinetics PSIU if on a Macintosh, or COMnn if a Windows PC, most likely the last one on the list. Click to select it and it should turn dark.

The USB driver for the PSIU9 must be installed in the computer for the serial port to be available. Download it from trikinetics.com and follow the installation steps. Then connect the PSIU9 via the USB cable, and click on the word Serial Port at the top of the list. A new entry should appear, which may then be selected.

Light Controller

Each DAMSystem3 application copy may control up to 4 external on/off devices through a single LC4 Light Controller. Multiple copies of the program in the same computer may each control a separate LC4, each on a separate USB port and PSIU9 Interface Unit.

Detailed instructions for the Light Controller settings may be found in the LC4 data sheet or the Help section of the DAMSystem3 program.
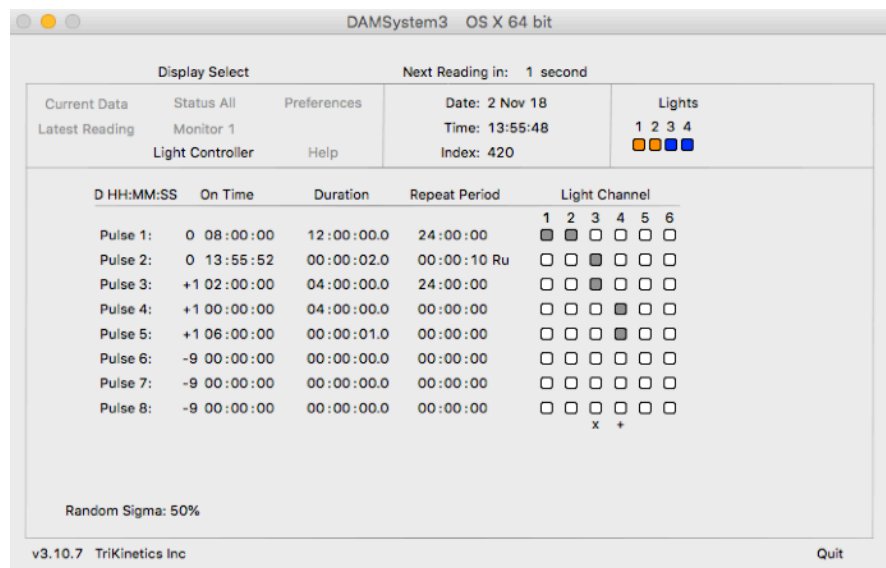
Light Controller Preference Settings

Program Operation

DAMSystem3 operates by watching the computer time-of-day clock for the end of a reading interval. When this occurs, the data in all monitors is frozen, and new data counters are initialized to begin the next reading interval. Then each monitor within the monitor range is polled for its data, and uploads it in turn through the PSIU9 network. Monitors which are not connected simply do not respond to the polling request.

After upload, the data from each monitor is written to its respective MonitorNN.txt file in the DAMSystem3 Data folder, 1 file for each monitor. The files for monitors which do not respond with data are written with status code 51. (The DAMSystem3 Data folder resides in the same folder as the DAMSystem3 application on the desktop.)

Data File Management

MonitorNN.txt files will grow without limit as long as the program runs, and eventually will become unwieldy in size if not managed. A good protocol is to drag the relevant monitor files out of the data folder at the conclusion of each experiment, and archive them in another folder with the experiment name, even on another machine.

The program will then create new files at the next reading to contain the data for the next experiment.
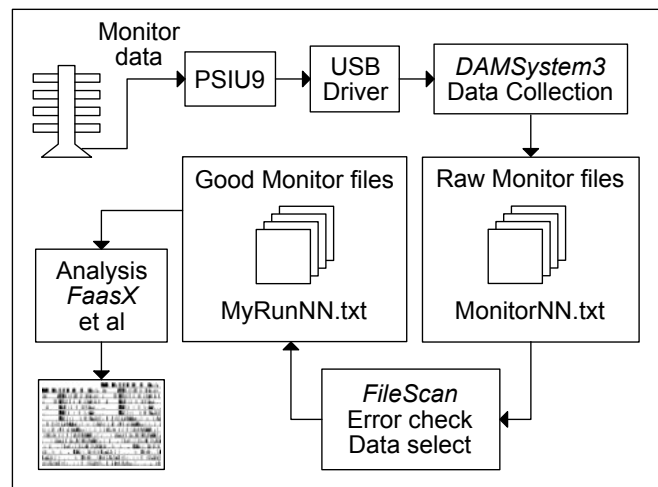
Monitor Data Flow

