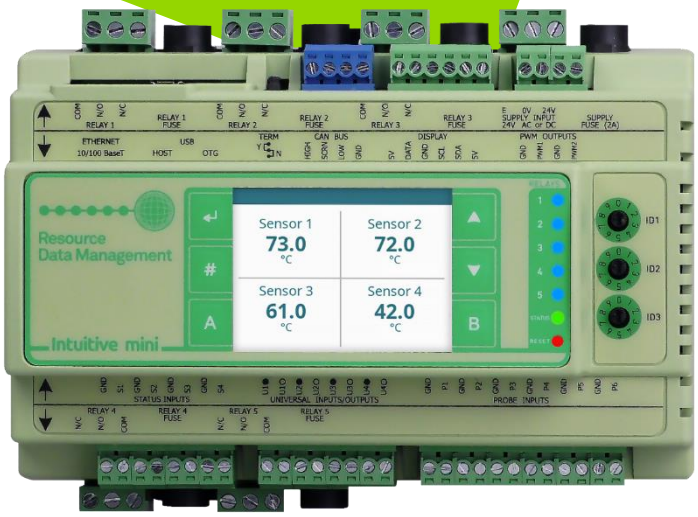
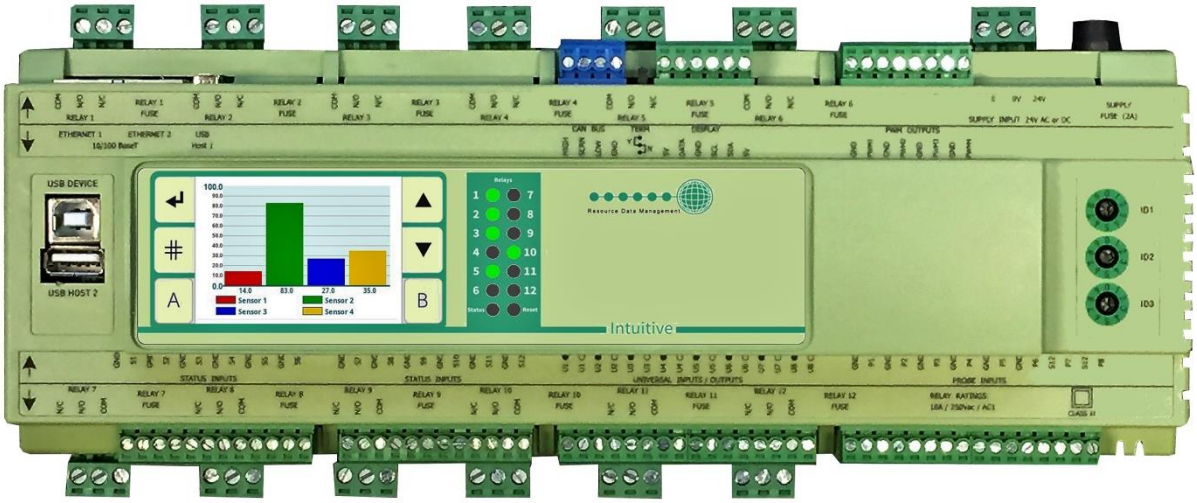
Resource
Data Management

Intuitive V2 & Mini
Intuitive TDB

Commissioning & User Guide
4.0.1





PR06XX-TDB

Contents

Please ensure all power is switched off before installing or maintaining this product.

Intuitive V2 & Mini TDB Controller Description

This document relates to Software version 4.0.1

The Intuitive Plant and Intuitive Mini Controller with Data Builder are versatile devices intended for user programming. Some example applications include HVAC, BMS and Refrigeration control.

The Intuitive V2 hardware consists of 8 probe inputs, 12 Digital Inputs, 8 Universal IO, 12 relay outputs (option to fuse), 4 Pulse width modulation (PWM) outputs along with the options of integral display, 2 stepper outputs and SSR outputs.

The Mini Intuitive hardware consists of 6 probe inputs, 4 Digital Inputs, 4 Universal IO, 5 relay outputs (option to fuse), 2 Pulse width modulation (PWM) outputs along with the options of integral display and SSR outputs.

There is no intrinsic program, but all of the inputs and outputs are available for use with the on-board Data Builder program.

An optional DIN rail mount, 24V 2.5A power supply unit (PR0625) is available for use with the controllers.

The controller can connect to IP networks by either its in-built Ethernet port(s) using a standard Ethernet cable or by a USB Wi-Fi adapter (PR0657). It can then communicate by means of standard IP or BACnet protocols (PR0655-BAC). There is also direct PC access available via a USB cable.

In addition to IP, it can also communicate to a DMTouch by means of the RDM-485 protocol over RS485 with use of the RDM 485 Plant TDB Comms Module (PR0623 DIN TDB).

The controller can connect to a variety of peripheral devices via Modbus using a USB network adapter. The Modbus devices are connected via a USB to RS485 interface (PR0623 / PR0623 DIN).

A USB Pulse Reader is available for use with the controller which allows pulsed outputs from 3rd party devices to be read, typical applications include energy monitoring or flow measurement. Up to ten RDM CT monitors (PR0626v/i-DIN), each with 5 CT's attached, can be connected via USB. The values of which can be used in the TDB application designed by the user.

Users have the added benefit of using the 'Type Writer' feature (PR0655-TYP) where Modbus templates can be written and saved within the TDB device. This enables 3rd party Modbus devices, where templates have not been previously developed for, to be logged on and monitored **Note: Read only. For templates where values can be written to please consult RDM Technical Support.**

Where RDM have been requested to develop a 'writable' template for 3rd party Modbus devices, the 'Modbus Write' feature can be activated. Then, using the TDB blocks in the plc, the 3rd party device can accept Modbus write commands.

The controller offers web-services support and has 40 general purpose timer channels available to configure. Logging of data and export of logged data is also available; if a memory stick is used, logged data sampling can be viewed at 15 second intervals.

The PR0657 (Wi-Fi adapter) is for use within the EU only. For more information about using outside the EU, please contact RDM technical support.

Note: The Modbus® template generation feature, Type Editor, requires the user to have a full and proficient understanding and working knowledge of the Modbus® protocol. RDM Technical Support cannot provide training or assistance in relation to the Modbus® protocol and the commands implemented therein. Support will only be provided to those conversant with Modbus® and in relation to the Type Editor functionality specifically. **RDM cannot accept any responsibility, or offer troubleshooting support, to clients who have created their own templates.**

For users unfamiliar with Modbus® RDM can provide on request a template creation service, allowing for a template to be generated for the third party device in question. A nominal fee will apply for each template created by RDM.

Hardware Options

Depending on the requirements, a number of hardware options are available on the intuitive range. Options include; integral display, fused or non-fused relay outputs, stepper outputs and number of solid state relays (SSR's). See ordering information below, for details.

Ordering Information

To order the correct hardware options the following part number descriptions are followed;

Intuitive Plant TDB - PR0650 X Y TDB Z
Intuitive Plant TDB with 2 stepper output - PR0652 X Y TDB Z
Mini Intuitive TDB Controller - PR0680 X Y TDB Z

Y	Description	X	Description	Z	Description
NF	Non Fused	CD	Integral Display	E1	Relay 1 SSR
blank	Fused Relays and Supply	blank	No Display	E2	Relays 1-2 SSR's
				E3	Relays 1-3 SSR's
				▼	▼
				E12	Relays 1-12 SSR's

Example:

To order an Intuitive TDB with integral display, non-fused with 3 SSR's the part number would be;

PR0650CD NF TDB E3

Optional Network Enablers / Adapters

The Controller can communicate over Wi-Fi, Modbus RS485, Wireless Mesh and BACnet when the features are activated. The part numbers are as follows;

Description	Part Number
Wi-Fi Adapter (enablement included)	PR0657
Wi-Fi Enabler	PR0657-ENA
BACnet Enabler	PR0655-BAC
USB 3G Modem	PR0496-3G
Modbus RS485 Dongle	PR0623
Modbus RS485 Adapter DIN Rail Mount	PR0623-DIN
RDM 485 Plant TDB Comms Module	PR0623-DIN TDB
Modbus Type Editor (per type)	PR0655-TYP
Modbus Writable Type Activation (per type)	PR0655-MOD
For User created 'writable' templates, please consult RDM Technical sales. The enablement is a 'factory-fitted' option only.	

Intuitive Expansion Boards

The following Intuitive expansion boards can be used to expand the available inputs and outputs for either the Intuitive Plant or Intuitive Mini controllers;

Description	Part Number
Intuitive Stepper, with 8 Probe Inputs, 8 Status Inputs, 8 Universal I/O, 4 Relay Outputs, 6 Stepper Motor outputs and 4 PWM* outputs.	PR0660
Intuitive IO Expansion Board with 8 Probe Inputs, 8 Status Inputs, 8 Universal I/O, 12 Relay Outputs and 4 PWM* Outputs.	PR0661
Intuitive 48 Probe Input Expansion Board with 8 Universal I/Os and 48 Probe Inputs	PR0662
Intuitive mini IO expansion module with 4 Analogue Inputs (mA / V) and 5 Relay Outputs	PR0663
Intuitive mini IO expansion module with 4 Analogue I/O (mA/V) and 4 Relay Outputs	PR0663 4-4
Intuitive mini IO expansion board with 6 Probe Inputs, 4 Status Inputs, 4 Universal I/O, 5 Relay Outputs and 2 PWM Outputs	PR0681
Intuitive Stepper Module with Auto Close – 1 Stepper Motor Output, 1 Analogue Input (mA/V), 2 probe Inputs, 1 Digital Input & 1 Relay output	PR0653

*__Note:__ only available on the V2 Expansion boards.

This document outlines how to map the TDB software in a Plant controller to use any of the above expansion module inputs and outputs. For further hardware information on all of the expansion board variations please see RDM Intuitive & Plant Controller Expansion Board User Guide on RDM Web Site.

Configuration

The controller has no configuration until a Data Builder application has been developed and saved.

Available Networks

The controller has a built-in IP network interface that allows for connection to an RDM Data Manager system or an IP network without the need for an extra communications module. Simply set the 3 rotary switches to the desired network ID for the unit to receive an IP address from a DHCP server. If a static IP address is required then the network details must be entered via the web interface, either through connecting via the USB lead or once it has obtained an address from a DHCP server (See Connecting to Controller).

With the addition of the USB Wi-Fi network card (PR0657), the controller can communicate over Wi-Fi networks without the need of any cables. The SSID and the pass code of the Wi-Fi network must be entered within the network setup page, accessible through the web interface.

When enabled, the unit can support BACnet communications, via the Ethernet port, allowing it to be logged on to a BACnet Network. Within the network setup pages the communications protocol can be selected.

Connecting to the controller via USB

The device can communicate directly to a PC using a USB lead[1]. Depending on the PC's operating system, it may require the necessary USB drivers to be installed and configured. On Windows 10 machines, no drivers are required to be installed. For older versions, the necessary drivers can be obtained from the 'Download Software' section of the RDM website which is found under 'Resources'. Along with the driver, there will be a walk through guide of how to set it up.

The Intuitive V2/ Mini TDB platform does not require the user's PC network card settings to be altered to connect to the controller, it will self-configure.

Power up the controller allowing at least 30 seconds to complete booting. Then, connect from the USB port on the controller[1] to a USB connection on the PC. It can then be accessed using a standard internet browser (such as Chrome, Edge, Internet explorer or Firefox) and browsing to the address http://**10.255.255.254**.

The controller's processor can be powered via the USB lead which enables the user to connect without the need to connect a power supply[2]. It should be noted however that the controller's inputs and outputs, such as relays and temperature probes, will not operate unless the 24v power supply is connected.

Note 1: The Intuitive V2 TDB can be connected from its 'Device Port' using a USB Type A to Type B lead. The Mini TDB can be connected from its 'OTG USB Port' using a Type A to Micro USB Type B connection.

Note 2: On the initial setup of the device, it must be connected to a 24v AC/DC power supply for a plc to be created or uploaded. After the initial upload, the TDB can be edited using only the USB power.

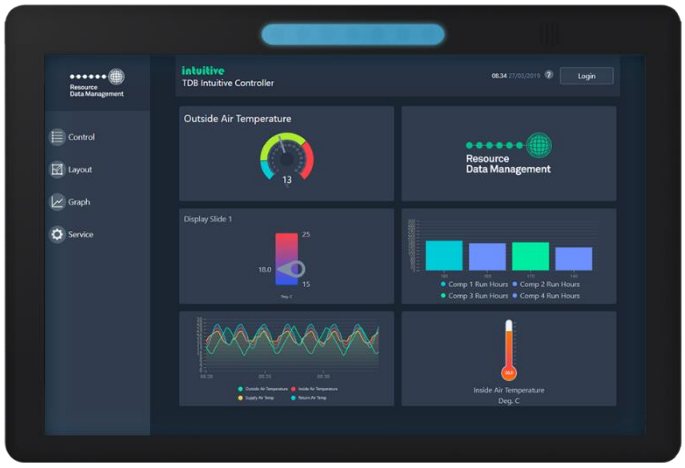
Networked Devices

The controller can communicate with up to 64 Modbus-equipped devices.

Modbus communications is active as default and only requires the USB to RS485 adapter (PR0623 / PR0623 DIN) connected. A list of available Modbus devices useable with the Intuitive TDB controllers can be found in the Modbus section.

Displays

TouchXL (PR0617-ID-X-X)



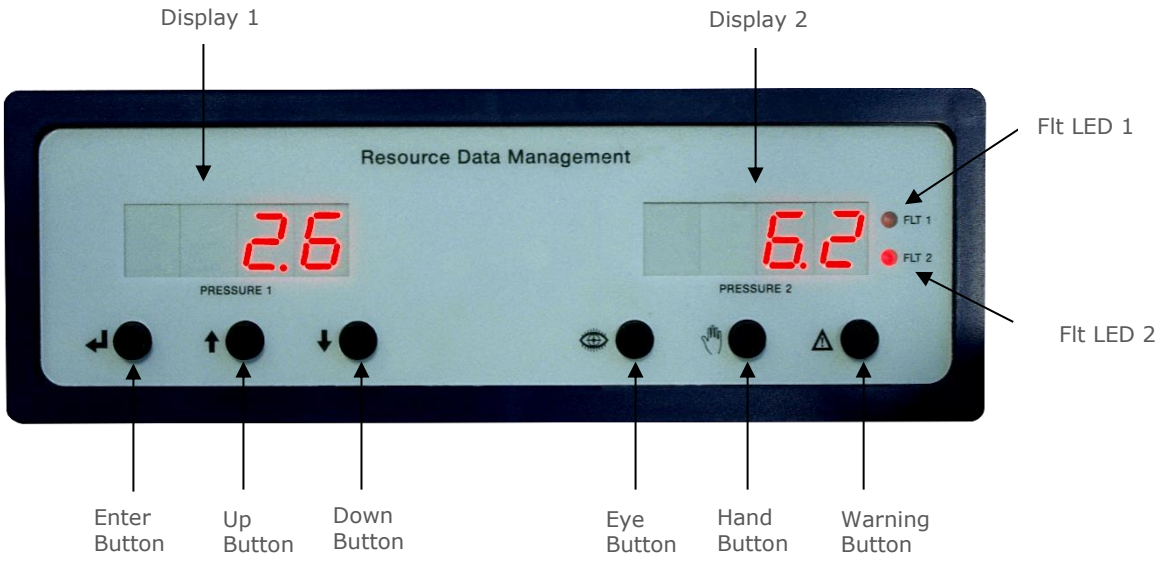
The TouchXL, when connected to the Intuitive, is used as a display, mimicking the view of the standard web interface to the controller. It is used to interact with the application software and alarm indication (if programmed into the TDB).

The TouchXL has the benefit of being able to connect to the Intuitive TDB either via USB connecting from its micro USB port to the USB host Port of the TDB controller or standard Ethernet connections over IP.

When connecting using the USB method, the communication of the two devices is automatic and the TouchXL will automatically configure itself for use.

Connecting over Ethernet comms requires the configuration of the TouchXL to be setup to 'point' to the Intuitive TDB device. This can be carried out in the 'Network Configuration' page within the TouchXL service menus (only accessible directly on the touch screen). Please consult the specific documentation for more details.

Remote Plant Display (PR0620)



When using the remote plant display, if the number sent to the display is greater than 999.9 then the decimal part of the value is dropped and replaced with a thousand digit e.g. 999.8, 999.9, 1000, 1001, 1002 and so forth. When the display is connected to the controller but not utilised in the TDB program it will show 'b 28' when the controller is powered on.

Integral Graphical Display (optional)

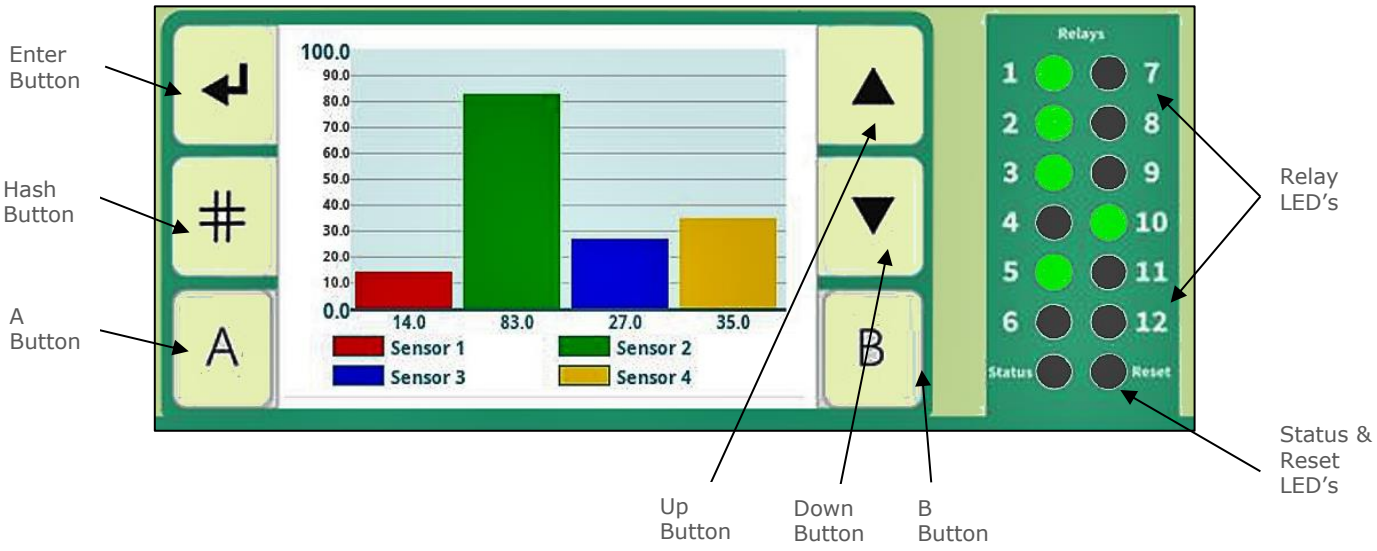
The buttons will allow the user to navigate through the menus/ screens of the device. Depending on the TDB and LCD screen setup, these screens will differ.

When mimics or screens have been setup, the A and B buttons will cycle through them.

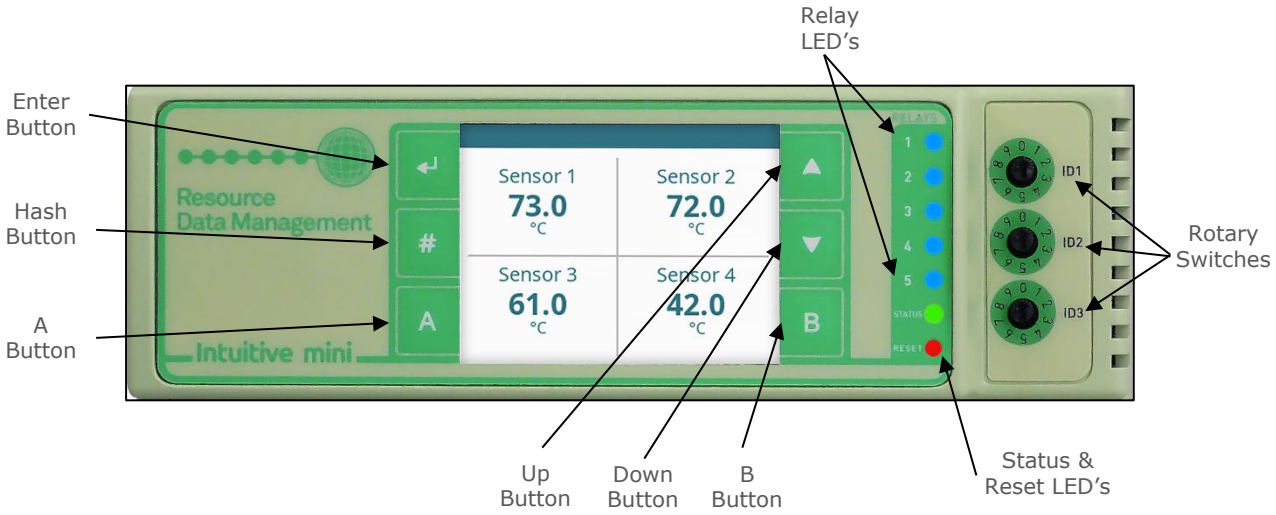
Holding the 'Enter' and 'Down' buttons for a couple of seconds will provide access to the IO list, parameters and states if setup in the TDB. The Hash button will exit back to mimics/ screens.

To change a parameter (see LCD setup for permissions) navigate to the parameter section using the A or B buttons and press Enter. Select the parameter using the Up and Down buttons and confirm by pressing Enter. The selected parameter and current value will be shown. Use the Up and Down arrow buttons to alter the setting and confirm with Enter.

Intuitive V2 Integral Display

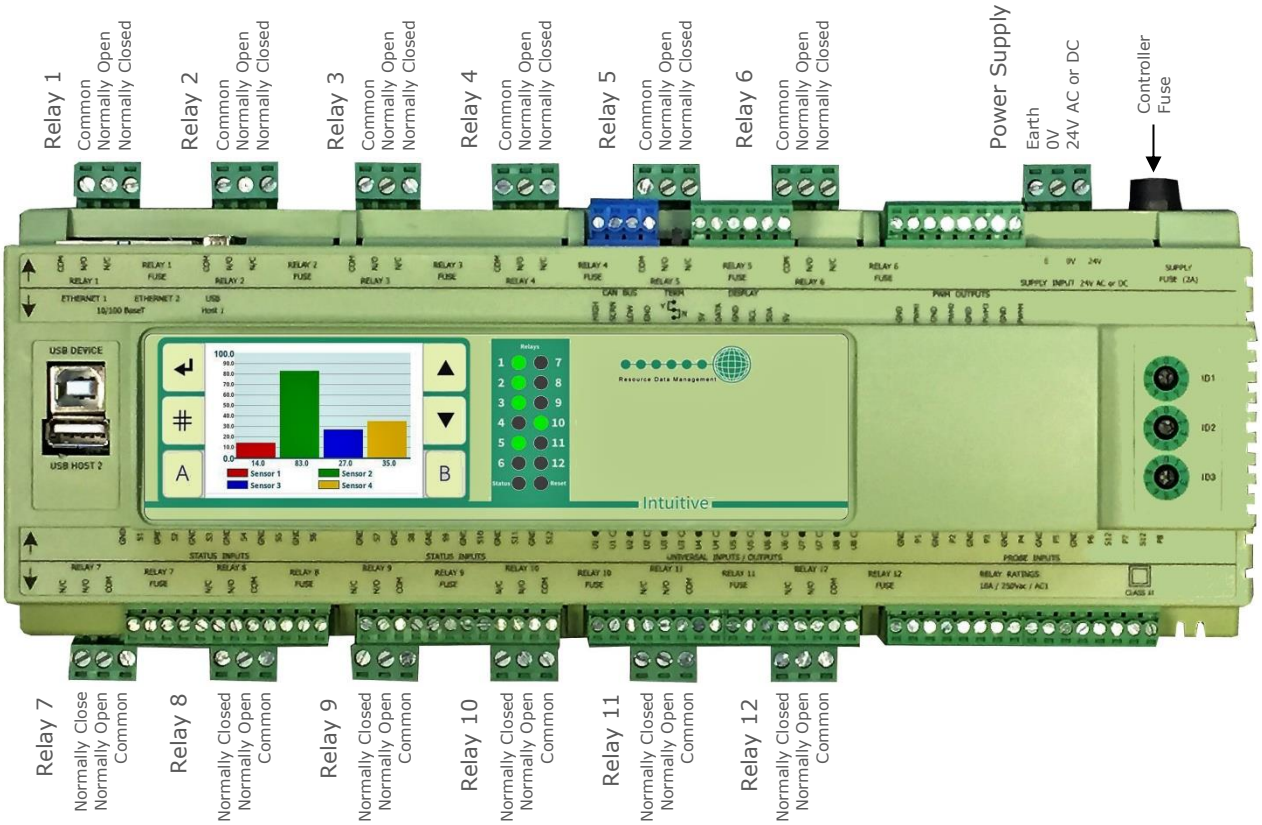


Intuitive Mini Integral Display



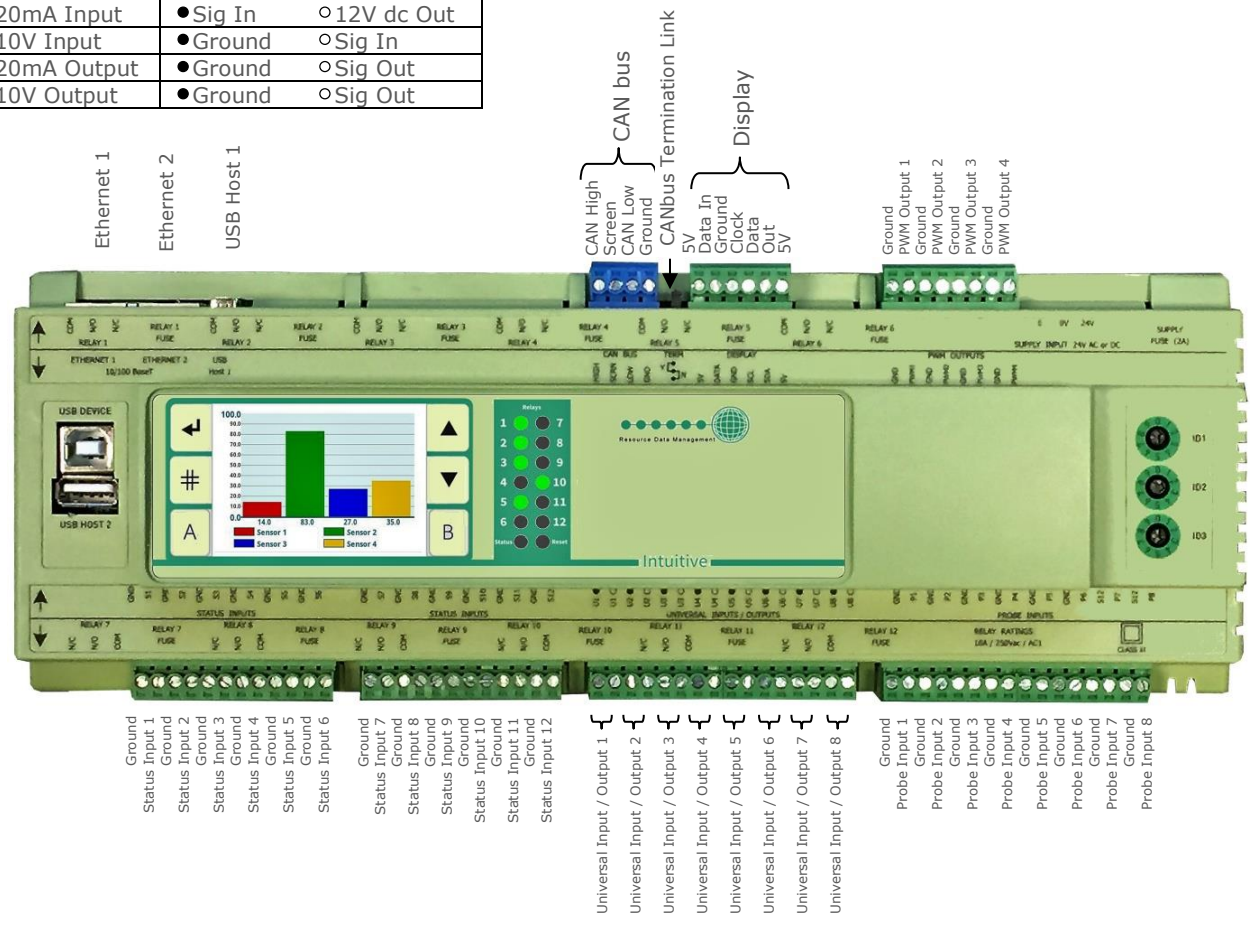
I/O Connections - Intuitive Controller – PR0650

Bottom Row Connections



Universal IO Type	Terminal Markings	
4-20mA Input	●Sig In	○12V dc Out
0-10V Input	●Ground	○Sig In
4-20mA Output	●Ground	○Sig Out
0-10V Output	●Ground	○Sig Out

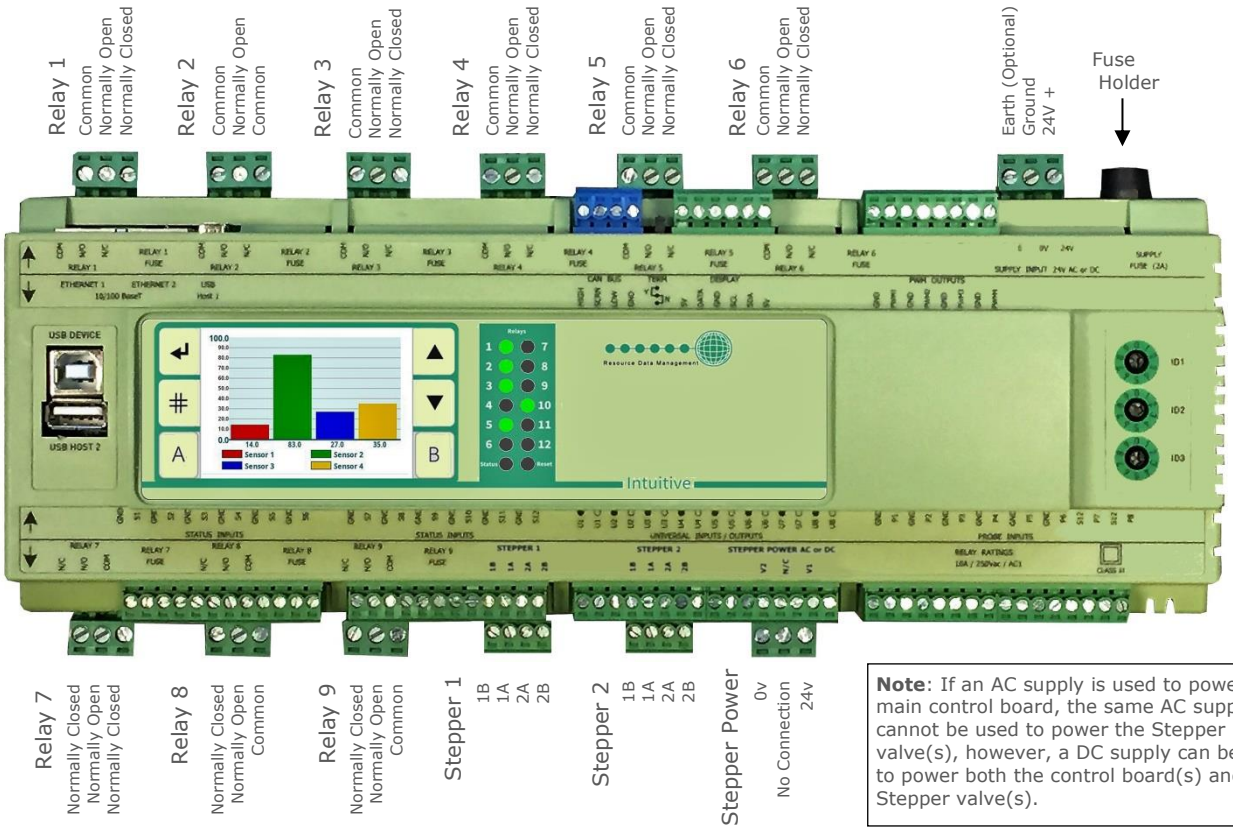
Top Row Connections



Please ensure all power is switched off before installing or maintaining this product.

I/O Connections - Intuitive Controller with 2 Stepper - PR0652

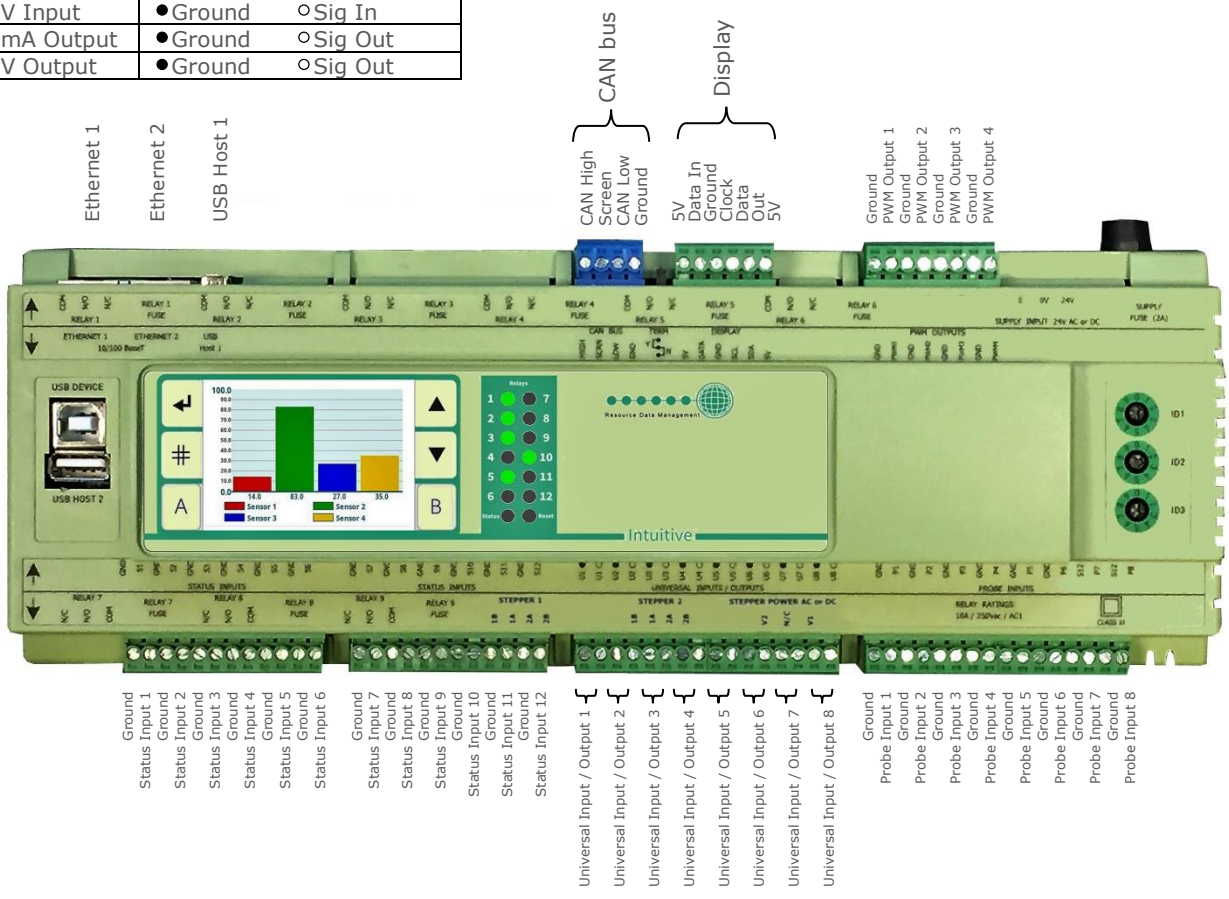
Bottom Row Connections



Note: If an AC supply is used to power the main control board, the same AC supply cannot be used to power the Stepper valve(s), however, a DC supply can be used to power both the control board(s) and the Stepper valve(s).

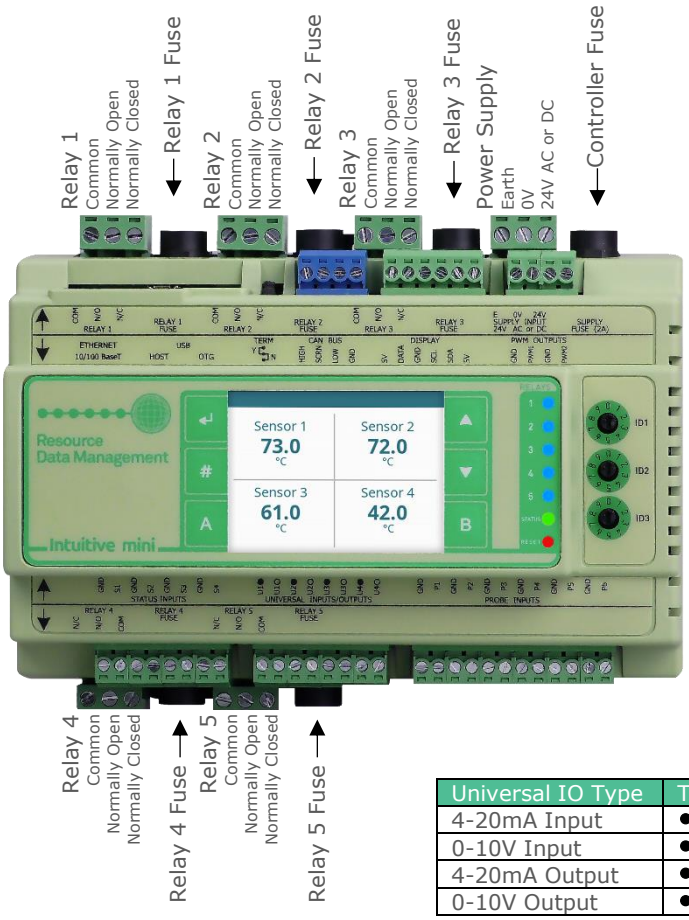
Universal IO Type	Terminal Markings	
4-20mA Input	●Sig In	○12V dc Out
0-10V Input	●Ground	○Sig In
4-20mA Output	●Ground	○Sig Out
0-10V Output	●Ground	○Sig Out

Top Row Connections

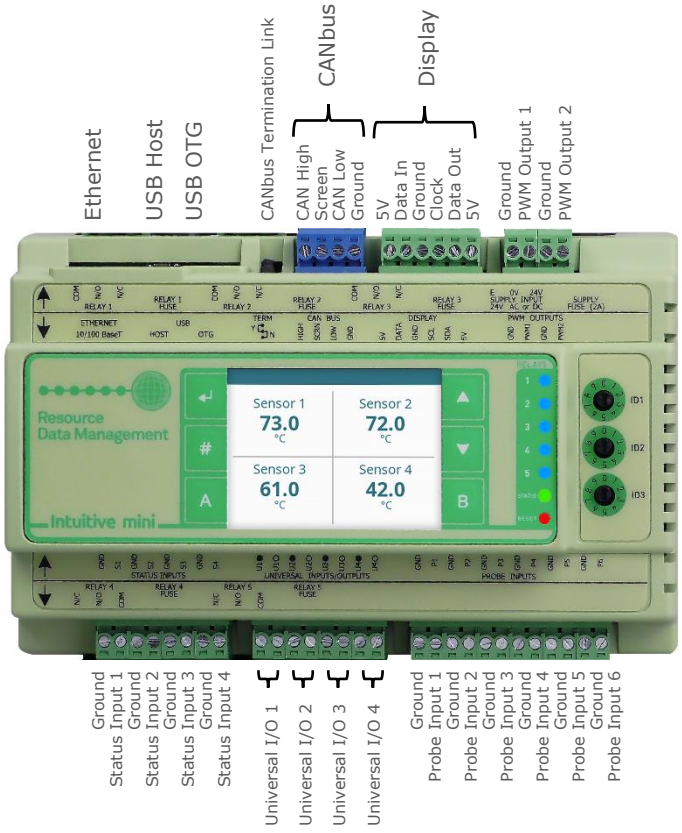


Please ensure all power is switched off before installing or maintaining this product.

I/O Connections - Mini Intuitive Controller – PR0680



Universal IO Type	Terminal Markings
4-20mA Input	●Sig In ○12V dc Out
0-10V Input	●Ground ○Sig In
4-20mA Output	●Ground ○Sig Out
0-10V Output	●Ground ○Sig Out



Please ensure all power is switched off before installing or maintaining this product.

Inputs & Outputs Descriptions

Intuitive Controller

All Types	Description	Comments
Status Input 1-12	0V return or 24 Vac	See **note 1**
Analogue Input 1-8	Probe input	See **note 2**
Universal Input / Output 1-8	Analogue Input or Output	4-20mA or 0-10V
Relay 1-12	N/O, N/C and Common	Volt Free
PWM 1-4	Pulse Width Modulation Output	Open collector or pull up
Status LED	Healthy LED	When powered up the LED will flash off/on every 0.5 seconds.

Intuitive Stepper Controller

All Types	Description	Comments
Status Input 1-12	0V return or 24 Vac	See **note 1**
Analogue Input 1-8	Probe input	See **note 2**
Universal Input / Output 1-8	Analogue Input or Output	4-20mA or 0-10V
Relay 1-9	N/O, N/C and Common	Volt Free
Stepper Outputs 1-2	Bi Polar Stepper Valve Driver	12-24vdc, 825mA / 8W maximum.
PWM 1-4	Pulse Width Modulation Output	Open collector or pull up
Status LED	Healthy LED	When powered up the LED will flash off/on every 0.5 seconds.
Stepper Power	Separate power supply for 2 stepper outputs	If an AC supply is used to power the main control board, the same AC supply cannot be used to power the Stepper valve(s), however, a DC supply can be used to power both the control board(s) and the Stepper valve(s).

Intuitive Mini Controller

All Types	Description	Comments
Status Input 1-4	0V return or 24 Vac	See **note 1**
Analogue Input 1-6	Probe input	See **note 2**
Universal I/O 1-4	Analogue Input or Output	4-20mA or 0-10V
Relay 1-5	N/O, N/C and Common	Volt Free
PWM 1-2	Pulse Width Modulation Output	Open collector or pull up
Status LED	Healthy LED	When powered up the LED will flash off/on every 0.5 seconds.

Note 1: 24 Vac must have the same 24 Vac return as the supply voltage. If using the Intuitive controller 24V power supply, only the 24Vac signal from the supply is required for the status input.

If using an external 24V power supply to signal a status change then both a common (0V) and status input signal (24V) is required for the appropriate status input. See Appendix 2 for status input connection wiring (If the Status LED is present (Mercury only) then Appendix 3 is not relevant).

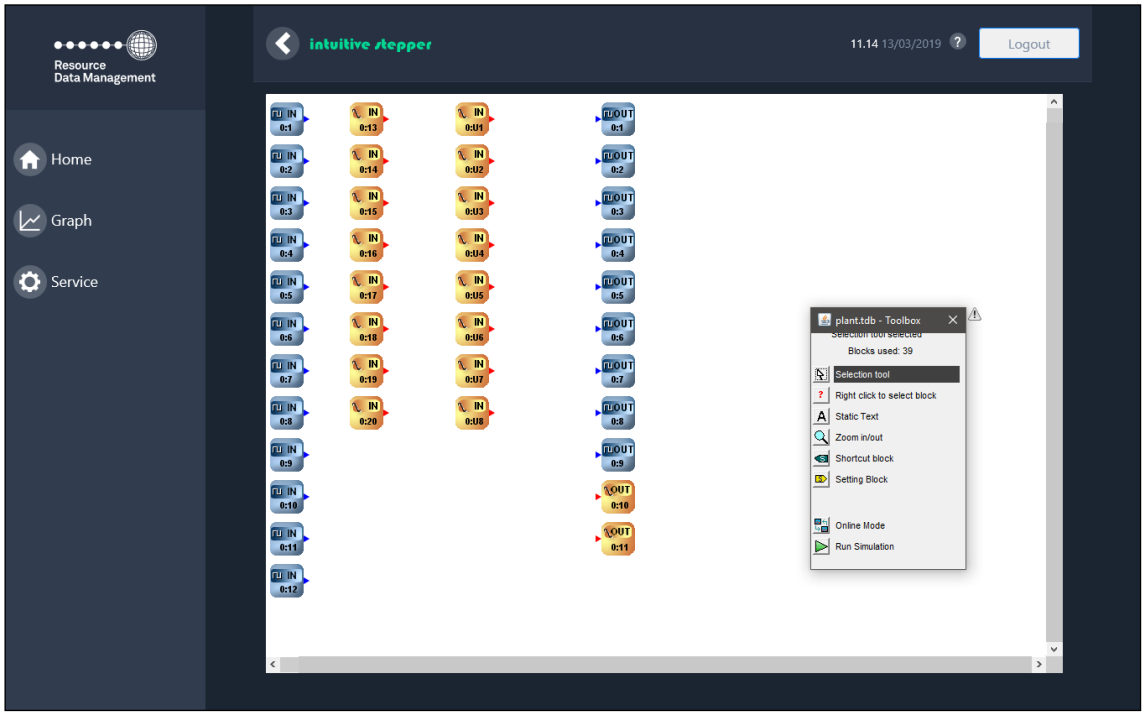
Note 2: A variety of probes can be used by the Data Builder Analogue block or a custom probe curve can be programmed.

All inputs and outputs should be configured on the controller before connecting an external device. Failure to do so may result in damage to the controller and/or external device.

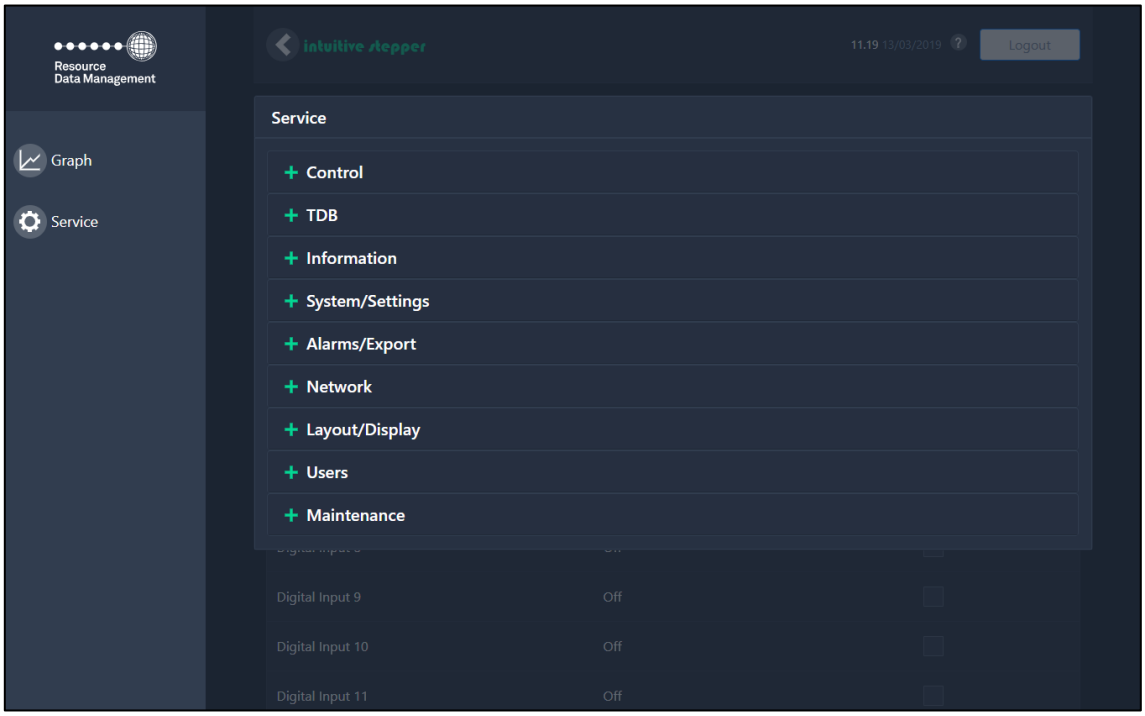
Webpage Appearance

Although the hardware of the devices differs slightly, the software functionality of the Intuitive V2, Dual Stepper or Mini TDB Controllers is identical, therefore the user interface, when viewing them through the web page, is identical.

TDB Controller View



TDB Menus view



Home	Navigates the user to the Home screen from whichever page they're in.	Graph	View the trends over a defined period of the device's Inputs, Parameters or States.
Control	Shows the device's Inputs, Outputs, Parameters and States.	Service	Opens the device's menu structure to select from
Layout	Available when a Layout has been uploaded.		

USB Devices

Intuitive DIN mountable 4 port USB Hub (PR0624/ PR0624-DIN)

The RDM USB 4 Port Hub can be used to expand the number of USB ports available. The RDM USB hub has a USB Device port which connects to one of the Intuitive controller's USB ports. This then allows for up to 4 USB devices to be connected to a single controller USB port. The RDM USB hub obtains its power supply from a 24Vac or dc supply. Please see the USB 4 Port user guide for further details.

If a third party USB hub is connected to the controller then the hub used **must be** self-powered and **should not** obtain its operating power supply from the controller USB ports. Failure to use a self-powered hub will result in damage to the controller and will invalidate the controller warranty.

USB Current Monitor (PR0626/ PR0626i/v-DIN)

The USB Current Monitor provides an interface for the RDM TDB Controller and allows 5 Current Transformers (CTs) to be connected.

The three types of current monitor are listed below:

Description	Part Number
5 Channel Current Monitor with USB Interface	PR0626
5 Channel Current Monitor with USB Interface, DIN rail mount, 5A Input	PR0626i-DIN
5 Channel Current Monitor with USB Interface, DIN rail mount, 0.33V Input	PR0626v-DIN

The two types of Current Monitor are designed to be used with two types of Current Transformers, either with 0.333V secondaries (RDM CT PR0675-xxxA) or with 5amp secondaries (Farnell part 1373206 for example). Scaling is carried out in the CT block within the editor.

Up to 10 Current Monitors can be connected to Controller, with each having a rotary switch ID to identify it. To accommodate multiple Current Monitors an RDM 4 Port USB Hub can be utilised (PR0624 or PR0624 DIN), this provides the controller with four additional USB ports.

