User Guide: IDT (app for mobile devices) - Logger User Interface.

Warning:

Please read, understand, and follow any instructions in the relevant manual for your logger or that were shipped with the equipment.
Where a logger is for use in a potentially explosive atmosphere, also refer to the relevant additional safety (Ex) documents for the equipment.

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1 PART1: ----- 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.

HWM 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 Technical Support team on +44 (0) 1633 489479, or email cservice@hwm-water.com

Most HWM 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 non-specific, typical, generic logger device. Many HWM loggers will operate in a manner similar to the descriptions provided. Other HWM equipment will have been designed for a specific purpose and will have certain IDT settings that are only relevant for that purpose.

Acknowledgements:

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1.2 LOGGER DEVICES SUPPORTED BY THE IDT APP

The IDT app can be used with the following logger families:

- COMLog2-IS
- ISLog
- Permanet-SU
- 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. 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 logger is often 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 a more meaningful way than just tables of raw data.

e.g., HWM provides the following web-based viewing platforms:

- DataGate (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 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 will 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.

The logger usually includes 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.

Most loggers are powered by a non-rechargeable Lithium 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. 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 logger 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 a server only if it has the facility to fork the message and send it to multiple users.

1.5 LOGGER SECURITY: SECURE AND UNPROTECTED MODES

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 “Secure” or “Unprotected” device. The loggers can communicate their security requirements to the IDT app. The setting will influence the cooperation of the device with the HWM IDT tool.

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

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

Secure 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 “secure” therefore require DataGate (or a compatible server) for IDT to operate with them.

1.6 ACTIVATING THE COMMUNICATIONS LINK

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 communications 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-Low-Energy (BLE) compatibility, GPS, and Internet capability.

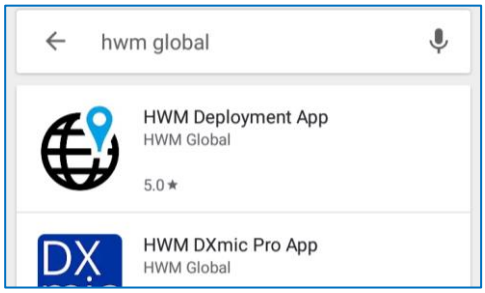
1.7.1 Installing the HWM software (IDT and HWM Deployment App)

The mobile device must be prepared for use with ISLog loggers by installing the HWM "IDT" mobile phone app.

On an Android device, open the "Play-Store" application.

Search for "HWM global".

A list of available HWM applications will be shown.



Select "IDT" and install it.

Once installed, an "IDT" icon will appear on the phone.

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

Note: The IDT app employs the use of the "HWM Deployment App" for deployment functions, so this must also be installed.

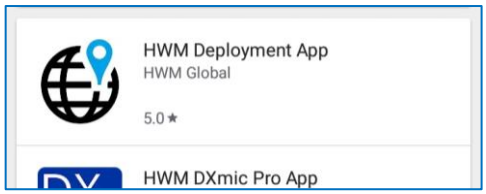
On an Android device, open the "Play-Store" application, as detailed above.

Search for "HWM global".

A list of available HWM applications will be shown.

Select "HWM Deployment App" and install it.

Once installed, an "HWM Deployment App" icon will appear on the phone.



Note: Further information can be found in the user-guide for the Deployment app.

For iOS-based devices, use the Apple App store to obtain the above two apps.

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 type that it is communicating with and adapts the content of its screens so that it presents only relevant options to the user. 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 it during manufacture of the device.

Some electronic interfaces are multi-purpose in nature. 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 one of a several types of channel (each requiring a different driver). The user can make one selection from the set and 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. The logger can have one or several interfaces producing data. IDT provides a means to identify a specific stream of measurement data; this is done by assigning a “channel number” to each data stream.

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).

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 sales representative at the time of ordering the loggers.

1.9 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:

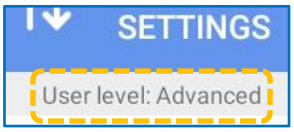
- The logger must be set up to be able to communicate with the DataGate server, using appropriate credentials.
- DataGate and the logger must agree on the way data is presented to the server.
    - Channel numbers in use and the channel content from the logger has to agree with the expectations of the server, in order to correctly receive and process the data.
    - Number formats and the units of measure in use have to match between logger and server.

2 USING THE IDT APP / MODES OF USE

2.1 IDT – USER-LEVELS

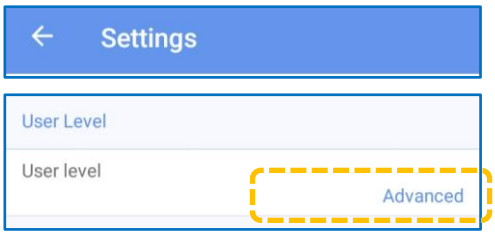
IDT can be set to various user-level "views" including:

- "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 line.



2.2 IDT - MODES OF USE

IDT may be used in two modes of operation:

- Operated in conjunction *with* the use of the DataGate server.
- Operated *without* the use of the DataGate server.

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:

- The user is required to authenticate themselves with a username and password.
- An internet connection is required initially for the authentication process and also at other times for communication to the server.
- The user is given the ability to manage secure loggers (as well as unprotected loggers).
  (Also requires that the User and loggers have been setup on DataGate correctly to give the required permissions, such as logger ownership).

  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.

  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.

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 secure loggers.

2.2.1 Use of IDT without Logging in

It is possible to use IDT without going through the login process, but restrictions will exist, (see also section 2.2). It will not be possible to see any secure logger, only unprotected ones. It will not be possible to go through the deployment process using an app 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. This can be done by clicking on the link to "Log in without DataGate". Once this link is activated, 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 this option, skip to section 2.3.

2.2.2 Logging in and initial actions

Locate the IDT icon on the phone 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, it 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.

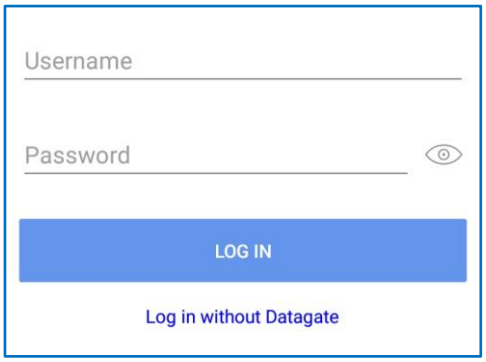
Ensure the "Connection test successful" appears.

Note: This screen also shows the IDT software version.

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

Enter your DataGate username and password for your mobile phone app.

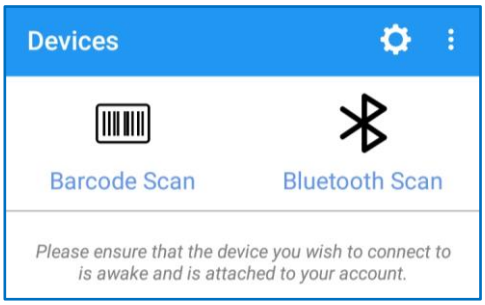
The password visibility can be turned on and off with the view control.



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. This includes a list of logger devices it is authorised to use. (i.e., All loggers have to be previously entered into the DataGate system).

2.3 DEVICES (INITIAL SELECTION SCREEN)



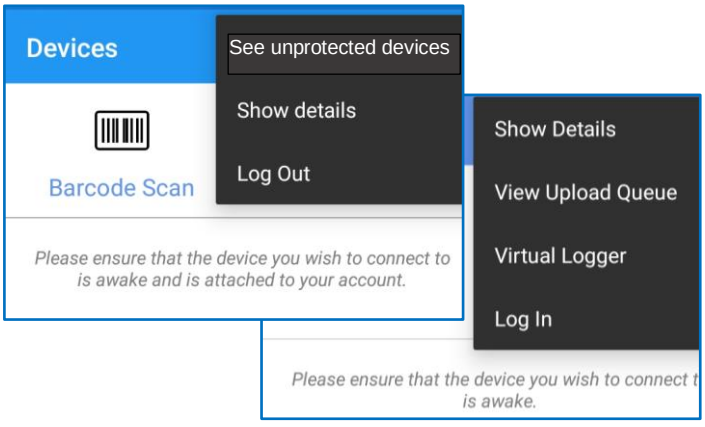
If login and authentication was successful, the app will show the "Devices" window.

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

("Device", as used by the app, means "logger device").

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

(The menu contents can vary).



2.4 SELECTING A LOGGER DEVICE

Select a logger and ensure its communications link has been activated (see section 1.6). The logger broadcasts its presence over the Bluetooth radio link.

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

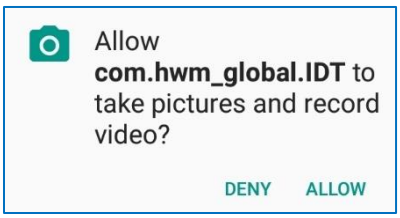
- Bar-code scan (automatic selection) … see section 2.4.1.
- Bluetooth scan (manual selection) … see section 2.4.2.

2.4.1 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 ALLOW.



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

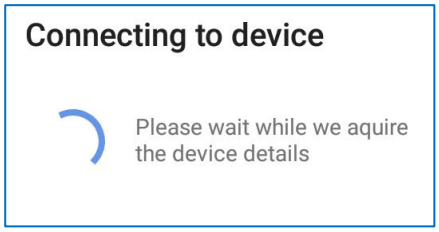
Locate and view the logger barcode using the camera. The red line in the displayed image should be positioned over the barcode.

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.

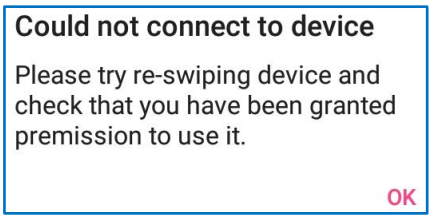
IDT next confirms the logger is physically present by trying to detect it. It therefore starts a scan and looks for Bluetooth devices in the area.

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).

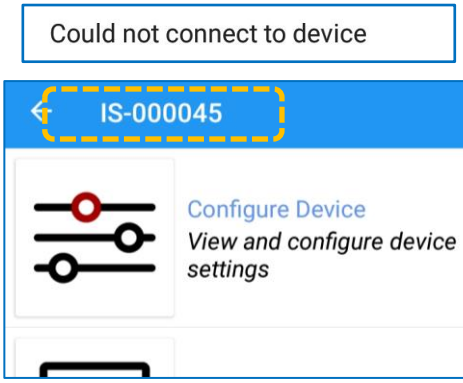
Follow the guidance message and then tap OK.



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.

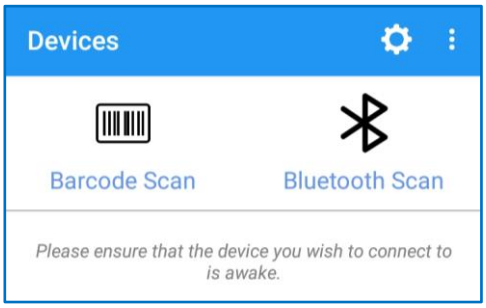


The IDT app automatically communicates with the logger and obtains its configuration and settings.

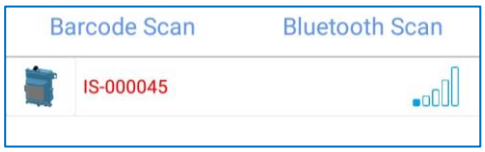
(Skip to section 2.5)

2.4.2 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.

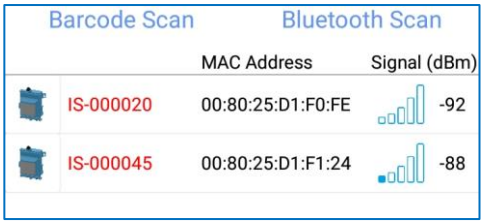
If you are not using DataGate:

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

If you are logged into DataGate:

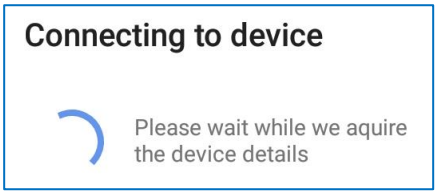
- Secure loggers that you own are listed with black text.
- Unprotected loggers that you “own” (on DataGate) are listed with red text (providing “show unprotected devices” is selected from the local menu).
- Loggers that you do not own are not listed.

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.

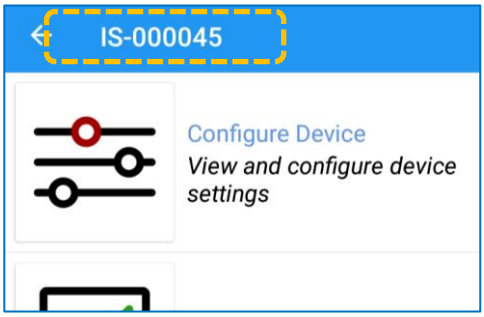
Tap on the line to select it. IDT will connect with it.



The identity of the logger is shown, and IDT displays some graphical controls that give access to the various options.

This is the main options screen.

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

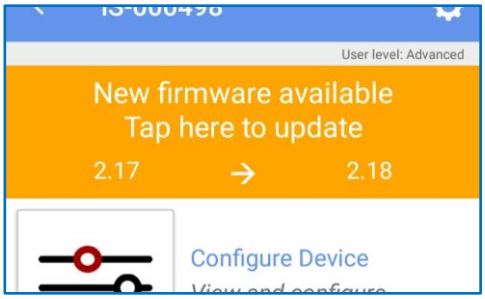


2.5 Logger Firmware Update

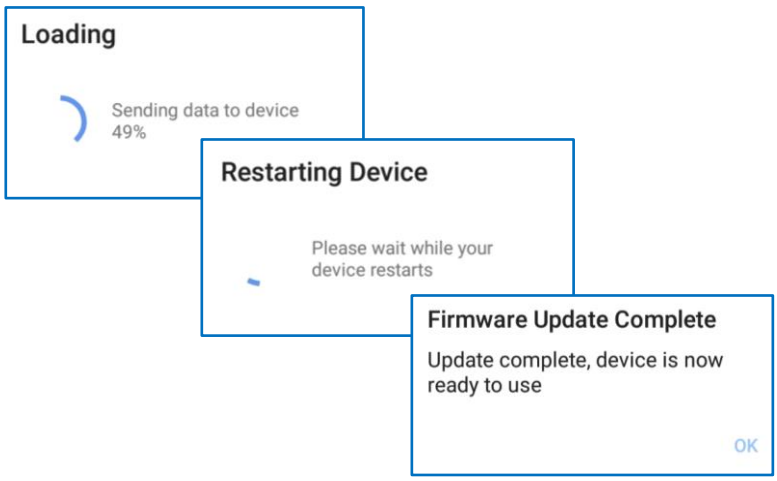
New software releases (firmware) for loggers are occasionally released from HWM.

Before reaching the main options page, IDT automatically checks the existing logger firmware version. If a newer one is available, the user has 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.



Progress is shown.



... Until the upgrade is completed.

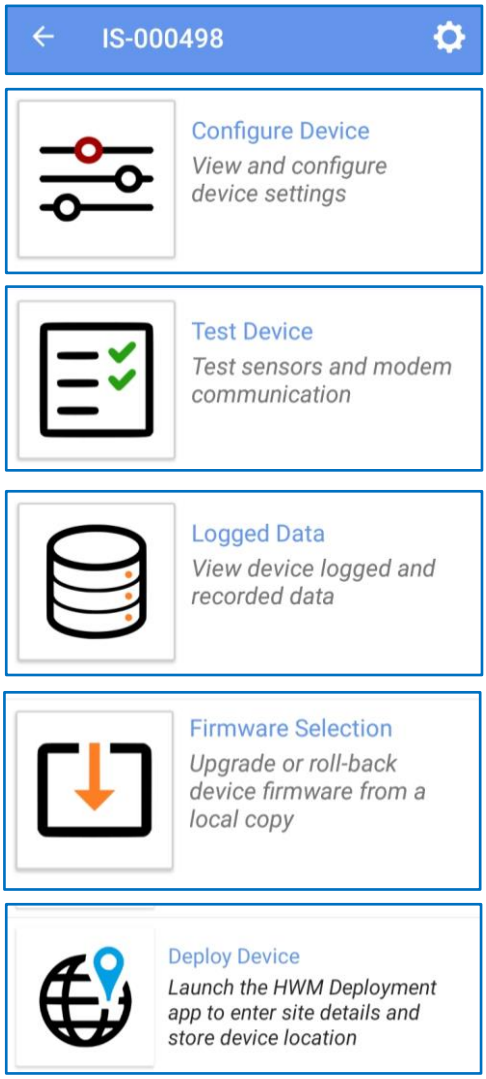
The main options screen is then shown.

3 IDT – MAIN OPTIONS PAGE

The main options page is shown below.

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

Controls are displayed for the user to select how they wish to use IDT app:



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:
The user can access measurement data held within the logger device.
(Access is temporary; data is not stored by the app).

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.

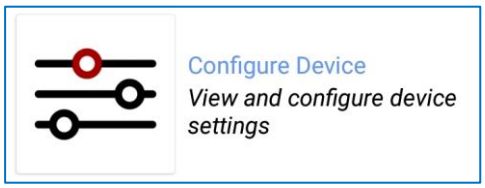
Tapping the Deploy Device option will launch the HWM Deployment app and passes details of the logger to it.
The user is able to record the installation location of the device.
(The HWM Deployment app is used to complete the task of selecting the site of deployment and an administrative update of the DataGate system).

.

3.1 DISPLAYING LOGGER DEVICE INFORMATION

3.1.1 ID information / Telephone number (SMS)

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 its current time.

The refresh symbol on this page updates the displayed Logger Time.

The "Editable settings" section allows the user to:

- (Optionally) input a unique identifier in the ID field, up to 32 characters.
- Modify the "Telephone Number" of the logger.
  Note: This acts as an identifier of the logger to the DataGate system, so **caution** should be taken.
  Only modify this field if advised by HWM.

This number is not read from the SIM card but has to be independently programmed into the logger memory.
It should match the number that appears on the logger front-panel label, (see example opposite).

The telephone number is usually pre-programmed into the logger by HWM prior to shipping and should remain unchanged. This is the case even if the SIM is changed.

3.1.2 Time-zone (UTC offset)

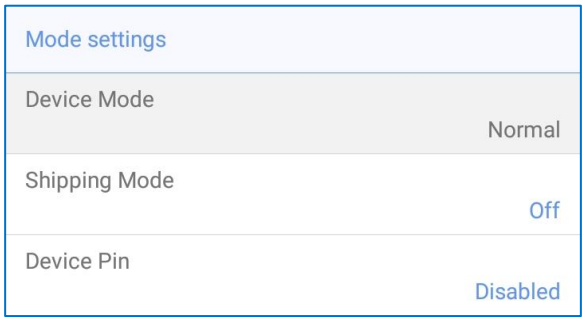
The logger communicates to DataGate using the global time reference, (called "UTC"; Coordinated Universal Time; it is similar to Greenwich Mean Time, GMT).
IDT allows the user to program loggers using local time. The logger needs to know the offset of the local time zone from UTC so it can communicate the correct timestamps for data to the server. This can be set by the user by tapping the "UTC offset" line.

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.

e.g. If your local time is 4 hours behind UTC / GMT then set this field to " - 04.00".

3.1.3 Logger mode / Security PIN

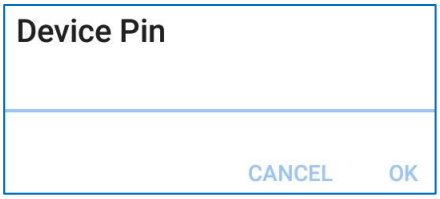
The “Mode Settings” area contains miscellaneous controls that affect device operation.



Device Mode should be “normal”; this is unavailable to edit for most users and is password protected.

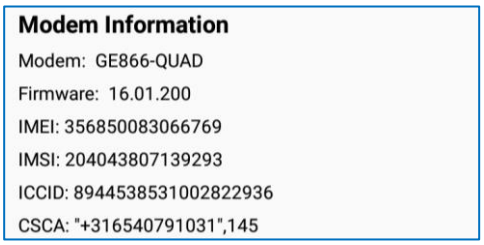
Shipping mode is used to render the device inactive and is used for shipping the unit and for long term storage. (Refer to section 5.1).

Device PIN gives the user the option of setting a user-defined PIN on an Unprotected device.
Tap on the line if you wish to set a PIN.
The PIN can be up to 8 characters in length.
Once set, IDT will not allow access to the device without a valid PIN being entered.
If you forget the PIN, the device can only be recovered using a HWM Master PIN; the PIN is unique to each device.



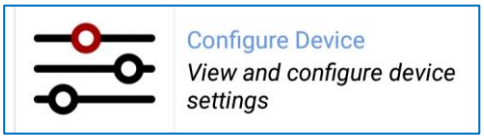
3.1.4 Modem Information

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.

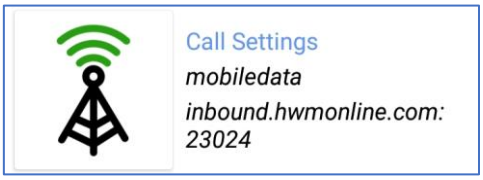


3.2 DISPLAYING / EDITING CALL-IN SETTINGS

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.

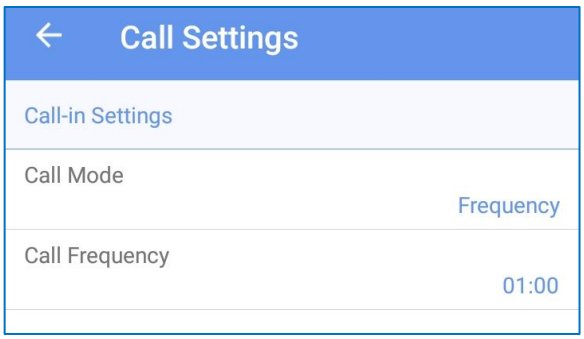
Tap on any line to change the setting; the change is made to the logger immediately without having to confirm it.

The page is divided into 4 areas of settings (1 for IDT in “Basic mode”):

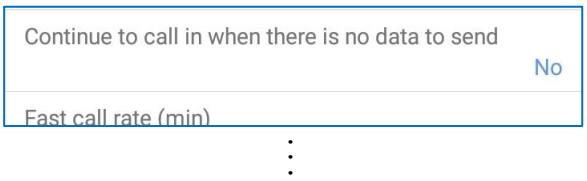
- Call-in settings (also available in Basic mode) ; Refer to section 3.2.1.
- Data Destination settings ; Refer to section 3.2.2.
- SIM settings ; Refer to section 3.2.3.
- Modem settings ; Refer to section 3.7.1.

3.2.1 Call-in settings

The Call-in settings for an IDT user-level of Basic are shown opposite.



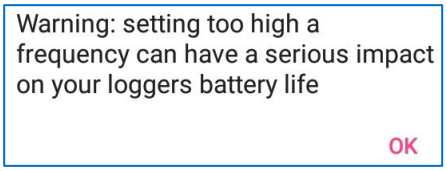
Additional settings can be accessed at a user-level of Advanced.



The Call-in settings affect when the logger calls in with measurement data.

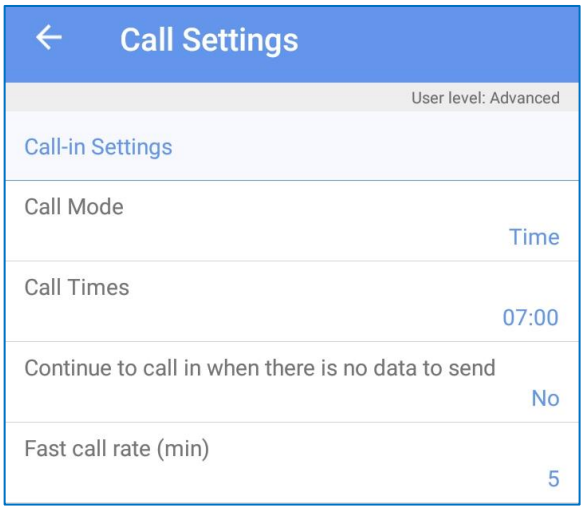
Note: These settings should be carefully chosen since every call-in uses some power from the battery.
To prolong battery life, keep the number of call-ins per day minimal.
3 calls per day (maximum) are recommended.

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



Call mode:

- 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).



Continue to call when there is no data:

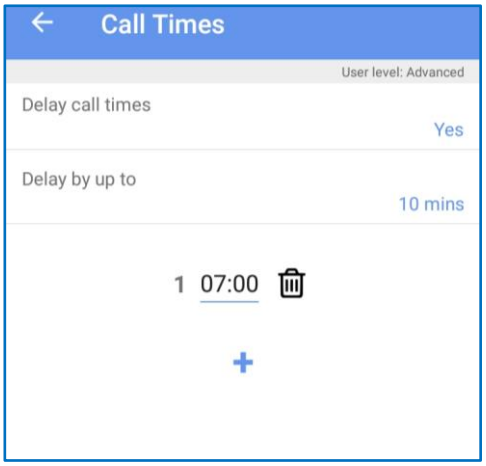
- This should usually be set to "No"; It is to save battery power.
  It takes effect when measurements are made infrequently; if there is no new (or unsent) data then do not call in.

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).

The selection method can vary according to what is call-mode details are being set (time or frequency). Tap on the part of the field you wish to change (i.e., hours or minutes), then make the adjustment.

When the Call-mode is set to “Time”:

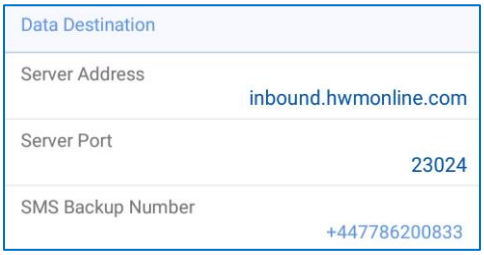
- Controls are available to delay the Fixed call-in times by a short random time; this can be used to reduce the peak load on the server.
- Fixed call-in times can be added. (Logger has a typical limit of 8).
- Fixed call-in times can be deleted.



When the Call-mode is set to “Frequency”:

- 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.

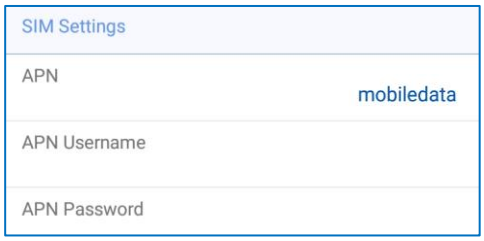
3.2.2 Data Destination settings



- Set the URL (sever 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 telephone number that the logger can use to send messages to the server. (Settings shown are for illustration purposes only).
  The SMS (text message) service is a fall-back connection path only used if the internet cannot be accessed for some time. Not all loggers or SIM cards support the SMS messaging service.

3.2.3 SIM settings

- Confirm the settings match those of your mobile-network data service provider.
- Edit any that are incorrect.
  (Settings shown are for illustration purposes only).



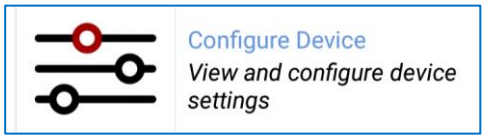
The APN (Access Point Name) is the name of the gateway being used by the mobile service provider to access the internet.
If required, enter a username and password.

3.3 TIMING INTERVALS FOR MAKING MEASUREMENTS

(See also section 5.6).

These settings determine what time periods the logger uses for its background activity of gathering data.

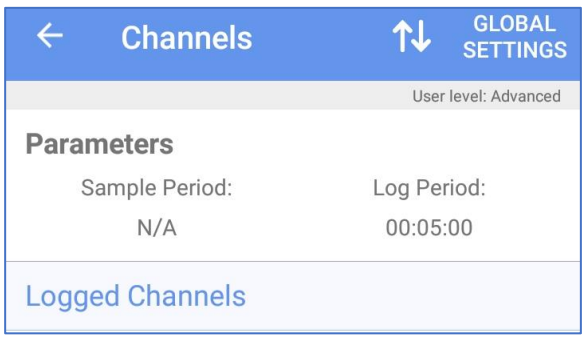
From the main options page, tap on the “Configure Device” selection.



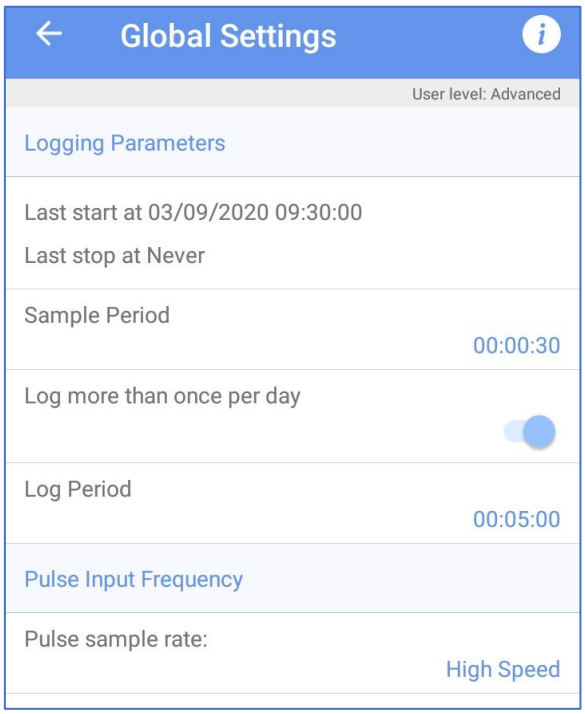
A new page will open with various configuration options. Select the “Channels” option.

The “Channels” summary page is displayed.

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



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

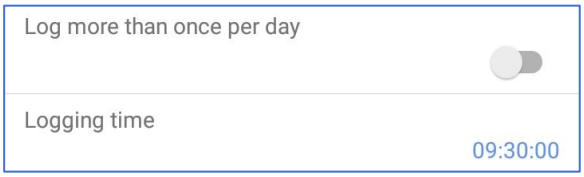


The page gives details of when the logger was activated or last restarted.
(This is for information only).

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

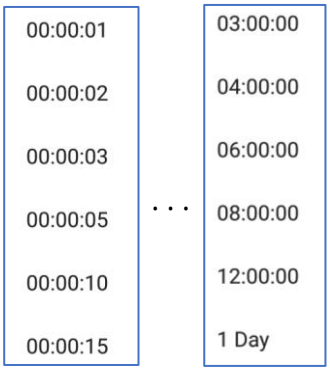
Most general-purpose loggers should be set to log more than once a day.

Note: Where just once a day is selected, the user must program the time that the measurements are to be made and logged. (e.g. This is used in scenarios where the logger is being used with specialised sensor to run a daily test and log the result).

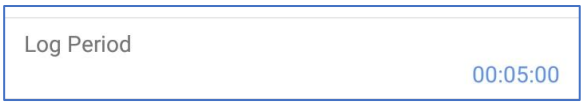


The “Sample Period” sets the time interval between making measurements on most of the interfaces.

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 the sample period.



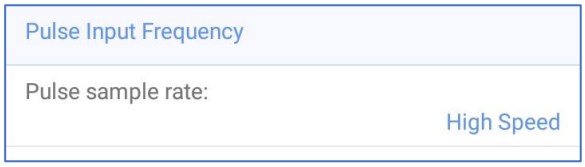
The Log period must be a multiple of the sample period.
If the user does not select an appropriate value, IDT will automatically adjust the input.

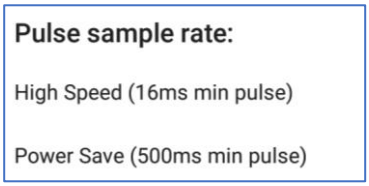
The data value stored is known as a “datapoint”, normally produced at the log period rate. The value is formed by (optionally) applying some mathematical function on a set of raw data measurements (made at the sample rate); the samples obtained between the log period intervals.

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

Pulse input interfaces are therefore sampled at a much higher rate than regular channels and have their own setting for selecting timing.

Select the most appropriate setting based on the expected maximum pulse rate and also the minimum pulse-width.
Where appropriate, battery life can be extended with the “power save” setting option.





3.4 CREATING 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. This user-guide will therefore give an example of the considerations needed and steps taken to set up a *typical general-purpose* logger channel for a *simple sensor*. This is for introduction purposes only; many channels will follow a similar setup procedure. However, some loggers employ specialised sensors or algorithms which require further discussion. (Refer to section 6 for further details).

Note: A channel can contain:

- A stream of data measured *direct from the sensor interface*.
- A stream of *indirect data* derived the direct data stream.
  e.g., Meter pulses can be used to indicate consumption.
  Indirect data can be in the form of flow (when timed)
  or a calculated meter reading (if the initial meter reading is known).

The example is based on simple sensor that is able to detect if a switch is open or closed. These can be used for a variety of applications including detecting output pulses from a gas meter.

3.4.1 Example 1: Gas flow and meter readings

A gas meter pulse represents a volume of gas that has travelled through the meter.
To accept the gas usage meter pulses as an input, the logger is required to have a suitable interface. IDT refers to this as a ***pulse input*** 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.

Note: This type of logger interface has many uses and could equally be set up to interface with water meters.
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.

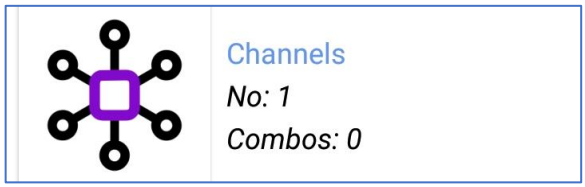
This is handled by allowing the installer to select from several available options when setting up the channel. The logger then uses the most relevant driver with the chosen settings

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.
A meter reading could also be obtained (if we also record the initial meter reading) by accumulating the total number of meter pulses.

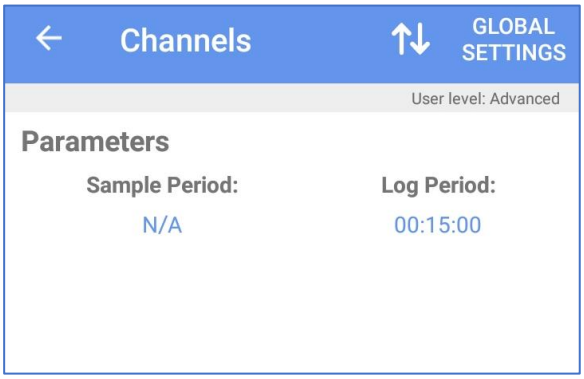
3.4.2 Setup of a new channel

Tap the Channels icon to begin setup of a channel.



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

(Here, the list is empty).

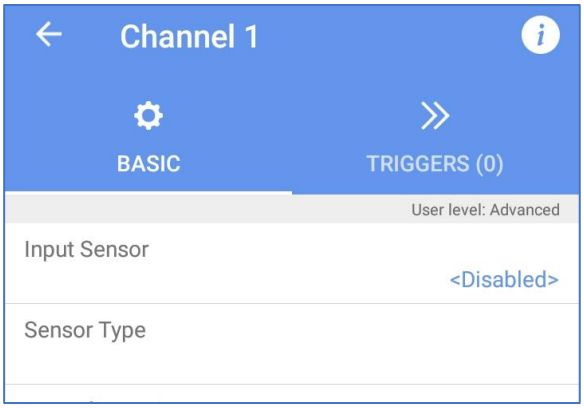


Tap the " + " line to add a new channel.

The new channel is enumerated; here it is channel “1”.

There are two tabs, select the “BASIC” tab.

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



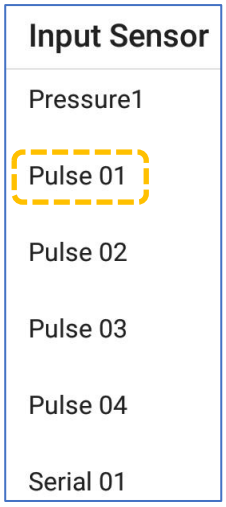
A pop-up selection box appears listing all installed sensor interface options.

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.

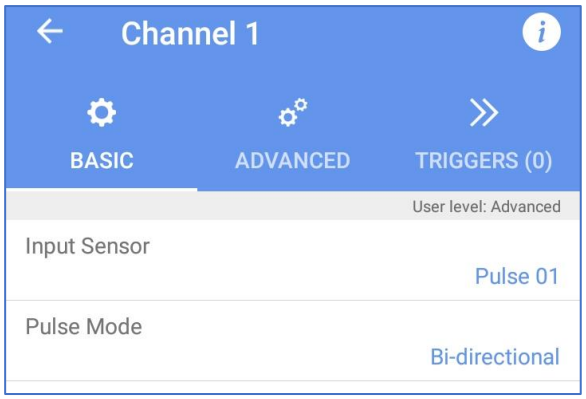
For this example, a uni-directional flow sensor is required; this uses only 1 pulse input pin.
Select a Pulse pin from the selection list by tapping it. (e.g., “Pulse 01”).

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



The screen updates to show the selected interface.

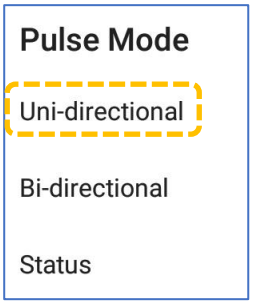
For this particular type of interface, multiple software driver options exist, and hence a new setting line is displayed, “Pulse Mode”.



