The DataLab Companion

HP 38G User's Notes

for the

DataLab Aplet

Notice

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Edition Information

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Getting Started

The DataLab aplet enables the HP 38G to control the DataLab. This aplet is an extension of the built-in Statistics aplet, with views added to watch real time measurements and to specify unattended data logging.

Like the Statistics aplet or the Function aplet, the DataLab aplet is a base for constructing more specific aplets. If you set up an experiment with the DataLab aplet, adding notes and sketches, and then save the aplet under a descriptive name, you can create an experiment aplet for others to use.

On the other hand, if you receive experiment aplets made by others, you don't need the general DataLab aplet, since it is "built into" the aplets received. Just follow the directions for those experiment aplets.

These notes describe basic use of the DataLab aplet. They assume you have some experience with the HP 38G, and that you have read the HP 38G User's Guide and the DataLab User's Manual.

Downloading the HP 38G DataLab Companion Aplet

HP 38G DataLab Companion software

Use of the Portable DataLab requires installation of a calculator or PC host-specific application. Downloading application files to calculators is made simple by the HP Connectivity Kit software found on the *DataLab Companion CD*. This CD is provided with the DataLab and includes software for the HP 38G, the HP 48G+/GX and HP49G series calculators.

To install DataLab Companion software to your HP 38G calculator:

1. Install to PC the HP38ConnKit from the *DataLab Companion CD*.

   - Exit all Windows programs.
   - Insert CD into CD-ROM of PC.
   - Double-click My Computer icon ➔ double-click Datalab… _cd icon (usually E: drive)➔ double-click the HP38ConnKit folder (note that ConnKit is for HP 48/49, **not** for HP 38) ➔ double-click setup icon (shown nearby) ➔ follow online instructions.

2. Install calculator files:

   - Launch (if not already running…) HP38G for PC Connectivity Kit. (In Windows: Start ➔ Programs ➔ Hewlett Packard ➔ HP38G for PC Connectivity Kit— **not** PC Connectivity Kit.)
   - Using Change Directory… if necessary, locate and open Calculator folder on Datalab… _cd.
   - Click on Hp38 folder. (Drive window should say [drive letter]:\Calculator\HP38.)
   - Connect calculator to PC, using serial cable provided with calculator.
   - Turn calculator [ON] and press [LIB] to access APLET LIBRARY window.
   - Press menu key under [RECV].

- Select [Disk drive…] in RECEIVE FROM… window and press [OK].
- Select [DataLab] aplet in APLETS window and press [OK].

File transfer will take a minute or so. The DataLab base application will appear at the top of the APLET LIBRARY window when the file transfers are completed.

To update the base DataLab aplet on your HP 38G:

1. Send to disk any experiment aplets you want to keep.
2. Delete the old DataLab aplet and all remaining experiment aplets.
3. Load from disk the new DataLab aplet.
4. Load from disk the experiment aplets. (They will use the updated base aplet.)

DataLab Views

The DataLab aplet has all the views of the HP 38G's built-in Statistics aplet (Auto Scale, Plot-Detail, Overlay Plot) along with the following views:

- Numeric Setup (Press [SHIFT] [NUM])

  Sets up the interval and sample quantity for the experiment and specifies the probes in use.

- Monitor Data (Press [SHIFT] [VIEWS] "Monitor Data")

  Displays readings from the DataLab in either numeric ({DIG}) or graphical ({GRPH}) form.

- Log Data (Press [SHIFT] [VIEWS] "Log Data")

  Provides menu keys to start, check, and stop experiments, and to retrieve data from the DataLab.

- Enhanced Numeric View (Press [NUM]{FCN})

  Provides additional data management and analysis features via an enhanced version of the Statistics Numeric view.

All other DataLab aplet views are identical to views in the Statistics aplet of the HP 38G.

