LogIT is a joint British development between
SCC Research and DCP Microdevelopments

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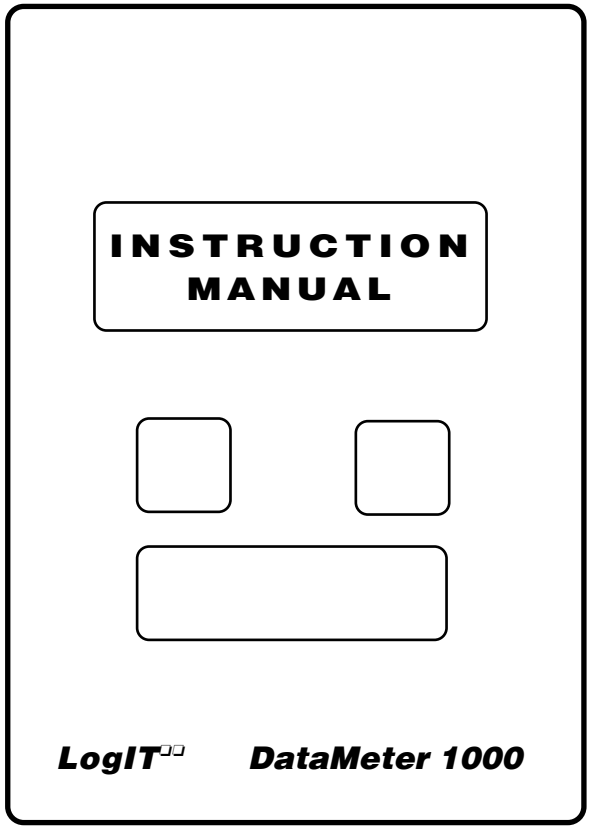
LogIT
DataMeter 1000



Meter • Datalogger • Interface

DataMeter 1000 Technical specifications

•Physical

Size	155 x 92 x 34mm
Mass	240g
Case material	ABS with back printed splash proof polyester keyboard

•Electronic

LCD display	2 X 16 character STN technology
Operating system	SCC Research LOGOS 2
Sensor system	DCP Microsense® sensor system
Memory	16K E^2 non volatile memory for data + system
Analogue capture	10mS on all three sensors (software dependent)
Analogue resolution	10bit + averaging
Digital event timing	64μS on all three sensors (software dependent)
Battery	Built-in NiMH rechargeable battery
Power requirements	9-14 volts DC maximum

Acknowledgments
The designers express grateful thanks to the following for their help and support throughout the development of DataMeter:
Dick Cianchi Viv Cousins Neil Dyer Joy Palmer

Disclaimer
The LogIT designers and software publishers cannot be held liable for any special, incidental, consequential, indirect or similar damages due to loss of data, loss of business profits, business interruption or any other reason, resulting from the use of LogIT products, even if they have been advised of the possibility of such damages.

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Fourth edition

CE **Electromagnetic compatibility declaration**
The LogIT system and accessories are designed for use as education and training equipment. The use of this apparatus outside the classroom, laboratory, study area or similar such place invalidates conformity with the protection requirements of the EEC Electromagnetic Compatibility directive (89/336/EEC) and could lead to prosecution.

Contents

Introduction

Designed as a versatile multi-purpose instrument for education and research, the LogIT DataMeter 1000 is really three products in one; meter, data logger and computer interface.

It is a member of the established LogIT family combining features from it's sister LogIT SL and LIVE products and utilising the latest technology to make a product that is really easy to use, portable and reliable. It retains the innovative 'press the green button to log' concept of the original LogIT but adds new programmable functions and features you previously had to set up by computer.

Whether you have used LogIT products before or are just starting sensing and interfacing for the first time, you will find DataMeter 1000 very intuitive with it's easy to understand menu screens and automatic sensor system. Although datalogging is now a vital tool in education, it is not in itself a subject and so, as with all good tools, it should be as simple to understand and operate as possible.

DataMeter allows you to measure and display most things using a range of over 30 different sensors and adapters.
You can record single readings, time events, program logging intervals or log automatically using AutoLog - all at the touch of a button and with prompts on the screen to help you.
You can also connect it to a computer to show live graphs on the monitor - you can even send the data *direct* to a printer for a printed table of data collected!

Although DataMeter is easy to use, as with any product there are things you should know to get the best from it, so please take time to read this manual. It has been written to satisfy the needs of both novice and advanced user, with an overview followed by a detailed guide later. Further information and help is also included on the multi-format system disc and from our web site. DataMeter should also be used in conjunction with the instructions and manuals which came with any software and accessories you intend to use.

Finally, we hope you really enjoy using DataMeter and find it an invaluable piece of equipment. We have always tried to design products which do what our customers want them to do and not just what we think they should do! So if you have any suggestions or features you would like us to incorporate, please let us know.

www.dcpmicro.com

David Palmer
May 1996

Problems .....

•I have a fully recharged battery but DataMeter is not responding?
If the battery completely discharges it may take several minutes to respond after putting on charge - you may need to RESET DataMeter - see pgs 4/9 for reset info.

•DataMeter does not work reliably with the computer?
You must use DataMeter compatible software - if using 3rd party software check you have selected DATAMETER (NOT just LogIT) from the interface/datalogger menu or contact publishers for an upgrade.
If running on a PC or Mac check that no other software is interfering with the serial port you are using (eg FAX or modem software).

•Cannot get software to communicate with DataMeter?
Check the link cable (they are specially wired cables - not pin to pin) and if using 3rd party software check DataMeter has been selected.

•Can I use other manufacturers sensors with DataMeter?
Never plug a non-Microsense® sensor *directly* into DataMeter - they could cause damage. However you can sometimes use other sensors or instruments via an adapter - see section on sensors.