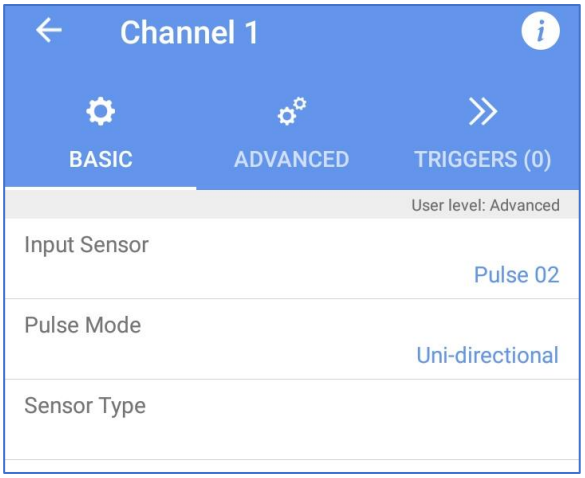
Tap on the Pulse mode setting and select from the available options.

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.



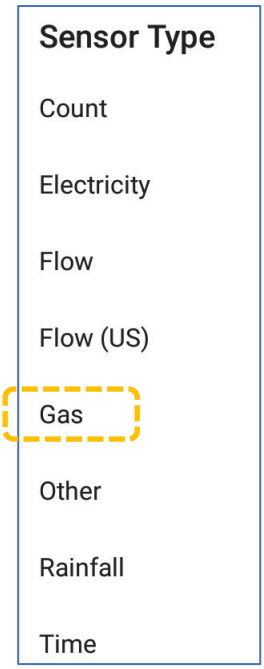
The software is now prepared to count pulses but has no idea of whether it is measuring the flow of electricity, water, or something else.

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

Tap on the “Sensor Type” line.

A list of options is presented.

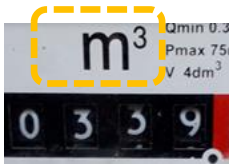
Select the type of measurement being made.
(In our example we are measuring gas. … Therefore, choose “Gas”).

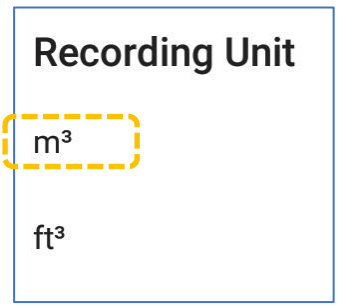


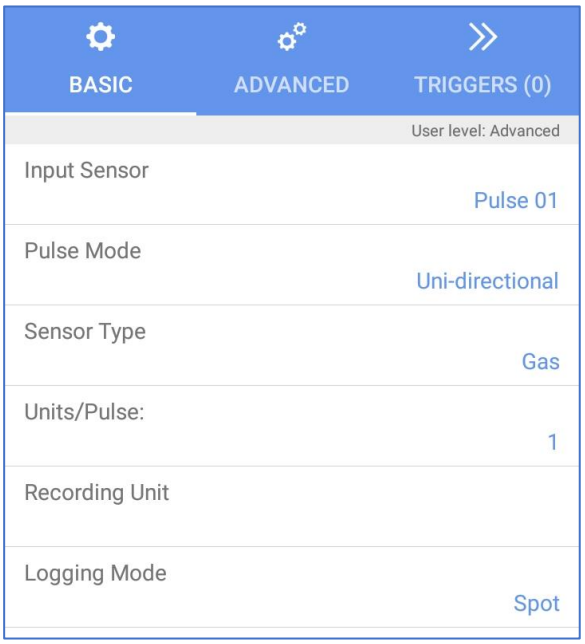
Next tap on “Recording Unit” and select a unit of measure from the list.

(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., m^3 for the example shown opposite).





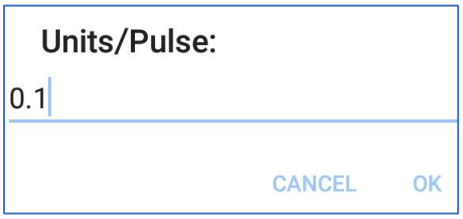


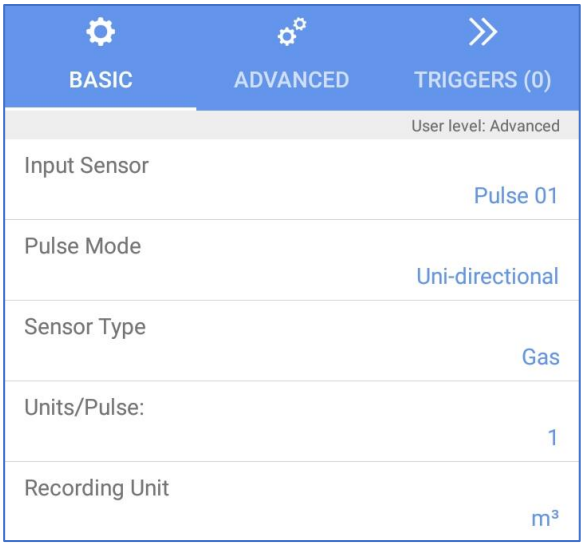
A relevant calibration factor for a gas-meter is units per meter pulse. (Other types of equipment may require a different type of calibration factor).

Tap on “Units/Pulse”.

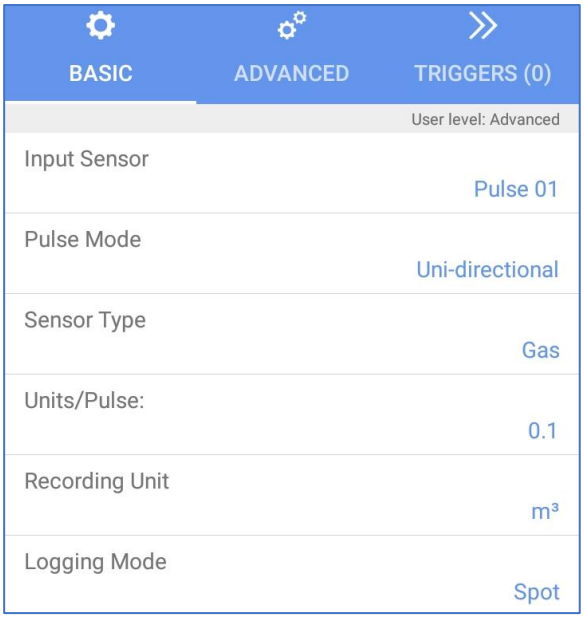
This selects the pulse significance of the meter. Select the correct setting based on the equipment you have attached the sensor to.

e.g. If the meter pulse represents 0.1 m^3 of gas, the units/pulse should be set to 0.1.



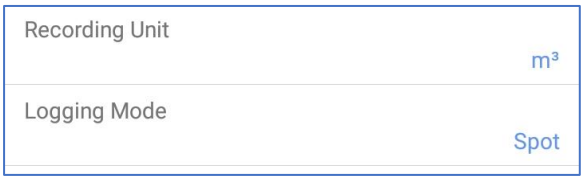


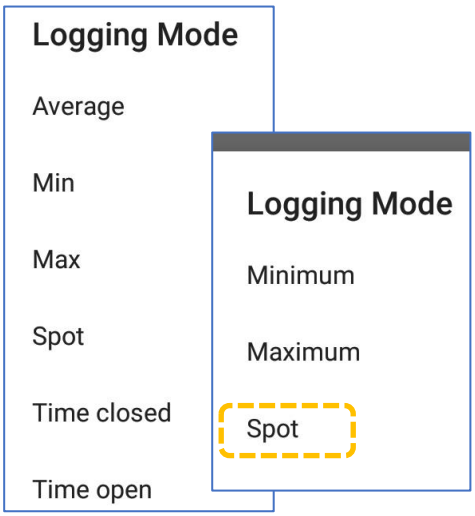
By repeatedly counting the number of pulses from the meter over a fixed period of time, the logger is able to determine the flow rate through the meter.



Next select the required logging mode.

The available options depend on what is being measured.

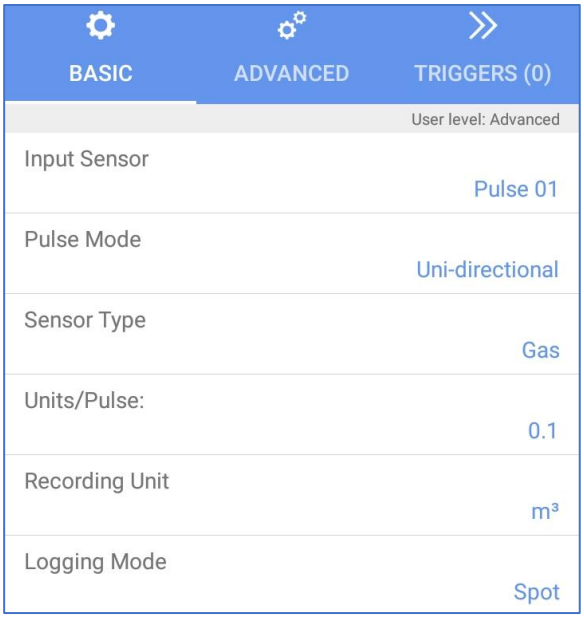




For example, “Average” will produce a datapoint (logged data) that is an average of the measurement samples it has made since it last produced a datapoint.
(i.e. A new datapoint value is produced and saved to memory at the rate set by the Log period setting).

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

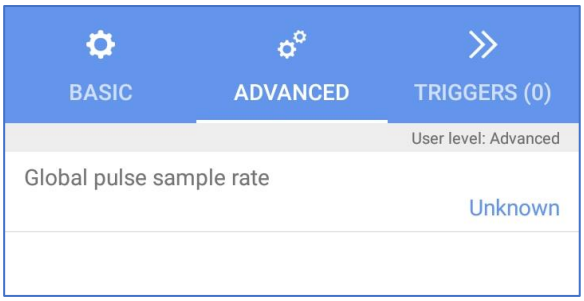
For a gas flow reading, the channel should be set to “Spot”.
The result will be the pulse count (i.e., total flow) since the last datapoint was produced.



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.

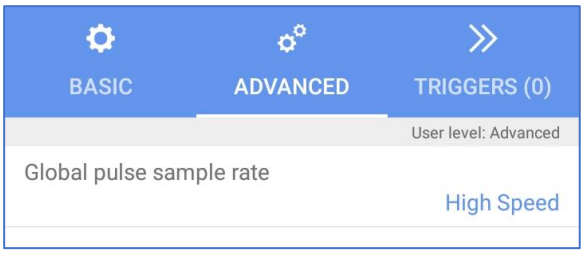
Select the “Advanced” tab.



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).

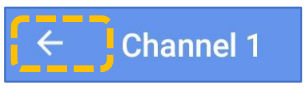
The setting may be changed here, or on the “Global Settings” screen; refer to section 3.3.

Select the fastest sample rate needed by the set of pulse channels in use.

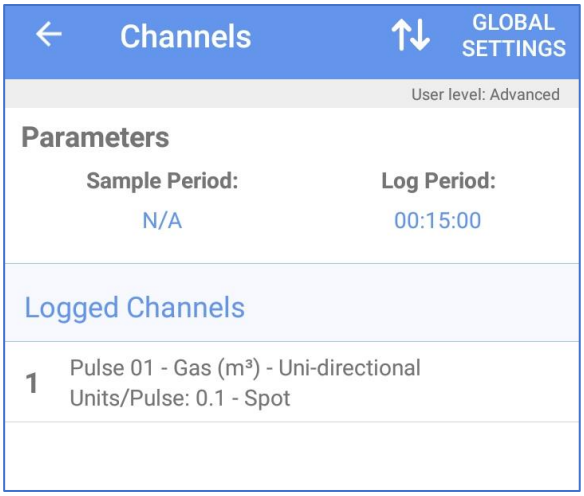


Tap the “ACCEPT” button.
IDT will save the channel settings to the logger.

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 "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 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 6.7.

3.5 Setting Triggers and Actions for a channel

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).

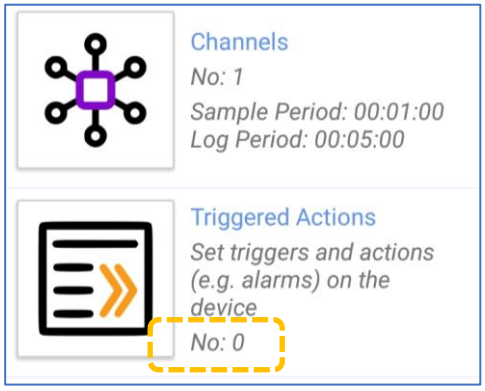
The conditions being monitored are referred to as a "Trigger" by IDT. Any subsequent action is referred to as an "Action" by IDT. The Trigger-Action(s) are sometimes referred to as "combos" (short for "Combination").

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.

3.5.1 Example 2: 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".

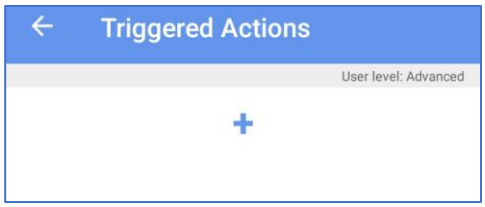
The requirement for our example is for a trigger to be setup, looking at the data from a sensor using channel 1, and used to inform the server (send an alarm message) for when the trigger condition is met. Similarly, we wish to inform the server (send an alarm clear message) when the trigger condition 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.

3.5.2 Setup of conditions for TRIGGER *start* and *end*

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

This page summarises any existing trigger-actions.
It also gives edit-access to any listed action.
(Currently none are set).

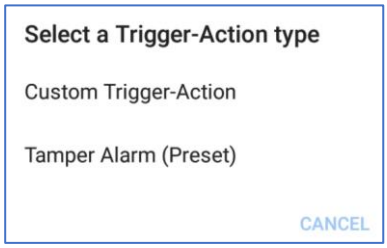
To add a new Trigger-Action, tap the " + " icon.



Then select a Trigger-Action type.

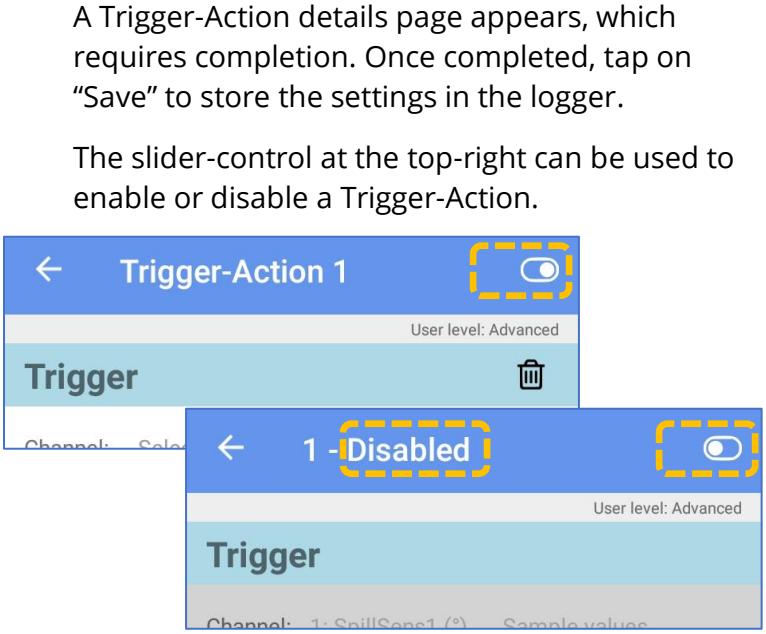
For our example, tap the "Custom Trigger-Action" line.

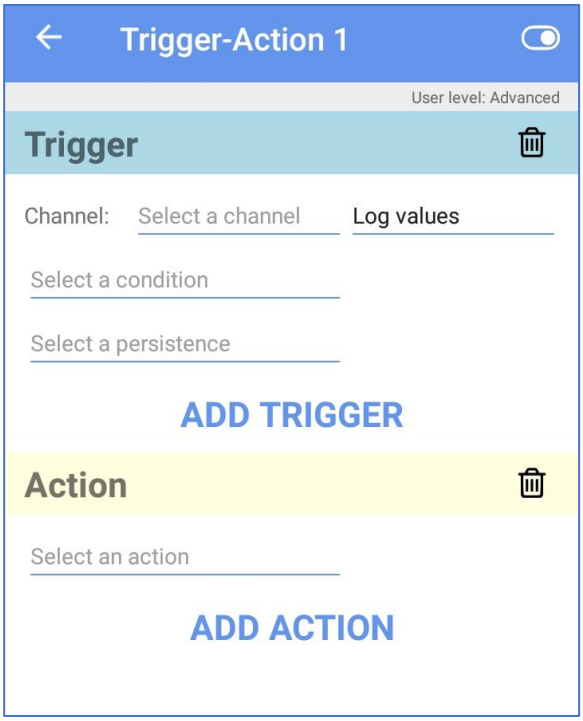
(Pre-set alarm types are also listed here but are not relevant to our example).



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.



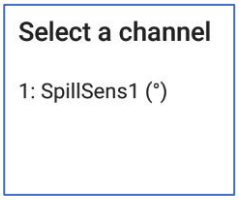


Set the triggering conditions, as follows:

Tap on the location which currently displays “Select a channel”.

A list appears showing all currently configured channels.

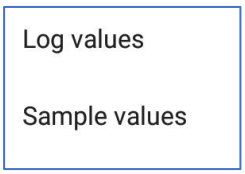
Tap on a line to select the required channel.

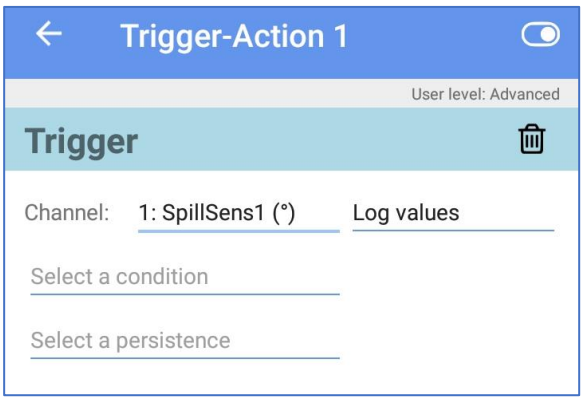


(In the logger used in this example, only one channel has been programmed; it is monitoring data from a SpillSens sensor, which produces angle measurement data).

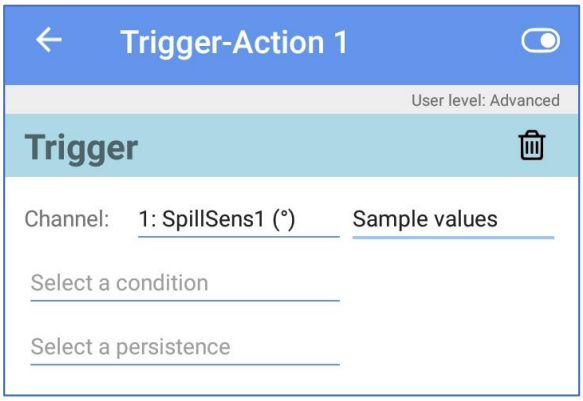
The channel is selected.

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).



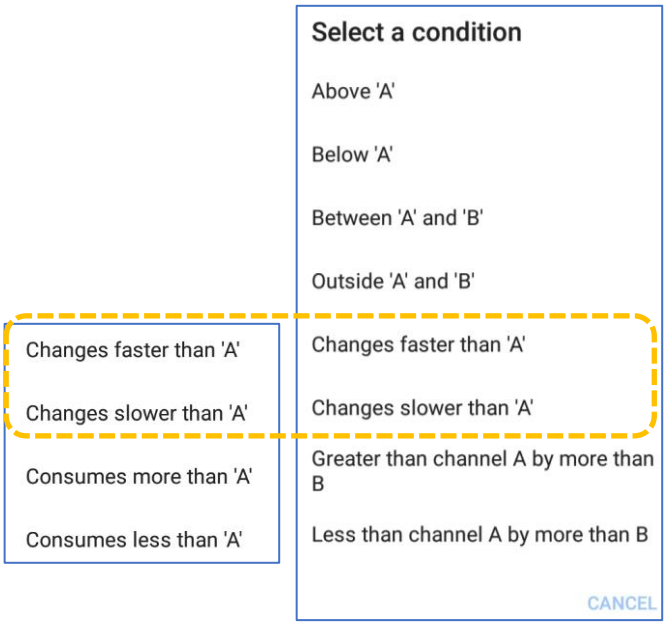


Tap on “Select a condition”.



Select a condition to monitor for from the available list.

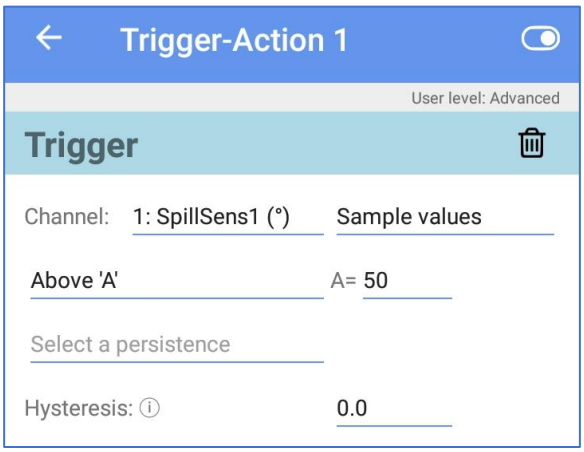
In our example, we wish to monitor for an angle exceeding 50°.
The appropriate selection is … Above ‘A’.



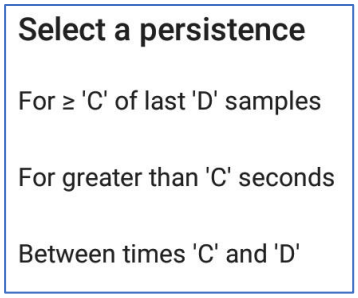
Note: IDT display content is adaptive.
The list can vary according to the type of channel or other settings.

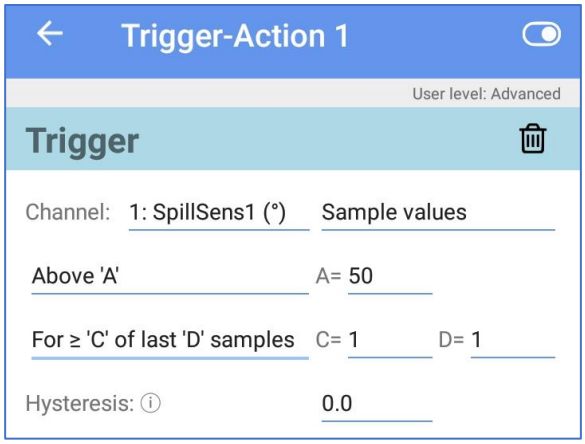
Add the appropriate value threshold(s).

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



Tap on “Select a persistence”.
Then select the type of persistence that is required before the trigger condition is evaluated as true.

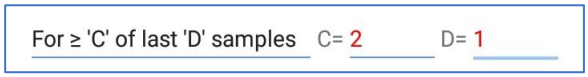




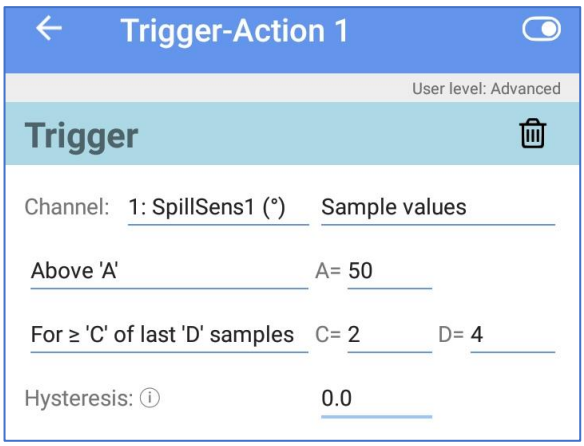
Complete any other settings required for the persistence.

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).

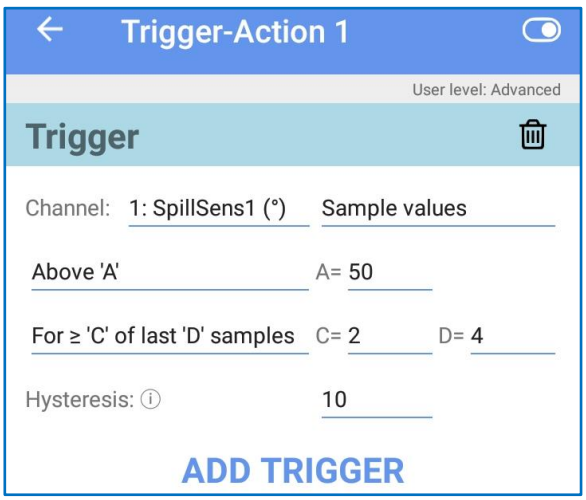


When selecting some trigger conditions, an additional field (hysteresis) is added.

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 in this example, this is 40; (A=50, Hysteresis = 10 ; 50 – 10 = 40).

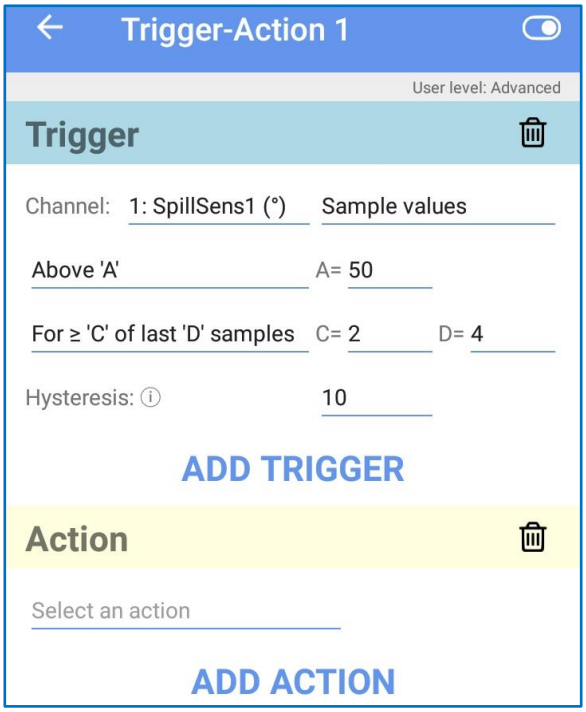
If the holding requirement is no longer met, the logger returns to the normal (non-triggered) state.

3.5.3 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.

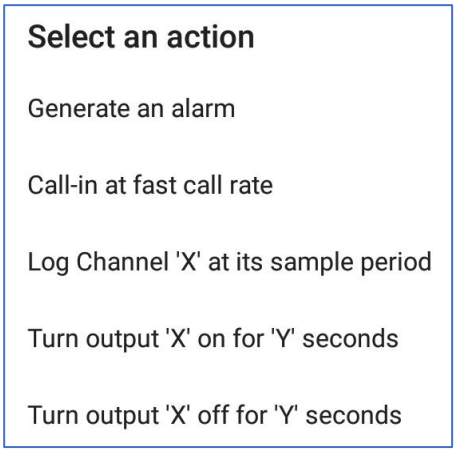
To set an action that should begin when the trigger activates … tap on "ADD ACTION ".

(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:



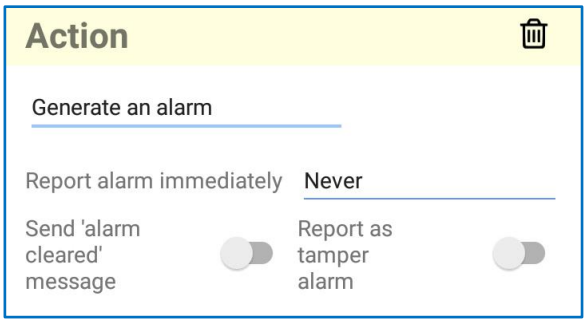
Logging a channel at a faster rate or calling into the sever more frequently will only occur whilst the in the triggered state. Normal operation resumes afterwards.

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.

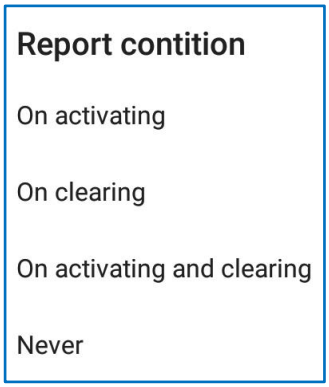
In our example we want to generate messages to the server; these are also known as alarms … so select "Generate an alarm".

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

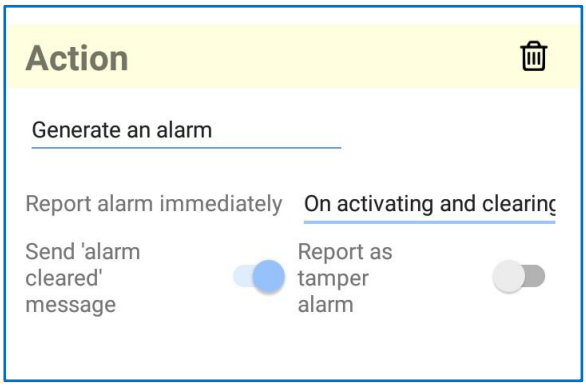


Note:
This control determines what messages get sent *immediately*, rather than waiting until the next scheduled call-in time.

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.

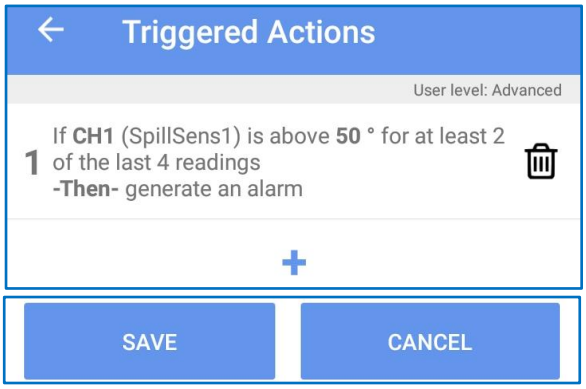


(An alternative would be to report the alarm immediately "On activating", and to use the slider control to also send an "alarm cleared" message. However, with these settings the "alarm cleared" message would not be sent until the next scheduled call-in time).

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

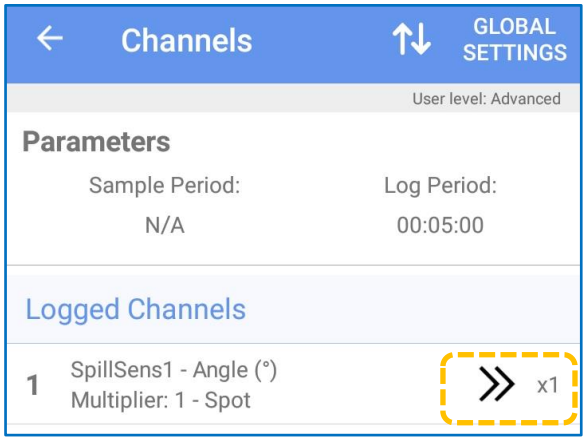
Tap the back-arrow and a summary of the Trigger Actions is displayed.

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



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.

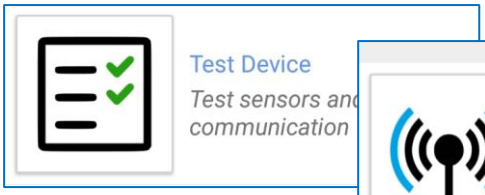


3.6 LOGGER AND SENSOR TESTS

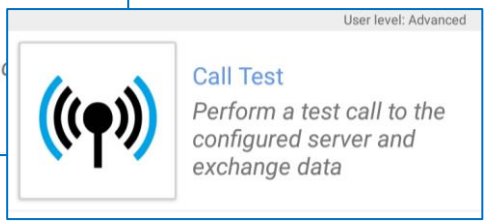
IDT provides access to be able to test some of the logger interfaces and the functioning of attached sensors.

To access the logger test menu,

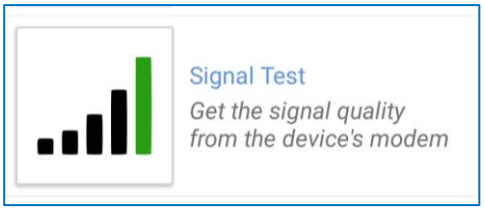
tap on the “Test Device” line.



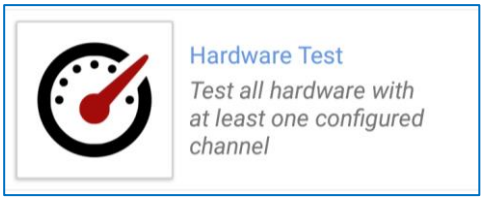
A new view will open with various test options.



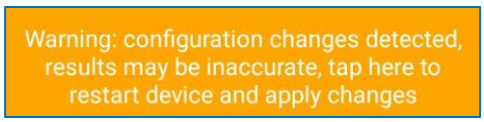
(Signal Test and Call Test are tasks to be performed at the end of logger installation and are covered in section 3.7).



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.



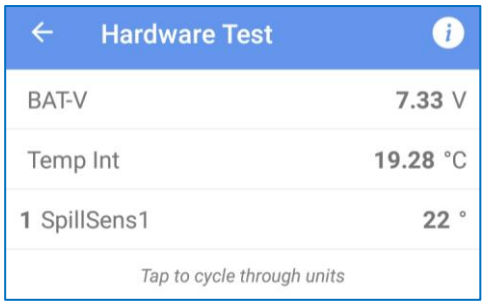
Note: Previous data is saved during a restart for loggers that use the IDT app.

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.

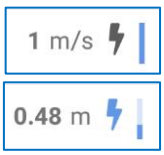


The hardware in this example can be tested by changing the position of the SpillSens digital float switch.
The example shows a sensor at 22 degrees from vertical; when the angle is changed the display will update to show a new angle; it can be proved to be functioning OK.

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. 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.



3.7 CELLULAR NETWORK SETUP - PROTOCOLS AND TESTS

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.

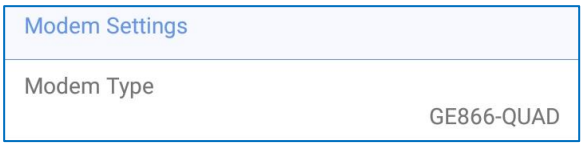
3.7.1 Modem Settings

CAUTION: Most installers **should not modify** these settings (Skip to section 3.7.2 or 3.7.3); They are for expert use only.

(See section 3.2 for how to navigate to these settings).

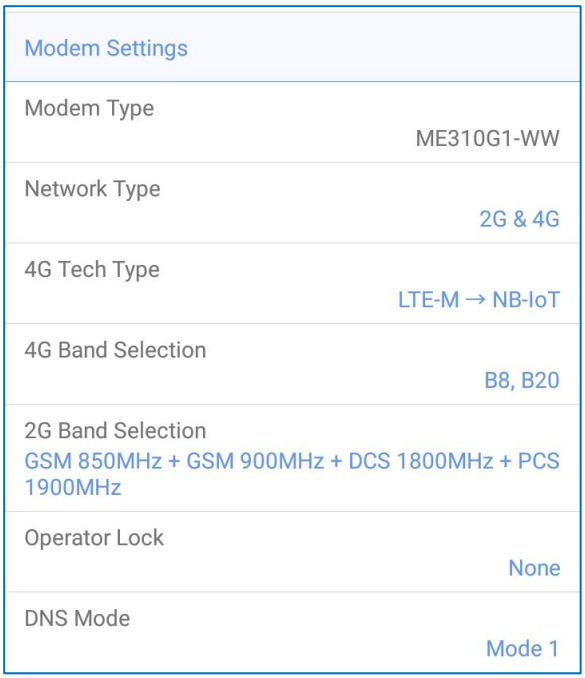
The loggers have a built-in modem circuit for connection to the cellular network. Depending on the part fitted, IDT can show a different content of control settings within the "Modem settings" section.

e.g. No setting options, shown opposite.



or ...

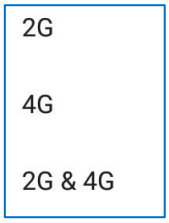
e.g., Many setting options, shown opposite.



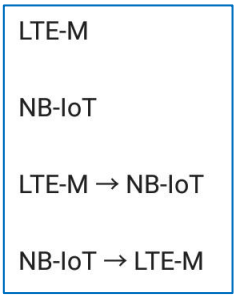
These settings are normally best left at the factory default, unless you understand cellular mobile technologies.

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.

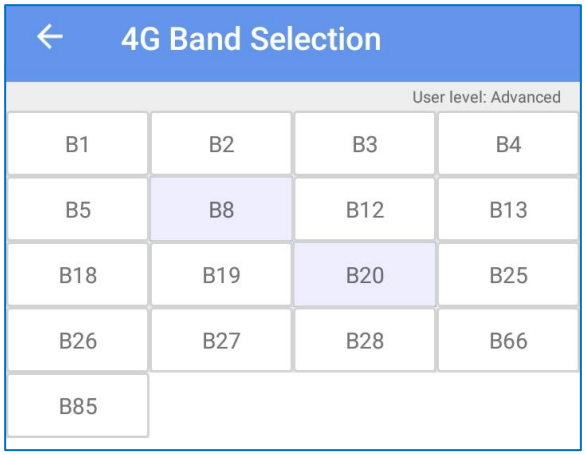
Network Type setting determines which network generation should be used to establish a connection.



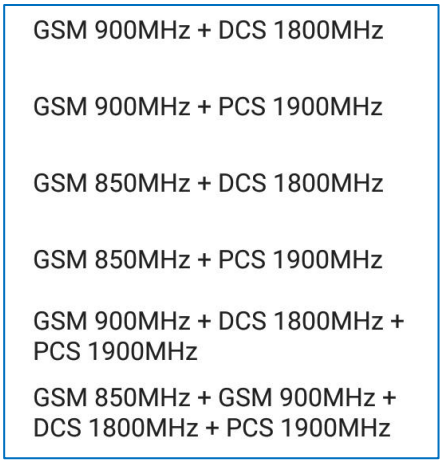
4G Technology Type setting determines which network generation should be used to establish a connection.



