HWM Global | Innovations that keep critical resources flowing.

Product User Manual

IDT (App for Mobile Devices) - Logger User Interface

Please also read, understand, and follow any instructions in the relevant manual for your logger or that were shipped with the equipment.

Document Number: MAN-2000-0001-M

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PART 1 : Introduction to Loggers and the IDT App

1 Introduction

1.1 Documentation and Support

IDT is available in two versions: IDT (PC version) and IDT (app for mobile devices). This user guide covers the latter. Any subsequent reference to "IDT" within this manual will refer only to the mobile app version.

IDT is currently available on mobile devices employing the Android and also iOS operating systems (from the Google and Apple corporations respectively).

Where the manual uses the phrase "mobile phone", it implies the use of any mobile / cellular device with suitable functionality.

This manual uses screenshots from an Android-based device. Some small differences in appearance or operation may exist between Android and iOS devices. The user interface uses controls that are widely used on each device; the user should find familiar.

Note: The system periodically has new features and changes released, thus you may observe slight changes in pictures from those shown in this manual.
Most users will be able to automatically download updates of the app from the usual app download servers.

Note: Your chosen tablet or mobile phone device may present the information slightly differently in layout or appearance. When your device is being used in landscape mode, information may be shown using additional columns.

HWM Global provides support by means of our customer support webpages:

https://www.hwmglobal.com/help-and-downloads/

Should you have any questions that are not covered by this manual or the system's online help, please contact the HWM Global Technical Support team on +44 (0) 1633 489479, or email: cservice@hwm-water.com

Note: This user-guide will use the term 'logger' to refer to either a logger device or a unit designed for another purpose but also includes built-in logger facilities.

Most HWM Global logger devices supported by the app will have some similarities in the setup process. For the purpose of providing an explanation to accompany a description of IDT settings, the document will refer to a generic logger device, but some distinction between the logger groups may be included to help the user to determine whether the text is relevant (or non-applicable) to their logger.

Acknowledgements:

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1.2 Logger Devices Supported by the IDT App

The IDT tool is designed to support a variety of HWM products. This user-guide covers its use with logger products. However, not all sections will apply to every logger, as the functionality will vary from one logger family to another. The loggers can be loosely classed into three different groups:

Group 1: Basic loggers. These are designed to be left on site for basic logging operation. When the task is complete, the user returns to extract the data from the logger using the IDT tool.

Group 2: Loggers that include a modem that can be used communicate to a remote sever. These loggers have the ability to periodically call into the server to automatically deliver their data. The loggers can also be programmed to monitor logger input channels for specific conditions, and (when met) trigger an event. The event can be used to start-up other activities within the logger.

Group 3: Loggers that also include a modem but offer some alternative features to the 'Group 2' loggers. The alternative features sometimes require different setup steps.

Note: The grouping of loggers is for the purpose of this user-guide only and has no other significance.

The IDT app can be used with the following logger families (**Group 1**):

- LoLog 450, 500, Vista

The IDT app can be used with the following logger families (**Group 2**):

- Multilog-LX2, (partial support; refer to the logger user-guide).
- Multilog2 (partial support; refer to the logger user-guide).
- Pegasus2
- Sentinel2

(Note: Where IDT (mobile) app does not currently support setup of a 'Group 2' logger feature or sensor, the IDT (PC / Windows) setup tool can be used).

The IDT app can be used with the following logger families (**Group 3**):

- COMLog2-IS
- ISLog
- Multilog-IS
- Multilog MX
- Permanet-SU ; (See logger user-guide for additional settings)
- StopwatchGSM

1.3 System Overview

The IDT app (Installation Diagnostic Tool) is installed onto a mobile phone, or similar device. It uses a Bluetooth radio link to communicate with compatible HWM logger devices (Group 3 loggers), but for other loggers a communications cable will be required. The app provides a graphical user interface for the purpose of Setup, Installation, Diagnostics, and Testing of a HWM logger.

HWM logger devices produce data. The data needs to be obtained from the logger in order to be viewed. For 'group 1' loggers, the data is obtained manually. For the other logger groups, the logger is usually deployed to a site with the intention of it interoperating with a central server for the purpose of storing data centrally; the server acts as a data receiver and data warehouse.
HWM provides software for this purpose, for example the DataGate server software.

Other servers can be set up using HWM software as the front-end to act as the receiver and decoder of logger messages.

If logger data is stored on a central server, it can be integrated with other server software that provides the ability to view the data. This provides the ability for the viewing platform to present the data to the user in various formats, some more meaningful way than just tables of raw data.

HWM Global provides the following web-based viewing platforms:

- DataView (includes a General-purpose graphical data view)
- PermaNETWeb (monitoring for potential water pipe leaks)
- PressView (water Pressure Reducing Valve performance viewing website)
- SpillGuard (monitoring system for potential water spills / floods)

A server usually has to be prepared to receive data from the logger device and can make the received data available to other users who are authorised to use the system. The central server can similarly provide an authentication service to the IDT app in order to verify that a user is registered on the system and has suitable permissions to access the settings of a logger.

Alternatively, the user can view logger data locally using the app and the mobile phone display, but features are limited in comparison to use of a logger device with a server.

Logger devices are normally partially pre-configured for use within the factory, with the user occasionally having to make limited on-site adjustments. (Discuss any requirements with your HWM representative prior to ordering). IDT can provide access to many, but not all, device settings. Some settings are exclusively factory set.

The data-warehouse often operates on the principle of a logger being installed for a time period onto an installation site. i.e., It is site-based.

The links that bind a logger to a site can be manually configured (by an administrator) or partially automated by the use of another app by the installer (e.g., the HWM deployment app).

1.4 Logger – Typical Operation

A typical logger device will behave as follows:

The logger's main task is to make periodic measurements and store the results. In addition, the logger may have daily tasks at set times, such as uploading its un-sent data over the internet. When sending data, the logger waits to receive confirmation from the server that the data was received without error; If confirmation is not received, it will re-send the data at the next call-in time. The task of logging does not stop during any communications.

Some loggers include an interface (referred to as a modem) that provides access to the internet via the cellular mobile communications network. A SIM card is used to give access of the network. Setup of the logger for use with the cellular network and SIM card network provider is required, as is the availability of a suitable signal from the network.

The loggers are powered by a non-rechargeable battery, which implies their service life is limited before the battery must be replaced. The installer should bear this in mind when making any changes to settings; keep tasks to the minimum required in order to give best battery life.

Most logger devices are shipped from the factory in an inactive state to preserve the life of the battery and will require activation during installation. Once activated, the logger will go into the state of "Recording" and begin repetitive logging of the various sensors fitted to the unit, according to its configuration and settings.

A typical logger can operate using two periods, known as the “sample period” and also the “log period”. It will periodically sample the sensors at the ***sample rate*** to create temporary measurement samples. After taking several measurement samples, some statistical functions can be optionally applied to produce a ***datapoint*** that is logged (saved) at the ***log rate***; these form the recorded (logged) measurements. The log period is always a multiple of the sample period.

The datapoints are stored in the memory of the unit. For loggers with a modem, at a set time, the unit calls into the cellular data network in order to contact the server; the data is then uploaded.

The logger makes measurements (as described above) which are saved into an area of memory which is referred to as the “primary recording”. In addition, if the logger has the feature enabled, it can also be set to occasionally save data into a “secondary recording” memory area (e.g., data sampled at a higher frequency). This is additional data.

(Note: This is not available on all supplied units and must be arranged through your sales representative before placing an order; it also has implications concerning expected battery life of the unit. The feature is not supported by ‘group 1’ loggers).

The loggers (except those in ‘group 1’) can be programmed to monitor data for certain patterns or conditions and can send a message to the server if it should detect a match. Commonly, this is used for setting a condition that can be an indication of an “alarm”. Alarms can be sent to a limited set of users, but a better way of handling (and preserving battery power) is to send the message to the server, which often has the facility to fork the message and send it to multiple users.

1.5 Logger Security: Protected / Unprotected Modes

(Note: This feature is not applicable to ‘group 1’ loggers or ‘group 2’ loggers).

At the time of leaving the factory, the loggers will be pre-configured to the requirements of the customer, including any security settings. The logger can include a setting that determines whether it operates as either a “protected” or an “unprotected” device. (See also section 3.1.6). The loggers can communicate their security requirements to the IDT app. The setting will influence the cooperation of the device with the HWM IDT App tool.

When required, this manual will refer to a logger as being either a “protected” or “unprotected” logger.

The “protected” mode restricts unauthorised users from making changes to the logger settings and or accessing logged data.

‘Protected’ loggers:

- Must be correctly registered on the Datagate server with appropriate ownership settings.
- Require the IDT user to successfully authenticate with the Datagate server (periodically).
- Block connections from unauthorised IDT users.

‘Unprotected’ loggers:

- Do not require registration on the DataGate server to be used with IDT.
- Can be connected to and have settings modified by anyone with the IDT app.
  (The user can implement a measure of security by programming the device with a user-defined PIN number; Factory default units need no PIN to gain access).

Loggers set as “protected” therefore require DataGate (or a compatible server) for IDT to operate with them.

1.6 Activating the Communications Link

Group 1 loggers:

These loggers have a communications interface that will require a cable. The communications link is automatically activated when both ends of the cable are attached and IDT is used (and permission to use the cable is granted).

Group 2 loggers:

These loggers have a communications interface that will require a cable. The communications link is automatically activated when both ends of the cable are attached and IDT is used (and permission to use the cable is granted).

Group 3 loggers:

The logger will include a Bluetooth radio interface, used for short-range communication. The IDT app similarly utilises the Bluetooth radio interface of a mobile phone for communications. No communications cable is required.

For the IDT app to communicate with logger devices, both ends of the Bluetooth communications link must be active.

Refer to section 2.4 for details regarding activating the mobile phone side of the link.

Since the radio interface uses power but is infrequently needed (it is only required when someone is attending to the logger on-site) it is normally on standby and has to be activated for temporary use. Refer your logger user-guide for specific details.

If communication is lost during the use of IDT, it may be due to the logger deciding the radio link is no longer being used and putting it back into standby; Re-activate the link if required. Another explanation is that the mobile phone is out of range of the logger, and the installer should keep the two devices closer together.

Where several loggers are within radio range, the user will need to select one using IDT.

1.7 Preparing a Mobile Phone (or Similar Device) for use with IDT

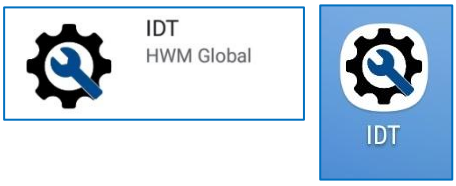
The HWM IDT app is available for both Android and iOS-based mobile devices.

The examples used in this guide will show an Android device, but similar methods, views and behaviour will exist using an iOS (Apple) device.

The mobile phone must have Bluetooth® LE compatibility, GPS, and Internet capability.

1.7.1 Installing the HWM Software (IDT App and HWM Deployment App)

The mobile device (for ‘group 3’ loggers) or tablet device (for ‘group 1’ loggers) must be prepared by installing the HWM “IDT” app.

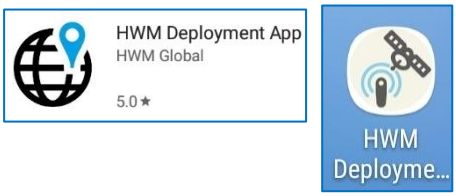


On an Android device, scan the QR code (shown opposite) or search for "HWM Global" using the "Play-Store" application.

Select the "IDT" app and install it.

"**IDT**" is the "**I**nstallation and **D**iagnostic **T**ool" for various HWM Global loggers.

Note: The IDT app can employ the use of the "HWM Deployment App" for collecting and uploading details of logger deployment to the DataGate server, so this may also be installed.



On an Android device, scan the QR code (shown opposite) or search for "HWM Global" using the "Play-Store" application.

Select "HWM Deployment App" and install it.

For iOS-based devices, the Apple App store can be used to obtain the above two apps, or scan the QR codes shown below:

IDT
App

Deployment
App

1.8 Logger Channel Types and Data Interpretation

The IDT app has an *adaptive user interface*. For example, although it can be used with several types of logger, it recognises the logger type that it is communicating with and adapts the content of its screens so that it presents only the options relevant to the logger model in use. Similarly, it presents only options that make sense based on any previous setup selections.

A typical logger model family may have many possible configuration options, but only certain options will be fitted for a customer order. These will have the appropriate electronic interfaces, including any connector options, built into the unit during its manufacture.

Some interfaces are single purpose, and both their functionality and channel allocation are fixed. These will have only a few setup steps. ('Group 1' logger input interfaces all behave like this).

The installer (as part of channel setup) also has to set the logger to interpret the data into its real significance (i.e., what each measurement represents).

Other electronic interfaces are multi-purpose in nature. For these, the logger has to use an appropriate software driver to make an interface work. The combination of both an electrical interface and a software driver put together form a "channel type". During manufacture, the logger will include (factory-only) settings that define what channel-types are built into the unit. IDT uses this information to adapt its display to show only relevant and sensible options to the user.

Sometimes an electronics interface can support several alternative types of channel (each requiring a different driver). The user can make just one selection from the set. IDT will subsequently exclude the other options from being available; the interface use has been already committed.

When the logger makes readings from an interface, it obtains data. Data is simply a numeric value. IDT provides a means to identify a specific stream of measurement data; this is done by assigning an outgoing "channel number" to each data stream.

Steps for channel setup to measure from an interface and save data will include:
(IDT can be used to make or check the required settings).

- Assigning a channel number and channel type for an interface.
- Setup the logger to be able to interpret raw data from a channel into its real-world significance (including any calibration requirements).
- Determining how often to make the measurement, and if any mathematical operations should be applied to the raw measurement data (e.g., averaging several samples).

This will create "data-points" (the values saved as logged data).

Note: The logger will usually have settings pre-programmed by the factory prior to shipping. However, the installer has responsibility for confirming the settings are appropriate for use at the installed site.

If you have specific requirements this can be discussed with your HWM Global sales representative at the time of ordering the loggers.

1.9 Use of Cellular networks – Important Notes

Availability of SMS

Most logger models include the ability to communicate to a server via use of the cellular data network (as used by mobile phones). Loggers can communicate via the regular data network (which gives internet access). Alternatively, SMS (Short Message Service) messaging can be used by some loggers; in most cases this will be as a fall-back if the logger is temporarily unable to access the regular data network. If configured for SMS use, the logger uses the available **2G network**.

Important: **2G services** (GPRS), which carry the **SMS** messaging system, are **slowly being turned off** around the globe. **Once 2G is switched off**, the **SMS** services available within the logger will **no longer be able to function**.

Unless deactivated in the logger settings, the logger will continue to try, wasting battery. Therefore, check with your cellular network operator for their switch off date before setting the logger to use the SMS backup service or any other feature requiring SMS use.

To deactivate the use of the SMS system, any related SMS settings should be removed (switched off or deleted). Any modified settings must be saved to the logger.

Note: For use of SMS services, both the logger and the cellular network provider must support SMS. In addition, the SIM card fitted inside the logger must support SMS use. (Check with your SIM supplier if required).

Most 'Group 3' loggers do not support the use of SMS, except for PermaNET SU, which can (depending on which modem IC is fitted) offer SMS call-in as a fall-back option.

Logger identity when using SMS

When using the cellular data network, the logger identity is included with the data within the message. However, when using the SMS system, the identity is the calling number (from the SIM card). Thus, when using any SMS services, these two numbers (IDT setting of logger telephone number and SIM telephone number) must match.

1.10 Logger Setup Requirements for use with a DataGate Server

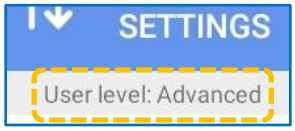
When a logger is set up for use in conjunction with the DataGate server, there are certain requirements for inter-operability between them. These include:

- All loggers must be previously entered into the DataGate system (registered using their Telephone / SMS number and linked to a dummy site) by an 'Admin' user.
- Loggers that are listed within 'group 1' have additional administrative requirements for identifying them; refer to the logger user-guide for further details.
- Loggers having modems (i.e., those from 'group 2' and 'group 3') must be set up to be able to communicate with the DataGate server, using appropriate credentials.
- DataGate and the logger must agree on the way data is presented to the server.
    - Channel numbers in use and the channel content from the logger must agree with the expectations of the server, in order to correctly receive and process the data.
    - Number formats and the units of measure in use must match between logger and server.

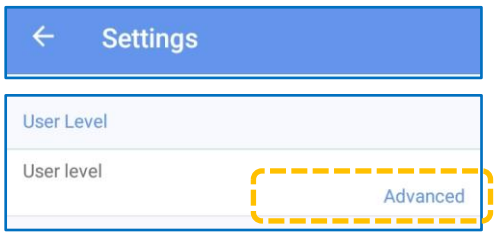
2 Using the IDT App

2.1 IDT – User-Levels

IDT can be set to various user-level "views" including:



- "Basic" (no user-level is shown on the display).
  … This gives basic details and is sufficient for most uses.
- "Advanced" ("User level: Advanced" appears on the display).
  … Additional options are available for advanced users.



Both user-levels are available and can be selected within the app from the Settings screen.

To change, navigate to the settings screen and tap the 'User level' line.

2.2 IDT – DataGate Login (use with or without)

IDT may be used in two modes of operation:

- Operated *with* the use of the DataGate server.
  IDT refers to this as the option to "Log in".
- Operated *without* the use of the DataGate server.
  IDT refers to this as the option to "Log in without DataGate".

Using IDT *without the DataGate server* removes access to some of the capabilities of IDT:

- The user is not required to authenticate themselves with a username and password.
- A regular internet connection is not needed since there is no communications from IDT to any server during use. (IDT requires occasional internet connection for obtaining any updates, including obtaining updates for the logger firmware).
- The user will be unable to manage or access the data of 'protected' loggers (applies to 'Group 3' loggers only).
- The user will be unable to store the logger data on the server for future reference (applies to 'Group 1' loggers only), although the user can share data via the clipboard or e-mail.
- The user will be unable to upload logger data into IDT for sending to the server (applies to 'Group 2' and 'Group 3' loggers only), although the logger itself may be able to send.

Using IDT *in conjunction with the DataGate server* adds certain requirements for use and gives the user access to the comprehensive functionality of IDT, including:

- An internet connection is required initially for the authentication process and also at other times for communication to the server.
- The user is required to authenticate themselves with a username and password.
- Logging in gives the app a token which enables IDT to be used for up to 48 hours, after which the user is required to log in again.
- The User and loggers are required to have been setup on DataGate correctly to give the required permissions, such as logger ownership.

- The user is given the ability to manage ‘protected’ loggers (as well as ‘unprotected’ loggers). (Applies to ‘Group 3’ loggers only).
- IDT can retrieve data from loggers and upload it to a server for storage.

A list of the loggers you have permission to access to is also transferred at login time; this is also required for the HWM Deployment app, in order for it to record changes in the logger location into the DataGate database.

2.2.1 Use of IDT without Login

It is possible to use IDT without going through the login process, but restrictions will exist, (see also section 2.2).

(‘Group 3’ loggers only): It will not be possible to see any ‘protected’ logger, only ‘unprotected’ ones.

Note: It will not be possible to go through the deployment process (using an app to record site installation details) without logging into DataGate.

After the initial splash-screen (which shows the

IDT logo), the user will have the option to either log in or select to use the app without DataGate.

If the user chooses to “Log in without DataGate”, the app will, in future, bypass the “Log In” page.

Note: Bypassing the log-in page still allows app communication with unprotected loggers. These can be set to communicate with DataGate if so desired.
It is simply *the app* that does not communicate with DataGate.

If you have selected the “Log in without DataGate” option, skip to section 2.3.

2.2.2 Login and ~Initial Actions

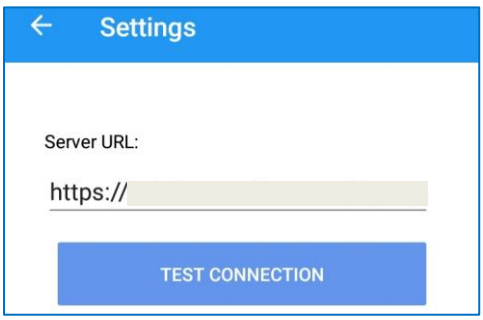
Locate the IDT icon and launch the app.

The initial screen is shown.

After several seconds, the “Log In” screen appears.

After launching the app for the first time, the Log In screen has to be configured to point to the correct server.

Tap the settings control.



Type the URL of the DataGate server being used.

(This will be provided by your system administrator).

To verify the server details are valid, tap on "TEST CONNECTION".

(This tests the URL, to verify it is valid and that a server is reachable using the entered details. It does not authenticate the app or its user for using the system).

Ensure the "Connection test successful" appears.

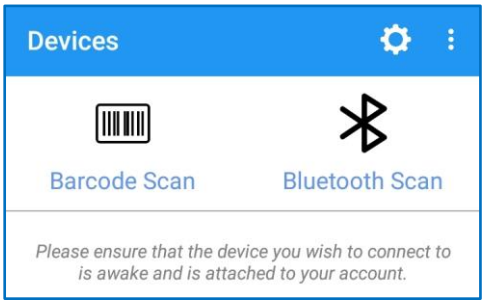
Tap the back-arrow to return to the Log In window.

Enter your DataGate username and password for your mobile phone app. (The Username is case-sensitive.)

Tap the "LOG IN" button, and the app will attempt to log into DataGate as an authenticated user.

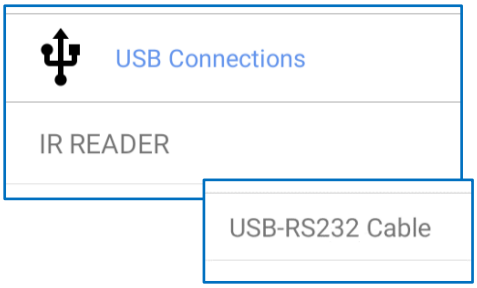
Following a successful login, DataGate downloads some information to the IDT app.

2.3 Devices (Initial Selection Screen)



If login and authentication was successful, the app will show the "Devices" window.

(This will also be shown if you have previously selected to use the app without DataGate, as in section 2.2.1).



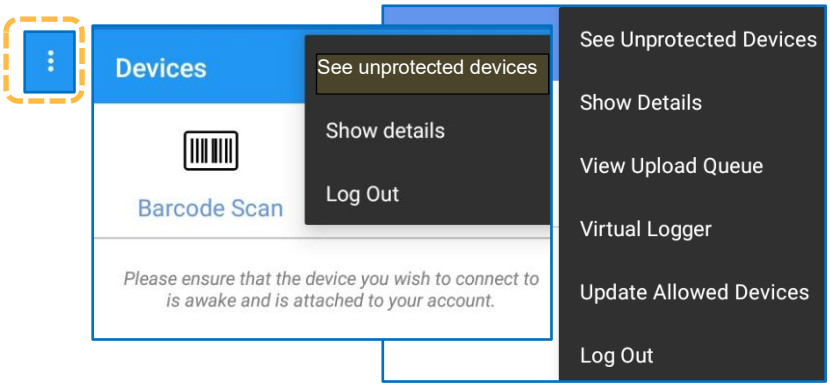
('Group 1' loggers and 'Group 2' loggers only).

When a tablet is directly connected to a cabled connection, the initial Devices selection screen will also show a "USB Connections" area.

This will list any attached cable or interface, such as:

- IR Reader.
- USB-RS232 cable.

Note: Some loggers may support two types of HWM communications cables, USB (direct) and USB (converted to RS232). The tablet (and hence IDT app) requires a USB (converted to RS232) type. If the incorrect cable type is used, it will not be recognised and the 'USB Connections' lines will not be displayed.



Note: Tap on the options control to access an options menu.

(The menu can vary).

2.4 Selecting a Logger Device & Connecting with IDT

Four methods exist to select the logger that IDT should communicate with:

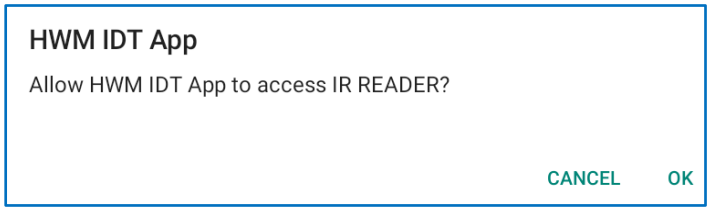
- Connection via a cabled connection (wired selection). See section 2.4.1.
  (This is available on 'Group 1' and 'Group 2' loggers only).
- Connection via a cabled connection to a Bluetooth Interface Link unit, which can be selected via a Bluetooth scan as the communications target. See section2.4.4.
  (This is available on 'Group 1' and 'Group 2' loggers only).
  Note: Use of the Bluetooth Interface Link provides compatibility with a wider variety of tablets and mobile phones than the direct cabled connection method.
- Bar-code scan (automatic selection). See section 2.4.2.
  (This is available on 'Group 3' loggers only).
- Bluetooth scan (manual logger selection). See section 2.4.3.
  (This is available on 'Group 3' loggers only).

If using a logger from 'Group 3', select and un-pack the logger and ensure its Bluetooth communications link has been activated (see section 1.6, and the relevant section of the logger user-guide). The logger will broadcast its presence over the Bluetooth radio link.

2.4.1 Wired Selection

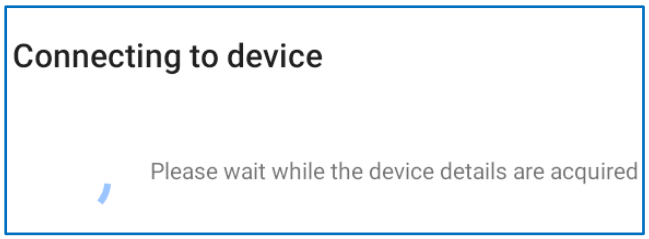
(This method can be used for a 'Group 1' logger that uses a USB port of a tablet to connect with a cabled connection to an IR Reader. Some 'Group 2' loggers also use an IR Reader, whilst others use a USB (to RS232) communications cable; Use a USB-C to USB-A adapter cable if needed).

Note: The connection method is only supported by certain Android tablet devices.
(Contact your HWM sales representative for further information).
However, see section 2.4.4 for an alternative connection method.



If using the IR Reader, position it over the logger you wish to connect to.
From the IDT Devices screen, tap the "IR Reader" line. Give permission for the IDT app to access the cable.

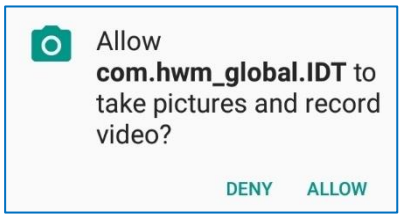
Similarly, if using a logger USB communications cable, connect both ends of the cable (to logger and tablet). Then, from the IDT Devices screen, tap the "USB-RS232" line.



Wait for a few seconds whilst the IDT app reads the logger program and status via the IR Reader (or communications cable).

(If the connection to the logger is successful, the app will load the main options screen, as shown in section 3).

2.4.2 Automatic Selection using Barcode Scan



From the Devices window…

Tap the “Barcode Scan” icon.

The app may request permission to use the camera for photos and video.

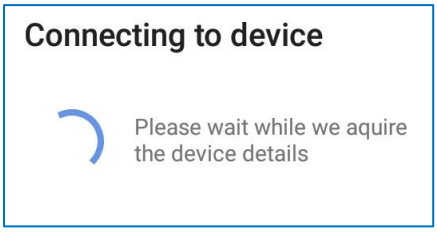
Tap on the ALLOW option.

The phone’s camera will activate, and the phone will display what is within its view.

Locate and view the logger barcode using the camera. The red line in the displayed image should be positioned over the barcode.

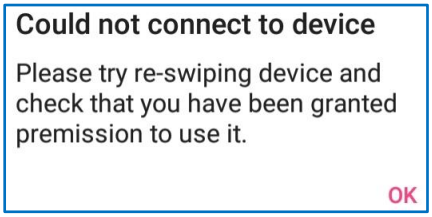
The app will continuously attempt to read the bar-code, changing focus settings until it comes into clear view.

When the phone reads the barcode successfully, it will check that it has permission (a serial-number match) to use the logger. If it has no permission, it will not move from the barcode scan window.



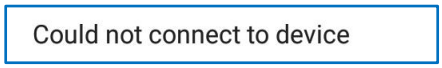
IDT next confirms the logger is physically present by trying to detect it. It therefore starts a scan and looks for Bluetooth devices in the area.

If it finds the logger signal, it connects with it.

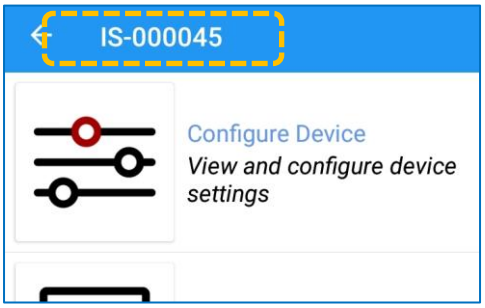


If the logger device is not discovered, an error message is displayed. (The phrase “re-swiping device” means to re-activate the logger’s communications link).

Follow the guidance message and then tap OK.



If the logger radio link disappears, you may get an error message … re-activate the logger communications link and try again.



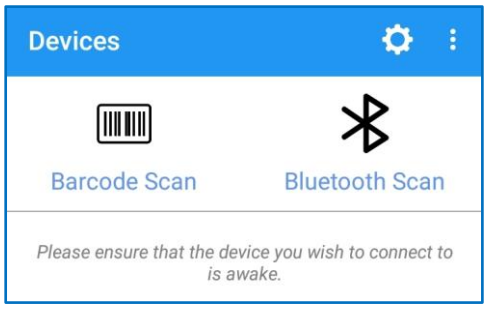
When successful, the identity of the logger is shown, along with controls to access various options.

This is the main options page.

The IDT app automatically communicates with the logger and obtains its configuration and settings.

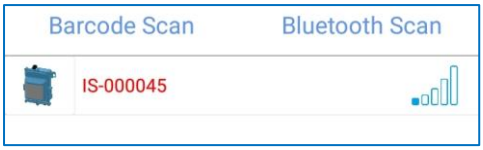
(Skip to section 2.5.)

2.4.3 Manual Selection using Bluetooth Scan



From the Devices window… Tap the “Bluetooth Scan” icon.

A scan will commence and list some of the Bluetooth-enabled logger devices found. The scan can pick up several types of logger, as long as they are within communications range.



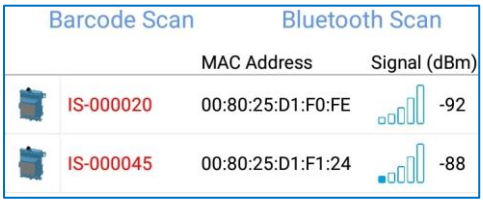
Your logger can usually be identified by comparing with information on its label (e.g., serial number).
If your logger is not listed, try re-activating the logger communications link.

If you are not using DataGate:

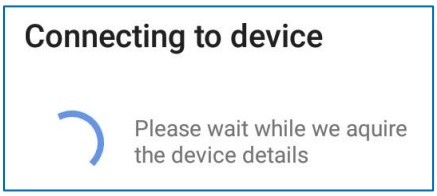
- All loggers you have access to appear in black text.

If you are logged into DataGate:

- ‘Protected’ loggers that you own are listed with black text.
- Unprotected loggers that you “own” (on DataGate) are listed with red text (providing “show unprotected devices” is selected from the local menu).
- Loggers that you do not own are not listed.



Note: Use of the options control gives the ability to show details:
MAC address (Android only)
and dBm.



Confirm (using the serial number) the correct logger device is listed on IDT.

Tap on the line to select it. IDT will connect with it.

The IDT app automatically communicates with the logger and obtains its configuration and settings.

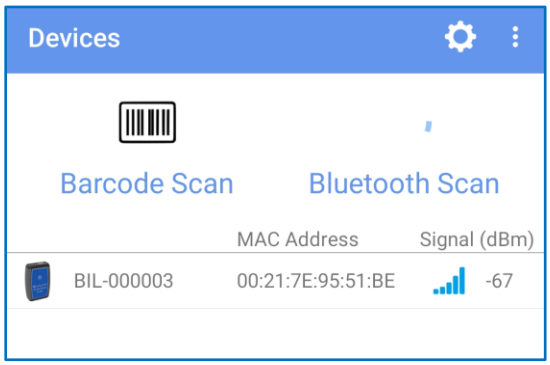
2.4.4 Using the Bluetooth Interface Link

Note: Refer to the Bluetooth Interface Link 'Quick Start Guide' to confirm the operation of your unit, in case of any variation from the description below.

Before any other action, ensure the Bluetooth Interface Link unit is switched on (not in the Standby mode). When first switched on, the Bluetooth Interface Link unit will go into 'Pairing mode' (rapidly flashing amber LED).

Note: Whilst in 'Pairing mode' it is operationally safe to either connect or to disconnect the logger communications cable.

Connect the logger communications cable between the logger and the Bluetooth Interface Link.



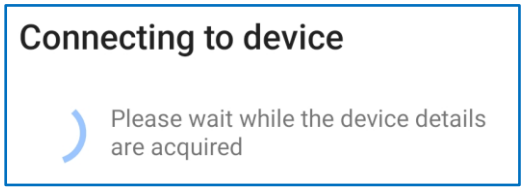
From the Devices screen… Tap the "Bluetooth Scan" icon.

A scan will commence, and IDT will list various Bluetooth devices found.

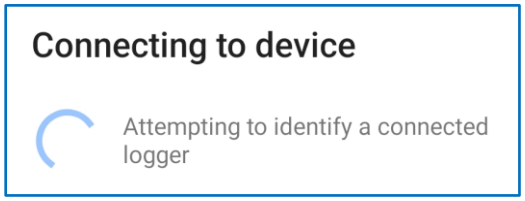
The Bluetooth Interface Link can be identified as 'BIL-nnnnnn', where 'nnnnnn' is the serial number.

(An example is shown opposite.)

Tap the BIL-nnnnnn line to select this communications path.



Initially, the IDT app makes a connection with the Bluetooth Interface Link unit, which will go into the 'Connected mode' (Green LEDs rapidly flashing).

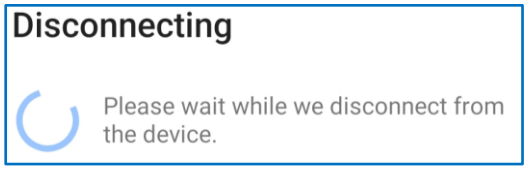


The IDT app will then try to communicate with the logger (via the Bluetooth Interface Link and attached cable), initially trying to identify what type of logger is connected. It then reads the current logger settings.

During the communications, the Bluetooth Interface Link will be in 'Logger Communication mode' (indicated by LEDs flashing Red and Green).

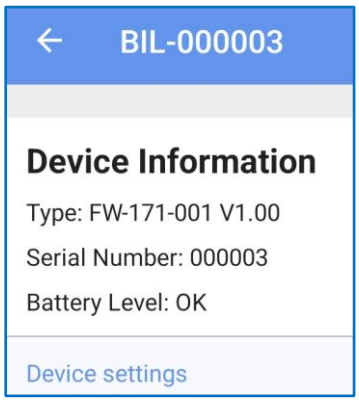
From this point on, the IDT app functions identically to any other connection method. However, the following points should be noted:

- For correct operation, do not detach the logger cable, except for when the Bluetooth Interface Link has returned to 'Pairing mode'. This can be achieved in an orderly way by tapping the back-arrow control in IDT to navigate back to the 'Devices' screen.



The IDT app will disconnect from the logger and Bluetooth Interface Link (which enters 'Pairing mode' once more).

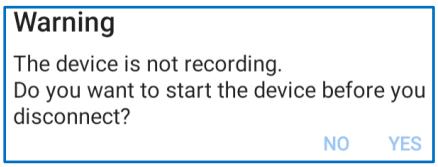
To connect to another logger, connect the cable, initiate a Bluetooth scan, and select 'BIL-nnnnnn' once more.



- If the Bluetooth Interface Link is selected by IDT but no cable is in use, IDT will produce a Device Information page showing various details of the Bluetooth Interface Link unit.
  (If connected to a logger, this information can also be accessed via a menu option on the logger's Device Information page).

2.5 Disconnecting a Logger from IDT

Once IDT has connected to the logger, it can be used to check and re-program the logger, as required. After you have finished using IDT, do not unplug any communications cables until you have first disconnected from the logger using the IDT controls.



To disconnect IDT from the logger, use the 'back-arrow' control until you reach the initial selection screen.

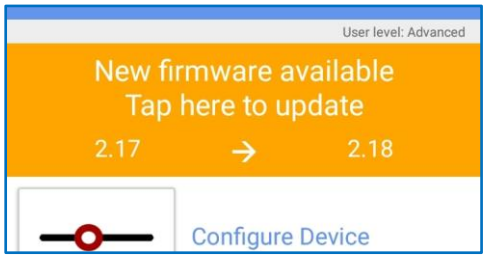
During the IDT disconnection, the IDT app makes certain logger settings checks, and prompts the user to confirm or correct anything it finds unusual. Examples are:

- The logger is not currently recording (logging).
- The device has a modem, but it has not been set to call into the server.

Once you have fixed any found issues, or confirmed intentional, the IDT app will disconnect, allowing you to select a new logger. At this point you may remove any communications cables in use.

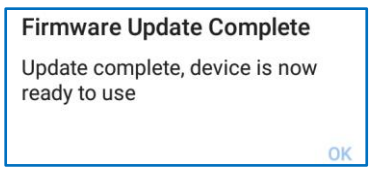
2.6 Logger Firmware Update

New software releases (firmware) for loggers are occasionally released from HWM Global.



Before reaching the main options page, IDT automatically checks the existing logger firmware version. If a newer one is available, the user will be offered the option to update the logger using the file saved in the phone. This is recommended.

Tap the "New firmware available" line to start the upgrade, which takes approximately one minute.



(Note: The IDT App does not support this facility for 'Group 1' loggers).

Progress is shown:

(Loading → Restarting Device → Firmware Update Complete).

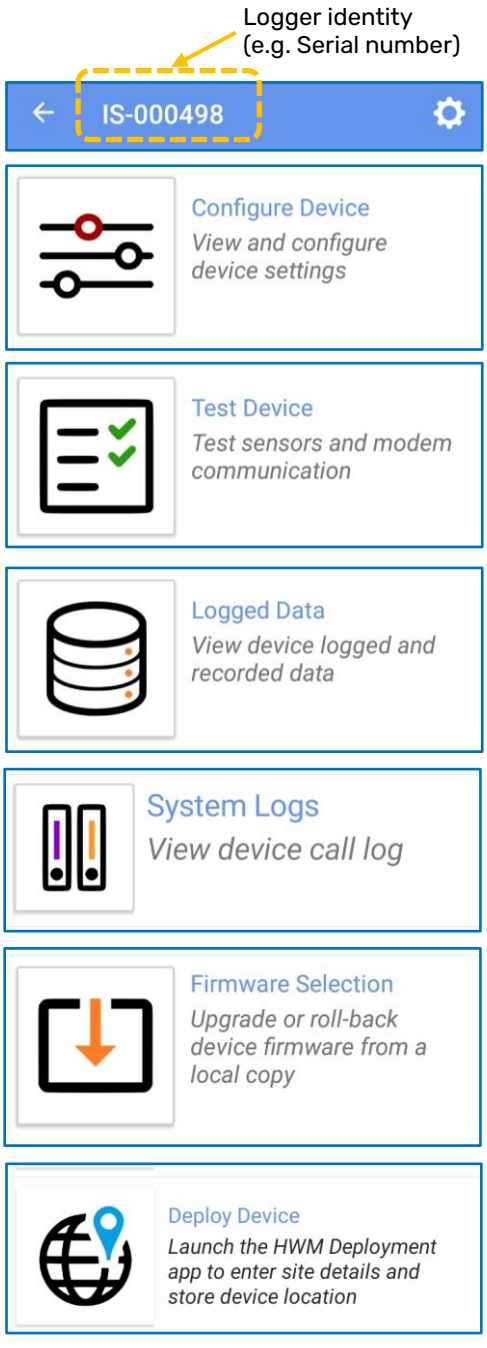
The main options screen is then shown.

PART 2 : IDT - Main Page, Logger Details, Timing, and Call-in Settings

3 IDT – Main Page (Use Options)

The main (use options) page is shown below. (The content will vary according to the logger type or the features available on your logger).

This page functions as a menu. Selecting an option on this page will open a new sub-page with further options.



Configure Device:

The user can use the app to check the device configuration (settings) or re-configure the device.

Test Device:

The user has access to some tests, to be able to confirm the logger device is operational within its installed environment.

Logged Data:

This shows when data is present. The user can access measurement data held within the logger device.

(Access is temporary; data is not stored by the app).

System Logs:

The user can check the history of call-attempts.

Firmware Selection:

The user can modify the device firmware.

(Roll-back is rarely used, only if advised by HWM)

Deploy Device:

Note: This option is only available when IDT is used with DataGate.

Tapping the Deploy Device option will launch the HWM Deployment app and pass details of the logger to it.

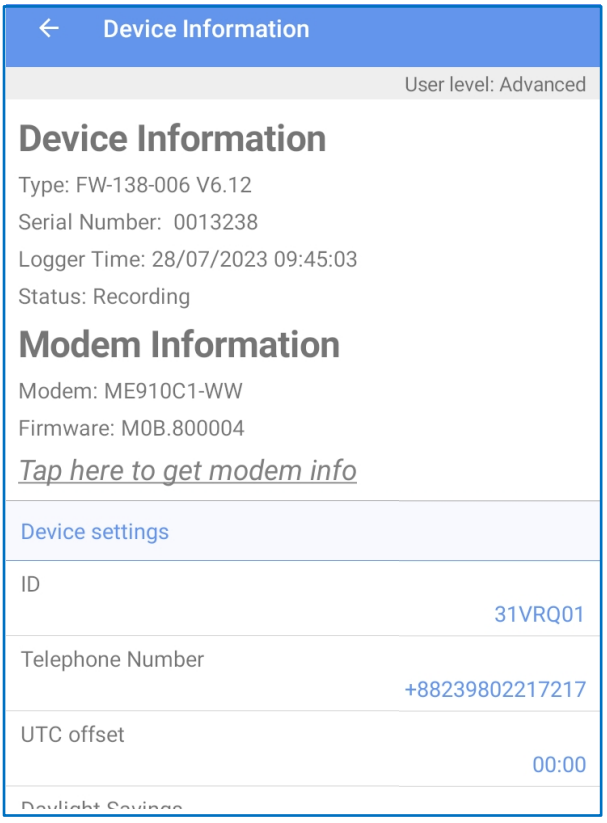
The user is then able to record the installation location of the device.

(The HWM Deployment app is then used to complete the task of selecting the site of deployment and an administrative update of the DataGate system).

3.1 Displaying Logger Device Information

3.1.1 ID Information / Telephone Number

From the main page, tap on the “Configure Device” selection.
A new menu page will open with various configuration options.
Select “Device Information”.



A new page will open with a read-only area showing various logger parameters, including the firmware version, serial-number, and the logger’s current time (not updated). On some logger models It also shows the logger recording status (see sections 3.2.4 and 3.2.5).

(The Logger time can be used to check the UTC offset has been set correctly; see section 3.1.2).

The user can (optionally) input a unique identifier within the ‘ID’ field.

There is a telephone number displayed. (This can also be referred to as the logger ‘SMS number’).
(Modification of this field is not permitted by IDT for some loggers. For ‘Group 1’ loggers the field may even be blank).

The telephone number is usually pre-programmed into the logger by the factory prior to shipping and should remain unchanged. It usually matches the number of the SIM card, if factory fitted.
(It is not read from the SIM card but has to be independently programmed into the logger memory). It also usually matches the telephone number printed on the logger label.

Note: Where IDT does permit a user to modify the “Telephone Number” of the logger, **caution should be taken**. This number acts as an identifier of the logger within data messages to the DataGate system.

Changing the number is only required when:

(1) Fitting a SIM card for the first time, or

(2) When replacing the SIM card and the use of SMS services is also required.

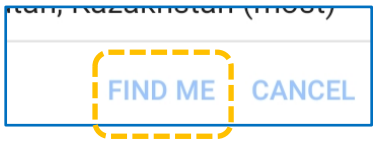
If the number is changed, administrative updates to DataGate will also be required.

(See section 1.9 for additional information about the availability of SMS services).

3.1.2 Time-zone (UTC Offset)

The logger communicates to DataGate using the global time reference, (called “UTC”; Coordinated Universal Time).

IDT allows the user to program loggers using local time. The logger needs to know the offset of the local time zone from UTC so it can communicate the correct timestamps for data to the server. This can be set by the user by tapping the “UTC offset” line.



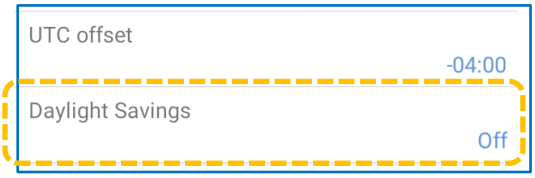
E.g. If your local time is 4 hours behind UTC / GMT then set this field to “ - 04.00” from the selections listed, or use the ‘Find me’ button within the selections page.

Note: For ‘group 3’ loggers, when a user adjusts the UTC offset, the setting does not immediately change the displayed “Logger Time”. The update only takes effect after the logger next calls into the server; the server then changes the logger’s time. This allows the server to be able to correctly interpret logger timestamps during any UTC offset change.

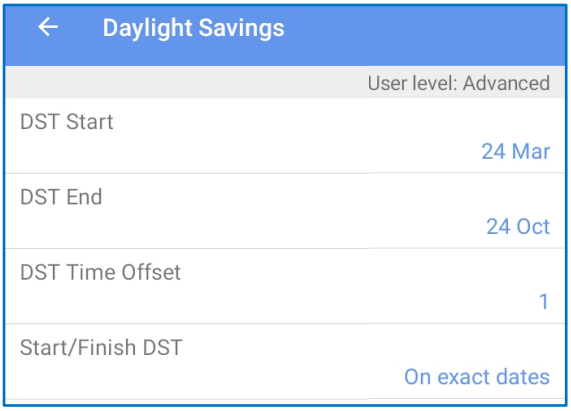
3.1.3 Automatic Time Adjustment (Daylight Savings)

(This feature is available on: ‘Group 2’ and “Group 3” loggers only.)

Setup of adjustment times:



Some countries make seasonal adjustments to their ‘clock time’, to make the best use of the available daylight hours. Typically, clock time is advanced by 1 hour during the spring and summer months.

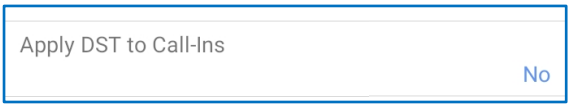


The logger can be set to use (or disregard) time adjustments for Daylight savings.

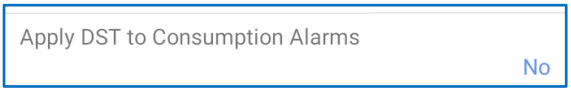
If required, navigate to the Device Information page and tap on “Daylight Savings” line to enable the feature and determine when the time changes come into effect.

Setup of applicability:

There are various setting options on how DST time changes will be applied to timed logger features. These include:



- Call-in times.



- The reset time (midnight) of consumption alarms

- Sound functions (e.g. Leak detection start time and sound recording start time). This is only available on loggers which include a Leak Noise Sensor interface that has been set up to operate.

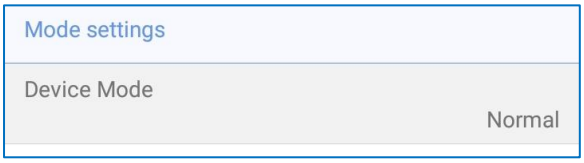
3.2 Presence of an External Battery Pack

When there is no external battery pack connected, this must be set to "No".

If an External Battery pack is fitted, the logger should have this setting changed to "Yes". (This makes the logger aware that additional power is available).

3.2.1 Mode Settings / Information – Logger Power Health

(Skip this section if using a 'Group 1' or 'Group 2' logger; It is not applicable).



The Device Mode line is related to the health of the logger's battery power.
It is for information only (unavailable to edit for most users and is password protected). (See also section 15.1),

- When '**Normal**' is displayed, this indicates that the logger is working correctly, with no recent power issues.
  If a significant drop in battery voltage is detected during operation, the logger will initially go into a mode termed 'Power Save'.
- Whilst in '**Power Save**' mode the logger will not attempt to call in for the next 24 hours (to allow the battery to rest and partially recover). During this time, logging still occurs.
  If the logger subsequently makes a successful call to the server, the logger will return to 'Normal' mode. The delayed data will then be uploaded to DataGate.

  If, whilst in 'Power Save' mode, the battery further degrades, the logger will go into a mode of 'Log Only'.
- Whilst in '**Log Only**' mode, no call-in attempts are made. Logging continues.

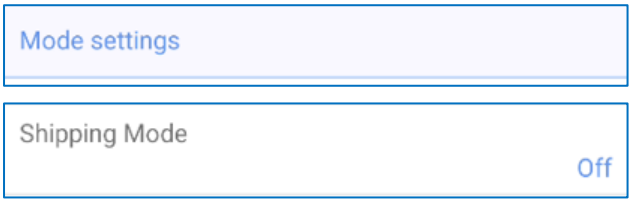
  To remedy the situation:

  First confirm the logger is correctly oriented, as incorr ect battery orientation can degrade battery performance. (Check any 'This way up' requirements of the logger and any external battery pack). If the problem persists, arrange to have the internal logger battery replaced (and battery use counters reset) by an authorised service center.
  (Refer to the logger user-guide or your HWM Global representative).

3.2.2 Mode Settings / Information – Shipping Mode

(Skip this section if using a 'Group 1' or 'Group 2' logger; It is not applicable).

Shipping mode:



The 'Shipping Mode' control is used to render the device inactive and is used for shipping the unit and for long term storage. (Refer to section 11.1).

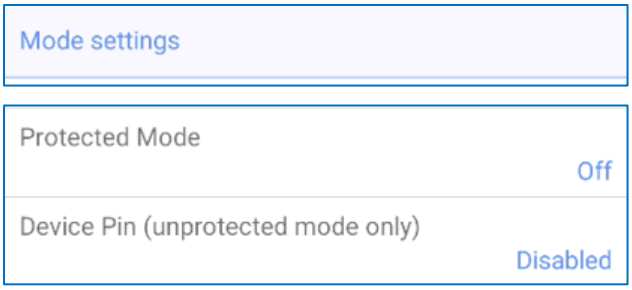
If 'shipping mode' is 'On', the logger is de-activated. However, the user will rarely see this setting as the

logger is usually re-activated during the process to start Bluetooth communications (required to use the IDT app).

If 'shipping mode' is 'Off', the logger will be in a recording state (regular operation, according to its current settings).

3.2.3 Mode Settings / Information – Bluetooth Security

(Skip this section if using a 'Group 1' or 'Group 2' logger; It is not applicable).



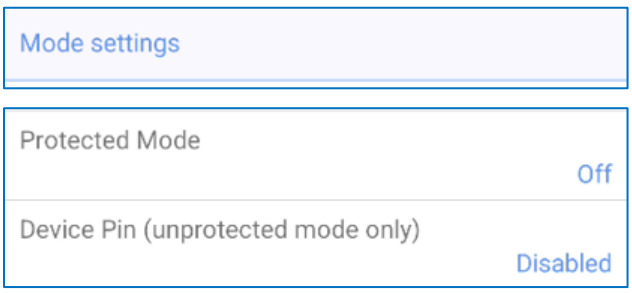
'Protected Mode' and 'Device PIN' settings are related to Bluetooth security.

The Protected Mode line does not get shown unless the IDT app is logged into DataGate.

Caution: Before considering changing the 'Protected Mode' setting from 'Off' to 'On', you are activating one of the security features of the logger; Check with your system administrator that DataGate setup will allow you to continue to use IDT with the logger.

- When Protected Mode is 'On', only a user who has signed into IDT with an authorized Datagate account which has permission to use that specific logger can use IDT with the logger.
  (A logger with Protected mode 'On' is referred to as a 'Protected logger'.
  A logger with Protected mode 'Off' is referred to as a 'Unprotected logger').
- When Protected Mode is 'Off', anyone with the IDT app can use the logger (subject to whether the logger has another security option enabled, namely protection by a PIN).

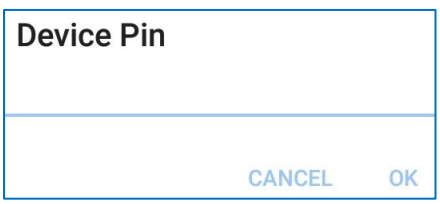
The Device PIN line gives the user the option of setting a user-defined PIN on a device which has 'Protected Mode' turned off.



Tap on the line if you wish to enable the feature and set a PIN.

The PIN can be up to 8 characters in length.
(Only numeric characters are allowed- 0 to 9).
Once set, IDT will not allow access to the device without a valid PIN being entered.

Note: This feature, and a PIN may have already been enabled by the factory, if specified by the customer at the time of placing the order.

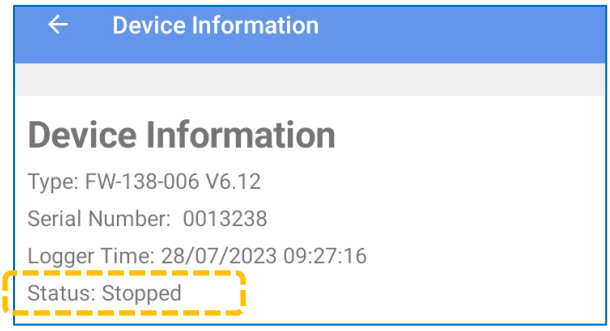


If you forget the user-defined PIN, the device can only be recovered using a HWM Global 'Master Password'.

The Master Password is unique to each device.
(It can be entered in place of the regular PIN code).

For a Master Password, contact HWM Global customer support.

3.2.4 Recording Status and Start Time ('Group 1' & 'Group 2' Loggers)



Within the Device Information page, IDT "Status" line indicates the current recording status of the logger.

If the diagram opposite, the logger is indicating that it is "stopped".

(This state is often used for long-term storage and for shipping the logger in an inactive state).

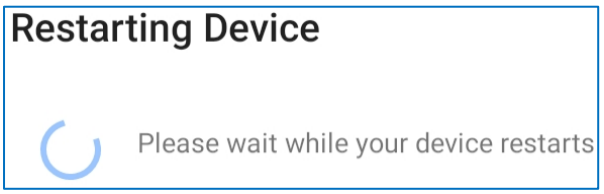
To change the current recording state of the logger, tap on the device control button, which appears at the bottom of the page.

This can either be used to start or stop the device, depending on the current state.

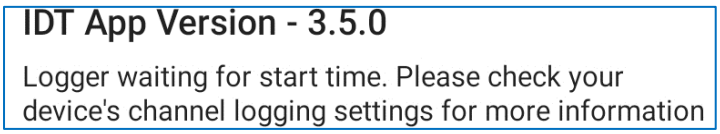
The logger status can be changed in the following cycle:

Recording → Stopped. ; by tapping 'Stop Recording'.

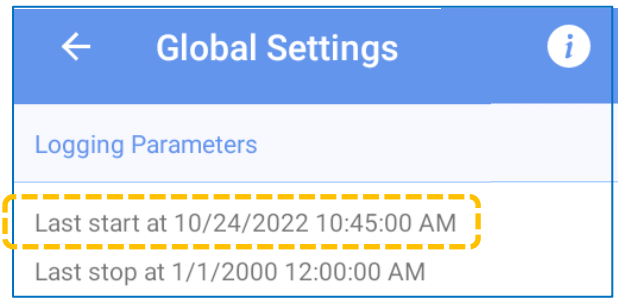
Stopped → Waiting → Recording. ; by tapping 'Start Recording'. The logger 'waiting'state is temporary and managed by the logger.



If changing from the 'Stopped' status, IDT will write the program settings back to the logger and then cause the logger to re-start.

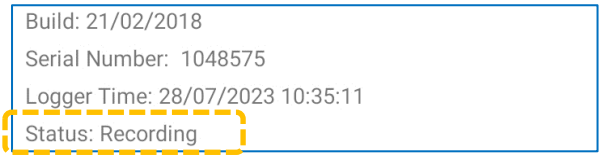


Once in the 'Waiting' state, an advisory message will appear informing you the logger is waiting to start.



Standard logger behaviour is to commence logging at the earliest possible time, but it must start producing data at a suitable time boundary. (E.g., If restarted at 10:26 the logger may schedule its start time at 10:30).

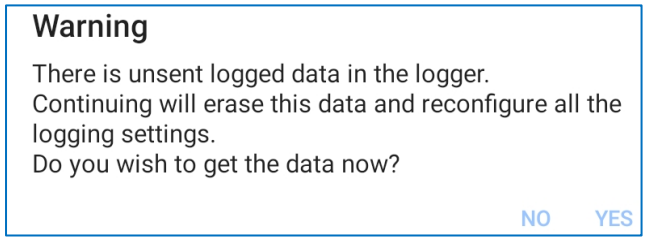
The expected start time can be checked on the Global Settings page (see section 3.4).

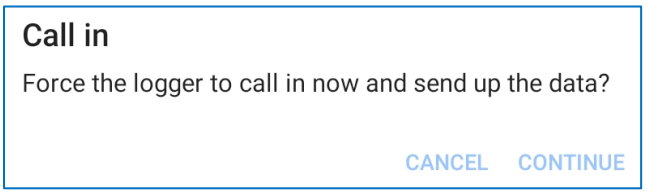


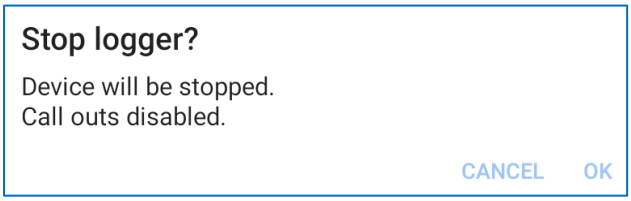
Upon reaching the start time, the logger will move into a state of 'Recording' and begin its regular repetitive program cycle of measuring from sensors and logging the results.

Note: Tapping on the Stop Device button when the logger is in a recording state will put the unit into a "stopped" state, suitable for long-term storage.

For 'Group 1' loggers, collect any required data from the unit before doing this.







For 'Group 2' loggers, IDT will provide additional warnings if there is unsent data.

(Select 'Yes' if the data is relevant and needs to be sent to the server. You will then be given the option of forcing an immediate logger call-in, during which the logger will upload any unsent data to the server).

If you are logged in, an alternative method of downloading the data to IDT for later synchronisation will also be offered.
(See also section 10.3).

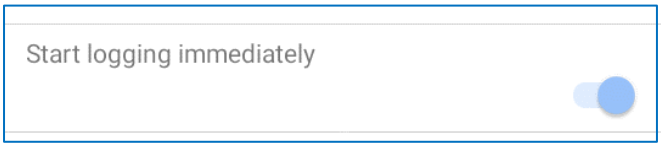
IDT then warns that the logger will no longer call into the server to send data.

Unless cancelled, the logger will stop recording, and go into a status of 'Stopped'.

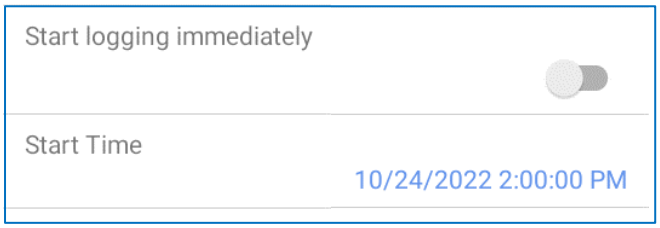
Every time a change is made to the logger program, it is uploaded to the logger (either immediately or upon accepting or saving the change). For changes that affect the channels, or the log period, the logger will also undergo a re-start. A re-start also occurs when the logger is activated (taken out of shipping mode).

The most common practise is for logging (data recording) to begin immediately upon a restart, although this can be deferred to a later time if required.

To **modify** the data recording **start time**:



The standard logger behaviour is to commence logging at the earliest possible time, by setting the "Start Logging Immediately" slider control to 'on'.



If the logger re-start is required to be deferred to a later time, move the slider to the 'off' position and then set the required time and date for the data logging to begin.

Note: When programming a logger start time, the logger may adjust the entered time to align it with the next suitable time boundary.

Note: A re-start of a 'Group 1' or 'Group 2' logger deletes any previously stored data and begins storing fresh data. It is therefore important to retrieve any data from the logger prior to either stopping the logger or making any program changes.

3.2.5 Logger Recording Status ('Group 3' Loggers)

'Group 3' loggers have a similar recording status as the Group 1 and Group 2 loggers:
"Stopped" → "Waiting" → "Recording" (… and back to → "Stopped").

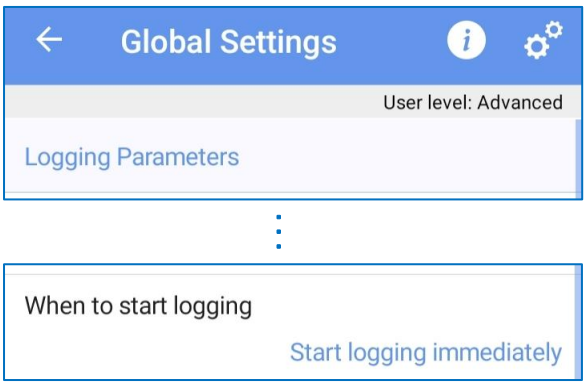
For certain loggers, the IDT app may not show the current recording status, but instead shows

whether the logger is in 'shipping mode' (or not).

- If Shipping Mode is ON, it is equivalent to the logger being stopped.
- If Shipping mode is OFF it is equivalent to the logger being operational (Recording).

For other loggers, the IDT app does show the recording state, in a similar manner to that shown in section 3.2.4.

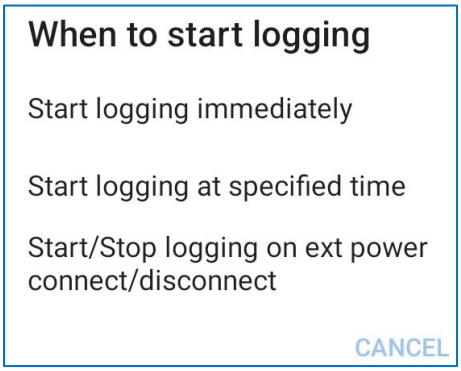
To **modify** the data recording **start time** (or event):



Navigate to the Global Settings page.
(Tap: Main page → Channels → Global Settings).

Then locate the "When to start logging" line.

Tap on this line if you wish to modify the setting.



IDT will show a list of options that are available within your logger.

"Start immediately" and "Start at specified time" are similar to the description given in section 3.2.4.

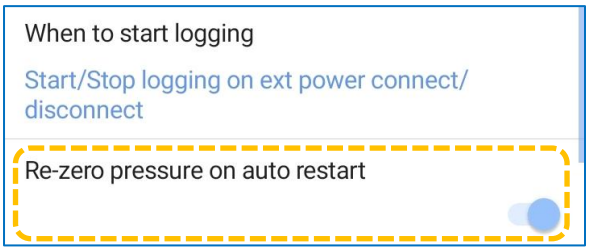
There is another option, used for "Incident Logger" purposes, (see below).

When "Start/Stop logging on ext power connect/disconnect") is in use, the recording status is modified, as shown below:
"Stopped" → "Waiting for auto start" → "Recording", when the external battery is connected
(… and back to → "Waiting for auto start", when the external battery is disconnected).

Incident Loggers:

Incident Loggers use the "Start / Stop logging on ext power connection/disconnect" logging start mode. This allows logger to be remain in a low activity / low power state when in storage. This changes to "Recording" (logging begins), after being triggered by the connection of an External Battery Pack to it.

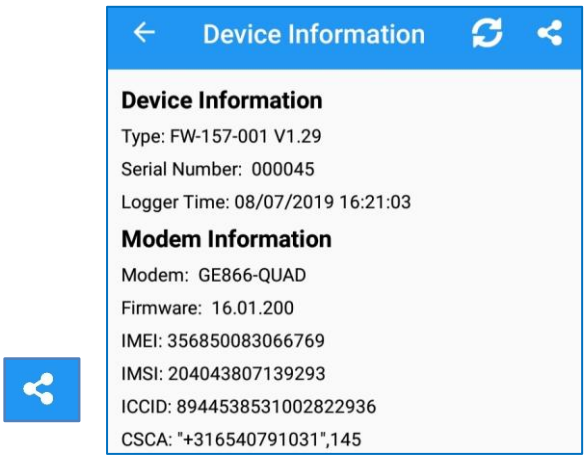
Battery connection is normally done immediately upon arriving at an incident location.
(These loggers have configuration settings already saved, thus allowing immediate logging of information related to the incident). The loggers (which have to be above ground when they are first activated) also obtain GPS coordinates during their start-up; this can be used to identify the incident location they are recording data from.



Most incidents are related to monitoring mains water pressure.

When set in this mode, a setting option is available to re-zero any internal or external pressure transducers to local atmospheric pressure (the sensors must be connected, but exposed to air, prior to connecting the battery).

3.2.6 Modem Information

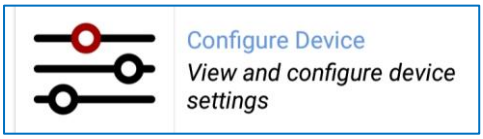


(Not applicable to 'Group 1' loggers.)

Additional Modem details can be shown by tapping the "… get modem info" line.

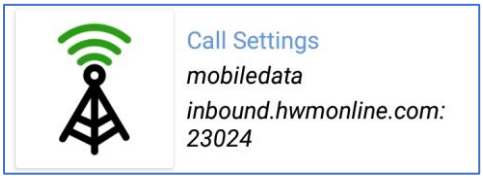
These can be forwarded to expert users for assistance by tapping on the share control.

3.3 Call-in Settings and Related Functions



(Not applicable to 'Group 1' loggers).

From the main options page, tap on the "Configure Device" selection.



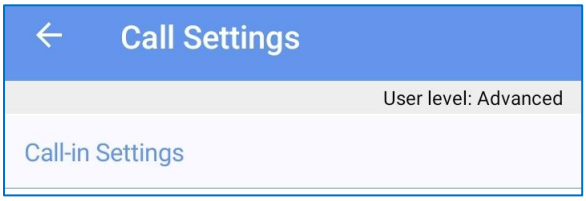
A new page will open with various configuration options. Select the "Call Settings" option.

The current call settings of the logger will be displayed.

Tap on any line to change the setting; the change is made to the logger immediately without having to confirm it.

The page is divided into several areas of settings (Less are shown for IDT in "Basic mode"). The page contents will vary based on the selections you make as you progress through setup.

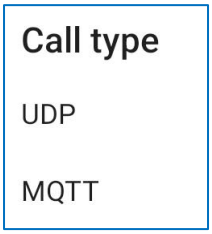
3.3.1 Call-in Settings – Protocol Selection



Call-in settings can be accessed by navigating to the Call Settings screen:

Main screen → Settings → Call Settings.

Locate the "Call type" line; this will only be present if your logger supports more than one protocol; if absent, only UDP will be available for use.



If available, the "Call type" is a selection of the communication protocol(s) that are to be used for logger communications:

- When "UDP" is chosen, the logger uses the regular communications method to DataGate. This is used for transfer of data, alarms, and other types of logger messaging (e.g. configuration changes).
- When "MQTT" is chosen, the logger still communicates with DataGate, but it is confined to occasional calls (typically at midnight) for maintenance purposes (i.e. logger firmware updates and any configuration changes).

  In addition, regular messages (logger datapoints only) will be transferred from the logger to a server (referred to as a "broker") using MQTT messaging.