The Current Monitor is powered via the host controller's USB port so no additional power supply is required, although the 4 Port USB hub, if used, requires a 24v AC or DC supply (the same as the TDB Controller).

Warning: Care should be taken when connecting and disconnecting the 5A current transformer secondaries. The secondary side should never be left open circuit when there is a load present the primary side.

Intuitive Touchscreen Display (PR0615)

Intuitive Controllers with Data Builder support a number of displays, one of which is the USB Touchscreen Display. Data Builder contains a selection of blocks which allow user interaction with this display (please see Display Cascade, 3 way, Override and Slide blocks). As well as displaying selected input, output, parameter, state and customised graphics, the Touchscreen Display allows the user to change set points, override values and accept alarms. The Touchscreen Display connects to an Intuitive Controller via one of the controller's USB sockets and does not require an additional power supply.

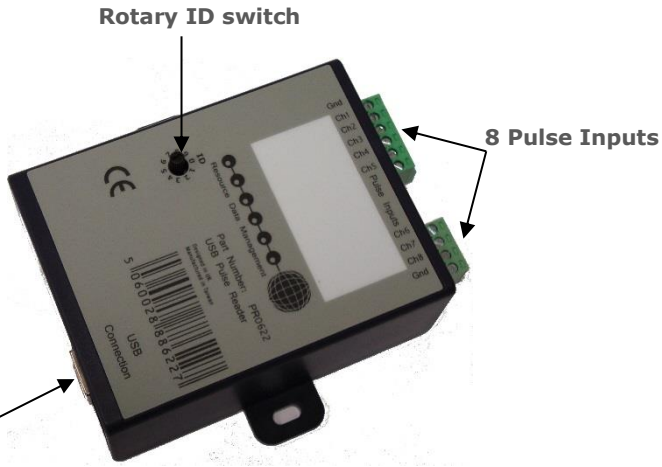
See the Touchscreen Display users guide for further details.

Note: the Touchscreen Display is a plug and play item. The display will operate when connected to an Intuitive TDB controller and will show the Home page, if a Custom page is not configured by default.

8 Channel Pulse reader (PR0622/ PR0622-DIN)

PR0622 DIN

PR0622

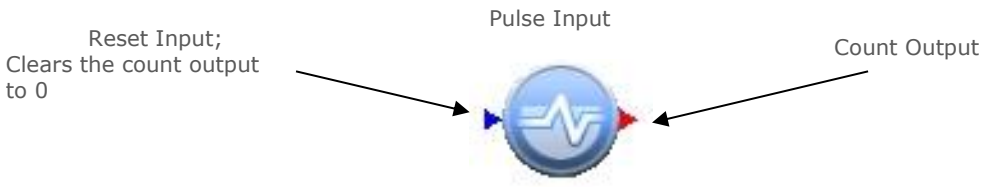


This device is available in two enclosure types, DIN rail mount (PR0622 DIN) and panel mount (PR0622), both of which connect to either USB Host 1 or 2. Up to three Pulse Readers can be connected to the system. Since there are only two USB host ports available then a USB hub must be used if more than two USB devices are required. The Pulse Reader has a rotary switch which allows the user to uniquely address each module. If the rotary switch is set to any of the following then the Pulse Reader channels will appear as highlighted.

Position 1: Equates to device 1 and Channel 1 through to 8.
Position 2: Equates to device 2 and Channel 9 through to 16.
Position 3: Equates to device 3 and Channel 17 through to 24.

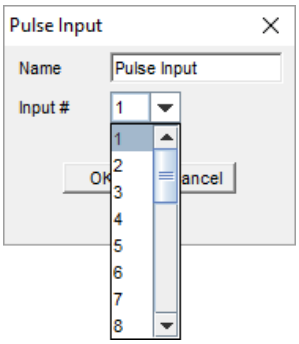
Note: If a USB hub is used then it must be self-powered and should not obtain its operating power supply from the controller USB ports. Failure to use a self-powered hub will result in damage to the controller and will invalidate the controller warranty. RDM recommend PR0624 DIN 4 Port USB Hub.

A single Pulse Reader has 8 channels to count pulses therefore a total of 24 channels can be monitored if three devices are used. A Pulse Reader input block/ channel must be used to incorporate the pulse counts from each channel into a data builder program. Each channel on the pulse reader requires a 0V return switching through e.g. a utility meter volt-free relay. **The maximum speed that the pulse reader can read is 10msec mark – 10mSec space per channel**. Below is the Data Builder Icon for pulse input:

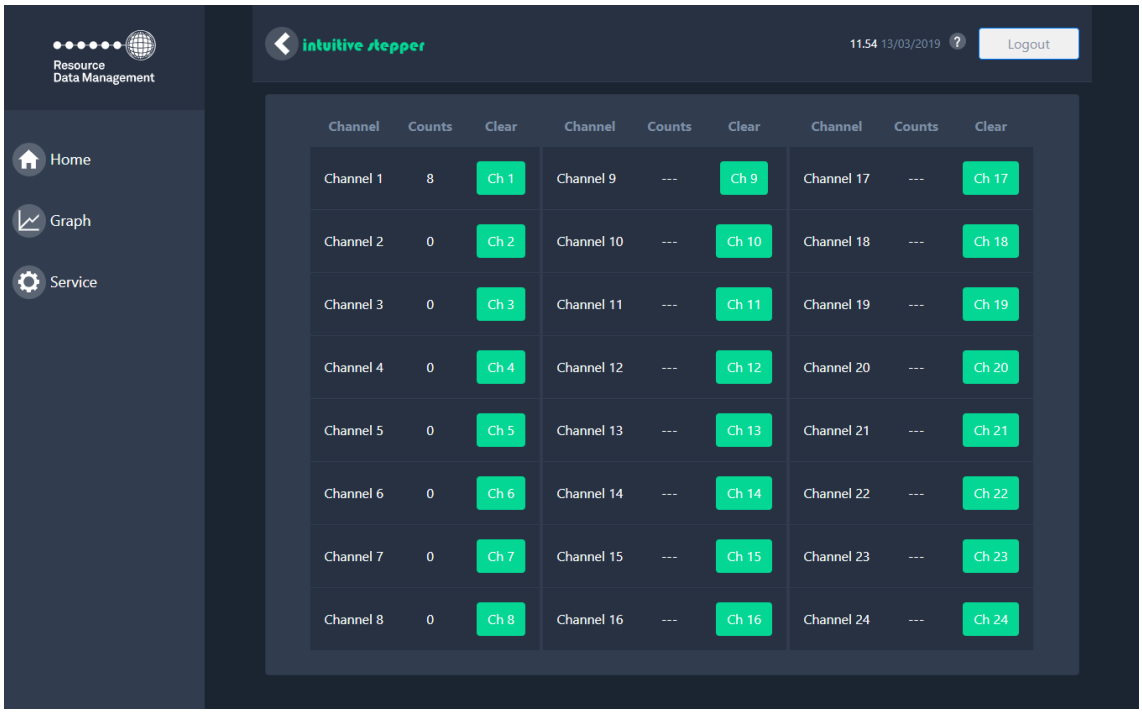


Use one of these blocks per channel required in the Data Builder program. The count output is stored in the controller memory on the hour and half past the hour.

Display the properties for this block to select the channel number and name the block. Up to 24 inputs are available to select from the drop down menu:



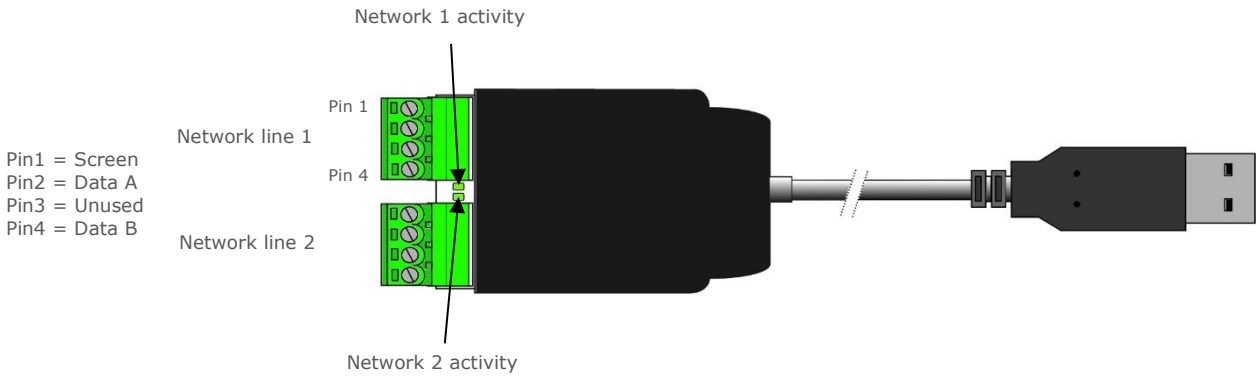
The Pulse Reader counts can be checked in the controller by selecting the System tab then Pulse Counter. Channel counts can be read from this screen and channel counts can be cleared on an individual basis. '0' in a channel count indicates that channel has had zero counts and the Pulse Reader module is present for that range of channels. '---' shows that the Pulse Reader module isn't present for that range of channels.



RS485 Modbus Adapter (PR0623/ PR0623-DIN)

This adapter connects to the USB Host port, where only 1 adapter can be connected to an Intuitive TDB controller. Each adapter has 2 RS485 network lines and each network line allows up to 32 Modbus devices. This allows for Modbus based devices to be logged on to the controller provided the appropriate template is present.

PR0623



PR0623-DIN

The Modbus adaptor is also available in a DIN rail mounted enclosure, connections are the same as the PR0623 adapter shown above.

The adaptor is connected to the controller using a USB type A to type B cable (this is a standard cable commonly used with PC printers).

RS485 Modbus Configuration

Note: the RS485 configuration of the USB Adapters is fixed and uses the following:

Baud rate:	9600
Data bits:	8
Parity:	No
Stop Bits:	1

USB Memory Stick

Inserting a USB memory stick into the USB port allows the controller to record data at 15 second intervals*. Without the use of a memory stick, data is recorded at 15 minute intervals and the number of recorded days is limited. The USB stick used should be formatted as FAT32. The data saved to the memory stick is encrypted and therefore cannot be viewed directly from a PC or Laptop. The Graph function or Export Data option should be used to view or obtain data from the TDB controller.

***Note**: 15 second intervals can only be viewed via the graph function, exported data will remain in 15 minute intervals.

When inserting or removing a USB memory stick the controller should be restarted. There are no software configuration options for the memory stick and the controller will automatically start logging to the memory stick when inserted.

Note: Only one memory stick is supported. Using two memory sticks will cause logging issues.

Note: whenever a TDB program is edited and saved the log data relating to the program before it was edited, is removed.

Default Username & Password

From Software version V3.7.9 the default username and password is unique to every individual panel. The specific credentials will be detailed in the documentation that ships with the unit.

The user name will be '**install**'.
The password will be '**PleaseChange**' followed by the panel ID (found within the log in page).

For example: **install**
PleaseChangeBC123456

The end user MUST add their own install level user.

These default credentials will only be enabled when accessing the system locally (TouchXL) or from a device connected within the systems local subnet. Additionally, If the end user wishes to add the username and password 'install'/ '1234' (not recommended), they will also only ever be enabled when accessing locally (TouchXL) or from devices within the local subnet.

Note:

In the unlikely event username and/or password is unknown, for example a new service contract is undertaken and the previous contractor has not passed across the login credentials, it is possible for RDM Technical Support to generate a panel specific, time limited, 'ONCE' code which allows temporary access to only the TDB device in question at install level allowing an engineer to add a new 'Install' level user. To do this RDM requires in writing, from the end-user/owner of the TDB device, permission to provide access to the system. There will also be an administration charge for this request.

For further information please contact Technical Support.

Intuitive TDB Homepage

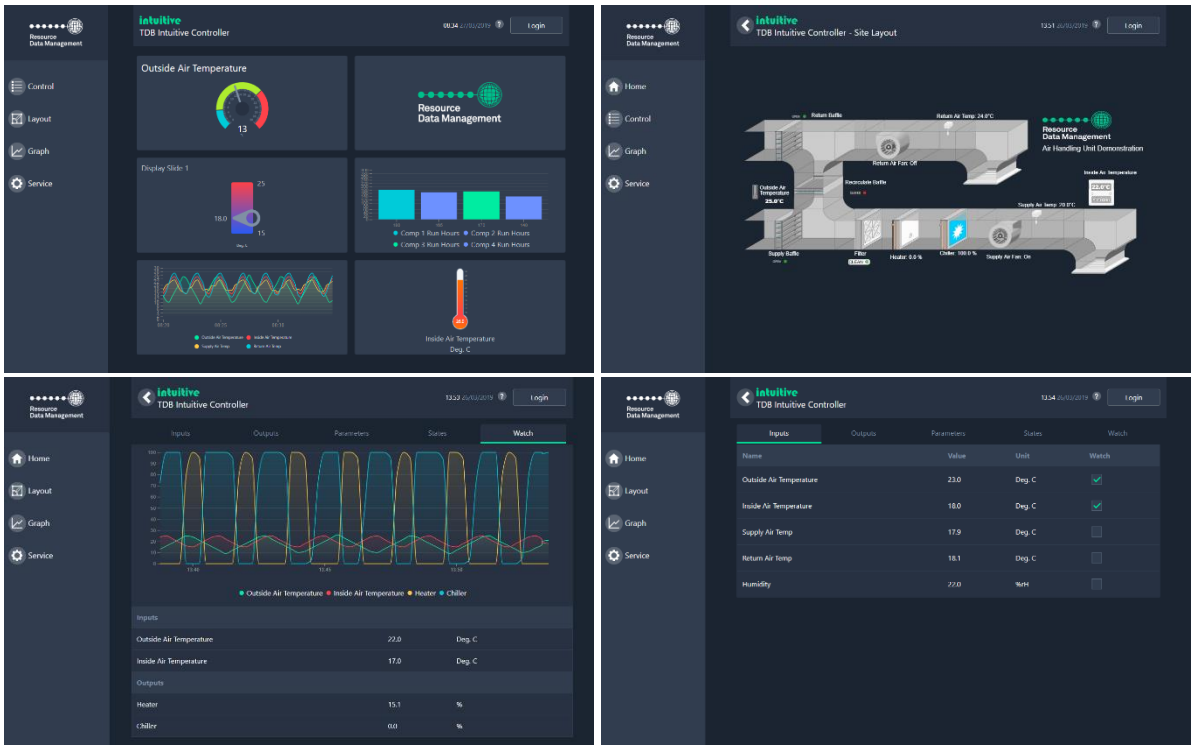
Upon first accessing the device's Homepage it will only show minimal details with a log in option, as by default 'Force CGI Login' is set to on. Once logged in (or Force CGI is set to off) the device's home page will indicate the status of all the I/O. This is because by default, a Data Builder input and output block has been allocated to each I/O.

Selecting the 'Service' icon will result in the Service menu being displayed providing all the options for that user level.

Note: If an analogue input or other item which does not have a device connected or it is out of range then the value shown will be -3200.1.

Custom Home Page

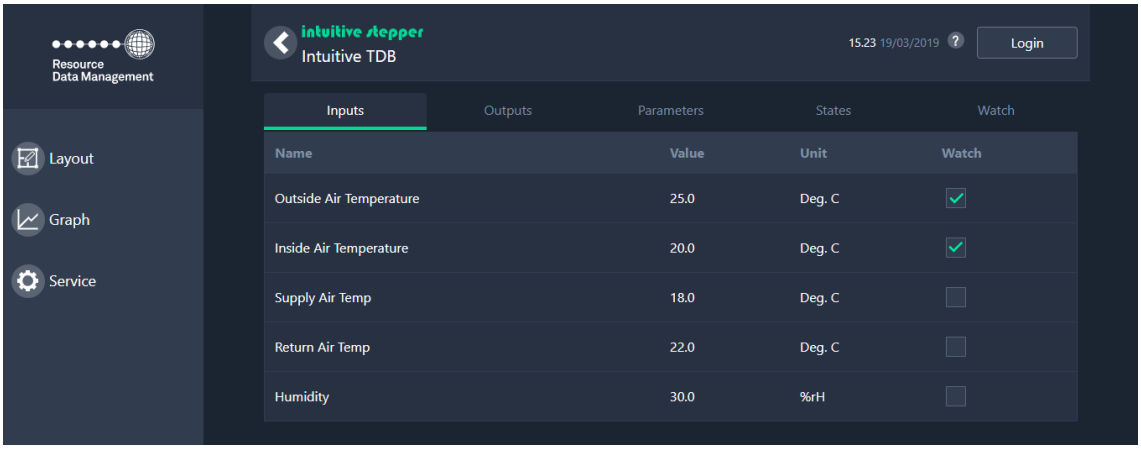
The default Home Page for the device will default to one of three pages; the Custom Home Page, Layout or the Control Summary page. Examples are shown below.



For setup, please consult the relevant sections.

Control

The Control Summary will be the device's default homepage, when there is no layout or Custom Home page set up. The 'Home' or 'Control' buttons located within the device's main web interface will also take the user here from any other page.



The Control Summary will list all Inputs, Outputs, Parameters and States which have been configured within the TDB program. It will also feature a Watch tab.

Watch Tab

The 'Watch' tab will permit the user to view dynamic real time graphing of whichever points the user selects from the Inputs, Outputs, Parameters and States.

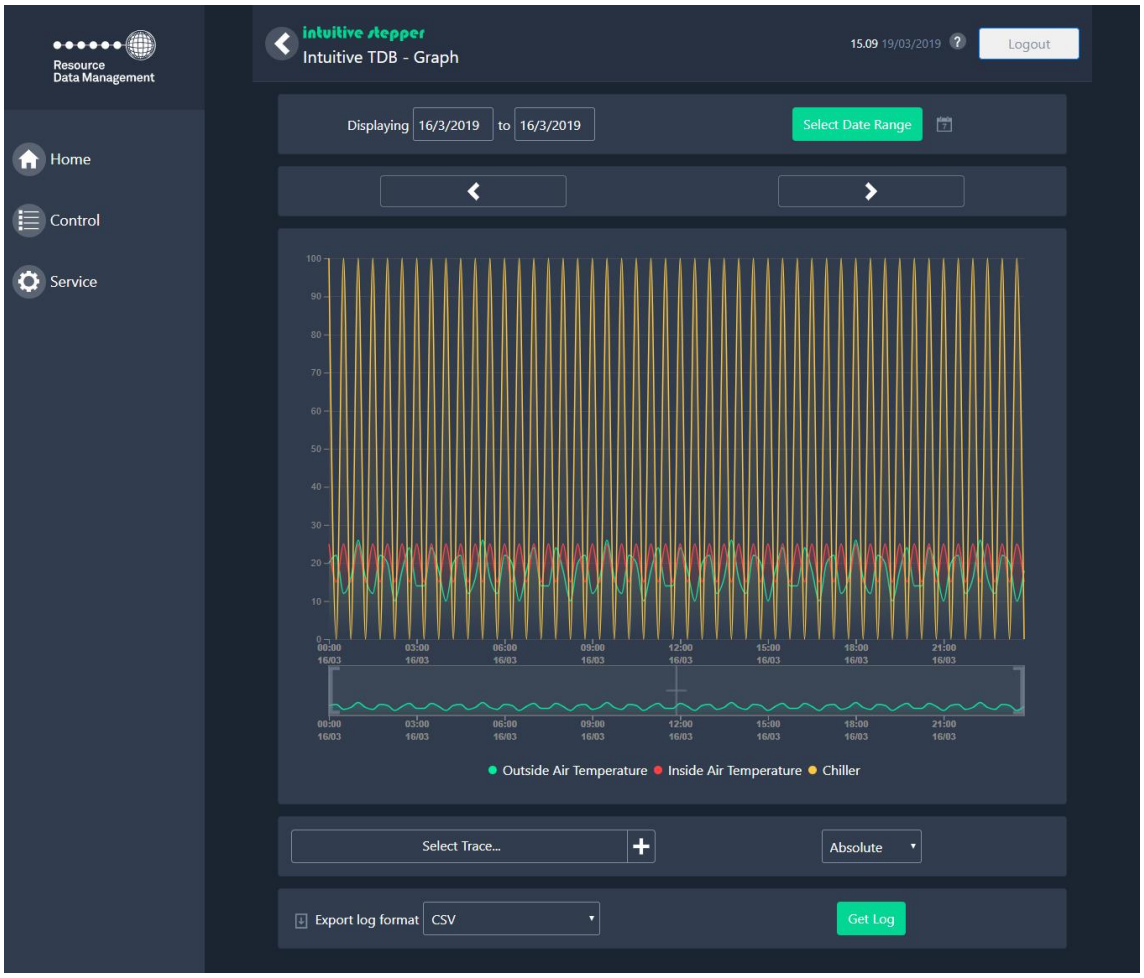
In order to add items to the 'Watch' tab the tick-box next to the desired item must be checked (see above image). Any of the items found in the Inputs, Outputs, Parameters or States tab can be selected. Performing this action will automatically add the item to the 'Watch' tab for monitoring.

The selected points are cached to the user's local machine meaning if the device is accessed by another user from a second interface, different items can be chosen.

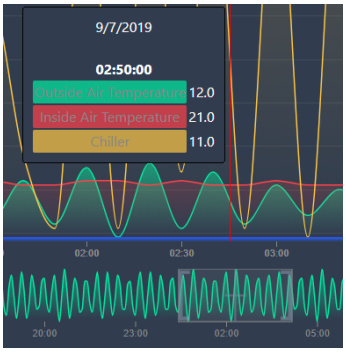
The graph will automatically scroll, refreshing the data every 15 seconds and will show traces over a 15 minute window. The graph is time stamped and the user can also temporarily hide certain traces by clicking on the name of the control value beneath the graph.

Graph

Clicking on the graph button will display the last 24 hours on the graph. From here the data can be interrogated further.



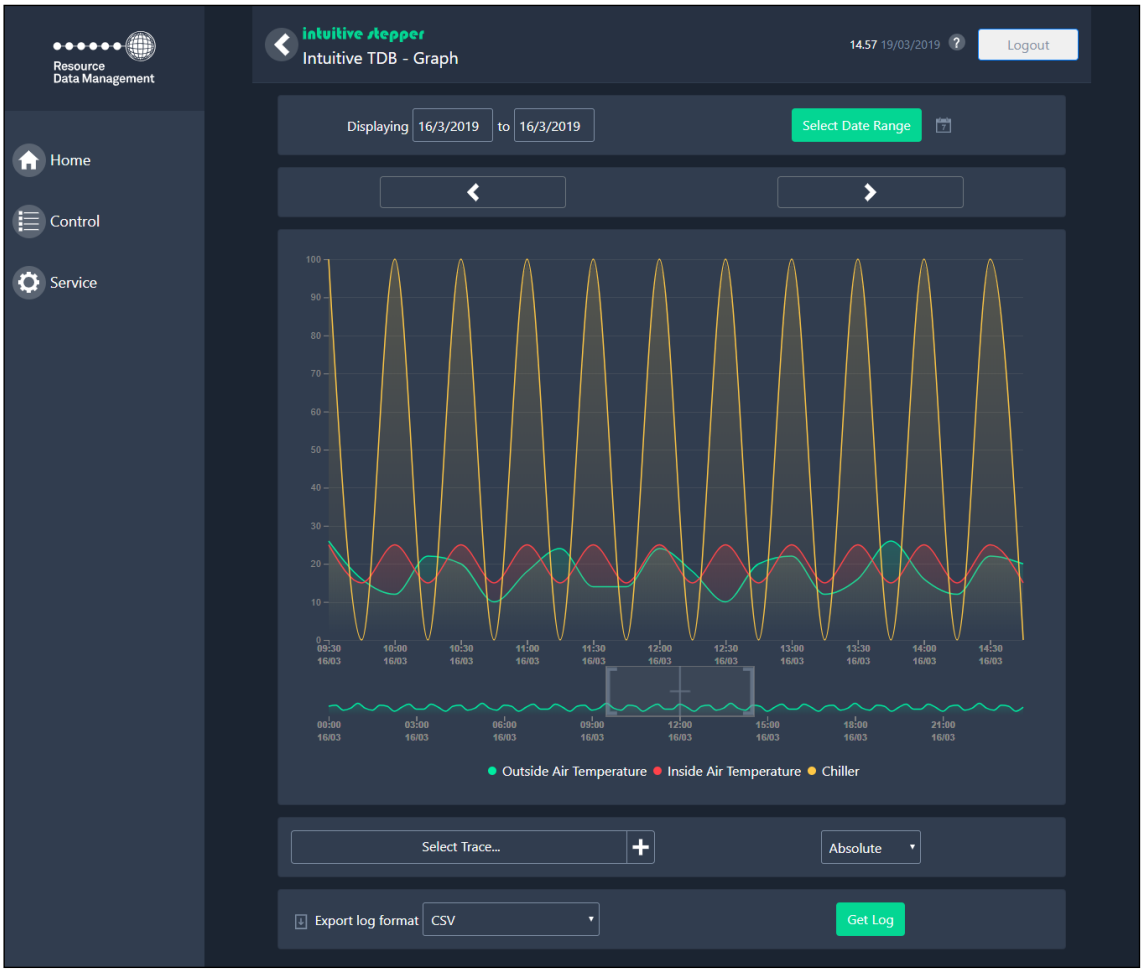
Initially, the data range shown will be the previous 24hrs. The navigation buttons ("<" and ">") will jump back and forward 24hrs. Or the user can select a specific date range.



The user can interact with the graph to 'zoom' into specific time periods.

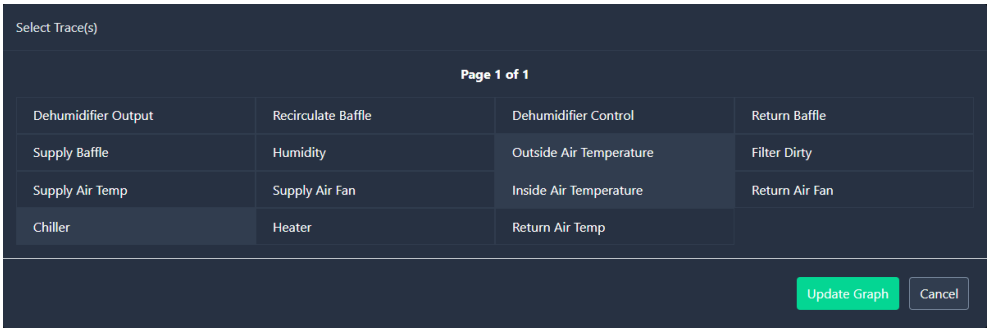
Using the panel below the main graph (pictured on left) the user can drag the markers at each end to zoom to show a shorter period. Furthermore, clicking on the central crosshair the user can easily shift the focal area along the time line (see image below).

Clicking anywhere on the graph will generate a vertical line and detail the individual item's value at that point (shown on left).



Select Trace

To add more traces to the graphing area, click 'Select Trace'. Here the user can add from any of the values that the TDB controller logs:



Use the 'Next' and 'Previous' buttons to navigate through the list. Clicking on the traces will highlight them accordingly and subsequently add them to the graph after the 'Draw Graph' has been selected.

Sample Frequency

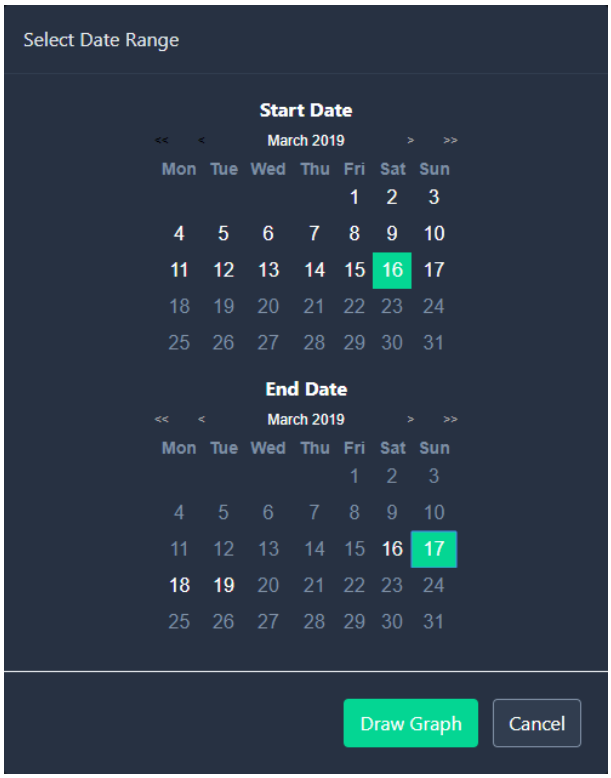
If a USB memory stick is being used there will be an additional menu available to select the sample frequency. Without the memory stick, the sample frequency will be fixed at 15min. Else, the time period can be reduced to 15 seconds.

Absolute or Differential

The graph can also be used to show the 'Absolute' values taken from the controller's traces. Or if 'Differential' is selected then it will be the difference between values taken at the frequency selected.

Graph Period

To select specific periods of data to be viewed use the 'Select Date Range' button. The below will be shown;



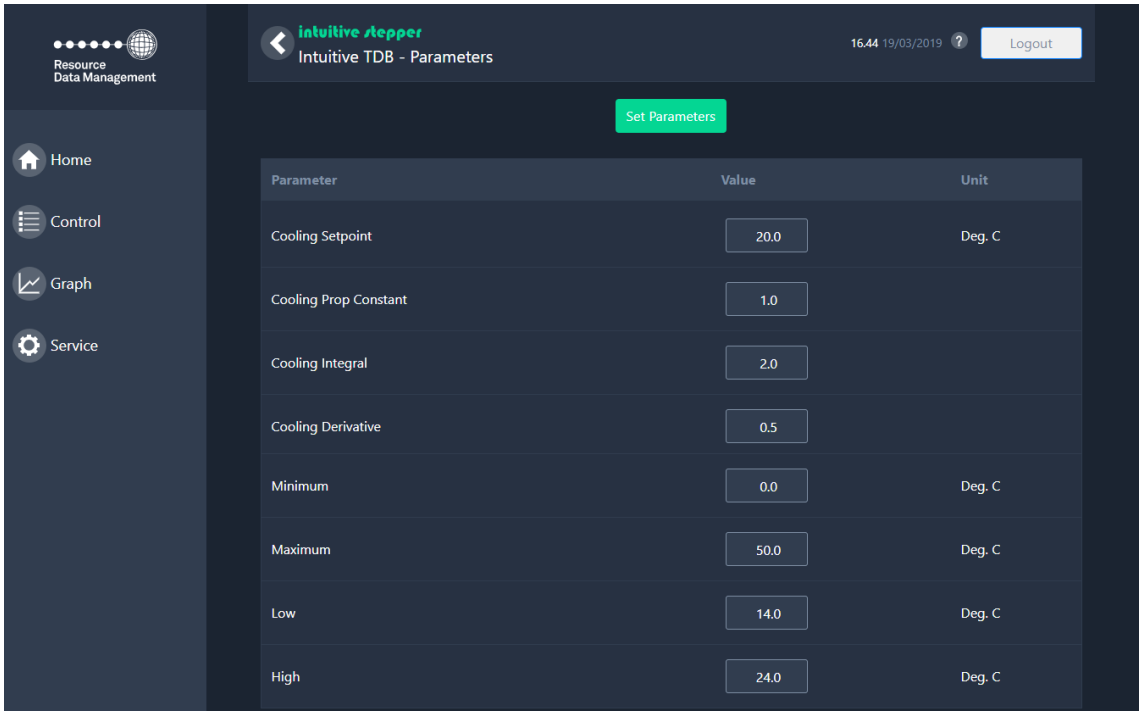
By using the navigational buttons within the calendars, selecting a specific date for 'Start' and 'End' followed by 'Draw Graph', the graph from the period chosen will be represented.

Note: if you make significant changes to the TDB program e.g. introduce or remove Input/outputs, then any previously recorded graph data will not be shown. You will be able to access any 'old' data up until the point the TDB program was edited by using the Export Log Data function.

Service Menus

Control

Set Parameters



Clicking on Parameters shows a list of the current operating setting block values within the Data Builder (TDB) program. The user can change TDB program parameters from this page.

Once the controller is logged onto a Data Manager any changes required to a setting block must be done from the 'Parameters' option or from the Data Manager and not by editing TDB program as any changes made to a setting block here will have no effect. **Note:** if the parameter locking features is in use then all changes must be made from the Data manager.

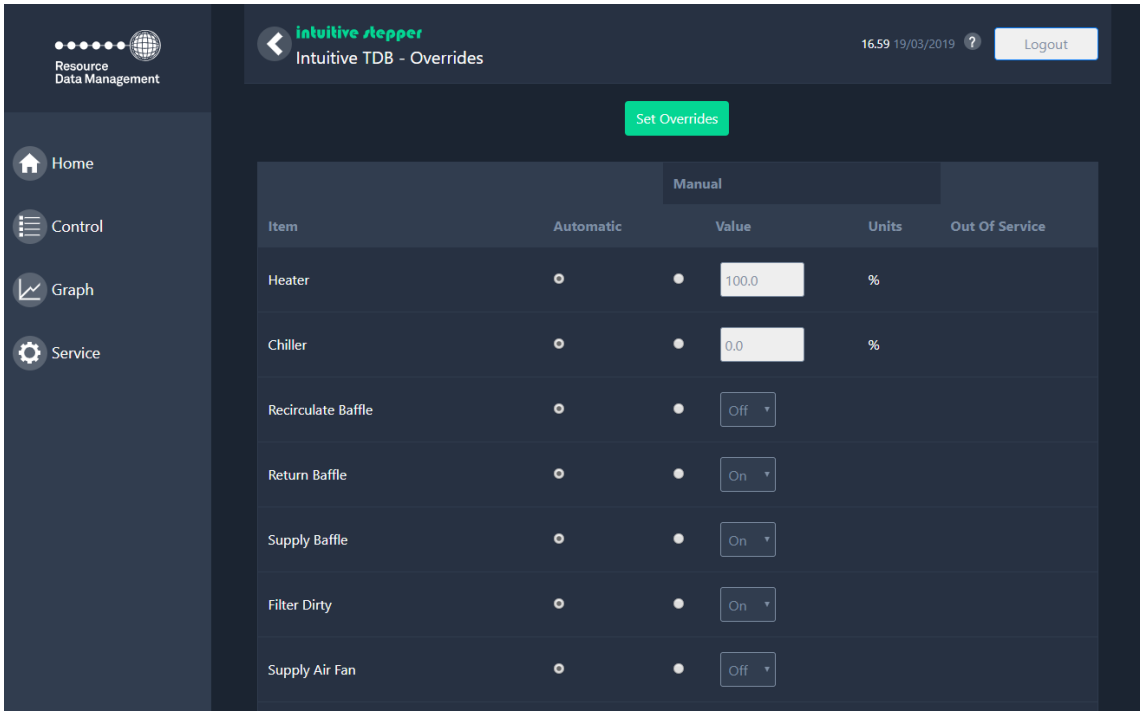
Default Parameters

The option 'Default Parameters' is seen when a user changes a parameter in TDB program from the Data Manager or via the 'Parameters' option. When used, this option will revert the setting blocks back to the original values they had, before they were edited from the Data Manager or via 'Parameters'. If you remove the controller from a Data Manager network and wish to operate it stand-alone then it is advisable to default the parameters before trying to edit the Data Builder program.

Overrides

The controller offers a facility where the program, which has been written to the device, can be overridden. Any Analogue Output, Digital Output or parameter can be forced to a specific value/ state. Looking at the below screen capture, it shows the general layout. All blocks within the PLC that are able to be overridden will be listed. They will all be as default, 'Automatic', where they will follow the TDB logic. By setting the override to 'Manual' and assigning the desired value, it will keep the override until 'Automatic' is chosen once again.

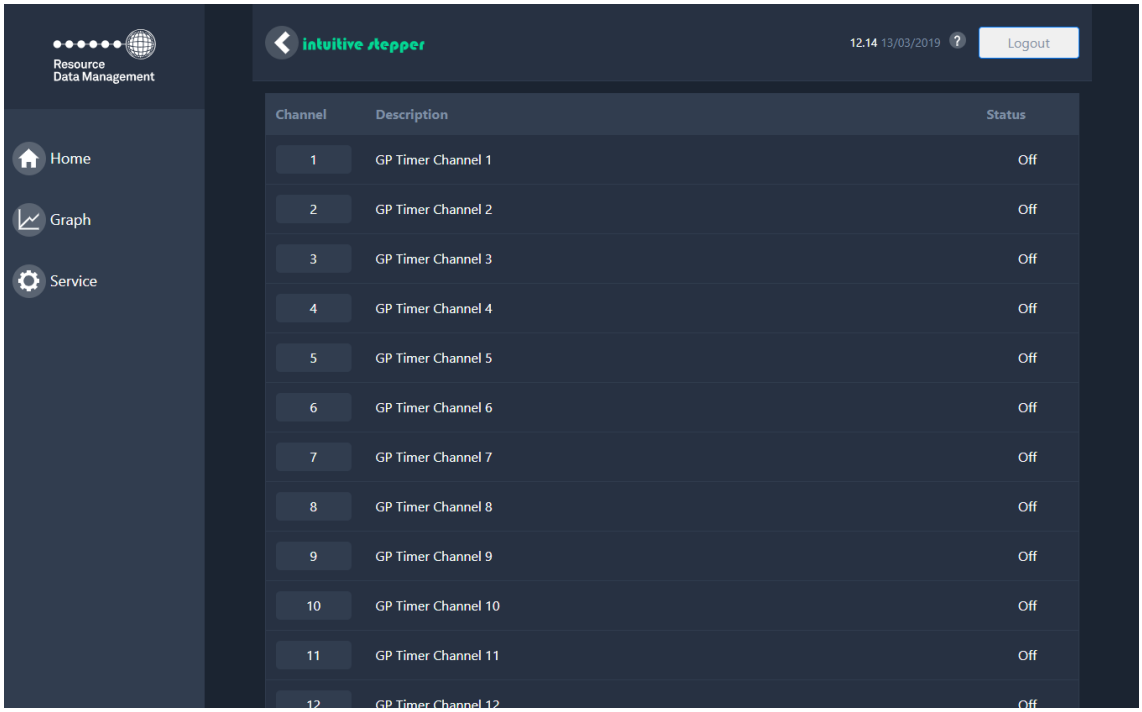
Note: The override will also revert to 'automatic' after the device is reset.

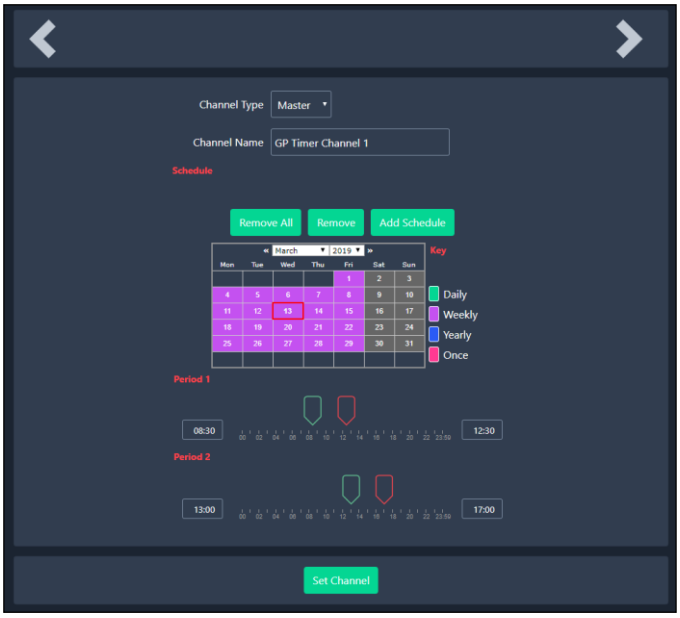


Note: the overrides are available via the Data Manager's interface only when the unit is logged on as a BACnet device.

GP Timer

The controller has General Purpose Timer functions, with 40 available channels. To program a GP timer click on the channel you want to use.





There are 32 general purpose timer channels and 8 'Global' channels.

Use the 'Add schedule' wizard to aid setting up the channel.

Note: Global channels cannot be re-named or be set to slave mode. This is particularly useful if web-services are going to be used to remotely change a channel time; as the channel name cannot be change inadvertently.

The arrows located at the top left and right of the GP Timer channel screen allows quick navigation to the next and previous channels.

Add Schedule Wizard

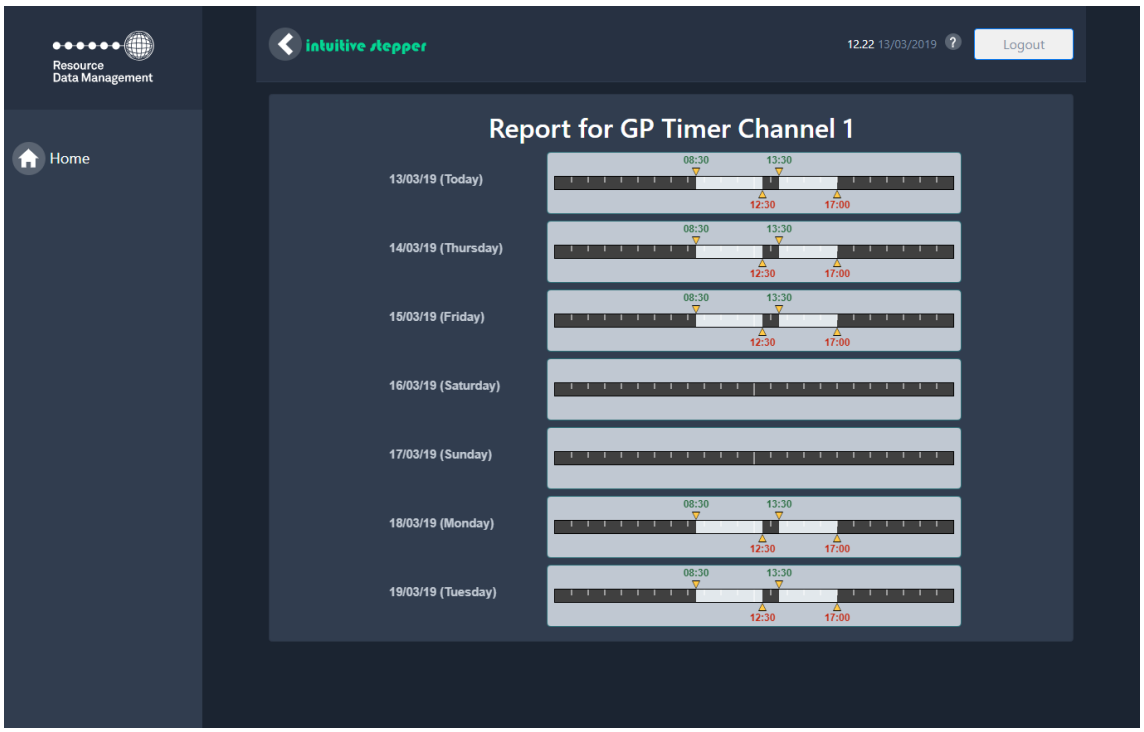
Run the 'Add Schedule Wizard' to quickly setup up the channel times. There is a selection of;

Daily	Every day has the same times.
Weekly	Separate days of the week can be selected and setup.
Yearly	Used for annual events, such as Christmas Day.
Once	Used for a once only event.

When the channel has been setup, the type of schedule can be easily identified using the colour key next to the calendar.

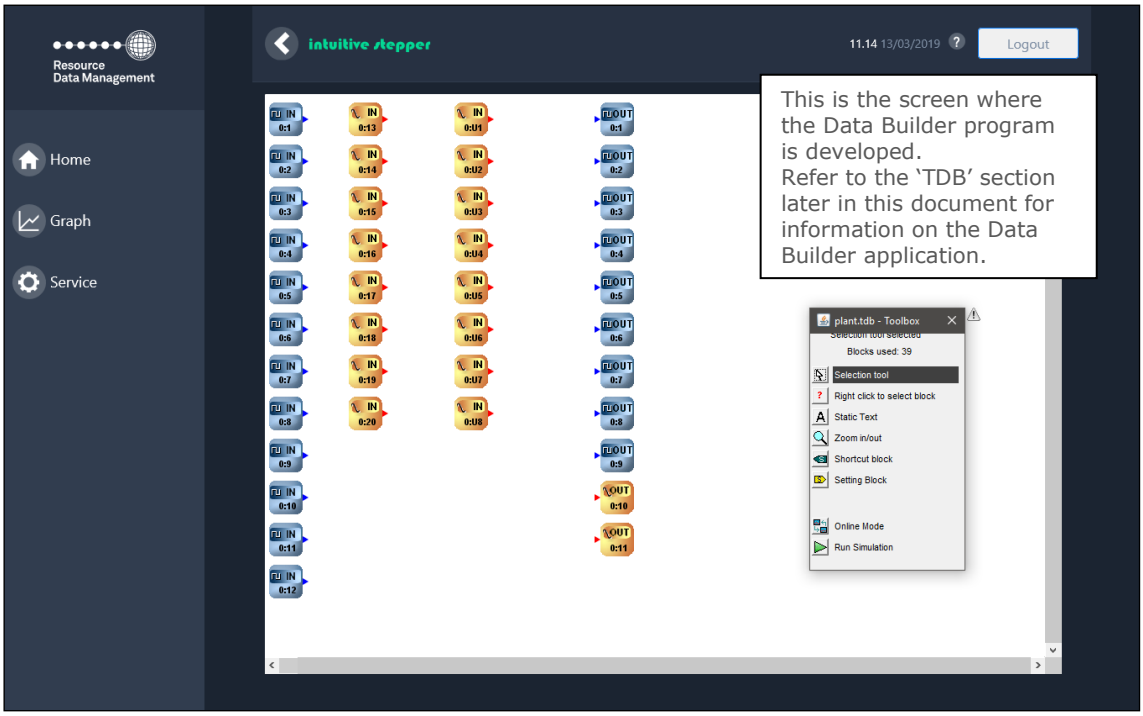
GP Timer Report

Selecting this option allows you to view each GP timer channels programmed times.



TDB

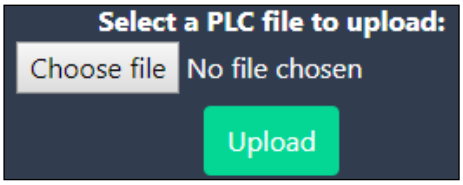
Edit



Note: In software V1.20 and above the analogue inputs (0:21 to 0:23) and analogue outputs (0:13 and 0:14) do not appear automatically in the TDB program, they can be easily added manually as required.

Send To Controller

Use this option to upload a previously created Data Builder application into the Controller.



Note: if there are block types, within the TDB that the Intuitive TDB controller does not support, the 'red warning' icon will appear at the bottom left corner of the CGI web interface. When this icon appears, please review your program and consult RDM technical support for assistance if required.

Get From Controller

Use this option to download the current Controller Data Builder file to a PC.

Delete

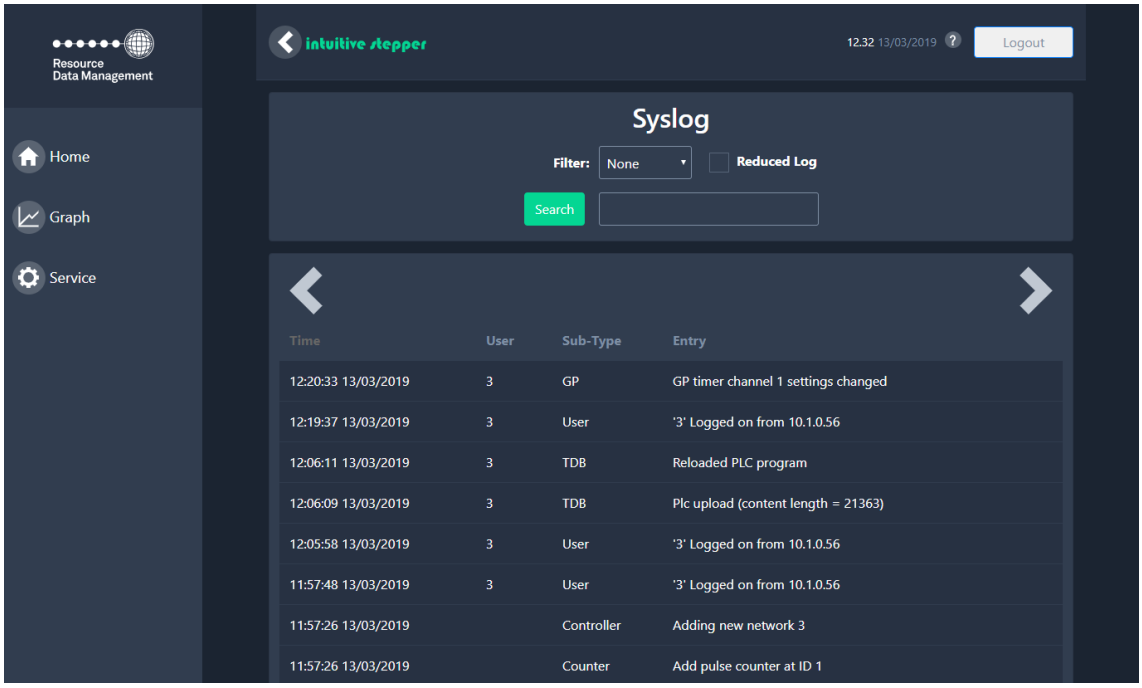
Use this option to delete a Data Builder program from the Controller

Restore

Use this option to restore the last deleted Data Builder file.