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.



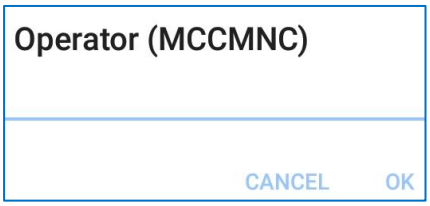
Operator Lock

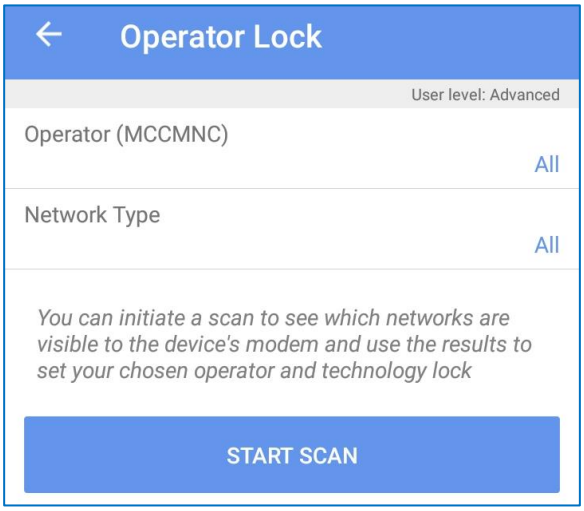
The Operator lock screen allows you to lock the logger to a specific Mobile Network Operator.

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.

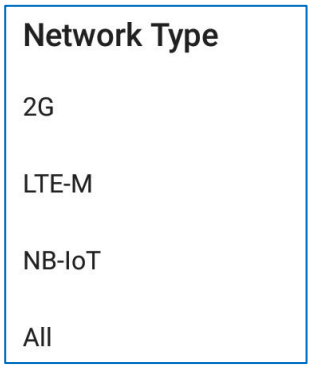




Note:
For the above setting to be functional, the SIM must also support the chosen network operator.

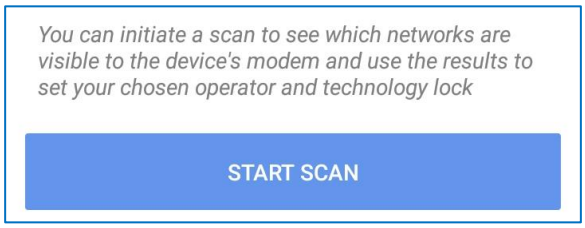
If a specific type of network technology is required, it can be set from this screen. Tap on the Network Type line and select from the list.

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

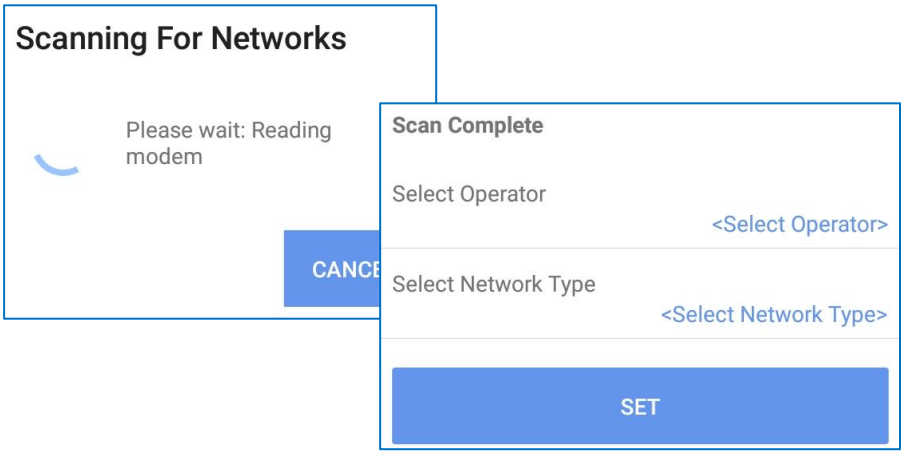


There is a tool to help with making the above settings:

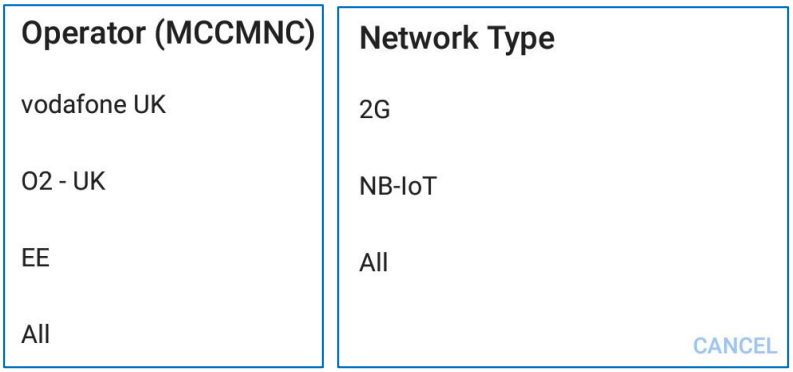
Tap on the “Start Scan” button.



The logger will scan for local networks.



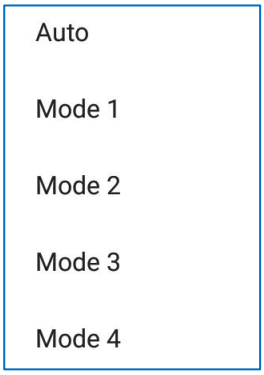
When finished, tap on each of the controls to make
a selection from those listed.
(Contents vary according to what is found to be locally available).



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

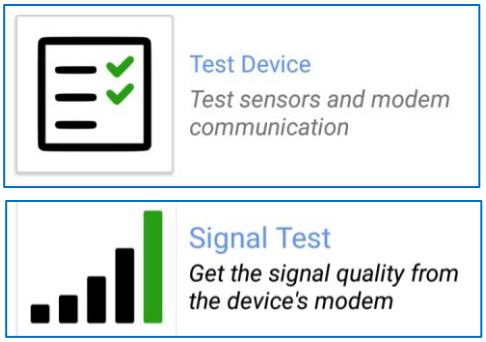
DNS Mode (Domain Name System) is factory set to “Auto”.

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.

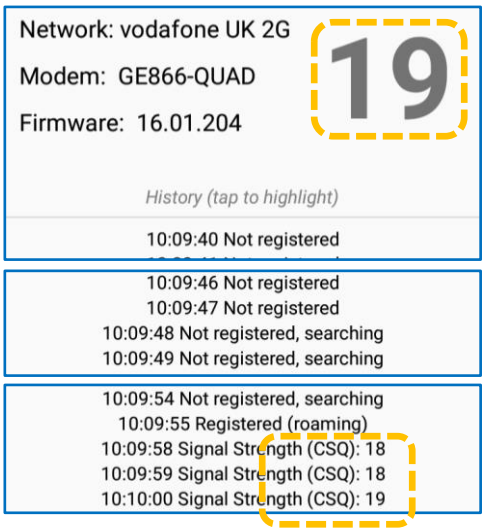
3.7.2 2G and 3G Networks: Signal Test (signal strength - CSQ)



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

Access the "Test Device" menu and then tap on "Signal Test".

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



Once connected to the mobile network, the provider details and signal strength indicator (CSQ) are displayed. The default is to show the average value of the last 10 readings, but it can be changed to show the latest value (by tapping on the number).

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.

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

0-7 **Poor.**
(The logger may be able to register with network but will not be able to send or receive data reliably).

8-14 **Acceptable**.
(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).

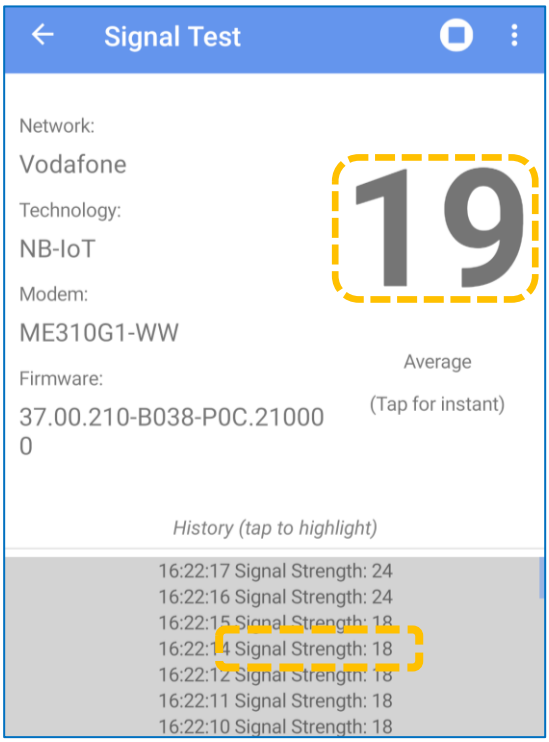
15+ **Good**.
(Data transmission should be reliable).

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 3.7.1 to determine what modem settings are in use for the logger. Refer to section 3.7.3 for 4G Network signal quality assessment).

3.7.3 4G Networks (NB-IoT, LTE-M): Signal Tests

Modems that use 4G networks have a different set of parameters for signal quality than those using 2G and 3G networks.

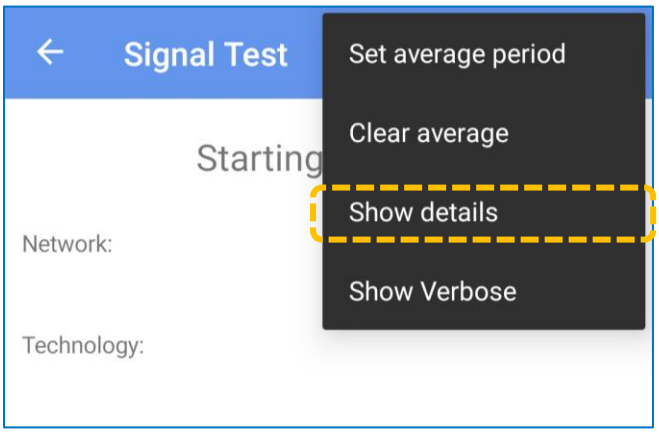
Navigate to the Signal Test screen, as detailed in section 3.7.2.



The CSQ indication is replaced for 4G networks by a "Signal Strength" indication.

(Note: CSQ is missing from the lower listing).

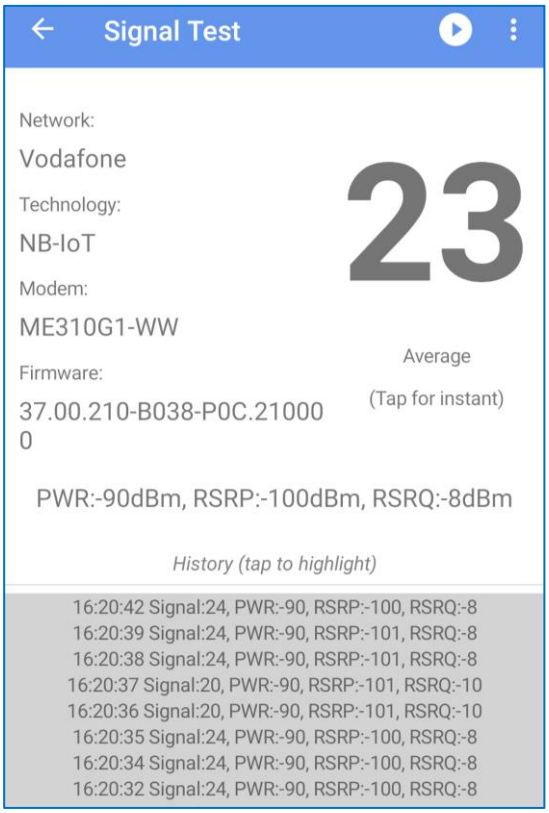
Select "Show details" from the local menu to provide additional information.



The lower listing will show additional parameters:

- Signal Strength
- Signal Power
- Signal RSRP (dBm)
  (Reference Signal Received Power).
- Signal RSRQ (dBm)
  (Reference Signal Received Quality).

These parameters may be used to assess the suitability of the logger communication with the cellular data network.



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

>= -80	Excellent. (Data transmission should be reliable).
-80 to -90	Good. (Data transmission should be reasonably reliable). It is important to select the correct antenna and install it in the most suitable location).
-90 to -100	Fair to Poor. (Reliable data speeds may be possible but drop-outs may occur. Performance drops considerably as the value approaches -100. 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.

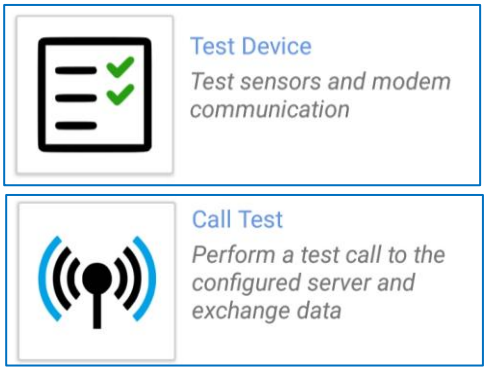
RSRQ value: The following guidelines are given for the cellular network signal, (as measured with the chamber closed):

>= -10	Excellent. (Data transmission should be reliable).
-10 to -15	Good. (Data transmission should be reasonably reliable). It is important to select the correct antenna and install it in the most suitable location).
-15 to -20	Fair to Poor. (Reliable data speeds may be possible but drop-outs may occur. Performance drops considerably as the value approaches -100. 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.

3.7.4 IDT – Call Test (logger to server)

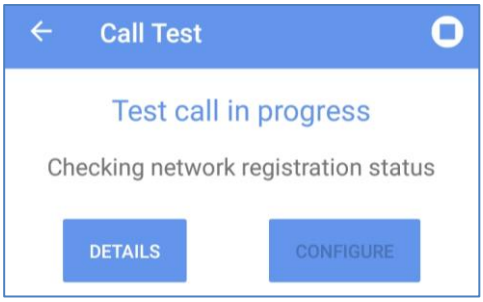
This test confirms the logger can **communicate with the DataGate server**.



Access the “Test Device” menu and then tap “Call Test”.

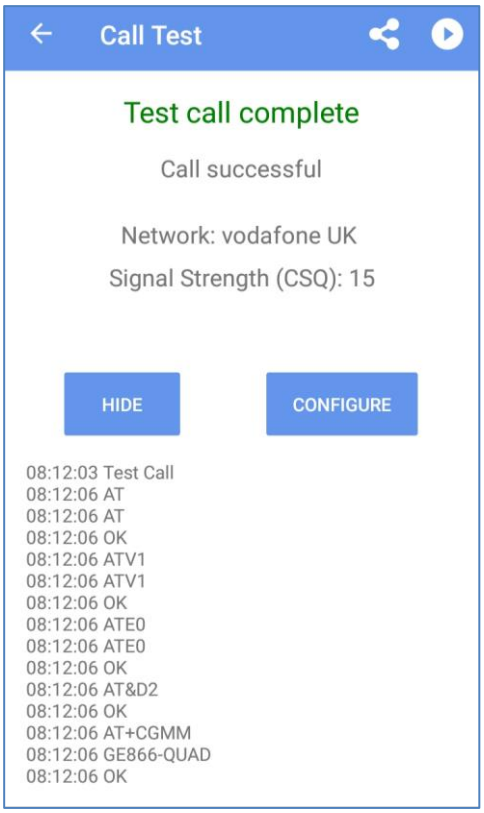
The call test will automatically start.
(The top-right corner of the display has a control to start and stop the test).

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.



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.

3.7.5 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. You need a CSQ (reported by the Call test) of at least 8 for reliable communications.	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.

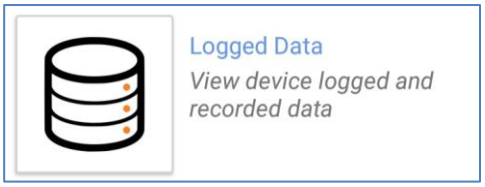
If you continue to experience problems with communication, you may need to check the network coverage in your location.

4 VIEWING DATA (WITHIN IDT)

The logger is usually set up to call into a server, where the data is stored. It is best viewed with the viewing tool linked to the server data-store (refer to the appropriate manual or instructions for your viewing tool).

The data can also be viewed graphically by using the IDT app to make a temporary copy of the data stored within the logger.

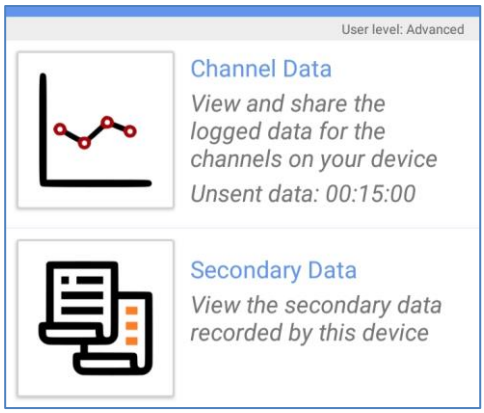
Tap on the “Logged data” line.



A new screen is displayed.
This screen gives access to any data contained in the logger’s primary and secondary data recordings.

Tap “Channel Data” for access to the primary data recordings.
The duration of unsent data is shown (format: d.hh:mm:ss)

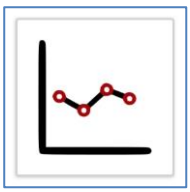
Tap “Secondary Data” for access to the primary data recordings.

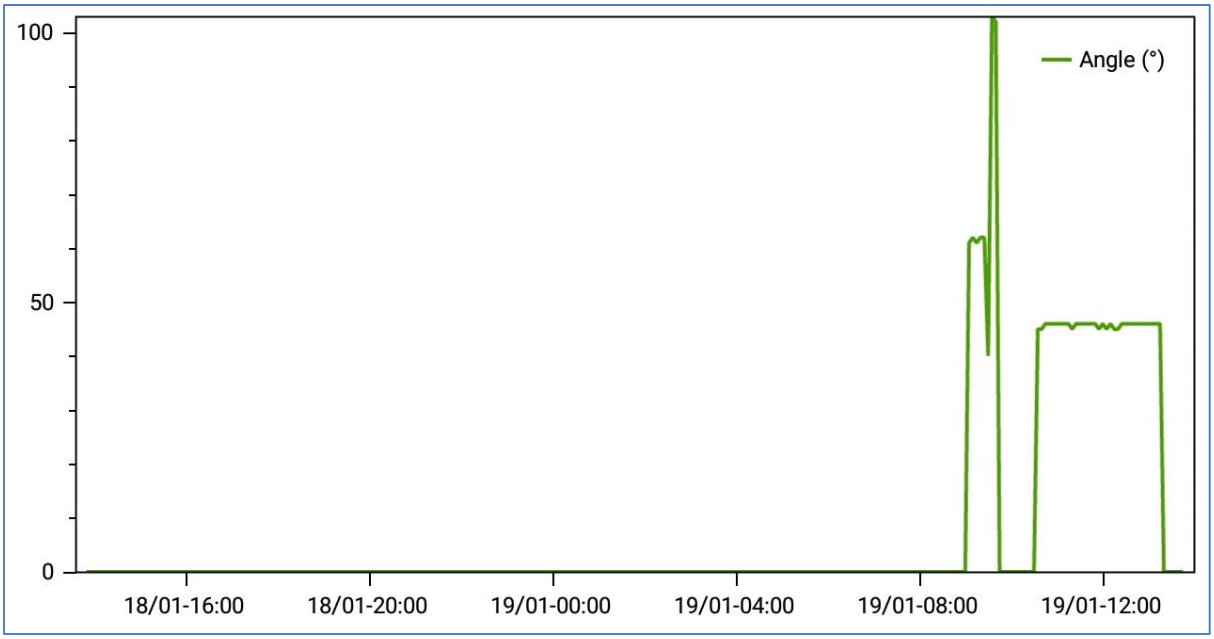


Tap to the left of the graph to select a duration that you wish to see on the graph.

Slider controls can be used to include or exclude data from a sensor on the graph.

Tap on the graph symbol to produce the graph.





The graph can be examined in more detail using the standard techniques available on your phone.
(e.g. finger movements to zoom in or out, re-position the graph within the display, etc).

Tap the back-arrow control on your phone (or the back-arrow on the display) 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.

5 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 7, which describes a few of the differences of operation of IDT under various use circumstances).

5.1 PUTTING THE EQUIPMENT INTO SHIPPING MODE (DE-ACTIVATING)

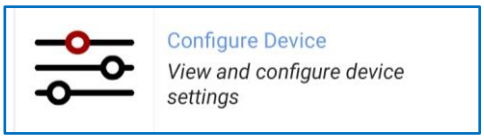
Before putting any HWM equipment into long term storage, moving an installed unit, or shipping for repair, it should be put into "Shipping mode" using IDT.

Note: Be sure to upload any unsent data before this operation.

To put the equipment into shipping mode:

Connect to the device using the normal procedure.

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

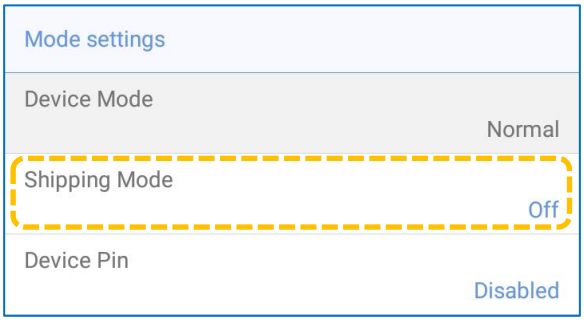


Then select the "Device Information" option.

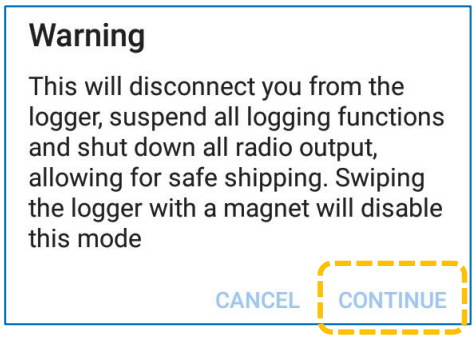
Move the display to show the Mode Settings panel.

The "shipping mode" setting will be shown as "off" since the logger is in use.

Tap on the shipping mode line.

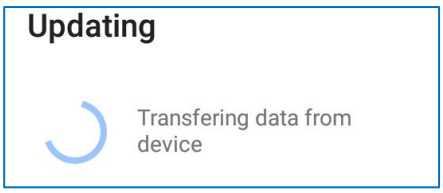


Read and accept the warning (by tapping on "Continue").



IDT will update the device.

The device will go into shipping mode and drop the communications link.
(IDT will therefore begin scanning for devices).



5.2 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).

5.3 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.

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.

5.4 THE DATA FROM THE LOGGER DOES NOT APPEAR ON THE SERVER.

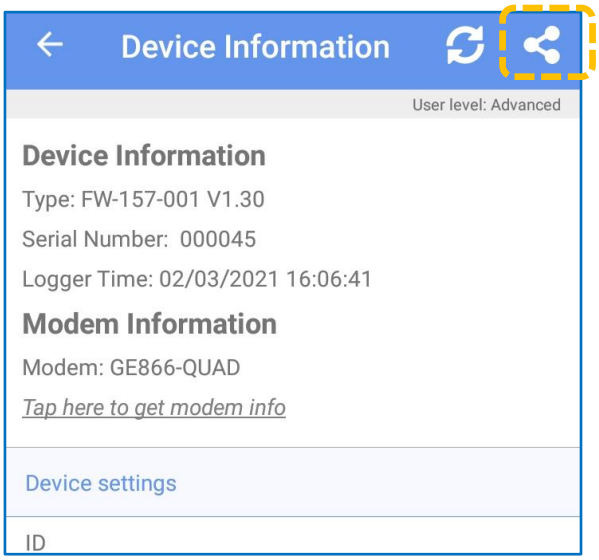
- Ensure the logger uses the correct data destination URL and port-number for your server.
- Check the logger antenna is attached and in an OK condition.
- Make a Call Test and confirm OK.
- Ensure your server is correctly configured to receive and present the data from the logger.

5.5 TRANSFER OF LOGGER SETTINGS FOR ASSISTANCE / LOAD VIRTUAL LOGGER

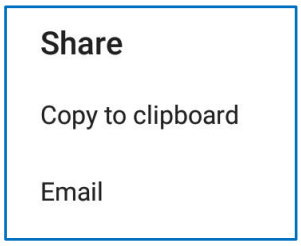
If requested by HWM-water, the logger configuration settings can be saved to a file and forwarded to HWM-water for assistance.

Connect to the logger and from the main screen navigate to the Device Information screen.

Tap on the Share icon.



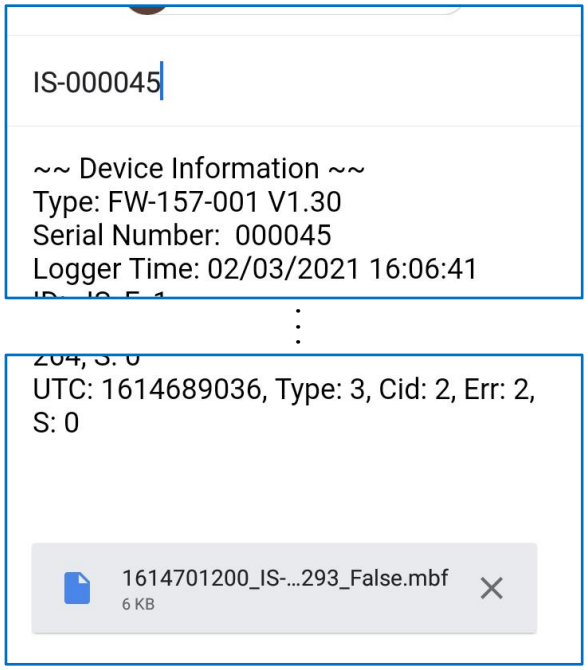
Select a method for sharing the information (a logger configuration file + recent event log messages).



Typically, this will be via e-mail.

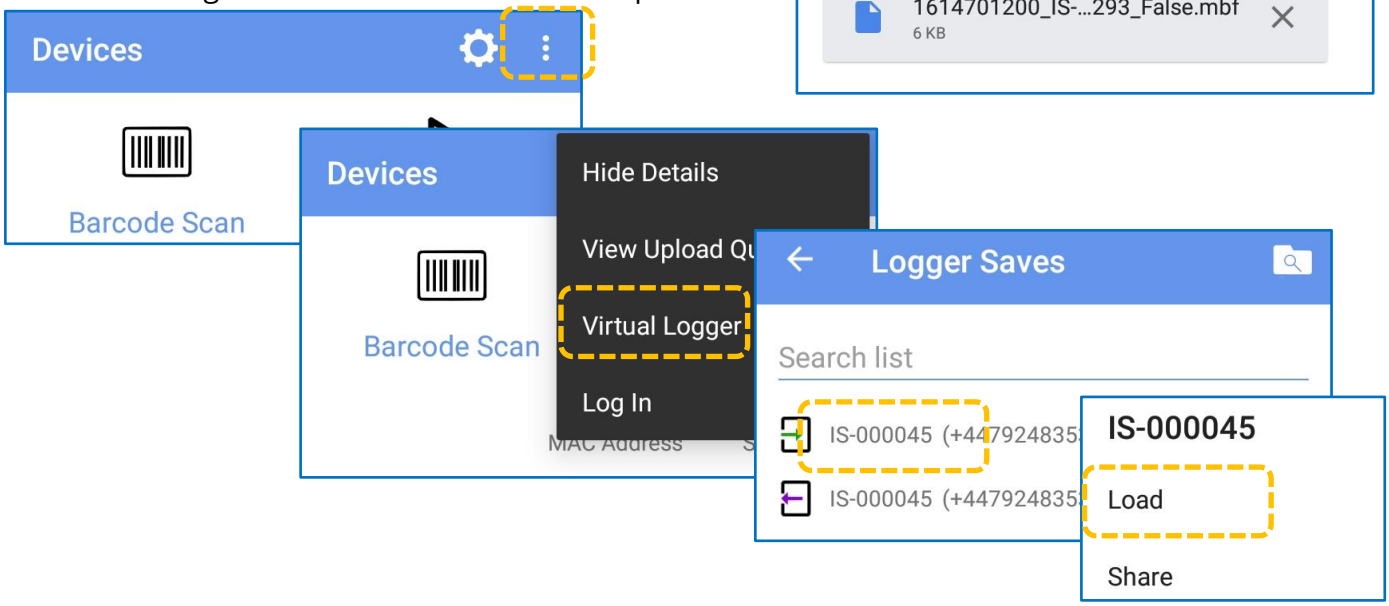
Select an e-mail program when the phone prompts you.

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

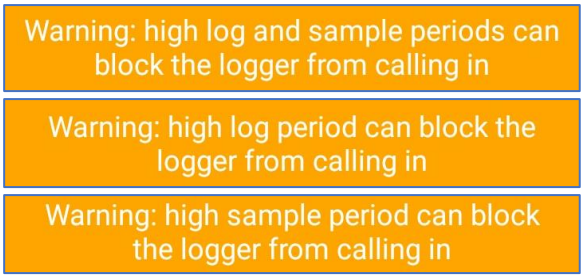


once the email recipient loads the configuration details as a “virtual device” (click as shown above, from left to right).

5.6 " ... 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.

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.

6 PART2: ----- SENSOR INTERFACES AND TRIGGER-ACTIONS -----

Note: Certain sensors have their own User Guide regarding installation and configuration using IDT. Follow the additional guidance where available.

6.1 DATA VIEWING PORTALS

- Data from the logger can generally be viewed the webpages provided by HWM DataGate server software.
- Where other HWM data viewing portals 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 that destination.

6.2 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.

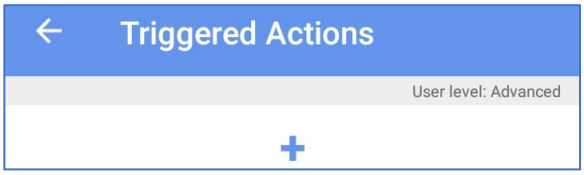
e.g. Refer to the diagram opposite, which shows two triggers set up for different angles of a Spillsens sensor.
Here these are both set to generate an alarm, but alternative actions may be selected.

6.3 SUPPORT OF MULTIPLE CONDITIONS FOR A SINGLE TRIGGER

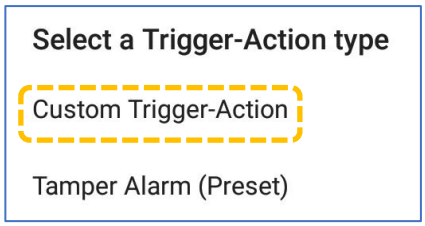
IDT supports setup of multiple-condition triggers, if supported by the logger.

From the main screen, select the Triggered Actions line.

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



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.

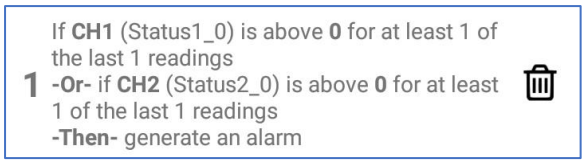
Select each condition.

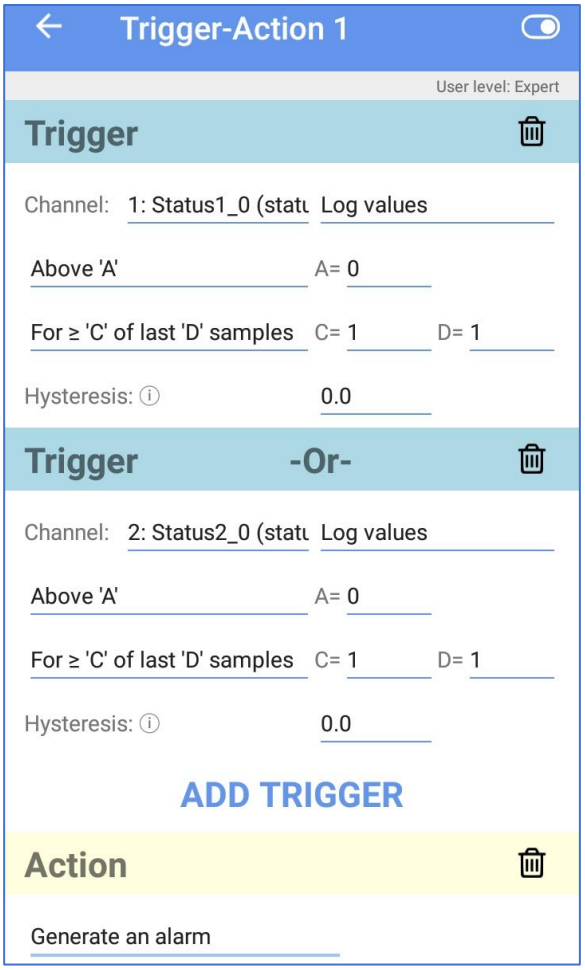
The conditions may be connected into either an “AND” gate or an “Inclusive OR” gate; only one selection is allowed per trigger-action (although additional Trigger-Actions can be set up to cover other combinations if required).

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

Add trigger requirements.

Tap the back-arrow to show a summary:





And then save the setting.

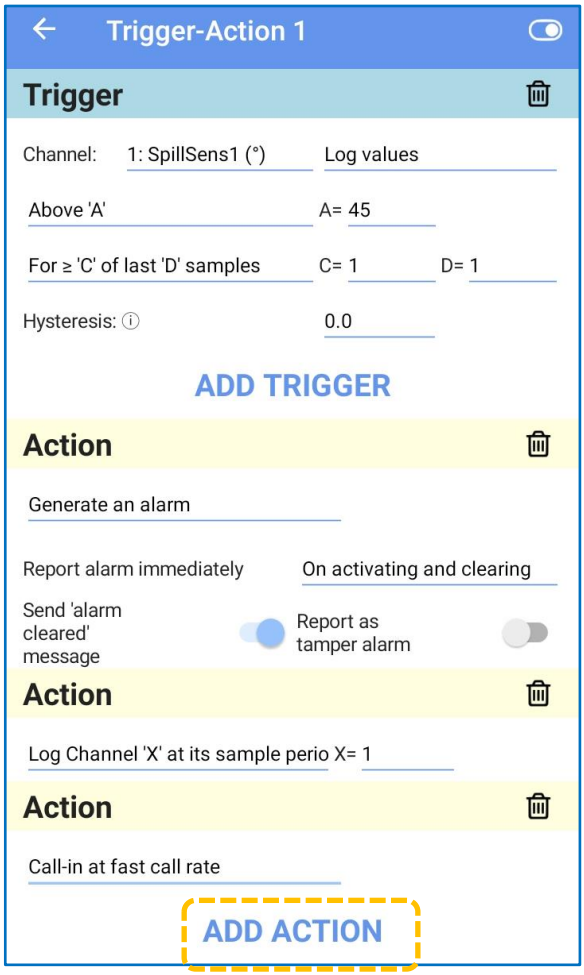
6.4 SUPPORT OF MULTIPLE ACTIONS FROM A SINGLE TRIGGER

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

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.



6.5 STATUS INPUT (FROM A FLOW / PULSE INTERFACE)

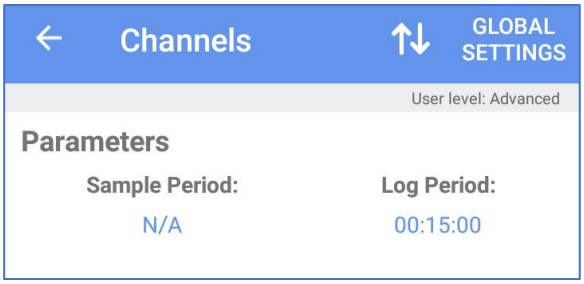
The interface known to IDT as “Pulse” may (where fitted) be labelled “Bi-Directional FLOW” or “Uni-Directional Flow” or similar. It may also be unlabelled except via inspection of the model-number of the logger (refer to the logger manual).

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.

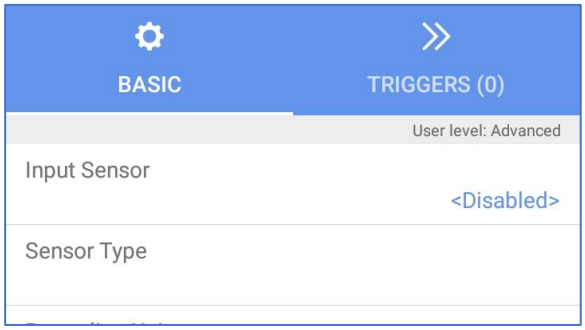
To set up a new Status Input channel:

Go to the Channels screen
(see section 3.4.2).



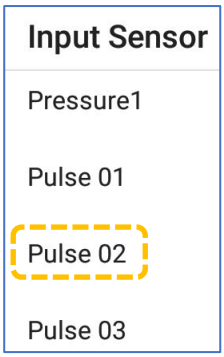
Tap the " + " line to add a new channel.

