



# USB DrDAQ<sup>®</sup>

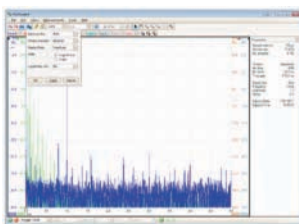
## VERSATILE DATA ACQUISITION

### USB DrDAQ: Making Data Logging Fun!

Whether you're a teacher, student, hobbyist or professional the USB DrDAQ Data Logger gives you an inexpensive entry into the world of PC-based data logging.



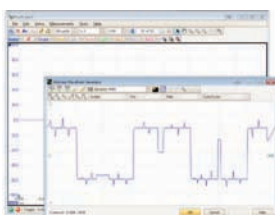
- Use DrDAQ as a **data logger**
- Use DrDAQ as an **oscilloscope**
- Use DrDAQ as a **signal generator**
- **Built-in sensors** for light, sound and temperature
- **Measure pH** – just plug in any standard pH electrode
- Sockets for **external sensors**
- **Digital outputs** to control external devices
- **USB** connected and powered
- **Use up to 20 USB DrDAQs** on a single PC



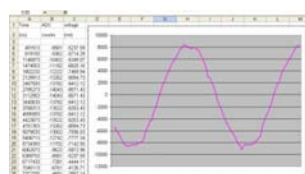
Oscilloscope /  
Spectrum Analyzer

| Alarm | Channel                | Reading | Units |
|-------|------------------------|---------|-------|
| ●     | Temperature            | 27.6    | °C    |
| ●     | Sound Waveform         | 0.0     |       |
| ●     | Sound Level            | 71.2    | dBA   |
| ●     | pH                     | 9.24    |       |
| ●     | Light                  | 65.5    |       |
| ●     | External 1 Humidity    | 54.2    | %     |
| ●     | External 2 Temperature | 34.0    | °C    |
| ●     | External 3 Temperature | 33.8    | °C    |

Multi-channel  
data logger



Arbitrary waveform  
generator



Write your  
own software



# Introduction to USB DrDAQ

## Sensors

Thanks to the built-in sensors for light, sound and temperature you can start using your USB DrDAQ Data Logger straight out of the box. The USB DrDAQ also has an RGB LED that you can program to show any 1 of 16.7 million colours.

When you want to do more with your DrDAQ you can thanks to the external sensor sockets. Simply buy an external sensor and your DrDAQ can measure humidity, oxygen levels, external temperatures and more. We provide you with all you need to know to connect external sensors to your DrDAQ so you can even design and use your own sensors.

