WET GP1 Logging

How to use a WET Sensor with a GP1 Data Logger

Quick Start Guide

Version 1.4

AT *Delta-T Devices Ltd*

1   Introduction

GP1 data loggers can read one WET sensor in addition to channels 1 to 6.

This guide explains how to use a WET sensor with a GP1 logger.
Read it in conjunction with the **GP1 Quick Start Guide** and the **WET Sensor User Manual** online at www.delta-t.co.uk.

Features

Record
- **Water content** or **permittivity**
- **Pore water conductivity** or **bulk conductivity**
- **Temperature**

- **Control irrigation** or **fertigation** - WET readings can be used to trigger the GP1 Alarm, Control, and Dual Rate Logging functions, the same as for the other sensor channels.
- Read sensor calibrations directly from the WET sensor (see box below).
- Specify soil types from a drop-down list which can be extended to include specialist horticultural substrates.

Calibrations

WET sensors require two different types of calibration:

Sensor calibrations *specify how to obtain accurate readings from individual sensors. These sensor calibrations are now programmed into the WET sensor, so that the GP1 can automatically load the correct calibration*. They are supplied in two forms – a **standard calibration** that enables accurate readings between 0 to 300 mS.m-1 bulk conductivity, and an **extended range calibration** that increases the range to 0 to 500 mS.m-1, but at reduced accuracy.*

Soil and substrate calibrations *specify how to convert the WET readings into water content measurements for a particular type of soil or substrate. The GP1 software includes organic, mineral, clay and sand calibrations, and you can also enter custom values obtained by soil specific calibration, or purchase soil parameters for a range of artificial soil substrates commonly used in commercial greenhouses (see: **Soil Properties** on page 6).*
Please contact Delta-T if you wish to purchase these.

Note: *WET-1 and older versions of WET-2 sensors can be used with the GP1, but you have to program the calibration into the GP1 from the calibration file supplied on the CD or floppy disk. You can also download the file from our website, if necessary.*

Requirements

For the full functionality you need:

- WET-2 sensor serial number WET-27/001 or later
  *Earlier versions can be used, see * note on page 2*
- DeltaLINK software version 2.3 or later
- GP1 logger with serial number GP1-06-001 or later
- GP1 firmware revision v1.45 or later.

For all WET sensor versions, if the sensor cable is >5m the inbuilt calibration cannot be read, so you must load the calibration from the USB stick, see instructions below.

Upgrades

To upgrade WET sensor or GP1

Please contact Delta-T if you want to upgrade your WET sensor or GP1 logger - you may need to buy a replacement.

To update DeltaLINK and the GP1 firmware

Visit https://www.delta-t.co.uk/software/deltalink/ and install the current version of DeltaLINK software on your PC.
Once that is installed, you can install the latest GP1 logger firmware:

1. Connect your GP1 to your PC using the serial cable provided along with a USB convertor (USB-RS232), if necessary.
2. From the Windows Start menu select, **DeltaLINK-PC, Firmware Upgrade**.
   *Note: this may vary depending on which version of Windows you have.

Cable Lengths

WET sensor cable length	Limitation
≤ 5m	WET sensor can be read and the built-in sensor calibration data can be retrieved, see *Calibration Options (page 6)*.
> 5m	WET sensor can be read but sensor calibration must be read "From file" on the supplied USB memory stick, see *Calibration Options (page 6)*.

2 GP1 WET Sensor Wiring

Select the wiring diagram that corresponds with the serial number of your WET sensor.

Warning: All WET-1 Sensors: (IMAG sensors and serial numbers WET-01/001 to WET-15/099) must **only** be powered from the +5V ref reference and not from the PWR (power) terminal (see diagram below).
Misconnection may cause permanent damage.
Such damage is not covered by the Delta-T warranty

WET-1 (IMAG)

4-core	
Braid	Screen
White	0V
Green	0V
Yellow	5V serial data out
Brown	+5V DC

WET-1   Serial numbers:
WET-01/000 to WET-15/099

4-core	
Braid	Screen
Blue	0V
Green	0V
Yellow	5V serial data out
Red	+5V DC

WET-2   Serial numbers:
WET-16/001 to WET-26/070

9-core	
Braid	Screen
Black	0V
Red	+5 to +9V DC
Yellow	5V serial data out
Turquoise	EEPROM - data
White	EEPROM - clock
Green	Not used
Brown	Not used
Blue	Not used