•Sensor reading changes slightly when I put DataMeter on charge?
If the battery was very low then the sudden change of voltage as the battery charges can cause small variations of readings with some sensors. This is normal & the changes are within specifications.

•DataMeter resets when I start logging or does other strange things?
Any microcomputer based system can 'crash' or get 'confused'. If you think DataMeter is behaving strangely we recommend you give it a FULL reset.
Press and hold the blue button at the same time as pressing both reset buttons - you will reset the clock and clear all data in the memory, so use this with care!

•The battery does not seem to last very long?
Battery life depends on many things - which sensors are used, charge/discharge cycles etc. For best battery performance do not charge continuously but cycle use and charge regularly. Occasional 24 hour full charges can also help.

•Display reads ??? when I plug in a sensor?
This indicates that you either have a new sensor which is not supported by your present system software (you will receive a card with the new sensor explaining how to upgrade) or you have an incompatible sensor (eg LIVE Sound or Breathing) which will not work.

•Battery is charged but DataMeter says '*RELOAD SYSTEM*' ?
DataMeter's internal system software has a problem and needs reloading. Many features and parameters for your DataMeter are stored in a special memory chip which can be updated or changed to add new sensors, languages etc. Please see README file on the system disc supplied for full details on how to reload your system.

•Still having problems?
If you have read this manual, charged the battery and Full-reset DataMeter but still have problems please try and seek telephone or FAX advice from your supplier or DCP before returning anything. And check our website for many more support FAQ's, FREE software upgrades and eMail links to get in touch with us.

Web support: www.dcpmicro.com

System Software

Your DataMeter may have been supplied with a System Software disc. This is not datalogging software but contains a system update program for DataMeter internal memory which contains sensor calibrations, languages etc. You may need to reinstall system software if your DataMeter ever says !RELOAD SYSTEM! - refer to disc ReadMe file for instructions (See www.dcpmicro.com for the latest).

Datalogging Software

There is a very wide choice of data logging software available and so we can only generalise in this manual. You should read the instructions which comes with the software, making particularly sure that it supports DataMeter. Note that Software for the original LogIT SL will NOT work correctly with DataMeter.
The following is a list of suitable software (as of August 1999).

•LogIT brand Datalogging software

Starter software is low cost software for DataMeter as supplied in the All-in-One pack bundles. MultiLink software works with the entire family of LIVE, LogIT SL and DataMeter, sensing the logger automatically. Free working evaluation versions for many of these packages are available on our web site www.dcpmicro.com

Computer type	**LogIT brand software**
IBM PC DOS or Windows	LogIT Lab, PC Starter DOS, PC MultiLink
Windows CE Palmtop	LogIT CE software
Acorn Archimedes/RISC OS	Arc Starter, Arc MultiLink Advanced
Psion 3/Acorn Pocket Book	Psion Palmtop Starter,Advanced & Timing
Apple Macintosh	Import with ClarisWorks (see Mac Insight)
Apple eMate 300	LogIT eLab
BBC Micro/Master	BBC Starter

•Independently produced 'third party' software

If you use third party datalogging software such as Insight or RM Investigate these have a choice of 'drivers' built in for different dataloggers and you must select the DataMeter option. NB Insight 1 does not include a DataMeter driver but a discounted upgrade to Insight 2 or 3 is available.

Computer type	**Third party software**
IBM with Windows	Insight, Junior Insight, RM Investigate
Acorn Archimedes/RISCOS	Insight, Junior Insight
Apple Macintosh	Insight, Junior Insight

•Link cables

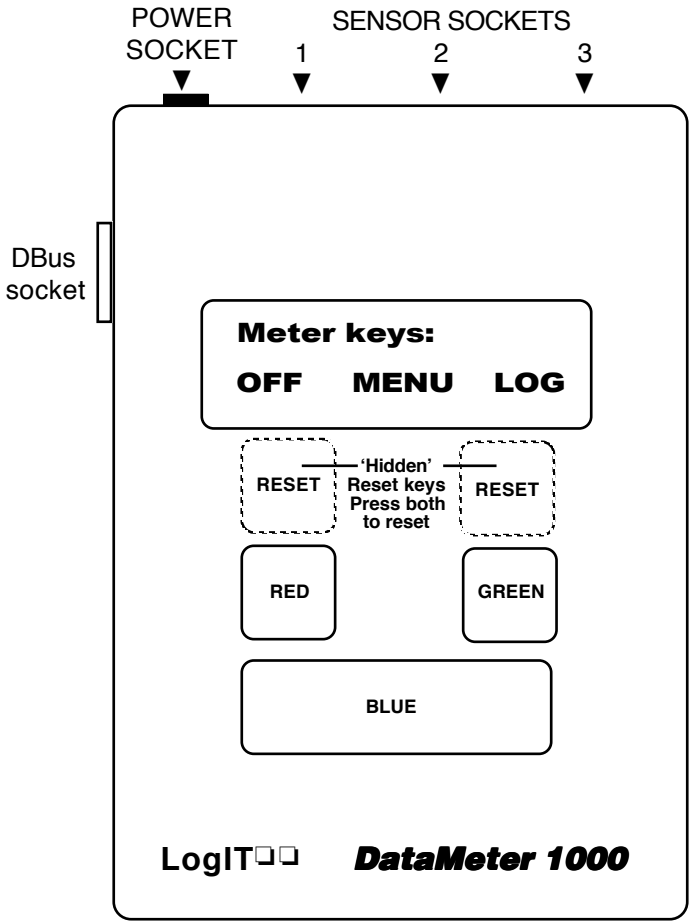
Depending on whether you purchased DataMeter on its own or as part of a pack you may need some Link cables. These are specially wired and tested cables which will work with all LogIT family products, including DataMeter. Note that the PC link cable is not a standard 'pin to pin' cable.