Information

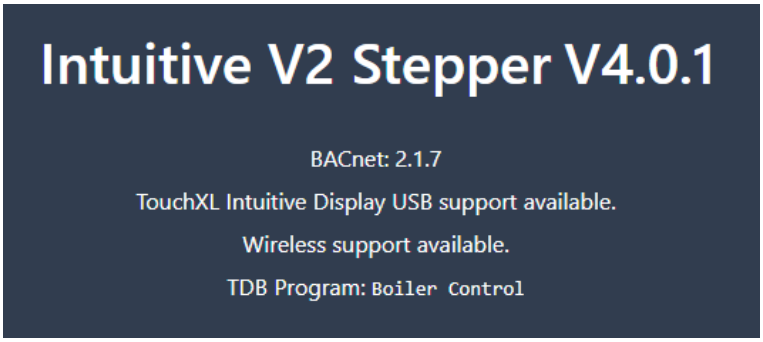
System Log



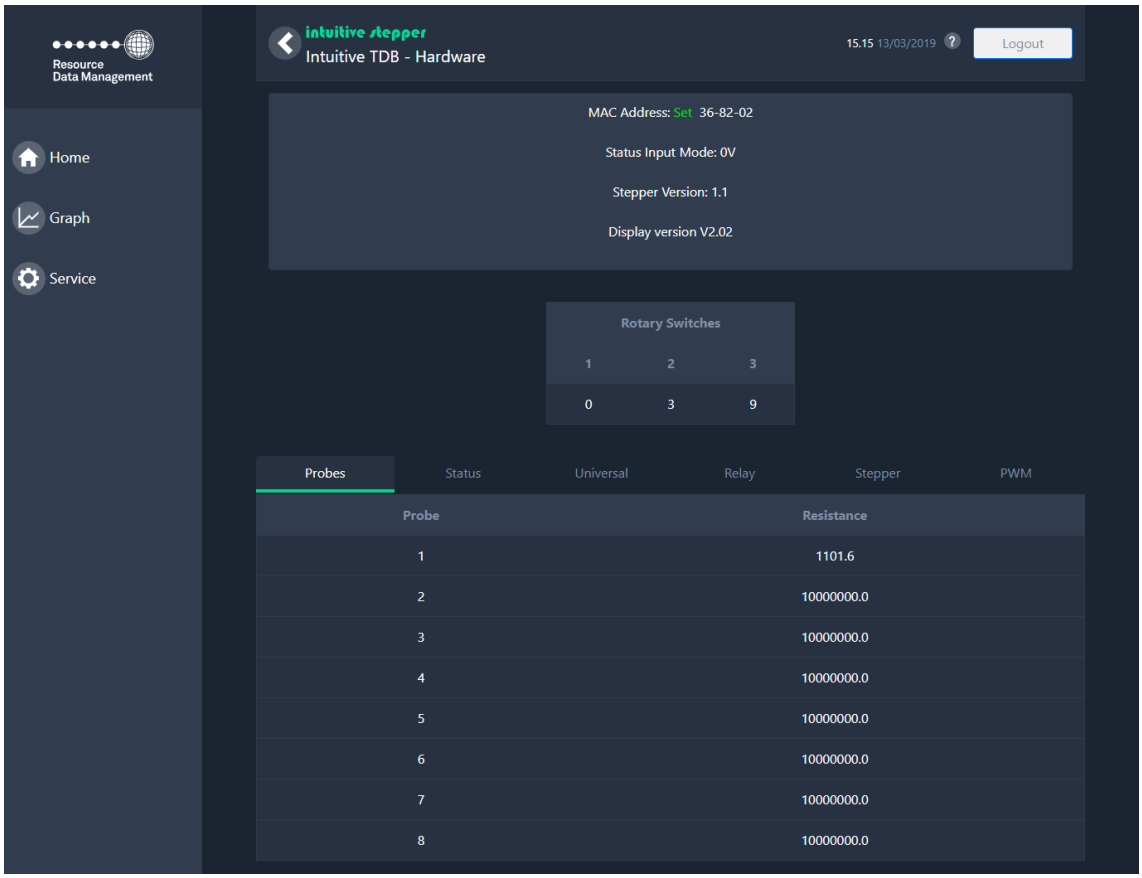
Use this option to view the system log. The system log is a record of commands that have been performed on the Controller. The system log also shows how many blocks have been used in a PLC program as well as any error messages should the maximum number of blocks permitted in a PLC program be exceeded. If the maximum number of blocks is exceeded the system log will highlight the number of blocks which the TDB program is over. **Note:** The controller will save around 300 entries in the system log.

Version

Here, information relating to the current software version running in the controller is displayed. It will also show the software version of the display if there is one attached. Furthermore it states whether Wireless/ Wi-Fi can be activated.

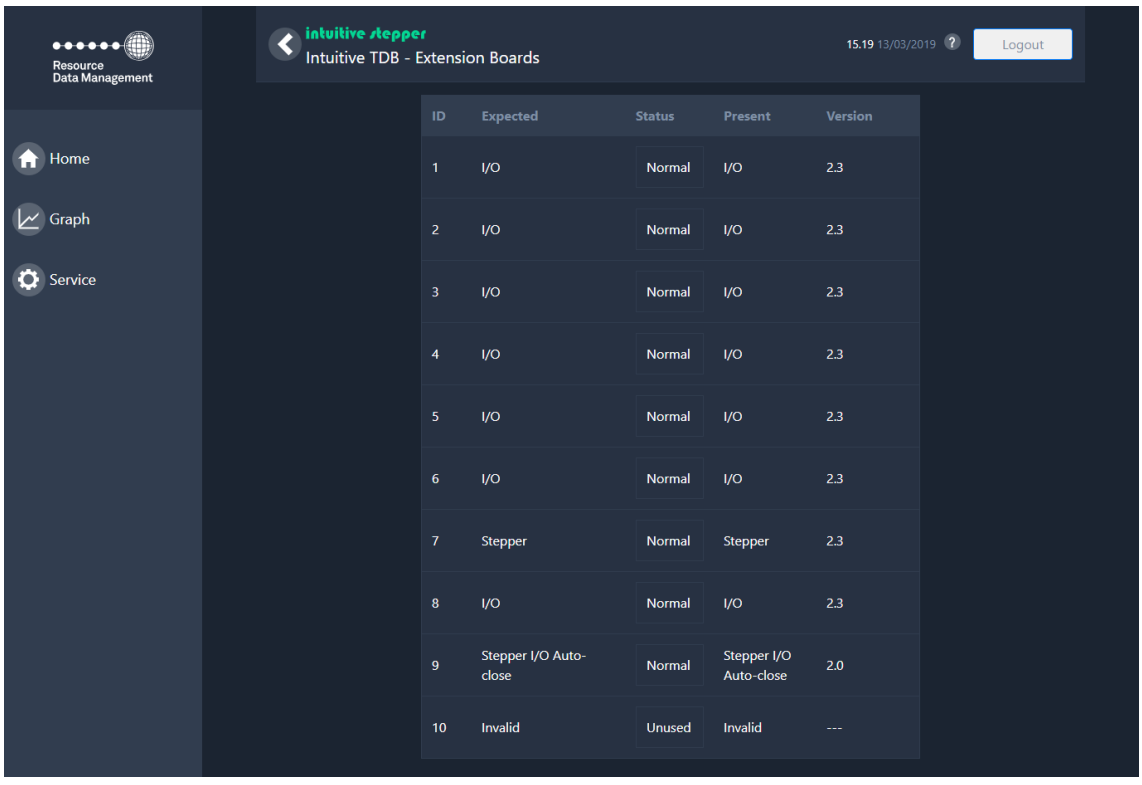


Hardware



As shown in the above screen shot viewing Hardware allows the user to check IO values for test purposes. It also provides a general overview of any other hardware setup, for example if the unit is logging to a memory stick or if there is a plant USB Touch screen attached.

Extension

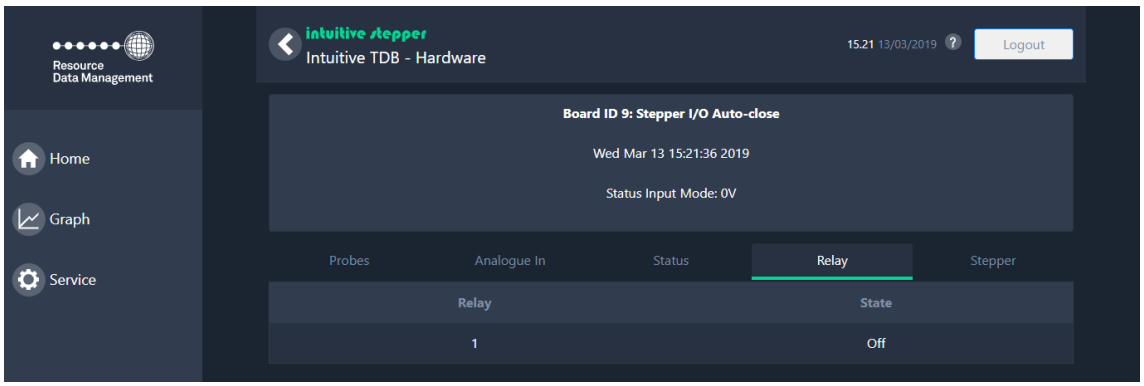


The Extension page will list the current expansion boards configured in the TDB program and their status. The 'Expected' column indicates the expansion board configured in the TDB program for that module ID number. If 'Invalid' is shown under 'Expected' then no expansion board has been assigned in the TDB program for that module ID. The 'Present' column shows confirmation of the type of expansion board detected by the controller.

With regards to the status column the following applies: -

Unused:	Board not defined in TDB program.
Normal:	Board defined in TDB program and is communicating.
Error:	Board assigned in TDB program but the Intuitive device is unable to communicate with it. Check comm's network.
Reset:	If this appears on a Stepper expansion module this indicates that a board reset command has been sent to overdrive the stepper outputs. If this appears on any other Expansion board it indicates the expansion board has had a software reset. This is expected behaviour, for example, if the Expansion board only has been powered off/on.

Clicking on any one of the present expansion boards from the list will result in a screen similar to the one below. Here the user can check input and output values for test purposes. If a board is not configured the message 'Board Unused' is shown.



Note: if a Humidistat display is connected additional Values for S1 & S2 will appear under the Probe heading. These account for the built in Humidity and Temperature sensors present in the display connected.

Broadcast Receive List

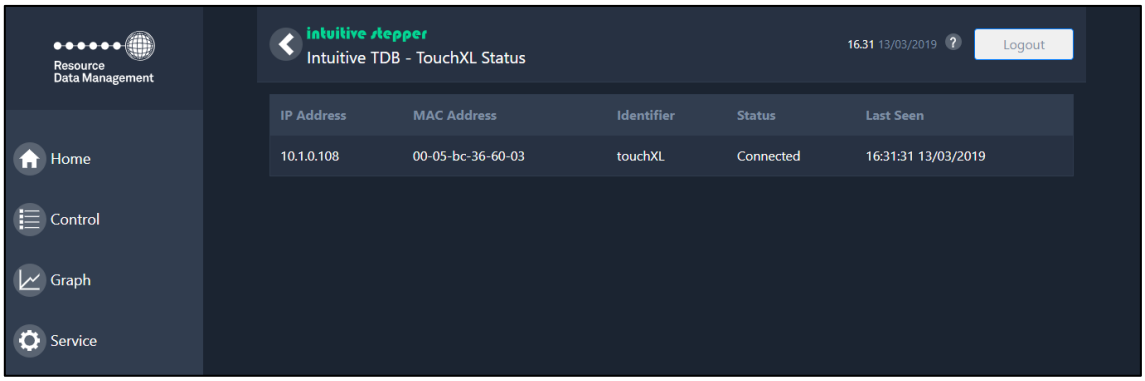
Devices running TDB applications have the ability to broadcast values across an IP network. Those devices and subsequent blocks set to broadcast, can be viewed in the broadcast receive list. The page will show the TDB device's name, block, value and the last time the point updated. If new devices are added to a network (broadcasting), the table will automatically update. For more information regarding broadcasting, see the individual blocks and the peer to peer section.

Pulse Counter

If installed the Pulse Reader counts can be checked in the Intuitive device by selecting the System tab then Pulse Counter. The channel's count can be read from this screen and also cleared on a channel by channel basis. Please see 8 Channel Pulse Reader (PR0622 / PR0622 DIN).

TouchXL Status

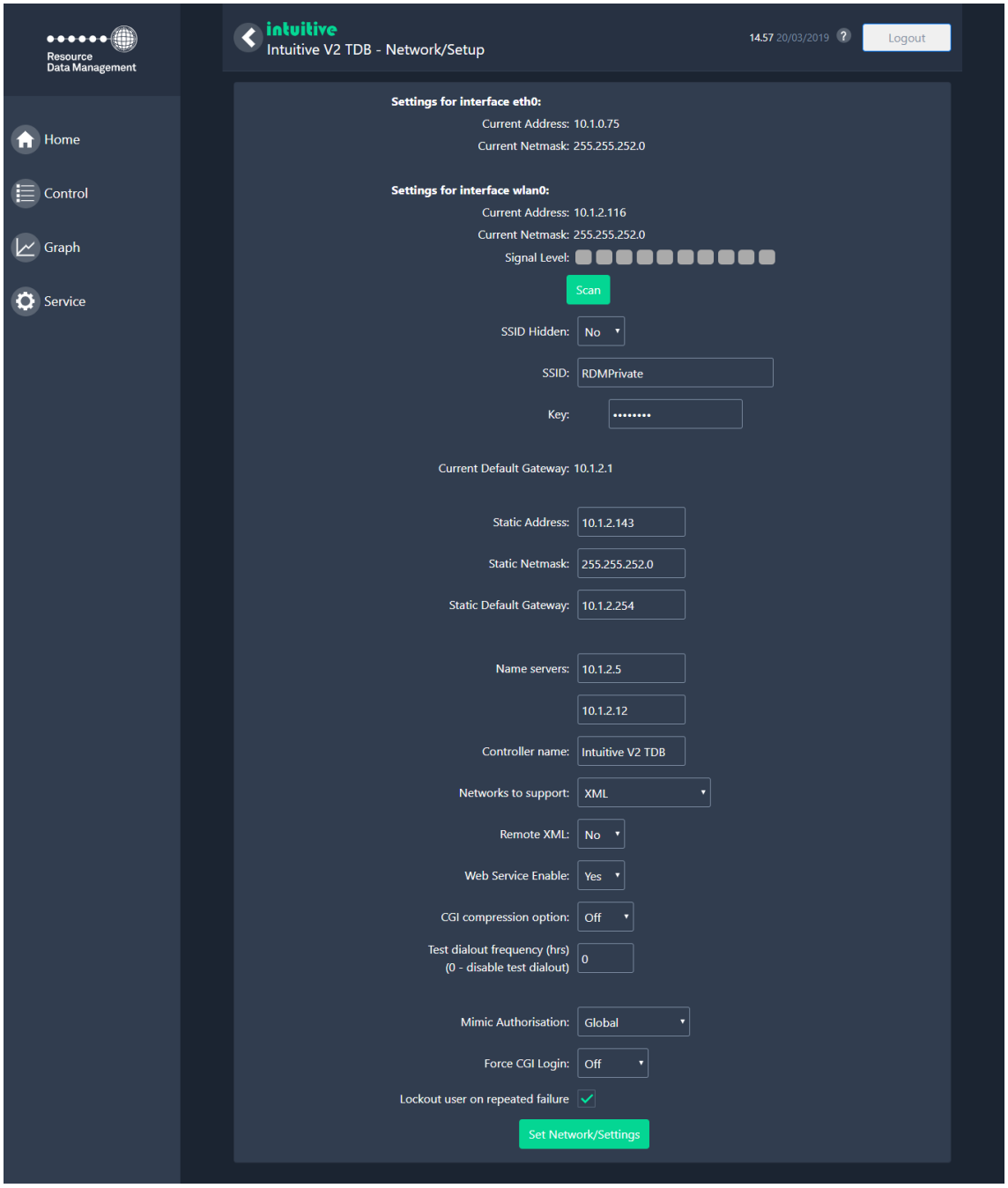
When a TouchXL Display has been connected to the Intuitive, the status of the connection between them will be shown in this screen:



System/ Settings

Network

Within the Network tab, it allows the user to configure and view the current settings for IP over Ethernet and/ or Wi-Fi.



Ethernet

If the device is connected to a Data Manager IP network, or a network which has a DHCP server, use the 3 rotary switches on the controller to set a Network ID. The Data Manager or DHCP server will then issue an IP address to the controller. The IP details will show under the current address for interface eth0 (shown above).

If the device is to be assigned a static IP address, this must be done either via the device's web pages or the LCD display (if fitted). If using the web interface the device must be accessed via USB (or Ethernet port if IP address is known). Within the 'Network' settings there will be fields available to enter the static IP details (address, netmask and gateway). Once 'set', power the controller off and set the 3 rotary switches to '000'. When powered on, the stated IP address will be associated to the Ethernet port.

Wi-Fi

Note: For the controller to communicate via Wi-Fi, along with the adapter, Wi-Fi support must be enabled on the controller. Please consult RDM Technical Support for activation.

The controller can log on to a Wi-Fi network either via DHCP or by issuing it a static IP address. To give it a static address set the rotary switches to '000'. Once powered on, the 'Network' tab will show the options allowing the user to issue an IP address, subnet mask and default gateway address for Wi-Fi. To automatically receive an IP address from a DHCP server, the rotary switches must be set to anything but '000'.

For the controller to log on to the desired Wi-Fi network, the SSID and the key to the network must be inserted in the fields within the Network setup pages. Alternatively, clicking on the 'Scan' button will list all available networks.

Note: For networks that do not broadcast their SSID, toggle the 'SSID Hidden' option, to show/ ignore them. Opting to scan for 'hidden' SSID's will lengthen the scan time.

Then, simply select the desired network, and enter the associated password*. The SSID and Key would be provided by the network administrator. Contact your IT support team should further assistance be required.

Once logged on, the Wi-Fi network signal level will indicate how strong/ weak the signal is.

***Note: Wi-Fi does not support WEP security.**

Name servers

Enter the IP address of the Primary and Secondary name server to enable DNS features. This is required when sending emails from the controller where the Mail Server does not have a static IP address and the use of a DNS Server is required.

Controller Name

The text entered in this field will appear at the top of the Intuitive TDB's webpage. This name is required for use with the Peer to Peer feature or for uniquely identifying each controller on the network. The Controller Name must be entered before the user can setup Alarms.

Networks to Support

As default, the intuitive TDB device is configured to 'XML', allowing communications over the IP network transferring XML data to, for example the Data Manager. This will allow the controller to log on to the DM's network as an IP device. To turn this function 'off', select 'none' instead.

When the 'BACnet' feature is enabled (PR0655), it will expand the options to include; BACnet/IP and RDM-485*. Please consult RDM Technical Support for activation.

Note: Access to the controller's web pages via Ethernet port/ USB is always possible regardless of selected network.

All options are listed;

XML:	The Ethernet port will utilise the IP network transferring XML, allowing the device to log on to a Data Manager as an IP device.
BACnet/ IP:	The device will use the BACnet protocol via the Ethernet port to communicate over a BACnet network.
XML and BACnet/ IP:	Uses both XML and BACnet protocols, via the Ethernet port, simultaneously.
RDM-485*:	Using the RDM 485 Plant TDB comms module (PR0623-DIN TDB), the device will communicate using RDM-485.
XML and RDM-485*:	Uses both XML and RDM-485 protocols, simultaneously.
None:	XML, BACnet and RDM-485 are disabled.

If either BACnet or the RDM-485* networks are selected, they must be configured in the BACnet/ RDM-485 setup page.

***Note**: RDM-485 network is compatible with DMTouch software V2.5 and above.

Remote XML

Remote XML can either be set to 'yes' or 'no'. When set to 'no', the device cannot be logged on to a remote Data Manager out with its own subnet. When set to 'yes' it will allow it.

Web Service Enable

Option to either enable the Web Services feature or disable it.

Note: All Web Services functions (read or write) will require authentication when Force CGI is set to 'Remote'.

CGI Compression

CGI compression relates to data that is sent to the browser used to view the controller's web interface. Data from the device can be compressed/ zipped (reducing data size) before sending it to the browser. The field can be set for; Off, On or Auto. If unsure, always leave on 'Auto'.

Off: Never compress any data sent to the browser.
On: Always compress data sent to the browser.
Auto: The device will detect automatically if the browser can handle compressed data.

Test Dialout Frequency

Where the device has been setup on a network, a 'test dialout' can be sent periodically to aid in highlighting communication issues. The value is set in hours and at these time intervals, a dialout notification is sent to the designated modems. For this feature to operate correctly the alarm setup must be configured.

Mimic Authorisation

When mimics have been setup to view, either on the web interface or the TouchXL, restrictions can be enforced to prevent unauthorised users interacting with them, for example pressing overrides or moving sliders. Select from the following;

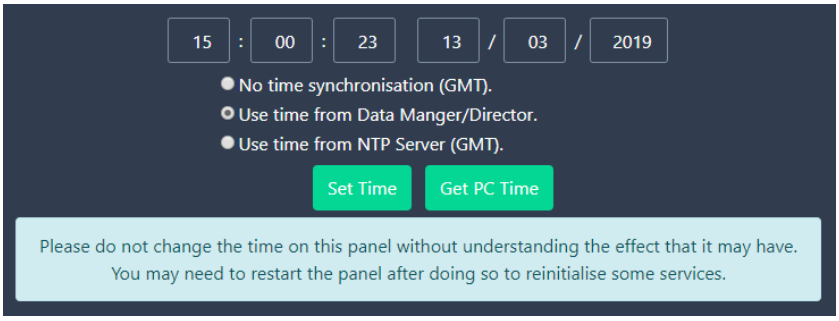
Logged-In only: Only permits interaction of mimics (from TouchXL or web interface) when user is logged in.
Panel: Permits interaction of mimics without requirement of log in from the TouchXL interface.
Local: Permits interaction of mimics without requirement of log in via local IP access i.e. remote access from within another subnet will require a log in.
Global: Allows interactions from any interface without being logged in.

Force CGI Login

Upon viewing the Intuitive TDB's web page, the 'Force CGI login' feature will dictate whether the user must be 'logged in' before they can view the device's home screen (IO list or mimics). The options will be either 'off' or 'Remote'. When the option is set to 'Remote' (default) the web CGI will only show minimal details removing any logos or site information.

Note: All Web Services functions (read or write) will require authentication when Force CGI is set to 'Remote'.

Time



No time synchronisation: Here the current time can be manually entered or if the 'Get PC Time' is used the fields will be filled using the current time and date from the PC.

Use time from Data Manager: If the controller is logged onto a front-end system its time clock can be synchronized with the Data Manger time clock. Check the tick box and press 'Set Time' to enable this feature.

Use time from NTP server: Here the IP address of an NTP time server can be entered. The controller will then synchronise with the NTP server time/date. **Note**: you must seek the permission from the owner of the NTP time server before directing the controller to it.

Note - If the time or date has been changed the user must restart the controller via the software feature 'Reset' or by powering the unit off/on.

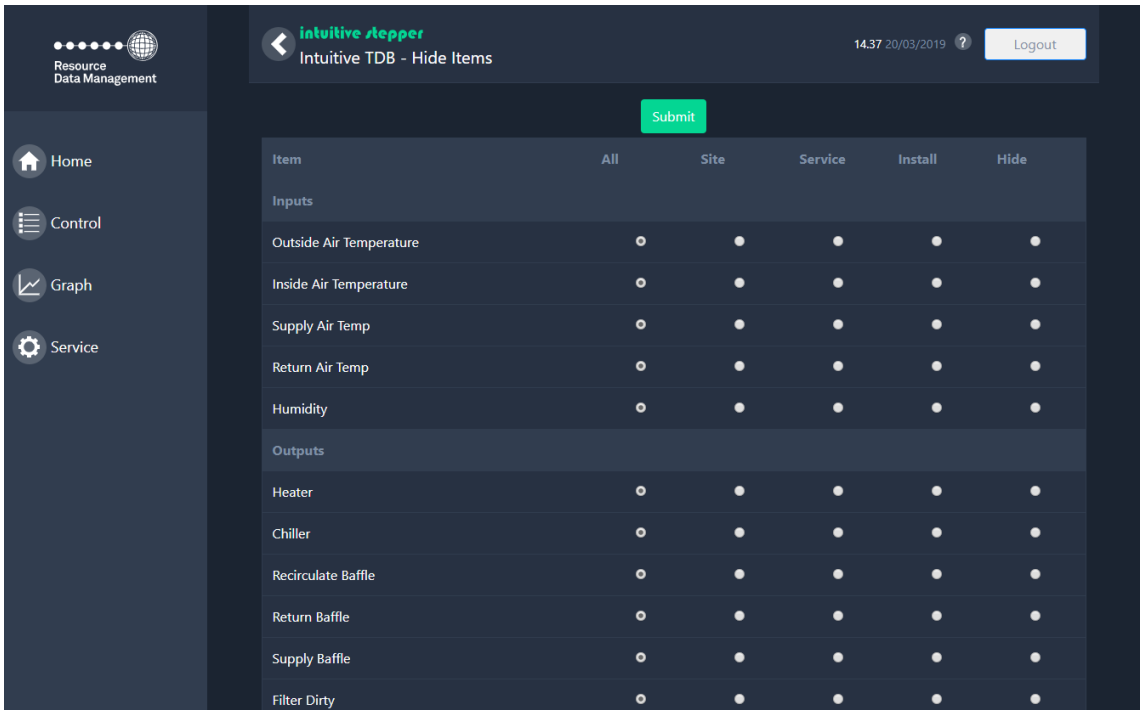
As default the controller operates in GMT and obeys BST when operating stand alone. If the controller is connected to a Data Manager then its time and date will be synchronised with it. If you wish to operate the controller stand alone in a time zone out with GMT then this can be achieved using a time zone upgrade file. Please contact RDM Technical Support for further details.

Locale

From within this menu the device can have its location and language preferences set. Use the drop down menus to select the desired settings.

Visibility

Following the creation (or upload) of a TDB program, the levels of which a user can view specific items (inputs, outputs or parameters) can be set. **Note**: when used in conjunction with the Data Manager (software V2.3 and above), these visibility settings will be transferred.



Within the 'Users' setup page, levels of access can be set to limit access to configuration and settings for the specific log-ins. Those user levels are; Install, Service and Site.

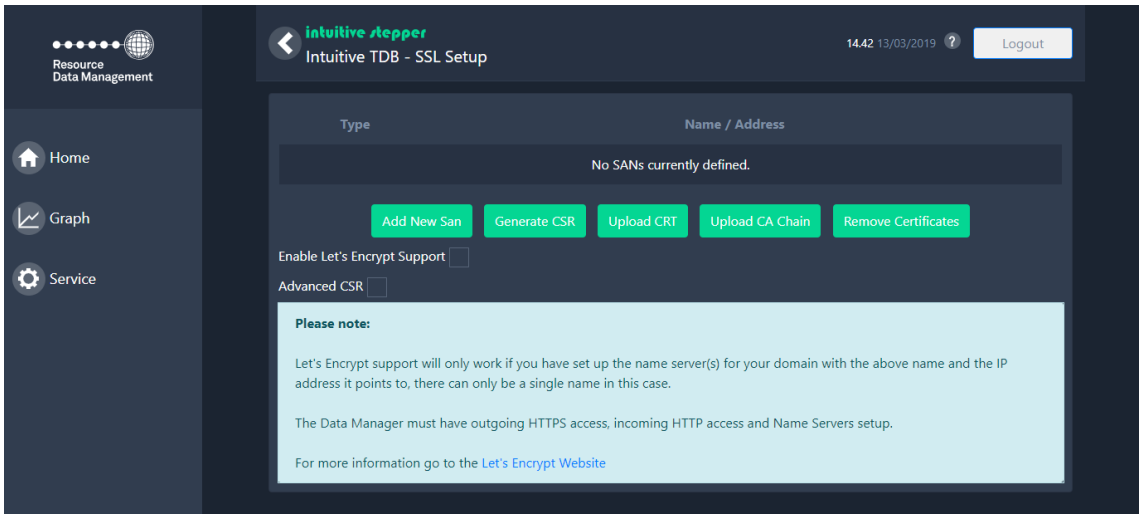
When in the Visibility menu, it will list all inputs, outputs and parameters that are in the TDB app. By using the radio buttons, choose the level at which the item is visible to the user level. Or completely hide the item from altogether.

SSL Setup

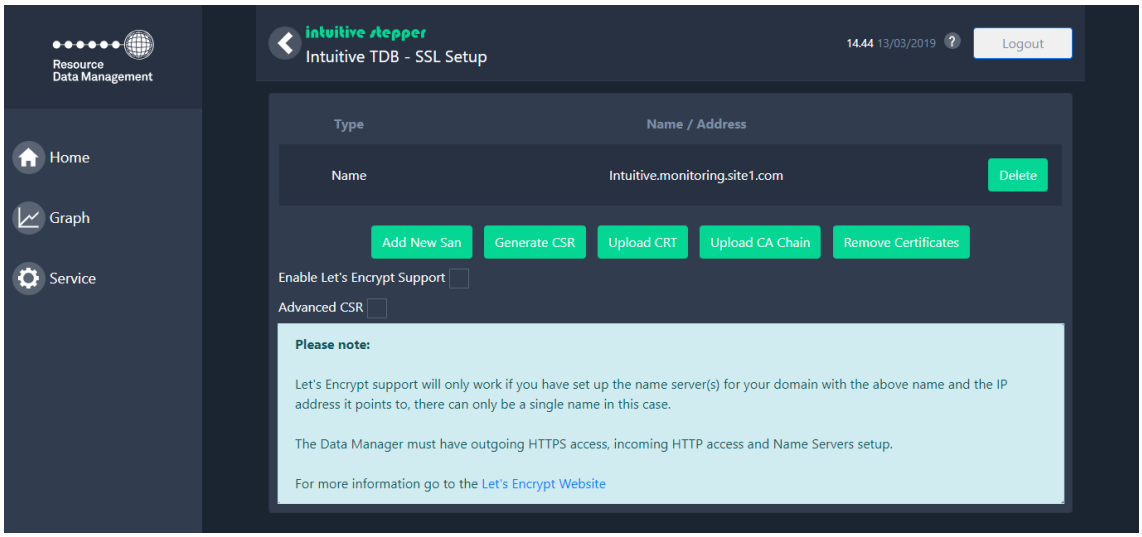
The TDB device offers the facility to allow SSL (Secure Sockets Layer) encrypted connections, offering a more secure link to its IP/URL. As with any SSL server/ client technology there is a strict process to set it up.

Note: To configure this feature requires specialist knowledge, please consult with an IT professional or your support team for further assistance if you are unsure.

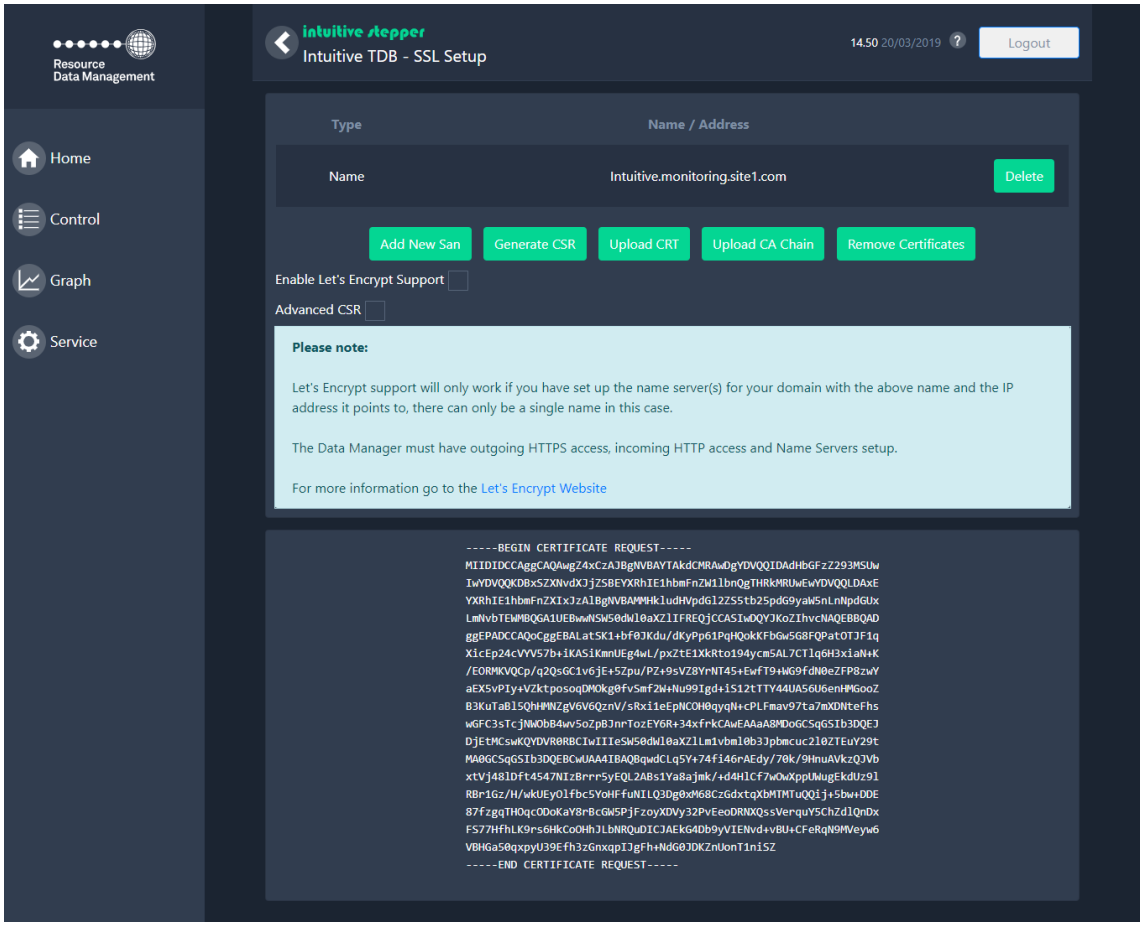
Entering the feature will show the below page;



To begin, click in 'Add New San' (Subject Alternative Name). This will allow the user to enter the Intuitive's IP address or hostname used to access it;



Click on 'Add'. This will add the URL/IP address to the table. When it's entered and listed, click on 'Generate CSR' (Certificate Signing Request). To which will produce something similar to the below;



The lines of text generated is what's required to be sent to the Certificate Authority (CA), therefore copy and paste the code into a text file and send it direct to them.

The CA will send back a 'CRT' file containing the public and private key pair used for encryption. When received, click on 'Upload CRT', select the file and upload.

The signing CA should publically make available on their website a trust chain file, use the 'Upload CA Chain' to upload the file.

Once completed the Intuitive will be accessible using the SSL encryption.

Note 1: The Intuitive will still be accessible using the https://<IP address> without a certificate, however unless the user installs a properly signed certificate as outlined above, most browsers will display warnings and security precautions.

Note 2: Http access will still be available over the standard port 80. When https is used it will also open standard port 443 for access.

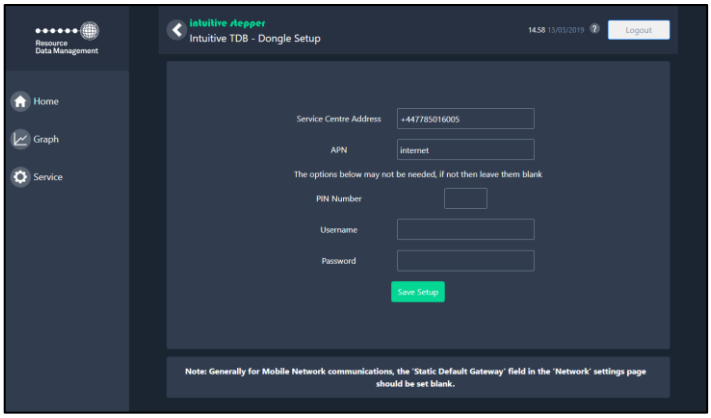
Let's Encrypt

The SSL setup section includes support for Let's Encrypt. Let's Encrypt is a service that provides digital certificates which are required to enable https connection to websites. Having Let's Encrypt support has a number of advantages as it provides a free, automated, open and transparent solution. To enable this 'check' the box.

Please consult the Let's Encrypt web site for more details.

Mobile Network Setup

When enabled (part No PR0496-3G), this feature will allow alarms to be sent over a mobile data network in the form of an email or to a URL (depending on alarm setup). **Note**: it will not send SMS.

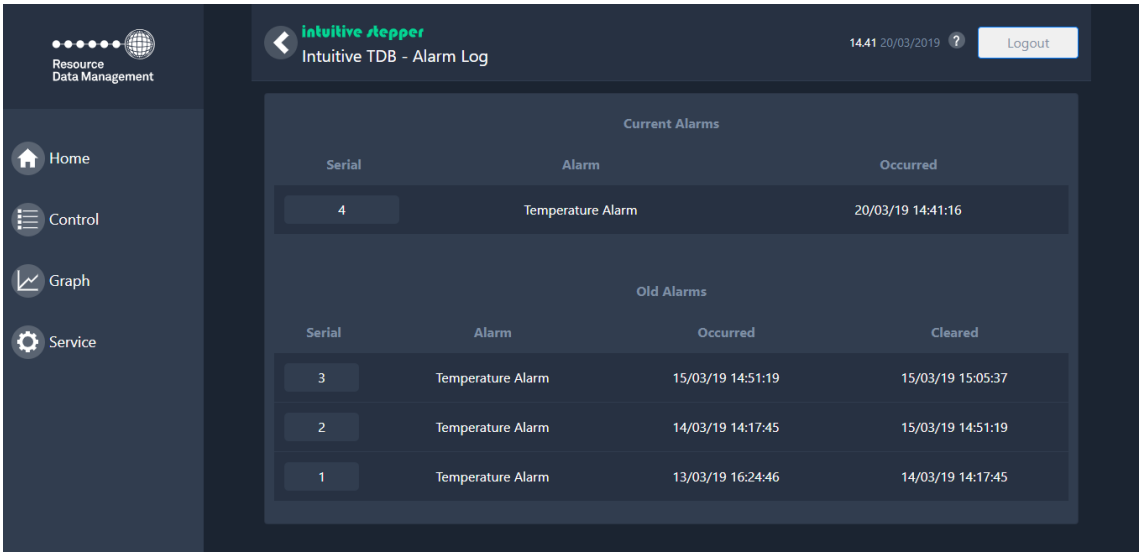


This page must be filled in for the GSM modem to operate correctly and the details required, can be found by contacting the service provider. Above is an example with Vodafone details entered (please note these details may be changed at any time by the service provider).

Alarms/ Export

Alarm Log

Alarms created by any alarm block are recorded in the controller alarm log. Here current alarms are shown as well as older alarm history.



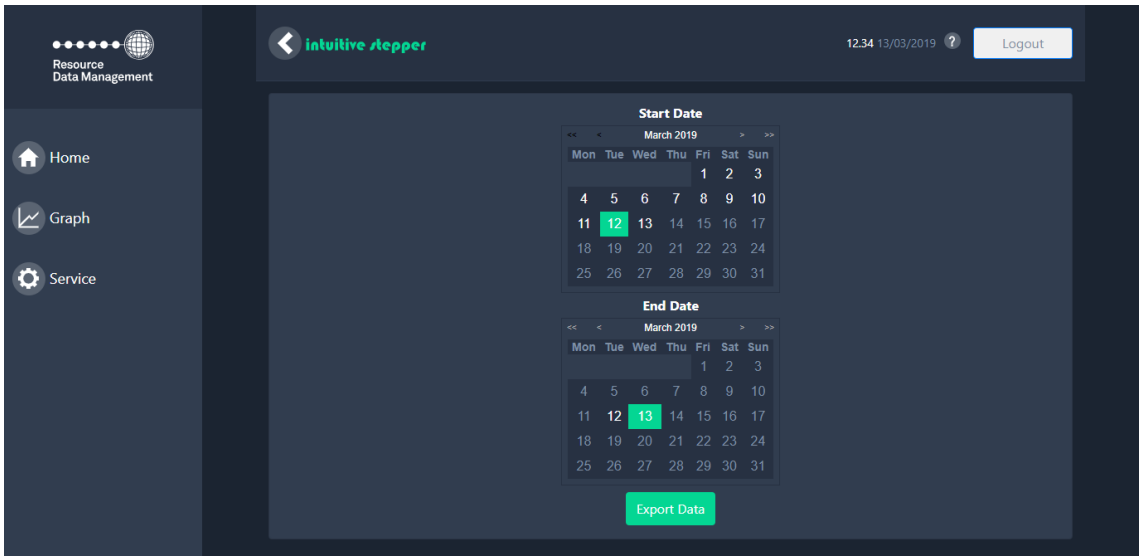
Serial: Each alarm generates a unique serial number. Click on the serial number for more information.
Alarm: Gives the description of the alarm (Description taken from alarm block which generated the alarm).
Occurred: Shows the time at which the alarm was generated.
Cleared: Shows the time at which the alarm has cleared.

Mute All Alarms

When multiple alarms have been generated from the PLC, they will sound out on a display if connected to the intuitive TDB. This function will silence the audible alarm from any displays. **Note**: it will not clear any alarms or prevent them being sent to the modems if setup.

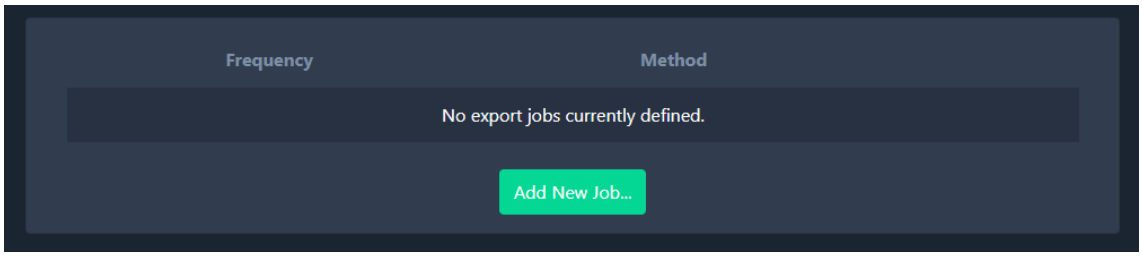
Export Data

Use this feature to extract data - select the Start Date then End Date and follow the on screen instructions.
Note: Log data will extract all external points in the controller at 15 minute intervals.



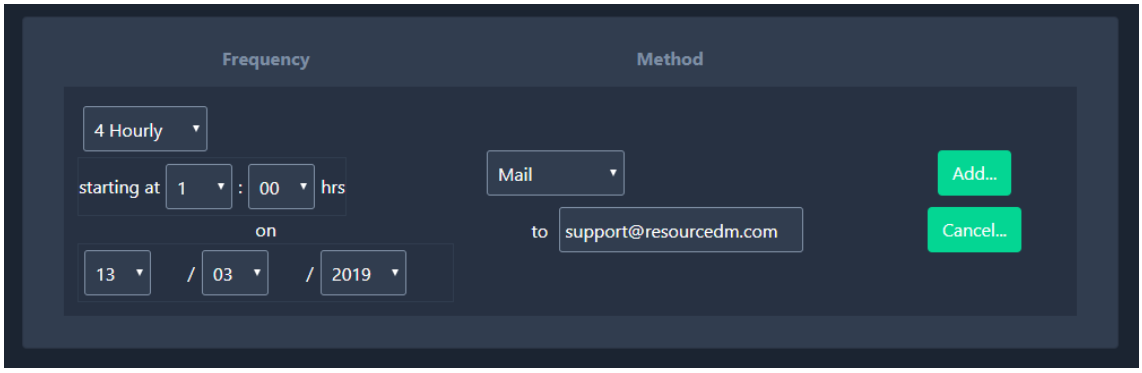
Log data is written to the controller's internal memory or a USB memory stick (if used) every 30 minutes, on the hour and ½ past the hour. If a software restart is initiated the controller will save any log data to memory or a USB memory stick (if fitted), before restarting thus minimising any possible data loss. The extracted file is a compressed 'zip' file, use standard windows routines to extract the data you want from the file. **Note**: the graphical interface or export log feature must be used to view/extract data on a USB memory stick as the logged data is encrypted.

Auto Export



This feature allows for logged data to be sent to a remote destination periodically. On viewing this page a list of the current automatic export schedules will be shown. If no schedules have been configured then 'No export jobs currently defined.' will be displayed.

Click 'Add New Job…' to create a new automatic export schedule. A screen similar to the one below will be shown.



Frequency: Select either hourly, 4 hourly, 12 hourly, Daily or Weekly from the drop down list. Now enter a start time and date.

Method: Select from;

Mail	- send the data as part of an email. The mail server must be configured.
FTP	- send data using the File Transfer protocol. See format below.
HTTP Post*	- send data using the post function of the HTTP protocol. Enter the URL/ IP address of the server that can accept such posts.
HTTPS Post*	- send data using the post function of the HTTPS protocol. Enter the URL/ IP address of the server that can accept such posts.

*__Note__: Prior knowledge of function is required and RDM cannot support setup of a receiving server.

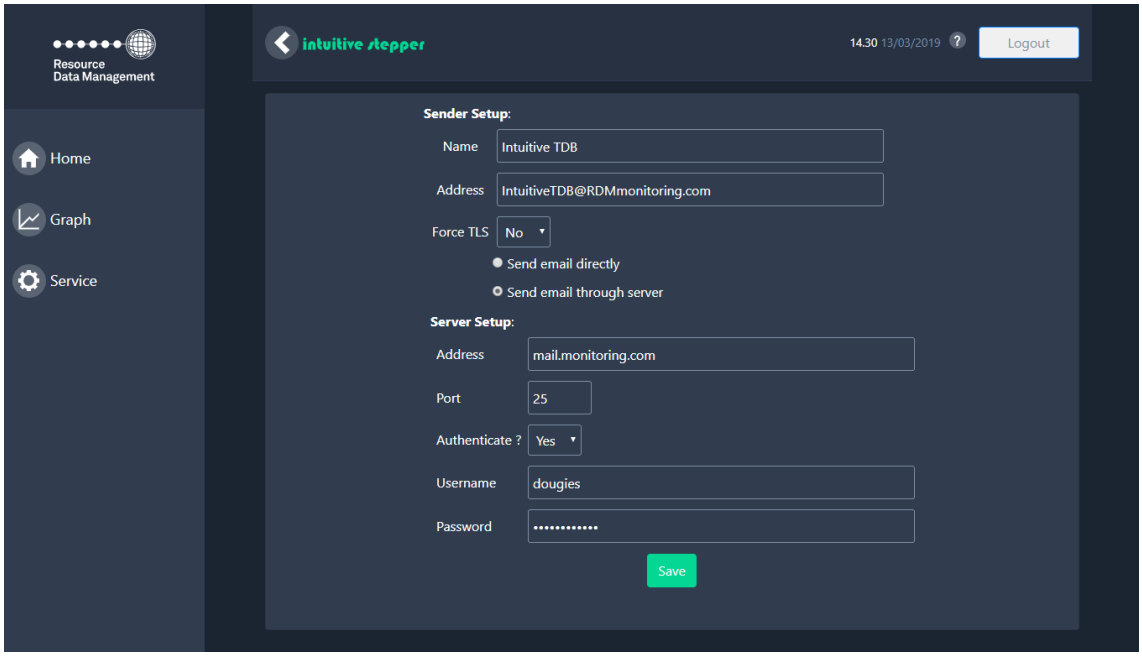
The file format sent will be a compressed CSV file with split date/ time.

Format of FTP: username:password@host/path/
e.g. support:12345@10.1.2.10/receiver/log/
Note: username and password must not contain and non-alpha numeric characters (}[#>).

Note 1: Using this feature will export log data at a 15 minute sample frequency regardless of a USB memory stick being fitted or not.

Note 2: If the automatic export should fail, it will continue to retry, incrementing the period of time between retries each time.

Mail Setup



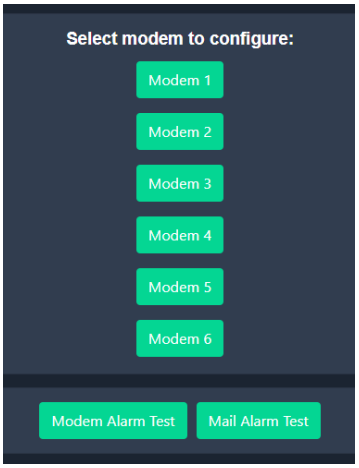
Sender Setup

Name:	Name that is appended to the sent alarms.
Address:	Email address that is appended to the sent alarms.
Force TLS:	If set to 'No', then if TLS Authentication fails it will try Plain Authentication. If Force TLS is set to 'Yes', it will only try TLS Authentication.
Send e-mail directly:	Sends the e-mails directly to the destination server, please note this may or may not work depending on the setting of firewalls and e-mail servers between the TDB controller and the remote system.
Send e-mail through server:	Sends the e-mails through an intermediate server. If enabled complete the fields required for Server Setup.

Server Setup

Address: Address of mail server used to send alarms e.g. office mail server.
Port: Defaults to '25' but may be changed if required.
Authenticate: This option should be set to 'Yes' if you need to authenticate when sending a mail.
Username: If authentication required enter a valid username for the mail server account.
Password: If authentication required enter a valid password.

Modem Setup

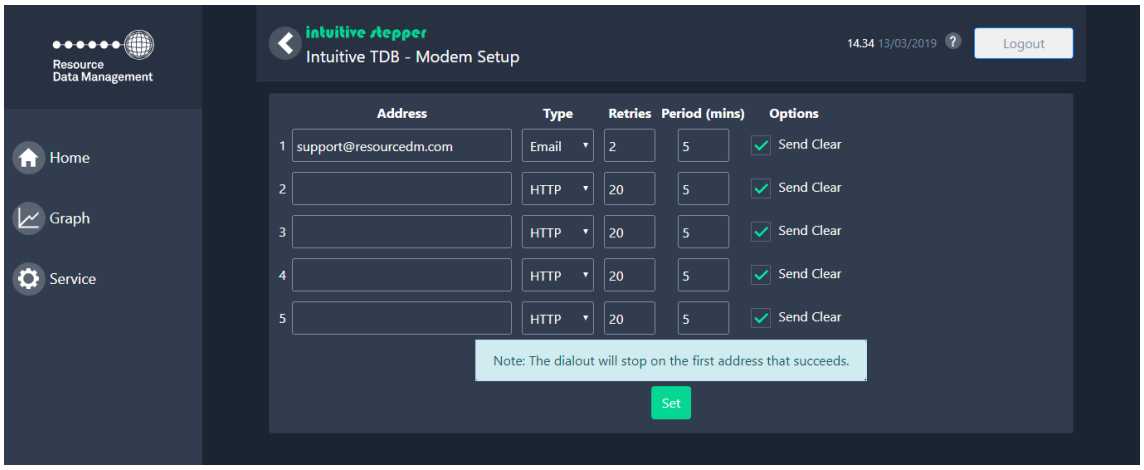


Any alarm generated from an alarm block can be sent to up to 6 modem destinations via the controller's IP network connection to a URL or email. The RDM software application Monitoring Remote Station (MaRS) can be used to receive and view the alarms generated by the TDB program. Selecting the 'Alarm Setup' tab will display the six modems (pictured on right).