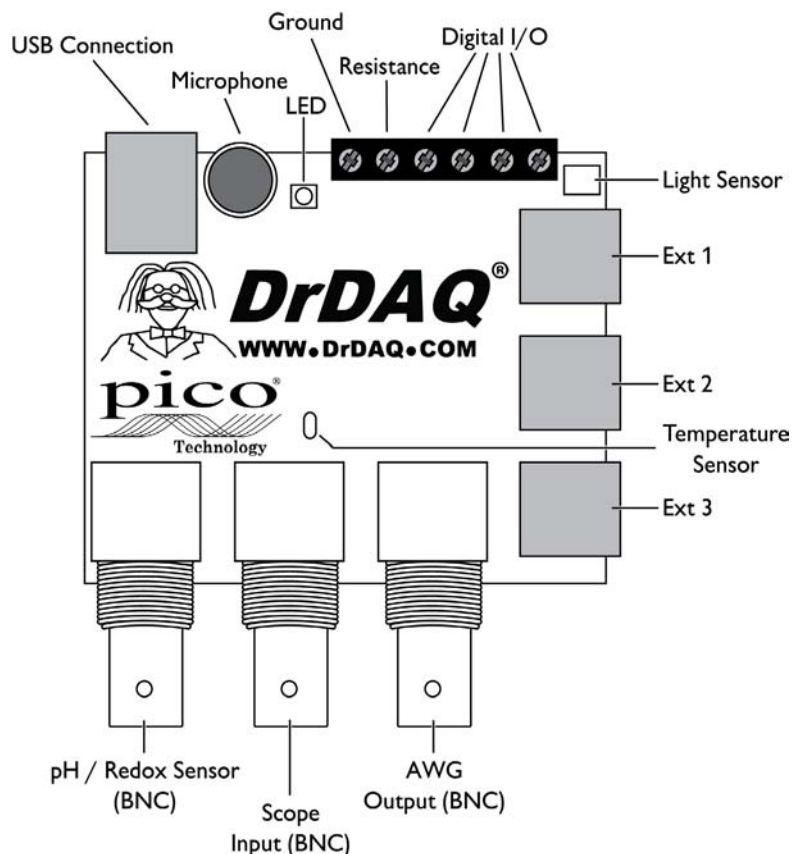
## More than just a data logger

Thanks to the power of your DrDAQ you can also use it as an oscilloscope or spectrum analyzer. Just run the supplied PicoScope software and your DrDAQ becomes a single-channel scope with a 100 kHz bandwidth, 8-bit resolution and the ability to measure voltages of up to  $\pm 10$  volts.

## Digital I/Os

Your USB DrDAQ also includes 4 digital input/outputs. In input mode these give you even more monitoring options. When used as outputs they enable you to use your DrDAQ to control external devices. 2 of the digital I/Os include a pulse-counting function when used as inputs, and a pulse-width modulation (PWM) output capability.

But that's not all. Your DrDAQ also includes a signal generator. The signal generator output not only includes a standard function generator, but also an arbitrary waveform generator (AWG) too. Using the AWG function you can create your own waveforms.



## Hobbyist, student or professional — DrDAQ is all you need

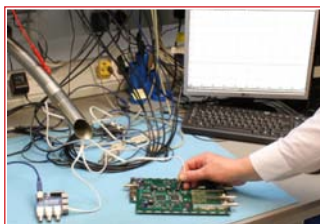
The **USB DrDAQ Data Logger** has something for everyone: whether you're a teacher looking for a fun way to perform data logging experiments in the classroom, a student wanting an inexpensive introduction to data logging and oscilloscopes, a computer programmer who wants to use C++ to monitor and control inputs and outputs of real-world devices, a hobbyist who wants to monitor and control their environment, or a professional wanting to measure pH under laboratory conditions — **DrDAQ** is all you need.



.....hobbyist



.....student



.....professional



# Data Logging and Oscilloscope Software for USB DrDAQ

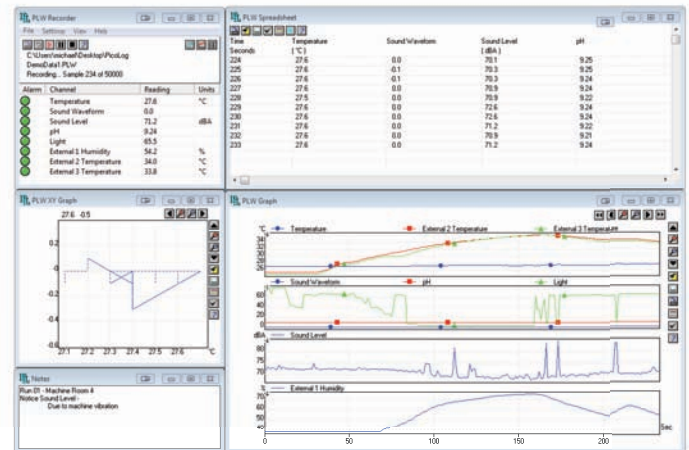
A PC-based data logger is only as good as its software — that's why the USB DrDAQ comes with a complete software package that enables you not only to use your DrDAQ as a data logger but also as an oscilloscope and AWG too.

Both PicoLog and PicoScope are fast and easy to use.

## PicoLog

PicoLog data acquisition software is a powerful yet flexible program for collecting, analysing and displaying data. Features of PicoLog include:

- Easy and intuitive to use
- Free upgrades and technical support
- Supports 32- and 64-bit editions of Windows XP (SP2 and above), Vista and Windows 7
- International language versions
- Easy to set up and use with online help
- Real time data collection, analysis and display
- Programmable alarm limits can be set for each channel
- Data can be exported to spreadsheets and databases
- Save multiple setups for different tests and experiments
- Can be used with desktop or laptop PCs
- Supports up to 20 USB DrDAQs on the same PC
- Uses PC monitor to give large colour display, ideal for education and training
- Waveforms can be saved, printed or e-mailed from your PC