Computer type	**Link cable**
IBM PC / notebook	IBM Link cable (9-25 pin adapter available)
Acorn Archimedes	Archimedes Link cable (A3000 requires serial port)
Psion 3/Pocket Book	Palmtop Link cable (some require A-Link/Serial link)
Apple Mac/eMate	Mac Link cable V2 (also for Powerbooks)
USB Compatibility	USB connection kits available
BBC Micro	BBC Link cable (for BBC-B/BBC Master)

Overview

Quick guide to DataMeter basics

Buttons and sockets



•**BUTTONS** - the exact function of buttons change depending on what you are doing but is shown on the screen above each button
To RESET DataMeter **both** *Hidden* reset buttons have to be pressed at the same time - see page 9 (These are hidden to prevent accidental use).

•**SENSOR SOCKETS** - all 3 sockets can accept any Microsense sensor which they automatically identify and calibrate in standard SI units.

•**DC POWER SOCKET** - Plugging the special LogIT power pack into this socket charges DataMeter and also allows you to use it at the same time if required. 16-24 hours is required for a full charge (see page 9).

•**DBus SOCKET** is for connecting DataMeter to a computer for transfer of data, updating system software or control facilities.

Sensor product range

The following is a list of DataMeter compatible sensors and adapters as available in August 1999 - check our web site *www.dcpmicro.com* or contact your dealer.

•**Temperature**
General HiTemp sensor - basic flexible wire ended (-10 to +110˚C)
ProTemp sensor - robust stainless steel 180mm probe (-30 to +130˚C)
K-Type thermocouple adapter for standard K type's (-50 to +1200˚C)

•**Environment**
Sound Level sensor - compact design with a range of 50 - 100dB
General purpose humidity sensor (10 - 90% R.H.)
HumiPro fast responding wide range humidity sensor (1-100% R.H.)
Air Pressure sensor - absolute / barometric pressure sensor (0-200kPa)
Light level sensor+lens; fast response light sensor with optics (0-100%)
LUX light level sensor - wide range reading in LUX (0 - 25000 LUX)

•**Electrochemistry**
pH amplifier adapter to enable standard pH electrodes to be used
Dissolved Oxygen probe set with probe and amplifier (0 - 200% sat)
Conductivity probe set including probe and amplifier (10μS - 20mS)
Redox adapter - for standard Redox potential electrodes

•**Health**
Heart Receiver for wire-less 'Polar Beat'
Pulse Monitor with ear clip

•**Movement & Position**
Position sensor - measures rotation 0-340˚ with very low torque
LogIT Ranger - Ultrasonic sensor module for dynamic speed & position

•**Digital sensors and switches**
Light gate set - pair of complete light gates for timing investigations
Light Switch - a switch to detect light - make your own light gate
Infra Red source - designed to act as source for Light switch
Push Switch - for manually triggering timing events
Reflective switch - built in IR source for tachometer work etc
Magnetic Switch - triggers on magnetic field (magnet supplied)

•**Voltage, Current and Magnetic field**
Voltage Measurement probe with set of plugs & probes (+/- 25V DC)
Current measurement set with set of plugs & probes (+/-1A DC)
Magnetic Field probe-electromagnetic investigations (-90mT/+90mT)

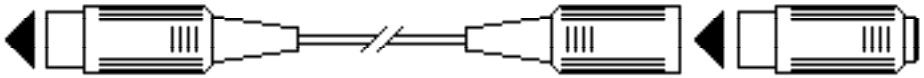
•**Adapters**
Designer sensor set with analogue & digital adapters for own designs
1 Volt sensor adapter - for using other equipment/sensors (0-2.5V DC)
100mV voltage adapter - with BNC socket (-100mV to +100mV DC)
Balance interface - for balances with suitable output to log mass
Ohaus Scout/Fisher Balance adapter for low cost balances
4-20mA Current loop adapter (Other adapters are available)

•**Accessories**
Remote Mark Switch, Extension cables and mounting clips available
Control accessories including Control Relay, LED, Buzzer and SwitchIT

Sensors

DataMeter uses the Microsense® range of sensors and adapters which were specially developed for LogIT products. There are two main types of sensor; analogue and digital. Analogue types measure levels but Digital sensors only have two conditions; on/off or 1/0.

•Sensor design
The main philosophy behind the design concept of sensors follows the same ideals as DataMeter - robust and easy to use.
One of the main problems with nearly all electrical items in the classroom is wires. Wires can break, get in the way and are invariably either too short or too long. Where possible and practical Microsense sensors are completely self contained in metal shells with no wires attached. This makes them robust, compact and they can be plugged directly into DataMeter so that logger and sensors can be held in one hand with no wires to trail around or break.
And if you want to use sensors away from DataMeter, just use an extension cable or several cables linked together:

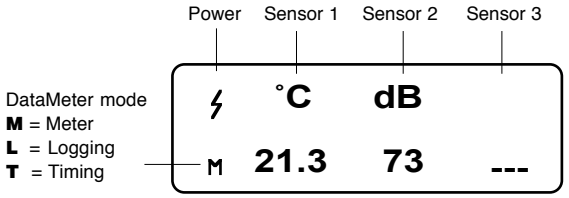


Standard 1 metre and 3 metre length robust extension cables with metal connectors are available (or if you prefer you can make your own). Then if a cable does get damaged you can still carry on using the sensor and because the cables are simple and have no electronics inside a technician can repair the broken wire!