Note: There must be a valid 'Controller Name' entered within the Network Setup page before modems can be setup.

Selecting between modem 1 through to modem 6 will show a page similar to the one below.

Note: Once configured, the user can then test the setup, by using the Modem/ Mail Alarm test buttons.



Address: Enter the destination URL/ IP or email address for the alarms to be sent. **Note:** If a domain name is entered, then the Name Server field(s) must be configured under the 'Network' setup heading.
Type: Select from HTTP, HTTPS or Email. **Note**: HTTP and HTTPS use the post function and prior knowledge of setup is required. RDM cannot support setup of a receiving server.
Retries: Number of retires before moving on to the next modem address should the alarm fail to dial out on the current modem address.
Period: Time delay in between each retry.
Send Clear: When an alarm is no longer present a 'Clear' alarm can be sent. Tick to enable this feature.

If alarms are to be sent to an e-mail address, the mail server setup must be completed. See: Mail setup

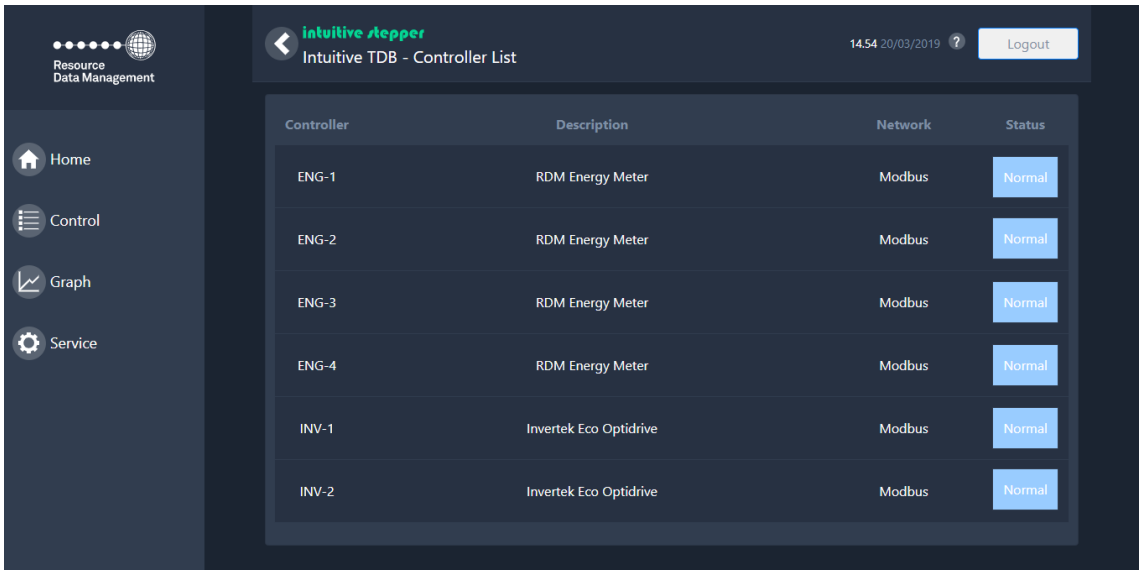
When a modem is set to use either the Http or Https protocol, the alarm is sent as an 'xml' packet. Within the packet there are different fields describing the specific alarm, two of which are 'Controller' and 'Alarm'. These fields relate to the Controller Name (set in network menu) and the alarm alias within the individual alarm blocks (set in TDB application). It is possible to override the Controller Name from within the individual alarm block by using the '#' symbol in the alias. Within the alarm block, alias it using the format; **controller name#alarm name.** Note no spaces before or after the # symbol.

Example;
Alias the alarm block as 'Device Number 23#Over Temperature Alarm'
This will define the xml fields as;
<controller>Device Number 23
<alarm>Over Temperature Alarm

Network

List

The TDB device can log devices onto its own network interfaces, specifically via Modbus. For the hardware options and basic setup see the USB Devices and Add Device sections. Selecting the 'List' option from the Network tab, will allow the user to browse the devices currently logged on. The Status will only show 'Normal' or 'Offline'. To view a device's IO values, simply click on the device.



Modbus devices will go offline immediately after loss of comms.

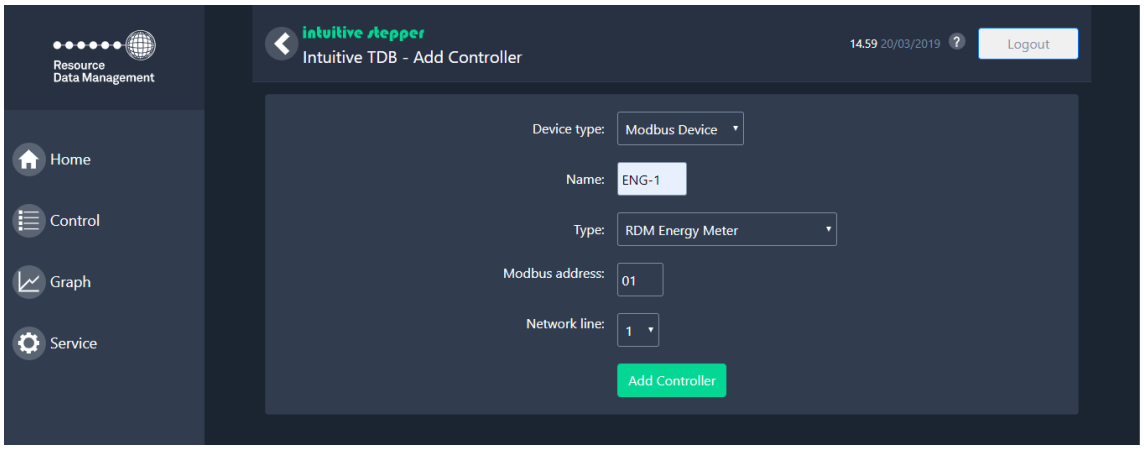
Note: No offline alarms will be generated. This can be setup using an analogue device input block.

Device values

The following screen is displayed when the 'INV-1' device is selected from the Device List:

Add Device

The 'Add Device' page is available for the user to add Modbus devices to the List of Networked Devices. Entering the page, will show a page similar to below:



Device Type:	Leave as Modbus Device
Name:	Enter a 6 character name (Avoid using control characters in the name)
Type:	Select from the drop-down list
Modbus Address:	Enter the Modbus Address (Decimal) that you have programmed in to the Modbus device.
Network Line:	Select the network line that is connected to the device (1 or 2)

Once this table is complete, click on Add Controller to bring the device on-line.

The following Modbus devices are available to select as standard:

Device	Device
Flash D Power Mon (4 Wire)	Schneider PM710
VIP396 Energy Meter	Flash D Power Mon (3 Wire)
4MOD Pulse Counter	Sirio Energy Meter
Autometer IC970	VIP396 Energy Meter (IEEE)
Socomec Diris A20	Shark Energy Meter
AEM33 Power Monitor	Powerscout
Enviro ENV901	Enviro ENV900
RDM Energy Meter	

Remove Device

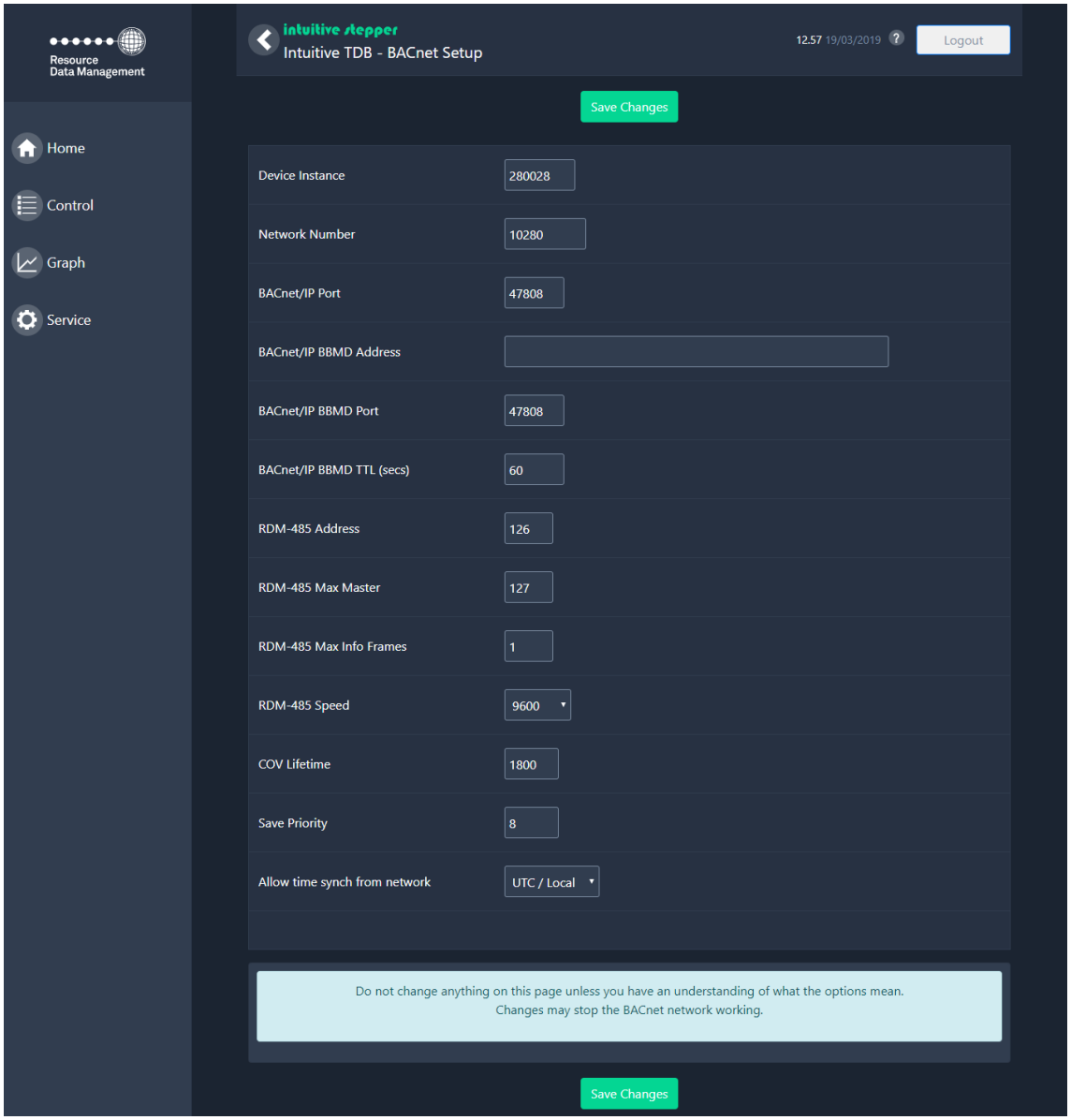
To remove a device, click on the 'Remove Device' tab, select the controller to remove and then click the 'remove Controller(s)' button. With wireless mesh devices, as they log on automatically, they must be not be connected to the network at the time of removal. Else they will continue to re-log themselves on.

Device values in a TDB program

To use one of the device's values in a TDB program, an appropriate input block must be used (analogue or Digital). RDM recommend the Analogue Device Input Block as this has an associated 'Offline' function. See block description for more details.

BACnet/ RDM-485 Setup

When the BACnet option (PR0655-BAC) is enabled, it will permit the TDB device to communicate over BACnet/ IP using the Ethernet ports. Additionally, it also allows the unit to communicate over RDM-485 using the RDM 485 Plant TDB comms module (PR0623-DIN TDB). Configuration of both BACnet and RDM-485 networks can be carried out within this menu. **Note**: for the Intuitive TDB to communicate using either BACnet or RDM-485 protocol ensure it is selected from within the Network setup pages.



Device Instance Unique instance number of the TDB Controller. Default 280028.

Network Number Network number the Controller is to communicate on. Default 10280.

BACnet/ IP Port Virtual port number for IP protocol to communicate on. Default 47808.

BACnet/ IP BBMD Address BACnet Broadcast Management Device IP address

BACnet/ IP BBMD Port BACnet Broadcast Management Device Port. Default 47808

BACnet/ IP BBMD TTL (min) BACnet Broadcast Management Device Time To Live setting.

RDM-485* Address Unique address for the Intuitive TDB device while communicating over RDM-485. Default 126.

RDM-485* Max Master MSTP Max Master. Default 127.

RDM-485* Max Info Frames MSTP Max Info Frames. Default 1.

RDM-485* Speed Select the MSTP network speed; 9600 or 38400.

COV Lifetime Change of Value period in seconds.

Save Priority The BACnet priority field is selectable between 1 and 16. It sets the priority level, at which an override with this priority number or above, is treated as a non-volatile parameter 'set' and so will be set and saved as that item's parameter value. So, when set to a value of 8, any override of priority 8-16 will be saved as a parameter.

Allow time synch from network Select from; UTC/ Local; Local; UTC or None. Permits time synchronisation from another networked device.

Please refer to the 3rd party BACnet client if you are looking for assistance logging the device on. Only users with a detailed knowledge of the BACnet protocol should amend these details as altering them can have detrimental effects on the communications.

*__Note__: RDM-485 network is compatible with DMTouch software V2.5 and above.

BACnet Object IDs

When the TDB device is configured for a BACnet network, the IO list will automatically be assigned unique object ID's. In version V3.4.0 and above the method of enumeration for the object ID was enhanced allowing for minor changes in the plc, permitting additions and slight alterations without affecting the current ID's.
Note: Any software upgrades made from devices with pre V3.4.0 software will affect the object ID numbers.

Type Writer

For Modbus devices that are not listed in the 'Add Device' section, the Type Editor feature allows a user to write their own 'typefile' (or template) to allow communications (read only) to a 3rd party device. For successful communications, the device must be compatible with RDM's USB RS485 dongle (please see the configuration section). The TDB controller can have multiple user-generated types enabled, activated one at a time with part number PR0655-TYP. The Type Editor User Guide can be found in appendix 5. The created user type will then be selectable in the 'Add Device' Section.

The Modbus template generation feature, Type Editor, requires the user to have a full understanding and working knowledge of the Modbus protocol. RDM Technical Support cannot provide training or assistance in relation to the Modbus protocol and the commands implemented therein. Support will only be provided to those conversant with Modbus and in relation to the Type Editor functionality specifically.

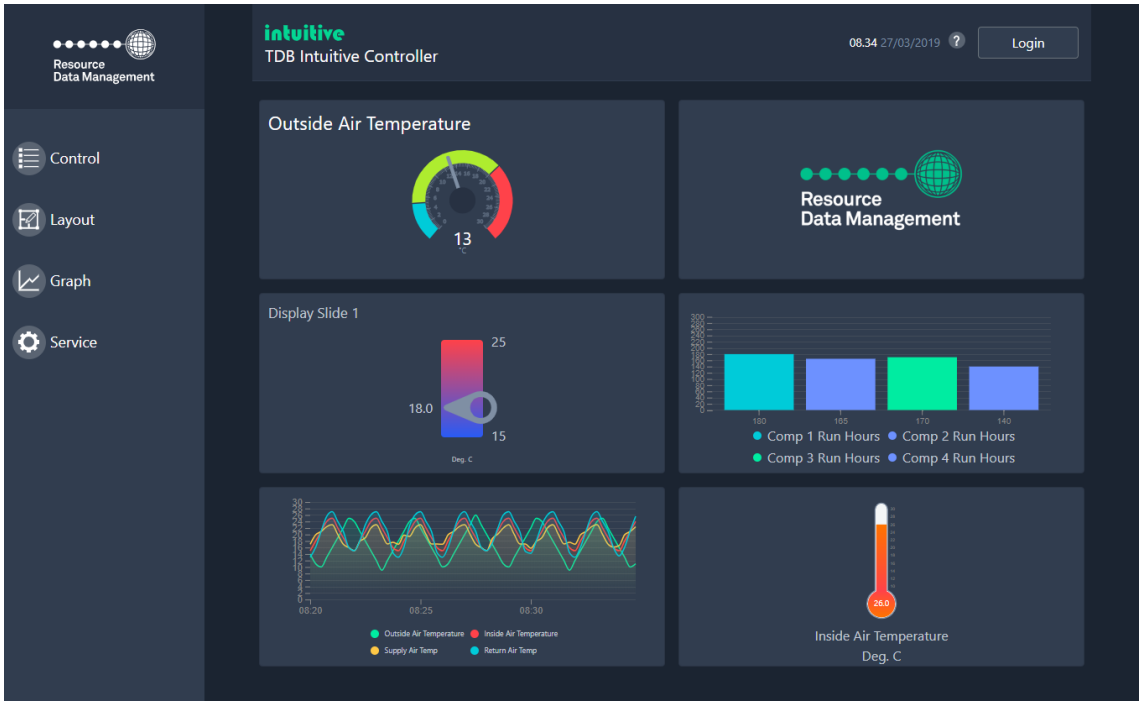
For users unfamiliar with Modbus, RDM provide a template creation service allowing for a template to be generated for the 3rd party device in question. A nominal fee will apply for each template created by RDM

Note: the above process relates to creating 'Read Only' templates. For Read/Write templates please contact RDM Technical Support.

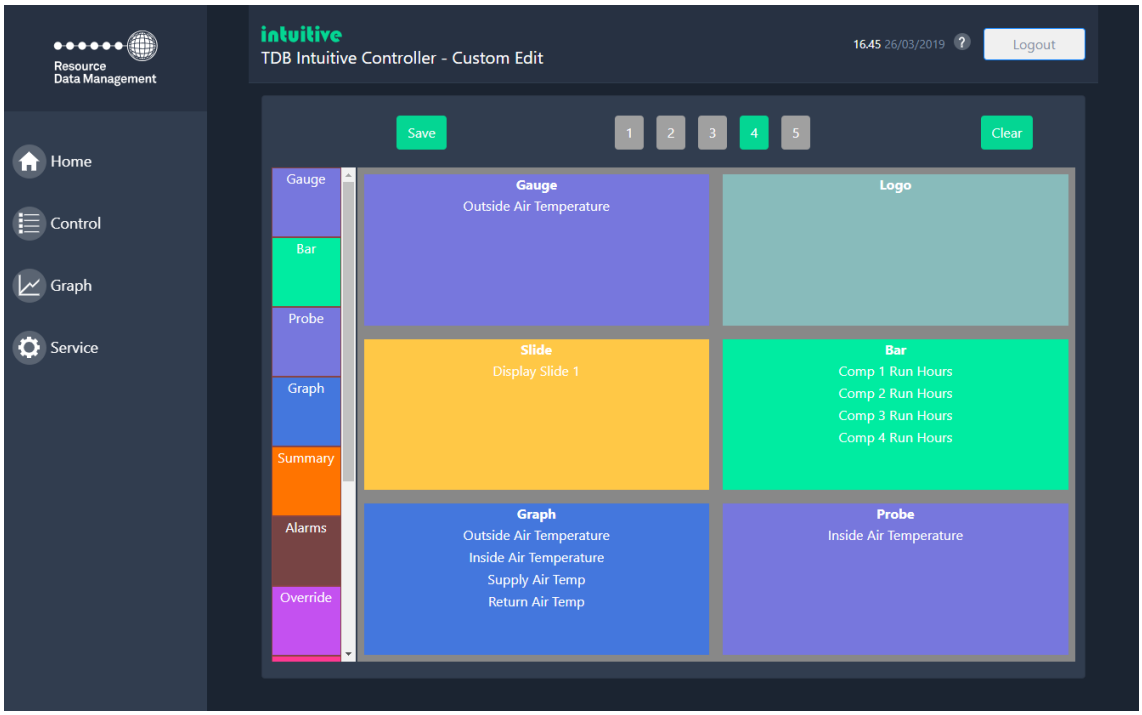
Layout/ Display

Custom Home Page

When configured the TDB device's Home screen will default to show the Custom Home Page. This can be configured from within the Custom Home Page feature. An example is shown below.

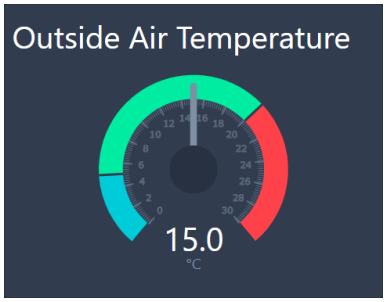


Upon entering the Setup page, if nothing has been configured, it will show a blank page with the options listed down the left side of the page. If a screen has previously been configured, it will look similar to below.



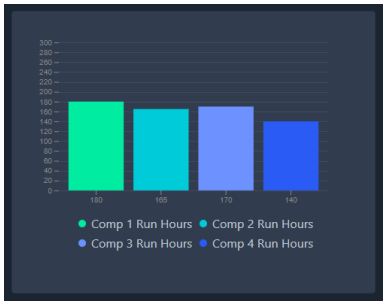
The icons listed on the left of the viewing pane can be dragged and dropped to the desired location. Once placed, the individual sections can be edited by double clicking on them. Depending on the selected widget the options to configure it will differ. Details are below.

Gauge



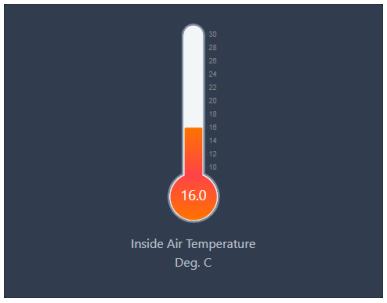
Value Item: Select from the drop down menu the item to be used.
Min: Minimum value the gauge will show.
Max: Maximum value the gauge will show.
Low: The low limit that outlines the lower band of the gauge.
High: The High limit that outlines the high band of the gauge.
Low Band: Select from the drop down menu the colour the Low band will have.
Main Band: Select from the drop down menu the colour the Main band will have.
High Band: Select from the drop down menu the colour the High band will have.

Bar



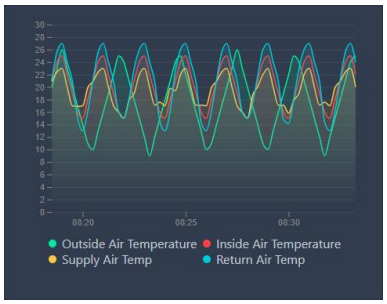
Item x: Select from the drop down menu the item to be used.
Colour x: Select the colour for the item to have
Min: Minimum value the graph will show.
Max: Maximum value the graph will show.

Probe



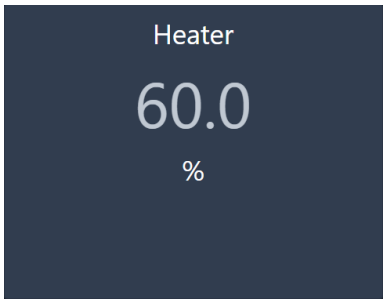
Value Item: Select from the drop down menu the item to be used.
Min: Minimum value the probe will show.
Max: Maximum value the probe will show.
Alert: Select an alarm the probe can be associated to (optional).

Graph



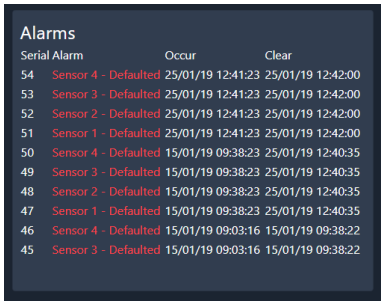
Period: Select the frequency the graph updates values. The higher the period set the greater the overall time period the graph shows. Select between; 15s, 1min, 5min, 15min, 30min and 1hr. Then select if the graph should use 'Absolute' values or 'Relative'.
Min: Minimum value the graph will show.
Max: Maximum value the graph will show.
Item 1-4: Select from the drop down menu the item to be used. Up to 4 items can be chosen.

Summary



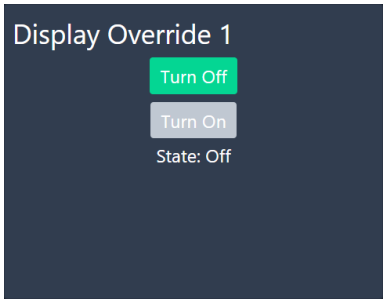
Item: Select from the drop down menu the item to be used.

Alarms



The Alarms widget will show a quick view of the most recent alarms, the size of the window or number of other widgets will dictate how many alarms are listed.

Override

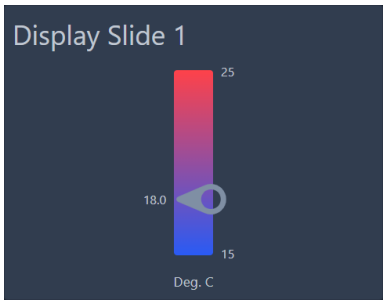


Item: Select from the drop down menu the item to be used.

Threeway

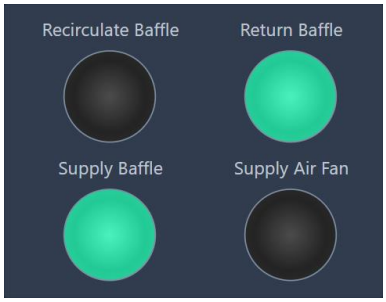
Item: Select from the drop down menu the item to be used.

Slide



Item: Select from the drop down menu the item to be used.

Status



Item x: Select from the drop down menu the item to be used.
Colour Off x: Select the colour for the item to have when 'Off'.
Colour Off x: Select the colour for the item to have when 'On'.

Logo

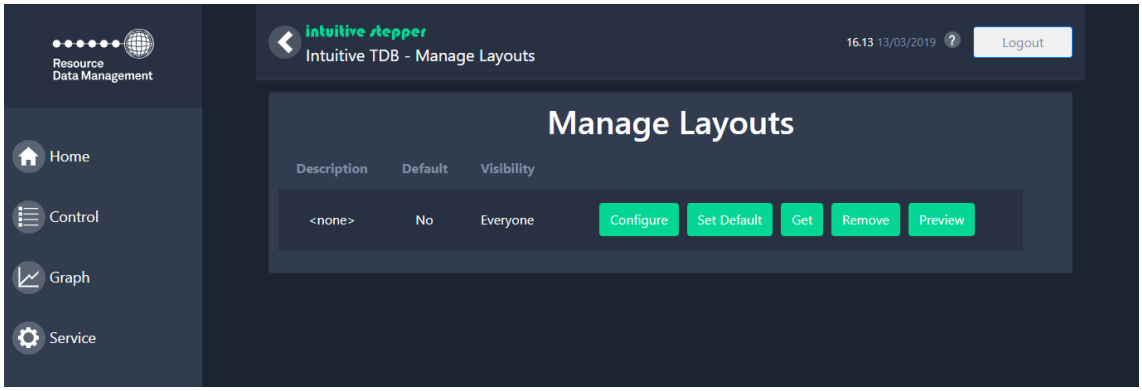
Use the 'Change' option to select an image from a local device (PC) to upload. A thumbnail of the image will be shown. Only images of the type; png, jpeg, gif can be used with a maximum size of 250KB.

Note: Only one logo can be used on the customised home pages.

Manage Layouts

This utility is used to upload and configure pre-prepared layouts created on the RDM Layout editor program. To upload a layout, click on 'Upload Layout' and select it from within your PC.

Note: The feature will support the upload of a single layout. For more information on creating layouts, please consult relevant documentation or your RDM accounts manager.



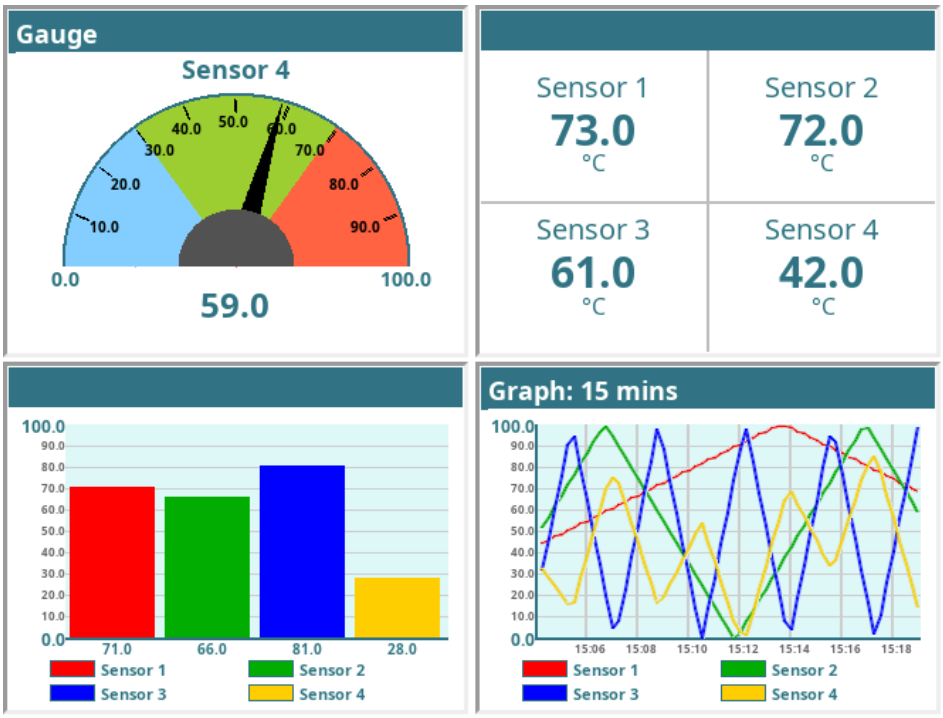
Once uploaded, there are a number of options;

Configure	Option to alias the layout. This name will appear on the tab in the main page.
Get	This option allows the layout to be downloaded to the user's PC.
Remove	Select this option to permanently remove the layout from the device. **Note: Once removed the layout cannot be recovered.**
Preview	Use this option for a quick view of the selected layout without leaving the setup page.

Note 1: The Intuitive V2/ Mini will support the LE3 mimics; TwoWay; Slide; ThreeWay.

Internal Screen Setup

The controller can be specified with a colour LCD display built in, this display allows a maximum of 6 pages of information to be displayed with a maximum of four values on each page. The values displayed can be in the form of a gauge, line graph, bar graph or a numerical value, an example of each is shown below.



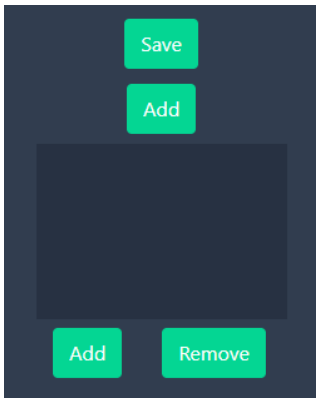
LCD Display Setup

From the service menu select 'system' followed by 'LCD Display Setup', here there are three set up parameters:

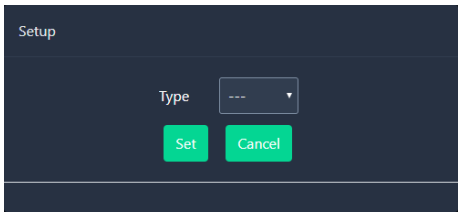
Screen Home (mins):	After this time period of inactivity (no button presses) the screen will revert to the home page.
Screen Off (mins):	After this time period of inactivity the display will switch off automatically.
Set Parameters Allowed:	If this is selected then controller parameters can be altered using the inbuilt display.

LCD Display Layout

From the service menu select 'system' followed by 'LCD Display Layout', here the display layout can be customised, a maximum of 6 different screens can be set up.

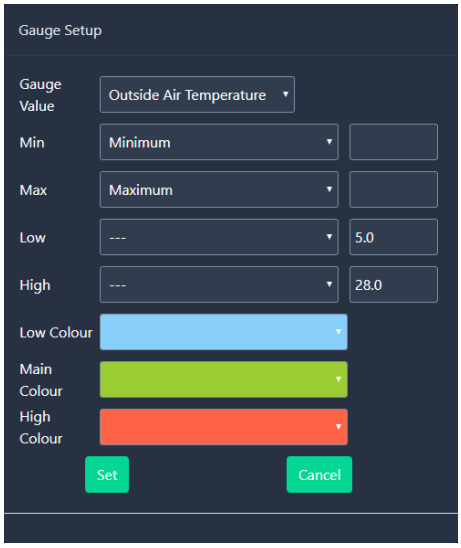


To add a new screen click 'Add'. A blank selection screen will be shown (see left), double clicking on the blank area will produce a drop down box (see right).
From the drop down box gauge, value, graph or bar can be selected.



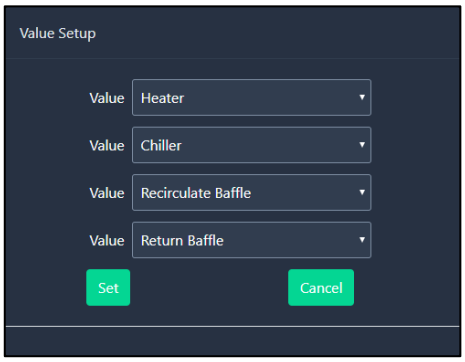
Gauge

Gauge Value:	Select an analogue value from the TDB program that is to be shown in gauge form.
Min:	This is the minimum value that the gauge can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.
Max:	This is the maximum value that the gauge can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.
Low:	This selects a low region on the gauge where the colour changes, for example a low pressure region. The area between the min value and the low value will then be the colour selected in the 'Low Colour' parameter.
High:	This selects a region on the gauge where the colour changes, for example a high pressure region. The area between the max value and the high value will then be the colour selected in the 'High Colour' parameter.



Value

Value: Selects up to four analogue values from the TDB program that can be shown in the form of text.



Graph

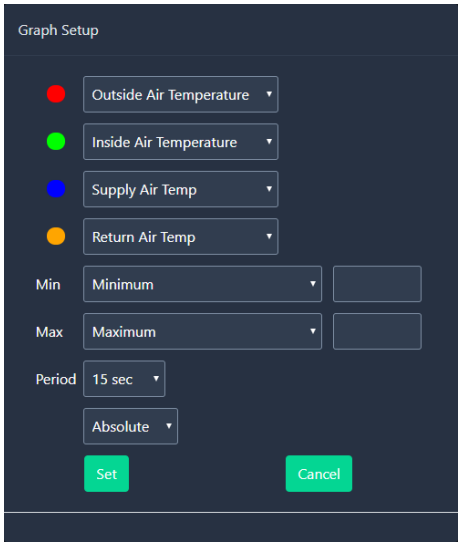
Value: Selects up to four analogue values from the TDB program that can be shown in the form of a real time graph.

Min: This is the minimum value that the graph can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.

Max: This is the maximum value that the graph can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.

Period: Selects the sample period of the graph, the controller will automatically scale the horizontal axis of the graph to match this sample period.

Absolute: Selects whether the graph will display an absolute value or relative value. Relative will show how much the value has changed and not what the actual value is.

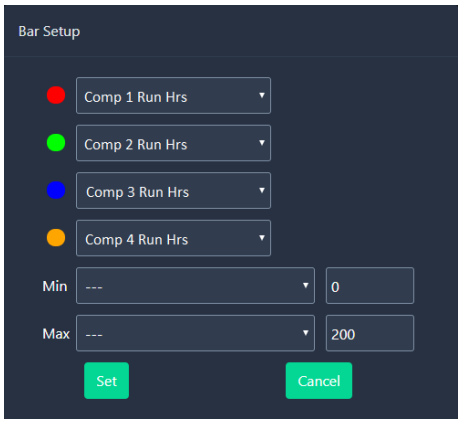


Bar

Value: Selects up to four analogue values from the TDB program that can be shown in the form of a bar graph.

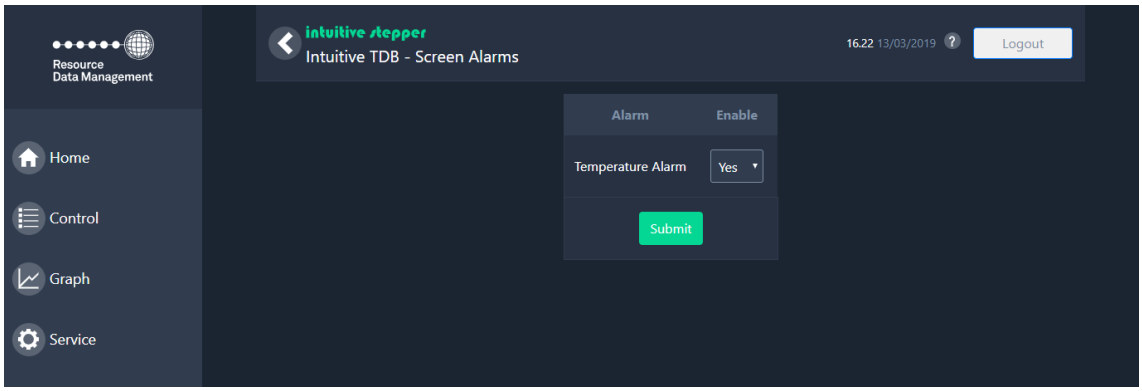
Min: This is the minimum value that the bar graph can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.

Max: This is the maximum value that the bar graph can display. It can be either selected from the drop down list of analogue parameters within the TDB program or entered manually in the field.



Screen Alarms

The 'Screen Alarms' menu is only for use with the TouchXL display and does not affect any other type of display attached to the Intuitive TDB Controller. From within the TDB editor, the user can utilise the Alarm Block to generate alarms under certain conditions. These 'alarms' (if any) will be listed in the Screen Alarms' menu offering the option of 'yes' or 'no':



If the alarm is not enabled, when activated, it will not be 'pushed' to any of the TouchXL's screens. It will still follow all other alarm actions (e.g. log and send to any modems setup). If the alarm is enabled, it will be pushed to all TouchXL's screens attached to the controller.

In addition to the alarm showing on the screen itself, the TouchXL's LED will show red and the sounder will alarm. It will remain in this state until the alarm has cleared or 'Muted' on the display. **Note**: Muting an alarm on one TouchXL will mute it on any other connected TouchXL device.

Users

List

Allows for current user names and their passwords to be edited or deleted. By selecting 'Edit' it will allow the User name, Level and password to be amended.

Add

Generate usernames and passwords for new users. Select between Install and Service level. Install level can access all options. Service can access all options apart from; Edit; Send to controller; Get from controller; Delete; Restore and Factory defaults option.

Note: A maximum of 10 users can be added.

Login Activity

This feature offers details on user login activity. It lists all users that have logged in to the device, their last login and how often they have.

Maintenance

System Config

Outlines a list of all features active on the controller. **Note**: once a feature has been activated it will fill the tick box of that feature.

Add Feature

When viewing the add feature page it will offer a 'System Key'. When having a feature activated this system key should be quoted. In return, RDM support will offer an activation number that can be entered to have the specified feature activated.

Reset

This will allow for a manual software restart of the controller and should be used as an alternative to power cycling the unit to achieve a restart.

Save Config

This allows for the controller setup to be copied and saved to a file. If a Plant Touchscreen display is connected to the Controller when using the Save Config feature then any Custom page configured in the display will also be saved. **Note**: the TDB program currently operating within the controller is not copied by this feature.

Restore Config

This allows for a previously saved configuration, from another controller, to be uploaded. Only configurations taken from a similar device type can be restored. E.g. Mini TDB to a Mini TDB. Customised home page, layouts and custom pages (created from within the Plant Touch screen) will be included. Saving the configuration from a different device type and trying to upload it, for example an Intuitive V2 to a TouchXL TDB is not supported.

Upgrade

Allows for the controller application software to be upgraded. Please contact RDM Technical support for further details.

Note: When upgrading from any version below V4.x.x any previously configured mimics will be removed. To set up new mimics please consult the Custom Home Page section.

Factory Settings

Note: use with caution. This feature will configure the controller back to factory default settings. All current settings, data and TDB programs will be deleted. This process is irreversible.

Display

The 'Display' section refers to the USB Touch Screen (PR0615 only), when attached. For details, please refer to the Touchscreen Display section.

Reset

Allows the display to be reset without resetting the plant controller.

Calibrate

Forces the display into calibration mode, calibration can then be carried out on the display (see Plant Controller Touchscreen Display user guide). This function can be used if the display has been calibrated incorrectly and has become unusable as a result.

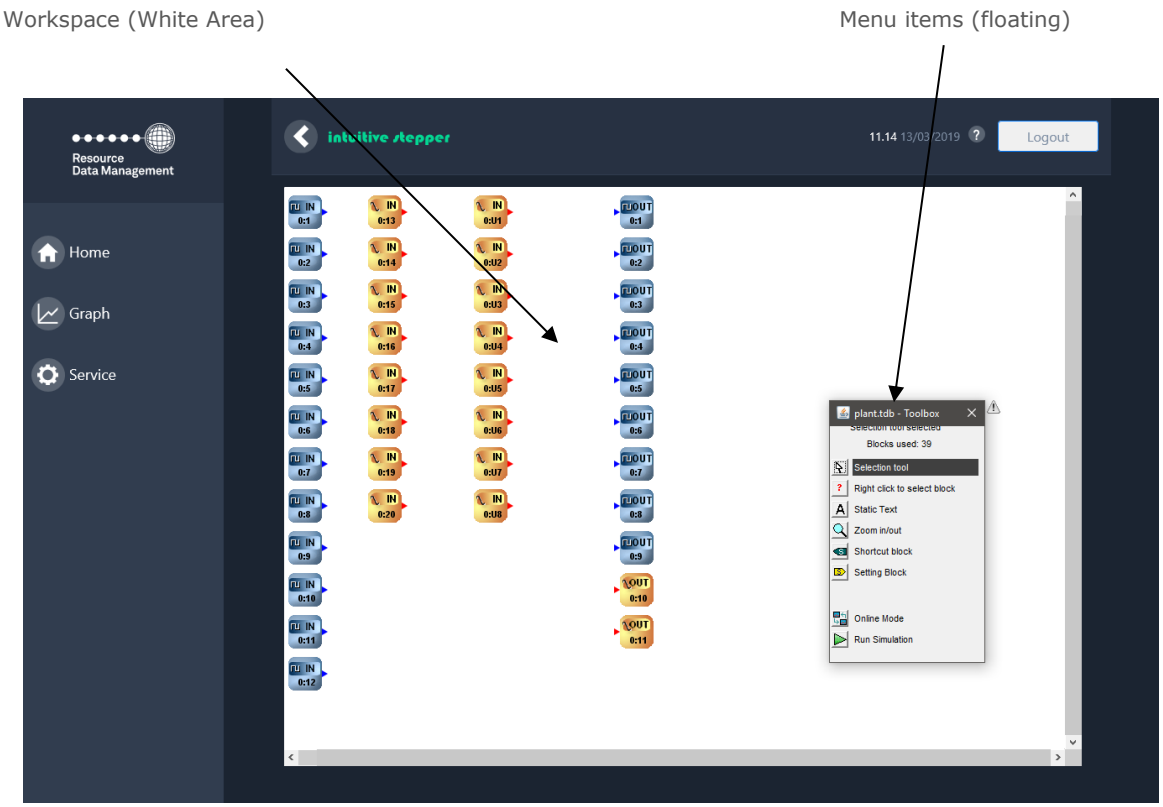
Data Manager Type Files

Once logged onto a Data Manager, if subsequent changes are made to the PLC program running in the controller, (e.g. an additional probe input is mapped) this will result in the generation of a new type file for the controller. If the Data Manager is running software version V1.50 and above, this process is automatic and no action is required. If this occurs in an older version of Data Manager Software then the user is advised to remove the controller from the Data Manger and log it back on to the front-end. This is done by the 'Remove Controller' option in the Data Manager. After a short delay the controller will automatically re-log back onto the Data Manager and will appear in the Device list. **Note**: you may have to re-alias the controller description. If this manual process isn't followed then it will automatically occur when the controller offline delay expires in the Data Manager.

Getting started

When logged in, from the menus*, click on 'Edit'.

The Data Builder Work page will be displayed along with the current program. As default the IO list (Digital Inputs, Analogue Inputs etc.), will be shown.



Each of the Controller inputs and outputs has a corresponding Data Builder block allocated. These can be used to start developing your application.

*__Note__: To utilise the in-built TDB editor within the device requires the use of a browser that supports java.

Program Size

The maximum number of blocks an Intuitive TDB device can have is 10,000. Of which a maximum of 2000 items (I/O, states & parameters) can be made visible.

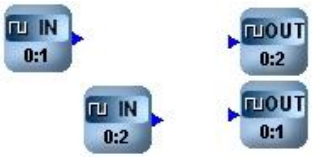
The Data Builder for the Intuitive Range

The Data Builder (TDB) is a user-friendly programming tool for developing applications to run on an Intuitive TDB device. The Data Builder has a vast library of functional parts that allow the user to build simple or sophisticated applications, which can be run on the Controller. There is a simulation option that allows for the completed application to be fully simulated and de-bugged before going 'live'. An 'on-line' option allows the user to view the application and its' values in real-time during operation.

Control Summary – Ordering

Automatic

The inputs and outputs are listed, in the control summary, as they appear in the actual PLC program. Priority is given to the blocks as they appear from left to right. If two blocks share the same 'X-axis coordinates' then priority is given to the block that appears first when viewed from top to bottom. An example is shown below.



Inputs	Outputs	Watch

Name	Value	Unit	Watch
Digital Input 1	Off		
Digital Input 2	Off		

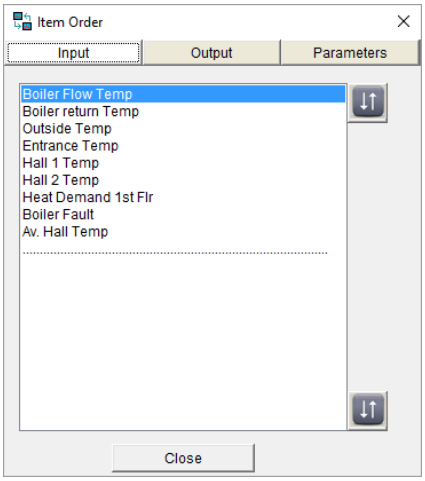
Inputs	Outputs	Watch

Name	Value	Unit	Watch
Digital Output 2	Off		
Digital Output 1	Off		

As shown above 'Digital Input 1' appears first in the control summary as it is the first block to appear when viewing from left to right. 'Digital Output 2' appears at the top of the control summary table as both blocks are equally placed from left to right but 'Digital Output 2' appears first when viewed top to bottom.

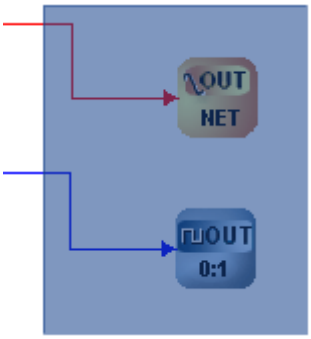
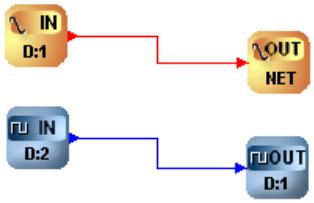
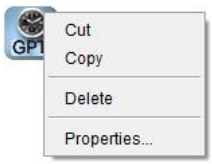
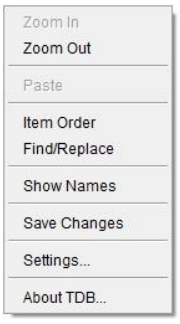
Manual

The Inputs, Outputs and Parameter order listings can be changed manually if required. On an empty part of the Data Builder work page, right click to bring up a sub menu and select 'Item Order'. This will bring up the 'Item Order' menu. This menu has tabs at the top for Inputs, Outputs and Parameters.
Selecting the appropriate tab will give a list of current Inputs, Outputs or Parameters.
Highlight the item to be moved and click on the up and down arrow boxes on the right to move the item up or down the list to confirm the desired order.



Designing the Application

General editing principles

Mouse Action	Result
Left double click on object	Opens object properties box
Left click and hold-drag-release	Moves object
Left click on canvas, hold-drag-release (with selection pointer)	Selects the objects under the selection area. 
Left click hold-drag-release on wire connection points (nodes) Blue points to blue, or red to red Note: Red to blue and blue to red connections are not allowed	Wire objects point to point 
Left click hold-drag-release on wire connection, then workspace (not a node)	Unwires object
Right click on object 	Sub menu: 
Right click on workspace (i.e. not on an object).	Sub menu: 

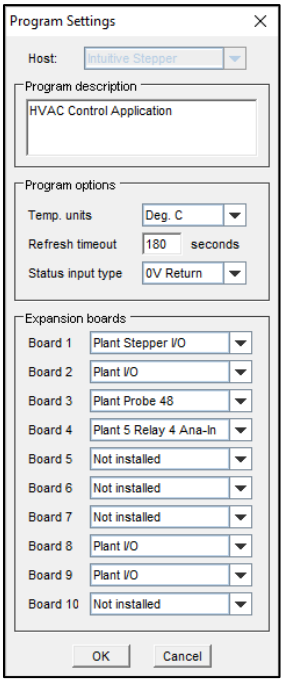
Allowable Characters

IMPORTANT NOTE:

Any text used to name a block within TDB editor must be alphanumeric and cannot use non-standard English characters, for example, A b c D X y Z are allowable, - + : $ Æ Ö are not. Blocks with non-alphanumeric characters contained in them may not operate correctly.

Text blocks used in a program do not have any functional use, so are not affected by non-alphanumeric characters.

Program Settings



Right click on the work space and select 'Settings…' The following options will be shown.

Host	This is predefined and cannot be altered.
Program Description	Enter a suitable description* for the TDB program created.
Temp. Units	Select between Degrees Celsius or Fahrenheit operation from the drop down list.
Refresh Timeout	Enter a time in seconds. This is used with certain TDB blocks such as Network Inputs.
Status Input Type	This is a global parameter. Define the operation of the Status inputs to detect either 0V Return or 24Vac. If set to 24V the controller will detect the presence or removal of 24Vac only and will ignore 0V return. If set to 0V the status inputs will trigger on either 0V return or 24V.

*__Note__: If the description contains the text 'monitor' and is logged on to a DMTouch, the DMTouch will treat the device as a monitor. When deemed a monitor, some functionality may differ, for example the end user will not be able to 'inhibit' the device from the Front End Panel.