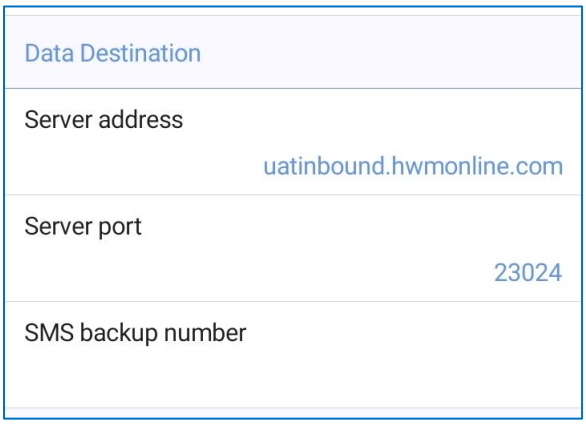
  - Each channel's data is identified within the logger message.
  - The broker temporarily stores each message "published" by the logger, and should include the ability to filter it based on topics.
  - The broker determines which client devices have "Subscribed" to receive messages relating to each of the topics.
  - Finally, the broker distributes messages for each topic to the identified lists of subscribed clients.

Refer to section 3.3.1.1 for logger settings relating to when UDP protocol is in use.

Refer to section 17 for logger settings relating to when MQTT protocol is in use.

3.3.1.1 Settings for UDP Protocol – Data Destination (Main and Fall-back)

Where UDP protocol has been selected or is the only available option (Refer to section 3.3.1), continue to set up for UDP by checking/adjusting fields required for sending information to the server:



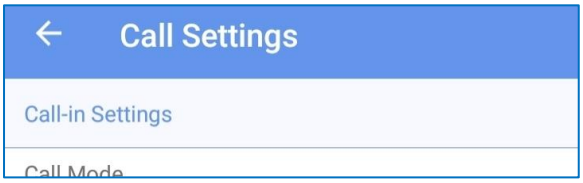
Locate the Data Destination area.

Set the URL (server address) and port number as required for your server.
(Check with your system administrator).
(Settings shown are for illustration purposes only).

- The SMS backup number is the **destination** telephone number that the logger can use to send messages to the server.
  (Settings shown are for illustration purposes only).

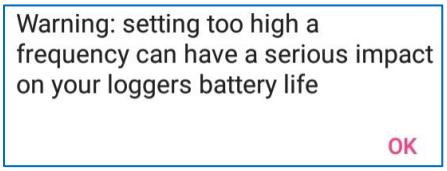
  The use of SMS is a fall-back connection path, only used if the internet cannot be accessed for some time. (See important note in section 1.9 about SMS use. If SMS is not to be used, ensure the destination SMS backup number is deleted).
- All primary channel data will be sent to the server using SMS messaging *only when required*, (when calls were not able to be made over the cellular data network).

3.3.2 Call-in Settings – Call Timing

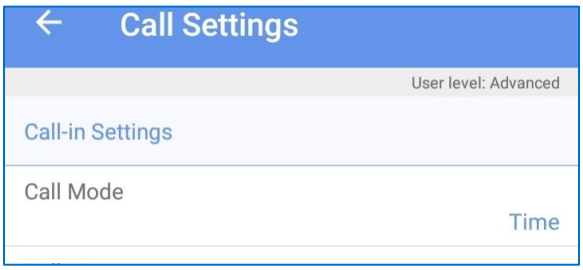


Settings which affect when the logger calls in with measurement data are listed in the Call-in Settings area, shown opposite.

Note: These settings should be carefully chosen since every call-in uses some battery power.
To prolong battery life, keep the number of call-ins per day minimal.
3 calls per day (maximum) are recommended.

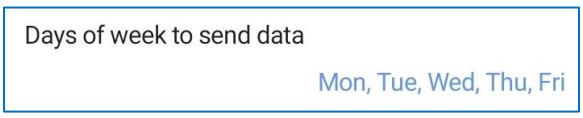


IDT provides some warnings and restrictions to limit very excessive call-levels being set by a user (e.g., at hourly intervals or less).

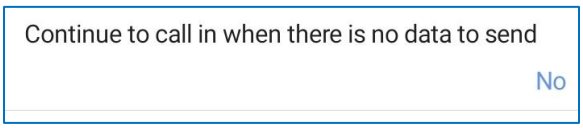


The call-in scheme for regular operation is determined by the "Call Mode" selection (see later in this section).

- Select "Time" to have the logger call-in at fixed times. (Then set the required call times).
- Set to "Frequency" to have the logger call in regularly after a set period of collecting measurement data. (Then set the required period between calls).



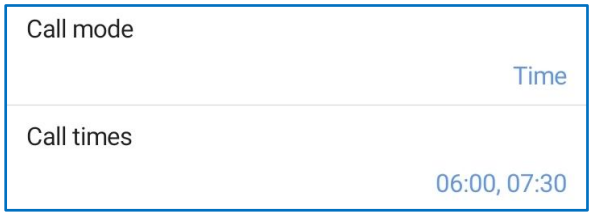
Battery consumption can be conserved by setting the days required for data to be sent in (e.g. calls may not be required during the weekend as no-one may be working over this period). Tap the control to set the required days.



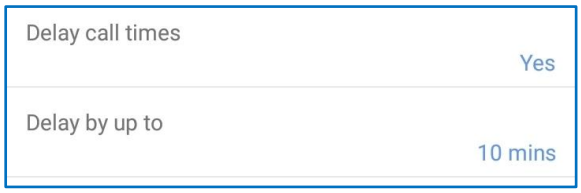
Battery consumption can be conserved by skipping the call-in if there is no logged data available to be sent (e.g. The logger may log once daily and has already successfully called in with the latest data).

Note: If the logger is unsuccessful at the first attempt to call-in (e.g., the network is busy), it will re-try at the next earliest call time, until it is successful. A logger can send in data from several previous days if it needs to (e.g., if the data could not be sent because the site was temporarily flooded, and the antenna signal was degraded).

When the **Call-mode** is set to "**Time**":

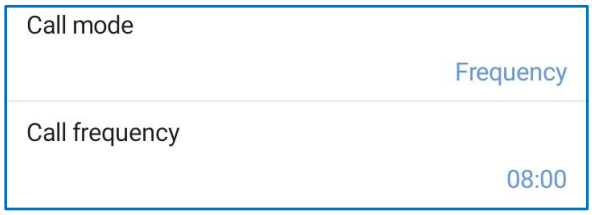


Fixed call times can be added or deleted by first tapping the "Call times" line.
(A logger has a typical limit of 8).



Your logger may have controls available to delay the fixed call-in times by a short random time; this can be used to reduce the peak load on the server. (If not used, this could increase the response time for DataGate websites users if many loggers call-in at the same time).

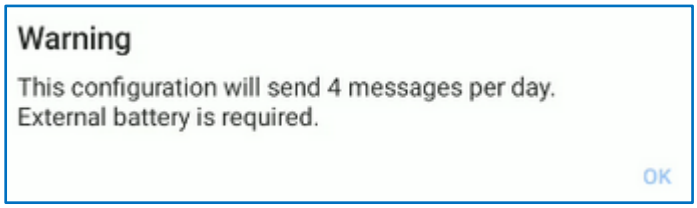
When the **Call-mode** is set to "**Frequency**":



The call frequency can be set to the required time period between making call-ins.

- The logger calls-in at the chosen interval, starting at midnight.
- If less than 1 hour, the logger calls in hourly, and the minutes setting governs the time past the hour when the call-in is made.

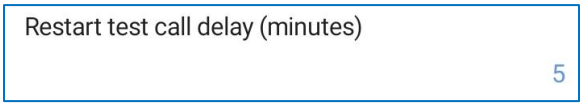
If a call-in via the normal data network fails, SMS messages can be sent instead. (See also section 1.9)



IDT may check whether the number of call-ins per day will cause excessive power use of the internal battery. If so, and if the logger model series supports an External Battery pack, IDT advises that an External Battery is needed.
For maximum service life, minimise the number of call-ins.

Deviations from Regular Call-in Schedule:

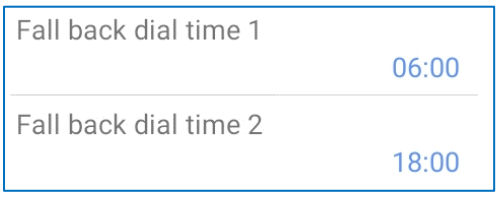
The logger can deviate from the regular call-in schedule for certain events:



The logger usually calls in after a short delay whenever it is re-started (e.g. by being taken out of its shipping mode). This time delay can be adjusted.

The logger may support a faster call-in rate. This is only available on some 'Group 3' logger models, and is an optional action that can be activated during a trigger-action combo. (See section 7).
Tap on the line to set the required call-in period.

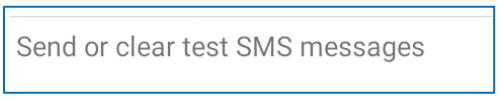
(Note: A similar setting is available for 'Group 2' loggers whilst in alarm state; See section 6.7).



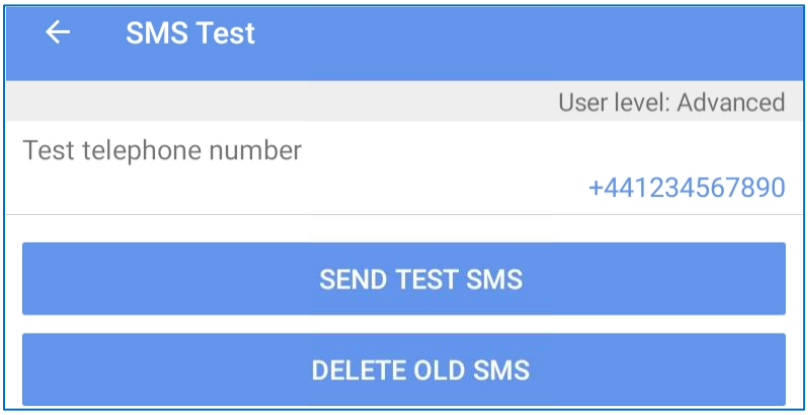
When in frequency mode, the fall-back times for sending data (only) to the server via SMS messaging can be added using the controls shown opposite. (See also section 3.3.1.1)

3.3.3 Test of SMS Connectivity

Your logger may have a facility to run a test to confirm the logger can **communicate using outgoing SMS messages** over the cellular network.



Tap on the 'Send test SMS message' line to access.
(Also, see important note in section 1.9 about SMS use).



Enter your mobile phone number into the 'Test Telephone number' field; the number must be in international format, as shown opposite.

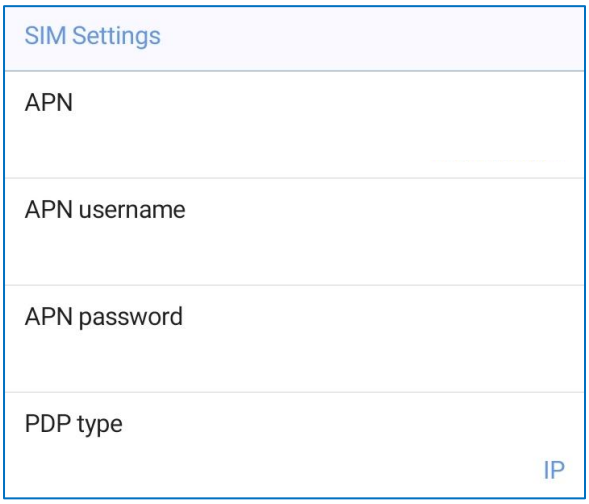
Click the "Send Test SMS" button.

If your SIM and the Cellular Network supports SMS messages, this will send a text to your phone, confirming the phone number of the SIM and that SMS calls can be made from the modem.

If you fail to receive a text message this could indicate a SIM or modem fault, but first verify that both the SIM and Cellular Network support SMS messages.

When finished, tap on the "Delete Old SMS" button.

3.3.4 SIM Settings

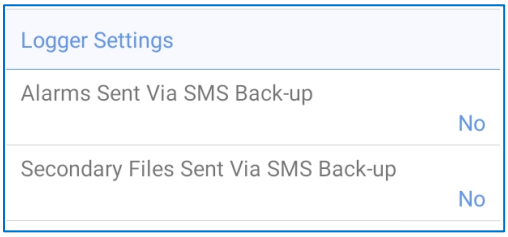


The APN (Access Point Name) is the name of the gateway being used by the mobile service provider to access the internet.
If required, enter a username and password.
Confirm any existing settings match those of your mobile-network data service provider.
Edit any that are incorrect.

The PDP type (Packet Data Protocol) should be set as required by your SIM provider.
(Select from IPV4, IPV6, or IPV4&V6).
(If in doubt, enquire with your system administrator).

3.3.5 Logger Settings (Related to Call-ins)

(These options are only available on some 'Group 2' loggers)

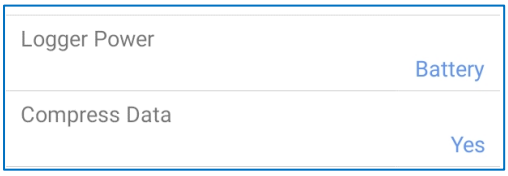


By default, the SMS fall-back mechanism of the logger only sends primary data channels.

To send in Alarm information also, set 'Alarms Sent via SMS backup' to 'Yes'.

To send in secondary files also (e.g., logged data), set 'Secondary Files Sent …' to 'Yes'.

Note: (See important note in section 1.9 about SMS use. If SMS is not to be used ensure the '… sent via SMS back-up' settings are deactivated).



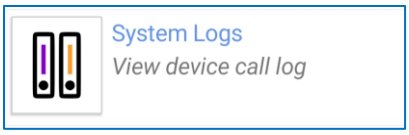
Most loggers will be battery operated and therefore have limited power; the logger restricts power use wherever possible. (Set Logger Power to 'Battery').

Certain logger applications permit the use of an external power source, in which case the logger can be less restrictive in its power use. (If such a supply is in use, set Logger Power to 'Mains').

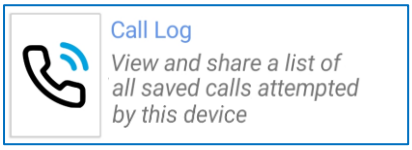
'Compress Data' can be set to minimise length of messages and hence call times.

3.3.6 Call Log (Call History)

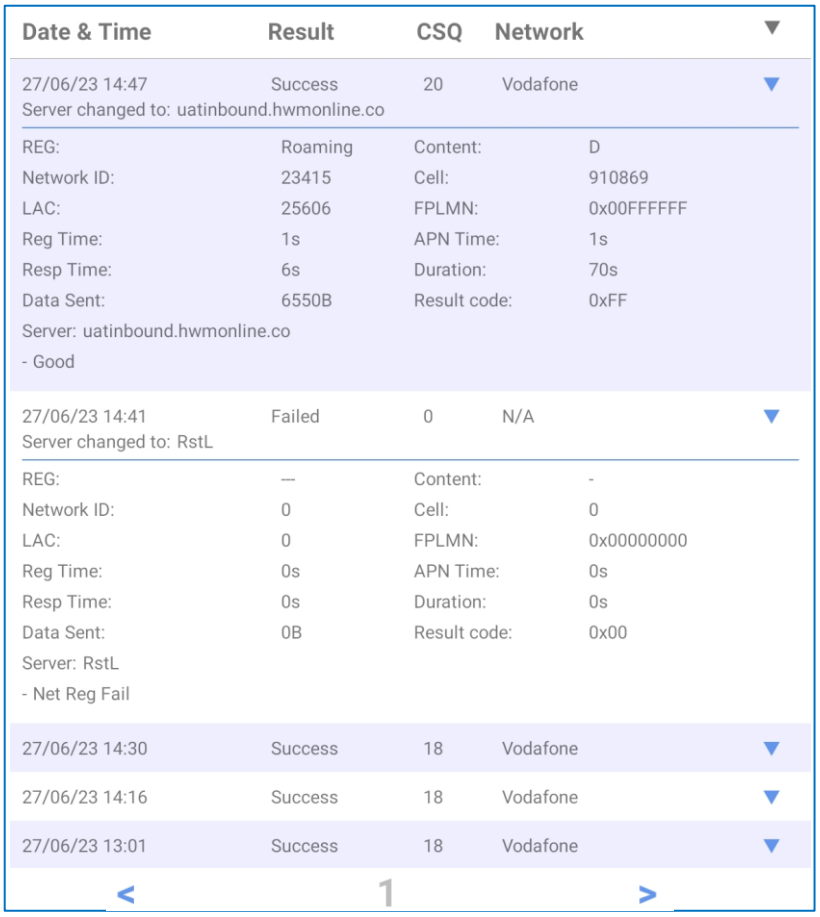
'Group 2' loggers keep a record of any attempted call to the server, and whether it succeeded. This can be viewed as follows:



Tap on System Logs.



Then tap on Call Log.



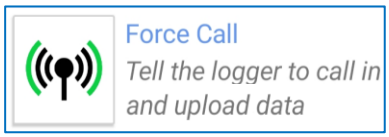
Each call is listed with the date and time and various parameters including CSQ and a success / fail indication.

Tap on the inverted triangle for details.

Tap on '<' or '>' to navigate the call log pages.

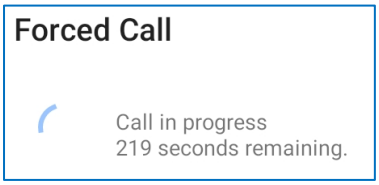
3.3.7 Forced Call-in

IDT can cause 'Group 2' loggers to make an immediate call-in to the server. This is useful for such occasions as when a logger is about to be removed from the installed site and an upload of final data is required. (e.g., As part of a 'lift and shift' operation).



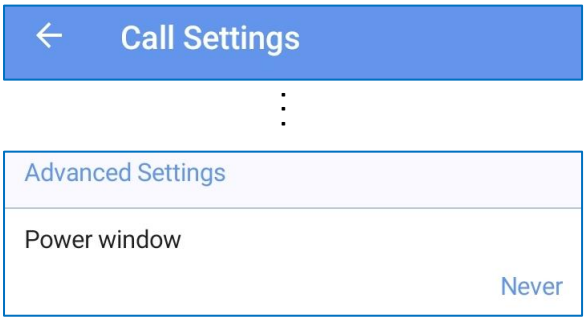
To make the call, from the main page, tap on 'Test Device'.

Then tap on 'Force Call'.



A call is initiated. The 'Forced Call' information box will show call progress and provide a countdown; this is the maximum length of time to wait, but usually the call finishes sooner, and the box will close.
If no error is indicated, the call and data upload was successful.

3.3.8 Power window – Daily Modem activation

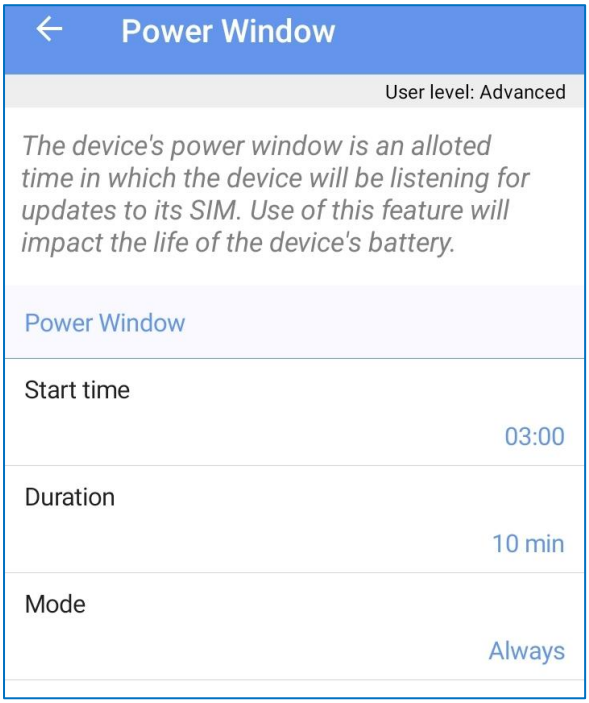


Your logger may include a “Power Window” setting.

This can be found by navigating to the call settings screen:

Main screen → Configure Device → Call Settings

Then locate the “Advanced Settings” area.

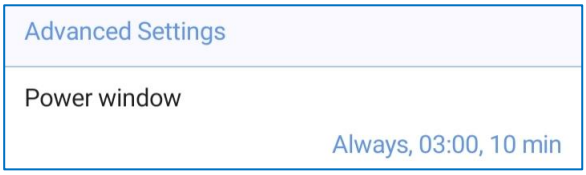


This setting allows daily activation of the logger’s cellular modem, allowing it to be contacted for over-the-air updates to the SIM card. (This is factory set and should not be adjusted unless advised by HWM Global).

Tap the “Power window” line if you require to modify the settings.

Then pick a short interval using the controls.

Return to the Call Settings screen, which now shows the modified settings.



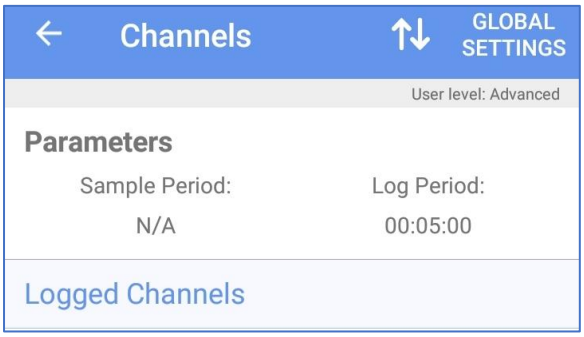
3.4 Timing Intervals for Making Measurements

3.4.1 Standard Logging

These settings determine what time periods the logger uses for its background activity of gathering data. (See also section 11.6).

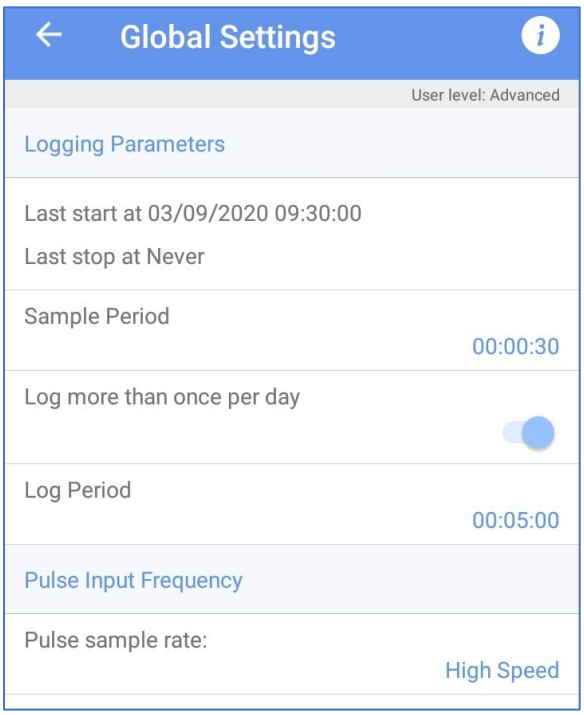
From the main options page, tap on the “Configure Device” selection.

A new page will open with various configuration options. Select the “Channels” option. (Information displayed will vary with logger model).



The “Channels” summary page is displayed.

Tap on the “Parameters” line, or the “Global Settings” link.



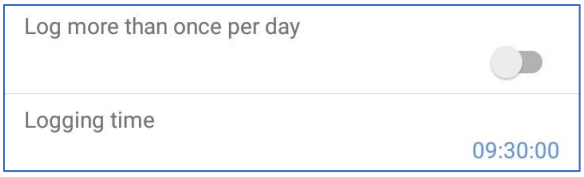
A new page is shown, called “Global settings”.

The page gives details of when logging was last started (or, if recently activated, is due to start).

The “Last stop” time will usually be a default value (as shown) unless the logger is currently in a stopped state.

There is a slider switch which determines if the logger “logs more than once per day”; if disabled it produces just a single log value per day.

Most general-purpose loggers should be set to log more than once a day.



Note: When ‘once a day’ is selected, the time of measurement is additionally required. (For ‘group 1’ loggers, there is no ‘Logging time’ field, and the logger will make and log a measurement at midnight).

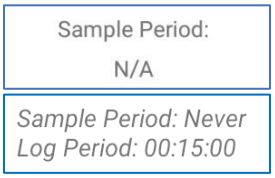
The “Sample period” line will not be shown when the logger model auto-configures this, based on the log-period setting. Where shown, “Sample Period” sets the time interval between making measurements on most of the interfaces.

The value can be selected from one of the many available options.

The “Log Period” sets the time interval between storing values and is set in a similar manner to that described for the sample period.

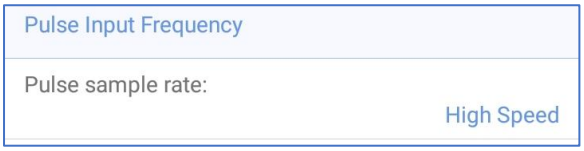
The Log period must be a multiple of the sample period. If the user does not select an appropriate value, IDT will automatically adjust the input.

The data value stored is known as a “datapoint”, normally produced at the log period rate. The value is formed by (optionally) applying some mathematical function on a set of raw data measurements (made at the sample rate); the samples obtained between the log period intervals.

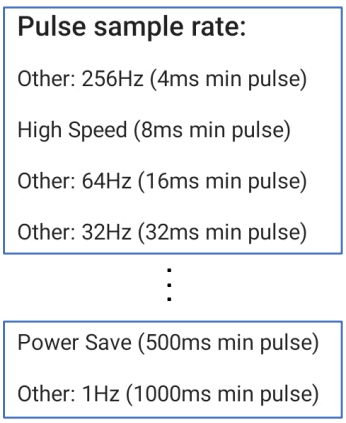


Note: “Sample Periods” for ‘group 1’ loggers are displayed as “N/A” or “Never” in IDT because it is adjusted by the logger software.
Background sampling of the sensors still occurs so that the logger can make an accurate assessment of the average value between producing the datapoints.
(The ‘N/A’ and ‘Never’ descriptions can therefore be disregarded).

Loggers with a pulse collection type of interface (e.g., digital flow interfaces that detect and count pulses output from meters) have to respond rapidly to the input signals.



Pulse input interfaces are sampled at a much higher rate than regular channels and (except for ‘Group 1’ loggers) have their own control for selecting timing.



Select the most appropriate setting based on the expected maximum pulse rate and also the minimum pulse-width.
(The available selections will depend on the logger supplied).

Where appropriate, battery life can be extended with the “power save” setting option.

3.4.2 Enhanced Logging - Fast & Transient (Group 3 loggers)

The logger normally samples data at the set sample period, and records datapoints at the set log period; Refer to sections 1.4 and 3.4.1; This is its normal repetitive operation.

Certain models of logger devices are (if the feature is enabled on your model) able to make additional data recordings at higher sampling rates. However, the feature can only be used with specific channel types, where the measurement cycle is quick to complete; typically these are pressure channels.

There are two possible classes of such recordings:

- Produce a data recording **at the set sample rate** (rather than the log rate).
  This is called “making a **secondary recording**”; the data recording is in addition to any normal repetitive data recording being made, which continues without interruption.
- Produce samples at a rate determined by a fixed frequency (**several frequency options** may be

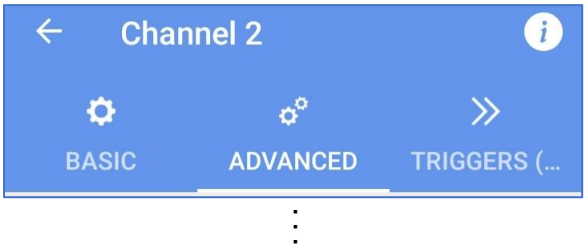
available from which the user is able to choose; 5Hz to 25Hz are typical).
This is called “making a **Transient recording**”; the data recording is in addition to any normal repetitive data recording being made, which continues without interruption.

The features should be disabled if not required, to preserve battery power.

The feature works in two basic modes:

- Recording at **specific times**.
  (Manually set time events to have data recorded at a higher speed).
- Recordings start when **triggered** by a channel data event, as part of a trigger-action combo (see section 7).
  (The logger monitors channel data. If the measurement value is outside of programmed limits, the logger then implements an action to make a makes a higher speed data recording).

3.4.2.1 Transient Recording at Specific Times (Scheduled)

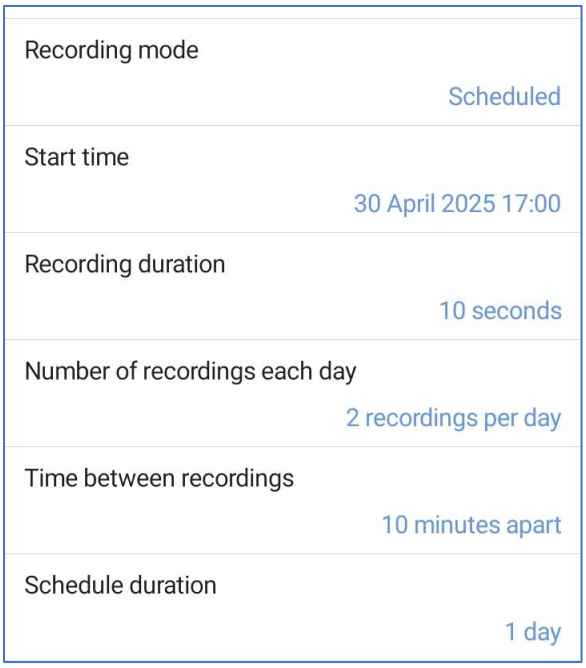


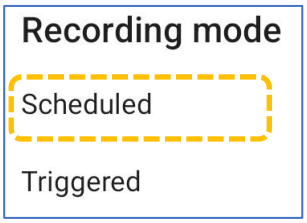
On a channel which has this feature available (typically the first pressure channel), navigate to the channel configuration and select the “Advanced” tab.

Locate the “Transient” section of the settings.

Set the “Transient mode enabled” control to enabled.
(It is shown here as disabled).

Once ‘Transient’ logging mode is enabled, other setting options will appear. Select one of the available sampling rates (5, 10, 25Hz are typical, but depends on model).





Tap on Recording Mode and select “Scheduled”.

Tap each line to:

Select a start date and time for the recording (data logging) cycle.
Recording duration (data recording period).
Number of recordings required per each daily recording cycle.
Time (gap to be inserted) between each recording period.
Schedule duration (quantity of days for which to repeat the cycle).

Tap the Accept button to save the settings to the logger.

Note: At this point, setup is complete. However, IDT will check if any clean-up tasks are required, such as removing incompatible / redundant triggers for the channel.
(Loggers are able to support scheduled or triggered Transient Logging functions, but only one type can be set within the logger; they are mutually exclusive).

The data recording will be made within the secondary recording memory at the specified time(s).

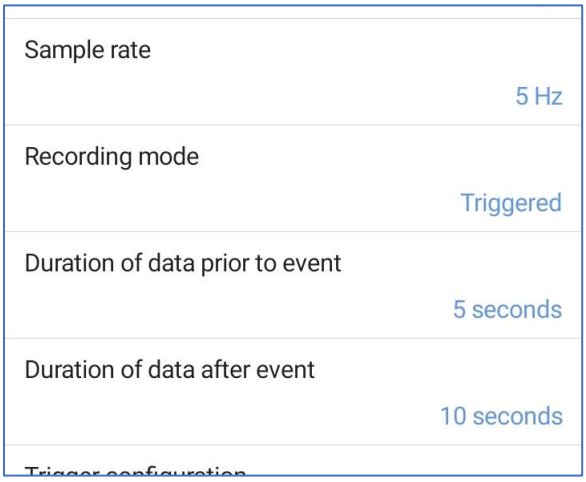
3.4.2.2 Transient Recording -Triggered (Started by Specified Conditions)

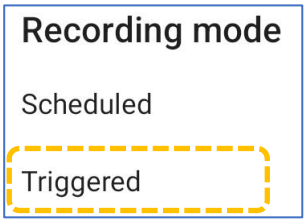
On a channel which has this feature available (typically the first pressure channel), navigate to the channel configuration and select the “Advanced” tab.

Locate the “Transient” section of the settings.

Set the “Transient mode enabled” control to enabled. (It is shown here as disabled).

Once ‘Transient’ logging mode is enabled, other setting options will appear. Select one of the available sampling rates (5, 10, 25Hz are typical, but depends on model).



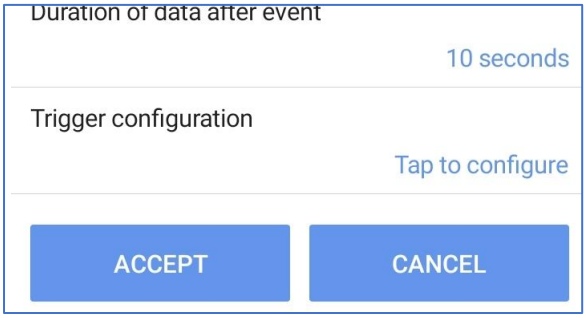


Tap on Recording Mode and select “Triggered”.

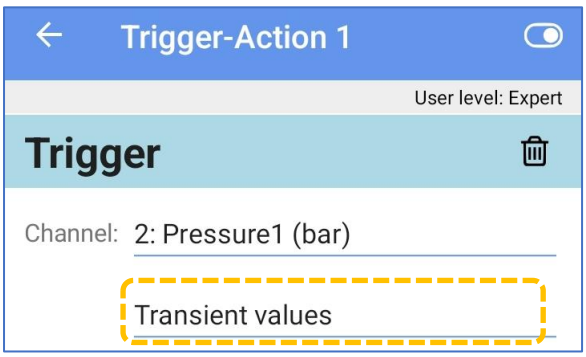
Tap each line to:

Select the amount of data (time duration) of data to include both prior to and after the triggering event. (The logger continuously samples enabled channels at the transient sample rate, temporarily storing several seconds of data; these can therefore be included in the logged Transient data recording).

The setup is not yet complete… A Trigger / Action combo needs to be defined, used to initiate the transient recordings.

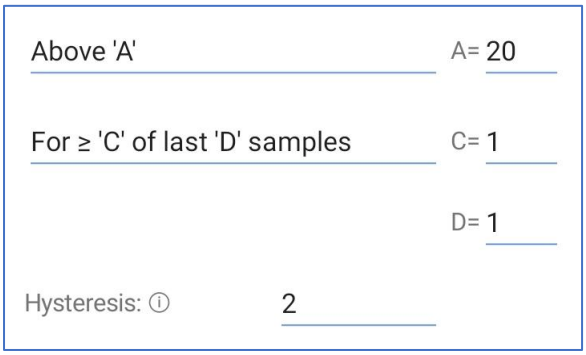


Tap the “Trigger Condition” line to begin the trigger setup process.



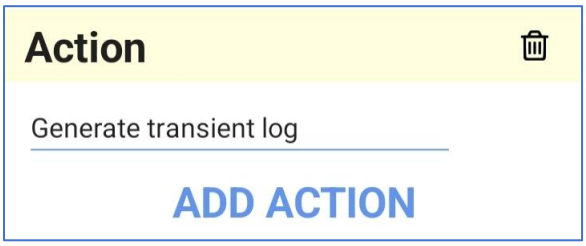
IDT will automatically show a trigger/action screen, with some setting suggestions.

Best practice is to leave the “Transient values” setting selected (rather than changing it to regular sampling rate or logged rate). This allows earliest response to a transient because the sample rate is much higher; other sampling options are likely to miss transients. The higher sampling rate is used when the logger is evaluating the event start (trigger) and end conditions.



Complete the trigger condition for when the logger should make the transient recording.

(This will be *immediately* on seeing a spike or dip in water pressure, for example).

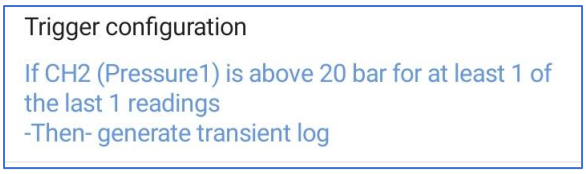


When channels have been enabled, there is a new type of action available … “Generate transient log”.

Select this action.

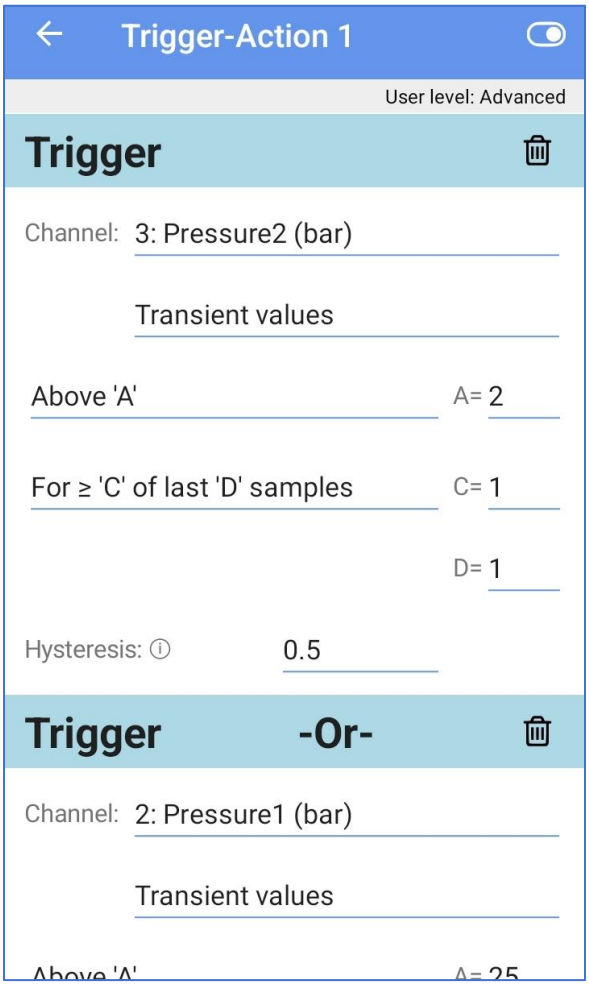
Add any other required actions (e.g. send an alarm).

Tap the back-arrow to return to the channel setup page, then tap the “Accept” button.



A summary of the trigger-action setup will be shown in the Trigger Configuration line.

Refer also to **Scope of Transient Mode Settings**.



Note: There is **only one trigger-action combo available** for use with triggered Transient logging.

Therefore, if the triggering situation is complex, or is required to consider more than one input, then additional trigger conditions (and associated logic) should be included in the one available trigger-action combo. (See also section 7.4).

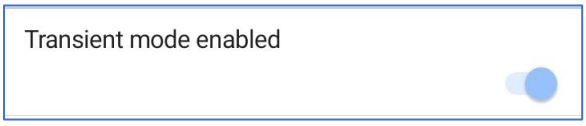
When multiple channels are involved, be sure to select "Transient Values" on all trigger conditions.

Refer also to **Scope of Transient Mode Settings**

Note: At this point, setup is complete. However, IDT will check if any clean-up tasks are required, such as enabling Transient mode on the required channels, or deleting any scheduled Transient settings.
(Loggers are able to support scheduled or triggered Transient Logging functions, but only one type can be set within the logger; they are mutually exclusive).

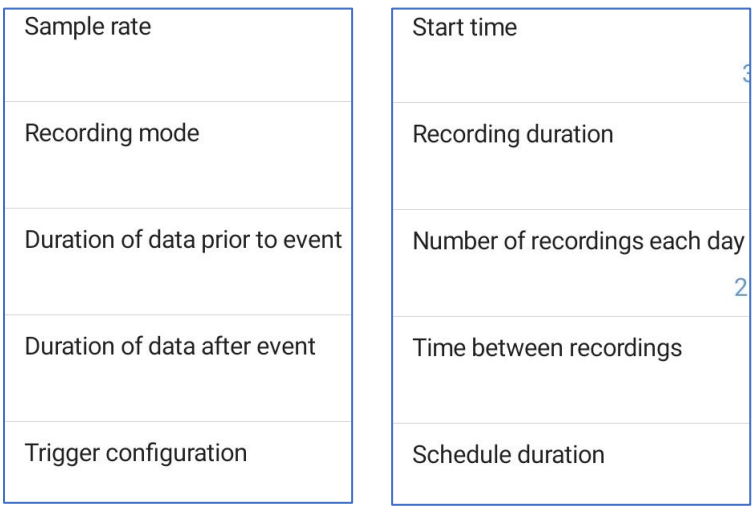
The data recordings will be made within the secondary recording memory whenever triggering conditions exist.

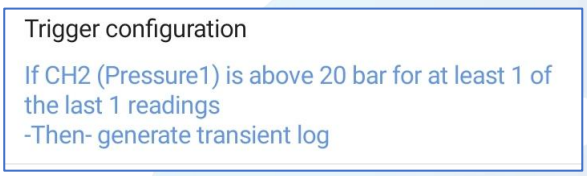
Scope of Transient Mode Settings.



The "Transient Mode Enabled" setting is **specific** to the channel. Therefore, each supporting channel can be individually switched on or off.

The other settings (see below) are **common** across all the supporting channels.





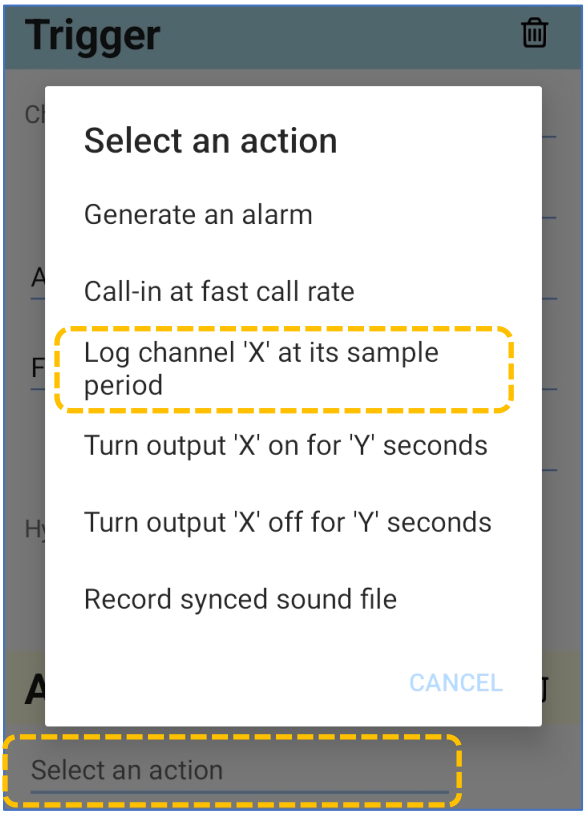
:
(etc …)

Because of the commonality of these settings, only one type is allowed.
There are further exclusions, due to commonality of settings, as described in section 3.4.2.3.

3.4.2.3 Sample Rate Recording -Triggered (Specified Start Conditions)

This function, if supported by your logger, is similar to transient recordings (it creates a secondary recording file), but the frequency is lower; it is set to the background sampling interval.

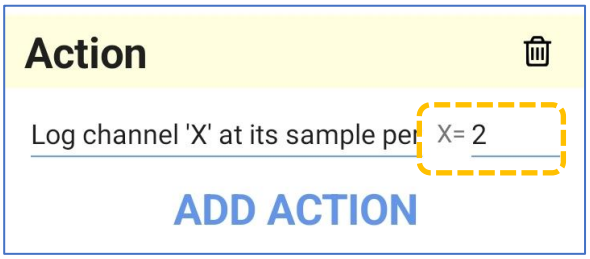
Note: If this feature is used, Transient recording (see sections 3.4.2.1 and 3.4.2.2) will be disabled; they are mutually exclusive. (Refer also to **Scope of Transient Mode Settings**, above).



To set up the function, open up the channel settings for the channel that is required to be monitored for a trigger condition, and set as normal.

When selecting an Action related to the trigger, a new option will be present: “Log channel ‘X’ at its sample period”.

Select this setting and then complete the action by adding the channel number, as shown below.



Add any other desired actions and then save the settings.

The data recordings will be made within the secondary recording memory whenever triggering conditions exist.

HWM Global

PART 3 : Introduction to Creating, Modifying, Testing a logger channel

4 Creating (or Modifying) a Logger Channel

Note: Loggers are usually shipped from the factory pre-configured to the requirements of a customer order. The steps described here therefore only need to be followed for setup of a new channel or modifying existing settings.

As discussed in section 1.8, a channel requires:

- A way to identify the channel and its data-stream.
  (IDT gives the channel a "channel number" for this purpose).
- A "channel type" (electrical interface and software driver)
  (IDT uses "input selector" and "sensor type" for this purpose).
- A means of interpreting data obtained from the sensor.
  (IDT uses such things as "input multiplier" and "units" for this purpose).
- Settings to govern when and how datapoints are produced for storage.
  (IDT uses the "log period" and "Logging mode" for this purpose).

The actual fields that are needed are *dependent on the type of sensor* and what a measurement from it represents. There is also some variation in the fields required dependent on the model of logger; 'Group 1' loggers are relatively basic in design and less setup steps are required than for the 'Group 2' and 'Group 3' loggers.

Furthermore, 'Group 2' and 'Group 3' loggers can also use the measurement channel datapoints to derive indirect data streams (in the form of additional channels) or other indirect information. For example, a meter pulse input can produce:

- A stream of data measured *direct from the sensor interface*.
- A stream of *indirect data* derived the direct data stream.

  Here, Meter pulses indicate consumption of a volume of fluid or gas.
  Indirect data can be in the form of flow rate (when timed) or a calculated meter reading (if the initial meter reading is known).

Examples will be given of the considerations needed and steps taken to set up a logger channel for typical sensors. This is for introduction purposes only; many sensors will follow a similar setup procedure. However, some sensors (or logger behaviour with the sensor) can be more complicated and require further discussion. (Refer to section 12 for further details of sensor setup).

The first example is based on an interface can detect if a switch is open or closed. A typical application of this interface is for the detecting output pulses from a gas or water meter. The logger input in the example will usually be labelled as either 'Flow' or 'Pulse', and IDT will similarly refer to the input by including 'Flow' or 'Pulse' in the description.

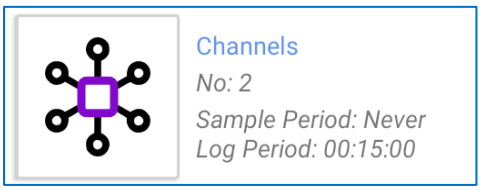
Note: The wiring of the interface will not be considered here. However, it is important to know the characteristics of the equipment that the logger is being connected to, since flow meters can have several "flavours" of output pulse signals. e.g.:

1. Uni-directional flow is represented by a single output from a meter.
2. Bi-directional flow can be represented (in several ways) by using two outputs from the meter, and therefore requires two signals within the input to the logger.

A typical gas meter has uni-directional flow, with a single pulse output. The rate of gas flow is derived from the pulses by requiring the logger to count the number of pulses obtained during a fixed interval of time; this is to be repeatedly logged.

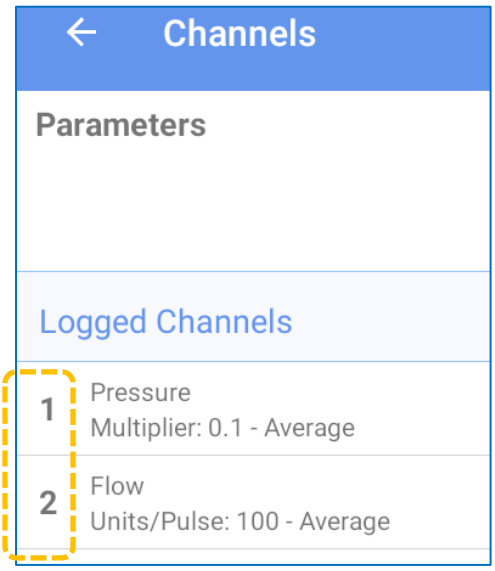
4.1 Example 1: Flow Channel (Using a Logger from 'Group 1')

(If required, from the main options page, tap on the "Configure Device" selection).



To check for the number of pre-programmed channels that the logger may have, refer to the "Channels" option line.

"No: 2", indicates that the logger has 2 channels set up.



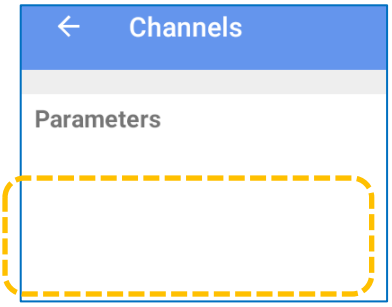
To check what channels exist tap the "Channels" line.

The "Channels" page will open.

A summary of the channel settings is shown below the "Logged Channels" line.

The numbers on the left are the assigned channel numbers for the data streams. (On 'group 1' loggers these cannot be changed from factory settings).

Tap a line if you wish to view more details or to edit the settings.



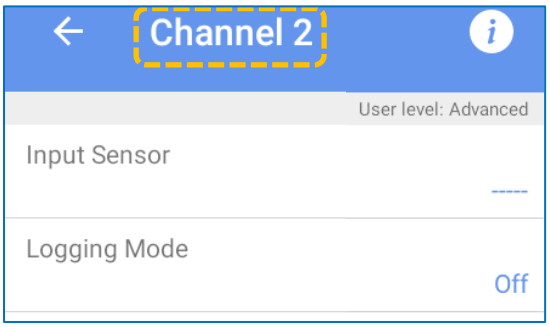
When a logger has no channels set up, there are none shown in the "Channels" page, nor is there a "Logged Channels" line.

(See blank area in the diagram opposite).

Channels can be added, as per the instructions that follow…

From the "Channels" page, Tap on the " + " symbol.

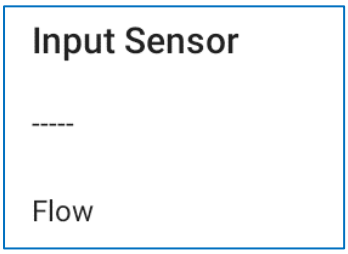
(The symbol is blue if a channel can be added, but grey if no further channels are available).



A channel number is allocated for the data stream, and a page is loaded with the current settings.

Initially there is no Input Sensor selected.
(Shown here as "-----" ; the channel is disabled).

To select an electrical interface for an input sensor, tap on the "Input Sensor" line.



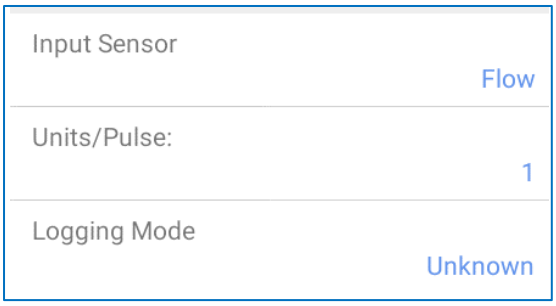
A pop-up box will appear for the user to select which input to use for this channel.

(Here, the logger offers either to disable the input, or to use a "Flow" sensor input).

Tap on the Flow line to make the selection.

Note: Where a 'group 1' logger has an unused interface, the related channel can be temporarily disabled (removed) to reduce battery power consumption and the saving of zero/null or erroneous data. Select '-----' to remove the channel.

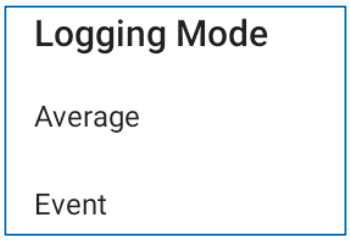
For 'group 1' loggers the channel can be easily re-enabled by adding it back, as described in this section.



The input sensor of "Flow" has now been selected.

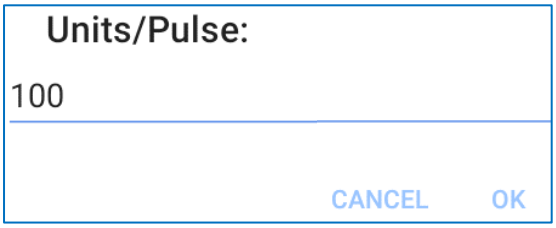
(For operational details of the interface, refer to the logger user-guide).

Now select the logging mode…



- Choose "Average" when connecting to meters that are producing frequent meter pulses.
- Choose "Event" when connecting to meters that are producing infrequent meter pulses.

Notes: "Average" counts pulses between log periods, and from that it calculates the flow rate.
"Event" waits for the log period to pass and then waits for the next pulse. It can then calculate an average value of the flowrate and record it by backfilling any datapoints that were missed whilst waiting for the pulse to arrive.

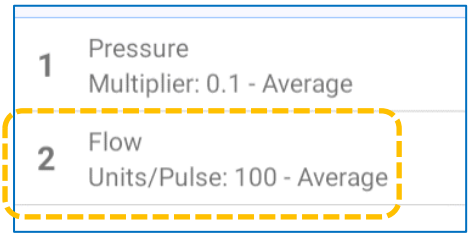


The "Units / Pulse" field can be edited by tapping on the line and entering the appropriate value.

(E.g., If you wish to record consumption in litres, and the meter generates one pulse per 100 litres consumption, then set this field to "100".
Tap on OK to confirm the change).

Tap on the “accept” button to commit the changes to the logger.

IDT will take a few seconds to modify the program settings within the logger. It will then re-start the logger, so the logger will be making a new recording; this is required because the operation of the channels has been changed.

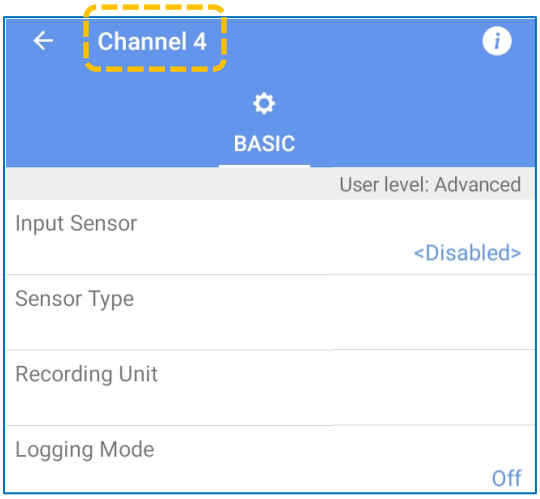


Tap the left arrow to return to the Channels screen, and check that the channel is now present and has correct settings.

For setup details of other channels, refer to the relevant sub-section within section 12.

4.2 Example 2: Flow Channel (Using a Logger from ‘Group 2’)

Setup of a channel using a ‘Group 2’ logger is similar to the example given for a ‘Group 1’ logger (see 4.1), but some additional steps will be needed; due to the logger being more flexible, it requires the completion of additional setup options.

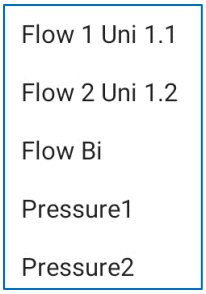


In the Logged Channels screen, tap on the “ + “ symbol to add a new channel.

The IDT app will assign a channel number for use. This is the datapoint output stream channel number, and (unlike ‘Group 1’ loggers) is flexible as to which interface can be used to produce it.

Initially, the input sensor is shown as ‘<Disabled>’; The channel is not in use. Logging mode is ‘Off’; No data is being produced.

Tap on the ‘Input Sensor’ line.

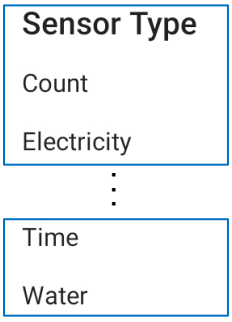


A list of all the available input interfaces is shown.

In this example, the logger is being set up for a uni-directional water meter. This type of meter has only one meter pulse output signal. Therefore, the ‘Flow-Bi” channel is disregarded; Flow Uni is required.

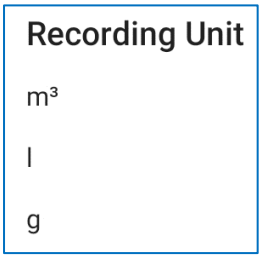
The Flow interfaces are presented as a pair of input signals. Flow Uni 1.1 can be selected; this will use the logger’s first ‘Flow’ interface (1.x) and on that interface it will use the first input signal (x.1).

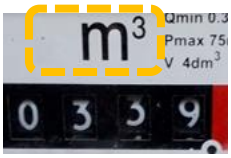
(This signal must be connected to the meter output.)



Tap on the 'Sensor Type' line and select what type of physical entity is being measured.

(In this example, select the material 'Water').





Tap on Recording Unit and make a unit of measure selection.

(The list will vary according to earlier-made selections.)

(In our example this has to match the units used by the specific meter installed.

e.g., m3 for the example shown opposite).

Tap on 'Units / Pulse' and enter the pulse significance of the meter.

e.g., If the meter pulse represents 0.001 m3 of water, the units/pulse should be set to 0.001.

Next select a logging mode. For a water flow reading, the channel can be set to "Spot". The result will be the pulse count (i.e., total flow) since the last datapoint was produced. (This is required to keep track of meter readings.)

By counting the number of pulses from the meter over a fixed period of time (the log period), the logger is able to determine the flow rate through the meter.

Select the 'Advanced' tab and check the pulse sample rate is adequate for the fastest meter pulse output rate.

Click on the 'Accept" button. (This saves the settings to the logger.)

4.3 Example 3: Flow Channel (Using a Logger from 'Group 3')

A gas meter pulse represents a volume of gas that has travelled through the meter.

To accept the meter pulses, the logger is required to have a suitable interface. On some loggers, the interface that handles pulse inputs may be labelled as "Single Bidirectional Flow" or "Dual Unidirectional Flow" or similar. For other loggers, interfaces may be unlabelled, but their type can be found from examination of the model-number of the logger (refer to the logger user-guide if required). They are often supplied as a pair of pulse input pins on a single connector. IDT will refer to each of these as a ***pulse input***.

Setup of the channel is like the method described in section 4.1, but the logger offers more flexibility with the use of the pins on the connector. The setup of the interface therefore requires more steps (see also sections 12.4 and 12.7). Once the installer has made selections from the options, the logger then uses the most relevant driver with the chosen settings.

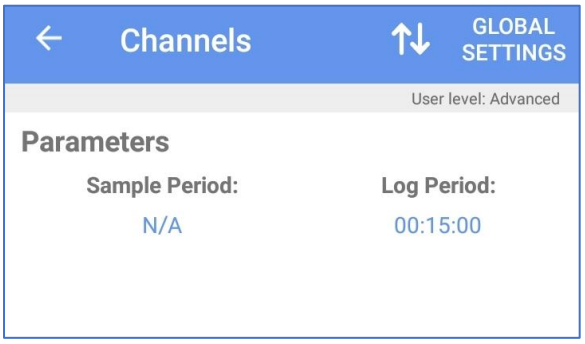
When set as a flow channel, the logger will count the number of pulses obtained on specified pins during a fixed interval of time; this will be repeatedly logged.

If the logger has the option enabled in the factory, an up-to-date meter reading can also be obtained

(if the initial meter reading is entered).

Tap the Channels icon to begin setup of a channel.

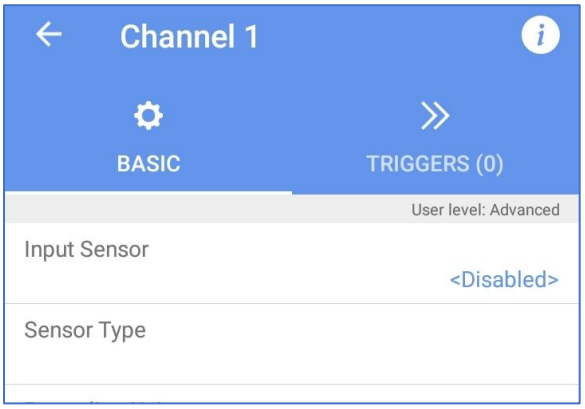
("Combos: 0" is a summary of the total number of programmed 'combos' that exist, here '0').



A summary of any channels and trigger-action combos that are already configured is shown on the page.

(Here, the list is empty).

Tap the " + " line to add a new channel.

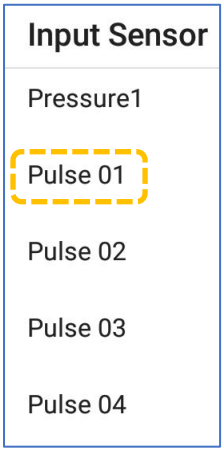


The new channel is enumerated by IDT; here it is "Channel 1".

(Note: Outgoing channel numbers are not fixed but do need to match DataGate expectations).

There are two tabs; select the "BASIC" tab.

Tap the "Input Sensor" line.
(Currently, it shows "<Disabled>"; it is unconfigured).



A pop-up selection box appears listing all installed sensor interface options.

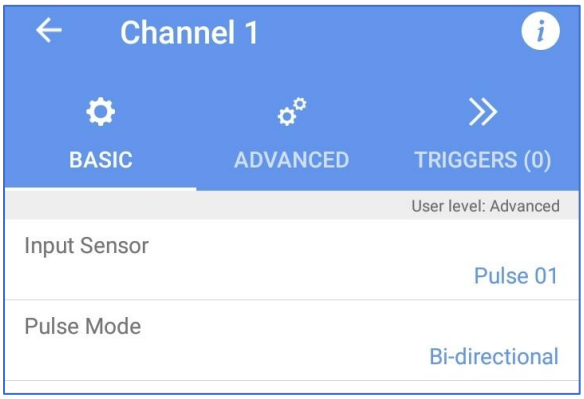
Notes:

- The list will show available interfaces.
  (It will vary according to logger model-number and also any requirements specified at the time of the logger being ordered).
- Selecting "<Disabled>" will delete any current configuration of the channel, including any calibration data.

For this example, (a uni-directional gas meter), a uni-directional flow sensor will be required; this uses only 1 pulse input pin.

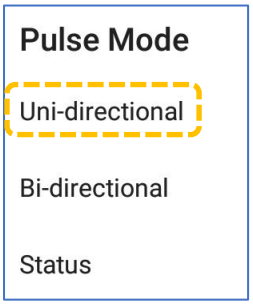
Select a Pulse pin from the selection list by tapping it. (e.g., "Pulse 01").

The selection commits the electrical interface for use by the logger.



The screen updates to show the selected interface.

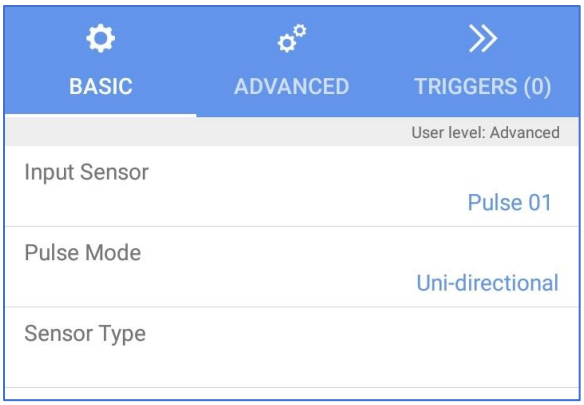
For this particular type of interface, multiple software driver options exist, and hence an *additional* setting line is displayed, “Pulse Mode”.



Tap on the Pulse mode setting and select from the available options.

For this example, a uni-directional flow sensor is required.
Therefore select “Uni-directional”.

This selection commits the relevant pins of the interface connector for a specific use. In this example, the software driver will count meter pulses that appear across the relevant pins of the connector.

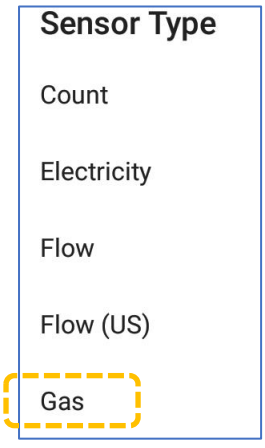


The selections made are shown in the channel configuration screen.

The software is now prepared to count pulses but has no idea of whether it is measuring the flow of electricity, water, or something else.

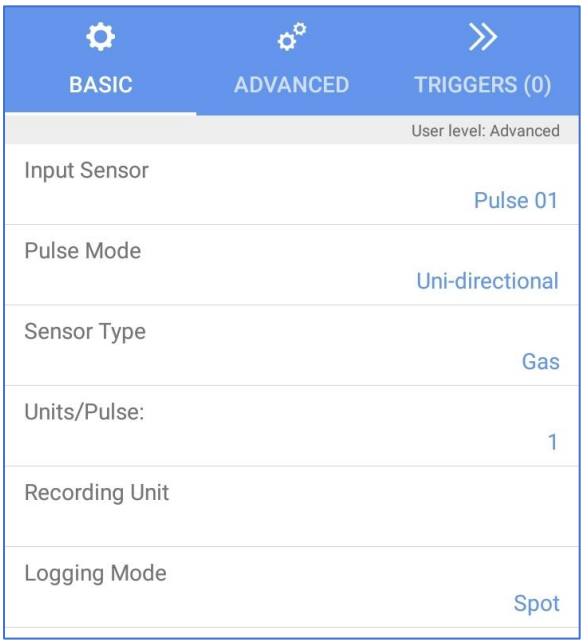
The next steps are to identify what the pulse count is representing.

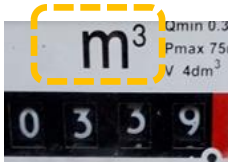
Tap on the “Sensor Type” line…

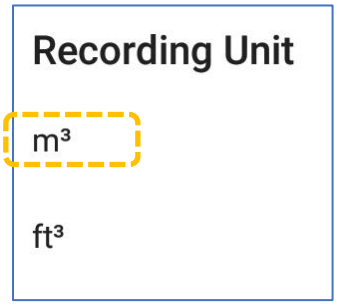


A list of options is presented.

Select the type of measurement being made.
(In our example we are measuring gas. … Therefore, choose “Gas”).



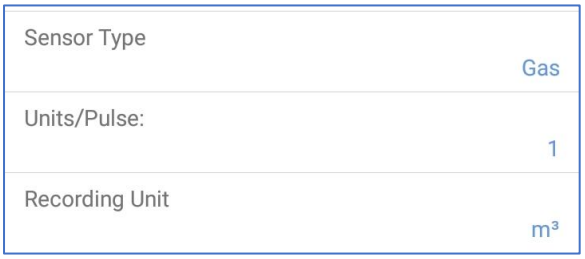




Next tap on “Recording Unit” and select a unit of measure from the list.

(Units of measurement listed will vary according to earlier-made selections).

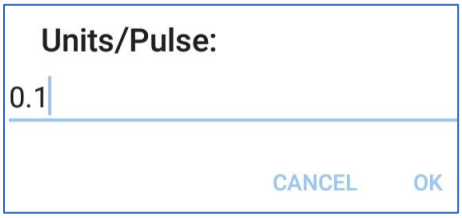
(In our example this has to match the units used by the specific gas meter installed. e.g., m3 for the meter shown opposite).



A relevant calibration factor for a gas-meter is units per meter pulse. (Other types of equipment may require a different type of calibration factor).

Tap on “Units/Pulse”.

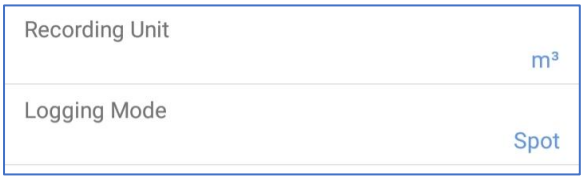
This selects the pulse significance of the meter.



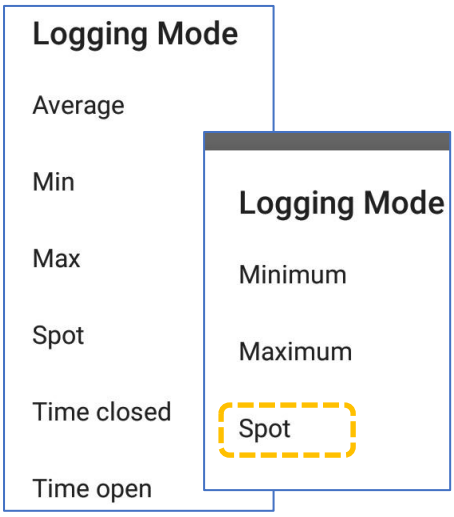
Enter the correct setting based on the equipment you have attached the sensor to.

e.g. If the meter pulse represents 0.1 m3 of gas, the units/pulse should be set to 0.1.

(By repeatedly counting the number of pulses from the meter over fixed time periods, the logger is able to determine the flow rate through the meter).