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

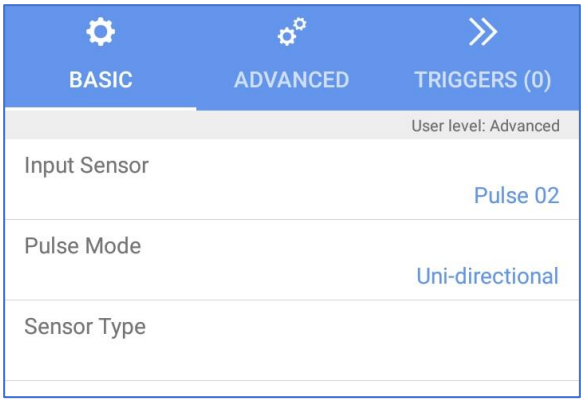


Select the required "Pulse (n)" type interface from the list of interfaces.

e.g., Tap on "Pulse 2".



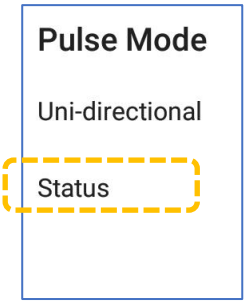
For this particular interface, multiple software driver options exist, and hence a new setting line is displayed, "Pulse Mode".



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

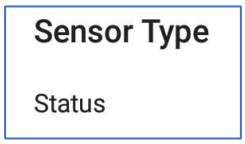
For this example, a Status sensor is required.
Therefore select "Status".

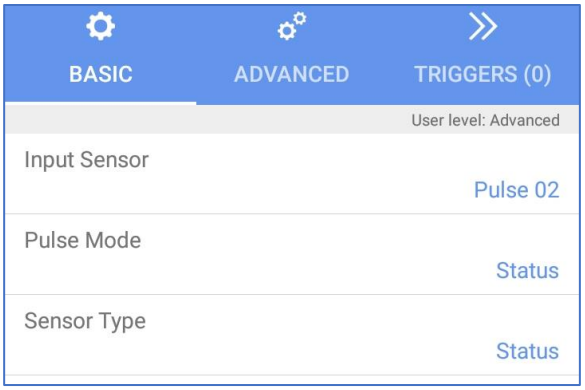
This selection commits the relevant pin of the interface connector for a specific use). For this selection, the software driver will use the input as for sensors that give a simple status indication (typically signalled by a switch being open or closed).



Ensure the “Sensor Type” also reads “Status”.

(Select if not already selected).





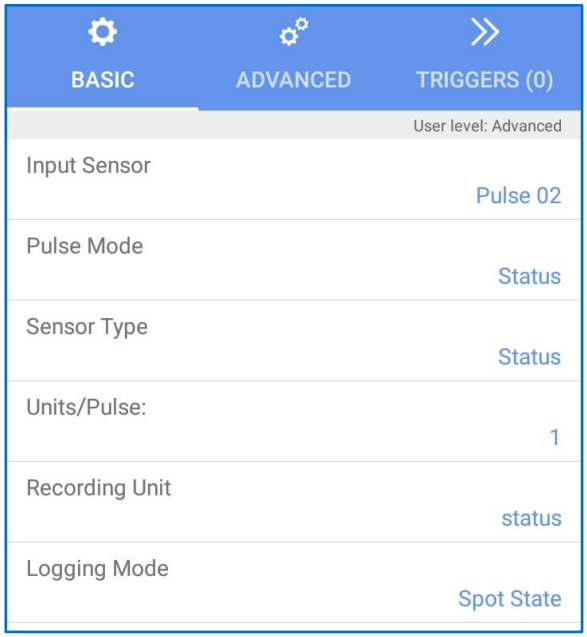
The selections made (so far) are shown in the channel configuration screen.

Additional settings are required, depending on what is to be measured and logged from the input …

6.5.1 Use as a logic-level data stream

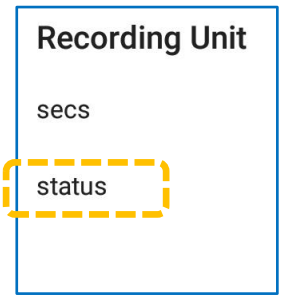
Complete the settings as shown to use the sensor as a digital status input.
(i.e., The input status can be either “1” or “0”.
Or, more precisely, either “Open” or “Closed”).

Note: The IDT app sometimes shows:
“Open” as “O”.
“Closed” as “X”.



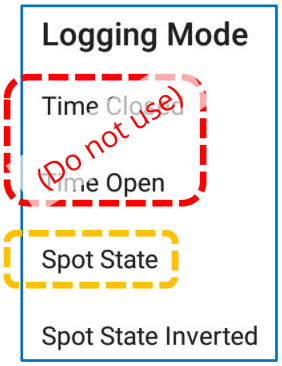
The recording unit must be set to “status”

This ensures the Pulse input is logged as a digital status (a value of either 0 or 1).

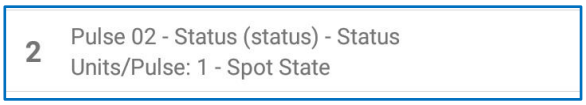


Select a logging mode of “Spot State” to record (log) the regular input status.

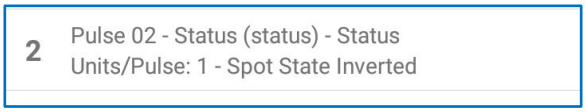
If you wish to change (invert) the logic of the status input, the “Spot state inverted” option may be chosen.
(e.g., This may be required for a switch which has a “normally closed” rather than a “normally open” condition).



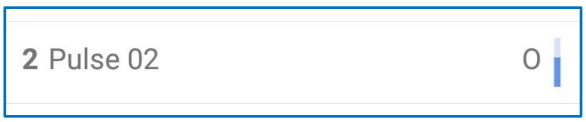
The summary status is shown opposite for a channel set up to the log normal state input.



The summary status is shown opposite for a channel set up to the log inverted state input.

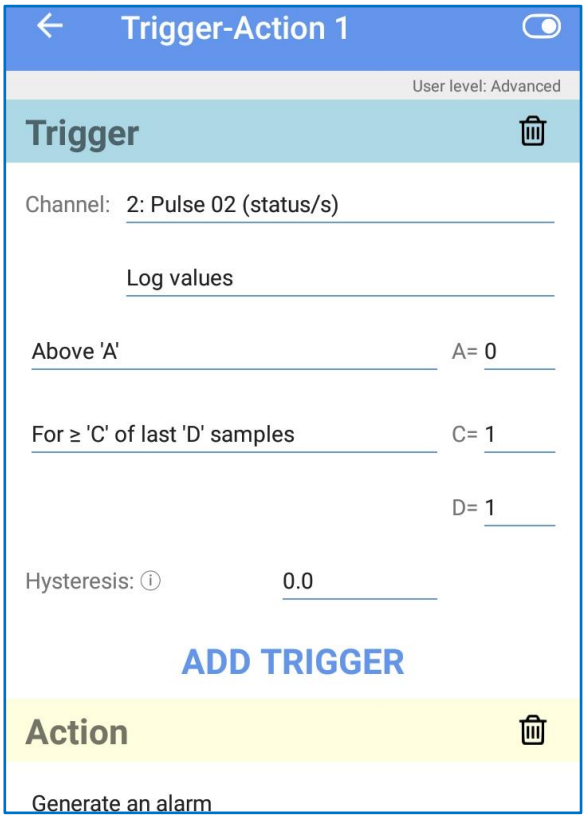


Both of the above give the same result for a hardware test; it reports the raw input state (before any inversion is applied).



Triggers and actions can be set using the regular setup process.

That is to say that 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).



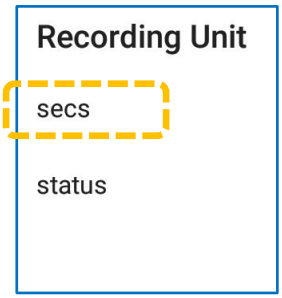
e.g. The settings shown opposite will trigger immediately (on a log boundary) if the input switches from 0 to 1.

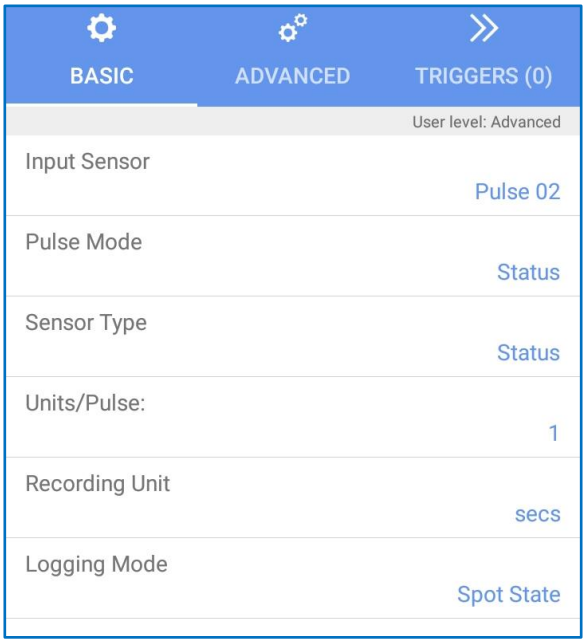
The user should consider any threshold values carefully to ensure the logger can be triggered.
e.g. In the example, setting A to “1” will not permit the logger to trigger since the required data value would be out of range; the data range for a status type data stream cannot exceed “1”, so cannot be “Above 1”.

6.5.2 Use as a Time-On data stream

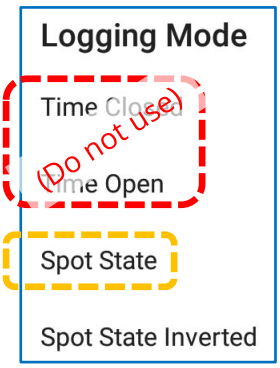
The logger can also measure how long a status input remains in a specific state within each log period. The results can be recorded (as datapoints) using a unit of time, namely seconds.

To accomplish this, select a recording unit of “secs”.





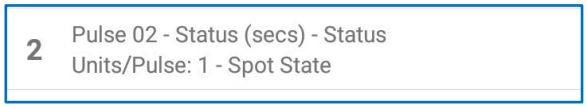
Set the Logging mode to be “Spot State” to consider the regular input status.



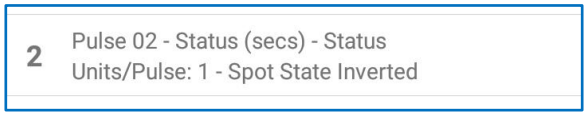
If you wish to change (invert) the logic of the status input, the “Spot state inverted” option may be chosen.
(e.g., This may be required for a switch which has a “normally closed” rather than a “normally open” condition).

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 datapoint has been created.

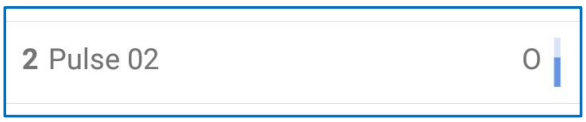
The summary status is shown opposite for a channel set up to the log normal state input.



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).

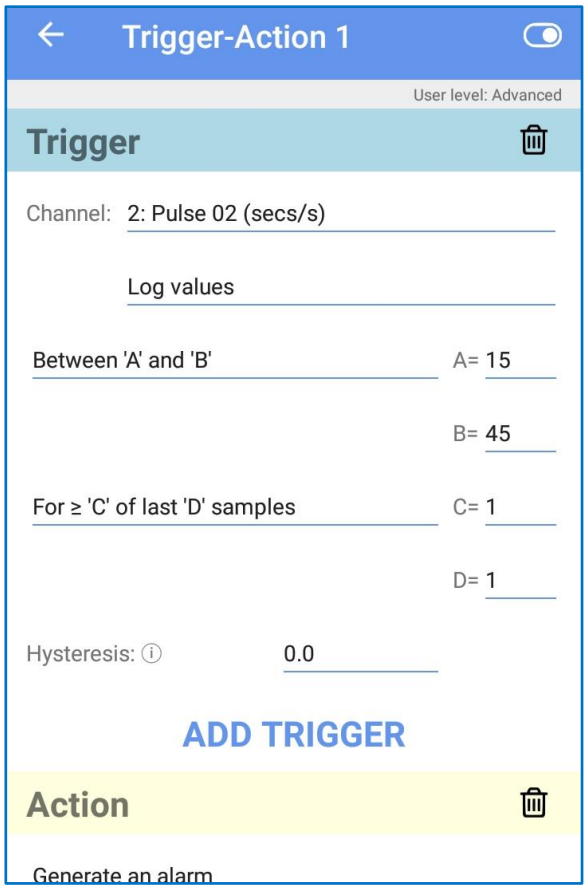


Note: The *time-on result* is not shown.

Triggers and actions can be set using the regular setup process.

i.e., 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.



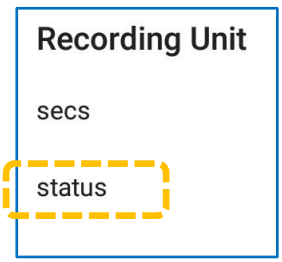
The user should consider any threshold values carefully to ensure the logger can be triggered.

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.

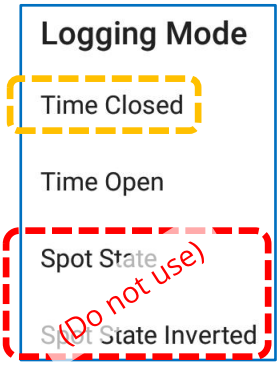
6.5.3 Use as a Time-On (%) data stream

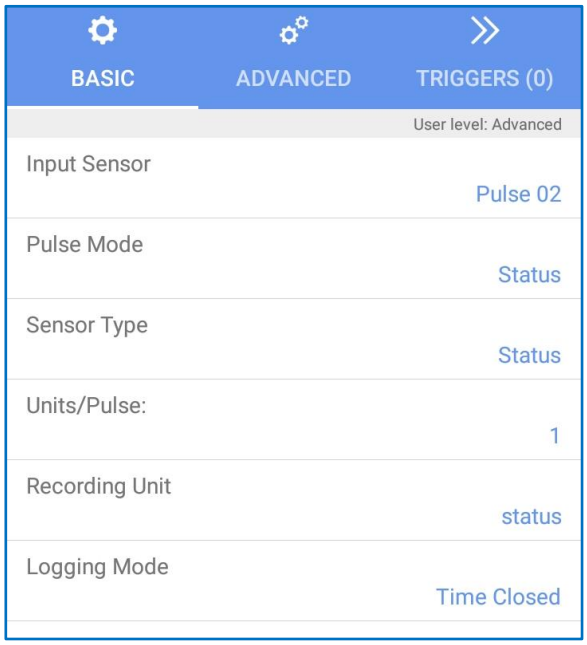
The logger can also measure what % of the time a status input is in a specific state within each log period. The results can be recorded (as a series of datapoints).

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").

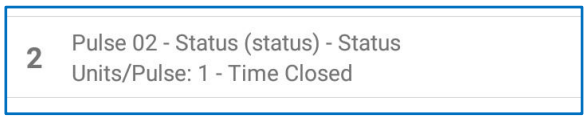




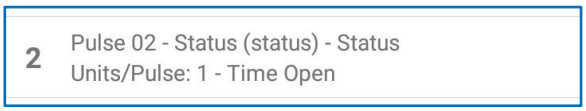
A “Time Open” option may alternatively be chosen if required.
(e.g., This may be required for a switch which has a “normally closed” rather than a “normally open” condition).

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.

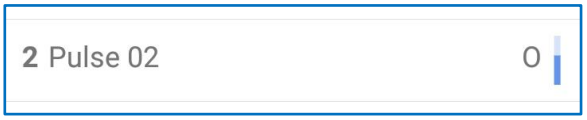


The summary status is shown opposite for a channel set up to the log % of Time Open.



Both of the above give the same result for a hardware test; it reports the raw input state (before any inversion is applied).

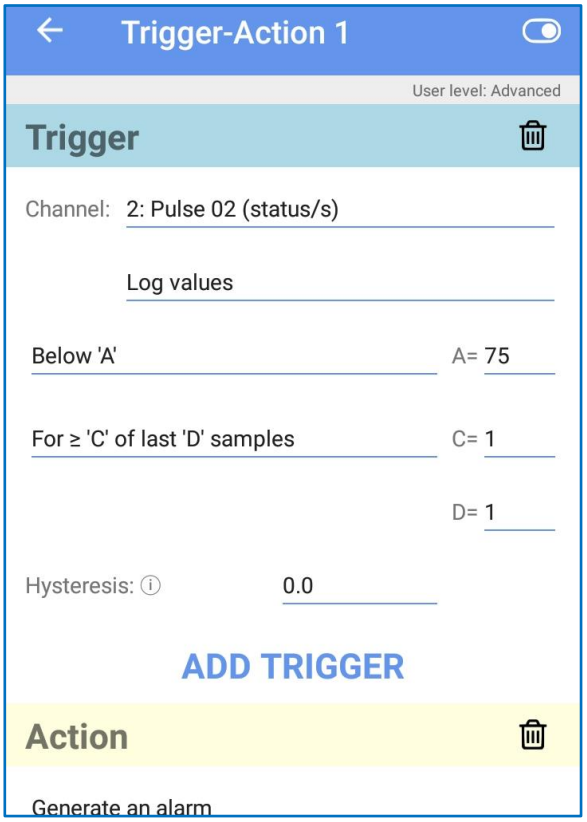
Note: The *% time-on result* is not shown.



Triggers and actions can be set using the regular setup process.

i.e., 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).

6.6 STATUS OUTPUTS

“Status Output” is a digital output signal 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:

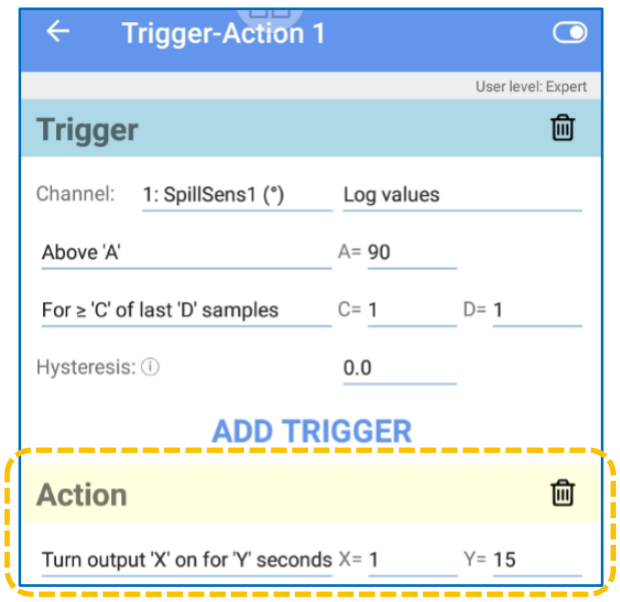
- Pulse replication of a digital flow meter (i.e., one which generates meter pulse outputs) (see section 6.7.2).
- General-purpose output signal that can be switched as the action part of a trigger-action logger setting (see section 6.6.1).

6.6.1 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).



6.7 FLOW INPUT (FROM A FLOW / PULSE INTERFACE)

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.

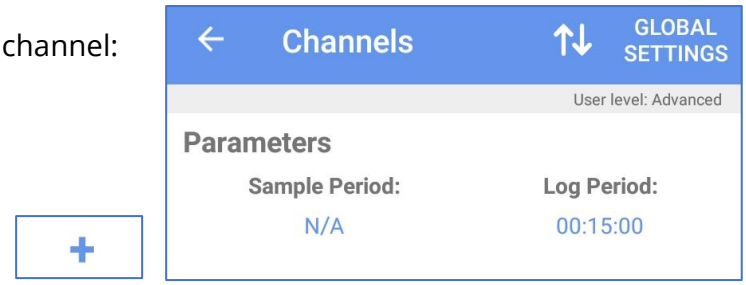
Flow input was introduced during an example earlier in the user-guide (see sections 3.4.1 and 3.4.2). Here we will consider the channel setup in more detail…

6.7.1 Flow input selection

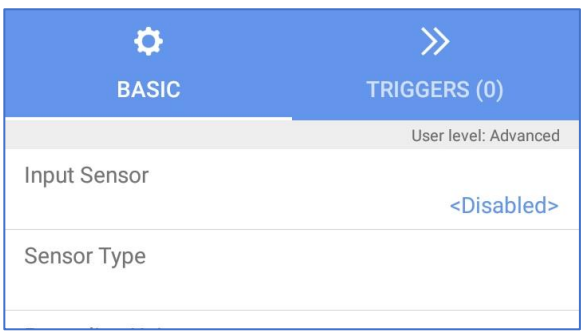
To set up a new Flow (meter pulse input) channel:

Go to the Channels screen
(see section 3.4.2).

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



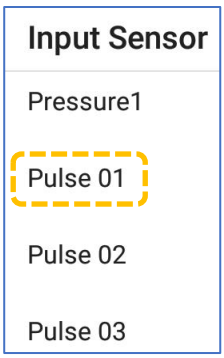
Tap the "Input Sensor" line.
(Currently, it shows "<Disabled>"; it is unconfigured).



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)

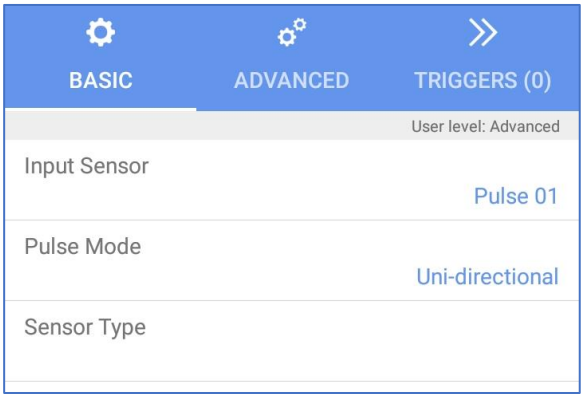
e.g., Tap on “pulse 01”.



An “Advanced” tab now appears.

The selection is shown on the screen.

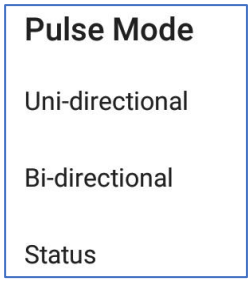
The “Pulse-Mode” setting may have defaulted to some value, which can be changed if required.



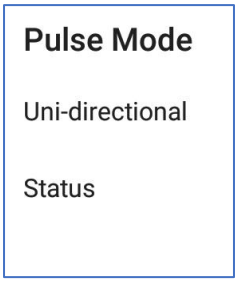
Next tap on the “Pulse Mode” line.

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”.



Pulse nn, (for odd nn)



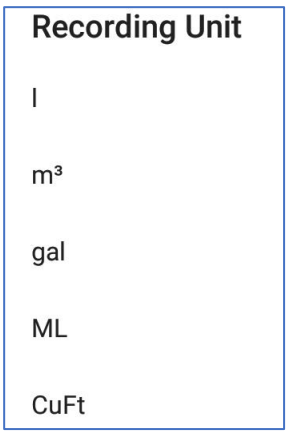
Pulse nn, (for even nn)

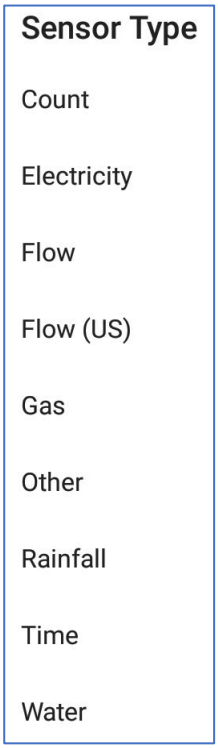
For a Pulse Mode of “Uni-directional” …

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).

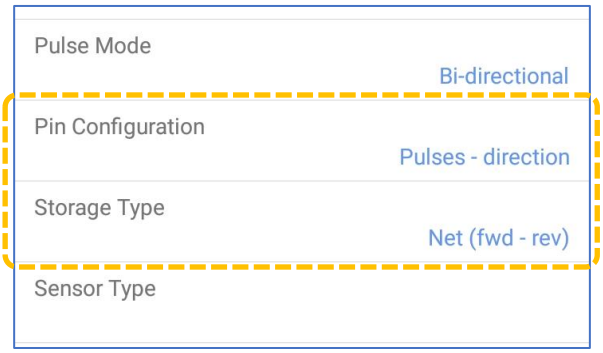
Continue setup by choosing a recording unit, etc; follow the guidance in section 3.4.2 (as required).





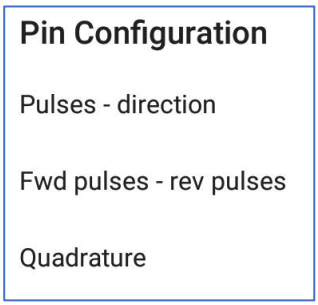
For a Pulse Mode of "Bi-directional" …

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.



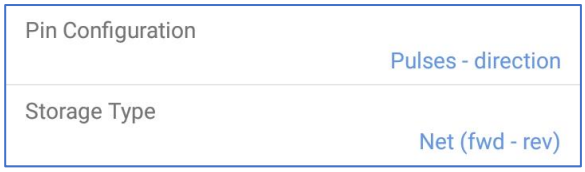
- Pulses – direction (Pulses & Direction signals)
  - The even pin (Pulse 02, Pulse 04, etc) acts as a direction indicator.
  - The odd pin (Pulse 01, Pulse 03, etc) acts as a meter pulse to indicate a volume of the commodity has passed through the meter.

  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.

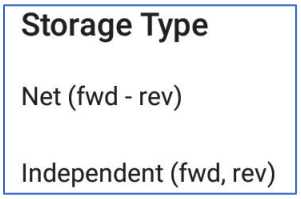
  Note: The logger supports "net flow" for this type of interface signalling. If 2 separate datapoint streams (forward flow and reverse flow) are required, use 2 Uni-directional channels instead; the split into forwards and reverse flow directions is already done at the meter.
- Quadrature
  - The signalling 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".



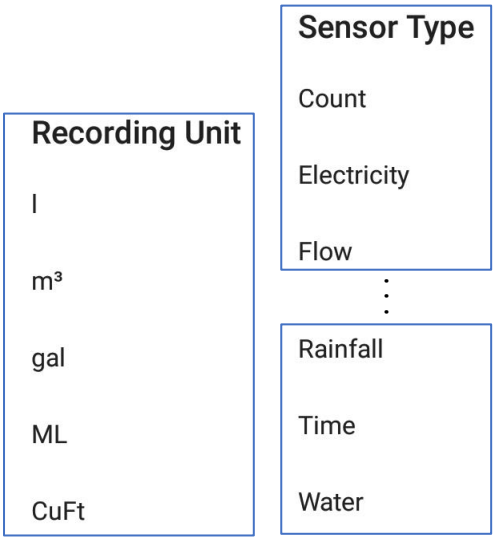
Then select from the listed options.
(e.g., "Net (fwd – rev)").

This sets the method used to produce and store channel datapoints.

- 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 here will determine the list of units of measure which are available to choose from later (i.e., the available recording units).

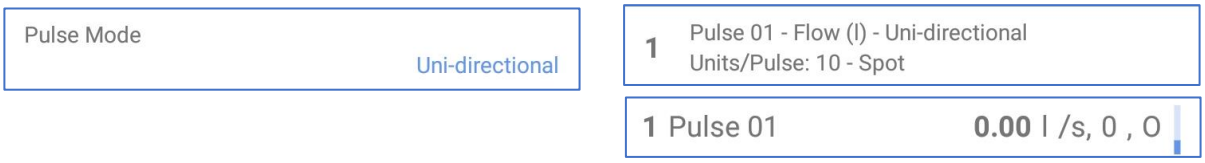


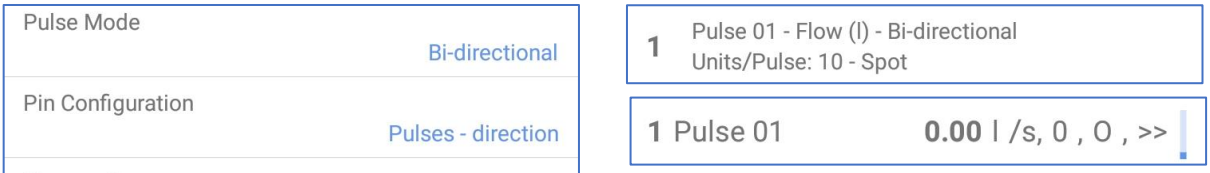
Continue setup by choosing a recording unit, etc; follow the guidance in section 3.4.2 (as required).

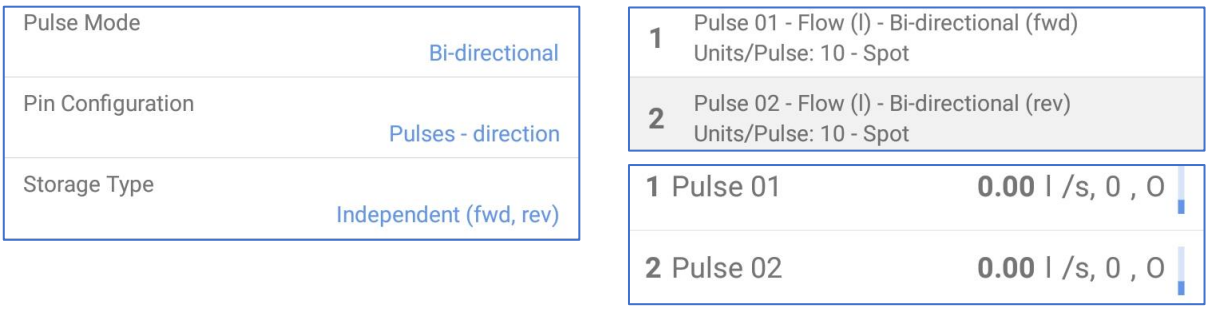
Typical Channel summary and Hardware Tests are shown below for the various options:

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.

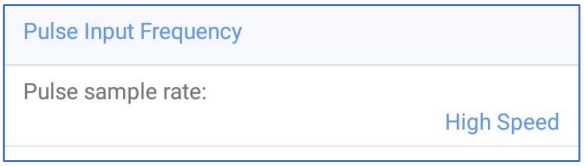




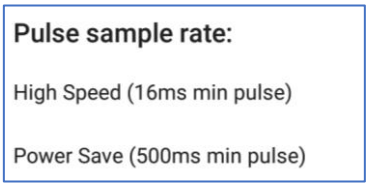


Pulse speed / Timing

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.

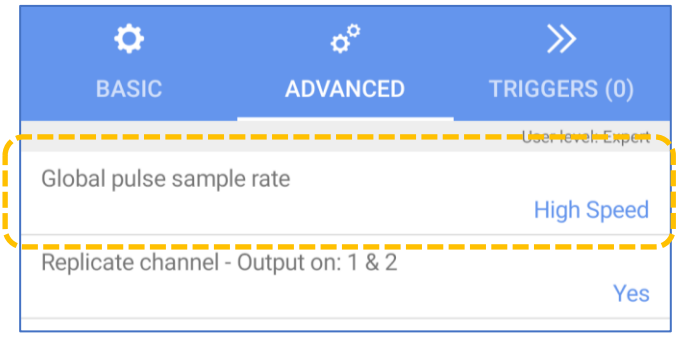


Refer to section 3.3 for details of how to check or adjust this timing parameter (see opposite).



Ensure the logger can capture pulses that are generated at the *maximum* expected meter output rate.

For convenience, the same control is accessible within the "Advanced" tab of the setup of a Flow (pulse) interface.
Note that the setting will be applied to all Flow (pulse) channels.



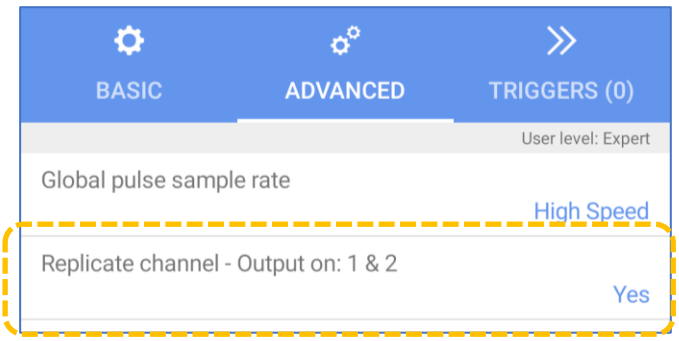
6.7.2 Pulse Replication output

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 channel that uses the meter signals.

In the channel configuration screen, select the Advanced tab.



If pulse replication is required check / adjust the setting for the "Replicate Channel – Output on: …". Setting to "Yes" 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 logger user-guide for any restrictions of pulse replication.

6.7.3 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 remain connected to the utility meter at all times.

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).

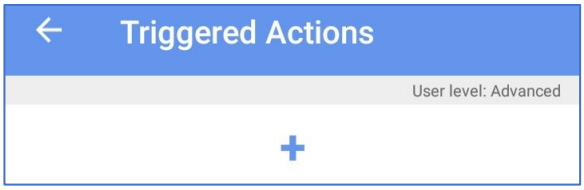
For loggers that support this facility, it is possible to use (re-purpose) a Flow (Pulse) Input to implement the tamper-detection. The pulse (tamper) input detects an electrical path (loop) is present when it is attached to the meter. If the cable is unplugged from the meter, the path no longer exists, 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 6.7.1) then follow the following steps:

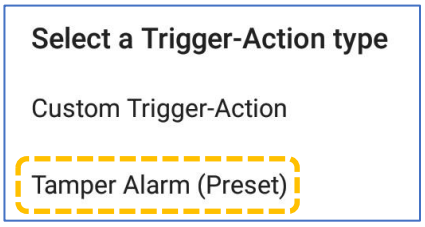
From the main page, find the Triggered Actions control and tap on it.

Tap on the "+" line to add a new Trigger-action combination.



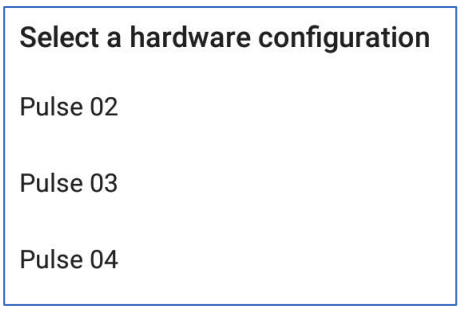
IDT has a facility to use a *Tamper-Alarm pre-set* to simplify its setup. Tap on this line.

(Pre-sets can sometimes implement settings that the user may not have direct access to).

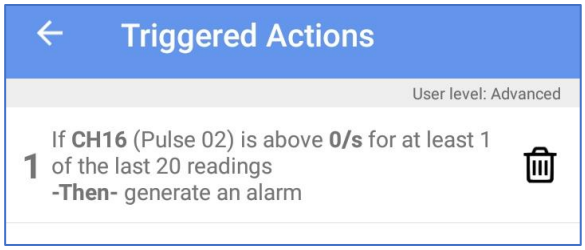


Next select the Pulse input pin that is to be used as the Tamper detection signal.

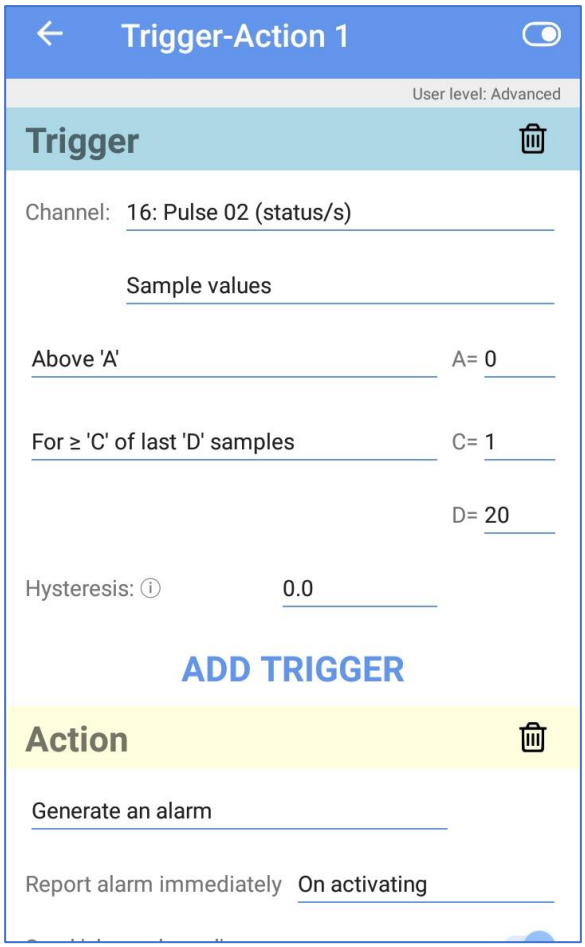
e.g., To protect a uni-directional Flow input set up using the Pulse 01 input, Pulse 02 should be chosen if it shares the same connector.

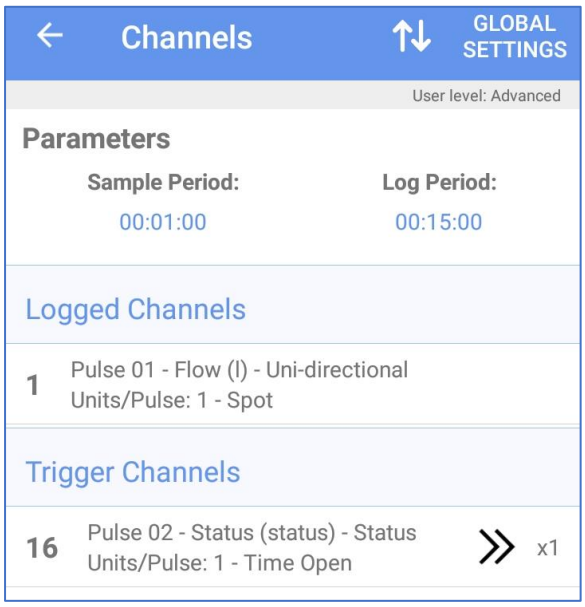


IDT will make several changes to logger settings to implement a tamper detection and the appropriate alarm.