•Adapters for connecting other equipment
As well as self contained sensors there are also Microsense adapters to enable you to use other equipment which has suitable outputs.
Some third-party sensors and instruments have outputs which have an analogue voltage range of 0 to 1 volt. A 1 volt sensor adapter is available, as are adapters for other output levels. Some software also allows you to redefine and recalibrate the voltage to the sensor's actual value and units. The balance interface adapter enables most balances with RS232 type data outputs to be plugged into DataMeter just like a sensor. This enables you to measure mass at the same time as other parameters - ideal for evaporation, transpiration etc.

•Updating for new sensors
DataMeter is compatible with all Microsense sensors and adapters (except Breathing sensor & LIVE sound) released as of August 1999.
However if you purchase a new sensor introduced after this date it may show ??? when you plug it in. You will need to upgrade the internal DataMeter system to recognise the new sensor. This is quick and easy to do using a new system update available free of charge from our web site (www.dcpmicro.com) or using a System disc which is available from DCP.

Meter and sensors



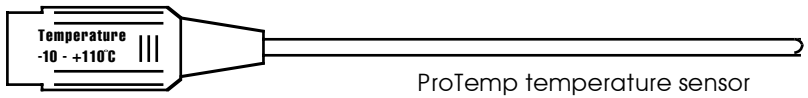
•METER MODE enables you to plug sensors and adapters in and use DataMeter as a meter without storing any data. Meter mode is automatically selected when you first switch DataMeter on and is indicated by a small **M** at the bottom left of the screen.

•BATTERY ICON - A small battery icon is shown just above the M and when the battery is healthy it should be 'full' as the picture above shows. When it is getting near to exhaustion the icon starts to empty until it flashes, when you have very little time left. You should charge DataMeter as soon as possible when the level starts to go down.

•CHARGING ICON- when the mains adapter is plugged into DataMeter the battery icon changes to a strike symbol as shown below. This indicates the battery is being charged - you can also use DataMeter at the same time.
See page 9 for more information on correct charging of the battery.

•GENERAL CONTROLS - by progressing through the menus using the blue button you can change some of the operational functions such as display contrast, beeper on/off and set the time and date.

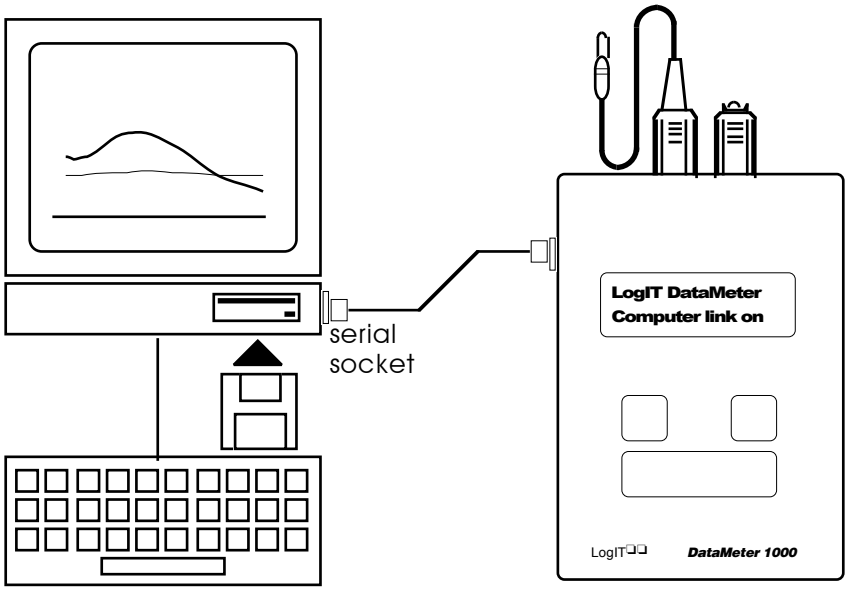
•SENSORS - most Microsense® sensors are compatible with DataMeter. All self identify themselves in calibrated SI units and most are compact and robust with no wires so that they plug directly into DataMeter - they can also be used remotely using Microsense extension cables.



ProTemp temperature sensor

Real Time Data-logging

Sensor values can be sent from DataMeter via cable to a computer to display and record results live, 'as it happens'. When used in this way DataMeter is an interface, linking sensors to your computer.
You will need a computer loaded with suitable software and a LogIT link cable. As there are many different computers and software we cannot be to specific in this manual - please refer to the instructions supplied with your software for detailed information.



You need a special LogIT to computer link cable which is either supplied with your DataMeter pack or available separately.
This plugs into the serial socket on the computer - usually marked COM, RS232 or serial - your software instructions will tell you which one to use.

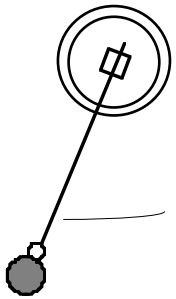
When you have loaded the software you should then select the option to start real time or As It Happens logging. Some independent software such as Insight or Investigate also needs you to set which data logger you have - here you must select DataMeter (not LogIT SL). The DataMeter display should say 'Computer link on' and you start to see data from your sensors appear live on the computer screen.

If this does not work double check cables and connections and check any fault finding information supplied with your software.

DataMeter in Education

DataMeter is a versatile tool designed for general school and college use and all departments can benefit from its portability, versatility and ease of use.
As well as standard experiments like cooling curves, there are many other demonstrations and investigations that suddenly become practical and exciting, which take minimal setting up but offer maximum educational value.

As an example of this, you can try a classic (but previously difficult to set up) physics demonstration of simple harmonic motion. You will need a Microsense Movement & Position Sensor, a piece of piano wire and a pendulum bob as shown - you do not need the computer at this point. Start the pendulum swinging and press the green button to start autologging. For best results only log for a few seconds - this will show the best resolution using AutoLog. When you download the data to your computer you should clearly see the constant frequency but decaying amplitude.