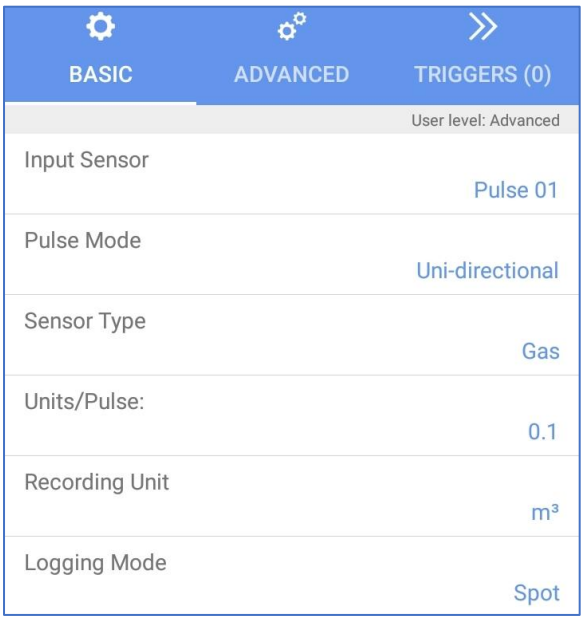
Next select the required logging mode.



The available options depend on what is being measured.

For example, “Average” will produce a datapoint (logged data) that is an average of the measurement samples it has made since it last produced a datapoint.

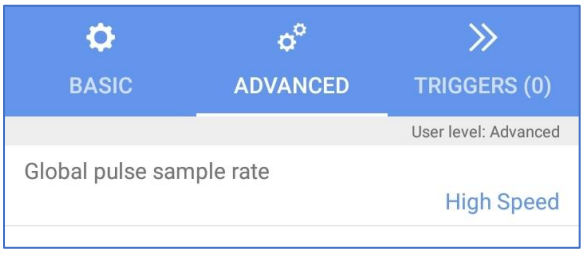
However, for a gas flow measurement, the shown options are less. (IDT presents only useful options based on any previous selections).



For a gas flow reading, the channel should be set to “Spot”.
The result will be the pulse count (i.e., total flow) since the last datapoint was produced.

The completed settings are now shown within IDT but have not yet been saved.

Tap the “ACCEPT” button.
IDT will save the channel settings to the logger.



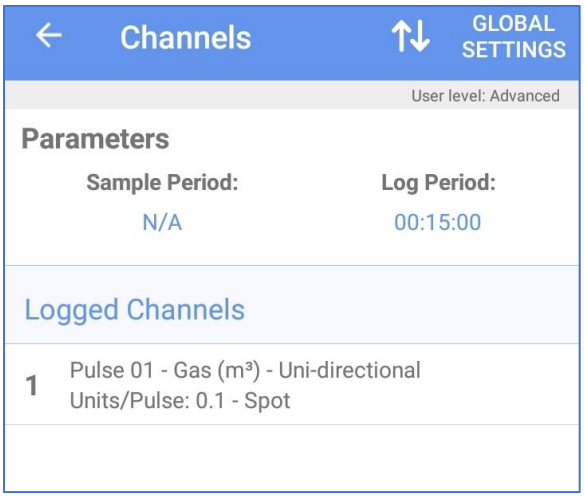
Select the “Advanced” tab.

Check the selection within the “Global pulse sample rate”. (“Global”, here, means that the selection is a single setting applicable to all pulse channels within the logger).

Select the fastest sample rate needed by the set of pulse channels in use. (The setting may be changed here, or on the “Global Settings” screen; see section 3.4.).

Tap the “ACCEPT” button; IDT will save the channel settings to the logger.

Then tap the “back” button.



The channel is now set up and will appear in the Channels list.
("1" shown here represents channel 1.
Datapoints will appear as the outgoing "Channel 1" data stream sent to the server).

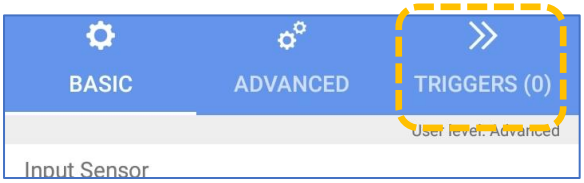
Where multiple channels have been set up, they will all be shown here as a summary of their settings.

(To edit the channel settings, tap on the relevant line).

Further discussion of setup of a logger for automated gas meter readings will not be discussed here, except to summarise:

- Because the context of the channel use is connection to a gas meter, additional options become available for a logger to be used in that application…
- The current meter reading can be taken and recorded in the logger as part of the setup of "meter readings" settings within IDT. It is linked to the Uni-directional flow (Pulse input) channel.
- The logger may offer the ability to regenerate meter pulses on an output channel. This allows the pulses to be passed to other instruments using a logger output interface. Enable this feature if required.

For further information refer to section 12.7.



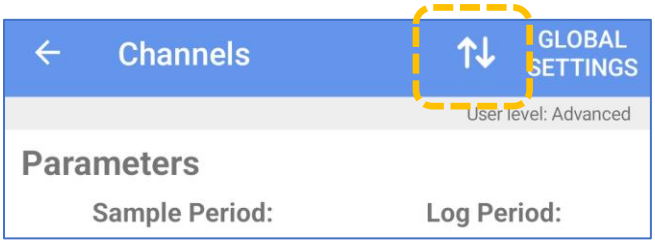
Note: 'Group 3' loggers usually have an additional tab on the channel settings page, called 'Triggers'. This will be discussed in section 7.

4.4 Channel Swap Utility

(This feature is not available on loggers from 'Group 1' or 'Group 2')

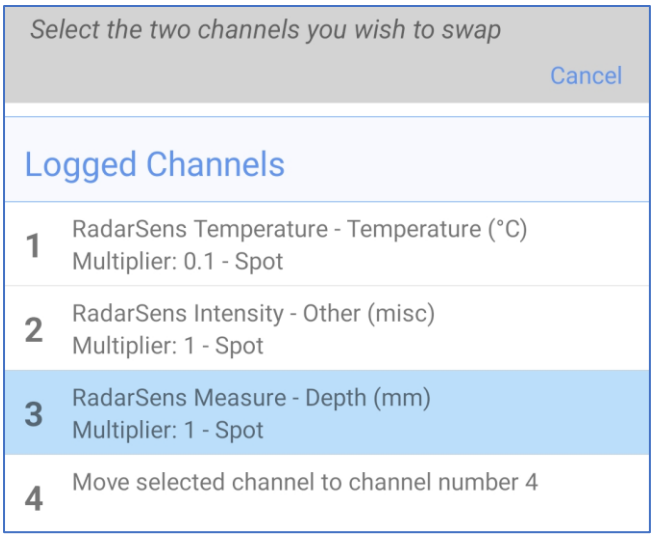
If a logger has several channels set up, but they are incorrectly numbered (e.g., If DataGate requires the data to be allocated to different channels), the IDT app has a utility to swap two channels over, thereby re-numbering them.

The IDT app handles all the required re-programming related to the channel swap, including any trigger-actions that may be set up. Calibration of the sensors is not affected by the channel swap.



Navigate to the Channels page.

Tap the channel swap control (up and down arrows).



Tap on two lines to select the two channels you wish to swap over.
(The selected channel lines will be coloured).

(The option to move to an unused channel is also available).

The IDT app will re-program the logger to swap the channel numbers over.

4.5 Data Substitution

Sections 4.1 thru 4.3 described how to set up the logger to use a sensor interface produce outgoing data streams, each of which was a series of measured datapoints. Some loggers have a facility to (temporarily) modify the datapoint streams by logging some other value. This is referred to as "Data Substitution". It can only be applied to one channel.

For data substitution, the replacement value can be one of the following:

- The previous data value. (This could either a measured or substituted value).
- A fixed data value.

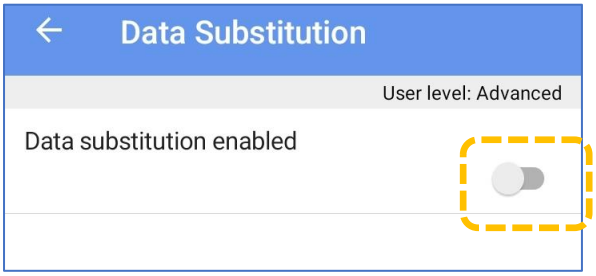
The conditions under which data substitution begins is dependent on data values obtained from a measurement channel (which could be the same or a different channel to the one having its data replaced).

The channel which is having datapoints replaced is known as the "Substitution Chanel".

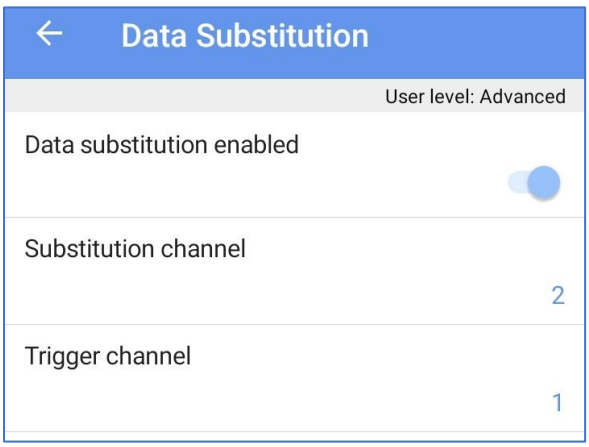
The channel being monitored for when the data (in the substitution channel) is to be replaced is known as the "Trigger Channel".

From the main screen, tap "Configure Device" and then locate the "Data Substitution" button, shown opposite.

Tap on the line.



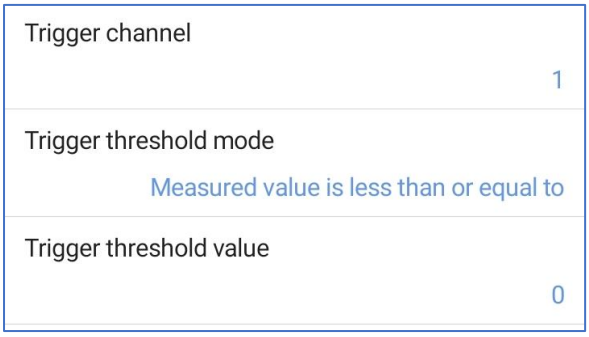
Tap on the line to enable data substitution functions and reveal the available settings.

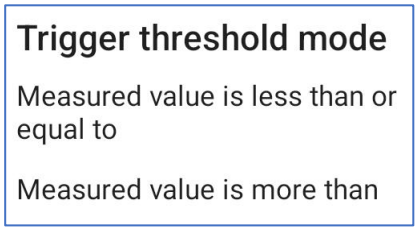


First define the channels being used:

Set the "Substitution channel" to the one which requires its data to be replaced.

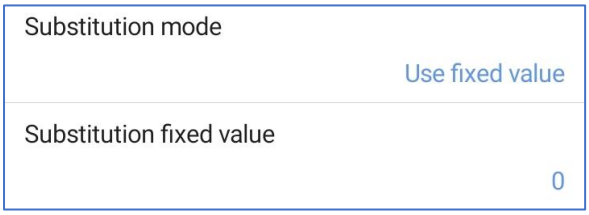
Set the "Trigger channel" to the one which is to be monitored to determine *when* the data to be replaced.

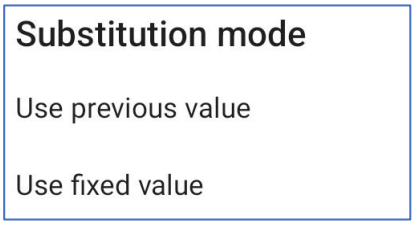




Set the trigger condition for the data being monitored in order to begin the data substitution.

Also add the threshold value (both positive and negative numbers are valid).

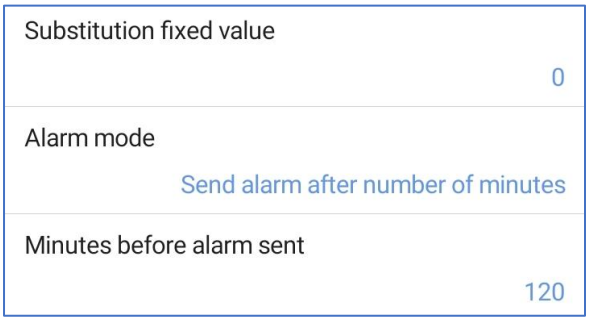


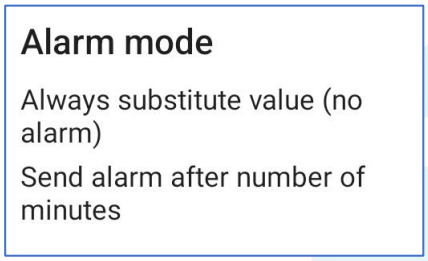


Set what type of data substitution is required.

If fixed value, also set the required value.

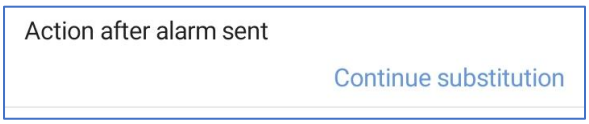
Data substitution is mainly intended to overcome some *short-term* aberration within the measurement data returned by a sensor. If this issue persists for some time, the logger can be programmed to take some action, such as raising an alarm.

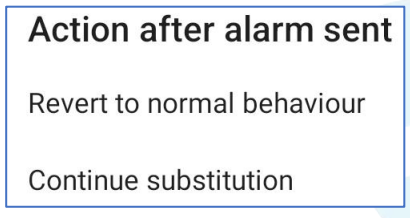




If no action is required, select "Always substitute value".

Alternatively, to enable an alarm, and its follow-on action, select "Send alarm after number of minutes" and then set the number of minutes to wait.

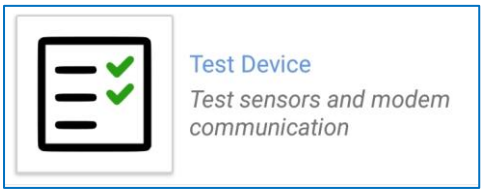




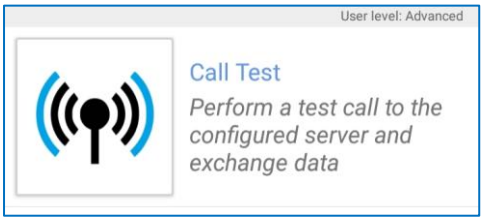
If an alarm is enabled, also program what behaviour is required after the alarm has been sent.

5 Logger and Sensor Tests

IDT provides access to be able to test some of the logger interfaces and the functioning of sensors.

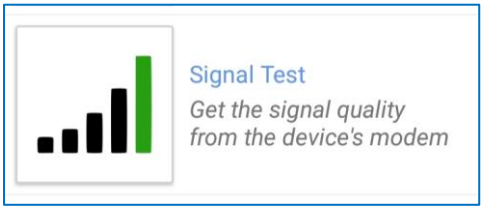


To access the logger test menu, tap on the “Test Device” line.



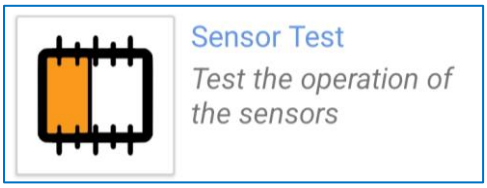
A new view will open with various test options.
(Only Hardware Test will be shown on ‘group 1’ loggers; they have no modem to test).

(Signal Test and Call Test are tasks to be performed at the end of logger installation and are covered in section 8.2).

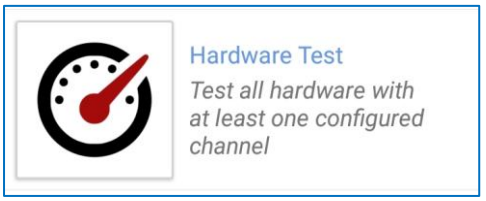


For certain sensors there may be a separate “Sensor Test” option. For most sensors, tap on “Hardware Test”.
A “Hardware Test” page will be generated.

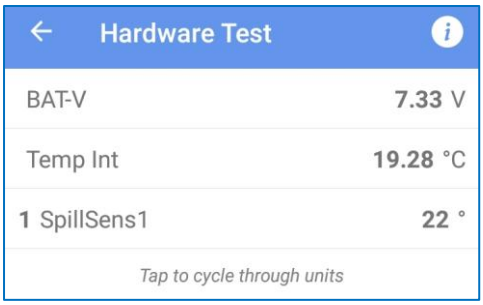
If there are recent changes, the logger may have to be restarted; tap the orange warning notice.



The test requires an interface to be configured for use before tests can be made; a channel must be configured to use the interface. Often the sensor also needs to be attached. The content of the test page will therefore depend on the logger model number (interfaces available) and configuration (settings).



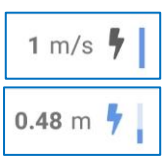
Each of the interfaces that have been configured for use by a channel will be shown, along with some additional internal sensors.



e.g. The diagram opposite shows a logger with Channel1 configured to use a SpillSens sensor.
The sensor is also fitted.
The hardware in this example can be tested by changing the position of the SpillSens digital float switch.
The example shows a sensor at 22 degrees from vertical; when the angle is changed, the display will update to show a new angle; it can be proved to be functioning OK.

The display is updated at 1 second intervals (approximately).

Similar methods will exist for many other interfaces and sensors.



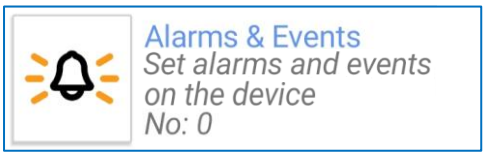
When powered sensors are in use, a lightning symbol is shown.
Tap the symbol to power the sensor constantly (blue) for faster readings (from all channels using this sensor); other powered sensors will be disabled.
If left for a long time, this will deplete the battery, so minimise the time used.
Tap to cancel. A progress bar gives approximate timing before the start of a sensor read cycle.

Part 4 : Introduction to setting Triggers, Actions, and Alarms

(This section is not applicable to 'Group 1' loggers; they have no means of initiating communication over a network to send alarm messages).

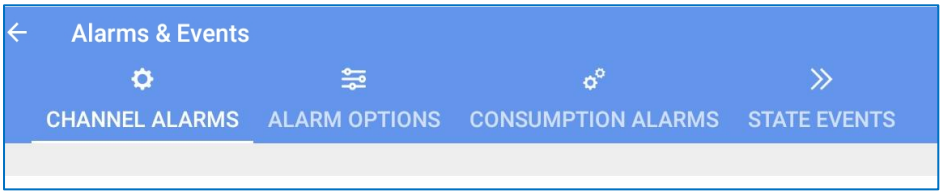
6 Setting Alarms ('Group 2' Loggers)

'Group 2' loggers include a cellular communications modem. This allows them to monitor channels for certain conditions, and (when met) send a message to a remote system. This ability is frequently used for sending an 'alarm' message. This can be done when entering an alarm condition and also when exiting the alarm condition.



The top-level screen for the logger alarm system settings can be reached by navigating:

(Main screen) → Configure Device → Alarms and Events.

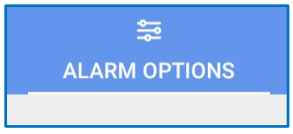


There are several tabs available at the top of the Alarms & Events screen. Each is related to a different type of alarm.

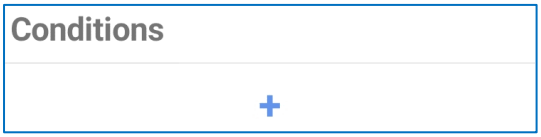
Channel Alarms: This can be used to set up to 8 different alarms, referred to as "Alarm 1" (through to 8). These alarms concern the monitoring of channel datapoint streams (measurements) for specific conditions.

Consumption Alarms: This can be used to set up to 4 different alarms, referred to as "Consumption Alarm Channel 1" (through to 4).
(The reference to a channel number is unrelated to the channel numbers of datapoint streams; it is just an enumerator).
These alarms concern the monitoring of Flow interfaces over a specified period of time, to check if the total consumption exceeds a certain value.
(An alarm is triggered immediately the threshold is exceeded.)

State Events: This concerns the monitoring of 'digital inputs' for specific events (open / closed). Unlike alarms, these have no exiting condition, but just report the occurrence of an event.

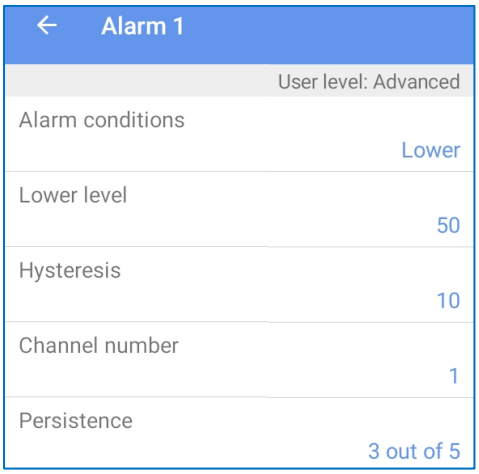


The 'Alarm Options' tab, contains a selection of setting options which will be applicable to all Channel Alarms. (Refer to section 6.7.)



The Channel Alarms tab lists any existing channel alarm conditions. New alarms can be added, or the settings of existing channel alarms can be checked.

(Tap a line to check / modify. Alternatively, tap ' + ' to add a new channel alarm).



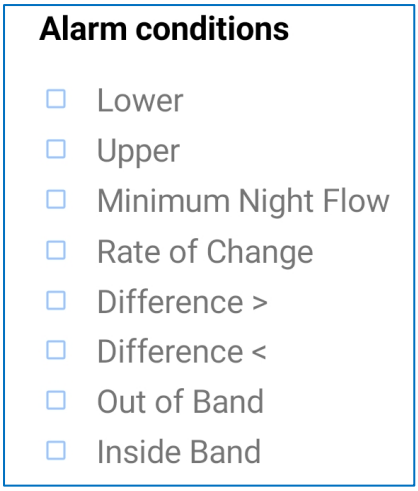
An example of a channel alarm is shown opposite.

To set up, first tap on the 'Channel number' line, and enter the channel number (datapoint stream) to be monitored.

Tap on the 'Alarm conditions' line and then select the required comparison type; these are discussed in sections 6.1 through to 6.5.

Complete the Persistence and Hysteresis fields, as required. (These are covered within section 6.6, and will not be repeated here.).

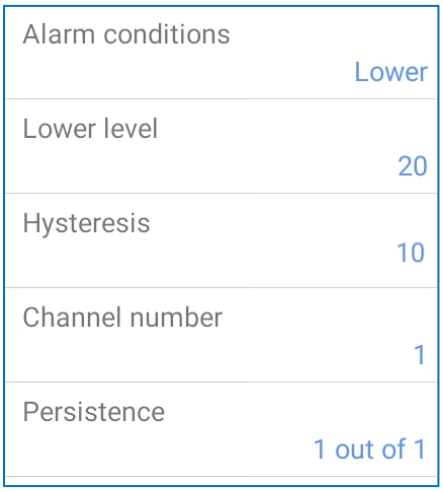
When finished, tap on 'Accept' to save the settings to the logger.



Various types of alarm conditions available (shown opposite). Details of each of the alarm conditions will be discussed in the next few sections of this document.

Note: The controls allow more than one selection, but it is up to the user to check the over-all effect makes sense.

6.1 "Lower" and "Upper" Limit Types



An alarm set as shown opposite will become active when the value of datapoints from the selected channel (here, channel number 1) are **below** the value shown in the "Lower level" limit.

Once activated, the alarm remains held in the active state until it is above a different limit, due to the Hysteresis field also having a value.

The release limit is: (Lower Level + Hysteresis).
(Here, it equals 20 + 10 = 30).

Alarm conditions	Upper
Upper level	80
Hysteresis	10
Channel number	1
Persistence	1 out of 1

Similarly, an alarm set as shown opposite will become active when the value of datapoints from the selected channel (here, channel number 1) are **above** the value shown in the "Upper level" limit.

Once activated, the alarm remains held in the active state until it is below a different limit, due to the Hysteresis field also having a value.

The release limit is: (Upper Level - Hysteresis).
(Here, it equals 80 - 10 = 70).

Refer to section 6.6 for a discussion of Persistence.

6.2 "Difference > " and " Difference < " Types (Comparing Two Channels)

Channels that measure similar parameters, with the same unit of measure, can be compared.
(i.e., The datapoints from each channel can be compared).

The comparisons are called "Difference > " and "Difference < " within IDT.

The comparisons can be more accurately described as either a "greater than" (">") comparison, or a "less than" ("<") comparison.

Alarm conditions	Difference >
Differential level	20
Hysteresis	10
Channel number	1
Differential channel number	2
Persistence	1 out of 1

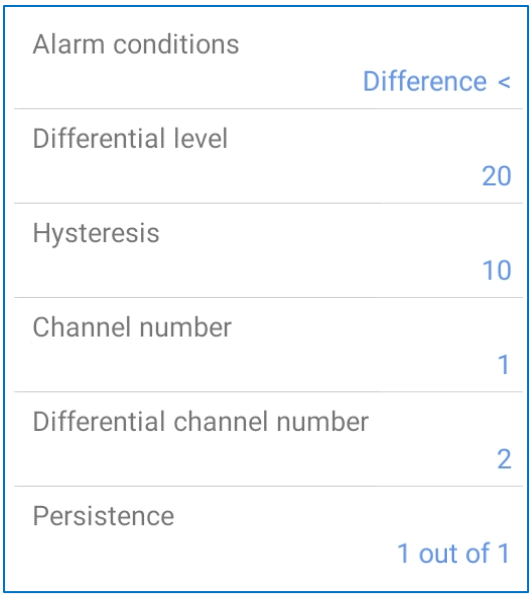
An alarm set as shown opposite will compare the values of datapoints from the two selected channels (here, channel 1 and channel 2).

The alarm will become active if:

(ch1 - ch2) > (**Difference** level). (**greater than**)

Once activated, the alarm remains held in the active state until the result of the above falls below a different difference limit, due to the Hysteresis field also having a value.

The release limit is: (Difference level) – (Hysteresis).
(Here, the difference release limit equals 20 - 10 = 10).



Similarly, an alarm set as shown opposite will compare the values of datapoints from the two selected channels (here, channel 1 and channel 2).

The alarm will become active if:
(ch1 - ch2) < (**Difference** level). (**less than**)

Once activated, the alarm remains held in the active state until the result of the above equation falls above a different difference limit, due to the Hysteresis field also having a value.

The release limit is: (Difference level) + (Hysteresis).
(Here, the difference release limit equals 20 + 10 = 30).

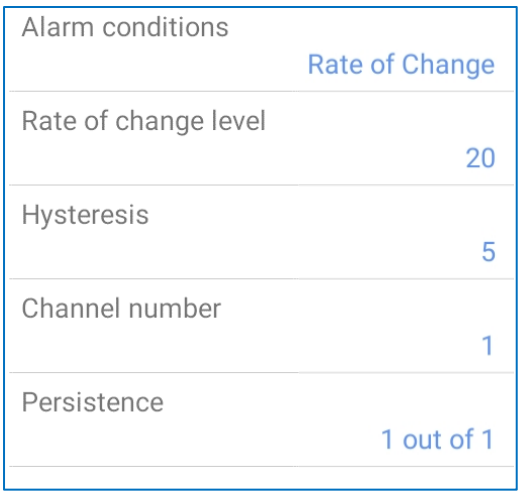
Refer to section 6.6 for a discussion of Persistence.

6.3 "Rate of Change" Type Alarm Trigger

It is possible for the logger to look at how quickly the datapoint values of a channel are changing, and if it exceeds a set limit to activate an alarm. This is known as a Rate of Change alarm trigger.

The "Rate of change level" field is the Rate of Change trigger threshold.

The logger looks at the current and previous data-point values to evaluate the rate of change. The time period involved is therefore the log-period of the logger channel.
If the values differ by more than the amount in the' Rate of change level', the alarm will become active.



An alarm set as shown opposite will compare the values of the current datapoint and the previous datapoint from the selected channel (here, channel 1).

The alarm will become active if:
(current value) – (previous value) is greater than the 'Rate of change' level.

Once activated, the alarm remains held in the active state until the result of the above calculation falls below a different limit, due to the Hysteresis field also having a value.

The release limit is: (Rate of change level) – (Hysteresis).
(Here, the release limit equals 20 – 5 = 15).

The Rate of Change trigger acts on datapoints which are increasing in value.
(There is no equivalent trigger for datapoints that are decreasing in value).

Refer to section 6.6 for a discussion of Persistence.

6.4 "Inside Band" and "Out of band" Types of Alarm Trigger

Alarm conditions	Inside Band
Lower level	20
Upper level	80
Hysteresis	10
Channel number	1
Persistence	1 out of 1

It is possible to define a band (a range with upper and lower boundaries) of values for the logger to test against. The test applied can be whether the datapoint value is within that range (called "Inside band") or outside of that range (called "Out of band").

An alarm set as shown opposite will become active when the value of datapoints from the selected channel (here, channel 1) are **between the values** shown in the "Lower level" limit and "Higher Level" limit.

Once activated, the alarm remains held in the active state until it is outside of different limits, due to the Hysteresis field also having a value.
The hysteresis is applied to both sides of the specified band.

The lower release limit is: (Lower Level - Hysteresis).
(Here, it equals 20 - 10 = 10).

The upper release limit is: (Upper Level + Hysteresis).
(Here, it equals 80 + 10 = 90).

Alarm conditions	Out of Band
Lower level	20
Upper level	80
Hysteresis	10
Channel number	1
Persistence	1 out of 1

An alarm set as shown opposite will become active when the value of datapoints from the selected channel (here, channel 1) are **outside of the values** shown in the "Lower level" limit and "Higher Level" limit.

Once activated, the alarm remains held in the active state until it is outside of different limits, due to the Hysteresis field also having a value.
The hysteresis is applied to both sides of the specified band.

The lower release limit is: (Lower Level + Hysteresis).
(Here, it equals 20 + 10 = 30).

The upper release limit is: (Upper Level - Hysteresis).
(Here, it equals 80 - 10 = 70).

When setting hysteresis, ensure that it is possible for the alarm to be cleared.
(e.g., If the band is 10 units wide, and the hysteresis is also set to 10, the alarm will never clear).

Refer to section 6.6 for a discussion of Persistence.

6.5 "Minimum Night Flow" Type Alarm Trigger

The "Minimum Night Flow" alarm trigger is designed for a specific application (looking at data from a channel collecting flow/consumption pulses from a water meter), however it can be applied to any channel producing datapoints.

Use Example:

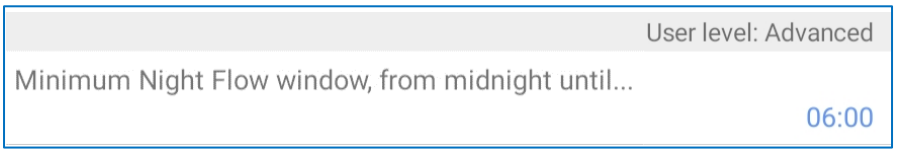
The alarm is designed for use as a means of detecting potential water leaks, using a water-meter. The logger will be set up to monitor the flowrate through the meter.

Typically, water use falls to a minimum level during the night.
A suitable Minimum Night Flow level is chosen (*just above the expected minimum water flow*).

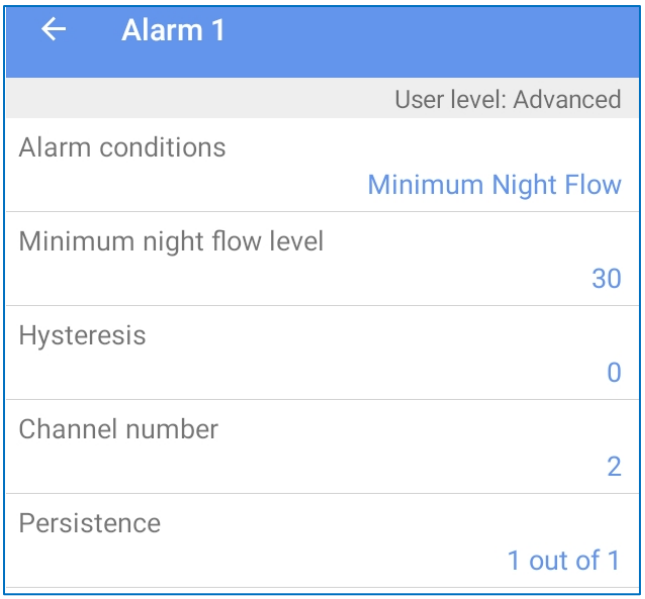
The data from a flow channel should always at some point fall below the chosen level when a leak (down-stream from the meter) is absent.
However, if a new leak is present, there will be an increased water flow through the meter, and it is likely that there will be *no datapoints below the chosen level*.

The test looks at the datapoints the channel has produced **between midnight (0:00) and a specified end time**. The time is adjustable.

To adjust the end time, navigate to the Alarms & Events screen. Then select the Alarm Options tab.



Tap on the 'Minimum Night Flow window …' line and set a new end-time.



Specify the channel number from which the datapoint values are to be taken.

At the end time, the logger will check all data-points to verify that one or more samples were **at or below** the value set as **the Minimum Night Flow level**.

If it finds suitably low values, raising the Minimum Night Flow alarm is evaded. However, if none are found the alarm is activated.

The alarm remains active until the following day, whereupon a new judgement is made.

If the values are then suitably low, the alarm is cleared.

Note: Hysteresis settings and Persistence settings have no bearing on the function of this trigger.

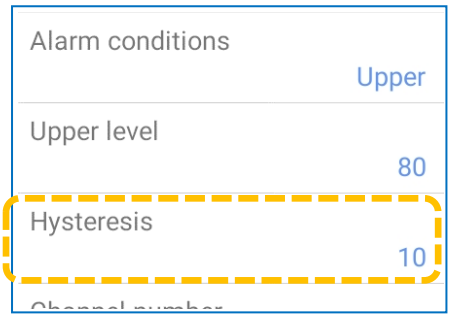
6.6 Hysteresis and Persistence – Explanation

Hysteresis

Hysteresis can be used as a means to avoid excessive messages being sent to the server, which could drain the logger battery prematurely.

When an alarm is triggered, and the hysteresis value is set to zero then:

- Immediately after the threshold is re-crossed, another message (alarm clear) will be sent.
- If there is a period when the channel data is borderline with the alarm threshold, this can result in numerous messages being generated for what is effectively the same event.



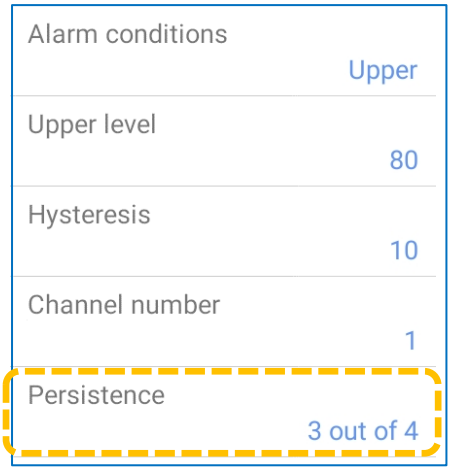
By specifying a value in the Hysteresis box, you can provide a 'no reaction' window that allows the threshold to be repeatedly crossed without sending excessive messages.

e.g. With an Upper limit of 80 and a hysteresis of 10, the alarm will trigger at 80, but will not clear (and therefore no 'alarm clear' message will be sent) until the value drops to below 70.

Persistence

Set the persistence settings to "1 out of 1", if an immediate response is required when the channel datapoint meets the threshold to trigger an alarm.

However, if the data from the channel has any possibility of "blips" (spikes or other noise characteristics) the use of the **persistence** settings can be employed to ensure (add greater certainty) that the trigger threshold has been crossed. This is, however, at the expense of delaying the alarm message; it is the nature of the assessment process.

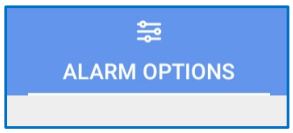


e.g., With an alarm set as opposite, the persistence settings require a minimum or 3 or maximum of 4 datapoints to evaluate the result.

Since data-points are produced at a rate set by the log period, 2 or 3 log periods needs to elapse before the logger has sufficient data to judge the alarm condition.

The logger requires a minimum of 3 out of the last 4 samples to activate the alarm. If it finds 3 samples in a row meet the threshold, it will activate the alarm. If there were not 3 in a row, it waits for the 4th sample to judge if the alarm should be activated.

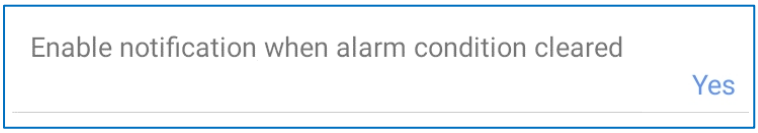
6.7 Alarm Options



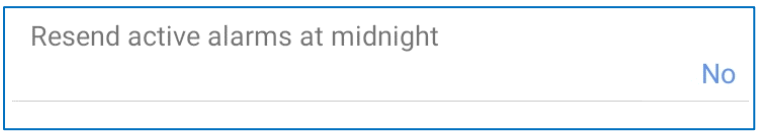
To check or adjust alarm options for 'group 2' loggers:
Navigate to the Alarms & Events screen. Then select the Alarm Options tab.

Note: These settings are universal and affect the actions that will be taken whenever any of the channel alarms (Alarm 1 to 8) are activated or become cleared.

The 'Minimum Night Flow window end' control is discussed in section 6.5.

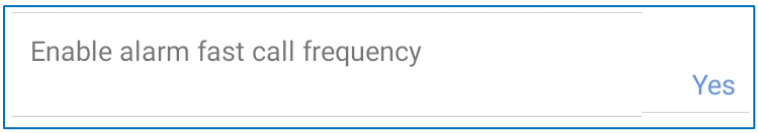


The 'Enable notifications when alarm condition cleared' control should normally be set to 'Yes'. This enables the generation of all "alarm cleared" messages for the server.

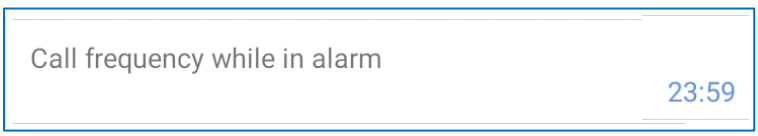


The 'Resend active alarms at midnight' control can be used to cause the logger to make an additional call to the server at around midnight, if any alarms are still active. This allows the logger to re-assert any alarm messages, in case a DataGate user has cleared the alarm on the server, in error.

The 'Call in when an alarm occurs' control can be used to cause the logger to make an immediate call to the server for any alarm messages (or alarm clear messages, if enabled).
(When set to 'No', alarm condition changes will only be reported at the next scheduled call-in time).



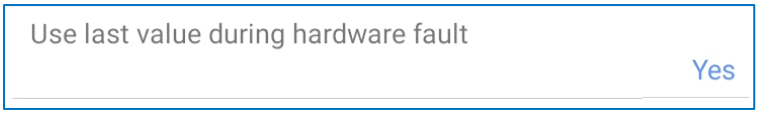
When a Channel Alarm becomes active, it may be desirable to send in channel data more frequently. This can be set using the 'Enable alarm fast call frequency' control (set to 'Yes' to enable).
Normally, this should be set to 'No' to preserve battery life.

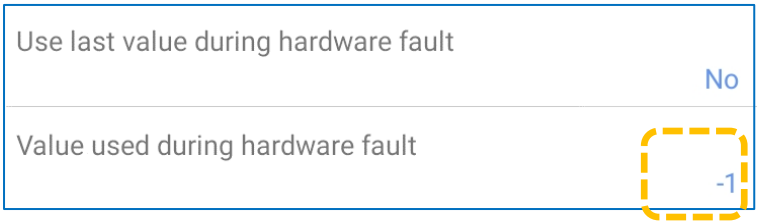


Then set the period between call-ins.
The logger will then temporarily disregard the regular call-in schedule and replace it with a new call-in schedule.

Note: Due to increased battery use, it is a requirement to attend the installation site and rectify the cause of any channel alarms that indicate a fault condition promptly.

The logger can detect certain hardware fault conditions. Typically, these faults will be related to a fault in communication with a sensor (e.g., A Modbus sensor) or an internal component. The data stream still has to be filled with values at the logged intervals to maintain continuity of data.





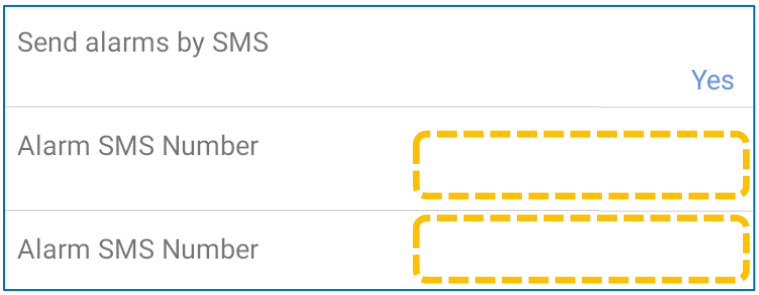
The logger supports two options:

- Use the last obtained value. (Select 'Yes'.) or
- Use some default data value. (Select 'No' and then specify the value to be used as the default. This could be chosen to be an 'obviously wrong' measurement level).

Note: If the fault is not temporary, the DataGate server can detect that the sensor is producing 'flatline data' and raise the appropriate system alarm.

The logger (as discussed elsewhere) has the ability to send alarms and/or data via SMS messages to DataGate; this is a back-up option where UDP messages fail to be sent.
The logger can also send SMS (text) messages regarding alarms to other destinations (having telephone numbers).

If this feature is not required, select 'No'.



If required, select 'Yes'.

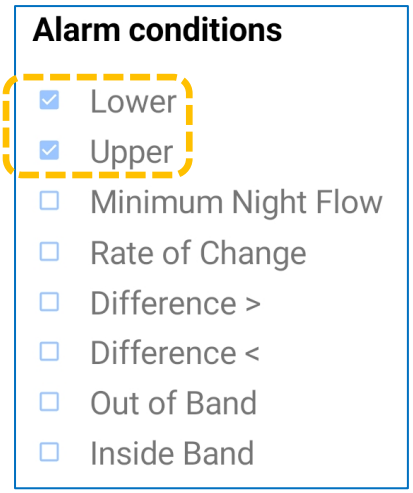
Then add up to 8 destination telephone numbers for the SMS alarm messages.

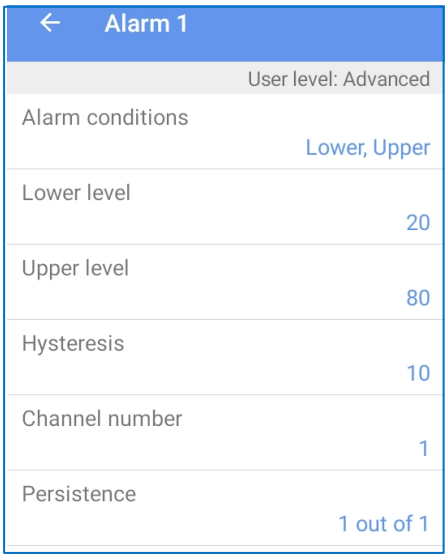
(See important note in section 1.9 about SMS use. If SMS is not to be used, ensure the destination SMS numbers are deleted and that the 'Send alarms by SMS' control is set to 'No').

Note: A new call is required for each destination, which leads to more power use.
A more power efficient way to distribute alarm messages is by use of DataGate to forward an alarm to subscribed users; this requires only one call from the logger.

6.8 Combining Alarm Conditions (Triggers)

Within a single Channel Alarm (e.g., 'Alarm 1') alarm triggering conditions can be combined, provided any common fields hold a common value.





e.g.: Upper limit and lower limit types can be combined, (by selecting both options, as shown) provided the use situation allows common Hysteresis and Persistence values.

(If common values are not acceptable, then set up more than one alarm, with each acting on the same channel datapoints.)

The installer should, however, confirm that the selected combinations make sense.

e.g.: Combining "Difference > " and "Difference < " triggers will result in an almost constant alarm being active.

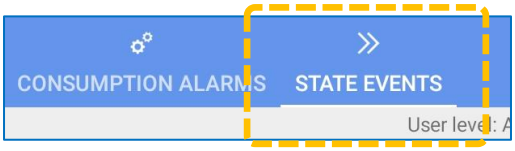
Combining "Inside Band" and "Out of band" triggers will also result in an almost constant alarm being active.

6.9 State Event Alarms

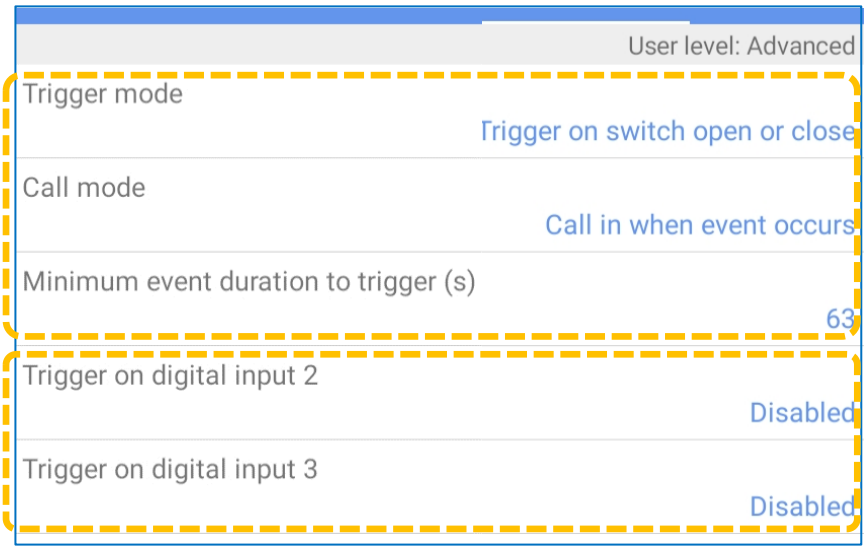
A 'State Event' refers to the logger monitoring one of its 'digital' (i.e., can exist in one of two-states) inputs for changes. For example, the input can detect an external contact has changed from open to closed. (These are normally labelled as a Status Input or a Flow input type of logger interface. For a 'Flow-Bi' input, the first pin/signal cannot be used).

To detect a change, the logger normally checks the input circuit once per second. Changes are recorded as a series of time-stamped 'events', and not as an alarm condition. However, the logger settings can include an immediate call-in to be made to update the server, or for the logger to defer the event notification to the next scheduled call-in time.

To set up an alarm, proceed as follows:



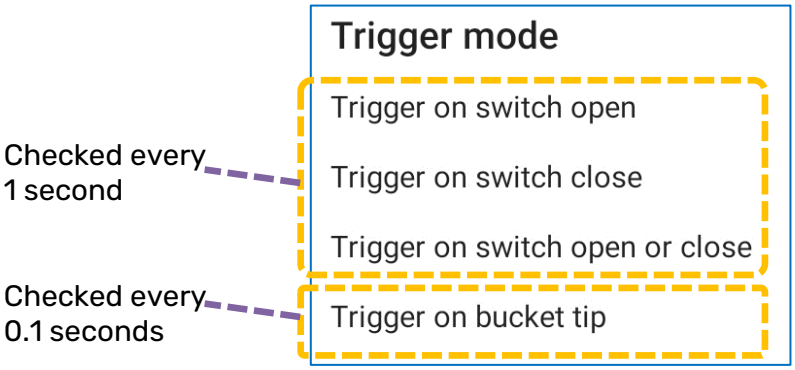
Within the Alarms & Events screen, select the 'State Events' tab.



The setup page is divided into two areas.

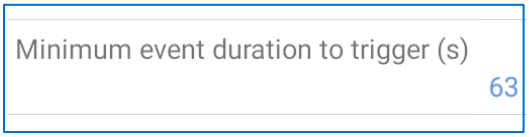
The top section deals with the setup of the input conditions required to be recognised as an event, and the required response (call-in urgency).

The bottom section lists all of the available interface signals that need to be monitored.
(The input conditions are common; They are applied to whichever inputs are selected as 'enabled').

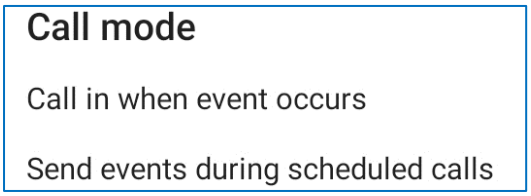


Tap on Trigger mode and choose which transitions will be recorded as events.

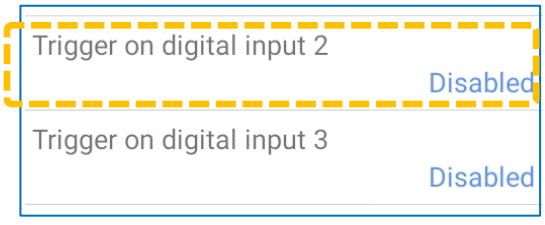
The 'bucket tip' selection is monitored more frequently, and is ideal for detecting short pulses. It reacts to a Closed → Open transition.



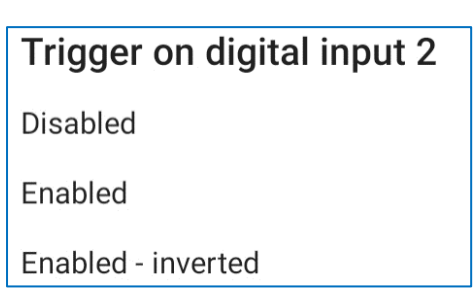
The 'minimum event duration…' control should be read as 'minimum duration between events'; after an event has occurred, any conditions that could potentially trigger additional events will be ignored, until this time period has expired.
Tap the line and enter a time interval.



Tap on the 'Call mode' line and select when the logger should notify the server.
Where possible, select to send only during scheduled calls (to minimise battery use).



Next, tap on the input required to be monitored.
(More than one input can be enabled.)



Choose whether the input is ignored (disabled), or whether it is enabled. There are two selections for enabled, allowing you to invert the logic of the input signal, if required.

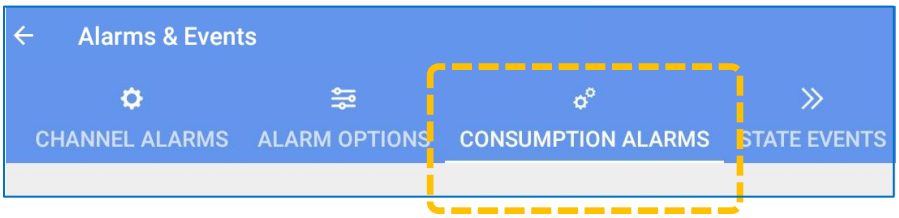
6.10 Consumption Alarms

Consumption alarms look at Flow inputs over a period of up to one day and raise a 'consumption alarm' if the accumulative volume of fluid (or whatever the meter is measuring the consumption of) exceeds a certain amount.

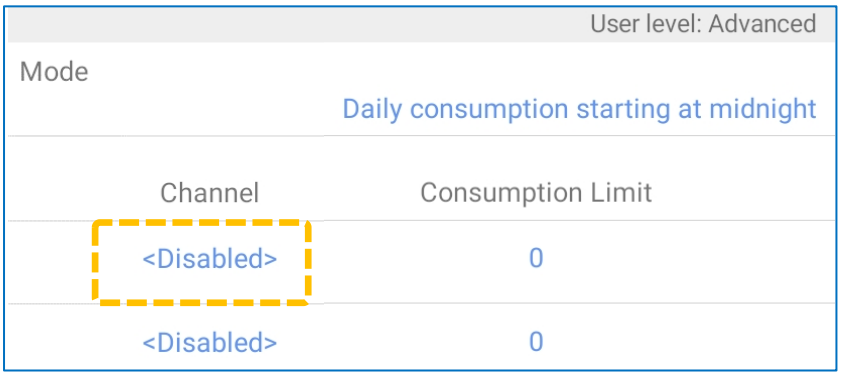
A derived flow measurement (e.g., datapoints from an Open Channel flow, FlowOCH, where flow is derived from a depth channel input) can be substituted instead of a metered flow input, if required.

It is a pre-requisite for correct operation of the logger that the input being used for a consumption alarm is set up as a logged channel. (For Flow channels, the logger uses the first occurrence of the selected input type in the channel list as a reference for interpreting the unit of measure of the input, etc).

Depending on which logger is in use, up to 4 consumption alarms can be set. To set up an alarm, proceed as follows:

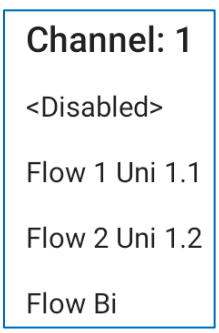


Within the Alarms & Events screen, select the Consumption Alarms tab.



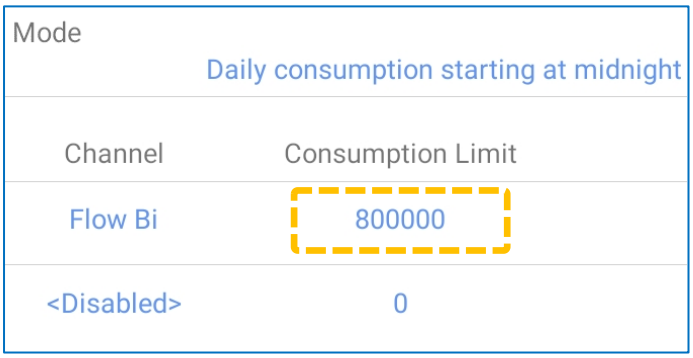
(Up to 4 lines will be listed).

Tap on the left-most field in a line to begin setup.



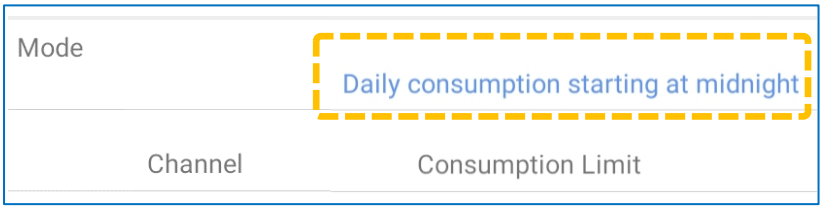
"Channel", as shown in the list, should be read as "Consumption alarm". (e.g., 'Consumption Alarm: 1').

Tap on the logger input that is to be tracked for the consumption alarm. (e.g., 'Flow Bi).



Tap on the right-most field to edit the value of the consumption limit.

(An alarm will be raised as soon as this limit is exceeded within the time window).



There are several 'Mode' settings for the consumption alarm.

Tap on the consumption Mode line to make a selection of the appropriate time window.

Daily consumption starting at midnight

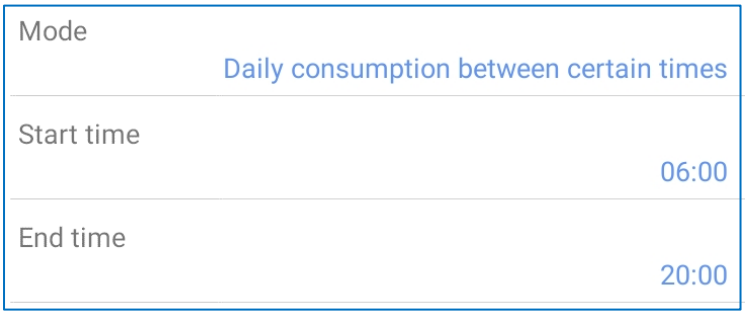
Daily consumption starting at a custom time

Daily consumption modes create a 24-hour window. This either starts at midnight, or it can be set to start at an alternative time.

A change in the start time will also change the time of day when an alarm will be indicated, since the consumption is 'reset' at the start time.

Daily consumption between certain times

The 24-hour period is not mandatory; another mode allows the time-window to be set with start and end times.



Set any Start and End times, as appropriate.

Hourly consumption

There is also an option for an hourly consumption (24 x 1hour time windows each day).

Any consumption alarm that is triggered during a time-window becomes cleared at the end time of the time-window.

7 Setting Triggers and Actions (Combo) for a Channel (Group 3 Loggers)

(If using a 'Group 1' logger, skip to section 5; Triggers and Actions are not applicable.
If using a 'Group 2' logger, refer to section 6; These use an alternative system of 'Alarm' activation with set actions).

Once channels are set up, a steady stream of data is made by the logger at both the log rate and also (stored temporarily) at the sample rate. Trigger-Actions can now be created.

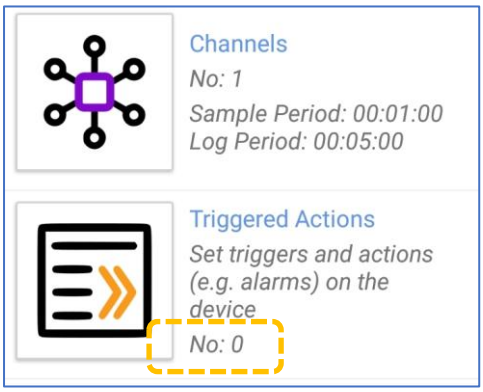
A "Trigger" is a monitoring function within the logger. It monitors for a single condition or combination of conditions to occur on the data produced by selected channels. If the condition(s) are met, the logger can be set to take one or more actions (e.g., inform the server of the event, thus indicating a potential alarm condition).

The conditions being monitored are referred to as a "Trigger" by IDT. Any subsequent action is referred to as an "Action" by IDT. The Trigger-Action(s) are sometimes referred to as "**combos**" (short for "Combination").

Within any trigger-action combo, either a *single condition*, or a *set of several conditions* can be used to evaluate the trigger result. Where multiple conditions are set, Boolean logic functions (AND or OR) can be applied.

This section will use an example of setting a trigger-action for a sensor.

7.1 Example 4: Introduction to Triggers and Actions



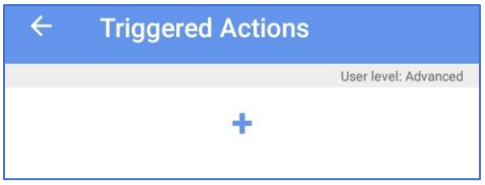
A channel has been set up, with samples and datapoints being obtained as summarised in the diagram opposite.

Trigger-actions are summarised with the number currently set within the logger being shown on the bottom line. The logger has no trigger-actions set, as indicated by "No: 0".

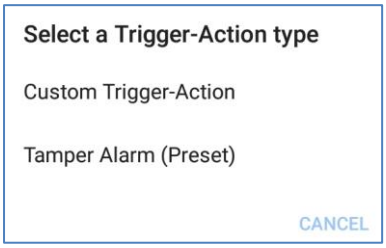
The requirement for our example is for a trigger to be setup, looking at the data from a sensor using channel 1, and used to inform the server (send an alarm message) for when the trigger condition is met. Similarly, we wish to inform the server (send an alarm clear message) when the trigger condition is no longer met. We require the trigger to be activated at a value of 50 or more and to be removed at a value of 40 or less. Both messages are required be sent immediately.

7.2 Setup of Conditions for Trigger (Start and End)

To setup the trigger action, tap on the “Triggered Actions” line.



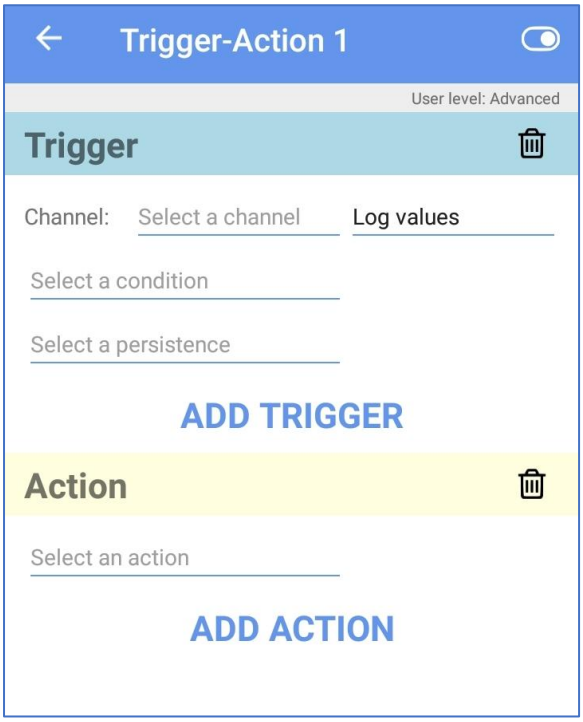
This screen summarises any existing trigger-actions.
It also gives edit-access to any listed action.
(Currently none are set).
To add a new Trigger-Action, tap the “ + “ icon.



Then select a Trigger-Action type.

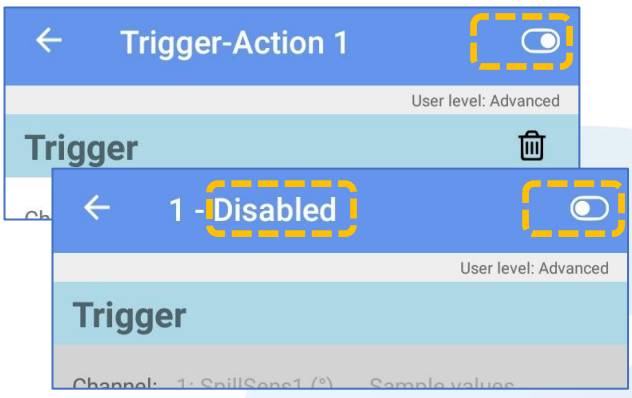
(For our example, tap the “Custom Trigger-Action” line).

(Pre-set alarm types are also listed here but are not relevant to our example).

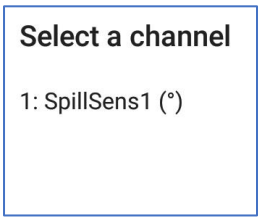


A Trigger-Action details page appears, which requires completion. Once completed, tap on “Save” to store the settings in the logger.

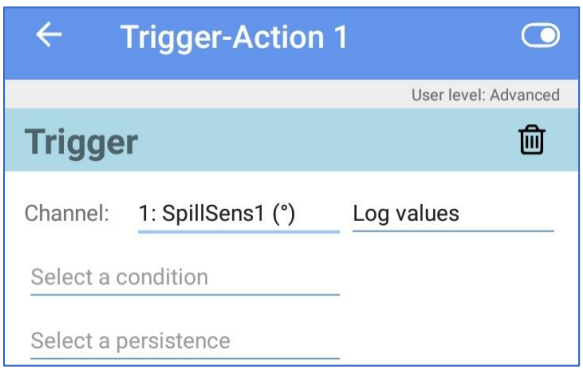
The slider-control at the top-right can be used to enable or disable a Trigger-Action.

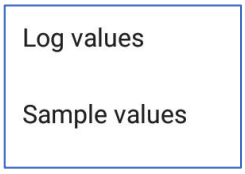


Set the triggering conditions, as follows:



Tap on the location which currently displays “Select a channel”.
A list appears showing all currently configured measurement channels.
Tap on a line to select the required channel.
(In the logger used in this example, only one channel has been programmed; it is monitoring data from a SpillSens sensor, which produces angle measurement data).

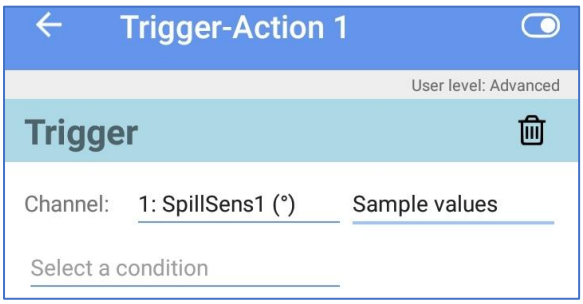




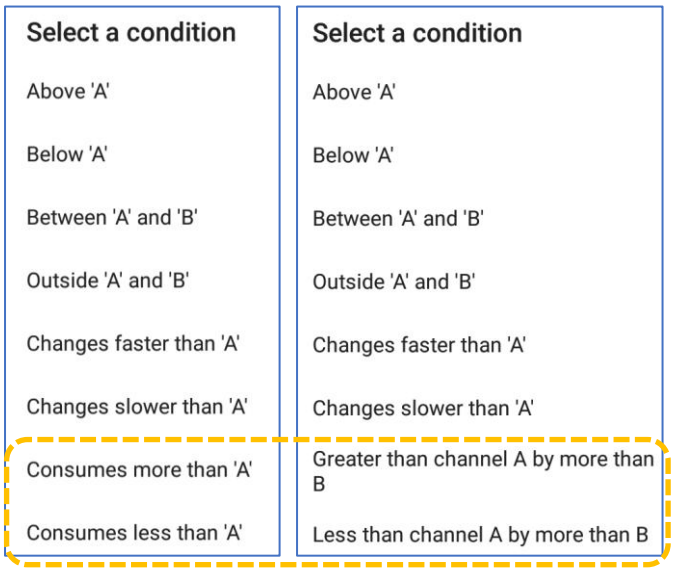
The channel is selected.

The data values being watched are, by default, the Log values; this can be changed to the sample values if required.

(Tap on the value and make a new selection).



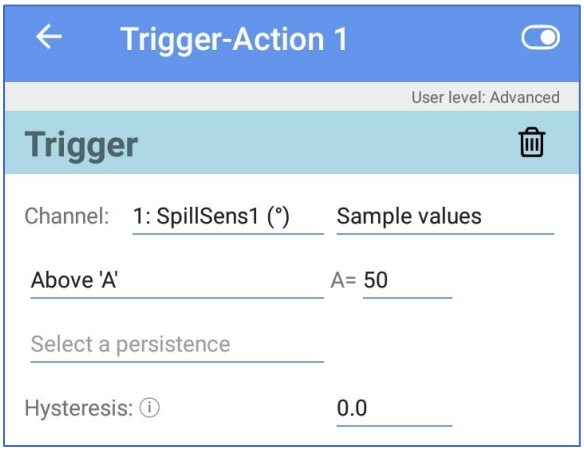
Tap on “Select a condition”.



Select a condition to monitor for from the available list.

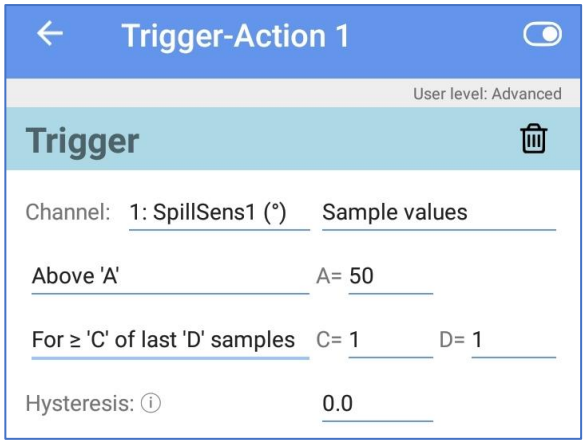
Note: IDT display content is adaptive.
The list can vary according to the type of channel or other settings. (See opposite).

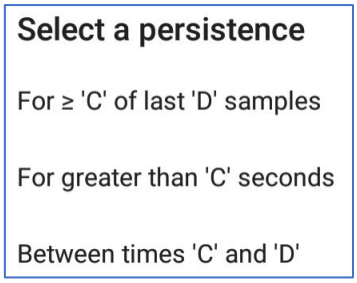
(In our example, we wish to monitor for an angle exceeding 50°.
The appropriate selection is … Above ‘A’).



Add the appropriate value threshold(s).

*In our example, we want to trigger when the angle is above the threshold of 50°.
The appropriate setting is … 50).

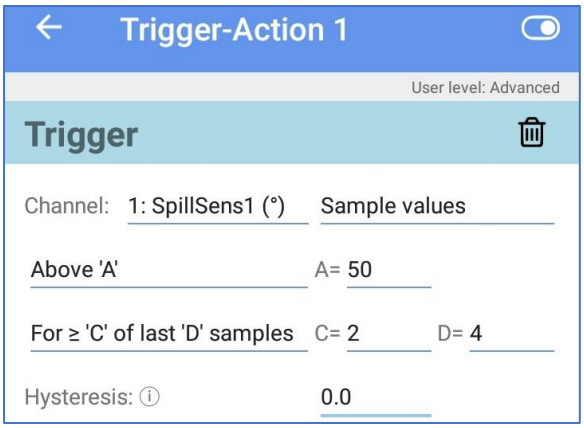




Tap on "Select a persistence".
Then select the type of persistence that is required before the trigger condition is evaluated as true.
Complete any other settings required for the persistence.

e.g. The settings shown will meet the trigger condition on first time the angle is above 50°.