(The illustrations opposite and below 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).



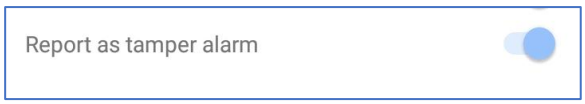


Note: Channel 16 is being used by the logger here. IDT chooses this “end channel number” to keep it separate from any channels that are in use for regular data-logging.

6.7.4 Tamper alarm (message option)

It should be noted that the tamper detect facility described in section 6.7.3 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 customer tamper attempts.



6.7.5 Meter Reading(s)

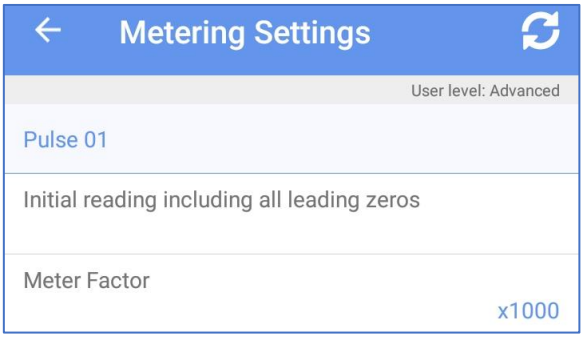
Digital Flow Interface channels are often used to track the usage of a commodity (e.g., of gas or electricity) supplied by a utility company. The commodity passes through an on-site meter, which can indicate consumption (use) by providing meter pulses. An initial meter reading has to be taken and entered 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 meters being monitored by the logger, as space allows, depending on how many meter interfaces are currently in use).

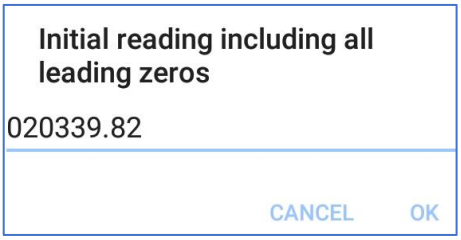
Tap on the "Metering Settings" line.

Read the main meter, noting its format.

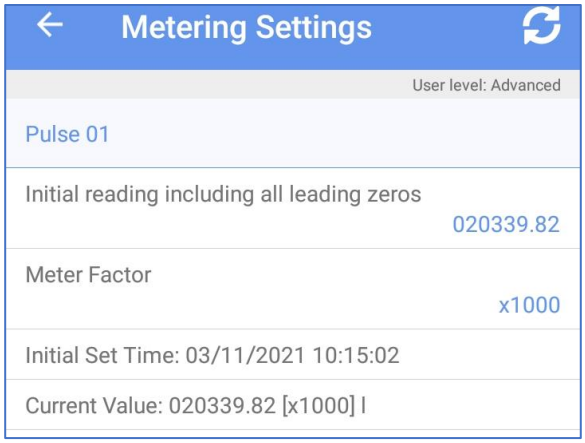
Tap on the "Initial reading …" line for the Pulse interface connected to the meter.



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 initial meter reading was obtained.

The "Current Value" will show the *calculated* current meter value. This is not live but updated upon entering the "Metering Settings" screen.

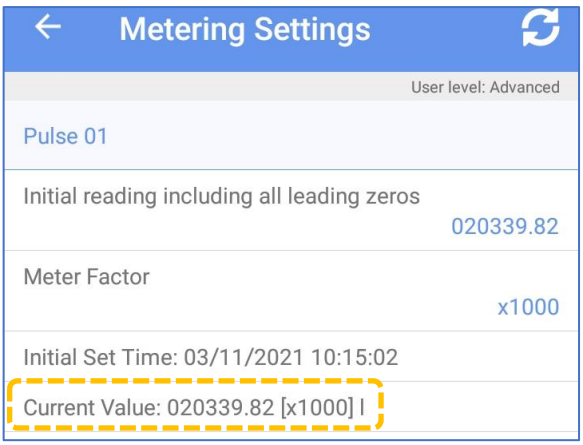
Calculate and enter a meter factor.

$$\text{Meter factor} = \frac{\text{Unit of volume measurement used on the Meter for each digit.}}{\text{Unit of volume measurement used on the Flow channel.}}$$

Tap the back-arrow and the entered reading for Meter 1 is now shown. (This is not a live value).

You can confirm logger is set up correctly by doing the following:

Wait for the display of the real meter to change by a few digits.
Note the meter reading and tap on the "Meter Settings" control.
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 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.

6.8 SDI12 INTERFACE

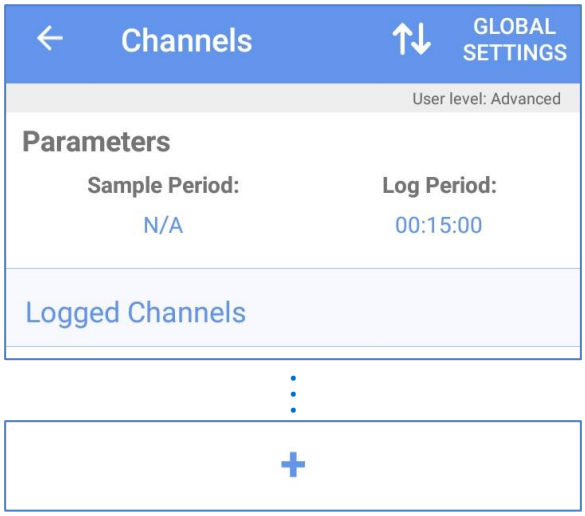
Some loggers may be fitted with an SDI-12 interface, with the ability to power the sensor from the logger (various voltages are available). SDI-12 is a multidrop serial communications interface that is supported by various intelligent sensors as a means of exchanging information with another device, 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 interface options for connection.
The logger SDI-12 interface requires a sensor to be wired to use its 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).

For HWM supplied sensors, the sensor will be supplied with an appropriate connector for your logger and will have had interoperability and 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:



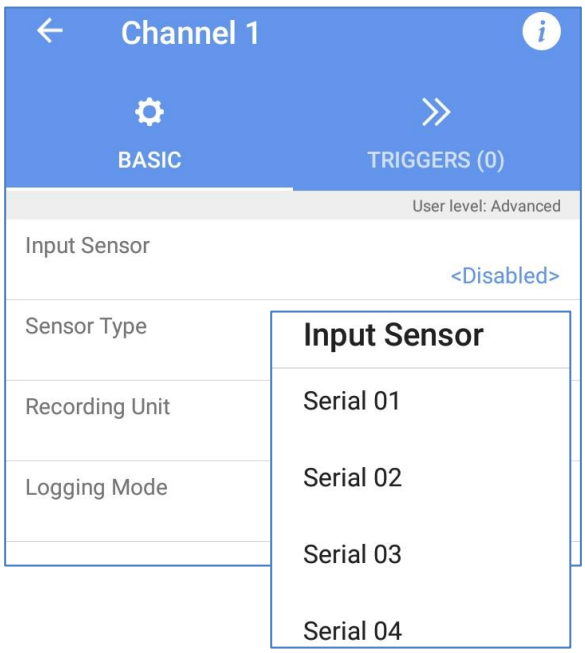
Tap on the + button to start setup of the interface for the sensor.

A channel setup screen will be shown with an available logger channel number allocated. The channels are enumerated according to availability; check that the allocated channel is suitable for any data transfer to your server (e.g., as expected on DataGate server).

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)

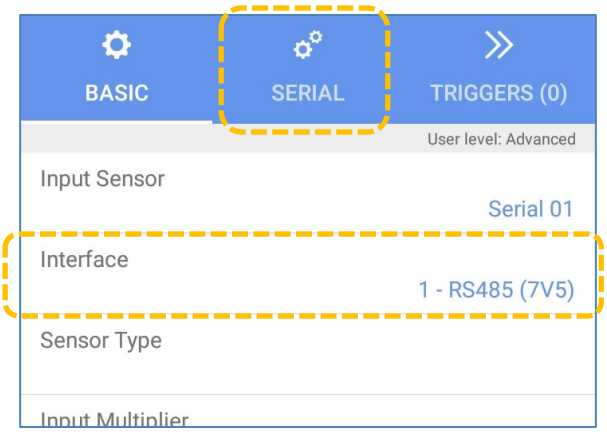


Note: Multiple “Serial nn” interfaces are provided by the logger. As described earlier, an intelligent sensor can often produce more than one type of measurement. These are available via the SDI-12 serial link. However, the logger will need to extract each of the required measurements individually. The logger will therefore use a dedicated “Serial nn” selection for each required measurement; 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 new line “SERIAL” tab also appears.

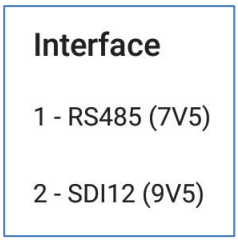
For loggers that have more than one interface fitted (of the type SDI-12 or RS485), the screen now shows an “Interface” selection line.



Tap on the Interface line to select the interface (connector) being used. (If required)

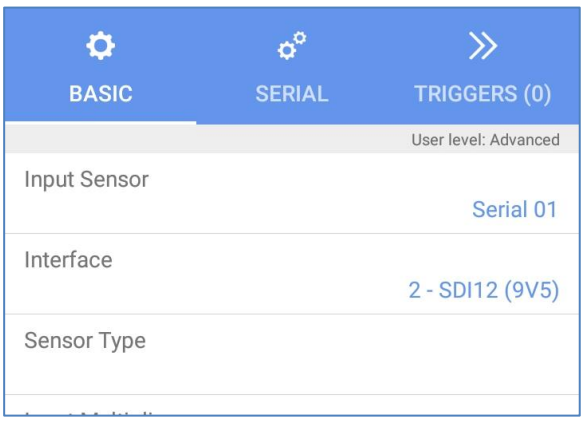
The contents of the selection will depend on what is available within your logger. (Here, the logger is fitted with 2 different types of interface).

Select an SDI-12 interface. 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).



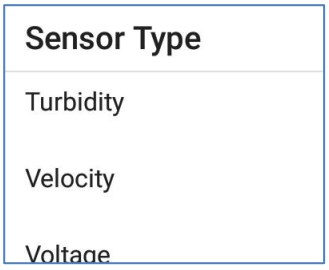
The SDI-12 interface is selected and displayed. (Only where more than one option exists).

Next tap on Sensor Type.

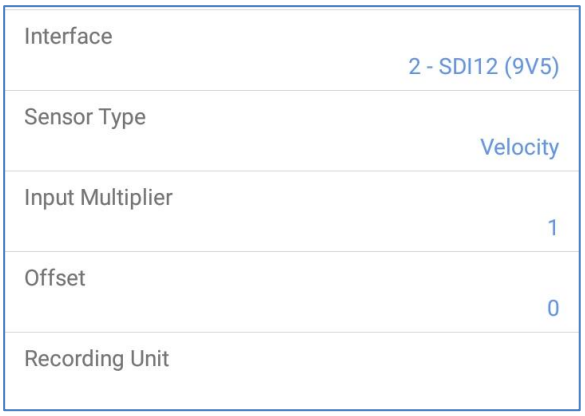


Select from the list the *physical parameter* which is being measured.

e.g., For a sensor which measures velocity of water, select “Velocity”.



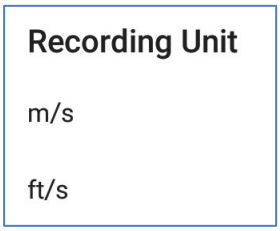
The Sensor type is set to the chosen parameter.

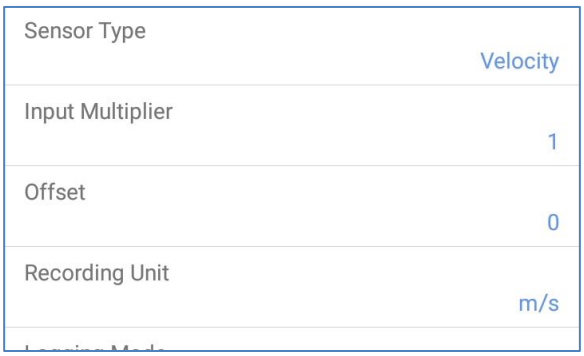


Next tap on “Recording Unit”.

Select an appropriate unit of measure.

e.g. For a sensor which gives data corresponding to metric units, such as meters per second, select “m/s”.





(Refer to the sensor manual for the units of measure employed for the measurement).

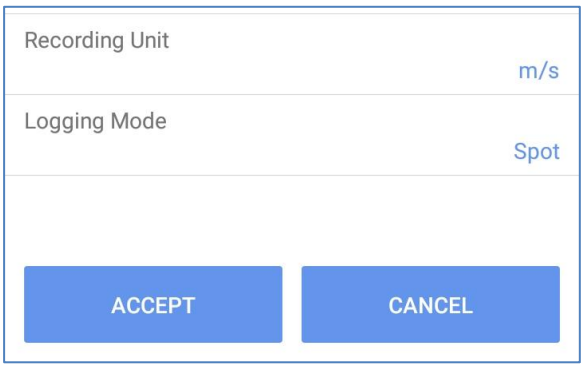
The chosen recording unit displayed.

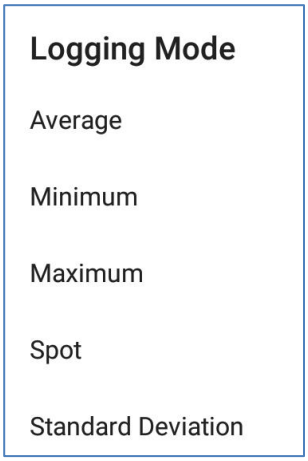
Set the input multiplier as required (see note below).

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 6.9).

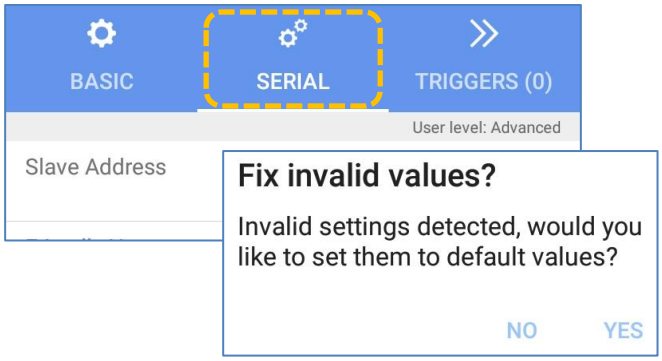
Tap on “Logging Mode” and select according to your requirements.

Check the settings on the screen and then tap on “Accept” to save the settings to the logger.





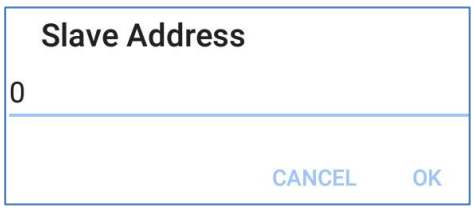
Next select the “SERIAL” tab.



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).

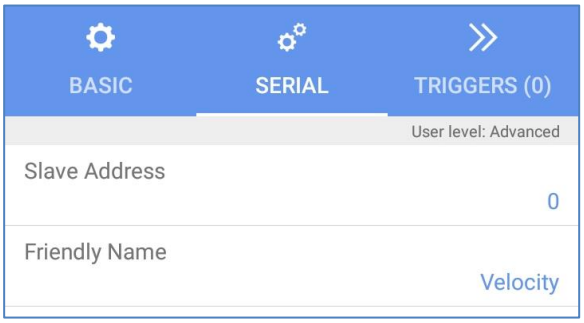
Tap on “Slave Address”.

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).



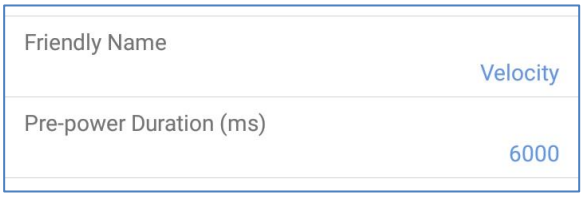
The default address for most SDI sensors is “0”, but some sensors may be required to be set to a different address.

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.



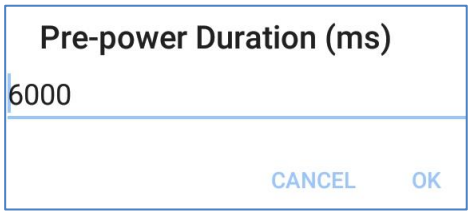
The chosen address displayed.

IDT suggests a “Friendly name” based on the measurement parameter. This can be changed if required.

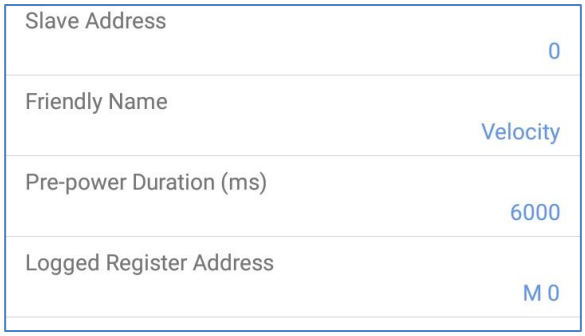


The logger usually only provides power to the sensor when it requires a measurement to be taken. However, most intelligent sensors require power to be applied for a minimum time in order to set up and complete the measurement cycle and any associated communications. This time period must be entered into the “Pre-power Duration” field.

Tap on the line and enter the required value.
(this can be 0 to 63750 in 250ms steps).
Refer to your sensor manual for guidance, or any sensor-specific setup hints detailed later in this user-guide.
(See also section 5.6)



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).

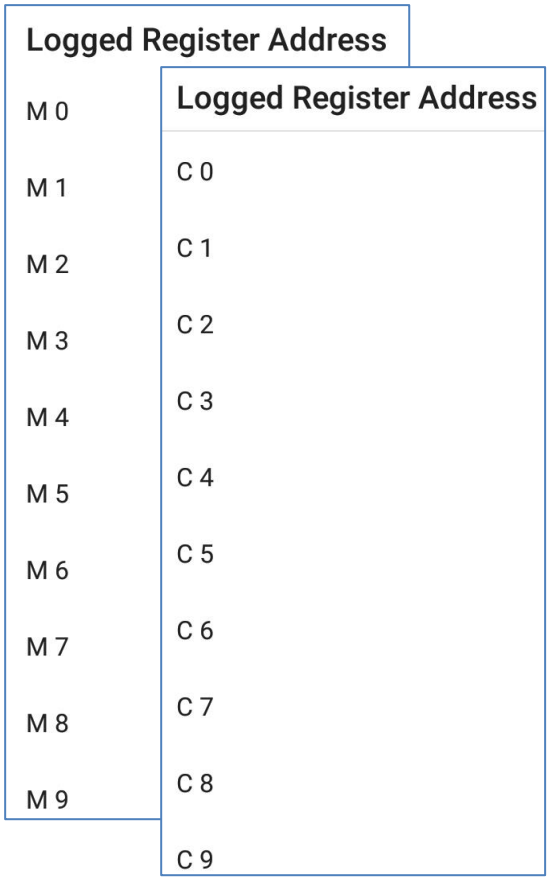


Following receipt of the command, the sensor will initiate the measurement and reply cycle.

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.

When the sensor indicates data will be available (the sensor provides an initial acknowledgement response to the logger which includes the measurement delay time), the logger automatically fetches the data until the transfer is completed (it makes 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.

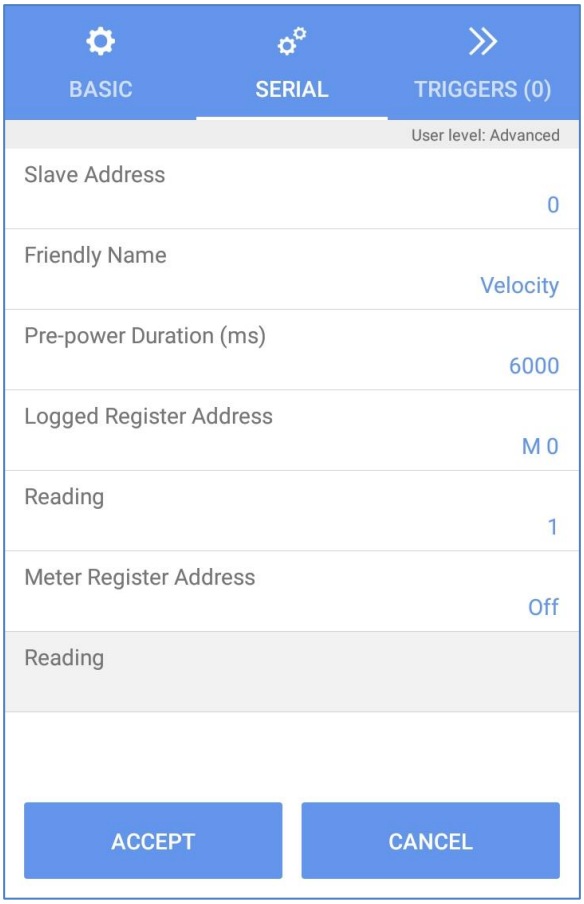
It is necessary to pick out (index) the measurement that is required. This is done by entering a “Reading” value (to index which result is required for the logger recording).

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 Reading 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).



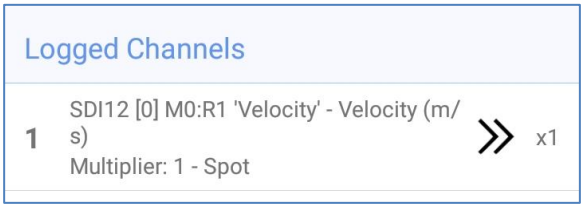
Tap on “Accept” to save the changes to the logger.

Note: Repeat the setup process for any additional parameters required from the sensor.
Use a different serial channel for each.

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.



6.9 RS485 / MODBUS INTERFACE

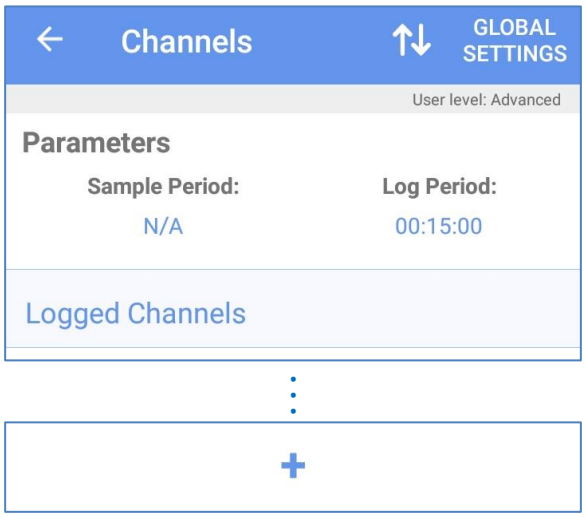
Some loggers may be fitted with an RS485 / MODBUS interface, with the ability to power the sensor from the logger (various voltages are available). RS485 is a multidrop serial communications interface that is supported by various intelligent sensors as a means of exchanging information with another device, 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 options for connection. The logger RS485 interface requires a sensor to be wired to use its RS485 / MODBUS 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).

For HWM supplied sensors, the sensor will be supplied with an appropriate connector for your logger and will have had interoperability and 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:



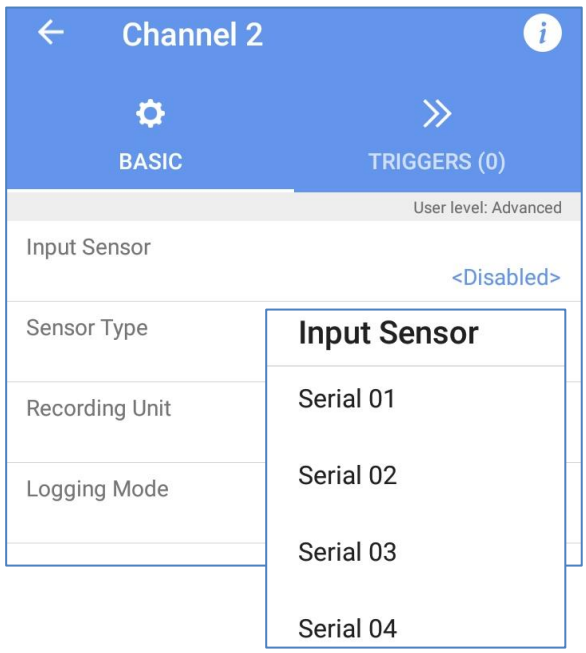
Tap on the + button to start setup of the interface for the sensor.

A channel setup screen will be shown with an available logger channel number allocated. The channels are enumerated according to availability; check that the allocated channel is suitable for any data transfer to your server (e.g. as expected on DataGate server).

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*.

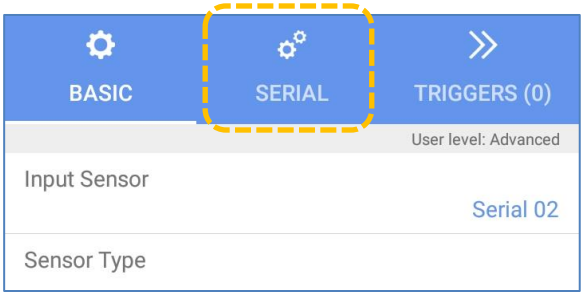
(e.g. Tap on Serial 01)



Note: Multiple “Serial nn” interfaces are provided by the logger. As earlier described, an intelligent sensor can often produce more than one type of measurement. These are available via the RS485 / MODBUS serial link. However, the logger will need to extract each of the required measurements individually. The logger will therefore use a dedicated “Serial nn” selection for each required measurement; the data stream will occupy its own channel number in the logger’s recording memory.

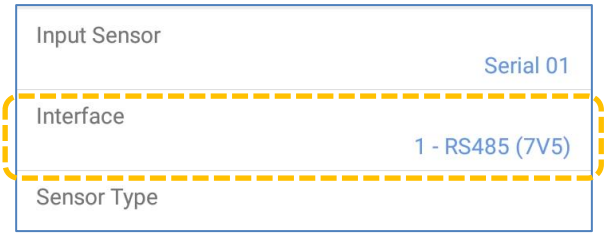
The chosen serial input is displayed as the input sensor.

A new line “SERIAL” tab also appears.



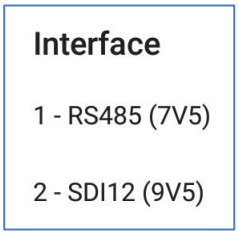
Note: For loggers that have more than one interface fitted (of the type SDI-12 orRS485), the screen will also show an “Interface” selection line.

Tap on the Interface line to select the interface (connector) being used.

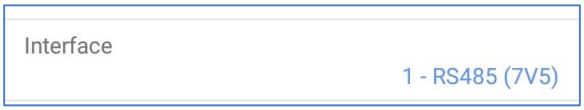


The contents of the selection will depend on what is available within your logger. (Here, the logger is fitted with 2 different types of interface).

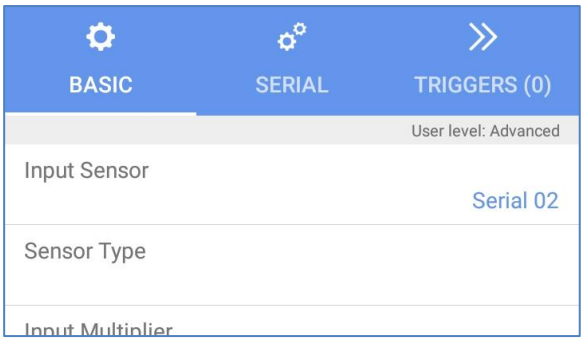
Select an RS485 interface. Check the voltage is appropriate for the sensor that is being attached.
The voltage may also be shown on the logger label for the connector.



The chosen RS485 interface is displayed.

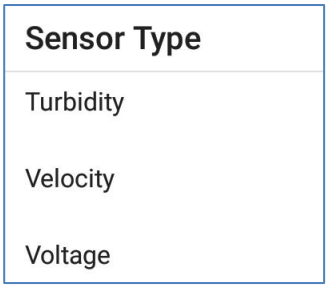


Next tap on Sensor Type.

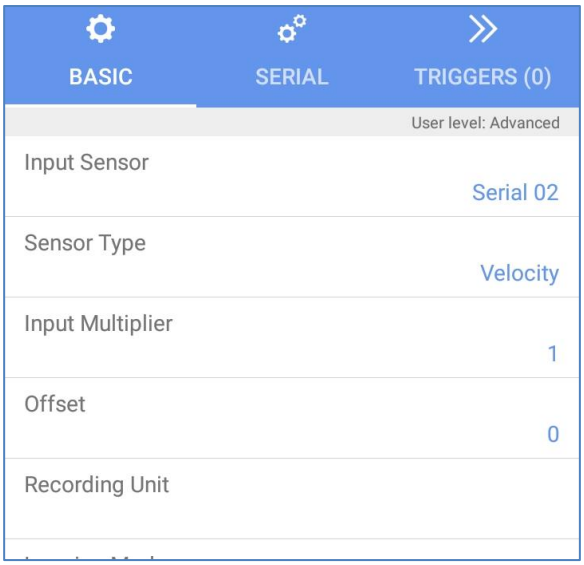


Select from the list the *physical parameter* which is being measured.

e.g., For a sensor which measures velocity of water, select “Velocity”.



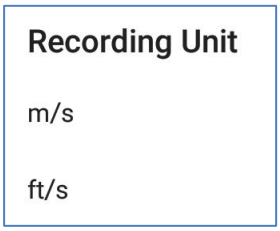
The Sensor type is set to the chosen parameter.



Next tap on “Recording Unit”.

Select an appropriate unit of measure.

e.g. For a sensor which gives data corresponding to metric units, such as meters per second, select “m/s”.



(Refer to the sensor manual for the units of measure employed for the measurement).

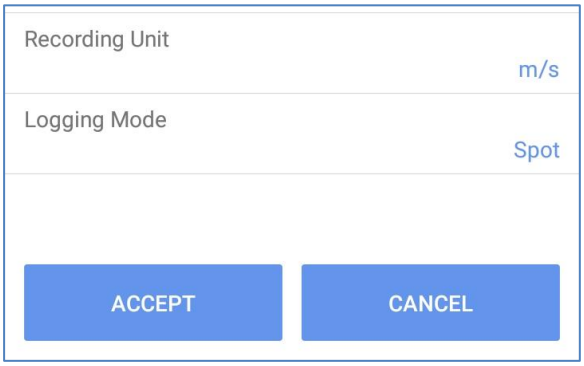
The chosen recording unit displayed.

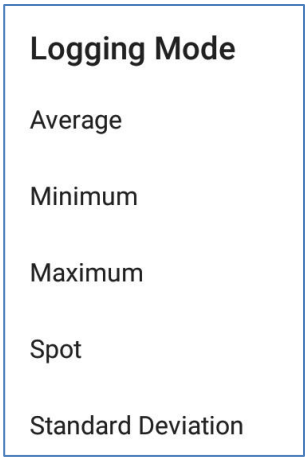
Set the input multiplier as required (see note below).

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).

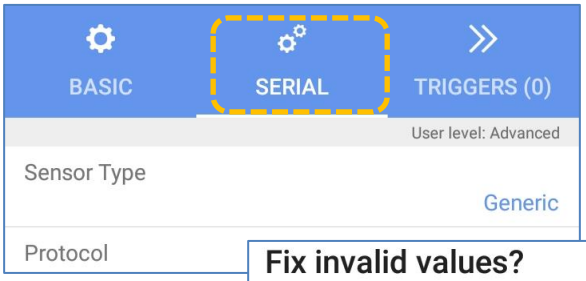
Tap on “Logging Mode” and select according to your requirements.

Then tap on “Accept”.





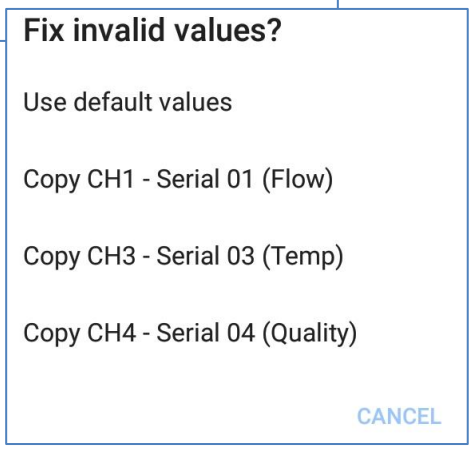
Next select the “SERIAL” tab.



Note:

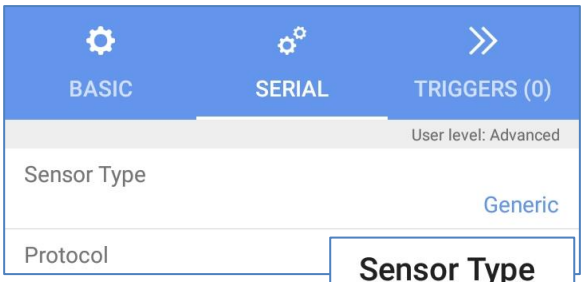
If a “Fix invalid values” message appears, it is likely that several “serial nn” channels are set up to use the same sensor equipment, but the default settings for the Serial tab (e.g., pre-power time) are inconsistent with existing channels.

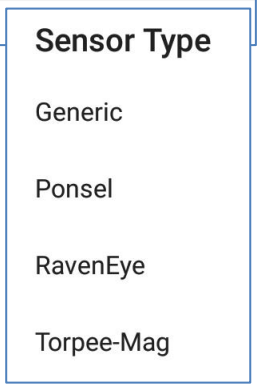
Tap on “Use default values” to ignore (and re-enter the settings of each field) or choose “Copy …” to copy settings across from another channel.



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 supplied sensors have completed interoperability tests to ensure readings can be correctly obtained.

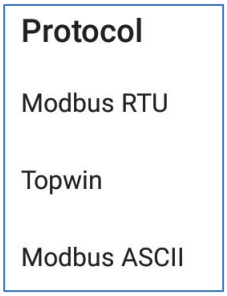
Note: For some the remaining setup parameters, you will need to refer to the sensor's manual to understand its requirements.

Tap on "Protocol".

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).

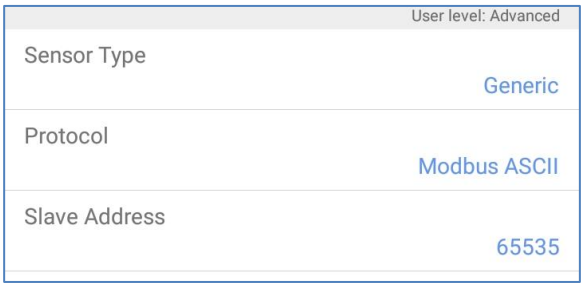
Note: If the wrong protocol is selected, the sensor will not operate correctly with the logger; The frame format and content will be incorrect.

e.g., if your sensor requires Modbus ASCII, tap on it to select.



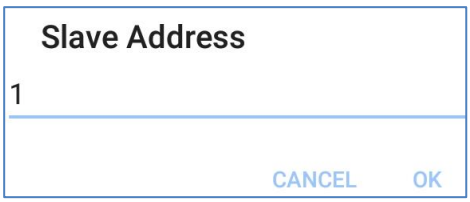
The chosen protocol is displayed.

Tap on the "Slave Address" line.



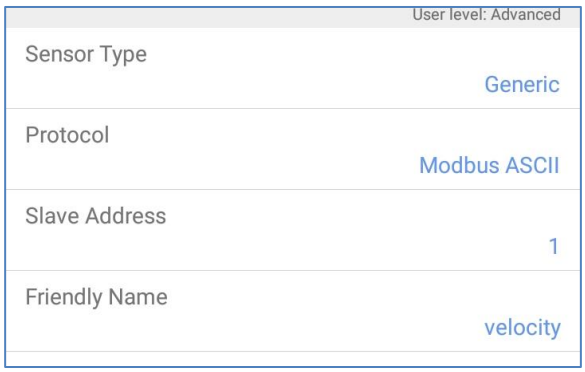
For Modbus over an RS485 interface, each device must have an address in the range 1 to 247. Refer to your sensor equipment documentation and locate its address.

Enter the address and then tap on OK.

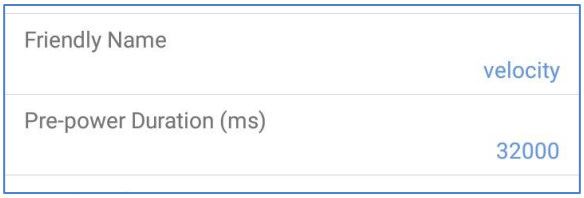


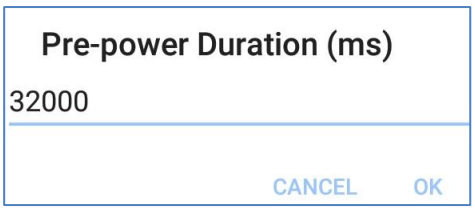
The address is displayed.

IDT suggests a "Friendly name" based on the measurement parameter. This can be changed if required.