It is beyond the scope of this instruction manual to detail experiments which fit precise requirements of the education curriculum. However there are resources available which were either written for or can be applied to using DataMeter in education. You will also find some on our web site at www.dcpmicro.com
Here is a selection:

•**LogIT Teaching File** West Park CDC/DCP Microdevelopments
Published by the designers of LogIT, this file contains a wide range of information and copyable resources including details of sensors and software as well as Worksheets and Activity reports.

•**Datalogging at Key Stage 4** Mid Glamorgan Educational IT
Designed to help teachers develop datalogging Information Technology courses at Key stage 4/GCSE of the UK National Curriculum and highlights ways in which LogIT can be used to meet the requirements of exam syllabuses.

•**Datalogging and Control** Roger Frost - IT in Science
The book sets out to illustrate the many aspects of science which can be explored with sensors. It is a practical guide with many ideas showing what data logging & control is & where it fits into your work.

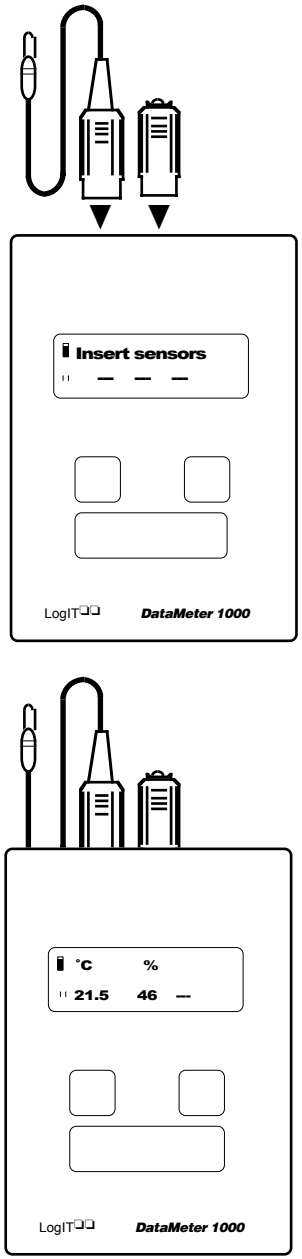
•**IT in Science** Roger Frost - IT in Science
Available in Secondary or Primary versions the books show the many ways that you can use computers to help teach science. As well as sensing it covers activities with word processors, databases etc.

Reference

Useful advice and product information

Remote Data-logging

Data can be stored in DataMeter without the need for a computer:



- **Plan your experiment**
Choose the sensor(s) you require and plug them into DataMeter. You should see the sensor's units and current values appear on the screen
Tip you can use any sensor socket but your graphs will look better if you start from socket 1.

- **AutoLog** logging records continuously over a period of time, up to 3 months. You start AutoLog simply by pressing the green button (or you can use the menu). The flashing **L** indicates logging has started. You can mark an event by pressing the green button again. To stop logging press the red button. You can now transfer the data or log again (up to 4 sets)

- **Snapshot logging** stores sensor readings when you press the green button. Choose 'Start SnapLog' from the setup logging menu. The red button stops the logging session.

- **Transferring logged data**
DataMeter should be connected to your computer in the same way as for real time logging (see previous page) but you need to select the load data option from your software.

- **Programmed logging**
As well as AutoLog and Snapshot logging you can also program DataMeter to record at intervals you select - see page 13 for more details.

In Detail

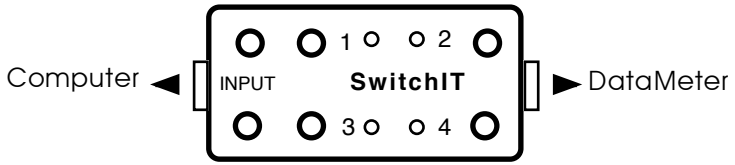
Comprehensive guide to DataMeter operation

DataMeter in Control

In addition to its meter and datalogging functions, DataMeter also incorporates real time control facilities. A relay interface, buzzer and control LED are available, as well as the internal beeper which can be controlled from suitable datalogging software which supports control.

•DataMeter internal beeper
Normally the internal beeper is utilised as a button beep, but it can also be used as a programmable alarm when used with appropriate software. It is located at control address 5 (same as AlarmIT address).

•SwitchIT Relay interface
SwitchIT is a relay interface incorporating 4 changeover relays each rated at 24 volts/1 amp - ideal for controlling low power lamps, motors, etc. Dual-colour LEDs for each output show relay positions.



SwitchIT plugs into the DBus socket of DataMeter using a DBus cable and the computer is then plugged into SwitchIT using the normal link cable. Instructions, examples and connection details are supplied with the SwitchIT set.

•Control LED, Buzzer and Relay
These are low cost control accessories which look similar to ordinary sensors and simply plug into any free sensor socket. The Control LED, Buzzer or Relay can be programmed to operate by using the socket number they are plugged into as their control address (ie 1, 2 or 3) - some software allows independent control of each address.

• Casio Camera Adapter
This adapter also allows you to connect some models of Casio Digital camera to allow pictures to be taken with certain sensor conditions - eg Monitor a bird box to take a picture of the bird and record activity.

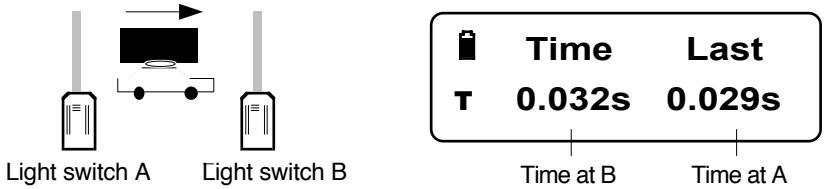
•Software programming of control
Programming instructions and facilities for control will be explained in the documentation supplied with control-supporting datalogging software.