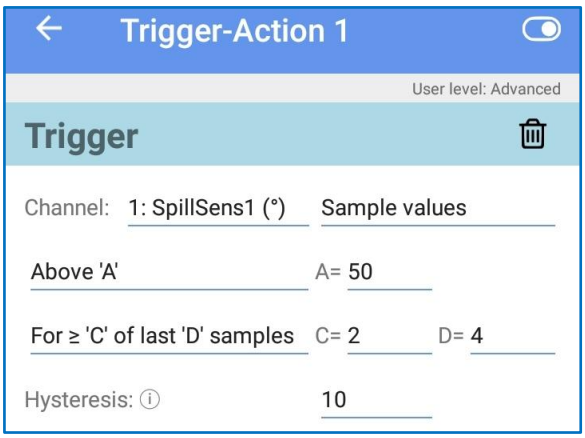
If you try to set an impossible situation, IDT will highlight the error (e.g., red text).



In our example, we want to trigger when the angle is above the threshold of 50 degrees for 2 out of 4 samples.
(e.g., We may have chosen to use persistence in order to disregard any transient "glitch" measurement conditions.
There is a side-effect to this that the trigger will be slightly delayed).

When selecting some trigger conditions, an additional field (hysteresis) is added.

Hysteresis can be used to provide a different threshold for when the logger releases from a triggered state. Thus, the logger trigger will **start** (or activate) when it first meets the triggering conditions, and it will remain held in a triggered state until it no longer meets the second threshold (determined by the hysteresis value); then the trigger will **end** (or clear).

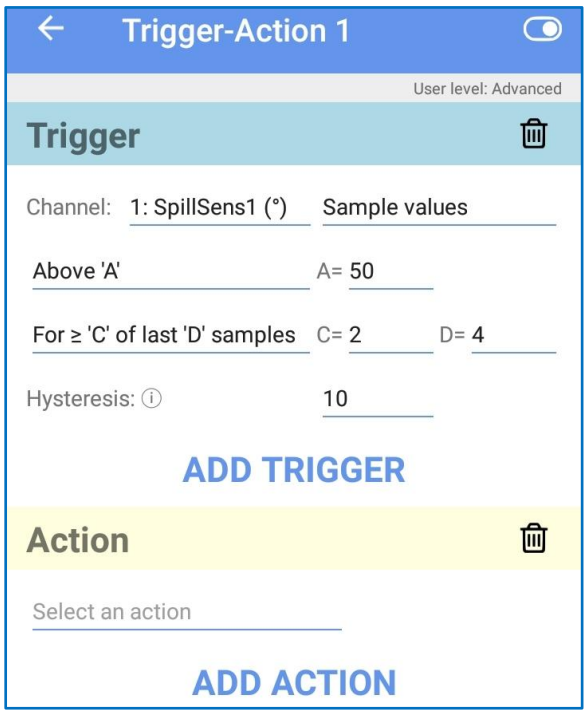


The example shown opposite requires a minimum of 2 of the last 4 samples to exceed the angle threshold (A) to **activate** the trigger.
This requires between 2 and 4 measurement values to evaluate.
Once triggered, it will be held in its triggered state providing the holding condition remains True.

The evaluation for **holding** the triggered state is that a minimum of 2 of the last 4 samples is required to be over the release threshold (i.e., A – hysteresis).
For the settings shown, this is 40; (A = 50, Hysteresis = 10 ; 50 – 10 = 40).

If the holding requirement is no longer met, the logger returns to the normal (non-triggered) state.

7.3 Setup of Actions Related to a Triggered Condition

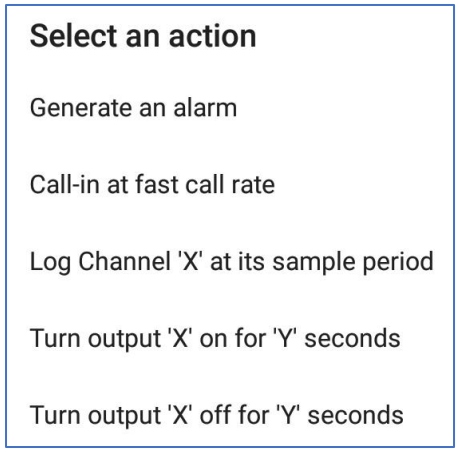


A trigger does not do anything on its own; actions should be linked to it in order to accomplish something useful.

To set an action that should begin when the trigger activates … tap on "ADD ACTION ".

(This is not required if only one action is needed).

Within the action area, tap on "Select an action".



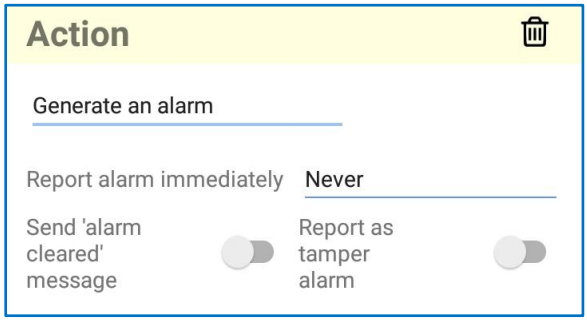
Several options may be listed, as shown opposite:

Logging a channel at a faster rate or calling into the sever more frequently will only occur whilst the in the triggered state. Normal operation resumes afterwards.

Turning a status output on or off will only occur whilst in the triggered state, and for a defined period. Normal operation resumes afterwards.
(Note: Only available if a logger has outputs fitted).

Tap on the required action to select it.

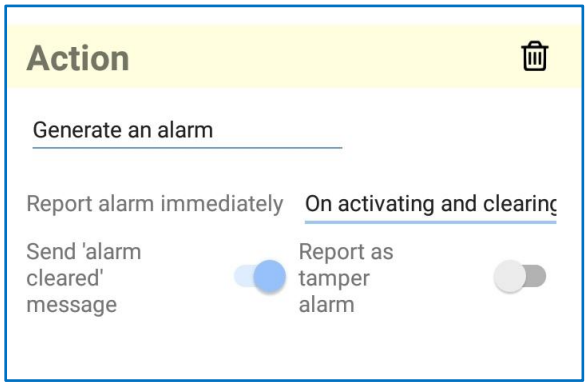
In our example we want to generate messages to the server; these are also known as alarms … so select "Generate an alarm".

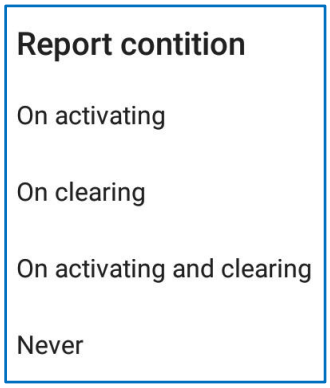


Select the required condition(s) that should be reported…

Note: This control determines what messages get sent *immediately*, rather than waiting until the next scheduled call-in time.

The conditions are shown in the setup screen.

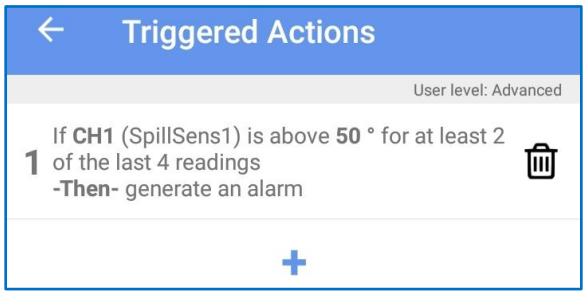




When "On activating and clearing" is set, the "send alarm cleared message" is also becomes selected. The server will therefore be informed of when the triggered state is activated and also when it is cleared.

(An alternative would be to report the alarm immediately "On activating", and to use the slider control to also send an "alarm cleared" message. However, with these settings the "alarm cleared" message would not be sent until the next scheduled call-in time).

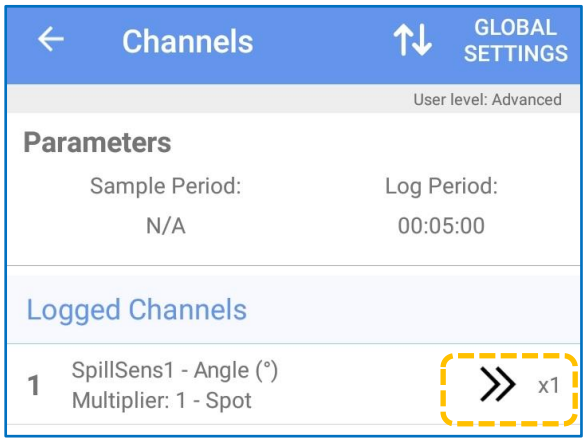
Note: The "Report as tamper alarm" slider should be deactivated (greyed out); a tamper alarm is not relevant to this type of sensor.



Tap the back-arrow and a summary of the Trigger Actions is displayed.

(Additional trigger-action combos can be added if required, using the " + " button).

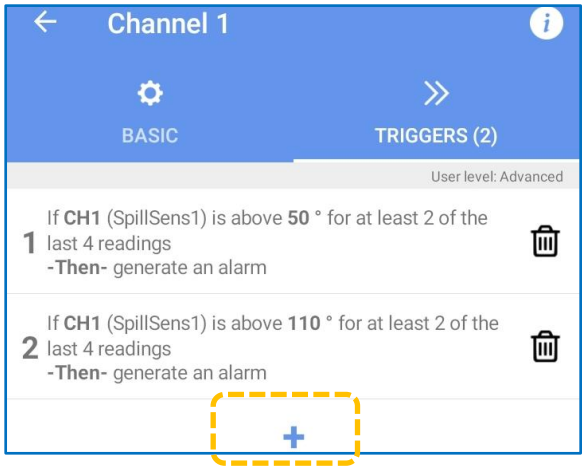
When finished, tap the "Save" button to write the combo(s) into the logger memory.



When a channel is being monitored for a trigger-action combination, this will be shown in the channel summary page, as shown here.

7.4 Trigger-Action Features (Using 'Group 3' Loggers)

7.4.1 Support of Multiple Triggers from Same Sensor



Loggers can support programming of multiple trigger conditions related to the same sensor.

This can be programmed within IDT by tapping the "+" line to add additional triggers.

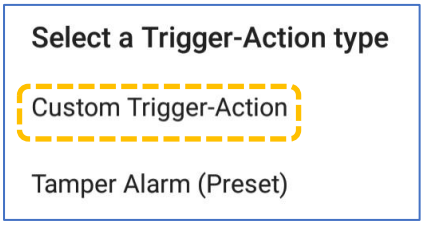
e.g. Refer to the diagram opposite, which shows two triggers set up for different angles of a SpillSens sensor.

Here these are both set to generate an alarm, but alternative actions may be selected.

7.4.2 Support of Multiple Conditions for a Single Trigger

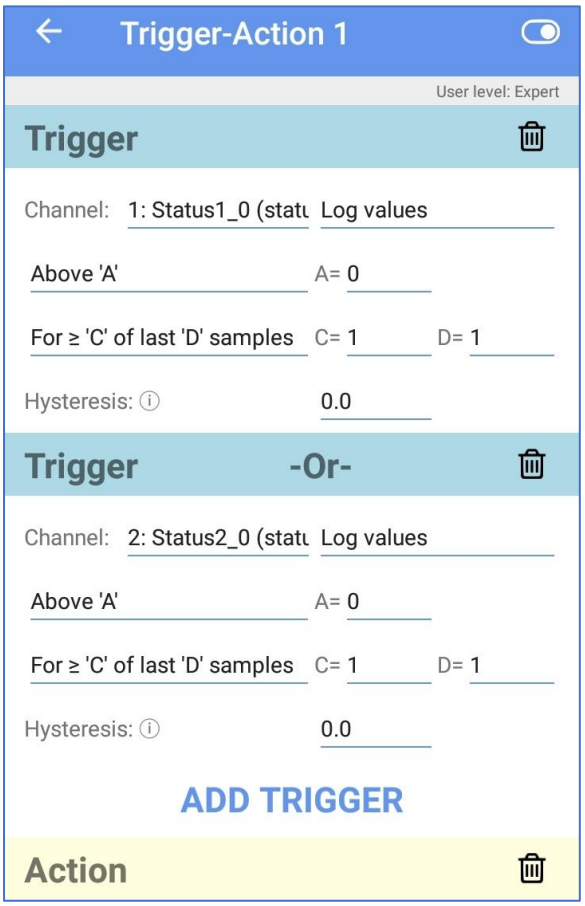
IDT supports setup of multiple-condition triggers, if supported by the logger.

From the main screen, select the Triggered Actions line.



Tap on the "+" symbol to create a new trigger action.

Then select "Custom Trigger-Action".



Tap on “Add Trigger” to allow two or more conditions that are to be considered as part of the over-all trigger result.

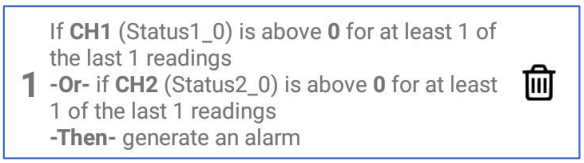
Select each condition.

The conditions may be connected into either an “AND” gate or an “Inclusive OR” gate; only one selection is allowed per trigger-action (although additional Trigger-Actions can be set up to cover other combinations if required).

(Tap on the “-Or-“ line to change the logic gate used).

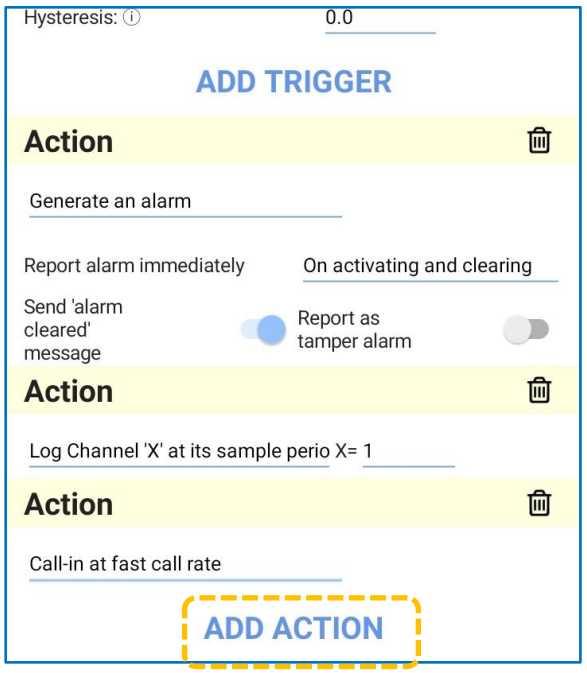
Complete the trigger requirements.

When finished, tap the back-arrow to show a summary:



Finally, tap on the ‘save’ button.

7.4.3 Support of Multiple Actions from a Single Trigger



IDT can support the programming of multiple actions conditions related to the same trigger, if supported by the logger.

This can be programmed within IDT by tapping the “Add Action” line to add the first and any required additional actions.

e.g. Refer to the diagram opposite, which shows three different actions set up for a single trigger condition.

Available options will depend on the model number of your logger and the options supported / enabled.

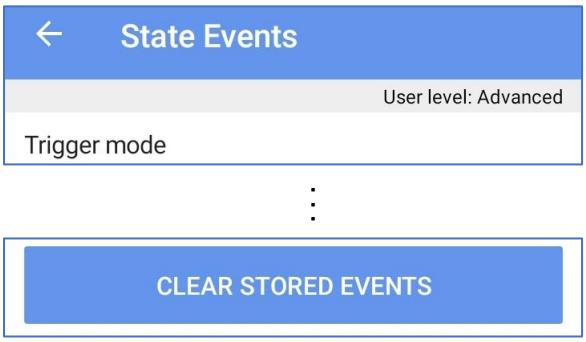
7.5 State Event Alarms

State event logging and associated alarms for Group3 loggers (where supported), are similar to that of Group2 loggers (refer to section 6.9), but with the following exceptions:

To access the setup page:

From the main screen, tap “Configure Device” and then locate the “State Event Logging” button, shown opposite.

Tap on the line to load the State Events screen.



(Refer to section 6.9 for screen content and controls for State Event Logging)

The screen includes a facility to clear existing events that are stored in the logger.

PART 5 : Cellular network setup and tests

8 Cellular Network Setup - Protocols & Tests / Antenna Checks

(Skip this section if using a 'Group 1' logger; It is not applicable. These loggers can only utilise the IDT App and the phone facilities to transfer data to a server).

The IDT app can be used to check that the logger can connect to the cellular network and provide information to help the installer to choose the optimal position of the antenna.

- Inspect or modify modem settings (if required).
- Perform the "Signal Test" to confirm the logger connects to the mobile network and find the best location of the antenna.

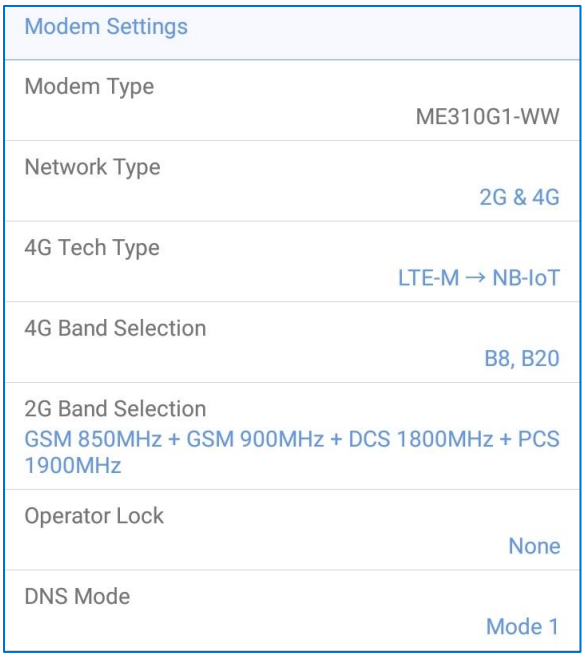
  Note: The process is different for 4G networks in comparison with the 2G and 3G networks.
- Perform a "Call Test" to confirm the logger can communicate with the DataGate server.

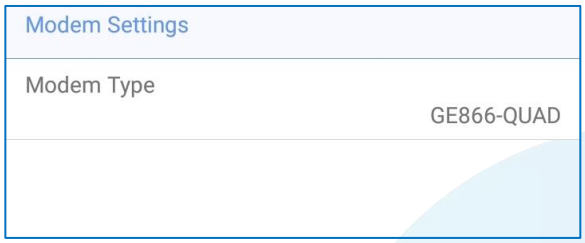
8.1 Modem Settings

CAUTION: Most installers **should not modify** these settings (Skip to section 8.2.1 or 8.2.2); they are for expert use only.

(See section 3.3 for how to navigate to these settings).

The loggers have a built-in modem circuit for connection to the cellular network. Depending on the modem fitted, IDT can show a different content of control settings within the "Modem settings" section.

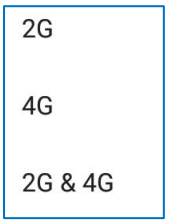




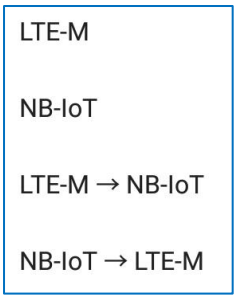
e.g., No setting options (shown above). or …
Many setting options (shown opposite).

These settings are normally best left at the factory default, unless you understand cellular mobile technologies.

For those that do understand cellular mobile technologies, the controls are available to use if you are aware of the SIM capabilities and also the radio services available local to the installation site.

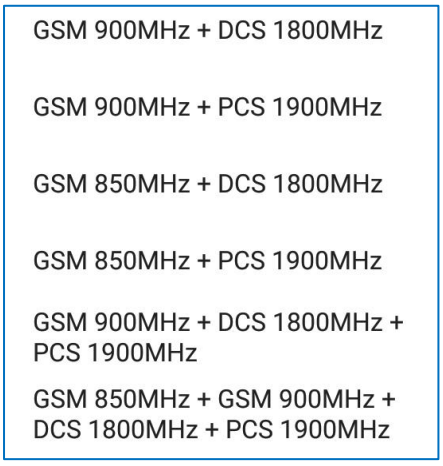


Network Type setting determines which network generation should be used to establish a connection.



4G Technology Type setting determines which network generation should be used to establish a connection.

4G Band Selection setting determines which frequency bands can be used to establish a 4G connection.

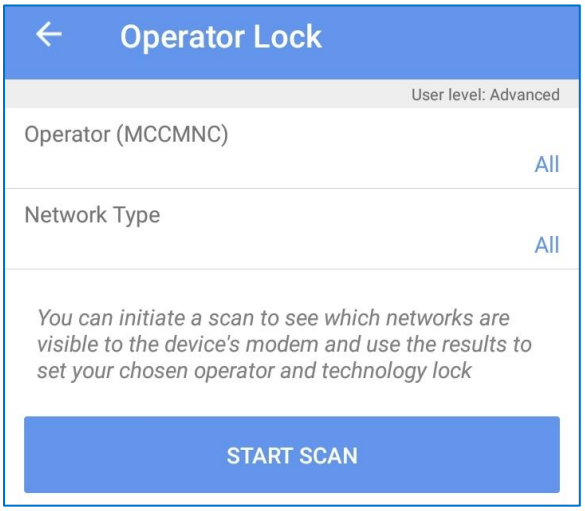


2G Band Selection setting determines which frequency bands can be used to establish a 2G connection.

Operator Lock

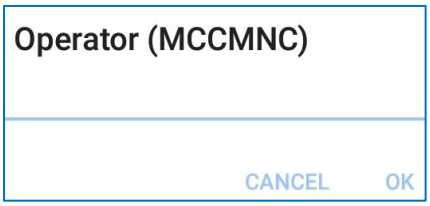
The Operator lock screen allows you to lock the logger to a specific Mobile Network Operator.

When set to “none” the logger will try an assortment of operators sequentially until it finds one that accepts the connection attempt.

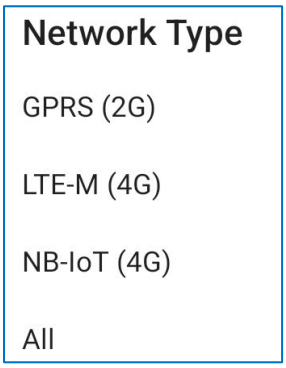


Each Mobile Network Operator can be identified by a 5-digit code – The MCC / MNC code.
(MCC / MNC codes can be found from an internet search).

If the code for the operator is known, it can be set from this screen.Tap on MCCMNC line and set the code.

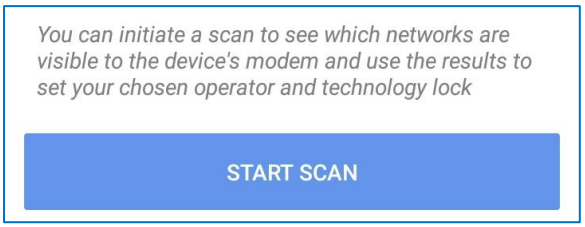


Note: For this setting to be functional, the SIM must also support the chosen network operator.



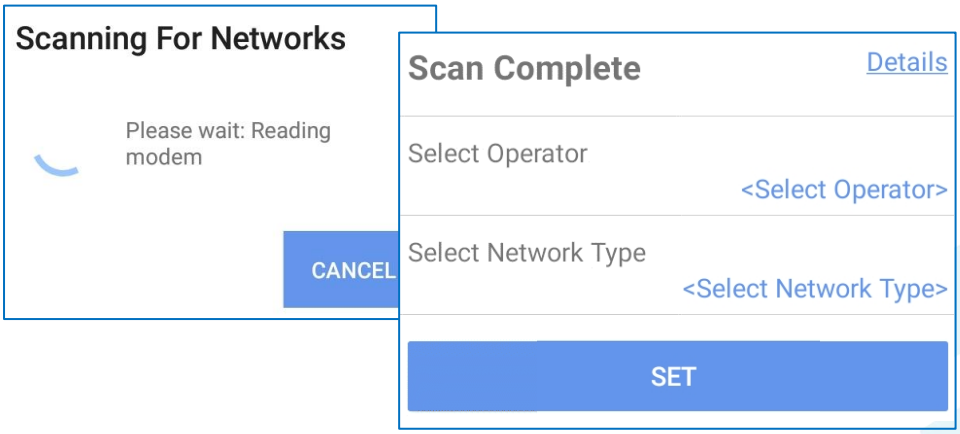
If a specific type of network technology is required, it can be set from this screen. Tap on the Network Type line and select from the available list.
(An example is shown. Actual choices will depend on logger model number).

Note: For the above setting to be functional, the SIM must also support the chosen network type.

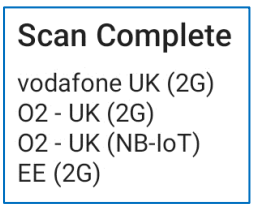


There is a tool to help with making the above settings:

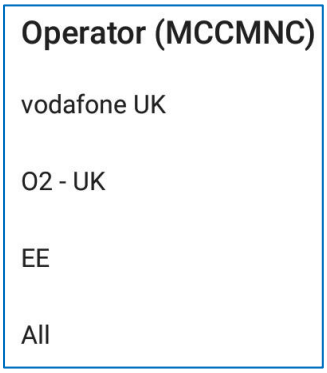
Tap on the “Start Scan” button.

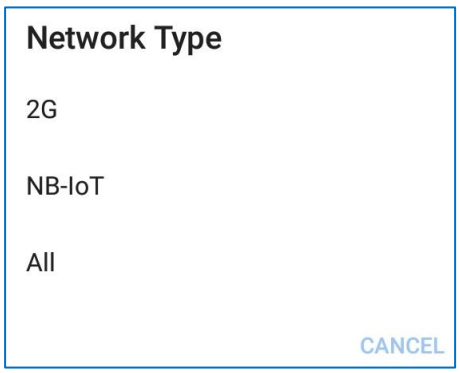


The logger will scan for local networks.



When the scan is complete, tap on 'Details' to get a comprehensive list of mobile networks and services available.



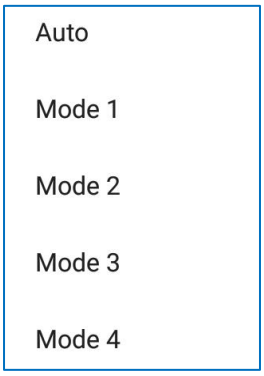


Review, and then tap on each of the settings line to make a selection from those listed.

(Contents vary according to what is found to be locally available).

Note: For the above setting to be functional, both the SIM and the network operator must also support the selections.

DNS Mode (Domain Name System) is factory set to "Auto".



When the logger dials-in it resolves the Domain Name part of the URL by doing a DNS lookup over the network.

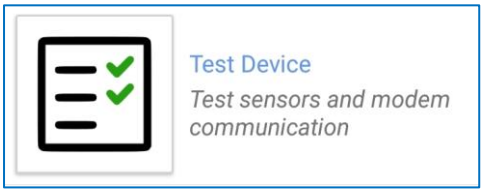
The network may not support all DNS protocol versions, so the logger (if set to Auto) tries several types until it finds one that works. It then uses that protocol option for future operation.

Alternatively, the user can pre-set this mode using the control, as shown below.

8.2 Cellular Network Signal Tests and Call Tests

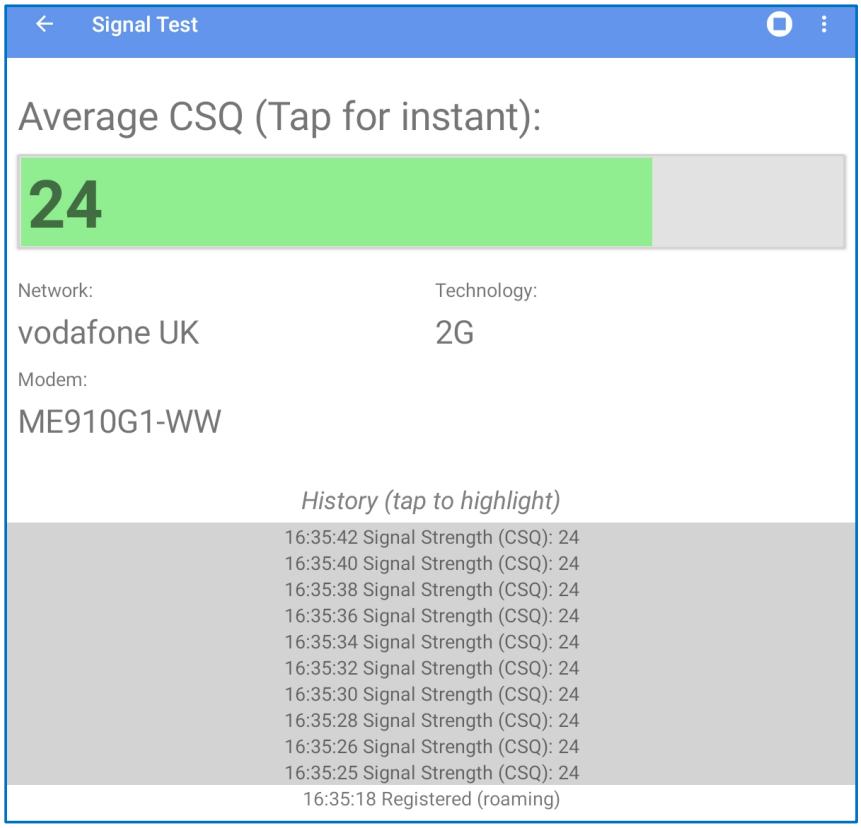
8.2.1 2G and 3G Networks: Signal Test (Signal Strength - CSQ)

This test measures the signal strength (CSQ) of the received 2G mobile network signal.



Tap on "Test Device".

Then tap on "Signal Test".



Once connected to the mobile network, the provider details and a colour-coded signal strength indicator (CSQ) are displayed.

The default is to show the average value of the last 10 CSQ readings, but it can be changed to show the latest value (by tapping on the number). The readings used to produce the CSQ average have a grey background. Their quantity can be adjusted via the menu.

Initially, this test should be done with an open chamber. This is to verify that the connection to the mobile network works, and to determine what the local signal strength is.

Then, with the test still running, close the chamber. The CSQ will drop due to the lid of the chamber reducing the strength of the received signal.

Re-position the antenna within the chamber to find the best signal strength (CSQ). The antenna should finally be installed in the best signal-strength position.

When you have finished, tap on the stop button to end the testing.

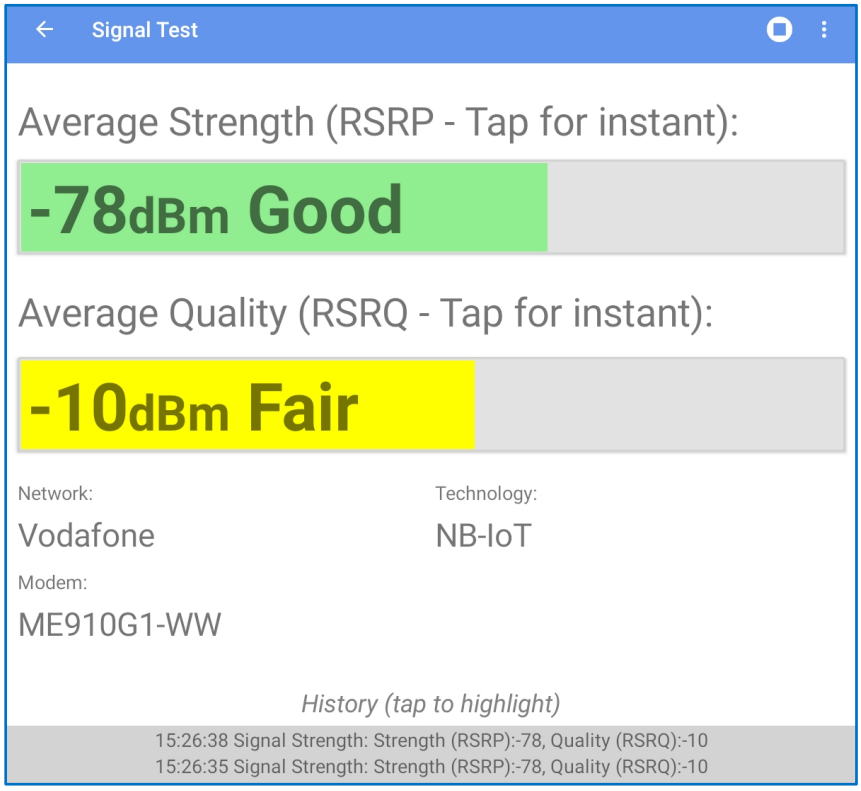
The following guidelines are given for the cellular network signal strength (as measured by **CSQ** result, with the chamber closed):

- **15+** **Good.** (Data transmission should be reliable).
- **8-14** **Fair.** (Depending upon the ambient conditions data transmission may be possible. It is important to select the correct antenna and install it in the most suitable location).
- **0-7** **Poor.** (The logger may be able to register with the network but will not be able to send or receive data reliably).

Note: When using a modem with 4G Network protocols (NB-IoT and LTE-M), CSQ levels are replaced with different quality parameters.
(Refer to section 8 to determine what modem settings are in use for the logger. Refer to section 8.2.2 for 4G Network signal quality assessment).

Note: **A poor CSQ level will reduce equipment battery life.**

8.2.2 4G Networks (NB-IoT, LTE-M): Signal Tests



The test method is similar to that described in section 8.2.1.

However, 4G networks have a different set of parameters for determining signal suitability than 2G and 3G networks.

The CSQ indication is replaced for 4G networks by:

- RSRP
  (Reference Signal Received Power; A Signal Strength indication).
- RSRQ
  (Reference Signal Received Quality; A Signal Quality indication).

These parameters may be used to assess the suitability of the logger communication with the cellular data network. The IDT app colour codes the results for ease of use.

RSRP value: The following guidelines are given for the cellular network signal, (as measured with the chamber closed):

	>= -105	**Good**. (Data transmission should be reliable).
	-106 to -120	**Fair**. (Data transmission should be reasonably reliable). It is important to select the correct antenna and install it in the most suitable location).
	< -120	**Poor**. (Reliable data speeds may be possible but drop-outs may occur. The logger may be able to register with network but will not be able to send or receive data reliably).

Note: The above values are negative. The higher the value (less negative) the better.

Note: **Poor RSRP or RSRQ levels will reduce equipment battery life.**

RSRQ value: The following guidelines are given for the cellular network signal, (as measured with the chamber closed):

	> -9	**Good**. (Data transmission should be reliable).
	-9 to -12	**Fair**. (Data transmission should be reasonably reliable). It is important to select the correct antenna and install it in the most suitable location).
	< -13	**Poor**. (Reliable data speeds may be possible but drop-outs may occur. The logger may be able to register with network but will not be able to send or receive data reliably).

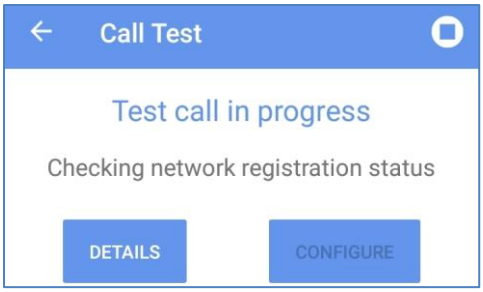
Note: The above values are negative. The higher the value (less negative) the better.

8.2.3 IDT – Call Test (Logger to Server)

This test confirms the logger can **communicate with the DataGate server**.

Tap on “Test Device”, and then tap on “Call Test”.

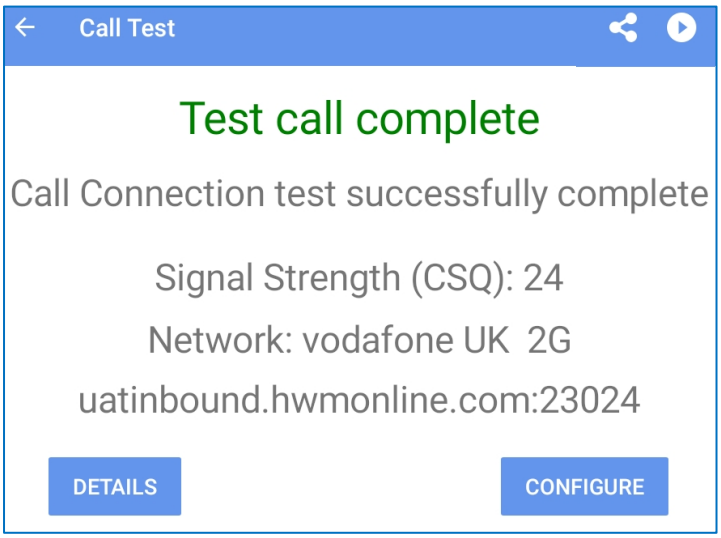
(During this test, the IDT app remains in contact with the logger and can track the progress of the call).



The call test will automatically start.

(The top-right corner of the display has a control to start and stop the test).

The logger makes a test-call to the data-server over the mobile network.



The call will progress through various stages until it is complete.

Check if it is successful.

Useful information (such as network details and signal strength) is shown as the call progresses.

If there is some problem with the test-call, some details are available to assist in finding where the problem exists.
(Tap the “Details” button to show).

The details can be forwarded to expert users for assistance by tapping on the share control.

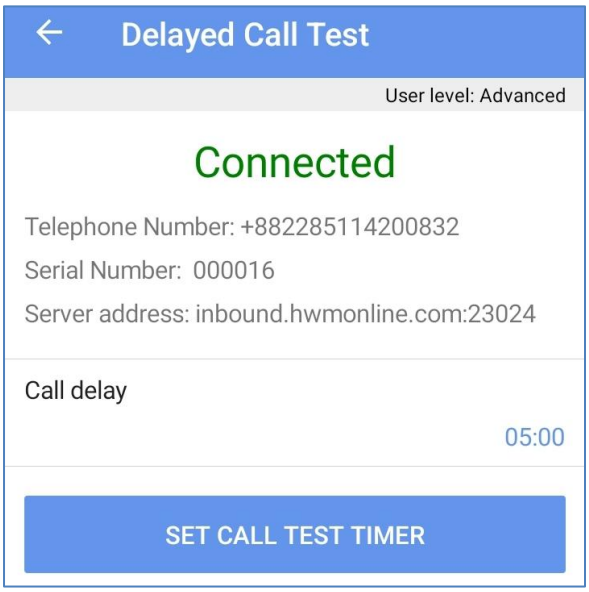
Note: When the equipment is installed below ground level, the Call Test can be made initially with the chamber lid open, to prove it is possible to communicate with DataGate using an unimpaired mobile phone signal.

Repeat the test later with the lid closed to confirm the signal is not degraded to an unusable level by the chamber lid.

8.2.4 Setup of a Delayed Test Call

The purpose of this function is to setup a test call from logger to server, but with a delay (typically of 5-minutes). This allows any communications cable to be removed and the chamber lid to be closed prior to the call commencing.

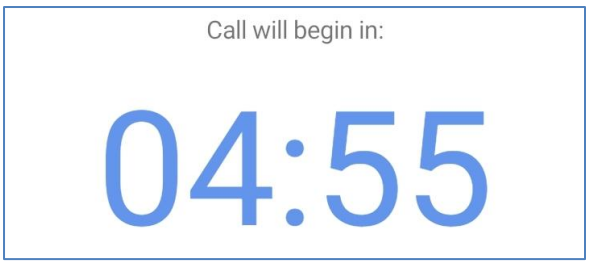
Access the “Test Device” menu and then tap “Delayed Call Test”.



Estimate the time needed to remove any communications cables and fully replace the chamber lid.

Change the Call delay setting, if required to give sufficient time. (Tap the existing setting to modify).

Then tap on the “Set Call Test Timer” button.



The Call Delay time is copied into the timer below and starts the delay countdown. During this time, detach any communications cable from the logger and replace the chamber lid.

IDT then shows a countdown timer for the call-in itself; this is for guidance only. When complete, check on DataGate for the arrival of a message from the logger.

8.2.5 Troubleshooting a Call Test Failure

Possible Issues and Checks

There are a number of reasons why a Call test may fail.

IDT provides some error messages to help diagnose problems:

e.g.:

- SPC low. Please wait for charge.
  (Power boost circuit within the logger requires time to re-charge).
- SIM card error. Please check SIM fitment.
  (SIM must be clean and fitted correctly).
- No networks found. Please check antenna connection and position.
  (Check antenna is undamaged and connected).
- DNS lookup failure. Please check server address.
  (Check with your system administrator that the URL entered as the server address is correct).
- Network registration was denied. Please check that SIM is activated on network.
  (Check SIM card is able to use the selected network operator for data).

(The above list is not exhaustive).

The following points should be checked before calling HWM support for assistance: -

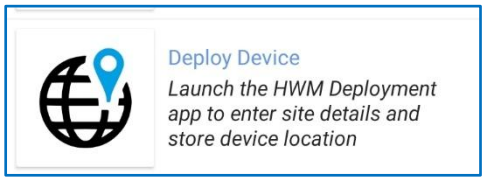
Possible Problem	Solution
Network Busy due to excessive traffic. Commonly occurs around schools and at peak travel times.	Retry the test after a few minutes.
Network signal not available at your location. Not all Cell masts carry data traffic.	Relocate the logger to an area that has a data service or change to a different network provider.
Network signal not strong enough. For 2G and 3G networks, you need a CSQ (reported by the Call test) of at least 8 for reliable communications. For 4G networks, check the RSRP and RSRQ values are suitable.	Relocate the antenna if possible or try alternative antenna configurations. Ensure antennas are vertically orientated where possible.
APN settings incorrect.	Check with your network operator that you have the correct settings for your SIM.

If you continue to experience problems with communication, you may need to check the network coverage in your location.

Part 6 : Recording installation site details

9 Recording Installation Site Details for DataGate Server

When a logger is being used in with the DataGate system, details of the site where the logger has been deployed have to be recorded and entered into the server. This is an administrative function, possibly undertaken by system administrators. However, the IDT app can be integrated with the HWM Deployment app to ease collection of the relevant data and automate many of the administrative tasks.



Within IDT, tap the Deploy Device option to launch the HWM Deployment app and pass details of the logger to it. The user is then able to record the installation location of the device.

(The HWM Deployment app is used to complete the task of recording details of the site of deployment and the administrative update of the DataGate system).

(For further guidance on the HWM Deployment app, refer to the relevant user guide, MAN-2002-0001).

The data sent by (or retrieved from) the logger will be stored on the DataGate server, linked to the site on which the logger is currently deployed.

Note: If the logger is removed from the site this should be registered with the DataGate server, as should any subsequent re-deployment of the logger to another site.
This will allow the server to link subsequent data to the new deployment site.

PART 7 : Retrieving, storing, sharing and viewing data

10 Retrieving, Storing, and Viewing Data

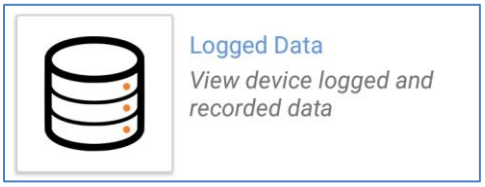
Measurement data is initially stored within the logger.

For 'Group 2' and 'Group 3' loggers, the device is usually set up to call into a server, where data is stored. The device keeps track of what has been already sent in order to minimise call length (to save unnecessary power consumption). Data will therefore automatically appear on the server, with site visits only needed for any maintenance tasks.

For 'Group 1' loggers, the device does not call into a server, so all data is retained within the logger. To access the stored data, return to the logger after some time and re-connect to it using the IDT app. The data can be temporarily downloaded into IDT and viewed graphically (See section 10.1). However, the graph can only be viewed whilst the IDT app is connected to the logger; the IDT app does not store the data. The data may also be shared with other apps whilst connected; refer to section 10.2. For data retrieval and permanent storage, IDT is required to be used in conjunction with the DataGate server (Refer to sections 9 and 10.3); the data can be manually uploaded to the server using the data modem within the mobile phone.

Data is best viewed with a viewing tool (webpage) that can access the data stored on the server. (Refer to the appropriate manual or instructions for your viewing tool).

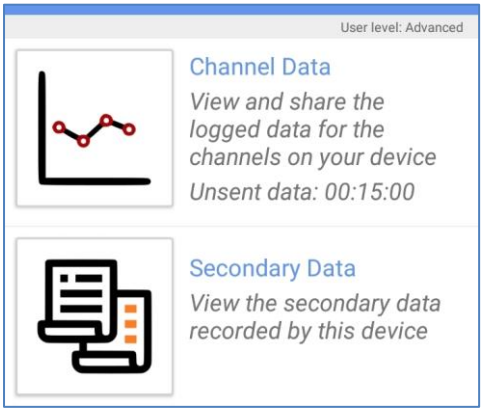
10.1 Viewing Data (within IDT)



The logger data can be viewed graphically by using IDT to temporarily copy the data from the logger.

Tap on the "Logged data" line.

A new screen is displayed. This screen gives access to any data contained in the logger's primary data recording. It will also give access to the logger secondary data recordings if they exist.



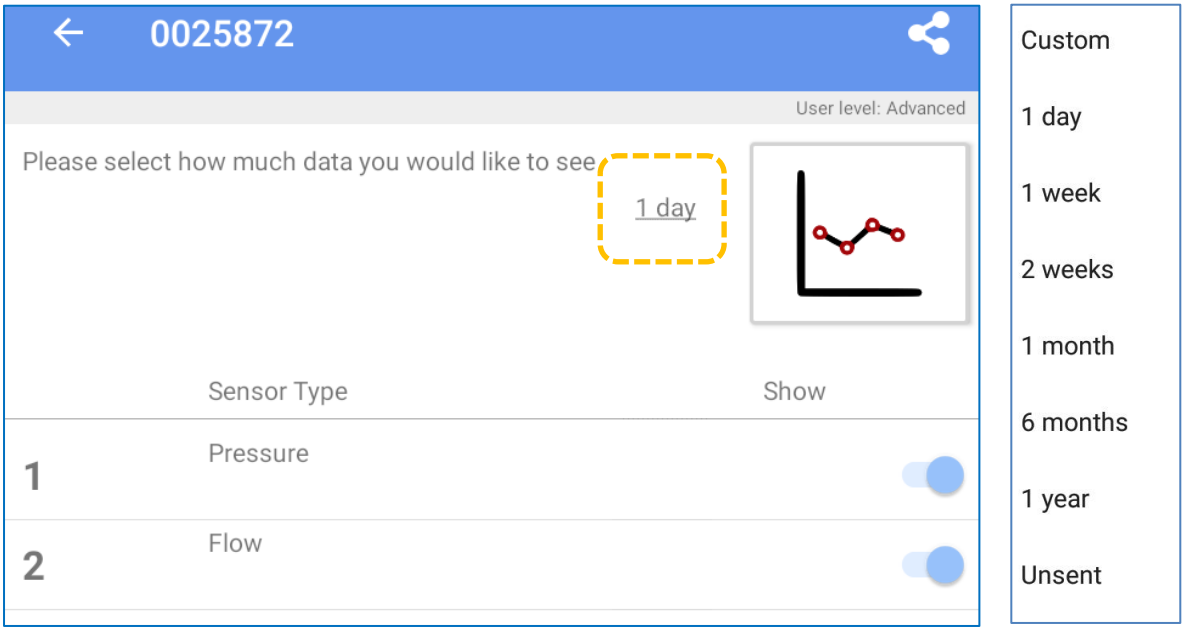
Tap "Channel Data" for access to the primary data recordings.

(For 'Group 2' and 'Group 3' loggers, this line will show the duration of any unsent data (format: d:hh:mm:ss)).

(Alternatively:

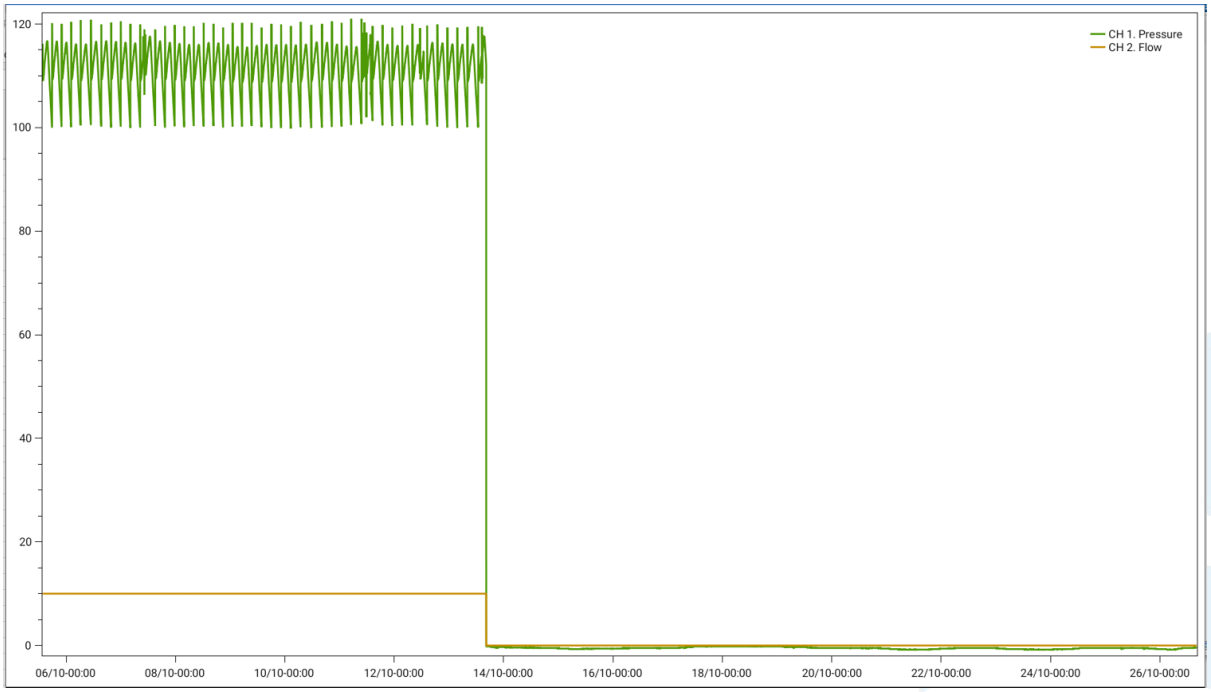
- Tap "Secondary Data" for access to a list of the secondary data recordings.
- Pick a recording from the list.
- The secondary data will be shown, in full, on a graph).

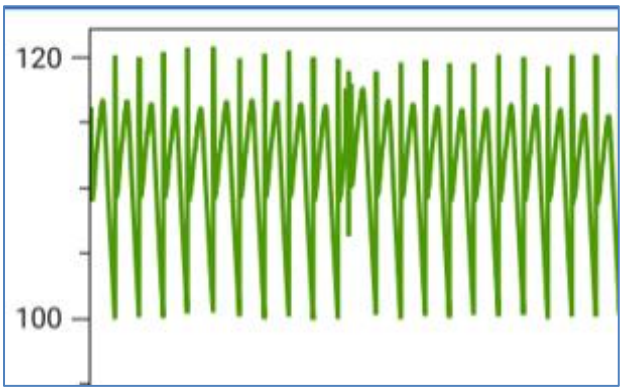
Tap to the left of the graph symbol to select a duration that you wish to see on the graph. (The 'unsent' option is not available on 'group 1' loggers).



The slider controls can be used to include or exclude data from a sensor on the graph.

Tap on the graph symbol to initiate the transfer of data from the logger to a temporary data store in IDT. Once the data is available a graph will be produced.





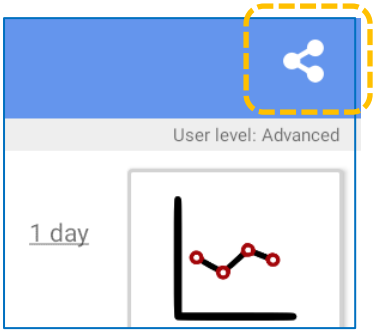
The graph can be examined in more detail using the standard techniques available on your tablet or phone. (E.g., Finger movements to zoom in or out, re-position the graph within the display, etc).

Tap the back-arrow control to exit.

Note: The graph contents will vary according to the sensors attached to the logger, the type of data produced, how long the logger has been running, and other factors.

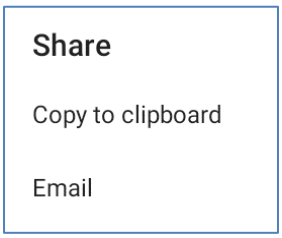
Once the graph page has been closed, the data is deleted from IDT. However, it is still present in the logger.

10.2 Sharing Data (in CSV Format)

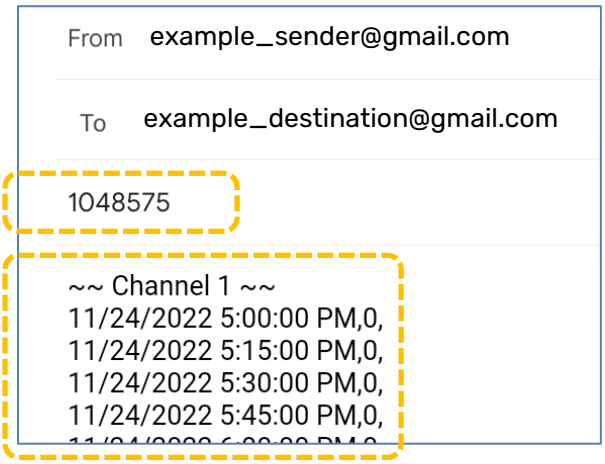


To share the logger data, follow the steps for viewing data in IDT (see section 10.1) up until the point where the channels and time period that are required have been selected.

Then tap on the “share” icon.



IDT offers the option of either copying the data to the clipboard (to be able to paste the data into another application), or to generate an e-mail with the data.



E.g., Tap on “Email” and IDT will fetch the data from the logger. IDT will then select your e-mail application and compose the message part of the e-mail.

The e-mail will include the logger identity (as a serial number) for the subject.

The main body of the e-mail is in plain text which is also in a c.s.v. (comma separated values) format.

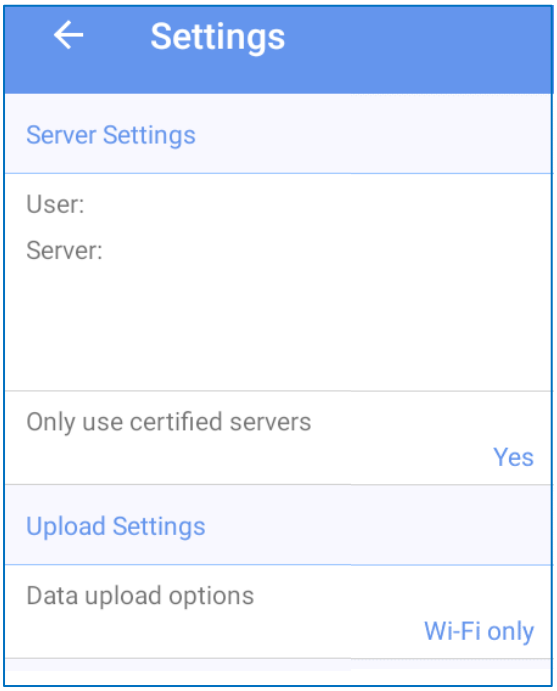
Complete the e-mail by adding e-mail addresses to the “To” field, and then send.

10.3 Upload of Data to DataGate Server

Note: In order to successfully upload data to the DataGate server, all loggers must be previously entered into the DataGate system (registered using their telephone number and linked to a dummy site; HWM Global usually does the initial logger registration. However, loggers within 'Group 1' do not have a standard telephone number, so require some alternative way to allocate a telephone / SMS number for use as an identifier; refer to the logger user-guide for details.

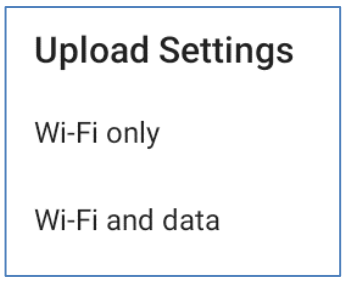
After logging into the IDT app, the mobile phone receives a token allowing use with the server for up to 48 hours. The IDT app can be used to retrieve data from a logger and store it for upload to the DataGate server for permanent storage. If no internet connection exists, the data is temporarily stored in data files which go into an "upload queue". This pending data will upload later when an internet connection becomes available.

Note: This method of uploading data is normally not needed for 'Group 2' or 'Group 3' loggers, since they are able to upload data regularly. It can however be used when visiting site for maintenance work.
The primary use is with 'Group 1' loggers, as these have no facility for automatic upload of data to the server.

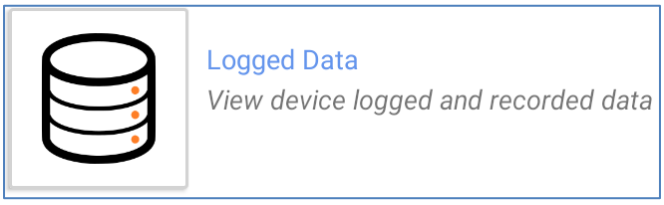


Options for use of various internet connections (Wi-Fi or by use of Cellular / Mobile Data) can be set within the app Settings page.

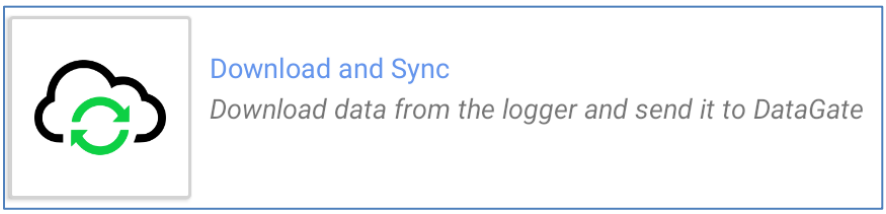
Tap on the "Data upload options" line.



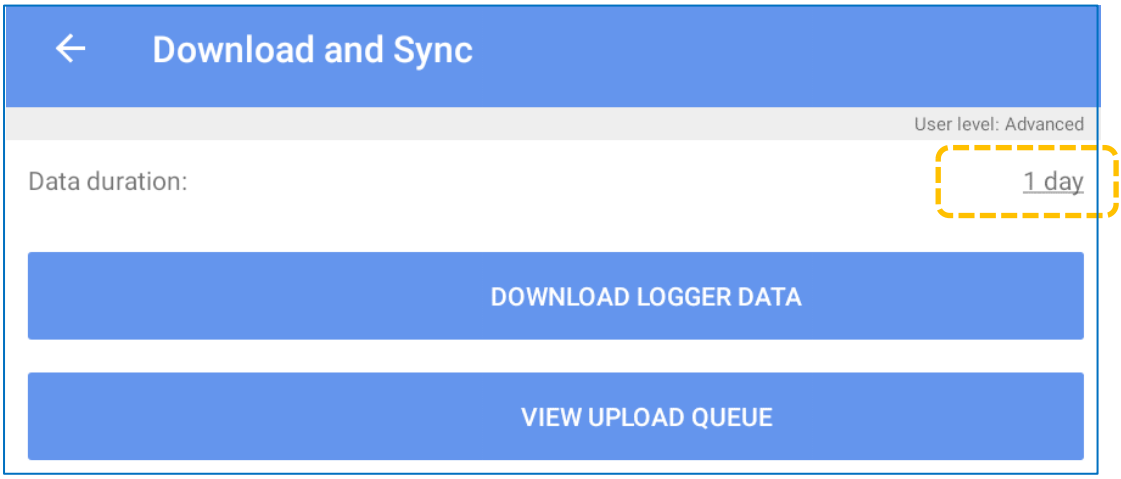
Select "Wi-Fi only" if you have a limited data package on your SIM card. This will defer data uploads to the server until a Wi-Fi connection is available.



After connecting to your logger, tap on the "Logged Data" option.



Then tap on "Download and Sync".



A new page will load.

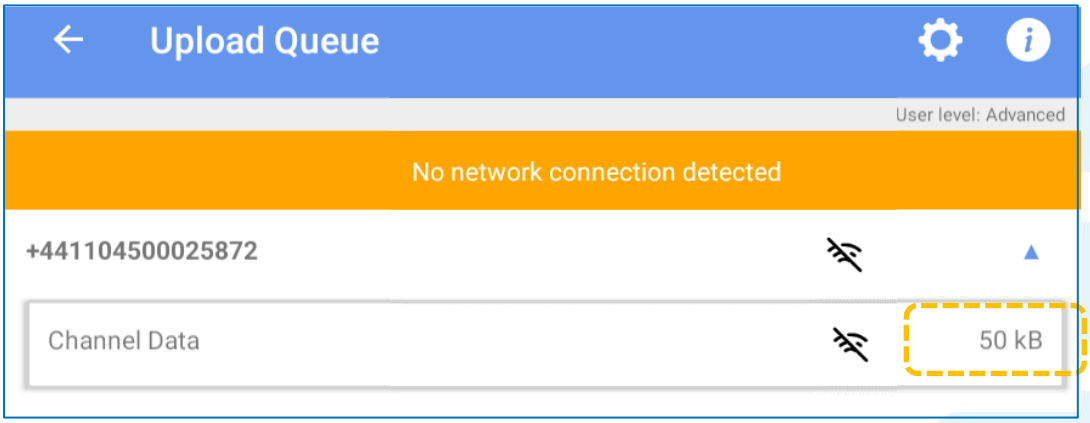
Tap on the "Data duration" line and select the required time period of the data you wish to retrieve.

Then tap on the "Download Logger Data" button.

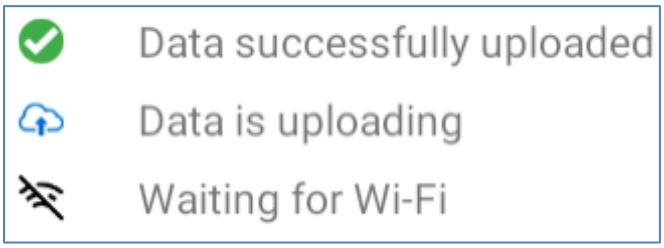
The IDT app will transfer the data from the logger device.

Note: IDT does not keep track of what data records (normally selected by a date range) have been uploaded to DataGate. To ensure IDT has all the available datapoints, the user should select a large enough date-range to over-lap with any previously obtained data.
If there are any duplications of data sent, the system will remove them before storage on the server.

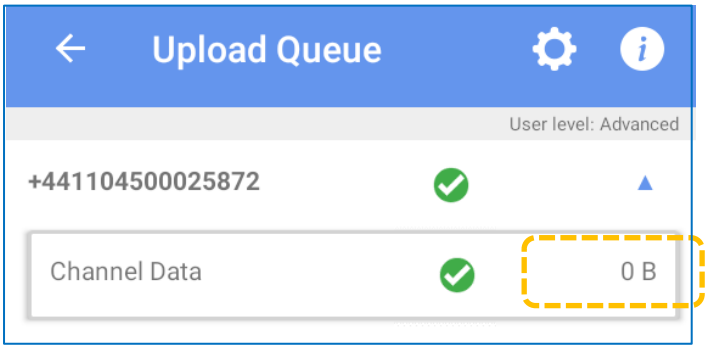
To view data that is queued for upload, tap on the "View Upload Queue" line.



A list of data that has been obtained from loggers is shown along with a status indication (icon) and number of bytes left to upload.



Tap the " i " button for a key with an explanation of the symbols.



When upload is finished, all logger devices should show '0 B' (0 bytes) as being left to upload, and a green circle with a tick as the status.

To clear the list, first check that all data items have been sent. Then tap on the "Clear Sent Data" button.
(This does not erase any data from the logger).

PART 8 : Troubleshooting

11 Troubleshooting

The app, the logger, the user and sometimes the server interact with each other. Any issues in use of the app should consider all four parts of the system.

(Refer also to section 16, which describes a few of the differences of operation of IDT under various use circumstances).

11.1 Putting the Equipment into Shipping Mode (De-activating)

Before removing HWM Global equipment from an installation site for storage, repair, etc, it must be put into "Shipping mode". This will prevent invalid measurements from being recorded. In addition, some equipment includes sensors for detecting movement or changes in logger position and could send an alarm to the server.

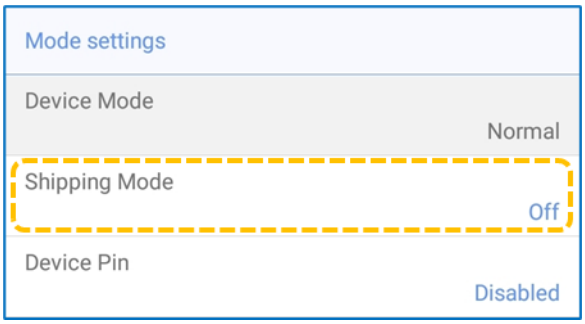
Note: Be sure to upload any unsent data before this operation.

'Group 3' loggers:

To put the equipment into shipping mode:

From the main options page, tap on the "Configure Device" selection.

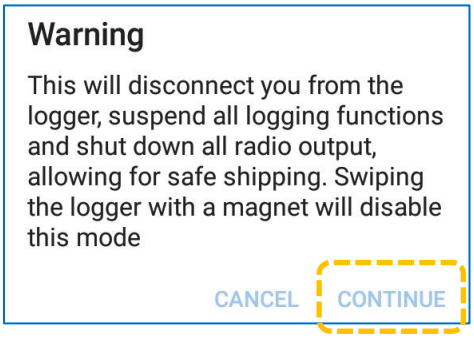
Then select the "Device Information" option.



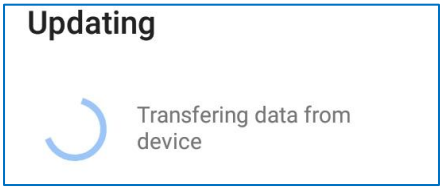
Move the display to show the Mode Settings panel.

The "shipping mode" setting will be shown as "off" since the logger is in use.

Tap on the shipping mode line.



Read and accept the warning (by tapping on "Continue").



IDT will update the device.

The device will go into shipping mode and drop the communications link.

(IDT will therefore begin scanning for devices).

'Group 1' loggers:

The equivalent to shipping mode is a recording state of 'stopped'. Refer to section 3.2.4 for how to do this.

11.2 The User Cannot Log In using the App

- Ensure the correct server URL exists (Test connection).
- Ensure the correct username and password are being used.
- Ensure the user is correctly set-up on DataGate.
  (Refer to your system administrator for assistance if required).

11.3 The IDT App Does Not List the Logger

- The logger communications link is not activated.
  – Activate the logger communication link again (see section 1.6).
- The phone may be out of the communication link range of the logger.
  - Bring them closer together.
- The logger battery may be depleted, or the logger may be defective.
- If using the Bluetooth Interface Link connection method, check the unit is charged and in pairing mode. Check the cable is properly connected.

When used with DataGate:

- The logger is not correctly registered on DataGate.
- The user is not logged into the app, or the initial synchronisation is incomplete.
- The user does not have the appropriate DataGate permissions.
- Try selecting "show unprotected devices". If the logger then appears listed in red, it is functioning correctly in "unprotected mode".
- Try re-starting the phone and the app.
  – Confirm the app Bluetooth connection is working correctly by trying with another logger.

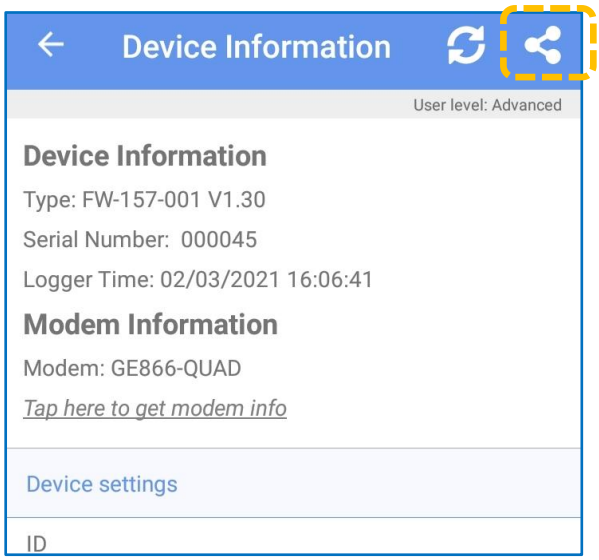
11.4 The Data from the Logger Does Not Appear on the Server

- Ensure the logger uses the correct data destination URL and port-number for your server.
- Check the logger antenna is attached and in an OK condition.
- Make a Call Test and confirm OK.
- Ensure your server is correctly configured to receive and present the data from the logger.

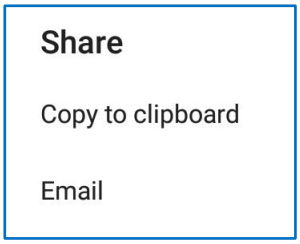
11.5 Transfer of Logger Settings for Assistance / Load Virtual Logger

If requested by HWM-water, the logger configuration settings can be saved to a file and forwarded to HWM-water for assistance.