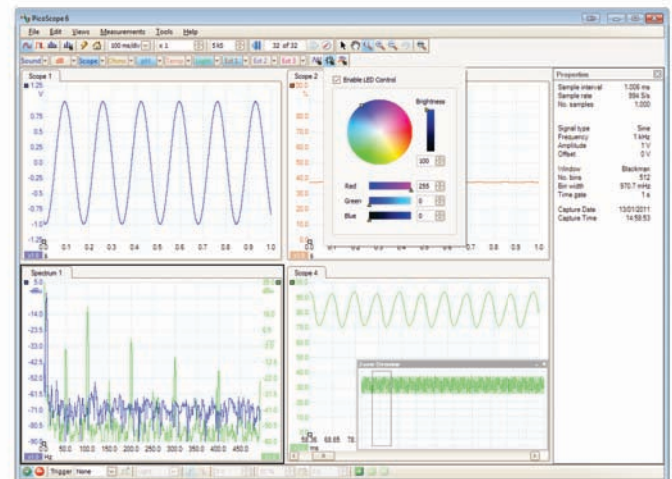


## PicoScope

PicoScope is the leading oscilloscope software for Windows-based PCs, yet it is much more than just 'oscilloscope software' — it's your complete test and measurement lab in a single application. Using PicoScope you can use your DrDAQ Data Logger as an oscilloscope or spectrum analyzer, as well as control the integrated signal generator, the RGB LED and the digital outputs.

PicoScope is packed full of many advanced features including:

- Advanced zoom controls
- Auto-arrange axes
- Auto setup
- Automated measurements
- Digital persistence mode
- Mask limit testing
- Math functions
- Reference waveforms



## Software Drivers

For users who wish to write their own software or use our products with third-party software we provide, free of charge, a range of software drivers and examples. Drivers are included for Windows XP (SP2 or later), Vista and Windows 7 (32 and 64 bit). Programming examples are supplied for C, C++, LabVIEW, and Excel.

# USB DrDAQ Technical Specifications

## DrDAQ Data Logger General Specifications

|   |  |
|---|--|
| Number of input channels                          | 14   |
| Maximum sampling rate (block mode)*               | 1 MS/s   |
| Maximum sampling rate (continuous USB streaming)* | 1 kS/s (PicoLog and PicoScope)<br>100 kS/s (Using API)                 |
| Memory depth (block mode)*                        | 16 kS  |
| Memory depth (USB streaming)*                     | 1 MS (PicoLog)**<br>2 MS (PicoScope)**                                 |
| Additional hardware (supplied)                    | USB 2.0 cable, user manuals, software CD-ROM                           |
| PC interface                                      | USB 2.0 (USB 1.1 compatible)   |
| Power requirements                                | Powered from USB port  |
| Input overload protection                         | ±30 V  |
| Compliance  | FCC (EMC), CE (EMC and LVD), RoHS compliant                            |
| Dimensions  | 77 × 70 × 23 mm (approx 3 × 2.7 × 0.9 in)<br>(includes BNC connectors) |
| Weight  | 60 g (approx 2.1 oz)   |

\* Shared between active channels

\*\*Unlimited using API

## Oscilloscope / Spectrum Analyzer Channel

|                       |                                 |
|-----------------------|---------------------------------|
| Bandwidth             | 100 kHz                         |
| Resolution            | 8 bits                          |
| Input characteristics | BNC connector, 1 MΩ, DC coupled |
| Input ranges          | ±1.25 V, ±2.5 V, ±5 V, ±10 V    |
| DC accuracy           | ±3 %                            |
| Timebases             | 10 μs/div to 200 s/div          |

## Function Generator / Arbitrary Waveform Generator

|                           |  |
|---------------------------|--|
| Channels                  | 1 (BNC)  |
| Standard output signals   | Sine, square, triangle, DC voltage, ramp, AWG                          |
| Standard signal frequency | DC to 20 kHz   |
| Output voltage range      | ±1.5 V amplitude plus ±1.5 V offset                                    |
| Sweep modes               | Up, down, dual with selectable start / stop frequencies and increments |
| AWG update rate           | 2 MS/s   |
| AWG buffer size           | 4096 samples   |
| AWG resolution            | 10 bit   |