Connecting an Expansion Board to an Intuitive TDB device

CANbus cable specification and wiring

CANbus communication cable **must** be of a standard to meet ISO11898 (PR0649) or equivalent and the screen cable **must** be connected.

Firstly wire the CANbus network from the device to each Expansion board. **Note:** end of line termination resistors must be used on the CANbus network. The Intuitive has a termination resistor built in which is selected by a jumper*. The termination jumper must be set on the first device and last device in the network chain.

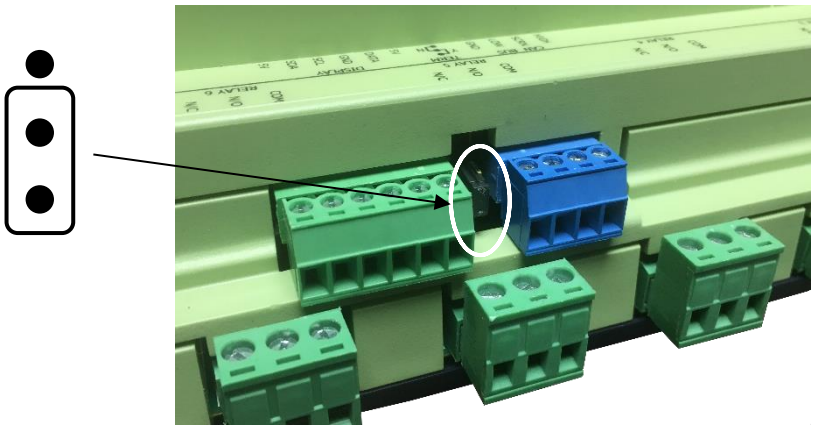
*__Note:__ if using an older Plant Expansion they require a resistor to be connected across the CANbus network connections. The resistor should be fitted to the CANbus network connector across the CAN High pin and the CAN Low pin. The termination resistor value required is a 120 Ohm and must have a tolerance of +/- 1% or better.

The network should be wired in a daisy chain configuration where only one Intuitive should be connected to a single CANbus network. The maximum allowable network cable length is 500M in total from one end of the network to the other providing a CANbus network cable which meets ISO11898 or equivalent is used.

A maximum of 10 expansion boards can be connected to a single Intuitive TDB device. When connecting an expansion board to an Intuitive TDB or another Expansion board the following should be observed.

Intuitive/ Expansion Board		Expansion Board
CAN High	Connects to	CAN High
Screen	Connects to	Screen
CAN Low	Connects to	CAN Low
Ground	Connects to	Ground

End of Line Termination Resistor



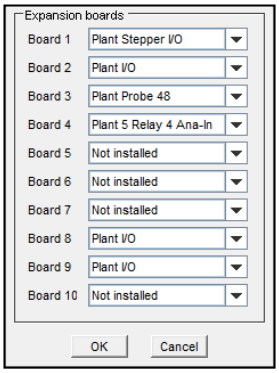
The end of line termination resistor link should be fitted to the middle and bottom pins on the Main control board and on the last expansion board on the CANbus network. All other expansion boards should have the link removed or fitted to the middle and top pins.

Basic Setup

Set the Module ID rotary switch on each Expansion board to a unique number between 0 and 9.

Now connect to the Intuitive TDB device. Login to the web interface, navigate to the 'Control' heading and select 'Edit'. Right click on the Data Builder workspace and select 'Settings…'

A screen similar to the one on the right will be shown.



Expansion Boards 1 through to 10 will be shown. Use the drop down box to define the Expansion boards currently connected to the Intuitive and their board positions. Select between Plant IO, Plant Stepper IO, Plant Probe 48, Plant 5 Relay/ 4 Analogue-In and Plant 4 Relay/ 4 Univ.

Board 1 equates to an Expansion board with a Module ID of 1. Board 10 Equates to an Expansion board which has a Module ID of 0.

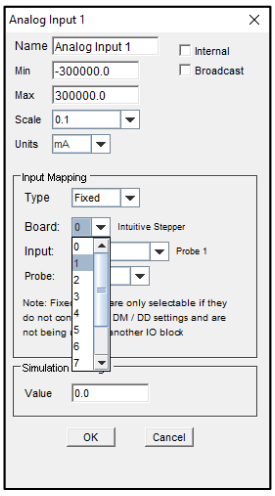
The Inputs/ Outputs for these boards will now be available to select in the TDB editor.

Note: If Expansion boards are not configured in the TDB program, as outlined above, then they will be reported as 'Unused' on the Extension webpage, found under the 'System' heading, even if they are powered and connected to the CANbus network.

To map a Remote Display connection to an expansion board, right click on any display block present in the TDB program and select the expansion board's number.

Configuring an Expansion Board Input or Output

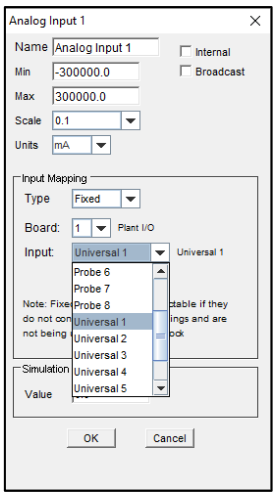
Firstly setup and connect the required Expansion boards to the controller as per the instructions above. Place the desired Analogue or Digital Input or Output block into the TDB program and view its properties. Shown is an Analogue Input block from an example TDB controller.



Note: Analogue Outputs, Digital Inputs and Digital Outputs are similarly configured.

Click on the Board option from the Analogue input and select the desired Expansion board from the drop down list. The description assigned to the board will update once a selection has been made. The Board menu is a list of the current configured Expansion boards. Board 0 is the TDB controller. Board 1 is the first Expansion board etc.

In the example opposite a number of boards have been configured for the TDB controller as per the Program Settings. Once all the Inputs and Outputs for a given Expansion board have been selected and mapped to TDB blocks the associated Expansion board will no longer appear in the board list.



Once the desired Expansion board has been selected, use the Input option to select the required Input from the Expansion board.

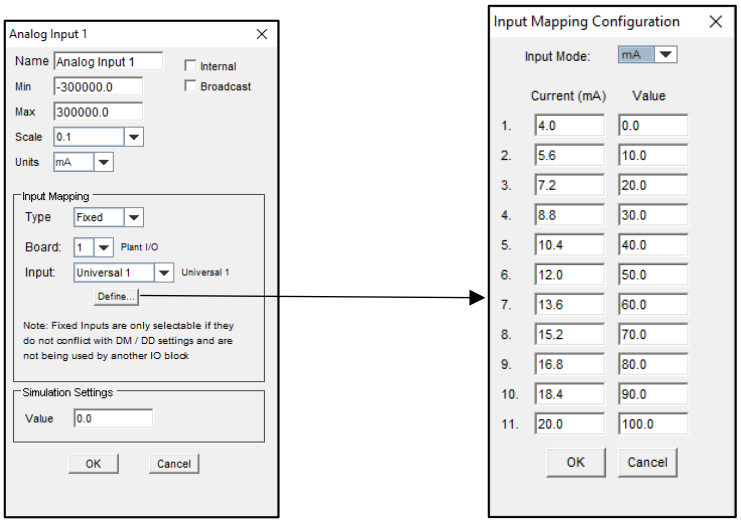
Stepper, IO Expansion and 5 relay/ 4 analogue in boards have Universal IO available for use. Each Universal IO* can be set as the following:

- 0-10 Volts DC Input or — Analogue Input Block
- 0-10 Volts DC Output or — Analogue Output Block
- 4-20ma Output or — Analogue Output Block
- 4-20mA Input — Analogue Input Block

*__Note__: the plant 5 relay/ 4 analogue input Universal IO can only be set to inputs.

Please refer to the appropriate Expansion board user document for further details

When using a Universal IO configured as an Input click on the 'Define' option to configure the Universal IO. Use the Input Mode to select between 0-10V Input or 4-20mA Input. See the block for more specific details.

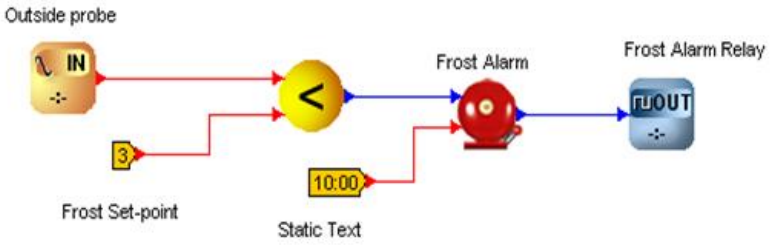


Building an Application Example

Using the tools provided in the toolbox, place, drag and drop blocks onto the workspace to form the application. Connect the objects' inputs and outputs using the wire connections (see General Editing principles). Using the properties box, set the appropriate values. Once complete, run a simulation to prove the design.

Once the design is complete, save your application.

Frost Alarm Example



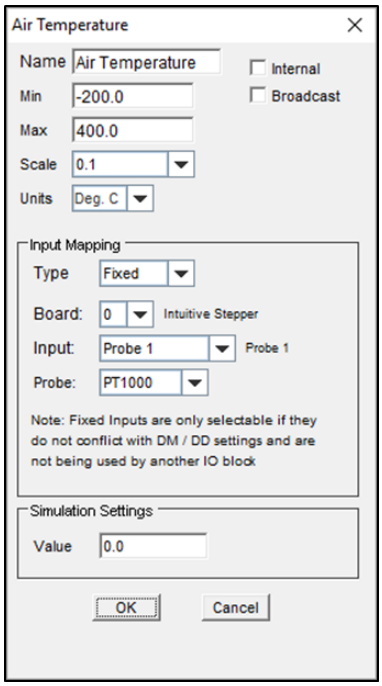
The above diagram shows a simple Data Builder application for a frost alarm. An outside temperature probe is connected to an analogue input and this is compared to a frost set-point. If the temperature goes below this set point (using a less than block) the output of the less than block goes on. This goes to the alarm block that has a delay of 10 minutes. If the signal is still on after the 10 minutes, the relay will be energised.

Configuring the Blocks

Each type of block has an associated properties box, use this to configure the block.

Properties Box

An example of a properties box assigned to a fixed Input is shown opposite.



Name Field — Type in the name of the item or leave the default name.

Min — Minimum value that will be displayed on web page summary screen and Data Manager (DM) values column after which '????' will be shown.

Max — Maximum value that will be displayed on web page summary screen and DM values column after which '????' will be shown.

Scale — In the drop down box, select from the following;

1	value displayed as whole numbers only
0.1	value displayed to 1 decimal place
0.01	value displayed to 2 decimal places
60	used for hrs:min to use scale of 60 seconds

These will appear in the DM and in the controller web page value columns

Example: Set for 0.1 will appear as value like 23.4
Set for 1.0 will appear as value like 23

Units — Select the desired units from the drop-down menu if required.

Internal — Check this box to keep the item internal (Does not get displayed on the values page when networked to a Data Manager). Uncheck this box if you want the value to be displayed.

Broadcast — Tick Broadcast to make this value available to other TDB devices on the same IP Network. Please see Peer to Peer Communication section.

Type — Select between 'Fixed' or 'Network'. For all hard wired inputs use fixed. See individual block properties for details of when to use 'Network'.

Board — Depending on the configuration, select either the Intuitive or corresponding expansion board the input is attached.

Input — Select the corresponding input/ output available from the chosen board.

Probe — Select the probe type used in the input.

Simulation Settings — Type in a value that will be used during simulations. **Note**: This value can be changed while running a simulation.

Click OK to save any changes or Cancel to exit without saving.

Saving the completed TDB program

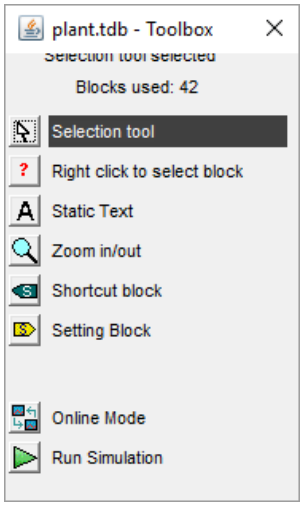
Once the design is complete, it can be saved by right clicking on the workspace and choosing 'save changes'. The password dialogue box allows the user to enter a Read or Edit password. The password feature is unused by leaving all fields empty.

Read Password: Prevents a user from viewing the TDB program within the controller unless a valid Read password is entered first.

Edit Password: Allows a user to view the TDB program within the controller but not make changes to the program unless a valid Edit password is entered.

Note: The Read and Edit features can be used in conjunction with each other.

Toolbox Menu Items



- Selection tool
- Building blocks (right click for sub menu's)
- Static Text
- Zoom in/out
- Shortcut block
- Setting Block
- Online Mode
- Run Simulation

The floating Toolbox also shows the current number of blocks used in the PLC program.

Selection Tool

Left click on this icon to select the 'selection tool', use this (left click and hold) to move items around on the workspace (release).

Building Blocks

Selection of building blocks is achieved by right clicking on the icon and rolling the mouse over one of the sub menu items and then left click on the item. Left clicking on the workspace will drop the item. Further left clicks will give more of the same item. To select another item, repeat the procedure. Initially this icon will show '?' until an item is selected.

The sub-menu choices are:

- **IO**
  - Analogue In
  - Analogue Out
  - Stepper Output
  - Digital In
  - Digital Out
  - Analogue Sensor
  - Analogue Device Input
  - Network Analogue In
  - Network Digital In
  - Nw Param
  - Drop List
  - CT Monitor/ CT Monitor 2
  - Pulse Input
  - GP Timer Block
  - GP Timer 2 Block
  - GP Timer 3 Block
  - Defrost Signal
  - Pack/ Rack Optimisation
  - State Block
  - Plant Display Block
  - Intuitive Display Block / V2 Display Block
  - Humidistat Display Block
  - Humidistat 2 Display Block
  - Coldroom Display Block
  - Mercury Display Block
  - Mercury 2 Display Block
- **Logic**
  - 2-AND Block
  - 3-AND Block
  - 4-AND Block
  - 2-OR Block
  - 3-OR Block
  - 4-OR Block
  - NOT Block
  - XOR Block
- **Mathematical**
  - Add
  - Subtract
  - Multiply
  - Divide
  - Absolute
  - X Power Y
  - Min Block
  - Max Block
  - Equals Block
  - Less-Than Block
  - Greater-Than Block
  - Less-Than-Or-Equals Block
  - Greater-Than-Or-Equals Block
  - 2-Average Block
  - 3-Average Block
  - 4-Average Block
  - Limit Block
  - In Range Block
  - Min/Max/Avg Block
  - Filter Block
  - Accumulator
  - Algebra
- **Time**
  - Delay On Timer
  - Pulse Timer
  - Heartbeat
  - Run On Block
  - Run Hours Block
  - Change Over Block
  - Pump Block
  - Match Date
  - Date Time Block
  - Summer Winter
  - Daylight Block
  - Time Block
  - Schedule Block
  - Day of Week

- **Functional**
  - Alarm Block
  - Analogue Switch
  - 2-Way Switch
  - Analogue Store
  - Pulse Counter
  - D-Type Latch
  - SR Latch
  - Digital Edge
  - Analogue Edge
  - Syslog
  - Push text
  - Reverse On/Off / Reverse On/Off 2
  - Direct On/Off / Direct On/Off 2
  - Direct PID / Direct PID 2
  - Reverse PID / Reverse PID 2
  - Performance
  - Levels Block
  - Occupancy Optimisation
  - Occupancy Optimisation 2
  - P to T / P to T 2 (Pressure to Temperature)
  - Comfort Block
  - Offline Indicator
  - Display Cascade Block
  - Display Override Block
  - Display 3-Way Block
  - Display Slide Block
- **Diagnostic**
  - Analogue Display Block
  - Digital Display Block

Static Text 

Left click on the item to use static text, left click on the workspace to drop a 'static text' line. Further left clicks will continue to give this option.
Once the 'static text block' is on the workspace, it can be edited with text of your choice.

Zoom In/Out 

Left click on this icon to use the Zoom tool. Left click on the workspace zooms in, right click zooms out.

Shortcut 

Left click on this icon to use a shortcut, left click on the workspace to drop a 'shortcut'. Further left clicks will continue to give this option.
Once the 'shortcut block' is on the workspace, it can be edited with links of your choice. See configuring the shortcuts

Setting Block 

Left click on this icon to use a setting, left click on the workspace to drop a 'setting'. Further left clicks will continue to give this option.
Once the 'setting block' is on the workspace, it can be configured with a value of your choice. See configuring Setting blocks

Online Mode 

Left click on this icon to use 'online mode'. This item will only function with 'running' programs.
Once online, rolling the mouse over start or end points will return the value at that point. (There is short delay as the value is retrieved from the controller before being displayed)
When online, the Icon Online will change to 'Disconnect'. Left click on this to exit the online mode.

Run Simulation 

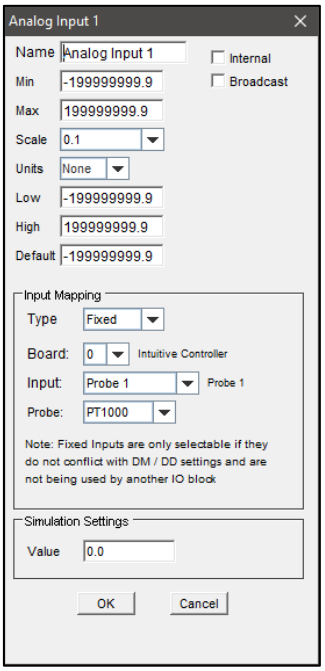
Left click on this icon to run a simulation of the program. See Running a Simulation

I/O Objects & Properties

Analogue Input

Icon	Properties

Name: Provide a unique alias for the input.
Min/ Max: When 'units' is selected, the values self-populate, else they can be entered manually. If the input value goes out with these bounds, the value read on the IO list will be '??????'.
Scale: When 'units' is selected, the scale self-populates, else it can be altered to suit the requirements.
Units: Depending on the measurement, select the appropriate unit. See Units section for more details.
Low/ High: These are adjustable limits the user can set and if the input's value goes out with them, the value will automatically take the 'Default' value.
Default: Static value the input will display if the input goes out with the Low/ High limits.
Internal: Check the 'Internal' field if the input is not to be shown on the device's IO list.
Broadcast: Check the 'Broadcast' field to broadcast the input's value across the IP network. See Peer to Peer for more details.



Simulation Settings: Value the input will have when running a simulation. **Note**: this can be altered during the running of the simulation.

Input Mapping

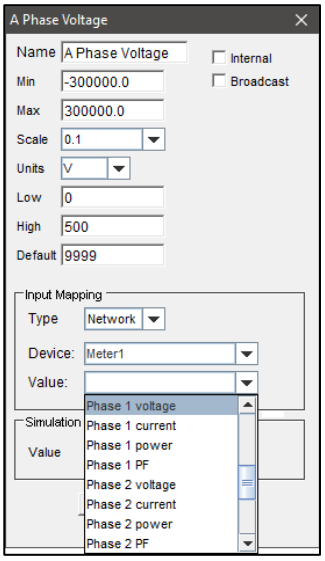
Type is Fixed or Network.

Network

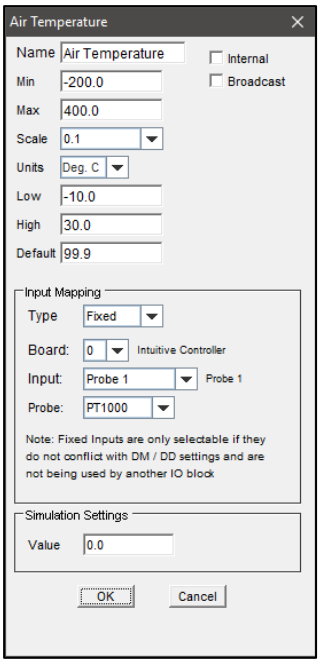
Network inputs are those from Modbus or Wireless Mesh devices. An example is shown above

Device: Select from the drop down menu listing the available networked devices - 'Meter1' from example above.
Value: Select from the drop down menu listing the device's items. 'Phase 1 Voltage' from example above is an item from within device 'Meter1'.

Note: On older versions the Device and Value fields must be manually typed. In these instances, the field must match exactly with the field in the Modbus or Wireless Mesh device.



Cont...



Fixed

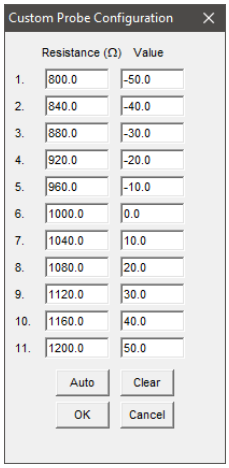
Fixed inputs are the device's or Expansion board's built-in Inputs.

Board: Intuitive TDB controller is board 0. Or using the drop down menu select from the list of expansion boards previously configured in the program settings menu.

Input: Select the available input from the drop-down menu. If a Probe Input has been selected, configure the probe type* in the subsequent drop down. If a Universal Input has been selected, a 'Define' button will be displayed where it can then also be configured.

Probe: When Input has been configured as a probe, select from the following; PT1000; 2K; 470R; 700R; 3K; 2K25; 100K; 5K; 6K; 10K; 10K Type2; Raw*; Custom**; Light***.

*Raw: If Probe type 'Raw' is selected then no resistance to temperature conversion will take place, value displayed will be the probe's resistance value in ohms.



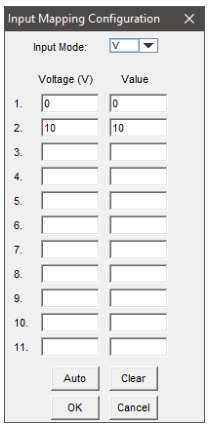
**Custom: If an analogue input has been configured to use a Custom profile then to select and use one of the pre-set probe types e.g. PT1000, the analogue input must be deleted and reinserted into the program

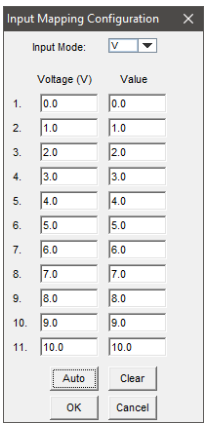
***Light: Used in conjunction with the RDM Light Level Sensor (PR0193). **Note**: It will not require any further resistors or computational blocks.

Define: If selecting either a 'Custom' probe type or a Universal Input, the user must configure the conversion table manually. A resistance conversion table (for custom probe type) is shown on the right.

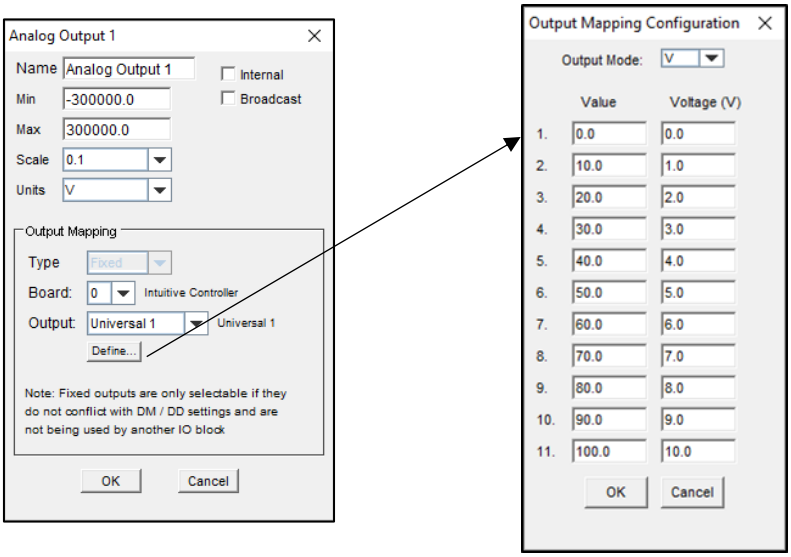
The first column's values (resistance/ mA/ V) must be entered in ascending order. The corresponding value (right column) must then be entered.

For convenience there are 'Auto' and 'Clear' buttons to aid in the entering of the details. Pressing 'Clear' will clear the complete table of all values. To utilise the 'Auto' calculation feature a minimum of 2 values must be entered. Then pressing 'Auto' will automatically calculate the remaining fields, as per below example;



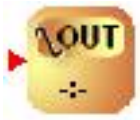


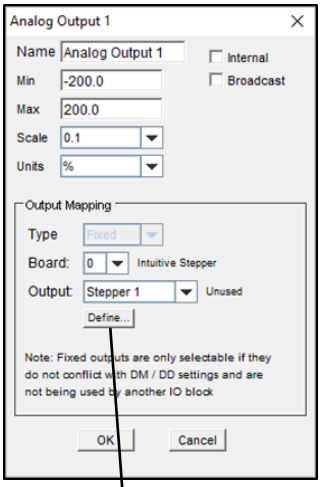
Analogue Output

Icon	Properties
	To use the Analogue Output with a stepper, please see the Stepper Output section. **Name**: Provide a unique alias for the output. **Min/ Max**: When 'units' is selected, the values self-populate, else they can be entered manually. If the output value goes out with these bounds, the value read on the IO list will be '??????'. **Scale**: When 'units' is selected, the scale self-populates, else it can be altered to suit the requirements. **Units**: Depending on the measurement, select the appropriate unit. See Units section for more details. **Internal:** Check the 'Internal' field if the output is not to be shown on the device's IO list. **Broadcast**: Check the 'Broadcast' field to broadcast the output's value across the IP network. See Peer to Peer for more details. **Output Mapping** Type is fixed. **Board**: Intuitive TDB device is board 0. Or using the drop down menu select from the list of expansion boards previously configured in the program settings menu. **Output**: Select the desired output from the drop-down menu. **Define:** Click on 'Define' to configure the output.  Select 'Output Mode' as either V or mA. There will be default values present. These values can be edited to match the requirements. **There are 11 definable points, and between points there is a linear interpolation. The points must be ascending**. **Note1**: Analogue outputs always need to be defined. **Note2**: Analogue Outputs have a built in delay of 10 seconds upon startup.

Stepper Output

Icon	Properties





Name: Provide a unique alias for the output.
Min/ Max: When 'units' is selected, the values self-populate, else they can be entered manually. If the output value goes out with these bounds, the value read on the IO list will be '??????'.
Scale: When 'units' is selected, the scale self-populates, else it can be altered to suit the requirements.
Units: Depending on the measurement, select the appropriate unit. See Units section for more details.
Internal: Check the 'Internal' field if the output is not to be shown on the device's IO list.
Broadcast: Check the 'Broadcast' field to broadcast the output's value across the IP network. See Peer to Peer for more details.

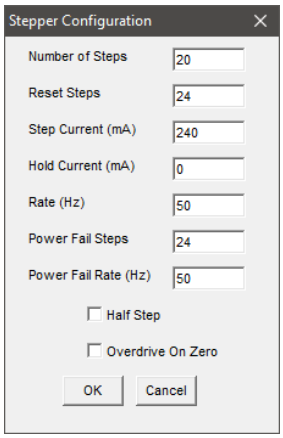
Output Mapping

Type is fixed.

Board: Using the drop down menu, select from the list, a Stepper expansion board (defined in Program Settings) or leave it as the main board (if it's an Intuitive Stepper host).
Output: Select the desired Stepper output from the drop-down menu.
Define: Click on 'Define' to configure the output.

Note: Stepper outputs always need to be defined

Stepper Configuration



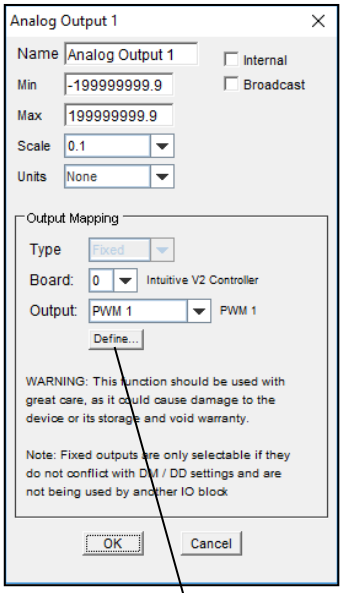
Number of Steps Enter the number of Steps for the given application (Range 1 to 25,000).
Reset Steps Enter the number of reset steps if required. For example in a refrigeration stepper valve application the reset steps are used to overdrive the stepper motor and ensure that the valve is fully closed (Range 1 to 25,000).
Step Current Enter the step current of the stepper motor in mA. **Note**: an incorrect value entered may damage the attached Stepper motor (Range 1 to 825mA).
Hold Current: Enter the hold current of the stepper motor in mA if required.
Rate: Enter the rate in Hz (Range 1Hz to 500Hz).
Power Fail Steps*: In the event of a power loss, enter the number of steps for to take.
Power Fail Rate*: In the event of a power loss, enter the rate in Hz (Range 1Hz to 500Hz) the valve should use.
Half Step: Tick the 'Half Step' option to step the motor in half steps.
Overdrive On Zero: Check the overdrive on zero box, to overdrive the valve whenever the valve steps get to zero.

*__Note__: Both the 'Power Fail Steps' and 'Power Fail Rate' settings are only compatible with the **Intuitive Stepper I/O Auto Close module.** For more details on its connections please refer to the relevant documentation.

Cont…

	Reset Steps Each time the TDB Controller is powered on, the controller will have no knowledge of the current stepper motor position for any valve attached to a Stepper Expansion board. During start-up the TDB controller will drive the stepper valve closed by a number of steps greater than the total number of steps for the valve configured. This is achieved using the Reset Steps parameter and is referred to as 'overdriving' the valve. This process will synchronise the TDB control strategy with the stepper motor output. This ensures the stepper motor is at the '0' steps position, fully closed when the TDB Stepper output is at '0'. **Note**: the Stepper valve may have to be overdriven periodically if the valve opening never drops to 0% (even with overdrive on zero checked) during normal use and this must be accounted for in the users TDB program. **Example** Using the example settings above, if an analogue value of 50 is entered into the Stepper output block the corresponding stepper motor would step forward 10 steps. If an analogue value of 75 is subsequently entered the stepper motor would step forward a further 5 steps. If the value of 100 is entered the stepper motor would step forward 5 steps more and the valve would be fully open. If the 'Overdrive On Zero' is checked and the analogue value of 0 is entered, the stepper motor will be overdriven and would step back 24 steps. **Note**: All configuration settings for a Stepper motor must be obtained from the stepper motor manufacturer's datasheet. Incorrect settings may result in damage to the stepper motor or incorrect operation of the valve. See also Appendix 3 Stepper Rate with regards to setting the Rate parameter for a stepper motor. **Note**: Analogue Outputs have a built in delay of 10 seconds upon start up.

PWM Output

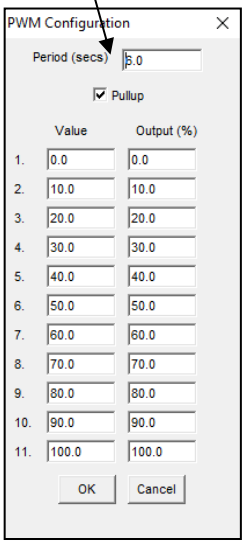
Icon	Properties
	

Name: Provide a unique alias for the output.
Min/ Max: When 'units' is selected, the values self-populate, else they can be entered manually. If the output value goes out with these bounds, the value read on the IO list will be '??????'.
Scale: When 'units' is selected, the scale self-populates, else it can be altered to suit the requirements.
Units: Depending on the measurement, select the appropriate unit. See Units section for more details.
Internal: Check the 'Internal' field if the output is not to be shown on the device's IO list.
Broadcast: Check the 'Broadcast' field to broadcast the output's value across the IP network. See Peer to Peer for more details.

Output Mapping

Type is fixed.

Board: Using the drop down menu, select from the list, an expansion board with PWM outputs (defined in Program Settings) or leave it as the main board.
Output: Select the desired PWM output from the drop-down menu.
Define: Click on 'Define' to configure the output.

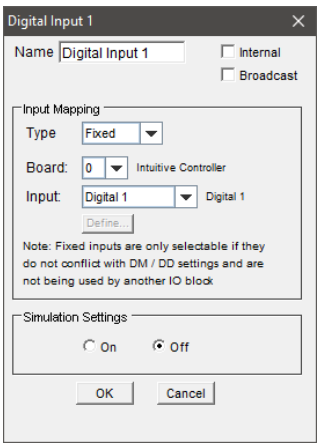
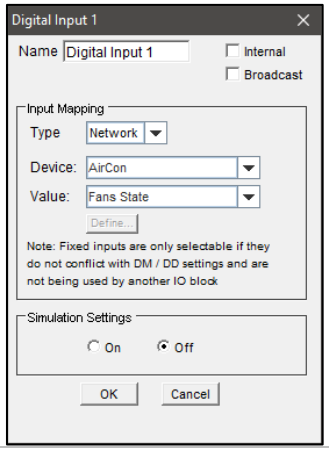


PWM Configuration

Period: Enter the period in seconds of the PWM output. Example:- period is set to 2 seconds and output is 50% then the PWM output will be ON for 1 second and OFF for 1 second.

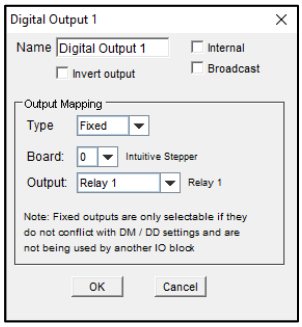
Pullup: The PWM outputs have an internal pull-up resistor that can be enabled or disabled using this setting. This allows the controller to output its own voltage signal or function as an Open Collector output to modulate an external voltage source. Each PWM channel is configured separately.

Digital Input

Icon	Properties
	**Name**: Provide a unique alias for the input. **Internal:** Check the 'Internal' field if the input is not to be shown on the device's IO list. **Broadcast**: Check the 'Broadcast' field to broadcast the input's value across the IP network. See Peer to Peer for more details. **Simulation Settings**: Value the input will have when running a simulation. **Note**: this can be altered during the running of the simulation. **Input Mapping** Type is Fixed or Network. **Fixed** Fixed inputs are the Controller's or Expansion's built-in Inputs. **Board**: The Intuitive device is board 0. Or using the drop down menu select from one of the expansion boards previously configured in the program settings menu. **Input**: Select which input is to be used from the drop-down menu. **Network** Network inputs are those from Modbus or Wireless Mesh devices. **Device**: Select from the drop down menu listing the available networked devices - 'AirCon' from example to the right. **Value**: Select from the drop down menu listing the device's items. 'Fans State' from the example is an item from within device 'AirCon'. **Note**: On older versions the Device and Value fields must be manually typed. In these instances, the field must match exactly with the field in the Modbus or Wireless Mesh device.  

Digital Output

Icon	Properties



Name: Provide a unique alias for the input.
Internal: Check the 'Internal' field if the input is not to be shown on the device's IO list.
Broadcast: Check the 'Broadcast' field to broadcast the input's value across the IP network. See Peer to Peer for more details.
Invert Output: Tick the invert output box to invert the relay operation.

Output Mapping

Type is Fixed or Network

Fixed

Fixed outputs are the Controller's or Expansion's built-in outputs.

Board: Select, from the drop down menu, the board to be used (0 being the main).
Output: Select which output is to be used from the drop-down menu.

Network

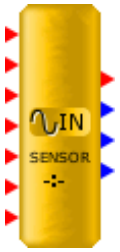
Network outputs refer to relays on networked devices, for example the Wireless Mesh device 2I2O (PR0731). When selected as 'Network', enter the Device Name as it appears on the 'Network List'. Then the device's Value as it appears on the device's IO list.

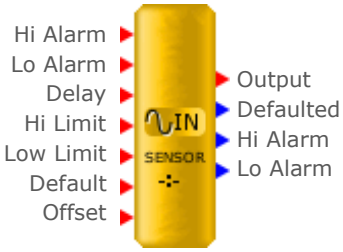
Note1: when viewing the block through the IO section of the controller it will show the logical state of the block as opposed to the physical state of the relay it is linked to. All versions below V2.00 will show the physical relay state.

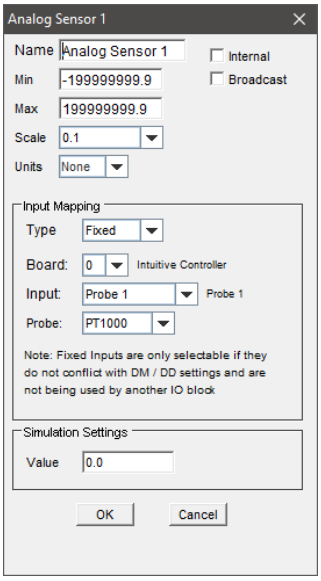
Note2: Digital Outputs have a built in delay of 10 seconds upon startup.

Analogue Sensor

Icon	Properties





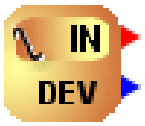


The properties of the Analogue Sensor is similar to the setup of the Analogue Input block.

Hi/ Lo Alarm: High and Low limits for which if the analogue value goes above or below, the Hi/ Lo Alarm outputs go 'on' (following delay time).
Delay: The time delay before the Hi/ Low Alarm outputs go 'on'.
Hi/ Low Limit: High and Low limits for which if the analogue value goes above or below, the Analogue Output will adopt the 'Default' input value and the 'Defaulted' output goes 'on'.
Default: Value adopted when analogue input value goes above/ below the Hi/ Low limits.
Offset: Allows for a positive or negative value to be added to the analogue input value.
Output: Analogue value which will be affected by the offset and/ or default limit settings.
Defaulted: If value goes above or below the Hi/ Low limits the output will go 'on'.
Hi/ Low Alarm: If value goes above or below the Hi/ Low Alarm limits the corresponding output (Hi/ Low Alarm) will go 'on'.

Analogue Device Input

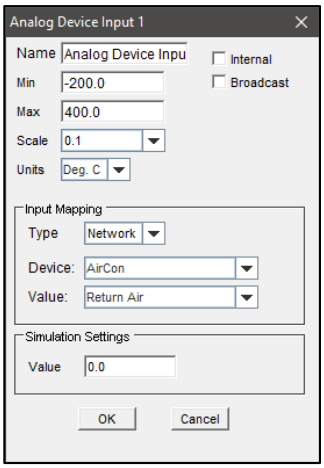
Icon	Properties



The Analogue Device Input block is used to extract values from devices logged on to the Intuitive Plant TDB. Such devices can be Modbus, Wireless Mesh devices or Wireless probes.

Please consult previous sections on logging Modbus devices on.

Fill in the details concerning the blocks name, min and max values along with units etc.



Input Mapping

The input mapping section is where the device and value details must be entered.

The type will always be 'Network'.

Device: Select from the drop down menu listing the available networked devices - 'AirCon' from example above.
Value: Select from the drop down menu listing the device's items. 'Return Air' from example above is an item from within device 'AirCon'.

Note: On older versions the Device and Value fields must be manually typed. In these instances, the field must match exactly with the field in the Modbus or Wireless Mesh device.

The offline digital output will switch 'on' if the networked device stops communicating (for the duration of the Refresh Timeout) with the controller.

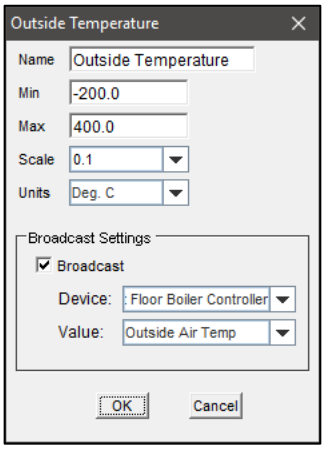
Network Analogue In

Icon	Properties

Network Analogue Inputs can be used to map analogue values being broadcast from another device running a Data Builder program on the same IP network. For example a Data Manager running TDB or an Intuitive TDB controller.

A number of blocks within the TDB application allow their values to be broadcast, these blocks will have a tick option within their properties box to enable it. This allows one TDB program to share an analogue value with a number of other TDB devices using peer to peer communication.

Output
Refresh Timeout



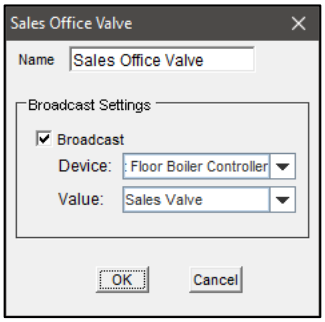
The properties box will allow details concerning the blocks name, min and max values along with units to be configured.

Output: The current analogue value that is being picked up from the broadcasting device.
Refresh Timeout: This output will go 'on' when communications are lost from the network source and the refresh timeout has expired.
Broadcast: Tick this box to configure the input to receive a value from another TDB. Select from the drop down lists, the broadcasting device's name and the item name in its IO list. For further details of broadcasting, please see Peer to Peer Communication section.

Network Digital In

Icon	Properties

Network Digital Inputs can be used to map digital values being broadcast from another device running a Data Builder program on the same IP network. For example a Data Manager running TDB or an Intuitive TDB controller.



A number of blocks within the TDB application allow their values to be broadcast, these blocks will have a tick option within their properties box to enable it. This allows one TDB program to share a digital value with a number of other TDB devices using peer to peer communication.

Output
Refresh Timeout

The properties box will allow details concerning the blocks name to be configured.

Output: The current digital value that is being picked up from the broadcasting device.

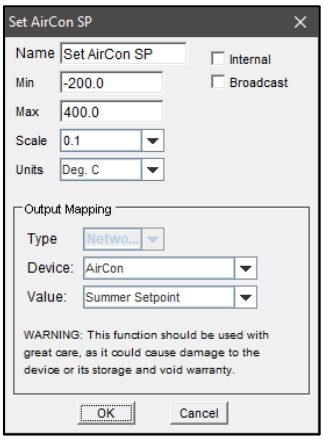
Refresh Timeout: This output will go 'on' when communications are lost from the network source and the refresh timeout has expired.

Broadcast: Tick this box to configure the input to receive a value from another TDB. Select from the drop down lists, the broadcasting device's name and the item name in its IO list. For further details of broadcasting, please see Peer to Peer Communication section.

Nw Param

Icon	Properties

The network parameter block is used to change parameters on Modbus devices connected to the controller.



Fill in the details concerning the blocks name, min and max values along with units etc.

Output Mapping

Device: Select from the drop down menu listing the available networked devices - 'AirCon' from the example.

Value: Select from the drop down menu listing the device's items. 'Summer Setpoint' from the example is an item from within device 'AirCon'.

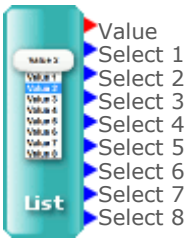
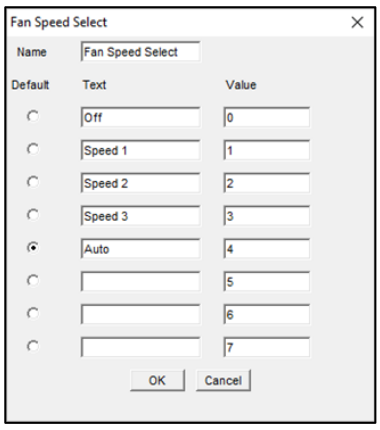
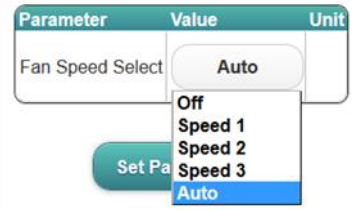
Note: On older versions the Device and Value fields must be manually typed. In these instances, the field must match exactly with the field in the Modbus or Wireless Mesh device.

Use the analogue input to send the desired value to the Modbus device. The network parameter block will attempt to change the parameter, once it receives an acknowledgment from the device.

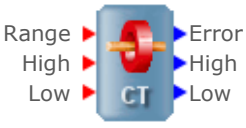
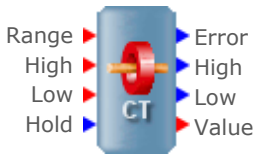
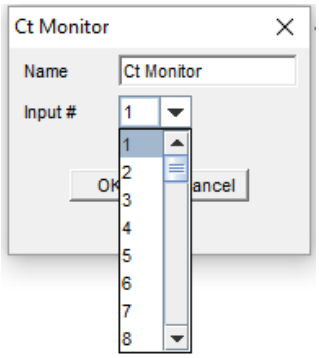
Note 1: the ability to change parameters on Modbus devices attached to the controller may be subject to a charge to enable the feature. Contact technical support for further information. Also see the Modbus Writable Templates section.

Note 2: the Nw Param block is designed for occasional use and must be used with caution. RDM and third party products can accept a finite number of parameter changes. Parameter information resides in the on-board non-volatile memory for a device. If the maximum number of memory writes are exceeded it will irreversibly damage the device. This type of failure is not covered under the RDM 5 Year warranty. For third party devices please refer to the respective manufacturer.

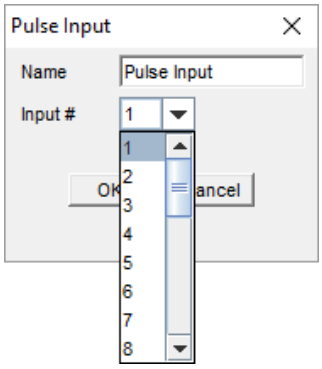
Drop List

Icon	Properties
	The Drop List block, when used in the program, will appear as a drop down selection menu within the parameter section of the TDB device. From the settings of the block, the name of the parameter (block) can be given. There are a possible 8 fields that can be used which appear in the drop down menu. **Note**: leaving the Text field blank will not include the item. A numerical value can be associated to the selection. This will dictate the output 'Value' of the block.  The 8 digital outputs will go 'ON' when the associated item is selected from the drop down menu. The 'default' radio buttons can be selected so that when the parameters are defaulted it initially takes this value. From the example given on the right, the below parameter option would be listed in the parameter section of the device.  

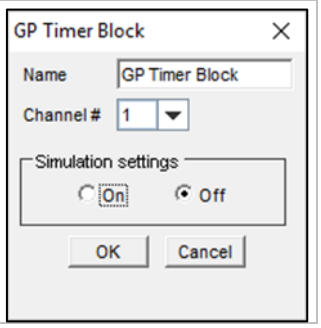
CT Monitor/ CT Monitor 2

Icon	Properties
CT Monitor  **CT Monitor 2** 	For the hardware setup, please refer to the USB Current Monitor section. Up to 10 Current Monitors can be attached to the controller, they subsequently support 5 CT's on each. Therefore to correctly 'map' the CT block to the specific CT, double click on the block to show the properties (indicated on right).  The 10 CT monitors are addressed via the rotary dial on the front of its enclosure. Rotary ID 1 = CT's 1 - 5 Rotary ID 2 = CT's 6 – 10 : Rotary ID 9 = CT's 41 - 45 Rotary ID 0 = CT's 46 - 50 **CT Monitor 1** Range: The actual range of the CT in Amps. E.g. 40A High: The value, in Amps, that will cause the 'High Output' to go 'ON' Low: The value, in Amps, that will cause the 'Low Output' to go 'ON' Error: The 'Error' digital output will switch 'ON' when there is no CT present or is not being read. **CT Monitor 2** Hold: When the digital input receives an 'on' signal, the digital outputs will be held at their current values. **Note**: analogue value will continue to read. Value: The reading, in Amps, from the connected CT.

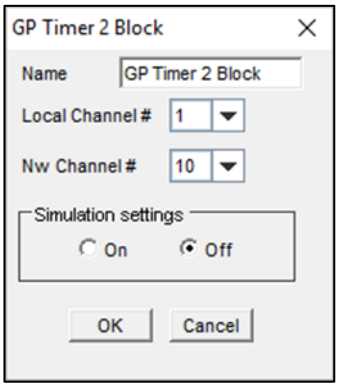
Pulse Input

Icon	Properties
	Pulse input blocks are used to pick-up pulse counts from any one of the 3 Pulse Reader USB module inputs. Select 1 of the 24 channels and give the block a meaningful name. The red analogue output is the channel count value. The digital Input, when activated resets the channel count to 0. **Note 1:** The pulse value (also visible in 'Pulse Counter' web menu), is periodically saved in the Intuitive TDB's non-volatile memory on the hour and half past the hour. **Note 2**: If more than one counter is being used then they must each have unique aliases. I.e. Pulse Input 1, Pulse Input 2 etc. 

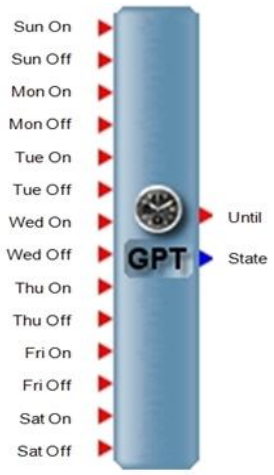
GP Timer block

Icon	Properties
	There are 32 General Purpose (GP) timer channels and 8 Global Channels. Set up the channels by clicking on the 'Control' tab, then the GP Timer tab. Use the 'Add schedule' wizard to aid setting up the channel. **Note**: Global channels cannot be re-named or be set to slave mode. This is particularly useful if web-services are going to be used to remotely change a channel time; as the channel name cannot be change inadvertently. 

GP Timer 2 block

Icon	Properties
	The analogue output provides the next 'on time' of the currently selected GP timer channel. This output is currently used with the Occupancy Optimisation Block only. **Note**: the time from the analogue output is not relevant for use by the end user. The digital output provides current status of the GP timer channel to which the block is mapped. **Local Channel:** There are 32 General Purpose (GP) timer channels and 8 Global Channels. Set up the channels by clicking on the 'Control' tab, then the GP Timer tab. Use the 'Add schedule' wizard to aid setting up the channel.  **Note**: Global channels cannot be re-named or be set to slave mode. This is particularly useful if web-services are going to be used to remotely change a channel time; as the channel name cannot be change inadvertently. **Network (Nw) Channel:** allows the block to be mapped to a Data Manager's GP timer channel. Select the desired channel number from the drop down list. Configure the appropriate GP timer channel in the Data Manager. Use the 'Transmit' feature for the selected Data Manager GP Timer channel Software version V1.51.1 and above is required in the Data manager. **Note 1**: If both the Local and Network channel are configured the network channel will get priority. If communication with the Data Manager is lost then the Local channel status will be used once the refresh timeout expires. **Note 2**: Each GP timer channel can have up to 50 events in total, for example 40 Once events, 7 yearly events and 3 weekly events for a given channel.