Connect to the logger and from the main screen navigate to the Device Information screen.

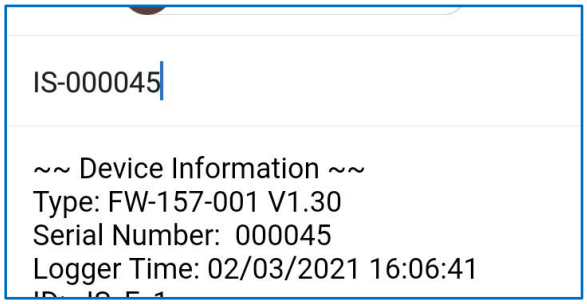


Tap on the Share icon. (This feature may not be enabled for your logger, but an alternative is shown below.)

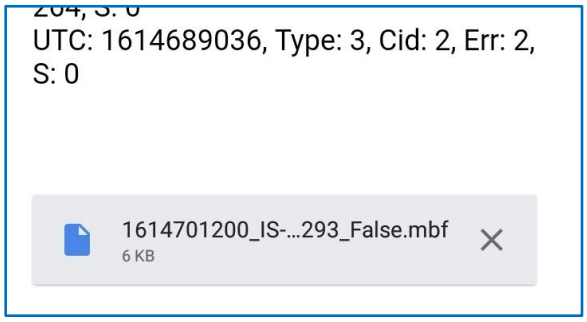


Select a method for sharing the information
(a logger configuration file + recent event log messages).

Typically, this will be via e-mail.
Select an e-mail program when the phone prompts you.

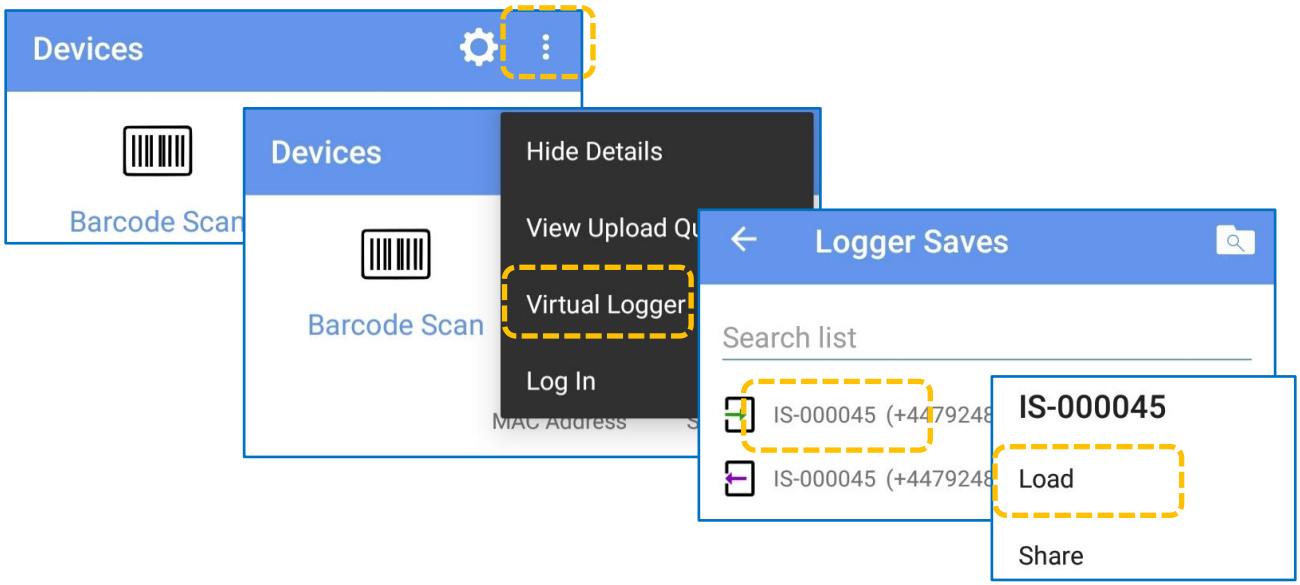


The contents of the e-mail are automatically generated. You will simply need to complete the destination e-mail address.



The logger details and a copy of its configuration file can now be sent for examination and debug.

All setting details will be available for inspection once the email recipient loads the configuration details as a “virtual device” (click as shown below, from left to right).



Note: Every time the IDT app connects to a logger and then disconnects from it, a backup file of the logger configuration is made. These can be accessed via the 'Logger Saves' page, shown in the diagram above.
When a file is selected, it can either be loaded as a virtual logger or shared (via e-mail, etc).

11.6 " … block the logger from calling in" Warning (Logger Over-commit)

The logger schedules its repetitive measurement tasks and also evaluates how much time is available for other tasks such as calling into the server. Whilst programming settings into the logger, it is possible for the user to over-commit the logger resources.
If some potential issue is found where the logger is likely to be over-committed and unable to fit all tasks into its schedule, it warns the user via an IDT warning message.

Warning: high log and sample periods can block the logger from calling in

Warning: high log period can block the logger from calling in

Warning: high sample period can block the logger from calling in

If IDT issues a warning during setup of the logger, similar to those shown opposite, it indicates that the logger may have insufficient time to call into the server.

The logger manages its expected power use during operation (so as to not cause an over-demand of the supply current beyond what is available). Some measurements are from sensors that use very little power and are only required to be powered for very short intervals. Other sensors may require more power or may need to be powered for several tens of seconds before a measurement can be obtained. Each measurement therefore has a power and time budget for the logger to consider when scheduling tasks, as does the operation of making a call-in to the server. The logger may manage power-use by sequencing certain measurement tasks to occur one after another rather than being done simultaneously.

The user should therefore consider a worst-case scenario in which only one sensor can be powered at any given time. Each sensor may need to be activated sequentially. Certain sensors may require a pre-power period and / or additional time for a measurement to be made and then communicated to

the logger). The user should also add approximately one minute for the call-in time.

Sensor interfaces that should especially be taken into consideration are:

- 4-20mA (active) ; Pre-power time
- SDI-12 ; Pre-power time ; Measurement time varies.
- RS485 ; Pre-power time ; Measurement time varies.
- SonicSens3 ; Measurement time is approx. 10s.

The user should minimise the period of use and number of samples obtained from sensors using the above interfaces. This helps the logger to schedule tasks. It also helps towards minimising over-all power consumption from the logger battery.

If IDT generates a warning message, the sensor pre-power timings, sample period, log period and logging mode should be re-visited and adjusted. Try:

- Use a “spot” logging mode (which samples only at the log rate) where possible; Other logging modes require more samples to obtain datapoints.
- A log period of 5 minutes or longer is recommended.

PART 9 : Detailed Setup of Interfaces (Inputs & Outputs) / Sensors

12 Setup of Interfaces

This section describes the setup of channels in detail. However, certain sensors have their own User Guide. Follow the additional guidance where available.

Data from the logger can generally be viewed using webpages provided by HWM DataView website. Where other HWM data viewing portals (websites) exist for certain sensors, they are identified within each sensor description. Your utility company may also employ its own data viewing tool. To view data on any portal, the data must be delivered to the server.

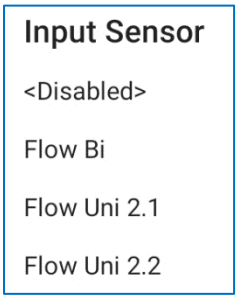
12.1 Flow Sensor Input (Using 'Group 1' Loggers)

To set up a Flow sensor input on this group of loggers, refer to section 4.1. Flow inputs have no other function on this logger group; skip to section 12.8.

12.2 Flow Sensor Input (Using 'Group 2' Loggers)

For an introduction to the setup of a Flow sensor input on this group of loggers, refer to section 4.2, which discusses Flow-Uni interfaces. This section provides additional information, including the setup of other types of Flow interfaces.

Internally, 'Group 2' loggers usually handle a flow interface as a pair of signals.



- Both signals are required for some meter interfaces.
  (e.g., 'Flow-Bi' interfaces; These are for meters that can measure Bi-Directional Flow).
- Alternatively, the electrical interface is factory modified (split into two) to form two separate interfaces.
  (e.g., 'Flow-Uni' interfaces; These are for meters that measure Uni-Directional Flow).
  (See opposite for IDT identification of the pair of signals for the 2nd Flow interface split into two; 'Flow-Uni 2.1' and 'Flow Uni 2.2'.)

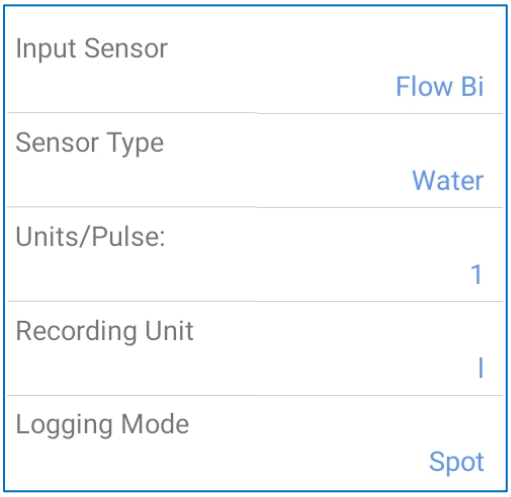
Meter readings:

After setup of a Flow Interface to produce a logged channel, it is possible for the logger to keep track of the meter reading and for it to be uploaded to DataGate. Refer to section 12.7.5.

12.2.1 Bi-directional Flow (Using Direction & Pulses; Producing 'Net Flow')

Channel summary:

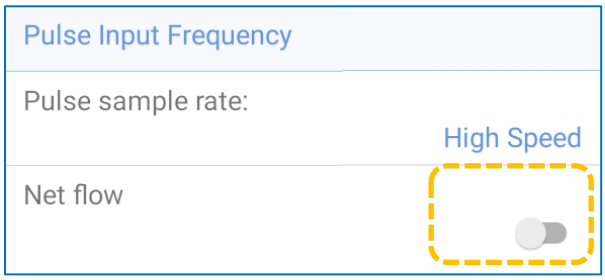
1 channel uses 2 input signals (Flow direction, Flow Pulses) and produces 1 logical output (datapoint channel output): "net flow".



Follow the steps described in section 4.2, but select the Input Sensor as a "Flow Bi".

(An example of the completed Channel setting, 'Basic' tab, is shown opposite).

Select the 'Advanced' tab (or Global Settings screen) and select a suitable pulse sample rate.



Next, go to the Global Settings screen and ensure the 'Net Flow' control is set to ON (see diagram opposite).

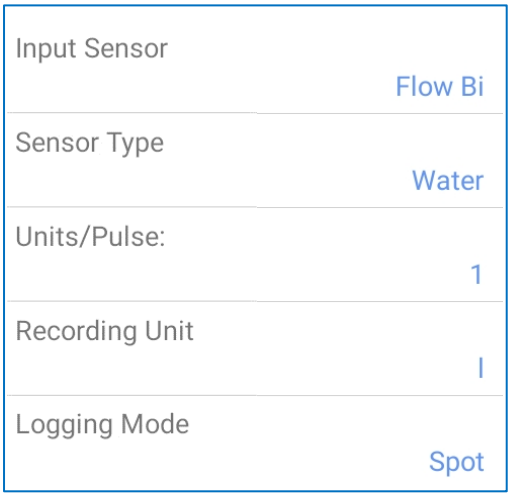
Note: This setting affects *every* Flow-Bi (n) channel within the logger.

When finished, save the settings.

12.2.2 Bi-directional Flow (Using Forward Pulses & Reverse Pulses; Producing 'Net Flow')

Channel summary:

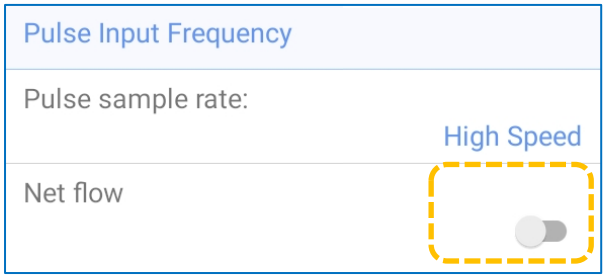
1 channel uses 2 input signals (Forward flow pulses, Reverse flow Pulses) and produces 1 logical output (datapoint channel output): "net flow".



Follow the steps described in section 4.2, but select the Input Sensor as a "Flow Bi".

(An example of the completed Channel setting, 'Basic' tab, is shown opposite).

Select the 'Advanced' tab (or Global Settings screen) and select a suitable pulse sample rate.

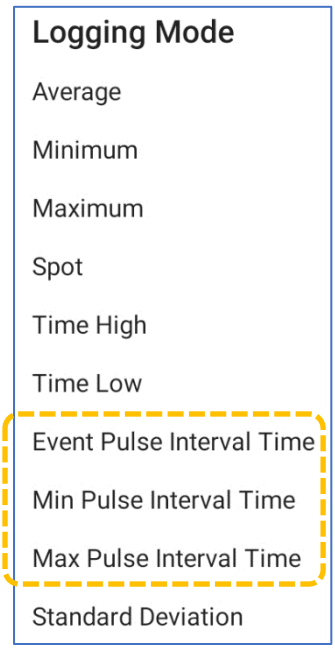


Next, go to the Global Settings screen and ensure the 'Net Flow' control is set to OFF (see diagram opposite).

Note: This setting affects every Flow-Bi (n) channel within the logger.

When finished, save the settings.

12.2.3 Logging Mode: Pulse Count or Pulse Interval Timing Options



For Flow channels, additional Logging Mode selections are available on 'Group 2' loggers. These modify the logger behaviour and are useful for flow inputs that sometimes have infrequent meter pulses.

They are known as 'P.I.T.' (Pulse Interval Time) logging modes.

The logger samples any flow input at a high frequency.
Instead of simply counting pulses between log periods, the logger can also time pulses.

When set to 'Event Pulse Interval Time':

- When the pulse arrival rate is low, the logger waits for the log period to pass and then waits for the next pulse. It can then calculate an average value of the flowrate and record it by backfilling any datapoints that were missed whilst waiting for the pulse to arrive.
- When the pulse arrival rate speeds up, a similar process operates, but the logger takes account of the additional pulses.

When set to 'Min Pulse Interval Time' or 'Max Pulse Interval Time':

- When the pulse arrival rate is low, the logger waits for the log period to pass and then waits for the next pulse. It can then calculate an average value of the flowrate and record it by backfilling any datapoints that were missed whilst waiting for the pulse to arrive.
  (Minimum and Maximum are the same value).
- When the pulse arrival rate speeds up, a similar process operates, but the logger takes account of the additional pulses.

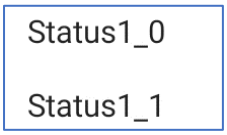
  The Minimum flow rate during the log period is found from the pulse having the longest interval.

  The Maximum flow rate during the log period is found from the pulse having the shortest interval.

12.3 Status Input ('Group 2' Loggers)

"Status Input" is a digital signal supported by some 'Group 2' logger models.
Where more than one channel is available, they may be available on different connectors or as separate signals on the connector or cable. Electrically, the inputs operate in a similar manner to Flow inputs, being able to detect if a switch is open or closed.

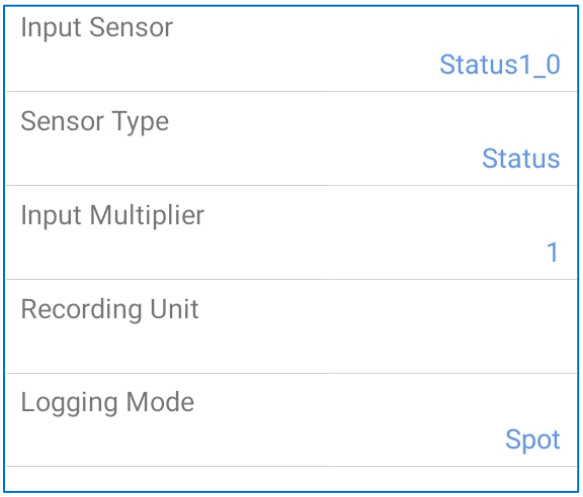
On 'Group 2' loggers, IDT may show two versions of a Status input.



e.g., In the picture opposite a single input pin is shown, but two versions exist.
The difference is at the output stage (logged datapoints).
Status1_0 is standard (non-inverted) Output.
Status1_1 is non-standard (inverted) Output.

There is no difference regarding the input processing. However, the non-standard channel will have its output (logged datapoints) inverted, and setup of alarms may also be affected, as these act on the logged datapoint values.

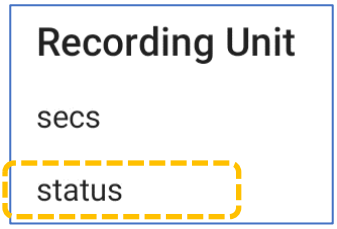
Note: During hardware tests, the Status Input will show as either an Open or Closed condition, (indicated by O and X, respectively).

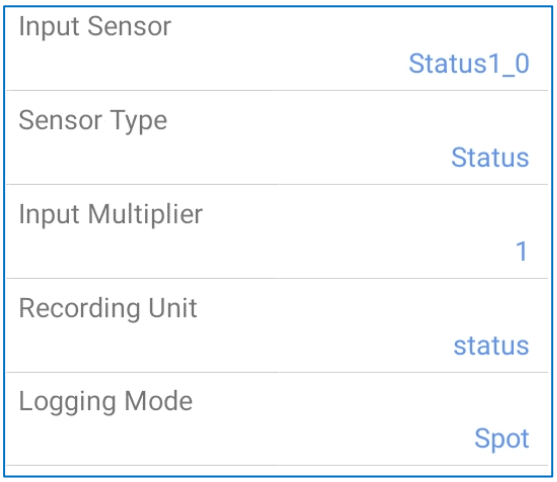


Complete the settings of the status input as shown opposite.

Then, to continue setup, follow the steps in sections 12.3.1 or 12.3.2.

12.3.1 Use as a Logic-level Data Stream



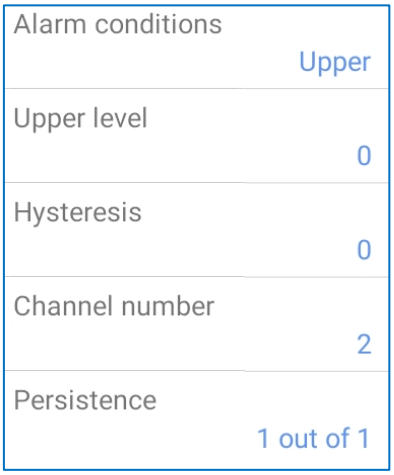


Complete the settings as shown opposite to use the sensor as a logged digital status input.

The Recording Unit must be "Status".

The input will be logged as a digital status (i.e., 0 or 1).

The logged data can participate in Channel Alarms and also in 'status' type alarms and events.

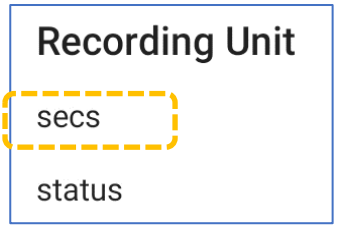


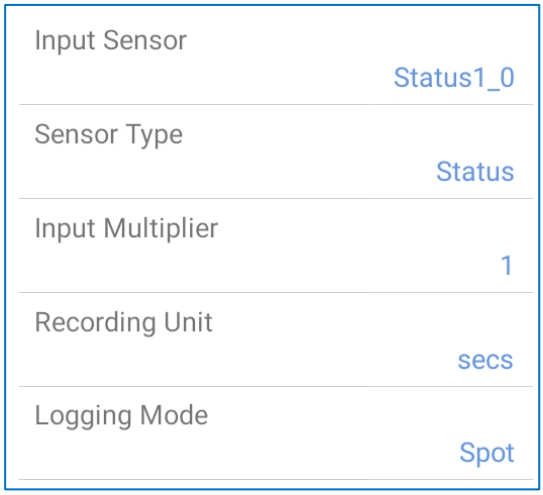
Triggers for Channel alarms can be set to match specific conditions met by the data-stream using the regular Alarm setup procedure.

e.g. The Channel Alarm settings shown opposite will trigger immediately if the input switches from 0 to 1.

The alarm will clear immediately when the input switches back from 1 to 0.

12.3.2 Use as a Time-On Data Stream





An alternative use of the status input is to set the recording unit as “secs” (seconds).

The logger now considers the input status as a function of time; the number of seconds the input is at a logic level of “1” (closed) between each datapoint being produced. This value is recorded as a channel datapoint.

The time counter resets whenever a datapoint has been created.

Note: Changing the input sensor to Status_x_1 has the effect of changing the polarity.
The number of seconds the input is at logic level “0” (Open) between each datapoint is now recorded as a channel datapoint.

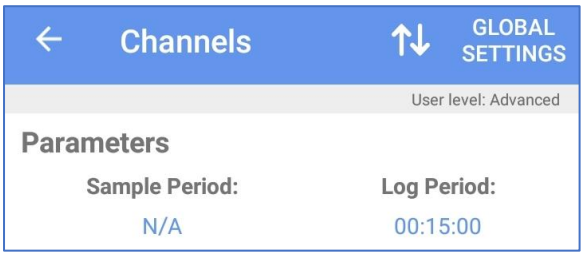
12.4 Status Input (from a Flow / Pulse Interface) (‘Group 3’ Loggers)

(This section applies to ‘Group 3’ loggers only).

The interface known to IDT as “Pulse” may (where fitted) be labelled “Bi-Directional FLOW” or “Uni-Directional Flow” or similar. It may also be unlabelled except via inspection of the model-number of the logger (refer to the logger manual).

Note: “Pulse input” can be considered as the general-purpose name for the interface.
It can be known by additional (more specific) names when the function has been set within the logger setup.
A pair of pins (i.e., 2 pulse inputs) is normally presented on a single connector.
Each pin may be assigned a different use, or their use combined as a pair.

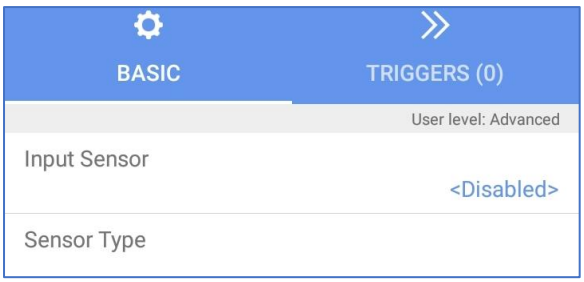
The interface is versatile and can be used for a variety of purposes. One such use is as a **Status Input**. A status input requires just one pin.



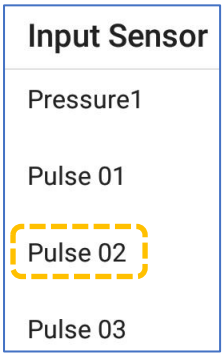
To set up a new Status Input channel:

Go to the Channels screen.

Tap the " + " line to add a new channel.

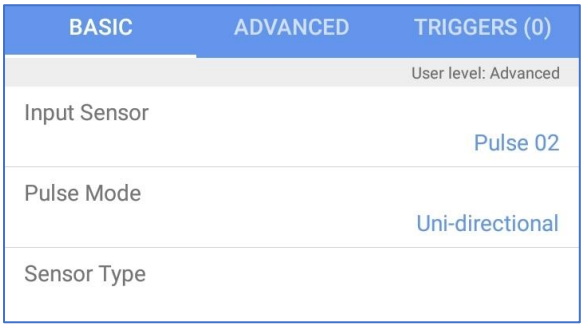


Tap the "Input Sensor" line.
(Currently, it shows "<Disabled>"; it is unconfigured).

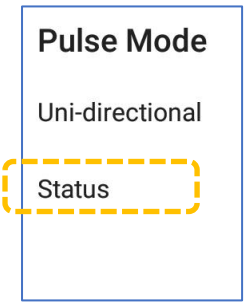


Select the required "Pulse (n)" type interface from the list of interfaces.

e.g., Tap on "Pulse 2".



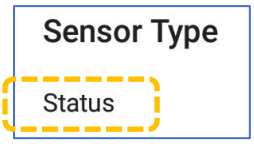
For this particular interface, multiple software driver options exist, and hence a new setting line is displayed, "Pulse Mode".

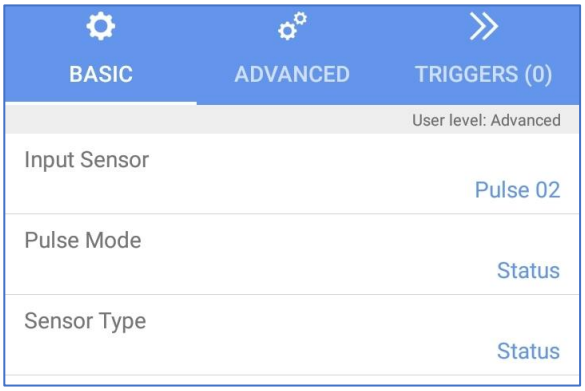


Tap on the Pulse mode setting and select from the available options.

For this example, a Status sensor is required.
Therefore select "Status".

This selection commits the relevant pin of the interface connector for a specific use).
For this selection, the software driver will use the input as for sensors that give a simple status indication (typically signalled by a switch being open or closed).

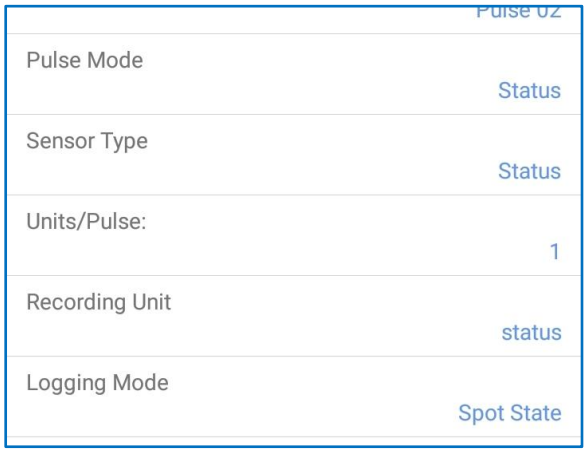




Ensure the "Sensor Type" also reads "Status".
(Select if not already selected).

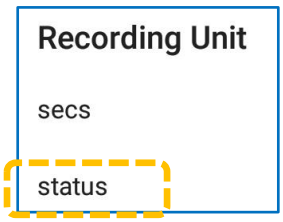
The selections made (so far) are shown in the channel configuration screen.
Additional settings are required, depending on what is to be measured and logged from the input …

12.4.1 Use as a Logic-level Data Stream

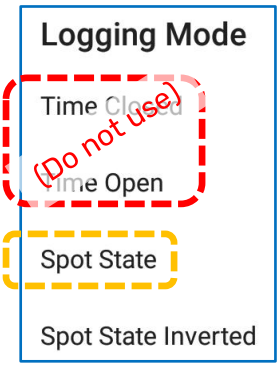


Complete the settings as shown to use the sensor as a digital status input.
(i.e., The input status can be either "1" or "0".
Or, more precisely, either "Open" or "Closed").

Note: The IDT app sometimes shows:
"Open" as "O".
"Closed" as "X".

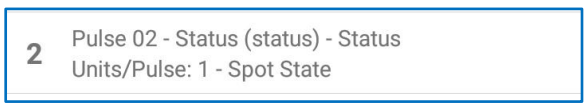


The recording unit must be set to "status".
This ensures the Pulse input is logged as a digital status (a value of either 0 or 1).

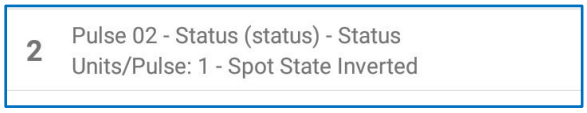


Select a logging mode of "Spot State" to record (log) the regular input status.

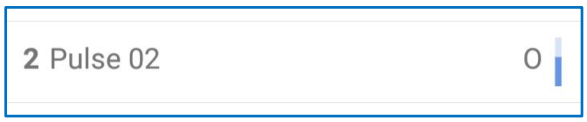
If you wish to change (invert) the logic of the status input, the "Spot state inverted" option may be chosen. (e.g., This may be required for a switch which has a "normally closed" rather than a "normally open" condition).



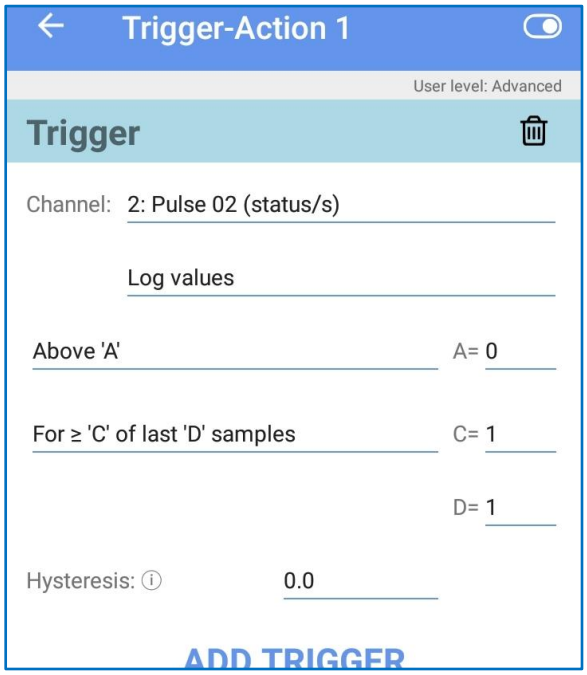
The summary status is shown opposite for a channel set up to the log normal state input.



The summary status is shown opposite for a channel set up to the log inverted state input.



Both of the above give the same result for a hardware test; it reports the raw input state.
(before any inversion is applied).



Triggers and actions can be set using the regular setup process, where triggers can be set to match specific conditions from recently logged datapoints.

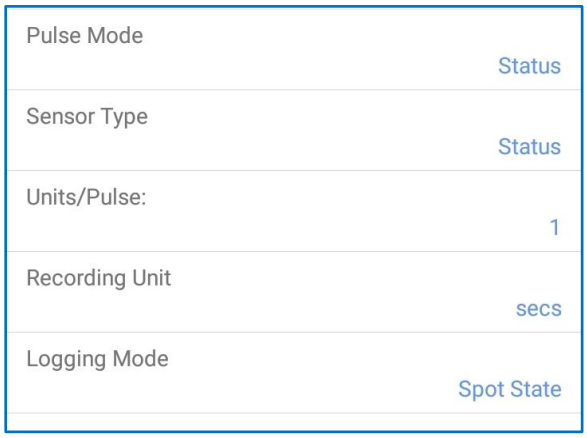
(The datapoints can be either the regular or inverted status input, depending on the channel settings).

e.g. The settings shown opposite will trigger immediately (on a log boundary) if the input switches from 0 to 1.

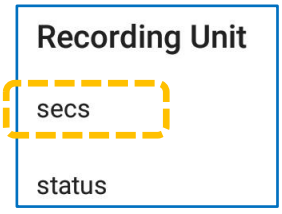
The user should consider any threshold values carefully to ensure the logger can be triggered.

e.g. In the example, setting A to "1" will not permit the logger to trigger since the required data value would be out of range; the data range for a status type data stream cannot exceed "1", so the value cannot be "Above 1".

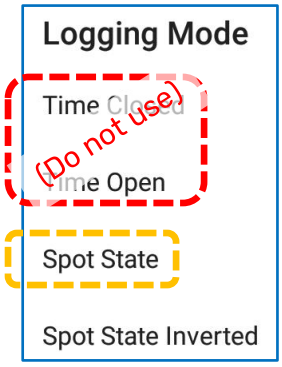
12.4.2 Use as a Time-On Data Stream



The logger can measure how long a status input remains in a specific state within each log period. The results can be recorded (as datapoints) using a unit of time, namely seconds.



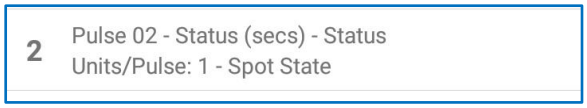
To accomplish this, select a recording unit of "secs".



Set the Logging mode to be “Spot State” to consider the regular input status.

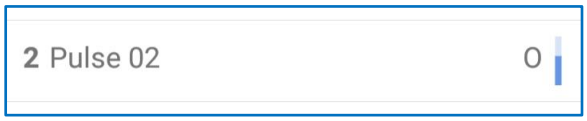
If you wish to change (invert) the logic of the status input, the “Spot state inverted” option may be chosen.
(e.g., This may be required for a switch which has a “normally closed” rather than a “normally open” condition).

This changes the logger trigger options to consider the input status as a function of time; the number of seconds the input is at a logic level of “1” between each datapoint being produced. The time counter resets to 0 seconds whenever a new datapoint has been created.



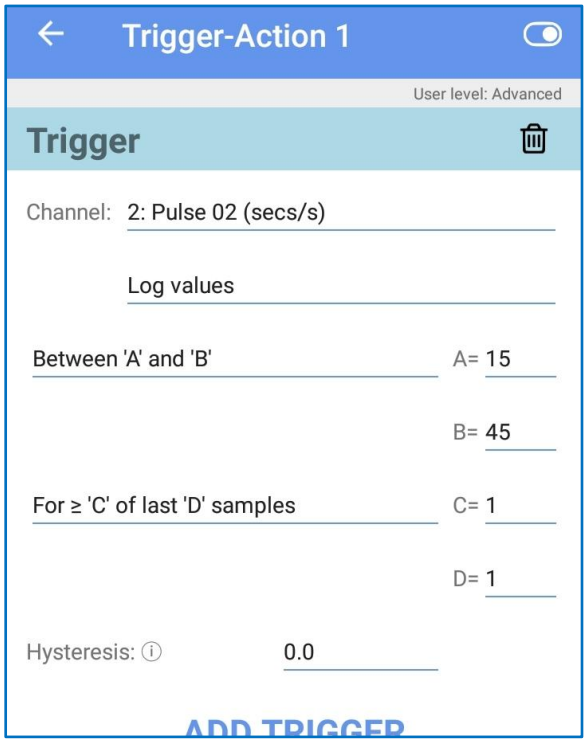
The summary status is shown opposite for a channel set up to the log normal state input.

The summary status is shown opposite for a channel set up to the log inverted state input.



Both of the above give the same result for a hardware test; it reports only the raw input state
(before any inversion is applied).

Note: The *time-on result* is not shown.



Triggers and actions can be set using the regular setup process, where triggers can be set to match specific conditions from recently logged datapoints.

(The datapoints can be either the regular or inverted status input, depending on the channel settings).

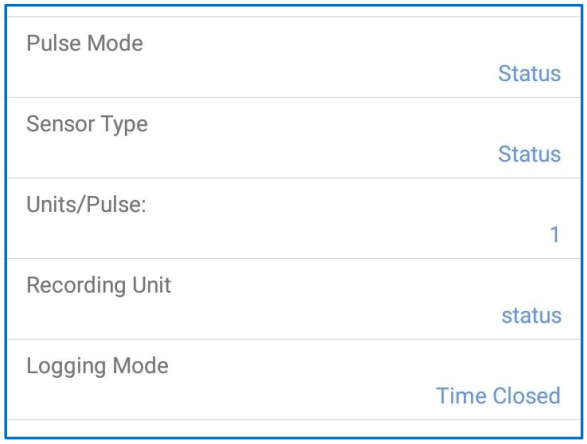
e.g. The settings shown opposite will trigger immediately (on a log boundary) if the status input is closed for a total time of between 15 to 45 seconds during the last log period.

The user should consider any threshold values carefully to ensure the logger can be triggered.

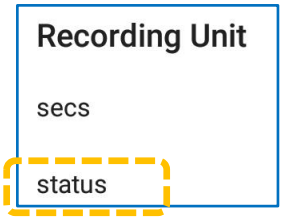
e.g. In the example, say the log period is set to be 5 minutes. (300 seconds).

Setting A above “300” will not permit the logger to trigger since the data value would be out of range; the data range for this channel data stream cannot exceed “300” (seconds) due to the log period set.

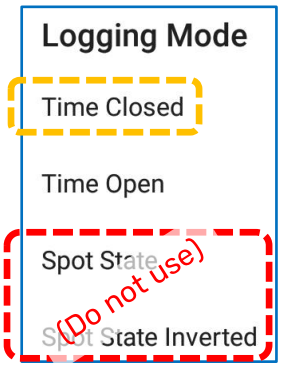
12.4.3 Use as a Time-On (%) Data Stream



The logger can measure what % of the time a status input is in a specific state within each log period. The results can be recorded (as a series of datapoints).



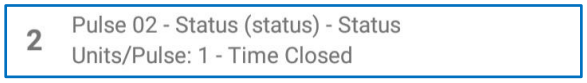
To accomplish this, select a recording unit of “status”.



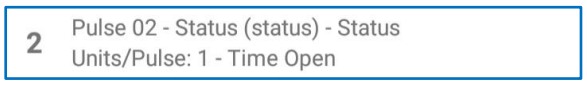
Set the Logging mode to be “Time Closed”.
(This should be considered as “% of time closed”).

A “Time Open” option may alternatively be chosen if required.
(e.g., This may be required for a switch which has a “normally closed” rather than a “normally open” condition).

The logger calculates the proportion of time (relative to a log period) that the Status pin is in the chosen condition. The datapoints will be in the range of 0 to 10000. So, if “Time Closed” is chosen, then a value of “0” would indicate permanently open, whilst a value of “10000” would indicate permanently closed.



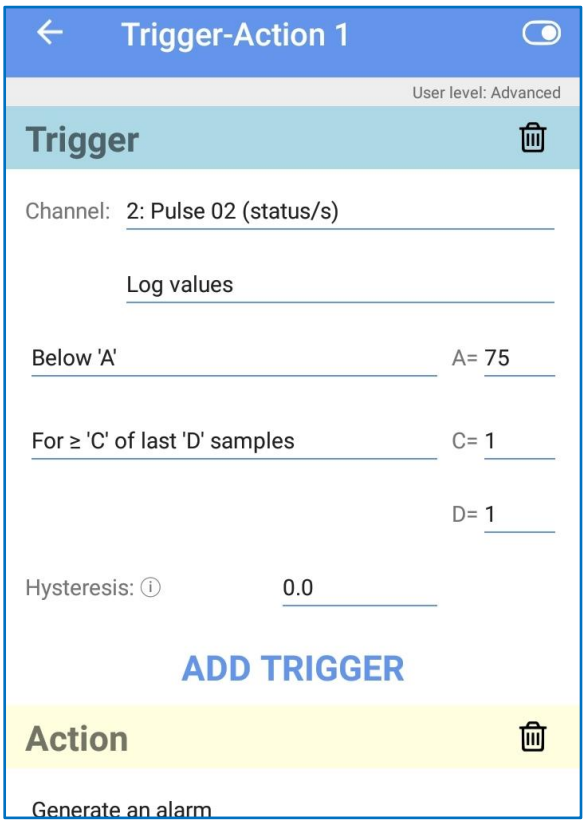
The summary status is shown opposite for a channel set up to the log % of Time Closed.



The summary status is shown opposite for a channel set up to the log % of Time Open.

Both of the above report the raw input state (before any inversion is applied).

Note: The *% time-on result* is not shown.



Triggers and actions can be set using the regular setup process, where triggers can be set to match specific conditions from recently logged datapoints.

(The datapoints can be based on either the proportion of Time Open or proportion of Time Closed, depending on the channel settings).

e.g. The settings shown opposite will trigger immediately (on a log boundary) if the status input is closed for a proportion of less than 75% of the time during the last log period.

The user should consider any threshold values carefully to ensure the logger can be triggered.

e.g. In the example trigger shown:
Setting A as "0" (or lower) will not permit the logger to trigger since the channel datapoint value would always exceed this; the data range for this channel data stream is always "0" (or above).
Setting A as "101" (or higher) will not permit the logger to clear from being triggered since the data value would always be below this; the data range for this channel data stream is always "100" (or below).

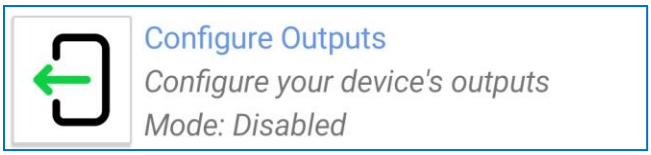
12.5 Outputs ('Group 2' Loggers)

(This Sub-section applies to 'Group 2' loggers only).

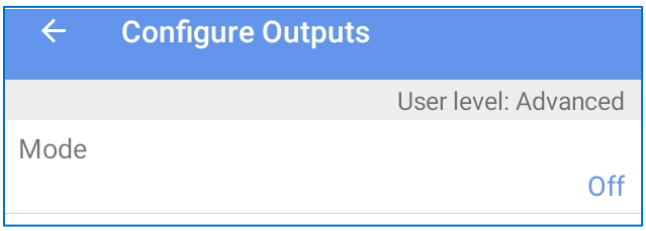
"Output" is a digital output signal (open / closed) supported by some logger models. Where more than one channel is available, they will appear as distinct outputs in IDT (e.g., Output 1, Output 2). (Refer to the logger user-guide.)

The outputs can be either de-activated or setup for use with other equipment. Example uses are:

- Replication of meter pulse inputs to Flow interfaces. (Meter pulse signals are made available for use by other equipment that may also require them).
- Control of other equipment (e.g., Closing a contact to drive a relay to supply power to a device. Closing a contact to drive a digital input of other equipment).
- Other options are available, related to date and time or some logger events.



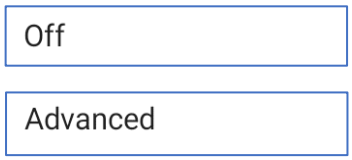
The top-level screen for setup of the logger Outputs can be reached by navigating:
Configure Device → Configure Outputs.



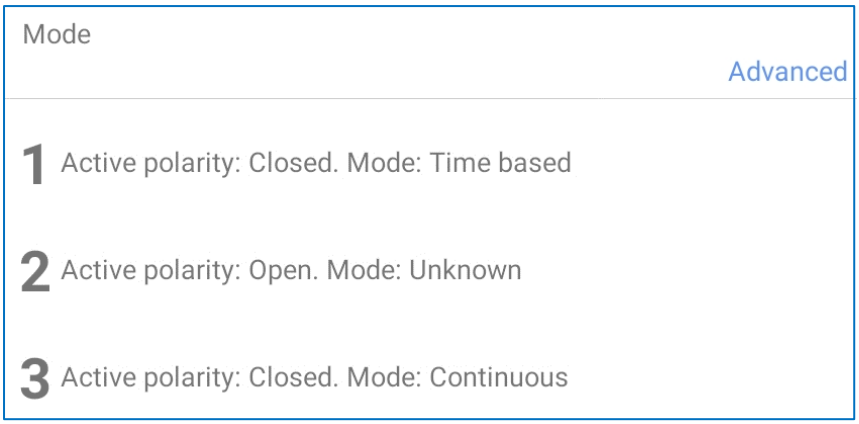
Tap on Configure Outputs to reach the 'Configure Outputs' screen.

The screen settings must be completed, starting from the top. The screen content (available settings) will vary, according to what settings are chosen.

First set ‘Mode’; this is the main selection.



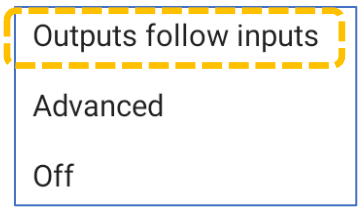
- If it is not required to use the logger outputs, set ‘Mode’ to ‘off’ (they will be disabled).
- If it is required to use logger outputs for a purpose (other than pulse replication), select ‘Advanced’.
- Refer to section 12.5.1 for outputs used for pulse replication.



Selecting ‘Advanced’ will list (and number) the available outputs.
A short summary of current settings is shown.

Setup options for each output are covered from section 12.5.2 onwards.

12.5.1 Outputs Follow Inputs (Pulse Replication)

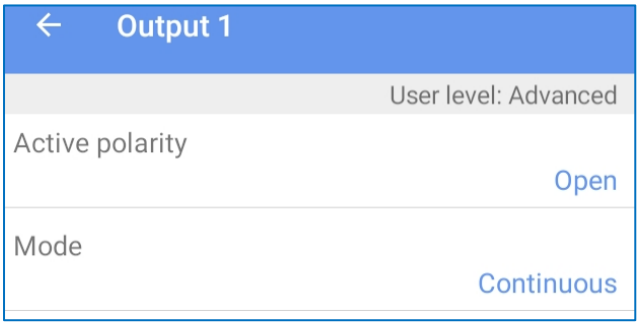


To enable meter pulse input replication (from Flow channels), select a Mode of ‘Outputs follow inputs’.
The setting applies to ‘Status Input’ type interfaces also.

Input 1 is replicated to Output 1
Input 2 is replicated to Output 2
Input 3 is replicated to Output 3 … etc.

(There is usually a limitation to this pattern. For example, the logger may support more inputs than available outputs. Refer to your logger user guide).

12.5.2 Continuous Output



Navigate to the ‘Configure Outputs’ screen and select the Mode to be ‘Advanced’.

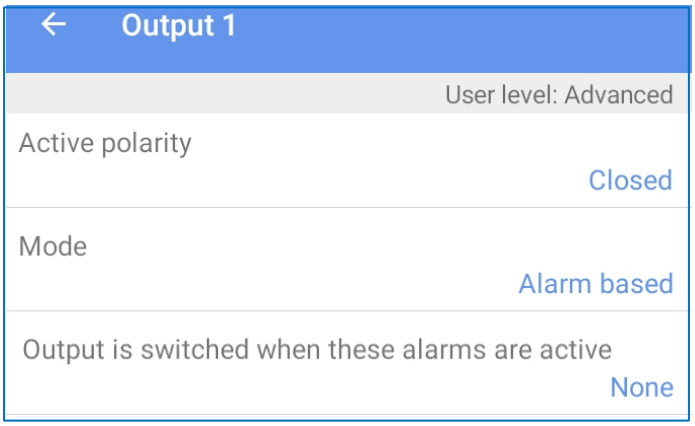
Then tap on the Output (numbered) that is to be set up.

Tap on the (second) ‘Mode’ control and select ‘Continuous’.

Next select the ‘Active polarity’ that is required (‘Open’ or ‘Closed’).

12.5.3 Alarm-based Output

Ensure that the Channel Alarms for the logger have first been set up.

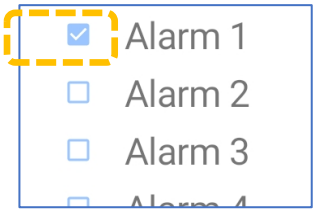


Navigate to the 'Configure Outputs' screen and select the Mode to be 'Advanced'. Then tap on the Output (numbered) that is to be set up.

Tap on the (second) 'Mode' control and select 'Alarm based'.

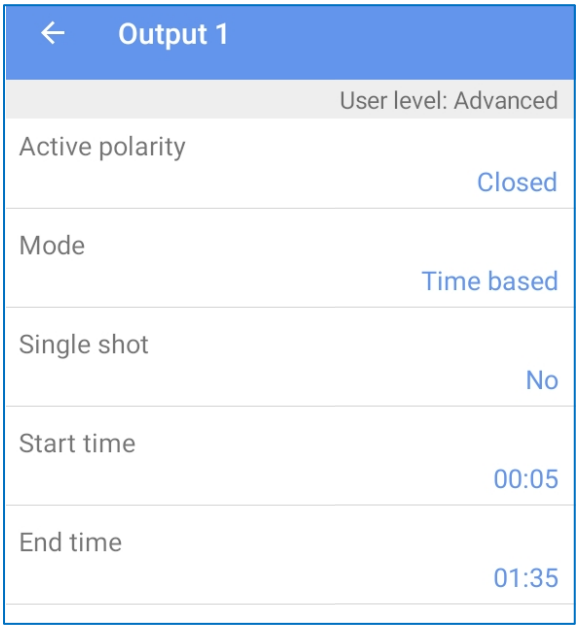
Next select the 'Active polarity' that is required ('Open' or 'Closed').

Tap on the 'Output is switched when these alarms are active' line.



Select which Channel Alarm(s) are to make this Output active, when they are in an active state.
(e.g., Alarm 1 is shown as being selected, opposite).

12.5.4 Time-based Output (Repeat Daily & Single-shot)



Navigate to the 'Configure Outputs' screen and select the Mode to be 'Advanced'. Then tap on the Output (numbered) that is to be set up.

Tap on the (second) 'Mode' control and select 'Time based'.

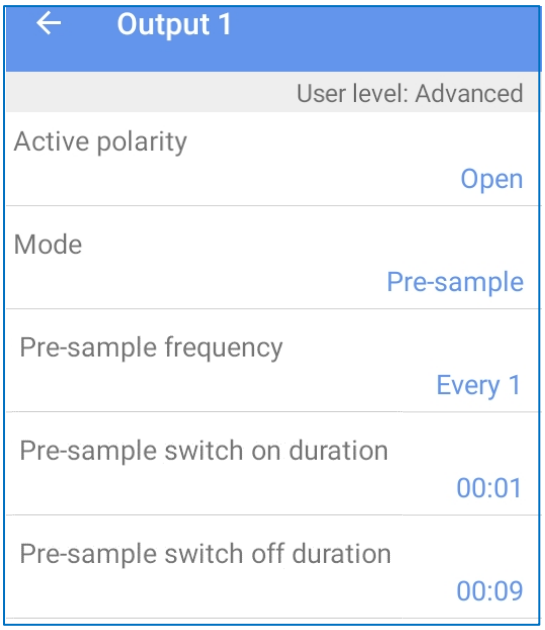
Next select the 'Active polarity' that is required ('Open' or 'Closed').

Tap on the 'Single shot' line.

- For daily repetitive switching of the output, select 'No'.
  Just start and end times will be required.
- For a one-time occurrence of switching of the output, select 'Yes'.
  Use the 'Start time' and 'End time' lines to enter the year, date, and time of when the output is to become active (and then again for when it becomes non-active).

12.5.5 Time-based Output (Pre and Post Measurement Times)

The logger can make an Output active at sample times (or more precisely, only Log times). Since sample times are of a minimal duration, the time the Output is made active can be extended by both a 'pre-sample duration' and a 'post-sample duration' time periods.



Navigate to the 'Configure Outputs' screen and select the Mode to be 'Advanced'. Then tap on the Output (numbered) that is to be set up.

Tap on the (second) 'Mode' control and select 'Pre-sample'; This gives the greatest control over the Output activation time.

Next select the 'Active polarity' that is required ('Open' or 'Closed').

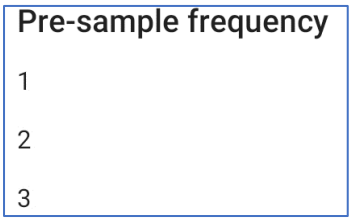
Tap on the 'Pre-sample frequency' line, and select 'Every 1' for activating the Output at around every sample (log) time.

Set the time periods required; Pre-sample and post-sample durations are available with this mode.

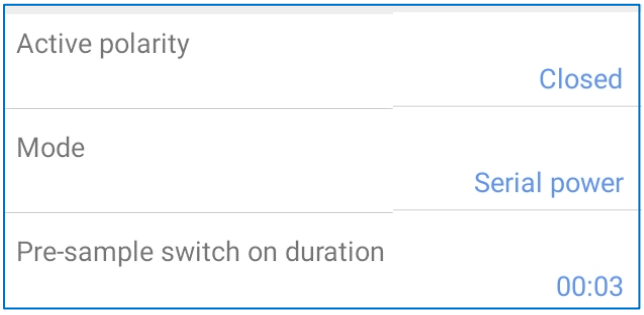
Note: The times are relative to the Logging time only (the time when data-points are made). Therefore, only "Spot" measurements can be applied to any input channels dependant of Output switching.

Example: Logging time of 00:05:00,
Pre-sample switch on duration set to 00:00:10,
Post Sample set to 00:00:05.

These settings will activate the Output ten seconds before the data is logged. It would be held active until 5 seconds afterwards. Then it would return to its inactive state.



If it should be required to activate the Output less frequently, it is possible to apply a frequency divider to the Output activation cycles.
(e.g., Selecting a pre-sample frequency of '3' will activate the output at every 3rd logging time).



A similar, but simpler, alternative is available, if a Mode of 'Serial Power' is selected.

Here, the Output is activated at every log sample. There is a pre-sample period, but not a post-sample period.

12.6 Outputs ('Group 3' Loggers)

(This Sub-section applies to 'Group 3' loggers only).

"Output" is a digital output signal (open / closed) supported by some logger models.

Where more than one channel is available, they will be available as separate output signals on the connector or cable.

IDT provides support for the setup of the logger for the following use of an output signal:

- Pulse replication of a digital flow meter (i.e., one which generates meter pulse outputs). (See section 12.7.2).
- General-purpose output signal that can be switched as the action part of a trigger-action logger setting. (See section 12.6.1).

12.6.1 Use of Status Output as part of a Trigger-Action

A Status Output can be used to control the activity of equipment external to the logger.

An example of use would be for the logger to monitor the water level of a channel and if it goes above a certain level (possibly indicating some spillage of wastewater into a river due to drains being overloaded), the output can be used to activate some water quality measuring equipment.

The trigger is set using data from an appropriate sensor. The action is set to drive the status output signal for a set time (e.g., see opposite).

12.7 Flow Input (from a Flow / Pulse Interface)

(This Sub-section applies to 'group 3' loggers only).

The interface known to IDT as "Pulse" may (where fitted) be labelled "Bi-Directional FLOW" or "Uni-Directional Flow" or similar. It may also be unlabelled except via inspection of the model-number of the logger (refer to the logger manual).

Note: "Pulse input" can be considered as the general-purpose name for the interface.
It can be known by additional (more specific) names when the function has been set within the logger setup.
A pair of pins (i.e., 2 pulse inputs) is normally presented on a single connector.
Each pin may be assigned a different use, or their use combined as a pair.

The interface is versatile and can be used for a variety of purposes. One such use is as a **Flow Input**. The interface supports a family of different types of Flow measurements, depending on the logger setup.

The interface is best considered as a pair of pulse input pins, since many Flow interface configurations require the use of two pins; others require just one pin. The two separate pins of a pulse input pair, however, are not necessarily equal in functionality. One of the pulse inputs (usually the odd numbered one, Pulse1, Pulse3 … etc) should be assigned a use first.

During setup of the odd-numbered pulse input, the logger determines how many pins are required to implement the chosen functionality. The even-numbed pulse input may be automatically seized by the logger for interfaces that require the two pins to be used together.

The interfaces that can be supported by a **single pulse input** (1 pin) are:

- Uni-directional Flow:
  Each open → closed transition of the input (from a meter) signals the flow of a set volume of a fluid. The rate of meter pulse arrival indicates the rate of fluid flow through the meter.
  The meter signalling gives no direction indication and is commonly used for uni-directional metering. For instance, uni-directional flow can indicate the consumption of a commodity (e.g., Water, Gas, or other fluids).

The interfaces that can be supported by **a pair of pulse inputs** (2 pins) are:

- Bi-directional Flow:
  Various systems of signalling can be used to indicate the flow of a set volume of a fluid and to specify the direction of flow (Forward or Reverse). The rate of meter pulse arrival (by various types of signalling) indicates the rate of fluid flow through the meter.
  The meter signalling includes direction information and is therefore used for situations that require 2-directional flow of fluid to be metered.

Note: Update of the logger firmware to the latest version is recommended.
If the user chooses to continue to operate a logger with firmware earlier than v3.0.0, then refer to the earlier version of this user guide (i.e., MAN-2000-0001-A) for a description of setup of the flow interface and its operation.
The setup method and selection choices are different, and the descriptions here do not apply.

Note: On some logger models, Status Inputs may share the same input electronics.
However, only one purpose can be assigned to a pin at any time.

Setup of a Flow interface can be summarised as follows:

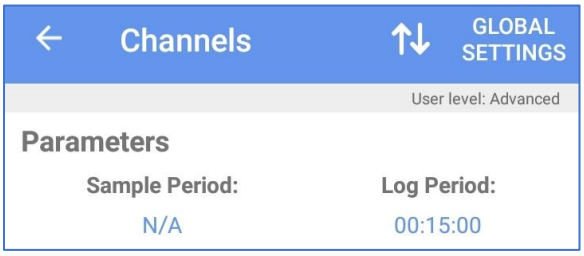
- Select the relevant Pulse interface for use.
  (For bi-directional meters this will require the setup of a specific pulse input of a pulse-input pair. For uni-directional meters, any input can be selected from the pulse input pair).
- Set the mode of the input (uni-directional or bi-directional).
- For bi-directional only:
  - Set the Pin Configuration / signalling.
  - Set the method of storing Flow results.
- Continue setting the channel in a manner similar to most other channels.

- Check that the sampling rate is suitable for the meter signals; adjust if needed. Unlike most other channels, a Flow (meter pulse detection) channel requires very frequent sampling of the input pins, so have an additional setting for timing.

Flow was introduced during an example earlier in the user-guide (see section 4.3). Here we will consider the channel setup in more detail…

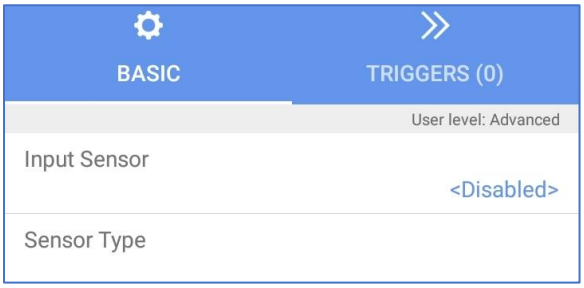
12.7.1 Flow Input Selection

To set up a new Flow (meter pulse input) channel:



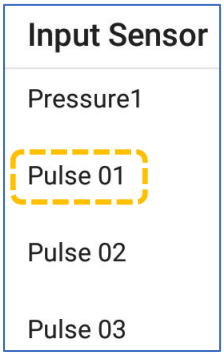
Go to the Channels screen.

Tap the " + " line to add a new channel.



Tap the "Input Sensor" line.

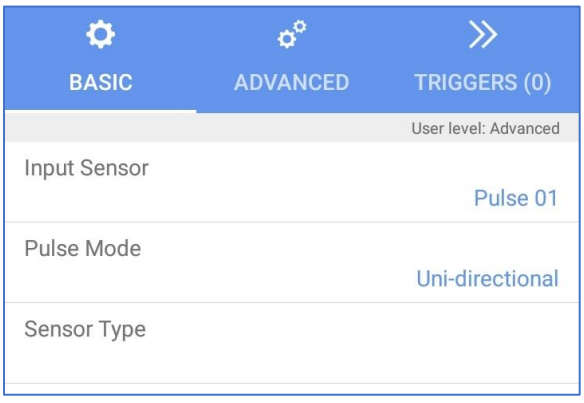
(Currently, it shows "<Disabled>"; it is unconfigured).



Select the required "Pulse (nn)" type interface from the list of interfaces.

If you are required to make an interface for a bi-directional meter, use an odd Pulse (nn) input (Pulse 01. Pulse 03, … etc).

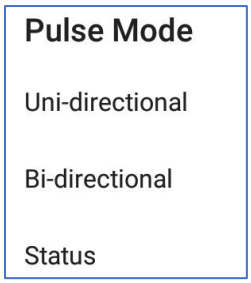
e.g., Tap on "pulse 01".



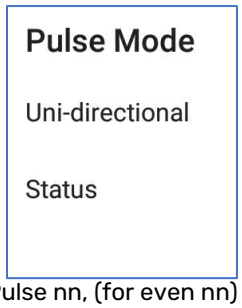
The selection is shown on the screen.

The "Pulse-Mode" setting may have defaulted to some value, which can be changed if required.

(An "Advanced" tab also now appears).



Pulse nn, (for odd nn)



Pulse nn, (for even nn)

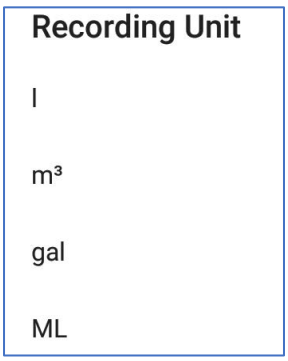
Next tap on the "Pulse Mode" line.

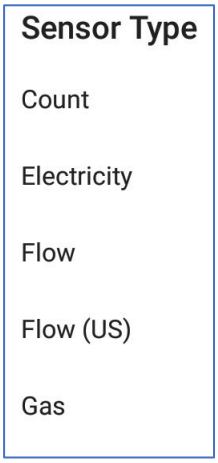
The shown options will vary according to whether an odd or even Pulse input is being set up.

Tap on the selection required.

e.g. For a uni-directional flow meter type interface, select "Uni-directional".

For a Pulse Mode of "Uni-directional" , , ,



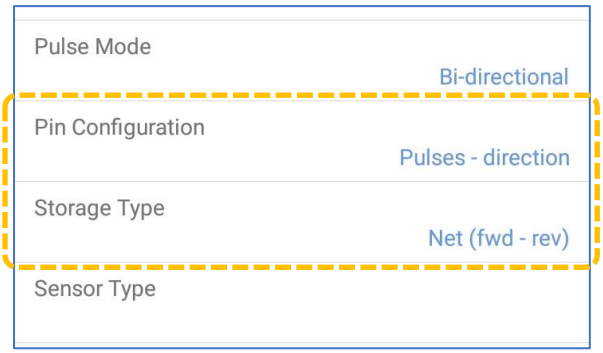


Tap on "Sensor Type" select the physical substance or characteristic which is being measured.

The selection here will determine the list of units of measure which are available to choose from later (i.e., the available recording units).

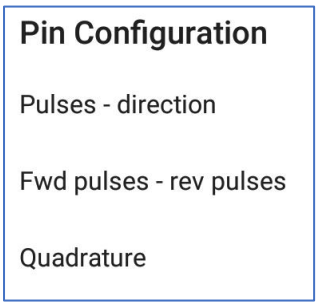
Continue setup by choosing a recording unit, etc; follow the guidance in section 4.3 (as required).

For a Pulse Mode of "Bi-directional" . . .



Further setting stages appear . . .

Tap on "Pin Configuration".



Select from the listed options.
(e.g., "Pulses – direction").

This sets the signalling protocol for the interface, and so must be set to match the meter that is being connected to the logger.

- Pulses – direction (Pulses & Direction signals)
  - The even pin (Pulse 02, Pulse 04, etc) acts as a direction indicator.

- The odd pin (Pulse 01, Pulse 03, etc) acts as a meter pulse to indicate a volume of the commodity has passed through the meter.

Note: The logger supports "net flow" for this type of interface signalling.
The logger can alternatively split the flow information into 2 separate datapoint streams (forward flow and reverse flow).

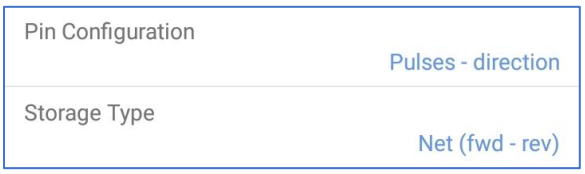
- Fwd pulses – rev pulses (Forward Pulses & Reverse Pulses)
  - The even pin (Pulse 02, Pulse 04, etc) acts as a meter pulse to indicate a volume of the commodity has passed through the meter in the Reverse direction.
  - The odd pin (Pulse 01, Pulse 03, etc) acts as a meter pulse to indicate a volume of the commodity has passed through the meter in the Forward direction.

Note: The logger supports "net flow" for this type of interface signalling.
If two separate datapoint streams (forward flow and reverse flow) are required, use two Uni-directional channels instead; the split into forwards and reverse flow directions is already done at the meter.

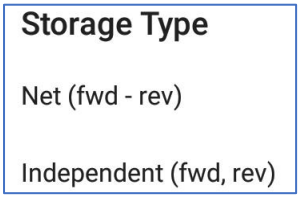
- Quadrature
  - The signalling is encoded in grey-scale binary.
  - Sequence 00 → 01 → 11 → 10 → 00 ;
    Each transition indicates *forward flow* through the meter.
  - Sequence 00 → 10 → 11 → 01 → 00 ;
    Each transition indicates reverse flow through the meter.

Note: The logger supports only "net flow" for this type of interface signalling.

When the Pin Configuration is set to: "Pulses – Direction":



Tap on "Storage Type".

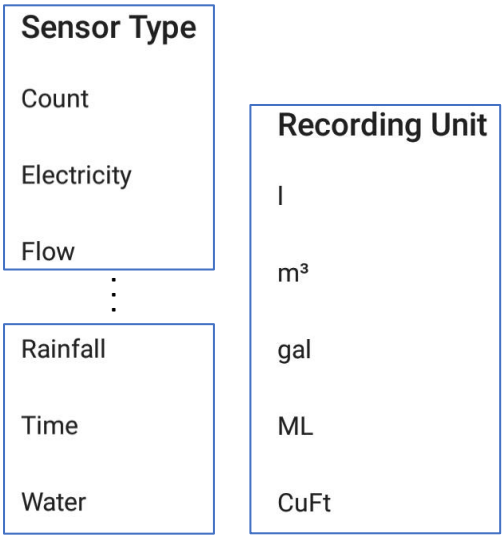


Then select from the listed options.
(e.g., "Net (fwd – rev)").
This sets the method used to produce and store channel datapoints.
(They are described below).

- Net (fwd – rev):
  - The logger keeps track of a forward and reverse consumption (flow pulses) using counters.
  - A single set of Flow Rate datapoints is added to the logger recording memory and is assigned to the channel number being set up.
  - The logger uses a Net Flow calculation to produce the datapoints.
    (Value recorded = Forward pulse count – Reverse pulse count
    … for new pulses obtained between each log period).

- Independent (fwd , rev)
    - The logger keeps track of a forward and reverse consumption (flow pulses) using counters.
    - Two sets of Flow Rate datapoints are added to the logger recording memory, one indicating the consumption in the forward direction and the other consumption in the reverse direction.
      … for new pulses obtained between each log period.
    - The Forward set of datapoints is assigned to the (odd) channel number being set up.
    - The Reverse set of datapoints is assigned to the (even) channel number immediately above the channel being set up.
      (It will be shaded grey when shown in IDT; There is no direct edit availability).

Tap on “Sensor Type”.



Select the physical substance or characteristic which is being measured.

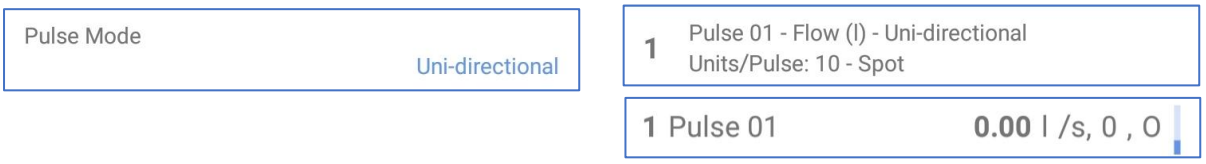
The selection made here will determine the list of units of measure which are available to choose from later (i.e., the available recording units).

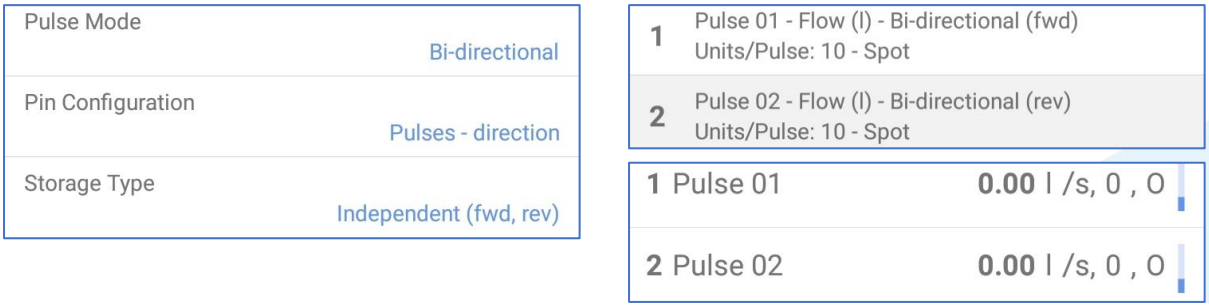
Continue setup by choosing a recording unit, etc; follow the guidance in section 4.3 (as required).