Centre pin size change at WET25.063

WET-2   Serial numbers:
WET-27/001+

7-core	
Braid	Screen
Blue	Power 0V
Red	+5 to +9V DC
Yellow	5V serial data out
Violet	EEPROM - data
White	EEPROM - clock
Grey	Factory use
Green	Not used

3   Program the GP1

Connect your GP1 to your PC via the serial cable and run **DeltaLINK**.
Select the **Program** window and Click **Change.**
Select **Edit, New Program** and select **Standard GP1 Program.**

The Standard GP1 Program should appear, showing three channels labelled W. E. and T. - configurable as WET sensor channels. See left hand figure below.
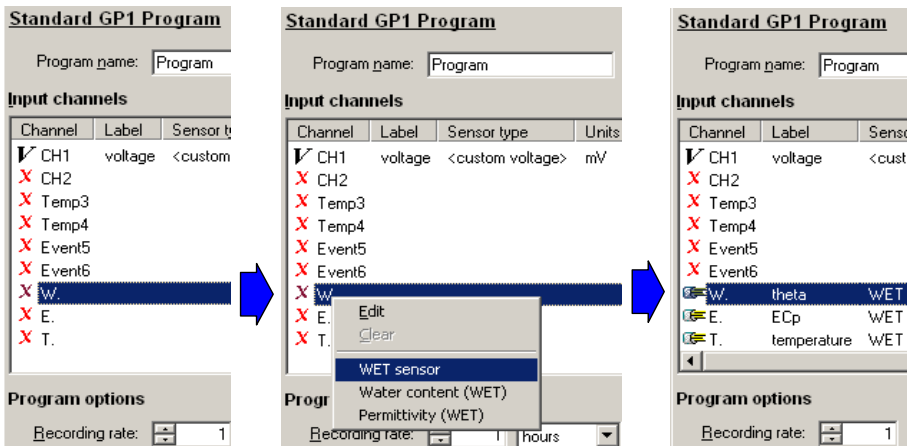
Right click on any of the W.E. or T. channels and select **WET sensor** to populate all the WET sensor channels with default settings, as shown above. Alternatively, you may set each channel individually.

Specify WET sensor properties

Double click on each of the WET sensor channels to display a **Properties** dialog and modify them to fit your requirements.

The figure at right shows the Properties dialog for the W channel.

See the **WET User Manual** for information on setting Measurement type, Units, and Soil properties not covered here.

Similarly - for the Conductivity and Temperature channels E & T, refer to the **WET User Manual** for an explanation of settings not covered here.
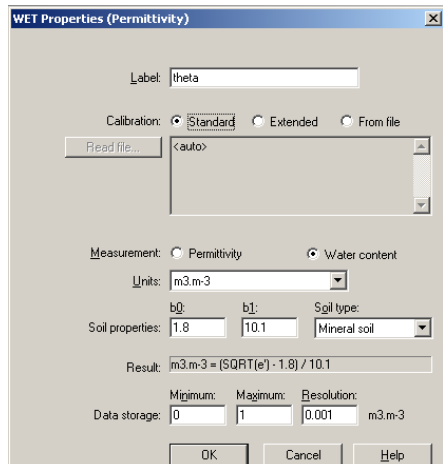
Calibration options

From serial number WET 27/001 onwards, **ALL** WET sensors have sensor calibrations supplied *built in to the sensor memory.*

Select from the available options:

■ **Calibration: Standard**   This uses the **built-in** Standard calibration which covers the normal salinity range specified for the sensor in the WET User Manual.

■ **Calibration: Extended**   This uses the **built-in** Extended calibration which enables the WET to read with reasonable accuracy over a higher conductivity range, up to 500 mS.m^{-1}.

■ **Calibration: From file**   This uses a WET sensor calibration file that can be downloaded from our website www.delta-t.co.uk. For sensors with cable lengths longer than 5m, the calibration file will be supplied on a USB memory stick. Standard calibration files are named WETxxyyy.CAL.
Extended salinity range files are named WE**X**xxyyy.CAL.
When prompted, select the calibration file that you want to use.

Note: Use of the underlined *built-in Standard and Extended option requires:*
■ *Serial number WET-27/001 or later.*
■ *Cable ≤5m.*

Note: the built-in WET sensor calibration is only read when you click **Apply** or do a **Warm Reset** (i.e. briefly press Reset)**.** So, if you do change the WET sensor, briefly press Reset. See the GP1 Quick Start Guide for more about Reset.
Note: all three W.E.T. channels share the same calibration data, so you only need to specify the source once for any given WET sensor.