Timing

DataMeter has two high resolution timing facilities which work with digital sensors such as Light Gates or switches to enable you to accurately time events on digital sensors from 0.001 to 9.999 seconds. These timing facilities are Meter-only functions so timing data is not stored in the DataMeter memory but displayed live on screen with both the last and current times shown. As well as sensors you can also use the green & red buttons for manual start/stop timing - the blue button is used to leave the timing facility.
The display may appear to count slowly but you would not be able to see thousandths of a second - but the display always catches up.

From the 'Setup timing' menu:

•Time at sensor
This timing option measures the amount of time taken AT digital sensors. For example, if a push switch sensor is pressed and released the display will show how long it was pressed for. You can use one or more sensors in any sensor socket.
Example: Using 2 Light gates/switches with a trolley or model car and a black card you could measure both speed and speed difference:



Two times will be shown which relate to the speed of the car at light switches A and B (this example shows that the car slowed down by 0.003 seconds=3mS). If the length of the card and distance between switches is known then speed, acceleration etc can be calculated.

•Sensor to sensor
As the name suggests, this measures time BETWEEN digital sensors.
For example, with a push switch sensor it will time between one press and the next press. Or with the car example above it will start timing when the card passes through one light switch and stop when it passes through the second.
Tip If you get start/stop sensing out of sequence press red button to reset timer. Further information is in README file on the system disc.

Tip Note that DataMeter does **not** shut down to save power when timing. When using Light gates we advise using the power pack wherever possible.

•Computer based Timing
Much more sophisticated timing and analysis along with saving, exporting and printing of data is possible using purpose written packages such as Insight or LogIT Lab software.

General features and controls

•POWER/CHARGING
Unfortunately, specifying battery life is not a precise art and depends on how often you use / charge DataMeter and the types of sensors you use with it.
- For a full charge from 'empty' DataMeter requires 14-24 hours
- If fully discharged you may need to wait 2-3 minutes then reset (see below)
- DataMeter may be used and charged simultaneously but for best performance always charge with DataMeter switched off
- Do not leave on charge for more than 72 hours or battery life may be reduced
- If using Light Gates we always recommend you power DataMeter from the power adapter supplied as Light Gates consume a lot of power
- To get the best from the battery, cycle the charge / discharge regularly and approx every 3 months discharge and recharge twice (you can discharge a DataMeter by holding the green button to get it into 'Meter staying on' mode).

Tip As a general guide you will probably need to charge DataMeter for around twice as long as you need to use it on battery power.

•RED, GREEN & BLUE BUTTONS
To avoid having lots of keys with complicated functions we have used just 3 buttons whose functions slightly vary but the display tells you what they do at any one time. Generally the red button is for stop/no, green is for start/yes/Mark and blue is the menu or help key. Watch the display for help prompts with labels above each button.

•LCD SCREEN
DataMeter uses a low power LCD screen for clarity. The contrast of the screen depends on several factors including ambient light, battery and temperature. There is a contrast menu which allows you to select a high or low contrast setting.

•BEEP
The key 'beep' can be alternately turned on/off using BEEP menu.

•SETTING TIME and DATE
Some LogIT datalogging software uses the 'time stamp' from the internal clock to show when data was collected. (see page 13).

•RESET
Any computer based product can occasionally get itself into a condition from which it cannot recover by itself (or 'crash'). DataMeter is no exception and so if, for example, you let the battery completely discharge or simply think it is not doing what you expect you should reset it. DataMeter has two *unmarked* hidden reset buttons located directly above the red and green buttons - you must press them *both* to reset (see page 4). We have hidden the buttons so that they are not pressed accidentally (or mischievously by a student!).
FULL RESET AND CLEAR: Pressing both buttons just gives DataMeter a basic reset. But if you press and hold the blue button and at *the same time* press both reset buttons you will also reset the clock and clear all data in the memory - use with care! NB: If Screen ever says "RELOAD SYSTEM" see "Problems" on page 23.

•GENERAL
The case is NOT waterproof - never let water or damp get into the DataMeter case and never use detergents etc. The battery should last many years if care is taken and the advice given in this manual is taken (NB: battery can only be replaced by the manufacturers).

Meter

The meter facility allows you to monitor sensors and adapters without actually storing data. When DataMeter is working as a meter a small **M** appears in the bottom left of the display. Plug sensor(s) into any socket and the display will show sensor SI units and readings directly below.

•Battery or Power pack

There are icons to indicate battery and charging conditions which are explained in the overview section at the front of this manual. Only use the mains power pack/charger supplied (or the original LogIT SL power pack). If it does not have LogIT on it, DON'T USE IT!

•Power save

To save battery power DataMeter switches itself off if no button has been pressed for 2 minutes. However you can override this by selecting 'Meter stay on' from the main menu - the **M** symbol on the screen will flash and DataMeter will then stay on until you switch it off or start logging. If you are using DataMeter with the power pack/charger then the display will automatically stay on until you switch it off.

Tip A quicker way to make the meter stay on is to hold green button down for more than 2 seconds when you switch DataMeter on.