Typical Channel summary and Hardware Tests are shown below for the various options:

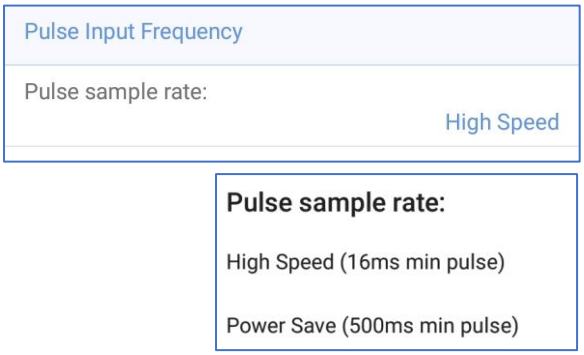
Formats: Flow value, unit, pulse count, pin state or
pulse count, pin state or
Flow value, unit, pulse count, pin state, pin direction or
Flow value, unit, pulse count, pin state, pin state.

Key: O = Open
X = Closed
<< = Reverse Direction
>> = Forward Direction.





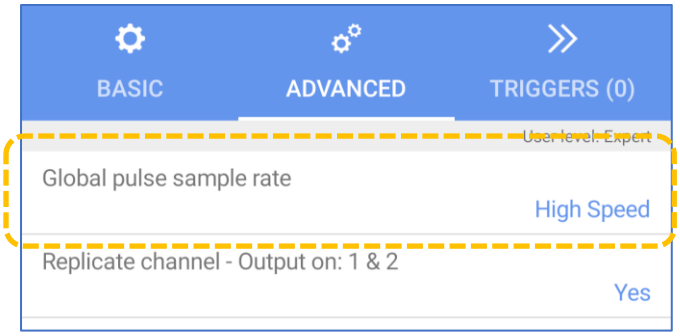
Pulse speed / Timing



Consideration should be given to the pulse speed of the meter in order to ensure the logger is set to sample the interface signal level quick enough to catch the pulses.

Refer to section 3.4 for details of how to check or adjust this timing parameter (see opposite).

Ensure the logger can capture pulses that are generated at the maximum expected meter output rate.



For convenience, the same setting is accessible within the "Advanced" tab of the setup of a Flow (pulse) interface.

Here, it is called "Global pulse sample rate".

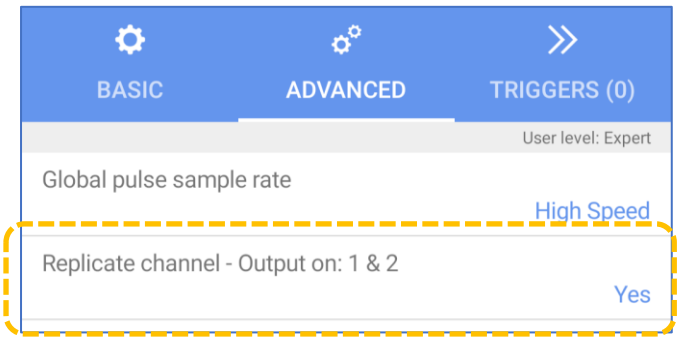
Note that the selection chosen will be applied to all Flow (pulse) channels.

12.7.2 Pulse Replication Output

Utility companies sometimes install several items of equipment that each require access to the meter output signals. One solution to this is for equipment to replicate the meter pulse signals that are input to them. The items of equipment can then be serially interconnected so that the pulse information is transferred from one unit to another.

It is possible to re-purpose a Status Output from certain loggers to replicate the meter pulse signals.

Select the logger Flow (Pulse) channel that uses the meter pulse signals as input.



In the channel configuration screen, select the Advanced tab.

If pulse replication is required set the control called "Replicate Channel – Output on: . . ." to "Yes"; this will activate the pulse replication.

The line lists the status outputs that are being used for the pulse replication. (One is required for a Uni-directional meter. Two are required for a Bi-directional meter).

Note: Not all loggers have this feature available.

Pulse replication may not be available for all pulse input channels. Check your logger user manual for any restrictions of pulse replication.

12.7.3 Tamper Alarm Sensor

Utility companies sometimes have items of equipment installed that are used for billing purposes (e.g., a gas meter). The logger may be used for automated meter reading purposes and must therefore always remain connected to the utility meter.

Utility companies can apply mechanical seals to bear witness to any attempt to tamper with the equipment. However, some loggers also have a facility of providing detection of a customer tamper attempt. Here, the inter-connecting cable between logger and meter is monitored electronically for any disconnection attempt (if the meter is compatible).

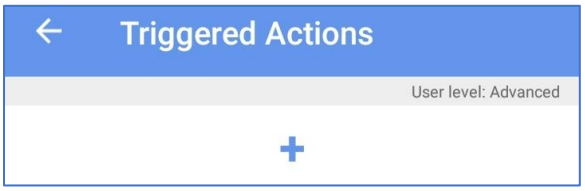
For loggers that support this facility, it is possible to use (re-purpose) a Flow (Pulse) Input to implement the tamper-detection. The pulse (tamper) input detects an electrical path (loop) is present when it is attached to the meter. If the cable is unplugged from the meter, the path no longer exists, and a tamper alarm can be indicated to the server.

Note: A single cable should include the meter pulse signals and the tamper detection signal, with both sharing the same connectors.

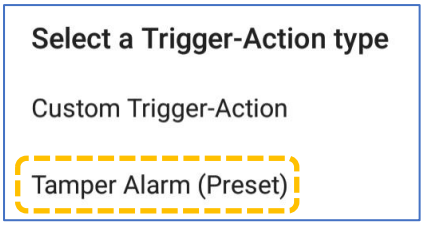
For loggers that are supplied with 2 pulse inputs per connector, the consequence is that the tamper detection feature is only available using a uni-directional flow channel (and is used at the expense of disabling the availability of the second flow channel within the interface).

To set up a sensor for Tamper alarm, first setup the Flow channel for use (see section 12.7.1) then follow the following steps:

From the main page, find the Triggered Actions control and tap on it.

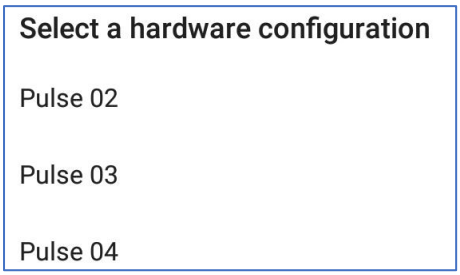


Tap on the "+" line to add a new Trigger-action combination.



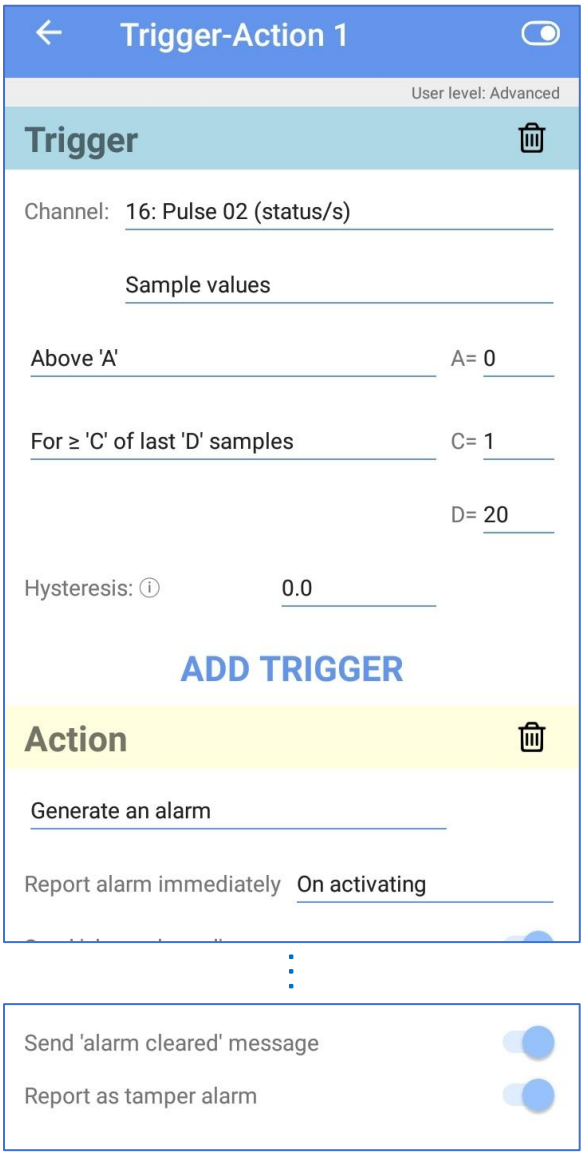
IDT has a facility to use a Tamper-Alarm pre-set to simplify its setup. Tap on this line.

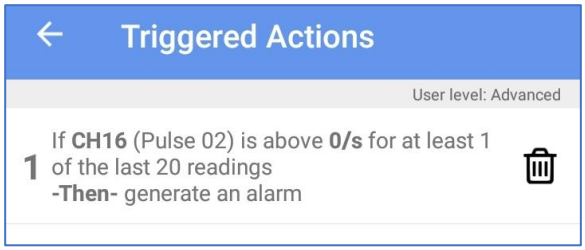
(Pre-sets can sometimes implement settings that the user may not have direct access to).

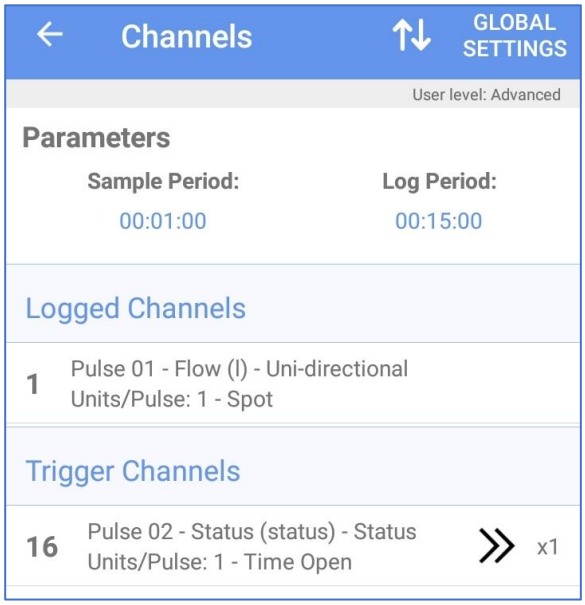


Next select the Pulse input pin that is to be used as the Tamper detection signal.

e.g., To protect a uni-directional Flow input set up using the Pulse 01 input, Pulse 02 should be chosen if it shares the same connector.







IDT will make several changes to logger settings to implement tamper detection along with the appropriate alarm.

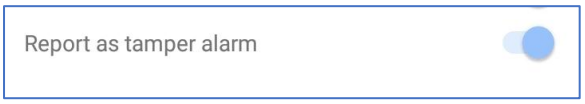
(Note: The illustrations opposite and above are for information only. The tamper detection has been implemented using the Pulse 02 input signal, monitoring time open, and triggering immediately when first seen.

It requires a compatible cable where Pulse 01 / Pulse 02 share the same connector; Pulse 02 input protects against removal of Pulse 01, which is the meter pulse input).

Note: Channel 16 is being used by the logger here. IDT chooses this “end channel number” to keep it separate from any channels that are in use for regular data-logging.

12.7.4 Tamper Alarm (Message Option)

It should be noted that the tamper detect facility described in section 12.7.3 is distinct from the ability to send a “report as tamper alarm” message, although they are intended to be used together.



The “Report as tamper alarm” option includes an additional message when sending the alarm to the server. It (if the server software supports) allows regular alarm conditions to be prioritised and handled differently to any tamper attempts.

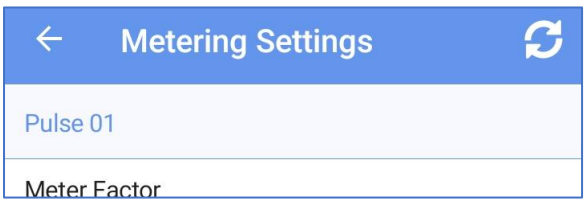
12.7.5 Meter Reading(s)

Digital Flow Interface channels are often used to track the usage of a commodity (e.g., of gas or electricity) supplied by a utility company. The commodity passes through an on-site meter, which can indicate consumption (use) by providing meter pulses. An initial meter reading has to be taken and entered into the logger to enable this feature. When the logger calls into the server with the flow measurements datapoints it can also include a calculated current meter reading.

From the main screen, locate the Metering settings control. (This includes a summary of all meter readings being monitored by the logger).

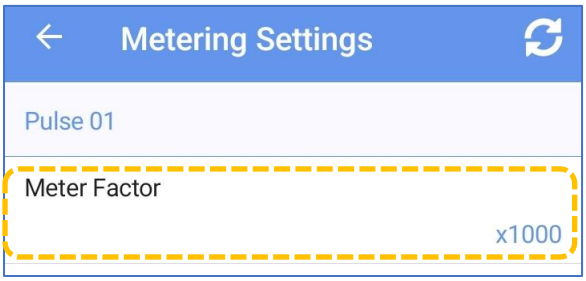
Tap on the “Metering Settings” line.

Read the main meter, noting its format.
(An example is shown opposite).



A list of the relevant interfaces is shown on the Metering Settings page.
The name may vary (Pulse, Flow-Uni, Flow-Bi, etc) according to which logger is connected to IDT.

$$\text{Meter factor} = \frac{\text{Unit of volume measurement used on the Meter for each digit.}}{\text{Unit of volume measurement used on the Flow channel.}}$$

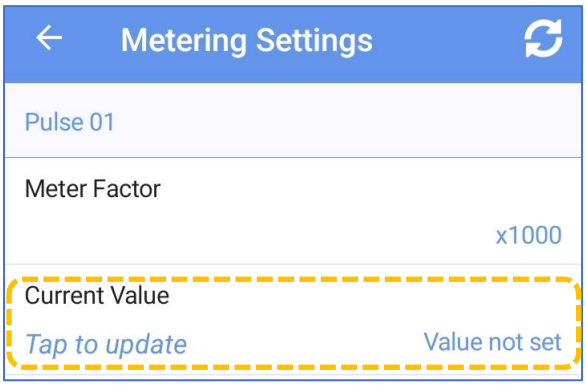


Calculate the meter factor (using formula shown above).

e.g. 1 digit for each m^3 (1000 litres).
Flow channel uses litres.

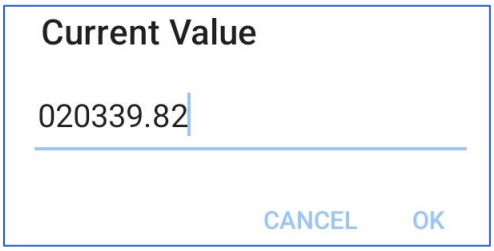
Meter factor therefore: 1000 / 1 = 1000.

Enter the meter factor.



A list of the relevant interfaces is shown on the Metering Settings page.
The name may vary (Pulse, Flow-Uni, Flow-Bi, etc) according to which logger is connected to IDT.

Tap on the “Current Value.” line for the logger interface connected to the meter.

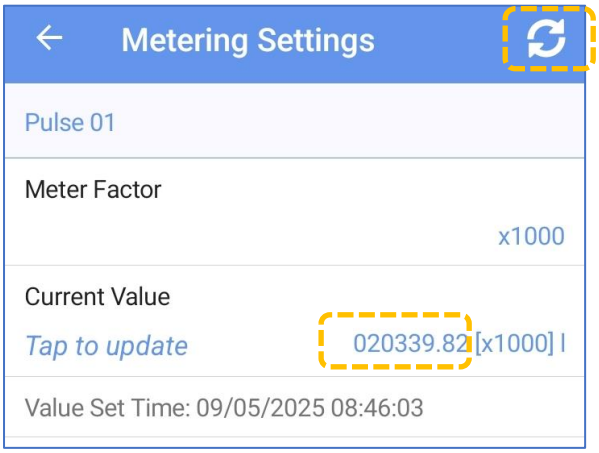


Next enter the meter reading.
(Include any leading zeros, the decimal point, and any other displayed digits).

The screen will update to show the meter reading that was entered. It also shows the time the meter reading was last entered into the logger.

(Note: The “Current Value” will show the calculated current meter value. This is not live but updated upon entering the “Metering Settings” screen).

Tap the back-arrow and the entered reading for Meter 1 is now shown in the meter summary. (This is not a live value).



You can confirm logger is set up correctly whilst in the Meter Settings screen by doing the following:

Wait for the display of the real meter to change by a few digits (must register at least one meter pulse).
Note the meter reading and tap on the Refresh control (arrows) at the top of the screen.
Confirm the logger’s “Current value” reading matches the meter reading (noted earlier).

If the reading is not correct, re-check:

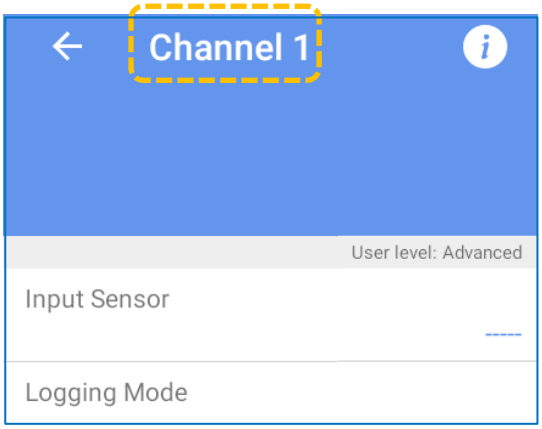
The cables go to the correct meter.
The meter factor is correct.
The channel settings (units/pulse and recording unit) are correct.
... and then repeat the test.

Where more than one Pulse / Flow channel is used for metering purposes, the meter reading entry page will show a section for each one. Make the settings (as above) for each meter in the relevant section. Then confirm the operation of each metering (calculated current value) is operating as expected, using the method described earlier.

12.8 Pressure Sensor Input (Using 'Group 1' Loggers)

12.8.1 Setup

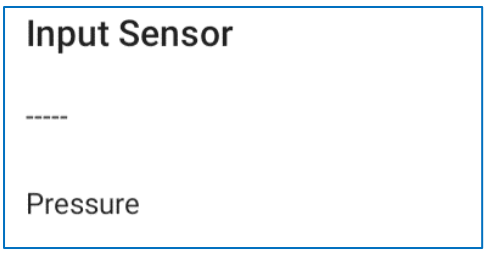
From the "Channels" page, tap on the " + " symbol to add the channel.



A channel number is allocated for the outgoing data stream, and a page is loaded with the current settings.

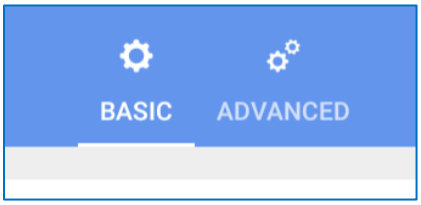
Initially there is no Input Sensor selected.
(Shown here as "-----", the channel is disabled).

To select an electrical interface for an input sensor, tap on the "Input Sensor" line.

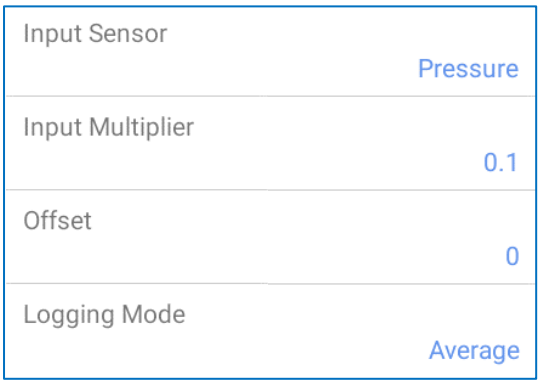


From the pop-up box, select which input to use for this channel.
(Here, the logger offers either to disable the input, or to use a "Pressure" sensor input).

Tap on the Pressure line to make the selection.



Continue channel set-up using the "Basic" tab.
However, certain sensors require additional settings or controls, which may cause other tabs to appear on the page, such as the "Advanced" tab (shown opposite); check for these.

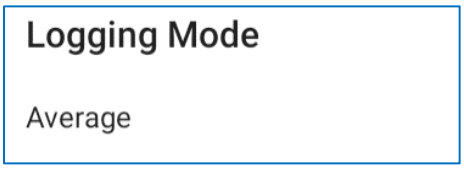


The input sensor of “Pressure” has now been selected.

Check the other fields before accepting the change.

The input multiplier field should be set to give your required unit of measure. (Refer to the logger user-guide for further information).

The offset for a pressure channel is usually “0”.

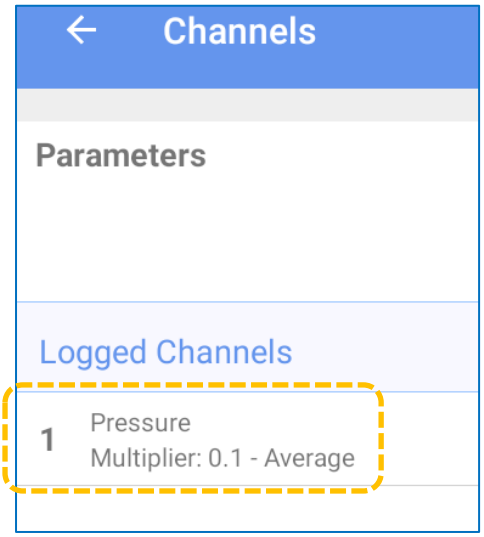


The Logging mode lists all available modes of operation on the channel for obtaining the datapoints.

Here, an “average” value of the sensor reading is the only available option.

Once the content of all the fields is correct, tap on the “accept” button to commit the changes to the logger.

IDT will take a few seconds to modify the program settings within the logger. It will then re-start the logger, so that the logger is making a new recording (because the operation of the channels has been changed).



Return to the Channels screen, and check that the channel is now present and has correct settings.

Note: Before using a pressure channel, be sure to re-zero the sensor. Refer to section 12.8.3.

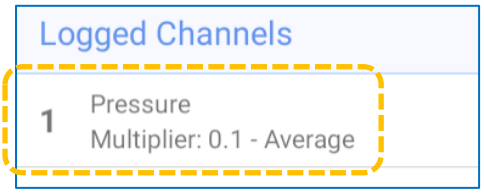
12.8.2 Calibration

Pressure transducers supplied with loggers listed in ‘Group 1’ are factory calibrated with the logger that they are supplied with. Any subsequent calibration must be made by an authorised service center.

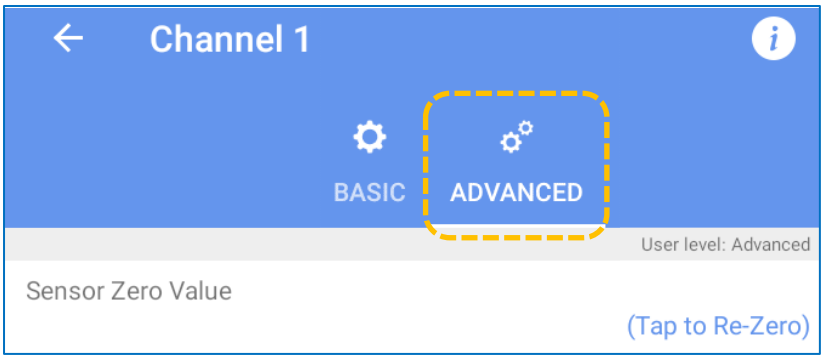
12.8.3 Re-Zeroing a Pressure Channel

IDT allows the user to re-zero the pressure channel to local atmospheric pressure prior to being used.

Note: Before proceeding, ensure that the pressure sensor has been removed from the measurement point and exposed to the local atmosphere.



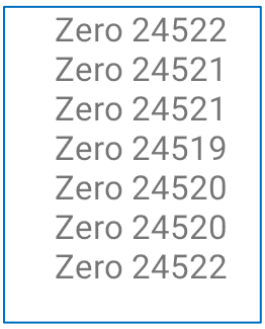
From the Channels page, tap on the Pressure channel that is to be re-zeroed.



Select the "Advanced" tab on the setup page of the channel.

When ready, tap on the "Sensor Zero Value" line.

Then tap on the "Start" button.



The screen will start making periodic measurements and will indicate a numeric (raw data) result.

Wait for the readings to stabilise.

Then tap on the Store button.
(This saves the last result as the pressure calibration 'zero' reference).

12.9 Pressure Sensor Input ('Groups 2 & 3' Loggers)

Your logger may have an "**Internal Pressure**" sensor fitted; 'Internal' indicates that the sensor is built-into the logger enclosure.

Your logger may have an "**External Pressure**" interface fitted. 'External' indicates that the sensor is attached to the logger via a cable.

The electronics of an *external* pressure sensor interface can be employed for other purposes, such as measuring depth or temperature (when used with a compatible cabled sensor). However, an *internal* pressure sensor is locked down so that it is only able to measure pressure. Therefore, the list of options presented during setup of internal and external pressure sensors will vary between the two types.

Depending on the type of sensor supplied, the interface to the sensor could be analogue or digital.

12.9.1 Setup of a Pressure Interface (Analogue)

This takes the form of an *analogue* interface which is compatible with certain analogue sensor transducers. Compatible sensors are available to measure:

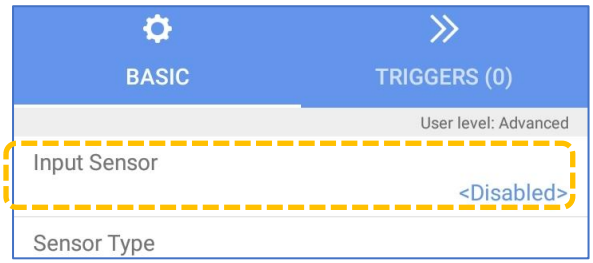
- Pressure of a fluid or gas.
- Depth of a fluid.

Pressure sensors connect to pressurised fluids within a pipe, at a measurement tap / access point. Depth sensors are installed at the bottom of a vessel and measure the depth of a fluid by also measuring pressure, which is related to the height of the fluid above the sensor.

'External' sensors are required to be calibrated with the logger prior to use.
Recalibration is required if sensors are replaced (or if swapped between logger connectors).

The IDT app gives access to the calibration settings as part of the channel setup, although the logger may optionally be set to default settings within the factory and calibrated with the sensor prior to shipping (logger and sensor are then shipped as a system).

12.9.1.1 Channel Setup (Pressure or Depth Measurement)

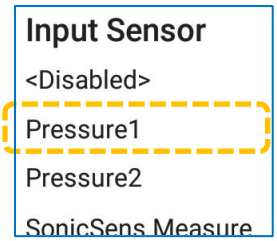


Pressure and Depth setups are very similar.

When creating a new channel for the sensor, initially there are two tabs displayed.

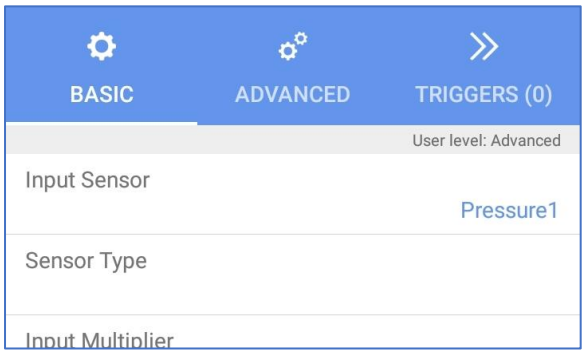
Select the "basic" tab.

Tap on the "Input Sensor" line.



Select the relevant interface by choosing "Pressure1"
(or "Pressure2" if you are setting up a second interface, if fitted, … etc.).

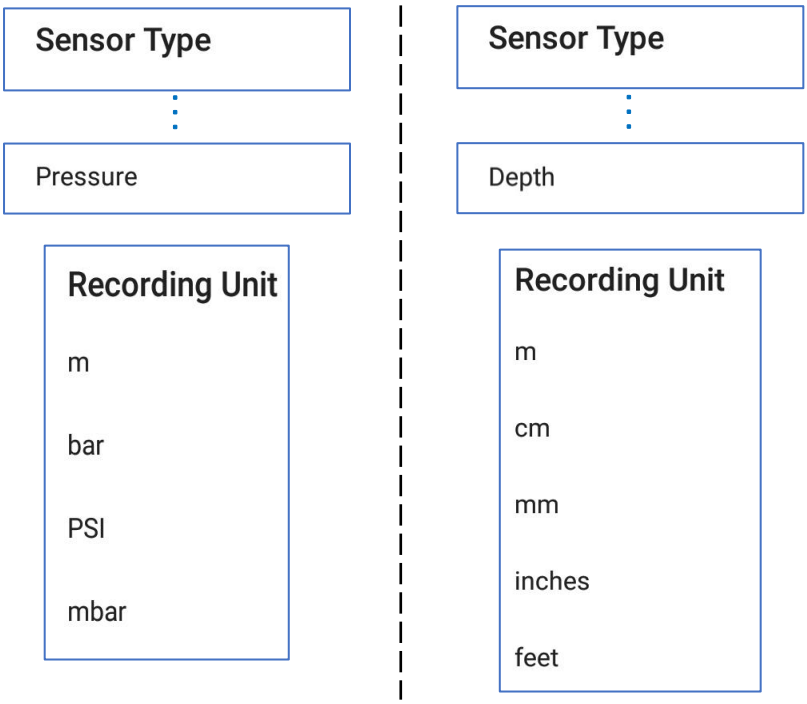
Note: This selection is also for sensors that measure fluid depth.



The screen shows the selected pressure channel.
In addition, it will now show an "advanced" tab.

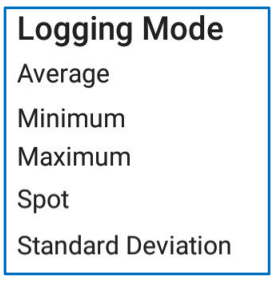
Tap on the Sensor Type line.

A list of physical parameters will be displayed.
(Many choices may be listed, as the setup of some other sensor types follow a similar process and use the same IDT screens).



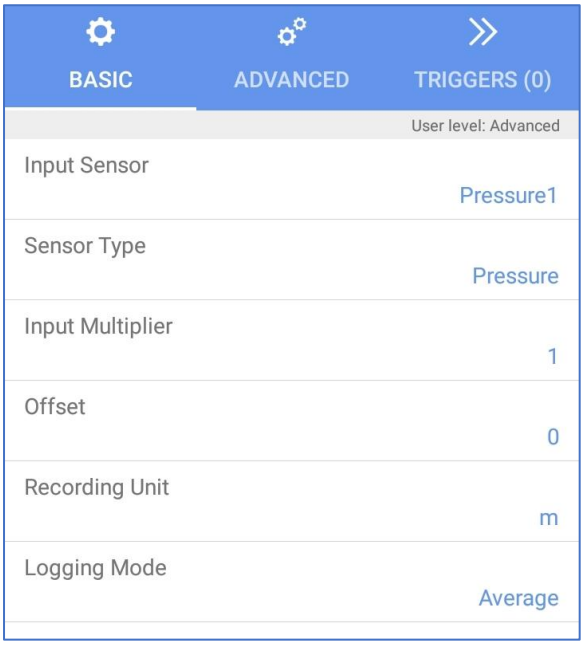
Select the physical parameter of "Pressure" or "Depth" from the displayed list.

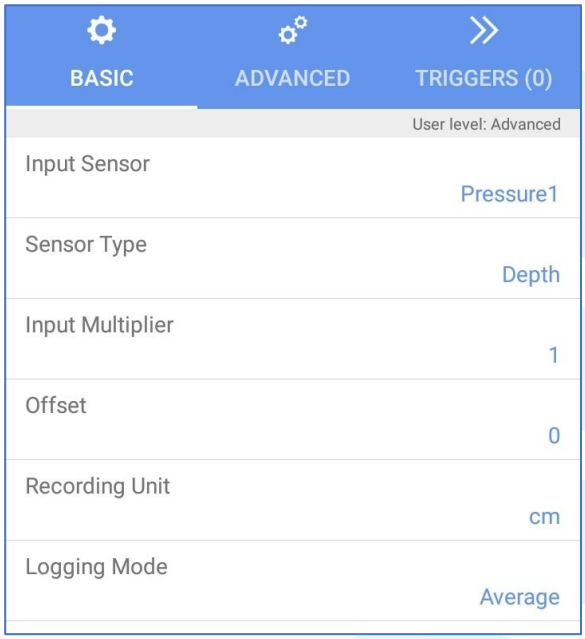
Tap on "Recording Unit" and then select the required unit of measure for the sensor data.



Tap on "Logging Mode" and then select the logging mode you require for producing the channel datapoints.

The completed channel setup screens (for pressure and depth) are shown below.





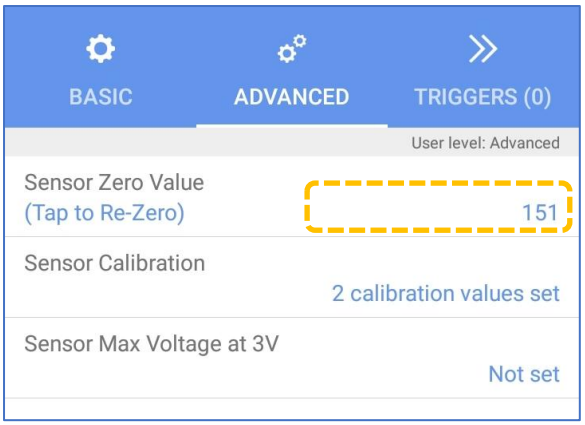
Usually, the Offset is left at “0”, as shown. The input multiplier and offset settings can be adjusted if required.

When finished, tap the “Accept” button to save the settings to the logger.

Note: The advanced tab includes controls to re-zero the pressure reading to local atmospheric pressure. (Refer to section 12.9.2).
It also includes access to calibration controls. (Refer to sections 14.2 and 14.3).

12.9.2 How to Re-Zero a Pressure Sensor to Local Atmospheric Pressure

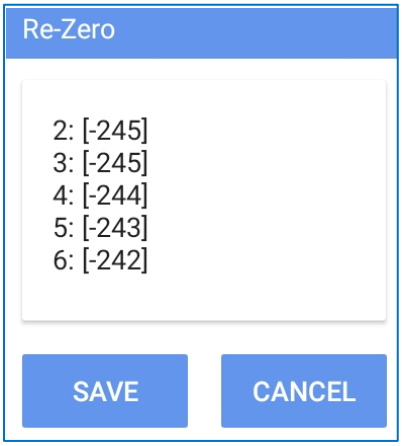
Pressure sensors supplied by HWM Global are often required to read the pressure relative to atmospheric pressure rather than absolute pressure. However, the local atmospheric pressure can vary according to the location of the installation. The user may therefore be required to re-zero the sensor to the local atmospheric pressure.



Important: The pressure sensor must be exposed to the local atmospheric pressure whilst making this setting.

Select the “Advanced” tab of the pressure channel configuration.

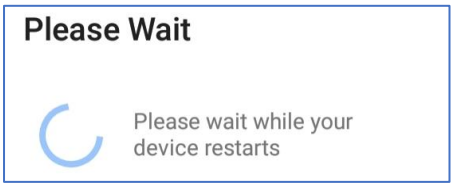
Tap on the “Sensor Zero Value” line.



A ‘Re-Zero’ information box will be displayed, which shows a series of readings made using the sensor.

Wait until the readings stabilise, and then tap on “Save” to accept the re-zero; The last of the listed results will be used as the new (internal reference) value for a pressure of “0” (relative to atmospheric pressure).

Note: If the readings do not stabilise, but show results that are varying significantly, it may indicate an issue with the sensor.



The logger may restart.

12.10 RTD (Temp) Interface - Temperature (Using 'Group 3' Loggers)

Your logger may have an "RTD (Temp)" interface fitted. This is an interface for use with analogue temperature sensors (RTD types); temperature dependant resistance.

Temperature sensors supplied by HWM Global will come complete with an attached cable and a connector suitable for the logger. The logger will also be supplied calibrated for use with the sensor.

Note: Other temperature sensors may be listed by IDT, such as those built into the logger or built into certain sensors (where temperature is not the primary purpose of the sensor).
This section does not cover the setup of any such equipment internal temperature sensors.

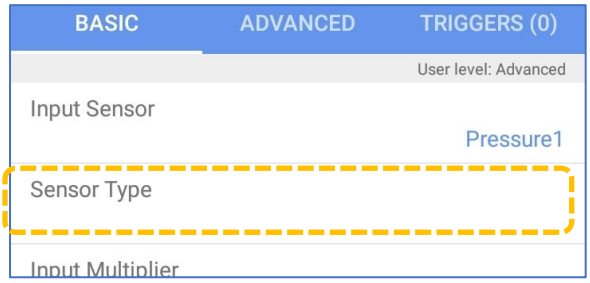
The interface for a temperature sensor will appear in the IDT app as a "Pressure" input sensor.
(The logger interface electronics and its driver may be multi-purpose, but in this case, it is wired and configured for use as a RTD temperature input, rather than a pressure input).

Temperature sensors must be calibrated with the logger prior to use. Recalibration is required if sensors are replaced (or if similar sensors are swapped between two similar logger connectors).

The IDT app gives access to the calibration settings as part of the channel setup (see section 14.4), although the logger may be set to default settings within the factory and calibrated with the supplied sensor prior to shipping.

For setup, proceed as follows:

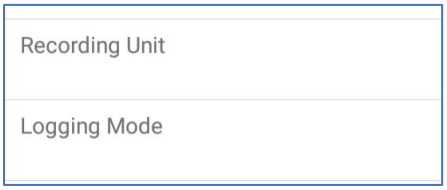
Follow the steps detailed in section 12.9.1.1, until the stage of entering a 'Sensor Type' is required.

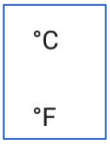


Then tap on the Sensor Type line.

A list of physical parameters will be displayed.
(Many choices are available.)

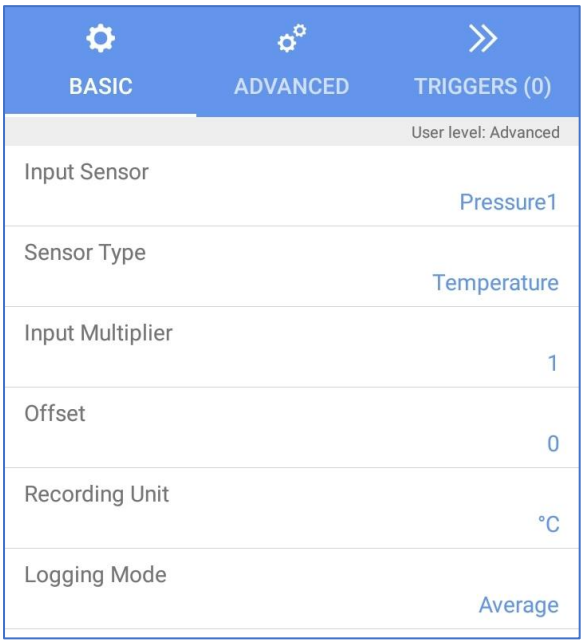
Select "Temperature" from the displayed list.





Tap on 'Recording Unit' and set to the required unit of measure. (Selections listed are now appropriate to temperature measurement).

Select the logging mode required for producing the channel datapoints.

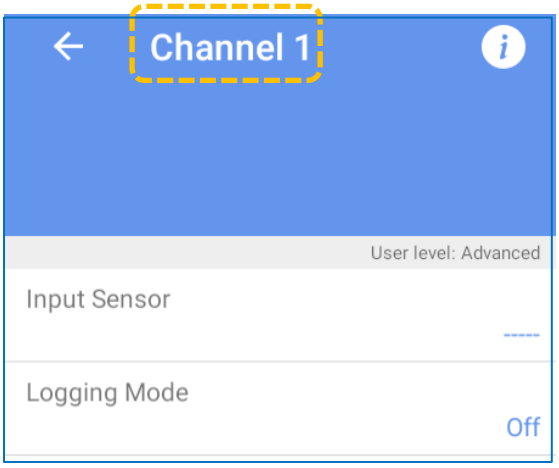


The input multiplier and offset settings can be adjusted if required but should usually be set as shown.

Tap the “Accept” button to save the settings to the logger.

12.11 4 – 20mA Input (Using ‘Group 1’ Loggers)

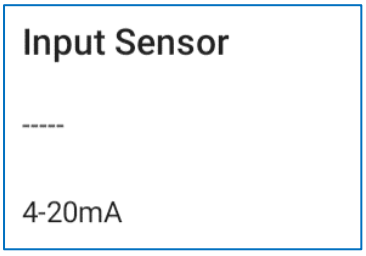
From the “Channels” page, tap on the “ + ” symbol. (The symbol is blue if a channel can be added, but grey if no further channels are available).



A channel number is allocated for the data stream, and a page is loaded with the current settings.

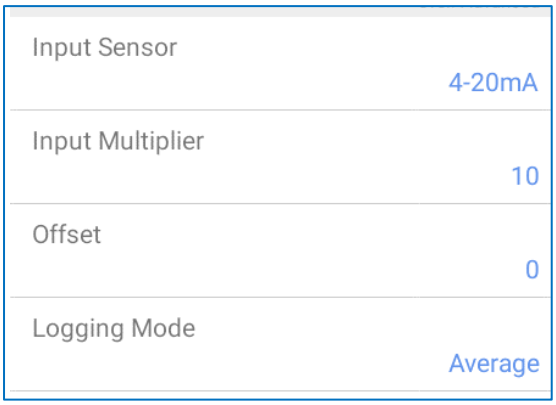
Initially there is no Input Sensor selected.
(Shown here as “-----“, the channel is disabled).

To select an electrical interface for an input sensor, tap on the “Input Sensor” line.



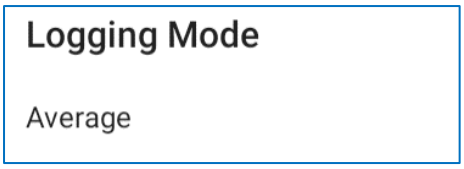
From the pop-up box, select which input to use for this channel.
(Here, the logger offers either to disable the input, or to use a “4 – 20mA” sensor input).

Tap on the 4 – 20mA line to make the selection.



The input sensor of “4 – 20mA” has now been selected.

Check the other fields before accepting the change. They should usually be set as shown in the diagram opposite.

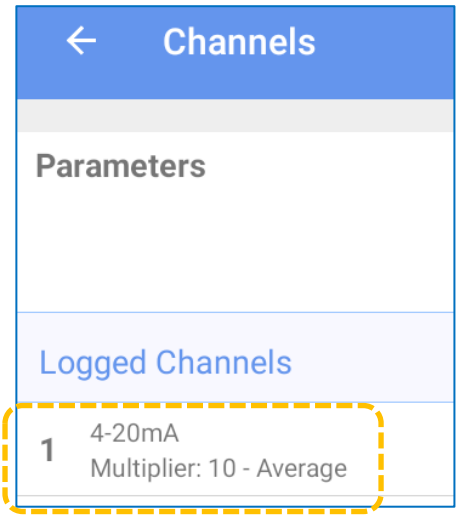


The Logging mode lists all available modes of operation on the channel for obtaining the datapoints.

Here, an “average” value of the pressure reading is the only available option.

Once the content of all the fields is correct, the “accept” button to commit the changes to the logger.

IDT will take a few seconds to modify the program settings within the logger. It will then re-start the logger, so the logger is making a new recording (because the operation of the channels has been changed).



Return to the Channels screen, and check that the channel is now present and has correct settings.

12.12 4 – 20mA Input (Passive or Active) (Using ‘Group 2 & 3’ Loggers)

Note: Setup of these interfaces for Group 3 loggers is described in this section.
Group 2 loggers have similar setup steps, but (at the time of writing) the IDT app does not fully support the setup of ‘Active’ 4-20mA interfaces on these logger types.

Your logger may have a ‘4 – 20mA’ interface fitted. This type of interface may be labelled as one of the following:

“Single Passive 4 – 20mA”, “4 – 20mA”, “Single Active 4 – 20mA”, “4 – 20mA Active”, “Dual Passive 4 – 20mA”, (… or similar).

Single and Dual refer to the quantity of inputs that are present in the logger connector. From an IDT perspective, one channel is required per current input. Dual inputs therefore require the setup of two channels.

These interfaces are used with sensors that provide an output signal using an analogue current which varies between 4mA and 20mA.

The logger is usually factory calibrated for a 0 to 20mA range. The IDT app also gives access to the calibration settings (as part of the channel setup) if re-calibration of the input should ever be required (see section 14.5).
Currents outside of the 4 - 20mA range usually indicate a fault condition (e.g., 0mA may indicate a broken sensor wire). (The logger can detect this fault condition as its current measuring range extends to below 0mA.)

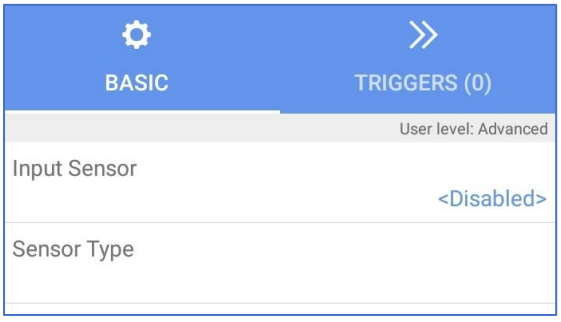
"**Passive** 4 – 20mA" interfaces, are for use with sensors that do not require power from the logger.

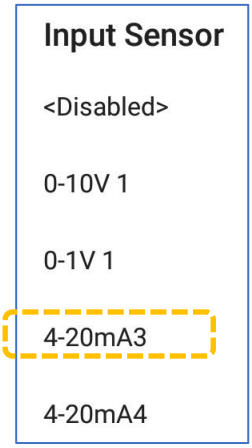
"**Active** 4 – 20mA" interfaces are for use with sensors that require power from the logger.
The logger is able to supply a limited amount of power for a short period of time (programable) whenever a measurement is required.

Pairing of a 4-20mA sensor to the logger requires setup of the following two aspects:

- Channel configuration for interpretation of the 4-20mA signalling.
- Consideration of the power requirements for the sensor.

Signalling:





When creating a new channel for the sensor, first select the "basic" tab. ('Triggers' tab is only shown on 'Group 3' loggers).

Tap on "Input Sensor" and then select the relevant interface by choosing the required "4 – 20mA (n)" sensor.

(Refer to the logger user guide regarding which selections apply to passive or active interfaces).

The screen shows the selected current input interface. (In addition, it will now show an "advanced" tab).

Two additional fields become visible, corresponding to the minimum and maximum valid signalling range of the sensor.
(i.e., The values when output is 4mA and 20mA).

Note: These are present when the interface has been calibrated using a base unit of "mA".
(Refer to section 14.5).

Tap on the "Sensor Type" line.

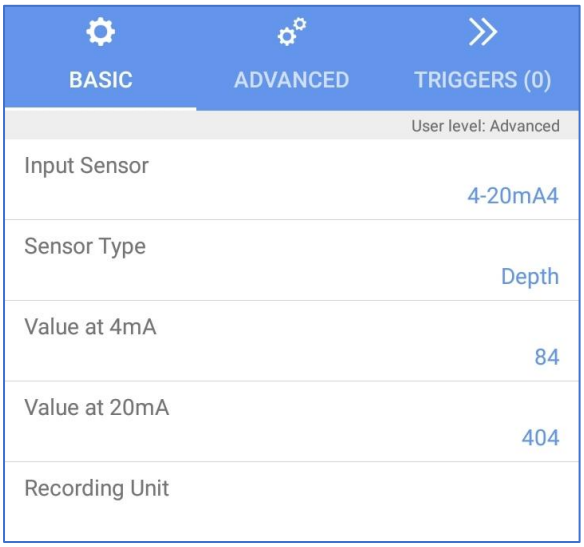
Sensor Type

Chlorine (Cl2)

CO2

Depth

Choose from the wide variety of physical parameters offered.
(The choice will affect the units of measure offered later in the setup.)
e.g., For a 4 – 20mA sensor which measures depth, select “Depth”.



The screen now shows the selected physical parameter to be measured by the channel, but the 4mA and 20mA values are not yet set.

Recording Unit

m

cm

mm

inches

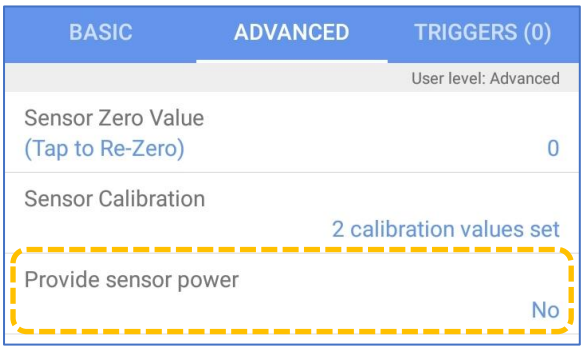
Tap on “Recording Unit”.
Select the unit of measure which is appropriate to the sensor output.

Refer to the sensor documentation and enter the values which correspond to the reference currents through the logger interface.
i.e., The “value at 4mA” and
the “value at 20mA”
in the example opposite.

Select the desired logging mode.

When finished, tap on “Accept”.

Power: (Group 3 loggers only)

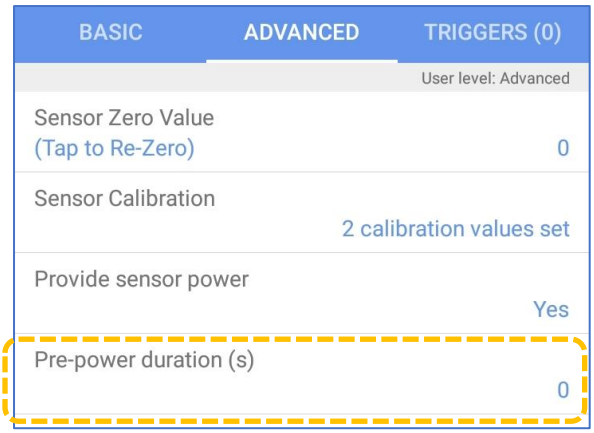


A sensor may depend on the logger as its source of power. If so, an *active* interface type is required.

For the "**Active**" 4 – 20mA interface, there are settings to control the power feed to the sensor:

Select the "Advanced" tab.

If the sensor requires power from the logger, tap on "Provide sensor power" and select "Yes".



Enter the required pre-measurement power duration; This allows the sensor to power up and may include a settling time.
(Refer to the sensor manual for guidance.)

Tap on the "Accept" button to save the settings.

When setup is complete:

The channel summary will indicate the settings (this will depend on the physical parameters that the sensor measures).

An IDT app hardware test of the 4 – 20mA sensor will indicate the sensor measurement in a similar way to that shown opposite.
(i.e., IDT will show an input current, rather than the physical parameter being measured by the sensor).

12.13 Voltage Input (0-1V and 0-10V) (Using 'Groups 2 & 3' Loggers)

Your logger may have a 'voltage' interface fitted. This type of interface may be labelled as one of the following:

"Single 0-1V", "Single 0-10V", "Dual 0-1V", "Dual 0-10V",
"0-1V Voltage", "0-10V Voltage" (… or similar).

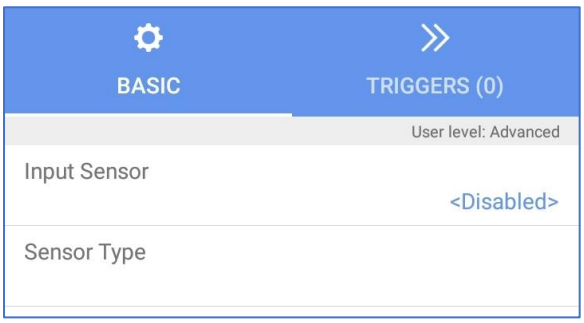
These interfaces are for use with sensors (not powered from the logger) that give an output signal in the form of an analogue voltage which varies in the 0-1V (or 0-10V) range.

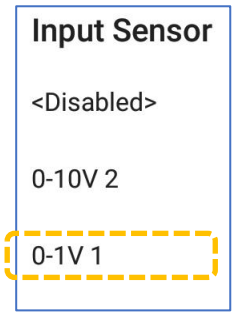
Although the logger measures a voltage, setup steps are available to guide the logger into re-interpreting the measured voltage into its true significance (i.e., Whatever measurement parameter the sensor is designed for).

Single and Dual refer to the quantity of inputs that are present in the logger connector. From an IDT perspective, one channel is required per input voltage.
Dual inputs therefore require the setup of two channels.

The logger is usually factory calibrated for the indicated voltage range. The IDT app also gives access to the calibration settings (as part of the channel setup) if re-calibration of the input should ever be required (see section 14.6).

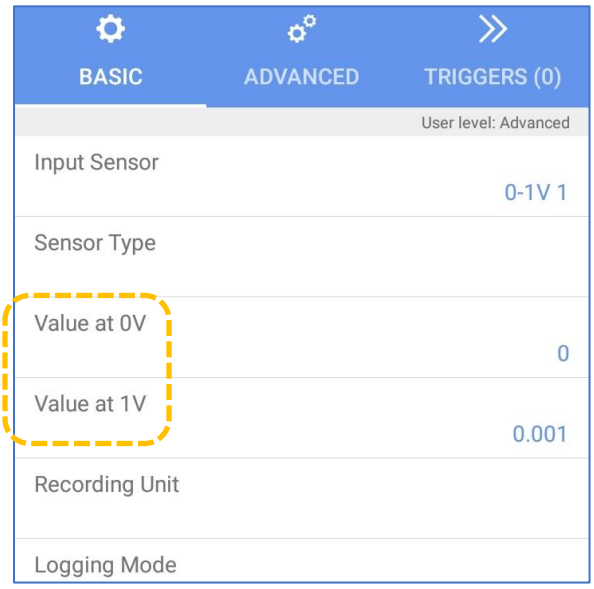
For setup, proceed as follows:





When creating a new channel for the sensor, first select the "basic" tab. ('Triggers' tab is only shown on 'Group 3' loggers).

Tap on "Input Sensor" and then select the relevant voltage interface.

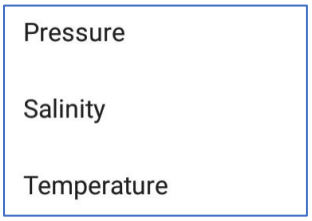


The screen shows the selected voltage input interface. In addition, it will now show an "advanced" tab.

Two additional fields become visible, corresponding to the minimum and maximum valid signalling range of the sensor.
(i.e., The values when output is 0V and 1V).

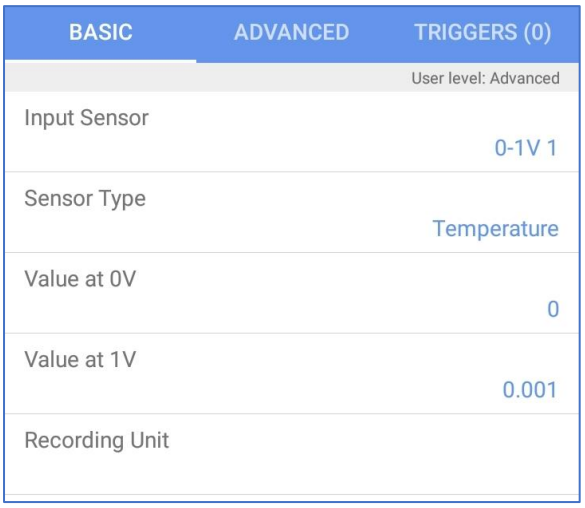
Note: These are present when the interface has been calibrated using a base unit of "volts". (Refer to section 14.6.)

Tap on the "Sensor Type" line.



Choose from the wide variety of physical parameters offered.
(The choice will affect the units of measure offered later in the setup.)

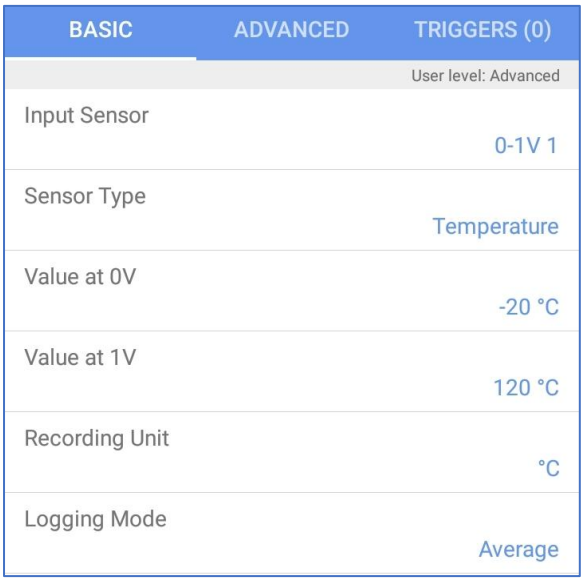
e.g., For a 0 to 1V sensor which measures temperature, select "Temperature".



The screen now shows the selected physical parameter being measured by the channel, but the 0V and 1V values are not yet set.

Tap on “Recording Unit”.

Select the unit of measure which is appropriate to the sensor output.



Refer to the documentation of the sensor and enter the values which correspond to the minimum and maximum voltage of the interface.

i.e., The “value at 0V” and
the “value at 1V”
in the example opposite.

Select the desired logging mode.

When finished, tap on “Accept” to save the settings.

Once the channel is saved, it is possible to select the ‘Advanced’ tab and re-zero the sensor, if it is appropriate for that sensor.

(e.g., A temperature probe measuring in degrees Centigrade can be placed in iced water, and re-zeroed. The re-zero applies to the interpretation value, not the underlying voltage measurement).

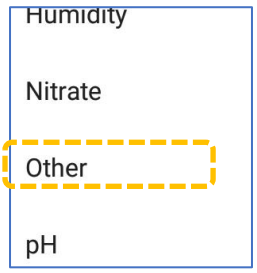
When setup of the logger voltage interface with the sensor is complete:

The channel summary will indicate the settings (this will depend on the physical parameters the sensor measures).

An IDT app hardware test of the 0-1V sensor will indicate the sensor measurement in a similar way to that shown opposite.

(i.e., IDT will show an input voltage, rather than the physical parameter being measured by the sensor).

12.14 New/Unknown types of Analogue Sensor (Using 'Group 2 & 3' Loggers)

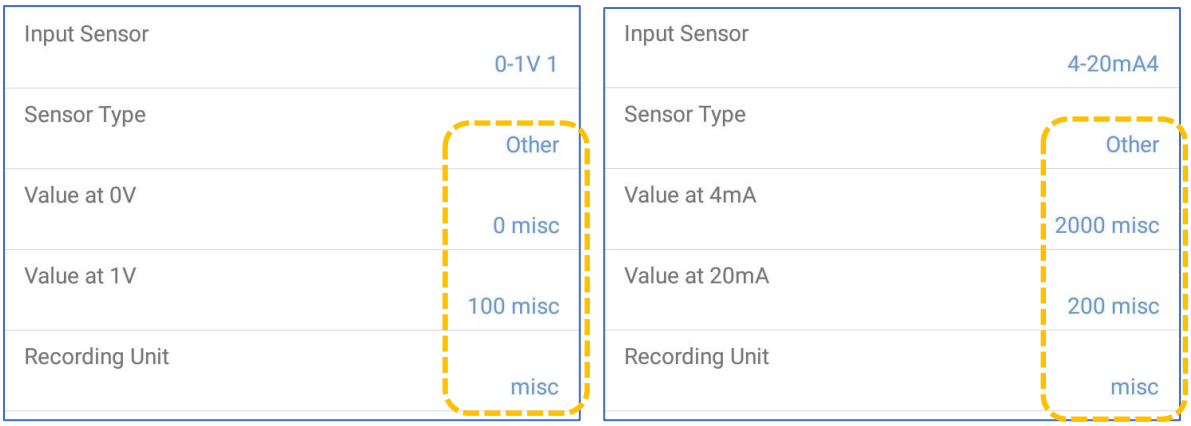


The loggers and IDT app support the measurement of a wide variety of physical properties on the analogue interfaces (voltage or 4-20mA inputs).

If a sensor measures a physical parameter that is not listed, it may be possible to support it by selecting "other" during channel setup, as shown below.

This is available for both 0-1V and 4-20mA inputs.

When none of the offered choices are suitable, select "Other"; this will use a unit of measure as "misc" as the recording unit. (The user must document elsewhere what "misc" represents, corresponding to the parameter measured by sensor).



12.15 SDI-12 Interface (Using 'Group 3' Loggers)

Some loggers may be fitted with an SDI-12 interface, with the ability to power the sensor from the logger (various voltages are available).

SDI-12 is a multidrop serial communications interface that is supported by various intelligent sensors as a means of exchanging information with another device, such as the logger. The sensor equipment attached to the logger can supply a single item or multiple items of measurement data to the logger.

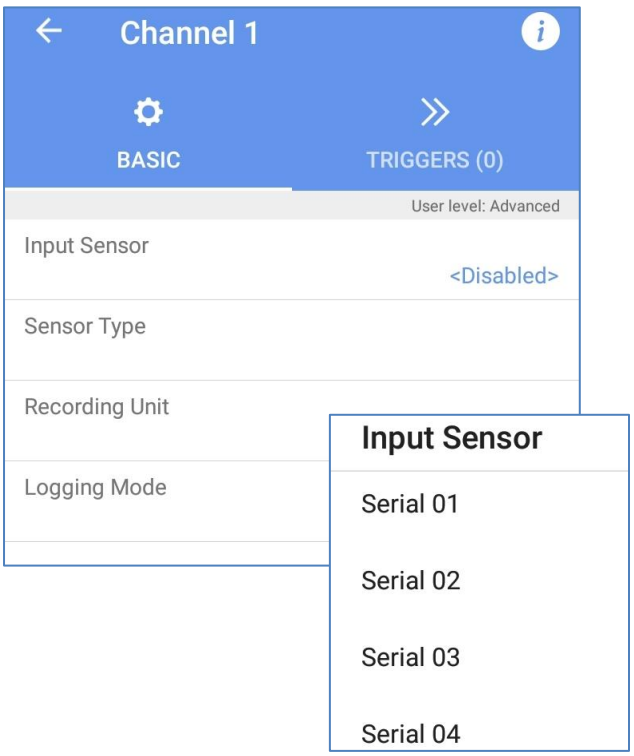
Some intelligent sensors have multiple connection options; use the SDI-12 option on the sensor when connecting to the logger SDI-12 interface.

Note: Study the manual for the sensor before proceeding to understand how it should be installed, how it presents data, and any other requirements (e.g., power).

HWM Global supplied sensors will include an appropriate connector for your logger and will have had interoperability testing to ensure the sensor and logger are compatible.

Where the logger is supplied without any pre-configuration for the sensor, setup proceeds as follows:

From the "Channels" page, tap on the " + " button to start setup of the interface for the sensor.



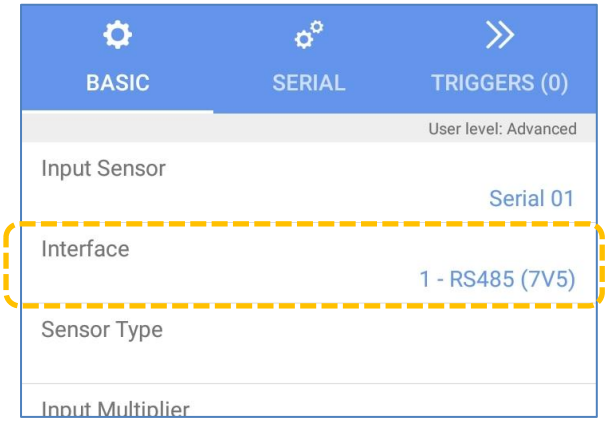
A channel setup screen will be shown with an available logger channel number allocated.

Initially, the channel will be disabled.

Tap on the input sensor line and choose one of the "Serial nn" options from the selection; it must be one that is not already in use.

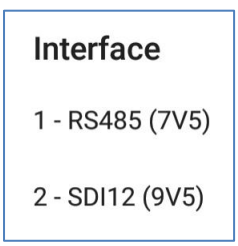
(e.g., Tap on Serial 01)

Note: Multiple "Serial nn" interfaces are provided by the logger.
An intelligent sensor can often produce more than one type of measurement.
The logger will need to extract each of the required measurements individually, using the SDI-12 link.
The logger uses a dedicated "Serial nn" selection for each of the required measurements; the data stream will occupy its own channel number in the logger's recording memory.



The chosen serial input is displayed as the input sensor.
A "SERIAL" tab is also added to the page.

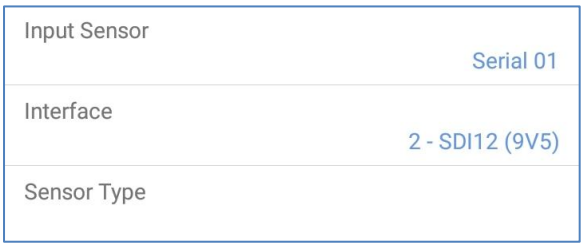
For loggers that have more than one interface fitted (of the type SDI-12 or RS485), the screen will also show an "Interface" selection line.



Tap on the Interface line to select the interface (connector) being used, (If required).

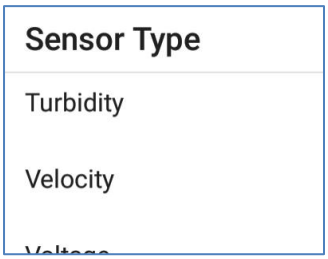
Select an SDI-12 interface.

Note: Check the voltage is appropriate for the sensor that is being attached. (The voltage may also be shown on the logger label for the connector).

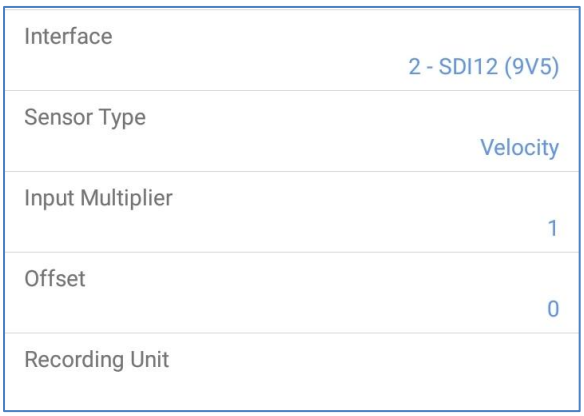


The SDI-12 interface is selected and displayed.
(Only where more than one option exists).

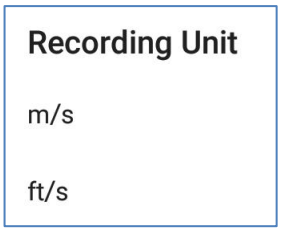
Next tap on Sensor Type.



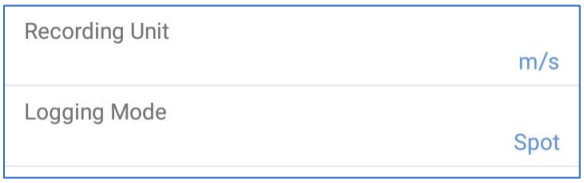
Select from the list the physical parameter which is being measured.
e.g., For a sensor which measures velocity of water, select “Velocity”.



The Sensor type is set to the chosen parameter.



Next. tap on “Recording Unit” and set an appropriate unit of measure.
(Refer to the sensor manual for the units of measure employed).

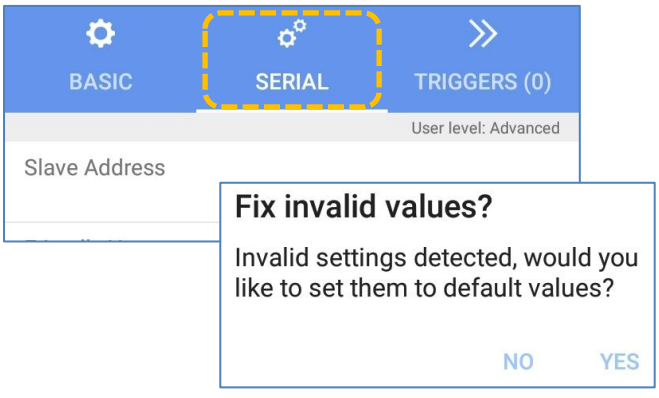


The chosen recording unit is displayed.
Set the input multiplier as required
(see Discussion below).

Note: SDI-12 always returns an ASCII format number which includes a decimal point.
The Input multiplier shown here is not strictly a number multiplier; Instead, it sets the resolution of the data. (Refer also to the notes and illustration of hardware test results at the end of section 12.16).