Numeric Setup (Press [SHIFT] [NUM])

Setting Up Interval and Sample Quantity

1. Press [SHIFT] [NUM] to show the "Timing Setup" form.
2. Fill in the fields in the form:

    - SAMPLE INTERVAL
      The interval in seconds between readings

    - NO. OF READINGS
      The number of samples to take

Setting Up a Probe

In many cases you can select a standard probe with preset calibration. To set up a probe:

1. Press {PAGE ▾} to go to Probe Setup.
2. To use the analog ports:

    - Highlight the desired analog port (1, 2 and/or 3).
    - Press {CHOOS} and highlight a probe from the aplet's list. (See the Probe Calibration Reference Table for additional details.)
    - Press [ENTER] or {OK} to select the desired probe. The port is automatically checked.
    - To deselect a port, highlight the port and press {✓CHK}. The probe name will remain on the list but will be inactive.

3. To use the SONIC sensor, arrow over to the measurement field (either CM, centimeters; or IN, inches) and press {✓CHK}. Or, to select one of the DataLab's built-in sensors (LUX or MIC), arrow to LIGHT or MIC and press {✓CHK} to make the selection.

Most calibrations are permanently stored in the calculator's ROM. Standard calibrations are automatically applied when an analog probe is selected from the aplet's probe list or when either the SONIC, LIGHT or MIC sensors are selected for data logging. See the table below for more details.

Probe Calibration Reference Table

Probe Name Description	Units	Slope	Intercept
Uncalibrated		1	0
VDC (0-5) Voltage	Volt	1	0
Std. Temp °C Standard Temperature (Linear)	Celsius	58.341	-53.073
Std. Temp. °F Standard Temperature (Linear)	Fahrenheit	105.01	-63.531
DCT Temp °C Direct Connect Temp. °C	Celsius	55.55	-17.78
DCT Temp °F Direct Connect Temp. °F	Fahrenheit	100.01	0
Thermistor °C Non-Linear Temp. °C	Celsius	1	-273
Thermistor °F Non-Linear Temp.°F	Fahrenheit	1.8	-459.67
Pressure (atm) Pressure Sensor	atm	2.203	0
Pressure (psi) Pressure Sensor	psi	32.37	0
Force (N) Student Force Sensor	Newton	9.8	-9.8
pH pH System	pH	-3.807	13.662
Humidity Relative Humidity Sensor	Humidity	-36.562	35.74
Light (0-600) Light Sensor	Light (0-600)	200	0
Light (0-6000) Light Sensor	Light (0-6000)	2220	0
Light (0-150K) Light Sensor	Light (0-150K)	50000	0
Internal DataLab Sensors			
Light (DLAB) Light Sensor (LUX)	Light (DataLab 0-600)	1	0
Mic (DLAB) Sound Sensor (MIC)	Sound (DataLab)	1	0
External Sonic Sensors			
SONIC Motion Detector (Ranger)	Distance (cm)	.06779	-8.6
SONIC Motion Detector (Ranger)	Distance (in)	.02669	0-3.4

Specifying a Custom Calibration

You may choose to enter a linear or polynomial function (up to power 9) as a custom calibration. Enter the coefficients in descending order using braces and commas, as shown by this example: $4x^2 + 3x - 9.2$ ➜ {4,3,-9.2}.

1. Highlight the desired port.

2. Type in the list of coefficients.

3. Press [ENTER] or {OK} to enter the calibration. The port is automatically checked.

Regarding the Sonic Port…

Note that the standard calibration for the motion detector port (SONIC) is only an approximation. Since the motion detector's measurement is based on the speed of sound, local conditions such as temperature, humidity, and barometric pressure will affect the results. You can create your own calibration by taking data with a calibration of "Uncalibrated," fitting the data, and using the fit results in a new calibration.

Monitor Data ([SHIFT] [VIEWS] "Monitor Data")

The Monitor Data view displays current readings from the DataLab, based on parameters set in Numeric Setup ([SHIFT] [NUM]).

1. Press [SHIFT][VIEWS] to show the VIEWS menu. Double check setup and connection of probe(s).

2. Highlight "Monitor Data" and press [ENTER]. The menu options are as follows:

   - {DIG}
     Takes readings continuously and displays them in digital (numeric) form.