## Built-in Sensors / Outputs

| Channel        | Range                          | Resolution                       | Accuracy                       |
|----------------|--------------------------------|----------------------------------|--------------------------------|
| Sound waveform | ±100                           | ±0.2                             | Not calibrated                 |
| Sound level    | 55 to 100 dBA                  | 1 dBA                            | 5 dBA                          |
| Temperature    | -10 to +70 °C (+14 to +158 °F) | 0.1 °C @ 25 °C (32.2 °F @ 77 °F) | 2 °C @ 25 °C (35.6 °F @ 77 °F) |
| Light          | 0 to 100                       | 0.1                              | Not calibrated                 |
| RGB LED        | 16.7 million colours           | 8 bit × 3                        | Not applicable                 |

## USB DrDAQ Technical Specifications Continued...

### Analogue Inputs

| Channel   | Range   | Resolution          | Accuracy                     |
|---|---|---------------------|------------------------------|
| pH (BNC)  | 0 to 14 pH  | 0.02 pH             | Sensor-calibration dependent |
| Redox/ORP (Oxidation/Reduction)<br>(BNC shared with pH) | $\pm 2$ V @ $10^{12} \Omega$  | 1.2 mV              | Sensor-calibration dependent |
| Resistance (screw terminal)                             | 0 to 1 M $\Omega$   | 250 $\Omega$ @ 10 k | 5%                           |
| External sensors (3 x FCC68 4/4)                        | Measure 0 to 2.5V<br>(Also supply power to external sensors and identify sensor type via ID resistor) | 0.1 mV              | 1%                           |

### Configurable Digital I/O

|                        |   |
|------------------------|---|
| Channels               | 4 (screw terminals)   |
| Input characteristics  | 0 to 5 V (Low: Ground - 0.8 V, High: 2 - 5.5 V)<br>TTL compatible |
| Output characteristics | 3.3 V, 2.2 k $\Omega$ output impedance                            |
| PWM output             | Period and Pulse: < 65535 $\mu$ s<br>Resolution: 1 $\mu$ s        |
| Pulse counting         | up to 65535 counts @ 1 MHz  |

### Software

|                          |   |
|--------------------------|---|
| PicoLog                  | PicoLog software is a powerful yet flexible program for collecting, analysing and displaying data. Features include:<br>Multiple views - view data as a graph, spreadsheet or text<br>Parameter scaling - convert raw data into standard engineering units<br>Math functions - use mathematical equations to calculate additional parameters<br>Alarm limits - program an alert if a parameter goes out of a specified range<br>IP networking - transfer measurements via a LAN or over the Internet  |
| PicoScope 6              | PicoScope 6 is your complete test and measurement lab in one application. Features include:<br>Capture modes - oscilloscope, spectrum and persistence modes<br>Channel maths - calculate the sum, difference, product, inverse or create your own custom function using standard arithmetic, exponential and trigonometric functions<br>Automated measurements:<br>Scope mode: AC RMS, cycle time, DC average, duty cycle, falling rate, fall time, frequency, high pulse width, low pulse width, maximum, minimum, peak-to-peak, rise time and rising rate<br>Spectrum mode: frequency at peak, amplitude at peak, total power, total harmonic distortion (THD), total harmonic distortion plus noise (THD+N), spurious-free dynamic range (SFDR), signal+noise+distortion to signal+noise ratio (SINAD), signal to noise ratio (SNR) and intermodulation distortion (IMD)<br>Export data formats - Comma separated values (CSV), tab delimited (TXT), Windows bitmap (BMP), graphics interchange format (GIF), portable network graphics (PNG), MATLAB 4 format (MAT) |
| Software development kit | A growing collection of drivers and example code for various programming languages including: C, C++, Excel and LabVIEW.  |

### Language Support

|             |  |
|-------------|--|
| PicoLog     | Full support for English, French and German; menus only for Italian, Spanish and Swedish   |
| PicoScope 6 | Full support for English, French, Italian, German and Spanish. Menus and dialogs only for Dutch, Hungarian and Simplified Chinese. |

### Documentation

|                    |  |
|--------------------|--|
| User's guide       | English  |
| Programmer's guide | English  |
| Software           | PicoLog, PicoScope 6, SDK and example programs. Microsoft Windows XP, Vista or Windows 7 |

## External Sensors and Probes

As well as the built-in sensors, USB DrDAQ has sockets for optional external sensors. When a sensor is plugged into the external sensor sockets, the software detects it and automatically scales readings. For example, if a temperature sensor is plugged in, readings are displayed in °C, or if a humidity sensor is plugged in, readings are displayed in % RH.