GP Timer 3 Block

Icon	Properties
	The GP Timer 3 Block provides a single 'on' and 'off' per day. Use a setting block to define an 'on time' and 'off time' for each day. The block has a digital output to show the current timer state. This is on when the timer is in the on state and off when the timer is in the off state. Analogue output 'Until' can be connected to the Occupation input on the Occupancy Optimisation block.

Df Signal

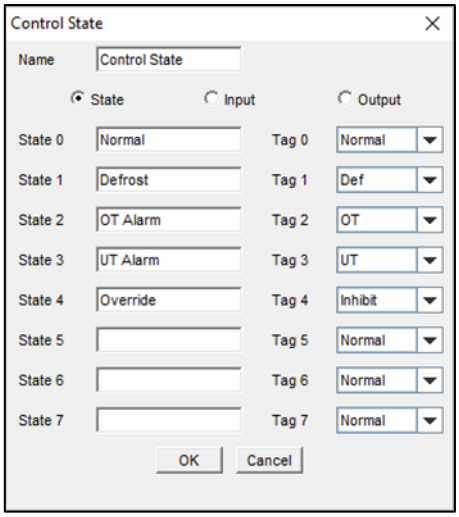
Icon	Properties
	The block allows for commands from the Defrost Timer schedules in a Data Manager to be mapped into the TDB program. Please consult the Data Manager's documentation for details on how to configure a DF Timer Channel. The output of this block will show the following. **Note:** the command sent to the output of this block is present momentarily: 0 = No defrost, defrost timer channel in the off period. 1 = Defrost, defrost timer channel in the on period. 3 = Defrost termination, used with Defrost Hold. It is advisable to configure a local schedule in the TDB program in the event of a communication loss between the controller and the Data Manager

Pack/ Rack Optimisation

Icon	Properties
	The Pack/ Rack Optimisation block will accept commands from the Suction Optimisation energy feature found in the Data Manager. **Note**: the optimisation feature has to be enabled in Data Manager and configured appropriately before this block will operate. A given digital output will be enabled based on commands received from the Data Manager (DM) ▪ If the DM sends an 'Opt Up' command the 'Up' output will pulse on. ▪ If the DM sends an 'Opt Down' command the 'Down' output will pulse on. ▪ If the DM sends an 'Opt Zero' command the 'Zero' output will pulse on. ▪ If the DM sends an 'Opt Stay' command the 'Stay' output will go pulse on. When an 'Up', 'Down' or 'Zero' is not being sent from the Data Manager a 'Stay' command is sent. The block outputs will pulse on momentarily, therefore the use of an SR-Latch may be required. If there is a loss of communication the users TDB program must detect this and decide if/when to clear any offset added. See the Data Manager User Guide for Optimisation Setup. **Note**: A maximum of three Pack/ Rack Optimisation blocks can be used per program from software version 3.6.0 and above.

Control State

The Control State block allows the user to define the current status of a TDB program.



The 'status' can be categorised into either a 'State', 'Input' or 'Output'. This will dictate the placement of it within the IO page of the device.

Varying the analogue value fed into the block allows the user to select the current state.

In the example to the right, Tag 4 is set to Inhibit, if the number '4' is fed into the control state block then the state would become Inhibit.

When viewing the controller details, 'Override' would be shown in the value column next to control state. If '0' is fed in the state would show Normal and the value would be Normal.

The Tag option allows the user to define what is shown in the Status column, found on the Device List of a Data Manager, when in a given state. This allows the Status column to indicate when the TDB Controller is in 'Defrost' or 'Alarm' etc.

Plant Display

RDM Part Number PR0620

The inputs are as follows;

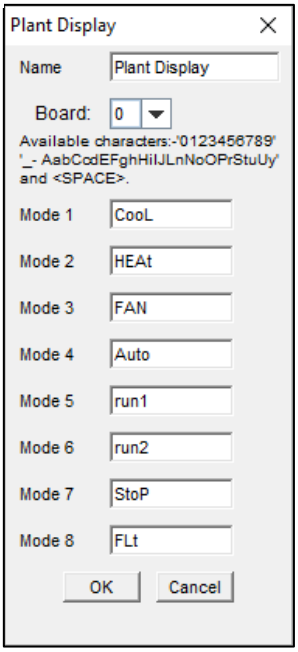
Display 1 Input: Enter analogue value to be shown on left of the screen.

Display 2 Input: Enter analogue value to be shown on left of the screen.

Fault 1/2 LED input: Switch the LED on the display on and off by changing the input.

Mode 1: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the left screen (see below).
Mode 2: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the right screen (see below).

Clicking on the properties of the block will display the menu to the right.



The display can be aliased.

If there are expansion boards attached (and configured within the properties of the TDB) then the 'board' drop down menu will offer other options. E.g. Board '0' refers to the main board, board 1 – expansion board 1 etc.

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on either the left or right hand side of the display by sending an integer value into either the Mode 1 or 2 Input;

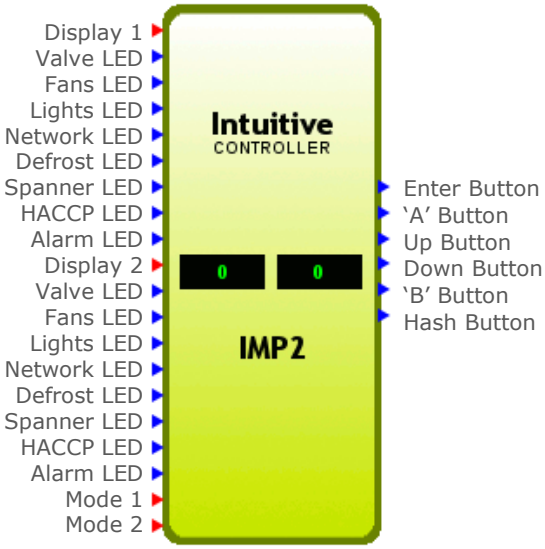
Value '0' – shows the value that Display 1/2 Input currently has
Value '1' – shows the character set within 'Mode 1' field
Value '2' – shows the character set within 'Mode 2' field
:
Value '7' – shows the character set within 'Mode 7' field
Value '8' – shows the character set within 'Mode 8' field

Clock Mode

The LCD display can format a minutes value (entered into either 'Display 1' or '2') into the format **00:00** by entering '-1' into the corresponding Mode input. E.g. Where Mode 1/2 is set to '-1', by entering the 'minutes' value 780 into Display 1/2, it would be translated to 13:00 on the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Intuitive Display



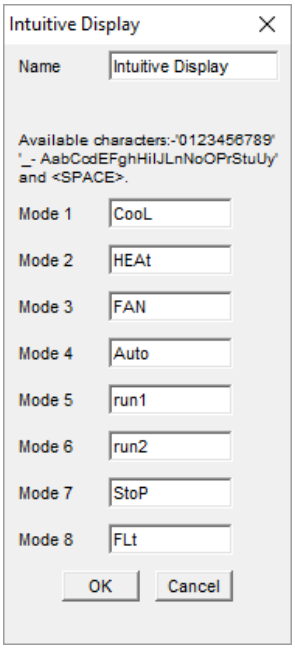
The inputs are as follows;

Display 1 Input: Enter analogue value to be shown on left of the screen.

Display 2 Input: Enter analogue value to be shown on left of the screen.

LED inputs – switch the LED's on the display on and off by changing the input.

Mode 1 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the left screen (see below).
Mode 2 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the right screen (see below).



Clicking on the properties of the block will display the menu to the right.

The display can be aliased

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on either the left or right hand side of the display by sending an integer value into either the Mode 1 or 2 Input;

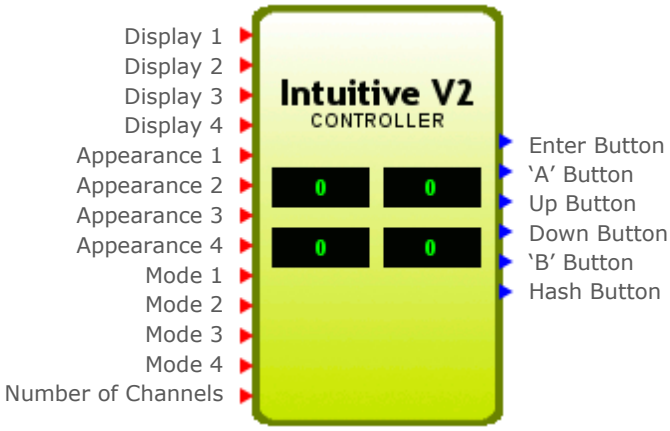
Value '0' – shows the value that Display 1/2 Input currently has
Value '1' – shows the character set within 'Mode 1' field
Value '2' – shows the character set within 'Mode 2' field
:
Value '7' – shows the character set within 'Mode 7' field
Value '8' – shows the character set within 'Mode 8' field

Clock Mode

The LCD display can format a minutes value (entered into either 'Display 1' or '2') into the format **00:00** by entering '-1' into the corresponding Mode input. E.g. Where Mode 1/2 is set to '-1', by entering the 'minutes' value 780 into Display 1/2, it would be translated to 13:00 on the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Intuitive V2 Display (Optional Internal Display)

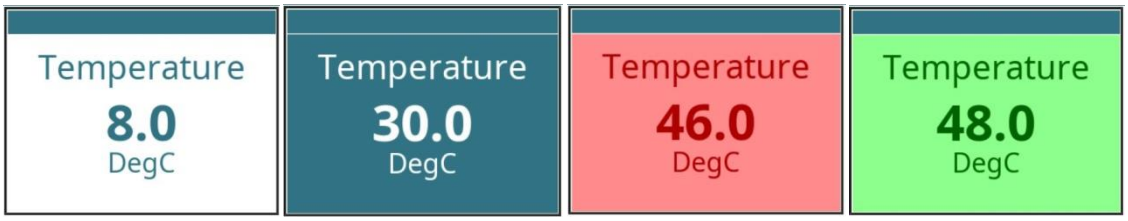


The inputs are as follows;

Display 1 Input: Enter analogue value to be shown on the top left of the screen.
Display 2 Input: Enter analogue value to be shown on the top right of the screen.
Display 3 Input: Enter analogue value to be shown on the bottom left of the screen.
Display 4 Input: Enter analogue value to be shown on the bottom right of the screen.

Appearance 1: Selects the screen appearance of display 1.
Appearance 2: Selects the screen appearance of display 2.
Appearance 3: Selects the screen appearance of display 3.
Appearance 4: Selects the screen appearance of display 4.

There are 7 different appearances available on the display, these are selected by entering a value of 0-6 on the respective appearance input. The different appearances are shown below:



Look=0 Look=1 Look=2 Look=3

Look=4 Look=5 Look=6

Mode 1 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the top left screen (see below).
Mode 2 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the top right screen (see below).
Mode 3 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the bottom left screen (see below).
Mode 4 – accepts an analogue integer value from -1 to 8 to display pre-set characters on the bottom right screen (see below).

Number of Channels: Select the number of channels (1-4) being utilised, the display will split into 2, 3 or 4 areas accordingly.

Clicking on the properties of the block will display the menu shown below.

Name: The display and individual segments of the display can be given individual names.

Units: Selects the units to be displayed after the analogue value.

Within the fields 'Mode 1' to 'Mode 8', a message can be inserted, the number of characters that can be used is dependent on how many channels are in use but typically this will be up to 8 characters.

These pre-set characters can be displayed on any of the four display segments by sending an integer value into the Mode 1 to Mode 4 Inputs;

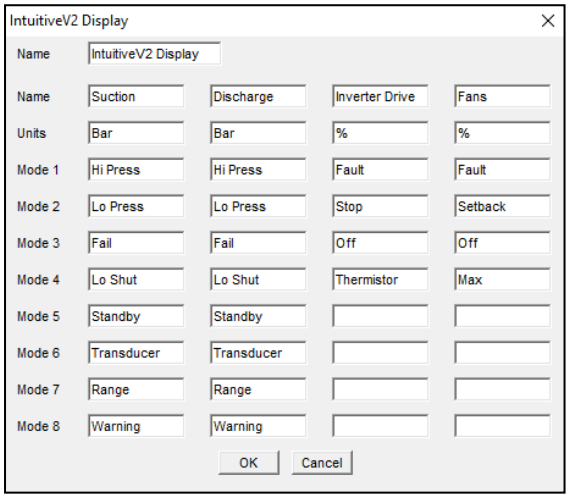
Value '0' – shows the analogue value currently present on the display 1-4 inputs, '16.6 Bar' for example.

Value '1' – shows the character set within 'Mode 1' field, 'Hi Press' for example.

Value '2' – shows the character set within 'Mode 2' field

Value '7' – shows the character set within 'Mode 7' field

Value '8' – shows the character set within 'Mode 8' field



Enter Button, 'A' Button, Up Button, Down Button, 'B' Button, Hash Button.
These represent the six pushbuttons on the display. When any of the buttons are pressed the corresponding digital output on the block will switch ON, these digital outputs can then be used in the TDB program to carry out operations.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Humidistat Display

RDM Part Number PR0445

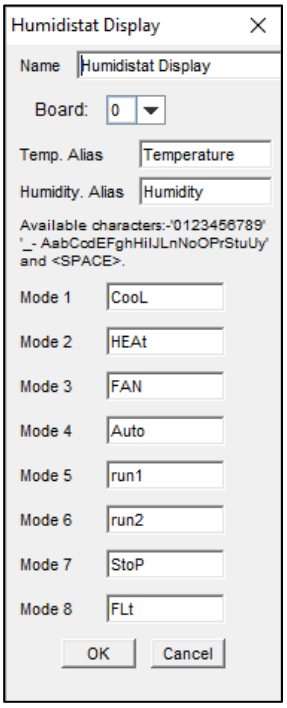
The inputs are as follows;

Display Input: Enter analogue value to be shown on the screen.

LED inputs: Switch the LED's on the display on and off by changing the input.

Mode 1: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the screen (see below).

Clicking on the properties of the block will display the menu to the right.



The display can be aliased.

If there are expansion boards attached (and configured within the properties of the TDB) then the 'board' drop down menu will offer other options. E.g. Board '0' refers to the main board, board 1 – expansion board 1 etc.

As the display monitors both Temperature and Humidity the values can be aliased. These inputs will appear in the controllers IO list.

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on the display by sending an integer value into the Mode 1 Input;

Value '0' – shows the value that Display Input currently has.
Value '1' – shows the character set within 'Mode 1' field.
Value '2' – shows the character set within 'Mode 2' field.
:
Value '7' – shows the character set within 'Mode 7' field.
Value '8' – shows the character set within 'Mode 8' field.

Clock Mode

The LCD display can format a minutes value (entered into 'Display input') into the format **00:00** by entering '-1' into the Mode input. E.g. Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display input', it would be translated to 13:00 on the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Humidistat 2 Display

HVAC / Fridge

Display 1
Display 2
Cool / Valve
Fans / Fans
Valve / Light
Unused / Network
Heat / Defrost
Network / Service
Service / HACCP
Alarm
Units C
Units F
Units rH
Units %
Backlight
Mode 1
Mode 2

Enter key Output
Hash key Output
Up key Output
Down key Output
Temperature Output
Humidity Output

RDM Part Numbers PR0445-LCD
PR0445-LCD-CAN
PR0445-BMS
PR0445-BMS-CAN

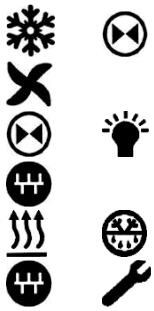
The Humidistat 2 display comes in two different hardware variants; **Fridge (PR0445-LCD)** or **HVAC (PR0445-BMS)**. Therefore within the display block properties (below), the user must define which 'Type' is being used. If the hardware and the selected type is mismatched, the functions will not work. **Note**: changing the type will dictate the input aliases as listed above.

The inputs are as follows;

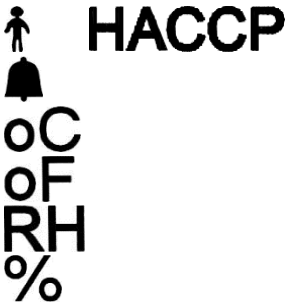
Display 1/2 Inputs: Enter analogue value to be shown on the screen.

Digital Inputs: Each digital input can be used to enable individual icons / symbols within the LCD. Depending on the hardware/ type set, will alter the associated symbols.

Cool / Valve
Fans
Valve / Light
Unused / Network
Heat / Defrost
Network / Service



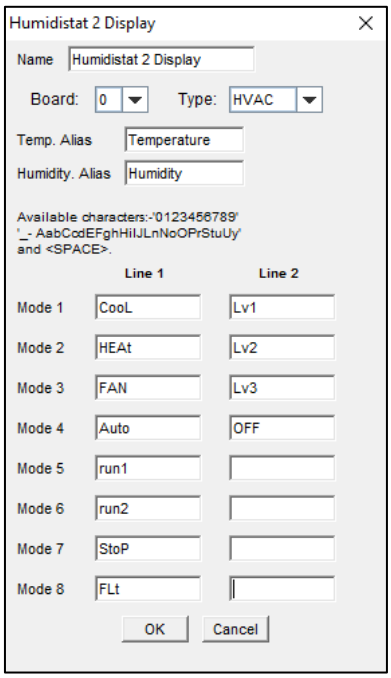
Service / HACCP
Alarm
Units C
Units F
Units rH
Units %



Backlight – Switches the backlight (blue) of the LCD on/ off. **Note**: the icons and characters will still be displayed regardless of backlight state.

Mode 1/ 2 Inputs – accepts an analogue integer value from -2 to 8 to display pre-set characters on the screen (see 'Modes' below).

Clicking on the properties of the block will display the menu to the right.



Name: The display block can be aliased.

Board: Set the board the Humidistat 2 display will be connected to. This can be set as either the main board (0) or if it is to be connected to the main controller via CANbus, select CAN-0 to CAN-15. For more information on the setup of the display, please see the Humidistat's documentation. **Note**: The maximum number of displays connected via CANbus is 15.

Type: Select Type as outlined above (HVAC / Fridge).

Aliases: The display monitors both Temperature and Humidity, these values can be aliased. These inputs will appear in the controllers IO list.

Modes: Two columns are shown; Line 1 and Line 2. Line 1 represents the characters that will be displayed on the top line on the display, Line 2 represents the bottom line on the display. Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters (three on display line 2) can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on the display by sending an integer value into the Mode 1/ 2 Input;

Value '0' – shows the value that Display Input 1/2 currently has.
Value '1' – shows the character set within 'Mode 1' field.
Value '2' – shows the character set within 'Mode 2' field.
:
Value '7' – shows the character set within 'Mode 7' field.
Value '8' – shows the character set within 'Mode 8' field.

Example: In the example shown within the properties box above, entering an integer '2' and '3' into analogue mode inputs 1 and 2 respectively, will show 'HEAt' on the top line of the display and 'Lv3' on the lower line of the display.

Clock Mode – Mode 1 input only

The LCD can format a 'minutes' value (entered into 'Display 1 input') into the format **00:00** (hr:min) by entering '-1' into the Mode 1 input.

Example: Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display 1 input', it would be translated to 13:00 on the display.

Left Justify Mode – Mode 2 input only

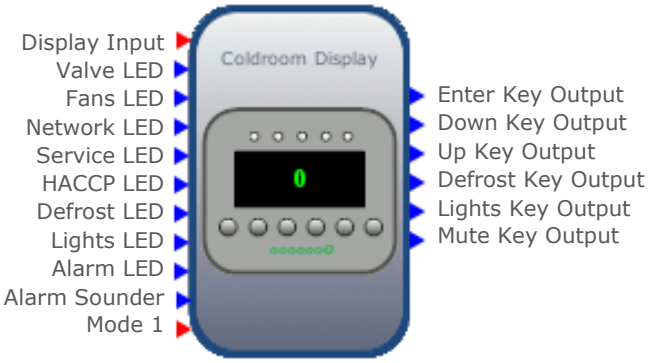
The lower line on the LCD can also be manipulated to left justify and remove the decimal point of the display 2 input.

Example: Where Mode 2 is set to '-2', by entering the analogue value ' 6.0' into the 'Display 2 input', it will be shown as '6' on the left hand side of the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Coldroom Display

RDM Part Number PR0152



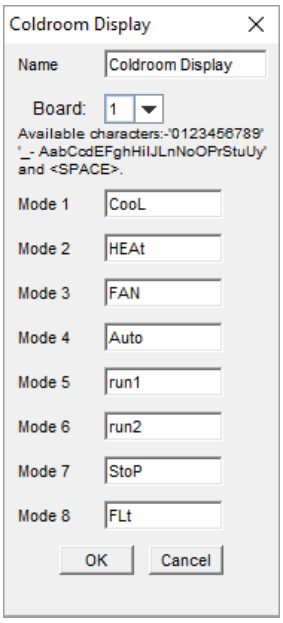
The inputs are as follows;

Display Input: Enter analogue value to be shown on the screen.

LED inputs: Switch the LED's on the display on and off by changing the input.

Mode 1: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the screen (see below).

Clicking on the properties of the block will display the menu to the right.



The display can be aliased.

If there are expansion boards attached (and configured within the properties of the TDB) then the 'board' drop down menu will offer other options. E.g. Board '0' refers to the main board, board 1 – expansion board 1 etc.

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on the display by sending an integer value into the Mode 1 Input;

Value '0' – shows the value that Display Input currently has.
Value '1' – shows the character set within 'Mode 1' field.
Value '2' – shows the character set within 'Mode 2' field.
:
Value '7' – shows the character set within 'Mode 7' field.
Value '8' – shows the character set within 'Mode 8' field.

Clock Mode

The LCD display can format a minutes value (entered into 'Display input') into the format **00:00** by entering '-1' into the Mode input. E.g. Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display input', it would be translated to 13:00 on the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Mercury Display

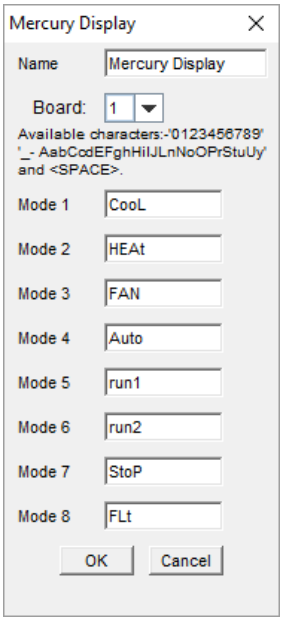
RDM Part Number PR0325

The inputs are

Display Input: Enter analogue value to be shown on the screen.

LED inputs: Switch the LED's on the display on and off by changing the input.

Mode 1: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the screen (see below).



Clicking on the properties of the block will display the menu to the right.

The display can be aliased.

If there are expansion boards attached (and configured within the properties of the TDB) then the 'board' drop down menu will offer other options. E.g. Board '0' refers to the main board, board 1 – expansion board 1 etc.

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on the display by sending an integer value into the Mode 1 Input;

Value '0' – shows the value that Display Input currently has.
Value '1' – shows the character set within 'Mode 1' field.
Value '2' – shows the character set within 'Mode 2' field.
:
Value '7' – shows the character set within 'Mode 7' field.
Value '8' – shows the character set within 'Mode 8' field.

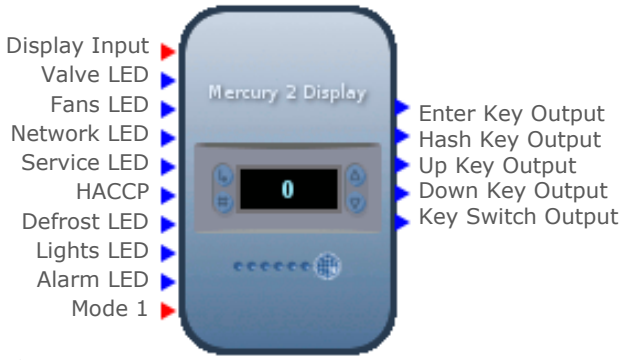
Clock Mode

The LCD display can format a minutes value (entered into 'Display input') into the format **00:00** by entering '-1' into the Mode input. E.g. Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display input', it would be translated to 13:00 on the display.

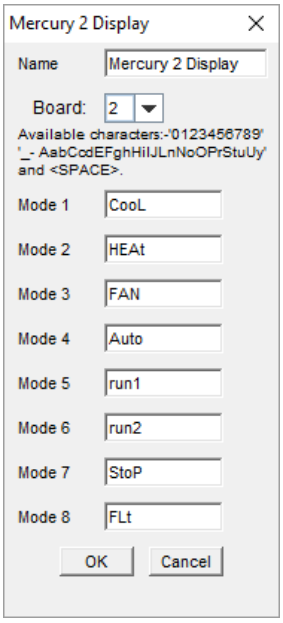
Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Mercury 2 Display

RDM Part Number PR0725



The inputs are as follows;



Display Input: Enter analogue value to be shown on the screen.

LED inputs: Switch the LED's on the display on and off by changing the input.

Mode 1: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the screen (see below).

Clicking on the properties of the block will display the menu to the right.

The display can be aliased.

If there are expansion boards attached (and configured within the properties of the TDB) then the 'board' drop down menu will offer other options. E.g. Board '0' refers to the main board, board 1 – expansion board 1 etc.

Within the fields 'Mode 1' to 'Mode 8', four alphanumeric characters can be inserted. The Available characters are listed within the properties box.

These pre-set characters can be displayed on the display by sending an integer value into the Mode1 Input;

Value '0' – shows the value that Display Input currently has.
Value '1' – shows the character set within 'Mode 1' field.
Value '2' – shows the character set within 'Mode 2' field.
:
Value '7' – shows the character set within 'Mode 7' field.
Value '8' – shows the character set within 'Mode 8' field.

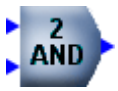
Clock Mode

The LCD display can format a minutes value (entered into 'Display input') into the format **00:00** by entering '-1' into the Mode input. E.g. Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display input', it would be translated to 13:00 on the display.

Note: The Display block must always be configured (right click) within the TDB program before it will activate.

Logic Blocks

And blocks

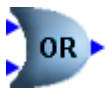


A	B	Output
Off	Off	Off
Off	On	Off
On	Off	Off
On	On	On

A	B	C	Output
Off	Off	Off	Off
Off	Off	On	Off
Off	On	Off	Off
Off	On	On	Off
On	Off	Off	Off
On	Off	On	Off
On	On	Off	Off
On	On	On	On

A	B	C	D	Output
Off	Off	Off	Off	Off
Off	Off	Off	On	Off
Off	Off	On	Off	Off
Off	Off	On	On	Off
Off	On	Off	Off	Off
Off	On	Off	On	Off
Off	On	On	Off	Off
Off	On	On	On	Off
On	Off	Off	Off	Off
On	Off	Off	On	Off
On	Off	On	Off	Off
On	Off	On	On	Off
On	On	Off	Off	Off
On	On	Off	On	Off
On	On	On	Off	Off
On	On	On	On	On

OR Blocks



A	B	Output
Off	Off	Off
Off	On	On
On	Off	On
On	On	On

A	B	C	Output
Off	Off	Off	Off
Off	Off	On	On
Off	On	Off	On
Off	On	On	On
On	Off	Off	On
On	Off	On	On
On	On	Off	On
On	On	On	On

A	B	C	D	Output
Off	Off	Off	Off	Off
Off	Off	Off	On	On
Off	Off	On	Off	On
Off	Off	On	On	On
Off	On	Off	Off	On
Off	On	Off	On	On
Off	On	On	Off	On
Off	On	On	On	On
On	Off	Off	Off	On
On	Off	Off	On	On
On	Off	On	Off	On
On	Off	On	On	On
On	On	Off	Off	On
On	On	Off	On	On
On	On	On	Off	On
On	On	On	On	On

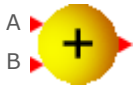
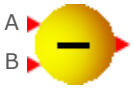
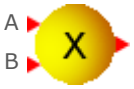
Not Block & Exclusive OR Block

A	Output
Off	On
On	Off

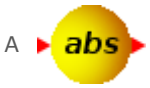
A	B	Output
Off	Off	Off
Off	On	On
On	Off	On
On	On	Off

Mathematical Blocks

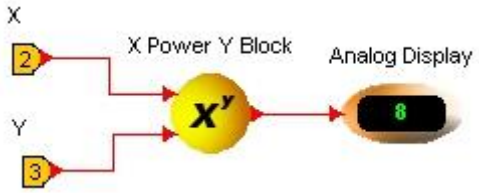
(+, - , x, ÷ blocks)

			
Output = A + B	Output = A - B	Output = A x B	Output = A ÷ B

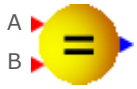
Absolute (abs) Block

Icon	Properties
	Output = A absolute The absolute block converts a value entered at 'A' to an absolute value, e.g. a negative value becomes a positive.

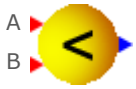
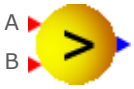
X to the Power of Y (x^y)

Icon	Properties
	Output=A^B An X^y block gives a value of X to the power of Y, in other words X multiplied by itself Y amount of times. In the example below, 2 to the power of 3 (or 2 cubed) equals 8. 

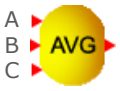
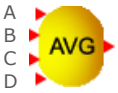
Min, Max, Equals blocks

		
If A < B Output = A If B < A Output = B	If A > B Output = A If B > A Output = B	If A = B Output = on If A ≠ B Output = off

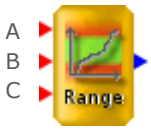
<, >, ≤, ≥ blocks

			
If A < B Output = On	If A > B Output = On	If A ≤ B Output = On	If A ≥ B Output = On

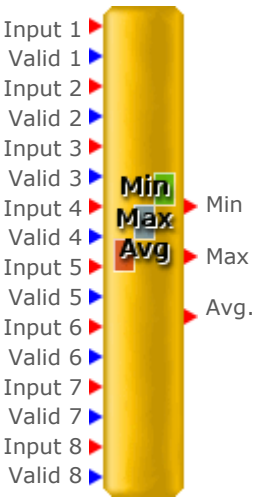
Average & Limit blocks

			
Output = (A + B) ÷ 2	Output = (A + B + C) ÷ 3	Output = (A + B + C + D) ÷ 4	If A > B Output = B If A < C Output = C If C < A < B Output = A

Range

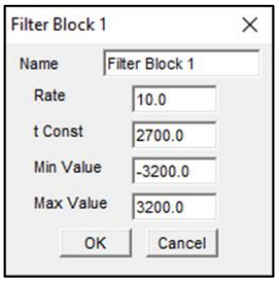
Icon	Properties
	**Input A**: Analogue Value **Input B**: Max Limit **Input C**: Min Limit Digital output goes off when the Analogue value is out with the Max and Min limits.

Min, Max, Avg. Block

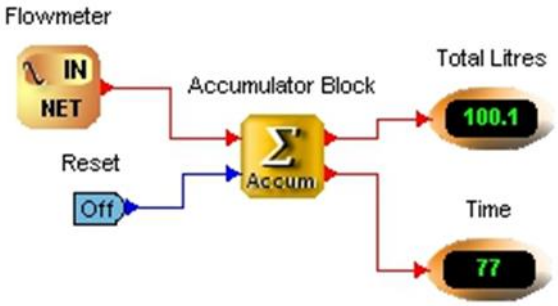
Icon	Properties
	**Input 1-8**: Analogue Values **Valid 1-8**: If the valid input is present the corresponding analogue input value will be used by the block. **Min**: The minimum value is outputted. **Max**: The maximum value is outputted **Avg**: The average value is outputted.

Filter

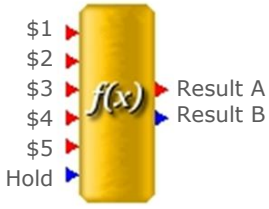
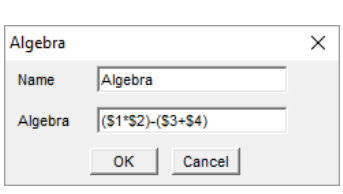
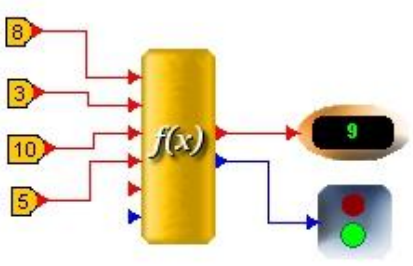
Icon	Properties
	The filter block can be used to apply a dampening factor to the analogue input. **Rate** How often the calculation occurs (in seconds). **T Const**. The time constant used (in seconds). **Min Value** Minimum value expected. **Max Value** Maximum value expected. **Operation** When an analogue value 'X' enters the block with a t-Const value of, for example 2700 (45min): With an increasing input, it calculates the rate of change for the value X to reach 63.2% of its current value over the 2700 seconds. If the t-Const is increased (from 2700), you are lengthening the time for it to get to the 63.2% point. Thus increasing the dampening factor. With a decreasing input, it works the same as above, only calculates the rate of change to reach 32.8% of its current value. The calculation is carried out every period set in the 'Rate' field. Depending on the input's rate of change will indicate what the 'rate' will need set to. Additionally, depending on the environment and required dampening, the t-Const will need to be adjusted.



Accumulator Block

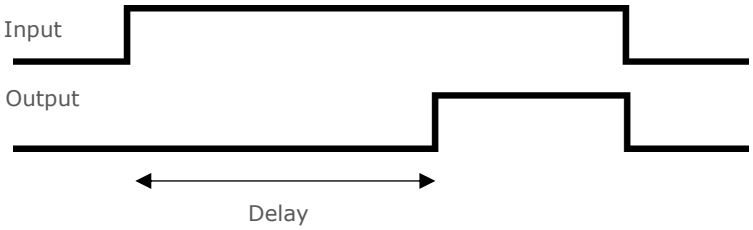
Icon	Properties
	**Input:** The accumulator block samples the value at the input and adds it to the running total count, this sample/calculation is fixed and is carried out every second. **Total:** This is the running total. The accumulation process will start as soon as the TDB program is running. **Time:** The time output is in seconds and provides the total elapsed time from last power on or reset. **Reset:** The total value count and time elapsed will be set to zero when the reset input is activated. In the example below, a flow meter with a litres per second analogue output is connected to the input of the accumulator block. Every second, the instantaneous litres per second value is added to the total. The total litres used and the total time, in seconds, is displayed on the right.  **Note**: The accumulator output, is periodically saved in the TDB Controller's non-volatile memory on the hour and half past the hour.

Algebra

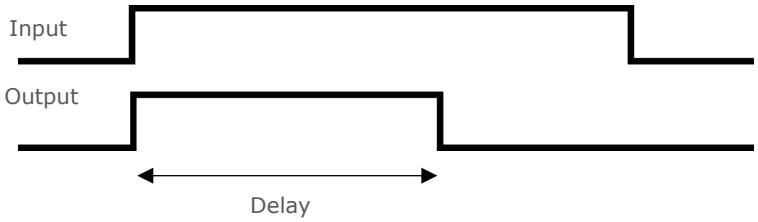
Icon	Properties
 Digital Output 'Result B' will go 'high' for a non 0 result.	This block has 5 variable analogue inputs and will perform advanced calculations. The digital 'Hold' input, when on, will hold the result regardless of the values updating on the analogue inputs. Calculation can be up to 255 characters long. Useable symbols within the equations; **+** Addition **-** Subtraction ***** Multiplication **/** Division **^** Raised to the power of. Precedence : ^ , * , / , + , - Brackets can be used to control execution order. **Rounding**; **round (x):** Value is rounded up or down to the nearest whole number. **ceil (x):** Value is rounded up to the nearest whole number. **floor (x):** Value is rounded down to the nearest whole number. The block will also perform trigonometric and log equations; **sin (x):** Sine of x (Argument in radians) **cos (x):** Cosine of x (Argument in radians) **tan (x):** Tangent of x (Argument in radians) **asin (x):** Arc sine of x (Argument in radians) **acos (x):** Arc cosine of x (Argument in radians) **atan (x):** Arc tangent of x (Argument in radians) **sqrt (x):** Square root of x **abs (x):** Absolute value of x **exp (x):** E raised to the power of x **ln (x):** Natural (base e) log of x **log (x):** Base 10 log of x **rad (x):** Convert x degrees to radians **deg (x):** Convert x radians to degrees **Note 1**: Spaces in a formula are ignored **Note 2**: The floating point calculation used in the Algebra block, within the TDB platform, supports 16 significant digits. In the simple example below: Input $1=8, $2=3, $3=10 and $4=5. The equation is ($1 x $2) - ($3 + $4) or (8 x 3) – (10 + 5) So the analogue result 'A' will be 9. Digital result 'B' will be ON as there is a non-zero result.  

Time Blocks

Delay On Timer

Icon	Properties
Input Reset Delay 	 When the input is activated, the output will remain 'off' until the delay period has elapsed. The output will then remain 'on' until the input goes 'off' or if the reset is activated.

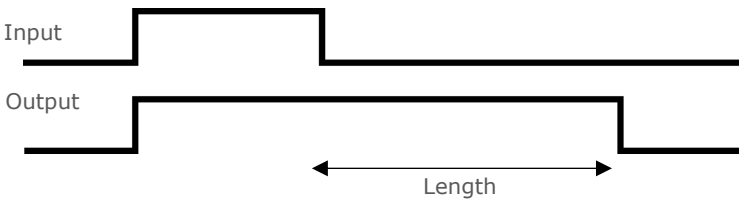
Pulse Timer

Icon	Properties
Input Reset Delay 	 When the input is activated the Output will turn on. The output will return to the 'off' state when the delay (pulse time) expires or the input is removed before the delay time has expired or the reset is activated before the delay time has expired.

Heartbeat

Icon	Properties
Period Sync 	A momentary on pulse is generated on the output at the beginning of every time period as determined by the value set in period. The period value is in seconds. The sync input will reset the period timer back to zero when activated allowing the pulse to become synchronised with another timed function. The Heartbeat Block would typically be used to trigger an event at a regular interval, for example, it could be used to activate an Analogue Store to store a temperature every minute. The shortest 'Period Value' that can be entered is 0.2 of a second. **Note**: The use of an SR latch block may be required.

Run On

Icon	Properties
Input Length 	 When the input is activated the output will turn 'on' and remain 'on' until the length time period has elapsed.

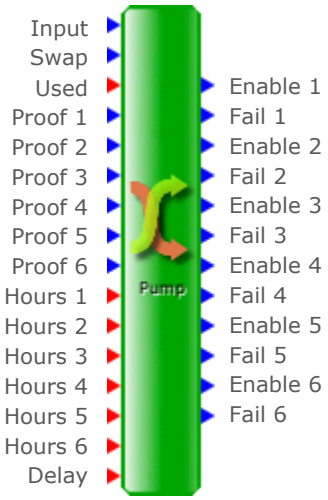
Run Hours

Icon	Properties
	The output displays the total number of hours that the input is active. The output is shown to one decimal place. The output will go to zero when the reset input is active (On). The maximum hour count is 596,680 (which equates to 68 years). **Note**: The Hour Count is periodically saved in the TDB's non-volatile memory on the hour and half past the hour.

Change Over

Icon	Properties
	**Input:** Demand required. Either Enable 1 or 2 will be turned on when this input is activated and will go off when the input is deactivated. The output activated will vary depending on whether or not the Swap input has been enabled. **Swap:** When activated the Enable output current operating will be turned off and the alternative Enable output turned on (Proof dependant). If the Swap input has never been activated then only Enable 1 will be activated by the Input. **Proof 1 & 2:** If used a proof signal must be returned when the associated Enable output is activated. If the proof is returned within the Delay parameter time the Enable output stays on, if not the associated Enable output is turned off and the alternative Enable output is turned on. **Note:** If Proof inputs are not required then a digital setting block set to 'On' must be used to bypass the Proof input('s). **Delay:** Time delay associated to Proof 1&2 **Enable 1:** Digital Output. **Fail 1:** Activated if Proof 1 is not returned within the 'Delay' time after Enable 1 is turned on. **Enable 2:** Digital Output. **Fail 2:** Activated if Proof 2 is not returned within the 'Delay' time after Enable 2 is turned on.

Pump Block

Icon	Properties
	The pump block permits for up to six outputs to be utilised, equalising the run hours of the individual 'channels'. **Input**: Demand required. One of the 'Enable' outputs will be turned on when this input is activated and go off when the input is deactivated. The output activated will vary depending on the number of run hours the 'channel' currently has. **Swap**: When activated, the 'Enable' output currently operating will be turned off and an alternative 'Enable' output turned on (Proof dependant). The 'Enable' turned on will be the channel with the lowest number of run hours. If the 'Swap' input has never been activated then only 'Enable 1' will be activated by the Input. **Used**: Integer value of how many pumps/ outputs are in use, i.e. 1-6. **Proof 1 – 6**: If used, a proof signal must be returned when the associated 'Enable' output is activated. If the proof is returned within the 'Delay' parameter time, the 'Enable' output stays on. If not, the associated Enable output is turned off and an alternative Enable output is turned on (based on run hours). **Note:** If Proof inputs are not required then a digital setting block set to 'On' must be used to bypass the Proof input(s). **Hours 1 – 6**: Analogue inputs specifying the number of hours the 'channel' has been active for. Possibly connect to the output of a 'Run Hours' block. **Delay**: Time delay associated to Proofs 1 – 6. **Enable 1 – 6**: Digital Output/ run signal for pumps. **Fail 1 – 6**: Activated if Proof X is not returned within the allotted time after Enable X is turned on. Within the properties of the block there is an option to use Run Proofs. With the box unchecked, the enable outputs will run without the requirement of the corresponding run signals.

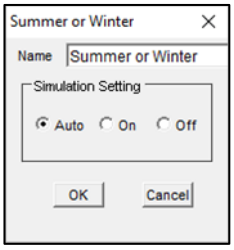
Match Date

Icon	Properties
	Match Date output goes high when the date in the controller hardware RTC matches the day, month and year defined. Output stays on for 24 hours until the date changes. Not defining the year field allows the block to match the day & month regardless of the year. Not defining the month and year fields allows the block to match the day regardless of the month & year. Uses the controllers current time and date.

Date Time Block

Icon	Properties
	This block uses the TDB device's Time and date. It separates the Time & Date segments and outputs them as analogue outputs. Time: Splits it into Seconds, Minutes and Hours. Date: Splits it into Day, Month and Year. DST: Output will come on when daylight saving time is on Since Midnight: Output counts up the seconds from midnight. Resets back to 0 at midnight and starts counting up again.

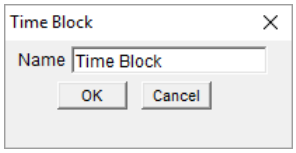
Summer or winter

Icon	Properties
	This block performs an automatic summer/ winter (BST/GMT) time change. Block Name can be changed if required. 

Daylight Block

Icon	Properties
	The Daylight block can be used to provide an indication of daylight and twilight hours for a given geographical location. Note the information provided by this block should be used as a guide only. **Latitude:** Enter the current Latitude coordinate of the TDB device e.g. 55.856742. **Longitude:** Enter the current Longitude coordinate of the TDB device e.g. -4.353971. **Morning Offset:** Allows for a positive or negative offset to be applied to the '**on**' time for the Daytime and Twilight outputs. A positive offset will delay the Daytime /Twilight '**on**' time. A negative offset will bring the Daytime/ Twilight '**on**' time forward. **Evening Offset:** Allows for a positive or negative offset to be applied to the '**off**' time for the Daytime and Twilight outputs. A negative offset will delay the Daytime /Twilight '**off**' time. A positive offset will bring the Daytime/ Twilight '**off**' time forward. **Daytime:** The Daytime output will turn on at sunrise and off at sunset based on the Latitude and Longitude settings entered. **Twilight:** The Twilight output will turn on when Twilight begins (shortly before sunrise) and off when Twilight ends (shortly after sunset). **Note**: Any offset should be added in Seconds, use the unit type 'secs'. To achieve a negative offset enter a negative number, for example -900 would equate to -15 minutes.

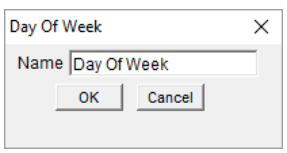
Time Block

Icon	Properties
	Block Name can be changed. Output turns on at the 'start time' and turns off at the 'stop time'. Both time inputs can work to a 'second' resolution. 

Schedule

Icon	Properties
	The Schedule block can be used to signal a number of events every specified number of days. The TDB Controller's real time clock is used to determine the current time. **Start:** Enter the initial start time. The Output will activate when this time is reached. Note the output is only active for 1 second. **End:** Enter the last scheduled start time. The Output will activate when this time is reached. Note the output is only active for 1 second. **No. Per Day:** Enter the number of events required per day. If more than two events occur in a single day then the total number of events will be evenly spaced including the Start and End times. Please see example below. Start 13:00 End 16:00 No. Per Day 4 In the above example the output would be active at 13:00, 14:00, 15:00 and 16:00 hours. Note if only 1 event per day is entered then the output will trigger on the 'Start' parameter **Days:** Enter the frequency of the events in days. For example if the 'Number Per Day' is set to 2 and the 'Days' parameter is set to 3 then every 3 days the output will be active twice. Once at the entered Start time and again at the End time. Note the schedule takes effect from the last TDB program save. Set to 1 if you wish the schedule to occur every day. Start and End time can span midnight e.g. Start 22:00 End 03:00

Day of Week Block

Icon	Properties
	Output = 0 = Sunday Output = 1 = Monday Output = 2 = Tuesday Output = 3 = Wednesday Output = 4 = Thursday Output = 5 = Friday Output = 6 = Saturday 

Functional Blocks

Alarm block

Switch Delay Setting 	The alarm block is used to indicate an alarm. It's activated by the switch input and can have an alarm delay assigned by using a setting block on the delay input. The alarm can have an 'index' type (used within the DMTouch to direct alarms) assigned by editing the properties box. An 'Alarm Priority' can also be assigned for when the device is logged on to BACnet networks. **Note**: An index of '1' will only alarm locally and not be sent over the network if setup.

Analogue Switch

Analogue Input Switch 	An analogue value can be switched off using the switch input.

Two-Way Switch

Analogue Input 1 Analogue Input 2 Switch 	If digital Input Switch is off the output will follow Analogue Input 1 value If digital input Switch is on the output will follow Analogue Input 2 value

Analogue Store

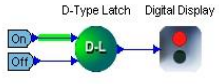
Value Switch Start-up Value 	Initially the output is at the start-up value. Analogue values can be stored by turning the switch on then off, the output retains the input value at the time the switch is turned off. Click the 'Non-Volatile' option to save the output value of the analogue store on the hour or half past the hour or during a software restart. **Note**: If more than one Analogue Store is being used then they must each have unique aliases. I.e. Analogue Store 1, Analogue Store 2 etc.

Pulse Counter

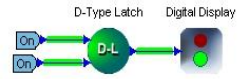
Count Up Count Down Reset 	The output increments and decrements in accordance with the up and down inputs. The output will go to zero when the reset input is active (On). **Note 1**: The current count is periodically saved in the TDB's non-volatile memory on the hour and half past the hour. **Note 2**: If more than one counter is being used then they must each have unique aliases. I.e. Pulse Counter 1, Pulse Counter 2 etc.

D-Latch

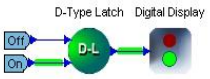
'D' Input Clock 	The 'D' digital input value is clocked through to the output on each rising edge of the clock input B.



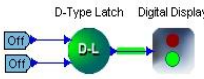
Input (A) is on.



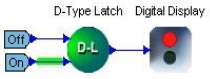
Input (A) is switched through to the output when the clock signal (B) is switched on



Input (A) is removed, output stays on.



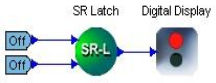
Clock (B) is removed, output stays on.



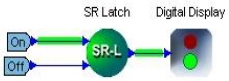
Clock (B) is switched on, Input (A), which is off, is 'clocked' through to the output which now goes off.

SR-Latch

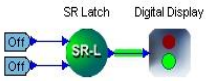
Set Reset 	The output goes on when the 'Set' input goes on, and goes off when the Reset input goes on.



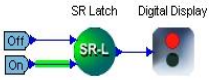
Input (A) and reset (B) are both off.



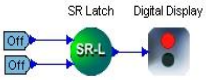
Input (A) is switched on and goes straight through to the output.



Input (A) is switched off, output remains on.



Reset (B) is switched on, output is 'reset' and switches off



Reset (B) is removed.

Digital Edge Block

Signal  Edge Rising Falling	For each Rising Edge of the input signal the Edge and Rising Outputs will pulse high for 0.1 seconds For each Falling Edge of the Input signal the Edge and Falling Outputs will pulse high for 0.1 seconds.

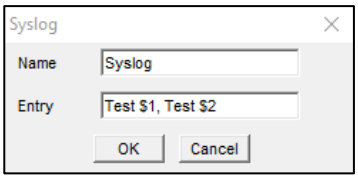
Analogue Edge Block

Signal  Edge Rising Falling	For each Rising Edge of the input signal the Edge and Rising Outputs will pulse high for 0.1 seconds. For each Falling Edge of the Input signal the Edge and Falling Outputs will pulse high for 0.1 seconds.

Syslog

When the digital input is activated the text defined in the 'Entry' field will appear in the controller system log. The entry will be time/date stamped with the controller's current time and date.

The use of $1 & $2 in the entry field allow for analogue values to be included in the system log entry. In the example to the right, when the digital input is activated the values currently fed into $1 & $2 will be included in the system log entry.

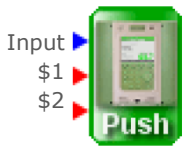


e.g. If the values '10.1' and '5.6' were connected to $1 & $2 respectively, The system log entry (from example to the right) would be;

Test 10.1, Test 5.6.

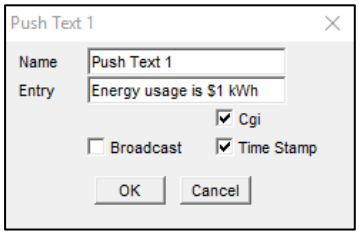
Note: the controller will save a maximum of 300 entries in the system log.

Push Text



This block allows a scrolling text message to appear both on the web interface and the TouchXL's display (if fitted).

When the Input is activated, the text message in the Entry field will appear on the TDB controller's web page. If the strings '$1' and '$2' are included within the text message then the analogue values connected to the $1 and $2 inputs will also be displayed in the text message.