     Press {START} to begin monitoring data. The display shows digital readings for the selected port(s). Press {PAUSE} (or leave the view) to stop monitoring.

   - {GRPH}
     Plots data from a single probe only. Only the first probe will be displayed when using the Monitor graph view with multiple probes selected.

     Monitor uses the current X-scaling factors and plots the actual probe readings as the Y values. To set the proper scale for viewing data, go to Plot Setup ([SHIFT] [PLOT]).

     Press {ERASE} to clear the display of previous plots.

     Press {START} to begin monitoring data. The display plots the number of readings as defined in Numeric Setup. Press {PAUSE} (or leave the view) to stop monitoring.

   - {START}
     Starts data monitoring in the mode selected either {DIG} or {GRPH}.

Log Data ([SHIFT] [VIEWS] "Log Data")

To run an experiment, you first specify the parameters for logging the data; then you tell the DataLab to start logging; and finally you transfer the data back to the HP 38G.

While the DataLab is logging data, you can disconnect it from the HP 38G and use the calculator for other purposes.

Before logging data make sure the probes are connected correctly. To change the experiment setup parameters, press [SHIFT] [NUM] to access "Timing Setup" or "Probe Setup."

To log data in batch mode:

1. Press [SHIFT] [VIEWS] to show the VIEWS menu.
2. Highlight "Log Data" and press [ENTER] or {OK}. The Log Data view appears, with the following menu labels:

    *   {ABOUT}
        Displays version and copyright information about the DataLab aplet.

    *   {→38G}
        Clears C1...C5 and transfers records from DataLab memory to C1...C5, applying calibrations as specified in the numeric setup view. When complete, displays the message, "nnn records received."

    *   {HALT}
        Instructs the DataLab to halt data collection. Displays the message, "Instrument halted."

    *   {INFO}
        Queries the DataLab and displays "DLAB has nnn records" and either "DLAB is running" or "DLAB is idle," depending on the instrument status.

    *   {START}
        Instructs the DataLab to begin the experiment as described in the numeric setup. Displays the message, "Experiment started."

3. Press {START} to begin the experiment.

While the experiment is running, you can disconnect the HP 38G and use it for other purposes, including running other aplets. To return to the experiment, start the DataLab aplet again, return to the "Log Data" view, and reconnect the DataLab.

4. To check on the progress of the experiment, press {INFO}.

5. When the experiment is completed, press {   38G} to transfer records to the HP 38G.

Enhanced Numeric View ([NUM]{FCN})

All the tools in the Statistics aplet are available for analyzing the data collected by the DataLab. The data from ports 1, 2 and 3 (external ports) and port 4 (SONIC, LUX or MIC) are stored in Statistics variables C1 to C4, respectively. The timestamps for the readings are stored in C5.

The DataLab aplet in [NUM] has the following additional tools to help in analyzing data, which are selectable by pressing {FCN}:

- ▲(Delta)List
  Calculates first differences of the data in the highlighted column and copies them to a selected column.

- Smooth 5-pt.
  Performs 5-point smoothing on the data in the highlighted column, leaving the endpoints unchanged.

- Sort list
  Sorts the data in the highlighted column. (The numeric view's standard SORT functionality.)

- Copy to list
  Copies the data in the highlighted column to a selected column.

Aplet Error Messages

The following error messages may be generated by the aplet:

- "Communications Error"
  The DataLab is resetting and not currently available, or the DataLab is not connected to the calculator.

- "Experiment Running"
  The DataLab is running an experiment, so a new experiment cannot be started.

- "Instrument Error"
  Unexpected or missing information was received from the DataLab in response to a command.

- "Invalid Record Number"
  The requested record number is not in the range of valid record numbers for the current experiment.

- "Timeout"
  The DataLab is not responding. Check that the DataLab is connected properly to the serial port.

- "Non-Real Result"
  The value of the calibration expression was not a real number.