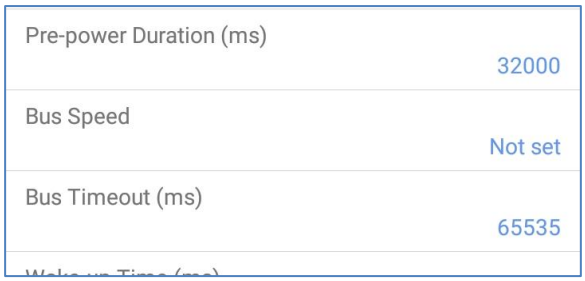
The logger usually only provides power to the sensor when it requires a measurement to be taken. However, most intelligent sensors require power to be applied for a minimum time in order to set up and complete the measurement cycle and any associated communications. This time period (plus some small margin) must be entered into the “Pre-power Duration” field.
(See also section 5.6)



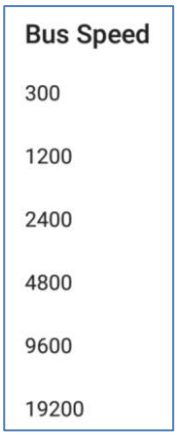


Tap on the line and enter the required value.
(0 to 63750ms in 250ms steps).
Refer to your sensor manual for guidance.

The chosen value is selected and displayed.

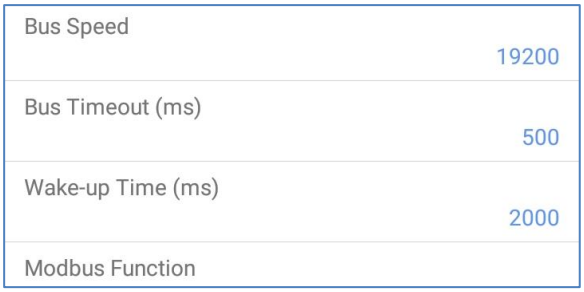


Next select the Bus speed (communications speed, also known as “Baud rate”); this must match your sensor.



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.

The selected Bus Speed is displayed.



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.

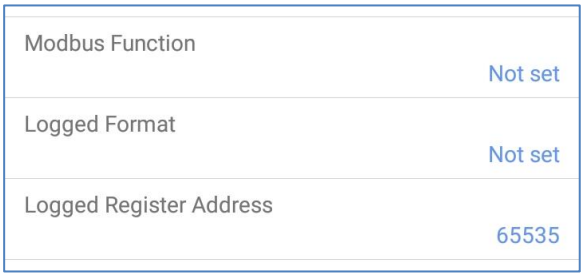
The Modbus protocol has a suit of available functions for reading and writing data; Each has a function code. The logger will support a subset of the function codes.

For reading data from the sensor, the user can specify the following function codes:

- Function 3: Read Holding Registers

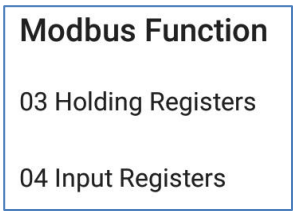
- Function 4: Read Input Registers

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).

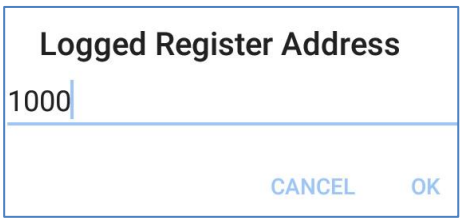
Tap on “Modbus Function” and select the required function code.



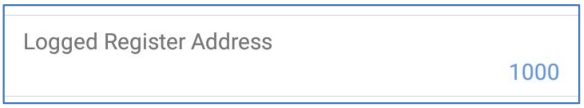
The chosen Modbus function is displayed.

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”.

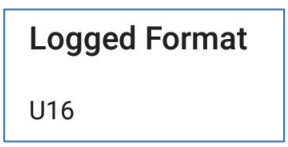


The start register address for the data is now displayed in IDT.



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.

U16: Unsigned Integer.
16-bits wide (1 register) data.
Includes positive integer values only.



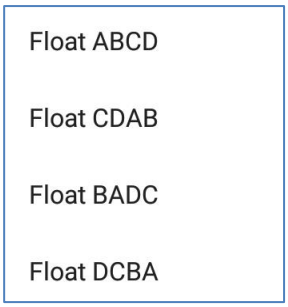
S16: Signed Integer.
16-bits wide data (1 register required).
Includes positive and negative integer values only.

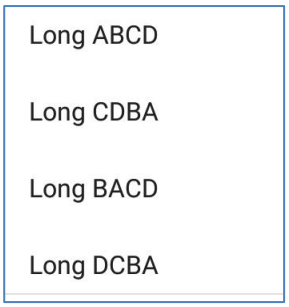
Long: Signed Integer.
64-bits wide data (4 registers required).
Includes positive and negative integer values only.

Float: Signed number including decimal point.
32-bits wide data (2 registers required).
Includes positive and negative values.

Double: Signed number including decimal point.
64-bits wide data (4 registers required).
Includes positive and negative values.

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 that is larger than 16-bits wide is to be read from the Modbus data frame into the logger memory. The data type must be selected (e.g., “Float” or “Long” ; this dictates its size) along with one of the options for the byte or word order.

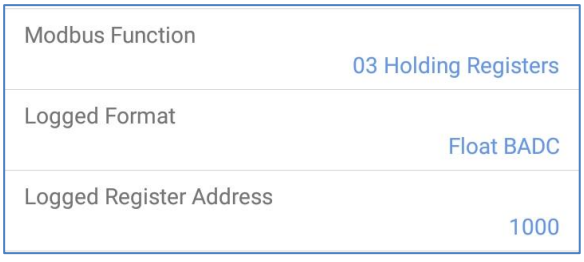
Selecting the right byte order option is often a case of trying the alternative settings to find the one which matches the data presentation from your sensor; the data will then make sense. (Check data using the IDT Hardware test feature).

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.

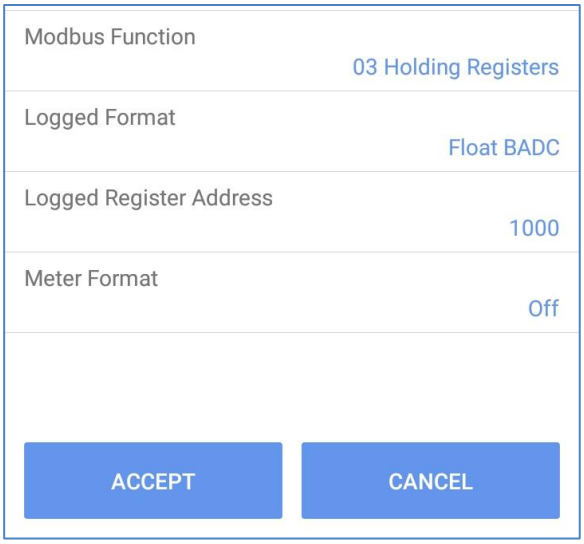
The number will be a “Float” type; it is spread across 2 registers (to make 32-bits).

The selection of one of the “Float” formats is now 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.

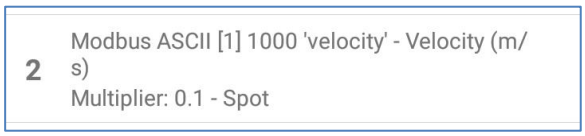


The section regarding “Meter Reading Address” is rarely used and can be left as shown.
(It is provided only for flow sensors which include providing access to meter reading values over the RS485 / Modbus link).

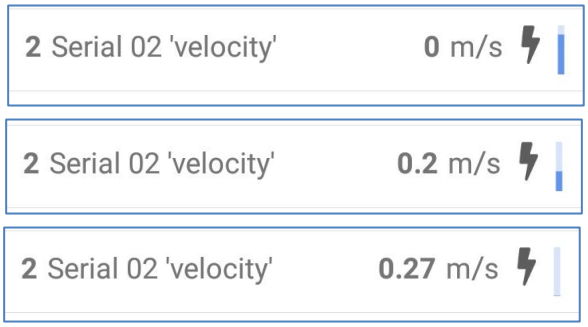
Tap on “Accept” to save the changes to the logger.

Note: Repeat the setup process for any additional parameters required from the sensor. Use a different serial channel for each.

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).

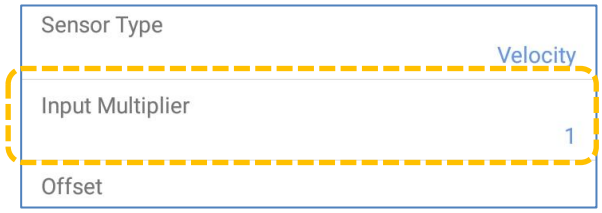


Note:

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 here 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).



6.10 Open Channel Flow using Velocity & Depth Sensors

The rate of flow of water through an open channel can be calculated if both the cross-sectional area of the moving body of water and the velocity of the water are known.

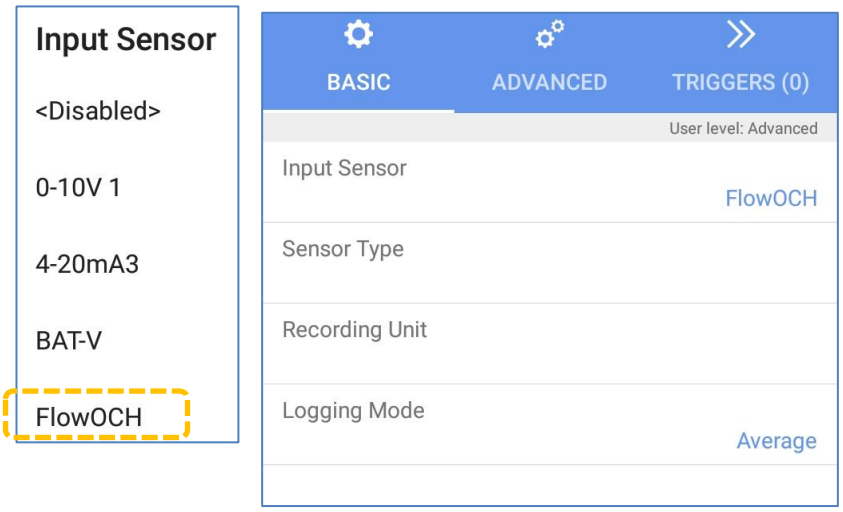
The velocity can be measured by the use of an appropriate type of sensor.

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.

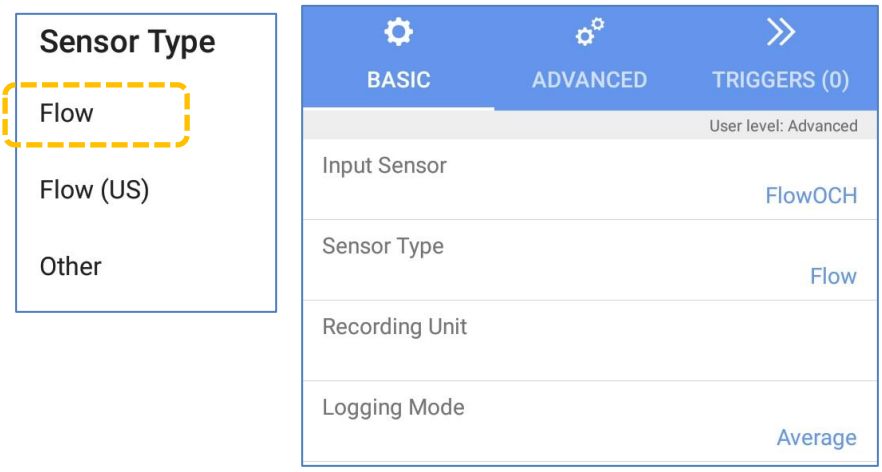
The logger, if equipped with suitable velocity and depth sensors, can produce flow-rate data (by calculation). This is achieved by setting up a “FlowOCH” channel, as follows:

Add a new channel to the logger (using the + button to add the channel).

When setting up the channel, choose “Flow OCH” as the Input Sensor.



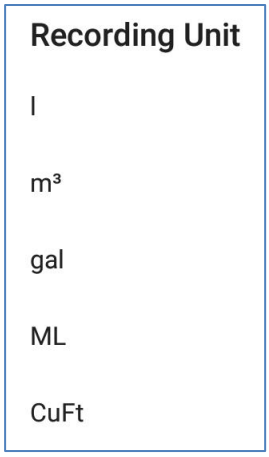
Choose a sensor type of “Flow” ; this is the physical parameter being recorded for this channel.

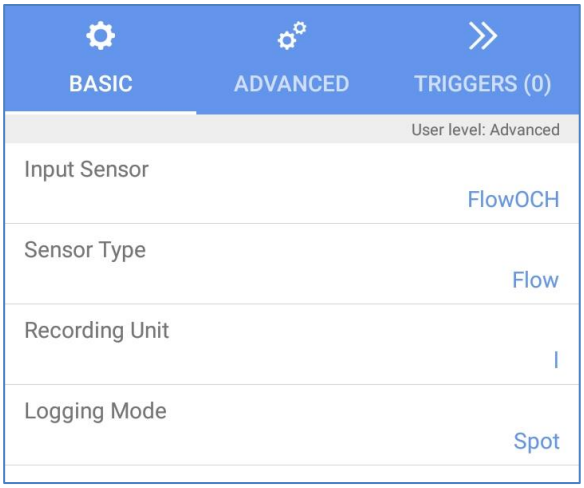


Select a recording unit.

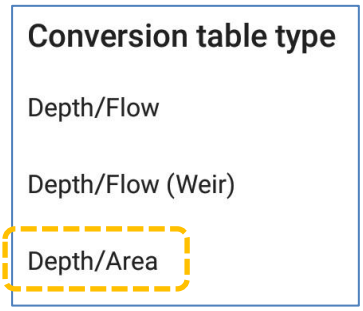
The measurement is an instantaneous rate of flow, so when “l” is selected, “litres per second” is implied, etc.

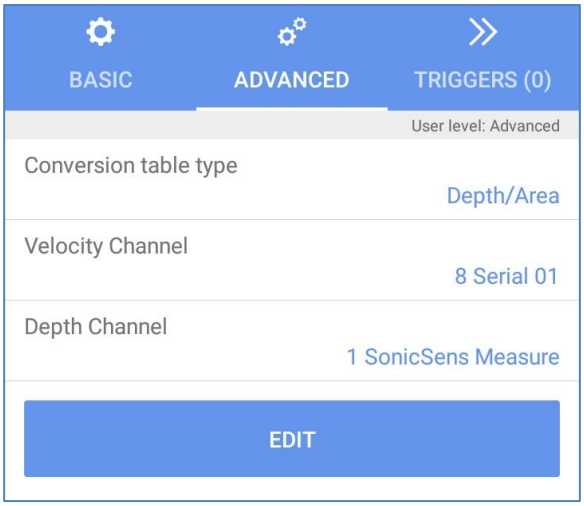
The logger calculates the instantaneous flow from the water channel dimensions and velocity, using an internal unit of measure. It subsequently converts the flow result to the unit of measure chosen here, used in producing datapoints.





Select the Advanced tab and select a “Conversion table type” of “Depth/Area”.





Tap on “Velocity Channel” and pick the relevant sensor for the water velocity.

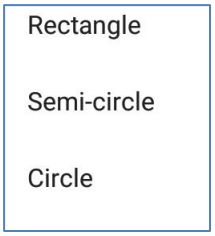
Tap on “Depth Channel” and pick the relevant sensor for the water depth.

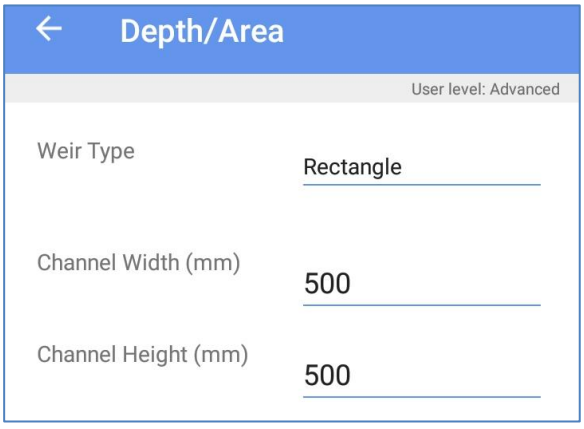
Note: The chosen channel must measure the *water depth*, (or provide a calculated water depth), and not the distance to the water surface.
The sensor must be set up to measure depth in mm.

Tap on the Edit button.

Then tap on Weir type.

Select the geometry that best describes the cross-section area of the water channel at the measurement point.

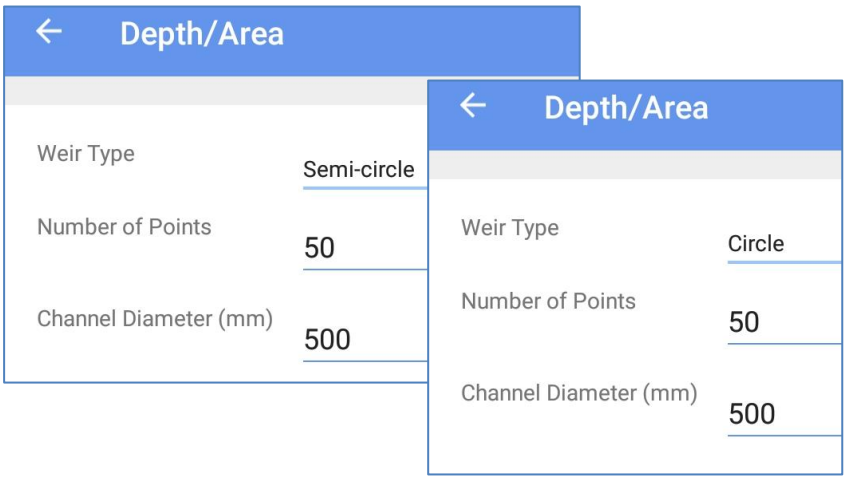




For a rectangular cross-section, measure and enter the height and width in mm.

For a semi-circle or circle, enter the diameter in mm.

Also enter a value (between 2 and 247) for the “number of points”.

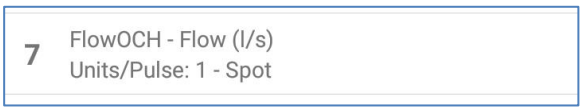


IDT will construct a table for use in the depth to flow conversion based on the entered geometry, dimensions, and number of points (lines) required.

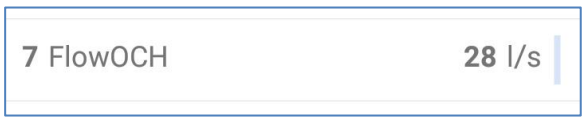
The table will be uploaded into the logger after the user taps the “Accept” button.

(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.



A message of “Error reading sensor” will be shown should any of the sensors employed to produce the flow calculation has an error condition.

6.11 System – obtaining Open Channel Flow from 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:

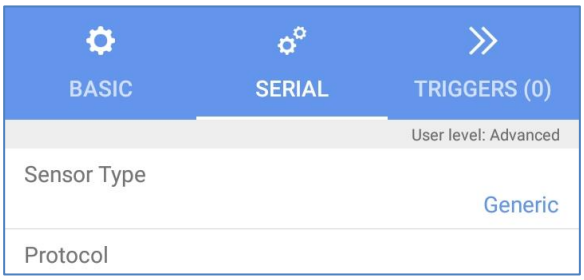
- Use the logger to make the rate of flow calculation (see section 6.10).
- Use the RavenEye sensor to make the rate of flow calculation (described here).

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.

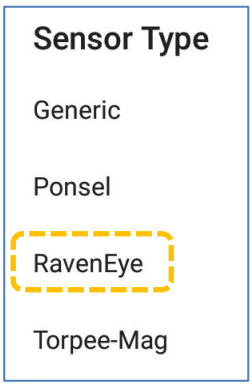
For setup of the RAVEN-EYE sensor, follow the guidance for a RS485 / Modbus sensor, as described in section 6.9, except as follows:

First, *set up the logger to obtain water velocity data* from the RAVEN-EYE sensor. However, when making settings on the "Serial" tab:

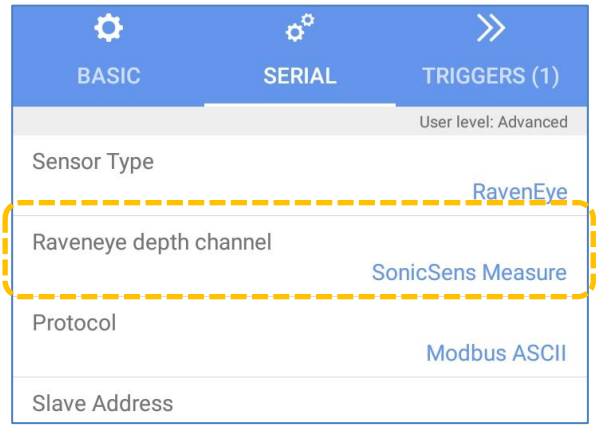
Tap on "Sensor Type".



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".

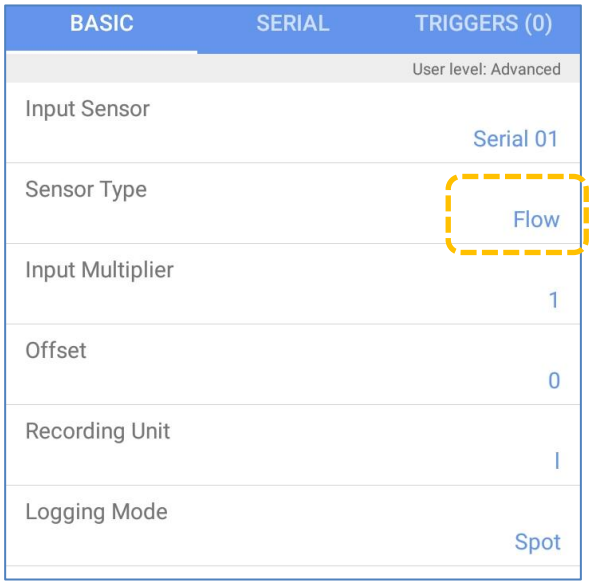
Any channel (which must have been previously set up) which measures the depth of water in the open channel can be used.
(Here, a SonicSens3 sensor is being used to provide the depth measurements).

Note: The unit of measure of the selected depth channel is important; the RAVEN-EYE 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.

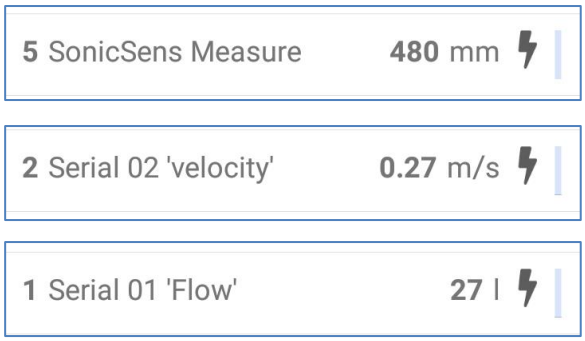
The register data must be interpreted as "Flow" and the selected unit of measure is to be "L" (litres, for litres per second).

(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.

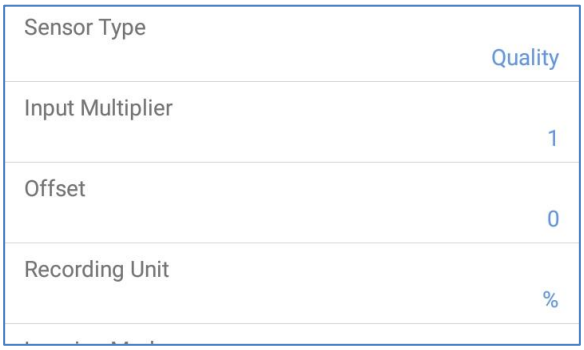
The flow will be shown during hardware test.

The flow result shown opposite is the rate of flow (in litres / second).

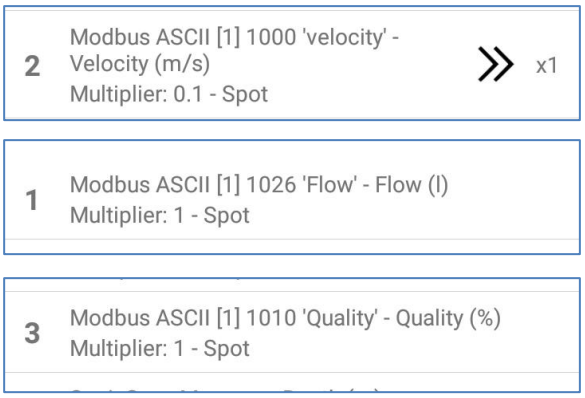


The RAVEN-EYE sensor has a variety of other parameters available including temperature and various judgements of the quality of its measurements.

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.



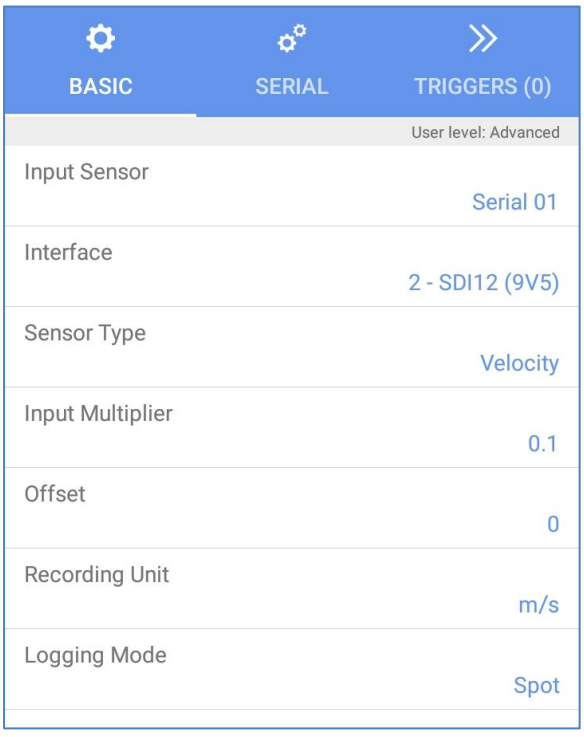
6.12 Setup Hint– Hydreka DVP (SDI-12)

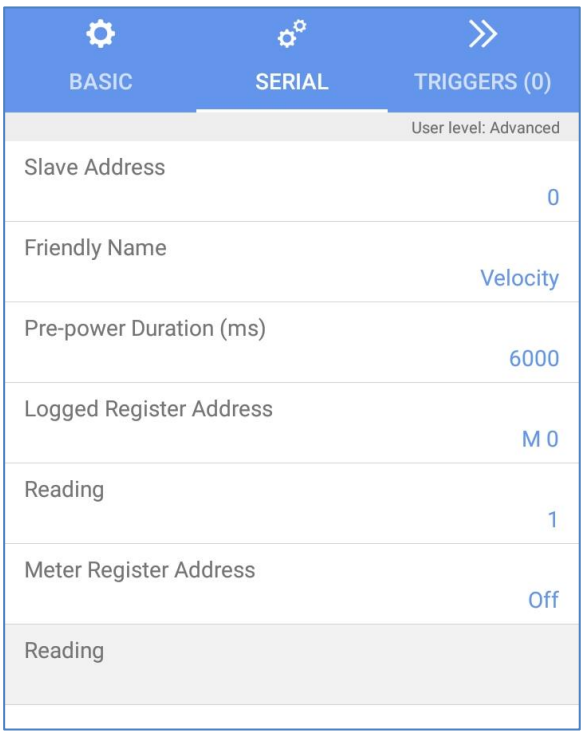
The Hydreka DVP (Doppler Velocity Probe) is a sensor which measures water velocity.

It is typically being 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 6.8. Channel settings are typically as shown below (subject to change; refer to the sensor manual for latest sensor requirements):





6.13 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.

6.13.1 Use with a SpillSens sensor

SpillSens is a digital float angle sensor.

SpillSens is often used with the following data viewing portals:

- 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.

6.14 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 6.13 for further details).

6.15 External Pressure sensor input

Your logger may have an “External Pressure” interface fitted.
This takes the form of an analogue interface which can be adapted to sensors which measure various physical parameters, including:

- Pressure of a fluid or gas.
- Depth of a fluid.

The term “External” is used to indicate that the sensor is attached to the logger via a cable (in contrast with a sensor that is built-into the logger itself).

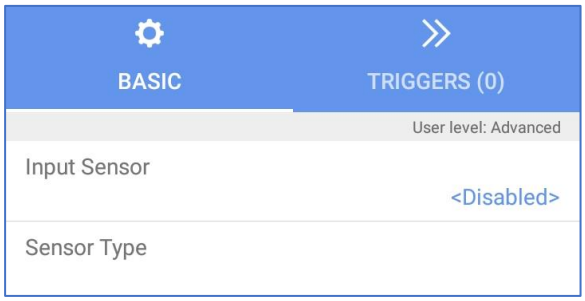
The sensors are required to be calibrated with the logger prior to use in order for readings to be accurate. Recalibration is required if sensors are replaced (or if similar sensors are swapped between two similar logger connectors).

The IDT app gives access to the calibration settings as part of the channel setup, although the logger may optionally be set to default settings within the factory and calibrated with the sensor prior to shipping.

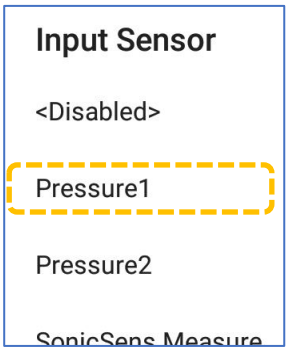
6.15.1 Used with Pressure Sensors

This section deals with the setup of the External Pressure interface for use with analogue pressure transducers.

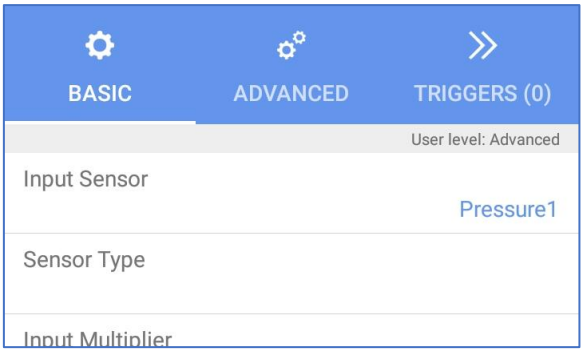
When creating a new channel for the pressure sensor, initially there are 2 tabs displayed.



Select the “basic” tab, tap on “Input Sensor” and then select the relevant interface by choosing “Pressure1” (… or Pressure2, etc, if more than one interface is fitted).

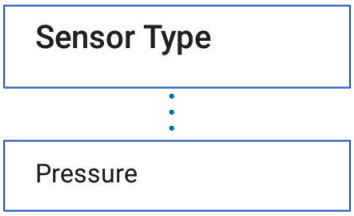


The screen shows the selected pressure channel.
In addition, it will now show an “advanced” tab.

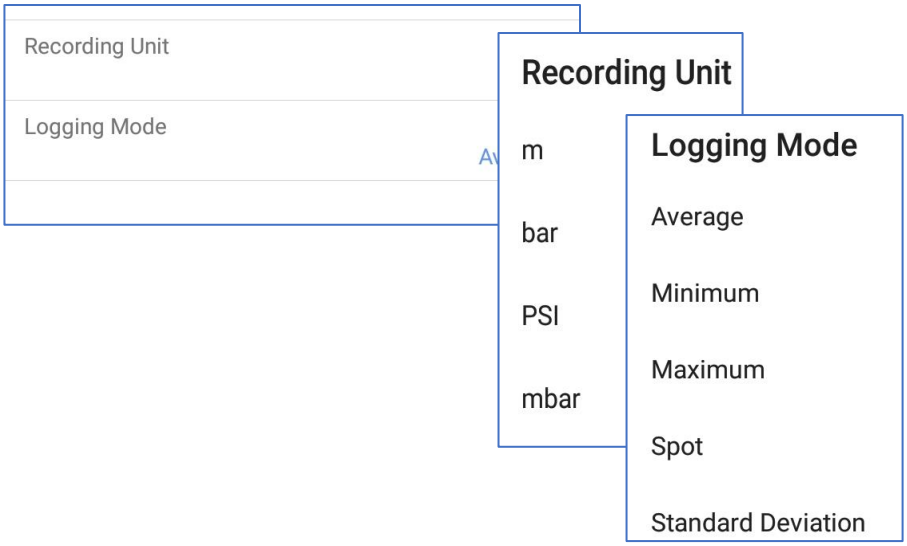


Tap on the Sensor Type line.

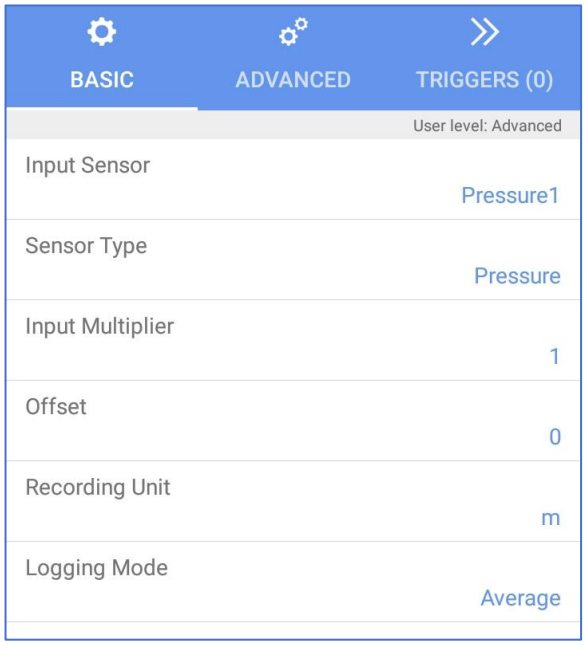
Then select the physical parameter of “Pressure” from the displayed list.



Select the required logging mode and recording unit for producing the channel datapoints.



Note: Pressure (force / area) has a wide selection of possible units of measure.



The input multiplier and offset settings can be adjusted if required.

Usually, the Offset is left at "0", as shown.

The Input Multiplier setting will depend on several factors including:

- What the recording unit is set to.
  (This must be common between the logger and any server expectations for the channel data).
- What units the sensor has been calibrated in.

e.g., If the sever expects a recording (data stream) to use a unit of measure of meters (m) of H^2O, but the sensor has been calibrated in millibars (mbar), then a multiplier of "0.0102" is required to convert from the numeric value in mbar to a numeric value in m of H^2O.
(1m of H^2O = 98 mbar ; 1 mbar = 0.0102 m of H^2O).

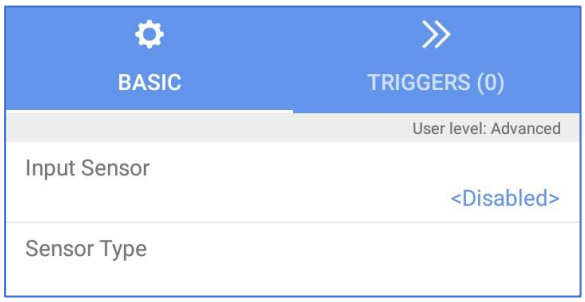
Tap the "Accept" button to save the settings to the logger.

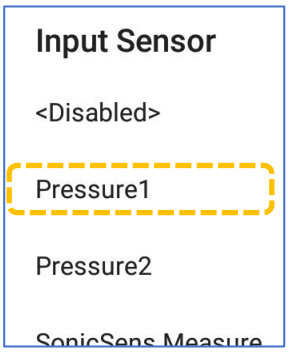
Note: The advanced tab include controls to re-zero the pressure reading to local atmospheric pressure. (The sensor must be exposed to atmospheric pressure when doing this).
It also includes access to the calibration controls. (Refer to section 6.16).

6.15.2 Used with Depth Sensors

This section deals with the setup of the External Pressure interface for use with analogue depth sensors that are designed to measure the depth of a fluid. They are installed at the bottom of a vessel and measure depth of a fluid by measuring pressure, which is related to the height of the fluid above the sensor. Their setup and calibration is similar to pressure sensors.

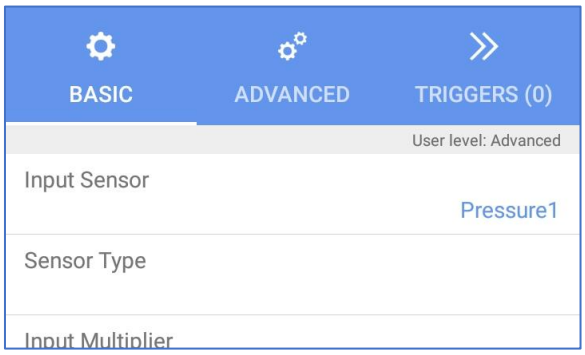
When creating a new channel for the depth sensor, initially there are 2 tabs displayed.



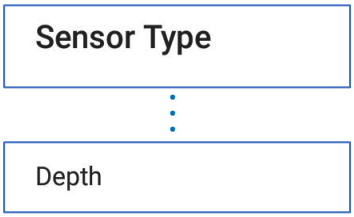


Select the “basic” tab, tap on “Input Sensor” and then select the relevant interface by choosing “Pressure1”
(... or Pressure2, etc, if more than one interface is fitted).

The screen shows the selected pressure channel.
In addition, it will now show an “advanced” tab.

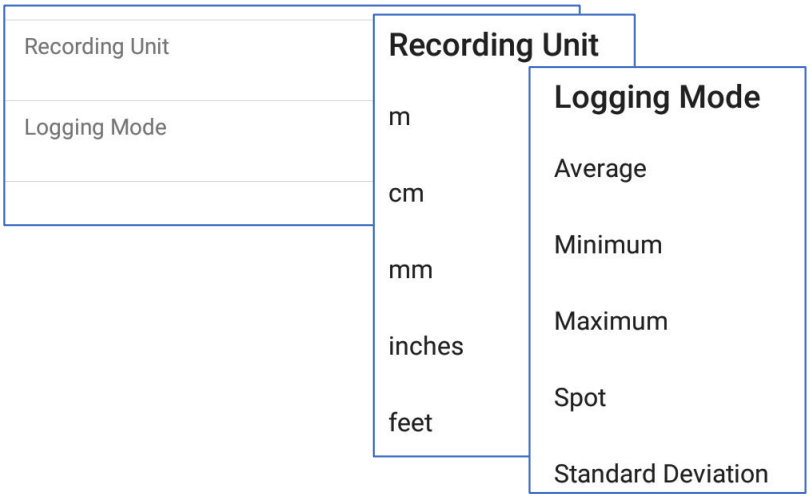


Tap on the Sensor Type line.