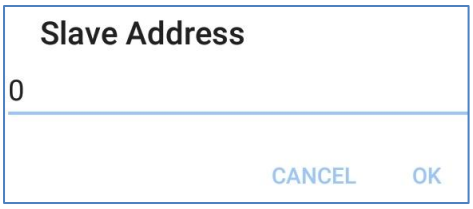
Tap on “Logging Mode” and select according to your requirements (e.g., Spot).

Check the settings on the screen and then tap on “Accept” to save the settings to the logger.



Next, select the “SERIAL” tab.
If a “Fix invalid values” message appears, tap on “Yes”.
(This may occur if, for example, IDT has detected blank values in fields on this page. IDT will fill the fields with some default settings. The user can then modify whatever settings need to change).

Tap on “Slave Address”.



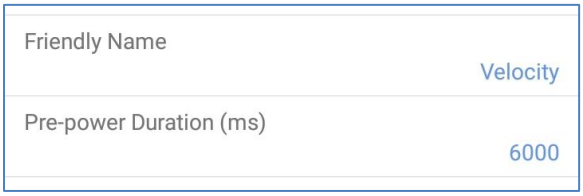
The “Slave Address” should be set to the current address of the sensor. The logger supports addresses in the single digit range (i.e., 0 ~ 9).

The default address for most SDI sensors is “0”, but some sensors may be required to be set to a different address.

Note: If more than one piece of equipment is attached to an SDI-12 bus, each must be set to a different address. For instructions of how to set the address within each piece of equipment, refer to its documentation.

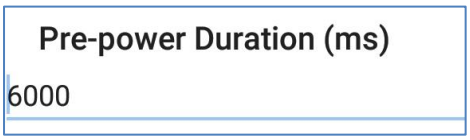
The chosen address is displayed.

IDT suggests a “Friendly name” based on the measurement parameter. This can be changed if required.



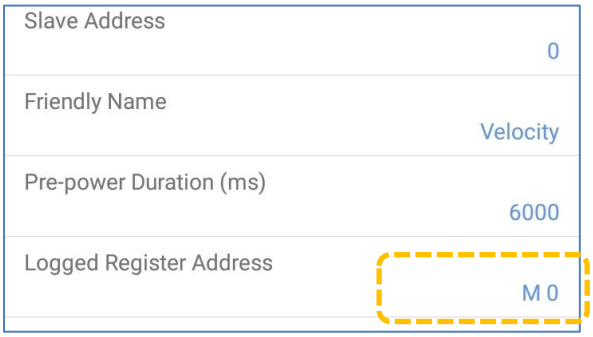
The logger usually only provides power to the sensor when it requires a measurement to be taken. However, most intelligent sensors require power to be applied for a minimum time, in order to set up and complete the measurement cycle and for any related communications.

This time period (plus some small margin) must be entered into the “Pre-power Duration” field.



Tap on the line and enter the required pre-power duration value. (This can be 0 to 63750 in 250ms steps).

Refer to your sensor manual for guidance.



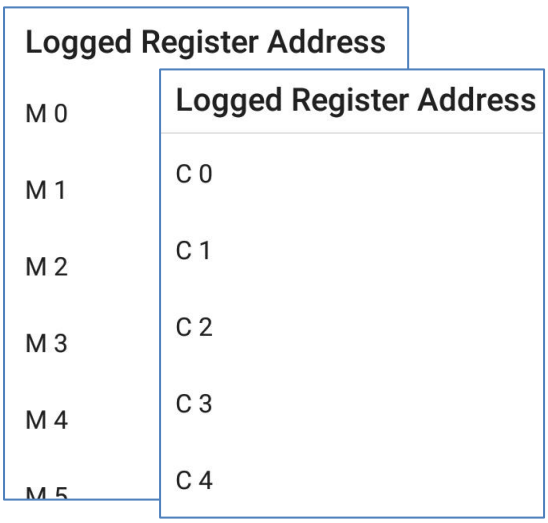
The logger must send a command to the SDI-12 sensor to initiate a measurement cycle.

This is typically achieved by the logger issuing a “M” type of command to the sensor (in the range of M0 to M9).

Following receipt of the command, the sensor will initiate the measurement and reply cycle.

Most SDI-12 sensors require only a M0 command. This will return a set of measurement data. More complex sensor equipment may arrange its data in groups and send a different set of measurement data according to which M command is sent.

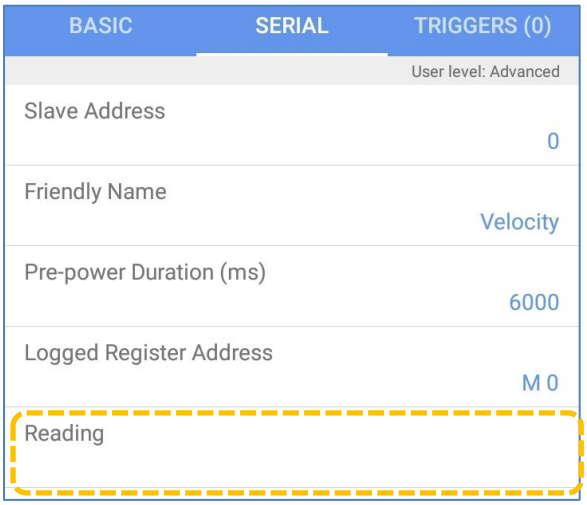
The sensor indicates when data will be available (by providing an initial acknowledgement response to the logger, which includes the measurement delay). The logger waits, and then automatically fetches the data until the transfer is completed (it makes data transfer requests using a series of D commands).

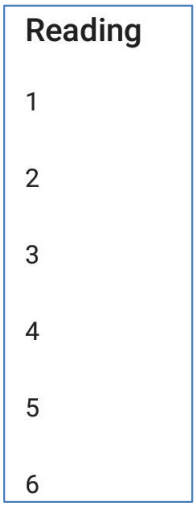


Tap on the “Logged Register Address” line and pick from the selection of available commands.

Refer to the sensor manual for the specific command needed by the sensor.

Refer also to the SDI-12 specification for more details of the protocol.

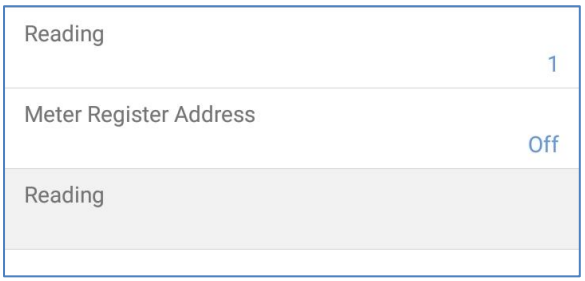




The sensor may send a block of data with many different measurement results enclosed.

It is necessary to pick out (index) the measurement that is required.
This is done by entering a “Reading” value (to index which result is required for the logger recording).

e.g. A sensor using SDI-12 provides a block of data in its reply in the following sequence:
Velocity, Direction, Temperature.
… To select “Velocity”, choose a “Reading” index value of “1”.

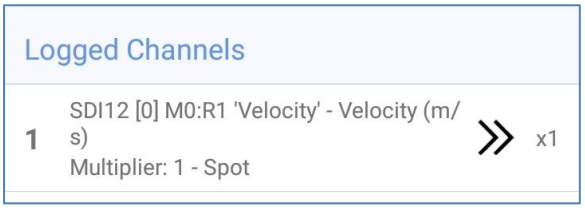


The reading index value is displayed.

Note: The section regarding “Meter Register Address” is rarely used and usually be left as shown.
(It is provided only for flow sensors which include providing access to meter reading values over the SDI-12 link).

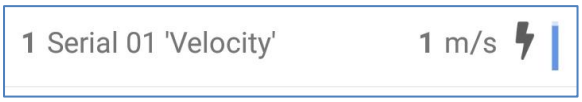
Tap on “Accept” to save the changes to the logger.

Note: Repeat the setup process for any additional parameters required from the sensor.
Use a different serial channel for each required measurement.



A typical summary configuration of the SDI channel setup is shown opposite.

(A trigger-action has also been set up, in the shown example).



During Hardware test the SDI-12 channel will typically be displayed as shown opposite.

12.16 RS485 / MODBUS Interface (Using 'Group 3' Loggers)

Some loggers may be fitted with an RS485 / MODBUS interface, *with the ability to power the sensor* from the logger (various voltages are available). Some loggers may have an RS485 / MODBUS interface, but *without the ability to power the sensor*. (Refer to the logger user guide).

RS485 is a multidrop serial communications interface that is supported by various intelligent sensors as a means of exchanging information with another device, such as the logger. The sensor equipment attached to the logger can supply a single item or multiple items of measurement data to the logger.

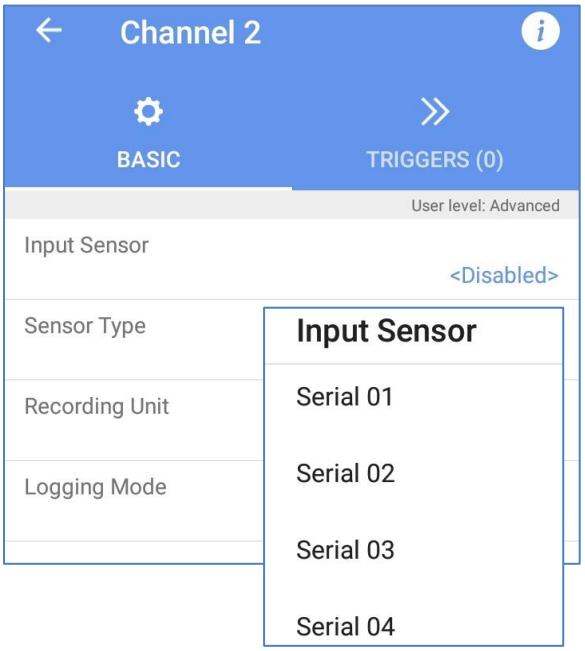
Some intelligent sensors have multiple connection options; Be sure to use the RS485 connection option when connecting to the logger RS485 / MODBUS interface.

Note: Study the sensor manual before proceeding to understand how it should be installed, how it presents data, and any other requirements (e.g., power).

HWM Global supplied sensors will be supplied with an appropriate connector for your logger and will have had interoperability testing to ensure the sensor and logger are compatible.

Where the logger is supplied without any pre-configuration for the sensor, setup proceeds as follows:

From the "Channels" page, tap on the " + " button to start setup of the interface for the sensor.



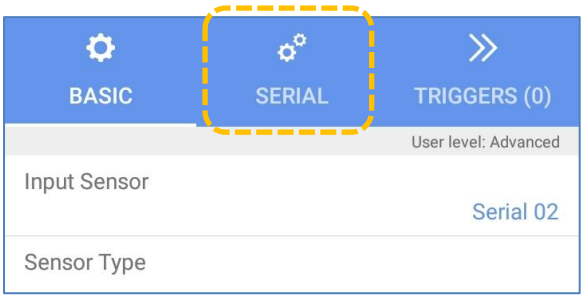
A channel setup screen will be shown with an available logger channel number allocated.

Initially, the channel will be disabled.

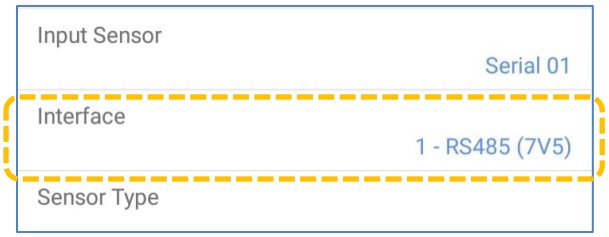
Tap on the input sensor line and choose one of the "Serial nn" options from the selection; it must be one that is not already in use.

(e.g., Tap on Serial 01)

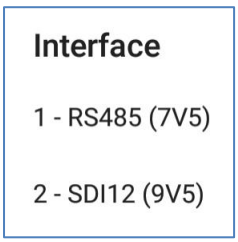
Note: Multiple "Serial nn" interfaces are provided by the logger.
An intelligent sensor can often produce more than one type of measurement.
The logger will need to extract each of the required measurements individually, using the RS485/MODBUS link.
The logger uses a dedicated "Serial nn" selection for each of the required measurements; the data stream will occupy its own channel number in the logger's recording memory.



The chosen serial input is displayed as the input sensor. A “SERIAL” tab is also added to the page.



For loggers that have more than one interface fitted (of the type SDI-12 or RS485), the screen will also show an “Interface” selection line.

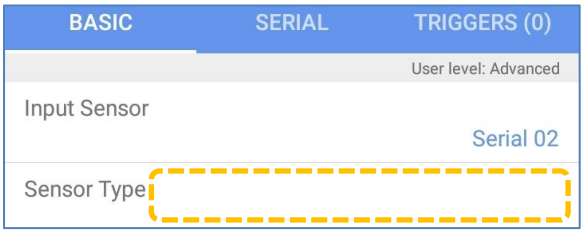


Tap on the Interface line to select the interface (connector) being used, (If required).

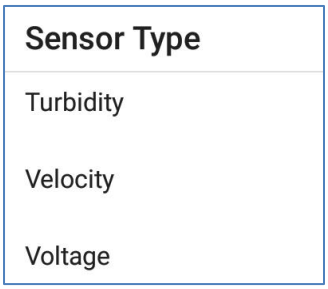
Select an RS485 interface.

Note: Check the voltage is appropriate for the sensor that is being attached. (The voltage may also be shown on the logger label for the connector).

The chosen RS485 interface is displayed.

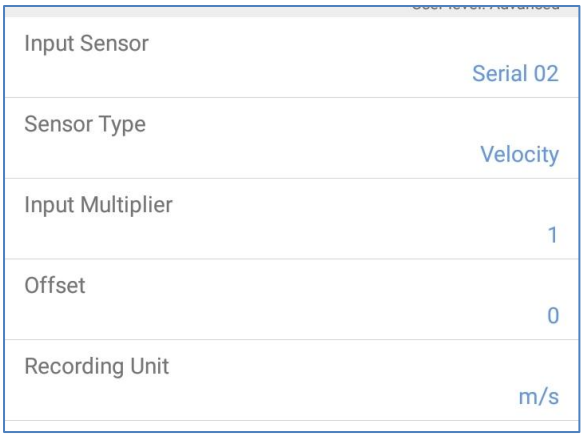


Next tap on Sensor Type.



Select from the list the physical parameter which is being measured.

e.g., For a sensor which measures velocity of water, select “Velocity”.



The Sensor type is set to the chosen parameter.

Next tap on “Recording Unit” and set an appropriate unit of measure. (Refer to the sensor manual for the units of measure employed).

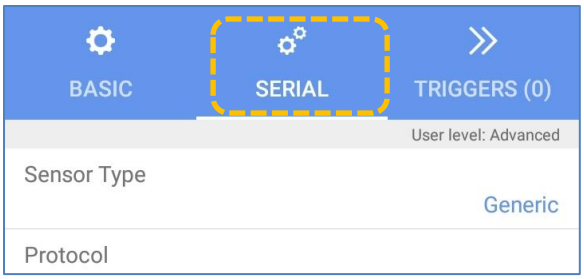
The chosen recording unit is displayed.

Set the input multiplier as required (see Discussion below).

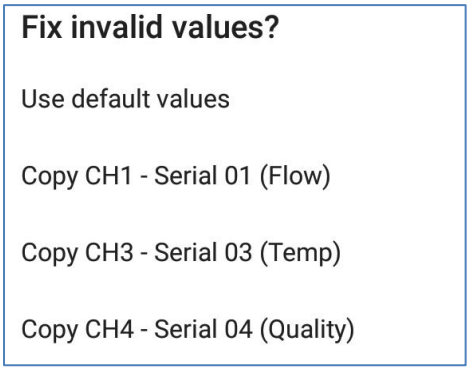
Note: The Input multiplier shown here is not strictly a data multiplier; Instead, it sets the resolution of the data. (Refer also to the notes and illustration of hardware test results at the end of this section).

Tap on “Logging Mode” and select according to your requirements (e.g., Spot).

Check the settings on the screen and then tap on “Accept” to save the settings to the logger.



Next select the “SERIAL” tab.

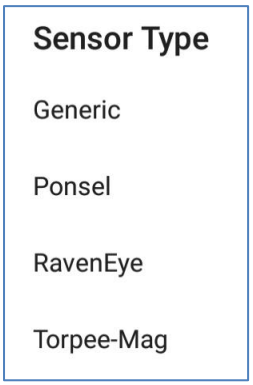


Note: If a “Fix invalid values” message appears, it is likely that several “serial nn” channels are set up to use the same sensor equipment, but the default settings for the Serial tab (e.g., pre-power time) are inconsistent with existing channels.

Tap on “Use default values” to ignore (and re-enter the settings of each field) or choose “Copy …” to copy settings across from another channel.

Tap on “Sensor Type”.

Choose “Generic” for most MODBUS / RS485 sensors.



Note: The logger may show other choices.
These options are from a library of known sensors, for which the logger gives additional support to ensure the logger and sensor interoperate optimally. Often these are not protocol issues, but are related to the sensor operation, requiring a specific sequence of operations to be undertaken to obtain certain data.

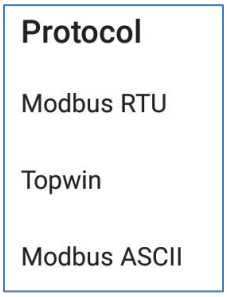
These sensors may also require additional setup options.

HWM Global supplied sensors have completed interoperability tests to ensure readings can be correctly obtained.

Note: For some the remaining setup parameters, you will need to refer to the sensor's manual to understand its requirements.

Tap on "Protocol".

(This may be initially shown as 'not set' or 'off'.
'Off" can be used to temporarily deactivate a channel without losing any other settings).

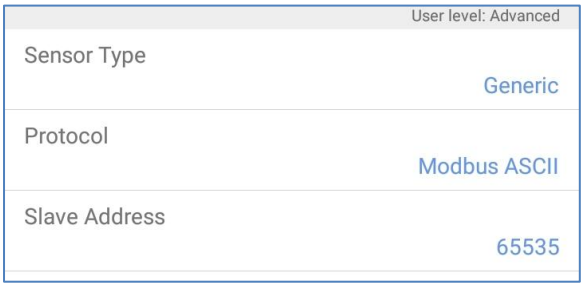


For most sensors, select Modbus RTU or Modbus ASCII, according to the requirements of your sensor; refer to the sensor manual.

(Topwin is a rarely used protocol).

Note: If the wrong protocol is selected, the sensor will not operate correctly with the logger; The frame format and content will be incorrect.

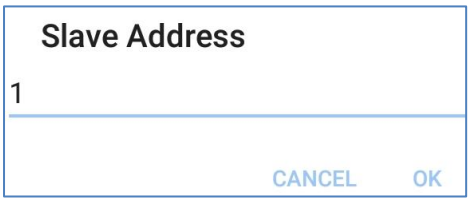
e.g., If your sensor requires Modbus ASCII, tap on it to select.



The chosen protocol is displayed.

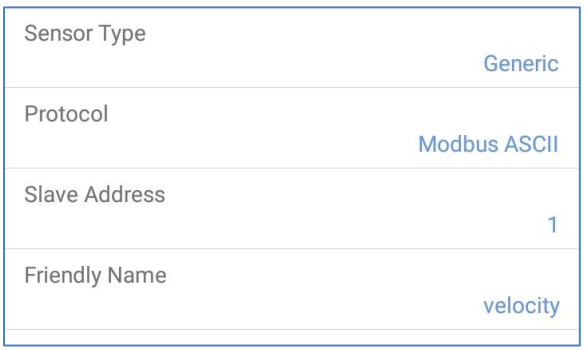
Tap on the "Slave Address" line.

(An invalid address may be initially shown).



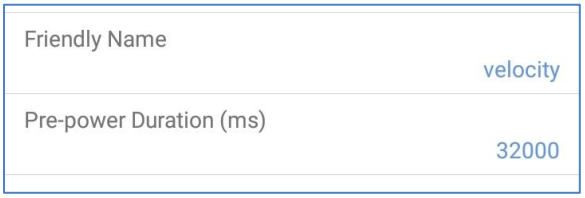
For Modbus over an RS485 interface, each device must have an address in the range 1 to 247.

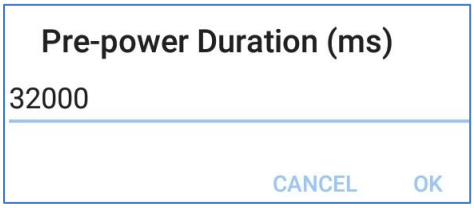
Refer to your sensor equipment documentation and locate its address. Enter the address and then tap on OK.



The address is displayed.

IDT suggests a “Friendly name” based on the measurement parameter. This can be changed if required.

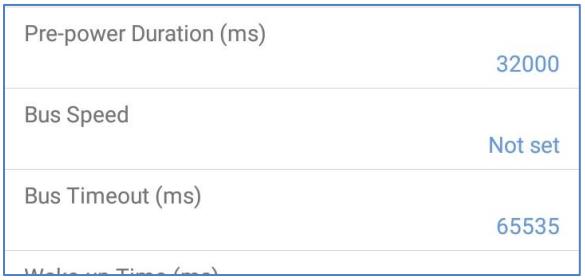


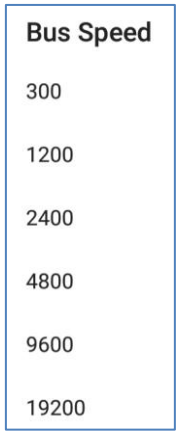


If the logger has the facility to provide power to the sensor:

The logger usually only provides power to the sensor when it requires a measurement to be taken. However, most intelligent sensors require power to be applied for a minimum time in order to set up and complete the measurement cycle and any related communications. This time period (plus some small margin) must be entered into the “Pre-power Duration” field.

Tap on the line and enter the required value.
(0 to 63750ms in 250ms steps).
(Refer to your sensor manual for guidance).

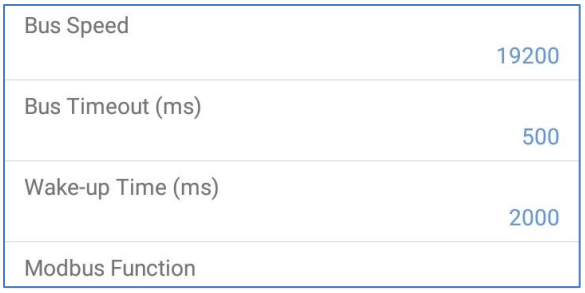




The chosen value is selected and displayed.

Next select the Bus speed (communications speed, also known as “Baud rate”); this must match your sensor.

Note: The Baud rate is the only serial communications parameter that can be set within the logger. Communication format is: 1 start bit, 8 data bits, no parity, 1 stop bit.



Next set the “Wake-up Time” and “Bus Timeout” parameters for communication.

The logger will send the sensor an initial command to wake it up (from standby); the sensor may not be able to process this command. After the specified wake-up time, the logger will send the required command, which the sensor should now be able to accept and process.

The bus timeout is the time period that the logger uses in subsequent message transactions to allow time for the sensor to send an initial response. If the sensor has not responded after this time, the logger will assume the message is lost and will repeat sending the command.

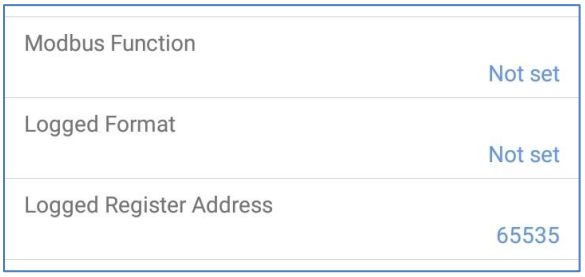
The Modbus protocol has a suit of available functions for reading and writing data; Each has a function code. The logger will support a subset of the function codes.

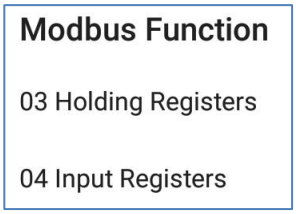
For reading data from the sensor, the user can specify the following function codes:

- Function 3: Read Holding Registers
- Function 4: Read Input Registers

The function codes are used to access 16-bit wide registers inside the sensor device. Each register within the sensor has an associated address. The Modbus protocol requires the address of a register to be specified for a read operation. It also requires the quantity of registers that are to be read to be specified; these will begin from the sent register address. It is therefore possible to read data that is more than 16 bits wide and that spans several registers.

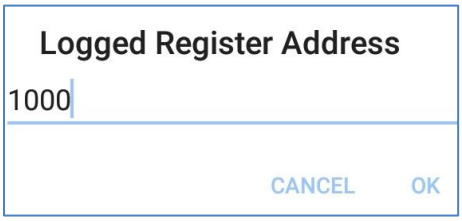
Refer to your sensor manual to locate the register start address of the data you require. Also, you will need to understand the format of the data (how many bits wide the data is, whether the format allows whole numbers only or if numbers which include decimal places are being used, etc).





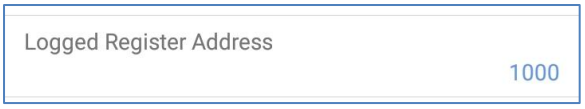
Tap on “Modbus Function” and select the required function code.

The chosen Modbus function is displayed.



Tap on “Logged Register Address” and enter the start address of the register that holds the required data within the sensor equipment.

e.g., A velocity sensor specifies (in its manual) that the register with address 1000 holds the velocity data.
… so enter “1000” and then tap on “OK”.



The start register address for the data is now displayed in IDT.

The “Logged Format” field must also be set to specify how many registers are being used to hold the data and what the number format is within the registers.

Logged Format U16	U16:	Unsigned Integer. 16-bits wide (1 register) data. Includes positive integer values only.
S16 (default)	S16:	Signed Integer. 16-bits wide data (1 register required). Includes positive and negative integer values only.
S32 ABCD	S32:	Signed Integer. 32-bits wide data (2 registers required). Includes positive and negative integer values only.
Float ABCD	Float:	Signed number including decimal point. 32-bits wide data (2 registers required). Includes positive and negative values.
Double ABCD	Double:	Signed number including decimal point. 64-bits wide data (4 registers required). Includes positive and negative values.

S32 ABCD	Float ABCD
S32 CDAB	Float CDAB
S32 BADC	Float BADC
S32 DCBA	Float DCBA

The Modbus protocol does not define the format that must be used on data that spans multiple registers. Often a sensor datasheet also does not detail this.

To overcome the above issue, the logger supports several alternatives for how data, larger than 16-bits wide, is to be interpreted when read from the Modbus data frame.

The data type must be selected (e.g.,"S32" or "Float"; this dictates its size) along with one of the options for the byte or word order.

Selecting the right byte order option is often a case of trying the alternative settings to find the one which matches the data presentation from your sensor; the data will then make sense. (Check data using the IDT Hardware test feature).

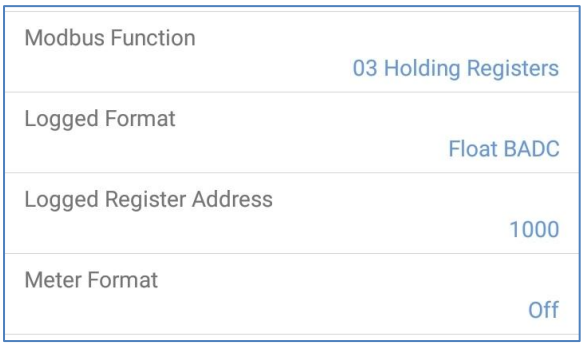
e.g., A velocity sensor manual says that the velocity (in m/s) is stored in address 1000 and uses a "Float 32" number format.

The number will be a "Float" type; it is spread across 2 registers (to make 32-bits).

Modbus Function	03 Holding Registers
Logged Format	Float BADC
Logged Register Address	1000

Selection of one of the "Float" formats is therefore required.
(Try various options until OK).

The choice of "Float BADC" was found to show meaningful data values during a hardware test of the example sensor; this selection was kept.



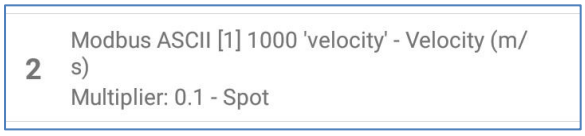
The Logged format is displayed.

Note: The section regarding “Meter Format” is rarely used and can usually be left as shown.
(It is provided only for flow sensors which include providing access to meter reading values over the RS485 / Modbus link).
(See Also: Setup of Sensors that include a Meter)

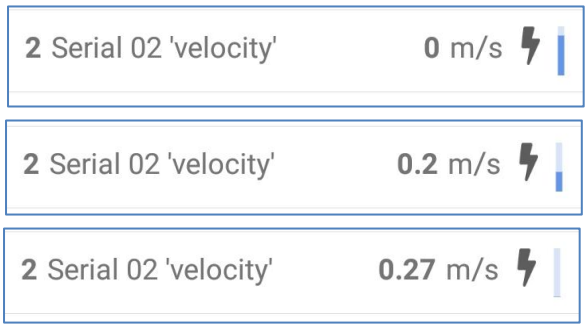
A Test button is provided if you wish to check the setup is valid.

Tap on “Accept” to save the changes to the logger.

Note: Repeat the setup process for any additional parameters required from the sensor.
Use a different serial channel for each.



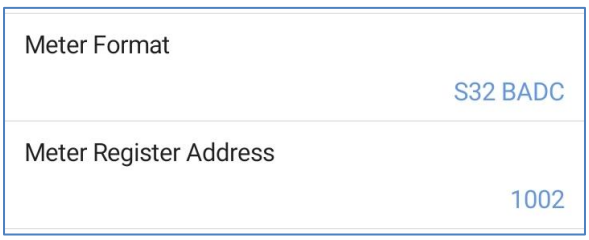
A typical summary configuration of the RS485 / Modbus channel setup is shown opposite.

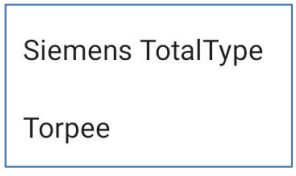


During Hardware test the RS485 / Modbus channel will typically be displayed as shown opposite (depending on setting of the “input multiplier”; x1, x10, x100 examples shown).

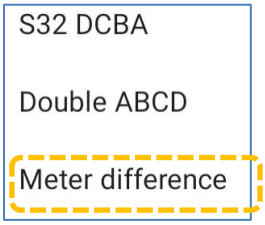
Setup of Sensors that include a Meter:

For equipment that **includes a meter reading register**, the MODBUS channel setup has additional setup requirements, described below.
To operate correctly, the logger is set up to log the consumption rate by repeatedly reading from the meter reading holding register and logging the differences between each meter read.
Set up as follows:



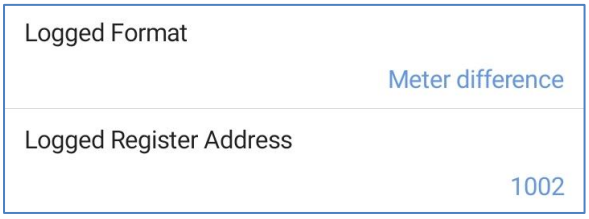


First enter the address of the holding register that contains the current meter reading.
Then set the format (refer to the equipment user guide).
(Additional register formats are available for meters).



Having set the above, an option of “Meter difference” becomes available as a Logged Format for the Logged Register Address.

Select this format.



The format is accepted.

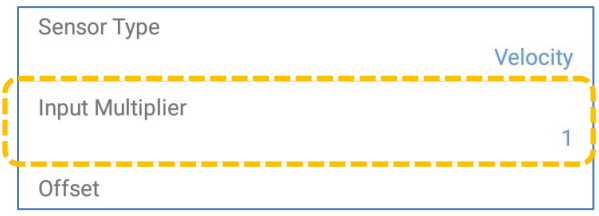
IDT requires a Logged Register Address (although it is irrelevant to any measurement), so it is typical to set this the same as the meter register address (entered earlier).

The datapoints of the logged channel will be the consumption (meter reading difference from last value) at each log period. In addition, the logger (outside of channel data) will include the full current meter reading.

Discussion: Use of Input Multiplier on MODBUS & SDI-12

For reasons of data compactness, the logger converts some sensor data formats to a Signed 16-bit format (S16) plus an indication of the applied multiplier.
For the Modbus (and SDI-12) interface, the multiplier (x1, x10, x100) is used to multiply the read sensor measurement value (if it includes any digits after a decimal point) before storage.
Only the whole number part of the result is stored as S16.
The original data value can be reconstructed by then dividing the (S-16) stored number by the saved multiplier value.

e.g. 123.45 can be stored as: “12345” and an applied multiplier of “100”.
To reconstruct: Original value = 12345 divided by 100 = 123.45



The *input multiplier* used in this context of SDI-12 and Modbus/RS485 therefore acts as a method to *set the data resolution*.
(i.e., the number of required decimal places).
(See hardware test illustration shown above).

However, it must be set such that the stored S16 number range is not exceeded (-32767 to +32768).

This is applicable to:

- All SDI-12 channels.
- Any RS485 / MODBUS channels that require the ‘Logged Format’ field set to ‘Float’ or ‘Double’ in order to correctly interpret sensor measurement data.

12.17 Digital Sensor Interface

The Digital Sensor interface is available on some logger models. It is an interface that is required for the attachment of certain sensors supplied by HWM.

Currently supported sensors include:

- SpillSens.

12.17.1 Use with a SpillSens Sensor

SpillSens is a digital float angle sensor.

It is often used with the following data viewing portal:

- SpillGuard.

SpillSens requires a specialised method of setup, especially when used with the SpillGuard data viewing portal. Refer to the SpillSens User-guide for more details.

12.18 SpillSens Interface

A Digital Sensor interface type that has been set up by the factory for use with a SpillSens sensor is sometimes factory labelled as “SpillSens” instead of “Digital Sensor”.

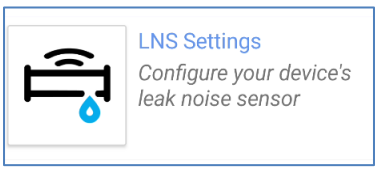
(Refer to section 12.17 for further details).

12.19 Leak-Noise Sensor (LNS)

A leak-noise sensor listens for leaks in water pipe networks.

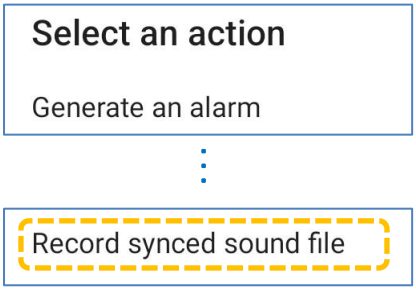
It is often used with the following viewing portals:

- PermaNETWeb.



This is a complex sensor and requires a specialised method of setup, using the “LNS settings” screen.
Refer to your logger User-guide for information if this sensor is supported and for more details.

Depending on logger model number, the IDT app may also give access to the data channels from the LNS sensor, which appear in a similar manner to other sensors. (The LNS Settings control, shown above, may not appear until one of the following channels has been added: LNS Level, LNS Spread, LNS Leak). These channels can then be used (similar to other channels) within trigger-action combos.



One of the additional available features is for a trigger to produce a “time-synced sound recording”.
(See opposite).
This consists of an initial time-sync activity, followed by a sound recording produced approximately 15 minutes later.

This feature could be used, for example, for leak detection algorithms making frequent leak detections; if a leak is judged to be present the action will make a sound recording available at a subsequent call-in.

12.20 SonicSens3 Sensor

SonicSens3 is a sensor which measures distance with ultra-sound.

It is often used with the following viewing portals:

- DataView

This is a complex sensor and requires a specialised method of setup. Refer to the SonicSens3 User-guide for more details. Refer to your logger User-guide for information if this sensor is supported.

12.21 RadarSens Sensor

RadarSens is a sensor which measures distance with a Radar signal.

It is often used with the following viewing portals:

- DataView

This is a complex sensor and requires a specialised method of setup. Re fer to the RadarSens User-guide for more details. Refer to your logger User-guide for information if this sensor is supported.

12.22 Pegasus2 (Pressure Reducing Valve Controller)

Pegasus2 is a PRV controller with built-in logger functions.

It is often used with the following viewing portals:

- PressView,
- DataView

There are many settings within Pegasus2 that are common with 'Group 2' loggers; these settings and operations are described in this user-guide.

The settings and features specifically related to a PRV installation and test are described in the Pegasus2 User Guide (MAN-163-0002), which should be referred to for further information.

Note: When Pegasus2 is used with PressView, it is possible for the PressView system to be employed to manage the device settings, including some that are not accessible via IDT.

12.23 Sentinel2 (Pressure Reducing Valve Controller)

Sentinel2 is a PRV controller with built-in logger functions.

It is often used with the following viewing portals:

- PressView, DataView

There are many settings within Sentinel2 that are common with 'Group 2' loggers; these settings and operations are described in this user-guide.

The settings and features specifically related to a PRV installation and test are described in the Sentinel2 User Guide (MAN-163-0004), which should be referred to for further information.

Note: When Pegasus2 is used with PressView, it is possible for the PressView system to be employed to manage the device settings, including some that are not accessible via IDT.

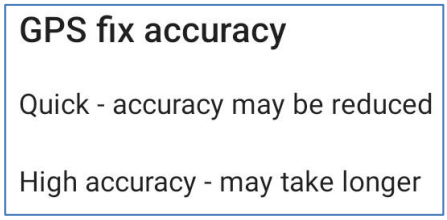
12.24 GPS / GNSS Input

Your logger may have built-in capability to detect its position, using signals from GPS/GNSS satellites that are in orbit around Earth. Availability depends on logger model and construction. The required antenna may be internal (as is the case with loggers supplied within “Incident kits”), but is most often an external antenna (which must be installed with an unobstructed view of the sky) connected to a GPS / GNSS antenna input on the logger.

12.24.1 Used for Logger Location (GPS coordinates)

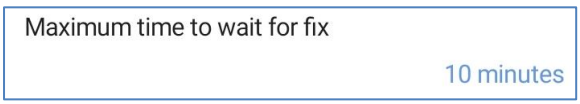
Locate and tap the GPS Positioning control to start setup. (Main screen → Configure Device → GPS Positioning).

A new screen will be shown (called “GPS Positioning”).

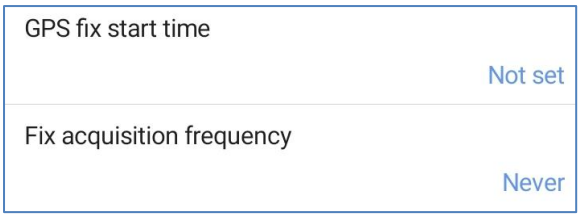


First decide how accurate you would like the GPS fix to be. (Tap and change the accuracy if required).

Use lower accuracy whenever acceptable, or if sky visibility is limited at the installation location.

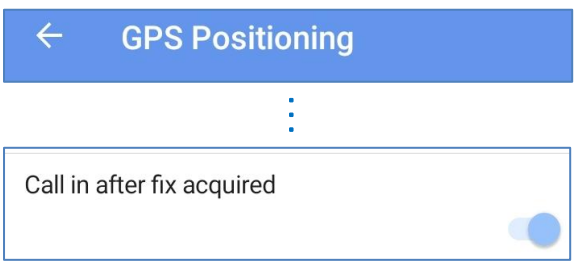


The GPS detection circuit is activated ‘on demand’ and takes some time to find the nearest satellites and obtain a location fix. You can specify the maximum time allowed for this process using this control. This is provided to limit battery use (in case of some temporary issue existing, such as a poor signal due to an object being placed over the antenna).



Next pick a date (and then time of day) on which you want the first location determination (called a “Location Fix”) to begin.

Also set the period between each subsequent location fix. (Using the “Fix acquisition frequency” control).

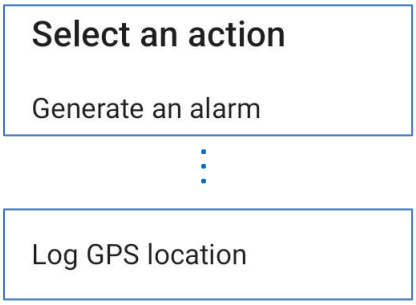


The location information (which is supplementary information, not a standard logged channel) is stored in the logger until it next calls in.

Leave the “Call in after position has been acquired” control disabled to wait for the next call.

Alternatively, enable the control to call in immediately after a location fix.

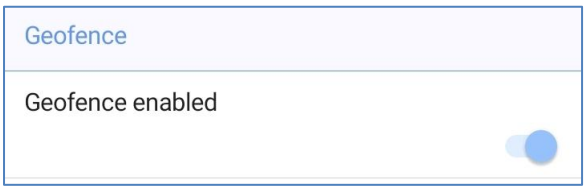
If a GPS fix was not possible, it will be reported to DataGate as a system alarm.



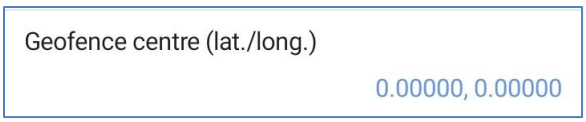
Note: A logger with GPS location feature installed may also be able to initiate a GPS location fix as part of the available "action" options following a channel (alarm) trigger being activated.

12.24.2 Used for Setup of a GeoFence Alarm

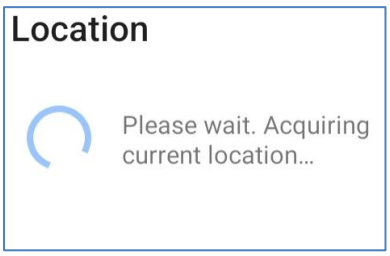
The GPS GeoFence Alarm feature allows the installer to define a geographical area, within which the logger is expected to reside. If the logger discovers that it has gone outside of the defined area, it will (if enabled) raise a GeoFence alarm.

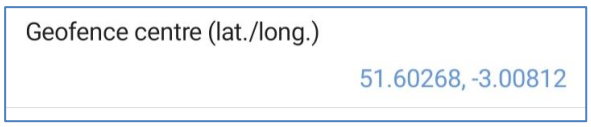


First set up GPS location, as described in section 12.24.1.
Locate the Geofence settings in the IDT screen.
Enable the "Geofence enabled" control.
(This will produce additional settings).



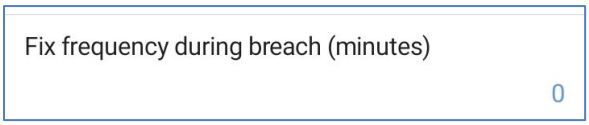
Tap the GeoFence center (Latitude / Longitude) line.





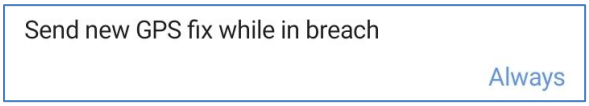
The current location is acquired by IDT app (using the phone GPS capabilities).
This will be the center of the GeoFence area.

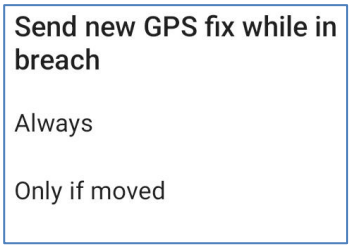
Enter the radius of the area (in metres); 100m is the minimum recommended but will depend on the accuracy setting (set earlier).



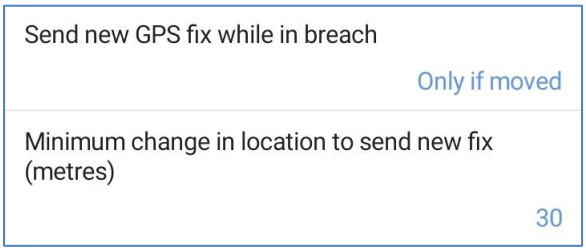
Whilst the GeoFence alarm is active, the logger will repeatedly check its location (obtain a GPS fix) at a specified interval. Enter the required interval (in minutes)

Note: GPS location fixes consume battery power. The interval between GPS fixes should therefore not be too rapid otherwise battery life will be reduced.





Whilst in a Geofence alarm, the logger can update DataGate whenever it has completed a new GPS location fix. Alternatively, it can update DataGate only if it changes location once more.



When “Only if moved” is selected, enter the minimum location change threshold. The logger will ignore location changes below this threshold so as not to generate excessive ‘nuisance’ calls to the server; GPS location fixes can vary by several 10s of meters (depending on measurement conditions) even though the logger itself does not move. Allow a few 10s of meters.

PART 10: Additional Measurements (from System)

13 Additional Measurements (from System)

13.1 Open Channel Flow using Depth & Velocity Sensors

13.1.1 Flow of Water from a Weir (Using Depth Sensor Only)

If the feature is available on your logger, a depth sensor (e.g., SonicSens 3, RadarSens) can be used to indirectly measure the water flowing from a weir. This requires the measurement from the sensor to be used as an input to the "Open Channel Flow Setup" panel (also called the FlowOCH channel). This channel requires the geometry of the weir to be entered. It then acts as a flow calculator, converting the depth of water into a flow calculation. The data from the depth sensor channel provides the necessary depth of water to be input into the calculation.

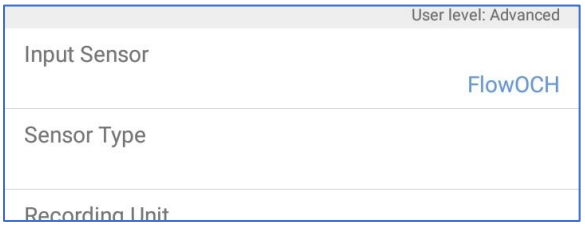
From the main options screen, tap on Configure Device → Channels.

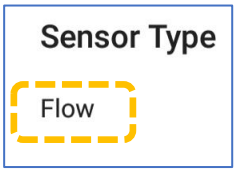
If the logger has not been set up for FlowOCH measurements, tap on the "+" control to add a new channel.

Tap on the Input Sensor line.

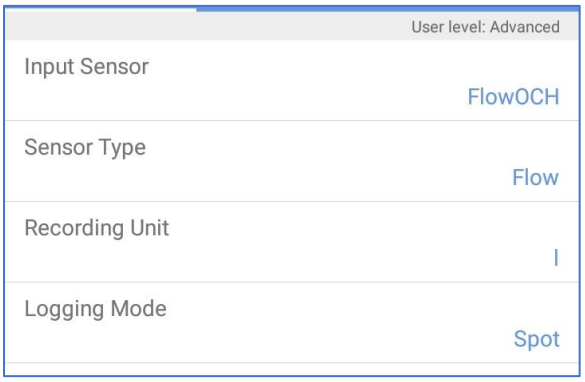
(This normally selects the interface type, but here the required 'interface' is a software connection to another channel from which it can use the data).

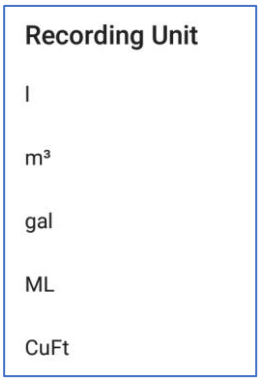
Choose "FlowOCH".





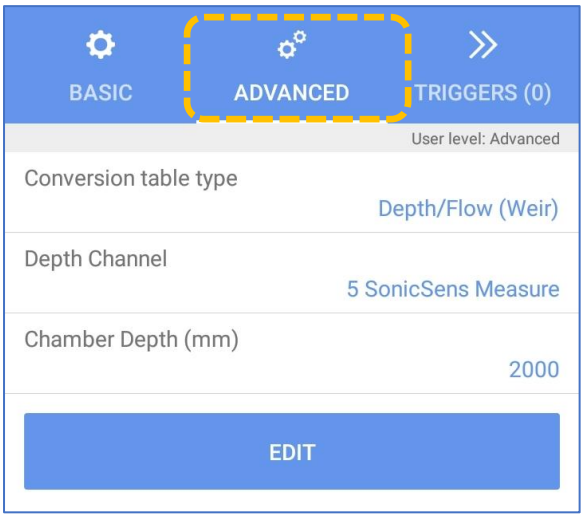
Tap the Sensor Type line and then select the Sensor Type as "Flow"



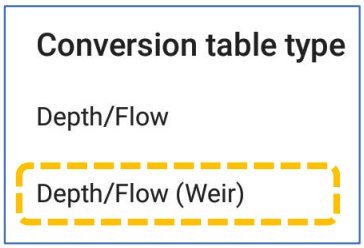


Select the desired recording unit. (e.g. Litres).

… and also set a Logging mode.



Switch to the “ADVANCED” tab.



Tap on the “Conversion table type” line.
Select “Depth/Flow (Weir)”.

Tap on the “Depth Channel” line to select the sensor channel from which data is being used.

(Note: The selected sensor must have been already set up to detect **Depth** of Water , and not the distance to the water surface).

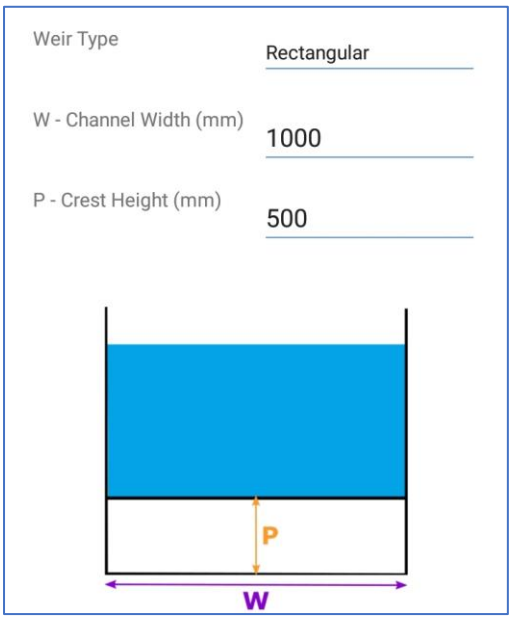
The depth of the chamber (distance from the sensor to the bottom of the water channel) is also shown in this screen for ease of adjustment. Confirm and adjust if required.

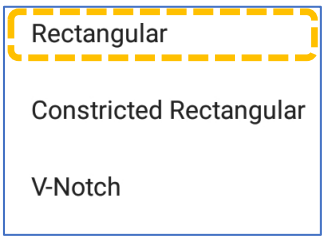
Tap on the Edit button, or if it is absent, the “ + ” line; this will show an additional setup screen, called the “Depth / Flow (Weir)” screen.

This channel type requires the geometry (shape and dimensions) of the weir to be entered. The logger then converts the depth of water (provided by the depth sensor channel) into an expected rate of flow from the weir.

Note: When describing the weir features, all dimensions are to be taken from **inside the water channel**, not from the external side. The weir blocks the flow of water until its depth exceeds the minimum height of the weir, known as the “**crest**”.

For a rectangular weir:

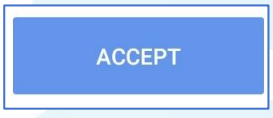




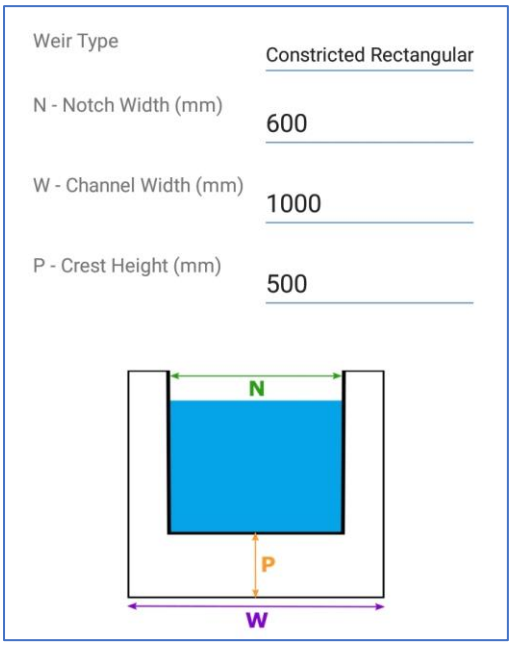
Tap on Weir Type and select “Rectangular”.

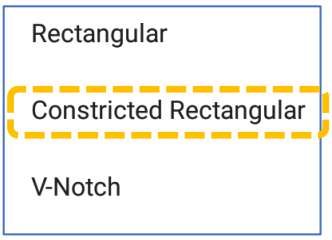
Measure the features of the weir and complete the settings in the setup screen.

Then tap on “Accept”.



For a constricted rectangular weir:



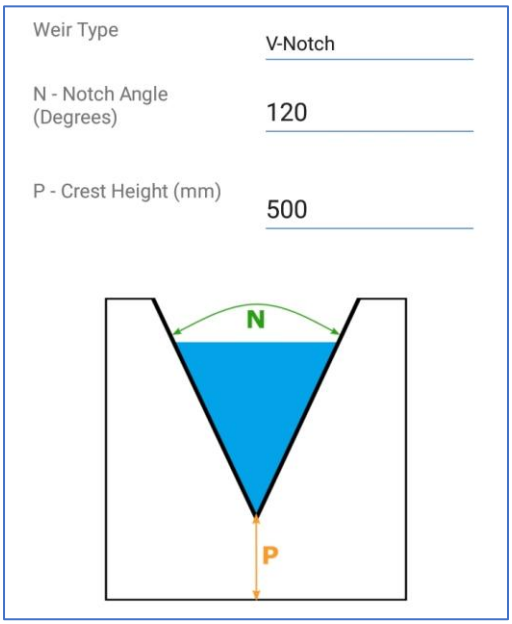


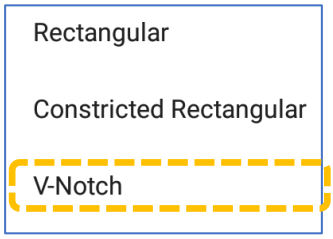
Tap on Weir Type and select "Constricted Rectangular".

Measure the features of the weir and complete the settings in the setup screen.

Then tap on "Accept".

For a V-notch weir:

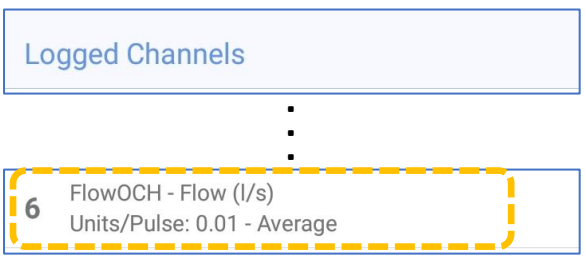




Tap on Weir Type and select "V-notch".

Measure the features of the weir and complete the settings in the setup screen.

Then tap on "Accept".



After accepting the setup, IDT will display the FlowOCH channel amongst the list of currently configured channels (each channel will produce datapoints that are logged).

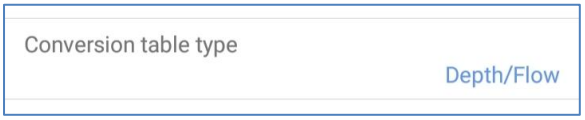
The FlowOCH summary includes selected units of measure for flow and any statistical function applied to produce the datapoints. (e.g., Average).
(The "units/pulse" figure has no meaning).

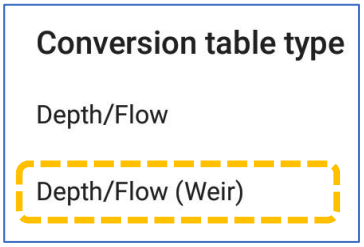
Note: For a weir of a different shape to the above options, but where the “depth to flow” characteristics are known, they can be entered in tabular form. (Refer to section 13.1.2).

13.1.2 Flow of Water through an Open Channel (Using Depth Sensor Only)

For any water channel *which has “depth to flow” characteristics that are known*, flow can be measured indirectly by using depth. The characteristics must be entered in tabular form.

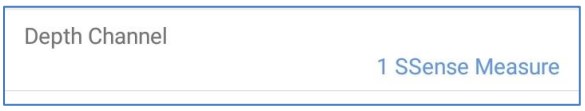
Proceed with setup as per section 13.1.1, until the Advanced tab is selected. Then proceed as follows:





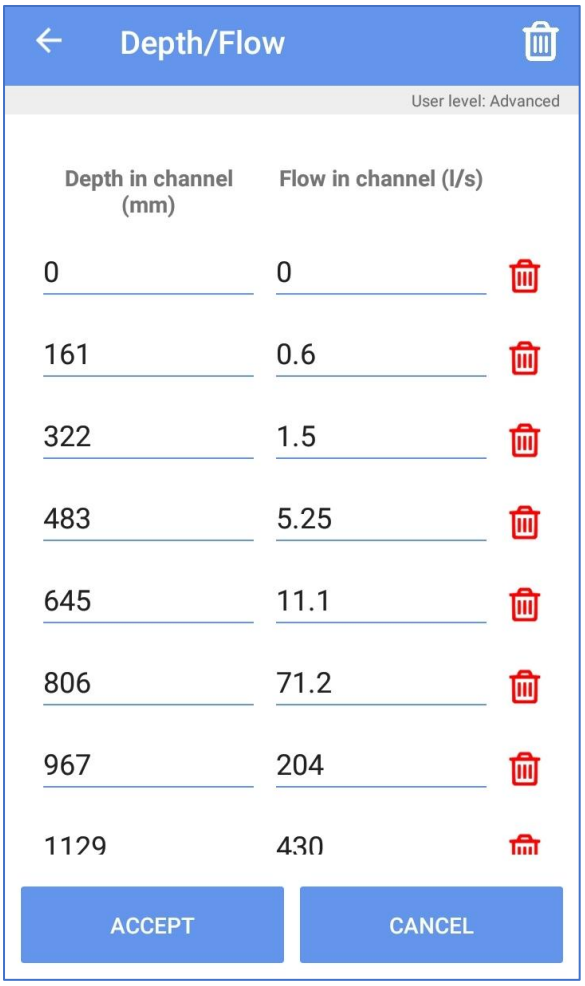
Tap on the “Conversion table type” line.

Select “Depth/Flow”.



Tap on the “Depth Channel” line to select the sensor channel from which data is being used.

(Note: The selected sensor must have been already set up to detect **Depth** of Water , and not the distance to the water surface).



Tap on the Edit button, or if it is absent, the “ + ” line; this will show an additional setup screen, called the “Depth / Flow” screen.

This channel requires the Depth to Flow characteristics of the water channel to be entered in table form.

The logger uses the table to convert the depth of water (provided by a depth sensor, e.g. SonicSens3) into an expected flow rate through the channel.

Note: The logger interpolates between the table entries to give a good approximation to the rate of flow at depths between table values.

Note: Where flow does not start until a specific depth of water is present (e.g. the crest of a weir will block the flow of water at low levels), two levels of “0” flow rate are needed; First at a depth of “0”, and second at the crest of the obstacle.

Complete the table. Then tap on “Accept”.

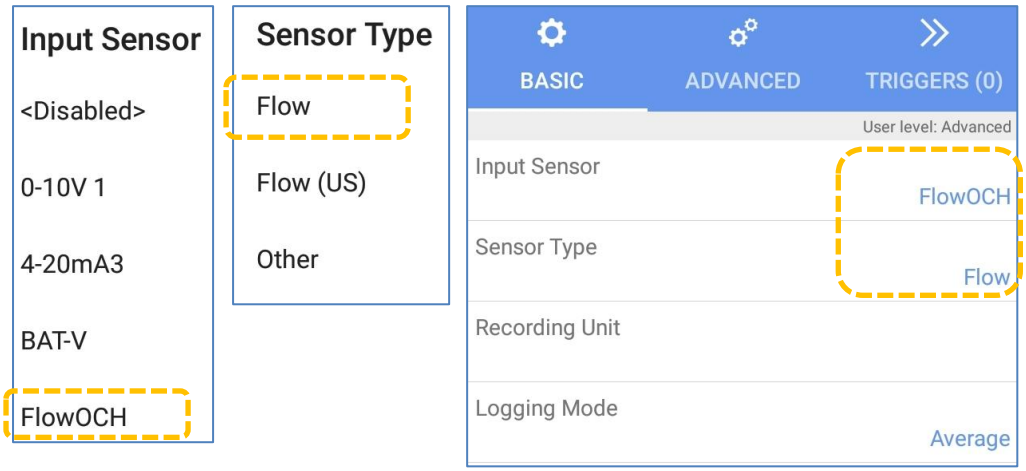
13.1.3 Open Channel Flow (using Depth & Velocity Sensors)

The rate of flow of water through an open channel can be calculated by the logger if both the cross-sectional area of the moving body of water and the velocity of the water are known.

The velocity can be measured by the use of an appropriate type of sensor.

The cross-sectional area of the body of water can be determined from the depth of the water and the channel geometry. The required water depth can be determined by measurement using an appropriate type of sensor.

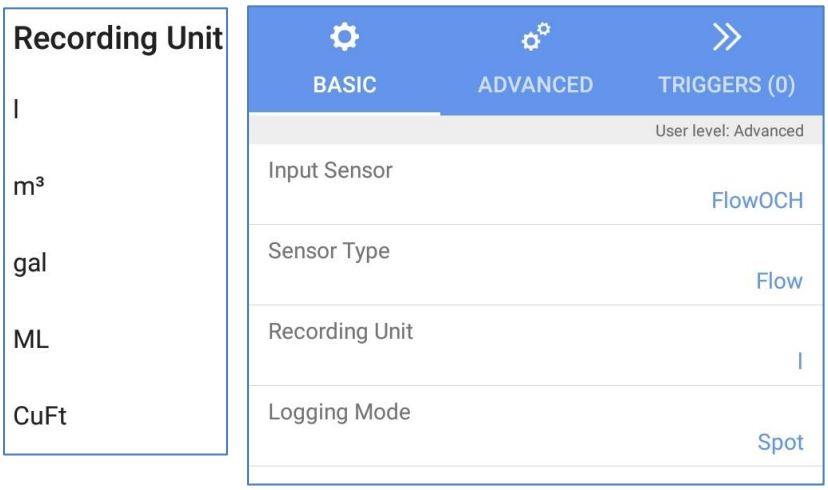
The logger, if equipped with suitable velocity and depth sensors, can produce flow-rate data (by calculation). This is achieved by setting up a “FlowOCH” channel, as follows:



Add a new channel to the logger (use the + button).

Choose “Flow OCH” as the Input Sensor.

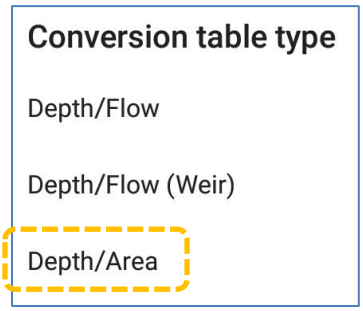
Choose a sensor type of “Flow”; this is the physical parameter being recorded for this channel.

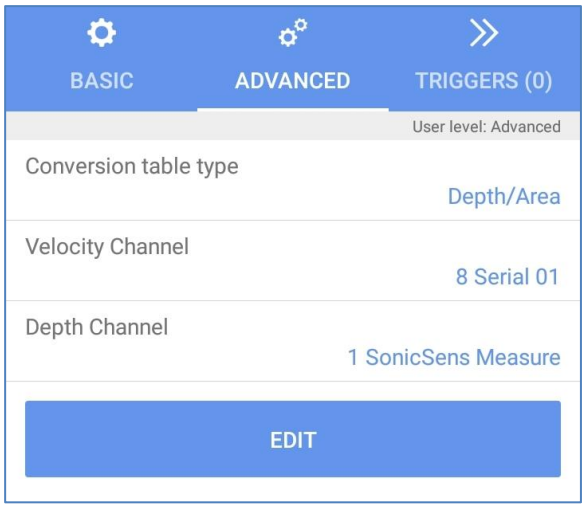


Select a recording unit.

The measurement is an instantaneous rate of flow, so when “l” is selected, “litres per second” is implied, etc.

The logger calculates the instantaneous flow from the water channel dimensions and water velocity, using an internal unit of measure. It subsequently converts the flow result to the unit of measure chosen here, which is used in producing datapoints.





Select the Advanced tab and select a Conversion table type of "Depth/Area".

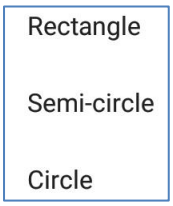
Tap on "Velocity Channel" and pick the relevant sensor channel for the water velocity. (This must be already set up).

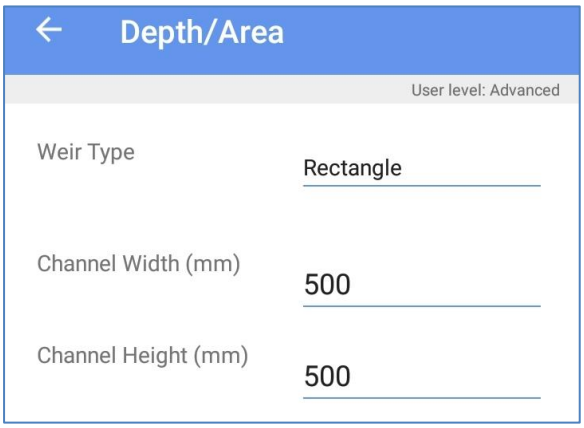
Tap on "Depth Channel" and pick the relevant sensor channel for the water depth. (This must be already set up).

Note: The chosen channel must measure the water depth, (or provide a calculated water depth), and not the distance to the water surface.

The channel using the sensor must be set up to measure depth in mm.

Next the channel geometry should be entered:

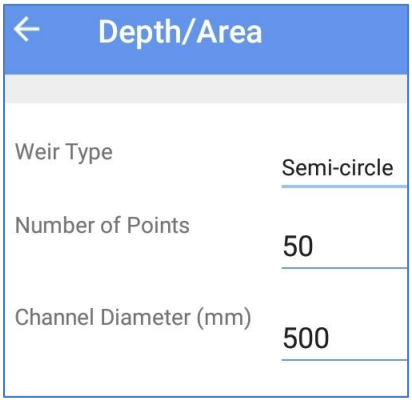


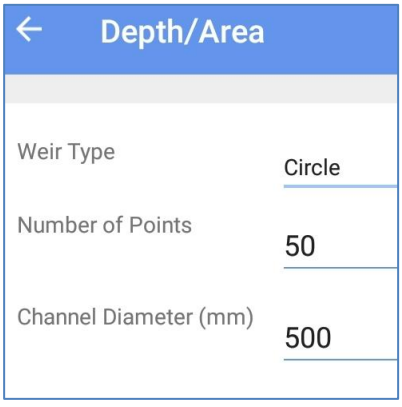


Tap on the Edit button.

Then tap on Weir type, and select the shape that best describes the cross-section area of the water channel at the measurement point.

For a rectangular cross-section, measure and enter the height and width in mm.



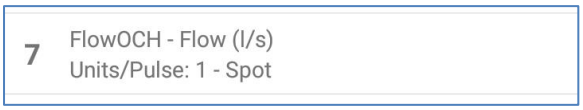


For a semi-circle or circle, enter the diameter in mm.

Also enter a value (between 2 and 247) for the "number of points".

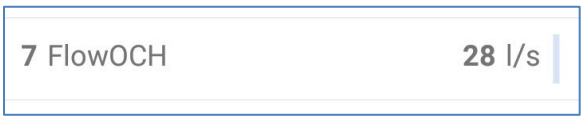
IDT will *construct a table* for use in the depth to flow conversion based on the entered geometry, dimensions, and number of points (table lines) required.

The table will be uploaded into the logger after the user taps the "Accept" button.
(For increased accuracy, the logger also interpolates between lines in the table when producing flow calculations).



A typical summary configuration of the FlowOCH channel setup is shown opposite.

(The units/pulse information should be ignored for a FlowOCH channel)



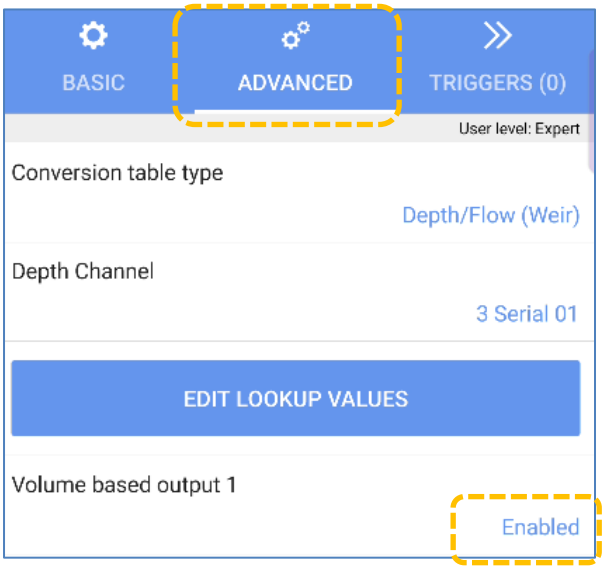
During Hardware test the FlowOCH channel will typically be displayed as shown opposite.