CGI: Check this for the message to be displayed on the computer generated interface, such as a PC.

Broadcast: Broadcasts to another TDB device on the network. See peer to peer Communications.

Time Stamp: The message will appear with the date and time shown first.

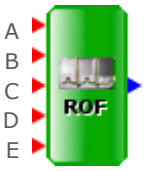
In the example shown above, if an analogue value of '4615' is connected to $1, then the Push Text output on the device will be;

Energy usage is 4615 kWh

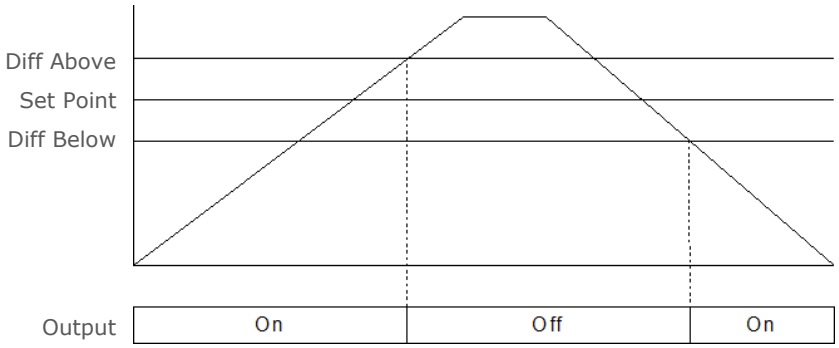
Reverse On/Off / Reverse On/Off 2

Reverse On/ Off 1

Reverse On/ Off 2



Input A: Analogue Input
Input B: Set Point
Input C: Diff above SP
Input D: Diff below SP
Input E: Delay



Reverse On/Off blocks are typically used to control a heating function.

As an example, input (A) would be from a temperature probe and setpoint (B) would be the temperature you want to maintain the room at. Differential above setpoint (C) and differential below setpoint (D) are bands either side of the setpoint at which the heating is turned on and off. If there were no differentials (C & D set to zero or not used) then the heating would constantly switch on and off around the set point and cause relay 'chattering'.

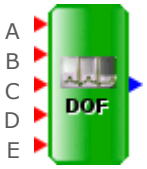
As shown in the above graph, when the system is initially switched on the temperature is below the set point minus the diff below, this would cause the output (heating) to be switched on. As the room heats up, the temperature rises above the set point, when the temperature reaches the set point plus the diff above the output (heating) is switched off. The room will gradually cool down, when the temperature falls to the set point minus the diff below, the output (heating) is switched on again.

The Reverse On/ Off 2 block has the additional 'Delay' input. When a time value is inputted, it delays the output from coming on or going off for that period. **Note**: Use with caution.

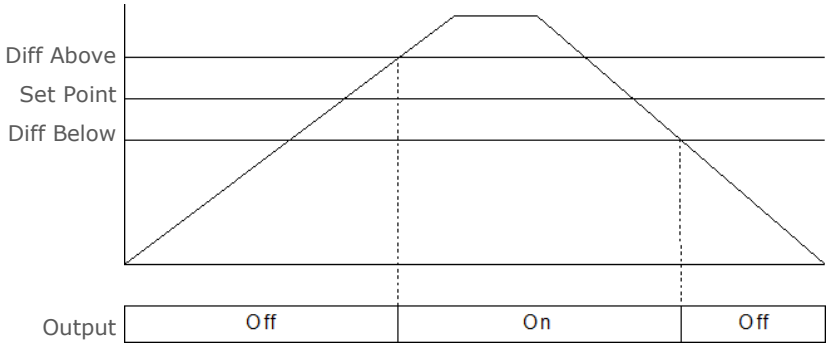
Direct On/Off / Direct On/Off 2

Direct On/ Off 1

Direct On/ Off 2



Input A: Analogue Input
Input B: Set Point
Input C: Diff above SP
Input D: Diff below SP
Input E: Delay

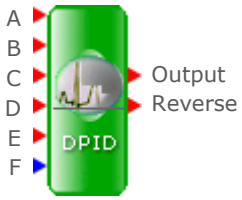


A Direct On/Off block works in the opposite manner to a Reverse On/Off block and would typically be used to control a cooling function.

Direct PID / Direct PID 2

Direct PID

Direct PID 2



Input A: Analogue input
Input B: Set Point
Input C: Proportional constant
Input D: Integral
Input E: Derivative
Input F: Hold

This block performs a PID control function where the set-point, proportional, integral and derivative values can be assigned. It is typically used in a cooling application.

A Direct PID block gives a variable output (0-100) depending on the relationship between the analogue input (A) and a set point (B). A Direct PID 2 block has a second output, 'Reverse', which is the inverse value to the Output.

If the application requires the output to have limits within the block's 0-100 range then a Limit block can be utilised.

Knowledge of PID loop mechanisms is advisable.

If the analogue input is increasing rapidly away from the set point then the PID block will increase its output rapidly in an attempt to maintain the set point.

If the analogue input is increasing more slowly away from the set point then the analogue output will be proportionally less.

A typical application would be to control a condenser fan(s) connected to a variable speed drive with the analogue input coming from a pressure transducer. The speed of the condenser fan(s) would depend on how close the pressure is to the set point and how quickly the pressure is changing.

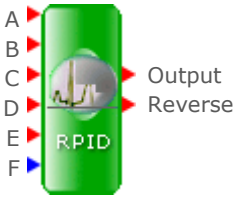
The Proportional constant, Integral and Derivative settings determine how quickly and by how much the output varies in relation to the input. These values require fine tuning and should be used with care.

The Direct PID 2 block has the additional 'Hold' input. When the digital input goes 'on' the analogue output values do not change from their current value regardless of any change to the analogue inputs. **Note**: Use with caution

Reverse PID / Reverse PID 2

Reverse PID

Reverse PID 2

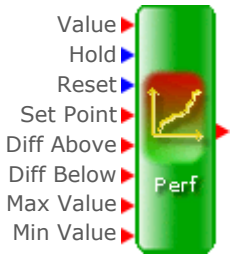


Input A: Analogue input
Input B: Set Point
Input C: Proportional constant
Input D: Integral
Input E: Derivative
Input F: Hold

This block performs a Reverse PID control function where the set-point, proportional, integral and derivative values can be assigned. It is typically used in a heating application.

If the application requires the output to have limits within the block's 0-100 range then a Limit block can be utilised.

Performance



This block calculates a performance indicator. The performance block will monitor the performance of the analogue value (Value) and give it a score.

The score is based on how close the analogue value is to Set-point and if it is being maintained within the diff above and diff below values. Consideration is also given to how close/ far the analogue value is from the max and min limits.

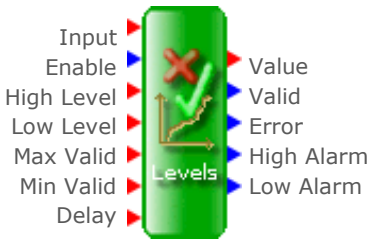
The min and max limits are generally the high and low alarm settings.

A score of 1 equates to a good performance, a score of 10 equates to a poor performance.

Alarms can be generated to alert users when a device relating to the value is underperforming.

Note: If the Min Value and the Set Point are both set to the same value and the Diff Below is set to zero then any values on input A *below* the set point will not affect the performance score. Similarly, if the Max Value and the Set Point are the same and the Diff Above is set to zero, any value on input A *above* the setpoint will not affect the performance score.

Levels



A Level block is used to monitor an analogue input and check that it is within pre-set parameters.

As an example, if the input was a temperature probe then the High Level and Low Levels would be set to initiate an alarm if the temperature went too hot or too cold (subject to the delay). The Max Valid and Min Valid parameters could be set to the limits of the probe scale, an error output would be generated if these limits were exceeded (subject to the delay) which would indicate a probe fault.

Input: Analogue Signal
Enable: When the input is activated it enables the checking features of the block. Note if disabled the analogue value is still fed through to the 'Value' output.

High level, Low Level, Max Valid and Min Valid are settable values.

Delay: Delay associated to the Error, High and Low alarm digital outputs.

Value: Value passed from the Input
Valid: The output is active whilst the Input signal is within the Max Valid and Min Valid parameters.
Error: The output is activated when the Input signal is out with the Max/Min Valid parameters.
High Alarm: The output is activated when the Input signal is above the parameter High Level.
Low Alarm: The output is activated when the Input signal is below the parameter Low Level.

Note: For this block to operate correctly all the inputs must have a value assigned. When the Enable is activated the controller checks all inputs. 'Input', 'High Level', 'Low Level', 'Max Valid', 'Min Valid' and 'Delay'.

Occupancy Optimisation

The Occupancy Optimisation block is used as an energy saving tool. The block calculates when to enable the output, connected to the heating/cooling strategy, to achieve the desired room temperature for when the room is first occupied.

Ambient: Temperature Input

Target: Desired temperature.

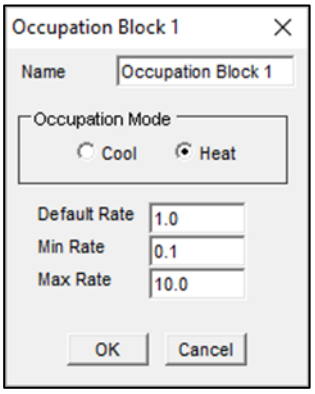
Occupation: Connect the analogue output of the GP2/GP3 block here.

Enable: Connect the digital output of the GP2/GP3 block here. Now configure the GP2/GP3 block with the desired occupied times.

No Learn: Occupation block uses the current calculated rate and stops any further calculations.

Hold: The predictive part of the block is disabled and the Output of the block follows the status of the Enable input.

The properties for the block are shown on the right.



Select between **Cooling** or **Heating**.

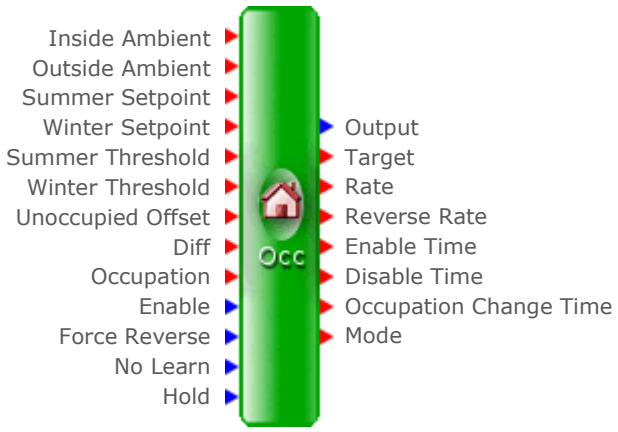
The Occupancy Optimisation block calculates the degree per hour change in room temperature when the heating/cooling plant is on. This allows the block to determine when to enable the output. The default rate is 1Deg per hour and is used until a current rate is calculated.

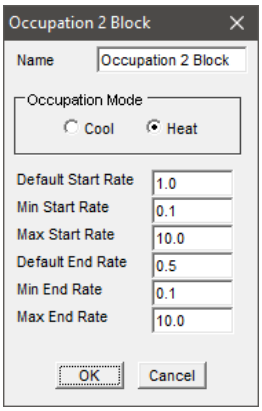
The rate is continuously calculated by the block.

A parameter appears for the Occupation block in the controller parameters screen. This parameter will vary to show the current calculated rate.

Enter Min and Max Rates. The Calculated degree Per hour value will never go above or below these values.

Occupancy Optimisation 2





The Occupancy Optimisation block 2 is used as an energy saving tool. The block calculates when to enable the output, connected to the heating/cooling strategy, to achieve the desired room temperature for when the room is first occupied.

Input Values

Inside Ambient: Temperature input of space to be cooled or heated.
Outside Ambient: Temperature input of outside air.
Summer Setpoint: Target temperature in 'summer' state, used to calculate actual Setpoint.
Winter Setpoint: Target temperature in 'winter' state, used to calculate actual Setpoint.
Summer Threshold: Temperature setting, of which above, deems a 'summer' state. Used to calculate actual Setpoint.
Winter Threshold: Temperature setting, of which below, deems a 'winter' state. Used to calculate actual Setpoint.
Unoccupied Offset: Time offset subtracted from the end of when the GP Timer switches off.
Diff: Temperature diff from the current setpoint used in the reverse rate calculation. See **Reverse End Rate** calculation.
Occupation: Connect the analogue output (until) of the GP2/GP3 Timer block here.
Enable: Connect the digital output (state) of the GP2/GP3 block here. The GP Timer blocks must be configured, as per their setup, with the desired occupied times.
Force Reverse: This input can be used to stop learning the reverse rate calculation.
No Learn: The Occupancy Optimisation 2 block uses the current calculated rate and stops any further calculations.
Hold: The predictive part of the block is disabled and the Output of the block follows the status of the Enable input.

Output Values

Output: Output signal from the block to enable the heating/ cooling plant.
Target: Calculated setpoint for the heating/ cooling application. See **Calculated target** below.
Rate: Current heating/ cooling rate (Deg./hr) for when the plant is switched on.
Reverse Rate: Current heating/ cooling rate (Deg./hr) for when the plant is switched off.
Enable Time: Time the occupation block is due to bring on the digital (heating/ cooling enable) output.
Disable Time: Time the occupation block is due to switch off the digital (heating/ cooling enable) output.
Occupation Change Time: Formatted 'until' time taken from the GP2/GP3 Time block. This is the time the next change will take place from the GP Timer (on or off).
Mode: Range of value from 0 – 6 representing the block's current mode/ state. The modes are as follows;

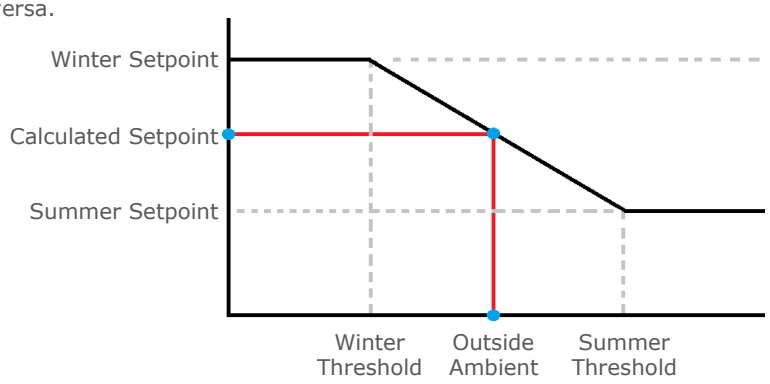
0: Initial State
1: Outwith time bands from GP Timer. i.e off state.
2: Inside of 'Enable' window
3: Enabled, but not learning
4: Enabled and learning
5: Reached target/ occupation time, finished learning
6: Reached target/ occupation time, not learning

The properties for the block are shown above. Select between **Cooling** or **Heating**.

Calculated Target

The initial step for the Occupancy Optimisation 2 block is to calculate the actual Target Setpoint for the occupied space to heat/ cool to. For this it utilises the following inputs; Outside Ambient; Summer SP; Winter SP; Winter Threshold; Summer Threshold.

Using the above inputs, the below graph can be created. If the outside ambient temperature goes above or below the Summer or Winter thresholds, the calculated setpoint will take the respective Summer or Winter Setpoint. When the Outside ambient temperature is between the two thresholds, the block uses the plotted graph to generate a Calculated Setpoint. This Setpoint will vary according to how near/ far it is from the winter/ summer thresholds. Closer to the Winter threshold, it will use a SP closer to the Winter Setpoint and vice versa.



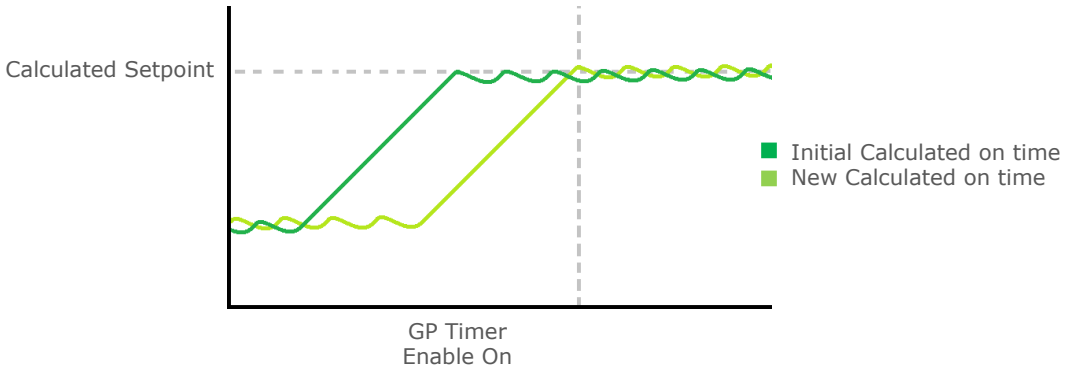
Start Rate

The Occupancy Optimisation 2 block calculates the degree per hour (Deg./hr) change in room temperature when the heating/cooling plant is on. This allows the block to determine when to enable the output so that the room temperature is at the target setpoint for when the room is occupied.

From the properties box, shown above, the default start rate is 1 Deg./hr (adjustable) and is used until a new start rate is calculated by the block. This start rate is then continuously calculated. In addition to the default, the min and max start rates can be set limiting the Start rate calculation, if necessary, to these values.

A parameter appears for the Occupancy Optimisation block in the controller parameters screen. This parameter will vary to show the current calculated rate.

In the heating example below, it shows two temperature lines. The block uses the initial 'default' start rate of change to calculate when to switch the heating plant on. Using the newly calculated rate of change, it then adapts to switch on the heating plant later, thus raising the room temperature to the setpoint for when space is occupied, saving energy.

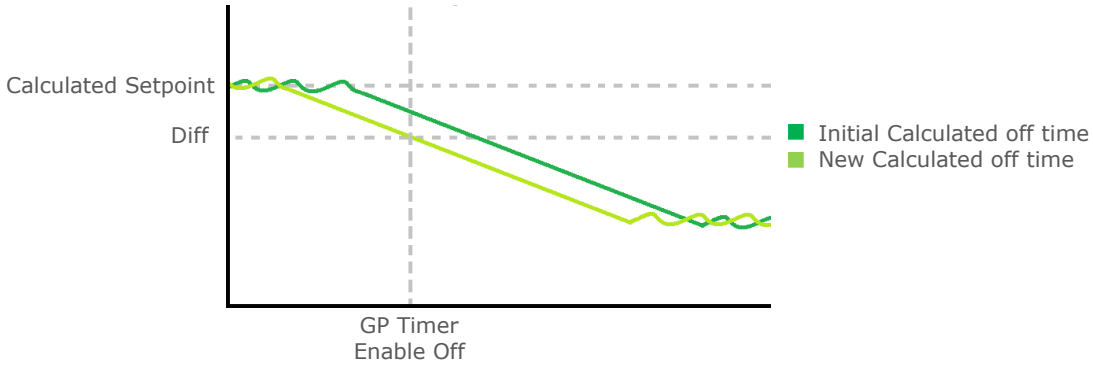


Reverse (End) Rate

Similar to the Start Rate, the Occupancy Optimisation 2 block calculates the Deg./hr change in room temperature when the heating/ cooling plant turns off. It then uses this End rate to determine when to disable the output so that the room temperature is at the target temperature minus/ plus (depending on heat/ cool) at the point of when the room is unoccupied.

From the properties box, shown above, the default start rate is 0.5 Deg./hr (adjustable) and is used until a new end rate is calculated by the block. This end rate is then continuously calculated. In addition to the default, the min and max end rates can be set limiting the end rate calculation, if necessary, to these values.

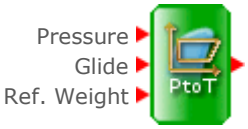
In the heating example below, it again shows two temperature lines. The block uses the initial 'default' end rate of change to calculate when to switch the heating plant off. The target temperature for the 'GP Timer Off' (or the end of occupied time) will be the current target setpoint minus the dif. Using the newly calculated rate of change, it then adapts to switch the heating plant off earlier, thus allowing the room temperature to drop to the acceptable level at the point the room is unoccupied.



Pressure to Temperature / Pressure to Temperature 2

Pressure to Temperature 1

Pressure to Temperature 2

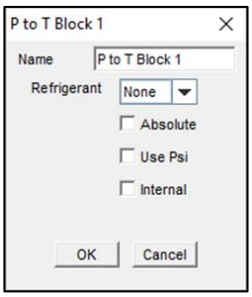


Current Supported Refrigerants;

R12*, R13*, R13b1*, R22, R23, R32, R114*, R134a, R142B, R227, R401, R401A*, R401B, R401C R402, R402A, R402B, R404A, R407A, R407B, R407C, R500, R502, R503, R507, R717, R290, R744, R407F, R410A, R449A, R513A.

*Not available in P2T2.

The pressure to temperature block is used to convert a pressure reading to a temperature based on the refrigerant gas type in use.



Pressure: Pressure Input.

Glide: Allows for a linear offset, in degrees Celsius or Fahrenheit, to be subtracted from the output temperature.

Ref. Weight: P2T2 block only. For blended refrigerants, the weighting (%) can be inputted for a non-linear conversion. When the refrigerant weight parameter is set to 0% then the liquid pressure is used (bubble), when set to 100% the vapour pressure is used (dew).

Output: Calculated temperature.

Absolute: Tick to use Absolute pressure, leave un-ticked for Gauge pressure.

Use PSI: Pressure input defaults to BAR. Tick if the pressure input to the block is in PSI.

Internal: Tick to prevent the refrigerant selection appearing in the parameter page.

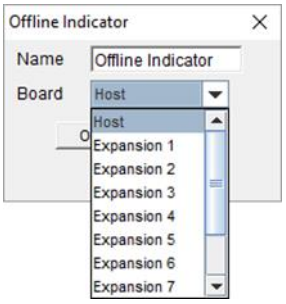
Comfort Block

This block can use both the Temperature analogue input and the humidity to calculate the apparent temperature using the comfort index shown in appendix 1.

Offline Block

Used to monitor comms to and from the TDB Controller and those devices it is connected.

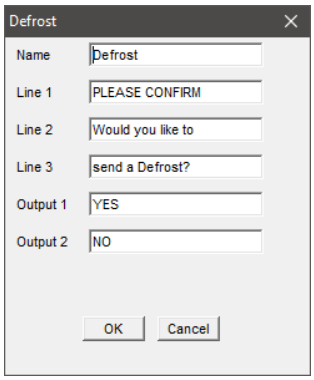
Block Name can be changed.



Host: When communications are lost between the TDB controller and the front-end the Output will go 'on' after the input 'Time' has elapsed.

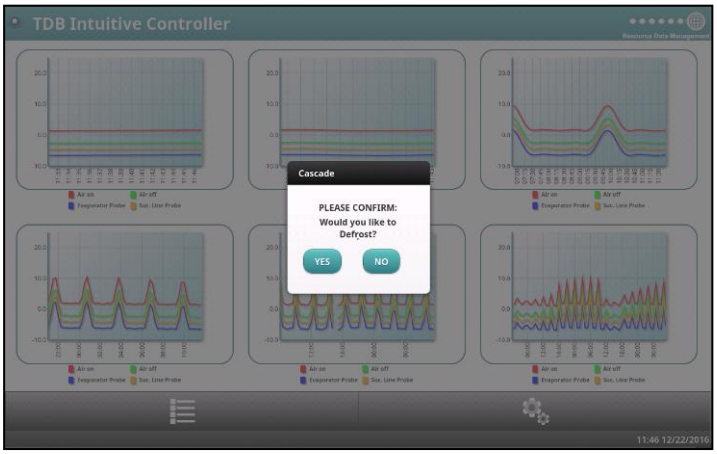
Expansion 'X': When communications are lost between the TDB controller and the selected Expansion board the Output will go on after the input 'Offline Timeout' has elapsed.

Display Cascade Block



The Display Cascade Block can be used in conjunction with the TouchXL Display or the Plant Touchscreen Display.

When the Trigger input is activated (switched from off to on), a prompt will be forwarded to the display. The prompt's text is entered in Line 1, Line 2 & Line 3 of the properties box. Within the prompt, there will be two 'response boxes'. The text displayed in these boxes is defined in the fields 'Output 1' and 'Output 2'.



An example of the display from the TouchXL screen would look similar to the left when 'triggered'.

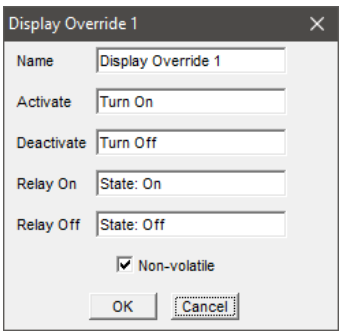
An example of the USB Plant Touch Screen display would look similar to the right when 'triggered'.

If the left hand response button ('YES') is pressed then the 'Yes Button' output is momentarily activated. If the right hand response button ('NO') is pressed then the 'No Button' output is momentarily activated.

Whichever response is pressed, the display will revert back to its home screen unless a subsequent cascade block connected to the output gets activated. The 'response' boxes' are defaulted to 'Yes' or 'No', but they are user definable e.g. 'Override' and 'Escape'.

Using a series of Display Cascade Blocks, they can provide a sequence of questions and answers; the yes and no outputs triggering the input of the next block or blocks.

Display Override Block



The Display Override Block can be used in conjunction with the Plant Touch Screen Display or the Custom Home page option within the web/ TouchXL's interface.

Plant Touch Screen
When a Plant Touch Screen Display is configured with a custom override block, it allows the user to override a digital value within the TDB control program, from the display. An 'ON/OFF' button appears on the display, with the override name and the current state value above it. The override name is entered in the properties page as well as the state descriptions. The state descriptions are defaulted to 'State: On' and 'State: Off'.

The text that appears inside the button can also be entered in the properties page. There are two lines of text, one which appears inside the button when the override is activated and one that appears when the override is deactivated, these are defaulted to 'Turn On' and 'Turn Off'.

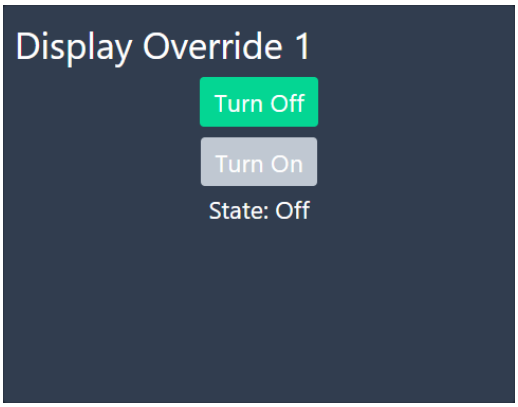
Pressing the override box changes the status of the override output and alters the text accordingly. In the above example (which is the default setting), initially the display will show the override name (Display Override 1 in this case) and 'State: Off'. The text inside the button will be 'Turn On' and the output of the block will be 'Off'.

When the button is pressed, the description will change to 'State: On' changing the output of the block to 'On' and the text inside the button will be 'Turn Off'

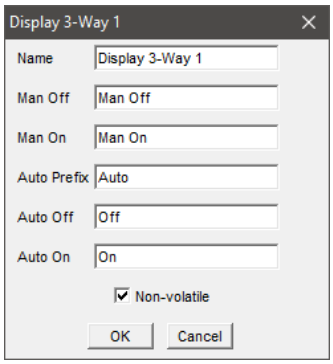
Blocks Digital Inputs
The Display Override Block can also be activated and deactivated by triggering (switching from 'Off' to 'On') the 'activate' and 'deactivate' digital inputs on the block. Priority is given to the latest trigger input whether it is from the touch screen or the Display Override Block inputs.

Non-Volatile Option
With this option 'unchecked', if the device receives a reset, the block will resort to its default state. When the option is 'checked' and the device is reset, it will return to the state it was in. **Note**: when implementing a strategy, take into considerations any settings/ logic going into override block.

Custom Home Page Setup
When the Display Override block is used in conjunction with the Custom Home Page setup, it will look similar to the image to the right. This will be on both the web interface and the TouchXL display (if fitted). Please see Custom Home Page section for details of configuration. In the layout, both buttons will be visible. The highlighted button (in the example 'Turn Off'), will represent the current state of the override. By selecting 'Turn On', it will change the State to 'On' and highlight the button.



Display 3-Way Block



The Display 3-Way Block can be used in conjunction with either the Plant Touch Screen Display or the layout option within the web/ TouchXL interface.

Plant Touch Screen
When a Plant Touch Screen Display is configured with a custom 3-Way block, it allows the user to override a digital value within the TDB control program, from the display.

A 'Man Off/ Man On/ Auto' button appears on the display, with the override name and the current state value above it.

If set to 'Auto', the state value above the override button will show Auto and whether the current state is 'On' or 'Off'. The override/ state names are entered in the block's properties page. The state descriptions are defaulted to 'Man: Off', 'Man: On' and 'Auto'. When in the 'Auto' state, the two values (Auto Off and Auto On) are defaulted to 'Off' and 'On' respectively.

The text that appears inside the button matches the 3 descriptions of the states (i.e. Man Off, Man On & Auto). Pressing the override box changes the status of the override output and alters the text accordingly.

Example
In the above example (which is the default setting), initially the display will show the override name (Display 3-Way 1), the current state (Auto Off) and the override button will show 'Man Off'. Similar to the image above.

- Pressing the button will override it to 'Man Off', updating the current state and the button will update to 'Man On'
- Press the button again, will override it to 'Man On', updating the current state and the button will then show 'Auto'.
- Pressing the button once more, will override it to 'Auto', updating the current state and the button will then show 'Man Off'.

Digital 3-Way Block's IO
The Digital '**Input**' to the block is the '**output**' value when the block is set to 'Auto'.
When a numerical value is given to the Analogue '**Mode**' Input, it activates/ deactivates the states of the block.

Enter a '1' and the output will go to 'Man Off'.
Enter a '2' and the output will go to 'Man On'.
Enter a '3' and the output will go to 'Auto On' or 'Auto Off' and follows the digital 'Input'.

Note: A '0' can also be entered into the Analogue 'Mode' input. This may be useful when using both the layout/ mimic and the Mode parameter methods.

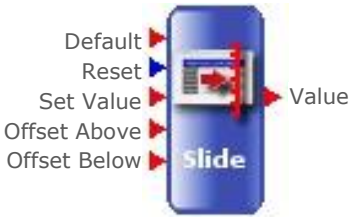
The '**Current Mode**' Analogue Output will be one of three values; 1 - when output is 'Man Off', 2 - when output is 'Man On' and 3 - when output is 'Auto'.

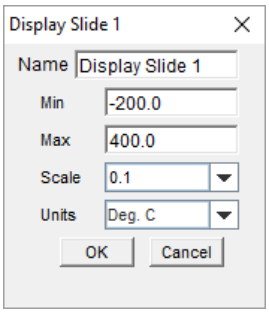
Note: Priority is given to the latest trigger input whether it is from the touch screen or the Display Override Block inputs.

Non-Volatile Option
The block has the option of saving the last override activation in non-volatile memory. With this option 'unchecked', if the device receives a reset, the block will resort to its default state. When the option is 'checked' and the device is reset, it will return to the state it was in. **Note**: when implementing a strategy, take into considerations any settings/ logic going into override block as they may also be saved in non-volatile memory.

Layout Setup
When the Display 3-Way Override block is used in conjunction with the Layout setup, it will look similar to the image to the right. Please see Layout Setup section for details of configuration. In the layout, all three buttons (representing the 3 states) will be visible. The highlighted button (in the example 'Auto'), will represent the current state of the override. By selecting 'Man On' or 'Man Off', will change the State to match and highlight that button.

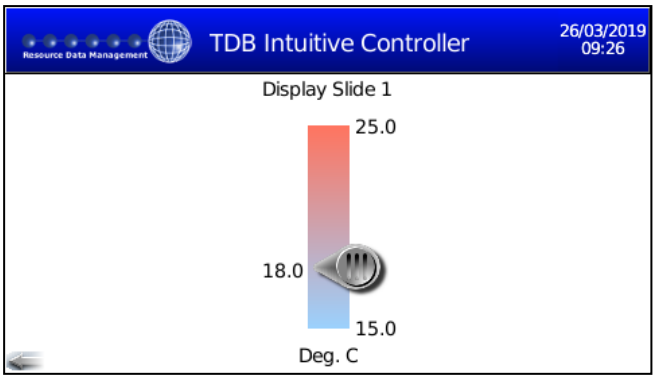
Display Slide Block





The Display Slide Block can be used in conjunction with either the Plant Touch Screen Display or the layout option within the web/ TouchXL interface.

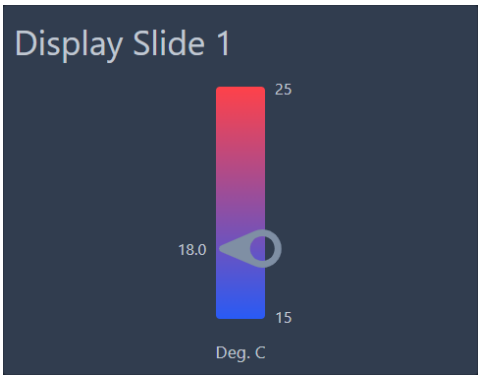
Plant Touch Screen
When a Plant Touch Screen Display is configured with a custom slide block, it allows the user to override an analogue value within the TDB control program, from the display. A slider icon will appear (Similar to right) on the touch display, with a pointer. The pointer can be moved up and down using the touch screen, which will alter an analogue output value attached to the display slider block.



Default	This is the default analogue value that the block will use when the 'reset' is activated.
Reset	When this is activated the block will return to its default setting.
Set Value	The base value to which the 'above' and 'below' offsets are referenced.
Offset Above	The highest value above the 'set value' that the slide on the touch screen can set.
Offset Below	The lowest value below the 'set value' that the slide on the touch screen can set.

Example
With the Set Value set to 20 and the Offset above and below both set to 5, the slide appears on the display with a maximum and minimum of 25 and 15. By sliding the pointer up or down, the analogue output (Value) of the block will follow what the pointer is moved to by the user. With the upper and lower setting being set by whoever compiled the program.

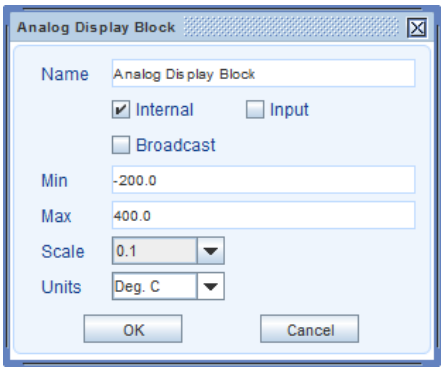
Layout Setup
When the Display Slide block is used in conjunction with the Layout setup, it will look similar to the image to the right. Please see Layout Setup section for details of configuration. It will work in the same way as detailed above, with the Plant USB touch display.



Diagnostic blocks

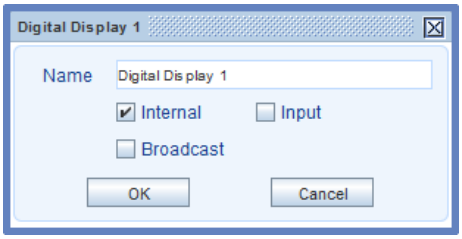
Analogue Display Block

Icon	Properties
	This block gives a visual display of an analogue value within a TDB program using online or simulation mode and has the option of assigning units (the units can also be manually inserted if required). **Internal** If the Internal option is ticked then this value will remain within TDB program. If un-ticked, the Analogue display will appear as a value in the output section of the device 'Control Summary'. **Input** If the Input option is ticked the Analogue display will appear as a value in the input section of the IO list. **Broadcast** Check the broadcast box for the value in the block to be 'broadcast' over the IP network to which the device is on. The value can be picked up from another TDB device set to receive it. For more information see Peer to Peer section.

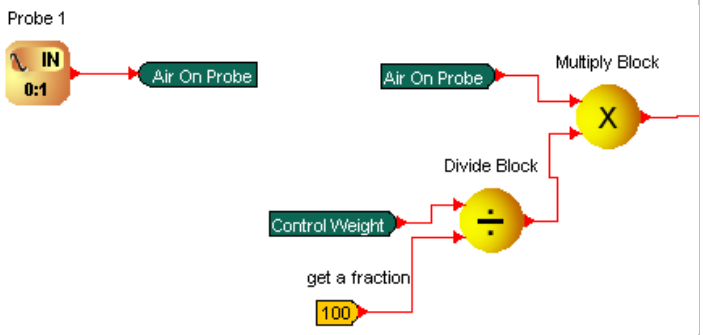
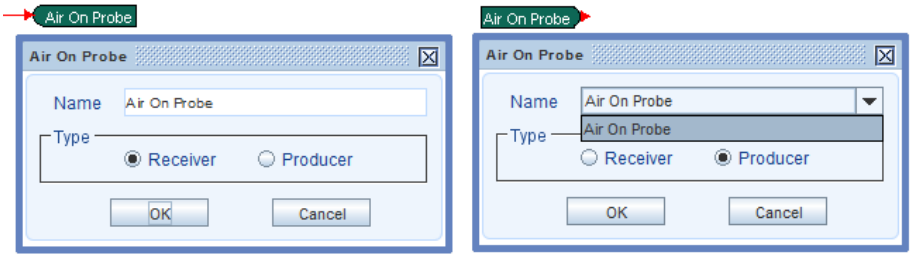


Digital Display Block

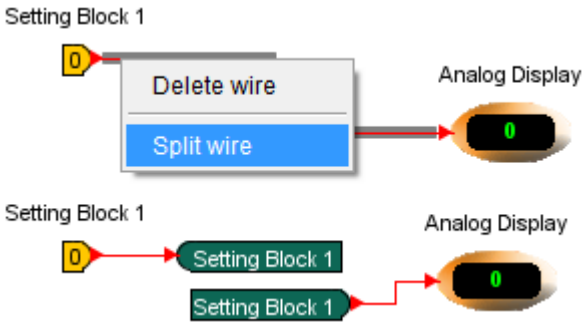
Icon	Properties
	This block gives a visual display of a digital value within a TDB program using online or simulation mode. **Internal** If the Internal option is ticked then this value will remain within TDB program. If un-ticked then the Digital display will appear as a value in the output section of the device 'Control Summary'. **Input** If the Input option is ticked the Digital display will appear as a value in the input section of the IO list. **Broadcast** Check the broadcast box for the value in the block to be 'broadcast' over the IP network to which the device is on. The value can be picked up from another TDB device set to receive it. For more information see Peer to Peer section.



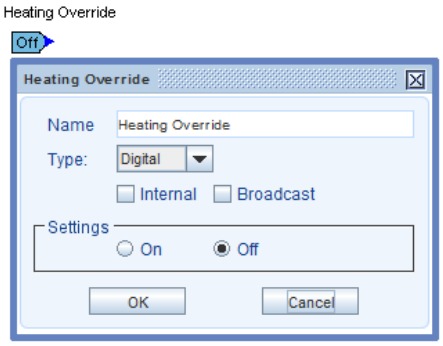
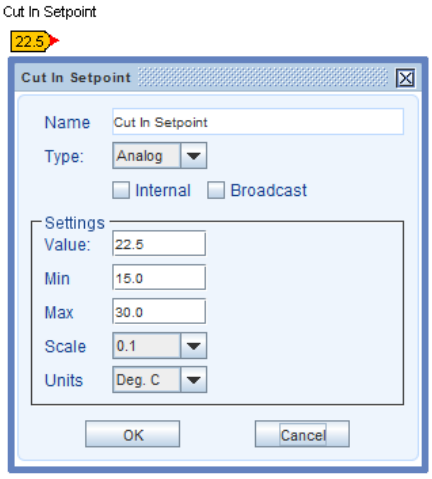
Shortcut Block

Icon	Properties
	Shortcut blocks can be used throughout the users program to 'de-clutter' the canvas from multiple wires linked across the entire program. While selected, by clicking on the canvas it will place the block. Editing the properties will allow the user to 'bridge' wires between blocks.  The below example will outline the basic setup. 

Split Wire

	Right clicking on any wire connection will give a 'Delete wire' and 'Split wire' option. Selecting the 'Split wire' will cut the wire and add a shortcut to the two cut ends, one being a producer and one being a receiver. The shortcuts will be given the name similar to the block to the left of the split 'Setting Block 1' in the example to the left. This will make the shortcuts have more sensible names. Splitting wires will make the layout simpler and the TDB program easier to follow.

Settings Block

Icon	Properties
	Setting blocks can be created to give permanent values or allow end users to set specific values when the program is in use. For example changeable set points in an 'Air Conditioning Application'. Setting blocks can be made 'Digital' or 'Analogue', each providing properties to set;  **Digital** When set to 'Digital' the setting icon will automatically set itself to be blue, making it easier to recognise it as a digital setting block as oppose to analogue (yellow). Within the properties box, along with the type, the block can be named and the desired 'default' value is selectable. **Internal Option** Dictates whether the setting block will be visible on the devices web page and/ or DM device list. If checked, the settings block is only set-able within the TDB Editor. **Broadcast Option** Allows the parameter to be broadcast over the IP network, picked up by other TDB devices.  **Analogue** While set for 'Analogue' the settings shown on the left will be visible. The Internal and Broadcast options are identical to that above. The example shows a setting block configured as 'Cut In Setpoint, given a default value of 22.5°C. The block can be configured from the I/O list of the program and can be set no higher than 30.0°C and no lower than 15.0°C.

Units

Within analogue input, output and parameter blocks the option to add a 'unit' is visible as a drop down menu. Many pre-set units are available, for example; DegC, Bar, %, Lux, kW/hr, m^3/sec. Users can also manually type in their own if required. Furthermore, superscripting text is also possible to suit the 'unit'. For example, for the controller to display '**cm^3/sec**', the user types in '**cm^3/sec**'. The '^' symbol preceding the character instructs it to be superscripted.

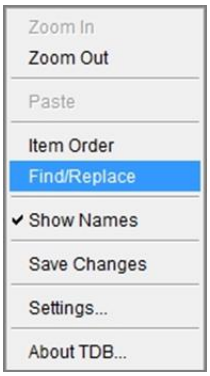
Show Names

Right click on the workspace and from the sub-menu select 'Show Names'. All TDB blocks will have their names shown above them.

Find/Replace

Finding an Item

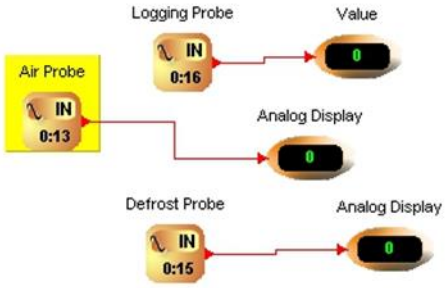
Right clicking on an unused area of the workspace brings up a sub menu shown on the right, select 'Find/Replace'.



Enter the name of the item you want to find, ('Air Probe' in the example) and click 'Find Now'.

The item being searched for will be highlighted in yellow as shown.

If the 'Orphans Only' box is ticked then only items with no wires attached will be found.

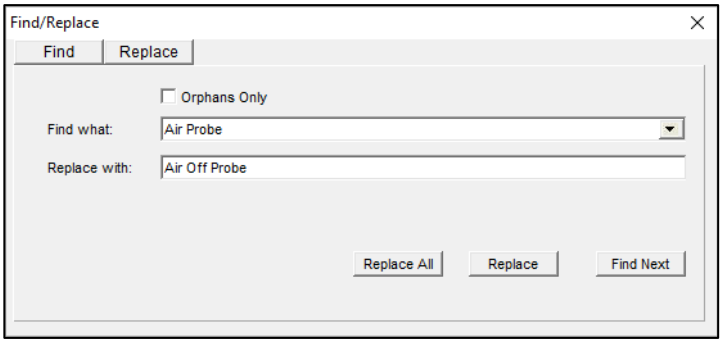


Replacing an Item

Select the 'Replace' tab and enter the name of the item you want to find. Enter the name you want to replace it with.

Selecting the 'Replace' button will highlight the target in yellow, clicking the 'Replace' button again will change the item's description.

If there are several items with the same name you can replace them all with another name by selecting the 'Replace All' button.



Note: Only the item's name will be changed, all other settings will remain the same.

Running a Simulation

The application can be simulated by clicking on the Run Simulation icon in the toolbox. When running, the toolbox changes to give similar options shown to the right.

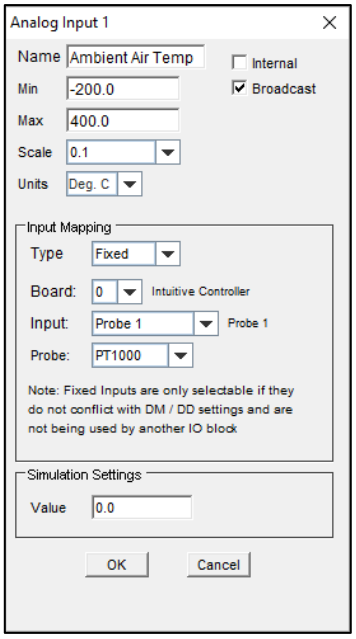
Hovering the mouse pointer over outputs and inputs will show the value. Diagnostic analogue or digital displays are also a useful way to observe data flow through the application.

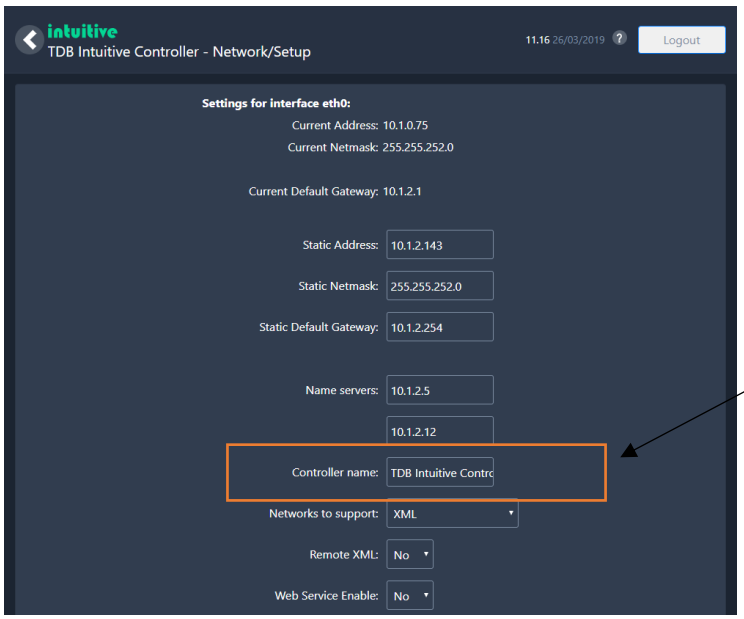
Values can be changed dynamically while simulating by clicking the item and then changing its value.

Peer to Peer Communication

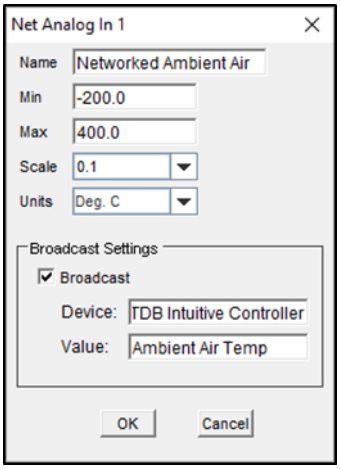
Peer to peer communication allows one TDB device, to share data with a number of other devices running TDB, operating on the same IP network.

Firstly configure the Input, Output, Setting or Diagnostic block you wish to broadcast. Shown on the right is an example Analogue Input block configured as a probe. Probe 1 is being used to measure the Ambient Air Temperature of a room. Tick the Broadcast option to share this temperature with other TDB devices. Click OK to save any changes.





Note: any TDB device which is set to broadcast data must be given a unique controller name (blank by default). This is done via the Network page as shown on the left. Assign the device a suitable designation via the 'Controller Name' field and click Set Network.



Now edit the TDB program in the TDB device you wish to receive the analogue value. Insert a Network Analogue Input block into the program and view the properties for this block as shown on the left.

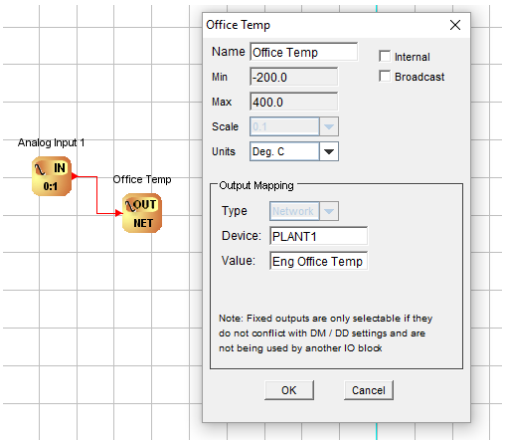
Tick the broadcast option.

Device: Enter the name of the TDB device you wish to receive the value from e.g. TDB Intuitive Controller. **Note**: This text is case sensitive.

Value: Enter the name of the block you wish to receive data from, for example 'Ambient Air Temp'. Click 'ok' to save changes. The analogue value has now been mapped.

Multiple TDB devices can receive the same broadcast value, setup these devices using the same method outlined above. A similar process should be followed for digital inputs and setting blocks.

Receiving Analogue Values from a Data Manager TDB Program



A simple Data Builder PLC program, running on a Data Manager, is shown on the left. The temperature of a room is being measured from probe 1 on the Data Manager's analogue input board and is being mapped to an analogue output. By right-clicking on the 'Analogue Output' block, in the Data Manager TDB program, the properties window on the left is shown. This block has to be configured so that values can be sent to a TDB controller.

Type: Select 'Network' from the drop down menu.

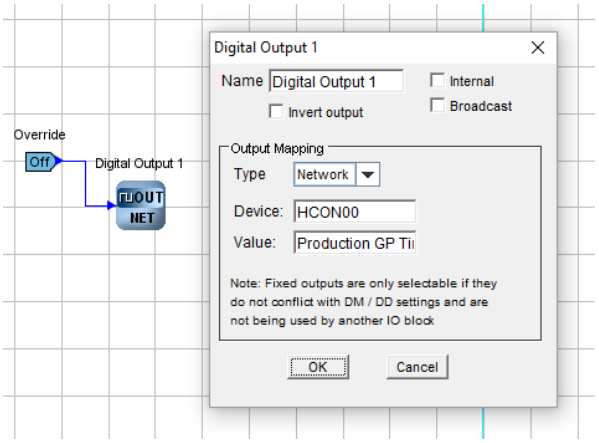
Device: Enter the controller name as it appears in the Data Manager's device list.