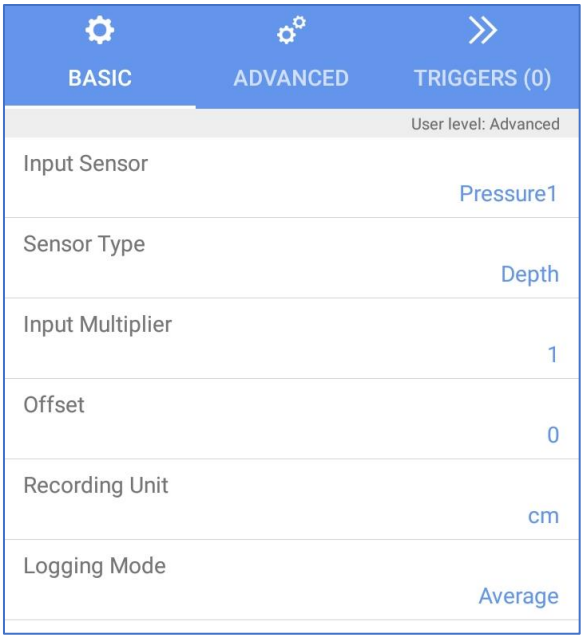


Then select the physical parameter of “Depth” from the displayed list.

Select the required logging mode and recording unit for producing the channel datapoints.



Note: Depth has a different selection for units of measure than when the interface is set to “pressure”, despite the transducers being similar.



The input multiplier and offset settings can be adjusted if required.

Usually, the Offset is left at “0”, as shown.

The Input multiplier setting that is needed depends on several factors including:

- What the recording unit is set to.
  (This must be common between the logger and any server expectations for the channel data).
- What units the sensor is calibrated in.

e.g., If the sever expects a recording (data stream) to use a unit of measure of meters (m) of H^2O, but the sensor has been calibrated in centimetres (cm) of H^2O, then a multiplier of “0.01” is required to convert from the numeric value in cm to a numeric value in m (of H^2O).
(1m = 100cm ; 1 cm = 0.01m).

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

Note: The advanced tab include controls to re-zero the pressure reading to local atmospheric pressure. (The sensor must be exposed to atmospheric pressure when doing this).
It also includes access to the calibration controls. (Refer to section 6.16).

6.16 CALIBRATION OF EXTERNAL PRESSURE INPUT

When calibrating a pressure sensor, use an appropriate calibration rig and sealing adaptor to apply the calibration pressure levels to the sensor.

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. (Not available on all loggers). (Refer to section 6.16.1).
- Multipoint calibration.

The multipoint calibration process pairs a reference pressure (entered into IDT by the user) with the corresponding numeric value that is output from the A to D converter. By using 2 or more reference pressures, the user can produce a table of calibration values.
The logger can subsequently use the calibration table to determine the characteristics of the attached sensor. It can use both interpolation and extrapolation)to calculate the current pressure level during a measurement.

IDT can use the same unit of measure as employed by the calibration jig for entering the reference pressure values. The IDT calibration process refers to this unit of measure as the "**Display"** unit. Prior to entering the reference pressures, ensure the Display unit of measure is correctly set within IDT.

The logger can be set to employ a different (or the same) unit of measure for calibration of the sensor input; The IDT calibration process refers to the logger unit of measure as the "**Mode**" unit.

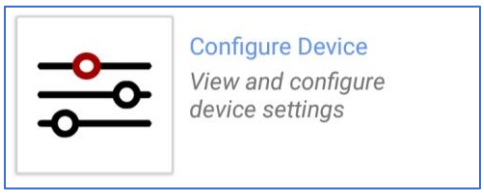
IDT converts between the pressure levels entered by the user (using the display unit of measure) into the corresponding value required for the logger (the mode unit of measure).
In summary, the calibration process can (if required) convert the values entered by the user in one unit of measure into another unit of measure for storage in the logger calibration table.

Prior to calibration, some additional setup of the logger may be required, since the calibration page can only be accessed via the "Advanced" tab of a channel that has been (or is being) created.

Note: The "External Pressure" input is sometimes used for compatible sensors that measure physical parameters other than pressure.
Therefore, when calibrating the interface, the use to which it is being applied (i.e., physical parameter being measured) will affect the list of available units of measure presented in IDT.

6.16.1 - Using Values (printed on a pressure or depth sensor cable)

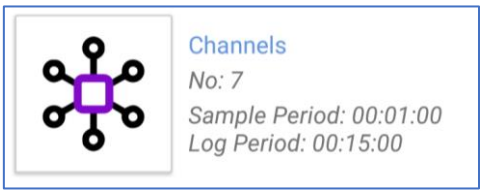
This method can be used with pressure sensors supplied by HWM that include calibration values on the cable.



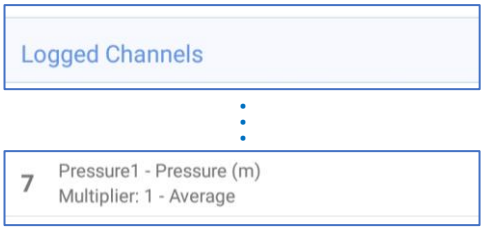
(Not all loggers have this calibration method available).

To access the calibration screen for an external pressure sensor:

Tap on “Configure Device”, then “Channels”



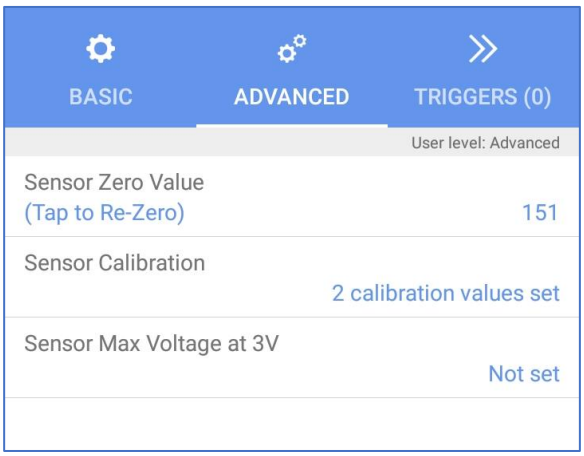
Then tap on the relevant line to select the pressure channel.
(The channel must be set to measure pressure or depth).



Select the “Advanced” tab.

This tab displays options to adjust several settings related to sensor operation.

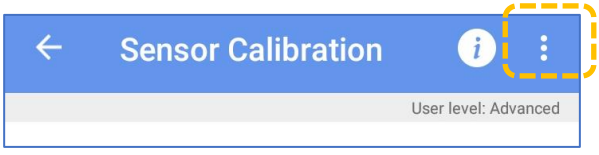
To select the pressure sensor calibration screen, tap on the “Sensor Calibration” line.

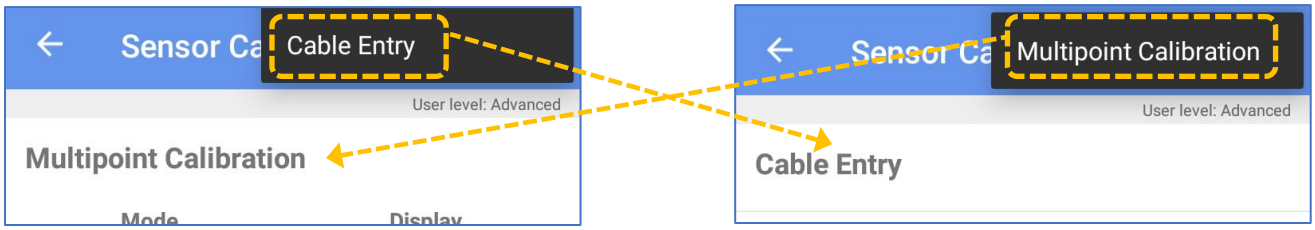


There are two possible methods for calibration with a pressure sensor. Each method has different screens.

Note: Your logger may support just one method (available in IDT basic mode) or possibly both methods (selectable only when in IDT advanced mode).

When in advanced mode, use the local menu to switch between the two calibration methods.
(Tap on the 3 dots and then select the alternative method if you wish to swap).

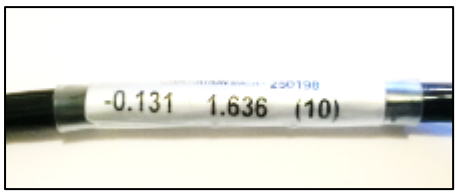




Select the “Cable Entry” option if it is available.

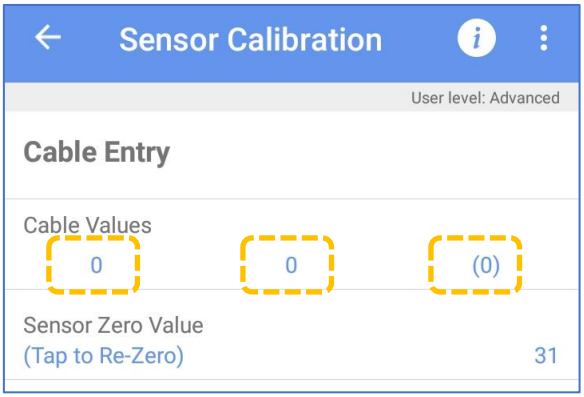
The screen for the “cable values entry” calibration method is shown opposite.

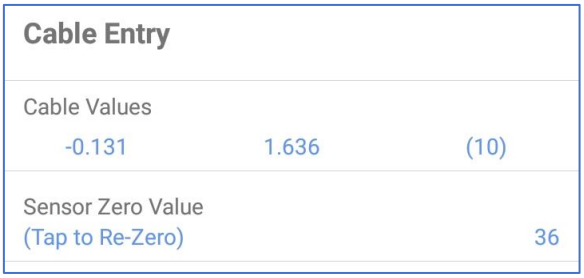
Tap in each of the areas show and enter the corresponding value as read off the pressure sensor cable (no brackets required).

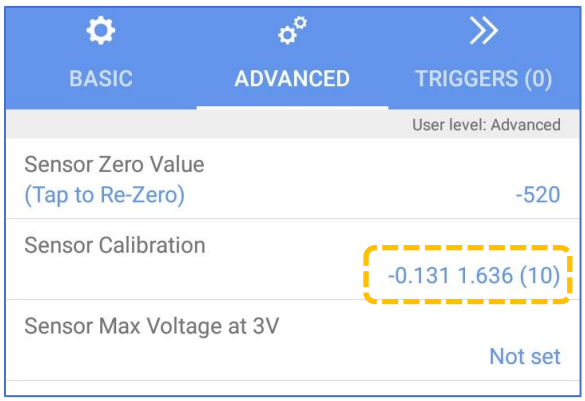


Then save the settings.

The calibration figures from the cable are now in use.







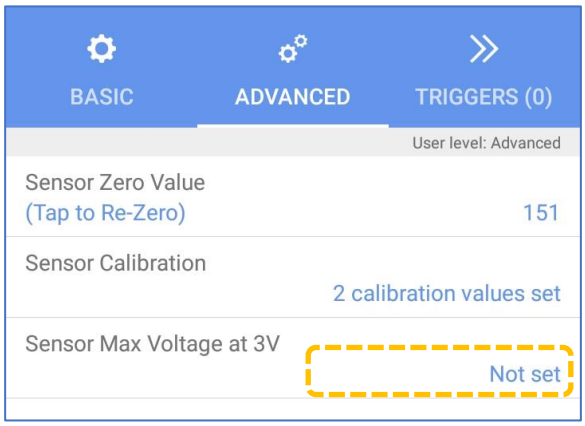
6.16.2 - Input Sensitivity Adjustment

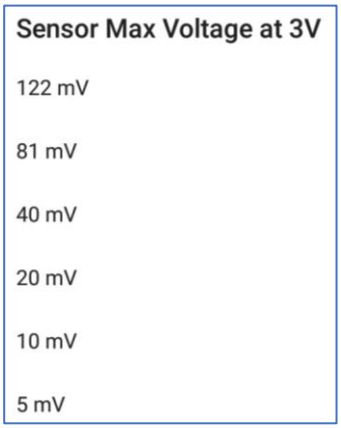
Note: Do not adjust the sensitivity of the External Pressure interface if your sensor has calibration values and you intend to use the cable value entry (as described in section 6.16.1).

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.

Some loggers contain a programable attenuator at the input of the external pressure sensor interface. 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.

To access the sensitivity adjustment screen, first select the Advanced tab.
The logger will use its default value if not set (see picture).





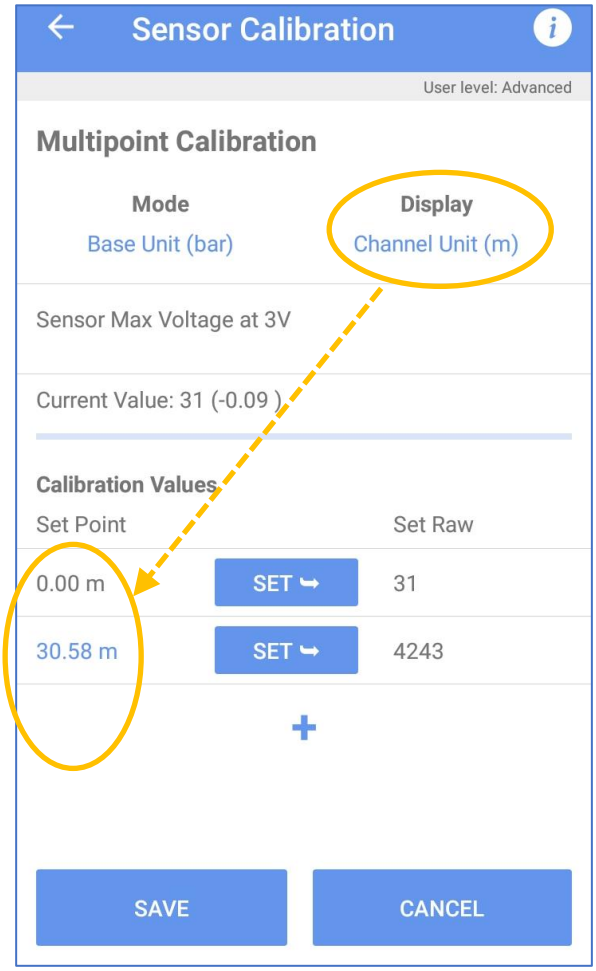
Refer to your logger manual for guidance regarding whether a specific setting may be required for your sensor.
If so, tap the "Sensor Max Voltage … " line and select the appropriate value.

However, for most loggers the sensitivity is pre-set by the factory to match the sensors supplied with your logger and should not be changed.

6.16.3 - Using Multipoint Calibration

This method can be used only if suitable equipment is available to assist with calibration (e.g., normally found in a calibration service).

This method produces a table of calibration points. The logger uses straight-line interpolation to produce measurement results between (and beyond) the stored points.

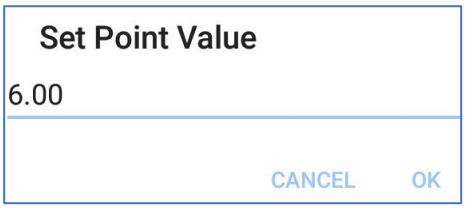


The sensor interface is calibrated according to the unit of measure chosen in "Mode". However, the user may use a different (or same) unit of measure for the purpose of entering calibration points, as chosen in "Display".
The IDT app will convert values from the Display unit of measure to the Mode unit of measure before sending the table to the logger.

To calibrate the pressure sensor to the logger, the sensor must be attached to a calibration rig that can apply known pressures. (It may be useful to change the display unit of measure to match the calibration rig during this process).

The table can be built within the "Calibration Values" part of the screen. Additional able lines can be added (as required) by tapping on " + ". (Drag the screen image if not all lines can be seen).

When a new line is added, the IDT app guesses the reference Set Point. The user can adjust this. Tap on a line to edit the reference pressure being applied.



Apply the relevant pressure to the sensor using the calibration rig and then store the value the logger is obtaining from the sensor by using the "SET" button; the value is shown in the Set Raw column.

A line of the table which has a pink background has some error condition. Either the "Set Raw" value is not correctly set, or the table line has not yet been saved to the logger.

Repeat the process for all calibration points.

When the table is complete, tap on the save button to store the calibration table into the logger.

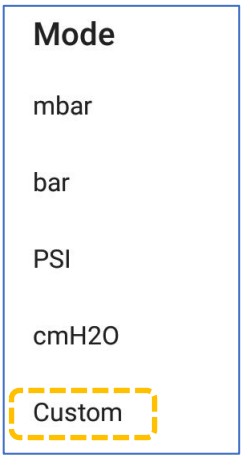
The calibration is now complete.

Note: The user may wish to predict (calculate) maximum and minimum “Set Raw” value that the sensor could produce, and if required adjust the input sensitivity. (as described in section 6.16.2).
If adjusted, the calibration process should be re-done.

“Mode” selection …

The IDT app calibration screen is used for multiple types of interfaces and sensor.

The mode selection shows a list of available choices that can vary. The list is dependent on the type of interface being calibrated, and the physical parameter being measured by the sensor. Only relevant options for the unit of measure are shown.



When choosing a unit of measure for calibration often a smaller unit of measure is to be preferred to a larger unit.
E.g., A cmH2O selection is more appropriate than mH2O for a depth sensor measuring shallow depths of water.

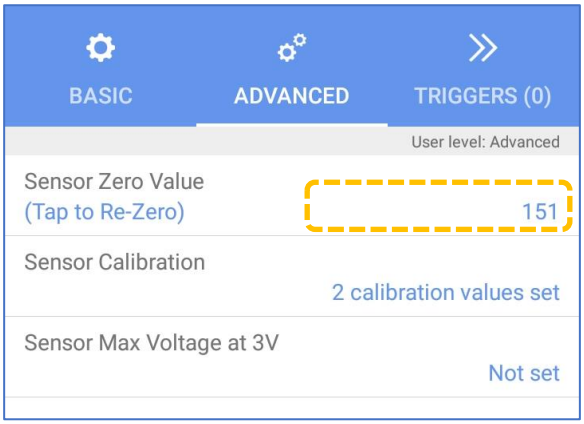
There is an additional option, “Custom”, which can sometimes be used for configuring certain types of sensors that are also compatible with the electronics of this interface. This setting should not be used, except as advised by HWM.

6.16.4 How to Re-zero a Pressure Sensor to local atmospheric pressure

Pressure sensors supplied by HWM are often required to read the pressure relative to atmospheric pressure rather than absolute pressure. However, the local atmospheric pressure can vary according to location of the installation. The user may therefore be required to re-zero the sensor to the local atmospheric pressure.

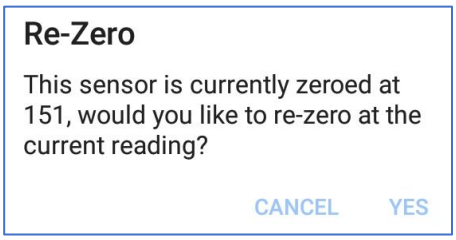
Important: The pressure sensor must be exposed to the local atmospheric pressure whilst making this setting.

Select the “Advanced” tab of the pressure channel configuration .

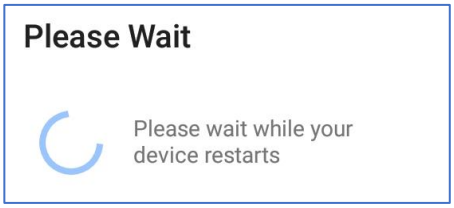


Then tap on the “Sensor Zero Value” line. This will record the current sensor output as a new value for a pressure of “0” (relative to atmospheric pressure).

Tap on “Yes” to accept the re-zero.



The logger will restart.



6.17 RTD (TEMP) INTERFACE -FOR TEMPERATURE SENSORS

Your logger may have an “RTD (Temp)” interface fitted. This is an interface for use with analogue temperature sensors (RTD types). Temperature sensors supplied by HWM 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 certain sensors (as a secondary feature, not their primary purpose). This section does not cover the setup of any such internal temperature sensors.

Depending on the supplied logger, interfaces for temperature sensors will appear in the IDT app as one of the following: (Check your logger manual for any guidance notes).

- A “Pressure” input sensor.
  (A logger may have dual-purpose electronics for either pressure or temperature but be wired and configured for use as a RTD temperature 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).

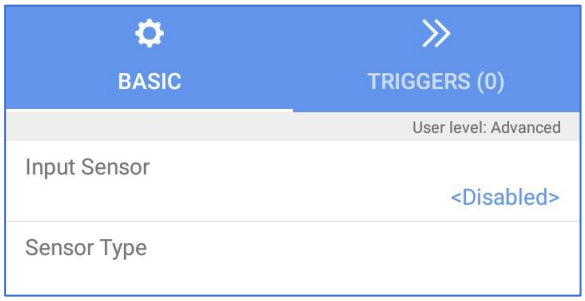
The IDT app gives access to the calibration settings as part of the channel setup.

6.17.1 Used with a Temperature sensor

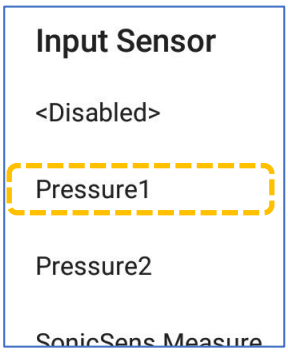
For setup, proceed as follows:

The temperature sensor interface appears as a pressure input in the IDT app.

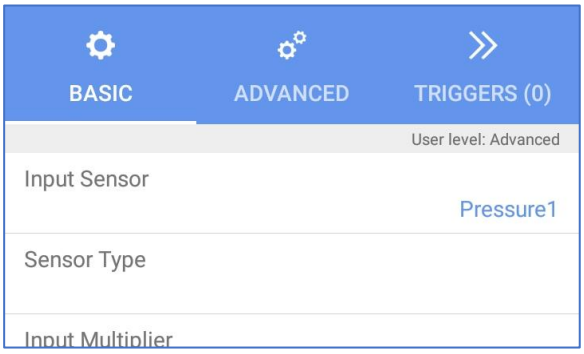
When creating a new channel for the temperature sensor, initially there are 2 tabs displayed.



Select the “basic” tab, tap on “Input Sensor” and then select the relevant interface by choosing “Pressure1” (... or Pressure2, etc, if more than one temperature interface is fitted).

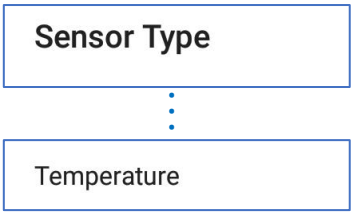


The screen shows the selected pressure (temperature) channel.
In addition, it will now show an “advanced” tab.



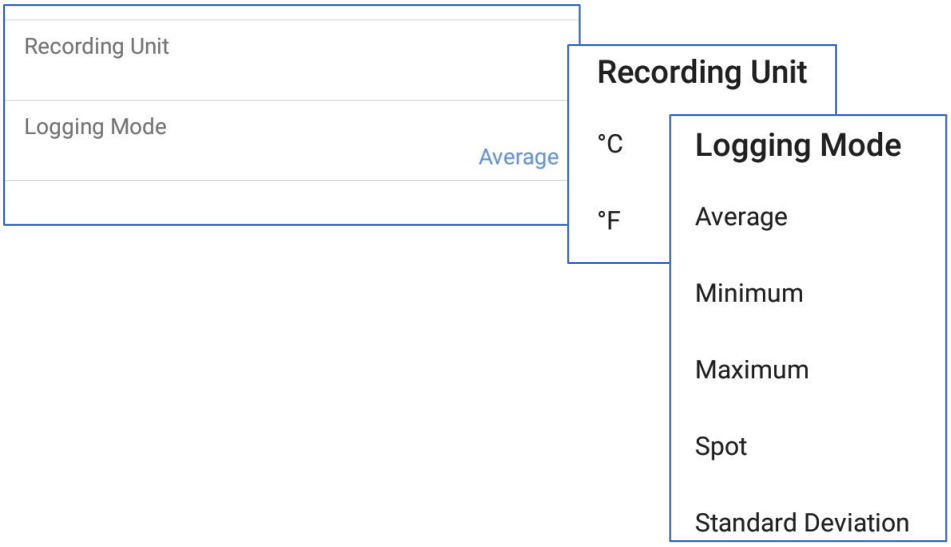
Tap on the Sensor Type line.

Then select the physical parameter of “Temperature” from the displayed list.



Select the required recording unit and logging mode for producing the channel datapoints.

(The recording unit selections listed are now appropriate to temperature measurement).

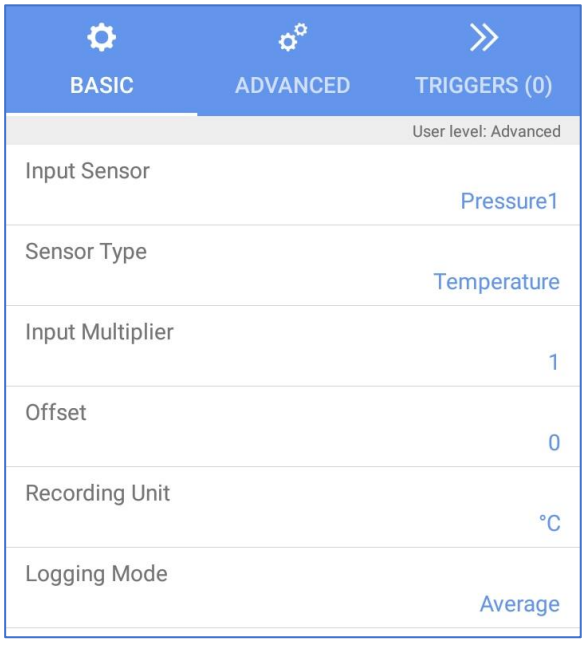


The input multiplier and offset settings can be adjusted if required but should usually be set as shown.

Note: An example use of multiplier and offset is for a temperature sensor which has been calibrated in degrees Centigrade but you wish to log results in degrees Fahrenheit.

Since deg F = (1.8 x deg C) + 32 , for the logger to convert:

set Input multiplier to 1.8,
set Offset to +32,
set Recording unit to deg F.



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

6.18 CALIBRATION OF RTD (TEMP) INPUT

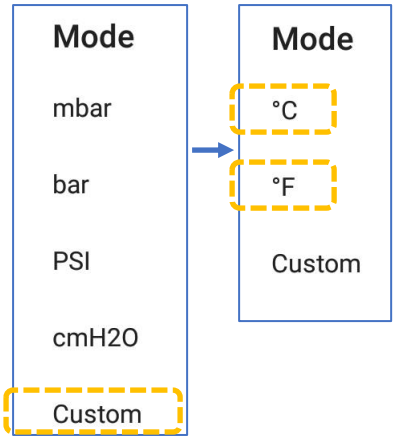
The temperature probe can be calibrated by inserting the probe into locations of known temperatures (e.g., ice-cooled water at 0 degrees C and boiling water at 100 degrees C). To calibrate, enter the known temperature references and set the corresponding A to D values. This produces the relevant calibration points within the logger calibration table.

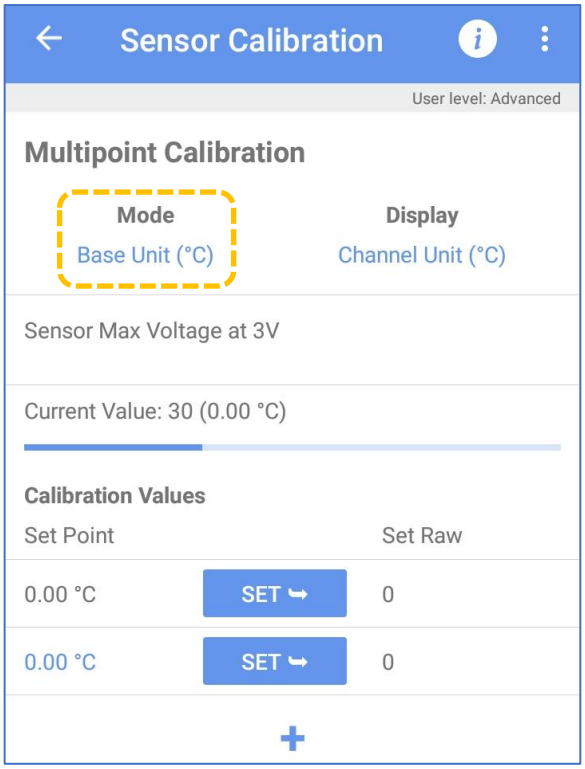
For loggers shipped with HWM supplied temperature sensors, calibration (and adjusting any input sensitivity) will not be necessary. The logger will be factory set to the most appropriate settings for the supplied sensor.

Calibration of the RTD (Temp) interface for temperature sensors follows a similar process to that described in sections 6.16, 6.16.2, and 6.16.3. To re-calibrate the sensor, follow steps (in the sections just listed), but with the following differences:

Ensure the sensor calibration mode is set to be relevant to the unit of measurement of temperature.

Tap on mode and make changes until the required unit of measurement for the sensor calibration is available.





Set the display unit to a unit of measure to match your calibration reference equipment (if needed).

For temperatures beyond the calibration table values, the calibration 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 similar way to that shown opposite.
(i.e., IDT will show a multi-purpose “Pressure” channel which is actually measuring from a temperature sensor).

6.19 Analogue Voltage Input: 0-1V and 0-10V Interfaces

Some loggers have interfaces labelled “Single 0-1V”, “Dual 0-1V”, “Single 0-10V”, “Dual 0-10V”or similar.

These interfaces are for use with sensors (that are not powered from the logger) that give an output signal in the form of an analogue voltage. 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 2 channels.

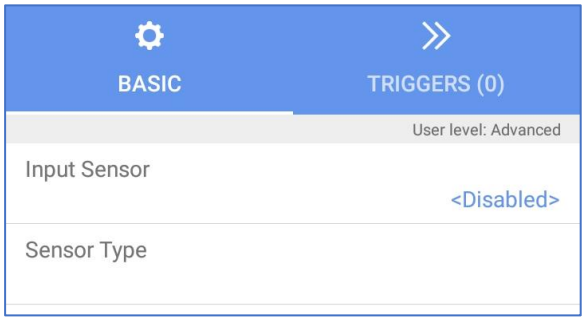
A wide variety of sensors exist that have a voltage output signal and can be used with these logger interfaces.

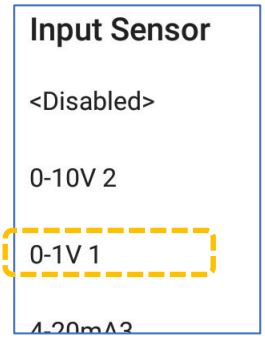
The logger is usually factory calibrated for the indicated voltage range. The IDT app also gives access to the calibration settings (as part of the channel setup) if re-calibration of the input should ever be required.

For setup, proceed as follows:

Note: The input can be calibrated using the expected units of measure (volts) or using a custom unit of measure (based on what the sensor is measuring). This is selected within the calibration screen, but it may also affect the appearance and fields present in the channel BASIC setup tab. Refer to the advice in section 6.21.

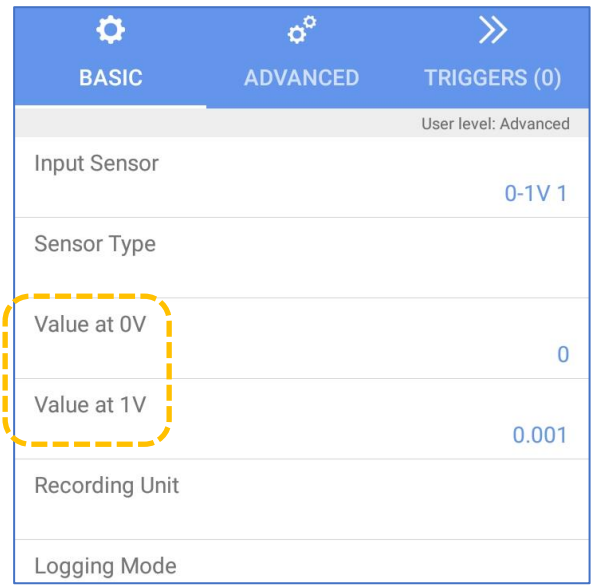
When creating a new channel for the temperature sensor, initially there are 2 tabs displayed.





Select the “basic” tab, tap on “Input Sensor” and then select the relevant interface by choosing “0-1V 1”
(... or a 0-10V sensor, if that is the range required, etc).

The screen shows the selected voltage input channel.
In addition, it will now show an “advanced” tab.



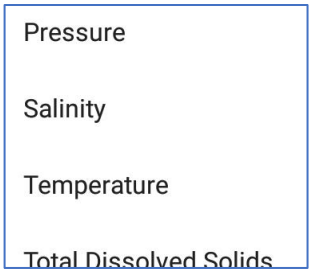
The screen now also shows two fields which correspond to the minimum and maximum selected voltages.

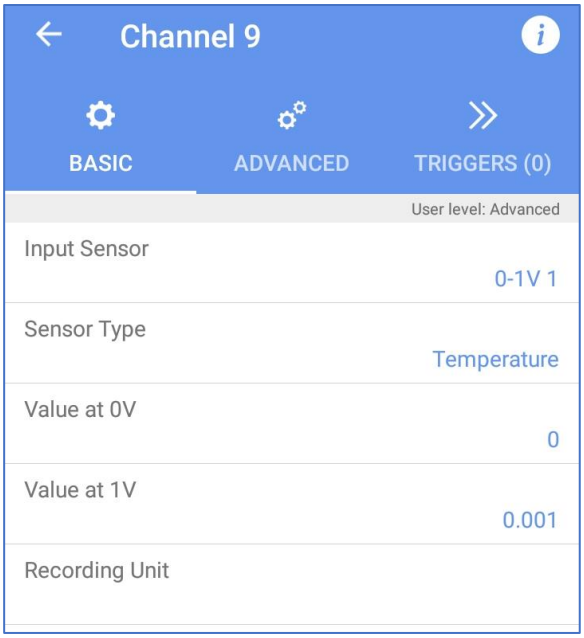
Note: These are present when the interface has been calibrated using a base unit of “volts”.

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”.

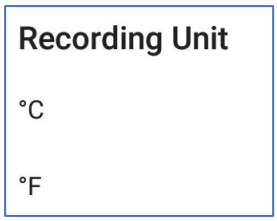




The screen shows the selected physical parameter being measured by the channel.

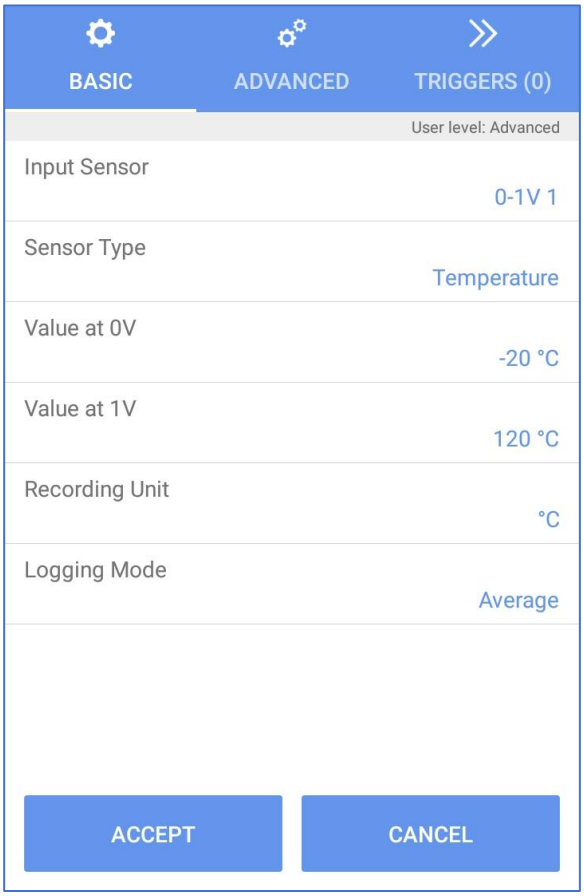
Tap on “Recording Unit”.

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.

Then tap on “Accept”.

When setup of the logger voltage interface with the sensor is complete:

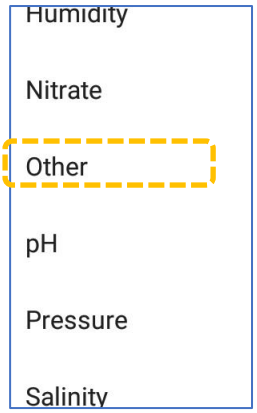
The channel summary will indicate the settings (this will depend on the physical parameters the sensor measures).

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 measured by the sensor).