Note: A message of "Error reading sensor" will be shown should *any of the sensors* employed to produce the flow calculation has an error condition.

13.2 Volume-based pulse output for an Open channel

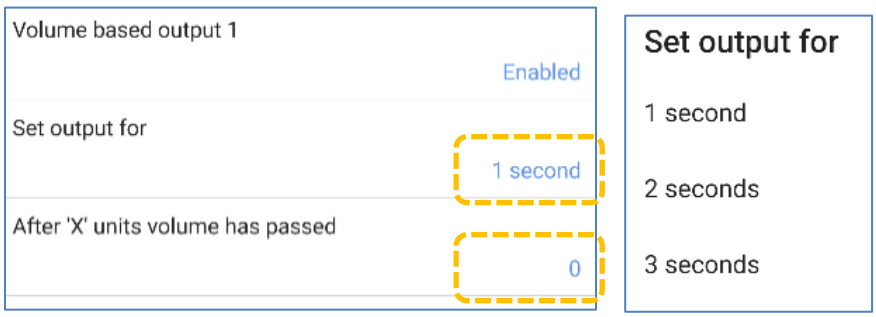
Where supported by the logger model, it is possible for the logger to generate a pulse of 1-20s duration on an output of the logger. The timing of the start of the pulse is based on a set volume of fluid being measured. The pulse repeats each time the specified volume of fluid passes. The output pin can be used to activate external (unspecified) equipment.

For loggers supporting this feature, the volume and timing of the pulse can be set as follows:



Select the "Advanced" tab of the Flow OCH channel.

Set "Volume-based output 1" to "Enabled".



Set the required pulse duration.

Also set and the number of units of volume required to pass to activate each pulse event.

13.3 System – Open Channel Flow using a Raven-Eye Sensor

Some logger systems are supplied with a RAVEN-EYE type sensor, which can measure water velocity in an open water channel.

The sensor requires the following to be set in the logger:

- A pre-power time of 32,000 milliseconds.
- A bus timeout of 500 milliseconds.
- A wake-up time of 2000 milliseconds.
- Modbus function “03 Holding Registers” should be selected for register reads; refer to the sensor manual for the register addresses required to be read for specific measurement values to be obtained.

When the logger is also supplied with a method of measuring water depth within the open channel, the system can be used to calculate the water flow through the channel.

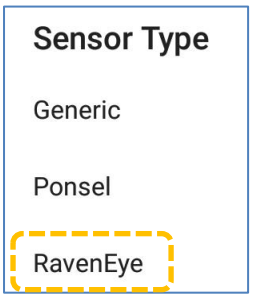
Two methods are possible:

- Use the logger to make the rate of flow calculation (see section 13.1.3).
- Use the RavenEye sensor to make the rate of flow calculation (described here).

Setup of the system requires the entry of information concerning the geometry of the channel, using the software provided with the RAVEN-EYE sensor. All required tables are stored in the RAVEN-EYE sensor. A depth measurement (provided from another sensor installed with the logger) is used by RAVEN-EYE to evaluate the cross-sectional area of the body of flowing water. The RAVEN-EYE sensor measures the velocity of the water.

For setup of the RAVEN-EYE sensor, follow the guidance for a RS485 / Modbus sensor, as described in section 12.16, except as follows:

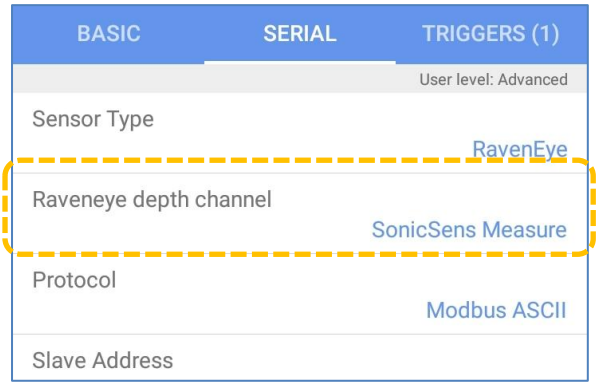
First, set up the logger to obtain water velocity data from the RAVEN-EYE sensor. However, when making settings on the “Serial” tab:



Tap on “Sensor Type”.

Choose the “RavenEye” setting.

Note: This selection must be *applied consistently* across any channels obtained from the RAVEN-EYE sensor.



An additional setting line will appear called “Raveneye depth channel”.

Any channel (which must have been previously set up) which measures the depth of water in the open channel can be used.
(Here, a SonicSens3 sensor is being used to provide the depth measurements).

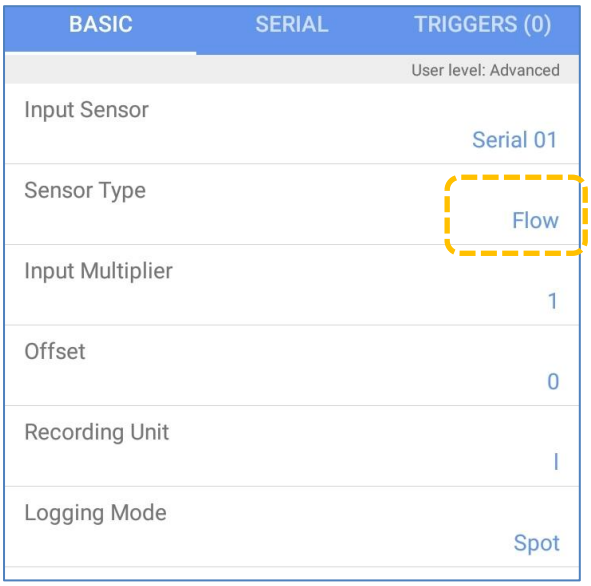
Note: The unit of measure of the selected depth channel is important; the RAVEN-EYE sensor

requires the chosen depth sensor channel to be set to use mm.

Continue to set up the velocity channel using the register specified for velocity in the sensor manual. RAVEN-EYE usually requires a Modbus-ASCII setting (but also check with the manual for your sensor model).

Note: By selecting a sensor type (in the serial tab) of “RavenEye” and then selecting a “Raveneye depth channel”, the logger is put into a mode to support additional requirements of the sensor, ensuring good interoperability with it.
In particular, the logger passes (writes) depth data into the logger as part of the measurement cycle. This happens in the background; no additional setup of the logger for the Modbus register writes is required.

The RAVEN-EYE sensor does a calculation of flow rate (using the depth data passed to it from the logger) and the result is made available via a Modbus register read.
An additional channel is therefore required to be set up for the flow-rate measurement:



Setup the logger to obtain the Flow data from the RAVEN-EYE sensor via a RS485 / Modbus register read.

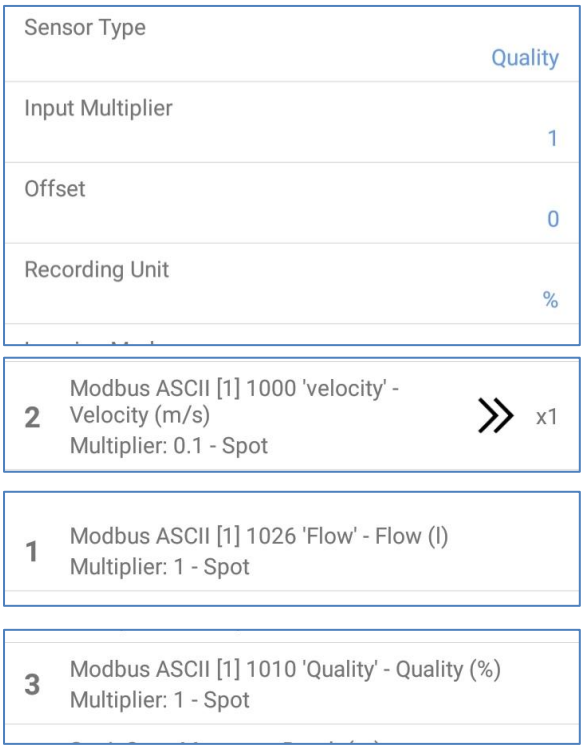
The register data must be interpreted as “Flow” and the selected unit of measure is to be “L” (litres, for litres per second).

Note: On the Serial tab, the Sensor type and protocol settings will remain the same as earlier chosen for obtaining the velocity data from the sensor.
Only the Logged Register Address will change to select the register in the sensor which holds the Flow-rate data (in litres / second).

During Hardware test the RS485 / Modbus channels and chosen depth channel will typically be displayed as shown opposite.

The velocity will be shown during hardware test.

The flow result shown opposite is the rate of flow (in litres / second).



The RAVEN-EYE sensor has a variety of other parameters available including temperature and various judgements of the quality of its measurements.

These may be added to other logger channels if required.

A typical summary configuration of the RS485 / Modbus channel setup for RAVEN-EYE sensors is shown opposite.

13.4 Water Velocity – Hydreka DVP (SDI-12)

The Hydreka DVP (Doppler Velocity Probe) is a sensor which measures water velocity.

It is typically positioned at the bottom of an open channel or on the wall of a pipe; both require a custom bracket or other means to hold the sensor firmly in position.

The sensor can communicate with the logger over an SDI-12 interface.

To setup this sensor to obtain water velocity data, refer to guidance of section 12.15.

BASIC	SERIAL	TRIGGERS (0)
		User level: Advanced
Input Sensor		Serial 01
Interface		2 - SDI12 (9V5)
Sensor Type		Velocity
Input Multiplier		0.1
Offset		0
Recording Unit		m/s
Logging Mode		Spot

BASIC	SERIAL	TRIGGERS (0)
		User level: Advanced
Slave Address		0
Friendly Name		Velocity
Pre-power Duration (ms)		6000
Logged Register Address		M 0
Reading		1
Meter Register Address		Off
Reading		

Channel settings are typically as shown opposite (subject to change; refer to the sensor manual for latest sensor requirements).

PART 11 : Appendices (additional information)

14 Appendix A – Calibration Procedures

This Appendix gives guidance on accessing and using calibration procedures for loggers.

Note: Most loggers will be paired with a set of sensors, and **calibration will have already been undertaken in the factory** prior to shipment.
In such circumstances, the calibration facilities of IDT are not required.

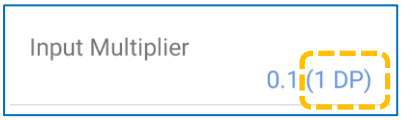
Calibration procedures can vary between interfaces and also logger types. The differences are sometimes required due to the internal electronics of the unit supplied.

14.1 Discussion: Input Multiplier & Channel Resolution

Prior to undertaking calibration of an interface, a channel must be set up which uses the interface. Of particular interest is the 'input multiplier' field.

For calibration purposes, the 'input multiplier' field also sets the channel resolution (number of digits available after the decimal point).

1	=	No digits after decimal point.
0.1	=	1 digit used after the decimal point
0.01	=	2 digits used after the decimal point, etc.



The multipoint calibration page has a useful indicator of the number of decimal places selected, as shown opposite.

Also, use the channel setup page to define the units of measure to be used during calibration.

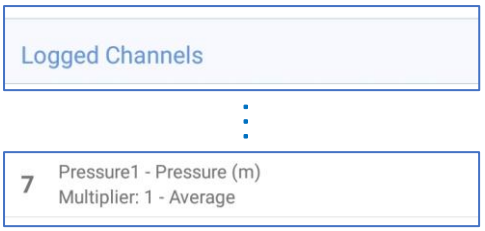
14.2 External Pressure Interface – Using Cable Values ('Group 3' Loggers)

This method can be used with pressure sensors supplied by HWM Global that include calibration values printed on a pressure (or depth) sensor cable, as shown opposite.

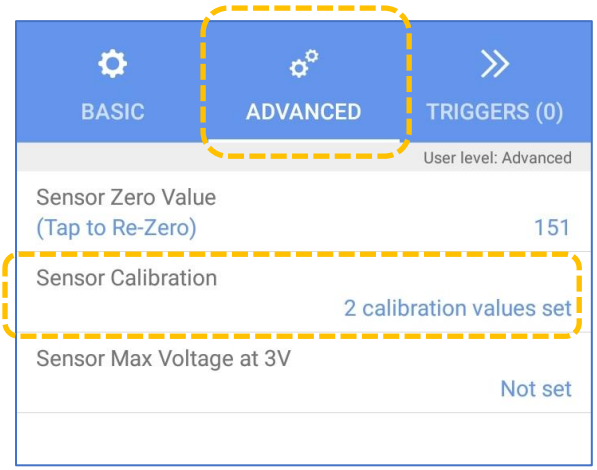
(Note: Not all loggers have this calibration method available).

Refer to section 14.1 before commencing calibration.

To access the calibration screen for an external pressure sensor:



Display the list of channels.
(Tap on "Configure Device", then "Channels").
Then tap on the relevant line to select the pressure channel.
(The channel must be set to measure pressure or depth).



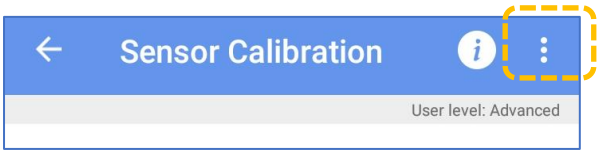
Select the “Advanced” tab.
(This tab displays options to adjust several settings related to sensor operation).

To select the pressure sensor calibration screen, tap on the “Sensor Calibration” line.

(If, as shown here, the line refers to a quantity of calibration values being set, ‘multipoint calibration’ use is currently selected.)

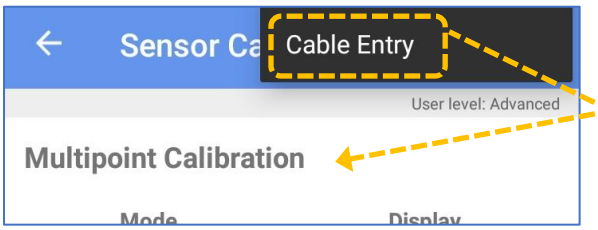
Note: If displayed, DO NOT make any adjustments to the “Sensor Max Voltage” setting when using this method of calibration.

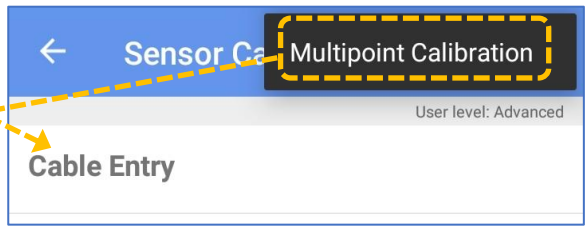
There are two possible methods for calibration with the pressure sensor. Each method has different screens. You may have to swap which screen is displayed.

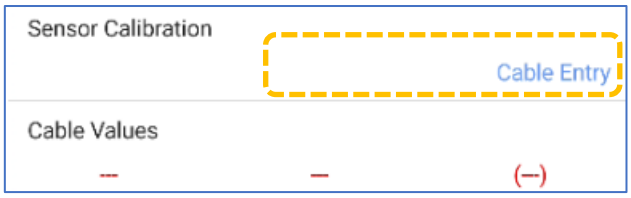


To swap screens, use IDT ‘advanced’ mode.

Use the local menu (tap on the 3 dots) to switch between the two calibration methods, as shown below.





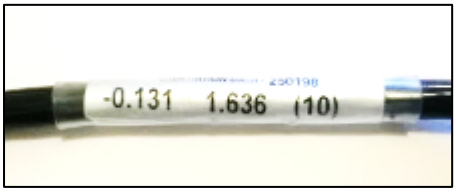


(For some loggers, IDT may swap by tapping a line in the Advanced tab of the channel configuration screen).

Note: Your logger may support just one method (available in IDT basic mode) or possibly both methods (but only available when in IDT advanced mode).

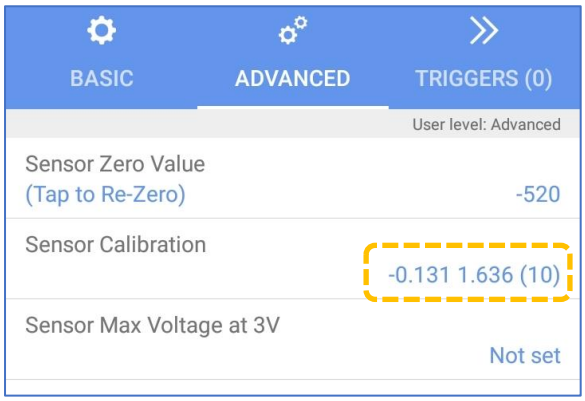
The screen for the “cable values entry” calibration method is shown below.

Tap in each of the areas shown and enter the corresponding value as read off the pressure sensor cable (no brackets required).



An example is shown (opposite).

Save the settings.



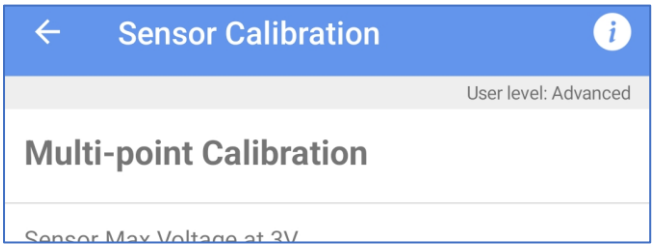
The calibration figures from the cable will now be in use (and the parameters are listed on the Sensor Calibration line).

14.3 Pressure Interface ('Group 2 & 3' loggers)

IDT supports the following 2 methods of calibrating a logger input for a pressure (or depth) sensor:

- Entry of calibration coefficients using the values printed on the cable. (Applies to External sensors only; Refer to section 14.2.)
- Multipoint calibration. (Can be applied to External or Internal sensor transducers. This is described in this section).

Refer to section 14.1 before commencing calibration.



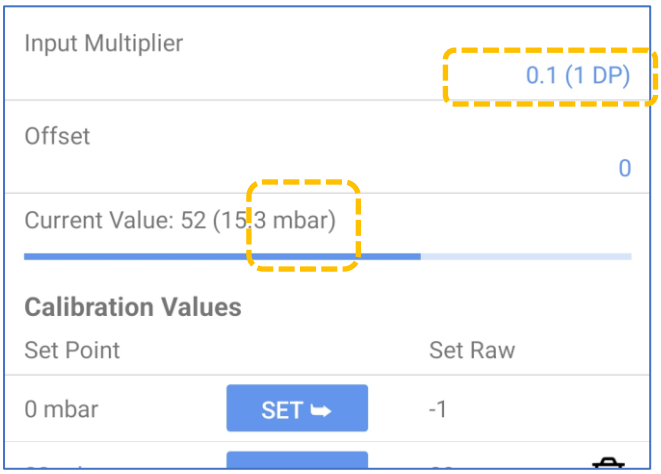
To use multipoint calibration, first navigate to the channel setup, select the 'Advanced' tab, and then navigate to the channel's Multi-point Calibration page (as shown within section 14.2).

Note: A related setup stage (input sensitivity adjustment) may also be required (described in section 14.3.1), although not all loggers have this available.

When calibrating a logger for use with a pressure sensor, an appropriate calibration rig and sealing adaptor is required to apply pressure levels to the sensor. This task should be completed by a service center, or similar facility, which has the required equipment; Ensure the calibration rig has a valid calibration record prior to use.

The multipoint calibration process pairs a reference pressure (entered into IDT by the user) with the corresponding numeric value that is output from an A to D converter within the logger. By using two or more reference pressures, the user can produce a table of calibration values. The logger can subsequently determine the characteristics of the sensor.

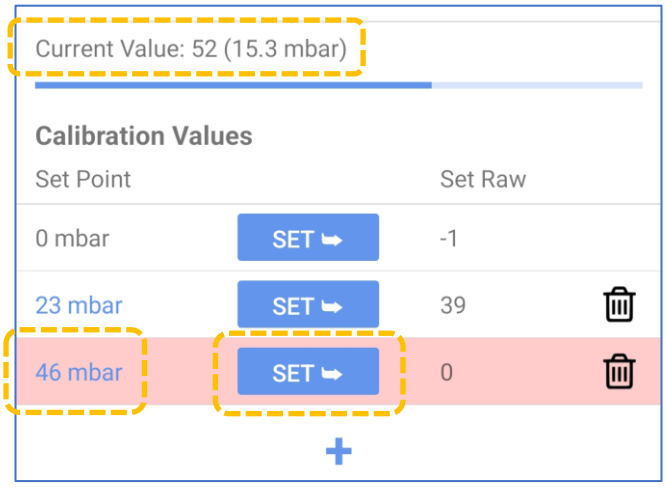
To calibrate, proceed as follows:



Check the *unit of measure* shown on the Current Value matches the unit of measure you wish to calibrate the sensor in; adjust on the 'basic' tab channel setup screen if required.

Check that the *number of decimal places* you wish to use is correct; adjust the Input Multiplier field if required.

Attach the sensor to the calibration rig.



Decide on the calibration reference pressures that are to be used and enter each of these into the 'Set point' column.
(Tap + or bin icons, as required, to ensure the required number of lines are available.)

Apply a known pressure (one of the calibration references) to the sensor. When the 'current value' number stabilizes, tap on the corresponding 'SET' button.

Repeat the process for each of the calibration reference pressures.

This produces a table of calibration points, with the corresponding Analogue to Digital converter output values listed in the 'Set Raw' column.

Note: A line of the table which has a pink background has some error condition.
(Either the "Set Raw" value is not set, or the table line has not yet been saved.)

When the table is complete, tap on the 'save' button to store the calibration table into the logger.
… Calibration is now complete. … However, see the note (below).

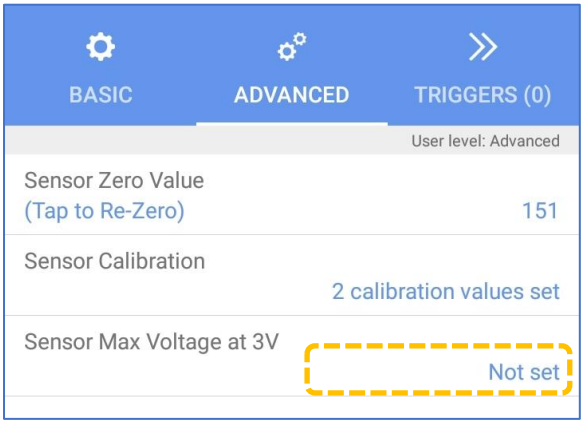
Safely remove the equipment from the calibration rig.

The logger uses straight-line interpolation to produce measurement results between (and beyond) the stored points.

Note: (Sensitivity / Numeric range check)
The user may wish to predict (calculate) both the maximum and minimum "Set Raw" value that the sensor could produce, and if required adjust the input sensitivity, (as described in section 14.3.1).

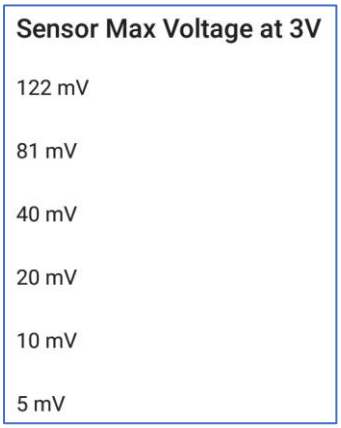
14.3.1 Analogue Inputs - Sensitivity Adjustment ('Group 3' Loggers)

Note: Do not adjust the sensitivity of the External Pressure interface if your sensor has calibration values and you intend to use the cable values calibration method.



Some 'group 3' loggers contain a programable attenuator for certain analogue inputs. This allows the sensitivity of the input to be adjusted so that (even at maximum or minimum sensor input) the logger electronics does not saturate, and the available numeric range is not exceeded. Conversely, if the attenuation is set too high, then the numeric range output from the A to D converter will be too limited, resulting in measurements that are coarse, being insufficiently fine in granularity.

The logger stores values obtained from analogue sensors in a S16 format (i.e., signed, 16-bits wide) which has a numeric range of -32767 to +32768. Ideally, the logger should make good use of the available number range (i.e., cover several 1000s), but not saturate at input levels slightly over the sensor's maximum level.



To access the sensitivity adjustment screen, first select the Advanced tab of the channel setup page. The sensitivity adjustment control for the channel will be shown (if applicable).
The control is labelled as "Sensor Max Voltage at 3V".

The logger will use a default value if not set.

To modify the gain, tap on the control and select a value from the available list.

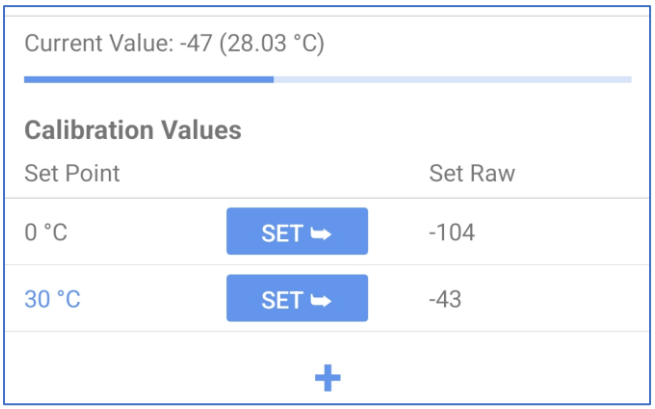
Note: If the sensitivity of the input is modified, the interface will require re-calibration.

For most loggers the sensitivity is pre-set by the factory to match the sensor that has been supplied with your logger and should not be changed.

14.4 Calibration of RTD (Temp) Input ('Group 3' Loggers)

The temperature probe can be calibrated by inserting the probe into locations of known temperatures (e.g., ice-cooled water at 0 degrees C and boiling water at 100 degrees C). To calibrate, enter the known temperature references and set the corresponding A to D values. This produces the relevant calibration points within the logger calibration table.

For loggers shipped with HWM supplied temperature sensors, calibration (and adjusting any input sensitivity) will not be necessary. The logger will be factory set to the most appropriate settings for the supplied sensor.



Calibration of the RTD (Temp) interface for temperature sensors follows a similar process to that described in sections 14.3 and 14.3.1.
To re-calibrate the sensor, follow the steps (in the sections just mentioned), but with the temperature sensor placed in a temperature-controlled environment at suitable calibration set-point temperatures.

For temperatures that are outside of the chosen calibration set points, the temperature characteristics curve will be extrapolated, allowing the sensor to continue to be used (but with limited accuracy).

When setup of the temperature sensor is complete:

The channel summary will indicate the current settings (a pressure channel reading temperature).

An IDT app hardware test of the temperature sensor will indicate the measured temperature in a way similar to that shown opposite.

(i.e., The IDT app will show a multi-purpose “Pressure” channel which is configured to measure from a temperature sensor).

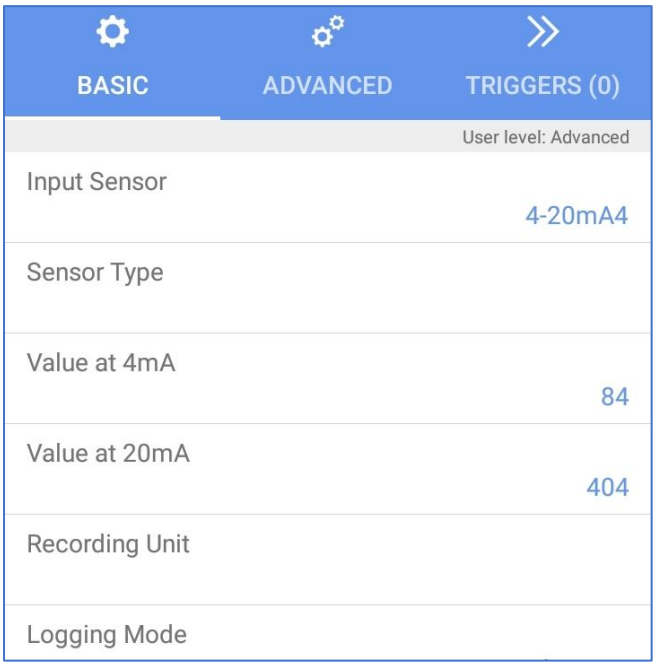
14.5 4 - 20mA Interface (Current Range) (‘Group 2 &3’ Loggers)

The 4-20mA interface types are used with sensors that communicate sensor values by means of a d.c. output current, in the 4mA to 20mA range.

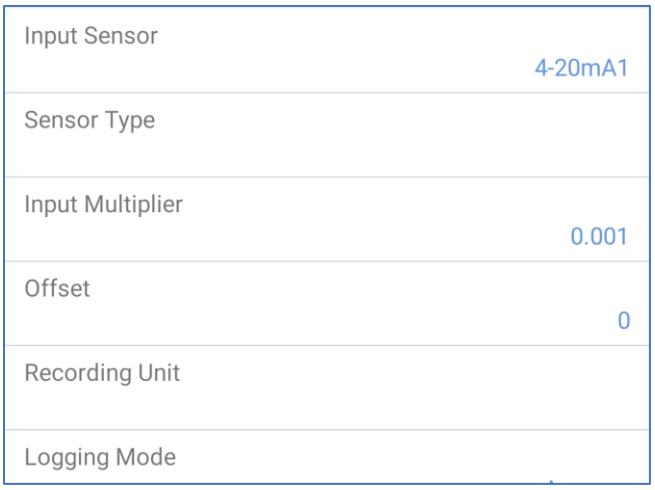
Calibration of the logger to use the sensor can be considered as a 2-stage process:

- Calibration of the logger interface to accurately read the input current over the required range. This is referred to as ‘calibration of the interface to use the **Base** unit of measure’, which in this instance is ‘current’. (This is described in this section.)
- Setup of the logger to accurately interpret the **significance** of the sensor current, using a unit of measure relevant to the sensor. (This is described in section 12.12. Refer also to the sensor datasheet).

To proceed, first navigate to the channel configuration page.

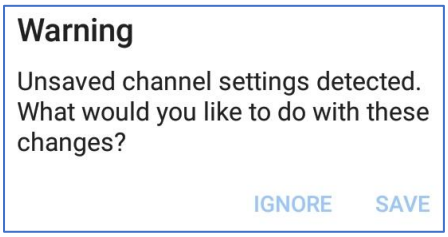


During this initial stage, it is possibly unknown as to what type of sensor will be attached, so the 'Sensor Type', 'Recording Unit', 'Value at 4mA', and 'Value at 20mA' fields do not need to be completed (or can be left at default).



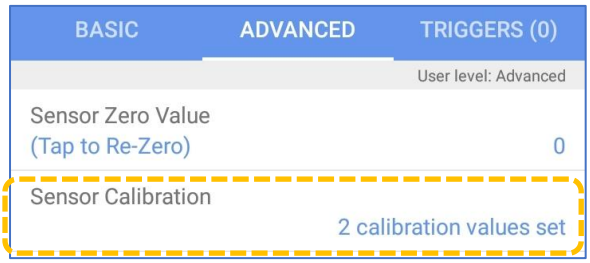
Depending on previous settings, or your logger defaults, the setup fields of the screen may be different. (See opposite.)

For either screen content, save the partially completed channel settings. Then select the ADVANCED tab.

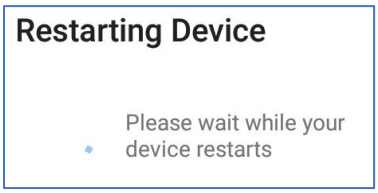


(If warned, then save the settings).

(Any "Units not set" warning is for information only.)

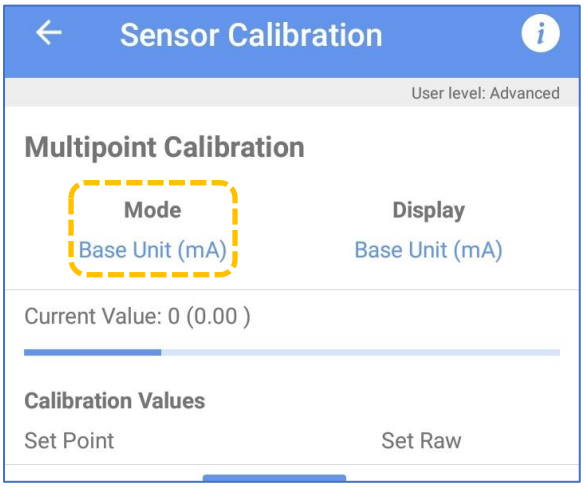


Tap on the "Sensor Calibration" line.

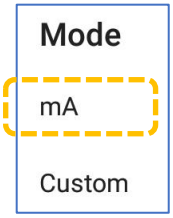


The IDT app will save the settings.

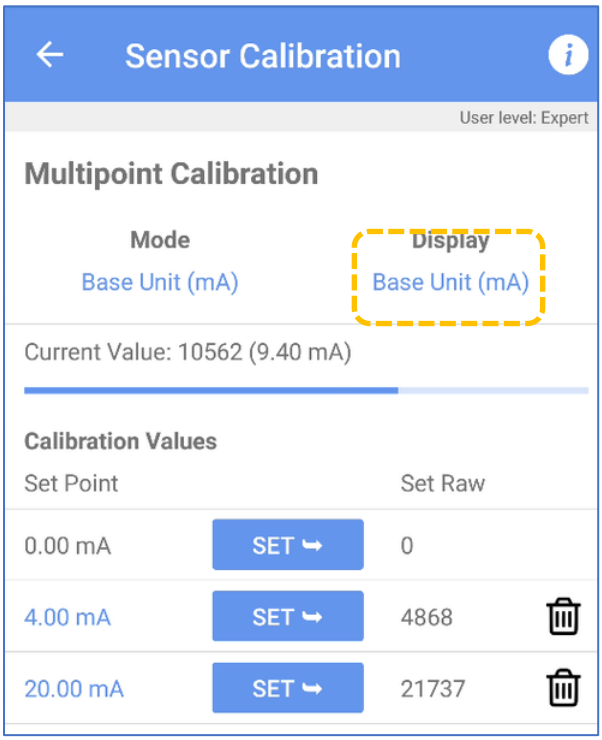
The logger may also have to restart (to begin a new recording).



Ensure the Mode is set to “Base Unit mA”.



(Adjust if required; select “mA”, and not “Custom”).



Similarly, set the Display unit to “Base Unit (mA)”.

Ensure the following set-points are available:

0mA, 4mA, 20mA.

(Tap the + symbol to add new lines to the table if needed)

(Tap on the values in the “Set Point” column to edit the current values).

Apply a precise input current of 0mA, 4mA and 20mA.

At each of the currents, monitor the live reading in the ‘current value’ until it stabilizes. Then tap the relevant ‘Set’ button. This will save the current A to D value into the table.

(Repeat for each of the reference currents).

When the table has been completed, tap on the ‘Save’ button, then back-arrow icon.
Calibration of the 4-20 mA input interface to use current ‘Base Unit (mA)’ is now complete.

Note: Channel setup will not be complete until the logger channel is set up to accurately interpret sensor output. The additional settings are sensor dependent, and can be found in the channel setup Basic tab.

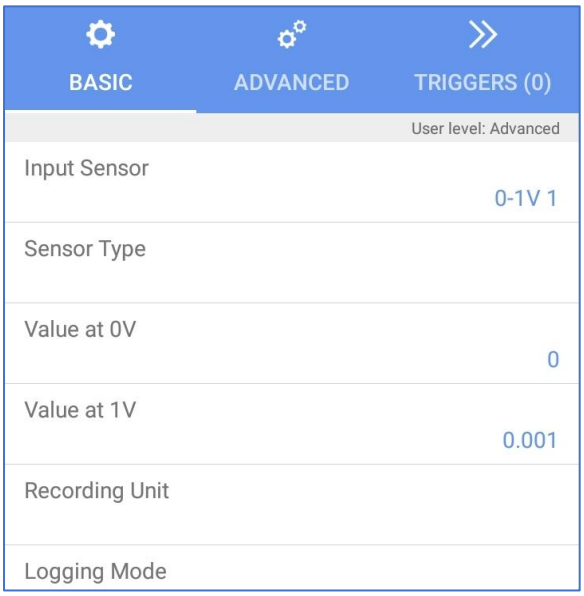
14.6 0-1V & 0-10V Interfaces (Voltage Range) ('Group 2 & 3' Loggers)

The 0-1V and 0-10V interface types are used with sensors that communicate sensor values by means of a d.c. output voltage (in the 0-1V or 0-10V range).

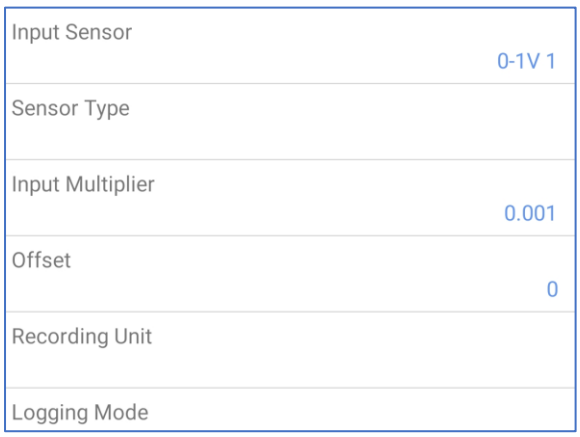
Calibration of the logger to use the sensor can be considered as a 2-stage process:

- Calibration of the logger interface to accurately read the input voltage over the required range. This is referred to as 'calibration of the interface to use the **Base** unit of measure', which in this instance is 'voltage'. (This is described in this section.)
- Setup of the logger to accurately interpret the **significance** of the sensor voltage, using a unit of measure relevant to the sensor. (This is described in section 12.13. Refer also to the sensor datasheet).

To proceed, first navigate to the channel configuration page.

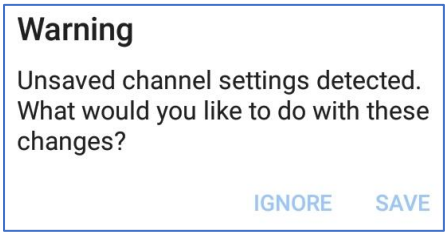


During this initial stage, it is possibly unknown as to what type of sensor will be attached, so 'Sensor Type', 'Recording Unit', and 'Value at 0V', 'Value at 1V/10V' fields do not need to be completed (or can be left at default).



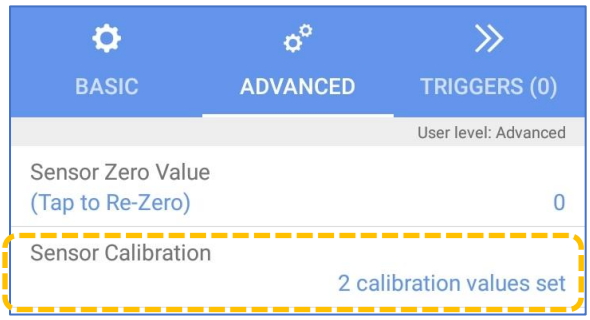
Depending on previous settings or your logger defaults, the setup fields of the screen may be different.
(See opposite.)

For either screen content, save the partially completed channel settings.
Then select the ADVANCED tab.

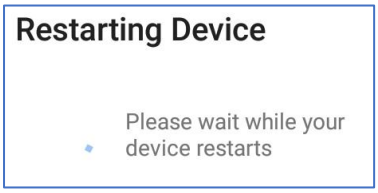


(If warned, then save the settings).

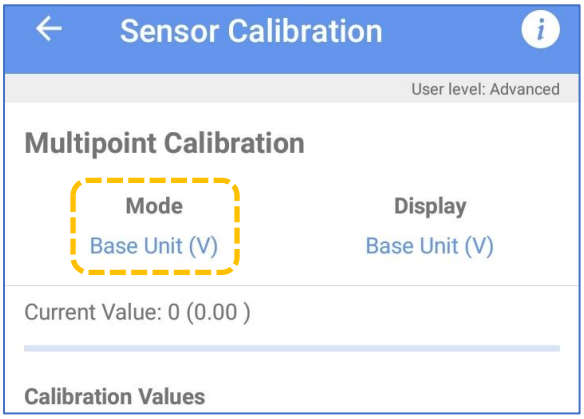
(Any "Units not set" warning is for information only.)



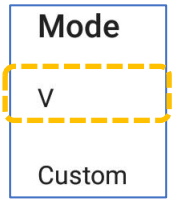
Tap on the “Sensor Calibration” line.



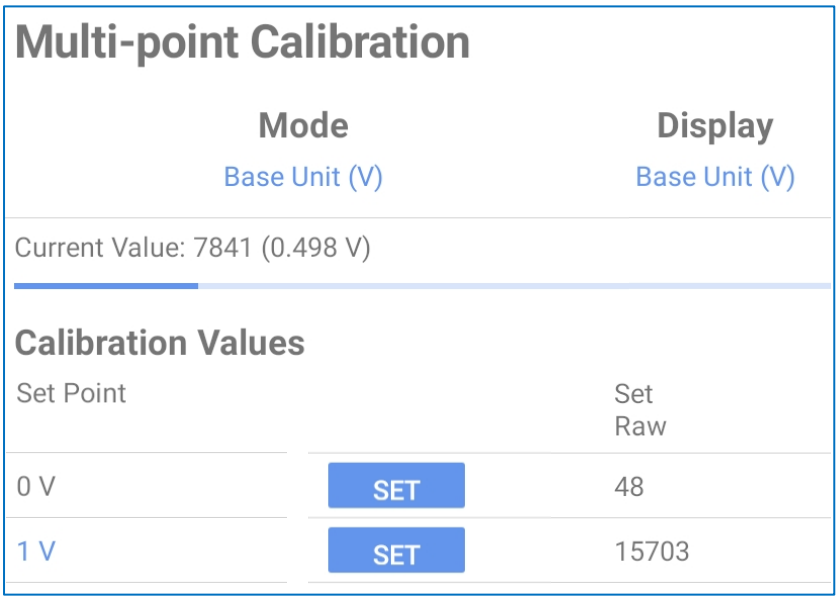
The IDT app will save the settings.
The logger may also have to restart (to begin a new recording).



Ensure the Mode is set to “Base Unit (V)”.



(Adjust if required; select “V”, and not “Custom”).



Similarly, set the Display unit to “Base Unit (V)”.

Ensure the following set-points are available:
0V, 1V
(or 0V, 10V for the 0-10V input range).

(Tap on the values in the “Set Point” column to edit the voltage values.)

Apply an input of precisely 0V and 1V (for a 0-1V channel)
or precisely 0V and 10V (for a 0-10V channel).

At each of the voltages, monitor the live reading in the ‘current value’ until it stabilizes. Then tap the relevant ‘Set’ button. This will save the current A to D value into the table.
(Repeat for each of the reference voltages).

When the table has been completed, tap on the Save button, then back-arrow icon. Calibration of the voltage input interface to use voltage 'Base Unit (V)' is now complete.

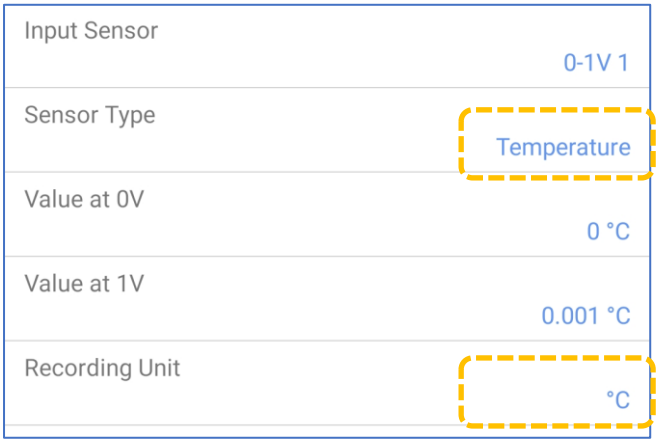
Note: Channel setup will not be complete until the logger channel is set up to accurately interpret sensor output. The additional settings are sensor dependent, and can be found in the channel setup Basic tab.

14.7 Sensor - Direct / Single-stage Calibration ('Group 3' Loggers, 0-1V / 4-20mA Interface)

For sensors using a 0-1V or 0-10V input, an alternative calibration method is available. This is by making use of the 'Custom' unit of measure when calibrating the logger / sensor pair.
The same method is also available for sensors using a 4-20mA input.

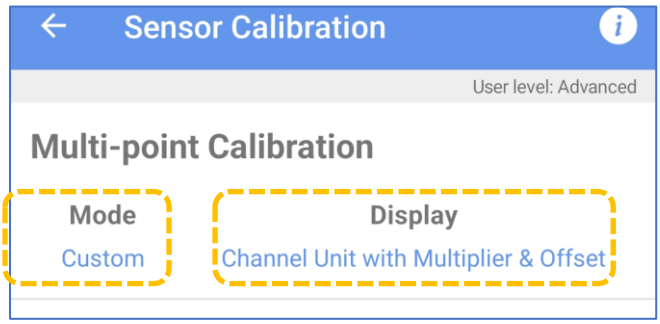
When the standard (base unit) calibration method is used, the sensor information requires two conversion steps. First, the binary (output from the logger electronics; from an A/D converter) gets interpreted as a voltage (or current) value. Then the voltage (or current) value is interpreted into the sensor measurement value. Calibration using a 'Custom' unit of measure can interpret the sensor result in a single conversion step. It is also useful if the sensor characteristics (e.g., The values at min and max voltage/current) are unknown. The calibration method does, however, have a disadvantage; The interface will require re-calibration if the sensor is ever replaced.

To use the direct calibration method, proceed as follows:



From the channel setup screen, select the 'Basic' tab. First ensure the 'Sensor Type' and then the 'Recording Unit' fields have suitable selections for the measurement parameter.

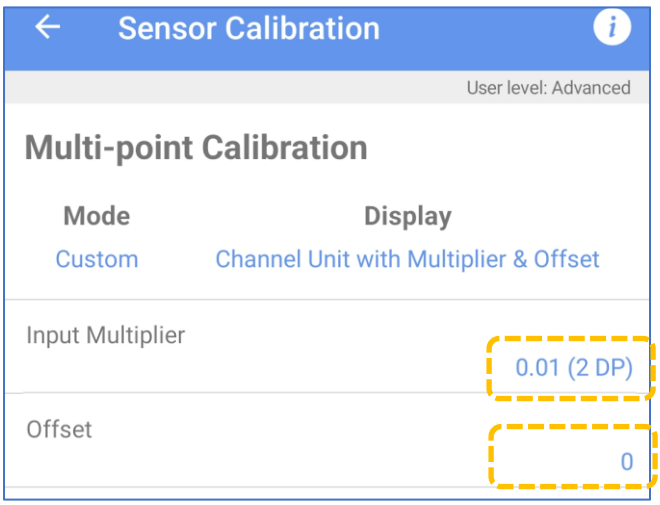
(An example is shown opposite, for a temperature sensor which has a 0-1V output range. Similar settings exist for the other signalling methods).



Then select the 'Advanced' tab and then tap on the 'Sensor Calibration' line.

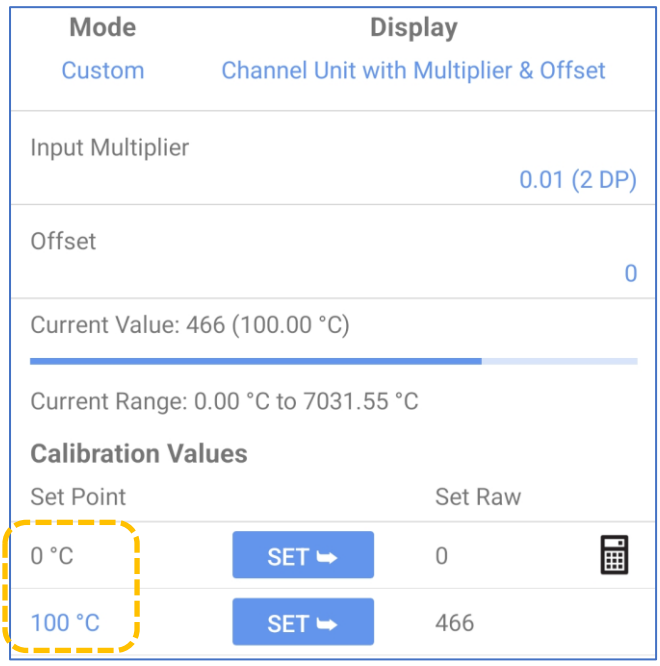
Ensure that the 'Mode' field is set to 'Custom'.

Ensure the 'Display' field is set to 'Channel Unit with Multiplier & Offset'.



Edit the Offset (if required); It should be set to read '0'.

Edit the Input Multiplier (if required); Refer to section 14.1



Tap on the 'Set Point' value of each line and add an appropriate reference point.

(e.g., 0 deg C for sensor calibration in iced water.
100 deg C for calibration in boiling water).

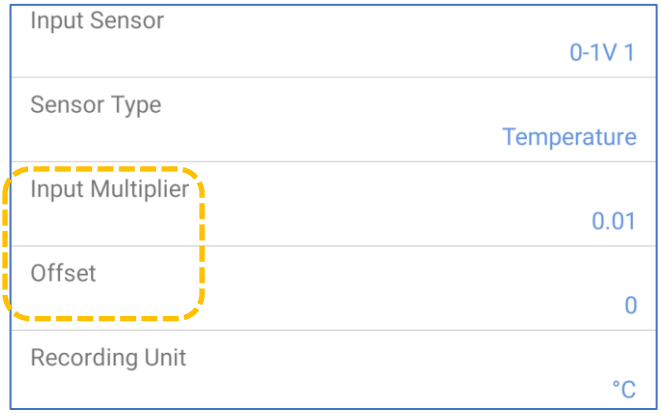
Place the sensor where it will experience each of the reference values.

Allow the sensor readings (shown in the 'current value' line to settle.

Then tap on the 'Set' button.

When finished, tap on 'Save' to save the calibration settings.

Calibration is now complete.



Note: When using the 'custom' unit of measure, set up as above, the 'Value at 0V' and 'Value at 1V' fields disappear, and are replaced with the 'Input multiplier' and 'Offset' fields.

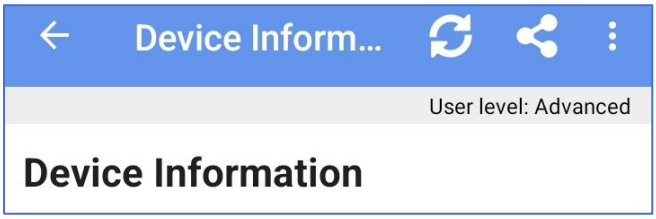
Similar changes happen with the other signalling types.

15 Appendix B - Facilities for Equipment Maintenance

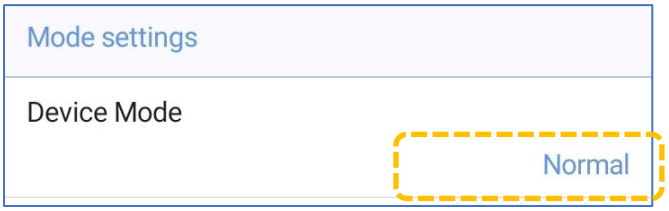
15.1 Battery Use and Activity Counters

Certain "Group 3" loggers are designed to allow battery replacement within a Service Center that has been approved by HWM Global. These loggers keep track of how much energy has been consumed by various activities, starting at the time when the battery was installed. This information can be displayed using IDT.

15.1.1 Activity Counters and Battery Level

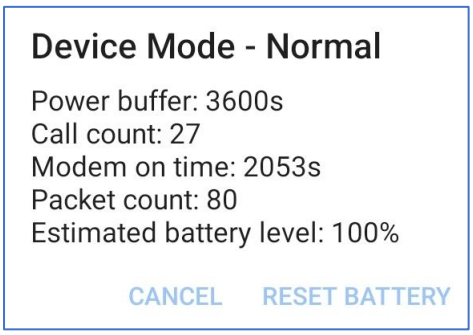


To display the activity counter and battery level:
From the Main screen, tap Device Information.
(The Device Information screen will load).



Locate the "Mode Settings" section and tap on the "Device Mode" line.

Note: This will only be enabled for certain logger models. IDT will disable the facility on other logger types

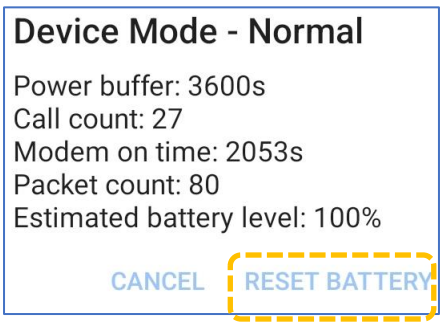


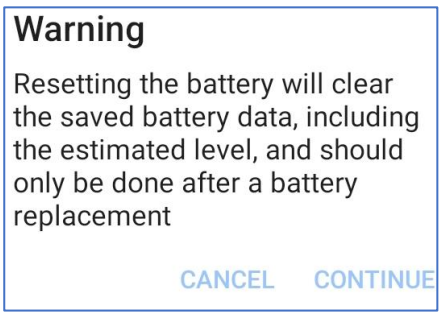
IDT will display use parameters of various logger activities; these activities are of significance because of their power consumption.

The *estimated* battery level is shown here; this is for the main internal battery.

There is another device within the unit (shown as "Power buffer") which stores power for immediate use. This is trickle-charged from the main internal battery and extends its useful life.

15.1.2 Battery Replacement – Activity Counter Reset





There is a control that informs the logger that a fully charged battery has just been fitted.

This control MUST be used during battery replacement to prevent a logger being returned to the field with "clocked up" power consumption counters.

Caution: This control must **ONLY be used** during the process of installing a **new, fully charged, battery**. Using the control without replacing the battery will soon cause the logger to malfunction, including possible memory corruption (logged data corruption), because its power source will unexpectedly fail. Batteries must only be replaced by a HWM-Global authorised Service Center

16 Appendix C - IDT - Operation Differences

The IDT app adapts the content of its screen options based on many factors:

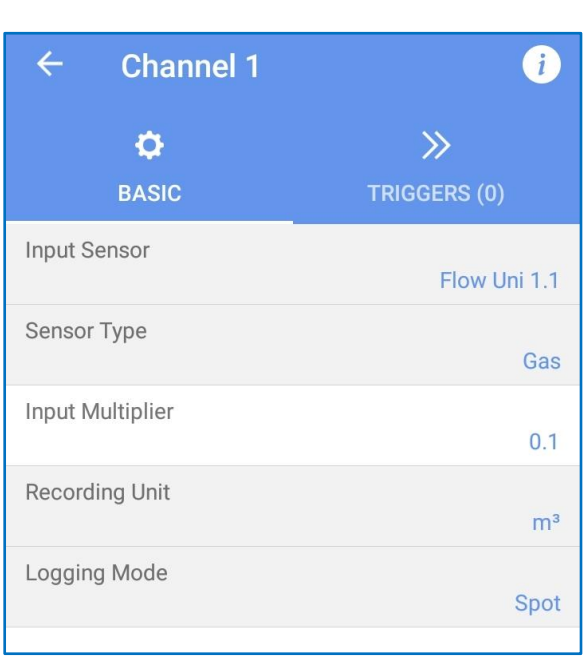
- IDT User level.
- Use of IDT with or without login to the server.
- Type of logger (logger family).
- Interfaces available for use (unconfigured and configured).
- Sensor attached or missing (applies to certain sensors only).
- Previously entered setting choices.
- Device security settings.

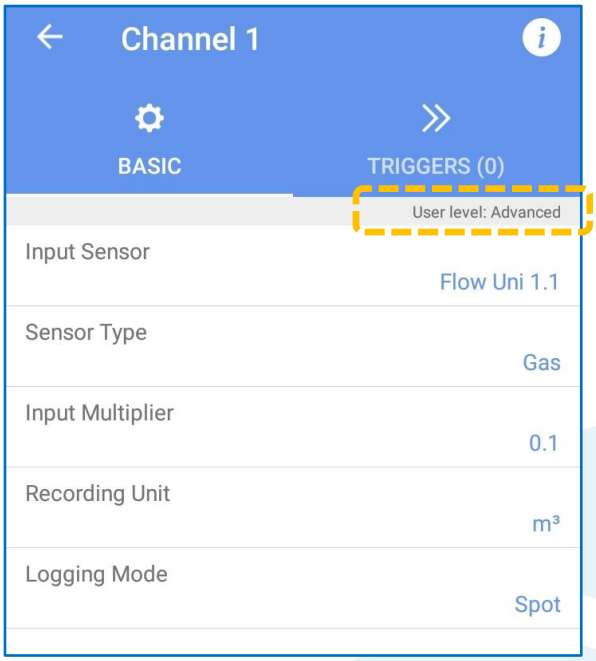
This section describes how this may sometimes affect the operation of IDT.
The description is not exhaustive but indicate typical issues which may arise due to circumstance of IDT use.

16.1 Restrictions of IDT Basic Mode

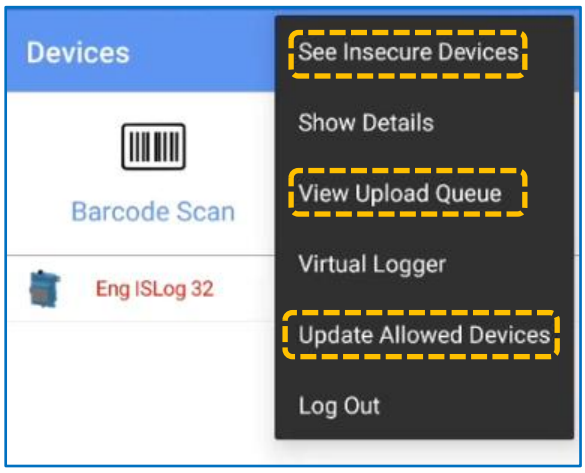
When operating IDT in BASIC mode, some features are restricted.

e.g. The ability to modify channel settings is restricted in BASIC mode (greyed-out), but available in Advanced mode. (See below for an example).





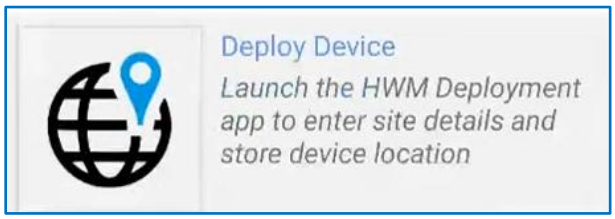
16.2 Use of IDT with DataGate vs without Datagate



Certain menus adapt to whether IDT is being used with or without the DataGate server.

Since DataGate is a player in the security of logger settings, the options to update allowed devices and see unprotected devices is removed when IDT is not used with DataGate.

Similarly, IDT will make no attempt to queue data for upload since it has nowhere to send the data from the phone device.



The main screen does not show the “Deploy Device” option.

It is not possible to deploy the device (using the same credentials as was used to log the IDT app into DataGate); as you have not logged into the IDT app, no credentials are available to use.

16.3 Use of IDT with a Virtual Logger

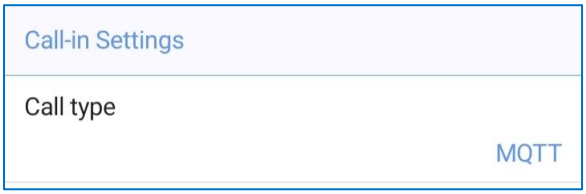
When IDT is used for inspecting the settings of a virtual logger (loaded from a logger settings file) it is read-only access. (See section 11.5)

IDT is not connected to any real device and has no facility to update either a real device or the settings file.

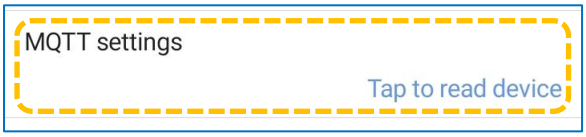
17 Appendix D - Settings for MQTT Protocol

MQTT protocol can be used to deliver logger data to a customer's server (broker) where an existing MQTT installation is available. Only channel data is delivered. Alarm information is not delivered, but alarms can be included in logger configuration to trigger additional call-ins to bring the server up to date promptly in situations where this is required.

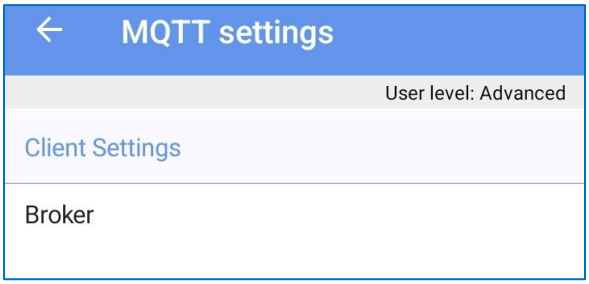
Where the MQTT protocol has been selected (refer to section 3.3.1), continue to set up for MQTT by checking/adjusting fields required for sending information to the server:



Locate the Call-in Settings area.



Locate the MQTT Settings line and tap to read the current settings from the logger.

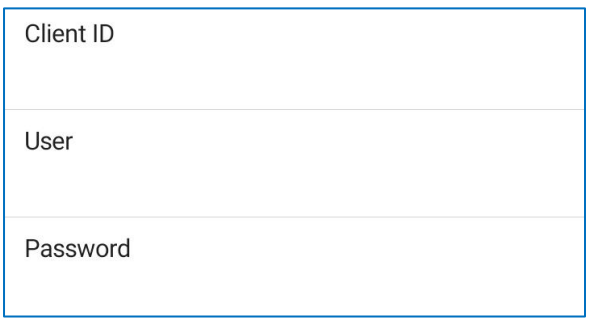


The MQTT settings screen will load.

The logger is an MQTT client.

Tap the line and add the URL of your MQTT Broker server. e.g. broker.mynetwork.io.

Similarly, add the IPv4 port number for your server's MQTT traffic.



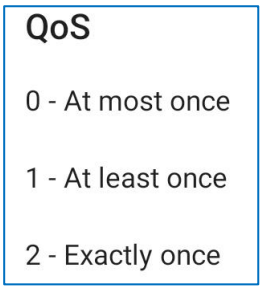
The logger requires a unique Client ID. (This may be obtained from the MQTT System Administrator).

Enter the username and password that is required to authenticate the client to use the MQTT server.

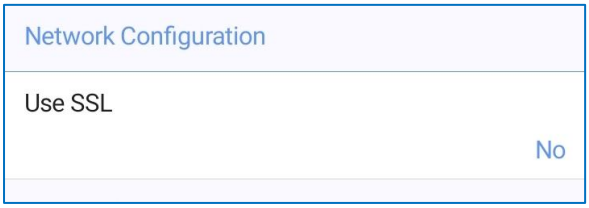
The logger requires a topic string.
Enter it here. (e.g. HWM/uniqueID).

Note: Example is for illustration only.
UniqueID is required to separate data from different loggers, where many are in use.

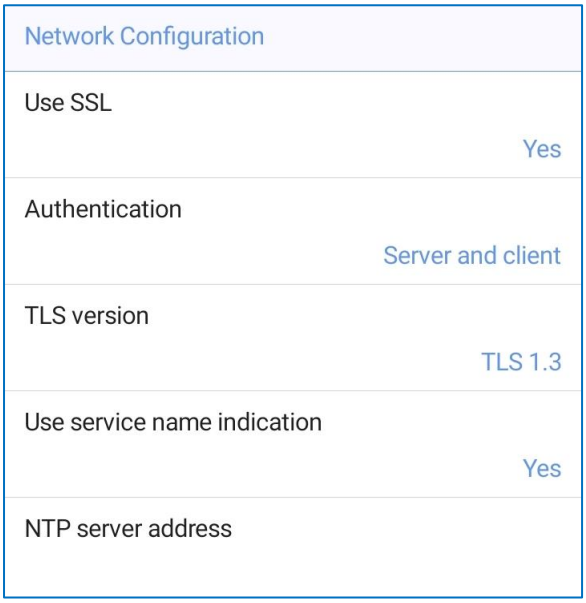
Each logger channel can be identified within the sent data but is not sent as a distinct topic. The broker or subscribing client has the task of separating channels.



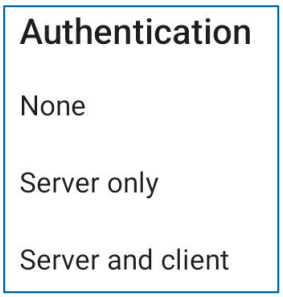
Pick the required Quality of Service that is required for the MQTT communications.

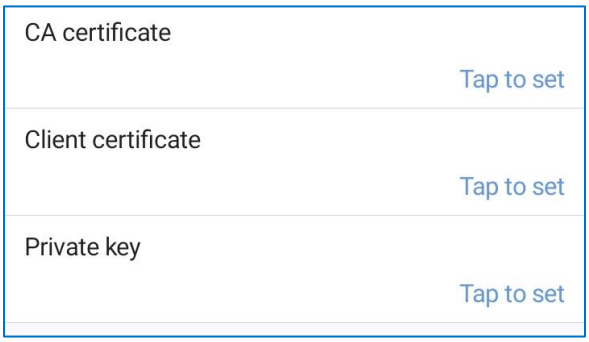


Choose whether SSL (Secure Sockets Layer) is required.

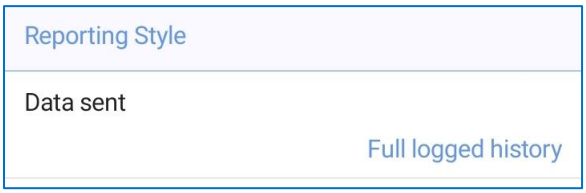


If SSL is enabled, complete the additional settings for it (see opposite).





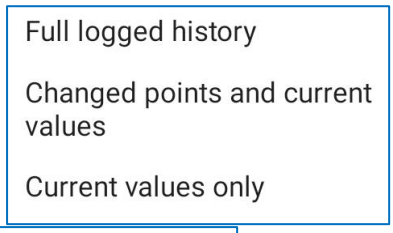
If any certificates or keys are required, tap and select the appropriate certificate file for each.

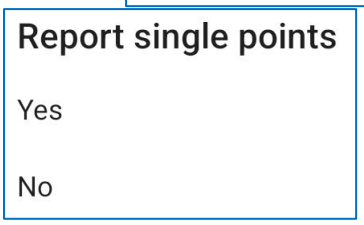


Locate the Reporting Style area.

Select an option of what data to send.

- "Full logged history" sends all datapoints since last message was sent.
- "Changed points and current values" removes data that has had no changes. It also sends current values.
- "Current values only" sends only the latest values.





When this option is "No" multiple datapoints can be sent as a single published message. (Preferred setting).

When this option is "Yes" each of the datapoints waiting to be sent will be handled individually, requiring its own publish message.

(Found in Options section).

The logger can support JSON message formats.

- Select "Standard JSON", or
- Use a template.
  (This requires the creation of a template file and upload to phone. Then select the file to use).

When this option is "Yes" the message will include timestamps in JSON format (ms since 01/01/1970, e.g. 1682500516000).

When this option is "No" the message will include timestamps in ISO8601 format (e.g. 2012-03-29T10:05:45-06:00).

(Found in Options section).

Channel Friendly Name
Channel 1
Channel 2
Channel 3

Channel Deadband
Channel 1
Channel 2
Channel 3

"Channel Friendly Name" fields are available for each channel to assist identifying the channel data.

"Channel Deadband" fields are available for each channel. This can further minimize data required to be sent (for certain settings) by treating data as being unchanged if it is within the deadband; this is effective at removing measurement noise.

Note: Friendly Name fields **must be completed** by the user and reflect the channel data.
If left blank, it will not be possible for the broker or subscribing client to identify the channel. (JSON fields used for describing the objects will be blank).
Each Friendly Name must be unique within the logger (e.g. Use Pressure1 and Pressure2 where two pressure channels exist

Additional Current Value Reports	
Battery voltage	No
CSQ	No
SMS number	No

It is possible to include non-channel information in the data upload.

Select "Yes" to include the required information.

UDP Config Call Settings	
Server address	inbound.hwmonline.com
Server port	23024

Having completed the MQTT options, the logger should also be set to call into the DataGate server so that it can check for configuration changes or firmware updates. (Refer to section 3.3.1.1 for guidance).

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hwmglobal.com

+44 (0)1633 489479

Ty Coch House
Llantarnam Park Way
Cwmbran
NP44 3AW
United Kingdom