Value: Enter the name, of the Network Analogue input, as it appears exactly in the controller's PLC Program created e.g. 'Eng Office Temp'.

Log the controller onto the Data Manager running the Data Builder program. Ensure a Network Analogue input on the controller is configured and that it is entitled 'Eng Office Temp'. Now, the analogue input from the Data Manager has been mapped to the controller Data Builder program.

Receiving Digital Values from a Data Manager TDB Program

Once the TDB controller is logged onto a Data Manager, Data Builder programs running within the Data Manager can be used to map digital values to the controller. Refer to the Data Manager Data Builder user guide for further details.



Shown on the left is a simple software manual override. This has been generated in a Data Builder program running on a Data Manager. By right-clicking on the 'Digital Output' block the properties window on the left is shown.

Type: This must be set to 'Network'.

Device: Enter the controller's device name as it appears in the DM's device list.

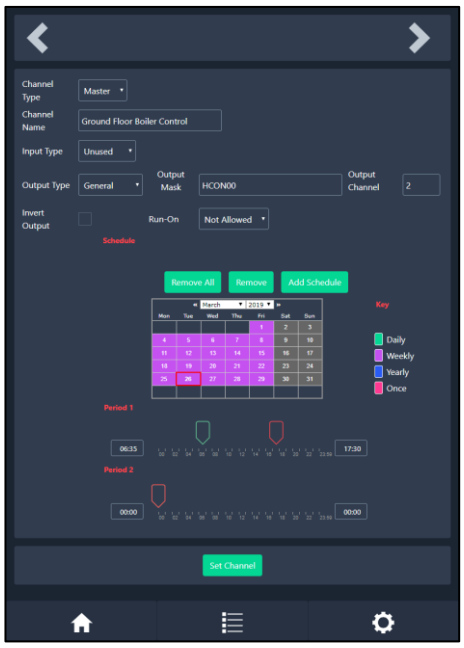
Value: Enter the name, of the network digital input, as it appears exactly in the TDB controller PLC Program created e.g. 'Production GP Timer Input'.

Once the Data Manger Data Builder program is running and the TDB controller is logged on to the Data Manger then the status of the digital output running in the Data Manager PLC program will be mapped to the controller network digital input named 'Production GP Timer Input'.

GP Timer (mapping from a Data Manager GP Timer)

Mapping a Data Manager's GP Timer to a digital input on the TDB controller is similar to receiving digital values from the Data Manager.

The TDB controller must be logged on to the Data Manger to utilise this setup. Then the GP timer channel must be configured to send values to the network digital input. An example is shown below. For the full GP timer setup instructions please refer to the Data Manager commissioning guide found on the RDM website.



Output Type: This should be set to 'General'.

Output Mask: Enter the TDB's controller name as it appears on the 'Device List', e.g. HCON00.

Output Channel: This value is derived from the order in which the network digital inputs appears on the values page, for the TDB controller, once it is logged onto a Data Manager.

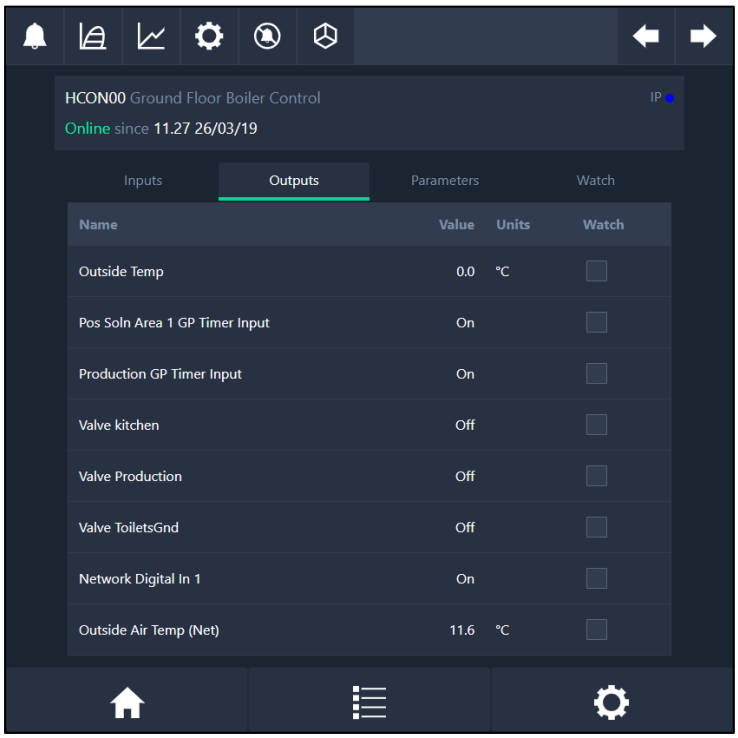
Below shows a TDB controller logged on with the alias HCON00.

Example 1: To 'hit' the network digital input item on the TDB controller called 'Production GP Timer Input' the GP timer field (Output Channel) must be set to 2.

Note: The value 2 is used since the digital input, 'Production GP Timer Input', appears third in the output table list. Output ordering is counted from 0, 1, 2…8, 9 etc.

Example 2: To hit 'Marketing Suite GP Timer Input' the 'Output Channel' field would have to be set to 1.

Example 3: To hit 'Boiler Run Sig' the 'Output Channel' field would have to be set to 8.



Technical Specification

General

	Intuitive V2 PR0650-TDB	Intuitive V2 (x2 stepper output) PR0652-TDB	Mini Intuitive PR0680-TDB
Operating temperature range	Without Internal LCD Display : -40°C to +65°C (-40°F to +149°F) With Internal LCD Display or SRR fitted: -20°C to +65°C (-4°F to +149°F)		
Operating Humidity	80% Maximum		
Storage temperature range	Without Internal LCD Display : -40°C to +65°C (-40°F to +149°F) With Internal LCD Display or SSR fitted : -30°C to +65°C (-22°F to +149°F)		
Environmental	Indoor use at altitudes up to 2000m, pollution degree 2, installation category II. Voltage fluctuations not to exceed ±10% of nominal voltage.		
Size (H x W x D)	122mm (4.8in) x 280mm (11in) x 67mm (2.6in)	122mm (4.8in) x 280mm (11in) x 67mm (2.6in)	101mm (3.97in) x 157mm (6.18in) x 67mm (2.63in)
Weight	750g (1.65lbs)	905g (2lbs)	TBC
Safety	EN 61010-1:2010, UL 62368-1		
IP Rating	IP20		
EMC	EN 61326-1:2013 FCC CFR 47 Parts 15.107 & 15.109 and ICES-003 Issue 6	EN 61326-1:2013 FCC CFR 47 Parts 15.107 & 15.109 and ICES-003 Issue 6	EN 61326-1:2013 FCC CFR 47 Parts 15.107 & 15.109 Class A
UL Compliance	UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07	UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07	TBC
Ventilation	There is no requirement for forced cooling ventilation		
Disposal	Please observe local legislation with regards to electrical products.		
Origins	Product designed in the UK manufactured in Taiwan.		
Battery	The controller contains a lithium battery to retain time and date information when the controller is not powered. Caution: this battery is not user replaceable and there is a danger of explosion if the battery is replaced incorrectly.		

Power Requirements

	Intuitive V2 PR0650-TDB	Intuitive V2 (x2 stepper output) PR0652-TDB	Mini Intuitive PR0680-TDB
Supply Voltage Range	24 Vac ±10% OR 24 Vdc ±10%		
Supply Frequency (AC only)	50 - 60 Hz ± 10%		
Maximum supply current	1.8A	1.6A (Not Including Stepper Power)	1.8A
Typical supply current	<1A	<1A (Not Including Stepper Power)	<1A

Insulation and Fuse Requirements

	Intuitive V2 PR0650-TDB	Intuitive V2 (x2 stepper output) PR0652-TDB	Mini Intuitive PR0680-TDB
Class 2 Insulation	**No** protective Earth is required. A functional Earth may be fitted in noisy environments.		
Supply Fuse	Built in fuse holder, fuse 2A 240Vac Ant surge (T) HRC conforming to IEC60127, 32 x 6.3mm		
Or MCB	2A, 240 VAC Type D conforming to BS EN 60898 (Note: controller has integral 2A fuse)		
Relay Fuse	10A 240Vac Ant surge (T) HRC conforming to IEC60127, 32 x 6.3mm		

Relay Specification

	Intuitive V2 PR0650-TDB	**Intuitive V2** (x2 stepper output) PR0652-TDB	**Mini Intuitive** PR0680-TDB
Mechanical Relay			
Max current	10A Resistive (CosØ = 1) 5A Inductive (CosØ = 0.4)		
Max voltage	250Vac. 24Vdc		
Relay Spacing	Relays 1-6 must together be either all mains or all low voltage. Relays 7-12 independently allow the use of mains or low voltage on any relay	Relays 1-6 must together be either all mains or all low voltage. Relays 7-9 independently allow the use of mains or low voltage on any relay.	Relays 1-5 allow the use of mains or low voltage on any relay.
Solid State Relay (SSR)			
Max Current	1Arms (1A Fuse if Applicable)		
Voltage	12-280Vac only, will not switch dc		

Stepper Outputs

	Intuitive V2 PR0650-TDB	**Intuitive V2** (x2 stepper output) PR0652-TDB	**Mini Intuitive** PR0680-TDB
Power Supply	N/A	A 24V AC or DC power supply must be connected to the Stepper board input 'Stepper Power' to operate the stepper outputs.	N/A
Stepper Rating	N/A	The type of Stepper motor used with the Stepper Board must conform to the following: - Bipolar Chopper Drive - Max 825mA or 8W	N/A
Current Protection	N/A	RDM advise the use of a suitable external over-current protection device	N/A

PWM Specification

	Intuitive V2 PR0650-TDB	**Intuitive V2** (x2 stepper output) PR0652-TDB	**Mini Intuitive** PR0680-TDB
Frequency Range	0.016667Hz - 20kHz		
Pulse Period Limits	Minimum 50µs (0.00005s) Maximum 60s		
Period Resolution	10µs		
Duty Cycle Range	0 - 100%		
Voltage with Internal Pull-Up Enabled	High-Level Output Voltage: Typical 4.7V ± 200mV (recommended minimum 10kΩ load impedance)		
Voltage with Internal Pull-Up Disabled	External Voltage Range: 1V - 30V DC Maximum Current Sinking: 75mA		

For duty cycle tolerance see Appendix 8.

Note: The PWM outputs have an internal pull-up resistor that can be enabled/disabled through software. This allows the controller to output its own voltage signal or function as an Open Collector output to modulate an external voltage source. Each PWM channel is configured separately.

Internal Display

	Intuitive V2 PR0650-TDB	**Intuitive V2** (x2 stepper output) PR0652-TDB	**Intuitive V2** PR0680-TDB
Display	2.4' 320x240 Full Colour TFT Graphic LCD		
Buttons	6x Pushbuttons		

Status Inputs

	0 volt return or 24 Vac (24 Vac must be the same as the supply 24 Vac). If a 24Vac signal is being sourced from the controller power supply then **do not** ground the Status Input common rail, this is grounded internally, only a 24Vac signal taken from the controller power supply as an input is required. If using an external 24Vac signal i.e. not obtained from the controller power supply then it is necessary to supply the 24Vac signal as well as the 0 Volt for the status input common from the external power supply.

Analogue Inputs

4-20mA	4-20mA current loop, use the 12 Vdc output to feed the 4-20mA device.
0-10V	Connect a 0-10Vdc signal.

Communications

Ethernet10/100baseT	Single port for connection to an IP network
CANbus Interface	A maximum of 10 expansion boards can be connected to a single Intuitive TDB device to expand the available IO. Please see Connecting an Expansion Board to an Intuitive TDB device for further details.

Analogue Outputs

	0 to 10 Volts DC or 4-20mA. (Selected in the properties box of the output block) **Note 1**: The 4-20mA output will not operate correctly if the target device input impedance is > 75Ω **Note 2**: The 0-10V output will not operate correctly if the target device input impedance is < 10KΩ A 50mA fuse is recommended for this output. **Note 3**: On the intuitive variant, when using the universal 0-10V output to drive an inductive load such as a relay coil, a back e.m.f. protection diode must be fitted. The cathode should connect to the output terminal and the Anode to GND/Return terminal. The maximum load current that can be supplied from these outputs is 38mA.

Note: The use of centre tapped to earth transformers is not allowed. This is to prevent damage to the transformer and/or controller.

The host equipment must provide adequate protection against contact to hazardous live parts.

RDM advise the use of a suitable external over-current protection on the Controller.

Warranty may be invalidated due to excess current being unlimited if there are no fuses/circuit breakers installed on the Plant Controller.

Surge Protection

Installations subject to high levels of electrical transients (Voltage spikes/lightning strikes) may require the fitting of protection devices to the external wiring of device's Mains supply input, RS485 ports, CAN port, or Ethernet ports. Please refer to document DM & Network Surge Protection for information on suitable devices and their application. Refer to the device manufacturers directions for detailed fitting instructions.

Please ensure all power is switched off before installing or maintaining this product.

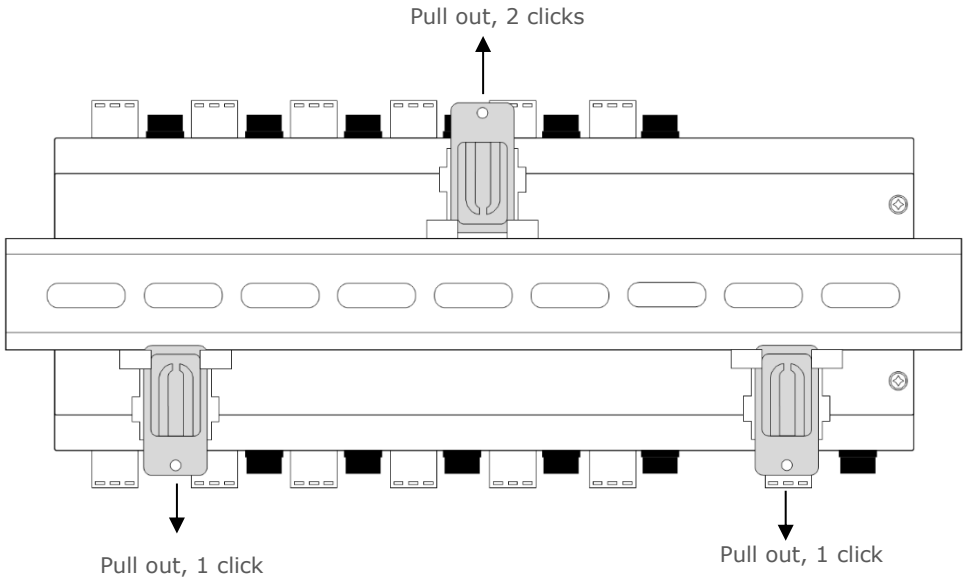
Installation

Mounting on to a DIN rail

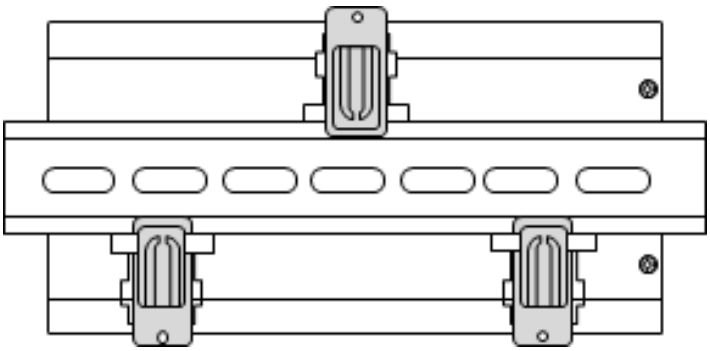
The Intuitive controller has three DIN rail mounting feet which can slide in and out to three different positions, sliding into each position is accompanied by a 'click' which locks the foot into that position.

To install the controller onto a DIN mounting rail, from the fully pushed in position slide the top mounting foot out by 2 clicks so that the foot is clear of the DIN rail channel. Slide the bottom two feet out by one click so that they are protruding slightly into the DIN rail channel. The controller can now be inserted onto the DIN rail by inserting the bottom lip of the DIN rail behind the two bottom mounting feet

Intuitive V2



Intuitive Mini



The controller can now be pushed flat onto the DIN rail and the top foot pushed in 2 clicks to hold the controller in place. Finally, push the bottom two feet in by one click to secure the controller.

The mounting feet also have M3 holes for direct mounting where DIN rail is not being used.

Clearances

The controller must have 10mm clearance above the top and 15mm clearance from the sides. Clearance at the front and rear is dependent on the site wiring.

There is no requirement for forced cooling ventilation

Cleaning

Do not wet the controller when cleaning. Clean the front by wiping with a slightly damped lint free cloth.

Terms of Use

Software running on this equipment is licensed for use. In using this equipment you are agreeing to Resource Data Management Ltd.'s standard Terms and Conditions for Software Licensing. To obtain a copy of the Terms and Conditions please visit our website www.resourcedm.com and select Technical Documentation.

Web Services

Web services can be used to obtain data from the TDB device or make changes to certain items.

To view the controller Web Services interface and find further details browse to the following address:

http://???.???.???.???/cgi-bin/cgi.cgi?WSDL

Where ???.???.???.??? is the IP address or URL of the controller.

For full details on web services please consult the Web Services documentation found on the RDM website.

Controller Power Supply Unit: PR0625

PR0625 is a Meanwell 24V 2.5A Din Mountable Power Supply Unit (Model DR-60-24) used with the controller. The user document for DR-60-24 can be found under Support on the RDM website.

Appendix 1: Comfort Index

Apparent Temperature for Values of Room Temperature and Relative Humidity (shown in Degree F)

	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
115	117.1	118.0	119.0	119.9	120.8	121.6	122.5	123.5	124.4								
110	111.1	112.0	113.0	113.9	114.8	115.6	116.5	117.5	118.4	119.3	120.1						
105	105.1	106.0	107.0	107.9	108.8	109.6	110.5	111.5	112.4	113.3	114.1	115.0	116.0				
100	99.2	100.1	101.0	101.9	102.8	103.7	104.6	105.5	106.4	107.3	108.2	109.1	110.0	110.9	111.8		
95	93.1	94.0	95.0	95.9	96.8	97.6	98.5	99.5	100.4	101.3	102.1	103.0	104.0	104.9	105.8	106.6	107.5
90	87.1	88.0	89.0	89.8	90.7	91.6	92.5	93.4	94.3	95.2	96.1	97.0	97.9	98.8	99.7	100.6	101.5
85	81.1	82.0	83.0	83.9	84.8	85.6	86.5	87.5	88.4	89.3	90.1	91.0	92.0	92.9	93.8	94.6	95.5
80	75.1	76.0	77.0	77.9	78.8	79.6	80.5	81.5	82.4	83.3	84.1	85.0	86.0	86.9	87.8	88.6	89.5
75	69.2	70.1	71.0	71.9	72.8	73.7	74.6	75.5	76.4	77.3	78.2	79.1	80.0	80.9	81.8	82.7	83.5
70	63.1	64.0	65.0	65.8	66.7	67.6	68.5	69.5	70.3	71.2	72.1	73.0	74.0	74.8	75.7	76.6	77.5

Apparent Temperature for Values of Room Temperature and Relative Humidity (Shown in Degree C)

	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
46.1	47.3	47.8	48.3	48.8	49.3	49.8	50.3	50.8	51.3								
43.3	43.9	44.4	44.9	45.1	45.9	46.4	46.9	47.4	47.9	48.4	48.9						
40.6	40.7	41.2	41.7	42.2	42.7	43.2	43.7	44.2	44.7	45.2	45.7	46.2	46.7				
37.8	37.3	37.8	38.3	38.8	39.3	39.8	40.3	40.8	41.3	41.8	42.3	42.8	63.3	43.8	44.3		
35.0	34.0	34.5	35.0	35.5	36.0	36.5	37.0	37.5	38.0	38.5	39.0	39.5	40.0	40.5	41.0	41.5	42.0
32.2	30.6	31.1	31.6	32.1	32.6	33.1	33.6	34.1	34.6	35.1	35.6	36.1	36.6	37.1	37.6	38.1	38.6
29.4	27.2	27.7	28.2	28.7	29.2	29.7	30.2	30.7	31.2	31.7	32.2	32.7	33.2	33.7	34.2	34.7	35.2
26.7	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0	31.5	32.0
23.9	20.6	21.1	21.6	22.1	22.6	23.1	23.6	24.1	24.6	25.1	25.6	26.1	26.6	27.1	27.6	28.1	28.6
21.1	17.3	17.8	18.3	18.8	19.3	19.8	20.3	20.8	21.3	21.8	22.3	22.8	23.3	23.8	24.3	24.8	25.3

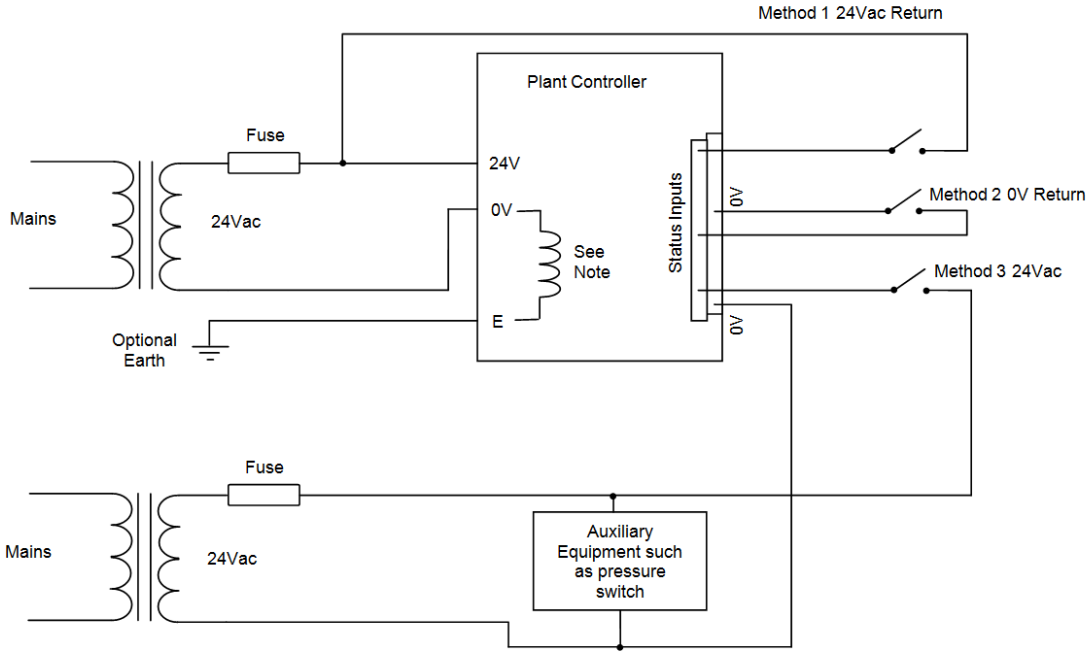
Appendix 2: Supply & Status Input Wiring

Method 1
Uses the 24Vac of the transformer supplying the input voltage; which is returned via a switch (or relay) to the status input signal line. No 0V is required at the status connector.

Method 2
Uses a 0V return (from the status connector) to the status signal input.

Method 3
Uses a 24Vac signal derived from another transformer (supplying an auxiliary piece of kit) to feed the status input signal line. Note the auxiliary transformer must be referenced to the Plant Controller supply transformer.

All transformers that have a connection to the Plant Controller must have their primaries connected to the same phase. Transformer should have fuse fitted in line with 24V input as per diagram.



Note: Current versions of Plant hardware have 0V and Earth linked internally via an inductor, this is recognisable by Status LED. See diagram on page 9 for location of status LED

The use of centre tapped to earth transformers is not allowed. This is to prevent damage to the transformer and/or controller.

Appendix 3: Stepper Rate (Frequency Hz)

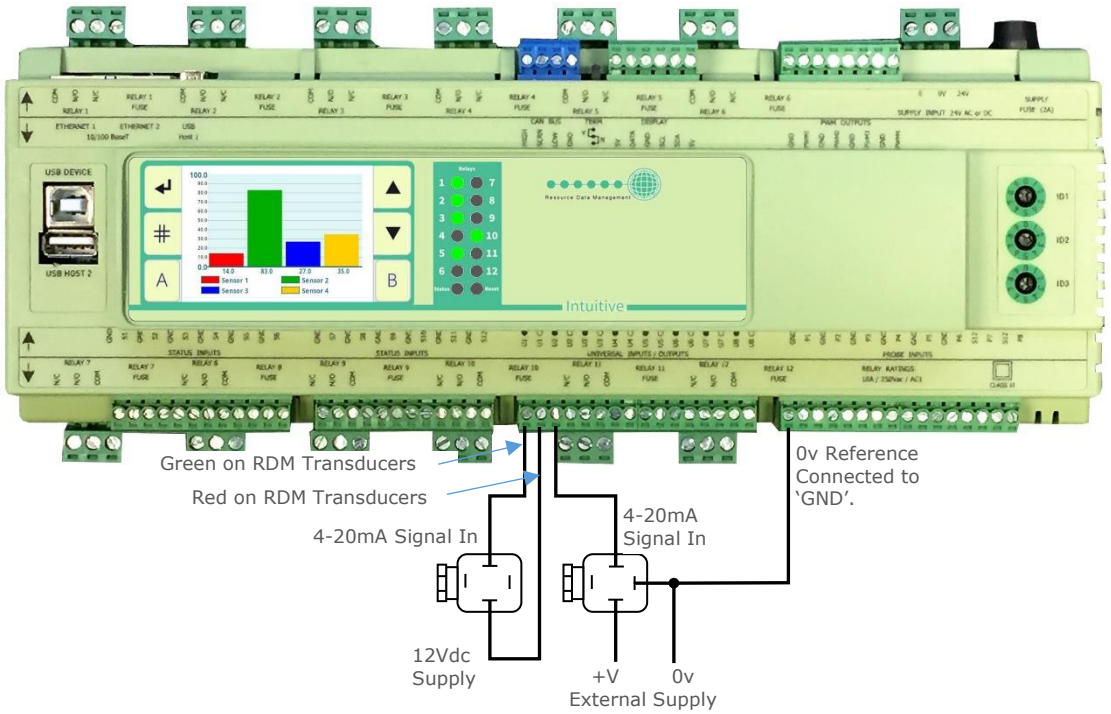
When configuring the Rate (Hz) for a Stepper output the following table applies.

Rate Entered	Speed Set (Hz)	Rate Entered	Speed Set (Hz)
500 and above	500	86 to 90	90
251 to 333	333	81 to 85	85
201 to 250	250	76 to 80	80
167 to 200	200	71 to 75	75
144 to 166	166	66 to 70	70
126 to 143	143	61 to 65	65
112 to 125	125	56 to 60	60
101 to 111	111	51 to 55	55
96 to 100	100	50 and below	50
91 to 95	95		

Please confirm with the Stepper valve manufacturer datasheets to select the correct step frequency. Note hardware manufactured before 2015 will not provide a holding current. In a small number of applications this may be required to ensure the correct operation.

Appendix 4: Typical 4-20mA Input Connection

When using a 4-20mA input device (such as a pressure transducer), the controller supplies a 12vdc supply to power the device and measures the 4-20mA current level being returned by the device, the connections for this setup are shown below on the below left, connected to universal IO1. If the 4-20mA device utilises its own power supply then the 12vdc supply from the controller is not required and should not be connected, only a 4-20mA signal input and 0v (or GND.) reference should be connected. This setup is shown below on the right, connected to universal IO2:

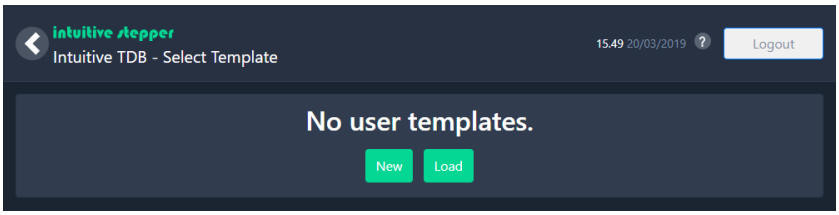


Appendix 5: Type Editor User Guide

Before any template can be added to the controller the feature must be enabled using part number PR0655-TYP. Multiple user type 'slots' can be added using the same part number. It can either be ordered when purchasing the controller, or later activated by RDM tech support. If the controller is not remotely accessible then using the 'Add Feature' menu, an activation code can be given.

Note: Before using this feature, a full understanding of Modbus and the 3rd party unit is required. RDM tech support will not offer assistance out with the bounds of our product.

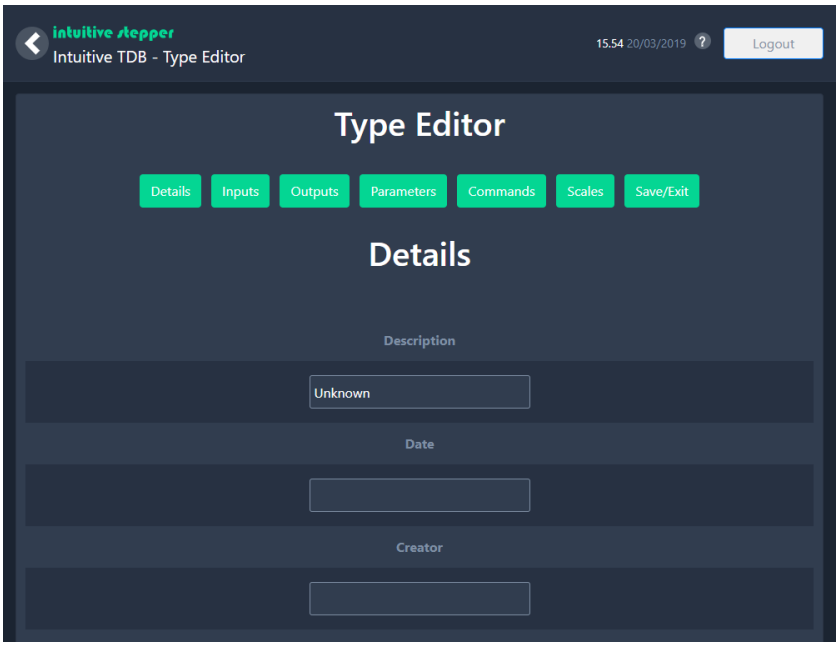
The Editor



Opening the Type Editor will result in the above page. At this point there are only two options, to either start a new 'template' or load a previously created one.

New template

Having clicked on 'New' it will launch the below;



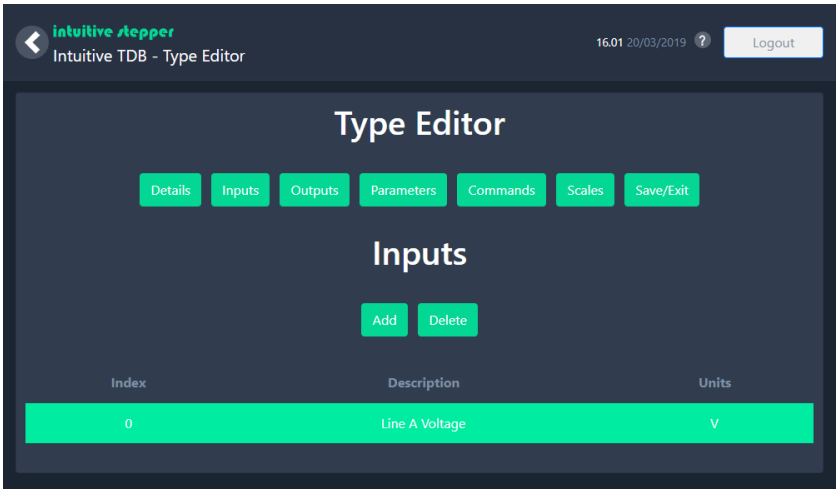
As shown, there are four tabs to select from; Details, Inputs, Scales and Exit. **Note**: with 'OEM' enabled, there will be two additional tabs; Outputs & Parameters. For more information please consult RDM Technical Support. When using parameters, their aliases must be unique and not conflict with any other points.

Details Tab

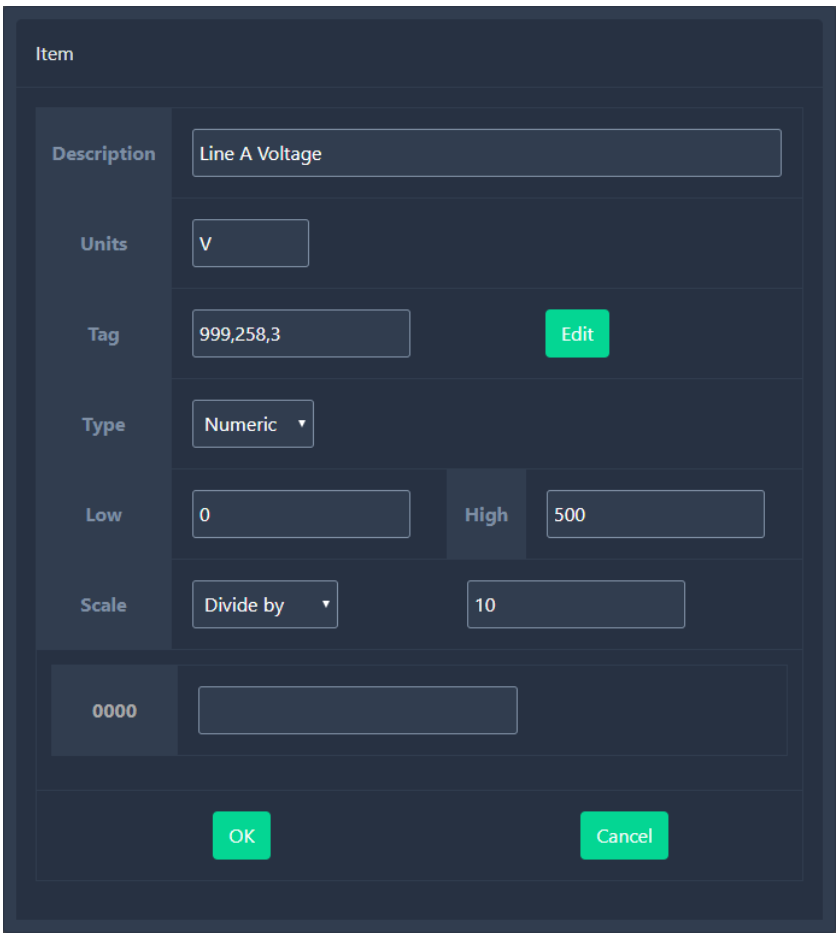
This allows general information relating to the template's description, date, creator's name along with the option to insert a password. Leave blank if no password is necessary.

Inputs Tab

The input section is where the viewable IO of the device is listed and configured with the corresponding Modbus register, type etc.



By either using the 'Add' button to add a new item, or by double clicking on the item already listed it will open a window to change the item's details.



Description

This is the text string that is shown to identify the item.

Units

Inset the unit type associated to the value. E.g. V, A, kwHr, Lux etc.

Type

The type will either be 'numeric' or 'string'.

When set to numeric it will simply show the number from the register. The high and low fields should be used to indicate the potential limits to the value.

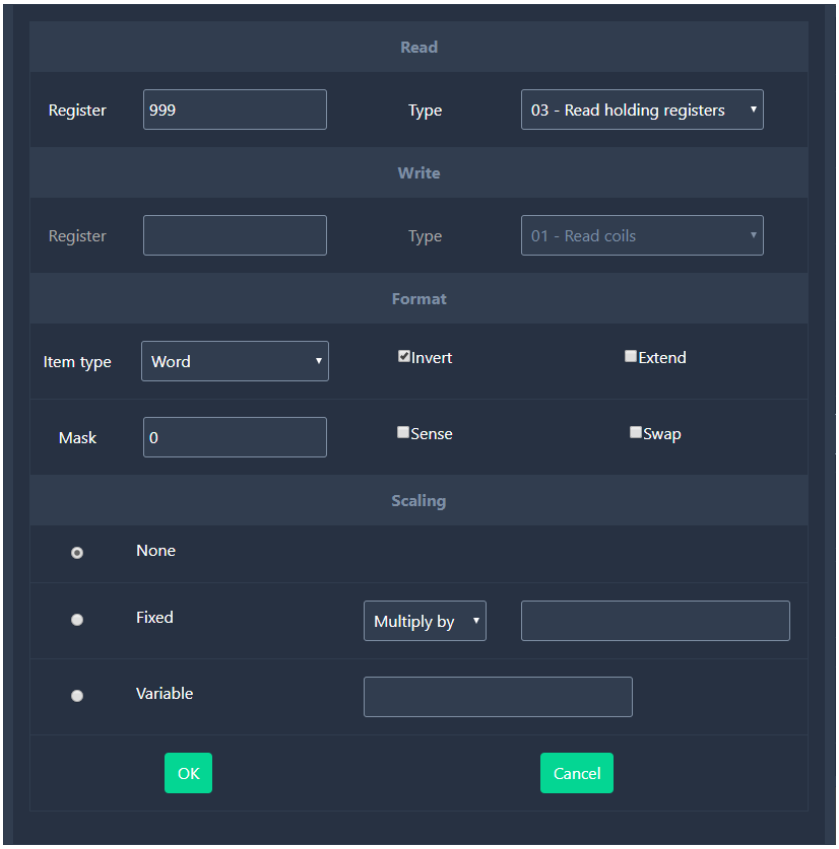
If set to 'string' it will associate the text (inserted in the fields) to the numerical value in the register. By using the fields at the bottom of the window, beginning at 0000, enter the text you want to appear in the field next to it. Pressing the 'Return' key will create a new field with a '0001' next to it. Again, enter the text to be associated to the value.
E.g. having the following inserted; '0000' – Off; '0001' – On. When the register reads either a 0 or a 1, it will show in the IO list either, 'Off' or 'On'.

Scale

Provides the option of scaling the register value by dividing or multiplication.

Tag

The 'tag' requires all the details of how to read the Modbus register and the type of data it holds so it can be translated to the relevant information when extracted;



Register

Insert the register number for the template to look at.

Type

Select the Modbus function to read from the register. The editor only supports functions 01 to 04. For writable functions, please consult RDM tech support.

Item type

Select the type of data that the Modbus register holds. The options are;

- Word – reads 16bits
- DWord – reads x2 16bit registers (32 bits)
- IEEE 754 – reads x2 16bit registers and treats as a 32 bit floating point number
- Coil – reads a single bit
- None – no type selected.
- Large-64 – reads a 64bit register but only uses the lower 32bits
- Large-64/x - reads a 64bit register, divides by x but only uses the lower 32bits

Note: when using any of the 'large-64' item types, it reads in all 64 bits but can only use the lower 32bits.

Mask

Insert the mask required. For example this may be required if the Modbus register holds individual bits to be read from a register containing a word. For example if a register (16 bits) returned 1111 0000 101**0 1**000, to read bit 3, insert the mask '8' (decimal). To read bit 4, enter 16 etc.

Invert

Refers to how the byte data is read from the register. Whether it is big-endian or little-endian. It can be used in either 16 or 32 bit registers. For example;

Example 1 – 16 bits
If the returned data is in the byte sequence:
AA BB

With Invert off it will be read as:
BBAA

With Invert on it will be read as:
AABB

Example 2 – 32 bits
If the returned data is in the byte sequence:
AA BB CC DD

With Invert off it will be read as:
DDCCBBAA

With Invert on it will be read as:
AABBCCDD

Extend

If the value read can be a negative value then tick this box, for example, a signed integer. When ticked, it will use Two's Complement to decipher if the number is negative or not. If unticked, it will assume the full word/ register is positive.

Sense

Inverts the 'sense' of a binary value. I.e. when ticked, it interprets a returned '0' value as 'on', '1' as 'off'. Normally only used with coils or 'masked' values reading single bits.

Swap

The 'Swap' function can only be used with 32bit registers. When checked, it will swap the ordering of the returned 'words'. For example;

Example 1
If the returned data is in the byte sequence:
AA BB CC DD

With Swap off it will be read as:
DDCCBBAA

With Swap on it will be read as:
BBAADDCC

If required, both Invert and Swap functions can be used, for example;

Example 2
If the returned data is in the byte sequence:
AA BB CC DD

With Invert Off Swap Off it will be read as:
DDCCBBAA

With Invert Off Swap On it will be read as:
BBAADDCC

With Invert On Swap Off it will be read as:
AABBCCDD

With Invert On Swap On it will be read as:
CCDDAABB

Scaling

Scaling has 3 types; None, Fixed or Variable.

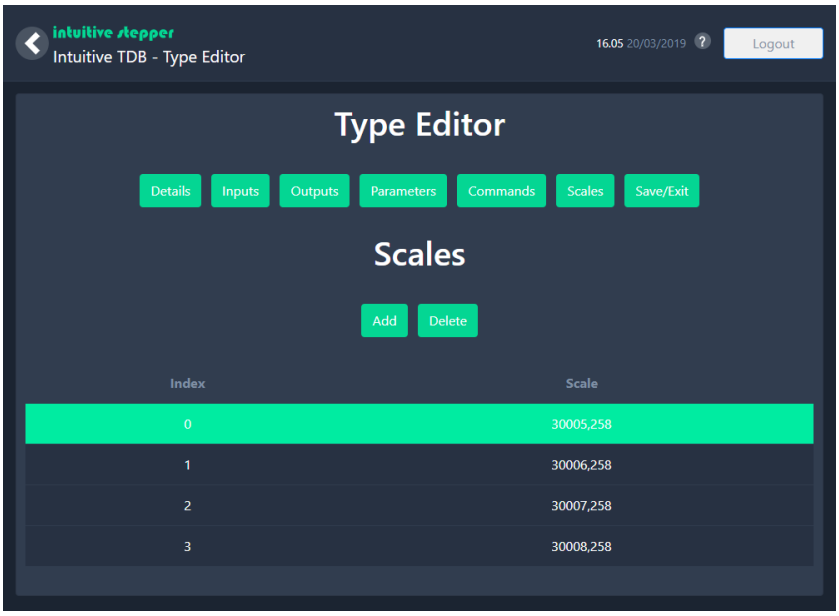
None: No scaling will be applied to the value.
Fixed: Choose between 'multiply' or 'divide' by the value entered.
Variable: Used in conjunction with the 'Scales' section. In the field the variables; $V, $0, $1, $2…. $N can be used to manipulate the value. $V refers to the value taken from the register. $0, $1, $2…$N refer to the indexed scale registers (in Scale Tab) where index 0 is $0, index 1 is $1, index 2 is $2 and so on.

The operands; '+' (plus); '-' (minus); '*' (multiply); '/' (divide); '%' (mod); '&' (bitwise and); '^' (bitwise xor) 'eq'; 'noteq'; 'pow';'log''log 10'; 'exp' and 'sqrt' can be used in the 'variable' field.

E.g. with the variable scale set to '$V*$0' it will multiply the value in the register by that of the value in the scaling register '$0'.

Scales Tab

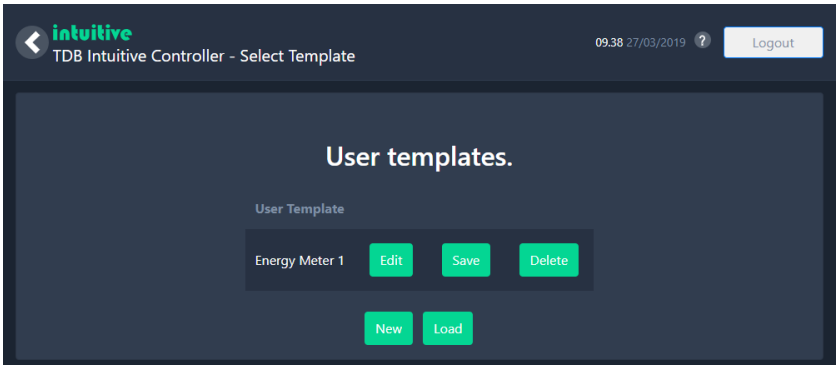
In some devices, there are dedicated registers advising of the scale applied to the values in other registers. In this section insert the details of how to read these registers. It uses the same format as the input section to define the registers.



Once created, the scaling values taken can be applied to the values by using the method described in the variable scaling section. The scales, as mentioned can be referred to by using $0, $1, $2, $3.

Save/ Exit Tab

Once the template is complete, click the 'Exit' button, this will confirm the save. It will also offer the options to exit without saving or 'cancel' the exit. The template will be saved and accessible through the Type Editor menu:

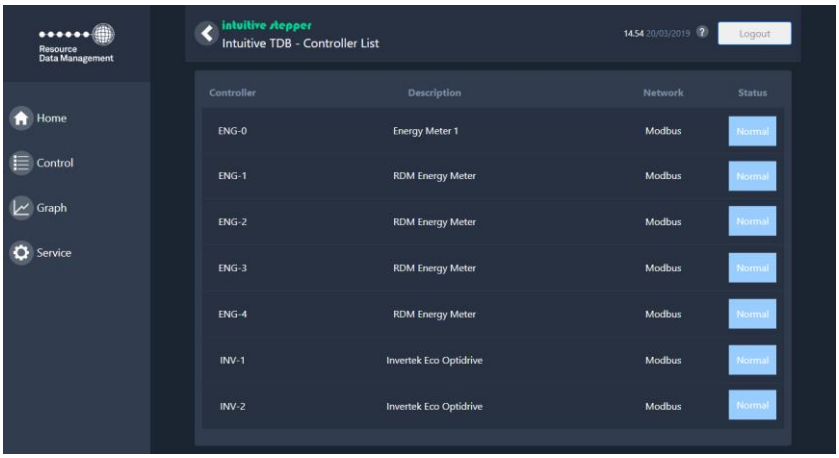


Following the creation, the template can be saved to a local PC, using the 'Save' button. The format will be saved as an xxxx.typ. When saved, the template can be re-used on other devices as long as the User Template feature is activated.

Load

The 'Load' feature can be used to utilise a previously generated (and saved) type file on another device. When clicked, navigate to the saved type file on your local PC and load it on.

Now that the type file has been generated it can be used to communicate with the third party device. Using the method outlined in Add Modbus Device section, the type will be in the drop down menu to select. Once added, it will be viewable:



Appendix 6: PWM Duty Cycle

Table 1: Duty Cycle Tolerance across Frequency Range

Frequency Range	Duty Cycle Tolerance
F ≤ 5kHz	±2%
5kHz < F ≤ 10kHz	±3%
F > 10kHz	±5%

Note: Tolerance is given as a percentage of the period as opposed to a percentage of the Duty Cycle e.g. a Duty Cycle of 50% ±3% gives a range of: 47% ≤ D ≤ 53%.

Period Resolution and Frequency Selection

Useful Formulae:

$$Frequency = \frac{1}{Period}$$

$$Period = \frac{1}{Frequency}$$

The period resolution is the minimum increment available to the period parameter. Frequency selection is governed by the max/min limits of the period and the resolution of the period. Any frequency in the given range may be selected provided that its period is a multiple of 10µs.

For example:

3000Hz requires a period of 333.333µs which is not available.
Rounding this to the nearest 10µs results in a period of 330µs.
This provides the closest available frequency of 3030Hz.

Disclaimer

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Revision History

Date	Revision	Update No	Changes
10/01/2018	V3.5.2	01	First Release
24/01/2018	V3.5.3	01	UL compliance statement added.
25/01/2018	V3.5.3a	01	USB Connection section updated
12/03/2018	V3.6.0	01	Layout Support added
		02	Update to BACnet library
		03	Enhanced protection to uploading programs
		04	Optimisation of memory allocation to exports
		05	Optimisation of memory allocation to blocks
		06	New support for https access
		07	Ability for manually entering limit values for mimics
		08	Enhancements to remote XML option
		09	LED operation on TouchXL display changed to match plant touch
		10	Access to menus via LCD display version updated
		11	Up to 3 Optimisation blocks now permitted per plc
		12	Update to P2T blocks when setting via DM.
		13	Remote XML option permitted for Wi-Fi
31/05/2018	V3.7.0	01	Update to BACnet protocol to permit BBMD setup
		02	Compatibility update to optimisation block in older DMs
		03	Enhancements to Modbus comms
		04	Support for PWM's on V2 expansion boards.
12/06/2018	V3.7.2	01	Update to US date format on exports
		02	Update to Version page to show BACnet version
		03	Update to Analogue Sensor block
25/06/2018	V3.7.3	01	Update to mail setup
26/07/2018	V3.7.5	01	Enhanced language support.
		02	Added UL safety
		03	Improved support added for reading a Modbus Coil.
20/09/2018	V3.7.6	01	Update to Web Services handling of different time zones
		02	Added BTL approved BACnet stack.
22/10/2018	V3.7.6a	01	Block aliases of Occupancy and Optimisation updated.
		02	Description of Humidistat 2 block updated
26/10/2018	V3.7.6b	01	Update to PR0652 IO diagram
06/11/2018	V3.7.6c	01	End of line termination description added
09/11/2018	V3.7.7	01	Support added for new Mini IO expansion board
		02	Support added for new Stepper IO Auto-close expansion board
		03	Update to USB connection description
		04	Update to RDM USA group address details
14/12/2018	V3.7.7a	01	Update to program size description
25/01/2019	V3.7.8	01	Enhancements to Broadcast frequency
		02	Update to Web Services GetVersion
		03	Updated description to Daylight block
22/02/2019	V3.7.9	01	Minimise details shown on web page when Force CGI is on
		02	Update to Web Services to follow Force CGI Login checkbox. If checked, all functions require authentication
		03	Default user name and password is now unique to every device
		04	The user 'install' can only access devices locally
07/05/2019	V4.0.0	01	New dark & light themes
		02	Updated menu layout
		03	New Login activity feature
		04	Increased character count of auto export destination
		05	Added Modbus write only function
		06	Enhancements made to CAN bus communication speed for solutions utilising six expansion boards or less.

		07	Custom Home screen
		08	New graph user interface
		09	User lock out after 5 failed attempts
		10	Compatibility added for connecting device to DMTouch V3.1.0
09/07/2019	V4.0.1	01	Amalgamation of Intuitive V2 and Intuitive Mini into single document
		02	New feature to append time and date to downloaded tdb
		03	Enhancements to mimics within Custom Home Page

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