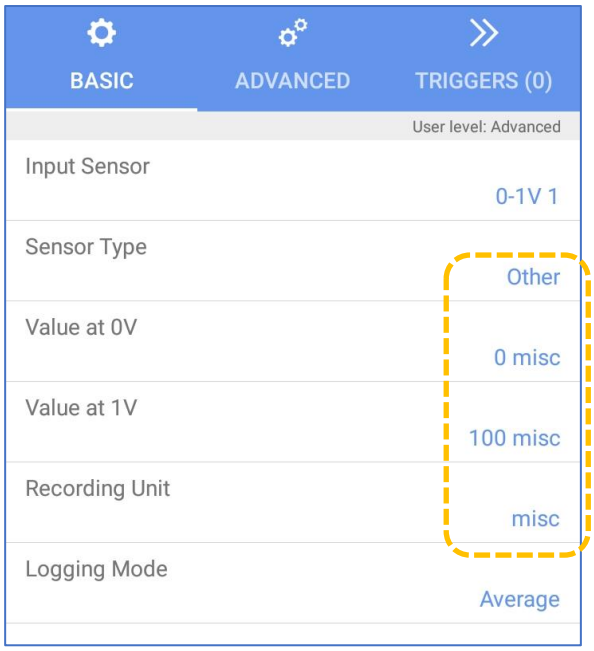
<u>Note:</u> Support for new types of sensors.

Your logger and IDT supports measurement of a wide variety of physical properties. However, if a sensor is available which is not currently listed, it may be possible to support it by selecting “other” during channel setup.

During channel setup, tap on the “Sensor Type” line.



When none of the offered choices are suitable, then choose “Other”; this will select 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).

(A selection of “Other” is also available within some other types of logger interface).

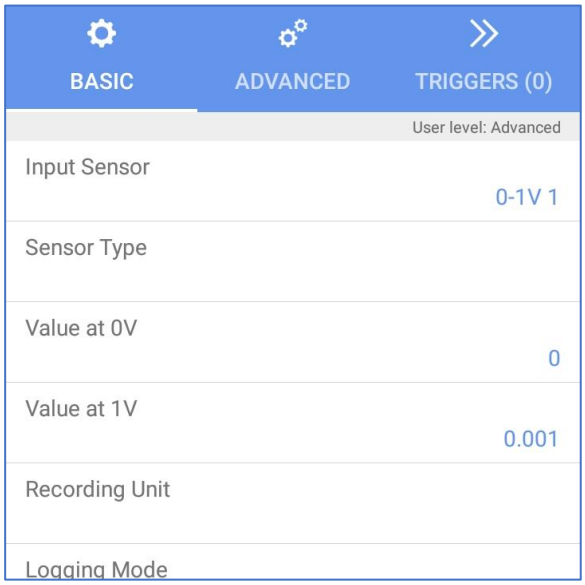
6.20 CALIBRATION OF 0-1V AND 0-10V INTERFACES FOR VOLTAGE INPUT

Note: Loggers are normally shipped pre-calibrated by the factory for this interface.

The interface can be calibrated by applying reference voltages to the input.
Enter the known voltage references and set the corresponding A to D values to make calibration points within the logger calibration table. For 2-point calibration, use 0v and the maximum voltage of the interface (as shown on the logger label).

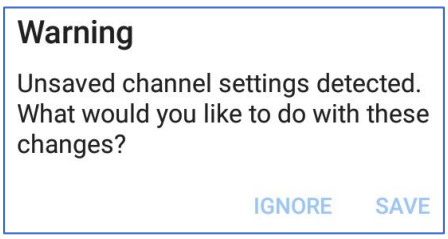
The BASIC tab of the logger channel setup must be at least partially completed before calibration can be undertaken.

i.e. The Input Sensor must have been selected, and the ADVANCED tab must be showing.

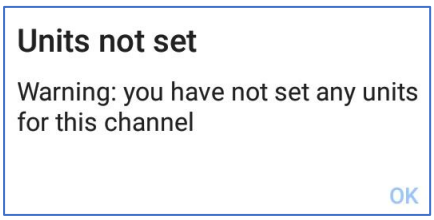


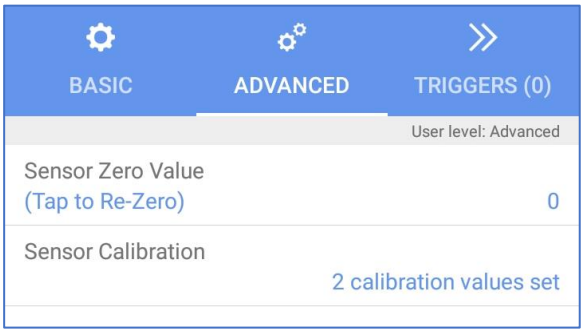
Select the ADVANCED tab.

(If warned, then save the settings).



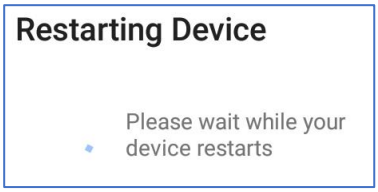
Any "Units not set" warning is for information only.





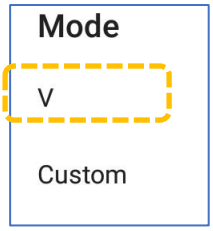
Tap on the "Sensor Calibration" line.

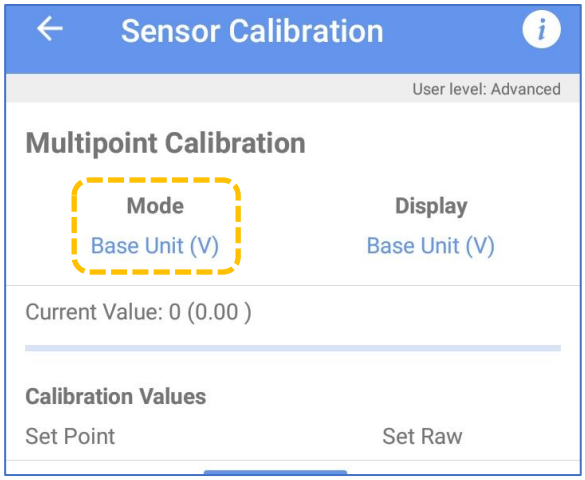
The logger may have to restart (to begin a new recording).



Ensure the Mode is set to “Base Unit V”.

Adjust if required (set to “V”)





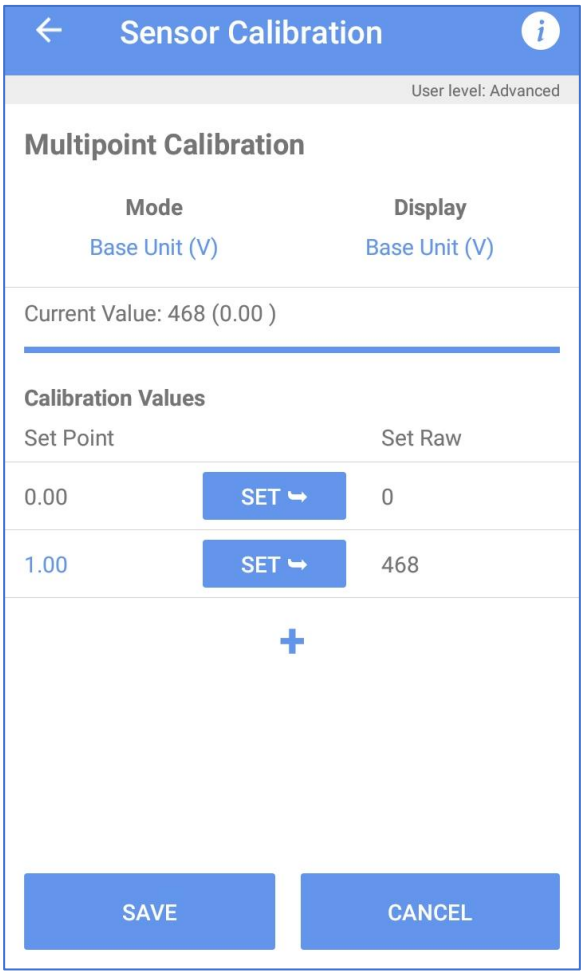
Set the Display unit to show your preferred units for calibration (V or mV).

Apply an input of 0V and 1V (for a 0-1V channel). or

Apply an input of 0V and 10V (for a 0-10V channel).

Tap Set to save the current A to D value for each of the reference voltages applied.

Enter the value of each reference voltage. (Tap on the values in the “Set Point” column to be able to edit the reference voltage).



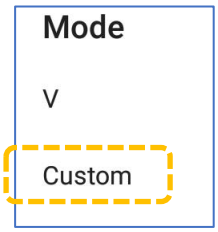
When completed, tap on the Save button.

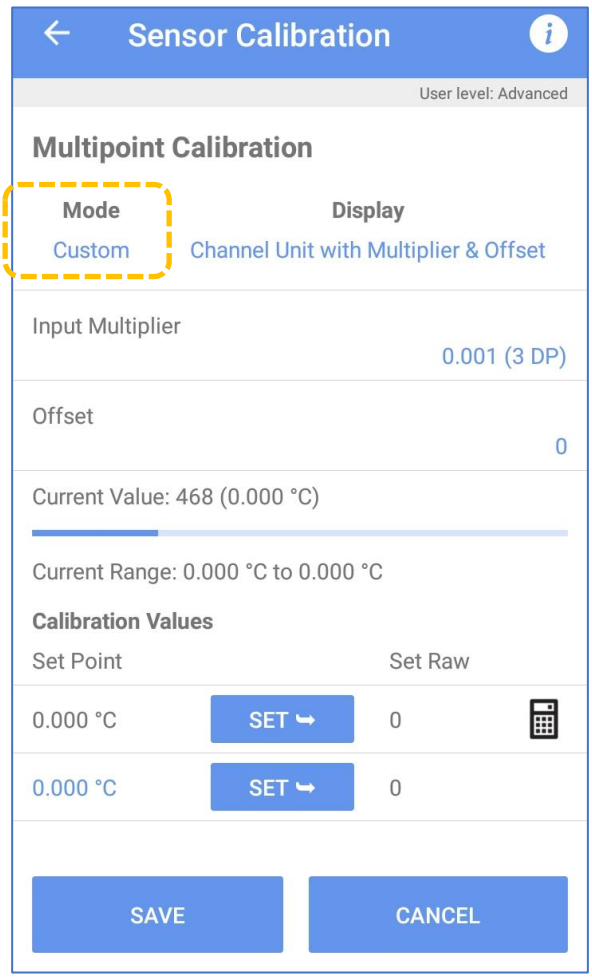
Calibration of the interface is completed. However, the channel setup will not be complete until all settings in the Basic tab are also completed; The additional settings are sensor dependent.

6.21 CALIBRATION OF 0-1V AND 0-10V INTERFACES (CUSTOM)

Refer to section 6.20 for regular calibration method for these interfaces (with various voltage ranges).

There is an alternative calibration process available which uses a Mode of “Custom”.





Caution: This calibration mode setting should only be used under advice from HWM.

6.22 Analogue Current Input: 4 - 20mA (Passive or Active) Interfaces

Some loggers have interfaces labelled “Single Passive 4 – 20mA”, “Dual Passive 4 – 20mA”, “Single Active 4 – 20mA”, or similar.

These interfaces are for use with sensors that give an output signal in the form of an analogue current. In particular, they are used with sensors that provide an industry-standard output signal using a current of between 4mA and 20mA.

A wide variety of sensors exist having a 4 to 20mA output signal. Currents outside the 4 - 20mA range usually indicate a fault condition (e.g., 0mA may indicate a broken sensor wire).

Single and Dual here 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 2 channels.

“**Passive** 4 – 20mA” interfaces are for use with sensors that do not require power from the logger.

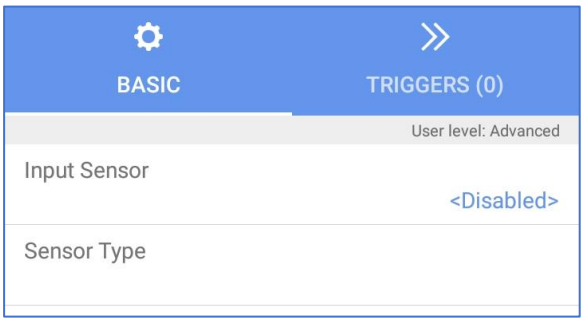
“**Active** 4 – 20mA” interfaces are for use with sensors that require power from the logger. The logger is able to supply a limited amount of power for a short period of time (programable) whenever a measurement is required. (See also section 5.6).

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.

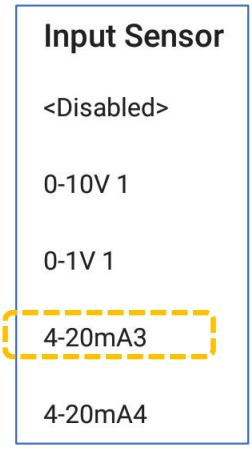
For setup, proceed as follows:

Note: The input can be calibrated using the expected units of measure (mA) or using a custom unit of measure (based on what the sensor is measuring). This is selected within the calibration screen, but it may also affect the appearance and fields present in the channel BASIC setup tab. Refer to the advice in section 6.24.

When creating a new channel for the temperature sensor, initially there are 2 tabs displayed.

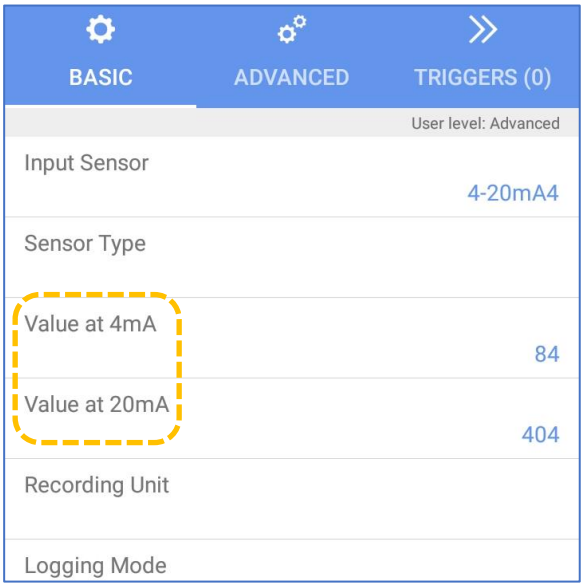


Select the “basic” tab, tap on “Input Sensor” and then select the relevant interface by choosing the required “4 – 20mA (n)” sensor.



(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.



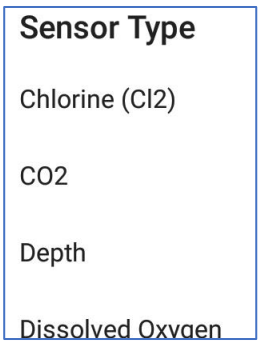
The screen now also shows two fields which correspond to the minimum and maximum sensor range.
(i.e., The values when output is 4mA and 20mA).

Note: These are present when the interface has been calibrated using a base unit of “mA”.

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.

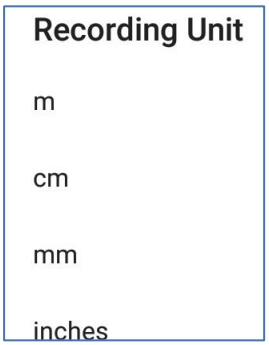
e.g., For a 4 – 20mA sensor which measures depth, select “Depth”.

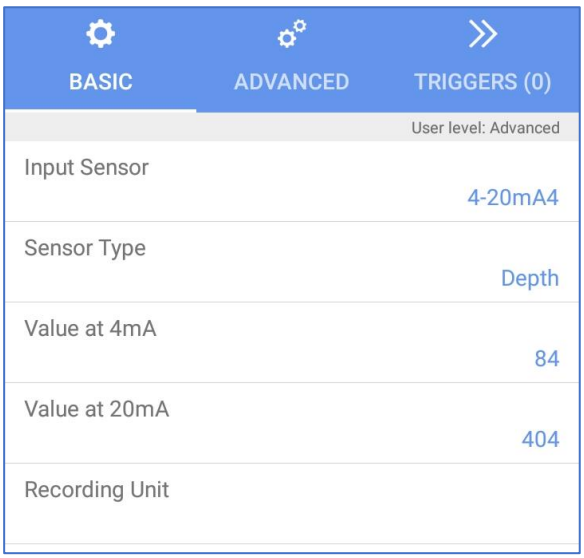


The screen shows the selected physical parameter being measured by the channel.

Tap on “Recording Unit”.

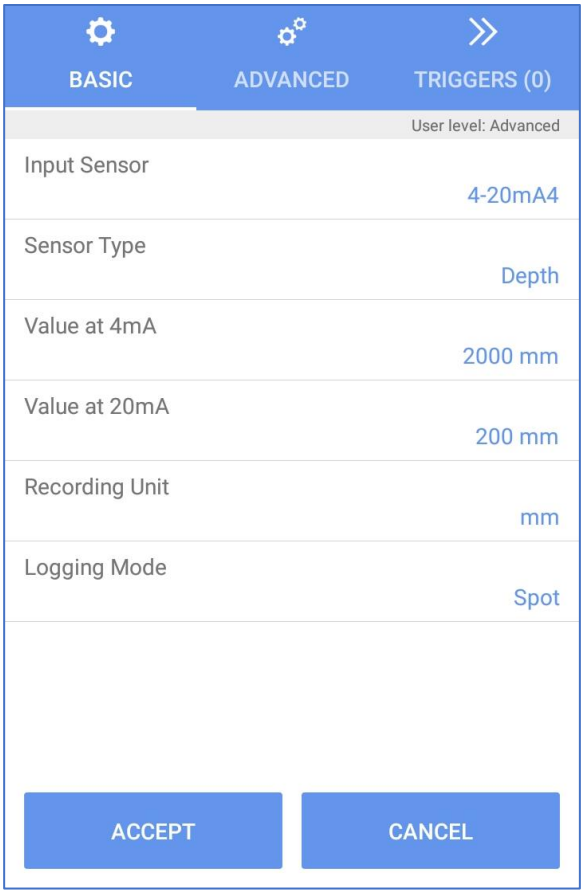
Select the unit of measure which is appropriate to the sensor output.





Refer to the documentation of the sensor and enter the values which correspond to the currents of 4mA and 20mA through the logger interface.

i.e., The “Value at 4mA” and the “Value at 20mA” in the example opposite.



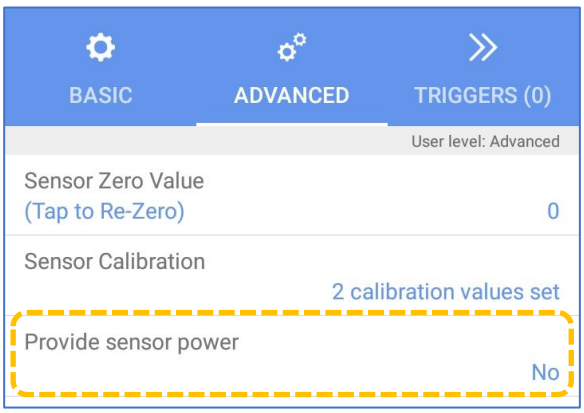
Select the desired logging mode.

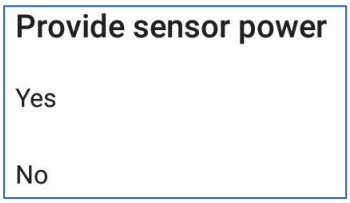
Then tap on “Accept”.

For the “**Active**” 4 – 20mA interface, there are also settings to control the power feed to the sensor:

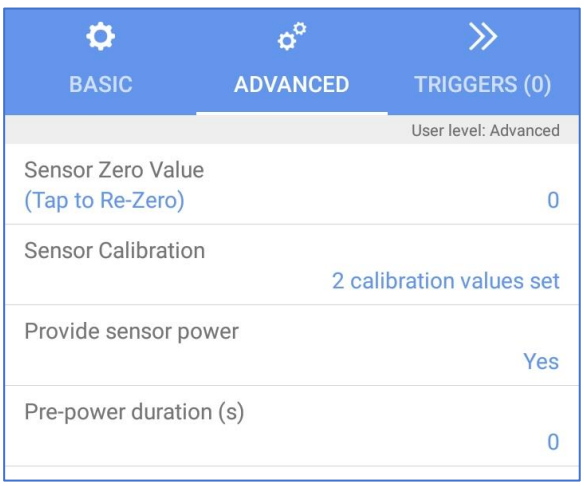
Select the “Advanced” tab.

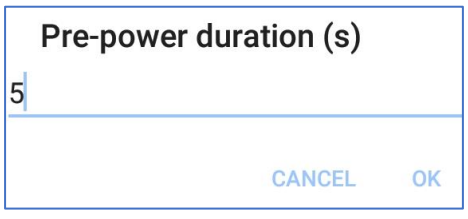
If the sensor requires power from the logger, tap on the “Provide sensor power” line and select “Yes”.





Then enter the pre-measurement power duration. (Refer to the sensor manual for guidance).





Then tap on the “Accept” button.

When setup of the logger 4 – 20mA interface with the sensor is complete:

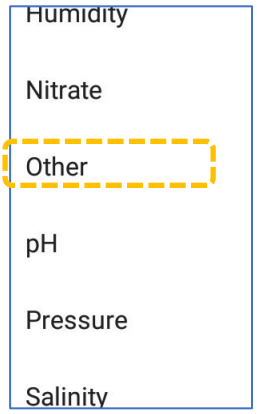
The channel summary will indicate the settings (this will depend on the physical parameters the sensor measures).

An IDT app hardware test of the 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 measured by the sensor).

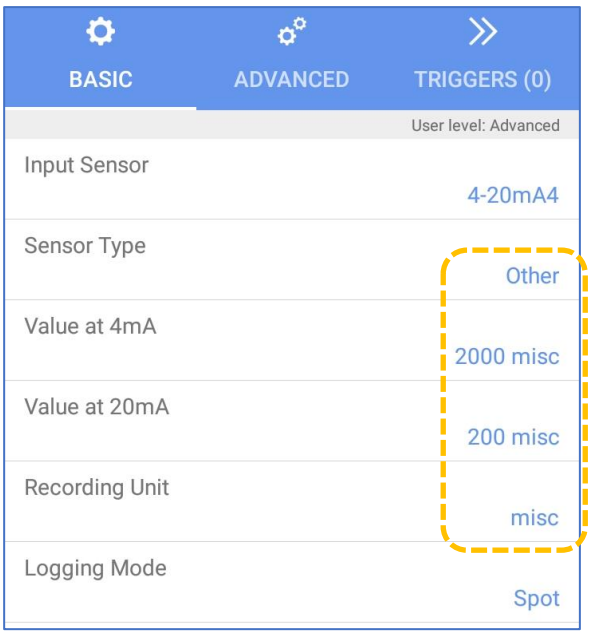
<u>Note:</u> Support for new types of sensors.

Your logger and IDT supports measurement of a wide variety of physical properties. However, if a sensor is available which is not currently listed, it may be possible to support it by selecting “other” during channel setup.

During channel setup, tap on the “Sensor Type” line.



When none of the offered choices are suitable, then choose “Other”; this will select 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).

(A selection of “Other” is also available for within some other types of logger interface).

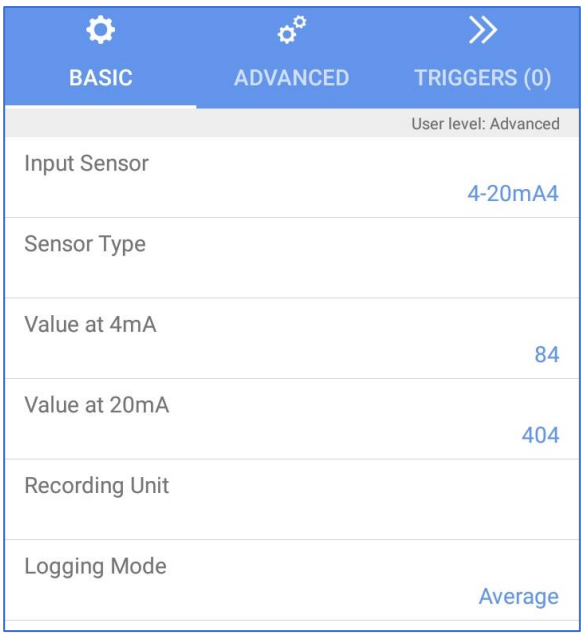
6.23 CALIBRATION OF 4 - 20MA INTERFACE FOR CURRENT INPUT

Note: Loggers are normally shipped pre-calibrated by the factory for this interface.

The interface can be calibrated by applying a constant current through the interface at the 0mA, 4mA and 20mA references.
Enter the known current and set the corresponding A to D values to make the relevant calibration points within the logger calibration table.

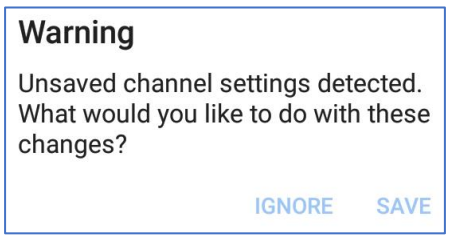
The BASIC tab of the logger channel setup must be at least partially completed before calibration can be undertaken.

i.e. The Input Sensor must have been selected, and the ADVANCED tab must be showing.

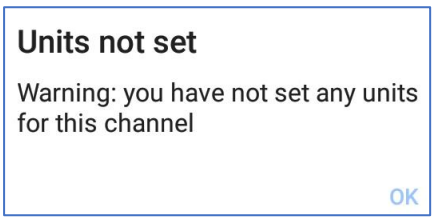


Select the ADVANCED tab.

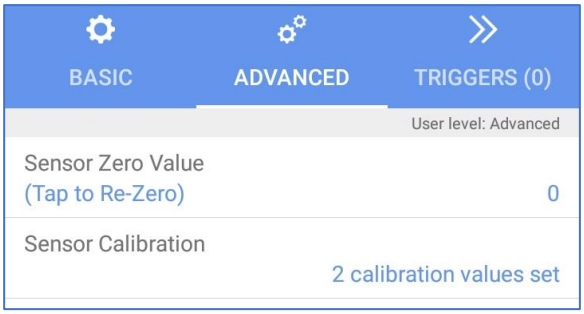
(If warned, then save the settings).



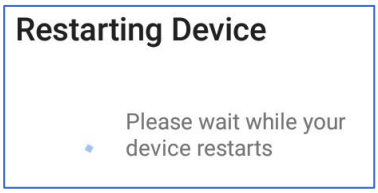
Any "Units not set" warning is for information only.



Tap on the "Sensor Calibration" line.

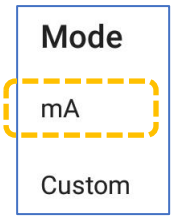


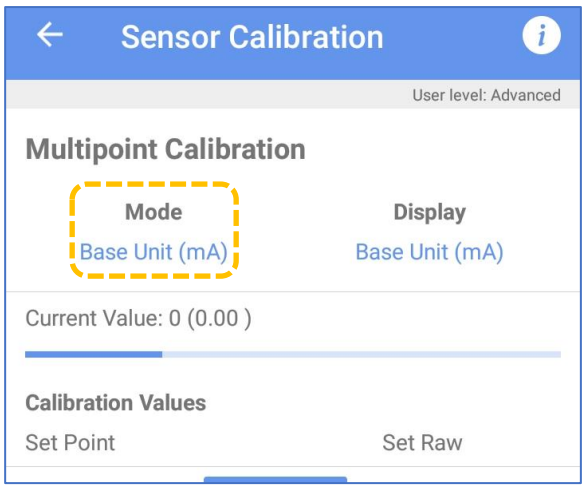
The logger may have to restart (to begin a new recording).



Ensure the Mode is set to “Base Unit mA”.

Adjust if required (select to “mA”, and not to “Custom”)





Set the Display unit to show your preferred units for calibration (mA or A).

Ensure the following set-points are available:

0mA, 4mA, 20mA.
(Tap the + symbol to add new lines to the calibration table if needed)

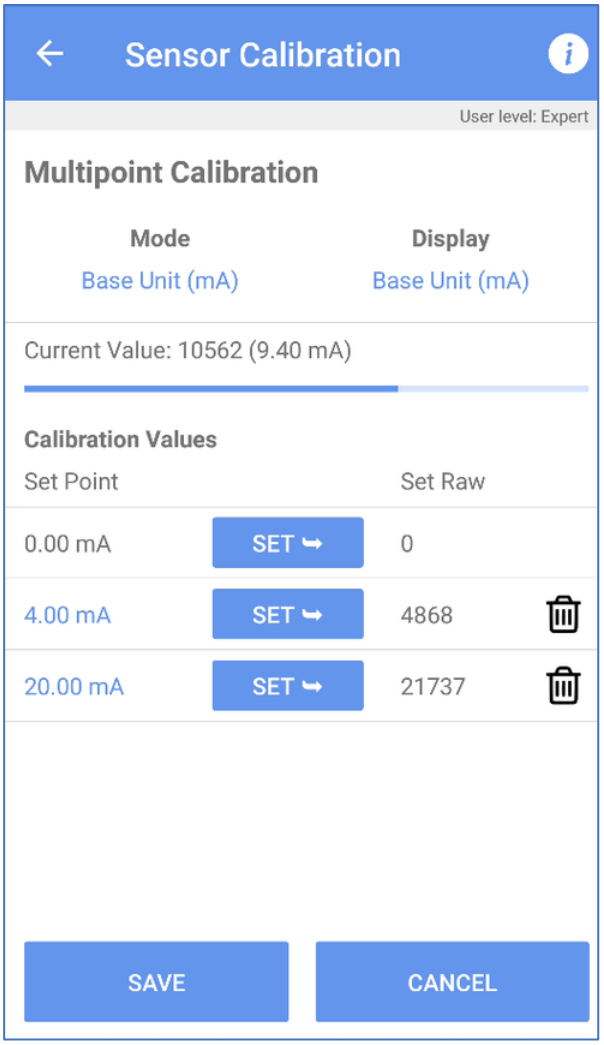
(Tap on the values in the “Set Point” column to be able to enter the reference current value).

Apply an input of 0mA, 4mA and 20mA.
(for a 0-1V channel).

Tap Set to save the current A to D value for each of the reference currents applied.

When completed, tap on the Save button.

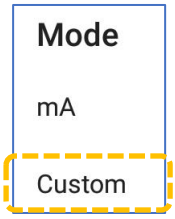
Calibration of the interface is completed. However, the channel setup will not be complete until all settings in the Basic tab are also completed; The additional settings are sensor dependent.



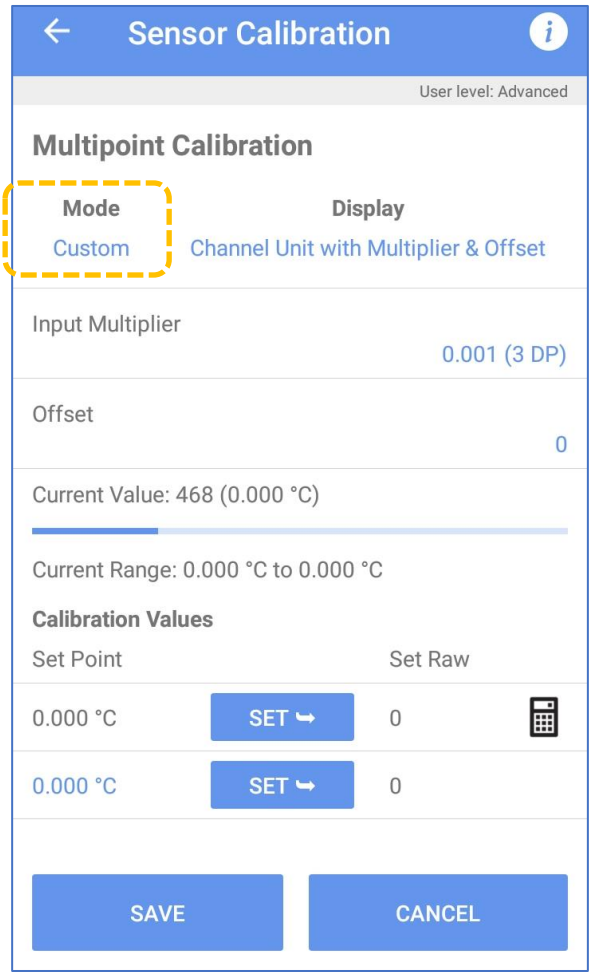
6.24 CALIBRATION OF 4 – 20MA INTERFACE (CUSTOM)

Refer to section 6.23 for regular calibration method for this interface.

There is an alternative calibration process available which uses a Mode of “Custom”.



Caution: This calibration mode setting should only be used under advice from HWM.



6.25 LEAK-NOISE SENSOR

- 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.
- Refer to your logger User-guide for information if this sensor is supported and for more details.

6.26 SONICSENS3 SENSOR

- SonicSens3 is a sensor which measures distances with ultra-sound.
- It is often used with the following viewing portals:
  Datagate
- This is a complex sensor and requires a specialised method of setup.
- Refer to your logger User-guide for information if this sensor is supported.
- Refer to the SonicSens3 User-guide for more details.

7 IDT - Operation Differences

The IDT app adapts the content of its screen options based on many factors:

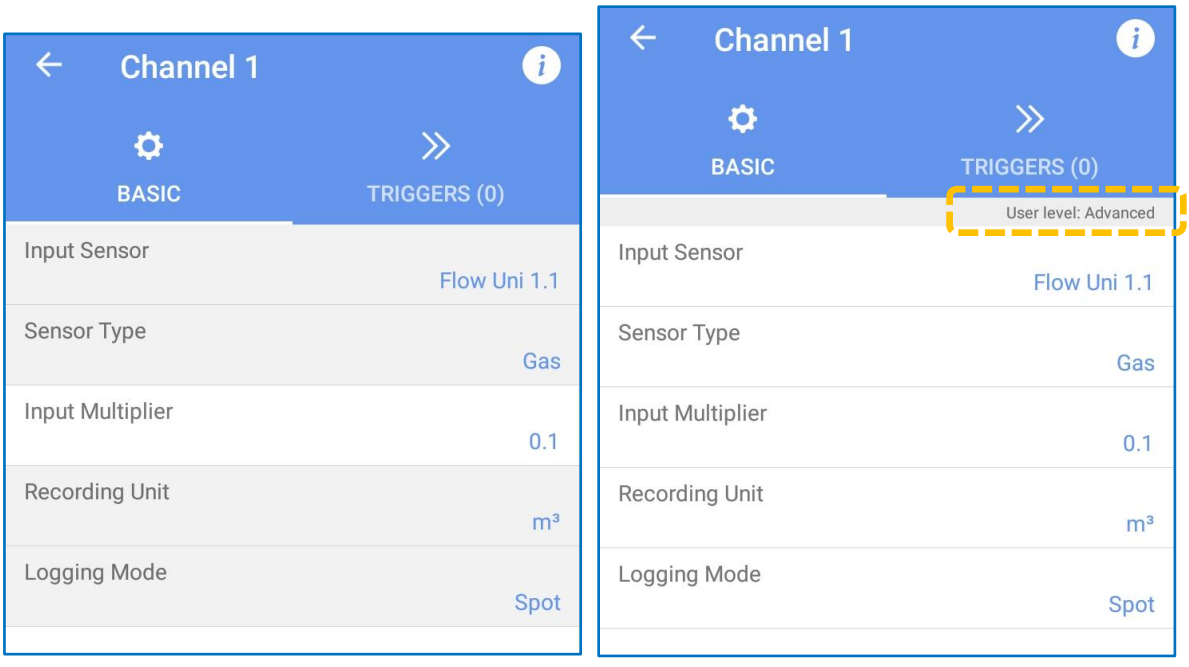
- IDT User level.
- Use of IDT with or without login to the server.
- Type of logger (logger family).
- Interfaces available for use (unconfigured and configured).
- Sensor attached or missing (applies to certain sensors only).
- Previously entered setting choices.
- Device security settings.

This section describes how this may sometimes affect the operation of IDT.
The description is not exhaustive, but indicates typical issues which may arise due to circumstance of IDT use.

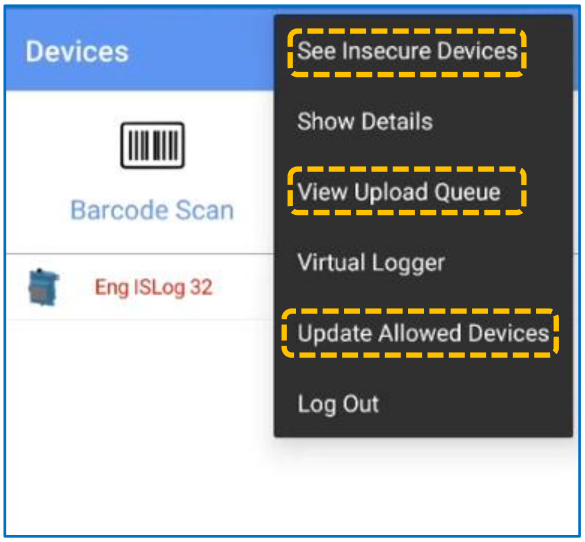
7.1 Restrictions of IDT Basic Mode

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).



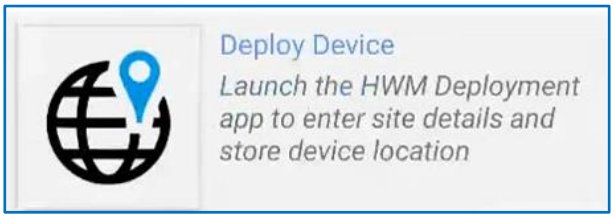
7.2 USE OF IDT WITH DATAGATE VS WITHOUT DATAGATE



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 be possible to deploy the device using the same credentials as was used to log the IDT app into DataGate; you have not provided credentials as you have not logged in.

7.3 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 5.5)

IDT is not connected to any real device and has no facility to update either a real device or the settings file.

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