FileScan

Prior to processing and analysis, the raw monitor files should be scanned using the FileScan program (www.trikinetics.com) to insure that all data records are complete, with no gaps or duplicate readings. This program produces a new set of 'good' monitor files, and in addition to error cleanup, allows for the extraction of data within a specified date/time range, and compression to a longer bin length if desired. Thus, activity data collected at 1-minute intervals may be converted to 30-minute intervals for analysis or plotting purposes.

Filescan also allows for the separation of data types into individual files - Counts, Moves, Rest, etc.- and conversion of data to the legacy Channel File format of DAMSystem2.

Note that Skipped and Extra readings are not associated with specific monitors, or even the Power Supply Unit, but instead with the time sequence of the readings as they are collected by the DAMSystem3 program. If the output file Bin Length in FileScan is set differently from the input file Reading Interval used by DAMSystem3 to collect the data, then Skipped or Extra readings will be generated in the output files, even if such errant readings do not exist in the collected data. Such skips or extras are strictly artifacts of the modified bin length, and are not malfunctions of the data collection system.

Data Analysis

MonitorNN.txt data files may be input into any number of applications which have been written by users - several of which have links on the trikinetics.com web site. The original of these was the Brandeis Rhythm Package, which is still available as FaasX from the Institut de Neurobiologie Alfred Fessard in France.

As the monitor files are simple tab-delimited text files, they may also be input into any spreadsheet or mathematics application for direct plotting or analysis.

Multiple Systems

A single computer may operate multiple monitoring systems in parallel, each with its own PSIU9, cabling network, and monitor set. Each system runs a separate copy of the data collection program, with independent control of the reading interval, USB port, and data type selection.

Large sets of monitors may be split into multiple systems for shorter overall reading intervals, and duplicate monitor numbers may be assigned to separate systems if necessary.

To setup multiple systems, place duplicate copies of the DAMSystem3 program (and libs if Windows) in separate folders on the desktop. Launch each copy and select its reading interval.

Multiple PSIU9s will appear in the Preferences Serial Port list as separate entries; select one for each system, and verify its operation using the Current Data setting.

Troubleshooting

Troubleshooting is best accomplished by setting the Reading Interval to 60 minutes and the Display Select to Current Reading and Status All. Verify that the PSIU9 green light is on, and the yellow light is flashing.

If the yellow light is off, verify that the proper Serial Port is selected in Preferences (text color black.) Repeat the PSIU9 installation steps if necessary; begin by unplugging its round power plug and rechecking its USB cable connections.

If the yellow light is on steadily, unplug the monitor cables one at a time from the PSIU9 until the light begins flashing. Verify that all status boxes are red or green.

Black status boxes indicate that either the PSIU9 is not connected or selected properly, or that a monitor cable is defective. To confirm the PSIU9 installation, disconnect all monitor cables from it and verify red status boxes (Current Reading.) Then reconnect the cables one by one until the boxes turn black; replace this cable.

Status Codes

Each attempt to read data from an activity monitor results in a numeric status code, as follows:

Code	Color		Status
1	🟩	Green	Good data read
24	🟨	Yellow	Monitor power-on reset
50	⬛	Black	No connection to Power Supply Unit
51	🟥	Red	No monitor response

Any code other than 1 indicates that no data was received from the monitor.

Black (50) codes indicate either a lack of connection to the PSIU9 (check the USB cable and the green power light) or a short-circuit in the monitor cabling network (unplug to verify.)

Red (51) codes indicate that the monitor was not connected to the network (unplug and replug its cable.)

MonitorNN.txt File Format

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

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