### DD100 Temperature Sensor

A high-accuracy general purpose temperature sensor with a 2 metre lead. Suitable for air, surface or liquid measurements.



|                      |                                    |
|----------------------|------------------------------------|
| Range                | -10 °C to +105 °C (14°F to +221°F) |
| Resolution (at 25°C) | 0.1 °C (32.2 °F)                   |
| Accuracy (at 25°C)   | 0.3 °C (32.5 °F)                   |
| Price                | £15 (approx \$25 / €18)*           |

### DD011 pH Electrode

The Pico pH sensor is a robust epoxy bodied pH electrode ideal for educational use. The pH sensor consists of a standard electrode capable of measuring the full to 0 to 14 pH range. The electrode comes complete with a small bottle of storage solution to help prevent it drying out.



|                       |                               |
|-----------------------|-------------------------------|
| Size                  | 12 x 120 mm                   |
| Operating temperature | 0 to 60 °C (32 °F to +140 °F) |
| Resolution            | 0.02 pH                       |
| Price                 | £35 (approx \$58 / €42)*      |

### PP163 Humidity Sensor

The Humidity Sensor measures humidity using a 'non-condensing' technique. It has a short response time and plugs into the external sensor connections of USB DrDAQ.



|                       |                                       |
|-----------------------|---------------------------------------|
| Size                  | 72 x 45 x 28 mm                       |
| Operating range       | 20% - 90% Relative Humidity           |
| Overall accuracy      | Reading ± 10%                         |
| Operating temperature | 0 - 60 °C (32°F to +140°F)            |
| Resolution            | 0.2% Relative Humidity                |
| Minimum response time | 60 seconds with vigorous air movement |
| Accuracy (at 25°C)    | 60 minutes in still air               |
| Price                 | £49 (approx \$81 / €59)*              |

### DD103 Oxygen Sensor

The DD103 Oxygen Sensor is used to measure the percentage of oxygen in a gas. The sensor plugs into the external sensor sockets of USB DrDAQ using the supplied cable.



|                       |  |
|-----------------------|--|
| Sensor Type           | Galvanic Cell (lead-oxygen with weak acid electrolyte)         |
| Input Range           | 0 to 100% oxygen   |
| Accuracy (Calibrated) | ±3.0% over operating conditions range                          |
| Response Times        | < 15 seconds for 90% response<br>< 25 seconds for 97% response |
| Humidity              | 0 to 95% Non-condensing  |
| Operating Temperature | 5 °C to 40 °C (41 °F to +104 °F)                               |
| Storage Temperature   | -15 °C to 50 °C (5 °F to +122 °F)                              |
| Price                 | £99 (approx \$163 / €120)*                                     |

### MI007 Scope Probe

This high quality general purpose oscilloscope probe has a 60 MHz bandwidth. A two position slide switch allows attenuation of either x1 or x10 to be selected.



|                   | x1                       | x10          |
|-------------------|--------------------------|--------------|
| Attenuation       | 1:1                      | 10:1         |
| Bandwidth         | DC to 15 MHz             | DC to 60 MHz |
| Rise time         | 23.3 ns                  | 5.8 ns       |
| Input resistance  | 1 MΩ                     | 10 MΩ        |
| Input capacitance | 46 pF plus oscilloscope  | Approx 15 pF |
| Cable length      | 1.2 m (approx 4ft)       |              |
| Price             | £15 (approx \$25 / €18)* |              |

### Magnetic Induction Kit

Over 170 years ago British scientist Michael Faraday discovered electromagnetic induction - the "induction" or generation of electricity in a wire by means of the electromagnetic effect of a current in another wire. Now with the Pico Magnetic Induction Kit and a DrDAQ data logger you too can perform your own electromagnetic induction experiments



Price: £34.95 (approx \$58 / €42)\*

\*Prices are correct at the time of publication. Please contact Pico Technology for the latest prices before ordering.

## External Sensors and Probes

### PP066 Reed Switch

The reed switch sensor can be used to detect the presence of a magnetic field such as from a bar magnet or an electromagnet. Alternatively, a simple external switch can be wired to the internal screw terminals. It has a fast response time of 2 ms so can be used as an alternative to a light gate for timing applications. Other uses include monitoring the amount of time a door is left open or a machine running.