Soil properties: Soil type

For best accuracy select the **Soil type**, which best matches your soil. DeltaLINK includes WET sensor soil properties for organic, mineral, clay and sandy soils.

Special soil substrate calibrations

You can also purchase soil properties for several artificial growing media:

■ **WET-ST-1G** for measurements in Stonewool (vertical and horizontal)

■ **WET-GH-1G** for measurements in horticultural media: coir, peat-based, mineral green-house and pot soils.

In the Soil types list you can choose one of the standard DeltaLINK soil properties, or for any artificial growing media which has been installed in the GP1.

Special soil types have to be pre-installed in the GP1 at the factory.
Please contact Delta-T if you wish to purchase these for your GP1.

Note: If you program the GP1 offline i.e. with no GP1 attached, DeltaLINK initially displays and accepts all soil types. But, when you try to Apply the program to the GP1, it will report an 'Incompatible Program' error if you have selected a soil type not installed in the GP1.

Comparing WET sensor readings to other sensors

In many situations it's convenient to use the supplied general soil substrate calibrations (e.g. for "mineral", "organic", "sand" or "clay" soils, or one of the special greenhouse substrates) as these calibrations provide reasonable accuracy and enable changes in water content to be monitored or controlled effectively.

When comparing readings *between* different types of sensors it's more appropriate to use a soil-specific calibration for each sensor, so that each provides readings as close as possible to the true (gravimetric) reading. For example, when comparing readings from a WET Sensor and an SM150T soil moisture sensor:

Accuracy	*WET sensor*	*SM150T*	*Typical reading difference**
Typical accuracy with soil-specific calibration	± 3%	± 3%	± 5%
Typical accuracy with general calibration	± 5%	± 6%	± 8%

* This is a rough estimate - the reading errors are not independent variables, particularly for generalised calibrations where the errors will often be in the same direction.

In addition, note there are some substrates for which the usual relationship between dielectric measurement and water content does not apply. It is still possible to obtain good comparisons between WET sensor and other sensor readings when used with appropriate substrate calibrations, but it is more difficult to derive the substrate calibrations for each sensor, and they may only apply over a more restricted range. This seems to occur with a few peat or coir-based composts and some artificial substrates.

Finalise the Program

Having configured the WET sensor channels in DeltaLINK, specify the rest of the program to meet your requirements. This may include control of the relay dependent on the WET or other sensor readings

See also: the **GP1 Quick Start Guide**, the **Irrigation Control Quick Start Guide**, the **DeltaLINK** on-line **Help** and Applications Notes from our website www.delta-t.co.uk.

4 Check Sensors and Start Logging

1. Select the **Sensors** window and click the **Read now** button.
   The sensor readings will continually refresh on a scrolling time graph.

2. Observe the sensor reading display in the scrolling charts and value panels while adjusting sensor wiring and/or installation conditions.
   Note: WET sensors will not read theta or EC in air.

3. Click the **Cancel** button when finished.

4. Select the **Logger Window** and click **Start** to commence logging.

5 Retrieve, View and Save Logged Data

1. Select the **Dataset** window. All stored data in the logger will be retrieved and displayed on the screen (it may take a few seconds to upload the data).
   Click **Refresh** if required.

2. Select **File, Save** to save the data to a dataset file.

3. Select **File, Open** to open and view a previously saved dataset file.

4. To save a dataset file as an ASCII file for importing into other programs, open the file in DeltaLINK, and select **File, Save As**… selecting the appropriate file type to save.
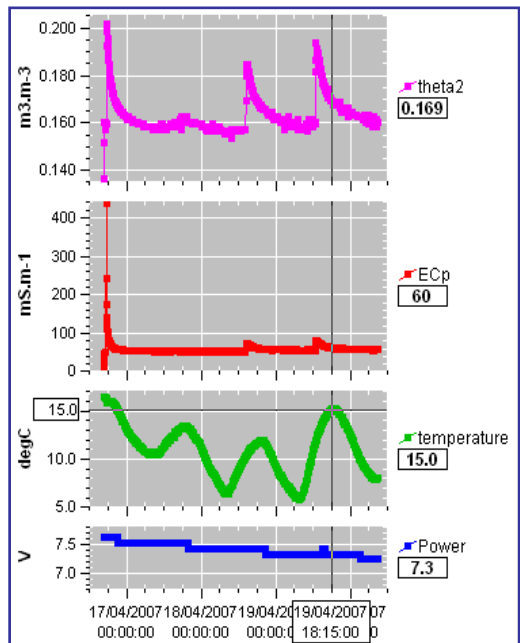
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