Real Time Logging

In real time DataMeter acts as a 'live' interface between sensors and the computer. The computer has total control over logging rates/time span and DataMeter sends back the sensor calibration and live data (no data is stored in DataMeter). As the computer has so much control, actual operation and function of real time logging will very much depend on which computer and software you have. However, here are the basics (it may also be useful to refer to the Real Time logging set-up picture on page 6):

- Connect DataMeter to your computer using the link cable
- Load datalogging software on computer (also select DataMeter as the interface type if required by your software)
- Set up logging rate and duration of experiment as required.
- Insert sensors required and check readings on DataMeter display
- Start logging with software (DO NOT press DataMeter's green button). Display should say 'Computer Link on'.
- When required select stop logging on the computer

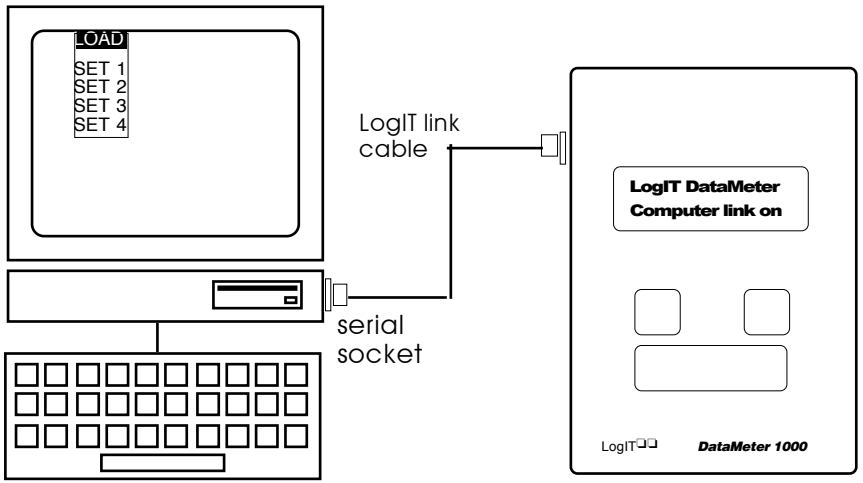
Tip The speed of real time datalogging is limited by the relatively slow serial link between DataMeter and Computer. If you need fast datalogging use DataMeter in remote AutoLog or Programmed logging mode and then download to your computer.

Downloading the stored data

Having logged data in DataMeter using AutoLog, Snapshot or Programmed logging you need to retrieve and use it.
There are basically two ways of downloading or 'exporting' data.

1 Dedicated Datalogging software

LogIT brand software, and most third party datalogging software supports DataMeter (see 'Software' in the reference section). With datalogging software all you have to do is connect DataMeter to your computer using the link cable and use an appropriate menu to load data. You may be given a choice from 4 sets of results to load because DataMeter can store up to 4 experiments data. You do NOT need to press DataMeter buttons - it will link automatically.



2 Sending Data direct to the computer with comms software

If you do not have datalogging software or if you just want to transfer the raw data into a spreadsheet etc you may be able to receive data with a communications or 'works' program. Eg:

IBM PC compatible	Windows Terminal, Microsoft Works
Apple Macintosh	Apple Terminal, ClarisWorks, MS Works,
Acorn Archimedes	ArcComm 2, Hearsay
BBC Master	Built-in terminal program
Psion/Acorn Pkt Bk	Serial/A-Link software (built into link)

The comms software should be set to 9600 Baud, 8 bit, no parity, 1 stop bit, RTS/CTS handshaking. Then select 'Send Data File' from the DataMeter menu & choose CSV (comma separated value) or TAB (tab sep. value) for spreadsheets, or SID for datalogging software. The last data set will be sent. For details see README on system disc.

•Printing data direct to a printer

You can print a table of ASCII text data direct to a serial printer using 'Send Data File'. The printer should be set to same settings as above.

Advanced Programming

Advanced programming enables you to change the reading type of individual sensors and/or allocate all of the data memory to just one logging session, greatly expanding the storage capacity for an experiment. Although these can be very useful and powerful facilities, they are quite complex and only recommended for those who are experienced with datalogging. Please note that not all software is able to take advantage of all of these facilities.

•Advanced setup

DataMeter uses sensors which self identify and scale themselves automatically to a standard default reading type/function.
Advanced setup allows you to choose other functions or parameters for some of these sensors . For example, instead of reading the default frequency in Hz on a digital sensor (counts per second) you could choose to display rate in counts per minute.
Advanced setup can be found in the Setup Logging menu and it offers the following sensor reading types which can be independently assigned to different sensors using the blue key to select sensor and red / green keys to select reading type:

Reading type	Description
Auto	The normal default automatic reading type
mV	Displays analogue sensor actual voltage output in mV
0 or 1	Displays logic state of digital sensor-good for testing
Counts	Count digital events during selected interval(max 255)
Hz	Shows number of events / second from digital sensor
Per min	Shows number of events per minute from digital sensor
Period	Shows time between digital events (max. 2.5 seconds)

You may find this facility particularly useful when making your own sensors using the Designer sensor adapter set but please use with caution - particularly when using the mV setting with voltage probes and adapters (for example, it can display mV instead of Volts!).

You can also program a specific logging rate similar to before but please note the 'Set Logging rate - uses all memory!' display warns you that you are assigning ALL of the memory to just one experiment. This gives you much more memory than normal but if you use it all it will overwrite any other data you have in memory, so use with care. Instead of logging you can go to meter mode to display readings live (the display shows the reading type you have set regardless of any sensors plugged in) or use AutoLog as normal (except for counting).

Because Advanced programming is so powerful it could also be confusing or misleading if it were left in a programmed condition indefinitely (and maybe used by somebody else). Therefore we have ensured that DataMeter returns to standard logging settings after each advanced programmed logging session or switch off.

AutoLog automatic data logging

AutoLog is DataMeter's built-in intelligent logging system. Although you can manually program DataMeter's sampling speed, sensor types etc, AutoLog works out the best compromise between memory & sampling rate and you will probably find it will prove ideal for most of your work.

•Start AutoLog

Choose the sensor(s) you wish to use, plug them into DataMeter and check the meter display. When you are ready to start Auto-logging just press the green button (NB you will find Start AutoLog in the Setup logging menu but pressing green button from meter mode is quicker).