Price: £20 (approx \$33 / €24)\* including cable and magnet

### PP266 600 A AC/DC Current Clamp

This high amp probe is a 600 A current clamp with a shielded cable for superior noise rejection.

The PP266 is terminated in a BNC connector and so can be connected directly to DrDAQ.



Price: £99 (approx \$163 / €120)\*

## Available Kits and Contents

The USB DrDAQ is available as a single unit or as part of a kit. These are detailed below:

### USB DrDAQ - PP706

- USB DrDAQ
- Software CD
- USB Installation Guide
- Cable: USB2 1.8m blue

### USB DrDAQ pH Logger Kit - PP716

- USB DrDAQ
- pH Electrode
- DrDAQ 2m temperature sensor
- Software CD
- Manual: USB Installation Guide r5
- Cable: USB2 1.8m blue

### USB DrDAQ 2011 Data Logging Kit - PP707

- USB DrDAQ
- pH Electrode
- 2 DrDAQ 2m temperature sensors
- DrDAQ Humidity Sensor
- Software CD
- USB Installation Guide
- 3m sensor extension cable
- Scope probe x1/x10 switchable
- Cable: USB2 1.8m blue

## External Sensors and Probes

While my DrDAQ unit comes with many built-in sensors, the optional sensors and probes detailed on these pages enable many other measurements to be taken, therefore allowing further experiments to take place! The kits mentioned above include some of the sensors and probes mentioned in this section, so why not take a look?



\*Prices are correct at the time of publication. Please contact Pico Technology for the latest prices before ordering.

# DrDAQ Science Experiments

Our website has a number of scientific experiments utilising the DrDAQ unit. The below example uses the DrDAQ with the addition of a pH Probe to measure the pH level over the entire pH Scale of a range of common drinks.

Recently dentists have begun warning about the dangers of drinking acidic drinks. Teenagers, they suggest, who drink large amounts of fizzy 'pop' drinks suffer from tooth erosion whereby the enamel covering of the tooth is dissolved by the acid in the drink. Athletes are also at risk from drinking sports drinks.

The recommended 'safe' level for the pH of drinks is 5.5, and anything below this can promote tooth erosion.

This experiment looks at the relative pH values of different drinks and can be used to determine whether a particular drink is 'safe' according to the above criteria. It can also be used as a good introduction to further studies into tooth decay and enamel stripping.

This experiment is suitable for ages 14+ and requires some knowledge of the pH measurement.

For further information on this experiment, please visit:

[www.picotech.com/experiments/ph\\_of\\_drinks/results.html](http://www.picotech.com/experiments/ph_of_drinks/results.html).

For the full list of experiments, please visit: <http://www.picotech.com/experiments/>.



## Ordering Information

| Details                               | GBP   | USD* | EUR* |
|---------------------------------------|-------|------|------|
| PP706 USB DrDAQ                       | 99    | 164  | 120  |
| PP716 USB DrDAQ pH Logger Kit         | 139   | 230  | 169  |
| PP707 USB DrDAQ 2011 Data Logging Kit | 219   | 362  | 265  |
| DD100 Temperature Sensor              | 15    | 25   | 18   |
| DD011 pH Electrode                    | 35    | 58   | 42   |
| PP163 Humidity Sensor                 | 49    | 81   | 59   |
| DD103 Oxygen Sensor                   | 99    | 163  | 120  |
| MI007 Scope Probe                     | 15    | 25   | 18   |
| PP216 Magnetic Induction Kit          | 34.95 | 58   | 42   |
| PP066 Reed Switch                     | 20    | 33   | 24   |
| PP264 60 A AC/DC Current Clamp        | 99    | 163  | 120  |
| PP266 600 A AC/DC Current Clamp       | 99    | 163  | 120  |

[www.drdaq.com](http://www.drdaq.com)

Pico Technology, James House, Colmworth Business Park,  
St. Neots, Cambridgeshire, PE19 8YP, United Kingdom

T: +44 (0) 1480 396 395

F: +44 (0) 1480 396 296

E: [sales@picotech.com](mailto:sales@picotech.com)

W: [www.picotech.com](http://www.picotech.com)

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