•Power save

If your experiment lasts longer than a few minutes then DataMeter will blank the display to save battery power but it is still recording results. To bring back the display at any time, press the blue button.

•Marking events

You can add marker(s) at particular times or readings you wish to emphasise by pressing the green button again whilst logging- this will appear as an arrow or mark on the graph (not used on all software).

•Stop AutoLog

Pressing the red button will stop the logging and you can then either transfer the data to your computer or do further experiments; DataMeter can store up to 4 separate experiments in its memory on a rotation basis so you always have the last 4 sets of data available. AutoLog can record for up to 3 months, depending on battery.

•How does AutoLog work?

AutoLog works on the principal that with short experiments you are likely to want to capture a lot of data quickly, whereas longer experiments will probably require less data so the sampling rate is slower. As you start Auto-logging DataMeter does not know how long your experiment will be and so it starts recording quickly (64 per second) and then gradually, as time goes on, reduces the sampling rate. So that memory is used efficiently DataMeter manages space so that old results are deleted to make way for new ones.

AutoLog sampling rates:
First 4 seconds 64 readings per second
Next 4 seconds 32 readings per second
Next 8 seconds 16 readings per second
Next 16 seconds 8 readings per second etc etc

In reality of course; all of this is worked out by the internal microprocessor and stored as consistent sets of results so that you never actually need to worry about how it works - after all, technology should make life better and easier, not more difficult!
Tip Remember that shorter experiments store data at a faster rate.

Snapshot Datalogging

An innovative facility built into DataMeter is Snapshot logging. It allows manual control of when single sets of sensor readings are recorded.

Standard electronic datalogging records data at regular programmed or automatic time intervals. But there may be times when you want to record readings at a precise moment which you decide.
For example, if you wanted to check environmental (pH, temperature, DO2 etc) levels at various points along a river you could take DataMeter and sensors and when you are happy with sensor readings just press the green button to record those results.
In this mode DataMeter works as a sort of electronic note pad, recording data when you press a button.

•Start Snapshot logging
Select Start SnapLog from the setup logging menu. DataMeter will then record the time and date and wait for you to start storing data.

•Recording data
Each time you want to record a set of readings press the green button - the display will acknowledge with 'Readings stored'.
Tip You may wish to note where you take the readings.

•Power save
If your experiment lasts longer than a few minutes then DataMeter will blank the display to save battery power but it will still record data. If this happens just press the blue button then take readings with the green button as before.

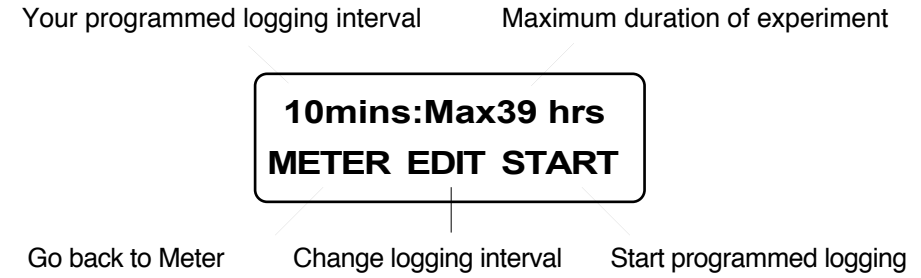
•Stop logging and downloading results
Press the red button to stop snapshot logging. You can then carry out further logging sessions (up to 4 sets in total) or download results into your computer. The way individual software displays this data will vary considerably but some will show the time along the bottom of the graph and others will show the number of readings (The start time and date may also be shown).

•Logging capacity
Snapshot logging can store up to 240 readings before the memory is filled. It can be over a long period of time but the time stamp, which records the time from start in seconds, will reset after 18 hours (not all software utilises the time stamp facility).

Tip Some software will automatically extrapolate between data points to produce a continuous line. However, If you want to see the points of actual data at which individual readings were taken try selecting the 'display points' option or alternatively analyse the data in tabular form (if available on your software).

Programmed Logging

This facility enables you to program DataMeter's logging parameters and is divided into two menus; 'Set log rate' and 'Advanced setup'.
Set Log rate allows you to program the time interval between readings only, whereas Advanced setup also enables you to set sensor logging types etc.
Before programming you need to consider the *minimum* time resolution you need for your experiment as there is a direct trade off between time interval and the total logging time.
•Set Log rate
This option is found in the Setup Logging menu. You can choose to either edit the existing interval or start logging with the time interval shown (which will be the last interval you set). If you select EDIT with the blue button you will be first asked to set the time units required (using red and green buttons) which can be either ms (milliseconds/ thousandth of a second), secs (seconds) or mins (minutes). When you have reached the units of sampling interval required press the OK (blue) button to move on to selecting the actual time interval from the choices given, again using the red and green buttons to increase or decrease times.
As you change times you will notice that the 'Max:' number on the right changes at the same time to give you the maximum duration of the experiment before the memory is filled.



When you have finished editing the interval just press the blue OK button and then, if you are ready to start logging, press the green button to START logging. The setup will remain the same until you change it (or DataMeter is reset) but you always need to go to the Set Log rate menu to start programmed logging. When the memory is full the DataMeter display will show 'Logging stopped' and return to meter display. As with the other types of logging on DataMeter you can store up to 4 sets of different results in the memory.

Setting the clock

DataMeter has an internal clock which some software makes use of to provide a time and date stamp or record of exactly when an experiment was started.
To check or set the clock, press the blue button several times to reach the Time and Date displayed on the top line - METER and ADJUST are shown below it.
Press the Green ADJUST key and then use the Red - and Green+ keys to increase or decrease the part of the time or date the flashing cursor is over - then press Blue OK button to move onto the next part of the time or date.